TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers all Tecumseh Peerless® gear products as follows:

100 Series Differentials
MST200 Series Transaxles
300 Series Transaxles
600 Series Transaxles
601 Slow Speed Transaxle
700 Series Transmissions
700H Series Transmissions
800/801 Series Transaxles
820 Series Transmissions
900 Series Transaxles
910 Series Transaxles
915/940 Series Transaxles
920 Series Transaxles
930 Series Transaxles
1000/1100 Series Right Angle/T-Drives
1200 Series Transaxles
1300 Series Transaxles
2300 Series Transaxles
2400 Series Transaxles
2500 Series Transaxles
2600 Series Transaxles
VST Transaxles

TECUMSEH & PEERLESS
TRANSMISSION and DRIVE PRODUCTS

TECUMSEH®
ENGINES & TRANSMISSIONS

Form No. 691218 R 1/02

IMPORTANT NOTICE!

SAFETY DEFINITIONS

Statements in this manual preceded by the following words are of special significance:

or

WARNING indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

NOTE

Refers to important information and is placed in italic type.

It is recommended that you take special notice of all items discussed on each page and wear the appropriate safety equipment.

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CHAPTER 1. MODEL OVERVIEW AND TERMS USED

TECUMSEH/TRANSMISSIONS UNITS

GENERAL

Manufactured since 1945, Tecumseh/Peerless gear products are found in many products worldwide. Applications vary from industrial products to residential and commercial lawn and garden equipment.

This book is intended for use by properly trained technicians that have appropriate facilities and the proper tools. If you are not a Tecumseh trained technician, DO NOT attempt a repair. Consult an Authorized Tecumseh Servicing Dealer.

IDENTIFICATION OF MODELS

All units manufactured since 1964 have identification numbers located on an attached tag or are stamped into the case. This information is required to obtain parts or replacement units. We have included illustrations on page 9 of this book to assist you in locating them.

TRANSAXLES

The term transaxle is a combination transmission and differential in one case. Tecumseh transmissions and transaxles are manufactured in many different gear ratio combinations from one to seven forward speeds with one reverse.

600 Series The 600 series is a lightweight transaxle used in riding mowers or similar applications. The 600 series has a vertical input shaft at the top of the aluminum case. Variations in the series (which determine the specific model number such as 603, 603A, 609 etc.) include:

1. Shift lever shape.
2. Axle lengths.
3. Axle machining for wheel hub attachment.
4. Axle housing variations.
5. Size of the brake shaft.

There may be other slight differences, however, these are present as a result of product improvement which are not options to an O.E.M. (Original Equipment Manufacturer).

800 Series This unit has 3 to 6 speeds forward and 1 reverse. This transaxle features bronze oil impregnated bushings with needle bearings or ball bearings on the axles, input and output shafts.

820 Series With 2 to 6 speeds forward and 1 reverse, this transaxle is built for heavy duty applications including use with ground engaging attachments. Sleeved needle bearings are used in place of oil impregnated bushings on all shaft ends and ball bearings are standard on the axles. The 820 also features steel cut gears for maximum durability.

900 Series This unit is similar to the 800 series transaxle with the added feature of 2, 3, or 4 speeds forward and 1 reverse.

910 Series The 910 series transaxle offers a forward and reverse unit. The speed changes with the use of a variable-drive pulley arrangement.

915/940 Series This unit has 3 to 5 speeds forward and 1 reverse. Reverse is gear driven instead of chain driven and the case is contoured around the gears.

920 Series The 920 series offers 3 to 7 speeds forward and 1 reverse. The shifter/brake shaft is similar to the 800 series shifter/brake shaft.

930 Series This unit has 3 to 7 speeds forward and 1 reverse. The transaxle is very similar to the 920 series except the differential and shifter/brake shaft are different.

The MST Series The MST (Manual Shift Transaxle) is a sealed unit which uses 16 oz. (473 ml) of 80W90 gear lube (part #730229B). The MST series is available with up to 6 speeds forward and one reverse and has a contoured case and cover.

1200 Series The distinguishing feature of the 1200 series transaxle is that the axle support housings are pressed in from the inside of the case and cover. Therefore they are not readily removable until the unit is completely disassembled. The case is cast iron for rugged, longtime use.

2300 Series Generally similar to the 1200 series transaxle. The distinguishing features are a more massive case and a larger shift lever opening machined area. The obvious difference from the standpoint of application is that these units have four speeds forward and will be found on equipment that can be used with ground engagement operations.

NOTE: The 1200 and 2300 series transaxles are fairly similar in appearance, but do have recognizable characteristics. Both of these units have cast iron cases for rugged applications, although the 2300 series is the only unit that can be used with ground engaging applications.

HYDROSTATIC GEAR REDUCTION AND DIFFERENTIAL UNITS

GENERAL

These units do not have a transmission function characteristic of transaxles, but rather, are designed to reduce input speed to a suitable axle speed and torque range. The hydrostatic units which mate to these units perform the transmission function.

1300 Series This unit is the hydrostatic counterpart of the three-speed forward unit (1200). It has an aluminum casing and pressed-through axle support housings, which is characteristic of the 1200 series. The hydrostatic pump is made by Eaton® Manufacturing and is not serviced by Tecumseh Service Dealers.

2400, 2500 & 2600 Series This series of hydrostatically driven reduction gear and differential units can be used in ground engaging operations such as plowing. The hydrostatic pump is manufactured by Sundstrand® Corp.

TRANSMISSIONS

Transmissions manufactured by Tecumseh consist of a shifting mechanism to take a constant input shaft speed and reduce it to the desired output speed. Transmissions need a belt drive or chain drive/differential assembly to deliver power to the wheels.

700 Series This unit can be 2, 3, 4, 5 & 6 speeds forward and 1 reverse. The brake system can be mounted on either side of the unit.

700 "H" Series This unit is built with almost all interchangeable parts within its two cases except with an "H" shift pattern. This unit has 3 or 4 speeds forward and 1 reverse.

DIFFERENTIALS

The 100 series is a self-contained differential/axle unit. It features hardened or non-hardened axle shafts of various lengths and is machined with many variations for hub attachment. The case is cast aluminum and the differential gears are sintered metal (powdered metal) or cut steel. The differential pin is held in place by the four retaining cap screws. Oil Lite bushings reduce friction during differential operation. The drive sprocket is part of the unit which, depending upon the application, can be of several diameters in size thus having a different number of gear teeth. This sprocket is often supplied by the O.E.M.

ANGLE DRIVES

These units are used primarily to change the direction of drive at the point where the working equipment attaches. They can be assembled for right or left hand rotation so that they can be used in various combinations for synchronous operation.

Right Angle Drives These units consist of input shafts, output shafts, and the beveled gearing necessary to change the direction of power at right angles. If the bevel gear (drive gear) on the input shaft is turned around and moved to the other side of the case (opposite end of the shaft), the output shaft will rotate in the opposite direction.

A cover identifies each unit as being either a left hand (LH) or a right hand (RH) right angle drive. The cases and bearings are identical in both drives.

"T" Drives The "T" drive is essentially the same as the right angle drive except that the input shaft extends out the other side of the case to transmit power in the same line to additional right angle drives or other equipment.

Shafts, Couplings, Pulleys, etc. These items are part of complete units and are used to connect angle drives, and other attachments. The serrated couplings match the serrations on the shafts of the angle drives and connecting shafts.

TERMS USED

AXLE - The shaft which connects the wheel or hub to the differential unit and transmits force back to the wheels.

AXLE HOUSING (or AXLE SUPPORT) - An extension of the case and cover to support the outer ends of the axles. Because the housing is visible, it is often the best means of distinguishing the series in question.

BEARING BLOCK (Strip) - Used to support the ring gear of the differential.

BEVEL (on a gear) This is a chamfer or roundness of the meshing side of the gear teeth to permit easy shifting. For instance, with "H" shift pattern transaxles, this is about the only allowance that can be made to make shifting easier. Input power should be stopped before shifting to keep these spur gears from developing wear.

BEVEL GEAR - A gear with teeth ground on a diagonal so that when it meshes with a second bevel gear, power is transmitted at an angle. If the angle is 90°, the gear is known as a MITER GEAR.

BEVEL PINION - The smaller of two meshed bevel gears in a gear train.

BRAKESHAFT/SHIFTER BRAKESHAFT) - The shaft on a unit (Transaxles or Transmission) to which a braking system may be attached. It is usually larger in diameter than the input shaft due to its function of taking shock loads experienced in braking.

CASE - That bottom half of the gear box which contains the shift lever , axle and brake shaft openings. The other half is the COVER. Unit reassembly is normally done into the case with variations listed by individual model.

CHAMFER - In gear products, chamfers provide two main functions. The first is to reduce gear wear at the leading contact point as two gears mate. The second purpose is to act as a ramp for shifter key compression through the shift washer prior to gear engagement. The chamfer in the washer is either stamped or machined in.

COUNTERSHAFT - A splined shaft which hold spur gears that are in constant mesh with shift gears and transfer input power to the shift gears.

COUPLING - A sleeve to connect two serrated or splined shafts in the same axial plane. Used in right angle drive systems, 700 series, output shafts or in a hydrostatic drive connecting the pump and motor to the gear drive of a transaxle.

COVER - The top half of a horizontally parting gear box such as 700,800,900 and MST models. The cover normally contains the input shaft, bearing(s) and the input bevel gear. The shaft may change location in the cover based on the OEMs mounting position.

DIFFERENTIAL GEAR BOLTS - Through bolts holding the differential parts together. The heads of these bolts must be opposite the output shaft gear (except in the 2400 series). This is an early check to see that the unit is being assembled correctly.

DOWEL PIN - An alignment pin used to align the case and cover and other parts in a transmission or transaxle. The dowel pins should be installed to hold the parts in alignment before tightening the retaining screws. Failure to install dowel pins first will usually lead to a unit that binds after assembly.

DUO-TRAK™ DIFFERENTIAL (Trademark -Illinois Tool Works) - A type of differential which increases torque to the tractive wheel to keep it turning. However in situations where differentiation is necessary (as in turning), the unit acts much like a regular differential.

EQUIPMENT - The complete assembled product (riding mower, tractor etc.) which uses of the drives listed in this manual.

HEAD ASSEMBLY - A complete unit containing all parts of one right angle or "T" drive assembly of a right angle drive system. The head assembly is permanently lubricated and sealed.

IDENTIFICATION NUMBER - See **MODEL NUMBER**

IDLER - A gear used in a gear train to transfer motion or direction. The gear rotates independently of the shaft upon which it is located.

INPUT OR INPUT SHAFT - The part of a unit which is always connected to the drive. Its rotational speed is dependent on the driving mechanism. The input shaft brings power to the unit.

LIMITED SLIP DIFFERENTIAL - See **DUO-TRAK™ DIFFERENTIAL.**

MITER GEAR - One of a pair of interchangeable bevel gears with axles at right angles. Since all bevel gears are miter gears, the terms can be the same.

MODEL NUMBER - The identifying number of a unit which will permit selection of the proper parts to repair that unit.

NEUTRAL SPACER - A single or split collar between forward and reverse gears that the shift keys engage into when the unit is in neutral.

OIL SEAL, SINGLE LIP/DOUBLE LIP - An oil seal with one or two sealing surfaces to prevent entrance of foreign matter and leakage of lubricant.

OIL SEAL, (SQUARE CUT O-RING)- A seal with two external and two internal sealing surfaces. Used in the shifter housing.

OUTPUT, OR OUTPUT SHAFT - On a transaxle, the shaft that contains the output pinion which is in direct mesh with and drives the differential. The output shaft on a transmission contains the sprocket for driving the axles. The output shaft is driven by the large **OUTPUT GEAR.**

OUTPUT SHAFT GEAR - The importance of defining this gear is to point out that it must be opposite the differential bull gear (except the 2400 series).

GEAR REDUCTION AND DIFFERENTIAL UNIT - A unit that reduces a high R.P.M. input speed to a suitable axle speed without the use of a transmission. Since there is a single gear train, there is a single input speed to output speed ratio, however, axle speeds are infinite, depending upon input speed.

REVERSE IDLER (915 Series) - The gear located between the reverse gear of the countershaft and the reverse gear of the shifter/brake shaft that allows the drive to operate in the opposite direction.

REVERSE IDLER - A gear added to the gear train so when in mesh, the direction of all gears driven after it is reversed. Its number of teeth also affects the reverse gear ratio. The center gear of the three gear cluster is always in mesh with the **REVERSE IDLER**, and the large shifter gear always shifts into it.

RIGHT ANGLE DRIVE / HEAD ASSEMBLY. The major operating parts are a pair of miter gears. The assembly consists of other right angle or "T" drive head assemblies and connecting hardware.

SEAL - A material which prevents lubricant from leaking past a rotating shaft. It can be a rubber or square cut "O"-ring, a sealing-type ball bearing, or most commonly, a rubber sealing surface encased in a metal form.

SEAL RETAINER - Found on some models of transaxles and on right angle drives.

SHIFT COLLAR - A round collar which retains shift keys onto the shifter/brake shaft. The shifter assembly pin (or pins) slide into the groove on the collar to move the shift keys.

SHIFT GEARS - The gears on the shifter/brake shaft that are in constant mesh with the spur gears of the counter shaft. The shift gear is engaged by the shift keys and it's size determines the speed of output by the axles.

SHIFT KEY - One of either two or four metal spring steel keys, which are held in the keyways of the shifter/ brake shaft by a shift collar. The shift keys are used to slide through the shift gears and engage the desired gear or speed.

SHIFT KEYWAY - One of either two or four slots in the shifter/brake shaft for the shift keys to slide through for gear selection.

SHIFT WASHER - The shift washer provides a ramp to gradually compress the shift key prior to engagement with the gear. We have used two types in production; the newer style has the chamfer stamped into the washer. Earlier production washer's had the chamfer machined in.

SHIFTER ASSEMBLY - Consists of a shift rod, shift fan, shift arms and shift pin or pins.

SHIFT LEVER - The lever by which the operator manually changes the shifter gears to vary reduction speed ratios in the transmission. The configuration of the lever is variable and is often the only reason for a unit being given a new model number.

SHIFTER FORK - A mechanical arm which is connected to the shifter rod to position the shifter gear at an exact spot axially along the shifter shaft.

SHIFTER GEAR, LARGE (600/2300) - This gear transmits 1st gear, reverse gear (and 2nd gear in 4-speed units) ratio force to the output shaft. It is beveled on both sides.

SHIFTER GEAR, SMALL (600/2300) - This gear transmits 2nd and 3rd (3rd and 4th in a 4-speed unit) gear ratio force to the output shaft. It can have two different beveled tooth diameters or it can have a beveled spline to engage 3rd (or 4th) gear through an additional splined shaft.

SHIFTER HOUSING (600/2300's) - This housing contains the shift lever and must be re-installed in the proper position to function correctly. If the housing does not already have guide marks, scribe the shifter housing and transmission case before removal.

SHIFTER ROD - One of two similar smooth rods of equal length with grooves which match the fork positioning with meshed positions of the shifter gears and those of the three gear cluster. Each rod has a snap ring to act as a fork stop, but can also be used to determine how the fork is assembled to it.

SHIFTER SHAFT - A splined shaft which meshes with the internal splines of the shifter gears, to transmit force to the output shaft gear. On in-line transmissions and transaxles the shaft has machined channels to accommodate the shift keys.

SHIFTER STOP (600/2300's) - A stamped metal plate which separates the shifter forks. The stop has a notch cut in it which corresponds to the neutral position on the shifter forks and rod. The shifter lever must return the engaged fork back to neutral before it can actuate the other fork.

SPROCKET - A geared wheel designed to turn a chain drive. Sprocket diameters vary and are available in different sizes for changing output ratios.

SPUR GEAR - A gear having the shaft bore and teeth in a parallel plane.

"T" DRIVE - A right angle drive with an input shaft extending thru the case to transmit power axially in a second direction to the right angle output. On "T" drives with dissimilar input and output ends, care must be taken to insure that the parts do not run in reverse when reassembled.

THREE GEAR CLUSTER (2300) - A three gear assembly in mesh with the input shaft. The gears are of different sizes to change gear ratios when meshing with the two shifter gears.

THRUSTER RACE - A thrust washer in which the outer edge is cupped to fit the outer diameter of a thrust bearing. This fit positions the thrust race concentric with the axle diameter. It further acts as a thrust washer.

THRUST WASHER - A flat polished surface separating metals of different hardness. It also acts as a spacer between shafts and the case and cover.

TRANSMISSION - A system of varying sized gears in a case, some of which can be moved along a shaft to vary the gear ratio in a unit. The net effect is to change speeds to the rear wheel according to the type of work being done.

UNIT - A general term for Tecumseh/Peerless Transmission products.

GENERAL SERVICING PROCEDURES

The following service procedures should be understood and practiced whenever service is needed on a Tecumseh transmission or drive product.

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

Before removing a unit (Transmission product) from any equipment, look for and ask the customer about:

1. Loose, worn or glazed drive belts.
2. A misadjusted or badly worn clutch or belt tension.
3. Loose/lost set screws and or sheared keys in drive, driven pulleys or axle.
4. Oil saturated drive belts or clutches.
5. Bad operating habits, such as clutch riding or not clutching when shifting.
6. Oil leaks.
7. If possible operate the equipment to help isolate the problem.
8. Review Service Bulletin 304.

Removal of the unit from the equipment:

1. Raise the equipment so the transmission or transaxle is accessible. Use wood blocks to prevent equipment from shifting. Do not use bricks, cement or cinder blocks.
2. Visually inspect the Tecumseh unit for oil leaks, a cracked housing, binding or rubbing of parts, or other symptoms of malfunction.
3. Use a jack under the unit to support it's weight when attachments are removed.
4. Remove wheels, drive belts, pulleys, chains and other associated equipment from the unit. Be aware of positioning of parts. Use a scribe mark, if in doubt, to reassemble parts quickly and accurately.
5. If the shifter lever will interfere with removal of the unit in anyway, remove it before unit removal. These can easily be bend out of shape.
6. Remove all attached hardware holding the Tecumseh/Transmission unit to the equipment on the case, cover, axle supports, brake and shifter.
7. Remove the unit from the equipment.

Preparing for disassembly of a unit:

1. Visually inspect for evidence of oil seepage, tampering, misalignment, freedom of rotating shafts, etc.
2. Clean the unit thoroughly of any dirt, oil and debris.
3. Remove the shift housing and drain the lubricant from unit. Observe the old lubricant to see if metal particles are present.
4. Check axle shafts carefully for smoothness. Use crocus cloth or a Scotch-Bright™ pad to rub down high spots and eliminate rust or paint from the shafts.
5. Check the model and specification number and remember to have the exploded parts diagram accessible during disassembly.
6. Have on hand seal protectors, drivers, shop cloths, appropriate tools and this technicians handbook while servicing a unit.

OIL LEAKS, SEAL AND GASKET SERVICE

Tecumseh units contain various styles and sizes of oil seals. The function of any oil seal is to seal inward to prevent lubricant leaks and prevent outside debris from entering the unit. Seals can be **single lipped** with the sealing edge facing inward or **double lipped** sealing inside and out.

GUIDELINES TO REMEMBER

1. Other than leaking seals, gaskets and "O" rings, leakage can occur due to a cracked case or cover, flats on shafts, porosity (rarely, if ever), and worn bushings and shafts.
2. Replace ALL seals/gaskets if disturbed. The small cost of installing new seals is small in comparison to a dissatisfied customer and the cost of rework.
3. Some seals have a "Redicoat" sealant applied, while others may need a thin coat of RTV silicone to the outer shell upon installation.
4. The surface over which the seal makes contact must be free of all cuts, scratches, high spots and rust. The shafts should be smooth, shiny and a thin film of light oil applied. Seal protectors must be used to clear keyways, splines, or other machined sharp edges on the shafts.

TORQUE VALUE TROUBLESHOOTING GUIDELINES

ALWAYS torque all fasteners to the appropriate value as listed in Chapter 1 page 9.

Over-tightening can strip the threads in the cases or on a fastener. It also can over-compress gaskets, and possibly cause binding in the unit.

A cross-tightening sequence to half the torque then finally to full torque value is a recommended procedure to prevent comebacks (repair returns).

Under-tightening fasteners can cause oil leakage, loosening of attaching parts, and possible shifting of the internal parts which may bring about a complete failure.

BASIC TESTING

The absence of binding and oil leakage are the best indications that the unit has been properly reassembled. Though other, more elaborate tests can be done, the following procedures are accurate and the preferred method for a quick check of the unit.

On an "H" shift pattern drive with the shift forks in neutral, rotate both axle ends in the same direction. They should turn smoothly although a little effort may be necessary. The brake shaft should rotate whenever the axles turn together, but in neutral, the input shaft should not turn. By moving any shifter gear into mesh, a greater drag should be felt on the axles, and both the input and brakeshaft should turn. For ease in turning the various shafts, insert a tool (such as a punch or a socket head screw key) into the keyway, however, do not force if the shaft is binding.

Potential reasons for binding in the unit could be:

1. Gaskets were left out on reassembly or installed incorrectly.

2. Oil seal retainers, differential, thrust washers, shifter stop or oil seal retainers were installed improperly.

3. The shifter assembly or spacers were installed incorrectly.

4. Foreign matter could be blocking the gear teeth that are in mesh.

5. The input shaft was not properly seated in the case.

6. The case and cover could be mis-aligned (dowel pins were missing).

7. The bearing(s) do not have the lock tabs or notches in the correct position.

For more information, consult the troubleshooting section.

LUBRICATION CHART

Check the Transmissions unit model and specification number before filling with lubricant. There may be a difference in the quantity recommended. This is dictated by the design of the vehicle and position of the transmission unit installed.

Model No.	Quantity
300	Sealed
600	24 oz./710 ml Oil
800	30 oz./887 ml Grease
801	36 oz./1065 ml Grease
820	36 oz./1065 ml Grease
900	26 oz./769 ml Grease
910	18 oz./532 ml Grease
915/940	10 oz./296 ml Grease
920	30 oz./887 ml Grease
930	30 oz./887 ml Grease
1200 1305 1309 1313	48 oz./1420 ml Oil †† 32 oz./946 ml Oil
1301 1302 1303 1304 1306 1307 1308 1310 1311 1312 1314 1315 1316 1317 1318 1320 1321 1322 1325 1328	 44 oz./1301 ml Oil
1329 1319 1323 1326	 24 oz./710 ml Oil
1327	
MST	16 oz./473 ml Oil
2300	64 oz./1892 ml Oil
2400	32 oz./.946 ml Oil
2500	†
2600	†

Model No.	Quantity
700	12 oz./355 ml Grease
700H	12 oz./355 ml Grease
2800	†

Model No.	Quantity
All Models Except *	4 oz./118 ml Grease
*1408-P91 *1409-P91 *1410-P91 *3002 *3003 *3028 *3029 *3035	 3 oz./89 ml Grease
1000 Series	6 oz. / 180 ml SAE E.P. 80W90 Oil
1100	16 oz./473 ml Oil
DIFFERENTIALS	
All Models	3 oz./89 ml Grease
TWO SPEED AXLE	
All Models	2 oz./59 ml Grease
THREE SPEED AXLE	
All Models	2 oz./59 ml Grease

NOTICE

Grease: Bentonite Grease
Part Number 788067C

Oil: SAE E.P. 80W90 Oil
Part Number 730229B

† Refer to O.E.M. Technician's Manual for type of lubricant and capacity system

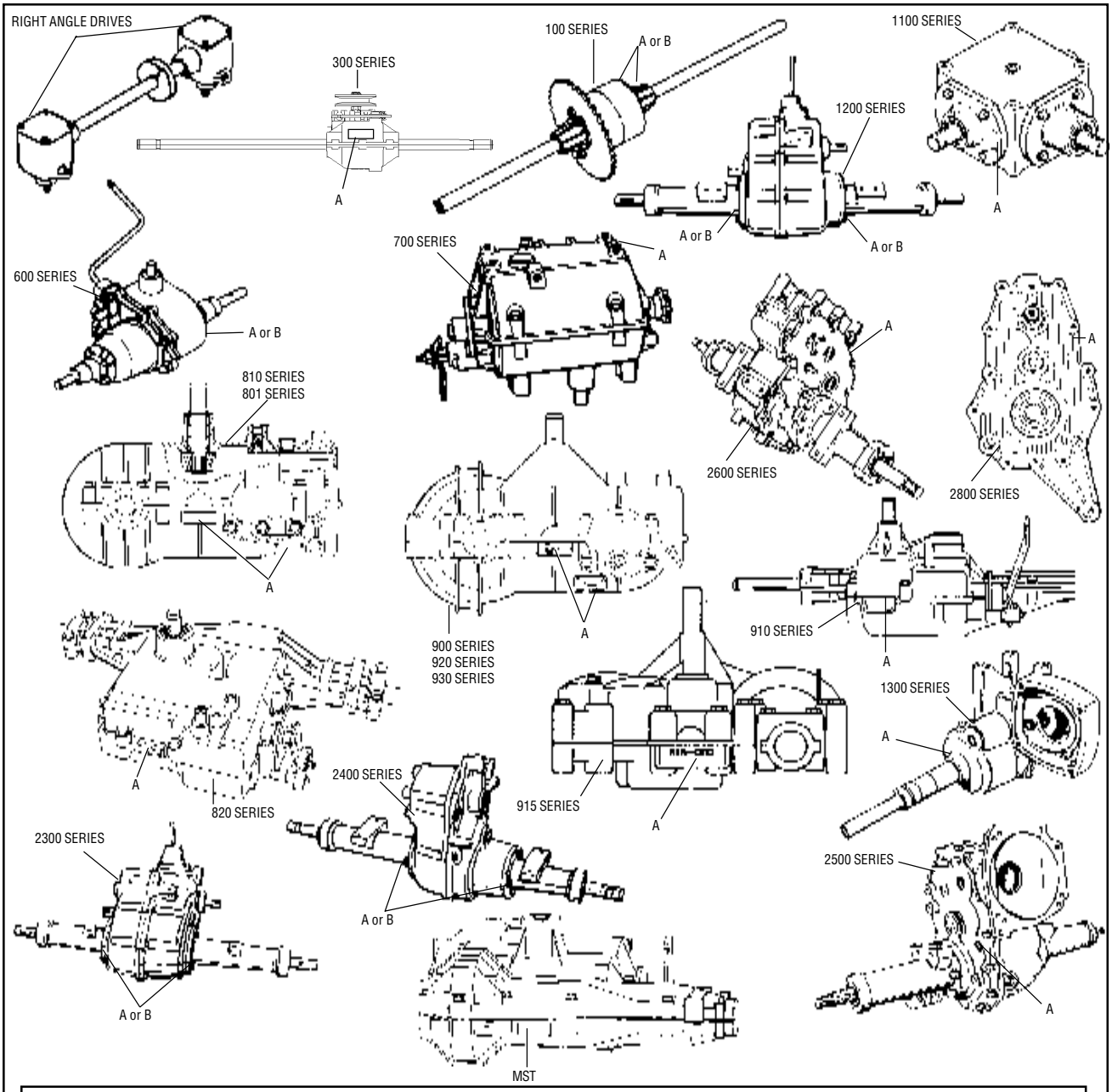
†† To be filled through shift lever opening

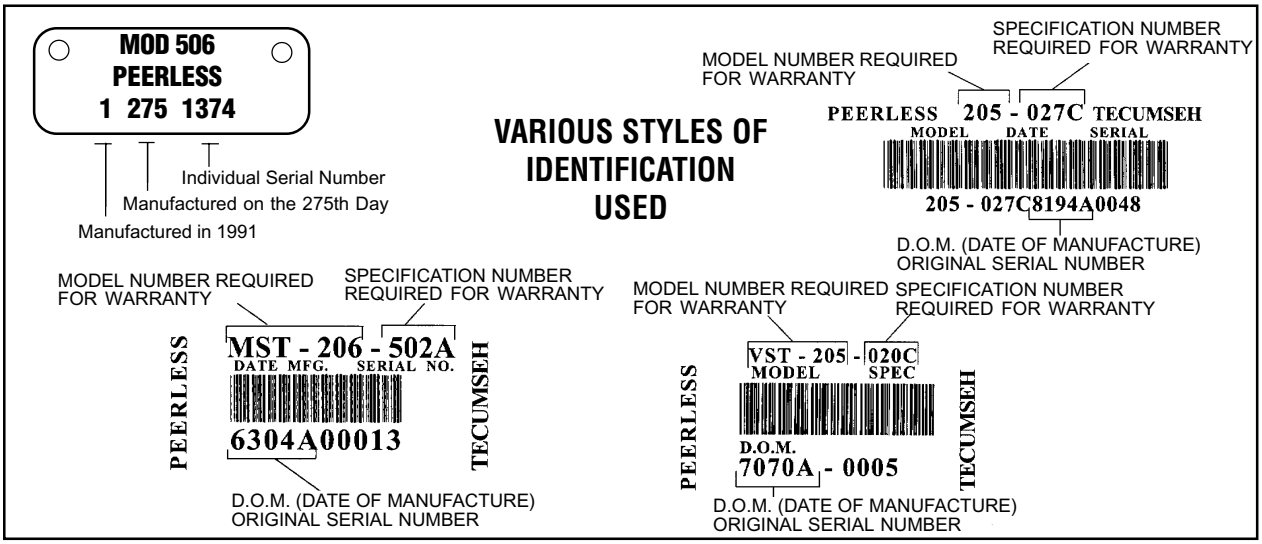
TORQUE VALUES CHART

MODELS PART	AFFECTED	IN-LBS	FT-LBS	NM
Bolt 5/16-18 (Housing)	100 Series	228-264	19-22	25.8 - 29.9
Nut 5/16-18 (Housing)	100 Series	120-156	10-13	13.6 - 17.7
Bolt 1/4-20 (Case to Cover)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 5/16-18 (Axle Support Housing)	600 Series	156-180	13-15	17.7 - 20.4
Bolt 1/4-20 (Shift Lever Housing)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Brake Disc)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Case to Cover)	800 & 900 Series (Except 820)	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Brake Disc)	800, 900 & MST Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16-18 (Case to Cover)	820 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Bearing Cap)	820 Series	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Differential)	820 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Brake Disc)	820 Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16 x 18	1100 Series	180-216	15-18	20.4 - 24.5
Bolt 5/16 x 18	2800 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Case to Cover)	1200 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1200 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1200 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1300 Series	90-110	7.5-9.2	10.2 - 12.5
Bolt 1/4-20 (Differential)	1300 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1400 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1400 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 5/16-18 (Axle Support Housing)	2300 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Differential)	2300 Series	84-120	7-10	9.5 - 13.6
Bolt 3/8-16 (Axle Support Housing)	2300 Series	240-312	20-26	27.2 - 35.4
Bolt 1/4-20 (Case to Cover)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Axle Support Housing)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Differential)	2400 Series	84-120	7-10	9.5 - 13.6
Bolt 5-16/18 (Case to Cover)	2500 Series	180-216	15-18	20.4 - 24.5
Bolt 3/8-16 (Differential)	2500 & 2600 Series	420-480	35-40	47.6 - 54.4
Bolt 1/2-13 (Axle Support Housing)	2500 & 2600 Series	720-780	60-65	81.6 - 88.4
Screws No. 10-24 (Cover)	R.A.D.	20-24	1.6-2	2.2 - 2.7
Bolts 1/4-20 (Retainer Cap)	R.A.D.	90-110	7.5-9.2	10.2 - 12.5

NOTE: On all units containing two jam nuts, secure brake lever, hold the bottom nut and torque the top nut to 100 in. - lbs. (11.3 Nm).

Differential Bolts	7 ft. - lbs. (9.5 Nm)
“T” Drive Bolt	8-11 ft. - lbs. (10.9 - 15.0 Nm)
“T” Drive Cover Screw	20-24 in. - lbs. (2.24 - 3.7 Nm)





Early Models were not identified with a model number on the unit.

THE MODEL NUMBER WILL BE FOUND ON: A. Metal tag or decal attached to unit as illustrated.
B. Stamped on unit as illustrated.

Identification Number Locations

TROUBLE SHOOTING TABLE

THE FIRST RULE IN TRANSAXLE TROUBLE SHOOTING IS TO ISOLATE THE PROBLEM TO THE TRANSAXLE. THE TECHNICIAN MUST CHECK FOR PROPER ADJUSTMENT OF THE BELTS, BRAKE, CLUTCH, SHIFTER AND LINKAGES. THE PULLEYS NEED TO BE CHECKED FOR SHEARED RETAINERS AND PROPER BELT DISENGAGEMENT. IF THE PROBLEM IS RELATED TO SHIFTING DIFFICULTIES, REMOVE THE DRIVE BELT AND RECHECK THE SHIFTING TO ASSURE THE PROBLEM IS NOT WITH THE ASSOCIATED EQUIPMENT.

With the engine off, shift through the gear sequence. Only light resistance should be felt. If the unit shifts hard the problem is in the transaxle. Otherwise, check the following areas: the clutch adjustment, brake adjustment, belt release and the belt guide positioning.

All current gear drive units are in-line shift and use shift keys to engage the desired gear to lock and then rotate with the shaft. This type of unit requires the transaxle or transmission to be in a no load condition (the clutch engaged) when gear selection occurs. Depressing the clutch pedal and therefore engaging the clutch, allows the unit to have the input and brake forces removed from the gears and shift keys, which allows the unit to shift freely and easily. Improper shifting (shifting while on an incline, shifting while towing any type of load, or shifting without clutch engagement) forces the shift keys to engage into a gear that is in a loaded condition. Improper shifting leads to premature wear and failure of the shift keys and drive gears and is considered abuse. Tecumseh's limited warranty covers only transaxle or transmission failures that are the result of a defect in the material or workmanship of the unit, not failures caused by normal wear or abuse by the operator.

Some Original Equipment Manufacturers (OEM)'s use Tecumseh transaxles and transmissions in lawn tractors that do not use a foot operated clutch. These lawn tractors combine the clutch release mechanism with the hand operated gear shift lever. When the gear shift lever is moved through the shift gate from the gear engagement position toward the neutral position, the attached clutch linkage moves the idler pulley to release all input drive belt tension from the transaxle input pulley. With the drive belt tension released (clutch engaged), the transaxle is able to shift while on an incline or while towing any type of load. Remember, the Tecumseh Peerless limited warranty covers defects in the material or workmanship. It does not cover worn shift keys or gears caused by clutch/belt linkages not adjusted correctly.

Isolate Unit from Transaxle

Use the following procedure to determine if a hard shifting condition is caused by the shifter/clutch linkage or an internal problem in the unit.

1. On level ground, start the engine and with engine running proceed to shift through the gears with the clutch pedal depressed (engaged).

2. If shifting is difficult, try shifting the transaxle with the engine shut off.

3. If the transaxle shifts freely through each gear with the engine shut off, the cause of the shifting problem is external to the unit. **DO NOT REMOVE THE TRANSAXLE.**

4. If shifting the unit with the engine shut off is difficult then disconnect the linkage from the shifter rod and shift through the gears with an open end wrench and compare the shift effort.

5. Check the clutch, shifter, and brake linkage for the proper adjustment by using the guidelines provided by the owner's manual or the Technician's Handbook for that specific equipment.

6. Hard shifting with the engine shut off can be caused by:
   a. bent or binding shift lever or linkage.
   b. shift linkage out of adjustment.
   c. corrosion in the transaxle or transmission.
   d. damaged shift keys, gears or shifter brake shaft.
   e. missing or misadjusted belt guides (see the (OEM's specs).

NOTE

DO NOT REMOVE TRANSAXLE UNTIL YOU HAVE CHECKED ITEMS 6A AND 6B.

If the problem is internal, remove the transaxle from the equipment, disassemble and determine the cause.

TROUBLESHOOTING TABLE

PROBLEM	REMEDY
UNIT CANNOT BE SHIFTED (OR DIFFICULT TO SHIFT)	
Gears installed incorrectly	Review positioning of gearing.
Forks and Rod assembly installed incorrectly	Remove assembly, recheck and correctly position parts.
Axle Housing installed incorrectly or not tightened correctly/ Axles cannot be turned (in the same direction) while unit is in Neutral	Seal retainers are not properly sealed. Tighten axle housing bolts.
Shifting lever improperly positioned	Determine if finger of shifting lever is correct for the unit and is correctly installed. Make sure shift lever housing has the required gasket.
Shifting keys broken or damaged	Replace keys and check unit for additional damage.
Shifting washers in backwards	Chamfered side on the inside diameter of the washer must face the tips of the keys.
Shifter/Brake shaft keyways damaged	Remove nicks and burrs from keyway.
Shift lever housing misaligned to case	Check if alignment marks on unit are correctly positioned. Also, determine if bend on shaft is in correct position.
Equipment clutch not engaging	Adjust clutch according to the operator manual of the equipment.
Shifter stop assembled backwards	Determine that the notch in the shifter STOP aligns with shifter forks in the NEUTRAL position.
Shift gear chamfer is positioned on the wrong side	Check that bevels on shifter gears are correct (fork flanges should be toward each other). On three-gear cluster models, the small gear and medium gear chamfers go down toward the larger gear. In-line models have the chamfer side of the gear facing toward the brake disc.
Improper fit of case to cover	Recheck positioning of thrust washers. A misplacement or omission of a washer can cause binding. Be sure that all tabs are down in the corresponding notches located in the case.
Dowel pins not installed	Check the exploded view for a correct assembly of parts.
Gears improperly installed	Check the exploded view for a correct assembly of parts.
Input shaft not properly installed	Input shaft spline must fit into the gear squarely and be tapped completely into the case.
Differential installed improperly	Re-check the positioning of the bolts in the differential. It must be opposite the output shaft gear (except 2400). In-line shift models need to have the differential gears centered so they will spin freely in the case with the cover removed.
Seal retainers improperly positioned	Check that seals are correctly installed.

TROUBLESHOOTING TABLE (Continued)

PROBLEM	REMEDY
UNIT JUMPS OUT OF GEAR	
Gear teeth are worn beyond tolerances	Replace worn gears.
Spring in shifter fork weak or broken	Replace spring.
Attaching screws for shift lever and housing assembly not properly torqued	Torque screws to 10 ft. lbs. (13.6 Nm).
Shifter/Brake shaft improperly assembled	Reassemble properly per exploded view
Keys weak or worn, shift gears damaged	Replace keys/Shift gears.
Shift lever bent and hitting unit frame	Replace shift lever.
Shift rod grooves worn	Replace shift rods.
Shift rod of improper length or grooving installed	Check rod length. Replace with correct part.
Constant mesh gears improperly installed on counter shaft	Reposition gears.
AXLES CANNOT BE TURNED (IN THE SAME DIRECTION) WITH UNIT IN NEUTRAL	
Axle housing not installed (or not tightened)	Seal retainers are not properly seated. Tighten axle housing bolts.
Burrs on gearing	Remove gear and debur with a sharpening stone.
Broken shifter stop allowing unit to be shifted into two speeds at the same time	Replace snap rings on shift rod out of groove.
Thrust washers in wrong position	Recheck thrust washer and if wrong, reposition.
Bearings not pressed in deep enough	Use the proper bearing tool to seat the bearing.
UNIT DOES NOT DRIVE	
Differential bevel gears broken	Replace.
Three gear cluster countershaft key sheared in Model 600	Replace.
Stripped teeth on gears	Replace.
Keys sheared in drive pulleys	Replace.
Broken input gear	Replace.
Shift keys broken	Replace keys/check keyways and shift gears.
Reverse chain broken (reverse only unless chain becomes wedged)	Replace chain.
UNIT IS NOISY	
Gearing is overly noisy chatter, etc.	Check oil/grease level.
Metallic pieces or other foreign objects in unit	Remove bits of broken metal, loose washers, etc.
Worn gears	Remove and replace with new gears.
Worn bearings, mainly input shaft ball bearing	Replace the bearing in question/check the belt tension.

CHAPTER 2. 300 SERIES

GENERAL INFORMATION

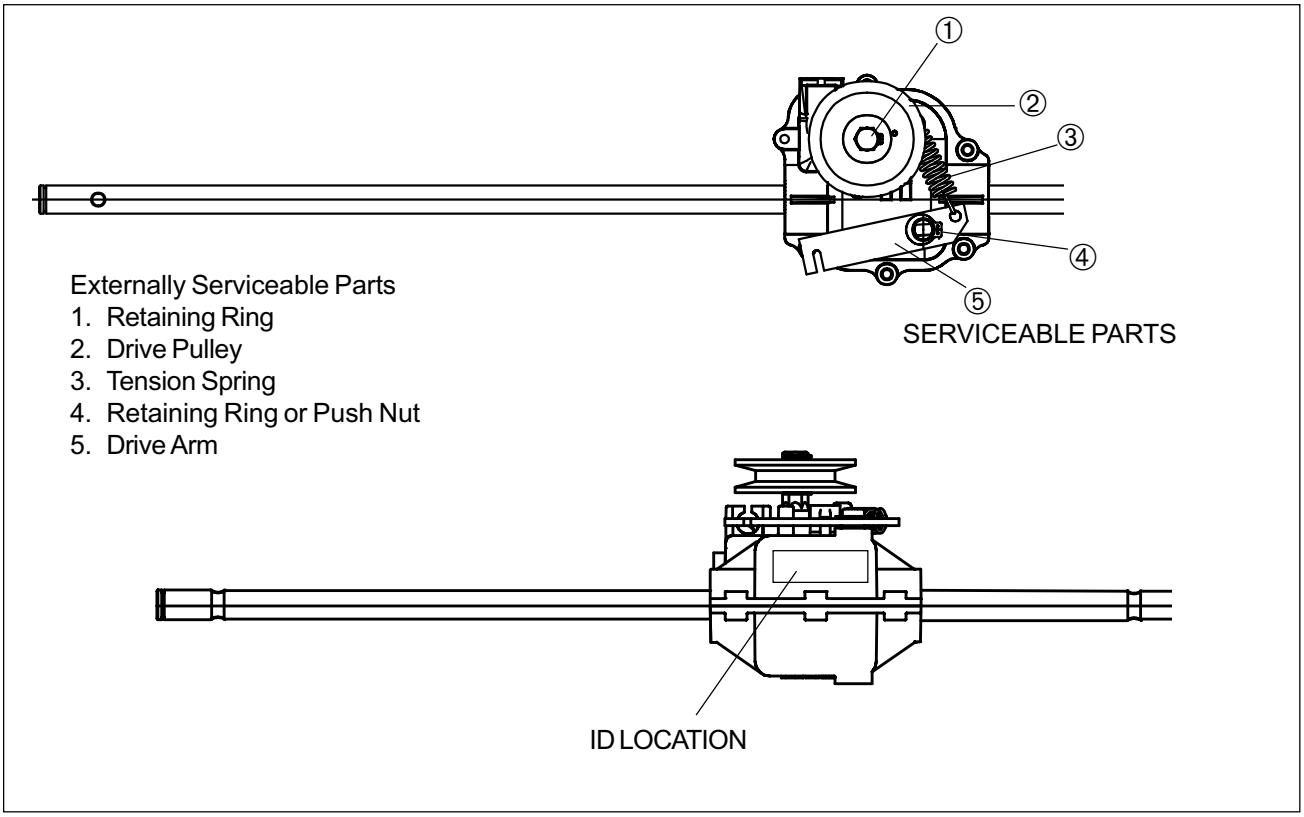
The 301 series is a single speed transmission manufactured in various styles to meet customer application needs. The unit uses synthetic lubrication and is completely sealed for life and therefore not internally serviceable.

Only the external parts listed below in the illustration are available from your normal source of supply.

Basic Troubleshooting

Should a drive problem exist, check the following:

1. Cable adjustment
2. Belt tension and mechanism
3. Drive lever operation
4. Check for worn or glazed belt or damaged pulley
5. Should the unit still not operate correctly replacement will be required.



Externally Serviceable Parts
1. Retaining Ring
2. Drive Pulley
3. Tension Spring
4. Retaining Ring or Push Nut
5. Drive Arm

CHAPTER 3. 600 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

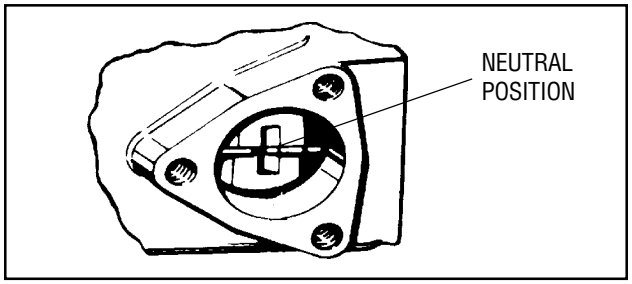
⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL INFORMATION

There are two types of 600 Series transaxles. One is the 600 standard series and the other is the 601-001, 002, 003, etc. slow speed series transaxle. This first section will deal with the standard 600 series. Please refer to the next section for information on 601 slow speed transaxle.

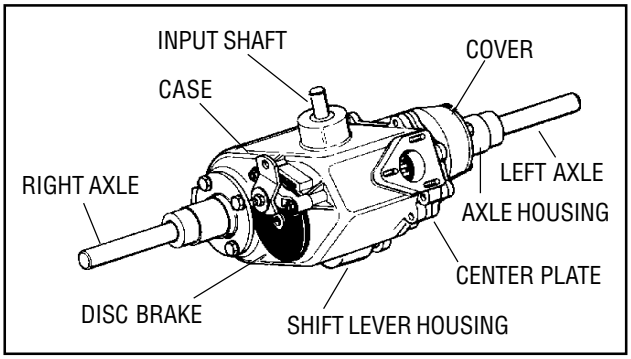
The 600 Series transaxle has an aluminum case and cover. The input shaft is on the top of the case to receive vertical shaft power from the engine. Some 600 series transaxles are equipped with an optional disc brake. Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

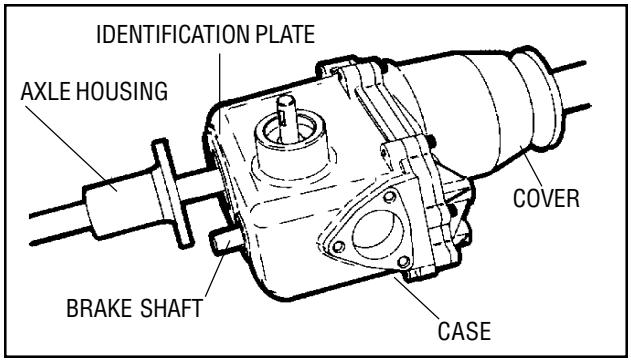
TRANSAXLE DISASSEMBLY



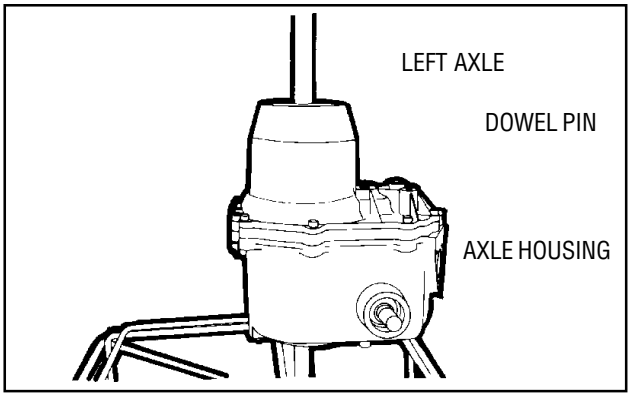
1. Clean the outside surface of the transaxle in an area away from where service will take place. Position the shift lever in the neutral position to ease disassembly of the transaxle. Remove the three screws holding the shift lever. Remove all keys from key ways, and remove all burrs and dirt from the shafts.

   On hardened shafts, use a stone or crocus cloth to remove any burrs and oxidation. All seals should be replaced whenever a shaft is pulled through a seal. Always use a new gasket whenever the gasket surfaces have been separated.

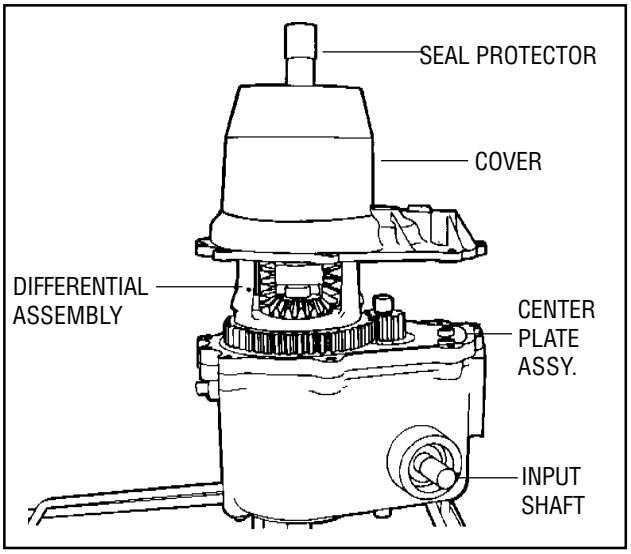




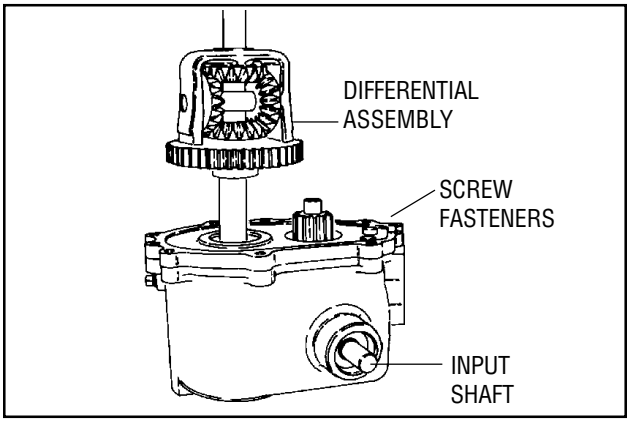
2. After removing axle housings bench or clamp the transaxle in a soft jaw vise. Position the transaxle so that the socket head cap screws are facing up.



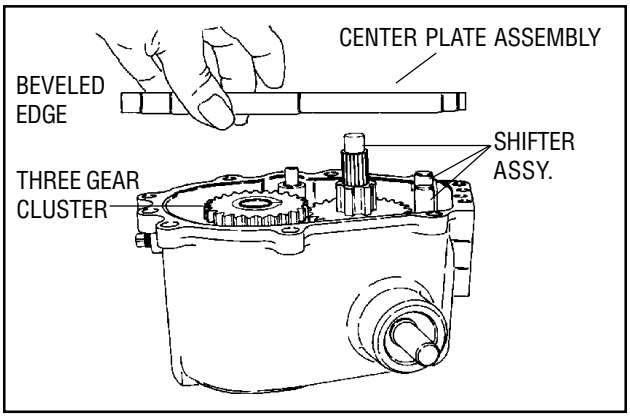
3. Remove the socket head cap screws holding the case and cover together. Drive out the dowel pins used for aligning the case and cover.



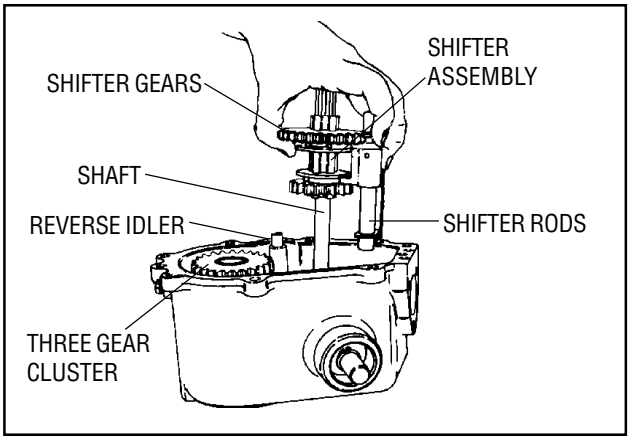
4. Use a seal protector on the axle shaft and lift off the transaxle cover assembly. Because this seal is the single lip style, it may be reused if care is taken to see that it isn't cut or scratched.



5. To remove the differential assembly, it may be necessary to replace two or three screws that hold the center plate assembly down. Pull assembly straight up. If tight, tap on lower axle with a soft mallet. CAUTION: DO NOT USE STEEL HAMMER. Refer to the chapter on differential assembly service. Remove the gear on top of the shifter shaft.



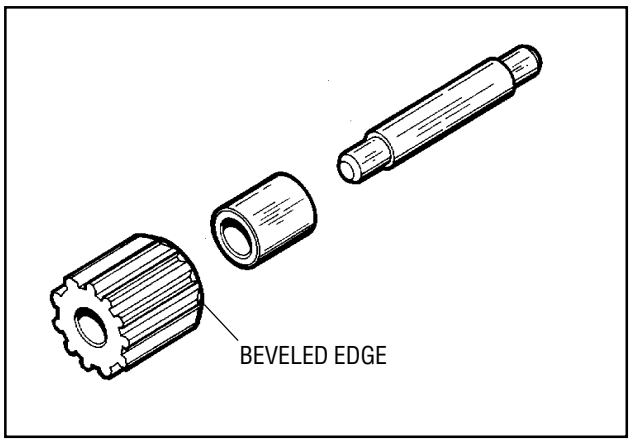
6. After removing the center plate assembly screws, remove center plate and discard the gasket.



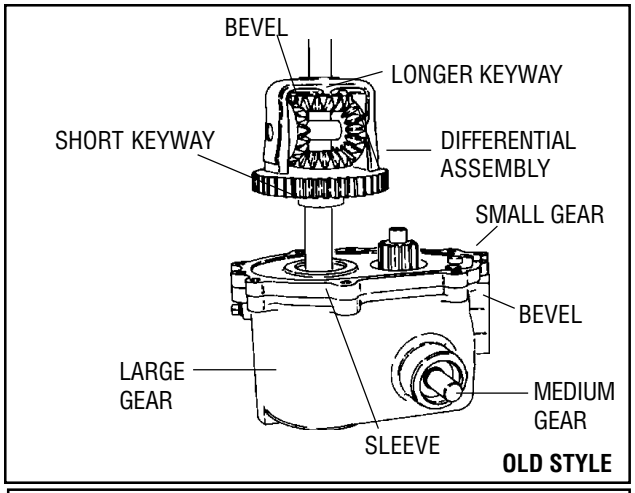
7. Remove the complete shifter assembly by grasping the shifting gears, shaft and both shifter rods as a complete unit.

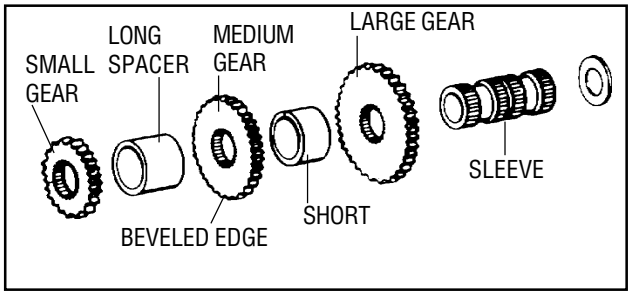
NOTE

Examine the assembly carefully; if no service is required, keep the assembly together as a unit. If service is necessary refer to Chapter 21 on shifting assemblies.



8. Remove the reverse idler shaft, spacer and gear.
9. Remove the cluster gear sub assembly and thrust washer.



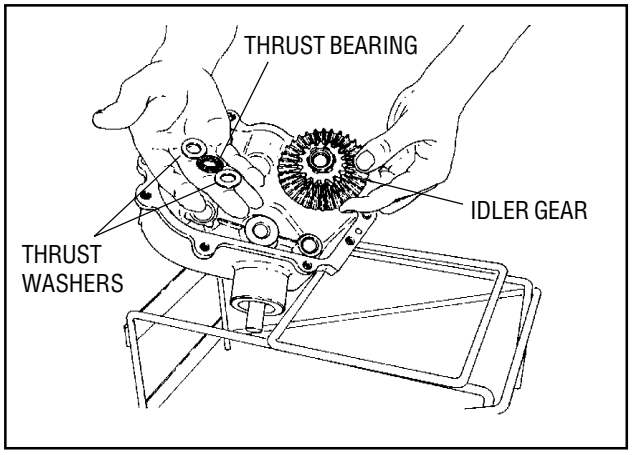


10. Cluster Gear Sub-Assembly

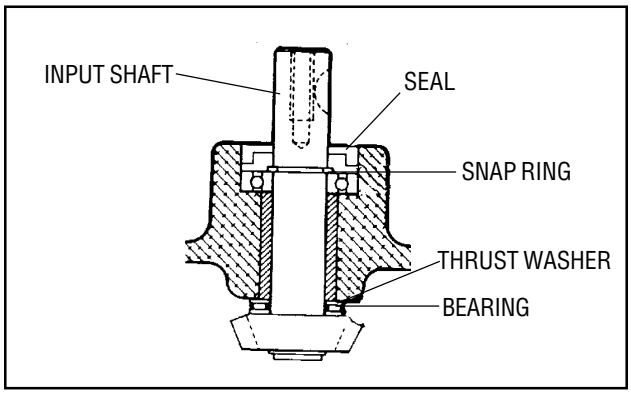
    a. The cluster gear can be disassembled. All worn gears are replaceable if damaged or worn. It's preferred to use a press to drive the shaft out squarely.

    b. The small and medium gears' bevel faces down. There is no beveled edge on the large gear. The shorter spacer fits between the medium and the large gear.

    c. Key edge ends must align with shaft ends.



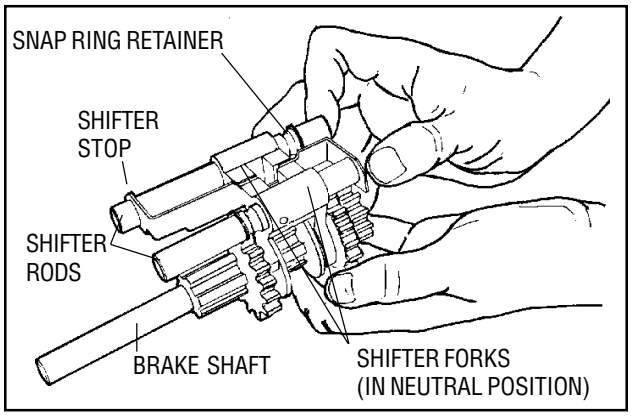
11. Remove the idler gear, thrust washers and thrust bearing.



12. Remove the input shaft oil seal to allow access to the snap ring. Remove snap ring and input shaft will slide out. A removed seal must be replaced by a new seal.

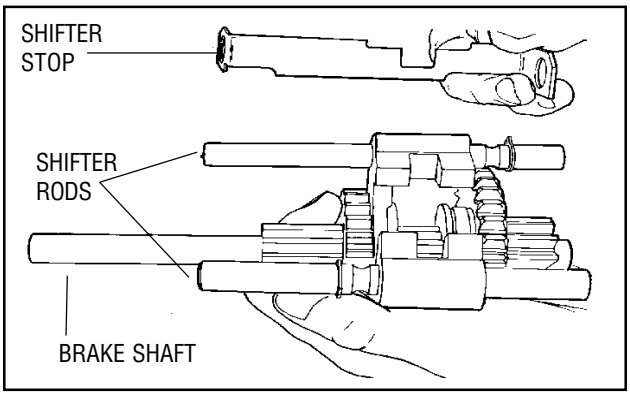
NOTE

One model (612) has a sealed ball bearing instead of an oil seal. To remove this unit, remove snap ring inside the case and drive out. On model 612-A, remove the oil seal in the normal manner.



SHIFTING ASSEMBLY

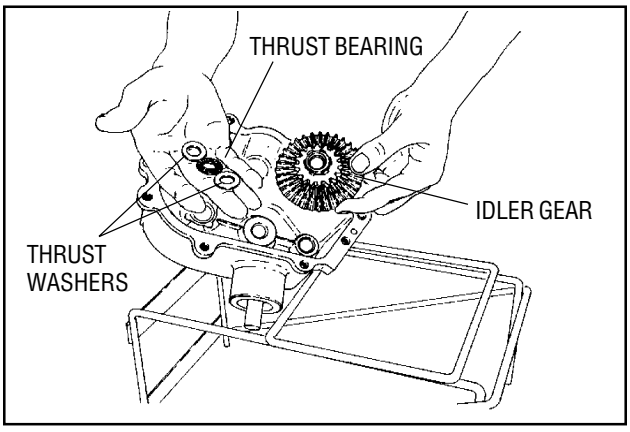
The shifting assembly is usually removed from and installed into the transaxle as a unit. The assembly is removed and replaced by grasping the shifting rods firmly. This will cause the binding necessary to hold the assembly together. Before removal or installation of the shifting assembly, the notches in the shifter forks should be aligned with those on the shifter stop.



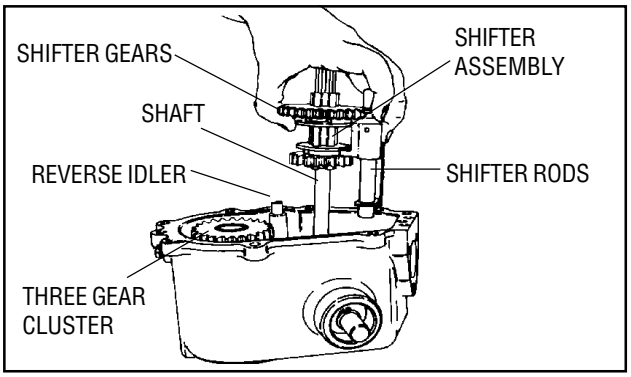
This alignment indicates the shifting assembly is in a neutral position. The shifter stop must be positioned so the notch aligns with the notches in the shifter forks. For service of the shifting assembly, refer to Chapter 9.

Transaxle Assembly

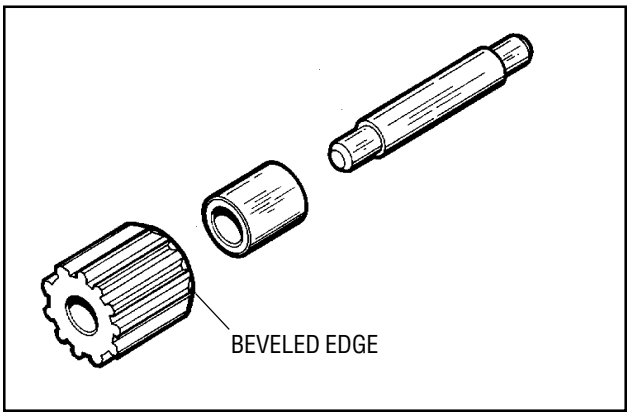
1. Install new seal, thrust washers, and bearing on input shaft. Note sequence, and install into case, using a seal protector.
2. Set case assembly open side up. Insert the idler gear assembly, thrust washers and bearing. Note sequence of washer and bearings from case; thick washer, thrust bearing thin washer, idler gear.



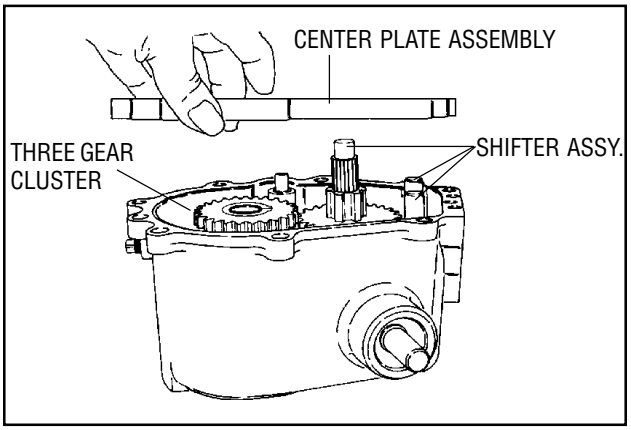
⚠ CAUTION Make sure the bearing and thrust washers remain in place while assembling the idler gear, shifter and brake shaft.



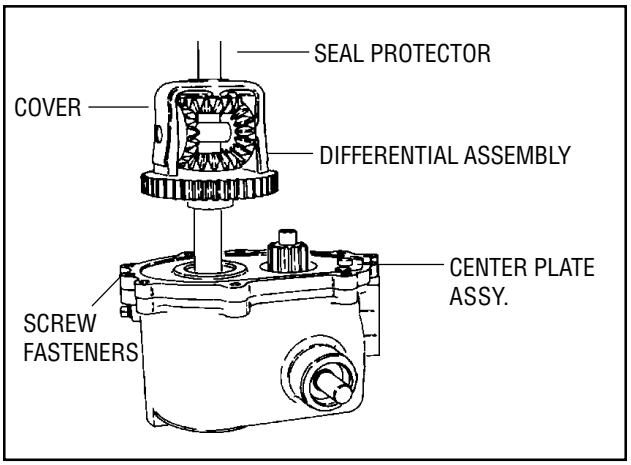
3. Insert the washer and then the three gear cluster assembly. Make sure the bevels on the two shifting gears are facing down.
4. Insert the shifter assembly. Check that the shifter rods are seated properly.



5. Install the reverse idler. Make sure the beveled edge is up. Place the spacer on top of the gear.

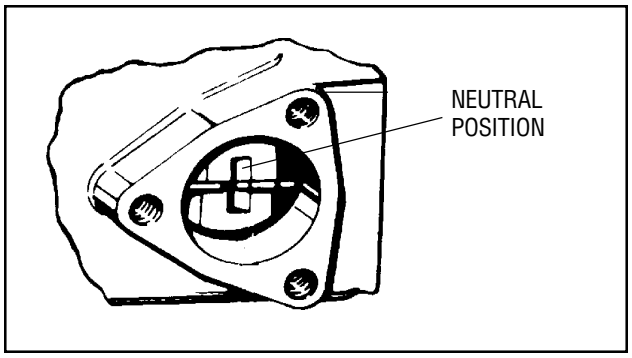


6. Install the dowel pins to ease the cover installation. Then place a new gasket on the case and install the center plate. Position the differential assembly with the longer axle in the down position and be sure the gear on the shifter shaft is installed.

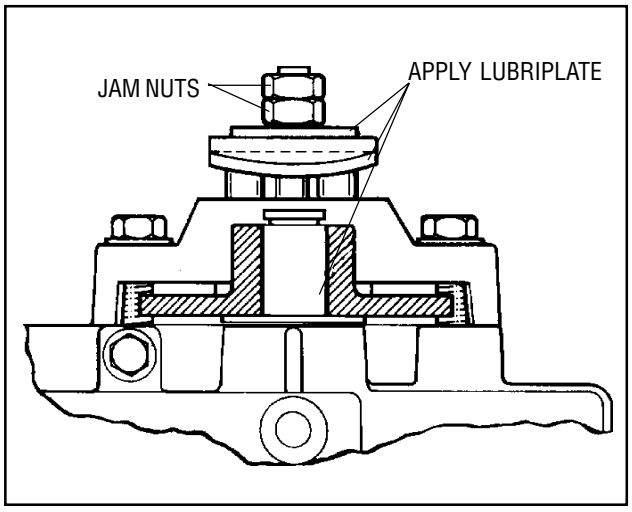


7. Install the cover assembly and torque the cap screws to 7-9 ft. lbs. / 84-108 in. lbs. (9.5-12.2 Nm).
8. If the unit needs bearings or bushings installed, consult Chapter 22 for proper procedures.

9. Install the axle supports and fill with 24 oz. (710 ml) of S.A.E. 80W90 part number 730229B gear lube. Fill through the shifter housing.



10. Inspection Note: For a neutral position, shift notches in forks and notch in stop must be aligned and centrally located.



11. The brake lever type is determined by the original equipment manufacturer's selection of this option. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. To secure the brake lever, hold the bottom nut and torque top nut to 100 in. lbs. (10.2-11.3 Nm).

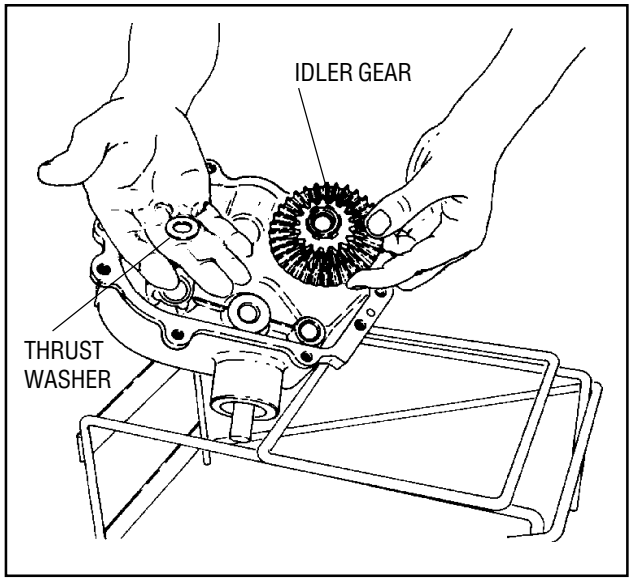
    The brake and linkages may vary.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

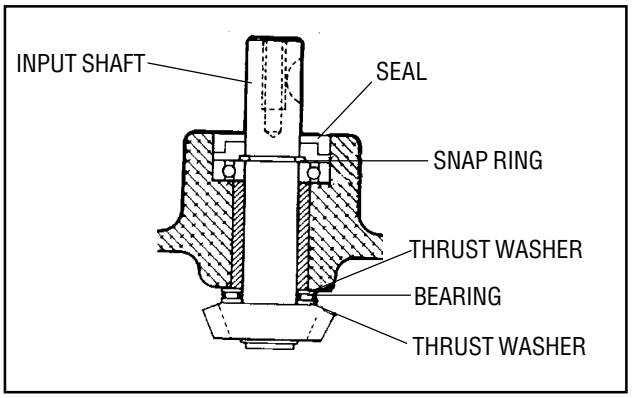
601 SLOW SPEED TRANSAXLE

GENERAL INFORMATION

The 601 slow speed series uses the same case and cover as the 600 series so the appearance is the same. The following differences are as listed in three steps.



1. Under the idler gear is one washer instead of a thrust bearing and two thrust washers. The 601 idler gear is different than the standard 600 Series.



2. The input shaft only has one thrust washer instead of a thrust bearing and two thrust washers.

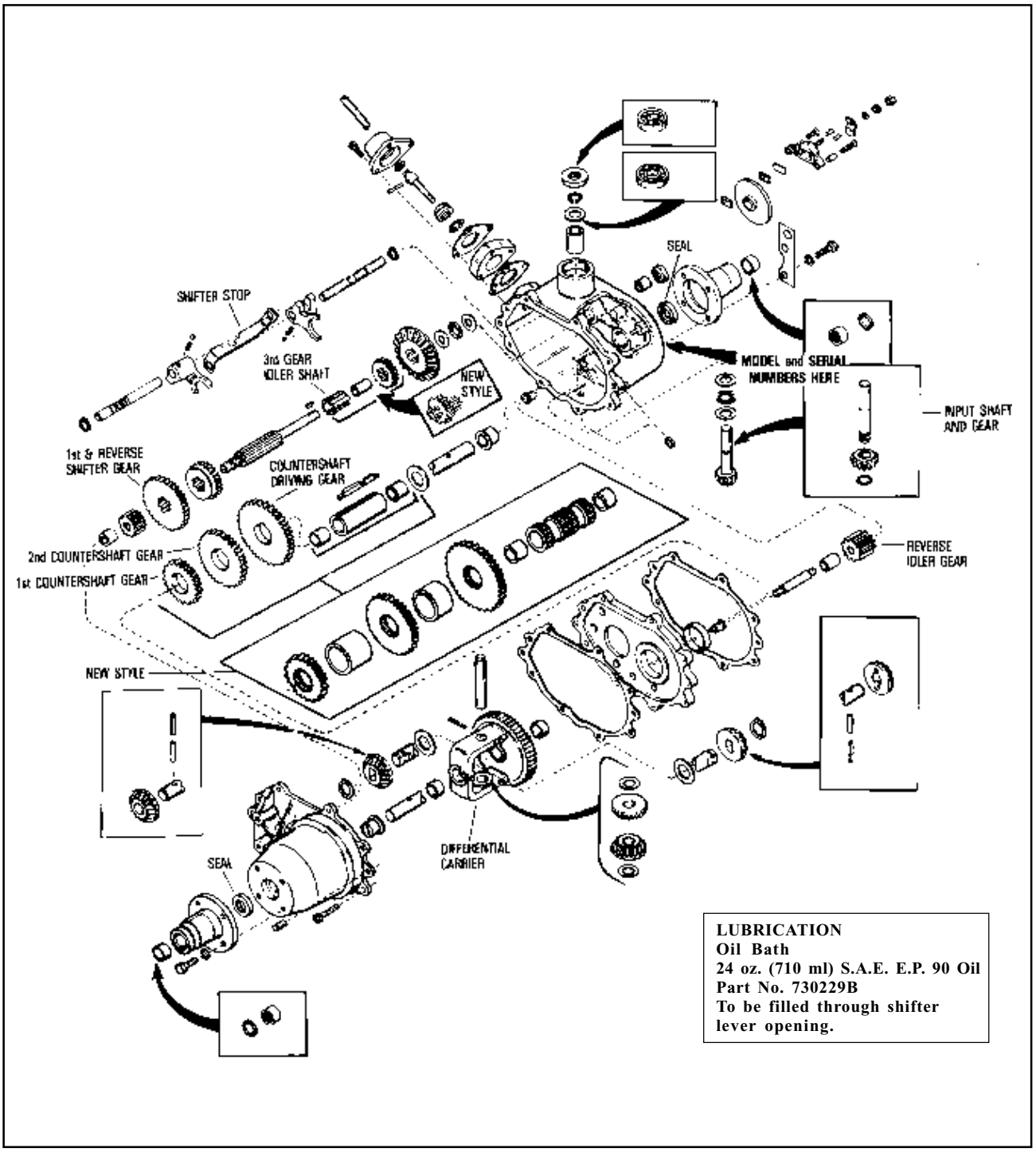
3. The 601 also has a different input shaft and bevel gear than the 600 transaxle.

600 SERIES BEARING TOOLS

PART LOCATION	TOOL REMOVE & REPLACE	BEARING SIZER
Brake Shaft	670210	(27 needles)
Axle	670204	
*Input Shaft	*670207A	
Center Plate	670205	
Brake Shaft	670213	(30 needles)
Differential	670204	
Cluster Gear	670204	
Idler Gear	670210	
Axle Housing	670204	
Reverse Idler		

*Bearing must be flush with top of case. Secure with Loctite.

600 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 4. 700 SERIES TRANSMISSION
IN-LINE SHIFT

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

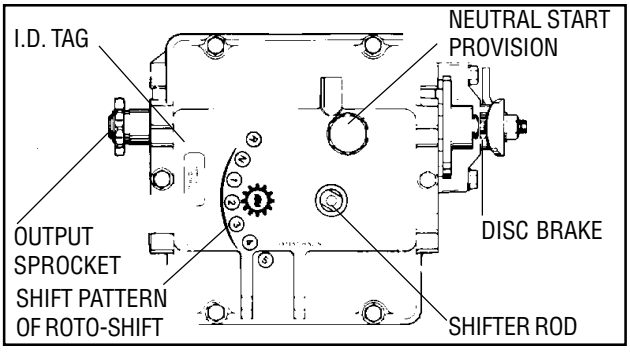
⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL INFORMATION

The 700 Series in-line shift transmission is available in 2, 3, 4 or 5 speeds forward depending on equipment manufacturer's specifications.

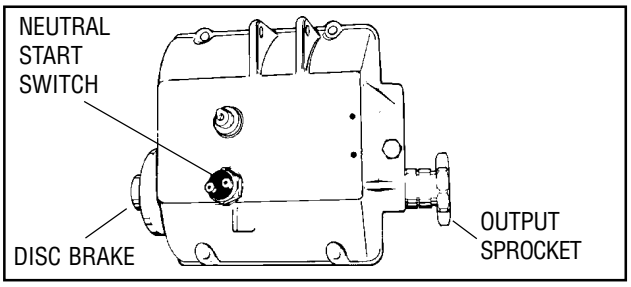
The two speed version is not covered here but can be disassembled and reassembled using the same information for the 700 described in this section.



Optional features include right or left hand output and a disk brake, for either in-line or "H" pattern unit.

NOTE

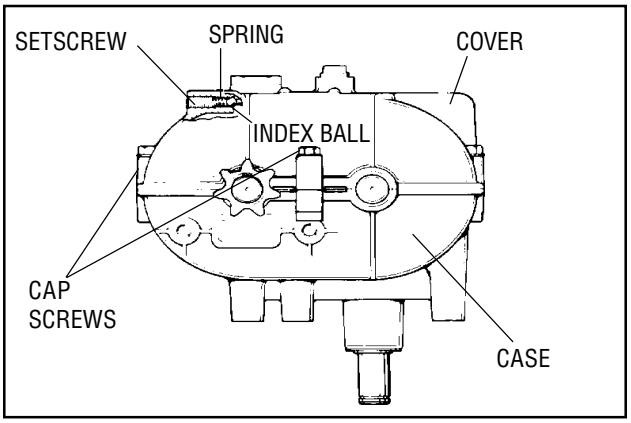
Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.



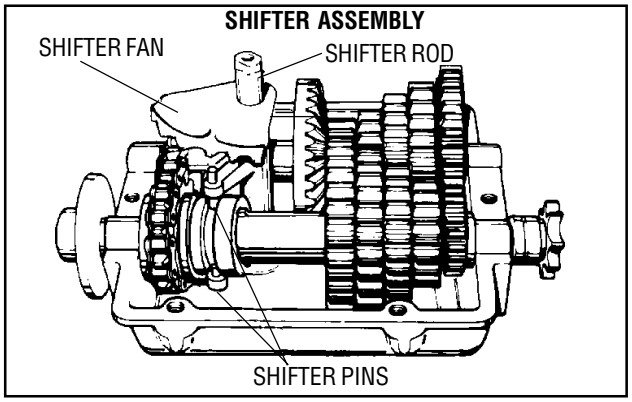
DISASSEMBLY OF TRANSMISSION

Clean outside surface of transmission. Position shift lever in neutral as indicated by the shift pattern.

1. If the unit has the OEM option of a neutral start switch, remove the switch.
2. Remove setscrew, spring and index ball from the transmission cover and six cap screws that fasten the cover to the case.
3. Remove cover. Remove shifter assembly (includes shafts, pins and fan from transmission by lifting shaft out of case.

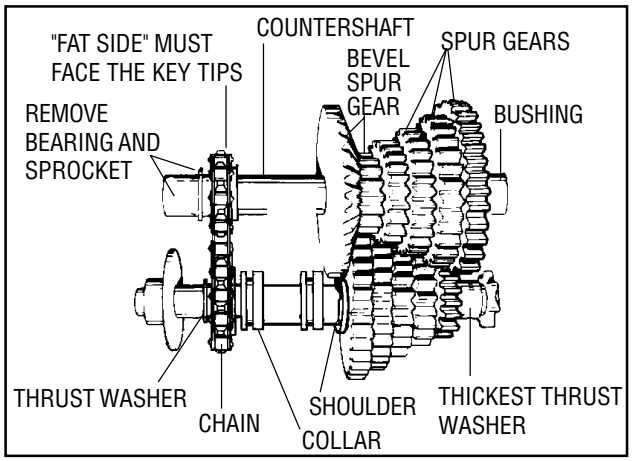


4. Remove gear and shaft assemblies from the case lifting the two shaft assemblies together taking care not to separate the drive chain and sprocket relationship. Take note that the "fat" side of the sprockets must face the tips of the keys.

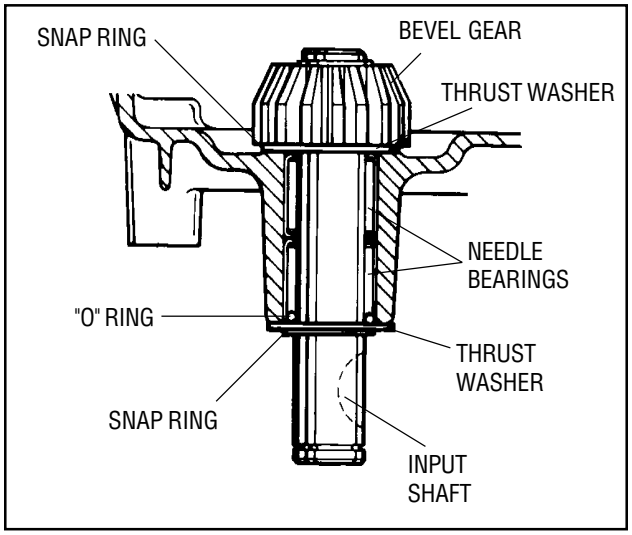


5. Remove the one-piece bevel spur combination gear and the remaining splined spur gears from the countershaft.
6. Remove from the shifter/brakeshaft the output sprocket, brake disc, all bushings, shifter spur gears, sprocket, collar, keys and chamfered washers.Note the inside chamfer on the shift washers face the tips of the keys to compress them and provide ease in shifting.

⚠ CAUTION **Use approved safety procedures with equipment when handling shifter/brakeshaft parts. These parts have extremely sharp edges. Inadequate safety precautions could result in equipment damage and serious injury.**



7. Remove the snap ring from the input shaft; remove bevel gear and pull shaft through case.
8. Input shaft needle bearings should be installed flush to .005" (.127 mm) below bearing bore surfaces from inside and outside the case.



INSPECTION AND REPAIR

Remove grease with rags and cleaning solvent and replace worn or damaged parts.

ASSEMBLY OF THE 700 SERIES IN-LINE TRANSMISSION

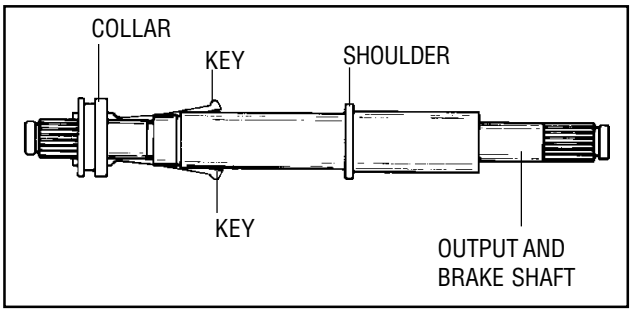
1. Install and secure the input shaft and bevel gear in the case. Review paragraphs 7 & 8 and reverse the order.

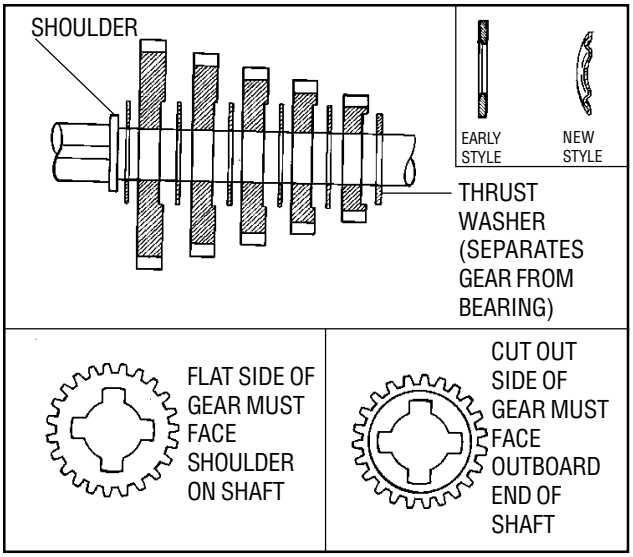
NOTE

All Needle bearings are lubricated with E.P. Grease. DO NOT USE BENTONITE GREASE on needle bearings. For maximum gear train life use Bentonite grease only on shafts and gears, Tecumseh part number 788067C.

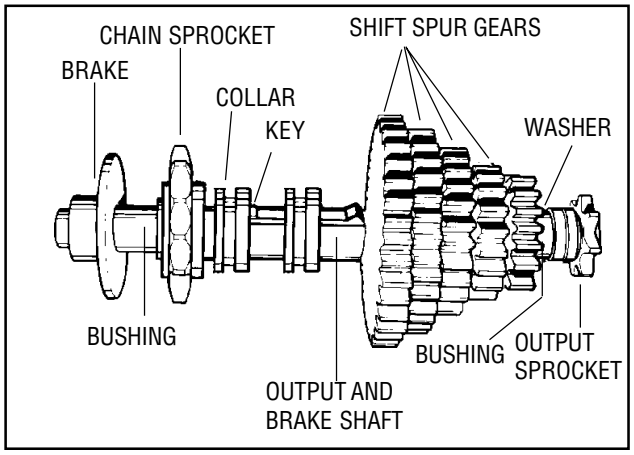
CHAMFERED SHIFT WASHERS. Many older models have a thrust washer with a 45° chamfer on the inside diameter. The latest style washer has a curved or rounded side. The purpose of the washers is to compress the shift keys as they slide into a gear. Therefore, the chamfered or rounded side of these washers must face the shoulder of the shaft or towards the tips of the shift keys. The washers are interchangeable.

SHIFT GEARS. One side of the gear is flat and the other side is chamfered or recessed. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shift keys.



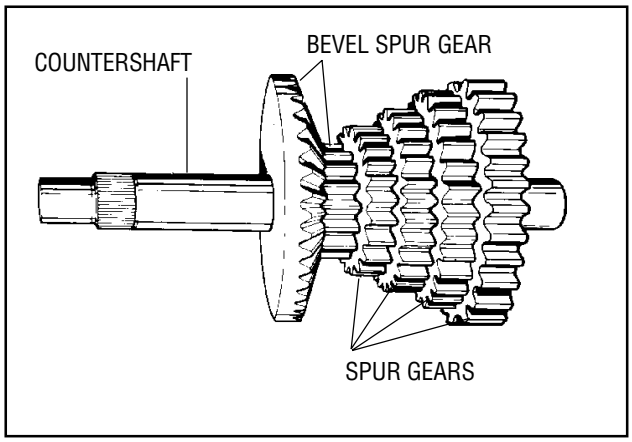


2. Starting from the output sprocket end on the shifter/brake shaft, install a chamfered washer with the chamfer facing the shoulder on the shaft. With the output sprocket end down, place the shaft vertically in a vice with protective jaws and slide the collar and keys downward toward the shoulder and through the chamfered washer. Remember the "fat" side of the shift collar MUST face the key tips. ***Use work gloves as the keyways on the shifter/brake shaft are extremely sharp.***



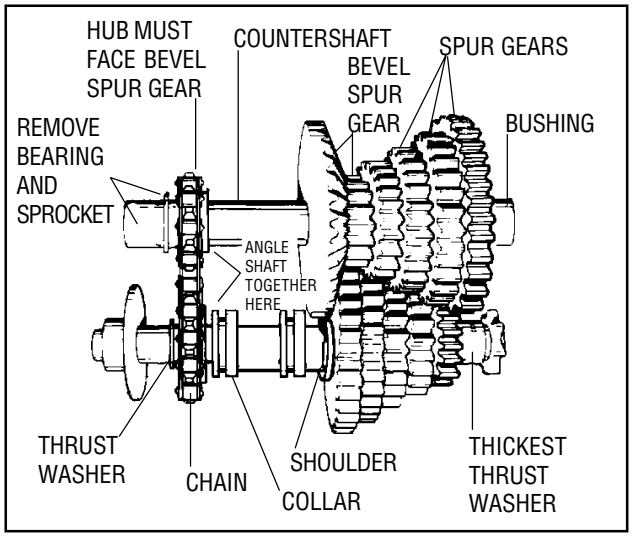
3. Install the largest gear (first gear) with the chamfered end facing away from the key tips so that the flat side of the gear contacts the flat side of the chamfered washer. Remember the order as chamfer to chamfer and flat to flat when assembling the gears on the shifter brake/shaft. Install another chamfered washer noting that the chamfered side makes contact with the chamfered side of first gear. Install second gear and all remaining gears and washers the same way. The number of gears and/or spacers will be determined by the number of speeds requested by the OEM.

4. Install the splined bevel spur gear first (with the bevel facing away from the shifter rod) and remaining splined spur gears starting with the smallest to the largest on the counter shaft as shown.

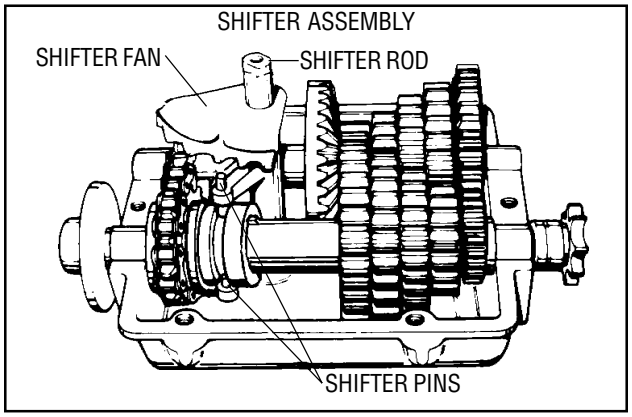


5. Install the chain over the two shafts making sure that the collars of both sprockets face inward toward the tips of the keys.

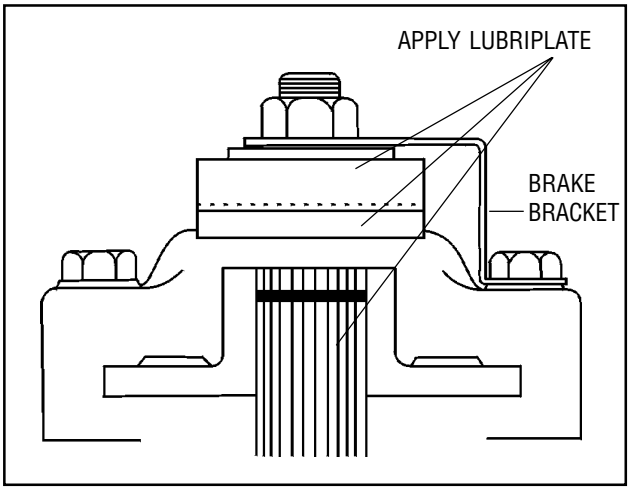
6. Install the appropriate protection washers on sprocket ends and bronze oil light bushings



7. Install shifter assembly (shaft, pins and fan) 12 oz. (355 ml) of Bentonite grease around the gearing, and reinstall the cover to the case. Torque cap screws 90-110 in. lbs. (10.2 - 12.5 Nm).



8. For in-line transmissions, install the detent ball, spring and setscrew, in that order, into the cover. Slowly tighten the screw to flush, then one full turn below flush. The deeper you turn in the set screw the more tension will be on the shifter fan which will make the gear positions feel more deliberate to the operator.



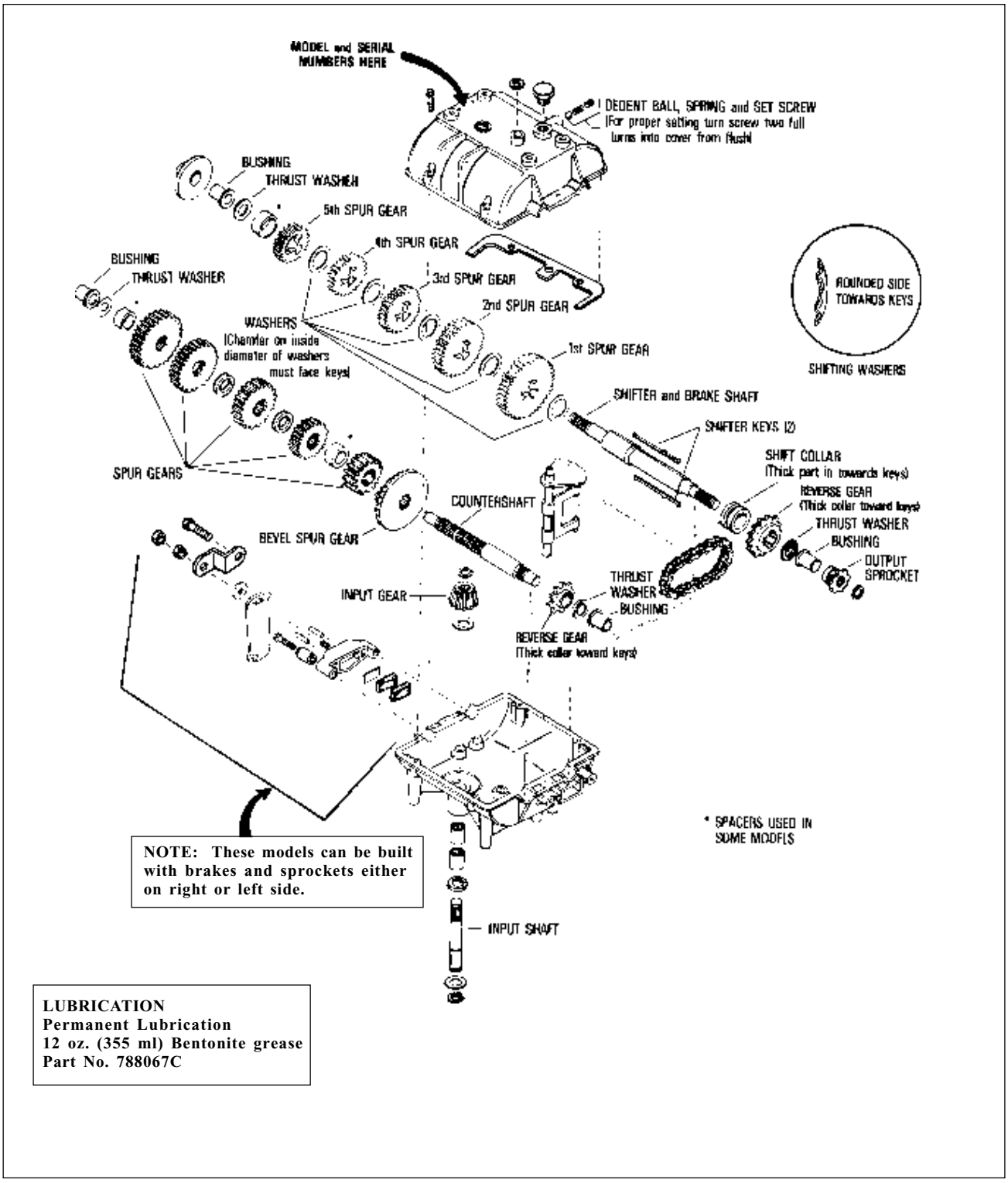
9. Check for binding by turning the input shaft. Install transmission on equipment. Install brake and linkage, and adjust to disengage when clutch is engaged. Consult equipment Owner's Manual.

10. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

    The brake and linkages may vary.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

700 SERIES TRANSMISSION



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

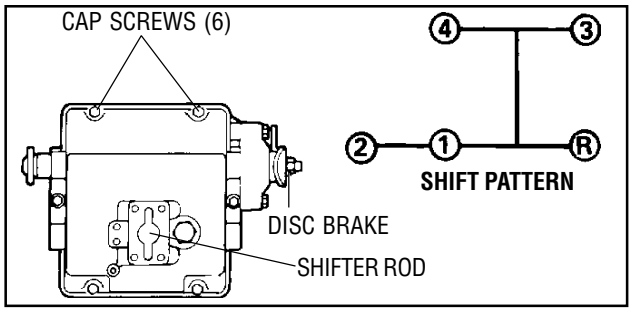
700H SERIES TRANMISSIONS

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

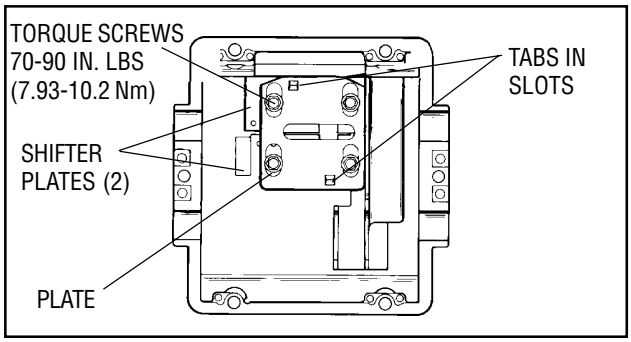
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

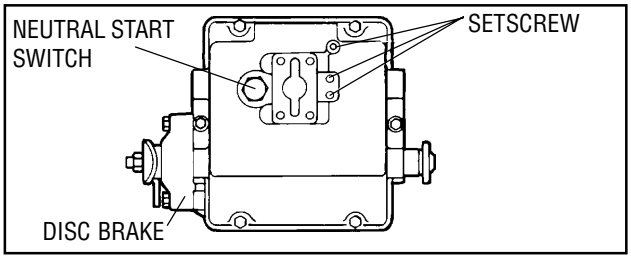
⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.



The "H' pattern transmission described here is a 4-speed forward, 1 reverse unit.



The 700 "H" pattern transmission gear arrangement is similar to the in-line transmission except for the shift gate and an additional collar and spacer on the shifter/ brake shaft. The countershaft also has an additional spacer.



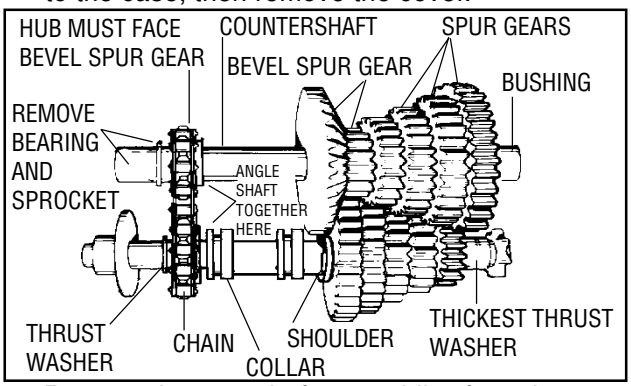
If installed, remove the neutral start switch. This can be an option to the OEM.

NOTE

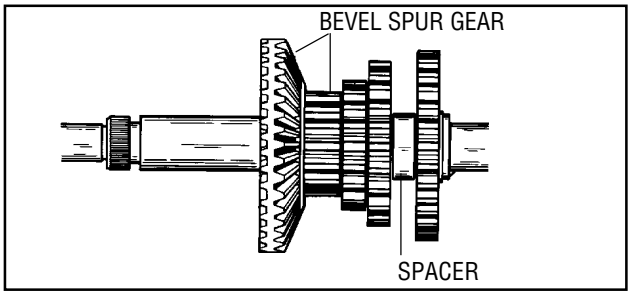
Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

DISASSEMBLY OF THE TRANSMISSION

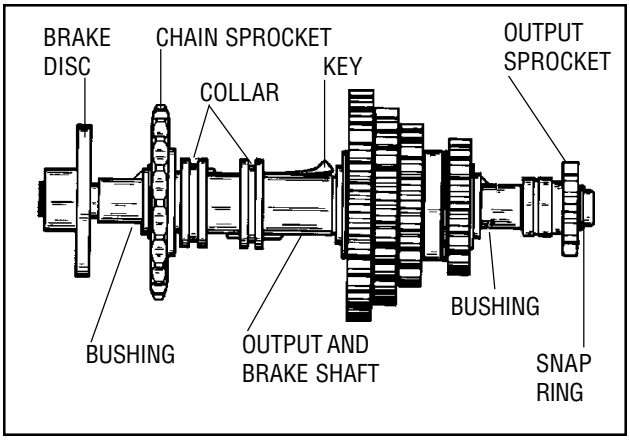
1. Clean the outside of the transmission and position the shift lever in the neutral position as indicated by the shift pattern.
2. Remove the shift lever by removing the four hex screws on the shift lever cover.
3. With a 3/32 inch Allen wrench, remove the set screw, spring and detent ball.
4. Remove the six cap screws that fasten the cover to the case; then remove the cover.



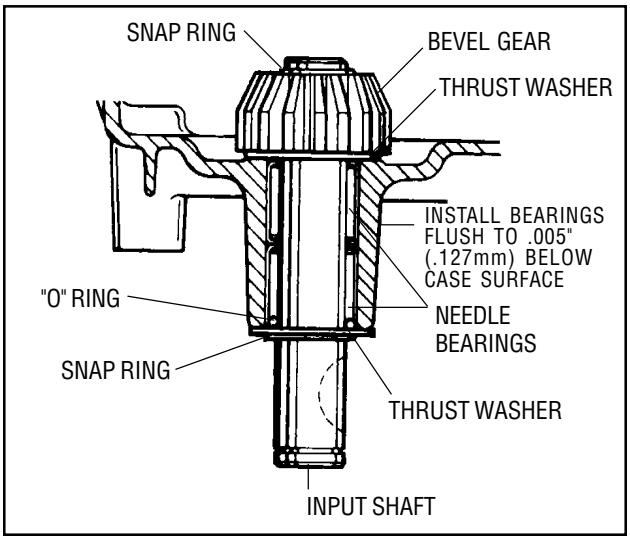
5. Remove the gear shaft assemblies from the case half of the transmission by lifting the two shafts out of the bearing supports taking care not to disturb the drive chain relationship of the sprockets.
6. Angle the chain and sprocket ends of shaft toward each other, removing the bearing and sprocket from the countershaft. Note the collar on the sprocket faces the bevel spur gear. Remove the chain.



Disassembly of the 700 series “H” shift pattern includes a spacer.



Disassembly of the 700 series "H" shift pattern includes a second collar and a spacer.



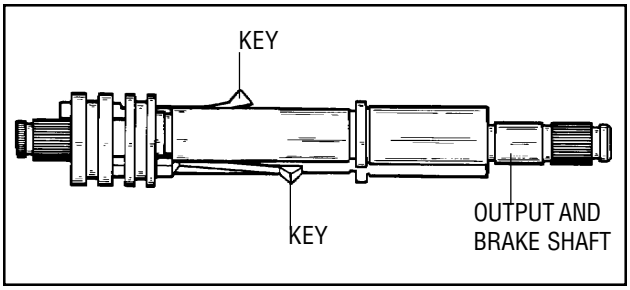
Input shaft removal is the same for both the 700 series in-line and “H” shift pattern transmissions.

7. Remove the snap ring and bevel gear from the input shaft and pull the shaft through the case.
8. The input shaft needle bearings should be installed flush or no more than .005" (.127 mm) below the bearing bore surface from inside and outside the case.

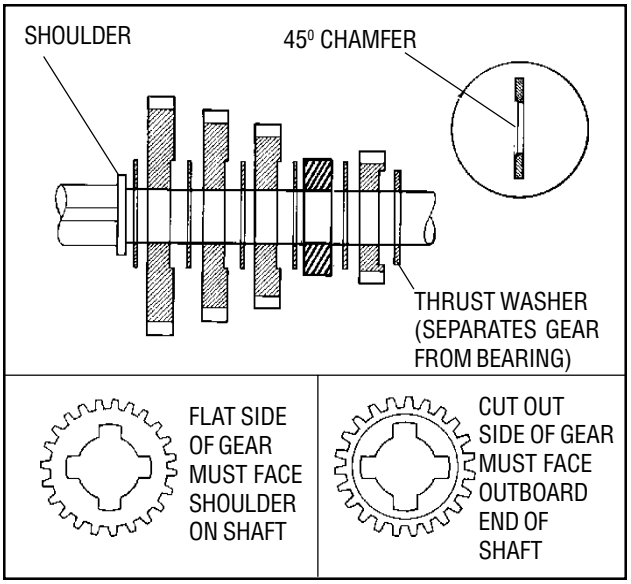
INSPECTION AND REPAIR

Examine all parts after removing grease with rags and cleaning solvent to determine which parts need replacement.

ASSEMBLY OF 700H SERIES TRANSMISSION

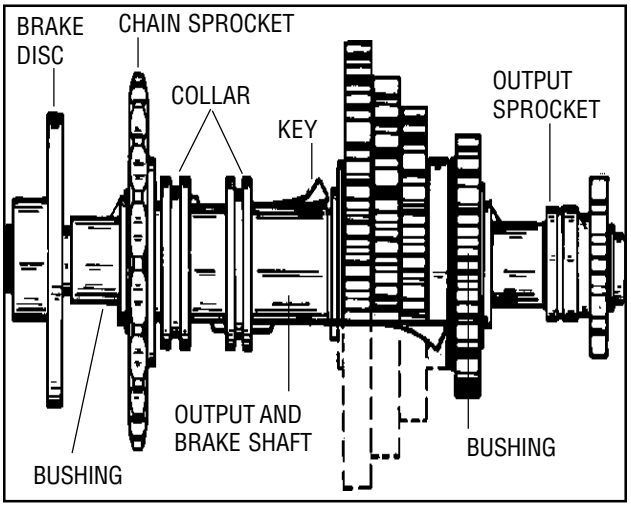


Assembly is the same as the 700 series in-line transmission except for an additional collar and spacer.

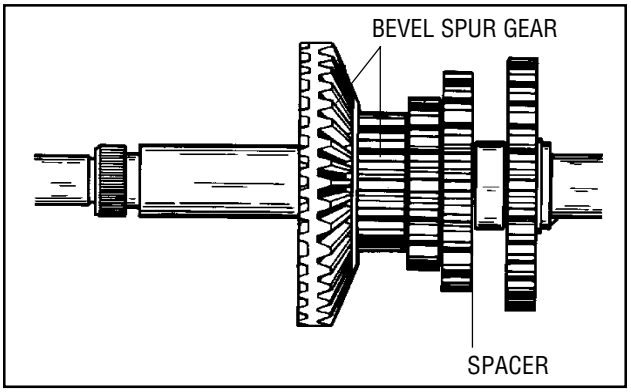


NOTE

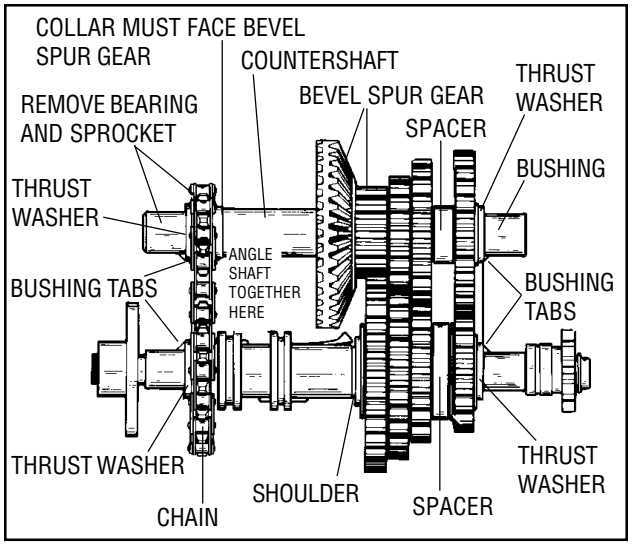
The thrust washer on the brake disc end of the shifter/ brake shaft does not have a chamfer on the inside diameter and must be positioned as shown above. It is thicker than the other thrust washers separating the gear works from the bearings.



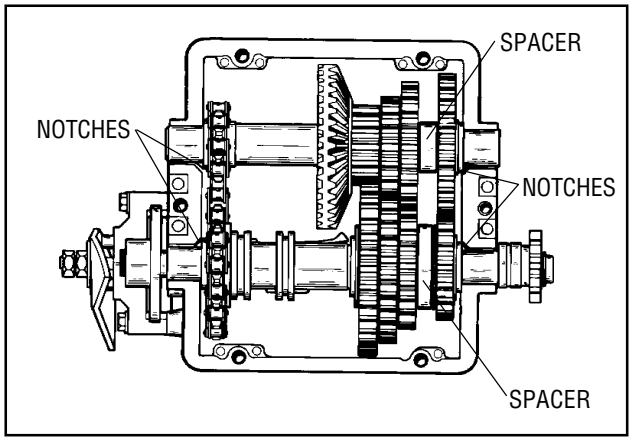
1. The first, second and third gears have to be forced over the keys when assembling. Remember to place the spacer in the 4th gear position.



2. Assemble the countershaft and gears as shown above remembering the spacer is in the 4th gear position.

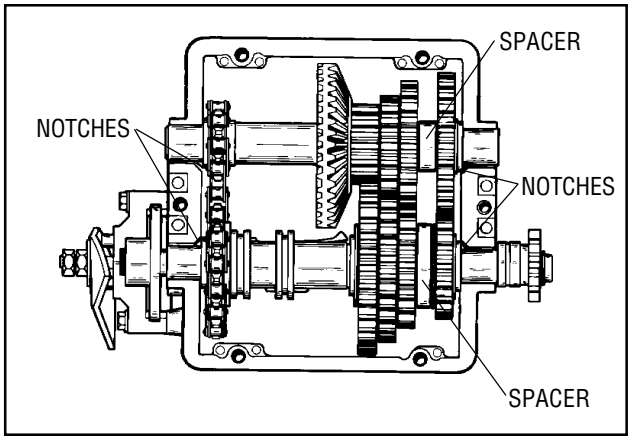


3. With the collar on the countershaft sprocket facing the bevel spur gear, install sprocket onto the serration and install chain. Install all four (4) thrust washers.

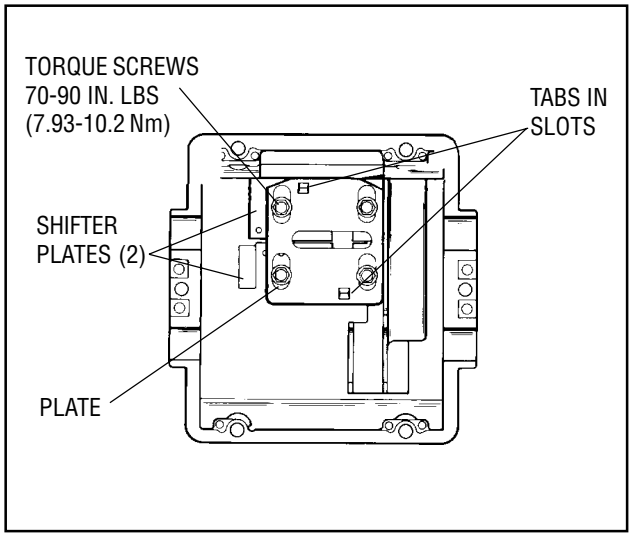


4. Install the bronze bushings, disc and sprocket. Install the shaft assemblies into the case pressing the bushing tabs into the notches in the case.

CAUTION **Be sure bushings tabs are seated in transmission case, or the cover won't sit squarely on the case.**

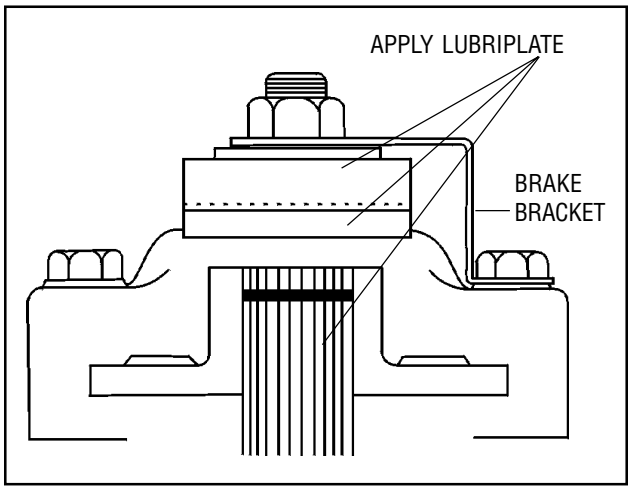


5. Install the shifter assembly, 12 oz. (355 ml) of Bentonite grease around the gearing, installing the cover on the case. Torque the cover fasteners 90-110 in. lbs. (10.2-12.5 Nm).



6. For in-line transmissions, install the detent ball, spring, and setscrew, in that order, into the cover and slowly tighten the screw up to two turns below flush. Depending on personal preference. The deeper you turn in the set screw the more tension will be on the shifter fan which will make the gear positions feel more deliberate to the operator.

7. Check for binding by turning the input shaft. Install the transmission on the equipment. Install the brake and linkage and adjust the clutch according to the equipment Owner's Manual.

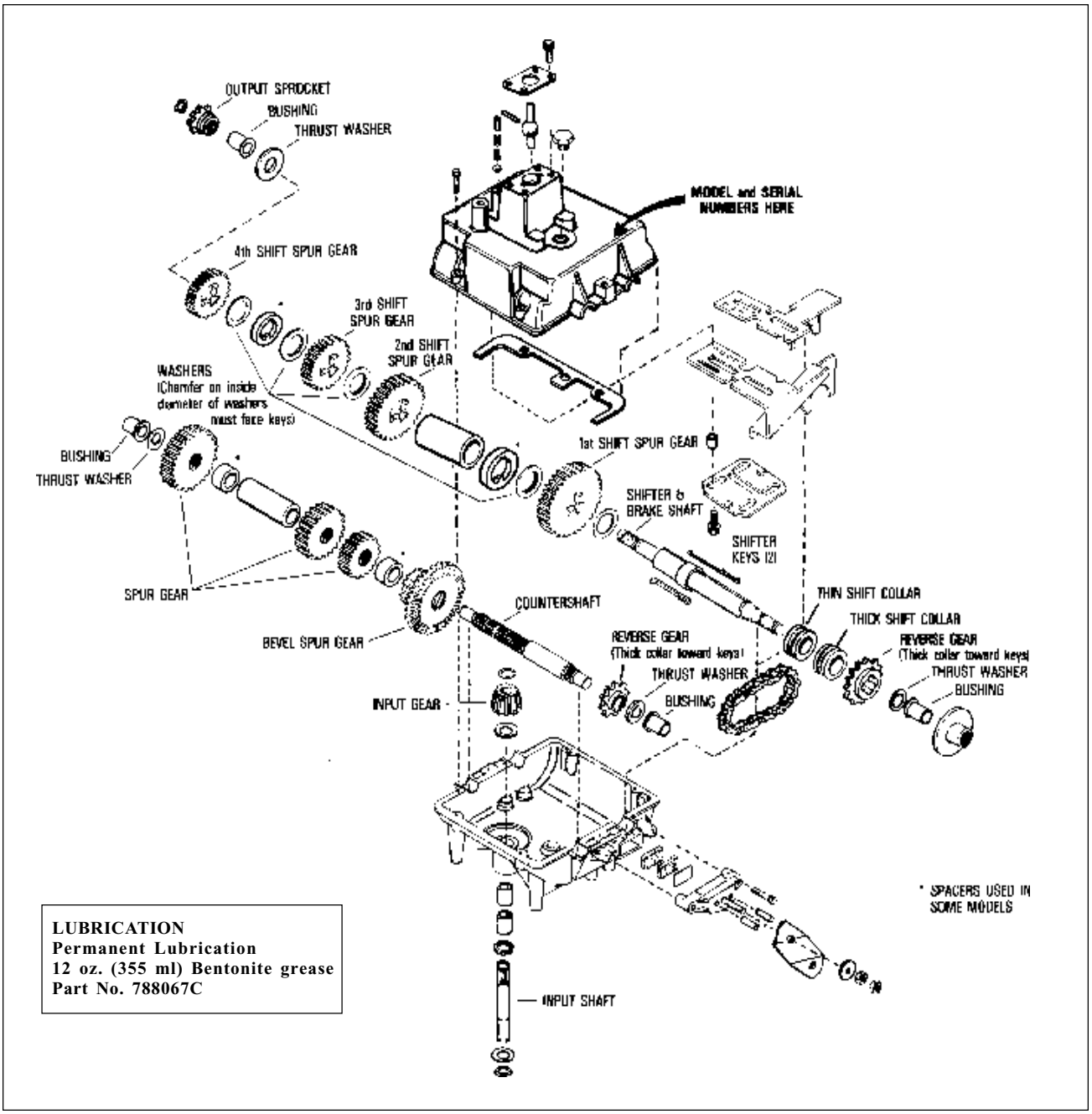


8. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil.

   The brake and linkages may vary.

⚠ WARNING **Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.**

700H SERIES TRANSMISSION



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 5. 800/801 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

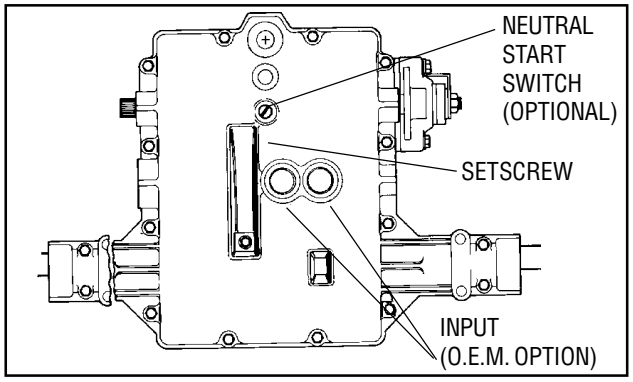
⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

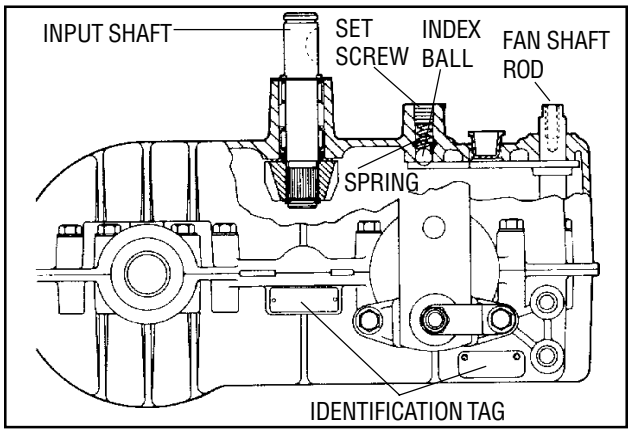
GENERAL INFORMATION

NOTE

Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty. The brake may be either a left-hand or right-hand per the O.E.M. option.



The 800/801 series transaxle is basically a combination of the 700 series transmission with a 600 series transaxle differential. The position of the input shaft varies with a particular model. Because of the option of the input shaft and gear positioning on either side of the bevel gear, the axle output will vary, which allows the O.E.M. the ability to rotate and reverse mount the transaxle. The model described in this section is a five speed forward, single reverse. The input shaft for this model is located to the left of the bevel gear.

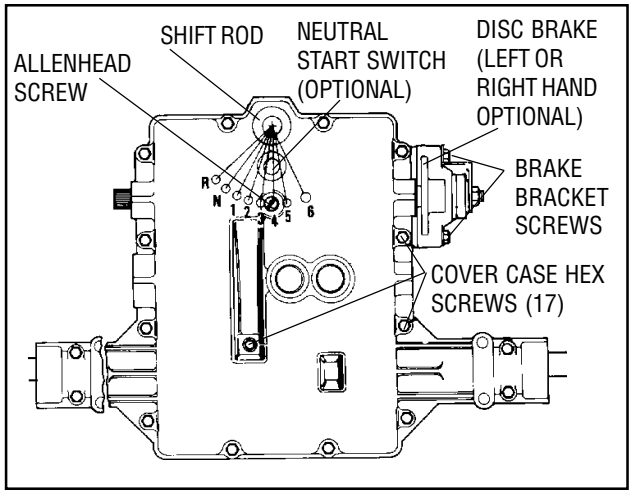


IDENTIFICATION

The unit model number will be found on a metal tag at either of the two locations.

DISASSEMBLY

1. Clean outside surface of the transaxle.
2. Position shift lever in the neutral position as indicated by the shift pattern.
3. If installed, (O.E.M. option) remove neutral start switch.
4. Remove the allenhead setscrew, the detent ball and spring .



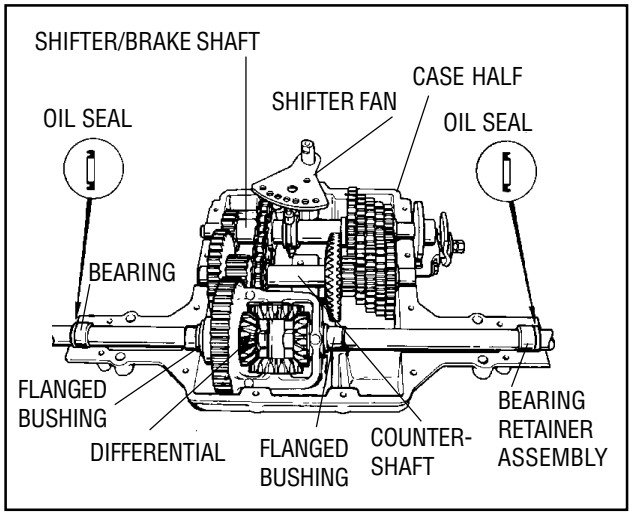
NOTE

Prior to removing the cover and the two gear shaft assemblies from the case, remove the square cut "O" ring from the top of the shifter rod.

5. Remove the case fasteners and push the shift rod through the cover. The shifting assembly may temporarily remain in the case.
6. Remove the two brake bracket screws, and remove the brake assembly.

NOTE

Before disassembly, observe how the "V" notches on the flanged bushings fit into the corresponding recess in the case.



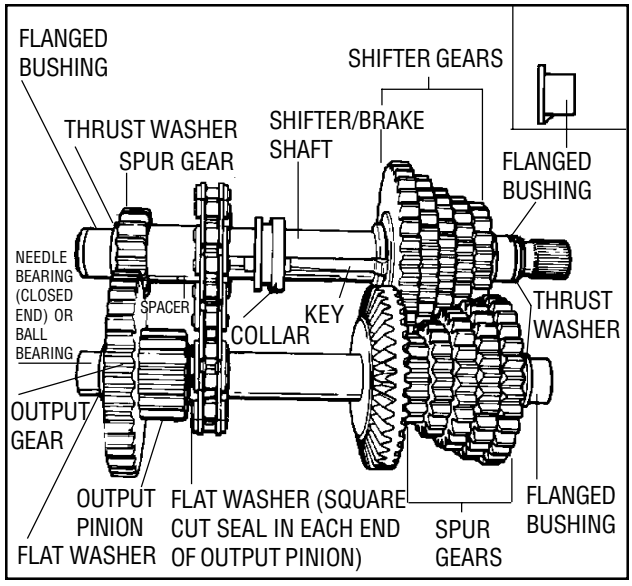
NOTE

The square cut black rubber "O" rings on the shifter brake shaft which retain the Bentonite grease in the case.

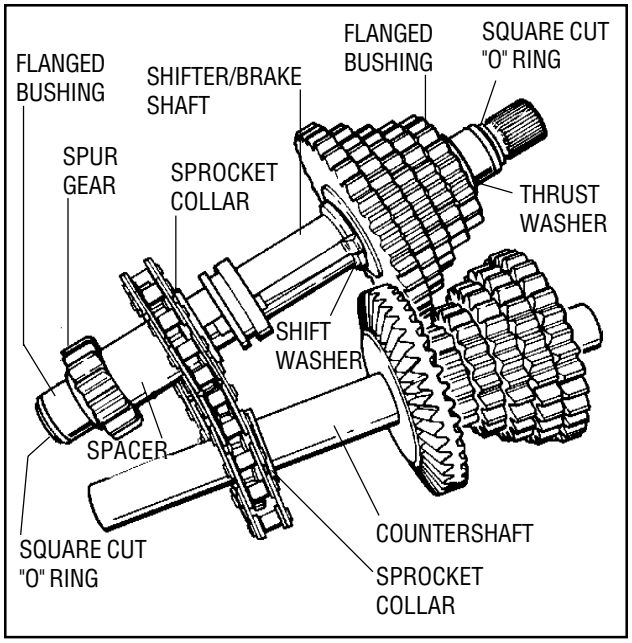
7. Remove gear and shaft assemblies from case half by lifting the two shafts out of the bearing supports taking care not to disturb drive chain relationship with the hubs on the sprockets.

NOTE

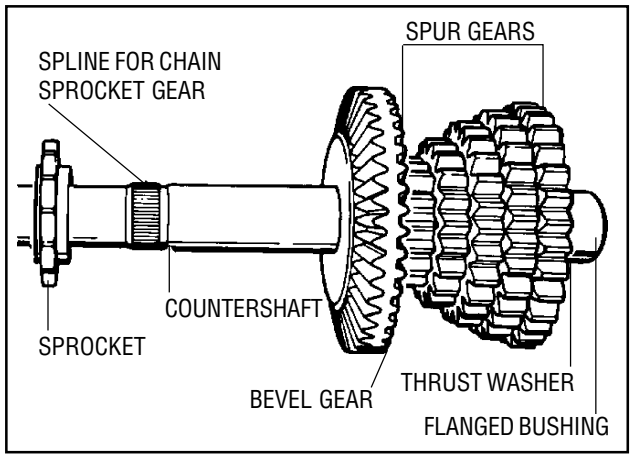
Remove the Bentonite grease from all parts and case halves as they are removed.



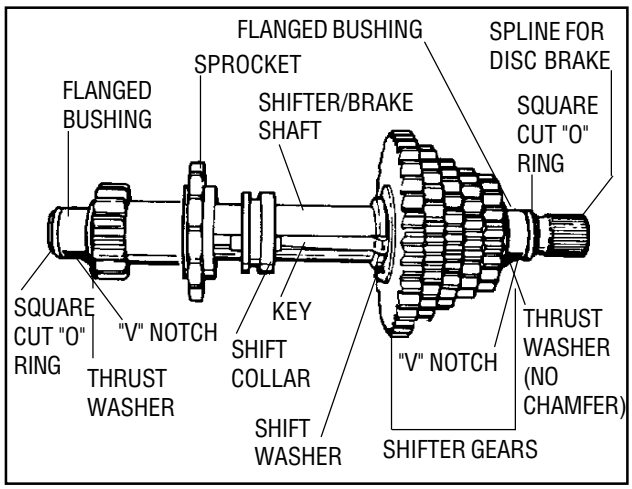
8. Remove the needle bearing (closed end) flat washers (2), output gear and output pinion, and 3 square cut seals from the countershaft. (2 seals in the output pinion 1 in the needle bearing cap). The "O" rings on the countershaft are larger than those on brake the shaft ends. Always replace with new seals whenever service is performed.



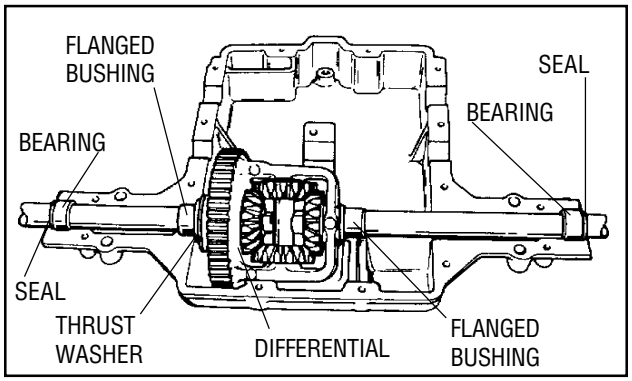
9. Angle the shifter/break shaft and countershaft chain sprocket ends toward each other. Note the collar on the sprockets face the bevel gear. Next remove the chain.



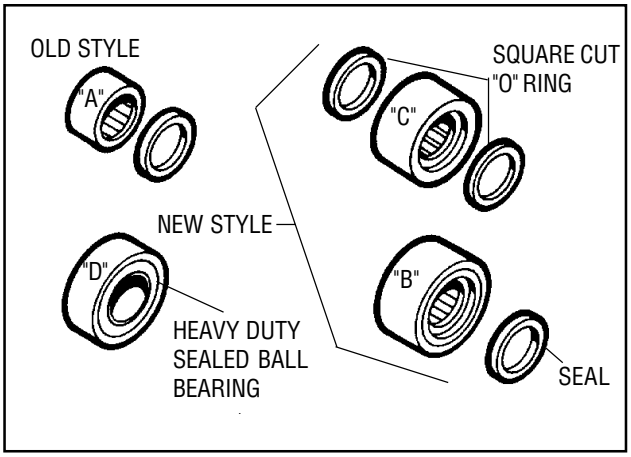
10. Remove the sprocket, bevel gear, spur gears, thrust washer, and flanged bushing. The spur gears are splined to the countershaft.



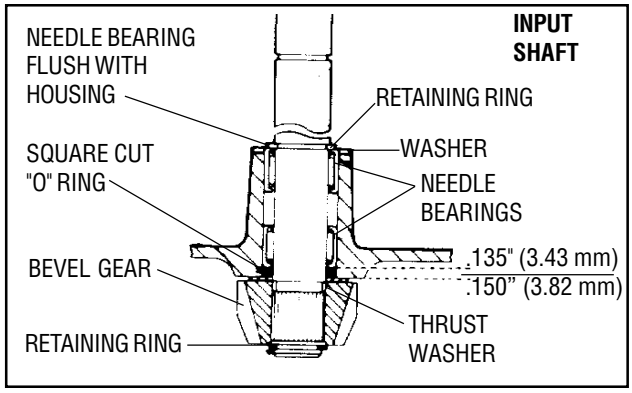
11. From the shifter/brake shaft remove the square cut seals (2), flanged bushings (2), thrust washers (2) on the shaft ends, spur gear, spacer, sprocket, shift collar with keys, thrust washers and the shifter gears.



12. Remove the differential from the case. Remove the (2) seals, needle bearings or ball bearings (2).



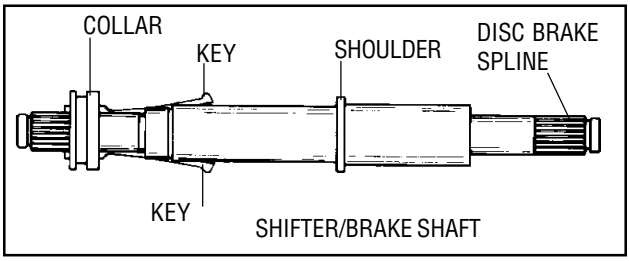
The 800 Series has used four styles of bearings on the axles. The earliest style "A" was a smaller caged needle bearimg. Style “B” must have the seal to the outside of the bearing. When bearing style “C” is used, a square cut “O” ring must be used on each side of the bearing. Bearing style “D” is a sealed ball bearing used in heavy duty applications. Styles “B”, “C” and “D” are interchangeable. All needle bearings must be repacked with grease. Never use Bentonite grease in ball or needle bearings; use wheel bearing grease.



13. To disassemble the input shaft remove the retaining ring on the bevel gear side from the input shaft; then remove the bevel gear and pull the shaft through the case. The square cut “O” ring must be replaced if removed. Tool Part No. 670251 is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135" - .150” (3.43 - 3.82 mm) below flush.

ASSEMBLY

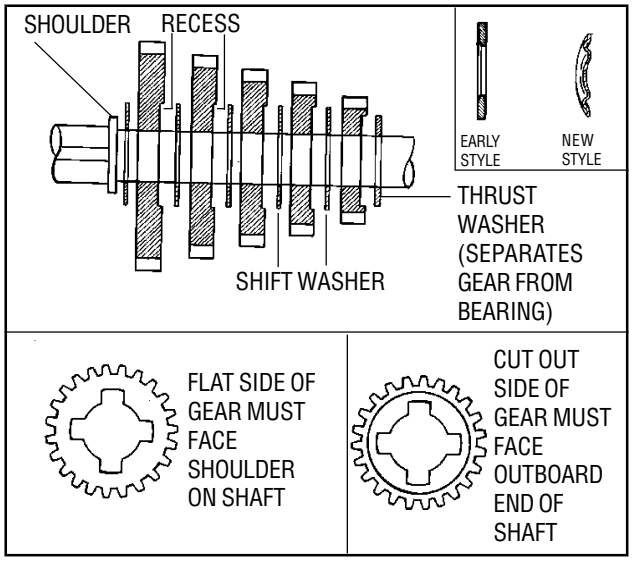
1. Apply E. P. grease between bearings and install and secure the input shaft and bevel gear in the cover. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.



2. Grease the keyways and slide the shift keys and collar onto the shifter/brakeshaft. The thick side of the shift collar MUST face the shoulder (brake end) on the shaft. Service replacement shifter/brake shafts will come with four keyways on the shaft instead of two.

NOTE

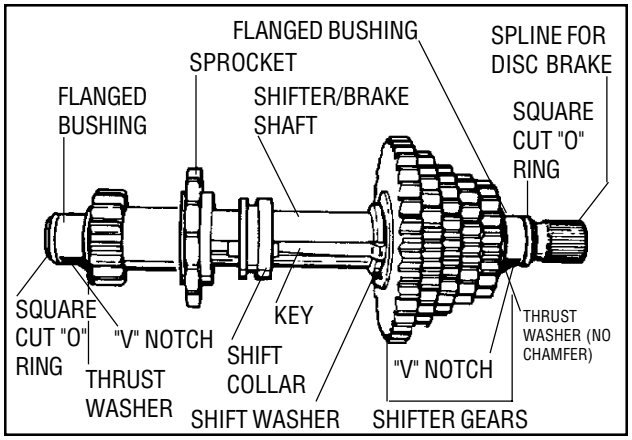
When repairing the unit use, the same number of keys that were used originally.



3. Install the thrust washers and shifting gears onto the shifter/brake shaft. The number of gears and/or spacers will be determined by the number of speeds in the transmission ordered by the O.E.M.

THRUST WASHERS. A running change has been made to the shift washers. Many models have used the thrust washer with a 45° chamfer on the inside diameter. The latest style washer has a curved or rounded side. The purpose of both washers is to compress the shift keys as they slide into the gears. Therefore, the chamfered or rounded side of these washers must face the shoulder of the shaft or towards the shift keys. The washers are interchangeable.

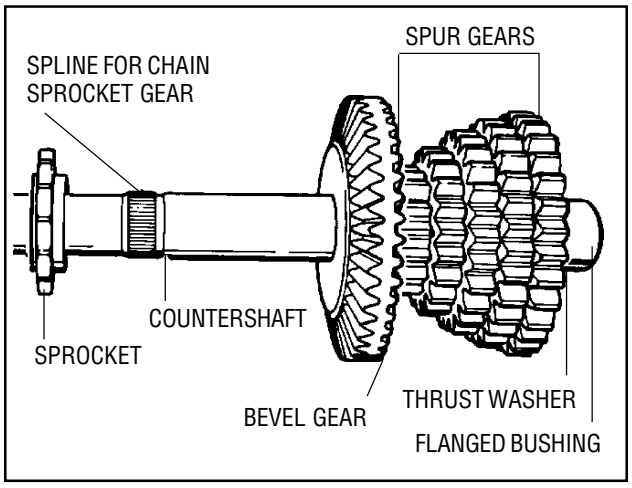
SHIFTING GEARS. The two sides of the shift gears are different. One side is flat and the other side is recessed to accept shift washers. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shift keys.



NOTE

The large thrust washer on the shift gear end of the shifter/brake shaft does not have a chamfer on the inside diameter.

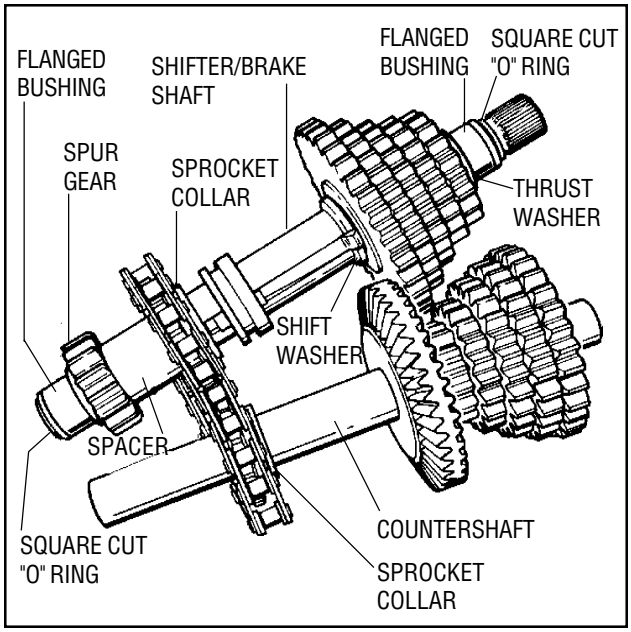
4. Reassemble the shifter/brake shaft by installing the sprocket and chain, spacer, spur gears, and thrust washers. Be sure the collar on the sprocket faces inward toward the shift collar or toward the brake end of the shaft. Install the appropriate thrust washers and the bronze oil light bushings on both ends of the shifter/brake shaft; then install the square cut “O” ring on the brake end of the shaft. Opposite the brake end, there is a steel spacer disk; there is not an "O" ring on that end.



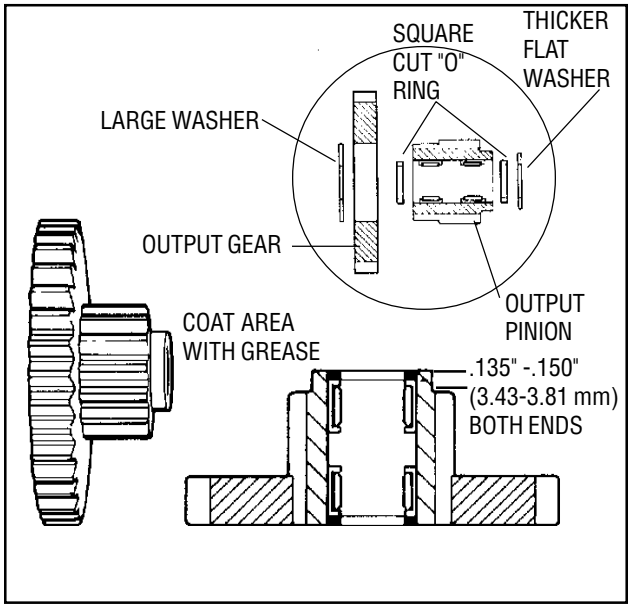
NOTE

Depending on the model specification, the bevel gear may be installed one of two ways. For description purposes, in this section, the model used has the bevel on the gear facing inward.

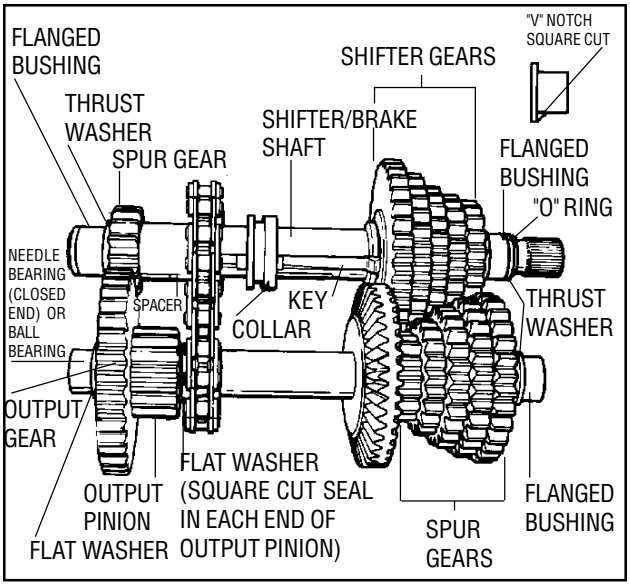
5. On the countershaft, install the bevel gear and the spur gears starting with the smallest to largest, (opposite the shifter/brake shaft spur gear arrangement). Place a thrust washer and bronze oil light bushing on the spur gear end of the countershaft. Note that the “V” notch on the bushing fits into the recess “V” in the case.



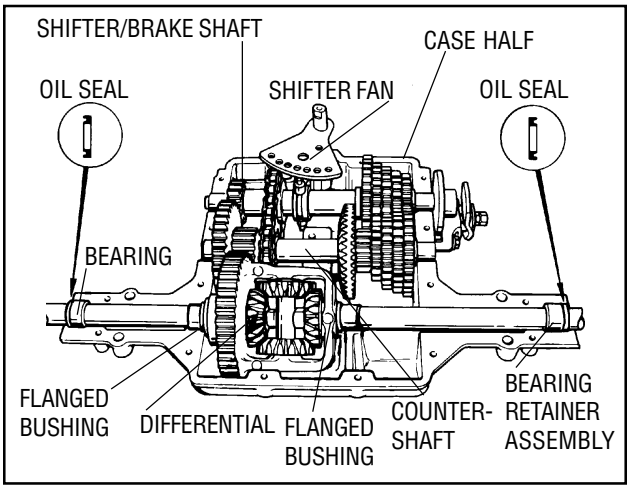
6. With the ends of the countershaft and shifter/brake shaft angled together, install the countershaft sprocket and chain on the countershaft.



7. For correct positioning of the needle bearings use the removal/installation tool, Tecumseh part # 670252. Fill the area between the needle bearings with axle grease before installing on the countershaft.



8. Install the flat washer to protect the turning sprocket from the square cut seal which fits into the recessed end of the output pinion gear. Install a square cut seal on the other end of the output pinion and the output gear. The large protective thrust washer keeps these in position. There is another square cut rubber seal that fits into the recessed end of the needle bearing sleeve assembly (closed end). Place it on the end of the countershaft and the two shafts are complete and ready to install into the case.



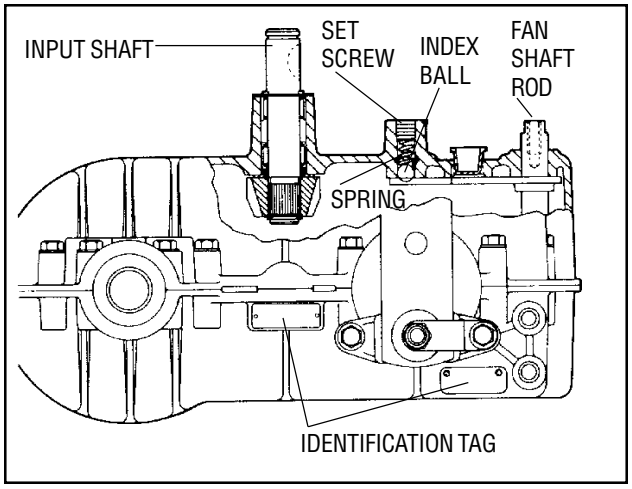
9. **DIFFERENTIAL ASSEMBLY**

   Install the flanged bushings (2), flat washers, needle bearings or ball bearings (2), and oil seals (2), with seal grooves facing out.

   For teardown and reassembly of the differential, see Chapter 18 on differentials.

   Install the differential in the case.

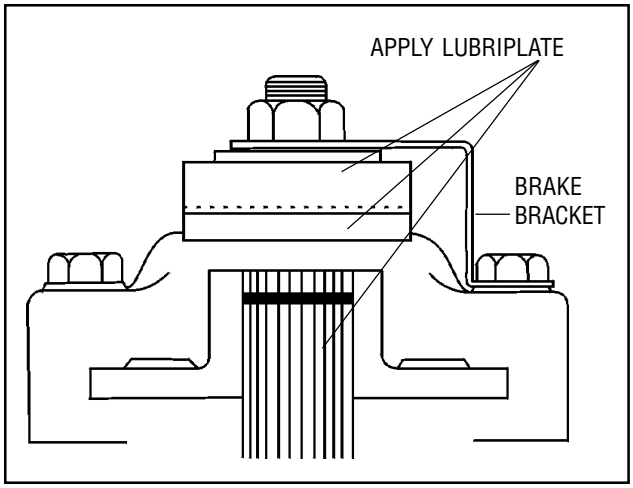
10. Install the shifter assembly, and pack 30 oz.(887ml) (36 oz. [1065 ml] 801 Series) of Bentonite grease around the bearings and gearing, then reinstall cover on the case. Torque cap screws 90-100 inch pounds (10.2-11.3 Nm).



NOTE

On reassembly, use either gasket eliminator Loctite 515 (part number 510334) or silicone RTV Loctite 598 (part number 788093).

11. Install the shifter fan detent ball, spring and setscrew in that order, into the cover, and slowly tighten the screw one turn below flush. If unit contained a neutral start switch, reinstall it. Check for binding by turning the input shaft.

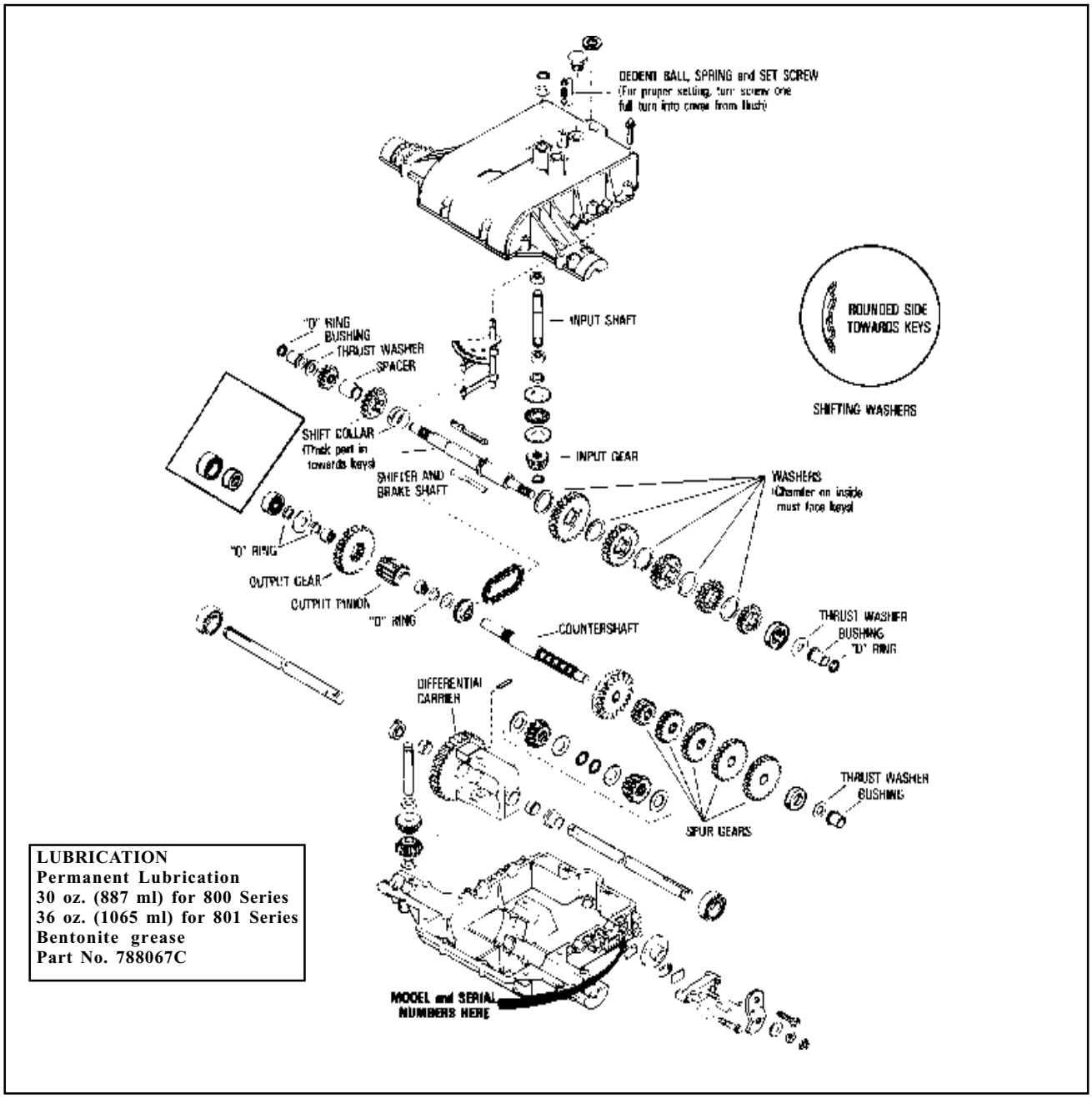


12. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

800/801 SERIES TRANSAXLES



LUBRICATION
Permanent Lubrication
30 oz. (887 ml) for 800 Series
36 oz. (1065 ml) for 801 Series
Bentonite grease
Part No. 788067C

The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

820 SERIES TRANSMISSIONS

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

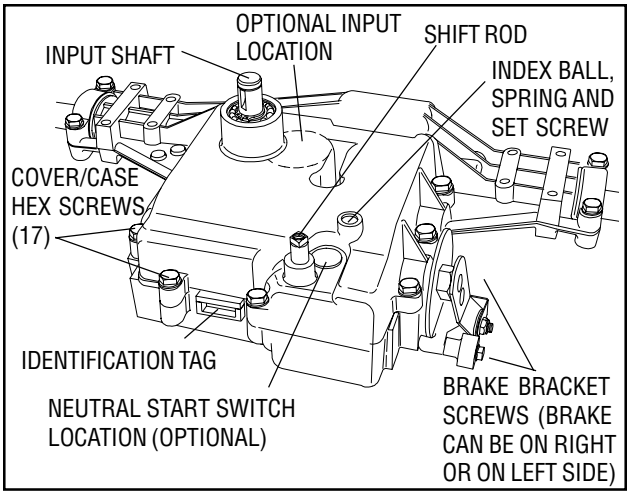
⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 820 series is similar to the 920 series transaxle in basic operation. It has up to 6 speeds forward and one reverse. The 820 series is a heavy duty unit which is suited for ground engaging attachments. The 820 features ball bearings, needle bearings and steel cut gears throughout.

NOTE

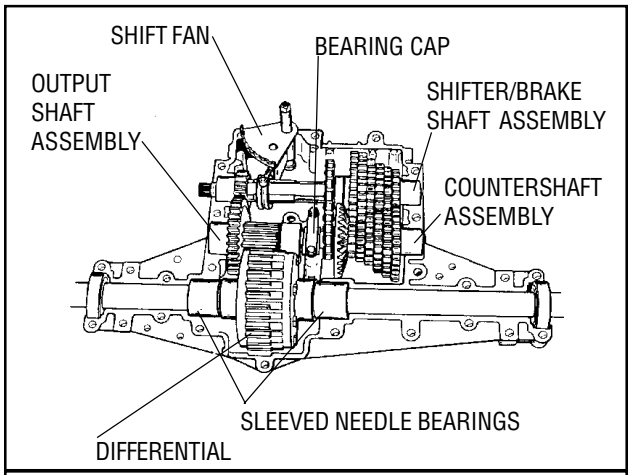
Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

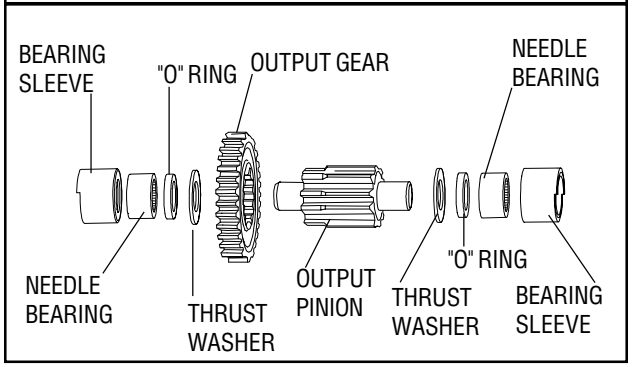


DISASSEMBLY OF TRANSMISSION

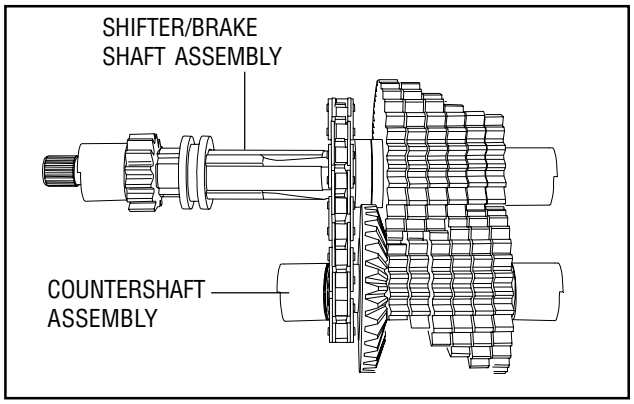
Clean outside surface of transmission. Position shift lever in neutral as indicated by the shift pattern.

1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. Remove setscrew, spring and index ball from the transmission cover and six cap screws that fasten the cover to the case.
3. Remove cover. Remove shifter assembly (includes shift rod and shifter fan) from transmission by lifting shaft out of case.
4. Remove bearing cap, differential, shift fan, output shaft assembly and then both the shifter/brake shaft and countershaft simultaneously. Take note that the "fat" side of the sprockets must face the tips of the keys or the brake side.
5. OUTPUT PINION AND SHAFT.
   Remove sleeved needle bearings. Remove the large thrust washers and large output gear. The output pinion gear is machined directly onto the output shaft in most models. There are models in which the output shaft is splined to accept a splined output pinion gear and a splined output gear.

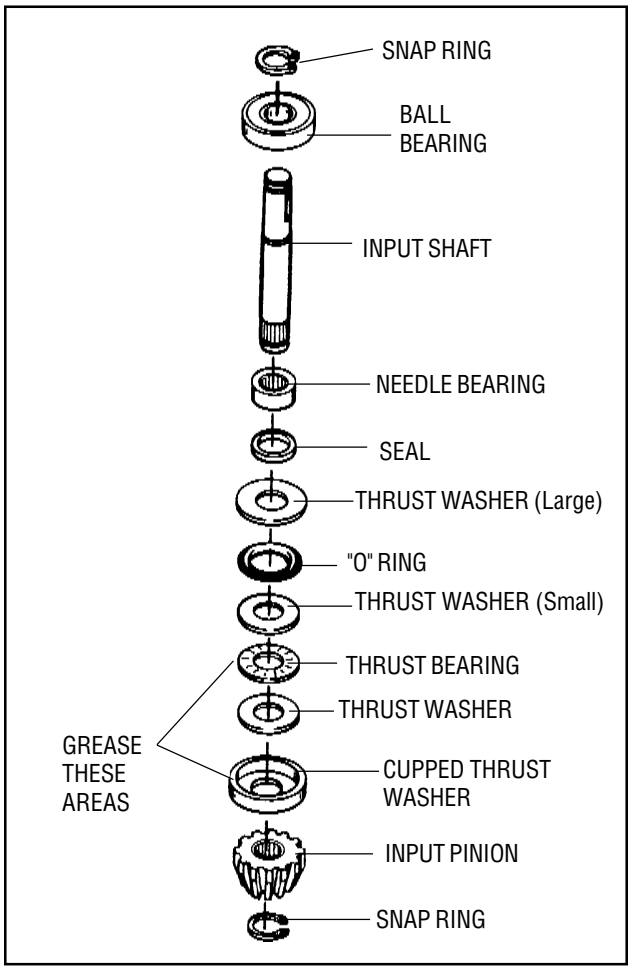




6. COUNTERSHAFT AND SHIFTER/BRAKE SHAFT
   As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.



7. INPUT SHAFT
   The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the cover. The seal must be replaced if the shaft is removed.



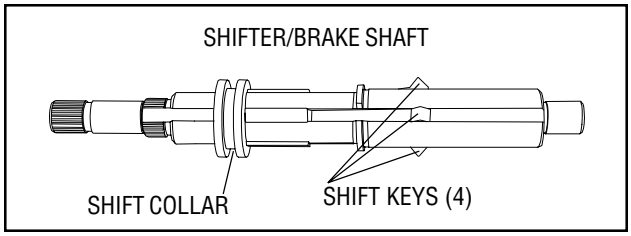
8. DIFFERENTIAL
   Refer to Chapter 18 on differentials for service. Should disassembly of the differential be necessary, 2 oz. (.59 ml) of bentonite grease should be placed around the gears on reassembly.

REASSEMBLY

NOTE

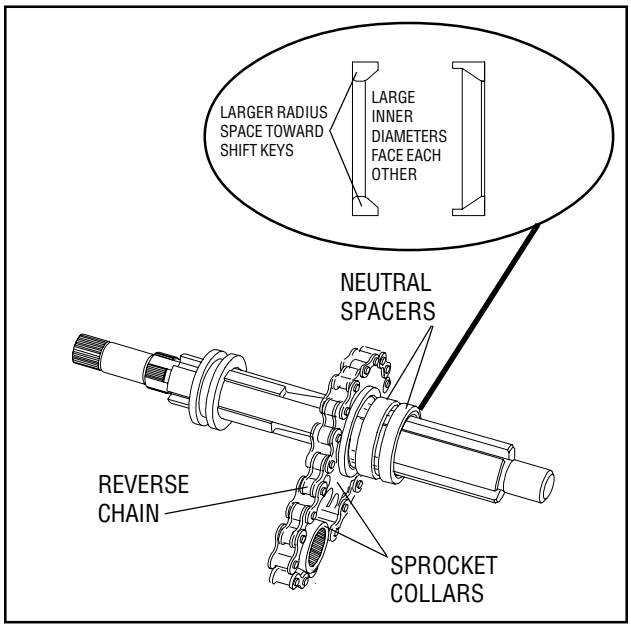
Do not apply bentonite grease to needle bearings; use only EP grease. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

1. Install the input shaft, and all the associated parts in the order shown on the input shaft breakdown.
2. Grease all four keyways, insert keys into collar and keyways and slide onto the shifter/brake shaft.

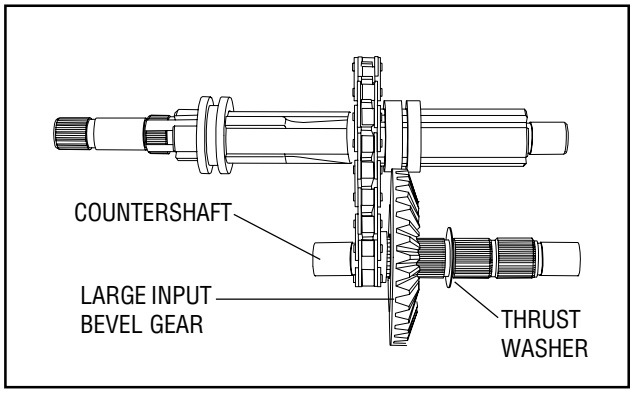


3. It is easier to assemble this transaxle if the countershaft and the shifter/brake shaft are assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure the collars on the sprockets are on the same side of the chain, facing the brake side and toward the tips of the keys.

   Place the neutral spacers onto the shifter/brake shaft with the larger inner diameter sides facing together. Position the spacer with the largest inner diameter radius toward the shift keys and brake end of the shifter/brake shaft. Push the shifting keys through the reverse sprocket and the first neutral spacer, pull the neutral spacers and the reverse sprocket up against the shoulder of the shifter/brake shaft.

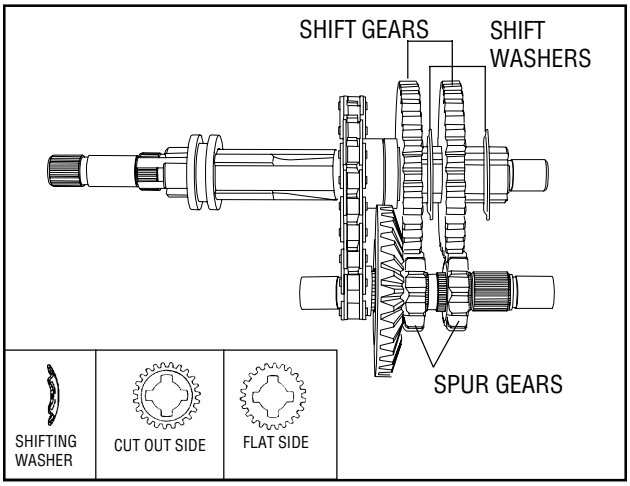


4. Insert the countershaft into the smaller reverse sprocket. Then install the large bevel gear, with the bevel facing away from the reverse sprocket. Place thin thrust washer on the countershaft next to the bevel gear.



NOTE

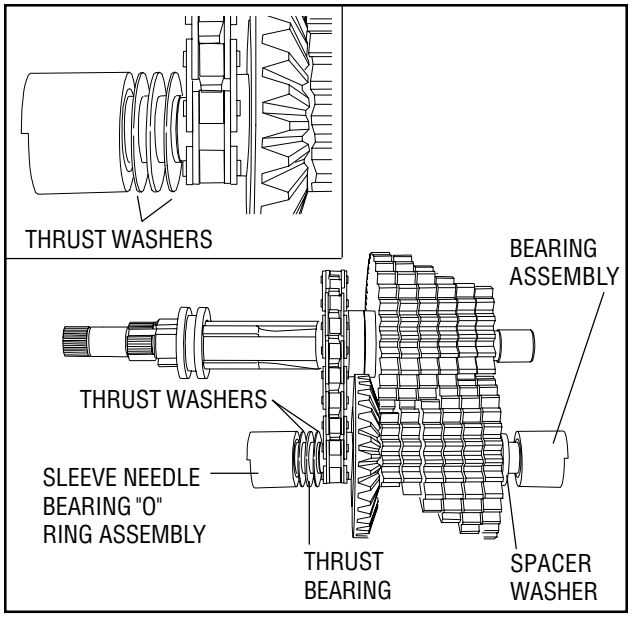
Depending on model, the bevel may be installed one of two ways. For description purposes in this section, the model used has the bevel side of the large bevel gear facing away from the reverse sprocket; in other models the bevel may face toward the reverse sprocket. In either case there is a thrust washer placed on the counter shaft after the large bevel gear. Some models may also have the smallest spur gear machined onto the countershaft. In this case the large bevel gear must be placed onto the countershaft prior to inserting shaft into the reverse sprocket. These models will not have a thrust washer placed next to the large bevel gear.



5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with it's mating gear on the other shaft. The first gear on the shifter/brake shaft is the largest of the shift gears. Place this gear next to the neutral spacer with the flat side of the gear next to the spacer. Place a shift washer onto the shifter/brake shaft with the rounded edge towards the shift keys. Continue this procedure until all the gears on both shafts have been added.

NOTE

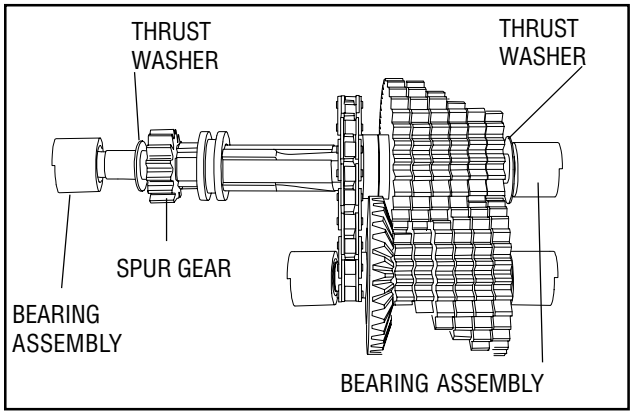
It is not only important that gears match up diameter-wise, but must match up according to thickness. As all the gears are placed back into the assembly, pack each with bentonite grease.



6. In the model pictured above, a thrust washer, thrust bearing, thrust washer and sleeved needle bearing with an "O" ring are placed on the countershaft next to the reverse sprocket. Place a spacer washer and sleeved needle bearing with an "O" ring next to largest spur gear. Install the sleeved needle bearing with the step facing outward and the wider portion of the bearing sleeve toward the cover. This will be true for all future sleeve bearing installations.

NOTE

On models with the large bevel gear facing in the opposite direction, the two thrust washers and the thrust bearing will be placed next to the largest spur gear, and the spacer washer will be placed next to the reverse sprocket. See the diagram at the top of the next page.

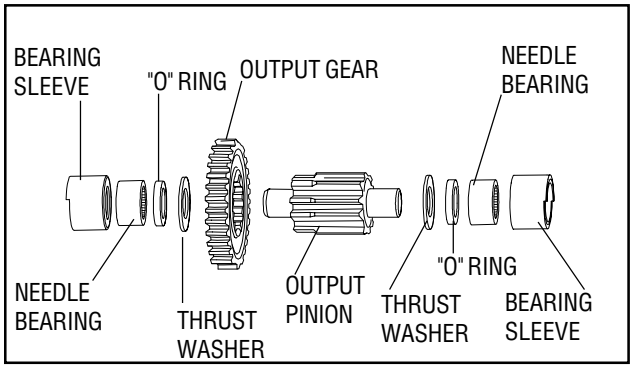


7. Place a large thrust washer next to the last shifting gear (this may be a step washer on some models) then a sleeved needle bearing with an "O" ring. Place the spur gear, small thrust washer and sleeved needle bearing with "O" rings on the opposite end of the shifter/brake shaft.

NOTE

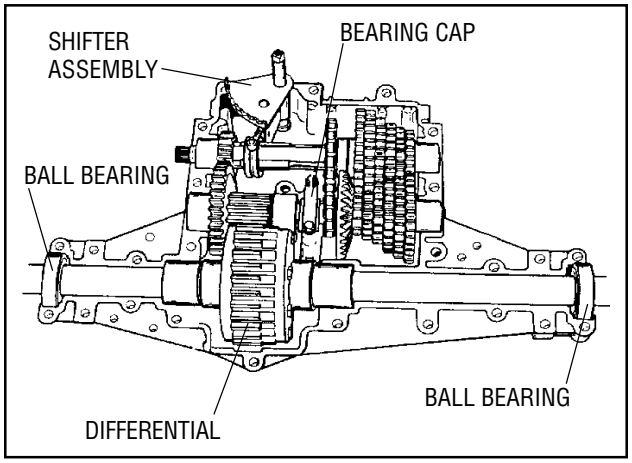
Dependent on whether the brake is on the right or the left, will determine which end uses a capped sleeved needle bearing.

8. Place the output gear on the stepped end of the output pinion. Place thrust washers on each end and then the large sleeved needle bearings with "O" rings. The "O" rings protect the axle/wheel bearing grease in the sleeved needle bearing from the Bentonite grease which lubricates the spur gears. Install the three shaft assemblies into the case.

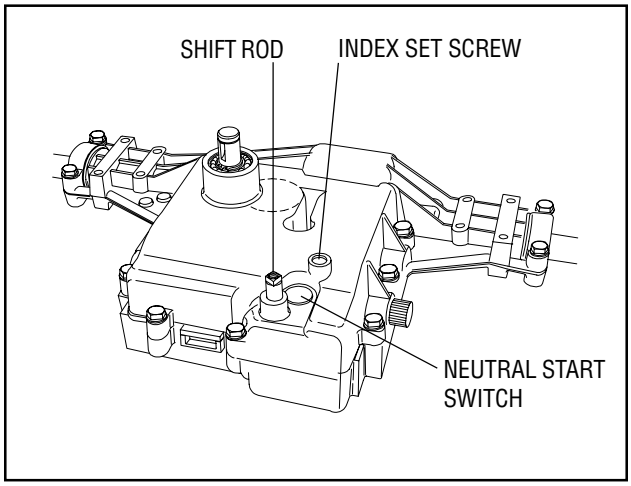


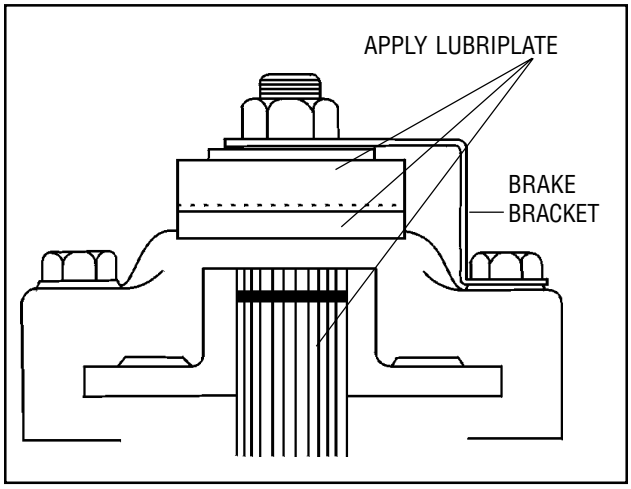
9. Insert differential into the case; position the caged ball bearings on the axle ends into the recessed areas of the case. Place the bearing cap over the sleeved needle bearing of the countershaft and torque the bolts 90-100 inch pounds (10.2-11.3 Nm). Install shifter fan and pack the transaxle with remaining bentonite grease. (36 oz. / 1065 ml total)

10. Clean mating surfaces of the case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh Part No. 510334 or the Loctite Silicone RTV 598, Tecumseh Part No. 788093.



11. Guide cover over shift rod and position onto case. Torque cover screws 180-216 inch pounds (20.4-24.5 Nm). Replace the detent ball, spring, and set screw. Turn set screw one (1) turn below flush. Install the neutral start switch if applicable. Check for binding by turning the input shaft.



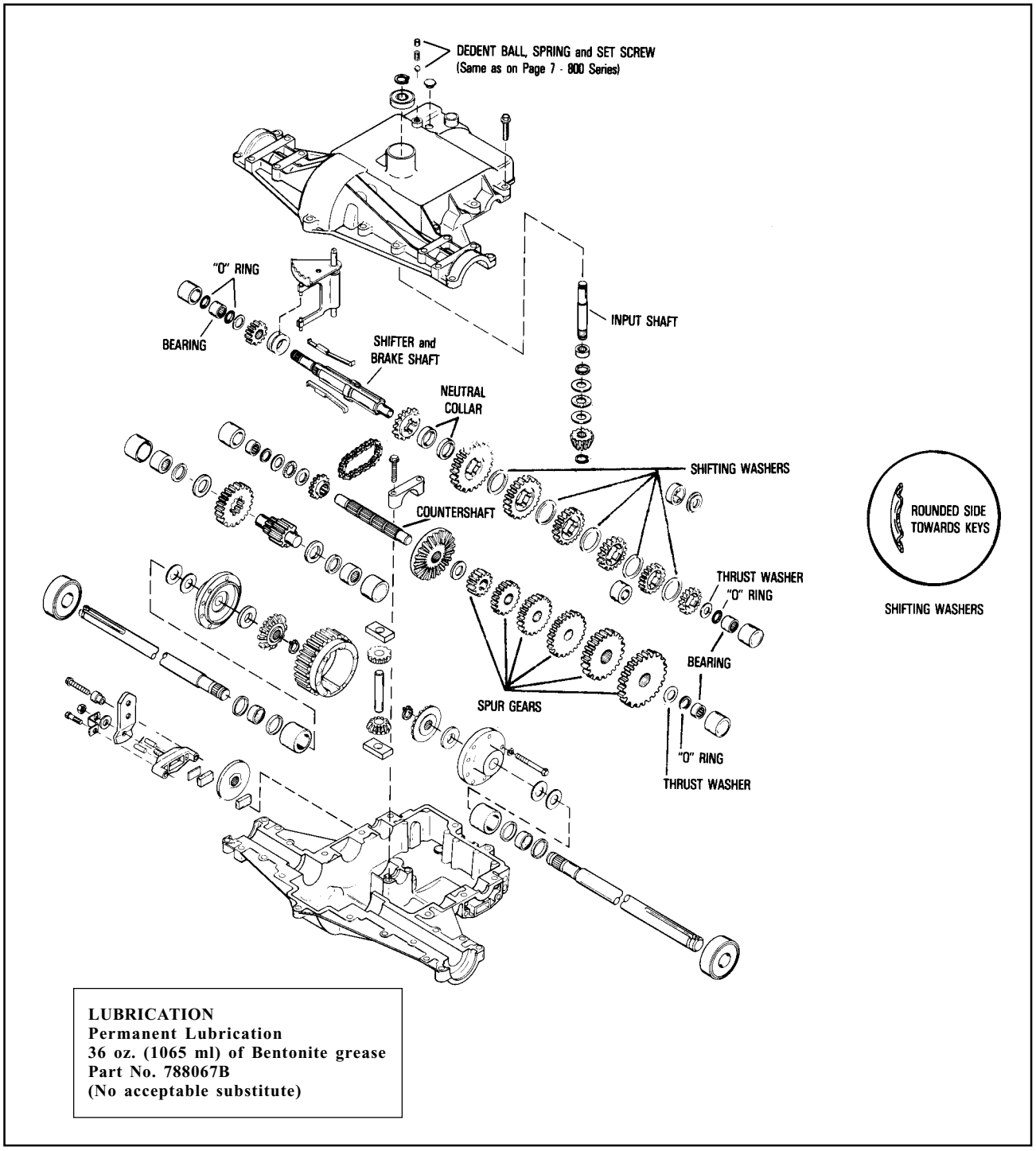


12. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

820 SERIES TRANSMISSION



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 6. 900 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

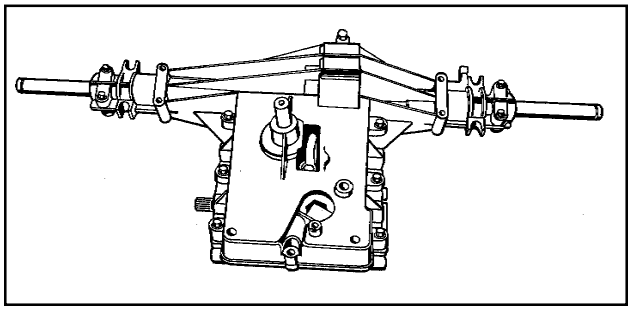
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

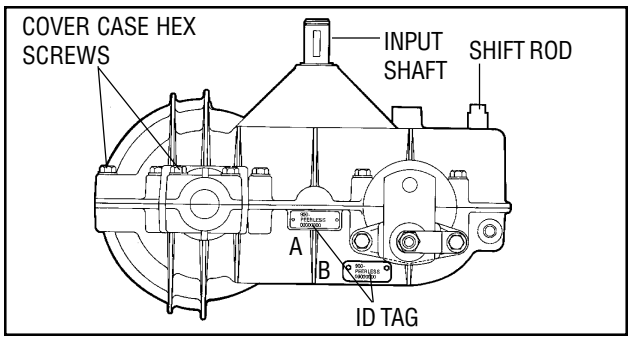
NOTE

Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.



GENERAL

The 900 series is similar to the 800 series transaxle but has only up to 4 speed offerings forward and 1 reverse. The differential utilizes bearing blocks and is retained by the case and cover. This unit contains an aluminum tag at location A or B, showing the model number.



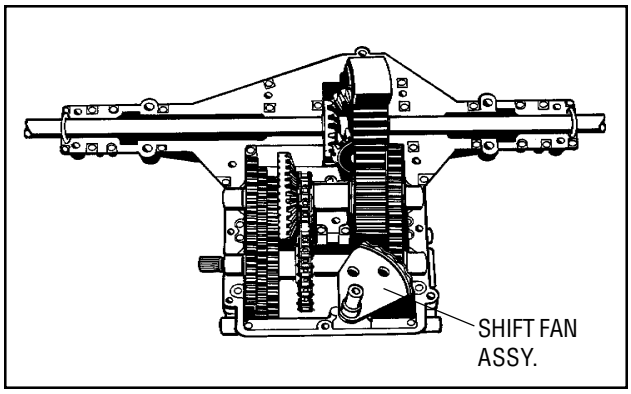
DISASSEMBLY OF TRANSAXLE

Clean outside surface of transaxle. Position shift lever in neutral as indicated by the shift pattern.

1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. Remove Allen head setscrew, spring and detent ball from the transmission cover and six cap screws that fasten the cover to the case.
3. Remove cover. Remove shifter assembly (includes shift rod, and shifter fan from transaxle by lifting shaft out of case.
4. Remove two brake bracket screws and remove brake assembly.

NOTE

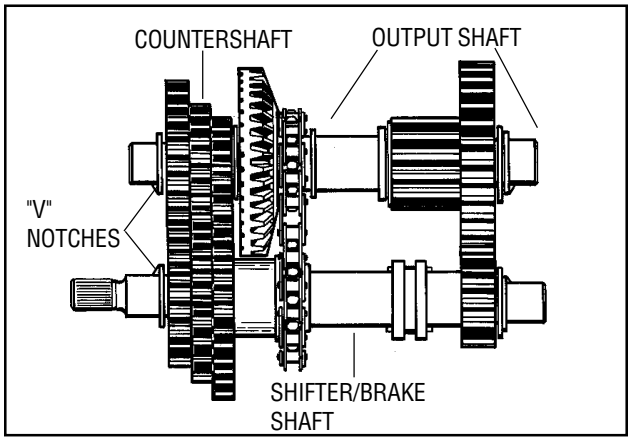
Remove grease from the unit as parts are removed. It will be difficult to keep parts from falling off the assemblies. Note position of parts before removal.



5. Remove the gear and shaft assemblies from the case half.

NOTE

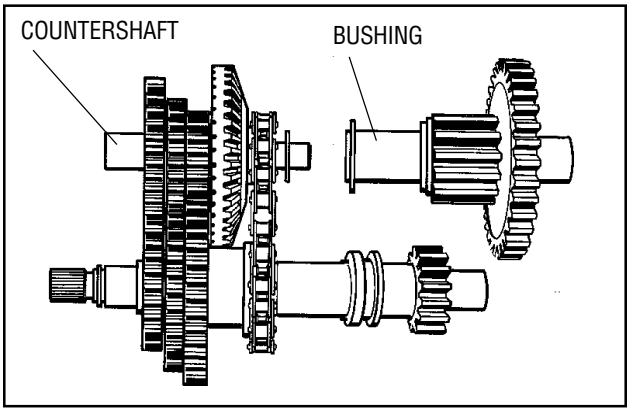
Before disassembly, observe how the bushing tabs on the flange bushings fit into recess “V” notches of the case. The cover will rock back and forth and not rest tightly on the case if these bushing tabs are not pressed down in the "V" notches.

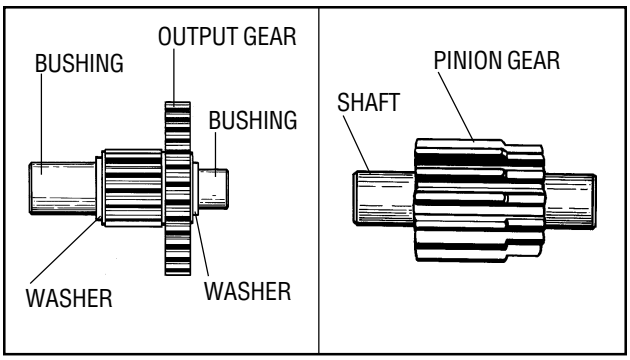


6. To disassemble the countershaft, output pinion and shaft assembly, simply pull apart.

COUNTERSHAFT

7. Remove the two (2) thrust washers, sprocket, bevel gear, spur gears and flanged bushing. The sprocket, bevel gear and spur gears are splined to the countershaft.



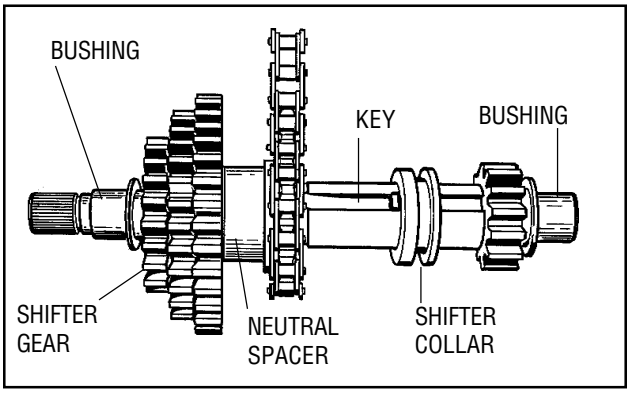


8. **OUTPUT PINION AND SHAFT**

Remove the large brass bushing, large washer, large output gear, washer and bushing. The shaft and output pinion gear come as an assembly.

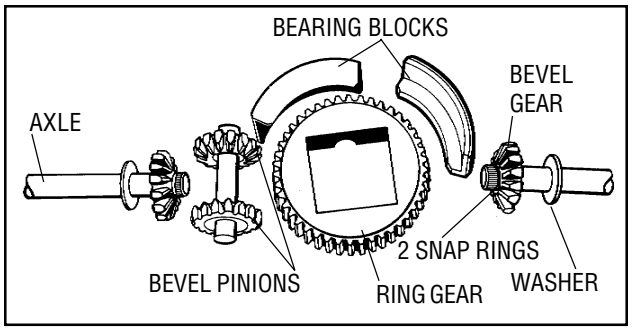
9. **SHIFTER SHAFT**

Remove the square cut “O” ring (1) and flanged bushings (2), thrust washers (2) on shaft ends, shift collar with keys, sprocket, spacer, shifter gears and thrust washers.



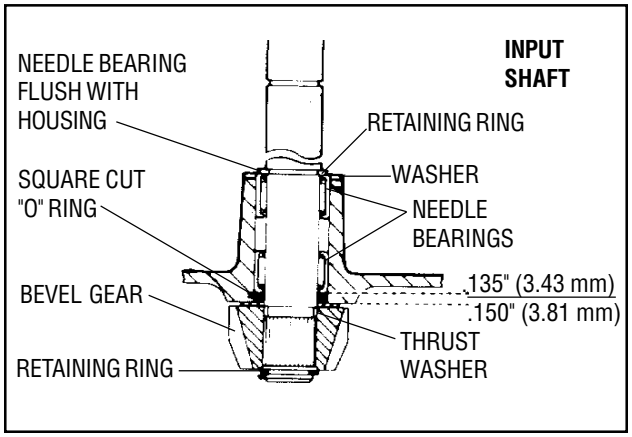
10. **DIFFERENTIAL**

Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft, and the axles. Grasp the axle bevel gears between your thumb and fingers; hold together while lifting differential from case. Remove bottom bearing block from case.



11. **INPUT SHAFT**

Remove retaining ring on bevel gear end from the input shaft, remove bevel gear and pull shaft through case. The square cut “O” ring must be replaced, if removed.



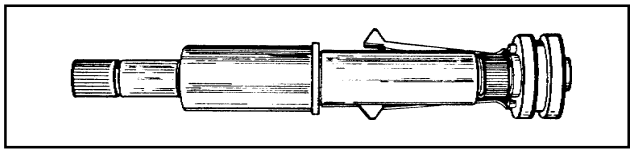
Tool part no. 670251 is used for removal and installation of needle bearings for the input shaft. The needle bearing on inboard side is installed .135"-.150” (3.43-3.81 mm) below flush.

REASSEMBLY

1. Apply E.P. grease between bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.

NOTE

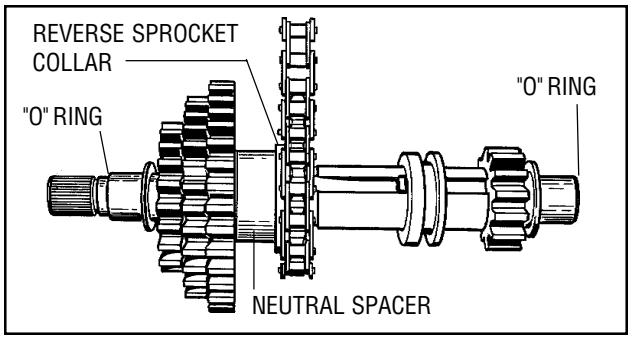
Needle bearings are lubricated with E.P. grease. Do not use bentonite on any needle bearing. For maximum gear train life use bentonite grease on shifter/brake shaft.



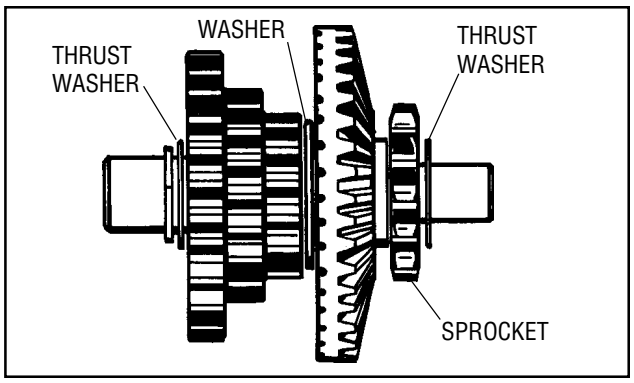
2. Grease both keyways and slide keys and collar on the shifter/brake shaft.

NOTE

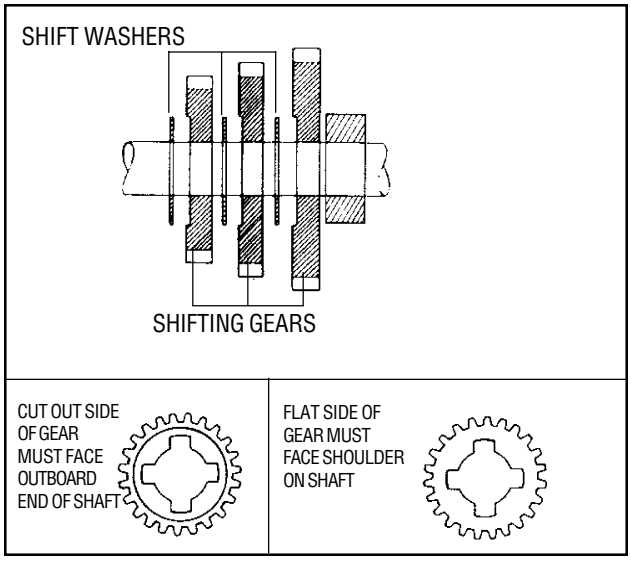
When reassembling the 900 series it is easier to assemble the shifter/brake shaft and the countershaft at the same time.



3. Place the reverse chain on the reverse sprockets. Make sure the collars on the sprockets are on the same side of the chain, facing the brake side, and toward the tips of the keys. Slide the keys through the sprocket and install the neutral spacer over the ends of the shifting keys and pull them back until the sprocket touches the shoulder of the shaft.



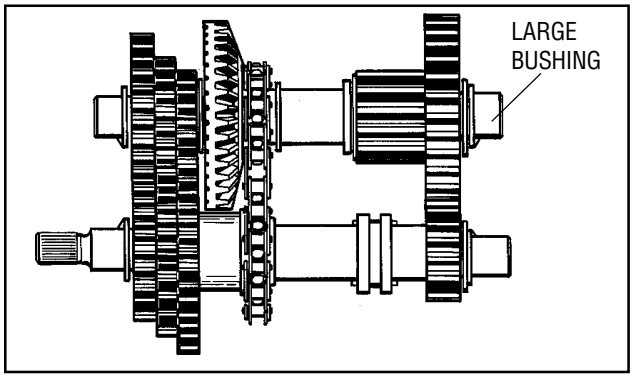
4. Insert the splined countershaft into the smaller reverse sprocket. Then place the large beveled gear on the countershaft with the beveled side of the gear towards the reverse sprocket. If the 900 series is a 1, 2, or 3 speed forward unit, place a washer over the shaft and next to the backside of the large bevel gear. If the unit is a speed forward there will not be a washer on the inside diameter of the washer next to the gear. The chamfer or rounded side must face towards the shifting keys.



5. Place the largest of the shifting gears with the flat side of the gear next to the neutral spacer. Then place a shifting washer with the chamfer on the inside diameter of the washer next to the gear. The chamfer or rounded side must face towards the shifting keys.

NOTE

As all the gears are placed back into the assembly, each should be packed with bentonite grease.



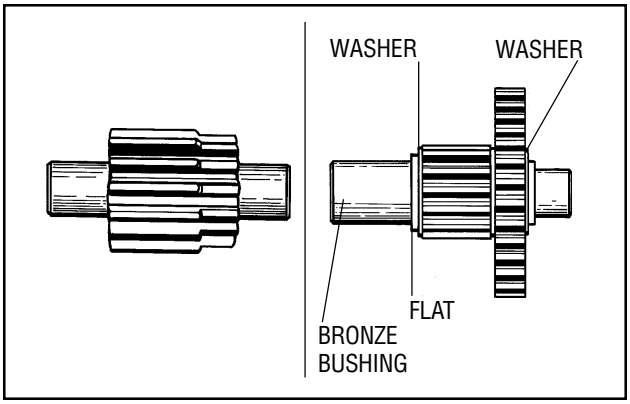
6. Next place a thrust washer on each end of the countershaft and a bushing on the end of the shaft with the largest spur gear.

7. On the shifter/brake shaft place a large thrust washer next to the smallest shifting gear, next the bronze bushing and then an “O” ring.

NOTE

Some units will use a stepped thrust washer; place the washer onto the shaft so that the step in the washer is out and away from the shifting gears.

8. The end of the shifter/brake shaft (opposite the shifting gears) has a spline. Install the spur gear on the spline that drives the output gear. Next install the thrust washer, bushing and “O” ring.



9. To assemble the output shaft assembly, place a washer and then the bronze bushing with the collar (flat down) next to the pinion. Place the output gear over the pinion as in the diagram above. There is a washer on the outside of the gear.

10. After both shafts are completed, place the flanged bushings on each end. Notice that one is larger than the other.

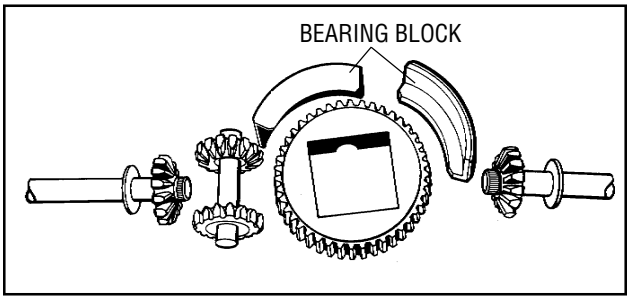
NOTE

The "V" notch on the bushing fits into the recess "V" in case.

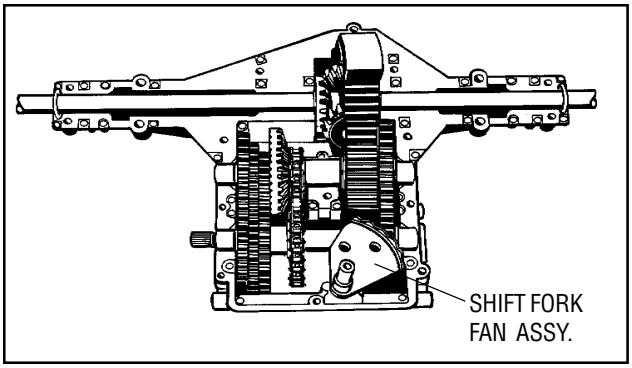
11. **DIFFERENTIAL ASSEMBLY**

    When assembling this unit, first make sure all parts are there, because the unit is put together in your hands and placed in the case at the same time. Axles and gears must be on the center line of the ring gear.

    When installed in the case the bearing block must have the flange to the left hand side. The bearing block in the cover must have the flange to the right hand side.



12. Before installing the differential into the case, apply Bentonite grease to the axle bearing areas.

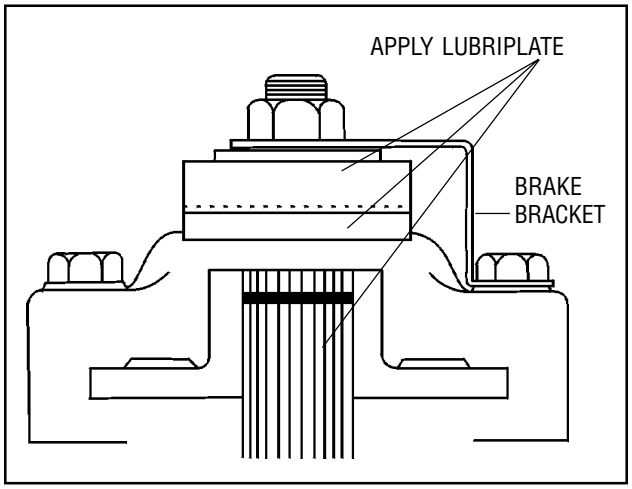


13. Install shifter assembly and pack 26 oz. (769 ml) Bentonite grease around bearings, gearing, and top of shift fan. Then reinstall the cover on the case. Torque cap screws 90-100 inch pounds (10.2-11.3 Nm).

14. Clean the mating surfaces of the case and cover. Place a continuous thin bead of sealant all around the seam; use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh Part number 788093.

15. Install index ball, spring, and set screw in that order into cover, and slowly tighten the screw one (1) turn below flush. If unit contains a neutral start switch, reinstall it now.

    Check for binding by turning the input shaft.

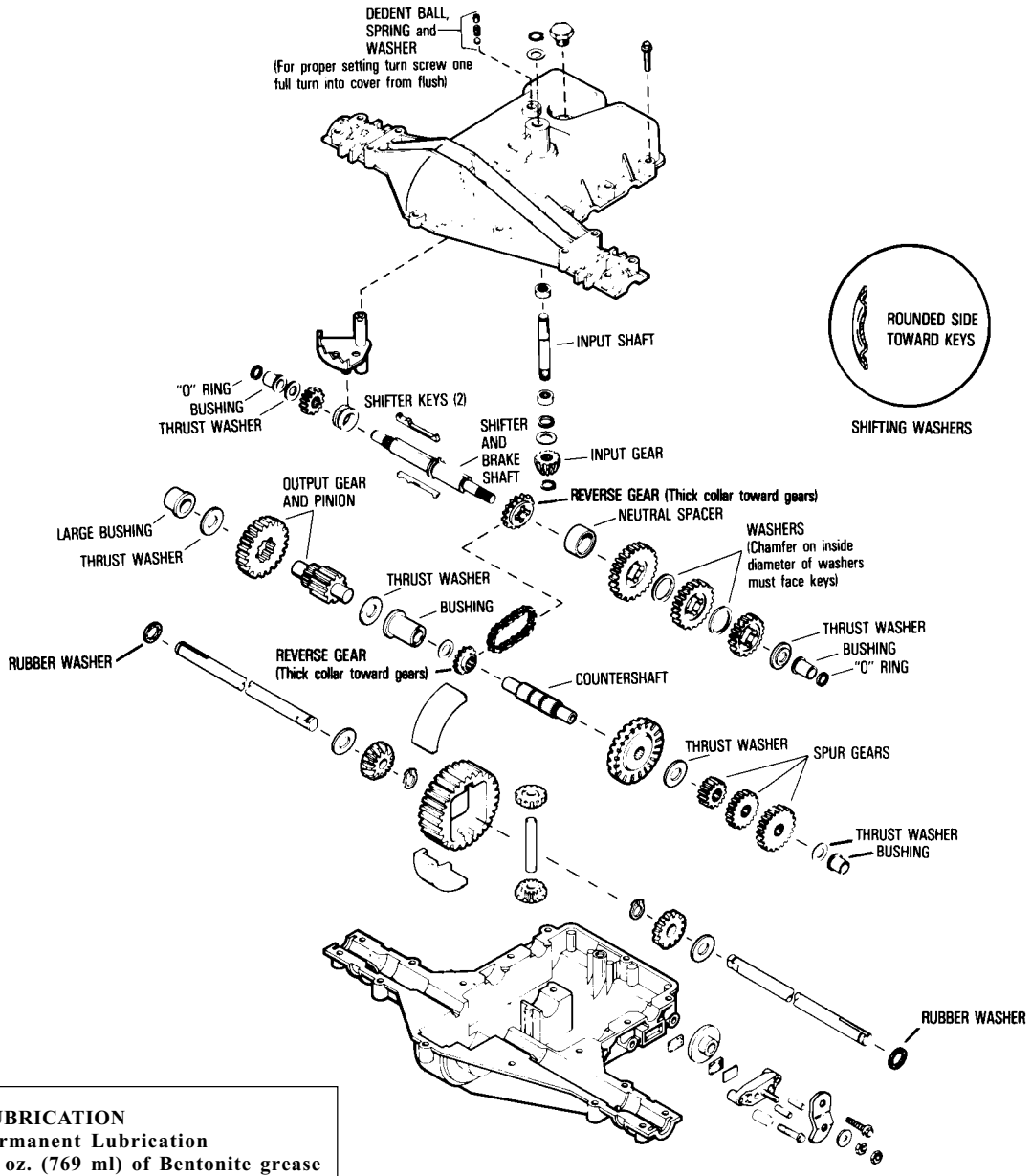


16. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

900 SERIES TRANSAXLE



LUBRICATION
Permanent Lubrication
26 oz. (769 ml) of Bentonite grease
Part No. 788067C
(No acceptable substitute)

The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 7. 910 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

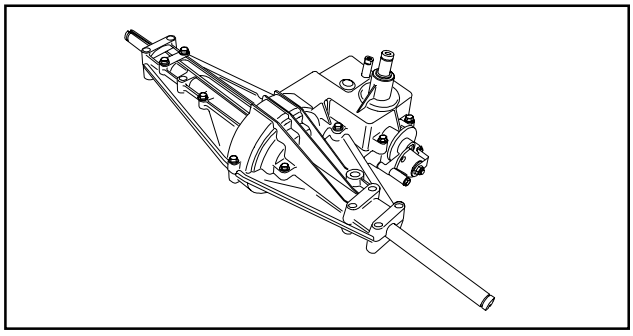
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

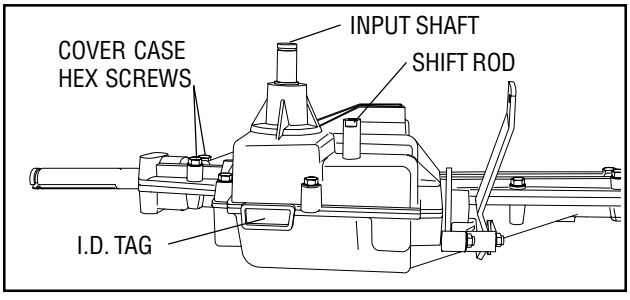
⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts my affect performance and could result in death or serious injury.

- **Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.**



GENERAL

The 910 series is available with 1 speed forward and 1 reverse.



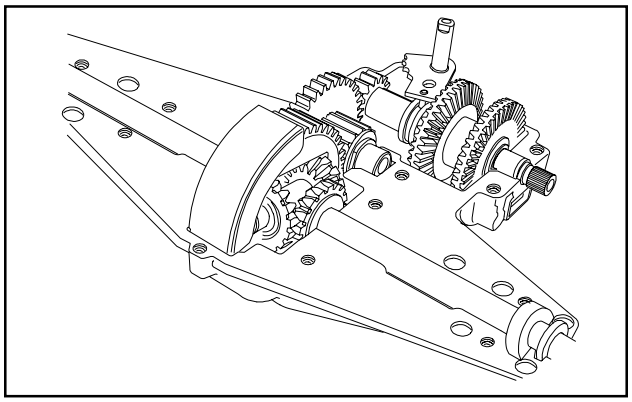
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLE

Clean the outside surface of transaxle. Position shift lever in neutral as indicated by the shift pattern.

1. The unit may have the OEM option of a neutral start switch; remove the switch.
2. Some 910 Series transaxles will have a Allen head setscrew, spring and detent ball. Remove these and the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan and lift out of case.

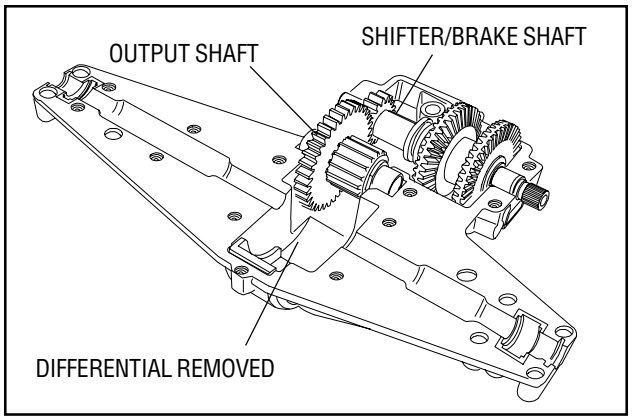


4. Remove the two brake bracket screws and remove brake assembly.
5. Remove the grease from the unit as the parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. Note the position of the parts before removal. Some parts may come off the shafts upon removal.

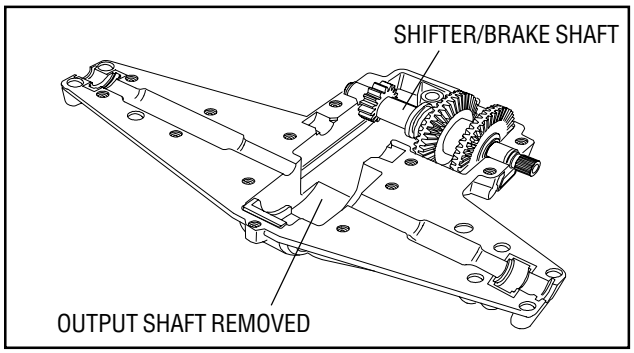
NOTE

Bentonite grease may stain clothing. Care should be used when handling.

6. Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles.



7. Remove the output shaft assembly and the shifter/brake shaft assembly.

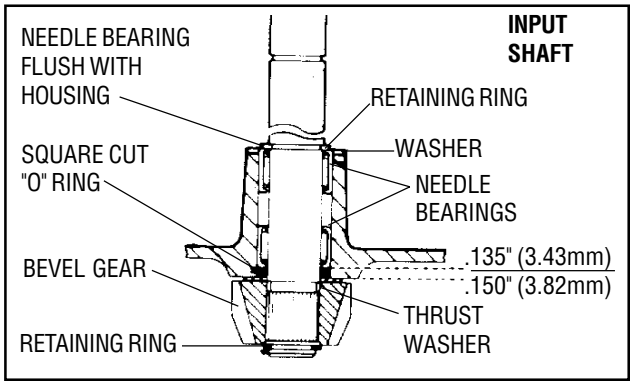


8. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

   Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 - .150" (3.43-3.81 mm) below flush.

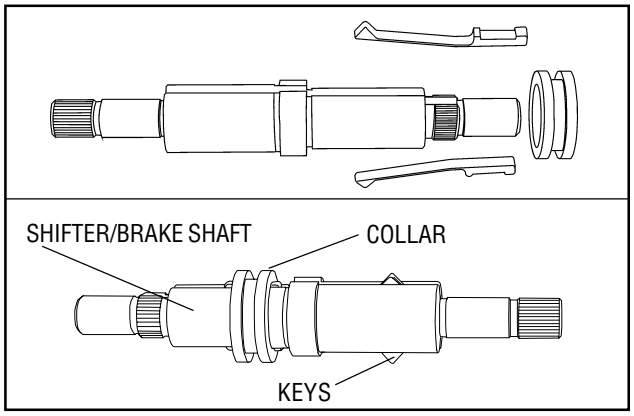
NOTE

Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE ON NEEDLE BEARINGS. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.



REASSEMBLY

1. Apply E.P. grease between the bearings in the cover and install the input shaft, bevel gear and snap ring.

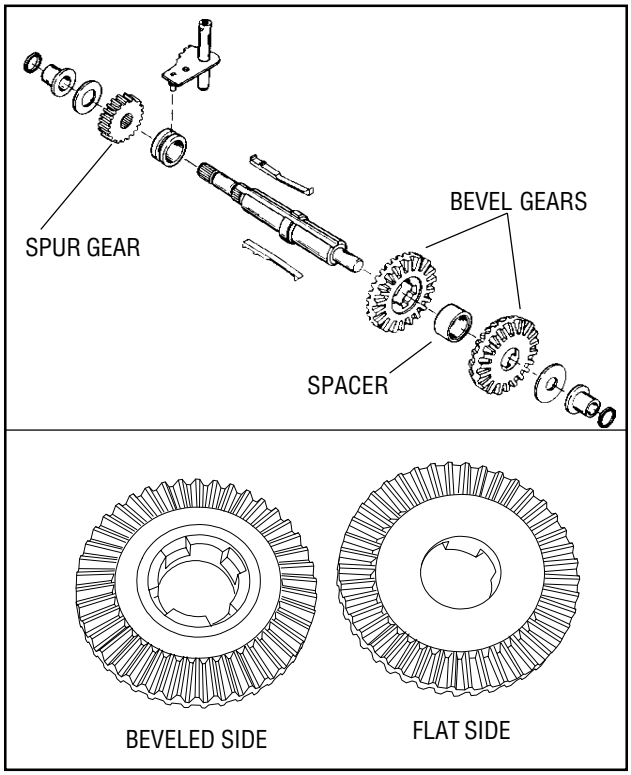


2. Grease both keyways and slide keys and collar on shifter/brake shaft.

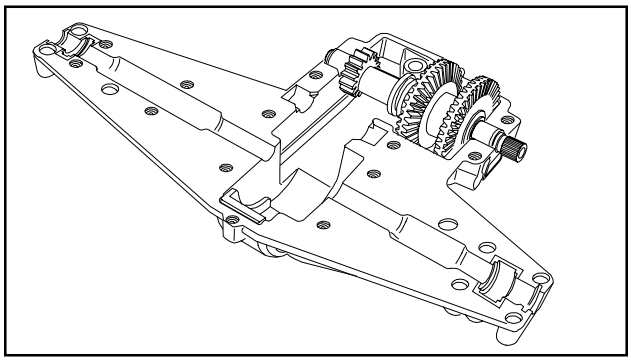
3. The large beveled shifting gears can be placed onto the shifter/brake shaft. The bevels on the gears face each other and are separated with a neutral spacer. Push shifting keys into the neutral spacer.

   Then place a thrust washer, bronze bushing, and an "O" ring on the shaft.

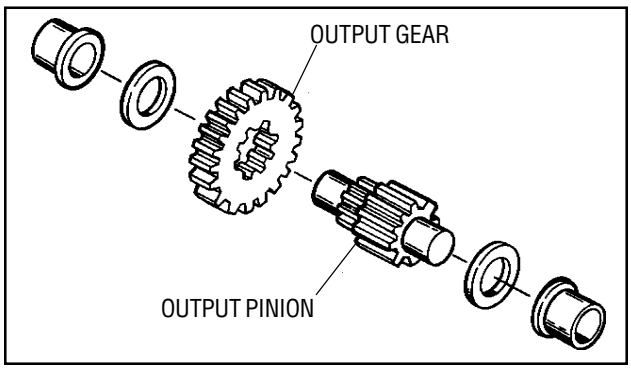
   The spur gear, washer, bushing and "O" ring are assembled to the other end of the shaft.

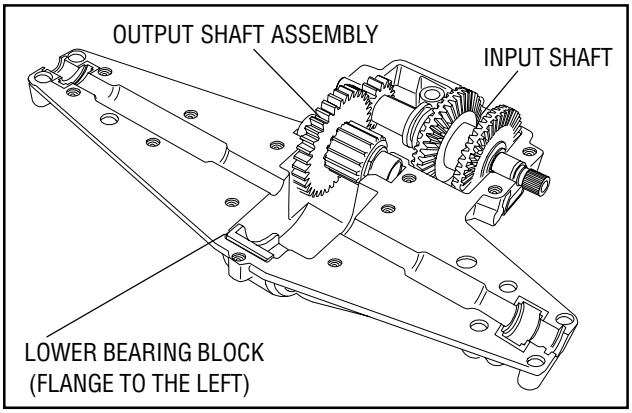


4. Place the shifter/brake shaft assembly in the case.

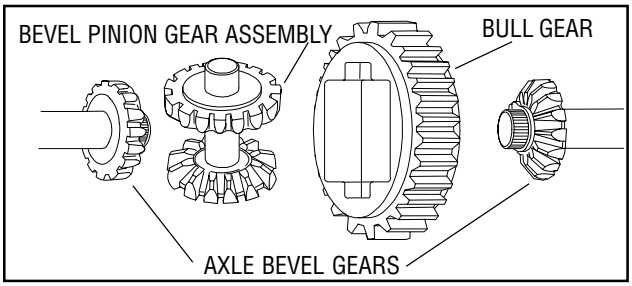


5. Place the output gear onto the output pinion. Install the thrust washers and bushings.





6. Insert the output shaft assembly into the case.
7. Prior to installing the differential into the case, apply Bentonite grease to the axle bearing surfaces.



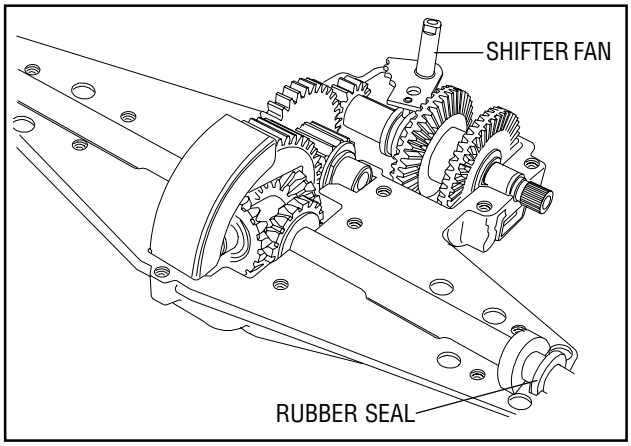
NOTE

The differential must be assembled out of the case and then placed in the case.

8. Insert the lower bearing block into the case with the flange to the left. (See diagram on the top of this page.) Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. This axle goes up to the side of the bull gear where the center shaft is located. On the opposite side of the bull gear, center the bevel gear with the other axle. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles. (If damaged or old, replace them).

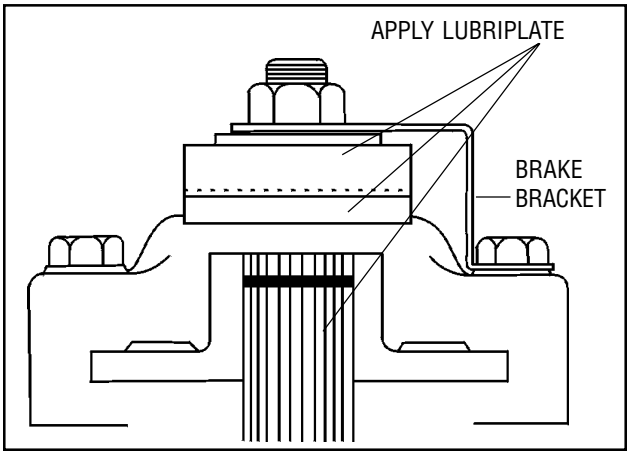
NOTE

With models that have an offset input, the differential assembly begins with the shortest axle.



9. Install the shifting fan with the pin in the groove of the shifting collar. Grease the top of the shift fan. Fill the unit with 18 oz. (532 ml) of Bentonite grease. Install the top bearing block with the flange to the right.
10. Clean the mating surfaces of the case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093.
11. Make sure that the tabs of all the bushings are in their “V” notches, install the cover and torque the cap screws to 90-100 inch pounds (10.2-11.3 Nm).
12. Reinstall the ball, spring and set screw on the models that have them. The setting for the screw is flush to the cover.

    Check for binding by turning the input shaft.

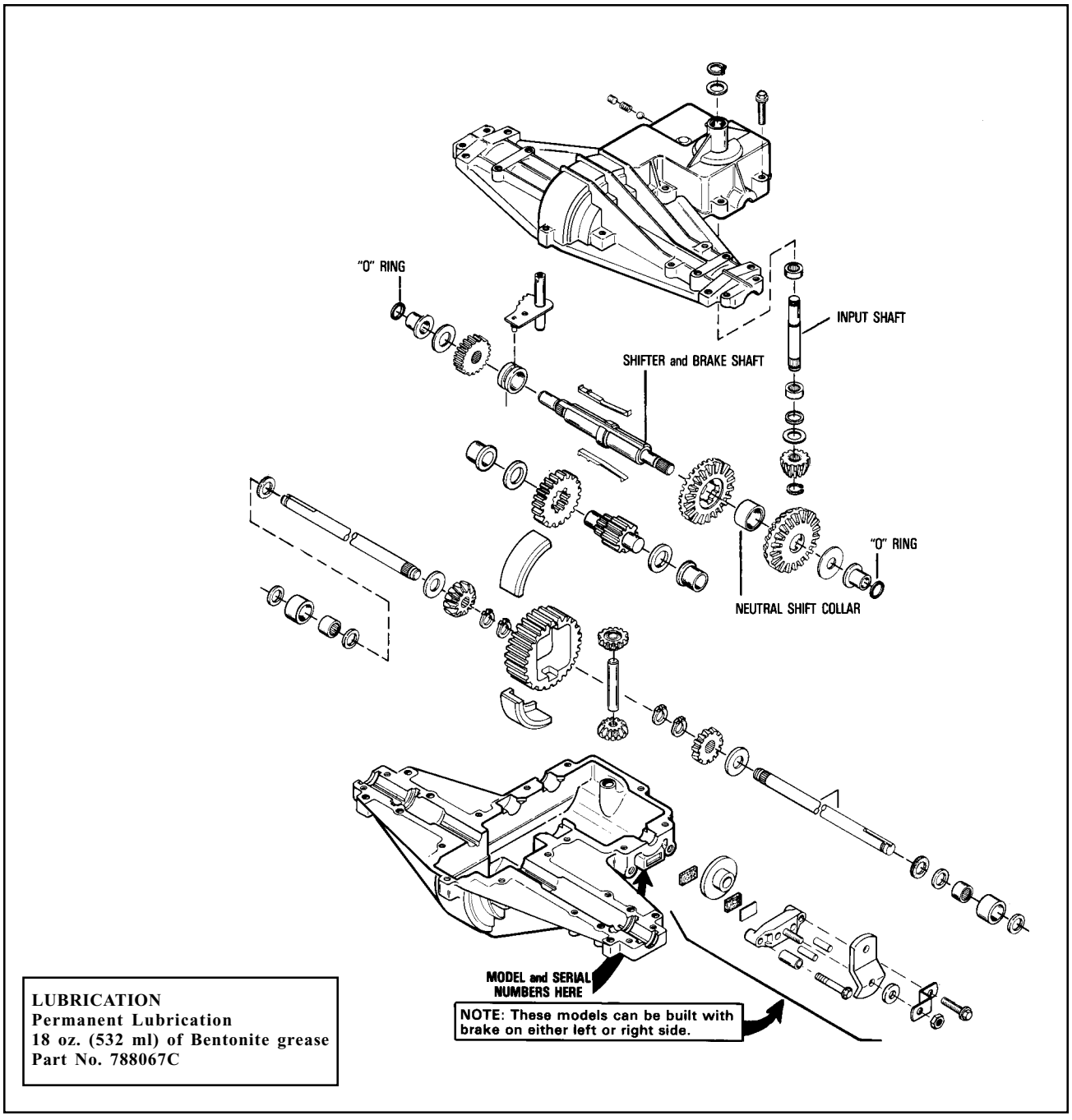


13. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer’s manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

910 SERIES TRANSAXLE



LUBRICATION
Permanent Lubrication
18 oz. (532 ml) of Bentonite grease
Part No. 788067C

The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 8. 915 SERIES / 940 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

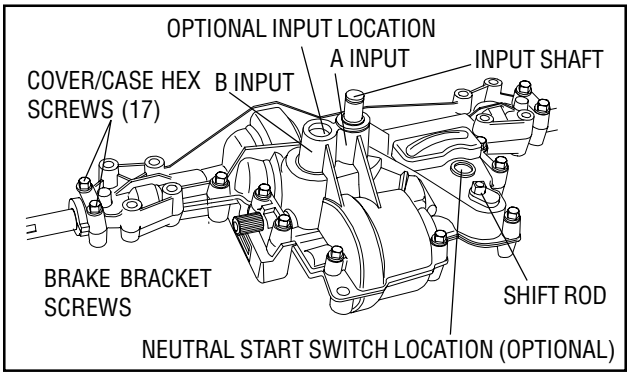
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

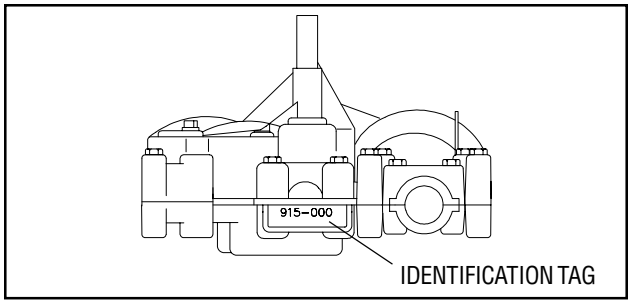
⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts my affect performance and could result in death or serious injury.

- **Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.**



GENERAL

The 915 series transaxle has a sculptured case, gear driven reverse and a unique power flow. The 915 series has 3, 4, 5 or 6 speeds forward and 1 speed reverse. The model pictured throughout this section utilizes an A input. Assembly variations for models with a B input or reverse input will be explained in the appropriate segment.



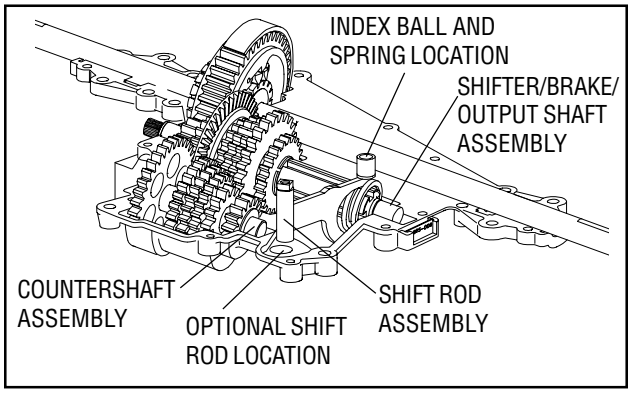
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLES

Clean the outside surface of transaxle. Position shift lever in neutral as indicated by the shift pattern.

1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. 915/940 Series transaxles will have a Allen head setscrew, spring and detent ball. Remove these and the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan) and lift out of case.
4. Remove the “O” ring from the top of the shifter rod.



5. Remove the two brake bracket screws and remove brake assembly.
6. Remove the grease from the unit as the parts are removed.

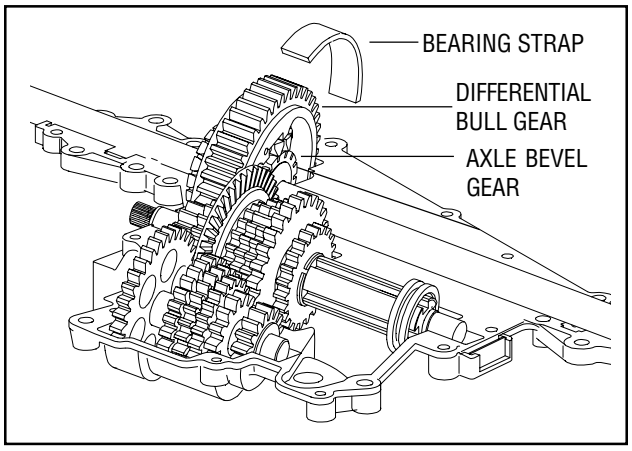
NOTE

Bentonite grease may stain clothes. Care should be used when handling.

940 SERIES

The 940 Series is identical to the 915 Series with the exception of 3 added bronze bushings. These bushings is located on the shifter brake shaft one opposite the brake rotor end. The other two are located on the spur gear shaft, one on each end.

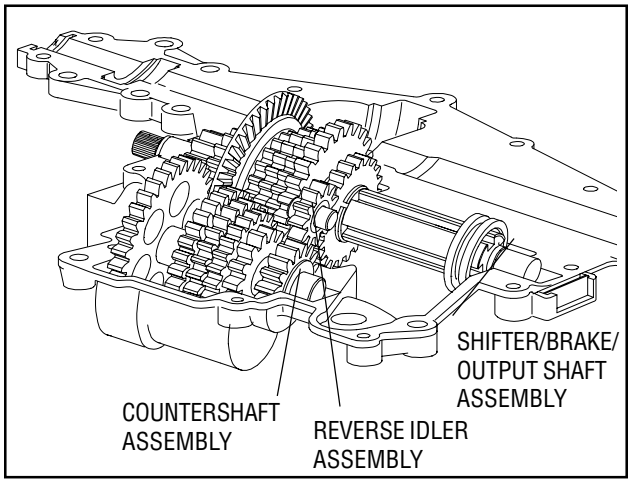
7. Remove the bearing strap on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft, and the axles. Grasp the axle bevel gears between your thumb and fingers, hold together while lifting differential from the case.



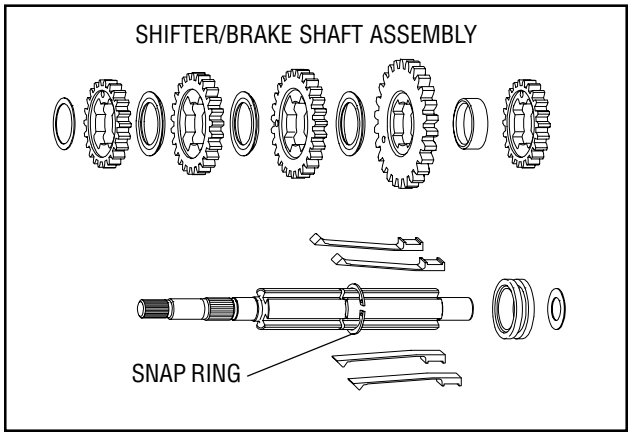
8. There are two (2) shaft assemblies in this transaxle; the countershaft and the shifter/brake/output shaft assembly. Remove these two shafts as complete assemblies from the case.

NOTE

Depending on the rotation of the countershaft gears, the reverse idler assembly will be located either above the reverse gears and held in place by bosses in the cover or below the reverse gears and held in place by bosses in the case. The reverse idler assembly will always be located against the thrust of the countershaft reverse gear.



9. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly and inspection of parts easier. Clean grease from each part as the parts are laid out. To remove keys from the shifter/brake/output shaft you must remove the large snap ring from its groove. Be careful not to stretch or twist the snap ring; it is not necessary to remove the snap ring from shaft.

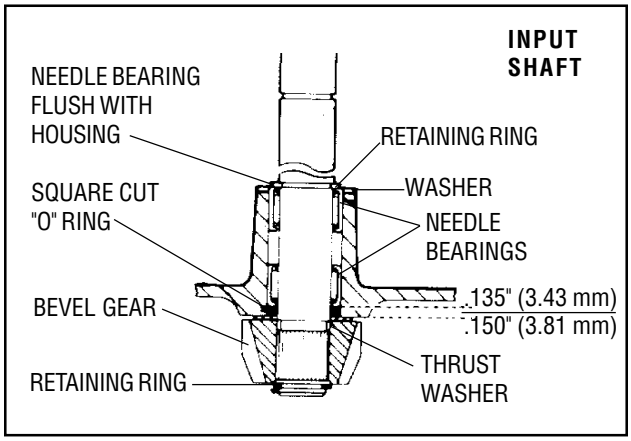


10. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut “O” ring must be replaced if the shaft is removed.

    Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 - .150” (3.43-3.81 mm) below flush.

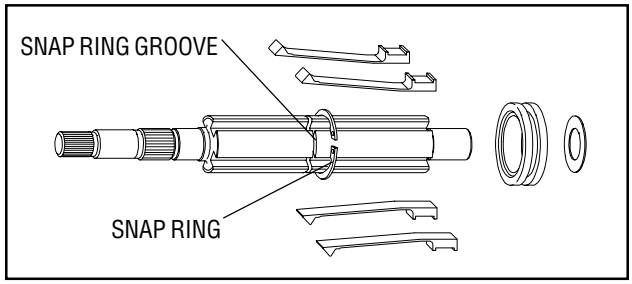
NOTE

Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE ON NEEDLE BEARINGS. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

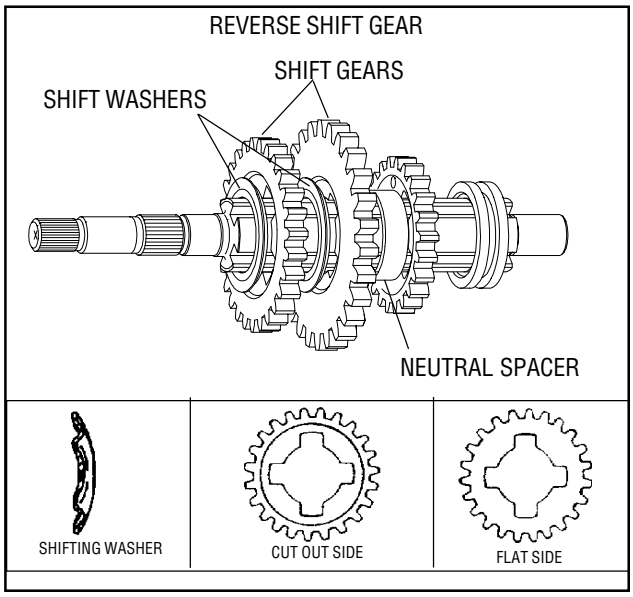


REASSEMBLY

1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



2. Grease all keyways and slide keys and collar onto the shifter/brake/output shaft. On models which have a inner diameter recess cut into one side of the shift collar, the recess side must face toward the gears and snap ring for proper gear selection. Place the large snap ring back into the snap ring groove. On five speed models that do not use the large bevel gear for the highest speed, an additional neutral spacer will be placed between the snap ring and the shift collar.

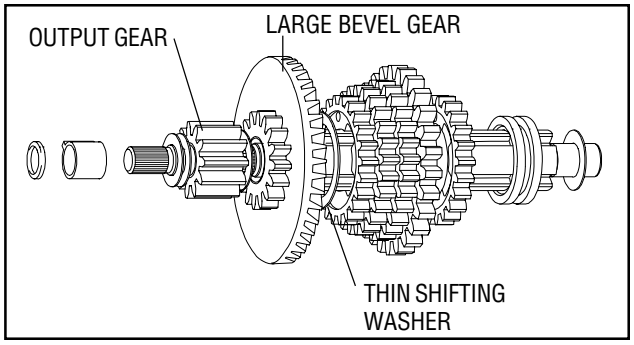


NOTE

As all the gears are placed back into the assembly, each should be packed with Bentonite grease.

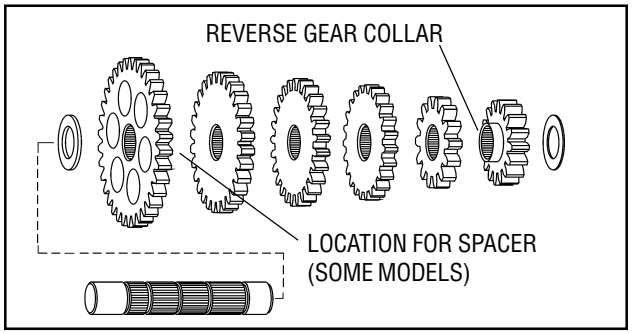
3. The shafts in this transaxle can be assembled separately. After replacing the snap ring into its' groove, place the reverse shifter gear onto the shaft with the flat side next to the snap ring. Push the shifting keys through the reverse gear and push the neutral spacer over the end of the keys and pull the neutral spacer and reverse gear up against the snap ring. Next place the shifting gear onto the shaft with the flat side next to the neutral collar.

   Then place a shifting washer onto the shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears and washers have been added in their proper sequence.



4. On the Shifter/brake shaft the last shifting washer will be a thin flat washer installed prior to the large bevel gear. The style of input will determine how the large bevel gear will be installed. In the model pictured, input "A" is used and the bevel is inward towards the keys. On models with a "B" input the bevel will be outward or away from the keys.

   In both instances the gear cut directly onto the large bevel gear will be toward the outside of the case. Install a washer and then the output gear. The output gear has an inner diameter recess on one end, this recess must face toward the large bevel gear. Two washers are installed next to the output gear followed by a bronze bushing and rubber "O" ring. Then place a washer on the opposite end of the shaft to complete the assembly of the shifter/brake shaft.



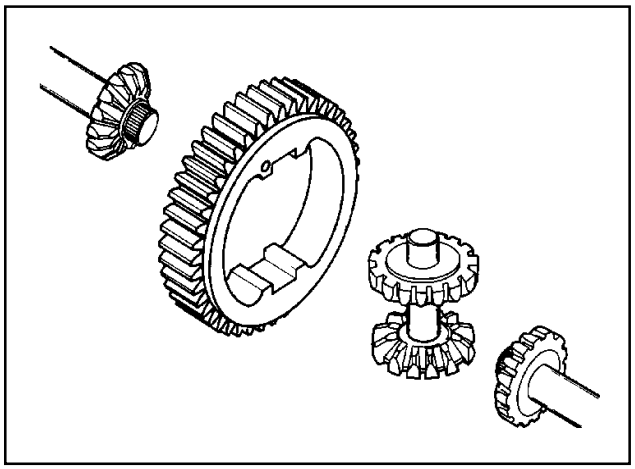
5. The countershaft must have the longer unsplined end toward the outside or brake side of the case and the shorter unsplined end toward the shifter assembly. The wide washer or spacer is placed on the longer unsplined end followed by the largest spur gear.

   If assembling a six speed or on some five speed models, a spacer will be placed next to the largest spur gear. On all other models, leave a space the width of the large bevel gear and then assemble the remainder of the spur gears with the reverse spur gear assembled with the collar side inward. The small washer is placed next to the reverse spur gear to complete the counter shaft assembly.

   The two assembled shafts can now be placed into the transaxle case. If the model has the reverse idler held in place by the case, insert the reverse idler into the case prior to the shafts.

NOTE

Depending on the rotation of the countershaft gears, the reverse idler assembly will be located either above the reverse gears and held in place by the bosses in the cover, or below the reverse gears and held in place by the bosses in the case. The reverse idler assembly will always be located against the thrust of the countershaft reverse gear. Make sure that the tab on the bronze bushing is located into the recess provided in the case.



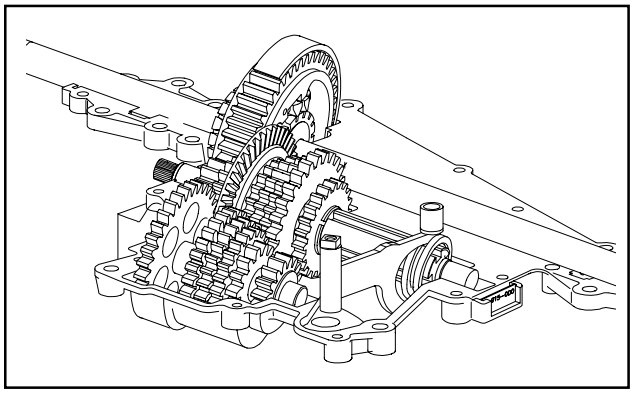
NOTE

The differential must be assembled out of the case and then placed in the case. Apply Bentonite grease anywhere the axle contacts the case.

6. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear of one axle with the pinion gears of the differential. Center the bevel gear of the other axle to the pinion gears of the differential. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).

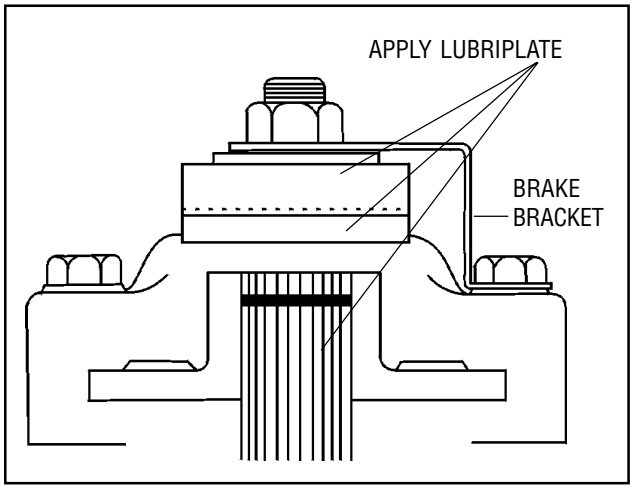
7. Install the shifter assembly, bearing strap and reverse idler assembly (if applicable). Pack the transaxle with the remaining Bentonite grease (10 ounces [296 ml] total). Replace the spring, set screw and the detent ball.

   Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515 , Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093A.



8. Guide the cover over the shift rod and position onto the case. Install the cover cap screws and torque 90-100 inch pounds (10.2-11.3 Nm). Install the neutral start sensing switch if applicable. Replace the square cut “O” ring on the exposed shift rod.

   Check for binding by turning input shaft.

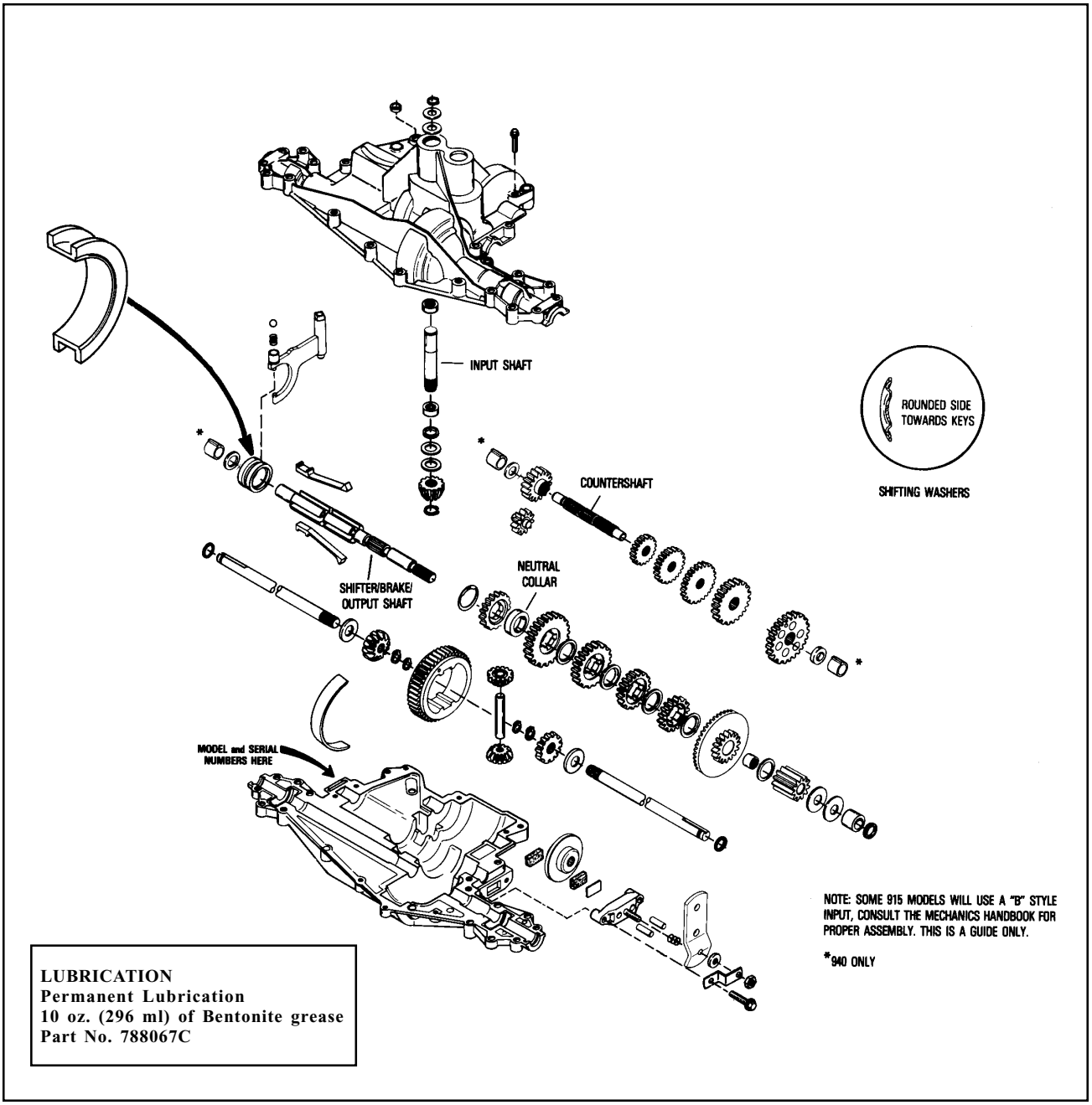


9. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

   Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer’s manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

915 SERIES / 940 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 9. 920 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

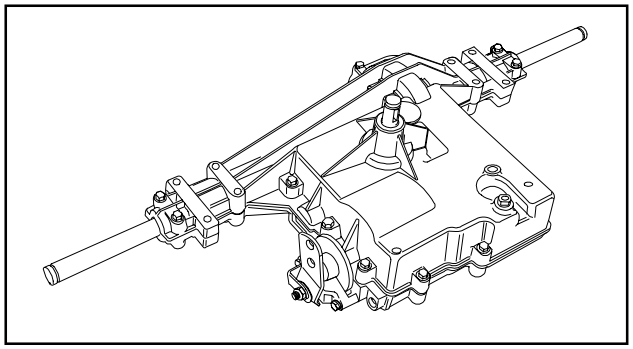
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

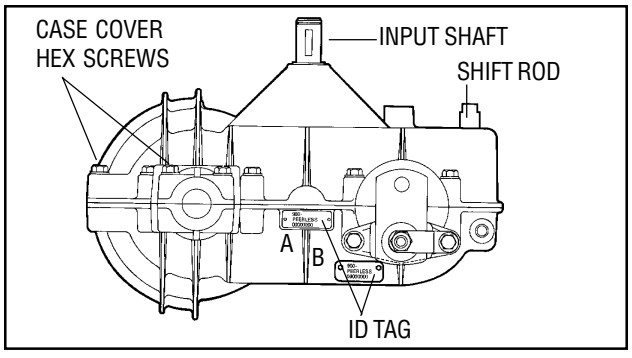
NOTE

Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.



GENERAL

The 920 series transaxle is very similar to the 900 series. The 920 series is available in 5, 6, or 7 speeds forward and 1 speed reverse. The 7 speed transaxle is shown in this section of this manual.



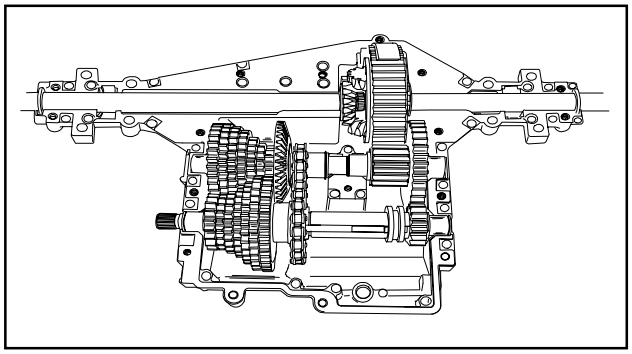
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLE

Clean outside surface of transaxle. Position shift lever in neutral as indicated by the shift pattern.

1. The unit may have the OEM option of a neutral start switch; remove the switch.
2. Remove the Allen head setscrew, spring and detent ball. Remove the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod and shifter fan) and lift out of case.



NOTE

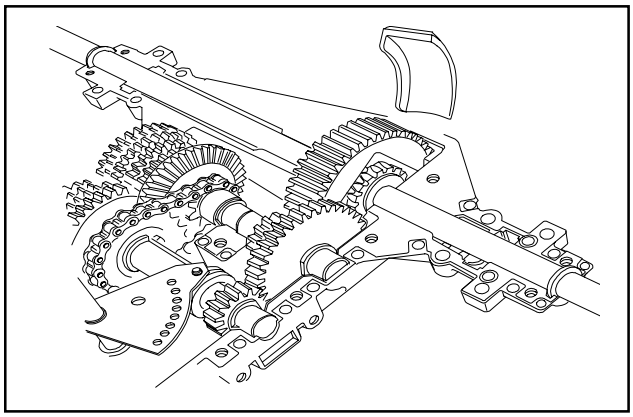
Some models will have the index ball and spring on the case end of the shift rod. Be careful not to lose parts when removing shift rod assembly.

4. Remove the two brake bracket screws and remove the brake assembly.
5. Remove the grease from the unit as the parts are removed.

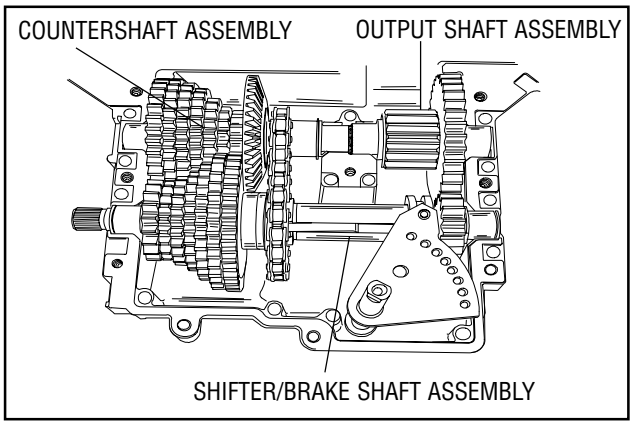
NOTE

Bentonite grease may stain clothes. Care should be used when handling.

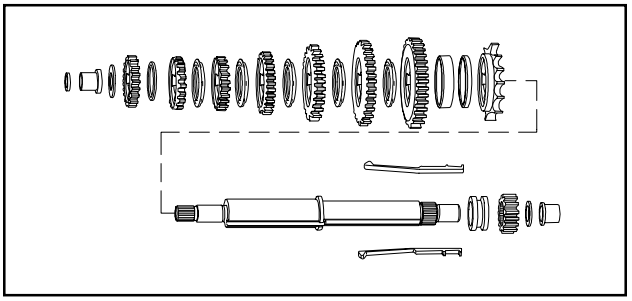
6. Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers, holding together while lifting differential from case.



7. There are three (3) shaft assemblies in this transaxle; the output shaft, the countershaft, and the shifter/brake shaft assembly. Remove these assemblies as complete as possible from the case.

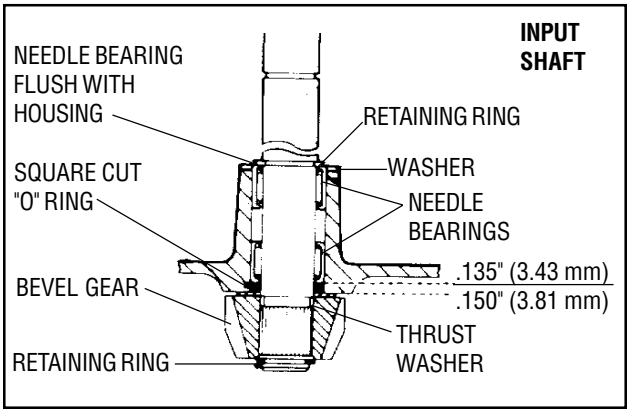


8. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.



9. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

   Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135" - .150" (3.43-3.81 mm) below flush.

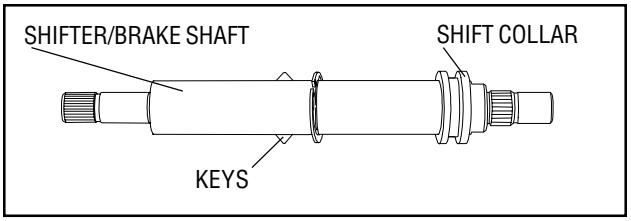


NOTE

Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

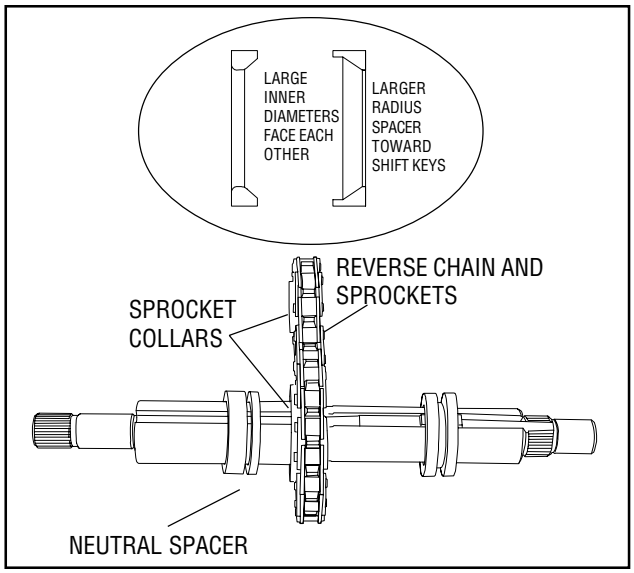
REASSEMBLY

1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



2. Grease both keyways and slide the shift keys and collar onto the shifter/brake shaft.

3. The countershaft and the shifter/brake shaft should be assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure the collars on the sprockets are on the same side of the chain and install the sprocket onto the shifter/brake shaft with the collar away from the shift keys.



Next place the neutral spacers onto the shifter/brake shaft with larger inner diameter sides facing together, and the spacer with the largest inner diameter radius toward the shift keys. Push the shifting keys through the reverse sprocket and the first neutral spacer. Pull the neutral spacers and the reverse sprocket up against the shoulder of the shifter/brake shaft.

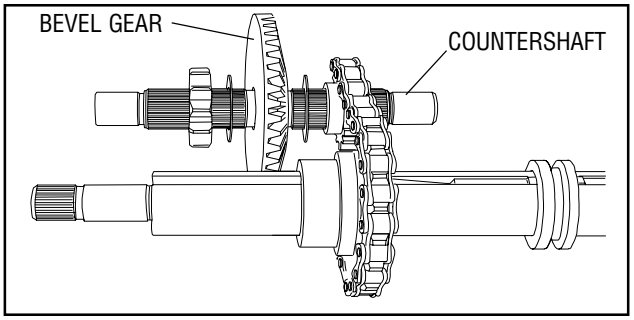
NOTE

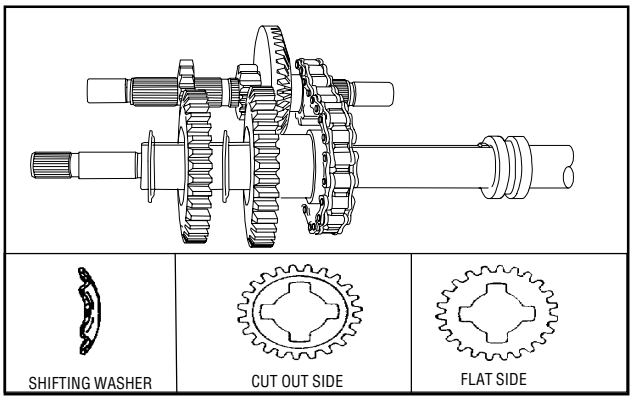
There have been a few 900 models built with identical neutral collar halves. These can be installed in either direction.

*4. Insert the countershaft into the smaller reverse sprocket. Insert a thin thrust washer next to the sprocket (collar side) and then install the large bevel gear with the bevel towards the reverse sprocket. Place another thin thrust washer on the back side of the bevel gear.

NOTE

As all the gears are placed back onto the assembly, each should be packed with bentonite grease.



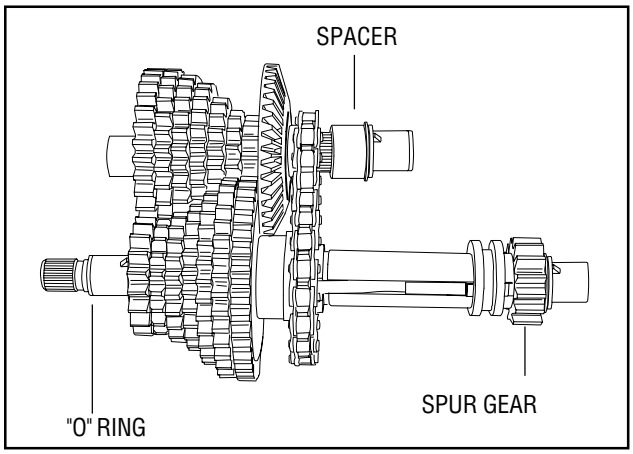


5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with it's mating gear on the opposite shaft. The first gear on the shifter/brake shaft would be the largest of the shift gears. Place this gear next to the neutral collar with the flat side of the gear next to the collar. (See the drawing on the prior page).

   Then place a shifting washer onto the shifter/brake shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears on both shafts have been added.

NOTE

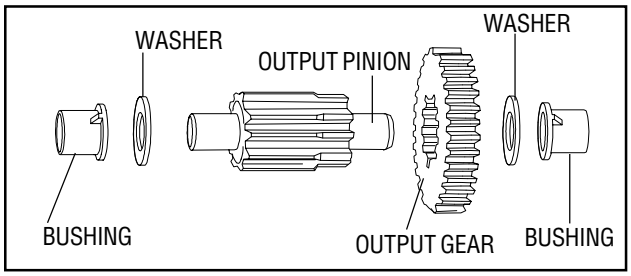
It is not only important that gears match up according to diameter, but also to thickness.



6. Place the spacer on the countershaft next to the reverse sprocket. Then place a thrust washer on each end of the countershaft and insert the bronze bushings.

   Place the large washer on the end of the shifter/brake shaft, followed by the bronze bushing and the "O" ring.

7. Place the spur gear onto the splines on the other end of the shifter/brake shaft. The thin washer, bushing, and "O" ring conclude the assembly of these two shafts.



8. Place the output gear on the stepped end of the output pinion. Place the thrust washers and the bronze bushings on the ends of the output shaft. Install these three shaft assemblies back into the case. Make sure that the tabs of all bushings are in their "V" notches in the case.

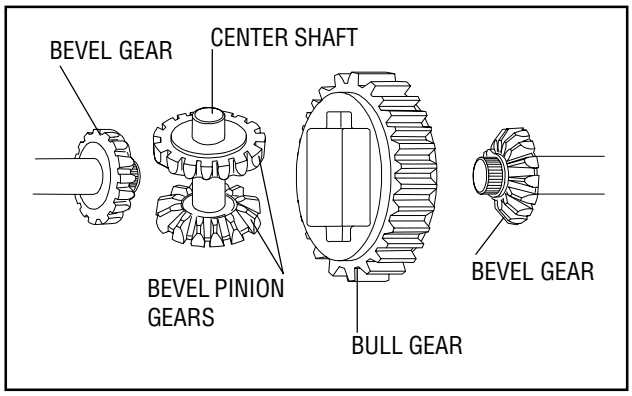
NOTE

The differential must be assembled out of the case and then placed in the case. Apply bentonite grease to axle contact areas of case.

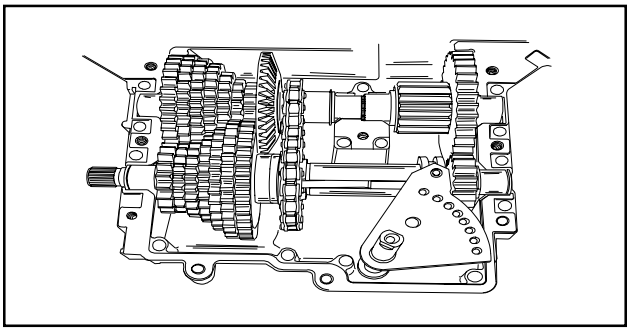
*ASSEMBLY VARIATIONS

On models which are driven from the opposite side of the input bevel gear, the following changes take place.

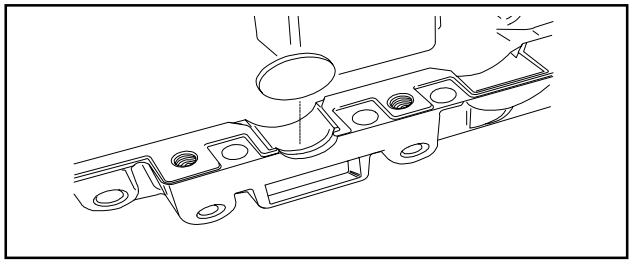
A slightly thicker large bevel gear is placed on the countershaft with the bevel facing the spur gears and in the previous location of the spacer. The thickness of the gear eliminates the need for the washers on each side of the large bevel gear. The reverse chain and sprocket are also turned 180°, which places the sprocket collars away from shifting gears and spur gears. The spacer is then placed in the previous location of the large bevel gear next to the reverse sprocket.



9. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. Center the bevel gear of the other axle on the other side. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).



10. Install the shifter assembly and bearing strap, pack the transaxle with the remaining Bentonite grease (30 ounces [887 ml] total). Apply grease to the top of the shifter fan.

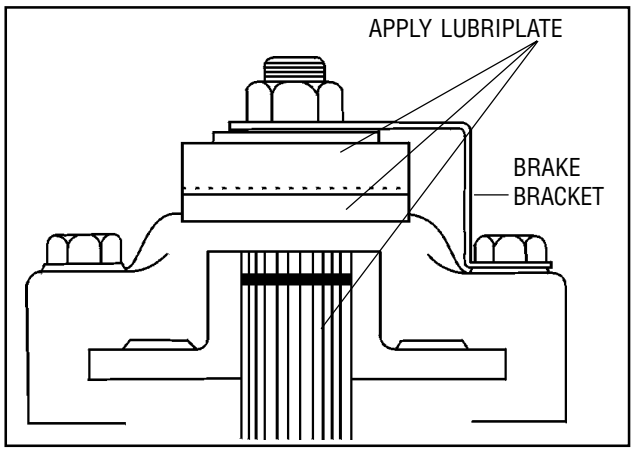


11. To seal the case and cover at the end of the shifter/ brake shaft, a flat plug is placed on the opposite end of the brake assembly. Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator # 515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093A.

12. Guide the cover over the shift rod and position onto the case. Install the cover cap screws and torque 90-100 inch pounds (10.2-11.3 Nm). Install the neutral start sensing switch if applicable. Replace the square cut “O” ring on the exposed shift rod.

    Replace the detent ball, spring and set screw and turn set screw one (1) turn below flush. Install the neutral start sensing switch if applicable.

    Check for binding by turning the input shaft.

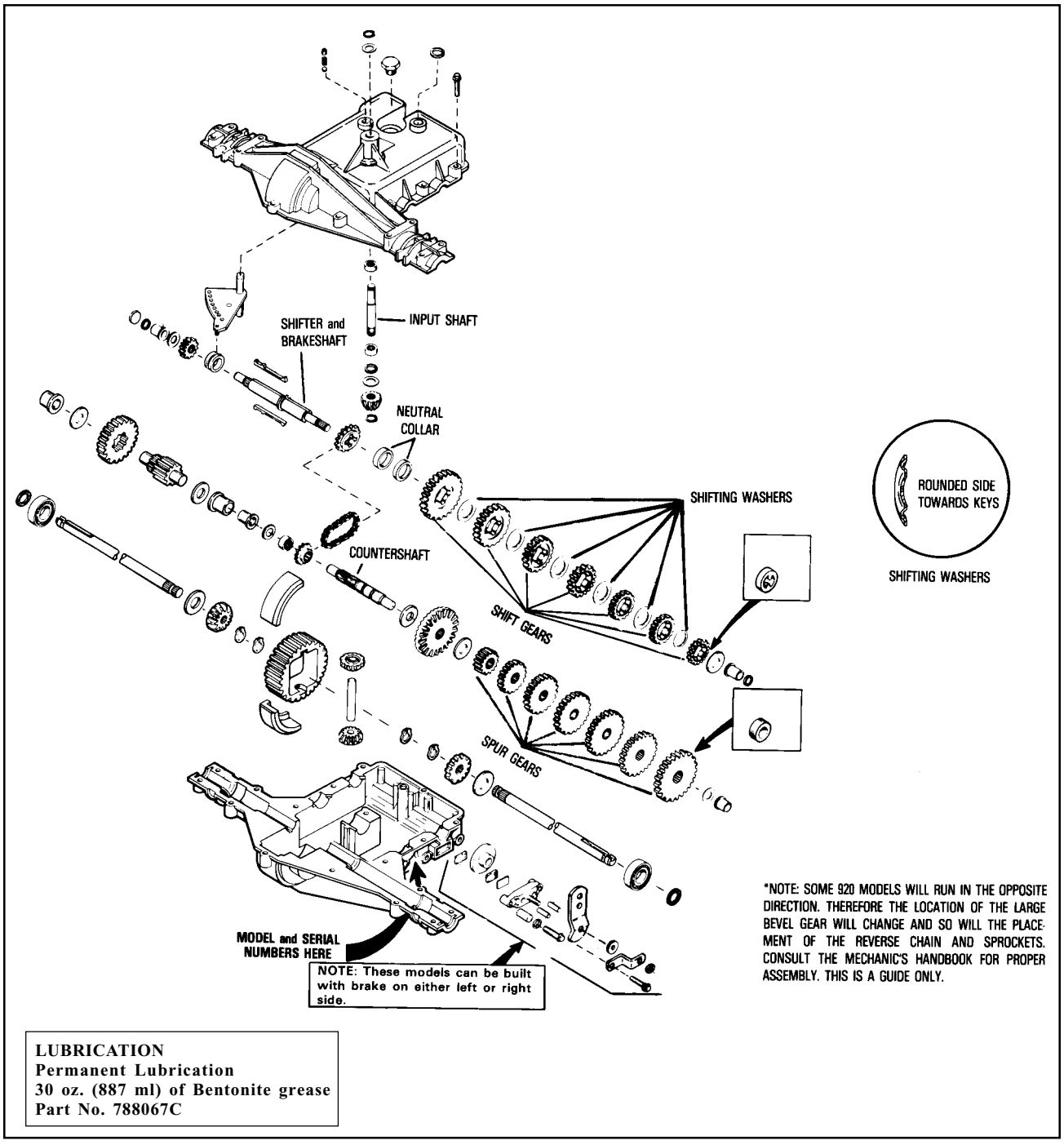


13. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer’s manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

920 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 10. 930 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

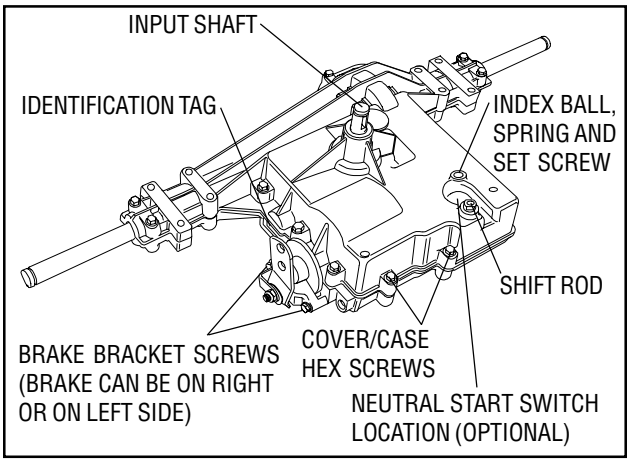
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

NOTE

Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

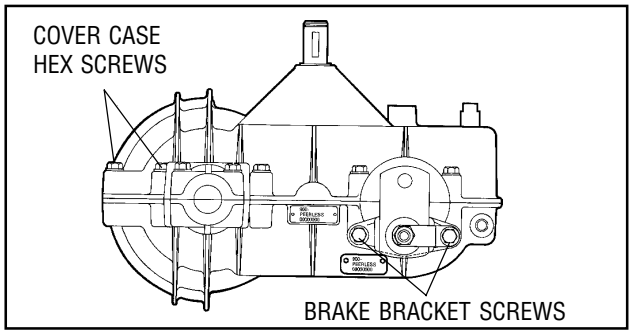


GENERAL

The 930 series transaxle is very similar to the 920 series. The 930 series is available in 3 through 7 speeds forward and 1 speed reverse. The model pictured throughout this section is the most popular type. There are models which operate in the opposite direction without changing the input location. Throughout this section an asterik (*) will direct the reader to the end of the section where the differences between these models are explained.

IDENTIFICATION

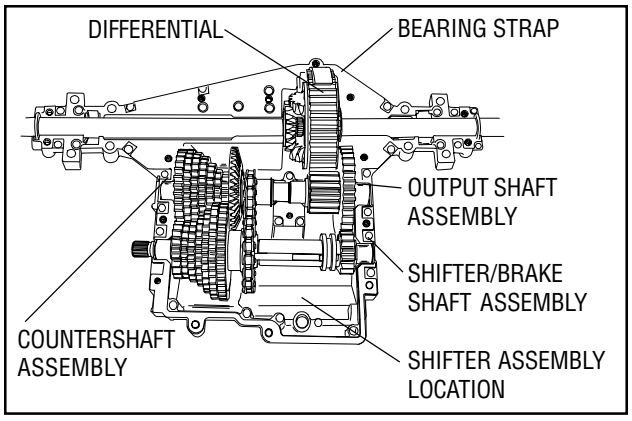
This unit contains an aluminum tag showing the model number.



DISASSEMBLY OF TRANSAXLE

Clean outside surface of transaxle. Position shift lever in neutral as indicated by the shift pattern.

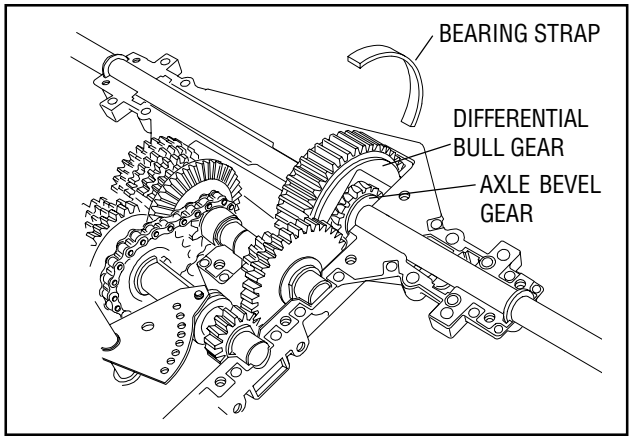
1. The unit may have the OEM option of a neutral switch; remove the switch.
2. Remove the Allen head setscrew, spring and detent ball. Remove the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan) and lift out of case.



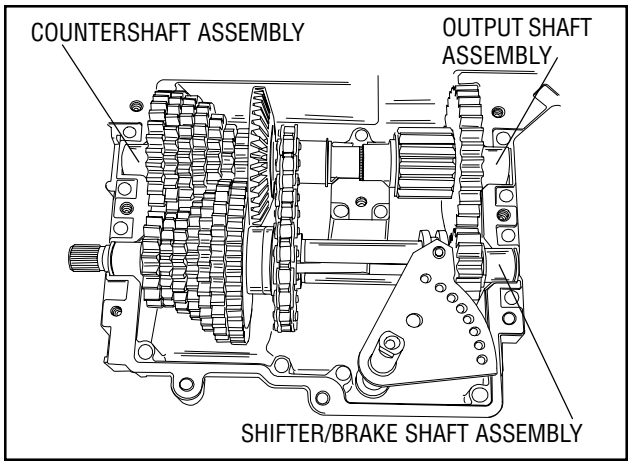
4. Remove the “O” ring from the top of the shifter rod.
5. Remove the two brake bracket screws and remove brake assembly.
6. Remove the grease from the unit as the parts are removed.

NOTE

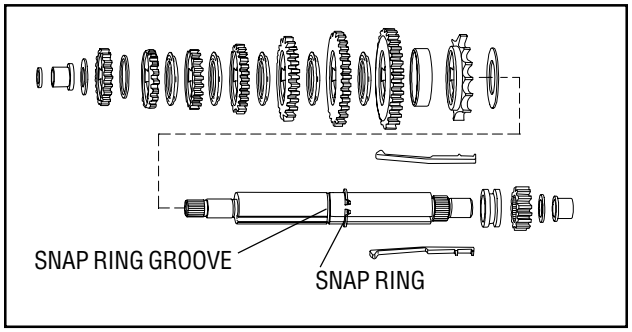
Bentonite grease may stain clothes. Care should be used when handling.



7. Remove the bearing strap on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers and hold together while lifting differential from case.

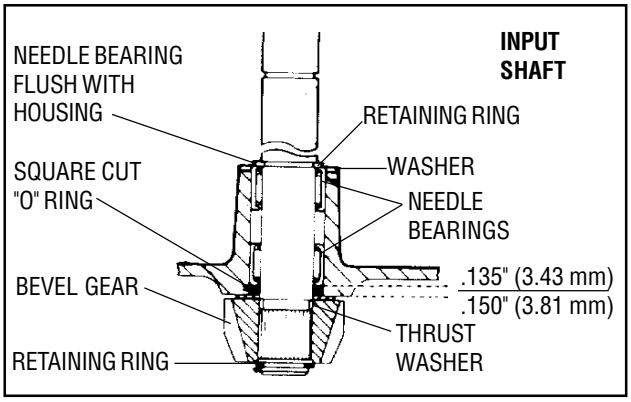


8. There are three (3) shaft assemblies in this transaxle; the output shaft, the countershaft, and the shifter/brake shaft assembly. Remove these assemblies as complete as possible from the case.



9. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.

   To remove keys from the shifter/brake shaft you must first remove the large snap ring from the snap ring groove. Be careful not to stretch or twist the snap ring; it is not necessary to remove the snap ring from the shaft.



10. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut “O” ring must be replaced if the shaft is removed.

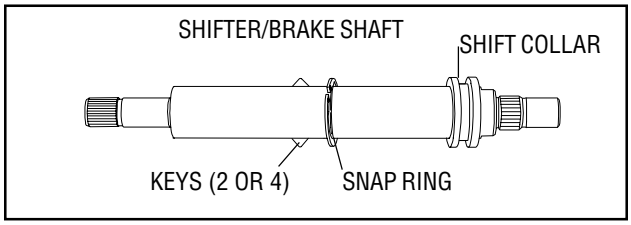
    Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 - .150” (3.43-3.81 mm) below flush.

NOTE

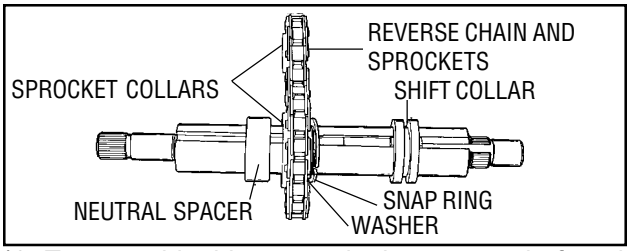
Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

REASSEMBLY

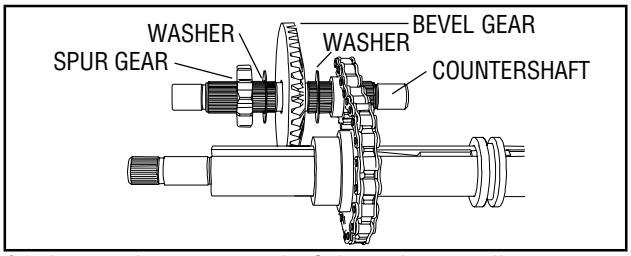
1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



2. Grease all keyways and slide keys and collar onto the shifter/brake shaft. (There are both 2 and 4 key models). Place the large snap ring back into the snap ring groove. On models which have an inner diameter recess cut into one side of the shift collar, the recess side must face toward the gears and snap ring for proper gear selection.



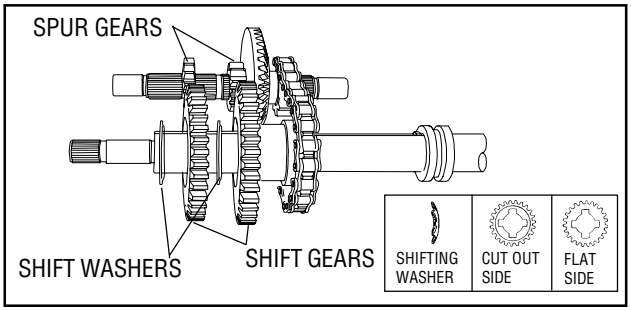
*3. To assemble this transaxle the countershaft and the shifter/brake shaft should be assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure that the collars on the sprockets are on the same side of the chain. Install a large washer onto the shifter/brake shaft next to the snap ring and then the large sprocket with the collar away from the shifting keys. Push the shifting keys through the reverse sprocket and push the neutral spacer over the end of the keys. Pull the neutral spacer and reverse sprocket up against the snap ring on the shifter/brake shaft.



*4. Insert the countershaft into the smaller reverse sprocket. Insert a thin thrust washer next to the sprocket (collar side) and then install the large bevel gear with the bevel towards the reverse sprocket. Place another thin thrust washer on the back side of the bevel gear.

NOTE

As all the gears are placed back into the assembly, each should be packed with Bentonite grease.

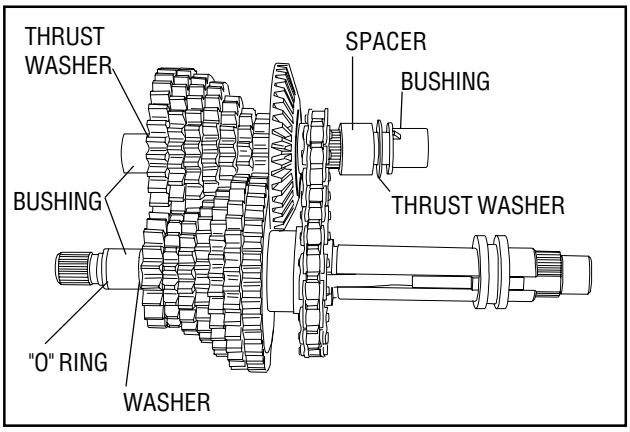


5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the other shaft. The first gear on the shifter/brake shaft would be the largest of the shifting gears. Place this gear next to the neutral spacer with the flat side of the gear next to the spacer.

   Then place a shifting washer onto the shifter/brake shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears on both shafts have been added.

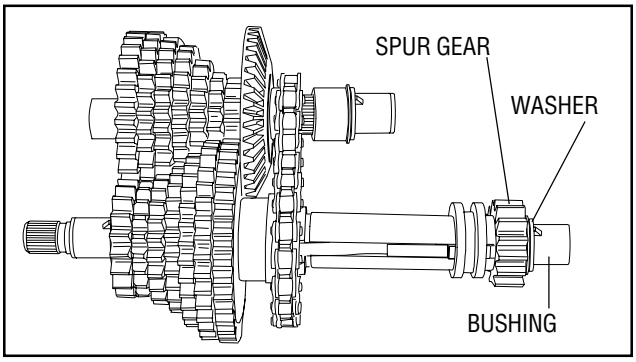
NOTE

It is not only important that gears match up according to diameter, but also to thickness.

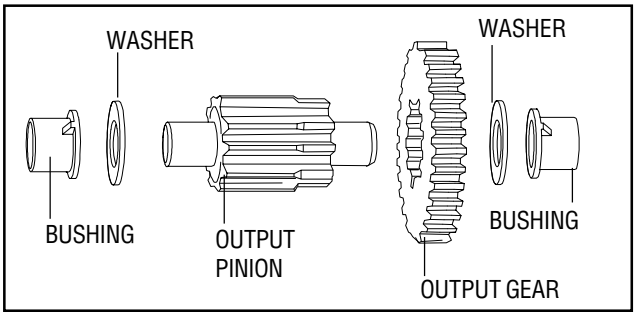


*6. Place the spacer on the countershaft next to the reverse sprocket. Then place a thrust washer on each end of the countershaft and insert the bronze bushings.

   Place the large washer on the end of the shifter/brake shaft, the bronze bushing and the “O” ring.

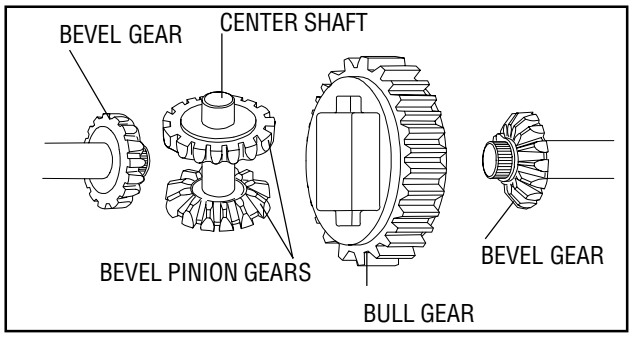


7. Place the spur gear onto the splines on the other end of the shifter/brake shaft. The thin washer and bushing conclude the assembly of these two shafts.



8. Place the output gear on the stepped end of the output pinion. Place the thrust washers on each end and then the bronze bushings. Install these three shaft assemblies back into the case. Make sure that the tabs of all the bushings are in their “V” notches in the case.

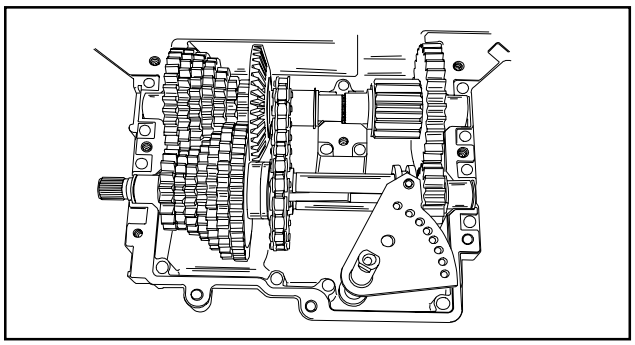
** See Assembly Variations on page 64*



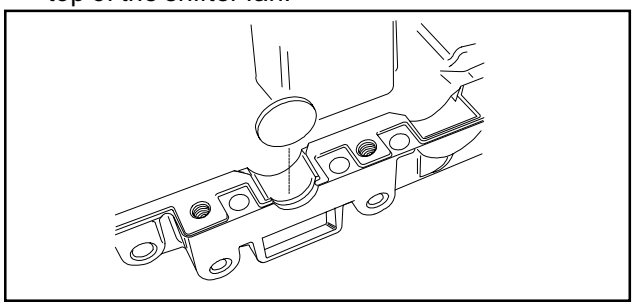
NOTE

The differential must be assembled out of the case and then placed in the case. Apply bentonite grease to axle contact areas of case.

9. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. Center the bevel gear on the other axle with the other side. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).



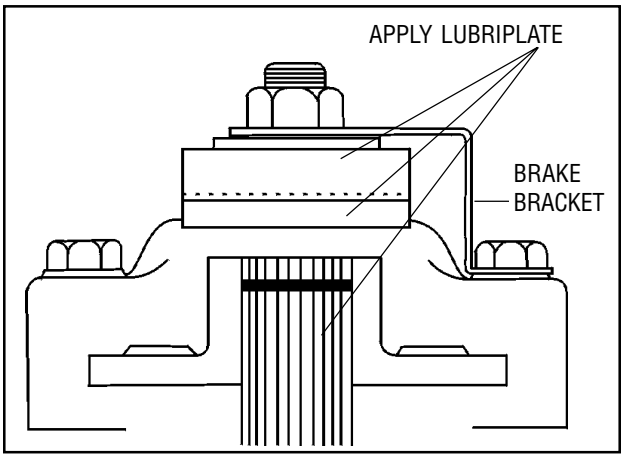
10. Install the shifter assembly and bearing strap, pack the transaxle with the remaining Bentonite grease (30 ounces total) (887 ml). Apply grease to the top of the shifter fan.



11. To seal the case and cover at the end of the shifter/ brake shaft, a flat plug is placed on the opposite end of the brake assembly. Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator # 515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093A. Install cover screws and torque to 90-100 inch pounds (10.2-11.3 Nm).

    Replace the detent ball, spring and set screw and turn set screw one (1) turn below flush. Install the neutral start sensing switch if applicable.

    Check for binding by turning input shaft.



12. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

    Install the transmission on the equipment. Adjust the brake linkage to disengage when the clutch is engaged. The brake and linkages may vary. Consult the equipment owner's manual.

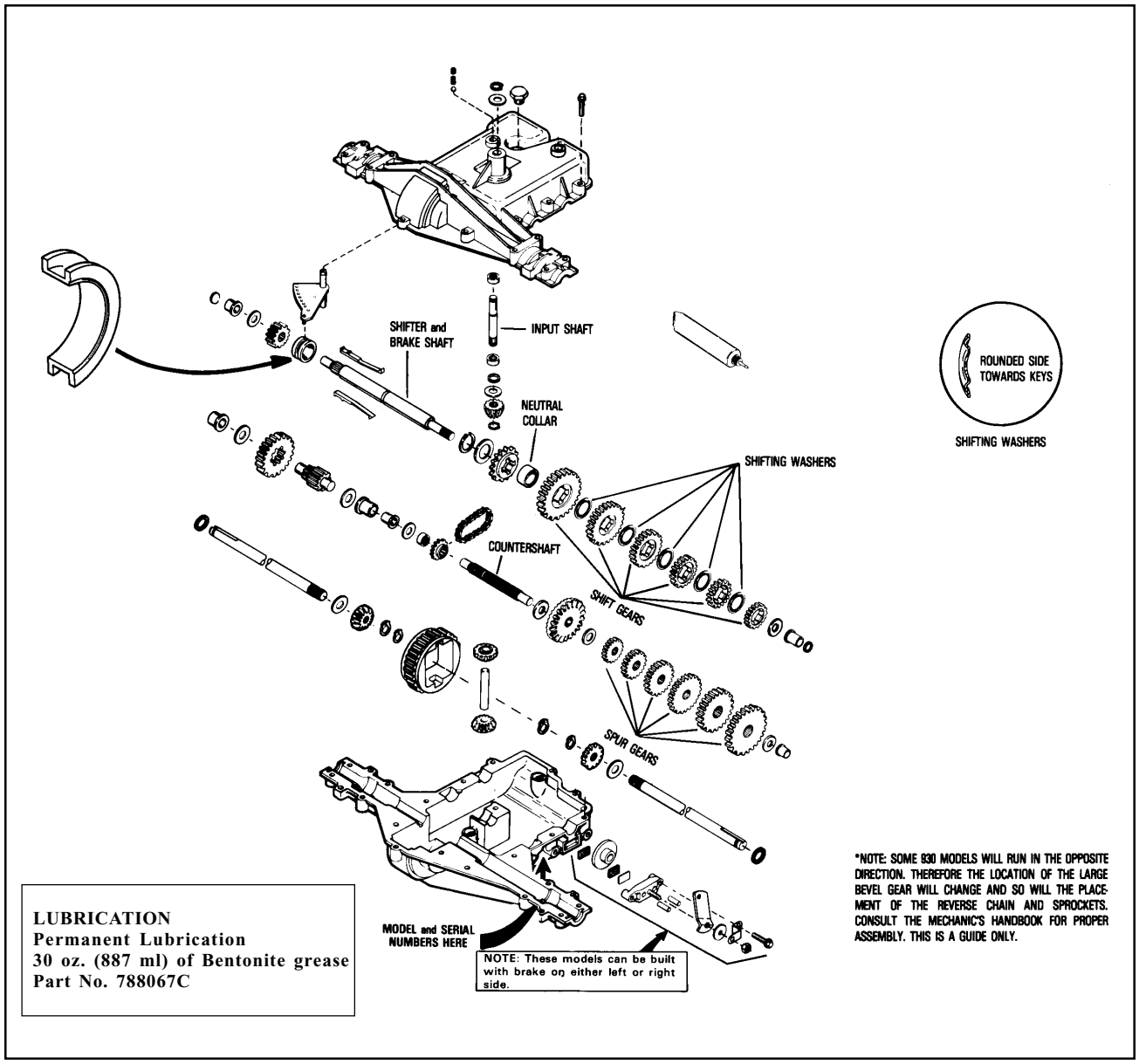
⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

*** ASSEMBLY VARIATIONS**

On models which are driven from the opposite side of the input bevel gear the following changes take place.

A slightly thicker large bevel gear is placed on the countershaft with the bevel facing the spur gears and in the previous location of the spacer. The thickness of the gear eliminates the need for the washers on each side of the large bevel gear, which places the sprocket collars away from the shifting gears and spur gears. The reverse chain and sprocket is also turned 180°. The spacer is then placed in the previous location of the large bevel gear next to the reverse sprocket.

930 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 11. MST200 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

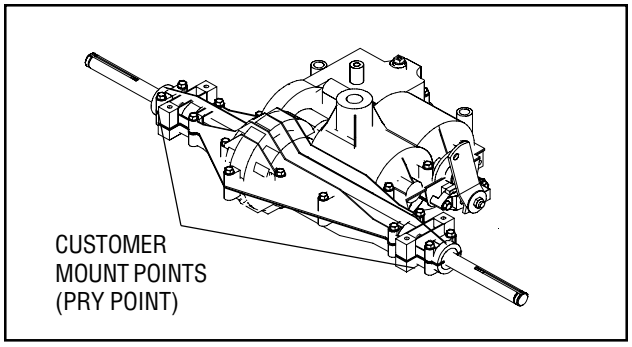
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts my affect performance and could result in death or serious injury.

- **Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.**



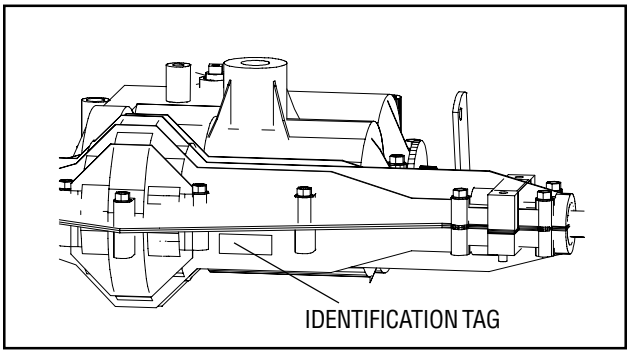
GENERAL

The MST (Manual Shift Transaxle) 200 is a sealed unit which uses 16 oz. (473 ml) of 80W90 gear lube (part #730229B). The MST series is available with up to 6 speeds forward and one reverse. It has a contoured case and cover. Its unique gear design system uses the input gear to drive both the forward and reverse motion. It also eliminates the recess previously found on shifter brake shaft spur gears.

Thrust washers are used on all transaxles to protect stationary surfaces from rotating surfaces. To determine the location of the thrust washer, check its inside diameter and compare it to the outside diameter of the shaft. If the fit is loose, it is out of position. The flat washer used on the shifter shaft (brake end) must have a diameter large enough to stop the keys from going past the end of the gear slots.

IDENTIFICATION

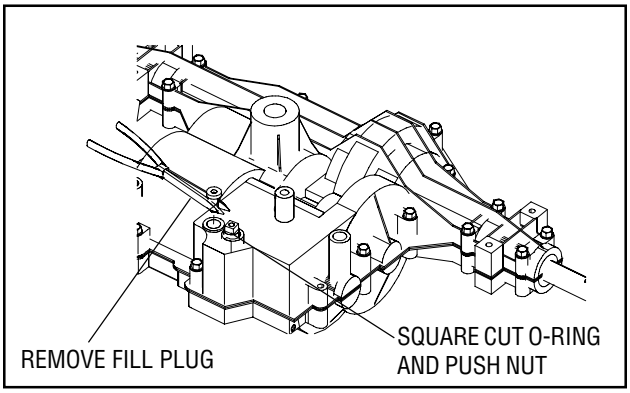
The MST has a decal placed at the rear of the unit and to the right of the differential gear section. This makes it easily visible without having to remove any obstructions to view it.



STEPS TO TAKE BEFORE DISASSEMBLY.

1. Clean the outside surface of the transaxle.

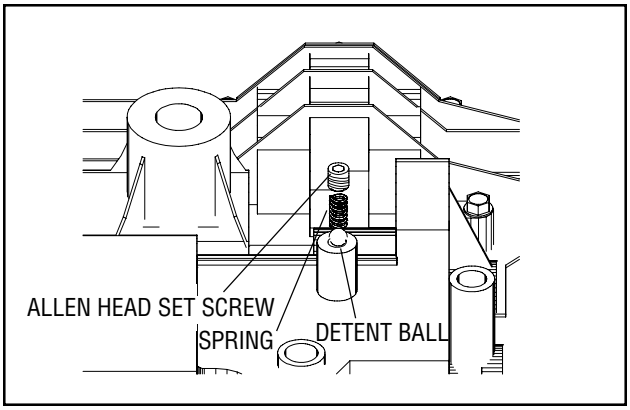
2. Position the shift lever in the neutral position.



3. Remove the oil drain / fill plug located on top of the unit. This can be done by using a needle nose pliers to pull the plug out. Drain all of the oil from the unit.

4. Remove the neutral start switch, if installed (O.E.M. option).

5. Remove the push nut (if equipped) and square cut "O" ring, from the top of the shift fork shaft.



6. Remove the set screw, spring and detent ball.

DISASSEMBLY

1. Remove the self-tapping hex head screws that hold the cover to the case and the two center screws located on the bottom (case side) of the transaxle.

⚠ CAUTION **When prying the crankcase from the crankcase cover use specified mount points. Failure to do so may result in equipment damage.**

2. With a rubber or leather mallet tap down on the shift lever rod while removing the cover from the case.

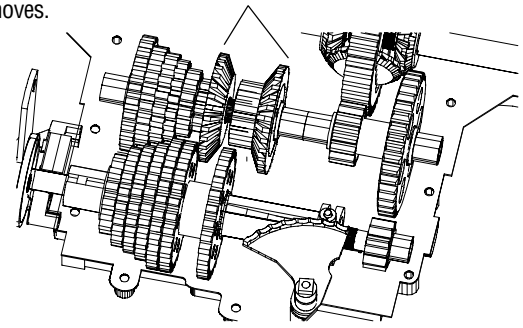
NOTE

If rust has occurred on the shaft, remove it with emery cloth before removing the shaft to prevent damage.

3. Remove the two brake bracket screws and remove the brake assembly.

4. Remove the differential ring gear, and bevel pinion gears with the center shaft drive pin and the axles. Grasp the axle bevel gears between your thumb and fingers. Hold the entire assembly together while lifting the differential from the case.

NOTE: When a "B" input is used the input bevel gears will be opposite of this picture. The drive spline on this shaft also moves.



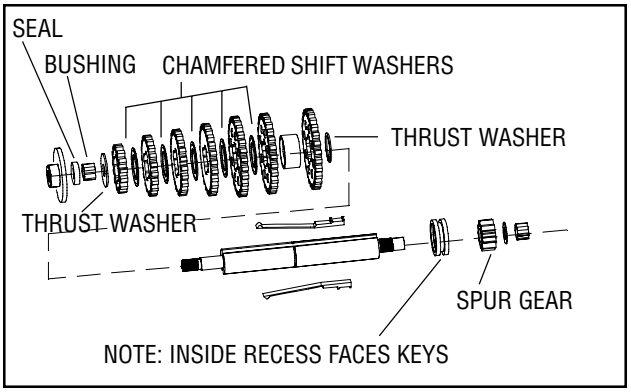
5. There are three shaft assemblies in this transaxle. The countershaft, shifter/brake shaft and output shaft. Remove the shifter fork assembly and then remove the shaft assemblies from the case.

NOTE

Before you begin disassembly, ask the customer if the unit has been serviced previously by a technician or perhaps himself. They may have misassembled it.

6. As these assemblies are taken apart, lay the parts out in a systematic order. This should help to make the reassembly easier.

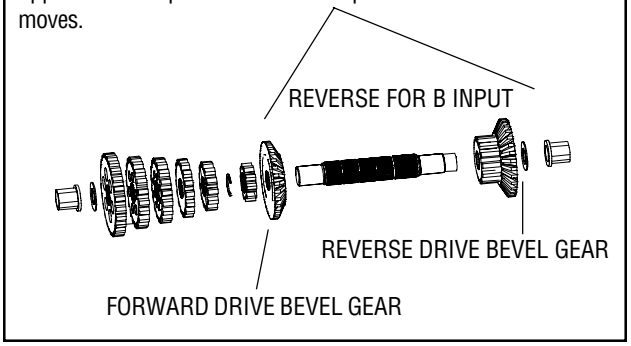
⚠ WARNING **Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.**



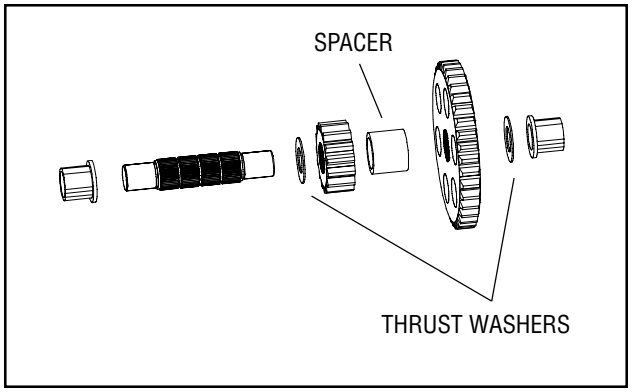
7. To disassemble the shifter/brake shaft, start on the spur gear side. Remove the oil seal, the bronze bushing and thrust washer. Remove all of the shifter spur gears (and spacers if used) and shift washers. Remove the neutral collar, reverse gear and thrust washer. On the output side of the shifter/brake shaft remove the bronze bushing, thrust washer, and output spur gear.

   To remove the shift keys from the shifter/brake shaft, you must first expand the large snap ring from the snap ring groove. Be careful not to stretch or twist the snap ring, it is not necessary to remove the snap ring from the shaft. Place the expanded snap ring onto the shifter/brake shaft and slide the shift keys and shift collar off the shifter/brake shaft.

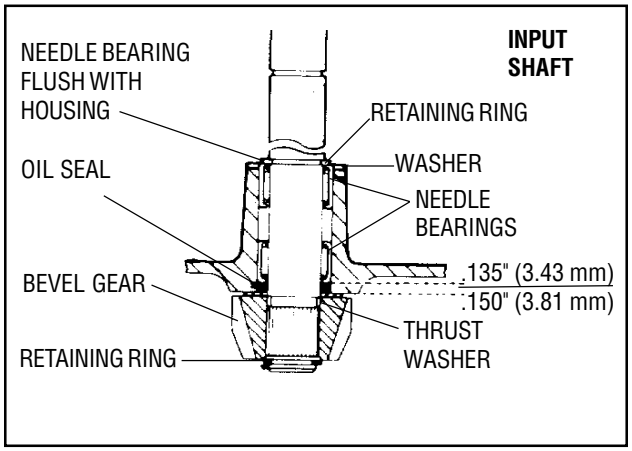
NOTE: When a "B" input is used the input bevel gears will be opposite of this picture. The drive spline on this shaft also moves.



8. To disassemble the counter spur gear shaft, remove the bushing, thrust washer and spur gears (and spacers if used) the last spur gear is held in place by a retaining ring. Remove the retaining ring and slide the spur gear and forward drive bevel gear off the splined end of the shaft. The bushing, thrust washer and reverse drive bevel gear can be removed from the unsplined end of the shaft.



9. To disassemble the output shaft, remove the bushing, thrust washer, large output spur gear, spacer, small output spur gear, thrust washer, and bushing.



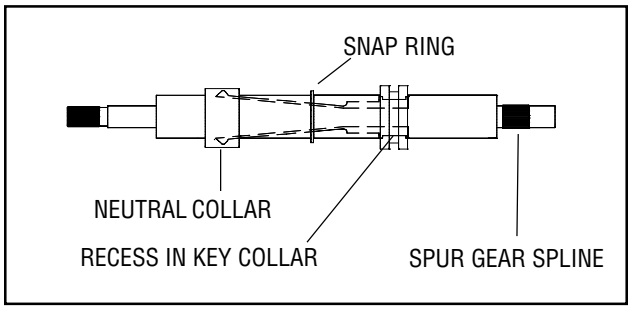
10. The input shaft can also be removed and inspected or serviced. Remove the snap ring and thrust washer on the input shaft, pull the shaft through the cover. The oil seal located on the inboard side of the cover should be replaced when reassembled. Be sure to reinstall the upper and lower thrust washers. Tool part number 670251 is used for removal of needle bearings for the input shaft.

11. After clean up of all parts, a complete inspection should be done. Check for chipping or damage to the gear teeth, keys or the four key slots in the shifter gears. You also should inspect the two keyways in the shifter shaft for damage, or chipping. Worn or damaged parts must be replaced.

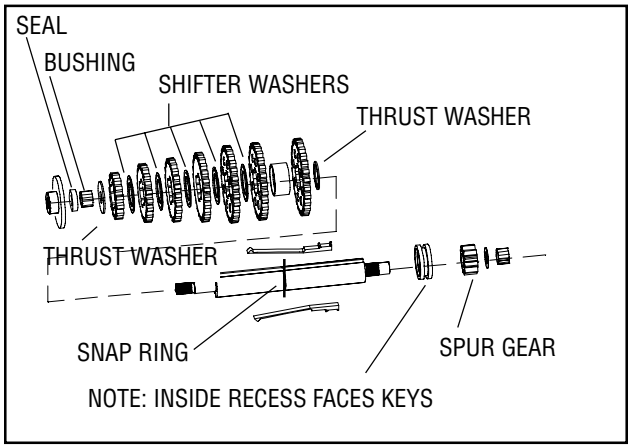
REASSEMBLY

The tool, part number 670251 can also be used for installation of the needle bearings for the input shaft. The inside needle bearings are installed .135" -.150" (3.43-3.81 mm) below flush. The top bearing is installed flush to the casting.

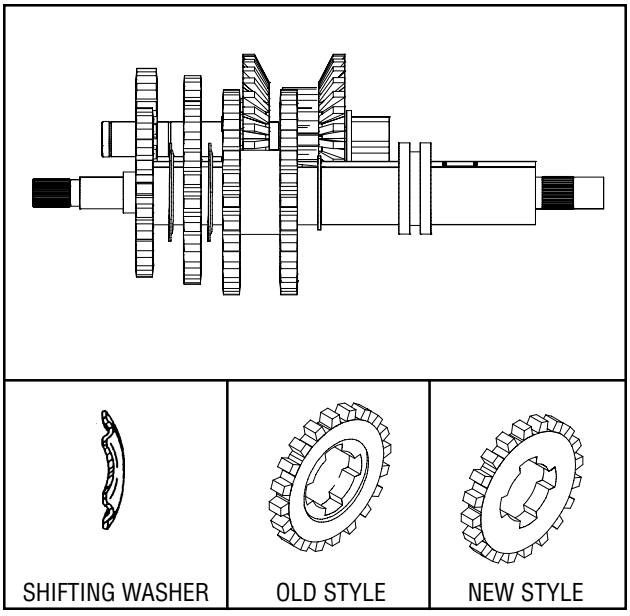
1. Use an EP bearing grease and apply it to the bearings in the cover. Place the seal into the cover with the grooved side of the seal visible and facing the installer. Place the snap ring and thrust washer on the input shaft and slide the shaft through the cover and seal. Place the square cut o-ring, thrust washer and input bevel gear on the shaft on the inboard side and secure them by placing a snap ring in the snap ring groove.



2. Next assemble the shifter brake shaft by placing the shift keys in the keyway on the shaft with the tip of the keys facing the shifter spur gear side of the shaft. Extend the collar end of the key slightly beyond the shaft. Place the shift collar in the notch provided on the shift key with the inside diameter recess on the collar facing toward the tips of the keys. Place the notch from the second key on the inside diameter of the shift collar and position the key in the slot on the shifter/brake shaft. Slide the keys and the collar onto the shaft under the snap ring. Place the snap ring back into the groove on the shaft.



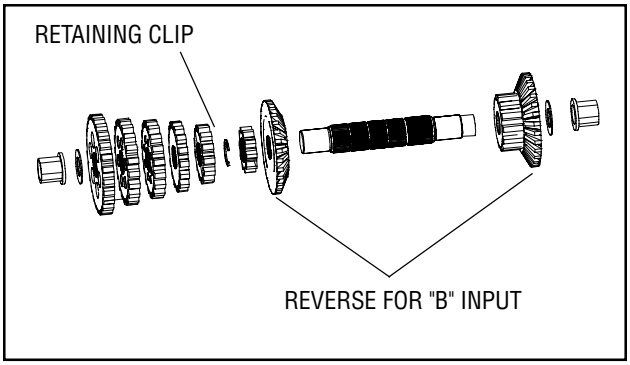
3. Place the plain large thrust washer over the key tips on the spur gear side of the shaft next to the snap ring. The sequence that follows is reverse gear, the neutral collar, then 1st thru the number of gears the unit contains (largest to smallest). Between each gear place a shift washer with the chamfered I.D. facing the shift key (opposite the brakeshaft).



NOTE

Reverse and first gear do not have a shift washer; the neutral collar compresses the key here. Shift washers have one side where the inside diameter is rounded, this rounded edge must face the shift keys. The shifter spur gears no longer have a recess on one side and do not require that they be positioned in any particular direction. Units that have less than six speeds will use a spacer in place of a gear. When this occurs it is not required to have a shift washer between the spacer and the preceding gear.

When the final spur gear or spacer is in place, a thrust washer is positioned on the shaft to protect the case from the rotating gear. This washer is slightly larger then the diameter of the spacer and large enough to cover the inside diameter of the key slot portion of the shifter spur gear. Next place the bronze bushing and the oil seal on the shaft (the open side of the seal must face inward). This completes the spur gear side of the shifter brake shaft. The output side only requires the output spur gear, washer and bushing.

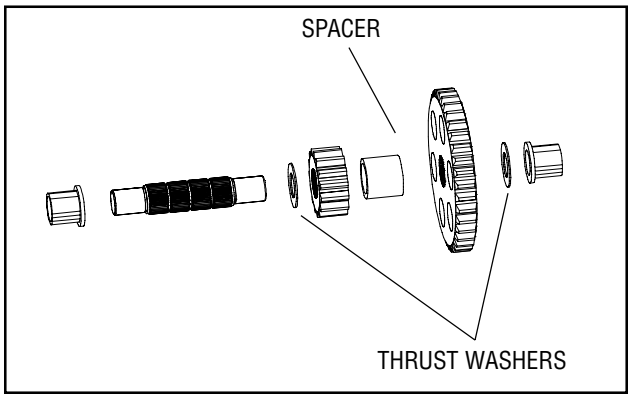


4. To assemble the countershaft, place the reverse input bevel gear on the unsplined end of the shaft. Follow with a washer and a bronze bushing to complete the reverse drive side of the countershaft. The forward drive side requires the forward input bevel gear and the smallest spur gear to be placed on the splined shaft with the bevel facing the reverse drive gear. A retaining ring is put on the shaft next to the spur gear between the splined sections to prevent the bevel gears from spreading.

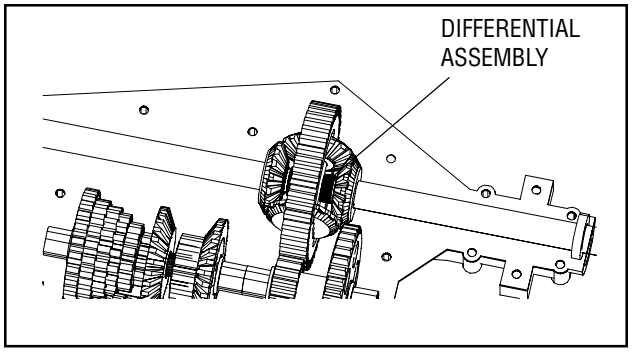
   The countershaft is then completed by placing the remaining spur gears on the shaft (smallest to largest). If the spacers are used they will be placed between the final spur gear and the thrust washer with the bushing to follow.

NOTE

The spur gears on the countershaft can be installed in either direction.

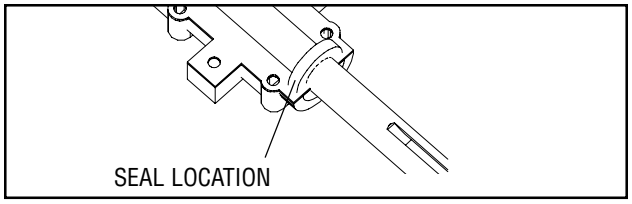


5. The output shaft is completely splined and consists of a bronze bushing, thrust washer, a large output gear, spacer, small output gear, thrust washer and bronze bushing.



6. To reassemble the differential, first inspect the axle bevel gears for damage or wear. If it is necessary to replace a gear, the mating gears must also be replaced.

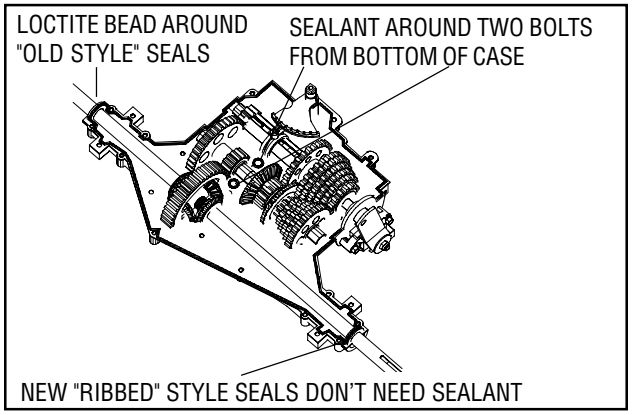
   The differential must be assembled outside of the case and placed into the case as an assembly. Using seal protector (part # 670262) place a new seal on each shaft with the open side facing inward. Hold the longest shaft with the bevel gear and washer in your hand between the ring and middle finger. Place the bull gear and the bevel pinion gears and shaft on top of the axle shaft and bevel gear. Center the pinion gear shaft on the axle shaft and place the short axle so it is also centered on the pinion shaft.



7. Pick up the entire assembly and place it into the case, positioning the seals in the seal pockets. When properly installed, the axle shaft should turn freely without any binding.

NOTE

Before closing the case make sure the case and cover fit together evenly. Insure the bushings are properly positioned with the flat sides of the bushings matching the pockets of the case and cover.

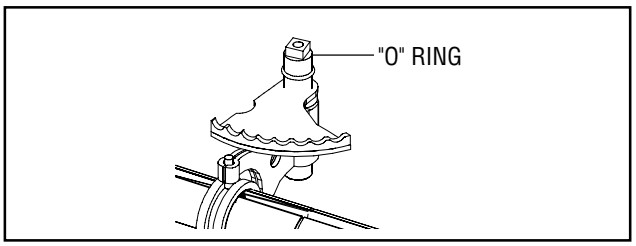


⚠ WARNING Avoid blocking oil passages leading to axle shafts when applying a silicone bead to case as shown. Failure to do so may result in oil leaks and could result in death or serious injury.

8. To seal the case and cover, clean the mating surfaces and place a continuous thin bead (1/16" / 1.5 mm) of Loctite 598 Silicone RTV (part # 788093A) around the entire perimeter of the cover to prevent an oil leak. Don't forget the two bottom bolts.

NOTE

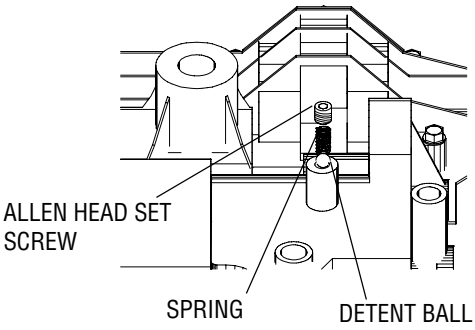
The axle and brake shaft seals on later production MST's have been redesigned to eliminate the need for sealant in the seal/bearing pocket area. These new seals are identified by external ribs that hold the seal in place and prevent leakage. ***DO NOT*** *put sealant in the seal/bearing pockets with this new type of seal.*



9. Before placing the cover on the case, place the shift rod and fork pins into the shift collar and the shaft into its' boss in the case. Inspect the shaft on the rod and fork for rust and burrs.

10. Place a coating of grease on the shaft for easy assembly and corrosion protection. Replace the "O" ring if needed. With the cover in position over the shaft, place it onto the case and rotate the input shaft to allow the gears to mesh, and drop the cover into place.

11. Install the cover screws and torque them to 90-100 inch pounds (10-11.3 Nm). Replace the detent ball, spring and set screw. Turn the set screw down to the flush position. Install the neutral start sensing switch if applicable.

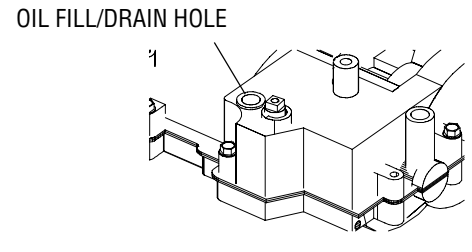


NOTE: Detent screw must have pipe thread sealant applied to prevent oil leakage.

NOTE

Do not forget to re-install the two bottom bolts.

12. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of the lever portion which contacts the pins, the outside lever which contacts the flat washer, and between the shaft O.D. and bore of the brake disc. Brake pads and the brake disc must be free of grease and oil. Install the brake assembly.



13. Refill the transaxle through the fill hole located in the cover. This unit requires 16 oz. (473 ml) of 80W90 gear lube (part #730229B). When completed, lubricate the plug lightly on the outside with oil. Use a 3/16" (4.7 mm) wood dowel placed in the plug recess to push it into the plug hole.

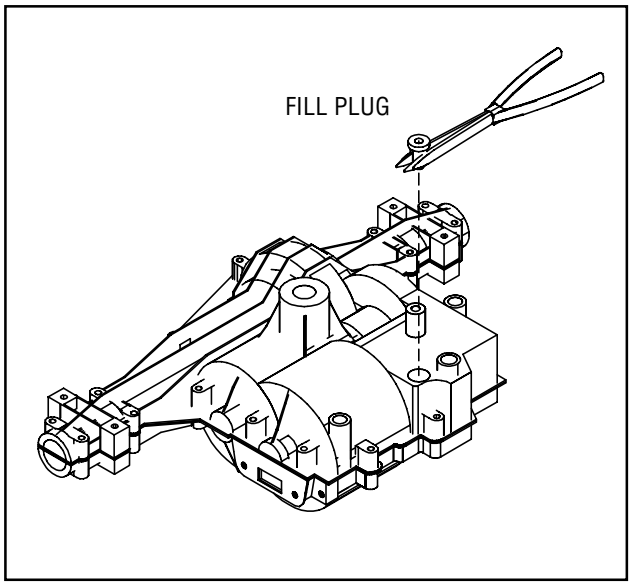
14. Install the transaxle on the equipment. Make any clutch and brake adjustments in accordance with the equipment manufacturers owners manual.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

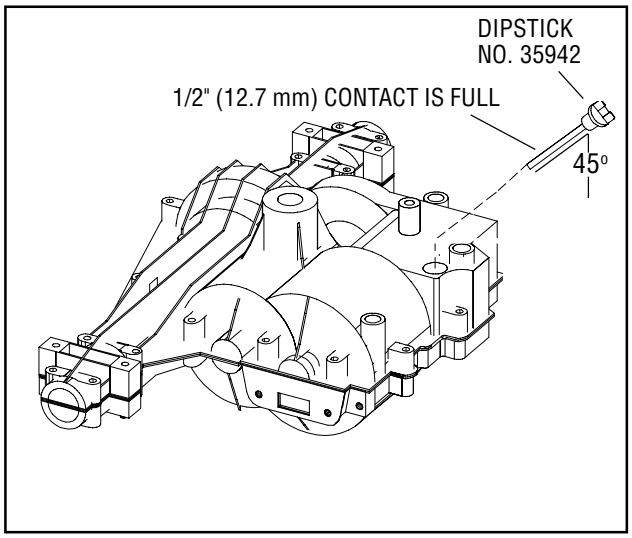
CHECKING OIL LEVEL

PROCEDURE:

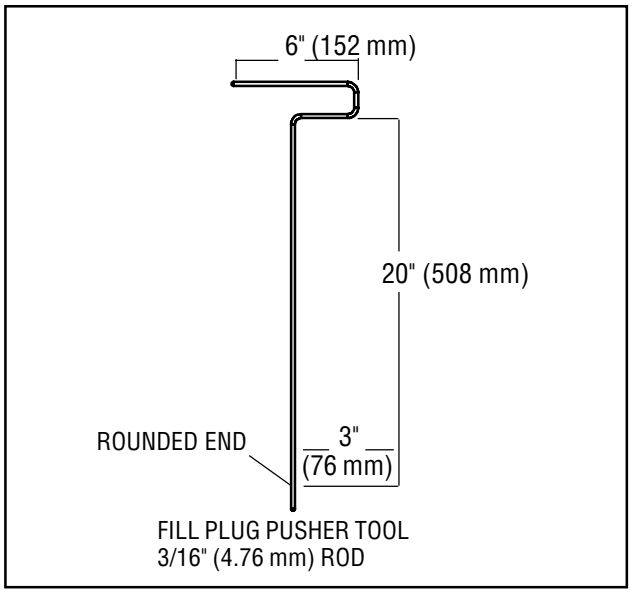
1. Place the tractor on a level surface.
2. Depress the clutch/brake pedal, engage parking brake and place the deck in lowest cutting position.
3. Locate the rubber fill plug next to the shift rod as it enters the transaxle cover.



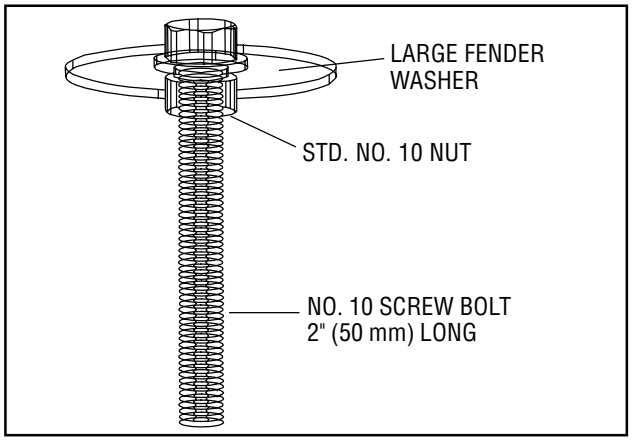
4. Work a needle nose pliers under the lip of the plug, rocking from side to side until plug is removed. Use care to not damage the rubber plug.



5. Insert the dipstick gauge at a 45° angle (Part Number 35942). Check for approximately 1/2 inch (12.7 mm) of oil when fully inserted. This is 16 ounces (473 ml) of EP90 gear oil.
6. If oil is needed, we recommend using a **16 ounce (473 ml)** goose neck mechanics oil can. (These are readily available at any hardware store.) Fill the unit with all **16 ounces (473 ml)** of 90 wt. gear oil to the level indicated.
7. Reinstall the plug by lubricating it with a silicon spray lubricant. An installation tool can be made by using one of the following procedures.



8. When the plug is accessible from the battery box area, make an installation tool from 3/16" (4.76 mm) cold rolled steel rod as shown.



9. If working from the bottom or side, use a No. 10 bolt screw approximately 2 inches (50 mm) long with full threads. Then find a large fender washer and nut for the screw. The washer will give your fingers a large surface area to push down on for reinstallation of the plug. The blunt end of a TORX 30 bit works well also.

CHAPTER 12. 1200 SERIES THREE-SPEED TRANSAXLES

H-SHIFT PATTERN

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

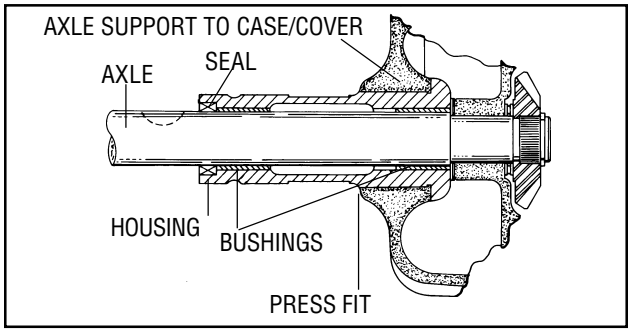
⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts my affect performance and could result in death or serious injury.

- **Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.**

GENERAL

1. The 1200 series transaxle has three forward speeds and one reverse.



2. This series is not intended for use with ground engaging equipment. That is, it should not be used to pull plows, tillers or similar equipment. Care is to be used and common sense is expected in any situation where a severe strain will be placed on the axles.

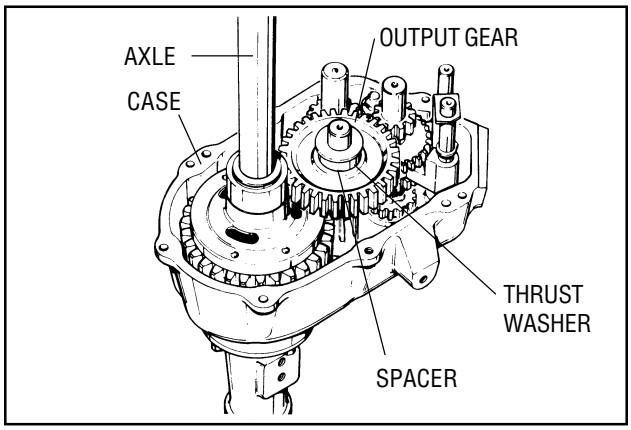
1200 Housing, Bushing and Seal Assy.

On the 1200 series, replace the seals after complete reassembly.

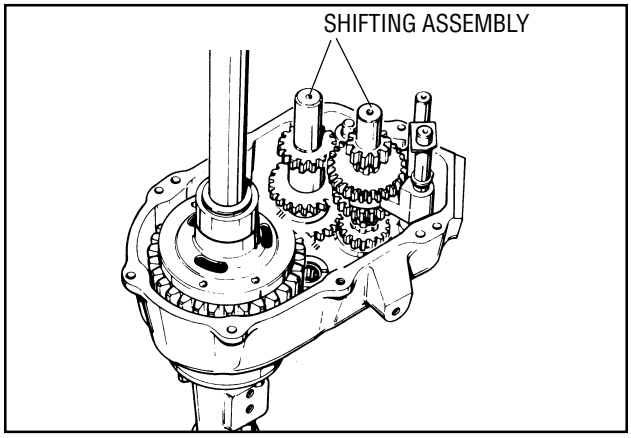
DISASSEMBLY

1. Position the shifter forks in neutral.
2. When disassembling the unit, it should be held so it lies on the case, and properly blocked so no weight rests on the input shaft or differential, but keeping the case rigid.

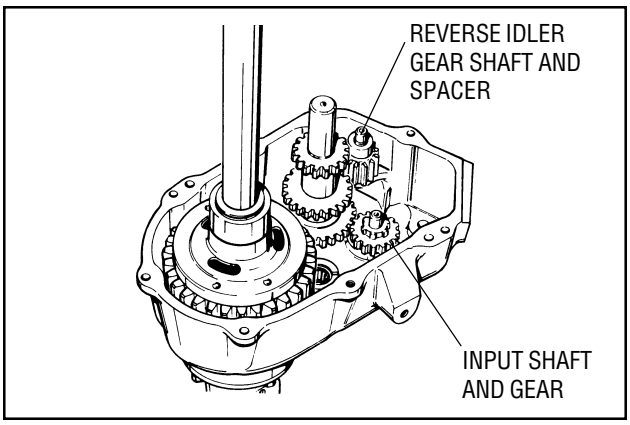
   The unit also needs to be held in a vice in such a way that it can be worked on without the chance of falling, or causing injury.
3. Oil seals have a double lip so seal sleeves do not offer much protection during removal. Upon reassembly new seals should be used.
4. Tap dowel pins into the case and remove socket head cap screws.



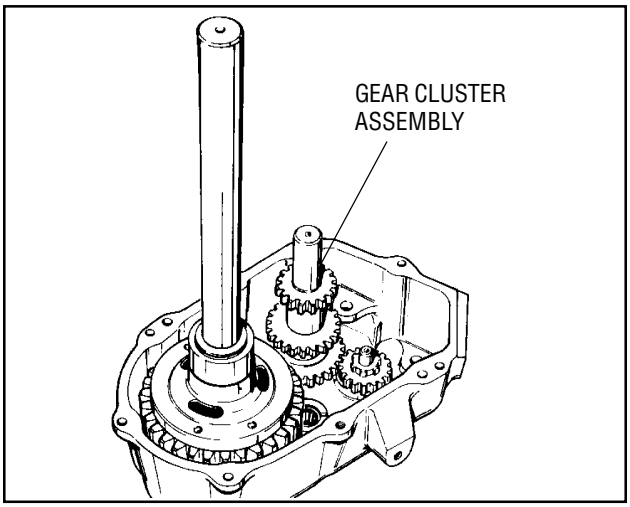
5. Lift the cover off of the case. Discard the gasket. Remove output gear and shaft.



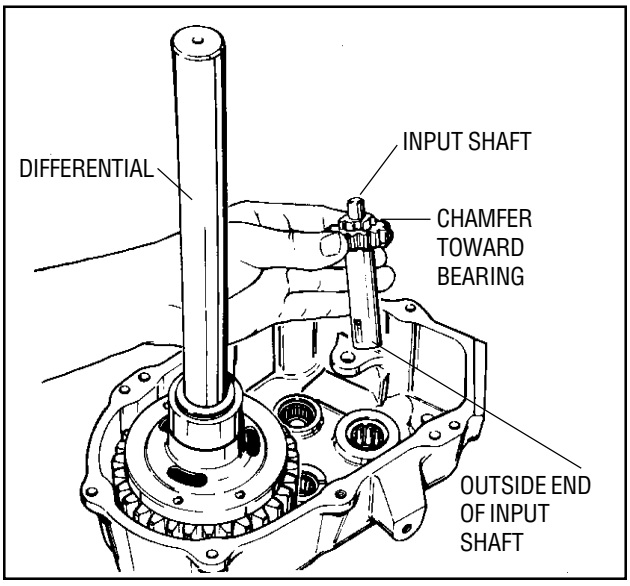
6. Remove the shifting assembly as one unit.



7. Remove the reverse idler shaft, spacer and gear.



8. Lift out the three gear cluster.



9. Remove the input shaft, then the differential.

NOTE

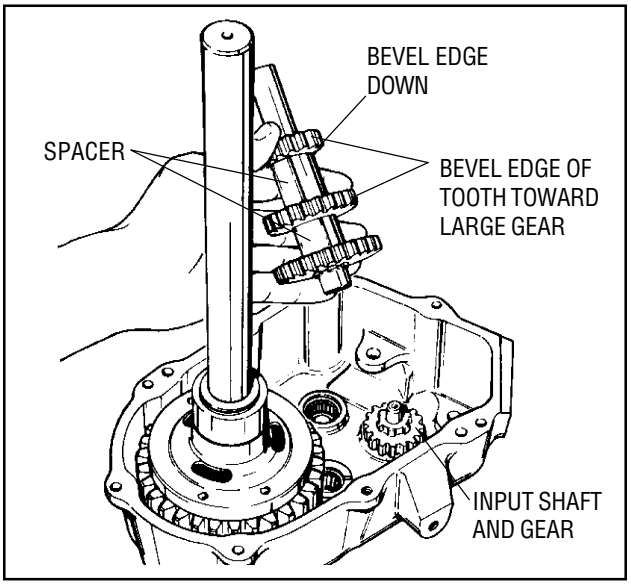
Note what the relationship of the bolt heads are prior to removal of the assembly.

INSPECTION AND REPAIR

Inspection of the case and cover on the 1200 series may indicate the need for replacement of the axle housings. Use an arbor press to drive out the housing, and a protective piece of bar stock between the housing and press when replacing the housing. Press the housing in squarely until the flange seats against the case and cover.

ASSEMBLY

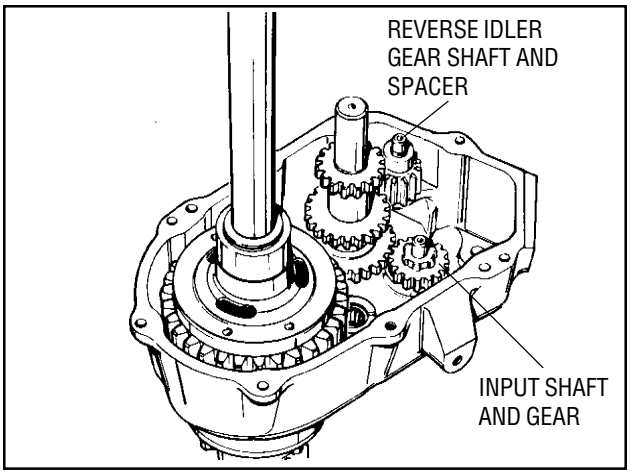
1. Install the input shaft in the case. Use a soft mallet to seat the shaft and gear completely. Binding can occur if the shaft is driven in only part way.
2. Install the differential assembly. The four cap screw heads should face away from the output gear or downward.



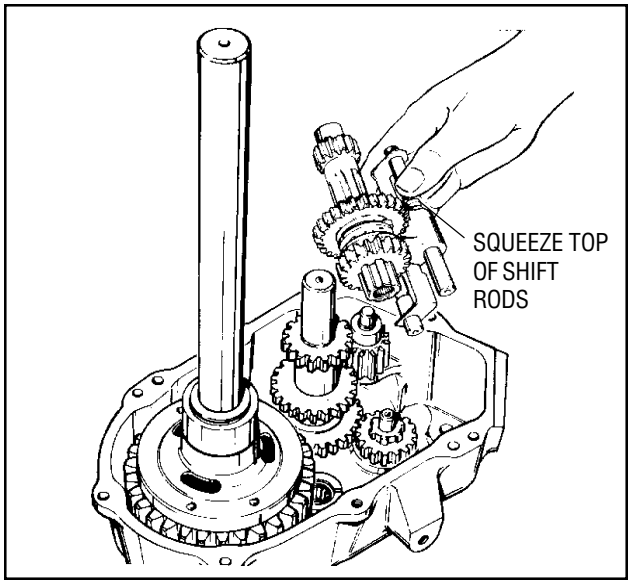
3. Install the three gear cluster, with the smallest gear facing up.

NOTE

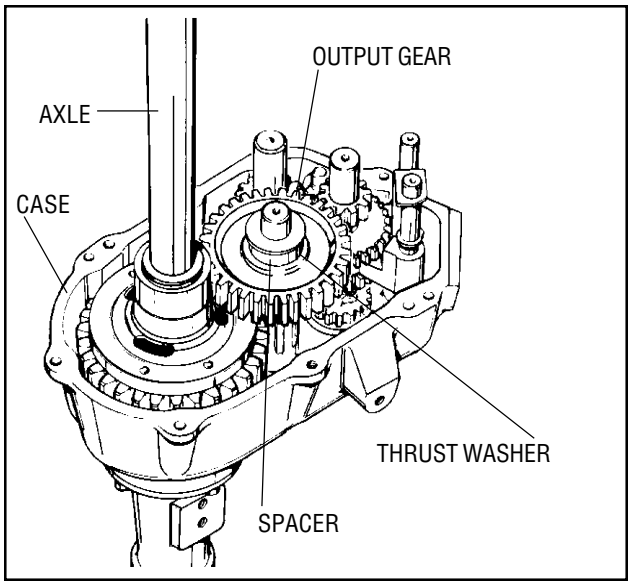
Bevels of the small and middle gears go down toward the large gear with the large gear bevel facing up. The short spacer goes between the large and middle gears.



4. Position the reverse idler shaft in the unit; then install the gear and spacer.



5. Install the shifter assembly as a unit into the case. When installed correctly, the neutral square formed by the shifting forks should appear through the case opening for attaching the shift housing. Both shift gears should be out of mesh.



6. Install the output shaft, gear, spacer and thrust washer.
7. Position a new gasket on the cover mounting surface; then install the cover.
8. Align the cover with the dowel pin and secure with the socket head cap screw. Torque to 10 ft. lbs. (13.6 Nm).
9. Install the axle seals using a sleeve and driver.
10. Install the axle supports. Be sure the mounting pad position is correct before tightening down the cap screws to 13 ft. lbs. (17.7 Nm).
11. Install a new gasket and shift lever housing. Torque screws to 10 ft. lbs. (13.5 Nm). Be sure the shift lever is in the proper position to allow shifting.

LUBRICATION

Use S.A.E. 90 E.P. oil in the transaxle.

Fill units 1203, 1204, 1204-A, and 1205 thru 1208 with 3 pints (1420 ml) of oil. All other units, fill with 2 pints (946 ml)of oil.

CHAPTER 13. HYDROSTATIC GEAR REDUCTION DIFFERENTIALS

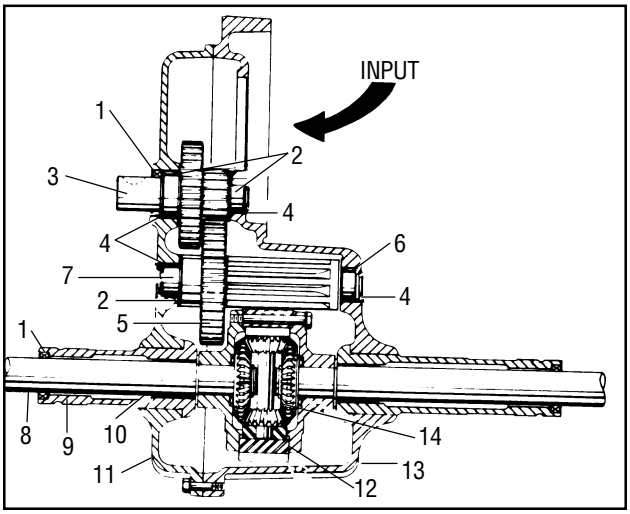
1300 SERIES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 1300 series unit, is driven by a hydrostatic pump connected to the units case. The transmission function is accomplished by the hydrostatic controls.The Tecumseh/Peerless unit, therefore, only reduces input shaft speed to the differential and axle assembly.

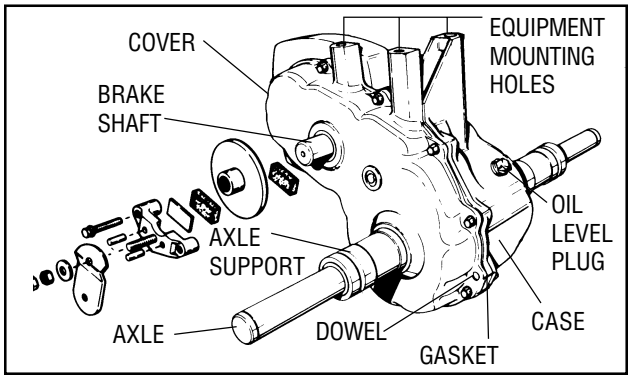


Legend for the 1300

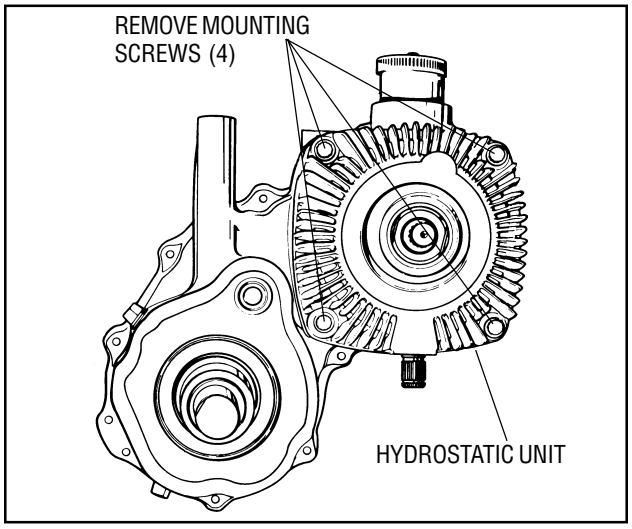
1 - Oil Seal	8 - Axle
2 - Thrust Washer	9 - Axle Support
3 - Brakeshaft	10 - Bushing
4 - Needle Bearing	11 - Cover
5 - Output Gear	12 - Differential Gear
6 - Output Shaft	13 - Case
7 - Spacer	14 - Thrust Washer

DISASSEMBLY

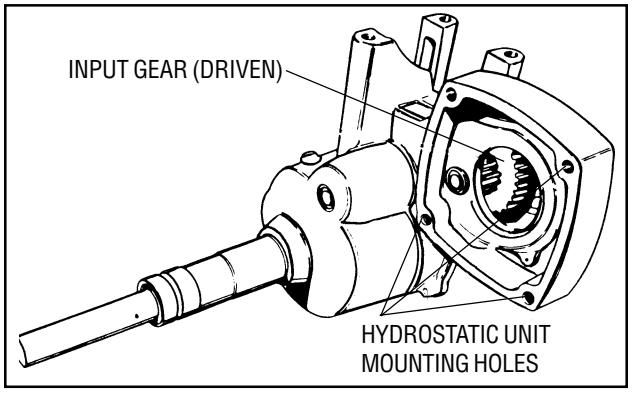
1. Clean the exterior surfaces. Drain lubricant; then separate the gear reduction from the hydrostatic unit. Check axle shafts for rough edges and high spots. Due to the hardness of the shafts, a stone may be necessary to remove metal burrs. Check for any evidence of oil leakage at the gasket or bearing surfaces.



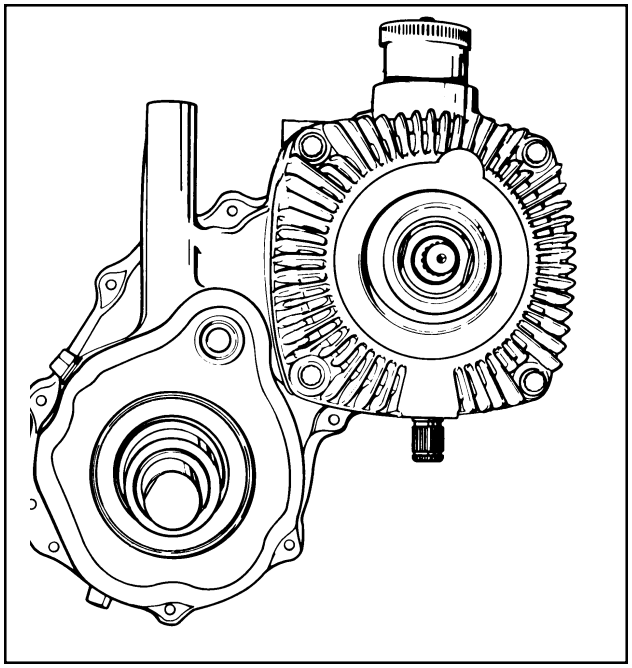
2. Axle supports, pressed from the inside out, must be removed from the case and cover, similar to the method used in the 1200 series transaxle.



3. To separate the hydrostatic unit from the 1300, support both parts, then remove the four mounting screws, and separate the parts. Drain the oil from the 1300 unit. Any hydrostatic repair must be done through the equipment brand dealer.



4. After removing the hydrostatic unit, inspect the surfaces and the gears from outside the unit.



5. Remove the lockscrews and tap the dowel pins out of the cover. Lift off the cover and discard the gasket.
6. Lift out the brake shaft, gear, and thrust washers on each side of the gears.
7. Lift the output shaft, gear, spacer, and thrust washer from the case. At the same time, lift out the differential assembly.

NOTE

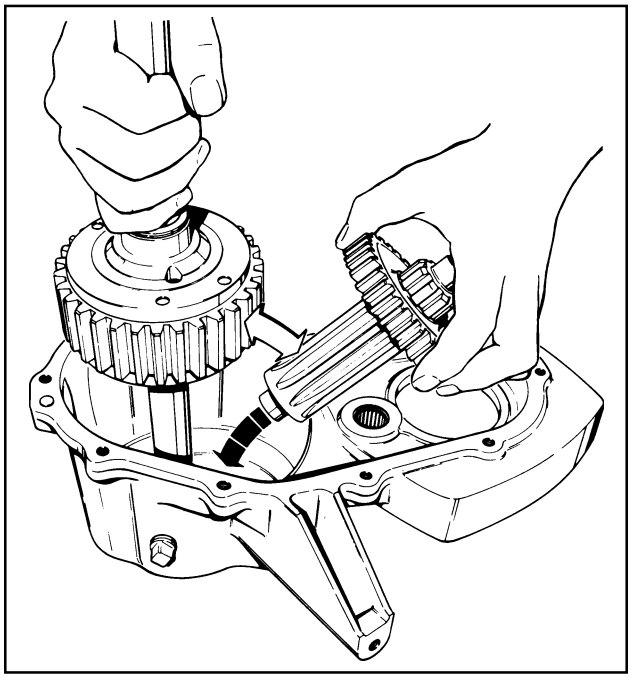
No thrust washer is located between the output shaft and the case.

8. To service the differential, refer to Chapter 18 on differentials.
9. To service bearings, refer to Chapter 22 on bearing service.
10. To separate axle supports from the case and cover, use an arbor or hydraulic press. A piece of bar stock should be used to protect the support from the ram of the press that you are using.

INSPECTION AND REPAIR

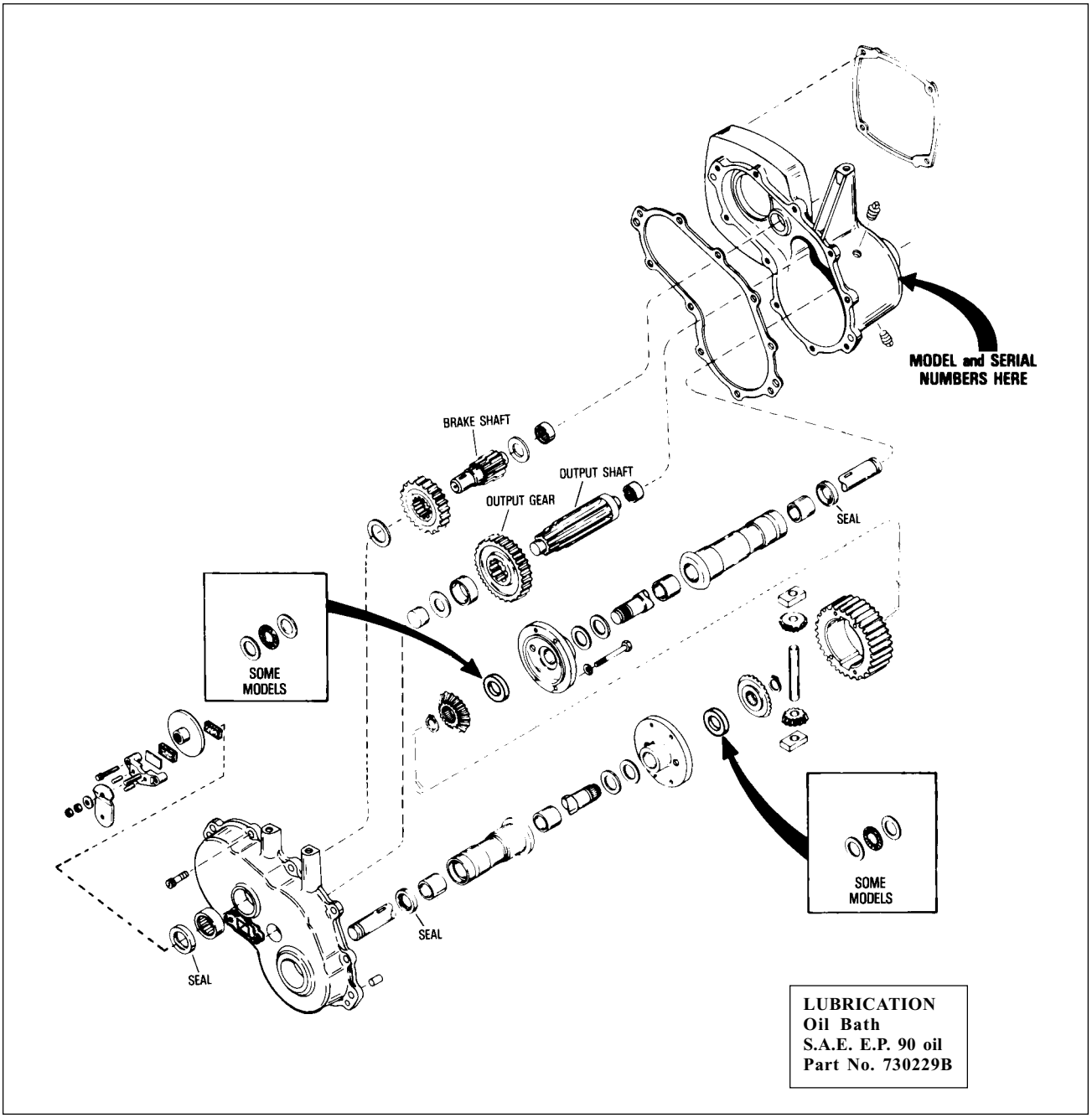
1. Inspect the case and cover for cracks, stripped threads, marred sealing surfaces, and bearing condition. The cause of any oil leakage should be corrected and if parts cannot be repaired, replace them.
2. Check shafts and gears for worn or chipped teeth. Check bearing surfaces for scratches which might affect oil seal performance. Check for wear.
3. Check needle bearings and be sure the bearings are not corroded or rusty. Replace bearings if in a questionable condition. Check the quality of the seal around the needle bearings.
4. Check differential for rigidity. Wobble indicates wear. Refer to the Chapter on differentials for service.

REASSEMBLY



1. When installing axle supports, be sure the case and cover alignment is true with the press. Press supports in until the flanged surfaces contact the case and cover.
2. Install the differential and output shaft simultaneously. Position the 3/4'' (19.1 mm) I.D. gear spacer and thrust washer on the shaft.
3. Center one 3/4'' (19.1 mm) I.D. thrust washer over the case needle bearings then install the brakeshaft gear, and another 1-1/8'' (28.6 mm) I.D. thrust washer.
4. Position a new gasket on the mounting surface of the case, then install the cover. Align the cover and case by tapping dowel pins into the cover and secure with lockscrews torqued to 10 ft. lbs. (13.6 mm).
5. Install a new brakeshaft oil seal and axle using seal protector.
6. Install new axle support oil seals using a seal protector.
7. Add 2-3/4 pints (44 oz.) (1301 ml) Oil (S.A.E. EP 90) before securing the hydrostatic drive to the 1300 series unit. Clean the mounting surfaces and use a new gasket between the units. Torque the four mounting bolts to 90-100 inch pounds (10.2-11.3 Nm).

1300 SERIES HYDROSTATIC GEAR REDUCTION DIFFERENTIAL



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 14. 2300 SERIES FOUR-SPEED TRANSAXLES

H-SHIFT PATTERN

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

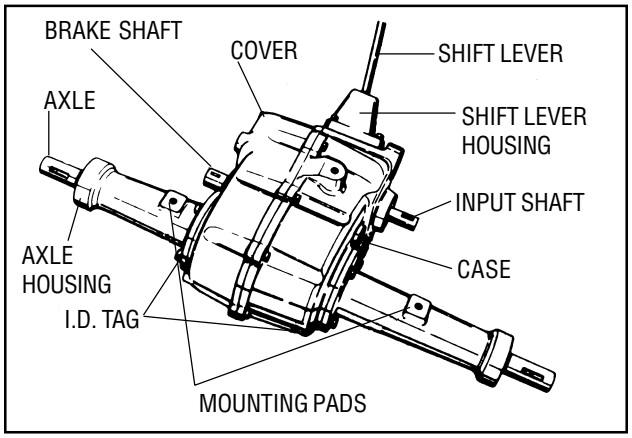
⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

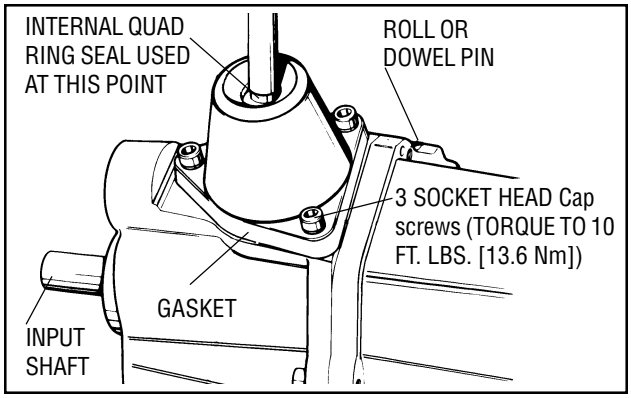
⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts my affect performance and could result in death or serious injury.

- **Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.**

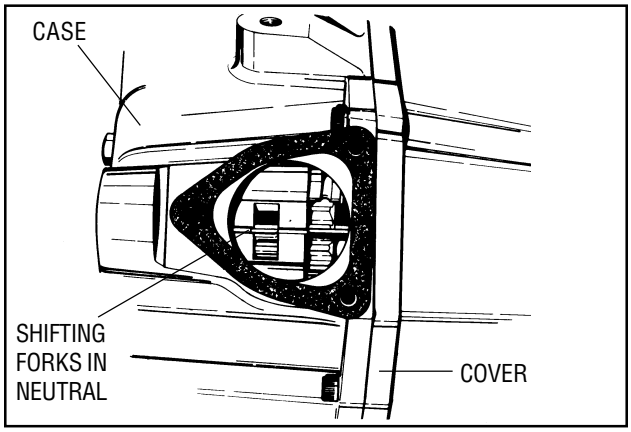
GENERAL

The 2300 series transaxle is a four speed forward with one speed reverse transaxle.

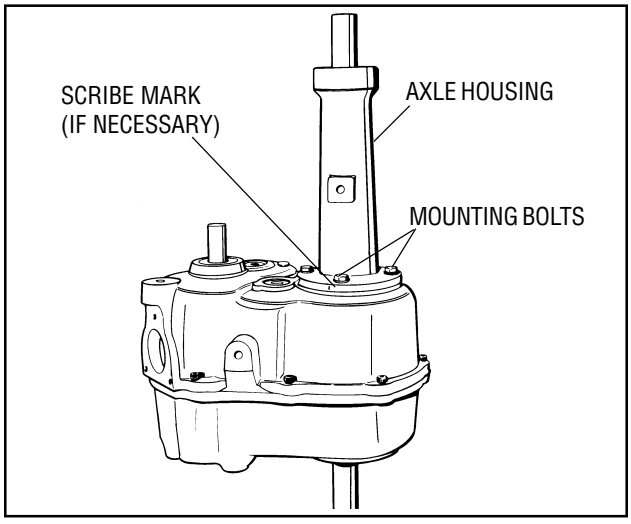




DISASSEMBLY

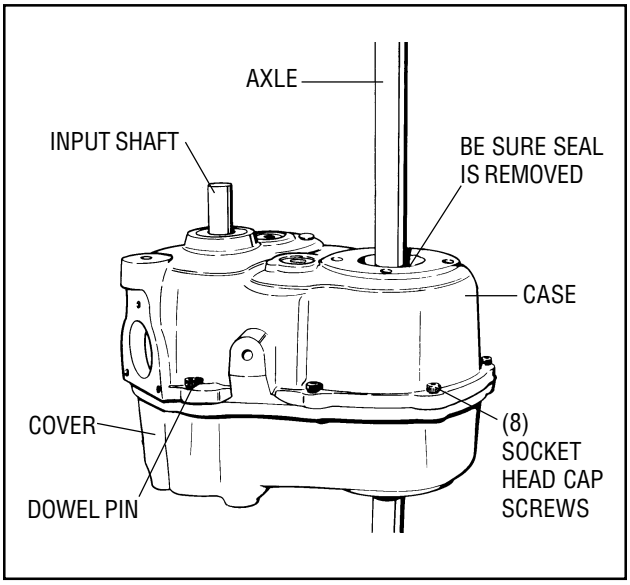


1. Position the shifter forks in neutral before disassembly.

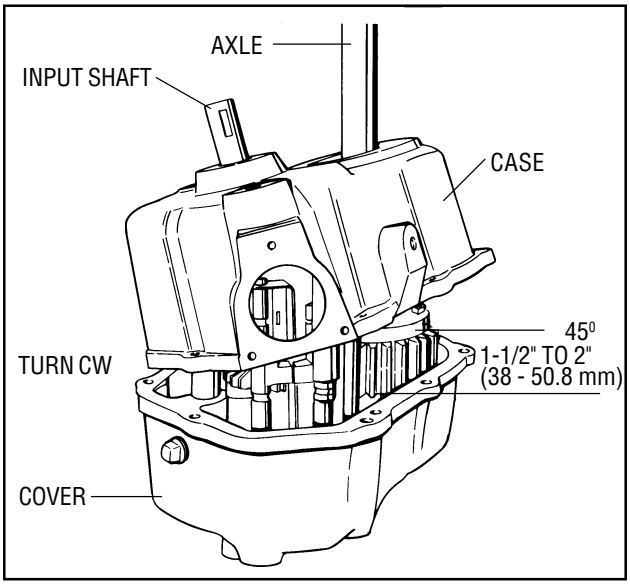


2. Remove both axle housings, and use the exposed axle as a ram to separate the seal retainers from the case and cover.
3. When disassembling the rest of the unit, it should be held so that it lies on the cover, properly blocked up, so that no weight rests on the brake shaft. The cover should sit rigidly so that the removal of parts can be done in a systematic step by step procedure. Be sure it does not fall causing injury.

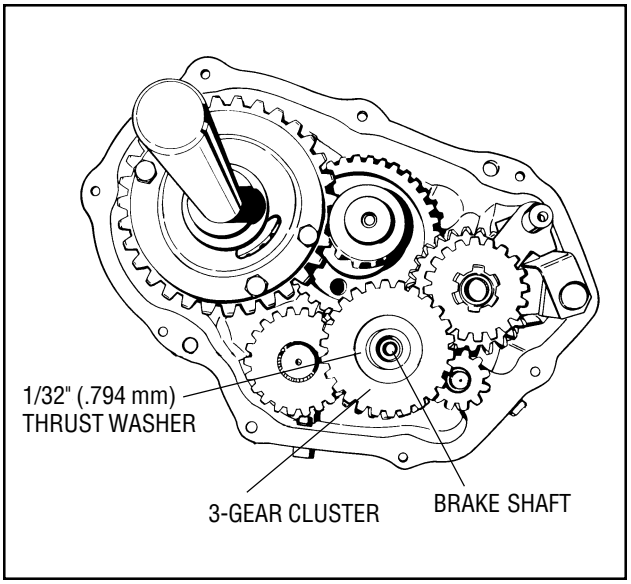
4. Oil seals are of the double lip type so sleeve protectors do not offer much protection when removing them. Upon replacement, new seals should be used.



5. Tap dowel pins into the cover and remove the socket head cap screws.



6. To separate the case from the cover. Lift the case 1-1/2 to 2'' (38-50.8 mm) above the cover. Tilt the case so that the shift rods will clear the edge. Rotate the case so the boss hidden inside will clear the gears, then lift it free of the differential.

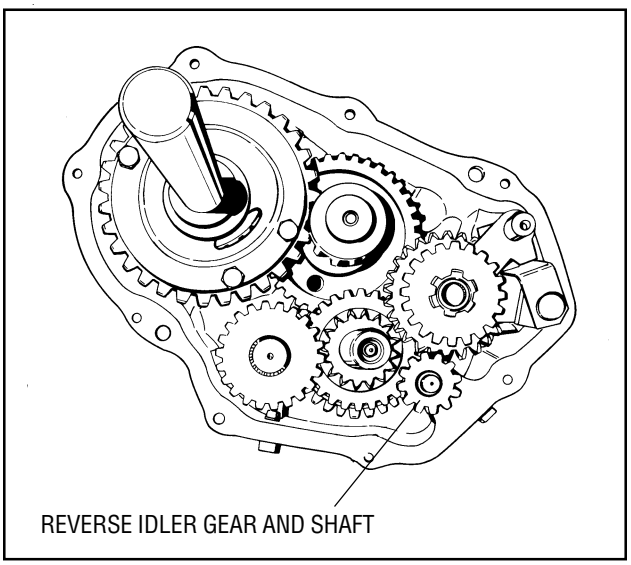


7. Remove thrust washer and three gear cluster from the brake shaft, noting whether the cluster has a sloppy fit.

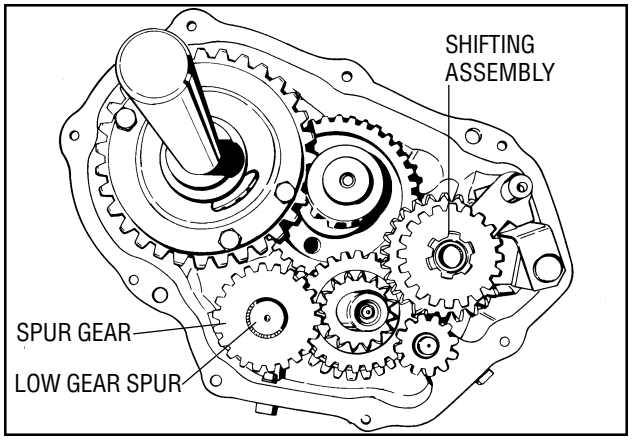
NOTE

To service the cluster bushings, refer to Chapter 22 on bearing and bushing service.

8. Inspect gear teeth for wearing, chipping or breaks. Wear or chipping on the bevel area only, indicates shifting while the equipment is in motion.

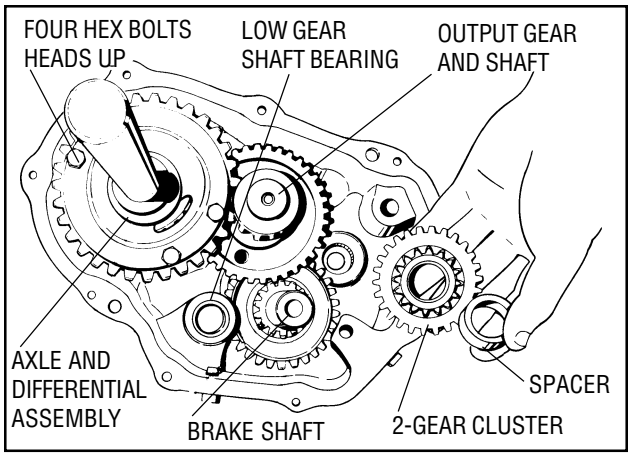


9. Remove the reverse idler gear, spacer and shaft from the boss in the cover. Note that the spacer goes between the gear and the cover, and the gear bevels go down. Excessive wear on teeth bevels indicates improper shifting technique.



10. Lift out the shifter assembly. Service of this unit is described in Chapter 21 on shifting assemblies. If it is evident that the shifter assembly needs no further teardown, place it aside intact in a clean place for servicing at a later time.

11. Remove the low gear and shaft, and splined spur gear. Separate the gear and shaft. Note there is no thrust washer between the gear and case.

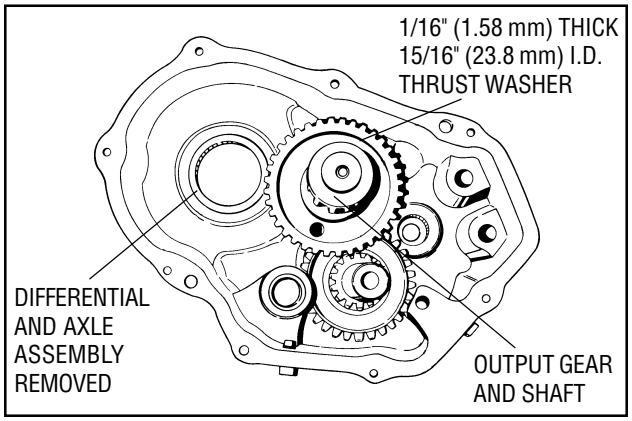


12. Remove the two gear cluster and spacer from the brake shaft.

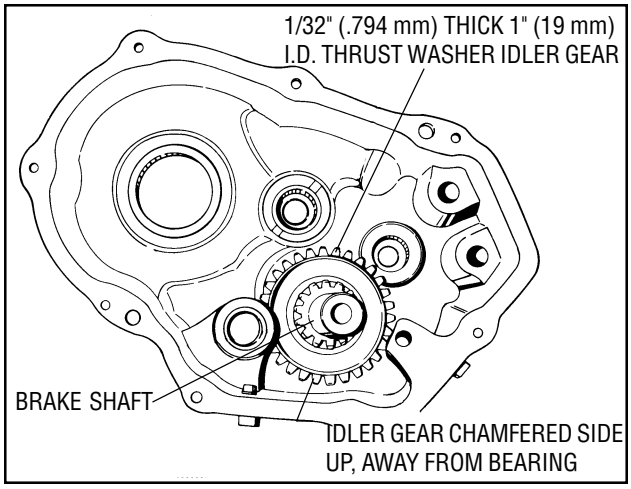
13. Lift the differential unit out of the cover.

NOTE

Service information appears in Chapter 18 on differentials.



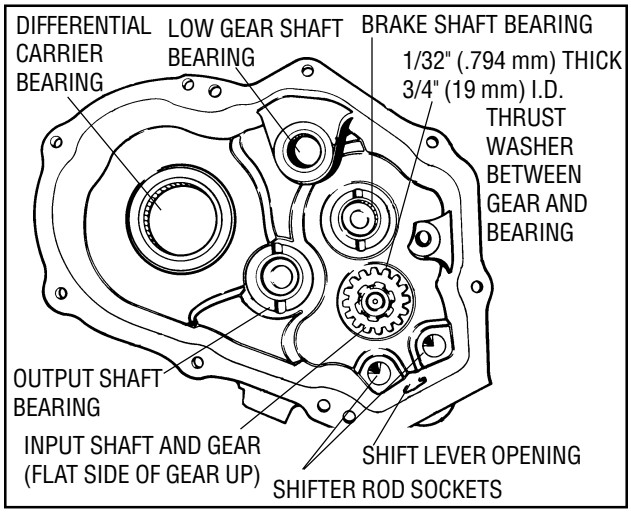
14. Remove the output shaft and gear and thrust washer from each end of the shaft.

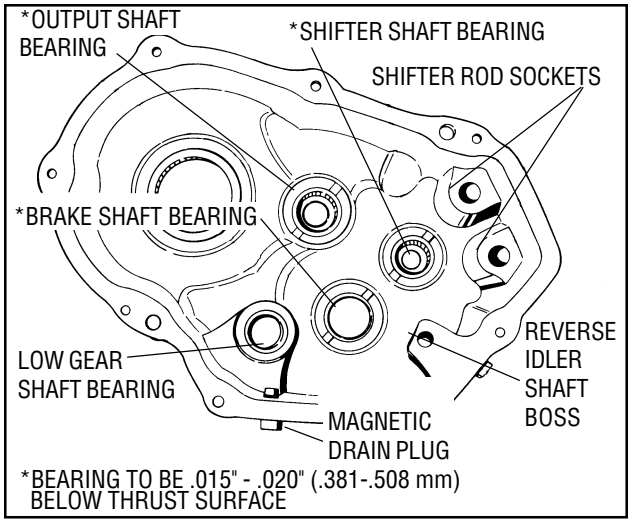


15. Remove the brake shaft.

NOTE

The brake shaft idler separates from the shaft. If separated, be sure that when reassembled, the idler gear chamfers are away from the cover.





16. Remove the input shaft from the case by tapping with a non-metallic hammer.

INSPECTION AND REPAIR

1. Gears.

   a. Check bevels for evidence of damage due to improper shifting.

NOTE

Input power to Tecumseh/Peerless Transaxles must be stopped before shifting.

   b. Check face of teeth for wear. Large shiny areas indicate too much tooth contact and possible excessive wear. Replace gears that are damaged or show excessive wear.

2. Shafts and Axles.

   a. Check surfaces for rust, pitting, scratches or wear.

   b. Check keyways, splines, threads, and grooves for wear. Replace parts if worn or damaged beyond a refinished state.

3. Case and Cover.

   Check for cracks, stripped threads, metal chips, flat sealing surfaces and rust. Clean out any rust. Replace parts if any damage is found that cannot be repaired.

4. Thrust Washers and Spacers.

   Check for shiny surfaces which indicate wear and replace if evident. Try to determine the cause of thrust washer wear such as lack of end play due to the reuse of an old gasket, or use of the wrong thrust washer.

5. Shifting Assembly.

   Refer to Chapter 21on shifting assemblies.

6. Gaskets.

   Replace all gaskets.

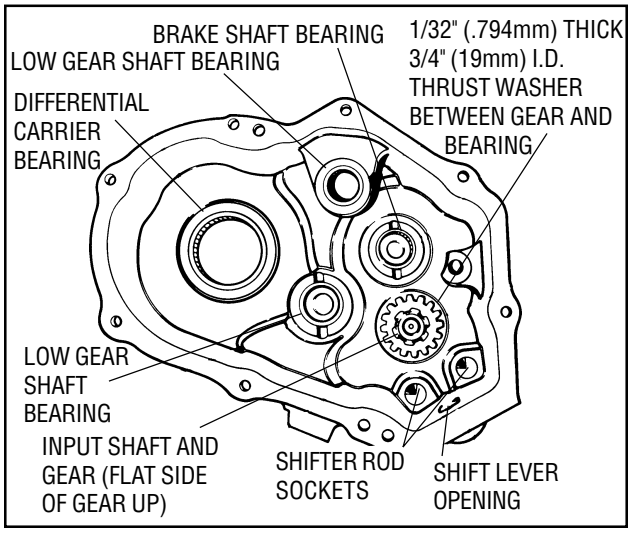
7. Oil Seals.

   It is a good habit to replace all seals. It is necessary to replace all double lip seals. See Chapter 1, for the paragraph on “OIL LEAKS, SEAL AND GASKET SERVICE”.

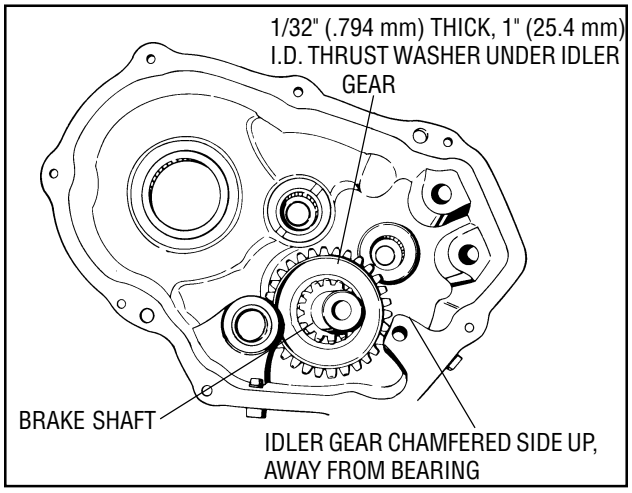
8. Bearings and Bushings.

   Refer to Chapter 22 on bearings and bushings.

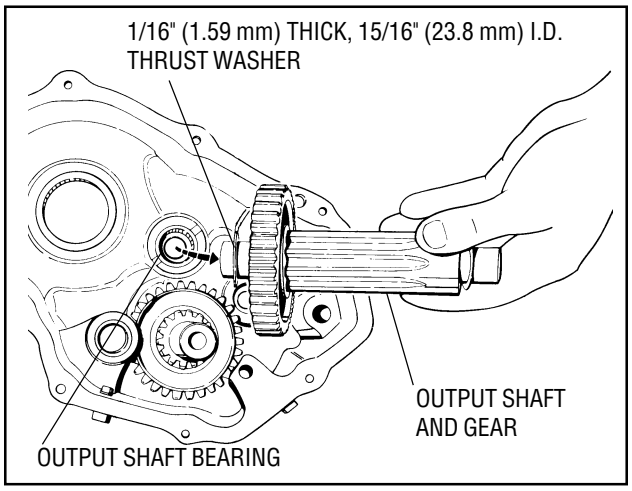
ASSEMBLY



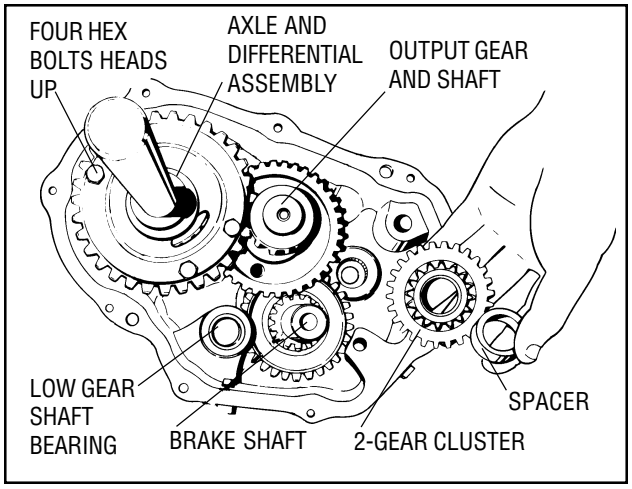
1. Install the input shaft in the case. Use a soft mallet to seat the shaft and gear completely. Often, binding in the assembled unit can be traced to a partially installed input shaft.



2. Center one 1/32'' (794 mm) thick by 1'' (25.4 mm) I.D. thrust washer on the cover brake shaft needle bearing, then install the brake shaft and gear, (with the chamfer side away from the cover).

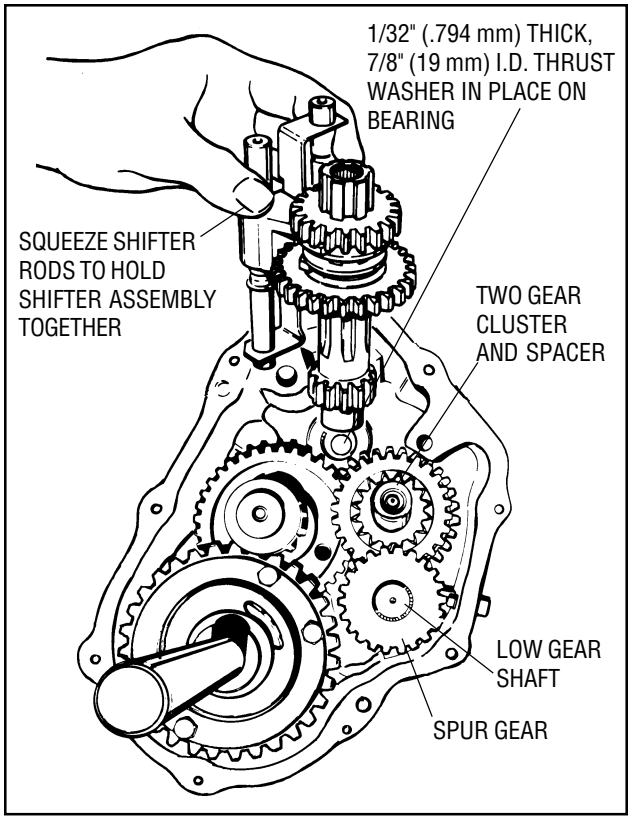


3. Install the output shaft and gear after centering a 1/16" (1.59) thick by 15/16" (23.8 mm) I.D. thrust washer on each end of the shaft.



4. Insert the differential assembly into the cover. Note that the four bolt heads should be facing away from the output gear.

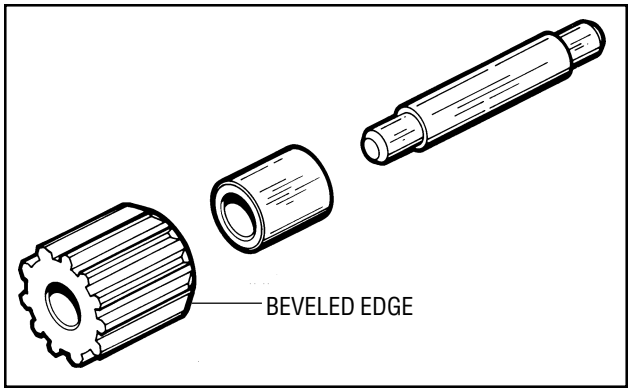
5. Install the two gear cluster and spacer on the brake shaft.



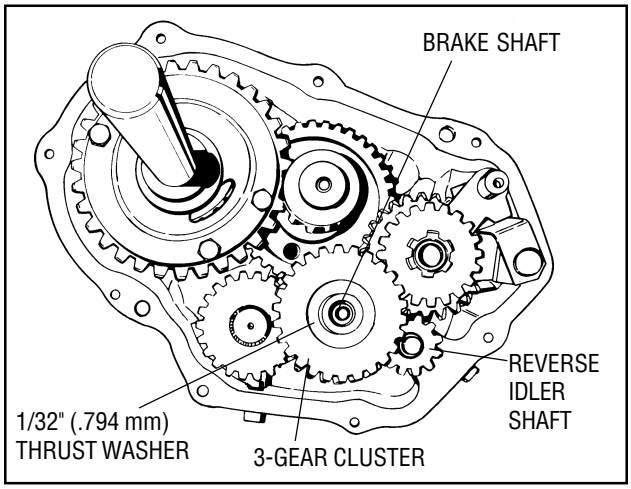
6. Install a 1/16'' (1.59 mm) thick by 3/4'' (19 mm) I.D. thrust washer, gear and low gear idler shaft in the cover. Do not put a thrust washer on the exposed end of this shaft. Be sure the small gear meshes with the larger gear of the two gear cluster.

7. Center one 1/32'' (.794 mm) thick by 7/8'' (19 mm) I.D. thrust washer on cover shifter shaft bearing.

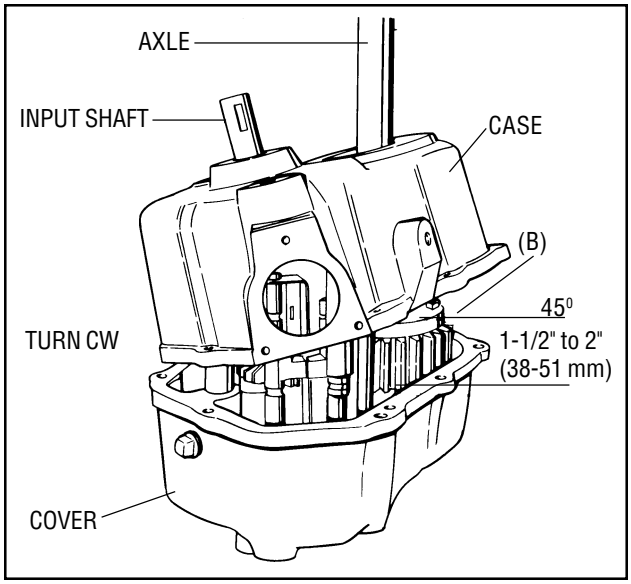
8. Install the shifter assembly (as a unit) into the cover.



9. Install the reverse idler shaft, spacer and gear into the cover. The beveled side of the idler gear should be down into the cover.

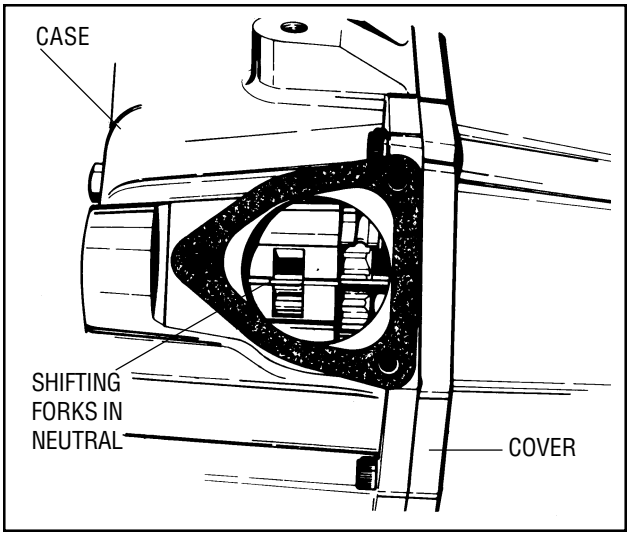


10. With the small gear of the three gear cluster toward the spacer, install the three gear cluster and another 1/32'' (.794 mm) thick by 7/8'' (19 mm) I.D. thrust washer on the brake shaft.



11. Position the gasket on the cover sealing surface, then install the case over the differential shaft. Be sure the boss goes under the gears and the edge of the case goes over the shaft rods in the opposite manner from which it was removed.

12. Once in position, if the case hangs up 1/2" to 1'' (12.7 - 25.4 mm) above the cover, turn the input shaft to get the gears to mesh. The case should drop to about 1/4'' (6.3 mm) from closing.

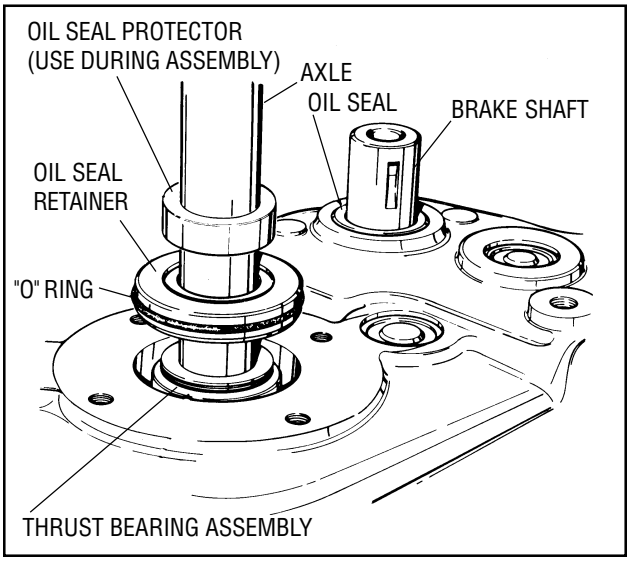


13. Use a pair of needle nose pliers on the shifter stop on each shifter fork to agitate the shifter rod ends into their machined recesses in the case.

14. Align the case and cover with the two dowel pins, then install and tighten the eight socket head cap screws. Torque screws to 10 ft. lbs. Unit can now be placed flat on the work bench.

NOTE

Seal protectors must be used, when installing a seal over the axle ends or any shaft with a machined keyway.



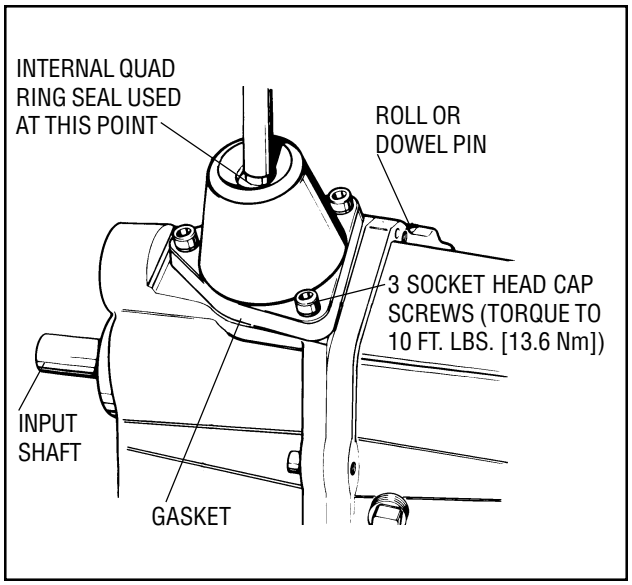
15. Install new “O” rings and oil seals using the seal protector as shown.

NOTE

Coating both the "O" ring and seal with lubricant will help ease assembly.

16. Upon installation of the axle housing, be sure mounting pads face in the same direction as when removed. Install cap screws and torque to 13 ft. lbs.(17.6 Nm).

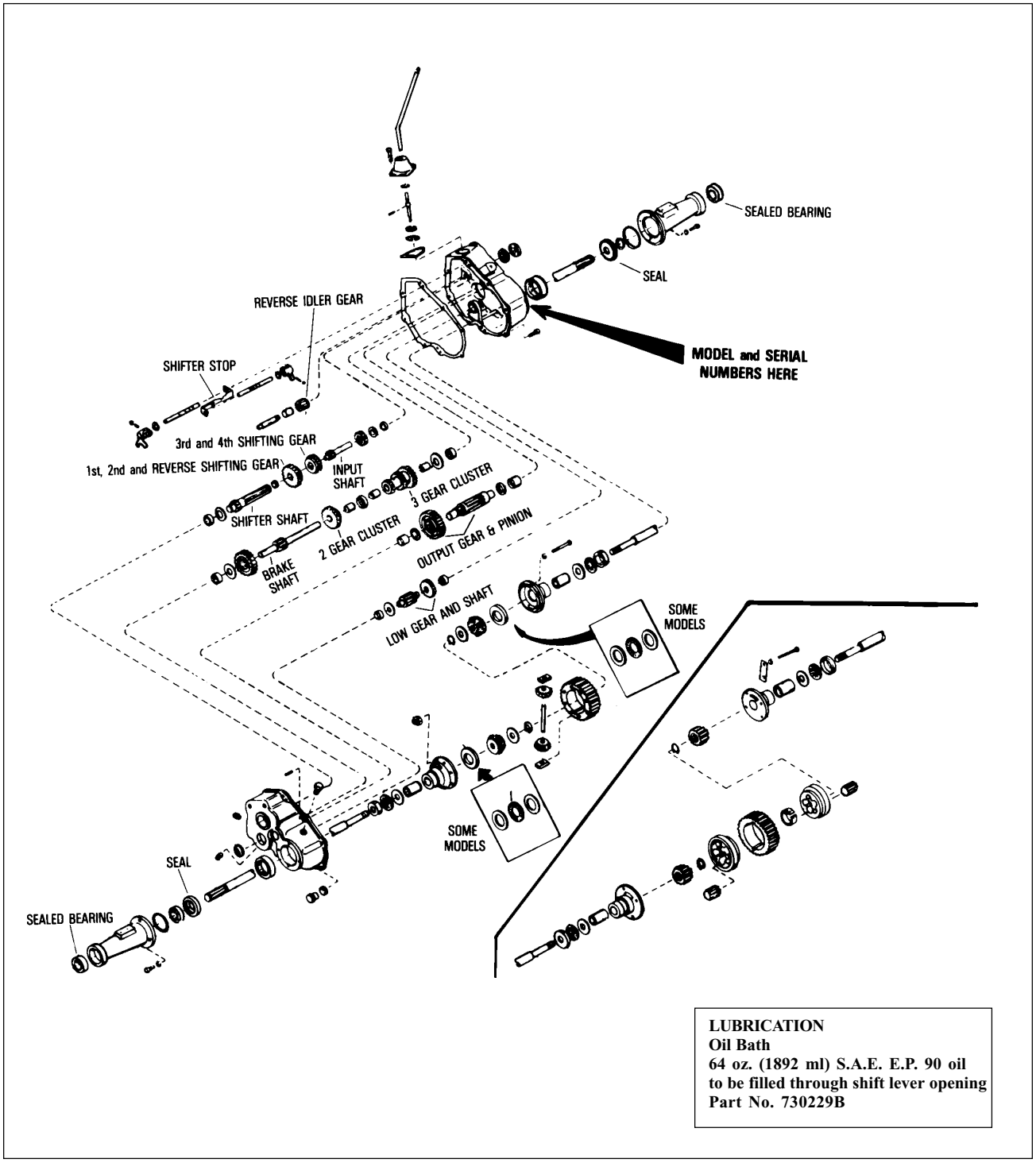
17. Install the shift lever housing and new gasket.



TESTING AND LUBRICATION

1. For testing, refer to Chapter 1, page 6.
2. For proper lubrication type and amount, refer to Chapter 1.

2300 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 15. 2400 SERIES HYDRO POWERED TRANSAXLES

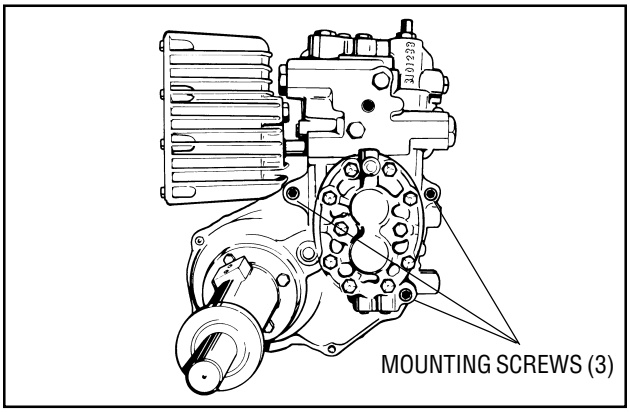
⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

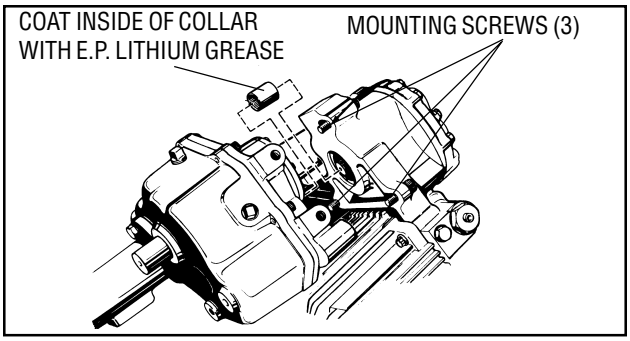
The 2400 Series transaxle is a gear reduction unit which is powered by a hydrostatic pump.

SEPARATING AND COMBINING THE HYDROSTATIC PUMP AND THE 2400 SERIES TRANSAXLE.

The two parts, gear reduction unit and pump, should be removed from the vehicle together.



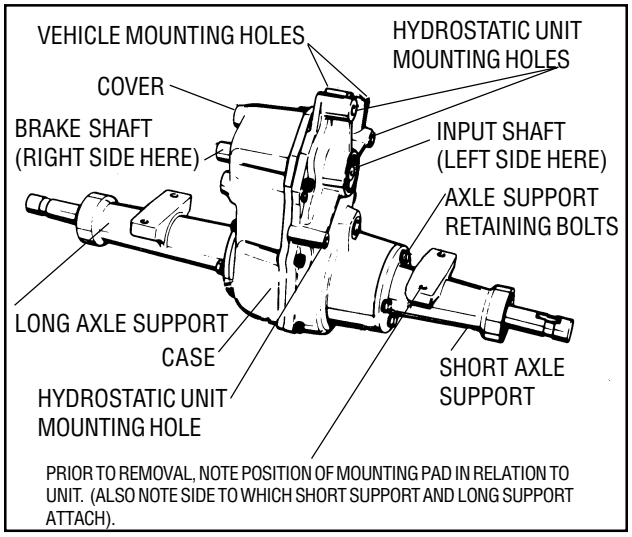
1. To separate the units, block the assembly in a protective vise, then remove the three hydrostatic mounting screws. Separate one unit from the other. If any binding occurs, remember that the drive shafts are held in common rotation by a splined coupling which will bind if the relationship between the input shaft and the pump is not straight.



NOTE

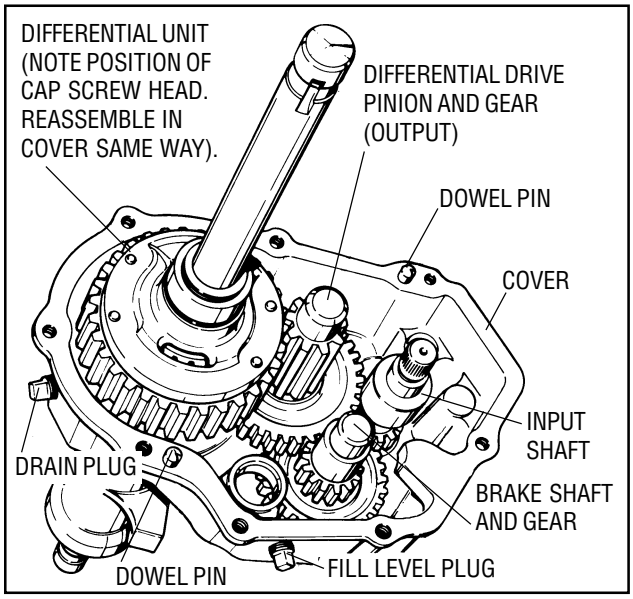
For service to the hydrostatic pump, it must be returned to the dealer who sold the vehicle for his service arrangement.

2. To combine the hydrostatic pump and the 2400 transaxle, coat the splined coupling with E.P. Lithium grease, and install it on the 2400 input driveshaft.
3. After the coupling is installed over the driveshaft of the hydrostatic pump press the parts together. Secure the assembly with three socket head cap screws, torqued to the standard for the bolt being used.

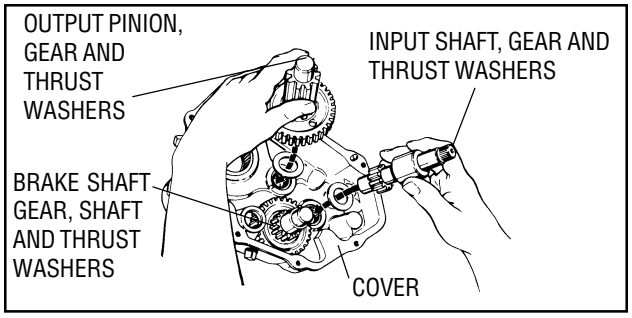


DISASSEMBLY

4. Clean axles of burrs, rust and sharp edges.
5. Remove axle supports. Be sure to note in what position and to which side they attach.
6. Drain the oil from unit. Remove the seal retainers and “O” rings.
7. Remove the eight socket head cap screws securing the case to the cover. Drive dowel pins out of case into cover, then lift case off of the cover.



8. Before removing the differential unit, note the position of the cap screw heads. Replace the unit in the same way to insure axle lengths will be correct when installing the axle supports.



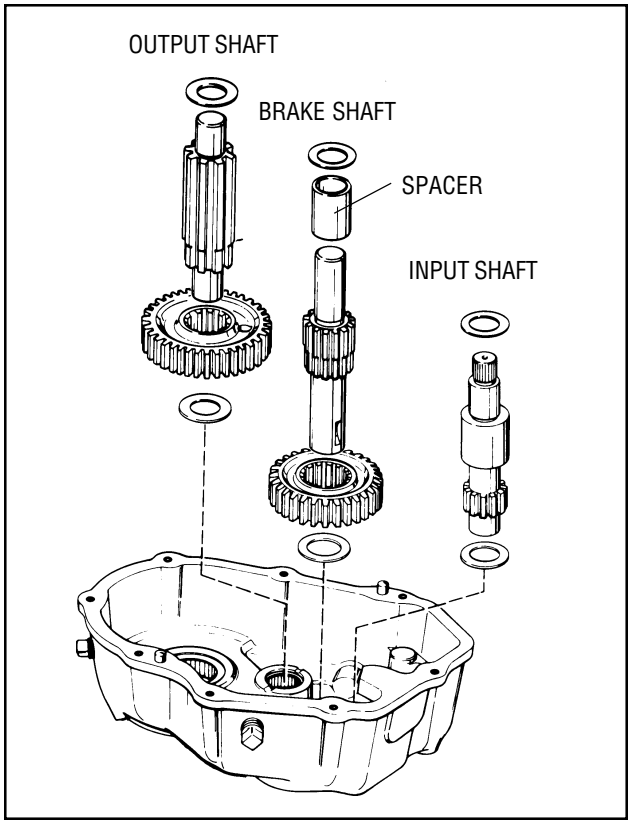
9. Remove the input shaft and gear assembly. Note that thrust washers are on both ends of the shaft.
10. Remove the output pinion and the gear splined to it. Note the position of thrust washers on each end of the pinion.
11. To remove the brake shaft, the shaft must be tapped from the gear splined to it. Use a soft hammer. Note that both ends of the shaft have thrust washers.

INSPECTION AND REPAIR

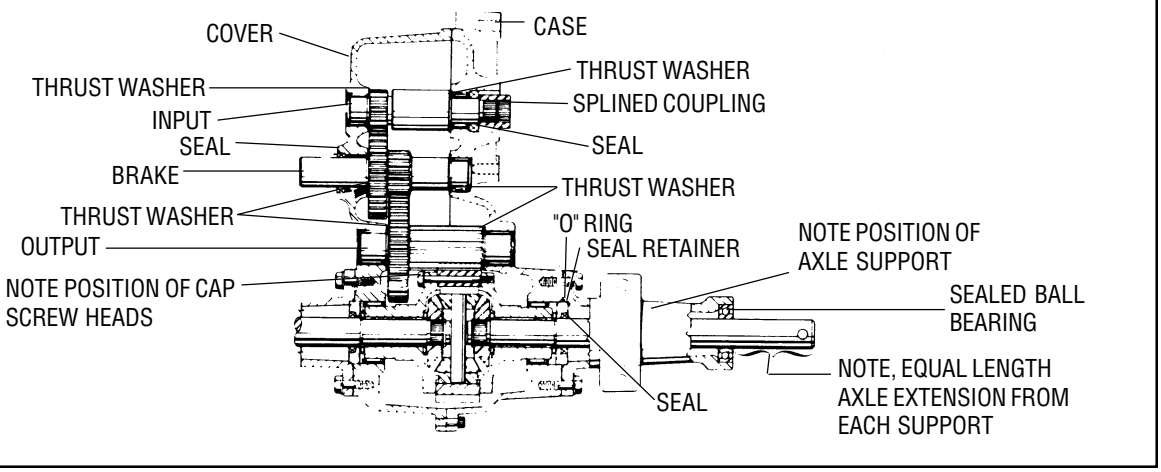
1. Clean all parts and examine for wear or damage.
2. Refer to Chapter 18 on differentials for service when working on differentials. Refer to Chapter 22 on bearing and bushing service to replace any loose or worn bearings.
3. Remove and discard oil seals from the input and brake shafts. Check axle seals and replace if any evidence of leaking exists. If protective seal sleeves were not used when removing seals and retainer assemblies, replace seals after assembly. Use seal protectors and correct drivers. See the paragraph in Chapter 1 "OIL LEAKS, SEAL AND GASKET SERVICE" for service.
4. Clean the case and cover. Protect the bearings from dirt. Lubricate the bearings to prevent rusting.

ASSEMBLY

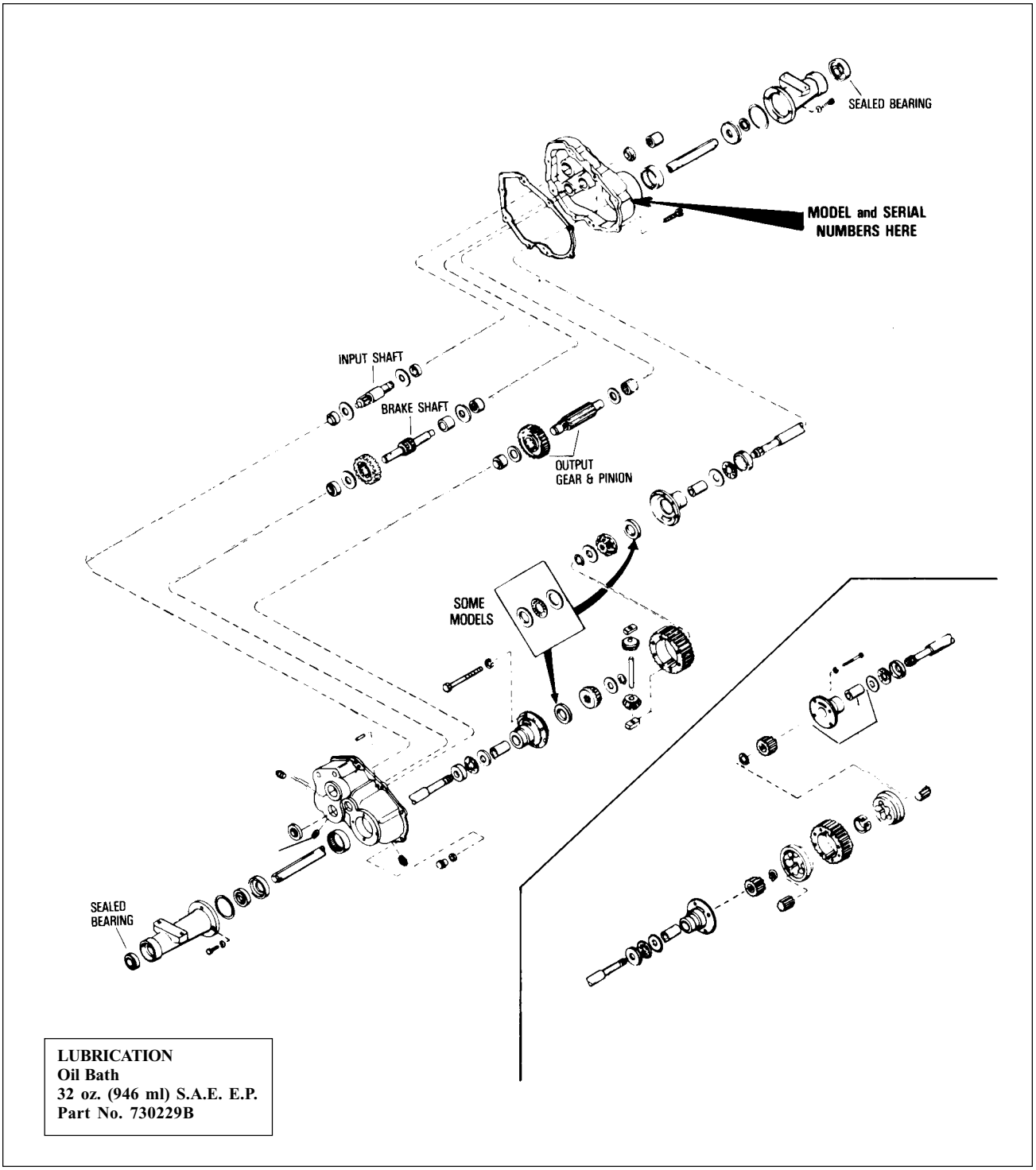
1. Install thrust washer in the cover for input, output and brake shafts.
2. Install the brake shaft into the gear in the cover.
3. Install the input and output shafts (with gear) and position spacers on the brake shaft. Install thrust washers on all shafts.



4. Install the differential unit with cap screw facing down.
5. Position a new gasket on slightly raised dowels and install the case. Turn down eight (8) socket head cap screws lightly. Tap dowel pins in and tighten the cap screws to 10 ft. lbs. (13.6 Nm).
6. Use a seal protector and install the seal and retainer assemblies. Position a new "O" ring on the seal retainer. Be sure the mounting pad is in the correct position. Install each axle support and bolt down. Torque the cap screws to 13 ft. lbs. (13.7 Nm).
7. Using the proper seal protector and driver, replace the input and brake shaft seals.
8. Rotate shafts to check for binding or noise.
9. Add lubricant (2 pints [946 ml] S.A.E. EP90 oil) to level of the fill plug with the unit in normal mounted position.



2400 SERIES HYDRO POWERED TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 16. 2500 SERIES HYDRO POWERED TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GEAR REDUCTION AND DIFFERENTIAL UNIT

GENERAL

Most 2500 Series two speed gear boxes are run by an Eaton® Model 10 hydrostatic unit. Power for the hydrostat is supplied by an engine with up to an 18 H.P. rating. The unit has infinite forward and reverse speeds in both a high and low range. The 2500 series are shipped without lubrication. Original equipment manufacturers fill each gear case with lubricant when installing the 2500 in the equipment. Lubrication for the 2500 is 7 to 8 pts. (3.3 - 3.8 Lt) of SAE Type A automatic transmission fluid.

DISASSEMBLY

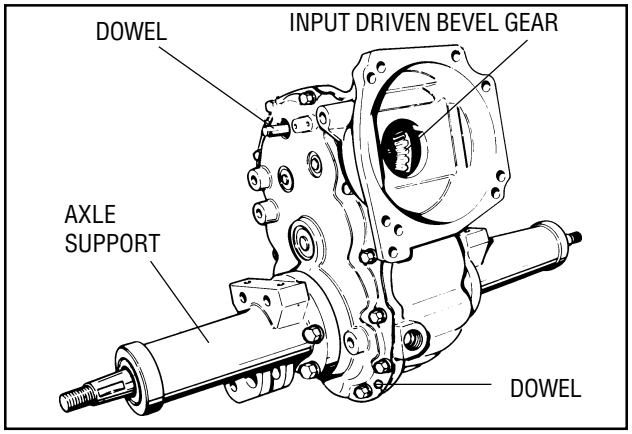
1. Remove piping and hydrostatic unit as necessary to allow repair.
2. Although the unit should have been drained of lubrication, be aware that removal of the axle support will allow trapped oil to spill.

NOTE

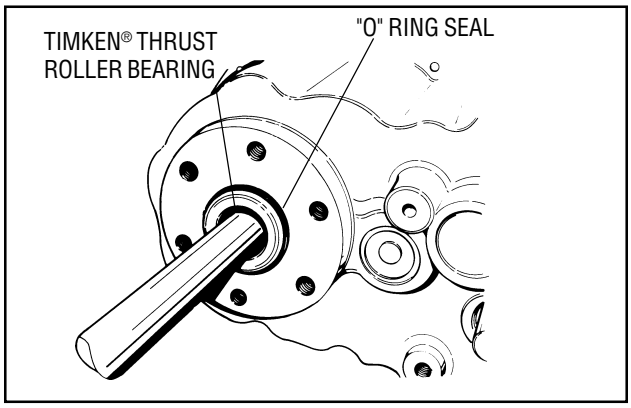
An oil supply is blocked in the hydrostatic pump when not running, so upon reassembly hydrostatic charging is not necessary.

NOTE

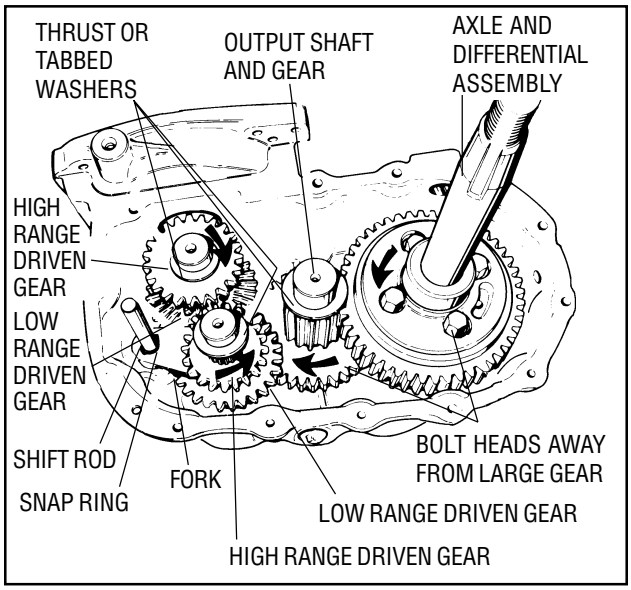
Any attempt to service the hydrostatic pump should be done only upon authorization of Eaton or the equipment manufacturer. Tecumseh does not authorize repair or adjustment of the unit.



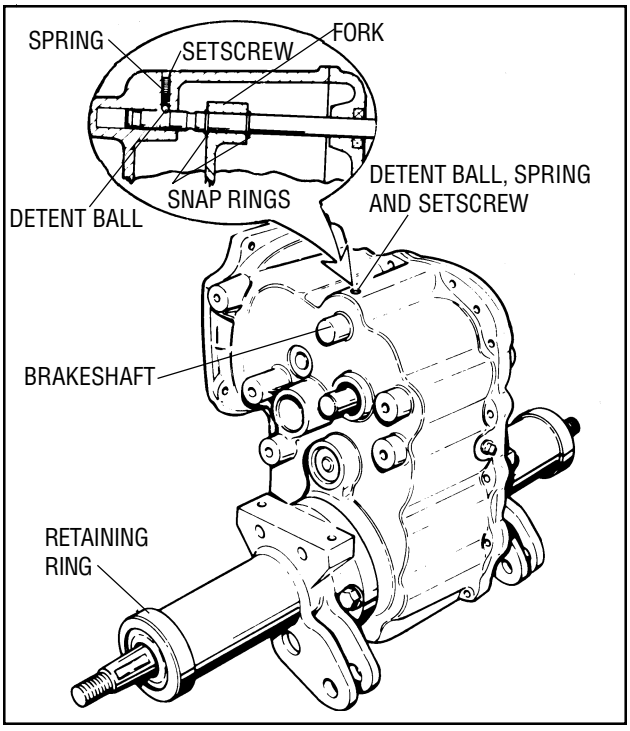
3. Clean all exterior surfaces of the transaxle.
4. Remove the axle supports. If supports are different or if there is a chance for confused reassembly, scribe alignment marks.



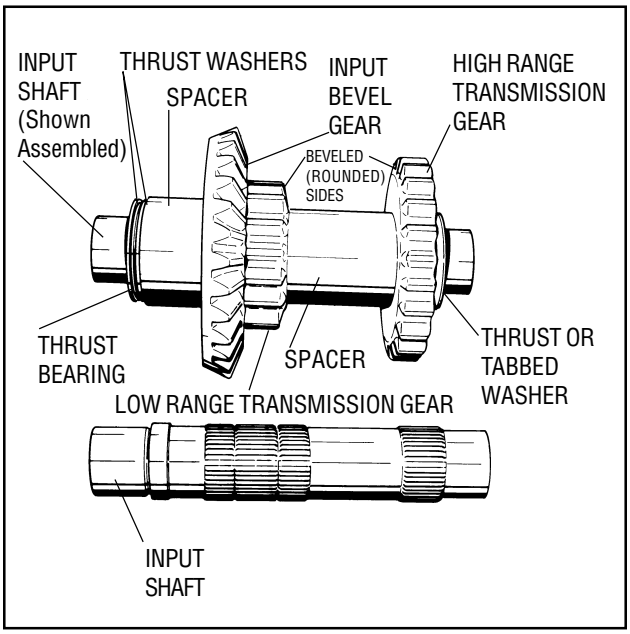
5. Remove and discard square “O” ring seal.
6. If the tapered roller bearings are loose, remove them.
7. Position the unit with the cover up side; then remove the dowels and screws. Lift off the cover and discard the gasket.



8. To remove the inside components, first remove the differential and then thrust washers.



9. To remove the shifter rod and fork, the set screw, spring and detent ball should be removed from the outside of the case.



10. Remove both the input and shifter gear and shaft assemblies, along with the shifter rod and fork.
11. Remove the input shaft and gear assembly.
12. Remove the output shaft and gear.

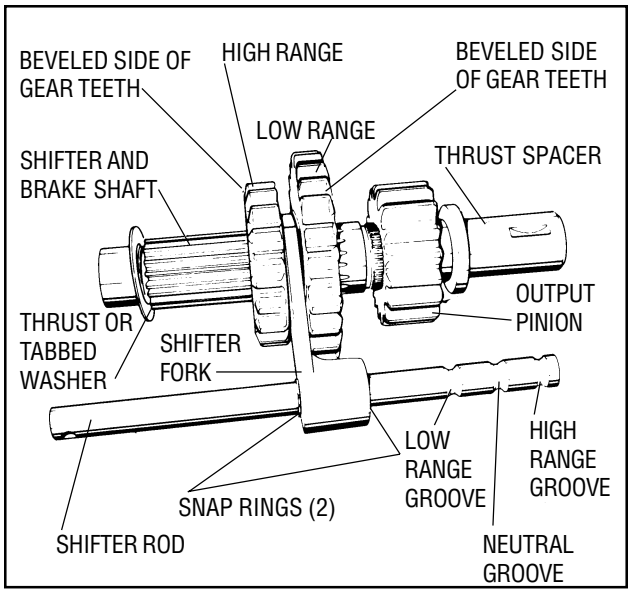
INSPECTION AND REPAIR

Axle Supports

1. Check ball bearings and bearing races for wear, rust and ease of rotation. Clean the interior of the support if necessary.
2. Replace the oil seals in the axle supports.
3. Check for cracks in the support.

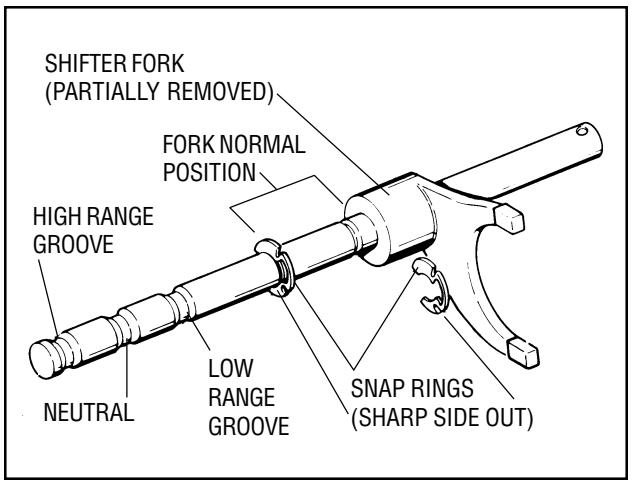
Case and Cover

1. Check for leaks or cracks.
2. As necessary, replace needle bearings as described in Chapter 10.
3. Do not replace brake shaft and shifter rod seals until the unit is reassembled.



Shafts and Gears

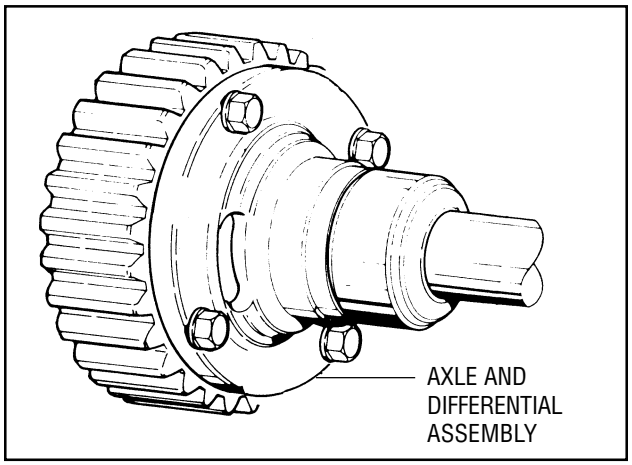
1. Check teeth for wear, pitting or breakage.
2. Inspect bearing surfaces for smoothness.
3. Inspect gears and shafts for out-of-round.
4. Splines should allow a smooth fit. Rotate meshing parts for a better fit if binding seems excessive.

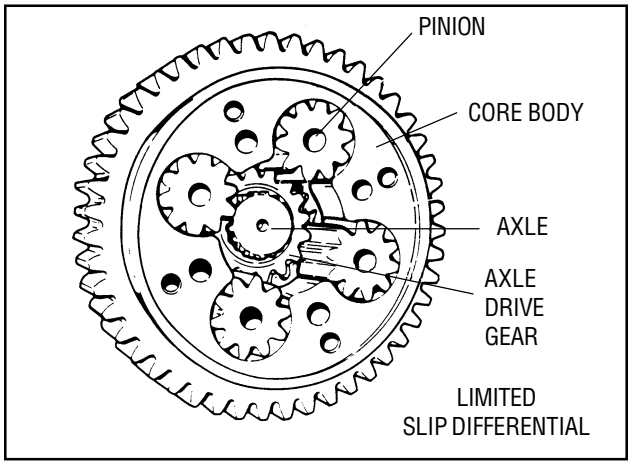


Shifter Mechanism

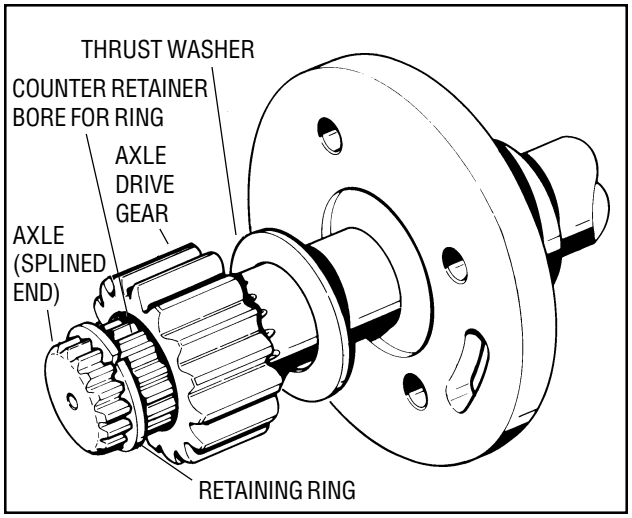
1. Check spring for tension and ball for wear.
2. Check shifter rod grooves for wear. Be sure the sharp edge of the snap ring goes away from shifter fork.
3. Inspect the shifter fork for straightness and wear.

Differential





1. Make sure you have all parts are present.
2. Check the snap rings for their condition.

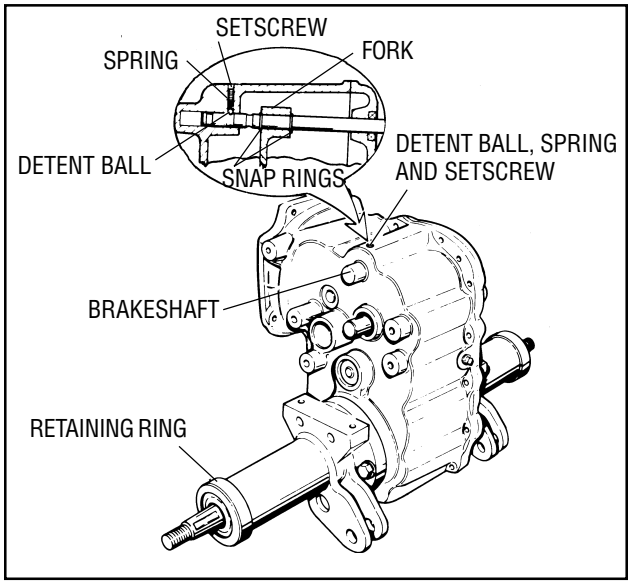


Other

1. Check thrust washers for wear.
2. Check tapered roller bearings for wear and ease of rotation.
3. Replace the shifter rod oil seal after assembly of all parts.
4. Check thrust bearing for wear. Replace any parts necessary.

ASSEMBLY

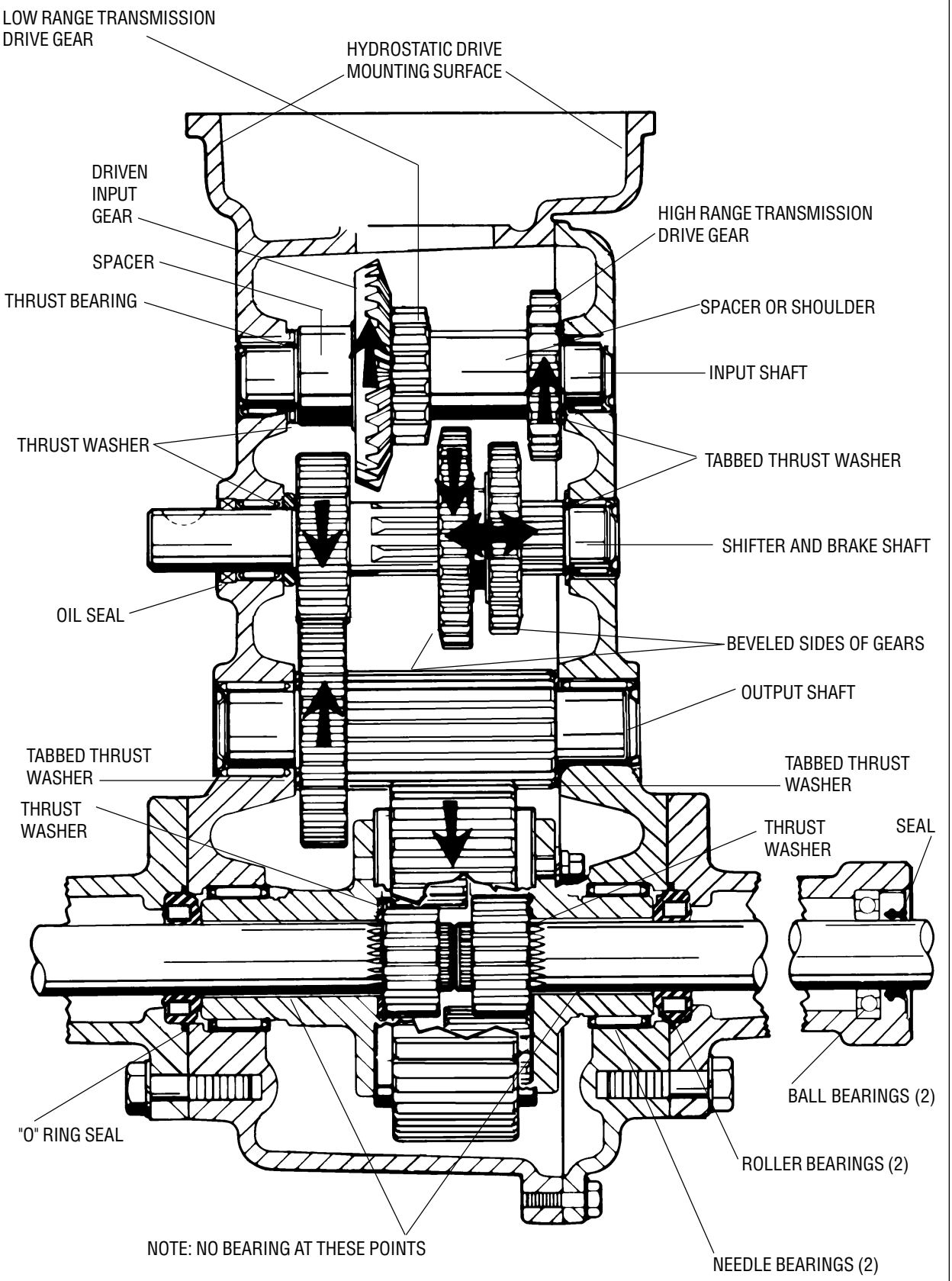
Install parts reversing the disassembly procedure. Be careful of the following:



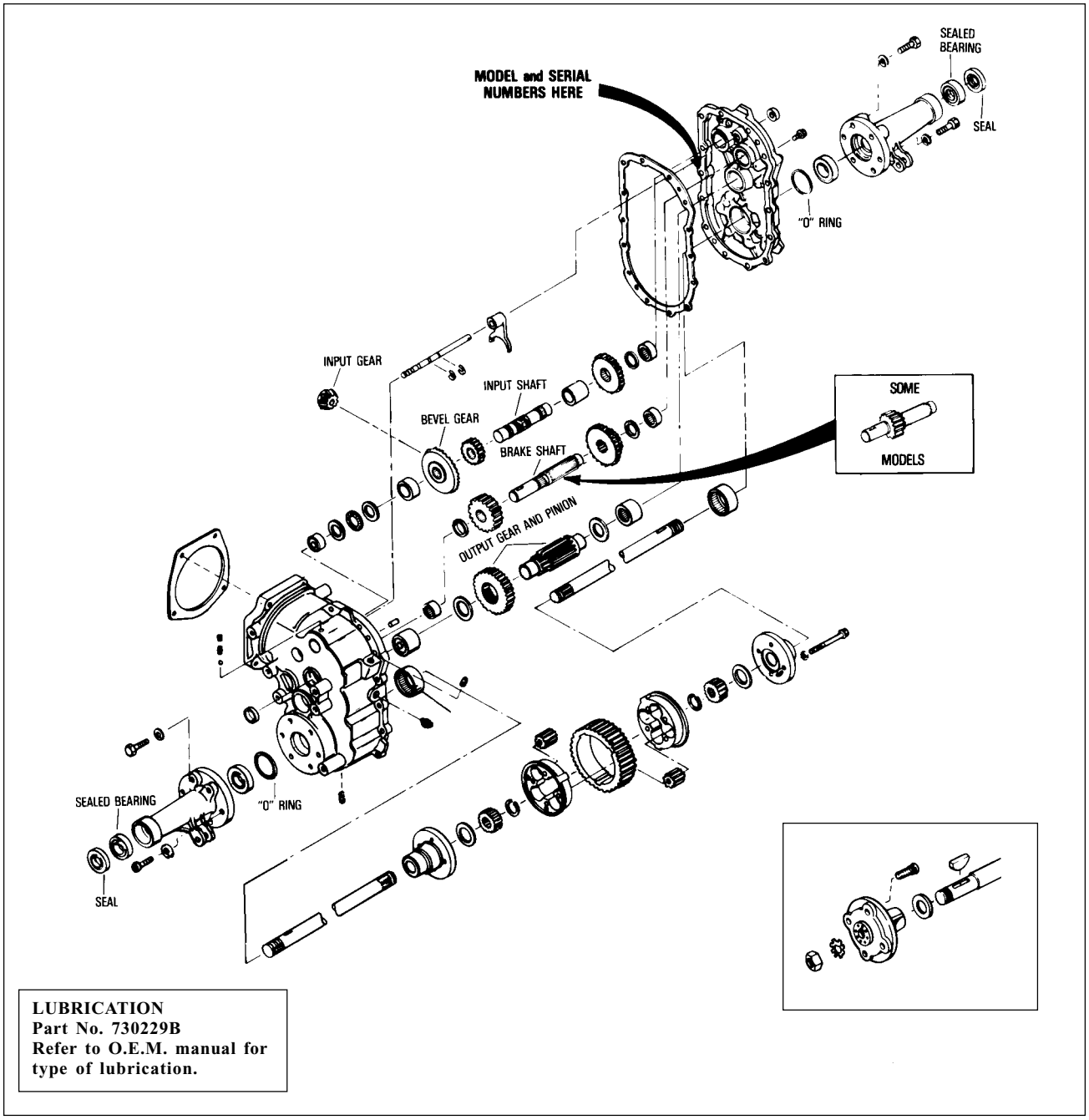
1. After the shifter rod is positioned, install the detent ball, spring and setscrew. Slowly turn the setscrew inward while raising and lowering the rod until the detent ball stops the rod movement.
2. Be sure that thrust washers and spacers are between every shaft and the case and cover.
3. Threads of the differential bolts must be coated with standard stud Loctite. The bolt heads on the differential are up when installed.
4. Install a new gasket. It may be helpful to dampen the gasket with oil to get it to lie flat.
5. Use a seal protector to protect the axle support oil seals during installation.
6. Install axle supports correctly. Do not rotate the support to a new position when pressed tight against the square “O” ring seal or the seal may be cut.

AFTER ASSEMBLY

1. To install the brake shaft oil seal using a seal protector.
2. To install the shifter rod oil seal, use seal sleeve 670206 and driver 670211.
3. Lubrication for all models is 7 to 8 pints (3.3 - 3.8 Lt) of S.A.E. Type A automatic transmission fluid. When filling, allow the fluid to settle behind the tapered bearings into the axle supports. This may necessitate filling, checking and adding. The oil fill hole is located in the case. If the shrouding on the equipment does not allow access to the oil fill hole when the 2500 is installed in the chassis, lubrication should be filled prior to installation in the equipment. If filling takes place before installing the 2500, orient the unit to a 90° angle to the axles. There should be no fluid leak.
4. Install the drive assembly according to the manufacturer’s instructions.


LOW RANGE TRANSMISSION DRIVE GEAR
HYDROSTATIC DRIVE MOUNTING SURFACE
DRIVEN INPUT GEAR
SPACER
THRUST BEARING
HIGH RANGE TRANSMISSION DRIVE GEAR
SPACER OR SHOULDER
INPUT SHAFT
THRUST WASHER
TABBED THRUST WASHER
SHIFTER AND BRAKE SHAFT
OIL SEAL
BEVELED SIDES OF GEARS
OUTPUT SHAFT
TABBED THRUST WASHER
TABBED THRUST WASHER
THRUST WASHER
THRUST WASHER
SEAL
BALL BEARINGS (2)
"O" RING SEAL
ROLLER BEARINGS (2)
NOTE: NO BEARING AT THESE POINTS
NEEDLE BEARINGS (2)

2500 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 17. 2600 SERIES HYDRO POWERED TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 2600 series transaxle has infinite forward and reverse speeds. It is powered by a Sundstrand® hydrostatic drive connected to an engine with up to a 20 Horsepower rating. The 2600 series are shipped without lubrication from Tecumseh/Peerless. Original equipment manufacturers fill each gear case with lubricant when installing the 2600 in the equipment. Lubrication for the 2600 is 7 to 8 pts. (3.3 - 3.8 Lt) SAE Type A automatic transmission fluid.

DISASSEMBLY

1. Remove the hydrostatic pump as necessary to allow repair.

NOTE

An oil supply is blocked in the hydrostatic pump when not running so upon reassembly, hydrostatic charging is not necessary.

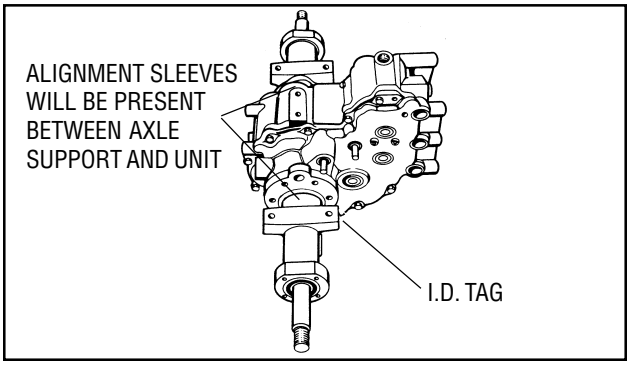
2. Although the unit should have been drained of lubrication, be aware that upon removal of the axle support, the axle will be removed as well. This will allow trapped oil to spill.

NOTE

Any attempt to service the hydrostatic pump will be done only upon the authorization of Sundstrand® or the equipment manufacturer. Tecumseh does not authorize repair or adjustments.

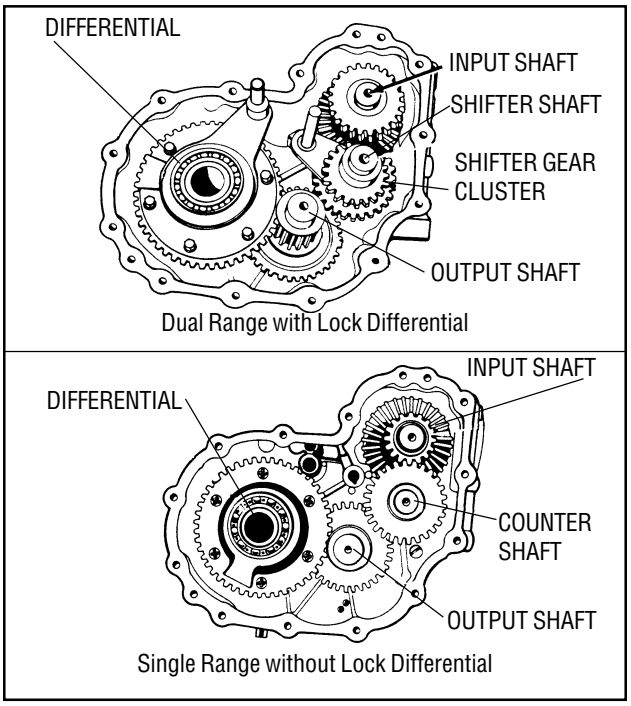
3. Clean all exterior surfaces before disassembly.

4. Scribe alignment marks on the unit before removal to assist in reassembly. Remove the axle supports.

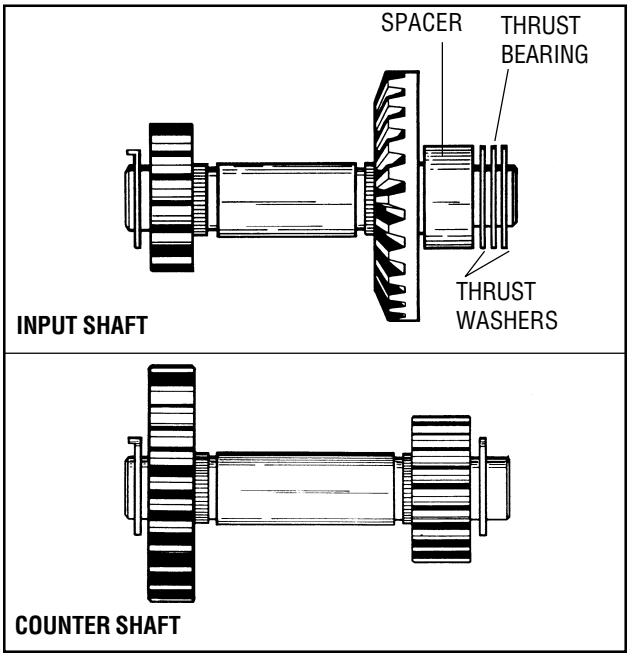


5. To remove axle out of its support, tap lightly with a mallet from the inside out. A pressed-on sealed bearing will be on the end of axle.

6. Position the unit with the cover side up. Then remove the dowels and screws. Lift the cover off, and discard the gasket.

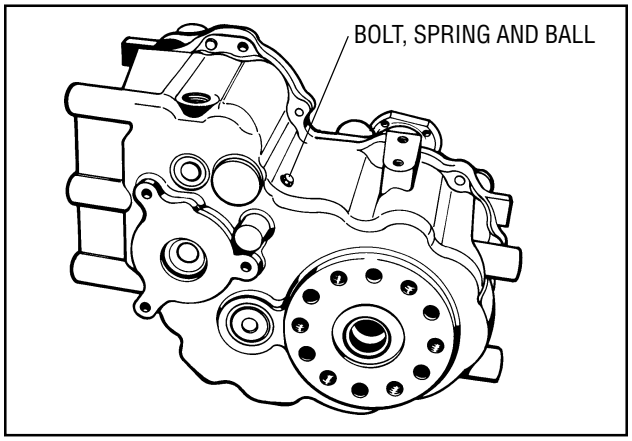


There are two different 2600 models as shown above.

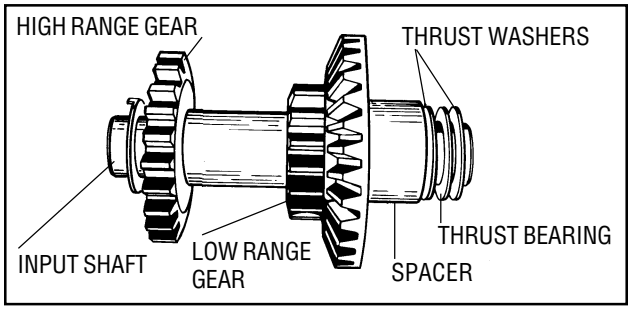


7. To remove components from the single speed version, first remove the differential, thrust washers, drive gear, input shaft, countershaft, output gear and shaft.

8. To remove components from the 2 speed with locking differential version, remove the shifter rod and fork, the outside bolt, spring and detent ball. Next remove the high range gear; then the shifter gear cluster and fork assembly together.



9. Remove the input shaft assembly.



10. Remove shifter shaft, output shaft and the output gear in this order.

11. Remove differential and lock fork assembly together.

INSPECTION AND REPAIR

Axle Supports.

1. Check the roller bearings on the axles. Clean and remove any rust.

2. Clean the axle supports and inspect.

Case and Cover.

1. Check for leaks or cracks.

2. Replace all oil seals. As necessary, replace needle bearings as described in Chapter 22 on bearing service.

3. Do not replace brake shaft seal, brake shaft, shifter rod and shifter differential lock seals until the unit is reassembled.

Shafts and Gears.

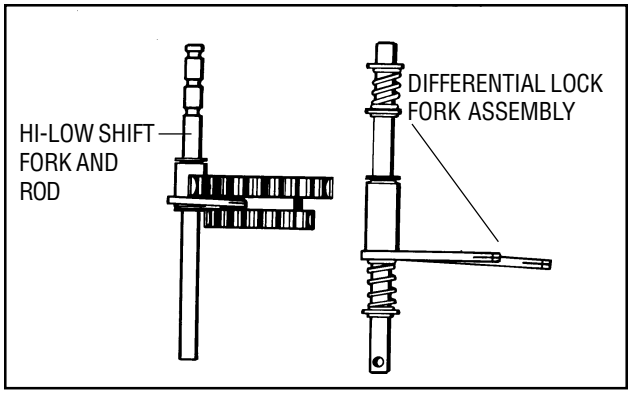
1. Check teeth for wear, pitting or breakage.

2. Inspect bearing surfaces for smoothness.

3. Inspect gears and shafts for an out-of-round condition.

4. Splines should allow a smooth fit. Rotate meshing parts for a better fit if binding seems excessive.

Shifter Mechanism (Dual Range).



1. Check spring for tension and ball for wear.

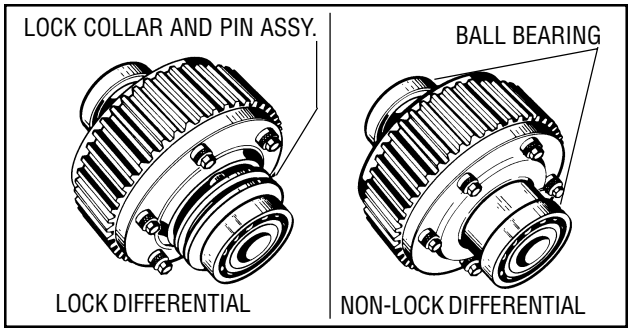
2. Check shifter rod grooves for wear. Be sure snap ring sharp edges goes away from shifter fork on both shifter shafts.

3. Inspect shifter fork for straightness and wear.

Differential

1. Make sure you have all parts.

2. Check thrust washers for wear.



3. Check differential lock collar for fork or pin wear.

4. Check ball bearings for ease of rotation. Replace any parts if necessary.

ASSEMBLY

Install parts reversing the disassembly procedure. Be careful of the following:

1. After the shifter rod is positioned, install the detent ball, spring and bolt. Turn the set bolt inward (dual speed) until it contacts the case.

2. Be sure that thrust washers and spacers are between every shaft and case and cover.

3. Threads of the differential bolts must be coated with standard stud Loctite. The bolt heads are up when installed. Refer to Chaper 18 on differentials.

4. Install a new gasket. It may be helpful to dampen the gasket with oil for easier installation.

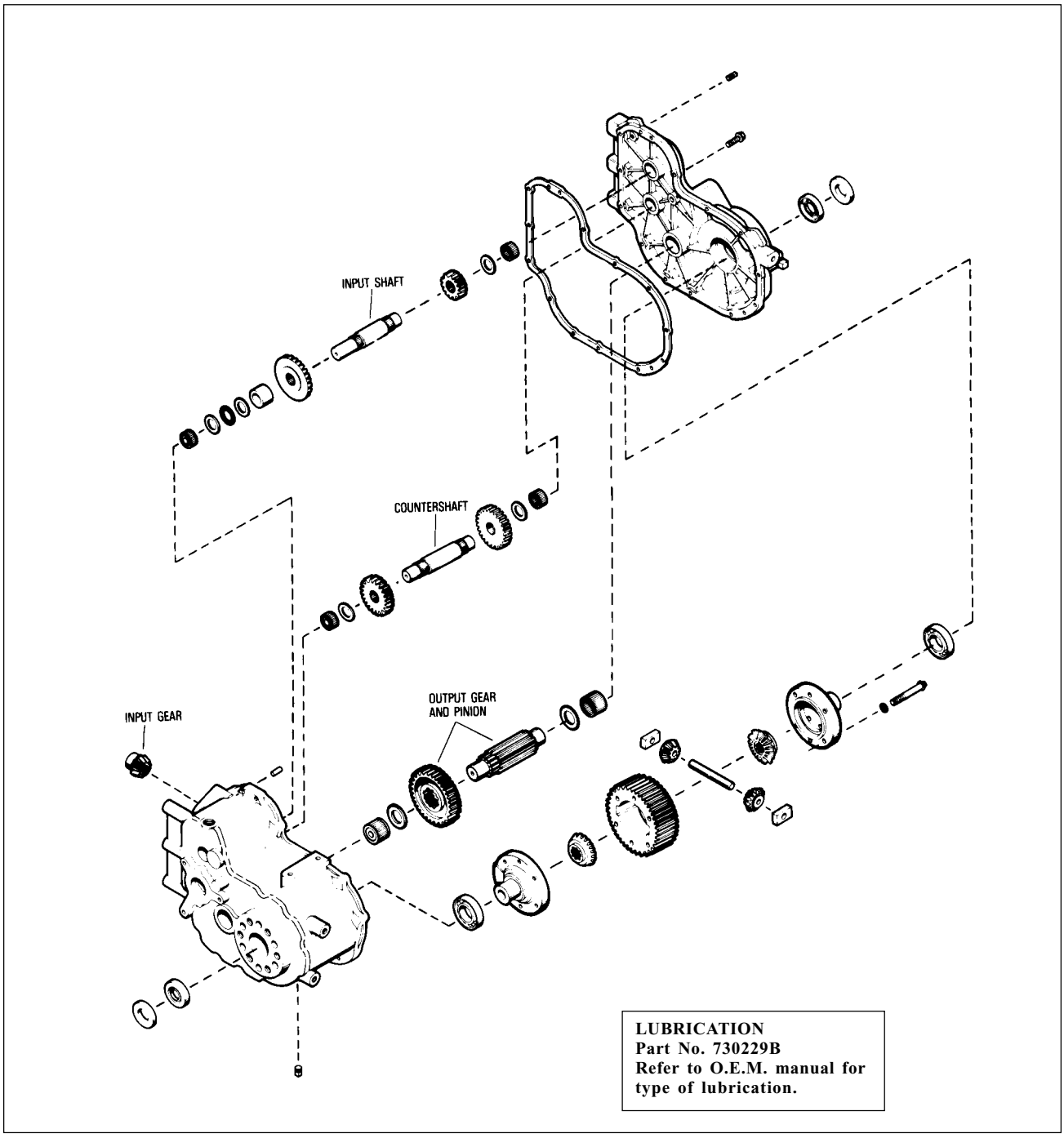
5. To place axle assemblies into case and/or cover, grease axle spline ends heavily. Push the axle through the seal, using extreme caution when axle splines are going through the seal.

NOTE

If you do not have the proper seal protector spray axle with brake cleaner and when dry, place one layer of thin, clear packing tape around splines and keyways. Lubricate the exposed tape, and the seals will be protected when pushing the axles through.

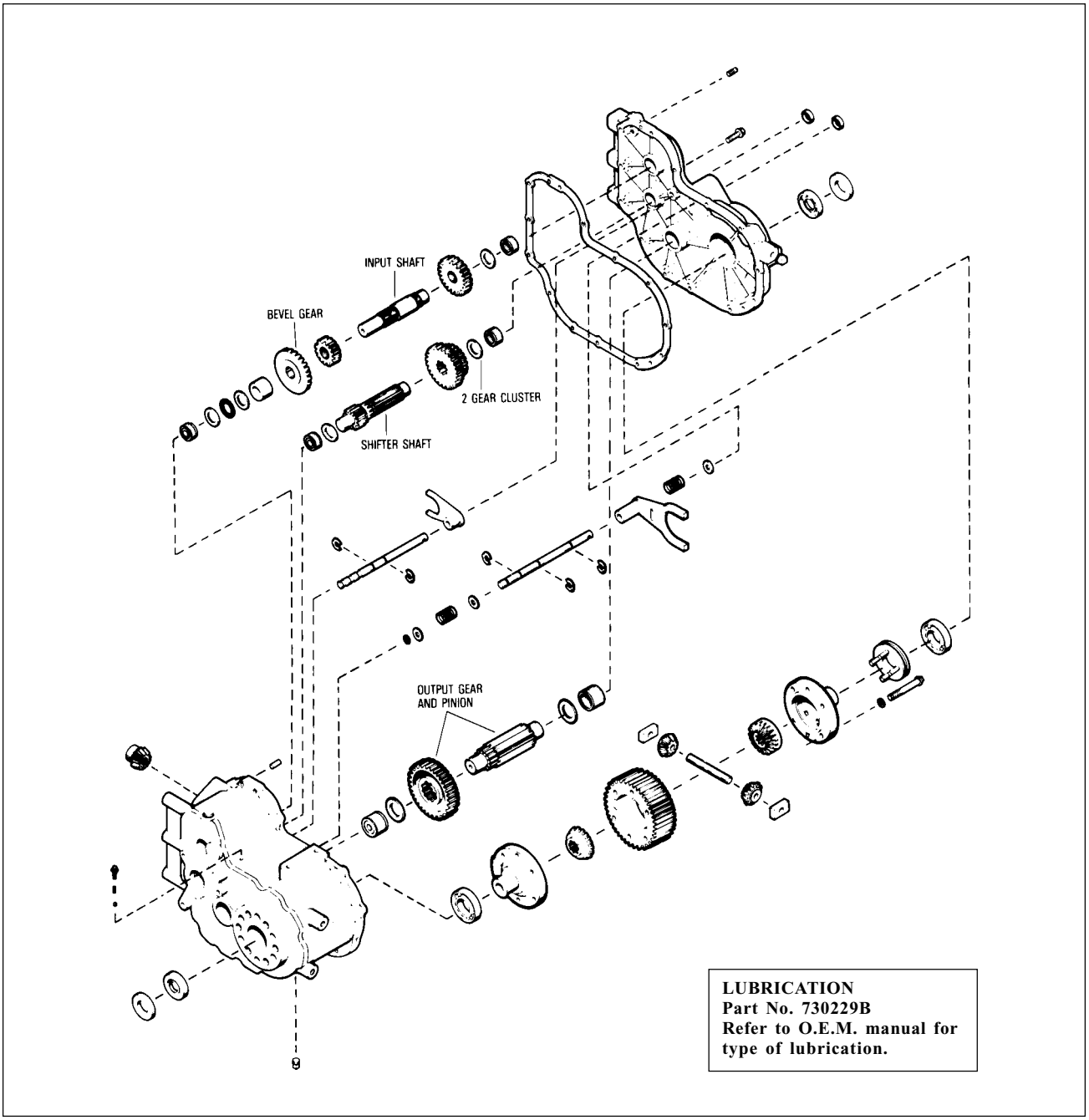
6. After the unit is assembled install the brake shaft oil seal, using a seal protector/installer.
7. Install the shifter rod oil seal, using the seal protector 670206 and driver 670211.
8. Install the locking differential shifter rod oil seal, using the seal protector 670206 and installer 670211.
9. Lubrication for all models is 7 to 8 pints (3.3 - 3.8 Lt) of SAE Type A automatic transmission fluid.

2600 SERIES HYDRO POWERED TRANSAXLE
SINGLE SPEED



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

2600 SERIES HYDRO POWERED TRANSAXLE
TWO SPEED



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 18. DIFFERENTIALS

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

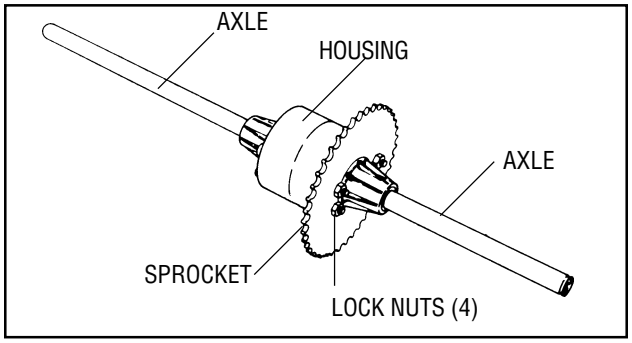
The differential assemblies of Tecumseh/Peerless units are grouped together in this section. Though there is little similarity between the 100, 600, 800 and remaining series units, they are grouped here because their function is the same.

The differential assemblies for the 820, 1200, 1300, 2300 and 2400 series Peerless units are very similar. However, each must be assembled in its own way. By grouping them together, you will become more aware of differences in each unit.

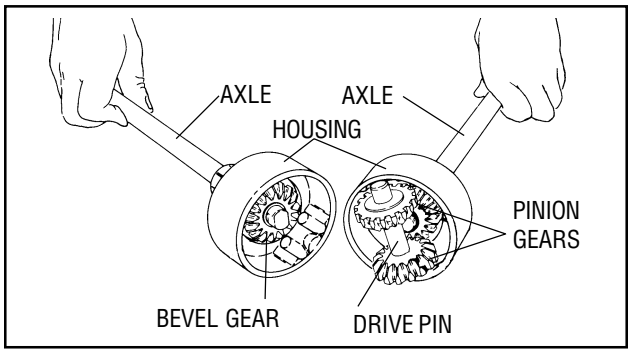
MODEL 100 DIFFERENTIAL

DISASSEMBLY

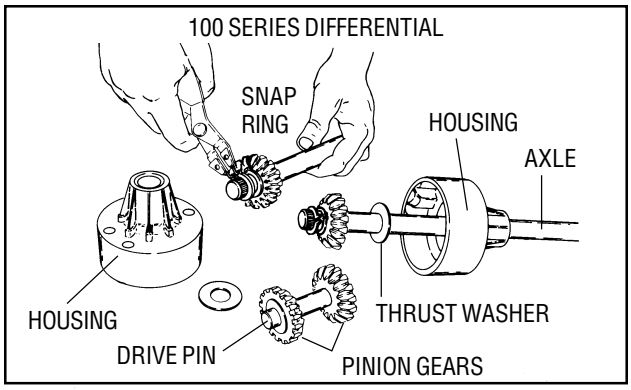
1. Clean the outside of the differential. Remove all keys, pins, etc. Remove all burrs from keyways and holes. Use a stone on hardened shafts.



2. Remove four (4) locknuts, bolts and the sprocket. Separate the differential carrier housings.



3. Remove the drive pin, pinion gears and thrust washers as a unit.



4. Remove the snap ring, bevel gear and thrust washer. Slide the axle from the differential carrier housing.

NOTE

Bushings are replaceable in the differential carrier housing. To replace bushing, use bushing tool 670204.

ASSEMBLY

1. Slip the axle into the differential housing carrier. Place the thrust washer and bevel gear on the axle and secure with a snap ring. Make sure the flat side of the snap ring is away from the gear.
2. Place pinion gears and thrust washers on the drive pin and insert the assembly into either differential housing carrier.
3. Use 3 oz. (89 ml) of bentonite grease as a lubricant.
4. Assemble the differential carrier housings and sprocket with 4 bolts and locknuts.

NOTE

No oil seals or gaskets are required in this unit. A few units use a gasket between the two housings and seals around the axles.

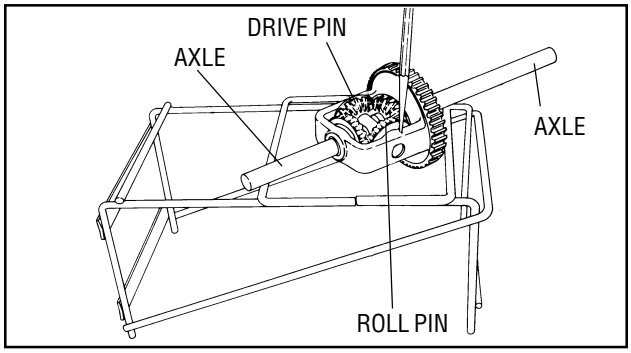
If no gasket is present, seal the housing with Loctite 598 part number 788093 using a 1/8" (3.18 mm) bead.

MODEL 600

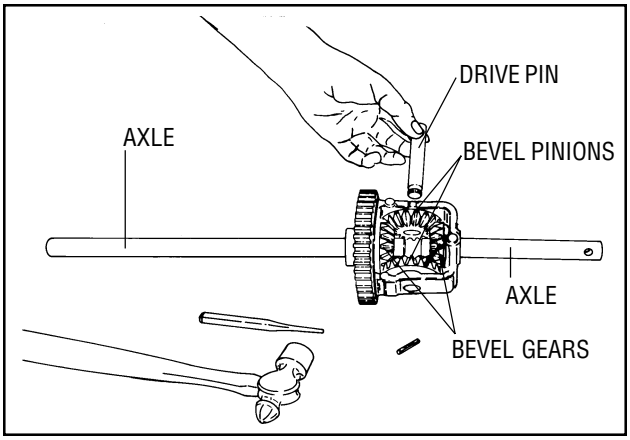
DISASSEMBLY

NOTE

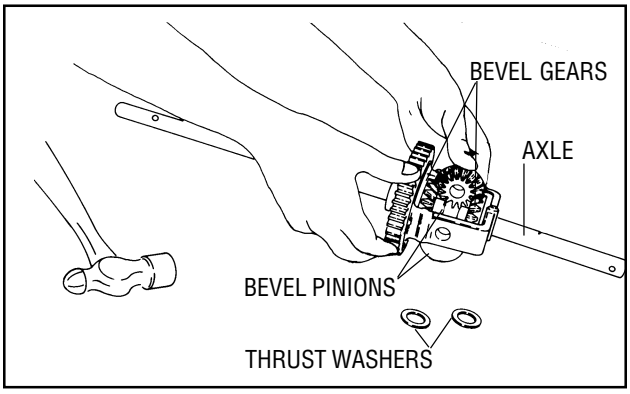
Axles vary in length so make a sketch of which axle goes where.



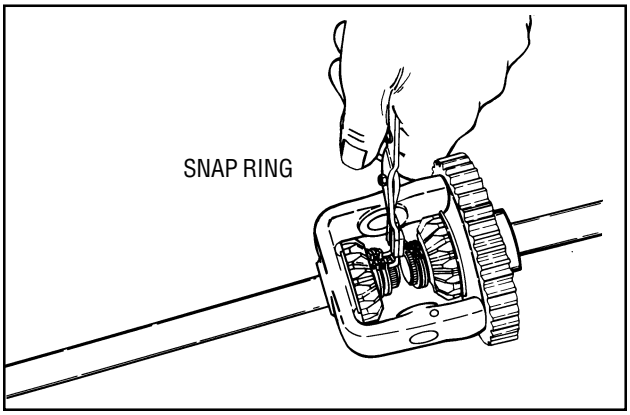
1. Drive out the roll pin that secures the drive pin with a suitable punch.



2. Remove the drive pin.



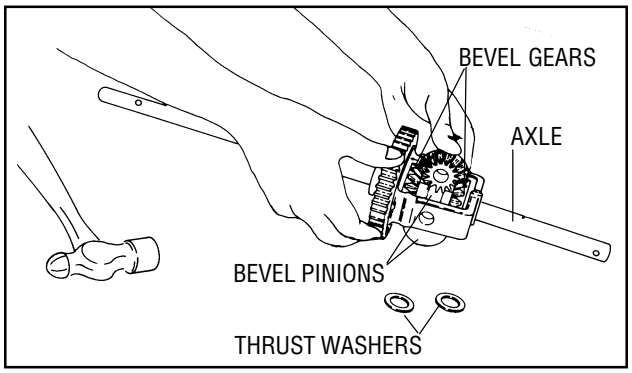
3. Thrust washers must be removed before attempting to remove the pinions. Remove the bevel pinions simultaneously by rotating the gears in the opposite direction; the gears will move out of position.



4. Remove snap ring, bevel gear and thrust washer. Slide the axle out.
5. Inspect the bushings and gears for wear and replace when necessary.

REASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. Place axles (left and right) into differential gear assembly. Install thrust washers.
2. Place the bevel gears on the shaft and install the snap ring in the groove on the shaft.
3. Install the bevel pinions SIMULTANEOUSLY FROM OPPOSITE SIDES by rotating pinions in opposite directions while sliding into position in gear assembly. Check the alignment by inserting fingers into drive pin holes. If not aligned, the drive pin cannot be inserted. Remove and replace the bevel pinions as only one tooth out of position will cause misalignment.



4. After aligning, insert thrust washers behind each pinion. Insert the drive pin and secure with a roll pin.

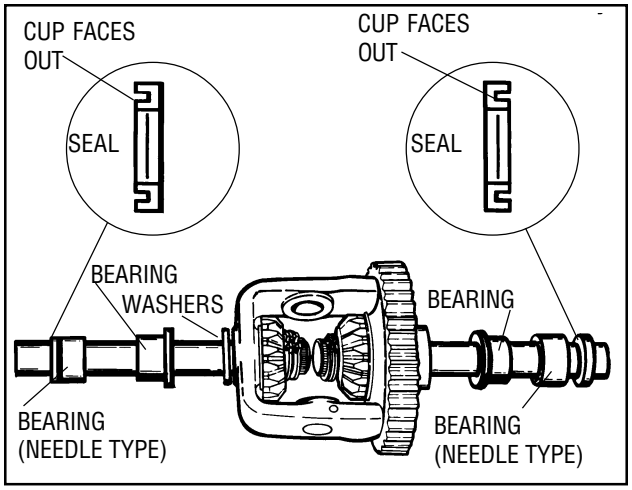
MODEL 800

DISASSEMBLY

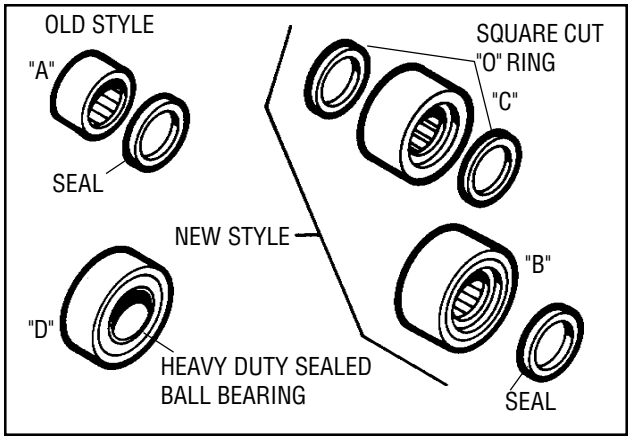
1. Same as disassembly for model 600, except for additional parts on the axle.
2. Remove and inspect seals, bearings and washers for wear; replace if necessary.
3. If differential was disassembled note positioning of differing length axles so correct reassembly may be performed.

REASSEMBLY

1. Reassemble in reverse order of disassembly.



2. Install seal cup end out from the center of the differential to prevent dirt entry.



The 800 Series has used four styles of axle bearings. The earliest style “A” was a smaller loose cage needle bearing and must have the seal to the outside of that bearing. Style “B” must have the seal to the outside of the bearing. When bearing style “C” is used, a square cut “O” ring must be used on each side of the bearing. Bearing style “D” is a sealed ball bearing used in Heavy Duty applications. Styles “B”, “C” and “D” are interchangeable. Needle bearings A, B, and C must be repacked with E.P. Lithium grease.

NOTE

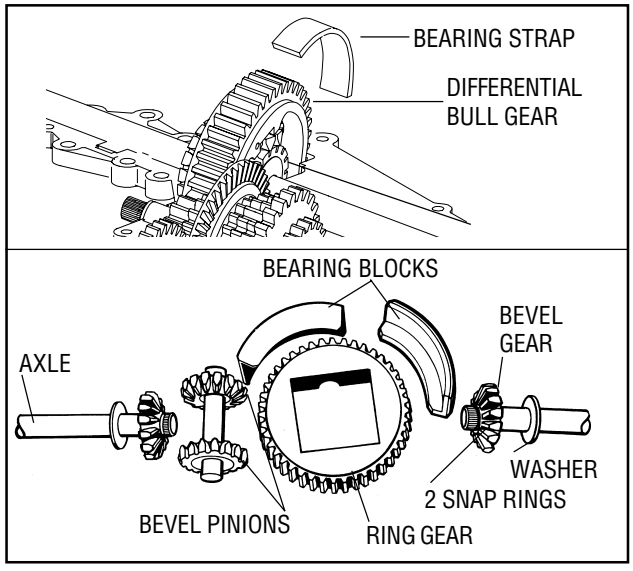
Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

MODELS 900, 910, 915, 920 and 930

DIFFERENTIAL

This style differential is supported by the case and cover with thrust load being absorbed by either bearing blocks or a bearing strap as shown. Both types use thrust washers on the axle bevel gears.

DIFFERENTIAL ASSEMBLY

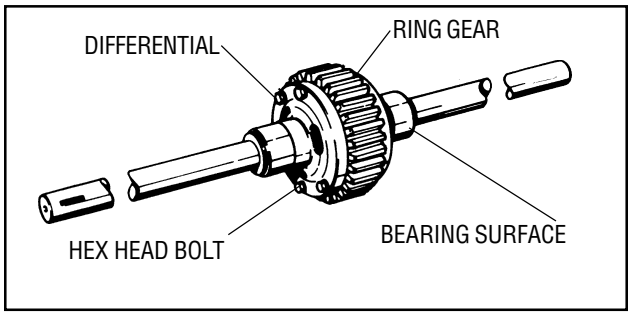


Ensure you have all of the parts as the unit is assembled in your hands and placed directly into the case.

MST SERIES DIFFERENTIAL

This unit is similar to the 900, except it uses no bearing blocks. The differential is supported by the shoulders on the ring gear.

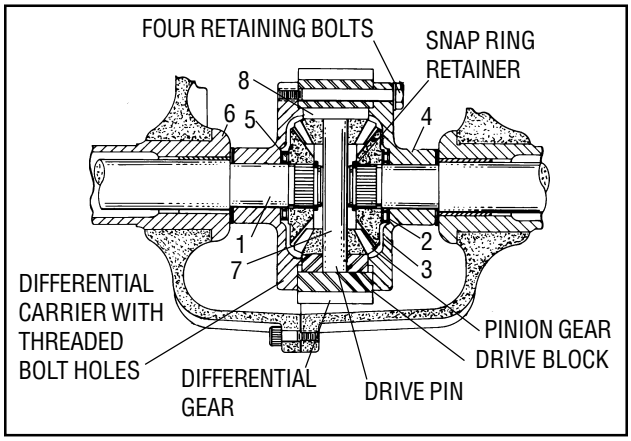
CAST IRON DIFFERENTIALS USED IN TECUMSEH/ PEERLESS TRANSAXLES



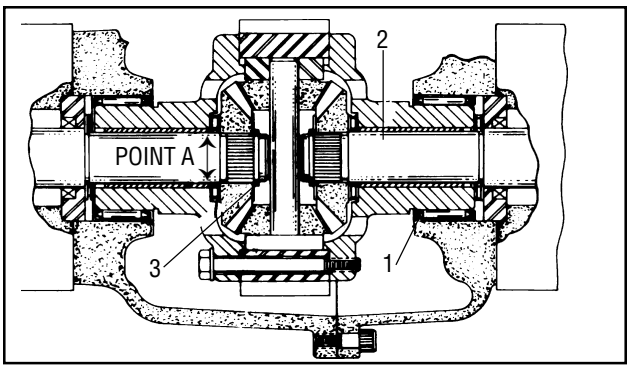
NOTE

The models covered are the 820, 1200, 1300, 1700, 2000, 2300 and 2400 series.

The differential construction may vary from the illustrations but is basically similar.



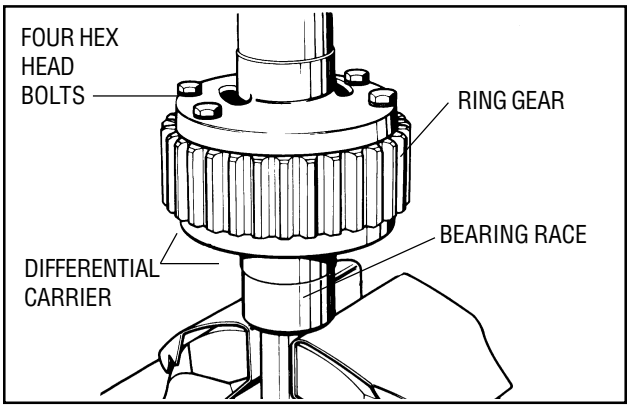
The 1200 series differential carrier is supported directly on the axle (1). Roller thrust bearings (2) are used between the bevel gear (3) and the differential carrier (4). This illustration shows axles with snap ring (5) retainers; some earlier production had rolled over axle ends to secure the assembly. Thrust washers (6) are used at the ends of the differential carriers and the case/cover thrust face. The drive pin (7) and drive blocks (8) are similar to those used on the 1700 series. Replace the differential carrier if worn in excess of .878 (22.3 mm) at point A.



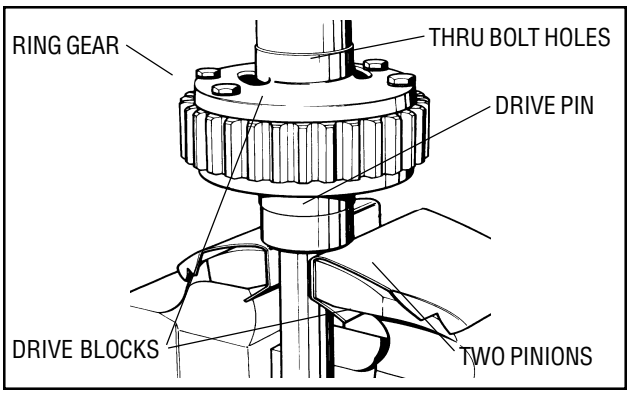
The 2000 series, three speed and the 2300 series, four speed differential will be discussed in this section. Examine the external bearing race on the differential carriers (1) for wear or pitting. Replace if necessary. The differential carriers in this assembly have replaceable bushings (2). Replace if worn in excess of .878" (22.3 mm) at point A. See Chapter 22 on Bearing and Bushing Service. These differentials have been built with rolled axle ends and also snap rings (3), as illustrated.

DISASSEMBLY

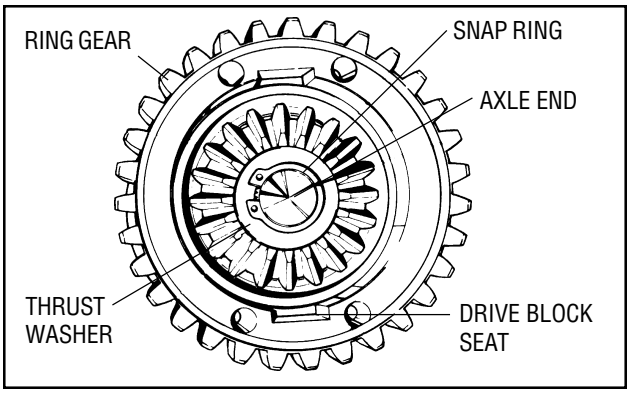
1. Clean the differential assembly, then check and note the axle lengths and their relation to the heads of the four hex screw bolts.
2. If the unit will not turn freely, note where the unit binds. Check and replace those parts.



3. Place the differential in a large vise with soft jaws (hex head bolts up). Do not clamp the vise on the bearing race of a differential carrier.
4. Remove the four hex head bolts, the upper axle and differential carrier. Remove the drive blocks, pinions, drive pin and thrust spacer if used, by lifting them out of the ring gear. Tap the ring gear lightly with a mallet to loosen them from the differential carrier.



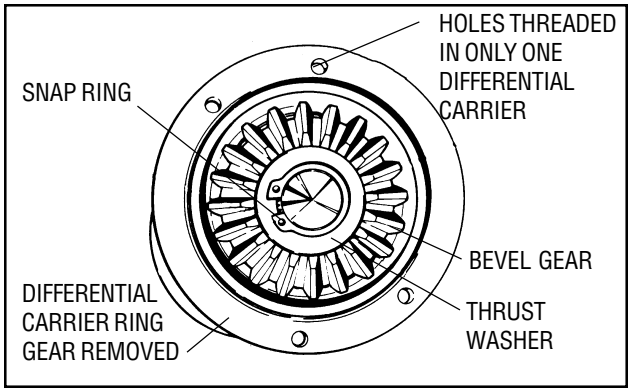
5. If a snap ring is used, the axle assembly may be disassembled. If the axle end has been rolled, do not attempt to break the rolled retaining edge. The parts are to be replaced as an assembly.



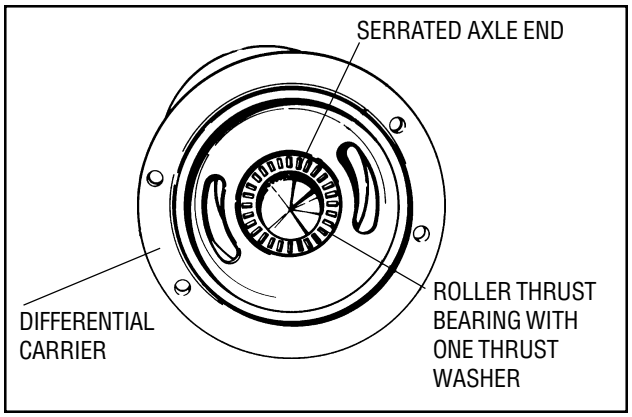
6. Remove the snap ring and the thrust washer. Separate the bevel gear and the differential carrier from the axle.

INSPECTION

1. See Chapter 22 on Bearing and Bushing Service.
2. Examine the gears for wear, cracked or chipped teeth. Check the internal splines of the gears and axle if the gear is removable. If excess play is noted, it may be necessary to replace the individual parts or both the gear and axle.
3. Examine the drive pinions, drive pins and drive blocks for wear and damage. Replace the pinion or the drive pin if excessively worn.



4. Examine the differential carriers. One has threaded holes and the other has larger holes so the bolts will pass through. Be sure to order the correct replacement parts.
5. Examine the internal bearing diameter of the differential carriers.



6. When assembling thrust bearings, always place a hardened thrust washer on each side of the caged thrust rollers. Never use the caged thrust rollers without the thrust washers.

REASSEMBLY

1. Oil all parts during reassembly. Select the correct axle for the side of the differential opposite the hex head bolts. If the wrong axle is used it will require complete teardown of the differential, or possibly the entire transaxle.
2. Clamp the axle, in a soft jaw vise (not the bearing or oil seal surfaces). The differential carrier with threaded holes is assembled to this axle.
3. Torque the four hex head bolts to 7 ft. lbs. (5.2 Nm).

TESTING

1. Test the differential action by holding the upper axle vertically, and spinning the differential. The unit should spin and rotate freely. Place the assembly on the bench and rotate both axles in different directions. If any binding is noted in either test, check retaining bolt torque, gear meshing, or bearing surfaces in the differential carriers. Little or no play should be apparent between the axles and carriers.

DUO-TRAK (Illinois tool works)* DIFFERENTIAL

OPERATION

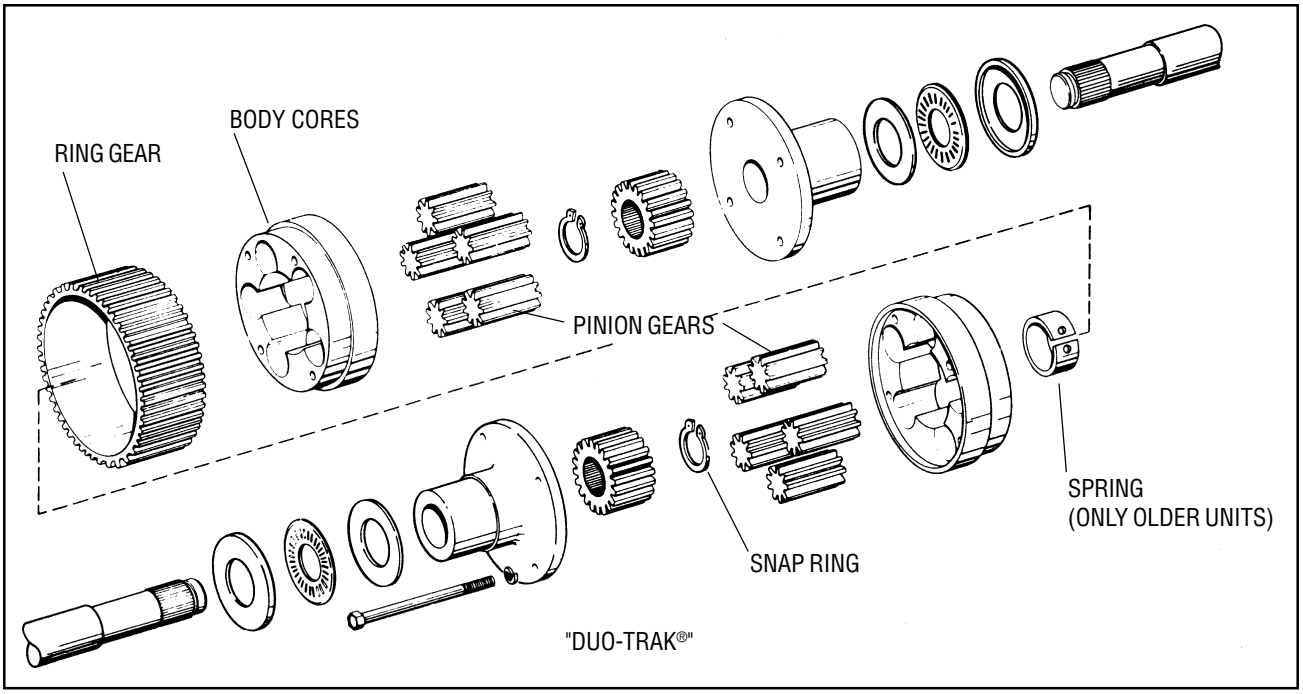
A cylindrical spring in the center of the unit presses the ten pinion gears against their pockets setting up a resistance to rotation. This resistance serves to lock up the gears in the differential until a moderate tractive difference in the wheels causes the resistance to be overcome. At this time the unit will act similar to a regular differential. The break away occurs when the equipment is turning, but under different tractive effort situations, such as operation on wet grass or snow. The spring acts to transmit torque to the non-tractive wheel to move the equipment.

DISASSEMBLY, INSPECTION AND REPAIR

Parts breakdown will be found on the next page. Remove the four through-bolts. Separate axle assemblies from the body cores. To disassemble the axles, remove the snap ring and retained parts. Be sure the flanged thrust washer goes toward hub end of the axle upon reassembly. Use a pair of large 90° tip snap ring pliers and remove the cylindrical spring putting tension on the ten pinion gears. Once the spring is removed, the gears can be removed. Separate the two body cores from the ring gear.

ASSEMBLY

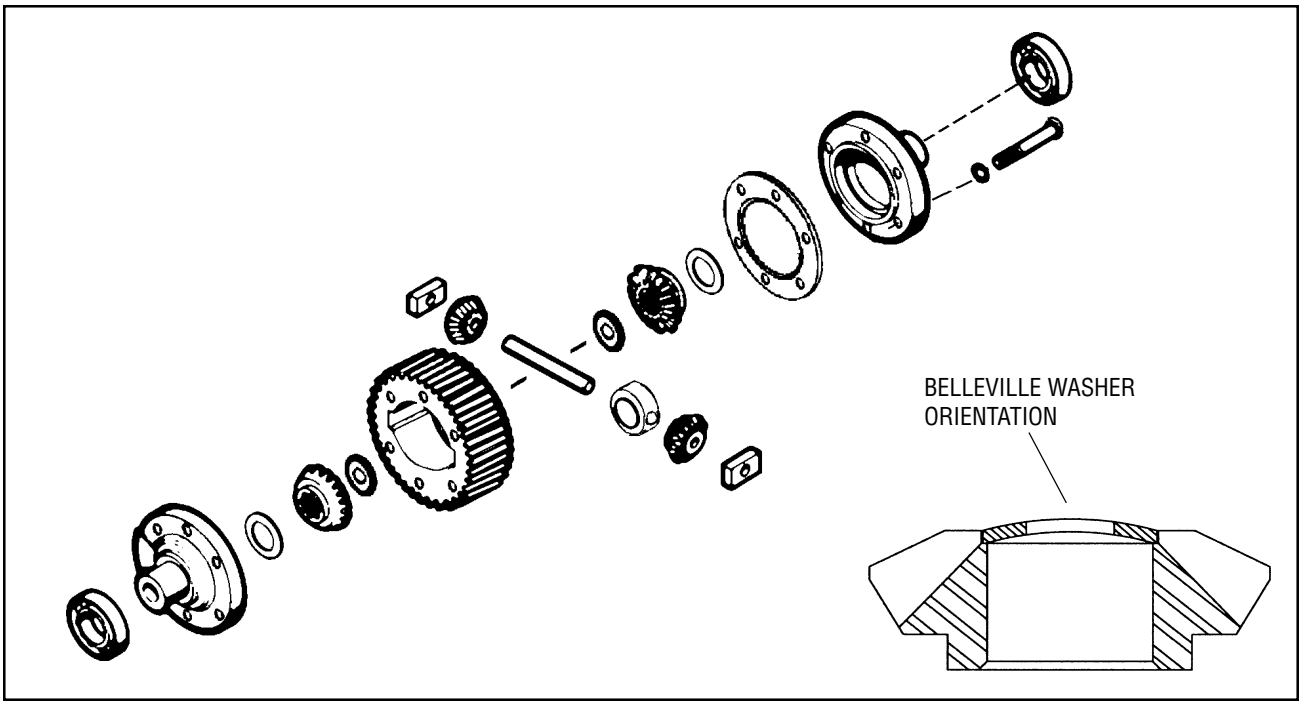
Install the body cores to the ring gear so that the pockets in one core are out of alignment with pockets in other core. Reassemble the thrust washers, bearing, carrier and side gear to the axle and secure with the snap ring. Install the pinion gears on one side, then use the differential carrier and axle to hold them from falling out when the unit is turned over. The side gear must mesh with the flat pinion. Install pinions in the other side to mesh with the previously installed pinions. Insert the cylindrical spring with a pair of large 90° tipped snap ring pliers so that it bottoms on the side gear. All ten pinions should be in contact with the spring. Install the other axle and secure the assembly with four through bolts and torque to 7-10 ft. lbs. (5.2 - 13.6 Nm).



*DUO-TRAK® is the trademark of a patented limited slip differential designed by Illinois Tool Works.

The Model 2600 transaxle has the unique customer option of a semi-locked differential. This system acts like a locked differential until the torque at the axle exceeds 50-70 ft./lbs. (68 - 95.2 Nm). At this point it acts like a regular differential. Using the following procedure, you can check for proper condition of this optional unit used on a few 2600 models, but not on all units.

1. Lift the rear of the tractor up so both tires are off the ground. Rotate one tire while in neutral; the other tire should rotate in the same direction. If not, disassemble the unit. If it does proceed to step 2.
2. Lock one axle or wheel assembly so it can not turn.
3. Using a torque wrench and socket on the other axle, turn in a clockwise rotation noting the break away point. It should be between 50-70 ft. lbs. (68 - 95.2 Nm).
4. If the torque is low, you will need to split the ring gear and carrier. Remove any shim between the two halves. If you do not find a shim, you will need to replace the spacer block. (see Illustration)
5. Re-assemble and check for proper break away torque as listed above. Breakaway should not exceed 70 ft./lbs (95.2 Nm).



CHAPTER 19. DRIVES

This chapter relates to service of all Right Angle and T-drives.

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

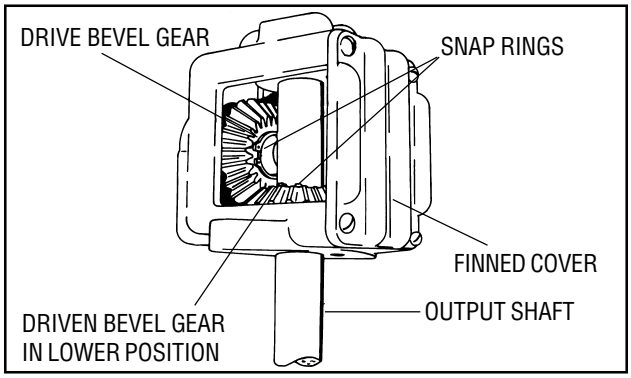
1. Prior to removing the assemblies, examine the following items that may have failed causing the right angle drives to appear inoperative.
2. Drive belts: Inspect for breaks, tension, oil or grease saturation and inoperative tightening devices.
3. Pulleys: Tighten retaining screws. Examine for sheared keys.
4. Mower blade clutches and breakaway devices; some blades have slip type clutches that may slip during operation which may cause the right angle drives to appear to be damaged. Shearing devices are also used to absorb a damaging impact load. Check and replace the clutch members or shearing devices prior to removal of the right angle drive if a failure is noted.
5. Loose blade retaining nuts; Check torque and tighten if required.

FINNED COVER RIGHT ANGLE DRIVE

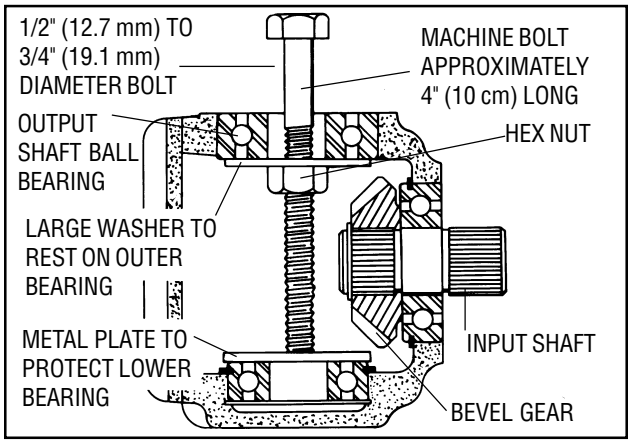
When finned cover right angle drives are to be serviced because of lubricant leakage, it will be necessary to replace the ball bearings.

DISASSEMBLY

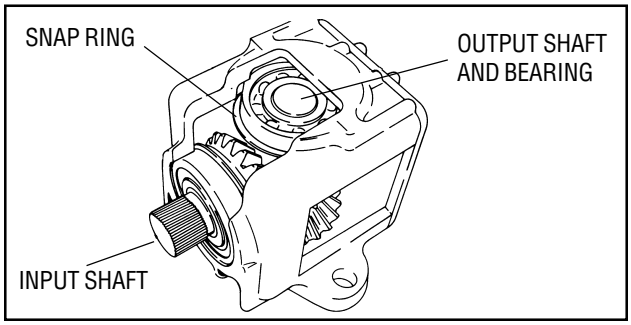
1. Scribe marks on the covers and shafts to ease in reassembly.
2. Remove the cover, gasket and the lubricant from the drive.



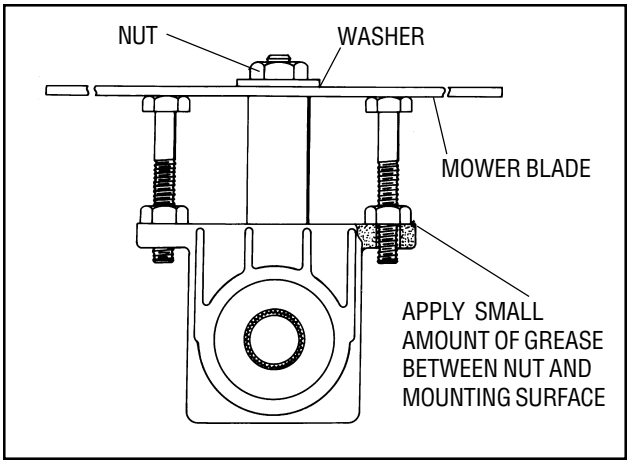
3. Output shafts achieve a different rotation by mounting a gear at the top or bottom of the shaft.



4. If the driven bevel gear is on the bottom, remove the snap ring on the output shaft and pull out the output shaft.
5. Remove the output shaft bearing by using a large machine bolt, washer and nut.



6. The input shaft bearing, input shaft and bevel gear may now be driven out of the housing. Press the bearing into housing to remove.
7. The top ball bearing in the blind end of the housing is removed by heating the housing on a hot plate and tapping the outside of the housing with a nonmetallic mallet. Another option is to simply load the bearing area with grease and tap the output shaft in the center of the bearing quickly with a hammer. It will pop the bearing out of its position.



8. Right angle drives with the driven bevel gear at the top will have to be disassembled as illustrated above. The output shaft is larger in diameter inside than outside. When the output shaft is pulled out, the bearing will also be removed.

INSPECTION

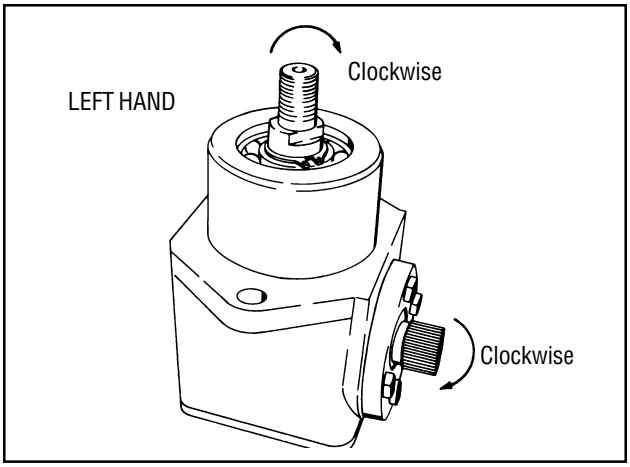
Clean all parts in a cleaning solvent. Examine for wear or damage and replace as needed. Use care when handling ball bearings. See Chapter 22, Bearing and Bushing Service.

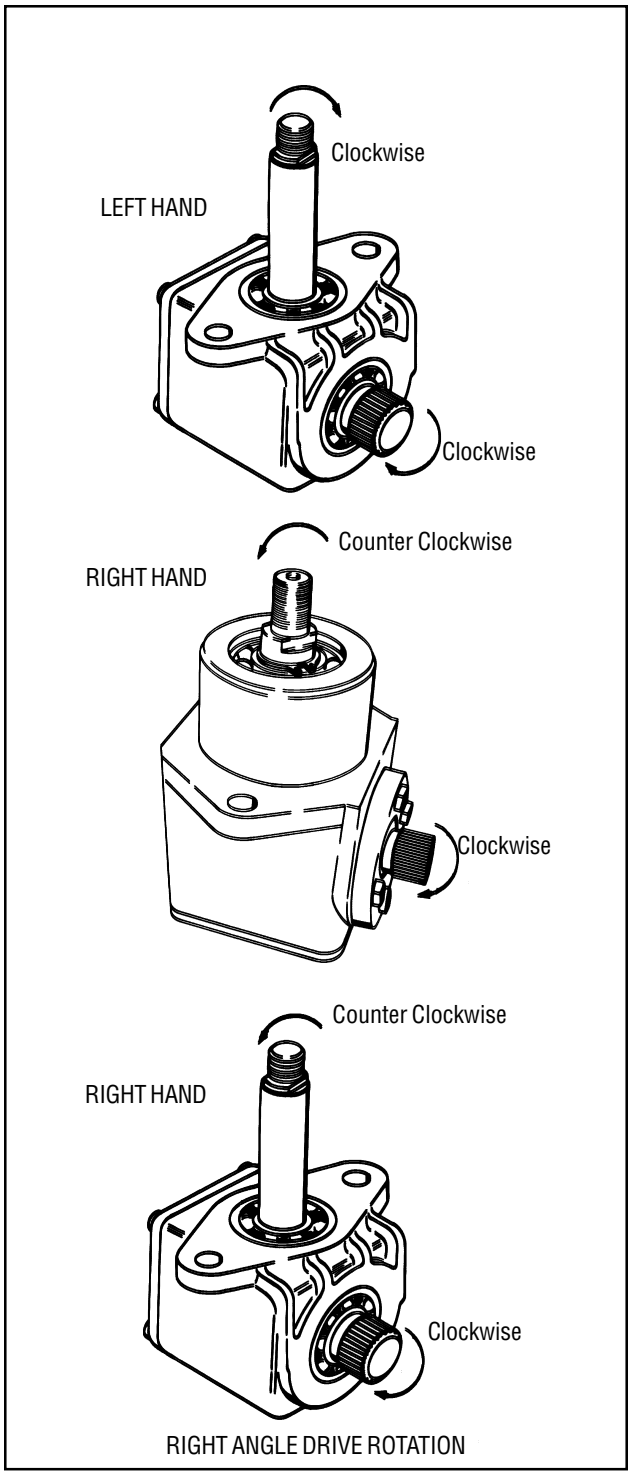
REASSEMBLY

Assemble in reverse of the disassembly instructions. It is important that only ball bearings with snap rings be used for the input shaft and top output shaft bearing. Use a tool for driving in bearings. In the event bearing bore is tight in the housing, heat the housing on a hot plate. Place a steel plate on the hot plate and rest the housing on the steel plate. DO NOT OVERHEAT. Work rapidly after removing the housing from the hot plate. Use care to prevent burns.

LUBRICATION

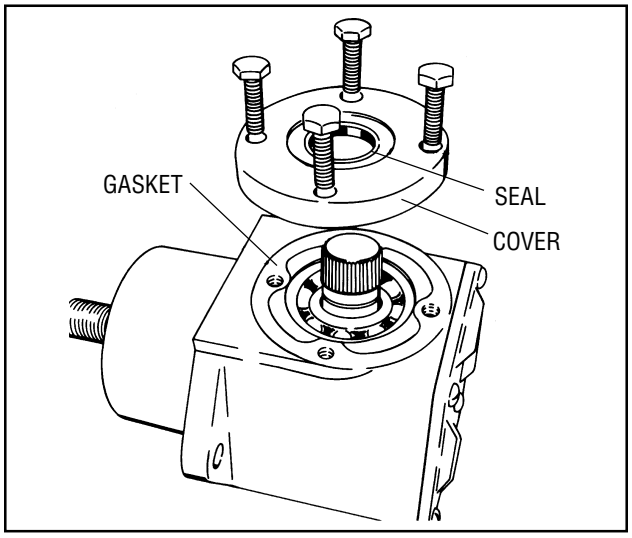
See Lubrication Chart in Chapter 1.





RIGHT ANGLE DRIVE ROTATION

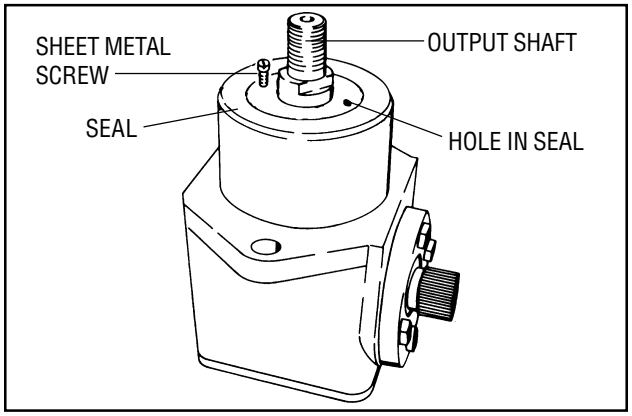
SMOOTH COVER RIGHT ANGLE DRIVE



SERVICE

Leaking lubricant: Correct lubricant leakage by replacing the seals at the input and output shaft as described below.

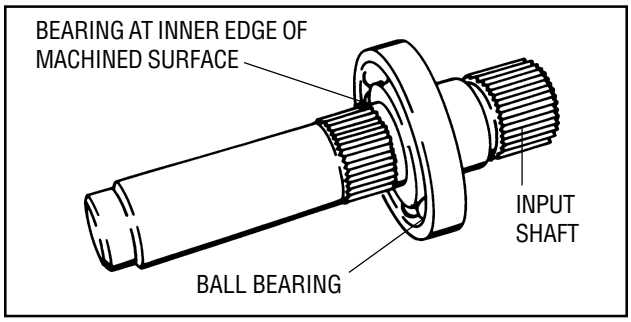
1. Input shaft seal replacement: Remove four screws and the cover. Replace the seal by driving in squarely so that it is .040'' to .050'' (1.02 - 1.27 mm) below flush. Use tool 670293 to protect the seal when replacing the cover and seal assembly over the input shaft. Place the seal protector on the shaft and coat with oil. Slide the seal and cover over the sleeve. Tighten the seal retainer screws and remove the sleeve.



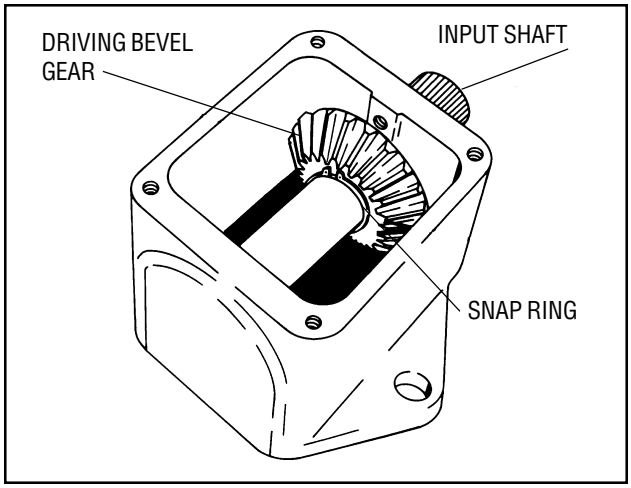
2. Output shaft seal replacement. Remove the seal by punching two small holes in the seal with an awl as close to the outer edge of the seal as possible and opposite each other. Use care when making holes in the seal so ball bearing underneath is not damaged. Do not use a drill. Insert sheet metal screws into the holes and pull on the screws to remove the seal. Long screws may be turned in until they contact the outer race of the ball bearing and turned to lift out the seal. Place seal protector 670293 on the shaft, lubricate generously with oil and slide on the seal. Drive the seal into the housing until it is flush with the bottom of the housing.

DISASSEMBLY

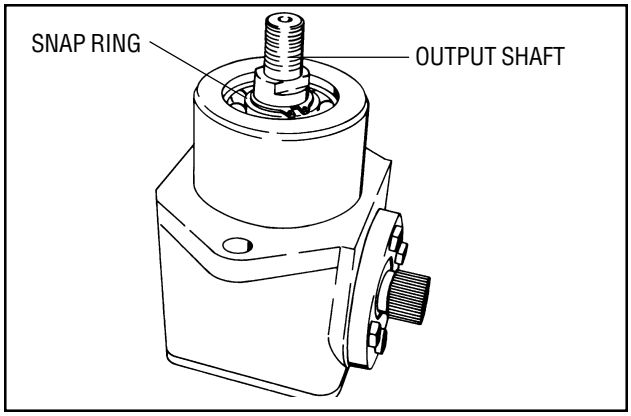
1. Scribe marks on the covers and shafts to aid in reassembly.



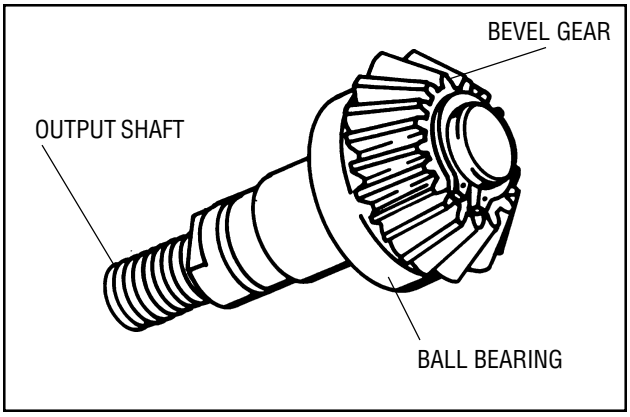
2. Remove the cover, gasket and lubricant.



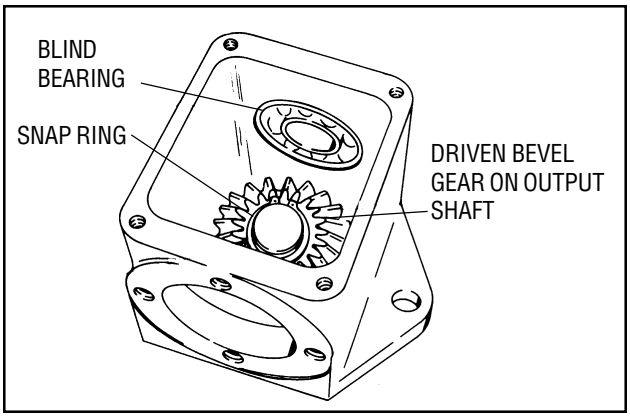
3. If the unit is built with the bevel gear on the input shaft toward the cover, remove the snap ring from the groove of the input shaft.



4. Remove four screws and the cover/seal assembly.
5. Remove the seal at the output shaft.
6. Remove the snap ring on the output shaft and tap it with a mallet on the outside end to drive it and the inner ball bearing out of the housing. Remove the output end ball bearing by driving it out from the inside.



7. Remove the input shaft from the ball bearing with an arbor press. Always support the inner race when removing and replacing the input shaft into the ball bearing. Use tool 670293 to support the inside ball bearing race.



8. The ball bearing that supports the inside end of the input shaft is removed by holding the housing in hand while tapping the housing sharply on the outside with a nonmetallic soft mallet behind the bearing. It may be necessary to heat the housing to remove this bearing. Be careful not to distort the case by overheating.

INSPECTION

Clean all parts in a cleaning solvent. Examine for wear or damage and replace parts as needed. Use care when handling ball bearings. See Chapter 22 on Bearing and Bushing Service.

REASSEMBLY

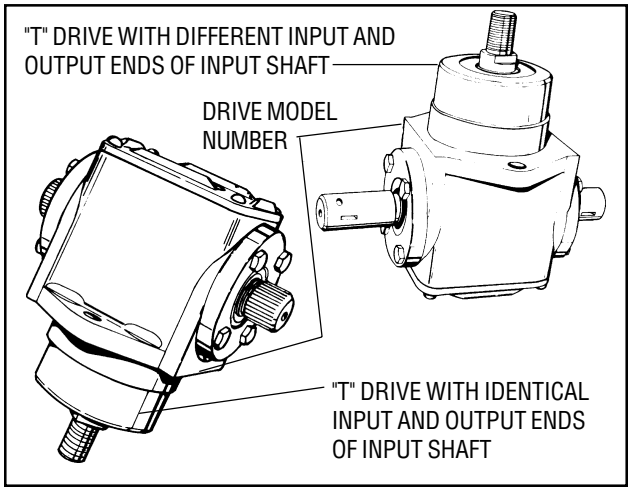
Assemble the unit in reverse of the disassembly. When building up the unit, it is important to install the correct input shaft and identify it with the correct cover. Use the identifying scribe marks to assemble parts correctly.

LUBRICATION

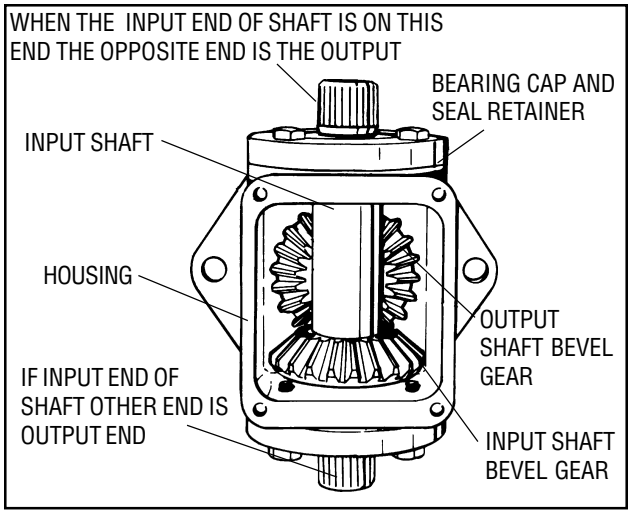
See the Lubrication Chart in Chapter 1.

"T" DRIVE SERVICE

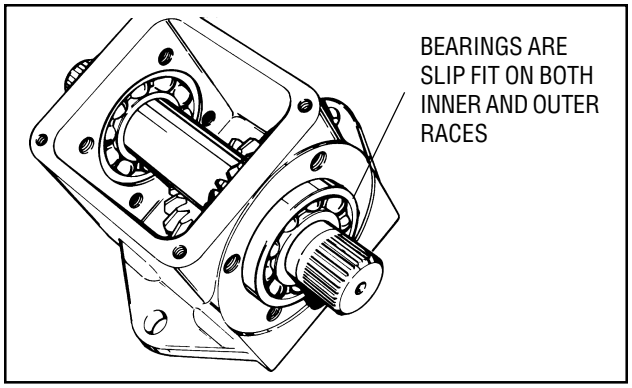
1. Before removing a "T" Drive from equipment, be sure to scribe marks at one mounting hole to ensure correct reassembly.



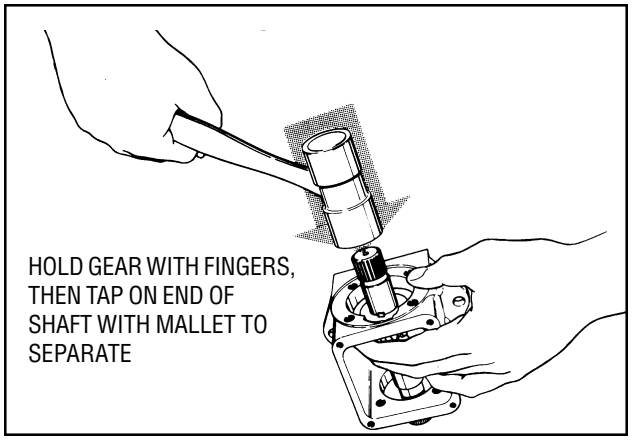
2. To disassemble "T" Drive, remove self-tapping screws and housing cover and clean grease from internal area. Note and mark near the gasket surface on the side where the beveled input gear is located. Switching the "T" 180° will result in the output shaft having the opposite rotation.



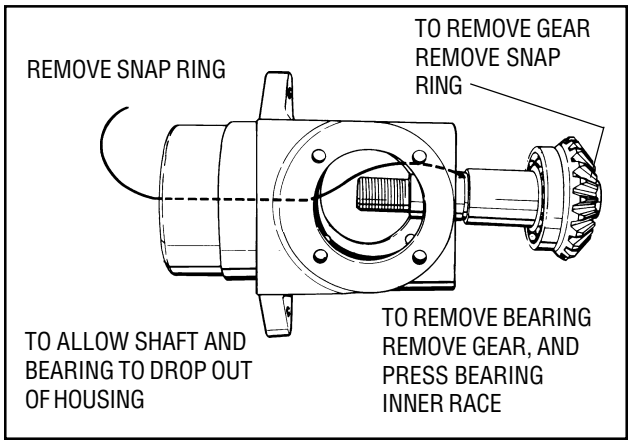
3. Remove cap screws and both retainer cap and seal assemblies. Separate and discard oil seals and gaskets.



4. Press input shaft ball bearings out of the housing with fingers. If they stick, tap lightly using a drift punch around the outer race.



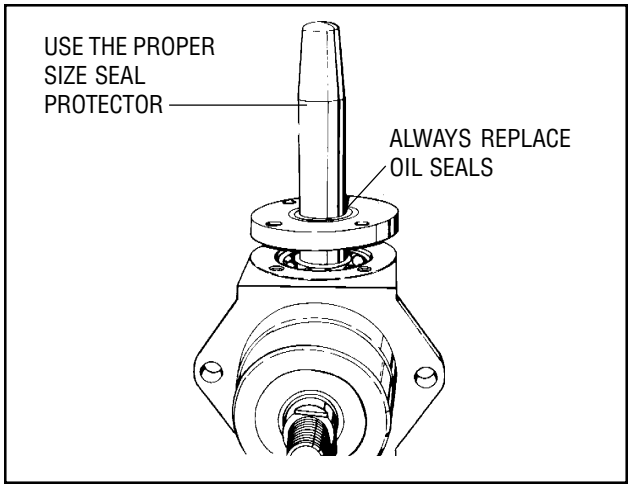
5. Using a soft mallet, separate the input shaft and gear. A slight press fit holds a spline surface on the shaft in a spline of the gear.
6. Remove and discard the output shaft oil seal. **TAKE CARE NOT TO SCRATCH THE SHAFT.** Remove and discard the snap ring and tap the shaft into the housing using a nonmetallic mallet.



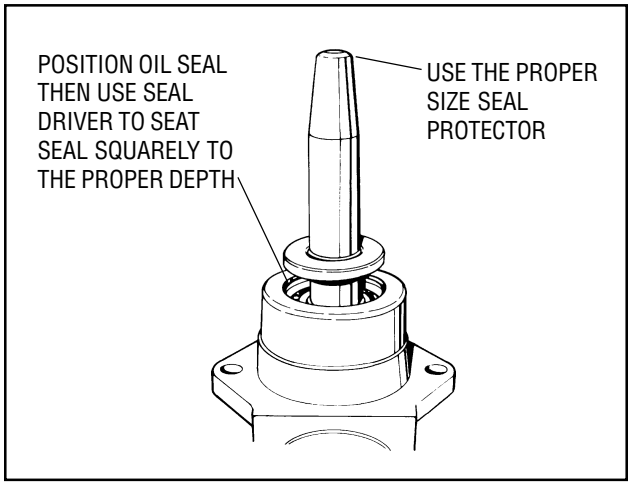
7. If necessary, remove the snap ring to separate the gear and bearing from the shaft. Hold the gear and bearing in one hand and tap the end of the shaft vigorously with a soft mallet.

Cleaning, Inspection and Repair

1. Clean all parts of grease, rust, or foreign material.
2. Dry all parts. Compressed air may be used on all parts EXCEPT BEARINGS.
3. Check bearings for smooth rotation, then lubricate.
4. Remove all burrs and scratches from shafts with a fine file or stone.
5. Check housing for cracks or pulled metal.
6. Replace all snap rings.
7. Replace all oil seals.
8. If separated, install the inside ball bearing and bevel gear on the output shaft. Be careful of alignment. The use of a press is preferable to installing bearings and seals with a mallet.
9. Press shaft, bearing and gear assembly into the housing until outer bearing race bottoms in its retaining cavity.
10. Install the outer bearing and a new snap ring.



11. Install a new oil seal, using a seal protector sleeve part # 670293 and driver until the seal is flush with the housing.



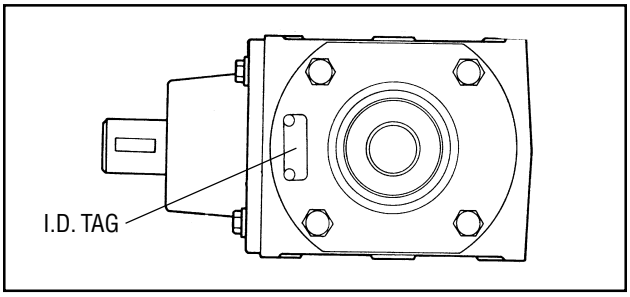
12. Position the input bevel gear in mesh with the output shaft bevel gear. Tap the input shaft into place with a nonmetallic mallet. Use one hand to hold the gear and shaft to dampen the blows from the mallet. Be sure gear is on the marked side of the housing.
13. Align the shaft and insert a ball bearing on each bearing surface by hand.
14. Install new seals in the retainer caps using a driver.
15. Using seal protector # 670293 over the shaft serrated ends; install new gaskets and the bearing cap. Tighten retaining cap screws to 8-11 ft. lbs. (27.3 - 14.7 Nm).
16. Lubrication: See the Lubrication Chart in Chapter 1.
17. Install the gasket and cover and secure with self tapping screws. Torque to 20-24 in. lbs. (2.3 - 2.7 Nm).
18. Align scribe marks and install “T” Drive on the equipment.

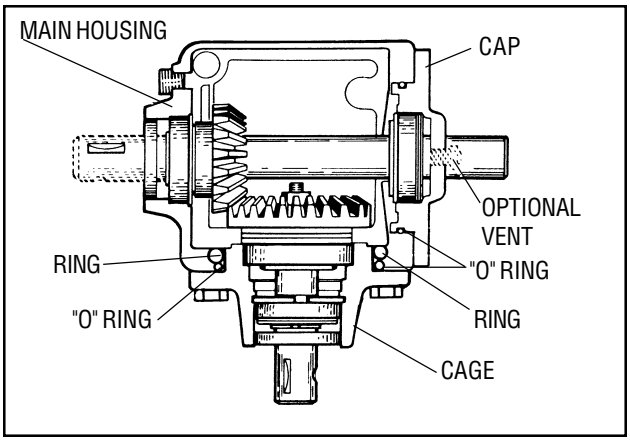
CHAPTER 20. 1100 SERIES DRIVES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/ installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

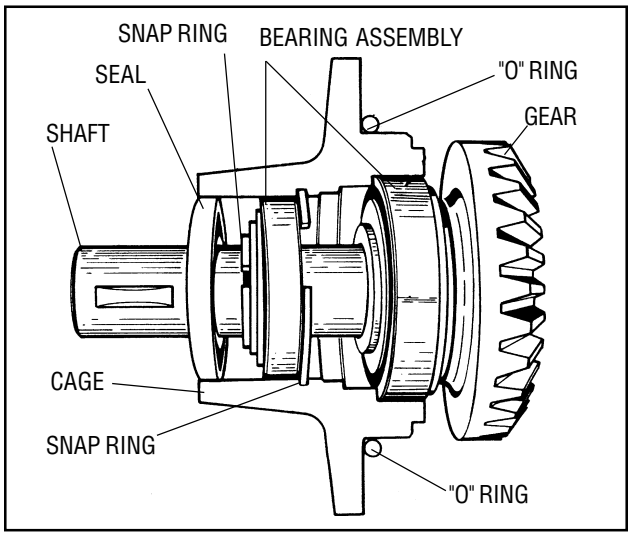
GENERAL



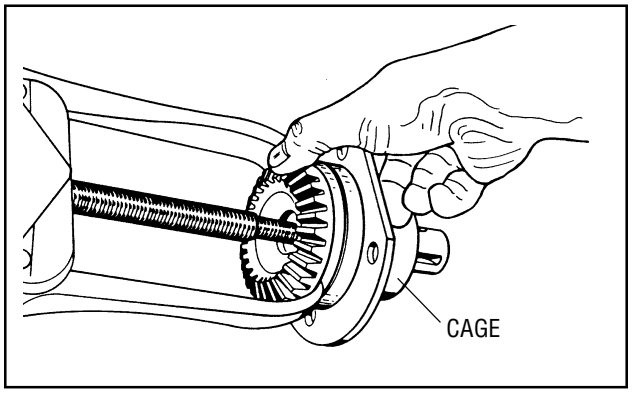


The 1100 series angle drive is a heavy duty gear box used with larger equipment with horse power ratings up to 20 H.P. This unit is of cast iron construction for strength featuring tapered roller bearings for longer life. It can be configured wither as a right angle drive with right or left handed rotation, or a “T” drive. Reassembly is the reverse of the disassembly procedure.

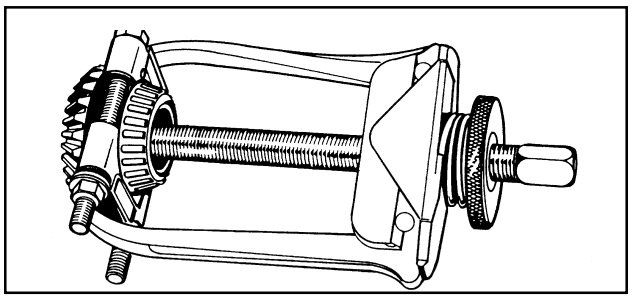
DISASSEMBLY



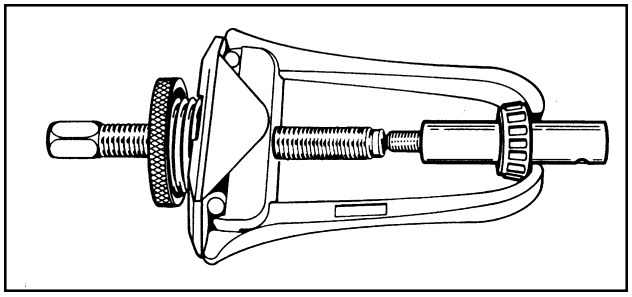
1. Scribe marks on the covers and shafts to aid in reassembly.
2. Clean and check all shaft ends before removing the cap and cage assembly.



3. Remove the four input cage bolts and remove the input cage; the assembly will follow.

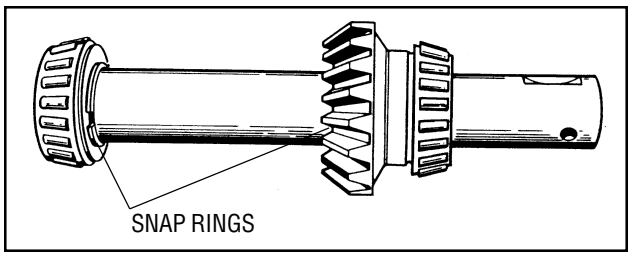


4. To disassemble the input cage assembly, first remove the nut and washer that holds the large keyed gear onto the shaft. With an outside puller, if necessary, remove the gear. The roller bearings will be attached.

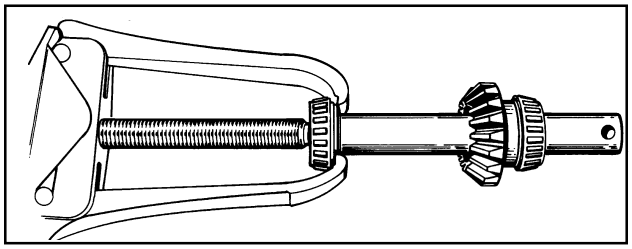


5. Remove bearing from gear by using a bearing splitter and puller.*
6. Remove the shaft out of the cage. Remove roller bearing with outside puller toward threaded side. * Then remove the snap ring.

*When roller bearings and races are removed with a bearing puller, discard and do not reuse.



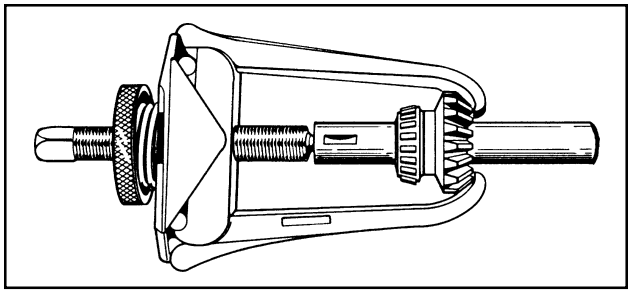
7. To remove the races, simply tap out with a punch and hammer. The large snap ring will be left in the cage when all parts are removed.



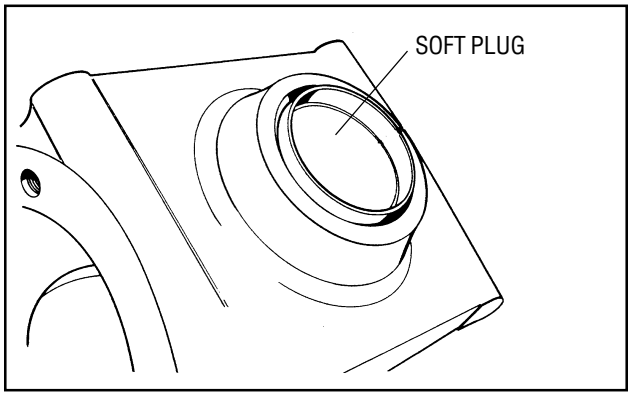
8. Remove the output cap and the assembly will follow.
9. To disassemble the output shaft assembly, first remove the bearing that is located under the cap on the shaft, by using an outside puller.*

NOTE

Do not hook a puller on the snap ring.



10. Remove the snap ring.
11. On the other end, use the same puller and remove both the keyed gear and bearing at the same time.
12. Remove the snap ring.



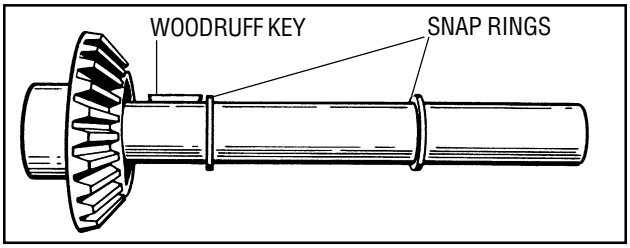
13. To remove the 1-3/4'' (44.5 mm) soft plug, simply tap it out of the case. Discard the old plug.
14. To remove races, simply tap the race out of the cap and pry the crush ring out. The other race can be tapped out with a punch and hammer. If the unit is not equipped with a plug, very carefully pry the race and crush ring out of cap and discard.

INSPECTION

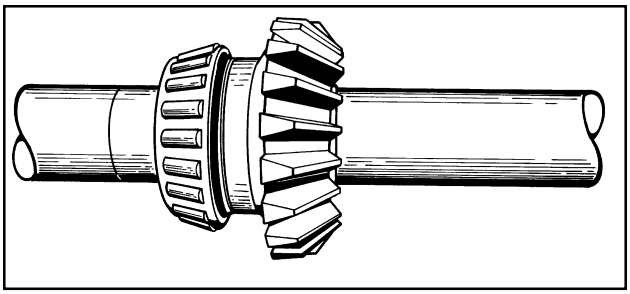
Clean all parts in cleaning solvent. Examine for wear or damage and replace as needed.

REASSEMBLY

It's very important when assembling this unit that you use all new seals and "O" rings.



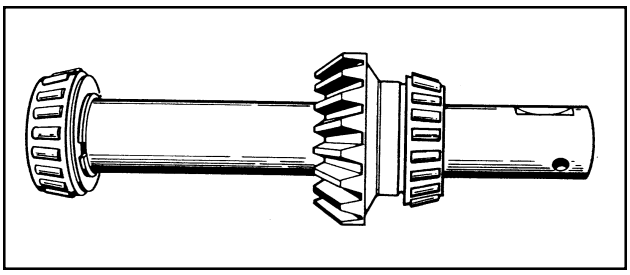
1. Following the scribe marks, press the keyed gear on if necessary, and replace the snap rings on the output shaft.



2. Make sure the inner bearing race is used when pressing roller bearings into place.

NOTE

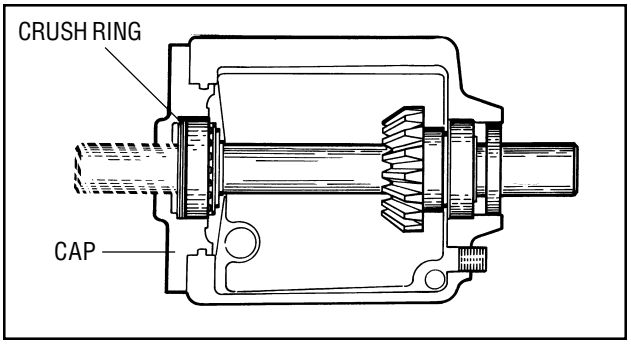
Service bearings for this unit may have a shim in the box along with a new outer race. When pressing the bearing next to the gear, place the shim for that bearing and race (if present) next to the gear first, then press in the race and bearing.



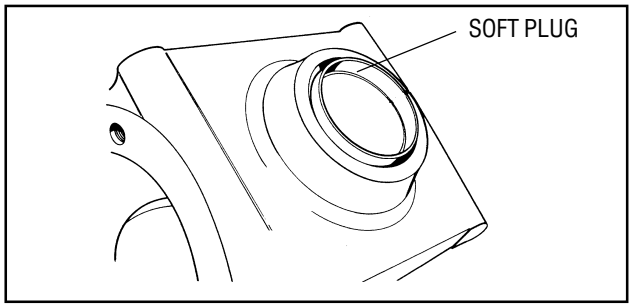
3. Install the other bearing that fits into the cap without the shim.
4. The race that is used with a roller bearing on the gear side mounts into the case. Press the race in carefully until seated.

NOTE

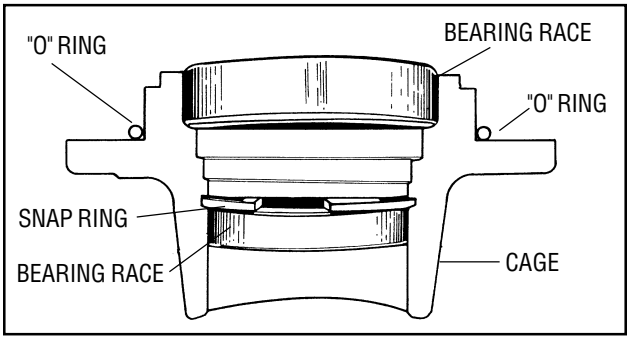
Make sure that all races and roller bearings are kept together as provided.



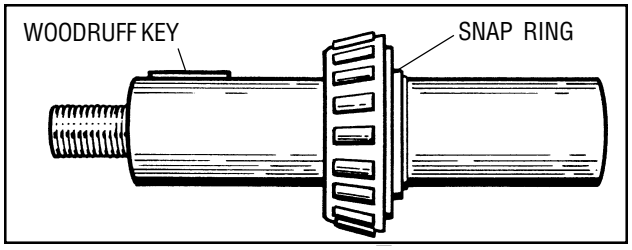
5. Before installing the cover, first install a new crush ring into the cover. Press a new race up to the crush ring. To properly set up the output shaft preload, place the shaft into the case, and place the cover over the shaft without the case/cover shim and "O" ring. Tighten the four bolts to a torque of 200 in. lbs. (22.6 Nm) at 50 inch pound (5.65 Nm) increments.
6. Now remove the cover and place a new case/cover shim with a new "O" ring and torque to 200 in lbs. (22.6 Nm) at 50 inch pound (5.65 Nm) increments.



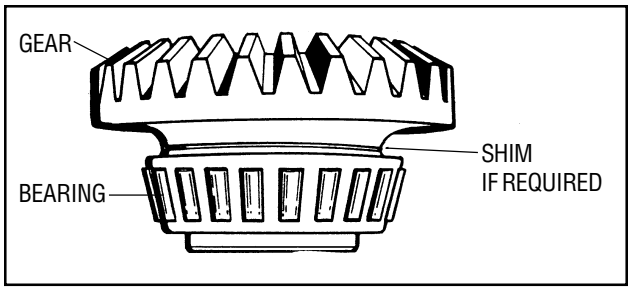
7. To install a 1-3/4'' (44.5 mm) soft plug, tap in carefully with the lip up until 1/16'' (.34 mm) below flush is achieved.



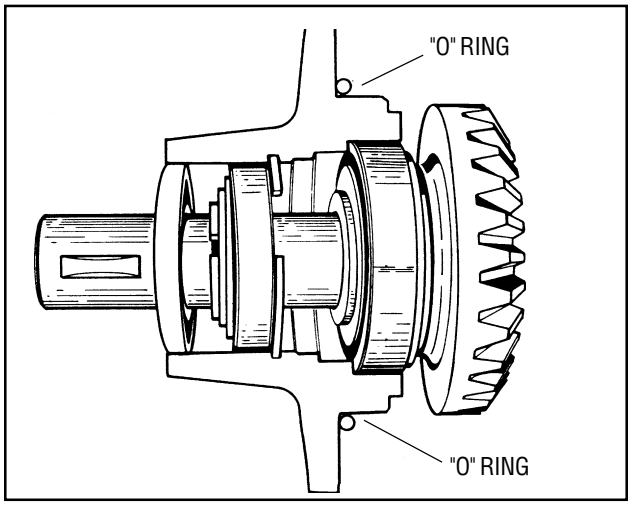
8. To assemble the cage assembly, place the large snap ring in its mounting area in the cage. Press the small race to the snap ring from the outside.
9. Press the large race into the cap.



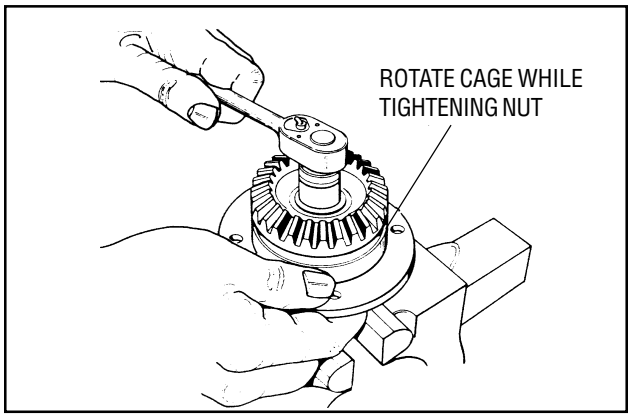
10. Place a small snap ring on the shaft.
11. Press a roller bearing on the shaft to the back side of the snap ring and do not use a shim. Install the woodruff key.



12. Press a large shim and a new large roller bearing onto the gear pressing on the inside bearing race.



13. Place the shaft into the proper position in the cage, and place the gear with the bearing onto the shaft.

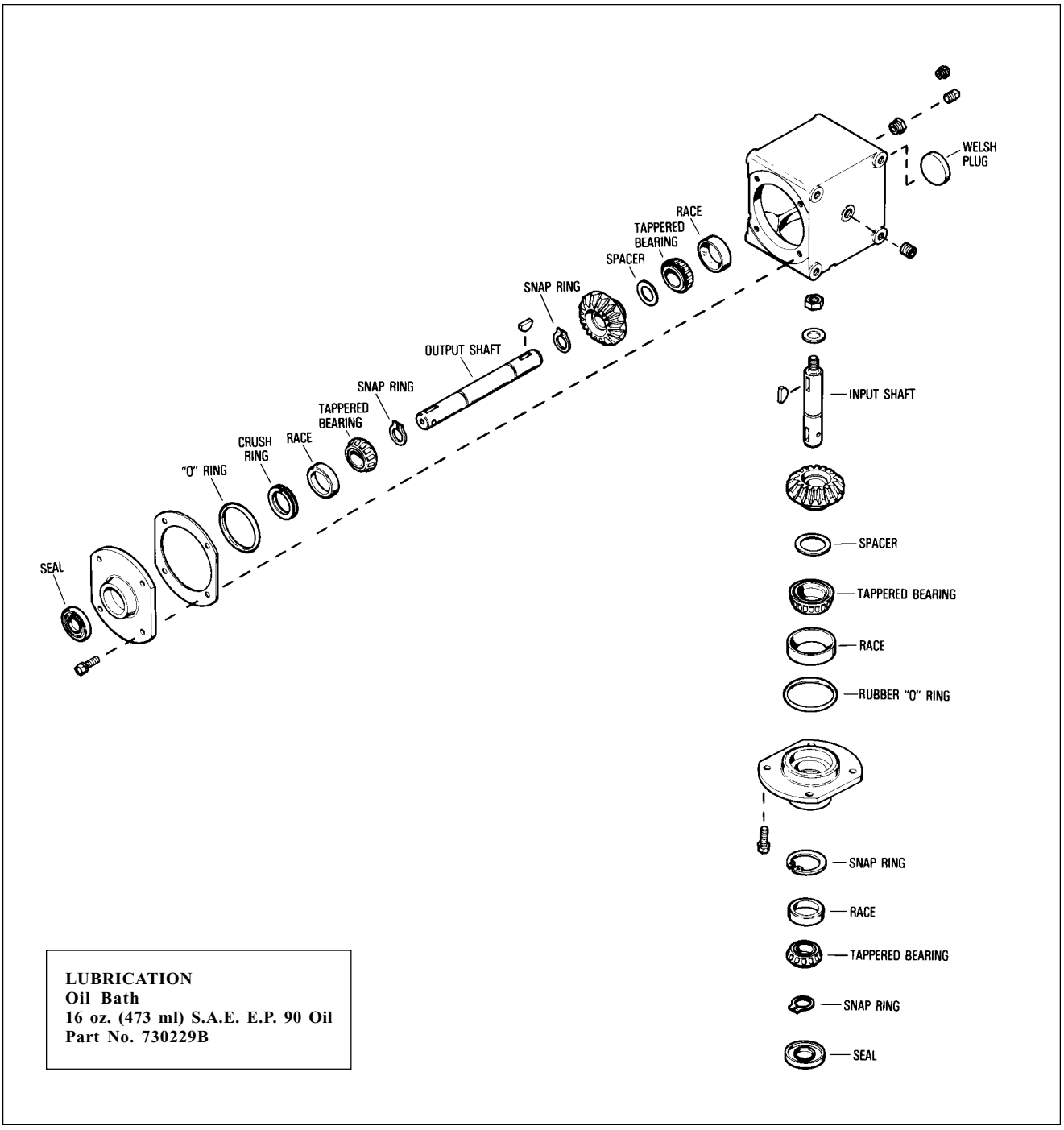


14. To achieve a proper pre-load on the bearings, place the outboard side of shaft in a protected jawed vice. Begin to tighten the nut on the gear side, while turning the cage until a very slight drag is achieved. Tighten so the bearing in the cage housing does not have end play and the parts should spin freely.
15. After loading to the bearing is done, place a new “O” ring around the outer diameter of the cage and position it in the case. Reinstall bolts and tighten to a torque of 200 in. lbs. (22.6 Nm).
16. To install seals, use a 1'' seal protector. Position seals so that they are installed .100" (2.5 mm) below flush.

LUBRICATION

After assembly, fill with 1 pt. (473 ml) E.P. 90 gear oil.

1100 SERIES DRIVE



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 21. SHIFTING ASSEMBLY

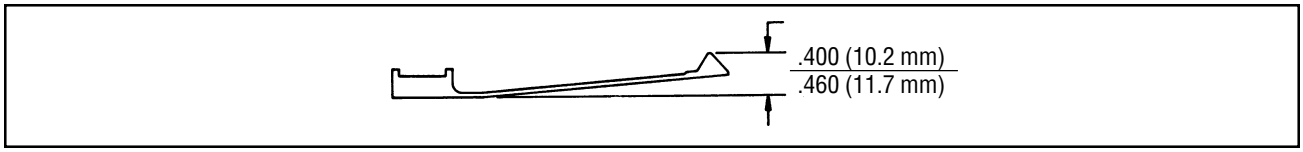
⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

KEY SPRING HEIGHT

To check shifting keys for loss of spring height, place the short flat portion of a key on a flat surface as shown, measure the distance from the surface to the key tip. The measurement should be from .400" to .460" (10.2-11.7 mm); if the measurement is below .400" (10.2 mm) the key should be replaced.

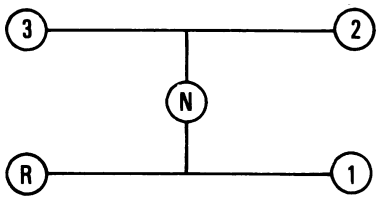
VERTICAL INPUT



H-SHIFT PATTERNS **IN-LINE SHIFT PATTERN**

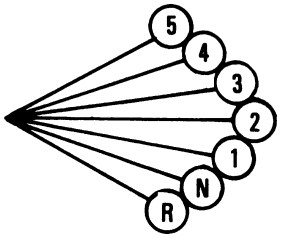
HORIZONTAL INPUT H-SHIFT PATTERNS

600 SERIES



700 SERIES
800, 820 SERIES
900, 910, 915, 920,
930 SERIES
MST SERIES

(AVAILABLE IN
2 to 8 SPEEDS)
FIGURE SHOWS
5 SPEED UNIT

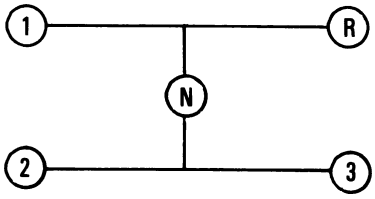


LEFT HAND INPUT **RIGHT HAND INPUT**

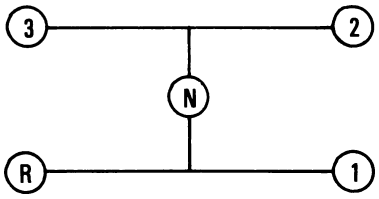
SHIFT LEVER ASSEMBLY

1700 SERIES
2000 SERIES

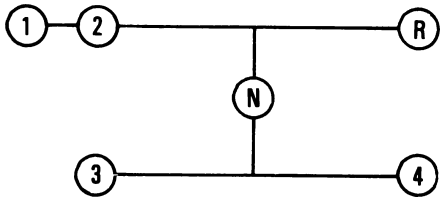
NO LEFT
HAND INPUT
1200 SERIES



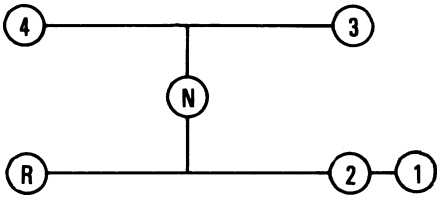
1200 SERIES
1700 SERIES
2000 SERIES



2300 SERIES



2300 SERIES



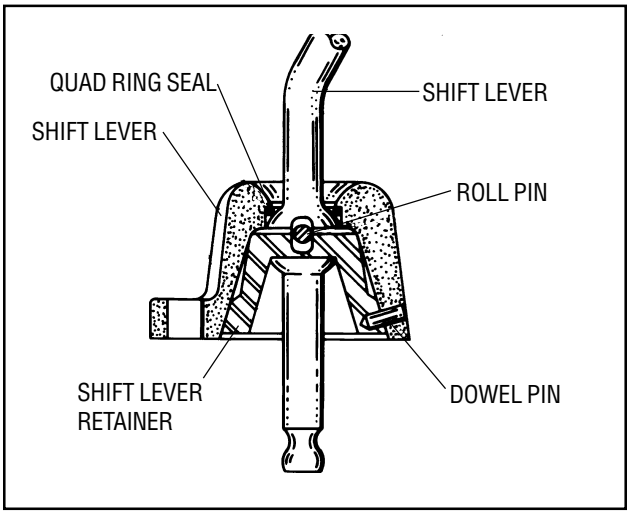
GENERAL

1. Prior to removing a shift lever assembly from a transaxle, make note of the position of the shift lever so that it may be assembled correctly to the shift lever housing.

2 Move the shift lever to Neutral, if possible, before removing it from the transaxle. Clean around the lever housing to prevent dirt from falling into the transaxle. Cover this opening by inserting a clean rag with a screwdriver.

DISASSEMBLY

1. Place the shift lever in a vise so the shift lever housing is at least one inch from the top of the vise jaws.



2. DOWEL PIN STYLE. Locate the dowel pin holding the retainer in the housing from the outside. Place a 1/4'' (6.3 mm) flat face punch on the gasket surface directly over the dowel pin. Strike the punch firmly with a hammer to dislodge the retainer from the shift lever housing. Always use a new dowel pin for reassembly.

3. SNAP RING STYLE. Use a snap ring pliers for removing the snap ring; loosen the vise and disassemble the pieces.

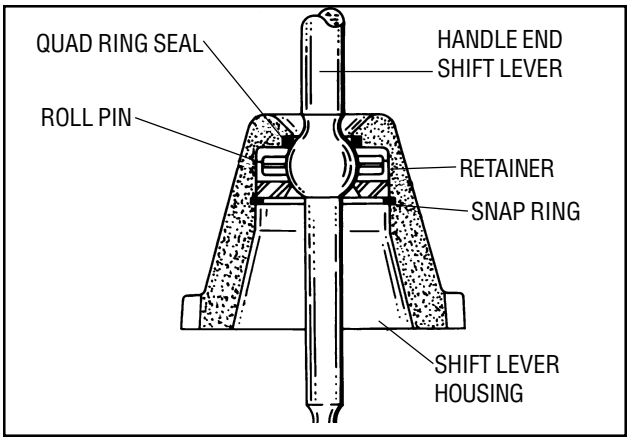
4. Remove the shift lever from the shift lever housing. Examine the roll pin in the ball of the shift lever. If bent or worn, replace. When inserting a new roll pin in the ball, position so equal lengths protrude from both sides of the ball.

5. Oil leakage past the point where the shift lever enters the shift lever housing will require replacement of the quad ring seal in the shift lever housing.

   Prior to reassembly, be sure the bends in the shift lever correspond to the mounting on the vehicle.

REASSEMBLY

1. DOWEL PIN TYPE. Secure with a new dowel pin. A second dowel pin is used in some assemblies for alignment. This dowel pin is located on the gasket surface of the shift lever housing and fits into a mating hole in the transaxle.



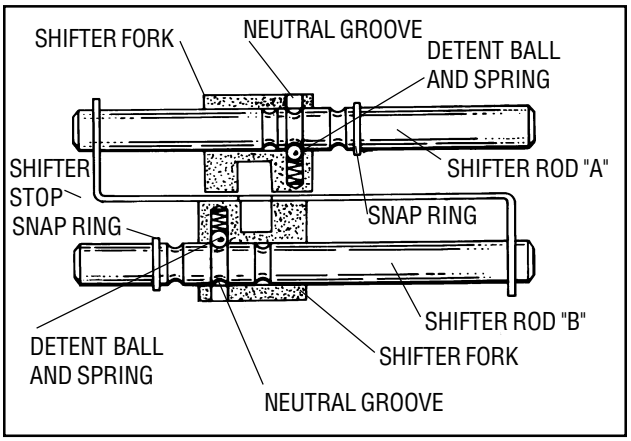
2. SNAP RING TYPE. Secure parts with the snap ring. Before installing the shift lever and housing into the transaxle housing, ensure the shifting forks are in the neutral position.

3. Always use new gaskets between the shift lever housing and the transaxle.

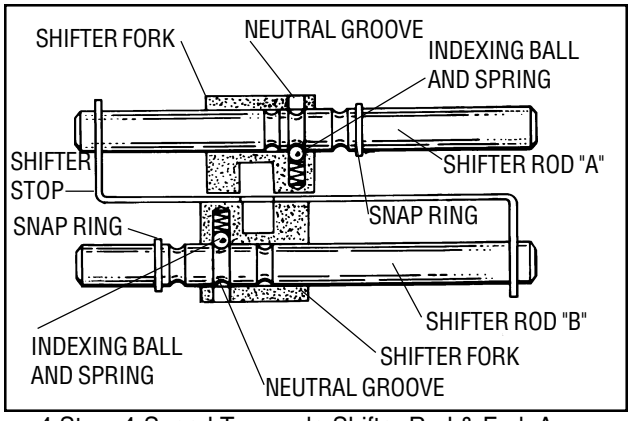
SHIFTING ASSEMBLY

GENERAL

1. Differences in assemblies will be noted in the following servicing procedure. Always use the parts list for each model to obtain the correct parts.



3 Stop, 3-Speed Transaxle Shifter Rod & Fork Assy.



4 Stop, 4-Speed Transaxle Shifter Rod & Fork Assy.

2. Shifting assemblies are removed from and installed into the transaxles by squeezing the top end of the shifter rods. This causes a binding that retains all parts during removal or installation.

INSPECTION

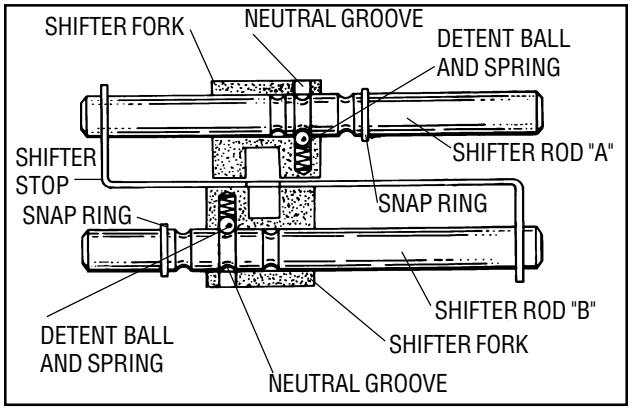
1. Replace the shifter stop if worn or damaged.
2. Examine the teeth and the internal splines of the two shifter gears. Replace damaged gears. The gears must slide freely on the shifter shaft. Excessive wear of the internal spline of the gears will create cocking and difficult shifting. Replace the gear if this condition is present.
3. Replace the shifter shaft needle bearings if wear is evident. See Chapter 22 on bearings for removal. Replace if the bearing surface of this shaft should be scuffed, pitted or worn to a diameter less than .750'' (19.1 mm).
4. Replace other parts showing wear, looseness, cracks, etc...

DISASSEMBLY

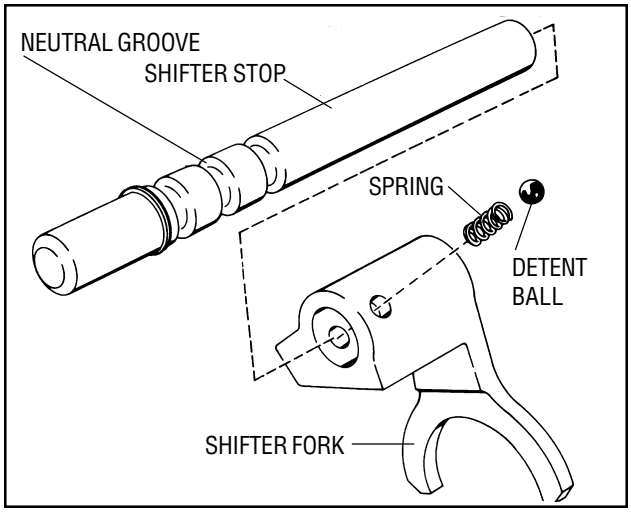
To disassemble the shifter and fork assembly, use the assembly procedure in reverse.

ASSEMBLY

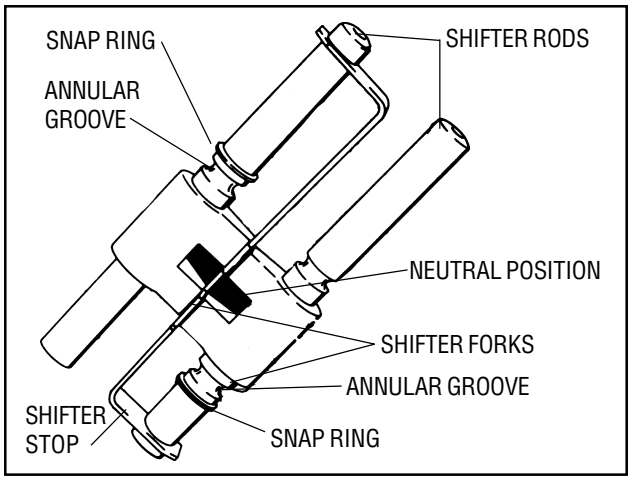
1. Reassemble the shifting assembly by following the illustrations. Lay the parts on the bench on a clean paper or shop cloth. Pay particular attention to the annular grooves in the shifter rods and snap rings.



2. Assemble the shifter forks onto the shifter rods. The shifter forks are interchangeable.

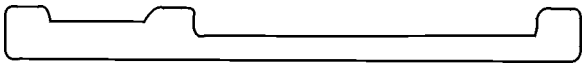
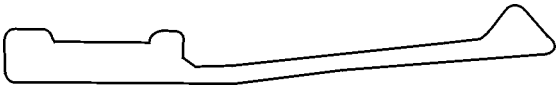
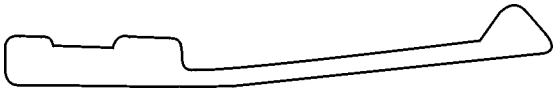
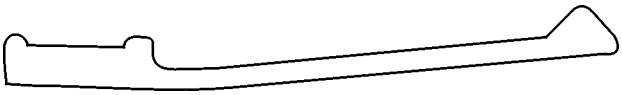
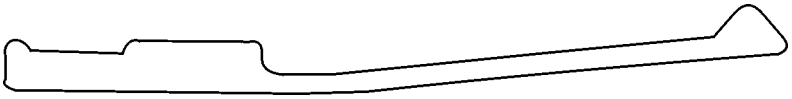
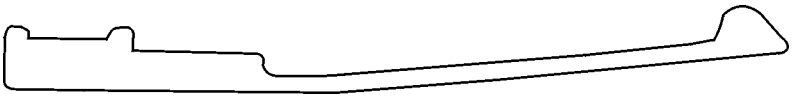


3. Slide the shifter fork into the shifter rod until it lines up with the hole with the detent ball and spring. With a flat blade screw driver, press the detent ball into the hole and move the shifting fork completely onto the shifter rod.
4. Move the shifting fork to the neutral position. The neutral groove is the center groove. If the shifter rod has four grooves, the neutral groove is the second groove from the shortest end. This neutral groove can be seen through the hole in the shifter fork.



5. When the shifter forks are properly assembled to the shifter rods and positioned in neutral, the ends of the notches in the shifter forks are in alignment.

Tecumseh Transmissions
Shift Key Quick Reference Guide

Service No.	Length	Where Used	Shape and Size (shown actual size)
792071	2.950" 7.493 cm	500s	
792089A	2.625" 6.668 cm	700/800/801/910	
792094	2.812" 7.142 cm	728/A/729/A/757/A/759/780/792	
792018	3.165" 8.039 cm	900s	
792123A	3.980" 10.109 cm	820/920/930	
792136A	3.980" 10.109 cm	820/930/MST	
792131	4.040" 10.262 cm	820-014/A	

CHAPTER 22. BEARING AND BUSHING SERVICE

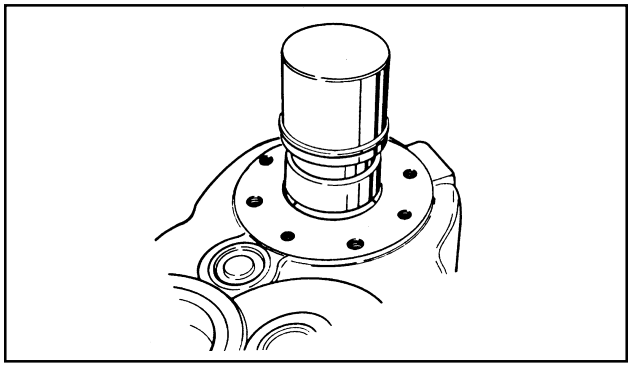
GENERAL BEARING AND BUSHING CARE

1. Bearings, bushings and bearing surfaces should be thoroughly cleaned prior to examination. Examine closely for scuffing, wear, pitting, and abnormal conditions. Replace if any of these conditions appear.
2. Use clean, filtered solvent to clean bearings. Then use a clean, lint free cloth to dry the bearings. Immediately coat the cleaned bearings with lubricant to prevent oxidation and corrosion. If the bearing is to be stored, wrap in oil proof paper until needed.
3. Take care of bearings in the case and cover. Cover them to keep out any foreign material. Place the gasket surface down on clean paper and cover with a clean cloth. Never clean the lubricant from new bearings. This lubricant prevents damage before the transaxle lubricant enters the bearing.

BALL BEARING SERVICE

The ball bearings used in the outer ends of the axle supports are sealed. Without removing the bearings, but with the axle removed, rotate the inner race with your fingers. If any roughness is noted, replace the ball bearing assembly. These ball bearings are factory lubricated and additional lubrication cannot be added. When driving in these ball bearings, use the proper tool that drives on the outer race as shown on the next page.

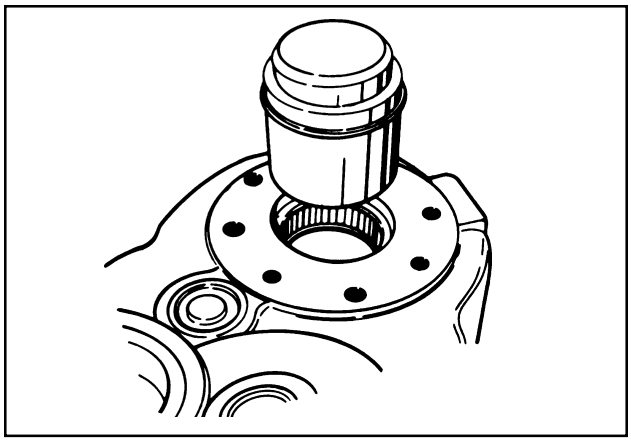
1. Install the needle and ball bearing combination for the input shaft into the cover prior to the installation of the input shaft.



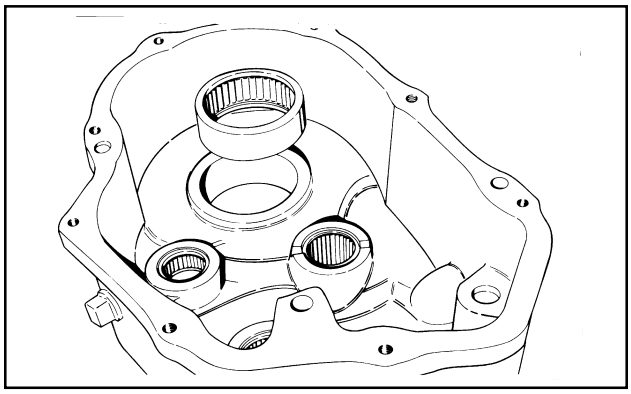
2. Using a socket or bearing installer, install the input shaft ball bearing into the case by driving on the outer race. After the input shaft bearings are installed, assemble the input shaft. Press the input shaft into the bearing combination while supporting the inner race of the ball bearing on a hollow tube.

NEEDLE BEARING SERVICE

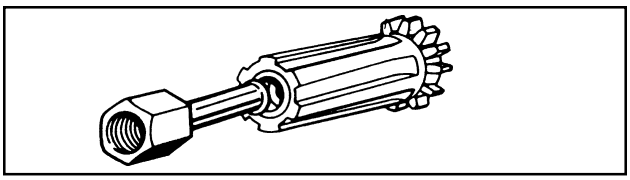
It is advisable to use an arbor press to remove and install needle bearings.



1. Use a bearing tool to press out the bearing. Insert the proper tool in the bearing, and with an arbor press, press out the bearing from the inside.
2. When installing open end needle bearings, always apply pressure to the stamped side.
3. Use only recommended tools to insert bearings. The opposite end of the same tool used for removal is used for replacement.



4. The inside face of the bearing housing should be below the thrust face on the case or cover. This distance is controlled by the design of the inserting tool. By using the proper tool, the bearing will be protected upon installation. Bearings should be pressed into the cover .015'' to .020'' (.381-.508 mm) below the thrust surface. The open end bearing in the low speed shaft of four speed transaxles is to be .010'' (.254 mm) below the thrust surface. The open end bearing in the shifter shaft should be .010'' (.254 mm) below the end as well.

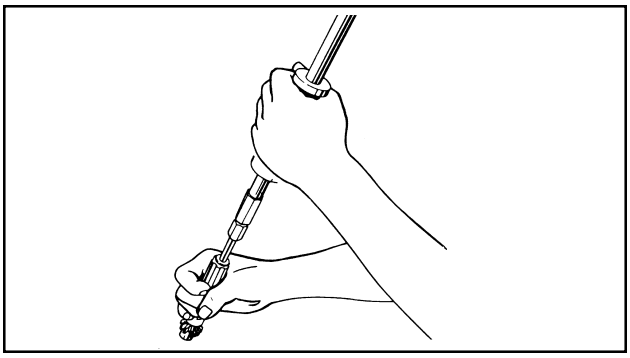


5. To remove the needle bearing in the splined shifter shaft, proceed as follows:

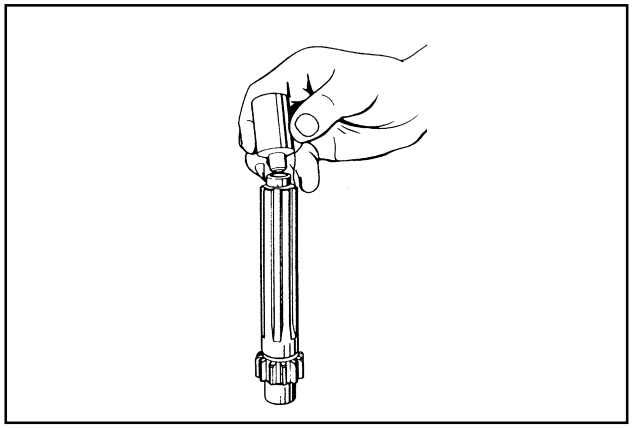
NOTE

Blind bearing pullers are available to remove this bearing. There is a space between the bottom of the drilled hole and the inside end of the bearing to accommodate the ridges of the bearing puller.

6. With the needle bearing up, clamp the splined shifter shaft vertically in a soft jaw vise so the lower end of the shaft rests on a block of wood.
7. Prepare some pieces of paper toweling, newspaper, etc. by soaking in water.
8. Tear paper into pieces, approximately one to two inches square. Stuff these wet pieces of paper into the needle bearings until full.



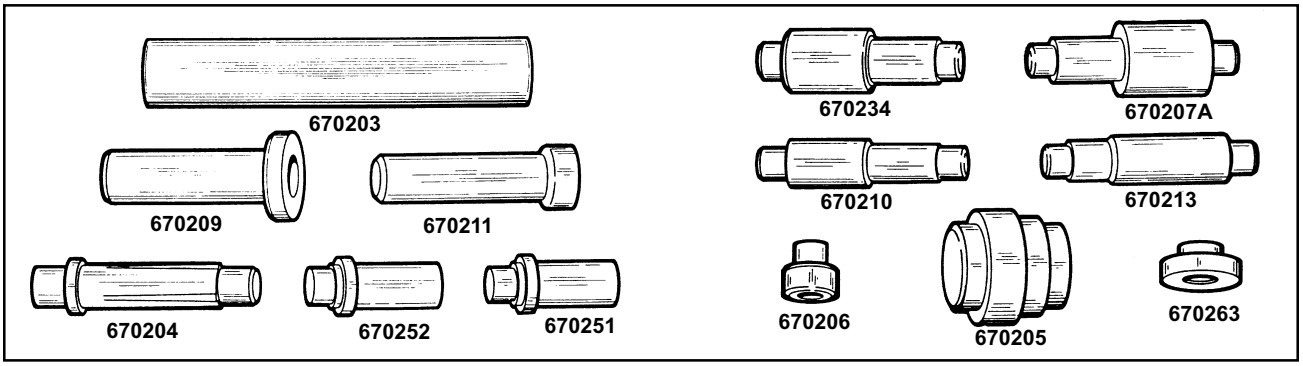
9. Insert a 7/16" (.438 mm) metal rod into this bearing. With a mallet strike the rod sharply to compress the wet paper. Continue to add more wet paper, this will hydraulically lift the bearing out of the shaft.
10. Use the authorized tool listed below to install the new bearing. Needle bearings in shifter shafts should be installed .010'' (.254 mm) below flush.



BUSHING SERVICE

When removing bushings, use the combined bushing remover and installation tool. Position the piece to be serviced on the table of an arbor press with an opening to allow the bushing to pass through.

1. Use the proper tool as illustrated.
2. The bushings in the three gear cluster, four speed transaxle are both removed at the same time. The bushing from one end will contact the bushing in the opposite end and both may be pushed out.
3. Use an arbor press and push the steel ball through the new bushing to expand it to the required size.



PEERLESS TOOL KIT 670254A

Tool No.	Description	Use with:
670203	Oil Seal Installer	Seal with 13/16" (20.64 mm) I.D.
670204	Bushing Driver and Installer	Bushing with 3/4" (19.05 mm) I.D.
670205	Bushing Driver and Installer	Busing with 1-1/2" (38.1 mm) I.D.
670206	Oil Seal Protector	Seal with 1/2" (12.7 mm) I.D.
670207A	Bearing Driver and Installer	Bearing with 5/8" (15.87 mm) I.D.
670209	Oil Seal Installer	Seal with 21/32" (16.7 mm) I.D.
670210	Bearing Driver and Installer	Bearing with 1/2" (12.7mm) I.D.
670211	Oil Seal Installer	Seal with 1/2" (12.7 mm) I.D.
670213	Bearing Driver and Installer	Bearing with 9/16" (14.29 mm) I.D.
670234	Bearing Driver and Installer	Bearing with 5/8" (15.87 mm) I.D.
670251	Bearing Installer	Input Bearing on 800 Series
670252	Bearing Driver	Bearing with 11/16" (17.46 mm) I.D. - 800 Series
670262A	Oil Seal Protector	All 3/4" (1.8 mm) Axle Shaft Seals
670263	Oil Seal Protector	Seal with 5/8" (15.87 mm) I.D.

CHAPTER 23. VST TROUBLESHOOTING

The information on the following pages has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs. Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, we would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 (12.7 mm) of the travel distance from neutral to forward.
3. Place the tractor on a 17 degree grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and/or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may show the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.
3. **Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows, With a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

   The second chamber is for the output gears including the differential. FIRST make sure the tractor is level, then remove the drain/fill plug. NOTE: Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. Insert a small pocket rule until you touch the bottom of the case. Remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact; this is full at its 8 oz. (236 ml) capacity.

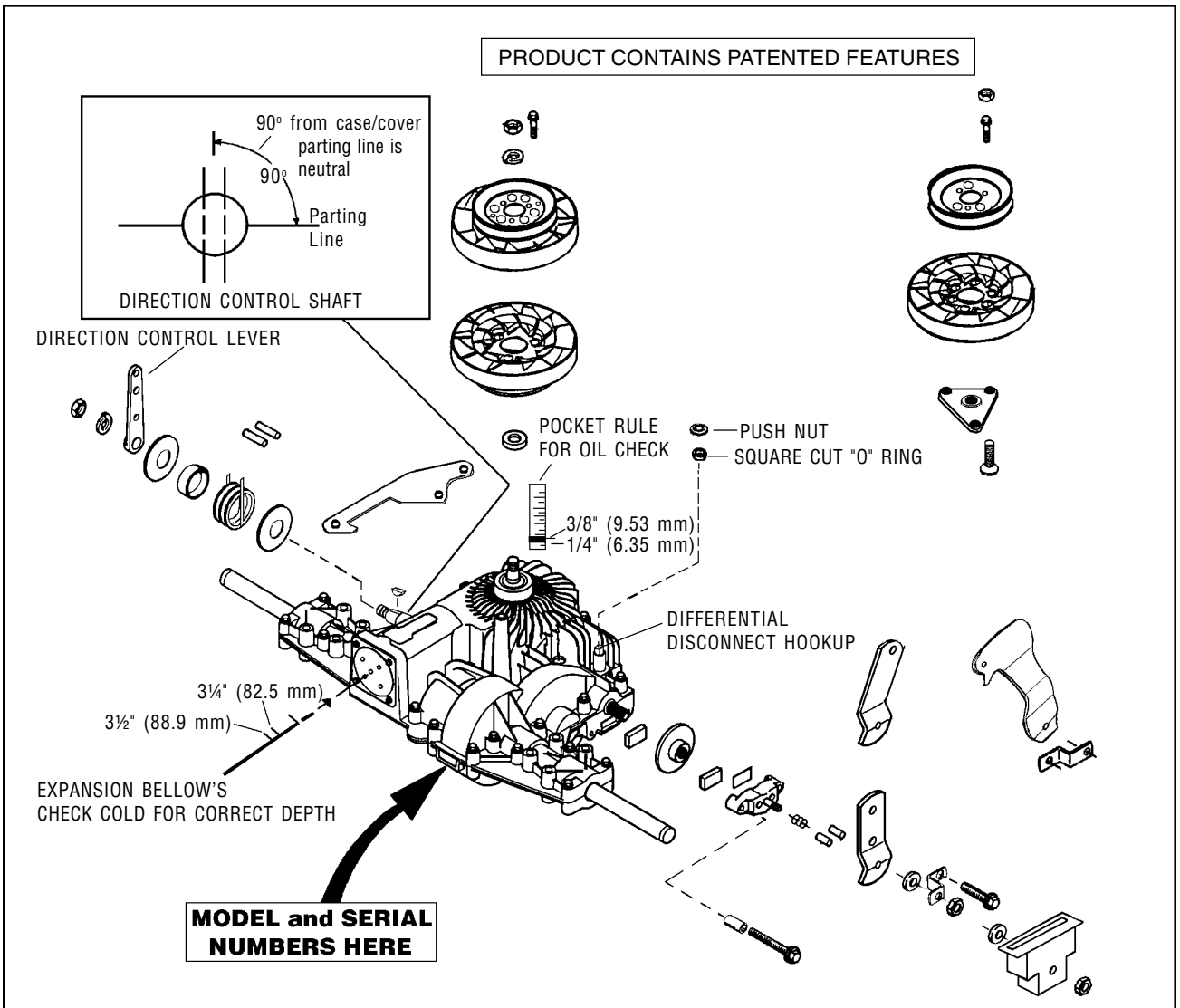
4. **Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

   To determine absolute neutral, the hole in the tapered control shaft must face straight up and down. At this point make sure the OEM linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 Nm) with the shaft and the lever in neutral.

   When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16" (7.94 mm) bolt in the hole as shown in illustration. Hold the bolt until the tapers are locked and the nut torque is correct.

   To make sure that the brake is not binding, drive the unit up a slight grade. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.

5. **Hard to shift:** Typically, hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Check the ease of movement of the shift arm with a torque wrench. For the following spec numbers, the reading should be 40-65 inch lbs (4.5-7.34 mm). measured at the end of the shaft (205-006, 016, 021, 022, 030, 033, 036, 040, 046). If the model has a neutral spring, the torque reading should be 70-150 inch lbs. (7.9-16.9 mm). All other models (without neutral return spring) should read 150 - 120 inch lbs. (13.5-16.9 mm) measured at the end of the shaft. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.



NOTE: The above illustration is of a foot control unit with differential disconnect. Consult your parts list by model and specification number to get correct parts for your unit. ALL PARTS SHOWN MAY NOT BE ON YOUR UNIT.

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

8 TO 18 HP CAST IRON FOUR CYCLE ENGINES

TECUMSEH®

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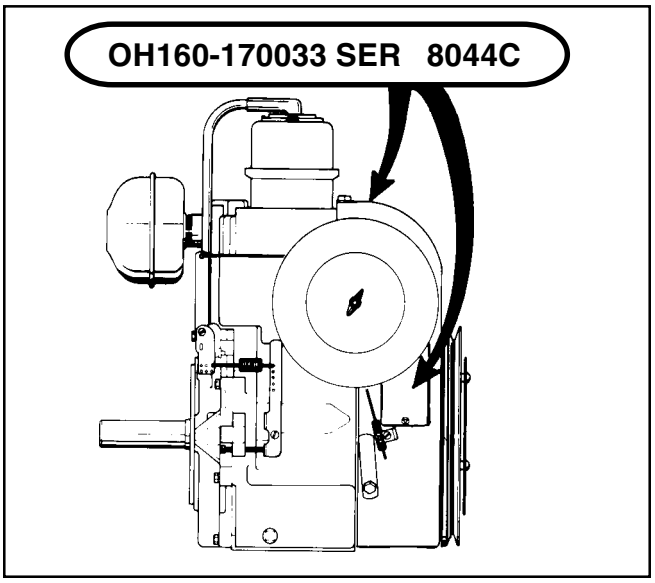
CHAPTER 1. GENERAL INFORMATION

SECTION 1. ENGINE IDENTIFICATION

Tecumseh engine model numbers are stamped into the blower housing, or are located on a nameplate or tag on the engine in locations as illustrated.



INTERPRETATION OF MODEL NUMBER. The first letter designations in a model number indicate the basic type of engine.

HH - Horizontal-Heavy Duty (Cast Iron)
VH - Vertical-Heavy Duty (Cast Iron)
OH - Overhead Valve-Heavy Duty (Cast Iron)

The number designations following the letter indicates the horsepower of the engine.

The number following the model number is the specification number. The last three numbers of the specification number indicate a variation to the basic engine specification.

The serial number indicates the production data.

Using model number OH160-170033, Serial 8044C as an example, interpretation is as follows:

OH160-170033 - is the model and specification number.
OH - Overhead Valve-Heavy Duty (Cast Iron)
160 - Indicates 16 horsepower.
170033 - is the specification number used for properly identifying the parts of the engine.
8044C - is the serial number.
8 - first digit is the year of manufacture (1998)
044 - indicates calendar day of that year (044 day or February 13, 1998).
C - represents the line, shift or plant in which the engine was built at the factory.

SHORT BLOCKS. New short blocks are identified by a tag marked SBH (Short Block Horizontal) or SBV (Short Block Vertical). Original model tags of engines should always be transferred to a short block for correct parts identification.

SECTION 2. ENGINE CARE

FUELS. Use clean, fresh unleaded automotive gasoline in all Tecumseh four-cycle engines. (Leaded "regular" gasoline is an acceptable substitute.)

NOTE: **Do Not** use gasoline containing methanol (wood alcohol). Gasoline containing a maximum of 10 ethanol or grain alcohol (sometimes called "gasohol") may be used but requires special care when engine is unused for extended periods.
See "STORAGE" instructions.

ENGINE OIL, ALL FOUR CYCLE ENGINES:

USE A CLEAN, HIGH QUALITY, DETERGENT OIL. Be sure original container is marked with engine service classification "SF - SJ."

DO NOT USE SAE10W40 OIL.

FOR SUMMER (ABOVE 32°F, 0°C) USE SAE 30 OIL
(SAE10W30 is an acceptable substitute.)

FOR WINTER (BELOW 32°F, 0°C) USE SAE 5W20 OR 5W30 OIL.
(SAE10W is an acceptable substitute.)

(BELOW 0°F, -18°C ONLY) Use 0W30 oil or SAE10W oil diluted with 10% kerosene is acceptable.

NOTE: For severe, prolonged, winter operation of HH120 model, SAE10W oil is recommended.

OIL CHANGE INTERVALS. Change oil after first two (2) hours of operation and every 25 hours thereafter, or more often if operated under dusty or dirty conditions.

OIL CHECK. Check oil every 5 hours or each time the equipment is used. Position equipment so the engine is level when checking the oil.

BREAK-IN PROCEDURE. Proper break-in procedure is important for proper seating of rings, on a new engine or newly overhauled engine.

Do normal work with the unit, running the engine under load. Vary the load on the engine frequently to aid in seating of the rings.

The engine should not be allowed to idle or run at part throttle for extended periods during break-in. Work the engine but do not abuse it.

TUNE-UP PROCEDURE. The following is a minor tune-up procedure. When this procedure is completed, the engine will operate properly or you may discover that further repairs may have to be performed.

NOTE: It is recommended to use only factory parts in a Tecumseh engine. This is especially important with an air filter, since the use of any other than the specified part number may result in serious damage to the engine.

CAUTION: Remove spark plug wire before doing any service work on engine.

1. Service or replace air cleaner as necessary.
2. Inspect level and condition of oil; drain oil.
3. Remove blower housing, clean all dirt, grass or debris from intake screen, head and cylinder cooling fins and carburetor governor levers and linkage.
4. Remove cylinder head, remove carbon, inspect valves and cylinder bore. Replace head using a new head gasket. Torque to specifications.
5. Remove carburetor, clean and install carburetor kit, make adjustment pre-sets where needed. Make sure fuel tank, fuel filters and fuel lines are clean. Reinstall carburetor, replacing any worn or damaged governor springs or linkage. Make proper governor adjustment.
6. Remove flywheel, check for leaks in oil seals, check flywheel key and reinstall flywheel. Replace spark plug and check for spark.
7. Make sure all remote linkage is properly adjusted for proper operation.
8. Replace fuel and oil.
9. Run engine and adjust carburetor and set R.P.M. to specifications found on Microfiche or computer parts lookup.

STORAGE: (IF THE ENGINE IS TO BE UNUSED FOR 30 DAYS OR MORE)

CAUTION: NEVER STORE THE ENGINE WITH FUEL IN THE TANK INDOORS , IN ENCLOSED POORLY VENTILATED AREAS WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

Gasoline can become unstable in less than 30 days and form deposits that can impede proper fuel flow and engine operation. To prevent deposits from forming, all gasoline must be removed from the fuel tank and the carburetor. An acceptable alternative to removing all gasoline is adding a fuel stabilizer to the gasoline. Fuel stabilizer (such as Tecumseh's **Part No. 730245**) is added to the fuel tank or storage container. Always follow the mix ratio found on the stabilizer container. Run the engine at least 10 minutes after adding the stabilizer to allow it to reach the carburetor.

DRAINING THE FUEL SYSTEM:

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

1. Remove all gasoline from the fuel tank by running the engine until the engine stops, or by draining the fuel tank by removing the fuel line at the carburetor or fuel tank. Be careful not to damage the fuel line, fittings, or fuel tank.
2. Drain the carburetor by pressing upward on the bowl drain (if equipped) which is located on the bottom of the carburetor bowl. On carburetors without a bowl drain, the carburetor may be drained by loosening the bowl nut on the bottom carburetor one full turn. Allow to completely drain and retighten the bowl nut being careful not to damage the bowl gasket when tightening.
3. If "Gasohol" has been used, complete the above procedure and then put one half pint of unleaded gasoline into the fuel tank and repeat the above procedure. If Gasohol is allowed to remain in the fuel system during storage, the alcohol content will cause rubber gaskets and seals to deteriorate.

Change Oil: If the oil has not been changed recently, this is a good time to do it.

Oil Cylinder Bore:

1. Disconnect the spark plug wire and ground the wire to the engine. Remove the spark plug and put 1/2 ounce (14 ml) of clean engine oil into the spark plug hole.
2. Cover the spark plug hole with a shop towel.
3. Crank the engine over slowly several times.

CAUTION: AVOID SPRAY FROM SPARK PLUG HOLE WHEN SLOWLY CRANKING ENGINE OVER.

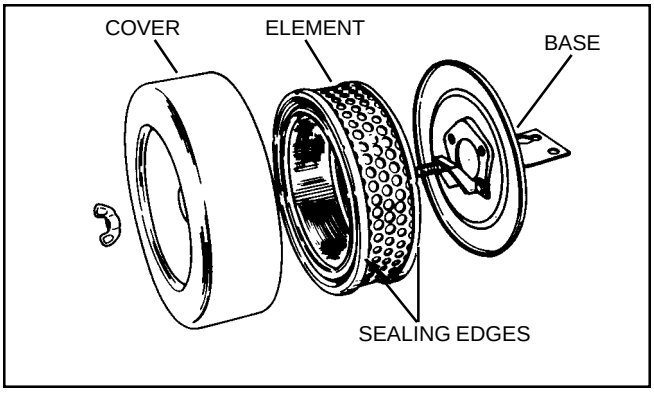
4. Install the spark plug and connect the spark plug wire.

Clean Engine: Remove the blower housing and clean all dirt, grass or debris from the intake screen, cylinder head, cylinder cooling fins, carburetor, governor levers and linkage.

CHAPTER 2. AIR CLEANERS, CARBURETORS, GOVERNORS AND LINKAGE

SECTION 1. AIR CLEANERS

PAPER-TYPE AIR CLEANER SERVICE. Dry type paper air cleaners are utilized on all Tecumseh Large Frame engines. These air cleaners have treated paper elements with rubberlike sealing edges. These edges must seal properly to prevent dirt leakage.



PAPER-TYPE AIR CLEANER SERVICE. Replace air filter once a year or more often in extremely dusty or dirty conditions.

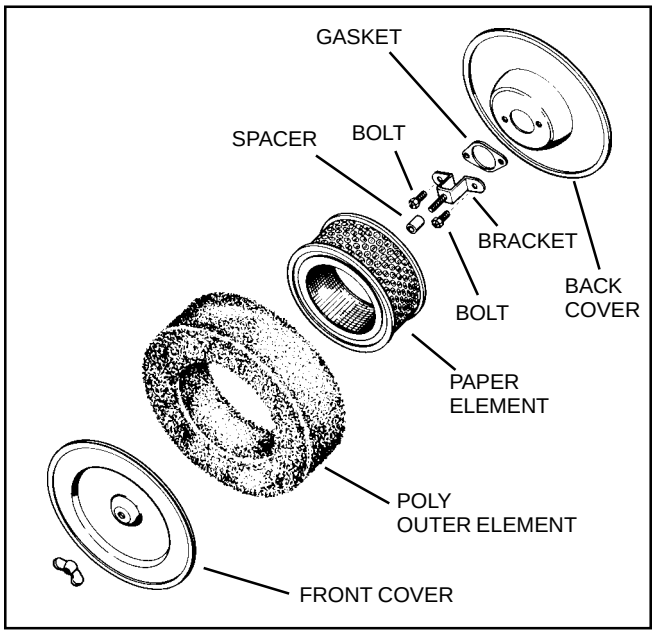
DO NOT ATTEMPT TO CLEAN OR OIL FILTER.

Be sure to clean base and cover thoroughly before installing new paper filter.

NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER INSTALLED ON THE ENGINE.

NOTE: Serious damage to the engine may result in using other than the specified part number filter. Use factory recommended parts only.

POLYURETHANE-TYPE AIR CLEANER. Some Tecumseh Large Frame engines may use a polyurethane air filter in conjunction with a paper filter.



POLY-TYPE AIR CLEANER SERVICE. Clean and re-oil every 3 months or every 25 operating hours, whichever comes first. Clean daily if used in extremely dusty or dirty conditions. Proceed as follows:

Remove wing nut and cover.

Slide foam filter off paper filter.

Wash foam filter in water and detergent solution and squeeze, **Don't twist** until all dirt is removed.

Rinse thoroughly in clear water.

Wrap in a clean cloth and squeeze, **Don't twist** until completely dry.

Saturate foam filter with engine oil and squeeze, **Don't twist** to distribute oil and remove excess oil.

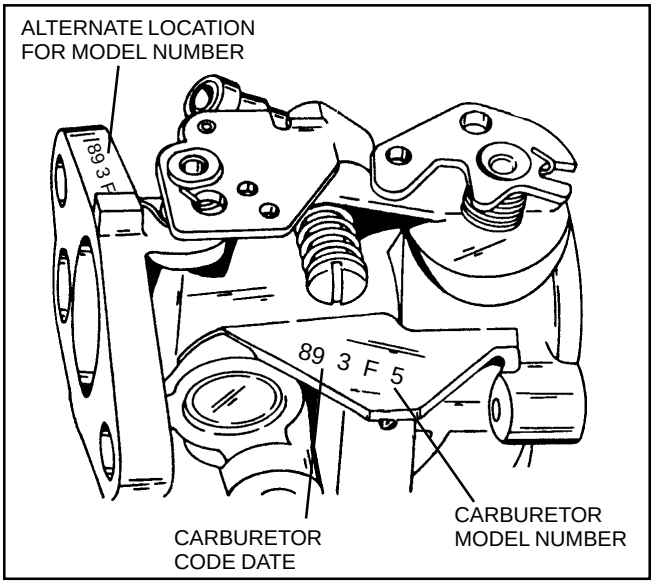
Clean top side of base and inside of cover thoroughly.

Replace foam filter, cover and wing nut. Tighten wing nut securely.

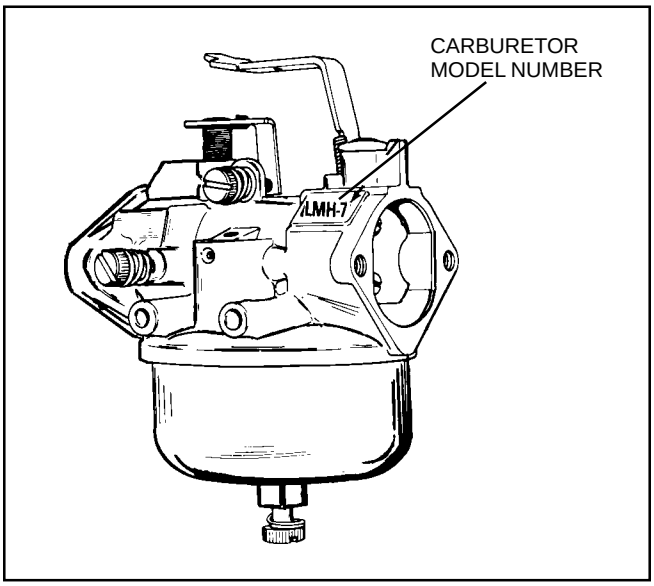
NEVER RUN ENGINE WITHOUT COMPLETE AIR CLEANER INSTALLED ON ENGINE.

SECTION 2. GENERAL CARBURETOR INFORMATION

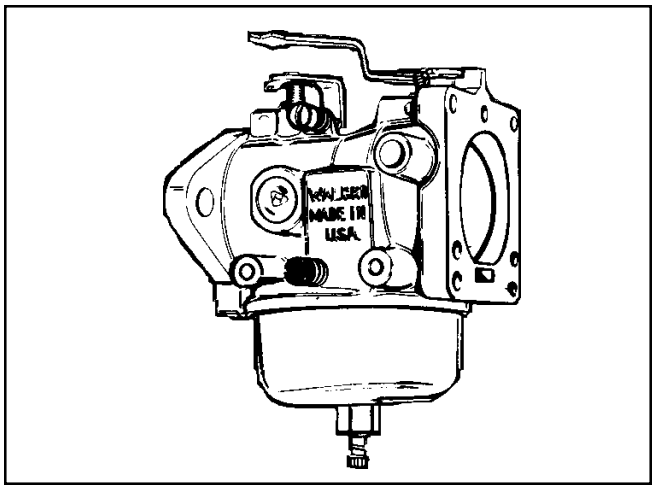
CARBURETOR IDENTIFICATION. Tecumseh carburetors are identified by a model number and code date stamping on the carburetor as illustrated.



When servicing carburetors, use the engine model number or the model number on the carburetor and proper section in the Master Parts Manual or Microfiche Catalog for proper service information.



These carburetors are used on some HH80-100-120 and VH80-100 engines.



This carburetor is used on the Overhead Valve engine 12, 14, 16 & 18 horsepower.

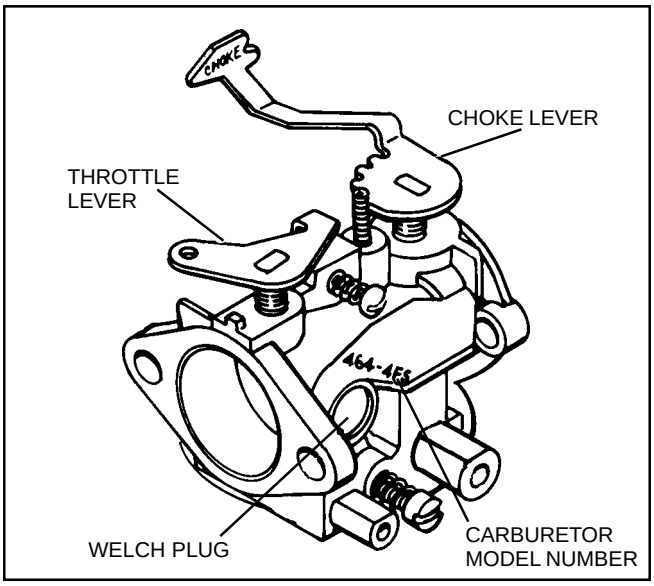
FLOAT-FEED CARBURETORS. Float-feed carburetors use a hollow metal float to maintain the operating level of fuel in the carburetor. As the fuel is used, the fuel level in the carburetor bowl drops and the float moves downward. This actuates the inlet needle valve, to allow fuel to flow by gravity into the fuel bowl. As the fuel level in the bowl again rises, it raises the float. This float motion adjusts the fuel flow at the proper rate and keeps the fuel at the proper mixture level.

SECTION 3. TECUMSEH CARBURETORS

Following are initial carburetor adjustments to be used to start the engine. After the engine has reached operating temperature make final adjustments.

Main Adjustment Screw	HH80-100-120 VH100, 1-3/4 turns.
Idle Adjustment Screw	HH80-100-120 VH100, 1-1/4 turns

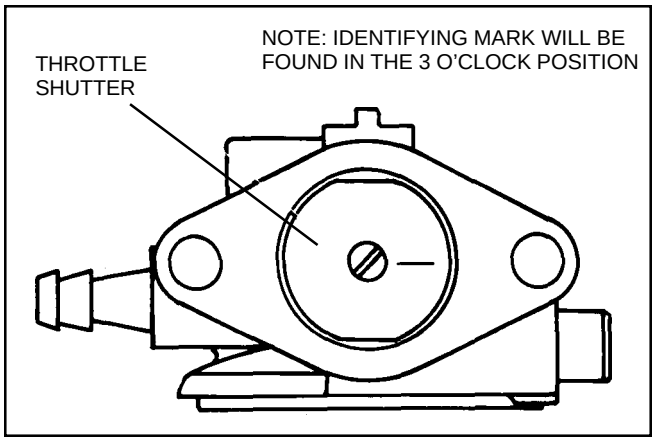
The Master Parts Manual or Microfiche has a direct engine-to carburetor reference list. Further identification of the carburetor is stamped on the carburetor body as shown. Refer to the standard service part number and the identification number on the carburetor body, in any correspondence.



CARBURETOR DISASSEMBLY, INSPECTION AND ASSEMBLY. Carefully disassemble carburetor, removing all non-metallic parts, i.e., gaskets, viton seats and needles, “O” rings, fuel pump valve, etc.

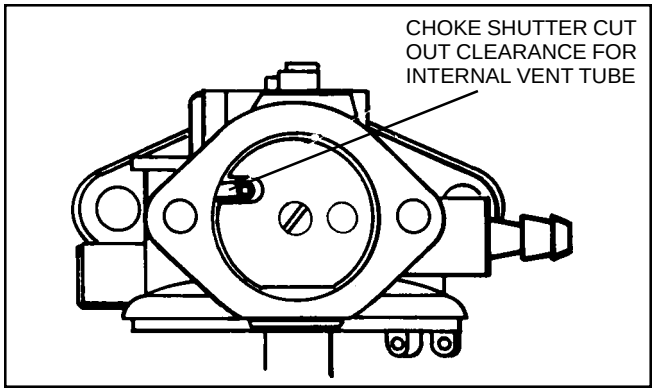
THROTTLE. Examine the throttle lever shaft and shutter prior to disassembly. Replace any worn parts.

1. Remove the screw in the center of the throttle shutter and pull out the throttle shaft lever assembly.
2. When reassembling, replace the throttle shutter with identifying marks as positioned prior to disassembly. The throttle shaft must be held in tight to the bottom bearing to prevent the throttle shutter from riding on the throttle bore of the body, causing excessive throttle shutter wear and governor hunting.

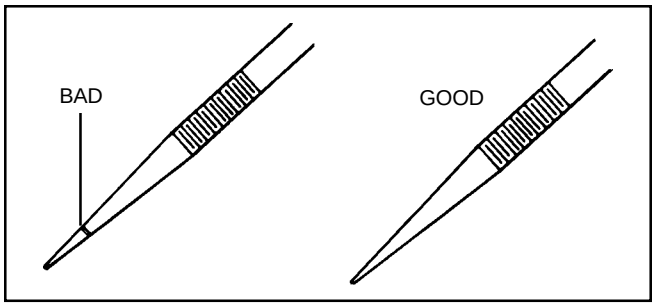


CHOKE. Examine the choke lever, shaft and shutter prior to disassembly. Replace any worn parts.

1. Remove the screw in the center of the choke shutter and pull out the choke shaft lever assembly.
2. When reassembling, replace the choke shutter with identifying marks as positioned prior to disassembly. Hold the choke shaft securely into the bearing bore when replacing the choke shutter.



IDLE ADJUSTMENT SCREW. Remove the idle screw from the carburetor body and examine the point for damage to the seating surface of the taper. Replace any damaged parts.

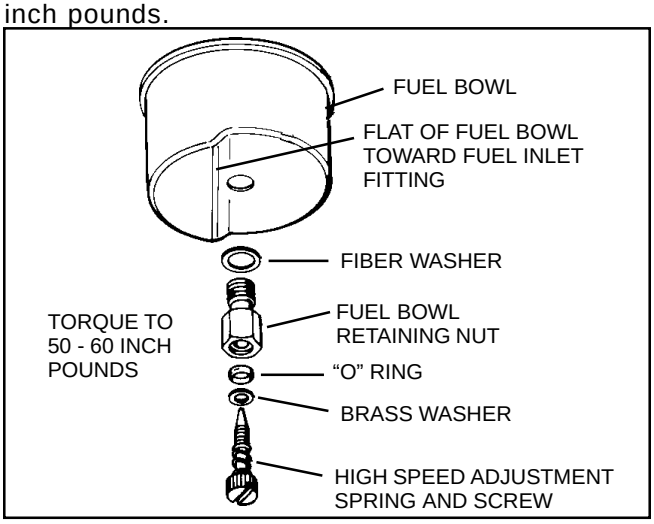


HIGH SPEED ADJUSTMENT SCREW. For service, examine the taper of the high speed adjustment screw. If the taper is damaged at the area where it seats, replace the screw and fuel bowl retainer nut as an assembly.

FUEL BOWL RETAINING NUT. Remove the fuel bowl retaining nut including fiber washer.

Examine the small fuel passage in the annular groove in the retaining nut. This passage must be clean for the proper transfer of fuel into the idle metering system. Replace any worn parts.

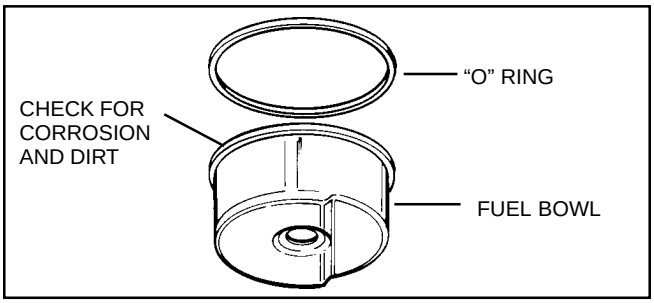
When replacing, torque the fuel bowl nut to 50-60 inch pounds.



FUEL BOWL. Check the bowl for corrosion or dirt. Replace if necessary.

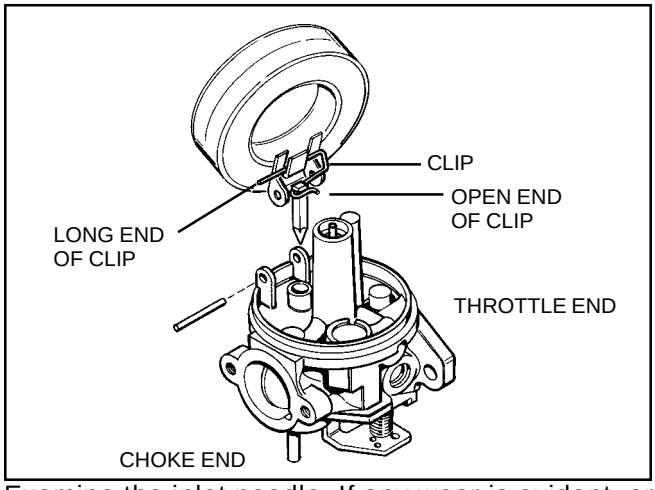
The fuel bowl must be free of dirt and corrosion. When tearing down carburetor for repair, replace fuel bowl "O" ring. Before installation lubricate the "O" ring with a small amount of oil for easier installation.

The fuel bowl flat surface must be positioned on the same side of the carburetor as the fuel inlet fitting or same side as the float hinge pin to assure full travel of the float.



FLOAT. Remove the float. Examine the float for crushing or holes. Examine the float hinge bearing surfaces through which the float hinge pin passes and replace if worn.

INLET NEEDLE. The inlet needle is anchored to the float tab by a clip, to assure proper movement of the inlet needle off of the seat when the float drops. The inlet needle clip must be positioned as shown during reassembly.



Examine the inlet needle. If any wear is evident, or any of the corners show signs of rounding, the needle should be replaced.

The inlet needle hooks onto the float tab by means of a spring clip. To prevent binding, the long, straight end of the clip should face the choke end of the carburetor as shown.

SERVICING THE VITON SEAT.

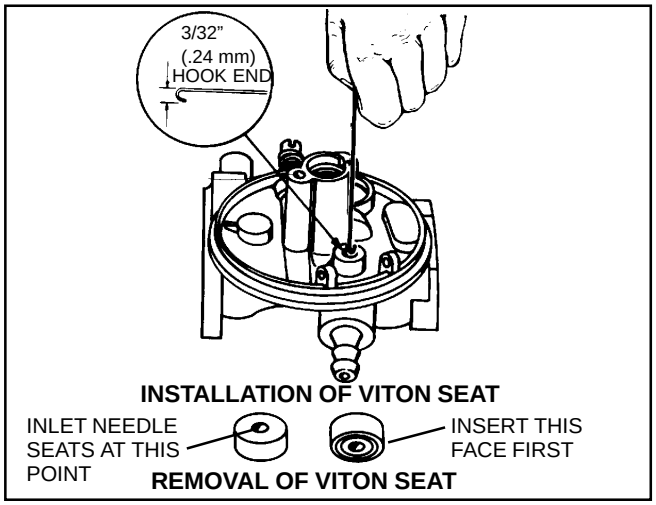
a. **REMOVAL.** If the seat is to be replaced use the bent end of a paper clip or wire with a 3/32'' (.24 mm) hook. Push the hook through the Viton seat hole. Then with the hook, pull the Viton seat out. Replace with a new seat.

NOTE: A #4 crochet hook can also be used for removal.

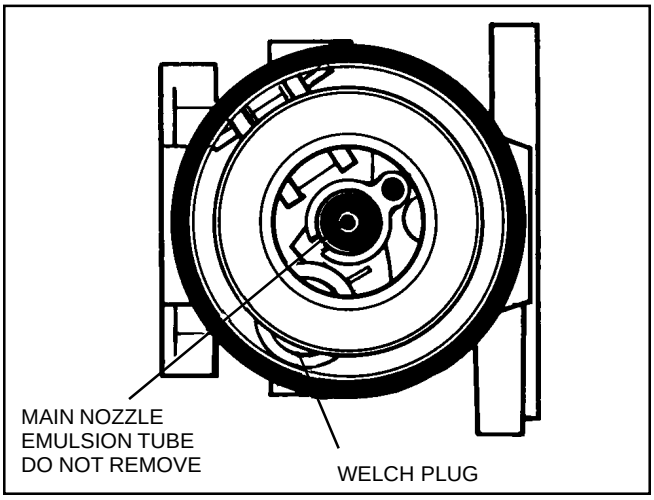
b. **INSTALLATION.**

NOTE: After thoroughly cleaning the cavity, moisten the viton seat with oil.

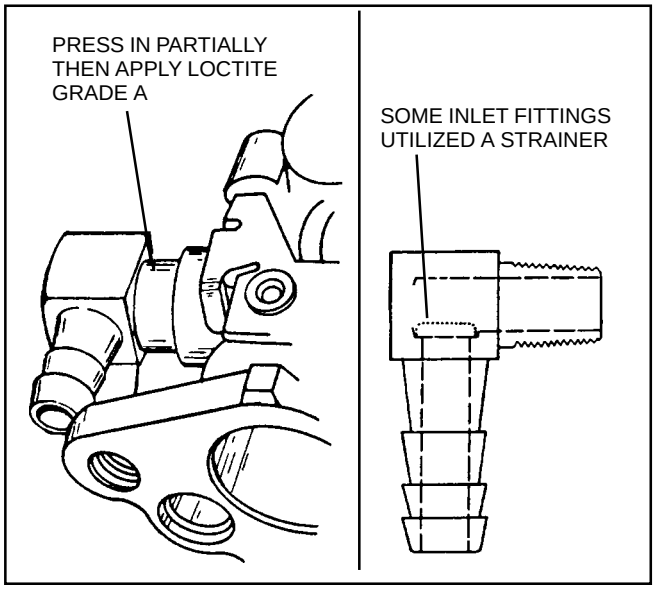
Insert the seat with the grooved side into the cup. Press the viton seat squarely into the base with a punch.



HIGH SPEED NOZZLE. The carburetor body contains a main nozzle emulsion tube pressed into the carburetor body to a predetermined depth and positioned within the venturi of the carburetor. Do not attempt to remove this main nozzle. Repositioning of this nozzle will seriously affect the metering characteristics of the carburetor and will require replacement of the entire carburetor.

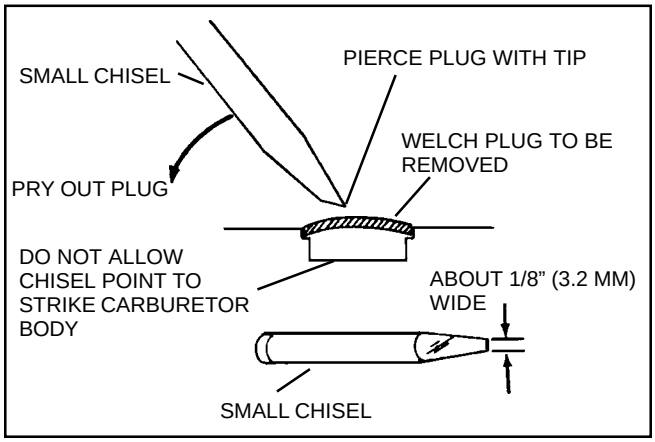


FUEL INLET FITTING. If necessary, this fitting can be removed by pulling and twisting. Be sure to install the fitting in the same position as the original. When installing the fitting, insert tip into the carburetor body, then coat the exposed portion of the shank with Loctite grade A; then press it in until the shoulder contacts the carburetor body.



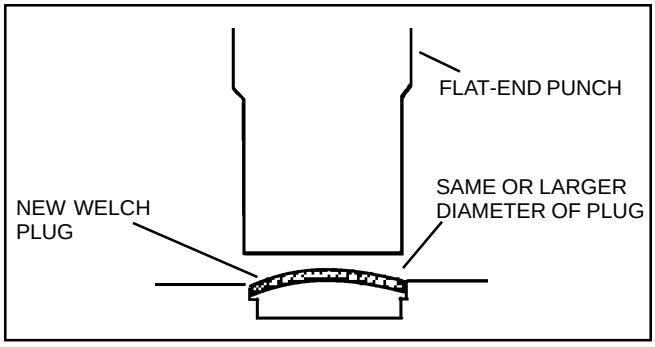
CARBURETOR BODY. When removing the choke and throttle shafts, check shafts and bearings in carburetor body for wear. Any looseness in these areas can cause dirt to enter the engine and cause premature wear. If dust seals are present, these should be positioned next to the carburetor body.

To do a proper cleaning job, welch plugs should be removed to expose drilled passages. To remove the welch plug, sharpen a small chisel to a sharp wedge point. Drive the chisel into the welch plug, push down on chisel and pry plug out of position.



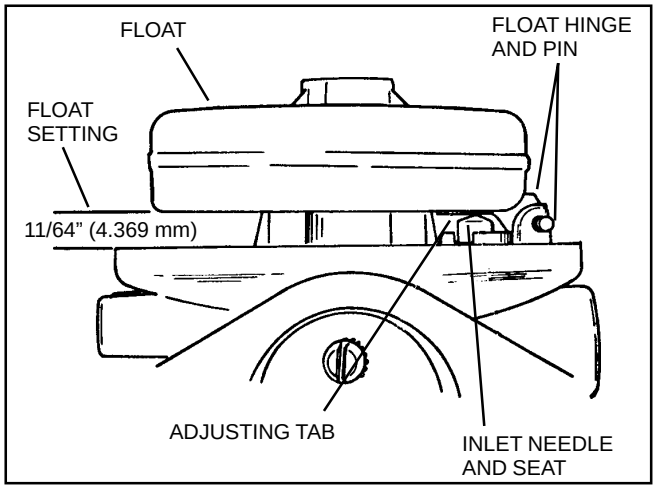
When all accessories and shafts have been removed, soak the carburetor in carburetor cleaner for a maximum of 30 minutes. Blow out all passages with compressed air in the opposite direction of normal fuel flow or use a soft tag wire. Clean all metallic parts with solvent.

To install a new welch plug after cleaning, place the welch plug into receptacle with raised portion up. With a punch equal, or greater than the size of the plug, merely flatten the plug. Do not dent or drive the center of the plug below the top surface of the carburetor.



FLOAT ADJUSTING PROCEDURE

All Tecumseh carburetors with an adjustable float require the correct float height to achieve the proper operation and easy engine starts. To check the float setting, hold the carburetor in an upside down position. Remove the bowl nut, float bowl, and "O" ring. Place an 11/64" (4.369 mm) drill bit across the top of the carburetor casting on the opposite side and parallel to the float hinge pin. The float must just touch the drill bit when the bit is flush with the edge of the float. If the float is too high or too low, adjust the height by bending the tab accordingly. If the required adjustment is minor, the tab adjustment may be made without removing the float and carefully inserting a small bladed screwdriver to bend the tab.



SECTION 4. WALBRO CARBURETORS

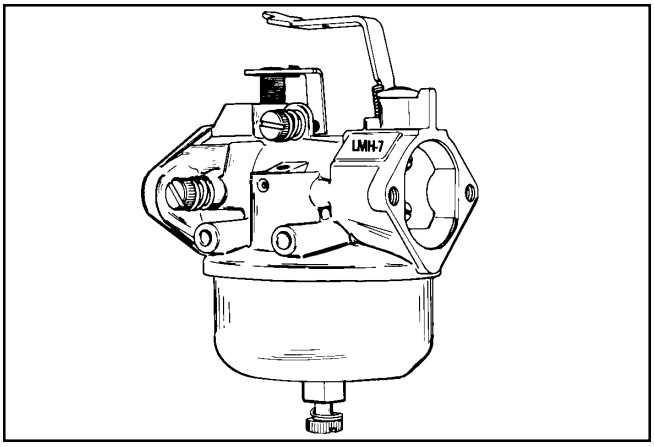
HH80 - 120, VH80 - 100

WALBRO CARBURETORS. Following are initial carburetor adjustments to be used to start the engine. After the engine has reached operating temperature, make final adjustments.

Main Adjustment Screw	HH80, 100, 120 VH80, 100, 1-1/2 turns off seat
Idle Adjustment Screw	HH80, 100 120 VH80 100 1-1/4 turns off seat

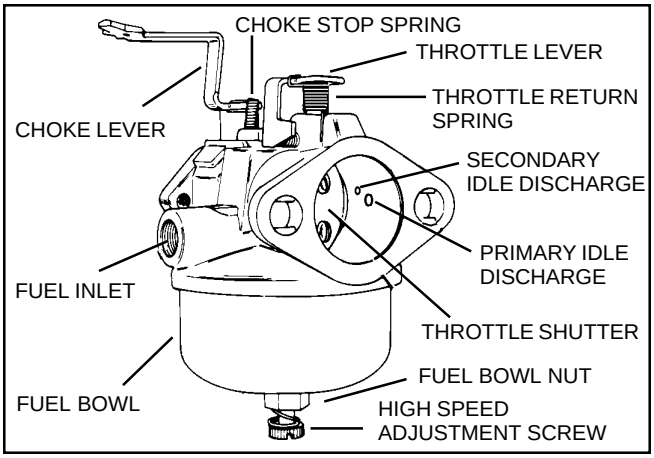
For proper carburetion the atmospheric vent MUST be open. Examine and clean if necessary.

A sluggish engine speed control may at times be caused by dirt or paint on the throttle return spring. Clean if required.

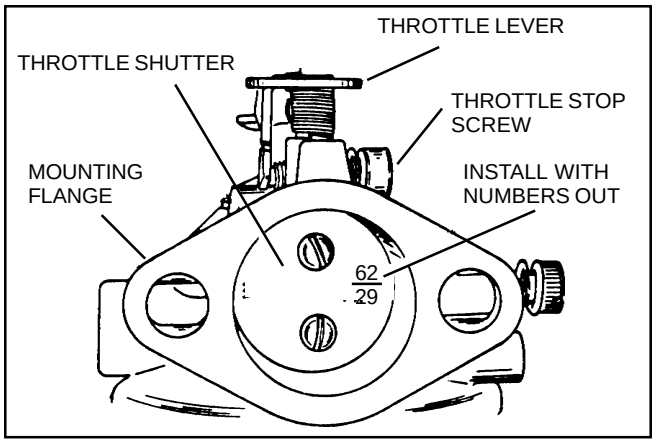


Choke lever positioning is maintained by the stop spring, replace if damaged.

The fuel inlet fitting should be checked if leakage is detected in the carburetor area. Do not screw in too tight, this may crack the carburetor body. The fuel bowl drain should also be examined in event fuel leakage is detected. It may be necessary at times to replace the internal rubber seat. Examine the throttle return spring if slow engine response is noted during operation. Correct by cleaning the throttle return or realigning the throttle plate.

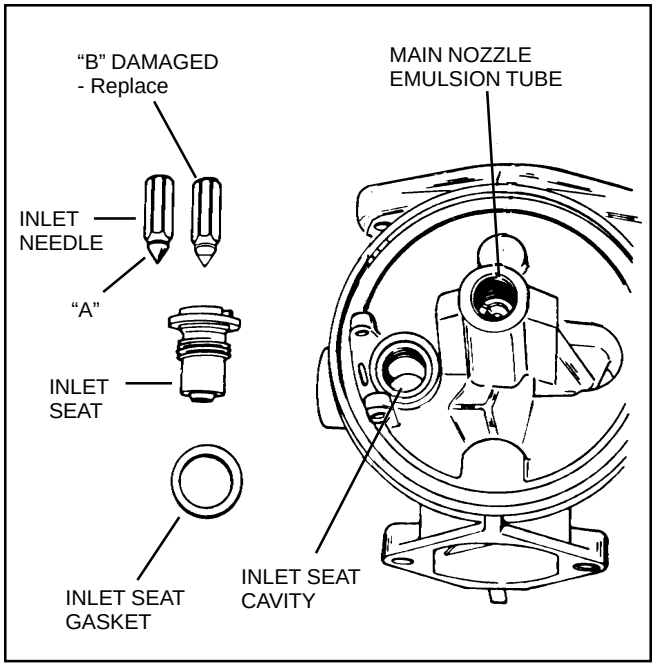


Install the throttle plate with the numbers (if present) facing out when closed. Move the throttle shaft to the closed position, place the throttle plate on the shaft and secure with the retaining screws. The throttle should move freely. If binding is present, correct by loosening screws and repositioning throttle plate.

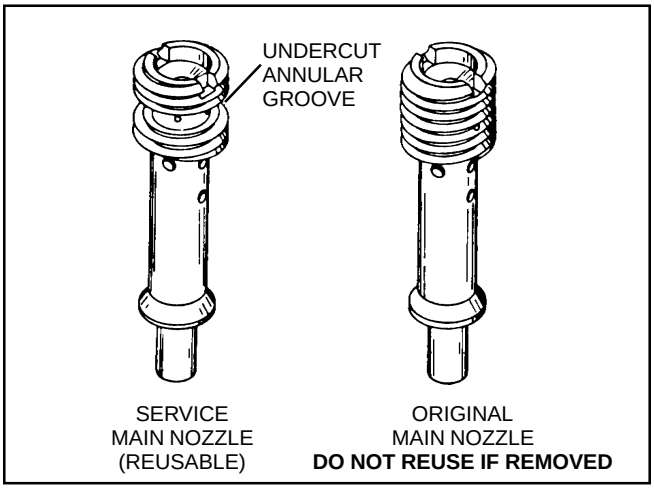


Examine the inlet needle. “A” is a needle that is serviceable, if the tip appears damaged as “B”, replace needle and seat assembly. Tighten the inlet seat to 40 to 50 inch pounds (4.5 - 5.7 Nm). Always use a new gasket. Clean all dirt from the inlet seat cavity.

Normally the main nozzle should not be removed. It is possible to clean the carburetor with solvent and compressed air. Remove and replace the main nozzle only if the high speed needle seat is damaged or because of excessive dirt.

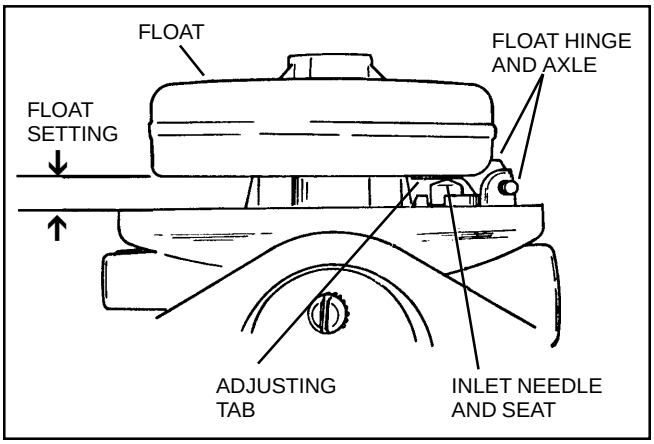


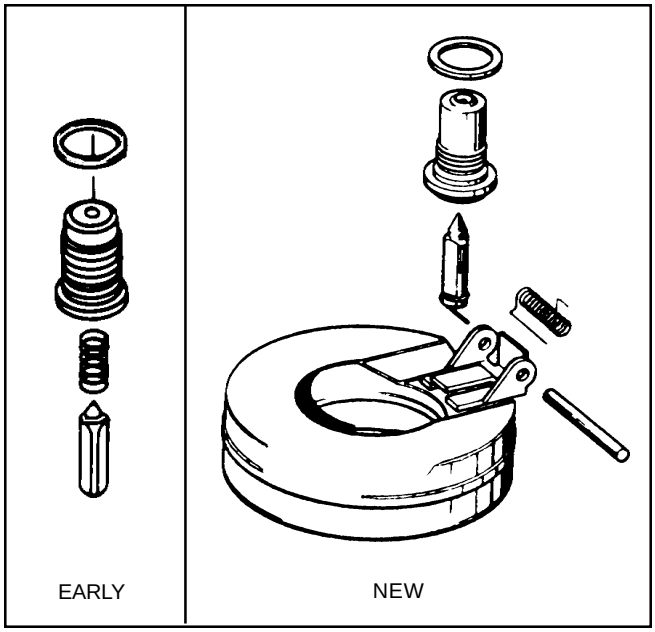
Do not remove the main nozzle. If it is necessary to remove the main nozzle to aid in cleaning, discard the main nozzle and use a service replacement nozzle with an under cut in the thread area. If the nozzle removed is under cut it can be reused. This procedure must be followed to assure delivery of fuel to the idle system.



Float settings are measured opposite the float hinge. Remove float by pulling out float axle. Bend adjusting tab to correct setting. Always remove the float to make adjustments.

Examine the float hinge and axle for wear. If evident replace the parts.





This shows early and new needle valve, seat, gasket, and spring assembly for large horsepower engine carburetors.

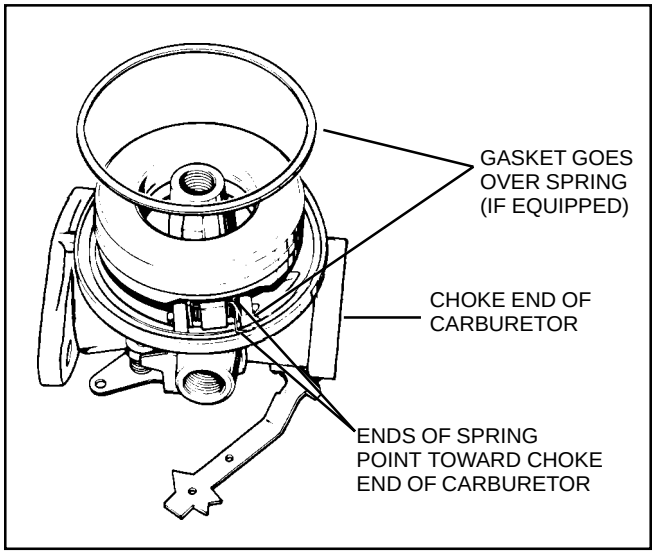
Early carburetors have a metal-to-metal needle and seat contact. The float setting for this model will be .110'' - .130'' (2.794 - 3.362 mm).

New carburetors contain a viton seal in the seat and a spring on the needle. For engines with the new carburetor and having a fuel pump, the float setting is .140 (3.556 mm).

For engines with the new carburetor, without a fuel pump, the float setting is .075 (1.905 mm).

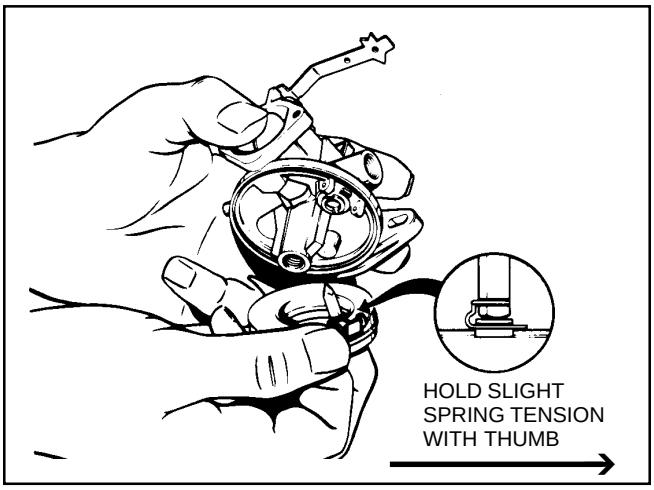
The float setting on carburetors used on vertical 8 and 10 H.P. engines is .070'' to .110'' (1.778 - 2.794 mm). No variance for carburetor having a fuel pump.

The gasket must fit over the float spring as shown to avoid cutting by the spring when assembled.



When assembling the float to the carburetor body, position the needle spring on the adjusting tag so that it hangs down. Hold the float spring under tension until the carburetor body will support the slight spring tension.

NOTE: THE SPRING ENDS MUST POINT TOWARD THE CARBURETOR CHOKE END.



Position the choke shaft and shutter in the closed position prior to tightening the screws. Hard starting may be due to insufficient choking action because of a misaligned choke plate. Correct by readjusting choke plate to close completely.

A typical choke shutter found on horizontal engines is shown in the figure below. The full choke position of choke lever is counterclockwise when viewed from top of the carburetor. Note cut-out position of choke shutter.

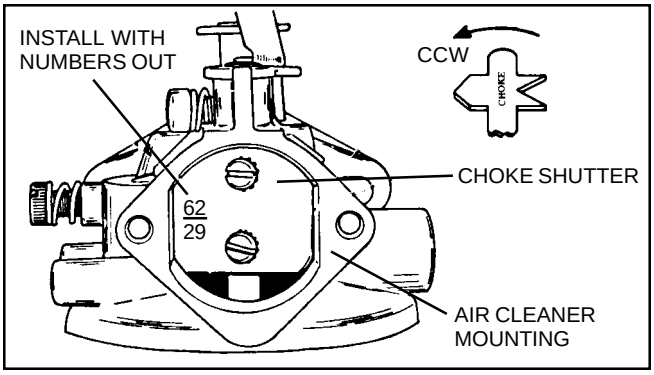
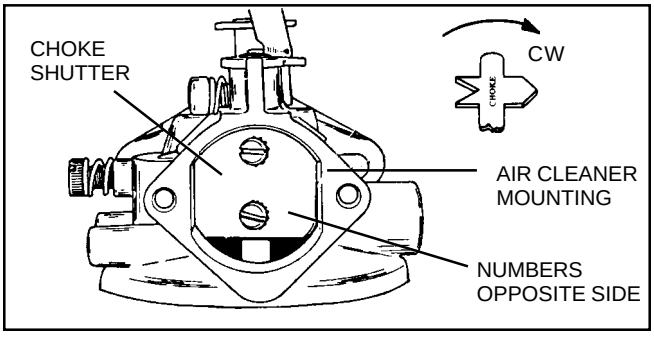
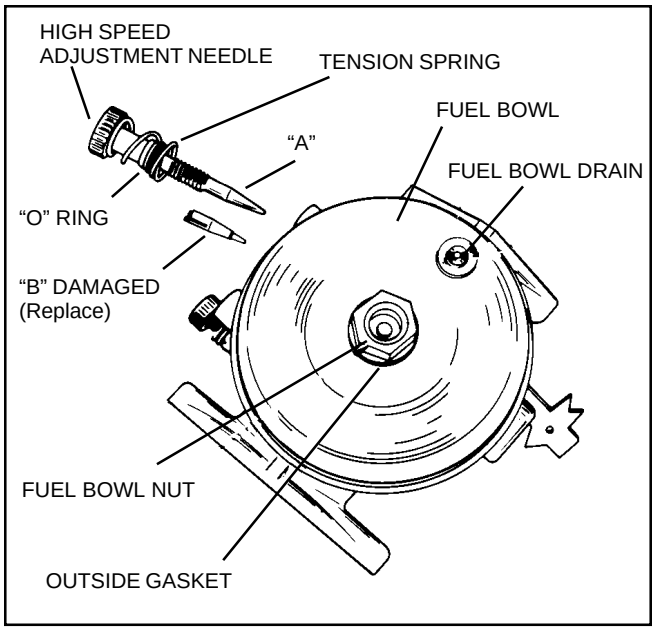


Figure below shows a typical choke shutter found on vertical engines. The full choke position of the choke lever is clockwise when viewing from the top of the carburetor. Note cut-out position of choke shutter.



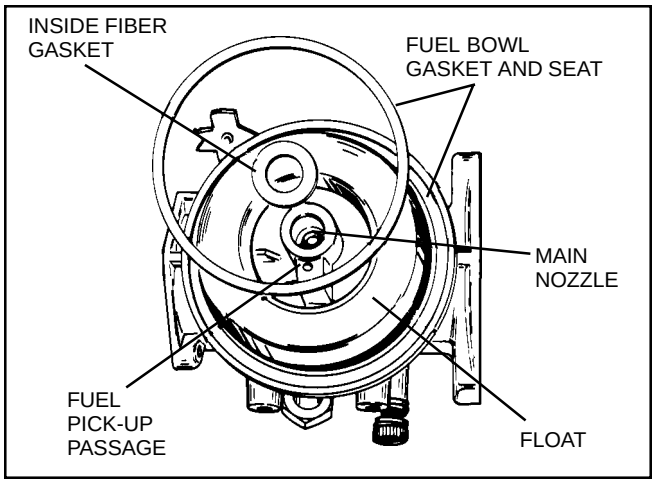
Prior to removing the fuel bowl nut, remove the high speed adjustment needle. Use a 7/16'' box end wrench or socket to remove the fuel bowl nut. When replacing the fuel bowl nut be sure to position the fiber gasket under the nut and tighten securely.

Examine the tip of the high speed needle, if it appears as illustrated, replace. If the tip of the high speed adjustment needle is damaged, the seat is probably damaged. The seat is part of the main nozzle. When replacing the high speed needle the main nozzle should also be replaced.



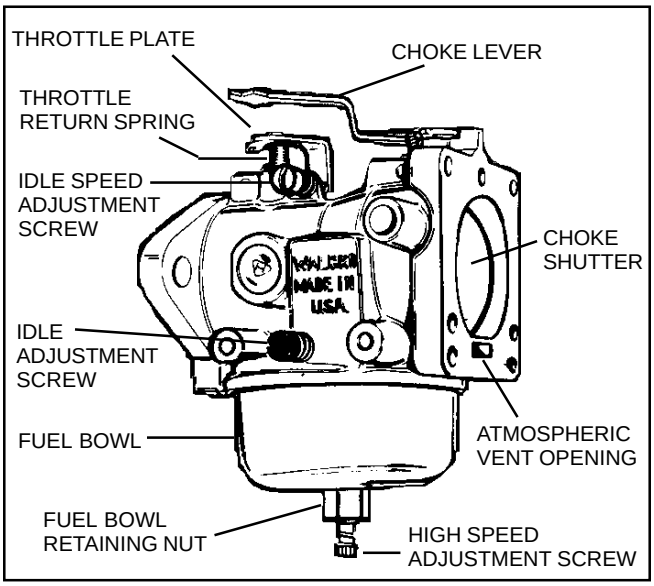
Use new gaskets when rebuilding the carburetor. If the fuel bowl to carburetor body gasket does not seat, enlarge by stretching with 4 or 5 quick short strokes. Fiber gasket must be used between center of fuel bowl and carburetor body.

The fuel pick up passage must be clean to assure adequate fuel flow from the fuel bowl to the metering systems.



SECTION 5. OVERHEAD VALVE ENGINE CARBURETORS

Overhead valve engines utilize Walbro carburetors.



CARBURETOR ADJUSTMENT. Carburetor factory adjustment should not be changed. However, if required, perform the following: with engine running (Allow engine to warm up for 5 minutes). Open throttle (speed control at "RUN" or "FAST" position). Adjust high speed adjustment screw per chart, clockwise or counterclockwise until engine runs smoothly. With control in idle or slow position, adjust idle speed adjustment screw to obtain correct idle speed. If necessary, readjust idle adjustment screw clockwise or counterclockwise until engine idles smoothly.

CARB.	HIGH SPEED ADJ. SCREW*	IDLE ADJ. SCREW*
OH120 THRU OH180	1 TURN*	1 TURN*
*All Adjustments Off of Seat		

IDLE ADJUSTMENT SCREW. Close idle adjustment screw by turning clockwise. Close finger tight only. Forcing will damage screw.

OPEN IDLE ADJUSTMENT SCREW: 1 turn counterclockwise.

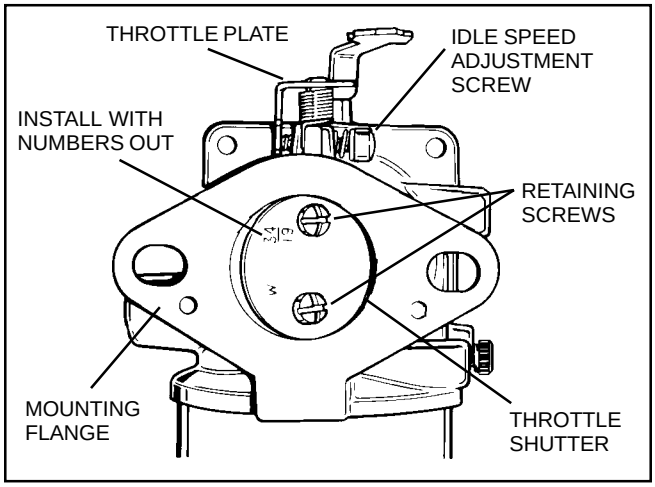
Start engine and with the throttle open (then return to idle position), adjust idle adjust screw one-eighth (1/8) turn at a time clockwise or counterclockwise until engine runs smoothly.

With control at "idle" or "slow" position, adjust idle speed adjustment screw to obtain correct idle speed. If necessary, readjust idle adjustment screw until engine idles smoothly.

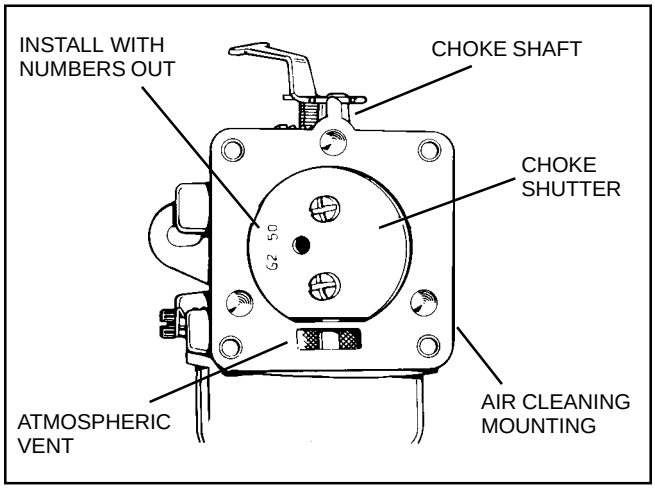
CARBURETOR SERVICING

Throttle Shutter

Install the throttle shutter with the numbers facing out when closed. Move the throttle shaft to the closed position, place the throttle shutter on the shaft and secure with new retaining screws. The throttle should move freely. If binding is present, correct by loosening screws and repositioning throttle shutter.

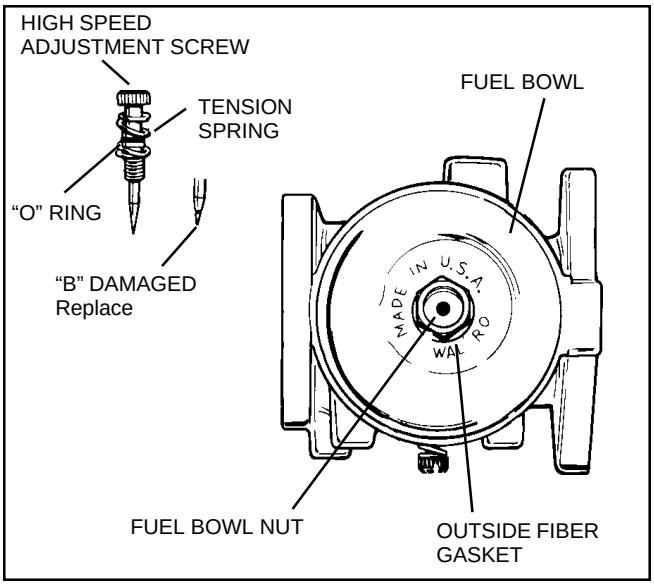


CHOKE SHUTTER. Position the choke shaft and shutter in the closed position to tighten the screws. Hard starting may be due to misaligned choke plate. Correct by readjusting the plate to close completely.



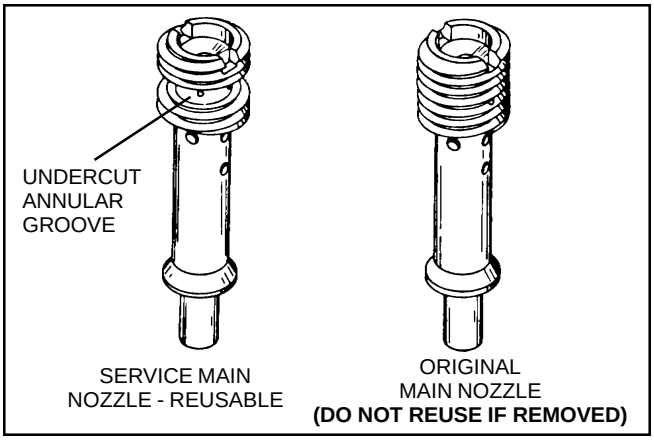
HIGH SPEED ADJUSTING SCREW. Prior to removing the fuel bowl nut, remove the high speed adjusting needle. When replacing the fuel bowl nut be sure to position a fiber gasket on each side of the fuel bowl.

Examine the tip of the high speed adjustment screw. If the tip of the screw is damaged, the seat, which is part of the main nozzle, is probably damaged. When replacing the screw, the nozzle should also be replaced with a service replacement nozzle only.

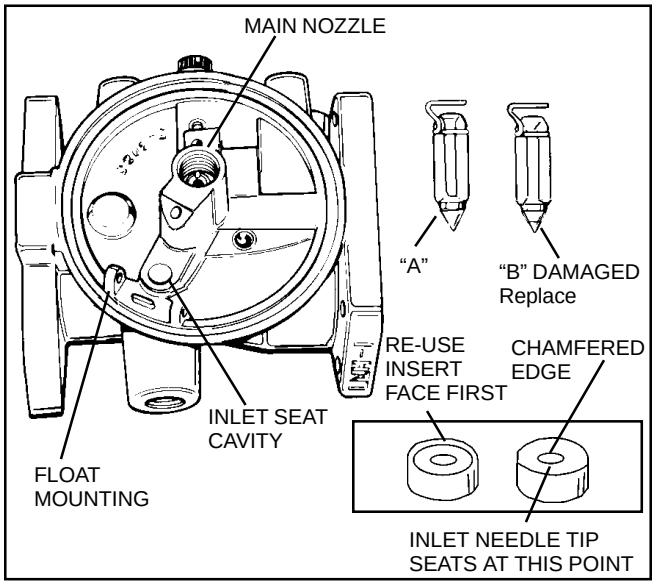


MAIN NOZZLE. Normally the main nozzle should not be removed, if it is, clean the carburetor with solvent and compressed air. Remove and replace the main nozzle only if the seat is damaged or is excessively dirty.

If it is necessary to remove the main nozzle, discard it and use a service replacement nozzle with an undercut in the thread area. If the nozzle removed is already under cut, it can be reused. This replacement assures delivery of fuel to the idle system.

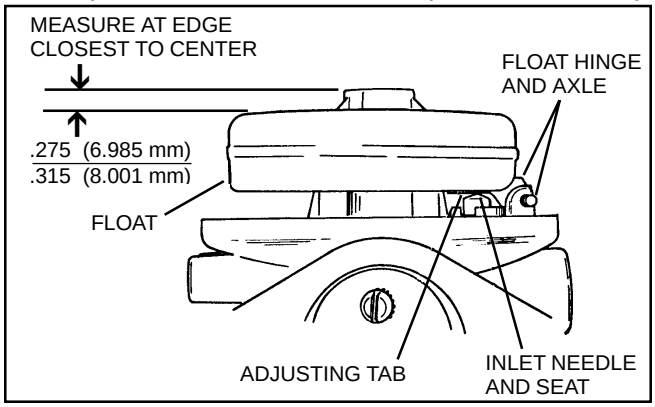


INLET NEEDLE & SEAT. The inlet needle and seat are replaceable as an assembly. If the tip appears damaged, replace the needle and seat assembly.



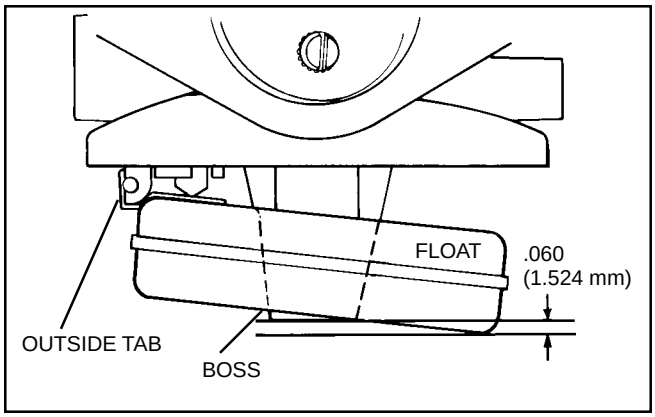
FLOAT SETTING. Float Settings are measured opposite the float hinge. Remove float by pulling out float axle. Bend adjusting tab to correct setting. Always remove the float to make adjustments.

Replace the float and axle if wear is evident. The float must measure .275" / .315'' (6.985 / 8.001 mm) from top of boss to surface of float (closest to center).

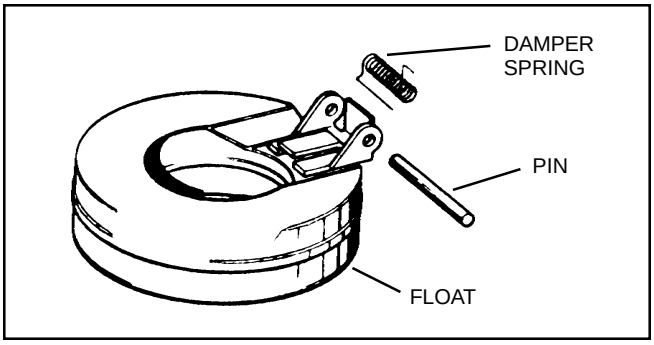


Position carburetor in an upright position.

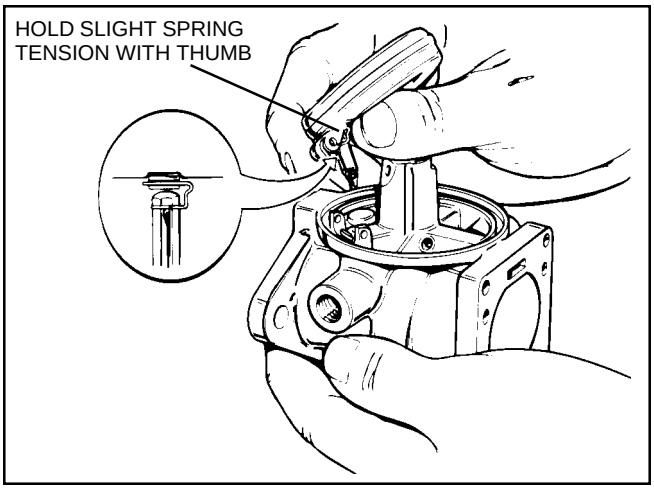
If float is lower than dimensions shown in figure, bend outside tab GENTLY so float does not drop plus or minus .060'' (1.524 mm) from base of boss.



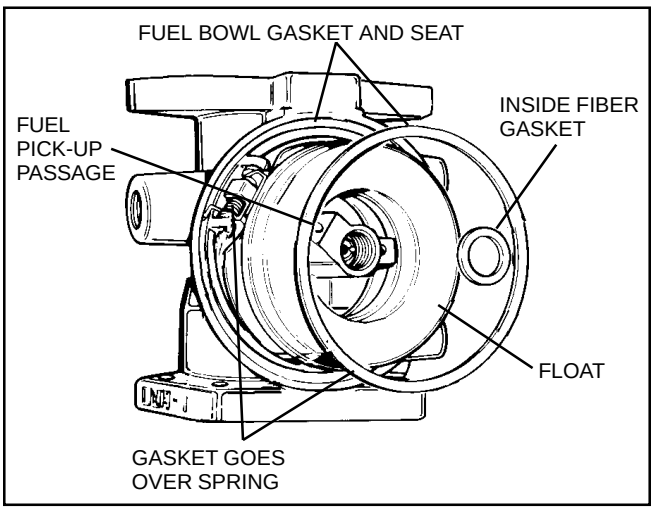
ASSEMBLING SEAT, SPRING & FLOAT. Shown below is the float, hinge pin, seat and the float spring.



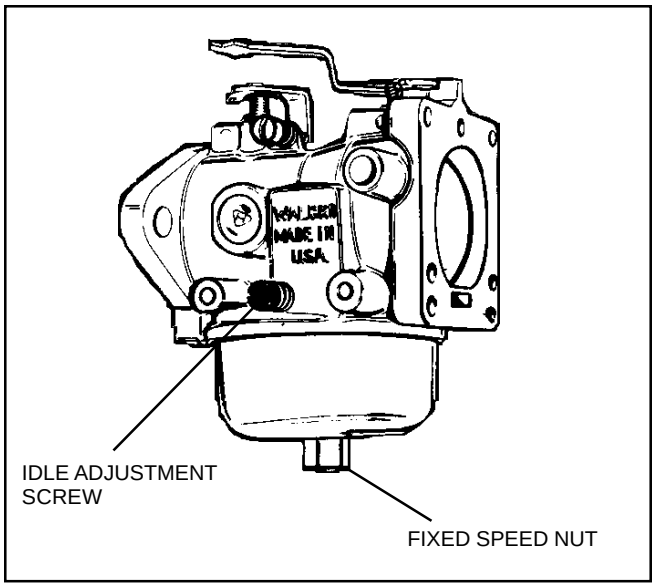
When assembling the float to the carburetor body, position the needle spring on the adjusting tang so that it hangs down. Hold the float damper spring under tension until the carburetor body will support the slight spring tension. The spring ends must point toward the carburetor choke end.



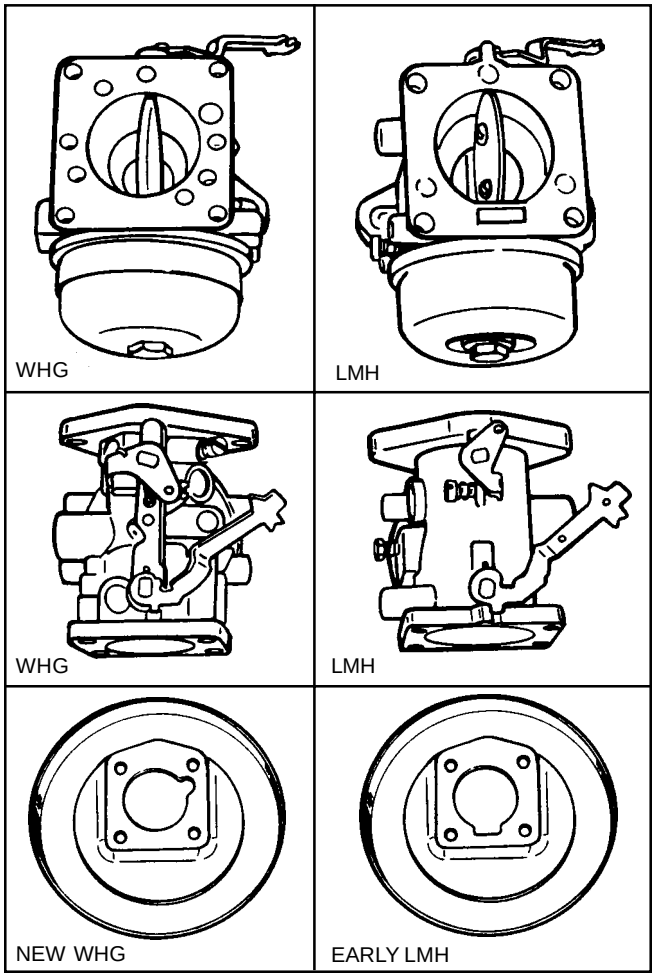
The bowl gasket must be positioned over the float spring as shown.



FIXED HIGH SPEED CARBURETOR. On carburetors of a later design the high speed screw has been replaced by a fixed speed nut. Adjustment is made only on the idle adjustment screw since the high speed setting is fixed.

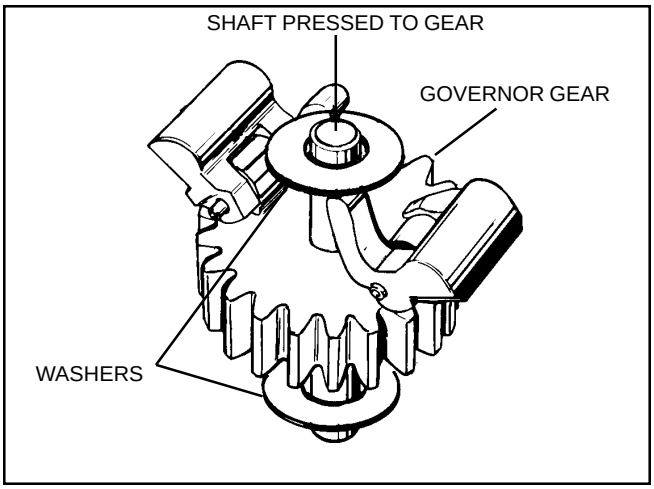


WALBRO WHG. The early production OH engine was equipped with a LMH carburetor. The newer engines since 1987 have been manufactured with a WHG carburetor. Service replacements are all WHG, which include an instruction sheet covering service.

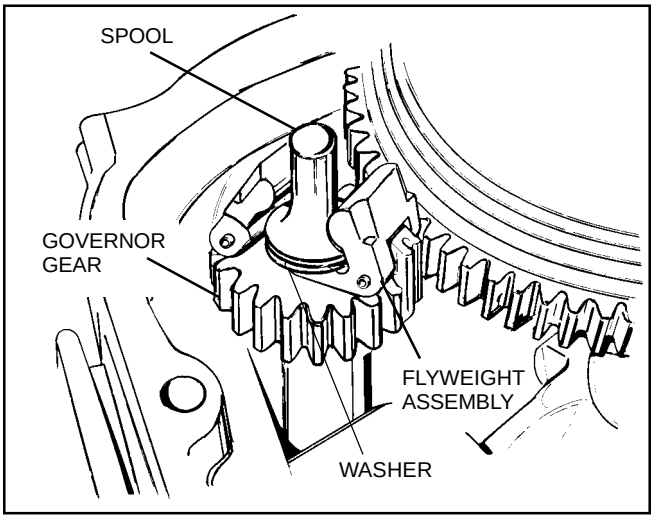


SECTION 6. GOVERNORS

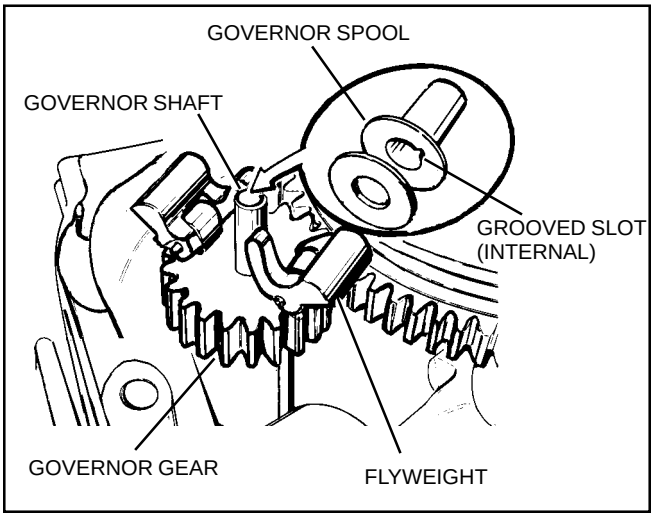
This Governor Assembly is used on current production HH & OH Tecumseh Engines.



To position the governor gear assembly, insert the shaft opposite the flyweights into the cylinder block.



Position the governor gear assembly (with washer under governor gear) to mesh with the camshaft gear. Place the governor spool (with washer under the spool) on the governor gear assembly, with the fingers of the flyweights under the rim of the spool.

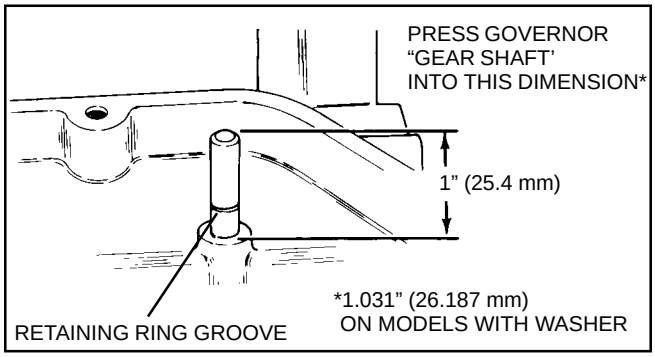


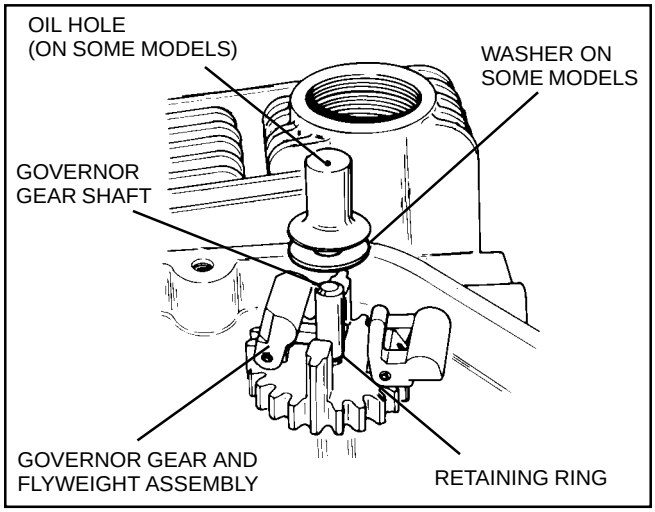
There is an oil groove on the inside of the spool to prevent oil pressure from building up under the spool.

Position the governor gear and flyweight assembly on the governor gear shaft. Secure with a retaining ring. Place the governor spool on the governor gear shaft.

The spool is positioned on the governor gear shaft with the fingers of the flyweight under the rim of the spool.

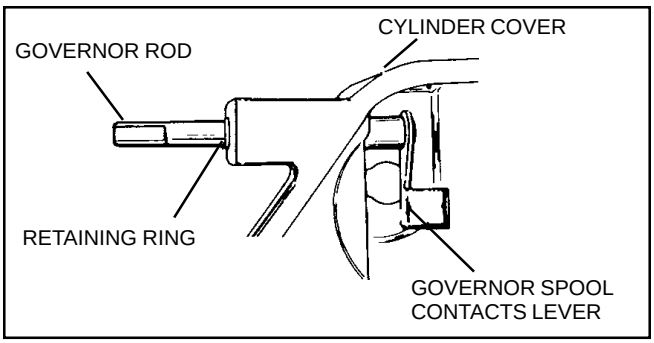
Some models have an oil hole in the closed end for lubrication. **CAUTION:** On reassembly make sure hole is open. Other models have a groove on the inside that serves the same purpose.





Remove the governor gear shaft by threading the shaft with 1/4-28 die. Place a number of washers on the shaft and turn on a nut. By tightening the nut against the washers the shaft will be pulled from the cylinder.

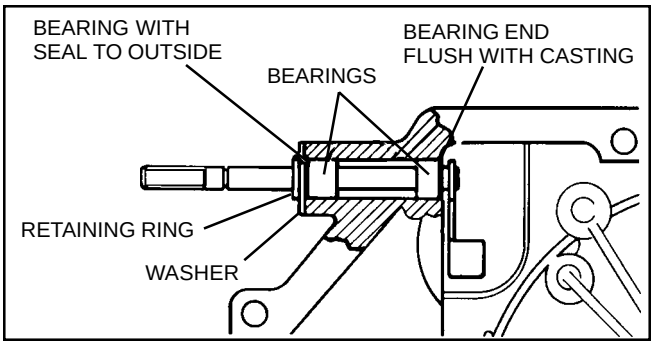
For old style governor assembly, position the governor gear shaft over the opening in the cylinder block and tap lightly with a hammer to start. Use a press to position. Refer to top picture for proper pressed in depth. Measure from the top of the governor gear shaft to the machined surface on the cylinder block.



The governor rod is retained in the cylinder cover bushing with a retaining ring.

The governor spool moves the governor rod by contacting the lever. Outward movement of the governor spool moves the governor levers and carburetor throttle to a closed position.

The lever must contact the governor spool tightly for best governor control and for correct adjustment procedure.



The governor rod on some valve-in-head model engines utilize needle bearings. If bearing(s) are removed, always install new bearing(s). Remove with 3/8'' (9.525 mm) diameter punch and mallet. To install, tap the first bearing in until the bearing end is flush with casting. Holding a finger over hole will indicate when bearing is driven into casting far enough. Drive the outside bearing in with edge flush with outside surface of casting and seal (in bearing) at outside end.

GOVERNOR ADJUSTMENT FOR HORIZONTAL ENGINES (See Picture: Governor Adjustment for Horizontal Engines)

Move remote controls to RUN position.

Loosen Screw “A”.

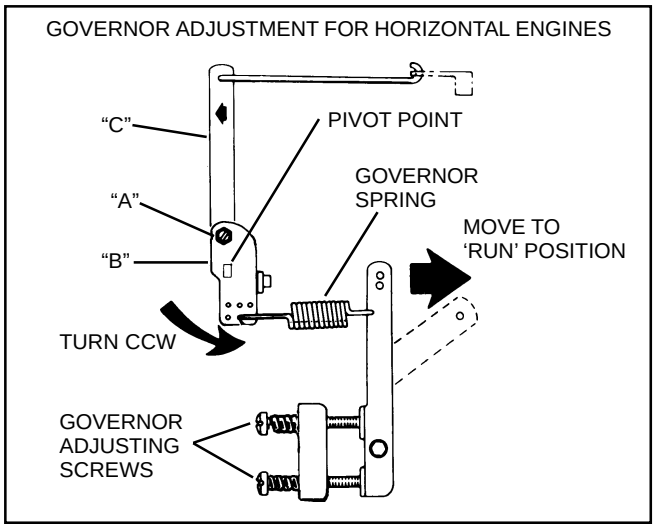
Pivot plate “B” counterclockwise (ccw) and hold.

Move lever “C” to left.

Tighten screw “A” securely.

When the governor is properly set, the carburetor throttle lever will be in a wide open position when the controls are set for starting.

The governor spring is to be anchored in the bottom center hole (D) of plate “B”. Do not stretch or cut the governor spring. Above adjustments will correct any variations in governor control.

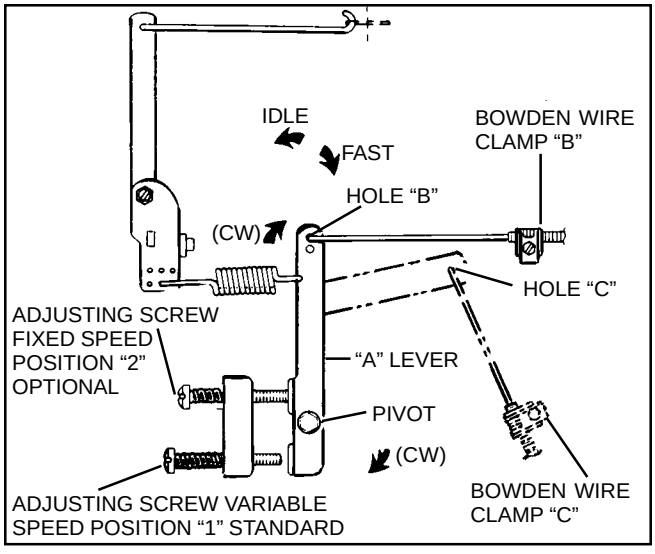


1. **SETTING VARIABLE SPEED ADJUSTING SCREW.** Before attaching the bowden wire, set the engine for maximum R.P.M. (See Mfg. specifications) with engine running. Use a good tachometer. Move lever “A” clockwise until lower end strikes the adjusting screw at “1”. (See picture below)

Loosen lock nut on adjusting screw and turn in to decrease R.P.M. Turn out to increase R.P.M.

CAUTION: DO NOT EXCEED RECOMMENDED R.P.M.

2. **ADJUSTING FIXED SPEED.** The fixed speed adjusting screw is the optional position “2”. Adjust it by starting the engine, then loosening the locknut. Turn screw in to increase R.P.M. and out to decrease R.P.M.



VERTICAL CRANKSHAFT GOVERNOR ADJUSTMENT.

Move remote controls to RUN position.

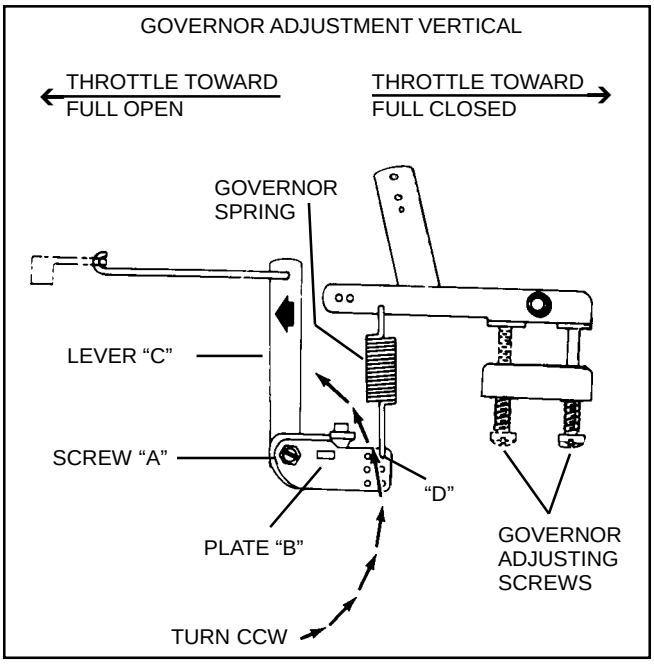
Loosen screw “A”.

Turn plate “B” counterclockwise (ccw) and hold.

Move lever “C” to left.

Tighten screw “A” securely.

When the governor is set properly the carburetor throttle will be in wide open position.



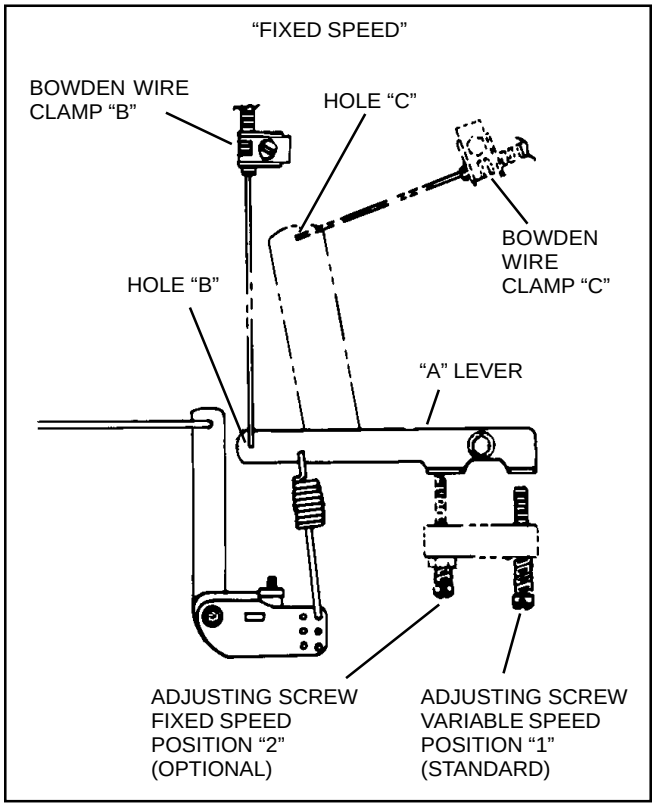
VARIABLE SPEED ADJUSTMENT. Before attaching the remote speed control (bowden wire) set the engine for maximum R.P.M. (See Mfg. specifications). Use a good tachometer.

Move lever “A” clockwise until lower end strikes the adjusting screw “1”.

Loosen lock nut on adjusting screw “1” and turn in (clockwise) to decrease R.P.M. and out counterclockwise to increase R.P.M.

CAUTION: DO NOT EXCEED RECOMMENDED R.P.M.

ADJUSTING FIXED SPEED. The fixed speed adjusting screw is the optional position “2”. Adjust it merely by starting the engine and after loosening the lock nut turn screw in (clockwise) to increase spring tension and hold engine at higher R.P.M. and out (counterclockwise) to decrease tension on spring and allow speed to be decreased more easily.

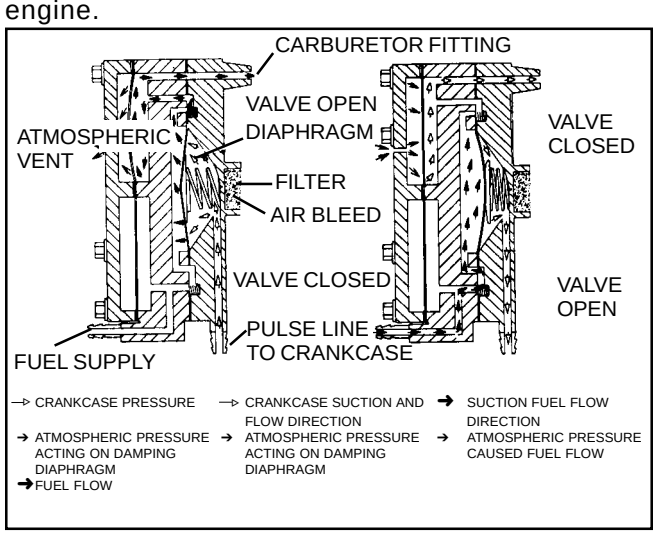


SECTION 7. IMPULSE FUEL PUMP

IMPULSE FUEL PUMP. This pump is mounted onto the carburetor inlet and has connections from the fuel supply and also a pulse line to the engine crankcase.

CAUTION: IN ORDER FOR THE PUMP TO OPERATE SATISFACTORILY THE CORRECT OIL LEVEL IN THE CRANKCASE MUST BE MAINTAINED. TOO MUCH OIL WILL ADVERSELY EFFECT THE PUMPS OPERATION.

It is operated by changing pressure created by the engine piston movement and transmitted to the pump through a pulse line. The increasing and decreasing pressures acting on the diaphragm and flap valves lift fuel from the fuel tank to the carburetor of the engine.

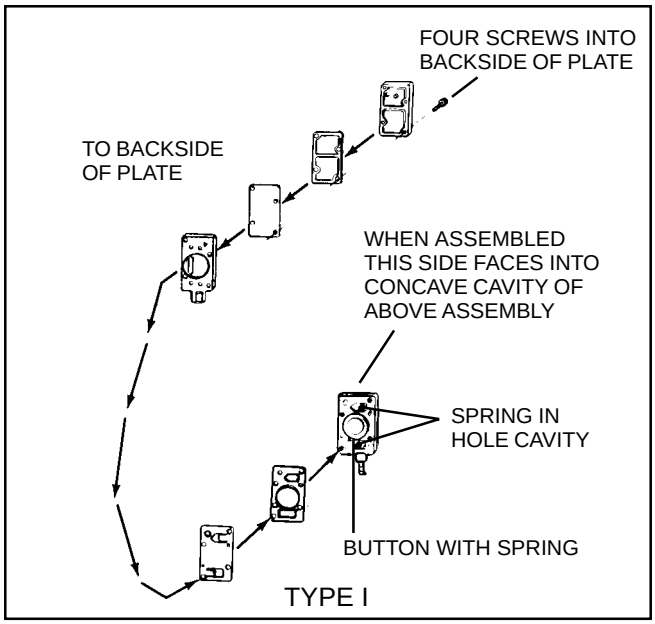


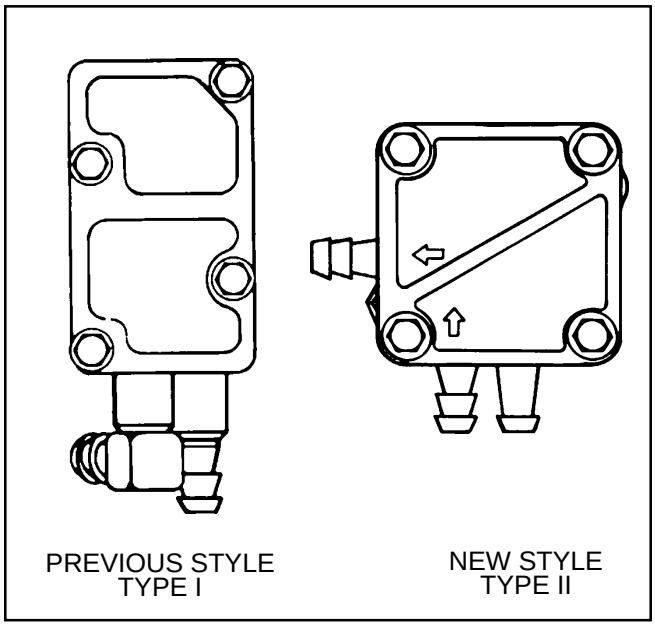
To service, separate the pump by removing the four (4) screws. Clean all new parts with a solvent and install a new kit which consists of coil springs, gaskets and diaphragms.

The diaphragms must be installed against the center body with the gaskets against the outside covers. The parts are designed so they cannot be misassembled without damage.

To test the unit, assemble the carburetor to the engine, leaving the pump off. Connect gravity fuel feed supply to the carburetor. With the pulse line connected to the pump and engine running, a definite flow should result.

If the flow is erratic or intermittent, the pump needs repair or replacement.





The new style pump (TYPE II) will replace older (TYPE I) pumps. An assembly kit is available with instructions and all the parts needed to convert to the new style. If a complete replacement of an old style is not necessary, a repair kit is still available.

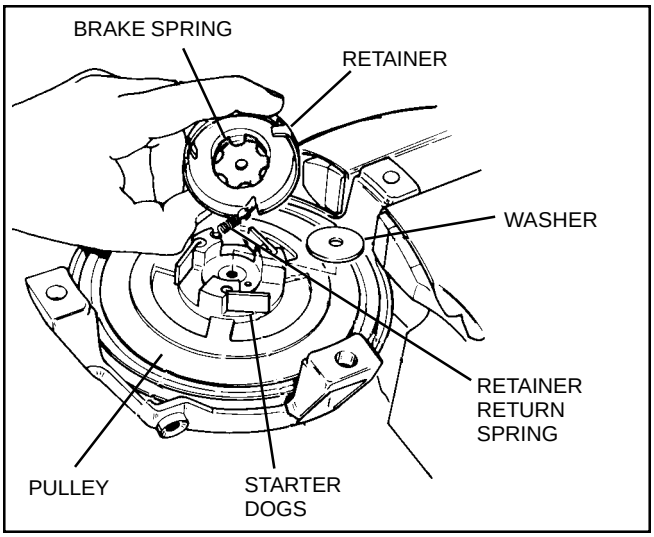
CHAPTER 3. REWIND STARTERS, ELECTRIC STARTERS, TROUBLESHOOTING AND GENERATORS

SECTION 1. REWIND STARTERS

REWIND STARTER DISASSEMBLY PROCEDURE

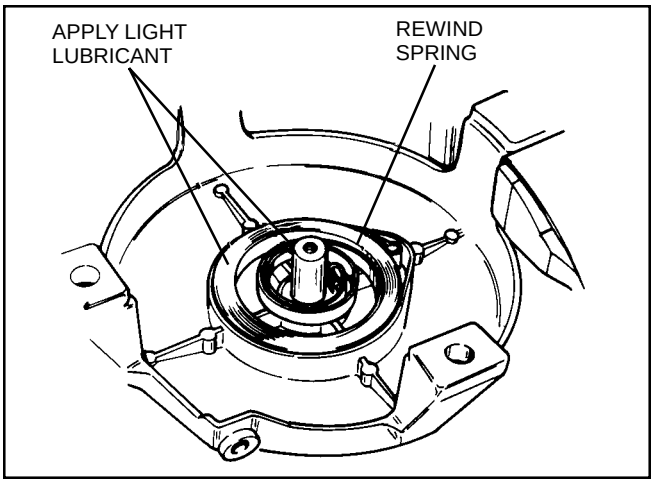
1. Clamp starter in a vise and pull rope out, and clamp pulley.
2. Untie knot in rope and remove.
3. Slowly release spring tension.
4. Remove retainer screw, retainer cup; starter dog and spring, and brake spring.
5. Lift out pulley, turn spring and keeper assembly to remove from housing.

Replace all worn or damaged parts.

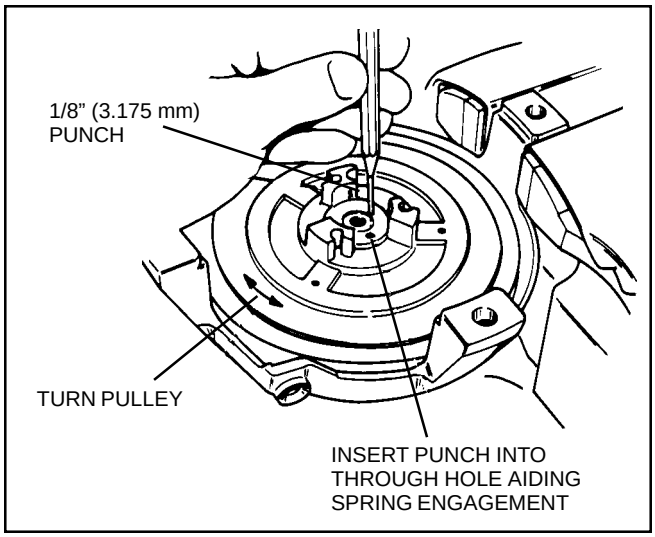


SPRING REPLACEMENT. Disassemble the starter completely.

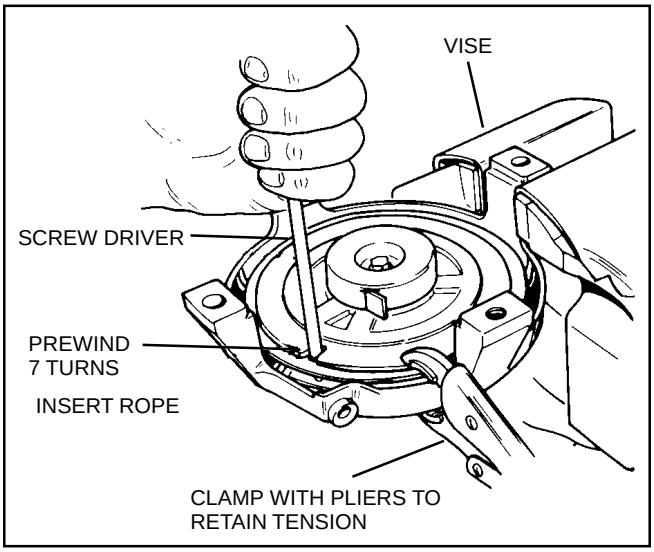
New springs are enclosed in retainers. Be sure spring is positioned with wrapping in direction as illustrated. Position new spring and retainer over housing and press the spring out of the retainer into the starter housing.



REASSEMBLY. Lubricate the recoil spring and center shaft with a small amount of light grease. Place the pulley over the center shaft and bottom. Insert a 1/8'' (3.175 mm) punch or rod into the through hole in the pulley, and turn the pulley. This will aid in positioning and engaging the spring.



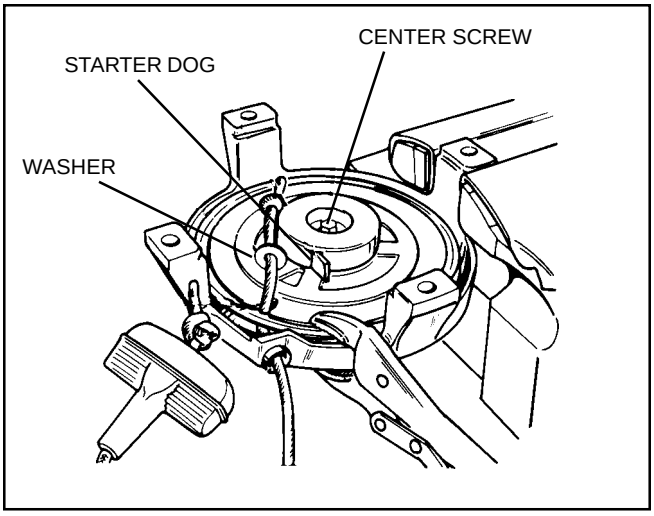
REWINDING SPRING AND REASSEMBLY. Place the large washer, 1-3/8'' (34.925 mm) over the center shaft. Insert the dogs, so that they will fold in close to the center. Press the brake spring on the retainer. The brake spring must be a tight fit on the retainer. Hold the retainer and brake spring assembly at an angle to engage the return spring to the dowel on the pulley. Secure with the center screw and washer and tighten securely. Failure of the starter to engage may be traced to either a loose center screw, or loose brake spring. Tighten the screw or replace the brake spring. Replace the rope as outlined.



ROPE REPLACEMENT. Prepare the rope, place a thin 3/4'' (19.05 mm) diameter washer with a 1/4'' (3.175 mm) hole on the rope and tie a knot. The other end of the rope should be thinned to a point for easier threading.

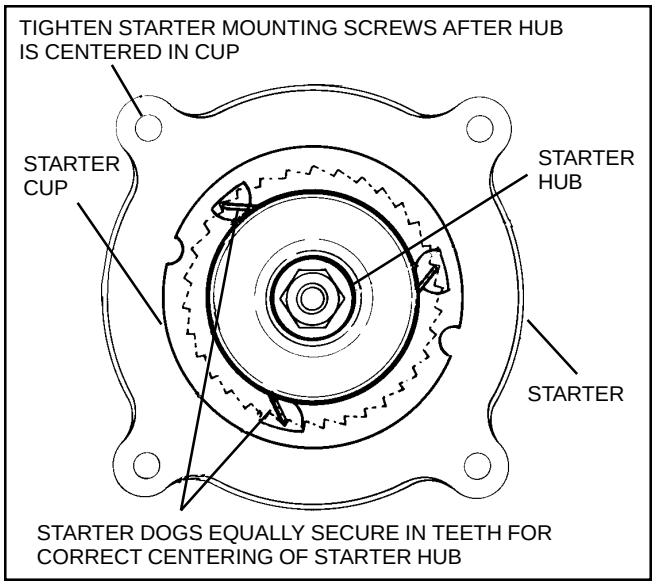
Clamp the starter in a vise, upside down, by one leg opposite the rope outlet. Place a screw driver in the rope hole of the pulley and turn counterclockwise until tight, then allow to unwind until hole in pulley for rope lines up with hole in housing. Clamp the pulley in this position with lever action pliers. Clamp over starter housing and pulley, protect the painted surface.

Insert the rope into the pulley hole and guide it with needle nose pliers through the rope outlet in the housing. Secure the handle with a double knot. Hold the rope taut, release the pliers and allow the rope to wind on the pulley.



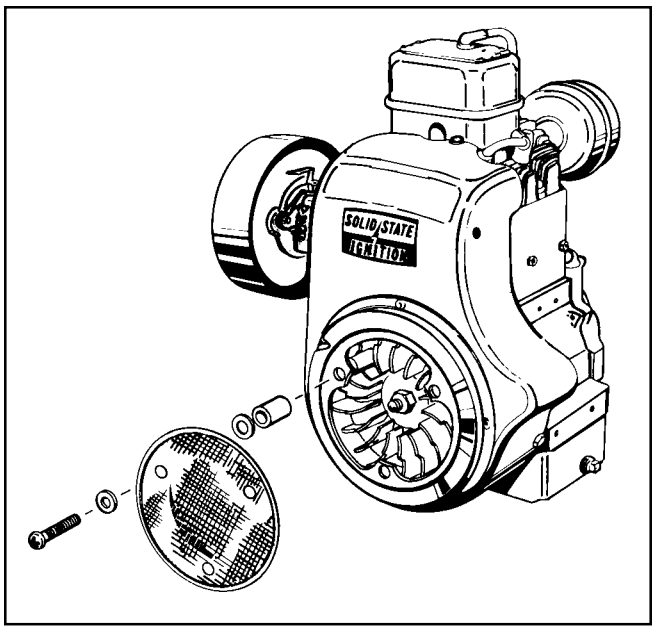
ASSEMBLING STARTER TO ENGINE. It is important to center the starter hub containing the starter dogs in the center cup so there is equal contact on all the dogs into the teeth of the cup.

Before securing the starter with the mounting screws, place the hub into the cup then pull the rope enough to cause the starter dogs to equally engage in the teeth. With the dogs securely in the cup, tighten the mounting screws to 40-60 inch pounds (4.5 - 6.8 Nm) torque. If mounting holes do not line up, blower housing is bent and must be replaced.



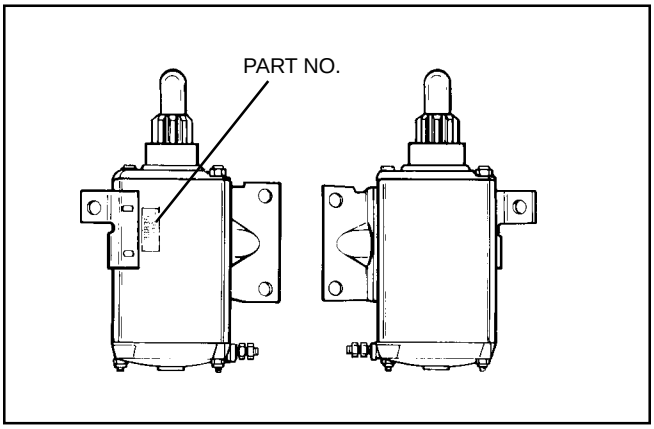
ON SOME VALVE-IN-HEAD ENGINES:

PULLEY (SHEAVE-TYPE) STARTER. Consists of a rope sheave-type. The engine comes equipped with starter rails and the blower housing is constructed with a removable plate for conversion to an electric start.



SECTION 2. ELECTRIC STARTERS

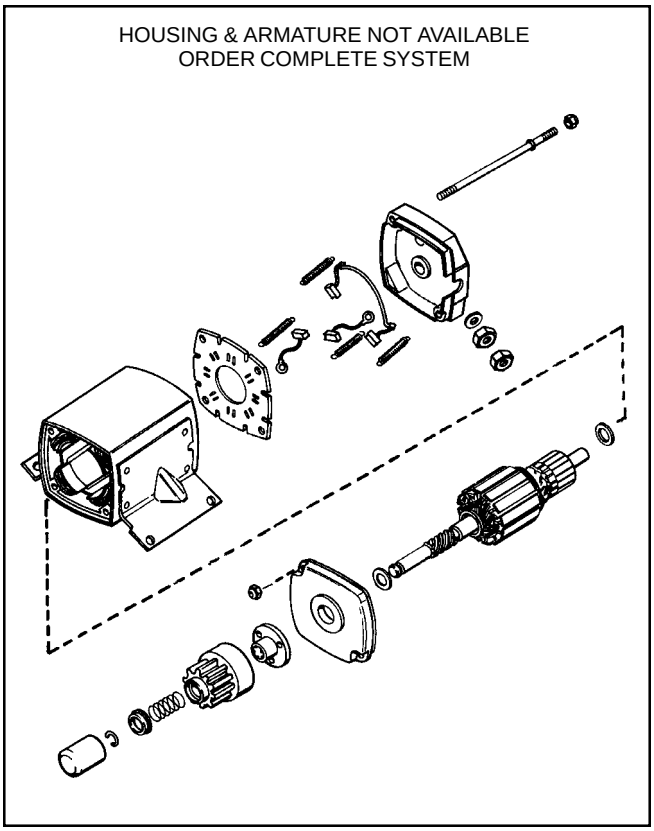
STARTER SERVICE, DISASSEMBLY AND INSPECTION. Part No. is found on identification tag. Used on large frame vertical and horizontal engines.



Repair of these starters consists of replacement of parts shown in the exploded view.

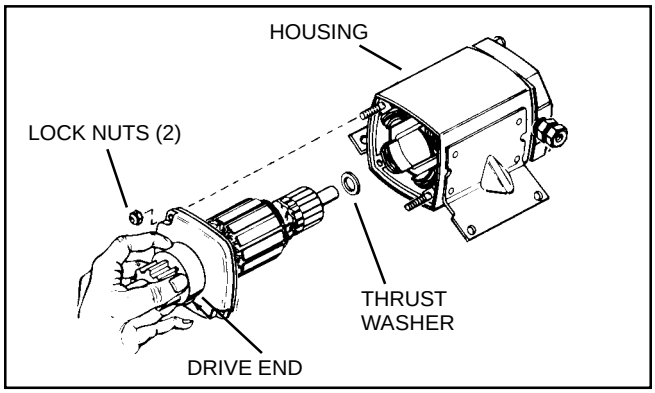
1. Testing
   Test 12 Volt starters under the following conditions:
   a. Conduct test with fully charged battery.
   b. Engine and oil temperature approximately 70° F (21°C).
   c. Engine contains recommended oil.
   d. Cranking test not to exceed 10 seconds.
   e. Parasitic loads removed from engine.

MODEL	AMPERES	ENGINE RPM
33835	70 MAX.	600 MIN.

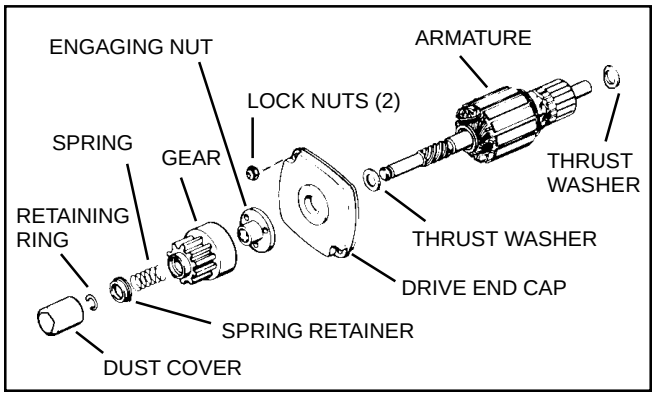


Test and trouble shooting procedures for 12 volt starters can be found in other Sections of this chapter.

2. Disassembly.
   a. Remove two (2) lock nuts from thru bolts on drive end of starter.
   b. Grasp drive end of starter and remove from housing as an assembly.



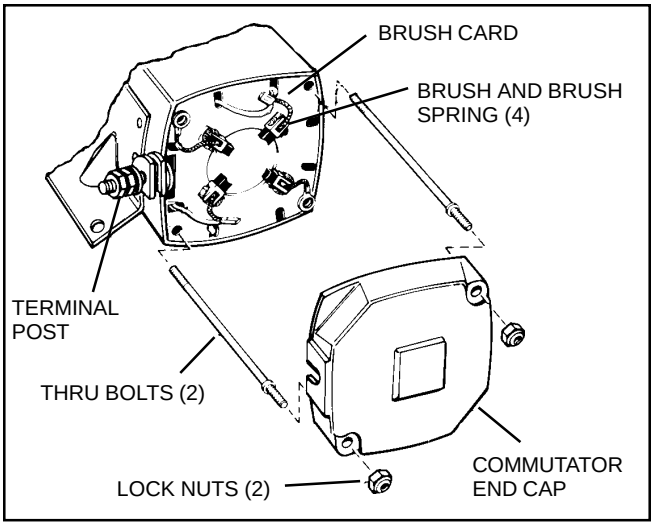
   c. Remove dust cover, retaining ring, spring retainer, anti-drift spring, gear and engaging nut. Remove drive end cap from armature.



   d. To remove end cap assembly, loosen the nut on terminal post. Remove the lock nuts and thru bolts from starter housing. Remove brushes or brush card separately or as an assembly.

      NOTE: Care must be taken in removing and reinstalling brush springs to eliminate damage to spring and malfunction of brushes.

3. Inspection
   Inspect, clean and replace parts if necessary. Test motor parts for open and shorted circuits.



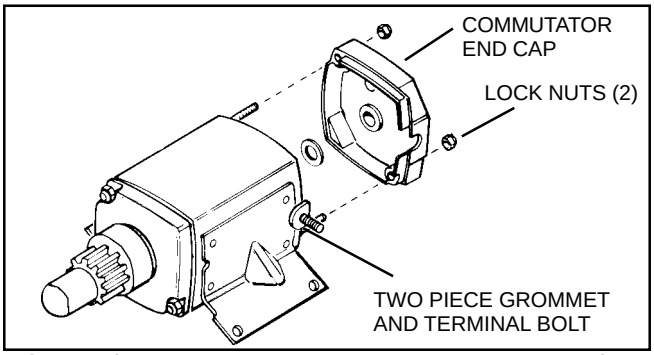
4. Assembly

   a. Install drive end cap, engaging nut and gear, anti-drift spring, spring retainer, retaining ring, and dust cover to armature. Install armature into housing.

   b. Install brush card assembly and two (2) thru bolts so stops on bolts will secure brush card. Secure lock nuts on drive end of starter.

   c. Install thrust washer on armature and install commutator end cap. Insure that the two-piece grommet is properly installed to prevent moisture from entering this area.

   d. Install end cap lock nuts.



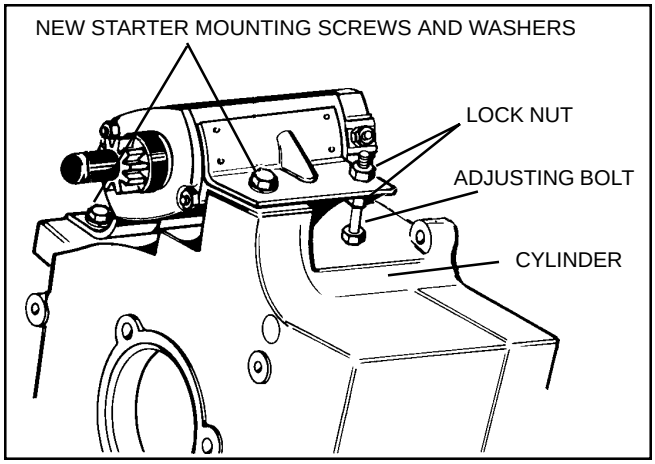
When using starter motor, part no. 33835 to replace starter part no. 32817 on vertical crankshaft models, proceed as follows.

1. Remove the two (2) 5/16-18 x 7/8'' (22.225 mm) screws that attached the original starter and discard.

2. Install the 5/16-18 x 1-3/8'' (34.925 mm) adjusting bolt through the hole in the starter bracket with a lock nut on each side of the bracket. Position bolt so head will not touch cylinder when starter is installed.

3. Install motor with two (2) 5/16-18 x 5/8'' (115.875 mm) screws and lockwashers. Torque screws to 140-170 inch lbs. (18.2 - 19.2 Nm).

4. Turn adjusting bolt so head of bolt securely bottoms on cylinder. Tighten nuts to hold bolt in position.



STARTER MOTOR TESTS

a. Preliminary Tests

Before checking the starter motor perform the following preliminary checks:

1. Battery must be at least 3/4 full charge.
2. Determine parts such as switch, solenoid, between power source and starter motor are in good working order.
3. Terminals must be bright and clean for full conductance.
4. Check wires for breaks, insulation breakdown.
5. Proper size (gauge) wire between power source and starter motor.
6. If starter motor does engage the flywheel but fails to crank engine, check the engine for excessive friction caused by a seized rod or piston.
7. Check related parts such as clutches, pulleys, etc. for excessive friction.

b. Visual Checks

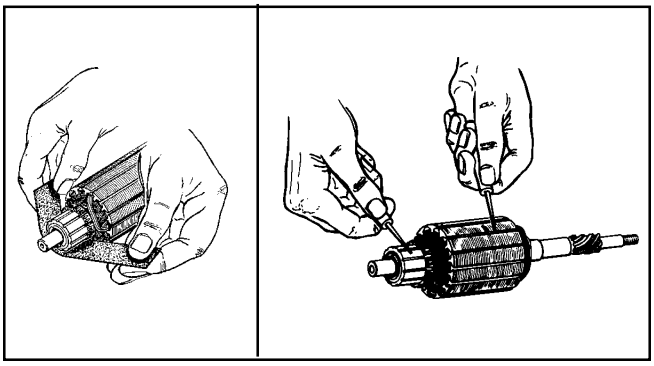
Make a visual check of the starter motor before checking electrically. Remove the starter motor and check for freedom of operation by turning the shaft. Look for:

1. Worn out brushes.
2. Weak brush springs.
3. Dirt on the commutator bars.
4. Armature binding, caused by dirt or bushings being gummed up through excessive lubrication.

STARTER CHECKING AND SERVICE. Remove nuts at both ends of starter and take off rear end cap.

CHECK FIELD. Using a continuity light or ohm meter, check field by attaching one lead to each field coil connection. Continuity should exist between these two points. Check continuity between each field coil connection and the starter housing. No continuity should exist.

ARMATURE CHECK. If commutator bars are glazed or dirty they can be turned down in a lathe. While rotating, hold a strip of 00 sandpaper lightly on the commutator, moving it back and forth. (Do not use emery cloth). Recut grooves between commutator bars to a depth equal to the width of the insulators.

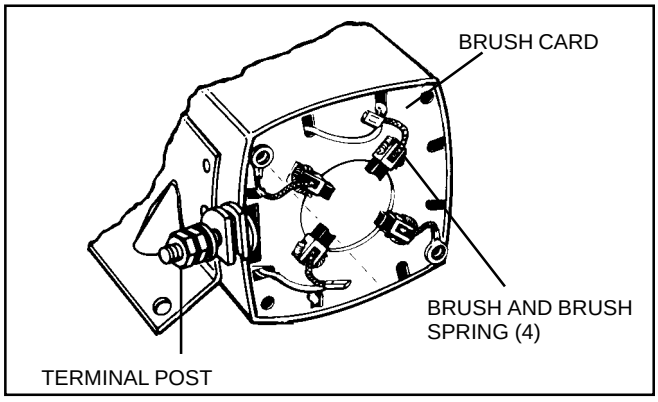


Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature, rotate armature and check out all commutator bars.

The armature can be thoroughly checked with a growler if available.

CHECK BRUSHES. Before removing armature, check brushes for wear. Make sure brushes are not worn to the point where the brush wire bottoms out in the slot of the brush holder. Brush springs must have enough strength to keep tension on the brushes and hold them against the commutator.

If brushes need replacement, remove by unhooking terminals or clipping connections and resoldering. If brush card is warped from overheating, replace the brush card assembly.



INSTRUCTIONS FOR REPLACING STARTER BRUSH CARD #33848 ON STARTER #33835

1. Loosen the two nuts on the starter terminal post, but do not remove.
2. Remove the nuts holding the starter and cap in place. Remove the starter end cap. Note the thrust washer on the end of the armature.
3. With a pliers or vise grip tool, grasp the through-bolts as close to the flanged end as possible (away from the threaded end), and remove the two nuts retaining the driving end cap of the starter. Remove the armature and driving cap assembly. Remove the two through-bolts, noting the position of the brush ground eyelet under the through-bolt flange.
4. Note the position and the connections of the brush wires. Clip the solid field wires as close to the connectors as possible.
5. Remove the brush card from the starter, noting the position of the clearance slot. Clean the starter and all parts of accumulated dust and dirt. Scrape the insulating varnish off of the solid field wires, back approximately 1/2” (12.7 mm) from ends.
6. Insert the new brush card into position, guiding the solid field wires through the proper slots in the brush card.
7. Using the proper crimp connector, crimp and solder the remaining brush leads to the solid field wires. Use a pair of pinchers or needle-nose pliers to hold the woven brush lead adjacent to the connector while soldering (this provides a heat sink so that solder does not flow up the brush lead). Using electrical tape or shrink tubing, insulate the crimped connection nearest the starter terminal post. Position the wires to prevent shorts or grounding of the starter.
8. Spread the brushes to install the armature into the housing, and replace the starter through-bolts, being sure to install them through the ground brush eyelet terminals. Install and tighten the drive end through-bolt nuts. Tighten securely, but do not over tighten as this may warp the new brush card and impair brush movement.
9. Replace the thrust washer on the end of the armature and replace the starter end cap. Install the starter end cap locking nuts and tighten securely. Tighten the nut on the starter terminal post.
10. Test the starter for proper operation before reinstallation on the engine.

SECTION 3

12 VOLT STARTER TROUBLE SHOOTING CHART

PROBLEM	PROBABLE CAUSE	FIX
Does not function	Weak or dead battery	Check charge and/or replace battery.
	Corroded battery terminals and/or electrical connections	Clean terminals and/or connections.
	Brushes sticking	Free brushes. Replace worn brushes and those that have come in contact with grease and oil.
	Dirty or oily commutator	Clean and dress commutator.
	Armature binding or bent	Free armature and adjust end play or replace starter.
	Open or shorted armature	Replace starter.
	Shorted, open or grounded field coil	Replace starter.
	Loose or faulty electrical connections	Correct.
	Load on engine	Disengage all drive apparatus and relieve all belt and chain tension.
	Electric starter cranks but no spark at spark plug.	Disconnect ignition cutoff wire at the engine. Crank engine. If spark at spark plug ignition switch, interlock switch and safety switch is inoperative. If no spark, check magneto. Check wires for poor connection cuts or breaks.
	Electric starter does not crank engine	Remove wire from starter. Use a jumper battery and cables and attach directly to starter. If starter cranks engine the starter is okay; check solenoid, starter switches, safety switches and interlock switches. Check wires for poor connections, cuts or breaks.
Low RPM	Unit controls engaged	Insure all unit controls are in neutral or disengaged.
	Worn bearings in cap assemblies	Clean bearings or replace cap assemblies.
	Bent armature	Replace starter.
	Binding armature	Free up armature. Adjust armature end play.
	Brushes not seated properly	Correct.
	Weak or annealed brush springs	Replace springs.
	Incorrect engine oil weight	Insure the correct weight of oil is being used.
	Dirty armature commutator	Clean commutator.
	Shorted or open armature	Replace starter.
	Loose or faulty electrical connections in motor	Correct.
Motor stalls under load	Shorted or open armature	Replace starter.
	Shorted field coil	Replace starter.

12 VOLT STARTER TROUBLE SHOOTING CHART (Cont.)

PROBLEM	PROBABLE CAUSE	FIX
Intermittent operation	Brushes binding in holders	Free up brushes. Replace worn brushes and those that have come in contact with grease and oil.
	Dirty or oily commutator	Clean and dress commutator. Replace any brush that has come in contact with grease or oil.
	Loose or faulty electrical connections	Correct.
	Open armature	Replace starter.
	Break in electrical circuit	Disconnect ignition cutoff wire at the engine. Crank engine. If spark, check ignition switch, safety switch, and interlock switch. Check wires for poor connections, cuts or breaks.
Sluggish disengagement of the drive assembly pinion gear	Dirt and oil on drive assembly and at armature shaft	Clean drive assembly and armature shaft and lubricate shaft splines.
	Bent armature	Replace starter.

CHAPTER 4. GENERAL VALVE INFORMATION, CYLINDER HEAD AND BREATHER ASSEMBLY

SECTION 1. GENERAL VALVE INFORMATION

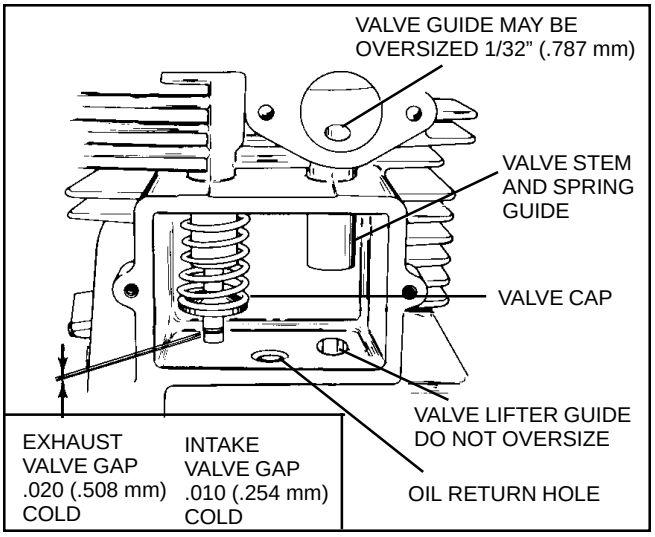
Adjusting valves for 8 horsepower and larger engines (except valve-in-head engines)

Intake valve gap .010, (.254 mm) exhaust valve gap .020, (.508 mm) set when engine is cold. Rotate the engine to Top Dead Center of the compression stroke, this will assure that the lifter is not raised by the compression relief pin. Valve stem ends must be ground flat when adjusting valve gap. An uneven or concave end can cause abnormal wear to the valve train.

The outside of the valve stem guide also guides the valve spring. A valve spring cap is used only on the bottom of the spring. A pin through the valve stem retains the spring.

Use a step type reamer to enlarge valve guides if worn. Oversize valves are 1/32'' (.787 mm) larger in diameter than standard. (For oversize reamer, Consult Chapter 11).

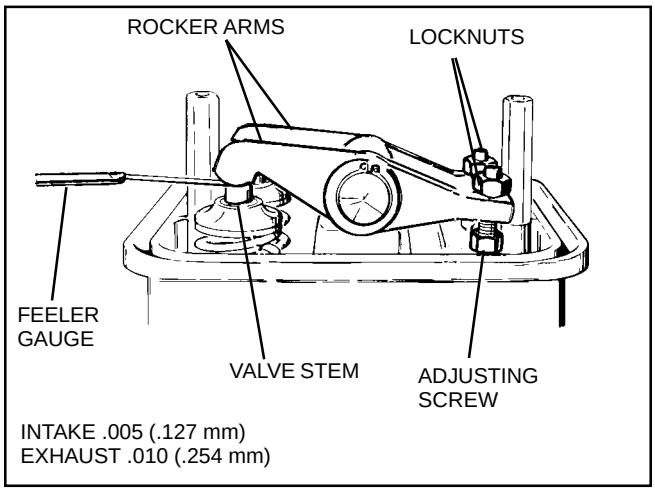
Do not enlarge the valve lifter guide, lifters with oversize stems are not available.



ADJUSTING VALVES ON OVERHEAD VALVE ENGINES. Remove the breather and top half of the valve cover. Rotate the engine to Top Dead Center of the compression stroke. Adjust the exhaust valve to .010 (.254 mm) and .005 (.127 mm) for the intake valve.

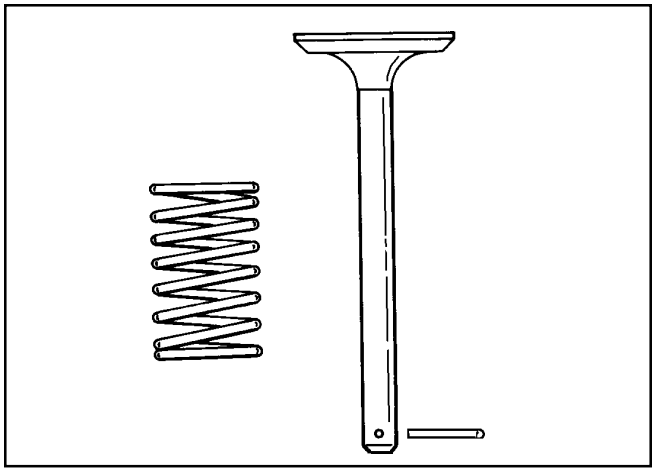
Assure that the locknut is loosened before attempting to turn adjusting screw. After the locknut is loosened, turn the adjusting screw with an open end wrench. Turn adjusting screw clockwise to decrease clearance and counterclockwise to increase clearance.

TURN ADJUSTING SCREW: CLOCKWISE TO DECREASE LASH, COUNTERCLOCKWISE TO INCREASE LASH.



VALVES. Valves must be in good condition, properly sealing and the proper gap must be maintained for full power, easy starting and efficient operation.

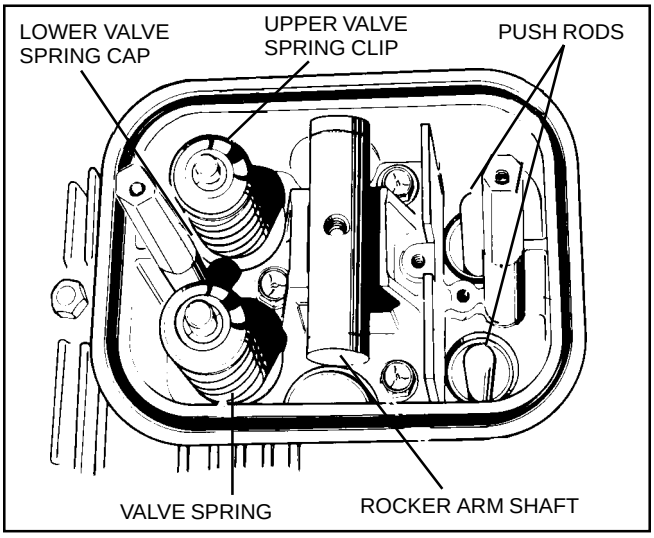
VALVE REMOVAL On 8 H.P. and Larger (except valve overhead engines). To remove valves, raise the lower valve spring caps, while holding the valve head tightly against the seat, and remove pin.



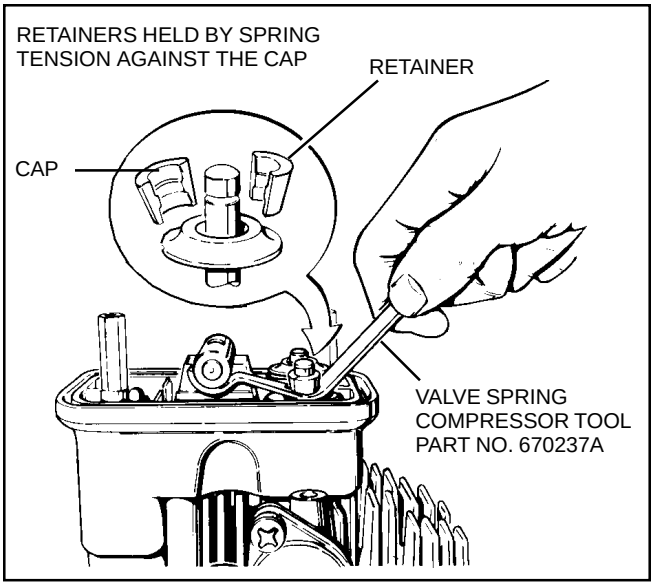
VALVE REMOVAL PROCEDURE FOR VALVE-IN-HEAD ENGINES.

The following is necessary for cylinder head disassembly.

REMOVAL OF ROCKER ARM HOUSING PARTS. Locate the piston at top dead center for easier access in servicing the valve train. After removing the rocker arms by removing the retaining rings, it may be necessary to loosen the locknut and back off the adjusting screw before pulling off the rocker arms. NOTE: Rocker arm shaft is not an inseparable unit from the rocker arm housing and should not be removed from the housing.



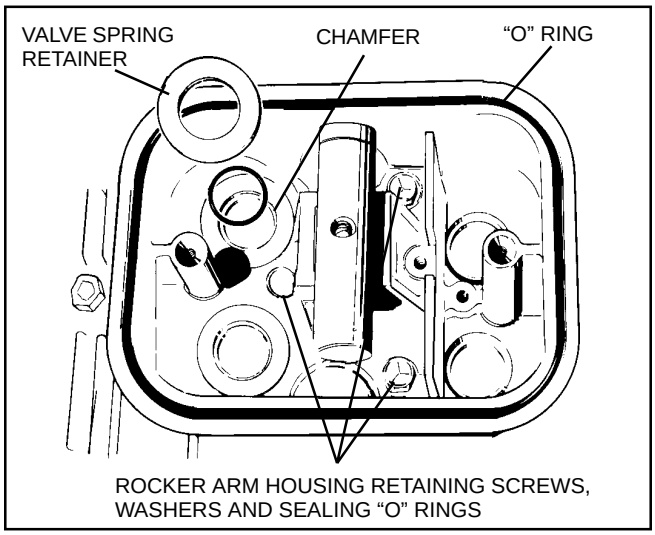
REMOVAL OF VALVE SPRINGS. Use a valve spring compressor tool, part No. 670237A to compress the valve spring and remove the valve retainers. Be sure piston is at T.D.C. The valve cap is then taken off for removal of the spring. When reinstalling the valve cap and retainers after valve servicing, it may be necessary to hold both valves in their seats until the springs, cap, and retainer have been installed on the valve stems. Access can usually be gained through the exhaust and intake manifold in the head.



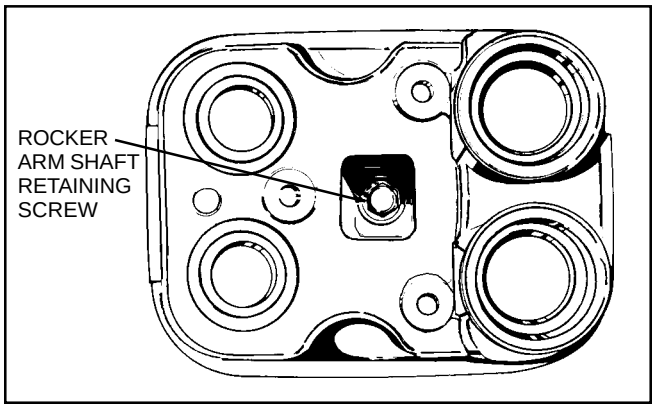
REMOVAL OF ROCKER ARM HOUSING. Remove rocker arm housing by removing the retaining cap screws. The valve spring retainer cupped side must be facing in the up position.

A white Teflon “O” Ring is used under the valve spring retainer on the exhaust valve. The regular black rubber “O” Ring is used under the valve spring retainer on the intake valve. Be careful not to switch rings, or damage may result.

Remove head to remove the valves - Reverse procedure for reassembly.



ROCKER ARM SHAFT. The rocker arm shaft is not a replaceable part. The rocker arm housing, rocker arm shaft and screw are an inseparable assembly.



VALVE SPRINGS FREE LENGTH

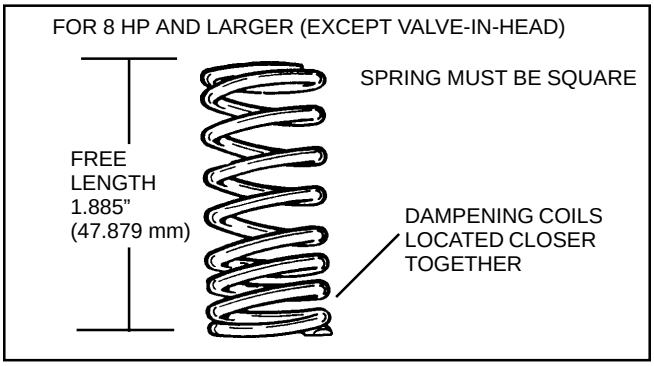
FOR 8 HORSEPOWER AND LARGER ENGINES (EXCEPT VALVE-IN-HEAD ENGINES). Valve springs should be replaced when an engine is overhauled. Weak valve springs will spoil the best overhaul job.

Valve spring free length should be checked. Comparing one spring with the other can be a quick check to notice any difference. If a difference is noticed, carefully measure free lengths and strength of each spring. See specifications.

Check valve spring free length, it should be 1.885'' (47.879 mm). If both ends are not parallel, replace with new springs.

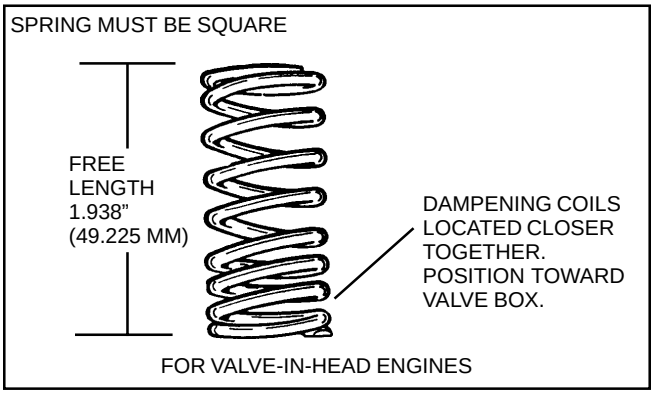
VALVE INSTALLATION. To reinstall valves, position valve caps and spring in the valve compartment. Valve spring free length should be checked and installed so the dampening coils are located opposite the keepers.

INSTALL PIN Release valve spring tension to lock cap in place.



DAMPENING COILS ON VALVE SPRINGS. The valve spring should be assembled so the dampening coil is located to the stationary end of the spring (opposite the cap and retainers).

VALVE-IN-HEAD SPRINGS. Check valve spring free length, it should be 1-15/16'' (49.225 mm) long. If both ends are not parallel, replace with new springs.



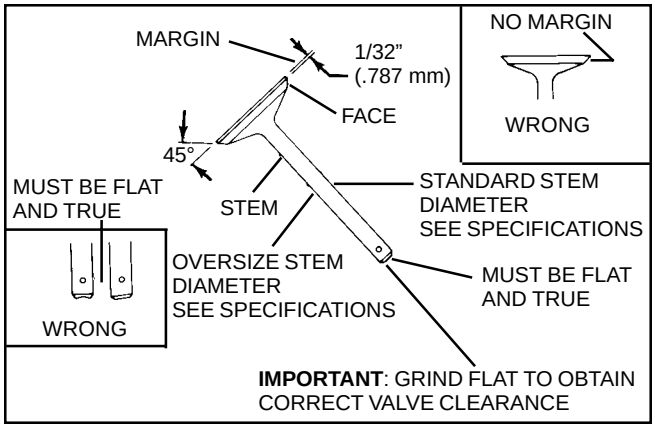
VALVE GRINDING. Valve grinding procedures are the same for all 8 horsepower and other engines. (Including overhead valve engines). See Chapter on specifications.

Correct valve grinding procedures are essential to obtain a satisfactory result.

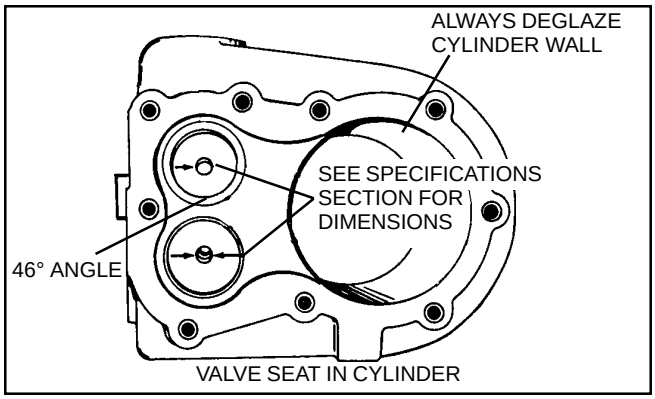
Face and seat angles must be accurate and the surfaces must be smooth.

A 1/32" (.787 mm) margin must be left on the valve head after refacing. The valve without a margin would burn and distort very rapidly.

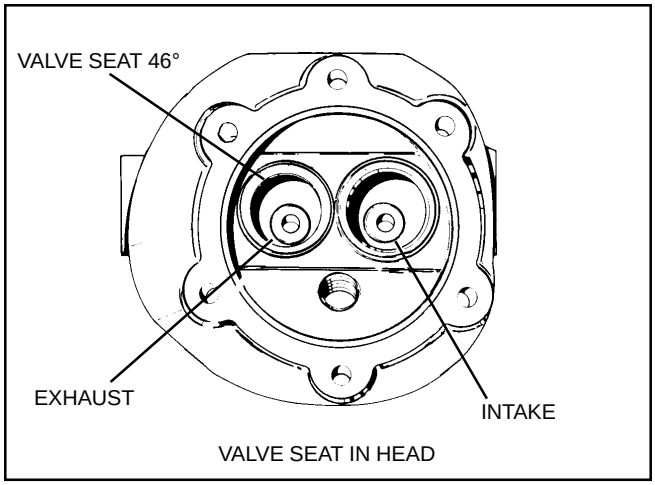
Use a "Vee" block and the flat side of a grindstone to grind valve clearance. The end of the stem must be flat and true or abnormal wear will occur.



VALVE SEATS. Valve seats are not replaceable. If they are burned or pitted, they can be recut using a Neway valve and seat cutter. Seats are cut to an angle of 46°. If the seat is over 3/64'' (1.194 mm) wide after cutting, use a 30° cutter to narrow the face.



VALVE SEAT CUTTING REQUIREMENTS. Cut valve seats to 46° and valve to 45°. See Specifications.



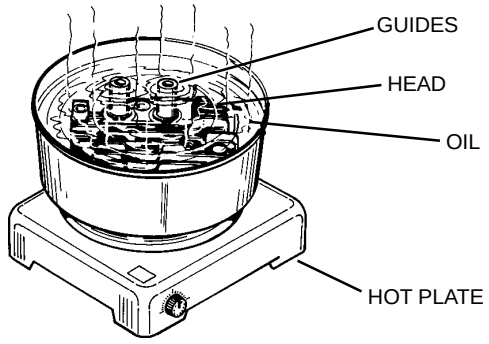
VALVE GUIDE DIMENSIONAL CHECK. Check dimensions per specification requirements, determine if valve guide clearance is beyond acceptable tolerance. If valve guide clearance is worn beyond tolerance, ream valve guide oversize and install 1/32'' (.787 mm) oversize valve, or replace valve guides.

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY AND/OR PROPERTY OF YOURSELF AND OTHERS. READ AND FOLLOW ALL INSTRUCTIONS.

VALVE GUIDE REMOVAL AND INSTALLATION INSTRUCTION FOR VALVE-IN-HEAD ENGINES.

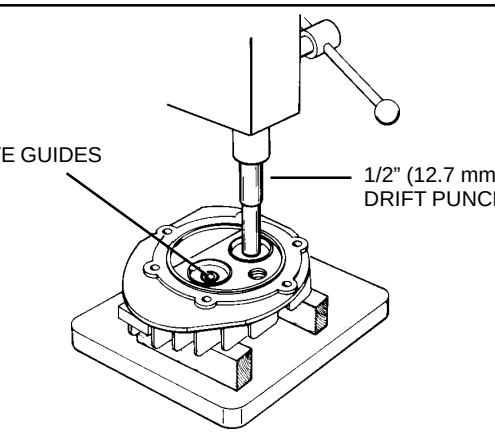
REMOVING THE OLD VALVE GUIDES

1. Submerge the head in a pan of oil so that both guides are covered with oil.
2. Heat oil on a hot plate until the oil begins to smoke. About 15 to 20 minutes. 375° (190°C) - 400° (204°C).
3. When the oil begins to smoke, remove the head from the pan of oil with a pair of pliers. Drain excess oil.
4. Place head on the bed of an arbor press on parallels with the snap rings on the long ends of the guides facing down.
5. Use a 1/2''(25.4 mm) diameter, 6'' (152 mm) drift-punch and the arbor press to push valve guides out of the head.



HEAT UNTIL OIL BEGINS TO SMOKE.

CAUTION - When locating the drift punch on the guides be sure to center the punch. DO NOT allow the punch to make contact with the head when pressing out the guides.



CENTER PUNCH DRIFT ON VALVE GUIDE

INSTALLING NEW GUIDES

NOTE For easy installation, the replacement guides should be placed in the freezer compartment of a refrigerator or on ice for no less than 30 minutes prior to installation.

1. Submerge head with guides removed in a container of oil so that both guide bores are covered with oil.
2. Heat oil on a hot plate until the oil begins to smoke. About 15 to 20 minutes.
3. When the oil begins to smoke, remove the head from the pan with a pair of pliers. Drain excess oil.
4. Place head, with gasket surface down, on a piece of wood, 6 x 12 inches (152 X 304 mm).
5. Remove the new guides from cold storage and install snap rings used for locating both valve guides. Insert the guides. It may be necessary to use a rubber or rawhide mallet to fully seat the guides to the snap ring depths in the head. DO NOT use a metal hammer head, or guide damage will result.
6. Allow head assembly to cool; recut both valve seats.

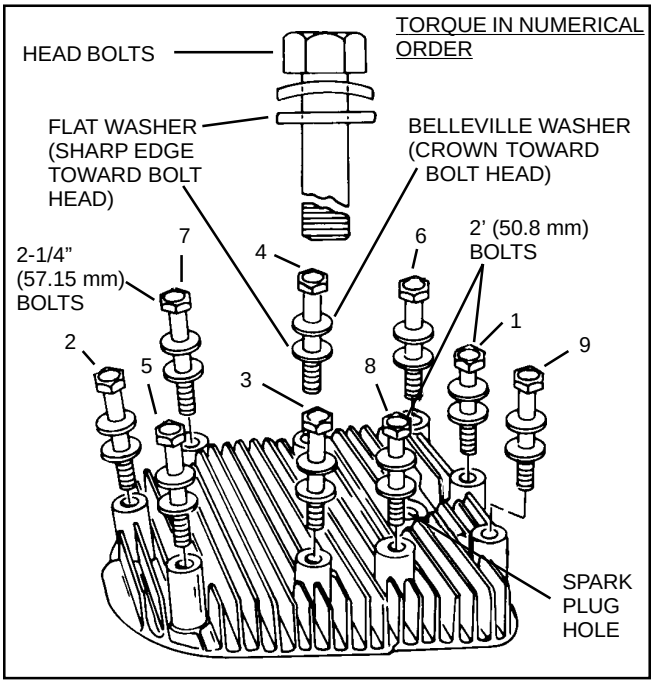
SECTION 2. CYLINDER HEAD

CYLINDER HEAD TORQUE. For 8 H.P. and larger engines (except valve-in-head engines), make sure surfaces are clean, then place new head gasket on cylinder and position head.

Slide one belleville washer (crown toward bolt head) and one flat washer (sharp edge toward bolt head) over each bolt as shown in illustration.

Insert the bolts in the head with the two shorter bolts in the position shown in the illustration. The two short bolts for positions 1 and 8 are 2'' long (50.8 mm) and all other bolts are 2-1/4'' long (57.15 mm).

Tighten bolts evenly to 50 in. lbs. (5.6 Nm) torque. Increase torque evenly by 50 in. lbs. (5.6 Nm) until final torque of 200 in. lbs. (22.6 Nm) is attained in the following sequence: (See Figure)

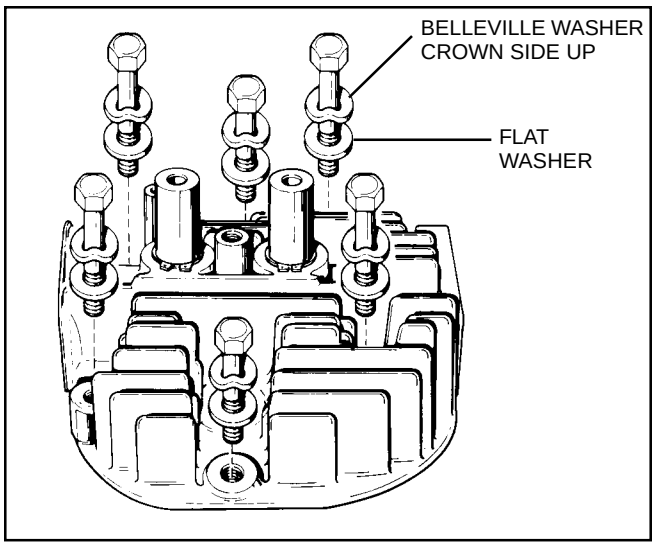


Run engine for 15 minutes, allow to cool and then retorque the bolts in the same sequence as described above.

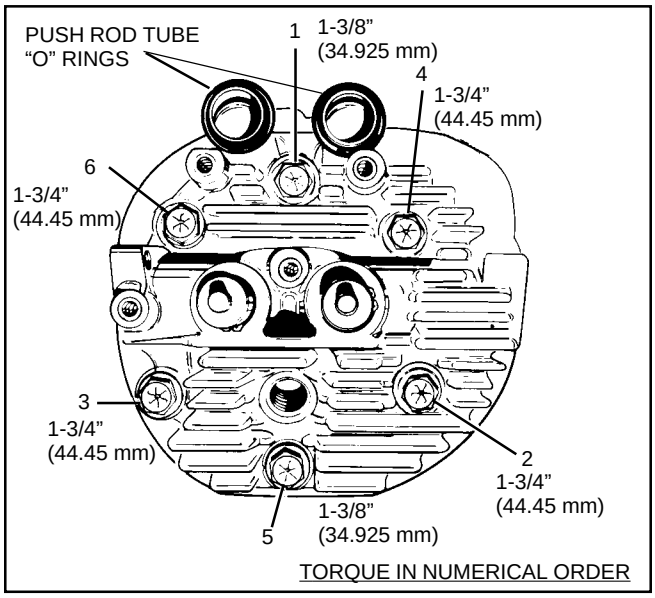
CYLINDER HEAD TORQUE FOR VALVE-IN-HEAD ENGINES.

Slide one belleville washer (crown toward bolt head) and one flat washer (sharp edge toward bolt head) over each bolt as shown in illustration.

Torque head bolts to 200 inch pounds (22.6 Nm) in 50 inch pound (5.6 Nm) increments. Tighten in numerical order. Note that head bolts marked 1 and 5 are 1-3/8'' long (34.925 mm). Other bolts are 1-3/4'' long (44.45 mm).



HEAD ASSEMBLY, TORQUE SPECIFICATIONS. Run engine for 30 minutes, allow to cool until head is cool to the touch and then retorque the bolts in the same sequence as described. (All except number "1" (25.4 mm) bolt which cannot be retorqued unless the rocker arm housing is removed.)



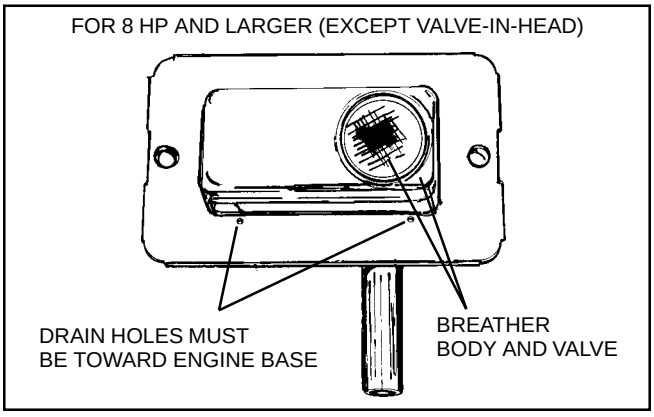
SECTION 3. BREATHER ASSEMBLIES

The Breather is a sealed assembly. If it is defective, replace the entire assembly. The rubber tube on the outside is not part of the assembly.

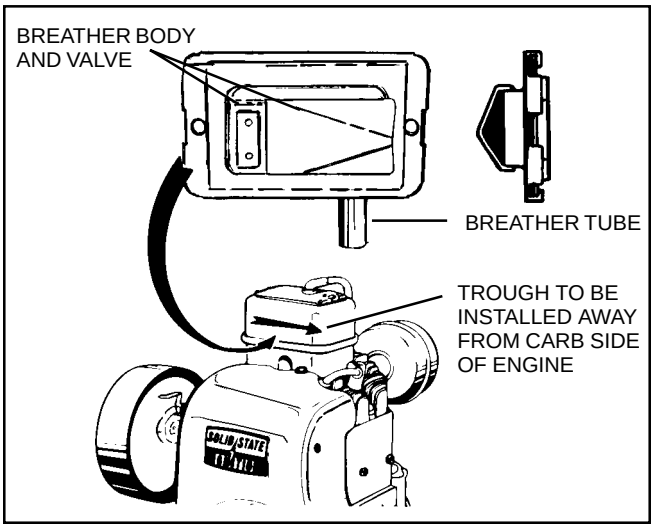
Install the breather with the drain holes toward the base of the engine. Always use a new gasket. The retaining screws must be tight.

If oil is being pumped out the breather:

1. Check for excess speed.
2. Operating at excessive angles.
3. Loose oil filler cap.
4. Worn rings.
5. Excess blow-by.
6. Breather body installed up-side down.
7. Overfilled with oil.



FOR VALVE-IN-HEAD ENGINES



CHAPTER 5. PISTON AND RINGS, CONNECTING RODS AND CRANKSHAFTS

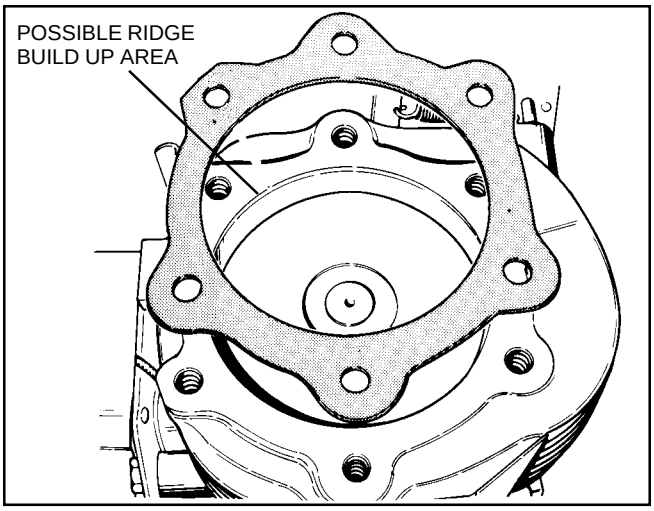
SECTION 1. PISTON AND RINGS

PISTON AND RING DISASSEMBLY. Always remove ridge and carbon buildup before attempting to remove the piston and ring assembly from the cylinder.

Always deglaze the cylinder when replacing the piston and rings. This must be done to allow the rings to seat.

Make sure surfaces are clean, then place new head gasket on cylinder and position head.

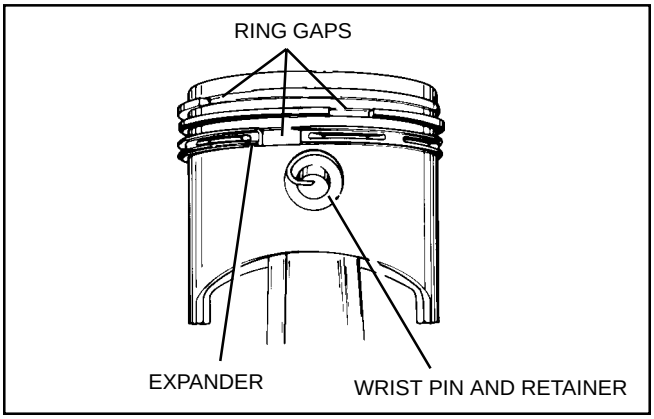
Always use a new head gasket if the cylinder head has been removed.



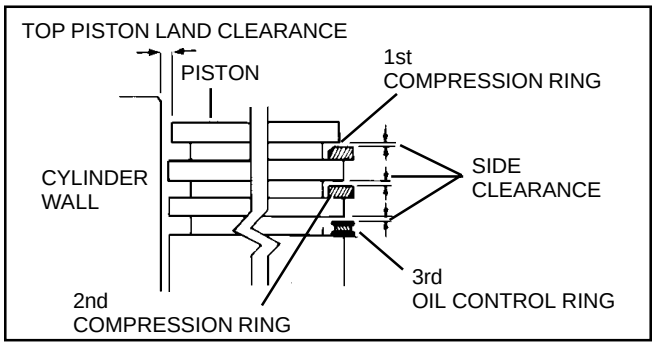
RING AND WRIST PIN ASSEMBLY. Stagger the piston ring gaps 90° apart when installing piston and ring assembly in cylinder.

The wrist pin retainers must be seated in the groove. Move the wrist pin if necessary. Failure to correctly seat the retainers may result in costly repairs.

The wrist pin is a palm press fit (pressed in by hand with some resistance). If loose, check connecting rod for seizing. Replace piston and wrist pin if loose.

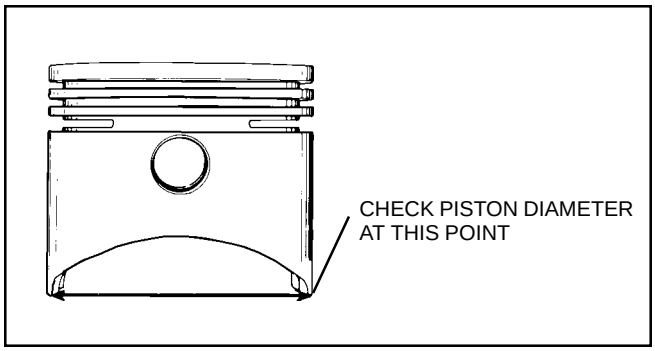


RING GROOVE CHECK. Check the side clearance of the ring in the groove using a feeler gauge. If excessive, replace the piston. See Specifications.



PISTON DIAMETER MEASUREMENT. Check piston diameter on the bottom of the skirt. Check at 90° to center line of wrist pin hole. This is a cam ground piston and the diameter will not be the same when checked at another point.

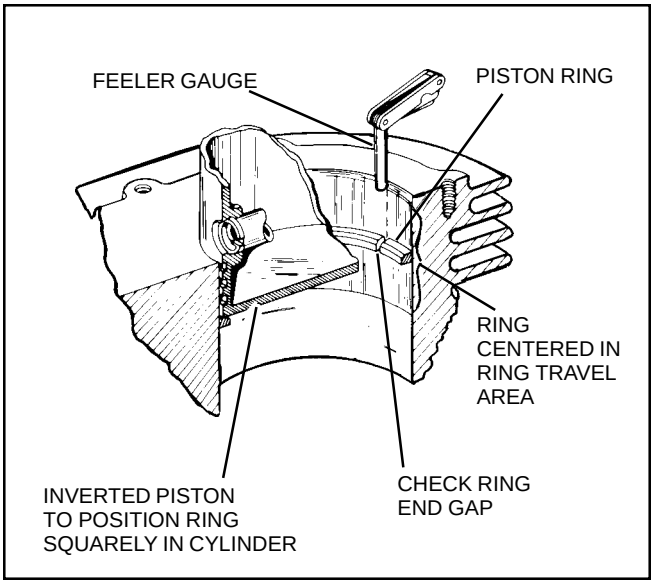
Pistons and rings may be available in either .010'' (.254 mm), .020'' (.508 mm), .030'' (.762 mm) and .040'' (1.016 mm) oversize.



RING END GAP MEASUREMENT. Before installing the rings, insert each ring into the cylinder bore to check the end gap. This gap check should be made in a worn cylinder, a reconditioned cylinder and a new cylinder.

An inverted piston should be used to push the ring into the cylinder to a point that would be the center of ring travel. The ring travel area will be the most worn area in a used cylinder. Insert the piston ring into the cylinder and place the top side of the piston on the ring to position the ring squarely in the bore; remove piston. Measure the end gap by inserting a feeler gauge between the ring ends. Check each ring using the same procedure.

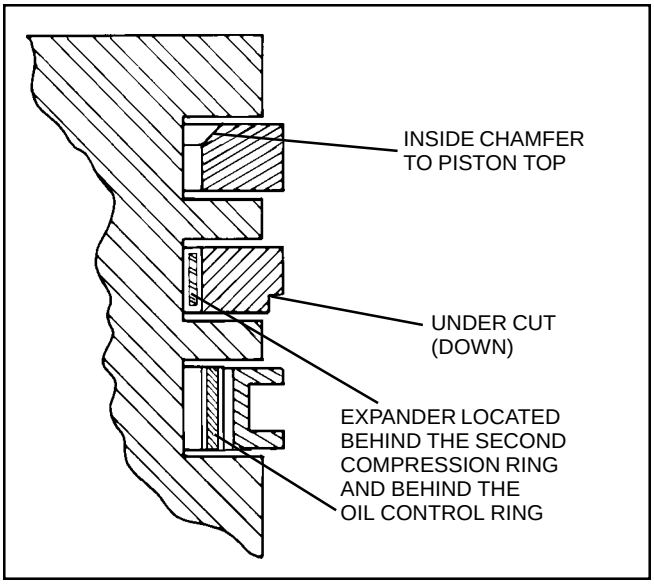
The end gap dimensions are shown in the specification division of this manual. If end gap is greater than the maximum specification, then the cylinder must be measured and perhaps bored oversize. If the end gap is too small, carefully remeasure the bore for undersize dimension and enlarge if necessary.



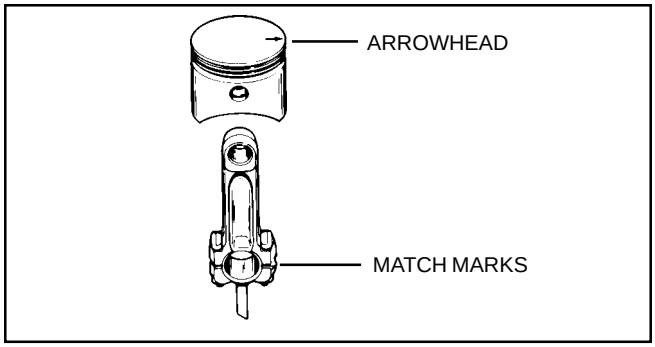
PISTON RING INSTALLATION. Only correct piston ring installation will assure full power. Carefully note the ring sequence when removing the worn rings from the piston. Note especially the ring expander, as it may be found both behind the second (compression) ring and the third (oil control) ring.

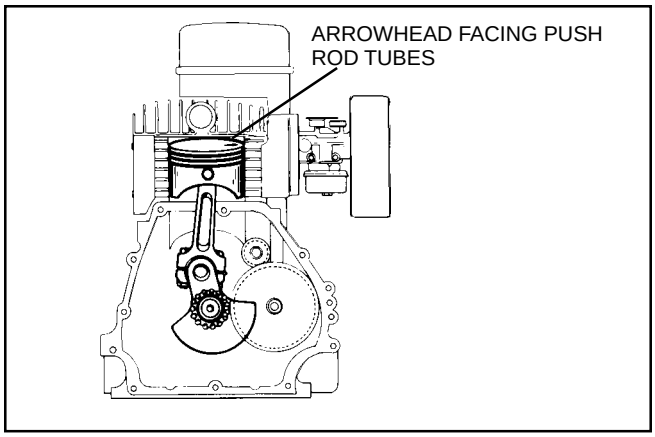
Although piston rings are installed correctly, they will not perform unless the piston and cylinder are reconditioned. Clean and check the ring grooves for wear. Deglaze the cylinder bore with a fine abrasive cloth; this will aid in the seating of the rings.

When reinstalling the rings, note the marks on the first and second rings in dictating the top of the ring. Stagger the ring end gaps to prevent compression loss. Use plenty of service classification SF - SJ rated oil to lubricate all friction surfaces during engine reassembly.



OFFSET PISTON INSTALLATION FOR OH180 VALVE OVERHEAD ENGINE. The connecting rod is assembled to the piston with match marks facing the mechanic and the arrowhead on the piston pointing to the right i.e., arrowhead facing the push rod tube area.





SECTION 2. CONNECTING RODS

When reinstalling a used connecting rod ALWAYS use new nuts on the bolts. These locking nuts will ensure that the torque will be retained when the connecting rod is replaced.

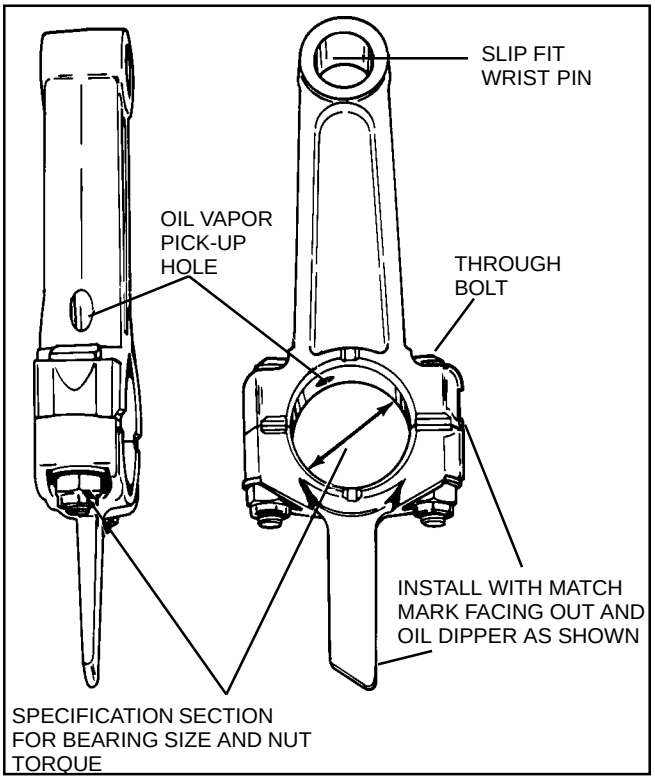
The connecting rod must be installed with the match mark facing out of the cylinder, toward the P.T.O. end of the crankshaft. This will ensure the correct positioning of the oil dipper. Install as illustrated.

The heads of the through bolts must be seated tight against the machined shoulder on the connecting rod. Failure to check this may result in a false torque reading and premature failure.

IMPORTANT Torque to correct specifications. 110 inch pounds (12.43 Nm).

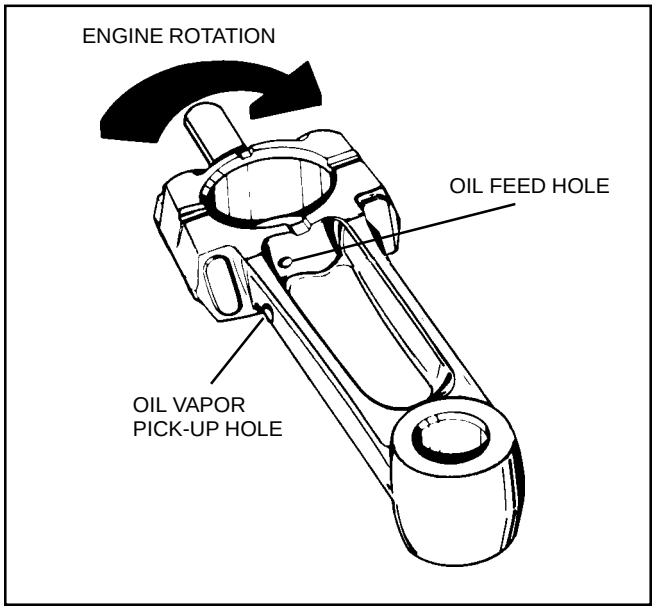
NOTE Before installing, clean the connecting rod bearing surfaces with a clean cloth. Rods are coated with lead which will slightly oxidize in storage, this oxidation must be removed.

FOR ENGINE MODELS HH80, HH100 and HH120 and VALVE-IN-HEAD ENGINES.



The vertical crankshaft 8 and 10 H.P. engines have a connecting rod with two lube holes. This rod is not interchangeable with the horizontal connecting rod. The above requirements listed for a horizontal crankshaft rod also apply to the vertical crankshaft engines connecting rod.

FOR ENGINE MODELS VH80 and VH100

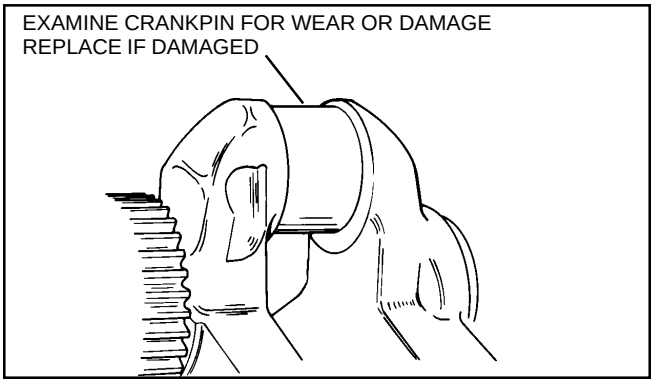


Torque to correct specifications 110-inch pounds (12.43 Nm). After initial torque use a drift and a hammer (13 oz.) (390 ml) and strike the rod bearing cap above each lock nut. This will seat the cap releasing some torque on the lock nuts. Retorque lock nuts to specifications.

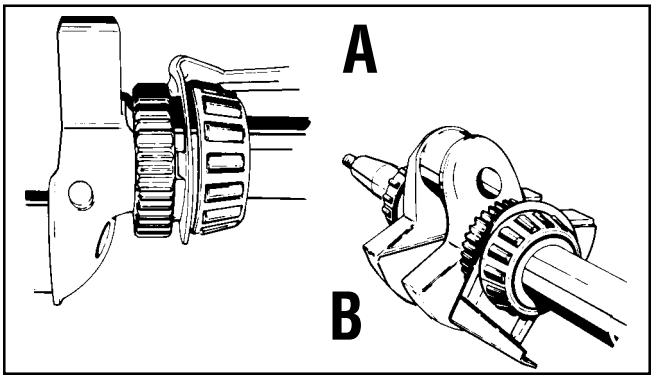
SECTION 3. CRANKSHAFTS

CRANKPIN WEAR. Crankpins should be examined for wear, scoring, or out of-round. If any of these conditions are noted, replace the crankshaft. See specifications.

Lubricate the crankpin generously before attaching the connecting rod. This will prevent damage during the initial run-in after reassembly.

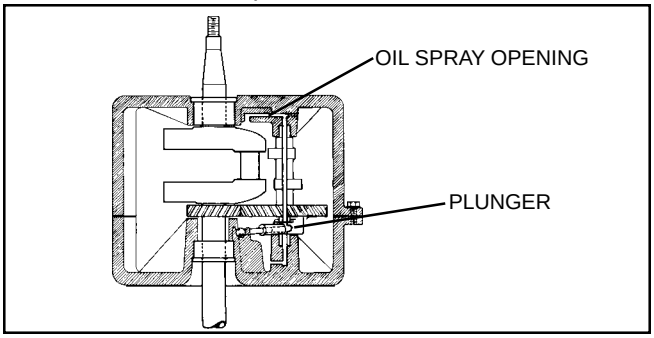


The vertical VH80 and VH100 (without oil pump) oil slinger is located on the crankshaft. It is locked in position between the bearing and the crank gear and maintains that position due to a slot in the gear and a stamped bulge in the slinger. This alignment is necessary to direct the lubricant up into the engine at a closely engineered angle. Note the pickup trough and the stiffening rib. View B shows the trough alignment in correct relation to the crankcase journal. The slinger should not be incorrectly assembled 180° out of phase.



PLUNGER TYPE PUMP

Some vertical VH100 engines use a plunger-type oil pump to circulate lubrication. The oil is pumped up through a hole in the camshaft to a passage allowing the crankshaft and parts to be lubricated.

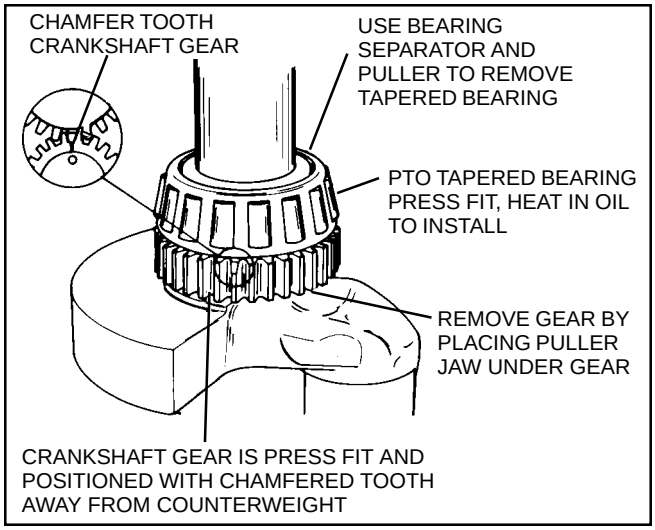


Note the chamfer tooth on the crankshaft gear. This tooth is used as a reference mark to be matched with the timing mark on the camshaft.

The crankshaft gear is replaceable. Remove gear with a conventional puller after the roller bearing has been removed. The gear and the bearing may be removed simultaneously, but much difficulty may be encountered.

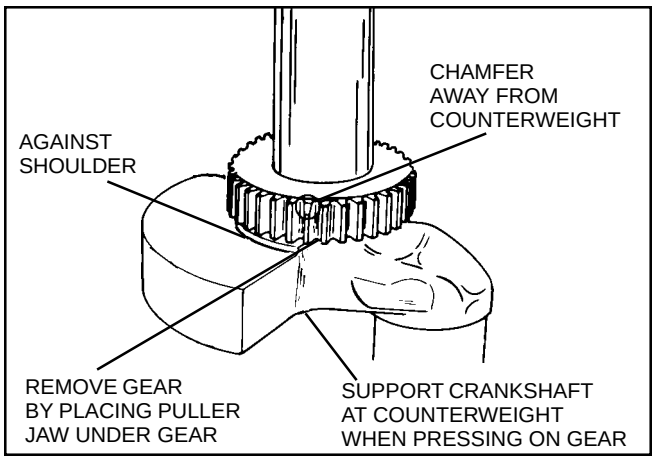
Roller bearing must be heated before it is installed.

NOTE: If a damaged gear is replaced, the mating gear should also be replaced. Example: If the camshaft is damaged and replaced, the crankshaft gear should be replaced.



CRANKSHAFT GEAR INSTALLATION. Use an arbor press and suitable driver to press crankshaft gear into position. Keyway in crankshaft gear is to fit over gear pin and beveled tooth must face P.T.O. end of crankshaft. Crankshaft gear must fit tightly against shoulder.

On engines equipped with Dyna-Static, the counterweight balance gear is installed between the crankshaft gear, spacer and the bearing. Keyway in counterbalance gear is to fit over gear pin and beveled tooth is in line with keyway.



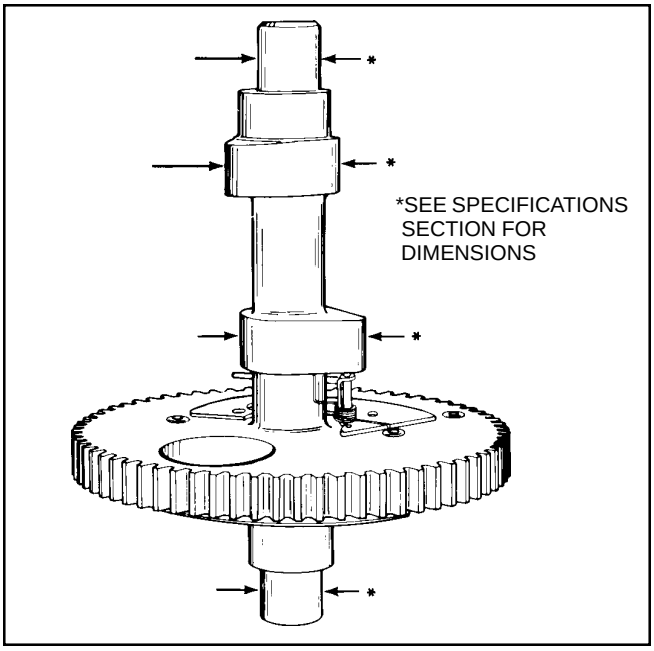
CHAPTER 6. CAMSHAFT, BEARINGS AND SEALS
SECTION 1. CAMSHAFT

CAMSHAFT GEAR TEETH WEAR. When servicing engines, check the camshaft at the points indicated by the asterisks in figure. Examine the gear teeth for wear and damage. See Specifications.

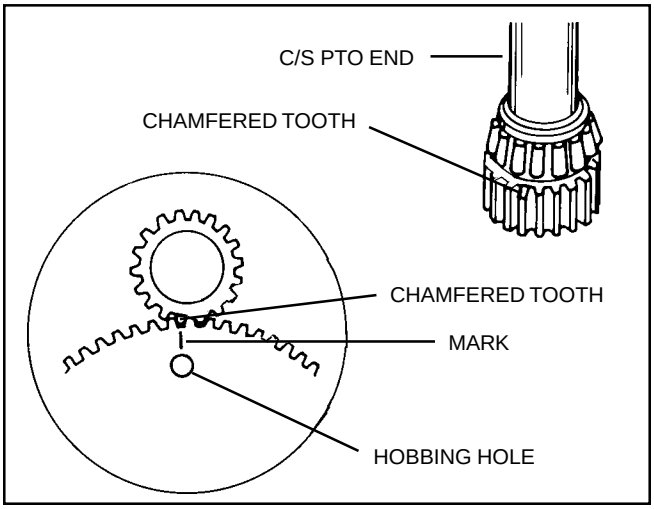
NOTE: If a damaged gear is replaced, the mating gear should also be replaced.

Example: If the camshaft is damaged and replaced, the crankshaft gear should be replaced.

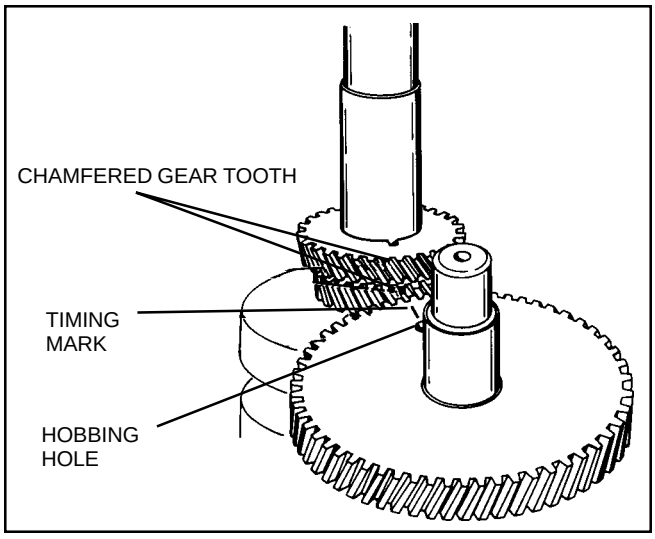
MECHANICAL COMPRESSION RELEASE. Clean the mechanism in a conventional parts cleaner and dry thoroughly. Individual component parts are not available as service replacement and cannot be obtained from the factory. New replacement camshafts with the compression relief mechanism are available.



VALVE TIMING. Match chamfered gear tooth on crankshaft with mark and hobbing hole on camshaft gear.



VALVE TIMING FOR ENGINE WITH HELICAL CUT GEARS.



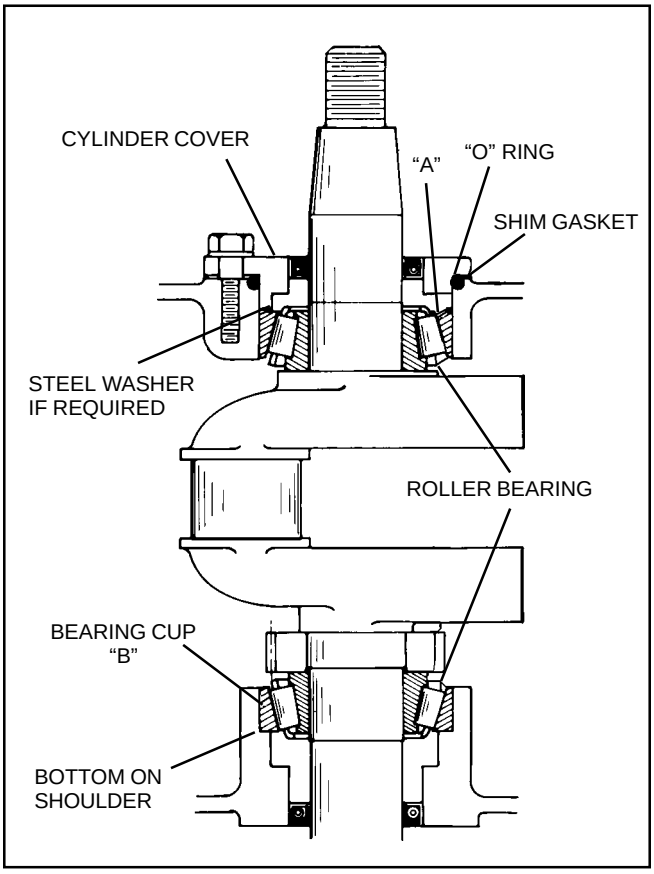
NOTE: When matching up helical gears, do so with a slight rotating motion of the crankshaft to the right. This way the teeth will slide together easier and the chamfered tooth and match mark will line up.

SECTION 2. BEARINGS

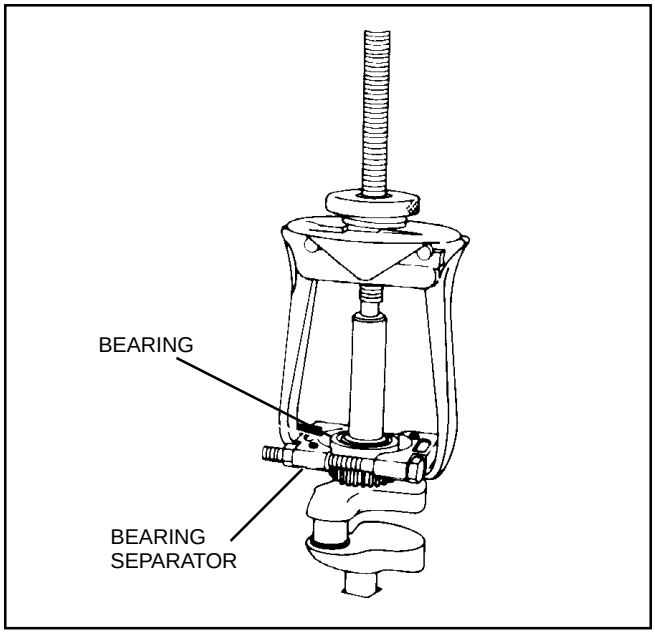
BEARING ASSEMBLY. The following figure illustrates the correct assembly of the tapered crankshaft bearings. The bearing at the flywheel end of the crankshaft seats in an adjustable bearing cup “A” in the cylinder.

The bearing cup “B” supporting the P.T.O. end of the crankshaft is a press fit in the cylinder cover.

Examine the bearing for wear, pitting, rust, alignment, and uneven wear of the rollers. If in doubt, replace to assure dependable trouble free service.



BEARING REMOVAL. Remove the bearing by securing a bearing separator between the bearing and crankshaft gear. Secure jaws of puller on the separator and draw bearing off shaft.

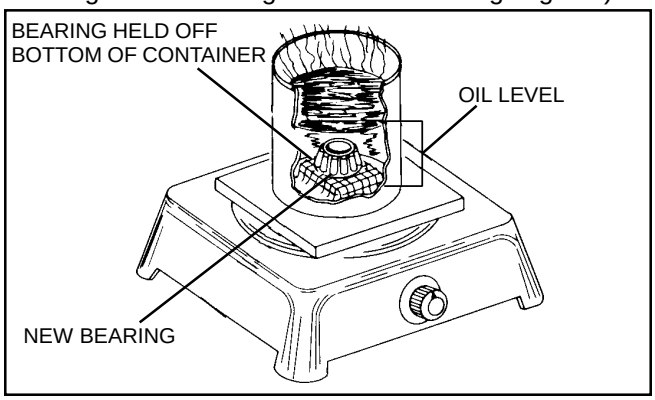


THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY AND/OR PROPERTY OF YOURSELF AND OTHERS. READ AND FOLLOW ALL INSTRUCTIONS.

BEARING INSTALLATION. Use only new bearings for installation on the crankshaft. Once a bearing has been removed it MUST be REPLACED as it becomes distorted and damaged while being removed. The new bearing may be installed on the crankshaft with pressure or heat. Heating the bearing is the preferred method.

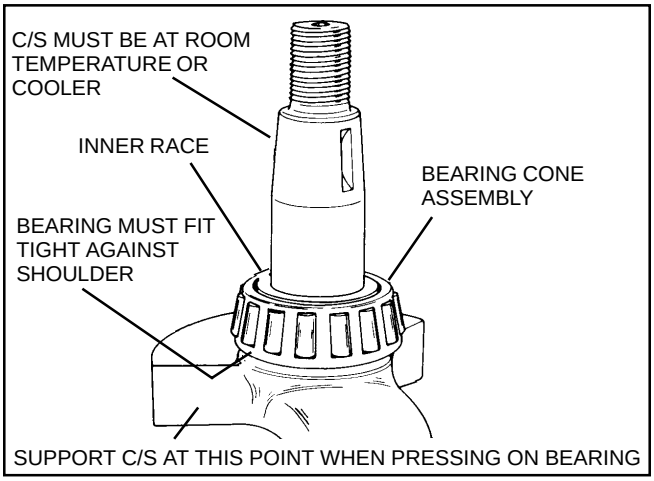
METHOD ONE - **Using Heat**. Heat the bearings in engine oil. Support the bearing off the bottom of the container as illustrated.

Heat to approximately 300° F (148° C) or until oil smokes. Support the crankshaft in a vise. Hold the bearing carefully to prevent burns. Work rapidly to assure proper placement while the bearing is hot. The bearing must seat tight against the shoulder of the magneto end and tight against the crankshaft gear on the P.T.O. end. (If on a counterweight system, bearing should be against counterweight gear.)



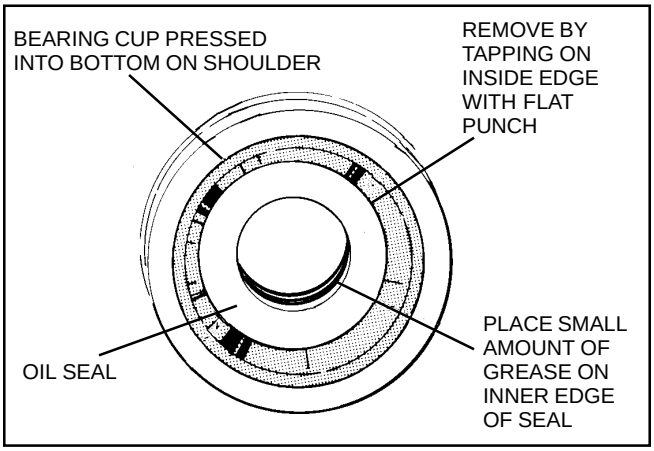
METHOD TWO - Cold Bearing. The crankshaft MUST be supported between the counterweights when pressing on bearings. Use a driver to direct the pressure of an arbor press onto the inner race of the bearing when installing. The bearing must be seated tight against the shoulder of the crankshaft counterweight (on magneto end).

⚠ This method may require a great amount of force, therefore, method one should be considered first.



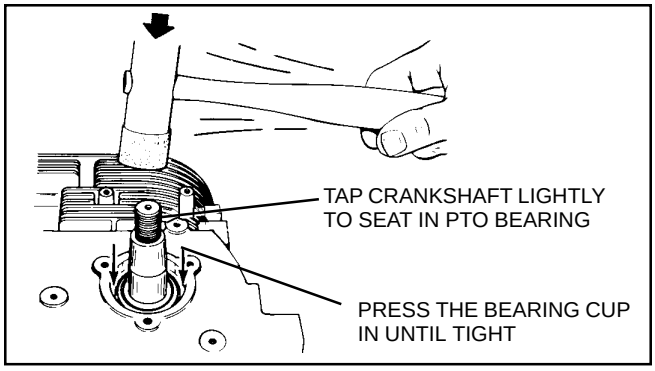
BEARING CUP INSPECTION. The bearing cup should be examined for rust, pitting, scuffing, cracks or other damage.

The bearing cup is removed by tapping the edge beneath the oil seal with a light hammer and flat punch. Press in a new cup until it bottoms on the shoulder. The bearing cup must be pressed in square, use an arbor press.



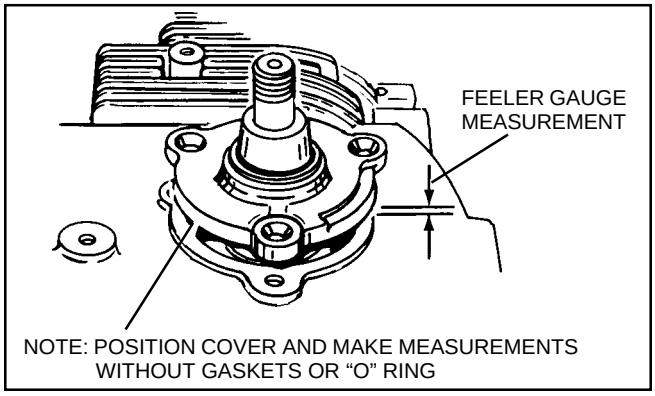
PROCEDURES FOR CYLINDER COVER FIT. Reinstall cylinder cover using a new gasket and torque to specifications.

After the cylinder cover is secured to correct torque specification, place the engine in a stand or device that will allow the P.T.O. (Power Take-Off) shaft to extend freely. Turn the crankshaft until the piston is at T.D.C. Tap the flywheel end of the crankshaft lightly with a mallet to seat the P.T.O. bearing. With either fingers or two screw drivers, press the bearing cup inward until tight.



Position the cylinder cover (magneto end), oil seal, and sleeve tool over the crankshaft and seat on the machined gasket surface. Insert a feeler gauge between the cover and cylinder, record the reading.

If there is no space between the cover and the machined gasket surface to allow insertion of the feeler gauge, use a .010" (.254 mm) metal spacer. The spacer fits between the bearing cup and inside surface of the cover. More than one may be used if required.



Determine the gap between the cover and the machined surface on the cylinder, which should be from .001'' - .007'' (.025 mm.- .178 mm), in which case no shim gaskets will be required. However, if the space measures over .007: (.178 mm), follow the example below. Use of gaskets must be limited to a combined total of .010" (.254 mm) thick. Steel spacers must then be used to eliminate crankshaft end play. (Note: For VH100 with oil pump, see procedure on next page).

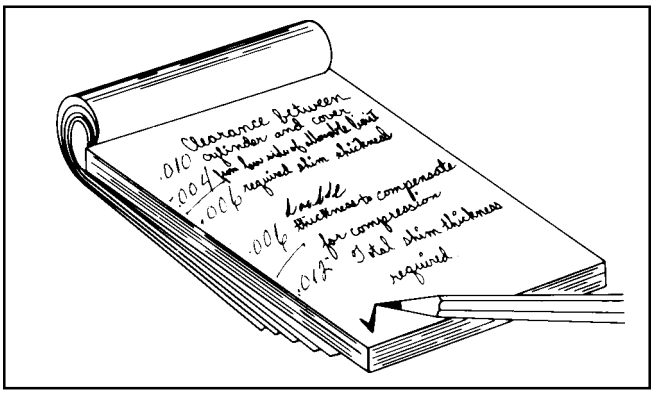
Example:

.010''	.254 mm	clearance measured between cover and cylinder. If clearance is over .010" (.254 mm), use spacer.
- .004''	-.102 mm	.001'' to .007'' (.025 - .1278 mm) allowed but use .004" (.102 mm) as the median.
= .006''	= .152 mm	Shim thickness required
+ .006''	.152 mm	Double above figure for thickness required to compensate for gasket compression
.012''	.305 mm	total amount of shim gaskets required

(Continued on top next page)

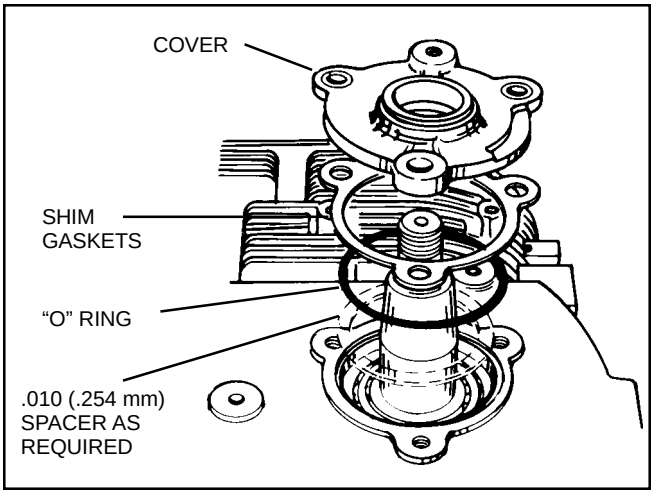
When the space measures .001'' (.025 mm) to .007'' (.178 mm) no gaskets required, or if over .007'' and shimmed with gaskets the end result is that there shall be no crankshaft end play. Shim gaskets are available in .004/.005" (.102/.127 mm) and .005/.007" (.127/.178 mm) thickness.

NOTE: If clearance between cover and cylinder is over .007'' (.178 mm) and gasket shims are not used, damage to the cylinder cover can result.



Insert an oil seal in the cover. Position the .010 (.254 mm) spacer, if required. Position the shim gaskets (if required) and place the cover on the cylinder. Use an oil seal sleeve to protect the oil seal. Secure the cover with the hex head bolts and TORQUE. See Specifications. Rotate the crankshaft and test for freedom of movement. There shall not be any crankshaft end play. The only exception is the VH100 with oil pump.

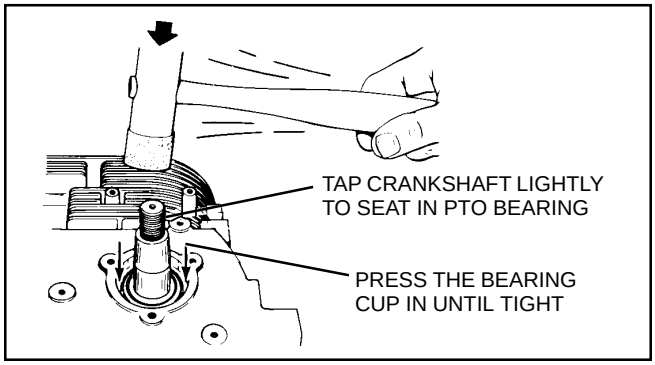
Knocking noise in an engine may at times be traced to excessive radial crankshaft play. If this is noted, review the cover shim gaskets. Correct by adding or removing as required.



Newer model engines have an "O" ring which seals between the shim gaskets and the chamfer on the crankcase.

END PLAY ADJUSTING PROCEDURES FOR VH100 WITH OIL PUMP

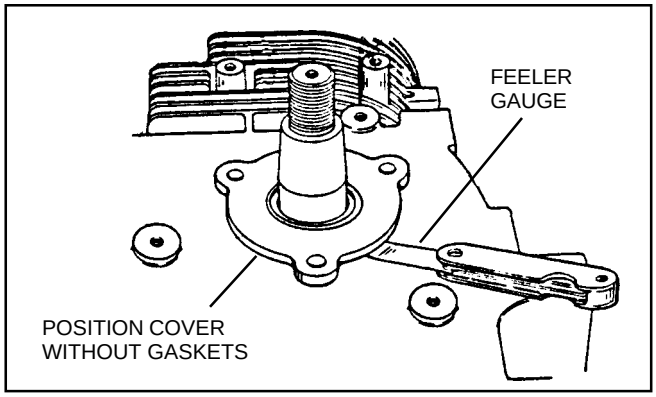
After the cylinder cover is secured to correct torque specification, place the engine in a stand or device that will allow the P.T.O. (Power-Take-Off) shaft to extend freely. DO NOT set engine on P.T.O. shaft or the correct crankshaft end play cannot be obtained. Turn the crankshaft until the piston is a T.D.C. Tap the flywheel end of the crankshaft lightly with a mallet to seat the P.T.O. bearing.



With either fingers or two screwdrivers, press the bearing cup inward until tight.

NOTE: When measuring for crankshaft end play be sure shim gaskets and O rings are removed.

Position the cylinder cover (magneto end), oil seal, and sleeve tool over the crankshaft and seat on the machined gasket surface. Insert a feeler gauge between the cover and cylinder; record the reading.



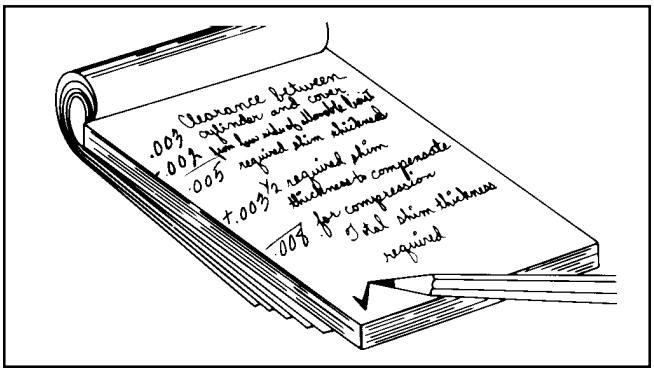
If space does not exist between the cover and the machined gasket surface to allow insertion of the feeler gauge use a .010 (.254 mm) metal spacer. The spacer fits between the bearing cup and inside surface of the cover. More than one may be used if required.

After determining the gap between the cover and the machined surface on the cylinder, determine the shim thickness as follows to result in the required .002 - .007 (.051 - .178 mm) crankshaft end play.

Example:

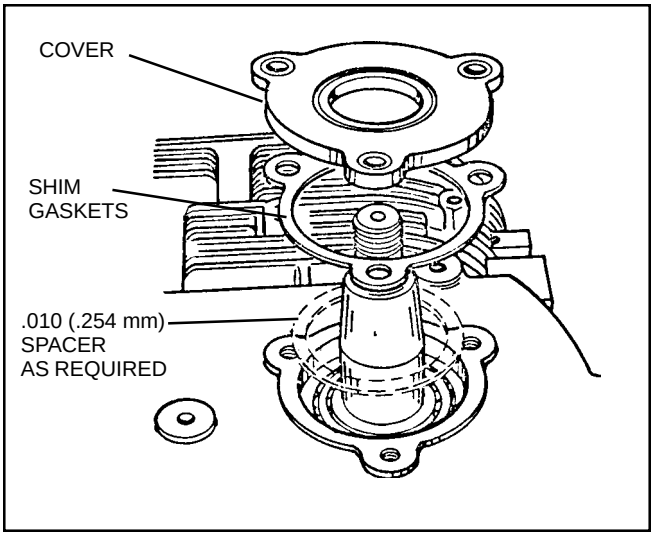
.003''	.076 mm	Clearance between cover and cylinder
- .002''	.051 mm	Required end play
.005''	.127 mm	Shim thickness required
+ .003''	.076 mm	Add half above figure for thickness required to compensate for gasket compression
.008''	.203 mm	Use shim gaskets that total this amount.

Shim gaskets are available in .004/.005" (.102/.127 mm) and .005/.007" (.127/.178 mm) thickness.

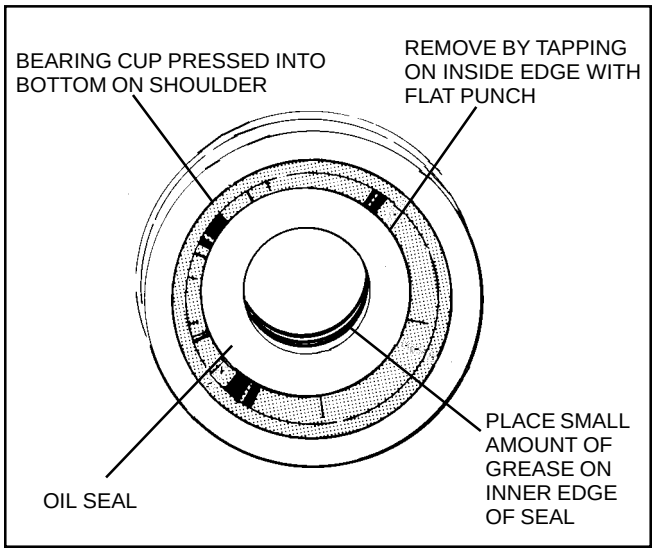


Insert an oil seal in the cover. Position the .010 (.254 mm) spacer if required. Position the shim gaskets and O ring and place the cover on the cylinder. Use an oil seal sleeve to protect the oil seal. Secure the cover with the hex head bolts and TORQUE to specifications. Rotate the crankshaft and test for freedom of movement, end play and radial play.

Knocking noise in an engine may at times be traced to excessive radial crankshaft play. If this is noted, check the cover shim gaskets. Correct by adding or removing as required.



The bearing cup should be examined for rust, pitting, scuffing, cracks or other damage.

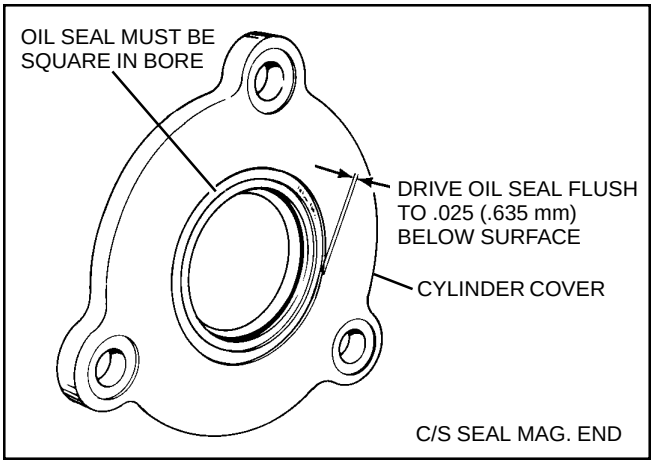


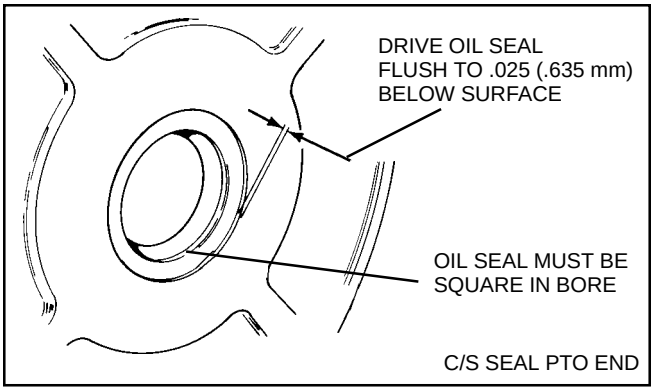
The bearing cup is removed by tapping the edge beneath the oil seal with a light hammer and flat punch. Press in a new cup until it bottoms on the shoulder. The bearing cup must be pressed in square, use an arbor press.

Reinstall cylinder cover using a new gasket and torque to specifications.

SECTION 3. SEALS

Use an oil seal protector when removing covers from crankshaft. See Chapter 11 of Mechanics Manual under “Tools”, using tool as shown. Remove the cylinder cover at either the P.T.O. or flywheel end. Drive the seal out of the cylinder cover from the inside out. Install a new seal. Use new gaskets. Use the seal protector when replacing the cover.

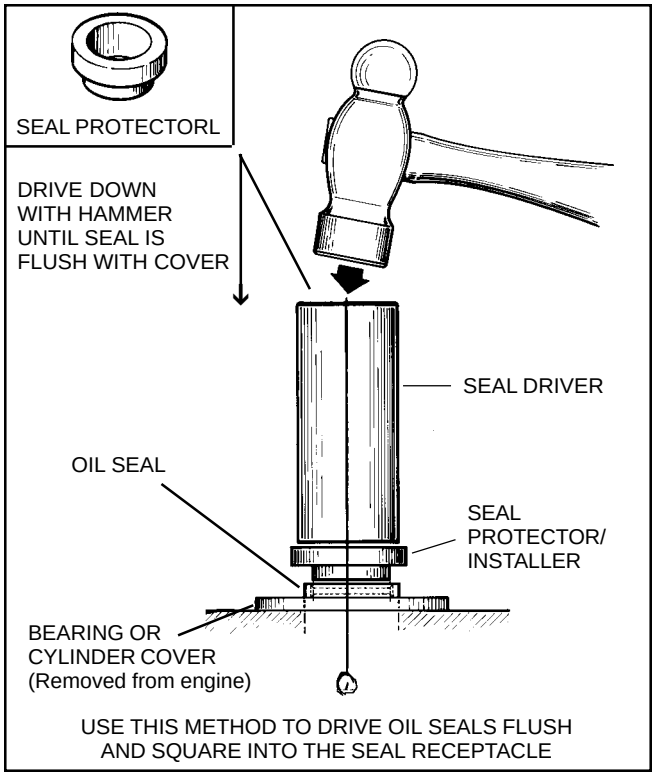




Remove the covers before installing the oil seal. The crankshaft cannot protrude while the seal is being installed.

Lay the cover on a flat clean surface. Use a seal driver and the correct seal installer to drive the seal into position. (See Chapter 11, Technician’s Manual for tools). Place the seal onto the seal protector/ installer and then over the bore, center the driver over the seal and drive the seal into position with a hammer.

USE A SEAL PROTECTOR EVERY TIME THE OIL SEAL IS PUT ONTO OR PULLED OFF OF THE CRANKSHAFT.



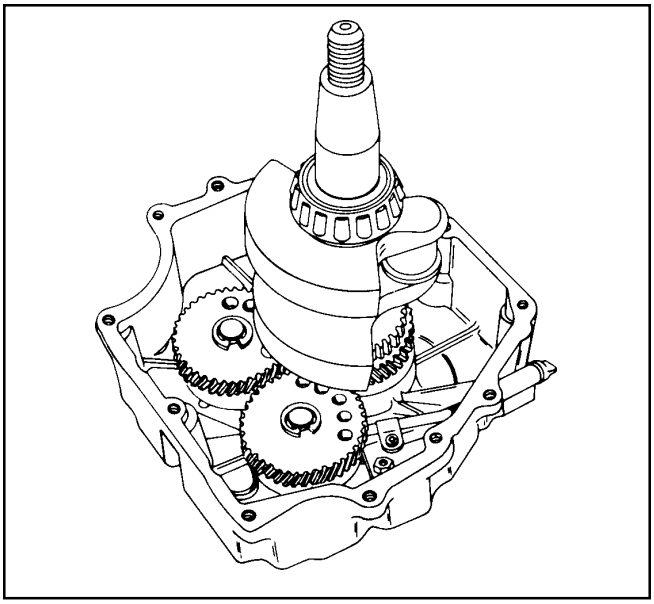
CHAPTER 7. DYNA-STATIC® BALANCING SYSTEM

TECUMSEH DYNA-STATIC® BALANCING SYSTEM.

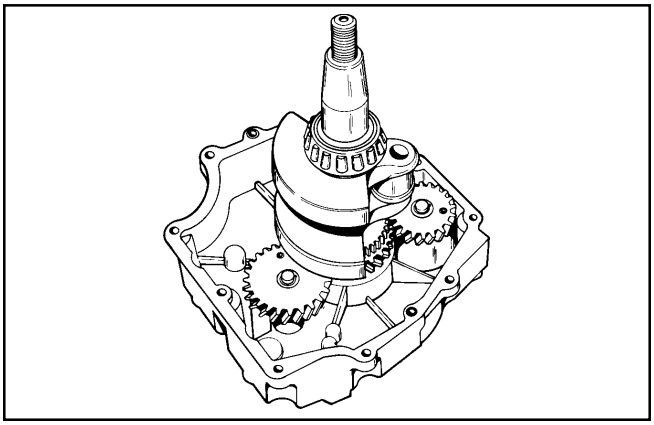
Dyna-Static® Tecumseh's Balancing system for horizontal crankshaft 10, 12, 14, 16 and 18 H.P.

Dyna-Static® operates by means of a pair of counterweighted gears driven off the crankshaft to counteract the unbalance caused by the counterweights on the crankshaft. The exterior distinguishing feature of an engine equipped with a balance system is the "deep-dished" side cover. This cover contains the counterbalance gears and shaft.

Tecumseh Dyna-Static® balancing system also utilizes a helical (angle) cut set of gears consisting of a crankshaft gear and two counterbalance gears. There are two sets of helical counterweight assemblies. The difference between the two assemblies is the counterweight mass. They cannot be distinguished by size. Check Parts Manual or Microfiche for correct counterweight set. The helical cut gear assemblies may be interchanged with the regular cut gear assemblies, but only if all three gears (crankshaft gear and two counterweight gears) are interchanged as a set.



On some production models the counterbalancing gears are placed top and bottom of crankshaft.

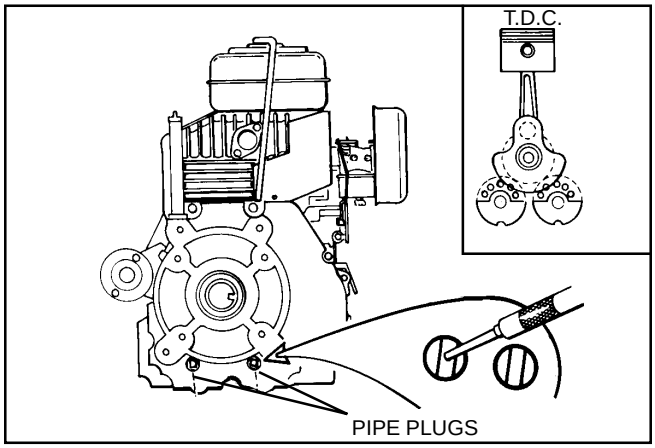


ALIGNING THE COUNTERWEIGHTS (Side-by-Side counterweights) This view of the side cover is from the outside showing the pipe plugs which plug the alignment holes during normal operation.

NOTE: Be careful when installing the cylinder cover that the counterweight balance gears remain in alignment.

Remove pipe plugs from flange, assemble flange to cylinder making sure the slots stay in hole. Slots may have to be moved either way with punch or screwdriver to mesh gears. If you can see any part of slots in holes after assembled, it is correctly assembled. Reinstall pipe plugs.

The important thing is to keep the counterweight gears perfectly aligned on the crankshaft gear. Any misalignment of these gears can cause vibration. Insure also that the governor rod assembly is correctly placed.

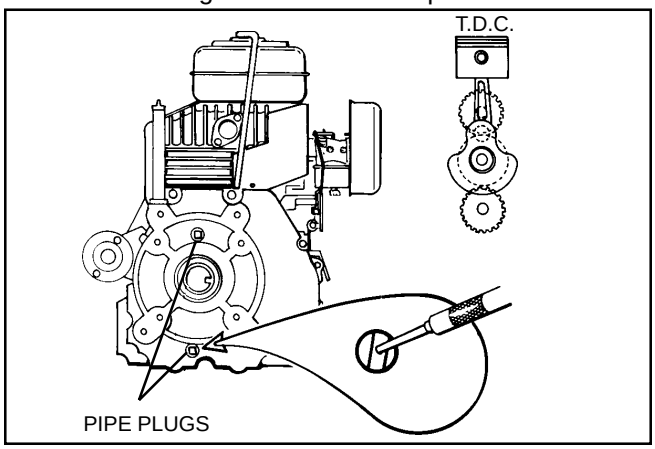


TOP & BOTTOM COUNTERWEIGHTS

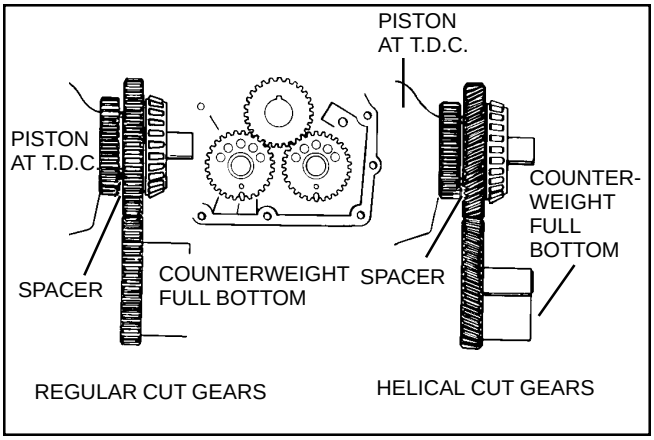
On some production models the counterweight balancing gears are placed top and bottom of the crankshaft. The gears mesh with the driver gear on crankshaft when the piston is at T.D.C. and the gear weights are down as shown.

NOTE: If a damaged gear is replaced, the mating gear should also be replaced.

Example: If the camshaft is damaged and replaced, the crankshaft gear should be replaced.



Positioning of helical-type gears is the same as shown in the figure below.



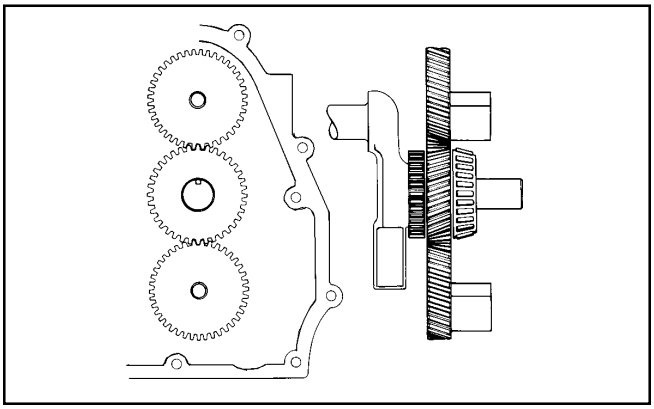
CRANKSHAFT GEAR ALIGNMENT

NOTE: Whenever the camshaft gear is damaged, the crankshaft gear should be replaced.

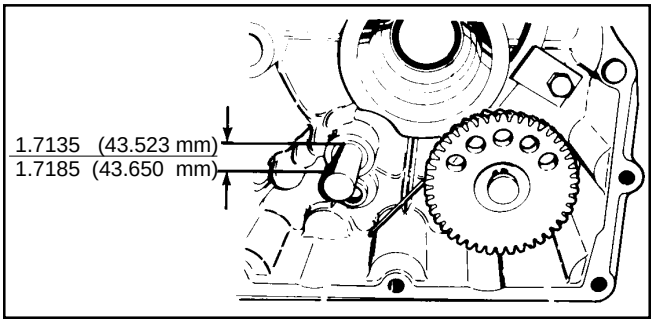
Note the chamfer tooth on the crankshaft gear. This tooth is used as a reference mark to be matched with the timing mark on the camshaft.

On engines equipped with Dyna-Static, the counterbalance weight drive gear is installed between the crankshaft gear and the bearing with a spacer.

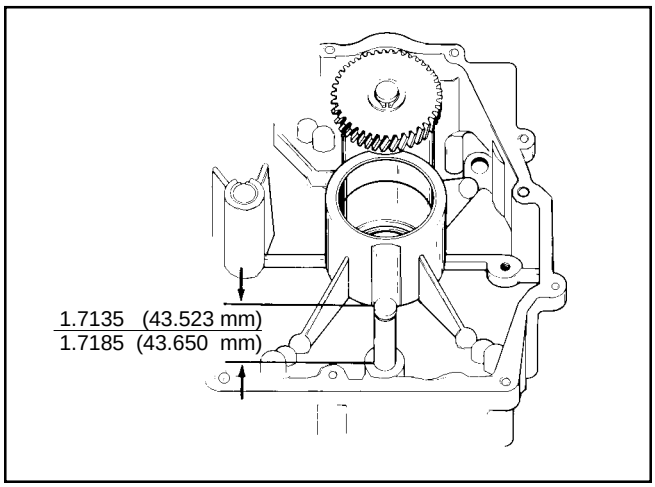
The crankshaft gear and the counterbalance weight drive gear are replaceable. Remove gears with a conventional puller after the roller bearing has been removed.



The figure below shows one counterbalanced driven gear removed from the shaft. Each counterbalanced shaft is pressed into the cylinder cover so that a dimension of 1.7135''(43.523 mm) to 1.7185'' (43.650 mm) exists between the side cover boss and the end of the shaft.

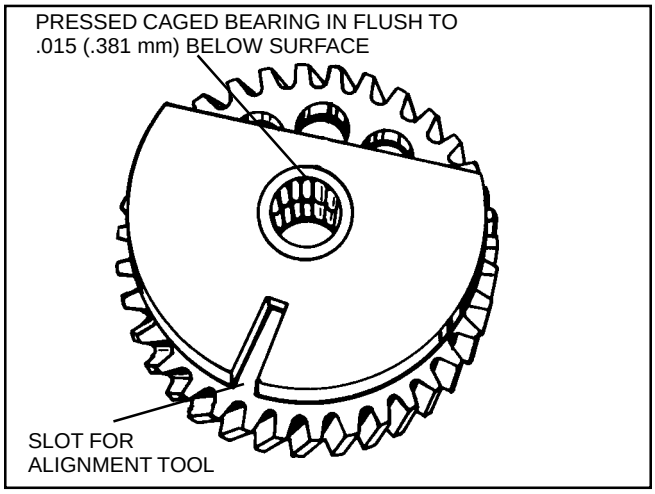


On current production models, the counterweight balancing gears are placed top and bottom of the crankshaft. The position dimension is the same as for side-by-side counterweight models.



BEARING REPLACEMENT.

If replacement of caged needle bearings is required, press the replacement in flush to .015 (.381 mm) below inside surface, use tool No. 670210. This figure shows the counterweight side and the slot cut for the tool alignment.



CHAPTER 8. IGNITION SYSTEMS, CHARGING SYSTEMS BATTERY SERVICE and ELECTRICAL CONTROL PANELS

SECTION 1. IGNITION SYSTEMS

SOLID STATE SYSTEM IGNITION SERVICE.

a. General. Follow through the checks and explanations below, if everything checks ok, then replace the ignition unit. The parts of the system are:

1. Ignition coil.
2. Flywheel.
3. Ignition unit.
4. High tension lead.
5. Spark plug.

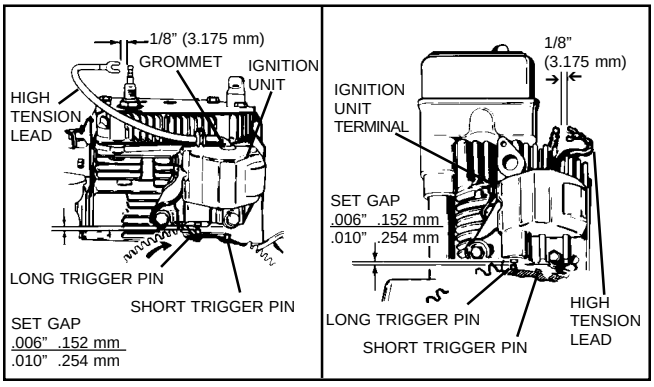
b. Spark Plug Check. Test ignition by using a test plug or hold the high tension lead terminal 1/8-in.(3.175 mm) from the spark plug. Crank the engine over rapidly. If a good blue spark jumps the gap, the ignition system is functional.

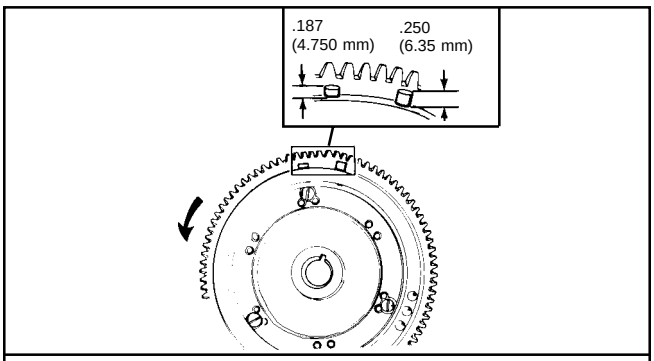
If no spark is present, make the following checks: c through f.

c. Check high tension lead for a ground or an open circuit in the ignition unit.

d. Check coil lead and connection to ignition unit terminal.

CAUTION: If the engine won't run, after previous acceptable performance, check the equipment ignition switch.





10 and 20 AMP ALTERNATOR SYSTEMS

e. Air Gap Checks. Adjust the system so that a .006/.010" (.152/.254 mm) clearance exists between the ignition unit and the long trigger pin in the flywheel.

To adjust, loosen the retaining screw and move the unit to find the proper gap.

Follow through the checks and explanations below, if everything checks ok, then replace the ignition unit.

REMOVAL OF FLYWHEEL TRIGGER PINS

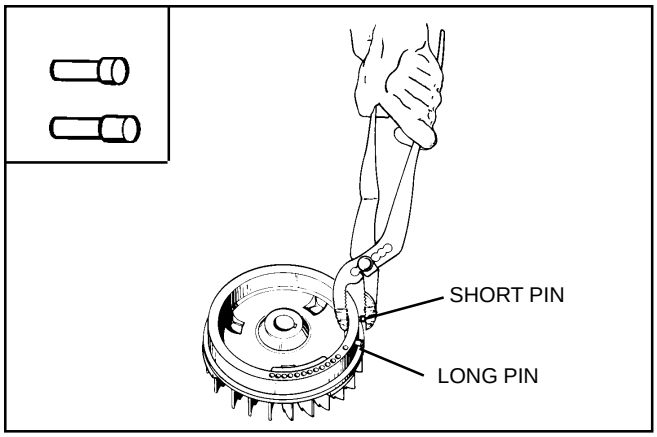
Removal of damaged pins. CAUTION: Pins must not be reused. Use care not to damage flywheel. Never hammer on a flywheel as permanent damage to the magnets could result.

Use vise-grip pliers to remove the pins. If the pins are very tight, hammer lightly on the pliers at the same time pulling on the pins. Do not twist. If a vise is used to secure the flywheel, use care not to damage.

INSTALLATION OF NEW TRIGGER PINS.

1. Position the flywheel with the fins on a flat surface. Holes toward you - See Figure.
2. Coat shaft of pins with Loctite.

   CAUTION: Do not use a hammer to drive in pins.
3. Use masking tape to cover wide-mouth pliers (channel lock type) and press fit the short pin into hole on right. Fit the long pin on the left.
4. Pins must be pressed up to pin shoulder. Wipe away any excess Locktite.
5. The magneto air gap must now be adjusted to correct for any changes in trigger pin height.



f. Coil Lead on 10 Amp Alternator Systems. Remove the coil lead from the ignition unit terminal. Attach the leads from a standard ohmmeter to the lead eyelet and to ground to check series resistance of the ignition generator coil.

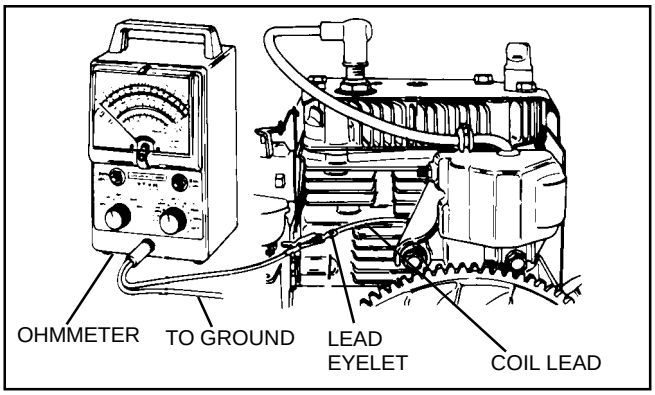
1. If resistance is below 400 ohms, replace the stator assembly which includes the coil.

NOTE: The ignition generator coil cannot be replaced separately.

2. If coil resistance is above 400 ohms, replace the ignition unit.

CAUTION: Before replacing Ignition Unit, meter ignition cutoff circuit in the switch for a “short”, allowing battery current to burn out the ignition unit.

Remove the switch and connect the leads from a continuity meter to the battery lead terminal and the ignition ground terminal. Actuate the switch in various positions to see if continuity exists. Any continuity indicates a bad switch. When replacing a switch be sure that the lead and terminal do not short through the equipment frame.

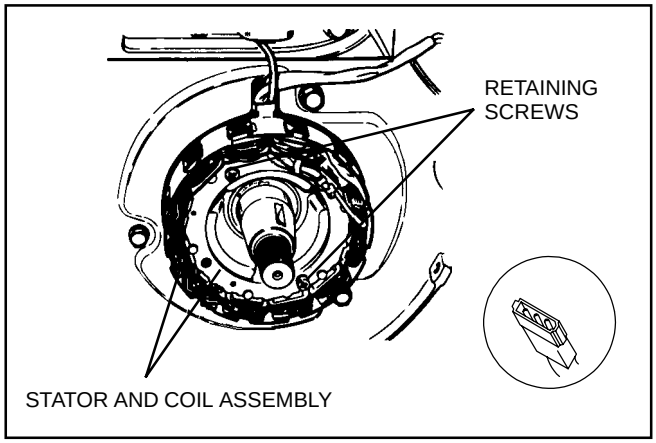


CONNECTIONS ARE THE SAME FOR 8 H.P. AND LARGER AND VALVE-IN-HEAD ENGINES

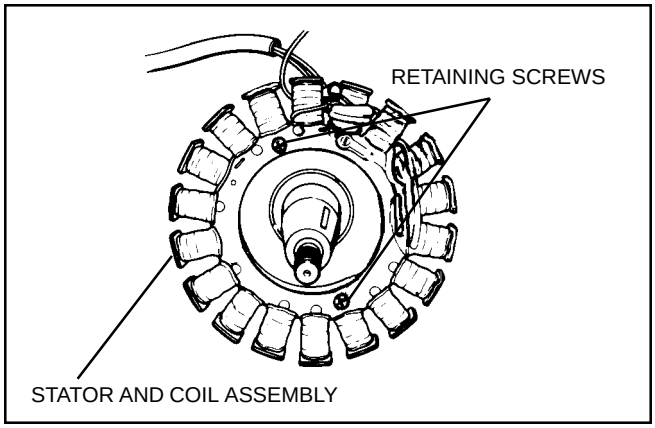
g. Coil Lead on 20 Amp Alternator Systems. Remove the coil lead from the ignition unit terminal. Attach leads from a standard ohmmeter to the lead eyelet terminal and to ground to check series resistance of the ignition generator coil.

If coil resistance is between 115 ohms and 171 ohms, replace the ignition unit.

CAUTION: Before replacing Ignition Unit check the ignition cutoff circuit in the switch, for a “short” allowing battery current to burn out the ignition unit. Remove the switch and connect leads from acontinuity meter to the battery lead terminal and the ignition ground terminal. Actuate the switch in various positions to see if continuity exists as shown on the meter. Any continuity indicates a bad switch. When replacing the switch be sure that the lead and terminal do not short through the equipment frame.



FOR 10 AMP IGNITION SYSTEM



FOR 20 AMP IGNITION SYSTEMS

SOLID STATE IGNITION SYSTEM (NON-ALTERNATOR TYPE).

CAUTION: Do not attempt to crank engine with the primary wire of the transformer disconnected. Also do not allow the primary wire of the transformer to be grounded or arc. A broken wire causing an open circuit to or in the transformer can also cause permanent damage. See Step 2.

1. Preliminary Tests

   Spark Test . . .Check for spark.

   Perform the following visual tests:

   HIGH TENSION LEAD . . . Inspect for cracks or indications of arcing. Replace the transformer if a questionable lead is found.

   LOW TENSION LEADS . . . Check all leads for shorts. Check ignition cut-off lead to see that unit is not grounded out. Repair leads if possible, or replace.

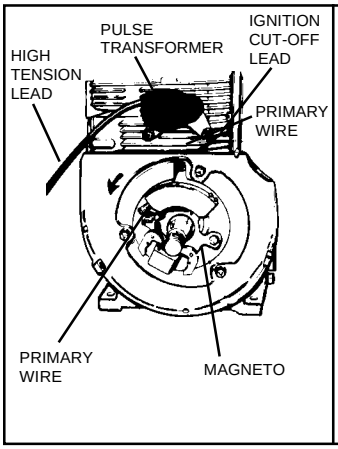
   FLYWHEEL . . . Check magnets for strength. Check key and keyway. Be sure that the key locks the flywheel to the crankshaft.

2. After the above visual checks are made the transformer and solid state components can be checked using a Merc-O-Tronic, Graham-Lee or similar tester.

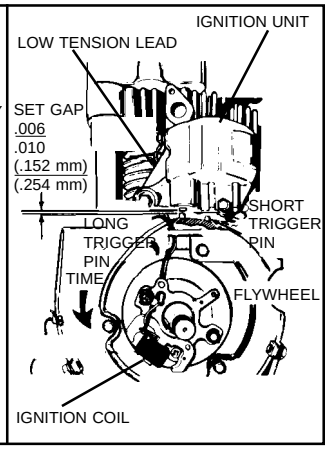
   NOTE: Before using parts for tests, be sure any problem which caused replacement is corrected first.

3. When testers are not available... Use new replacement parts as test for possible failed parts.

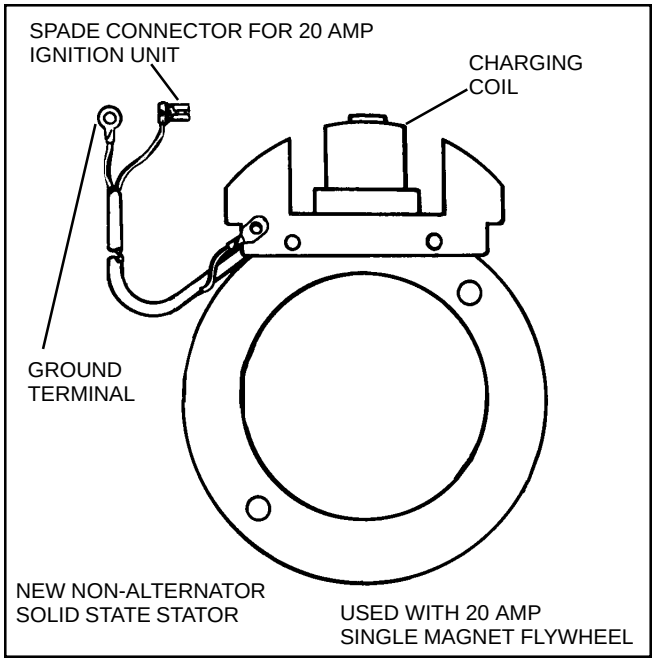
   SOLID STATE STATOR - Replace and test for spark. Time the magneto by turning counterclockwise as far as it will go. Tighten retaining screws to 5-7 foot pounds (6.8 - 12.4 mm).

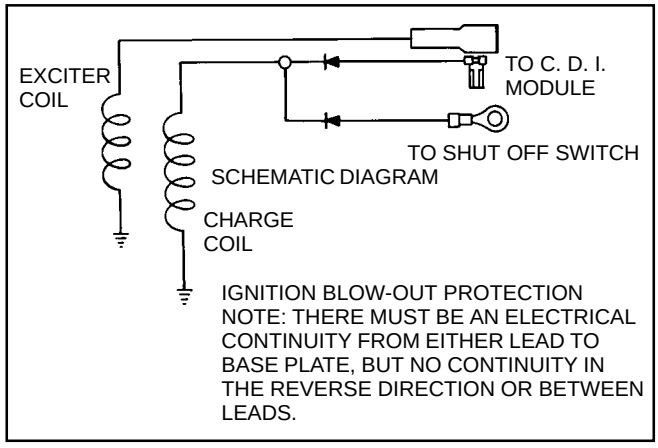


ONE TYPE OF NON-ALTERNATOR IGNITION
FOUND ON 8 HP AND LARGER ENGINES



ONE TYPE OF NON-ALTERNATOR IGNITION
FOUND ON VALVE-IN-HEAD ENGINES





STATOR PLATE ASSEMBLY (20 AMP SYSTEM). Previous tests also apply, except for the following:

1. Test the ignition unit first. If good, remove flywheel and check coil for continuity.
2. Determine if correct flywheel is used, if previously replaced. The flywheel used for a 20 amp system is not compatible with flywheel used on a 10 amp systems.
3. The stator cannot be turned once secured with stator bolts.

SECTION 2. CHARGING SYSTEMS

PRECAUTIONS

CAUTION: Electrical components of the 10 amp alternator system are similar to the 20 amp alternator system. Use care not to interchange electrical components; severe damage will result.

A. Do not connect battery to cables in wrong polarity. This will cause regulator-rectifier damage.

B. Break continuity between the regulator-rectifier unit and battery when using a remote charger on the battery. This will eliminate damage to the regulator-rectifier if polarity is reversed.

C. Disconnect wiring harness at regulator-rectifier before using arc welder on equipment.

D. Do not short alternator leads together.

E. When normally running the engine DO NOT disconnect the lead to the battery.

NOTE: Only when testing the D.C. output, should the D.C. output lead be disconnected from the battery.

F. If wiring must be replaced in any part of the circuitry, be certain the same size (gauge) wire is used. Wire between the battery to the starter motor must be a minimum of No. 6 gauge. For the 20 amp alternator system the charge circuit uses No. 14 gauge wire. Most of the remaining portion of the circuitry will be No. 18.

Newer 20 amp systems are distinguished by the regulator-rectifier installed in the blower housing. Connectors are not interchangeable with connectors on the external type regulator-rectifier 20 amp system. Do not force or modify connectors. Test values are identical to original 20 amp alternator system.

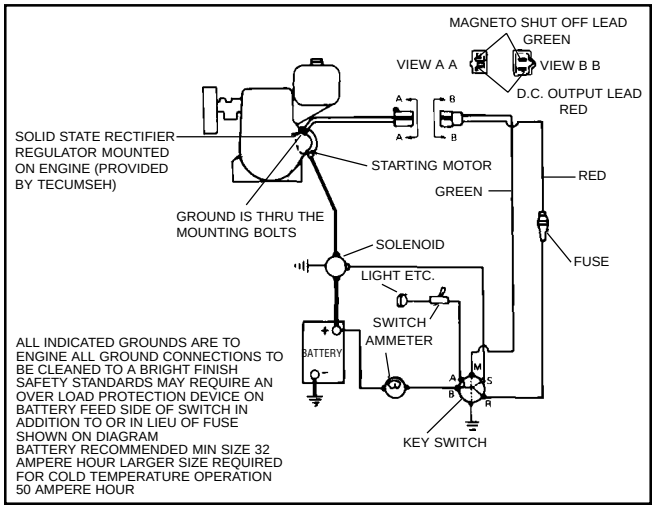
PRE-SERVICE CHECKS

a. Check for a good ground between regulator-rectifier and mounting.

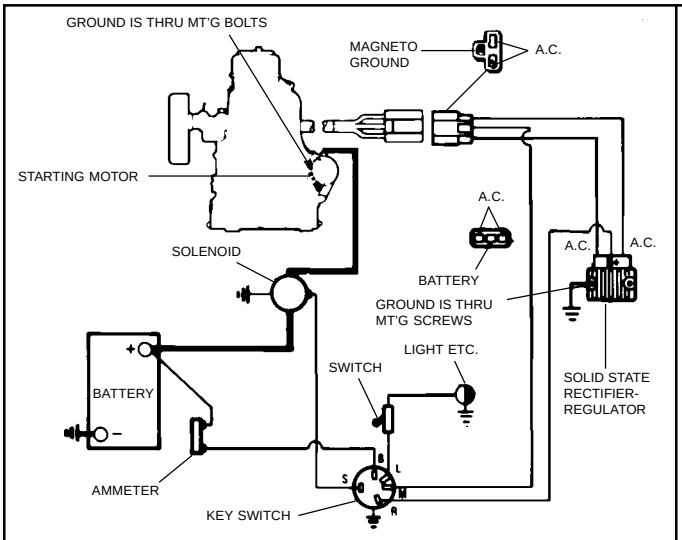
b. Check for poor connections or broken wires.

c. Check the fuse.

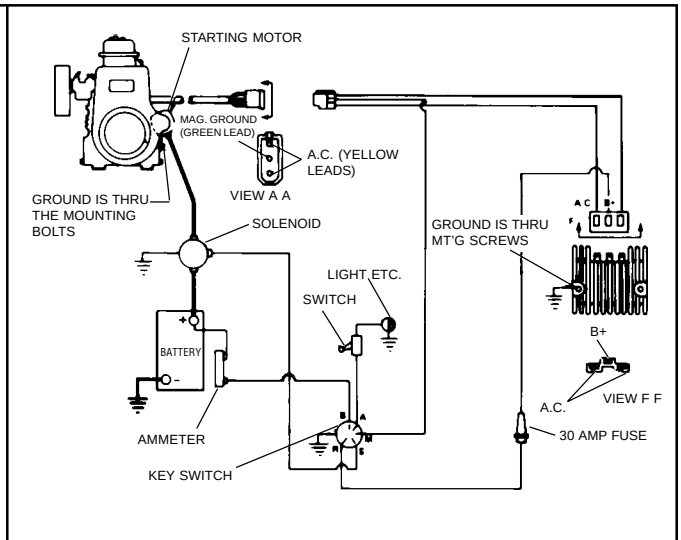
NOTE: Battery voltage must be above 6 volts for the regulator to be activated. This applies only to the 20 amp system with regulator-rectifier in housing.



20 AMP. ALTERNATOR SYSTEM



10 AMP. ALTERNATOR SYSTEM

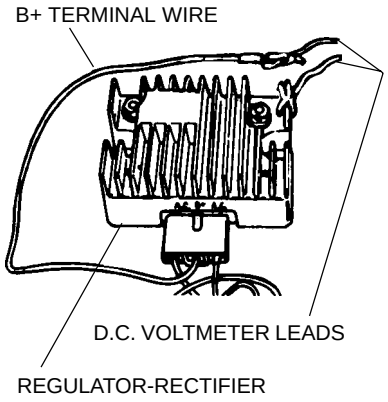


20 AMP. ALTERNATOR SYSTEM

Before performing the following tests see page 48, A through F.

TEST NO. 1 (NO CHARGE TO BATTERY)

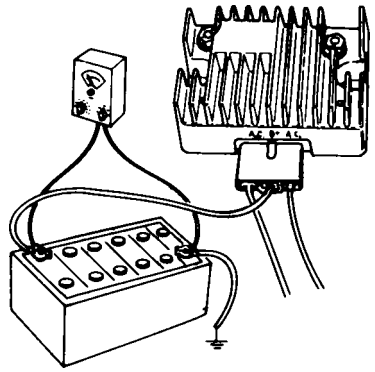
NOTE: Tests must be followed in their order of listing. EXAMPLE: Test No. 1 must be completed before proceeding to Test No. 2. Replace any defective part.



10 AMP ALTERNATOR TEST

Disconnect B+ at battery lead (NOTE: Keep test to a minimum with B+ wire disconnected from the battery) and check D.C. voltage between B+ regulator lead and case:

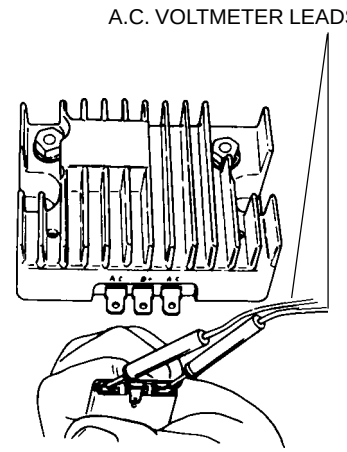
1. 2500 RPM 13.0 volts min. 3000 RPM 16.0 volts min. 3600 RPM 20.00 volts min.	1. System okay. Check for defective ammeter.
2. If less than above voltages but greater than 0 volts.	2. Check for possible defective regulator-rectifier.
3. If 0 volts at any above speeds.	3. Check for defective stator or regulator-rectifier.



TEST NO. 2 (NO CHARGE TO BATTERY)

With battery connected, check B+ to ground voltage with D.C. voltmeter.

1. 2500 RPM: If 11.0 volts or higher place load (head lights) on battery to reduce battery voltage to 10.0 volts. 3000 RPM: If 20.0 volts or higher place load (head lights) on battery to reduce battery voltage to 11.0 volts. 3600 RPM: If 13.5 volts or higher place load (head lights) on battery to reduce battery voltage to 12.0 volts.	
a. If charge rate increases.	System okay. Battery was charged fully.
b. If charge rate does not increase.	Check for defective stator or regulator.

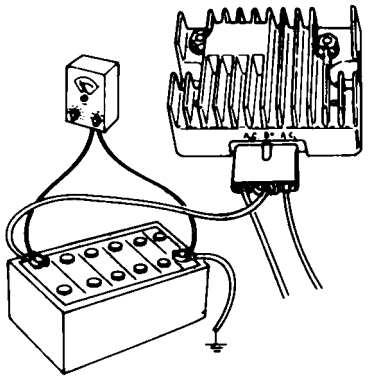


TEST NO. 3 (NO CHARGE TO BATTERY)

Disconnect plug from regulator-rectifier and test A.C. voltage at plug.

1. 2500 RPM: Voltage reads less than 16 volts.	1. Defective stator
2. Voltage reads over 16 volts.	2. Defective regulator-rectifier.
3. 3000 RPM: Voltage reads less than 19 volts.	3. Defective stator
4. Voltage reads over 19 volts.	4. Defective regulator-rectifier.
5. 3600 RPM: Voltage reads less than 24 volts.	5. Defective stator
6. Voltage reads over 24 volts.	6. Defective regulator-rectifier.

TEST NO. 4 (BATTERY ALWAYS CHARGING AT HIGH RATE)



Check B+ to ground voltage with D.C. voltmeter.

1. 2500 RPM: Voltage over 14.7 volts.	1. Regulator not functioning.
2. 3000 RPM: Voltage over 14.7 volts.	2. Regulator not functioning.
3. 3600 RPM: Voltage over 14.7 volts.	3. Regulator not functioning.
4. 2500 RPM: Voltage under 12.0 volts.	4. Battery charge low. Alternator and Regulator System okay. Check battery.
5. 3000 RPM: Voltage under 13 volts.	5. Battery charge low. Alternator and Regulator System okay. Check battery.
6. 3600 RPM: Voltage under 14.7 volts.	6. Battery charge low. Alternator and Regulator System okay. Check battery.

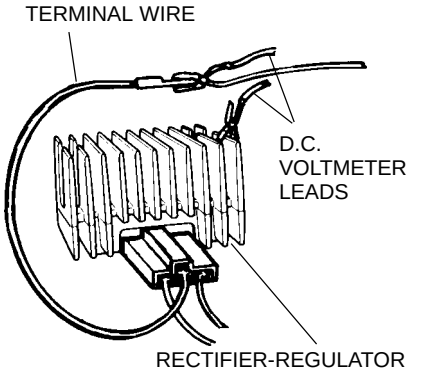
TEST NO. 5 (BATTERY BOILING OR FUMING)

Check B+ to ground voltage with D.C. voltmeter.

1. If over 14.7 volts.	1. Regulator not functioning.
Visual check for overfilling.	Overfilled battery may appear to fume due to expansion.

20 AMP. ALTERNATOR TESTS

Before performing the following tests, see page 48, A through F.



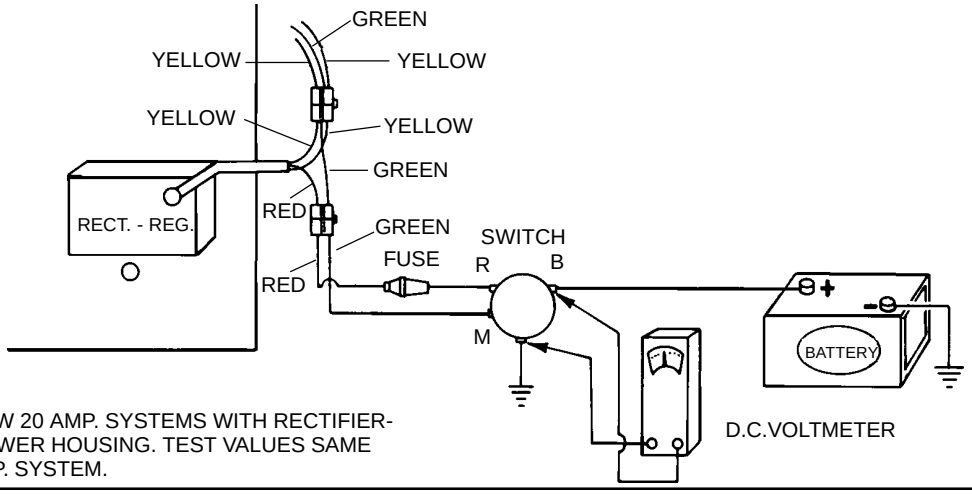
TEST SET-UP ON 20 AMP SYSTEMS WITH EXTERNAL REGULATOR-RECTIFIER

TEST NO. 1 (NO CHARGE TO BATTERY)

NOTE: Tests must be followed in their order of listing. EXAMPLE: Test No. 1 must be completed before proceeding to Test No. 2. Replace any defective part.

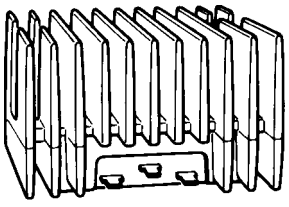
With battery connected check B+ to ground voltage with D.C. voltmeter.

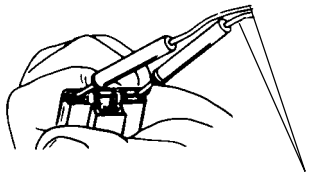
1. Place load (head lights) on battery to reduce battery voltage to below 12.5 volts. (This may take a few minutes.)	
2. Start engine. Run at 2500 RPM, 3000 RPM and 3600 RPM with same load as above.	
a. If voltage increases.	a. System okay - Battery was charged fully.
b. If voltage does not increase.	b. Check for defective stator or regulator system. Tests No. 2 and No. 3.



TEST SETUP ON NEW 20 AMP. SYSTEMS WITH RECTIFIER-REGULATOR IN BLOWER HOUSING. TEST VALUES SAME AS ORIGINAL 20 AMP. SYSTEM.

TEST NO. 2 (NO CHARGE TO BATTERY)

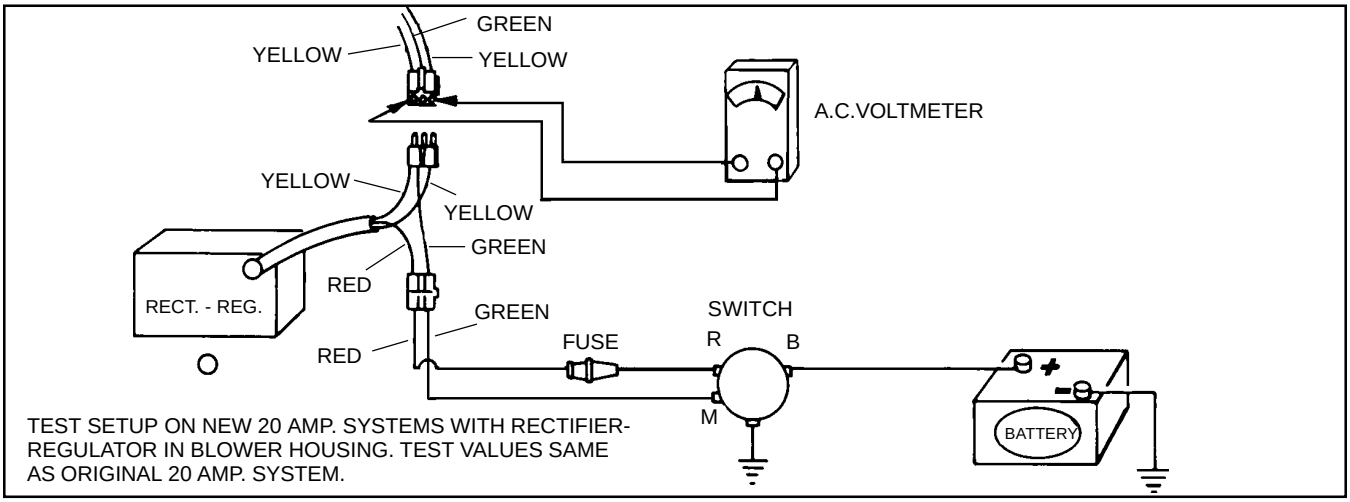




A.C. VOLTMETER LEADS

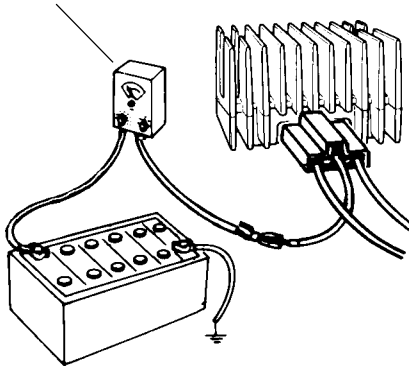
Disconnect plug from regulator and test AC voltage at plug.

1. 2500 RPM: Voltage reads less than 32 volts.	1. Defective stator.
2. Over 32 Volts.	2. Defective regulator See Test No.3.
3. 3000 RPM: Voltage reads less than 38 volts.	3. Defective stator.
4. Over 38 volts.	4. Defective regulator See Test No.3.
5. 3600 RPM: Voltage reads less than 45 volts.	5. Defective stator.
6. Over 45 volts	6. Defective regulator See Test No.3.



TEST SETUP ON NEW 20 AMP. SYSTEMS WITH RECTIFIER-REGULATOR IN BLOWER HOUSING. TEST VALUES SAME AS ORIGINAL 20 AMP. SYSTEM.

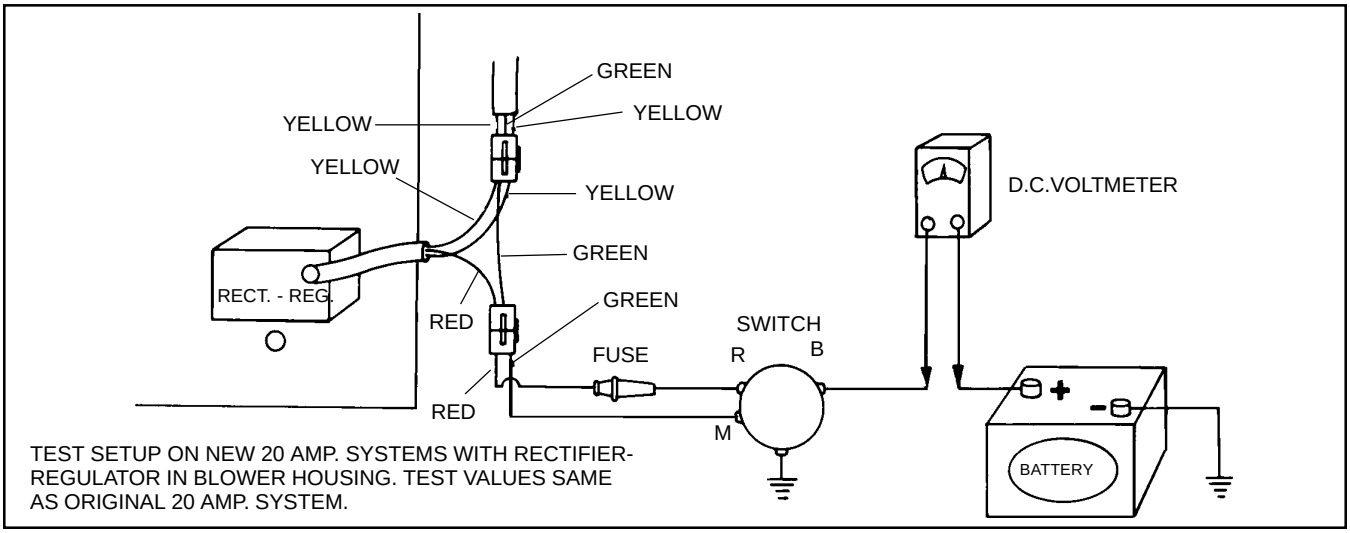
D.C. AMMETER



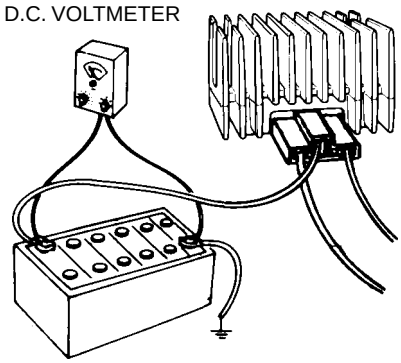
TEST NO. 3 (LOW CHARGE TO BATTERY)

Check current output with D.C. ammeter connected in series from B+ of regulator to positive side of battery.

1. 2500 RPM @ 12.5 volts load current reads less than 13 amps.	1. Defective stator.
2. 3000 RPM @ 12.5 volts load. current reads less than 15 amps	2. Defective stator.
3. 3600 RPM @ 12.5 volts load current reads less than 17 amps.	3. Defective stator.



TEST SETUP ON NEW 20 AMP. SYSTEMS WITH RECTIFIER-REGULATOR IN BLOWER HOUSING. TEST VALUES SAME AS ORIGINAL 20 AMP. SYSTEM.



TEST NO. 4 (BATTERY ALWAYS CHARGING AT HIGH RATE)

Check B+ to ground voltage with D.C. voltmeter.

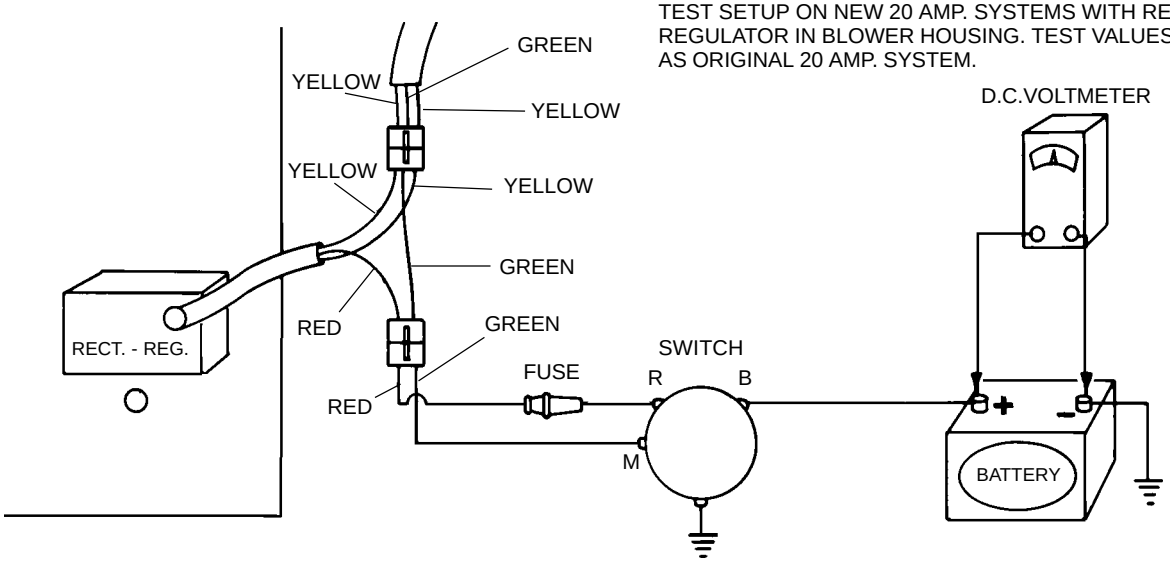
1. If over 14.8 volts at 2500 RPM, 3000 RPM, and 3600 RPM.	1. Regulator is not functioning.
2. If under 14.4 volts @ 2500 RPM. @ 3000 RPM. @ 3600 RPM.	2. Battery charge low. Alternator okay, check battery.

TEST NO. 5 (BATTERY BOILING OR FUMING).

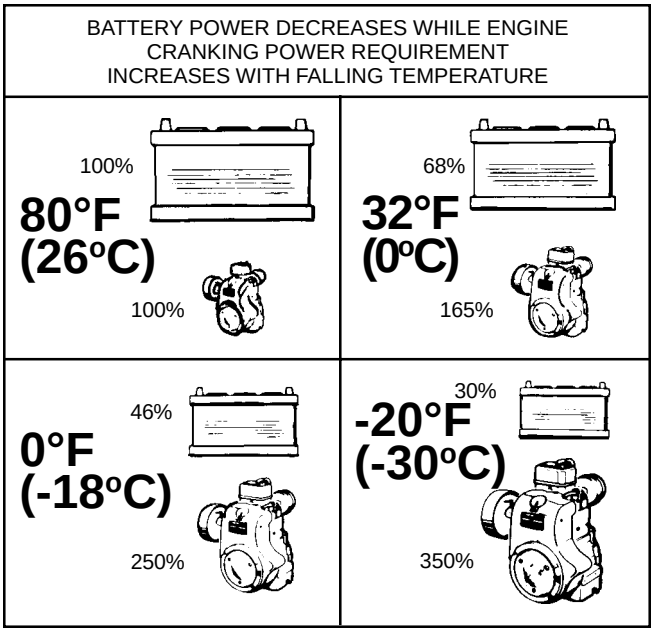
Check B+ to ground voltage with D.C. voltmeter.

1. If over 14.8 volts.	1. Regulator not functioning.
Visual check for overfilling.	Overfilled battery may appear to fume due to expansion.

TEST SETUP ON NEW 20 AMP. SYSTEMS WITH RECTIFIER-REGULATOR IN BLOWER HOUSING. TEST VALUES SAME AS ORIGINAL 20 AMP. SYSTEM.



SECTION 3. BATTERY SERVICE



BATTERY CHECK. Because the battery is part of two circuits starting, ignition and charging (in the ignition circuit, only in switch starting units) the battery should be checked first.

If battery has a shorted cell, overcharging can result, and the regulator rectifier may appear to be at fault. If a cell has an open or high resistance connection, cranking motor operation will be affected, but replacing the cranking motor will not cure the trouble. If the battery is badly sulphated, consistent low gravity readings, slow cranking, and possible poor ignition performance can be experienced during starting.

BATTERY SIZE RATIO: AMPERAGE TO TEMPERATURE. It is always good practice to select a replacement battery of an electrical size at least equal to the battery originally engineered for the vehicle by the manufacturer.

Battery power decreases while the need for engine cranking power increases with falling temperature. Subzero cold reduces battery capacity of a fully charged battery to 30% of its normal power and at the same time increases cranking load beyond the normal warm weather load.

Hot weather will place excessive electrical loads on batteries. Difficulty in starting may occur when cranking is attempted shortly after a hot engine has been turned off.

If the capacity rating for the original equipment battery cannot be determined, a 32 amp or greater rated replacement battery would be sufficient. IMPORTANT: For operation at colder temperatures, a 50 amp or greater rating is recommended.

BATTERY CONDITION. While the battery is built to satisfactorily withstand the conditions under which it will normally operate, excessive mechanical abuse leads to early failure.

The following points are important to properly install a battery:

1. Be sure the battery carrier is clean and that the new battery rests level when installed.
2. Tighten the hold-down evenly until snug. Do not draw down tight enough to distort or crack the battery case.
3. Be sure the cables are in good condition and the terminal clamps are CLEAN. Grease battery terminals lightly with petroleum jelly before attaching cable clamps. Make sure the ground cable is CLEAN and TIGHT at the engine block or frame.
4. Check polarity to be sure battery is not reversed with respect to the generating system.
5. Connect “ground” terminal of the battery last, to avoid “short” circuits which will damage the battery.

CAUTION: The charging process will chemically liberate oxygen and hydrogen gasses. This highly flammable mixture may be dangerous if ignited. Disconnect ground terminal first to prevent arcing at the positive terminal.

BATTERY PRECAUTIONS. If a battery is not used for a long period of time, it is advisable to remove the terminal connections to prevent a slow discharge. On some units there is an ON-OFF switch to cut the battery out of the circuit when not in use.

Be careful when replacing battery connections. A reversal of polarity can cause damage to the regulator-rectifier.

BATTERY MAINTENANCE: (Acid-Type) Check water level periodically to determine that the top of the battery plates are covered. Never overfill !

Whenever possible, add only distilled water. If not available, use water with the lowest possible mineral content. Hard water will cause an accumulation of calcium deposits.

Never add water to a battery at below freezing temperatures unless the water has been thoroughly mixed with electrolyte first. This may be done by operating the engine for about 4 hours.

Do not add acid unless it has been lost. Only water in the sulfuric acid solution is normally evaporated through normal usage. If the solution has been lost by spilling, add acid so there is not more than a 10 to 1 ratio of acid to water.

Check to determine if the vent holes in the caps are open.

In normal usage the battery casing may be partially covered with a white powder. Clean such areas with a solution of 1 part bicarbonate of soda to 4 parts water. Use care to prevent solution from entering battery cells.

If battery terminals show corrosion, remove battery connections carefully. Do not twist or use unnecessary force to remove from battery. Brighten battery posts and connections. Coat battery posts and terminal connections with petroleum jelly and replace. (Never hammer on battery posts!)

TESTING THE BATTERY. Voltage Check of Acid-Type Battery (12 volt).

NOTE: Do not attempt to measure individual cell voltage by "jabbing" a voltmeter probe through the battery cover.

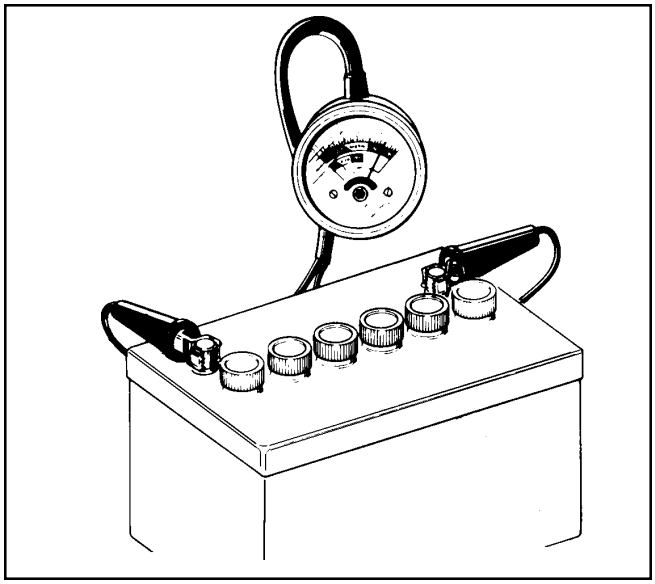
*Specific Gravity	Percentage of Charge in Battery	**Time Required to Charge Battery at 5 Amp Hour Rate		
		24 Amp Hours	32 Amp Hours	50 Amp Hours
1.140	Discharged	5 hours	7 hours	10 hours
1.170	25% Charged	4 hours	5 hours	8 hours
1.200	50% Charged	3 hours	5 hours	4 hours
1.230	75% Charged	1 hours	2 hours	3 hours
1.260	100% Charged			

*This may vary from battery manufacturer's specifications.

**These are approximations. Time may vary due to cell conditions, battery construction, heat, etc.

NOTE: The approximate charging time can be calculated by dividing the Amp-Hour rate of the battery by the Amp-Hour charging rate of charger. (For example: a 55 amp-hour battery on a 5 amp hour charger will take about 11 hours to charge.) The slower charging rate, the easier it is on the battery, and the more thoroughly you will dissolve the sulfate that has collected. Generally a charge rate of 5-7 amps per hour is ideal.

1. Using a battery tester voltmeter, hook up the battery and adjust for 3 times the amp-hour rating of the battery.
2. After 15 seconds (no longer) read the voltmeter. If the voltage is over 9.6 volts check the specific gravity. If reading is below 1.230, charge the battery.



SPECIFIC GRAVITY CHECK. Use a hydrometer to determine that there is at least 75% charge in the battery.

CAUTION: Electrolyte solution contains sulfuric acid. Handle with care since spilled liquid is very corrosive to skin and clothing. Use protective eye cover.

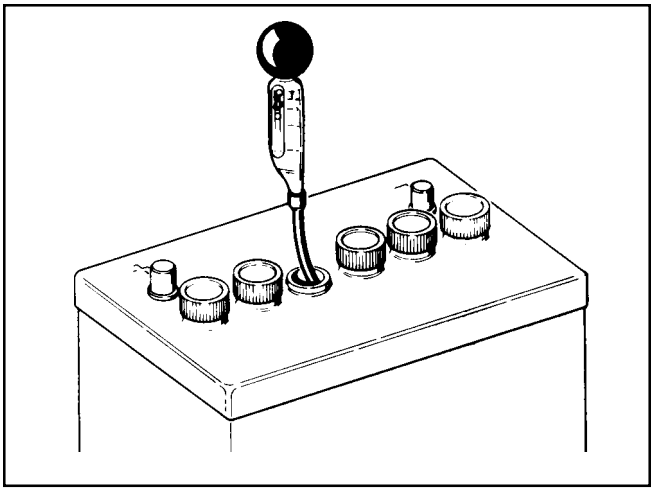
1. Remove caps and check water level, if below battery plates, add water and recheck battery after the water has mixed with the electrolyte after about 4 hours use with engine charge.
2. Put the hydrometer into battery and draw electrolyte into barrel.
3. Make sure the hydrometer float rides freely in electrolyte. Clean inside of barrel with soap and water if float persistently sticks to side of barrel. Clean and dry before use.
4. Make certain readings on float are at eye level.
5. Adjust reading according to temperature of electrolyte. Add .004 for each 10° (12°C) above 80°F (26°C). or subtract .004 for each 10° (12°C) below 80°F (26°C).

If there is a difference of more than .05 volts between the highest and lowest cells, replace the battery.

If there is less than .05 volts between the highest and lowest cells, charge the battery per the chart. If battery is above 9.6 volts the battery is o.k.

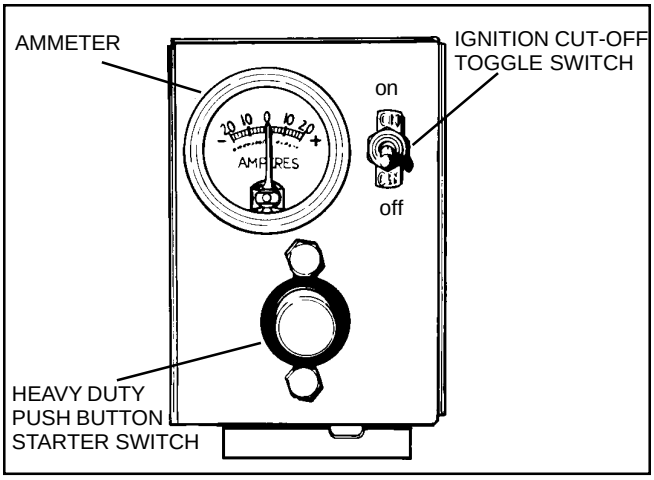
If battery reads less than 9.6 volts after charge, the battery is ready to be replaced.

Use caution in reconnecting the battery cables to the battery. An accidental reversal of polarity can cause damage to the regulator-rectifier.



Battery Condition	Specific Gravity
Discharged	1.110 to 1.130
No useful charge	1.140 to 1.160
25%	1.170 to 1.190
50%	1.200 to 1.220
75%	1.230 to 1.250
100%	1.260 to 1.280

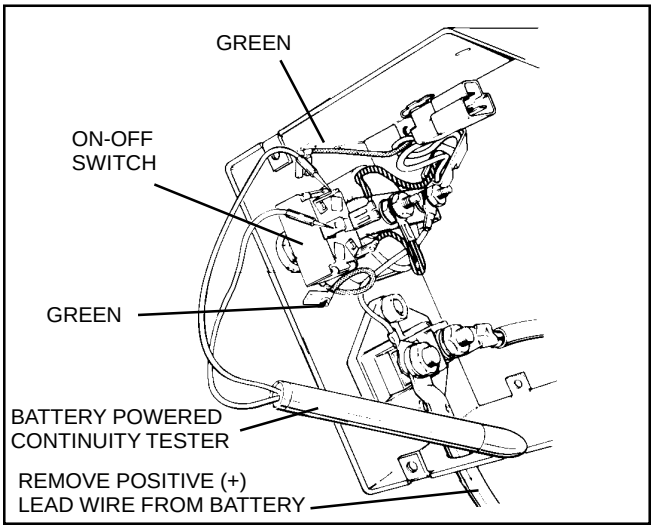
SECTION 4. ELECTRICAL CONTROL PANELS



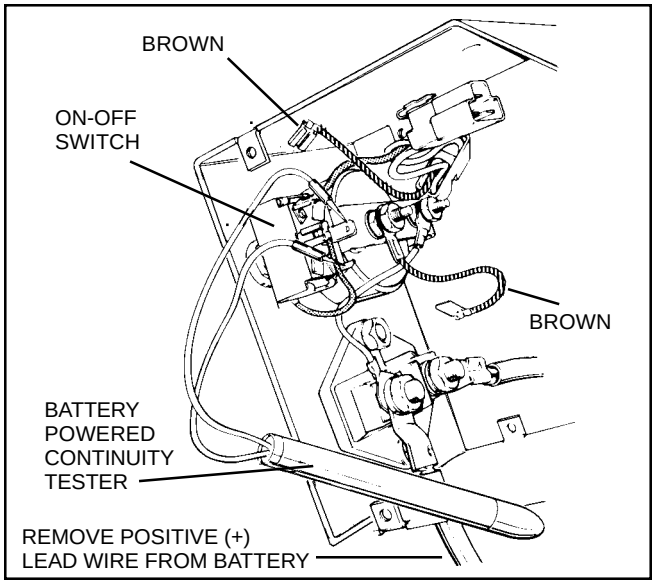
ELECTRICAL CONTROL PANEL SERVICE PART NO. 730155. The test procedures explained below will deal only with the control panel.

Before attempting to locate an apparent defect in the control panel switches or ammeter, insure all connections between control panel, starter and battery are secure and free from corrosion and wire or insulation breaks. Battery should be fully charged or be at a minimum of 75% charge. Engine ignition spark should be checked for an intense spark.

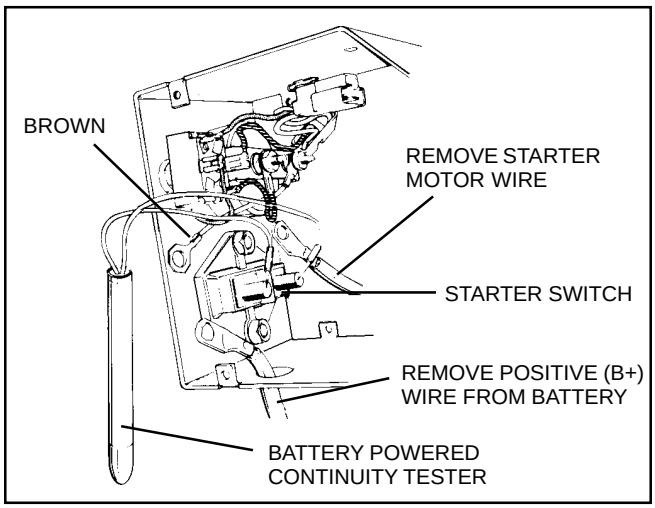
Remove side plates from control panel. Remove engine alternator connector plug from panel connector. Use a volt-ohm-millimeter or battery powered test light for the following tests. **CAUTION** - Remove (+) lead from battery before attempting any of the following tests.



ON-OFF SWITCH IGNITION GROUND CIRCUIT. Remove both the green wires from switch terminals. Attach test leads of tester (Battery type test light or ohmmeter) to switch terminals. Move toggle switch to the “ON” position. No continuity (light should not light) should exist. Leave test leads attached to switch and move switch to “OFF” position. Continuity should exist (light should light). If switch fails to either test, switch must be replaced.



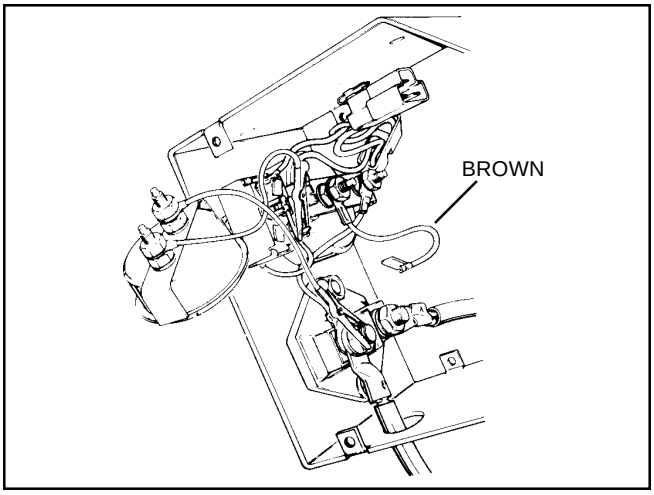
ON-OFF SWITCH - DC RELAY CIRCUIT. Remove both brown wires from switch terminal. Attach test leads to switch terminal. Place switch to the “ON” position. Continuity (test light should light) should exist. Leave test leads attached and move switch to the “OFF” position. Continuity should not exist (test light should not light). If switch fails either of these tests, switch must be replaced.

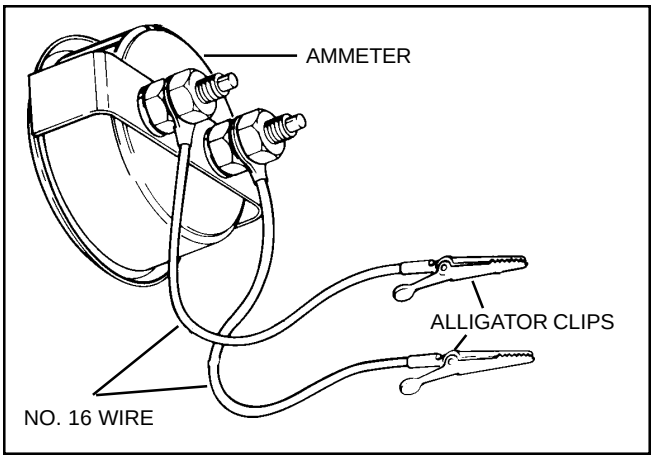


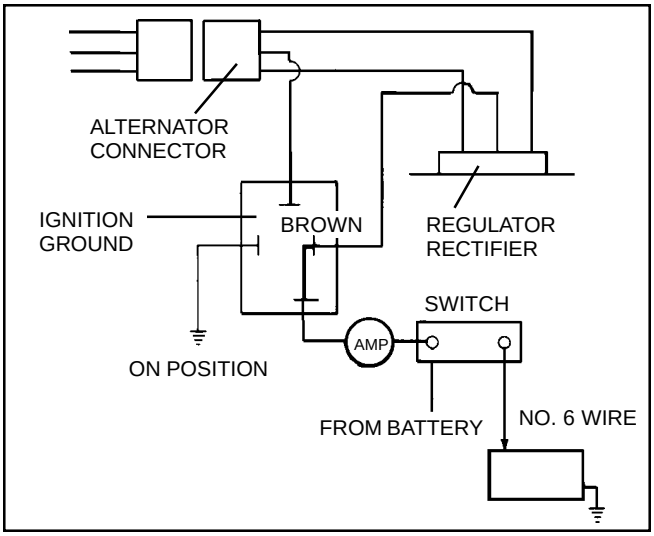
STARTER SWITCH. Remove wires from starter switch. Place test leads on to switch terminals. No continuity should exist (Test light should not light). Leave test leads attached depress starter button. Continuity should exist (Test light should light). If starter switch fails either of these tests, replace switch.

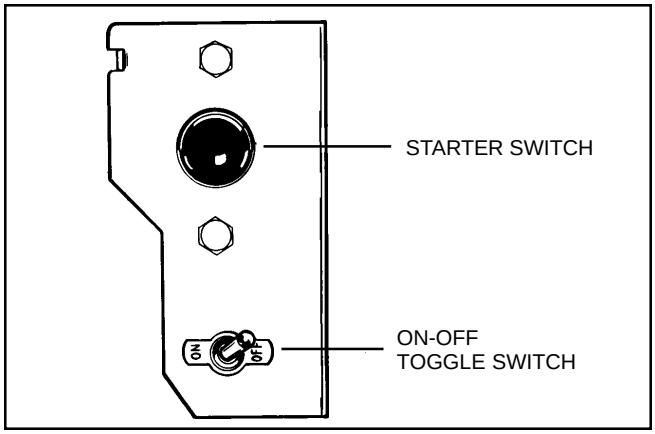
AMMETER. CAUTION The ammeter will not show a charge if the battery is at full charge. The rate of charge will depend on the amount of charge in the battery. The lower the charge in the battery, the higher the reading on the ammeter. If ammeter does not show a charge or discharge, start and stop engine (use electric starter) several times to lower charge of the battery. Observe ammeter and if there is no deflection, proceed with the following test.

To test ammeter remove right side panel. Remove brown wire from “On/Off” switch. Use a volt/ohm/millimeter. Attach one test lead to the terminal the brown wire was removed from, attach other test lead to positive terminal of start switches. Set tester to the ampere scale and start engine. Set throttle control at full throttle and observe meter. If meter registers a charge, system is okay and meter on panel is inoperative. This test can also be made using a good ammeter. Attach a wire to each terminal of the ammeter and hookup as described above. No reading on either meter would indicate a problem with the regulator-rectifier and/or alternator.

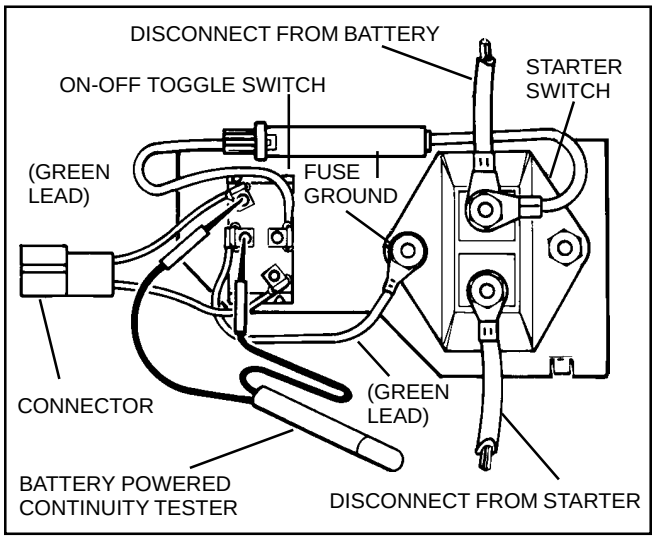








ELECTRICAL CONTROL PANEL SERVICE PART NO. 730198. The following test procedures will be limited to the control panel. Test procedures for electrical components external to this control panel will be found in their respective areas. Before attempting to locate an apparent defect in the control panel switches insure all connections between control panel, starter and battery are secure and free from corrosion and wire or insulation breaks. Battery should be fully charged or be at a minimum of 75% charge. Engine ignition spark should be checked for an intense spark.



CAUTION - Remove the control panel from the engine bracket then remove (+) lead from battery before attempting any of the following tests.

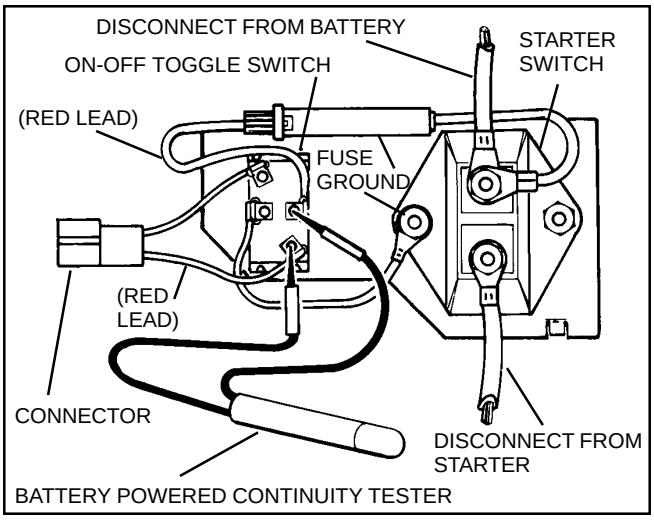
ON-OFF TOGGLE SWITCH-IGNITION GROUND CIRCUIT. Note: One of several continuity testers may be used. For the following tests a battery powered continuity tester is used.

When disconnecting spade connectors from terminals use care not to damage wire connections or switch terminals. The use of a pair of needlenosed pliers is recommended.

A. Test for switch continuity of magneto cutout circuit.

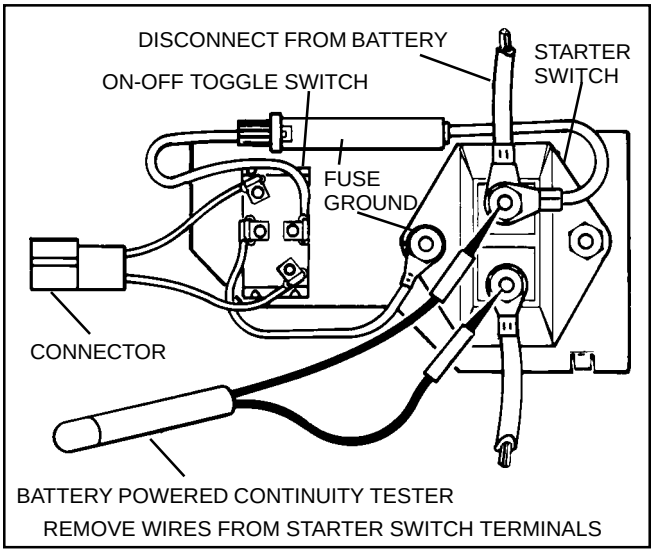
1. Disconnect the two green leads by pulling spade connectors off of terminals.
2. Place continuity tester probes on each switch terminal.

3. With the toggle switch in the “off” position, the test light will light.
4. With the toggle switch in the “on” position, the test light will not light.
5. Position the spade connectors to the original positions.



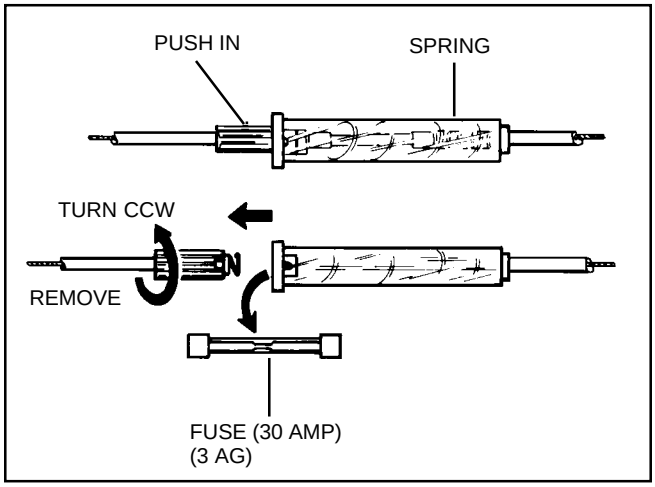
B. Test for switch continuity of D.C. circuit.

1. Disconnect the spade connector (red wire) from the switch terminal.
2. Disconnect the other spade connector (red wire) from the switch terminal.
3. Place continuity tester probes on each switch terminal.
4. With the toggle switch in the “on” position the test light will light.
5. With the toggle switch in the “off” position the test light will not light.
6. Position the spade connectors to the original positions.



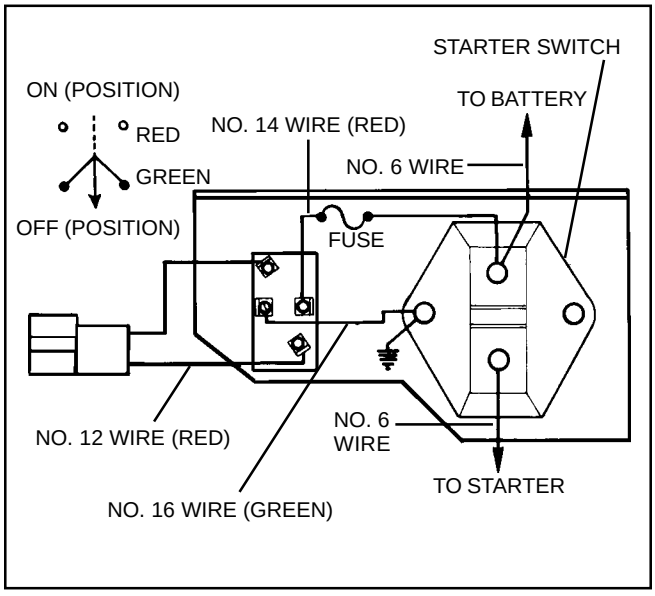
If either of the tests do not give the correct results, replace the switch.

STARTER SWITCH CONTINUITY TEST. Remove wires from starter switch. Place test leads on to switch terminals. No continuity should exist (Test light should not light). Leave test leads attached; depress starter button. Continuity should exist (Test light should light). If starter switch fails either of these tests, replace switch.



FUSE. To remove the fuse, push the cap in to compress spring at base of fuse holder and with same motion turn the cap counterclockwise (ccw) and pull cap away from holder. Fuse can now be removed from holder. Inspect condition of fuse. If in doubt, perform continuity test on fuse and/or connections in fuse holder. To reinstall, reverse disassembly procedure.

If fuse is defective, replace with a 12 volt/30 amp. size. (3 AG)



WIRING DIAGRAM. The wiring diagram is shown to show the correct placement of electrical connections, color code and wire gauge. The wire to the battery is supplied by the O.E.M.

TROUBLESHOOTING FOR ELECTRICAL CONTROL PANEL, SERVICE PART NO. 730155.		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Electric Starter Does Not Crank Engine	Check to determine if crankshaft turns freely; if not, check for binding belts, pulleys, clutches, etc.	Relieve load on crankshaft. Disengage associated equipment clutches, belts or pulleys.
	Check battery connections for corrosion and/or breaks.	Correct problem.
	Weak or bad battery.	Replace or charge battery if less than 3/4 charged.
	Push button starter switch.	Replace if inoperative. See Service Instruction on preceding pages.
	Electric starter.	See troubleshooting chart.
	Panel wiring.	Correct problem.
Starter Cranks Engine But Engine Does Not Start	Toggle switch.	If inoperative, replace. See Service Instructions on preceding pages.
	Insure spade connectors are secured to appropriate switch terminals.	Correct. See Service Instructions on preceding pages. See “Engine Fails to Start”
Ammeter Does Not Show A Charge (If battery is fully charged, ammeter will not show a charge)	Weak or bad battery.	Charge or replace.
	Faulty wiring and/or connections.	Correct or replace.
	Shorted or open alternator.	Replace.
	Regulator-Rectifier.	Replace.
	Ammeter.	Replace if inoperable. See Service Instruction on preceding pages.
Ammeter Shows A Discharge.	Broken wiring and/or insulation.	Correct problem.
	Toggle switch.	Check and replace if inoperable. See Service Instructions on preceding pages.

TROUBLESHOOTING FOR ELECTRICAL CONTROL PANEL, SERVICE PART NO. 730198.		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Electric Starter Does Not Crank Engine.	Check to determine if crankshaft turns freely; if not, check for binding belts, pulleys, clutches, etc.	Relieve load on crankshaft. Disengage associated equipment clutches, belts or pulleys.
	Check battery connections for corrosion and/or breaks.	Correct problem.
	Weak or bad battery.	Replace or charge battery if less than 3/4 charged.
	Push button starter switch.	Replace if inoperative. See Service Instruction on preceding pages.
	Electric starter.	See troubleshooting chart.
	Panel wiring.	Correct problem.
Starter Cranks Engine But Engine Does Not Start.	Toggle Switch	If inoperative, replace. See Service Instruction on preceding pages.
	Insure spade connectors are secured to appropriate switch terminals.	Correct problem.

CHAPTER 9. TROUBLESHOOTING

TROUBLESHOOTING

Below is a list of common problems and remedies. Follow a uniform procedure to locate and eliminate the causes.

Cause	Remedy
A. ENGINE FAILS TO START OR STARTS WITH DIFFICULTY	
No fuel in tank.	Fill tank with clean, fresh fuel.
Shut-off valve closed.	Open valve
Obstructed fuel line.	Clean fuel screen and line. If necessary, remove and clean carburetor.
Tank cap vent obstructed.	Open vent in fuel tank cap.
Water in fuel.	Drain tank. Clean carburetor and fuel lines. Dry spark plug electrodes. Fill tank with clean, fresh fuel.
Engine over-choked.	Close fuel shut-off and pull starter until engine starts. Reopen fuel shut-off for normal fuel flow.
Improper carburetor adjustment.	Adjust carburetor.
Loose or defective magneto wiring.	Check magneto wiring for shorts or grounds; repair if necessary.
Faulty ignition unit.	Check ignition unit. Solid State. Check points, timing on standard ignition units.
Spark plug fouled.	Clean and regap spark plug.
Spark plug porcelain cracked.	Replace spark plug.
Poor compression.	Check compression.
No spark at plug.	Disconnect ignition cut-off wire at the engine. Crank engine. If spark at spark plug, ignition switch, safety switch or interlock switch is inoperative. If no spark, check magneto. Check wires for poor connections, cuts, or breaks.
Electric starter does not crank engine.	See 12 volt starter trouble shooting chart page.
B. ENGINE KNOCKS	
Carbon in combustion chamber.	Remove cylinder head and clean carbon from head and piston.
Loose or worn connecting rod.	Replace connecting rod.
Loose flywheel.	Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to proper torque (See Table of Specifications).
Worn cylinder.	Recondition cylinder or replace.
Improper Magneto Timing.	Time ignition.
Improperly set ignition unit.	Check ignition unit.
Excessive main bearing end play.	Readjust to correct crankshaft end play.

C. ENGINE MISSES UNDER LOAD	
Cause	Remedy
Spark plug fouled.	Clean and regap spark plug.
Spark plug porcelain cracked.	Replace spark plug.
Improper spark plug gap.	Regap spark plug.
Pitted magneto breaker points.	Clean and dress breaker points. Replace badly pitted breaker points.
Magneto breaker arm sluggish.	Clean and lubricate breaker point rod and arm. Check for spring tension.
Faulty condenser.	Check condenser on a tester; replace if defective.
Improper carburetor adjustment.	Adjust carburetor.
Improper valve clearance.	Adjust valve clearance.
Weak valve spring.	Replace valve spring.
D. ENGINE LACKS POWER	
Choke partially closed.	Open choke.
Improper carburetor adjustment.	Adjust carburetor.
Magneto improperly timed.	Time engine.
Loss of compression.	Check compression.
Lack of lubrication.	Fill crankcase to the proper level.
Air cleaner restricted.	Clean or replace air cleaner.
Valves leaking.	Grind valves.
Valve timing inaccurate.	Check timing marks on camshaft and crankshaft gear.
Carburetor dirty or damaged.	Clean, repair carburetor. See Carburetor Chapter 2.
Ignition system malfunction.	Check and repair system.
E. ENGINE OVERHEATS	
Engine improperly timed.	Time engine.
Carburetor improperly adjusted (lean).	Adjust carburetor.
Air flow obstructed.	Remove any obstructions from air passages in shrouds.
Excessive load on engine.	Check operation of associated equipment. Reduce excessive load.
Carbon in combustion chamber.	Remove cylinder head and clean carbon from head and piston.
Lack of lubrication.	Fill crankcase to proper level.
F. ENGINE SURGES OR RUNS UNEVENLY.	
Fuel tank cap vent hole clogged.	Open vent hole.
Governor parts sticking or binding.	Clean, and if necessary repair governor parts.
Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking.	Clean, lubricate, or adjust linkage and deburr throttle shaft or butterfly.

Cause	Remedy
Governor not properly adjusted.	Adjust governor.
Carburetor not properly adjusted.	Adjust carburetor.
Intermittent spark at spark plug.	Disconnect ignition cut-off wire at the engine. Crank engine. If spark, check ignition switch, safety switch and interlock switch. If no spark, check magneto. Check wires for poor connections cuts or breaks.
G. ENGINE VIBRATES EXCESSIVELY	
Engine not securely mounted.	Tighten loose mounting bolts.
Bent crankshaft.	Replace crankshaft.
Associated equipment out of balance.	Check associated equipment.
Counterbalance counterweights not properly aligned.	Check.
H. ENGINE USED EXCESSIVE AMOUNT OF OIL.	
Engine speed too fast.	Using tachometer adjust engine RPM to specification.
Oil level too high.	Check level turn dipstick cap tightly into receptacle for accurate level reading.
Oil filler cap loose or gasket damaged causing spillage out of breather.	Replace ring gasket under cap and tighten cap securely.
Breather mechanism damaged or dirty causing leakage.	Replace breather assembly.
Gaskets or “O” rings damaged or gasket or “O” ring surfaces nicked causing oil to leak out.	Install new gaskets or “O” rings.
Valve guides worn.	Ream valve guide oversize and install 1/32'' (.787 mm) oversize valve.
Cylinder wall worn or glazed allowing oil to pass rings into combustion chamber.	Deglaze cylinder as necessary.
Piston rings and grooves worn excessively.	Reinstall new rings and check land clearance and correct as necessary.
Piston fit too loose.	Measure and replace as necessary.
Piston oil control ring return holes clogged.	Remove oil control ring and clean return holes.
Oil passages obstructed.	Clean out all oil passages.
I. OIL SEAL LEAKS	
Seal hardened or worn.	Replace seal.
Crankshaft seal contact surface is slightly scratched causing seal to wear excessively.	Crankshaft seal rubbing surface must be smoothed before installing new seal. Use a fine crocus cloth. Care must be taken when removing seals.
Crankshaft bearing under seal is worn excessively causing crankshaft to move.	Check crankshaft bearings for wear and replace if necessary.
Seal outside seat (oil seal bore) in cylinder or side cover is damaged allowing oil to seep around outer edge of seal.	Visually check seal receptacle (oil seal bore) for damage. Replace P.T.O. cylinder cover or small cylinder cover on the magneto end, if necessary.
New seal installed without correct seal driver and not seating squarely in cavity.	Replace with new seal using proper tools and methods.

Cause	Remedy
New seal damaged upon installation.	Use proper seal protector tools and methods for installing another new seal.
Bent crankshaft causing seal to leak.	Check crankshaft for straightness and replace if necessary. (Never straighten a bent crankshaft)
Oil seal driven too far into cavity.	Remove seal and replace with new seal using the correct driver tool and procedures.
J. BREATHER PASSING OIL	
Engine speed too fast.	Use tachometer to adjust correct RPM.
Loose oil fill cap or gasket damaged or missing.	Install new ring gasket under cap and tighten securely.
Oil level too high.	Check oil level Turn dipstick cap tightly into receptacle for accurate level reading. DO NOT fill above full mark.
Breather mechanism damaged.	Replace.
Breather mechanism dirty.	Clean thoroughly in solvent.
Piston ring end gaps aligned.	Rotate end gaps so as to be staggered 90° apart.
Drain hole in breather box clogged.	Clean hole with wire to allow oil to return to crankcase.
Breather mechanism loose or gaskets leaking.	Install new gaskets and tighten securely.
Damaged or worn oil seals on end of crankshaft.	Replace seals.
Rings not seated properly.	Check for worn or out of round cylinder. Replace rings. Break in new rings with engine working under a varying load. Rings must be seated under high compression or in other words under varied load conditions.
Breather assembly not assembled correctly on engine.	Refer to breather section.
Cylinder cover gasket leaking.	Replace cover gaskets.

K. TROUBLE SHOOTING CARBURETION

POINTS TO CHECK FOR CARBURETOR MALFUNCTION

Trouble	Correction
Carburetor out of adjustment	4-12-13-14-15-17-22
Engine will not start	1-2-3-4-5-6-7-9-12-13
Engine will not accelerate	3-4-12-13-14-26
Engine hunts (at idle or high speed)	4-5-9-10-11-12-13-14-22-23-26
Engine will not idle	5-9-10-12-14-15-16-22-23-24-26
Engine lacks power at high speed	3-4-7-9-12-13-22-23-26
Carburetor floods	5-8-19-23-24
Carburetor leaks	7-8-11-20-25-26
Engine overspeeds	9-10-12-16-17-20-22
Idle speed is excessive	9-10-15-16-17-20-22
Choke does not open fully	9-10-17
Engine starves for fuel at high speed (leans out)	1-2-4-5-7-12-17-19-21-23
Carburetor runs rich with main adjustment needle shut off	8-12-19-20-21-23
Performance unsatisfactory after being serviced	1thru 14 and 17 thru 23

1. Open fuel shut-off valve at fuel tank, fill tank with fuel.
2. Examine and clean fuel line and filter (where applicable).
3. Check ignition, spark plug and compression.
4. Clean air cleaner, service as required.
5. Dirt or restriction in fuel system, clean tank and fuel strainers, check for kinks or sharp bends.
6. Check for stale fuel or water in fuel, fill with fresh fuel.
7. Examine fuel line and pick-up for sealing at fittings.
8. Check and clean atmospheric vent holes.
9. Examine throttle and choke shafts for binding or excessive play, remove all dirt or paint, replace shaft.
10. Examine throttle and choke return springs for operation.
11. Examine idle and main mixture adjustment screws and “O” rings for cracks or damage.
12. Adjust main mixture adjustment screw. Check to see that it is the correct screw.
13. Examine main nozzle and replace with service nozzle.
14. Adjust idle mixture adjustment screw. Check to see that it is the correct screw.
15. Adjust idle speed screw.
16. Check position of choke and throttle plates.
17. Adjust control cable or linkage to assure full choke and carburetor control.
18. Clean carburetor after removing all non-metallic parts that are serviceable. Trace all passages.
19. Check inlet needle and seat condition and proper installation.
20. Check sealing of welch plugs, cups, plugs and gaskets.
21. Check fuel pump operation of pulse pump, clean the pulse line after removing it from the pump and engine fittings.
22. Adjust governor linkage.
23. Adjust float setting.
24. Check float shaft for wear and float for leaks or dents.
25. Check seal for fuel drain or bowl gasket.
26. Is carburetor operating at excessive angle, 31° or more ?

CHAPTER 10. 8 H.P. & LARGER ENGINE AND TORQUE SPECIFICATIONS ALSO VALVE-IN-HEAD SPECIFICATIONS AND TORQUES

SECTION 1. CROSS REFERENCE LIST FOR TABLE OF SPECIFICATIONS

Craftsman Engine Model	See Model
143.558012	HH80
143.558022	HH80
143.558032	HH80
143.558052	HH80
143.559012	HH100
143.559022	HH100
143.559032	HH100
143.559042	HH100
143.562012	HH120
143.562022	HH120
143.562032	HH1200
143.568032	HH80
143.569022	HH100
143.569032	HH100
143.569042	HH100
143.569052	HH100
143.569082	HH100
143.572012	HH120
143.572022	HH120
143.572032	HH120
143.572042	HH120
143.572052	HH120
143.572062	HH120
143.572092	HH120
143.572102	HH120
143.578012	HH80
143.578022	HH80
143.578052	HH80
143.578062	HH80
143.578072	HH80
143.579012	HH100
143.579022	HH100
143.579032	HH100
143.579042	HH100
143.579052	HH100
143.579062	HH100
143.579072	HH100
143.579082	HH100
143.579092	HH100
143.579102	HH100
143.579112	HH100
143.579132	HH100
143.582012	HH120
143.582022	HH120
143.582032	HH120
143.582042	HH120
143.582052	HH120
143.582062	HH120
143.582072	HH120
143.582082	HH120
143.582092	HH120
143.582102	HH120
143.582112	HH120
143.582122	HH120
143.582132	HH120
143.582142	HH120
143.582172	HH120
143.588012	HH80
143.588032	HH80
143.589012	HH100
143.589022	HH100
143.589032	HH100
143.589042	HH100
143.589052	HH100
143.589072	HH100
143.592012	HH120
143.592022	HH120
143.592032	HH120
143.592052	HH120
143.592062	HH120
143.592072	HH120
143.592082	HH120
143.598012	HH80
143.599012	HH100
143.599022	HH100
143.599042	HH100
143.599052	HH100
143.599062	HH100
143.602012	HH120
143.602022	HH120
143.602032	HH120
143.602052	HH120
143.602062	HH120
143.602072	HH120
143.602082	HH120
143.602092	HH120
143.602102	HH120
143.602112	HH120
143.602122	HH120
143.608012	HH80
143.608022	HH80
143.608032	HH80
143.609022	HH100
143.609032	HH100
143.609042	HH100
143.609052	HH100
143.609072	HH100
143.612012	HH120
143.612022	HH120
143.619012	HH100
143.622012	HH120
143.622022	HH120
143.622032	HH120
143.622042	HH120
143.622052	HH120
143.622062	HH120
143.622072	HH120
143.622082	HH120
143.622092	HH120
143.622102	HH120
143.628012	HH80
143.628022	HH80
143.629012	HH100
143.629022	HH100
143.629032	HH100
143.629042	HH100
143.629052	HH100
143.629062	HH100
143.629072	HH100
143.632022	HH120
143.632032	HH120
143.632042	HH120
143.639012	HH100
143.642012	HH120
143.642022	HH120
143.642032	HH120
143.642042	HH120
143.649012	HH100
143.649022	HH100
143.652012	HH120
143.652022	HH120
143.652032	HH120
143.652042	HH120
143.652052	HH120
143.652062	HH120
143.652072	HH120
143.659012	HH100
143.659022	HH100
143.659032	HH100
143.662012	HH120
143.669012	HH100
143.672012	HH120
143.672022	HH120
143.672032	HH120
143.672042	HH120
143.672052	HH120
143.672062	HH120
143.672072	HH120
143.676082	HH100
143.679012	HH100
143.679022	HH100
143.679032	HH100
143.712012	HH120
143.712022	HH120
143.712032	HH120
143.712042	HH120
143.760012	HH120
143.780012	HH120

Model	HH80		HH100		HH120	
	U.S.	Metric	U.S.	Metric	U.S.	Metric
Displacement	23.7	384.4cc	23.7	284.4cc	27.66	453.4 cc
Stroke	2-3/4''	69.85mm	2-3/4''	69.85mm	2-7/8''	73.025mm
Bore	3.3120 3.3130	84.125 84.150	3.3120 3.3130	84.125 84.150	3.500 3.501	88.900mm 88.925mm
Timing Dimension	TDC-Start .095 Run	2.41	TDC-Start .095 Run	2.41	TDC-Start .095 Run	2.41mm
Point Gap	.020	.508	.020	.508	.020	.508
Spark Plug Gap	.028 .033	.711 .838	.028 .033	.711 .838	.028 .033	.711mm .838mm
Valve Clearance Intake / Exhaust	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254mm .508mm
Valve Seat Angle	46°		46°		46°	
Valve Seat Width	.042 .052	.042 .052	.042 .052	1.067 1.321	.042 .052	1.067mm 1.321mm
Valve Face Angle	45°	45°	45°	45°	45°	45°
Valve Face Width	.089 .099	2.261 2.515	.089 .099	2.261 2.515	.089 .099	2.261 2.515
Valve Lip Width	.06	1.524	.06	1.524	.06	1.524
Valve Spring Free Length	1.885	47.879	1.885	47.879	1.885	47.879
Valve Guides STD Diameter	.312 .313	7.925 7.950	.312 .313	7.925 7.950	.312 .313	7.925 7.950
Valve Guides Over-Size Dimensions	.343 .344	8.712 8.738	.343 .344	8.712 8.738	.343 .344	8.712 8.738
Dia. Crankshaft Conn. Rod Journal	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938
Maximum Conn. Rod Dia.Crank Bearing	Maximum 1.3765	34.963	Maximum 1.3765	34.963	Maximum 1.3765	34.963
Shaft Seat Dia. for Roller Bearings	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150
Crankshaft End Play	None		None		None	
Piston Diameter	3.3080 3.3100	84.023 84.074	3.3080 3.3100	84.023 84.074	3.4950 3.4970	88.773 88.824

NOTE: All dimensions are in inches and millimeters unless noted.

Model	HH80		HH100		HH120	
	U.S.	Metric	U.S.	Metric	U.S.	Metric
Piston Pin Diameter	.6873 .6875	17.457 17.463	.6873 .6875	17.457 17.463	.6873 .6875	17.457 17.463
Width Comp. Ring Groove	.0950 .0960	2.413 2.438	.0950 .0960	2.413 2.438	.0950 .0960	2.413 2.438
Width Oil Ring Groove	.1880 .1900	4.775 4.826	.1880 .1900	4.775 4.826	.1880 .1890	4.775 4.826
Side Clearance Ring Groove	.0020 .0035	.051 .889	.0020 .0035	.051 .889	.0020 .0035	.051 .889
Ring End Gap	.007 .020	.178 .508	.007 .020	.178 .508	.007 .020	.178 .508
Top Piston Land Clearance	.0305 .0335	.775 .851	.030 .035	.762 .889	.031 .036	.787 .914
Piston Skirt Clearance	.002 .005	.051 .127	.002 .005	.051 .127	.003 .006	.076 .127
Camshaft Bearing Diameter	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850
Cam Lobe Diameter Nose to Heel	1.3045 1.3085	33.134 33.326	1.3045 1.3085	33.134 33.236	1.3045 1.3085	33.134 33.236
Magneto Air Gap	.006 .010	.152 .254	.006 .010	.152 .254	.006 .010	.152 .254

Model	VH80		VH100	
	U.S.	Metric	U.S.	Metric
Displacement	23.7	388.4 cc	23.7	388.4 cc
Stroke	2-3/4''	69.85	2-3/4''	69.85
Bore	3.3120 3.3130	84.125 84.150	3.3120 3.3130	84.125 84.150
Timing Dimension	Solid State		Solid State	
Point Gap	Solid State		Solid State	
Spark Plug Gap	.035	.889	.035	.889
Valve Clearance Intake Exhaust	.010 .020	.254 .508	.010 .020	.254 .508
Valve Seat Angle	46°	46°	46°	46°
Valve Seat Width	.042 .052	1.067 1.321	.042 .052	1.067 1.321

Model	VH80		VH100	
	U.S.	Metric	U.S.	Metric
Valve Face Angle	45°	45°	45°	45°
Valve Face Width	.089 .099	2.261 2.515	.089 .099	2.261 2.515
Valve Lip Width	.06	1.524	.06	1.524
Valve Spring Free Length	1.885	47.879	1.885	47.879
Valve Guides STD Diameter	.312 .313	7.925 7.950	.312 .313	7.925 7.950
Valve Guides Over-Size Dimensions	.344 .345	8.738 8.763	.344 .345	8.738 8.763
Diameter Crankshaft Conn. Rod Journal	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938
Maximum Conn. Rod Dia. Crank Bearing	1.3761	44.097	1.3761	44.097
Shaft Seat Dia. for Roller Bearings	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150
Crankshaft End Play	None		None	
Piston Diameter	3.308 3.310	84.023 84.074	3.308 3.310	84.023 84.074
Piston Pin Diameter	.6873 .6875	17.457 17.463	.6873 .6875	17.457 17.463
Width Comp. Ring Groove	.0950 .0960	2.41 2.438	.0950 .0960	2.41 2.438
Width Oil Ring Groove	.1800 .1900	4.572 4.826	.1800 .1900	4.572 4.826
Side Clearance Ring Groove	.0025 .0030	.635 .076	.0025 .0030	.635 .076
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508
Top Piston Land Clearance	.0305 .0335	.775 .851	.0305 .0335	.775 .851
Piston Skirt Clearance	.003	.076	.003	.076
Camshaft Bearing Diameter	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850
Cam Lobe Diameter Nose to Heel	1.3045 1.3085	33.134 33.236	1.3045 1.3085	33.134 33.236
Magneto Air Gap	.006 .010	.152 .254	.006 .010 Solid State	.152 .254

NOTE: All dimensions are in inches and millimeters unless noted.

SECTION 2. TORQUE SPECIFICATIONS

8 H.P. & LARGER ENGINES (EXCEPT VALVE-IN-HEAD)

	INCH POUNDS	NEWTON METER
Cylinder Head Bolts	180 - 240	20.3 - 27.1
Connecting Rod Lock Nuts	86 - 110	9.7 - 12.4
Mounting Flange or Cylinder Cover	100 - 130	11.3 - 14.7
Flywheel Nut	600 - 660	67.8 - 74.6
Spark Plug	220 - 280	24.9 - 31.6
Carburetor to Cylinder	72 - 96	8.1 - 10.9
Air Cleaner to Elbow	15 - 25	1.7 - 2.8
Air Cleaner Bracket to Carburetor	15 - 25	1.7 - 2.8
Tank Bracket to Housing	35 - 50	4.0 - 5.7
Tank Bracket to Cylinder (5/16'' Lower)	150 - 200	17 - 22.6
Tank Bracket to Head Bolt	150 - 200	17 - 22.6
Starter-Top Mount Recoil	40 - 60	4.5 - 6.8
Belt Guard to Blower Housing	25 - 35	2.8 - 4.0
Flywheel Screen & Pulley	72 - 96	8.1 - 10.9
Stationary Point Screw	15 - 20	1.7 - 2.3
Blower Housing Baffle to Cylinder	72 - 96	8.1 - 10.9
Blower Housing to Baffle or Cylinder	48 - 72	5.4 - 8.1
Breaker Point Cover	15 - 25	1.7 - 2.8
Magneto Stator Mounting	72 - 96	8.1 - 10.9
Breather to Cylinder	20 - 25	2.3 - 2.8
Oil Drain Plug 3/8 18	80 - 100	9.0 - 11.3
Blower Housing Extension to Cylinder	72 - 96	8.1 - 10.9
Stub Shaft Bolts to Flywheel	100 - 125	11.3 - 14.1
Motor Generator all Mounting Bolts	65 - 100	7.4 - 11.3

NOTE: Divide by 12 for foot pounds.

SECTION 3. VALVE-IN-HEAD ENGINE SPECIFICATIONS

Description	Model OH120		Model OH140		Model OH150		Model OH160		Model OH180	
	U.S.	Metric	U.S.	Metric	U.S.	Metric	U.S.	Metric	U.S.	Metric
			See Note		See Note		See Note			
Displacement	21.1	346 cc	23.7	388 cc	27.66	453 cc	27.66	453 cc	30.0	492 cc
Stroke	2.75	69.80	2.75	69.80	2.875	69.80	2.875	69.80	2.875	69.80
Bore	3.125 3.126	79.375 79.400	3.312 3.313	84.125 84.150	3.500 3.501	88.900 88.925	3.500 3.501	88.900 88.925	3.625 3.626	92.075 92.100
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Valve Clearance Intake Exhaust	.005 .010	.0127 .254	.005 .010	.0127 .254	.005 .010	.0127 .254	.005 .010	.0127 .254	.005 .010	.0127 .254
Valve Seat Angle	46°		46°		46°		46°		46°	
Valve Seat Width	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321
Valve Face Angle	45° +	45°	45° +	45°	45° +	45°	45° +	45°	45° +	45°
Valve Face Width	.094	2.388	.133	3.378	.133	3.378	.133	3.378	.133	3.378
Valve Lip Width	.06	1.524	.06	1.524	.06	1.524	.06	1.524	.06	1.524
Valve Spring Free Length	1.915	48.641	1.980	50.292	1.980	50.292	1.980	50.292	1.980	50.292
Valve Guides STD Diameter	.312 .313	7.925 7.950	.312 .313	7.925 7.950	.312 .313	7.925 7.950	.312 .313	7.925 7.950	.312 .313	7.925 7.950
Dia. Crankshaft Conn. Rod Journal	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938	1.3750 1.3755	34.925 34.938
Maximum Conn. Rod Dia. Crank Bearing	1.3765	34.963	1.3765	34.963	1.3765	34.963	1.3765	34.963	1.3765	34.963
Shaft Seat Dia. for Roller Bearings	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150	1.1865 1.1870	30.137 30.150
Crankshaft End Play	*None .001 .007 Preload	.025 .178	*None .001 .007 Preload	.025 .178	*None .001 .007 Preload	.025 .178	*None .001 .007 Preload	.025 .178	*None .001 .007 Preload	.025 .178
Piston Skirt Diameter	3.121 3.123	79.273 79.324	3.3080 3.3100	84.023 84.074	3.4950 3.4970	88.773 88.824	3.4950 3.4970	88.773 88.824	3.620 3.622	91.948 91.999
Piston Pin Diameter	.6876 .6880	17.465 17.475	.6876 .6880	17.465 17.475	.6876 .6880	17.465 17.475	.6876 .6880	17.465 17.475	.7810 .7812	
Width Comp. Ring Groove	.0950 .0960	2.413 2.438	.0950 .0960	2.413 2.438	.0950 .0960	2.413 2.438	.0950 .0960	2.413 2.438	.0955 .0965	
Width Oil Ring Groove	.1880 .1900	4.775 4.826	.1880 .1900	4.775 4.826	.1880 .1890	4.775 4.826	.1880 .1890	4.775 4.826	.1880 .1895	4.775 4.826

Note: First Model Year was designated as an HH140, 150, 160.

	Model OH120		Model OH140		Model OH150		Model OH160		Model OH180	
Description	**U.S.**	**Metric**	**U.S.**	**Metric**	**U.S.**	**Metric**	**U.S.**	**Metric**	**U.S.**	**Metric**
Side Clearance Ring Groove Compression	.0015 .0035	.038 .089	.0015 .0035	.038 .089	.0015 .0035	.038 .089	.0015 .0035	.038 .089	.0015 .0035	.038 .089
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Top Piston Land Clearance	.031 .034	.787 .864	.030 .035	.762 .889	.031 .036	.787 .864	.031 .036	.787 .864	.031 .036	.787 .864
Camshaft Bearing Diameter	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850	.6235 .6240	15.837 15.850
Cam Lobe Diameter Nose to Heel	1.3117 1.3167	33.317 33.444	1.3117 1.3167	33.317 33.444	1.3117 1.3167	33.317 33.444	1.3117 1.3167	33.317 33.444	1.3117 1.3167	33.317 33.444

CROSS REFERENCE LIST		CROSS REFERENCE LIST	
Craftsman Engine Model	**See Model**	**Craftsman Engine Model**	**See Model**
143.626272	OH160	143.670052	OH160
143.630012	OH160	143.670062	OH160
143.630022	OH160	143.670072	OH160
143.640012	OH160	143.670082	OH140
143.640022	OH160	143.670092	OH140
143.640032	OH160	143.680012	OH140
143.640042	OH160	143.680022	OH140
143.640052	OH160	143.680032	OH160
143.650012	OH160	143.700012	OH180
143.650022	OH160	143.710012	OH160
143.650032	OH160	143.710022	OH140
143.660012	OH160	143.730012	OH160
143.660022	OH160	143.730022	OH140
143.670012	OH140	143.740012	OH140
143.670032	OH160	143.740022	OH160
143.670042	OH140	143.770022	OH180

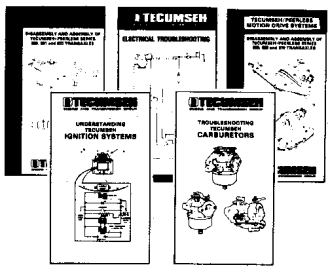
“Torque specifications listed on this page should not be confused with the torque value observed on engines which have been run. Torque relaxation occurs on all engines from thermal expansion and contraction. The torque specifications take relaxation into account so a sufficient clamping force exists after an engine has been run.”

SECTION 4. TORQUE SPECIFICATIONS
VALVE-IN-HEAD

TORQUE SPECIFICATIONS		
	INCH	**Nm**
Cylinder Head Bolts	180 - 240	20.3 - 27.1
Connecting Rod Screw or Nut	86 - 110	9.7 - 12.4
Mounting Flange Cylinder Cover Screw	100 - 130	11.3 - 14.7
Cylinder Cover Flywheel End	120 - 160	13.6 - 18.1
Flywheel Nut	600 - 660	67.8 - 74.6
P.T.O. Shaft to Flywheel	100 - 125	11.3 - 14.1
Spark Plug	220 - 280	24.9 - 31.6
Intake Pipe to Cylinder	72 - 96	8.1 - 10.9
Carburetor to Intake Pipe	48 - 72	5.4 - 8.1
Air Cleaner Elbow to Carburetor	25 - 35	2.8 - 4.0
Air Cleaner Bracket to Elbow	15 - 25	1.7 - 2.8
Air Cleaner Bracket to Carburetor	15 - 25	1.7 - 2.8
Tank Bracket to Cylinder (5/16'' Lower)	150 - 200	17.0 - 22.6
Tank Bracket to Cylinder (1/4'')	96 - 120	10.9 - 13.6
Starter-Recoil-Top Mount	40 - 60	4.5 - 6.8
Starter-Electric-Straight Drive	140 - 170	15.8 - 19.2
Rope Start Pulley Mounting Screws	60 - 75	6.8 - 8.5
Rocker Arm Box to Cylinder Head	80 - 90	9.0 - 10.2
Rocker Arm Cover and Breather (Screw to Stud)	15 - 20	1.7 - 2.3
Rocker Arm Adjusting Screw Lock Nut	50 - 70	5.5 - 8.0
Rocker Box Cover to Mtg. Stud	20 - 30	2.3 - 3.4
Magneto Stator Mounting Screw	72 - 96	8.1 - 10.9
Blower Housing to Baffle or Cylinder	48 - 72	5.4 - 8.1
Housing Baffle to Cylinder	72 - 96	8.1 - 10.9
Blower Housing Extension to Cylinder	72 - 96	8.1 - 10.9
Governor Rod Clamp to Rod (Screw and Nut)	15 - 25	1.7 - 2.8
Governor Rod Clamp to Lever (Screw and Nut)	15 - 20	1.7 - 2.3
Ground Wire to Terminal	5 - 10	.6 - 1.1
Toggle Stop Switch Nut	10 - 15	1.1 - 1.7
Oil Drain Plug 3/8 18	80 - 100	9.0 - 11.3
Oil Drain Cap	35 - 50	4.0 - 5.7
Oil Fill Plug (Large Diameter)	Hand Tighten	Hand Tighten

CHAPTER 11. EDUCATIONAL MATERIALS AND TOOLS

VIDEO PROGRAMS



695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

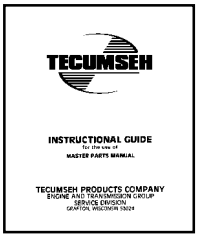
695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS

INSTRUCTIONAL GUIDE
692738



Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS
695590

This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

CARBURETOR TROUBLESHOOTING BOOKLET
695907

This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET
694903

This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

SPECIAL TOOLS BOOKLET
694862

This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET
695933

This booklet contains the quick reference information found on Tecumseh wall charts.

This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

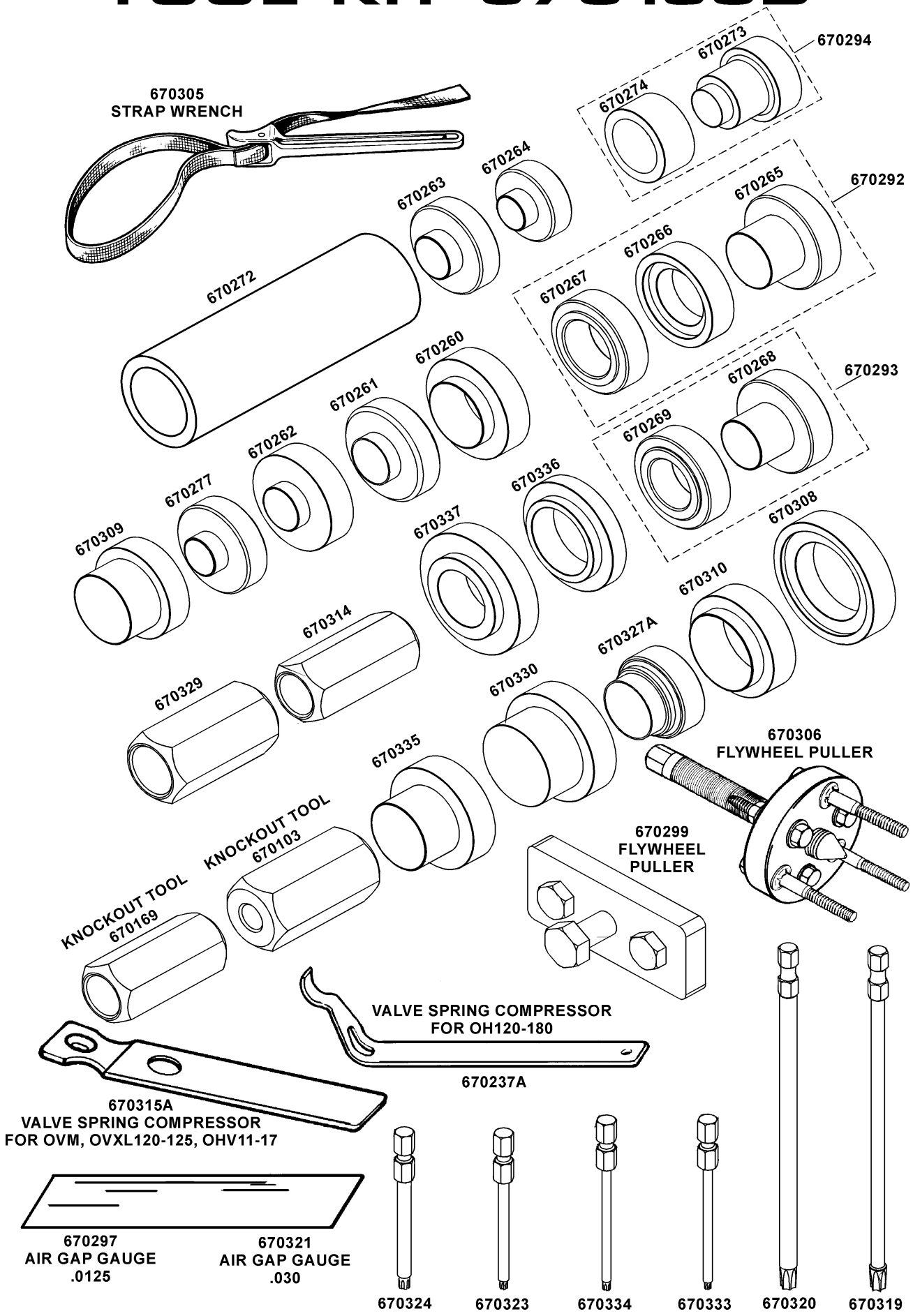
TESTER BOOKLETS
694529

Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

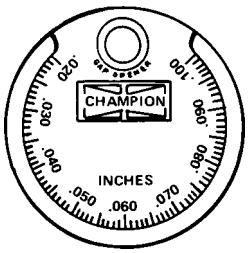
694530

Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

TOOL KIT 670195D

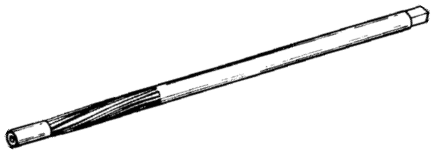


TAPER GAP GAUGE



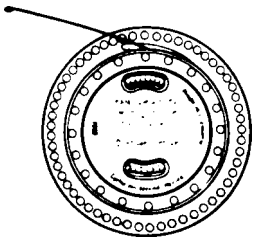
No. 670256 - Taper Gap Gauge

1/32'' OVERSIZE GUIDE REAMER



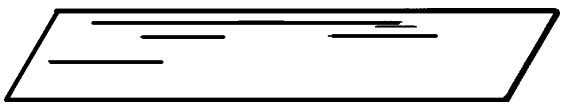
No. 670284 - HH & VH80-120 and OH120-180

VIBRATION TACHOMETER



No. 670156 - Vibration Tachometer

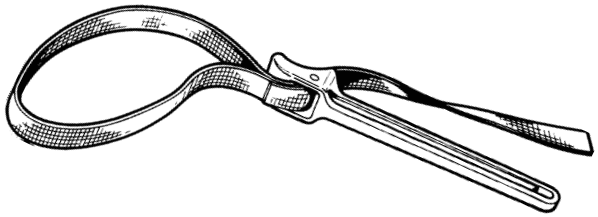
AIR GAP GAUGE



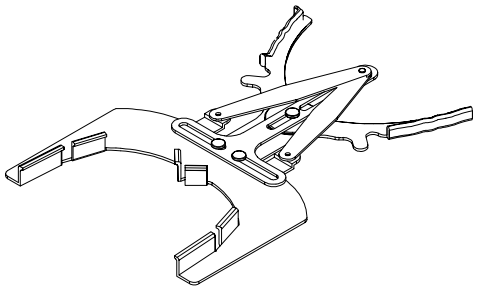
***No. 670216 -** Air gap gauge .0075 (.191 mm) shim stock for setting air gap.

VALVE LAPPING TOOL

No. 670154 - Valve lapping tool.



No. 670305 - Strap Wrench



No. 670117 - Ring Expander

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers the following basic type or model numbers dependent on age of product: AH520, AH600, AV520, AV600, HSK600, TVS600.
This manual covered many engines under an Old form of Identification which will need to be reviewed as well.
TYPE / SPECIFICATION NUMBER 638-670 1398-1642 and Craftsman 200 Series Models.

2-CYCLE ENGINES

TECUMSEH®

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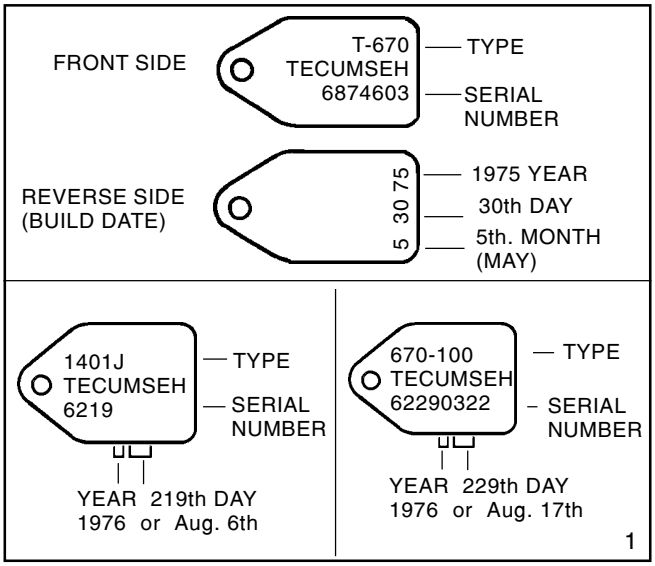
This manual contains information on Tecumseh Engines built to comply with emission regulations. As a technician it is unlawful to modify or cause a change in the original calibration of these engines. All speed adjustments must remain within the limits that are specified for each engine, and are not to exceed the maximum. Any deviation must be specifically approved by Tecumseh Products Company.

GENERAL INFORMATION

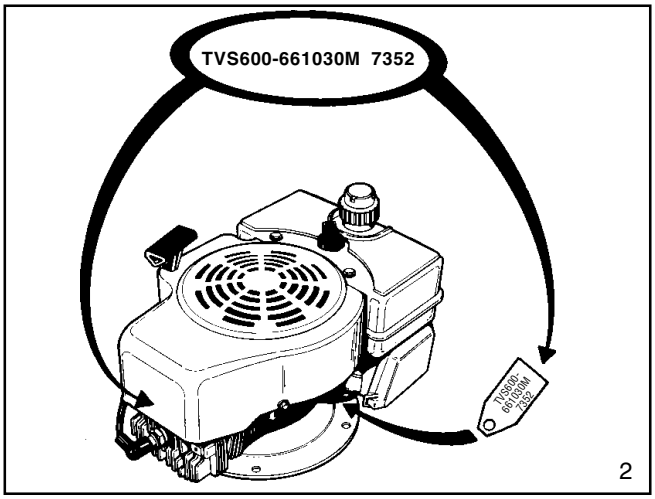
ENGINE IDENTIFICATION

Tecumseh has used two different methods of identifying 2 cycle engines. The first method was used until the mid 1980's using the base model number with a type number. The type number was used to identify variations for the OEM's specific needs (Fig. 1)



1

The second method was put in place to standardize 2 cycle and 4 cycle engine identification. The type number has now become the specification number, which is preceded by the engine model as illustrated in Figure 2 and 3.



2

INTERPRETATION OF MODEL NUMBER

The letter designations in a model number indicates the basic type of engine.

AH - Aluminum Horizontal
AV - Aluminum Vertical
BV - Outboard Vertical
HSK - Horizontal Snow King
TVS - Tecumseh Vertical Styling

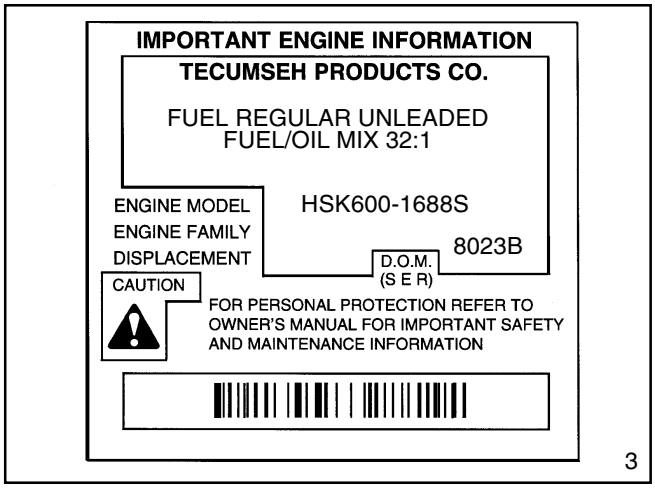
The numbers that follow the letter designations indicate the horsepower or cubic inch displacement.

Following the engine size are the engine specification numbers which are used for identification when ordering parts.

The final set of numbers are the date of manufacture (D.O.M.).

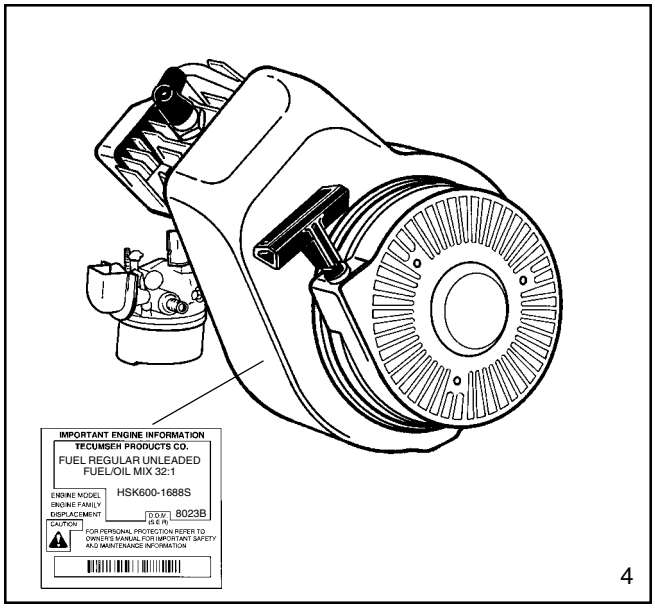
Example: HSK600 1688S

HSK - Horizontal Snow King
600 - 6 Cubic Inch displacement
1688S - Specification number
8023B - Serial number D.O.M. (date of manufacturing previously serial number)
8 - First digit is the year of manufacturing (1998)
023 - Indicates the calendar day of the year (23th day or Jan. 23, 1998)
B - Represents the line and shift on which the engine was built at the factory



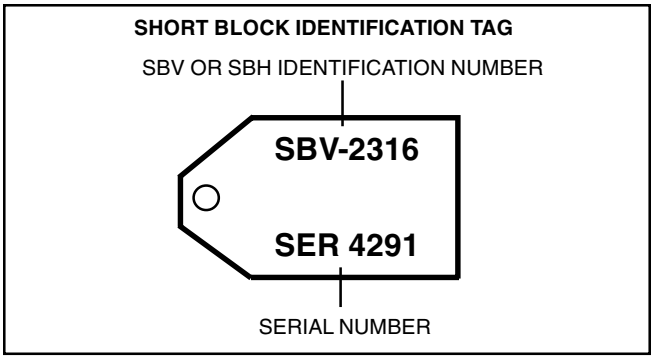
3

Tecumseh engine model, specification, and D.O.M. number are now located on a decal adhered to the blower housing.



4

ENGINE CARE



SHORT BLOCKS

New short blocks are identified by a tag marked S.B.H. (Short Block Horizontal) or S.B.V. (Short Block Vertical). Original model identification numbers of an engine should always be transferred to a new short block for correct parts identification.

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY OF YOURSELF AND OTHERS. FOLLOW ALL INSTRUCTIONS.

ENGINE FUEL MIX				
	U.S.	U.S.	METRIC	METRIC
	Gasoline	Amount of Oil To Be Added	Petrol	Amount of Oil To Be Added
24:1	1 Gallon 2 Gallons	5.3 oz. 10.7 oz.	4 Liters 8 Liters	167 ml 333 ml
32:1	**1 Gallon 2 Gallons**	**4 oz. 8 oz.**	**4 Liters 8 Liters**	**125 ml 250 ml**
50:1	**1 Gallon 2 Gallons**	**2.5 oz. 5.0 oz.**	**4 Liters 8 Liters**	**80 ml 160 ml**

FUELS. Tecumseh Products Company strongly recommends the use of fresh, clean, UNLEADED regular gasoline in all Tecumseh Engines. Unleaded gasoline burns cleaner, extends engine life and promotes good starting by reducing the build up of carbon deposits. Premium gas or gasohol containing no more than 10% ethanol can be used if unleaded fuel is not available.

NOTE: NEVER USE GASOLINE CONTAINING METHANOL, GASOHOL CONTAINING MORE THAN 10% ETHANOL, UNLEADED REGULAR GASOLINE CONTAINING MORE THAN 15% M.T.B.E. OR ETBE, GASOLINE ADDITIVES, OR WHITE GAS BECAUSE ENGINE/FUEL SYSTEM DAMAGE COULD RESULT.

NOTE: In countries where unleaded gasoline is not available, regular gas can be used.

Make sure that gasoline and oil are stored in clean, covered, rust free containers. Dirt in fuel can clog small ports and passages in the carburetor. Use fresh gasoline only. Gasoline standing for long periods of time develop a gum that will result in fouled spark plugs, clogged fuel lines, carburetors and fuel screens. Using fuel that is not fresh will cause engines to be hard starting, especially in cold temperatures.

Clean gas cap, tank and fuel container spout when filling fuel tank, to assure that dirt will not get into fuel system.

If gasohol is used, special care is required when the engine is to be stored for extended periods.

ENGINE OIL. Use Clean, high quality **2 CYCLE OIL. NMMA TC-WII, or TC-W3.**

FUEL/OIL MIX. Follow fuel and engine oil requirements listed in the Owner's Manual. Disregard conflicting instructions found on oil containers.

NOTE: Sears Craftsman models use a 40:1 mix which is acceptable.

NOTE: ALWAYS DOUBLE THE AMOUNT OF OIL FOR THE FIRST GALLON OF MIX FOR ENGINE BREAK IN.

To assure thorough mixing of oil and gasoline, fill container with gasoline to one quarter full, add oil as recommended, shake container vigorously and then add remainder of gasoline. **Do not mix directly in engine or equipment fuel tank.**

TWO-CYCLE FUEL/OIL MIX RATIOS
24:1 AV520 All Basic Specifications 670 & 653 AV600 All Basic Specifications 600-10 & Up
32:1 TVS600 All Specifications AH600
50:1 HSK600

STORAGE:

NEVER STORE ENGINE WITH FUEL IN TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED ENCLOSURES WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER, ETC.

If engine is to be stored over 30 days, prepare for storage as follows:

1. Remove all gasoline from fuel tank to prevent gum deposits from forming in tank and other fuel system components, causing possible malfunction of the engine.

DRAIN FUEL INTO APPROVED CONTAINER OUTDOORS, AWAY FROM OPEN FLAMES.

Run engine until fuel tank is empty and engine stops due to lack of fuel.

Fuel stabilizer (such as Tecumseh's Part No. 730245) is an acceptable alternative in minimizing the formation of fuel gum deposits during storage.

Add stabilizer to fuel in fuel tank or storage container. Always follow mix ratio found on stabilizer container. Run engine at least 10 minutes after adding stabilizer to allow it to reach carburetor.

If gasohol has been used, complete preceding instructions and then add a small amount, one pint or less, of unleaded regular automotive gasoline properly mixed with the specified lubricating oil and run the engine until the fuel tank is empty and the engine stops due to lack of fuel.

2. Pull starter handle slowly until resistance is felt due to compression pressure, then stop. Release starter tension slowly to prevent engine from reversing due to compression pressure. This position will close both the intake and exhaust ports to prevent corrosion of the piston and the cylinder bore.

3. Clean unit by removing any dirt from exterior of the engine and equipment.

TUNE-UP PROCEDURE. The following is a minor tune-up procedure. Repair procedures for this engine and it's components are listed in this manual if the engine does not perform to satisfaction after tune-up is performed.

CAUTION: Remove spark plug wire before doing any service work on engine.

1. Service or replace air cleaner as necessary.

   NOTE: Snow King® engines do not use an air filter due to the clean operating environment and to prevent filter freeze-up.

2. Remove blower housing, clean all dirt, grass or debris from air intake screen, cylinder cooling fins, and carburetor governor levers and linkage.

3. Remove carburetor, clean and install a carburetor kit, make adjustment presets where needed. Presets are found in the carburetor section of this manual. Make sure fuel tank, fuel filters and fuel lines are clean. Reinstall carburetor, replacing any worn or damaged governor springs or linkage. Make proper governor adjustment. Adjustments are found in the manual under governor linkage and adjustment and engine reassembly.

4. Replace the spark plug with a correct equivalent.

5. Make sure all ignition wires are properly routed, so they will not rub on flywheel. Inspect all ignition wires for abrasion or damage. Remove flywheel and check flywheel key, reinstall flywheel, torque flywheel nut to specifications. Set air gap between solid state module and flywheel at .0125''. Air gap gauge, part no. 670297 may be used.

6. The engine must be firmly mounted to the associated equipment. On rotary lawnmowers, make sure blade is properly balanced and correctly torqued. See disassembly section for flywheel removal and air gap setting procedure.

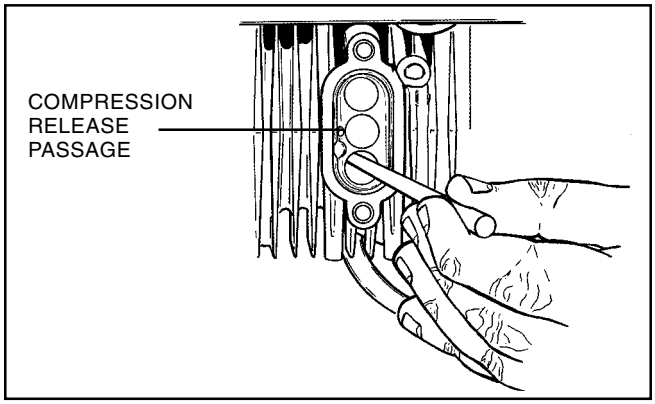
7. Make sure all remote linkage is properly adjusted for operation.

8. Fill tank with the proper fuel/oil mix.

9. Start the engine, allow it to warm up 5 minutes, then adjust carburetor and engine R.P.M. according to Tecumseh's recommendations.

Snow King® engines should be run in outdoor temperatures for engine adjustments.

NOTE: Emissionized engines have non-adjustable carburetors in compliance with CARB (California Air Resource Board) and U.S. EPA (United States Environmental Protection Agency). These engines can not be modified without specific authorization.



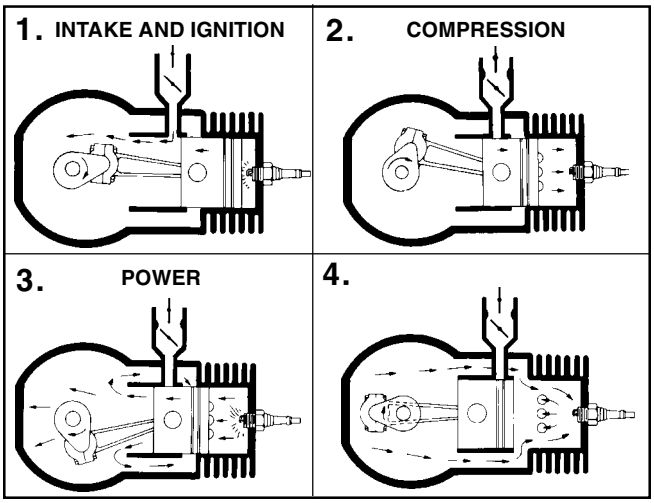
EXHAUST PORT CLEANING. The exhaust ports should be cleaned after each seventy-five (75) to one hundred (100) hours of use.

Before cleaning the ports place the piston in the Bottom Dead Center position. Then clean the ports using a pointed 3/8'' diameter wooden dowel or similar tool. Be sure not to scratch the port area. Also remember to remove all the loose carbon particles from the engine.

NOTE: When cleaning the exhaust ports, check and clean the compression release passage.

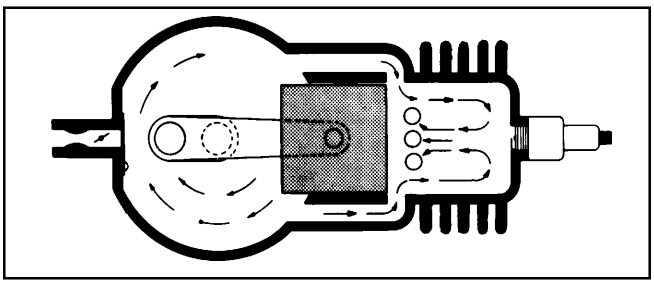
2-CYCLE THEORY OF OPERATION

Air cooled 2-cycle engines differ from 4-cycles by having one power stroke for every revolution of the engine versus every other stroke on 4-cycles.



OPERATION OF PISTON PORT STYLE.
A low pressure area is created in the crankcase as the piston moves upward to compress the air/fuel mixture in the cylinder. When the piston moves far enough to uncover the intake port, the air/fuel mixture from the carburetor flows into the engine crankcase due to higher pressure atmospheric air. Just before the piston reaches top dead center (TDC), the spark plug ignites the air / fuel mixture in the cylinder.

The expanding combustion gases force the piston down. The downward piston travel causes a pressure buildup in the crankcase. The piston uncovers the exhaust port first, followed by the transfer ports. The exhaust flows out the exhaust port while the pressurized air/ fuel mixture enters the cylinder from the crankcase through the transfer ports. As the piston travels upward the sequence is repeated.



OPERATION OF REED PORTED STYLE WITH LOOP SCAVENGING

The following illustrates the loop scavenge design which uses a vacuum-pressure activated reed valve. Here the ports are located on three sides of the cylinder; the intake ports are on two sides opposite each other, and the exhaust ports are illustrated by the three holes just above the head of the piston.

As the mixture flows into the combustion chamber through the transfer ports, it collides and is directed to the top of the combustion chamber looping when it strikes the cylinder head, thus forcing all spent gases out through the open exhaust ports.

TERMS. Listed are common terms often referred to on 2-cycle engines.

EXHAUST or SCAVENGE PHASE. The burned gases must be cleared out of the combustion chamber and replaced by a fresh charge of fuel-air mixture through the intake ports. The exhaust passes out through the exhaust ports into the outside air.

PORTS. Openings in the cylinder allow gases to pass into and out of the combustion chamber. The ports are opened or closed by the upward and downward movement of the piston.

EXHAUST PORTS. Allow the burned gases to pass out of the combustion chamber.

THIRD PORT (Sometimes called piston port). A third port is for entry of the fuel-air and oil mixture to the crankcase. From the crankcase the fuel-air mixture enters the combustion chamber through the intake ports. The third port is controlled by the piston skirt.

REED VALVE. A reed valve is activated by crankcase pressure or vacuum. A decrease in crankcase pressure opens the reed allowing the fuel air and oil mixture to enter the crankcase. Increased crankcase pressure closes the valve, preventing escape of the fuel-air and oil mixture back through the carburetor.

LUBRICATION. Tecumseh 2-cycle engines are lubricated by a gas oil mix. The correct mix ratio of oil and gas combines with air in the venturi and enters the crankcase. During engine operation the oil clings to all the internal moving parts for lubrication.

AIR CLEANERS, CARBURETORS, GOVERNORS AND LINKAGE

AIR CLEANERS
Service the air cleaner frequently to prevent clogging of the cleaner and to prevent dust and dirt from entering the engine. Dust bypassing an improper or damaged air filter can quickly damage an engine. Always make certain covers and air cleaner connections are tightly sealed to prevent entry of dirt.

NOTE: Snow King® models do not use air cleaners due to the clean environment that they operate in and also to prevent air cleaner freeze-up.

When excessive carburetor adjustment or loss of power results, inspect the air filter for clogging.

NOTE: Use factory recommended parts only.

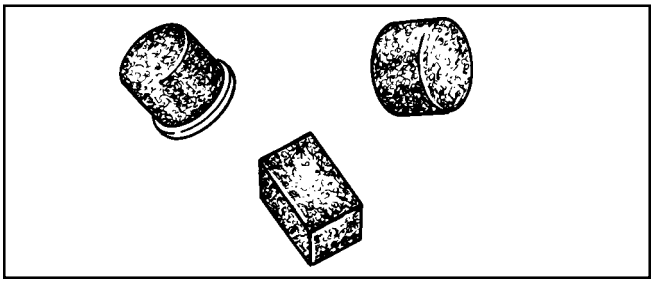
POLYURETHANE-TYPE AIR CLEANER. These serviceable air cleaners utilize a polyurethane element which will clog up with use. The element should be cleaned and serviced in the following manner.

Wash element in a detergent and water solution and squeeze (don't twist) until all dirt is removed. Rinse thoroughly.

Wrap in clean cloth and squeeze (don't twist) until completely dry.

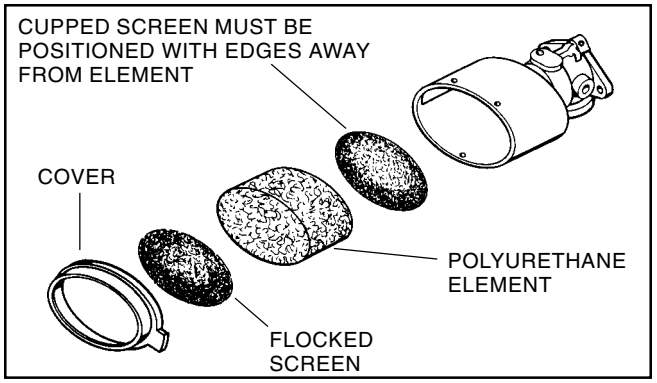
Clean air cleaner housing and cover. Dry thoroughly.

Re-oil element by applying generous quantity of oil to all sides. Squeeze vigorously to distribute oil and to remove excess oil. (S.A.E. 30)

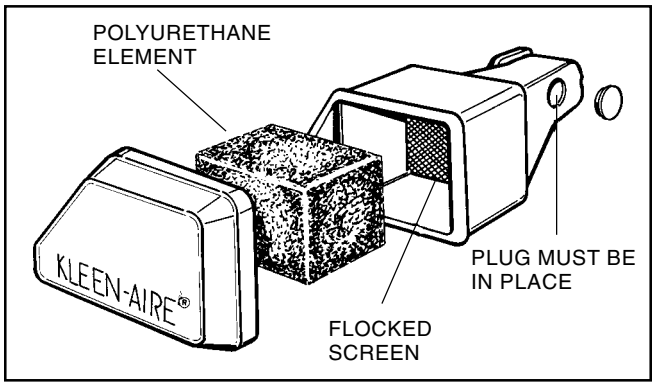


When reassembling polyurethane oval type air cleaners, place cupped screen into housing with edge against carburetor end of housing. Screen should be installed to hold element away from housing to allow full utilization of air cleaner element.

NOTE: Polyurethane type filters will lose effectiveness if stored for extended periods of time, due to oil migration (settling Down) through the filter. Re-oil filter as necessary.



KLEEN-AIRE® SYSTEM. This system uses a polyurethane type element. Service as described under polyurethane-type air cleaner. When removing air cleaner body from carburetor, remove plug in the body to gain access to the mounting screw. Make certain plug is put back in place. If it shows damage, replace.



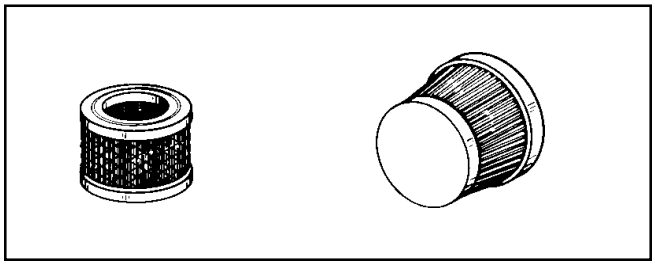
PAPER-TYPE AIR CLEANER SERVICE. Replace air filter once a year or more often in extremely dusty or dirty conditions.

DO NOT ATTEMPT TO CLEAN OR OIL PAPER-TYPE FILTER.

Be sure to clean base and cover thoroughly before installing new paper filter.

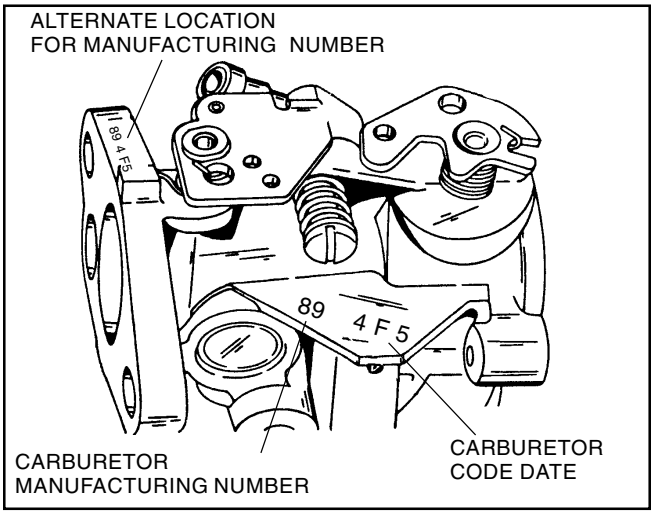
NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER INSTALLED ON THE ENGINE.

NOTE: Serious damage to the engine may result in using any other but the specified part number filter. Use factory recommended parts only.



GENERAL CARBURETOR INFORMATION

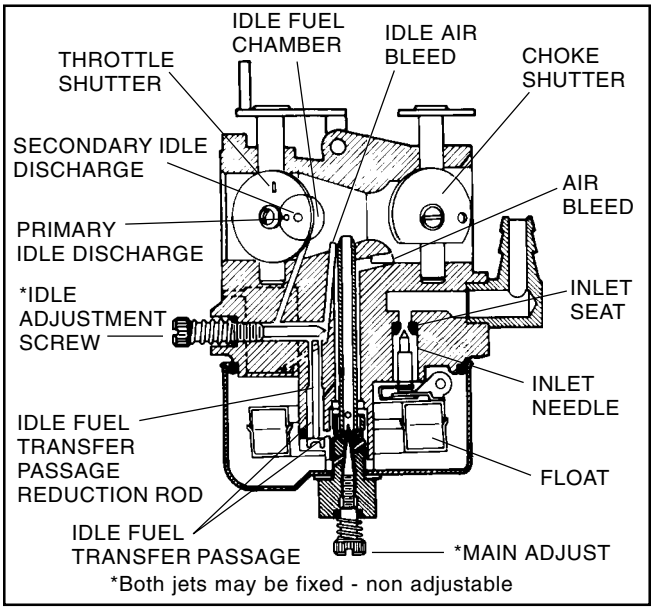
CARBURETOR IDENTIFICATION. Tecumseh carburetors are identified by a manufacturing number and code date stamped on the carburetor as illustrated.



When servicing carburetors, you may use either the engine model specification number or the manufacturing number on the carburetor to properly identify. Information regarding replacement parts or kits are available in the master parts manual, microfiche catalog or electronic parts look-up systems.

Tecumseh uses two basic types of carburetors for their 2 cycle engines, float-type and diaphragm.

FLOAT-TYPE CARBURETORS. Float-type carburetors use a hollow metal float to maintain the operating level of fuel in the carburetor. As the fuel is used, the fuel level in the carburetor bowl drops and the float moves downward. This actuates the inlet needle valve, to allow fuel to flow into the fuel bowl. As the fuel level in the bowl again rises, so will the float. This float action adjusts the fuel flow and keeps the fuel at the proper mixture level. Some carburetors are of the fixed main type. On these models, the main adjusting screw and nut are replaced by a fixed main jet bowl nut.



*Both jets may be fixed - non adjustable

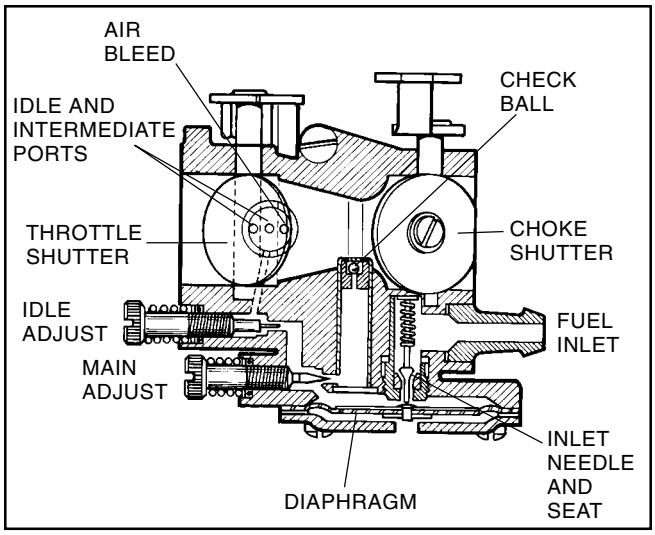
DIAPHRAGM (PRESSURE DIFFERENTIAL) CARBURETORS

This type of carburetor uses a rubber-like diaphragm which is exposed to intake manifold pressure on one side and to atmospheric pressure on the other. Tecumseh diaphragm carburetors use the diaphragm as a metering device. As the intake manifold pressure decreases due to downward piston travel, the atmospheric pressure on the vented side of the diaphragm moves the diaphragm against the inlet needle. The diaphragm movement overcomes the spring tension on the inlet needle and moves the inlet needle off the seat. This permits the fuel to flow through the inlet valve to maintain the correct fuel volume in the fuel chamber. The inlet needle return spring closes the inlet valve when the pressure on the diaphragm equalizes or a pressure higher than atmospheric exists on the intake side (upward piston travel). The diaphragm meters a correct fuel volume in the fuel chamber to be delivered to the mixing passages and discharge ports.

A main or idle adjustment needle may be replaced by an internally fixed jet on some models.

The main nozzle contains a ball check valve. The main purpose of this ball check is to eliminate air being drawn down the main nozzle during idle speeds and leaning the idle mixture.

An advantage of the diaphragm carburetor over the float system is that the diaphragm carburetor increases the angle that the engine may be operated at.



OPERATION
In the “CHOKE” or “START” position, the choke shutter is closed, and the only air entering the engine enters through openings around the shutter. As the engine starts to rotate the downward piston travel will create a low air pressure area in the engine cylinder above the piston. Higher pressure (atmospheric air) rushes into the engine to fill the created low pressure area. Since the majority of the air passage is blocked by the choke shutter, a relatively small quantity of air enters the carburetor at increased speed. The main nozzle and both idle fuel discharge ports are supplying fuel due to the low air pressure in the intake of the engine. A maximum fuel flow through the carburetor orifices combined with the reduced quantity of air that passes through the carburetor, make a very rich fuel mixture which is needed to start a cold engine.

At engine IDLE speed, a relatively small amount of fuel is required to operate the engine. The throttle is almost completely closed. A fuel / air mixture is supplied through the primary idle-fuel discharge orifice during idle.

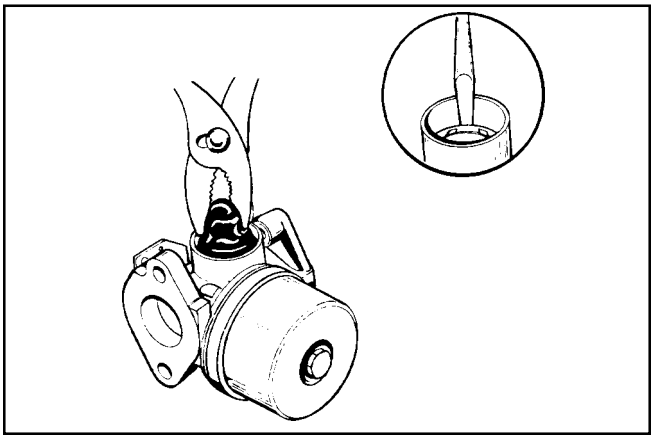
During INTERMEDIATE engine operation, a second orifice is uncovered as the throttle shutter opens, and more fuel mixture is allowed to atomize with the air flowing into the engine.

During HIGH SPEED engine operation, the throttle shutter is opened. Air flows through the carburetor at high speed. The venturi, which decreases the size of the air passage through the carburetor, further accelerates the air flow. This high speed movement of the air decreases the air pressure at the main nozzle opening. Fuel is forced out the main nozzle opening due the difference in the atmospheric air pressure on the fuel in the carburetor bowl and the reduced air pressure at the main nozzle opening.

CARBURETOR SERVICE. Carefully disassemble carburetor, removing all non-metallic parts, i.e., gaskets, viton seats and needles, “O” rings, fuel pump valves, etc.

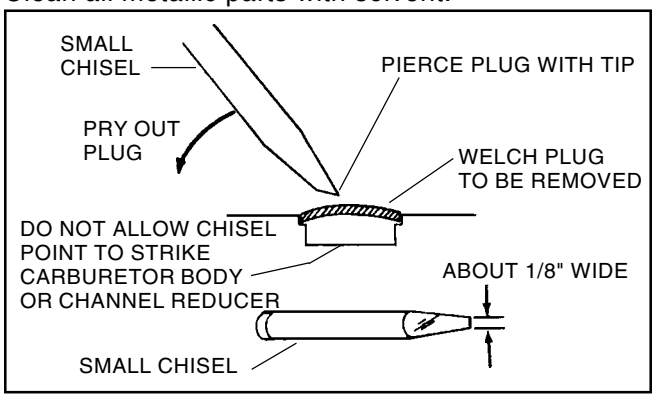
Nylon check balls used in some diaphragm carburetors are not serviceable. Nylon can be damaged if subjected to harsh cleaners for prolonged periods.

Remove the primer bulb (if equipped) by grasping with a pliers and pulling and twisting out of the body. Remove the retainer by prying and lifting out with a screwdriver. Do not re-use old bulb or retainer.

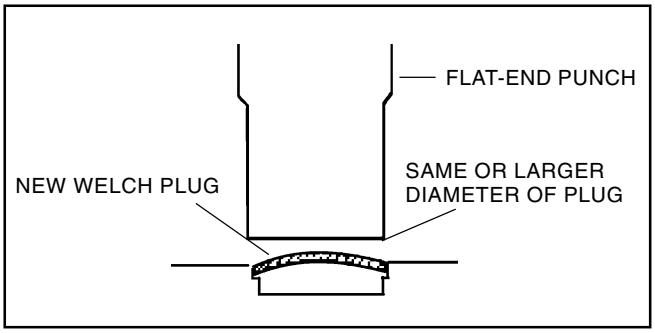


Remove all welch plugs if cleaning the carburetor. Secure the carburetor in a vise equipped with protective jaws. Use a small chisel sharpened to a 1/8" wide wedge point. Drive the chisel into the plug to pierce the metal and push down on the chisel to pry the plug out of the hole.

Clean all metallic parts with solvent.

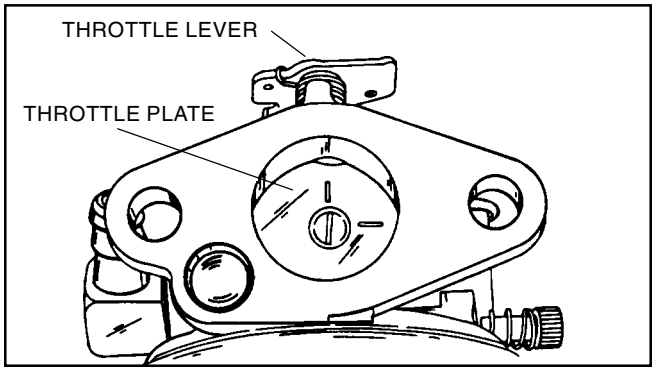


To install a new welch plug after cleaning, place welch plug into receptacle with raised portion up. With a punch equal to the size of the plug, merely flatten the plug. Do not dent or drive the center plug below the top surface of the carburetor. After installing the welch plug, seal the outer diameter with finger nail polish. (Do not use clear polish).

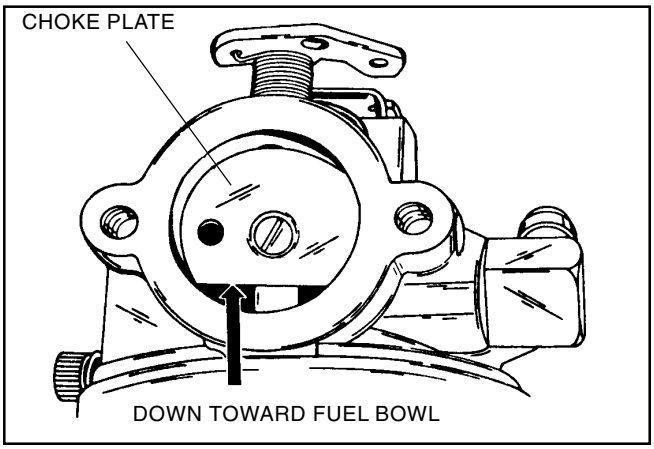


THROTTLE. Examine the throttle lever and plate prior to disassembly. Replace any worn and/or damaged parts.

When reassembling, it is important that the lines on the throttle plate are facing out when in the closed position. Position throttle plates with the two lines at 12 and 3 o’clock. If throttle plate has only one line, the line should be positioned in the 12 o’clock position. If binding occurs, correct by loosening the screws and repositioning the throttle plate.



CHOKE. Examine the choke lever and shaft at the bearing points and holes into which the linkage is fastened, and replace if worn or damaged. The choke plate is inserted into the air horn of the carburetor in such a position, that the flat side of the choke is down. Before disassembly note the direction of choke plate movement. Choke plates will operate in either direction. Make sure it is assembled properly for your engine.



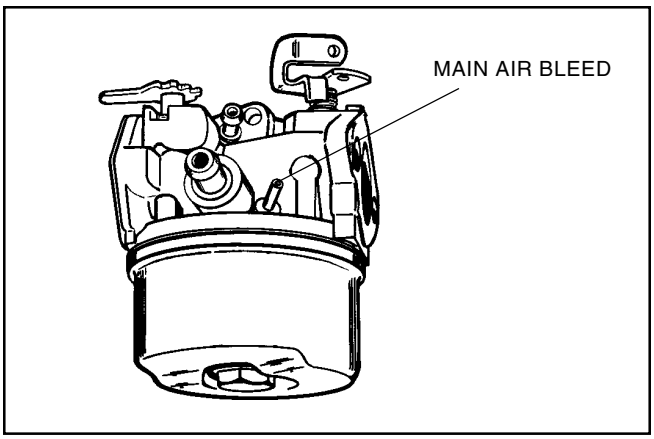
ADJUSTING SCREWS. Remove the adjusting screws from the carburetor body and examine the point, replace the screws if damaged. Tension is maintained on the screw with a coil spring. Examine and replace the "O" ring seal(s) if damaged.

NOTE: If screws are made of plastic, dip the end of the screw in oil before installation to prevent damage.

FUEL BOWL RETAINING NUT. The fuel bowl retaining nut has a fixed main jet incorporated in the nut. This small jet must be clean for proper fuel metering. Clean by using compressed air. **DO NOT USE WIRE OR HARD OBJECTS FOR CLEANING.**

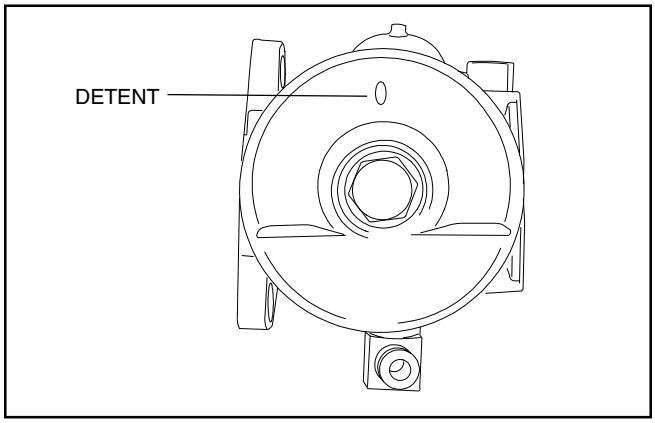
CARBURETOR VENTING. Float-type carburetors must have atmospheric air pressure acting against the fuel in the fuel bowl. These vents can be external, with a hole drilled through the side of the carburetor casting or internal where atmospheric air is picked up in the air horn near the air cleaner. Regardless of the type, these vents must be clear and free from dirt, paint, grease, etc.

HIGH TILT FLOAT STYLE carburetors use an external main air bleed.



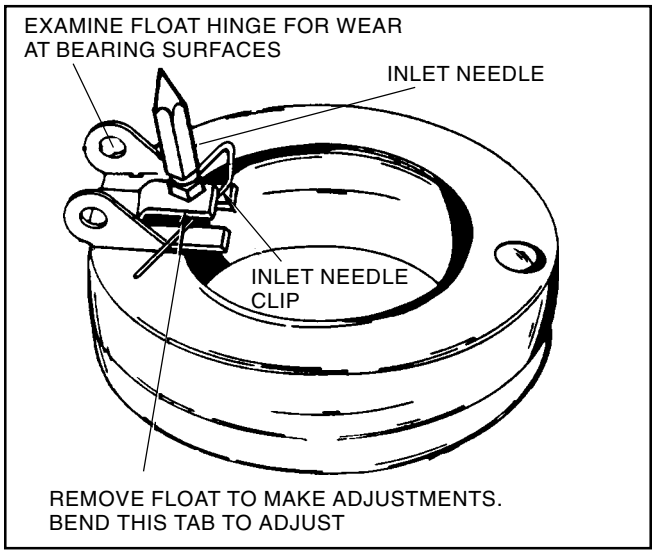
FUEL BOWL. The fuel bowl must be free of dirt and corrosion. When disassembling a carburetor for repair, always replace the fuel bowl "O" ring. Lubricate the "O" ring with a small amount of oil for easier installation.

Install the float bowl by placing the detent portion opposite of the hinge pin. Make sure the deepest end of the bowl is opposite of the inlet needle. The bowl has a small dimple located in the deepest part. The purpose of this dimple is to minimize the chances of the float sticking to the bottom of the bowl caused by stale fuel.



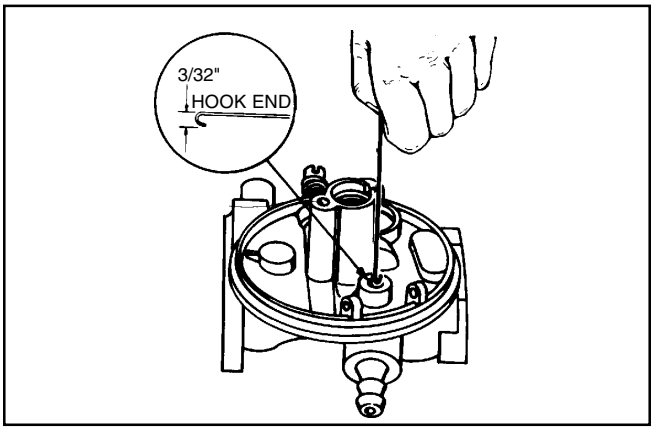
FLOAT. Remove the float by pulling out the float hinge pin. Lift the float away from the carburetor body. This will also lift the inlet needle out of the seat.

Examine the float for damage. Check the float hinge bearing surfaces for wear, as well as the tab that contacts the inlet needle. Replace any damaged or worn parts.



Float sticking can occur due to fuel deposits (gum or varnish). This can be corrected by loosening the carburetor bowl nut one full turn and rotating the bowl 1/4 turn in either direction. Return the bowl to it's original position and retighten the bowl nut.

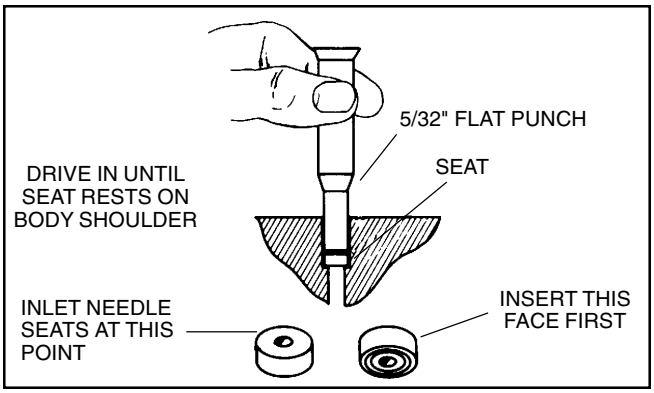
INLET NEEDLE AND SEAT (FLOAT CARBURETORS). Tecumseh carburetors are built with removable seats made out of a material called VITON®. These seats are easily removed by bending the end of a paper clip or wire with a 3/32" hook or use a #4 crochet hook. Push the hook through the hole in the center of the seat and remove it. Never reuse the old seat, always replace it with a new seat.



To install a new seat, make sure the seat cavity is clean, then moisten the seat with a drop of oil to help it slide into place. Position the seat with the grooved side of the seal down and carefully push the seat into its cavity with a 5/32" flat punch until it bottoms out.

NEEDLE AND SEAT POP-OFF TEST

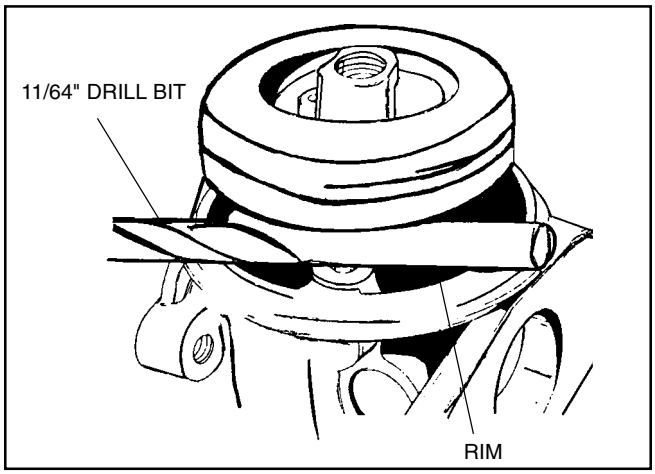
To test the pop-off pressure, remove the carburetor from the engine. Be sure to drain any fuel into an approved container. Invert the carburetor and remove the float bowl. Place a drop of an oil based product such as WD-40 on the tip of the needle valve. Using a commercially available 0-30 psi pump and gauge, attach the pumps hose to the carburetor inlet. Apply approximately 6 psi or until the needle pops off the seat. The needle should seat at 1.5 psi or greater for a minimum of 5 minutes. If the minimum 1.5 psi cannot be maintained for this period of time, then service to the needle and seat is required.



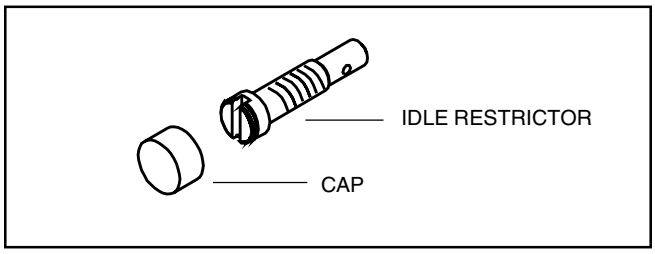
FLOAT HEIGHT SETTINGS

Previously the float height was set by using a 670253A float setting tool. The new float setting will require an 11/64" drill bit. The procedure for setting the float height is as follows. Remove the bowl gasket, then hold the carburetor in the inverted position. Place the drill bit across the carburetor body opposite and parallel to the float hinge pin. Adjust the float height by bending the tab on the float until it touches the bit.

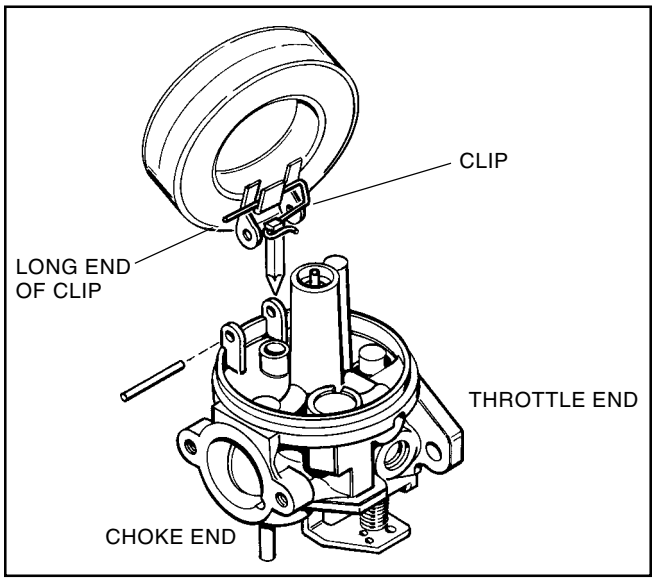
If the required adjustment is minor, the tab adjustment may be made without removing float and carefully inserting a small bladed screwdriver to bend the tab. Be careful not to damage other parts.



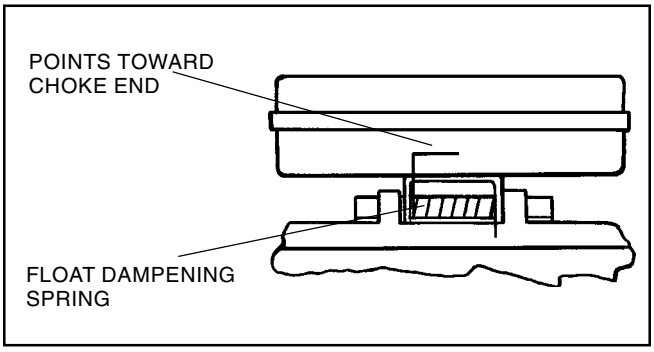
The idle on the Series 8 is metered using a threaded restrictor (See illustration). Proper torque of this restrictor is critical, it should be torqued to 5-8 in. lbs. or .5 to 1 nm, or it may vibrate loose. When the restrictor is placed in the idle circuit passage it is capped with a tamper resistant plastic cap. If the jet is removed for cleaning it must be recapped to prevent tampering when it is re-installed.



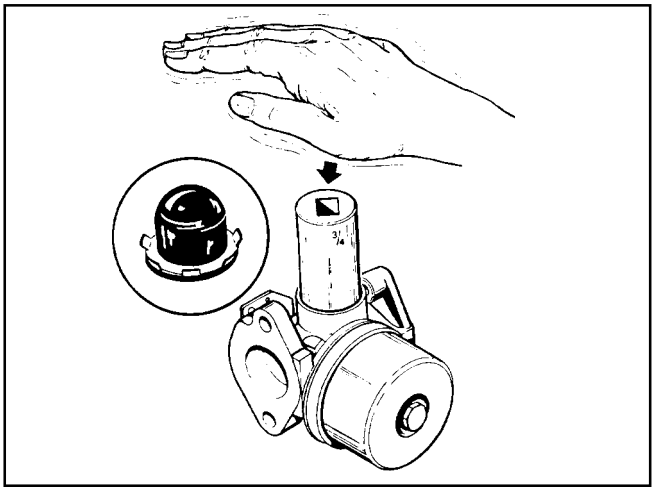
The inlet needle hooks onto the float tab by means of a spring clip. To prevent binding, the long, straight, open end of the clip must face the choke end of the carburetor as shown.



The float dampening spring on the HIGH TILT FLOAT STYLE carburetor has an extended end which must point toward the choke end of the carburetor.



PRIMER BULB. To install, start the retainer and bulb into the casting with the retainer tabs pointed out. Firmly push the bulb and retainer into position using a 3/4" (19mm) deep well socket.

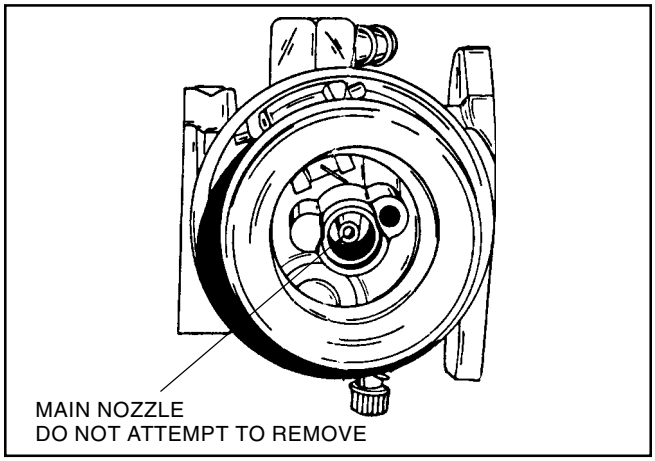


CLEANING CARBURETOR BODY. When removing choke and throttle shafts, check shafts and bearings in carburetor body for wear. Any looseness in these areas can cause dirt to enter the engine resulting in premature wear. If dust seals are present, they should be positioned next to the carburetor body. Install the dust seal, metal washer, and finally the return spring.

Welch plugs should be removed for proper cleaning of the carburetor (See welch plug service at the beginning of this section). When all accessories and shafts have been removed, soak the carburetor in carburetor cleaner for a maximum of 30 minutes. Blow out all passages with compressed air in the opposite direction of normal fuel flow.

The carburetor body on non-emission carburetors contains a main nozzle tube pressed into the carburetor body to a predetermined depth within the venturi of the carburetor. DO NOT attempt to remove this main nozzle. Any movement of this nozzle will seriously affect the metering characteristics of the carburetor. (Emissions carburetors have a serviceable plastic nozzle.)

Clean the well surrounding the main nozzle with carburetor



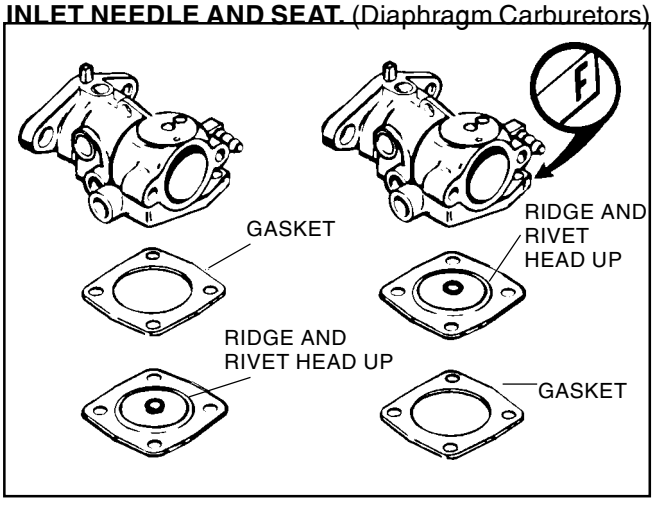
cleaner and compressed air. With the choke plate and shaft removed, blow compressed air through the high speed air bleed located just behind the lower choke shaft bearing and immediately in front of the venturi to remove any dirt that may have accumulated.

Blow compressed air through all of the passages, making sure they are free of dirt, varnish or foreign material.

DIAPHRAGMS. Inspect diaphragms for cracks, tears or brittleness. Replace if necessary. Rivet head on diaphragm must always face toward the inlet needle valve.

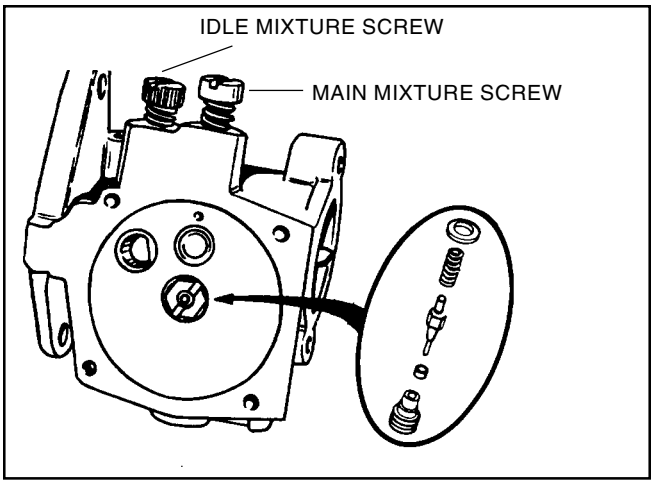
If the carburetor has an "F" designation on the casting, it will identify the installation sequence of the gasket and diaphragm on the carburetor. "F" designated carburetors have the diaphragm installed first then the gasket then the cover. If there is no designation, the sequence is gasket, diaphragm and cover.

INLET NEEDLE AND SEAT. (Diaphragm Carburetors)



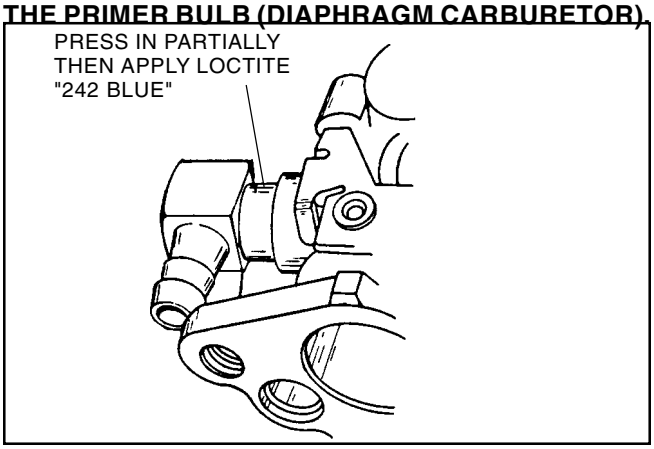
Use a socket to remove inlet needle and seat. Replace with complete assembly.

FUEL INLET FITTING. If necessary this fitting can



be removed by pulling and twisting. Be sure to install in the same position as the original. When installing fitting, insert tip into the carburetor body, then coat the exposed portion of the shank with Loctite 242 Blue; then press it in, until the shoulder contacts the carburetor body.

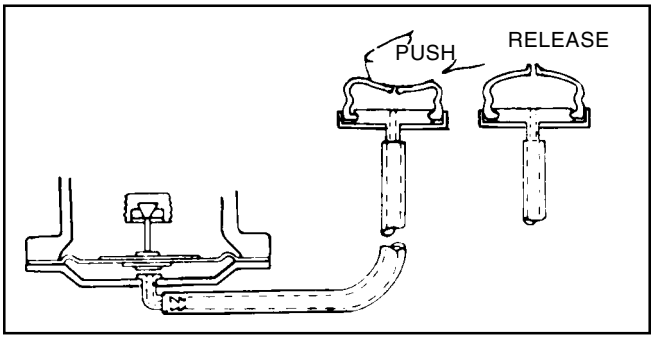
THE PRIMER BULB (DIAPHRAGM CARBURETOR).



Pressing the bulb creates air pressure against the diaphragm. Fully depress primer bulb with your thumb, making sure that the vent hole in bulb is covered. Release and allow bulb to return to original position.

As the diaphragm lifts, the inlet needle is lifted off its seat and the fuel within the reservoir is fed up through the passages into the air horn. A one-way valve in the body prevents the fuel from being forced back into the fuel tank.

CARBURETOR CHECK VALVE. Diaphragm carburetors



with primers must have a check valve located in or behind the fuel inlet fitting of the carburetor. This is to prevent fuel from being forced back to the fuel line and tank when priming.

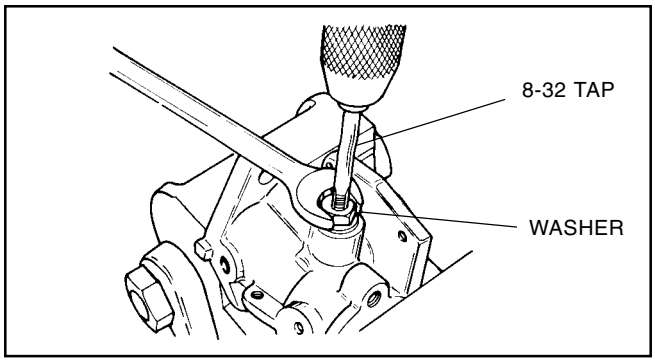
Two types of check valves have been used. One is a brass check valve pushed into the carburetor body in the fuel inlet. The other is a teflon disc located in the area under the fuel fitting. These two types of check valves are not interchangeable.

To remove the brass type check valve, drill a 9/64'' (3.57 mm) hole through the center of the check valve, making sure drill does not travel more than 1/8'' (3.17 mm) into the body and damage the carburetor.

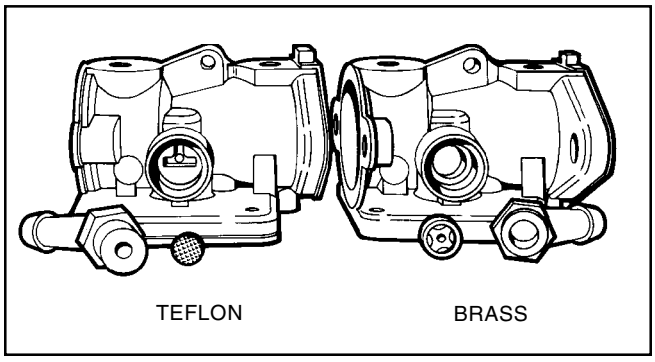
Turn a nut on to a 8-32 tap and slide a washer on after it.

Turn the tap with nut and washer into the valve until the tap begins to protrude through the valve when viewed through the inlet needle and seat opening.

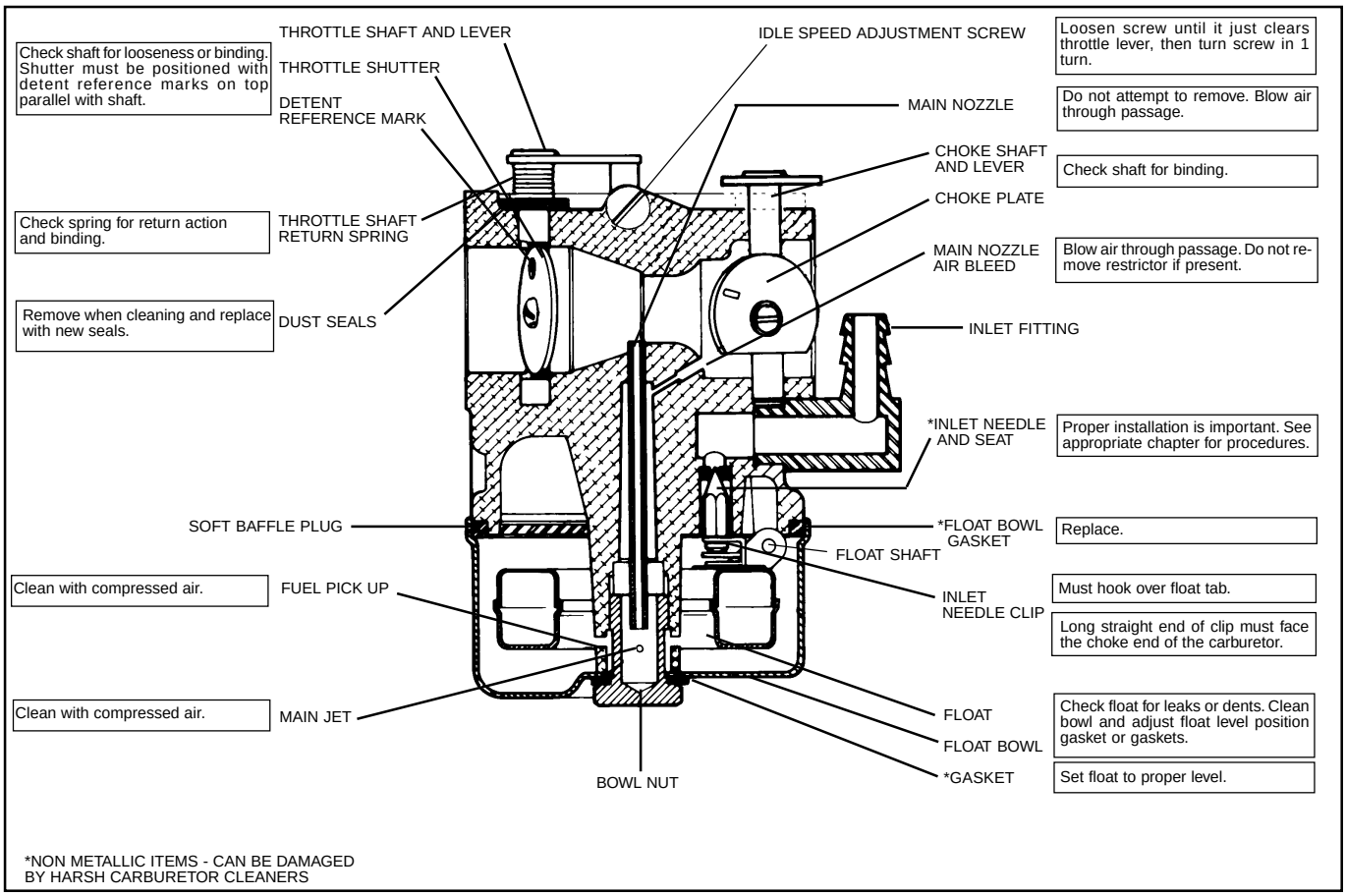
Turn the nut clockwise to pull the valve out from the carburetor body.



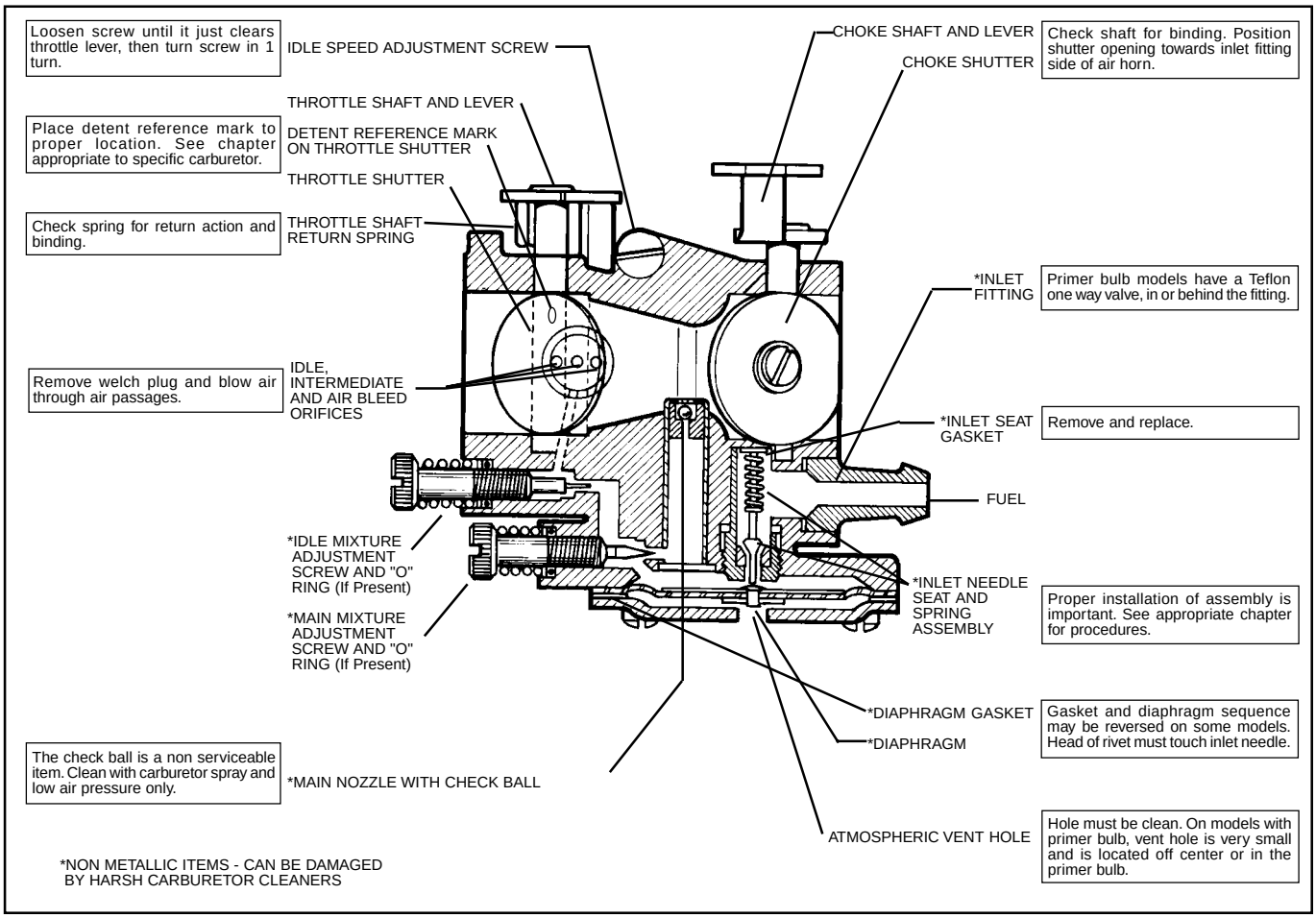
The teflon disc-type can be cleaned by using low air pressure forced into the inlet fitting. If service is required, pull out inlet fuel fitting and replace the teflon disc. Put a drop of oil on the disc and position in the cavity of the carburetor. Replace fuel inlet fitting as outlined in Fuel Inlet Fitting instructions.



CARBURETOR SERVICE PROCEDURE

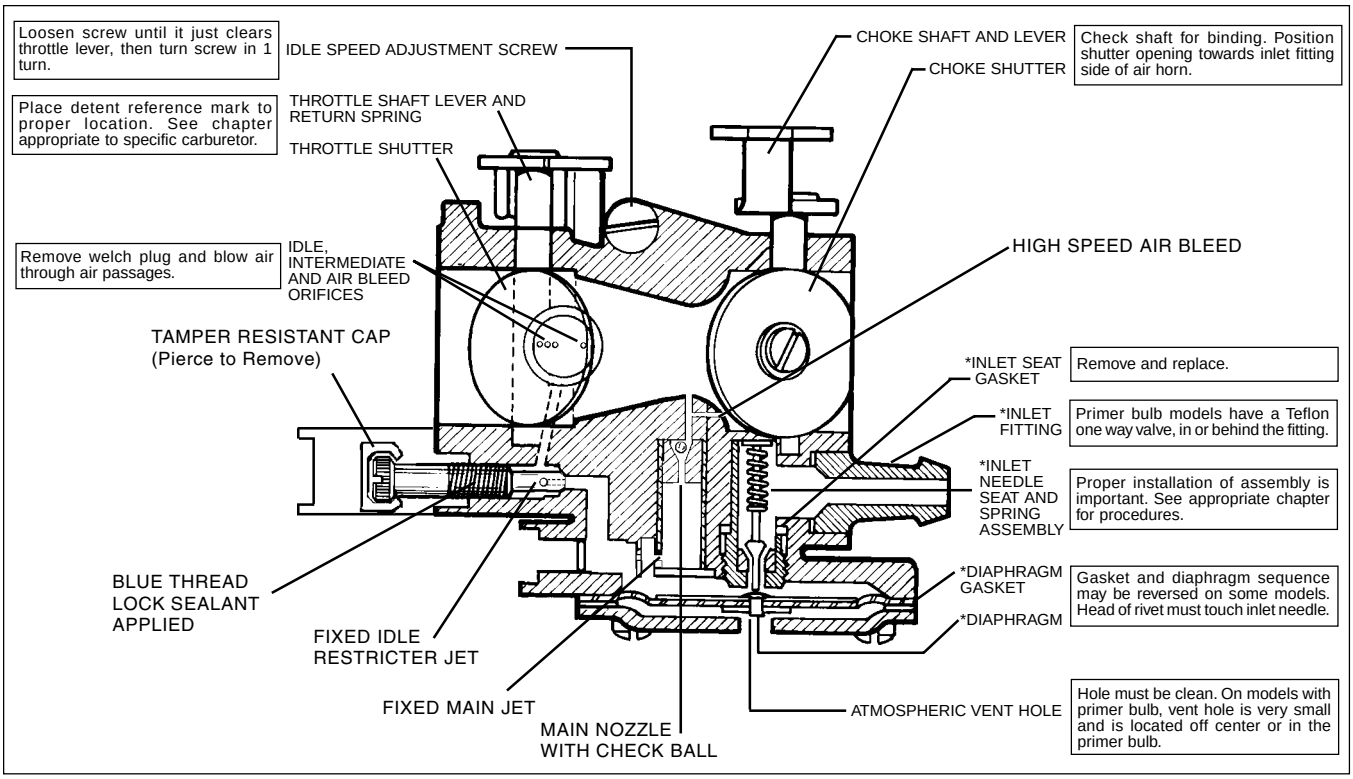


*NON METALLIC ITEMS - CAN BE DAMAGED BY HARSH CARBURETOR CLEANERS



*NON METALLIC ITEMS - CAN BE DAMAGED BY HARSH CARBURETOR CLEANERS

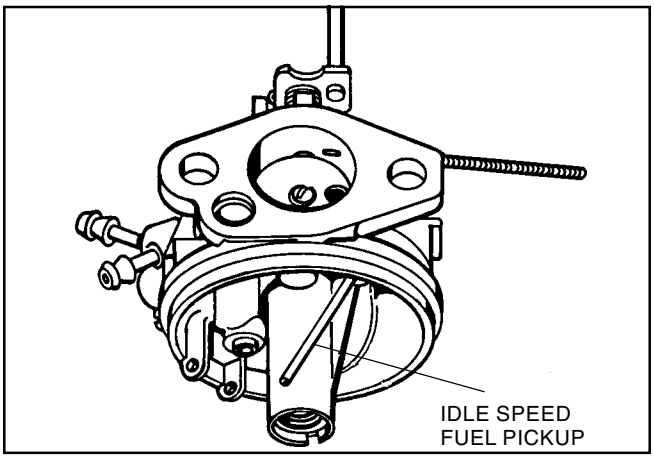
EMISSIONIZED DIAPHRAGM CARBURETION



OUTBOARD CARBURETORS

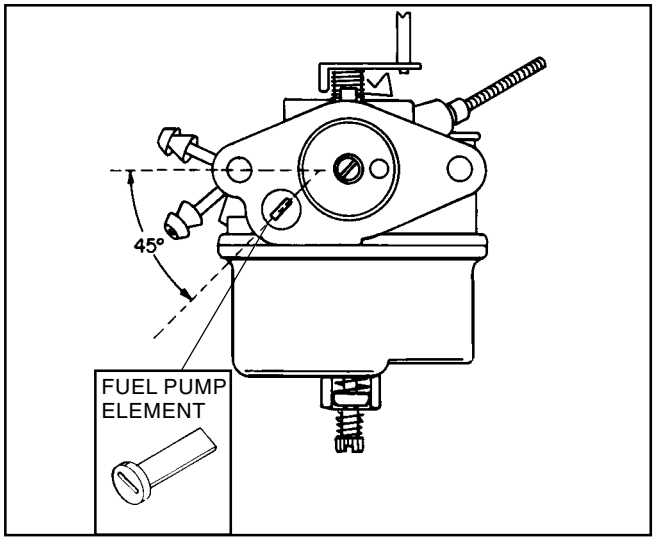
Carburetors on outboard applications use float type which have a separate idle speed fuel pickup tube pressed into the casting. The idle mixture screw is located on the top of the carburetor near the engine.

This carburetor has been manufactured with 2 different types of inlet needle and seats. One has a hard needle with a synthetic rubber seat, the other has a non-replaceable brass seat with a synthetic rubber tipped needle.



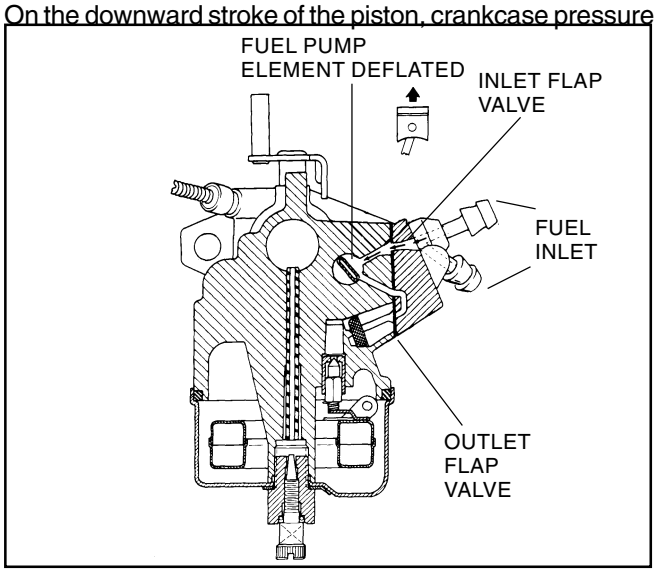
Outboard carburetors have a built-in fuel pump consisting of a fuel pump element which inflates and deflates with crankcase pulses which opens and closes two flap valves in the fuel pump, thereby pumping fuel from a remote tank to the carburetor float bowl.

When replacing the fuel pump element, install with the slot opening at a 45° angle as illustrated.



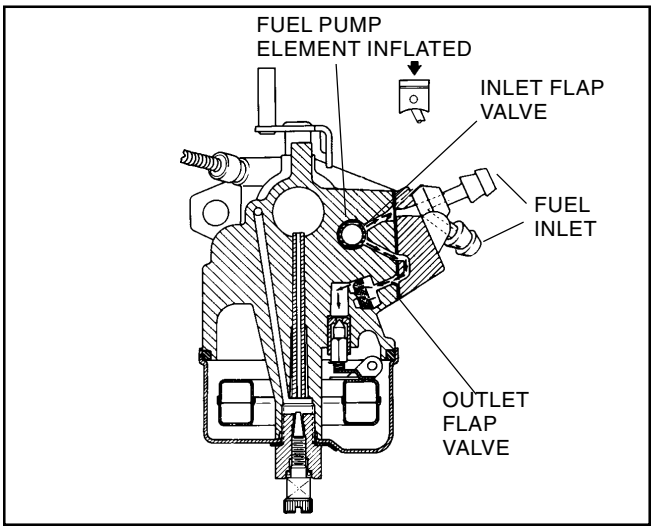
As the engine's piston, moves upward, a partial vacuum is created in the crankcase, which collapses the fuel pump element in the carburetor. On the outside of the element, suction opens the inlet flap drawing a supply of fuel from the tank and lines into the cavity created by the deflating pump element. Suction pulls the outlet flap closed, sealing the outlet port so that fuel isn't pulled from the area of the inlet needle and seat.

On the downward stroke of the piston, crankcase pressure



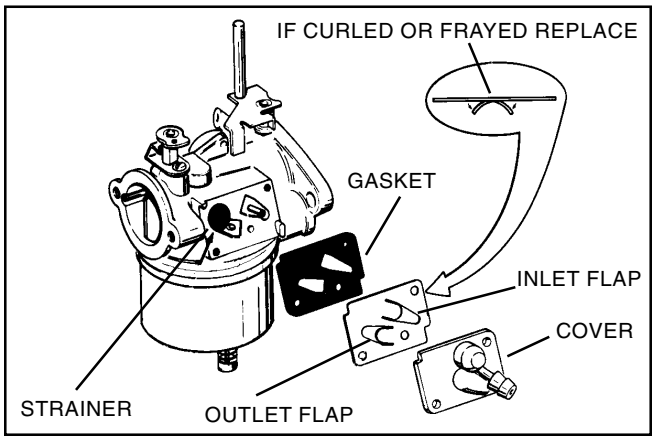
enlarges the pump element forcing fuel out of its cavity. This pressurized fuel acts against the outlet flap valve, opening it, allowing a head of pressurized fuel to be transmitted to the inlet needle and seat port. The inlet valve is pressed against the inlet port, sealing it so that pressurized fuel does not escape back into the fuel tank and lines.

The flap valves are located between the cover and



gasket. Make sure the flaps are in good condition and the strainer is not clogged or damaged. Replace as necessary. Make sure the cover is not warped; check by laying on a flat surface. If warped, replace. If not warped severely, it can be refaced using a hard surface and emery cloth. Notches on the carburetor body insure that the gasket, valve, and cover are positioned on the body correctly. When tightening screws, snug bottom screw, then top screw and torque to 6-8 in. lbs.

OUTBOARD CONTROL PANEL. Install the idle adjustment rod into the bracket then turn the setscrew



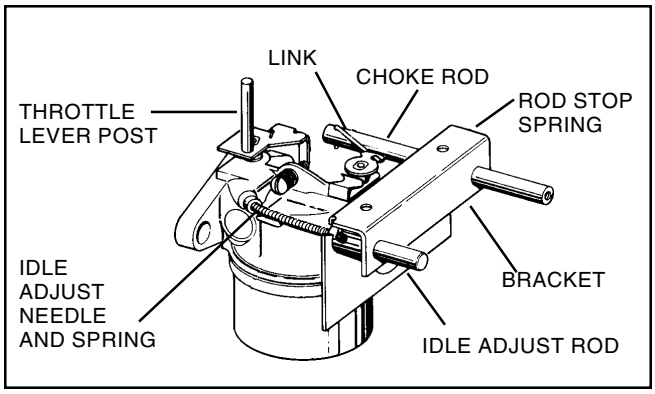
into the rod a complete 2 turns.

Then position the extended end of the choke rod spring on the idle adjustment rod and align the spring with the choke rod holes in the bracket. Press the choke rod through the bracket and spring with the link attaching hole toward the carburetor side.

Install the choke shaft link in the rod, then install the other end in the choke lever.

Install the control bracket to the carburetor, but do not tighten screw completely.

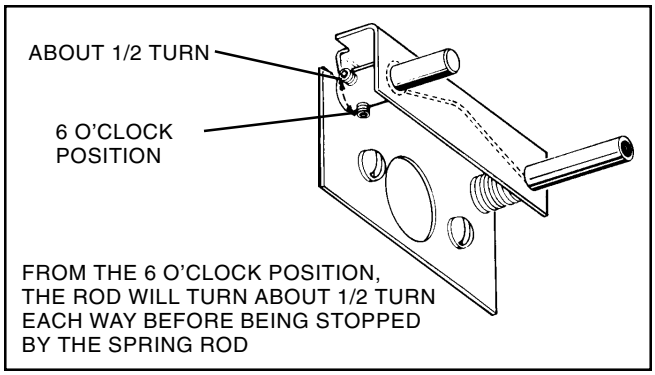
Tighten the setscrew to secure the rod to the idle



adjustment cable. The rod should turn about a half turn before contacting the extended end of the choke spring.

It is important that the idle adjustment screw be one full turn from closed, and that the rod setscrew be down (6 o'clock position) when connecting the rod and coil.

Tighten the control bracket screw. Pull the choke rod to assure that the choke shutter closes.



CARBURETOR ADJUSTMENTS

Emission grade carburetors will have fixed main and idle circuits. The absence of adjustment screws indicate fixed jets with no adjustments necessary.

CARBURETOR ADJUSTMENTS

IDLE SPEED ADJUSTMENT
This screw is located on top of the carburetor and contacts the throttle. To pre-set the idle speed, back out the screw, then turn in until the screw just touches the throttle lever. Finally, turn the screw in one (1) turn. Once the engine is running and brought up to operating temperature (3-5 minutes), the final idle R.P.M. can be adjusted with the aid of a tachometer.

FLOAT TYPE-FIXED MAIN, IDLE ADJUST
Turn the mixture adjusting screw in (clockwise) finger tight, then one (1) turn out (counterclockwise). This setting is approximate and will be enough to allow the engine to start so that final carburetor adjustments can be made. Start the engine and allow it to warm-up for approximately 5 minutes. **Do not adjust the carburetor with the engine cold.**

NOTE: If the engine falters or stops after the choke lever is moved to the "OFF" position, open the mixture adjusting screw 1/4 turn counterclockwise and restart the engine.

With the engine running, place the speed control in the "slow" position. Turn the mixture adjusting screw clockwise until the engine starts to falter, remember this location. Next turn the screw counterclockwise until the engine start to sputter or drops in R.P.M., remember this location. Now turn the screw clockwise until it is halfway between these two locations. This will be the optimum carburetor setting.

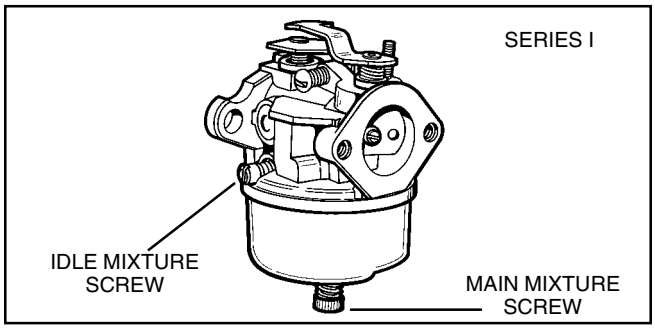
DIAPHRAGM - SINGLE AND DUAL ADJUSTMENT
Turn the mixture adjustment screw(s) clockwise finger tight, then one (1) turn counterclockwise. This setting will allow the engine to be started so that the carburetor can be fine tuned. **Do not adjust the carburetor when the engine is cold.**

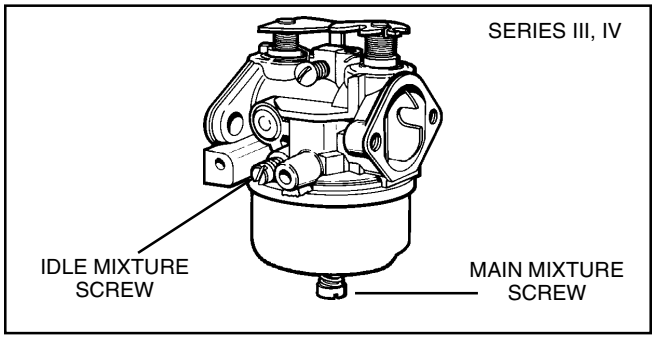
Start the engine and let it warm-up for approximately 5 minutes. If the engine falters or stops after the choke lever is moved to the "OFF" position, turn the adjusting screw 1/4 turn counterclockwise and restart the engine.

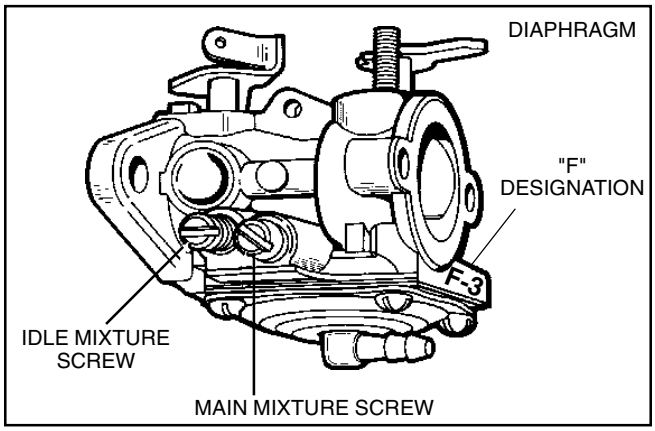
NOTE: On dual adjust, the first adjustment must be made with the main mixture screw.

With the engine running, turn the mixture adjustment screw clockwise until the engine starts to falter, remember this location. Next turn the screw counterclockwise until the engine starts to sputter or drop in R.P.M., remember this location. Now turn the screw clockwise until it is halfway between these two locations. This will be the optimum carburetor setting.

With dual adjust carburetor, repeat the above steps for the second (idle) mixture adjusting screw.







TROUBLESHOOTING CARBURETION

POINTS TO CHECK FOR CARBURETOR MALFUNCTION

TROUBLE	CORRECTIONS
Carburetor out of adjustment	3-4-11-12-13-15-20
Engine will not start	1-2-3-4-5-6-8-9-10-11-12-14-15-16-17-19-21-24-25
Engine will not accelerate	2-3-4-5-11-12-19-24
Engine hunts (at idle or high speed)	3-4-8-9-10-11-12-14-20-21-24-26-27
Engine will not idle	3-4-8-9-10-11-12-13-14-18-20-21-22-24-25-26-27
Engine lacks power at high speed	2-3-4-6-8-10-11-12-15-18-19-20-21-24-25-26
Carburetor floods	4-7-17-21-22-25-26
Carburetor leaks	4-6-7-10-17-18-23-24-25
Engine overspeeds	8-9-11-14-15-18-20
Idle speed is excessive	8-9-13-14-15-18-20-25-26-27
Choke does not open fully	8-9-14-15
Engine starves for fuel at high speed (leans out)	1-3-4-5-6-10-11-15-16-17-18-19-21-25-26
Carburetor runs rich with main adjustment needle shut off	7-8-9-11-14-17-18-19-21-25-26
Performance unsatisfactory after being serviced	1-2-3-4-5-6-7-8-9-10-11-12-14-15-16-17-18-19-20-21-24-25-26

1. Open fuel shut off valve at fuel tank. Fill tank with fresh clean fuel.
2. Check ignition, spark plug and compression.
3. Clean air cleaner service as required.
4. Dirt or restriction in fuel system clean tank and fuel strainers, check for kinks or sharp bends.
5. Check for stale fuel or water in fuel. Fill with fresh fuel/oil mixture of correct ratio.
6. Examine fuel line and pick-up for sealing at fittings.
7. Check and clean atmospheric vent holes.
8. Examine throttle and choke shafts for binding or excessive play remove all dirt or paint, replace shaft.
9. Examine throttle and choke return springs for operation.
10. Examine idle and main mixture adjustment screws and “O” rings for cracks or damage.
11. Adjust main mixture adjustment screw. Some models require finger tight adjustment. Check to see that it is the correct screw.
12. Adjust idle mixture adjustment screw. Check to see that it is the correct screw.
13. Adjust idle speed screw.
14. Check position of choke and throttle plates.
15. Adjust control cable or linkage to assure full choke and carburetor control.
16. Clean carburetor after removing all non-metallic parts that are serviceable. Trace all passages.
17. Check inlet needle and seat for condition and proper installation.
18. Check sealing of welch plugs, cups, plugs and gaskets.
19. Check fuel pump operation pump element, inner and outer one way valves.
20. Adjust governor linkage.

FLOAT CARBURETOR CHECKS

21. Adjust float setting.
22. Check float shaft for wear and float for leaks or dents.
23. Check seal for fuel drain or bowl gasket.
24. Is carburetor operating at excessive angle?

CHECKS FOR DIAPHRAGM

25. Check diaphragm for cracks or distortion and check nylon check ball for function.
26. Check sequence of gasket and diaphragm for the particular carburetor being repaired.
27. Check spring tension on idle governor (if present).

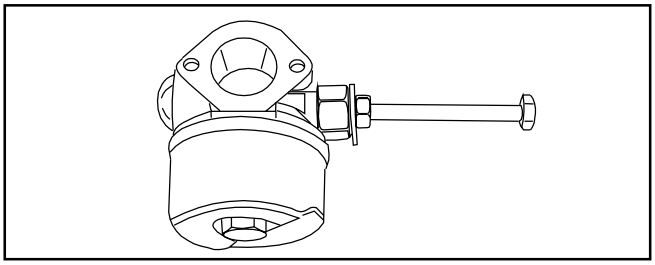
STANDARD SERVICE CARBURETORS

FUEL FITTING
NOTE: MOST service carburetors are marked “SVC CARB NF” in the Price List. This means that the carburetor comes with NO FUEL FITTING.

Use the parts manual to obtain the same fuel inlet fitting that was installed in the original carburetor. Install the fuel fitting in the new carburetor body in the same position as on the original carburetor. Support the carburetor body with a wood block to avoid damage to other parts. Use a bench vise or press to install the fitting squarely. Press it in until it bottoms out.

NOTE: PRESS FUEL FITTING IN SQUARELY USING CAUTION SO THAT THE CARBURETOR BODY IS NOT DAMAGED.

INLET FUEL FITTING
To remove a leaking or damaged fuel inlet fitting, use a 1/4"(6 mm) bolt, 1/4" (6 mm) nut and 1/4" (6 mm) washer, along with a 1/2" (12 mm) nut. Use a pliers or vise to remove the plastic part of the inlet fitting. Tap the inside of the remaining metal portion of the fitting using a 1/4"- 20 (6 mm) tap. Place a 1/2" (12 mm) nut over the fuel fitting (it may be necessary to guide one side of the nut to seat it squarely to the carburetor). Next thread the 1/4" (6 mm) nut on the bolt until it contacts the shank, add the washer, and thread the bolt into the fitting until snug. Tighten the 1/4"-20 (6 mm) nut until the fitting is removed.



CHOKE SHAFT

NOTE: Never reuse choke or throttle shutter screws, always replace with new Tecumseh service screws part number 650506.

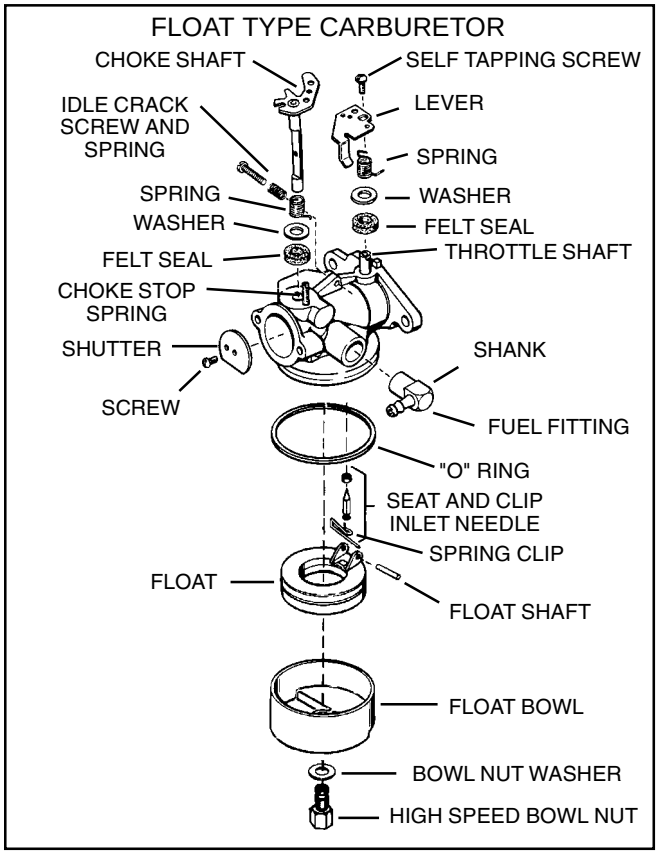
Remove the choke shutter screw from the original carburetor and remove the choke shaft. Observe the position of the ends of the choke return spring if one is present. Also observe the position of the cut-out and/or holes in choke shutter. Some chokes turn clockwise and some turn counterclockwise, note the position of the choke shaft prior to removal from the old carburetor.

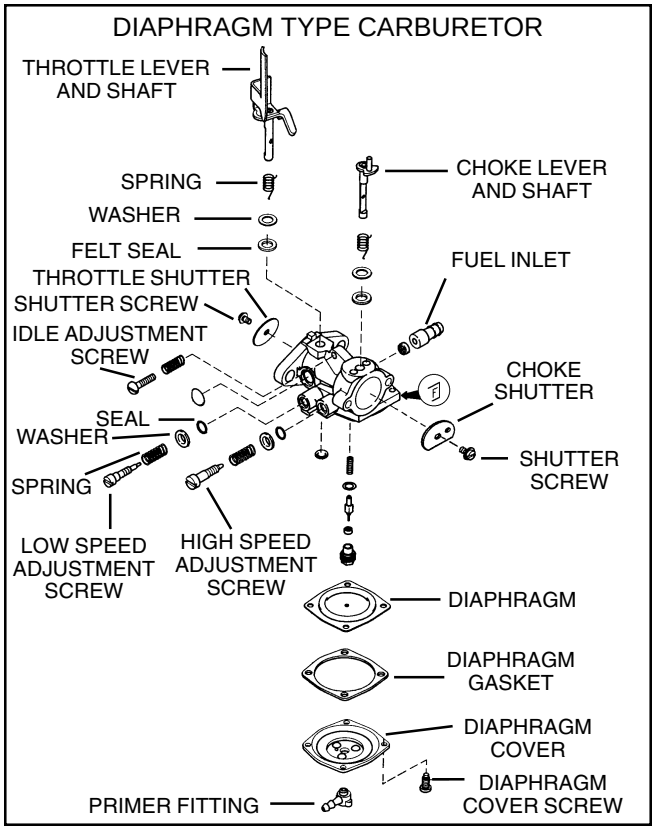
If a choke stop spring is present on the new carburetor and is not used on the old carburetor, cut it off with a side cutter or pull it out using a pliers.

Test the action of choke shaft to make sure it moves freely and easily and does not bind in either open or closed position. If binding occurs, loosen the shutter screw; reposition the shutter and tighten the screw.

THROTTLE LEVER
Remove the throttle lever and spring and file off the peened end of the throttle shaft until the lever can be removed. Install the throttle spring and lever on the new carburetor with the self-tapping screw furnished. If dust seals are furnished, install them under the return spring.

IDLE SPEED ADJUSTMENT SCREW
Remove the screw assembly from the original carburetor and install it in the new carburetor. Turn it in until it contacts the throttle lever. Then an additional 1 turn for a static setting.





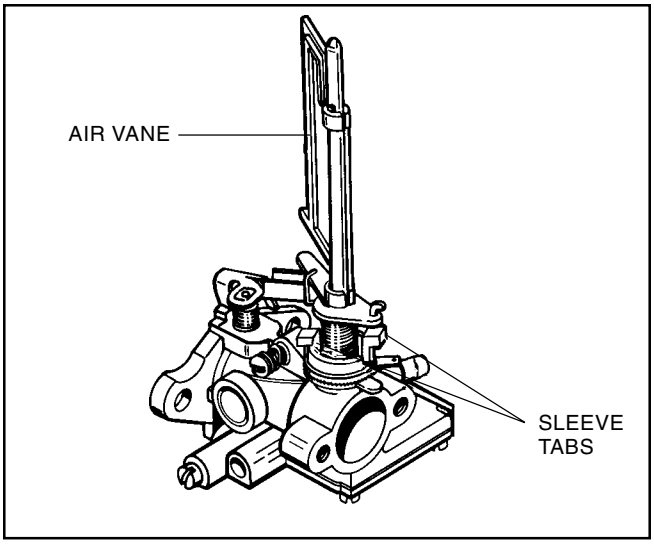
GOVERNORS AND LINKAGE

AIR VANE GOVERNORS. All Tecumseh 2 cycle engines covered in this book are equipped with pneumatic (air vane) governors. The governor's function is to maintain a R.P.M. setting when engine loads are added or taken away. Air vane governors are controlled by the air velocity created by fins on the flywheel. Changes in the engine R.P.M. cause the air vane to move. The throttle is opened as the engine R.P.M. drops and is closed as the engine load is removed.

OPERATION
Engine R.P.M. changes cause an increase or decrease in the air velocity created by the fins on the flywheel. The air velocity exerts pressure on the air vane while a governor spring exerts pressure against the air velocity force. The air vane pivots on the engine flange or is attached to the throttle shaft of the carburetor. As an engine load is applied and the engine's R.P.M drop, the air velocity also drops, allowing the governor spring to pull open the throttle shaft and increase engine speed.

LINKAGE INSTALLATION. The best method is to record the linkage attachment points prior to disassembly and reinstall the same way.

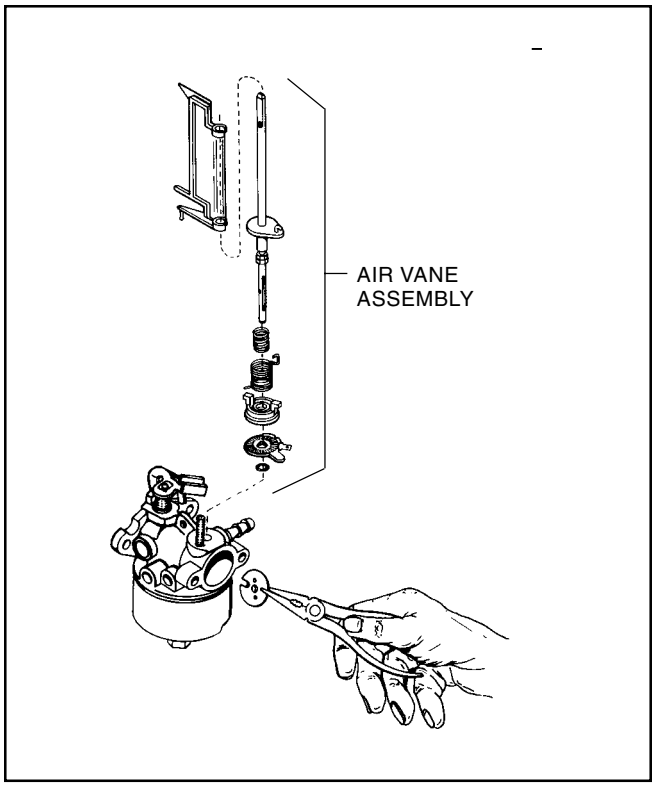
Illustrations showing most governor and linkage hookups are pictured in this section. Select the diagram that resembles the engine you are servicing. R.P.M. settings may be found in microfiche catalog, card number 30.

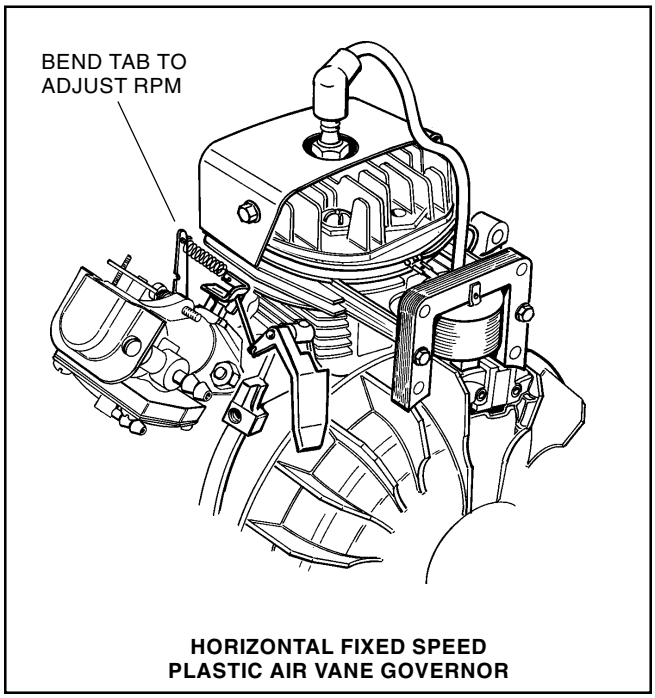


Rotate sleeve clockwise to increase R.P.M.; counterclockwise to decrease R.P.M.

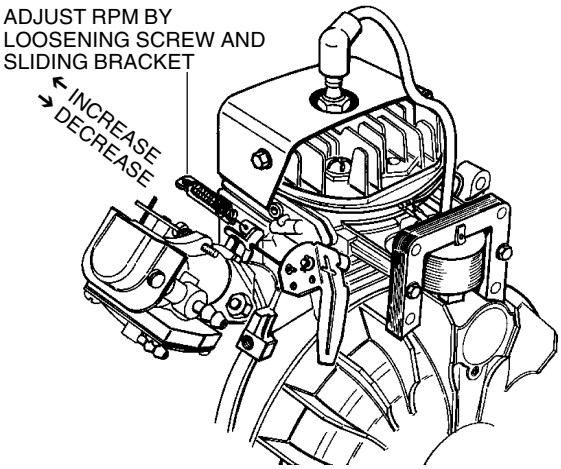
NOTE: The sleeve is serrated to rotate in a clockwise direction and must be raised using the sleeve tabs before it can be rotated counterclockwise.

To disassemble, remove choke shutter with needle-nose pliers; the vane assembly may then be removed from the carburetor.

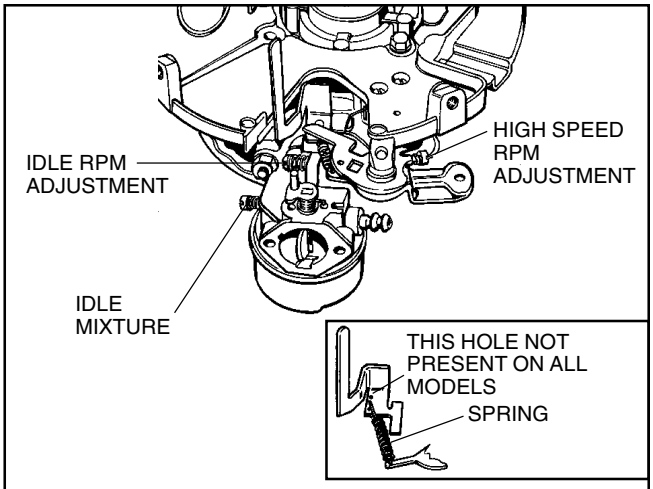




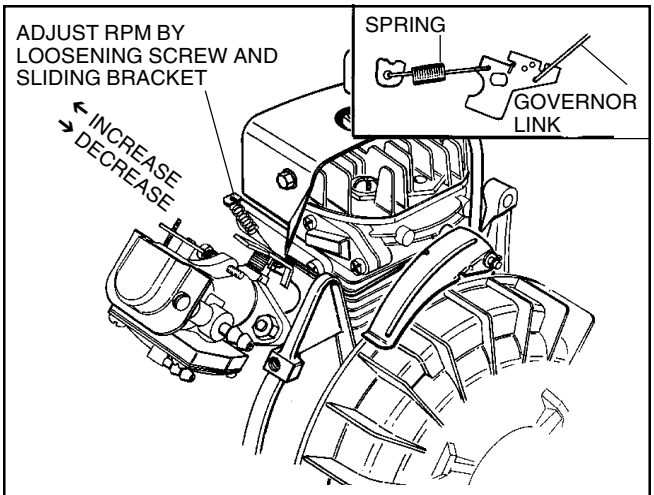
HORIZONTAL FIXED SPEED
PLASTIC AIR VANE GOVERNOR



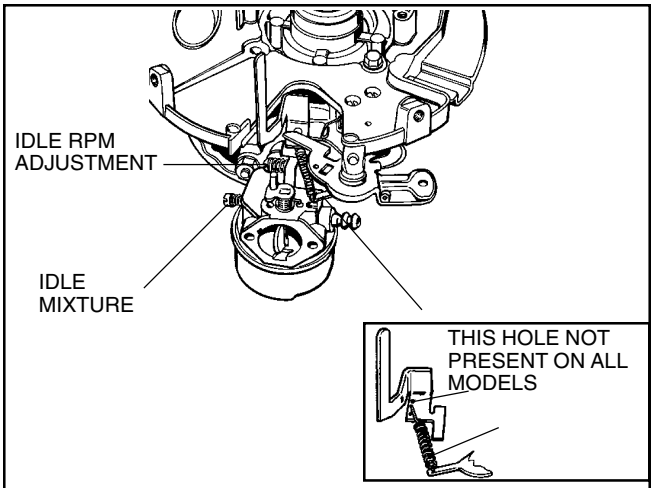
HORIZONTAL FIXED SPEED
(ALUMINUM AIR VANE GOVERNOR)



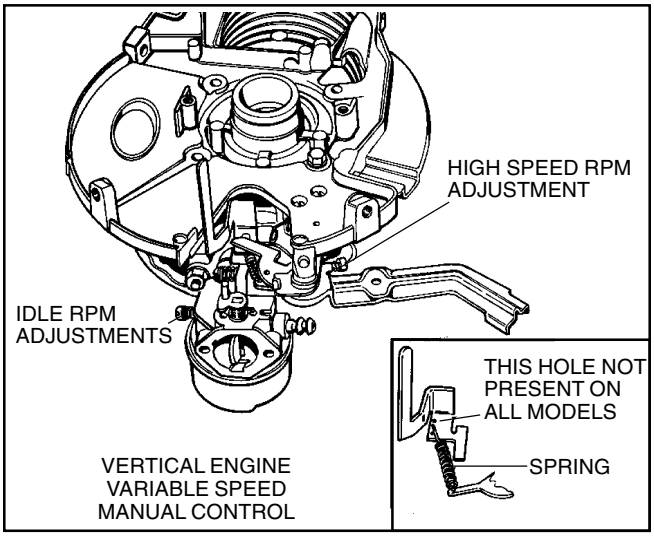
VERTICAL ENGINE
VARIABLE SPEED-REMOTE CONTROL



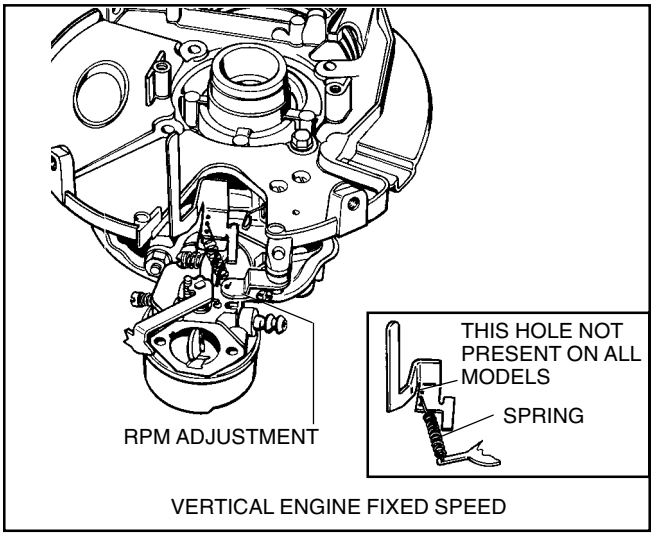
HORIZONTAL FIXED SPEED



VERTICAL ENGINE
FIXED SPEED-REMOTE CONTROL



VERTICAL ENGINE
VARIABLE SPEED
MANUAL CONTROL



VERTICAL ENGINE FIXED SPEED

REWIND STARTERS, ELECTRIC STARTERS AND ALTERNATORS

REWIND STARTERS

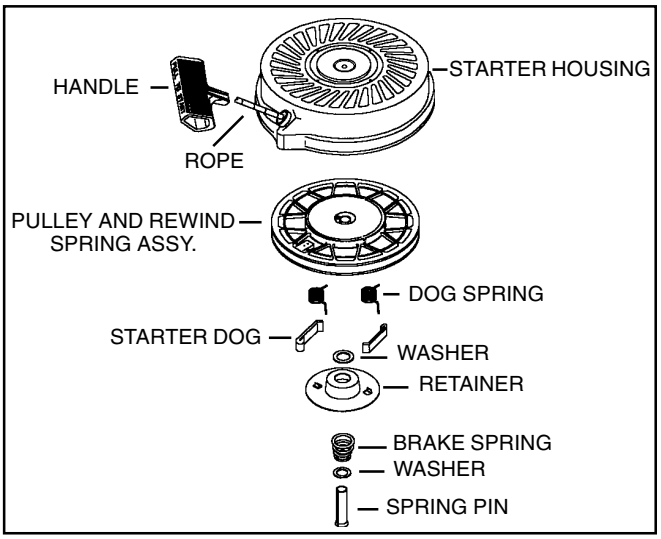
GENERAL INFORMATION

Rewind starters used on vertical shaft Tecumseh engines are top mount horizontal pull style or side mount vertical pull style. Horizontal shaft engines use side mounted starters which can be mounted to pull either vertically or horizontally. All rewind starters except the vertical pull style turn the engine over by engaging a dog(s) into the starter cup attached to the engine flywheel. The vertical pull starter engages the starter gear into the ring gear of the flywheel to turn the engine over. All starters are spring loaded to retract the dog(s) or starter gear when the engine speed exceeds the turning speed of the starter.

OPERATION

As the starter rope is pulled, the starter pulley rotates on the center pin. The starter dog(s) is pinned or pocketed in the pulley hub and extends outward when the pulley's rotation forces the starter dog(s) to contact the ears on the retainer. The retainer ears act as a ramp to fully extend the starter dog(s). The fully extended starter dog(s) locks in contact with notches in the starter cup. When the engine fires and the rotational speed of the starter cup exceeds the starter pulley, the starter dog(s) disengages from the starter cup. The starter dog spring(s) returns the starter dog(s) to the disengaged position. The recoil spring turns the starter pulley in the opposite direction, retracting the starter rope until the handle contacts the stop.

COMPONENTS



SERVICE

Starter related problems will require the starter to be removed from the engine to diagnose the cause. Visually inspect the starter dog(s), starter cup, retainer, springs, rope, washers, and the starter pulley for wear or breakage. Use one of the following procedures that applies to your application, to disassemble, repair, and assemble the starter. Always consult the Tecumseh Master Parts Manual for the correct replacement parts.

ROPE SERVICE

Rope replacement should be done using the correct part number replacement rope or braided rope of the correct diameter and length. Consult the Tecumseh Master Parts Manual to obtain the correct part number, length, and size required. Use the following rope chart to convert a numbered rope to a fractional diameter for bulk rope use.

# 4 1/2 rope	=	9/64" (3.572 mm) diameter Part No. 730526 -100' (30.48 meters) spool
# 5 rope	=	5/32" (3.964 mm) diameter Part No. 730514 - 100' (30.48 meters) spool
# 6 rope	=	3/16" (4.762 mm) diameter Part No. 730516 - 100' (30.48 meters) spool

Standard rope lengths

54" (16.5 meters)	standard stamped steel starter
61" (18.6 meters)	vertical pull - horizontal engagement type
65" (20 meters)	vertical pull - vertical engagement type
85" (26 meters)	extended handlebar rope start (compliance)

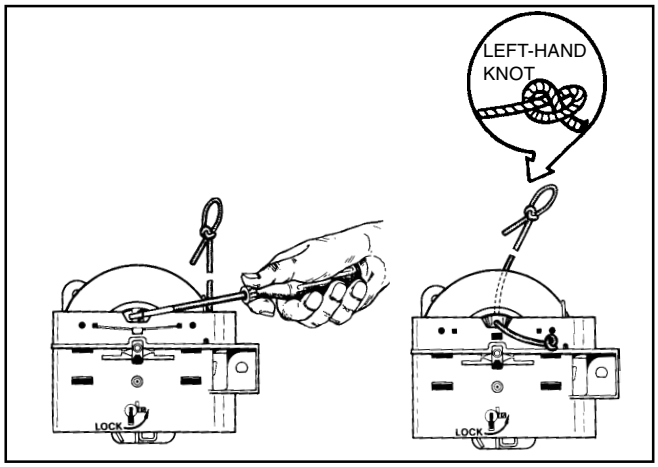
Check the old rope for the right length for the application. Some applications require longer lengths. The rope ends should be cauterized by burning with a match and wiping the rope end with a cloth while hot.

Rope replacement can be done without the starter being disassembled on vertical pull starters that have "V" notches in the bracket. Use the following procedure for rope replacement.

1. Remove the starter assembly from the engine.
2. Turn the pulley until the staple in the pulley lines up with the "V" notch. Pry out the staple with a small screwdriver and remove the original rope.

3. Turn the pulley counterclockwise to fully wind the starter return spring until tight. Allow the pulley to unwind until the hole in the pulley lines up with the "V" notch.

4. Hold the pulley in this position and feed the new rope through the hole and tie a left-handed knot on the rope end. Make sure the rope and knot do not protrude from the knot cavity and bind the pulley rotation.

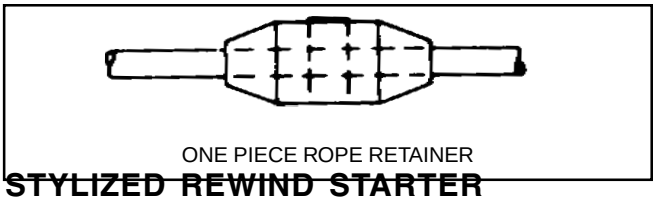


RETAINER REPLACEMENT

1. Remove the starter handle if the retainer is a complete circle design. Remove the staple and old retainer.

2. Slide the rope retainer into the proper position and insert the staple using a pliers.

3. Install the starter handle and tie a left hand knot to secure the handle.



ONE PIECE ROPE RETAINER

STYLIZED REWIND STARTER

Disassembly Procedure

1. After removing the rewind assembly from the engine blower housing, release the tension on the rewind spring. This can be done by removing the starter handle and carefully allowing the rope to unwind in the starter housing assembly.

2. Place a 1" (25 mm) deep well socket under the retainer. Set the rewind on a bench, supported on the socket.

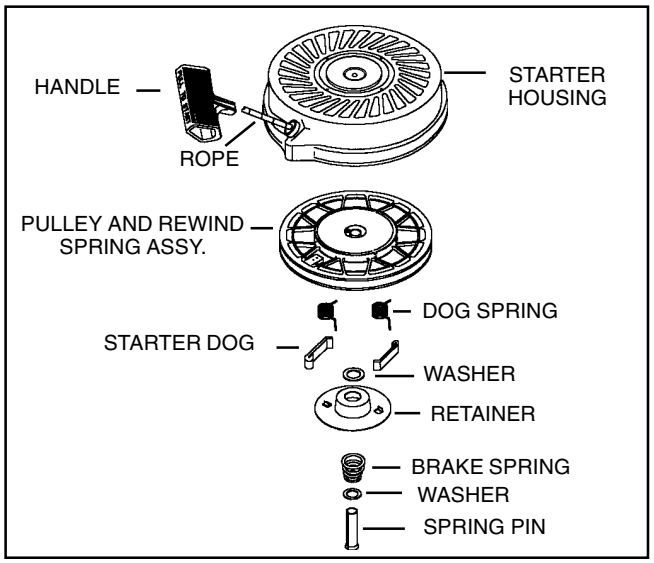
3. Use a 5/16" (7.938 mm) or 1/4" (6.35 mm) (for stamped steel) roll pin punch to drive out the center pin. The stamped steel center pin is driven out from the top, inside the center hole. Move the punch around while driving the pin to help keep the pin straight.

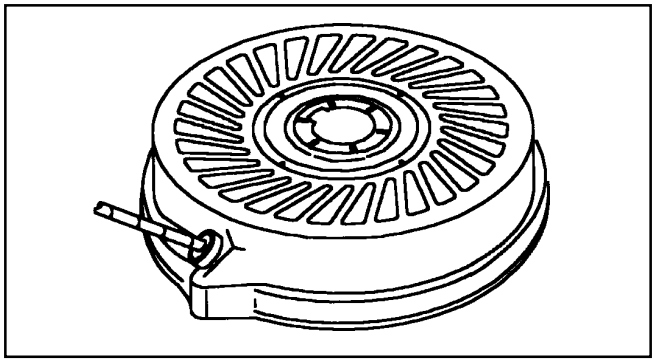
CAUTION: THIS REWIND SPRING IS NOT SECURED IN A CANISTER. PULLEY BOSSES HOLD THE REWIND SPRING AND COVER, AND CAN BE EASILY DISLODGED DURING HANDLING.

4. Remove the brake spring, spring retainer, washers, and pulley assembly (diag. 7, 8, 9 & 10)

   NOTE: The starter dogs face out on the stamped steel starter and the dogs face in on the stylized rewind starter.

5. All components in need of service should be replaced.





ASSEMBLY PROCEDURE

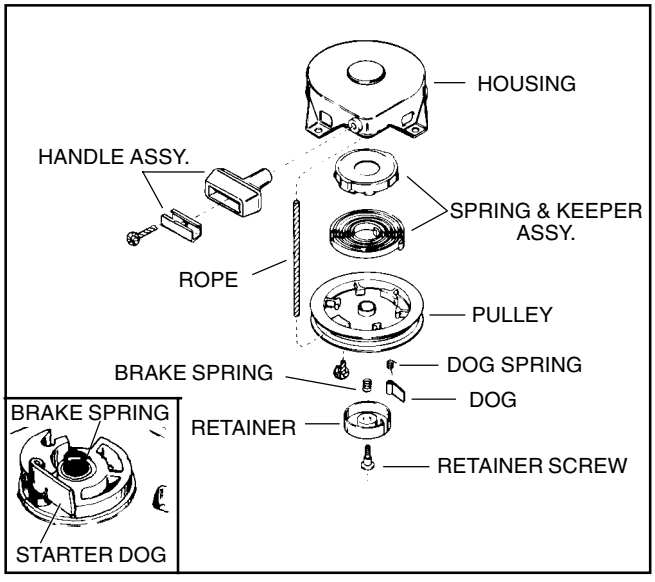
NOTE: It is critical to support the starter on a deep well socket to prevent damage.

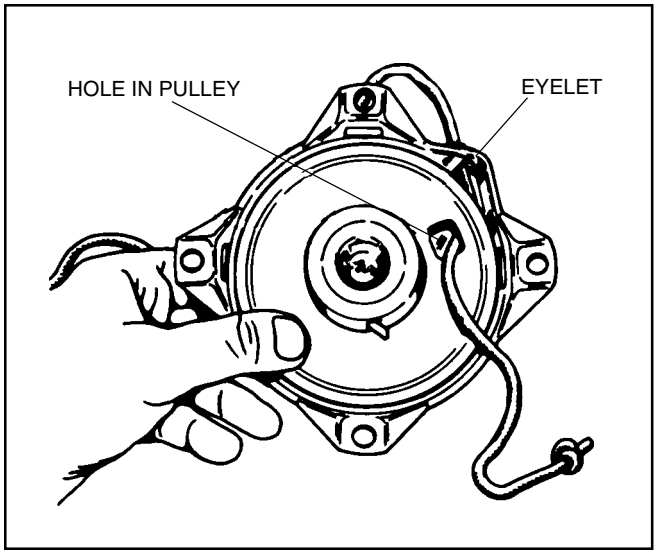
1. Reverse the disassembly procedure. The starter dogs with the dog springs must snap back to the center of the pulley (disengaged position). When the rope is pulled, the tabs on the retainer must be positioned so that they will force the starter dogs to engage the starter cup. (diag. 7 & 8)
2. Always replace the center spring pin with a new one upon reassembly. Place the two new plastic washers between the center leg of the starter and the retainer. New plastic washers are provided with a new center spring pin. Discard the old plastic washer.
3. Place the rewind on a flat surface and drive the new center pin in until it is within 1/8" (3.175 mm) of the top of the starter.

NOTE: DO NOT DRIVE THE CENTER PIN IN TOO FAR.

The retainer will bend and the starter dogs will not engage the starter cup. On the stamped steel starter the center pin should be driven in until it contacts the shoulder in the starter body.

4. Wind the starter pulley counterclockwise four or five turns to pre-load the recoil spring, thread the rope through the starter housing eyelet and tie a temporary knot in the rope. Reattach the starter handle to the rope using a left-hand knot. Untie the temporary knot and allow the rope to recoil.

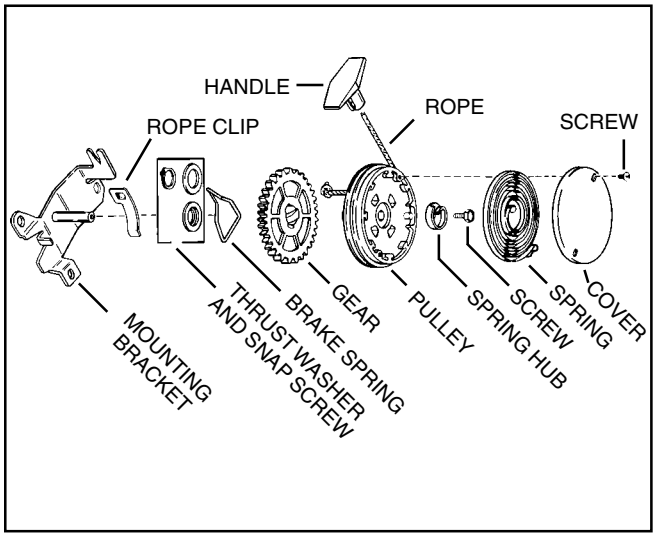




VERTICAL PULL STARTER HORIZONTAL ENGAGEMENT TYPE

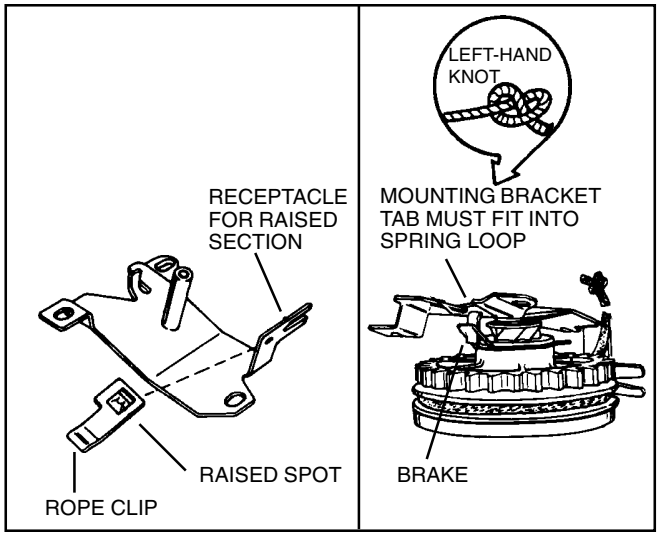
DISASSEMBLY PROCEDURE

1. Remove the handle and relieve the starter spring tension by allowing the rope to slip past the rope clip.
2. Remove the spring cover by carefully removing the two small screws. Carefully take out the spring.
3. Remove the center hub screw and the spring hub.
4. Lift off the gear and pulley assembly. Disassemble the pulley assembly by removing the snap ring and washer (diag. 13).
5. Remove the starter rope if necessary. Replace all worn or damaged parts.



Assembly Procedure

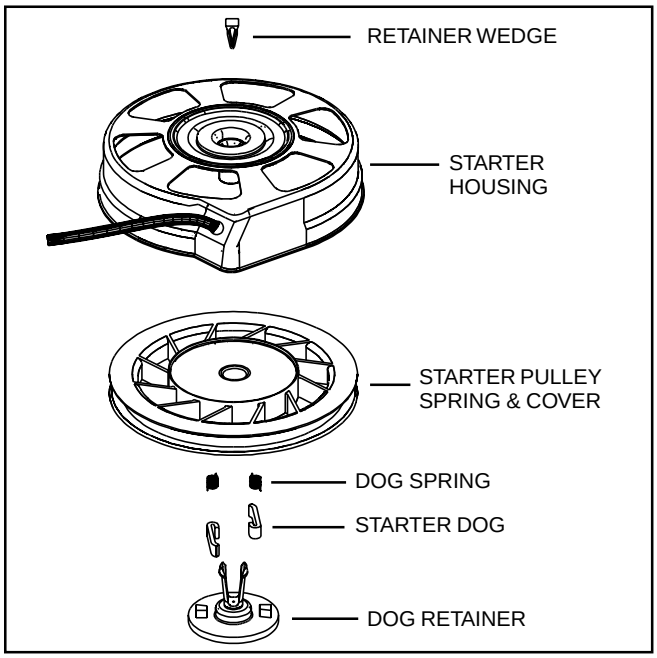
1. Insert the rope through the starter pulley.
2. Assemble the gear, pulley, washer, and snap ring.
3. Place a small amount of grease on the center shaft, place the gear and pulley into position making sure the brake spring loop is positioned over the metal tab on the bracket. The rope clip must fit tightly onto the bracket. The raised section fits into the hole in the bracket.
4. Install the hub and hub screw. Torque the hub screw to 45 - 55 in. lbs. (5 - 6 Nm). A loose hub screw will prevent the rope from retracting.
5. Install the return spring if necessary. A replacement spring is installed by placing the spring and its retainer over the top of the pulley and pushing the spring out of the retainer into the pulley's recessed area.
6. Install the spring cover and the cover screws.
7. Wind the rope onto the pulley by slipping it past the rope clip. When the rope is fully wound on the pulley, wind the pulley assembly two additional turns to put tension on the spring.
8. Mount the starter on the engine making sure the top of the starter gear teeth are no closer than 1/16" (1.59 mm) from the top of the flywheel ring gear teeth.



STYLIZED REWIND STARTER WITH PLASTIC RETAINER

DISASSEMBLY PROCEDURE

1. After removing the rewind assembly from the engine blower housing, remove the starter handle by first pulling a length of rope out using the handle, tying a temporary knot in the exposed rope, and either untying the knot in handle or prying out the staple.
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Remove the decal from the center of the starter housing.
4. Use a small Phillips screwdriver or similar tool to pry the retainer legs apart and lift out the retaining wedge.
5. Pinch the legs of the retainer together and pull on the head of the retainer to remove it from the housing.
6. Remove the pulley assembly from the recoil housing.
7. Repair or replace as necessary.



ASSEMBLY

1. If replacing the starter rope, see Step 8.
2. Install a new recoil spring if necessary by pushing the new spring out of the holder into the pulley cavity while aligning the outside spring hook into the deep notch in the pulley. Push the spring cover in until seated.
3. Apply a small amount of lithium grease to the inner bore of the center shaft.
4. Replace or check that both starter dogs are in the pulley pockets and that the dog springs are hooked on the outer surface of the dog.

5. Pinch the two legs of the plastic retainer together and start into the center shaft hole.
6. Rotate the retainer so the two tabs on the bottom of the part fit between the dog and pulley hub (left side of the dog). Push the retainer in until the leg prongs pop out of the center shaft.
7. Turn the starter over and snap the locking tab between the retainer legs, replace the top decal.

   NOTE: Refer to Service Bulletin 122 for metal locking tab.
8. Wind the starter pulley counterclockwise four or five turns to pre-load the recoil spring and thread the rope through the starter housing eyelet. Pull enough rope through to tie a temporary knot in the rope. Reattach the starter handle to the rope using a left-hand knot. Untie the temporary knot and allow the rope to recoil.

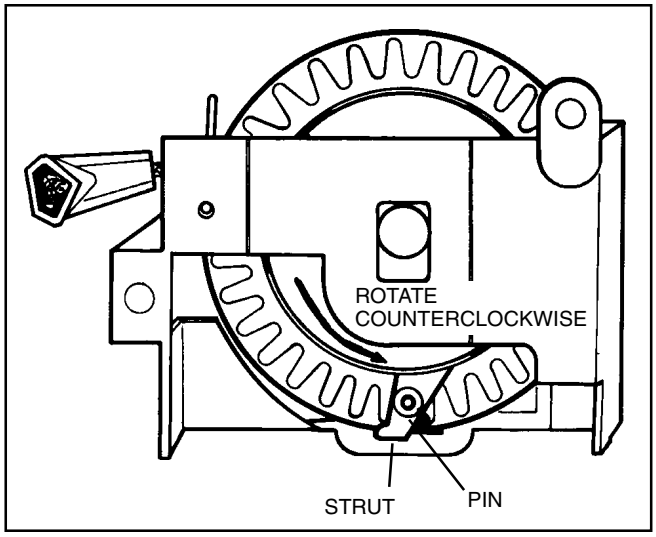
VERTICAL PULL STARTER, VERTICAL ENGAGEMENT TYPE

DISASSEMBLY PROCEDURE

1. Pull out enough rope to lock the rope in the "V" of the bracket.
2. Remove the handle if necessary by prying out the small staple in the handle with a screwdriver.
3. Place the starter bracket on the top of a deep well socket that is large enough to receive the head of the center pin. Use an arbor press to drive out the center pin.
4. Rotate the spring capsule strut until it is aligned with the legs of the brake spring. Insert a nail or pin no longer than 3/4" (19.05 mm) through the hole in the strut so it catches in the gear teeth. This will keep the capsule in the wound position.
5. Slip the sheave out of the bracket.

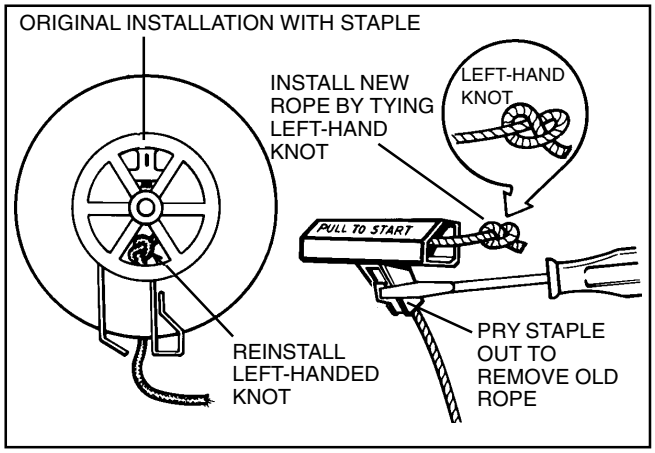
CAUTION: DO NOT ATTEMPT TO REMOVE THE SPRING CAPSULE FROM THE SHEAVE ASSEMBLY UNLESS THE SPRING IS FULLY UNWOUND.

6. Squeeze and hold tightly by hand the spring capsule at the outer edge against the gear sheave.
7. Remove the retainer pin from the strut and slowly relieve the spring tension by allowing the spring capsule to rotate slowly under control, until completely unwound. The spring capsule can now be removed from the gear sheave.

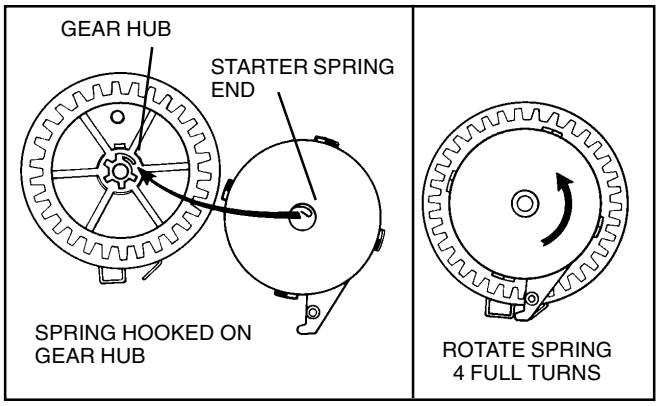


ASSEMBLY PROCEDURE

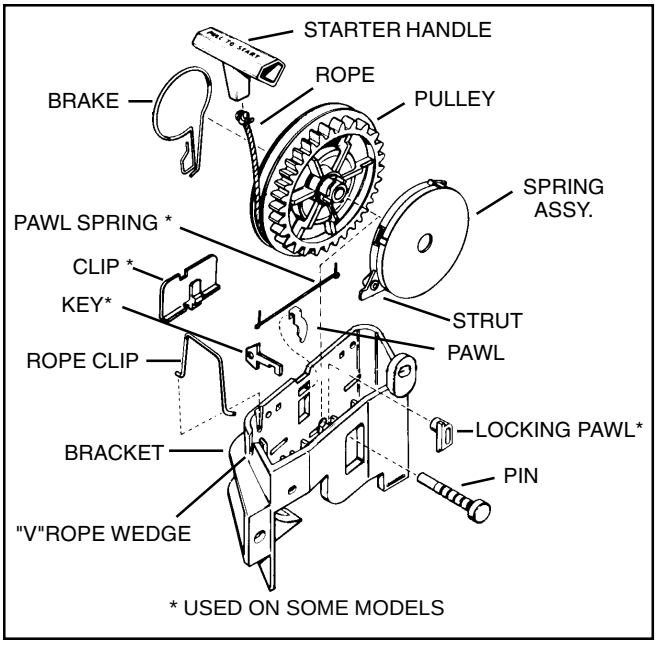
1. Feed the new rope through the hole and tie a left-handed knot on the rope end. Make sure the rope and knot do not protrude from the knot cavity and bind the pulley rotation.

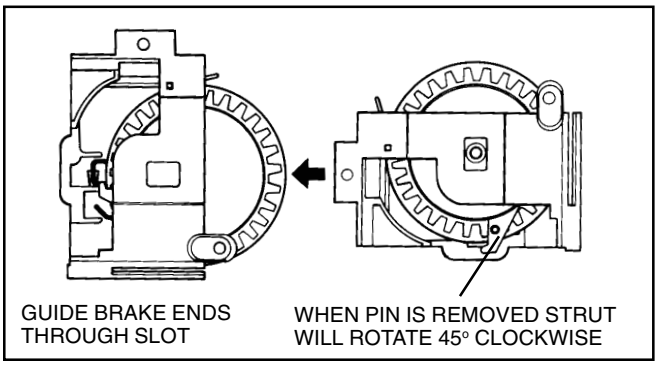


2. Wind the rope on the sheave assembly clockwise, viewing the gear from the gear side of the sheave.
3. Reinstall the brake spring, being careful not to spread the spring more than necessary.
4. Install the spring capsule, making sure the starter spring end hooks on the gear hub.
5. Wind the spring four full turns and align the brake spring legs with the strut as shown. Insert the pin in the strut.



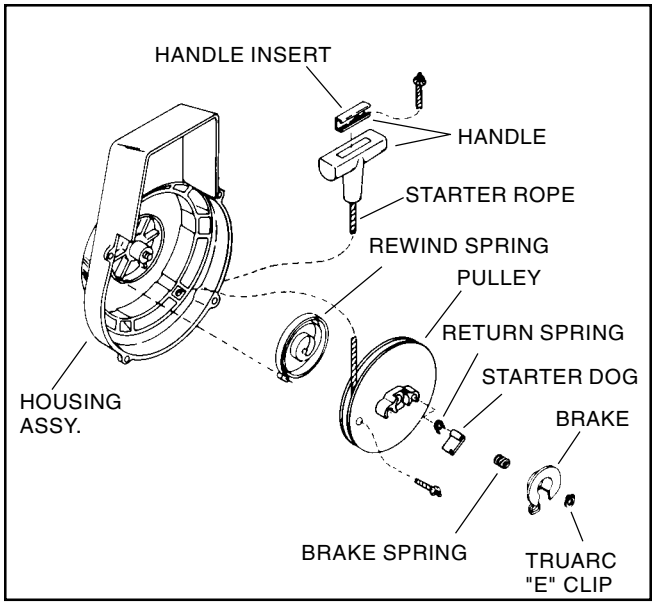
6. If the starter is equipped with a locking or delay pawl and spring, make sure these are in place before grasping the gear and spring capsule assembly and sliding it into the bracket. Make sure the legs of the brake spring are positioned in the slots of the bracket.
7. Feed the rope end under the rope guide and hook it into the "V" notch. Remove the pin and the strut will rotate clockwise against the bracket.
8. Insert the new center pin by pressing or driving the pin firmly in place. Reinstall the starter assembly on the engine.





REWIND STARTER MOUNTED IN HOUSING DISASSEMBLY PROCEDURE.

1. Pull rope out to untie knot in rope and slowly release spring tension.
2. Remove “E” clip, brake, brake spring, starter dog and return spring.
3. Lift out pulley; rewind spring is located in the housing. Replace all worn or damaged parts.

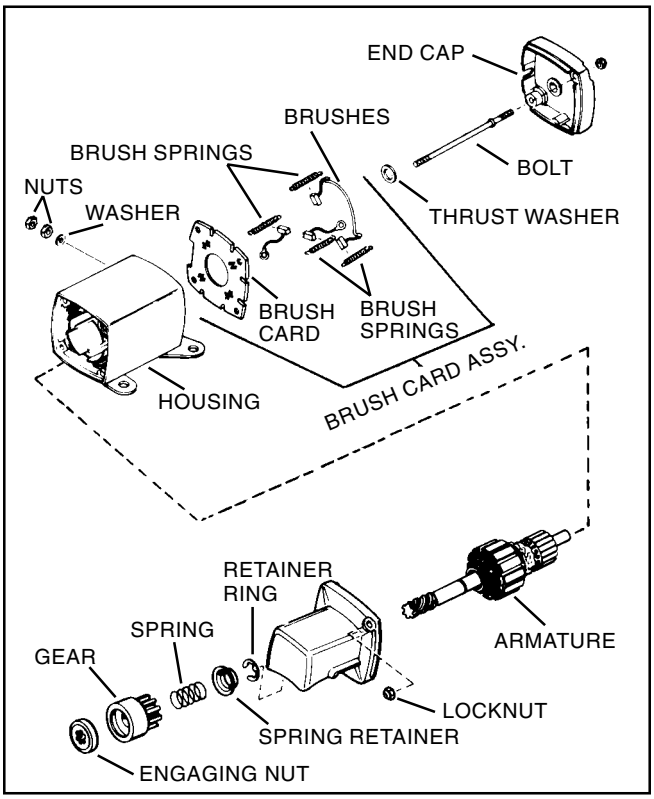


ASSEMBLY PROCEDURE.

1. Hook loop of spring into housing and wind in housing in a counterclockwise direction. The spring should have a light coating of grease on it.
2. Place pulley into housing.
3. Install dog spring and dog in starter pulley in the socket closest to the rope hole in pulley.
4. Replace brake spring, brake and install “E” clip.
5. To put tension on spring, wind pulley counterclockwise until tight, then allow to unwind until the hole in the pulley lines up with the eyelet in housing, then install rope and handle.

ELECTRIC STARTERS

The following electric starter illustrations will not be identical in configuration to the starter being serviced, but tests apply unless otherwise stated. Starters labeled CSA cannot be serviced, except for external components.



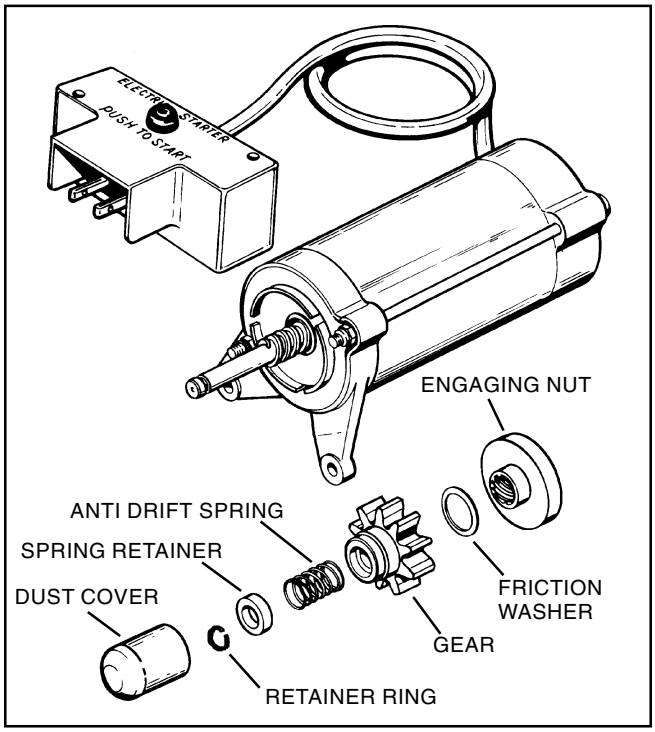
DRIVE ASSEMBLY SERVICE. Pinion gear parts should be checked for damage or wear. If the gear sticks on the shaft, it should be washed in solvent to remove dirt and grease, then dried thoroughly. If damaged, replace with new parts.

On units with the gear under the cap assembly, use the following procedure for disassembly:

1. Remove retainer ring from armature shaft.
2. Remove the two nuts from the through bolts holding on the cap assembly.
3. Slide off the cap assembly. The engaging nut, gear, spring and spring retainer will remain in the cap assembly.
4. Remove, inspect, and replace as necessary.

Use reverse procedure for assembly.

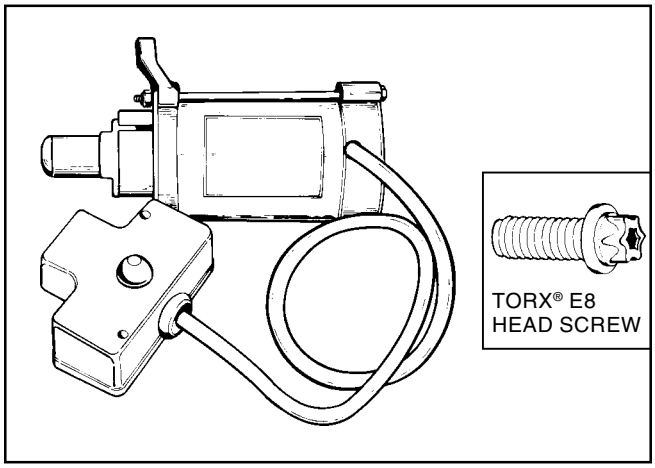
The following starter, number 590556, is a sealed UL and CSA approved starter, and the only component that can be serviced is the drive assembly.



To disassemble the drive assembly, use the following procedure:

1. Remove plastic dust cover.
2. Push down spring retainer and remove retainer ring.
3. Slide off spring retainer, anti-drift spring, gear, friction washer, and engaging nut. Inspect and replace as necessary.

Use reverse procedure for assembly.

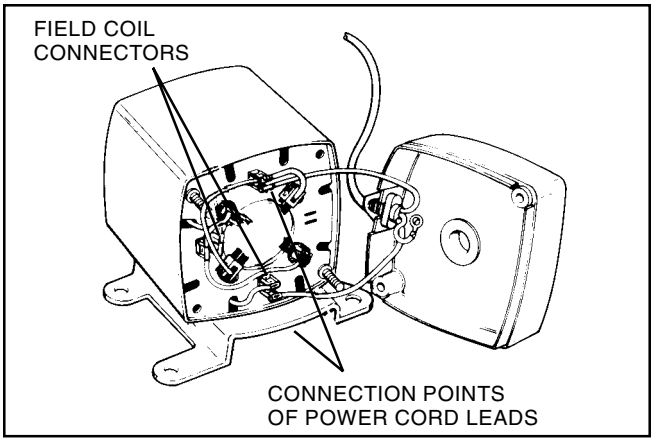


The 590556 Electric Starter uses a mounting screw with a Torx® E-8 head. To torque this screw you must use a 670307 Torx® E-8 socket.

STARTER CHECKING AND SERVICE. Remove nuts at both ends of the starter and take off rear end cap.

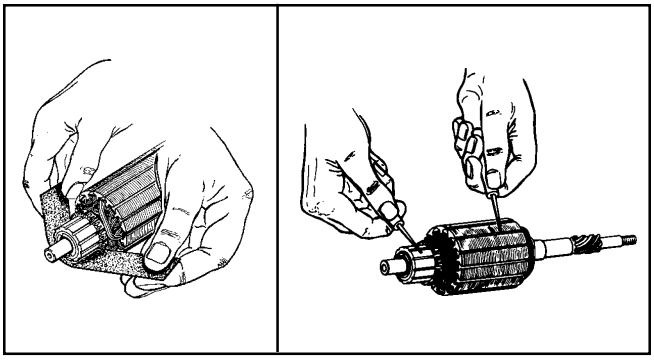
CHECK BRUSHES. Before removing the armature, check brushes for wear. Make sure brushes are not worn to the point where the brush wire bottoms out in the slot of the brush holder. Brush springs must have enough strength to keep tension on the brushes and hold them against the commutator.

If brushes need replacement, remove by unhooking the terminals or cutting the connections and then resoldering. If the brush card is warped from overheating, replace the card assembly.



CHECK FIELD. Using a continuity light or ohmmeter, check the field by attaching one lead to each field coil connection. Continuity should exist between these two points. Check continuity between each field coil connection and the starter housing. No continuity should exist.

ARMATURE CHECK. If the commutator bars are glazed or dirty they can be turned down on a lathe. While rotating, hold a strip of 00 sandpaper lightly on the commutator, and moving it back and forth. (Do not use emery cloth). Recut the grooves between the commutator bars to a depth equal to the width of the insulators.



Use a continuity tester to make certain no continuity exists between the commutator (copper) and the iron core of the armature, rotate armature and check out all commutator bars.

The armature can be thoroughly checked with a growler if available.

TROUBLESHOOTING STARTERS.

STARTER DOES NOT FUNCTION. Check for:

1. No current to the starter caused by faulty connections or blown circuit breaker.
2. Faulty safety switches, ignition, starter switch, or solenoid.
3. Engine locked up or parasitic load on engine.
4. Shorted, open, or grounded field coil.
5. Open, shorted, or bent armature.
6. Brushes sticking or damaged.
7. Dirty or oily brushes or commutator.

STARTER CRANKS ENGINE SLOWLY. Check for:

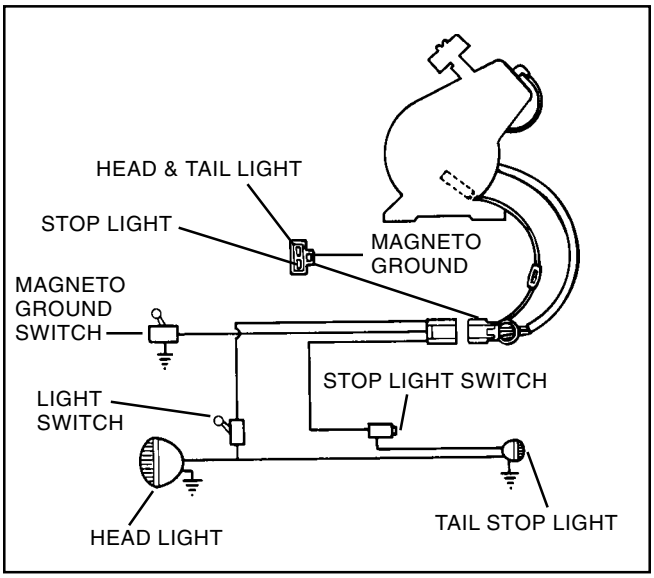
1. Parasitic load or “tight” engine.
2. Worn brushes or weak brush springs.
3. Dirty, oily, or worn commutator.
4. Worn bearings in cap assemblies.
5. Defective armature.

STARTER SPINS, ENGINE DOES NOT CRANK. Check for:

1. Pinion gear sticking on shaft.
2. Damaged pinion or flywheel ring gear.

ALTERNATORS

Some engines are equipped with an alternator and regulator to supply current to power head lights, tail lights, etc. on recreation vehicles. Shown here is a typical wiring diagram.



CHECKING THE SYSTEM. At an idle speed (2600 R.P.M.) a slight dimming of the lights will be noticed, This is normal and should not be considered faulty.

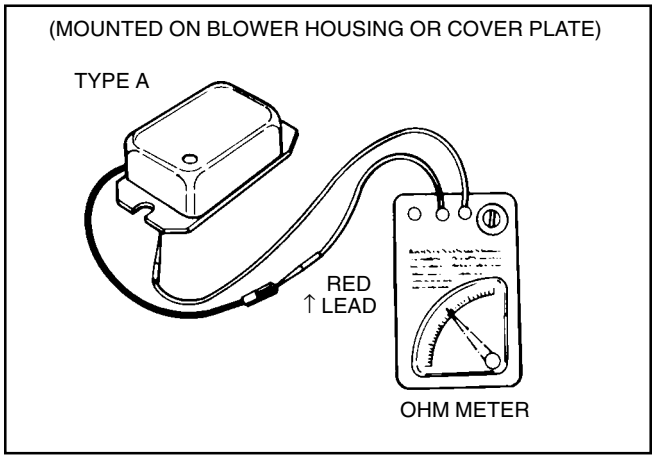
Before going into extensive checks, be sure to examine the more basic causes first, such as:

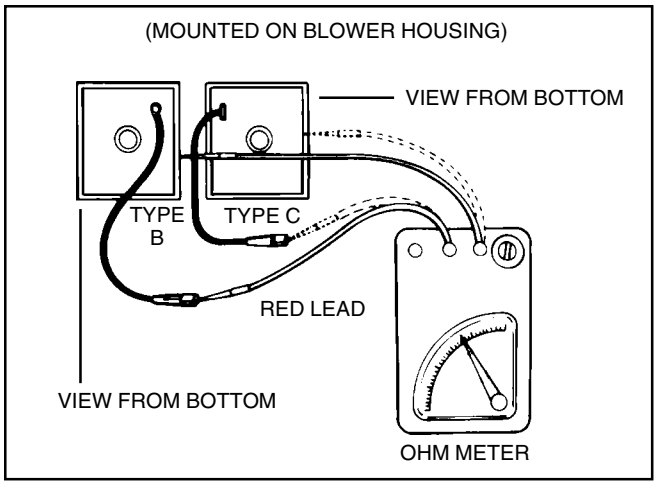
1. Make sure bulbs are good and the right ones are being used. Number 1157 for tail & stop light; 4416 or 4420 for head lights.
2. Corroded terminals.
3. Cracked wire insulation.
4. Broken wires.
5. Broken wires covered by insulation.
6. A wire grounding out the system.
7. Loose connections.
8. Make sure regulator has good ground.
9. Faulty Switch.

Check the regulator for resistance. If regulator checks out and all bulbs and wiring are ok, replace alternator coils.

Three types of regulators have been utilized. Use the ohm readings in the chart below for the type that you are servicing. Readings should be as follows:

Type A	Type B	Type C
100 to 200 Ohms	Over 50,000 Ohms	100 to 200 Ohms





FLYWHEEL (INSIDE-EDGE) BRAKE SYSTEM

Tecumseh's brake systems provide two methods of meeting compliance standards which has become a Federal law as of June 30, 1982. There are two additional methods used by equipment manufacturers that also meet compliance standards, they are:

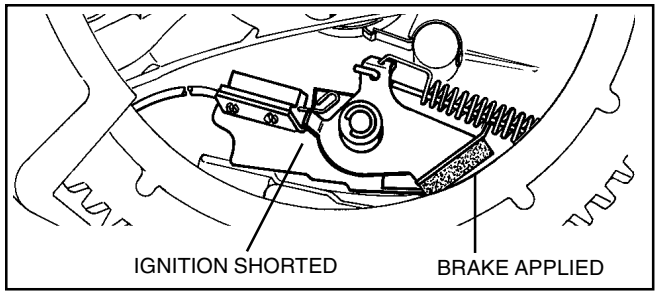
1. Use of the blade brake clutch in conjunction with either a top or side mounted recoil starter. The blade stops within three seconds after the operator lets go of the blade control bail at the operator position and the engine continues to run. Starter rope handle is on the engine.
2. Use of a recoil starter (top or side mounted) with the rope handle on the engine as opposed to within 24 inches from the operator position. This method is acceptable if the mower deck passes the 360 degree foot probe test. A specified foot probe must not contact the blade when applied completely around the entire blade housing. This alternative can be used with engine mounted brake systems and typical bail controls. The blade stops within three seconds after the operator lets go of the blade control bail at the operator position and the engine is stopped.

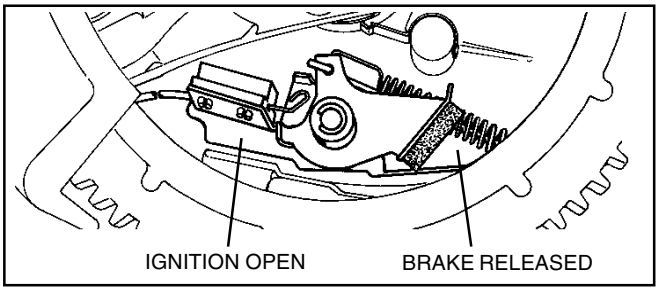
Tecumseh's Flywheel (Inside-Edge) Brake System provides consumer safety by shutting down the engine and lawnmower blade within seconds after the operator releases the Engine/Blade control at the handle of the lawnmower.

INSIDE EDGE SYSTEM

In the stop position the brake pad is applied to the inside edge of the flywheel, at the same time the ignition system is grounded.

In order to restart the engine, the brake control must be applied. This action pulls the brake pad away from the inside edge of the flywheel and opens the ignition kill switch. On electric start systems the starter is energized by an ignition switch or a two motion control. On non-electric start systems, the recoil starter rope must be pulled to start engine.





COMPONENTS

The Inside Edge system uses the following components:

The **brake lever and pad** assembly consists of a steel lever with a brake pad bonded to the lever.

The **ignition kill switch** is a plastic block with a wire extending out of it. The wire is attached to a terminal which is connected to the ignition kill wire. The brake lever contacts and grounds the wire of the switch when the engine / blade control is released, and the ignition module is grounded. This in turn kills the ignition.

The **interlock switch** is a push button switch that is activated by the brake lever when the engine / blade control is actuated. If there is a starter switch used to start the engine, the interlock switch acts as a safety switch and will not allow the starter to crank unless the engine / blade control is depressed.

Where a two motion control is used the interlock switch is utilized as the starter switch.

The **Torsion Spring** supplies the pressure to the brake lever and brake pad to stop the flywheel.

The **Control Cable** transfers the motion of the engine / blade control to the brake system.

SERVICE

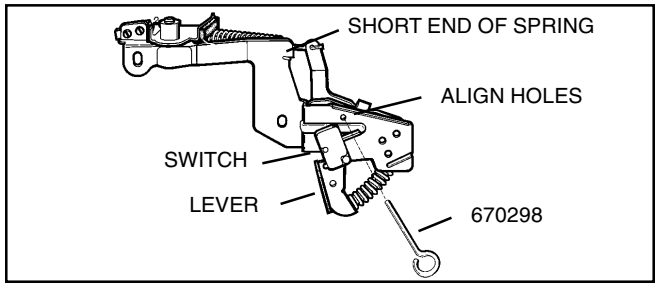
If the brake system fails to kill the ignition and stop the blade within 3 seconds the following service procedures should be followed.

Remove the flywheel as outlined in "IGNITION" section.

NOTE: BEFORE THE FLYWHEEL IS REMOVED OR REPLACED, THE BRAKE PRESSURE ON THE FLYWHEEL MUST BE RE-LEVELED AS OUTLINED.

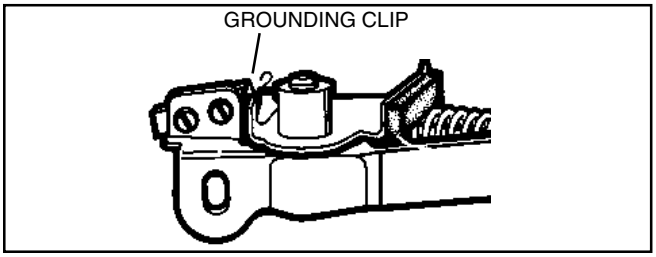
INSIDE EDGE

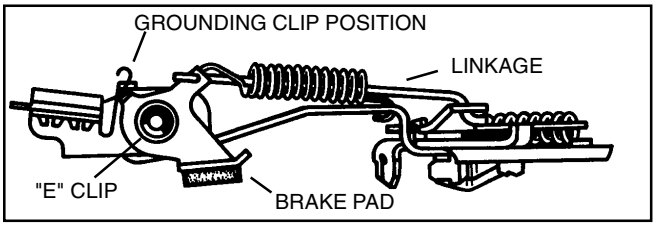
To relieve the brake pressure on the flywheel, compress the spring by moving the lever toward the spark plug, when the hole in the lever aligns with the hole in the bracket, secure the lever with alignment tool 670298 then remove the flywheel (diag. 7). Remove the alignment tool. Release the spring tension by unhooking the short end of the spring from bracket with a pliers. Remove the “E” clip from the brake pad shaft. Slide the pad lever from the shaft and unhook the link. Inspect the brake pad for dirt, oil or grease contamination. If the pad is contaminated, or if there is less than .060" (1.524 mm) of brake pad material at the pad’s thinnest point, replacement is necessary. The brake pad is bonded to the brake lever and must be replaced as an assembly. Rehook the link, install the brake lever and pad assembly, install the "E" clip, rehook the short end of the spring and continue to reassemble the brake system in the reverse order of disassembly.



IGNITION GROUND OUT TERMINAL

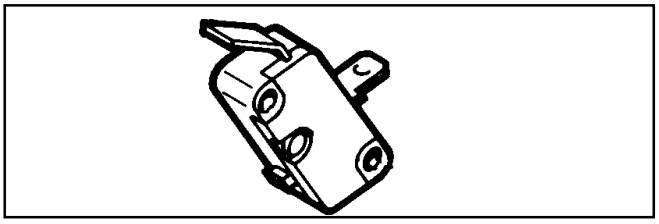
Inspect the ignition kill switch grounding clip for proper alignment and contact with the brake arm. Insure that all electrical connections are clean and secure.



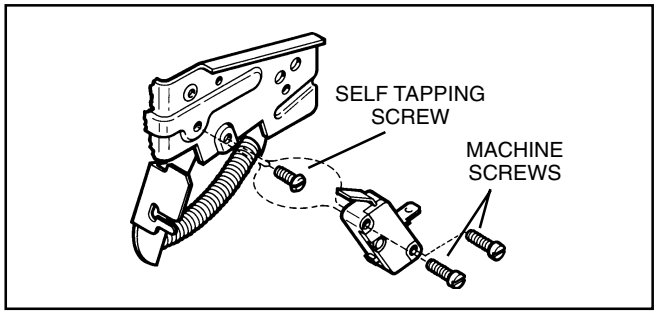


STARTER INTERLOCK SWITCH

The engine / blade control must close the interlock switch before the starter can be engaged. To check the interlock switch, use an ohmmeter or continuity light to perform a continuity check. Continuity should exist between the two terminals when the interlock switch button is completely depressed. No continuity should exist when the button is released. If the switch fails replace the switch.



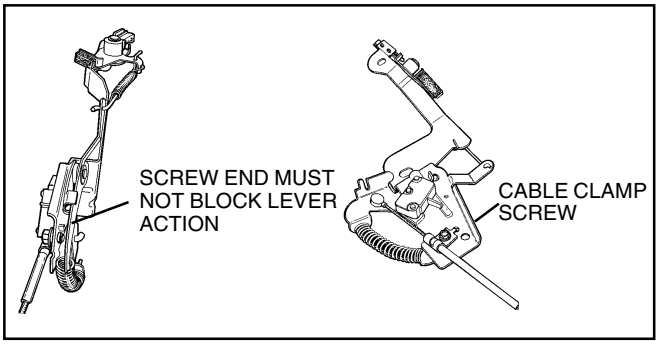
To replace the interlock switch, carefully grind the heads off of the rivets that fasten the interlock switch to the brake bracket. Remove the rivets from the back side of brake bracket. Use the self-tapping screw supplied with the new switch to make threads in the bracket. Install the interlock switch onto the brake bracket in the proper position and secure the switch to the brake bracket with the machine screws supplied. Be careful not to overtighten the screws as switch breakage can occur.



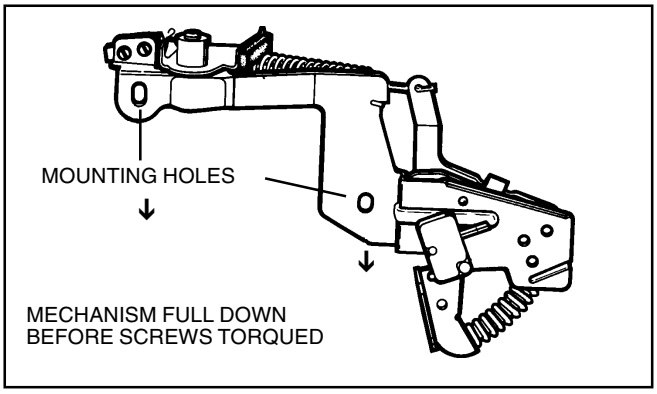
CONTROL CABLE

INSIDE EDGE

If replacing the cable conduit screw with a screw other than a service part replacement, be certain that the screw length is not too long as to prevent free travel of the lever. Make sure the button on the starter interlock switch is completely depressed when the control is fully applied. The cable must provide enough travel so the brake will contact the flywheel. Some slack should exist in the cable adjustment to compensate for brake pad wear.



When installing a inside edge brake bracket assembly, be sure the slotted holes in the brake bracket are all the way down on the fasteners. This will properly align the brake bracket to the flywheel brake surface.



IGNITION

IGNITION OPERATION

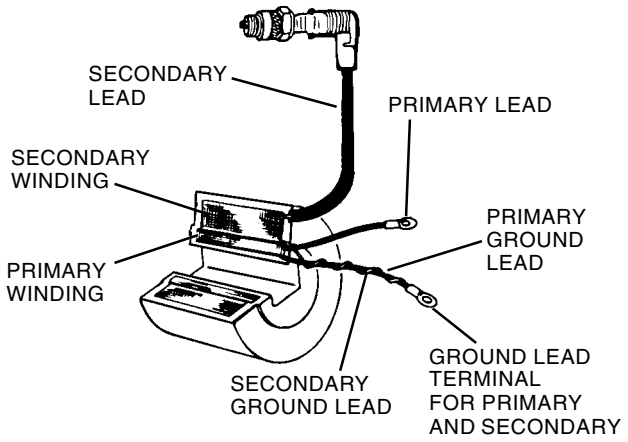
(PRE-1985 Production)

MAGNETO IGNITION. Tecumseh's magneto ignition consists of a stator assembly made up of a coil, laminations, contact points, condenser, and a permanent magnet mounted in the flywheel of the engine.

COIL: The coil consists of a primary and a secondary winding of wire. The primary is the low voltage (200-300 volts) primary winding consists of about 150 turns of heavy gage wire next to the core. One end of the primary is connected to the insulated contact point and the other end is grounded to the stator body.

The secondary winding consists of extremely fine wire with many turns (about 10,000) wrapped over the primary windings. One end connects to the spark plug and the other end is grounded to the stator body.

The coil is used as a transformer to increase the primary voltage to a high voltage (10,000 - 20,000 volts) which jumps across the spark plug gap.

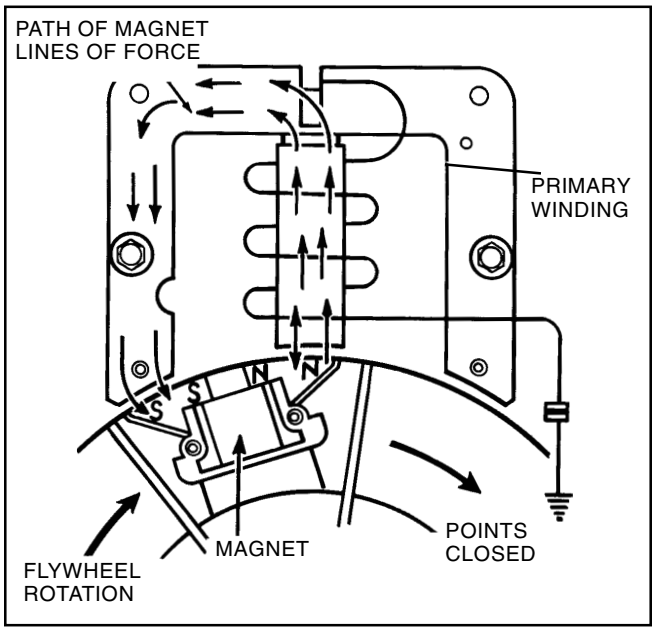


*The actual connection of the primary and secondary ground is normally made inside of *the coil, but it is shown above to illustrate the individual wires.

CONTACT POINTS. The contact points consist of an insulated movable point that connects to the coil primary lead and a stationary point that is grounded to the stator body which provides the return path for the primary circuit.

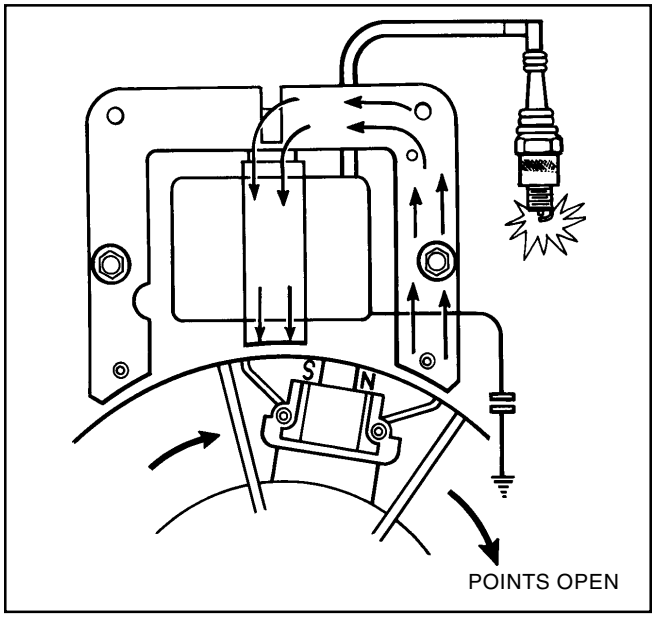
CONDENSER. The condenser acts as an electrical shock absorber to prevent arcing between the contact points as they open. Arcing lowers the voltage at the spark plug, as well as burn and pit the contact points, thus shortening point life.

OPERATION OF THE TECUMSEH MAGNETO IGNITION. As the flywheel turns, the magnets (mounted in the wheel) pass the coil mounted on the stator. As the magnet's North Pole enters the area of the center leg of the stator, a magnetic field is concentrated through the laminations to the magnet's South Pole. This causes a generation of current flow in the coil's primary winding. The ignition points are closed.



As the flywheel continues to rotate, the North Pole approaches the last leg of the lamination stack. The magnetic field through the center leg reverses, producing a large change in the magnetic field and a high current in the primary windings of the coil.

At this time, the contacts open and the primary current stops flowing. This change in current causes a voltage in the primary windings, which induces the high voltage in the secondary winding of the coil. The voltage is routed through the spark plug wire, to the spark plug, and then jumps the gap of the plug to ignite the fuel air mixture.



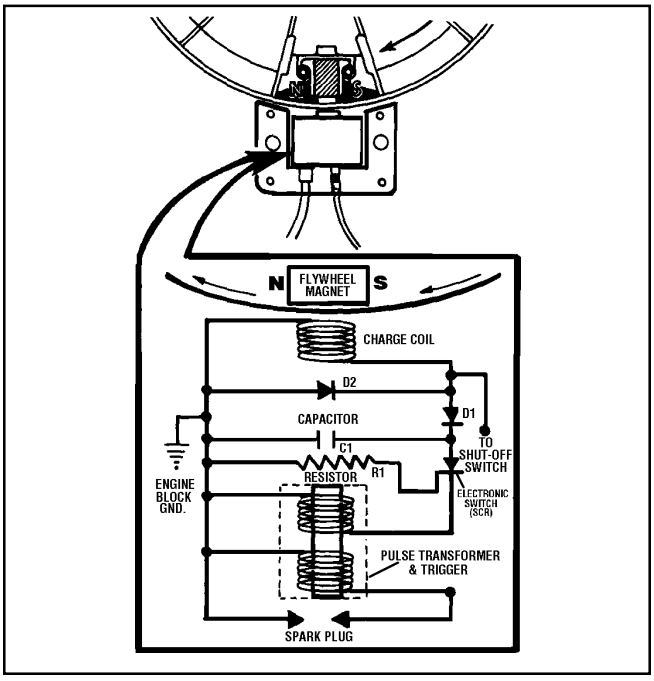
1985 to Present

SOLID STATE IGNITION. Tecumseh's solid state capacitor discharge ignition (CDI) is an all electronic ignition system and is encapsulated in epoxy for protection against dirt and moisture.

SOLID STATE IGNITION OPERATION. As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. This energy is transferred to a capacitor where it is stored until it is needed to fire the spark plug.

The magnet continues rotating past a trigger coil where a low voltage signal is produced and closes an electronic switch (SCR).

The energy which was stored in the capacitor is now transferred through the switch (SCR) to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage is transferred by means of the high tension lead to the spark plug, where it arcs across the electrode of the spark plug and ignites the fuel-air mixture.



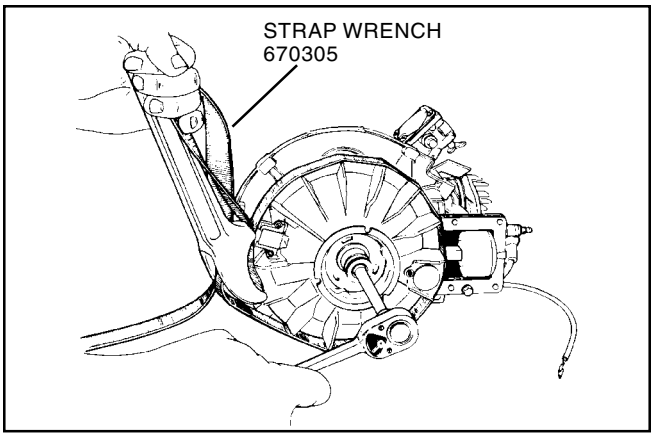
IGNITION SERVICE

SPARK PLUG SERVICE. Spark plugs should be cleaned and adjusted periodically. Check point gap with wire feeler gauge (.030" - .762 mm) and adjust gap. Replace if points are pitted and burned or the porcelain is cracked. Refer to Master Parts Manual or Micro-Fiche for correct replacement number.

If spark plug fouls frequently, check for the following conditions:

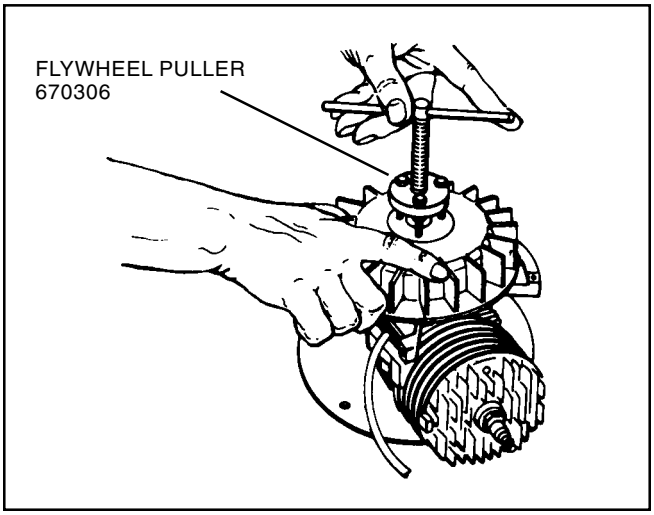
1. Carburetor set too rich.
2. Choke not opening fully.
3. Poor grade gasoline.
4. Clogged exhaust system.
5. Incorrect spark plug.
6. Improper oil fuel ratio.
7. Inconsistent spark.
   NOTE: Ensure cleaned spark plugs are free of all foreign material before installation.

FLYWHEEL REMOVAL AND SERVICE. To remove flywheel, use a strap wrench Part No. 670305 to hold the flywheel and remove the nut by turning it in the direction opposite of crankshaft rotation.



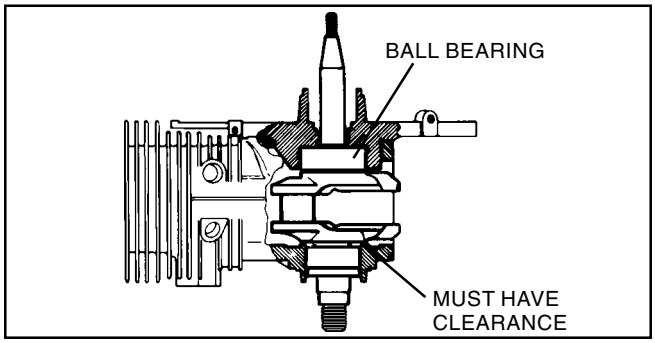
NOTE: Do not attempt to remove flywheel using a jaw type pullers on the outer diameter of the flywheel or flywheel breakage will occur.

On engines with cored holes (not tapped) use flywheel puller part No. 670306.

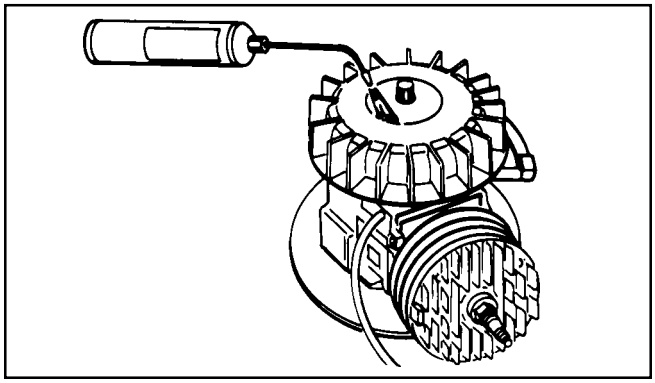


NOTE: A KNOCK-OFF TOOL IS NOT RECOMMENDED FOR ENGINES WITH A BALL BEARING ON THE MAGNETO END OF THE CRANKSHAFT.

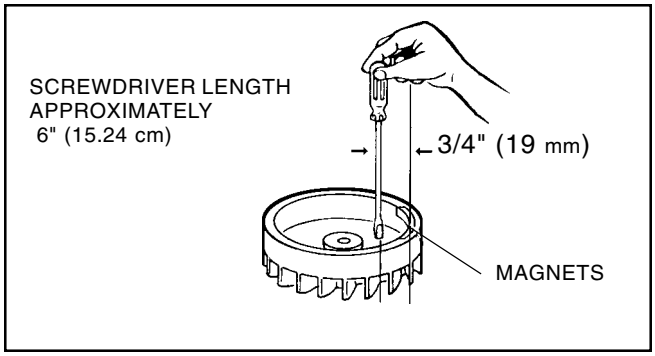
NOTE: If a knock-off tool is used, the pounding may cause the ball bearing to dislodge from the shroud base and force the lower thrust face of the crankshaft against the cylinder thrust face. TO CORRECT THIS CONDITION RAP SHARPLY WITH RAWHIDE MALLET ON THE P.T.O. END TO PROVIDE CLEARANCE BETWEEN CRANKSHAFT AND CYLINDER THRUST FACE.



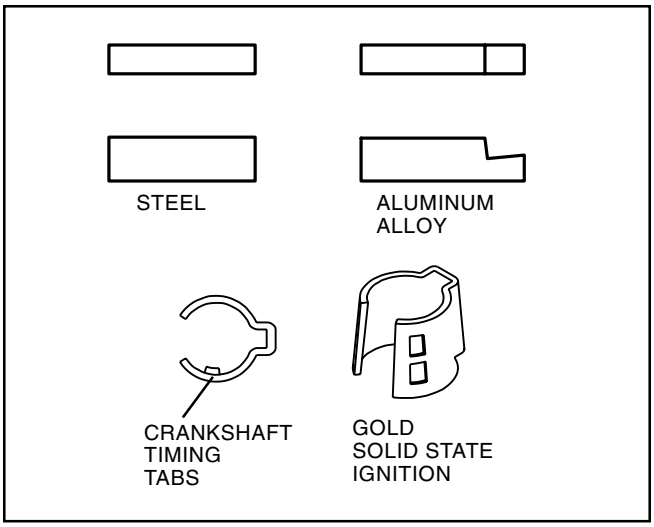
If the flywheel is difficult to remove from the crankshaft because of rust, etc., the use of a propane torch can be helpful. Heat the area immediately outside of the crankshaft. The aluminum alloy in the flywheel should expand enough to break the seal away from the steel crankshaft.



FLYWHEEL MAGNETS. The magnets in the flywheel rarely lose their magnetic strength. If magnets are suspected to be faulty, place the flywheel upside down on a wooden surface. Hold a screwdriver by the extreme end of handle with the point down. Move the blade to within 3/4 inch of magnets. The magnets should attract the screwdriver blade against the magnet.

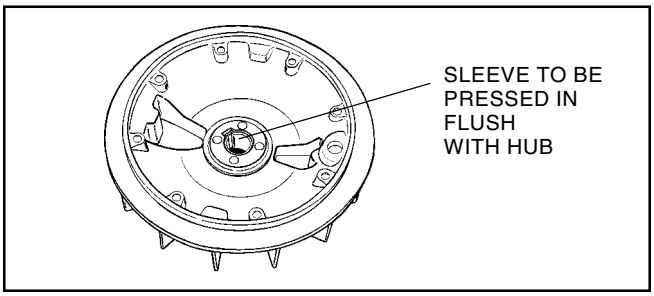


FLYWHEEL KEYS. The flywheel key locates the flywheel to the crankshaft in the proper position. If a flywheel key is sheared, or partially sheared, the engine will not start or may be difficult to start.



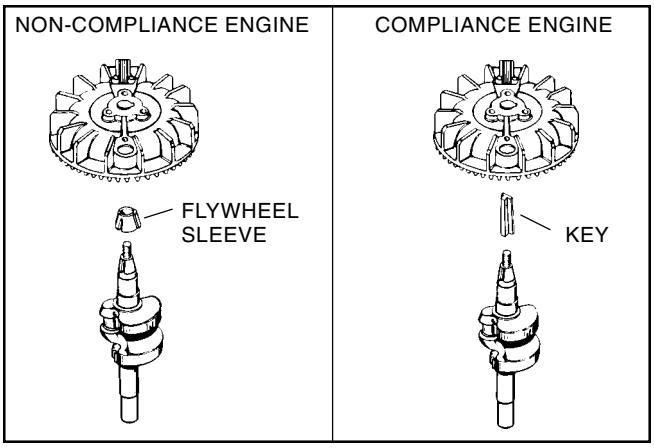
NOTE: Use the Tecumseh Master Parts Manual to determine correct key for the application.

ADAPTER KEY TO FLYWHEEL ASSEMBLY. When an adapter is used, place the adapter with its raised key area in the flywheel keyway before putting the flywheel on the engine.



FLYWHEEL SLEEVE. Some engines utilize a sleeve between the crankshaft and flywheel which acts as a flywheel key. If this sleeve becomes sheared or damaged, replace. The flywheel sleeve is pressed into the crankshaft opening in the flywheel, and should be flush or slightly below flush from the inside surface of flywheel before in stalling on crankshaft.

For engines equipped with brake system, a new key and flywheel are shown. Torque procedures are the same.



FLYWHEEL TORQUE. Torque flywheel to the proper specification. See the tables in specification section for the proper torque setting.

Loose lawn mower blades and adapters can contribute to sheared keys.

REPLACING MAGNETO BREAKER POINTS. Remove the nut holding the electrical leads to the screw on the movable portion of the breaker points.

Remove the screw from the stationary breaker point and remove point set. Reinstall the new breaker point set into position and adjust the point gap according to the specifications. Points must be adjusted, when the rubbing block of the points is on the highest spot on the breaker cam.

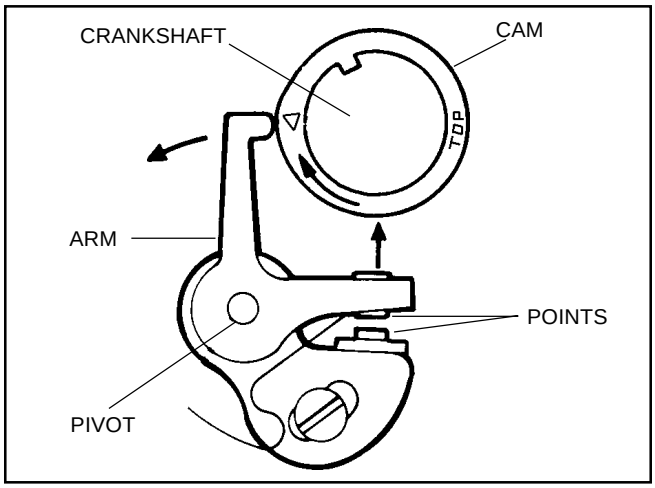
Clean points by putting lint-free paper between them and sliding it back and forth. Then open points and remove paper and any paper fiber remaining between the point set. Any oil, fingerprints or contamination will cause the points to burn prematurely.

CONDENSER CHECK. Check condenser on a good quality tester, following the test equipment manufacturer's instructions to check capacity and resistance. Replace condenser if condition is questionable.

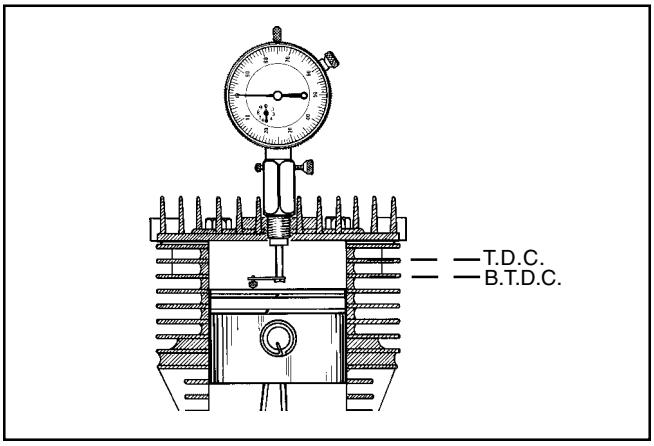
IGNITION COIL. Inspect the coil for cracks in insulation or other damage. Make sure electrical leads are intact, especially where they enter the coil.

Check operation of the coil using an approved tester following the instructions furnished with the test unit. If laminations are distorted or damaged, replace. Some coils are permanently attached to the laminations and must be serviced as an assembly.

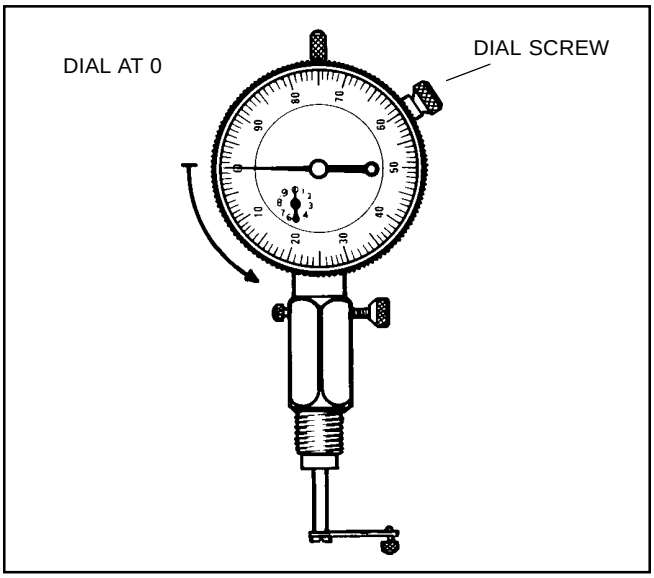
IGNITION TIMING. Begin procedure by setting the point gap. This is done by rotating the crankshaft until the point arm is resting on the high side of the ignition cam. Set the point gap by loosening the screw on the movable point, and insert a feeler gauge per specification. Tighten the screw then recheck the gap.



Install dial indicator (Part No. 670241) equipped with the correct tip on the extender leg. Use the small tip for engines with timing dimensions of between Top Dead Center and .050" (1.27 mm) BTDC . Use the large tip for engines with timing dimensions of between .051" (1.29 mm) BTDC to .150" (3.81 mm) BTDC. Loosen the screw on the side of the adaptor sleeve to allow the sleeve to be turned into the threads of the spark plug hole, not the entire dial indicator. This will ensure the proper location of the tip. Once the adapter sleeve is secured in the hole, tighten screw on sleeve adaptor to prevent the dial from moving up or down, which would give a false reading.

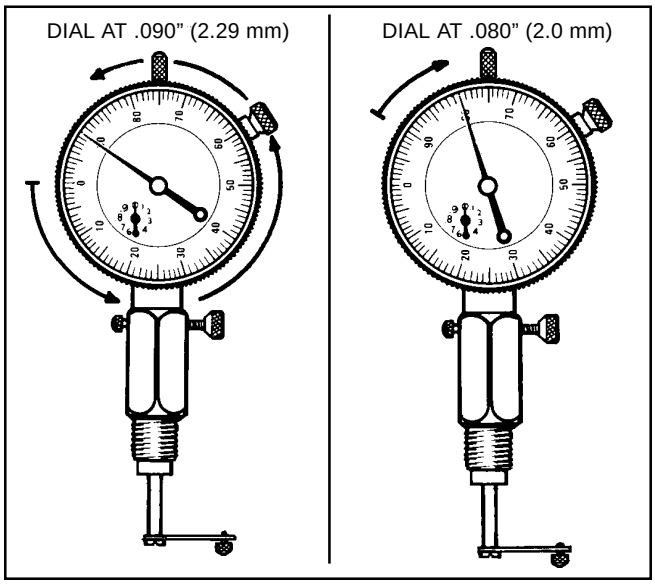


Find top dead center (TDC) by rotating the crankshaft clockwise (when looking at the magneto end of the crank) until the needle on the dial stops and reverses direction. Where the needle stops is TDC. Loosen the screw on the dial, and rotate the dial so that zero is lined-up with the needle at TDC. Tighten the screw on the dial to secure it in place.

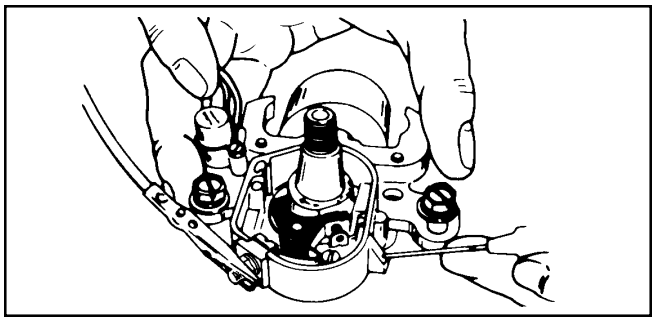


While watching the needle on the dial indicator, rotate the crankshaft counterclockwise (when looking at the magneto end of the crank) past the specified Before Top Dead Center (BTDC) dimension. Then rotate the crankshaft back clockwise to the proper dimension, this will take out any slack between the connecting rod and crankshaft assembly.

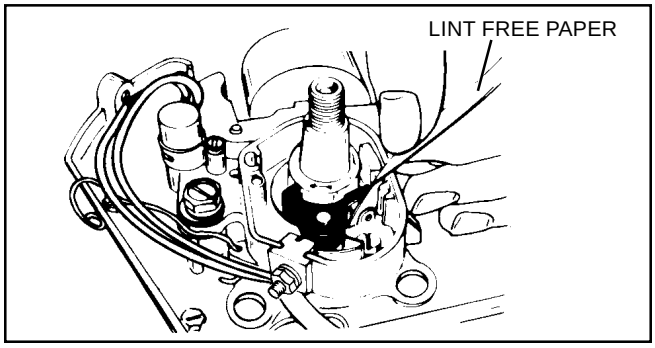
(Using .080" (2.0 mm) BTDC dimension as an example.)



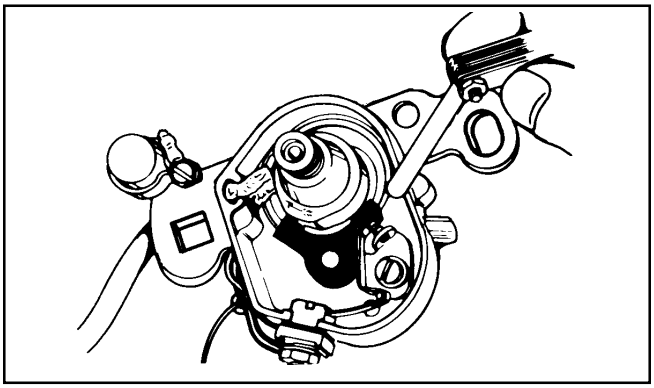
Next, disconnect the leads from the point terminal, and be sure to reinstall the securing nut & tighten it up. Connect one lead of a continuity light, or Ohmmeter to the point terminal and the other lead to a good ground. Loosen the two bolts holding down the stator and rotate the stator until the continuity light or Ohmmeter indicates a break in the circuit. At this point torque down the stator bolts and the timing procedure is completed.



Before putting the dust cover back on the points box, clean the points by sliding lint free paper back and forth between the contacts. Manually, open the points when removing the paper to eliminate paper fibers from remaining between the contact points.

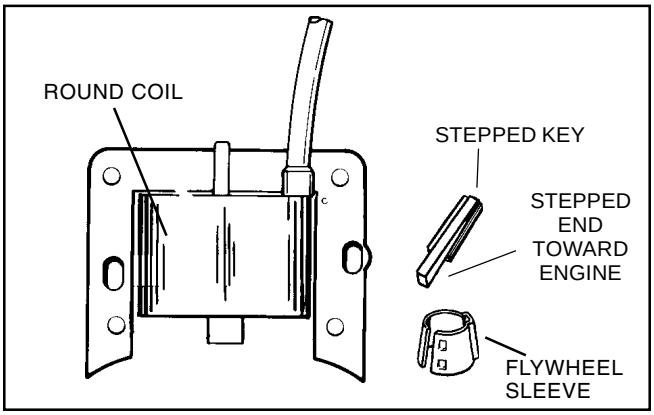


FIXED TIME SYSTEM (External Coil). This system has the contact points and condenser mounted under the flywheel with the laminations and coil mounted outside the flywheel. This system is identified by the square hole in the stator, the round configuration of the coil, and a stepped flywheel key.

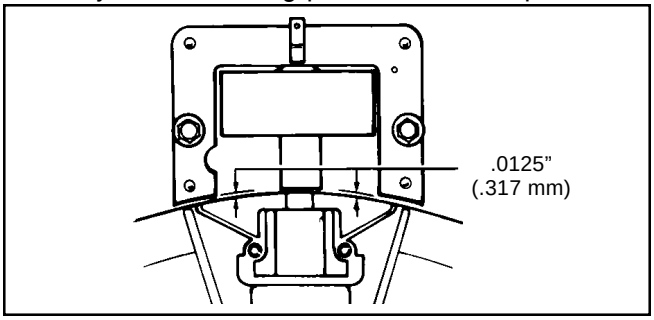


Begin the timing procedure, torque down the stator bolts to secure the stator in place. Next rotate the crankshaft until the point arm is resting on the high side of the ignition cam. Set the point gap at to the proper specification by loosening the screw on the movable point, and inserting a feeler gauge between the contact points. Tighten the screw on the movable point and then recheck the point gap. Be sure to clean the contact points with lint free paper.

Reinstall the proper flywheel key, flywheel, washer, and torque down the flywheel nut to specification. Reinstall the external coil, but do not tighten down the mounting screws.

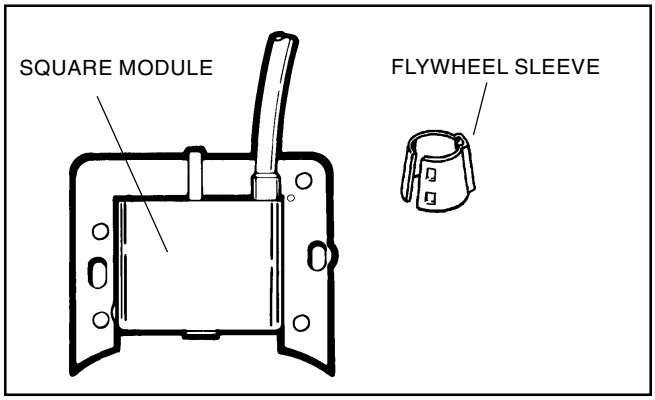


Timing this system consists of having the proper .0125" (.317 mm) air gap gauge, (Part No. 670297) between the magnets and laminations and torque down the mounting screws to specification. Remove air gap gauge and rotate flywheel to check for any possible striking points. If none are found, the air gap is set correctly and the timing procedure is completed.

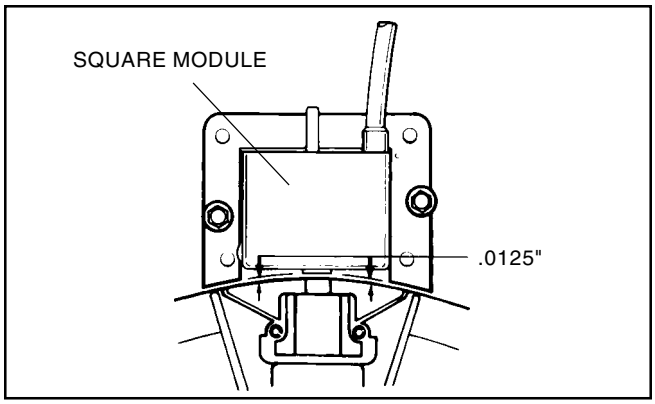


SOLID STATE (CDI). This is an all electronic ignition system with the components sealed in a module and located outside the flywheel.

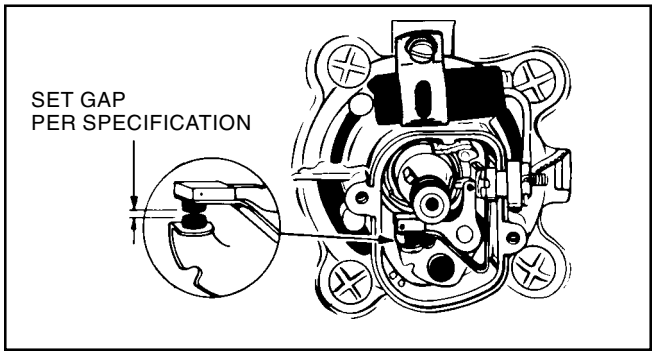
A Solid State module can be identified by its square configuration, which will identify the need for the proper flywheel key or sleeve.



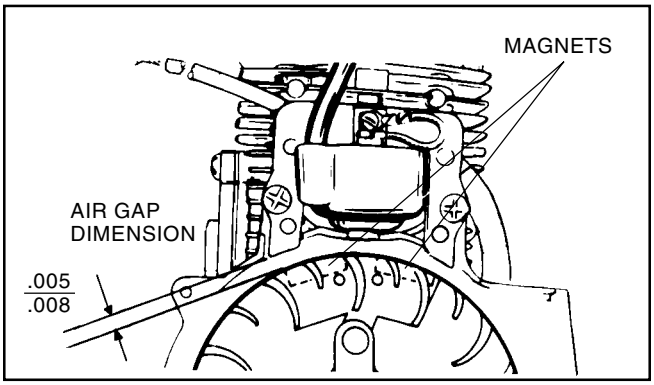
The proper air gap setting between the flywheel magnets and the laminations on both the fixed time and CDI systems is .0125''. Place .0125'' gauge, part No. 670297 between the magnets and laminations and torque down mounting screws to specification. Recheck gap setting to make certain there is proper clearance between the magnets and laminations. **NOTE:** Due to variations between pole shoes, air gap may vary from .005/.020'' when flywheel is rotated. There is no further timing adjustment on external lamination systems.



OTHER IGNITION SYSTEMS. Ignition systems on engines with a non-adjustable stator, set the points per specification. If the coil is located under the flywheel, no other timing is required.



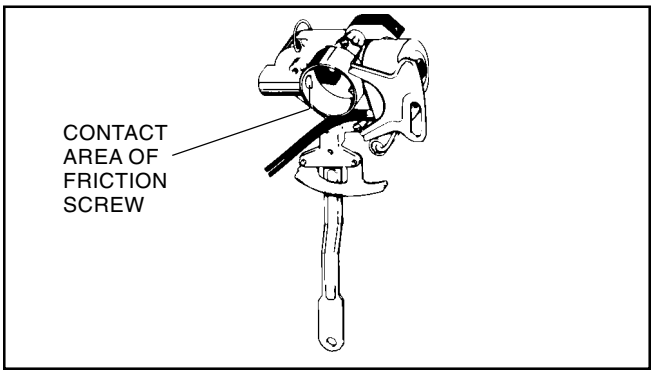
If engine has the coil and lamination outside of flywheel, set points per specification and set air gap between flywheel magnets and laminations to .005'' to .008''. Air gap gauge, part number 670216 which measures .0075'' may be used. Use Loctite "242 Blue" on screws and torque down mounting screws to specification. Remove air gap gauge.



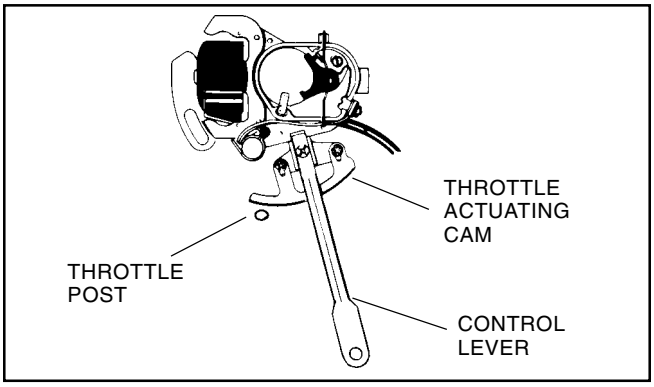
OUTBOARD TIMING

OUTBOARD TIMING. (STANDARD IGNITION). Follow the step-by-step procedure outlined for timing outboard engines with Standard ignition magnetos (non-solid state).

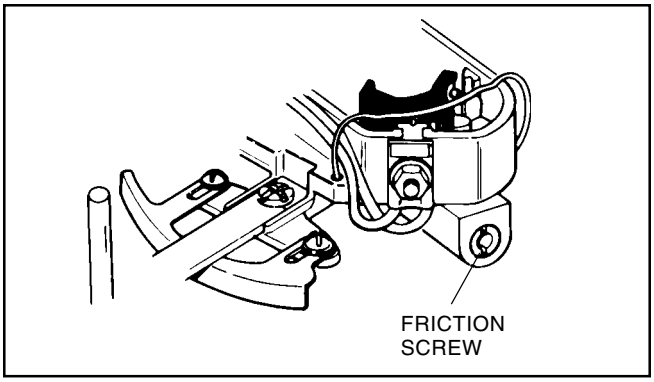
Apply a small amount of E.P. Lithium grease to the contact area of the friction screw. Do not turn the screw into the radius of the stator collar.



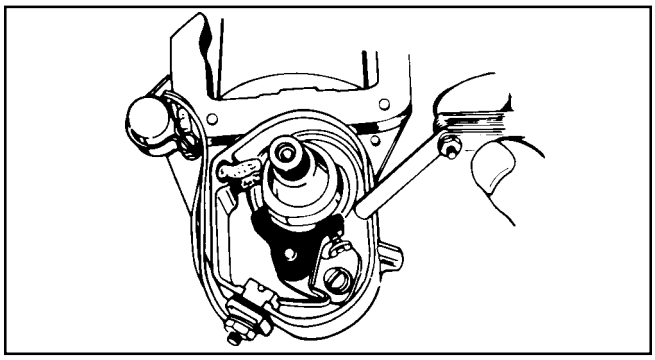
Install the stator with operating handle pointed in the direction of the carburetor. Be sure the throttle post is NOT INSIDE the arc of the throttle actuating cam. Hold the throttle open when installing the stator.



Move the control lever to full retard, then move toward full advance while tightening the friction screw until the lever will not vibrate out of position when the engine is running and yet can be easily rotated when speed is adjusted.

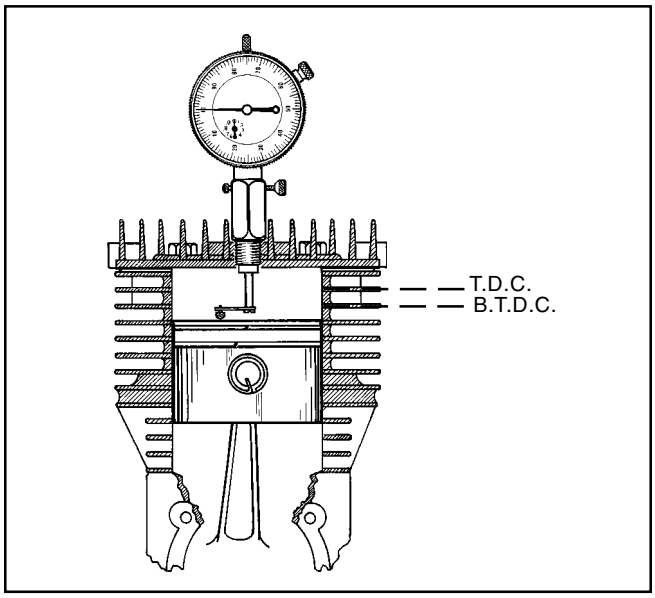


Adjust ignition points to proper specification.

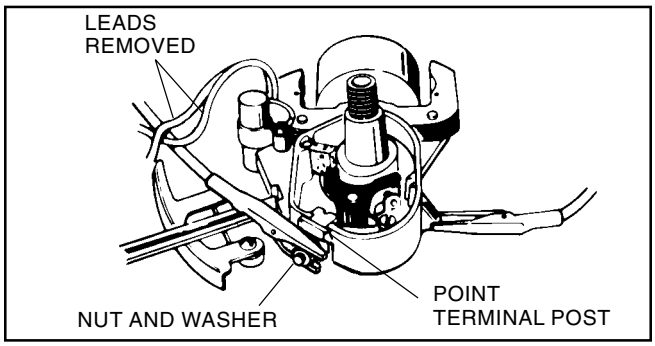


Clean points by sliding lint free paper back and forth between the contacts. Manually open points when removing paper to eliminate paper fiber from remaining between contacts.

Using a dial indicator, set the piston to the proper Before-Top-Dead-Center (BTDC) to the specified dimension.

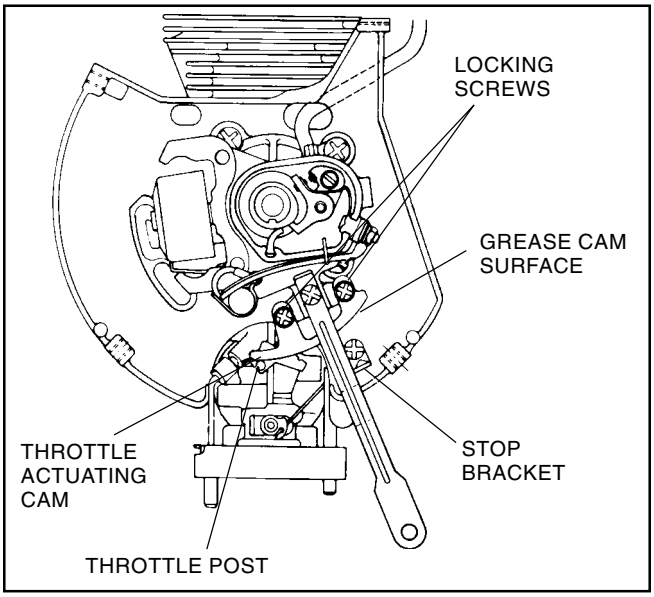


Remove leads from point terminal, then reinstall and tighten the nut and washer. Attach a continuity device to the point terminal post and to a good ground on the engine as shown.



Move the stator counterclockwise, advancing the timing until the continuity reading breaks and reads zero. Tighten the stop bracket to secure the stator.

Loosen the actuating cam locking screws just enough to allow adjustment of the cam. Move the actuating cam to open the throttle completely WITHOUT causing any binding with the throttle post.

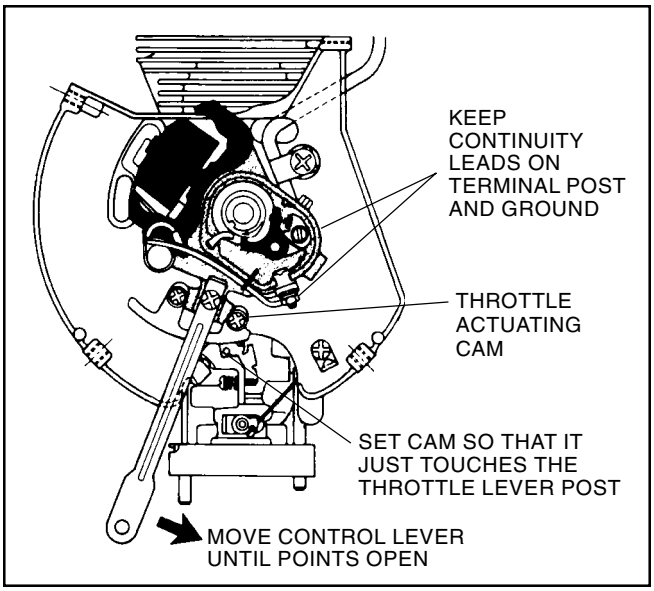


To coordinate the carburetor idle with ignition timing, rotate the crankshaft clockwise, to .003'' After-Top-Dead-Center (ATDC).

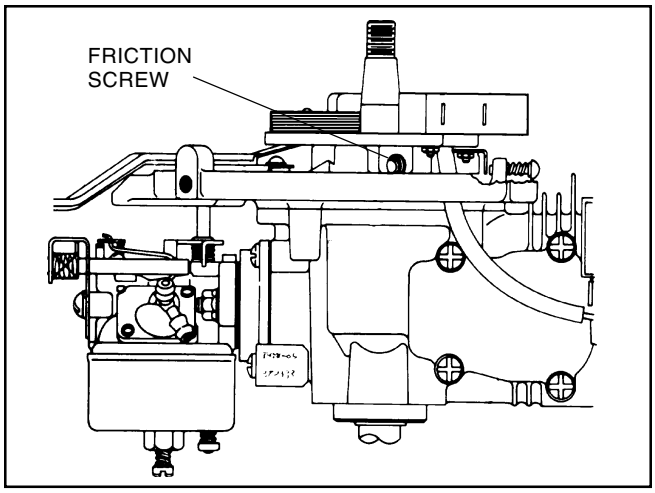
Rotate the control lever toward the idle position until continuity is obtained.

Move the throttle actuating cam until it just touches the throttle post, without moving it.

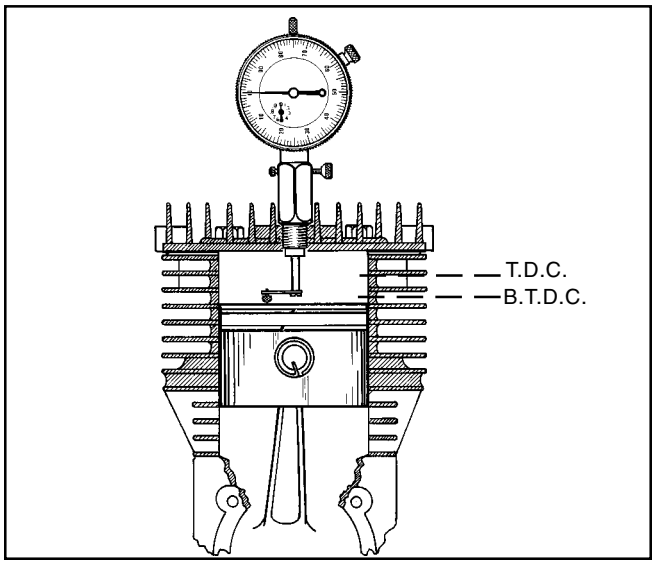
Tighten the screw slightly, then check the run position and idle position alternately to make sure the actuating cam is adjusted for both positions. Now tighten the screws.



OUTBOARD TIMING. (SOLID STATE). Follow these step-by-step procedures outlined for timing outboard engines with solid state magnetos.



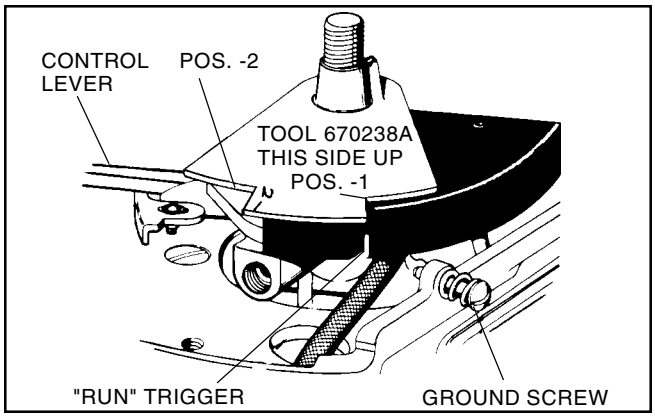
Using a dial indicator, set the piston to the specified Before-Top-Dead-Center (BTDC) dimension.



Install timing tool 670238A on the crankshaft, be careful not to distort the keyway area.

Without disturbing the BTDC piston position, move the control lever counterclockwise until the run trigger aligns with the timing tool (670238A) notch marked #1. Hold this position.

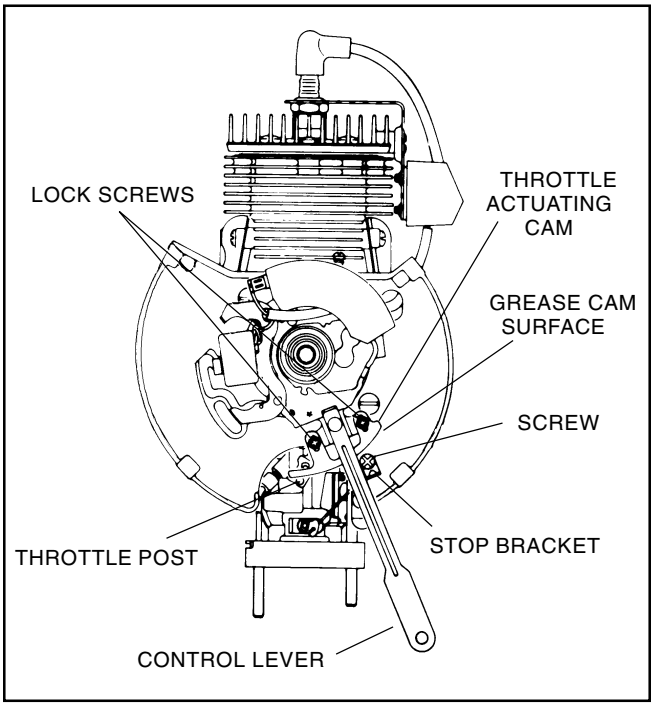
NOTE: Some models do not have the "start" trigger.



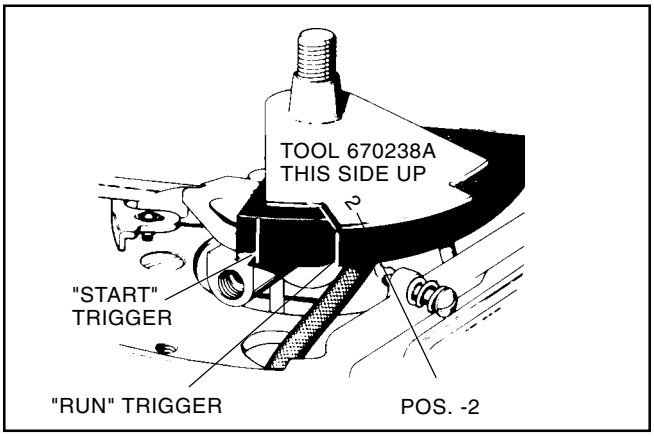
Adjust the stop bracket to prevent the control lever from moving any further counterclockwise. Then tighten the stop bracket screw.

Loosen the actuating cam lock screw enough to allow adjustment of the cam. Position the cam so that it opens the throttle completely, making sure that the cam doesn't cause binding on the post.

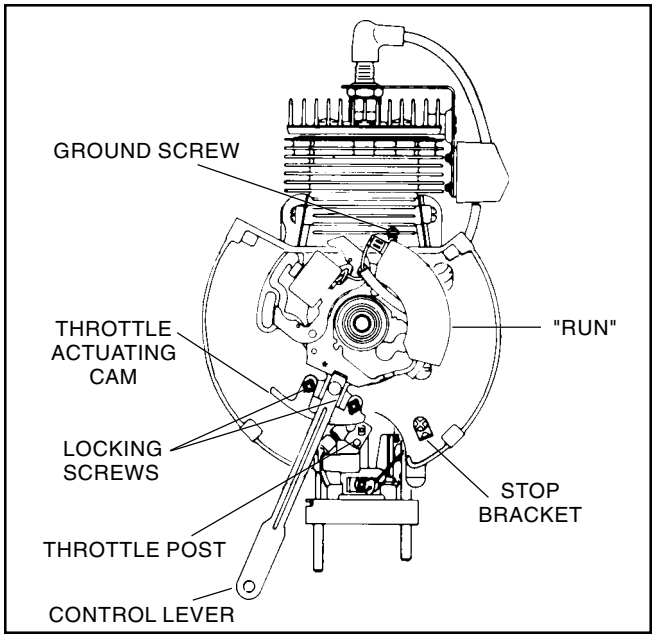
When the correct position is attained, tighten the lock screw on the "high" end to hold the cam in place.



Move the control lever to align the "RUN" trigger of the ignition unit with the number 2 position of the timing tool. Hold this position.



Adjust the actuating cam to touch the post without moving it. Tighten the lock screw to hold the cam in place.



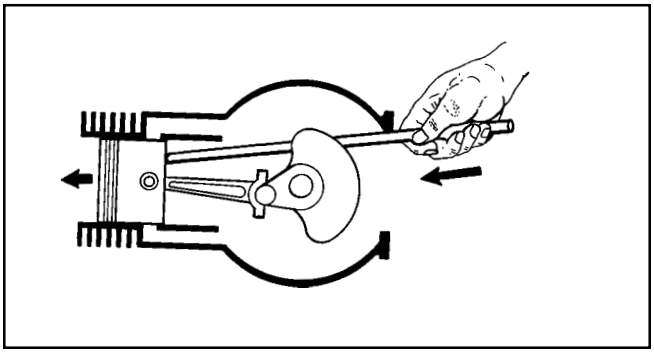
Recheck to insure that the high speed point hasn't changed or that binding will not occur. Readjust from the high speed point to the pickup point as necessary.

When assured that the cam position is correct at the FULL RUN and IDLE positions, torque the lock screw to 10-15 in. lbs.

PISTON & RING SERVICE

Before removing the piston, clean all carbon from the cylinder, making certain that the carbon ridge is removed from the top of the cylinder. This will prevent ring damage when removing the piston.

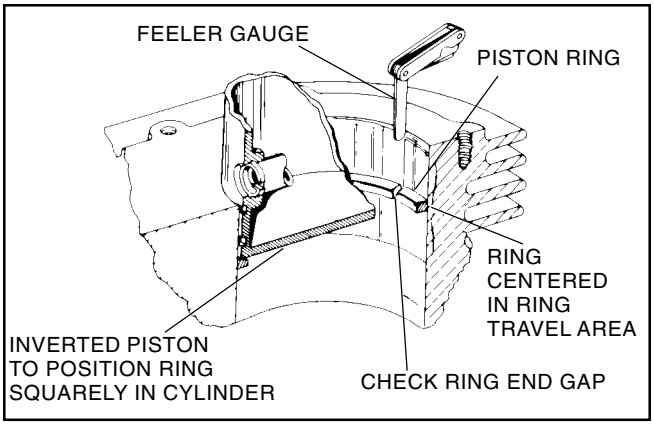
Push the piston through the top of the cylinder using a wooden dowel on the inside of the piston so that the connecting rod and other parts will not be damaged.



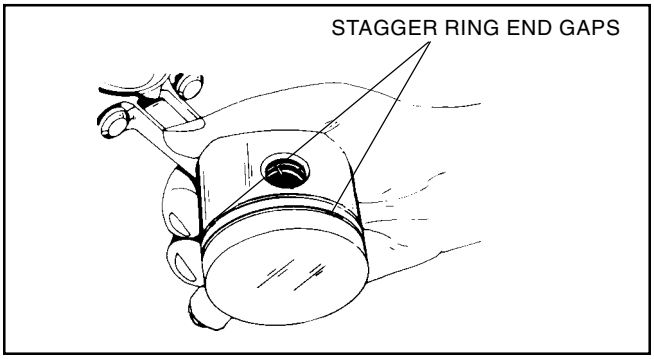
Check the piston and cylinder for scoring or other damage.

Check the piston rings for wear by inserting them into the cylinder to about 1/2 inch from the top of the cylinder. Check at various places to make sure that the gap between the ends of the ring do not exceed the dimensions indicated in the Table of Specifications.

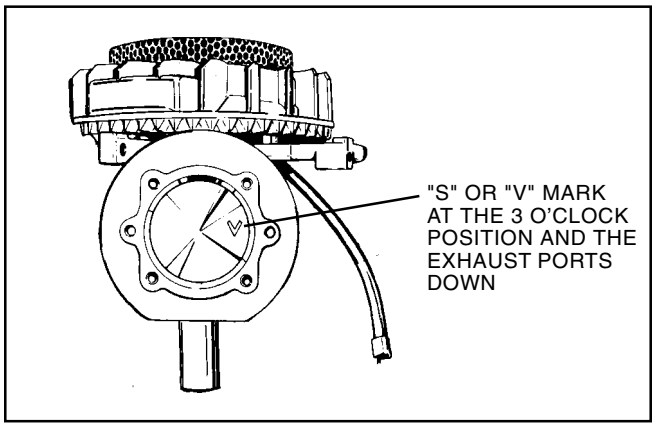
Bore wear can be checked by the same method, except, use a new ring to measure the end gap.



Before installing the piston into the bore, put oil on the rings and piston, and stagger the ring end gaps.



Most models have offset pistons. The pistons on these models have a “V” or "S" stamped on the piston head. When installing piston, this “V” mark must be in a 3 o’clock position when viewing the engine with the exhaust ports down.



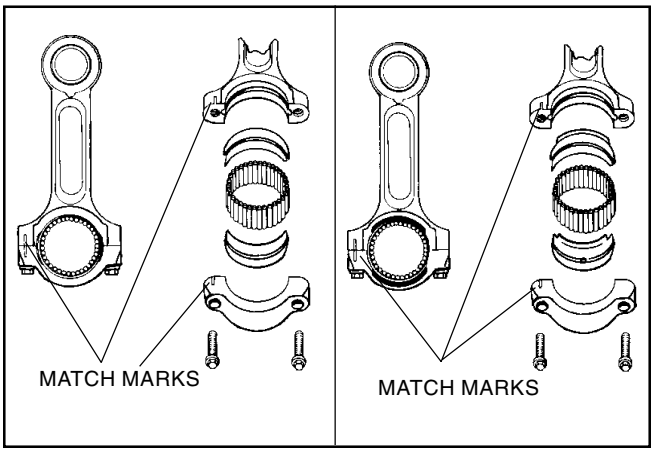
CONNECTING ROD SERVICE

Two cycle engines may be equipped with steel or aluminum connecting rods. Aluminum connecting rods use steel liners when needle bearings are utilized.

The connecting rod bolts used are Torx®, size E6. If torx sockets are not locally available, they can be purchased through your Tecumseh parts supplier under part number 670257.

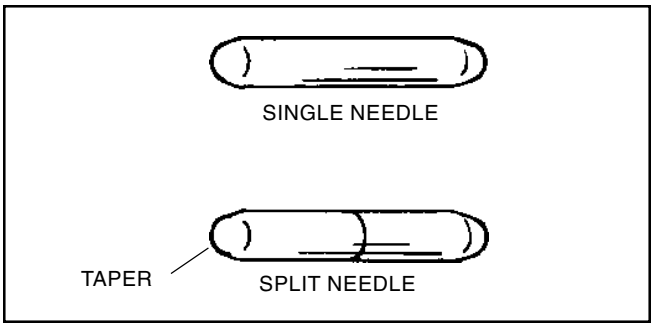
The connecting rod bolts should be tightened alternately and torqued to proper specification.

All connecting rods have match marks on the connecting rod and cap. Make certain these match marks are aligned when assembling.



NEEDLE BEARINGS. Needle bearings may be single or split row.

Split needles are to be installed with the blunt ends together and tapered ends outward.



Service needles are supplied with a coating to hold the needles together and make installation easier.

Remove the paper backing on the bearings and wrap uniformly around the crankshaft journal. Pull the connecting rod onto the crankshaft journal, place a few drops of oil onto the needle bearings and install rod cap. Torque bolts to specification.

CRANKSHAFT, BEARING AND OIL SEAL SERVICE

Check if crankshaft is bent or otherwise damaged. Make certain keyways are not worn or damaged and flywheel taper is clean and in good condition. If taper or keyways are worn or damaged, replace crankshaft.

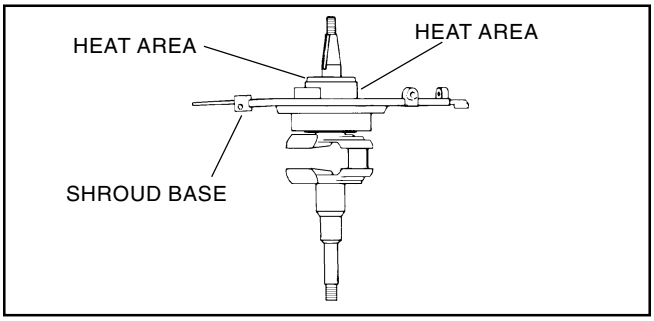
Check oil seal contact surfaces on crankshaft for damage or scratches which would damage oil seal or cause leaks.

On engines that are equipped with ball bearings, the crankshaft must be removed with the shroud base.

Before removing shroud base with crankshaft, disassemble rod cap from rod and remove the piston from the bore, then remove four (4) shroud base screws and tap shroud base so base and crankshaft can be removed together.

To remove crankshaft and bearing from shroud base, use following procedure:

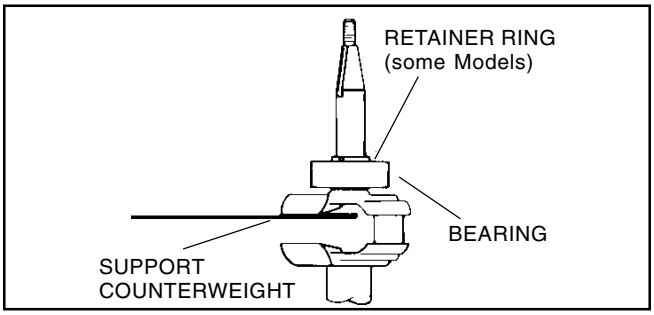
⚠ Using a propane torch, heat the area of shroud base around the bearing area, until there is enough expansion to remove the crankshaft and bearing.



To remove the bearing from crankshaft, remove retainer ring if so equipped, and use a bearing splitter to pull bearing.

Before installing bearing on crankshaft, clean out the grooves on the crankshaft where bearing locates and put Loctite in the groove. Models with the retainer ring do not require Loctite.

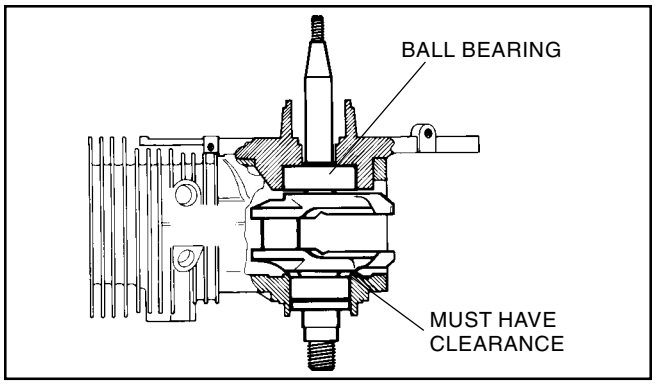
Using a sleeve over the crankshaft, press bearing into position with arbor press. Make certain crankshaft counter weight is supported and bearing is pressed on inner race only.



To reinstall crankshaft and ball bearing, heat shroud base to expand bearing seat and drop ball bearing into seat of base shroud. Allow to cool.

On outboards only, install shroud base onto cylinder but before tightening screws, rotate shroud base fully clockwise. Tighten screws.

If a ball bearing engine appears to be tight, or if the flywheel was removed with the use of a knock-off tool, the ball bearing may be dislodged from shroud base, forcing the crankshaft lower thrust face against the cylinder thrust face, To correct this condition, rap sharply on the P.T.O. end of the crankshaft with rawhide mallet to provide the clearance between the crankshaft and cylinder thrust face.



NEEDLE BEARINGS. Caged needle bearings can be removed and replaced by pressing them in and out of cylinder using an arbor press.

NOTE: Always press against the lettered side of the bearing.

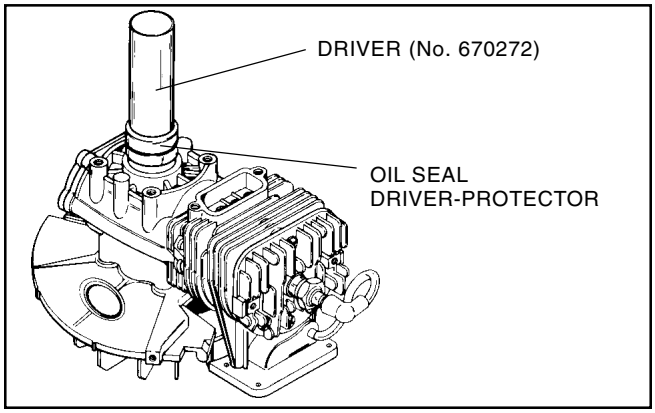
If the needles fall out of the cage, they can be reinstalled using grease to hold them in position.

OIL SEALS. It is important on 2 cycle engines that oil seals are in good condition. A leaky seal will cause hard starting, erratic running, and possible damage to internal components due to a lean fuel-oil mixture caused by extra air getting into the crankcase.

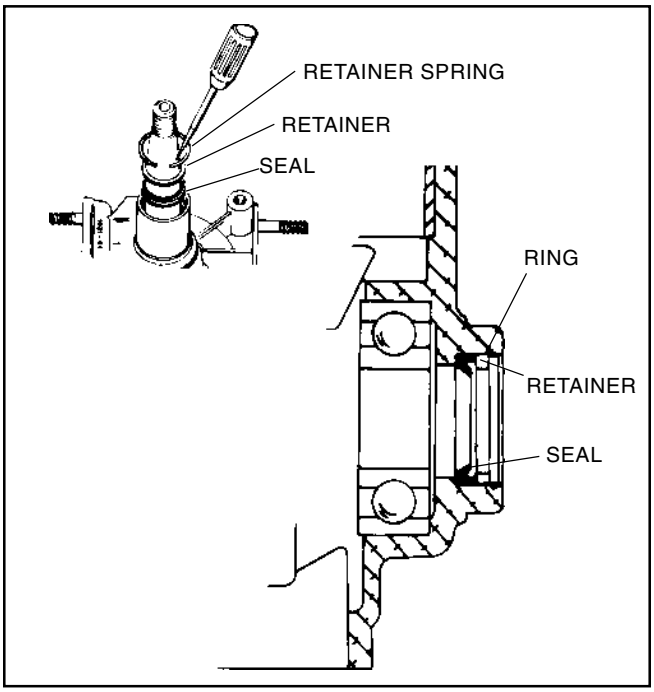
Engines could be equipped with either one piece oil seals or three pieces consisting of a seal, retainer and retainer ring; they are not interchangeable.

ONE PIECE SEALS. An oil seal remover tool can be used for seal removal in some engines. In some cases it may be necessary to disassemble engine to remove the oil seals.

Seal driver-protectors are available for most one piece oil seals. Select the proper tool from the tool list in Chapter 8. Place the oil seal over the driver protector, place over crankshaft, and drive into position using universal driver No. 670272.



THREE PIECE SEALS. To remove seals, use a sharp object such as an ice pick to pry out the retainer spring, then remove the retainer and seal. In some cases it may be necessary to remove the crankshaft to remove the oil seals.



OUTBOARD SEAL SERVICE. Oil seals on the power-take-off end of the crankshaft are installed in an inverted (upside down) position to keep water out of engine.

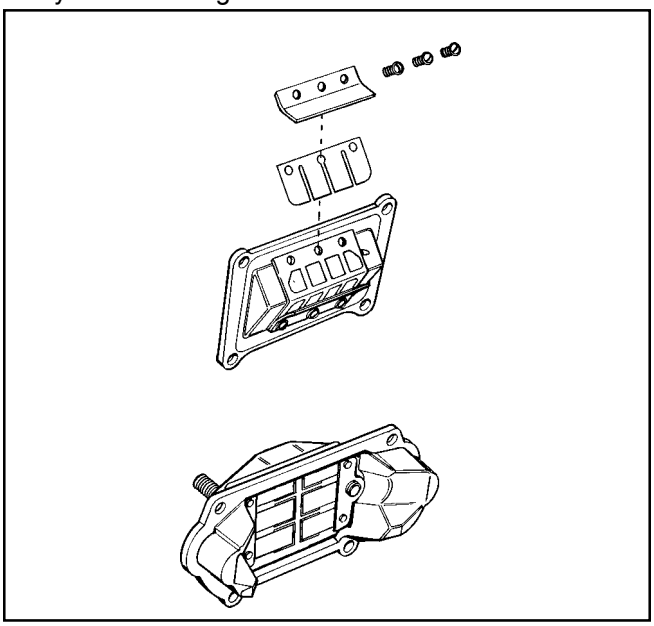
CYLINDERS, REEDS & COMPRESSION RELEASE

CYLINDER & HEAD SERVICE. Check cylinder for bore damage or scoring. Check for broken or cracked fins, warped head or head mounting surface. If warped extensively, (more than .005"/.127 mm) replace. Always replace head gasket and torque to proper specification.

GASKETS. Replace all gaskets in reassembly and make sure all sealing surfaces will not leak. A leaking gasket will cause erratic running, hard starting and could damage internal components by causing an imbalance of fuel-oil air mixture.

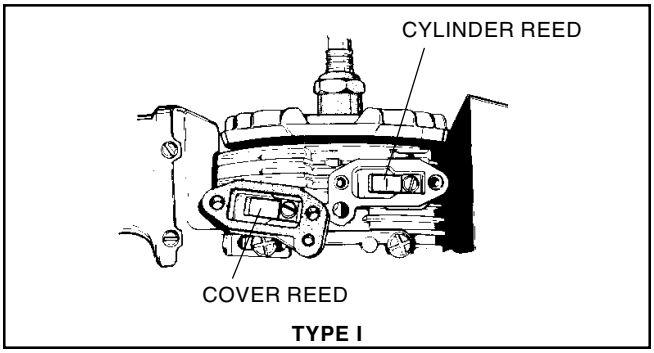
REED VALVES. Make sure reeds and sealing surfaces are free of dirt and foreign matter. Check reeds for seal against sealing surface of the adapter. Reeds should not bend away from sealing surface more than .010'' (.254 mm).

If the reeds are serviceable, the smooth side of the reed must locate against the sealing surface. Service reeds have "smudge" marks on smooth side. If these marks are gone, feel for a rough edge and assemble away from sealing surface.



AUTOMATIC COMPRESSION RELEASE (DOUBLE REED TYPE).

Cranking compression pressures bleed past reeds and into muffler. Once the engine is started, a high pressure build-up between the reeds forces the reeds against their seats stopping compression bleed off and allowing engine to run at full compression.



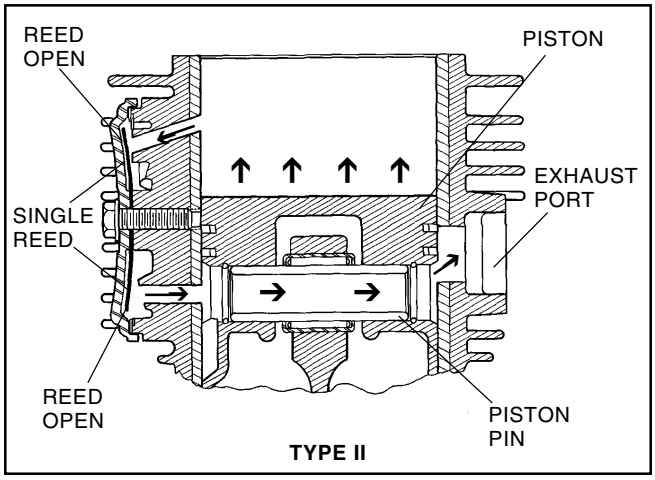
TYPE I

Replace both reeds If either is defective. When installing reeds be sure the colored side of the reed faces its seating surface. If in doubt, feel for a rough edge on the reed. The rough edge must be installed away from the seating surface. Assemble reed stop and hold down and tighten self-tapping screws.

Poor running or lack of power may be caused by a leaking reed or cover gasket.

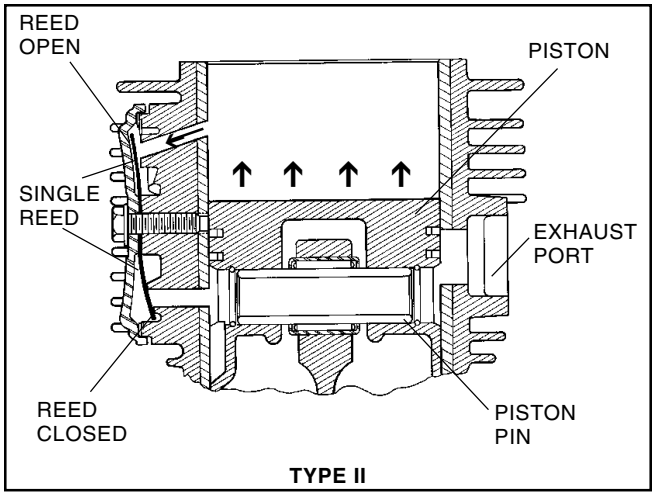
AUTOMATIC COMPRESSION RELEASE (SINGLE REED TYPE).

Cranking compression pressures bleed past reed valve, through a port, into the piston pin and out the exhaust port.



TYPE II

As the engine starts and compression increases, the reed will be forced against the bottom port, sealing it and the engine will run under full compression.



TYPE II

Install the reed cover (single reed type) with the small hole towards the spark plug.

The piston used in the single reed compression release system has a cutout at the piston pin hole. The piston must be installed with the cut-out located on the side facing the compression release.

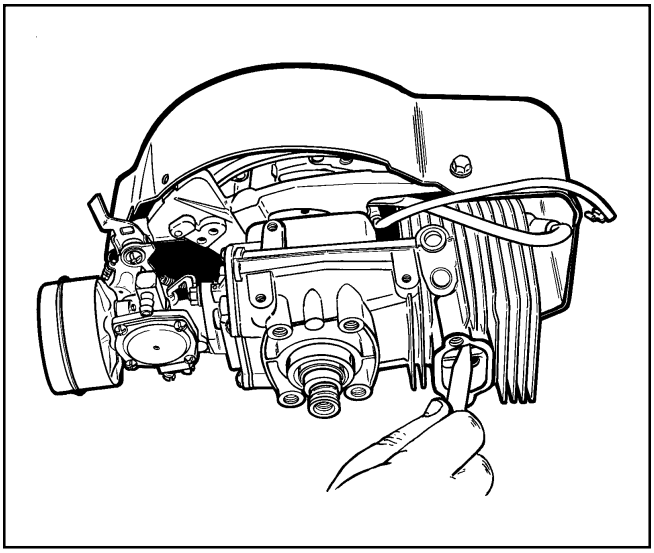
CYLINDER EXHAUST PORTS. The muffler and cylinder exhaust ports should be cleaned after each seventy-five (75) to one hundred (100) hours of operation.

It is recommended that the cylinder head be removed and carbon cleaned from the ports, cylinder head and top of piston.

CAUTION: Do Not Scratch Metal Surfaces.

With the cylinder head removed, remove any carbon deposits from the cylinder wall, head, and the top of the piston. Using a pointed 3/8'' wooden dowel or similar tool, remove the carbon from the exhaust ports. Being sure to remove all loose carbon particles from the engine.

NOTE: When cleaning the exhaust ports, check and clean the compression release passage.



TROUBLESHOOTING

2 CYCLE ENGINE TROUBLESHOOTING CHART	
Cause	**Remedy and Reference**
ENGINE FAILS TO START OR STARTS WITH DIFFICULTY	
No fuel in tank	Fill tank with clean, fresh fuel with correct oil ratio.
Fuel shut-off valve closed	Open valve.
Obstructed fuel line	Clean fuel screen and line. If necessary, remove and clean carburetor.
Tank cap vent obstructed	Open vent in fuel tank cap or replace cap.
Water in fuel	Drain tank. Clean carburetor and fuel lines. Dry spark plug points. Fill tank with clean, fresh fuel.
Engine overchoked	Close fuel shut-off and pull starter until engine starts. Reopen fuel shutoff for normal fuel flow immediately after engine starts.
Improper carburetor adjustment	Adjust carburetor.
Loose or defective magneto wiring	Check magneto wiring for shorts or grounds; repair if necessary.
Sheared or incorrect flywheel key or adapter sleeve	Replace with correct key or adapter sleeve.
Faulty Magneto	Check timing, point gap, and if necessary, overhaul magneto.
Spark plug fouled	Clean and regap spark plug.
Crankcase seals and/or gaskets leaking	Replace seals and/or gaskets.
Spark plug porcelain cracked	Replace spark plug.
Poor Compression	Overhaul engine.
Exhaust ports plugged	Clean exhaust ports
ENGINE KNOCKS	
Carbon in combustion chamber	Remove cylinder head or cylinder and clean carbon from head and piston.
Loose or worn connecting rod	Replace connecting rod.
Loose flywheel	Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to proper torque.
Worn cylinder	Replace cylinder.
Improper magneto timing	Time magneto.

2 CYCLE ENGINE TROUBLESHOOTING CHART (Cont.)

Cause	Remedy
ENGINE MISSES UNDER LOAD	
Spark plug fouled	Clean and regap spark plug.
Spark plug porcelain cracked	Replace spark plug.
Improper spark plug gap	Regap spark plug.
Pitted magneto breaker points	Clean and dress breaker points. Replace badly pitted breaker points.
Magneto breaker arm sluggish	Clean and lubricate breaker point arm.
Faulty condenser	Check condenser on a tester; replace if defective (see test instrument instructions and specifications).
Improper carburetor adjustment	Adjust carburetor.
Reed fouled or sluggish	Clean or replace reed.
Crankcase seal leak	Replace worn crankcase seals.
ENGINE LACKS POWER	
Choke partially closed	Open choke.
Blown head gasket	Replace head gasket.
Improper carburetor adjustment	Adjust carburetor.
Improper or partially sheared flywheel key or adapter sleeve.	Replace with new correct key or sleeve.
Magneto improperly timed	Time magneto.
Worn piston or rings	Replace piston or rings.
Air cleaner clogged	Clean air cleaner.
Reed fouled or sluggish	Clean or replace reed.
Improper amount of oil in fuel mixture	Drain tank; fill with correct mixture (See engine decal).
Carburetor improperly adjusted	Adjust carburetor.
Crankcase seals leaking	Replace worn crankcase seals
ENGINE OVERHEATS	
Engine improperly timed	Time engine.
Improper or partially sheared flywheel key or adapter sleeve.	Replace with new correct key or sleeve.
Air flow obstructed	Remove any obstructions from air passages in shrouds.
Cooling fins clogged	Clean cooling fins.

2 CYCLE ENGINE TROUBLESHOOTING CHART (Cont.)

Cause	Remedy
ENGINE OVERHEATS (continued)	
Excessive load on engine	Check operation of associated equipment. Reduce excessive load.
Carbon in combustion chamber	Remove cylinder head or cylinder and clean carbon from head and piston.
Improper amount of oil in fuel mixture	Drain tank; fill with correct mixture.
ENGINE SURGES OR RUNS UNEVENLY	
Fuel tank cap vent hole clogged	Open vent hole.
Crankcase air leak	Inspect and replace gasket or seal.
Governor parts sticking or binding	Clean, and if necessary repair governor parts.
Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking	Clean, lubricate, or adjust linkage and deburr throttle shaft or butterfly.
ENGINE VIBRATES EXCESSIVELY	
Engine not securely mounted	Tighten loose mounting bolts (See equipment instructions).
Bent crankshaft	Replace crankshaft.
Driven equipment out of balance	Recheck driven equipment.
Piston installed incorrectly. Engines with wrist pin offset.	Install piston correctly.

SPECIFICATIONS

ENGINE TYPE NUMBER AND LETTER REFERENCE

Tecumseh has used two different methods of identifying 2 cycle engines.

The first method was used until the mid 1980's using the base model number with a type number. The type number was used to identify variations for the OEM's specific needs.

The second method was put in place to standardize 2 cycle and 4 cycle engine identification. The type number has now become the specification number, which is preceded by the engine model. Example: AV520

Tecumseh type numbers are stamped into the blower housing, or are located on a nameplate or tag on the engine.

Model and Specification numbers are either stamped into the blower housing, or located on a decal on the side of the blower housing.

TYPE NO.	Column No.
Vertical Crankshaft Engines	
638 thru 638-100	6
639 thru 639-13A	13
640-02 thru 640-06B 21	
640-07 thru 640-21-A	22
640-23	36
641 thru 641-14	11
642-01,A 9A	
642-02, A thru G	9A
642-02E, F	9B
642-03, A, B	9A
642-04, A, B, C	9A
642-05, A, B	9A
642-06, A	9A
642-07, A, B	9A
642-07C	9B
642-08	9B
642-08A, B, C	9A
642-09 thru 642-14	9A
642-13 thru 14C	9B
642-15 thru 642-23	9B
642-24 thru 642-33	9C
642-35	34
643-01, A, 03, A	10A
643-03B, C	10B
643-04, 05A	10A
643-05B	10B
643-13,14	10A
643-14A, B, C	10B
643-15	10A
643-15A thru 643-32	10B
643-32A	32
643-33	33
643-34	33
643-35,A,B	37
650	14
653-01 thru 653-05	31
653-07 thru 653-10	38
660-11 thru 660-38	18
660-39,A	39
660-40	40
661-01 thru 661-29	29
661-30 thru 661-45	41
662-02	42
662-623A 42	
670-01 thru 670-109	8
Horizontal Crankshaft Engines	
1398 thru 1399	11
1400	11
1401 thru 1401F	16
1401G, H	17

TYPE NO.	Column No.
Horizontal Crankshaft Engines	
1401J	27
1402 and 1402B	7
1425	7
1430A	7
1432, A	7
1440, A, B, C, D	1
1442, A, B,	7
1444, A	7
1448 thru 1450	16
1450A, A, B, C, D, E	16
1450F	17
1454, A	1
1459	7
1460, A, B ,C, D, E, F	1
1462	1
1464, A, B	12
1465	1
1466, A	16
1471, A, B	5
1472, A, B, C	12
1473, A, B	1
1474	12
1475 thru 1476	1
1479	7
1482, A	16
1483	16
1484, A, B, C, D	3
1485	7
1486	4
1488, A, B, C, D	1
1489 thru 1490B	3
1491	12
1493, A	7
1494 and 1495A	2
1496	7
1497	1
1498	5
1499	16
1500	5
1501,A, B, C, D, E,F,G	1
1503, A, B, C, D	12
1506	16
1506B	17
1507	16
1508	7
1509	3
1510	12
1511	3
1512, A	2
1513	12
1515 thru 1516C	3
1517	5
1518	4

TYPE NO.	Column No.
Horizontal Crankshaft Engines	
1519 thru 1521	1
1522	12
1523	1
1524	2
1525A	16
1527	3
1528,A,B	1
1529, A, B	3
1530, A, B	1
1531	3
1534A	17
1535B	3
1536	12
1537	1
1538 thru 1541A	12
1542	5
1543 thru 1546	1
1547	3
1549	3
1550A	15
1551	16
1552	20
1553	16
1554,A	3
1555 and 1556	16
1557 thru 1560	15
1561	19
1562 thru 1571	23
1572	2
1573	3
1574 thru 1577	23
1575	24
1578	25
1581 thru 1582A	23
1583 thru 1599A	26
1600 thru 1617	28
1618 thru 1619	43
1620	30
1622 thru 1623A	42
1624 thru 1642	35

MODEL	PAGE NO.
AV520	61
AV600	61
AH600	61
HSK600	61
TVS600	61

SEARS CRAFTSMAN CROSS REFERENCE

Craftsman Vertical Crankshaft Engines	
Craftsman No.	**Column No.**
200.183112	6
200.183122	6
200.193132	6
200.193142	6
200.193152	7
200.193162	7
200.203112	8
200.203172	8
200.203182	8
200.203192	8
200.213112	8
200.213122	8
200.213132	8
200.223112	41
200.233112	41
200.243112	8
200.283012	8
200.2131128	31
200.2132228	29

Craftsman Horizontal Crankshaft Engines	
Craftsman No.	**Column No.**
200.503111	16
200.583111	16
200.593121	16
200.602112	35
200.613111	16
200.633111	35
200.643121	35
200.672102	26
200.682102	26
200.692112	26
200.692122	26
200.692132	26
200.701001	AH600-1665N
200.711001	HSK600-1665P
200.731001	HSK600-1686R
200.731011	HSK600-1687R
143.943071	HSK600-1687S
143.953071	HSK600-1700S
143.973071	HSK600-1705S
143.973091	HSK600-1700S
143.983071	HSK600-1708T
143.993071	HSK600-1712T

TABLE OF SPECIFICATIONS

Reference Column	1		2		3		4		5	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.250	31.75	1.410	35.814	1.410	35.814	1.410	35.814	1.410	35.814
Cu. In. Displacement (in^3) (cc)	4.40	72.1	4.80	78.7	4.80	78.7	4.80	78.7	4.80	78.7
Point Gap	.017	.432	.017	.432	.017	.432	.017	.432	.017	.432
Timing B.T.D.C.	.122	3.098	.100	2.54	.135	3.429	.100	2.54	.135	3.429
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.007 .017	.178 .432	.007 .017	.178 .432	.006 .011	.15 .28	.006 .014	.15 .35	.006 .011	.15 .28
Piston Diameter	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0875 2.0885	53.023 53.048	2.0875 2.0885	53.023 53.048	2.0875 2.0885	53.023 53.048
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0975 .0985	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0955 .0965	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0925 .0935	2.35 2.375	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.3750 .3751	9.525 9.528	.4997 .4999	12.693 12.697
Crank Pin Journal Diameter	.5611 .5618	14.252 14.270	.5614 .5621	14.260 14.277	.5614 .5621	14.260 14.277	.6857 .6865	17.417 17.437	.5611 .5618	14.252 14.270
Crankshaft P.T.O. Side Main Brg. Dia.	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005
Crankshaft Magneto Side Main Brg. Dia.	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005
Crankshaft End Play	None	None	None	None	None	None	None	None	None	None

TABLE OF SPECIFICATIONS

Reference Column	6		7		8		9A		9B	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.500	38.1	1.500	38.1	1.500	38.1	1.500	38.1	1.500	38.1
Cu. In. Displacement (in^3) (cc)	5.20	85.2	5.20	85.2	5.20	85.2	5.20	85.2	5.20	85.2
Point Gap	.018	.457	.017	.432	.020	.508	.018	.457	.020	.508
Timing B.T.D.C.	.100	2.54	.185	4.699	.070 See Note 1	1.778	.100 See Note 2	2.54	.085	2.159
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .014	.153 .356	.007 .017	.178 .432	.006 .016	.153 .406	.007 .017	.178 .432	.006 .016	.153 .406
Piston Diameter	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035
Piston Ring Groove Width (Top)	.0975 .0985	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
(Bot.)	.0955 .0965	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0925 .0935	2.35 2.375	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.3750 .3751	9.525 9.528	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.6857 .6865	17.417 17.437	.5611 .5618	14.252 14.270	.8442 .8450	21.443 21.463	.6857 .6865	17.417 17.437	.8442 .8450	21.443 21.463
Crankshaft P.T.O. Side Main Brg. Dia.	.8745 .8750	22.212 22.225	.6690 .6694	16.993 17.003	.9998 1.0003	25.349 25.408	.8745 .8750	22.212 22.225	.9998 1.0003	25.349 25.408
Crankshaft Magneto Side Main Brg. Dia.	.7495 .7500	19.037 19.05	Ball Bearing .6690 .6694 See Note A	16.993 17.003	.6691 .6695	16.995 17.005	.7495 .7500	19.037 19.05	.7498 .7503	19.045 19.058
Crankshaft End Play	.003 .016	.076 .406	None	None	None	None	.003 .016	.076 .406	.003 .016	.076 .406

NOTE 1: 642-08, 14A, 14B B.T.D.C. = .110

642-16D, 19A, 20A, 21, 22 B.T.D.C. = .078

NOTE 2: 642-24, 26, 29 B.T.D.C. = .087

NOTE A: Needle Bearing .7498 / .7503

TABLE OF SPECIFICATIONS

Reference Column	9C		10A		10B		11		12	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.500	38.1	1.750	44.45	1.750	44.45	1.750	44.45	1.410	35.814
Cu.In. Displacement (in^3) (cc)	5.20	85.2	6.00	98.3	6.00	98.3	6.00	98.3	4.80	78.7
Point Gap	.020	.508	.018 See Note 4	.457	.020	.508	.018	.457	.017	.432
Timing B.T.D.C.	.078 See Note 2	1.98	.090 See Note 3	2.286	.087	2.21	.100	2.54	.135	3.429
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston RIng End Gap	.006 .016	.152 .406	.007 .017	.178 .432	.006 .016	.152 .406	.006 .014	.152 .356	.007 .017	.178 .432
Piston Diameter	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0873 2.0883	53.017 53.043	2.0870 2.0880	53.01 53.035
(Top) Piston Ring Groove Width	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0665 .0975	1.689 2.477	.0655 .0985	1.664 2.413	.0655 .0665	1.664 1.689
(Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0955 .0965	2.426 2.451	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0935	1.562 2.375	.0625 .0925	1.587 2.349
Piston Pin Diameter	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.8442 .8450	21.443 21.463	.6857 .6865	12.417 17.437	.8442 .8450	21.443 21.463	.6857 .6865	17.417 17.437	.5614 .5621	14.26 14.277
Crankshaft P.T.O. Side Main Brg. Dia.	.9998 1.0003	25.395 25.408	.8745 .8750	22.212 22.225	.9998 1.0003	25.395 25.408	.8745 .8750	22.212 22.225	.6691 .6695	16.995 17.005
Crankshaft Magneto Side Main Brg. Dia.	.6691 .6695	16.995 17.005	.7495 .7500	19.037 19.05	.7498 .7503	19.045 19.058	.7495 .7500	10.037 19.05	.6691 .6695	16.995 17.005
Crankshaft End Play	None	None	.003 .016	.076 .406	.003 .016	.076 .406	.003 .016	.076 .406	None	None

NOTE 2: 642-24, 26, 29 B.T.D.C. = .087

NOTE 3: 643-13 B.T.D.C. = .095

NOTE 4: 643-93A, 05A, 13, 14 = .020

TABLE OF SPECIFICATIONS

Reference Column	13		14		15		16		17	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.375 2.376	60.33 60.35	2.093 2.094	53.162 53.188	2.4375 2.4385	61.913 61.938	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.680	42.672	1.500	38.1	1.750	44.45	1.500	38.1	1.500	38.1
Cu. In. Displacement (in^3) (cc)	7.50	122.9	5.20	85.2	8.17	133.9	5.20	85.2	5.20	85.2
Point Gap	.020	.508	.018	.457	.018	.457	.017	.432	.017	.432
Timing B.T.D.C.	.095	2.413	.100	2.54	.100	2.54	.110	2.794	.110	2.794
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.005 .013	.127 .330	.006 .014	.152 .356	.007 .017	.178 .432	.006 .016	.152 .406	.006 .016	.152 .406
Piston Diameter	2.3685 2.3695	60.16 60.185	2.0870 2.0880	53.01 53.035	2.4302 2.4312	61.727 61.753	2.0875 2.0885	53.023 53.048	2.0880 2.0890	53.035 53.061
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.664	.0975 .0985	1.664 1.689	.0655 .0665	1.664 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0955 .0965	2.426 2.451	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0935	1.562 2.375	.0625 .0925	1.587 2.35	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.3750 .3751	9.525 9.528	.4997 .4999	12.692 12.698	.3750 .3751	9.525 9.528	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.6259 .6266	15.898 15.916	.6957 .6865	17.671 17.427	.6259 .6266	15.898 15.916	.6857 .6868	17.417 17.445	.6857 .6865	17.417 17.445
Crankshaft P.T.O. Side Main Brg. Dia.	.8650 .8850	21.971 22.479	.8745 .8750	22.12 22.225	.6691 .6695	16.995 17.001	.6691 .6695	16.995 17.001	.9998 1.0003	25.349 25.408
Crankshaft Magneto Side Main Brg. Dia.	.7495 .7503	19.037 19.058	.7495 .7500	19.037 19.058	.7495 .7500	19.037 19.058	.7495 .7500	19.037 19.058	.7495 .7500	19.037 19.058
Crankshaft End Play	None	None	.003 .016	.076 .406	None	None	None	None	None	None

TABLE OF SPECIFICATIONS

Reference Column	18		19		20		21		22	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.4375 2.4385	61.913 61.938	2.437 2.438	61.900 61.925
Stroke	1.750	44.45	1.410	35.814	1.250	31.75	1.750	44.45	1.750	44.45
Cu. In. Displacement (in^3) (cc)	6.02	98.7	4.80	78.7	4.40	72.1	8.17	133.9	8.17	133.9
Point Gap	.020	.508	.017	.432	.017	.432	.020	.508	.020	.508
Timing B.T.D.C.	.070	1.778	.100	2.54	.122	3.099	.118	2.997	.115	2.921
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .406	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432
Piston Diameter	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.4302 2.4312	61.727 61.753	2.4302 2.4312	61.727 61.753
Piston Ring Groove Width (Top)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.675	.4997 .4999	12.692 12.675	.4997 .4999	12.692 12.675	.4997 .4999	12.692 12.675	.4997 .4999	12.692 12.675
Crank Pin Journal Diameter	.8442 .8450	21.443 21.463	.5614 .5621	14.26 14.277	.5611 .5618	14.252 14.270	.6259 .6266	15.898 15.916	.6919 .6927	17.574 17.595
Crankshaft P.T.O. Side Main Brg. Dia.	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005
Crankshaft Magneto Side Main Brg. Dia.	Ball Bearing .9998 1.0003 See Note A	25.395 25.408	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.8745 .8750	22.212 22.225	.8748 .8753	22.223 22.233
Crankshaft End Play	None	None	None	None	None	None	None	None	None	None

NOTE A: Needle Bearing .7498
.7503

* Does not apply to units with Solid State Ignition.

TABLE OF SPECIFICATIONS

Reference Column	23		24		25		26		27	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	.1500	38.1	1.410	35.814	.1410	35.814	1.500	38.1	1.500	38.1
Cu. In. Displacement (in^3) (cc)	5.20	85.2	4.80	78.7	4.80	78.7	5.20	85.2	5.20	85.2
Point Gap	.017	.432	.017	.432	.020	.508	.020	.508	.017	.432
Timing B.T.D.C.	.110	2.794	.135	3.429	Fixed	Fixed	.062	1.575	.100	2.54
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .406	.007 .017	.178 .432	.007 .017	.178 .432	.006 .016	.152 .406	.006 .016	.152 .406
Piston Diameter	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0870 2.0880	53.01 53.035	2.0875 2.0885	53.01 53.035
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.6919 .6927	17.574 17.595	.5614 .5621	14.26 14.277	.5614 .5621	14.26 14.277	.6919 .6927	17.574 17.595	.6922 .6927	17.582 17.595
Crankshaft P.T.O. Side Main Brg. Dia.	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.6691 .6695	16.995 17.005	.7498 .7503	19.045 19.058	.6691 .6695	16.995 17.005
Crankshaft Magneto Side Main Brg. Dia.	.7498 .7503	19.045 19.058	.6691 .6695	17.551 17.005	.6691 .6695	17.551 17.005	.6691 .6695	17.551 17.005	.7498 .7503	19.045 19.058
Crankshaft End Play	None	None	None	None	None	None	None	None	.003 .016	.076 .406

TABLE OF SPECIFICATIONS

Reference Column	28		29		30		31		32	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.500	38.1	1.746	44.348	1.746	44.348	1.500	38.1	1.746	44.348
Cu. In. Displacement (in^3) (cc)	5.20	85.2	6.0	98.3	6.0	98.3	5.20	85.2	6.0	98.3
Point Gap	.020	.508	.020*	.508	.020	.508	.020	.508	.020	.508
Timing B.T.D.C.	Ext. Ignition	Ext. Ignition	Ext. Ignition	Ext. Ignition	.052	1.321	Ext. Igniton	Ext. Ignition	.088	2.235
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .152	.007 .017	.178 .432	.006 .016	.152 .152	.006 .016	.152 .152	.006 .016	.152 .152
Piston Diameter	2.0875 2.0885	53.023 53.048	2.0865 2.0875	52.997 53.023	2.0875 2.0885	53.023 53.048	2.0865 2.0875	52.997 53.028	2.0865 2.0875	52.997 53.023
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .06251	1.652 .587	.0615 .0625	1.652 1.587	.0615 .0625	1.652 1.587	.0615 .0625	1.652 1.587	.0615 .0625	1.652 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.6922 .6927	17.582 17.595	.8113 .8118	20.607 20.620	.8113 .8118	20.607 20.620	.8113 .8118	20.607 20.620	.8445 .8450	21.450 21.463
Crankshaft P.T.O. Side Main Brg. Dia.	.7498 .7503	19.045 19.058	.9998 1.0003	25.395 25.408	.7498 .7503	19.045 19.058	.9998 1.0003	25.395 25.408	.9998 1.0003	25.395 25.408
Crankshaft Magneto Side Main Brg. Dia.	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.7498 .7503	17.005 17.015	.6695 .6699	17.005 17.015
Crankshaft End Play	None	None	None	None	None	None	None	None	.003 .016	.076 .406

*Does not apply to units with Solid State Ignition.

TABLE OF SPECIFICATIONS

Reference Column	33		34		35		36		37	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.437 2.438	61.90 66.925	2.093 2.094	53.162 53.188
Stroke	1.746	44.348	1.746	44.348	1.500	38.1	1.746	44.348	1.750	44.45
Cu. In. Displacement (in^3) (cc)	6.0	98.3	6.0	98.3	5.20	85.2	6.0	98.3	6.0	98.3
Point Gap	.020	.508	.020	.508	*.020	.508	.020	.508	.020	.508
Timing B.T.D.C.	.073	1.854	.078	1.854	Ext. Ignition	Ext. Ignition	.112	2.845	.088	2.235
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.007 .017	.178 .432	.006 .016	.152 .406
Piston Diameter	2.0865 2.0875	52.997 53.023	2.0865 2.0875	52.997 53.023	2.0882 2.0887	53.04 53.05	2.4307 2.4317	61.74 61.765	2.0880 2.0885	53.035 53.049
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.698	.4997 .4999	12.692 12.698	.4997 .4999	12.692 12.698	.4997 .4999	12.692 12.698	.4997 .4999	12.692 12.698
Crank Pin Journal Diameter	.8113 .8118	20.607 20.620	.8445 .8450	21.450 21.463	.8113 .8118	20.607 20.620	.6922 .6927	17.582 17.595	.8445 .8450	21.450 21.463
Crankshaft P.T.O. Side Main Brg. Dia.	.9998 1.0003	25.395 25.408	.9993 1.0003	25.295 25.408	.7498 .7503	19.045 19.058	.6695 .6699	17.005 17.015	.9998 1.0003	25.395 25.408
Crankshaft Magneto Side Main Brg. Dia.	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.8748 .8753	22.22 22.233	.6695 .6699	17.005 17.015
Crankshaft End Play	.003 .016	.076 .406	.003 .016	.076 .406	None	None	None	None	.003 .016	.076 .406

TABLE OF SPECIFICATIONS

Reference Column	38		39		40		41		42	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188	2.093 2.094	53.162 53.188
Stroke	1.828	46.431	1.500	38.1	1.828	46.431	1.746	44.348	1.500	38.1
Cu. In. Displacement (in^3) (cc)	6.0	98.3	5.20	85.2	6.0	98.3	6.0	98.3	5.20	85.2
Point Gap	*		.020	.508	.020	.508	*		.020	.508
Timing B.T.D.C.	Ext. Ignition	Ext. Ignition	.088	2.235	.070	1.778	Ext. Ignition	Ext. Ignition	Ext. Ignition	Ext. Ignition
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406
Piston Diameter	2.0880 2.0885	53.035 53.049	2.0880 2.0885	53.035 53.049	2.0880 2.0885	53.035 53.049	2.0880 2.0885	53.035 53.049	2.0880 2.0885	53.035 53.049
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664	.0645 .0655	1.638 1.664
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697	.4997 .4999	12.692 12.697
Crank Pin Journal Diameter	.8113 .8118	20.607 20.620	.8113 .8118	20.607 20.620	.8445 .8450	21.450 21.463	.8113 .8118	20.607 20.620	.8113 .8118	20.607 20.620
Crankshaft P.T.O. Side Main Brg. Dia.	.9998 1.0003	25.395 25.408	.9998 1.0003	25.395 25.408	.9998 1.0003	25.395 25.408	.9998 1.0003	25.395 25.408	.7498 .7503	19.045 19.058
Crankshaft Magneto Side Main Brg. Dia.	.7498 .7503	19.045 19.058	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015
Crankshaft End Play	None	None	None	None	None	None	None	None	None	None

* Does not apply to units with Solid State Ignition.

TABLE OF SPECIFICATIONS

Specification	43		AV520		AV600		AH600		HSK600		TVS600	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Bore	2.093 2.094	53.162 53.188	2.09	53	2.09	53	2.09	53	2.09	53	2.09	53
Stroke	1.5	38.1	1.5	38	1.75	44	2.09	44	1.75	44	1.75	44
Cu. In. Displacement (in^3) (cc)	5.20	85.2	5.2	85 cc	6.0	98 cc	6.0	98 cc	6.0	98 cc	6.0	98 cc
Point Gap	.020	.508										
Timing B.T.D.C.	Ext. Ignition	Ext. Ignition										
Ignition Module Air Gap			.0125	.3175	.0125	.3175	.0125	.3175	.0125	.3175	.0125	.3175
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762	.030	.762
Piston Ring End Gap	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406	.006 .016	.152 .406
Piston Diameter	2.0880 2.0885	53.035 53.049	2.0877 2.0882	53.03 53.04	2.0877 2.0882	53.03 53.04	2.0877 2.0882	53.03 53.04	2.0877 2.0882	53.03 53.04	2.0877 2.0882	53.03 53.04
Piston Ring Groove Width (Top)	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Groove Width (Bot.)	.0645 .0655	1.638 1.664	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689	.0655 .0665	1.664 1.689
Piston Ring Width	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587	.0615 .0625	1.562 1.587
Piston Pin Diameter	.4997 .4999	12.692 12.697	.5005 .5007	12.713 12.718	.5005 .5007	12.713 12.718	.5005 .5007	12.713 12.718	.5005 .5007	12.713 12.718	.5005 .5007	12.713 12.718
Crank Pin Journal Diameter	.6922 .6927	17.582 17.595	.8445 .8450	21.450 21.463	.8445 .8450	21.450 21.463	.8445 .8450	21.450 21.463	.8445 .8450	21.450 21.463	.8445 .8450	21.450 21.463
Crankshaft P.T.O. Side Main Brg. Dia.	.7498 .7503	19.045 19.058	.9998 1.0003	25.395 25.408	.9998 1.0003	25.395 25.408	.7498 .7503	19.045 19.058	.7498 .7503	19.045 19.058	.9998 1.0003	25.395 25.408
Crankshaft Magneto Side Main Brg. Dia.	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015	.6695 .6699	17.005 17.015
Crankshaft End Play	None	None	.003 .016	.076 .406	.003 .016	.076 .406	.003 .016	.076 .406	.003 .016	.076 .406	.003 .016	.076 .406

TABLE OF TORQUE LIMITS

	INCH POUNDS	NEWTON METERS
Cylinder	80 - 100	9 - 11
Flywheel Nut	264 - 324	30 - 37
Connecting Rod Screws		
Aluminum Rods	40 - 50	4.5 - 5.5
Steel Rods	70 - 80	8 - 9
Spark Plug	192 - 264	21.5 - 30
Fuel Tank Screws	12 - 20	1.5 - 2
Blower Housing Mounting Screws	80 - 100	9-11
Muffler Mounting Screws	80 - 100	9 - 11
Muffler Cover (Snowthrowers)	20 - 30	2 - 3.5
Stator to Base (Except Outboards)	80 - 100	9 - 11
External Screws to Laminations	30 - 40	3.5 - 4.5
Point Screw	15 - 25	1.5 - 3
Air Filter or Carburetor Baffle (Metal)	30 - 40	3.5 - 4.5
Air Filter (Plastic)	18 - 25	2 - 3
Carburetor Mounting Nuts	60 - 75	7- 8.5
Reed Plate, Cover Plate	35 - 45	4-5
Reed Hold down	15 - 25	1.5- 3
Compression Release Cover	30 - 40	3.5 - 4.5
Shroud Base to Block	80 - 100	9 - 11
Starter Mounting Screws (Metal)	50 - 70	5.5- 8
Starter Mounting Screws (Plastic)	30 - 40	3.5 - 4.5
Electric Starter Mounting Screws	65 - 85	7.5 - 9.5
Stop Lever to Head	80 - 100	9 - 11
Speed Control to Shroud Base	30 - 40	3.5 - 4.5
Compliance Brake Bracket to Cylinder	60 - 80	7 - 9
Compliance Brake Bracket to Base	35 - 50	4 - 5.5

"Torque specifications listed on this page should not be confused with the torque value observed on engines which have been run. Torque relaxation occurs on all engines from thermal expansion and contraction. The torque specifications take relaxation into account so a sufficient clamping force exists after an engine has been run."

EDUCATIONAL MATERIALS AND TOOLS

AVAILABLE TECHNICIAN'S HANDBOOKS

692508
Covers the diagnosis and repair of Tecumseh 2-cycle engines. Except the TC Engine and TVS840.

692509
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

691462A
Covers the diagnosis and repair of Tecumseh 4-cycle large frame engines.

691218
Covers the diagnosis and repair of Peerless® power train components.

694782
Contains technical information for the repair of the TC series, 2-cycle engines.

694988
Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.

695244A
Covers the diagnosis and repair of the OVRM/OVM/OHH/OHM/OHV 4-cycle overhead valve engines.

695578
Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

AVAILABLE FOREIGN TECHNICIAN'S HANDBOOKS

694732 Spanish
This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

695555 Spanish
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695657 German
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695562 French
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

VIDEO PROGRAMS

695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIALTY / TROUBLESHOOTING BOOKLETS

INSTRUCTIONAL GUIDE

692738
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS

695590
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

CARBURETOR TROUBLESHOOTING BOOKLET

695907
This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903
This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

SPECIAL TOOLS BOOKLET

694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET

695933
This booklet contains the quick reference information found on Tecumseh wall charts.

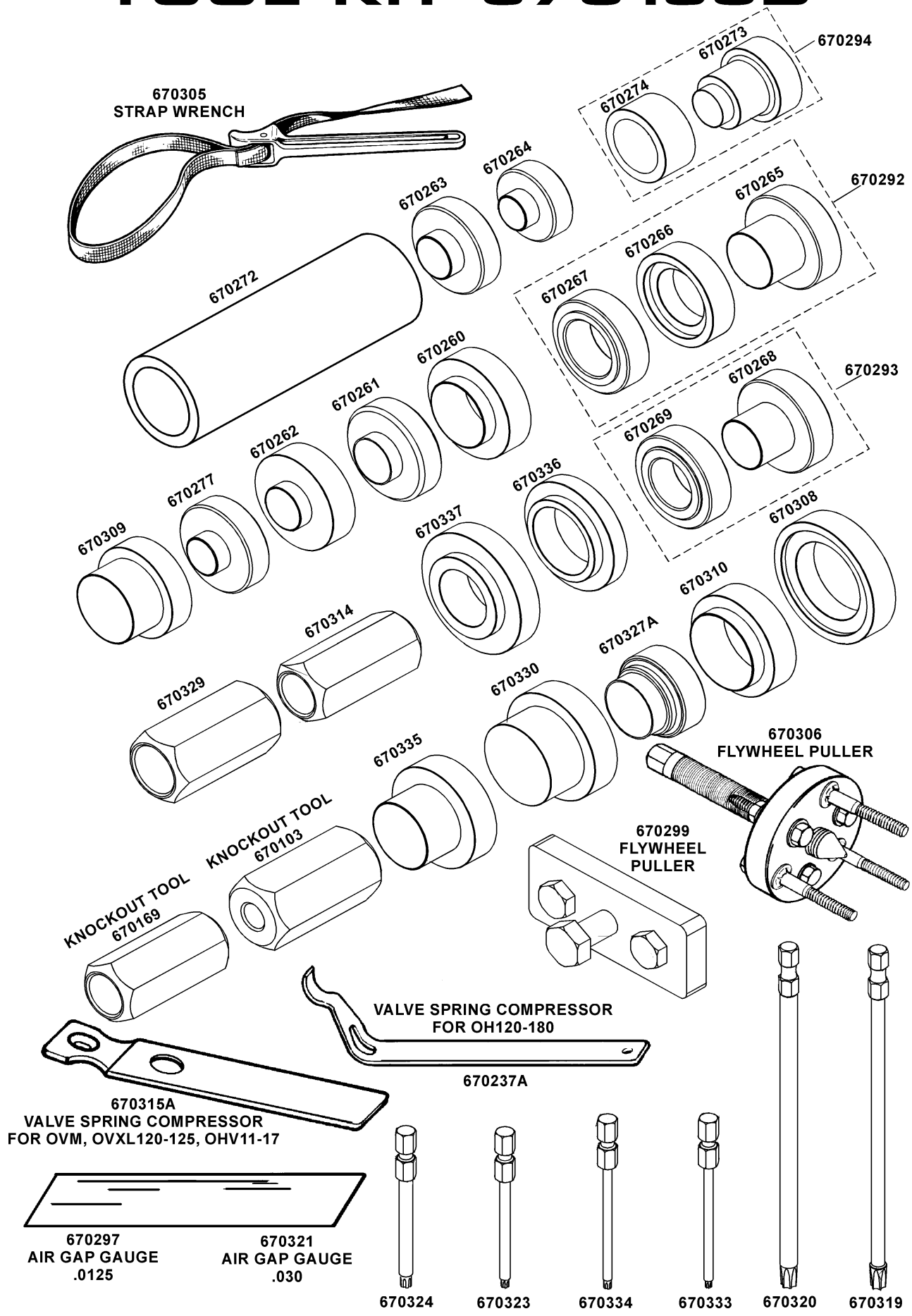
This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

TESTER BOOKLETS

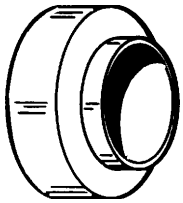
694529
Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

694530
Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

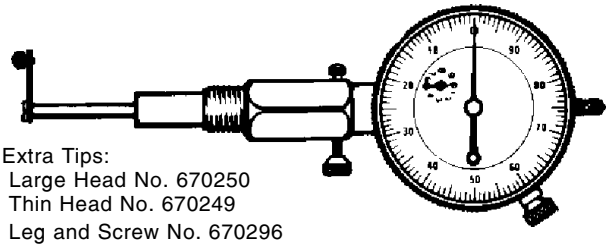
TOOL KIT 670195D



OIL SEAL DRIVER - PROTECTOR



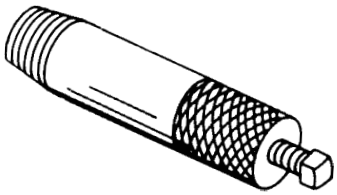
DIAL INDICATOR



Extra Tips:
Large Head No. 670250
Thin Head No. 670249
Leg and Screw No. 670296

No. 670241 - Dial Indicator.

OIL SEAL REMOVER



No. 670286. Used on P.T.O. end of single cylinder outboards with one piece oil seals. Includes tool No. 670285 and center screw.

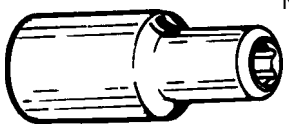
No. 670291. Used on magneto end of all two cycle engines with one piece oil seals and P.T.O. end of 1600 series. Includes tool No. 670280 and center screw.

No. 670257. Used on 2 cycle connecting rod screws.

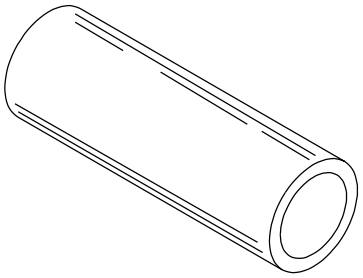
No. 670307. Used on 590556 electric starter mounting screws.

TORX® E-6 SOCKET
No. 670257

TORX® E-8 SOCKET
No. 670307

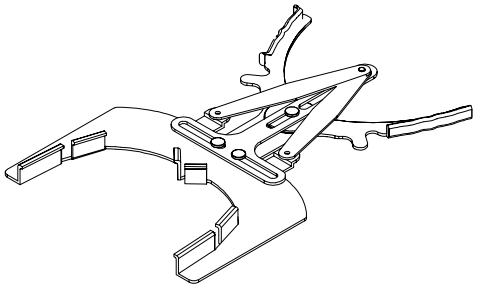


BALL BEARING DRIVER



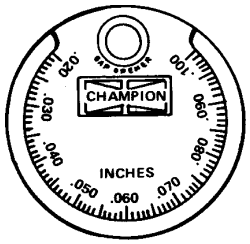
No. 670258

PISTON RING EXPANDER



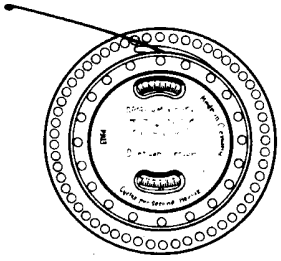
No. 670117 - Piston ring expander

TAPER GAP GAUGE

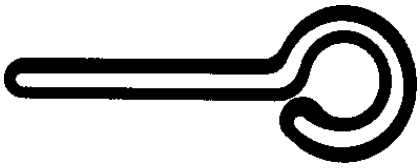


No. 670256 - Taper Gap Gauge

VIBRATION TACHOMETER



No. 670156 - Vibration tachometer.



No. 670298 - Aligning Pin

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers engine models:
ECV100 - 120, H22 - 80, HH40 - 70, HHM80, HM70 - 100, HMSK70 - 110, HMXL70, HS40 - 50, HSK30 - 70, HSSK40 - 50, HT30 - 35, HXL35, LAV30 - 50, LEV80 - 120, TNT100 - 120, TVM125 - 220, TVXL170 - 220, TVS75 - 120, TVXL105 - 115, V40 - 80, VH40 - 70, V60 - 70, VM70 - 100
Model numbers are located on the engine shroud.

3 TO 11 HP 4-CYCLE L-HEAD ENGINES

TECUMSEH®

ENGINES & TRANSMISSIONS

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1998

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CHAPTER 1 GENERAL INFORMATION

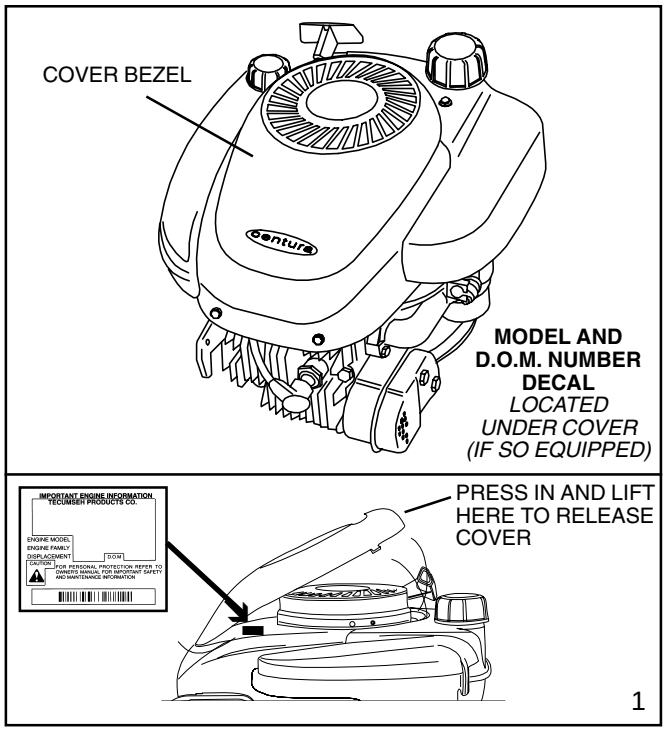
ENGINE IDENTIFICATION

Tecumseh engine model, specification, and serial numbers or (date of manufacture, DOM) are stamped into the blower housing or located on a decal on the engine in locations as illustrated (diag. 1 & 2).

NOTE: On some LEV engines, a cover bezel must be removed to provide access to the identification decal (diag. 1).

The engine identification decal also provides the applicable warranty code and oil recommendations (diag. 3).

Emissionized engines that meet the California Air Resource Board (C.A.R.B.) or the Environmental Protection Agency (E.P.A.) standards will include additional required engine information on the engine decal (diag. 3).

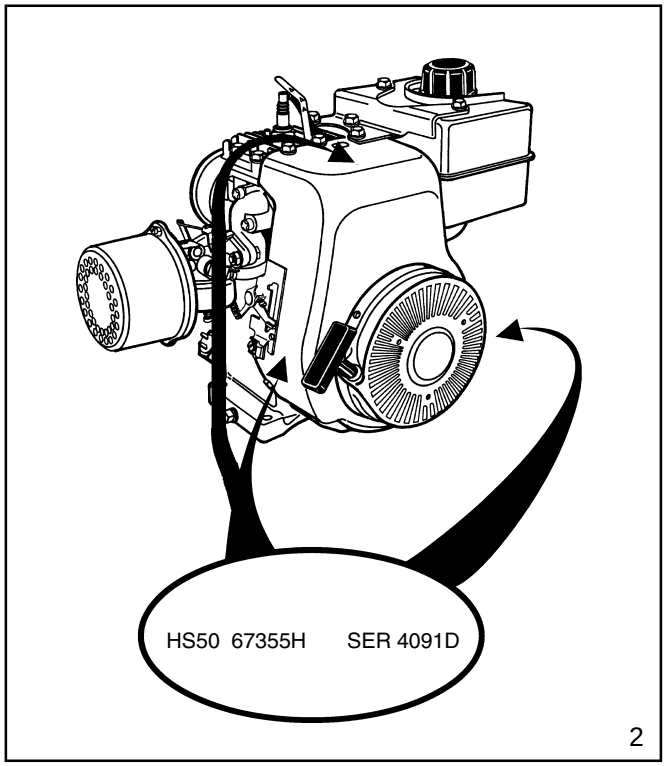


1

INTERPRETATION OF MODEL NUMBER

The first letter designation in a model number indicates basic type of engine.

V - Vertical Shaft
LAV - Lightweight Aluminum Vertical
VM - Vertical Medium Frame
TVM - Tecumseh Vertical (Medium Frame)
VH - Vertical Heavy Duty (Cast Iron)
TVS - Tecumseh Vertical Styled
TNT - Toro N' Tecumseh
ECV - Exclusive Craftsman Vertical
TVXL - Tecumseh Vertical Extra Life
LEV - Low Emissions Vertical
H - Horizontal Shaft
HS - Horizontal Small Frame
HM - Horizontal Medium Frame
HHM - Horizontal Heavy Duty (Cast Iron) Medium Frame
HH - Horizontal Heavy Duty (Cast Iron)
ECH - Exclusive Craftsman Horizontal
HSK - Horizontal Snow King



2

The number designations following the letters indicate the horsepower or cubic inch displacement.

The number following the model number is the specification number. The last three numbers of the specification number indicate a variation to the basic engine specification.

The serial number or D.O.M. indicates the production date.

Using model **LEV115-57010B**, serial **8105C** as an example, interpretation is as follows:

LEV115-57010B is the model and specification number

LEV Low Emissions Vertical

115 Indicates a 11.5 cubic inch displacement

57010B is the specification number used for properly identifying the parts of the engine

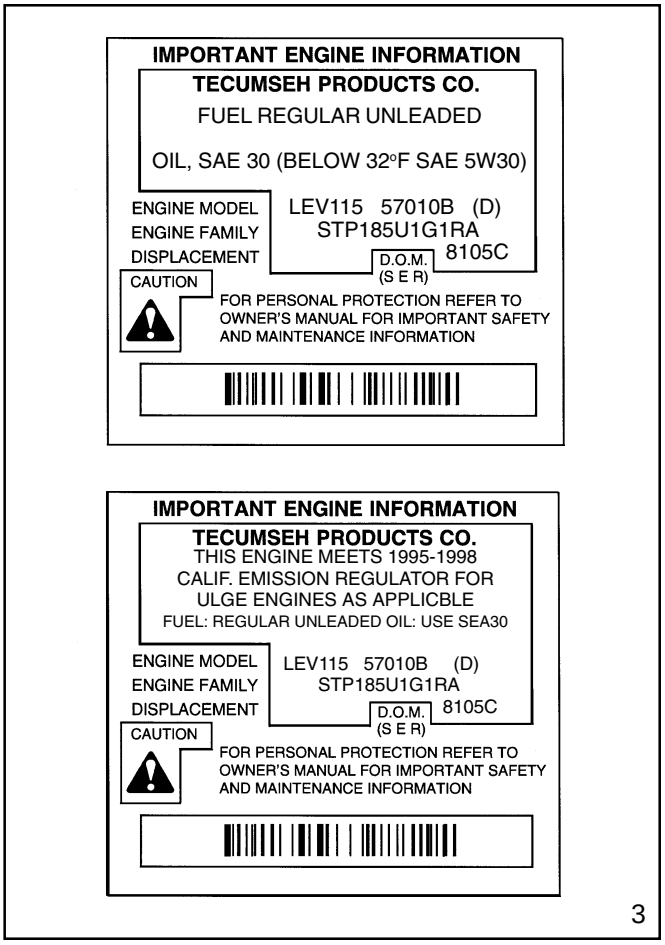
8105C is the serial number or D.O.M. (Date of Manufacture)

8 first digit is the year of manufacture (1998)

105 indicates calendar day of that year (105th day or April 15, 1998)

C represents the line and shift on which the engine was built at the factory.

Engine Family: Engine Tracking Information

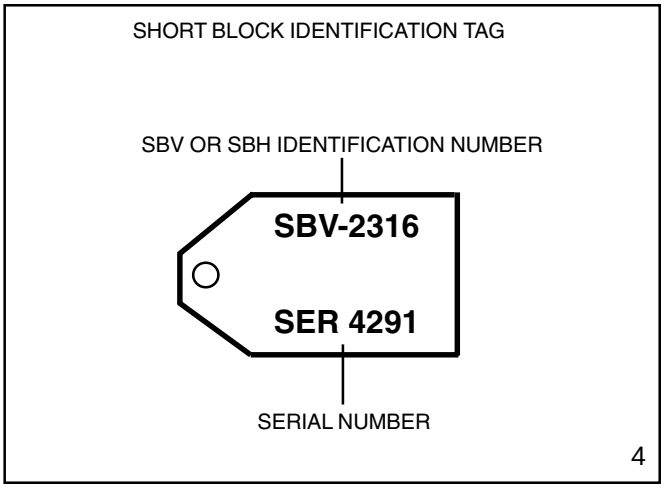


3

SHORT BLOCKS

New short blocks are identified by a tag marked S.B.H. (Short Block Horizontal) or S.B.V. (Short Block Vertical). Original model identification numbers of an engine should always be transferred to a new short block for correct parts identification (diag. 4).

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY OF YOURSELF AND OTHERS. FOLLOW ALL INSTRUCTIONS.



4

FUEL

Tecumseh strongly recommends the use of fresh clean unleaded regular gasoline in all engines. Unleaded gasoline burns cleaner, extends engine life and promotes better starting by reducing build-up of combustion chamber deposits.

REFORMULATED AND OXYGENATED FUELS

Reformulated fuels containing no more than 10% Ethanol, 15% MTBE, 15% ETBE or premium gasoline can be used if unleaded regular gasoline is not available. Leaded fuel may be used in countries where unleaded fuel is not available. **NEVER USE FUEL CONTAINING METHANOL**.

ENGINE OIL

Use a clean, high quality **detergent** oil. Be sure original container is marked: A.P.I. service SF thru SJ. The use of multigrade oil may increase oil consumption under high temperature, high load applications.

NOTE: DO NOT USE SAE10W40 OIL.

For summer (above 32°F, 0°C) use SAE 30 oil part # 730225 (1 quart, .946 liter container) in high temperature, high load applications.

S.A.E.10W30 is an acceptable substitute.

For winter (below 32°F, 0°C) use S.A.E. 5W30 oil part # 730226 (1 quart, .946 liter container)

S.A.E.10W is an acceptable substitute.

S.A.E. 0W30 should only be used when ambient temperature is below 0°F, -18°C.

CAPACITIES:

Engine Model	Oz.	mL.
LAV30-50, TVS75-120, LEV80-120	21	630
ECV100-120, TNT100-120	21	630
V & VH50, 60, 70	27	810
TVM 125, 140	27	810
TVM & TVXL 170, 195, 220	32	960
VM70, 80, 100	32	960
VH100	50	1500
H & HSK30, 35, HS & HSSK40, 50	21	630
H, HH & HSK50, 60, 70	19	570
HM & HMSK70, 80, 100	26	720

EUROPA MODELS

	Oz.	mL.
Vantage	21	630
Prisma	21	630
Synergy	21	630
Synergy "55"	27	810
Spectra	21	630
Futura	21	630
Centura	21	630
HTL	21	630
BVS	21	630
BH Series	21	630
Geo Tech Series 35-50	21	630

Oil Change Intervals. Change the oil after the first two (2) hours of operation and every 25 hours thereafter, or more often if operated under dusty or dirty conditions, extreme temperature, or high load conditions.

Oil Check. Check the oil each time the equipment is used or every 5 hours. Position the equipment so the engine is level when checking the oil.

CAUTION: REMOVE THE SPARK PLUG WIRE BEFORE DOING ANY SERVICE WORK ON THE ENGINE.

Oil Change Procedure: Locate the oil drain plug. On some units this plug is located below the deck through the bottom of the mounting flange. Other units drain at the base of the engine above the deck or frame. If access to the drain plug is restricted by the equipment it may be necessary to drain the oil by tipping the mower in a position that would allow the oil to drain out of the fill tube.

On units that the drain plug is accessible, remove the plug and allow the oil to drain into a proper receptacle. Always make sure that drain oil is disposed of properly.

Once the oil is drained, reinstall the plug and fill the engine with new oil to the proper capacity.

TUNE-UP PROCEDURE.

The following is a minor tune-up procedure. When this procedure is completed, the engine should operate properly. Further repairs may be necessary if the engine's performance remains poor.

CAUTION: REMOVE THE SPARK PLUG WIRE BEFORE DOING ANY SERVICE WORK ON THE ENGINE.

1. Service or replace the air cleaner as needed.
2. Inspect the level and condition of the oil and change or add oil as required.
3. Remove the blower housing and clean all dirt, grass or debris from the intake screen, cylinder head, cylinder cooling fins, carburetor, governor levers and linkage.
4. Make sure the fuel tank, fuel filter and fuel line are clean. Replace any worn or damaged governor springs or linkage. Make the proper governor adjustments and carburetor presets where required.

5. When replacing the spark plug, consult the parts breakdown for the proper spark plug to be used in the engine being serviced. Set the spark plug gap to .030" (.762 mm) and install the spark plug in the engine. Tighten the spark plug to 15 foot pounds of torque (20.4 Nm). If a torque wrench isn't available, screw the spark plug in as far as possible by hand, and use a spark plug wrench to turn the spark plug 1/8 to 1/4 turn further if using the old spark plug, or 1/2 turn further if using a new spark plug.
6. Make sure all ignition wires are free of abrasions or breaks and are properly routed so they will not rub on the flywheel.
7. Properly reinstall the blower housing, gas tank, fuel line and air cleaner assembly if removed.
8. Make sure all remote cables are properly adjusted for proper operation. See chapter 4 under "Speed Controls and Linkage".
9. Reinstall the spark plug wire, add fuel and oil as necessary, and start the engine.

STORAGE: (IF THE ENGINE IS TO BE UNUSED FOR 30 DAYS OR MORE)

CAUTION: NEVER STORE THE ENGINE WITH FUEL IN THE TANK INDOORS , IN ENCLOSED POORLY VENTILATED AREAS WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

Gasoline can become stale in less than 30 days and form deposits that can impede proper fuel flow and engine operation. To prevent deposits from forming, all gasoline must be removed from the fuel tank and the carburetor. An acceptable alternative to removing all gasoline is adding a fuel stabilizer to the gasoline. Fuel stabilizer (such as Tecumseh's Part No. 730245) is added to the fuel tank or storage container. Always follow the mix ratio found on the stabilizer container. Run the engine at least 10 minutes after adding the stabilizer to allow it to reach the carburetor.

CAUTION: THE USE OF SOME ANTI-ICING ADDITIVES MAY CREATE A METHANOL FUEL BLEND. DO NOT USE ADDITIVES THAT CONTAIN METHANOL. FUEL CONDITIONERS THAT CONTAIN ISOPROPYL ALCOHOL IS RECOMMENDED.

Draining the Fuel System:

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

1. Remove all gasoline from the fuel tank by running the engine until the engine stops, or by draining the fuel tank by removing the fuel line at the carburetor or fuel tank. Be careful not to damage the fuel line, fittings, or fuel tank.
2. Drain the carburetor by pressing upward on the bowl drain (if equipped) which is located on the bottom of the carburetor bowl. On carburetors without a bowl drain, the carburetor may be drained by loosening the bowl nut on the bottom carburetor one full turn. Allow to completely drain and retighten the bowl nut being careful not to damage the bowl gasket when tightening.
3. If "Gasohol" has been used, complete the above procedure and then put one half pint of unleaded gasoline into the fuel tank and repeat the above procedure. If Gasohol is allowed to remain in the fuel system during storage, the alcohol content will cause rubber gaskets and seals to deteriorate.

Change Oil: If the oil has not been changed recently, this is a good time to do it.

Oil Cylinder Bore:

1. Disconnect the spark plug wire and ground the wire to the engine. Remove the spark plug and put 1/2 ounce (14 ml) of clean engine oil into the spark plug hole.
2. Cover the spark plug hole with a shop towel.
3. Crank the engine over slowly several times.

CAUTION: AVOID SPRAY FROM SPARK PLUG HOLE WHEN SLOWLY CRANKING ENGINE OVER.

4. Install the spark plug and connect the spark plug wire.

Clean Engine: Remove the blower housing and clean all dirt, grass or debris from the intake screen, cylinder head, cylinder cooling fins, carburetor, governor levers and linkage.

CHAPTER 2 AIR CLEANERS

GENERAL INFORMATION

The air cleaner is the device used to eliminate dust and dirt from the air supply. Filtered air is necessary to assure that abrasive particles are removed before entering the carburetor and combustion chamber. Dirt allowed into the engine will quickly wear the internal components and shorten the life of the engine.

Tecumseh engines use either a polyurethane or a paper-type air filter system. A polyurethane pre-cleaner or a flocked screen may be used in conjunction with the main filter. Snow King® engines do not use an air filter.

Extremely dirty conditions may require more frequent filter cleaning or replacement.

OPERATION

The outer cover encapsulates the air filter element(s) and prevents large particles from entering the filter box. Air is filtered through the pre-cleaner or flocked screen (if equipped) and the polyurethane or paper filter element. Pre-cleaners or flocked screens provide additional air cleaning capacity.

In Tecumseh's Kleen Aire® system, air is drawn in through a rotating screen or recoil cover to be centrifugally cleaned by the flywheel before the air is drawn into the air filter.

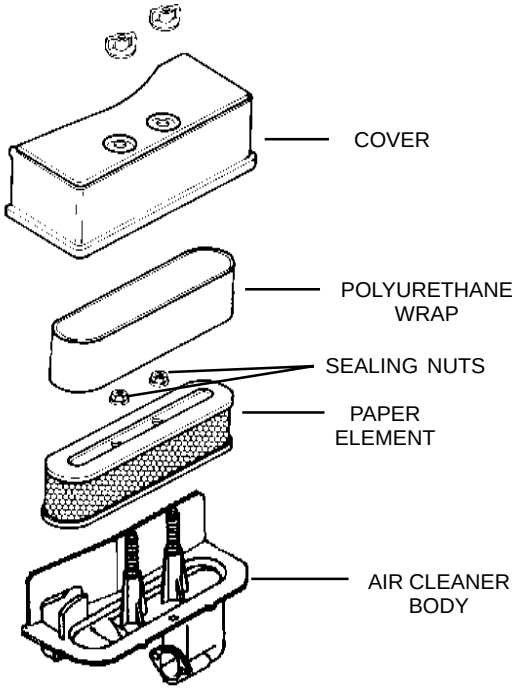
COMPONENTS (diag 1 & 2)

The **cover** holds the filter element and prevents large debris from entering the filter element.

The **polyurethane wrap pre-filter** is used on XL or XL/C engine models with paper filter elements.

The **paper** or **polyurethane filter element** is the main filter to trap dust and dirt. Dry-type paper elements have treated paper folded for increased surface area and rubber-like sealing edges. The polyurethane filter uses an oil film to trap fine particles found in dust.

The **flocked screen** is used as an additional filter on XL or XL/C engine models that use a polyurethane filter element.



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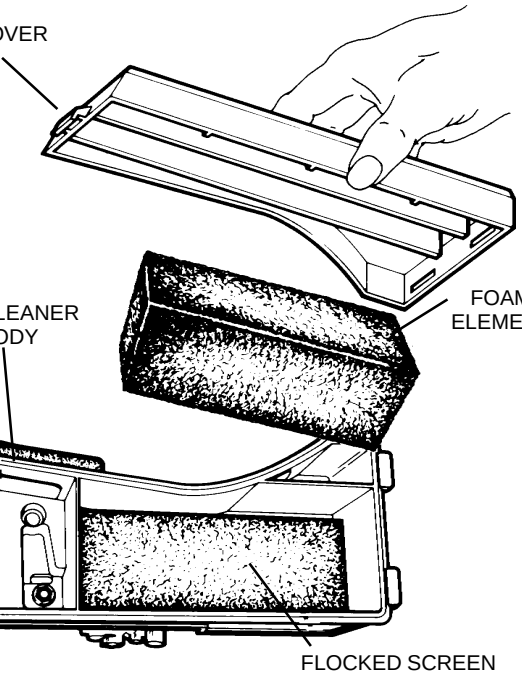

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TROUBLESHOOTING OR TESTING

If the engine's performance is unsatisfactory (needs excessive carburetor adjustments, starts smoking abnormally, loses power), the first engine component to be checked is the air cleaner. A dirt restricted or an oil soaked element will cause noticeable performance problems. A polyurethane element may be cleaned following the service procedure listed under "Service" in this chapter. A paper-type air filter should only be replaced. A paper-type element cannot have an oil film present on the paper. Follow the procedure listed in the "Service" section of this chapter for replacement. Re-try the engine after filter replacement or service. If the problem persists after filter service, see Chapter 9 under "Engine Operation Problems" for additional causes.

SERVICE

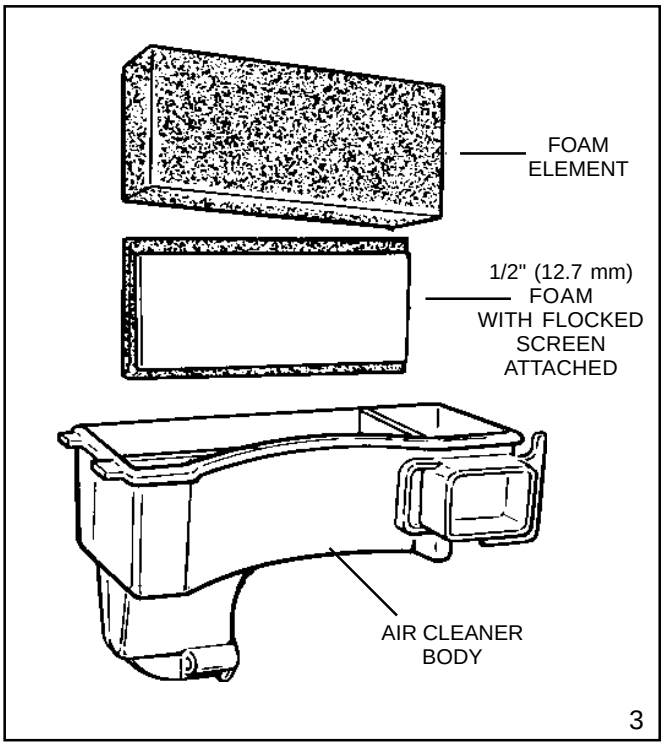
Service on the polyurethane element (cleaning and oiling) is recommended every three months or every twenty five operating hours, whichever comes first. Extremely dirty or dusty conditions may require daily cleanings.

The paper filter element should be replaced at least once a year or more frequently if operated in dusty or dirty conditions.

NOTE: NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER ASSEMBLY INSTALLED ON THE ENGINE. ALWAYS REPLACE THE FILTER ELEMENT WITH THE PROPER TECUMSEH ORIGINAL REPLACEMENT PART.

DISASSEMBLY PROCEDURE

1. Unlock the tabs or remove the screws, wingnuts or snaps holding the air cleaner cover in place.
2. Remove the hex nuts holding the element down if equipped. New nuts are supplied with a new filter and **MUST** be used for proper sealing.
3. Clean the excess contaminants out of the air cleaner body before removing the old element.
4. Remove the old element and the polyurethane pre-cleaner if equipped.
5. On air cleaners that use a flocked screen under the polyurethane element, remove the air cleaner assembly from the carburetor before removing the flocked screen. This prevents dirt from entering the carburetor (diag 3).
6. Clean the inside of the cover and body, remove the old gasket between the carburetor and the air cleaner assembly.
7. Reinstall the air cleaner assembly using a new gasket.
8. Use the reverse procedure for reassembly. When installing the foam polyurethane pre-cleaner, make sure the seam is installed to the outside to prevent gaps between the paper element and the pre-cleaner.



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POLYURETHANE-TYPE FILTER ELEMENT

This type of air filter can be serviced when restricted with dust or dirt. Wash the filter or pre-cleaner in a liquid detergent and water solution until all the dirt is removed. Rinse in clear water to remove the detergent solution. Squeeze the element (do not twist) to remove the excess water. Wrap the element in a clean cloth and squeeze it (do not twist) until completely dry.

Re-oil the element by applying engine oil and squeezing it vigorously to distribute the oil. Roll the element in a cloth and squeeze it (do not twist) to remove the excess oil.

Clean the air cleaner housing and cover being careful not to allow dirt to fall into the carburetor or intake pipe.

PAPER -TYPE FILTER ELEMENT

Paper type air filter elements can only be serviced by replacement. Do not attempt to clean a paper filter element.

CHAPTER 3 CARBURETORS AND FUEL SYSTEMS

GENERAL INFORMATION

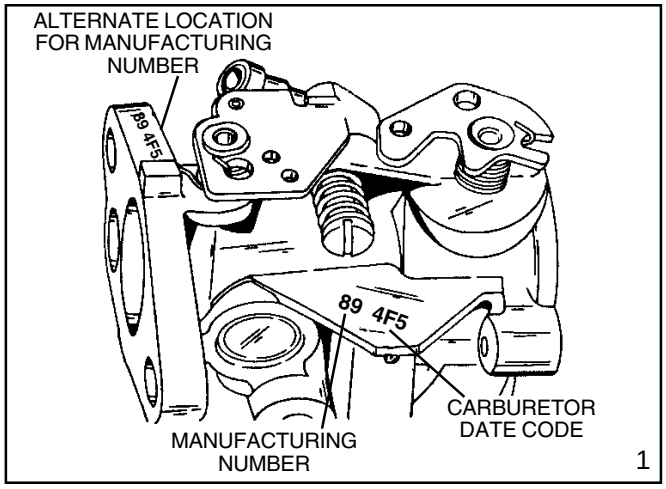
Tecumseh uses two basic types of carburetors, float and diaphragm type carburetors. Float type carburetors use a hollow float to maintain the operating level of fuel in the carburetor. Diaphragm type carburetors use a rubber-like diaphragm. One side is exposed to intake manifold pressure and the other side to atmospheric pressure. The diaphragm provides the same basic function (maintaining the proper fuel level in the carburetor) as the float.

An advantage of the diaphragm carburetor over the float style is that the diaphragm carburetor will allow the engine to operate at a greater degree of tiltability.

Tecumseh carburetors are identified by a manufacturing number and date code stamped on the carburetor as illustrated (diag. 1).

When servicing carburetors, use the engine model and specification number to obtain the correct carburetor part number. An alternate method of finding the correct carburetor part number is to use the manufacturing number stamped on the carburetor and convert this number to a part number. In the carburetor section of the Master Parts Manual, Microfiche Catalog or computer parts look-up system, a cross reference chart will convert a carburetor manufacturing number to a Tecumseh part number.

Complete carburetor replacement may be accomplished with a standard service carburetor. A standard service carburetor is a basic carburetor that may require the use of original carburetor parts or additional new parts to adapt to the specification. An instruction sheet is provided with the new service carburetor or see “SERVICE” in this chapter.



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CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

NOTE: Todays fuels can cause many problems in an engines performance, due to the fuels quality and short shelf life. Always check fuel as a primary cause of engine performance.

1. Remove the air filter, heater box, or air cleaner assembly if applicable to visually check that the choke shutter completely closes or check to see if fuel comes out of the main nozzle during priming.
2. If the fuel flow from the tank is adequate and no fuel is evident during priming, the carburetor will need to be removed for service. See “Service” in this chapter or consult the “Carburetion Troubleshooting” chart to diagnose carburetor symptoms. Improper fuel flow indicates the fuel, fuel line, filter or tank require cleaning or replacement.
3. Check the engine compression using a commercially available compression tester and follow the tester’s recommended procedure. Low compression, a dry spark plug, adequate fuel flow, and a known good functional carburetor indicates an internal engine problem exists. See under “Troubleshooting.”
4. A wet spark plug indicates fuel is being supplied by the carburetor. The engine may be flooded by a restricted air filter, carbon shorted or defective spark plug, excessive choking or over priming, improperly adjusted or defective carburetor. With the spark plug removed and a shop towel over the spark plug hole, turn the engine over slowly 3 or 4 times to remove excess gasoline from the engine cylinder.

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER.

5. Replace the air filter if restricted or oil soaked. Replace the spark plug if questionable. Install the spark plug and high tension lead and try to start the engine.
6. If the engine floods and fails to start, the carburetor will require service. See the proceeding “Carburetion Troubleshooting” chart for additional causes. If the carburetor is functioning properly the problem may be ignition timing related. See “Troubleshooting" under "Ignition”.

OPERATION

In the “CHOKE” or “START” position, the choke shutter is closed and the only air entering the engine enters through openings around the shutter. As the engine starts to rotate, downward piston travel creates a low air pressure area (or vacuum) above the piston. Higher pressure (atmospheric) air rushes into the engine and fills this low pressure area. Since the majority of the air passage is blocked by the choke shutter, a relatively small quantity of air enters the carburetor at an increased speed. The main nozzle and both idle fuel discharge ports are supplying fuel due to the low air pressure in the engine intake. Maximum fuel flow through the carburetor orifices combined with the reduced quantity of air that passes through the carburetor, make a very rich fuel mixture which is needed to start a cold engine.

At engine IDLE speed, a relatively small amount of fuel is required to operate the engine. The throttle is almost completely closed. Fuel is supplied through the primary idle-fuel discharge orifice.

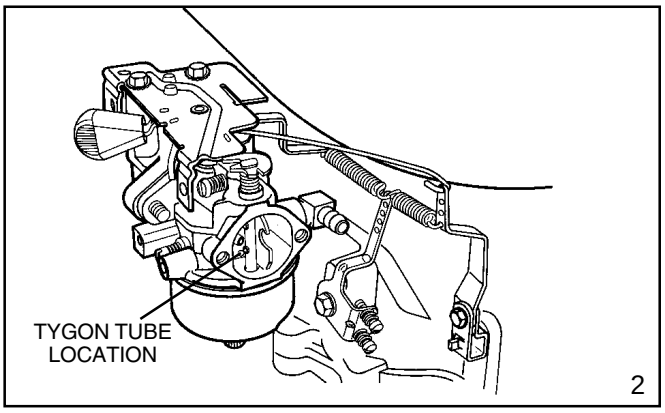
NOTE: Dual system carburetors do not have an idle circuit.

During INTERMEDIATE engine operation, a second orifice is uncovered as the throttle shutter opens, and more fuel is allowed to mix with the air flowing into the engine.

During HIGH SPEED engine operation, the throttle shutter is fully opened. Air flows through the carburetor at high speed. The venturi, which decreases the size of the air passage through the carburetor, further accelerates the air flow. This high speed movement of the air decreases the air pressure at the main nozzle opening. Fuel is forced out the main nozzle opening due to the difference in the air pressure on the fuel in the carburetor bowl and the reduced air pressure at the main nozzle opening.

For the fuel to flow, the carburetor bowl must be either vented externally or internally. Some internally vented float style carburetors use a tygon tube and a vent within the air intake. This tube must be present for the carburetor to operate properly (diag. 2).

Air is bled into the main nozzle and through the air bleed located in the air horn. This mixes the fuel and air prior to the fuel leaving the main nozzle. Atomization occurs as the fuel mixture contacts the fast moving air stream. This mist then flows into the intake of the engine.

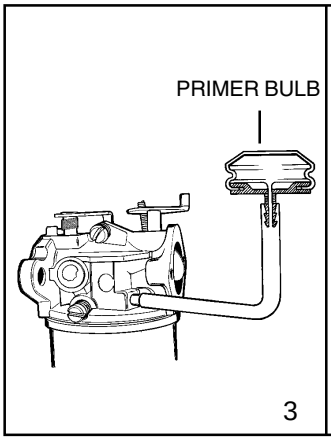


2

FUEL PRIMERS

Primers may be mounted remotely or as an integral part of the carburetor. The basic function of the primer is to supply a charge of air to the carburetor main well, or carburetor bowl. On diaphragm carburetors it displaces fuel directly into the carburetor venturi. This displaced fuel provides a rich mixture necessary for engines to start easily on the first or second attempt (diag. 3 & 4).

Primers must be vented either internally (a passage in the carburetor air horn prior to the venturi) or externally (through a hole in the primer bulb). The vent allows air to fill the primer bulb after the primer bulb is released. On diaphragm carburetors a one way valve in the body prevents the fuel from being forced back into the fuel tank.



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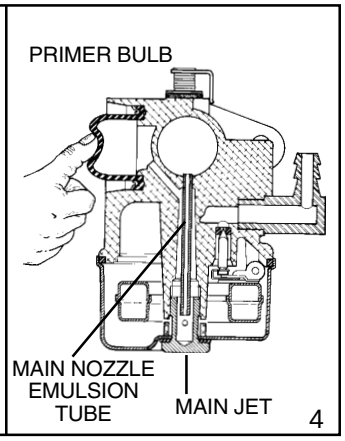
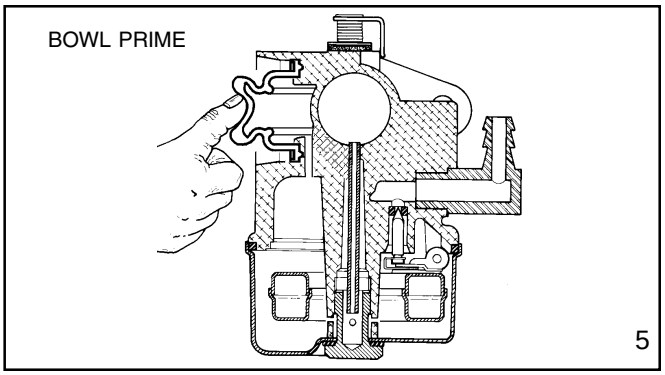


4

Two different methods are used to prime float style carburetors, leg prime and bowl prime. The leg prime system is used only on the dual system carburetor. Air is forced into the center leg of the carburetor, which then forces an enriched mixture of fuel up the main nozzle. The bowl prime method is used on Series 6, 8, 9 and 10 carburetors and is distinguished by a stepped or hour glass shaped primer bulb. A good seal of the primer bulbs center lip is critical to assure that a full charge of air reaches the bowl. **Also critical is a tight seal around the float bowl.**

NOTE: Never re-use a bowl gasket.

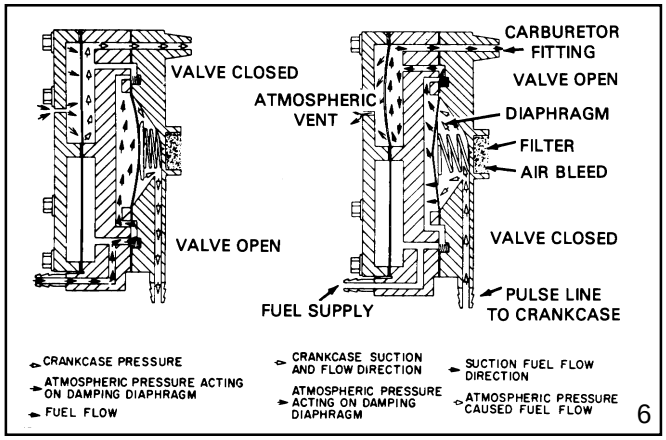


5

IMPULSE FUEL PUMPS

Impulse fuel pumps may either be mounted externally onto the carburetor fuel inlet or remotely mounted. These pumps are connected in the fuel line between the fuel supply and the carburetor or directly to the fuel inlet.

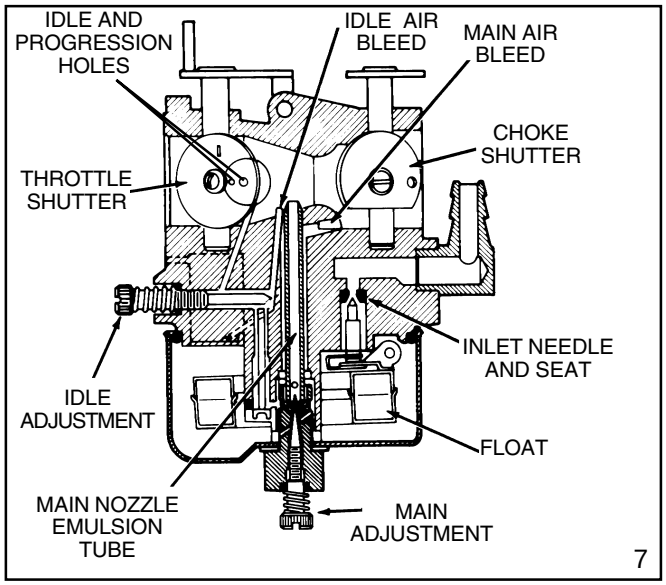
Impulse fuel pumps are operated by crankcase impulses created by the up and down movement of the piston. A hose called a pulse line connects the fuel pump diaphragm chamber to the crankcase and transmits these impulses to the pump diaphragm. The impulses actuate the diaphragm and flap valves to lift the fuel from the fuel tank to the carburetor (diag. 6).



6

FLOAT STYLE CARBURETORS

A float is used to maintain the operating volume of fuel in the carburetor bowl. As the fuel is used by the engine, the fuel volume in the carburetor bowl drops and the float moves downward. This allows the inlet needle valve to move off the sealing seat. Fuel flows by gravity or a pulse pump into the fuel bowl. As the fuel volume in the bowl again rises, it raises the float. This upward float motion moves the inlet needle valve to the closed position. When the needle contacts the seat, the fuel flow is stopped. The tapered end of the inlet needle varies the fuel flow rate so that the fuel volume in the carburetor bowl will remain constant (diag. 7). The float height is set according to the service procedure.



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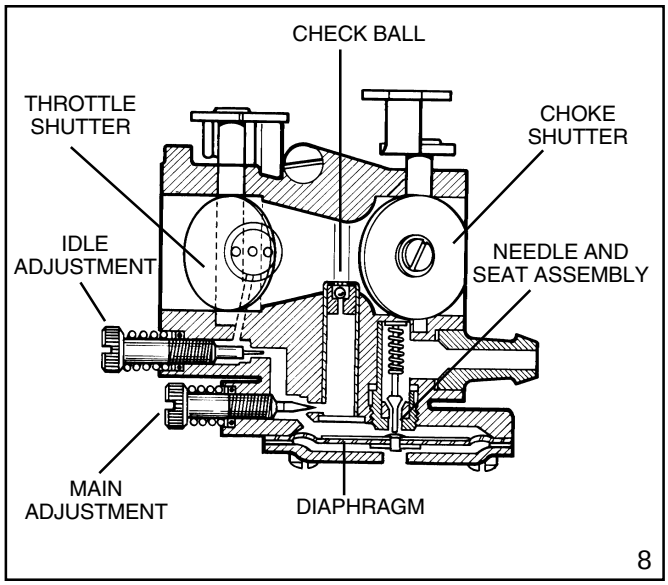
DIAPHRAGM (PRESSURE DIFFERENTIAL) CARBURETORS

This type of carburetor uses a rubber-like diaphragm which is exposed to intake manifold pressure on one side and to atmospheric pressure on the other. Tecumseh diaphragm carburetors use the diaphragm as a metering device. As the intake manifold pressure decreases due to downward piston travel, the atmospheric pressure on the vented side of the diaphragm moves the diaphragm against the inlet needle. The diaphragm movement overcomes the spring tension on the inlet needle and moves the inlet needle off the seat. This permits the fuel to flow through the inlet valve to maintain the correct fuel volume in the fuel chamber. The inlet needle return spring closes the inlet valve when the pressure on the diaphragm equalizes or a pressure higher than atmospheric exists on the intake side (upward piston travel). The diaphragm meters a correct fuel volume in the fuel chamber to be delivered to the mixing passages and discharge ports (diag. 8).

A main or idle adjustment needle may be replaced by an internally fixed jet on some models.

The main nozzle contains a ball check valve. The main purpose of this ball check is to eliminate air being drawn down the main nozzle during idle speeds and leaning the idle mixture.

An advantage of the diaphragm carburetor over the float system is that the diaphragm carburetor increases the angle that the engine may be operated at.



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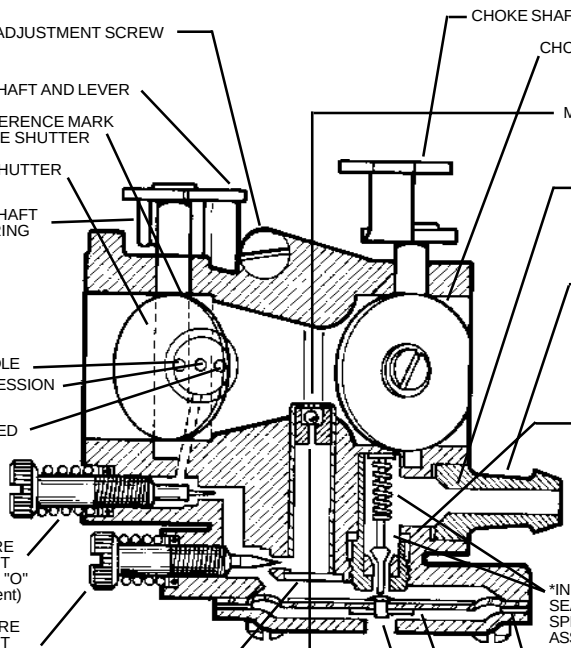
COMPONENTS



Loosen screw until it just clears throttle lever, then turn screw in 1 turn.

IDLE SPEED ADJUSTMENT SCREW

Place detent reference mark to proper location.

THROTTLE SHAFT AND LEVER

DETENT REFERENCE MARK ON THROTTLE SHUTTER

THROTTLE SHUTTER

Check spring for return action and binding.

THROTTLE SHAFT RETURN SPRING

Remove welch plug and blow air through air passages.

IDLE

IDLE PROGRESSION HOLE

IDLE AIR BLEED

Remove adjustment screw. To adjust 20° slant engines, the engine must be mounted in its normal 20° slant position.

*IDLE MIXTURE ADJUSTMENT SCREW AND "O" RING (If Present)

*MAIN MIXTURE ADJUSTMENT SCREW AND "O" RING (If Present)

Check ball is not serviceable on some models.

WELCH PLUG (If Present)

*MAIN NOZZLE CHECK BALL (If Present)

CHOKE SHAFT AND LEVER

Check shaft for binding. Position shutter opening towards inlet fitting side or air horn.

CHOKE SHUTTER

MAIN NOZZLE

Blow air through passage.

*INLET FITTING SCREEN

Part of inlet fitting. If fuel is restricted, clean or replace fitting.

*INLET FITTING

Bulb primer models have Viton* one way valve, in or behind fitting.

*INLET SEAT GASKET

Remove and replace.

*INLET NEEDLE SEAT AND SPRING ASSEMBLY

Proper installation of assembly is important.

*DIAPHRAGM GASKET

*DIAPHRAGM

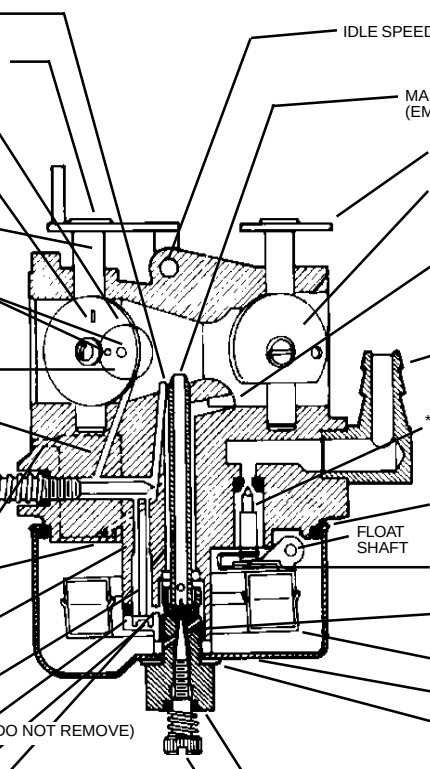
Gasket and diaphragm sequence may be reversed on some models. Head of rivet must touch inlet needle. Rivet is hooked into inlet needle control lever on some models.

ATMOSPHERIC VENT HOLE

Hole must be clean. On models with bulb primer, vent hole is very small and is located off center.

*NON METALLIC ITEMS - CAN BE DAMAGED BY HARSH CARBURETOR CLEANERS

9



Blow air through passage.

IDLE AND INTERMEDIATE AIR BLEED

Check shaft for looseness or binding. Shutter must be positioned with detent reference marks on top parallel with shaft and to the right or 3 o'clock position.

THROTTLE SHAFT AND LEVER

THROTTLE SHUTTER

DETENT REFERENCE MARK

Check spring for return action and binding.

THROTTLE SHAFT RETURN SPRING

IDLE AND INTERMEDIATE ORIFICES

Remove idle adjustment screw. Check needle tip and condition of "O" ring. Remove welch plug and blow out all passages.

IDLE AND INTERMEDIATE FUEL CHAMBER (COVERED WITH WELCH PLUG)

IDLE AND INTERMEDIATE FUEL MIXTURE PASSAGE

*IDLE ADJUSTMENT SCREW AND "O" RING

ATMOSPHERIC VENT

SOFT BAFFLE PLUG

IDLE AND INTERMEDIATE FUEL TRANSFER PASSAGE

METERING ROD OR PIN IN FUEL TRANSFER PASSAGE

BALL PLUG

CUP PLUG

(DO NOT REMOVE)

IDLE AND INTERMEDIATE FUEL TRANSFER PASSAGE

IDLE AND MAIN FUEL PICK UP ORFICE

NOTE: On models which have metering rods, do not install idle adjustment screw with carburetors upside down, as pin will obstruct movement of adjustment screw causing damage

IDLE SPEED ADJUSTMENT

Loosen screw until it just clears throttle lever, then turn screw in one turn.

MAIN NOZZLE (EMULSION TUBE)

Removable on emission carbs. non-metallic only.

CHOKE SHAFT AND LEVER

Check shaft for binding position opening to bottom of air horn.

CHOKE PLATE

HIGH SPEED AIR BLEED

Blow air through passage. Do not remove restrictor if present.

INLET FITTING

*INLET NEEDLE AND SEAT

Proper installation is important.

*FLOAT BOWL GASKET

Replace.

FLOAT SHAFT

INLET NEEDLE CLIP (If Present)

Must hook over float tab.

IDLE FUEL TRANSFER PASSAGE AND ANNULAR GROOVE

FLOAT

Check float for leaks or dents. Clean bowl and adjust float level position gasket or gaskets.

FLOAT BOWL

*GASKET

If the carburetor is used on a 20° slant engine, the engine must be in its normal 20° slanted position for adjustment.

NUT AND MAIN ADJUSTMENT SEAT

*MAIN ADJUSTMENT SCREW AND "O" RING SEAL

Check needle for damage and "O" ring for cracks. Clean all passages in nut with compressed air.

*NON METALLIC ITEMS - CAN BE DAMAGED BY HARSH CARBURETOR CLEANERS

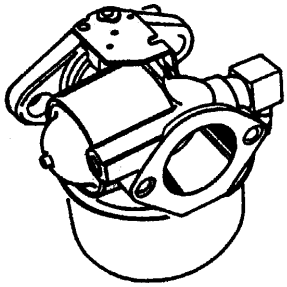
10

CARBURETOR IDENTIFICATION

Tecumseh has a variety of carburetors. To help identify these carburetors here are some simple procedures to follow.

DUAL SYSTEM CARBURETORS

The easiest way to identify the dual system carburetor is by the presence of a large primer bulb located on the side of the carburetor. The absence of adjustment needles help to identify the carb as well. The dual system carburetor is used on 4-cycle vertical crankshaft rotary mower engines. (diag. 11).

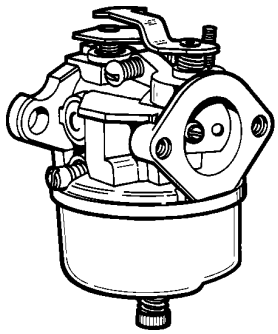


11

SERIES 1 CARBURETORS

Series 1 carburetors come in a variety of styles. They are used on both 2 and 4 cycle vertical and horizontal shaft engines in the 2 through 7 h.p. range. It is a float style carburetor with a smaller venturi than the Series 3 and 4 carburetors. Some will have an adjustable idle and main and others will have a fixed main with an adjustable idle. There are also some fixed speed applications that will only have a fixed main system and the idle system will not be drilled. (diag. 12).

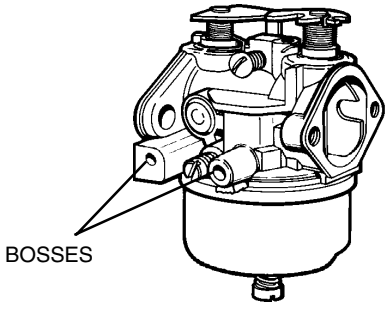
NOTE: Emissionized carburetors will have a fixed jet.



12

SERIES 3 & SERIES 4 CARBURETORS

Series 3 and 4 carburetors are generally used on 8 through 12.5 horsepower 4-cycle engines. The venturi size of these carburetors are larger than Series 1 and Dual System Carburetors. The quickest way to identify these carburetors is by the presence of bosses on each side of the idle mixture screw. To identify the Series 3 from a Series 4, view the carburetor from the throttle end. The Series 3 has (1) screw securing the throttle plate and the Series 4 uses (2) screws. (diag. 13 - 15)



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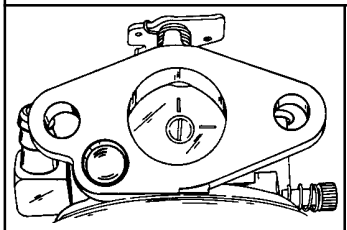
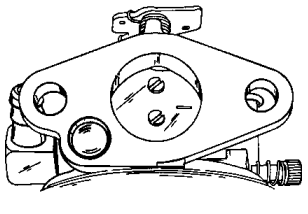


SERIES 3

14



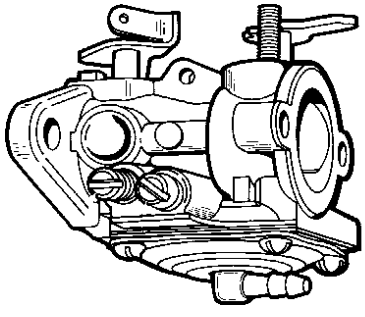
SERIES 4

15

DIAPHRAGM CARBURETORS

The diaphragm carburetors are unique. These carburetors can be operated at a more severe angle than float style carburetors. They still require that the fuel supply be located in a position that allows it to be gravity fed. Its most distinctive feature is the lack of a fuel bowl. (diag. 16).

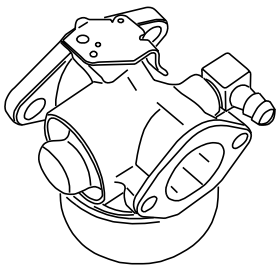
NOTE: Emissionized carburetors will have a fixed jet.



16

SERIES 6 CARBURETORS 4-CYCLE

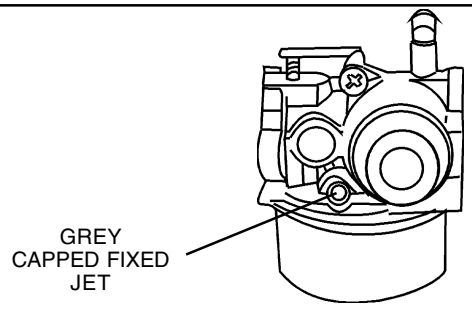
Series 6 carburetors are used on 2 and 4-cycle engines. They have a larger venturi than the dual system carburetor and use a simple fixed idle system. Series 6 carburetors used on both vertical and horizontal applications are nonadjustable. The 4 cycle version pictured has a stepped primer bulb. (diag. 17).



17

SERIES 8

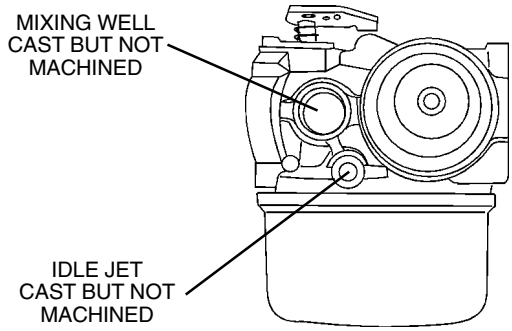
The Series 8 carburetor has both a fixed main and idle circuit. The fixed idle system uses a restricted jet that meters the fuel. The idle restrictor jet will be capped to prevent access unless removed. The fixed main jet is part of the bowl nut. A ball plug is visible from the bottom, which seals the metering passage. This carburetor also has a serviceable main nozzle emulsion tube. It also has a stepped primer bulb to assist in starting. (diag. 18)



18

SERIES 9

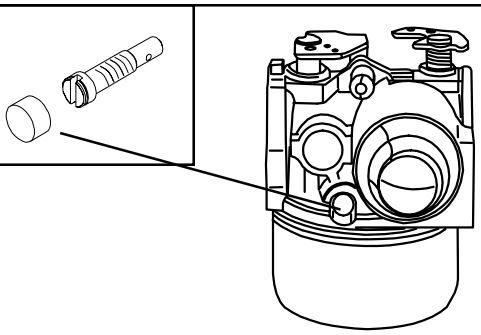
The Series 9 carburetor uses the same body as the Series 8 but has a simple fixed idle system, identical to the one used on the Series 6 carburetor. It has the idle discharge port located at the 7 o'clock position on the throttle end of the carburetor. Identify this carburetor by the stepped primer bulb, the presence of a non-drilled idle mixing well and a serviceable main nozzle emulsion tube. (diag. 19)



19

SERIES 10 (EMISSION)

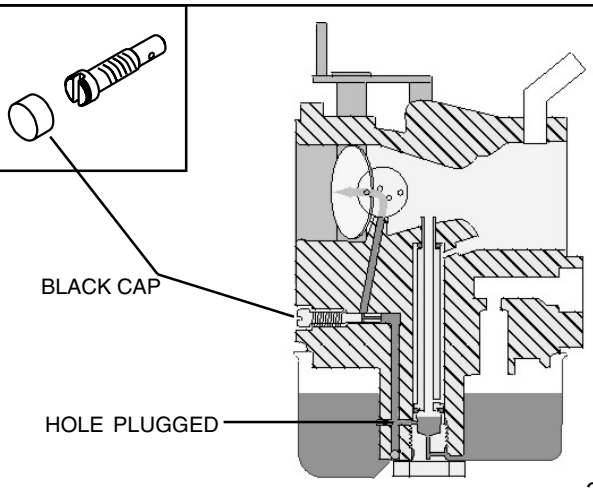
The Series 10 carburetor is identical to the Series 8 carburetor with the addition of a choke to assist in cold weather starts. It also has a fixed idle and main. The idle restrictor jet is capped to prevent access unless the cap is removed. The fixed main jet is part of the bowl nut. A ball plug is visible from the bottom, which seals the metering passage. This carburetor also has a serviceable main nozzle emulsion tube and a stepped primer bulb to assist in starting. (diag. 20)



20

SERIES 11

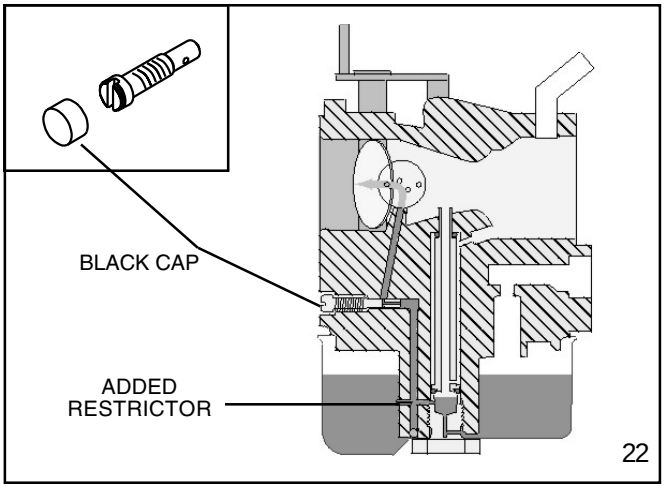
The Series 11 carburetor is used on most LEV model engines. This carburetor contains a patented auto-enrichment system for improved starting and performance of a cold engine. The system contains a fuel well that is filled as part of the priming procedure and emptied as the engine runs in the first minute. This added fuel provides smooth operation of today's emission grade engines. The carburetor can be identified externally by the BLACK colored restrictor cap (diag. 21). Internally the standard Series 11 is identified by the plugged passage as shown.



21

SERIES 11 BRIDGED

Externally this carburetor looks identical to the standard series 11 with the black restrictor cap. The difference is internal through the addition of a second idle feed passage with a restrictor as shown. This extra passage improves run quality during light load engine operation (diag. 22).

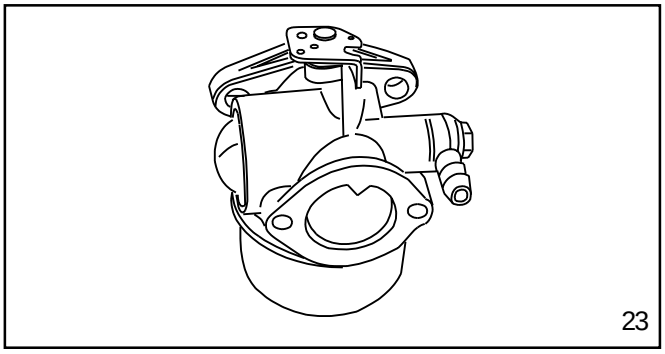


22

NON-TECUMSEH CARBURETORS

DELLORTO CARBURETOR

The Dellorto carburetor is similar to the dual system carburetor. It has no adjustments and has a primer assist start. It has a noncorrosive float and the needle is viton tipped, eliminating the viton seat found in the dual system carburetor. The angle of the fuel inlet is adjustable and attached to the carburetor body with a banjo bolt. This carburetor is used on some TVS rotary lawnmower engines.


23

ENGINE TROUBLESHOOTING

Engine Will Not Start

Check For Spark

Check If Spark Plug Is Wet or Dry

Wet

- Defective Spark Plug
- Restricted Air Filter
- Improper or Stale Fuel
- Sheared or Partially Sheared Flywheel Key
- Carburetion Problems Due to Flooding, Over Priming, etc.
- Ignition System

Dry

- Check Fuel Supply and Fuel Cap Vent
- Restriction in Fuel System (filter, screen)
- Carburetion Problem
- Poor Compression

CARBURETION TROUBLESHOOTING

	START			IDLE					ACCELERATE			HIGH SPEED				
AIR SYSTEM PROBLEMS	Hard Starting	Fuel Leak at Carburetor	Engine Floods	Will Not Idle	Rich Idle	Idles with Needle Closed	Hunts - Erratic Idle	Idles Fast - Lean	Will Not Accelerate	Over Rich Acceleration	Hesitates	Will Not Run at High Speed	Low Power	Hunts at High Speed	Runs with Needle Closed	Engine Over-speeds
Plugged Air Filter	●			●	●				●	●		●	●			
Leaky Carburetor Gasket				●			●	●			●					●
Throttle or Choke Shafts Worn	●			●			●	●					●	●		●
Choke Not Functioning Properly	●															
Plugged Atmospheric Vent		●	●													
Air Bleed Restricted	●			●	●		●		●		●			●		
Damaged or Leaky "O" Rings		●					●	●						●		●
DIAPHRAGM SYSTEM PROBLEM																
Damaged Diaphragm	●	●		●				●					●		●	
Stuck or Dirty Ball Check				●		●			●		●			●		
Diaphragm Upside Down	●															
FUEL SYSTEM PROBLEM																
Plugged Tank Filter or Vent	●								●		●	●	●			
Fuel Pick-up Restricted	●			●			●		●		●	●		●		
Idle Port Restricted				●			●									
Damaged Adjustment Needles	●			●	●	●	●		●			●	●	●	●	●
Incorrect Float Height			●				●		●	●			●	●		
Main Nozzle Restricted	●								●		●	●	●	●		
Dirty, Stuck Needle and Seat	●	●	●										●			
Fuel Inlet Plugged	●			●			●						●	●		

TESTING

1. After repeated efforts to start the engine using the procedure listed in the operator's manual fail, check for spark by removing the high tension lead and the spark plug. Install a commercially available spark plug tester and check for spark. If spark is evident and acceptable, proceed to step 2. If no or weak spark, see Chapter 8 under "Testing".
2. Visually inspect the spark plug for a wet condition indicating the presence of gasoline in the cylinder.
3. If the spark plug is dry, check for restrictions in the fuel system before the carburetor. If the spark plug is wet, continue with step # 7. Check to see if the fuel cap vent is open. With a proper draining receptacle, remove the fuel line clamp on the carburetor fuel inlet and pull the fuel line off the fitting to examine the fuel flow and fuel condition.
4. Remove the air cleaner element or air cleaner assembly to visually check that the choke shutter completely closes or check to see if fuel comes out from the main nozzle during priming.
5. If the fuel flow is adequate and no fuel is evident during priming, the carburetor will need to be removed for service. See "Service" in this chapter or consult the "Carburetion Troubleshooting" chart if other problems exist. Improper fuel flow indicates the fuel, fuel line, filter or tank require cleaning or replacement.
6. Check the engine compression using a commercially available compression tester and follow the tester's recommended procedure. Low compression, a dry spark plug, adequate fuel flow, and a known good functional carburetor indicates an internal engine problem exists. See Chapter 9 under "Engine Operation Problems."
7. A wet spark plug indicates fuel is being supplied by the carburetor. The engine may be flooded by a restricted air filter, carbon shorted or defective spark plug, excessive choking or over priming, improperly adjusted or defective carburetor, or the wrong ignition timing. With the spark plug removed and a shop towel over the spark plug hole, turn the engine over slowly 3 or 4 times to remove excess gasoline from the engine cylinder.

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER.

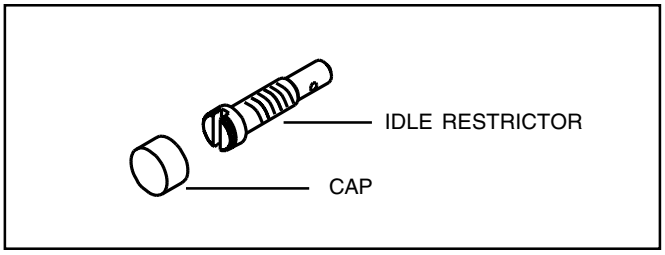
8. Replace the air filter if restricted or oil soaked. Replace the spark plug if questionable. Install the spark plug and high tension lead and retry starting the engine.
9. If the engine floods and fails to start, the carburetor may require service. See the preceding "Carburetion Troubleshooting" chart for additional causes. If the carburetor is functioning properly the problem may be ignition timing related. See Chapter 8 under "Ignition Troubleshooting."

SERVICE

CARBURETOR PRE-SETS AND ADJUSTMENT

NOTE: EMISSION GRADE CARBURETORS HAVE FIXED IDLE AND MAIN JETS. THE ABSENCE OF THE ADJUSTING SCREW INDICATES A FIXED JET OR RESTRICTOR AND NO ADJUSTMENT IS NECESSARY. THE IDLE RESTRICTOR ON AN EMISSIONS CARBURETOR APPEARS AS AN ADJUSTABLE SCREW. THIS IS NOT ADJUSTABLE AND MUST REMAIN TIGHT FOR PROPER OPERATION.

The idle on an emission is metered using a threaded restrictor (see Illustration). Proper torque of this screw is critical and should be torqued to 5-8 in. lbs. or .5 to 1 nm, if not, it may vibrate loose. When the restrictor is placed in the idle circuit passage it is capped with a tamper resistant plastic cap. **Tampering is considered the rejetting or modification through resizing of the jet.** If the jet is removed for cleaning it must be recapped to prevent tampering when it is re-installed.



Before adjusting any mixture screws the necessary carburetor presets should be made. Check for the proper governor adjustments as outlined in Chapter 4. Identify the correct carburetor model and manufacturer to find locations of the high and low speed adjustment screws. Check the throttle control bracket for proper adjustment allowing a full choke shutter position. See Chapter 4 under "Speed Controls and Linkage". Check to see if the normal maintenance procedures have been performed (oil changed, fresh fuel, air filter replaced or clean). Consult microfiche card #30 to find the correct R.P.M. settings for the engine, or consult Service Bulletin #107 for the revised safety specification for rotary type power lawn mowers. Start the engine and allow it to warm to operating temperature. The carburetor can now be adjusted.

PRE-SETS AND ADJUSTMENTS

(TECUMSEH AND WALBRO CARBURETORS)

NOTE: OVERTIGHTENING WILL DAMAGE THE TAPER PORTION OF THE NEEDLE. All adjustments should be made with the carburetor in the operating position.

Turn both the main and idle mixture adjusting screws in (clockwise) until finger tight.

Now back the mixture screws out (counterclockwise) to obtain the pre-set figure in the chart shown at right.

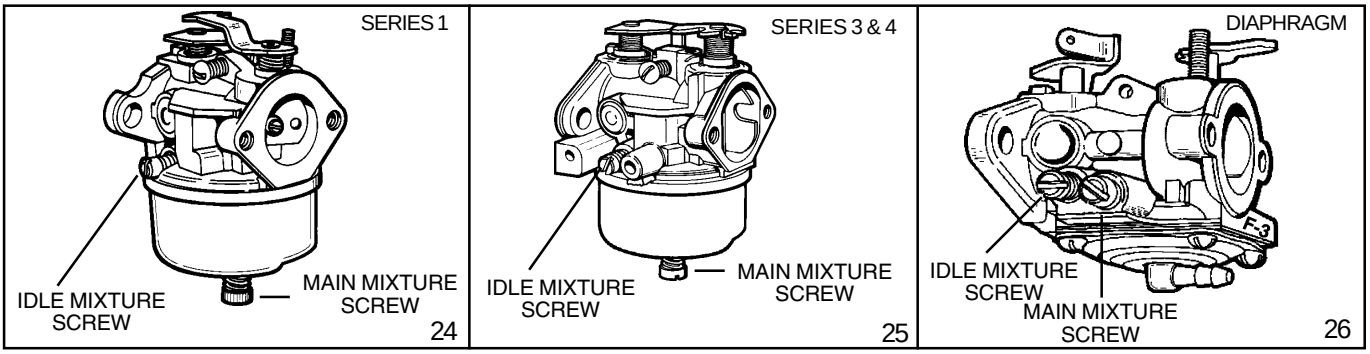
Tecumseh Carburetors		
Engine Model	Main Pre-set	Idle Pre-set
All models with float-type carburetors	1-1/2 turn	1 turn
All models with diaphragm-type carburetors	1 turn	1 turn
Walbro Carburetors		
Carburetor Model Number		
LMH	1-1/2 turn	1-1/2 turn
WHG & LME	1-1/4 turn	1-1/4 turn
LMK	Fixed	1 turn

FINAL ADJUSTMENTS (NON EMISSION ENGINES)

Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the HIGH or FAST position. From the recommended preset position, turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic (lean). Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic (rich). Turn the screw in (clockwise) midway between these two positions. This will be the best setting. (diag. 24, 25 & 26).

Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment screw.

TECUMSEH CARBURETORS



If further adjustment is required, the main adjustment should be made under a loaded condition.

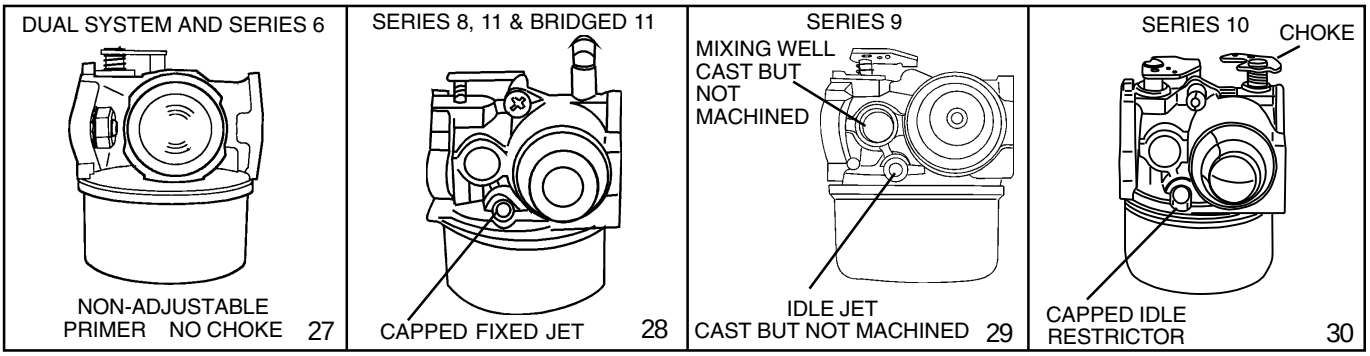
If the engine stops or hesitates while engaging the load (lean), turn the main mixture adjusting screw out (counterclockwise) 1/8 turn at a time, testing each setting with the equipment under load, until this condition is corrected.

If the engine smokes excessively (rich), turn the main adjusting screw in (clockwise) 1/8 turn at a time, testing each setting with the equipment under load, until this condition is corrected.

After the main mixture screw is set, move the speed control to the IDLE or SLOW position. If the engine does not idle smoothly, turn the idle mixture screw 1/8 turn either in (clockwise) or out (counterclockwise) until engine idles smoothly.

Recheck the high and low R.P.M. setting and adjust as necessary.

NON-ADJUSTABLE CARBURETORS

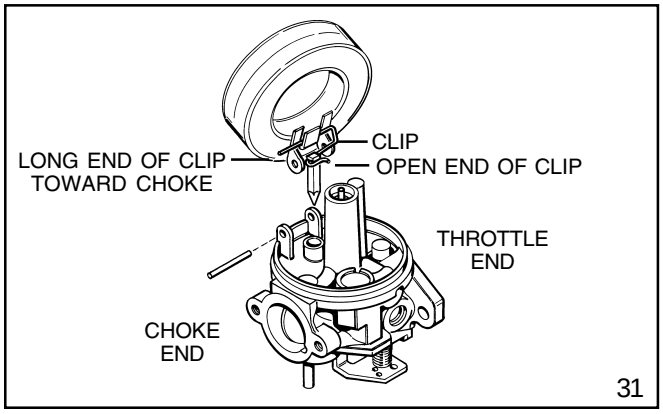


DISASSEMBLY PROCEDURE

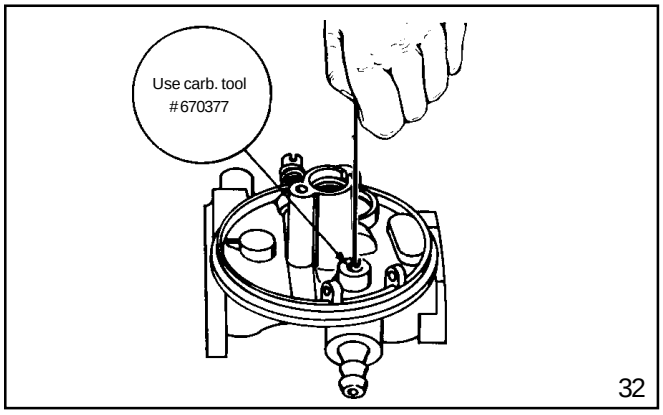
NOTE: Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from the factory settings unless specifically authorized.

FLOAT STYLE CARBURETORS

1. Note or mark the high and low mixture adjusting screws to aid in reassembly (if applicable). Remove the high speed adjusting screw, bowl nut, and float bowl. Remove the idle mixture screw assembly.
2. Note the position of the spring clip on the inlet needle and float, the long end of the clip must face toward the choke end of the carburetor. Remove the float hinge pin with a needlenose pliers. Some carburetors use a float dampening spring to aid the inlet valve in maintaining a steady position during rough service applications. Note the position of the hooks before removing the float hinge pin (diag. 31).
3. Remove the float, clip, and inlet needle.
4. Remove the inlet needle seat using the Tecumseh carburetor tool #670377 as shown. Push the hook through the hole in the center of the seat to remove it. (diag. 32).
5. Note or mark the action of the choke and throttle shutters, and/or the hook points of the choke or throttle return spring, or seal retainer springs located on the top of the choke and/or throttle shaft. Remove the throttle shutter, throttle shaft, choke shutter, springs and choke shaft by removing the screw(s) that attach the throttle or choke shutter to the shaft inside the air horn.
6. Remove the primer bulb (if equipped) by grasping it with a pliers and pulling and twisting out of the body. Remove the retainer by prying and lifting it out with a screwdriver. Do not re-use the old bulb or retainer (diag. 33).
7. Some Tecumseh float style carburetors have a damper spring which is installed as shown. (diag. 34)



31



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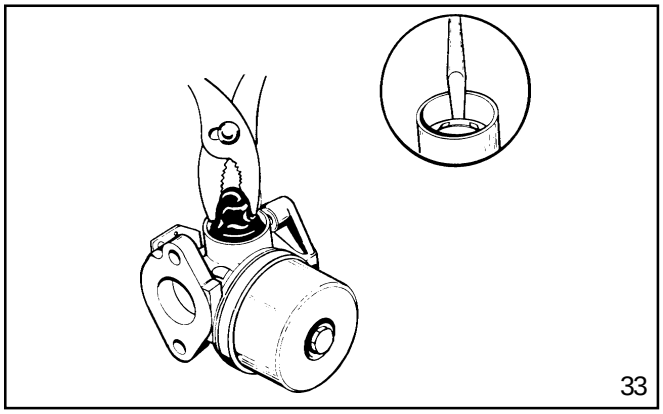
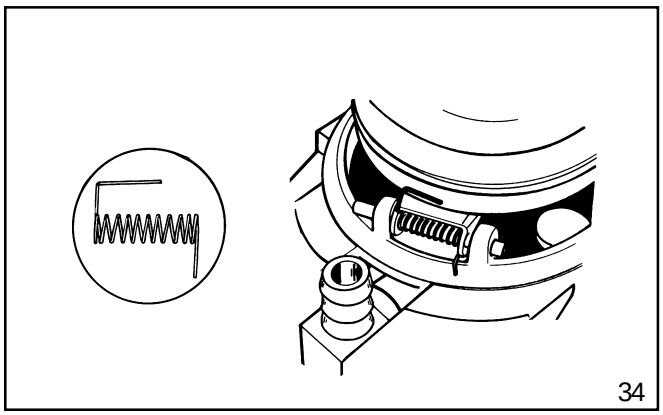

33


34

8. Remove all welch plugs if cleaning the carburetor. Secure the carburetor in a vise equipped with protective jaws. Use a small chisel sharpened to a 1/8" (3.175 mm) wide wedge point. Drive the chisel into the plug to pierce the metal, then push down on the chisel to pry the plug out of the hole (diag. 35).

NOTE: DO NOT REMOVE ANY BALL OR CUP PLUGS (diag. 37).

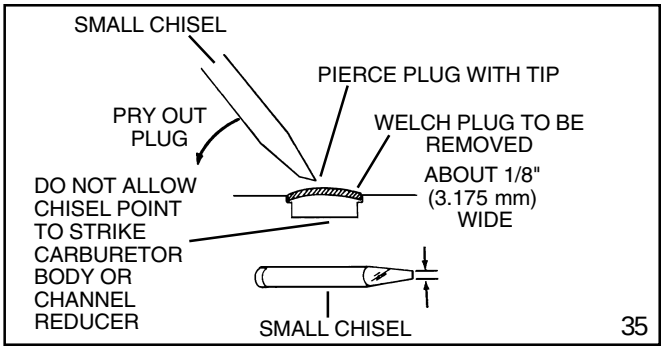
9. Note the direction of the inlet fitting. If necessary the inlet fitting can be removed. (See page 24).

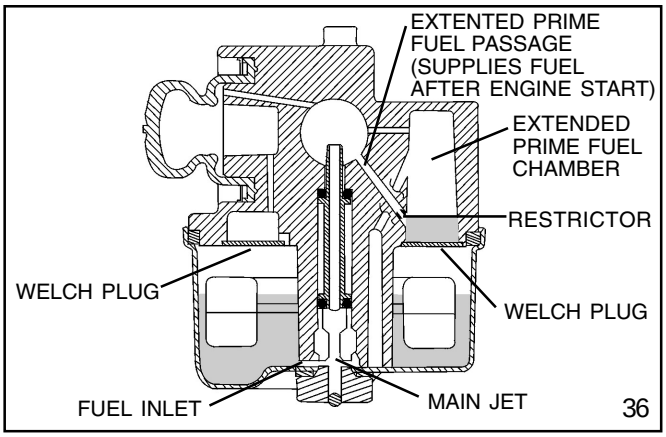
10. The main nozzle on Series 8 and Series 9 carburetors can be removed by pressing the tube outward from the venturi thru the center leg. This nozzle is non-metallic and has an "O" ring seal on the top and bottom end of the tube. Do not remove a main nozzle that is made of brass from any Tecumseh carburetor. These are pressed in at the factory to a specific depth. When removing the nozzle, the top "O" ring may not come out with the tube. The "O" ring must be removed and placed on the nozzle before it is placed back into the center leg or it will not seal properly. (diag. 38)

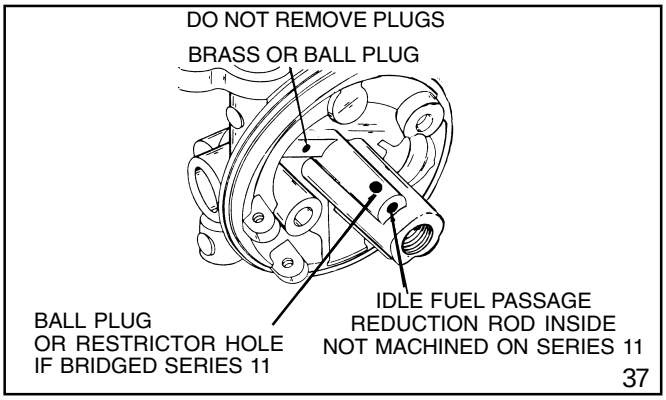
11. **Servicing the standard series eleven and bridged model.**
When servicing the series eleven DO NOT soak it in dipping type carburetor cleaners, use only spray cleaner or standard solvent tank cleaners. Proper cleaning requires removal of both welch plugs and cleaning of the restictor(s) as equipped.

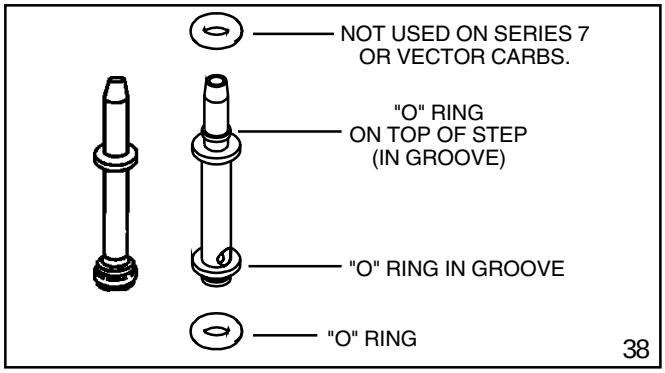
The standard series eleven has one restictor in the extended prime well as shown (diag. 36). The Bridged series eleven has an additional restrictor on the idle leg of the carburetor as shown (diag. 37). Both are cleaned using spray carburetor cleaner, compressed air and soft tag wire no larger than .012 inch (.3mm) or damage will occur.

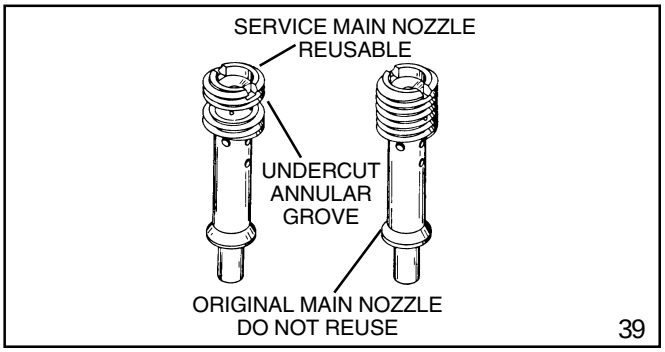
The main nozzle on some Walbro carburetors are removable for service. If you remove it, a service nozzle with the under cut fuel passage must be installed or problems will occur (diag. 39).











Diaphragm Carburetors

1. Remove the screws holding the diaphragm cover on.
2. Remove the cover, gaskets, and diaphragm noting or marking the sequence or location to aid in reassembly.

   NOTE: If a "F" designation on the choke end of the carburetor is present, place the diaphragm on first, then the gasket and cover. If no "F" is present, the gasket goes first.
3. Note or mark the high and low mixture adjustment screws. Remove the screw assemblies.
4. Note or mark the action of the choke and throttle shutters and the hook points of the choke or throttle return spring or seal retainer springs located on the top of the choke or throttle shaft. Remove the throttle shutter, throttle shaft, choke shutter, springs and choke shaft by removing the screw or screws that attach the throttle or choke shutter to the shaft inside the air horn.
5. Use a 9/32" (7.144 mm) thin wall socket to unscrew and remove the inlet needle and seat assembly (diag. 40).
6. Note and mark the direction of the inlet fitting. If necessary the inlet fitting can be removed by pulling with a pliers or vise. Some diaphragm carburetors have a strainer as an integral part of the fuel fitting. If the strainer is lacquered or cannot be cleaned, the fitting must be replaced.
7. Remove all welch plugs if cleaning the carburetor. Secure the carburetor in a vise equipped with protective jaws. Use a small chisel sharpened to a 1/8" (3.175 mm) wide wedge point. Drive the chisel into the plug to pierce the metal, then push down on the chisel to pry the plug out of the hole.

NOTE: DO NOT REMOVE ANY BALL OR CUP PLUGS.

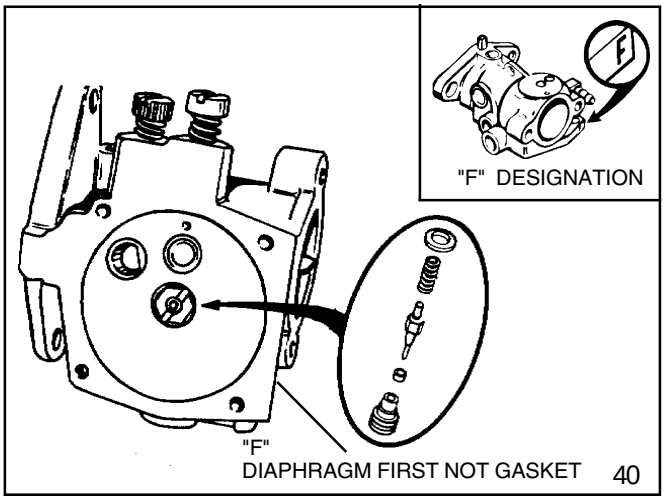
IMPULSE FUEL PUMP

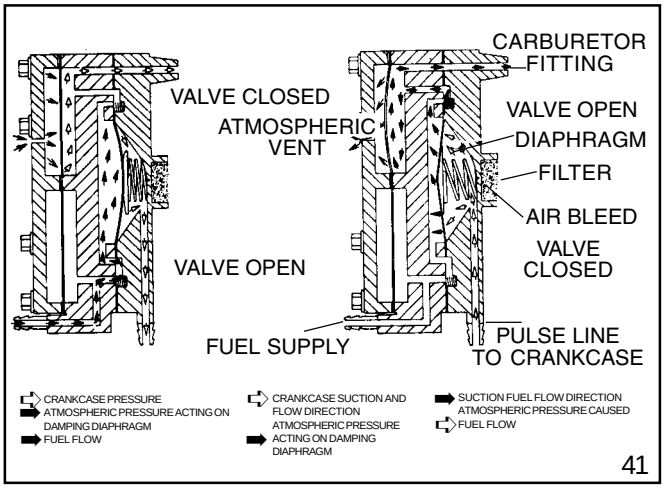
To service, disassemble the pump by removing the four (4) screws. Clean all parts with a solvent and install a new kit which consists of a coil spring, gaskets and diaphragms (diag. 41 & 42).

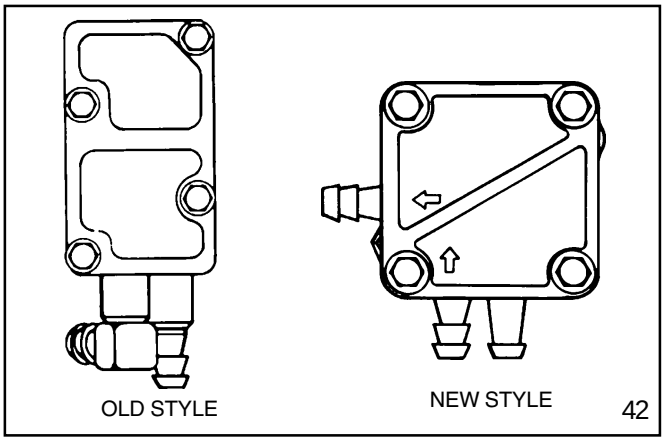
FLOAT ADJUSTING PROCEDURE

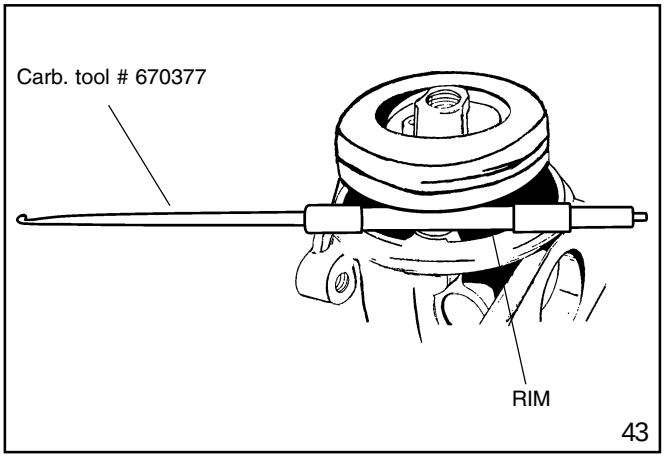
All Tecumseh carburetors with an adjustable float require a specific float height adjustment to achieve proper operation and easy engine starts. To check the float height, hold the carburetor in an upside down position. Remove the bowl nut, float bowl, and "O" ring. Place the Tecumseh carburetor tool #670377 with flat dimensions of 11/64" (4.36 mm) across the top of the carburetor casting on the opposite side and parallel to the float hinge pin (diag. 43). The float must just touch the carb tool. If the float is too high or too low, adjust the height by bending the float tab accordingly. If the required adjustment is minor, the tab adjustments may be made without removing the float and carefully inserting a small bladed screwdriver to bend the tab.

Float sticking can occur due to fuel deposits or when the fuel tank is filled for the first time, this condition can be quickly corrected by loosening the carburetor bowl nut one full turn. Turn the bowl 1/4 turn in either direction, then return the bowl to its original position and tighten the bowl nut.









INSPECTION

After careful disassembly of the carburetor and the removal of all non metallic parts, the carburetor body and all other metallic parts should be cleaned with solvent, or commercial carburetor cleaner, no longer than 30 minutes. Use compressed air and soft tag wire to clean internal carburetor passages. To do a proper cleaning job, the welch plugs must be removed to expose the drilled passages.

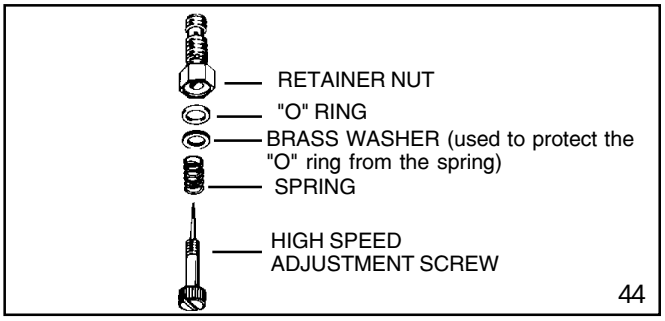
NOTE: The nylon check balls used in some diaphragm carburetors are not serviceable. Nylon can be damaged if subjected to harsh cleaners for prolonged periods.

Throttle and Choke

Examine the throttle lever and shaft, choke lever and shaft, and carburetor body at the bearing points and holes into which the linkage is fastened, and replace if worn or damaged. Any looseness in these areas can cause dirt to enter the engine and cause premature wear. If dust seals are present, these should be positioned next to the carburetor body.

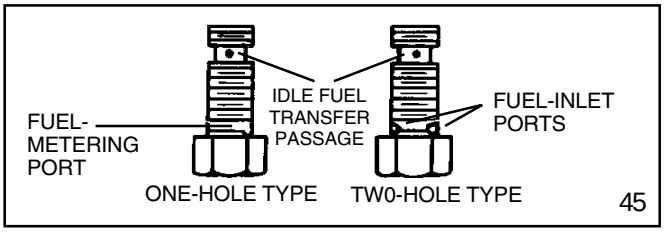
Idle and High Speed Mixture Adjusting Screw

Examine the idle mixture needle tip and tapered surface for damage. The tip and tapered surface of the needle must not show any wear or damage at all. If either is worn or damaged, replace the adjusting needle. Tension is maintained on the screw with a coil spring. Examine and replace the “O” ring seal if damaged (diag. 44).



44

Examine the tapered surface of the high speed mixture needle. If the tapered surface is damaged or shows wear, replace the needle (non-emissioned). Some Tecumseh carburetors use serviceable jet main nozzles. These are identified as being non-metallic.



45

Fuel Bowl Retaining Nut

The retaining nut contains the transfer passage or metering jet through which fuel is delivered to the high speed and idle circuit of the carburetor. If a problem occurs with the idle circuit, examine the small fuel passage in the annular groove in the retaining (metering) nut. This passage must be clean for the proper transfer of fuel into the idle metering circuit. Torque retaining nut to 50 in. lbs. (5.65 Nm) when reinstalling.

There are two different types of bowl nuts that are used on adjustable main, float style carburetors. One type has one fuel metering port at the bottom of the nut, and the other has two fuel inlet ports at the bottom of the nut. This difference relates to calibration changes to the carburetor and is dependent on the application (diag. 45).

NOTE: DO NOT INTERCHANGE BOWL NUTS.

The fuel inlet ports must be free of any debris to allow proper fuel flow.

Fuel Bowl, Float, Needle and Seat

The float bowl must be free of dirt and corrosion. Clean with solvent or carburetor cleaner.

Examine the float for damage. Check the float hinge bearing surfaces for wear, as well as the tab that contacts the inlet needle. Replace any damaged or worn parts.

The needle and seat should be replaced if any fuel delivery problems are experienced (flooding or starvation). Sealing problems with the inlet needle seat may not be visible, so replacement is recommended.

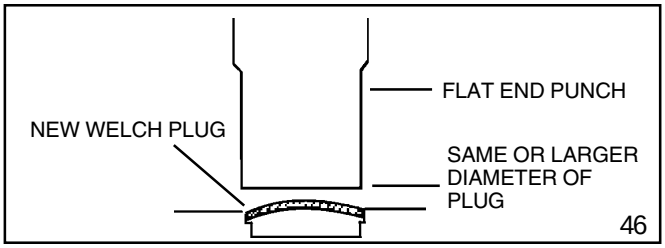
Diaphragms, Pulse Pumps, and Primer Bulbs

Inspect diaphragms, gaskets, and primer bulbs for cracks, tears, hardness or brittleness. Replace if necessary.

ASSEMBLY

Welch Plugs

To install a new welch plug after cleaning the carburetor, secure the carburetor in a vise equipped with protective jaws. Place the welch plug into the receptacle with the raised portion up. With a punch equal to, or greater than the size of the plug, merely flatten the plug. Do not dent or drive the center of the plug below the top surface of the carburetor. After installation of the welch plug, seal the outer diameter with finger nail polish or equivalent (diag. 46).



46

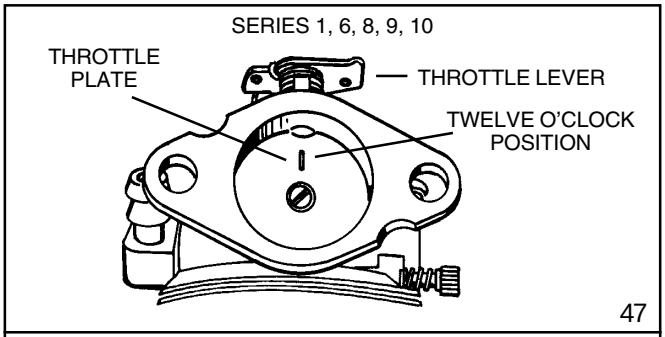
Throttle Shaft and Plate

When reassembling, it is important that the lines or lettering on the throttle plate are facing out when in the closed position. Position throttle plate with two lines at 12 and 3 o'clock. If the throttle plate has only one line, the line should be positioned in the 12 o'clock position on Series 1, 6, 8, and 9 carburetors, and positioned in the 3 o'clock position on Series 3 and 4 carburetors (diag. 47 & 48).

Test the operation of the throttle and return spring (if equipped). If binding occurs, correct by loosening screws and repositioning throttle plate.

Always use a new screw(s) when reinstalling the throttle shutter (Tecumseh screws are treated with dry-type adhesive to secure them in place).

NOTE: NEVER REUSE OLD SCREWS.



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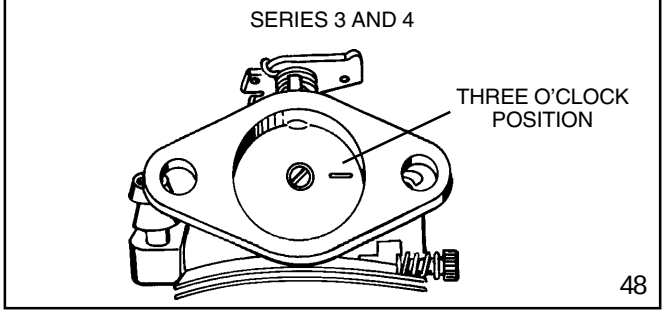


48

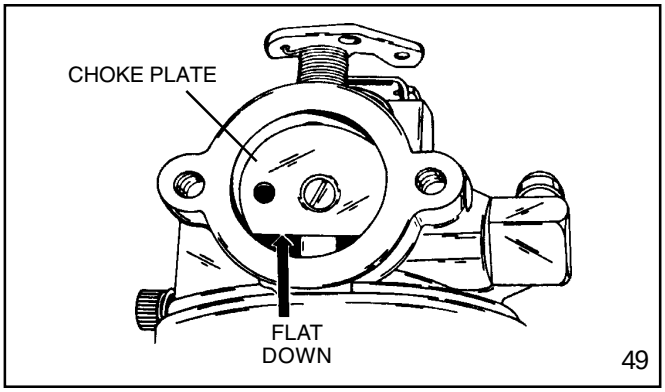
Choke Shaft and Plate

The choke plate is inserted into the air horn of the carburetor in such a position that the flat surface of the choke is down. Choke plates will operate in either direction. Make sure it is assembled properly for the engine. Test the operation of the choke and return spring function if equipped (diag. 49).

Always use a new screw(s) when reinstalling the choke shutter as the screws are treated with dry-type adhesive to secure them in place.

NOTE: NEVER REUSE OLD SCREWS.

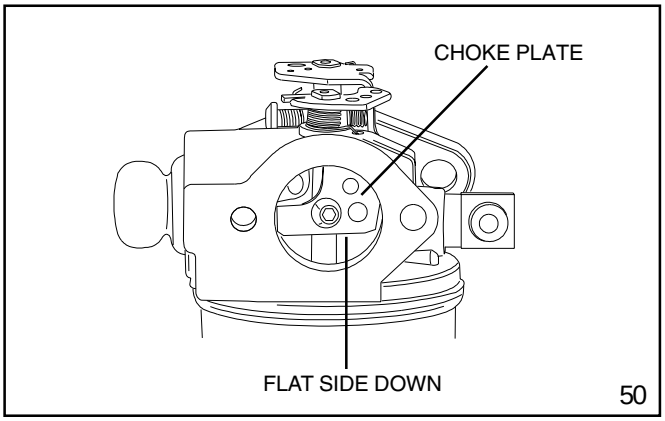
The choke shaft and plate must be in the closed position prior to tightening the screws. Hard starting may be due to insufficient choking action because of a misaligned choke plate. Correct by readjusting the choke plate to close completely. Note the cut-out position of choke shutter if applicable.



49

Fuel Inlet Fitting

Support the carburetor body with a wood block to avoid damage to other parts. Use a bench vise or press to install the fitting squarely. Insert the tip into the carburetor body, coat the exposed portion of the shank with Loctite grade A, then press it in until the shoulder contacts the carburetor body.



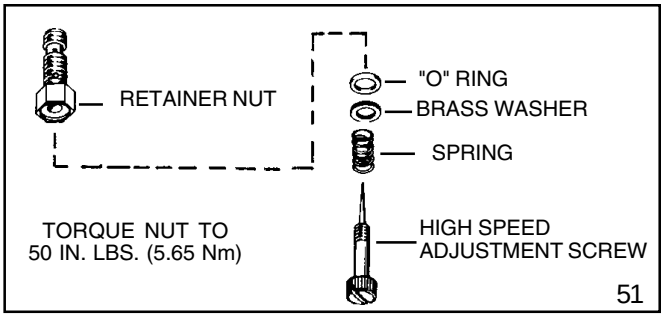
50

High and Low Speed Adjusting Screw, Main Nozzle

When reassembling, position the coil spring on the adjusting screws, followed by the small brass washer and the “O” ring seal. Turn the high speed adjustment screw in approximately one turn into the bowl retainer nut to make an assembly (diag. 51).

On 2-7 hp. engines that use carburetors which have the metering rod in the idle circuit (carburetor should rattle when shaking), make certain that the idle adjustment screw is installed when the carburetor is in an upright position or the needle will damage the metering rod, adjustment screw and carburetor casting.

Some carburetors are of the fixed main type and would not have a high speed adjusting screw.



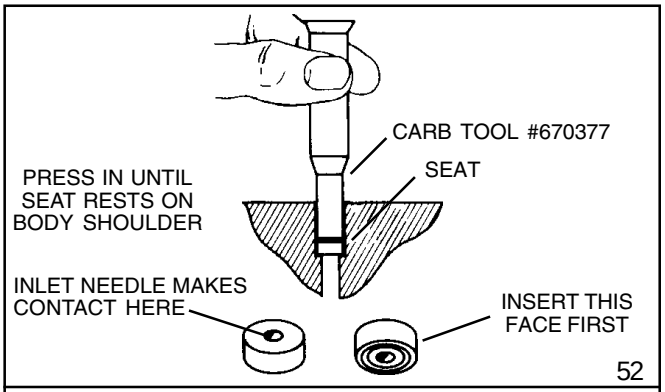
51

Inlet Needle and Seat

On float type carburetors, make sure the seat cavity is clean. Moisten the seat with oil and insert the seat with the grooved side down and away from the inlet needle. Press the seat into the cavity using the Tecumseh carburetor tool #670377 making sure it is firmly seated (diag. 52).

The inlet needle hooks onto the float tab by means of a spring clip. To prevent binding, the long, straight end of the clip should face the air intake end of the carburetor as shown (diag. 53).

On diaphragm carburetors the inlet needle and seat assembly are installed by using a socket to tighten the assembly until seated.



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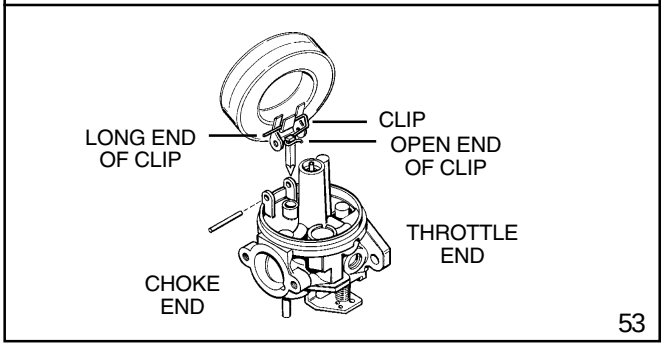
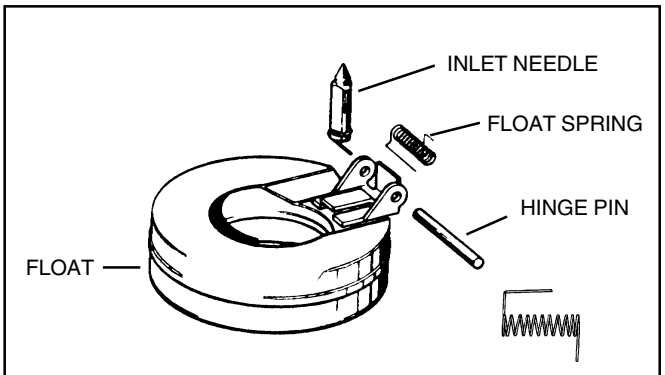


53

Needle and Seat Pop-Off Test

To test the pop-off pressure, remove the carburetor from the engine. Be sure to drain any fuel into an approved container. Invert the carburetor and remove the float bowl. This test is best performed when the carburetor is placed upside down and level in a soft jawed vice. Lift the float and needle assembly off of the seat in order to place a drop of WD-40 on the tip of the needle or on the seat surface. Reposition the float and needle assembly. Using the Tecumseh Leak Tester part # 670340, connect the high pressure regulator to the low pressure regulator and attach the clear low pressure air line to the carburetor fuel inlet. Apply approximately 5-6 psi of compressed air, close the gate valve and disconnect the low pressure guage from the high pressure guage. Monitor the low pressure guage to make sure the needle shouldn't drop below 1.5 psi before 1 minute of time elapses. If the minimum of 1.5 psi cannot be maintained for this period of time, then replacement of the needle and seat is required.



54

Float Installation

Reinstall the inlet needle and float into the carburetor. The long end of the spring or clip on the inlet needle must point toward the air intake end of the carburetor. If a float dampening spring is used, reassemble using the following steps (diag. 54).

1. Place the float upside down.
2. Position the spring on the float with the long end around and to the back side of the float’s center back tang. The ends must point toward the choke end of the carburetor. Hook the inlet needle clip on the inside float tang so the clip end points to the choke end of the carburetor (diag. 54).
3. Place the float, float spring, clip and inlet needle in position between the hinge legs of the carburetor. As the float assembly nears the hinge legs, wind the outside end of the spring so it goes to the outside of the leg (counterclockwise looking from the choke end).

4. Install the hinge pin from the opposite hinge leg. The bowl gasket must be positioned over the end of the spring (diag. 55).

5. Set the proper float height. See “Float Adjusting Procedure” in this chapter.

Diaphragm Assembly

The rivet head on the diaphragm must always face toward the inlet needle valve. On carburetors with an “F” cast into the carburetor flange as illustrated, the diaphragm goes next to the carburetor body. Other diaphragm carburetors have the gasket located between the diaphragm and carburetor body. Install the cover retaining screws and tighten (diag. 56).

Fuel Bowl And Bowl Nut

Whenever a carburetor bowl is removed for service, the fuel bowl “O” ring **must be replaced**. For easier installation, lubricate the “O” ring with a small amount oil.

Install the float bowl by placing the detent portion opposite of the hinge pin. Make sure the deepest end of the bowl is opposite of the inlet needle. The bowl has a small dimple located in the deepest part. The purpose of this dimple is to minimize the chances of the float sticking to the bottom of the bowl caused by stale fuel (diag. 57).

On some fixed jet (non-adjustable) and adjustable carburetors, a fibered washer is required between the carburetor bowl and the bowl retaining nut.

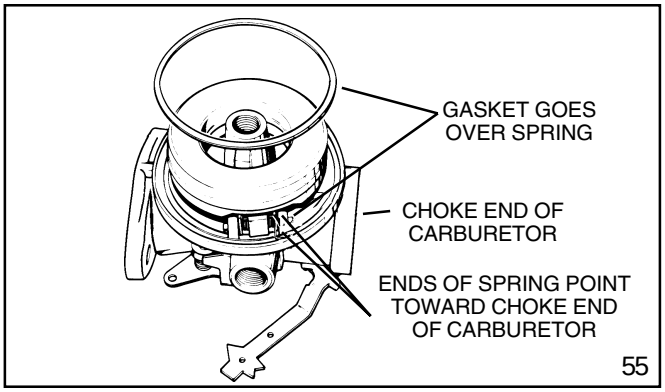
Occasionally, on engines equipped with the dual system carburetor, some rich starting conditions have occurred when the engine is warm. This condition can be corrected by inserting a non-metallic spacer in the center leg of the carburetor, as shown (part # 632158). This spacer is designed to reduce the amount of prime charge in the main nozzle area for better starting under warm engine conditions. It can only be used on Dual System carburetors and does not lean out the carburetor mixture. (diag. 58) This spacer must be reinstalled if originally equipped in the carburetor.

Impulse Fuel Pump

The diaphragms must be installed against the center body with the gaskets against the outside covers. The parts are designed so they cannot be misassembled without damage (diag. 58).

To test the unit, assemble the carburetor to the engine, leaving the fuel line from the pump off. Use a different fuel tank remotely placed above the carburetor to provide gravity fuel flow to the carburetor inlet to run the engine while testing the pump. Make sure fuel is available in both fuel tanks and that the original fuel tank's fuel line is connected to the fuel pump inlet. Place the pump outlet line in a proper draining receptacle. With the pulse line connected from the engine crankcase to the pump and the engine running, a definite fuel flow should result at the pump outlet.

If the flow is erratic or intermittent, the pump needs repair or replacement.



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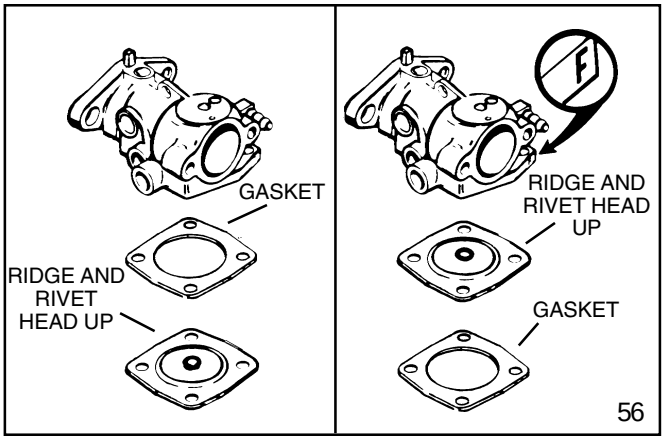

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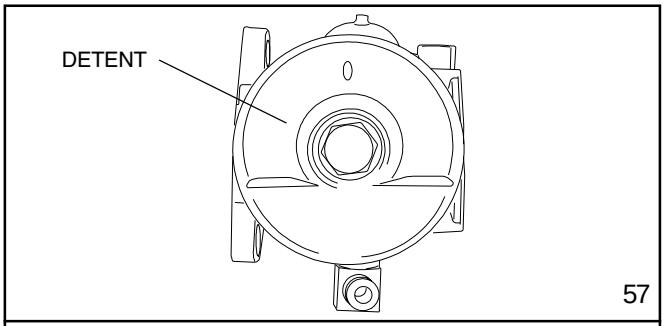

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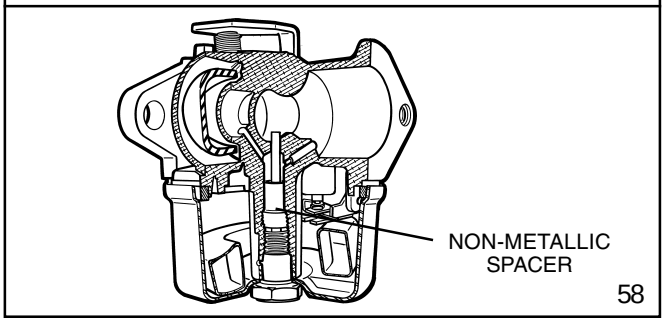
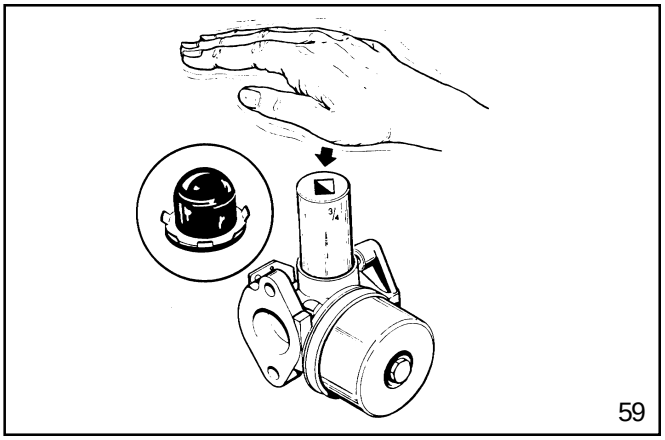


58

Primer Bulb

To install, start the retainer and bulb into the casting with the retainer tabs pointed out. Firmly push the bulb and retainer into position using a 3/4'' (19.05 mm) deep well socket (diag. 59).


59

Final Checks

Before reinstalling a newly overhauled carburetor, pre-set the main mixture adjustment screw, the idle mixture adjustment screw and the idle speed adjustment screw. See “Pre-sets and Adjustments” in this chapter.

STANDARD SERVICE CARBURETORS

Tecumseh supplies some replacement carburetors on which parts from the old carburetors can be reused or new parts added. This Standard Service Carburetor helps to reduce dealer inventories.

Standard Service Carburetors are built in both float and diaphragm versions.

The parts from the original carburetor that are necessary to make a standard service carburetor are: choke shaft, shutter and spring, throttle lever and spring, fuel fitting, idle adjustment screw and spring. If any or all of these old parts are worn or damaged, replace each part with a new service part to assure proper function and prevent engine damage. Use the diagrams on the next page as a guide to facilitate the correct installation of parts (diag. 61 & 62).

Fuel Fitting

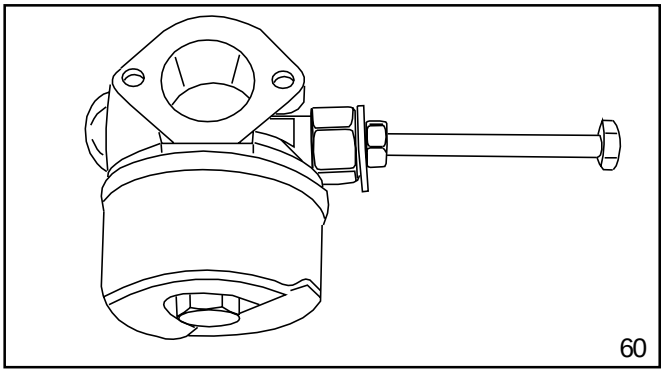
NOTE: MOST SERVICE CARBURETORS ARE MARKED “SVC CARB NF” IN THE PRICE LIST. THIS MEANS THAT THE CARBURETOR COMES WITH NO FUEL FITTING.

Use the parts manual to obtain the same fuel inlet fitting that was installed in the original carburetor. Install the fuel fitting in the new carburetor body in the same position as on the original carburetor. Support the carburetor body with a wood block to avoid damage to other parts. Use a bench vise or press to install the fitting squarely. Press it in until it bottoms out.

NOTE: PRESS FUEL FITTING IN SQUARELY USING CAUTION SO THAT THE CARBURETOR BODY IS NOT DAMAGED.

Inlet Fuel Fitting

To remove a leaking or damaged fuel inlet fitting, use a 1/4"(6 mm) bolt, 1/4" (6 mm) nut and 1/4" (6 mm) washer, along with a 1/2" (12 mm) nut. Use a pliers or vise to remove the plastic part of the inlet fitting. Tap the inside of the remaining metal portion of the fitting using a 1/4"- 20 (6 mm) tap. Place a 1/2" (12 mm) nut over the fuel fitting (it may be necessary to guide one side of the nut to seat it squarely to the carburetor). Next thread the 1/4" (6 mm) nut on the bolt until it contacts the shank, add the washer, and thread the bolt into the fitting until snug. Tighten the 1/4"- 20 (6 mm) nut until the fitting is removed. (diag. 60)


60

Choke Shaft

NOTE: Never reuse choke or throttle shutter screws, always replace with new Tecumseh service screws.

Remove the choke shutter screw from the original carburetor and remove the choke shaft. Observe the position of the ends of the choke return spring if one is present. Also observe the position of the cut-out and/or holes in choke shutter. Some chokes turn clockwise and some turn counterclockwise, note the position of the choke shaft prior to removal from the old carburetor.

If a choke stop spring is present on the new carburetor and is not used on the old carburetor, cut it off with a side cutter or pull it out using a pliers.

Test the action of choke shaft to make sure it moves freely and easily and does not bind in either open or closed position. If binding occurs, loosen the shutter screw; reposition the shutter and tighten the screw.

Throttle Lever

Remove the throttle lever and spring and file off the peened end of the throttle shaft until the lever can be removed. Install the throttle spring and lever on the new carburetor with the self-tapping screw furnished. If dust seals are furnished, install them under the return spring.

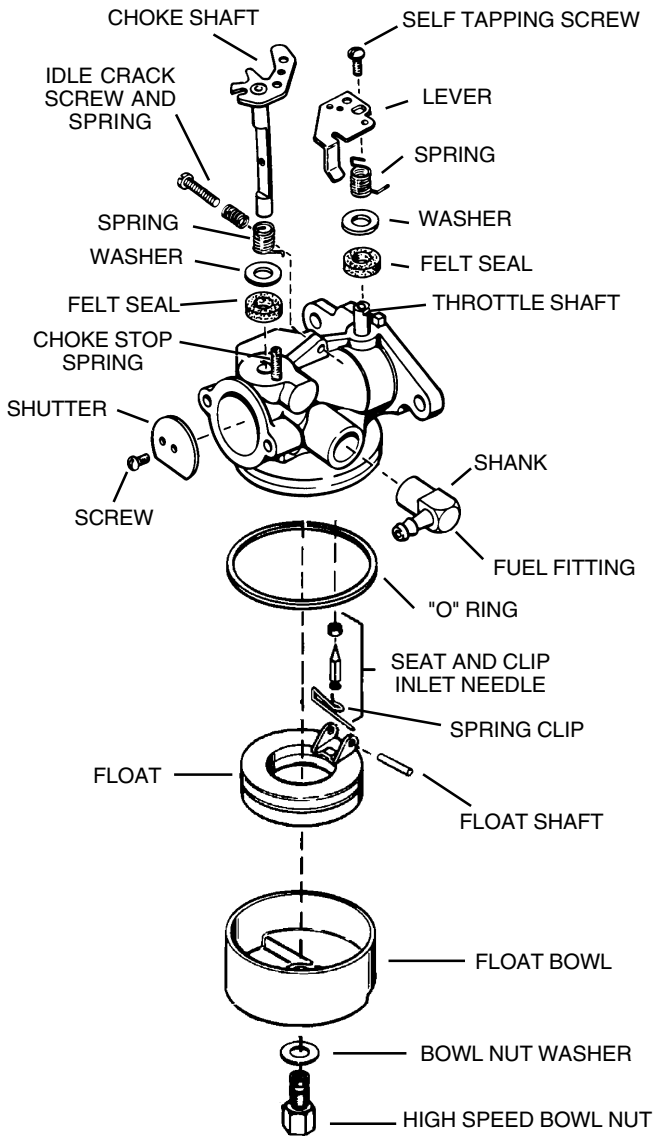
Idle Speed Adjustment Screw

Remove the screw assembly from the original carburetor and install it in the new carburetor. Turn it in until it contacts the throttle lever. Then an additional 1-1/2 turns for a static setting.

Final Checks

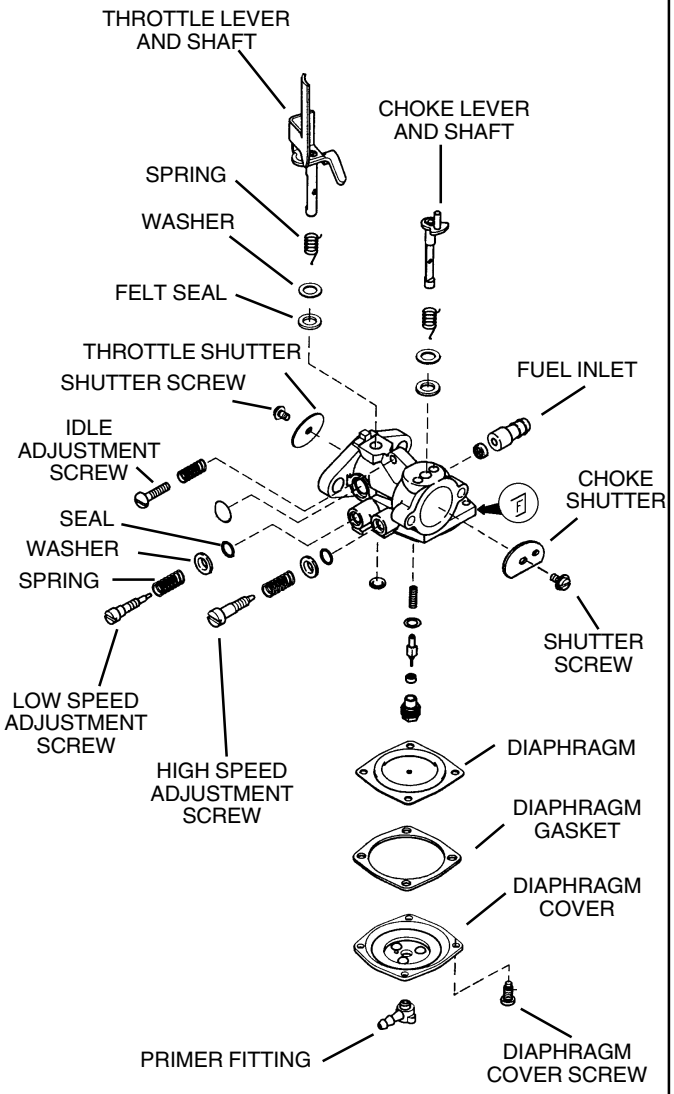
Consult the service section under “Pre-sets and Adjustments” and follow the adjustment procedures before placing the carburetor on the engine.

FLOAT TYPE CARBURETOR



61

DIAPHRAGM TYPE CARBURETOR



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CHAPTER 4 GOVERNORS AND LINKAGE

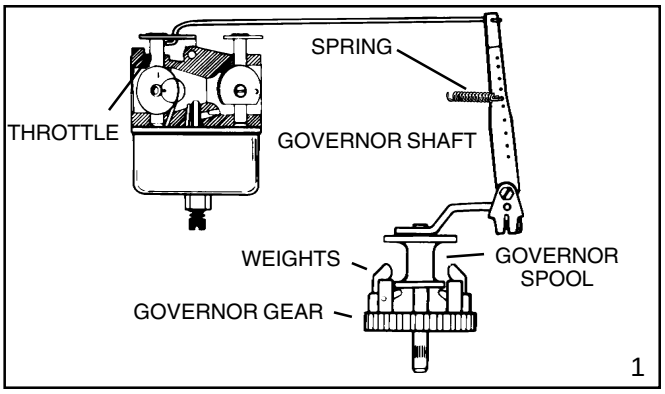
GENERAL INFORMATION

This chapter includes governor assembly and linkage illustrations to aid in governor or speed control assembly.

Tecumseh 4 cycle engines are equipped with mechanical type governors. The governor's function is to maintain a constant R.P.M. setting when engine loads are added or taken away. Mechanical type governors are driven off the engine's camshaft gear. Changes in engine R.P.M. cause the governor to move the solid link that is connected from the governor lever to the throttle in the carburetor. The throttle is opened when the engine R.P.M. drops and closes as the engine load is removed.

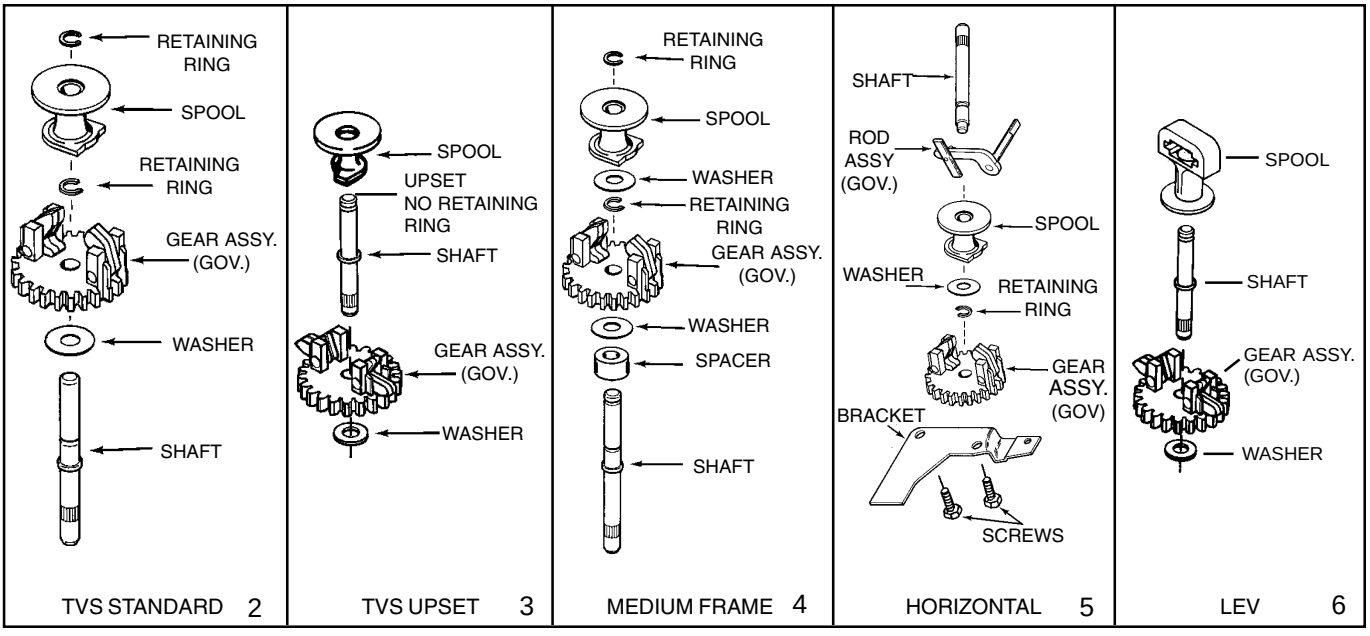
OPERATION

As the speed of the engine increases, the governor weights (on the governor gear) move outward by centrifugal force. The shape of the governor weights force the governor spool to lift. The governor rod maintains contact with the governor spool due to the governor spring tension. As the spool rises, the governor rod rotates, causing the attached outer governor lever to pull the solid link and close the throttle opening. When the engine speed decreases, the lower centrifugal force allows the governor weights to be pulled in by the governor spring. As the spool lowers, the governor rod rotates and the solid link pushes the throttle to a more open position (diag. 1).



1

INTERNAL COMPONENTS (VARIOUS STYLES)



TROUBLESHOOTING

Engine problems where the governor is suspected to be the cause, may actually be the result of other engine system problems. Hunting (engine R.P.M. surging up and down) indicates that the engine is incapable of maintaining a constant R.P.M. with or without an engine load. Engine overspeeding (either with or without throttle movement) must be corrected immediately before serious engine damage occurs. Use the following procedure to diagnose a suspected governor problems.

ENGINE OVERSPEEDING

1. If the engine runs wide open (faster than normal), shut the engine off **immediately.**
2. Check the condition of the external governor shaft, linkage, governor spring, and speed control assembly for breakage, stretching or binding. Correct or replace binding or damaged parts.
3. Follow the governor adjustment procedure and reset the governor - see "Service" in this chapter.
4. Run the engine. Be ready to shut the engine off if an overspeed problem still exists. If the problem persists, the engine will require disassembly to inspect the governor gear assembly for damage, binding, or wear.
5. See Chapter 9 under "Disassembly Procedure" to disassemble the engine.
6. Remove the governor gear assembly. Repair or replace as necessary.

ENGINE SURGING

1. Try to stabilize the engine R.P.M. by holding steady the solid link between the governor arm and the carburetor throttle, using a pliers or fingers.
2. If the engine R.P.M. stabilizes, the governor or governor adjustment should be checked. See "Service" governor adjustment procedure in this chapter. If the engine R.P.M. does not stabilize, the engine will require additional checks, see Chapter 9 under "Troubleshooting".
3. If the problem persists after the governor adjustment, check the engine R.P.M. found on microfiche card # 30. The R.P.M. settings are critical. If the R.P.M. setting for high and low speed are within specification and a slight surge is experienced, increasing the engine idle R.P.M. setting slightly may eliminate this condition.
4. Check the governor shaft or linkages for binding, wear, or improper hookup. Check the governor spring for adequate tension. Repair or replace as necessary.

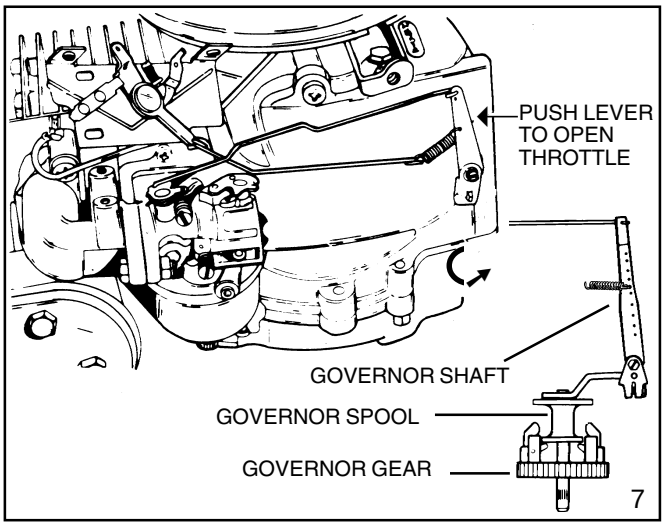
SERVICE

GOVERNOR ADJUSTMENT

With the engine stopped, loosen the screw holding the governor clamp on the governor lever. Rotate the clamp in a direction that will force the throttle shaft open and allow the governor follower arm to rest on the governor spool. Push the governor lever connected to the throttle to the wide open throttle position. Hold the lever and clamp in this position while tightening the screw (diag. 7).

GOVERNOR ADJUSTMENT PROCEDURE FOR SHORT BLOCK INSTALLATIONS

Short block installation on 3-5 h.p. vertical shaft engines built prior to 1977 may require the governor clamp (tinnerman style) to be repositioned to work properly. The clamp must be removed from the governor rod and turned to the same position as the original engine. Hook the solid link and spring to the governor lever and position the clamp on the governor rod. Follow the above governor adjustment procedure to complete the short block governor set-up. Units built after 1977 use the normal governor set up procedure. (diag. 8)



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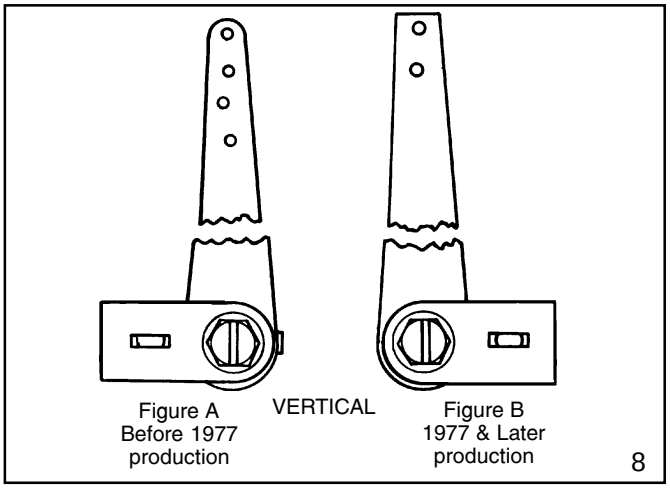


8

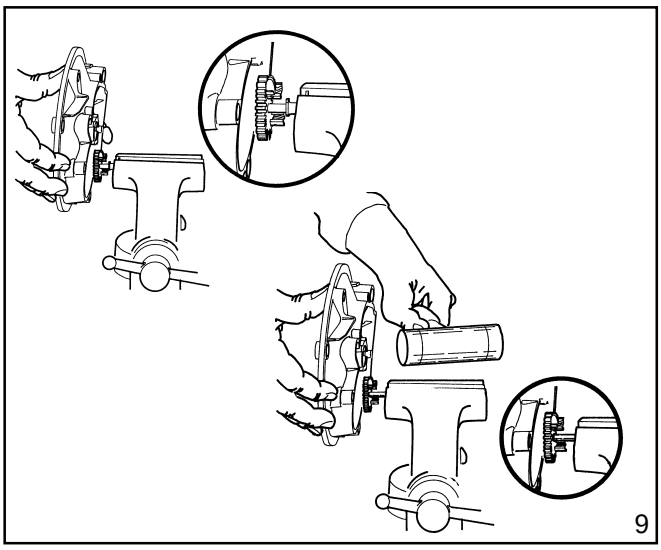
GOVERNOR GEAR AND SHAFT SERVICE

After the cylinder cover is removed from the engine, the governor spool, gear, or governor shaft can be removed. On older style governor assemblies, the retaining ring must be removed to allow the spool or gear to slide off the shaft. Newer style governor shafts (3 - 6.75 model engines) use an upset to hold the governor spool on. If the gear requires replacement, the governor shaft will have to be removed.

Governor Spool Replacement With Upset Style Governor Shaft

The spool can be replaced without removing the governor shaft. Grip the original spool in a vise and use a twisting and pulling motion on the flange until the spool is free.

Install the new spool by starting it on the shaft and then turning the flange over. This will allow the weights to hang in the proper position. Place the spool on a solid surface and push on the flange until the spool seats. The governor weights must be in position under the spool after installation. (diag. 9)

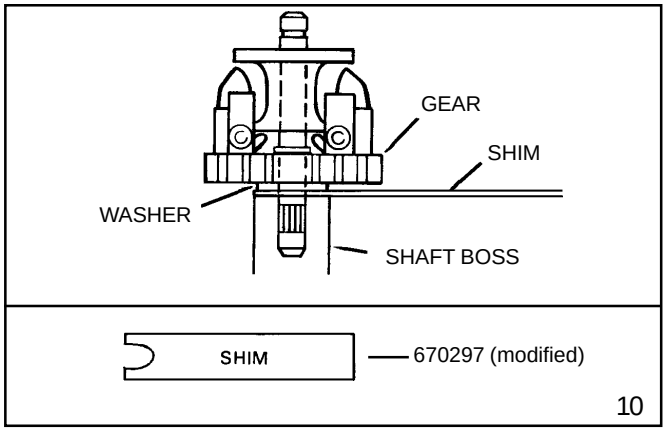

9

Governor Gear or Shaft Replacement, Upset Style Governor Shaft

1. Grip the original spool in a vise and use a twisting and pulling motion on the flange until the spool is free.
2. Clamp the shaft in a vise and pound gently on the flange with a wooden or plastic mallet to remove the shaft.

NOTE: DO NOT TWIST THE SHAFT WHEN REMOVING. THE SHAFT BOSS MAY BECOME ENLARGED, LEAVING THE NEW GOVERNOR SHAFT LOOSE AND CAUSING SEVERE DAMAGE.

3. To install a new shaft, first assemble the gear and washer on the shaft. Start the shaft into the hole with a few taps from a soft faced hammer.
4. Place the flange in a press with a solid piece supporting the area below the shaft boss. Press the shaft in until a shim, part # 670297 just becomes snug [.010 - .020 (.254 - .508 mm) clearance].



10

Governor Shaft Replacement, Retaining Ring Style

1. Remove the retaining ring, spool, gear assembly, and washers.
2. Clamp the shaft in a vise and pound gently on the flange with a wooden or plastic mallet to remove the shaft.

NOTE: DO NOT TWIST THE SHAFT WHEN REMOVING. THE SHAFT BOSS MAY BECOME ENLARGED AND THE NEW GOVERNOR SHAFT WILL BE LOOSE AND MOVE.

3. Start the new shaft into the shaft boss by tapping with a soft faced hammer.
4. Refer to the chart at right for the proper shaft exposed length. Add a drop of red Loctite 271 and press the governor shaft to the proper depth using a press or a vise. Wipe the extra Loctite off after installation (diag. 11).
5. Reassemble the governor and install the retaining ring.

ENGINE MODEL	EXPOSED SHAFT LENGTH
ECH90 ECV100 H 30, 35 HS 40, 50 LAV 35 LEV (all) OHH (all) OVRM (all) TNT 100, 120 TVS (all)	Mounting flange to Top 1.319 - 1.334" (33.502 - 33.883 mm)
TVM (all) V 50, 60, 70 VH 50, 60, 70	Mounting flange to Top 1.581 - 1.596" (25.806 - 26.314 mm)
HH 100, 120 VH 100	Mounting flange to Top 1.016 - 1.036" (25.806 - 26.314 mm)
H 50, 60, 70 HH 60, 70 HHM80 HM 70, 80, 100	Mounting flange to Shoulder 1.283 - 1.293" (32.588 - 32.842 mm)

11

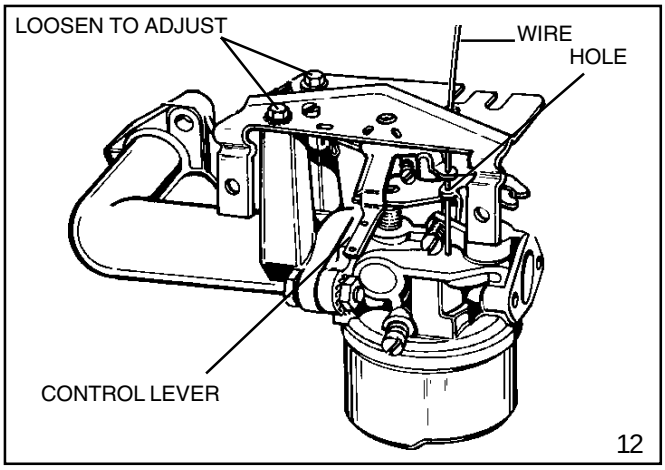
SPEED CONTROLS AND LINKAGE

Many different types of speed controls and linkage are used for O.E.M. applications. Linkage attachment points are best recorded or marked prior to disassembly. This assures the correct placement during reassembly. On vertical shaft engines the solid link is always connected from the outermost hole in the governor lever to the throttle in the carburetor. The link with the governor spring attached is connected between the control lever and the lower hole in the governor lever. Horizontal engines use one location (non-adjustable) speed control brackets. Most vertical engines use an adjustable speed control bracket mounted above the carburetor. The ignition ground out switch, idle R.P.M. and high speed R.P.M. adjustment screws are located on the speed control bracket. Some models use the idle R.P.M. adjustment on the carburetor.

Most vertical shaft engines must have the speed control bracket aligned when installing. To align the control bracket, use the following steps.

1. Loosen the two screws on the top of the panel.
2. Move the control lever to full wide open throttle position and install a wire or aligning pin through the hole in the top of the panel, the hole in the choke actuating lever, and the hole in the choke (diag. 12).
3. With the components aligned, tighten the two screws on the control panel.

The following pages illustrate common linkage attachment. Whenever the carburetor or the governor linkage is removed or replaced, the engine R.P.M.'s should also be checked. Use microfiche card #30 or the computer parts look-up system for the correct R.P.M. settings for the engine model and specification.

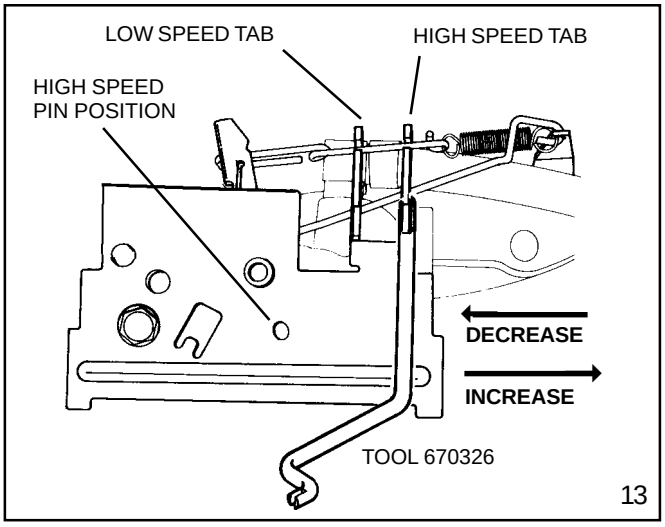


12

SNAP IN "STYLE SPEED CONTROL"

This style of speed control is used on 3 - 6.75 model rotary mower engines and is adjusted by two bendable tabs. Use the speed adjustment tool (part # 670326) as illustrated in diag.13 to adjust engine speed.

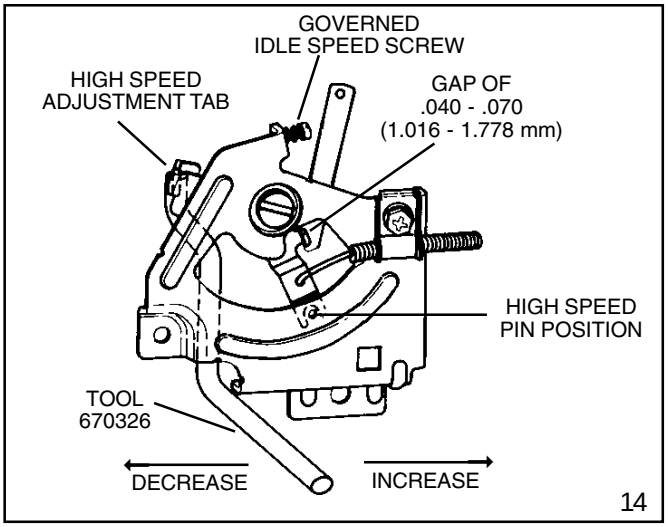
To adjust high speed, move the speed control lever to the high speed position and align the high speed pin holes. Place the adjustment tool on the high speed tab and move the tab to achieve the correct engine speed. Move the speed control lever to the low speed position, place the adjustment tool on the low speed tab and bend to either increase or decrease to the correct speed.



13

ADJUSTING RPM ON MEDIUM FRAME VERTICAL SPEED CONTROL

This speed control is adjusted by aligning the slot in the speed control lever with the alignment hole on the mounting bracket. Place a pin through the two holes, place the equipment throttle control to the wide open position, hook the bowden cable end in the control as shown, and tighten the cable housing clamp. In this position, the gap of .040" - .070" (1.016 - 1.778 mm) should exist at the gap location as illustrated. This will assure that the carburetor will go into full choke when the control is placed in the start position.



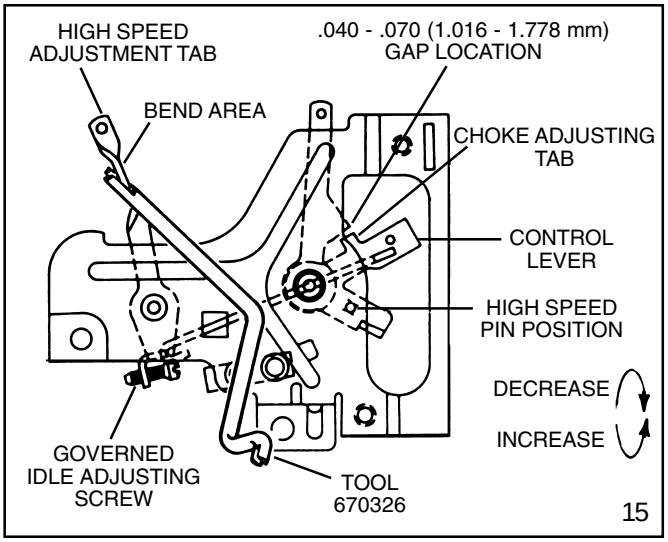
14

ADJUSTING GOVERNED/NON-GOVERNED

With the engine running at its lowest speed, set the governed idle at the designated RPM by adjusting the governed idle screw or bending the idle tab. Next set the non-governed idle by pushing the bottom of the governor lever away from the control brackets so the throttle lever contacts the idle speed crack screw (on the carburetor). Hold the lever in this position and turn the crack screw to 600 RPM below the governed idle speed. This setting prevents the throttle plate from closing off when going from high speed RPM to low speed RPM. If improperly adjusted, the engine could experience an over lean condition.

The idle speed is adjusted by turning the idle speed screw clockwise to increase engine R.P.M. and counter-clockwise to decrease R.P.M. Use tool part # 670326 to adjust the high speed engine R.P.M. Place the slotted end of the tool onto the adjustment tab and bend the tab to the left (toward the spark plug end) to increase engine R.P.M. (diag. 14).

NOTE: Some engines use nylon bushings on the throttle and choke linkage hook-up points to extend the life of the linkage and to enhance the stability of the governor system. Make sure they are in good condition and in place.

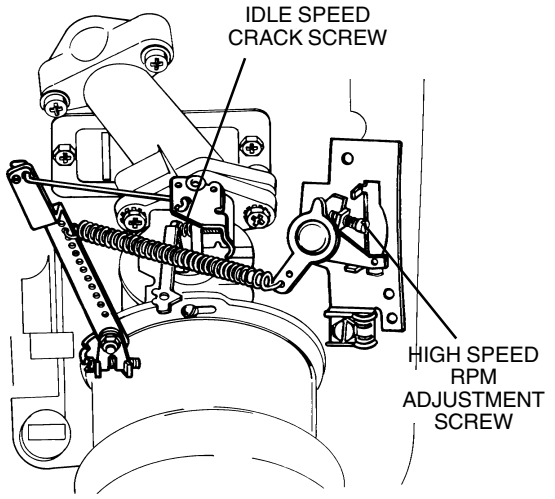


15

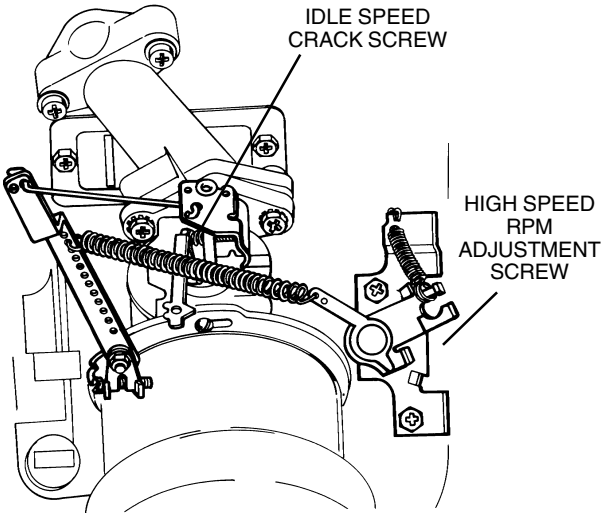
ADJUSTING RPM ON MEDIUM FRAME VERTICAL (up/down speed control)

To adjust the high speed RPM on Medium Frame Vertical engines, move the control lever to the high speed pin position (align high speed pin holes in the speed control bracket). Place the slot on the straight end of tool (number 670326) onto the high speed adjustment tab as pictured. Rotate the bent end of the tool counterclockwise to increase RPM and clockwise to decrease RPM. (diag. 15).

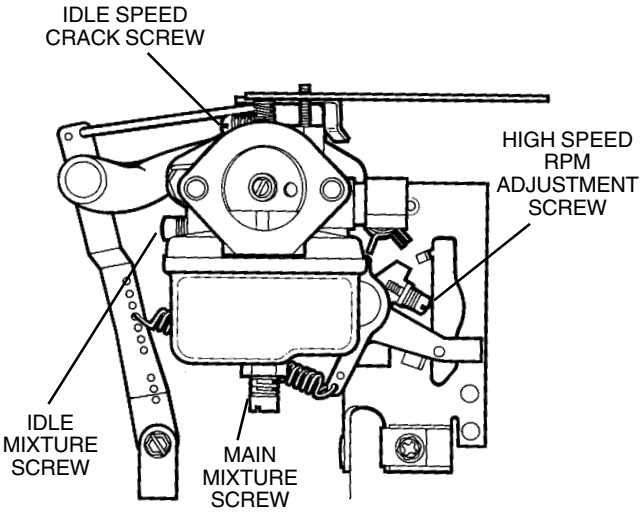
HORIZONTAL SHAFT ENGINES



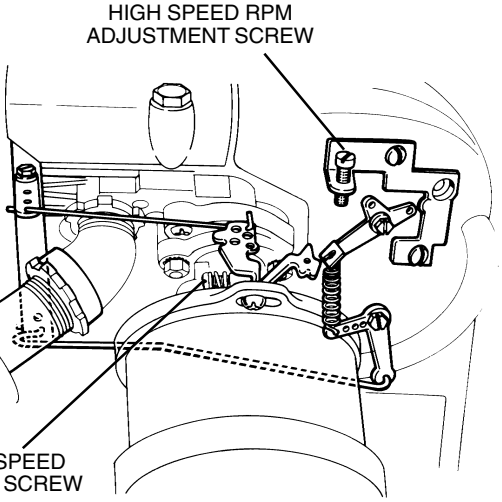
HORIZONTAL LIGHTWEIGHT 16



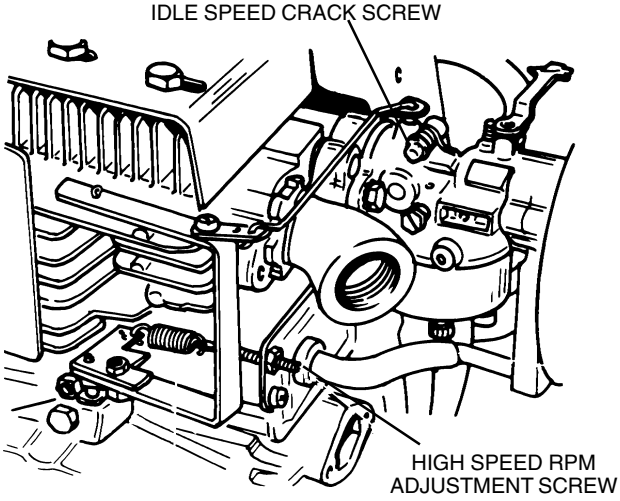
LIGHTWEIGHT R.V. TYPE 17



SMALL FRAME 18

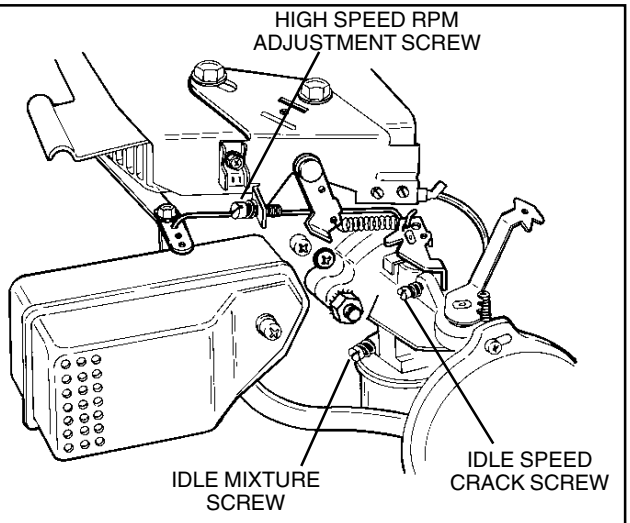


HORIZONTAL MEDIUM FRAME 19

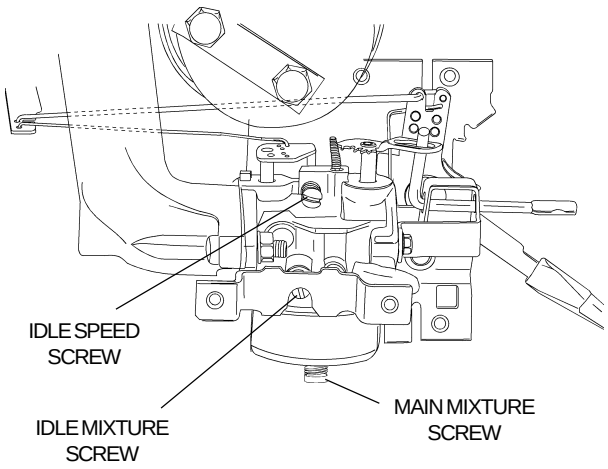


CONSTANT SPEED APPLICATIONS 20

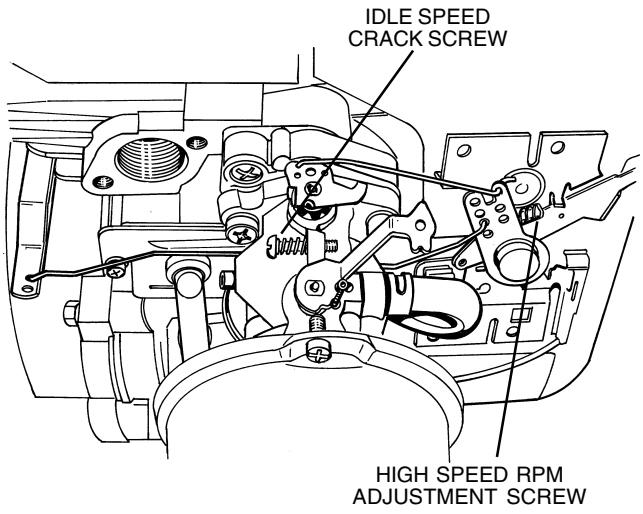
HORIZONTAL SHAFT ENGINES (CONTINUED)



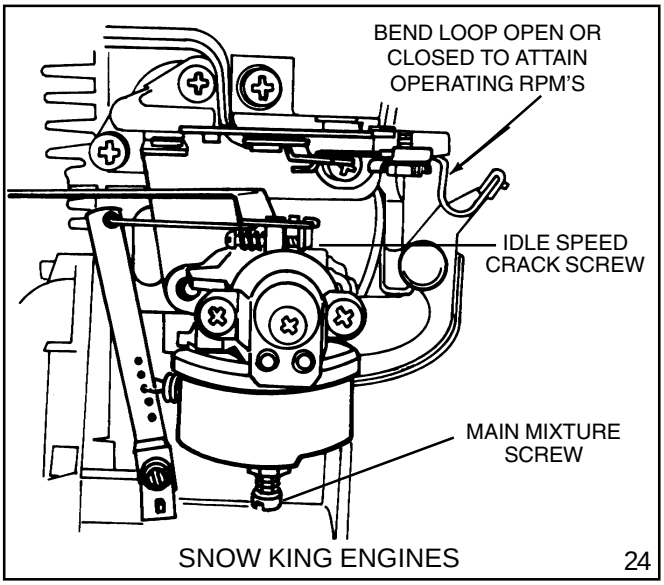
HORIZONTAL MEDIUM FRAME 21



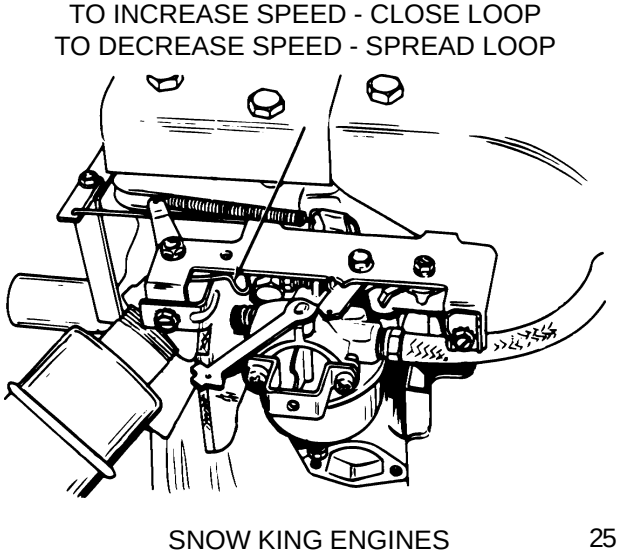
HMSK80-100 22



MEDIUM FRAME 23

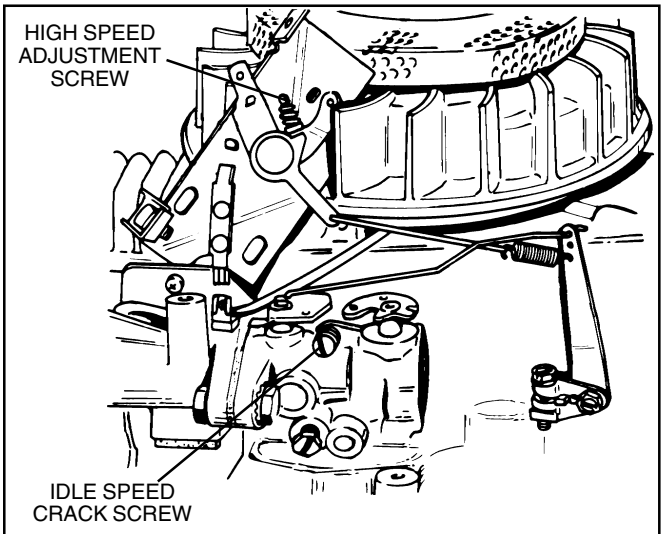


SNOW KING ENGINES 24

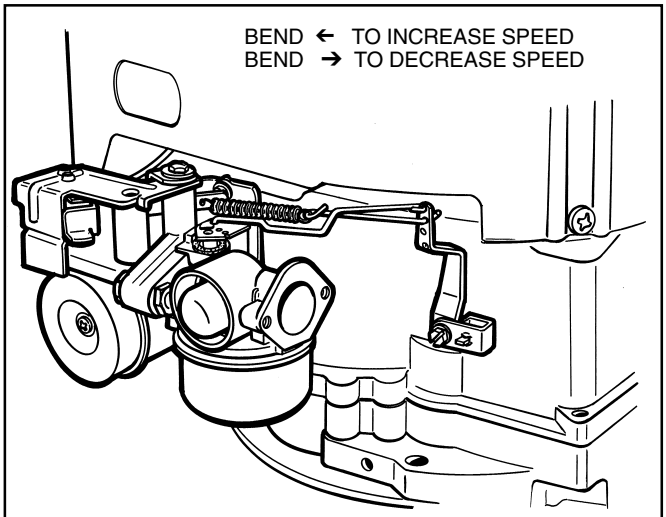


SNOW KING ENGINES 25

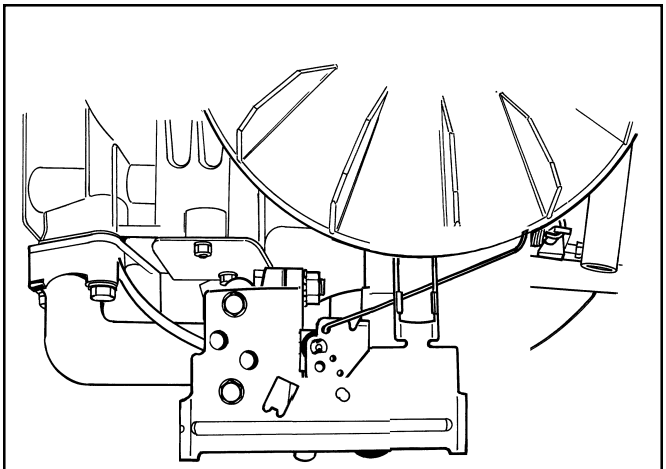
VERTICAL SHAFT ENGINES



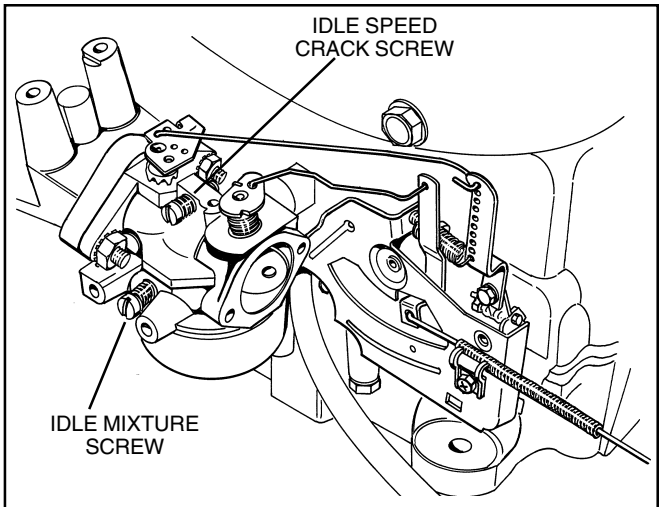
VERTICAL SHAFT ENGINES 26



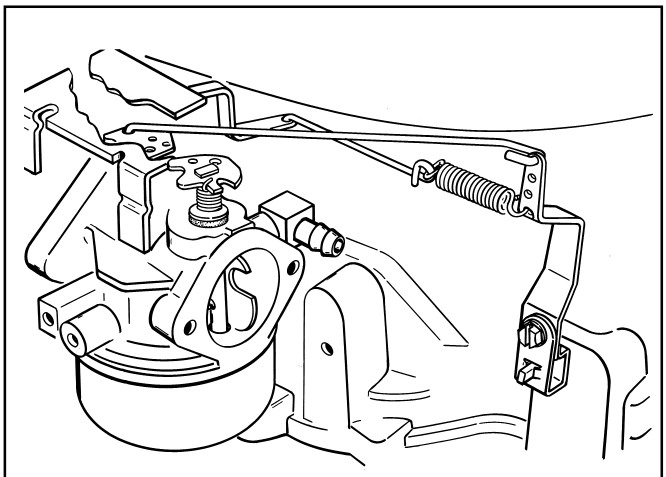
TNT 100 VERTICAL ENGINES 27



TVS 115/LEV ENGINE
SPEED CONTROL 28



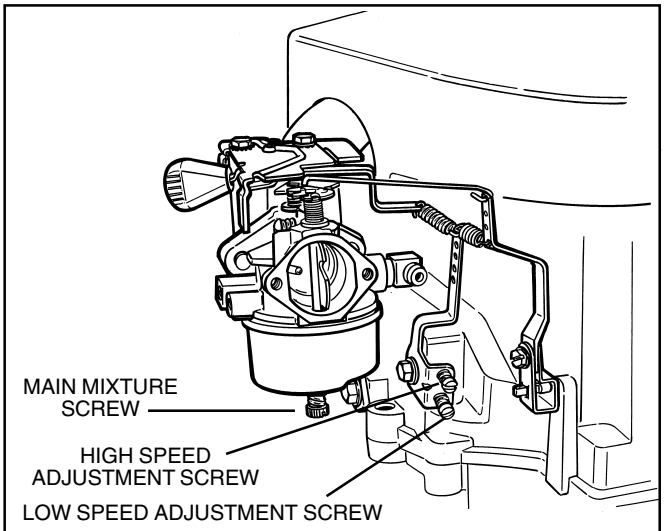
TVXL 220 WITH HORIZONTAL SPEED CONTROL
29



STANDARD TVM ENGINE WITHOUT GOVERNOR
OVERRIDE 30

GOVERNOR OVERRIDE SYSTEM FOR TVM170, 195 AND 220 ENGINES

This system will be found starting on 1985 production models, and will not retrofit onto older engines. It is designed to allow the governor to regulate the low and high speeds of the engine. The high speed is adjusted at the top screw of the override lever; to increase R.P.M. turn the screw out (counterclockwise), to decrease R.P.M. turn the screw in (clockwise). The low speed is adjusted at the bottom screw of the override lever; to increase R.P.M. turn the screw in or clockwise, to decrease R.P.M. turn the screw out or counterclockwise (diag. 31).



TVM ENGINES WITH GOVERNOR OVERRIDE 31

GOVERNED / NON-GOVERNED IDLE

With the engine throttle set at its lowest speed, set the governed idle at the designated RPM by bending the idle RPM tab or adjusting a screw. Next set the non-governed idle by pushing the bottom of the governor lever away from the control brackets, so the throttle lever contacts the idle speed screw. Hold the lever in this position and turn the idle adjustment screw clockwise to increase or counterclockwise to decrease engine idle speed. The setting on the carburetor screw should be set 600 RPM below the governed idle setting. This setting prevents the throttle plate from closing when going from high speed RPM to low speed RPM. If improperly adjusted, the engine could experience an over lead condition.

CHAPTER 5 REWIND STARTERS

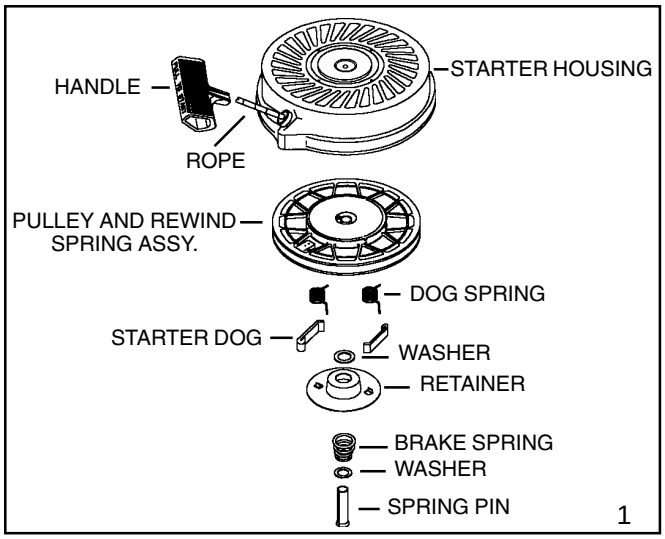
GENERAL INFORMATION

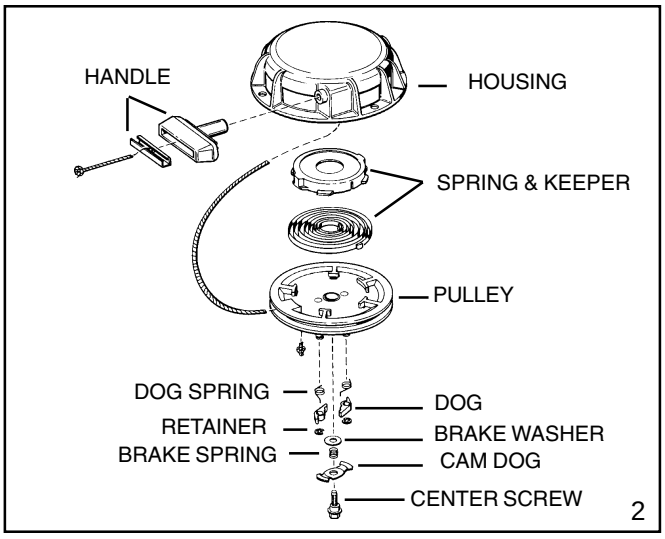
Rewind starters used on vertical shaft Tecumseh engines are top mount horizontal pull style or side mount vertical pull style. Horizontal shaft engines use side mounted starters which can be mounted to pull either vertically or horizontally. All rewind starters except the vertical pull style turn the engine over by engaging a dog(s) into the starter cup attached to the engine flywheel. The vertical pull starter engages the starter gear into the ring gear of the flywheel to turn the engine over. All starters are spring loaded to retract the dog(s) or starter gear when the engine speed exceeds the turning speed of the starter.

OPERATION

As the starter rope is pulled, the starter pulley rotates on the center pin. The starter dog(s) is pinned or pocketed in the pulley hub and extends outward when the pulley's rotation forces the starter dog(s) to contact the ears on the retainer. The retainer ears act as a ramp to fully extend the starter dog(s). The fully extended starter dog(s) locks in contact with notches in the starter cup. When the engine fires and the rotational speed of the starter cup exceeds the starter pulley, the starter dog(s) disengages from the starter cup. The starter dog spring(s) returns the starter dog(s) to the disengaged position. The recoil spring turns the starter pulley in the opposite direction, retracting the starter rope until the handle contacts the stop.

COMPONENTS





SERVICE

Starter related problems will require the starter to be removed from the engine to diagnose the cause. Visually inspect the starter dog(s), starter cup, retainer, springs, rope, washers, and the starter pulley for wear or breakage. Use one of the following procedures that applies to your application, to disassemble, repair, and assemble the starter. Always consult the Tecumseh Master Parts Manual for the correct replacement parts.

ROPE SERVICE

Rope replacement should be done using the correct part number replacement rope or braided rope of the correct diameter and length. Consult the Tecumseh Master Parts Manual to obtain the correct part number, length, and size required. Use the following rope chart to convert a numbered rope to a fractional diameter for bulk rope use.

# 4 1/2 rope	=	9/64" (3.572 mm) diameter	Part No. 730526	100' (30.48 meters) spool
# 5 rope	=	5/32" (3.964 mm) diameter	Part No. 730514	100' (30.48 meters) spool
# 6 rope	=	3/16" (4.762 mm) diameter	Part No. 730516	100' (30.48 meters) spool

Standard rope lengths

54" (16.5 meters)	standard stamped steel starter
61" (18.6 meters)	vertical pull - horizontal engagement type
65" (20 meters)	vertical pull - vertical engagement type
85" (26 meters)	extended handlebar rope start (compliance)

Check the old rope for the right length for the application. Some applications require longer lengths. The rope ends should be cauterized by burning with a match and wiping the rope end with a cloth while hot.

Rope replacement can be done without the starter being disassembled on vertical pull starters that have "V" notches in the bracket. Use the following procedure for rope replacement.

1. Remove the starter assembly from the engine.
2. Turn the pulley until the staple in the pulley lines up with the "V" notch. Pry out the staple with a small screwdriver and remove the original rope (diag. 3).
3. Turn the pulley counterclockwise to fully wind the starter return spring until tight. Allow the pulley to unwind until the hole in the pulley lines up with the "V" notch.
4. Hold the pulley in this position and feed the new rope through the hole and tie a left-handed knot on the rope end. Make sure the rope and knot do not protrude from the knot cavity and bind the pulley rotation.

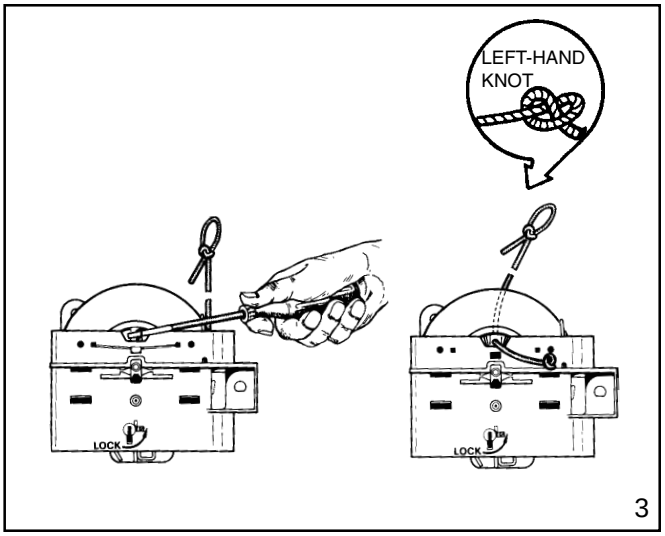
RETAINER REPLACEMENT (DIAGRAM 4)

1. Remove the starter handle if the retainer is a complete circle design. Remove the staple and old retainer.
2. Slide the rope retainer into the proper position and insert the staple using a pliers.
3. Install the starter handle and tie a left hand knot to secure the handle.

STYLIZED REWIND STARTER (TVS, HM, TVM, TVXL), AND STAMPED STEEL STARTER (HM, VM, TVM, TVXL)

Disassembly Procedure

1. After removing the rewind assembly from the engine blower housing, release the tension on the rewind spring. This can be done by removing the starter handle and carefully allowing the rope to unwind in the starter housing assembly.
2. Place a 1" (25 mm) deep well socket under the retainer. Set the rewind on a bench, supported on the socket.
3. Use a 5/16" (7.938 mm) or 1/4" (6.35 mm) (for stamped steel) roll pin punch to drive out the center pin. The stamped steel center pin is driven out from the top, inside the center hole. Move the punch around while driving the pin to help keep the pin straight.



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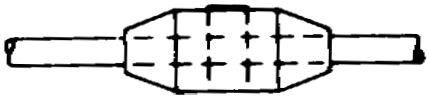
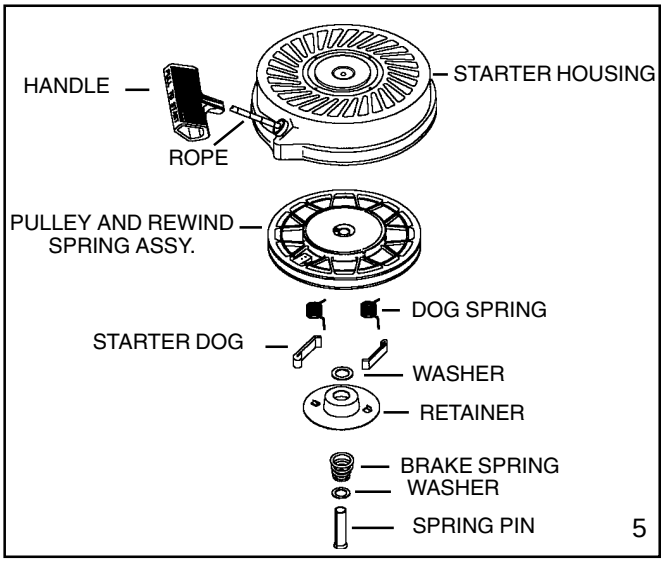

ONE PIECE ROPE RETAINER
4



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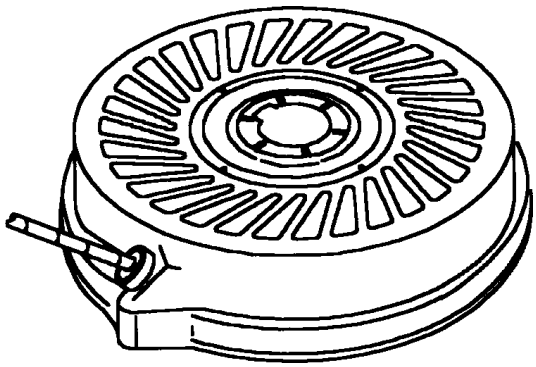

6

CAUTION: THIS REWIND SPRING IS NOT SECURED IN A CANISTER. PULLEY BOSSES HOLD THE REWIND SPRING AND COVER, AND CAN BE EASILY DISLODGED DURING HANDLING.

4. Remove the brake spring, spring retainer, washers, and pulley assembly (diag. 7)

NOTE: THE STARTER DOGS FACE OUT ON THE STAMPED STEEL STARTER AND THE DOGS FACE IN ON THE STYLIZED REWIND STARTER.

5. All components in need of service should be replaced.

Assembly Procedure

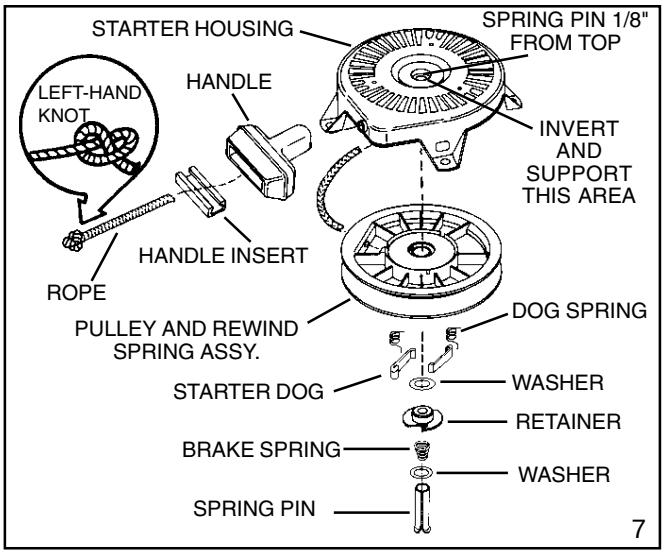
NOTE: It is critical to support the starter on a deep well socket to prevent damage.

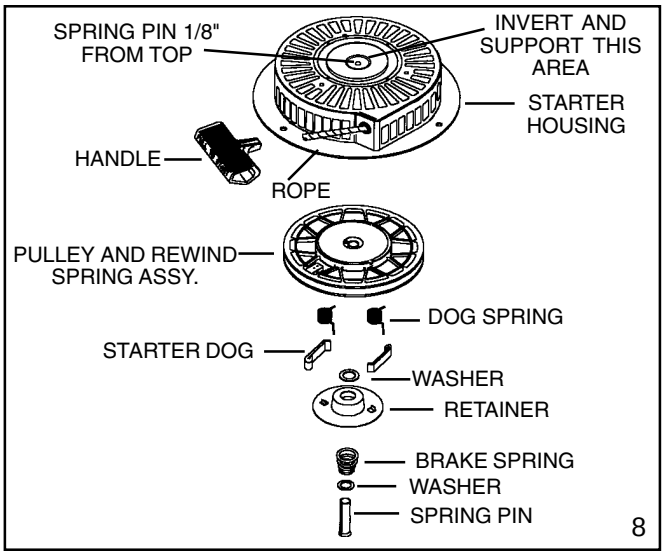
1. Reverse the disassembly procedure. The starter dogs with the dog springs must snap back to the center of the pulley (disengaged position). When the rope is pulled, the tabs on the retainer must be positioned so that they will force the starter dogs to engage the starter cup. (diag. 7 & 8)
2. Always replace the center spring pin with a new one upon reassembly. Place the two new plastic washers between the center leg of the starter and the retainer. New plastic washers are provided with a new center spring pin. Discard the old plastic washer.
3. Prior to reinstalling the new spring pin, invert the housing and support the center of the housing on a socket approximately 3/4" (19 mm). Drive the pin into the housing until 1/8" (3.1 mm) as shown. (diag. 7 & 8)

NOTE: DO NOT DRIVE THE CENTER PIN IN TOO FAR.

   The retainer will bend and the starter dogs will not engage the starter cup. On the stamped steel starter the center pin should be driven in until it contacts the shoulder in the starter body.

4. Apply tension to the recoil spring by winding the pulley counterclockwise until it becomes tight, then allow the pulley to unwind until the hole in the pulley lines up with the rope eyelet in the starter housing. Install a knotted rope through the pulley and the eyelet and install the handle. A left-hand knot should be tied on the end of the rope to secure the handle.





STYLIZED REWIND STARTER WITH PLASTIC RETAINER

Disassembly Procedure

1. After removing the rewind assembly from the engine blower housing, remove the starter handle by first pulling a length of rope out using the handle, tying a temporary knot in the exposed rope, and either untying the knot in the handle or prying out the staple.
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Remove the decal from the center of the starter housing.
4. Use a small Phillips screwdriver or similar tool to pry the retainer legs apart and lift out the retaining wedge (or steel clip on newer style starters).
5. Pinch the legs of the retainer together and pull on the head of the retainer to remove it from the housing.
6. Remove the pulley assembly from the recoil housing.
7. Repair or replace as necessary.

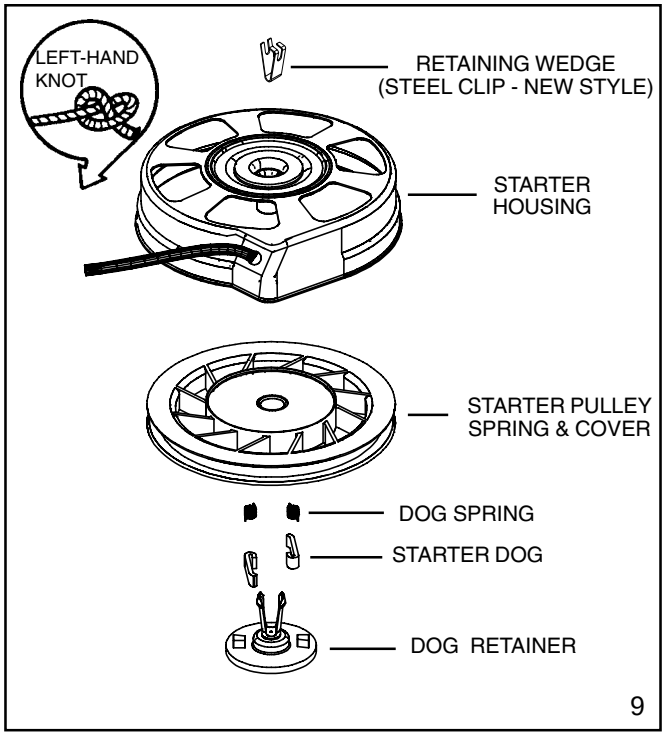
Assembly

1. If replacing the starter rope, see Step 8.

Recoil starters are under heavy tension. Extreme caution should be used when working with these parts and always wear safety glasses, leather gloves and a heavy, long sleeved shirt.

2. Install a new recoil spring/pulley assembly into the starter housing.
3. Replace or check that both starter dogs are in the pulley pockets and that the dog springs are hooked on the outer surface of the starter dog.
4. Pinch the two legs of the plastic retainer together and slightly push the retainer into the center shaft hole.
5. Rotate the retainer so the two tabs on the bottom of retainer contact the dog on the inward side so when the rope is pulled the retainer tabs cause the dogs to flair outward. Push the retainer in until the leg prongs pop out of the center shaft.
6. Turn the starter over and snap the locking tab between the retainer legs, replace the top decal.

   The service replacement retaining wedge is spring steel.
7. Apply tension to the recoil spring by winding the pulley counterclockwise until it becomes tight, then allow the pulley to unwind until the hole in the pulley lines up with the rope eyelet in the starter housing. Install a knotted rope through the pulley and the eyelet and install the handle. A left-hand knot should be tied on both ends of the rope to secure the handle and rope in pulley.



9

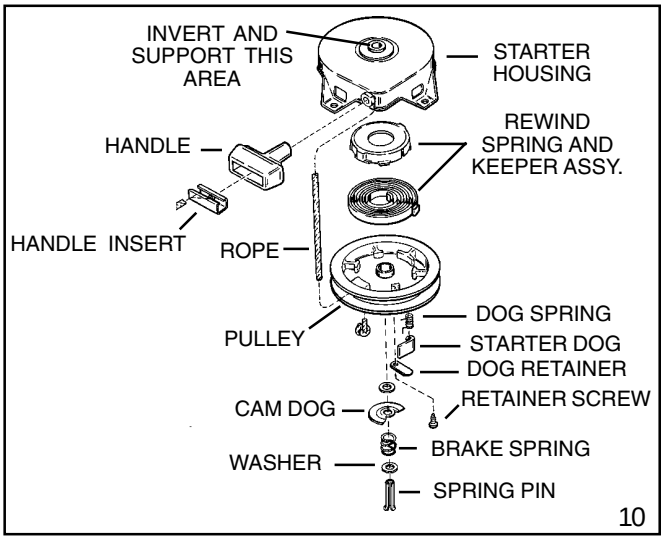
STANDARD STAMPED STEEL AND CAST ALUMINUM STARTER (HM, VM)

Disassembly Procedure

1. Untie the knot in the rope and slowly release the spring tension.
2. Remove the retainer screw, retainer cup (cam dog on snow proof type), starter dog(s) and dog spring(s), and brake spring (diag. 10).
3. Turn the spring and keeper assembly to remove the pulley. Lift the pulley out of the starter housing. Replace all worn or damaged parts.

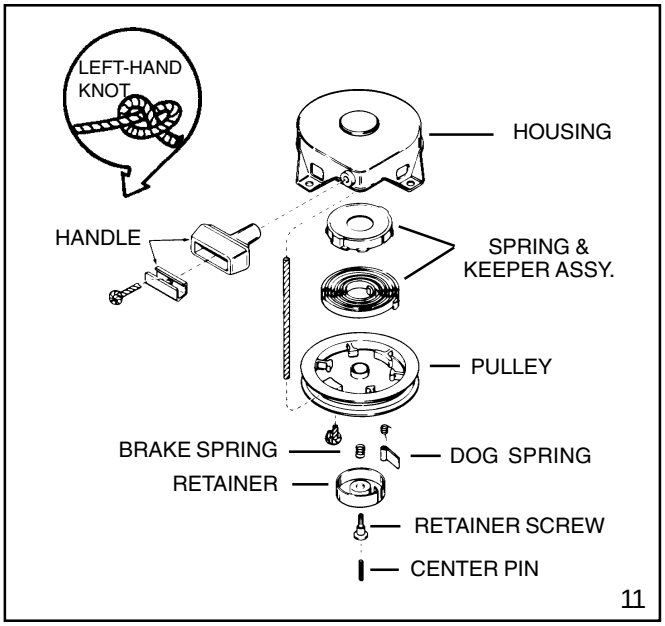
Assembly Procedure

1. Apply a light coat of NON-FREEZE grease to the spring before installing into the pulley. Install the pulley assembly into the starter housing.
2. Install the brake spring, starter dog(s), and starter dog return spring(s). The starter dog spring(s) must hold the dog(s) in against the pulley. On Snow King engines the starter dog posts should be lubricated with S.A.E. 30 engine oil to prevent oxidation.



10

3. Replace the retainer cup (cam dog on snow proof starter) and retainer screw. Tighten to 65 - 75 in. lbs. Older models that use a 10 - 32 retainer screw can be replaced with a larger 12 - 28 screw (part # 590409A). Re-drill the screw hole using a 13/64" (4.35 mm) drill bit. The center screw torque on cast aluminum starters is 115 to 135 in. lbs (13 - 15 Nm) (diag. 11 & 12).
4. Add-on alternator starters must have the center tubular rivet replaced each time the tubular rivet is removed. The tubular rivet should be pressed to a depth of 1/4" (3.175 mm) from the top of the starter housing. Skip this step if not applicable.
5. Apply tension to the recoil spring by winding the pulley counterclockwise until it becomes tight, then allow the pulley to unwind until the hole in the pulley lines up with the rope eyelet in the starter housing. Install a knotted rope through the pulley and the eyelet and install the handle. A left-hand knot should be tied on the end of the rope to secure the handle.
6. If a centering pin is used, be sure to align with the crankshaft (bottom pin in center screw hole). Install nylon sleeve 1/8" (3.175 mm) onto pin. Position nylon sleeve in aligning recess in the crankshaft. START two mounting screws in blower housing 90° apart. With sleeve centered in crankshaft, gently push the starter in place, tighten the two mounting screws, insert and tighten the other two screws.



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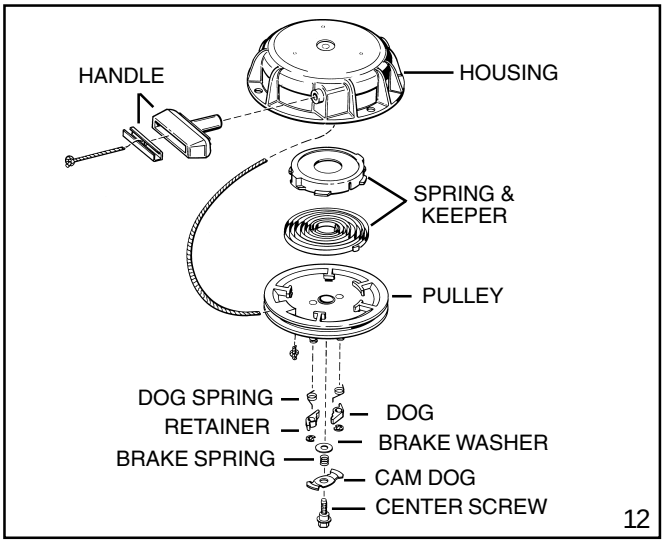

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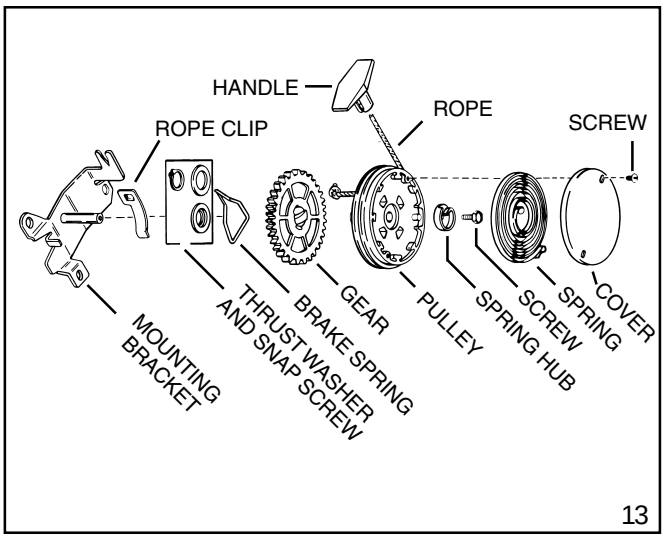
VERTICAL PULL STARTER HORIZONTAL ENGAGEMENT TYPE

Disassembly Procedure

1. Remove the handle and relieve the starter spring tension by allowing the rope to slip past the rope clip.
2. Remove the spring cover by carefully removing the two small screws. Carefully take out the spring.
3. Remove the center hub screw and the spring hub.
4. Lift off the gear and pulley assembly. Disassemble the pulley assembly by removing the snap ring and washer (diag. 13).
5. Remove the starter rope if necessary. Replace all worn or damaged parts.



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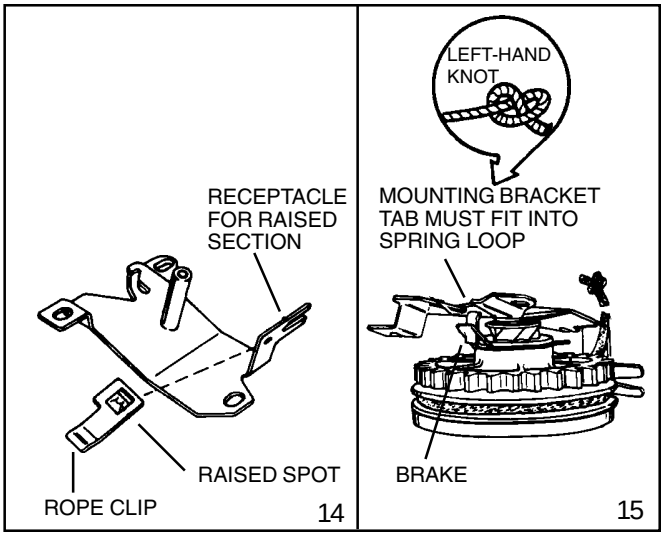
Assembly Procedure

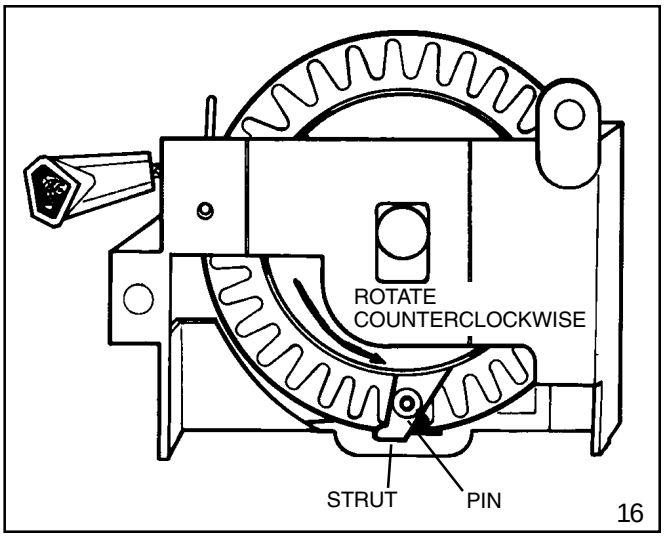
1. Insert the rope through the starter pulley.
2. Assemble the gear, pulley, washer, and snap ring.
3. Place a small amount of grease on the center shaft, place the gear and pulley into position making sure the brake spring loop is positioned over the metal tab on the bracket. The rope clip must fit tightly onto the bracket. The raised section fits into the hole in the bracket (diag. 14 & 15).
4. Install the hub and hub screw. Torque the hub screw to 45 - 55 in. lbs. (5 - 6 Nm). A loose hub screw will prevent the rope from retracting.
5. Install the return spring if necessary. A replacement spring is installed by placing the spring and its retainer over the top of the pulley and pushing the spring out of the retainer into the pulley's recessed area.
6. Install the spring cover and the cover screws.
7. Wind the rope onto the pulley by slipping it past the rope clip. When the rope is fully wound on the pulley, wind the pulley assembly two additional turns to put tension on the spring.
8. Mount the starter on the engine making sure the top of the starter gear teeth are no closer than 1/16" (1.59 mm) from the top of the flywheel ring gear teeth.



VERTICAL PULL STARTER, VERTICAL ENGAGEMENT TYPE

Disassembly Procedure

1. Pull out enough rope to lock the rope in the "V" of the bracket.
2. Remove the handle if necessary by prying out the small staple in the handle with a screwdriver.
3. Place the starter bracket on the top of a deep well socket that is large enough to receive the head of the center pin. Use an arbor press to drive out the center pin.
4. Rotate the spring capsule strut until it is aligned with the legs of the brake spring. Insert a nail or pin no longer than 3/4" (19.05 mm) through the hole in the strut so it catches in the gear teeth. This will keep the capsule in the wound position (diag. 16).
5. Slip the sheave out of the bracket.



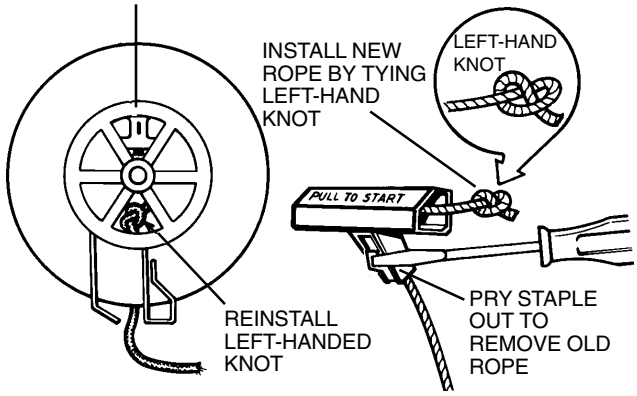
CAUTION: DO NOT ATTEMPT TO REMOVE THE SPRING CAPSULE FROM THE SHEAVE ASSEMBLY UNLESS THE SPRING IS FULLY UNWOUND.

6. Squeeze and hold tightly by hand the spring capsule at the outer edge against the gear sheave.

7. Remove the retainer pin from the strut and slowly relieve the spring tension by allowing the spring capsule to rotate slowly under control, until completely unwound. The spring capsule can now be removed from the gear sheave.

Assembly Procedure

1. Feed the new rope through the hole and tie a left-handed knot on the rope end. Make sure the rope and knot do not protrude from the knot cavity and bind the pulley rotation (diag. 17).
2. Wind the rope on the sheave assembly clockwise, viewing the gear from the gear side of the sheave.
3. Reinstall the brake spring, being careful not to spread the spring more than necessary.
4. Install the spring capsule, making sure the starter spring end hooks on the gear hub (diag. 18).
5. Wind the spring four full turns and align the brake spring legs with the strut as shown. Insert the pin in the strut (diag. 19).
6. If the starter is equipped with a locking or delay pawl and spring, make sure these are in place before grasping the gear and spring capsule assembly and sliding it into the bracket. Make sure the legs of the brake spring are positioned in the slots of the bracket.
7. Feed the rope end under the rope guide and hook it into the "V" notch. Remove the pin and the strut will rotate clockwise against the bracket (diag. 21).
8. Insert the new center pin by pressing or driving the pin firmly in place. Reinstall the starter assembly on the engine (diag. 21).



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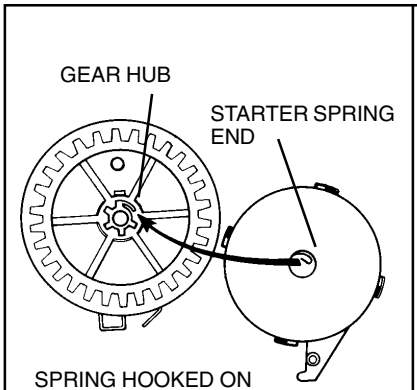

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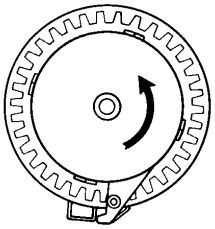
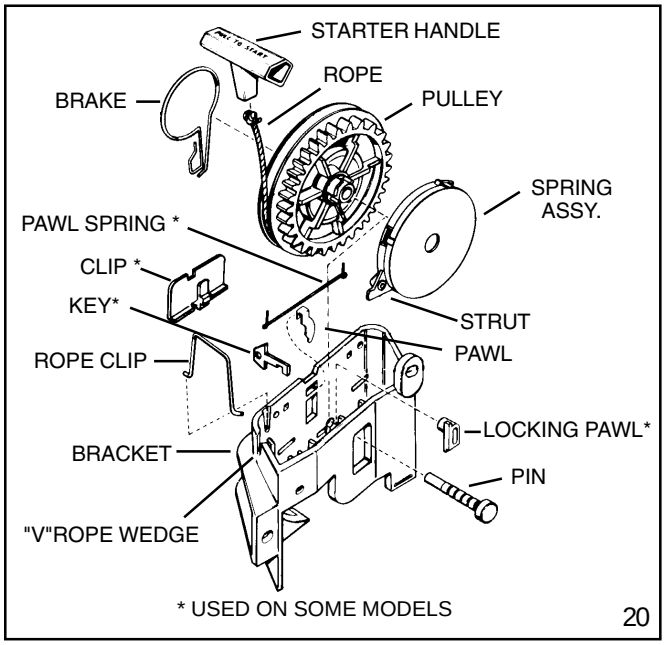
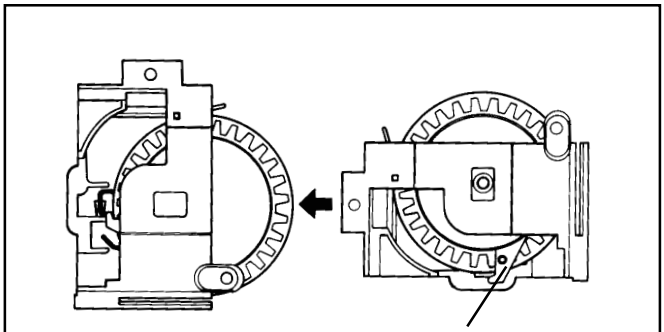

ROTATE SPRING 4 FULL TURNS
19



* USED ON SOME MODELS
20



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CHAPTER 6 ELECTRICAL SYSTEMS

GENERAL INFORMATION

The electrical system consists of three main elements: a battery, a starting circuit, and a charging circuit. The battery is part of both the starting and charging circuit. The battery should be checked before going into any extensive starter or charging system checks. If a battery has a shorted cell, overcharging can result, and the regulator or rectifier may appear to be at fault. If a cell has an open or high resistance connection, the electric starter operation will be affected.

The power source used to provide the energy to turn an electric starter motor on Tecumseh engines is either 120 volt A.C. current or 12 volt D.C. An A.C. starter circuit utilizes a 120 volt power source instead of a battery. The 12 volt battery models require a charging system to maintain proper battery charge.

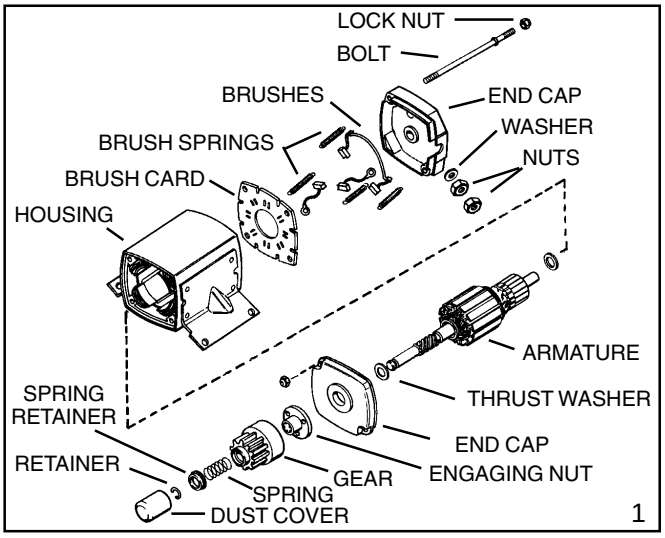
The starting circuit includes the battery, battery cables, starter or ignition switch, safety switches, and an electric starter motor.

The charging system consists of alternator charge coils, rectifiers or diodes, regulator, ignition switch, flywheel magnets, and a battery. All engines that have a charging system will use a combination of some or all of these features.

OPERATION

STARTING CIRCUIT AND ELECTRIC STARTERS

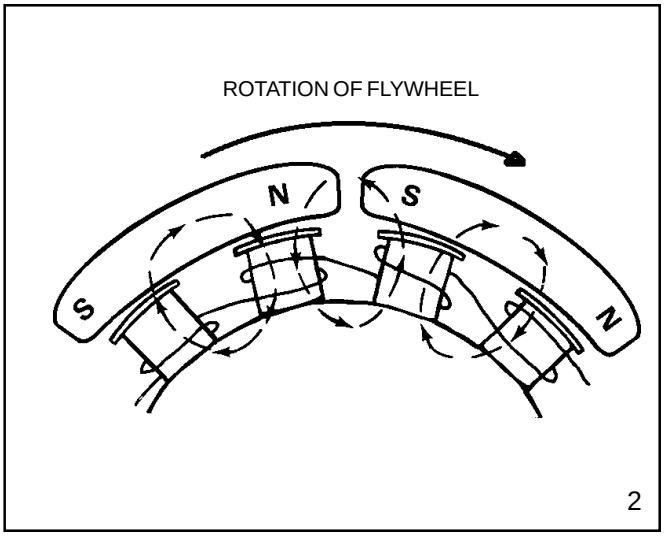
After all of the safety interlock switches have been activated, the starter switch will complete the circuit. A strong magnetic force is produced by the electrical current running through the armature windings. The armature magnetism repels the magnetism produced by the permanent field magnets of the electric starter. The repelling magnetic forces cause the armature to rotate, moving the drive pinion laterally on the splined armature shaft, meshing the starter pinion gear with the flywheel ring gear. When the drive pinion contacts the stop at the end of the armature shaft, the pinion rotates along with the armature shaft to crank the engine. The armature and pinion remain positively engaged until the engine fires and the flywheel rotates faster than the armature. The greater momentum of the flywheel throws the starter pinion gear out of mesh and forces the starter pinion back to the disengaged position. After the switch is released, the starting circuit is opened and the armature coasts to a stop. A small anti-drift spring holds the pinion in the disengaged position (diag. 1).



1

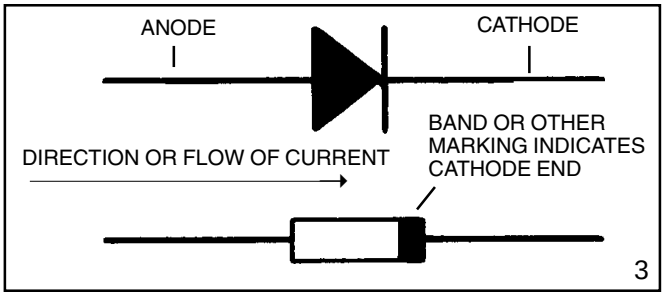
CHARGING CIRCUIT

When a conductor (alternating coils) cuts the magnetic field generated by the magnets in the flywheel, a current will be induced in the alternator coil. The permanent magnets in the flywheel have a magnetic field in which the lines of magnetic force run from the North Pole to the South Pole. As the flywheel rotates and the position of the magnets change, the direction of the magnetic field changes or alternates. The alternating coils are wound in different directions to allow current to flow as an A.C. waveform (diag. 2).



2

CONVERTING ALTERNATING CURRENT TO DIRECT CURRENT

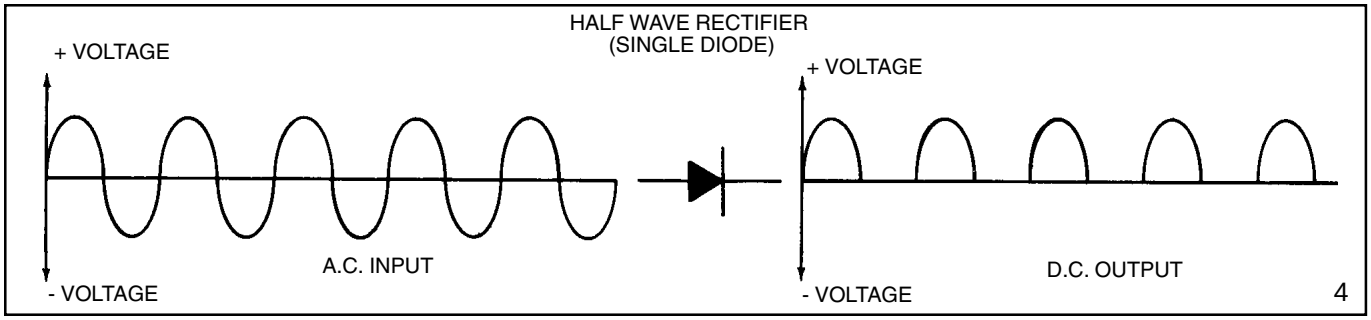


In order to charge a battery, it is necessary to convert alternating current (A.C.) to direct current (D.C.). This is accomplished by using a diode or rectifier (diag. 3). A single diode makes use of only one half of the A.C. signal and is known as HALF WAVE RECTIFICATION (diag. 4). This is acceptable in certain applications. In certain situations it is necessary to make use of the entire A.C. signal. To accomplish this, multiple diodes in a bridge configuration are used to produce FULL WAVE RECTIFICATION (diag. 5).

Current flows through a diode when the anode is more positive than the cathode. The cathode end of the diode should point toward the battery when diode is used between a charging system and a battery.

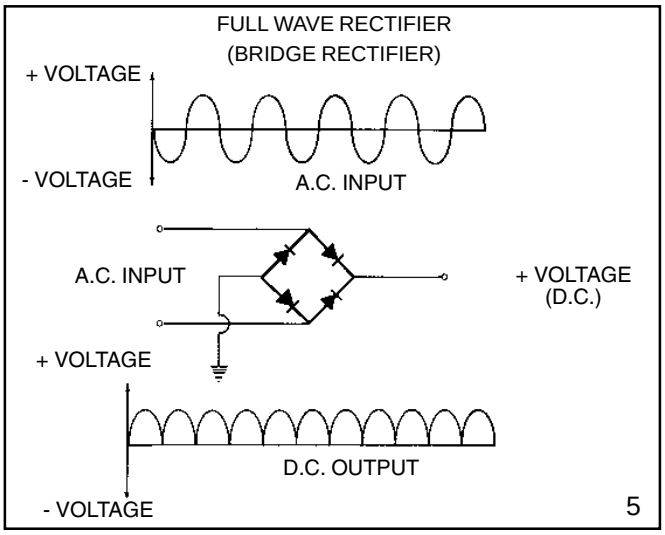
HALF WAVE RECTIFIER SINGLE DIODE

The single diode allows only the positive half of the A.C. signal through. It does not allow the negative portion through.



FULL WAVE RECTIFIER (BRIDGE RECTIFIER)

The full wave rectifier makes use of the entire A.C. signal, converting it to D.C.



COMPONENTS

BATTERY

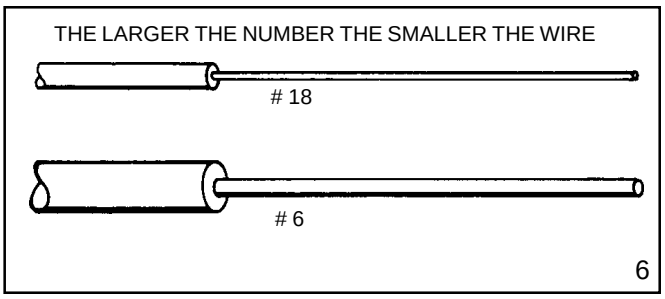
The batteries used in conjunction with Tecumseh engines are 12 volt lead acid or “maintenance free” style. The chemical energy produced by the dissimilar metals of the battery plates provides a electrical potential that is used to power the electric starter or unit accessories. Consult the original equipment manufacturer’s service manual for battery size, capacities, and testing procedure.

WIRING

The wires used in Tecumseh electrical systems are copper stranded with an insulated coating around the copper strands.

CONDITION: All wiring must be fully insulated between connection points, securely fastened and free of foreign material (such as rust and corrosion) at the connection points. This is especially important in the use of batteries where much of the potential may be lost due to loose connections or corrosion. Remember to check the insulation on the wire. All it takes is a pin hole to "ground out" on the engine or frame. This is of special concern when moisture or water is present. This may cause the engine to run erratically or be impossible to start.

WIRE GAUGE: The proper thickness of wire is necessary in all electrical circuits. Wire diameter is measured in increments of gauge numbers. As the gauge number of the wire increases, the wire diameter decreases in size (diag.6).



6

1. The starter circuit wiring must be rated at #6 or lower gauge number.
2. The charging circuit wiring must be rated at #16 or lower gauge number (20 amp system requires #14 or lower gauge number).
3. The magneto circuit wiring (ground circuit) must be rated at #18 or lower gauge number.

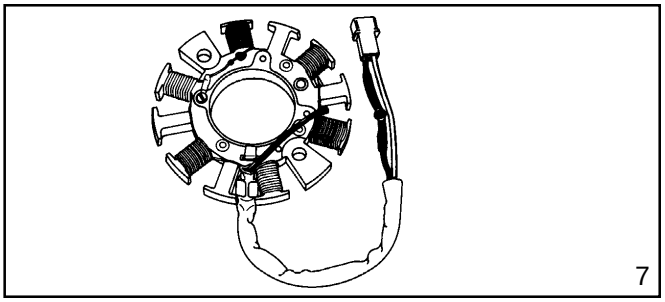
Tecumseh's standard engine wiring color codes, effective August, 1992 are as follows:

Code		Product
Yellow	-	Alternator A.C. Leads
Red	-	Alternator D.C. + Leads
Brown	-	Alternator D.C. - Leads
Black	-	Alternator Ground Leads, Battery Ground Leads
Orange	-	12 Volt Starter B + Leads
Dark Green	-	Ignition Shut-Off Leads

NOTE: PRIOR TO AUGUST 1992, WIRE CODES CHANGED ACCORDING TO MODEL AND SPECIFICATION NUMBERS.

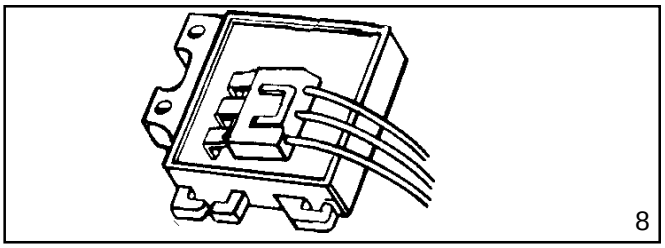
ELECTRICAL TERMS

ALTERNATOR - An alternator consists of coils of wire wound around a metal lamination stack. When a magnet is moved past the coils, a current is induced in the coils. In general, the greater the number of coils, the greater the output of the alternator (diag. 7).


7

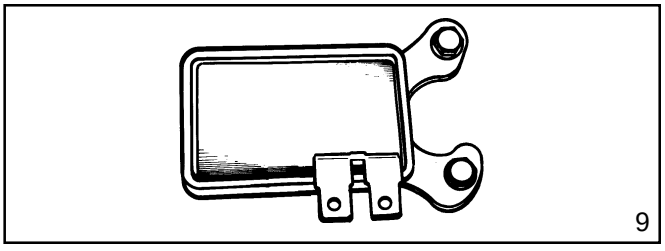
IGNITION COIL - The ignition coil is used to fire the spark plug. It is completely independent from the alternator coils.

RECTIFIERS and DIODES - Charging a battery requires that the alternating current produced by the alternator be changed to direct current. This is accomplished by using a diode or rectifier.

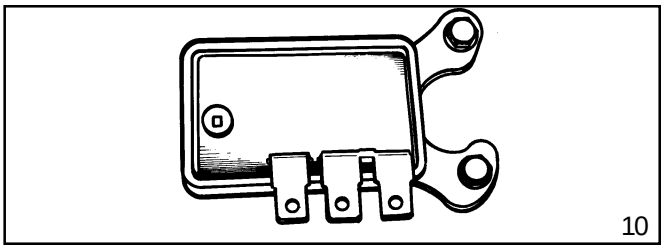

8

REGULATOR/RECTIFIERS - This combines a regulator with a rectifier. The regulator prevents overcharging of the battery and the rectifier changes the alternating current to direct current (diag.8, 9, 10).

CONDUCTORS - A conductor is a material that allows an electric current to pass through it. All metals are conductors of electricity, but some are better conductors than others. Silver, copper and gold are some of the better known conductors. As the temperature of the conductor increases, the resistance increases.


9

INSULATORS - An insulator is a material that will not allow an electric current to pass through it. Some of the more common materials that are insulators are glass, plastic, rubber, ceramics and porcelain.


10

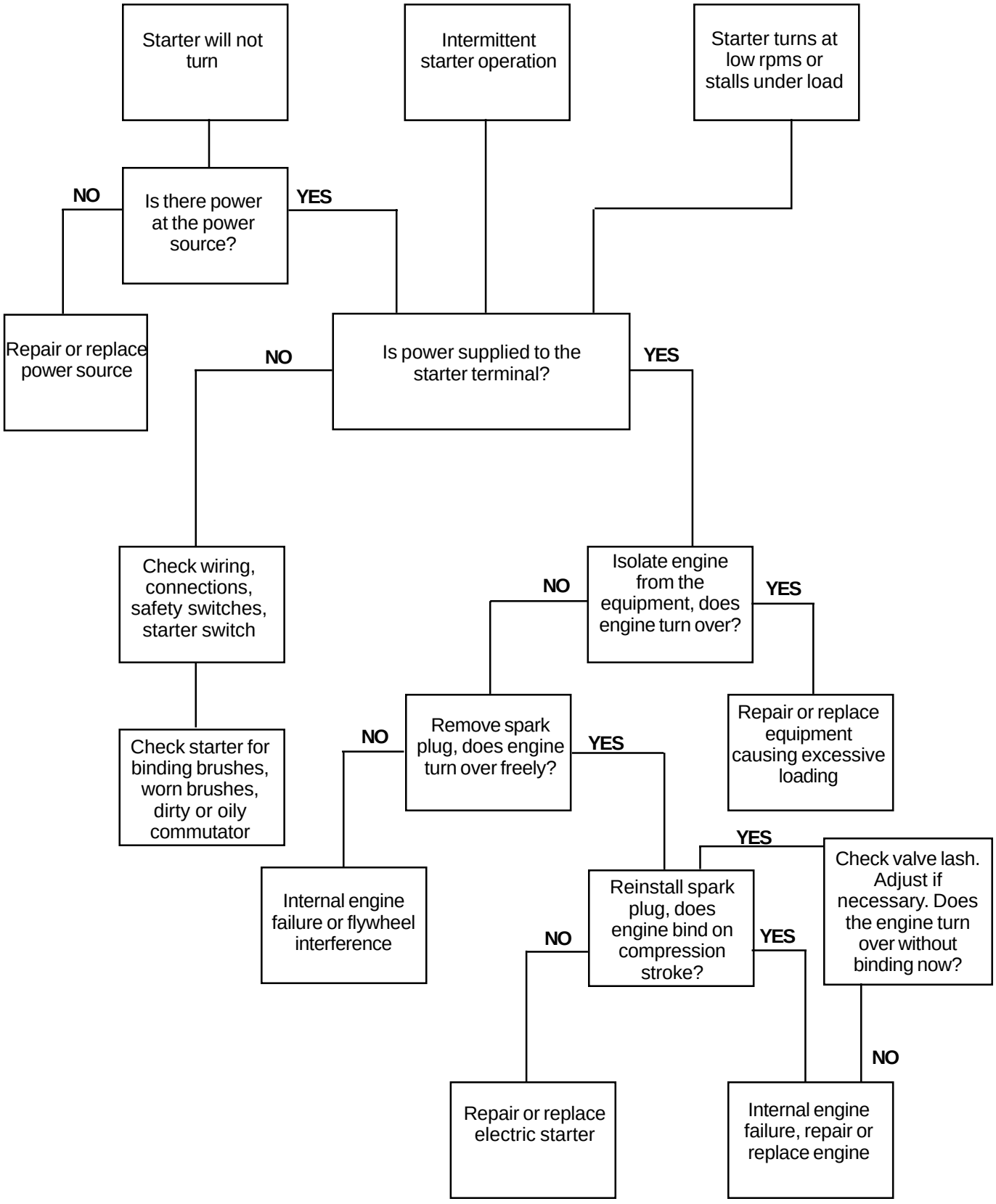
BASIC CHECKS

Before going into extensive checks, be sure to perform the more basic checks first, such as:

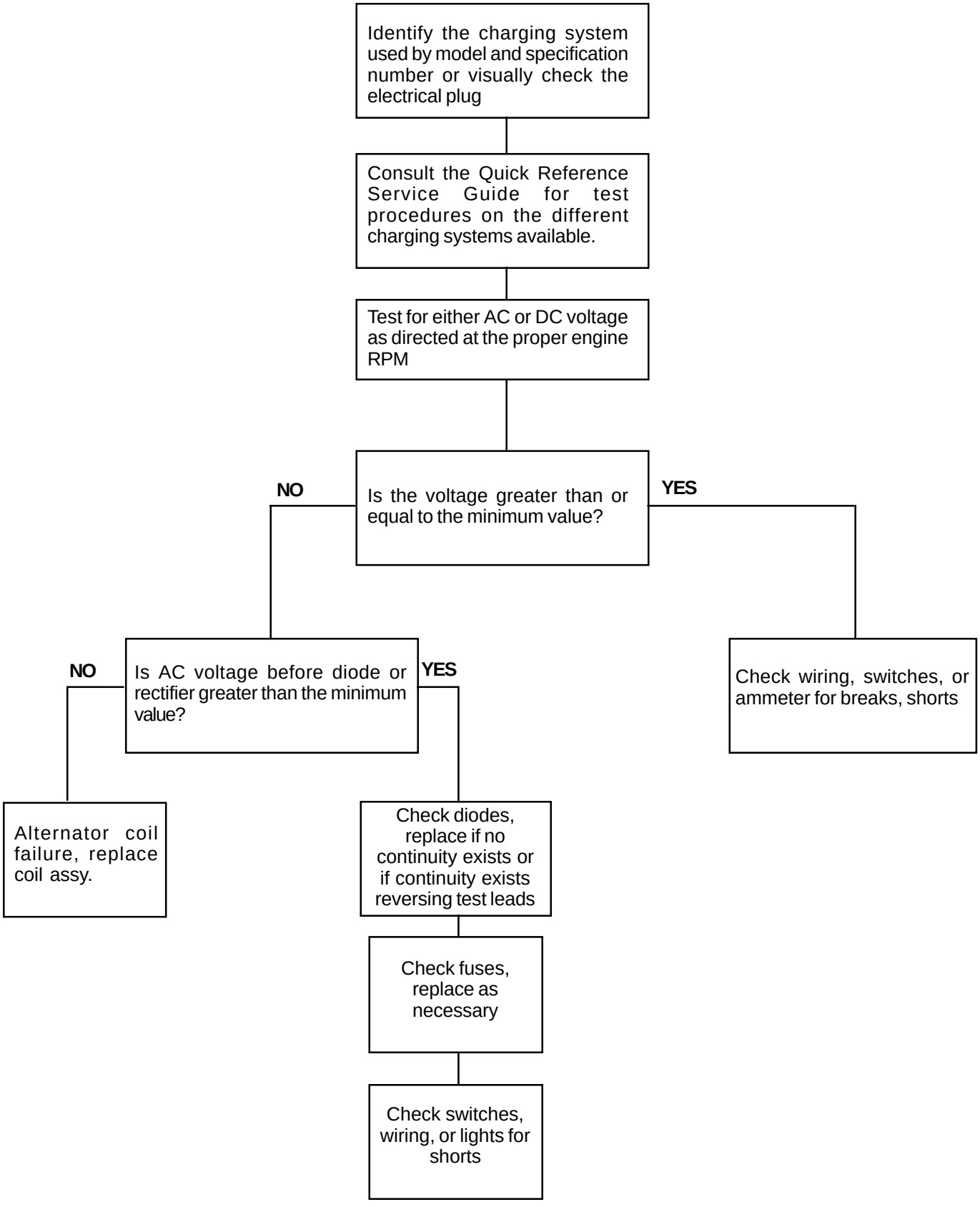
1. Battery defective or not charged.
2. Corroded or loose terminals and connections, or wrong connections.
3. Cracked insulation or broken wires.
4. A wire "grounding out" in the system.
5. Defective switch.
6. Operator presence system functioning properly.*

***NOTE:** ALL LAWN AND GARDEN TRACTORS BUILT AFTER JULY OF 1987 ARE REQUIRED TO HAVE AN OPERATOR PRESENCE SYSTEM AND MANY CAME EQUIPPED WITH SUCH A SYSTEM PRIOR TO THIS DATE. IF THE TRACTOR IS "CUTTING OUT" OR WILL NOT START, THIS IS AN AREA THAT SHOULD BE CHECKED OUT.

TROUBLESHOOTING ELECTRICAL STARTER CIRCUIT FLOW CHART



TROUBLESHOOTING ELECTRICAL CHARGING CIRCUIT FLOW CHART



TESTING PROCEDURE

STARTING CIRCUIT

1. Check the power source using an electrical tester and follow the testers recommended procedure. Make sure the battery meets the minimum battery voltage requirements found in the original equipment manufacturer's service manual.
2. Check the electric starter terminal for the required voltage (12v D.C. or 120 v A.C.) using a voltmeter.

⚠ CAUTION: FOLLOW ALL SAFETY PRECAUTIONS WHEN TESTING FOR A.C. VOLTAGE, ELECTRIC SHOCK CAN KILL.

3. Check wiring, connections, fuses, ignition or starter switch, safety switches, or solenoid for continuity using a ohmmeter or a continuity light. Repair or replace as necessary.
4. Remove all equipment loads from the engine. Take off all drive belts, chains, and couplers to isolate the engine from the equipment it is powering.
5. Try to turn the engine over using the recoil assembly if equipped. If the engine doesn't turn over, a mechanical binding may be the cause. Check for proper lubrication (oil level and viscosity), starter gear and flywheel ring gear interference. If no problem is discovered, the problem is an internal failure.
6. If the engine binds only on the compression stroke, check the engine valve clearance per the specification table in Chapter 10. If the valve clearance is within the specifications, the camshaft (compression release) may require replacement. Valve clearance not within the listed specifications will require either resetting or grinding the valve stems to obtain the proper clearance.
7. If the engine turns over freely, the electric starter should be disassembled and checked. If the preceding steps fail to correct the problem, the engine will require disassembly to find the mechanical failure. See Chapter 9 under "Disassembly Procedure".

CHARGING CIRCUIT

The following pages will show wiring diagrams of several Tecumseh charging systems. The charging system used on the engine is best identified by obtaining the engine model number and the specification number on the engine. Consult a Tecumseh dealer or a parts manual to identify the charging system. To make many of the tests it is necessary to run the engine and measure alternator output with a voltmeter. When making voltage tests with the engine running, it is not necessary to take readings at all the listed R.P.M.s. Checking at one of the speeds is sufficient.

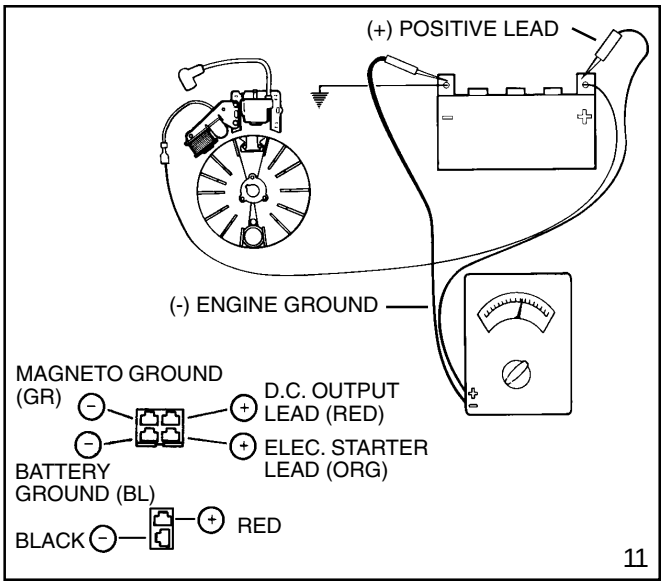
In some cases an open circuit D.C. check cannot be made. An SCR (Silicon Controlled Rectifier) is located in the circuit which requires a minimum "turn on" voltage to allow it to conduct. Without the battery in the circuit this "turn on" voltage is not present. The SCR "senses" this and there will be no D.C. output from the regulator or rectifier.

Each charging system has its own testing procedure. Test the charging system using the applicable procedure on the following pages.

350 Milliamp Charging System Models: Rotary Mower Engines Equipped with Electric Start

CHECKING THE SYSTEM: The battery must be in the circuit to perform the test properly. Connect a voltmeter across the battery. The voltmeter should read the battery voltage. Start the engine. With the engine running, there should be an increase in the voltage reading. If there is no change in the voltage reading, the alternator is defective and should be replaced. See Chapter 9 for "Disassembly Procedure" (diag. 11).

NOTE: SET THE VOLTMETER TO THE 0-20 VOLT D.C. SCALE FOR THE TEST.



11

18 Watt A.C. Lighting Alternator Models: H35, HS & HSSK 40-50, HM & HMSK 70-80-100

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a wire lead from the single pin connector coming out of the engine to one terminal of a No. 4414, 18 watt bulb. Connect another wire lead to the other terminal of the bulb and run to a good ground on the engine. Start the engine and test the circuit using the A.C. voltmeter as shown (diag. 12).

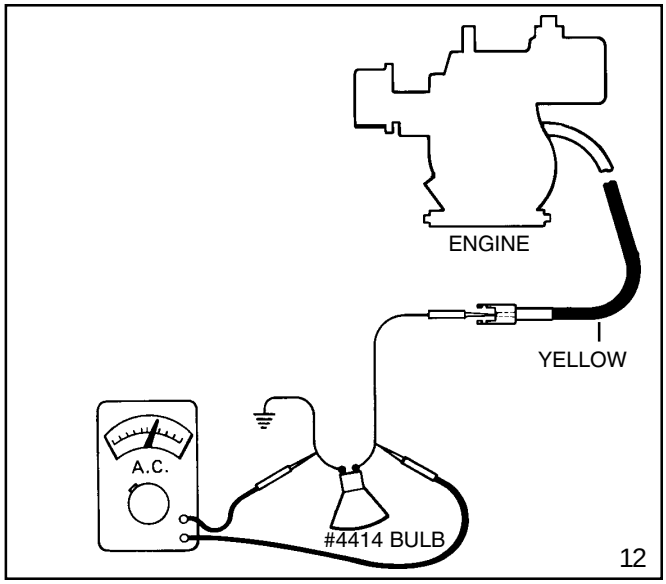
With the engine running, minimum A.C. voltage across the bulb should be:

2000 R.P.M. - 6.0 Volts A.C.

3000 R.P.M. - 8.5 Volts A.C.

3600 R.P.M. - 10.0 Volts A.C.

If minimum values are noted, the alternator is okay. If less than the minimum values, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



12

1 Amp (18 Watt) Add-on Alternator

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a No. 4414, 18 watt bulb in line with each terminal in the plug. Start the engine and test the circuit using a voltmeter as shown (diag. 13).

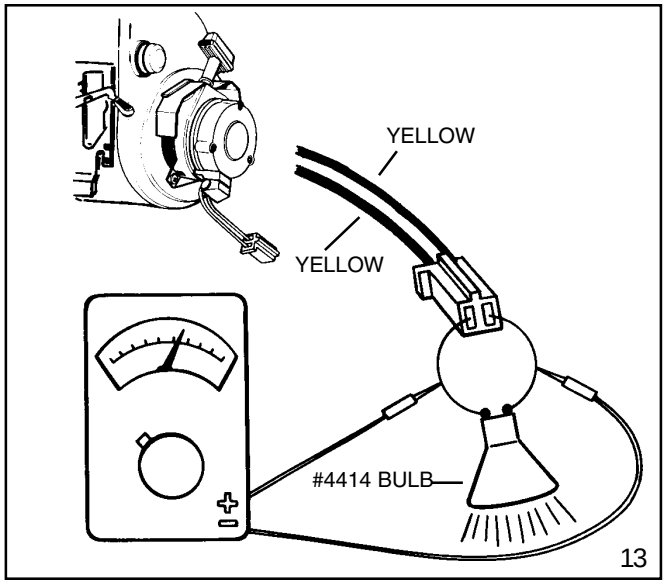
With the engine running, minimum A.C. voltage values across the bulb should be:

2000 R.P.M. - 8.0 Volts A.C.

3000 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 12.0 Volts A.C.

If minimum values are noted, the alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective. See Chapter 9 for "Disassembly Procedure".



13

D.C. Charging Adaptor

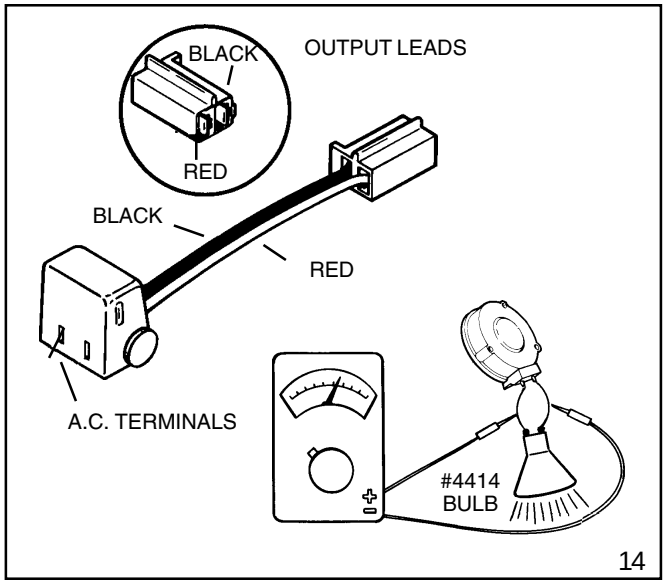
Rectifier Bridge Check With Ohmmeter for D.C. Adaptor

The following tests should be performed without the engine running to determine the condition of the D.C. adaptor.

Continuity should exist during one of the two following tests. No continuity should exist while performing the opposite test.

If continuity exists during both tests, or if no continuity exists during both tests, the D.C. adaptor is defective.

TEST NO. 1 - Connect negative probe of meter to red output lead. Connect positive probe of meter to both A.C. terminals and black output lead (diag. 14).



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(continued on top of next page)

TEST NO. 2 - Connect the positive probe of meter to red output lead. Connect the negative probe of meter to both A.C. terminals and black output lead.

Connect the negative probe of meter to black output lead. Connect the positive probe of meter to both A.C. terminals and red output lead.

If the D.C. adaptor is not defective and a known good battery fails to hold a charge, then perform an A.C. output voltage test.

NOTE: PRIOR TO AUGUST 1992, THE BLACK WIRE WAS BROWN.

CHECKING THE SYSTEM: To check the system, disconnect the D.C. adaptor from the add-on alternator. Connect a No. 4414, 18 watt bulb in line with each terminal in the alternator. Start engine and test circuit using an A.C. voltmeter as shown (diag 14).

With the engine running, minimum A.C. voltage values across the bulb should be:

2000 R.P.M. - 8.0 Volts A.C.

3000 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 12.0 Volts A.C.

If the minimum values are noted, alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective.

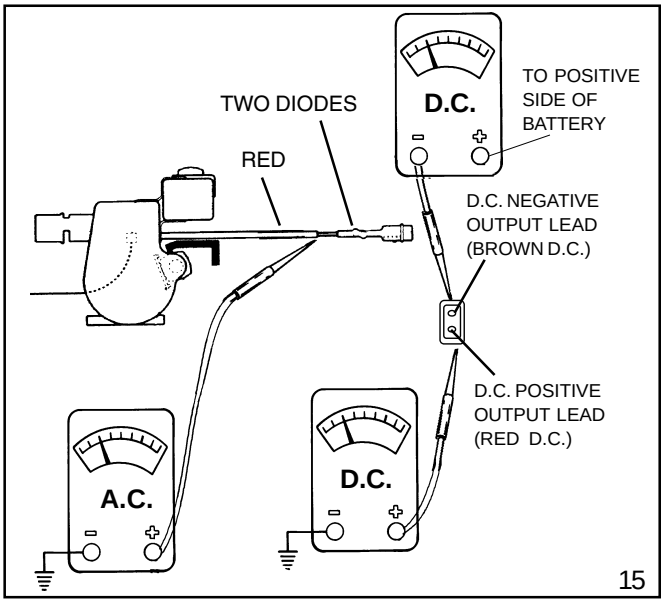
2.5 Amp D.C., 35 Watt Lighting

To check this system follow the meter hook ups at the right, checking the D.C. negative and D.C. positive first. If output is below standard listed, pull back protective coating in front of the diode and check A.C. output. If A.C. is good check each diode it services as requested see parts list. (diag. 15)

D.C. value (+) or (-) check. A.C. outputs both sides.

R.P.M. D.C. Volts	R.P.M. Volts A.C.
2500 - 8.0 Volts D.C.	2500 - 18 Volts A.C.
3000 - 9.5 Volts D.C.	3000 - 22 Volts A.C.
3300 - 10.5 Volts D.C.	3600 - 26 Volts A.C.
3600 - 11.5 Volts D.C.	

NOTE: These minimum numbers should be obtained by your meter and will often be higher.



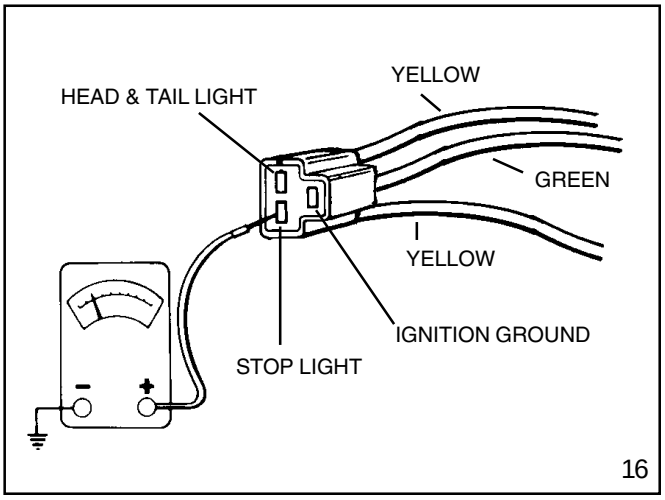
3 Amp A.C. Lighting Alternator Models: H & HSK 30- 35, HS & HSSK 40, H & HSK 50-60, HH50-60, HM & HMSK 70-80-100, HHM80

Before making any exterior tests, check for an inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground (diag. 16).

With engine running, minimum values should read:

2500 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 9.5 Volts A.C.
3300 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 11.5 Volts A.C.

If the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches. If less than the above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



NOTE: ON OLDER POINT IGNITION SYSTEMS, THE A.C. OUTPUT LEADS ARE BLACK AND RED.

3 Amp D.C. Alternator System - Rectifier Panel

This 3 amp system is readily identified by the rectifier panel in the circuit. The panel includes two diodes and a fuse for overload protection. The rectifier panel does not regulate the output of this system.

CHECKING THE SYSTEM: Check the fuse to determine if it is good. A continuity light or ohmmeter can detect a faulty fuse. Replace with a six (6) amp fuse if necessary. Determine if the diodes are functioning properly. A continuity light may be used to check diodes. (diag. 17).

When replacing the diode in the rectifier panel, locate the undercut on one end of the diode and match it to the detent on terminal clip of the rectifier panel.

Test the D.C. output of the rectifier panel as follows:

Disconnect the battery lead from the terminal of rectifier panel. Use D.C. voltage meter probe on + battery terminal as shown in the diagram (diag. 18). Connect negative lead to engine ground.

Minimum values should read:

2500 R.P.M. - 12.0 Volts D.C.

3000 R.P.M. - 14.0 Volts D.C.

3300 R.P.M. - 16.0 Volts D.C.

3600 R.P.M. - 18.0 Volts D.C.

If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

If less than above reading, proceed to make an A.C. output check. With the battery lead disconnected from rectifier panel, probe the A.C. terminals with the voltmeter on the A.C. scale (diag. 19).

Minimum values should read:

2500 R.P.M. - 24.0 Volts A.C.

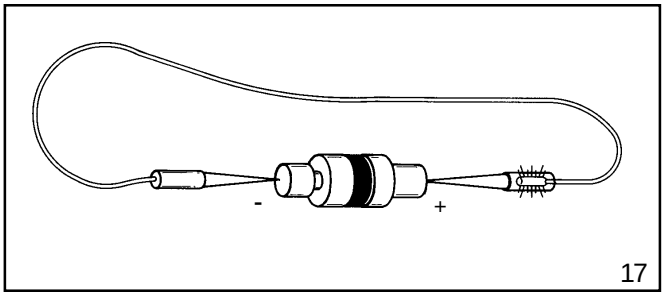
3000 R.P.M. - 29.0 Volts A.C.

3300 R.P.M. - 32.0 Volts A.C.

3600 R.P.M. - 35.0 Volts A.C.

If less than above output, generating coil assembly is defective. See Chapter 9 for "Disassembly Procedure".

NOTE: There is no regulator in this system. The total output of the two diodes is three (3) AMPS. If the battery is overcharging (boiling and bubbling), reduce the D.C. input by one-half by removing one of the diodes.



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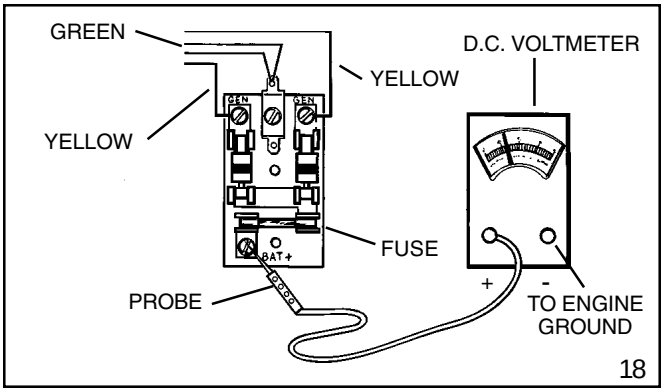

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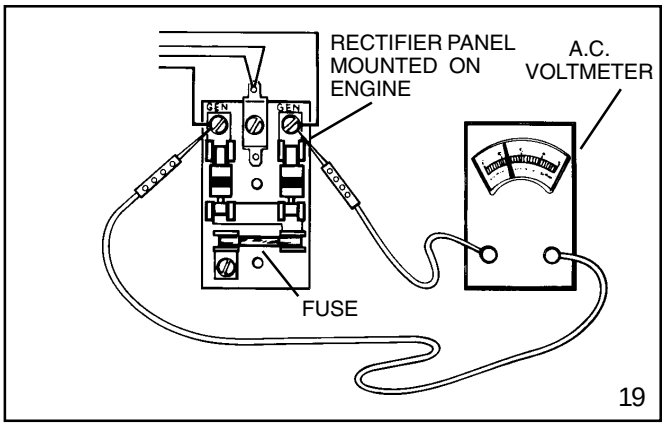


19

3 Amp DC Alternator System - Diode in Harness Sleeve
Models: H30-35, HS40, H50-60, HH50-60, HM70-80-100, HHM80

This system has a diode included in the red wire which converts the alternating current (A.C.) to direct current. The direct current (D.C.) is used to provide a trickle charge for the battery. The leads from the alternator and the type of connector may vary, but the output readings will be the same.

CHECKING THE SYSTEM: Remove the fuse from the fuse holder and check the fuse to make certain it is good. If faulty, replace with a six (6) AMP fuse.

To check D.C. output, separate the connectors at the engine. Place the probe (+) in the red wire lead connector. Ground the other probe to the engine (diag. 20).

With the engine running minimum values should read:

2500 R.P.M. - 8.0 Volts D.C.

3000 R.P.M. - 9.5 Volts D.C.

3300 R.P.M. -10.5 Volts D.C.

3600 R.P.M. -11.5 Volts D.C.

If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

If less than the above readings, proceed to make an A.C. output check by pulling back the protective coating from the fuse holder and diode. Using an A.C. voltmeter, check voltage from a point between the engine and the diode as shown in the diagram (diag. 21).

With the engine running, minimum values should read:

2500 R.P.M. - 18.0 Volts A.C.

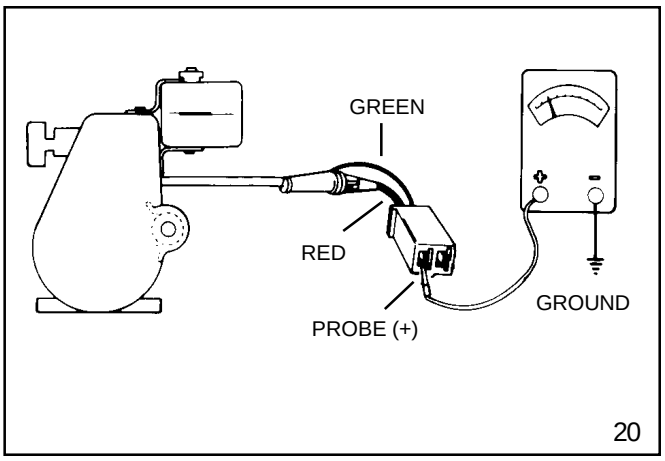
3000 R.P.M. - 22.0 Volts A.C.

3300 R.P.M. - 24.0 Volts A.C.

3600 R.P.M. - 26.0 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.

To replace the diode, disconnect at plug (spade terminal) and cut the wire on the opposite end of the diode at the solderless (crimped) connector. Remove 1/4" (6.35 mm) of insulation from the cut end of the wire and twist the strands together. Place the solderless connector from the new diode onto the exposed 1/4" (6.35 mm) wire and crimp the connector with a standard electricians pliers. Reconnect plug end (or spade connector (diag. 22).



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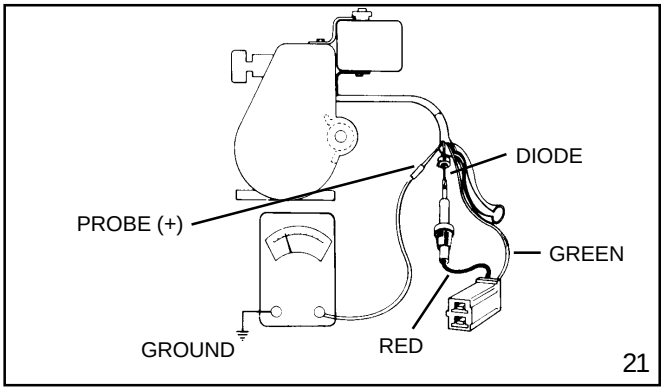

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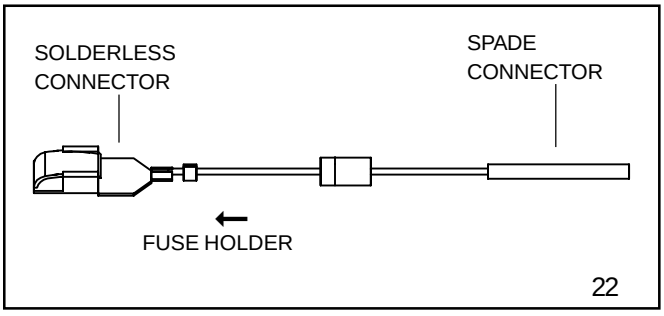

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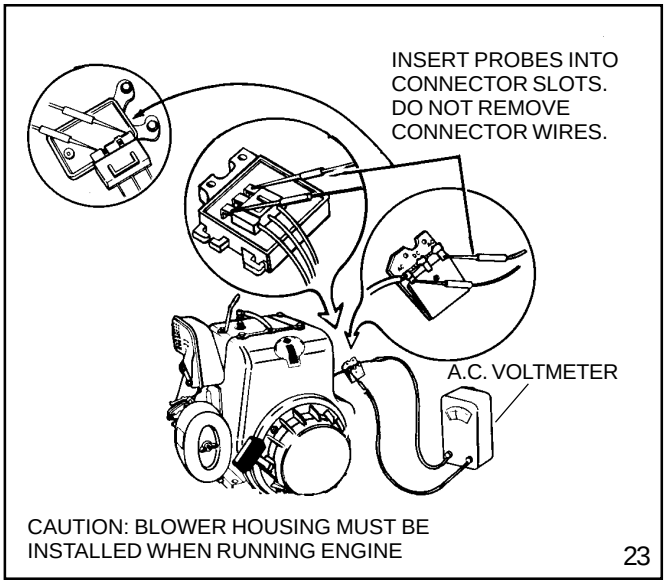
5 Amp Alternator System Regulator-Rectifier Under Blower Housing

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.

Disconnect the red D.C. output connector at the wiring harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 23).



CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.

With the engine running, the minimum values should read:

2500 R.P.M. - 19.0 Volts A.C.

3000 R.P.M. - 23.0 Volts A.C.

3300 R.P.M. - 26.0 Volts A.C.

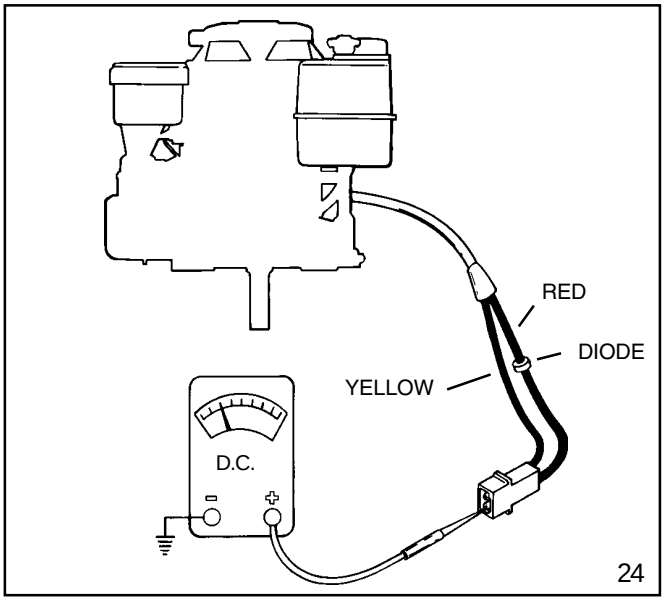
3600 R.P.M. - 28.0 Volts A.C.

If the minimum values are noted, the alternator is okay; the regulator-rectifier is defective. If less than above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".

3 Amp D.C. 5 Amp A.C. Alternator

Models: H & HSK 50-60, HH50-60, HM & HMSK 70-80-90-100, TVM125-140-170-195-220, TVXL195-220

This unit combines a 3 Amp D.C. system used to charge a battery with a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.



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CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 24). Measure the A.C. voltage at the yellow wire terminal. With the engine running, the minimum values should be:

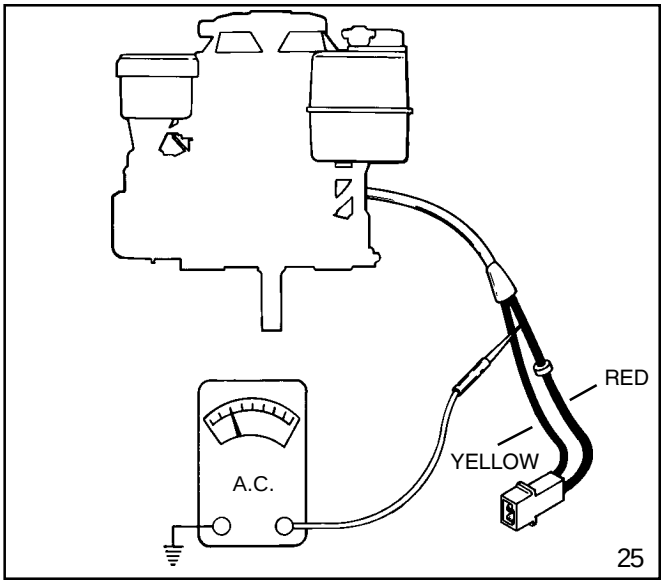
3 Amp D.C.

2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 13.0 Volts D.C.

5 Amp A.C.

2500 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 11.0 Volts A.C.
3600 R.P.M. - 13.0 Volts A.C.

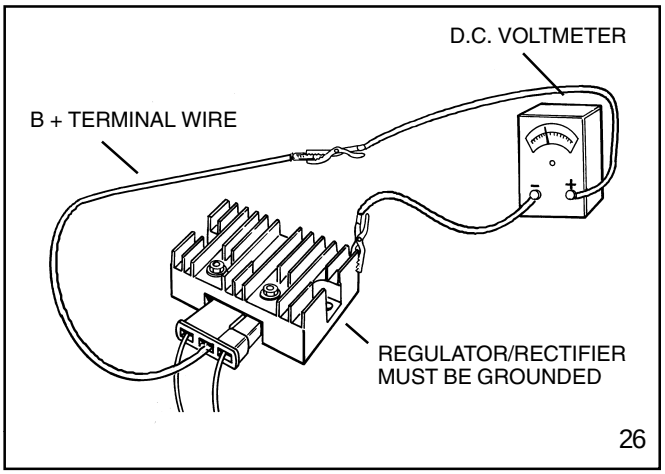
If the above minimum values are noted, system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage going into the diode from alternator, at the lead on the alternator side of the diode (diag.25).



25

All Models

With the engine running, the minimum values should read:
2500 R.P.M. - 20.0 Volts A.C.
3000 R.P.M. - 25.0 Volts A.C.
3300 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 29.0 Volts A.C.
If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



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7 Amp Alternator System Regulator-Rectifier External to Engine

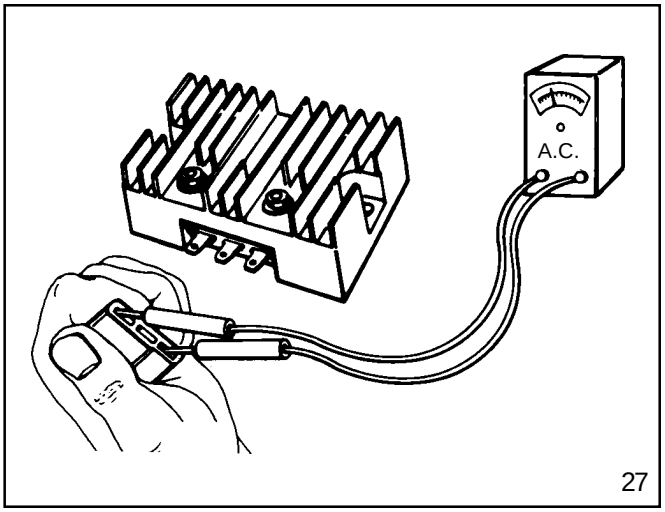
CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B+ wire at the switch end and measure D.C. voltage between the lead and ground (diag. 26).

With the engine running, minimum values should read:
2500 R.P.M. - 9.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 14.0 Volts D.C.

If the minimum readings are noted, system is okay. Check for defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 27).

With the engine running, minimum values should read:
2500 R.P.M. - 12.0 Volts A.C.
3000 R.P.M. - 14.0 Volts A.C.
3600 R.P.M. - 18.0 Volts A.C.

If the minimum readings are noted, the alternator is okay; the regulator-rectifier is defective. If less than the above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



27

7 Amp Alternator System Regulator-Rectifier Under Engine Block Housing Models: H50-60, HH50-60, HM70-80-100, HHM80, TVM125-140-170-195-220

In this system, the regulator and rectifier are combined in one solid state unit mounted under the blower housing of the engine.

Various types of regulator-rectifiers have been used on different applications. Test procedures for all types are the same. However, regulator styles are not interchangeable (diag. 28).

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.
Keep the A.C. leads attached to the regulator-rectifier. Install the blower housing with the regulator-rectifier outside the housing. With an A.C. voltmeter probe the regulator as shown (diag. 29)

CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.

With engine running, minimum A.C. voltage from lead to lead should be:

2500 R.P.M. - 16.0 Volts A.C.
3000 R.P.M. - 19.0 Volts A.C.
3300 R.P.M. - 21.0 Volts A.C.
3600 R.P.M. - 23.0 Volts A.C.

If the minimum readings are noted, the alternator is okay. If the system fails to charge a known good battery, the regulator-rectifier must be defective.

10 Amp Alternator System - Regulator-Rectifier-External to Engine

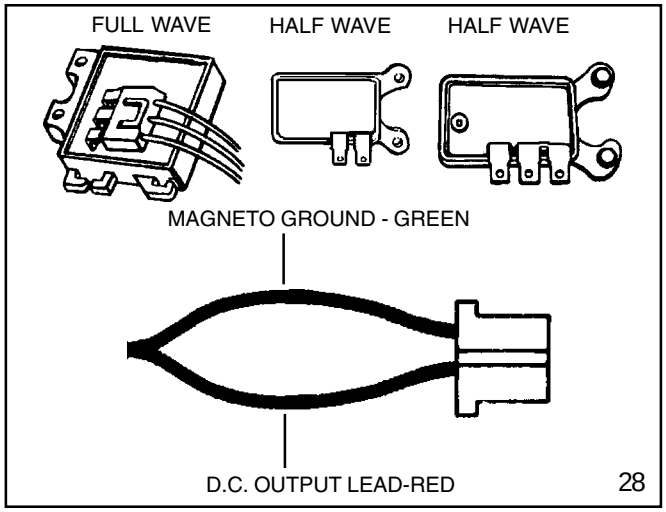
In this system, the regulator and rectifier are combined in one solid state unit.

CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B+ wire at the switch end and measure D.C. voltage between the lead and ground (diag. 30).

With the engine running, minimum values should read:

2500 R.P.M. - 13.0 Volts D.C.
3000 R.P.M. - 16.0 Volts D.C.
3600 R.P.M. - 20.0 Volts D.C.

If the minimum values are noted, the system is okay. Check for defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 31).



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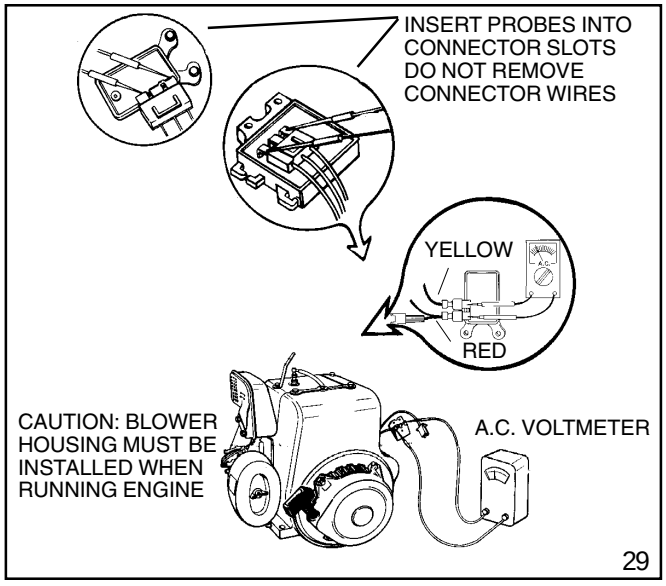

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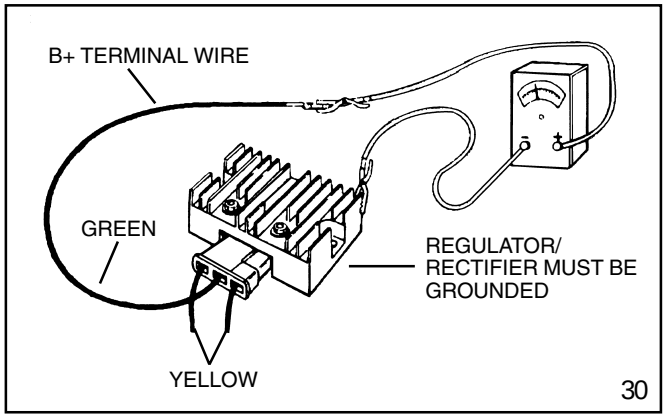

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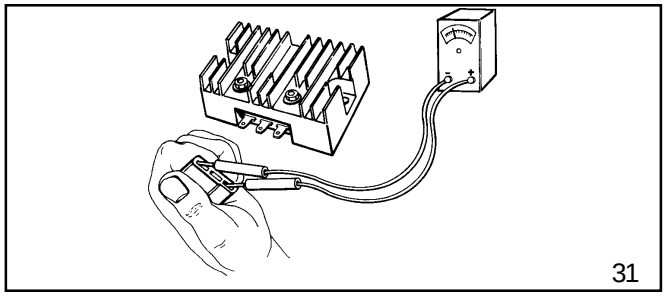
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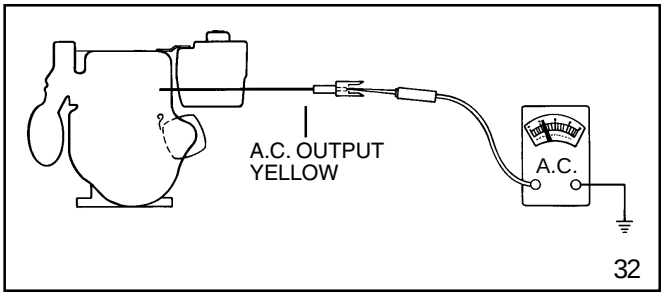
With the engine running, minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 19.0 Volts A.C.

3600 R.P.M. - 24.0 Volts A.C.

If the minimum readings are noted, the alternator is okay; the regulator-rectifier is defective. If less than above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



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10 Amp Alternator
Models: H & HSK 50-60, HH50-60, HM & HMSK 70-80-100, HHM80, TVM125-140-170-195-220

CHECKING THE SYSTEM: Unplug the connector at the wiring harness supplied by the OEM. Proceed to make an A.C. output check. Place one lead of the A.C. voltmeter on the center plug of the connector. Place the other lead to engine ground (diag. 32).

With the engine running, minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 20.0 Volts A.C.

3300 R.P.M. - 22.0 Volts A.C.

If less than above output, the alternator assembly is defective. See Chapter 9 for "Disassembly Procedure".

12 Amp D.C. Regulated Alternator
Models: HM80-100, OHM90-110, OHV110-130, TVM220

CHECKING THE SYSTEM: Unplug the connector at the wiring harness supplied by the OEM. Proceed to make an A.C. output check. Place one lead of the A.C. voltmeter on the center plug of the connector. Place the other lead to engine ground.

With the engine running, minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 20.0 Volts A.C.

3600 R.P.M. - 25.0 Volts A.C.

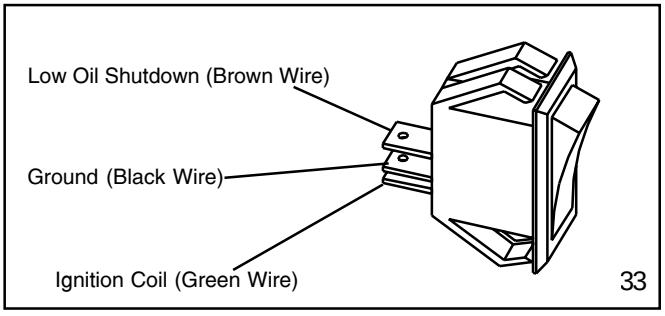
If less than above output, the alternator assembly is defective. See Chapter 9 for "Disassembly Procedure".

VOLTAGE REGULATORS

If a known good or load tested battery fails to maintain a charge, the charging system and the regulator can be checked using a voltmeter. Set the voltmeter on the 0-20 Volt D.C. scale and connect the probes across the battery terminals as shown. Note the battery voltage. Start the engine, the voltage reading should increase from the noted battery voltage but not exceed 15 Volts D.C. If no voltage increase is noted, proceed to make an A.C. voltage check using the applicable procedure. If the battery voltage exceeds 15 Volts D.C., or the proper minimum A.C. voltage is noted during the check, replace the regulator.

LOW OIL SHUTDOWN SWITCHES

Check the LOS switch while it is in the engine. The engine must be level, and the oil level at the full mark. Place the speed control in the run position. Remove the spark plug wire from the spark plug. Install a gap type tester connected to the spark plug wire and a good engine ground. Spin the engine over using the electric or recoil starter. A bright blue spark should be seen at the tester. If not, remove the blower housing and disconnect the LOS lead from the ignition module. Reinstall the blower housing and spin the engine over. If spark occurs now, replace the LOS switch. If no spark is seen, replace the ignition module.



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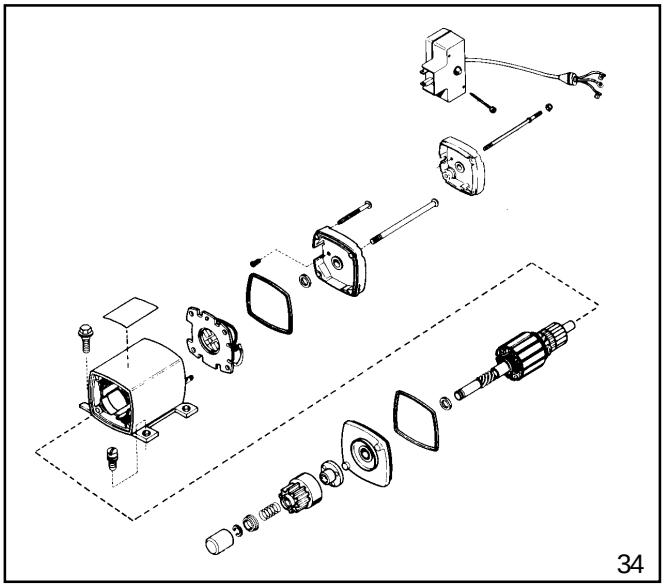
ON/OFF LIGHTED ROCKER SWITCH WITH LOW OIL SHUTDOWN (LOS)

SERVICE

This section covers the service procedures for the 12 and 120 volt electric starters. For diagnosis of the starting circuit see “Electrical Starter Troubleshooting” in this chapter. Illustrations may not be identical in configuration to the starter being serviced, but procedures and tests apply unless otherwise stated.

12 VOLT OR 120 VOLT ELECTRIC STARTERS WITH EXPOSED SHAFT

1. Remove the plastic dust cover on the armature end (diag. 34).
2. Push down the spring retainer and remove the retainer ring.
3. Slide off the spring retainer, anti-drift spring, gear, and drive nut.
4. If internal service is necessary, scribe a line across the cap assemblies and armature housing to aid in reassembly.
5. Remove the two or four retaining nuts from the through bolts holding the cap assembly.
6. Slide off the cap assembly. The terminal insulator slides out of the commutator cap.
7. Remove the armature.
8. Inspect and replace as necessary.
9. Use the reverse procedure for reassembly.
10. **Inspect flywheel ring gear for damage before installation.**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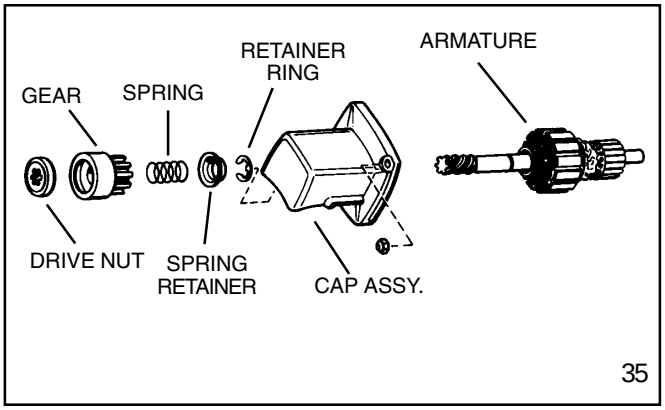
12 VOLT D.C. OR 120 VOLT A.C. ELECTRIC STARTERS WITH CAP ASSEMBLY

1. Remove the retainer ring from the armature shaft (diag.35).
2. Remove the two nuts from the through bolts holding the cap assembly on.
3. Slide off the cap assembly. The engaging nut, gear, spring, and spring retainer will remain in the cap assembly.
4. If complete disassembly is required, refer to step # 4 in the previous section for additional steps.
5. Inspect and replace as necessary. Use reverse procedure for assembly. (For ease of assembly, place the armature into the brush end frame first.)
6. **Inspect flywheel ring gear for damage before installation.**



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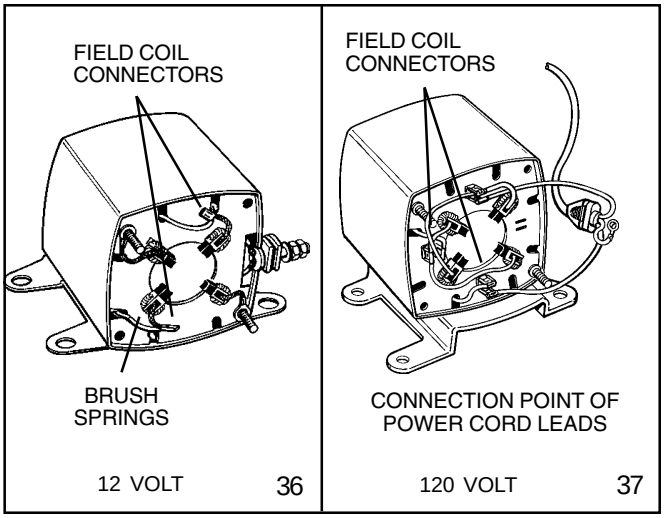
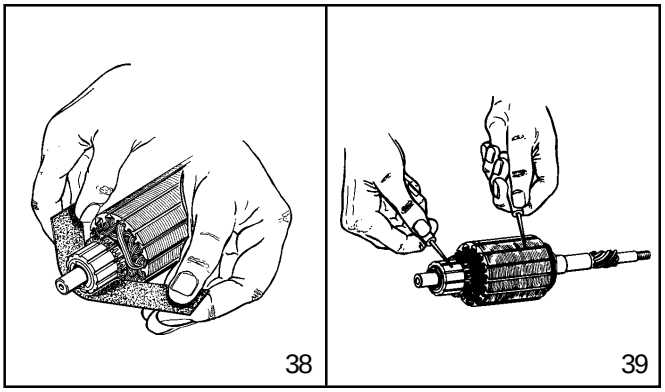
INSPECTION AND REPAIR

1. The pinion gear parts should be checked for damage or wear. If the gear does not engage or slips, it should be washed in solvent (rubber parts cleaned in soap and water) to remove dirt and grease, and dried before reassembly. Also check the armature and drive nut splines for wear or damage. Replace parts as necessary.
2. The brushes and brush card holder should be checked for wear. With the armature in place and the brushes engaging the commutator surface, check the brushes for wear. Brushes should be replaced if the brush wire approaches the bottom of the brush holder slot. Brush springs must exhibit enough strength to keep tension on the brushes and hold them on the commutator.
3. The field windings can be checked using a continuity light or ohmmeter. Attach one lead to each field coil connection. Continuity should exist between each field coil connection, and no continuity should exist between the field coil connections and the starter housing (diag. 36 & 37).
4. The armature should be checked for glazing or wear. If necessary the armature can be turned down in a lathe. While rotating, polish the commutator bars using a piece of 00 sandpaper (diag. 38). Light pressure and back and forth movement should be used. Recut the commutator bars to a depth equal to the width of the insulators between the bars. Check for continuity between the copper commutator bars and the iron of the armature, none should exist (diag. 39). If any is noted the armature must be replaced.





Brush Card Replacement

1. Loosen but do not remove the two nuts on the starter terminal post.
2. Remove the nuts holding the end cap in place. Remove the end cap and the thrust washer.
3. Grasp the thru bolts using a vise grip positioned as close to the flanged end as possible to prevent thread damage. Remove the two nuts holding the driving end cap in place. Remove the armature and driving cap assembly, followed by the two thru bolts. Notice the position of the brush ground eyelet under the thru bolt flange.
4. Note or mark the position of the connectors of the brush wires. Use a wire cutter to clip the solid field wires as close to the connectors as possible.
5. Note or mark the brush card in the starter housing and remove the brush card assembly. Clean the accumulated dirt off all starter parts. Scrape the insulating varnish off the last 1/2" (12.7 mm) of the solid field wires.
6. Insert the new brush card into position while guiding the solid field wires through the proper slots in the brush card.
7. Crimp and solder the brush leads to the solid field wires. Use a needle nose pliers or vise grip to hold the woven brush lead close to the connector while soldering. This prevents solder and heat from flowing up the brush lead. Insulate the crimped connection nearest the starter terminal post using electrical tape or heat shrink tubing. Route the wires to prevent damage during assembly.
8. Install the armature into the housing while spreading the brushes. Install the thru bolts while checking to make sure the bolts go thru the ground brush eyelet terminals. Install and tighten the drive end thru bolt nuts, but do not overtighten.
9. Install the thrust washer (cupped side faces towards the end cap) on the end of the armature and then install the starter end cap. Secure the cap with the locking nuts and tighten the nut on the starter terminal post. Rotate the armature by hand to check for binding before installation on the engine.

CHAPTER 7 FLYWHEEL BRAKE SYSTEMS

GENERAL INFORMATION

Tecumseh's brake systems provide two methods of meeting compliance standards which has become a federal law as of June 30, 1982. There are two additional methods used by equipment manufacturers that also meet compliance standards and they are as follows:

1. Use of the blade brake clutch in conjunction with either a top or side mounted recoil starter or 12 volt electric starter. The blade stops within three seconds after the operator lets go of the blade control bail at the operator position and the engine continues to run. Starter rope handle is either on the engine or on the equipment handle.
2. Use of a recoil starter (top or side mounted) with the rope handle on the engine as opposed to within 24 inches (60.9 cm) of the operator position. This method is acceptable if the mower deck passes the 360 degree foot probe test. A specified foot probe must not contact the blade when applied completely around the entire blade housing. This alternative can be used with engine mounted brake systems and typical bail controls. The blade stops within three seconds after the operator lets go of the engine/blade control bail at the operator position.

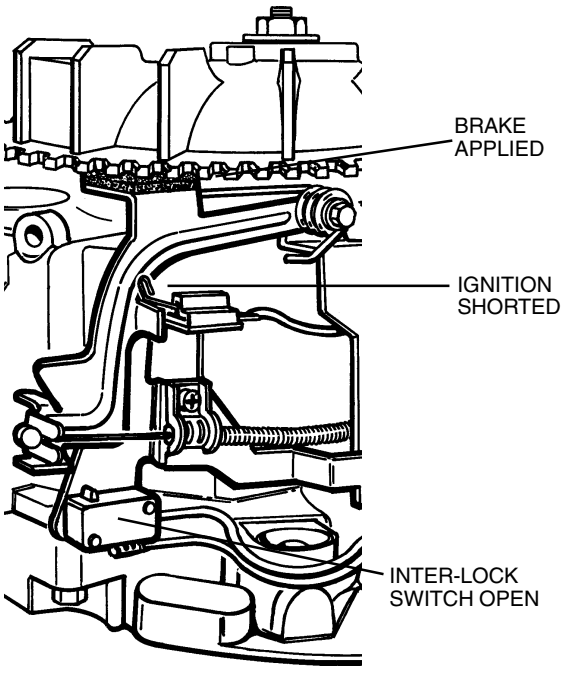
Tecumseh's Flywheel Brake system provides consumer safety by stopping the engine and blade within three seconds after the operator releases the engine/blade control bail at the handle of the lawnmower. These systems are available on both recoil and electric start models. The engine stopping time is affected by the engine R.P.M. Consult microfiche card #30, the Plus 1 or Parts Smart Look-Up system, or Service Bulletin #107 to determine the correct engine RPM or blade tip speed.

OPERATION

BOTTOM SURFACE SYSTEM

In the stop position with the handle mounted engine / blade control released, the torsion spring rotates the brake lever forcing the brake pad against the underside of the flywheel, actuates the ignition kill switch and on electric start models, opens the starter interlock switch (diag. 1).

In order to restart the engine, the handle mounted engine / blade control must be applied. This action pulls the brake pad away from the flywheel, opens the ignition kill switch and on electric start models, closes the starter interlock switch. This will allow the engine to be started by energizing the starter with a starter switch (diag. 2).



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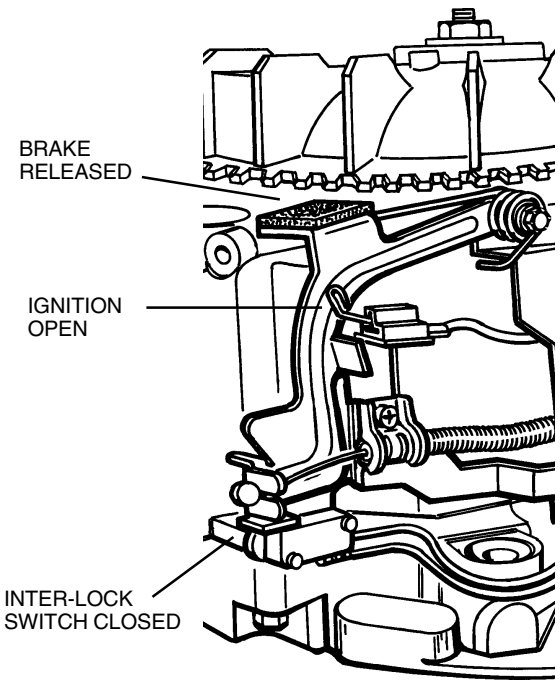

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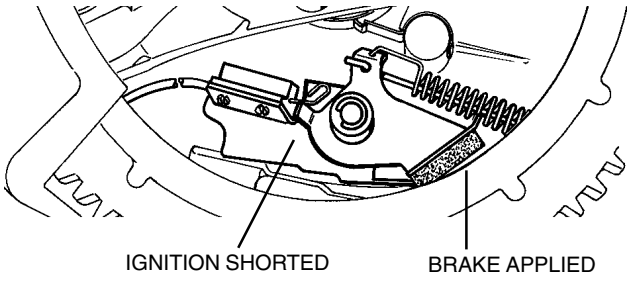
OPERATION (CONTINUED)

INSIDE EDGE SYSTEM

In the stop position the brake pad is applied to the inside edge of the flywheel, at the same time the ignition system is grounded (diag. 3).

In order to restart the engine, the brake control must be applied. This action pulls the brake pad away from the inside edge of the flywheel and opens the ignition kill switch. On electric start systems the starter is energized by an ignition switch or a two motion control. On non-electric start systems, the recoil starter rope must be pulled to start engine (diag. 4).



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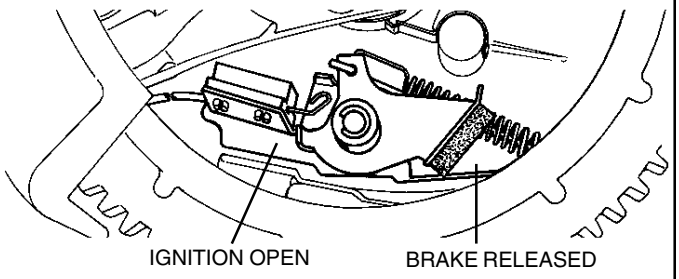

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COMPONENTS

Both the Bottom Surface and the Inside Edge systems use the following components:

The **brake lever and pad** assembly consists of a steel lever with a brake pad bonded to the lever (diag. 5).

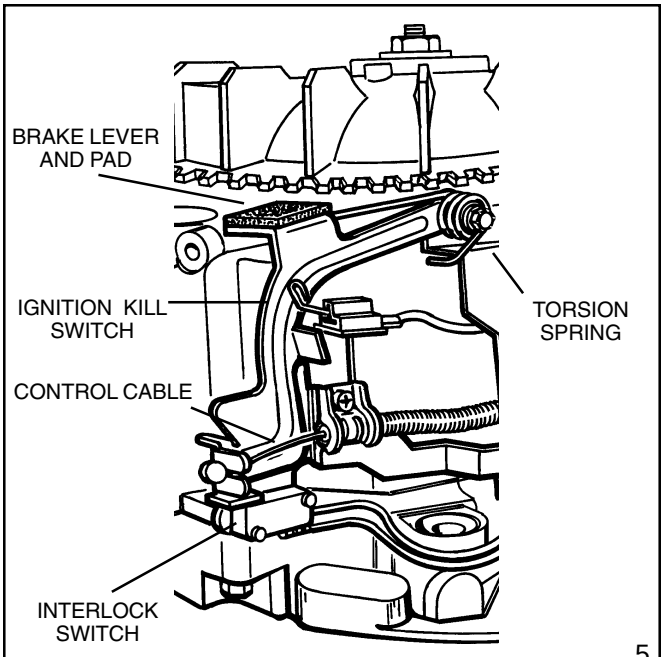
The **ignition kill switch** is a plastic block with a wire extending out of it. The wire is attached to a terminal which is connected to the ignition kill wire. The brake lever contacts and grounds the wire of the switch when the engine / blade control is released, and the ignition module is grounded. This in turn kills the ignition (diag. 5).

The **interlock switch** is a push button switch that is activated by the brake lever when the engine / blade control is actuated. If there is a starter switch used to start the engine, the interlock switch acts as a safety switch and will not allow the starter to crank unless the engine / blade control is depressed.

Where a two motion control is used the interlock switch is utilized as the starter switch.

The **Torsion Spring** supplies the pressure to the brake lever and brake pad to stop the flywheel.

The **Control Cable** transfers the motion of the engine / blade control to the brake system.



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SERVICE

If the brake system fails to kill the ignition and stop the blade within 3 seconds the following service procedures should be followed.

FLYWHEEL REMOVAL

NOTE: BEFORE THE FLYWHEEL IS REMOVED OR REPLACED, THE BRAKE PRESSURE ON THE FLYWHEEL MUST BE RELIEVED AS OUTLINED BELOW UNDER "BRAKE LEVER AND PAD".

Remove the flywheel as outlined in Chapter 9 under "Disassembly".

BRAKE LEVER AND PAD

Bottom Surface

To relieve the brake pressure on the flywheel, remove the torsion spring by firmly grasping the short end of the spring with a pliers and unhook the spring from the bracket then remove the flywheel (diag. 6).

Remove the brake lever and pad assembly. Inspect the brake pad for dirt, oil or grease contamination. If the pad is contaminated, or if there is less than .060" (1.524 mm) of brake pad material at the pad's thinnest point, replacement is necessary. The brake pad is bonded to the brake lever and must be replaced as an assembly. Install the brake lever and pad assembly and continue to reassemble the brake system in the reverse order of disassembly.

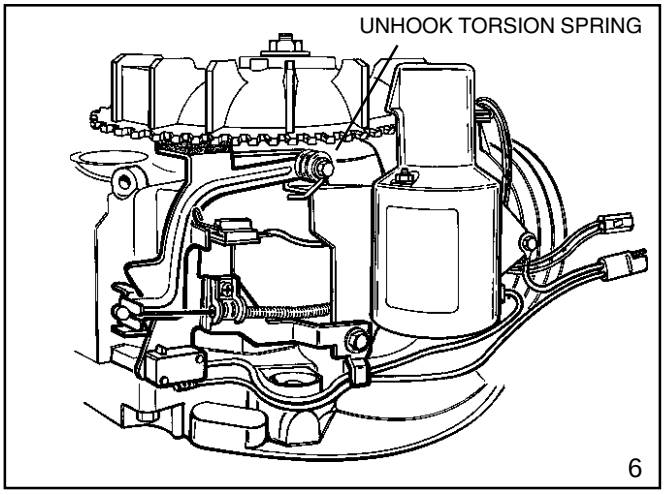
NOTE: WHEN REMOVING THE BRAKE BRACKET THE TORSION SPRING MUST BE RELEASED BEFORE THE TOP STARTER BOLT IS REMOVED OR THE THREADS IN THE CYLINDER BLOCK WILL BE DAMAGED.

Inside Edge

To relieve the brake pressure on the flywheel, compress the spring by moving the lever toward the spark plug, when the hole in the lever aligns with the hole in the bracket, secure the lever with alignment tool 670298 then remove the flywheel (diag. 7). Remove the alignment tool. Release the spring tension by unhooking the short end of the spring from bracket with a pliers. Remove the “E” clip from the brake pad shaft. Slide the pad lever from the shaft and unhook the link. Inspect the brake pad for dirt, oil or grease contamination. If the pad is contaminated, or if there is less than .060" (1.524 mm) of brake pad material at the pad's thinnest point, replacement is necessary. The brake pad is bonded to the brake lever and must be replaced as an assembly. Rehook the link, install the brake lever and pad assembly, install the "E" clip, rehook the short end of the spring and continue to reassemble the brake system in the reverse order of disassembly.

IGNITION GROUNDOUT TERMINAL

Inspect the ignition kill switch grounding clip for proper alignment and contact with the brake arm. Insure that all electrical connections are clean and secure (diag. 8 & 9).



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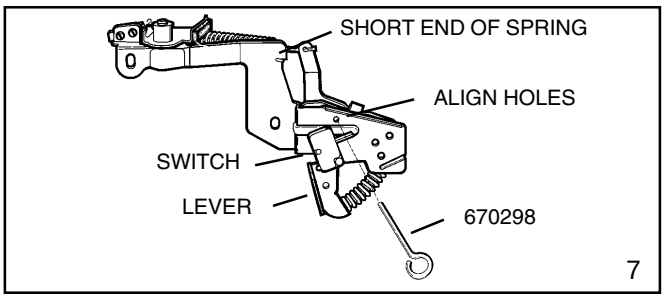

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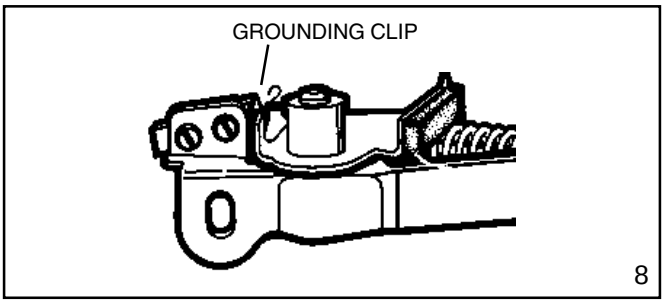

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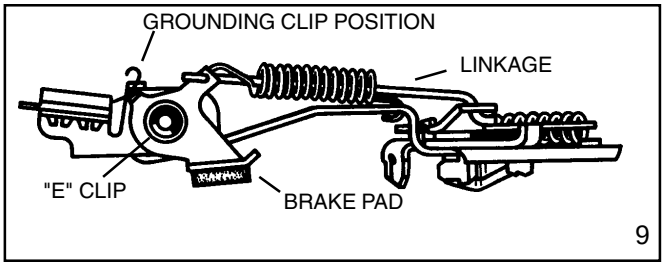
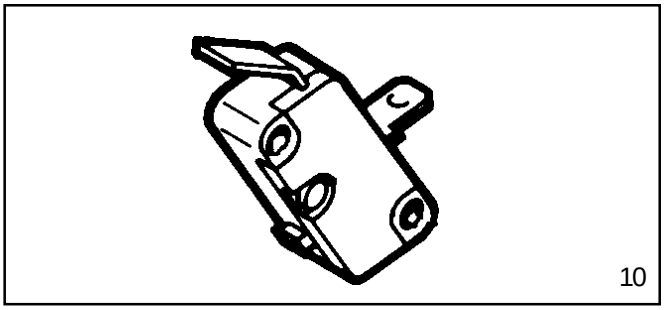


9

STARTER INTERLOCK SWITCH

The engine / blade control must close the interlock switch before the starter can be engaged. To check the interlock switch, use an ohmmeter or continuity light to perform a continuity check. Continuity should exist between the two terminals when the interlock switch button is completely depressed. No continuity should exist when the button is released. If the switch fails replace the switch (diag. 10).

To replace the interlock switch, carefully grind the heads off of the rivets that fasten the interlock switch to the brake bracket. Remove the rivets from the back side of brake bracket. Use the self-tapping screw supplied with the new switch to make threads in the bracket. Install the interlock switch onto the brake bracket in the proper position and secure the switch to the brake bracket with the machine screws supplied. Be careful not to overtighten the screws as switch breakage can occur (diag. 11).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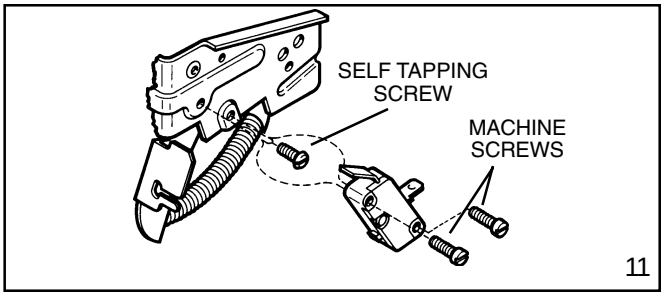
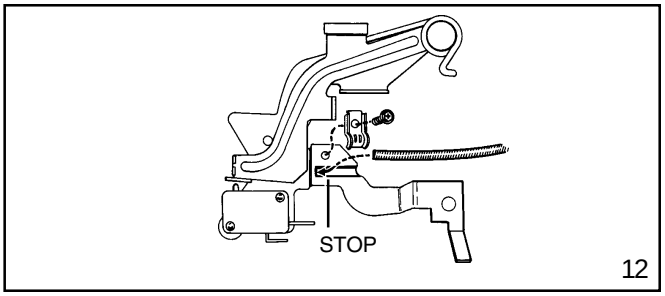


11

CONTROL CABLE

Bottom Surface

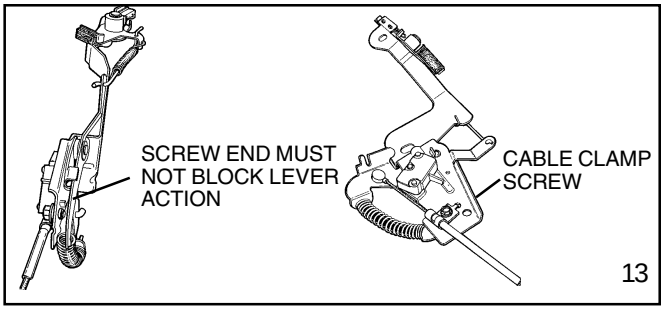
The control cable conduit must be assembled against the stop in the bracket. Make sure the bottom of the lever completely depresses the button on the starter interlock switch, if equipped, when the control is fully applied. The cable must provide enough travel so the brake will contact the flywheel. Some slack should exist in the cable adjustment to compensate for brake pad wear (diag. 12).



12

Inside Edge

If replacing the cable conduit screw with a screw other than a service part replacement, be certain that the screw length is not too long as to prevent free travel of the lever. Make sure the button on the starter interlock switch is completely depressed when the control is fully applied. The cable must provide enough travel so the brake will contact the flywheel. Some slack should exist in the cable adjustment to compensate for brake pad wear (diag. 13).

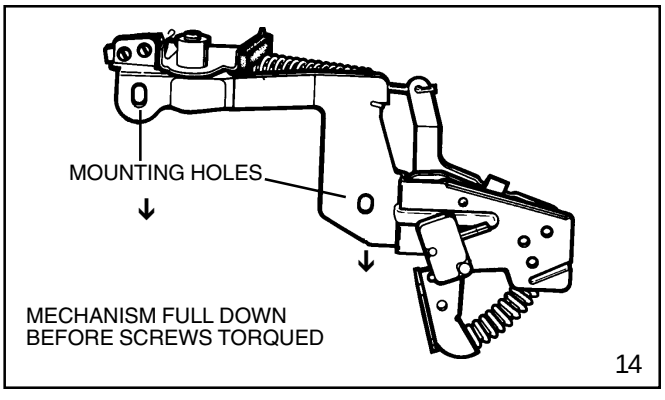


13

BRAKE BRACKET REPLACEMENT

The tension must be relieved on the lower brake spring prior to the removal of the top electric starter bolt, or damage to the threads in the cylinder block can occur.

When installing a inside edge brake bracket assembly, be sure the slotted holes in the brake bracket are all the way down on the fasteners. This will properly align the brake bracket to the flywheel brake surface (diag. 14).



14

CHAPTER 8 IGNITION

GENERAL INFORMATION

The ignition systems used on Tecumseh engines are either solid state capacitor discharge modules or magneto ignition systems. The basic functional difference is that the solid state modules are triggered by an electronic switch (SCR). Magneto ignition systems rely on the mechanical action of opening and closing a set of moveable contact points to trigger when the spark will occur.

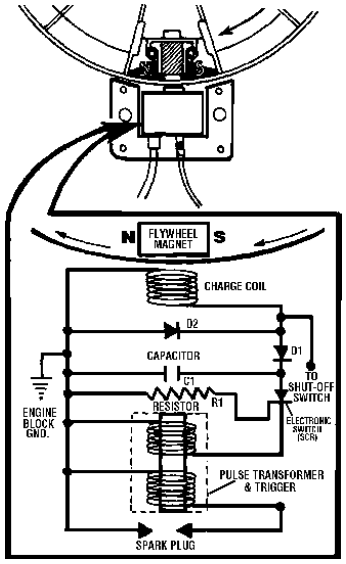
The solid state ignition system consists of a flywheel magnet and key, charge coil, capacitor, a silicon controlled rectifier, pulse transformer, trigger coil, high tension lead, and a spark plug. Everything except the flywheel magnet, key and the spark plug are located in a encapsulated ignition module. This solid state (CDI - Capacitive Discharge Ignition) module is protected by epoxy filler from exposure to dirt and moisture. This system requires no maintenance other than checks of the high tension lead and spark plug.

The Tecumseh magneto ignition consists of a stator assembly made of laminations, a coil, contact points, condenser, a permanent magnet mounted in the flywheel, high tension lead, and a spark plug. The coil is sealed by epoxy filler, and the points and condenser are sealed from dirt and moisture by a crankshaft seal and cover gasket.

OPERATION

SOLID STATE IGNITION SYSTEM (CDI)

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. The energy is stored in the capacitor (approx. 200 volts) until it is released by an electrical switch (SCR). As the magnet continues to rotate, it travels past a trigger coil where a low voltage signal is produced. This low voltage signal closes the SCR switch, allowing the energy stored in the capacitor to flow to a transformer where the voltage is increased from 200 volts at 200 RPM to 22,000 volts at 3000 RPM. This voltage flows through the high tension lead to the spark plug where it arcs across the electrodes and ignites the air-fuel mixture (diag. 1).



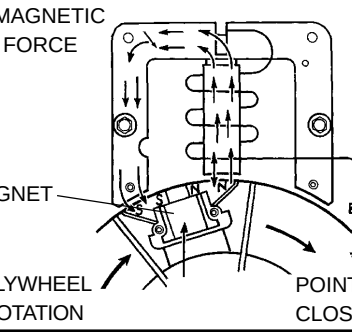
1

MAGNETO IGNITION SYSTEM (POINTS)

As the flywheel turns, the magnets that are mounted in the wheel, pass the coil mounted on the stator. As the magnet's North Pole enters the area of the center leg of the stator, a magnetic field is concentrated through the laminations to the magnet's South Pole. This causes a generation of current flow in the coil's primary winding. The ignition points are closed (diag. 2).

As the flywheel continues to rotate, the North Pole approaches the last leg of the lamination stack. The magnetic field through the center leg reverses, producing a large change in the magnetic field, and a high current in the primary side of the coil (diag. 3).

At this time, the contacts open and the primary current stops flowing. This change in current causes a voltage in the primary, which induces a high voltage in the secondary winding of the coil. The voltage travels through the spark plug wire, to the spark plug and jumps the gap of the plug to ignite the air/fuel mixture.



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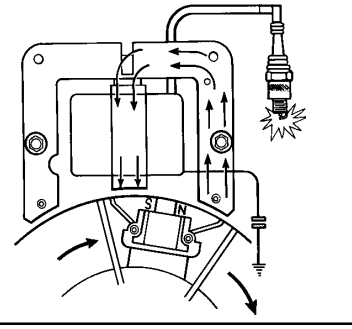

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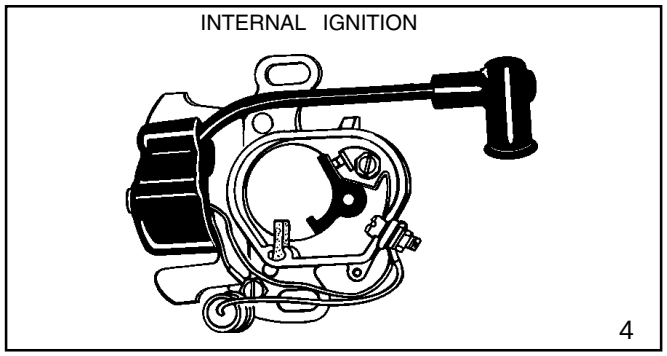
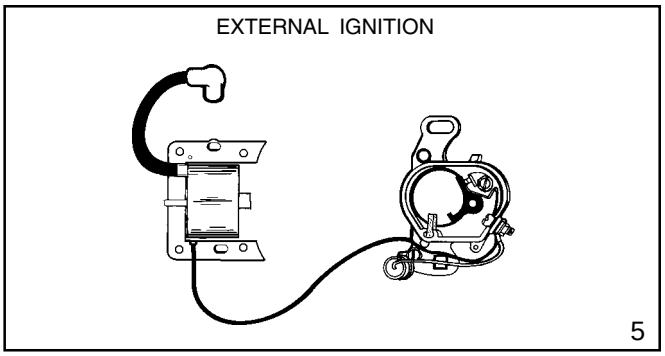
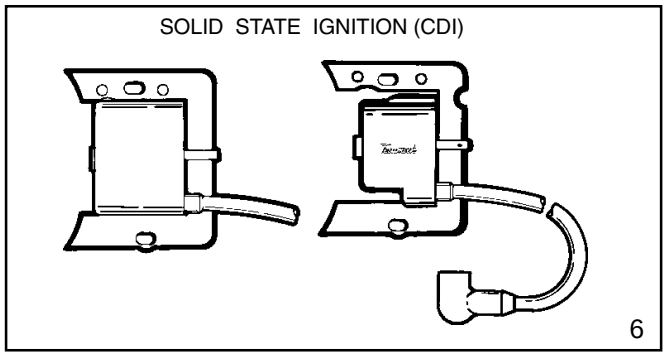
IDENTIFICATION OF TECUMSEH IGNITION SYSTEMS







COMPONENTS OF A TECUMSEH MAGNETO IGNITION SYSTEM (DIAG. 7)

A. Flywheel with magnets

B. Coil

C. Condenser

D. Spark plug

E. Contact points

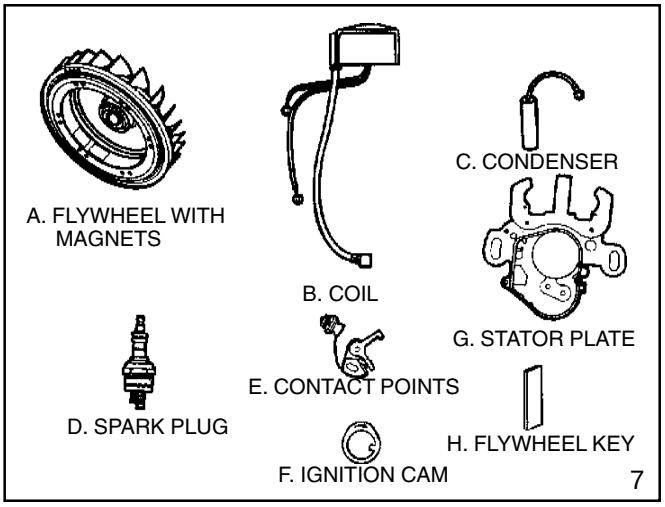
F. Ignition cam

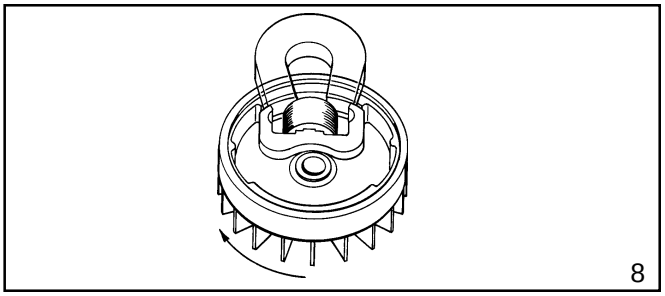
G. Stator plate (dust cover, cam wiper, and laminations.)

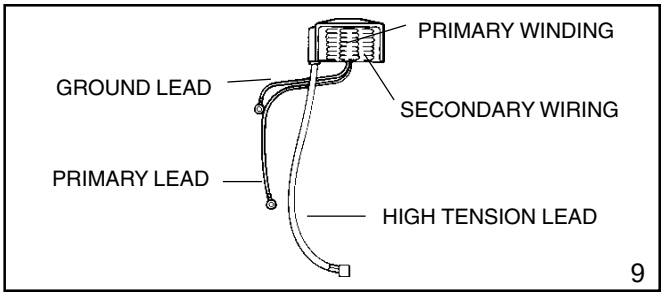
H. Flywheel key

The flywheel with magnets provide the magnetic flux (or field) which is necessary to induce the low voltage in the primary circuit. A horseshoe magnet is a good example of how the magnets function in the flywheel. The magnets are either cast in or glued onto the flywheel, and are not a replaceable item (diag. 8).

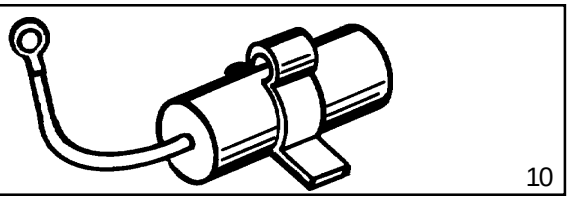
The ignition coil is used to increase the low voltage in the primary to high voltage in the secondary, capable of jumping the spark plug gap. The coil consists of a primary and a secondary winding of wire. The primary is the low voltage (200 - 300 volts) winding, consisting of approximately 150 turns of heavy gauge wire next to the core. The secondary winding consists of approximately 10,000 turns of very fine wire wrapped over the primary. When induced by the primary, the secondary winding generates a voltage of between 10,000 - 20,000 volts, which can arc the spark plug gap (diag. 9).







The condenser acts as an electrical shock absorber to prevent arcing between the contact points as they open. Arcing will lower the voltage at the spark plug, as well as burn and pit the contact points. The condenser is a replaceable item (diag. 10).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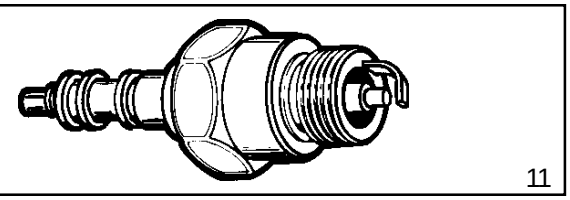
The spark plug is made up of two electrodes. The outside electrode is grounded and secured to the threaded sleeve. The center electrode is insulated with porcelain. The two are separated by an air gap which creates a resistance. A large voltage from the secondary arcs the air gap which causes a spark and ignites the air-fuel mixture in the cylinder (diag. 11).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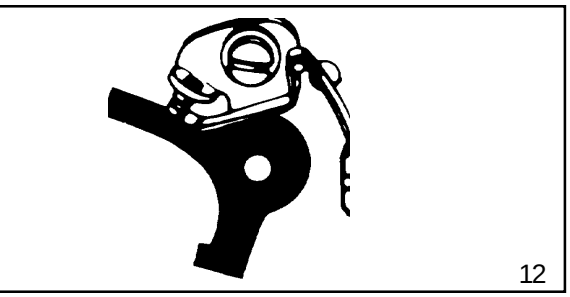
The contact points consist of an insulated, movable point that connects to the coil primary lead, and a stationary point that is grounded to the stator body. Spring tension holds the points together making a complete path for the primary circuit, and are opened by the action of the point arm which rests on the ignition cam. The contact points are a replaceable item (diag. 12).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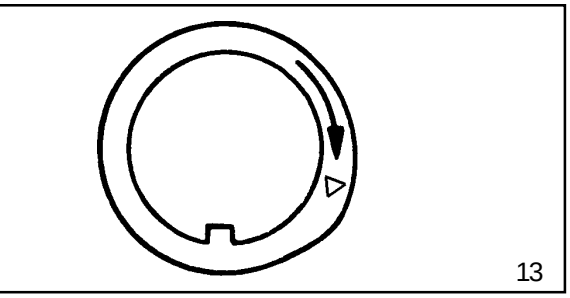
The ignition cam is an oblong device which rotates with the crankshaft, and opens the points for firing the ignition system. It is important to check the ignition cam for roughness, if rough replace the cam. When inserting the ignition cam onto the crankshaft make sure that the side stamped "TOP", or the side that has an arrow on it faces the mechanic (diag. 13).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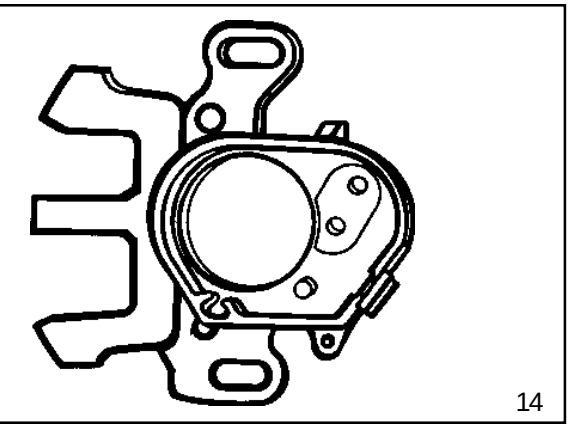
NOTE: SOME IGNITION CAMS ARE MACHINED DIRECTLY ONTO THE CRANKSHAFT AND ARE NOT REPLACEABLE.

The stator plate is an aluminum fixture which houses the points, cam wiper, condenser, and has the laminations riveted to it. The laminations are strips of iron riveted together to form an iron core. Rust or debris in between the laminations will hamper the performance of the ignition system. If corrosion on the laminations is severe, the stator plate should be replaced (diag. 14).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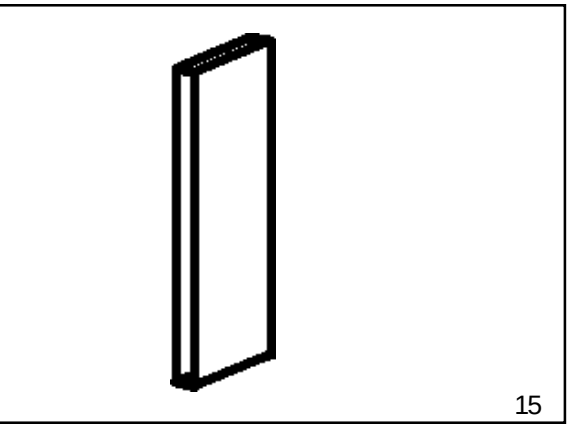
The flywheel key locates the flywheel to the crankshaft in the proper position. If a flywheel key is sheared, or partially sheared, the engine will not start or be difficult to start (diag. 15).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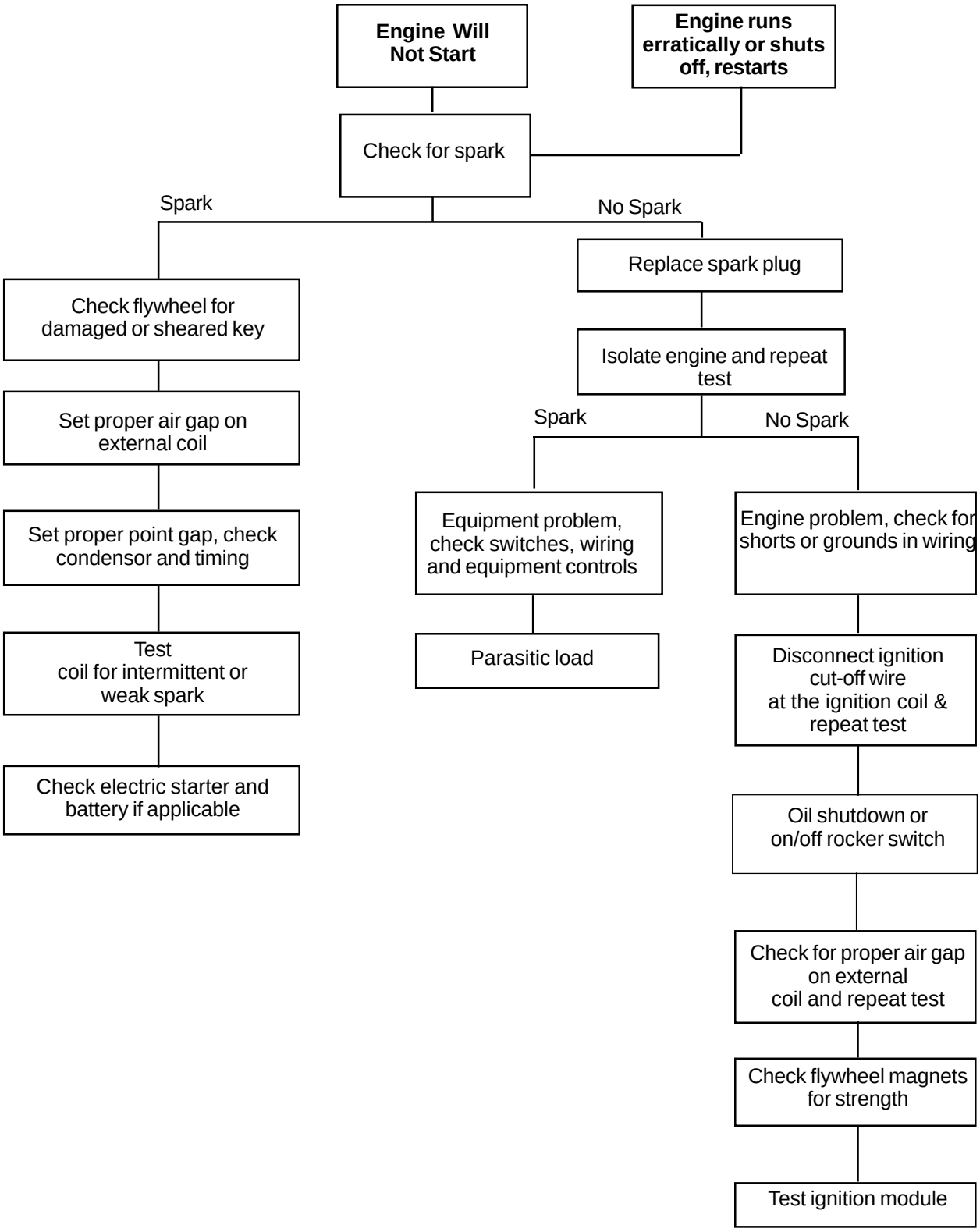
IGNITION TROUBLESHOOTING

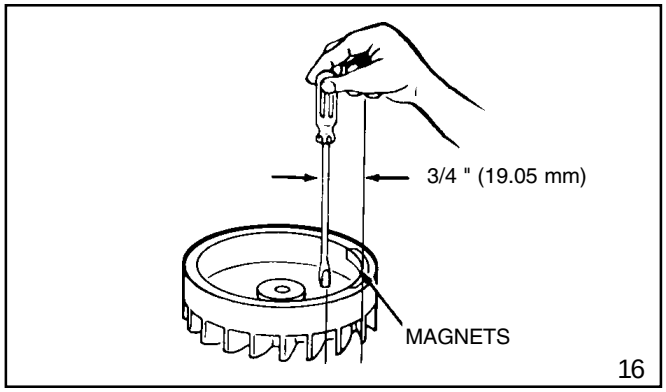


TESTING PROCEDURE

1. Check for spark using a commercially available spark tester and following the tester's recommended procedure.
2. Check for the correct spark plug and for cracks in the porcelain, pitted or burned electrodes, excessive carbon buildup, and proper air gap setting. Replace if questionable.
3. Remove the blower housing, disconnect the ignition ground lead at the ignition coil (solid state only). Reinstall the blower housing and crank the engine over. If spark occurs, check the ignition switch, safety interlock switches, electrical wiring for shorting to ground, or oil shutdown switch.

NOTE: STANDARD POINT IGNITION MAY HAVE TO BE DISCONNECTED AT THE IGNITION SHUTOFF (AT THE SPEED CONTROL).

4. Check the air gap between the flywheel magnets and the laminations of an externally mounted coil or module. It should be .0125 (.317 mm) or use gauge part # 670297.
5. Check the flywheel magnets for the proper strength using this rough test. Hold a screwdriver at the extreme end of the handle with the blade down, move the blade to within 3/4 inch (19.05 mm) of the magnets. If the screwdriver blade is attracted to the magnets, the magnetic strength is satisfactory (diag. 16).
6. Examine the stator components (diag. 17).
   A. Check the ignition cam for roughness.
   B. Check the movable point arm that rests on the ignition cam for wear.
   C. Check the spring steel on the point assembly for evidence of excessive heat.
   D. Check contact points for wear. If they are pitted or burned, this is an indication that the condenser is not functioning properly. If any of the above are faulty, replace accordingly.
   E. When replacing the points, also replace the condenser.
   F. After the points are replaced and engine is re-timed, be sure to clean the points with lint free paper. An engine will not run smoothly if the points are improperly set or coated with even a small quantity of oil, etc.



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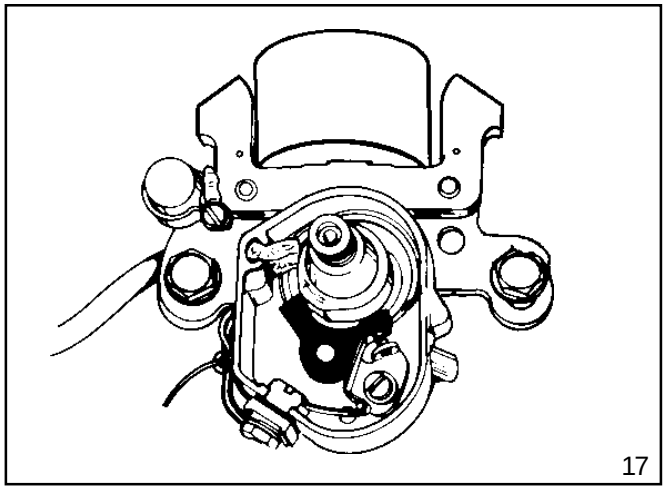
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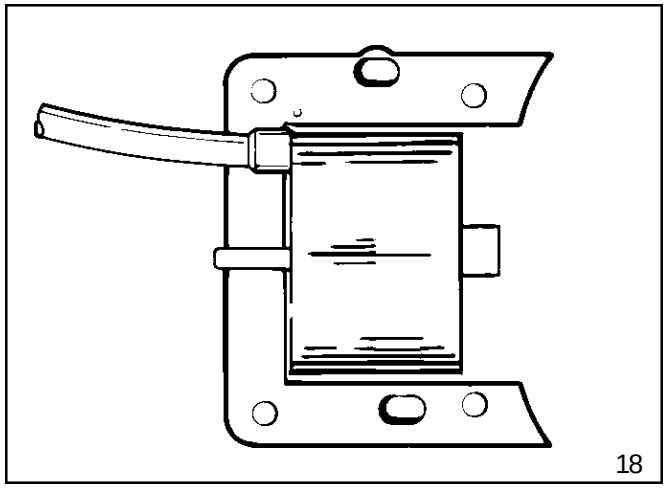
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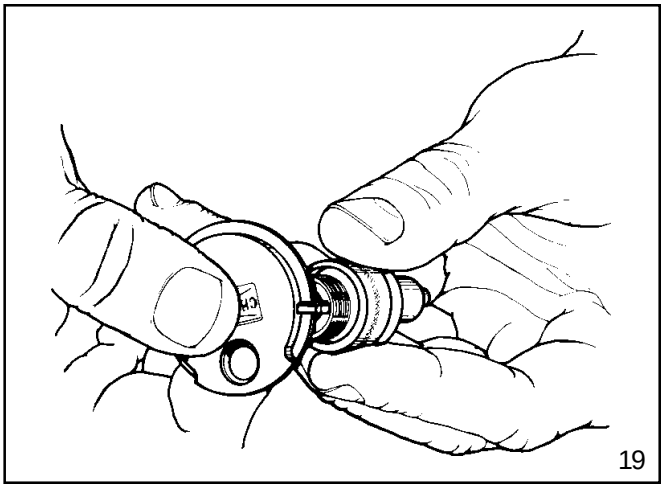
7. Examine the coil and lamination assembly (either internal or external) for cracks in the insulation or other damage which would cause shorts or leakage of current. Make sure the electrical leads are intact, especially where they enter the coil (diag. 18).
8. Check the operation of the coil using an approved tester. Follow the instructions furnished with the test unit or booklets offered by the Tecumseh Products Co. Engine and Transmission Group Service Division. If the coil or lamination assembly is defective, replace as necessary.

NOTE: IF LAMINATIONS ARE BAD ON AN INTERNAL COIL ASSEMBLY, THE ENTIRE STATOR BODY MUST BE REPLACED SINCE THE LAMINATIONS ARE PERMANENTLY RIVETED TO THE STATOR.

External coils are permanently attached to the lamination and must be serviced as an assembly.

SERVICE

To remove ignition components from the engine, see Chapter 9 under "Disassembly".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SPARK PLUG SERVICE

Spark plugs should be removed, cleaned, and adjusted periodically.

Check the air gap with a spark plug gap gauge and adjust accordingly. Set the spark plug gap at .030" (.762 mm) (diag. 19).

Replace the plug if the center and ground electrodes are pitted or burned, or if the porcelain is cracked or discolored.

When reinstalling the plug make sure it is clean of all foreign material.

NOTE: DO NOT USE A SAND BLASTER TO CLEAN PLUGS, MICROSCOPIC PARTICLES LEFT IN THE PLUG CAN SCORE THE ENGINE CYLINDER DURING OPERATION. USE A SOLVENT AND A WIRE BRUSH TO CLEAN, AND BLOW OUT THOROUGHLY WITH COMPRESSED AIR.

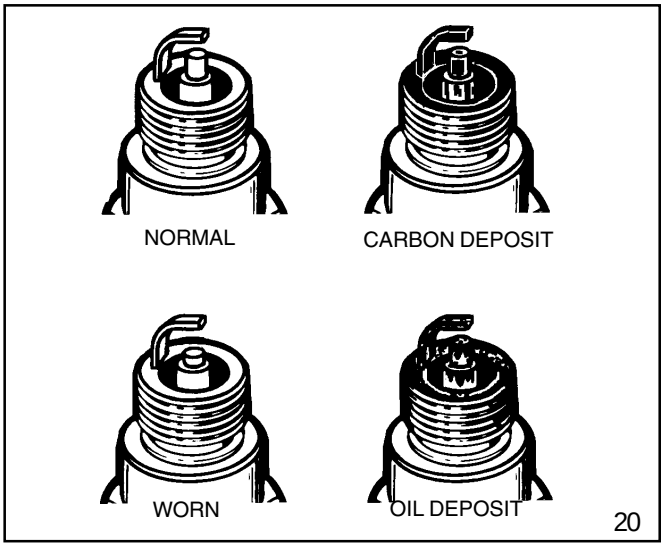
Replace the spark plug with the proper spark plug. Consult the proper parts breakdown for the spark plug to be used in the engine being serviced.

Set the spark plug gap at .030" (.762 mm).

Install the spark plug and tighten to 250 inch pounds torque (28.5 Nm). If a torque wrench is not available, screw spark plug in as far as possible, by hand, and use a spark plug wrench to turn spark plug 1/8 to 1/4 of a turn further if using the old spark plug or 1/2 of a turn further if using a new spark plug.

CONDITIONS CAUSING FREQUENT SPARK PLUG FOULING

1. Carburetor setting too rich or air cleaner restricted.
2. Partially closed choke shutter.
3. Poor grade of gasoline.
4. Improper fuel.
5. Restricted exhaust system.
6. Incorrect spark plug.
7. Incorrect spark plug gap.
8. Oil level too high, or breather is restricted.
9. Faulty piston rings.
10. Weak ignition system.



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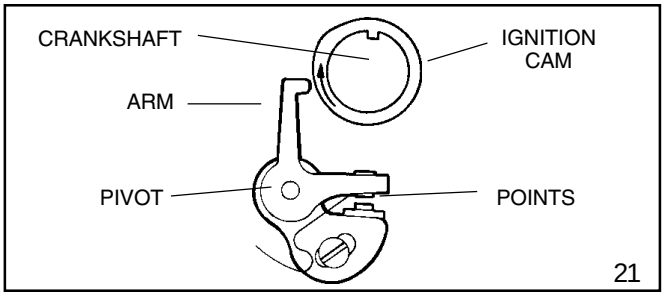
IGNITION TIMING PROCEDURE

In order for an engine to run effectively and efficiently, the spark must ignite the compressed air-fuel mixture when the piston is in a specific position to deliver maximum power. This position is known as Before Top Dead Center (BTDC). If the mixture is ignited too soon, kickback can be experienced due to preignition. If the mixture is ignited too late, loss of power can be experienced due to retarded spark.

The Standard Point System

Internal coils are used on small and medium frame 4 cycle engines. First check the specification charts in the back of this manual or the quick reference chart for the correct ignition dimensions, (point gap setting and timing specification) depending on the model of engine.

Begin the procedure by replacing the points if necessary. To do this remove the nut that secure the movable portion of the breaker points. Remove the screw from the stationary portion of the breaker points and the worn breaker point assembly. Install a new breaker point assembly and adjust the point gap. This is done by rotating the crankshaft until the point arm is resting on the high side of the ignition cam. Set the point gap by loosening the screw on the movable point set and insert a feeler gauge per specification. Adjust the point gap so that a light drag is felt on the feeler gauge. Tighten the screw and recheck the gap. Leave the leads unattached for the timing procedure. Use this procedure on all standard point ignition systems when point replacement is necessary (diag. 21).



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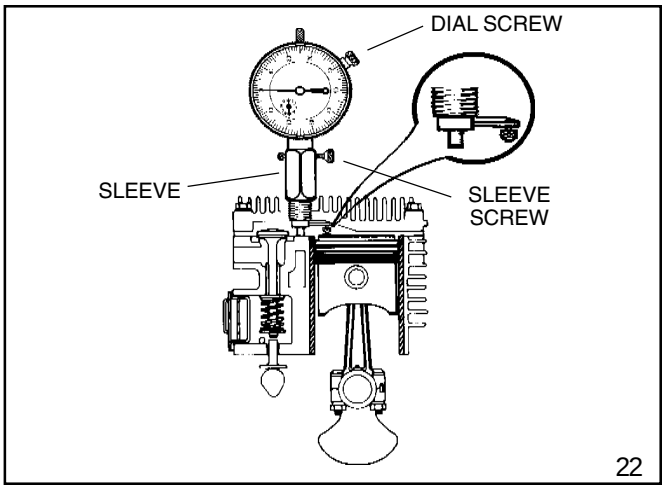
Install a dial indicator (Part # 670241), equipped with the correct tip on the extender leg. Use the small tip for engines with timing dimensions of between top dead center (T.D.C.) and .050" (1.27 mm) before top dead center (B.T.D.C.). Use the large tip for engines with timing dimensions of between .051" (1.295 mm) B.T.D.C. to .150" (3.81 mm) B.T.D.C. Make sure to secure the extender leg in position to locate the tip directly over the piston head. Loosen the screw on the side of the adaptor sleeve to allow the sleeve to be turned into the threads of the spark plug hole, not the entire dial indicator. This will ensure the proper location of the tip. Once the adapter sleeve is secured in the hole, tighten screw on sleeve adaptor to prevent the dial from moving up or down, which would give a false reading (diag. 22).



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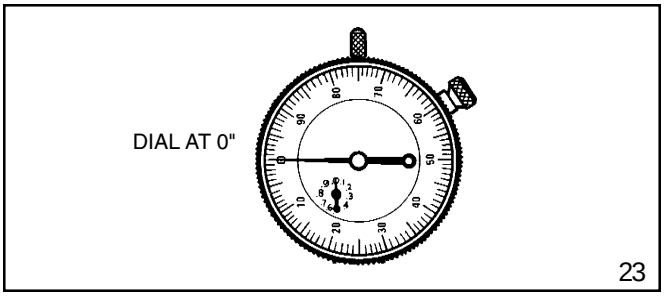
Find T.D.C. with both valves closed by rotating the crankshaft clockwise when looking at the magneto end of the crank, until the needle on the dial stops and reverses direction. Where the needle stops is T.D.C. Loosen the screw on the dial, and rotate the dial so that zero is lined up with the needle at T.D.C. Tighten the screw on the dial to secure it in place (diag. 23).



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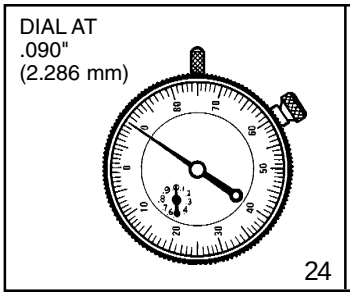
While watching the needle on the dial indicator, rotate the crankshaft counterclockwise when looking at the magneto end of the crank, .010" (.254 mm) past the B.T.D.C. dimension. Then rotate the crankshaft clockwise to the proper B.T.D.C. dimension, this will take out any slack between the connecting rod and crankshaft assembly.

Example: If the specification of .080" (2.032 mm) is the B.T.D.C. dimension, rotate the crankshaft counter-clockwise so that the needle on the dial indicator travels to .090" (2.286 mm) B.T.D.C. (diag. 24), then rotate the crankshaft clockwise so that the needle travels to the specified dimension of .080" (2.032 mm) B.T.D.C. (diag. 25).



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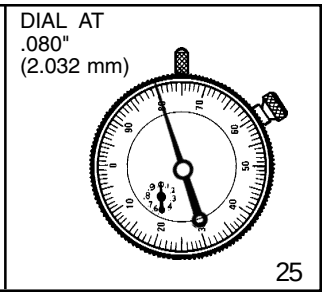

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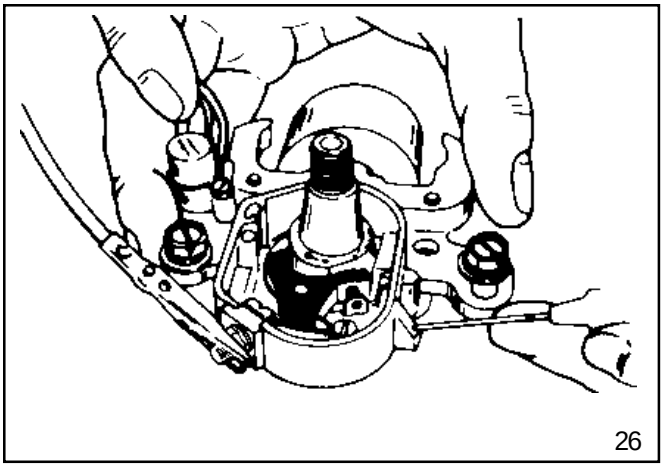
Next, if the original breaker points are being used, disconnect the leads from the point terminal. Reinstall the nut & tighten. Connect one lead of a continuity light, or ohmmeter to the point terminal and the other lead to a good ground. Loosen the two bolts holding down the stator and rotate the stator until the continuity light or ohmmeter indicates a break in the circuit. Torque down the stator bolts while maintaining the stator plate position and the timing procedure is completed. Reconnect the leads on the point terminal and tighten the nut making sure that the leads do not touch the flywheel (diag. 26).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(continued on top of next page)

Before putting the dust cover back on the points box, clean the points by sliding lint free paper back and forth between the contacts. Manually, open the points when removing the paper to eliminate paper fibers from remaining between the contact points (diag. 27).

Fixed Timed System (External coil)

This system has the contact points and condenser mounted under the flywheel with the laminations and coil mounted outside the flywheel. This system is identified by the square hole in the stator, the round configuration of the coil, and on older coils, the word "Grey Key" is stamped on the coil to identify the proper flywheel key to be used. When ordering an external coil for replacement from Tecumseh Products, a solid state module will be received as a replacement. The new module will be supplied with the proper flywheel key (diag. 28).

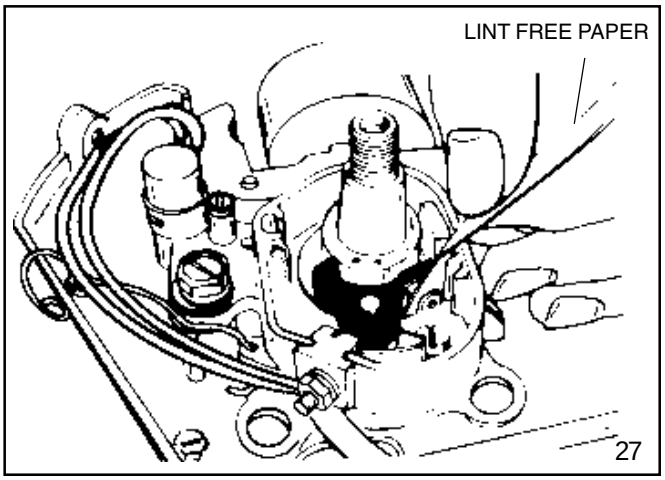
Torque down the stator bolts to secure the stator in place. Next, rotate the crankshaft until the point arm is resting on the high side of the ignition cam. Set the point gap at .020" (.508 mm), by loosening the screw on the movable point, and insert a .020" (.508 mm) feeler gauge between the contact points (diag. 29). Tighten the screw on the movable point and then recheck the point gap. Be sure to clean contact points with lint free paper (diag. 27).

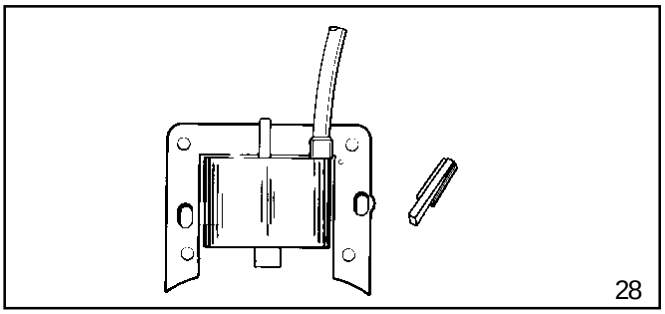
NOTE: The flywheel key used on engines with an external coil and points looks similar to the solid state key, however, timing will be effected if the wrong key is used.

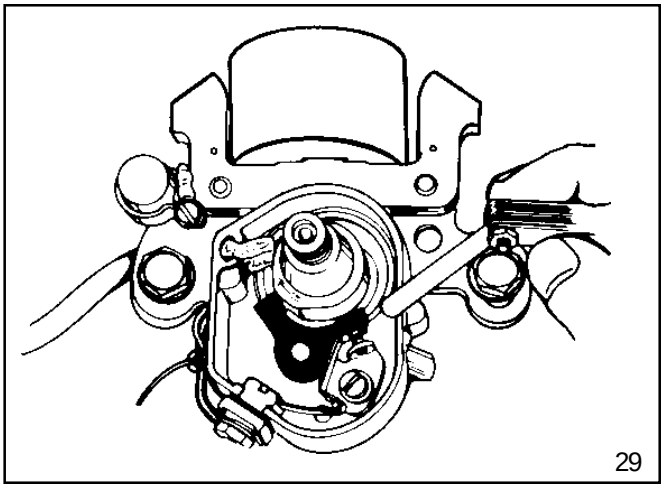
Reinstall the proper flywheel key, flywheel, washer and torque down the flywheel nut to specification. Reinstall the external coil and set the proper air gap to .0125" (.3175 mm) using air gap gauge, part # 670297 between the magnets and laminations and torque the mounting screws to specification. Remove the air gap gauge and rotate the flywheel to check for any possible striking points. If none are found, the air gap is set correctly and the timing procedure is completed (diag. 30).

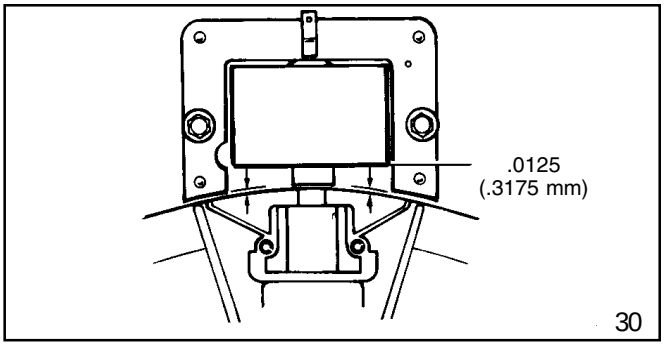
Solid State Ignition Timing

Timing is set using a .0125" (.3175 mm) air gap gauge (Part No. 670297). Loosen the two hold-down screws, insert the .0125" (.3175 mm) remove semi-color gauge between the laminations and the magnet on the flywheel. Slide the solid state ignition assembly against the air gap gauge and the flywheel magnet. Torque the two hold down screws to the correct specification and remove the air gap gauge. Rotate the flywheel one full revolution to check for any possible striking points. If none are found, the air gap is set correctly and the timing procedure is completed (diag. 30).





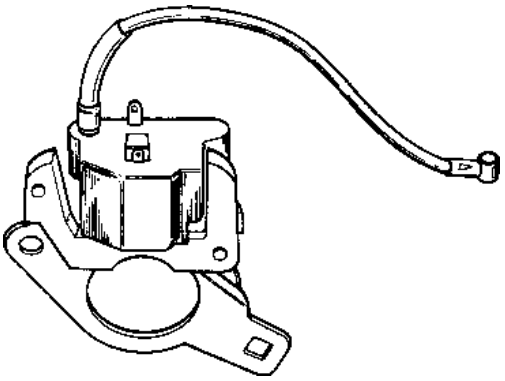




Other Solid State Systems

The following systems are located under the flywheel. All components are encapsulated into one module. No timing is necessary with this type (diag. 31, 32, 33).

Check the system by checking for a spark or use a commercially available test equipment.



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SERVICE TIPS

DO NOT:

Interchange flywheels, flywheel keys, spark plugs, condensers, or points. (Some systems do not use standard points and condensers.)

Use flywheels with cooling fins that are broken off.

Reglue ceramic magnets back onto the inside of the flywheel.

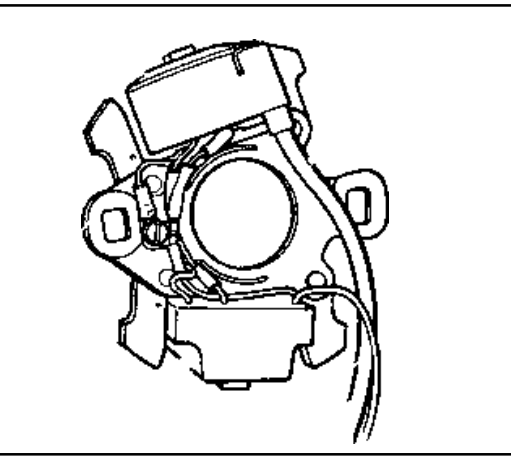
Re-oil the cam wiper in a magneto system.

Use a standard business card as an air gap gauge.

File the contact points.

Attempt to reglue the spark plug lead back into a coil or a solid state module.

Store a solid state module within 20 feet (6.1 meters) of an unshielded welder.



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PLEASE DO:

Follow directions carefully.

Lookup the correct ignition dimensions in the proper mechanic's manual or quick reference chart, for the engine being repaired.

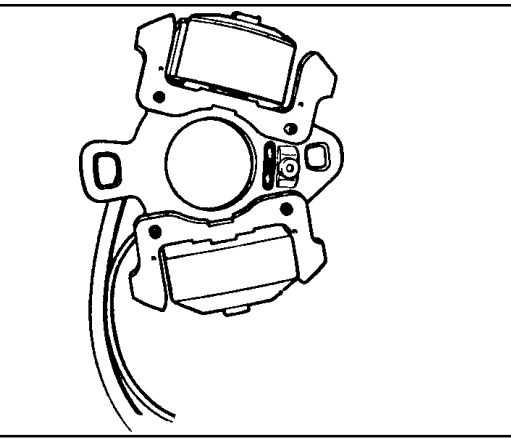
Clean points with lint free paper after setting gap.

Reinstall the point terminal nut and tighten after removing leads, before timing procedure.

Remember to correctly TIME a Tecumseh engine, even when just changing points on a magneto system.

Remember to use correct air gap gauge.

Check for correct flywheel key which effects timing.



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CHAPTER 9 INTERNAL ENGINE AND CYLINDER

GENERAL INFORMATION

This chapter covers the cylinder block, piston and rod assemblies, cylinder head, crankshaft, camshaft, valve train, breather, cylinder cover, flywheel, counterbalance systems, and lubrication systems. The governors and the governor systems are covered in Chapter 4.

All Tecumseh engines covered in this manual are four cycle engines with the valves in the engine block. The crankshaft position is designated as either horizontal or vertical as the engine rests on its base. The engines identified by decals or model as XL (Extra Life) or XL/C (Extra Life / Commercial) are made using aluminum alloy diecast around a cast iron cylinder liner. However, not all engines with cast iron cylinder liners are identified as XL or XL/C. Engine blocks of the heavy frame series (HH, VH) are made of cast iron. All other engines use aluminum alloy for the cylinder block along with pistons that are chromium plated.

OPERATION

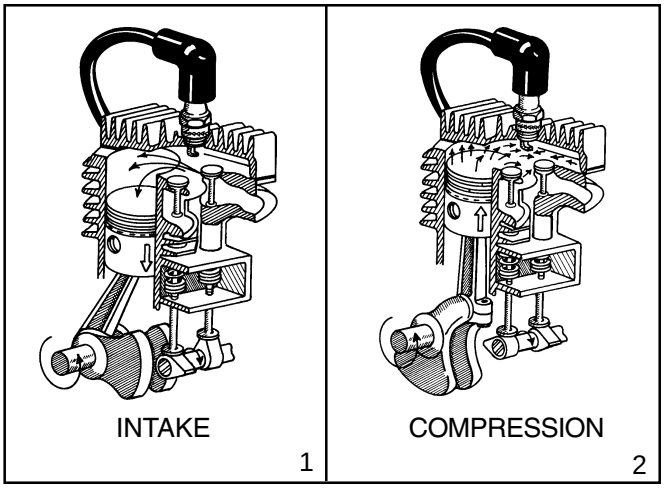
4-CYCLE ENGINE THEORY

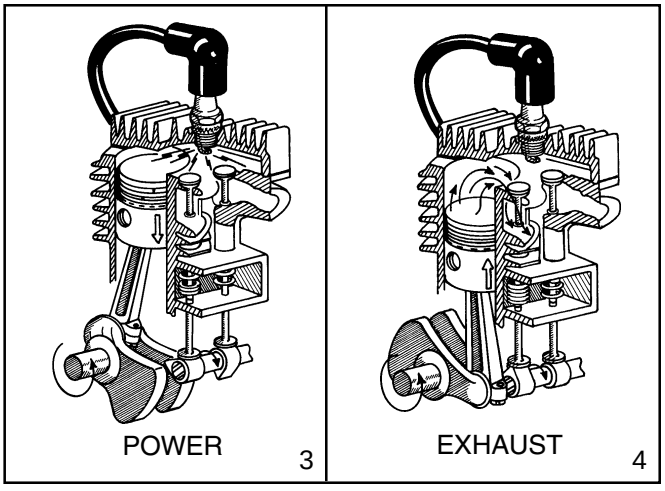
All 4-cycle engines require four piston strokes to complete one power cycle. The flywheel on one end of the crankshaft provides the inertia to keep the engine running smoothly between power strokes.

The camshaft gear is twice as large as the mating gear on the crankshaft so as to allow proper engine valve timing for each cycle. The crankshaft makes two revolutions for every camshaft revolution.

1. **INTAKE**. The intake valve is open and the exhaust valve is closed. The piston is traveling downward creating a low pressure area, drawing the air-fuel mixture from the carburetor into the cylinder area above the piston (diag. 1).
2. **COMPRESSION**. As the piston reaches Bottom Dead Center (BDC) the intake valve closes. The piston then rises, compressing the air-fuel mixture trapped in the combustion chamber (diag. 2).
3. **POWER**. During this piston stroke both valves remain closed. As the piston reaches the Before Top Dead Center (BTDC) ignition point, the spark plug fires, igniting the air-fuel mixture. In the time it takes to ignite all the available fuel, the piston has moved to Top Dead Center (TDC) ready to take the full combustive force of the fuel for maximum power during downward piston travel. The expanding gases force the piston down (diag. 3).
4. **EXHAUST**. The exhaust valve opens. As the piston starts to the top of the cylinder, the exhaust gases are forced out (diag. 4).

After the piston reaches Top Dead Center (TDC), the four stroke process will begin again as the piston moves downward and the intake valve opens.





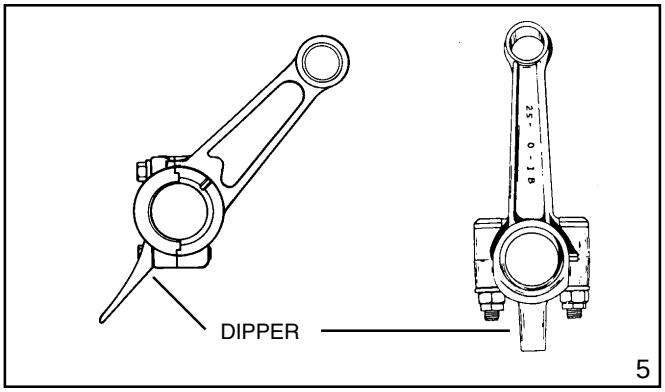
LUBRICATION SYSTEMS

The lubrication system used with all Tecumseh horizontal crankshaft engines covered in this manual utilize a splash type system. An oil dipper on the connecting rod splashes oil in the crankcase to lubricate all internal moving parts. Some engines have the dipper as an integral part of the connecting rod assembly, while others have a dipper that is bolted on with one of the rod bolts (diag. 5).

All vertical shaft engines use a positive displacement plunger oil pump or rotary type oil pump. Oil is pumped from the bottom of the crankcase, up through the camshaft and over to the top main bearing. Oil under pressure lubricates the top crankshaft main bearing and camshaft upper bearing (diag. 6).

On all Tecumseh vertical shaft 4-cycle engines, the oil is sprayed out under pressure through a small hole between the top camshaft and crankshaft bearing to lubricate the piston, connecting rod, and other internal parts (diag. 7).

The plunger style oil pump is located on an eccentric on the camshaft. As the camshaft rotates, the eccentric moves the barrel back and forth on the plunger forcing oil through the hole in the center of the camshaft. The ball on the end of the plunger is anchored in a recess in the cylinder cover (diag. 8).



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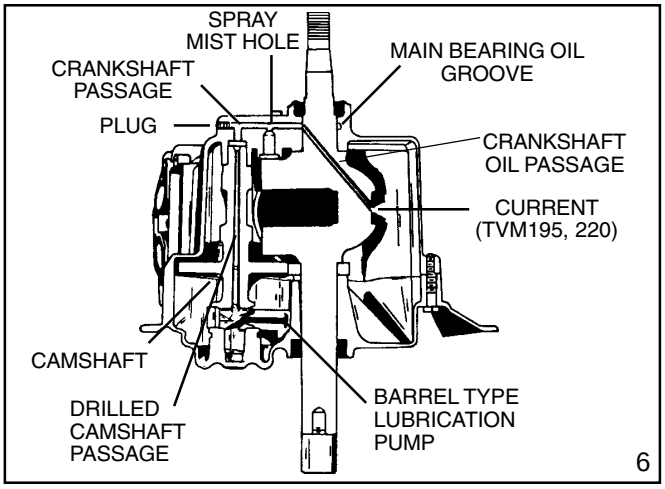

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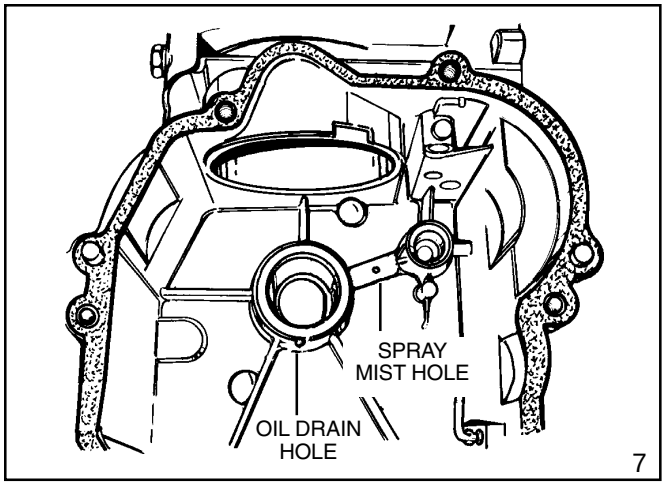

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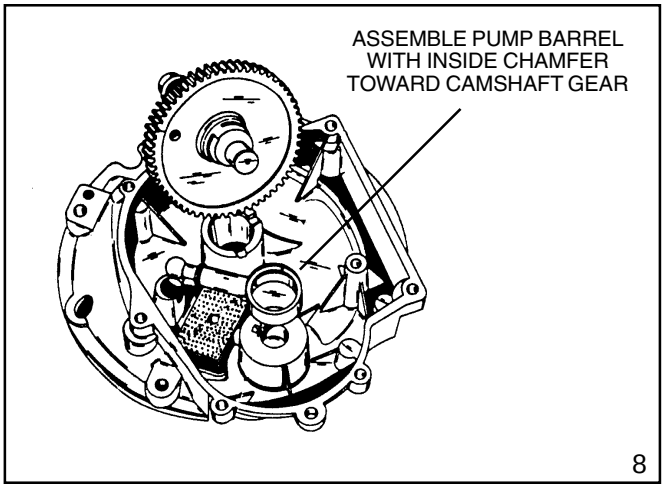

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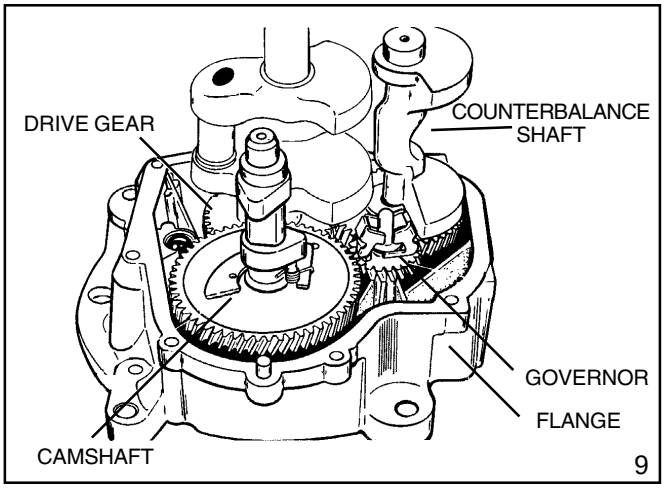
COUNTERBALANCE SYSTEMS

Some Tecumseh engines may be equipped with an Ultra-Balance® counterbalance system. This system uses a single weighted shaft that is driven off the crankshaft. The shaft's function is to counteract the imbalance caused by the counterweights on the crankshaft and the combustion forces (diag. 9).



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COMPONENTS

The **cylinder block** houses the piston, valves and along with the cylinder cover all the internal components. The block is a one piece diecast aluminum alloy or cast iron cylinder casting (diag. 10).

The **piston** transmits the force of the burning and expanding gases through the connecting rod to the crankshaft.

The **piston rings** provide the seal between the cylinder wall and the piston. The rings keep the combustion pressures from entering the crankcase and also wipe the oil off the cylinder wall and return it to the sump.

The **connecting rod** assembly is the link between the piston (piston pin) and the crankshaft.

The **cylinder head** is a one piece aluminum alloy or cast iron casting that is bolted to the top of the cylinder block. The many fins provide cooling for the engine.

The **crankshaft** converts the up and down piston movement to the rotational force (torque) by an offset crankpin or rod journal.

The **camshaft** lobes raise and lower the lifters at the proper time to allow air and fuel in and exhaust out of the cylinder. Teeth on the camshaft gear time the camshaft to the crankshaft.

The **valves** allow air-fuel mixture to enter the cylinder and exhaust gases to exit. The valves provide a positive seal when closed.

The **valve springs** return the valves to the closed position and must be strong enough to maintain valve lifter and cam lobe contact. The valve retainers lock the spring to the valve stem.

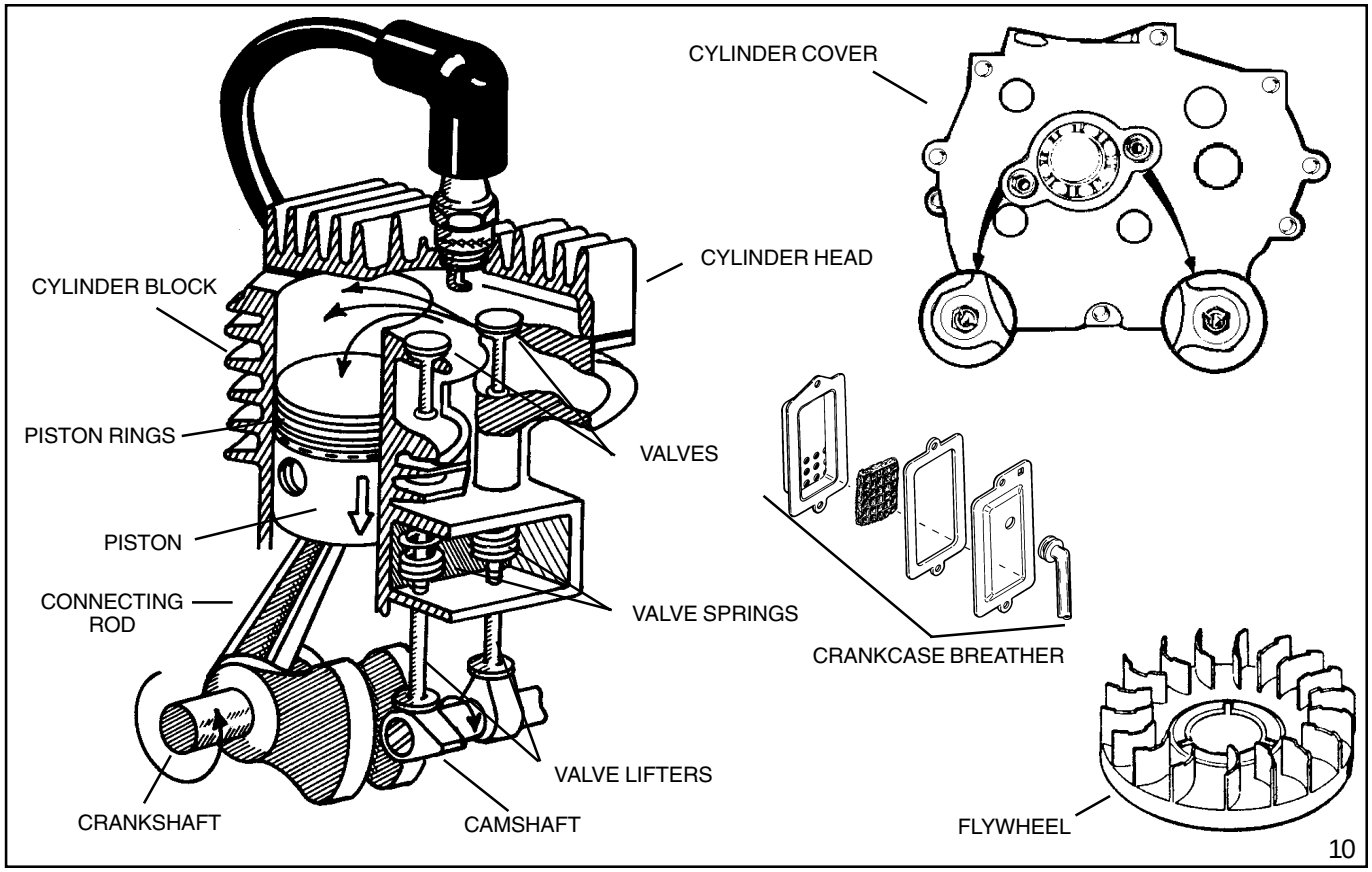
The **valve lifters** maintain contact on the camshaft and push the valves open.

The **crankcase breather** is a one way check valve that allows air out and prevents air from coming in. It allows the engine to develop a partial vacuum in the crankcase during operation.

The **cylinder cover** (or flange on verticals) provides the bearing surface for the power take off (P.T.O.) end of the crankshaft and camshaft. This bolted on cover is removed to provide access to all internal components.

The **oil pump** (vertical shaft only) consists of a steel plunger and a nylon housing that rides on the camshaft eccentric.

The **flywheel** provides the mass to smooth the effects of one power stroke every other crankshaft revolution. Flywheels are made of aluminum alloy or cast iron. The flywheel fins act as a fan to cool the engine.



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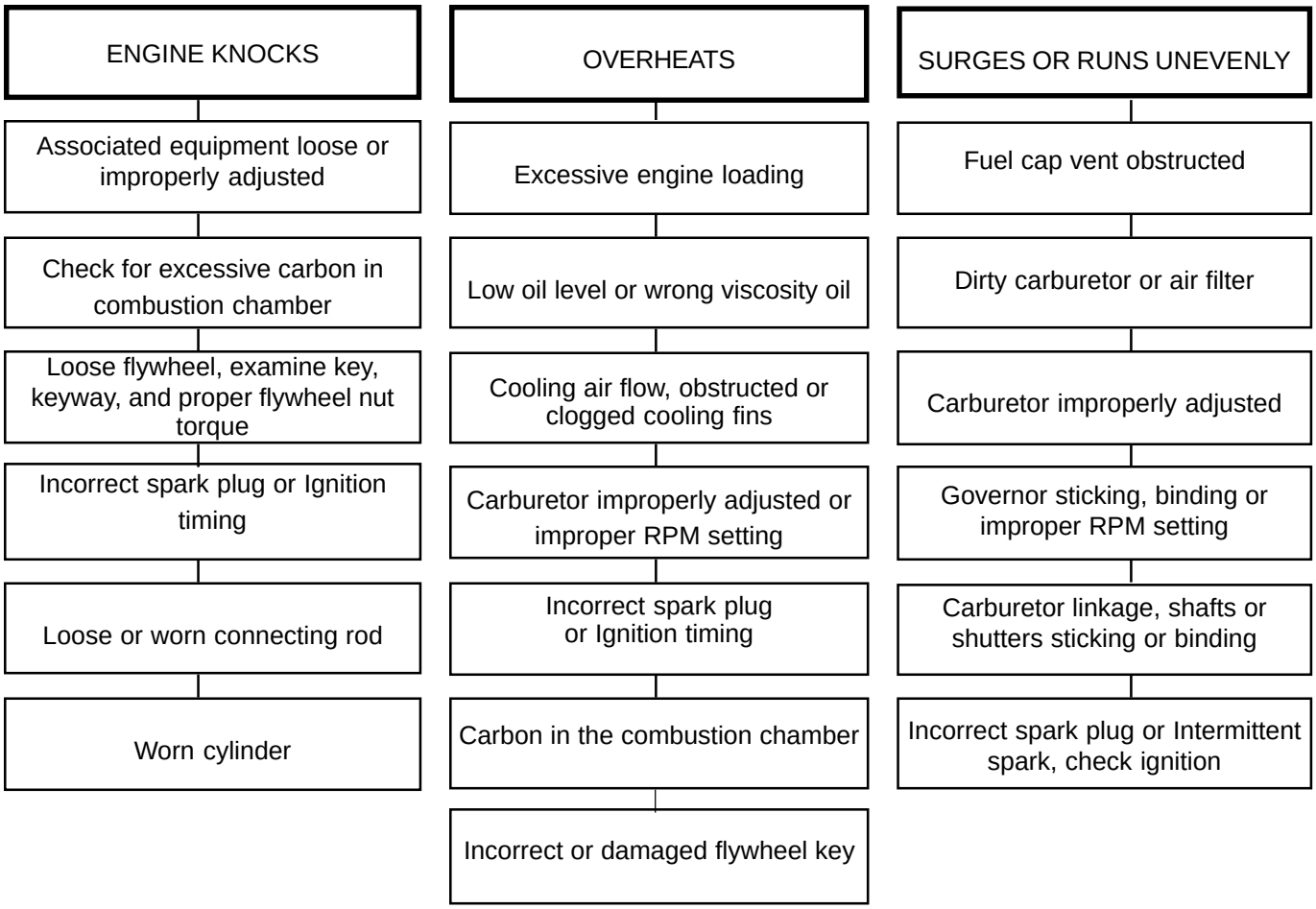
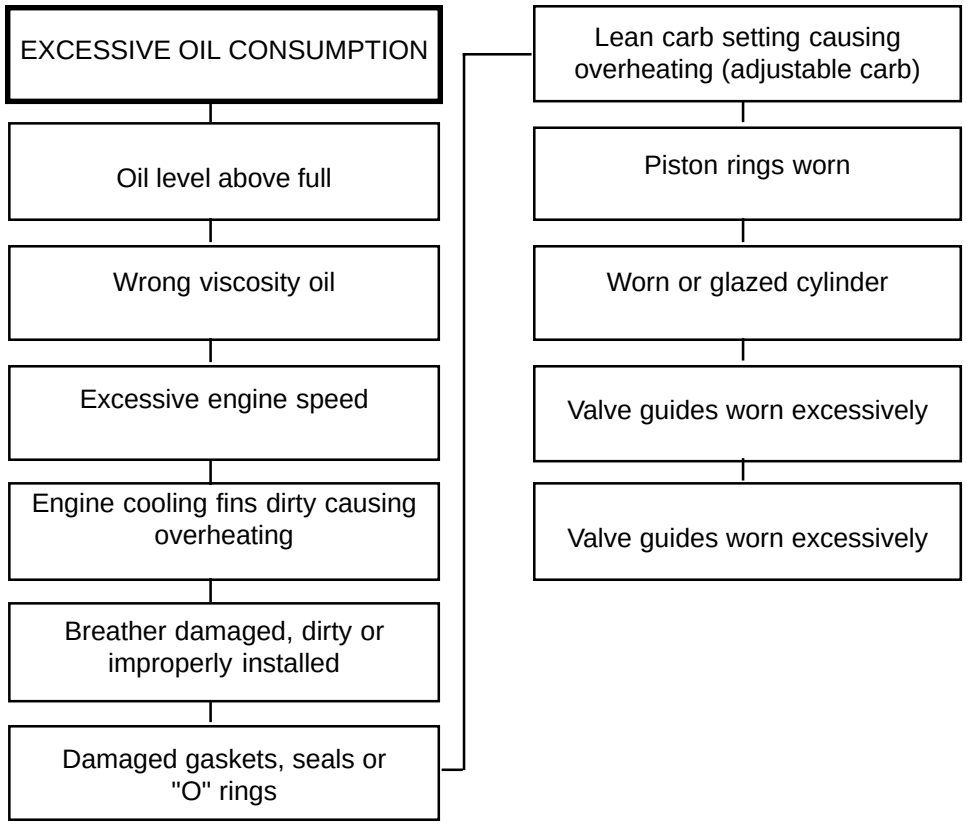
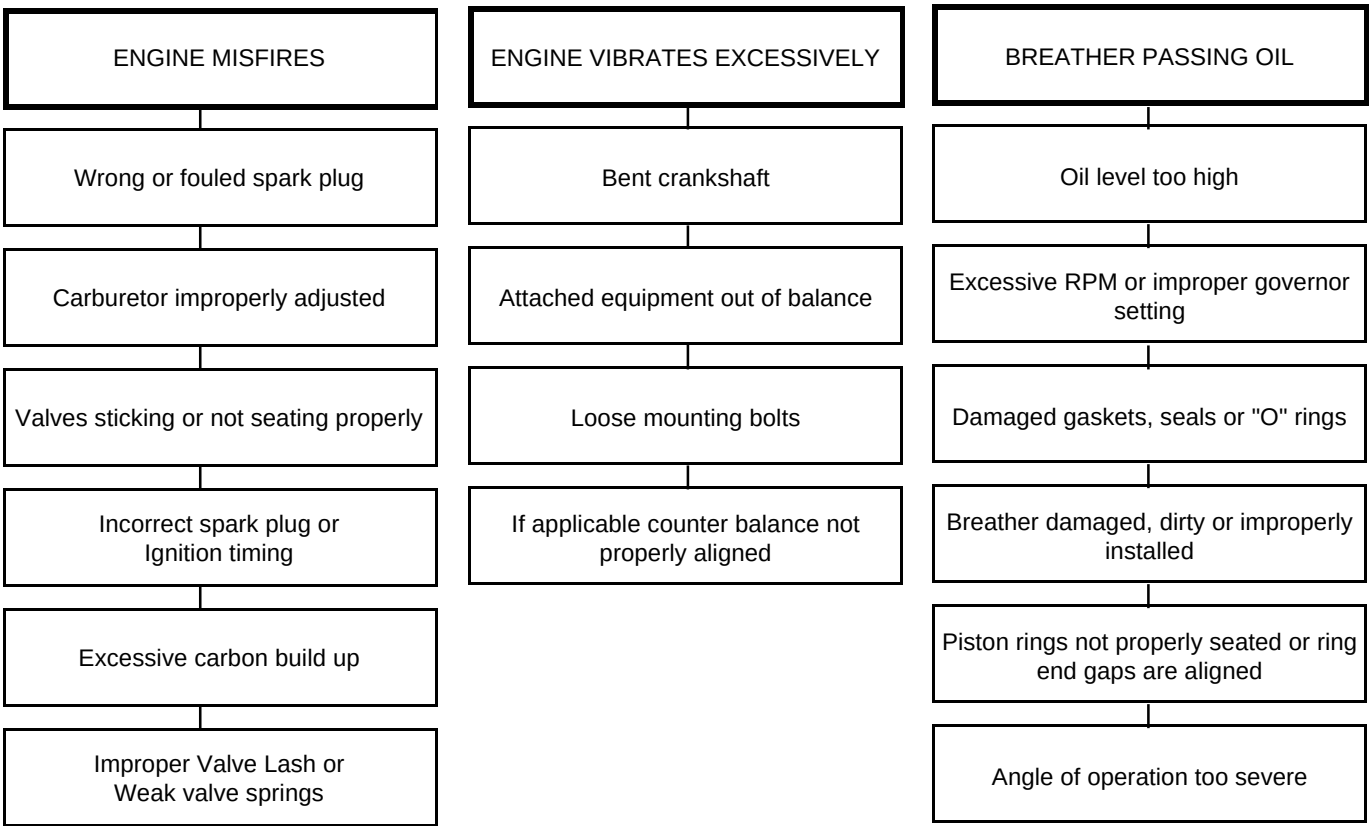
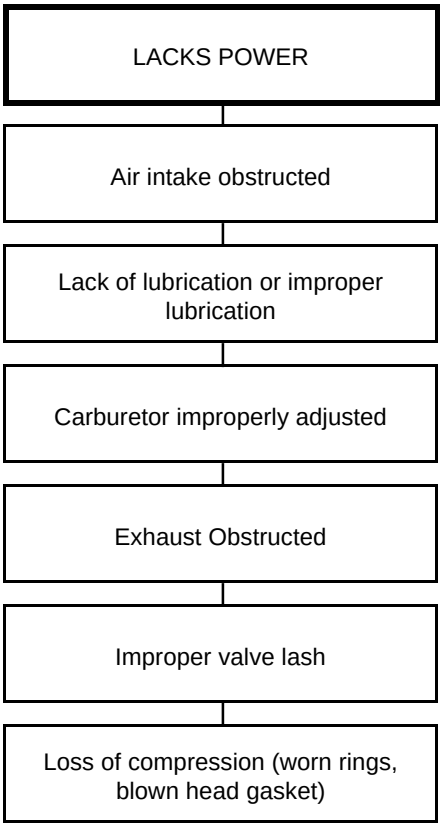
ENGINE OPERATION PROBLEMS





ENGINE OPERATION PROBLEMS





TESTING

ENGINE KNOCKS

1. Check the blade hub, blade adapter, or crankshaft coupler for loose fit, loose bolts, or crankshaft key damage. Remove, inspect, replace if necessary. Reinstall and re-torque the bolts to the proper torque.
2. Check the flywheel key and the flywheel and crankshaft keyway for wear or partial shearing. Replace if any damage is evident. Tighten the flywheel nut to the proper torque.
3. Check for the correct ignition module air gap or the correct timing (point ignition). Replace the points and condenser if the points show any wear, oil, or pitting.
4. Remove the cylinder head and check for excessive carbon in the combustion chamber. Also check for the correct head gasket used, and check the spark plug for proper reach and heat range (correct spark plug for the engine).
5. Check for the proper valve lash using a feeler gauge, and check the internal components (piston, cylinder, connecting rod, crankshaft journal) for excessive clearance.

ENGINE OVERHEATS

1. Make sure the engine is not being overloaded. Remove excess load (sharpen blades, limit operation speed, process less material).
2. Check the oil level and viscosity. Add or replace as necessary.
3. Check for clogged cooling fins or obstructions to the air flow. Remove the blower housing, clean and reinstall.
4. Check the carburetor for correct adjustment or remove and clean the carburetor using tag wire and compressed air. See Chapter 3 under "Service."
5. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card #30 according to the engine model and specification number. Adjust as necessary.
6. Make sure the correct spark plug is being used. Check the ignition timing. See Chapter 8 "Ignition - Service." Correct flywheel key or partially sheared key.
7. Remove the cylinder head to check for excessive carbon buildup. Clean as necessary.

SURGES OR RUNS UNEVENLY

1. Check the fuel cap to make sure it is venting. Loosen the cap and retry engine operation.
2. Replace or clean the air filter.
3. Check the carburetor adjustment or clean the carburetor. See Chapter 3 under "Service."
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card #30 according to the engine model and specification number. Adjust as necessary.
5. Visually check all linkages. Check the governor shaft, throttle shaft, or pivot points for binding.
6. Check the ignition module operation using a gap type tester inserted in the high tension lead. Check for intermittent spark, incorrect spark plug, or a fouled condition.

ENGINE MISFIRES

1. Check the spark plug for the proper application or a fouled condition. Replace if questionable.
2. Reset the carburetor following the adjustment procedure or clean the carburetor. See Chapter 3 under "Service."
3. Check the ignition timing. See Chapter 8 under "Service."
4. Check for carbon buildup in the combustion chamber.
5. Inspect the valves and valve seats for leakage. Check for scoring or discoloration on the valve stem in the valve guide area. Recut the valves and seats if questionable. See "Valve Service" in this chapter.

(continued on top of next page)

ENGINE VIBRATES EXCESSIVELY

1. Check the engine crankshaft on the PTO end for bends using a straight edge, square or a dial indicator. Blades or adapters must be removed. Any deflection will cause a vibration problem.
2. Check the engine mounting bolts, make sure they are tight.
3. Remove and check the attached equipment for an out of balance condition.
4. If the engine is equipped with a counterbalance shaft, check the gear timing to determine if the counterbalance is out of time.

BREATHER PASSING OIL

1. Check the oil level, make sure the engine is not overfilled. Also verify that the viscosity rating on the container of the oil being used is to specification.
2. Check the angle of operation. Avoid prolonged use at a severe angle.
3. Check the engine R.P.M. setting for excessive R.P.M. using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 according to the engine model and specification number. Adjust the high and low R.P.M. as necessary.
4. Check for leaking or damaged gaskets, seals, or "O"-rings. External leaks may not be evident; however, the leak may prevent the engine from achieving a partial crankcase vacuum.
5. Check the breather for damage, dirty condition, or improper installation. The oil return hole(s) must face down.
6. Check the engine compression using a compression tester. If the engine has weak compression, determine the cause of weak compression: worn rings, leaking head gasket, or leaking valves. Follow the compression tester's procedure.

EXCESSIVE OIL CONSUMPTION

1. Check the oil level, oil viscosity on the container of the oil being used, and oil condition. Replace and fill to the proper level.
2. Check the angle of operation. Avoid prolonged use at a severe angle.
3. Check for leaking or damaged gaskets, seals, or "O"-rings. External leaks may not be evident, however, the leak may prevent the engine from achieving a partial crankcase vacuum.
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card #30 according to the engine model and specification number. Adjust as necessary.
5. Check the breather for damage, dirty condition, or improper installation. The oil return hole(s) must face down.
6. Clean the cooling fins to prevent overheating.
7. Check the carburetor setting causing a lean running condition, overheating the engine.
8. Check the engine compression using a compression tester. If the engine has weak compression, determine the cause of weak compression: worn rings, leaking head gasket, or leaking valves. Follow the compression tester's procedure.
9. Check the valve guide clearance for excessive wear.

LACKS POWER

1. Check the air intake for an obstruction (dirty filter, oil saturated filter, other debris).
2. Check the oil level, oil viscosity on the container of the oil being used and oil condition. Replace and fill to the proper level.
3. Readjust the carburetor or remove the carburetor for cleaning. See Chapter 3 under "Service."
4. Check the exhaust for a restriction preventing proper exhaust flow.

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5. Check the engine valve lash. Reset the valves at the proper lash.
6. Check the valves for proper seating and valve guide lash. Recondition the valves and seats. Replace the valves if necessary.
7. Check the ignition timing. Check the flywheel key for partial shearing.

SERVICE

DISASSEMBLY PROCEDURE

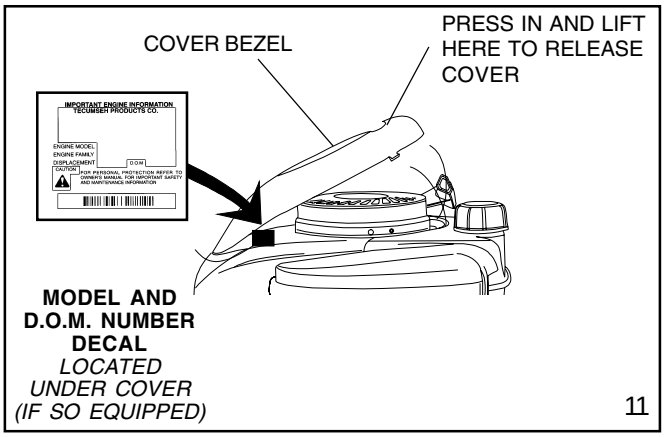
The following procedures apply to most engine models. Actual procedure may vary.

1. Disconnect the high tension lead from the spark plug. Remove the spark plug.
2. Drain the oil from the crankcase. Drain or shut off the fuel supply.
3. Remove the air cleaner assembly.
4. Remove the fuel tank if it is attached to the engine. Fuel tanks may be held on with bolts, screws, or some models require taps upward with a soft face hammer loosening the plastic tank wedged in the blower housing slots.

   On some LEV engine models, removal of the bezel cover is necessary to view the engine identification or to provide access to the recoil assembly screws. Push in toward the spark plug end (as shown), lift up to clear the recoil, then pull the cover away from the spark plug to remove. (diag. 11)
5. Remove the blower housing by first unscrewing the screw holding the dipstick tube to the blower housing or unscrewing the dipstick tube and removing the remaining bolts on the blower housing.
6. Unplug the ignition kill wire from the terminal on top of the ignition module and unbolt the ignition module.
7. Remove the flywheel nut, washer, and starter cup. Use a strap wrench (part # 670305) to hold the flywheel from turning (diag. 12). Thread the appropriate flywheel knock-off tool part # 670103, (7/16") or part # 670169 (1/2") on the crankshaft until it bottoms out, then back-off one complete turn. Using a large screwdriver, lift upward under the flywheel and tap sharply and squarely on the knock-off tool to break the flywheel loose. If necessary, rotate the flywheel a half turn and repeat until it loosens (diag. 13). A flywheel puller (part # 670306) may be used on engines with cored holes and also on flywheels with holes drilled and tapped (diag. 14).

NOTE: DO NOT USE A JAW TYPE PULLER.

8. Remove the flywheel key, stator, and baffle plate.
9. Remove the muffler.
10. Remove the intake pipe and the carburetor. Be careful not to bend or damage the linkage when removing. Mark the hookup points or diagram the linkage arrangement to aid in reassembly.
11. Remove the cylinder head.
12. Remove the crankcase breather.



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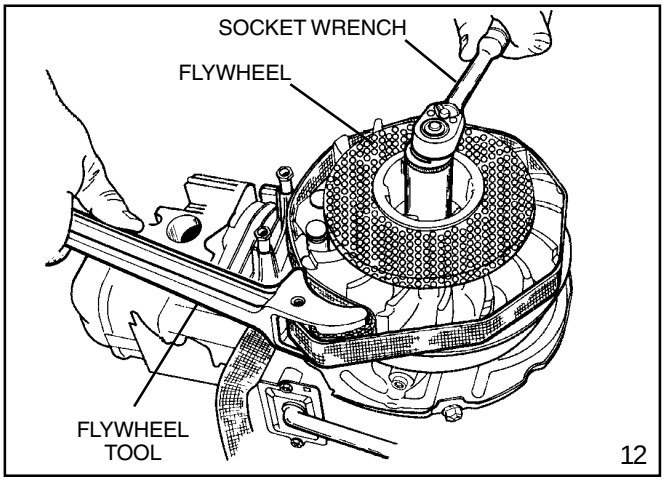

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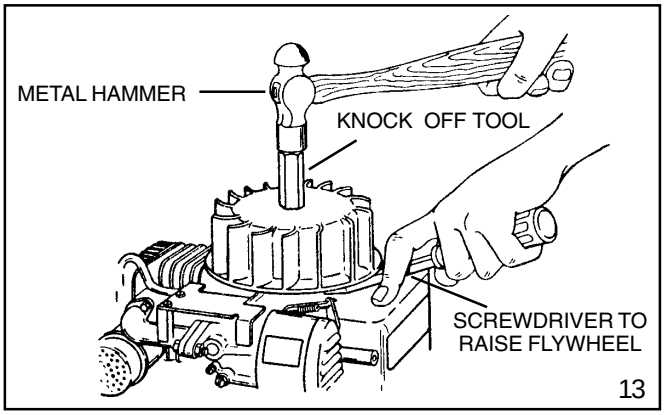

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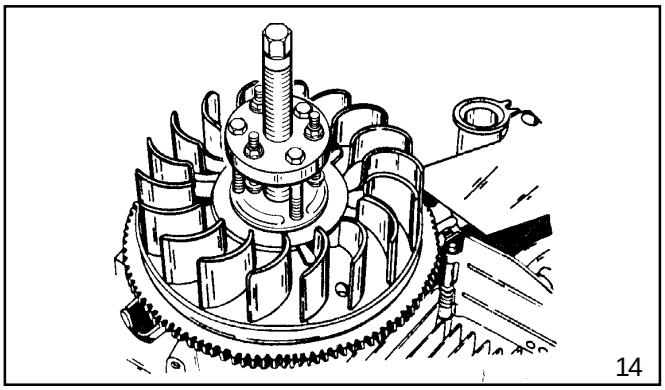
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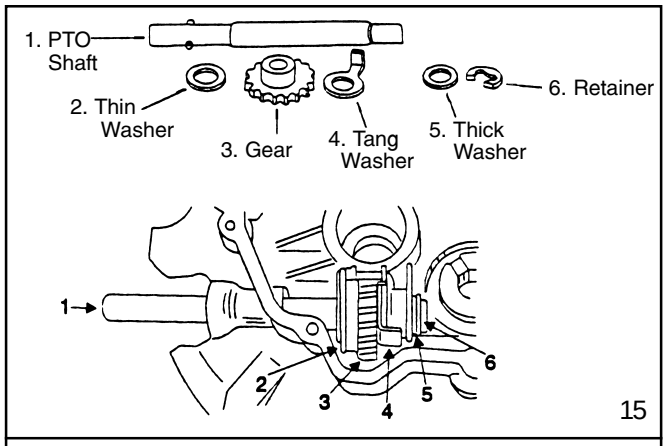
13. Remove the cylinder cover or mounting flange using a seal protector positioned in the seal to prevent seal damage. The crankshaft must be free of rust or scale to slide the cover off the crankshaft. H30-HS50 horizontal crankshaft engines with ball bearings on the crankshaft require the oil seal and the snap ring to be removed prior to the cylinder cover removal. On engines equipped with 8 1/2:1 gear reduction, turn the crankshaft to roll the reduction shaft gear off the crankshaft worm gear when removing the cylinder cover (diag. 15, 16, 17, 18).



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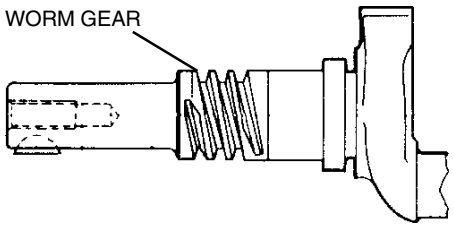

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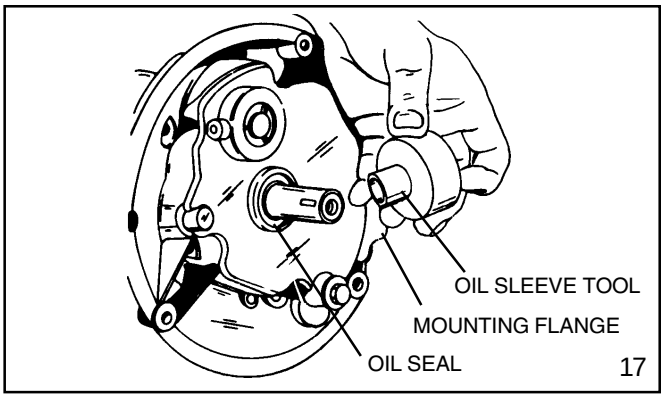

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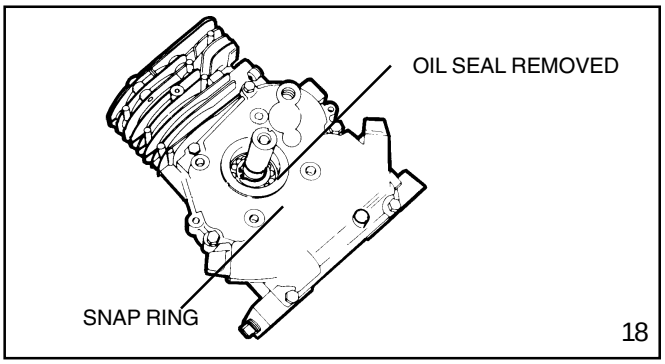

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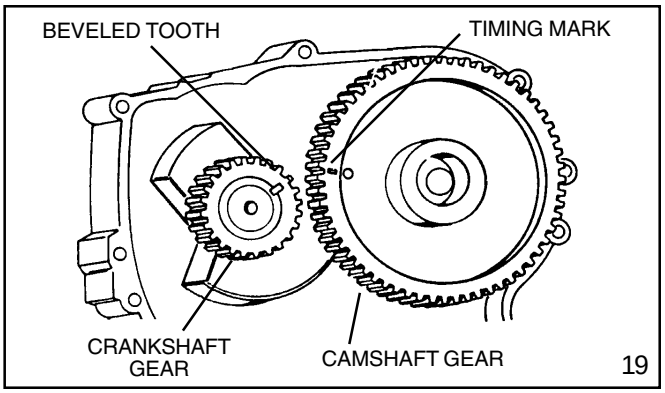
14. Remove the internal components. Align the timing marks on all engines except VM70, 80, 100, HHM80, HM70, 80, 100, TVM170, 195, 220 to relieve valve lifter pressure. On these engines it is necessary to rotate the camshaft clockwise three (3) teeth past the aligned position to allow the compression release mechanism to clear the exhaust valve lifter and to allow the camshaft to be removed (diag. 19 & 20).

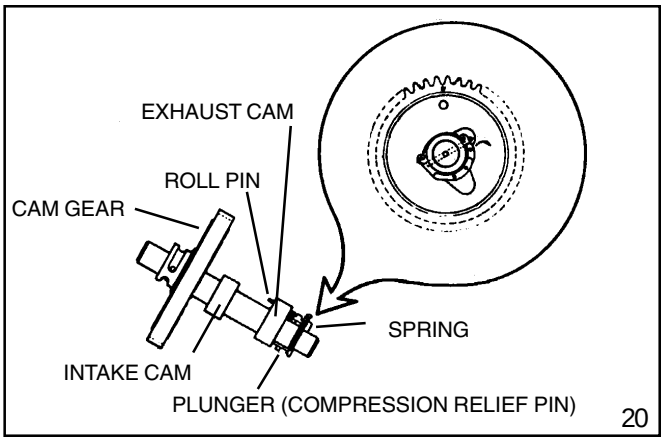


19

15. Remove the lifters, rod cap, and balance shaft or gears if applicable.

16. Before removing the piston, remove any carbon from the top of the cylinder bore to prevent ring breakage. Push the piston out the top of the cylinder bore.

17. Remove the valves by using a valve spring compressor to compress the valve spring and rotate the valve spring retainer to allow the valve stem to pass through. Lift the valves out of the cylinder block. Remove the spring assemblies being careful to note the differences, the original placement of the springs and the presence of seals. Reinstall the spring assemblies on the same valve in the reverse order as they are removed.



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CYLINDERS

Visually check the cylinder for broken or cracked fins or a scored cylinder bore. Check the main bearings for wear or scoring. If the main bearings are worn or scored they can be replaced on some models. See "Crankshaft Bearing Service" in this chapter.

Use a dial bore gauge or telescoping gauge with a micrometer to accurately measure the cylinder bore. Measure in the piston travel area approximately 1/2 to 3/4 of an inch (12.7 to 19.05 mm) from the top and the bottom . Measure at 90 degrees to the piston pin, 45 degrees to the piston pin, and even with the piston pin as the piston would appear when assembled. A rigid hone is recommended to "true" any cylinder irregularities. If the cylinder bore is worn more than .005" (.127 mm) oversize, out of round or scored, it should be replaced or re-sized to .010 or .020 oversize (.254 mm or .508 mm). In some cases engines are built with oversize cylinders. If the cylinder is oversize, the oversize value will be imprinted in the top of the cylinder (diag. 23).

To re-size a cylinder, use a commercially available hone of the proper size. Chuck the hone in a drill press with a spindle speed of about 600 R.P.M.

Start with coarse stones and center the cylinder under the drill press spindle. Lower the hone so the lower end of the stones contacts the lowest point in the cylinder bore.

Rotate the adjusting nut so that the stones touch the cylinder wall and begin honing at the bottom of the cylinder. A light honing oil should be used to lubricate and cool while honing. Move the hone up and down at a rate of 50 strokes per minute to avoid putting ridges in the cylinder wall. Every fourth or fifth stroke, move the hone far enough to extend the stones one inch beyond the top and bottom of the cylinder bore.

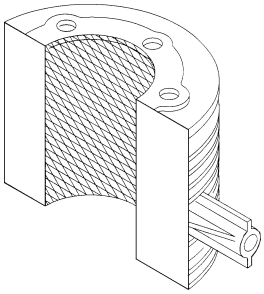
Check the bore diameter every twenty or thirty strokes for size and a 35° - 45° crosshatch pattern. If the stones collect metal, clean the stones with a wire brush when the hone is removed. (diag. 21).

Hone with the coarse stones until the cylinder bore is within .002 inch (.051 mm) of the desired finish size. Replace the coarse stones with finishing stones and continue honing the cylinder to the final size. Tecumseh recommends using a 390 grit hone for finishing.

Clean the cylinder and crankcase with soap and water and dry thoroughly.

Replace the piston and the piston rings with the correct oversize parts as indicated in the parts manual.

Trenching has been incorporated in the cylinders of the H50, H60, HHM80, and HM100 series of engines, as well as the TVM125,140, and 220 models. Trenching improves air/fuel flow and results in increased horsepower in these engines. When reinstalling the piston, rings, and rod assembly in these engines, stagger the ring end gaps and place the ring end gaps out of the trenched area. This will prevent the rings from possibly catching the trenched area and breaking during assembly (diag. 22).



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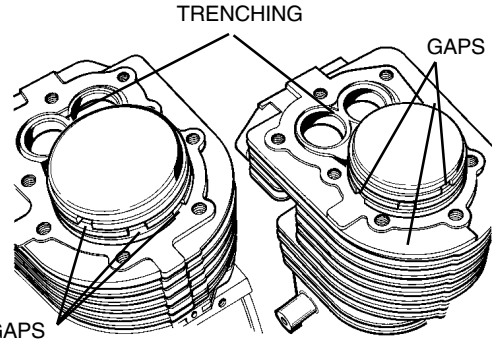
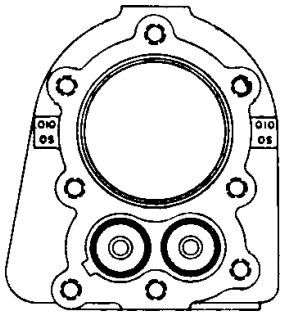


STAGGER RING END GAPS AWAY FROM TRENCHING 22



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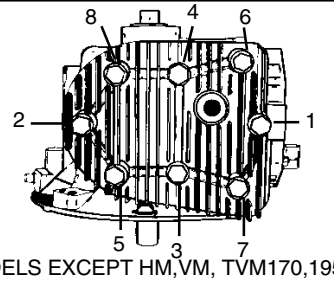
CYLINDER HEADS

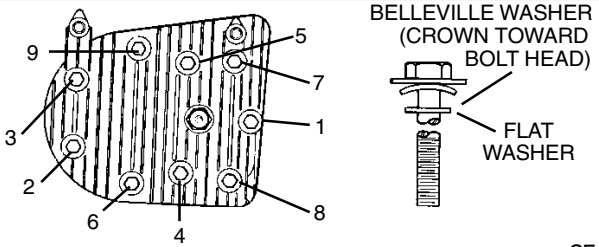
Check the cylinder head for warpage by placing the head on a precision flat surface. If warped in excess of .005" (.13 mm) replace the head. Slight warpage can be corrected by placing a sheet of #400 wet /dry sandpaper on a precision flat surface and rubbing the head gasket surface in a circular pattern until the entire gasket surface shows evidence of sanding. A small amount of honing oil on the sandpaper will make it easier to slide the head. Always replace the head gasket and torque the head bolts in 50 inch pound increments in the numbered sequence to 200 inch pounds (22.5 Nm) (diag. 24 & 25).

Engine models V50, H50, H60, H70, VH50, VH60, VH70 require a flat and a belleville washer on bolts numbered 1, 3, and 7. Current production HM80 and HM100 use flat washers only on bolts numbered 2 and 3 in conjunction with the gas tank mounting bolts. All other head bolts on HM80 and HM100 use a flat and a belleville washer on each bolt.

Engine models V60, V70, TVM125, 140, 195, 220 require a flat washer and a belleville washer on all head bolts.



ALL MODELS EXCEPT HM,VM, TVM170,195,220 24



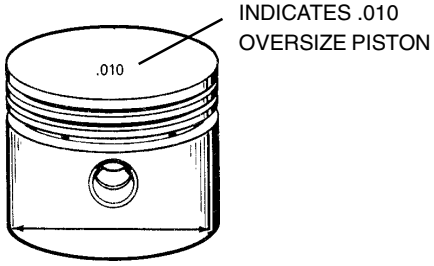
TVM170,195,220,VM & HM MODEL ENGINES 25

PISTONS, RINGS, AND CONNECTING RODS

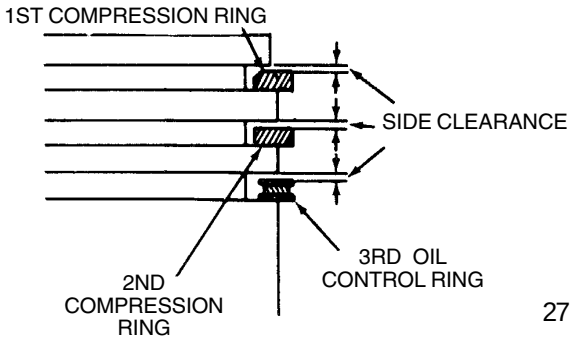
Piston

The piston should be checked for wear by measuring at the bottom of the skirt 90 degrees from the piston pin hole with a micrometer. Check the ring side clearance using a feeler gauge with new ring. Clean all carbon from the piston top and the ring grooves before measuring. Visually inspect the piston skirt area for scoring or scratches from dirt ingestion. If scoring or deep scratches are evident, replace the piston.

If the cylinder bore needs re-sizing, an oversize piston will be necessary. Oversize pistons are identified by the imprinted decimal oversize value imprinted on the top of the piston (diag. 26).



PISTON MEASUREMENTS ARE TAKEN AT
BOTTOM OF SKIRT 90⁰ FROM WRIST PIN HOLE 26



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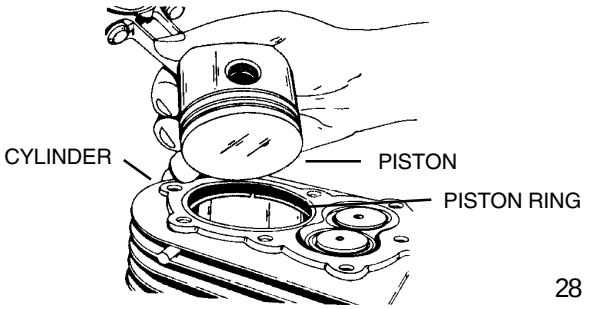
Rings

After the cylinder bore diameter has been checked and is acceptable to rebuild, the ring end gap should be checked using new rings. Place a new compression ring squarely in the center of the ring travel area. Use the piston upside down to push the ring down (diag. 28) and measure the gap with a feeler gauge. The ring end gap must be within the specification to have adequate oil control (diag. 29). This procedure will assure correct piston ring end gap measurement. Ring side clearance should also be checked with a feeler gauge when using new rings with an old piston (diag. 27).

Replace the rings in sets and install the piston, rings, and rod assembly in the cylinder bore with the ring end gaps staggered. When installing new rings in a used cylinder, the cylinder wall should be de-glazed using a commercially available de-glazing tool or hone.



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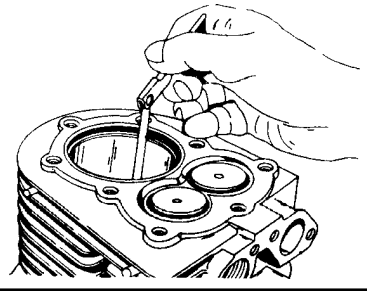
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Use a ring expander to remove and replace the rings. Do not spread the rings too wide or breakage will result.

If the top compression ring has an inside chamfer, this chamfer must face UP. The second compression ring will have either an inside chamfer or an outside notch. The rule to follow is an inside chamfer always faces up. An outside notch (diag. 31) will face down or towards the skirt of the piston.

The oil control ring can be installed with either side up. The expander (if equipped) end gap and the ring end gap should be staggered.

Emission Rings

Used on TVS, LEV, H35, VLV, HM80 and TVXL195 engines that comply with emission standards. These rings have a narrower width and a different profile (barrel faced). Barrel faced rings may be installed in either direction. The underside of the oil control ring utilizes a coil type expander.

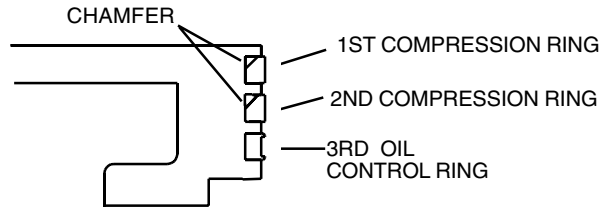
These rings conform better to the cylinder allowing for better oil control by wiping the cylinder wall cleaner. The coiled expander ring helps create a more uniform load on the cylinder wall which gives a more consistent distribution of oil. NOTE: The use of these rings on a standard non-emission piston will cause ring breakage due to its wider ring grooves.

Connecting Rods

Some engine models have offset piston pins (not centered) to centralize the combustion force on the piston. Engine models LAV50, HM70, HM80, HHM80, HM100, TVM170,195, 220, have offset pistons. When installing the connecting rod to the piston it is imperative that the rod be installed correctly. The piston used on these models will have either an arrow stamped above the piston pin hole, a number cast on the inside of the piston skirt or an arrow stamped on the top of the piston (diag. 32 & 33). All other engine models use a centered piston pin. If the piston does not have an arrow or number cast inside, the piston can be installed in either direction on the connecting rod. **On all engine models, the match marks on the connecting rod must align and face out when installing the assembly in the engine (diag. 34 & 35).**

The arrow on the top of the piston must point toward the valves when installing it in the cylinder (diag. 33). The inside casting number (if present) must face toward the long side of the connecting rod. If there is an arrow on the side of the piston, the arrow must point toward the short side of the connecting rod. (diag. 32).

On horizontal shaft engines, oil dippers are attached to the bottom connecting rod bolt. Some engines have the oil dipper cast in the rod cap. Consult the specification chart for the proper rod bolt torque when installing the cap. The rod bolts should be torqued in 50 inch pound (5.5 Nm) increments until the specified torque is achieved.



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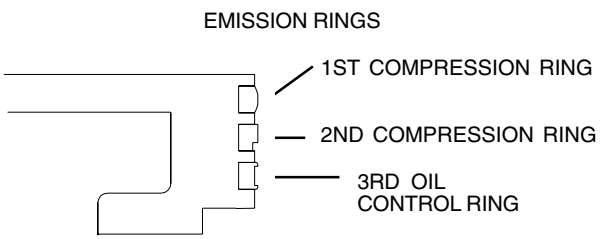

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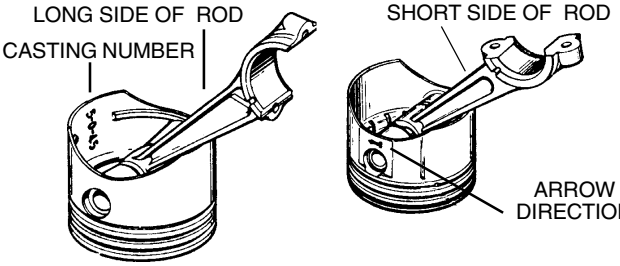
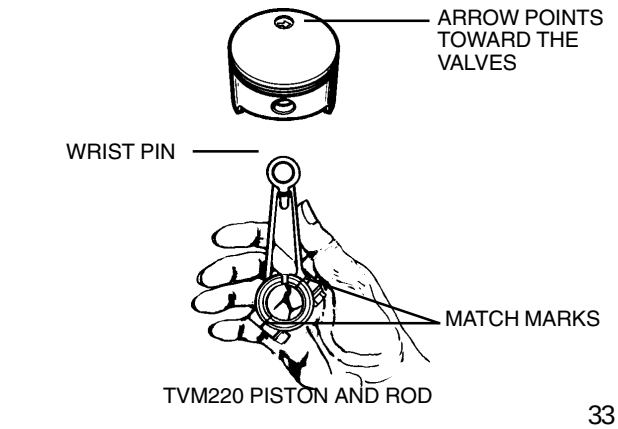
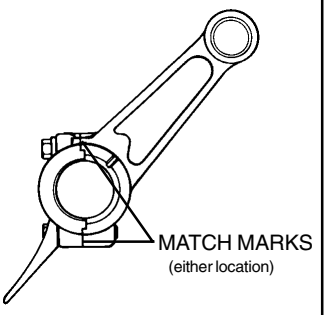


VM70, VM100, HM70-100, V80, H80, HHM80, AND TVM SERIES PISTON AND CONNECTING ROD ASSEMBLIES
32



TVM220 PISTON AND ROD
33



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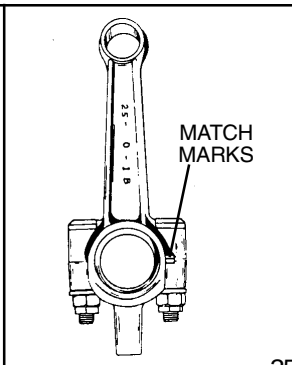


35

CRANKSHAFTS AND CAMSHAFTS

Inspect the crankshaft visually and with a micrometer for wear, scratching, scoring, or out of round condition. Check for bends on the P.T.O. end using a straight edge, square or a dial indicator.

CAUTION: NEVER TRY TO STRAIGHTEN A BENT CRANKSHAFT.

The timing marks on the camshaft and the crankshaft gears must be aligned for proper valve timing. (diag. 36 & 37).

Camshafts

Check the camshaft bearing surfaces for wear using a micrometer. Inspect the cam lobes for scoring or excessive wear. If a damaged camshaft is replaced, the mating crankshaft and governor gear should also be replaced. If the crankshaft gear is pressed on it is not serviceable and the crankshaft must also be replaced.

Clean the camshaft with solvent and blow all parts and passages dry with compressed air, making sure that the pins and counterweights are operating freely and smoothly on mechanical compression relief types.

Camshafts used in rotary mower engines utilize a composite gear (glass filled nylon) for the purpose of reducing internal gear noise.

Mechanical Compression Release (MCR) camshafts have a pin located in the camshaft, that extends over the exhaust cam lobe, to lift the valve and relieve the engine compression for easier cranking. When the engine starts, centrifugal force moves the weight outward and the pin will drop back down. The engine will now run at full compression (diag. 38).

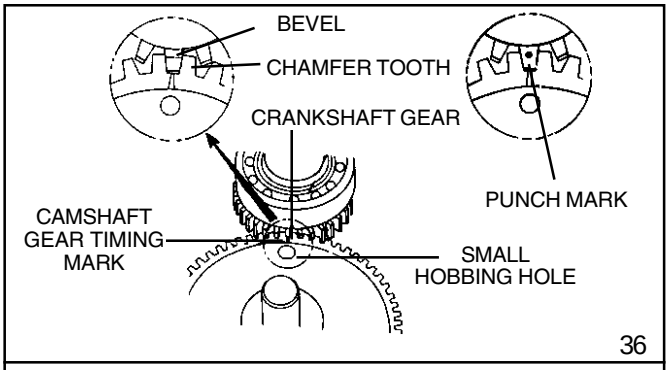
Some engines are equipped with Bump Compression Release (BCR) camshafts that have a small bump ground on the exhaust lobe of the camshaft to relieve compression (diag. 39).

Newer camshafts are designated as Ramp Compression Release (RCR) and utilize a less aggressive ramp than what is used on the BCR camshaft.

LEV Exhaust Mechanical Compression Release (MCR) Cam Bushing Service (Used in production October 1999)

Removal

1. Place an LEV cylinder in a soft jawed vice and using a nonmetallic mallet, tap a #6 easy-out into the bushing so the easy-out makes a solid contact with the cam bushing.
2. Turn counterclockwise until the easy-out goes into the bushing a sufficient amount so that the bushing can be removed without the easy-out releasing. Spin the bushing counterclockwise with the easy-out while pulling for removal. **CAUTION:** Cam bushings should never be reused.
3. Blow compressed air down the top main bearing oil galley to the top cam bearing. This will clean any plastic particles that might have entered into the passage from the cam bushing removal procedure. Rinse cylinder in a parts tank, then lubricate the cam bearing pocket with oil.



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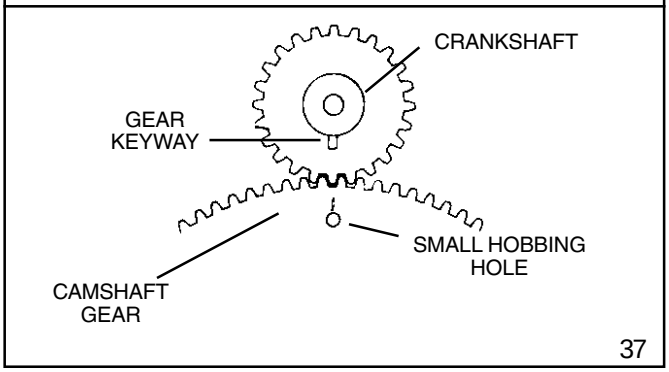

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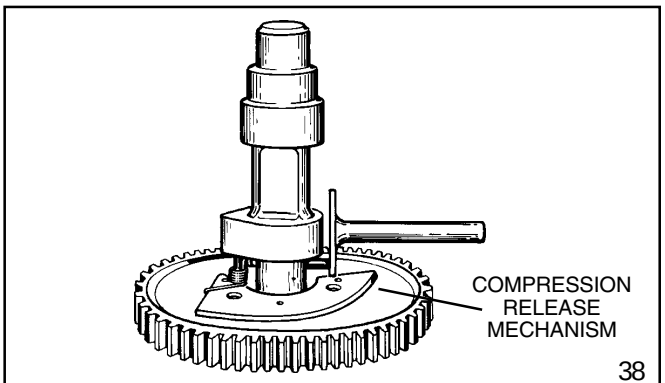

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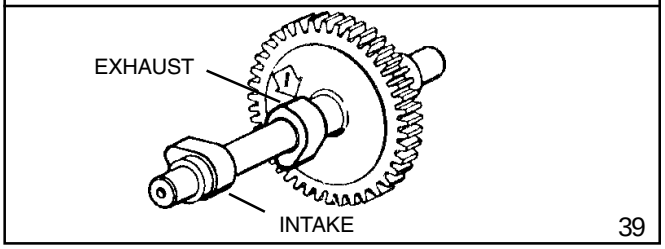

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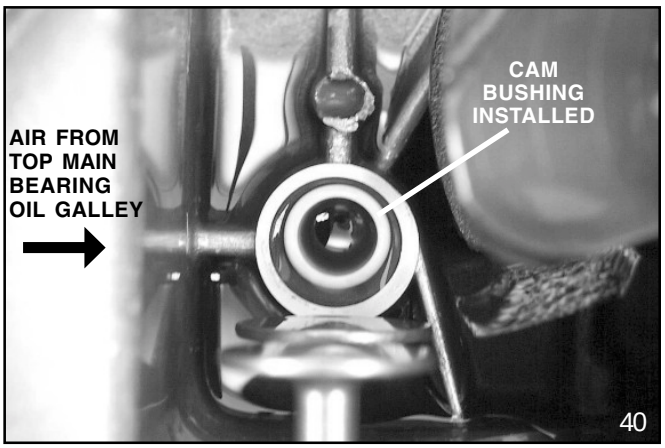

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Installation

1. Lube the small end of the LEV/VSK camshaft and a new cam bushing liberally with oil. (Never reuse cam bushings once removed).
2. With the strength of your hand, place a new cam bushing on the corresponding end of the camshaft and press the bushing into the cam until flush with the casting.

VALVES

The valves should be checked for proper clearance, sealing, and wear. Valve condition is critical for proper engine performance. Valve clearance should be checked before removal from the engine block if a valve problem is suspected or when the valves or seats are recut.

Valve clearance (between the valve stem and valve lifter) should be set or checked when the engine is cold. The piston should be at T.D.C. on the compression stroke (both valves closed).

Use a valve grinder or "V" block to hold the valve square when grinding the valve stem to obtain the proper clearance (diag. 43).

When servicing the valves, all carbon should be removed from the valve head and stem. If the valves are in a usable condition, the valve face should be ground using a valve grinder to a 45 degree angle. If after grinding the valve face the margin is less than 1/32 of an inch (.793 mm), the valve should be replaced (diag. 43).

Valves are not identical. Valves marked "EX" or "X" are installed in the exhaust valve location. Valves marked "I" are installed in the intake valve location. If the valves are unmarked, the nonmagnetic valve (head) is installed in the exhaust valve location.

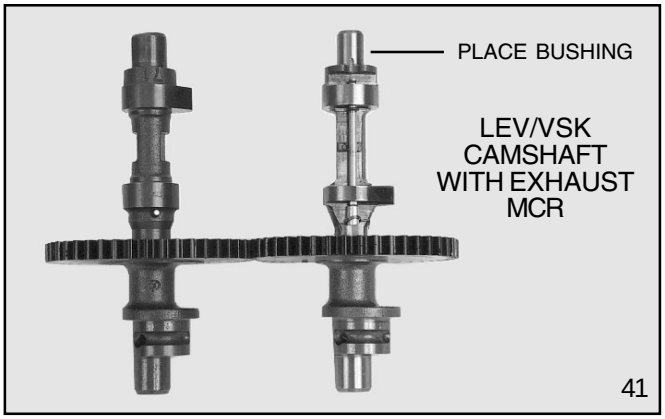
To reinstall the valves, position the valve caps and springs in the valve compartment. If the spring has dampening coils, the valve spring should be installed with the dampening coils away from the valve cap and retainer (diag. 44).

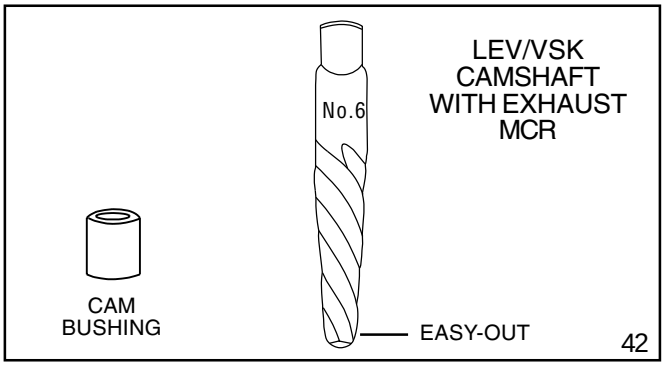
Install the valves into the guides making sure the correct valve is in the proper port. The valve stem must pass through the upper valve cap and spring. Hook the valve spring retainer on the groove in the valve stem and release the spring tension to lock the cap in place. Early models may have a pin through the valve stem. Compress the spring and cap and use a needle nose pliers to insert the pin in the valve stem hole. Release the spring and check that the pin is locked under the cap.

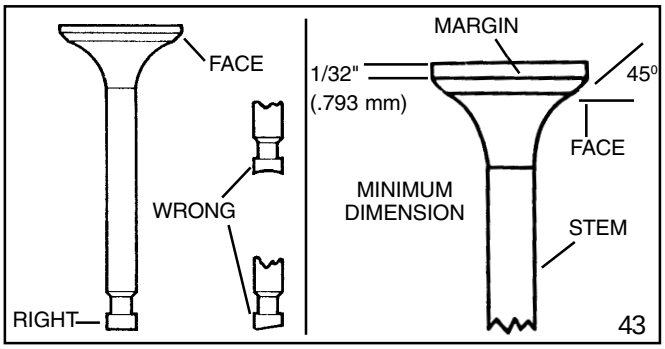
Emissionized engines have a valve stem seal on the intake valve which prevents excess oil vapor from entering the combustion chamber. This vapor would produce an unsatisfactory exhaust emission and fail today's CARB and EPA emission standards.

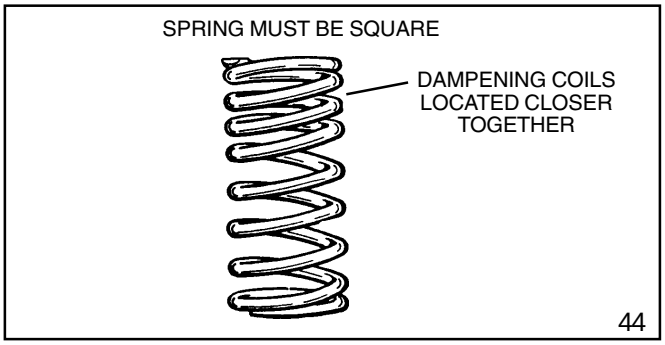
Tecumseh's position on emissionized engines is that oversized valves are not necessary. The emissionized valve with the valve stem seal should last the life of the engine. Therefore, seals for oversized valves do not exist for our small frame engines. Replacement of this seal is necessary if valves have been removed for service.

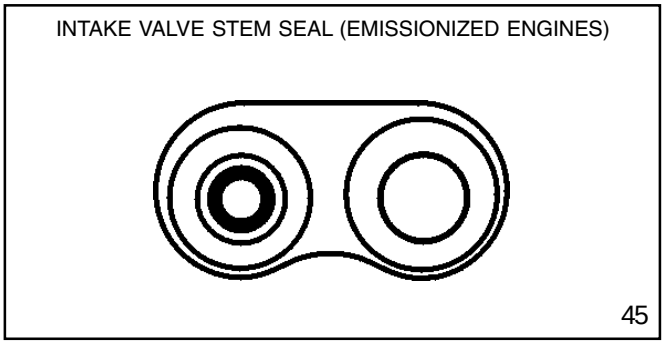
NOTE: If the spring has dampening coils, they always go toward the stationary surface.











Valve Seats

Valve seats are not replaceable. If they are burned, pitted, or distorted they can be reground using a grinding stone or a valve seat cutting tool. Valve seats are ground to an angle of 46 degrees. Check the specifications section for proper width.

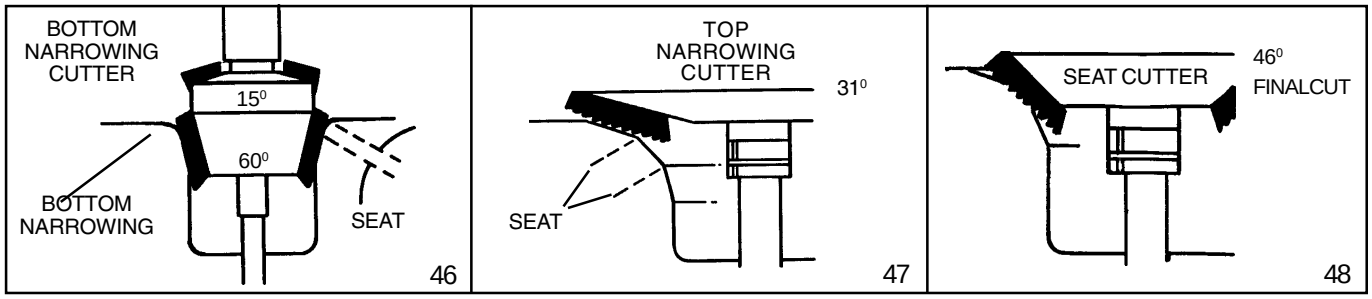
The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different cutters. LEV engines have a small combustion chamber and require the use of a special Neway cutter #103 for the 46 and 31 degree combination cutter. The 60 degree cutter is Neway cutter #101. The tapered pilots required are; Neway #100-1/4-1 for the .249 (6.325 mm) exhaust guide, and Neway #100-1/4 for the .250 (6.35 mm) intake guide. Consult the cutter's complete procedure guide for additional information.

NOTE: The valve seats are cast into the engine block at a slight angle on the LEV engines. When reconditioning valve seats on the LEV engine, the seat cutter will make simultaneous contact with the seat and the aluminum portion of the engine block. There is no detrimental effect to performance or life of the valve seat or block from the procedure if done correctly.

First, use the 60 degree cutter to cut the bottom narrowing/angle. The more of bottom narrowing that is removed the higher the contact surface will be on the valve face (closer to the margin diagram 46).

Second, use the 31 degree cutter to cut the top narrowing/angle. The more of top narrowing that is removed the lower the contact surface will be on the valve face (away from the margin diagram 47).

Lastly, use the 46 degree cutter to cut the middle angle which is where the valve will contact the valve seat (diagram 48). Consult the specifications pages for specific valve seat width dimensions by engine model.



Valve Lifters

The valve lifters on some engines are different lengths. The shorter lifter is installed in the intake position and the longer lifter is installed in the exhaust position. When removing, mark the lifters to install the lifter in the same position as it was removed from.

Oversize Valve Guides (Pre-emmisionized Engines)

The valve guides are permanently installed in the cylinder block. If they get worn excessively, they can be reamed oversize to accommodate a 1/32" (.793 mm) oversize valve stem.

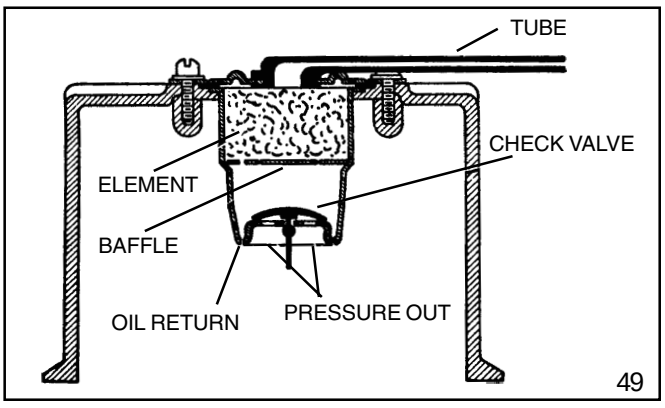
The guides should be reamed oversize with a straight shanked hand reamer or low speed drill press. Refer to the "Table of Specifications" (Chapter 10) to determine the correct oversize dimension. Reamers are available through your local Tecumseh parts supplier. Consult the tool section in Chapter 11 for the correct part numbers.

The upper and lower valve spring caps must be redrilled to accommodate the oversize valve stems.

After oversizing the valve guides, the valve seats must be recut to align the valve seat to the valve guide.

CRANKCASE BREATHERS

The breather element and case can be cleaned using cleaning solvent. Make sure the small drain hole or holes are clean and installed facing down, so as to allow oil to return back into the crankcase.

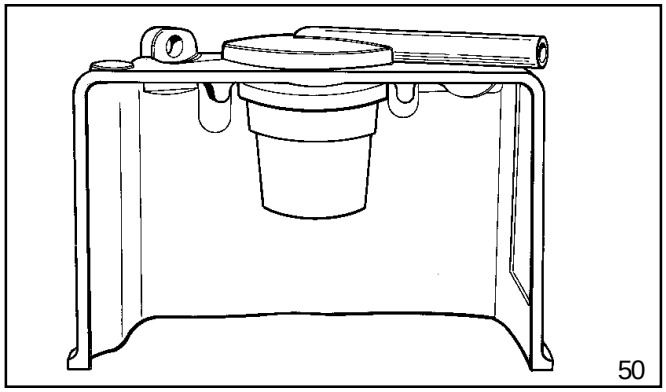


Top Mounted Breather

This type of breather is mounted in the top and rear of the cylinder block in vertical shaft engines. The check valve allows positive pressure to be vented through the element and out the tube. Some engines have the breather tube connected to the air cleaner assembly (diag. 49).

Late production top mounted breathers use the rubber boot and breather tube as a push in design. Mark or note the location of the breather tube. Use a large flat blade screwdriver to pry the boot up and lift the breather assembly out. Be careful not to drop the breather body out of the rubber boot when removing (diag. 50).

A new breather tube boot is recommended for replacement to assure proper crankcase seal. Apply engine oil to the breather tube boot and push the breather in until the top shoulder of the boot contacts the crankcase.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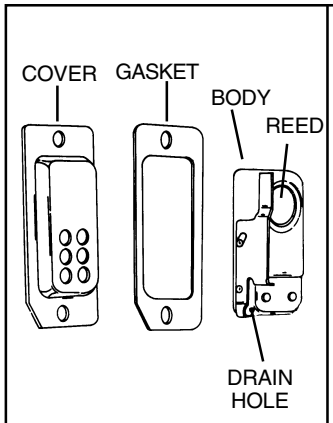
Side Mounted Breather

This type of breather mounts over the valve compartment and uses a reed style check valve. Most horizontal shaft engines use this style of breather. The filter element is held in place by a small barb in the cover. To remove the filter, insert a knife blade between the filter element and the barb, and depress the filter element (diag. 51).

Some engine models have two gaskets installed next to the cylinder block. If two gaskets were originally installed, replace them using two gaskets (diag. 52).



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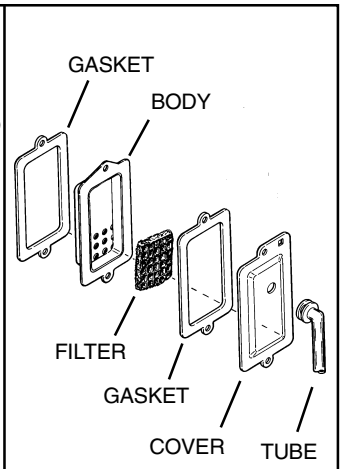

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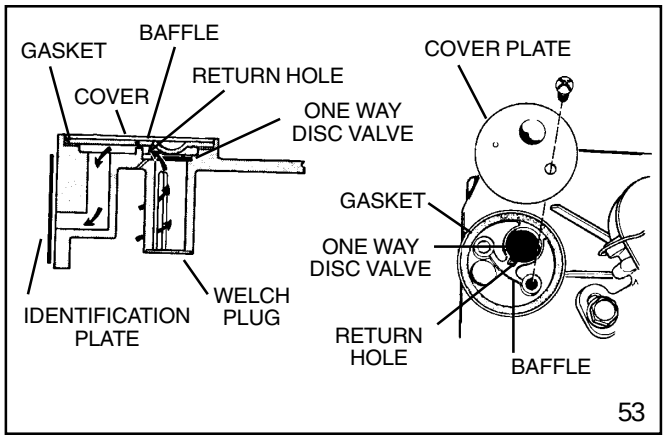
Integral Breather

Some ECV engines are equipped with breathers that are part of the cylinder block. Venting is accomplished through passages drilled in the block to route the air flow to the outside (diag. 53).



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CYLINDER COVER, OIL SEAL, AND BEARING SERVICE

Cylinder Cover

The following procedures, except oil seal replacement, require engine disassembly. See "Disassembly Procedure" in this chapter.

Clean and inspect the cover, look for wear and scoring of the bearing surfaces. Measure the bearing surface diameters using a micrometer and check the specifications for worn or damaged parts. Replace as necessary.

When reinstalling the cover, apply a drop of Loctite 242 to the cover screw threads and re-torque to the recommended specification. Always use new oil seals and gaskets after disassembly.

Oil Seal Service

NOTE: BEFORE REMOVING THE OIL SEAL, CHECK TO SEE IF THE SEAL IS RAISED OR RECESSED. WHEN INSTALLING A NEW OIL SEAL, TAP IT INTO POSITION GENTLY UNTIL IT IS SEATED INTO ITS BOSS. SOME SEALS ARE NOT POSITIONED FLUSH TO THE CYLINDER COVER. ATTEMPTING TO INSTALL THE SEAL TOO FAR IN CAN CAUSE DAMAGE TO THE OIL SEAL AND ENGINE.

If the crankshaft is removed from the engine, remove the old oil seals by tapping them out with a screwdriver or punch from the inside. If the crankshaft is in place, remove the seal by using the proper oil seal puller (diag. 54).

Select the proper seal protector and driver from the tool list in Chapter 11 to install a new oil seal. Place the oil seal over the protector (spring side of seal faces inward) and place it over the crankshaft. Drive the seal into position using the universal driver part no. 670272. The seal protector will insure that the seal is driven in to the proper depth (diag. 55).

CRANKSHAFT BEARING SERVICE

Ball Bearing Service (H40-HM100 engines)

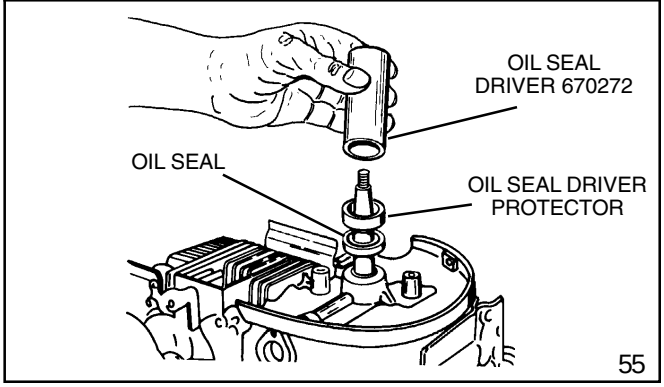
To remove the ball bearing from the cylinder cover, the bearing locks will have to be rotated out of the way. First loosen the locking nuts with a socket. Turn the retainer bolts counterclockwise to the unlocked position with a needle nose pliers (diag. 56). The flat side of the retainer will face away from the bearing in the unlocked position (diag. 57).

When reinstalling the locks, the flat side must face the bearing while the locking nuts should be torqued to 15-22 inch pounds (1.695 - 2.486 Nm).

To remove a ball bearing from the crankshaft, use a bearing splitter and a puller (diag. 58).

When installing the ball bearing to the crankshaft, the bearing must be heated by either using a hot oil bath or heat lamp to expand the bearing. This will allow the bearing to slide on the crankshaft with no interference fit. Be careful to use adequate protection handling the hot ball bearing. The bearing and the thrust washer must seat tightly against the crankshaft gear.

54



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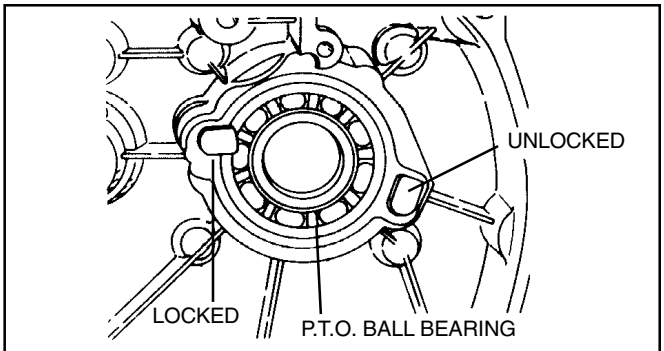

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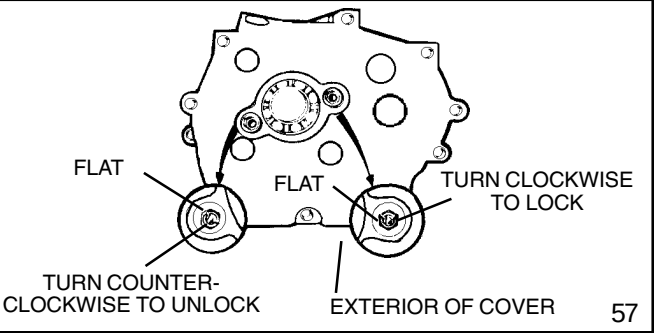

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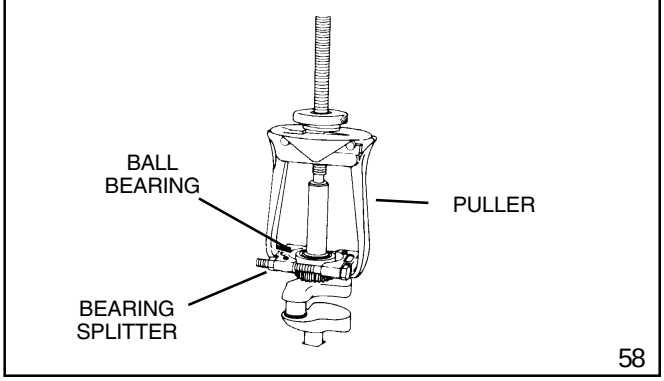

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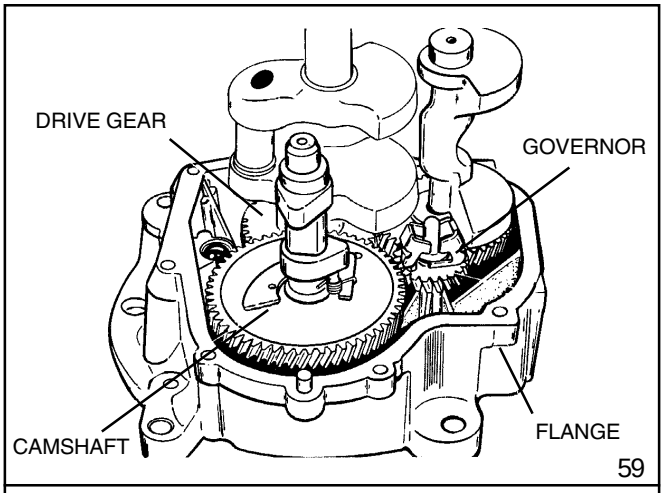
COUNTERBALANCE SERVICE

To correctly align the Ultra-Balance® system, rotate the piston to top dead center (TDC) and insert the counterbalance shaft into its boss in the cylinder block with the arrow on the gear pointing toward the crankshaft.

Slide the drive gear on the crankshaft, making sure the drive gear is located on the crankshaft key and that the arrow on the drive gear is aligned with the arrow on the gear on the counterbalance shaft (diag. 59 & 60).



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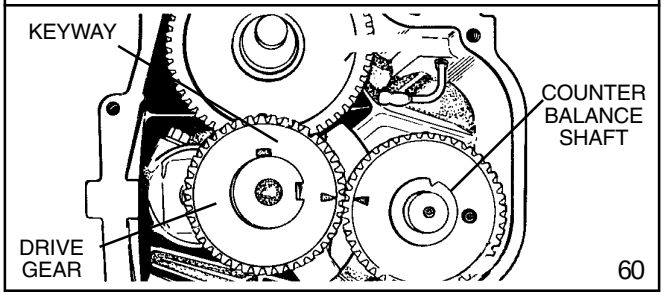

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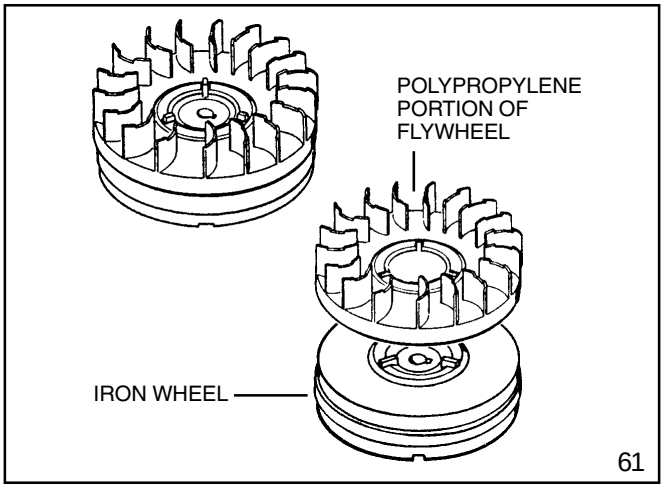
FLYWHEEL SERVICE

Some Tecumseh engines have polypropylene fans that are replaceable. A damaged fan can be replaced by tapping on the outside portion of the fan until it separates from the iron portion of the flywheel (diag. 61).

A new fan may be installed by heating the polypropylene fan in a pan of boiling water. Suspend the fan off the bottom of the pan while heating. Using adequate protection, install the hot fan to the flywheel. Make sure the fan locators fit into the hub area of the flywheel.

Flywheel magnets are factory installed and permanently bonded to the flywheel. If the magnets are damaged or lose their magnetic strength, the flywheel must be replaced.



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CHAPTER 10

ENGINE SPECIFICATIONS

The engine specifications listed on the following pages include tolerances that are considered acceptable to achieve normal engine operation. Observed values inside the listed tolerance range are satisfactory and require no adjustments.

FOUR CYCLE TORQUE SPECIFICATIONS

The torque specifications listed in this chart are to be used for replacing components after disassembly, not for checking an existing engine bolt torque. Checking a torque value on a new or used engine may be lower due to torque relaxation that occurs on all engines from thermal expansion and contraction. However, sufficient clamping force exists and a re-torque is not necessary.

Location	in. lbs.	ft. lbs.	Nm	ALL TVXL TVS	ALL TNT	ALL ECV	ALL LAV	H, V, HH, VH 30-40	HSSK HS	TVM 125, 140	HSK H50-60	V50 V60 V70	HSK H70	VM TVM & TVXL 170, 195,220	HMSK HMXL HM	HH, VH 50-70	LEV VSK
Cyl. Head Bolts	200	16.5	22.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Conn. Rod Bolts	105	8.5	11.5	X	X	X	X	X	X							X	X
Conn. Rod Bolts	170	14	19							X	X						
Conn. Rod Bolts	210	17.5	24									X	X	X	X		
Cyl. Cover or Flange	115	9.5	13	X	X	X	X	X	X	X	X	X	X				X
Cyl. Cover or Flange(Powerlok)	125	10.5	14							X				X	X	X	
Flywheel Nut (Aluminum)	450	37.5	51	X	X	X	X	X	X								X
Flywheel Nut	475	40	54							X		X		X	X		
Flywheel Nut (Cast iron)	550	46	62	X				X	X		X		X				X
Flywheel Nut	630	52.5	71													X	
Flywheel Nut Ext. Ign.	700	58	79											X	X	X	
Spark Plug	250	21	28.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ign. Mounting (Direct to Cylinder)	45	4	5	X	X	X	X										X
Ign. Mounting (Direct to Cylinder)	90	7.5	10													X	
Ign. Mounting (Stud to Cylinder)	35	3	4					X	X								
Ign. Mounting (to Stud)	45	4	5					X	X	X	X	X	X	X	X		
Intake Pipe to Cylinder	95	8	11	X	X	X	X	X	X								X
Intake Pipe to Cylinder	110	9	11.5							X		X		X		X	
Intake Pipe to Cylinder	120	10	13.5							X		X			X		
Carburetor to Intake Pipe	70	6	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carb. Adapter to Cylinder	85	7	9.5								X		X				

FOUR CYCLE TORQUE SPECIFICATIONS - CONTINUED

The torque specifications listed in this chart are to be used for replacing components after disassembly, not for checking an existing engine bolt torque. Checking a torque value on a new or used engine may be lower due to torque relaxation that occurs on all engines from thermal expansion and contraction. However, sufficient clamping force exists and a re-torque is not necessary.

Location	in. lbs.	ft. lbs.	Nm	ALL TVXL TVS	ALL TNT	ALL ECV	ALL LAV	H, V, HH, VH 30-40	HSSK HS	TVM 125, 140	HSK, H50-60	V50 V60 V70	HSK H70	V80 VM TVM & TVXL 170, 195, 220	HMSK HMXL HM	HH, VH 50-70	LEV VSK
Muffler Mounting Shoulder Screw	100	8.5	11.5	X	X	X											X
Muffler Mounting No Shoulder Screw	20	2	2.5	X	X	X	X	X									
Muffler Mounting (Pancake)	37.5	3	4					X									
Muffler Mounting (Lock Tabs)	72.5	6	8	X		X	X		X								
Muffler Mounting (HTL)	87.5	7.5	10	X													
Muffler Mtg.	120	10	13							X	X	X	X	X	X		
Muffler Mtg. Flanged	80	6.5	9					X	X	X	X	X	X	X	X		
Muffler Mtg. Shoulder Bolt	110	9	12.5												X		
Magneto Stator To Cylinder	65	5.5	7.5	X	X	X	X	X	X	X	X	X	X	X	X		
Recoil Starter Top Mount & 8-32 Thread Forming	22.5	2	2.5	X	X	X	X	X	X								X
Recoil Starter (Top Mount)	50	4	5.5				X	X	X	X	X	X	X	X	X	X	X
Recoil Starter (Side Mount Plastic)	85	7	9.5	X	X	X											
Recoil Starter (Side Mount Metal)	60	5	7	X	X	X											
Electric Starter To Cylinder	65	5.5	7.5	X	X	X	X	X	X	X	X	X	X	X	X		X
Electric Starter To Cylinder	95	8	11							X	X	X	X	X	X		
Electric Starter To Cylinder	155	13	17.5													X	

ENGINE SPECIFICATIONS STANDARD POINT IGNITION

All models have point setting of .020" (.508 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°.
All U.S. dimensions are in inches.

SPECIFICATIONS	LAV25, LAV30 TVS75-90 Prior to 8/1987, H25, H30-1982 & Prior		H30 (1983 Serial no.)		LAV35, H35 (1982 & prior)		H35 (1983 Serial no.)		ECV100	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	7.75	127.02	9.06	148.50	9.06	148.50	9.52	156.03	9.98	163.57
Stroke	1.844	46.838	1.844	46.838	1.844	46.836	1.938	49.225	1.844	46.838
Bore	2.3125 2.3135	58.738 58.763	2.5000 2.5010	63.5 63.525	2.5000 2.5010	63.5 63.525	2.5000 2.5010	63.5 63.525	2.6250 2.6260	66.675 66.700
Timing Dim. B.T.D.C.	0.065	1.651	0.035	.889	0.065	1.651	0.035	.889	0.035	.889
Valve Clearance	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143
Valve Guide Oversize Dim.	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	.8610 .8615	21.869 21.882	.8610 .8615	21.869 21.882	.8610 .8615	21.869 21.882	.9995 1.0000	25.387 25.400	.8610 .8615	21.869 21.882
Crankshaft Mag. Main Brg. Dia.	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.8735 .8740	22.187 22.200
Crankshaft P.T.O. Main Brg. Dia.	.8735 .8740	22.187 22.200	.8735 .8740	22.187 22.200	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.8735 .8740	22.187 22.200
Camshaft Journals	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.712	.4999 .5005	12.675 12.712	.4999 .5005	12.675 12.712	.4999 .5005	12.675 12.712
Connecting Rod Diameter Crank Bearing	.8620 .8625	21.895 21.908	.8620 .8625	21.895 21.908	.8620 .8625	21.895 21.908	1.0005 1.0010	25.413 25.425	.8620 .8625	21.895 21.908
Piston Diameter Bottom Of Skirt	2.3092 2.3100	58.654 58.674	2.4952 2.4960	63.378 63.398	2.4952 2.4960	63.378 63.398	2.4952 2.4960	63.378 63.398	2.6202 2.6210	66.553 66.573
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.0005 .0035	.013 .089	.0005 .0035	.013 .089	.0005 .0035	.013 .089	.0005 .0035	.013 .089	.001 .004	.025 .102
Piston Skirt Clearance	.0025 .0043	.064 .109	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147
Ring End Gap	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432
Cylinder Main Brg.	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	.8755 .8760	22.238 22.250
Cylinder Cover / Flange Main Bearing Diameter	.8755 .8760	22.238 22.250	.8755 .8760	22.238 22.250	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	.8755 .8760	22.238 22.250

ENGINE SPECIFICATIONS STANDARD POINT IGNITION (CONT.)

All models have point setting of .020" (.508 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°.
All U.S. dimensions are in inches.

SPECIFICATIONS	TNT100		V40-V40B, VH40, H40, HH40		LAV40, TVS105, HS40, TVXL105		ECV105		ECV110	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	9.98	163.57	11.04	180.95	10.49	171.93	10.5	172.10	11.5	188.49
Stroke	1.844	46.838	2.250	57.15	1.938	49.23	1.938	49.23	1.938	49.23
Bore	2.6250 2.6260	66.675 66.700	2.5000 2.5010	63.500 63.525	2.6250 2.6260	66.675 66.700	2.6250 2.6260	66.675 66.700	2.7500 2.7510	69.85 69.88
Timing Dim. B.T.D.C.	0.035	.889	0.050	1.27	0.035	.889	0.035	.889	0.035	.889
Valve Clearance	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.042 .052	1.067 1.321	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143
Valve Guide Oversize Dim.	.2807 .2817	7.130 7.155	.3432 .3442	8.717 8.743	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	.8610 .8615	21.869 21.882	1.0615 1.0620	26.962 26.975	.9995 1.0000	25.387 25.400	.9995 1.0000	25.387 25.400	.9995 1.0000	25.387 25.400
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9990 .9995	25.375 25.387
Crankshaft P.T.O. Main Brg. Dia.	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Camshaft Journals	.4975 .4980	12.637 12.649	.6230 .6235	15.824 15.837	.4975 .4980	12.637 12.649	.4975 .4980	25.413 25.425	.4975 .4980	25.413 25.425
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.6245 .6255	15.862 15.888	.4999 .5005	12.675 12.712	.4999 .5005	12.675 12.712	.4999 .5005	12.675 12.712
Connecting Rod Diameter Crank Bearing	.8620 .8625	21.895 21.908	1.0630 1.0635	27.000 27.013	1.0005 1.0010	25.413 25.425	1.0005 1.0010	12.637 12.649	1.0005 1.0010	12.637 12.649
Piston Diameter Bottom Of Skirt	2.6202 2.6210	66.553 66.573	2.4945 2.4950	63.360 63.373	2.6202 2.6210	66.553 66.573	2.6202 2.6210	66.553 66.573	2.7450 2.7455	69.723 69.736
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.0040 .0058	.102 .147	.0055 .0070	.140 .178	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0045 .0060	.114 .152
Ring End Gap	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432	.007 .017	.178 .432
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover / Flange Main Bearing Diameter	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425

ENGINE SPECIFICATIONS STANDARD POINT IGNITION

All models have point setting of .020" (.508 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°.
All U.S. dimensions are in inches.

SPECIFICATIONS	LAV50, TVS120, HS50		TNT 120 ECV120		V50, VH50*,TVM125 H50, HH50*		V60, VH60*,TVM140 H60, HH60*		V70, VH70*, VM70 H70, HH70*	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in³) (cc)	12.04	197.34	12.04	197.34	12.18	199.63	13.53	221.76	15.04	246.51
Stroke	1.938	49.23	1.938	49.23	2.25	57.15	2.5	63.5	2.532	64.31
Bore	2.8120 2.8130	71.425 71.450	2.8120 2.8130	71.425 71.450	2.6250 2.6260	66.675 66.700	2.6250 2.6260	66.675 66.700	2.7500 2.7510	69.85 69.88
Timing Dim. B.T.D.C.	0.035	.889	0.035	.889	0.080	2.032	0.080	2.032	0.080	2.032
Valve Clearance	.004 .010	.102 .254	.004 .010	.102 .254	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.035 .045	.889 1.143	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321
Valve Guide Oversize Dim.	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .027	.005 .027 note C	.127 .027	.005 .027 note C	.127 .027	.005 .027 note C	.127 .027
Crankpin Journal Dia.	.9995 1.0000	25.387 25.400	.9995 1.0000	25.387 25.400	1.0615 1.0620	26.962 26.975	1.0615 1.0620	26.962 26.975	1.1860 1.1865	30.124 30.137
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft P.T.O. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Camshaft Journals	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.712	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888
Connecting Rod Diameter Crank Bearing	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0630 1.0635	27.000 27.013	1.0630 1.0635	27.000 27.013	1.1880 1.1885	30.175 30.188
Piston Diameter Bottom Of Skirt	2.8072 2.8080	71.303 71.323	2.8072 2.8080	71.303 71.323	2.6210 2.6215	66.573 66.586	2.6210 2.6215	66.573 2.6215	2.7450 2.7455	69.723 69.736
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .004	.051 .102	.002 .004	.051 .102	.002 .003	.051 .076
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.002 .004	.051 .102	.002 .004	.051 .102	.001 .003	.025 .076
Piston Skirt Clearance	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0035 .0050 note A	.089 .127	.0035 .0050 note A	.089 .127	.0045 .0060 note B	.114 .152
Ring End Gap	.007 .017	.178 .432	.007 .017	.178 .432	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover / Flange Main Bearing Diameter	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425

* Notes: (A) VH50, 60 .0015/.0055 (.038/.140mm) (B) VH70 .0038/.0073 (.097/.185 mm) (C) VH, HH50-70 Models .003/.031 (.762/.787 mm)

ENGINE SPECIFICATIONS STANDARD POINT IGNITION (Cont.)

All models have point setting of .020" (.508 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°.
All U.S. dimensions are in inches.

SPECIFICATIONS	TVM170, HM70		V80, VM80*, H70*, HM80*		VM80*, TVM195, HM80*, HHM80		VM100, HM100		TVM220, HM100	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	17.17	281.42	18.65	305.67	19.43 note A	318.46	20.2	333.08	21.82	357.63
Stroke	2.532	64.31	2.532	64.31	2.532	64.31	2.532	64.31	2.532	64.31
Bore	2.9375 2.9385	74.613 74.638	3.0620 3.0630	77.775 77.800	3.1250 3.1260	79.375 79.400	3.1870 3.1880	80.950 80.975	3.3120 3.3130	84.125 84.150
Timing Dim. B.T.D.C.	0.090	2.286	0.090	2.286	0.090	2.286	0.090	2.286	0.090	2.286
Valve Clearance	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305
Valve Seat Width Intake Exhaust	.042 .0938	1.067 2.383	.042 .0938 note B	1.067 2.383	.042 .0938	1.067 2.383	.042 .0938	1.067 2.383	.042 .0938	1.067 2.383
Valve Guide Oversize Dim.	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	1.1860 1.1865	30.124 30.137	1.1860 1.1865	30.124 30.137	1.1860 1.1865	30.124 30.137	1.1860 1.1865	30.124 30.137	1.1860 1.1865	30.124 30.137
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft P.T.O. Main Brg. Dia.	1.1870 1.1875	30.150 30.163	1.1870 1.1875	30.150 30.163	1.1870 1.1875	30.150 30.163	1.1870 1.1875	30.150 30.163	1.1870 1.1875	30.150 30.163
Camshaft Journals	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837
Camshaft Bearings Cylinder & Cover / Flange	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888
Connecting Rod Diameter Crank Bearing	1.1880 1.1885	30.175 30.188	1.1880 1.1885	30.175 30.188	1.1880 1.1885	30.175 30.188	1.1880 1.1885	30.175 30.188	1.1880 1.1885	30.175 30.188
Piston Diameter Bottom Of Skirt	2.9325 2.9335	74.486 74.511	3.0575 3.0585	77.661 77.686	3.1195 3.1205	79.235 79.261	3.1815 3.1825	80.810 80.836	3.3090 3.3105	84.049 84.087
Piston Pin Diameter	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6873 .6875	17.457 17.463	.6873 .6875	17.457 17.463
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.004 .006	.102 .152	.0035 .0055	.089 .140	.0045 .0065	.114 .175	.0045 .0065	.114 .175	.0015 .0040	.038 .102
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover / Flange Main Bearing Diameter	1.1890 1.1895	30.201 30.213	1.1890 1.1895	30.201 30.213	1.1890 1.1895	30.201 30.213	1.1890 1.1895	30.201 30.213	1.1890 1.1895	30.201 30.213

* Check to determine bore size
Notes: (A) VM & HM80 - Displacement 19.41 (318 cc), (B) H70 Exhaust Valve Seat Width .052"

SOLID STATE AND EXTERNAL IGNITION

All solid state models have air gap settings of .0125" (.3175 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°. All U.S. dimensions are in inches.

SPECIFICATIONS	TVS 75 Prior to 8/87		TVS90		H35		V40, TVS105, HS40		TVS100, ECV100, TNT100	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	7.75	127.02	9.06	148.50	9.52	156.03	10.49	171.93	9.98	163.57
Stroke	1.844	46.838	1.844	46.838	1.938	49.225	1.938	49.225	1.844	46.838
Bore	2.3125 2.3135	58.738 58.763	2.500 2.501	63.500 63.525	2.500 2.501	63.500 63.525	2.625 2.626	66.675 66.700	2.625 2.626	66.675 66.700
Valve Clearance	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143
Valve Guide Oversize Dim.	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	.8610 .8615	21.869 21.882	.8610 .8615	21.869 21.882	.9995 1.0000	25.387 25.400	.9995 1.0000	25.387 25.400	.8610 .8615	21.869 21.882
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft P.T.O. Main Brg. Dia.	.8735 .8740	22.187 22.200	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.8735 .8740	22.187 22.200
Camshaft Journals	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713
Connecting Rod Diameter Crank Bearing	.8620 .8625	21.895 21.908	.8620 .8625	21.895 21.908	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	.8620 .8625	21.895 21.908
Piston Diameter Bottom Of Skirt	2.3092 2.3100	58.654 58.674	2.4952 2.4960	63.738 63.398	2.4952 2.4960	63.738 63.398	2.6202 2.6210	66.553 66.573	2.6202 2.6210	66.553 66.573
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.0005 .0035	.013 .089	.0005 .0035	.013 .089	.0005 .0035	.013 .089	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.0025 .0043	.064 .109	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover / Flange Main Bearing Diameter	.8755 .8760	22.238 22.250	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	.8755 .8760	22.238 22.250

SOLID STATE AND EXTERNAL IGNITION

All solid state models have air gap settings of .0125" (.3175 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46^0.
All U.S. dimensions are in inches.

SPECIFICATIONS	TVS/ TVXL115 57000 Series ONLY		TVS105 56000 Series TVS/TVXL 115 57000 A & later		TVS120 J & later HS50 H & later HSSK 50-55 N & later		LAV50,TVS120 HS50 G & earlier HSSK50 M & earlier		VH50, TVM125 H50, HH50	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	11.44	187.50	11.32	185.53	11.9	195.04	12.04	197.34	12.18	199.63
Stroke	1.844	46.838	1.844	46.838	1.938	49.23	1.938	49.23	2.250	57.15
Bore	2.812 2.813	71.425 71.450	2.795 2.796	70.993 71.018	2.795 2.796	70.993 71.018	2.812 2.813	71.425 71.450	2.625 2.626	66.675 66.700
Valve Clearance	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.008 .012	.203 .305
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.042 .052	1.067 1.321
Valve Guide Oversize Dim.	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.2807 .2817	7.130 7.155	.3432 .3442	8.717 8.743
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	.8610 .8615	21.869 21.882	.8610 .8615	21.869 21.882	.9995 1.000	25.387 25.400	.9995 1.000	25.387 25.400	1.0615 1.0620	26.962 26.975
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft P.T.O. Main Brg. Dia.	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Camshaft Journals	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.6230 .6235	15.824 15.837
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.6245 .6255	15.862 15.888
Connecting Rod Diameter Crank Bearing	.8620 .8625	21.895 21.908	.8620 .8625	21.895 21.908	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0630 1.0635	27.000 27.013
Piston Diameter Bottom Of Skirt	2.8072 2.8080	71.303 71.323	2.790 2.791	70.866 70.891	2.790 2.791	70.866 70.891	2.8072 2.8080	71.303 71.323	2.6212 2.6220	66.578 66.599
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.6247 .6249	15.867 15.872
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0040 .0058	.102 .147	.0030 .0048	.076 .122
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover/Flange Main Bearing Diameter	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425

SOLID STATE AND EXTERNAL IGNITION

All solid state models have air gap settings of .0125" (.3175 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46^0.
All U.S. dimensions are in inches.

SPECIFICATIONS	LEV80		LEV100		VSK100		LEV115		LEV120	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	7.75	127.02	9.98	163.57	9.98	163.57	11.32	185.53	11.90	195.04
Stroke	1.844	46.838	1.844	46.838	1.844	46.838	1.844	46.838	1.938	49.23
Bore	2.311 2.312	58.750	2.625 2.626	66.675 66.700	2.625 2.626	66.675 66.700	2.795 2.796	70.993 71.018	2.795 2.796	70.993 71.018
Valve Clearance	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203	.004 .008	.102 .203
Valve Seat Width Intake Exhaust	.035 .045	.889 1.143	.066 .086	1.676 2.184	.066 .086	1.676 2.184	.066 .086	1.676 2.184	.066 .086	1.676 2.184
Valve Guide Oversize Dim.	.2505 N / A	6.363 N / A	.2505 N / A	6.363 N / A	.2505 N / A	6.363 N / A	.2505 N / A	6.363 N / A	.2505 N / A	6.363 N / A
Crankshaft End Play	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686	.005 .027	.127 .686
Crankpin Journal Dia.	.8610 .8615	21.869 21.882	.9995 1.000	25.837 25.400	.9995 1.000	25.837 25.400	.9995 1.000	25.837 25.400	.9995 1.000	25.837 25.400
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft P.T.O. Main Brg. Dia.	.8735 .8740	22.187 22.200	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Camshaft Journals	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649
Camshaft Bearings Cylinder & Cover / Flange	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713	.4999 .5005	12.675 12.713
Cam Journal Bushing End	.3725 .3730 note A	9.462 9.474	.3725 .3730 note A	9.462 9.474	N/A	N/A	.3725 .3730 note A	9.462 9.474	.3725 .3730 note A	9.462 9.474
Cam Bushing Inside Diameter	.376 .378 note A	9.550 9.601	.376 .378 note A	9.550 9.601	N/A	N/A	.376 .378 note A	9.550 9.601	.376 .378 note A	9.550 9.601
Connecting Rod Diameter Crank Bearing	.8620 .8625	21.895 21.908	1.0005 1.0010	25.413 25.425	1.0020 1.0025 note B	25.451 25.464	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Piston Diameter Bottom Of Skirt	2.309 2.310	58.649 58.674	2.620 2.622	66.548 66.599	2.620 2.622	66.548 66.599	2.790 2.792	70.866 70.917	2.790 2.792	70.866 70.917
Piston Pin Diameter	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300	.5628 .5630	14.295 14.300
Ring Groove Side Clearance 1st & 2nd Comp.	.0011 .0043	.028 .109	.005 Max.	.127	.005 Max.	.127	.005 Max.	.127	.005 Max.	.127
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.0035 Max.	.089	.0035 Max.	.089	.0035 Max.	.089	.0035 Max.	.089
Piston Skirt Clearance	.0025 .0045	.064 .114	.003 .006	.076 .152	.003 .006	.076 .152	.003 .006	.076 .152	.003 .006	.076 .152
Ring End Gap	.005 .013	.127 .330	.005 .024	.127 .610	.005 .024	.127 .610	.005 .024	.127 .610	.005 .024	.127 .610
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover/Flange Main Bearing Diameter	.8755 .8760	22.238 22.250	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425

Note A - LEV's built after 10-99 have the new Exhaust MCR Camshaft which require the bushing.
Note B - VSK100 - Connecting Rod Diameter is larger than LEV models.

SOLID STATE AND EXTERNAL IGNITION

All solid state models have air gap settings of .0125" (.3175 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°. All U.S. dimensions are in inches.

SPECIFICATIONS	HSK60 VH60, TVM140, H60, HH60		V70, VH70,H70, HSK70, HH70, TVM170 (E) MODEL		HM70 (Models ending in C)		HM70 (Models ending in D)		TVM170 Models F & UP), HM70 Models (E & up)	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in³) (cc)	13.53	221.76	15.04	246.51	17.17	281.42	17.17	281.42	19.43	318.46
Stoke	2.500	63.5	2.532	64.31	2.532	64.31	2.532	64.31	2.532	64.31
Bore	2.625 2.626	66.675 66.700	2.750 2.751	69.85 69.88	2.9375 2.9385	74.613 74.638	2.9375 2.9385	74.613 74.638	3.125 3.126	79.374 79.400
Valve Clearance	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305
Valve Seat Width Intake Exhaust	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321	.042 .052	1.067 1.321
Valve Guide Oversize Dim.	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743
Crankshaft End Play	.005 .027 Note (A)	.127 .686	.005 .027 Note (A)	.127 .686	.005 .027	.127 .686	.007 .029	.178 .737	.007 .029	.178 .737
Crankpin Journal Dia.	1.0615 1.0620	26.962 26.975	1.1862 1.1865	30.129 30.137	1.1860 1.1865	30.124 30.137	1.3740 1.3745	34.900 34.912	1.3740 1.3745	34.900 34.912
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	1.3745 1.3750	34.912 34.925	1.3745 1.3750	34.912 34.925
Crankshaft P.T.O. Main Brg. Dia.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	1.1870 1.1875	30.150 30.163	1.3745 1.3750	34.912 34.925	1.3745 1.3750	34.912 34.925
Camshaft Journals	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837
Camshaft Bearings Cylinder & Cover / Flange	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888
Connecting Rod Diameter Crank Bearing	1.0630 1.0635	27.000 27.013	1.0630 1.0635	27.000 27.013	1.1880 1.1885	30.175 30.188	1.3760 1.3765 Note (F)	34.950 34.963	1.3760 1.3765 Note (F)	34.950 34.963
Piston Diameter Bottom Of Skirt	2.6212 2.6220 Note (D)	66.578 66.599	2.6212 2.6220 Note (E)	66.578 66.599	2.9325 2.9335	74.486 74.511	2.9325 2.9335	74.486 74.511	3.1195 3.1205	79.235 79.261
Piston Pin Diameter	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127	.002 .005	.051 .127
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.0030 .0048 Note (B)	.076 .122	.0030 .0048 Note (C)	.076 .122	.004 .006	.102 .152	.004 .006	.102 .152	.0045 .0065	.114 .165
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.3765 1.3770	34.963 34.976	1.3765 1.3770	34.963 34.976
Cylinder Cover/Flange Main Bearing Diameter	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.1890 1.1895	30.200 30.213	1.3765 1.3770	34.963 34.976	1.3765 1.3770	34.963 34.976

Notes: (A) VH, HH50-70 models .003/.031 (.762/.787 mm) (B) VH, HH50-60 .0015/.005 (.038/.140 mm) (C) VH, HH70 .0038/.0073 (.097/.185 mm) (D) VH, HH50-60 2.6235/2.6205 (66.637/66.561 mm) (E) VH, HH70 2.7462/2.7437 (69.754/69.69 mm) (F) After Serial Number 9274 1.3775/1.3780 (34.989/35.001 mm)

SOLID STATE AND EXTERNAL IGNITION (Cont.)

All solid state models have air gap settings of .0125" (.3175 mm), spark plug gap of .030" (.762 mm), valve seat angle of 46°.
All U.S. dimensions are in inches.

SPECIFICATIONS	HMSK80 VM80*, TVM195 (A-K), HM80**		HM80**, HM90, HMSK80-90, TVM195 (L & up), TVXL195		TVM220 (A-F), HM100**		HMSK100, HMSK110 TVM220 (G & up), TVXL220, HM100**	
	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm	U.S.	Metric mm
Displacement (in^3) (cc)	19.43	318.46	19.43	318.46	21.82	357.63	21.82	357.63
Stroke	2.532	64.31	2.532	64.31	2.532	64.31	2.532	64.31
Bore	3.125 3.126	79.375 79.400	3.125 3.126	79.375 79.400	3.312 3.313	84.125 84.150	3.312 3.313	84.125 84.150
Valve Clearance	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305	.008 .012	.203 .305
Valve Seat Width Intake Exhaust	.042 .0938	1.067 2.383	.042 .0938	1.067 2.383	.042 .0938	1.067 2.383	.042 .0938	1.067 2.383
Valve Guide Oversize Dim.	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743
Crankshaft End Play	.007 .029	.178 .737	.007 .029	.178 .737	.007 .029	.178 .737	.007 .029 Note (B)	.178 .737
Crankpin Journal Dia.	1.1860 1.1865	30.124 30.137	1.3740 1.3745	34.900 34.912	1.1860 1.1865	30.124 30.137	1.3740 1.3745	34.900 34.912
Crankshaft Mag. Main Brg. Dia.	.9985 .9990	25.362 25.375	1.3745 1.3750	34.912 34.925	.9985 .9990	25.362 25.375	1.3745 1.3750	34.912 34.925
Crankshaft P.T.O. Main Brg. Dia.	1.1870 1.1875	30.150 30.163	1.3745 1.3750	34.912 34.925	1.1870 1.1875	30.150 30.163	1.3745 1.3750	34.912 34.925
Camshaft Journals	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837
Camshaft Bearings Cylinder & Cover / Flange	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888	.6245 .6255	15.862 15.888
Connecting Rod Diameter Crank Bearing	1.1880 1.1885	30.175 30.188	1.3760 1.3765 Note (A)	34.950 34.963	1.1880 1.1885	30.175 30.188	1.3760 1.3765 Note (A)	34.950 34.963
Piston Diameter Bottom Of Skirt	3.1195 3.1205	79.235 79.261	3.1195 3.1205	79.235 79.261	3.3090 3.3105	84.049 84.087	3.3098 3.3108	84.069 84.094
Piston Pin Diameter	.6247 .6249	15.867 15.872	.6247 .6249	15.867 15.872	.6873 .6875	17.457 17.463	.6873 .6875	17.457 17.463
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.051 .127	.002 .005	.051 .127	.0015 .0035	.038 .039	.0015 .0035	.038 .039
Ring Groove Side Clearance Bottom Oil	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102	.001 .004	.025 .102
Piston Skirt Clearance	.0045 .0065	.144 .165	.0045 .0065	.144 .165	.0015 .0040	.038 .102	.0012 .0032	.030 .081
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508
Cylinder Main Brg.	1.0005 1.0010	25.413 25.425	1.3765 1.3770	34.963 34.976	1.0005 1.0010	25.413 25.425	1.3765 1.3770	34.963 34.976
Cylinder Cover/Flange Main Bearing Diameter	1.1890 1.1895	30.200 30.213	1.3765 1.3770	34.963 34.976	1.1890 1.1895	30.200 30.213	1.3765 1.3770	34.963 34.976

* Check to detemine bore size

Notes: (A) After Serial Number 9274 1.3775/1.3780 (34.989/35.001 mm) (B) TVM 220 Ultra Balance .002/.042 (.153/2.184 mm)

** Check to determine crankshaft bearing diameters

CHAPTER 11
EDUCATIONAL MATERIALS AND TOOLS

AVAILABLE TECHNICIAN'S HANDBOOKS

692508
Covers the diagnosis and repair of Tecumseh 2-cycle engines. Except the TC Engine and TVS840.
692509
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.
691462A
Covers the diagnosis and repair of Tecumseh 4-cycle large frame engines.
691218
Covers the diagnosis and repair of Peerless® power train components.
694782
Contains technical information for the repair of the TC series, 2-cycle engines.
694988
Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.
695244A
Covers the diagnosis and repair of the OVRM/OVM/OHM/OHV 4-cycle overhead valve engines.
695578
Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

AVAILABLE FOREIGN TECHNICIAN'S HANDBOOKS

694732 Spanish
This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.
695555 Spanish
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.
695657 German
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.
695562 French
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

VIDEO PROGRAMS

695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.
695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.
695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.
695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.
695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS

INSTRUCTIONAL GUIDE
692738
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS
695590
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

CARBURETOR TROUBLESHOOTING BOOKLET
695907
This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET
694903
This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

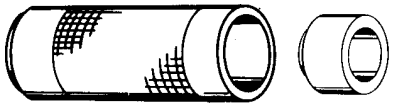
SPECIAL TOOLS BOOKLET
694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET
695933
This booklet contains the quick reference information found on Tecumseh wall charts.
This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

TESTER BOOKLETS

694529
Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.
694530
Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

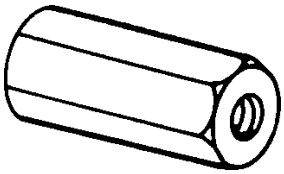
OIL SEAL DRIVER



No. 670272 - Oil Seal Driver. Used with all oil seal protector-drivers to drive the seal into position.

OIL SEAL PROTECTOR / INSTALLER
Consult the specification chart or measure the shaft diameter to determine the correct tool.
670260 - Seal Protector
PTO & Magneto w/dia. of 1.187”-1.875”
HH80-120, VH80-120, OH120-180, VM70-100, HM70-100
670261 - Seal Protector
PTO & Magneto w/dia. of .811”-.815”
External ignition lightweight engines
670262 - Seal Protector
PTO & Magneto w/dia. of .749”-.750”
Standard ignition lightweight engines
670308 - Seal Adaptor
PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750"
670309 - Seal Protector
PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750"
670310 - Seal Protector / Installer
PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750"
670263 - Seal Protector Driver
Oil seal on extended camshaft medium frame engines w/dia. of .6248”-.6253”
Extended 5/8" camshaft medium frame engines
670264 - Seal Protector Driver
Oil seal on 1/2" extended camshaft small frame engines w/dia. of .4998”-.5001”
670272 - Seal Driver
Used with all oil seal installers
670277 - Seal Protector
Oil seal on 8-1/2:1 1/2” shaft on light weight vertical crankshaft engines
670292 - Seal Protector and Installer Assy.
Includes 670265, 670266, & 670267
(I.D. 1.002", 1.052" and 1.050") for V70, VM70-100, H70, HM70-100, V50-70, H50-70, HS40-50, LAV40-50, TVS105-120, TNT120
670293 - Seal Protector and Installer Assy.
Includes 670268 & 670269
(I.D. .875" and .935") H30-35, LAV30-35, TNT100, TVS75-90, ECV90-100
670294 - Seal Protector and Installer Assy.
Includes 670273 & 670274
(I.D. .680" and 1.005") AH520 & AH600 with one piece oil seal
670330 - Seal Protector / Installer
OHV13.5-17 w/ 1-1/2” extended camshaft
670335 - Seal Protector / Installer
HM70-100 PTO & Magneto w/dia. of 1.1870”-1.1875”
670336 - Seal Installer - Adpator
HM70-100 w/ 1-1/8” crankshaft
670337 - Seal Installer for Ball Bearing PTO
OHH engines, use w/ tool 670265
Use tool 670266

FLYWHEEL KNOCK-OFF TOOL



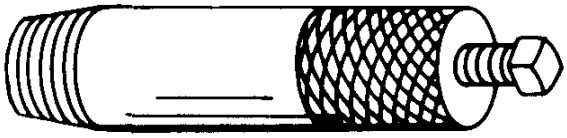
No. 670103 - Knock-off tool (right hand) (7/16").

No. 670169 - Knock-off tool (right hand) (1/2").

No. 670314 - Knock-off tool (right hand) (5/8").

No. 670329 - Knock-off tool (right hand) (3/4").

OIL SEAL REMOVER



Consult the specification chart or measure the shaft diameter to determine the correct tool.

NOTE: Due to variations in oil seal dimensions, these removers may not pull all oil seals.

USE WITH:

No. 670287. 7/8" Crankshaft bearing diameters

No. 670288. 3/4" Crankshaft bearing diameters

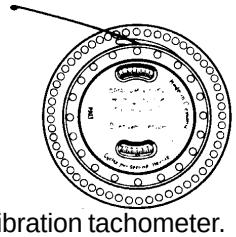
No. 670289. 13/16" Crankshaft bearing diameters

No. 670290. 1" Crankshaft bearing diameters

No. 670312. 1-3/8" Crankshaft bearing diameters

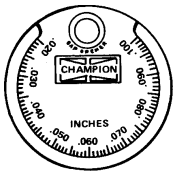
No. 670331. 1-1/2" Crankshaft bearing diameters

VIBRATION TACHOMETER



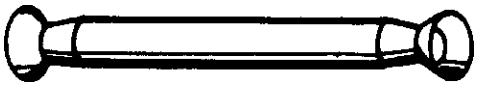
No. 670156 Vibration tachometer.

TAPER GAP GAUGE



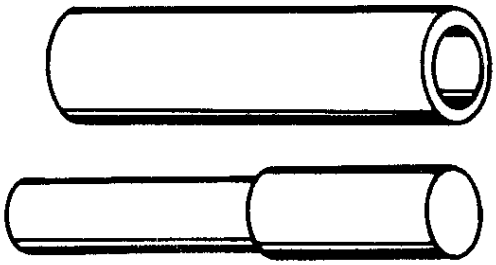
No. 670256 Taper Gap Gauge

VALVE LAPPING TOOL



No. 670154 Valve lapping tool.

REBUSHING DRIVERS



Tool Number		Description	Use with:
A.	670158	Bearing Driver	7/8'' (22.225 mm) Main Bearings where bushings are available.
B.	670159	Bushing Driver	
A.	670162	Bearing Driver	1'' (25.4 mm) Main Bearings where bushings are available
B.	670163	Bushing Driver	
A.	NONE		
B.	670311	Bushing Driver	1-3/8'' (41.275 mm) HM70 100, TVM170 220 and OVM120.
	670317	Bushing Driver	1-3/16" (20.6375 mm) HM70, HM80 and HM100 Cylinder cover

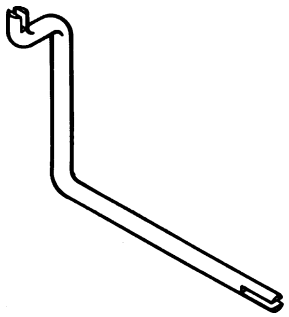
No. 670298 Alignment Tool.

1/32" (.794 mm) OVERSIZE VALVE GUIDE REAMER

No. 670283. Used on small frame 4 cycle engines on Intake and Exhaust valve guides. Oversize diameter .2807 .2817

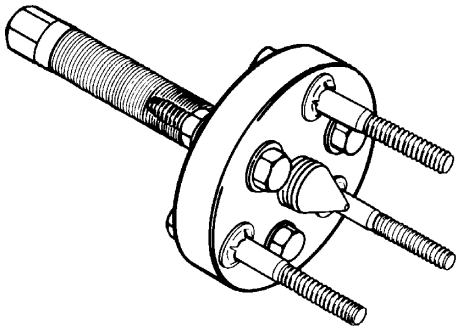
No. 670284. Used on medium and large frame 4 cycle engines on Intake and Exhaust. Oversize diameter .3432 .3442

OVRM and OHV11-17 ADJUSTMENT TOOL



No. 670326

FLYWHEEL PULLER



No. 670306

DECIMAL/FRACTION CONVERSIONS

.016	=	1/64
.031	=	1/32
.047	=	3/64
.063	=	1/16
.078	=	5/64
.094	=	3/32
.109	=	7/64
.125	=	1/8
.141	=	9/64
.156	=	5/32
.172	=	11/64
.188	=	3/16
.203	=	13/64
.219	=	7/32
.234	=	15/64
.25	=	1/4
.266	=	17/64
.281	=	9/32
.297	=	19/64
.312	=	5/16
.328	=	21/64
.344	=	11/32
.359	=	23/64
.375	=	3/8
.391	=	25/64
.406	=	13/32
.422	=	27/64
.438	=	7/16
.453	=	29/64
.469	=	15/32
.484	=	31/64
.50	=	1/2
.516	=	33/64
.531	=	17/32
.547	=	35/64
.563	=	9/16
.578	=	37/64
.594	=	19/32
.609	=	39/64
.625	=	5/8
.641	=	41/64
.656	=	21/32
.672	=	43/64
.688	=	11/16
.703	=	45/64
.719	=	23/32
.734	=	47/64
.75	=	3/4
.766	=	49/64
.781	=	25/32
.797	=	51/64
.813	=	13/16
.828	=	53/64
.844	=	27/32
.859	=	55/64
.875	=	7/8
.891	=	57/64
.906	=	29/32
.922	=	59/64
.938	=	15/16
.953	=	61/64
.969	=	31/32
.984	=	63/64

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.001000	TVM220-157285G
143.001001	HM100-159411R
143.001002	TVM220-157286G
143.001101	HMSK110-159960A
143.001103	HMSK110-159961A
143.001105	HMSK110-159963A
143.003001	H30-35517Y
143.003500	LEV100-335023D
143.003501	H35-45767Z
143.003502	LEV100-335010D
143.003504	LEV115-350144E
143.003504	LEV115-350144E
143.003506	TVS90-43775R
143.003508	LEV100-335011D
143.003800	VSK100-338501A
143.003802	LEV100-338012D
143.003804	TVS90-46129F
143.004000	LEV100-340048D
143.004001	H40-55704A
143.004002	LEV100-340037D
143.004004	LEV100-340024D
143.004006	TVS90-48048D
143.004008	LEV115-350159E
143.004010	LEV100-340031D
143.004012	LEV100-340033D
143.004014	LEV100-340015D
143.004016	LEV100-340016D
143.004018	LEV115-350168E
143.004500	LEV120-361069C
143.004502	LEV100-345014D
143.004504	LEV100-345006D
143.004506	TVS115-57065G
143.005001	HSSK50-67399S
143.005003	HSSK50-67400S
143.005004	LEV115-350128E
143.005006	LEV115-350090E
143.005008	LEV115-350060E
143.005504	LEV115-355021E
143.005506	TVS115-62124D
143.005508	LEV120-361504A
143.005510	LEV115-355022E
143.005512	LEV120-361075C
143.006000	LEV115-360021D
143.006002	TVS120-66021C
143.006004	LEV115-360025D
143.006006	LEV115-360024D
143.006200	LEV115-360026D
143.006202	TVS120-66020C
143.006204	LEV120-361505A
143.006206	LEV115-360030D
143.006502	LEV120-361044C
143.006504	LEV120-361013C
143.006506	LEV120-361054C
143.006508	LEV120-361047C
143.006510	LEV120-361045C

Craftsman	Tecumseh
143.006512	LEV120-361037C
143.006700	LEV120-361501A
143.006702	LEV120-361502A
143.006712	LEV120-361503A
143.006714	LEV120-361509A
143.006716	LEV120-361510A
143.008001	HM80-155658T
143.008003	HM80-155680T
143.008501	HM85-155851B
143.009001	HMSK90-156530D
143.009003	HMSK90-156531D
143.009005	HM90-156017E
143.009007	HM90-156018E
143.009009	HM90-156019E
143.011000	TVM220-157220H
143.011002	TVM220-157286H
143.011004	TVM220-157285H
143.011101	HMSK110-159964A
143.011103	HMSK110-159965A
143.013500	LEV100-335011E
143.013501	H35-45768Z
143.013502	LEV100-335010E
143.013503	H35-45777Z
143.013802	LEV100-338022E
143.014000	LEV100-340031E
143.014001	H40-55705A
143.014002	LEV100-340032E
143.014004	LEV100-340033E
143.014006	LEV100-340015E
143.014008	LEV100-340016E
143.014010	LEV100-340017E
143.014012	LEV100-340021E
143.014014	LEV100-340024E
143.014016	LEV100-340052E
143.014500	LEV120-361082C
143.014502	LEV100-345006E
143.014504	LEV100-345021E
143.014506	LEV120-361105C
143.015000	LEV115-350121E
143.015001	HSSK50-67405S
143.015002	LEV115-350189E
143.015003	HSSK50-67406S
143.015004	LEV115-350192E
143.015005	HSSK50-67407S
143.015007	HSSK50-67408S
143.015500	LEV115-355026E
143.015502	LEV120-361096C
143.015504	LEV120-361097C
143.016000	LEV115-360033D
143.016002	LEV115-360034D
143.016004	LEV115-360035D
143.016200	LEV115-360031D
143.016202	LEV120-361519A
143.016502	LEV120-361093C
143.016504	LEV120-361537A

Craftsman	Tecumseh
143.016700	LEV120-361515A
143.016702	LEV120-361517A
143.016704	LEV120-361518A
143.016706	LEV120-361520A
143.016708	LEV120-361521A
143.016710	LEV120-361522A
143.016712	LEV120-361523A
143.016714	LEV120-361524A
143.016718	LEV120-361526A
143.016720	LEV120-361527A
143.016722	LEV120-361528A
143.016724	LEV120-361529A
143.016726	LEV120-361530A
143.016728	LEV120-361531A
143.016730	LEV120-361532A
143.016732	LEV120-361533A
143.016734	LEV120-361534A
143.016736	LEV120-361535A
143.016738	LEV120-361536A
143.018001	HM80-155680U
143.018501	HM85-155853C
143.019001	HMSK90-156534D
143.019003	HMSK90-156536D
143.019005	HMSK90-156537D
143.019007	HM90-156021F
143.019009	HM90-156018F
143.019011	HM90-156019F
143.021101	HMSK110-159964B
143.021103	HMSK110-159965B
143.025001	HSSK50-67410S
143.025003	HSSK50-67411S
143.025005	HSSK50-67412S
143.029001	HMSK90-156534E
143.029003	HMSK90-156536E
143.029005	HMSK90-156537E
143.207012	LAV40-50254B
143.207022	LAV40-50205B
143.207032	LAV40-50207B
143.207042	LAV40-50254B
143.207052	LAV40-50201B
143.207072	LAV40-50270B
143.217042	LAV40-50254C
143.217062	LAV40-50207C
143.217072	LAV40-50201C
143.217102	LAV40-50217C
143.235032	LAV50-62002
143.235072	LAV50-62010
143.237042	LAV40-50336C
143.245012	LAV50-62012
143.245012	LAV50-62012
143.245092	LAV50-62015
143.245142	LAV50-62018
143.245152	LAV50-62019
143.245172	LAV50-62023
143.245182	LAV50-62024

Craftsman	Tecumseh
143.255012	LAV50-62027
143.255022	LAV50-62029
143.255042	LAV50-62037
143.255052	LAV50-62039A
143.255062	LAV50-62043
143.255072	LAV50-62043A
143.255082	LAV50-62015A
143.255092	LAV50-62037A
143.255102	LAV50-62029A
143.255112	LAV50-62039A
143.257012	LAV40-50358D
143.257022	LAV40-50358C
143.257032	LAV40-50366D
143.257042	LAV40-50201D
143.257052	LAV40-50369D
143.257062	LAV40-50369E
143.257072	LAV40-50366E
143.265012	LAV50-62015A
143.265032	LAV50-62047A
143.265042	LAV50-62030A
143.265052	LAV50-62049A
143.265062	LAV50-62039B
143.265072	LAV50-62047B
143.265082	LAV50-62015B
143.265092	LAV50-62029B
143.265112	LAV50-62037B
143.265122	LAV50-62043B
143.265132	LAV50-62050B
143.265142	LAV50-62051B
143.265152	LAV50-62052B
143.265162	LAV50-62053B
143.265172	LAV50-62024B
143.265192	LAV50-62049B
143.267012	LAV40-50368E
143.267022	LAV40-50368F
143.267042	LAV40-50369F
143.274092	LAV35-40938L
143.274102	LAV35-40939L
143.274112	LAV35-40940L
143.274122	LAV35-40941L
143.274132	LAV35-40942L
143.274162	LAV35-40899L
143.274172	LAV35-40943L
143.274182	LAV35-40944L
143.274252	LAV35-40751L
143.274272	LAV35-40948L
143.274282	LAV35-40949L
143.274292	LAV35-40950L
143.274302	LAV35-40951L
143.274312	LAV35-40952L
143.274322	LAV35-40953L
143.274332	LAV35-40954L
143.274352	LAV35-40955L
143.274372	LAV35-40956L
143.274472	LAV35-40957L

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.274492	LAV35-40858L
143.274552	LAV35-40961L
143.274592	LAV35-40962L
143.274642	LAV35-40626L
143.274662	LAV35-40967L
143.274682	LAV35-40882L
143.274702	LAV35-40926L
143.274772	LAV35-40924L
143.274792	LAV35-40774L
143.275012	LAV50-62059B
143.275012	LAV50-62059B
143.275022	LAV50-62060B
143.275042	LAV50-62018B
143.275052	LAV50-62063B
143.275062	LAV50-62065B
143.275072	LAV50-62019B
143.275082	LAV50-62066B
143.277012	LAV40-50387D
143.277022	LAV40-50382D
143.284012	LAV35-40969M
143.284022	LAV35-40970M
143.284032	LAV35-40971M
143.284052	LAV35-40972M
143.284062	LAV35-40973M
143.284082	LAV35-40974M
143.284092	LAV35-40975M
143.284112	LAV35-40977M
143.284142	LAV35-40980M
143.284152	LAV35-40981M
143.284162	LAV35-40982M
143.284182	LAV35-40986M
143.284222	LAV30-30538M
143.284242	LAV35-40990M
143.284252	LAV35-40991M
143.284282	LAV35-40992M
143.284292	LAV35-40993M
143.284302	LAV35-40994M
143.284312	LAV35-40882M
143.284322	LAV35-40858M
143.284392	LAV35-40751M
143.284402	LAV35-40995M
143.284412	LAV35-40996M
143.284422	LAV35-40962M
143.284442	LAV30-30539M
143.284482	LAV35-40961M
143.284512	LAV35-40997M
143.284522	LAV35-40998M
143.284542	LAV35-40999M
143.284552	LAV35-41000M
143.284562	LAV35-41001M
143.284572	LAV35-41002M
143.284592	LAV35-41003M
143.284632	LAV35-41006M
143.284652	LAV35-40923M
143.284662	LAV35-40938M

Craftsman	Tecumseh
143.284712	LAV35-40926M
143.284722	LAV35-40917M
143.284732	LAV35-40859M
143.284762	LAV35-40463M
143.285012	LAV50-62050C
143.285022	LAV50-62024C
143.285032	LAV50-62066C
143.285042	LAV50-62049C
143.285052	LAV50-62067C
143.285062	LAV50-62065C
143.285072	LAV50-62037C
143.285082	LAV50-62063C
143.285092	LAV50-62068C
143.285102	LAV50-62043C
143.287012	LAV40-50389E
143.287022	LAV40-50391D
143.287032	LAV40-50392E
143.294552	TVS105-53012A
143.294562	TVS105-53013A
143.294622	TVS105-53017A
143.294632	TVS105-53018A
143.294642	TVS105-53016A
143.294702	TVS105-53025A
143.295012	LAV50-62071C
143.295022	LAV50-62072C
143.295032	LAV50-62053C
143.297012	TVS105-53006A
143.304362	LAV35-40906M
143.305042	LAV50-62073C
143.305062	LAV50-62074C
143.313012	TVS75-33010B
143.313022	TVS75-33012B
143.314032	TVS90-43020B
143.314042	TVS90-43022B
143.314052	TVS90-43023B
143.314062	TVS90-43025B
143.314072	TVS90-43032B
143.314082	TVS90-43033B
143.314092	TVS90-43094B
143.314102	TVS90-43095B
143.314112	TVS90-43096B
143.314182	TVS90-43121B
143.314262	TVS90-43059B
143.314272	TVS90-43061B
143.314282	TVS90-43107B
143.314292	TVS90-43019B
143.314302	TVS90-43134B
143.314322	TVS90-43040B
143.314332	TVS90-43112B
143.314342	TVS90-43111B
143.314362	TVS90-43145B
143.314382	TVS90-43044B
143.314402	TVS90-43068B
143.314412	TVS90-43108B
143.314432	LAV35-40917N

Craftsman	Tecumseh
143.314482	TVS90-43150B
143.314542	TVS90-43066B
143.314552	TVS90-43088B
143.314562	TVS90-43116B
143.314702	LAV35-40906N
143.314722	TVS90-43139B
143.314732	TVS90-43140B
143.314742	TVS90-43141B
143.314752	TVS90-43142B
143.314762	TVS90-43143B
143.314772	TVS90-43144B
143.315022	LAV50-62071D
143.315032	TVS105-53018B
143.315042	TVS105-53025B
143.315062	LAV50-62065D
143.315072	TVS105-53006B
143.315092	LAV50-62037D
143.315102	LAV50-62053D
143.315112	LAV50-62050D
143.315122	LAV50-62067D
143.321012	TVS75-33010C
143.321022	TVS75-33012C
143.324052	TVS90-43020C
143.324112	TVS90-43116C
143.324142	TVS90-43139C
143.324152	TVS90-43121C
143.324162	TVS90-43025C
143.324172	TVS90-43142C
143.324182	TVXL105-54009A
143.324192	TVS90-43144C
143.326012	TVM195-150016H
143.326022	TVM195-150062H
143.326032	TVM195-150063H
143.326042	TVM195-150114H
143.326052	TVM195-150122H
143.326062	TVM195-150017H
143.326072	TVM195-150065H
143.326082	TVM195-150071H
143.326092	TVM195-150039H
143.326102	TVM195-150080H
143.326112	TVM195-150064H
143.326122	TVM220-157028D
143.326132	TVM220-157035D
143.326142	TVM220-157014D
143.326152	TVM220-157026D
143.326162	TVM220-157047D
143.326172	TVM220-157027D
143.326182	TVM220-157025D
143.326282	TVM140-70281K
143.326292	TVM140-70259K
143.326302	TVM140-70304K
143.326322	TVM170-127008C
143.326332	TVM195-150116H
143.326342	TVM195-150134H
143.326372	TVM170-127009C

Craftsman	Tecumseh
143.331012	TVS75-33025D
143.331022	TVS75-33012D
143.334022	TVS90-43173D
143.334032	TVS90-43174D
143.334052	TVXL105-54012B
143.334062	TVS90-43175D
143.334072	TVS90-43176D
143.334112	TVS90-43177D
143.334122	TVS90-43178D
143.334142	TVS90-43068D
143.334152	TVS90-43019D
143.334162	TVS90-43145D
143.334192	LAV35-40917P
143.334202	TVS90-43116D
143.334262	TVS90-43139D
143.334272	TVS90-43140D
143.334282	TVS90-43141D
143.334292	TVS90-43142D
143.334302	TVS90-43143D
143.334312	TVS90-43144D
143.334332	TVS90-43201D
143.334352	TVS90-43121D
143.334362	TVS90-43215D
143.334372	TVS90-43220D
143.334382	TVS90-43226D
143.335032	LAV50-62037E
143.335042	LAV50-62067E
143.335052	TVS120-63209A
143.335062	LAV50-62065E
143.335072	TVS120-63210A
143.336012	TVM140-70371K
143.336022	TVM220-157058D
143.336032	TVM220-157062D
143.336042	TVM220-157069D
143.341012	TVS75-33039D
143.344022	TVS90-43213D
143.344032	TVS90-43214D
143.344042	TVS90-43221D
143.344072	TVS90-43219D
143.344102	TVS90-43222D
143.344112	TVXL105-54017B
143.344142	TVS90-43230D
143.344162	TVS90-43250D
143.344182	TVS90-43252D
143.344192	TVS90-43253D
143.344202	TVS90-43254D
143.344212	TVS90-43255D
143.344222	TVS90-43256D
143.344402	TVXL105-54020B
143.344412	TVXL105-54021B
143.344422	TVS90-43268D
143.344432	TVS90-43269D
143.344442	TVS105-53059D
143.344462	TVS105-53067D
143.345032	TVS120-63211A

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.345042	LAV50-62082E
143.346012	TVM220-157058E
143.346022	TVM220-157062E
143.346032	TVM170-127008D
143.346042	TVM195-150116J
143.346052	TVM195-150134J
143.346062	TVM220-157069E
143.346072	TVM220-157035E
143.346082	TVM170-127009D
143.346092	TVM195-150016J
143.346102	TVM195-150114J
143.346112	TVM195-150122J
143.346122	TVM195-150039J
143.346132	TVM195-150080J
143.346142	TVM220-157028E
143.346152	TVM220-157014E
143.346162	TVM220-157026E
143.346172	TVM220-157047E
143.346182	TVM220-157027E
143.346192	TVM220-157025E
143.346202	TVM125-60249K
143.351012	TVS75-33046D
143.351022	TVS75-33052D
143.354012	TVS90-43290D
143.354062	TVS90-43291D
143.354092	TVS90-43292D
143.354102	TVS90-43293D
143.354122	TVS90-43294D
143.354132	TVXL105-54024B
143.354142	TVS90-43295D
143.354162	TVS90-43289D
143.354172	TVS90-43288D
143.354182	TVS90-43296D
143.354192	TVS90-43297D
143.354202	TVS90-43298D
143.354212	TVS90-43299D
143.354232	TVS90-43300D
143.354282	LAV35-40917R
143.354292	TVS90-43307D
143.354312	TVS90-43312D
143.354322	TVS90-43315D
143.354332	TVS90-43316D
143.354342	TVS90-43321D
143.354352	TVS90-43322D
143.354482	TVS105-53077D
143.354492	TVS105-53083D
143.354502	TVS105-53084D
143.355032	LAV50-62050F
143.356012	TVM220-157081F
143.356022	TVM125-60249L
143.356032	TVM195-150134K
143.356042	TVM220-157069F
143.356052	TVM195-150151K
143.356062	TVM125-60251L
143.356072	TVM195-150152K

Craftsman	Tecumseh
143.356082	TVM220-157083F
143.356092	TVM220-157084F
143.356102	TVM170-127013E
143.356122	TVM195-150154K
143.356132	TVM195-150155K
143.356142	TVM195-150156K
143.356152	TVM195-150157K
143.356162	TVM220-157085F
143.356172	TVM220-157086F
143.356182	TVM220-157087F
143.356192	TVM220-157088F
143.356202	TVM220-157089F
143.356212	TVM220-157090F
143.356222	TVM220-157091F
143.356232	TVM220-157093F
143.356252	TVM220-157097F
143.356362	TVM125-60251L
143.361012	TVS75-33054D
143.364012	TVS90-43333D
143.364082	TVS90-43334D
143.364102	TVS90-43335D
143.364112	TVS90-43336D
143.364122	TVS90-43337D
143.364132	TVS90-43338D
143.364142	TVS90-43339D
143.364202	TVS90-43341D
143.364222	TVS90-43342D
143.364262	TVS105-53087D
143.364352	TVS90-43346E
143.364362	TVS90-43347E
143.364372	TVS90-43348E
143.364392	TVS90-43351D
143.364402	TVS105-53090D
143.366022	TVM195-150134L
143.366032	TVM220-157069G
143.366042	TVM195-150151L
143.366052	TVM220-157093G
143.366062	TVM220-157081G
143.366082	TVM125-60252L
143.366102	TVM195-150152L
143.366112	TVM220-157083G
143.366122	TVM220-157084G
143.366132	TVM220-157097G
143.366152	TVM195-150163L
143.366172	TVM220-157108G
143.366182	TVM125-60254L
143.366192	TVM220-157106G
143.366222	TVM220-157110G
143.371012	TVS75-33056E
143.371022	TVS75-33057E
143.371032	TVS75-33059E
143.374012	TVS90-43352E
143.374022	TVS90-43353E
143.374032	TVS90-43354E
143.374052	TVS90-43356E

Craftsman	Tecumseh
143.374072	TVS90-43358E
143.374082	TVS90-43359E
143.374212	TVS90-43360E
143.374222	TVS90-43361E
143.374232	TVS90-43362E
143.374292	TVS105-53601E
143.374302	TVS90-43371E
143.374312	TVS105-53101E
143.374322	TVS90-43342E
143.374332	TVS90-43375E
143.374362	TVS90-43307E
143.374372	TVS105-53602E
143.374382	TVS90-43215E
143.374422	TVS105-53102E
143.374432	TVS90-43389E
143.375042	LAV50-62037F
143.376022	TVM220-157106H
143.376042	TVM195-150164M
143.376052	TVM220-157115H
143.376062	TVM195-150151M
143.376092	TVM220-157083H
143.381012	TVS75-33061F
143.381022	TVS75-33059F
143.384012	TVS90-43379F
143.384022	TVS90-43380F
143.384032	TVS90-43381F
143.384042	TVS90-43382F
143.384052	TVS90-43383F
143.384062	TVS90-43384F
143.384072	TVS90-43385F
143.384082	TVS90-43386F
143.384092	ECV100-145313G
143.384102	ECV100-145314G
143.384112	ECV100-145315G
143.384122	ECV100-145316G
143.384172	ECV100-145317G
143.384202	ECV100-145318G
143.384212	ECV100-145319G
143.384222	ECV100-145258G
143.384232	ECV100-145295G
143.384242	ECV100-145296G
143.384252	ECV100-145286G
143.384262	ECV100-145287G
143.384272	TVS90-43342F
143.384282	TVS90-43347F
143.384292	TVS90-43346F
143.384302	TVS90-43215F
143.384312	TVS90-43396F
143.384322	ECV100-145321G
143.384332	ECV100-145322G
143.384342	TVS90-43348F
143.384352	ECV100-145285G
143.384362	ECV100-145294G
143.384372	ECV100-145293G
143.384382	TVS90-43402F

Craftsman	Tecumseh
143.384392	TVS90-43403F
143.384402	TVS105-53107F
143.384412	TVS105-53602F
143.384422	TVS105-53607F
143.384432	TVS100-44604B
143.384442	TVS90-43405F
143.384452	TVS90-43375F
143.384462	ECV100-145273G
143.384472	ECV100-145291G
143.384482	ECV100-145292G
143.384492	ECV100-145266G
143.384502	ECV100-145290G
143.384512	ECV100-145288G
143.384522	ECV100-145297G
143.384532	ECV100-145289G
143.384542	ECV100-145310G
143.384552	TVS90-43389F
143.384562	ECV100-145320G
143.384572	TVS90-43415F
143.385042	LAV50-62037G
143.385052	LAV50-62082G
143.386022	TVM220-157120J
143.386042	TVM220-157122J
143.386052	TVM195-150152N
143.386062	TVM220-157083J
143.386072	TVM220-157084J
143.386082	TVM220-157097J
143.386122	TVM195-150151N
143.386132	TVM195-150164N
143.386142	TVM220-157115J
143.386172	TVM220-157126H
143.386182	TVM220-157128J
143.391012	TVS75-33066F
143.394012	ECV100-145323G
143.394022	TVS90-43420F
143.394032	TVS90-43422F
143.394042	TVS90-43423F
143.394052	TVS90-43424F
143.394062	TVS90-43425F
143.394072	TVS90-43426F
143.394082	ECV100-145324G
143.394122	TVS90-43438F
143.394132	TVS90-43421F
143.394142	TVS90-43428F
143.394152	TVS90-43443F
143.394162	ECV100-145333G
143.394172	ECV100-145327G
143.394222	ECV100-145326G
143.394232	ECV100-145325G
143.394242	TVS90-43451F
143.394252	ECV100-145330G
143.394262	ECV100-145332G
143.394272	ECV100-145331G
143.394282	ECV100-145329G
143.394302	TVS90-43454F

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.394312	TVS90-43455F
143.394322	TVS90-43456F
143.394332	TVS90-43457F
143.394342	ECV100-145334G
143.394352	ECV100-145335G
143.394362	ECV100-145336G
143.394372	ECV100-145337G
143.394382	ECV100-145338G
143.394392	ECV100-145339G
143.394402	ECV100-145340G
143.394412	ECV100-145341G
143.394422	ECV100-145342G
143.394442	ECV100-145344G
143.394452	ECV100-145345G
143.394462	ECV100-145346G
143.394472	ECV100-145347G
143.394482	ECV100-145348G
143.394492	TVS90-43458F
143.394502	LAV35-40917S
143.394512	ECV100-145349G
143.394522	TVS100-44605B
143.395012	ECV120-152044D
143.395022	ECV120-152045D
143.396022	TVXL220-157213
143.396042	TVXL220-157206
143.396052	TVXL220-157205
143.396082	TVXL220-157215
143.396102	TVM125-60258L
143.396122	TVXL220-157220
143.404022	TVS90-43490F
143.404032	TVS90-43491F
143.404042	TVS105-53123G
143.404082	TVS105-53901G
143.404092	TVS105-53902G
143.404122	TVS120-63114F
143.404132	TVS105-53130G
143.404142	TVS105-53903G
143.404152	TVS120-63115F
143.404162	TVS105-53132G
143.404172	TVS105-53131G
143.404182	TVS120-63901F
143.404202	TVS105-53136G
143.404222	TVS105-53137G
143.404232	TVS105-53138G
143.404242	TVS105-53133G
143.404252	TVS105-53134G
143.404282	TVS105-53139G
143.404292	TVS120-63117F
143.404312	TVS105-53140G
143.404322	TVS105-53153G
143.404332	TVS105-53904G
143.404342	TVS90-43498F
143.404352	TVS90-43499F
143.404362	TVS105-53143G
143.404372	TVS105-53905G

Craftsman	Tecumseh
143.404382	TVS105-53906G
143.404392	TVS105-53907G
143.404402	TVS120-63902F
143.404412	TVS105-53147G
143.404422	TVS105-53148G
143.404432	TVS105-53149G
143.404442	TVS105-53150G
143.404452	TVS105-53151G
143.404462	TVS105-53152G
143.404472	TVS120-63120F
143.404482	TVS120-63903F
143.404502	TVS90-43504F
143.404532	TVS90-43497F
143.406022	TVXL220-157205A
143.406032	TVXL220-157215A
143.406042	TVXL220-157220A
143.406082	TVM125-60261L
143.406092	TVXL195-150233
143.406102	TVXL220-157230A
143.406122	TVXL220-157206A
143.406172	TVXL195-150238
143.414012	TVS90-43512G
143.414022	TVS105-53162H
143.414032	TVS90-43513G
143.414042	TVS90-43514G
143.414052	TVS90-43515G
143.414062	TVS105-53163H
143.414072	TVS105-53165H
143.414082	TVS90-43497G
143.414092	ECV100-145334H
143.414102	ECV100-145335H
143.414112	ECV100-145339H
143.414122	ECV100-145340H
143.414132	ECV100-145341H
143.414142	ECV100-145342H
143.414152	ECV100-145344H
143.414162	ECV100-145345H
143.414182	TVS90-43299G
143.414192	ECV100-145337H
143.414202	ECV100-145338H
143.414212	TVS90-43389G
143.414222	TVS105-53167H
143.414222	TVS105-53167H
143.414232	TVS90-43526G
143.414242	TVS90-43375G
143.414252	TVS90-43215G
143.414262	ECV100-145346H
143.414272	ECV100-145347H
143.414282	TVS90-43528G
143.414292	TVS105-53153H
143.414292	TVS105-53153H
143.414302	TVS120-63124G
143.414312	TVS105-53130H
143.414322	TVS105-53901H
143.414332	TVS90-43504G

Craftsman	Tecumseh
143.414342	TVS105-53903H
143.414362	TVS105-53911H
143.414372	TVS105-53169H
143.414382	TVS105-53151H
143.414402	TVS105-53902H
143.414412	TVS105-53168H
143.414422	TVS120-63115G
143.414482	TVS105-53139H
143.414492	TVS120-63120G
143.414502	TVS90-43534G
143.414522	TVS90-43901G
143.414542	TVS105-53907H
143.414572	TVS120-63902G
143.414582	TVS105-53910H
143.414592	TVS105-53912H
143.414602	TVS105-53913H
143.414612	TVS90-43537G
143.414622	TVS120-63127G
143.414632	TVS105-53914H
143.414642	TVS120-63907G
143.414652	TVS105-53175H
143.414662	TVS105-53176H
143.414672	TVS105-53177H
143.414682	ECV100-145349H
143.416032	TVXL220-157240A
143.416052	TVM125-60254M
143.416072	TVXL220-157241A
143.424012	TVS90-43504H
143.424022	TVS105-56001
143.424032	TVS90-43497H
143.424042	TVS105-53153J
143.424052	TVS90-43526H
143.424062	TVS120-63129H
143.424072	TVS100-44026D
143.424082	TVS105-56904
143.424102	TVS120-63910H
143.424112	TVS100-44029D
143.424122	TVS100-44030D
143.424132	TVS100-44031D
143.424142	TVS105-56905
143.424152	TVS120-63911H
143.424162	TVS105-56906
143.424172	TVS120-63130H
143.424182	TVS100-44032D
143.424192	TVS100-44033D
143.424202	TVS90-43215H
143.424212	TVS90-43514H
143.424222	TVS90-43513H
143.424232	TVS90-43375H
143.424242	TVS90-43553H
143.424252	TVS90-43528H
143.424262	TVS105-53163J
143.424282	TVS105-53912J
143.424292	TVS105-53913J
143.424312	TVS105-56005

Craftsman	Tecumseh
143.424322	TVS105-56006
143.424332	TVS120-63134H
143.424342	TVS120-63135H
143.424352	TVS105-53180J
143.424362	TVS90-43555H
143.424372	TVS90-43556H
143.424382	TVS105-56007
143.424392	TVS105-56907
143.424402	TVS120-63902H
143.424412	TVS90-43558H
143.424462	TVS100-44038D
143.424472	TVS90-43515H
143.424482	TVS120-63137H
143.424492	TVS105-53920J
143.424502	TVS120-63915H
143.424512	TVS90-43298H
143.424532	TVS100-44043D
143.424542	TVS100-44045D
143.424552	TVS100-44046D
143.424562	TVS90-43389H
143.424572	TVS90-43299H
143.424582	TVS120-63916H
143.426012	TVM125-60261M
143.426032	TVXL195-150238A
143.426042	TVXL220-157205B
143.426052	TVXL220-157206B
143.426062	TVXL220-157220B
143.426072	TVXL220-157245B
143.426132	TVXL220-157215B
143.434012	TVS90-43504J
143.434022	TVS90-43526J
143.434032	TVS115-61902
143.434042	TVS115-56007A
143.434052	TVS115-56012A
143.434062	TVS115-57902A
143.434072	TVS90-43572J
143.434082	TVS115-56011A
143.434092	TVS90-46005
143.434102	TVS115-61002
143.434122	TVS115-56010A
143.434132	TVS115-61901
143.434142	TVS90-43497J
143.434152	TVS115-56906A
143.434162	TVS115-56001A
143.434182	TVS115-56017A
143.434192	TVS90-46003
143.434202	TVS115-57012A
143.434212	TVS90-43576J
143.434222	TVS90-46012
143.434232	TVS115-56016A
143.434242	TVS90-46013
143.434262	TVS90-46007
143.434272	TVS90-46015
143.434282	TVS120-63917J
143.434292	TVS90-46017

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.434302	TVS90-46018
143.434312	TVS90-46019
143.434332	TVS120-63918J
143.434342	TVS100-44037E
143.434352	TVS90-43375J
143.434362	TVS100-44033E
143.434372	TVS90-43513J
143.434382	TVS100-44031E
143.434392	TVS90-43515J
143.434402	TVS90-43553J
143.434412	TVS90-43298J
143.434422	TVS100-44043E
143.434432	TVS90-43215J
143.434442	TVS100-44030E
143.434452	TVS100-44038E
143.434462	TVS100-44032E
143.434472	TVS100-44036E
143.434482	TVS90-43528J
143.434492	TVS105-53913K
143.434502	TVS105-53163K
143.434512	TVS115-61016
143.434522	TVS115-61906
143.434532	TVS90-43514J
143.434542	TVS100-44029E
143.434552	TVS100-44045E
143.434562	TVS90-43299J
143.434572	TVS90-43512J
143.434582	TVS100-44048E
143.434592	TVS115-56911A
143.434602	TVS115-56031A
143.436012	TVXL220-157245C
143.436052	TVM125-60267N
143.436062	TVXL195-150246B
143.436072	TVXL220-157220C
143.436082	TVXL220-157215C
143.436112	TVXL220-157206C
143.436122	TVXL220-157205C
143.436162	TVM125-60254N
143.436172	TVXL195-150238B
143.586112	H70-130006
143.606012	H70-130070
143.606022	H70-130071
143.606032	H70-130072
143.606042	H70-130069
143.606052	H70-130081
143.606102	H70-130097
143.616012	H70-130099
143.616122	H70-130108
143.626012	H70-130138A
143.626032	H70-130135A
143.626052	H70-130029A
143.626062	H70-130097A
143.626082	H70-130037A
143.626092	H70-130108A
143.626102	H70-130013A

Craftsman	Tecumseh
143.626122	H70-130036A
143.626142	H70-130006A
143.626152	H70-130070A
143.626172	H70-130081A
143.626192	H70-130017A
143.626212	H70-130057A
143.626292	H70-130168A
143.626312	H70-130069A
143.626322	H70-130015A
143.636032	H70-130172A
143.636062	H70-130173A
143.64152	TVXL105-54029B
143.646012	H70-130182A
143.646022	H70-130181A
143.646032	H70-130183A
143.646062	H70-130013B
143.646072	H70-130006B
143.646082	H70-130181B
143.646092	H70-130182B
143.646102	H70-130173B
143.646122	H70-130057B
143.646132	H70-130108B
143.646152	H70-130081B
143.646172	H70-130185B
143.646182	H70-130183B
143.646192	H60-75365K
143.646202	H70-130186B
143.656032	H60-75403K
143.656062	H70-130172B
143.656102	H70-130193B
143.656122	H70-130196B
143.656132	H70-130197B
143.656152	H70-130200B
143.656192	H70-130069B
143.656232	H70-130202B
143.656262	H70-130203C
143.656272	H70-130205C
143.665032	HS50-67062C
143.665042	HS50-67037C
143.665052	HS50-67128C
143.665072	HS50-67135C
143.666012	H70-130097C
143.666022	H70-130206C
143.666042	H70-130207C
143.666052	H70-130193C
143.666062	H70-130197C
143.666072	H70-130202C
143.666102	H60-75420K
143.666112	H60-75426K
143.666122	H60-75411K
143.666132	H60-75404K
143.666142	H60-75398K
143.666172	H60-75403L
143.666182	H60-75437K
143.666192	H60-75438K

Craftsman	Tecumseh
143.666192	H60-75438K
143.666202	H60-75439K
143.666222	H70-130200C
143.666242	HH60-105096F
143.666252	H70-130172C
143.666272	H60-75416K
143.666282	H70-130211C
143.666292	H60-75442M
143.666302	H70-130212D
143.666312	H70-130213D
143.666332	HM100-159008B
143.666342	H70-130006C
143.666362	HM100-159011B
143.666372	H60-75445K
143.666382	H70-130205D
143.667052	HS40-55482G
143.667062	HS40-55477G
143.667072	HS40-55212G
143.667082	HS40-55495G
143.675012	HS50-67146C
143.675022	HS50-67149C
143.675032	H50-65398L
143.676032	H70-130219C
143.676062	HM100-159014A
143.676072	HM100-159015A
143.676082	HM100-159016A
143.676092	HM100-159017A
143.676102	H70-130221C
143.676112	H60-75452K
143.676112	H60-75452K
143.676122	H70-130211D
143.676132	H60-75403M
143.676152	HM100-159019A
143.676162	HM100-159020A
143.676172	H70-130172D
143.676192	H70-130224C
143.676212	HM100-159011C
143.676242	H60-75457M
143.676262	HM100-159008C
143.677022	HS40-55363G
143.685022	HS50-67163C
143.685032	HS50-67177C
143.686012	HM70 132007A
143.686022	HM70 132008A
143.686032	HM80-155122E
143.686042	HM80-155121E
143.686052	HM80-155146E
143.686062	H70-130206D
143.686082	HM80-155164E
143.686092	HM80-155170E
143.686102	HM100-159034C
143.686122	H60-75461M
143.686122	H60-75461M
143.686132	H70-130232D
143.686132	H70-130232D

Craftsman	Tecumseh
143.686142	HM80-155171E
143.686142	HM80-155171E
143.686152	HM100-159036C
143.686152	HM100-159036C
143.686162	H60-75462M
143.686172	HM100-159040C
143.686182	H60-75464K
143.687012	HS40-55502G
143.687042	HS40-55514G
143.696012	H60-75465K
143.696032	HM80-155145E
143.696042	H60-75461N
143.696052	H70-130232E
143.696062	HM80-155171F
143.696072	HM100-159036D
143.696082	HS50-67181C
143.696092	HM80-155170F
143.696102	H70-130205E
143.696112	HM100-159034D
143.696122	H60-75462N
143.696132	HM80-155131F
143.696142	H50-65413L
143.696152	H60-75403N
143.697022	HS50-67170C
143.697042	HS50-67117C
143.697052	HS50-67178C
143.706012	H60-75467K
143.706022	H60-75468K
143.706032	HM80-155190E
143.706042	HM80-155189E
143.706052	HM80-155189E
143.706062	H60-75469K
143.706072	HM80-155194E
143.706082	HM80-155193E
143.706092	H70-130172E
143.706102	H60-75470P
143.706112	H70-130240F
143.706122	HM80-155195G
143.706132	HM100-159055E
143.706142	H60-75471P
143.706152	HM100-159034E
143.706162	HM80-155170G
143.706172	H70-130205F
143.706182	H70-130172F
143.706192	H70-130206F
143.706212	H50-65447M
143.706222	HM80-155204G
143.706232	HM100-159062E
143.707012	HS50-67188C
143.707042	HS40-55524G
143.707052	HS50-67190C
143.707072	HS50-67191C
143.707082	HS50-67192C
143.707092	HS50-67193D
143.707102	HS40-55526G

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Craftsman	Tecumseh
143.707112	HS50-67195D
143.707122	HS40-55534G
143.707132	HS50-67200D
143.716012	HM70-132014B
143.716022	HM80-155208F
143.716032	H60-75465L
143.716042	H60-75445L
143.716052	HM70-132007B
143.716062	HM70-132008B
143.716072	HM80-155189F
143.716082	HM80-155190F
143.716092	HM100-159014B
143.716102	HM100-159015B
143.716112	H70-130221D
143.716122	H70-130207D
143.716132	H70-130193D
143.716142	H70-130197D
143.716152	HM80-155194F
143.716162	H50-65398M
143.716172	HM80-155122F
143.716182	HM80-155145F
143.716192	HM80-155146F
143.716202	H70-130232F
143.716212	HM100-159066B
143.716222	HM80-155211F
143.716232	H60-75469L
143.716242	H50-65413M
143.716252	H70-130224D
143.716282	H60-75439L
143.716292	H60-75437L
143.716302	HH60-105096G
143.716312	H70-130006D
143.716322	H70-130196D
143.716332	HM100-159019B
143.716342	HM70-132015B
143.716352	H60-75438L
143.716362	H70-130205G
143.716372	HM100-159034F
143.716382	HM100-159055F
143.716392	HM80-155204H
143.716412	H60-75404L
143.716422	H50-65447N
143.716432	HM100-159062F
143.717012	HS40-55482H
143.717022	HS40-55502H
143.717032	HS40-55524H
143.717042	HS50-67190D
143.717052	HS40-55363H
143.717062	HS50-67128D
143.717072	HS50-67163D
143.717082	HS50-67192D
143.717092	HS50-67195E
143.717102	HS40-55537H
143.717112	HS50-67206E
143.724052	HS40-55526H

Craftsman	Tecumseh
143.725012	HS50-67210E
143.726012	H60-75480M
143.726022	HM100-159019C
143.726032	HM80-155228F
143.726042	H70-130207E
143.726052	H70-130224E
143.726082	H60-75445M
143.726092	H50-65461P
143.726102	HM100-159066C
143.726132	H60-75416M
143.726142	HH60-105096H
143.726152	HM80-155229H
143.726182	H70-130193E
143.726192	H70-130197E
143.726202	H70-130006E
143.726212	H70-130196E
143.726222	H60-75465M
143.726232	HM100-159014C
143.726242	H60-75469M
143.726252	H70-130206G
143.726262	H60-75439M
143.726272	HM80-155231F
143.726282	H70-130205H
143.726292	HM100-159034G
143.726302	H50-65413P
143.726312	HM100-159072G
143.726322	HM100-159020C
143.734042	HS40-55542H
143.735012	HS50-67220E
143.735022	HS50-67224D
143.736032	H60-75484M
143.736042	HM80-155235F
143.736052	H60-75486M
143.736062	H60-75487M
143.736072	H50-65447P
143.736082	HM80-155238F
143.736092	H70-130252H
143.736102	HM100-159079H
143.736112	H50-65473P
143.736122	HM80-155246J
143.736132	HM80-155247J
143.736142	HM100-159086H
143.742032	HM80-155256F
143.742042	H50-65479N
143.742052	H50-65480N
143.744092	HS50-67238E
143.744102	HS40-55546H
143.744112	HS50-67247E
143.746012	H60-75489M
143.746022	HM80-155250F
143.746062	H70-130256J
143.746072	HM100-159095J
143.746082	HM80-155279J
143.746092	HM80-155280J
143.746102	HM100-159101J

Craftsman	Tecumseh
143.751012	H30-35342R
143.751022	H30-35333R
143.751032	H30-35362R
143.751042	H30-35363R
143.751052	H30-35350R
143.751062	H30-35351R
143.754012	H35-45581R
143.754022	H35-45379R
143.754032	H35-45575R
143.754042	H35-45592R
143.754052	H35-45576R
143.754062	HS50-67224E
143.754072	H35-45595R
143.754082	HS50-67163E
143.754092	HS50-67192E
143.754102	H35-45587R
143.754112	HS50-67238F
143.754122	HS40-55546J
143.754132	HS50-67247F
143.754142	HS50-67200F
143.754152	H35-45554R
143.756012	H60-75487N
143.756022	H60-75489N
143.756042	H70-130207F
143.756052	H70-130006F
143.756062	HM100-159020D
143.756072	H60-75469N
143.756082	HM80-155228G
143.756092	H60-75465N
143.756102	HM80-155146G
143.756112	HM100-159014D
143.756122	HM80-155256G
143.756132	H70-130224F
143.756142	H50-65479P
143.756152	HM100-159019D
143.756162	H70-130256K
143.756172	HM100-159095K
143.756182	HM80-155279K
143.756192	HM80-155280K
143.756202	HM100-159101K
143.756212	HM80-155299G
143.756222	H70-130260K
143.764012	HS50-67178F
143.764022	HS50-67265F
143.764032	HS40-55556J
143.764042	HS50-67268F
143.764052	H35-45604R
143.764062	HS50-67273F
143.764072	HS50-67274F
143.766012	HM80-155302H
143.766072	HM80-155306H
143.766082	HM80-155299H
143.766092	HM100-159111L
143.766102	HM80-155308L
143.766112	HM80-155309L

Craftsman	Tecumseh
143.766122	HM100-159115L
143.766132	H70-130263K
143.766142	HM100-159125L
143.766152	HM80-155321L
143.774012	H35-45605R
143.774102	H30-35374R
143.774122	H35-45612R
143.774132	HS50-67280E
143.776012	HM80-155299J
143.776022	H70-130264F
143.776042	HM80-155327J
143.776052	HM100-159134F
143.776062	HM100-159135F
143.784012	HS40-55556K
143.784022	HS50-67268G
143.784032	HS50-67274G
143.784042	HS40-55562K
143.784062	H30-35382S
143.784072	HS50-67192F
143.784082	H30-35333S
143.784092	H30-35362S
143.784102	H30-35374S
143.784102	H30-35374S
143.784112	H35-45592S
143.784112	H35-45592S
143.784122	H35-45612S
143.784132	HS50-67280F
143.784142	H35-45379S
143.784152	HS50-67163F
143.784162	H30-35350S
143.784172	H30-35393S
143.784182	H35-45595S
143.784192	HSK35-45554T
143.786012	HM80-155308M
143.786022	HM80-155309M
143.786032	HM80-155321M
143.786042	HM100-159115M
143.786052	HM80-155338M
143.786062	HM100-159140M
143.786072	HM100-159141M
143.786092	HM80-155340L
143.786112	HM80-155346K
143.786122	HM100-159135G
143.786132	H70-130006G
143.786142	H70-130269G
143.786152	H70-130264G
143.786162	H60-75469P
143.786172	HM80-155327K
143.786182	HM100-159111N
143.786192	HM100-159134G
143.786202	HM100-159158G
143.794042	HS50-67268H
143.794052	HS40-55572L
143.794053	HS50-67291H
143.794072	HS40-55573L

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Craftsman	Tecumseh
143.794082	HS50-67300H
143.796012	HM80-155308N
143.796022	HM80-155309N
143.796032	HM80-155321N
143.796042	HM80-155338N
143.796052	HM100-159115N
143.796062	HM100-159140N
143.796072	HM100-159141N
143.796082	HM80-155365N
143.796092	HM80-155366N
143.796102	HM100-159162N
143.796132	HM80-155370N
143.796142	HSK70-130267M
143.796152	HM80-155346L
143.796162	HM100-159169H
143.796172	HM100-159135H
143.796182	H70-130006H
143.796192	HM80-155327L
143.796202	HM80-155384L
143.804062	HS40-55586M
143.804072	HS50-67309J
143.804082	H30-35419S
143.804092	H30-35420S
143.804102	H35-45629S
143.804112	H30-35424S
143.806012	HM80-155370P
143.806022	HM80-155309P
143.806032	HM80-155389P
143.806042	HM100-159115P
143.806052	HM100-159180P
143.806072	HM80-155308P
143.806082	HM80-155394P
143.806092	HM100-159183P
143.806092	HM100-159183P
143.806102	HM80-155400L
143.806112	H70-130264H
143.806122	H70-130267N
143.806132	HM100-159192J
143.806142	H70-130268H
143.806152	HM80-155411L
143.806162	HM100-159135J
143.806172	HM100-159169J
143.806182	HM80-155424L
143.814012	HS40-55586N
143.814022	HS50-67309K
143.814032	H30-35426S
143.814042	H30-35427S
143.814072	H30-35431S
143.816012	HMSK100-159183R
143.816022	HM80-155416P
143.816032	HM100-159199R
143.816052	HM80-155433L
143.816062	H60-75469S
143.824012	H30-35427T
143.824022	H30-35426T

Craftsman	Tecumseh
143.824022	H30-35426T
143.824042	H30-35431T
143.826012	HM80-155445P
143.826022	HM100-159209R
143.826032	HM80-155433M
143.826042	HM80-155454M
143.826052	HM100-159135K
143.826062	H60-75537S
143.826072	HM80-155424M
143.826092	H60-75538S
143.826102	HM80-155462M
143.826112	H60-75539S
143.826122	HM80-155400M
143.834012	HSSK50-67338L
143.834022	H30-35426U
143.834042	H35-45595T
143.836012	HMSK80-155478R
143.836022	HMSK80-155416R
143.836032	HMSK100-159199S
143.836042	HMSK100-159244S
143.836082	HM80-155487M
143.836092	H60-75537T
143.836102	H60-75538T
143.836112	H60-75469T
143.836122	H60-75539T
143.836132	H60-75554T
143.941000	TVXL220-157245D
143.941001	HMSK100-159244T
143.941001	HMSK100-159244T
143.941002	TVXL220-157205D
143.941003	HMSK100-159261T
143.941004	TVXL220-157215D
143.941005	HM100-159262K
143.941006	TVXL220-157206D
143.941007	HM100-159135L
143.941008	TVXL220-157220D
143.941009	HM100-159262L
143.943001	H30-35426V
143.943003	H30-35431V
143.943005	H30-35450V
143.943009	H30-35453V
143.943009	H30-35453V
143.943501	H35-45655V
143.943502	TVS90-43515K
143.943503	H35-45654V
143.943504	TVS90-43513K
143.943505	H35-45595U
143.943506	TVS90-43215K
143.943507	H35-45657U
143.943508	TVS90-43572K
143.943508	TVS90-43572K
143.943509	H35-45661V
143.943510	TVS90-43298K
143.943512	TVS90-43375K
143.943514	TVS90-43576K

Craftsman	Tecumseh
143.943526	TVS90-43512K
143.943528	TVS90-43299K
143.943530	TVS90-43514K
143.943532	TVS90-43700K
143.943800	TVS100-44048F
143.943802	TVS100-44036F
143.943804	TVS90-46030A
143.943806	TVS90-46031A
143.943808	TVS90-46032A
143.943810	TVS100-44043F
143.943812	TVS90-46035A
143.943814	TVS90-46036A
143.943816	TVS90-46037A
143.943818	TVS100-44038F
143.943820	TVS100-44029F
143.943830	TVS100-44046F
143.943832	TVS100-44030F
143.943834	TVS100-44031F
143.943838	TVS100-44033F
143.943842	TVS100-44045F
143.943844	TVS100-44032F
143.944000	TVS105-53163L
143.944002	TVS115-56032B
143.944004	TVS115-56031B
143.944006	TVS115-56033B
143.944008	TVS105-53912L
143.944010	TVS115-56012B
143.944012	TVS115-56010B
143.944014	TVS115-56036B
143.944016	TVS115-56037B
143.944018	TVS115-56016B
143.944022	TVS115-56043B
143.944024	TVS115-56042B
143.944026	TVS105-53913L
143.944028	TVS115-56044B
143.944030	TVS115-56046B
143.944032	TVS115-56912B
143.944034	TVS115-56047B
143.944036	TVS115-56048B
143.944500	TVS115-57020B
143.944502	TVS115-57023B
143.944504	TVS115-57028B
143.944506	TVS115-57030B
143.945000	TVM125-60254P
143.945001	HSSK50-67338M
143.945002	TVS115-61901A
143.945003	HS50-67163H
143.945004	TVS115-61021A
143.945006	TVS115-61022A
143.945010	TVS115-61906A
143.945012	TVS115-61016A
143.945014	TVS115-61002A
143.945016	TVS115-61024A
143.945016	TVS115-61024A
143.945018	TVS115-61026A

Craftsman	Tecumseh
143.945020	TVS115-61027A
143.945300	TVS120-63918K
143.945300	TVS120-63918K
143.945302	TVS120-63919K
143.945502	TVS120-63921K
143.945502	TVS120-63921K
143.945504	TVS120-63920K
143.945506	TVS120-63922K
143.945508	TVS120-63923K
143.945510	TVS120-63924K
143.946001	H60-75539U
143.946003	H60-75469U
143.946005	H60-75537U
143.946007	H60-75554U
143.948000	TVXL195-150238C
143.948001	HMSK80-155478S
143.948001	HMSK80-155478S
143.948003	HMSK80-155502S
143.948005	HM80-155487N
143.948007	HM80-155433N
143.948009	HM80-155424N
143.951000	TVM220-157245E
143.951001	HMSK100-159282T
143.951002	TVM220-157206E
143.951003	HM100-159262M
143.951004	TVM220-157215E
143.951005	HM100-159135M
143.951006	TVM220-157205E
143.951008	TVM220-157220E
143.951010	TVM220-157255E
143.953001	H30-35431W
143.953003	H30-35453W
143.953005	H30-35450W
143.953007	H30-35459W
143.953500	TVS90-43576L
143.953501	HT35-45595V
143.953502	TVS90-43513L
143.953503	H35-45654W
143.953504	TVS90-43215L
143.953505	H35-45655W
143.953506	TVS90-43515L
143.953507	H35-45671W
143.953508	TVS90-43700L
143.953509	H35-45657V
143.953510	TVS90-43375L
143.953511	H35-45675W
143.953512	TVS90-43512L
143.953513	H35-45674W
143.953514	TVS90-43514L
143.953515	H35-45661W
143.953516	TVS90-43298L
143.953800	TVS90-46036B
143.953802	TVS100-44029G
143.953804	TVS100-44031G
143.953806	TVS100-44036G

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.953808	TVS100-44037G
143.953810	TVS100-44046G
143.953812	TVS100-44038G
143.953814	TVS90-46035B
143.953818	TVS100-44030G
143.953820	TVS100-44033G
143.953822	TVS100-44045G
143.953824	TVS100-44032G
143.954000	TVS115-56033C
143.954001	HSSK40-55585S
143.954002	TVS115-56036C
143.954004	TVS105-53163M
143.954006	TVS105-53913M
143.954008	TVS115-56037C
143.954010	TVS115-56051C
143.954018	TVS115-56044C
143.954020	TVS115-56912C
143.954022	TVS115-56047C
143.954024	TVS115-56048C
143.954026	TVS115-56046C
143.954500	TVS115-57031C
143.954502	TVS115-57023C
143.954504	TVS115-57032C
143.954506	TVS115-57030C
143.954508	TVS115-57033C
143.954516	TVS115-57028C
143.955000	TVS115-61907B
143.955001	HSSK50-67338N
143.955001	HSSK50-67338N
143.955002	TVS115-61024B
143.955004	TVS115-61032B
143.955005	HS50-67163J
143.955006	TVS115-61906B
143.955008	TVS115-61016B
143.955010	TVS115-61021B
143.955016	TVS115-61037B
143.955018	TVS115-61039B
143.955020	TVS115-61027B
143.955022	TVS115-61026B
143.955024	TVS115-61041B
143.955300	TVS120-63924L
143.955500	TVS120-63920L
143.955502	TVS120-63925L
143.955506	TVS120-63921L
143.958000	TVM195-150238D
143.958001	HMSK80-155535S
143.958003	HM80-155424P
143.958005	HM80-155487P
143.958007	HM80-155544P
143.959001	HM90-156004B
143.959003	HM90-156005B
143.959005	HM90-156006B
143.961000	TVM220-157259E
143.961001	HMSK100-159244U
143.961003	HMSK100-159305U

Craftsman	Tecumseh
143.961005	HM100-159309M
143.961007	HM100-159294M
143.963001	H30-35453X
143.963500	TVS90-43515M
143.963501	H35-45657W
143.963502	TVS90-43215M
143.963503	H35-45687W
143.963504	TVS90-43576M
143.963505	H35-45671X
143.963506	LEV115-350009A
143.963507	H35-45674X
143.963508	TVS90-43729M
143.963509	H35-45675X
143.963511	H35-45661X
143.963513	H35-45697X
143.963515	H35-45698X
143.963517	H35-45595W
143.963800	TVS100-44031H
143.963802	TVS100-44029H
143.963804	TVS90-46068C
143.963806	TVS100-44033H
143.963808	TVS90-46035C
143.963810	TVS100-44030H
143.963812	TVS90-46081C
143.964000	TVS115-56047D
143.964001	HSSK40-55585T
143.964002	TVS115-56036D
143.964004	TVS115-56048D
143.964006	TVS90-48001A
143.964008	TVS90-48005A
143.964010	LEV115-350002A
143.964012	LEV115-350008A
143.964014	TVS115-56071D
143.964016	TVS115-56072D
143.964018	TVS115-56073D
143.964020	TVS115-56074D
143.964022	TVS115-56078D
143.964024	TVS115-56077D
143.964026	TVS115-56076D
143.964028	TVS115-56082D
143.964500	TVS115-57023D
143.964502	TVS115-57031D
143.964504	TVS115-57030D
143.964506	TVS115-57032D
143.964510	LEV115-350005A
143.964512	LEV115-350003A
143.965000	TVM125-60254R
143.965001	HSSK50-67365P
143.965002	TVS115-61049C
143.965003	HSSK50-67338P
143.965004	TVS115-61021C
143.965005	HSSK50-67374P
143.965006	TVS115-61050C
143.965008	TVS115-61016C
143.965010	TVS115-61051C

Craftsman	Tecumseh
143.965012	TVS115-61026C
143.965014	TVS115-61037C
143.965016	LEV115-350004A
143.965018	LEV115-350006A
143.965020	TVS115-61027C
143.965022	TVS115-61056C
143.965024	LEV115-350015B
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143.965508	TVS115-62902A
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143.966003	H60-75539V
143.966004	TVS120-63929M
143.966005	H60-75554V
143.966010	TVS120-63930M
143.966012	TVS120-63924M
143.968000	TVM195-150238E
143.968001	HMSK80-155547T
143.968003	HMSK80-155478T
143.968005	HMSK80-155555T
143.969001	HM90-156007B
143.969003	HM90-156008B
143.969005	HM90-156004B
143.969007	HM90-156005B
143.971000	TVM220-157205F
143.971001	HMSK100-159244V
143.971002	TVM220-157215F
143.971003	HMSK100-159339V
143.971004	TVM220-157206F
143.971005	HM100-159309N
143.971007	HM100-159352M
143.971009	HM100-159135N
143.971011	HM100-159374N
143.973500	TVS90-43576N
143.973501	H35-45657X
143.973502	TVS90-43729N
143.973503	H35-45698Y
143.973504	LEV115-350009B
143.973505	H35-45675Y
143.973507	H35-45697Y
143.973508	TVS90-43515N
143.973509	H35-45674Y
143.973510	TVS90-43746N
143.973511	H35-45661Y
143.973512	LEV115-350043B
143.973513	H35-45657Y
143.973800	TVS90-46083D
143.973802	TVS90-46081D
143.973804	LEV115-350040B
143.974002	TVS115-56089E
143.974004	TVS115-56048E
143.974006	TVS90-48014B
143.974008	TVS90-48013B
143.974010	TVS115-56090E

Craftsman	Tecumseh
143.974012	TVS115-56047E
143.974014	TVS115-56094E
143.974016	TVS115-56095E
143.974018	TVS115-56073E
143.974020	LEV115-350044B
143.974022	LEV100-340002A
143.974024	TVS115-56071E
143.974026	TVS115-56074E
143.974030	LEV115-350045B
143.974032	TVS90-48023B
143.974034	TVS115-56077E
143.974036	TVS90-48029B
143.974500	TVS115-57048E
143.974502	TVS115-57049E
143.974504	LEV115-350029B
143.974506	LEV115-350030B
143.974508	TVS115-57054E
143.975000	TVS115-61037D
143.975001	HSSK50-67338R
143.975002	LEV115-350012B
143.975004	TVS115-61051D
143.975006	TVS115-61027D
143.975007	HSSK50-67374R
143.975008	TVS115-61026D
143.975010	TVS115-61056D
143.975012	TVS115-61063D
143.975014	TVS115-61064D
143.975016	TVS115-61065D
143.975024	LEV115-350031B
143.975026	LEV115-350032B
143.975028	TVS115-61072D
143.975030	TVS115-61071D
143.975032	TVS115-61016D
143.975034	LEV115-350047B
143.975036	TVS115-61081D
143.975038	TVS115-61082D
143.975500	TVS115-62106B
143.975502	TVS115-62107B
143.975504	TVS115-62108B
143.975506	TVS115-62110B
143.975508	LEV115-355005B
143.975510	LEV115-355006B
143.975516	TVS115-62114B
143.976002	TVS120-66901A
143.976003	H60-75469W
143.976005	H60-75539W
143.976007	H60-75554W
143.976250	TVS120-66101A
143.976252	TVS120-66102A
143.976254	LEV115-360005A
143.976256	LEV115-360007A
143.976258	LEV115-360008A
143.976260	TVS120-66103A
143.977001	HSK70-130299T
143.978000	TVM195-150238F

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

Craftsman	Tecumseh
143.978001	HMSK80-155478U
143.978003	HMSK80-155580U
143.978005	HM80-155587R
143.978007	HM80-155424R
143.978501	HMSK85-155901A
143.979001	HMSK90-156518C
143.979003	HM90-156004C
143.979005	HM90-156005C
143.979009	HM90-156007C
143.979011	HM90-156008C
143.981000	TVM220-157215G
143.981001	HMSK100-159365W
143.981002	TVM220-157272G
143.981003	HM100-159135P
143.981005	HM100-159374P
143.981007	HM100-159388P
143.983500	LEV100-335009B
143.983501	H35-45661Z
143.983502	LEV100-335010B
143.983504	LEV100-335011B
143.983506	TVS90-43746P
143.983508	LEV100-335015B
143.983510	LEV100-335018B
143.983800	LEV100-338007B
143.983804	LEV100-338012B
143.983806	TVS90-46111E
143.984000	LEV115-350056C
143.984001	H40-55701A
143.984002	LEV115-350057C
143.984004	LEV115-350058C
143.984006	LEV115-350059C
143.984008	LEV100-340012B
143.984012	LEV100-340014B
143.984014	LEV100-340015B
143.984016	LEV100-340016B
143.984018	LEV100-340017B
143.984020	LEV100-340021B
143.984022	LEV100-340022B
143.984024	LEV100-340024B
143.984026	LEV100-340026B
143.984028	LEV100-340027B
143.984030	LEV100-340028B
143.984500	LEV100-345003B
143.984502	LEV100-345002B
143.984504	LEV100-345006B
143.984506	TVS115-57057F
143.984508	LEV100-345009B
143.984510	LEV100-345010B
143.984512	LEV100-345011B
143.984514	LEV100-345012B
143.985000	LEV115-350060C
143.985002	LEV115-350073C
143.985003	HSSK50-67338S
143.985004	LEV115-350070C
143.985006	LEV115-350071C

Craftsman	Tecumseh
143.985007	HSSK50-67374S
143.985008	LEV115-350072C
143.985010	TVS115-61085E
143.985012	LEV115-350090C
143.985014	TVS115-61083E
143.985016	LEV115-350119C
143.985018	LEV120-361038A
143.985500	LEV115-355008C
143.985502	LEV115-355007C
143.985504	TVS115-62116C
143.985506	TVS115-62117C
143.985508	TVS115-62118C
143.985510	LEV115-355012C
143.985512	LEV115-355014C
143.986000	LEV115-360014B
143.986002	LEV115-360012B
143.986004	LEV115-360013B
143.986006	LEV115-360015B
143.986010	TVS120-66011B
143.986250	LEV115-360008B
143.986252	LEV120-361019A
143.986500	LEV120-361012A
143.986502	LEV120-361013A
143.986504	LEV120-361021A
143.986506	TVS120-66104B
143.986508	TVS120-66105B
143.986512	LEV120-361031A
143.986514	LEV120-361037A
143.988000	TVM195-150287G
143.988001	HM80-155587S
143.988003	HMSK80-155614V
143.988005	HM80-155424S
143.988503	HM85-155851A
143.989001	HM90-156004D
143.989003	HM90-156005D
143.989005	HM90-156007D
143.989007	HM90-156008D
143.991001	HM100-159411P
143.991002	TVM220-157275G
143.991004	TVM220-157277G
143.991101	HMSK110-159951A
143.991103	HMSK110-159959A
143.993001	H30-35512Y
143.993500	LEV100-335018C
143.993501	H35-45754Y
143.993502	LEV100-335010C
143.993503	H35-45756Z
143.993504	LEV100-335020C
143.993506	LEV100-335011C
143.993508	TVS90-43746R
143.993510	LEV80-333003A
143.993512	LEV100-335023C
143.993514	LEV115-350144D
143.993800	LEV100-338012C
143.993802	TVS90-46111F

Craftsman	Tecumseh
143.994000	LEV100-340026C
143.994001	H40-55703A
143.994002	LEV100-340029C
143.994004	LEV100-340030C
143.994006	LEV100-340031C
143.994008	LEV100-340021C
143.994010	LEV100-340016C
143.994012	LEV100-340017C
143.994014	LEV100-340032C
143.994016	LEV100-340033C
143.994018	LEV100-340015C
143.994020	LEV115-350129D
143.994022	LEV100-340037C
143.994024	LEV100-340024C
143.994500	LEV100-345013C
143.994502	LEV100-345012C
143.994504	LEV100-345006C
143.994506	TVS115-57064G
143.994508	LEV100-345014C
143.994510	LEV120-361053B
143.995000	LEV115-350114D
143.995001	HSSK50-67392S
143.995002	LEV115-350090D
143.995003	HSSK50-67396S
143.995004	LEV120-361046B
143.995005	HSSK50-67398S
143.995006	LEV115-350121D
143.995008	LEV115-350060D
143.995012	LEV115-350070D
143.995014	LEV115-350128D
143.995500	LEV115-355008D
143.995502	LEV115-355016D
143.995504	LEV115-355007D
143.995506	LEV115-355014D
143.995508	TVS115-62122D
143.996000	LEV115-360012C
143.996002	LEV115-360015C
143.996004	LEV115-360021C
143.996006	TVS120-66018C
143.996008	TVS120-66011C
143.996010	LEV115-360024C
143.996012	LEV115-360025C
143.996200	LEV115-360028C
143.996502	LEV120-361012B
143.996504	LEV120-361013B
143.996506	LEV120-361041B
143.996508	LEV120-361042B
143.996510	LEV120-361044B
143.996512	LEV120-361045B
143.996514	LEV120-361037B
143.996516	LEV120-361047B
143.996516	LEV120-361047B
143.996518	TVS120-66104C
143.996520	TVS120-66105C
143.996522	TVS120-66107C

Craftsman	Tecumseh
143.996524	LEV120-361054B
143.998000	TVM195-150289G
143.998001	HM80-155658S
143.998003	HM80-155680S
143.998501	HMSK85-155903A
143.998503	HM80-155852A
143.999001	HMSK90-156522D
143.999003	HM90-156017D
143.999005	HMSK90-156525D
143.999007	HMSK90-156529D
143.999009	HM90-156018D
143.999011	HM90-156019D

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers all TC, TCH 200 & 300 models.

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

TC SERIES 2-Cycle Engines

TECUMSEH®

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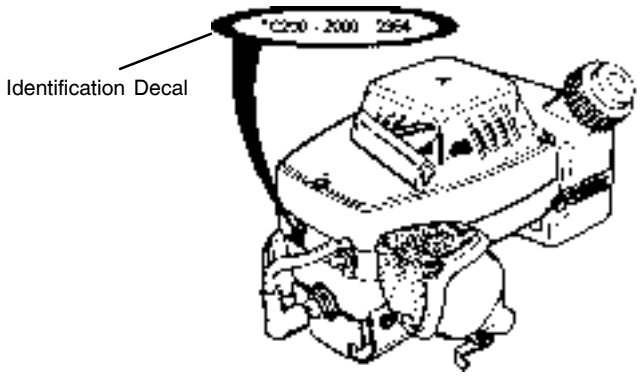
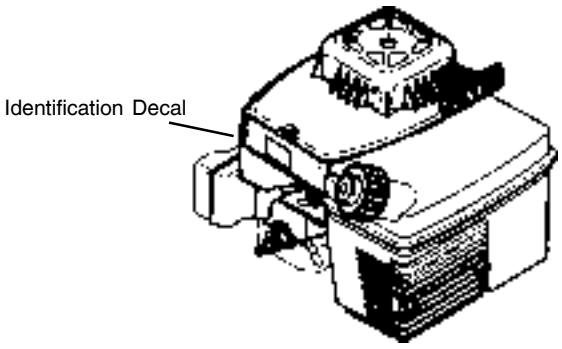
CHAPTER 1 GENERAL INFORMATION

ENGINE IDENTIFICATION

TC engine identification numbers are stamped into the blower housing or blower housing base near the spark plug, or a decal is permanently attached to the side of the blower housing (diag. 1-1).



TC TYPE I ENGINE



TC TYPE II ENGINE

1-1

The engine identification decal will include the model number, specification number, warranty code, and date of manufacture (diag. 1-2).

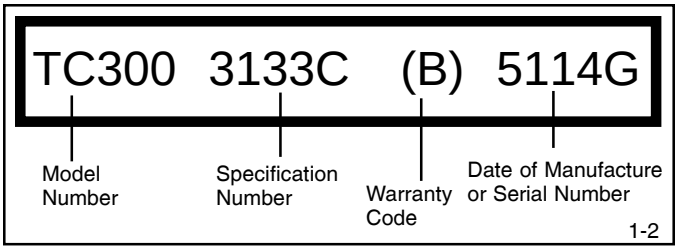
The model number designation following TC (Tecumseh Compact) indicate the cubic inch displacement of the engine. TC 300 indicates a 3.0 cubic inch displacement.

The number (3133C) following the model number is the specification number. The last two numbers and letter character (33C) indicate a variation to the basic engine specification.

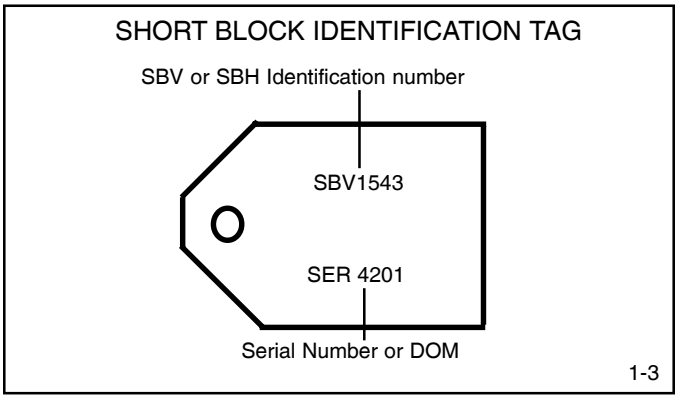
The warranty code letter (B) indicates the length of warranty that is supplied by Tecumseh.

The DOM (Date of Manufacture) or Serial Number indicate the date the engine was produced. The first digit (5) is the year in the decade (1995). The next three digits (114) indicate the Julian build date (114 th day or April 24). The letter designation indicates the line or shift on which the engine was built at the factory.

Short blocks are identified by a tag marked SBH (Short Block Horizontal) or SBV (Short Block Vertical) (diag. 1-3).



1-2



1-3

CAUTION: THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY OF YOURSELF AND OTHERS. FOLLOW ALL INSTRUCTIONS.

OIL REQUIREMENTS

TECUMSEH RECOMMENDS USING TWO CYCLE OIL PART #730227, which is a premium blend that ensures cylinder wall lubrication, mixes easy, does not separate and is specially formulated for use in air or water cooled two cycle engines.

Tecumseh two cycle engines require the use of a NMMA TC-W3 or TC-WII certified oil.

The proper fuel mixture ratio of oil to gasoline for specific engines will be found in the owners operating instructions and on the decal attached to the blower housing or fuel tank of the engine.

FUEL REQUIREMENTS

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build-up of combustion chamber deposits. Leaded gasoline, gasohol containing no more than 10% ethanol, premium gasoline, or unleaded gasoline containing no more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, can be used if unleaded regular gasoline is not available.

Reformulated gasoline that is now required in several areas of the United States is also acceptable.

NEVER USE gasoline, fuel conditioners, additives or stabilizers containing methanol, gasohol containing more than 10% ethanol, unleaded regular gasoline containing more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, gasoline additives, or white gas because engine/fuel system damage could result.

See “STORAGE” instructions in Technician’s Manual, Operator’s Manual, or Bulletin 111.

For year round fuel stability in and out of season, use Tecumseh's fuel stabilizer part number 730245.

24:1 FUEL MIXTURE CHART ALL TC ENGINES

NOTE: DO NOT MIX FUEL IN ENGINE OR EQUIPMENT FUEL TANK.

	U.S.	METRIC	
Gas	Oil To Be Added	Petrol	Oil To Be Added
1/2 Gal.	3.00 oz.	2 Liters	83 ml.
1 Gal.	6.00 oz.	4 Liters	167 ml.
2 Gal.	11.00 oz.	8 Liters	333 ml.

MIXING OIL AND GASOLINE PROCEDURE

1. Fill approved, clean container one quarter full with the recommended gasoline.
2. Add the recommended amount of oil to the gasoline.
3. Secure the cap on the container and shake the container vigorously.
4. Remove the cap, add the remainder of the gasoline, secure the cap, re-mix. The fuel is ready to use.

1-4

FUEL ADDITIVES

Only fuel additives such as Tecumseh's fuel stabilizer part number 730245 or liquid varieties can be used when mixed properly. **For winter applications, Isopropyl alcohol** fuel dryers may be used in the fuel system but must be mixed at the proper ratio recommended by the manufacturer. **NEVER USE METHANOL BASED DRYERS.**

Gasoline and oil containers must be clean, covered, and rust-free. Old gas or fuel contamination can restrict or block fuel filters, and small fuel ports and passages in the carburetor. If the engine is to be unused for 30 days or more see "Storage" for fuel system instructions.

TUNE-UP PROCEDURE

The following is a minor tune-up procedure. If the engine does not perform properly after the tune up is completed, consult the "Troubleshooting Engine Operation Chart" found in Chapter 7. Repair procedures are listed in each chapter.

CAUTION: REMOVE THE SPARK PLUG WIRE BEFORE DOING ANY SERVICE WORK ON THE ENGINE.

1. Service or replace the air cleaner as necessary. Use the applicable procedure found in Chapter 2 under "Service".
2. Remove the fuel from the fuel tank by running the engine until stopping or draining into an approved fuel container.
3. Remove the fuel tank and blower housing to clean all debris from the air intake screen, cylinder cooling fins, governor and carburetor linkage.
4. Replace the blower housing and check all remote linkage for proper adjustment and operation.
5. Check to see that the engine is properly secured to the equipment. On rotary lawnmowers, balance the blade and check the blade hub and crankshaft key for wear. Replace as necessary. Torque the bolts to the correct specification.
6. Replace the spark plug with the correct replacement by using the Master Technician's Parts Manual. Set the spark plug gap at .030" (.762 mm) and install it in the engine. Tighten the spark plug to 230 inch pounds (2.6 Nm) of torque. If a torque wrench isn't available, screw the spark plug in as far as possible by hand. Use a spark plug socket or wrench to turn the spark plug 1/8 to 1/4 turn further if using the old spark plug, or 1/2 turn further if a new spark plug is used. Reinstall the spark plug wire.

TUNE-UP PROCEDURE (continued)

7. Fill the fuel tank with the proper fuel/oil mix.
8. Start the engine and allow it run 3 - 5 minutes to reach operating temperature. Adjust the carburetor if necessary (see Chapter 3 under "Service" for the final idle mixture adjustment procedure) and set the engine R.P.M.(s) according to the specification number found on microfiche card # 30 or computer parts look up system.

STORAGE (IF THE ENGINE IS TO BE UNUSED FOR 30 DAYS OR MORE.)

CAUTION: NEVER STORE THE ENGINE WITH FUEL IN THE TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED AREAS, WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER, OR OTHER GAS APPLIANCE.

Gasoline can become unstable in less than 30 days and form deposits that can impede proper fuel flow and engine operation. To prevent deposits from forming, all gasoline must be removed from the fuel tank and the carburetor. An acceptable alternative to removing all gasoline is adding a fuel stabilizer to the gasoline such as Tecumseh part number 730245. A fuel stabilizer is added to the fuel tank or storage container. Always follow the mix ratio and mixing procedure found on the stabilizer container. Run the engine at least 10 minutes after adding the stabilizer to allow it to reach the carburetor.

Draining The Fuel System

1. Remove all gasoline from the fuel tank by running the engine until the engine stops, or by draining the fuel tank by removing the fuel line at the carburetor. Be careful not to damage the fuel line or the carburetor fitting.

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTIVE SOURCE. BE SURE THE ENGINE IS COOL.

2. If "Gasohol" has been used, complete the above procedure and then put 2 ounces (60 ml) of the recommended fuel / oil mixture using regular unleaded gasoline into the fuel tank. Run the engine until it stops due to a lack of fuel. If "Gasohol" is allowed to remain in the fuel system during storage, the alcohol content may cause gaskets and seals to deteriorate.

Oil Cylinder Bore

1. Remove the spark plug wire from the spark plug. Pull the starter handle slowly until resistance is felt due to compression pressure, then stop. Slowly release starter tension to prevent the engine from reversing due to compression pressure.
2. Remove the spark plug, squirt 1/2 ounce (15 ml.) of clean 2-cycle engine oil into the spark plug hole.
3. Cover the spark plug hole with a shop towel and crank the engine over, slowly, several times.
4. Replace the spark plug and tighten (see step # 5 under Tune-Up Procedure for proper spark plug torque). Pull the starter handle as performed in step # 1. The piston position blocks the cylinder ports, preventing atmospheric air from entering and oil from leaving the cylinder bore during storage.
5. Replace the spark plug wire on the spark plug.

CHAPTER 2 AIR CLEANERS

GENERAL INFORMATION

The air cleaner is designed to eliminate dust and dirt from the air supply. Most models of 2-cycle and 4-cycle engines use an air cleaner except engines that run in clean environments like snow throwers or ice augers. On these applications, a filter is not necessary and could collect snow or moisture and prevent proper engine operation. On most applications, filtered air is necessary to assure abrasive particles are removed before entering the combustion chamber. Dirt allowed into the engine will quickly wear the internal components and shorten the life of the engine.

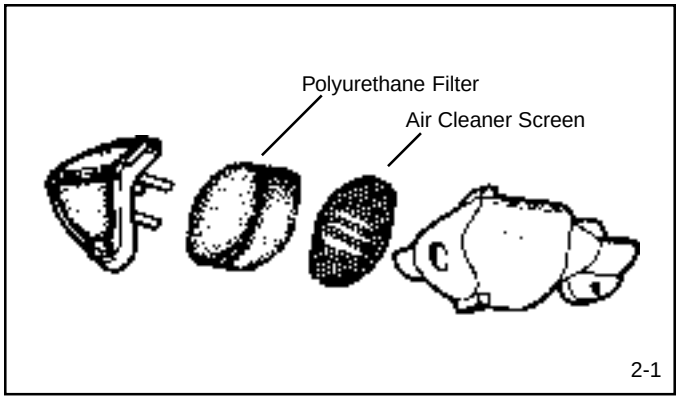
Tecumseh engines use either a polyurethane or a paper type air filter system. A polyurethane pre-filter or a flocked screen may be used in conjunction with the main filter. Extremely dirty operating conditions may require frequent filter cleaning or replacement.

OPERATION

The outer cover holds the air filter element(s) and prevents debris from entering the filter box. The air supply is filtered through the pre-filter if equipped, filter element (polyurethane or paper), and a flocked screen if equipped. Pre-filter elements do not extend the recommended air filter service intervals listed under "Service". However; in extremely dirty operating conditions a pre-filter element may increase the run time of the engine before the filter becomes restricted (not to exceed the service recommendations), and service on the filter is necessary.

TROUBLESHOOTING

If the engine's performance is unsatisfactory (needs excessive adjustments, starts smoking abnormally, loses power), the first component to be checked is the air cleaner. A dirt restricted or an oil soaked filter element will cause noticeable performance problems. A polyurethane element may be cleaned following the service procedure listed under "Service" in this chapter. A paper-type air filter should only be replaced. Follow the procedure listed in the service section in this chapter for replacement. Re-try the engine after filter replacement or service. If the problem persists after filter service, see Chapter 7 under "Troubleshooting" for additional causes.



2-1

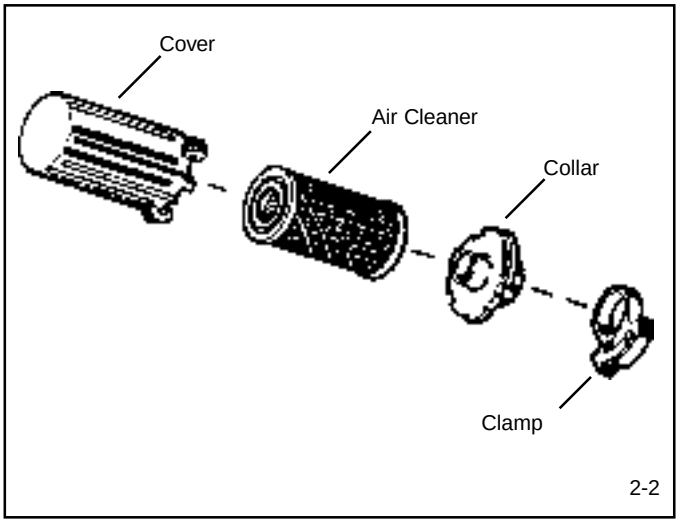
SERVICE

Cleaning and oiling the polyurethane element (diag. 2-1) is recommended every three (3) months or every 25 operating hours. If the engine is used in extremely dusty or dirty conditions, the filter may require service every three hours or as often as necessary to maintain proper engine performance.

Polyurethane type filters require re-oiling after extended storage due to oil migration out of the filter.

A paper type element (diag. 2-2) should be replaced once a year, every 100 operating hours, or more often if used in extremely dusty conditions. Use only original factory recommended replacement filters.

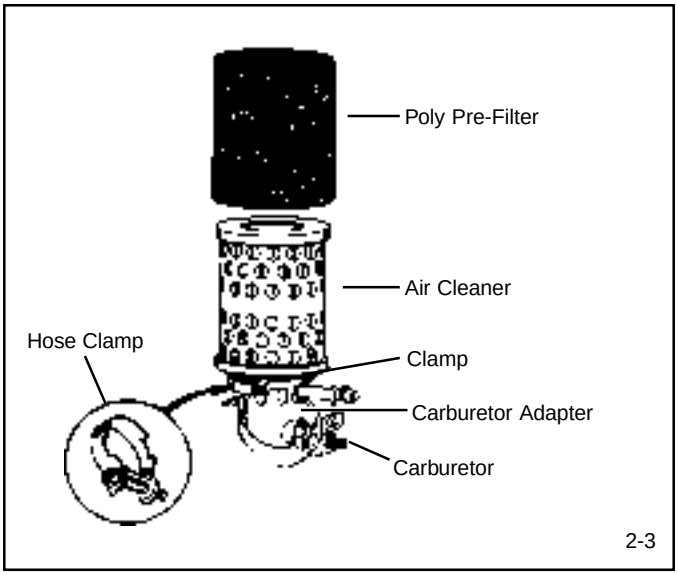
NOTE: DO NOT ATTEMPT TO CLEAN OR OIL PAPER FILTERS.



2-2

Paper Filter Removal and Replacement

1. Remove the polyurethane pre-filter (if equipped) from the air filter.
2. Inspect the filter(s) for discoloration or dirt accumulation. (For the polyurethane pre-cleaner service see step # 5 under "Polyurethane Filter Removal and Service"). If either condition is present, replace the paper type filter using the following steps.
3. Loosen the clamp and slide the clamp toward the air filter. (diag. 2-3)
4. Slide the air filter and clamp off the carburetor adapter. Discard the old filter and keep the clamp.
5. Apply a thin layer of silicon sealant to the outside of the air cleaner adapter.
6. Install the clamp on the new air filter, slide the filter assembly onto the carburetor adapter as far as it will go.
7. Slide the clamp as close to the carburetor as possible. Tighten the clamp securely.

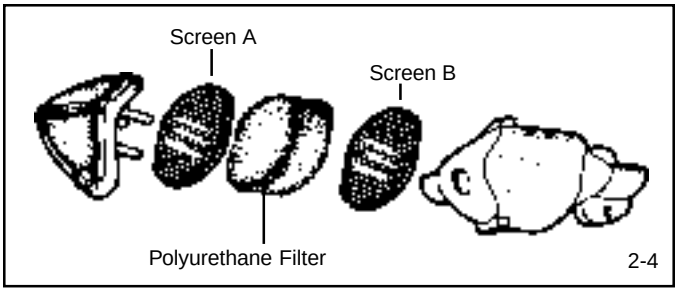


2-3

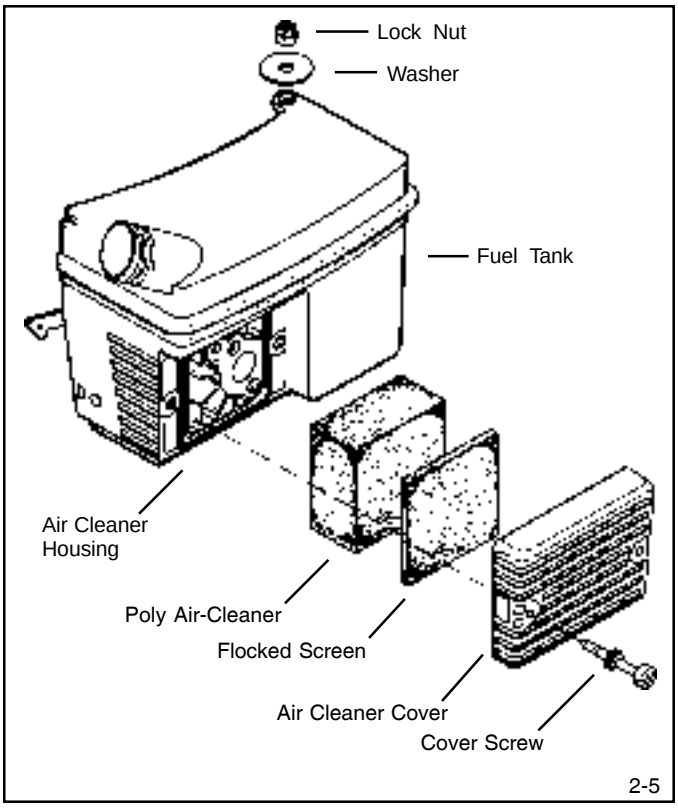
Polyurethane Filter Removal and Service

Kleen Aire® Air Cleaner or TC Type II

1. Remove the cover by pulling outward on the tab (diag. 2-4). On the TC Type II style engine, loosen the two screws (diag. 2-5).
2. Remove screen A (if equipped), foam filter and screen B from the air cleaner body (diag. 2-4). On TC Type II engines, remove the flocked screen and the foam filter (diag. 2-5).
3. Inspect the flocked screen and foam filter for discoloration or dirt accumulation. If either condition is present, service the element or screen using the following steps.
4. The flocked screen pre-filter may be cleaned by blowing compressed air through the screen from the back side. Replace the screen if this procedure does not fully remove the accumulated particles.
5. Wash the polyurethane filter or polyurethane pre-filter (used with paper air filters) in a detergent water solution and squeeze (don't twist) until all dirt is removed.
6. Rinse the polyurethane filter or polyurethane pre-filter thoroughly in clean water. Wrap the filter in a clean cloth and squeeze (don't twist) until completely dry.
7. Saturate the polyurethane filter with engine oil and squeeze (don't twist) to distribute and remove excess oil.
8. Reassemble the filter assemblies per the illustrations.



2-4



2-5

CHAPTER 3 CARBURETORS AND FUEL SYSTEMS

GENERAL INFORMATION

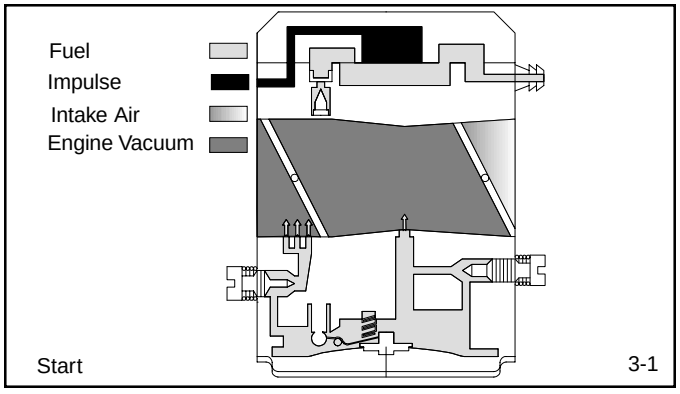
TC engines almost exclusively use diaphragm-type carburetors to be able to run effectively at any operating angle. The diaphragm carburetors are produced by Walbro and Tillotson for Tecumseh. The carburetors use an internal diaphragm fuel pump to supply the fuel to the carburetor fuel metering chamber. The metering diaphragm has one side exposed to intake manifold pressure and one side exposed to atmospheric pressure. This diaphragm provides the same basic function (maintaining the proper fuel level in the carburetor) as the float.

A limited number of TC engines were produced as outboards using a Tecumseh Series II float style carburetor. Consult the Two Cycle Technician's Handbook (part # 692508) if service is required on this series of carburetor.

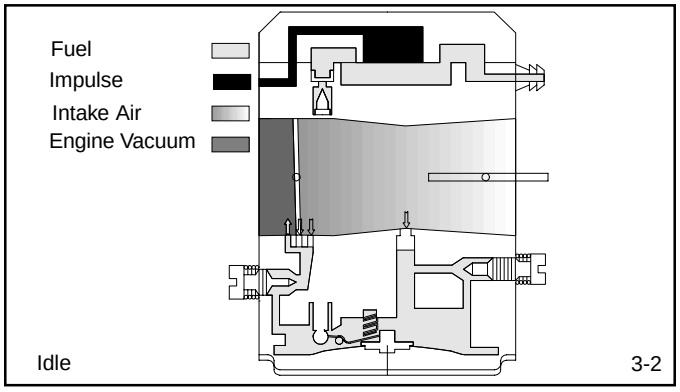
When servicing carburetors, use the engine model and specification number to obtain the correct carburetor part number. An alternate method to find the correct carburetor part number on float type carburetors is to use the manufacturing number and date code stamped on the carburetor and convert this number to a part number. In the carburetor section of the Master Parts Manual or Microfiche Catalog, a cross reference chart will convert a carburetor manufacturing number to a Tecumseh part number.

OPERATION

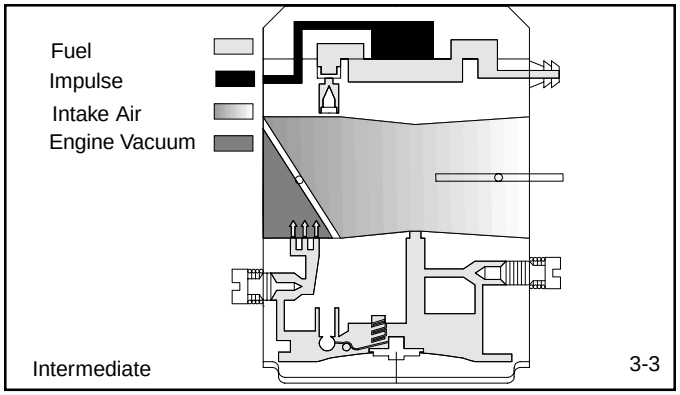
In the "CHOKE" or "START" position, the choke shutter is closed, and the only air entering the engine flows through openings around the choke shutter. As the recoil assembly is operated to start the engine, downward piston travel creates a low pressure area in the engine cylinder above the piston. Higher pressure atmospheric air rushes into the engine to fill the created low pressure area. Since the majority of the air passage is blocked by the choke shutter, a relatively small quantity of air enters the carburetor at increased speed. The main nozzle and both idle fuel discharge ports are supplying fuel due to the low air pressure in the intake of the engine and the fuel side of the main diaphragm. Atmospheric air pressure on the opposite side of the main diaphragm forces the diaphragm upward, depressing the inlet control lever, overcoming inlet spring pressure and allowing fuel to enter the fuel chamber through the inlet valve. A maximum fuel flow through the carburetor orifices combined with the reduced quantity of air that passes through the carburetor, make a very rich fuel mixture which is needed to start a cold engine (diag. 3-1).



At IDLE the throttle shutter is almost closed, the low pressure acts only on the primary idle fuel discharge port due to throttle plate position. A relatively small quantity of fuel is needed to operate the engine (diag. 3-2).

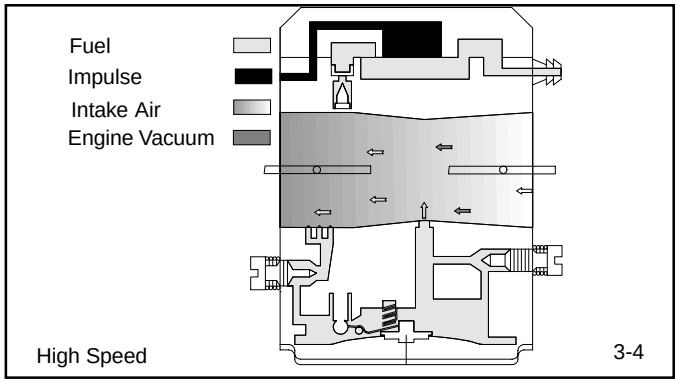


During INTERMEDIATE throttle operation, the secondary idle fuel discharge port supplies fuel after it is uncovered by the throttle plate. As the throttle plate opens progressively further, engine speed increases. The velocity of air going through the carburetor venturi creates a low pressure area to develop at the main fuel discharge port while diminishing the effect of the low pressure area on the engine side of the throttle plate. When the pressure at the venturi throat is less than that existing within the fuel chamber, fuel is forced through the high speed mixture orifice and out the main fuel discharge port (diag. 3-3).



At high speed operation, the throttle shutter is in a full open position. The air velocity through the venturi increases which further lowers the air pressure at the main fuel discharge port. All discharge ports are supplying fuel as the adjustment orifices will allow (diag. 3-4).

The fuel pump diaphragm in the carburetor moves up and down by pressure changes (pulsations) caused by piston movement. The pulsations are transferred to the pump by a passage called the impulse channel. The pump diaphragm moves up drawing fuel into the pump fuel chamber during a positive pulse, and a negative pulse moves the diaphragm down forcing fuel out of the fuel chamber through the inlet needle into the metering chamber.

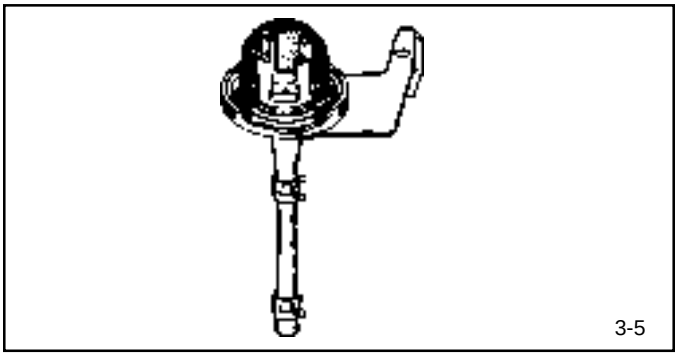


3-4

FUEL PRIMERS

Primers used on TC engines supply a solid fuel charge to the carburetor main nozzle (diag. 3-5). Fuel is forced directly into the carburetor venturi. A choke shaft and shutter is not needed or used when a primer is used. This charge of fuel provides the rich mixture necessary to start the engine.

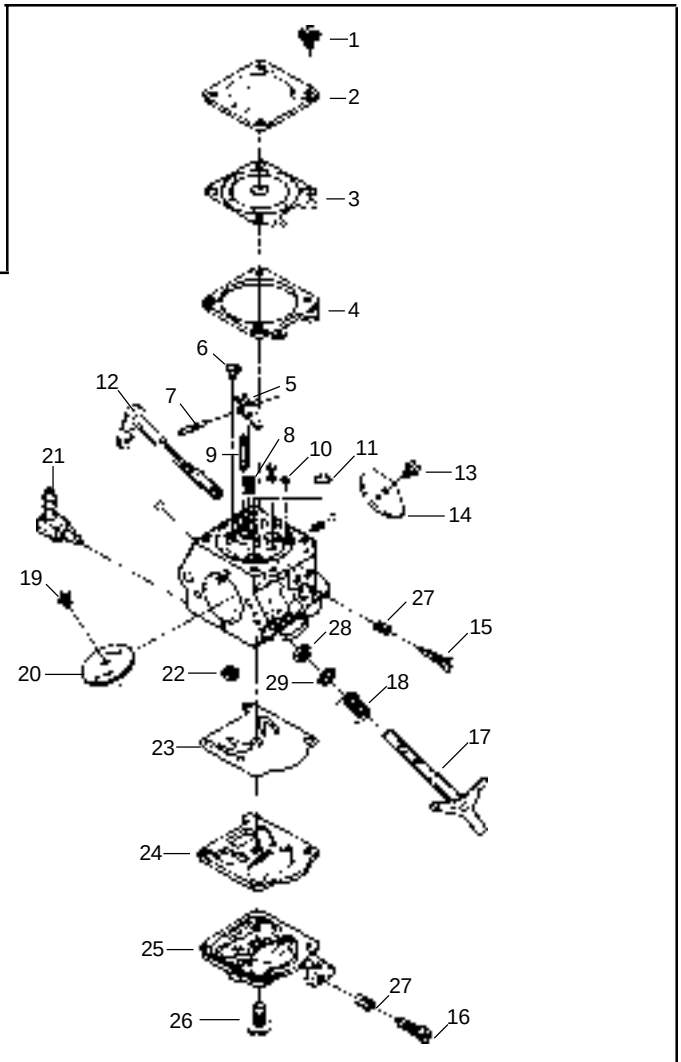
Below the main nozzle is a one way check valve to prevent fuel from being drawn back into the fuel chamber when the primer bulb is released. The check valve also prevents air from entering the carburetor during normal engine operation.


3-5

COMPONENTS

WALBRO CARBURETOR

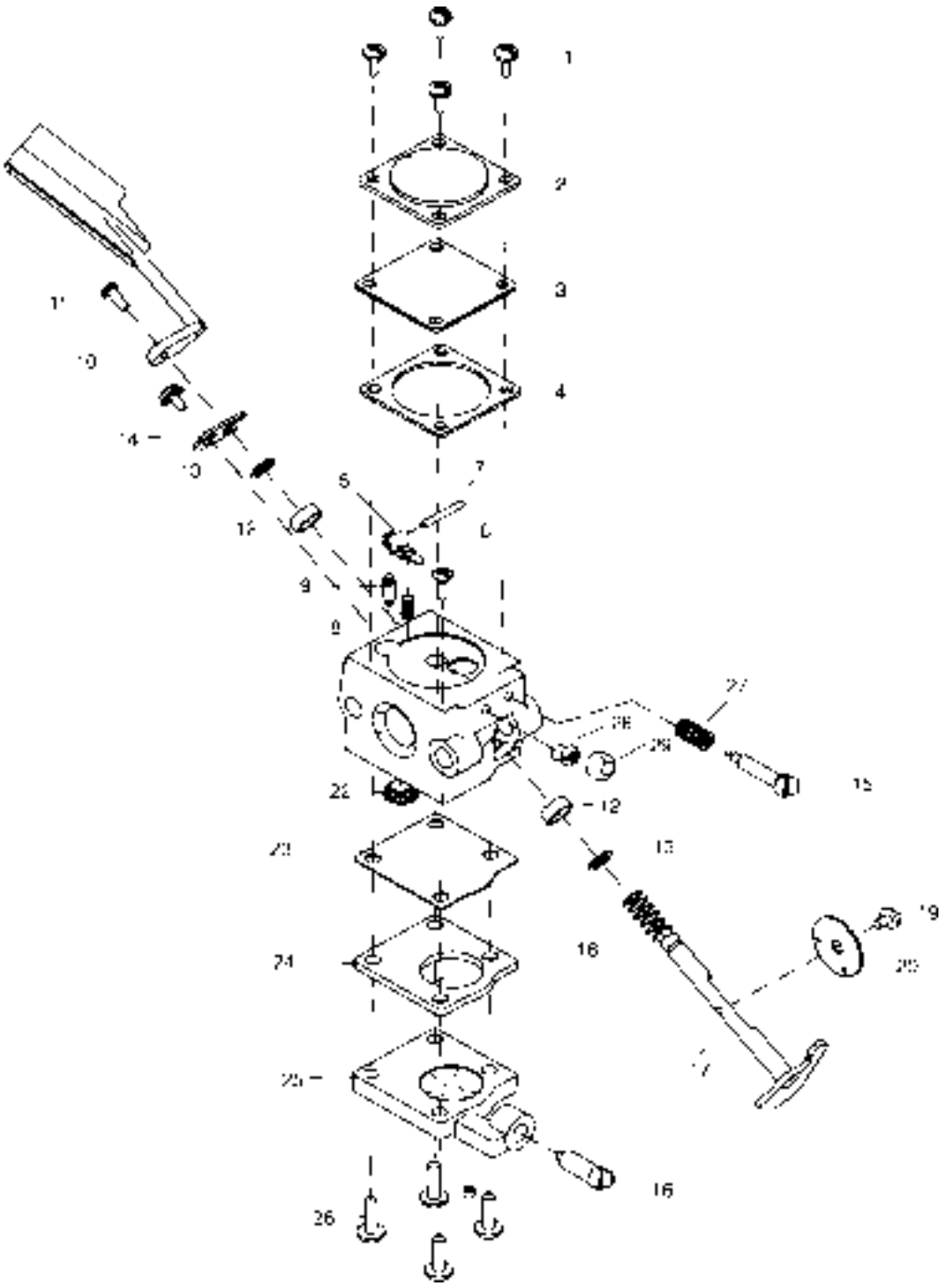
1. Diaphragm Cover Screw
2. Metering Diaphragm Cover
3. Diaphragm
4. Diaphragm Gasket
5. Metering Lever
6. Metering Lever Screw
7. Metering Lever Pin
8. Metering Lever Spring
9. Inlet Valve Needle
10. Inlet Valve Seat
11. Welch Plug
12. Choke Shaft
13. Choke Shutter Screw
14. Choke Shutter
15. Idle Mixture Screw
16. Idle Speed Screw
17. Throttle Shaft
18. Throttle Shaft Return Spring
19. Throttle Shutter Screw
20. Throttle Shutter
21. Fuel Fitting
22. Fuel Inlet Screen
23. Pump Diaphragm
24. Pump Cover Gasket
25. Pump Cover
26. Pump Cover Screw
27. Tension Spring
28. Dust Seal
29. Dust Seal Washer



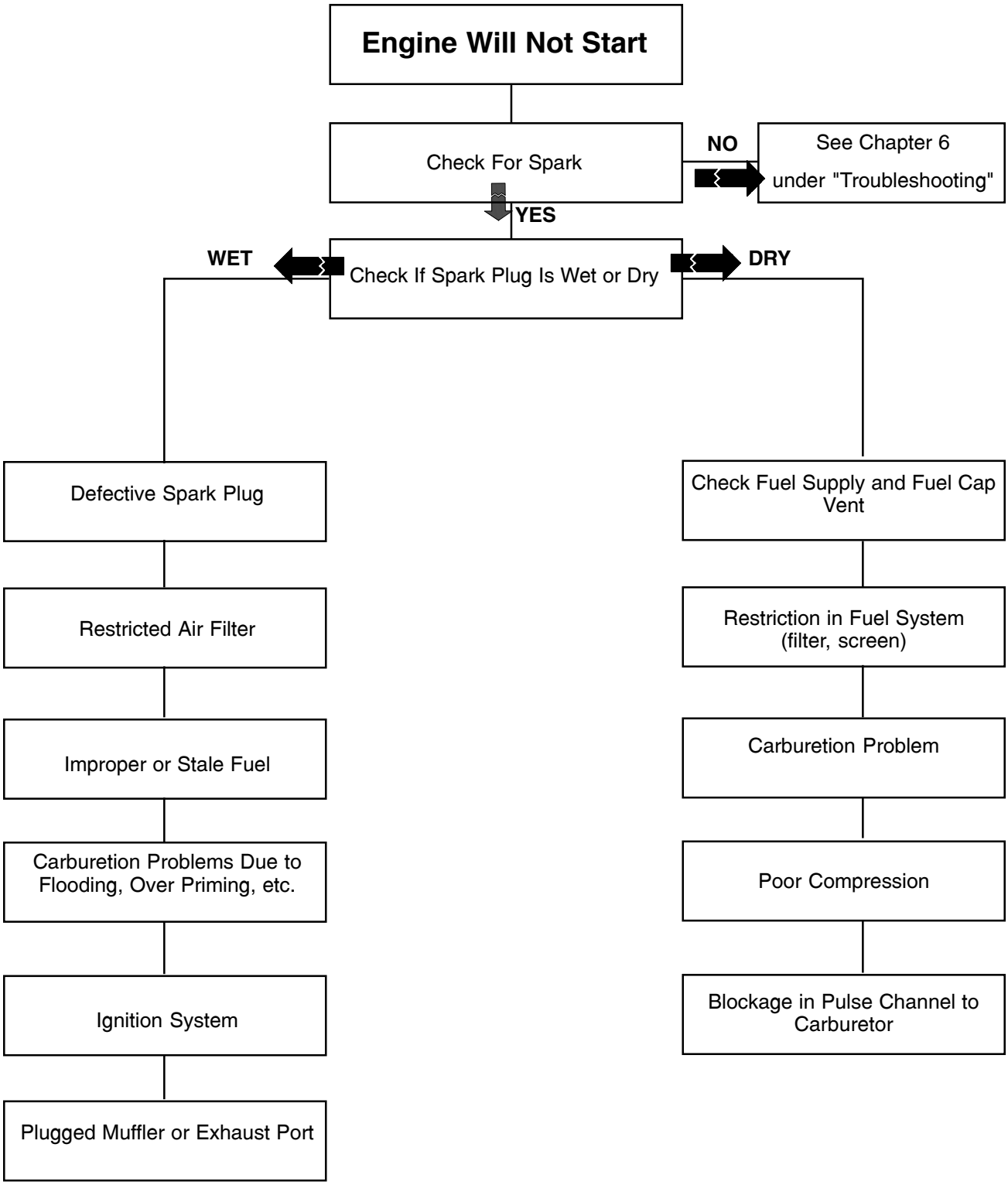
3-6

TILLOTSON CARBURETOR

1. Diaphragm Cover Screw
2. Metering Diaphragm Cover
3. Diaphragm
4. Diaphragm Gasket
5. Metering Lever
6. Metering Lever Screw
7. Metering Lever Pin
8. Metering Lever Spring
9. Inlet Valve Needle
10. Air Vane
11. Air Vane Screw
12. Dust Seal
13. Dust Seal Washer
14. Dust Seal Retainer
15. Idle Mixture Screw
16. Idle Speed Screw
17. Throttle Shaft
18. Throttle Shaft Return Spring
19. Throttle Shutter Screw
20. Throttle Shutter
21. Fuel Fitting
22. Fuel Inlet Screen
23. Pump Diaphragm
24. Pump Cover Gasket
25. Pump Cover
26. Pump Cover Screw
27. Tension Spring
28. Main Mixture Jet
29. Welch Plug



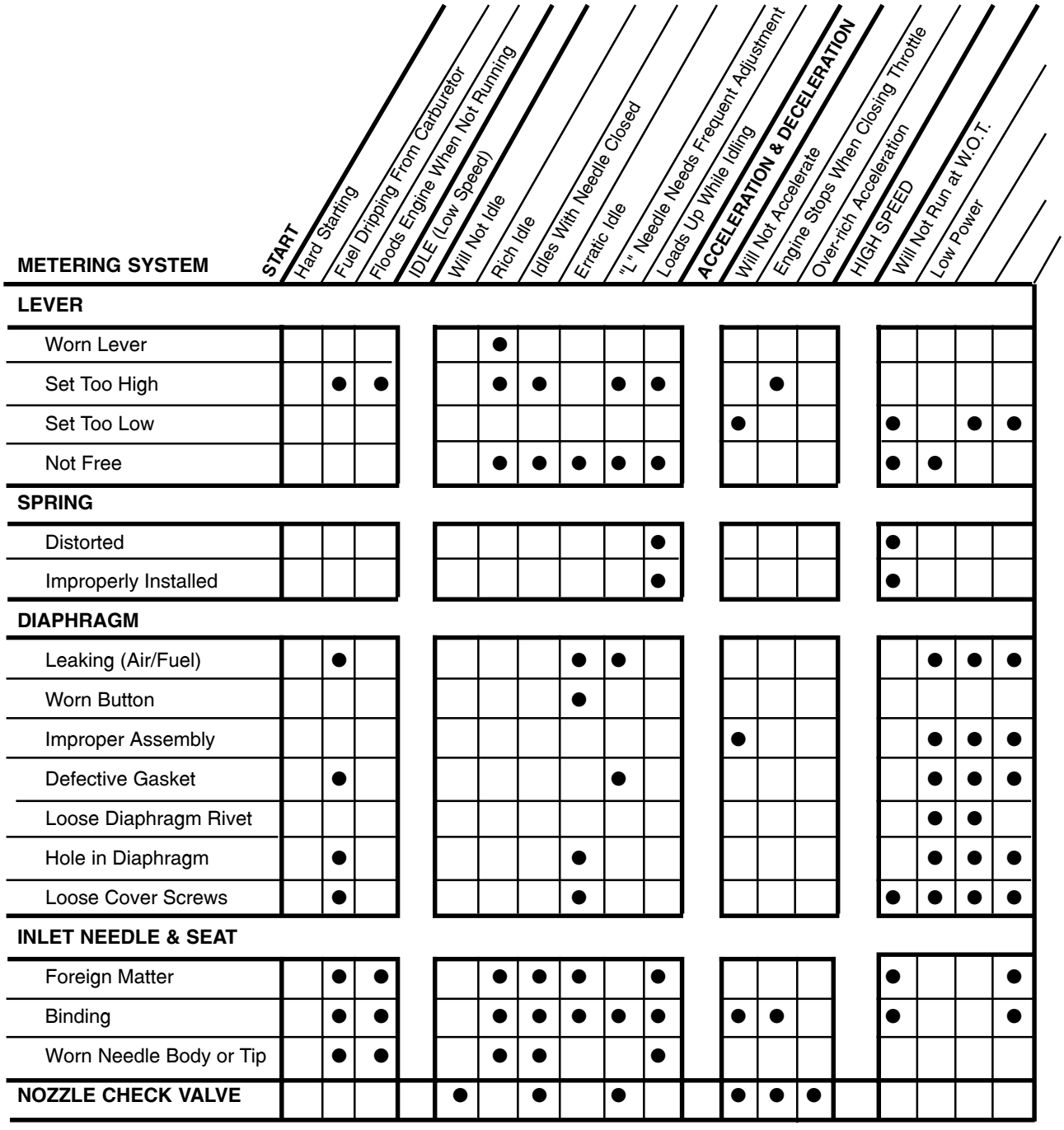
ENGINE TROUBLESHOOTING



TROUBLESHOOTING CARBURETION - TC SERIES

	START			IDLE (Low Speed)						ACCELERATION & DECELERATION			HIGH SPEED			
ADJUSTMENTS	Hard Starting	Fuel Dripping From Carburetor	Floods Engine When Not Running	Will Not Idle	Rich Idle	Idles With Needle Closed	Erratic Idle	"L" Needle Needs Frequent Adjustment	Loads Up While Idling	Will Not Accelerate	Engine Stops When Closing Throttle	Over-rich Acceleration	Will Not Run at W.O.T.	Low Power	No Rich Drop Off	
Low	●			●	●					●	●	●				●
High										●	●	●	●	●		
FUEL SYSTEM																
Plugged Tank Filter or Vent	●			●						●			●	●	●	●
Restricted Fuel Line	●			●						●			●		●	
Dirt in Fuel Passage				●			●	●		●			●		●	
Loose, Damaged Fuel Line		●		●			●			●			●		●	
Leak in Pulse System	●			●						●			●	●	●	●
Restricted Pulse Channel	●			●						●			●	●	●	●
Loose Pump Cover Screws		●								●			●	●	●	●
Defective Pump Diaphragm										●	●	●	●	●	●	●
AIR SYSTEM																
Plugged Air Filter	●									●		●	●	●		●
Defective Manifold Gasket				●			●			●			●		●	
Loose Carb. Mounting Bolts				●			●			●					●	
Worn Throttle Shaft or Valve							●									●
Incorrect Throttle Assembly																
Loose Throttle Valve Screw							●									
Throttle Shaft Too Tight				●												
Bent Throttle Linkage				●												
Defective Throttle Spring				●												
Bent Throttle Stop Lever				●												
Choke Not Functioning Properly	●															
Worn Choke Shaft or Valve	●															●

TROUBLESHOOTING CARBURETION - TC SERIES (CONTINUED)



TESTING

1. After repeated efforts to start the engine using the procedure listed in the operator's manual fail, check for spark by removing the high tension lead and removing the spark plug. Install a commercially available spark plug tester and check for spark. If the spark is bright blue and fires every revolution, proceed to step # 2. If no spark, weak spark, or intermittent spark see Chapter 6 "Ignition" under "Troubleshooting".
2. Remove the spark plug and visually check the removed spark plug for a wet condition indicating the presence of fuel mixture in the cylinder.
3. If the spark plug is dry, check for restrictions in the fuel system before the carburetor. If the spark plug is wet, continue with step # 6. Check the fuel cap vent, the cap must allow air to be blown through it when testing. Using a proper draining receptacle, remove the fuel line from the carburetor inlet fitting (Type I) or fuel tank (Type II) and pull off the fuel line. Examine the fuel flow and fuel condition. Improper fuel flow indicates the fuel, fuel line, filter, or tank require cleaning or replacement.
4. Visually inspect the choke shutter for complete closing or check to see fuel flowing from the main nozzle during priming. Remove the air cleaner element or air cleaner assembly to provide access for visual inspection.
5. If the fuel flow to the carburetor is adequate and no fuel flows out the main nozzle during priming or choking, the carburetor will require service. Consult the Troubleshooting Carburetion Chart for possible causes for the lack of fuel.
6. Check the engine compression using a commercially available compression tester and follow the tester's recommended procedure. Low compression, no fuel present on the spark plug, adequate fuel flow and a known good functional carburetor indicates an internal engine problem exists. See Chapter 7 under "Troubleshooting".

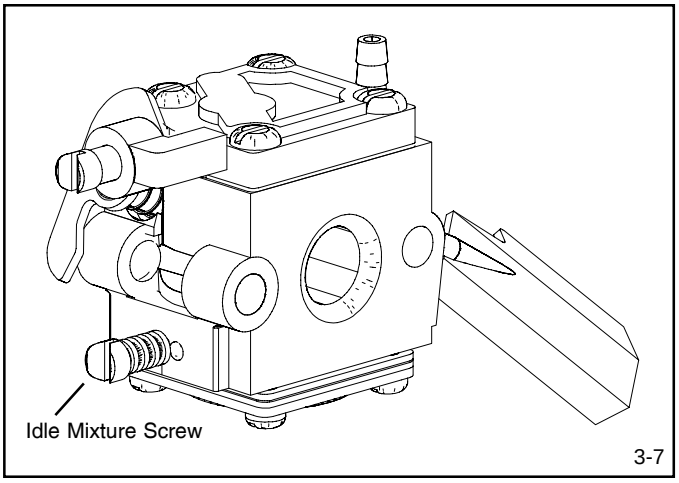
SERVICE

CARBURETOR PRE-SET AND ADJUSTMENT

Both the Walbro and the Tillotson carburetors used on TC engines have non-adjustable main mixture jets. Only the idle mixture is adjustable by turning the idle mixture screw. Use the following procedure to pre-set the idle mixture screw. Turn the idle mixture screw (clockwise) finger tight to the closed position, then turn the screw counterclockwise to obtain the proper preset (diag. 3-7).

Walbro model WTA, WT 1 - 1 1/8 turns

Tillotson model HU 1 1/4 - 1 3/8 turns



3-7

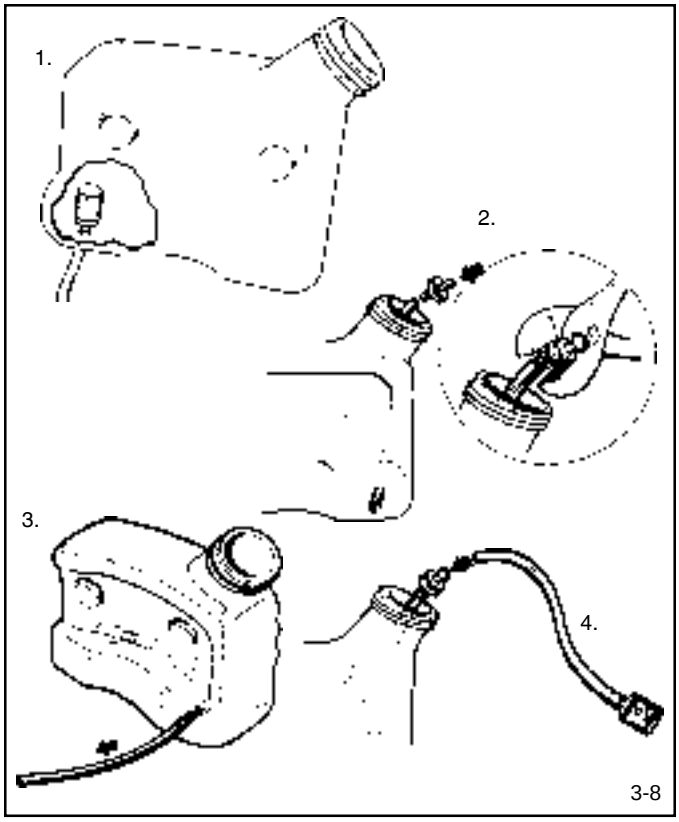
Final Idle Mixture Adjustment

Start the engine and allow it to reach normal operating temperature (after 3-5 minutes). As the speed control is set at the idle position, turn the idle mixture screw slowly clockwise until the engine R.P.M. just starts to decrease. Stop and note this screw position. Turn the idle mixture screw slowly counterclockwise. The engine will increase R.P.M. Continue to slowly turn the screw until the engine R.P.M. starts to decrease. Note this position and turn the mixture screw back clockwise halfway between the two engine R.P.M. drop off positions. The idle mixture adjustment is complete.

FUEL TANK SERVICE

TC type II engines have fuel tanks with an integral fuel screen and integral outlet fuel fitting. Some TC type I engine models use a pressed in fuel filter or a weighted filter and a flexible fuel line in the tank. Integral screens or fittings are not serviceable. Pressed in fuel filters and fittings can be serviced using the following procedure (diag. 3-8).

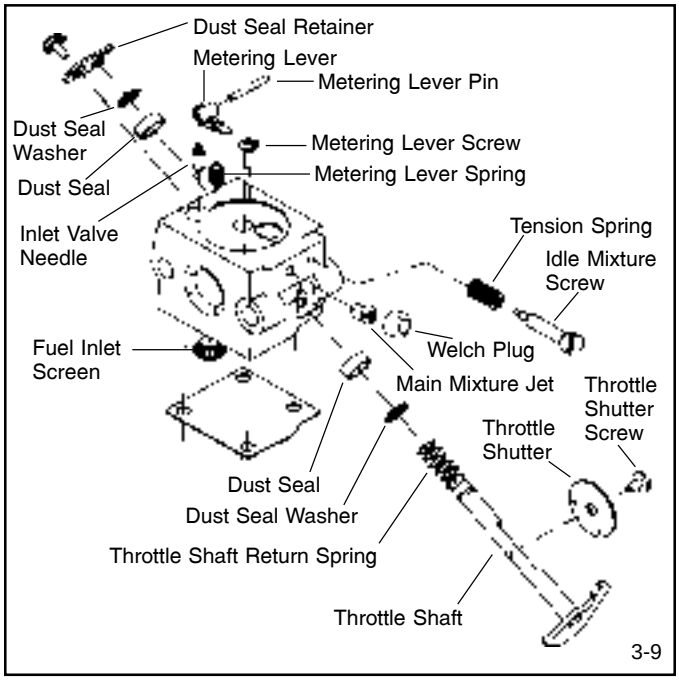
1. Press the fuel fitting into the tank and feed the fuel line in until the filter can be removed through the filler neck. Remove the filter and fuel line if necessary.
2. To install a new filter and fuel line, push the new fuel line through the tank outlet until the fuel line protrudes through the filler neck.
3. On tanks without weighted filters, push a new filter on the fuel line. For weighted filters, slide the new retaining ring on the fuel line protruding from the filler neck. Push the fitting into the line to the fitting shoulder. Slide the retaining ring over the groove in the fitting and crimp the retaining ring using a pliers.
4. Attach the fuel line and weighted fuel filter if applicable. Pull the fuel line through the tank outlet. The filter barb or the fuel fitting barb must protrude from the tank.



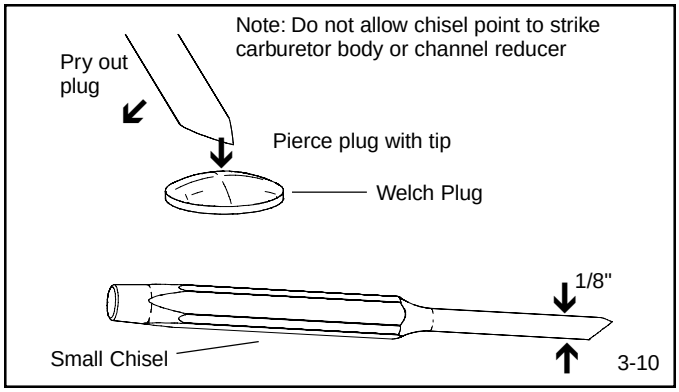
3-8

CARBURETOR DISASSEMBLY

1. Note or mark the location and sequence of the diaphragm(s), gasket(s), and the metering or pump cover. Remove the screw(s), gaskets, and diaphragms.
2. Remove the idle mixture screw. On Tillotson model HU carburetors, remove the plastic screw or brass plug over the main mixture jet and remove the main mixture jet if necessary for cleaning (diag. 3-9).
3. Use a 8-32 tap with the tapered flutes removed to turn into the brass welch plug until it bottoms and begins to turn the welch plug. Carefully pull the welch plug from the carburetor body.
4. Note or mark the location and action of the throttle and air vane, and choke shaft (if applicable). Remove the screw holding the throttle or choke shutter to the shaft. Remove the Torx T8 screw (use part # 670334) holding the air vane to the throttle shaft if applicable. Remove the clip screw, dust seal retaining clip, and throttle shaft. On some older Walbro carburetors it is necessary to remove the circlip on the end of the throttle shaft to remove the shaft (diag. 3-9).
5. Remove the inlet needle valve, metering lever, and metering lever spring by removing the retainer screw on the pivot pin (diag. 3-9).
6. Remove the fuel inlet screen and check valve screen using an "O" ring pick. Remove all welch plugs using a sharpened small chisel. Drive the sharpened chisel into the welch plug, push down on the chisel to pry the welch plug out of position. Be careful not to damage the carburetor body (diag. 3-10).
7. On Walbro carburetors, the fuel inlet fitting can be removed with a pliers using a twisting and pulling motion. Do not re-use the old fuel fitting. The fuel fitting on Tillotson carburetors is not replaceable. Do not remove. Carburetor cleaner will not affect this fitting.



3-9



3-10

8. Clean all metallic parts in carburetor cleaner. Do not exceed 30 minutes soak time. Blow out all fuel passages with compressed air. Do not use tag wire to clean the orifice in the main mixture seat assembly. The main mixture seat assembly contains a teflon disc check valve. If the disc is damaged with tag wire, the carburetor will not function properly.

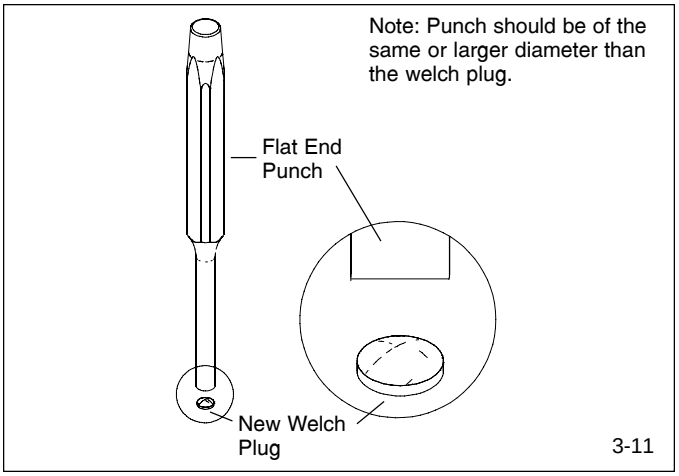
CARBURETOR INSPECTION

Visually examine the throttle lever shaft and choke shaft for wear at the bearing points in the carburetor body. Inspect the pump and metering diaphragms for hardness, fuel contamination, holes or tearing in the diaphragm. Pump diaphragm flapper valves should appear flat with no curling. Check the inlet screen and check valve screen for contamination. Check the atmospheric vent hole in the metering cover and clean if necessary.

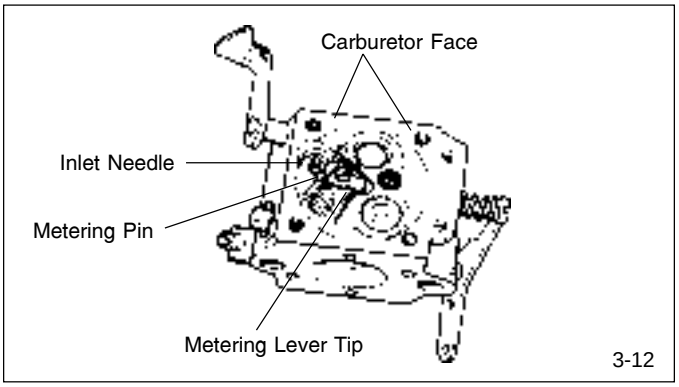
Check the inlet needle for wear on the taper portion of the needle. Replace as necessary.

CARBURETOR ASSEMBLY

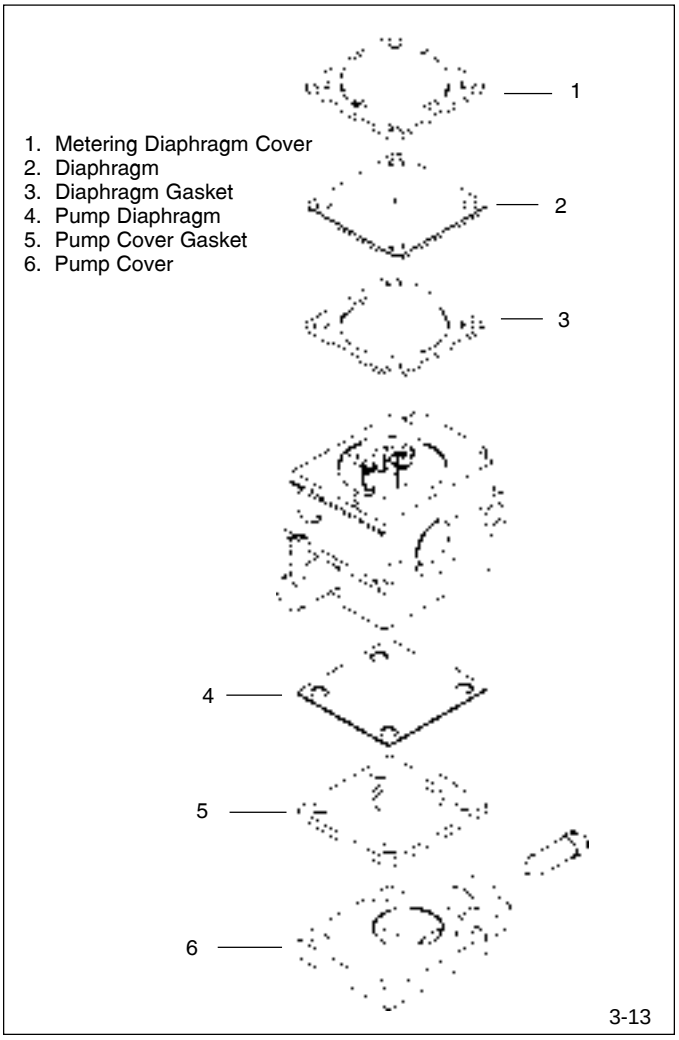
1. Install new inlet screen(s) using a small flat punch slightly smaller than the screen. Push in until the screen contacts the seat.
2. If removed, install the high speed jet. Use a slightly larger flat punch to install the brass welch plug over the high speed jet. The closed, tapered end of the plug goes toward the jet. Tap the brass welch plug in until it is flush with the carburetor body. Apply sealant like fingernail polish to the brass plug.
3. Install new welch plug(s) using a flat punch equal to or slightly larger than the plug. The welch plug(s) must be flattened by taps with a small hammer on the installing punch. Sealant such as fingernail polish is recommended to apply to an installed welch plug. Use sparingly and wipe off excess immediately (diag. 3-11).
4. Install the inlet needle, spring, metering lever and pin. The metering lever hooks on the inlet needle and rests on the metering spring. Install as an assembly and install the retaining screw (diag. 3-12).
5. Check the metering lever tip height using a metering lever gauge (part # 670325). The tip height should be .060" to .070" (1.52 mm to 1.77 mm) from the face of the carburetor body on Walbro carburetors. On Tillotson carburetors the tip of the metering lever should be flush with surface of the carburetor body.
6. Install the idle mixture screw and spring and back the screw out from the closed position 1 - 1 1/8 turns for Walbro, 1-1/4 - 1-3/8 turns for Tillotson carburetors.
7. Install the metering diaphragm, cover gasket, and cover. Place the cover gasket (over the locator pins on Walbro only) on the carburetor body, add the metering diaphragm with the long rivet head toward the carburetor body on top of the gasket, add the cover and fasten the four screws (diag. 3-13).



3-11



3-12

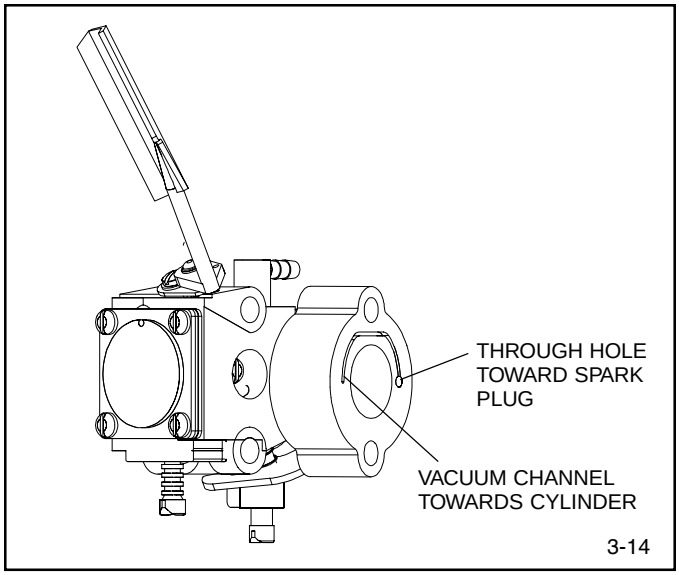


3-13

8. Install the pump gasket over the locator pins on the pump cover, add the pump diaphragm next, and place the assembly on the carburetor body. Check to see that the locator pins fit the corresponding holes in the carburetor body. Install the pump cover retaining screw (diag. 3-13).

9. If removed on Walbro carburetors, install a new fuel inlet fitting in the same position as the original (diag. 3-14). When installing a new fitting, insert the tip into the carburetor body, then coat the exposed portion of the shank with Loctite grade A (red), then press it in squarely using support on the opposite side to prevent damage to the carburetor body or fitting. Press it in until the fitting bottoms out in the carburetor body.

10. Install the choke and throttle shaft assemblies in the reverse order of removal. Visually check for proper operation of the choke and throttle.



3-14

NOTE: Do not re-use old choke or throttle plate shutter screws. New screws are treated with a dry Loctite adhesive to secure them in place.

11. If applicable, attach the air vane and torque the mounting screw to 3-5 inch pounds (.34 - .57 Nm) (diag. 3-14).

12. Newer style TC series engines use an insulator / spacer between the carburetor and cylinder. That spacer **MUST** be installed, as shown, for the fuel pump to operate.

EMISSIONIZED TC CARBURETOR

The Tillotson carburetor is now an emissions grade carb. It has a married idle and high speed circuitry with limited jet adjustments on the idle.

EMISSIONS CARBURETOR IDLE MIXTURE ADJUSTMENT PROCEDURES

The carburetor is preset at the factory at a normal setting required for initial engine operation.

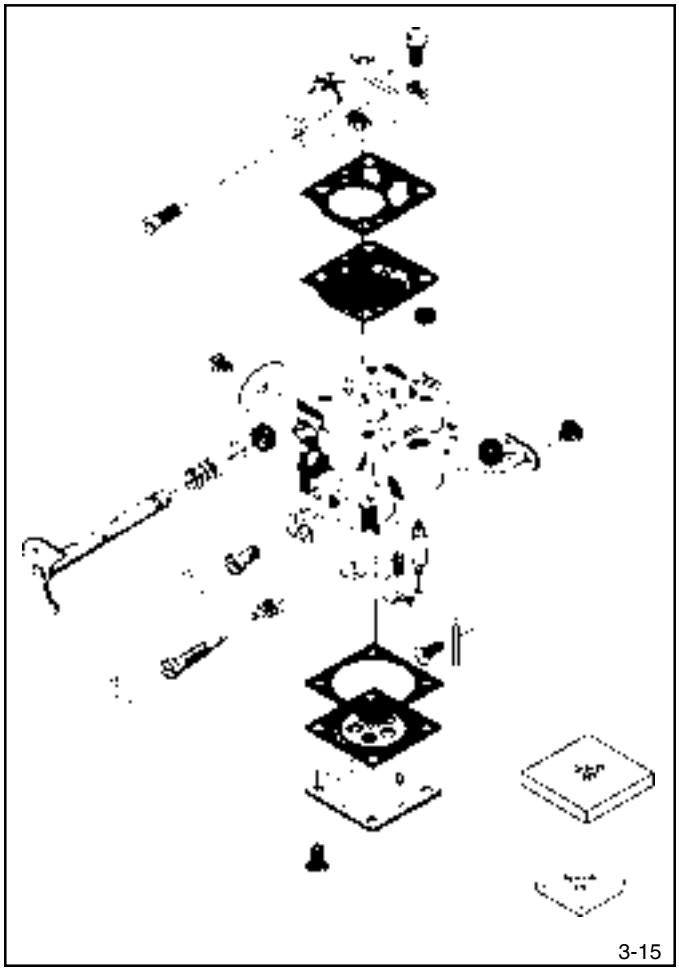
Allow the engine to reach normal operating temperature (after 3-5 minutes).

Set the engine speed control in the idle position. With the engine at idle speed (Note: must be less than 2400 R.P.M. for accurate adjustment). Using a small tip screw driver that fits through the access hole in the limiter cap, adjust the mixture screw slowly clockwise until the engine R.P.M. just starts to decrease. Stop and note this screw position. Turn the idle mixture screw slowly counterclockwise. As the engine increases R.P.M. continue to slowly turn the screw counterclockwise until the engine R.P.M. starts to decrease. Note this position and turn the mixture screw back clockwise halfway between the two engine R.P.M. drop off positions.

Verify the engine will accelerate from low speed to high speed and that the idle speed remains at the desired setting.

Once adjustments are complete, center the adjustment limiter cap between the two stops and press inward to engage the limiter. The limiter will snap into position and engage the adjusting screw. All future adjustments should now be made using the adjusting slot in the limiter cap.

CAUTION: Once the limiter cap is snapped into place it is not possible to remove the limiter or to adjust the mixture screw beyond the limits of the limiter assembly. Make sure that initial adjustments are made per the above procedure prior to engaging the limiter cap.


3-15

CHAPTER 4 GOVERNORS AND LINKAGE

GENERAL INFORMATION

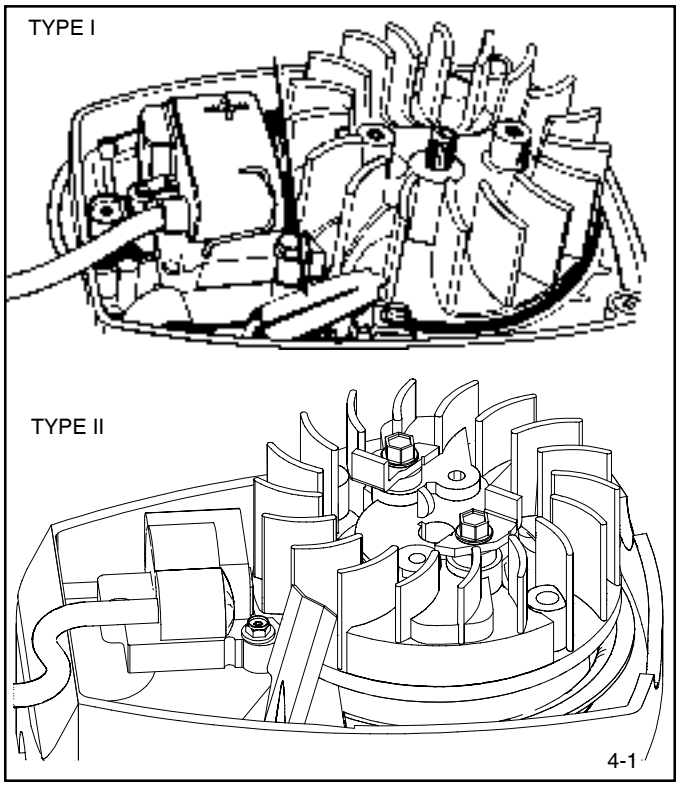
TC series engines are equipped with pneumatic (air vane) governors. The governor's function is to maintain a R.P.M. setting when engine loads are added or taken away. Air vane governors are controlled by the air velocity created by fins on the flywheel. Changes in the engine R.P.M. cause the air vane to move. This movement opens the throttle shaft either by a link between the air vane and the throttle plate, or the air vane is mounted directly onto the throttle shaft. The throttle is opened as the engine R.P.M. drops and is closed as the engine load is removed.

This chapter includes governor assembly linkage and speed control illustrations to aid in assembly.

OPERATION

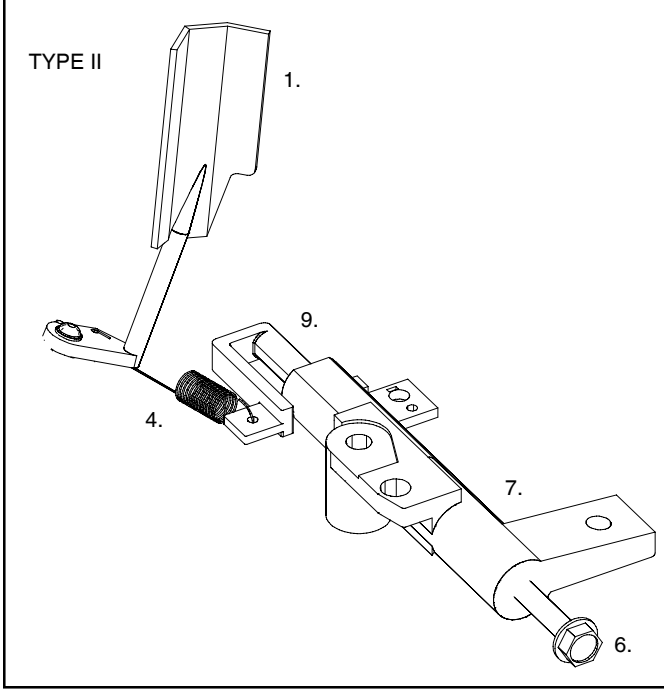
Engine R.P.M. changes cause an increase or decrease in the air velocity created by the fins on the flywheel. The air velocity exerts pressure on the air vane while a governor spring exerts pressure against the air velocity force. The air vane pivots on the engine blower housing base or is attached to the throttle shaft of the carburetor. As an engine load is applied and the engine's R.P.M drop, the air velocity also drops, allowing the governor spring to pull open the throttle shaft and increase engine speed (diag. 4-1).

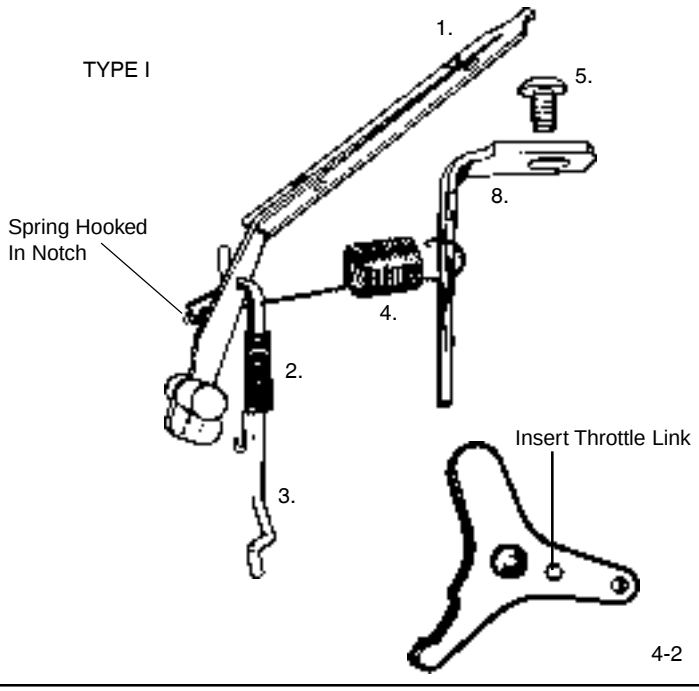
If the engine uses a remote speed control, the bowden wire will move the speed control plunger or the throttle shaft. Moving the speed control plunger results in changing the governor spring tension which increases or decreases the engine's governed speed.



COMPONENTS

1. AIR VANE
2. BACKLASH SPRING
3. GOVERNOR LINK
4. GOVERNOR SPRING
5. MOUNTING SCREW
6. SPEED ADJUSTMENT SCREW
7. SPEED CONTROL BODY
8. SPEED CONTROL LEVER
9. SPEED CONTROL PLUNGER





TROUBLESHOOTING

ENGINE OVERSPEEDING

1. If the engine runs wide open (faster than normal), shut the engine off or slow it down **immediately**.
2. Visually inspect the air vane, linkage, carburetor throttle shaft, and speed control for debris blockage, binding, breakage, or incorrect hook-up. Check the governor spring for a stretched or distorted condition. Remove the recoil assembly and / or fuel tank if necessary. See "Disassembly Procedure" in Chapter 7.
3. Clean, correct or replace binding or damaged parts. Set the speed control to the recommended engine R.P.M.

ENGINE SURGING

1. Try to stabilize the engine R.P.M. by holding in one position the carburetor throttle shaft on the exterior of the carburetor.
2. If the engine R.P.M. stabilizes, the governor or governor adjustment should be checked. Follow the procedure under "Governor Adjustment" in this chapter. If the engine R.P.M. does not stabilize, the engine will require additional checks see Chapter 3 under "Troubleshooting".
3. If the problem persists after the governor adjustment, check the engine R.P.M. found on microfiche card # 30 or in the computer parts lookup. If the setting for high and low speed are within the listed specification and a slight surge is experienced, increasing the engine idle speed slightly may eliminate this condition.
4. Visually inspect the air vane, linkage, carburetor throttle shaft, and speed control for debris blockage, binding, breakage, or incorrect hook-up. Check the governor spring for a stretched or distorted condition. Remove the recoil assembly and/or fuel tank if necessary. See "Disassembly Procedure" in Chapter 7. Repair or replace as necessary.

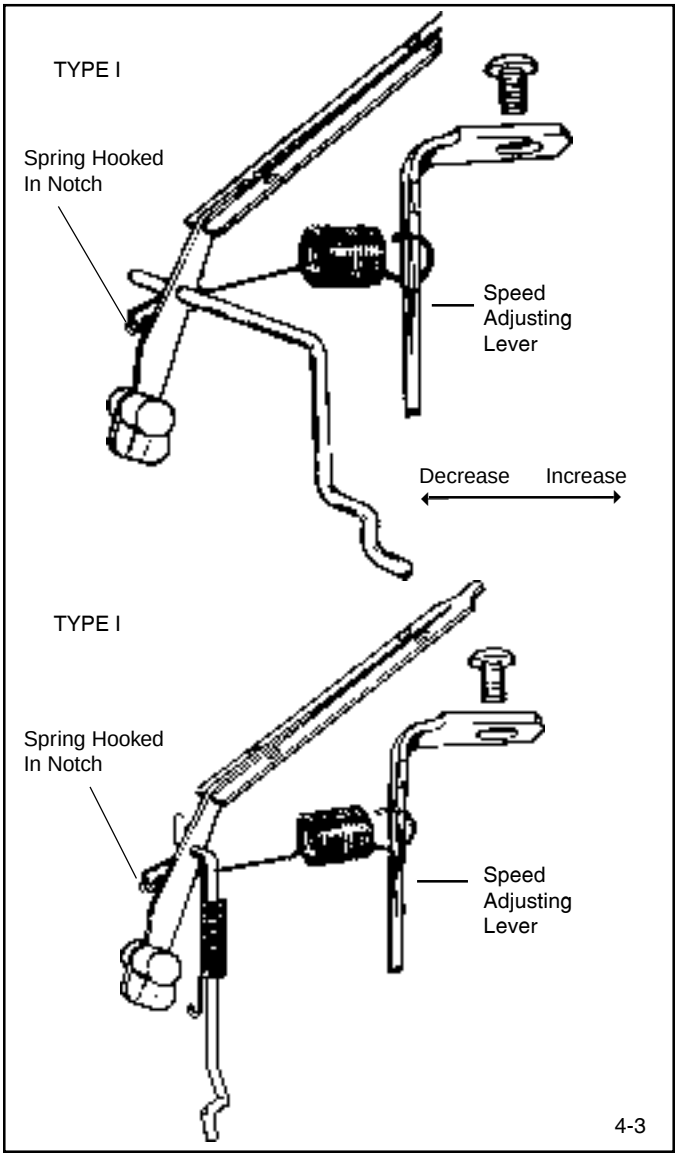
SERVICE

For governor disassembly or assembly procedures see "Service" in Chapter 7.

GOVERNOR ADJUSTMENT

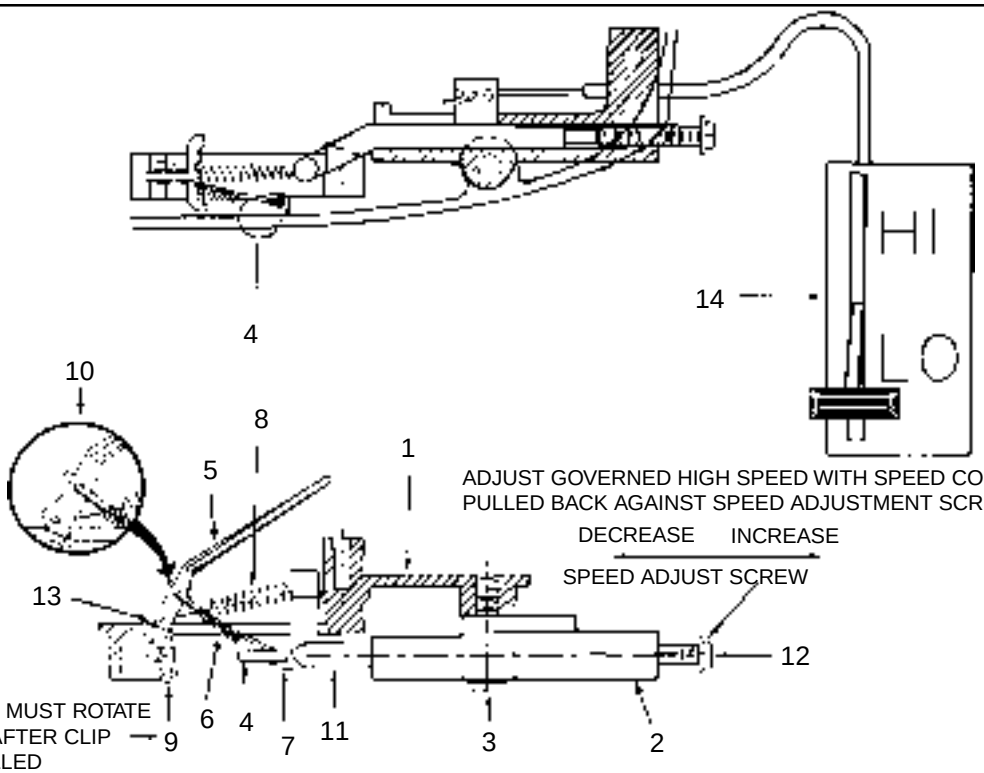
Three different styles of governor systems are used on TC engines. Use the following illustrations (diags. 4-3, 4-4 and 4-5) to identify the governor system used and the following procedure to adjust the governed engine speed.

1. Allow the engine to run for at least 5 minutes to reach the operating temperature. Make sure the air filter (if equipped) is clean and the choke is in the off position.
2. Using a Vibratach (part # 670156) or other tachometer, determine the engine's R.P.M at idle and wide open throttle. Consult microfiche card # 30 or the computer parts lookup to obtain the recommended engine speeds.
3. Using the applicable illustration, either bend the speed adjusting lever toward the spark plug end of the engine to decrease high speed R.P.M., or bend the lever in opposite direction to increase R.P.M. On TC Type II engines, turn the speed adjusting screw out to increase or in to decrease engine high speed R.P.M. If the speed adjustment screw is turned out to increase the engine R.P.M., the speed control lever must be moved to allow the speed control plunger to contact the speed adjustment screw.
4. The low speed is set by moving the throttle control to the lowest speed position and adjusting the low speed adjustment screw on the carburetor.



4-3

TYPE II



ADJUST GOVERNED HIGH SPEED WITH SPEED CONTROL PLUNGER PULLED BACK AGAINST SPEED ADJUSTMENT SCREW

DECREASE INCREASE

SPEED ADJUST SCREW

AIR VANE MUST ROTATE FREELY AFTER CLIP IS INSTALLED

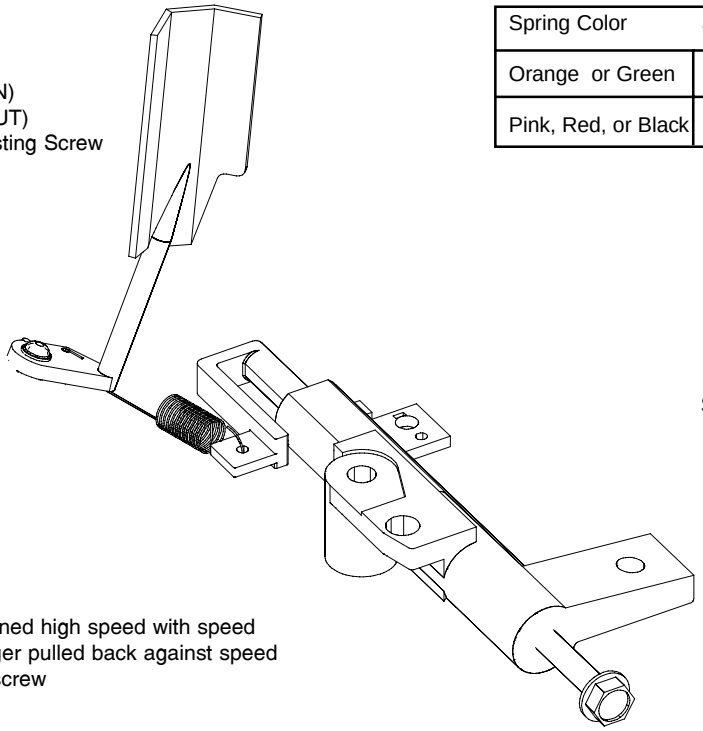
ITEM	DESCRIPTION
1	Base - Housing
2	Body Assy. - Speed Control
3	Screw
4	Throttle Plate
5	Air Vane
6	Spring - Backlash
7	Link - Governor

ITEM	DESCRIPTION
8	Spring - Governor
9	Clip - Spring
10	Spring and Link Attachment
11	Speed Control Plunger
12	Speed Adjustment Screw
13	Notch in Air Vane for Governor Spring Attachment
14	Speed Control lever

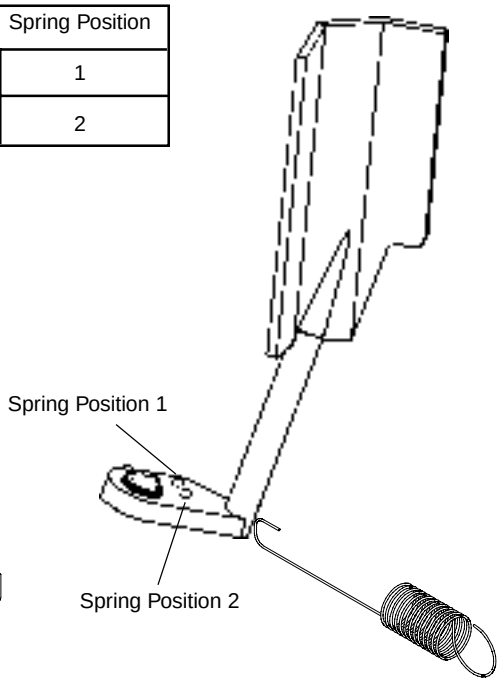
4-4

TYPE II

Decrease (IN)
Increase (OUT)
Speed Adjusting Screw



Spring Color	Spring Position
Orange or Green	1
Pink, Red, or Black	2



Adjust governed high speed with speed control plunger pulled back against speed adjustment screw

4-5

CHAPTER 5 REWIND STARTERS

GENERAL INFORMATION

TC series engines have the recoil assembly as a part of the engine's blower housing. Two different styles of recoil starters are used along with different starter rope locations. Use the engine model and specification number to identify the recoil style and correct replacement parts.

OPERATION

TYPE I

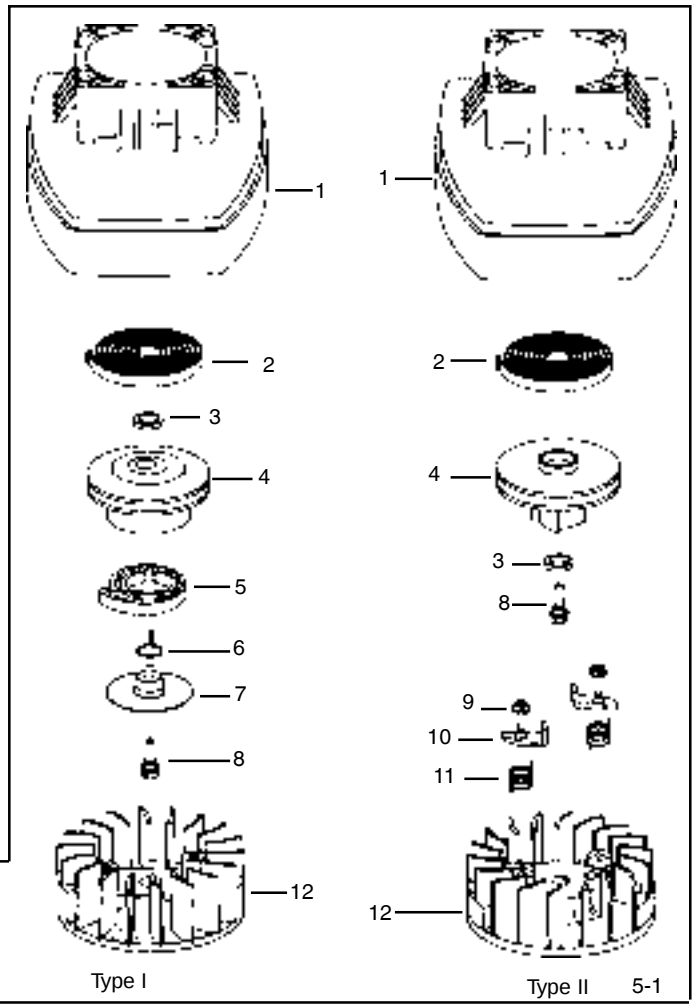
As the starter rope is pulled, the starter pulley rotates on the center leg of the starter. The starter pawl is connected to the starter pulley by an offset hole in the pawl and a corresponding raised boss on the pulley. The pawl has a oversize inside diameter which allows the pawl to be pulled off center. The flat contact surface of the pawl engages with one of the flywheel fins. This engagement turns the flywheel until the engine fires and the flywheel speed exceeds the speed of the starter pulley. The flywheel fins push the pawl (using the ramp side) to the disengaged position. The brake spring slows the pulley and pawl from turning (diag. 5-1).

TYPE II

This starter uses two engagement pawls bolted to the flywheel with shoulder bolts. Each pawl uses an engagement spring to keep the pawl in contact with the pulley hub. The pawls lock into two of the four notched surfaces when the starter rope is pulled. When the engine fires and the flywheel speed exceeds the speed of the starter pulley, the pawls disengage, and centrifugal force keeps the pawls in the disengaged position (diag. 5-1).

COMPONENTS

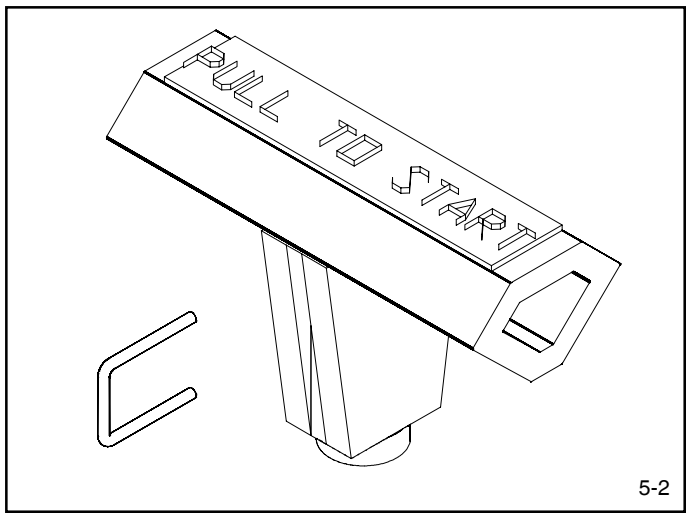
1. Blower Housing
2. Recoil Spring
3. Washer
4. Pulley
5. Pawl
6. Brake Spring
7. Retainer
8. Retainer Screw
9. Dog Screw
10. Starter Dog
11. Pawl Spring
12. Flywheel



Type I Type II 5-1

SERVICE

Starter related problems will require the starter to be removed from the engine to diagnose the cause. On TC Type I engines, try starter operation off the engine to see pawl engagement. Visually inspect the starter pawl, brake spring, retainer, pulley, washer(s) and rope for wear or breakage. Repair or replace as necessary. On TC Type II engines, recoil disassembly is necessary only if the pulley is worn, the recoil will not retract, or the rope needs replacement. Check starter pawl engagement on the flywheel for broken springs, sticking or bent condition, or loose pawl screws.



5-2

DISASSEMBLY PROCEDURE

1. Remove the fuel tank spring and recoil assembly from the engine. On TC Type II engines, the air filter and fuel tank must be removed before the recoil assembly.

2. Release the recoil spring tension on the rope by removing the staple or knot in the starter handle and slowly release the rope into the recoil housing (diag. 5-2).

3. Remove the 5/16" retainer screw. On TC Type I starters, remove the pawl retainer, brake spring, and pawl.

4. Remove the starter pulley. Use caution if removal the recoil spring if necessary.

CAUTION: BE CAREFUL NOT TO PULL THE REWIND SPRING OUT OF THE BLOWER HOUSING WHEN REMOVING THE STARTER PULLEY. THE REWIND SPRING WILL UNCOIL AND EXPAND WITH FORCE IF REMOVED FROM THE BLOWER HOUSING.

ASSEMBLY PROCEDURE

1. Lightly grease the center leg and the area where the rewind spring will rest in the blower housing with "Chem-Lube" or "Lubriplate" (diag. 5-3).

2. Install a new starter spring if necessary. Securely grip the rewind spring a short distance away from the spring tail with a needlenose pliers. Position the rewind spring in the blower housing and hook the spring tail to the housing as shown. Make sure the spring tail is fully seated before slowly releasing the needlenose pliers from the spring. Push the coiled spring into the recessed boss area and discard the spring holder. Apply a thin coating of "Chem-Lube" to the top of the spring (diag. 5-4).

3. Insert the starter rope into the starter pulley and tie a left handed knot in the end of the rope. Wind the starter rope counterclockwise (as viewed from the pulley bottom) on the pulley and place the end of the rope in the notch in the pulley (diag. 5-5).

4. Place the pulley in the blower housing, press down and rotate the pulley until the pulley drops down and catches the end of the rewind spring. On TC Type II models, continue assembly at step 7 (diag 5-6).

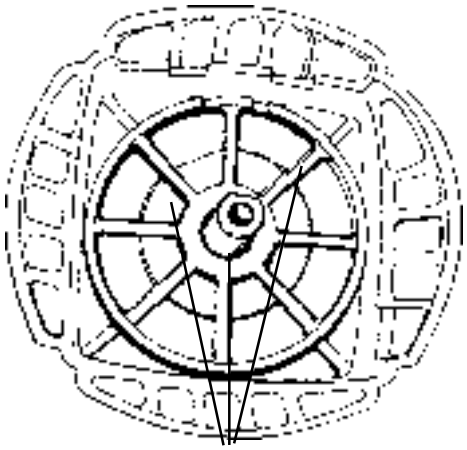
5. Lightly grease the pawl retainer and place the pawl (with the numbers up) on the retainer. Place the brake spring on the center of the retainer with the tab locating the pawl (diag. 5-7).

6. Install the retainer, pawl, and spring assembly on the center leg, locate the notch in the center leg and the tab of the retainer and align when installing (diag. 5-8).

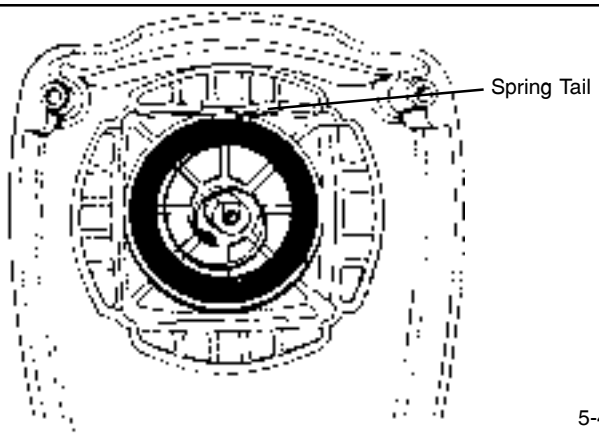
7. Insert the retainer screw and torque to 30-40 inch pounds (3.4 - 4.5 Nm).

8. Use the starter rope or fingers to turn the pulley and pre-wind the recoil spring a minimum of 1 3/4 and a maximum of 2 1/2 turns in a counterclockwise rotation.

9. Feed the starter rope through the starter grommet and secure the starter handle using a left hand knot.



5-3



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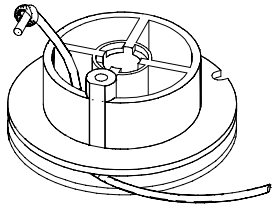
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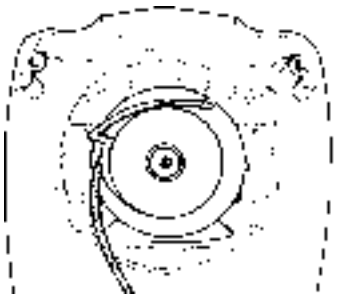
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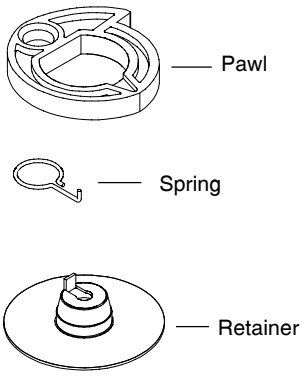

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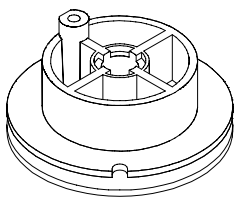
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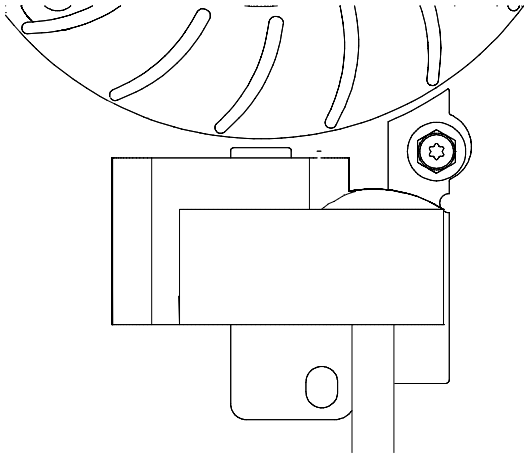
CHAPTER 6 IGNITION

GENERAL INFORMATION

All TC engines are equipped with a solid state ignition module mounted outside the flywheel. The solid state ignition system consists of a flywheel magnet, charge coil, capacitor, a silicon controlled rectifier, a pulse transformer, trigger coil, high tension lead, and a spark plug. All components except the spark plug and high tension lead are located in an encapsulated ignition module. The module is protected by epoxy filler from exposure to dirt and moisture. This system requires no maintenance other than checks of the high tension lead and spark plug.

OPERATION

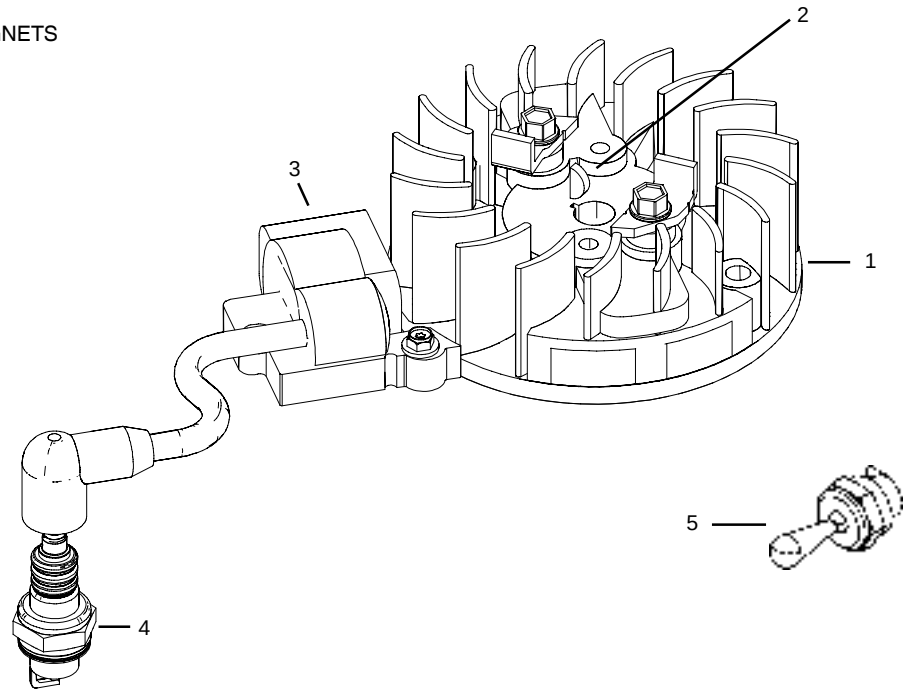
As the magnet in the flywheel rotates past the charge coil, electrical energy is produced in the module. The energy is stored in the capacitor (approx. 200 volts) until it is released by an electrical switch (SCR). As the magnet continues to rotate, it passes past a trigger coil where a low voltage signal is produced. This low voltage signal closes the SCR switch, allowing the energy stored in the capacitor to flow to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage flows along the high tension lead to the spark plug where it arcs across the electrodes and ignites the air-fuel mixture (diag. 6-1).



6-1

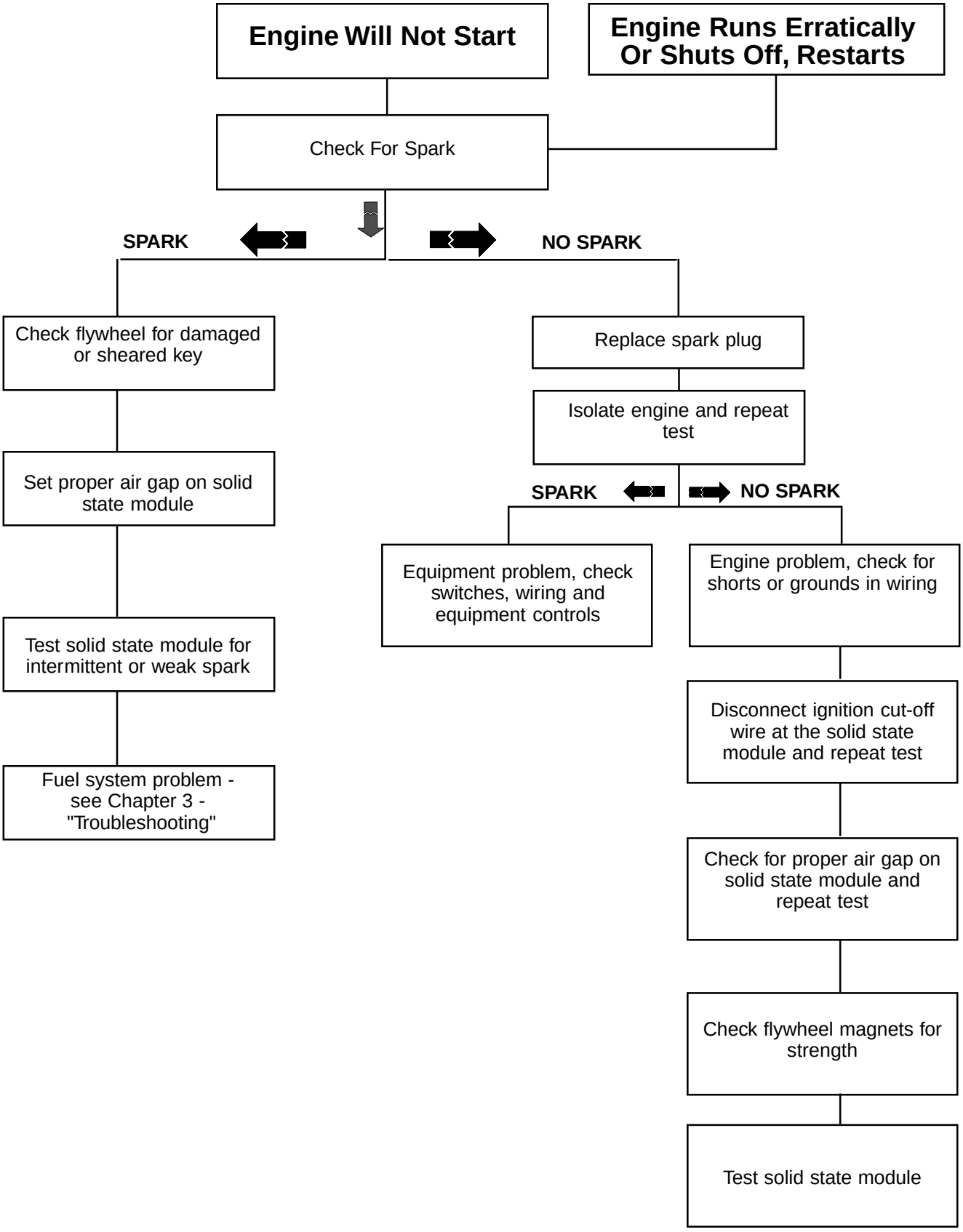
COMPONENTS

1. FLYWHEEL WITH MAGNETS
2. FLYWHEEL KEY
3. IGNITION MODULE
4. SPARK PLUG
5. IGNITION SWITCH



6-2

IGNITION TROUBLESHOOTING



TESTING

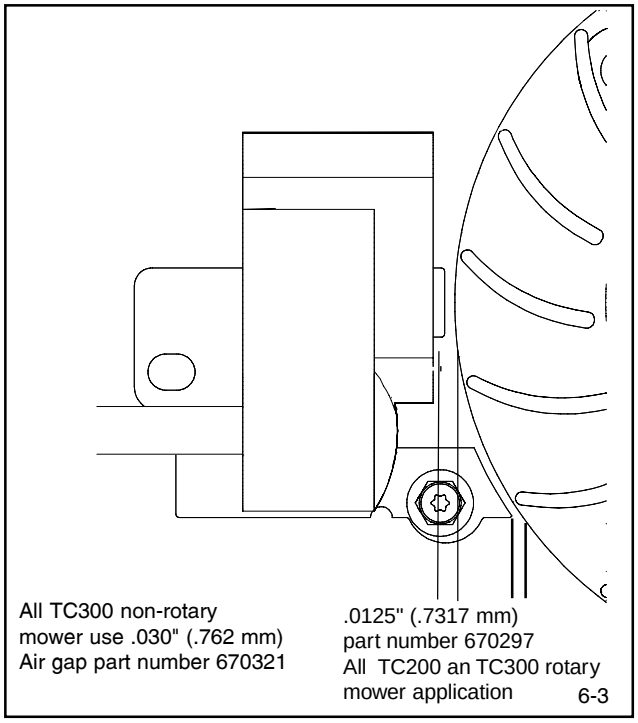
1. Check for spark using a commercially available spark tester and following the tester's recommended procedure.
2. Check the spark plug for cracks in the porcelain, pitted or burned electrodes, excessive carbon build-up and proper air gap setting. Replace if questionable.
3. Check the air gap between the ignition module and the flywheel magnet. See "Service" in this chapter.
4. Disconnect the ignition grounding lead at the ignition coil and crank the engine over. If spark occurs, check the ignition switch or the electrical wiring for shorting to ground. If no spark, test the ignition module using a coil tester or replace the ignition module.

SERVICE

AIR GAP SETTING

Timing on the solid state module is fixed. The air gap dimension between the laminations of the ignition module and the magnet is .0125" (.317 mm) (use gauge part # 670297) for TC 300 rotary mower engines and all TC 200 engines. All other TC 300 applications require a .030" (.762 mm) air gap dimension (use gauge part # 670321). Loosen the module mounting bolts, insert the air gap gauge, hold the module against the flywheel magnets and torque the mounting screws to the specification. Remove the gauge and rotate the flywheel to check for any possible striking points. If none are found, the air gap is set correctly (diag. 6-3).

NOTE: When using the 670321 gauge push the module tight to the flywheel before tightening.



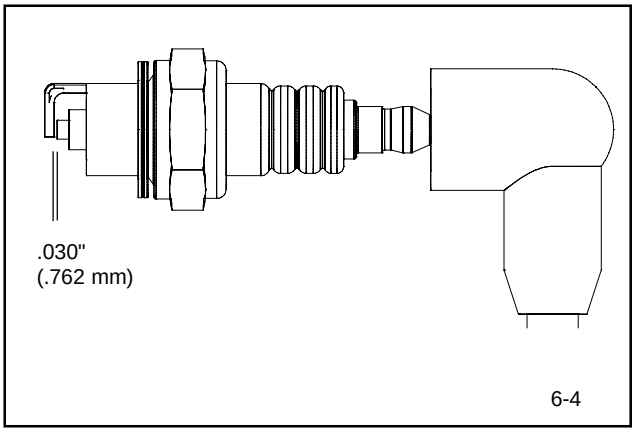
6-3

SPARK PLUG SERVICE

Spark plugs should be removed, cleaned, and adjusted periodically. If the porcelain shows cracking, or the electrodes show evidence of pitting, burning, or excessive carbon build-up, replace the spark plug.

NOTE: DO NOT USE A SAND BLASTER TO CLEAN SPARK PLUGS. MICROSCOPIC PARTICLES LEFT IN THE PLUG CAN SCORE THE ENGINE CYLINDER DURING OPERATION. Use solvent and a wire brush to clean the plug and compressed air to blow out completely.

Consult the Master Parts Manual for the correct spark plug and replace if necessary. Set the spark plug gap at .030" (.762 mm) (diag. 6-4). Install the spark plug in the engine and tighten to 230 inch pounds (2.6 Nm) torque. If a torque wrench is not available, screw the spark plug in as far as possible by hand and use a spark plug wrench to turn the spark plug 1/8 to 1/4 of a turn more if using the old plug, and a 1/2 of a turn more if using a new spark plug.



6-4

CHAPTER 7 INTERNAL ENGINE AND CYLINDER

GENERAL INFORMATION

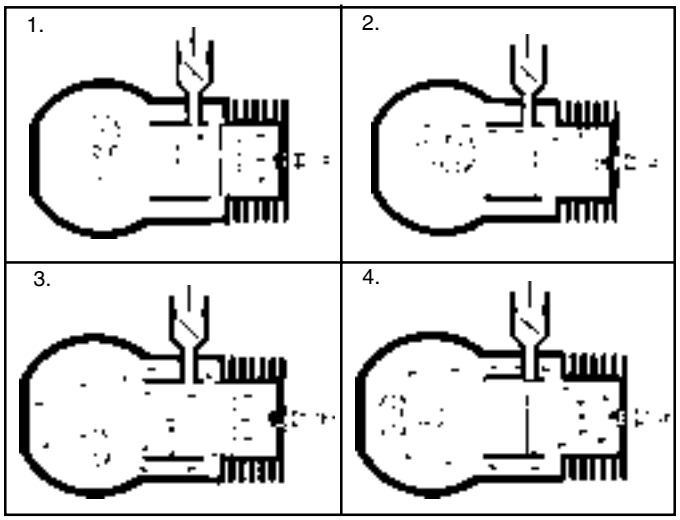
TC series engines use two cycle operation. Two cycle engines provide a higher horsepower to weight ratio than the same size four cycle engines. Two cycle engines use two piston strokes for a complete cycle that occurs every crankshaft revolution, while four cycle engines use four piston strokes and two crankshaft revolutions for a complete cycle.

Lubrication is accomplished through oil mixed in the fuel, and the air / fuel / oil mixture flows into the crankcase during upward piston travel. This mist lubricates all internal bearing surfaces.

OPERATION

A low pressure area is created in the crankcase as the piston moves upward to compress the air / fuel mixture in the cylinder. When the piston moves far enough to uncover the intake port, the air / fuel mixture from the carburetor flows into the engine crankcase due to higher pressure atmospheric air. Just before the piston reaches top dead center (TDC), the spark plug ignites the air / fuel mixture in the cylinder.

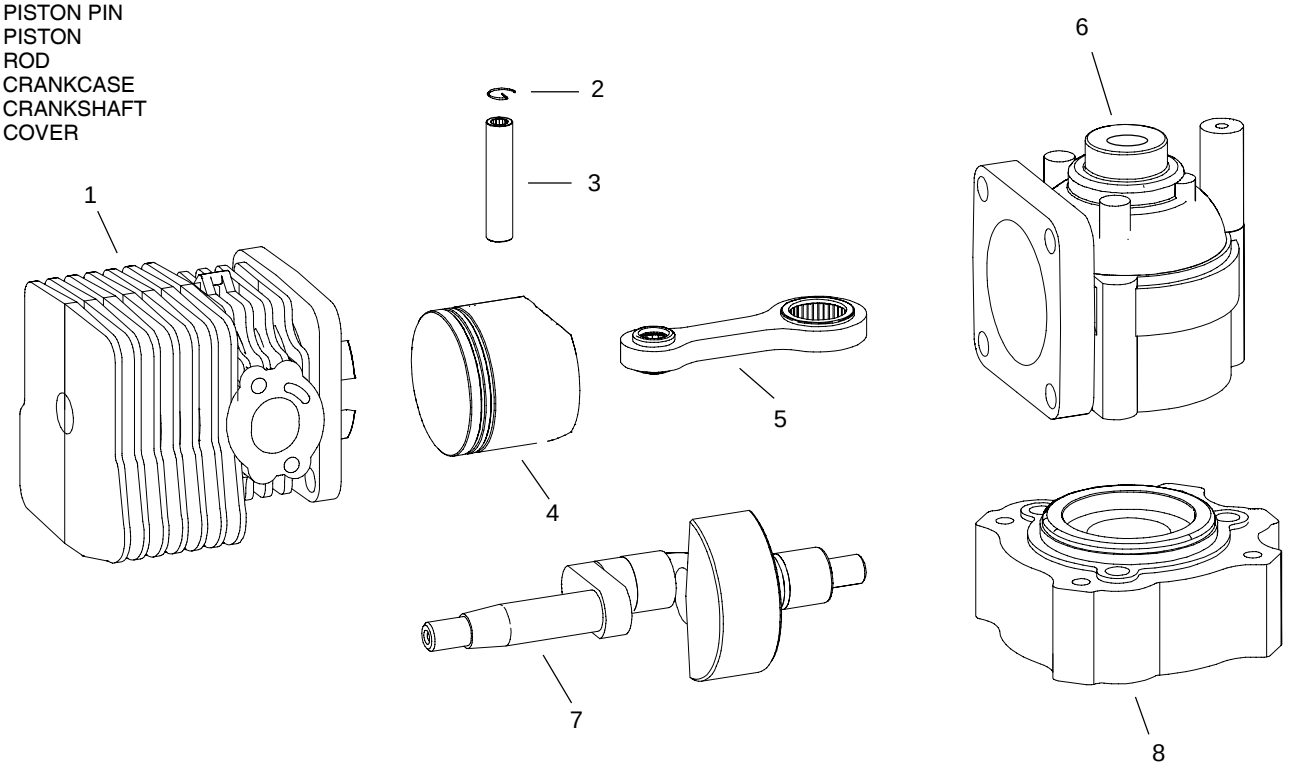
The expanding combustion gases force the piston down. The downward piston travel causes a pressure build-up in the crankcase. The piston uncovers the exhaust port first followed by the transfer ports. The exhaust flows out the exhaust port while the pressurized air / fuel mixture enters the cylinder from the crankcase through the transfer ports. As the piston travels upward the sequence is repeated (diag. 7-1).



7-1

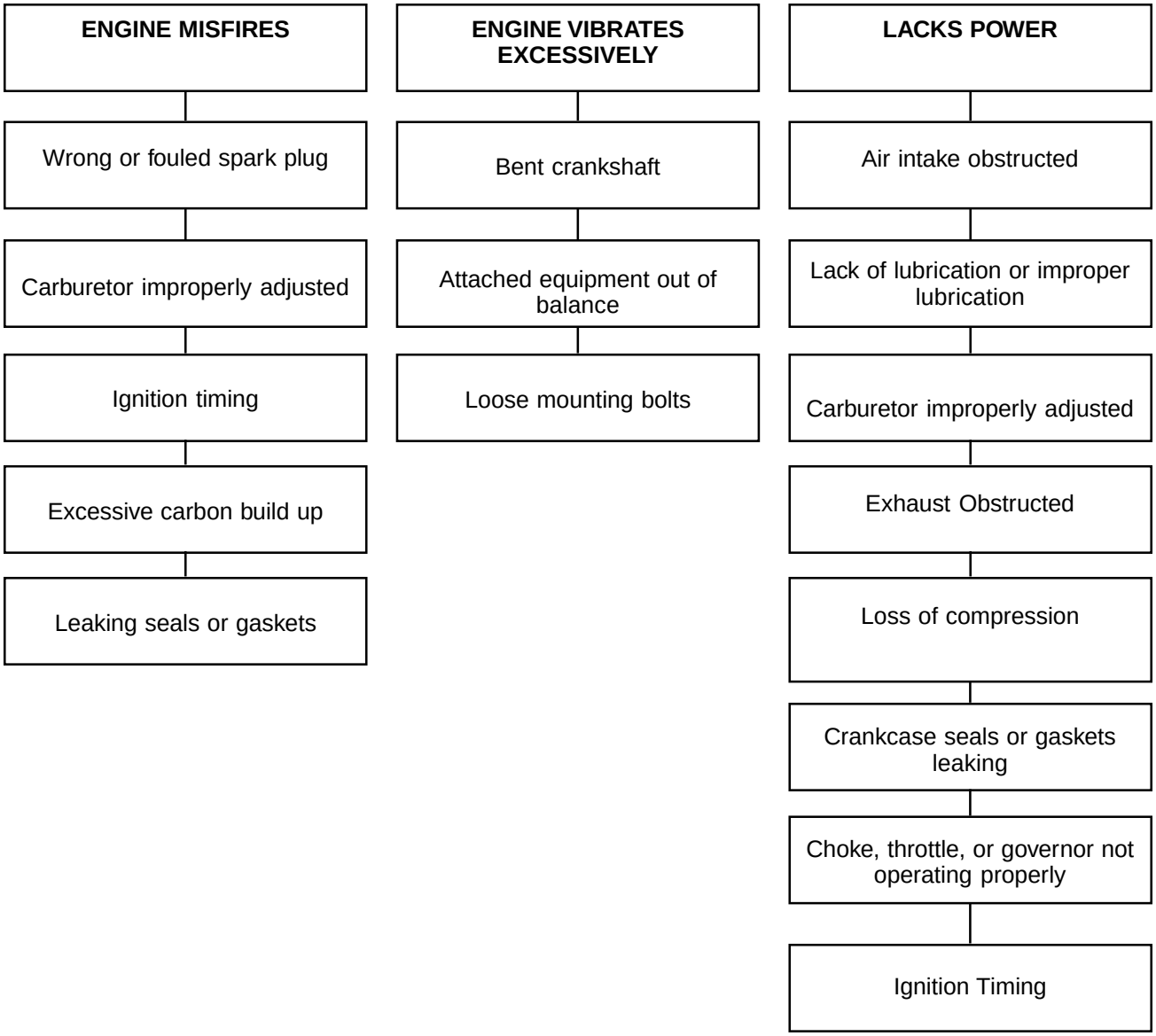
COMPONENTS

1. CYLINDER
2. "G" CLIP
3. PISTON PIN
4. PISTON
5. ROD
6. CRANKCASE
7. CRANKSHAFT
8. COVER

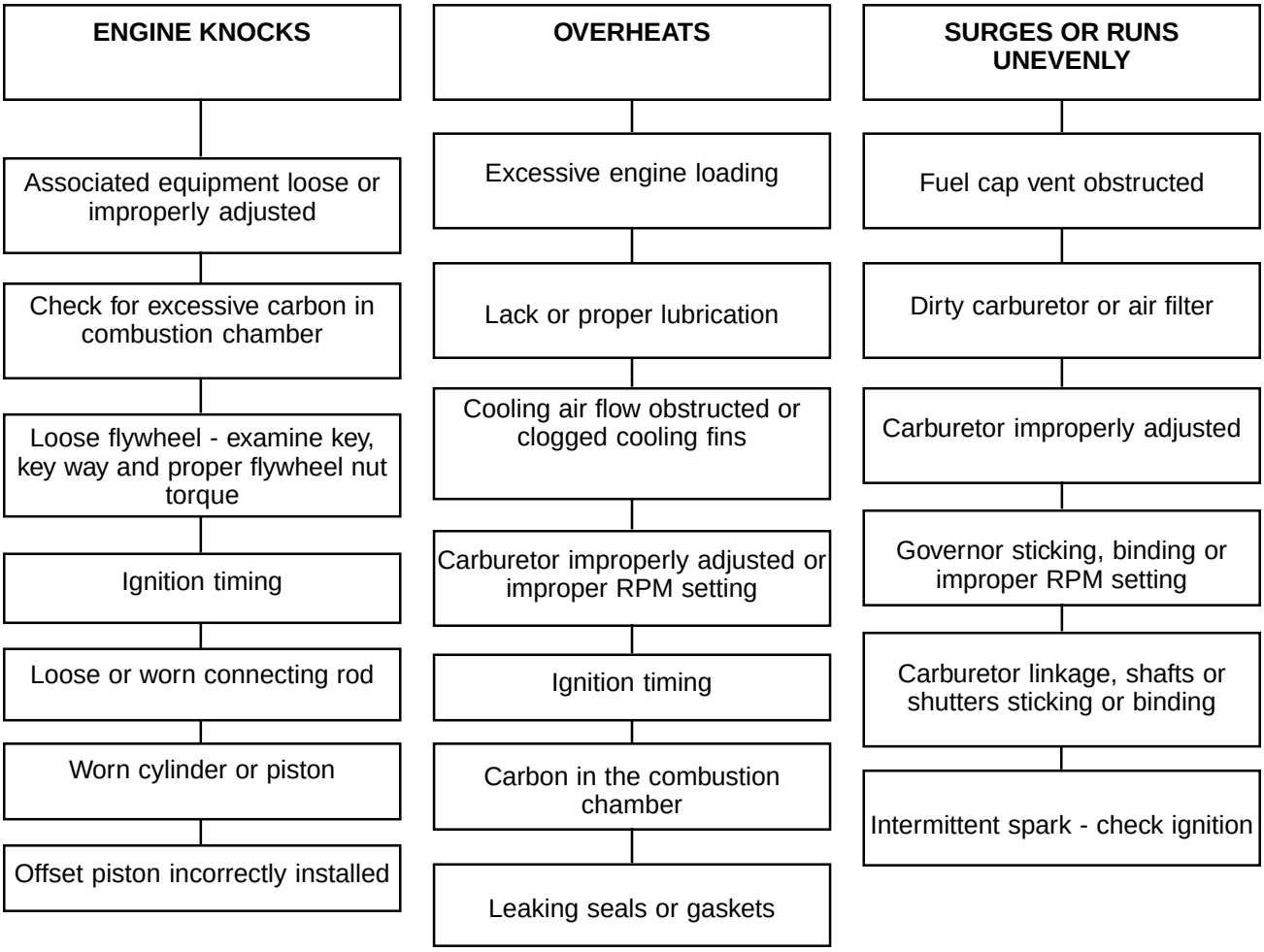


7-2

TROUBLESHOOTING ENGINE OPERATION PROBLEMS



TROUBLESHOOTING ENGINE OPERATION PROBLEMS



TESTING

ENGINE KNOCKS

1. Check the blade hub, adapter, crankshaft coupler or associated equipment for loose fit, loose bolts, or crankshaft key or adapter damage. Re-install and re-torque the bolts to the proper torque.
2. Check the flywheel key and the flywheel and crankshaft keyway for wear or partial shearing. Replace if any damage is evident. Tighten the flywheel nut to the proper torque.
3. Check for the correct ignition module air gap. See Chapter 6 under "Service".
4. Remove the muffler and check for carbon build-up in the combustion chamber and exhaust port. Check the spark plug for the proper reach and heat range (correct spark plug for the engine). Clean carbon build-up if necessary.
5. Check the internal components (piston, cylinder, connecting rod, and crankshaft journal) for excessive clearance using a dial bore gauge, micrometer, and telescopic gauges.

ENGINE OVERHEATS

1. Make sure the engine is not being overloaded. Remove excess load (sharpen blades, limit operation speed, or process less material).
2. Make sure the fuel mixture contains the correct ratio of certified 2-cycle oil to gasoline. Replace the fuel supply if questionable.
3. Check for clogged cooling fins or obstructions to the air flow. Remove the rewind assembly, clean and reinstall.
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 or computer parts lookup according to the engine model and specification number. Adjust as necessary.
5. Remove the muffler and check for carbon build-up in the combustion chamber and exhaust port. Clean as necessary.
6. Check the carburetor for the correct idle mixture adjustment. Clean the carburetor if the problem persists see Chapter 3 under "Service".
7. Check for the correct ignition module air gap. See Chapter 6 under "Service".
8. Inspect the intake gaskets, crankcase seals or gaskets for a leaking condition. Use a commercially available crankcase pressure tester and follow the tester's recommended test procedure. See "Disassembly Procedure " in this chapter for component removal.

SURGES OR RUNS UNEVENLY

1. Check the fuel cap to make sure it is venting. Loosen the cap and retry engine operation.
2. Replace or clean the air filter if applicable.
3. Check the carburetor for the correct idle mixture adjustment. Clean the carburetor if the problem persists see Chapter 3 under "Service".
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 or computer parts lookup according to the engine model and specification number. Adjust as necessary.
5. Visually check all linkages. Check the governor spring for a stretched or damaged condition. Check the governor shaft, throttle shaft, and pivot points for binding.
6. Check the ignition module operation using a gap type tester inserted in the high tension lead. Check for intermittent spark.
7. Inspect the intake gaskets, crankcase seals or gaskets for a leaking condition. Use a commercially available crankcase pressure tester and follow the tester's recommended test procedure. See "Disassembly Procedure " in this chapter for component removal.

ENGINE MISFIRES

1. Check the spark plug for a fouled condition. Replace if questionable.
2. Check the carburetor for the proper adjustments. See "Pre-sets and Adjustments" in this chapter.
3. Check the air gap dimension. Follow the procedure in Chapter 6 under "Service". Use an in-line spark tester to see if the problem is ignition related.

4. Check the flywheel key for partial shearing.
5. Remove the muffler to check for excessive carbon build-up in the combustion chamber or exhaust port.
6. Inspect the intake gaskets, crankcase seals or gaskets for a leaking condition. Use a commercially available crankcase pressure tester and follow the tester's recommended test procedure. See "Disassembly Procedure " in this chapter for component removal.

ENGINE VIBRATES EXCESSIVELY

1. Remove the engine drive and check the attached equipment for an out of balance condition.
2. Check the engine mounting bolts, make sure they are tight.
3. Check the engine crankshaft on the P.T.O. end using a straight edge, square or dial indicator. Blades or adapters must be removed. Any deflection will cause a vibration problem.
4. Check the internal engine for bearing roughness or wear, crankshaft bearing journal wear, or a worn cylinder or piston.

LACKS POWER

1. Check the air intake for an obstruction (dirty filter, saturated filter, or other debris).
2. Check the exhaust for a restriction preventing proper exhaust flow.
3. Check the fuel / oil mixture for the gasoline being fresh and the proper amount and kind of oil used. Replace if questionable.
4. Visually check the operation of the throttle, air vane governor, and choke (if applicable) for restrictions preventing proper movement.
5. Check the carburetor for the correct idle mixture adjustment. Clean the carburetor if the problem persists see Chapter 3 under "Service".
6. Inspect the intake gaskets, crankcase seals or gaskets for a leaking condition. Use a commercially available crankcase pressure tester and follow the tester's recommended test procedure. See "Disassembly Procedure " in this chapter for component removal.
7. Inspect the engine cylinder and ring(s) for a worn condition using an inside micrometer or dial indicator.
8. Check the flywheel key for partial shearing.

SERVICE

GENERAL INFORMATION

TC engines do not have oversize pistons available. If the engine bore diameter exceeds the maximum engine specification and new installed rings exceed the maximum ring end gap, a new shortblock or engine will be necessary. Engines built with needle bearing P.T.O. main bearings have been upgraded to be serviced with P.T.O. ball bearing replacements. Gaskets have replaced Loctite sealant between the engine cylinder and the crankcase. Crankcases that used Loctite sealant between the cylinder cover and the engine crankcase have been upgraded to use an "o" ring in a machined channel. Engines requiring replacement of the cylinder, cylinder cover, crankcase, or piston and rod assembly may require the replacement of the short block or a complete engine. Consult the Tecumseh Master Technician's Parts Manual using the engine model and specification number for replacement part information.

DISASSEMBLY PROCEDURE

1. Remove the high tension lead boot from the spark plug by twisting and pulling.
2. Remove the spark plug using a 3/4" (19 mm) deep well socket.
3. Drain the fuel from the tank by sliding the fuel line clamp off the carburetor fuel fitting (TC type I) or fuel tank fitting (TC type II), twist and pull the fuel line off and drain the fuel into an approved container.

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

4. Remove the two hex nuts on the carburetor studs and remove the air cleaner assembly. On TC type II engines, remove the two screws on the filter cover, the filter element(s), and then the two hex nuts on the carburetor studs. If the carburetor stud loosens; try retightening the hex nuts first, then loosen the nuts.

5. Remove the fuel tank on TC type I engines by unhooking the tank spring. For TC type II engines, remove the self-locking nut and washer on the blower housing stud and remove the fuel tank.

6. Remove the rewind starter assembly by removing three machine screws (diag. 7-3). Remove the rubber plugs.

7. Remove the ignition grounding lead off the ignition module and remove the ignition module using a 1/4" socket or Torx T15 drive.

8. Use the strap wrench (part # 670305) to hold the flywheel and loosen the flywheel nut until it is flush with the end of the crankshaft.

9. Use flywheel puller (part # 670299) to pop the flywheel off the crankshaft taper, unthread and remove the puller. Remove the flywheel nut, washer, flywheel and flywheel key (diag.7-4).

   NOTE: DO NOT USE A KNOCK-OFF TOOL ON THE CRANKSHAFT WHEN REMOVING THE FLYWHEEL. PERMANENT ENGINE DAMAGE MAY RESULT.

10. Mark or note the location of the throttle link, governor spring hook-up, and speed control to aid in assembly. Remove the carburetor, spacer, gaskets, and air baffle if equipped using a 1/4" socket on the carburetor studs.

11. Remove the blower housing base by removing the three 5/16" hex head screws (diag. 7-5).

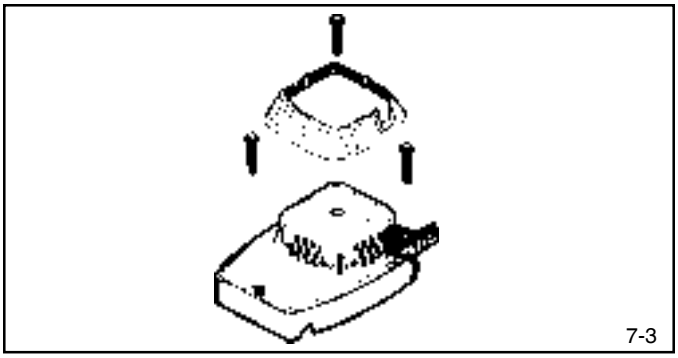
12. Attach the engine tool holder (part # 670300) to the crankcase using the three removed blower housing base hex head screws. Place tool in a bench vise (diag. 7-6).

13. Remove the muffler using a 12" (304 mm) piece of heavy gauge wire with a 1/4" (6.31 mm) hook on one end to pull the muffler spring off (diag. 7-7). A diagram of the wire hook is in the tool section of this manual. On TC type II engines, remove the shoulder bolts holding the muffler on.

14. Note or mark the location of the cylinder to the crankcase and remove the four Torx bolts holding the cylinder to the crankcase using a six inch long Torx T30 driver (part # 670320). Pull the cylinder off squarely using caution so the rod does not bend. Use a 3/8" open end wrench to loosen the four cylinder nuts on early production type I engines (diag. 7-8).

15. Insert seal protector (part # 670301) to protect the flywheel end oil seal and seal protector (part # 670303) for the P.T.O. end oil seal (diag. 7-9).

16. Remove the crankcase cover screws and remove the cover. On TC type II engines with a ball bearing in the cover, the cover and crankshaft will be removed as an assembly.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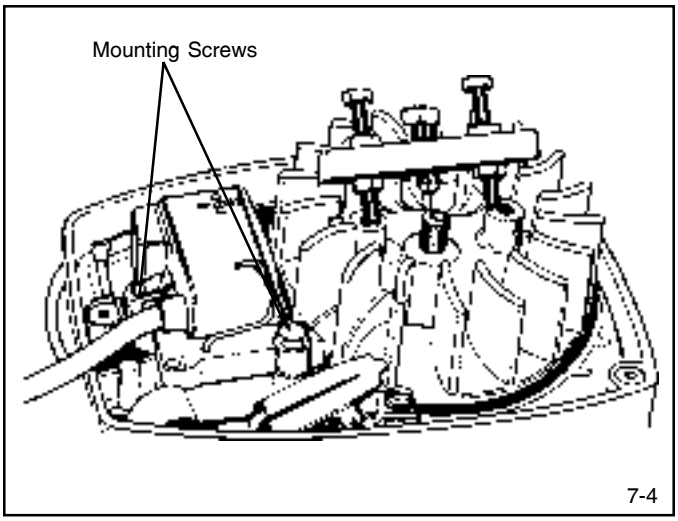

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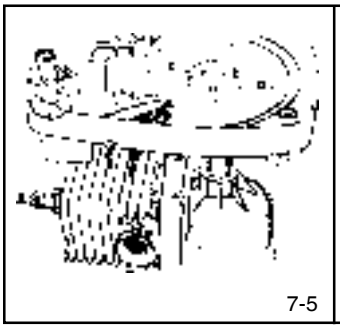
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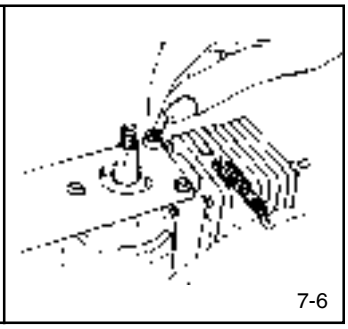
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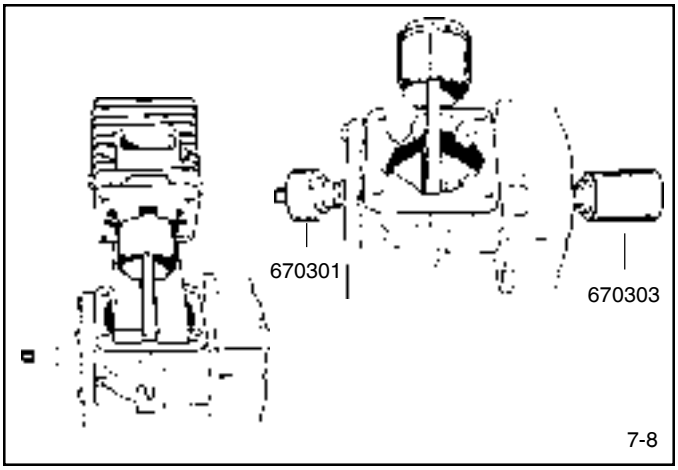


7-8

17. Turn the crankshaft to the 90° past the top dead center (T.D.C.) position and remove the crankshaft out of the crankcase opening while sliding the connecting rod off the crankpin and crankshaft. TC type II engines use a pressed in mechanically retained needle bearing in the connecting rod. Older TC engines use loose crankpin needle bearings, make sure to collect all 23 needle bearings. Engines built after Aug. 1995 may also use loose needle bearings (grease retained), 36 needles are required (diag. 7-9).

18. Use a bearing splitter and an arbor press to remove the ball bearing and cover assembly from the crankshaft on TC type II if necessary.

19. Remove the oil seals by supporting the area around the seal and using a small punch or screwdriver to drive out the seal.

BEARING AND SEAL SERVICE

The crankcase and crankcase cover oil seals can be removed by prying out or tapping out with a screwdriver. On older TC engines, a retainer ring must be removed with a pick before the crankcase bearing can be pressed out (diag. 7-10).

Remove the needle bearing by using the bearing installer tool (part # 670302) inserted from the outside to drive the bearing out.

To install a new bearing in the engine crankcase, place a new caged needle bearing on the installation tool (part # 670302). Use bearing installation tool (part# 670304A) for installing the crankcase cover caged needle bearing. Place the printed side of the bearing toward the installation tool. Lightly oil the outside of the bearing and the crankcase bearing bore. Press the bearing into the crankcase until the tool is flush with the crankcase or cover housing. Insert the retainer ring if applicable (diag. 7-11).

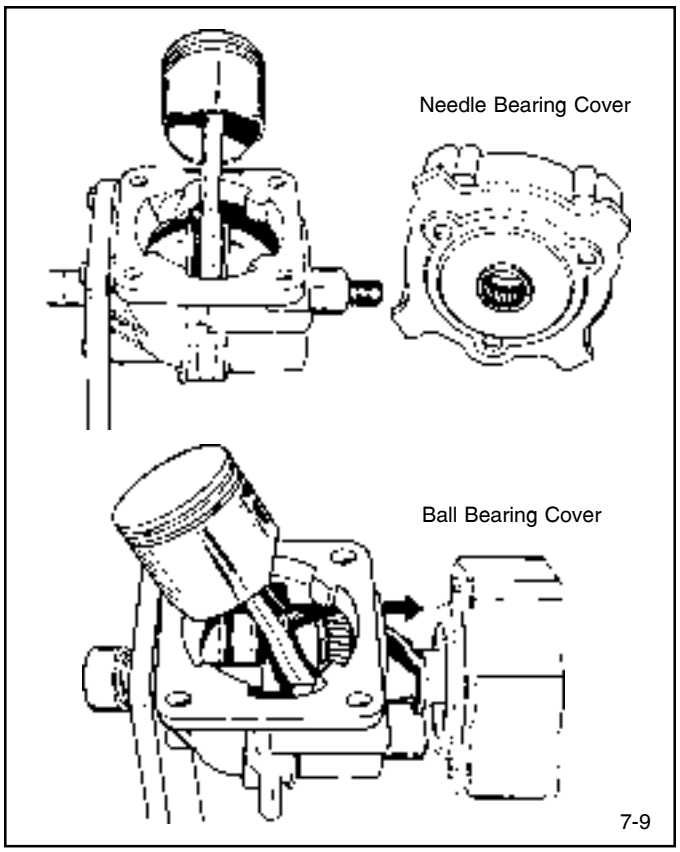
Install a new crankcase oil seal using seal protector / installer (part # 670301). Use seal installer (part # 670303) to install the crankcase cover oil seal. The metal case of the seal goes onto the seal protector first. Lightly oil the outside of the seal. Press the tool and seal in until the tool is flush with the crankcase (diag. 7-12).

Later production TC engines have a step machined in the crankcase and crankcase cover bearing area. This change eliminated the need for a retainer ring. The bearing and seal installation tools (part # 670302, 670303, 670304A) can be used with either style of crankcase cover. The installation tools place the bearing in the cover or the crankcase to the proper depth.

Models equipped with a ball bearing in the crankcase cover can have the ball bearing removed using an arbor press with support placed near the bearing diameter. Press the bearing out of the cover from the outside, pushing the bearing away from the machined step.

A new crankcase cover ball bearing can be installed using an arbor press. Press the bearing in until the bearing is flush and the bearing contacts the machined step.

Seal protector / installer part # 670303 should be used to install a new oil seal in the crankcase cover.



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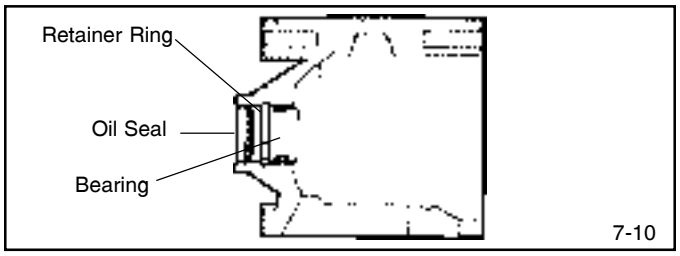
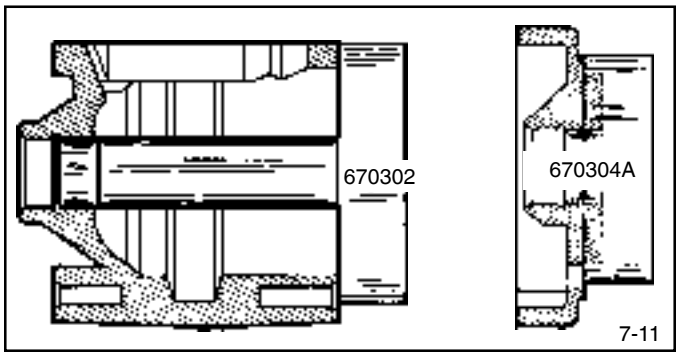


7-10



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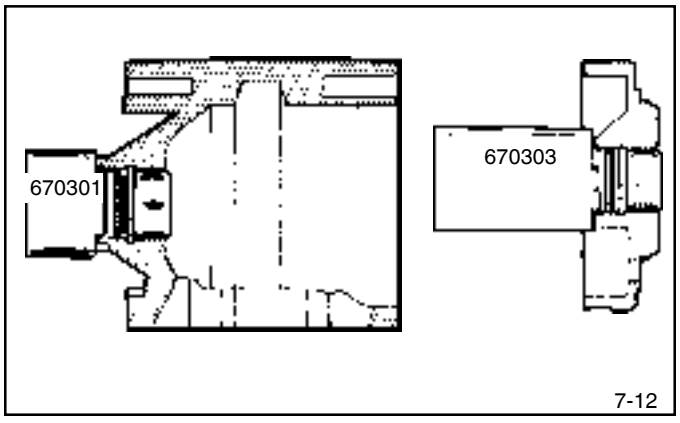


7-12

ASSEMBLY

1. Remove old gasket material. Be careful not to damage scratch or burr the sealing surfaces. Clean the crankcase, cylinder, piston assembly, crankshaft, and crankcase cover using cleaning solvent and blow dry with compressed air (diag. 7-13).

2. On TC type II engines with a ball bearing on the P.T.O. end, assemble the crankshaft into the cylinder cover. Place a drop of 680 Loctite in the crankshaft groove, position supports under the cylinder cover, and using an arbor press, press the shaft into the bearing until it bottoms on the bearing.

3. Install the crankshaft and piston assembly into the crankcase at the same time. Install a new bearing strip on the crankpin or grease retain the loose needles if applicable. If the piston has an arrow on top, the arrow must point toward the exhaust port side of the engine. If the piston does not have an arrow, the piston and rod assembly must have the wrist pin retainer facing the P.T.O. side of the engine. Position the crankshaft crankpin at 90° to top dead center while sliding the piston assembly over the crankshaft. Do not use force positioning the assembly (diag. 7-14).

4. Install either a new crankcase cover "O" ring and lightly oil if one was originally used, or apply Loctite # 515 gasket sealant eliminator (Tecumseh part # 510334) to the crankcase surface to seal the crankcase cover. Apply a continuous bead of Loctite (.062" [1.57 mm] bead width) on the crankcase surface. The bead must completely surround the tapped holes for the cover. Loctite must not enter the crankcase (diag. 7-15).

5. Align the crankcase cover to the proper position using the mounting bolts as a guide. Do not allow the cover to rotate while assembling. Tighten the bolts to achieve 70 - 100 inch pounds (7.9 Nm - 11.3 Nm) of torque.

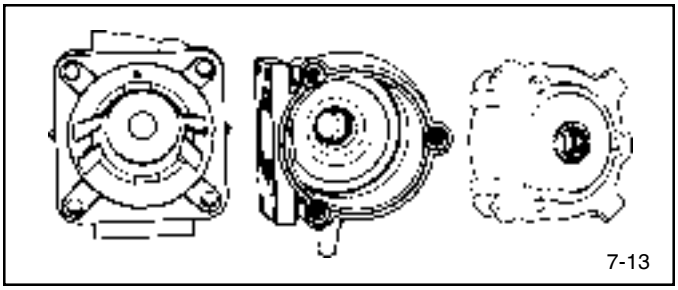
6. Install the crankcase oil seal using seal protector (part # 670301) on crankcase oil seal. The metal case of the seal must face toward the tool. Press the tool flush to the crankcase.

7. Install crankcase cover oil seal using seal protector / installer part # 670303 to protect the oil seal during installation. The metal case of the seal must face toward the tool. Press the tool flush to the cover.

8. Apply mineral spirits or kerosene to the crankpin bearing and rotate the crankshaft to dissolve the wax of a new needle bearing strip. Apply engine oil and rotate the crankshaft to displace the grease used to hold the needles in place on grease retained crankpin bearings.

9. Install cylinder gasket (notched edge toward the cylinder cover and the exhaust port side of cylinder), or apply a .062" (1.57 mm) bead of Loctite # 515 to the cylinder crankcase surface if Loctite was originally used. The Loctite bead must completely surround the cylinder bolt holes. Loctite must not be allowed to enter the crankcase.

10. Use a piston and rod holder (dimensions are in Chapter 9 tool section) to prevent damage to the rod when installing the cylinder. Make sure the ring end gaps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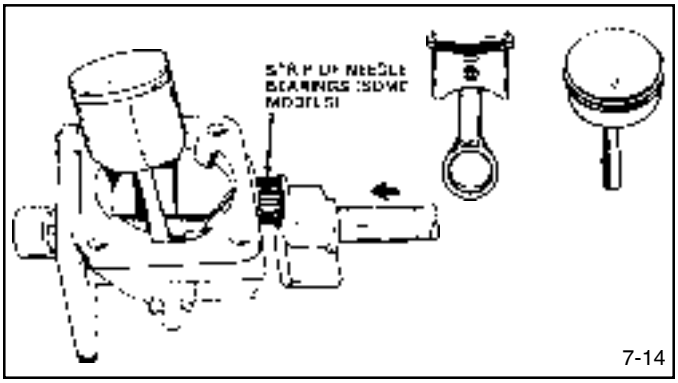
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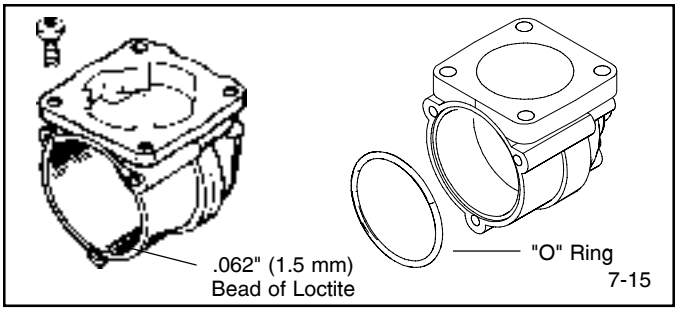
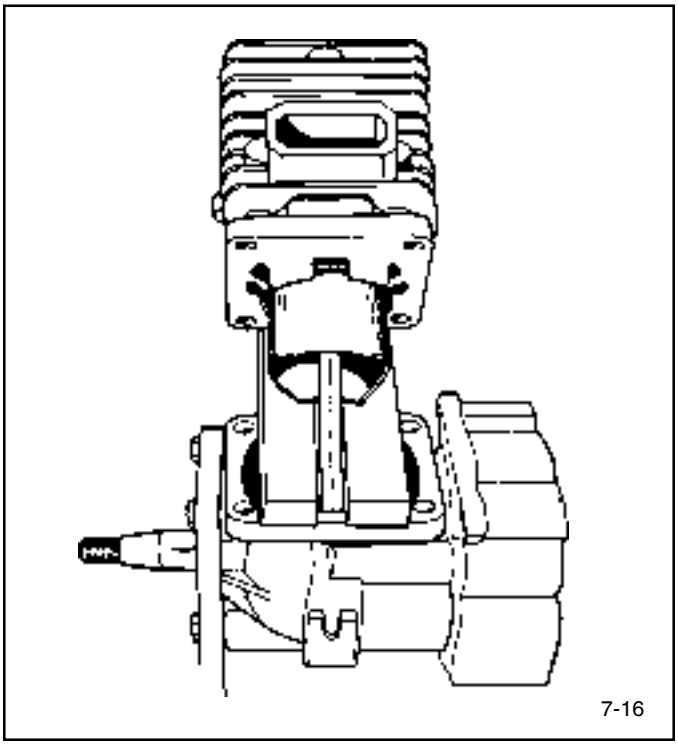


7-15


7-16

are staggered and the cylinder is in the correct position. Use fingers to compress the piston rings and push the cylinder onto the piston. Do not rotate or twist the cylinder (diag. 7-16).

11. Install Torx bolts and alternately torque the bolts to 80-95 inch pounds (9.04 Nm - 10.7 Nm), or on engines with studs instead of bolts: push the cylinder down to a depth where the nuts can be started on the studs. Finger tighten the nuts, use a wrench to snug, and torque the nuts to 70 -100 inch pounds (7.9 Nm - 11.3 Nm) using a crowfoot on the torque wrench.

12. Install the exhaust gasket, muffler, spark arrestor if applicable, bolts or muffler springs. Torque the muffler bolts to 85 - 105 in. lbs (9.6 Nm - 11.8 Nm) of torque if applicable. The longer ends of the springs hook into the bosses on the cylinder. Use heavy gauge wire (as shown in the tool section) to stretch and hook the muffler springs (diag. 7-17). Install the muffler heat shield if applicable. Remove the engine holder.

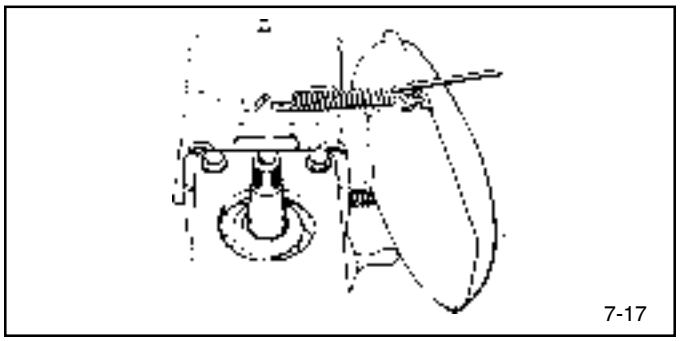
13. Attach the blower housing base using the three screws removed from the engine holder and torque the screws to 30-40 inch pounds (3.3 Nm - 4.5 Nm).

14. On TC type I models, install the governor air vane assembly into the blower housing base as shown. Some models use a spring clip to hold the air vane in position. Insert and tighten the speed adjusting lever holddown screw to the blower housing base. Hook the long end of the governor spring into the notch on the neck of the air vane. The short end hooks into the hole in the speed adjusting lever as shown (diag. 7-18).

15. Insert one end of the throttle link in the hole in the air vane and the other end in the hole closest to the throttle shaft. Install the air baffle if equipped, gaskets, spacer, and carburetor. Assemble gaskets correctly, do not plug the pulse passage. Torque the bolts to 30-40 in.lbs. (3.3 Nm - 4.5 Nm). On TC type II models, attach and torque the air vane to the carburetor throttle shaft before installation. Hook the long end of the governor spring in the hole in the air vane and the short end in the hole in the speed control bracket. The spring hooks from beneath both components. Use the illustration (diag. 7-19) and the following spring location chart if the air vane has more than one governor spring hole and uses a colored spring with a square and round end.

SPRING COLOR	SPRING POSITION
Orange or Green	1
Pink, Red, OR Black	2

16. Install the flywheel key and flywheel. Install the flywheel washer and nut, use a strapwrench (part# 670305) to hold the flywheel, and torque the nut to 15-20 foot pounds (1.6 Nm - 2.2 Nm).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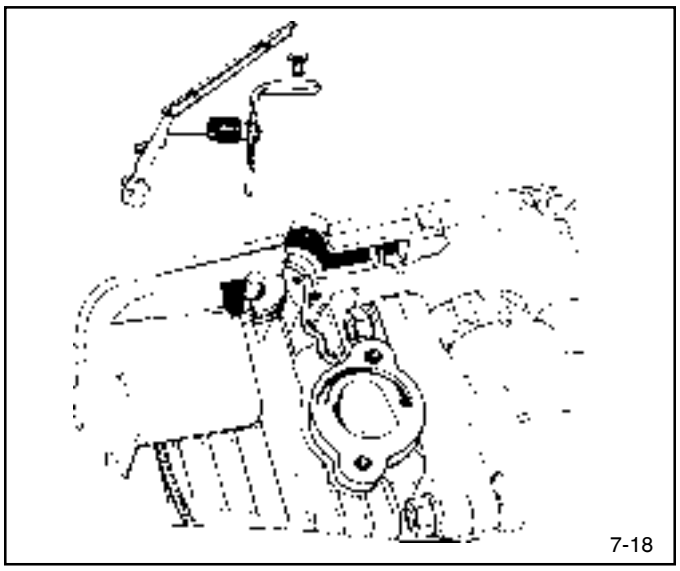
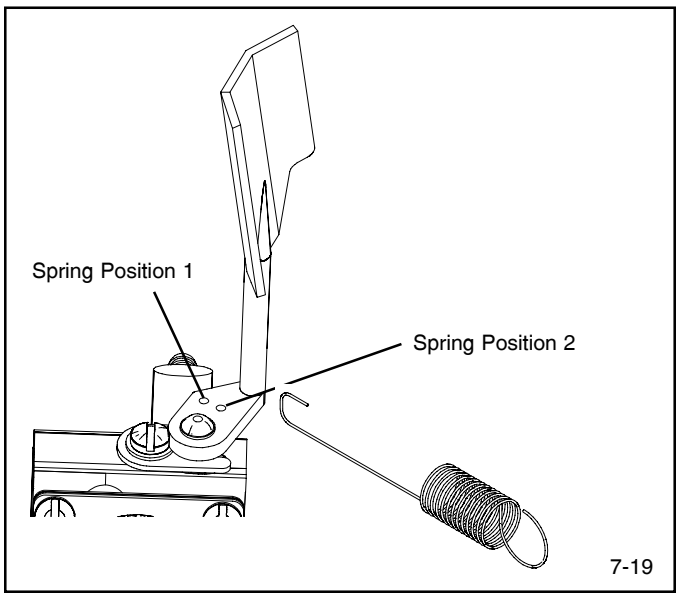

7-18



7-19

17. Attach the ignition module, use the proper air gap gauge between the flywheel magnets and the module laminations (TC300 rotary mower applications and all TC 200 models use air gap .0125" (.317 mm) part # 670291. All other TC 300 engine applications use a 030" (.762 mm) air gap or part # 670321). Torque the module mounting screws to 30-40 inch pounds (3.3 Nm - 4.5 Nm). Remove the air gap gauge, rotate the flywheel to assure it does not strike the ignition module. Attach ignition grounding lead to the module terminal (diag. 7-20).

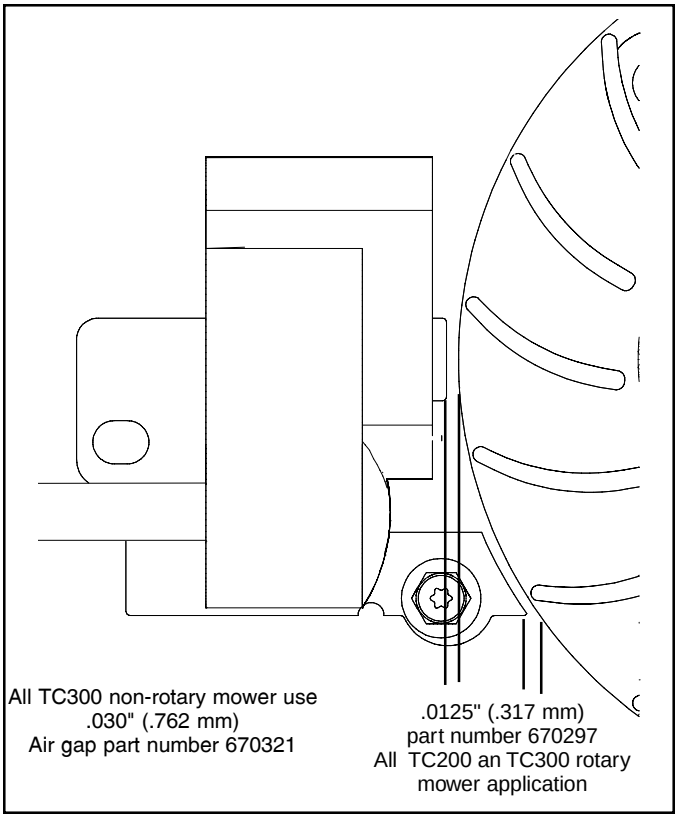
    NOTE: When using .030" (.762 mm) air gap gauge, it is critical to push the module against the flywheel magnet before tightening the mounting screw.

18. Install the blower housing and rewind assembly. Replace the debris guard if applicable.

19. Connect the fuel line at the carburetor, position the fuel line clamp on the fuel fitting, and attach the fuel tank to the engine using the mounting spring. On TC type II engines, hook the upper fuel tank mounting tab over the blower housing stud and the carburetor studs. Make sure the "O" ring is in position between the fuel tank and the carburetor. Tighten the retaining nuts, install filter(s), and attach the air cleaner cover.

20. Reset the governor and / or speed control using the procedure in Chapter 4 under "Service".

21. Install the spark plug and connect the high tension lead.



CHAPTER 8
ENGINE SPECIFICATIONS AND SEARS CRAFTSMAN CROSS-REFERENCE

TC TORQUE SPECIFICATIONS

The torque specifications listed in this chart are to be used for replacing components after disassembly, not for checking an existing engine bolt torque. Checking a torque value on a new or used engine may be lower due to torque relaxation that occurs on all engines from thermal expansion and contraction. However, sufficient clamping force exists and a re-torque is not necessary.

	Inch lbs.	Ft. Lbs.	Nm
Crankcase Cover to Crankcase	85	7	10
Cylinder Block to Crankcase	88	7	10
Spark Plug	230	19	26
Flywheel Nut	210	17.5	24
Solid State Mounting Bolts	35	3	4
Blower Housing Base to Crankcase	35	3	4.0
Starter Retainer Screw	35	3	4
Carburetor to Block	35	3	4
Air Vane to Carburetor	4	-	.5
Starter Pawl to Flywheel	73	6	8.5
Muffler to Cylinder	95	8	11
A/C Cover TC Type II	4	-	.5
Filter/Tank to Carburetor	23	2	2.6
Fuel Tank to Housing	23	2	2.6
Type II Speed Control to base	35	3	4

ENGINE SPECIFICATIONS

All Dimensions are in inches	TC200		TC300	
	US	Metric mm	US	Metric mm
HP (Approx.)	1.6	1.19 Kw	2.0	1.49 Kw
Bore	1.4370 1.4380	36.49 36.52	1.7495 1.7505	44.43 44.46
Stroke	1.25	31.7	1.25	31.7
Displacement (in^2) (cc)	2.0	32.78 cc	3.0	49.17 cc
Spark Plug Gap	.030	.762	.030	.762
Ignition Module Air Gap	.0125	.317	.030 Note (A)	.762
Piston Ring End Gap	.004 .014	.101 .355	.005 .015	.127 .381
Piston Diameter	1.4330 1.4345	36.398 36.436	1.7450 1.7465	44.303 44.361
Piston Ring Groove Width Top/Bottom	.0485 .0495	1.231 1.257	.0485 .0495	1.2319 1.2573
Piston Ring Width	.046 .047	1.168 1.193	.046 .047	1.1684 1.1938
Crankpin Journal Diameter	.5985 .5990 Note (B)	15.201 15.214	.5985 .5990 Note (B)	15.201 15.214
Main Bearing Diameter P.T.O. Side	.6248 .6253 Note (C)	15.869 15.882	.6248 .6253 Note (C)	15.869 15.882
Main Bearing Diameter Flywheel	.4993 .5003	12.682 12.702	.4993 .5003	12.682 12.707
Crankshaft End Play	.004 .012 Note (D)	.1016 .305	.004 .012 Note (D)	.1016 .305

Note (A) *- TC300 rotary mower applications use .0125" (.317 mm) air gap.*
Note (B) *- Mechanically retained needle bearings use .6850/.6855 (17.399 mm / 17.411 mm) or .6870/.6875 (17.449 mm / 17.462 mm)*
Note (C) *- Check to determine bearing diameters .7498/.7503 (19.044 mm / 19.057 mm), .6695/.6699 (17.005 mm / 17.015 mm), .5898/.5903 (14.980 mm / 14.993 mm)*
Note (D) *- Engine with P.T.O. ball bearings no end play.*

SEARS CRAFTSMAN CROSS REFERENCE

143.681001	TC300	3010A
143.681021	TC300	3013A
143.941600	TC200	2103C
143.961670	TC200	2124D
143.961672	TC200	2103D
143.971670	TC200	2103E
143.971674	TC200	2124E
143.972070	TC300	3153E
143.982070	TC300	3176F
143.982072	TC300	3173F
143.992070	TC300	3187F
200.651001	TC200	2019C
200.681001	TC300	3010A
200.681021	TC300	3013A
200.681061	TC300	3021A
200.691001	TC300	3019A
200.691011	TC200	2040D
200.701011	TC200	2045E
200.701021	TC300	3027B
200.701031	TC300	3013B
200.701041	TCH300	3305
200.701051	TC300	3031B
200.711021	TCH300	3305A
200.711031	TC300	3013C
200.721001	TC200	2103
200.731031	TC300	3013E

CHAPTER 9 EDUCATIONAL MATERIALS AND TOOLS

AVAILABLE TECHNICIAN'S HANDBOOKS

692508
Covers the diagnosis and repair of Tecumseh 2-cycle engines. Except the TC Engine and TVS840.

692509
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

691462A
Covers the diagnosis and repair of Tecumseh 4-cycle large frame engines.

691218
Covers the diagnosis and repair of Peerless® power train components.

694782
Contains technical information for the repair of the TC series, 2-cycle engines.

694988
Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.

695244A
Covers the diagnosis and repair of the OVRM/OVM/OHM/OHV 4-cycle overhead valve engines.

695578
Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

AVAILABLE FOREIGN TECHNICIAN'S HANDBOOKS

694732 Spanish
This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

695555 Spanish
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695657 German
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695562 French
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

VIDEO PROGRAMS

695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS

INSTRUCTIONAL GUIDE

692738
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS

695590
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

CARBURETOR TROUBLESHOOTING BOOKLET

695907
This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903
This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

SPECIAL TOOLS BOOKLET

694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET

695933
This booklet contains the quick reference information found on Tecumseh wall charts.
This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

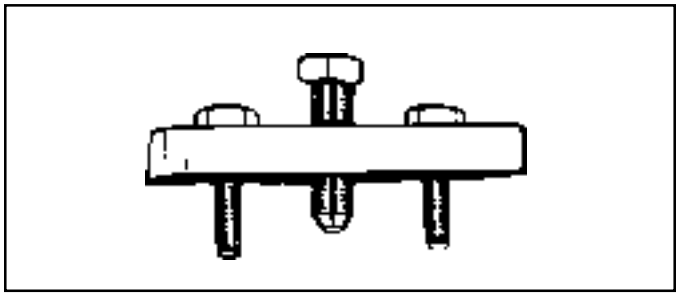
TESTER BOOKLETS

694529
Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

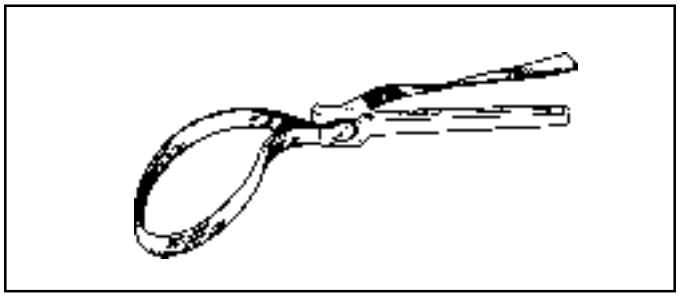
694530
Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

TOOLS

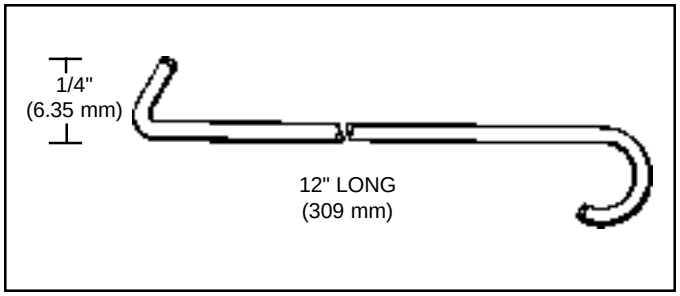
FLYWHEEL PULLER **670299**



STRAP WRENCH **670305**

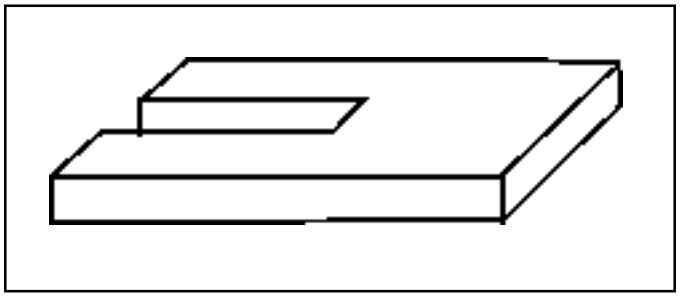


HEAVY GAUGE WIRE HOOK FOR REMOVING MUFFLER SPRINGS



PISTON AND ROD HOLDER

A piece of 3/8" (9.5 mm) wood, 1-1/2" (38.1 mm) wide by 4" (101 mm) long with a slot 3/8" (9.5 mm) wide by 2" (50 mm) long cut out of the center will hold the piston and rod.



ENGINE HOLDER **670300**

To assist in reassembly of the engine block and it's components an Engine Holder, part number 670300, has been developed. Attach to the crankcase of the engine with the blower housing base screws and insert the other end into a bench vise to hold crankcase while inserting engine components.

670300

AIR GAP GAUGE **670297**

Used on all TC200 and all TC300 engines used on rotary mower applications.

AIR GAP GAUGE .0125 (.317 mm)

PART NO. 670297

AIR GAP GAUGE **670321**

Used on TC300 non-rotary mower engine applications.

AIR GAP GAUGE .030 (.762 mm)

PART NO. 670321

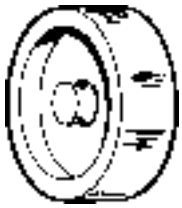
SEAL PROTECTOR AND INSTALLER **670303**

Used on the PTO oil seal.

670303

BEARING INSTALLER **670304A**

Used to install the PTO bearing.



670304A

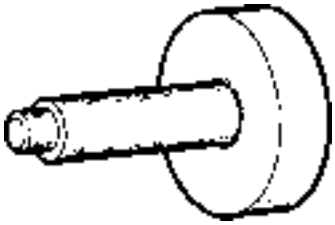
SEAL PROTECTOR AND INSTALLER **670301**

Used on the flywheel end oil seal.

670301

BEARING INSTALLER **670302**

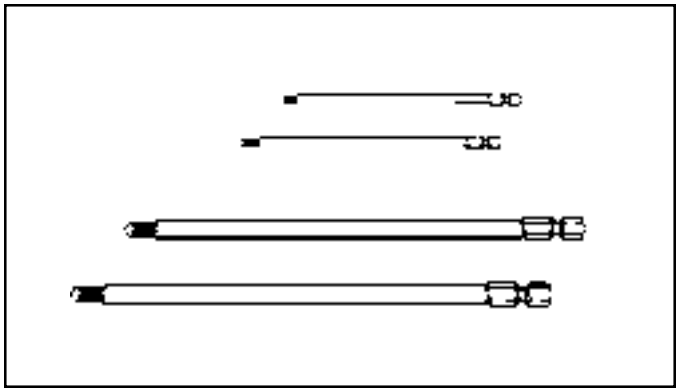
Used to install the bearing in the flywheel end.



670302

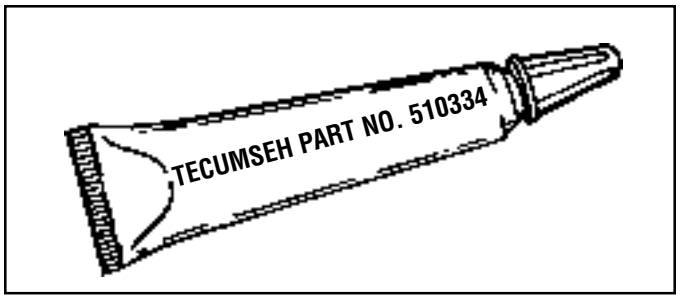
TORX DRIVERS

Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320

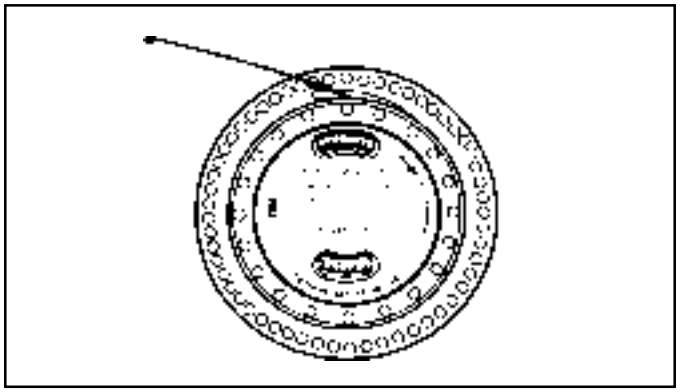


SPECIAL PART **510334**

Loctite Gasket Sealant Eliminator No. 515 will be sold by Tecumseh under the part number 510334.

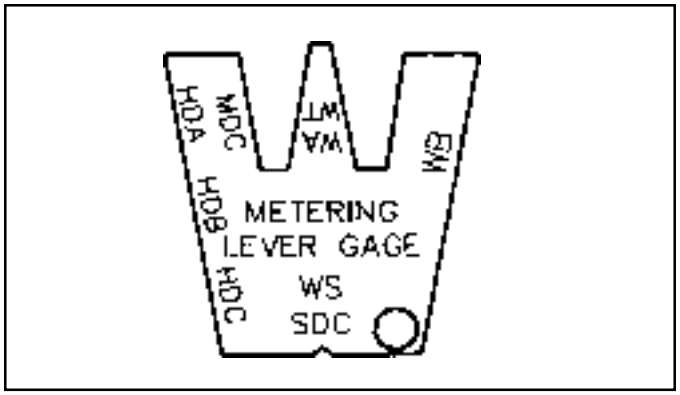


VIBRATION TACHOMETER **670156**



METERING LEVER GAGE **670325**

Used to set carburetor metering lever.



TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers the following models:
TVS, TVXL, HXL, HSK 840 - 850

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

HSK/HXL840 - 850
TVS/TVXL840
2-Cycle Engines

TECUMSEH®

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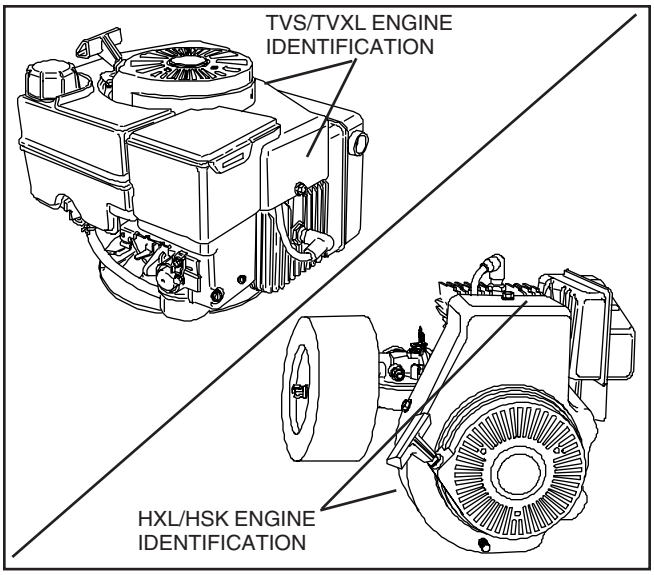
1996

ENGINE IDENTIFICATION AND CARE

IDENTIFICATION
Tecumseh engine Models 840 - 850, specification, and serial number or date of manufacture (D.O.M.) are stamped into the blower housing, or located on a decal on the engine in locations as shown.



Interpretation of Model Number

The letter designations in a model number indicate the basic type of engine. This is followed by the specification number and date of manufacture.

HXL - Horizontal Extra Life
HSK - Horizontal Snow King®
TVS - Tecumseh Vertical Style
840/850 - Base engine model

SPECIFICATION NUMBER
Specification number used to locate correct parts.

5215C is the serial number or D.O.M. (Date of Manufacture)
5 is the last digit in the year of manufacture (1995).
215 indicates the calendar day of that year (215th day or August 3, 1995).
C represents the line and shift on which the engine was built at the factory.

FUELS. Tecumseh Products Company strongly recommends the use of fresh, clean, UNLEADED regular gasoline in all Tecumseh Engines. Unleaded gasoline burns cleaner, extends engine life and promotes good starting by reducing the build up of carbon deposits. Premium gas or gasohol containing no more than 10% ethanol can be used if unleaded fuel is not available.

NOTE: NEVER USE GASOLINE CONTAINING METHANOL, GASOHOL CONTAINING MORE THAN 10% ETHANOL, UNLEADED REGULAR GASOLINE CONTAINING MORE THAN 15% M.T.B.E. OR ETBE, GASOLINE ADDITIVES, OR WHITE GAS BECAUSE ENGINE/FUEL SYSTEM DAMAGE COULD RESULT.

NOTE: In countries where unleaded gasoline is not available, regular gas can be used.

Make sure that gasoline and oil are stored in clean, covered, rust free containers. Dirt in fuel can clog small ports and passages in the carburetor. Use fresh gasoline only. Gasoline standing for long periods of time develop a gum that will result in fouled spark plugs, clogged fuel lines, carburetors and fuel screens. Using fuel that is not fresh will cause engines to be hard starting, especially in cold temperatures.

Clean gas cap, tank and fuel container spout when filling fuel tank, to assure that dirt will not get into fuel system.

If gasohol is used, special care is required when the engine is to be stored for extended periods.

ENGINE OIL. Use Clean, high quality **2 CYCLE OIL**. **NMMA TC-WII, or TC-W3**.

FUEL/OIL MIX. Follow fuel and engine oil requirements listed in the Owner's Manual. Disregard conflicting instructions found on oil containers. The fuel/oil mix for all 840-850's is 50:1.

NOTE: Sears Craftsman models use a 40:1 mix which is acceptable.

NOTE: ALWAYS DOUBLE THE AMOUNT OF OIL FOR THE FIRST GALLON OF MIX FOR ENGINE BREAK IN.

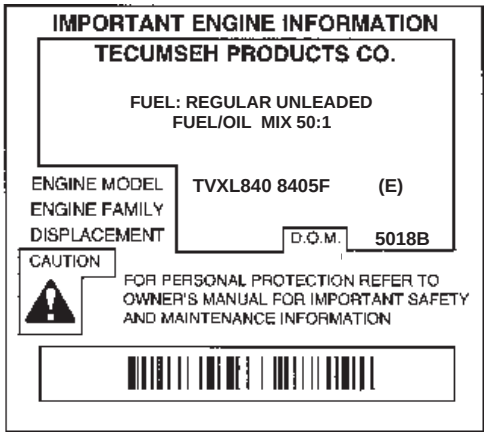
To assure thorough mixing of oil and gasoline, fill container with gasoline to one quarter full, add oil as recommended, shake container vigorously and then add remainder of gasoline. **Do not mix directly in engine or equipment fuel tank.**

Some models will have a Mix-Rite cup attached to the under side of the air cleaner cover to assure proper fuel/oil mixture.

The mixing chart below should be used for proper fuel and oil mix ratio.

FUEL MIX CHART		Mixture 50:1	
U.S.		S.I. (METRIC)	
Gas	Oil To Be Added	Petrol	Oil To Be Added
1 Gal.	2-1/2 oz.	4 Liters	80 ml
2 Gal.	5 oz.	8 Liters	160 ml
5 Gal.	13 oz.	20 Liters	400 ml

NOTE: Beginning with the 1998 Snowblower season, Horizontal Snow King® engines will have Emission Compliance information on the identification decal.



STORAGE:

NEVER STORE ENGINE WITH FUEL IN TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED ENCLOSURES WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER, ETC.

If engine is to be stored over 30 days, prepare for storage as follows:

1. Remove all gasoline from fuel tank to prevent gum deposits from forming in tank and other fuel system components, causing possible malfunction of the engine.

DRAIN FUEL INTO APPROVED CONTAINER OUTDOORS, AWAY FROM OPEN FLAMES.

Run engine until fuel tank is empty and engine stops due to lack of fuel.

Fuel stabilizer (such as STA-BIL) is an acceptable alternative in minimizing the formation of fuel gum deposits during storage. Add stabilizer to fuel in fuel tank or storage container. Always follow mix ratio found on stabilizer container. Run engine at least 10 minutes after adding stabilizer to allow it to reach carburetor.

If gasohol has been used, complete preceding instructions and then add a small amount, one pint or less, of unleaded regular automotive gasoline properly mixed with the specified lubricating oil and run the engine until the fuel tank is empty and the engine stops due to lack of fuel.

2. Pull starter handle slowly until resistance is felt due to compression pressure, then stop. Release starter tension slowly to prevent engine from reversing due to compression pressure. This position will close both the intake and exhaust ports to prevent corrosion of the piston and the cylinder bore.

3. Clean unit by removing any dirt from exterior of the engine and equipment.

TUNE-UP PROCEDURE. The following is a minor tune-up procedure. Repair procedures for this engine and it's components are listed in this manual if the engine does not perform to satisfaction after tune-up is performed.

CAUTION: Remove spark plug wire before doing any service work on engine.

1. Service or replace air cleaner as necessary.

NOTE: Snow King® engines do not use an air filter due to the clean operating environment and to prevent filter freeze-up.

2. Remove blower housing, clean all dirt, grass or debris from air intake screen, cylinder cooling fins, and carburetor governor levers and linkage.

3. Remove carburetor, clean and install a carburetor kit, make adjustment presets where needed. Presets are found in the carburetor section of this manual. Make sure fuel tank, fuel filters and fuel lines are clean. Reinstall carburetor, replacing any worn or damaged governor springs or linkage. Make proper governor adjustment. Adjustments are found in the manual under governor linkage and adjustment and engine reassembly.

4. Replace with correct spark plug.

5. Make sure all ignition wires are properly routed, so they will not rub on flywheel. Inspect all ignition wires for abrasion or damage. Remove flywheel and check flywheel key, reinstall flywheel, torque flywheel nut to specifications. Set air gap between solid state module and flywheel at .0125''. Air gap gauge, part no. 670297 may be used.

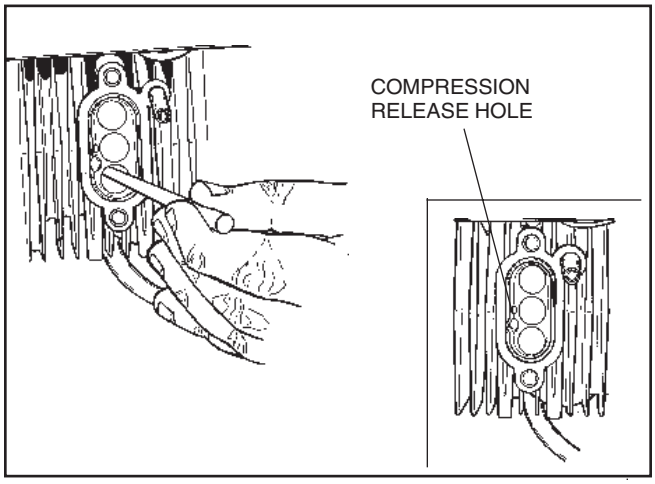
6. The engine must be firmly mounted to the associated equipment. On rotary lawnmowers, make sure blade is properly balanced and correctly torqued. See dissassembly section for flywheel removal and air gap setting procedure.

7. Make sure all remote linkage is properly adjusted for proper operation.

8. Fill tank with proper fuel/oil mix.

9. Run the engine, allow it to warm up 5 minutes, then adjust carburetor and set R.P.M. according to Tecumseh's recommendations.

Snow King® engines should be run in outdoor temperatures for engine adjustments.



EXHAUST PORT CLEANING. The exhaust ports should be cleaned after each seventy-five (75) to one hundred (100) hours of use.

Before cleaning the ports place the piston in the Bottom Dead Center position. Then clean the ports using a pointed 3/8'' diameter wooden dowel or similar tool. Be sure not to scratch the port area. Also remember to remove all the loose carbon particles from the engine.

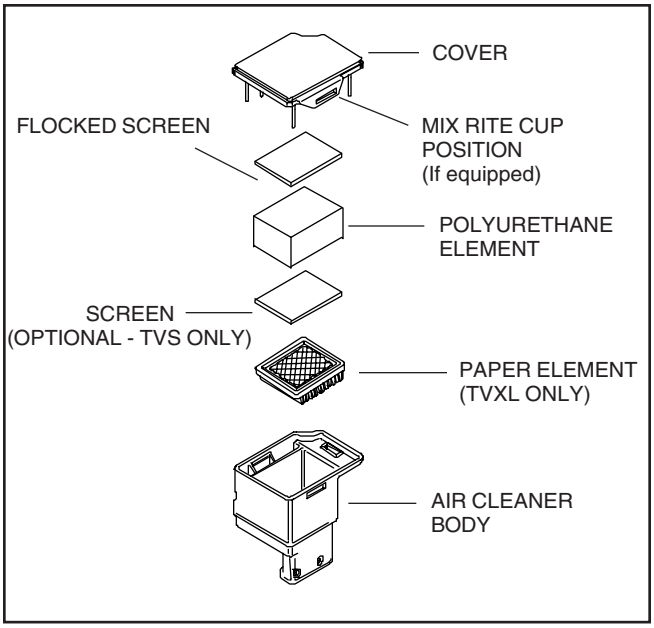
AIR CLEANER

AIR CLEANER. Service the air cleaner frequently to prevent clogging of the element & screen and to prevent dust and dirt from entering the engine. Dust by- passing an improper or damaged air filter can quickly damage an engine. Always make certain covers and air cleaner connections are tightly sealed to prevent entry of dirt.

NOTE: SNOW KING MODELS DO NOT HAVE AIR FILTERS DUE TO THE CLEAN ENVIRONMENT THEY OPERATE IN AND TO PREVENT AIR CLEANER FREEZE UP.

If a loss of power occurs, inspect the air filter for clogging before making any adjustments.

NOTE: Use factory recommended parts only.



POLYURETHANE-TYPE AIR CLEANER. This serviceable air cleaner utilizes a polyurethane element which will clog with use. The element should be cleaned and serviced in the following manner.

Wash element in a detergent and water solution and squeeze (don't twist) until all dirt is removed. Rinse thoroughly.

Wrap in clean cloth and squeeze (don't twist) until completely dry.

Clean air cleaner body and cover. Dry thoroughly.

Re-oil element by applying generous quantity of engine oil to all sides. Squeeze vigorously to distribute oil and to remove excess oil.

When reassembling polyurethane type air cleaners, replace in the same order as pictured above.

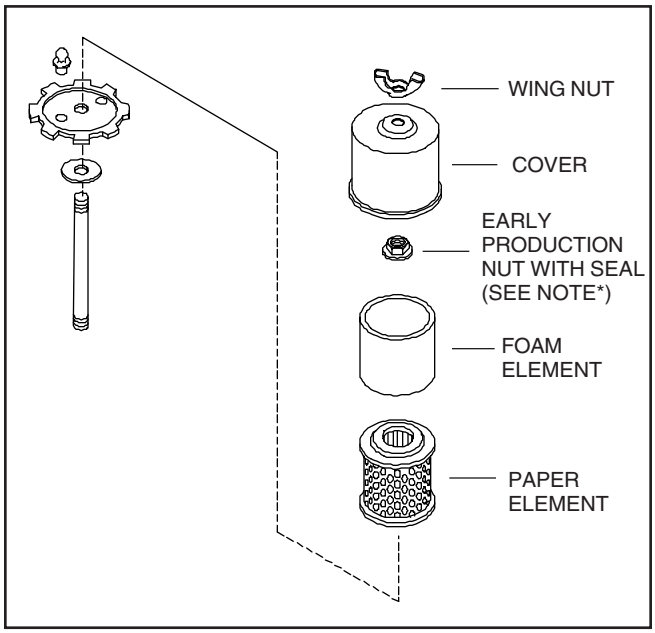
Flocked screen elements may be cleaned by blowing compressed air through the screen from the back side. If screen can not be cleaned with this procedure, it should be replaced with a new screen.

NOTE: Polyurethane type filters will lose effectiveness if stored for extended periods of time, due to oil migration out of the filter. Re-oil filter as necessary.

PAPER TYPE AIR CLEANER. The paper type air cleaners found on some HXL, TVS and TVXL840-850's should be replaced once a year or more often in extremely dirty or dusty conditions.

DO NOT ATTEMPT TO CLEAN OR OIL PAPER FILTER'S.

NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER INSTALLED ON THE ENGINE IF SO EQUIPPED.



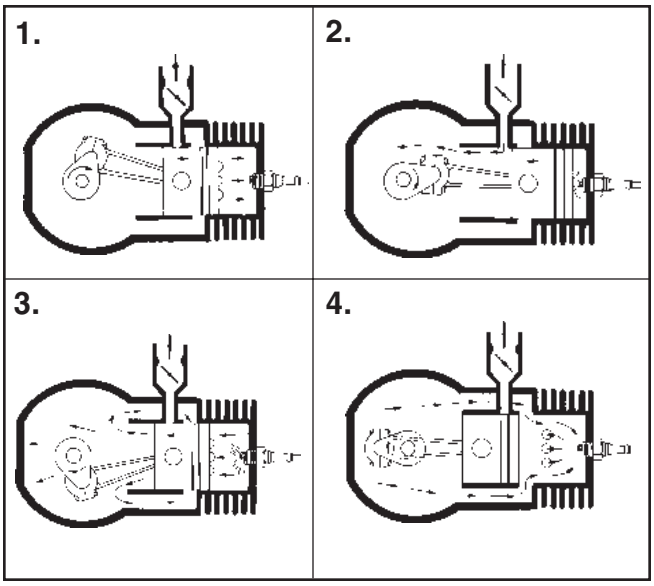
KLEEN-AIRE® CANISTER STYLE DUAL STAGE AIR CLEANER. This air cleaner consists of a paper type element with a polyurethane pre-cleaner around it. For servicing the assembly see instructions under Paper Type Air Cleaner and Polyurethane Type Air Cleaner.

Be sure to clean base and cover thoroughly before installing new paper filter.

NOTE: When installing a new foam pre-cleaner always turn it inside out before installing around the paper element to prevent gaps between paper element and pre-cleaner.

***NOTE*:** Tecumseh has changed the cannister filter cartridge to remove the nut/seal assembly. If you receive a new filter with a rubber seal that is tight around the stud, follow the instruction sheet included regarding NOT RE-USING THE NUT.

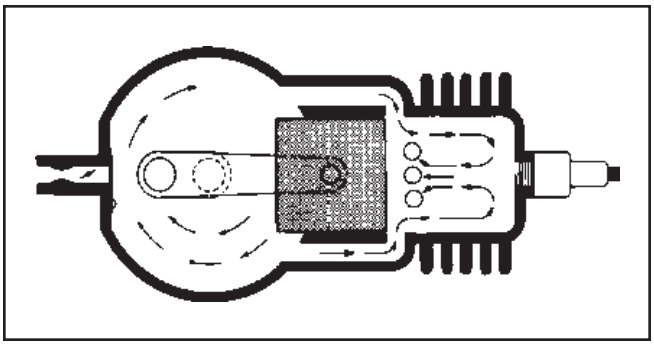
2 CYCLE THEORY OF OPERATION



OPERATION OF HSK, HXL840-850 MODELS.

A low pressure area is created in the crankcase as the piston moves upward to compress the air / fuel mixture in the cylinder. Then the piston moves far enough to uncover the intake port, the air / fuel mixture from the carburetor flows into the engine crankcase due to higher pressure atmospheric air. Just before the piston reaches top dead center (TDC), the spark plug ignites the air / fuel mixture in the cylinder.

The expanding combustion gases force the piston down. The downward piston travel causes a pressure buildup in the crankcase. The piston uncovers the exhaust port first followed by the transfer ports. The exhaust flows out the exhaust port while the pressurized air / fuel mixture enters the cylinder from the crankcase through the transfer ports. As the piston travels upward the sequence is repeated.



OPERATION OF TVS, TVXL840

This model uses a loop scavenge system with a reed valve.

The following illustrates the loop scavenge design which uses a vacuum-pressure activated reed valve. Here the ports are located on three sides of the cylinder; the intake ports are on two sides opposite each other, and the exhaust ports are illustrated by the three holes just above the head of the piston.

As the mixture flows into the combustion chamber through the transfer ports, it collides and is directed to the top of the combustion chamber looping when it strikes the cylinder head, thus forcing all spent gases out through the open exhaust ports.

TERMS. Listed are common terms often referred to on 2-cycle engines.

EXHAUST or SCAVENGE PHASE. The burned gases must be cleared out of the combustion chamber and replaced by a fresh charge of fuel-air mixture through the intake ports. The exhaust passes out through the exhaust ports into the outside air.

PORTS. Openings in the cylinder allow gases to pass into and out of the combustion chamber. The ports are opened or closed by the upward and downward movement of the piston.

EXHAUST PORTS. Allow the burned gases to pass out of the combustion chamber.

THIRD PORT (Sometimes called piston port). A third port is for entry of the fuel-air and oil mixture to the crankcase. From the crankcase the fuel-air mixture enters the combustion chamber through the intake ports. The third port is controlled by the piston skirt.

LUBRICATION. Tecumseh 2-cycle engines are lubricated by a gas oil mix. The correct mix ratio of oil and gas combines with air in the venturi and enters the crankcase. During engine operation the oil clings to all the internal moving parts for lubrication.

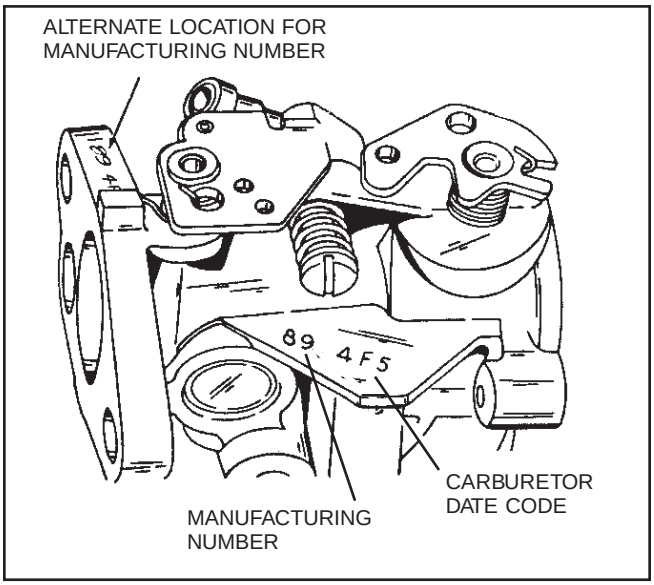
NOTE: ALWAYS MIX AT OUR RECOMMENDED RATIO AND USE ONLY CERTIFIED OILS OR WARRANTY IS VOID.

REED VALVE. A reed valve is activated by crankcase pressure or vacuum. A decrease in crankcase pressure opens the valve allowing the fuel air and oil mixture to enter the crankcase. Increased crankcase pressure closes the valve, preventing escape of the fuel-air and oil mixture back through the carburetor.

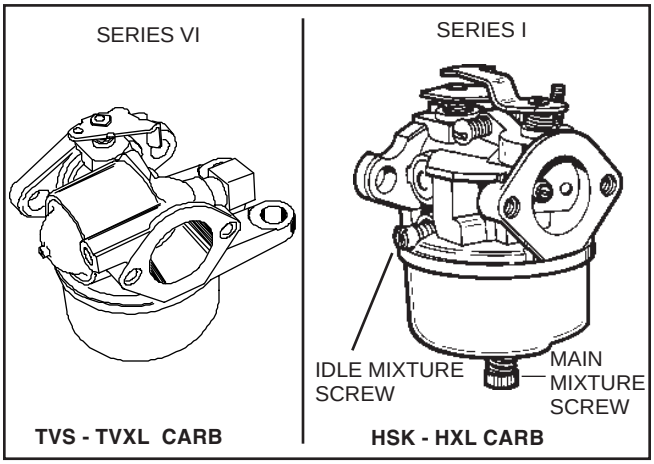
CARBURETION

CARBURETOR IDENTIFICATION

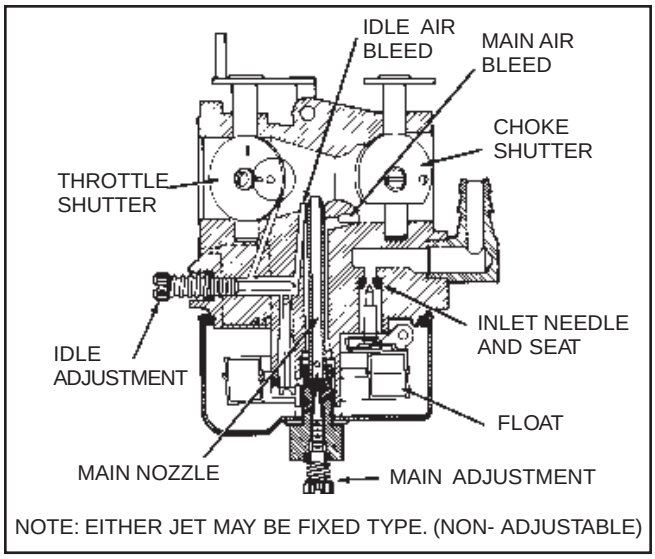
Tecumseh carburetors are identified by a model number and code date stamped on the carburetor as illustrated.



When servicing carburetors the model and date code number of the carburetor will be found on the carburetor body. It is a recommended procedure to use the engine model and specification number for looking up repair parts. However, if they are not available, the carburetor model number may be used for the proper carburetor repair parts. Cross reference the carburetor model number into a service part number using the Master Parts Manual or Microfiche and look up the required parts.

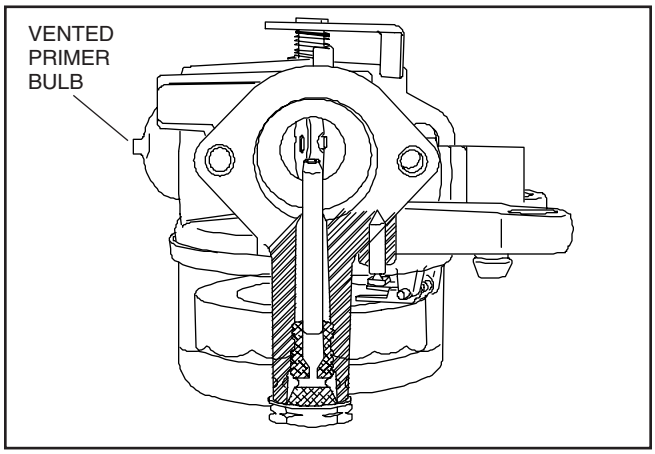


The TVS or TVXL840 engines use a Series VI carburetor. The Series VI has a fixed high speed and a fixed idle system.



SERIES I OPERATION. The HSK and HXL840-850 models use a Series (I) carburetor. (Fixed speed models have no idle circuit with a fixed main jet.)

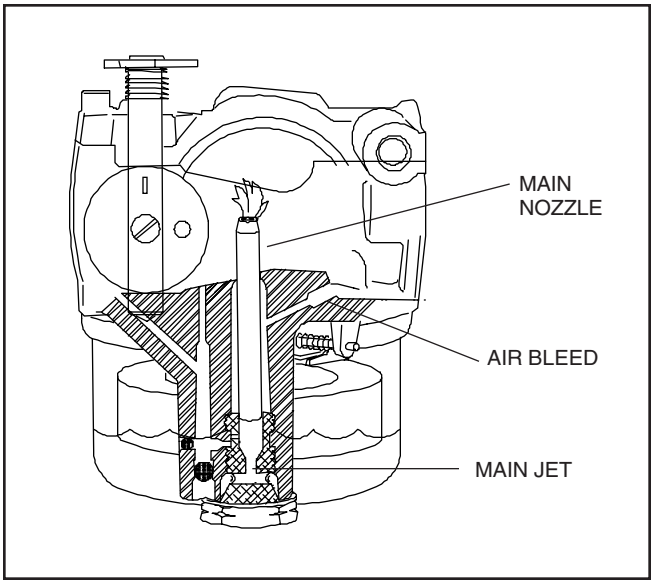
Variable speed engines use a full circuit Series I which has an idle fuel circuit (as shown above).



SERIES VI OPERATION. This carburetor is a high bred of the dual system carburetor. It is equipped with a primer for easy starting and has a fixed main and idle circuit. Fuel fills the prime well in the bowl nut to the level maintained by the float. Pushing the primer button 3-5 times will provide the rich mixture required to start a cold engine. It takes about 3 seconds for the prime well to refill after each prime.

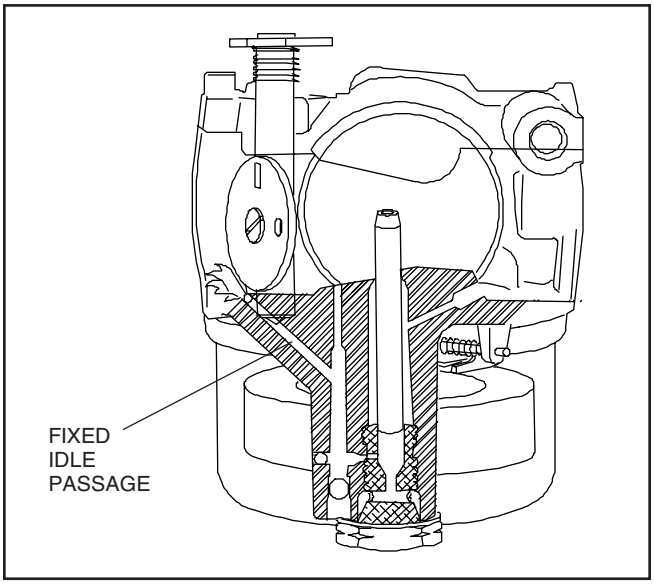
If the engine is used under cool weather conditions, the number of primes should be increased.

NOTE: All Emissionized engines will be equipped with fixed jet carburetors.



When the engine starts and runs, the fuel level in the bowl and prime well stabilizes, then air from the air bleed and fuel from the main jet is pulled up the main nozzle for engine operation.

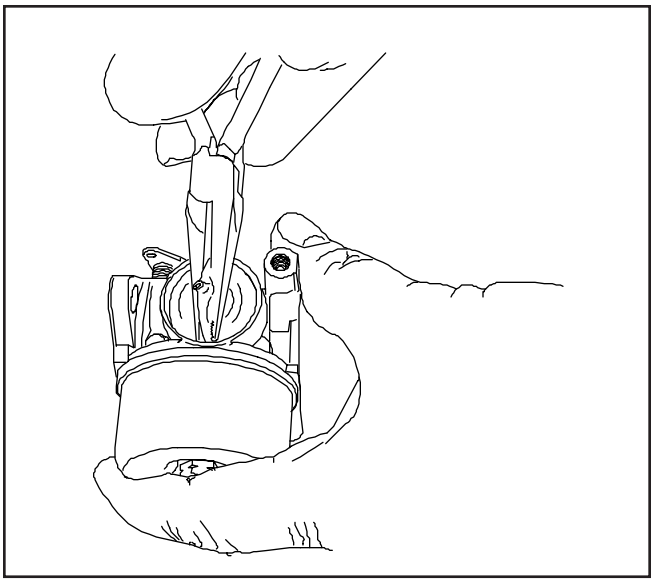
CAUTION: Do not exceed equipment manufacturers recommended RPM. Excessive RPM will cause the carburetor fuel mixture to lean out and the engine may overheat and eventually fail.



At Idle or Low Load running, the fuel will be drawn up the fixed idle passage in the carb.

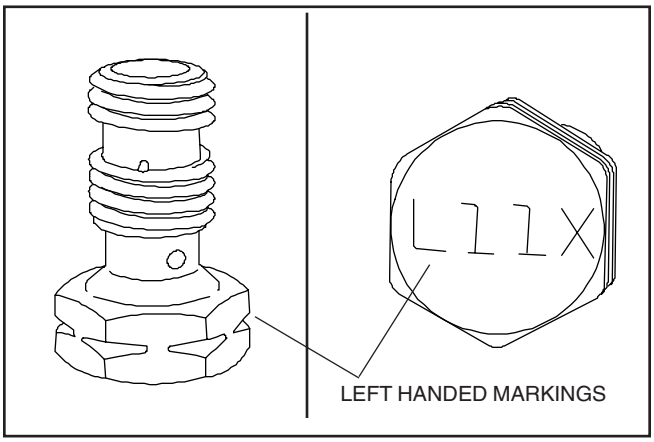
SERVICING THE CARBURETOR - SERIES VI

To service the Series VI carburetor follow the procedure listed in this section of the manual.



After the carburetor has been removed from the engine, remove the primer bulb. Using a needle nose pliers, grasp the primer bulb and roll the primer bulb out.

CAUTION: Wear safety glasses or goggles while removing the retaining ring that holds the primer bulb in place.

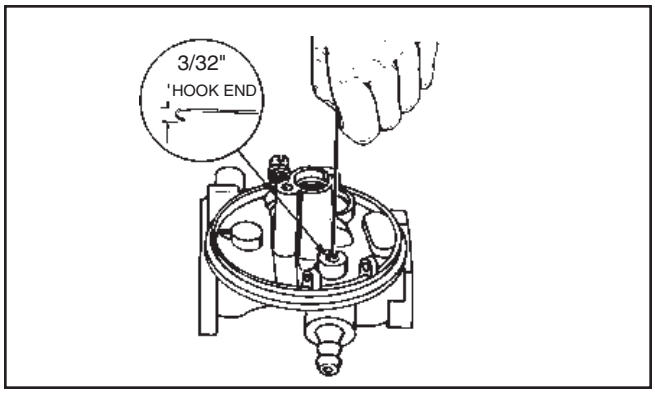


NOTE: Left handed fixed jets are used on TVS/TVXL840 models only.

Remove the bowl nut. The bowl nut on this carburetor has LEFT HANDED threads. This can be identified by the letter “L” preceding the numbering on the bowl nut. Also, the head of the bowl nut is notched. This is the same identification used in many industries for left handed nuts.

If the bowl nut is turned the wrong way, it will break off in the center leg where the fuel pick up passages are drilled. If this happens, a screwdriver will fit into the bowl nut which then may be turned out in the proper direction.

Remove the throttle plate and shaft with the dust seal and spring.

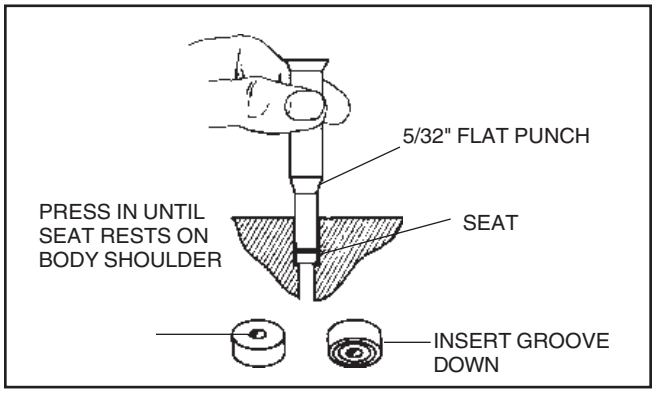


Remove the inlet seat using a hook made from a paper clip or a No. 4 crochet hook.

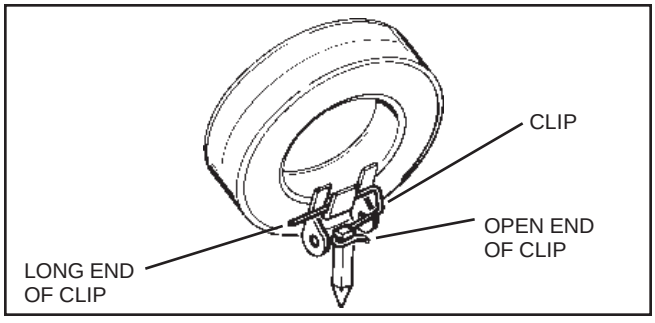
Soak the carburetor body and bowl nut in a commercial cleaner no longer than 30 minutes. Is is not necessary to remove the fuel fitting when soaking the carburetor.

All passages may be probed with soft tag wire and blown out with compressed air to open plugged or restricted passages.

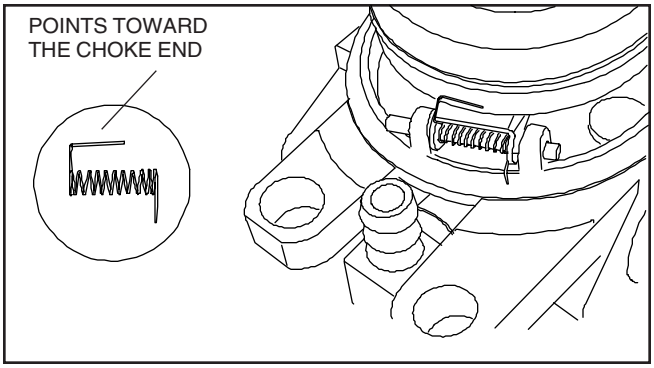
REBUILDING THE CARBURETOR



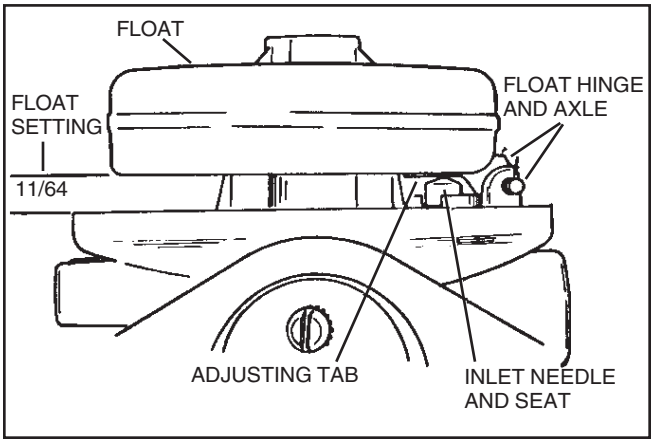
Replace the seat into the carburetor body. The side of the seat with the groove in, goes into the carburetor body so that the smooth side can be seen. Place a small drop of oil onto the seat and press it in with a flat punch or a point plunger until it seats. Be careful not to scratch the polished inlet bore.



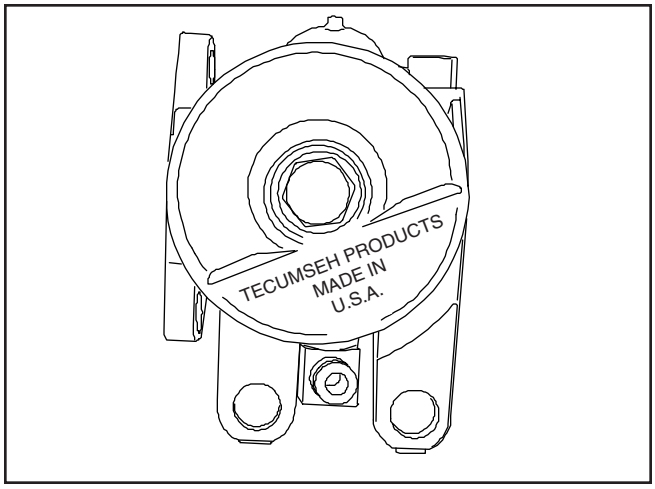
Place the inlet needle and spring clip onto the float and set in place. The long end of the spring clip must point towards the air cleaner end of the carburetor. This will ensure that the inlet needle will drop and raise in a straight line.



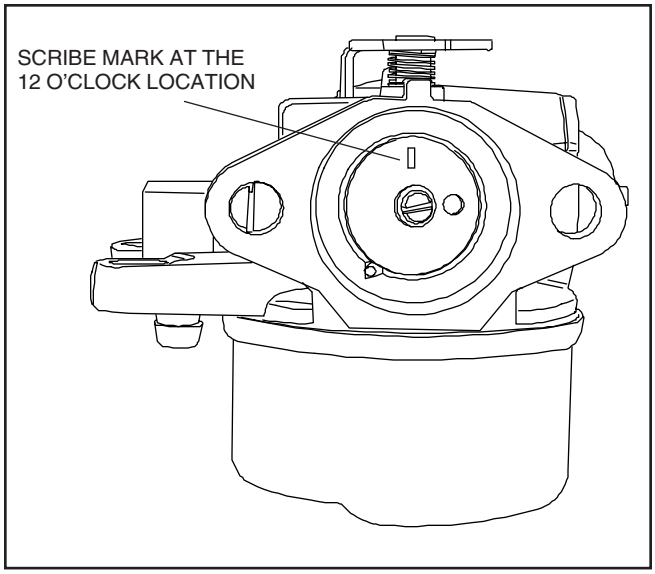
This carburetor uses a dampening spring on the float. The short leg hooks onto the carburetor body and the longer end points towards the choke end.



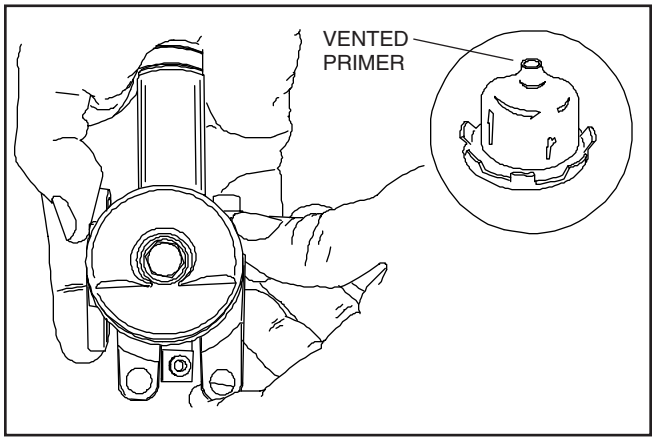
All Tecumseh carburetors with an adjustable float require the correct float height to achieve the proper operation and easy engine starts. To check the float setting, hold the carburetor in an upside down position. Remove the bowl nut, float bowl, and "O" ring. Place an 11/64" diameter drill bit across the top of the carburetor casting on the opposite side and parallel to the float hinge pin. The float must just touch the drill bit when the bit is flush with the edge of the float. If the float is too high or too low, adjust the height by bending the tab accordingly. If the required adjustment is minor, the tab adjustment may be made without removing the float and carefully inserting a small bladed screwdriver to bend the tab.



Install a new bowl “O” ring. Place the bowl onto the carburetor with the flat area of the bowl over the hinge pin and running parallel to the hinge pin. Insert the bowl nut with the fiber washer between the bowl and the nut. Remember this is a left handed bowl nut.

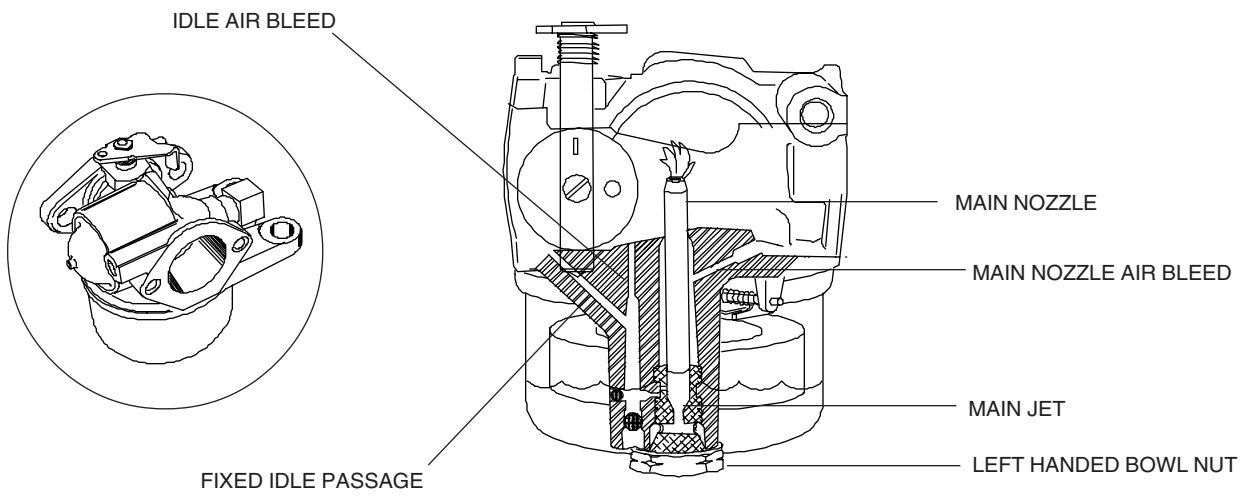


Install the throttle shaft and shutter. The scribe mark on the shutter is in the twelve o’clock position. Any other position may cause the throttle to stick. Use a new throttle shutter screw to insure that the screw does not come loose during running. A new dust seal should also be used on the throttle shaft.



Place the primer bulb with the retainer ring into a 3/4’’ deep reach socket. Press down until seated. NOTE: An improper seat will cause poor priming.

TROUBLESHOOTING CARBURETION
SERIES VI

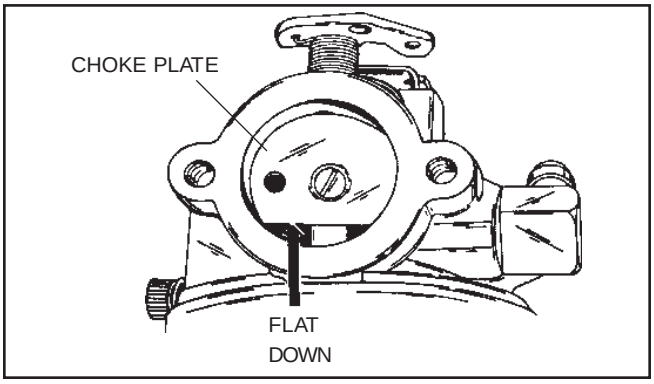


TROUBLE	CORRECTIONS
Carburetor out of adjustment	3, 4, 11, 15
Engine will not start	1, 2, 3, 4, 5, 8, 10, 11, 13, 16, 18, 19
Engine will not accelerate	2, 3, 4, 5, 8, 11, 15, 18
Engine hunts (at idle or high speed)	3, 4, 8, 9, 10, 11, 15, 16, 18
Engine will not idle	3, 4, 8, 9, 10, 11, 14, 15, 16, 18
Engine lacks power at high speed	2, 3, 4, 7, 8, 11, 15, 16, 18, 19
Carburetor floods	4, 7, 13, 16, 17, 18
Carburetor leaks	4, 6, 7, 13, 14, 18
Engine overspeeds	8, 9, 10, 11, 14, 15
Idle speed is excessive	8, 9, 10, 11, 14, 15
Engine starves for fuel at high speed (leans out)	1, 3, 4, 5, 11, 12, 13, 14, 16
Performance unsatisfactory after being serviced	ALL

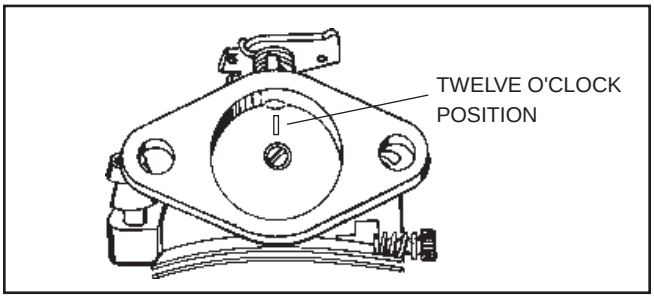
1. Fill tank with fuel.
2. Check ignition, spark plug and compression.
3. Clean air cleaner service as required.
4. Dirt or restriction in fuel system clean tank and fuel strainers, and filter, check for kinks or sharp bends.
5. Check for stale fuel or water in fuel fill with fresh fuel/oil mixture of correct ratio.
6. Examine fuel line and pick-up for sealing at fittings.
7. Check and clean atmospheric vent holes.
8. Examine throttle shaft for binding or excessive play -remove all dirt or paint, replace shaft.
9. Examine throttle return spring for operation.
10. Check position of throttle plate.
11. Adjust control cable or linkage to assure carburetor control.
12. Clean carburetor after removing all metallic parts that are serviceable. Trace all passages.
13. Check inlet needle and seat for condition and proper installation.
14. Check sealing of gaskets and O rings.
15. Adjust governor linkage.
16. Adjust float setting.
17. Check float shaft for wear and float for leaks or dents.
18. Is carburetor operating on excessive angle?
19. Check primer bulb for damage.

SERVICING THE CARBURETOR
SERIES I

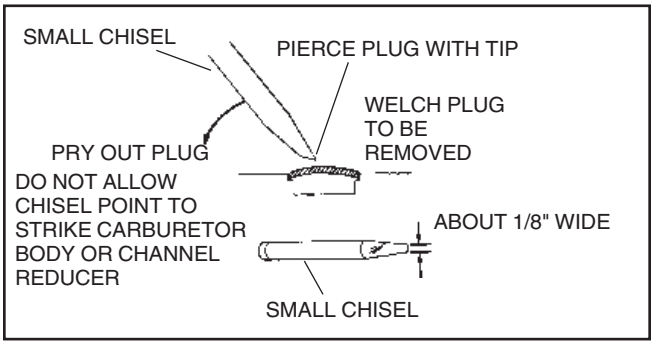
The following covers variations from the Series VI carburetors.

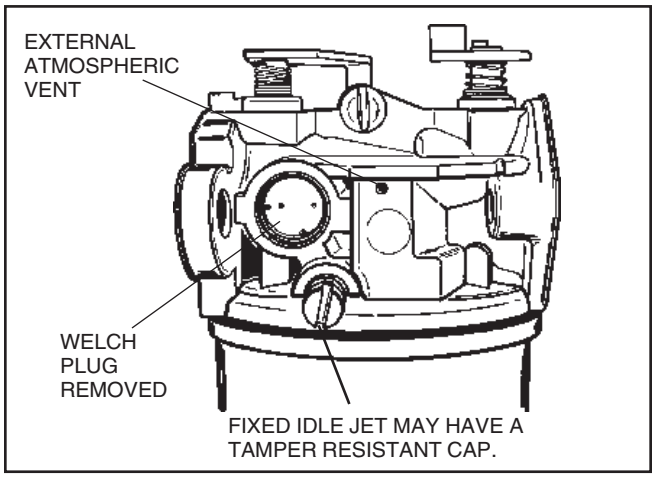


The Series (I) carburetor is used on summer and winter versions of the horizontal 840 thru 850 Series, and is equipped with a choke to be positioned as shown.



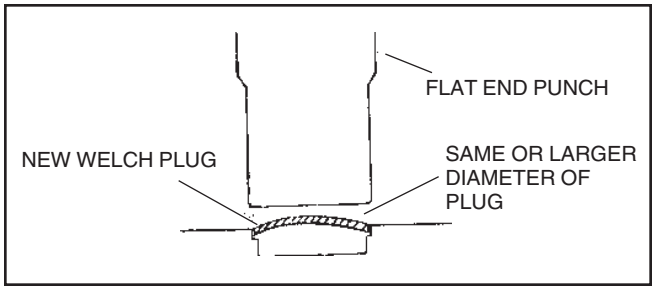
The throttle plate on the Series (I) is set in place at the 12 o'clock position. ALWAYS USE SERVICE SCREWS IF YOU HAVE REMOVED EITHER THE CHOKE OR THROTTLE SHUTTER. TECUMSEH SCREWS ARE EQUIPPED WITH DRY LOCTITE ADHESIVE.





Clean all passages out with soft tag wire. To do a proper cleaning job welch plugs should be removed to expose drilled passages, if equipped. To remove welch plug, sharpen a small chisel to a sharp wedge point. Drive the chisel into the welch plug, push down on chisel and pry plug out of position.

NOTE: Snow KIng® engines have a primer tube on the carburetor. Make sure this passage is open and replace the hose when servicing.



To install a new welch plug after cleaning, place welch plug into rmixing well with raised portion up. With a punch equal to the size of the plug, merely flatten the plug. Do not dent or drive the center plug below the top surface of the carburetor. To insure sealing use, nail polish around the plug.

If float sticking occurs due to deposits, or when the fuel tank is filled for the first time, this condition can be quickly corrected by loosening the carburetor bowl nut one full turn. Turn the bowl 1/4 inch in either direction, then return the bowl to its original position and tighten the bowl nut.

SERVICE
CARBURETOR PRE-SETS AND ADJUSTMENT

NOTE: Some carburetors have fixed main and idle jets. The absence of the adjusting screw indicates a fixed jet and no adjustment is necessary.

Before adjusting any mixture screws the necessary carburetor presets should be made. Check for the proper governor adjustments (see governor adjustment section). Identify the correct carburetor model to find locations of the high and low speed adjustment screws. Check the throttle control bracket for proper adjustment allowing a full choke shutter position. (see "Speed Controls and Linkage"). Check to see if the normal maintenance procedures have been performed (oil changed, fresh fuel, air filter replaced or clean). Consult microfiche card #30 to find the correct R.P.M. settings for the engine. RPM specifications can also be found on Plus One or Parts Smart computer programs. Start the engine and allow it to warm to operating temperature. The carburetor can now be adjusted.

Pre-sets and Adjustments If Equipped.

Turn both the main and idle mixture adjusting screws in (clockwise) until finger tight.

NOTE: OVERTIGHTENING WILL DAMAGE THE TAPER PORTION OF THE NEEDLE.

Now back the mixture screws out (counterclockwise) to obtain the pre-set figure in the chart shown at right.

Tecumseh Carburetors		
Engine Model	Main Pre-set	Idle Pre-set
All models with float-type carburetors	1-1/2 turn	1 turn

Final Adjustments

Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the HIGH or FAST position, then turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic (lean). Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic (rich). Turn the screw in (clockwise) midway between these two positions. This will be the best setting.

Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment screw.

Identify the location of both HIGH and LOW speed adjustment screws, then identify the recommended HIGH and LOW R.P.M. setting according to microfiche card # 30 and adjust carburetor accordingly.

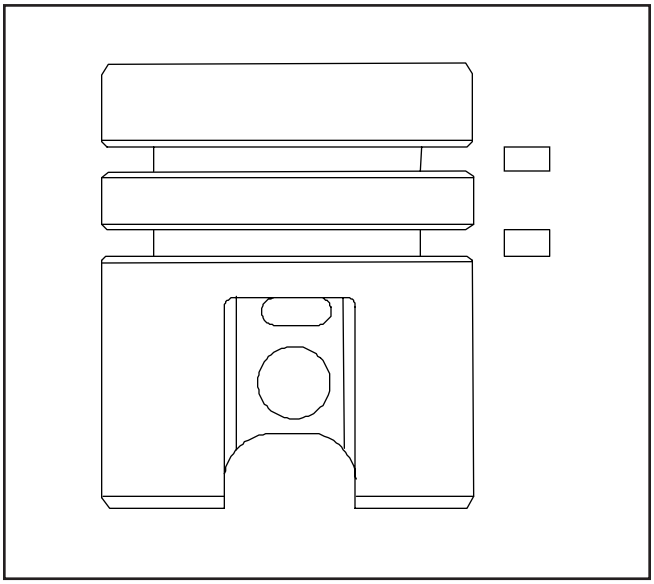
TROUBLESHOOTING CARBURETION SERIES I

TROUBLE	CORRECTIONS
Carburetor out of adjustment	3, 4, 11, 12, 13, 15, 19
Engine will not start	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 20, 23
Engine will not accelerate	2, 3, 4, 5, 11, 12, 15, 19, 23
Engine hunts (at idle or high speed)	3, 4, 8, 9, 10, 11, 12, 14, 19, 20, 23
Engine will not idle	3, 4, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 23
Engine lacks power at high speed	2, 3, 4, 7, 8, 10, 11, 12, 15, 18, 19, 20, 23
Carburetor floods	4, 7, 17, 20, 21
Carburetor leaks	4, 6, 7, 10, 17, 18, 22, 23
Engine overspeeds	8, 9, 13, 14, 15, 18, 19
Idle speed is excessive	8, 9, 13, 14, 15, 18, 19
Choke does not open fully	8, 9, 14, 15
Engine starves for fuel at high speed (leans out)	1, 3, 4, 5, 6, 10, 11, 15, 16, 17, 18, 20
Carburetor runs rich with main adjustment needle shut off	7, 11, 17, 18, 20
Performance unsatisfactory after being serviced	ALL

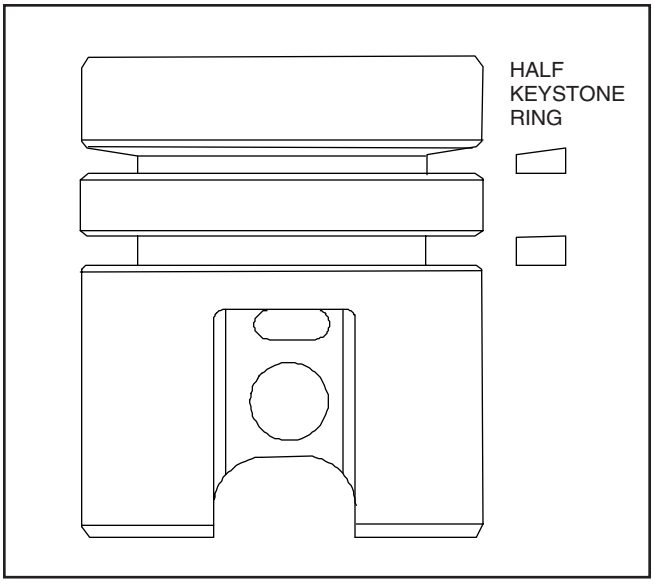
1. Open fuel shut off valve at fuel tank fill tank with fuel.
2. Check ignition, spark plug and compression.
3. Clean air cleaner service as required.
4. Dirt or restriction in fuel system clean tank and fuel strainers, check for kinks or sharp bends.
5. Check for stale fuel or water in fuel fill with fresh fuel/oil mixture of correct ratio.
6. Examine fuel line and pick-up for sealing at fittings.
7. Check and clean atmospheric vent holes.
8. Examine throttle and choke shafts for binding or excessive play remove all dirt or paint, replace shaft.
9. Examine throttle and choke return springs for operation.
10. Examine idle and main mixture adjustment screws and “O” rings for cracks or damage.
11. Adjust main mixture adjustment screw. Check to see that it is the correct screw.
12. Adjust idle mixture adjustment screw. Check to see that it is the correct screw.
13. Adjust idle speed screw.
14. Check position of choke and throttle plates.
15. Adjust control cable or linkage to assure full choke and carburetor control.
16. Clean carburetor after removing all non-metallic parts that are serviceable. Trace all passages.
17. Check inlet needle and seat for condition and proper installation.
18. Check sealing of welch plugs, cups, plugs and gaskets.
19. Adjust governor linkage.
20. Adjust float setting.
21. Check float shaft for wear and float for leaks or dents.
22. Check seal for fuel drain or bowl gasket.
23. Is carburetor operating at excessive angle?

PISTON AND RINGS

Their are various types of piston and ring sets used in 840-850 models, and should not be interchanged.



The piston and ring sets on some 840-850's are of a standard type construction. Either ring may be placed in either ring groove of the piston.



Some 840-850 models use a half keystone upper ring. The ring groove in the piston and on the ring have a distinctive taper to them. The ring must be placed in the top ring groove with the long beveled side towards the dome of the piston as shown.

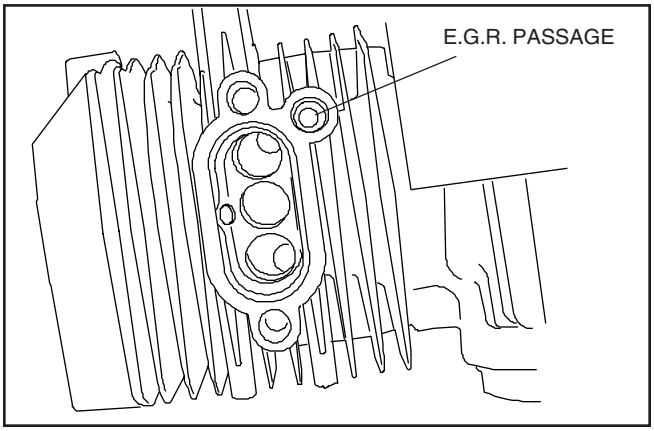
NOTE: Piston ring end gaps should be staggered upon installation.

E.G.R. TUBE
SERVICE & INSTALLATION
TVS / TVXL 840 ONLY

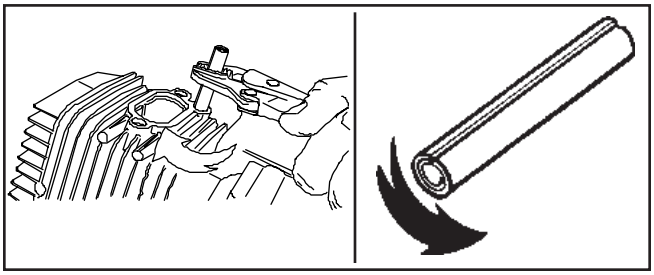
NOTE: HXL, HSK840 thru 850 models do not use the E.G.R. system.

An E.G.R. (Exhaust Gas Recirculation) tube is placed in the block of the TVS/TVXL840 engine and extends into the outer chamber of the muffler.

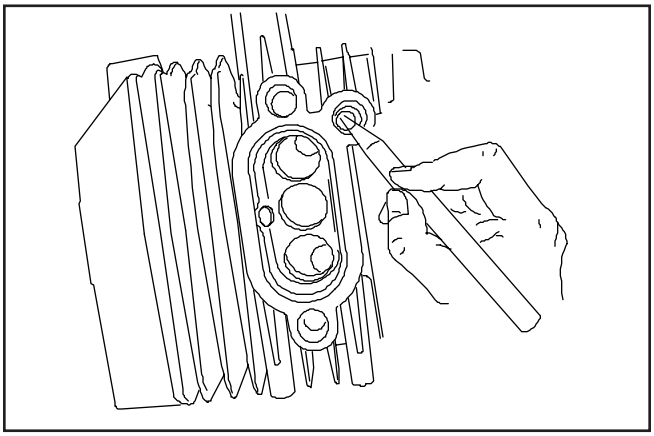
A controlled amount of exhaust gas is drawn into the crankcase of the engine to aid in the movement of the air/fuel mixture to the combustion chamber.



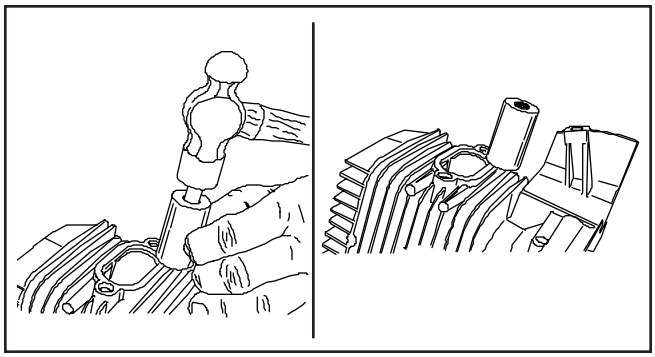
It is a good idea when decarbonizing the exhaust ports, check the E.G.R. passage as well.



The E.G.R. tube is a hardened steel roll pin. To remove the tube, grasp it with a vise grip and rotate in the direction that will collapse the tube and allow it to be removed.



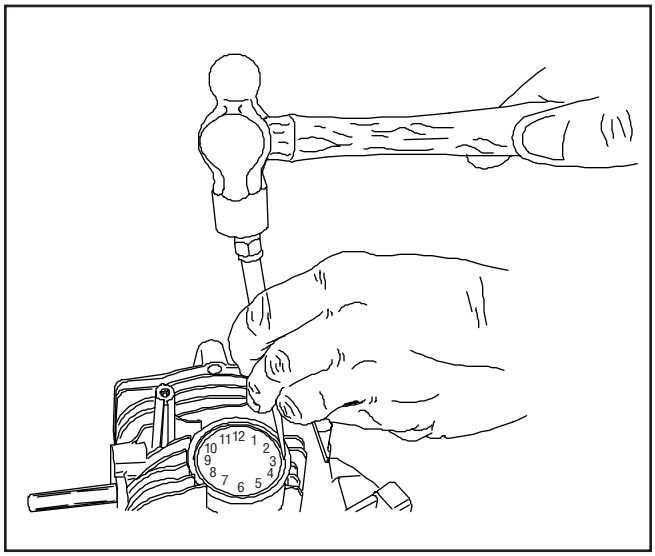
It is best to clean this passage when the piston is out of the bore to eliminate any possible damage to the piston or bore. Use any non-metallic material and clean the E.G.R. port in the cylinder.



Install the E.G.R. tube in to the proper depth by using service tool number 670318.

PORT PLUG REINSTALLATION

The large transfer port plug's on all 840 series engines are pressed into the block and should not have to be removed.



However, if for any reason the plug should come out of the engine, it can be reinstalled. Clean the block and the port plug with lacquer thinner or comparable product so that it is free of all oil.

Using a small, thin center punch or large scribe, stake the port plug in 12 evenly spaced positions.

Use 5 minute epoxy and fill in around the outer diameter of the plug. This will ensure you have no air leaks.

Allow epoxy to cure for 24 hours before using engine.

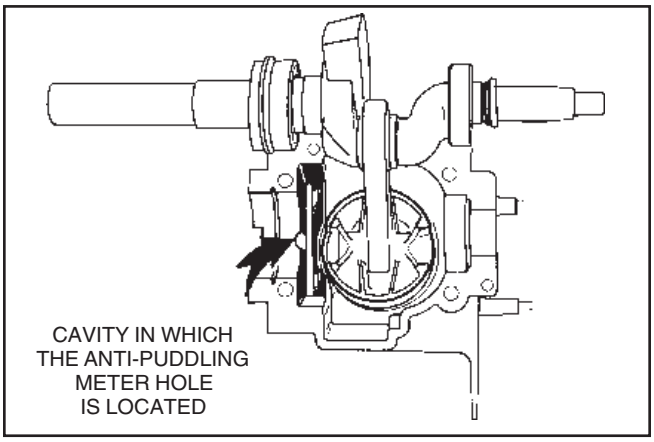
ANTI-PUDDLING METER HOLE SCREEN

NOTE: This section applies to TVS, TVXL840's only.

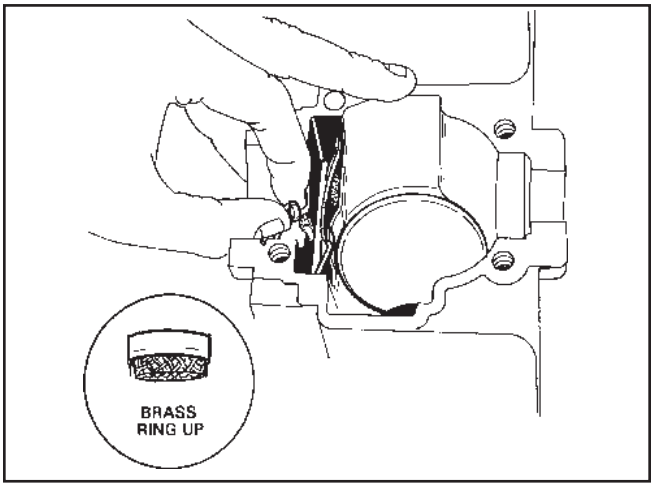
TVS / TVXL840 engines built since 1/1/87, serial numbers 7001 and thereafter, have a screen pressed into the cavity below the anti-puddling meter hole.

This screen is a precautionary measure against abuses such as contaminated fuel or in some instances customers removing air cleaner elements allowing contaminants to enter the crankcase. Engines built prior to 1/1/87 can also have a screen installed. Part No. 430233 can be installed using the following procedure.

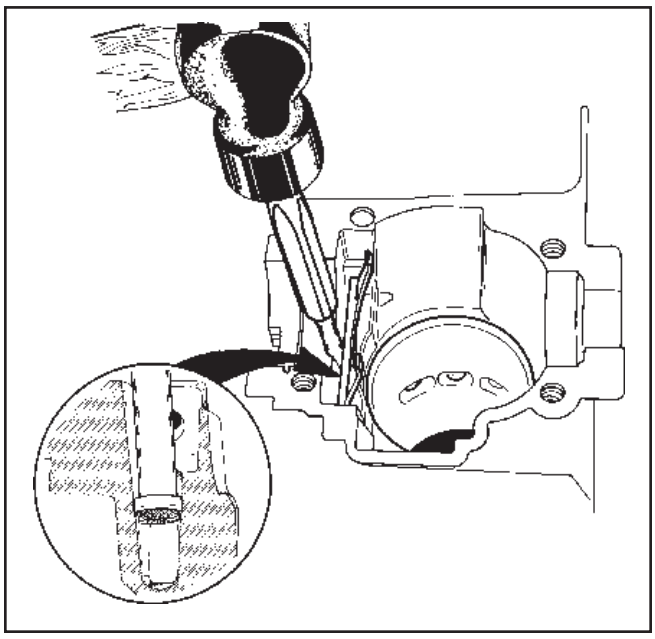
1. Disassemble engine so the piston, rod and crankshaft assembly can be removed.



2. After removing the crankshaft assembly, clean the antipuddling meter hole with a soft tag wire. Probe the hole several times to assure proper cleaning. The hole is located between the shelf and PTO end of the block directly under the governor lever.



3. Insert the screen past the governor lever into the tapered cavity with brass ring up. Use a small punch or scribe to seat the screen squarely. Be careful not to bend or poke a hole in the screen.



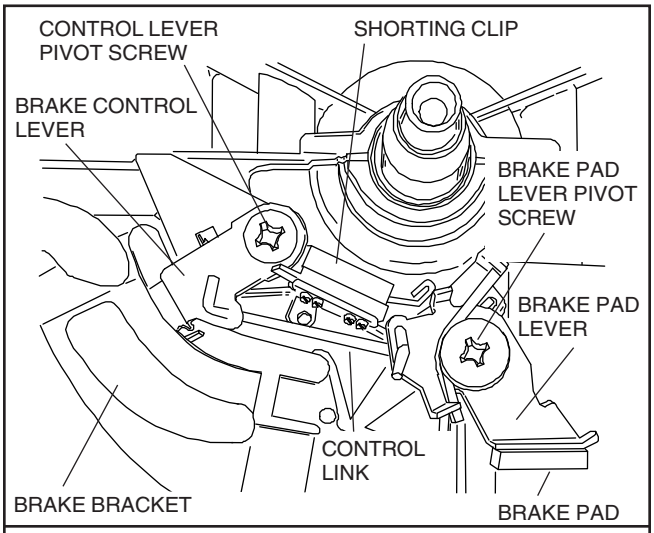
4. With the screen in place, take a 1/4'' roll pin punch, place it on top of the screen and tap until the screen is seated securely in the hole.

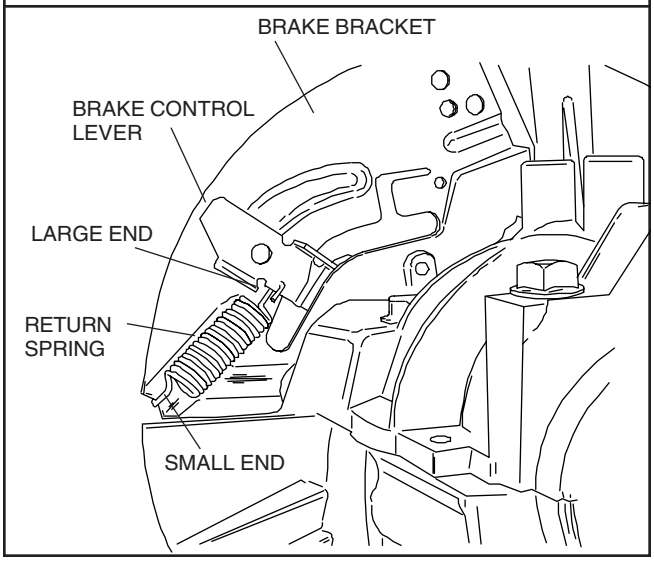
5. Reassemble the engine as stated in that section of this book. Engines built after 1/1/87 (serial numbers 7001 and beyond) have a screen installed in production.

REPLACEMENT OF SCREEN

If the anti-puddling meter hole screen becomes clogged with debris, a wire hook can be used to remove the screen. The same procedure as outlined in this section should be followed for reinstallation of the new screen.

SELF-ENERGIZING BRAKE SYSTEM
TVS/TVLX840 Models

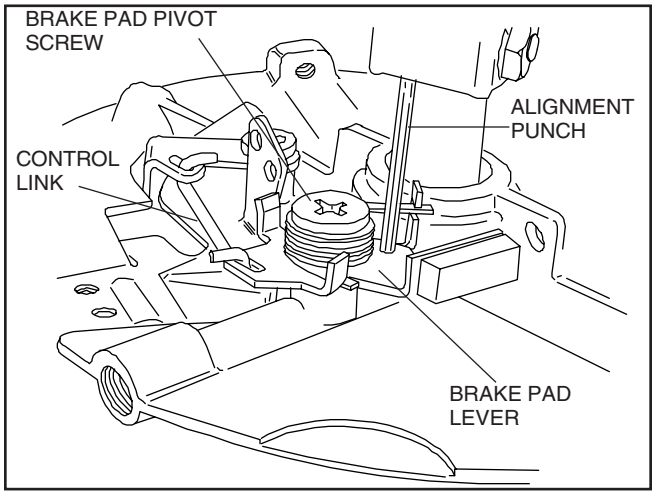




These are the components of the self-energizing brake system.

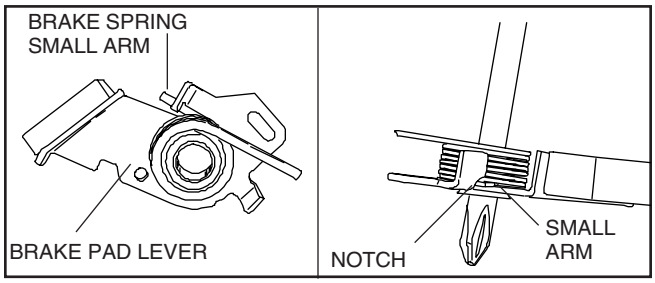
DISASSEMBLY OF THE BRAKE SYSTEM.

1. Disconnect the grounding wire from the shorting clip.
2. Press the shorting clip out of the brake bracket.
3. Unhook the return spring from the brake bracket.

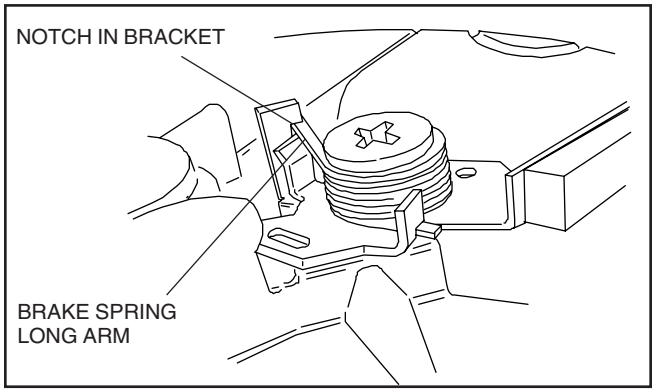


4. Align the hole in the brake pad lever to the hole in the bracket and hold in this position with a small punch.
5. Remove the control lever pivot screw.
6. Disconnect the control link from brake pad lever. Remove punch.
7. Remove brake pad lever pivot screw.
8. Turn the brake spring so the small arm (on the bottom) clears the notch in the brake pad lever.

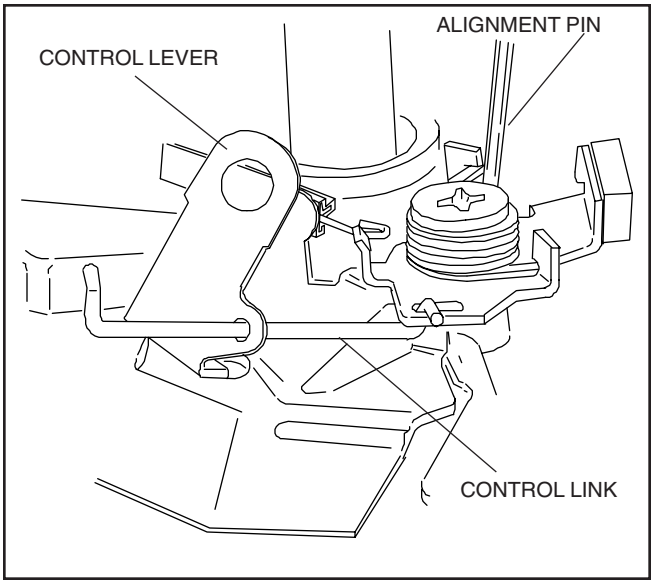
REASSEMBLY OF THE BRAKE SYSTEM.



1. Position brake spring on brake pad lever with small extension of spring into notch on pad arm.

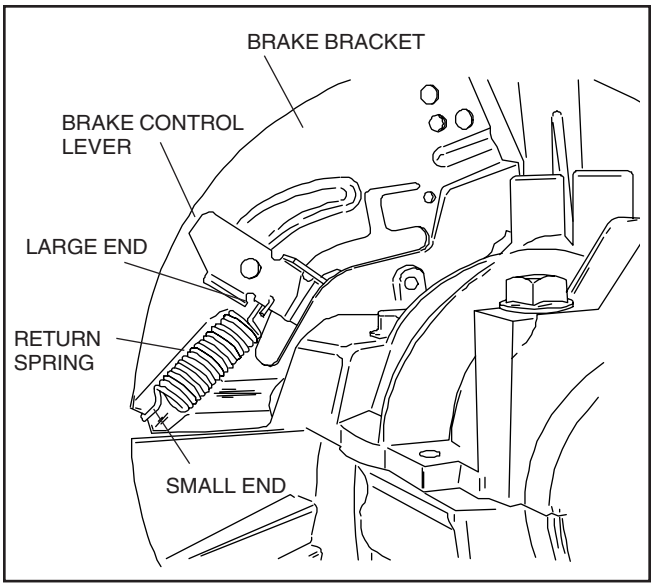


2. Assemble the brake pad lever and spring assembly to the bracket with the pivot screw. Position the long extension from the brake spring into the notch on the bracket.
3. Position the control lever in the brake bracket.



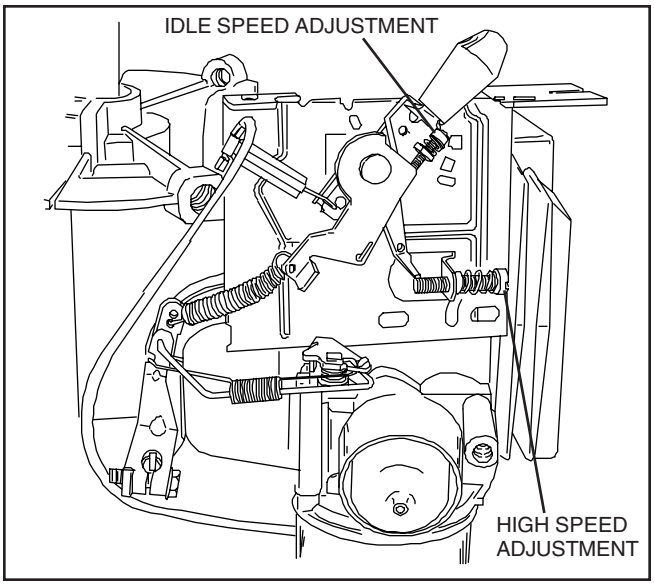
4. Align the hole in the brake pad lever to the hole in the bracket with a small punch.
5. With the short side up, slide the control link through the slotted hole of the control lever. Place opposite end of link into slotted hole of brake pad lever short side up.
6. Slide control link to its proper position in the control lever.
7. Position control lever and pivot screw.
8. Tighten both pivot screws, and remove alignment punch.

   CAUTION: Secure the screws with red Loctite. DO NOT over torque or the brake pad will be distorted. Then a new pad and lever assembly will be required.

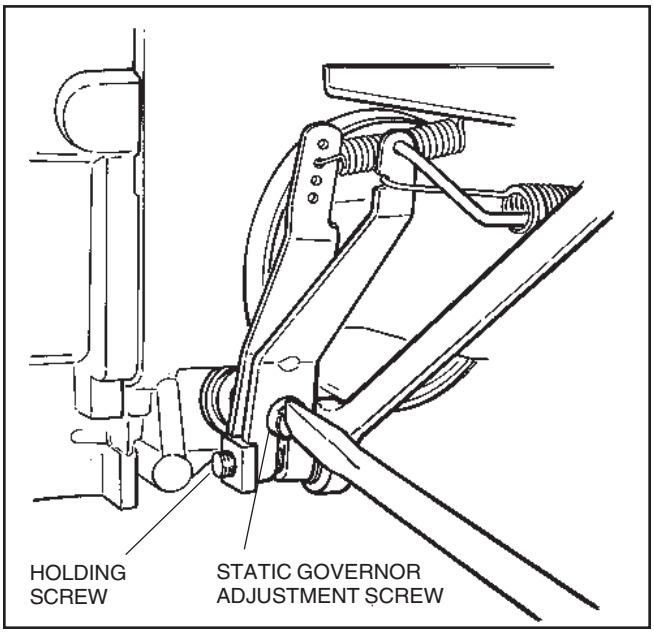


9. Place large end of return spring in hole of control lever, short end of spring on the notch in the brake bracket.
10. Reposition shorting clip and attach grounding wire.

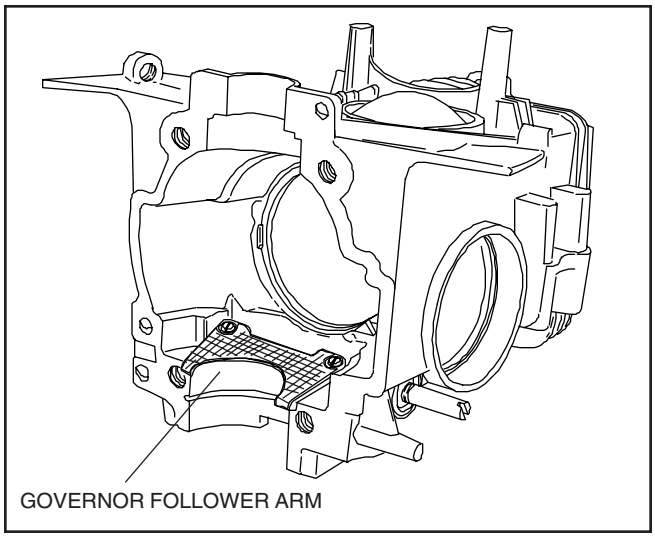
GOVERNOR LINKAGE, AND ADJUSTMENT



LINKAGE LOCATION. To aid in the proper reassembly of the governor linkage, mark the linkage locations.



GOVERNOR ADJUSTMENT. To adjust the governor, move the throttle to the wide open position. Loosen the holding screw, turn the slotted governor shaft clockwise as far as it will go without forcing it. Then tighten the holding screw.



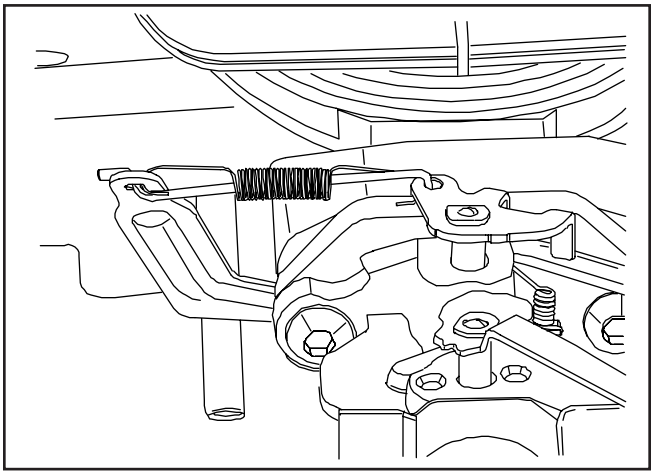
GOVERNOR FOLLOWER ARM AND SHAFT ASSEMBLY. The governor following lever and governor shaft can be serviced by removing the two screws in the following lever and shaft. Reassemble the following lever and governor shaft so that curved end of the following lever points toward the P.T.O. end of the engine.

New service screws should be used when the old screws are removed. The new service screws have a dry adhesive applied to them to prevent them from coming loose. This is the same screw that is used on the choke and throttle plates in the carburetor.

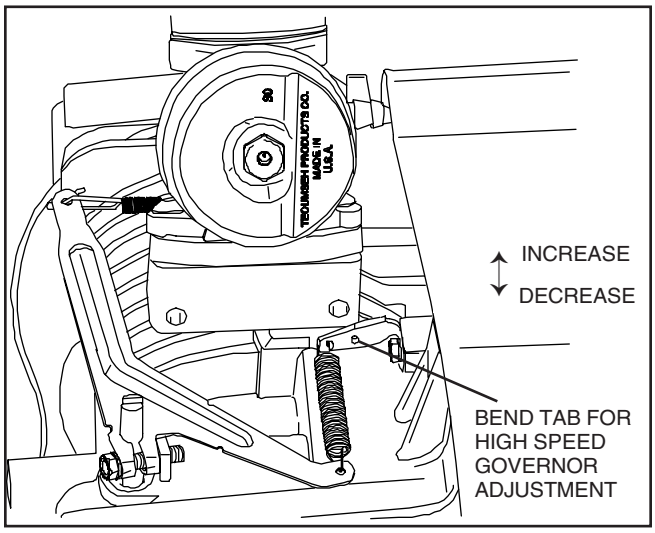
GOVERNOR SHAFT SEAL. The governor shaft seal may be pressed in until it seats in the boss of the block. Care should be used when this seal is replaced, forcing the seal to far into the block will distort the seal and cause it not to seal the governor shaft.

GOVERNOR LINKAGE AND ADJUSTMENT
HXL, HSK840 - 850

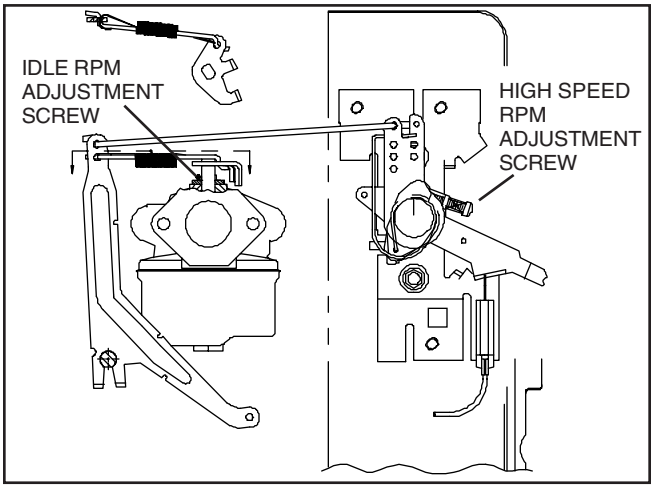
The following are controls used on HSK and HXL models.



Fixed speed governor linkage hookups.



RPM adjustment of fixed speed models is done by bending at the tab as shown.



The HXL840 - 850 Series with variable speed control have the following adjustments. Idle speed is set at the carburetor crack screw. High speed is set with the screw shown above. Always check Microfiche card 30, Plus One or Parts Smart computer program for correct speed settings.

REWIND STARTER

TYPE I

The rewind starter on the engine can be disassembled by using the following steps.

1. After removing the rewind from the engine blower housing release the tension on the rewind spring.
2. Place a 3/4'' deep reach socket inside the retainer pawl. Set the rewind on a bench, supported on the socket.
3. Using a 5/16 roll pin punch, drive out the center pin.
4. All components that are in need of service should be replaced.

THIS REWIND SPRING IS NOT IN A CANISTER. Care must be used when handling the pulley because the rewind spring and cover is held by the bosses in the pulley.

TO REASSEMBLE THE REWIND STARTER:

1. Reverse the above listed procedure keeping in mind that the starter dogs with the dog springs must snap back to the center of the pulley.
2. Always replace the center pin with a new pin upon reassembly. Also add an additional plastic washer (two total) upon reassembly. This washer will be provided along with the new center pin.
3. Check retainer pawl. If it is worn, bent or damaged in any manner replace upon reassembly.

   Tap the new center pin in until it is within 1/8 of an inch of the top of the starter.

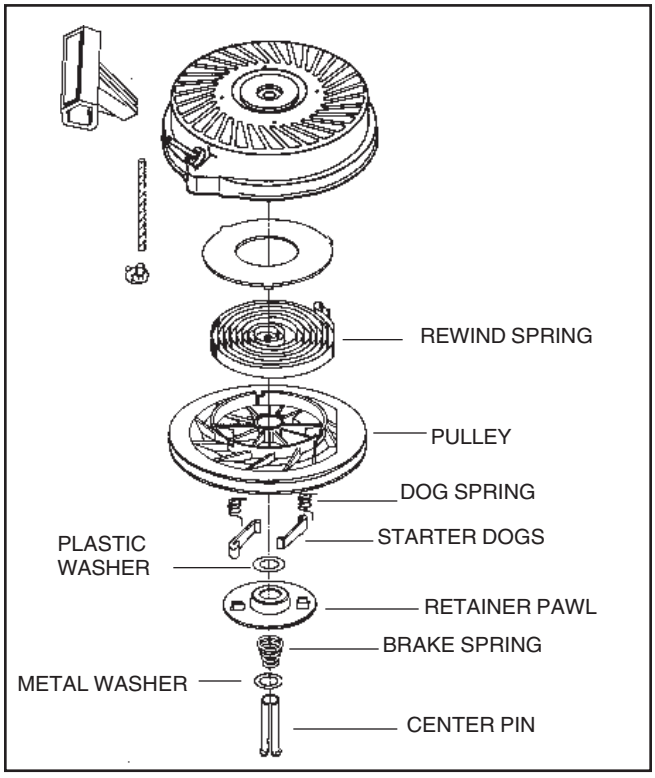
CAUTION: Driving the center pin in too far will cause the retainer pawl to bend and the starter dogs will not engage the starter cup.

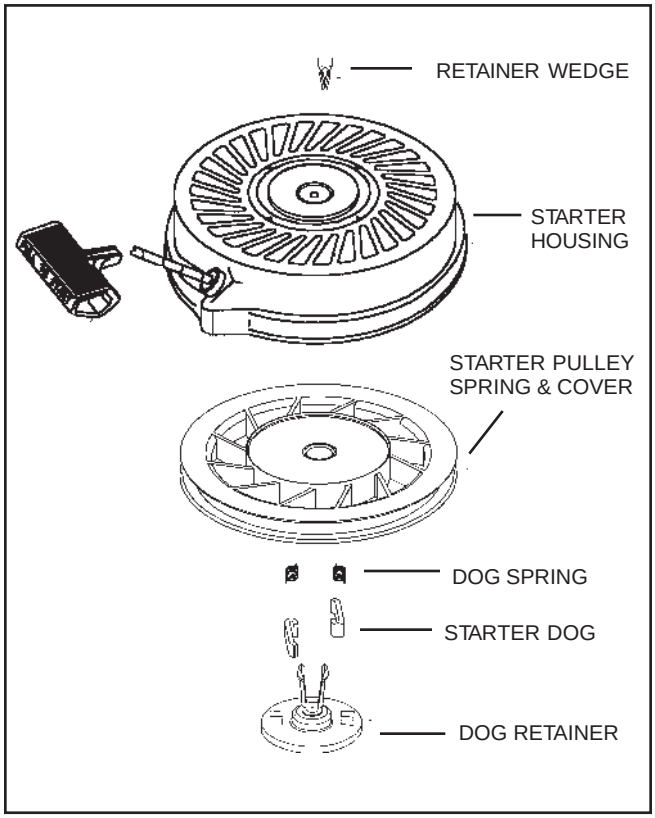
TYPE II

Starters use a new wedge and post system which is serviced in the following steps.

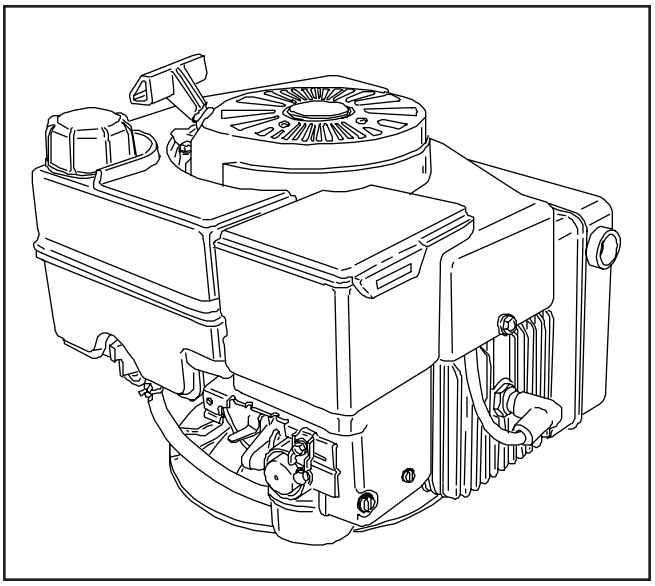
1. Remove decal covering the pin wedge.
2. Use a small screw driver to pry out the wedge.
3. Next use a needle nose pliers to compress the retainer assembly and push it out.
4. Inspect all parts and replace using the Parts Look Up system by model and specification numbers.
5. Always replace the retainer and retainer wedge.

NOTE: Snow King® recoil springs have a specially designed recoil pulley with a frost ring.



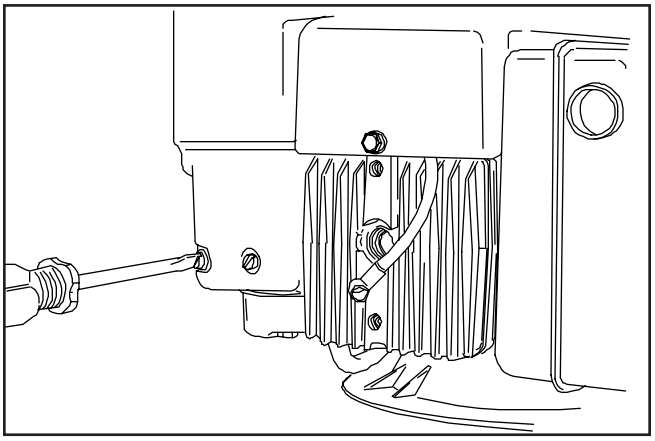


840 - 850 DISASSEMBLY



MODEL 840-850 DISASSEMBLY. Disconnect the high tension lead from the spark plug. Remove the spark plug with a 3/4'' deep reach socket.

Before removing the fuel tank, drain the fuel into an approved container outdoors, away from any open flame.

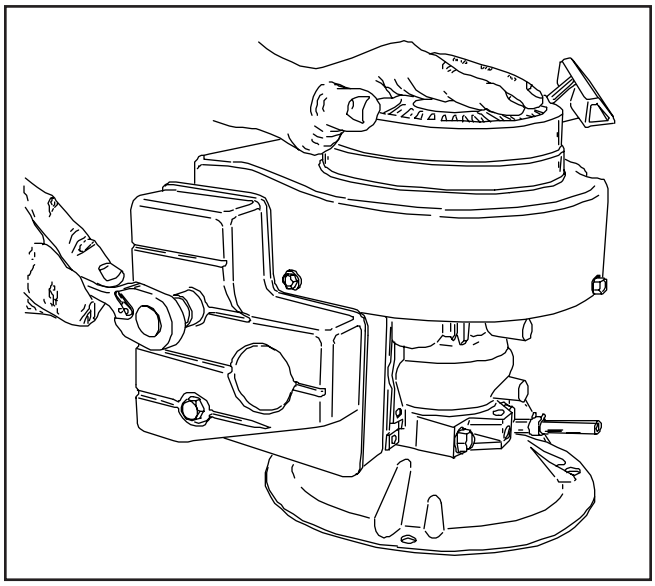


Using a screwdriver remove the 2 screws holding the air cleaner assembly to the carburetor body. Then remove the air cleaner assembly from the engine.

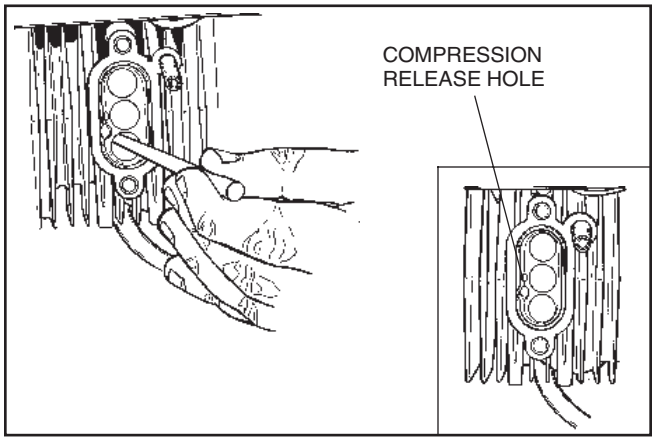
Remove the carburetor and intake/reed assembly if equipped.

NOTE: The horizontal 840 thru 850 engines use a piston port intake system and do not have reed block.

EXHAUST PORT CLEANING



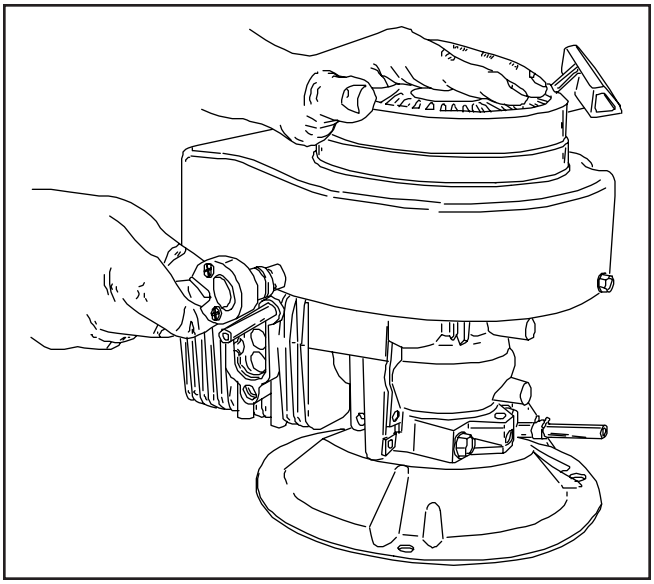
Remove the muffler and gasket from the engine.



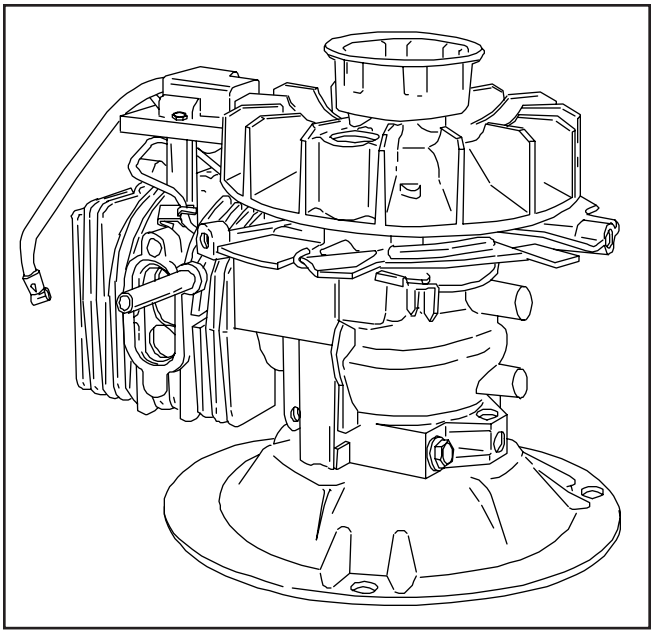
EXHAUST PORT CLEANING. The exhaust ports should be cleaned after each seventy-five (75) to one hundred (100) hours of use.

Before cleaning the ports place the piston in the Bottom Dead Center position. Then clean the ports using a pointed 3/8'' diameter wooden dowel or similar tool. Be sure not to scratch the port area. Also remember to remove all the loose carbon particles from the engine.

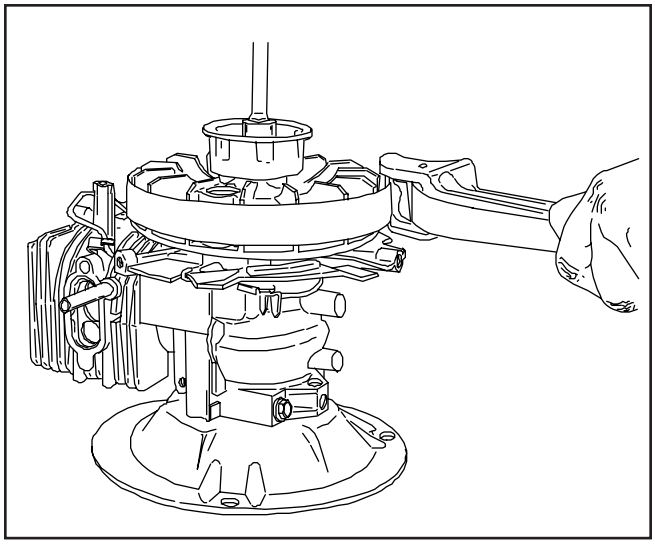
NOTE: The small compression relief hole drilled up into the cylinder must be checked as well. This hole allows for easy starting.



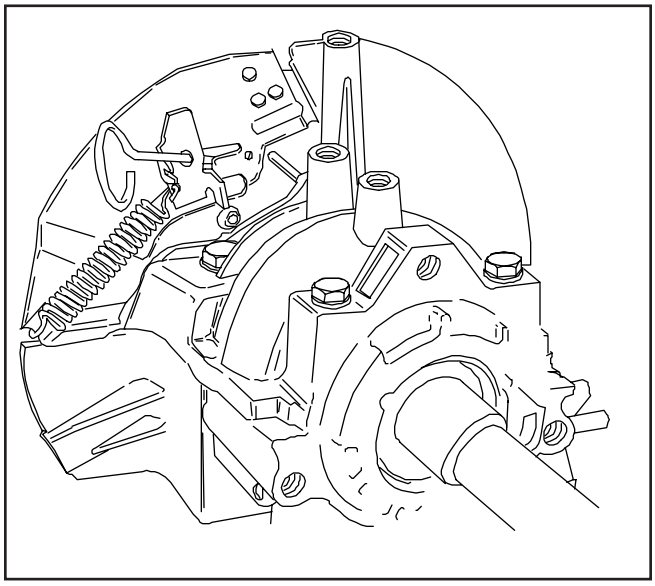
Remove the 4 screws that hold the blower housing in place and remove the housing from the engine.



Check the routing of all the wires from the Solid State Ignition unit before removing them from the unit. Then remove the solid state module from it's posts.

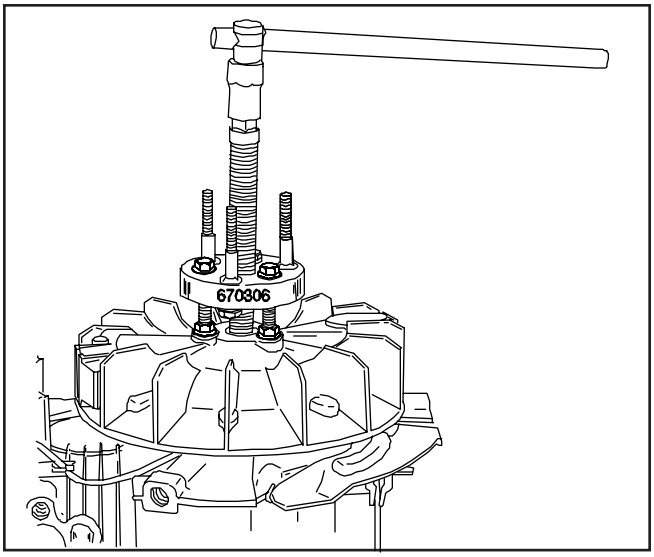


Use strap wrench #670305 to hold the flywheel while removing the flywheel nut.

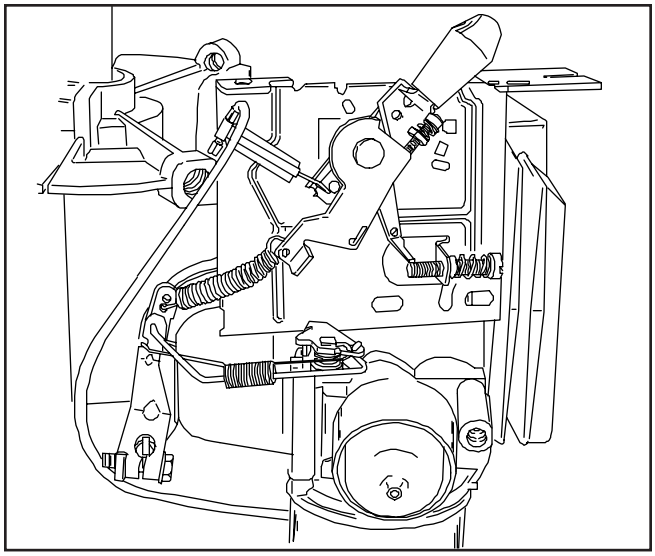


On TVS/TVXL Models before removing the flywheel, the brake pad must be disengaged from the inside of the flywheel. If this is not done damage could occur to the brake system.

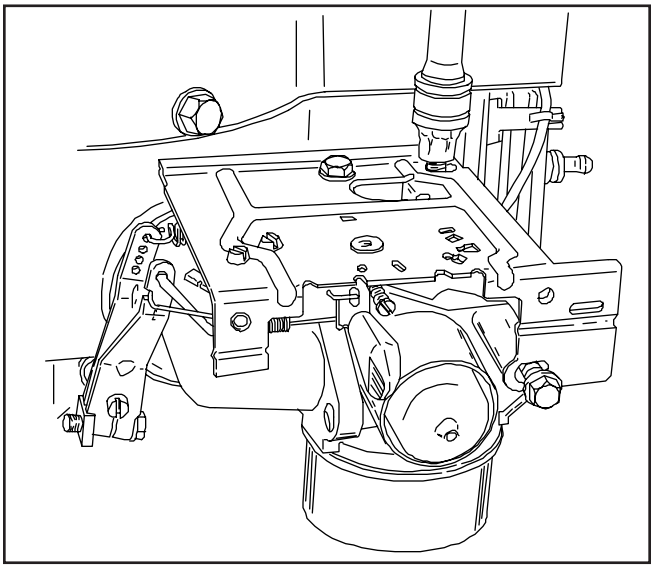
To disengage the brake pad from the flywheel, pull the brake lever away from the return spring as far as it will go. Place an alignment pin through the lever hole so it catches on the shroud. This will hold the pad off the flywheel.



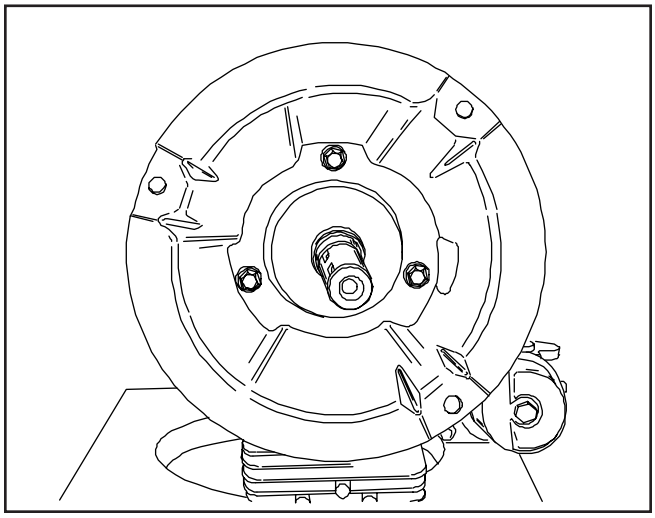
Use flywheel puller #670306 to remove the flywheel. DO NOT USE A KNOCKOFF TOOL.



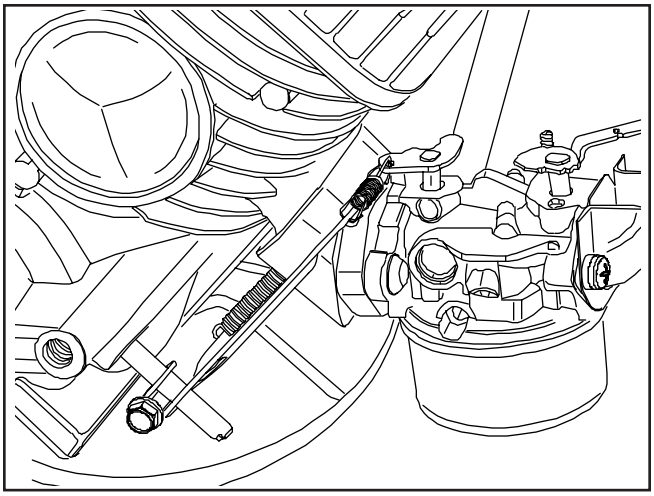
BE SURE TO MARK LINKAGE CONNECTIONS.



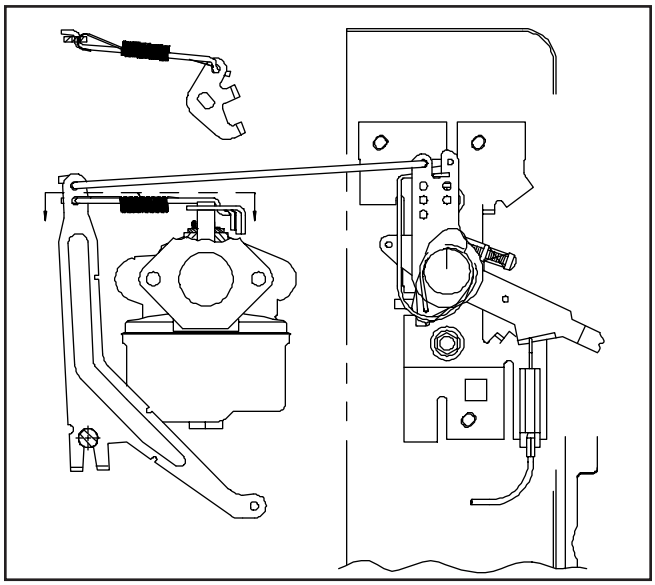
On TVS/TVXL840 models remove the 3 screws that hold the speed control to the block.



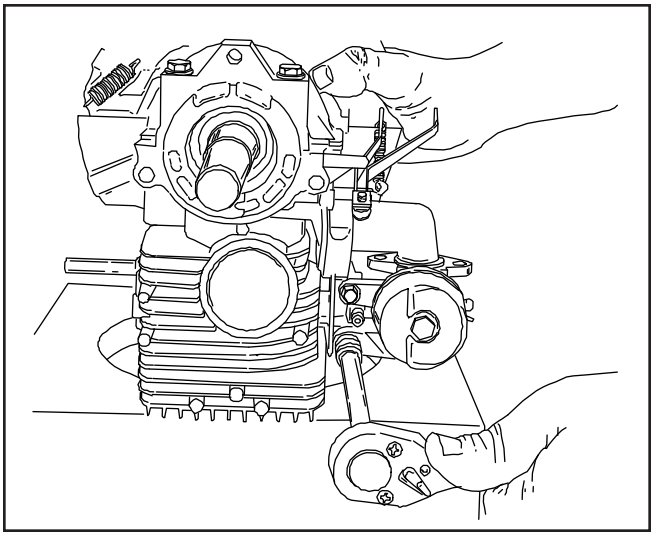
On TVS/TVXL840, after removing the 3 screws from the PTO mounting adaptor, it may be necessary to tap lightly on the ring with a rawhide mallet to remove it.



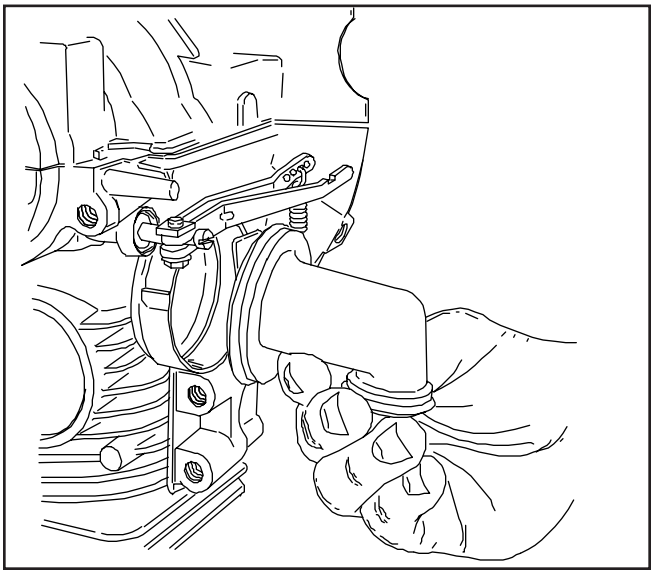
Remove governor linkage on HSK model, always mark all spring and linkage positions



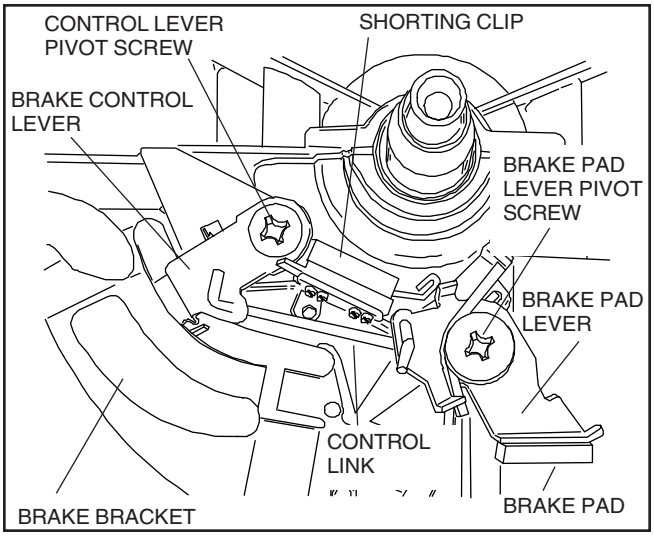
Remove governor linkage on HXL model with variable speed.

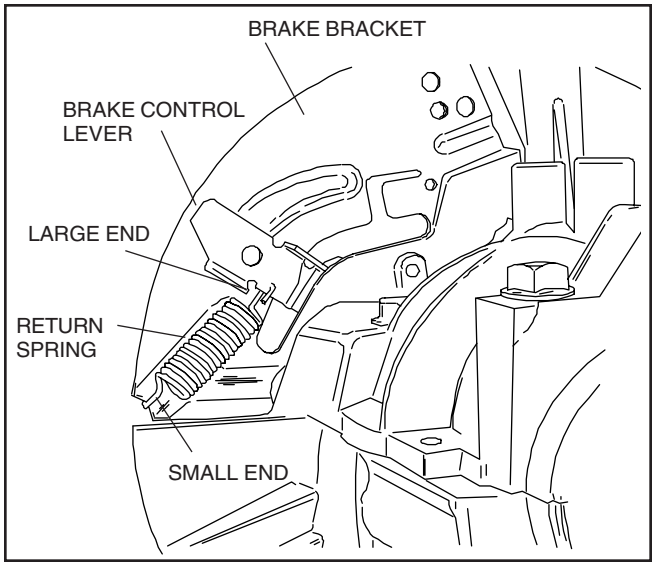


On TVS/TVXL840 models, the 2 bolts that hold the carburetor to the cylinder can be removed. Notice the position of the fiber washers on the carburetor screws. These are for vibration and must be re-installed on assembly between the carburetor and block.

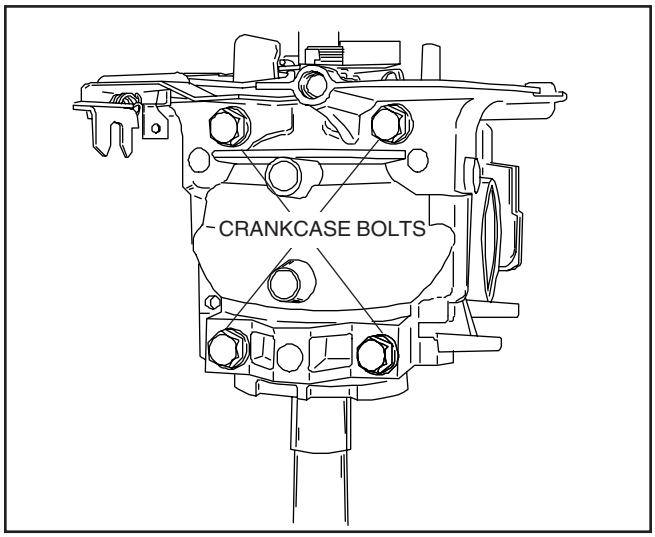


TVS/TVXL models, pull the intake elbow out of it's cavity. Discard the rubber "O" rings. Examine the reed valve for damage and wear. If reed clearance is .020" or more replace the intake elbow.

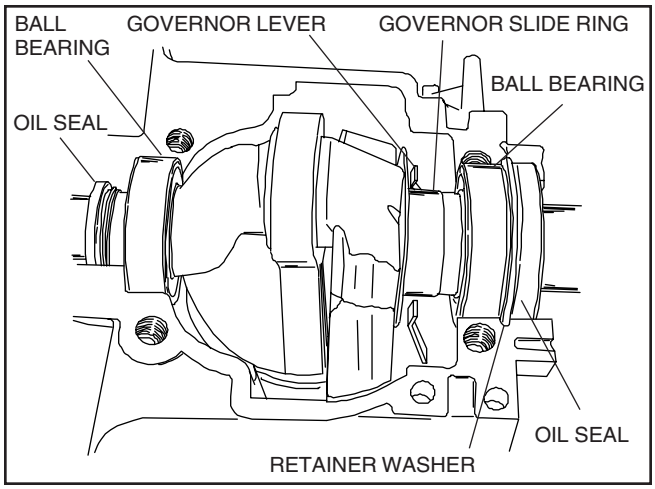




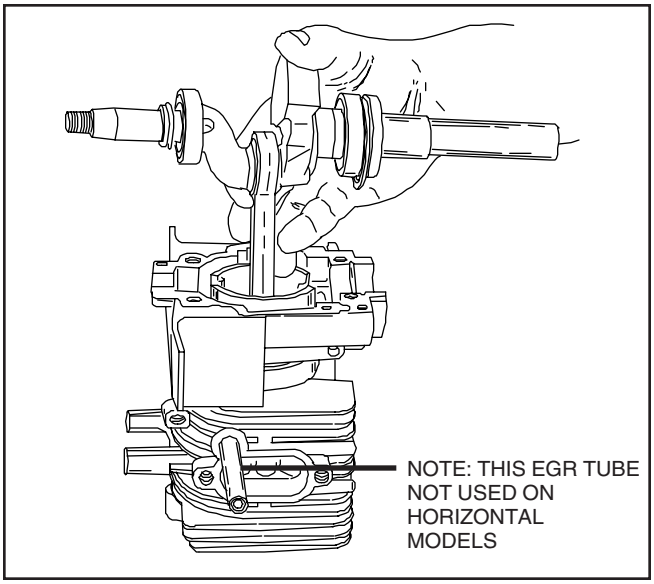
Examine the positioning of the brake assembly components before removing the assembly. For disassembly instructions see Self-Energizing Brake System in this manual. (TVS/TVXL models only)



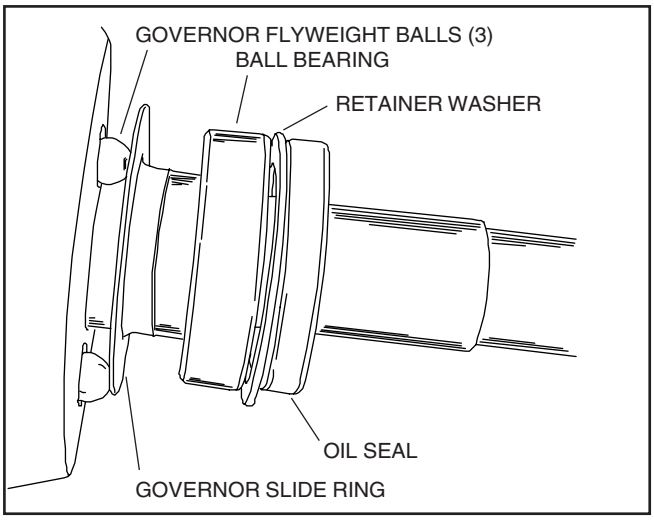
This engine has a split crankcase. To service the internal components of this engine, remove the 4 bolts that hold the crankcase cover to the cylinder. Then lift the crankcase cover off the cylinder.



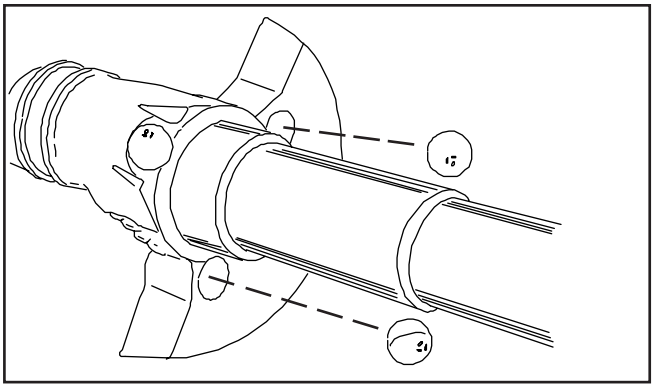
With the crankcase cover removed the positioning of the internal components can be noted.



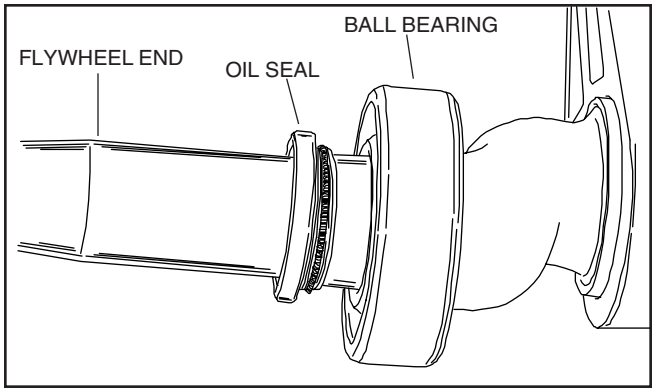
To be sure you don't drop any of the needle bearing needles, follow these steps. First rotate the piston towards the spark plug. Next hold the rod against the crankshaft counter weight and pull the assembly out.



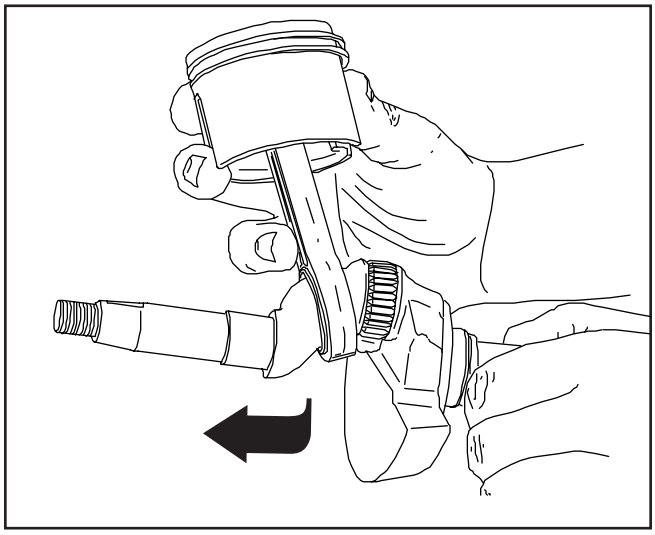
The proper positioning of the PTO side oil seal, retainer washer and ball bearing are shown here. Along with the governor slide ring which is a component of the engines Mechanical Governor System. To remove all of these components simply slide them off the PTO end of the crankshaft.



After removing the governor slide ring the governor flyweight balls can be removed and replaced if necessary.



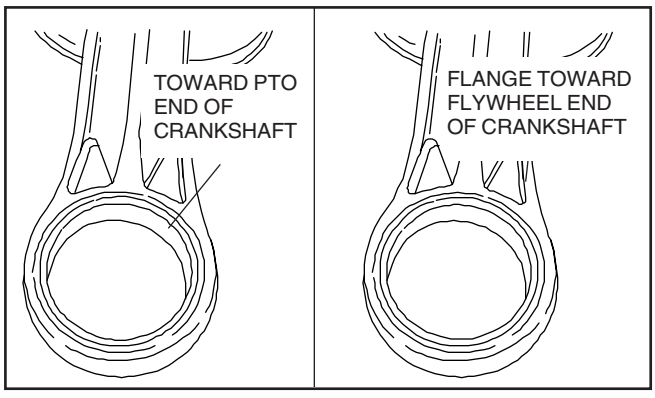
Remove the oil seal and ball bearing from the flywheel end of the crankshaft.



Slide the piston and connecting rod off towards the flywheel end of the crankshaft.

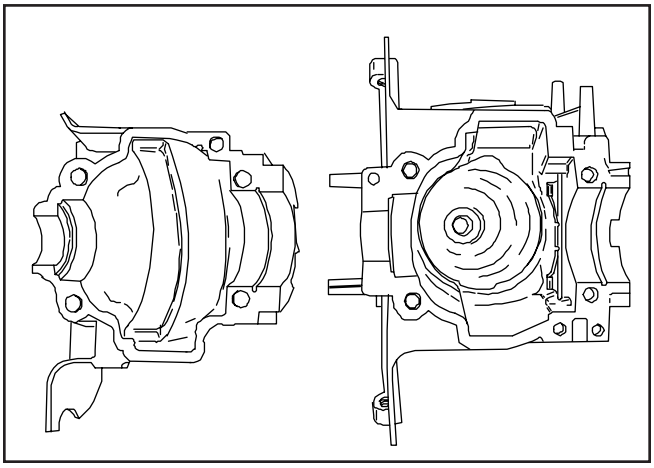
IMPORTANT: The crankpin needles are loose, not caged! Collect and count the needles. There should be 31.

NEVER REUSE OLD NEEDLES.

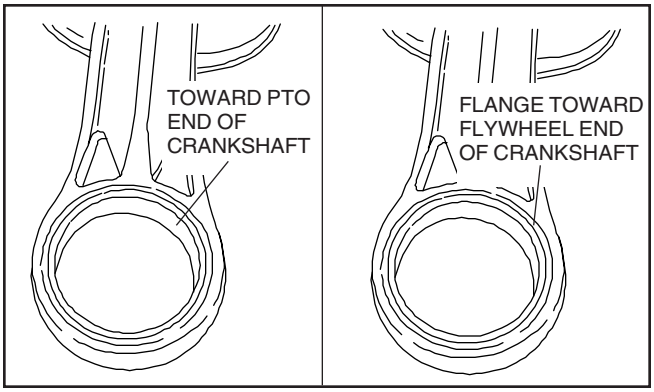


The connecting rod has a pressed in steel bearing liner. Notice that the flange of the connecting rod liner faces the flywheel end of the crankshaft.

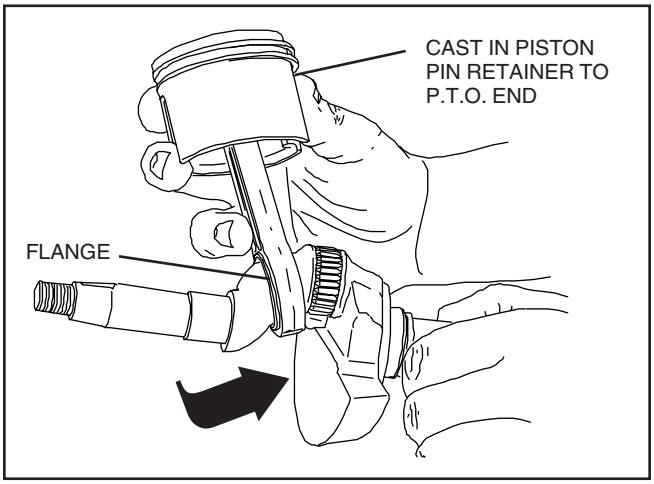
840 - 850 REASSEMBLY



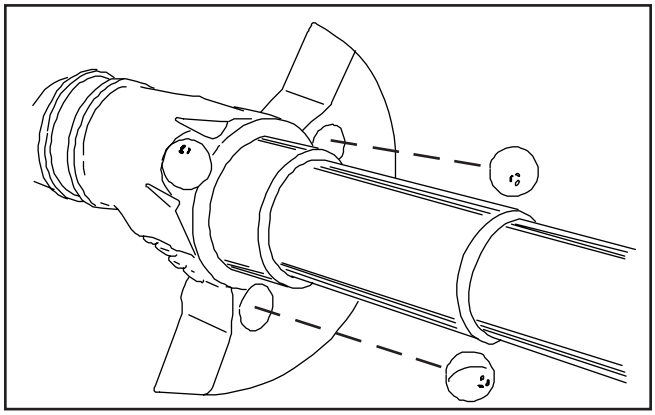
840 HORIZONTAL AND VERTICAL REASSEMBLY. Apply cleaning solvent to the mating surfaces of the cylinder and crankcase, and allow to stand for a few minutes. If scraping is required, avoid causing any scratches or burrs.



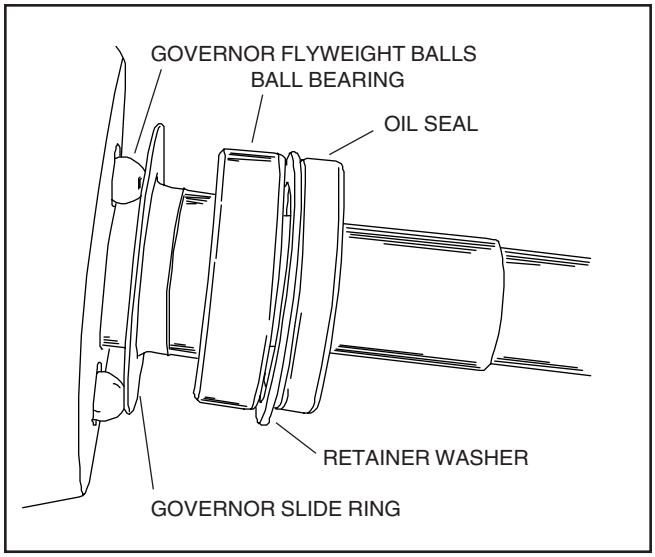
On older units the flange side of the rod race must face toward the flywheel end of the crankshaft.



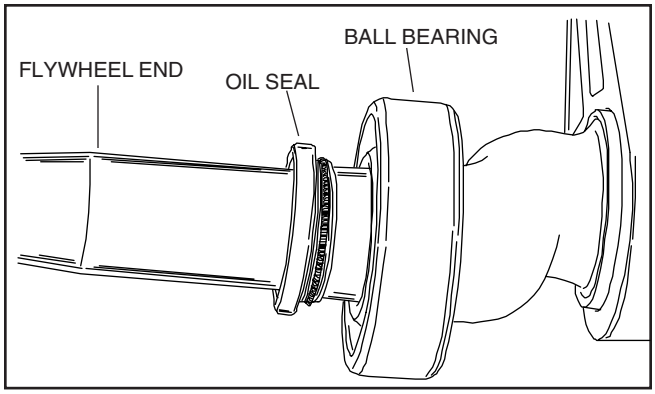
After installing a new strip of needle bearings (31 needles) position the piston and connecting rod on the crankshaft, making sure the flange side of the rod liner is toward the flywheel end of the crankshaft. On newer units the connecting rod flange is less noticeable and will require the cast in side of the piston pin retainer to face the PTO end of the crankshaft.



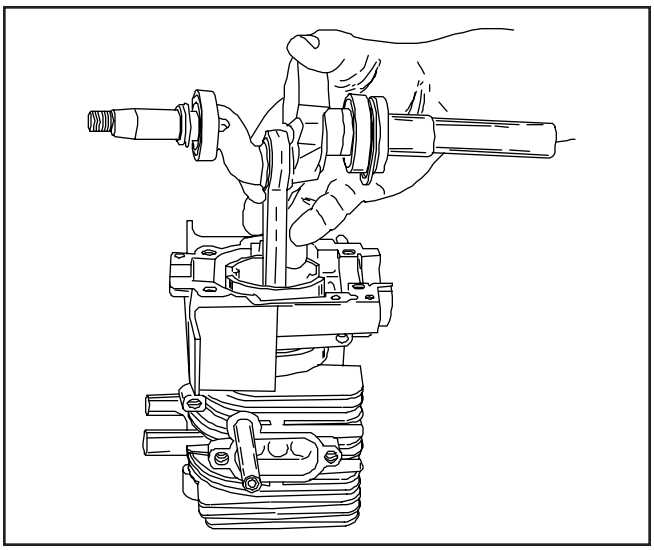
Reposition the 3 governor flyweight balls in the crankshaft.



Place the governor slide ring on the PTO end of the crankshaft so the flat portion covers the flyweight balls. Then position the ball bearing, retainer washer and large oil seal as shown. Use seal protector #670265 when positioning the oil seal.

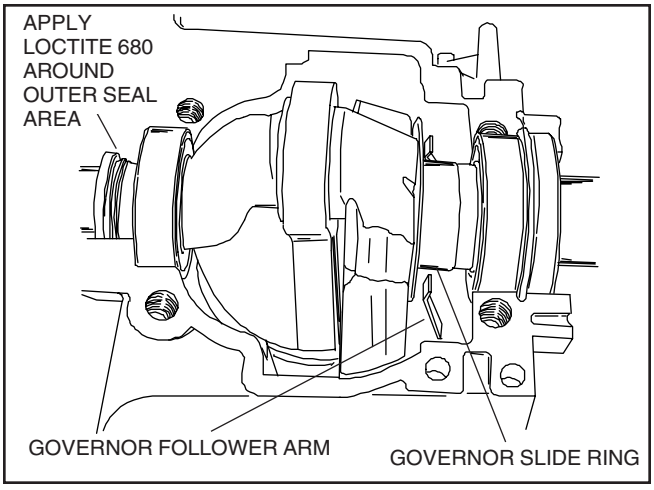


Reposition the ball bearing and oil seal on the flywheel end of the crankshaft.

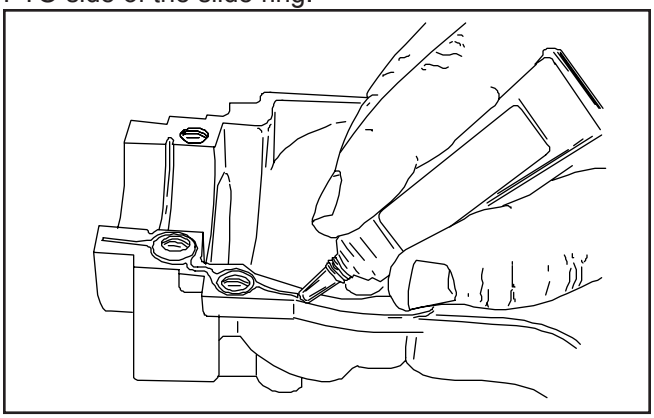


If piston rings need assistance to go in, use a hard wooden wedge made from a dowel.

Place the complete crankshaft and piston assembly into the cylinder. Make sure to stagger the ring end gaps. The tapered edge of the cylinder will compress the rings. Use care not to damage the connecting rod.

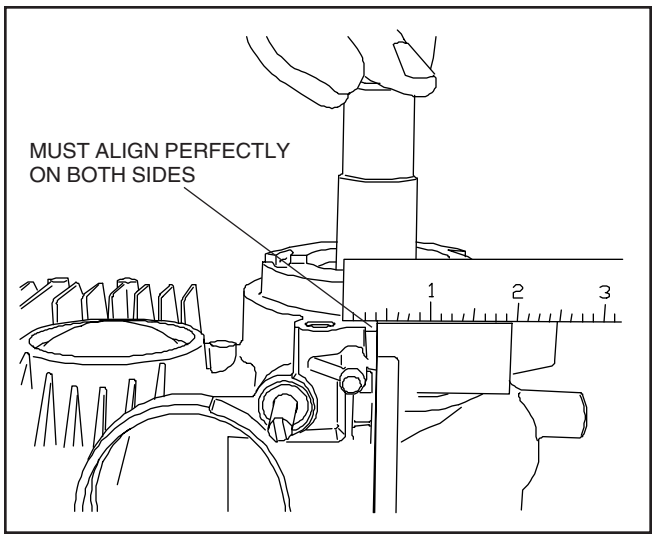


Position the governor following lever so it rides on the PTO side of the slide ring.

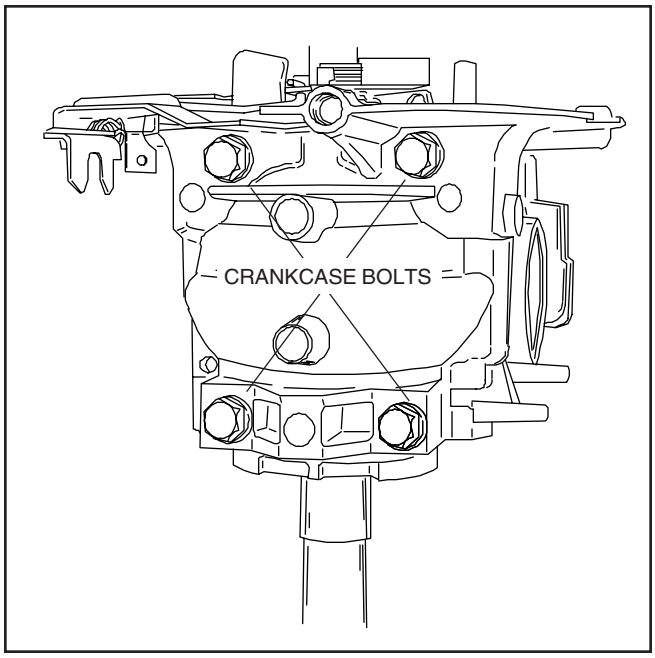


Before replacing the crankcase cover, apply a thin layer of Loctite #515 Gasket Sealant Eliminator (Tecumseh part #510334) around the crankcase, completely covering the mating surface.

NOTE: LOCTITE 680 MUST BE USED AROUND THE OUTSIDE FLYWHEEL END SEAL FOR RETENTION.



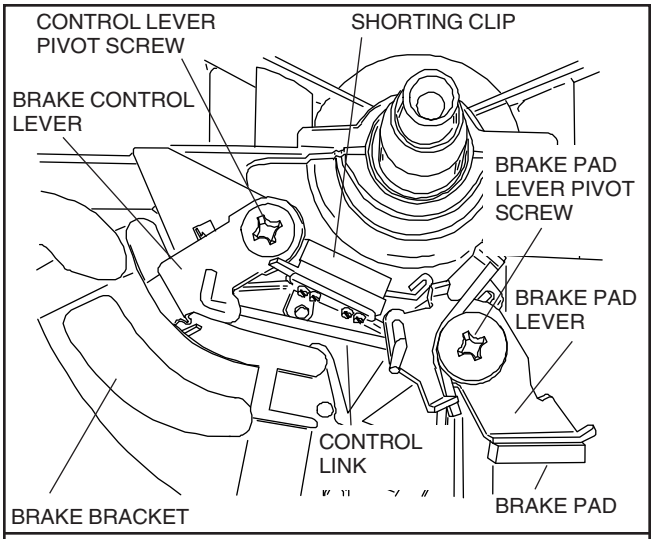
It is critical the crankcase cover be aligned to the crankcase at the PTO end. This can be accomplished by checking with a straight edge or by using a 1/4'' alignment tool such as the shank end of a drill.

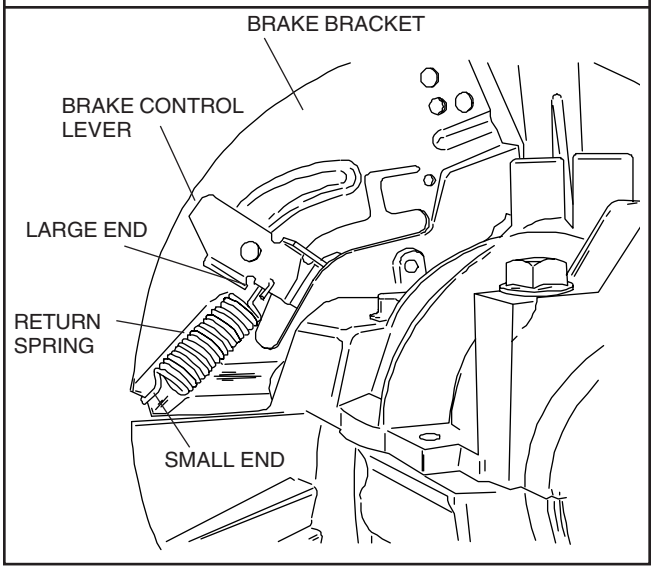


Reassemble the crankcase cover to the cylinder.

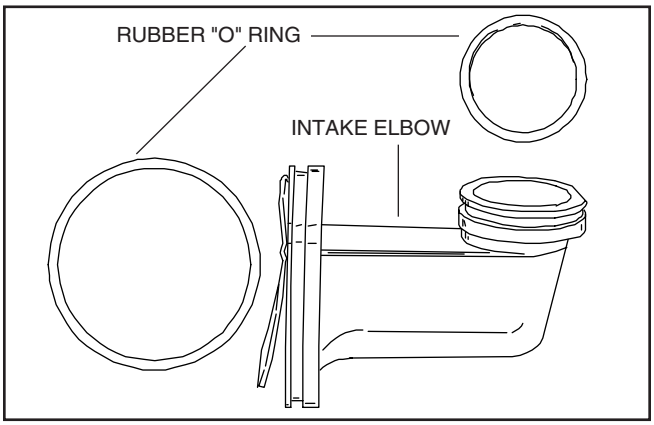
Torque in increments of 50 inch pounds to the requirement listed in the table of specifications.

TVS/TVXL840 ONLY



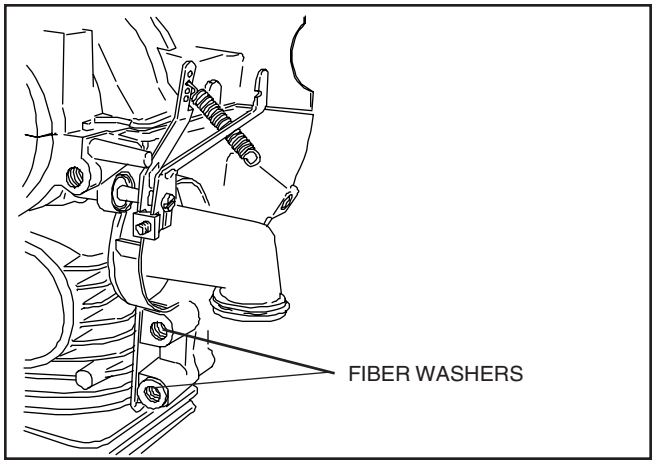


Assemble the brake assembly as shown. Only on TVS\TVXL840 models.

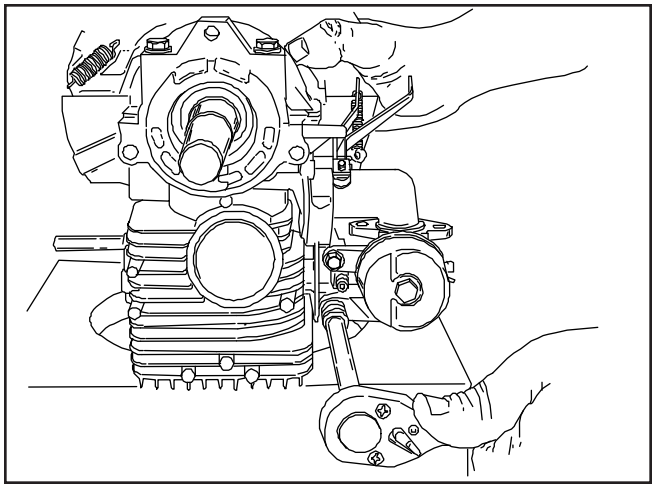


TVS/TVXL840 Models. To insure proper sealing of the intake elbow to the carburetor and the cylinder, replace the rubber “O” rings on the intake elbow with the proper replacement parts.

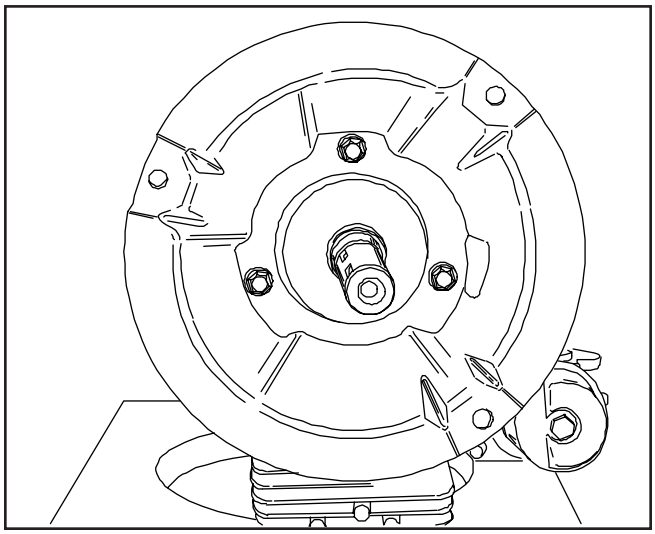
NOTE: TO PREVENT "O" RING DAMAGE, ALWAYS LUBRICATE THEM WITH OIL ON ASSEMBLY.



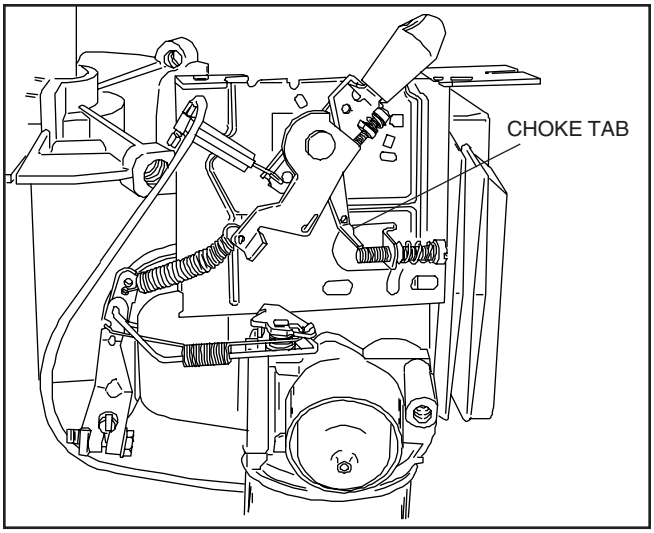
Place one (1) fiber washer on each carburetor post before attaching the carburetor to the cylinder block.



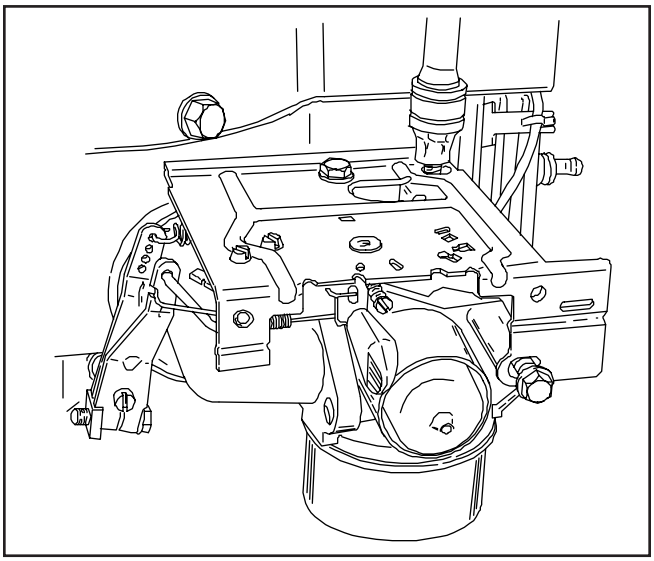
Assemble the carburetor so that the bowl of the carburetor faces the PTO end of the engine.



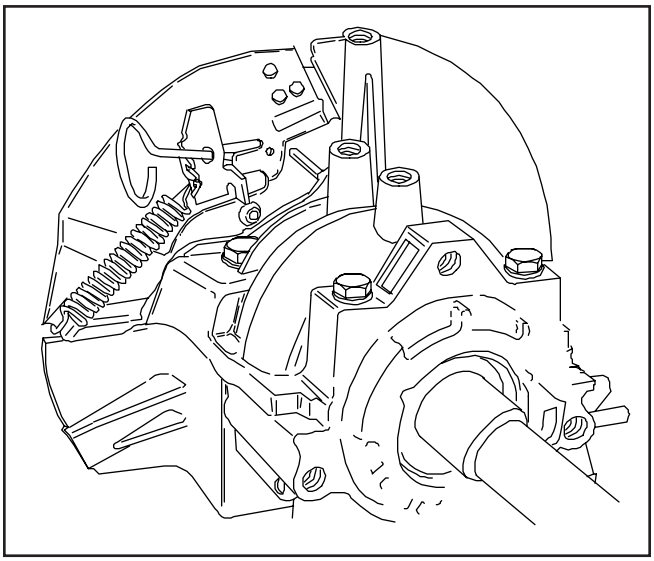
Position the PTO mounting adapter so that the holes line up. You may need to use a rawhide mallet to tap the adapter into place. RTV sealant is used in production on these three mounting screws; be sure to remove all old RTV from screws and mounting holes. New RTV should be placed on screws when reassembling to avoid any porosity leaks.



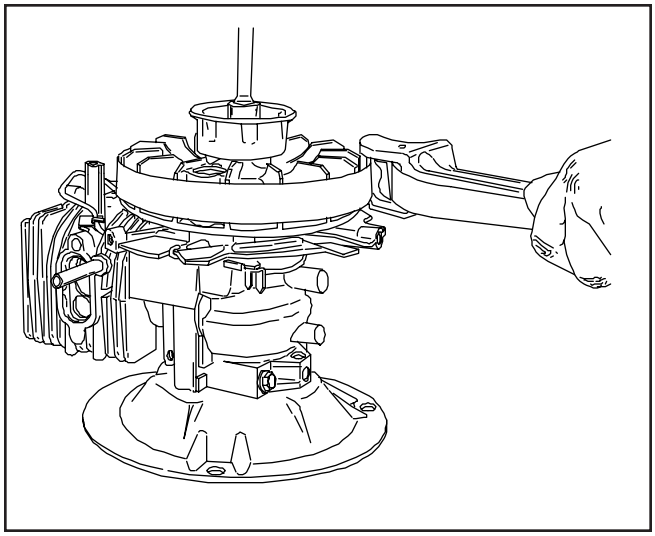
TVS/TVXL840 - Attach the governor linkage to the speed control bracket and carburetor as shown.



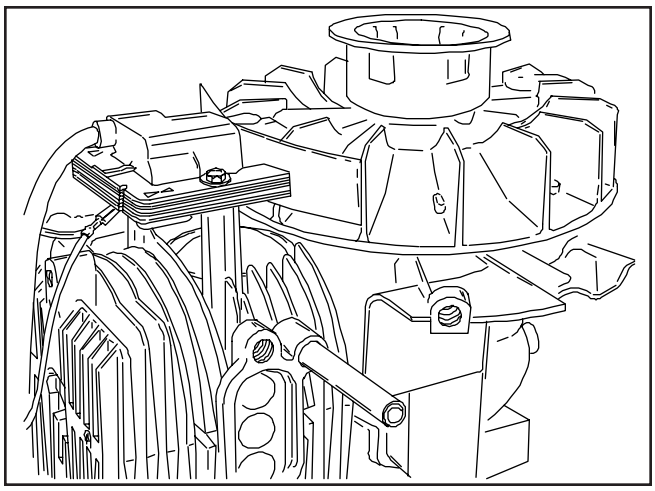
TVS/TVXL840 - Reposition the speed control bracket.



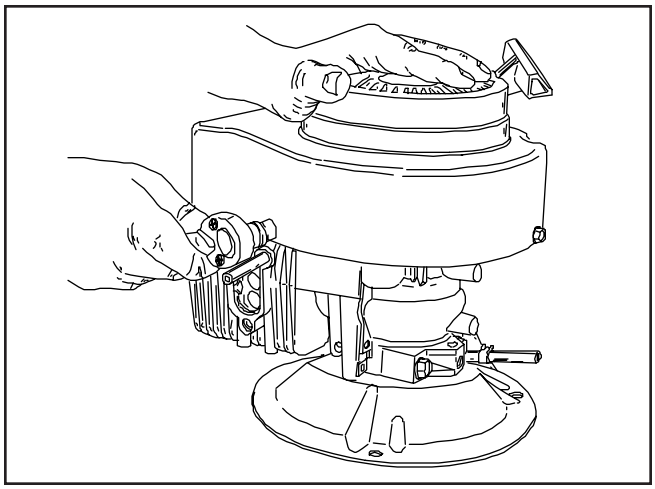
Before repositioning the flywheel be sure to place the brake in the disengaged position. Pull the brake lever away from the return spring as far as it will go. Then place the alignment pin in the hole in the lever so it catches on the shroud.



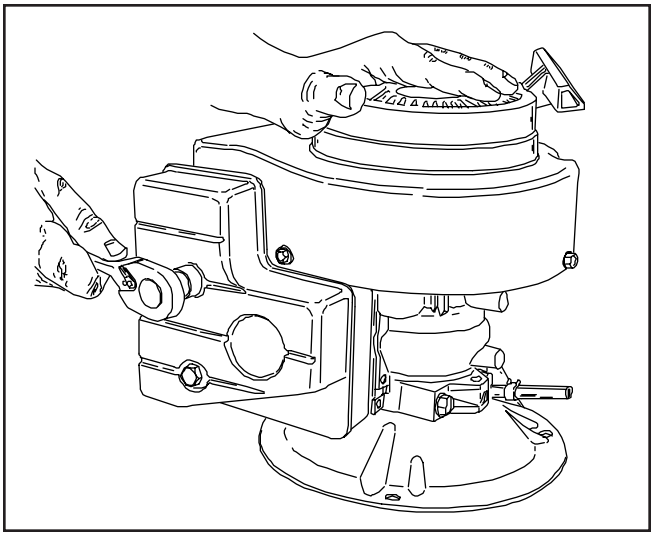
Reposition the flywheel key, starter cup, washer and flywheel nut. Hold the flywheel with the strap wrench #670305, and torque the flywheel nut to specifications.



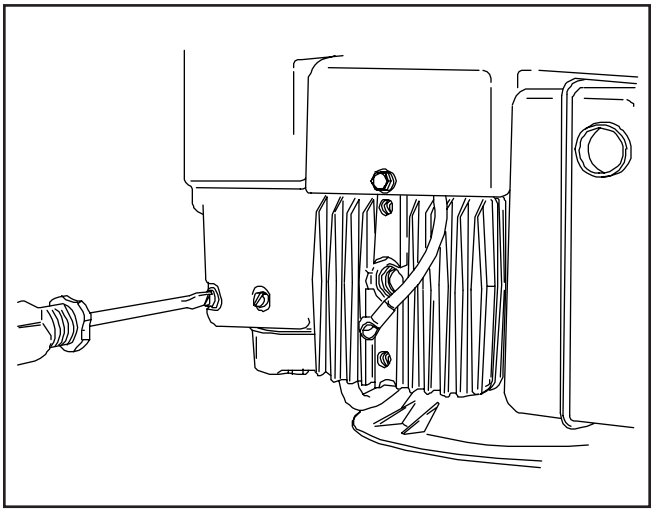
Reattach the solid state module to the engine. Set the air gap between the flywheel and the module laminations at .0125'' using Tecumseh air gap gauge #670297. Rotate the flywheel to assure that the flywheel does not strike solid state module.



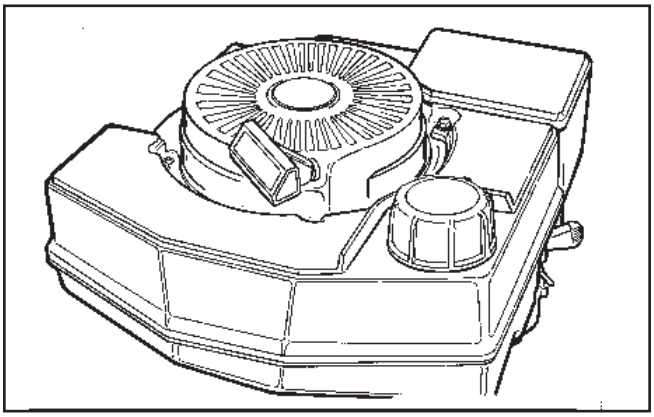
Reinstall the blower housing and rewind assembly.



Reposition the gasket and muffler.



Reassemble the air cleaner components and assemble the air cleaner to the carburetor. These screws require red Loctite #271 to assure retention.



Install the fuel tank and connect the fuel line. Fill the tank with a fuel/oil mixture of 50:1.

NOTE: If the engine was rebuilt, use double the mixture of oil for the first gallon of fuel.

Install the correct spark plug and reconnect the high tension lead.

NOTE: On Snow King® models the fuel tank is supplied by the O.E.M.'s.

TORQUE SPECIFICATIONS

	FOOT POUNDS	INCH POUNDS	Nm
CRANK CASE to CYLINDER	10 - 17	120 - 204	13.5 - 22.9
GOVERNOR LEVER to SHAFT		4 - 8	.5 - .9
GOVERNOR SHAFT BOLT/NUT		30 - 50	.5 - 6.2
CARBURETOR to CYLINDER (TVS/TVXL840)	10 - 10.5	120 - 150	13.4 - 16.8
CARBURETOR to CYLINDER (HXL/HSK845/850)	3.4 - 5.4	40 - 65	4.5 - 7.3
SPEED CONTROL BRACKET to CYLINDER (TVS/TVXL840)		35 - 50	3.9 - 5.6
FLYWHEEL NUT	30 - 33.3	360 - 400	40.3 - 44.8
IGNITION COIL to CYLINDER		30 - 40	3.4 - 5.6
SPARK PLUG	16 - 20	192 - 240	21.5 - 26.9
MUFFLER to CYLINDER	8.3 - 10	100 - 120	12 - 13.4
ADAPTER PLATE to CYLINDER	13 - 18	156 - 216	17.5 - 24.2
BLOWER HOUSING to CYLINDER	7.5 - 10	90 - 120	10.8 - 13.4
FUEL TANK to BLOWER HOUSING (TVS/TVXL840)		25 - 46	2.8 - 5.2
COMPLIANCE BRACKET to CRANKCASE		30 - 40	3.4 - 4.5
MUFFLER GUARD to BLOWER HOUSING		20 - 30	2.2 - 3.4
STARTER		15 - 25	1.7 - 2.8
AIR CLEANER CANISTER HEX NUT		14 - 20	1.6 - 2.2
STUD to AIR CLEANER ELBOW		36 - 60	4.0 - 6.7
AIR CLEANER ELBOW to CARBURETOR		20 - 30	2.2 - 3.4
AIR CLEANER WING NUT		10 - 20	1.1 - 2.2
AIR CLEANER (PLASTIC) to CARBURETOR		6 - 8	.7 - .9
AIR CLEANER BRACKET TO CARBURETOR		15 - 25	1.7 - 2.8
AIR BAFFLE TO CARBURETOR		30 - 50	3.4 - 5.6
SPEED CONTROL BRACKET TO CYLINDER (HXL/HSK845/850)		20 - 35	2.2 - 3.9
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AIR CLEANER SUPPORT BRACKET TO ELBOW	10 - 12.5	120 - 150	13.4 - 16.8

"Torque specifications listed on this page should not be confused with the torque value observed on engines which have been run. Torque relaxation occurs on all engines from thermal expansion and contraction. The torque specification take relaxation into account so a sufficient clamping force exists after an engine has been run."

NOTE: Torque is below 5 Ft/LBS. will not be listed. These should only be done with a Inch/Lb. torque wrench.

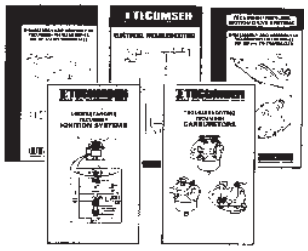
ENGINE SPECIFICATIONS

	TVS840 INCHES	TVXL840 INCHES	HSK/HXL840-850 INCHES
BORE	2.437 in. 2.438 in. (61.9 mm)	2.437 in. 2.438 in. (61.9 mm)	2.437 in. 2.438 in. (61.9 mm)
STROKE	1.812 (46 mm)	1.812 (46 mm)	1.812 (46 mm)
CUBIC INCH DISPLACEMENT	8.46 (139 cc)	8.46 (139 cc)	8.46 (139 cc)
SPARK PLUG GAP	.030 (.76 mm)	.030 (.76 mm)	.030 (.76 mm)
PISTON RING END GAP	.007 (.18 mm) .017 (.43 mm)	.007 (.18 mm) .017 (.43 mm)	.007 (.18 mm) .017 (.43 mm)
PISTON DIAMETER	2.4320 (61.77 mm) 2.4326 (61.79 mm)	2.4320 (61.77 mm) 2.4326 (61.79 mm)	2.4320 (61.77 mm) 2.4326 (61.79 mm)
PISTON RING GROOVE WIDTH TOP	.0645 (1.64 mm) .0655 (1.66 mm)	Half Keystone Ring	Half Keystone Ring
PISTON RING GROOVE WIDTH BOTTOM	.0645 (1.64 mm) .0655 (1.66 mm)	.0645 (1.64 mm) .0655 (1.66 mm)	.0645 (1.64 mm) .0655 (1.66 mm)
PISTON RING WIDTH TOP	.0615 (1.56 mm) .0625 (1.59 mm)	Half Keystone Ring	Half Keystone Ring
PISTON RING WIDTH BOTTOM	.0615 (1.56 mm) .0625 (1.59 mm)	.0615 (1.56 mm) .0625 (1.59 mm)	.0615 (1.56 mm) .0625 (1.59 mm)
CRANK PIN JOURNAL DIAMETER	.9710 (24.98 mm) .9715 (24.68 mm)	.9710 (24.66 mm) .9715 (24.68 mm)	.9710 (24.66 mm) .9715 (24.68 mm)
CRANKSHAFT P.T.O. SIDE MAIN BEARING DIAMETER	.9833 (24.98 mm) .9838 (24.99 mm)	.9833 (24.98 mm) .9838 (24.99 mm)	.9833 (24.98 mm) .9838 (24.99 mm)
CRANKSHAFT MAGNETO SIDE MAIN BEARING DIAMETER	.7864 (19.98 mm) .7869 (19.99 mm)	.7864 (19.98 mm) .7869 (19.99 mm)	.7864 (19.98 mm) .7869 (19.99 mm)
CRANKSHAFT END PLAY	.0004 (.01 mm) .0244 (.62 mm)	.0004 (.01 mm) .0244 (.62 mm)	.0004 (.01 mm) .0244 (.62 mm)

NOTE: SPECTIFICATIONS ARE IN INCHES
( ) ARE FOR METRIC DIMENSIONS

TRAINING AIDS AND TOOLS

VIDEO PROGRAMS



695015

Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059

Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

695148

Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185

Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285

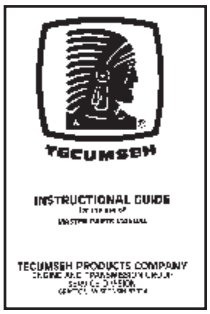
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS

INSTRUCTIONAL GUIDE

692738

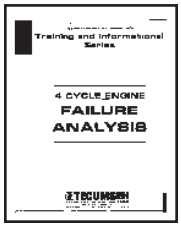
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.



4-CYCLE ENGINE FAILURE ANALYSIS

695590

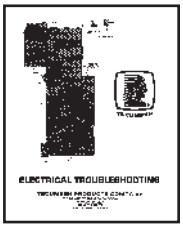
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.



ELECTRICAL TROUBLESHOOTING BOOKLET

693505A

This booklet contains schematic drawings of Tecumseh direct current and alternating current systems and how to check them when problems occur.



CARBURETOR TROUBLESHOOTING BOOKLET

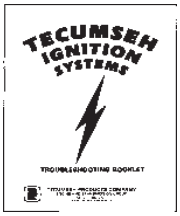
695907

This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903

This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.



QUICK REFERENCE CHART BOOKLET

695933

This booklet contains the quick reference information found on Tecumseh wall charts.

This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

SPECIAL TOOLS BOOKLET

694862

This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

TESTER BOOKLETS

694529

Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

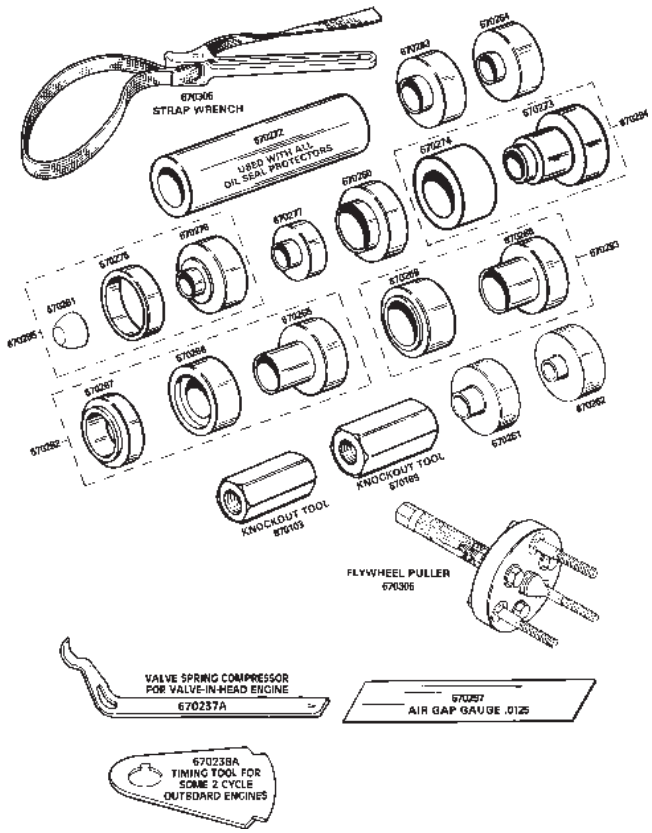
694530

Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

TOOLS

TOOL KIT 670195B

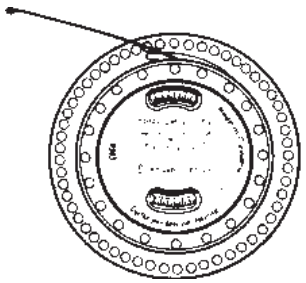
Kit contains tools for 2 and 4 cycle engines.



OIL SEAL REMOVER

No. 670288

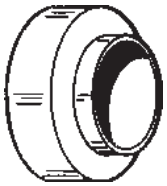
VIBRATION TACHOMETER



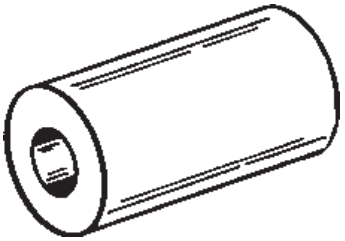
No. 670156 - Vibration tachometer

No. 670298 - Aligning Pin

OIL SEAL PROTECTOR



No. 670226 - Used on P.T.O. end oil seal.

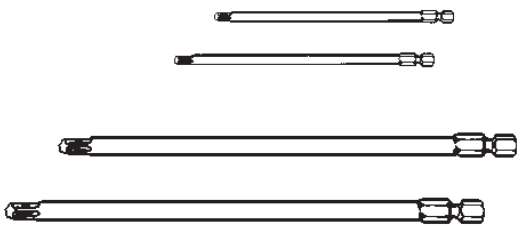


No. 670318 - Installation of E.G.R. tube

Loctite Gasket Sealant Eliminator No. 515 will be sold by Tecumseh under the part number 510334.

TORX DRIVERS

Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320



TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers engine models:
OHH50 - 65, OHHSK50 - 130, OHV11 - OHV17, OVM120, OVRM40-675, OVRM120, OVXL/C120, OVXL120, OVXL125.

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

CONTAINS SEARS CRAFTSMAN CROSS REFERENCE

4-CYCLE OVERHEAD VALVE ENGINES

TECUMSEH®

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CHAPTER 1 GENERAL INFORMATION

ENGINE IDENTIFICATION

Tecumseh engine model, specification, and serial numbers or date of manufacture (D.O.M.) are stamped into the blower housing, or located on a decal on the engine in locations as illustrated (diag. 1 & 2). The engine identification decal also provides the applicable warranty code and oil recommendations (diag. 2).

Interpretation of Model Number

The letter designations in a model number indicate the basic type of engine.

OHH - Overhead Valve Horizontal

OHM - Overhead Valve Horizontal MediumFrame

OHSK - Overhead Valve Horizontal Snow King

OVM - Overhead Valve Vertical Medium Frame

OVRM - Overhead Valve Vertical Rotary Mower

OVXL - Overhead Valve Vertical Medium Frame Extra Life

OHV - Overhead Valve Vertical

The number designations following the letters indicate the basic engine model.

The number following the model number is the specification number. The last three numbers of the specification number indicate a variation to the basic engine specification.

The serial number or D.O.M. indicates the production date of the engine.

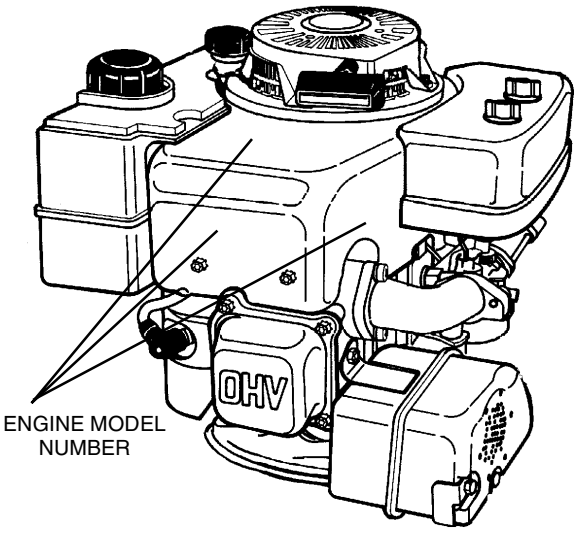
Using model **OHV16-204207A**, serial **5215C** as an example, interpretation is as follows:

OHV16-204207A is the model and specification number.

OHV	Overhead Valve Vertical
16	Indicates the basic engine model.
204207A	is the specification number used for properly identifying the parts of the engine.
5215C	is the serial number or D.O.M. (Date of Manufacture)
5	is the last digit in the year of manufacture (1995).
215	indicates the calendar day of that year (215th day or August 3, 1995).
C	represents the line and shift on which the engine was built at the factory.

Emissionized engines that meet the California Air Resource Board (C.A.R.B.) or the Environmental Protection Agency (E.P.A.) standards will include additional required engine information on the engine decal.

NOTE: To maintain best possible emission performance, use only Genuine Tecumseh Parts.



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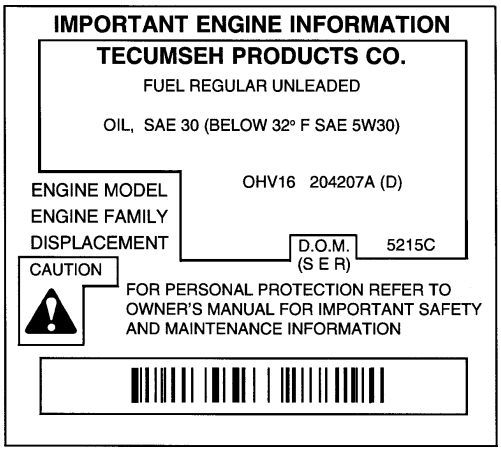

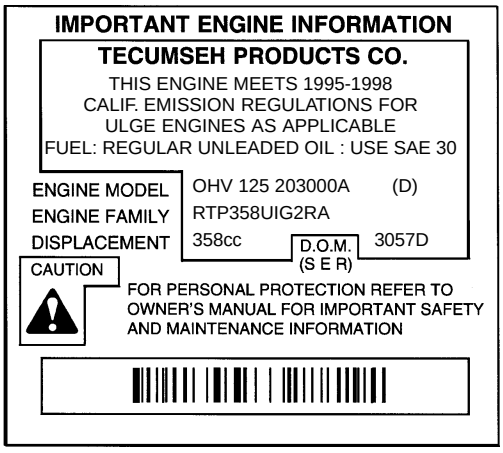

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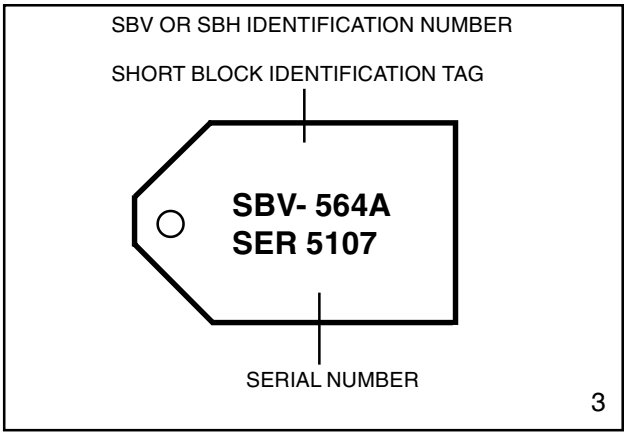
SHORT BLOCKS

New short blocks are identified by a tag marked S.B.H. (Short Block Horizontal) or S.B.V. (Short Block Vertical). Original model identification numbers of an engine should always be transferred to a new short block for correct parts identification (diag. 3).

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED COULD ENDANGER THE PERSONAL SAFETY OF YOURSELF AND OTHERS. FOLLOW ALL INSTRUCTIONS.



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FUELS

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh Engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build up of combustion chamber deposits. Unleaded regular, unleaded premium or reformulated gasoline containing no more than 10% Ethanol, or 15% MTBE, or 15% ETBE may also be used.

Leaded fuel is generally not available in the United States and should not be used if any of the above options are available.

Never use gasoline, fuel conditioners, additives or stabilizers containing methanol, white gas, or fuel blends which exceed the limits specified above for Ethanol, MTBE, or ETBE because engine/fuel system damage could result.

Regardless of which of the approved fuels are used, fuel quality is critical to engine performance. Fuel should not be stored in an engine or container more than 30 days prior to use. This time may be extended with the use of a fuel stabilizer like TECUMSEH'S, part number 730245.

See "STORAGE" instructions in the Technician's Manual, Operators Manual, or Bulletin 111.

ENGINE OIL

TECUMSEH FOUR CYCLE ENGINES REQUIRE THE USE OF A CLEAN, HIGH QUALITY DETERGENT OIL. Be sure original container is marked: A.P.I. service "SF" thru "SJ" or "CD".

TECUMSEH RECOMMENDS USING ONE OF THE FOLLOWING FOUR CYCLE OILS THAT ARE SPECIALLY FORMULATED TO TECUMSEH SPECIFICATIONS.

DO NOT USE SAE10W40 OIL.

FOR SUMMER (Above 32^0 F) (0^{o}C) USE SAE30 OIL. PART #730225

Use SAE30 oil in high temperature, high load applications. Using multigrade oil may increase oil consumption.

FOR WINTER (Below 32^{0}F) (0^{o}C) USE SAE5W30 OIL. PART #730226

(SAE 10W is an acceptable substitute.)

(BELOW 0^{0}F (-18^{o}C) ONLY): SAE 0W30 is an acceptable substitute.

NOTE: For severe, prolonged winter operation of HH120 model, SAE10W oil is recommended.

Capacities

Engine Model	Oz.	ml.
OHH,OHSK 50-70	21	630
OVRM 40 - 6.75	21	630
OVRM105 & 120	21	630
OHSK80 - 100	26	720
OHM, OHSK 110* - 130	32	960
OVM 120, OVXL 120, 125	32	960
OHV 11 - 13 without oil filter	32	960
OHV 11 - 13 with filter	39	1170
OHV 13.5 - 17 without oil filter	55	1650
OHV 13.5 -17 2 1/4" filter (part # 36563)	62	1860
OHV 13.5 -17 2 5/8" filter (part # 36262)	64	1920

** NOTE: Model OHSK110 with a spec. of 221000 and up, have a capacity of 26 oz. (720 ml.)*

Oil Change Intervals: Change the oil after the first two (2) hours of operation and every 25 hours thereafter (OHH & OHSK50-130, OHV13.5-17 every 50 hours), or more often if operated under dusty or dirty conditions. If the engine is run less than 25 hours per year, change the oil at least once per year.

NOTE: The oil filter (if equipped) requires changing every 100 hours or more often if operated under dusty or dirty conditions.

Oil Check: Check the oil each time the equipment is used or every five (5) hours of operation. Position the equipment so the engine is level when checking the oil.

CAUTION: Remove the spark plug wire before doing any service work on the engine.

Oil Change Procedure: Locate the oil drain plug. On some units this plug is located below the deck through the bottom of the mounting flange. Other units drain at the base of the engine above the deck or frame. On some rotary mower applications, where access to the drain plug is restricted by the equipment, it may be necessary to drain the oil by tipping the mower in a position that would allow the oil to drain out of the fill tube.

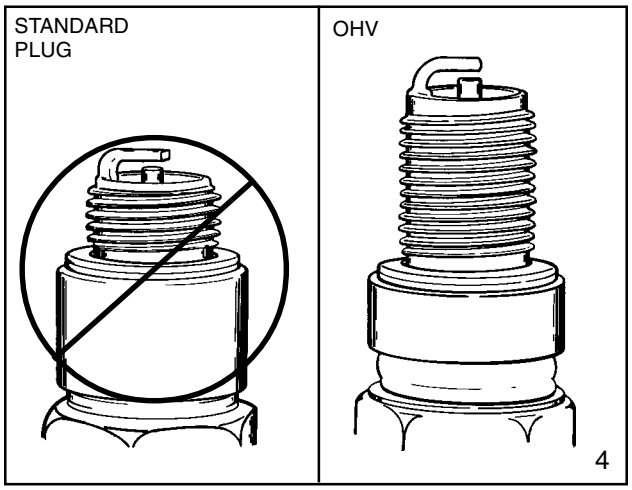
On units that the drain plug is accessible, remove the plug and allow the oil to drain into a proper receptacle. Always make sure that drain oil is disposed of properly. Contact your local governing authorities to find a waste oil disposal site.

Once the oil is drained, reinstall the drain plug and fill the engine with new oil to the proper capacity.

TUNE-UP PROCEDURE:

NOTE: Today's fuels can cause many problems in an engines performance due to the fuels quality and short shelf life. Always check fuel as a primary cause of poor engine performance.

The following is a minor tune-up procedure. When this procedure is completed, the engine should operate properly. Further repairs may be necessary if the engine's performance remains poor.



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CAUTION: Remove the spark plug wire before doing any service work on the engine.

1. Service or replace the air cleaner. See Chapter 2 under "Service".
2. Inspect the level and condition of the oil and change or add oil as required.
3. Remove the blower housing and clean all dirt, grass or debris from the intake screen, head, cylinder cooling fins, carburetor, governor levers and linkage.
4. Make sure the fuel tank, fuel filter and fuel line are clean. Replace any worn or damaged governor springs or linkage. Make the proper governor adjustments and carburetor presets where required.
5. When replacing the spark plug, consult the proper parts breakdown for the spark plug to be used in the engine being serviced. Set the proper spark plug gap (.030") (.762 mm) and install the spark plug in the engine. Tighten the spark plug to 21 foot pounds (28 Nm) of torque. If a torque wrench isn't available, screw the spark plug in as far as possible by hand, and use a spark plug wrench to turn the spark plug 1/8 to 1/4 turn further if using the old spark plug, or 1/2 turn further if using a new spark plug.
6. Make sure all ignition wires are free of abrasions or breaks and are properly routed so they will not rub on the flywheel.
7. Properly reinstall the blower housing, gas tank, fuel line, and air cleaner assembly if removed.
8. Make sure all remote cables are properly adjusted for proper operation. See Chapter 4 under "Speed Controls and Linkage".
9. Reinstall the spark plug wire, add fuel and oil as necessary, start the engine.

STORAGE (IF THE ENGINE IS TO BE UNUSED FOR 30 DAYS OR MORE)

CAUTION: NEVER STORE THE ENGINE WITH FUEL IN THE TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED AREAS, WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

Gasoline can become stale in less than 30 days and form deposits that can impede proper fuel flow and engine operation. To prevent deposits from forming, all gasoline must be removed from the fuel tank and the carburetor. An acceptable alternative to removing all gasoline, is by adding Tecumseh's fuel stabilizer, part number 730245, to the gasoline. Fuel stabilizer is added to the fuel tank or storage container. Always follow the mix ratio found on the stabilizer container. **Run the engine at least 10 minutes after adding the stabilizer to allow it to reach the carburetor.**

Draining the Fuel System

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

1. Remove all gasoline from the fuel tank by running the engine until the engine stops, or by draining the fuel tank by removing the fuel line at the carburetor or fuel tank. Be careful not to damage the fuel line, fittings, or fuel tank.
2. Drain the carburetor by pressing upward on bowl drain (if equipped) which is located on the bottom of the carburetor bowl. On carburetors without a bowl drain, the carburetor may be drained by loosening the bowl nut on the bottom carburetor one full turn. Allow to completely drain and retighten the bowl nut being careful not to damage the bowl gasket when tightening.
3. If "Gasohol" has been used, complete the above procedure and then put one half pint of unleaded gasoline into the fuel tank and repeat the above procedure. If Gasohol is allowed to remain in the fuel system during storage, the alcohol content can cause rubber gaskets and seals to deteriorate.

Change Oil: If the oil has not been changed recently, this is a good time to do it. See "Oil Change Procedure" on page 3.

Oil Cylinder Bore

1. Disconnect the spark plug wire and ground the spark plug wire to the engine. Remove the spark plug and put a 1/2 ounce (15 ml.) of clean engine oil into spark plug hole.
2. Cover the spark plug hole with a shop towel.
3. Crank the engine over, slowly, several times.
4. Install the spark plug and connect the spark plug wire.

Clean Engine: Remove the blower housing and clean all dirt, grass or debris from the intake screen, head, cylinder cooling fins, carburetor, governor levers and linkage.

CHAPTER 2 AIR CLEANERS

GENERAL INFORMATION

The air cleaner is the device used to eliminate dust and dirt from the air supply. Filtered air is necessary to assure that abrasive particles are removed before entering the combustion chamber. Dirt allowed into the engine will quickly wear the internal components and shorten the life of the engine.

Tecumseh engines use either a polyurethane or a paper-type air filter system. A polyurethane pre-cleaner or a flocked screen may be used with the main filter. Snow King® engines do not use an air filter due to the clean operating environment and to prevent filter freeze-up.

Extremely dirty conditions may require more frequent filter cleaning or replacement.

OPERATION

The air cleaner cover allows access to the air filter element(s) and prevents large particles from entering the filter body. Air is filtered through the pre-cleaner or flocked screen if equipped, and the polyurethane or paper filter element. Pre-cleaners or flocked screens provide more air cleaning capacity.

In Tecumseh's Kleen Aire® system, air is drawn in through a rotating screen or recoil housing to be centrifugally cleaned by the flywheel before the air enters the air filter.

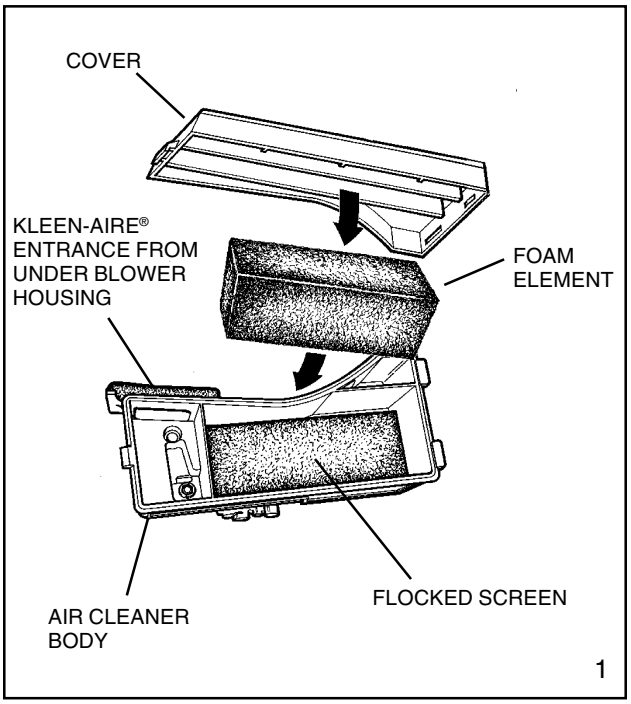
COMPONENTS

The **cover** holds the filter element and prevents large debris from entering the filter body.

The **polyurethane wrap pre-cleaner** is used on XL or XL/C engine models with paper filter elements.

The **paper** or **polyurethane filter element** is the main filter to trap dust and dirt. Dry-type paper elements are pleated paper for increased surface area and rubberized sealing edges. The polyurethane filter uses an oil film to trap fine particles found in dust.

The **flocked screen** is used as an additional filter on XL or XL/C engine models that use a polyurethane filter element.



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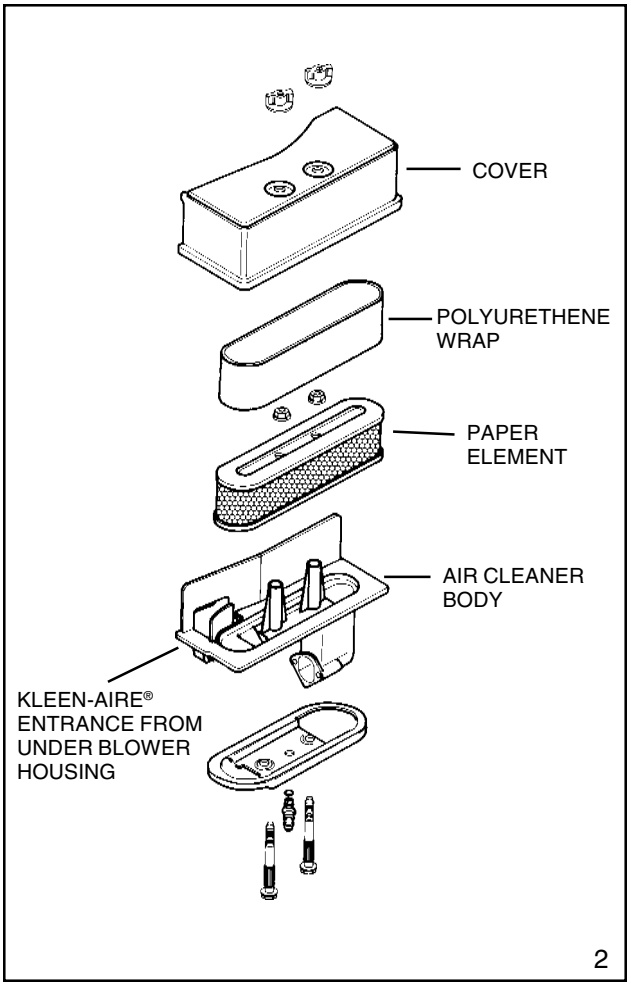

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TROUBLESHOOTING OR TESTING

If the engine's performance is unsatisfactory (needs excessive carburetor adjustments, starts smoking abnormally, loses power), the first engine component to be checked is the air filter. A dirt restricted or an oil soaked filter will cause noticeable performance problems. A polyurethane filter may be cleaned following the service procedure listed under "Service" in this chapter. A paper-type air filter should only be replaced. A paper-type filter cannot have an oil film present on the paper. Follow the procedure listed in the "Service" section of this chapter for filter replacement or cleaning.

SERVICE

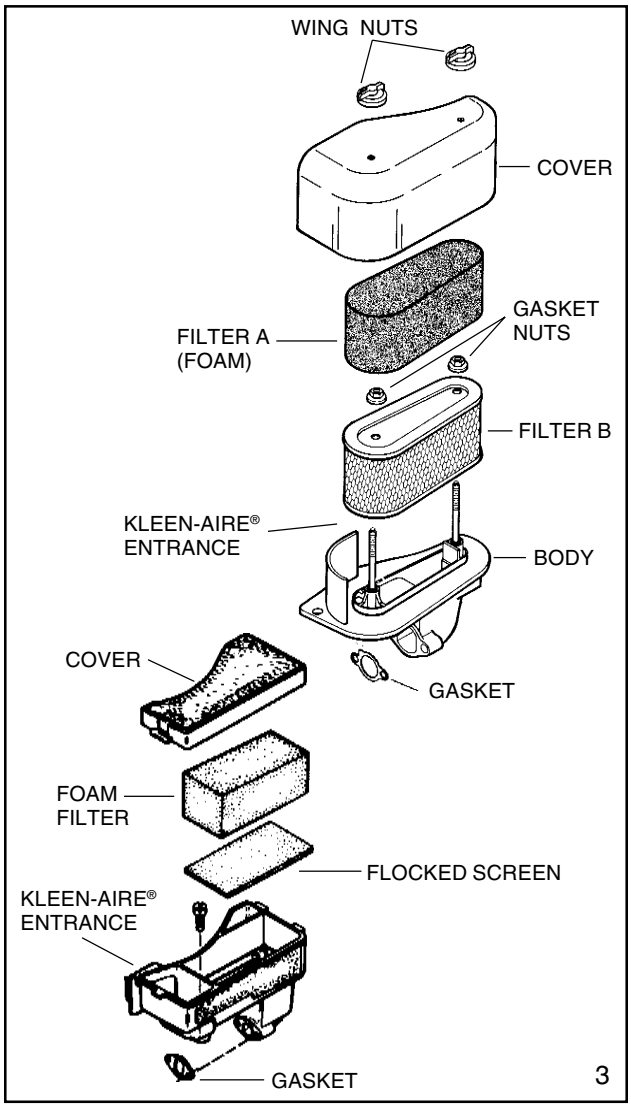
Service on the polyurethane filter element (cleaning and oiling) is recommended every three (3) months or every twenty five (25) operating hours, whichever comes first. Extremely dirty or dusty conditions may require daily cleanings.

The paper filter element should be replaced once a year or every 100 operating hours, more often if used in extremely dusty conditions.

NOTE: NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER ASSEMBLY INSTALLED ON THE ENGINE. ALWAYS REPLACE THE FILTER ELEMENT WITH THE PROPER TECUMSEH ORIGINAL REPLACEMENT PART.

DISASSEMBLY PROCEDURE

1. Unlock the tabs or remove the screws or wing nuts holding the air cleaner cover in place.
2. Remove the hex nuts holding the element down if equipped. New nuts are supplied with a new filter and are to be used for proper sealing.
3. Clean the excess contaminants out of the air cleaner body before removing the old element.
4. Remove the old element and the polyurethane pre-cleaner if equipped.
5. On air cleaners that use a flocked screen under the polyurethane element, remove the air cleaner assembly from the carburetor before removing the flocked screen. This prevents dirt from entering the carburetor (diag 3).
6. Clean the inside of the cover and body, remove the old gasket between the carburetor and the air cleaner assembly.
7. Reinstall the air cleaner assembly using a new gasket.
8. Use reverse procedure for reassembly. When installing the polyurethane pre-cleaner, make sure the seam is installed to the outside to prevent gaps between the paper element and the pre-cleaner.



Polyurethane-Type Filter Element or pre-cleaner

This type of air filter or pre-cleaner can be serviced when restricted with dust or dirt. Wash the filter or pre-cleaner in a detergent and water solution until all the dirt is removed. Rinse in clear water to remove the detergent solution. Squeeze the filter or pre-cleaner (do not twist) to remove the excess water. Wrap the filter or pre-cleaner in a clean cloth and squeeze it (do not twist) until completely dry.

On the polyurethane filter only, re-oil the filter by applying engine oil and squeezing it vigorously to distribute the oil. Roll the filter in a cloth and squeeze it (do not twist) to remove the excess oil. The pre-cleaner must not be oiled.

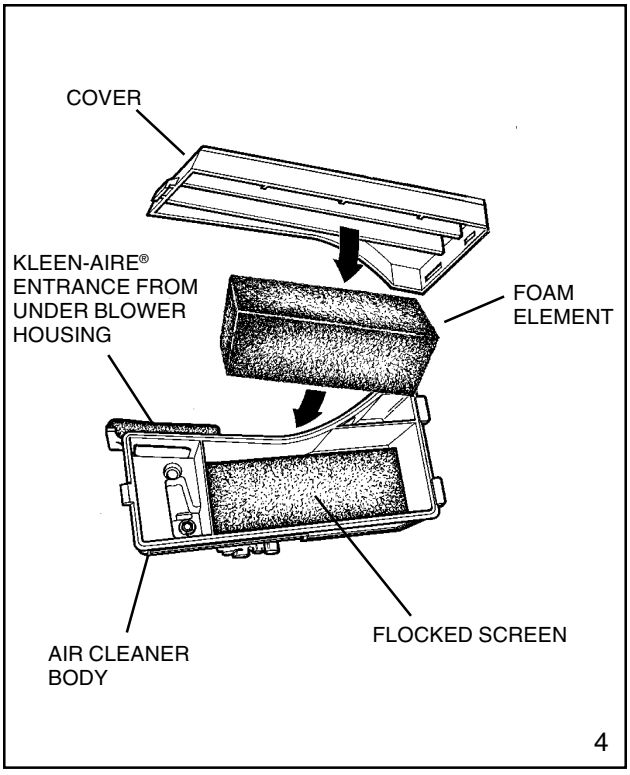
Clean the air cleaner housing and cover being careful not to allow dirt to fall into the carburetor or intake pipe.

Paper -type filter element

Paper type air filter elements can only be serviced by replacement. Do not attempt to clean a paper filter element. Replacement filters are available at any authorized Tecumseh Service Outlet. Be sure to use new filter nuts or seals for the air cleaner studs if supplied with the new filter (diag. 5).

Flocked Screen

A flocked screen may be cleaned by blowing compressed air through the screen from the backside. If the screen cannot be cleaned with this procedure, it should be replaced with a new screen.



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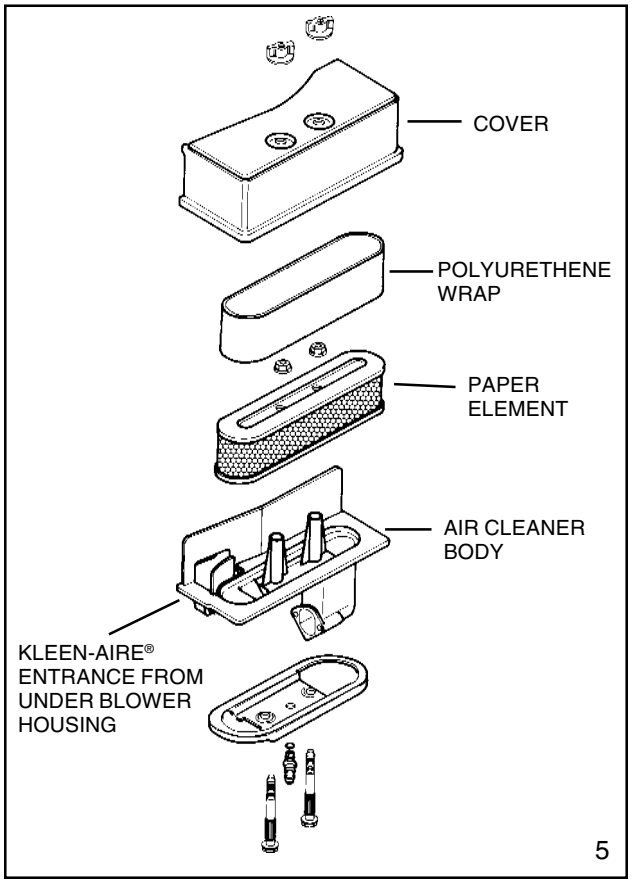

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CHAPTER 3 CARBURETORS AND FUEL SYSTEMS

GENERAL INFORMATION

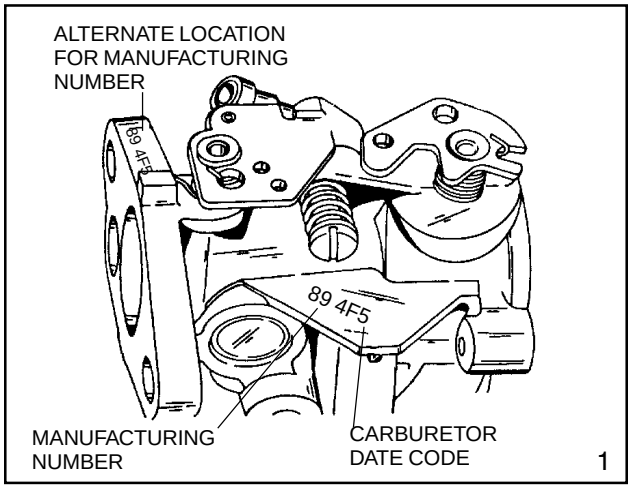
Tecumseh overhead valve engines use float type carburetors. Float type carburetors use a hollow float to maintain the operating level of fuel in the carburetor.

The float type carburetor will have a fuel enrichment system of either a primer or a manual choke to provide easy cold engine starting. The carburetor fuel mixtures are either fully adjustable, partially adjustable, or nonadjustable. Carburetor adjustments, cleaning, and related fuel system service is covered in this chapter.

Some Tecumseh engines utilize Walbro carburetors. Basic operation is very similar to the Tecumseh float style carburetor.

Carburetors used by Tecumseh can be identified by a manufacturing number stamping on the carburetor as illustrated (diag. 1).

When servicing carburetors, use the engine model and specification number to obtain the correct carburetor part number. An alternate method to find the correct carburetor part number is to use the manufacturing number stamped on the carburetor and convert this number to a service part number. In the carburetor section of the Master Parts Manual or Microfiche Catalog, a cross reference chart will convert a carburetor manufacturing number to a Tecumseh Service part number.



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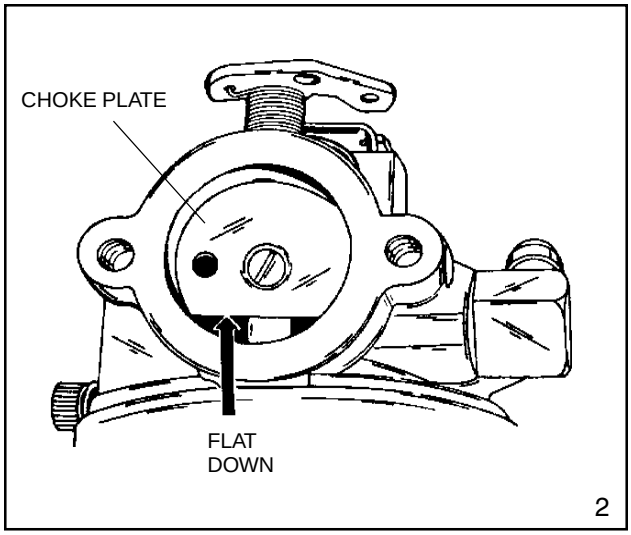
Complete carburetor replacement may be accomplished by a standard service carburetor. A standard service carburetor is a basic carburetor that may require the use of original carburetor parts or additional new parts to adapt to the specification. An instruction sheet is provided with the new service carburetor or see “SERVICE” in this chapter.

OPERATION

In the “CHOKE” or “START” position, the choke shutter is closed, and the only air entering the engine enters through openings around the shutter. As the starting device is operated to start the engine, downward piston travel creates a low air pressure area in the engine cylinder above the piston. Higher pressure (atmospheric air) rushes into the engine to fill the created low pressure area. Since the majority of the air passage is blocked by the choke shutter, a relatively small quantity of air enters the carburetor at increased speed. The main nozzle and both idle fuel discharge ports are supplying fuel due to the low air pressure in the intake of the engine. A maximum fuel flow through the carburetor orifices combined with the reduced quantity of air that passes through the carburetor, make a very rich fuel mixture which is needed to start a cold engine.



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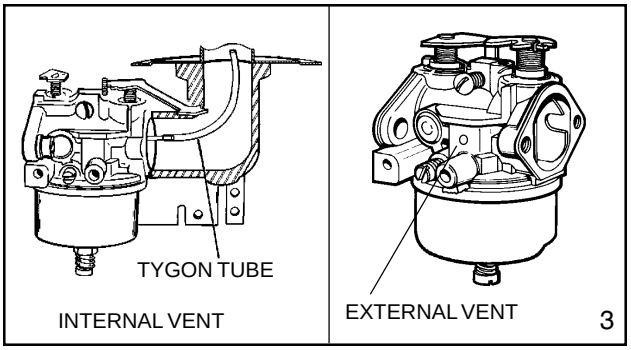
At engine IDLE speed, a relatively small amount of fuel is required to operate the engine. The throttle is almost completely closed. A fuel / air mixture is supplied through the primary idle-fuel discharge orifice during idle.

During INTERMEDIATE engine operation, a second orifice is uncovered as the throttle shutter opens, and more fuel mixture is allowed to atomize with the air flowing into the engine.

During HIGH SPEED engine operation, the throttle shutter is opened. Air flows through the carburetor at high speed. The venturi, which decreases the size of the air passage through the carburetor, further accelerates the air flow. This high speed movement of the air decreases the air pressure at the main nozzle opening. Fuel is forced out the main nozzle opening due the difference in the atmospheric air pressure on the fuel in the carburetor bowl and the reduced air pressure at the main nozzle opening.

For the fuel to flow, the carburetor bowl must be either vented externally or internally. Some internally vented float style carburetors use a tygon tube and a vent within the air intake. This tube must be present for the carburetor to operate properly (diag. 3).

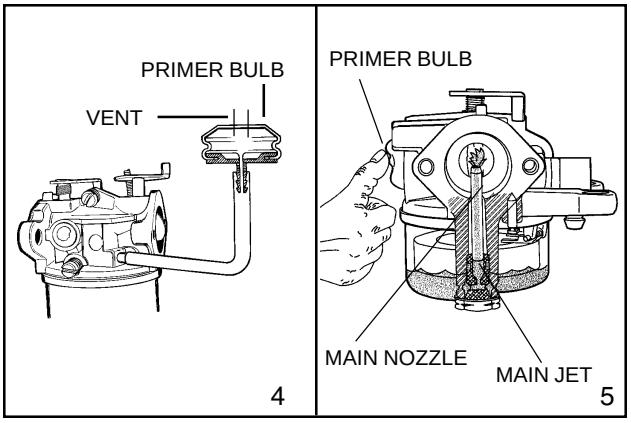
Air is bled into the main nozzle through the air bleed located in the air horn. This mixes fuel and air prior to the fuel leaving the main nozzle. Atomization occurs as the fuel mixture contacts the fast moving air stream and the mist flows into the intake of the engine.



FUEL PRIMERS

Primers may be mounted remotely or as an integral part of the carburetor. The basic function of the primer is to supply an air pressure charge to the carburetor main well or carburetor bowl to displace fuel directly into the carburetor venturi. This displaced fuel provides a rich mixture necessary for engines to start easily on the first or second attempt (diag. 4 & 5).

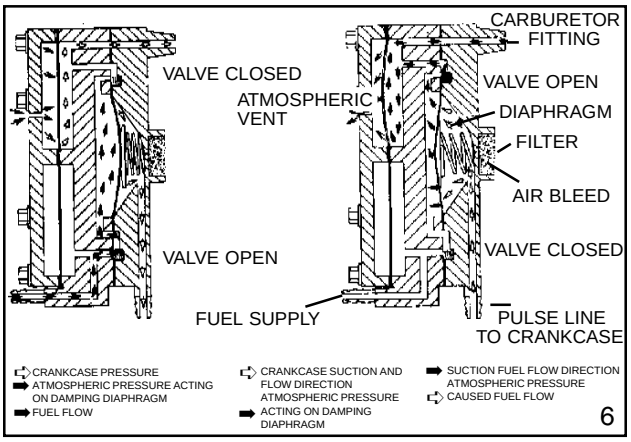
Primers must be vented either internally through a passage in the carburetor air horn prior to the venturi or externally through a hole in the primer bulb. The vent allows atmospheric air to enter the fuel bowl during operation and to fill the primer bulb after the primer bulb is released.



IMPULSE FUEL PUMPS

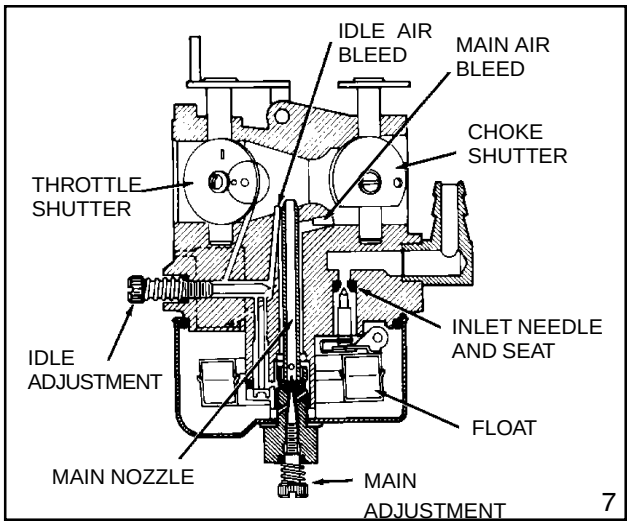
Impulse fuel pumps may either be mounted externally onto the carburetor fuel inlet or remotely mounted. This pump is connected in the fuel line between the fuel supply and the carburetor or directly to the fuel inlet.

Impulse fuel pumps are operated by crankcase impulses created by the up and down movement of the piston. A hose called a pulse line connects the fuel pump diaphragm chamber to the crankcase and transmits the impulses to the pump diaphragm. The impulses actuate the diaphragm and flap valves to lift the fuel from the fuel tank to the carburetor (diag. 6). A crankcase overfilled with engine oil can affect pump operation.



FLOAT STYLE CARBURETORS

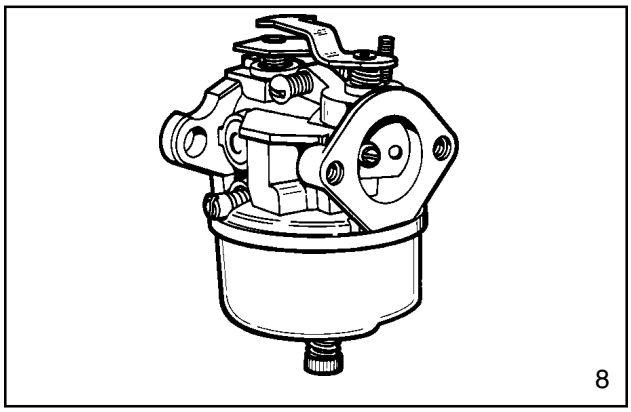
A float is used to maintain the operating level of fuel in the carburetor bowl. As the fuel is used by the engine, the fuel level in the carburetor bowl drops and the float moves downward. This allows the inlet needle valve to move off the sealing seat. Fuel flows by gravity or a pulse pump into the fuel bowl. As the fuel level in the bowl again rises, it raises the float. This upward float motion moves the inlet needle valve to the closed position. When the needle contacts the seat, the fuel flow is stopped. The tapered end of the inlet needle varies the fuel flow rate and the fuel level in the carburetor bowl remains constant (diag. 7). The float height is set according to the service procedure.



CARBURETOR VISUAL IDENTIFICATION

Series1 Carburetors

Series 1 carburetors are used on some 4 - 7 model overhead valve engines. This float style carburetor has a smaller venturi than the Series 3 or 4 carburetor and has no bosses on each side of the idle mixture screw. The main and idle mixture may be fixed or adjustable. A remote primer or choke may also be used with this carburetor (diag. 8).

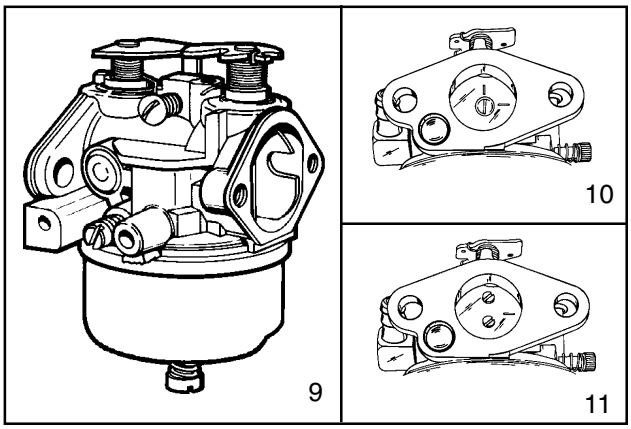


8

Series 3 & Series 4 Carburetors

Series 3 or 4 carburetors are generally used on 8 through 14 model 4-cycle engines. The quickest way to identify these carburetors is by the presence of bosses on each side of the idle mixture screw (diag. 9).

To determine whether the carburetor is a Series 3 or Series 4, look at the throttle end of the carburetor. Series 3 will have one throttle plate screw (diag. 10). The Series 4 will have two throttle plate screws (diag. 11).



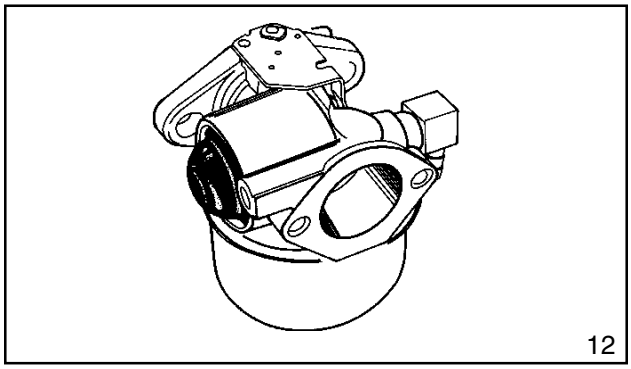
9

10

11

Series 6 Carburetors

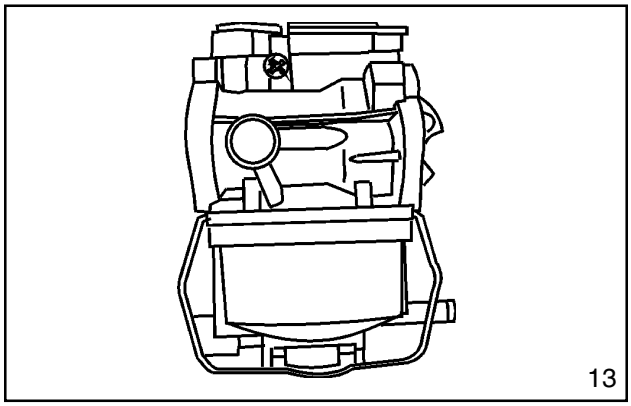
Series 6 carburetors are used on 2 and 4-cycle engines in the 3 to 6 model range. Series 6 uses a simple fixed idle and fixed main fuel circuit. Series 6 carburetors are commonly used on rotary mower applications. Series 6 are nonadjustable, with a stepped primer bulb and a bowl prime system (diag. 12).



12

Series 7

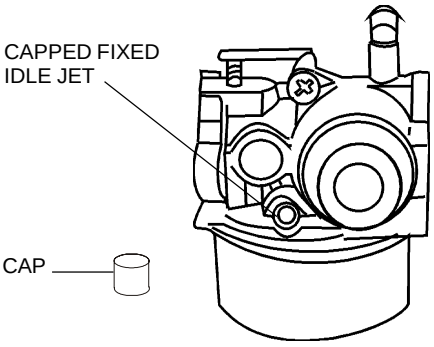
Series 7 carburetors are totally nonadjustable. The die cast carburetor body is similar in appearance and slightly longer than the Walbro LMK body. The choke shaft is made of a plastic material with an internal slot to hold the choke shutter. The carburetor base is flat to accept a Vector style bowl that is held on with a wire bail. (diag. 13)



13

Series 8

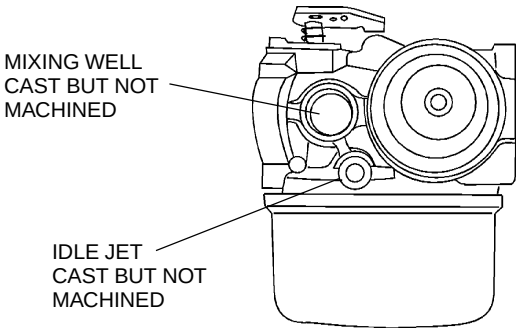
Series 8 carburetors have both a fixed main and a fixed idle circuit. These carburetors are totally nonadjustable. This series of carburetor uses an integral primer system like the Series 6. Distinguish this carburetor from the Series 6 by the fixed idle jet that appears as a screw just above the bowl on the primer side. This fixed idle jet may also be capped. (diag. 14)



14

Series 9

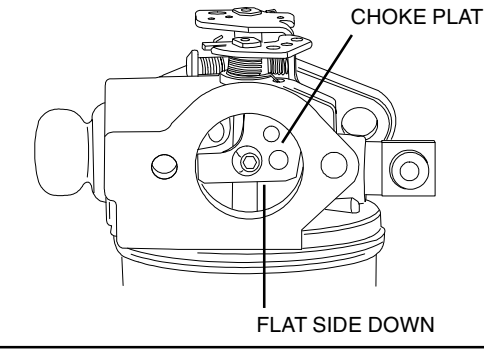
Series 9 carburetors are hybrid versions of the Series 8. This carburetor uses a fixed idle jet and fixed main fuel circuit. This carburetor is totally nonadjustable. The bowl nut uses a ball plug on the bottom to cover the center drilling. Also visible is a plastic main fuel discharge nozzle in the venturi. The Idle mixing well and jet will be visible but not machined (diag. 15)



15

Series 10

This carburetor is for use on all season engine applications. It is the equivalent of the series "8" with the addition of a choke. It has a fixed main and idle with a serviceable main nozzle and a primer assist, with the added benefit of a choke for cold weather starting.



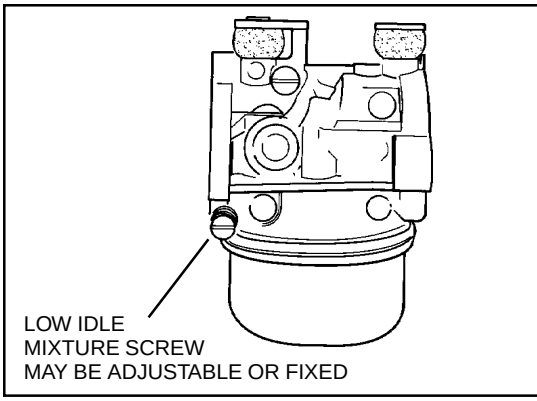
15

Walbro Model LMK

OHV 15-17 models use this float-feed carburetor. The carburetor is attached to the intake pipe using studs that also fasten the air filter body. Walbro model and manufacturing numbers are found on the throttle end of the carburetor. This carburetor has a fixed, nonadjustable main mixture jet.

Idle mixture screws were adjustable on early production OHV15. This has since changed to a fixed idle jet which may be capped for tamper resistance.

If no spring is visible, the jet is fixed. Servicing should be done by a Authorized Tecumseh Dealer.



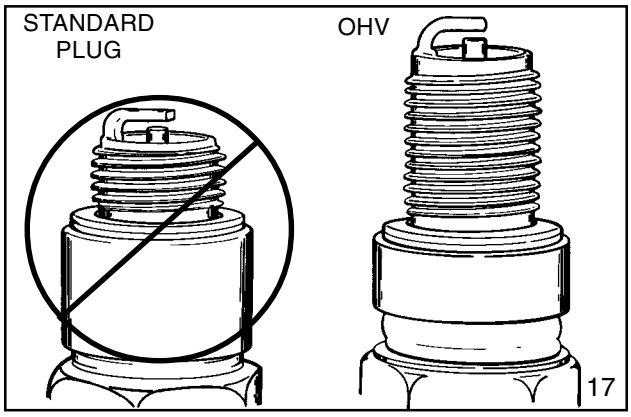
16

TESTING

1. After repeated efforts to start the engine using the procedure listed in the operator's manual fail, check for spark by removing the high tension lead and removing the spark plug. Install a commercially available spark tester and check for spark. If the spark is bright blue and consistent, proceed to step 2. If no or irregular spark see Chapter 8 under "Testing".

2. Visually inspect the removed spark plug for a wet condition indicating the presence of gasoline in the cylinder.

   NOTE: Check plug for correct reach (diag. 17).



3. If the spark plug is dry, check for restrictions in the fuel system before the carburetor. If the spark plug is wet, continue with step # 7. **CHECK THE FUEL CAP FOR PROPER VENTING**. With a proper draining receptacle, remove the fuel line clamp on the carburetor fuel inlet and pull the fuel line off the fitting. Examine the fuel flow with the fuel cap both on and off the fuel tank.

CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

NOTE: Todays fuels can cause many problems in an engines performance, due to the fuels quality and short shelf life. Always check fuel as a primary cause of engine performance.

4. Remove the air filter, heater box, or air cleaner assembly if applicable to visually check that the choke shutter completely closes or check to see if fuel comes out of the main nozzle during priming.

5. If the fuel flow from the tank is adequate and no fuel is evident during priming, the carburetor will need to be removed for service. See "Service" in this chapter or consult the "Carburetion Troubleshooting" chart to diagnose carburetor symptoms. Improper fuel flow indicates the fuel, fuel line, filter or tank require cleaning or replacement.

6. Check the engine compression using a commercially available compression tester and follow the tester's recommended procedure. Low compression, a dry spark plug, adequate fuel flow, and a known good functional carburetor indicates an internal engine problem exists. See Chapter 9 under "Troubleshooting."

7. A wet spark plug indicates fuel is being supplied by the carburetor. The engine may be flooded by a restricted air filter, carbon shorted or defective spark plug, excessive choking or over priming, improperly adjusted or defective carburetor. With the spark plug removed and a shop towel over the spark plug hole, turn the engine over slowly 3 or 4 times to remove excess gasoline from the engine cylinder.

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER.

8. Replace the air filter if restricted or oil soaked. Replace the spark plug if questionable. Install the spark plug and high tension lead and try to start the engine.

9. If the engine floods and fails to start, the carburetor will require service. See the proceeding "Carburetion Troubleshooting" chart for additional causes. If the carburetor is functioning properly the problem may be ignition timing related. See Chapter 8 "Ignition" under "Troubleshooting."

SERVICE

Carburetor Pre-sets and Adjustments

Before adjusting any mixture screws the necessary carburetor presets should be made. Check for the proper governor adjustments as outlined in Chapter 4. Identify the correct carburetor model and manufacturer to find locations of the high and low speed adjustment screws. Check the throttle control bracket for proper adjustment allowing a full choke shutter position. See Chapter 4 under "Speed Controls and Linkage". Check to see if the normal maintenance procedures have been performed (oil changed, fresh fuel, air filter replaced or clean). Consult microfiche card #30 to find the correct R.P.M. settings for the engine. Start the engine and allow it to warm to operating temperature. The carburetor can now be adjusted.

NOTE: RPM SETTINGS CAN ALSO BE FOUND ON THE COMPUTERIZED PARTS LOOK UP SYSTEMS.

Pre-sets and Adjustments (Tecumseh and Walbro carburetors)

Turn both the main and idle mixture adjusting screws in (clockwise) until finger tight if applicable.

NOTE: OVERTIGHTENING WILL DAMAGE THE TAPERED PORTION OF THE NEEDLE.

Now back the mixture screws out (counterclockwise) to obtain the pre-set figure in the chart shown.

NOTE: SOME CARBURETORS HAVE FIXED IDLE AND MAIN JETS. IDENTIFY THE SERIES OF CARBURETOR USING THE VISUAL IDENTIFICATION IN THIS CHAPTER. IDLE MIXTURE FIXED JETS APPEAR AS ADJUSTING SCREWS WITHOUT TENSION SPRINGS AND ARE NOT ADJUSTABLE.

Tecumseh Carburetors		
Engine Model	Main Pre-set	Idle Pre-set
All models with float-type carburetors	1-1/2 turn	1 turn
All models with diaphragm-type carburetors	1 turn	1 turn
Walbro Carburetors		
Carburetor Model		
LMK	Fixed	1 turn if adjustable or seated, if fixed

Final Adjustments

Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the HIGH or FAST position, then turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic. Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic. Turn the screw in (clockwise) midway between these two positions. This will be the best setting.

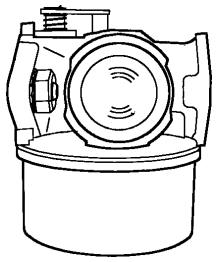
Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment screw.

Identify the location of both HIGH and LOW speed adjustments, then locate the recommended HIGH and LOW R.P.M. setting according to microfiche card # 30 and adjust the engine speed accordingly.

NOTE: RPM SETTINGS CAN ALSO BE FOUND ON THE COMPUTERIZED PARTS LOOK UP SYSTEMS.

TECUMSEH CARBURETORS

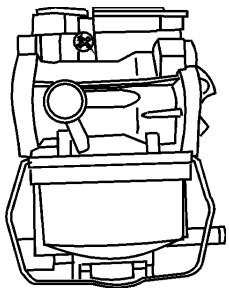
DUAL SYSTEM / SERIES "6"



NON-ADJUSTABLE
PRIMER NO CHOKE

18

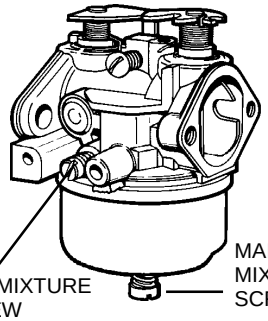
SERIES "7"



FIXED HIGH AND LOW SPEED MIXTURE

19

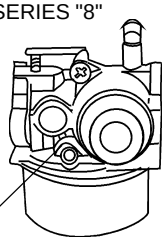
SERIES "3" & "4"



20

WALBRO CARBURETOR

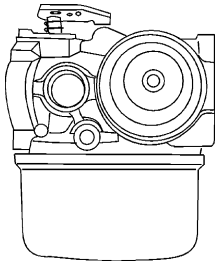
SERIES "8"



NON-ADJUSTABLE
(ADJUSTABLE MAIN FOR EXPORT)

21

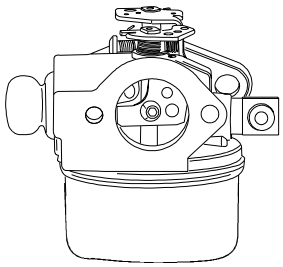
SERIES "9"



NON-ADJUSTABLE

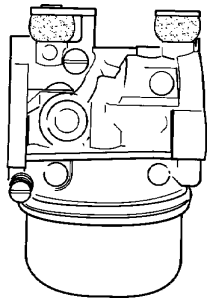
22

SERIES "10"



23

WALBRO LMK



24

If further adjustment is required, the main adjustment should be made under a load condition.

If the engine stops or hesitates while engaging the load (lean), turn the main mixture adjusting screw out (counterclockwise) 1/8 turn at a time, testing each setting with the equipment under load, until this condition is corrected. A few Tecumseh carburetors were built as air adjust idle system. If you have one, the adjustments are reversed out for lean in for richer.

If the engine smokes excessively (rich), turn the main adjusting screw in (clockwise) 1/8 turn at a time, testing each setting with the equipment under load, until this condition is corrected.

After the main mixture screw is set, move the speed control to the IDLE or SLOW position. If the engine does not idle smoothly, turn the idle mixture screw 1/8 turn either in (clockwise) or out (counterclockwise) until engine idles smoothly.

Recheck the high and low R.P.M. setting and adjust as necessary.

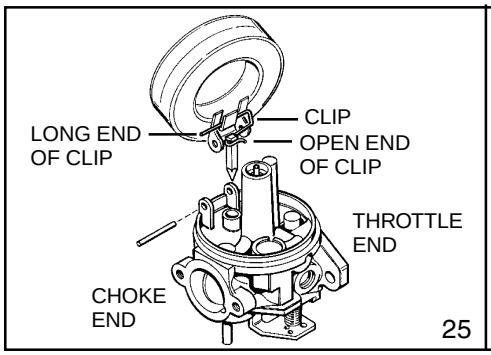
CARBURETOR DISASSEMBLY PROCEDURE

NOTE : CARBURETORS THAT ARE EMISSION COMPLIANT (MANUFACTURING NUMBERS 5000 OR GREATER) WITH FIXED IDLE OR MAIN JETS ARE TO BE REMOVED BY DEALERS ONLY FOR INSPECTION AND CLEANING.

1. Note or mark the high and low mixture adjusting screws to aid in reassembly (if applicable). Remove the high speed mixture screw, bowl nut, and float bowl. Remove the idle mixture screw assembly. On Series 7 carburetors, release the wire retainer that retains the bowl and remove the bowl assembly. If a screwdriver or similar tool is used to release the retainer, carefully move the retainer to prevent bending of the wire.
2. Series 8 carburetors have a tamper resistant cap, over the fixed idle jet. (diag. 21). The cap is removed by piercing it with an ice pick or similar instrument, then remove the jet for service, always replace the cap.
3. Note the position of the spring clip on the inlet needle and float. Remove the float hinge pin with a needlenose pliers. Some carburetors use a float dampening spring to aid the inlet valve to maintain a steady position in rough service applications. Note the position of the hooks before removing the float hinge pin (diag. 25). On Series 7 carburetors, grasp the crossbrace on the float with a needlenose pliers and pull straight out to release the float hinge pin.
4. Remove the float, clip, and inlet needle.
5. Remove the inlet needle seat using a wire or a paper clip with a 3/32" (2.38 mm) hook end (Tecumseh carburetors only, Walbro model LMK uses a non-serviceable seat). Push the hook through the hole in the center of the seat and pull out to remove it.
6. On Series 7 only, remove the main nozzle tube, "O" ring, and spring located in the center leg of the carburetor bowl. Remove the bowl drain screw and gasket. Remove the spring, metering jet, and "O" ring.
7. Note or mark the action of the choke and throttle shutters and the hook points of the choke or throttle return spring or seal retainer springs located on the top of the choke or throttle shaft.

   NOTE: MARK THE EDGES OF THE THROTTLE AND CHOKE SHUTTERS PRIOR TO DISASSEMBLY. THE SHUTTERS HAVE BEVELED EDGES AND MUST BE INSTALLED IN THE ORIGINAL POSITION.

   Remove the throttle shutter, throttle shaft, choke shutter, springs and choke shaft by removing the screw or screws that attach the throttle or choke shutter to the shaft inside the air horn. To remove the choke shaft assembly on Series 7 or Walbro LMK carburetors, grasp the choke shutter with a pliers and pull it through the slot in the choke shaft. Slide the choke shaft out of the carburetor body.



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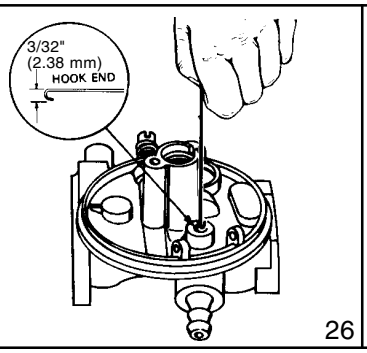

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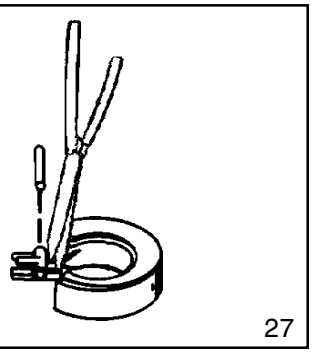
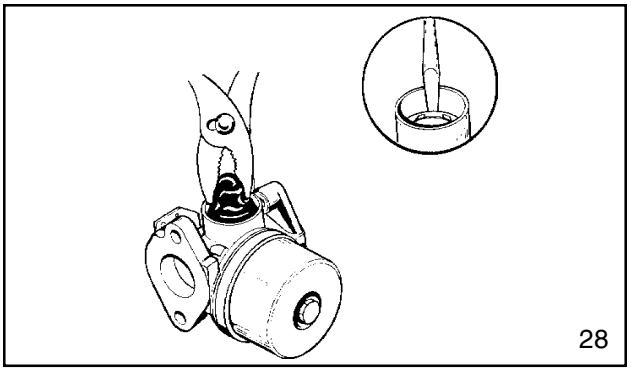

27

8. Remove the primer bulb (if equipped) by grasping with a pliers and pulling and twisting out of the body. Remove the retainer by prying and lifting out with a screwdriver. Do not re-use old bulb or retainer (diag. 28).

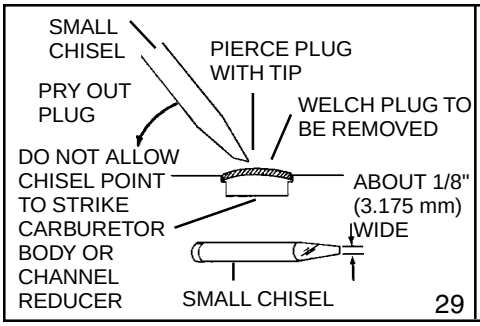
9. Remove all welch plugs if cleaning the carburetor. Secure the carburetor in a vise equipped with protective jaws. Use a small chisel sharpened to a 1/8" (3.175 mm) wide wedge point. Drive the chisel into the plug to pierce the metal and push down on the chisel to pry the plug out of the hole (diag. 29).


28

NOTE: DO NOT REMOVE ANY BALL OR CUP PLUGS (diag. 29).

10. Note the direction of the inlet fitting. If necessary the inlet fitting can be removed by pulling with a pliers or vise, do not twist. The fitting must be replaced. Tap a 1/4-20 thread inside the metal shank, use 1/4"-20 bolt and nut inserted into a 1/4" (6.350 mm) flat washer and 1/2" (12.700 mm) nut, thread the bolt into the shank, and thread the nut down to pull out the shank.

11. The Walbro LMK carburetor main fuel jet can be removed only if the jet is damaged or if a high altitude jet is needed to be installed. To remove place the carburetor firmly in a soft jawed vice. Using a punch the same size or slightly smaller than the jet, drive the jet through and into the center leg. Insert the high altitude jet in the same hole. Using a punch slightly larger than the diameter of the new jet, tap it into place flush with the outside of the center leg casting (diag. 31).



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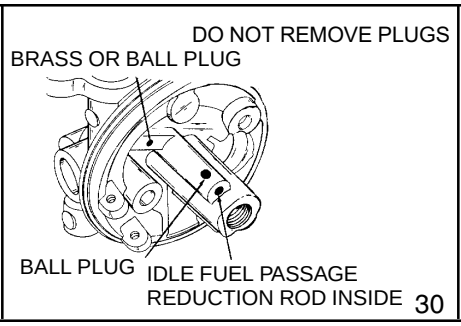

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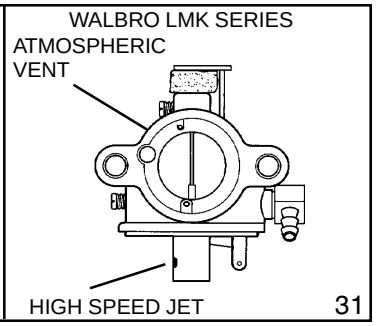

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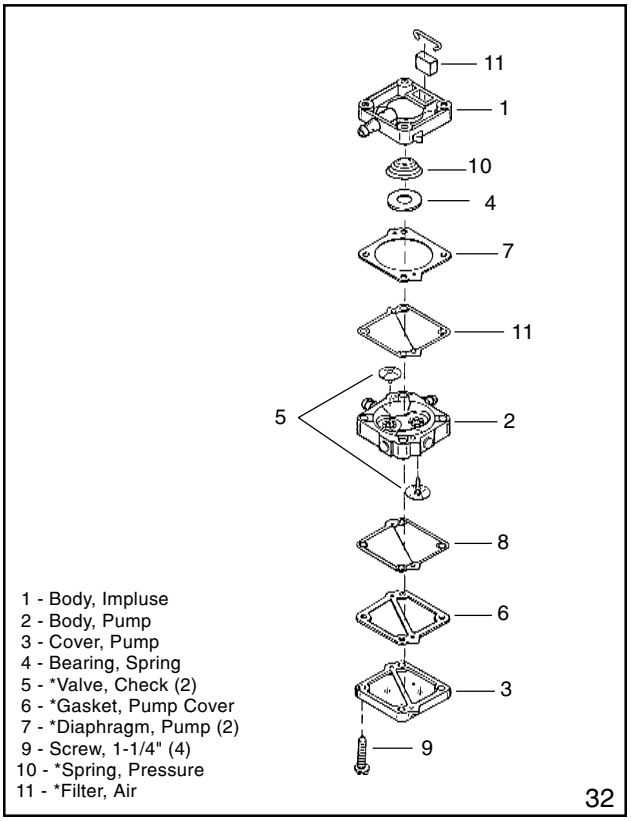
Impulse Fuel Pump

The valve type impulse pump can be serviced using the following procedure.

1. Remove the old filter on the back of the pump body if applicable.
2. Note or mark the pump body alignment, remove the four screws and disassemble the pump.
3. Remove the gaskets, diaphragms, old valves and spring bearing from the spring.
4. Clean the body parts with solvent.
5. Install new valves with the face of the valve facing the raised portion of the passage. After installation, cut off the extended portion of the valves.
6. Install the diaphragms against the center portion of the body with the gaskets against the outside covers. The parts can only can be assembled one way without damage.
7. Install the spring bearing on the new spring and place into position.
8. Assemble the body sections, install the retaining screws, and torque the screws to 12 - 16 inch pounds (1.36 - 1.81 Nm).
9. Install new filter in pump cavity if applicable.



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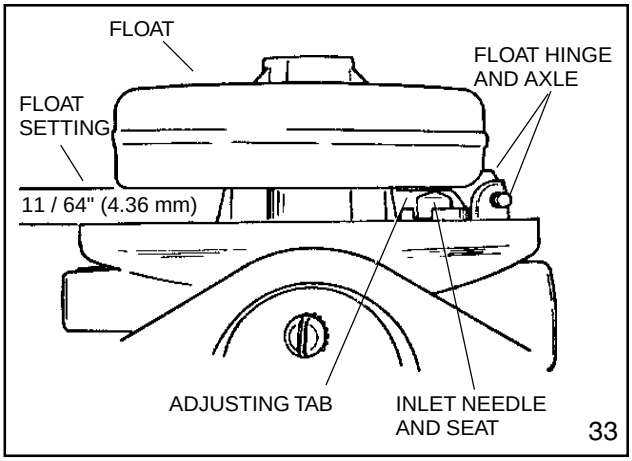
FLOAT ADJUSTING PROCEDURE

All Tecumseh carburetors with an adjustable float require the correct float height to achieve the proper operation and easy engine starts. To check the float setting, hold the carburetor in an upside down position. Remove the bowl nut, float bowl, and "O" ring. Place an 11/64" (4.36mm) diameter drill bit across the top of the carburetor casting on the opposite side and parallel to the float hinge pin. The float must just touch the drill bit when the bit is flush with the edge of the float. If the float is too high or too low, adjust the height by bending the tab accordingly. If the required adjustment is minor, the tab adjustment may be made without removing the float and carefully inserting a small bladed screwdriver to bend the tab.



33

If float sticking occurs due to deposits, or when the fuel tank is filled for the first time, this condition can be quickly corrected by loosening the carburetor bowl nut one full turn. Turn the bowl 1/4 inch in either direction, then return the bowl to its original position and tighten the bowl nut.

THE TECUMSEH SERIES 7 AND THE WALBRO MODEL LMK CARBURETOR HAVE A FIXED AND NONADJUSTABLE FLOAT HEIGHT.

Inspection

After careful disassembly of the carburetor and the removal of all non metallic parts, all metallic parts should be cleaned with solvent, or commercial carburetor cleaner, no longer than 30 minutes. Wearing eye protection, use compressed air and soft tag wire or monofilament fishing line to clean internal carburetor passages. To perform a proper carburetor rebuild, the welch plugs must be removed to expose the drilled passages.

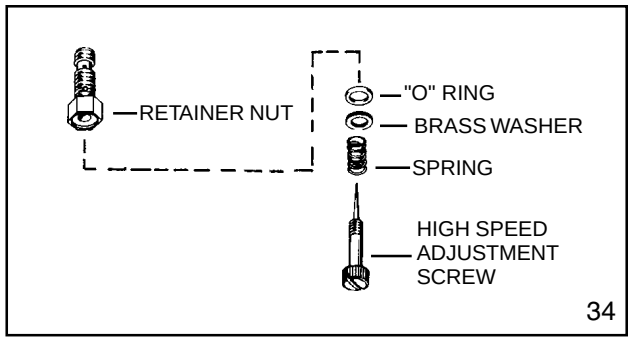
Throttle and Choke

Examine the throttle and choke shaft, and carburetor body at the bearing points and holes into which the linkage is fastened, and replace if worn or damaged. Any excessive wear in these areas can cause dirt to enter the engine and cause premature wear. If dust seals are present, check the seal condition and the correct placement next to the carburetor body.

Idle and High Speed Mixture Adjusting Screw

Examine the idle mixture needle tip and tapered surface for damage. The tip and tapered surface of the needle must not show any wear or damage. If either is worn or damaged, replace the adjusting needle. Tension is maintained on the screw with a coil spring. Replace the “O” ring seal if removed (diag. 34).

Examine the tapered surface of the high speed mixture needle. If the tapered surface is damaged or shows wear, replace the needle.



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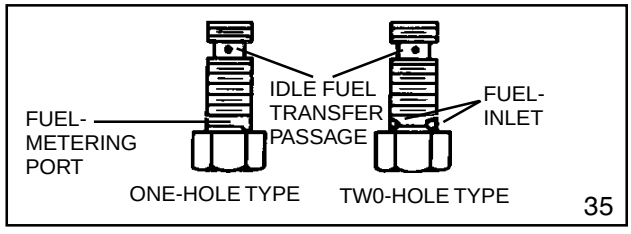
Fuel Bowl Retaining Nut

The bowl nut contains the passage through which fuel is delivered to the high speed and idle fuel system of the carburetor. If a problem occurs with the idle system of the carburetor, examine the small fuel passage in the annular groove in the bowl nut. This passage must be clean for the proper transfer of fuel into the idle metering system.
Bowl nuts that are used on adjustable main, float style carburetors may use either one or two metering ports. This difference relates to calibration changes of the carburetor, depending on the application (diag. 35).



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NOTE: DO NOT INTERCHANGE BOWL NUTS.

The fuel inlet ports must be free of any debris to allow proper fuel flow.

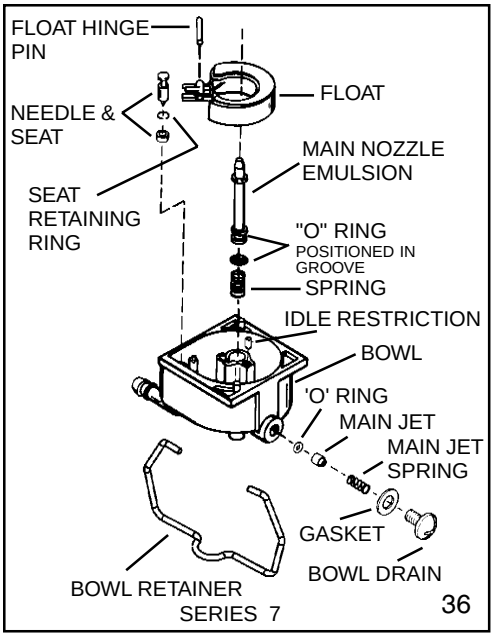
Fuel Bowl, Float, Needle and Seat

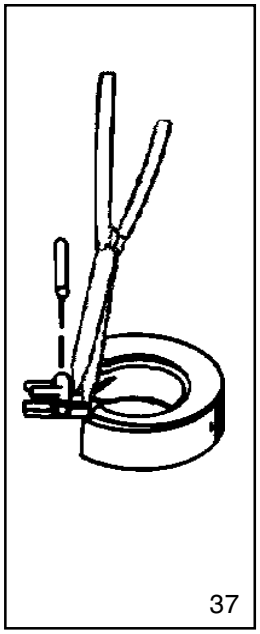
NOTE: To prevent damage to the float bowl on Series 7 carburetor, pull straight up with a needle nose pliers in the pocket closest to the main fuel well (diag. 37).

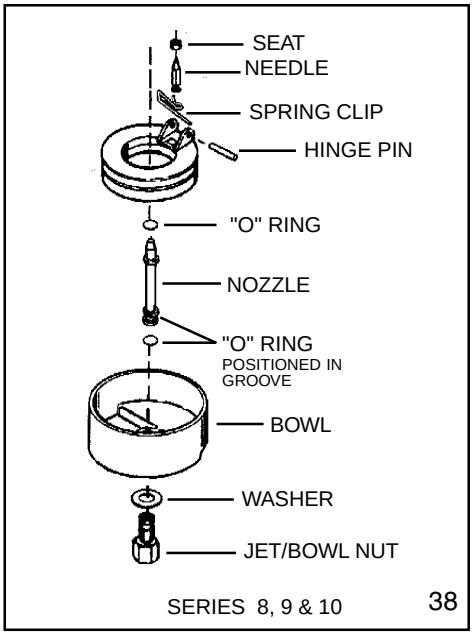
The float bowl must be free of dirt and corrosion. Clean the bowl with solvent or carburetor cleaner (soak 30 minutes or less).

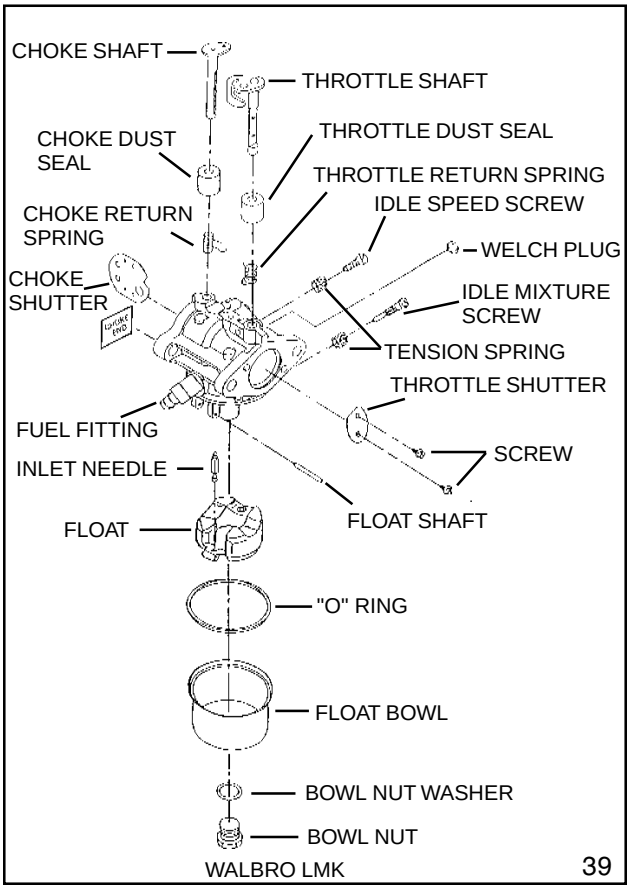
Examine the float for cracks or leaks. Check the float hinge bearing surfaces for wear, as well as the tab that contacts the inlet needle. Replace any damaged or worn parts.

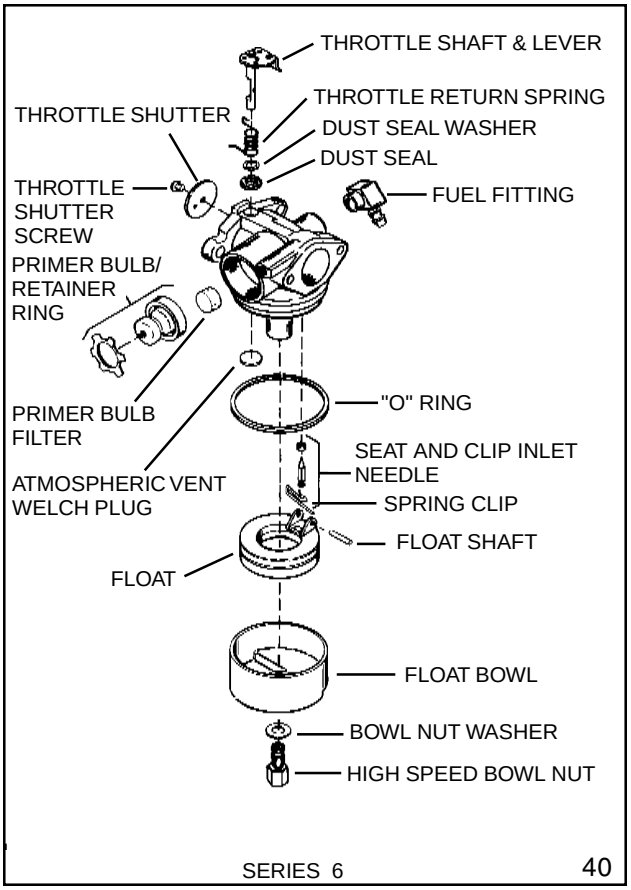
The needle and seat should be replaced if any fuel delivery problems are experienced (flooding or starvation). Sealing problems with the inlet needle seat may not be visible and replacement is recommended. Only the inlet needle is serviceable on the Walbro model LMK carburetor.







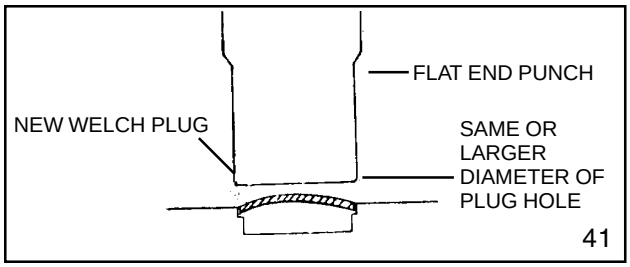




ASSEMBLY PROCEDURE

Welch Plugs

To install a new welch plug after cleaning the carburetor, secure the carburetor in a vise equipped with protective jaws. Place the welch plug into the receptacle with the raised portion up. With a punch equal to the size of the plug hole, merely flatten the plug. Do not dent or drive the center of the plug below the top surface of the carburetor. After installation of the welch plug, seal the outer diameter with fingernail polish (diag. 41).



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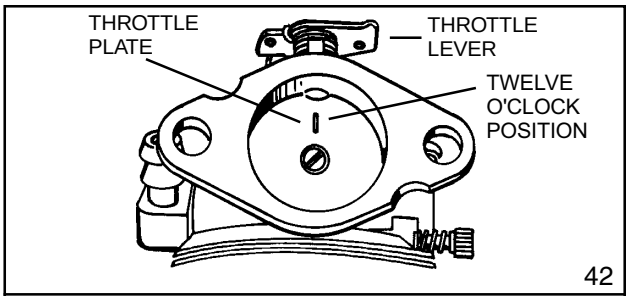
Throttle Shaft and Plate

When reassembling Tecumseh or Walbro carburetors, it is important that the lines, lettering, or numbers on the throttle plate are facing out when in the closed position. If the throttle plate has only one line, this line should be positioned in the 3 o'clock position on Series 3, 4, and 7 carburetors, and at the 12 o'clock position on Series 1, 6, 8, 9 carburetors. (diag. 42 & 43).

Test the operation of the throttle and return spring if equipped. If binding occurs, correct by loosening the screws and repositioning throttle plate.

Always use a new screw(s) when reinstalling the throttle shutter to prevent the screws from loosening and being drawn into the engine. New Tecumseh screws are treated with dry-type adhesive to secure them in place.

NOTE: NEVER REUSE OLD SCREWS.



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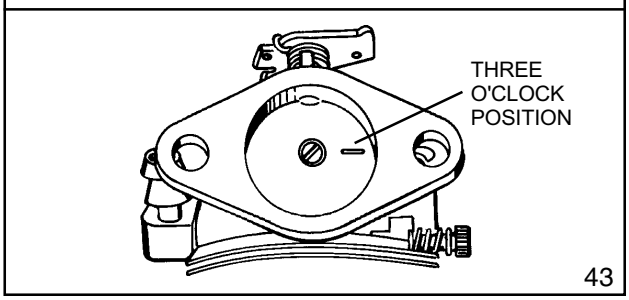

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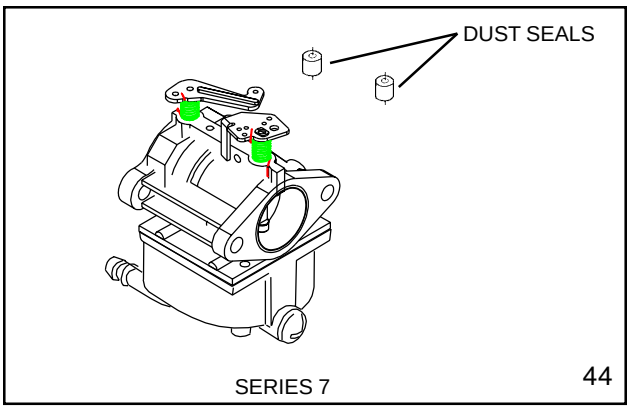
On Walbro LMK and Series 7 carburetors, install the throttle return spring on the throttle shaft with the squared end up. Slide the foam dust seal over the spring. Insert the throttle lever assembly into the carburetor body with both tangs of the return spring on the left side of the center boss (viewed from throttle end) and the flat side of the shaft toward the carburetor mounting flange. Install the throttle shutter to the throttle shaft using notes or marks to place the shutter as originally found (Series 7 must have the line on the shutter at the 3 o'clock position) (diag. 44).

Always use new throttle shutter screws when reinstalling. Install the screws so they are slightly loose. Apply light downward pressure on the throttle shaft and rotate it clockwise to seat the throttle shutter in the bore, then tighten the throttle shutter screws. Check for binding by rotating the throttle shaft. If necessary, adjust the throttle shutter by loosening and repositioning the shutter, then retighten the screws (diag. 45).



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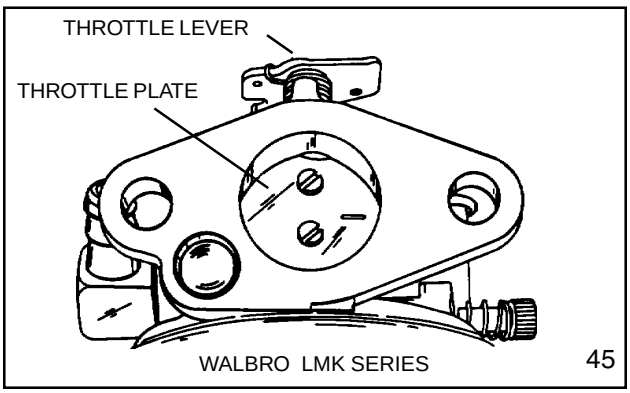

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Choke Shaft and Plate

The choke plate is inserted into the air horn of the carburetor in such a position that the flat surface (if applicable) of the choke is down. Choke plates will operate in either direction. Make sure it is assembled properly for the engine. Test the operation of the choke and return spring function if equipped (diag. 46).

Always use a new screw(s) when reinstalling the choke shutter as the screws are treated with dry-type adhesive to secure them in place.

NOTE: NEVER REUSE OLD SCREWS.

The choke shaft and plate must be in the closed position prior to tightening the screws. Hard starting may be due to insufficient choking action because of a misaligned choke plate. Correct by readjusting the choke plate to close completely. Note the cutout position of choke shutter if applicable.

On Walbro LMK and Series 7 carburetors, install the choke return spring on the choke shaft with the squared end up and hooked into the notch in the plate. Work the dust shield up around the spring and insert the choke shaft into the carburetor body. Rotate the shaft counterclockwise until the tang on the spring rests against the left side of the center boss on the carburetor body (viewed from choke end) . Rotate the choke shaft approximately 1/4 turn counterclockwise and insert the choke shutter into the slot in the choke shaft. Make sure the tabs on the shutter lock the choke shaft between them. Rotate the shaft and check for binding, the choke must return to the open position when released (diag. 47).

Fuel Inlet Fitting

When installing the fitting, insert the tip into the carburetor body. Support the carburetor body with a wood block to avoid damage to other parts. Use a bench vise or press to install the fitting squarely. Press it in until it bottoms out (diag. 48).

High and Low Speed Adjusting Screw, Main Nozzle

When reassembling, position the coil spring on the adjusting screws, followed by the small brass washer and the “O” ring seal. Turn the high speed adjustment screw into the bowl nut and the low speed mixture screw into the carburetor body (diag. 49).

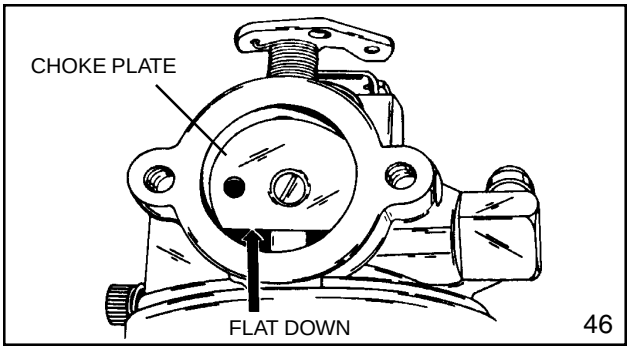
Some carburetors may have a fixed main mixture or both a fixed idle mixture and main mixture, and are not adjustable.

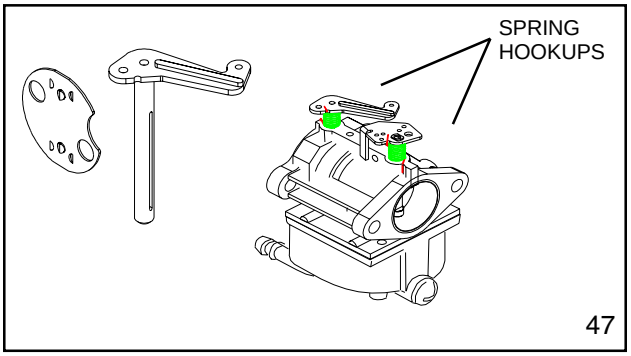
On Series 7carburetors, place the main nozzle spring into the main nozzle cavity. Apply oil to the main nozzle "O" ring and push the main nozzle into the cavity with the "O" ring end in first.

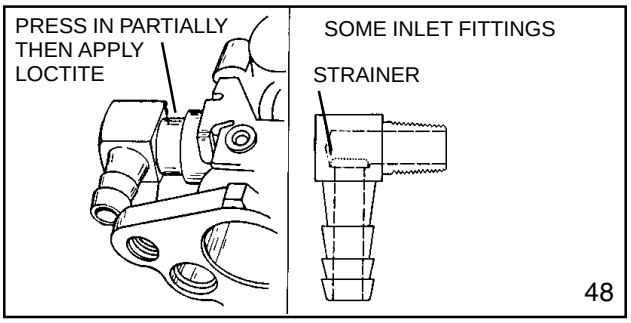
Next install the "O" ring in the main jet cavity. Place the spring over the shoulder on the main jet and push the jet into the cavity with the main jet toward the "O" ring. Place a new gasket on the drain screw and tighten in position (diag. 50).

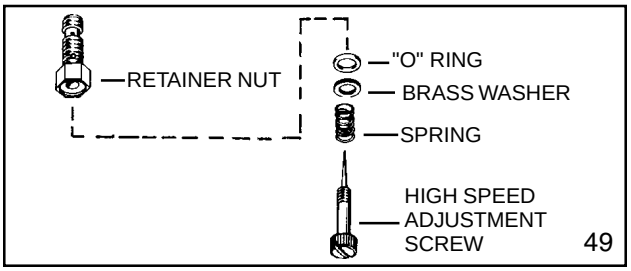
On Walbro LMK carburetors, the main jet can be replaced by pressing it into the center leg of the carburetor until flush. (diag. 31 page 15).

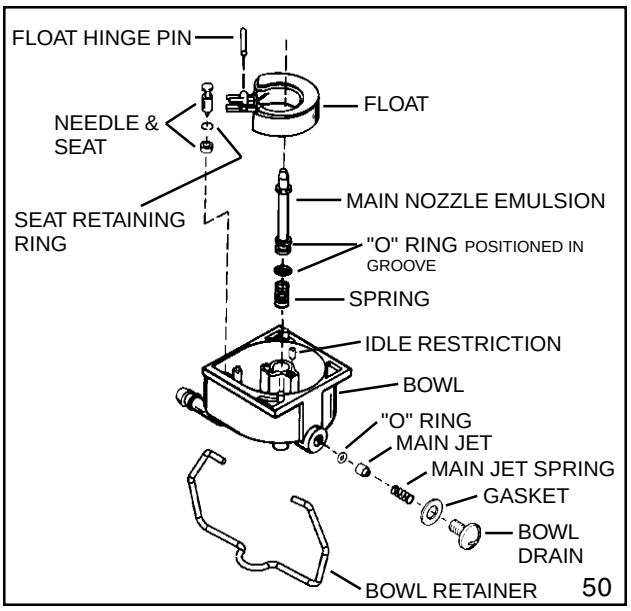
NOTE: FOR HIGH ALTITUDE JETTING, CONSULT BULLETIN 110.





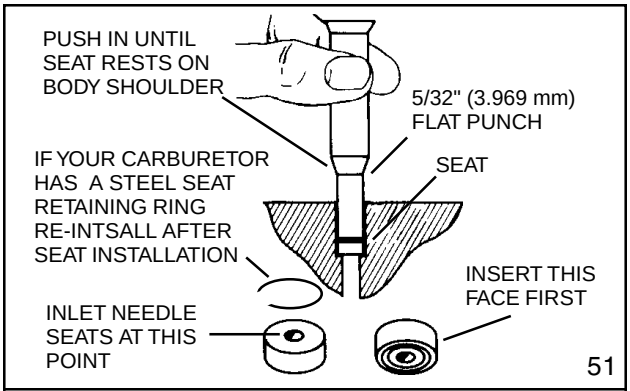






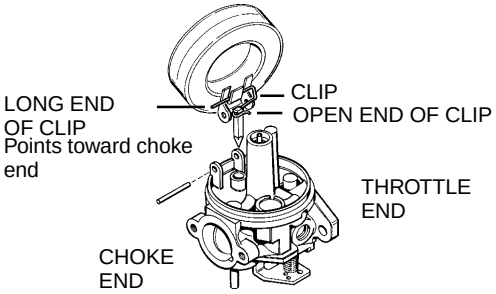
Inlet Needle and Seat

Make sure the seat cavity is clean. Moisten the seat with oil and insert the seat with the grooved side down and away from the inlet needle. Press the seat into the cavity using a 5/32" (3.969 mm) flat punch, making sure it is firmly seated (diag. 51). On Series "7" carburetors, install the seat retainer into the cavity and push it down using the flat punch until it contacts the seat.



51

The inlet needle hooks onto the float tab by means of a spring clip. To prevent binding, the long, straight end of the clip should face the choke or air filter end of the carburetor as shown (diag. 52).



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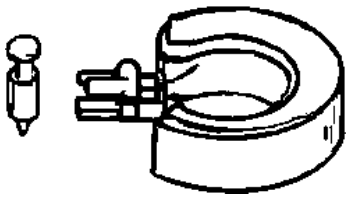
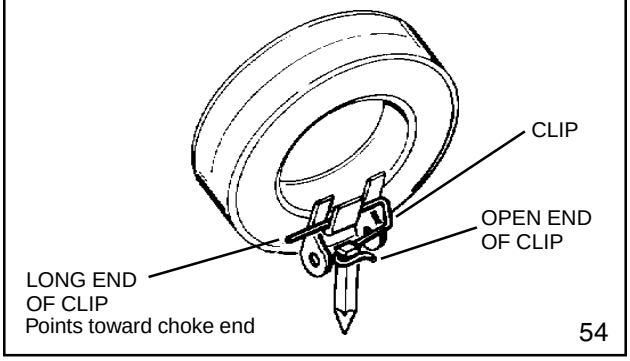
Float Installation

On Series 7 carburetors, slide the hinge pin into the hinge on the float. Position the needle into the fuel inlet and snap the float pin into the tabs on the float bowl. Float height is not adjustable.

On Series 7 carburetors and the Walbro LMK, reinstall the inlet needle on to the float and place it into the carburetor (diag. 53).


SERIES 7 WALBRO / LMK
53

1. When rebuilding a carburetor with a clip on the needle, position carburetor float side up for assembly.
2. Place the inlet needle and spring clip onto the float as shown. The long end of the spring clip must point towards the choke end of the carburetor. This will ensure that the inlet needle will move up and down in a straight line (diag. 53).
3. To set the proper float height on carburetors except Series 7 and Walbro LMK, see adjusting procedure.
4. Some Tecumseh float style carburetors have a damper spring which is installed as shown in diag. 55.



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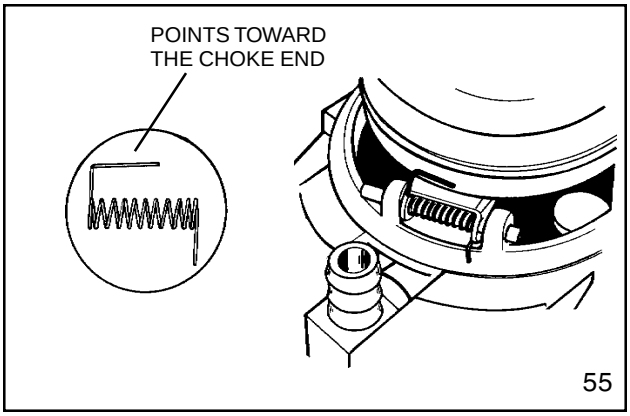

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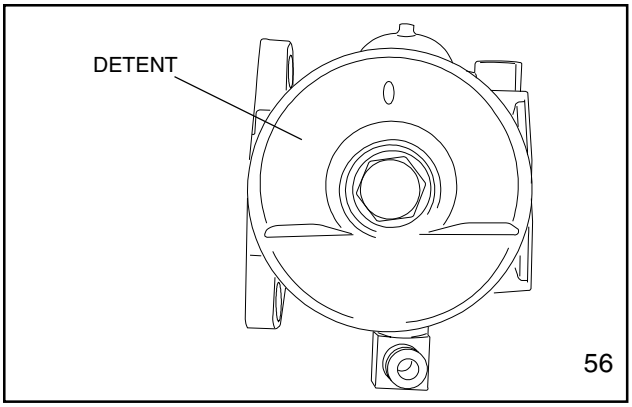
Fuel Bowl And Bowl Nut

Whenever a carburetor bowl is removed for service, the fuel bowl “O” ring (or gasket on Series "7") and the bowl nut washer must be replaced. For easier installation, lubricate the “O” ring with a small amount oil.

Installing the Float Bowl

Install the float bowl by placing the detent portion opposite of the hinge pin. Make sure the deepest end of the bowl is opposite of the inlet needle. The bowl has a small dimple located in the deepest part. The purpose of this dimple is to minimize the chances of the float sticking to the bottom of the bowl caused by stale fuel.



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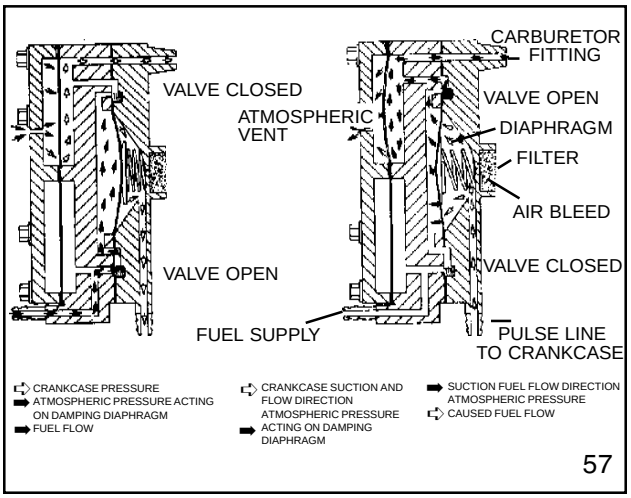
Impulse Fuel Pump

The diaphragms must be installed against the center body with the gaskets against the outside covers. The parts are designed so they cannot be misassembled without damage (diag. 57).

To test the unit, assemble the carburetor to the engine, leaving the fuel line from the pump off. Use a different fuel tank remotely placed above the carburetor to provide gravity fuel flow to the carburetor inlet to run the engine while testing the pump. Make sure fuel is available in both fuel tanks and the original fuel tank’s fuel line is connected to the fuel pump inlet. Place the pump outlet line in a proper draining receptacle. With the pulse line connected from the engine crankcase to the pump and the engine running, a definite fuel flow should result at the pump outlet.

If the flow is erratic or intermittent, the pump needs repair or replacement.



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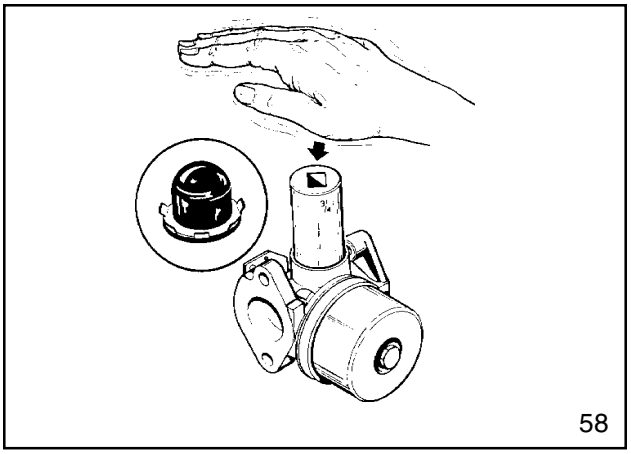
Primer Bulb

To install, start the retainer and bulb into the casting with the retainer tabs pointed out. Firmly push the bulb and retainer into position using a 3/4” (19.05 mm) deep well socket (diag. 58).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Final Checks

Before reinstalling a newly overhauled carburetor, pre-set the main mixture adjustment screw, the idle mixture adjustment screw and the idle speed adjustment screw. See “Pre-sets and Adjustments” in this chapter.

CHAPTER 4 GOVERNORS AND LINKAGE

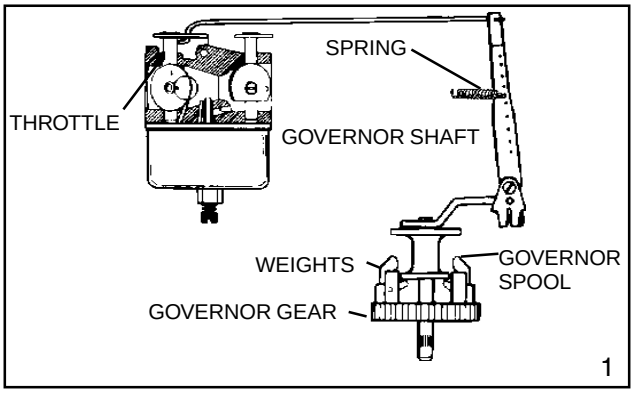
GENERAL INFORMATION

Tecumseh 4 cycle engines are equipped with mechanical type governors. The governor's function is to maintain a R.P.M. setting when engine loads are added or taken away. Mechanical type governors are driven off the engine's camshaft gear. The governor follower arm rests on the center of the governor spool on center force governors, and off to one side on other governor systems. Changes in engine R.P.M. cause the governor lever to move the solid link that is connected from the governor lever to the throttle in the carburetor. The throttle is opened when the engine R.P.M. drops and is closed as an engine load is removed.

This chapter includes governor assembly linkage illustrations to aid in governor or speed control assembly.

OPERATION

As the speed of an engine increases, the governor weights on the governor gear move outward by centrifugal force. The shape of the governor weights force the governor spool to lift. The governor rod maintains contact with the governor spool due to the governor spring tension. The governor rod rotates causing the attached outer governor lever to push the solid link and close the throttle opening. When the engine speed decreases, the lower centrifugal force allows the governor weights to be pulled in by the governor spring. The governor rod rotates and the solid link moves the throttle to a more open position (diag. 1).



TROUBLESHOOTING

Engine operation problems where the governor is suspected to be the cause may actually be the result of other engine system failures. Hunting (engine R.P.M. surging up and down) indicates that the engine is incapable of maintaining a constant R.P.M. with or without an engine load. Engine overspeeding must be corrected immediately before serious engine damage occurs. Use the applicable following procedure to diagnose a suspected governor failure.

ENGINE OVERSPEEDING

1. If the engine runs wide open (faster than normal), shut the engine off or slow it down **immediately.**
2. Check the condition of the external governor shaft, linkage, governor spring, and speed control assembly for breakage or binding. Correct or replace binding or damaged parts.
3. Follow the governor adjustment procedure and reset the governor - see "Service" in this chapter.
4. Run the engine. Be ready to shut the engine off if an overspeed problem still exists. If the problem persists, the engine will require disassembly to inspect the governor gear assembly for damage, binding, or wear.
5. See Chapter 9 under "Disassembly Procedure" to disassemble the engine.
6. Remove the governor gear assembly. Repair or replace as necessary.

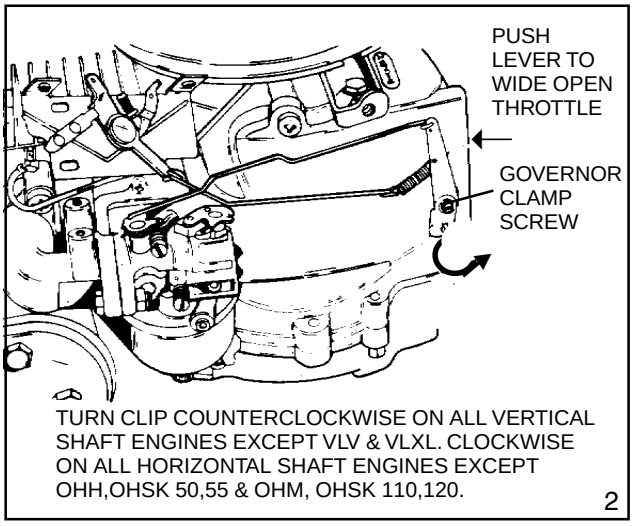
ENGINE SURGING

1. Try to stabilize the engine R.P.M. by holding in one position the solid link between the governor arm and the carburetor throttle, using a pliers or fingers.
2. If the engine R.P.M. stabilizes, the governor or governor adjustment should be checked. See "Service" governor adjustment procedure in this chapter. If the engine R.P.M. does not stabilize, the engine will require additional checks see Chapter 9 under "Troubleshooting".
3. If the problem persists after the governor adjustment, check the engine R.P.M. found on microfiche card # 30. The R.P.M. settings are critical. If the R.P.M. setting for high and low speed are within specification and a slight surge is experienced, increasing the engine idle R.P.M. setting slightly may eliminate this condition.
4. Check the governor shaft or linkages for binding, wear, or improper hookup. Check the governor spring for adequate tension or damaged condition. Repair or replace as necessary.

SERVICE

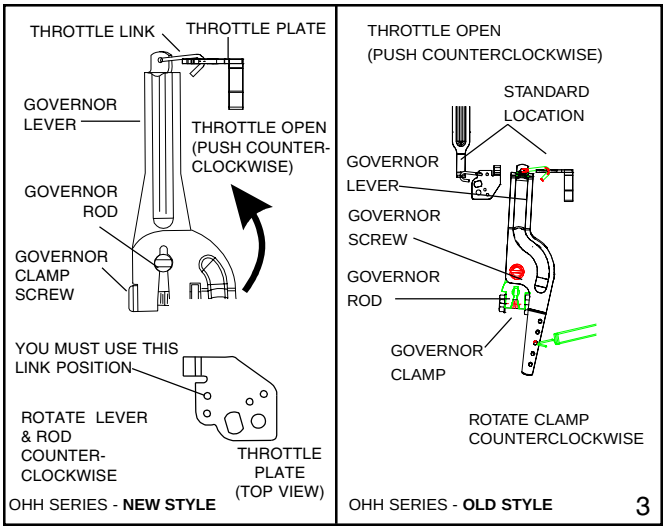
GOVERNOR ADJUSTMENT

With the engine stopped, loosen the screw holding the governor lever to the governor shaft clamp. Push the governor lever to move the carburetor throttle plate to the wide open position. Rotate the governor clamp counterclockwise on all overhead valve engines covered in this manual. Hold the lever and clamp in this position while tightening the screw (diag. 2).



TURN CLIP COUNTERCLOCKWISE ON ALL VERTICAL SHAFT ENGINES EXCEPT VLV & VLXL. CLOCKWISE ON ALL HORIZONTAL SHAFT ENGINES EXCEPT OHH,OHSK 50,55 & OHM, OHSK 110,120.

2



3

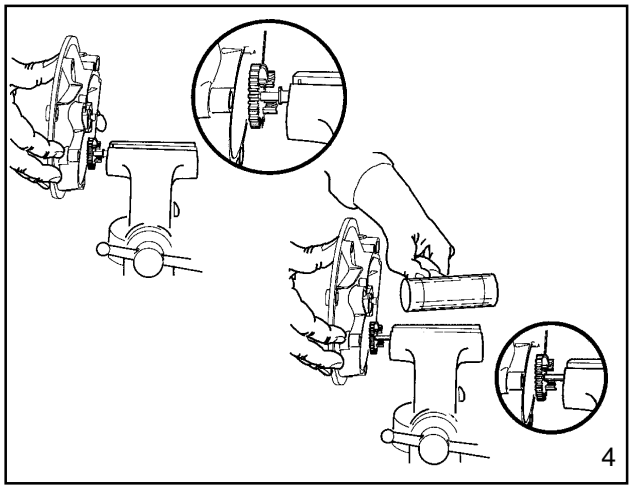
GOVERNOR GEAR AND SHAFT SERVICE

After the cylinder cover is removed from the engine, the governor spool, gear, or governor shaft can be removed. On some governor assemblies, the retaining ring must be removed to allow the spool or gear to slide off the shaft. Other governor shafts use an upset to hold the governor spool on. If the gear requires replacement, the governor shaft will have to be removed.

Governor Gear or Shaft Replacement, Upset Style Governor Shaft

1. Grip the original spool in a vise and use a twisting and pulling motion on the flange until the spool is free.
2. Clamp the shaft in a vise and pound gently on the flange with a wooden or plastic mallet to remove the shaft (diag. 4).

   NOTE: DO NOT TWIST THE SHAFT WHEN REMOVING. THE SHAFT BOSS MAY BECOME ENLARGED AND THE PRESS FIT WILL NOT SECURE THE NEW GOVERNOR SHAFT.
3. To install a new shaft, first assemble the gear and washer on the shaft. Start the shaft into the hole with a few taps from a soft faced hammer.
4. Place the flange in a press with a solid piece supporting the area below the shaft boss. Press the shaft in until a part # 670297 (.0125" / .3175 mm) shim just becomes snug (.010" - .020" / .254-.508 mm clearance) (diag. 5).



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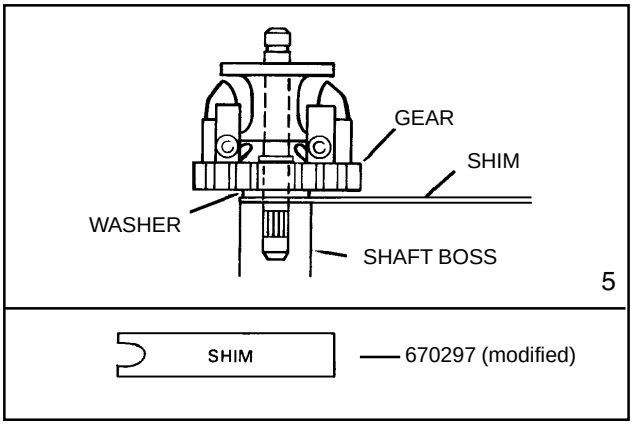


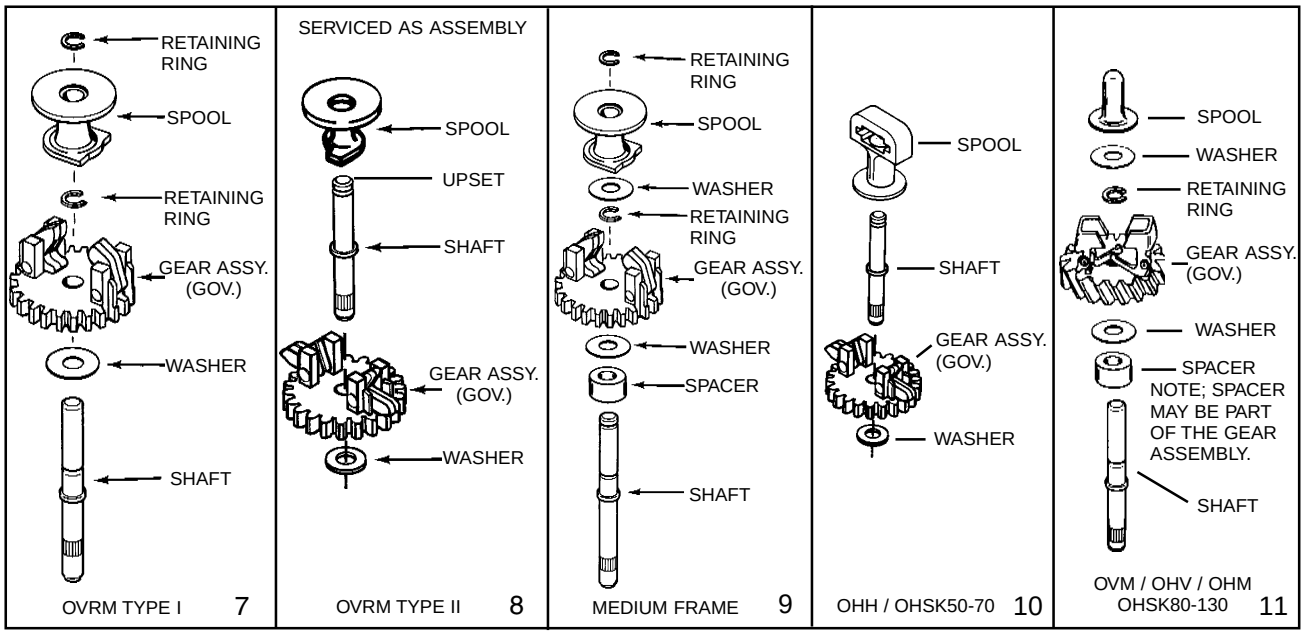
5

Governor Shaft Replacement, Retaining Ring Style

1. Remove the retaining ring, spool, gear assembly, and washer(s).
2. Clamp the shaft in a vise and pound gently on the flange with a wooden or plastic mallet to remove the shaft.

   NOTE: DO NOT TWIST THE GOVERNOR SHAFT WHEN REMOVING. THE SHAFT BOSS MAY BECOME ENLARGED AND THE PRESS FIT WILL NOT SECURE THE NEW GOVERNOR SHAFT.
3. Start the new shaft into the shaft boss by tapping with a soft faced hammer.
4. Refer to the chart at right for the proper shaft exposed length from the mounting surface. Add a drop of red Loctite 271 and press the governor shaft to the proper depth using a press or a vise. Wipe the extra Loctite off after installation.
5. Reassemble the washer (s), governor gear, and spool followed by the retaining ring.

ENGINE MODEL	EXPOSED SHAFT LENGTH
OHH/OHSK50-70 OVRM	1.319" - 1.334" (33.502 - 33.883 mm)
OHM OHSK80-130	1.085" - 1.100" (27.559 - 27.940 mm)
OVM OVXL OHV	1.350" - 1.365" (34.290-34.671 mm) 6

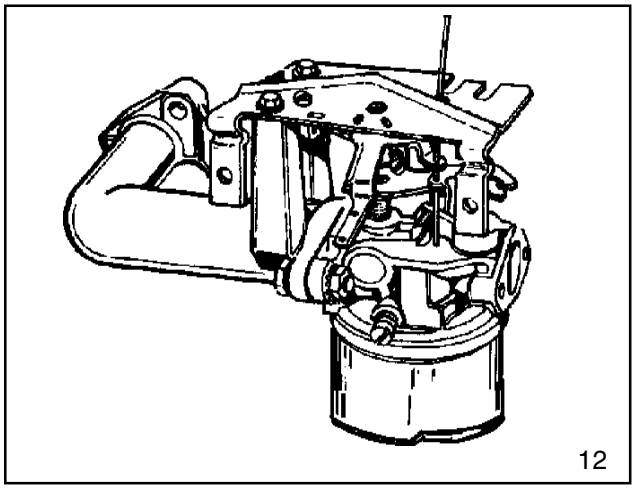


Speed Controls And Linkage

Many different types of speed controls and linkage are used for O.E.M. applications. Linkage attachment points are best recorded or marked prior to disassembly. This assures the correct placement during reassembly. The solid link is always connected from the outermost hole in the governor lever to the throttle in the carburetor. The governor spring is connected between the speed control lever and the governor lever. Vertical shaft engines may use an adjustable intake pipe mounted speed control bracket located above the carburetor, or a vertical or horizontal control mounted on the side of the engine. The ignition ground out terminal, idle R.P.M. and high speed R.P.M. adjustment screws may be located on the speed control bracket.

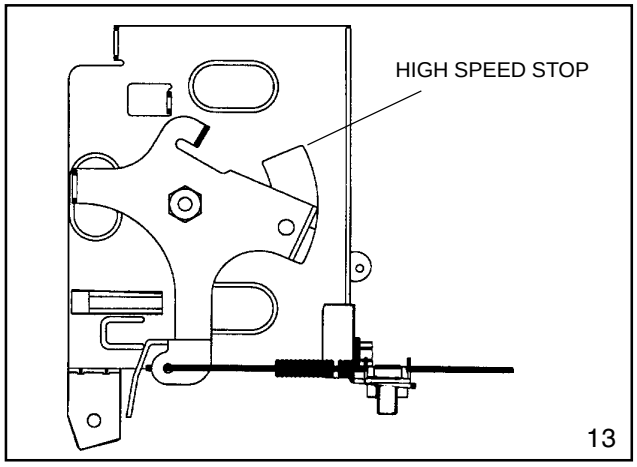
The adjustable speed control bracket which is mounted on the intake pipe must be aligned properly when installing. To align the control bracket, use the following steps.

1. Loosen the two screws on the top of the panel.
2. Move the control lever to full wide open throttle position and install a wire or aligning pin through the hole in the top of the panel, the hole in the choke actuating lever, and the hole in the choke (diag. 12).
3. With the components aligned, tighten the two screws on the control panel.


12

The following pages show common linkage hookup arrangements. Whenever the carburetor or the governor linkage is removed or replaced, the engine R.P.M.'s should also be checked. Use microfiche card #30 or contact a local Tecumseh dealer for the correct R.P.M. settings for the engine model and specification.

NOTE: RPM SETTINGS CAN ALSO BE FOUND ON THE COMPUTERIZED PARTS LOOK UP SYSTEMS.



13

OHH REMOTE SPEED CONTROL

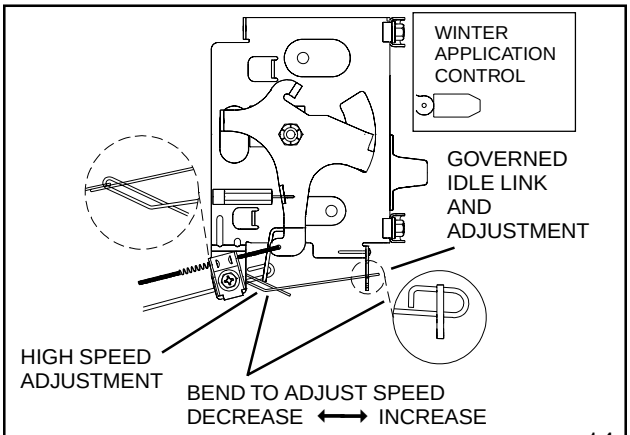
The engine and equipment control must be adjusted to allow the engine control lever to touch the high speed stop when the equipment control is set in the "highspeed" or "fast" position. Loosen the bowden wire clamp, place the equipment control to the "fast" position, move the engine control lever to contact the high speed stop, and hold the lever in this position while tightening the bowden wire clamp.

OHH GOVERNED IDLE SPEED CONTROL

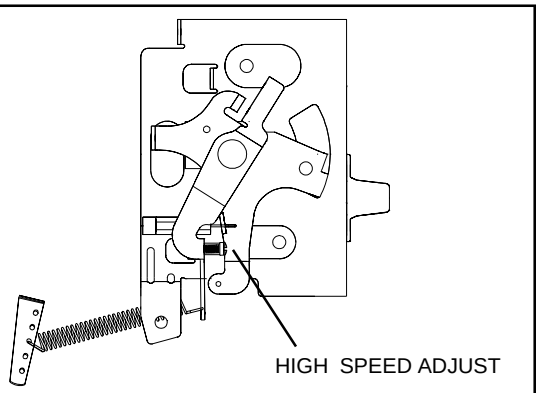
This control is adjusted by bending the tabs on the control bracket to achieve the correct idle speed and high speed. When the engine is running, the governor controls both the idle and the high engine speed. In order for the governor to respond properly to a crankshaft load at engine idle, the idle speed screw on the top of the carburetor must be set 600 RPM lower than the governed idle speed. Use the following procedure to set the engine speeds (diag. 14 & 16).

1. Check to find the correct engine speeds found on microfiche card # 30 or using the Computer Parts Look-up System.
2. Start and allow the engine to run (3-5 minutes) before beginning adjustments. Place the control knob in the lowest engine speed position. Use a Vibra-Tach or other tachometer to set the non-governed idle speed (600 RPM lower than the governed idle speed) by pushing the bottom of the governor lever away from the control bracket so the throttle lever contacts the idle speed screw and hold the lever in this position. Turn the idle speed screw clockwise to increase or counterclockwise to decrease engine idle speed.
3. Allow the governor to control the throttle. Use a Vibra-Tach or other tachometer and bend the tab as shown to achieve the specified governed idle speed.
4. Slide the control knob to the high speed position and bend the tab as shown to achieve the specified governed high engine speed.

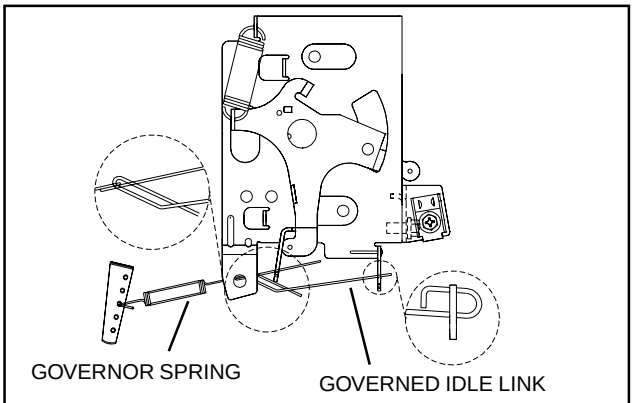
NOTE: Early production OHH engines did not have governed idle, set only the idle crack screw and high speed governor stop.



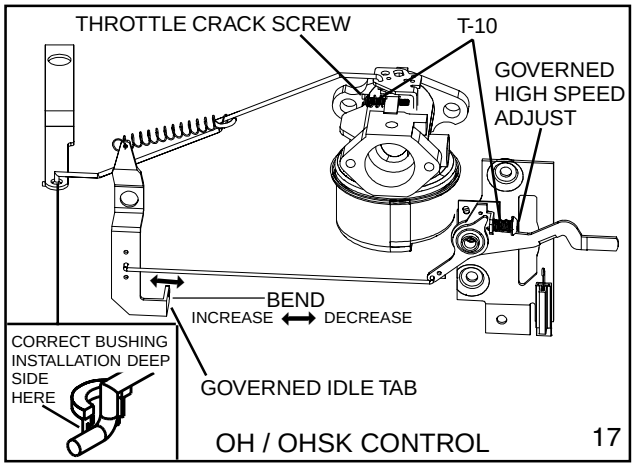
OHH REMOTE & MANUAL 14



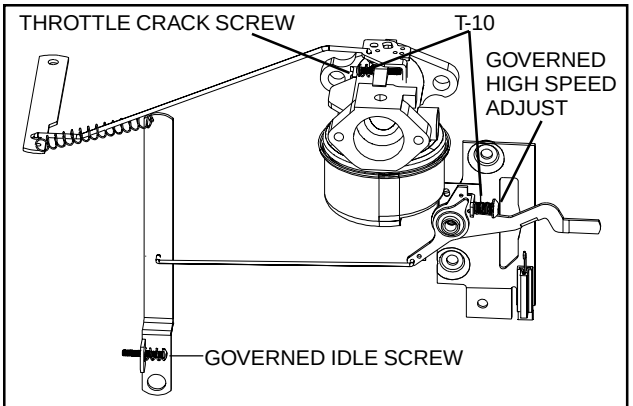
OHH FIXED SPEED 15



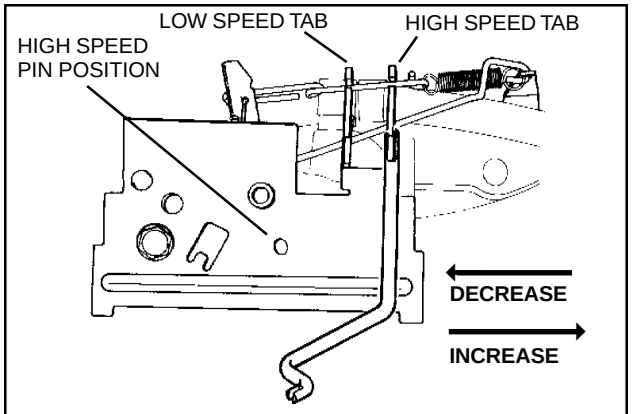
OHH RV CONTROL 16



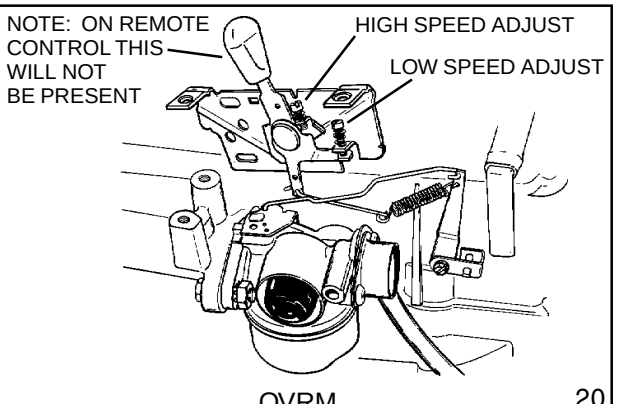
OH / OHSK CONTROL 17



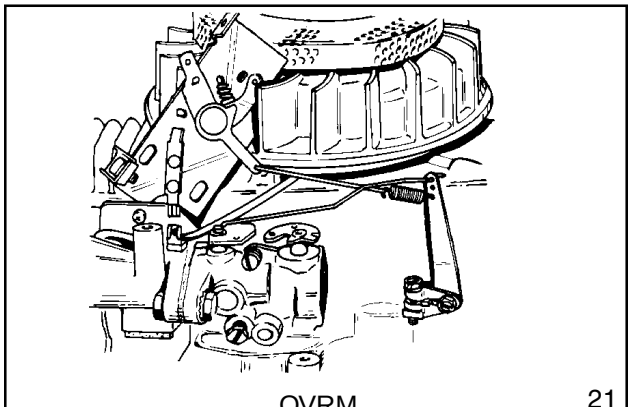
OHSK / OHM CONTROL 18



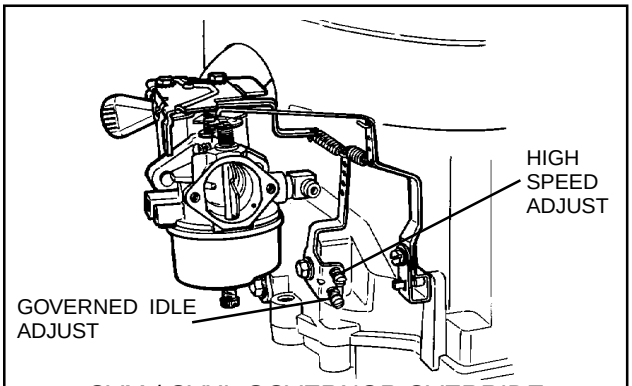
OVRM SNAP IN CONTROL 19



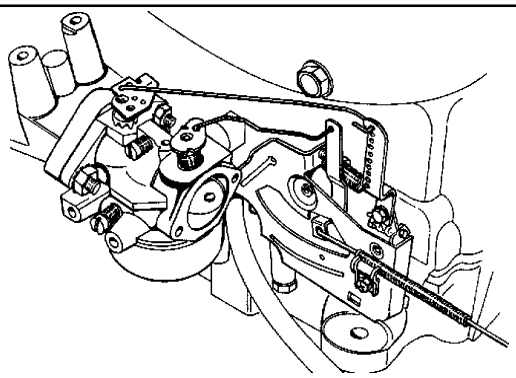
OVRM 20



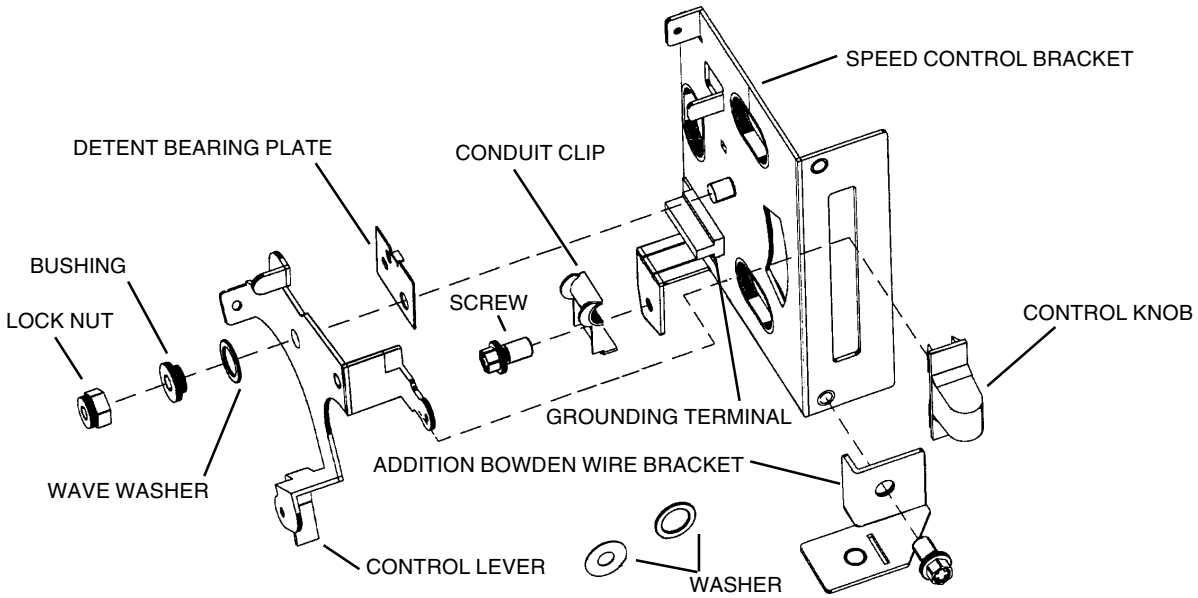
OVRM 21



OVM / OVXL GOVERNOR OVERRIDE 22



OHV11 - 17 SPEED CONTROL 23



NOTE: THIS CONTROL IS STANDARD ON SERVICE ENGINES AND IS OPTIONAL TO CUSTOMERS 24

CONVERSION TO REMOTE CONTROL

Remove the manual control knob by squeezing together with a pliers or prying with a screw driver. Remove the air cleaner cover and air cleaner element to gain easier access to the speed control lock nut that holds the control levers together.

Remove the 3/8" (9.525 mm) locknut, bushing, wave washer, control lever, and the detent bearing plate.

Reassembly of **REMOTE** control.

Discard the detent bearing plate and in its place install the washer with the smaller I.D. from the new parts bag.

Install the lever over the post making sure that the end of the lever is in the slot of the control.

Place the other washer with the large I.D. from the parts bag next to lever, then the bushing. The smaller side of the bushing goes towards the lever and fits inside of the lever and the washer.

Discard the wave washer.

Install the lock nut.

Check the alignment of the lever, bushing and washers to ensure that everything is aligned properly and torque the lock nut to 20 in. lbs. (2 Nm).

The control lever should move freely.

This engine speed control is set up with the "stop in the control". If a remote stop is desired remove and discard the short green wire that runs from the speed control grounding terminal (to the remote grommet stop blade). Reinstall the blade and screw. It will now be necessary to run a grounding wire to a remote grounding switch in order to stop the engine.

A remote grounding switch can be added to the engine at this terminal as well, thus allowing the engine to be stopped at either the stop in the control or the remote grounding switch.

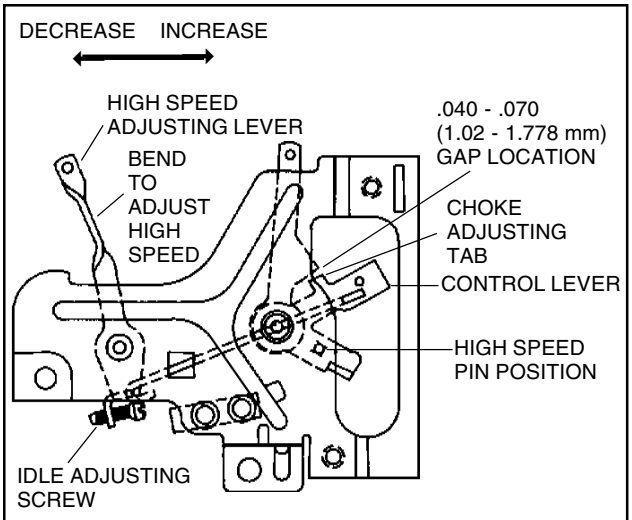
OVM, OVXL, OHV VERTICAL SPEED CONTROL

This remote speed control may have governed idle, a choke override, and the option of an ignition remote stop terminal block.

The speed control is adjusted to the equipment throttle control by aligning the slot in the speed control lever with the alignment hole on the mounting bracket. Place a pin through the two holes, place the equipment throttle control to the wide open position, hook the bowden cable end in the control as shown, and tighten the cable housing clamp. In this position, the gap of .040" - .070" (1.02 - 1.778 mm) should exist at the gap location as illustrated. This will assure that the carburetor will go into full choke when the control is placed in the start position.

The idle speed is adjusted by turning the idle speed screw clockwise to increase engine R.P.M. and counterclockwise to decrease R.P.M. Use tool part # 670326 to adjust the high speed engine R.P.M. Place the slotted end of the tool onto the adjustment tab and bend the tab to the left (away from the control) to increase engine R.P.M.

Throttle plate alignment on all models with speed controls mounted on intake manifold. This adjusts choke in control as well (diag. 12 on page 25).



OHV VERTICAL CONTROL 25

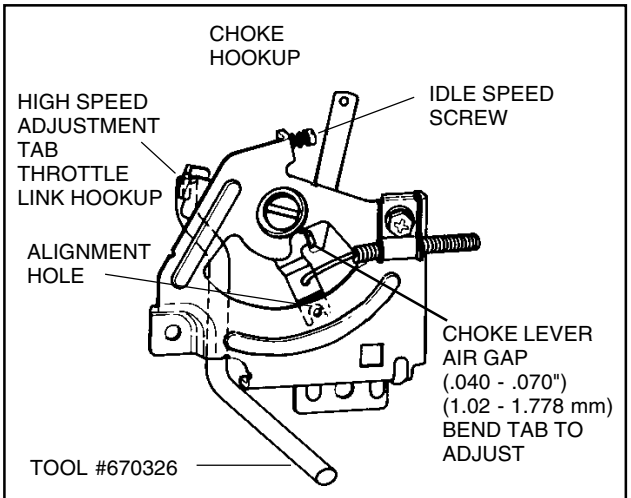
OHV 11-17 HORIZONTAL SPEED CONTROL

This speed control is adjusted to the equipment throttle control by aligning the slot in the speed control lever with the alignment hole on the mounting bracket. Place a pin through the two holes, place the equipment throttle control to the wide open position, hook the bowden cable end in the control as shown, and tighten the cable housing clamp. In this position, the gap of .040" - .070" (1.02 - 1.778 mm) should exist at the gap location as illustrated. This will assure that the carburetor will go into full choke when the control is placed in the start position.

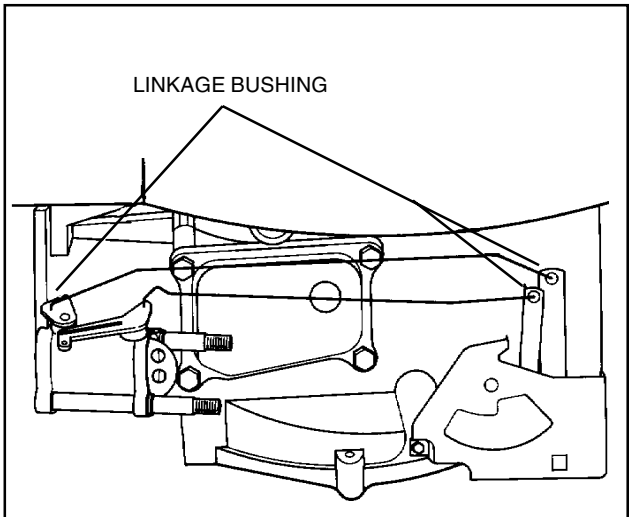
NOTE: Assure that the throttle cable has full travel from wide open throttle to full choke. **Hard starting** could result if the cable is not properly adjusted to allow for full choke.

The idle speed is adjusted by turning the idle speed screw clockwise to increase engine R.P.M. and counterclockwise to decrease R.P.M. Use tool part # 670326 to adjust the high speed engine R.P.M. Place the slotted end of the tool onto the adjustment tab and bend the tab to the left (toward the spark plug end) to increase engine R.P.M.

OHV 11 -17 engines use nylon bushings on the throttle and choke linkage hook-up points to extend the life of the linkage and to enhance the stability of the governor system. Make sure they are in good condition and in place (diag. 27).



OHV 11 - 17 HORIZONTAL CONTROL 26



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CHAPTER 5 RECOIL STARTERS

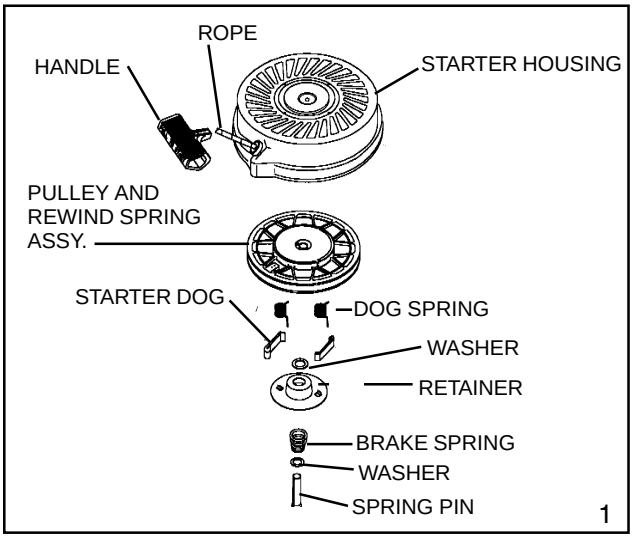
GENERAL INFORMATION

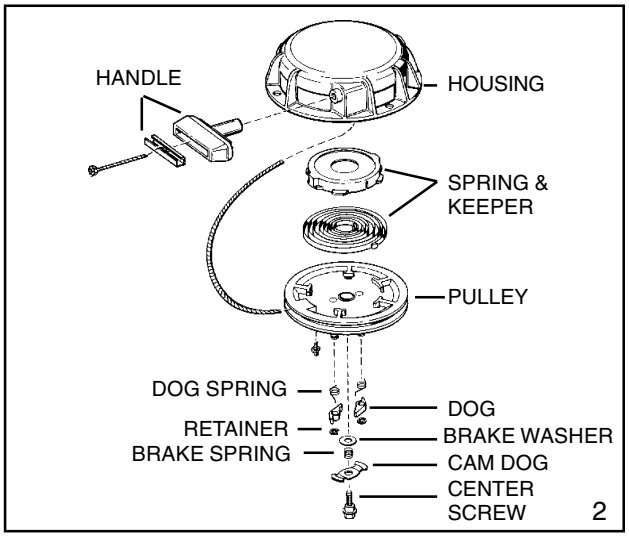
Recoil starters used on vertical shaft Tecumseh engines are top mount horizontal pull style. Horizontal shaft engines use recoil starters which can be mounted to pull either vertically or horizontally. All recoil starters turn the engine over by engaging a dog(s) into the starter cup attached to the engine flywheel. All starters are spring loaded to retract the dog(s) when the engine speed exceeds the turning speed of the starter.

OPERATION

As the starter rope is pulled, the starter pulley rotates on the center pin. The starter dog(s) is pinned or pocketed in the pulley hub and extend outward when the pulley rotation forces the starter dog(s) to contact the ears on the retainer. The retainer ears act as a ramp to fully extend the starter dog(s). The fully extended starter dog(s) locks in contact with notches in the starter cup. When the engine fires and the rotational speed of the starter cup exceeds the starter pulley, the starter dog(s) disengages from the starter cup. The starter dog spring(s) returns the starter dog(s) to the disengaged position. When the starter handle is released, the recoil spring turns the starter pulley in the opposite direction to retract the starter rope.

COMPONENTS





SERVICE

Starter related problems will require the starter to be removed from the engine to diagnose the cause. Visually inspect the starter dog(s), starter cup, retainer, springs, rope, washers, and the starter pulley for wear or breakage. Use one of the following procedures that apply to the application to disassemble, repair, and assemble the starter. Always consult the Tecumseh Master Parts Manual for the correct replacement parts.

ROPE SERVICE

Rope replacement should be done using the correct part number replacement rope or braided rope of the correct diameter and length. Consult the Tecumseh Master Parts Manual to obtain the correct part number, length, and size required. Use the following rope chart to convert a numbered rope to a fractional diameter for bulk rope use. The rope ends should be cauterized by burning with a match and wiping the rope end with a cloth while hot.

CAUTION: HANDLE MATCHES SAFELY TO AVOID BURNS, AND EXTINGUISH COMPLETELY BEFORE DISCARDING.

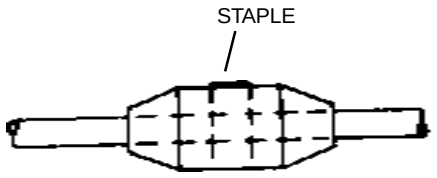
4 1/2 rope = 9/64" diameter (3.572 mm)

5 rope = 5/32" diameter (3.969 mm)

6 rope = 3/16" diameter (4.762mm)

ROPE RETAINER REPLACEMENT

1. Remove the starter handle if the retainer is a complete circle design. Remove the staple and old retainer.
2. Slide the rope retainer into the proper position and insert the staple using a pliers.
3. Install the starter handle and tie a left hand knot to secure the handle.



ONE PIECE ROPE RETAINER 3

STYLIZED REWIND STARTER (OHH, OVRM, OHM, OHSK, OVM, OVXL, OHV), and STAMPED STEEL STARTER

Disassembly Procedure

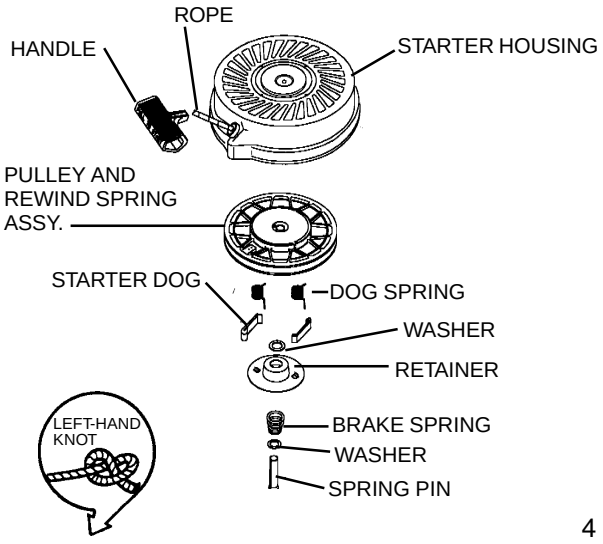
1. After removing the rewind assembly from the engine blower housing, release the tension on the rewind spring. Remove the starter handle and carefully allow the rope to unwind into the starter housing (diag. 4).
2. Remove the decal or plastic disc in the center of the rewind.
3. Place a 1" (25.4 mm) deep well socket under the retainer. Set the rewind on a bench, supported on the socket.
4. Use a 5/16" (7.937 mm) or a [1/4" (6.35 mm) punch for stamped steel] roll pin punch to drive out the center pin. The stamped steel center pin is driven out from the outside, the punch tip must be angled inside the center hole. Move the punch around while driving the pin to help keep the pin straight.

CAUTION: THIS REWIND SPRING IS NOT SECURED IN A CANISTER. PULLEY BOSSES HOLD THE REWIND SPRING AND COVER, AND CAN BE EASILY DISLODGED DURING HANDLING.

5. Remove the brake spring, retainer, washers, and pulley assembly (diag. 4).

   Note: The starter dogs face out on the stamped steel starter and the dogs face in on the stylized rewind starter.

6. All components in need of service should be replaced.



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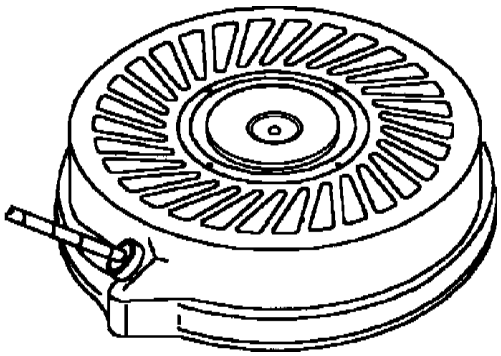

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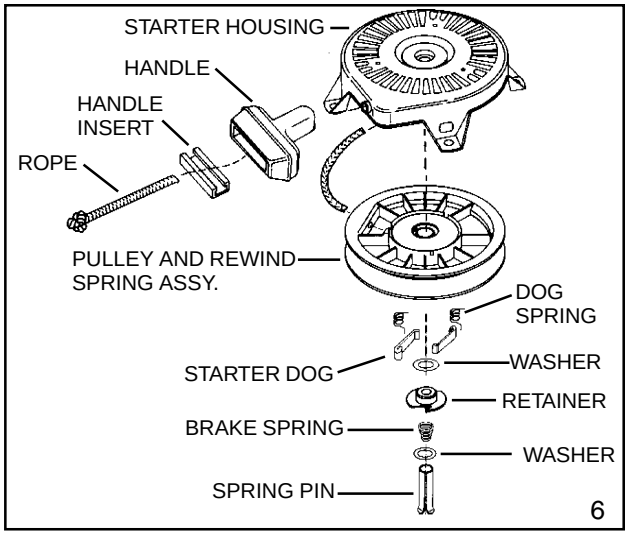
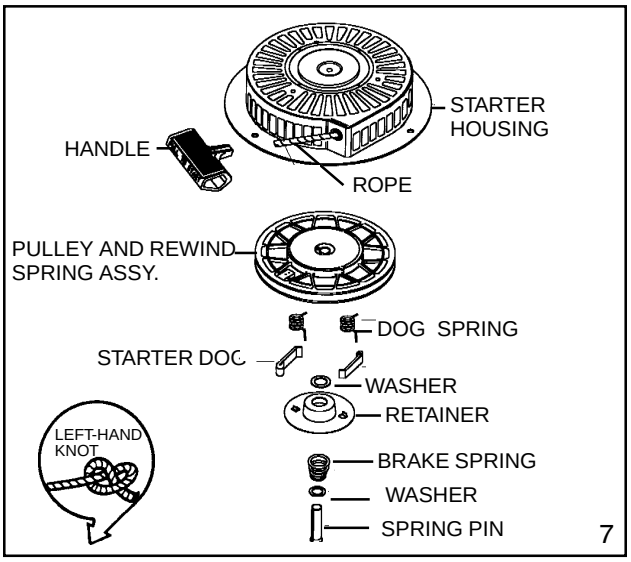
Assembly Procedure

1. Reverse the disassembly procedure. The starter dogs with the dog springs must snap back to the center of the pulley (disengaged position). When the rope is pulled, the tabs on the retainer must be positioned so that they will force the starter dogs to engage the starter cup. (diag. 6 & 7)
2. Install a new recoil spring if necessary by pushing the new spring out of the holder into the pulley cavity while aligning the outside spring hook into the deep notch in the pulley. Push the spring cover in until seated.
3. Always replace the center spring pin with a new one upon reassembly. Place the two new plastic washers between the center leg of the starter and the retainer. New plastic washers are provided with a new center spring pin. Discard the old plastic washer.
4. Place the rewind on a flat surface and drive the new center pin in until it is within 1/8" (3.175 mm) of the top of the starter.

   NOTE: DO NOT DRIVE THE CENTER PIN IN TOO FAR.

   The retainer will bend and the starter dogs will not engage the starter cup. On the stamped steel starter the center pin should be driven in until it contacts the shoulder in the starter housing.
5. Replacing rope wind the starter pulley counterclockwise four or five turns to pre-load the recoil spring and thread the rope through the starter housing eyelet. Pull enough rope through to tie a temporary knot in the rope. Reattach the starter handle to the rope using a left-hand knot. Untie the temporary knot and allow the rope to recoil.

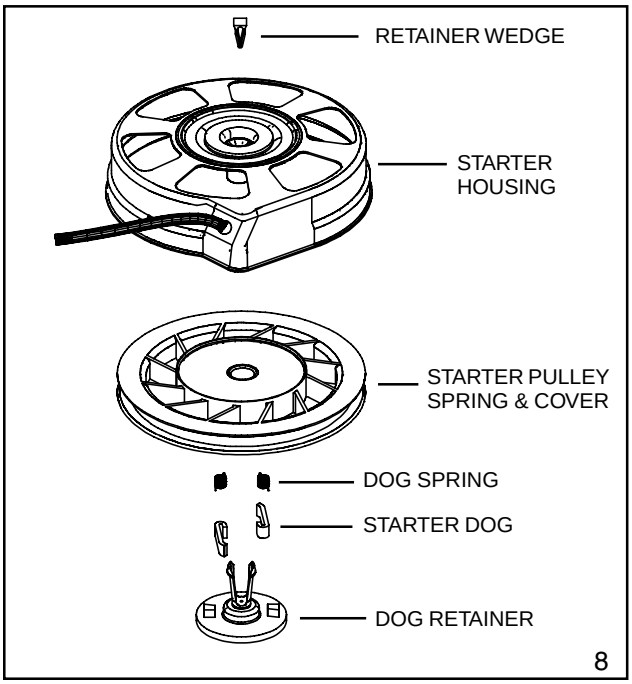




STYLIZED REWIND STARTER WITH PLASTIC RETAINER

Disassembly Procedure

1. After removing the rewind assembly from the engine blower housing, remove the starter handle by first pulling a length of rope out using the handle, tying a temporary knot in the exposed rope, and either untying the knot in handle or prying out the staple.
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Remove the decal from the center of the starter housing.

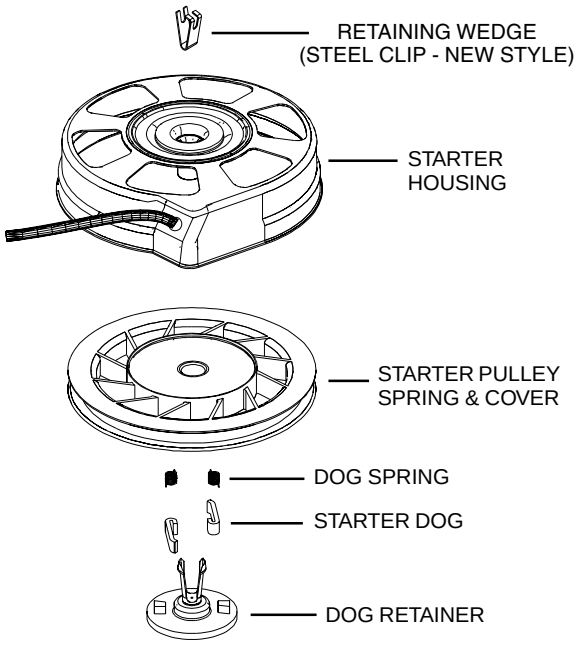


4. Use a small Phillips screwdriver or similar tool to pry the retainer legs apart and lift out the retaining wedge.
5. Pinch the legs of the retainer together and pull on the head of the retainer to remove it from the housing.
6. Remove the pulley assembly from the recoil housing.
7. Repair or replace as necessary.

Assembly

1. If replacing the starter rope, see Step 8.
2. Install a new recoil spring if necessary by pushing the new spring out of the holder into the pulley cavity while aligning the outside spring hook into the deep notch in the pulley. Push the spring cover in until seated.
3. Apply a small amount of lithium grease to the inner bore of the center shaft.
4. Replace or check that both starter dogs are in the pulley pockets and that the dog springs are hooked on the outer surface of the dog.
5. Pinch the two legs of the plastic retainer together and start into the center shaft hole.
6. Rotate the retainer so the two tabs on the bottom of the part fit between the dog and pulley hub (left side of the dog). Push the retainer in until the leg prongs pop out of the center shaft.
7. Turn the starter over and snap the locking tab between the retainer legs, replace the top decal.

   NOTE: Refer to Service Bulletin 122 for metal locking tab.
8. Wind the starter pulley counterclockwise four or five turns to pre-load the recoil spring and thread the rope through the starter housing eyelet. Pull enough rope through to tie a temporary knot in the rope. Reattach the starter handle to the rope using a left-hand knot. Untie the temporary knot and allow the rope to recoil.

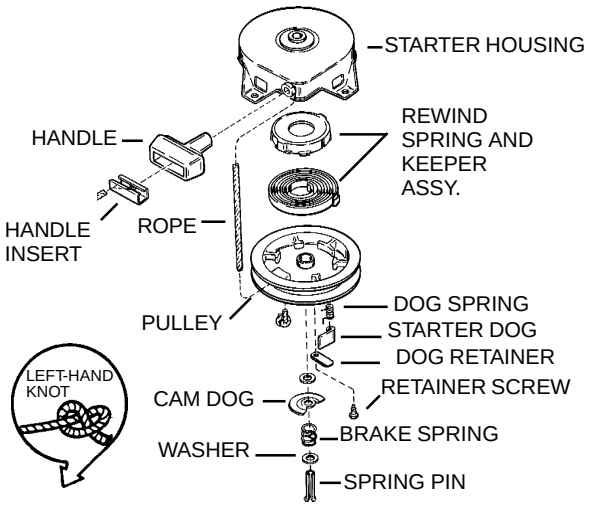


9

KEEPER SPRING STYLE STARTERS

Disassembly Procedure

1. Untie the knot in the rope and slowly release the spring tension.
2. Remove the center screw, retainer (cam dog on snow proof type), starter dog(s) and dog spring(s), and brake spring (diag. 10).
3. Turn the spring and keeper assembly to remove the pulley. Lift the pulley out of the starter housing. Replace all worn or damaged parts.



"STAMPED STEEL WITH ROLL PIN"
10

Assembly Procedure

NOTE: This procedure covers three starters. Follow illustration of your starter type as shown.

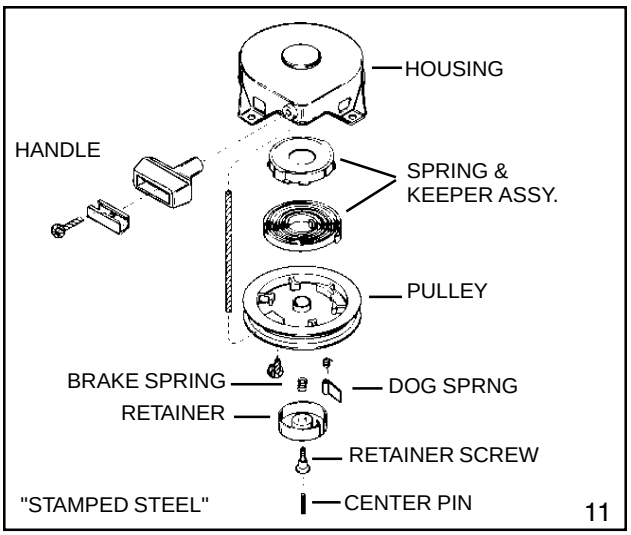
1. Place the rewind spring and keeper assembly into the pulley. Turn the pulley to lock into position. A light coating of grease should be on the spring.

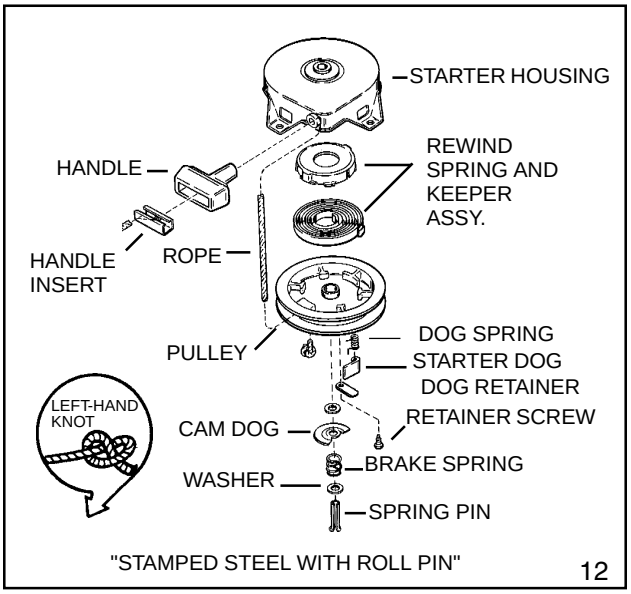
2. Place the pulley assembly into the starter housing.

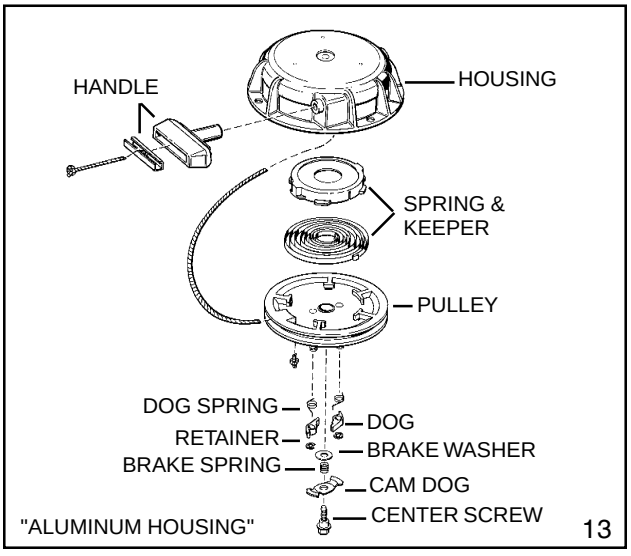
3. Install the brake spring, starter dog(s), and starter dog return spring(s). The starter dog spring(s) must hold the dog(s) in against the pulley.

4. Replace the retainer cup (cam dog on snow proof starter) and retainer screw. Tighten to 65 - 75 in. lbs. (7-8.5 Nm) Older models that use a 10 - 32 retainer screw can be replaced with a larger 12 - 28 screw (part # 590409A). Re-drill the screw hole using a 13/64" (5.159 mm) drill bit. The center screw torque on cast aluminum starters is 115 to 135 in. lbs. (13-15 Nm) (diag. 11).

5. Tension the recoil spring by winding the pulley counterclockwise until it becomes tight, then allow the pulley to unwind until the hole in the pulley lines up with the rope eyelet in the starter housing. Install a knotted rope through the pulley and the eyelet and install the handle. A left-hand knot should be tied on the end of the rope to secure the handle.





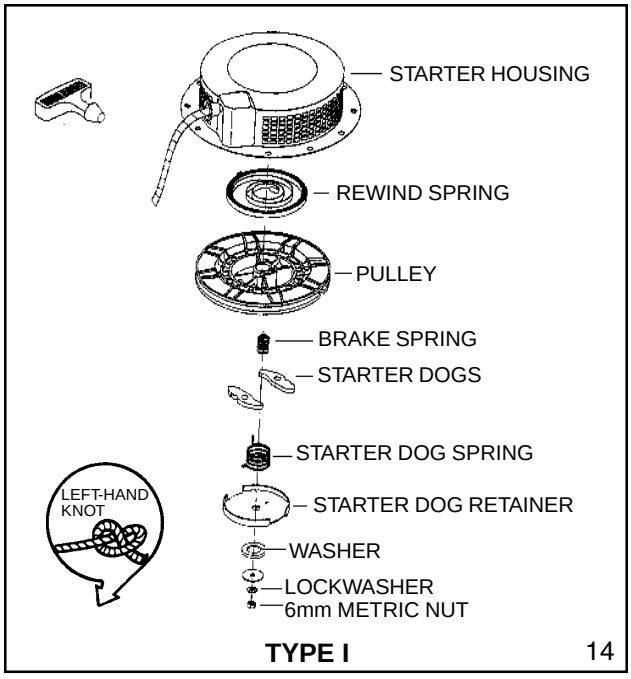


Stylized Starter (OHV 13.5 -17)

1. Remove the starter handle by first pulling a length of rope out using the handle, tying a temporary knot in the exposed rope, and untying the knot in the handle.
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Remove the nut (using a 10 mm socket) and washers from the center leg of the recoil housing. Slowly unwind the dog spring by allowing the starter dog retainer to rotate.
4. Remove the starter dog retainer, starter dog spring, brake spring, and starter dogs.
5. Remove the starter pulley.

CAUTION: THE REWIND SPRING IS NOT SECURED IN PLACE. HOUSING BOSSES HOLD THE REWIND SPRING, AND THE SPRING CAN BE EASILY DISLODGED DURING HANDLING.

6. Remove the starter rope from the pulley if necessary.

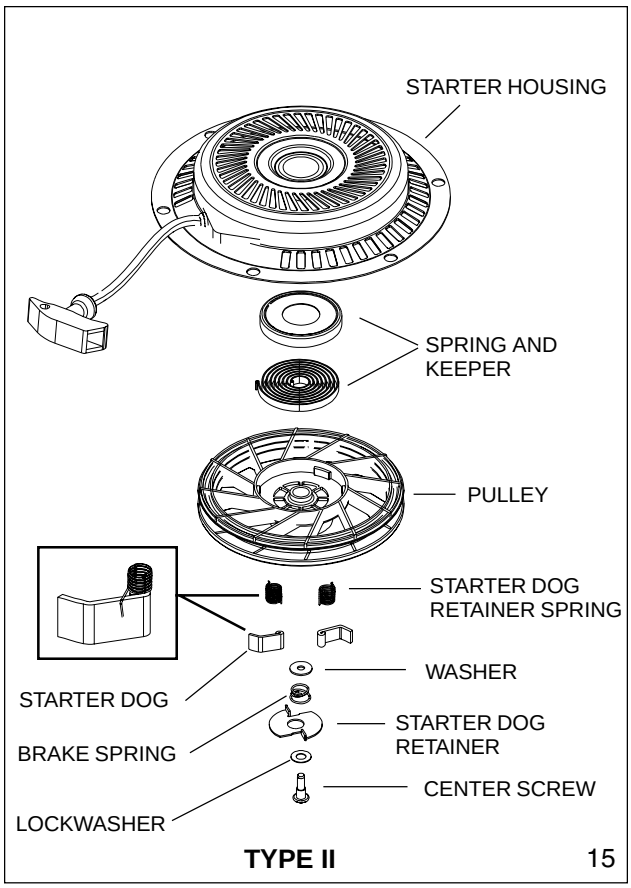


TYPE I 14

Assembly

1. Replace the starter rope if removed by inserting one end through the hole in the side of the pulley and tying a left hand knot near the rope end. Pull the knot into the squared area and wind the rope counterclockwise (viewed from the pulley bottom) on the starter pulley.
2. Place the pulley on the housing center leg, align the end of recoil spring and the notch in the pulley and push down until seated.
3. Insert the starter dogs on the pulley pegs with the flat side away from the pulley, place the brake spring and starter dog spring on the pulley. The starter dogs must be free to retract into the pulley pocket.
4. Place the starter dog retainer on the center leg, hook the end of the dog spring into the hole in the retainer, press down and turn 1/2 a turn clockwise to line up the notches to the starter dogs, add the nylon washer, metal washer, lock washer, and hex nut. Tighten the hex nut to 40 inch pounds (4.5 Nm) torque.

   NOTE: Type II - Apply blue Loctite to the center screw and torque to 70 in pounds (8 Nm).
5. Wind the pulley counterclockwise 4-5 turns, thread the rope through the starter housing hole, and place a temporary knot in the rope leaving at least one foot of rope length.
6. Slide the starter handle on the end of the rope and secure using a left hand knot. Remove the temporary knot and allow the rope to retract.



TYPE II 15

CHAPTER 6 ELECTRICAL SYSTEMS

GENERAL INFORMATION

The electrical system consists of three main elements: a battery, a starting circuit, and a charging circuit. The battery is part of both the starting and charging circuit. The battery should be checked before going into any extensive starter or charging system checks. If a battery has a shorted cell, overcharging can result, and the regulator or rectifier may appear to be at fault. If a cell has an open or high resistance connection, the electric starter operation will be affected.

The power source used to provide the energy to turn an electric starter motor on Tecumseh engines is either 120 volt A.C. current or 12 volt D.C. A 120 volt A.C. starter circuit utilizes a 120 volt power source instead of a battery. The 12 volt battery models require a charging system to maintain proper battery charge.

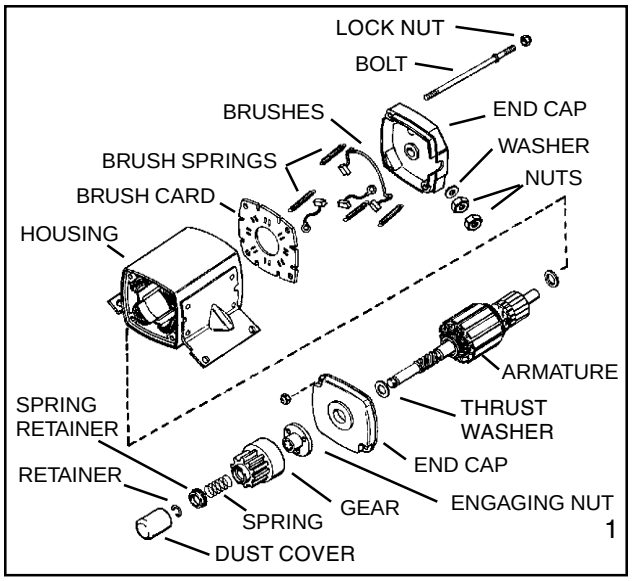
The starting circuit includes the battery, battery cables, starter or ignition switch, safety switches, starter solenoid, and an electric starter motor.

The charging system consists of alternator charge coils, rectifiers or diodes, regulator, ignition switch, flywheel magnets, and a battery. All engines that have a charging system will use a combination of some or all of these features.

OPERATION

STARTING CIRCUIT AND ELECTRIC STARTERS

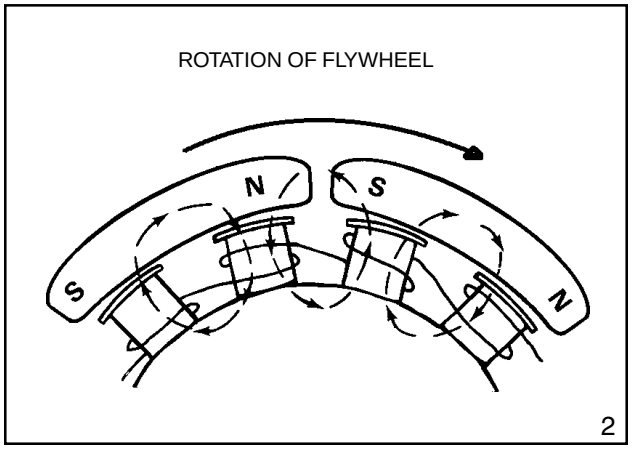
After all of the safety interlock switches have been activated, the starter switch closes the starting circuit. A strong magnetic force is produced by the electrical current running through the armature windings. The armature magnetism repels the magnetism produced by the permanent field magnets of the electric starter. The repelling magnetic forces cause the armature to rotate, moving the drive pinion laterally on the splined armature shaft, meshing the starter pinion gear with the flywheel ring gear. When the drive pinion contacts the stop at the end of the armature shaft, the pinion rotates along with the armature shaft to crank the engine. The armature and pinion remain positively engaged until the engine fires and the flywheel rotates faster than the armature. The greater momentum of the flywheel throws the starter pinion gear out of mesh and forces the starter pinion back to the disengaged position. After the switch is released, the starting circuit is opened and the armature coasts to a stop. A small anti-drift spring holds the pinion in the disengaged position (diag. 1).



1

CHARGING CIRCUIT

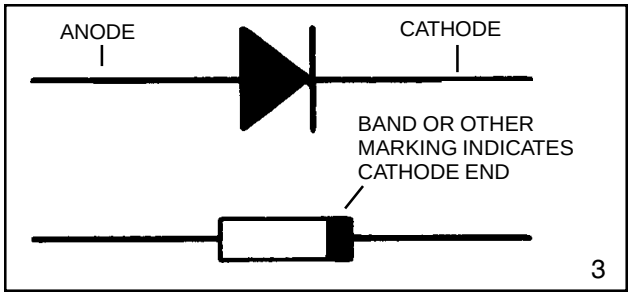
The charging system works independently of any manual controls. The engine needs to be running to produce an electric current flow. When a conductor (alternating coils) cuts the magnetic field generated by the magnets in the flywheel, a current is induced in the alternator coil. The permanent magnets in the flywheel have a magnetic field in which the lines of magnetic force run from the North Pole to the South Pole. As the flywheel rotates and the position of the magnets change, the direction of the magnetic field changes or alternates. The alternating coils are wound in different directions to allow current to flow as an A.C. waveform (diag. 2).



2

CONVERTING ALTERNATING CURRENT TO DIRECT CURRENT

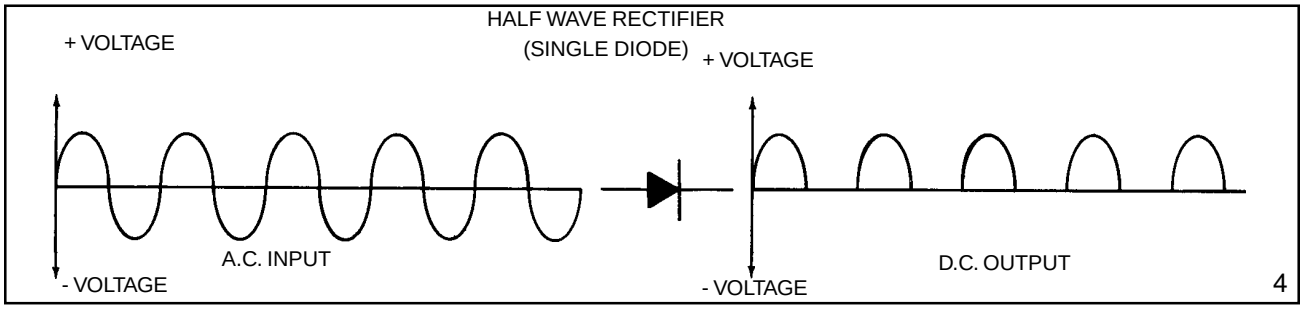
In order to charge a battery, it is necessary to convert alternating current (A.C.) to direct current (D.C.). This is accomplished by using a diode or rectifier (diag. 3). A single diode makes use of only one half of the A.C. signal and is known as HALF WAVE RECTIFICATION (diag. 4). This is acceptable in certain applications. In certain situations it is necessary to make use of the entire A.C. signal. To accomplish this, multiple diodes in a bridge configuration are used to produce FULL WAVE RECTIFICATION (diag. 5).



Current flows through a diode when the anode is more positive than the cathode. The cathode end of the diode should point toward the battery when diode is used between a charging system and a battery.

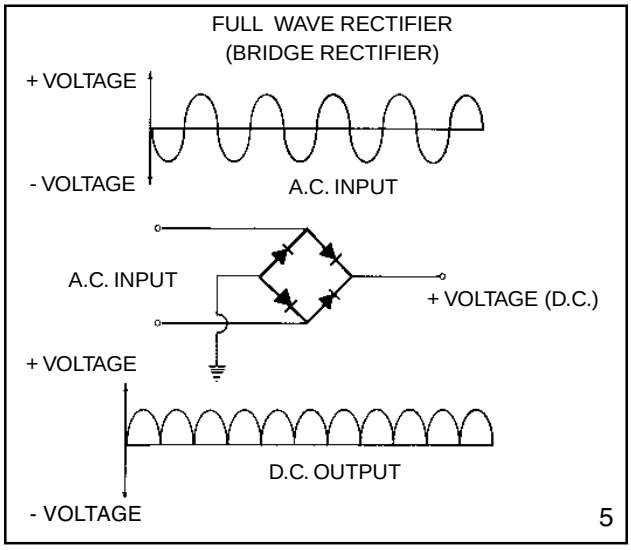
Half Wave Rectifier Single Diode

The single diode allows only the positive half of the A.C. signal through. It does not allow the negative portion through.



Full Wave Rectifier Bridge Rectifier

The full wave rectifier makes use of the entire A.C. signal, converting it to D.C.



COMPONENTS

BATTERY

The batteries used in conjunction with Tecumseh engines are 12 volt lead acid or “maintenance free” style. The chemical energy produced by the dissimilar metals of the battery plates provides a electrical potential that is used to power the electric starter or unit accessories. Consult the original equipment manufacturer’s service manual for battery size, capacities, and testing procedure.

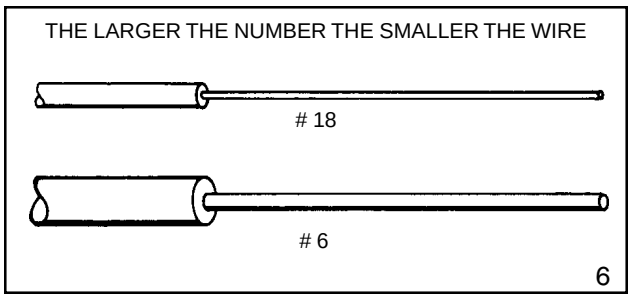
WIRING

The wires used in Tecumseh electrical systems are copper stranded with an insulated coating around the copper strands.

CONDITION: All wiring must be fully insulated between connection points, securely fastened and free of foreign material (such as rust and corrosion) at the connection points. This is especially important in the use of batteries where much of the potential may be lost due to loose connections or corrosion. Remember to check the insulation on the wire. All it takes is a pin hole for leakage to "ground out" on the engine or frame. This is of special concern when moisture or water is present.

WIRE GAUGE: The proper thickness of wire is necessary in all electrical circuits. Wire diameter is measured in increments of gauge numbers. As the gauge number of the wire increases, the wire diameter decreases in size (diag. 6).

1. The starter circuit wiring must be rated at #6 or lower gauge number.
2. The charging circuit wiring must be rated at #16 or lower gauge number (20 amp system requires #14 or lower gauge number).
3. The magneto circuit wiring (ground circuit) must be rated at #18 or lower gauge number.



Tecumseh Products Company's standard wiring color codes effective August, 1992 are as follows:

Code		Product
Yellow	-	Alternator A.C. Leads
Red	-	Alternator D.C. + Leads
Brown	-	Alternator D.C. - Leads
Black	-	Alternator Ground Leads, Battery Ground Leads
Orange	-	12 Volt Starter B + Leads
Dark Green	-	Ignition Shut-Off Leads

NOTE: PRIOR TO AUGUST 1992, WIRE CODES CHANGED ACCORDING TO MODEL AND SPECIFICATION NUMBERS.

ELECTRICAL TERMS

ALTERNATOR - An alternator consists of coils of wire wound around a metal lamination stack. When a magnet is moved past the coils, a current is induced in the coils. In general, the greater the number of coils, the greater the output of the alternator.

RECTIFIERS and DIODES - Charging a battery requires that the alternating current produced by the alternator be changed to direct current. This is accomplished by using a diode or rectifier.

REGULATOR/RECTIFIERS - This combines a regulator with a rectifier. The regulator prevents overcharging of the battery and the rectifier changes the alternating current to direct current.

CONDUCTORS - A conductor is a material that allows an electric current to pass through it. All metals are conductors of electricity, but some are better conductors than others. Silver, copper and gold are some of the better known conductors.

INSULATORS - An insulator is a material that will not allow an electric current to pass through it. Some of the more common materials that are insulators are glass, plastic, rubber, ceramics and porcelain.

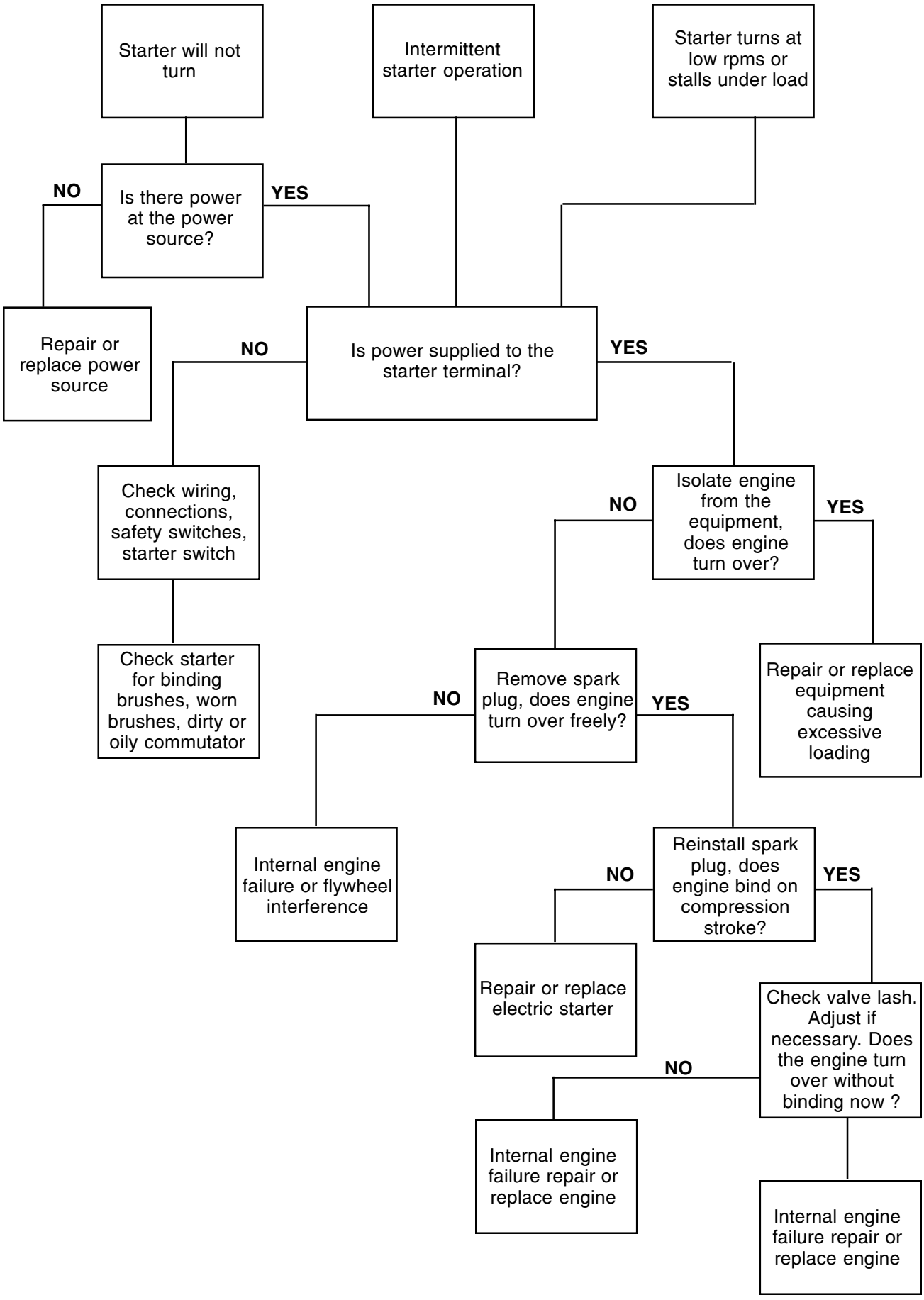
BASIC CHECKS

Before going into extensive checks, be sure to perform the more basic checks first, such as:

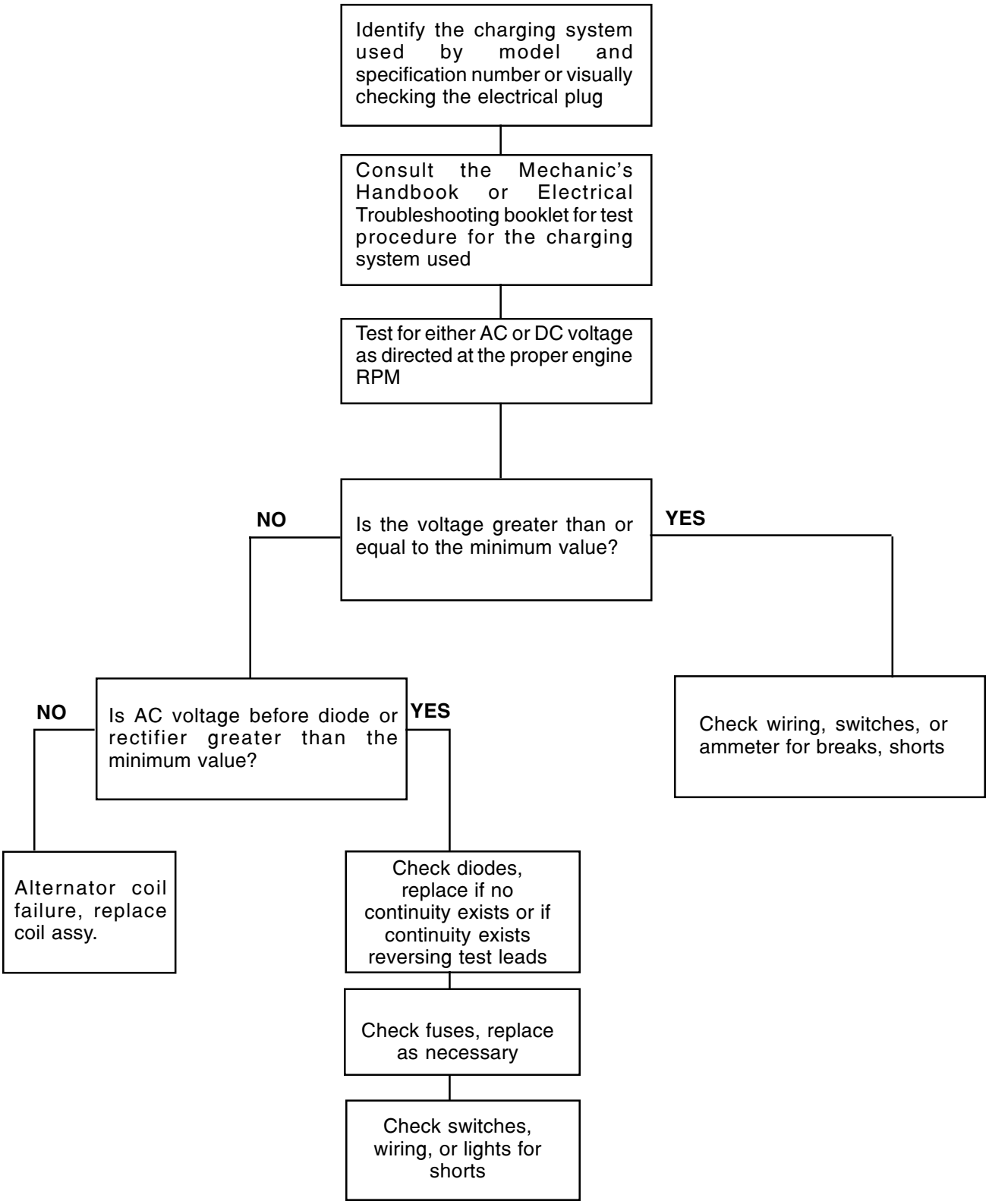
1. Battery defective or not charged.
2. Corroded or loose terminals or connections, or wrong connections.
3. Cracked insulation or broken wires.
4. A wire "grounding out" in the system.
5. Defective switch.
6. Operator presence system functioning properly.*

***NOTE:** ALL LAWN AND GARDEN TRACTORS BUILT AFTER JULY OF 1987 ARE REQUIRED TO HAVE AN OPERATOR PRESENCE SYSTEM AND MANY CAME EQUIPPED WITH SUCH A SYSTEM PRIOR TO THIS DATE. IF THE TRACTOR IS "CUTTING OUT" OR WILL NOT START, THIS IS AN AREA THAT SHOULD BE CHECKED OUT.

TROUBLESHOOTING ELECTRICAL STARTER CIRCUIT FLOW CHART



TROUBLESHOOTING ELECTRICAL CHARGING CIRCUIT FLOW CHART



TESTING PROCEDURE

STARTING CIRCUIT

1. Check the power source using an electrical tester and following the tester's recommended procedure. Make sure the battery meets the minimum battery voltage requirements found in the original equipment manufacturer's service manual.
2. Check the electric starter terminal for the required voltage (12v D.C. or 120v A.C.) using a voltmeter.

CAUTION: FOLLOW ALL SAFETY PRECAUTIONS WHEN TESTING FOR A.C. VOLTAGE, ELECTRIC SHOCK CAN KILL.

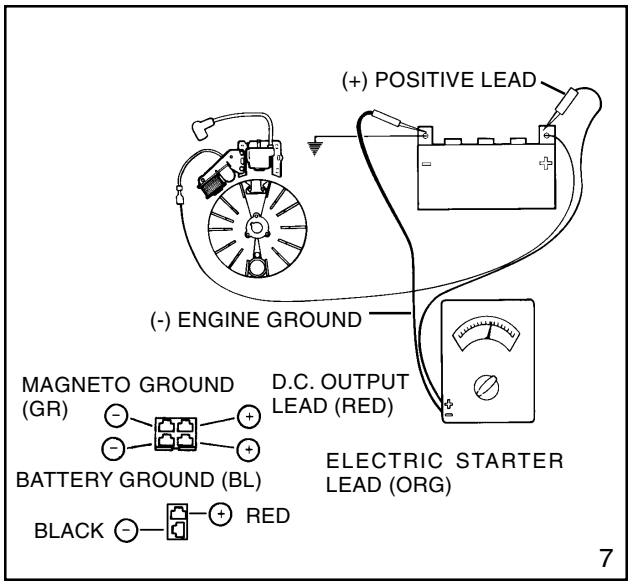
3. Check wiring, connections, fuses, ignition or starter switch, safety switches, or solenoid for continuity using a ohmmeter or a continuity light. Repair or replace as necessary.
4. Remove all equipment loads from the engine. Take off all drive belts, chains, and couplers to isolate the engine from the equipment it is powering.
5. Try to turn the engine over using the recoil assembly if equipped. If the engine doesn't turn over, a mechanical binding may be the cause. Check for proper lubrication (oil level and viscosity) and check for electric starter gear and flywheel ring gear interference. If no problem is discovered, the problem is an internal failure.
6. If the engine binds only on the compression stroke, check the engine valve clearance per the specification table in Chapter 10. If the valve clearance is within the specifications, the camshaft (compression release failure) may require replacement. Valve clearance not within the listed specifications will require resetting the rocker arms to obtain the proper clearance.
7. If the engine turns over freely, the electric starter should be replaced or disassembled and checked. See "Service" in this chapter. 120 volt starters labeled UL Listed/CSA Approved can be serviced; however, starters labeled CSA must only be replaced. If the preceding steps fail to correct the problem, the engine will require to be disassembled to find the mechanical failure. See Chapter 9 under "Disassembly Procedure".

CHARGING CIRCUIT

The following pages will show wiring diagrams of several Tecumseh charging systems. The charging system used on the engine is best identified by obtaining the engine model number and the specification number on the engine. Consult a Tecumseh dealer or a parts manual to identify the charging system. To make many of the tests it is necessary to run the engine and measure alternator output with a voltmeter. When making voltage tests with the engine running, it is not necessary to take readings at all the listed R.P.M.s. Checking at one of the speeds is sufficient.

In some cases an open circuit D.C. check cannot be made. A SCR (Silicon Controlled Rectifier) is located in the circuit which requires a minimum "turn on" voltage to allow it to conduct. Without the battery in the circuit this "turn on" voltage is not present. The SCR "senses" this and there will be no D.C. output from the regulator / rectifier.

Each charging system has its own testing procedure. Test the charging system using the applicable procedure found on the following pages.



7

350 Milliamp Charging System

CHECKING THE SYSTEM: The battery must be in the circuit to perform the test properly. Set the voltmeter to the 0 - 20 D.C. volt scale. Connect a voltmeter across the battery. The voltmeter should read the battery voltage. Start the engine. With the engine running, there should be an increase in the voltage reading. If there is no change in the voltage reading, the alternator is defective and should be replaced. See Chapter 9 for "Disassembly Procedure" (diag. 7).

18 Watt A.C. Lighting Alternator

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a wire lead from the single pin connector coming out of the engine to one terminal of a No. 4414, 18 watt bulb. Connect another wire lead to the other terminal of the bulb and run to a good ground on the engine. Start the engine and test the circuit using the A.C. voltmeter as shown (diag. 8).

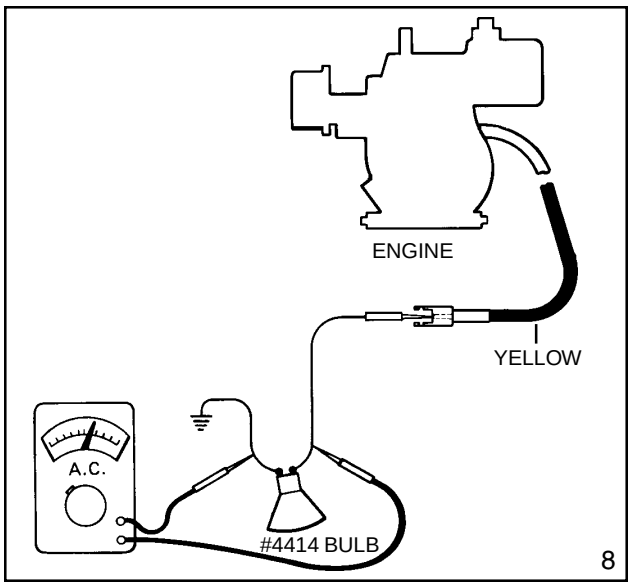
With the engine running, minimum A.C. voltage across the bulb should be:

2000 R.P.M. - 6.0 Volts A.C.

3000 R.P.M. - 8.5 Volts A.C.

3600 R.P.M. - 10.0 Volts A.C.

If minimum values are noted, the alternator is okay. If less than the minimum values, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



3 AMP

Before making any exterior tests, check for inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground at each yellow wire (diag. 9).

With engine running, minimum values should read:

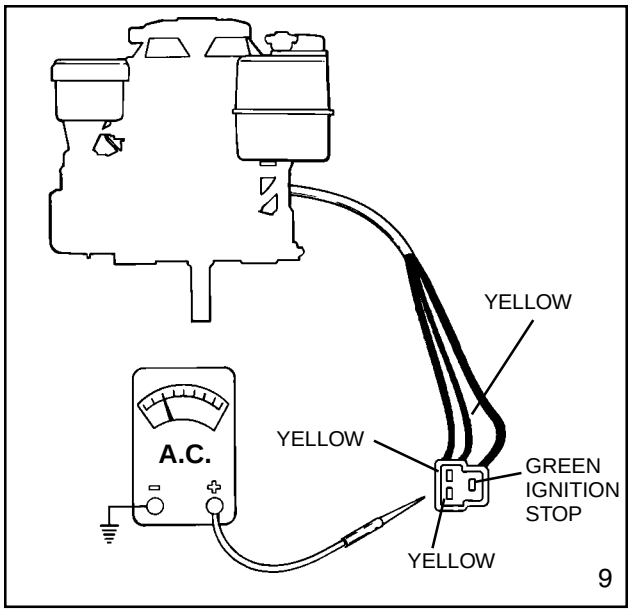
2500 R.P.M. - 8.0 Volts A.C.

3000 R.P.M. - 9.5 Volts A.C.

3300 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 11.5 Volts A.C.

It the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches, if less than the above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



NOTE: ON OLDER POINT IGNITION SYSTEMS, THE A.C. OUTPUT LEADS ARE BLACK AND RED.

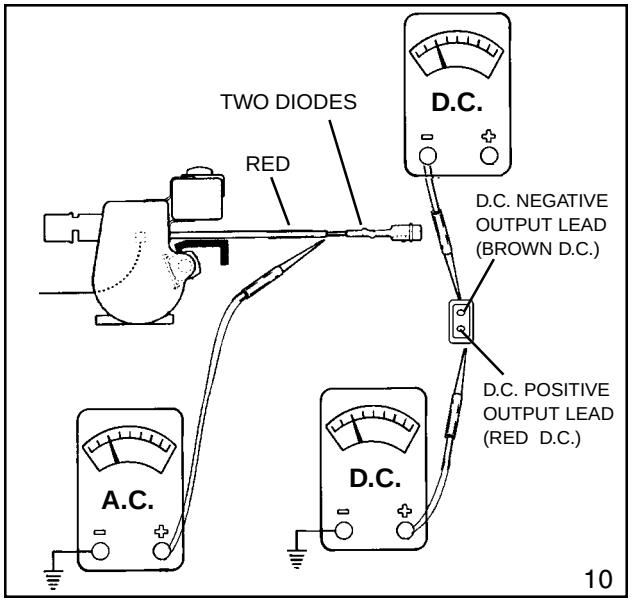
2.5 Amp D.C., 35 Watt Lighting

To check this system follow the meter hook ups at the right, checking the D.C. neg and D.C. positive first. If output is below standard listed pull back protective coating in front of the diode and check A.C. output. If A.C. is good check each diode it services as requested see parts list.

D.C. valve (+) or (-) check A.C. outputs both sides.

R.P.M. D.C. Volts	R.P.M. Volts A.C.
2500 - 8.0 Volts D.C.	2500 - 18 Volts A.C.
3000 - 9.5 Volts D.C.	3000 - 22 Volts A.C.
3300 - 10.5 Volts D.C.	3600 - 26 Volts A.C.
3600 - 11.5 Volts D.C.	

NOTE: These minimum numbers should be obtained by your meter and will often be higher.

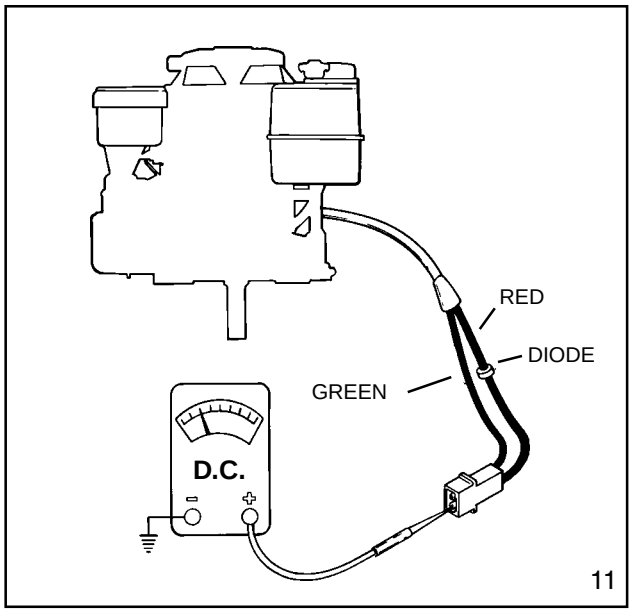


3 AMP DC ALTERNATOR SYSTEM - DIODE IN HARNESS SLEEVE

This system has a diode included in the red wire which converts the alternating current (A.C.) to direct current. The direct current (D.C.) is used to provide a trickle charge for the battery. The leads from the alternator and the type of connector may vary, but the output readings will be the same.

CHECKING THE SYSTEM: Remove the fuse from fuse holder and check the fuse to make certain it is good. If faulty, replace with a six (6) AMP fuse.

To check D.C. output, separate the connectors at the engine. Place the probe (+) in the red wire lead connector. Ground the other probe to the engine (diag. 11).



With the engine running minimum values should read:

2500 R.P.M. - 8.0 Volts D.C.

3000 R.P.M. - 9.5 Volts D.C.

3300 R.P.M. -10.5 Volts D.C.

3600 R.P.M. -11.5 Volts D.C.

If one of these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

If no reading or less than the above reading, proceed to make an A.C. output check by pulling back the protective coating from the wire on the alternator side of the diode. Test the A.C. voltage before the diode using an A.C. voltmeter.

With the engine running minimum values should read:

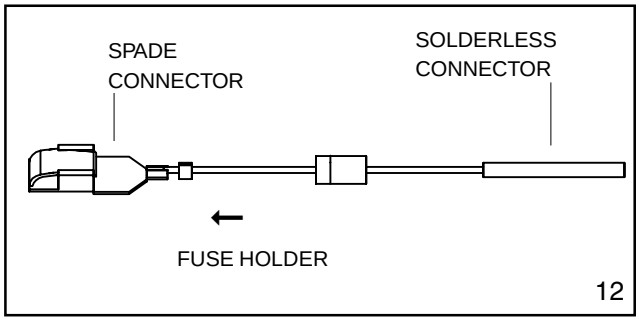
2500 R.P.M. - 18.0 Volts A.C.

3000 R.P.M. - 22.0 Volts A.C.

3300 R.P.M. - 24.0 Volts A.C.

3600 R.P.M. - 26.0 Volts A.C.

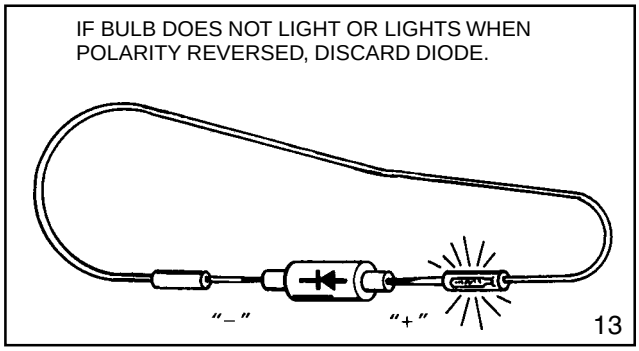
If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



To replace the diode, disconnect at plug (spade terminal) and cut the wire on the opposite end of the diode at the solderless (crimped) connector. Remove 1/4" (6.35 mm) of insulation from the cut end of the wire and twist the strands together. Place the solderless connector from the new diode onto the exposed 1/4" (6.35 mm) wire and crimp the connector with a standard electricians pliers. Reconnect plug end (or spade connector (diag. 12).

NOTE: DO NOT USE ACID CORE SOLDER. BE CAREFUL NOT TO APPLY HEAT DIRECTLY TO THE DIODE - USE A HEAT SINK.

New heat shrink tubing can be installed by slipping over the wires and heating with a hot air gun. If this is not available, tape the diode and connections with electrical tape.



5 AMP D.C. ALTERNATOR SYSTEM REGULATOR-RECTIFIER UNDER BLOWER HOUSING

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing. Reinstall the blower housing. Disconnect the red D.C. output connector at the wiring harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 14).

CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.

With the engine running, the minimum values should read:

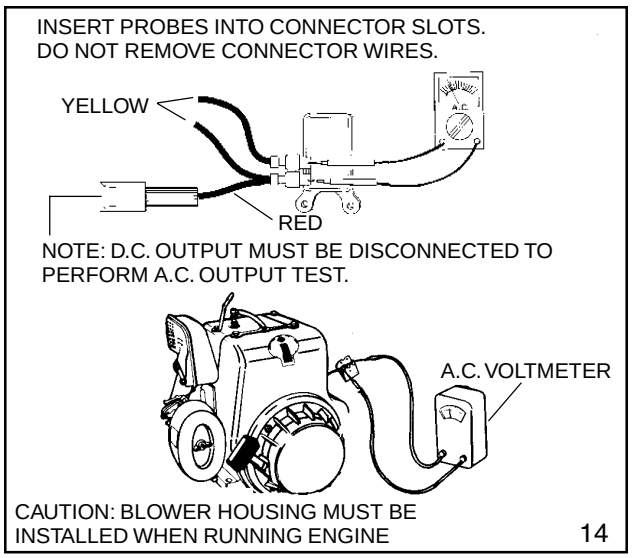
2500 R.P.M. - 19.0 Volts A.C.

3000 R.P.M. - 23.0 Volts A.C.

3300 R.P.M. - 26.0 Volts A.C.

3600 R.P.M. - 28.0 Volts A.C.

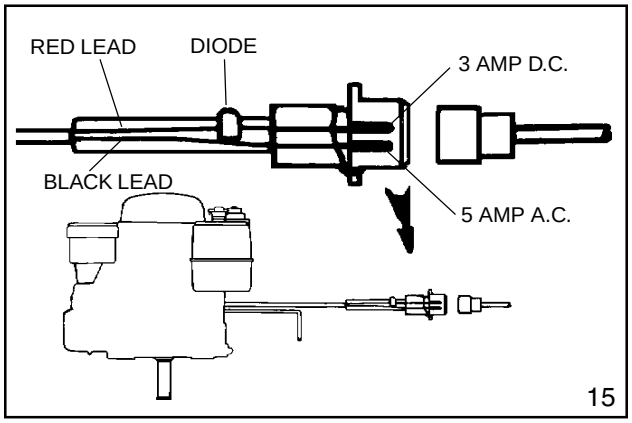
If the minimum values are noted, the alternator is ok and the regulator-rectifier is defective. If less than above readings, the alternator is defective. See Chapter 9 for "Disassembly Procedure".



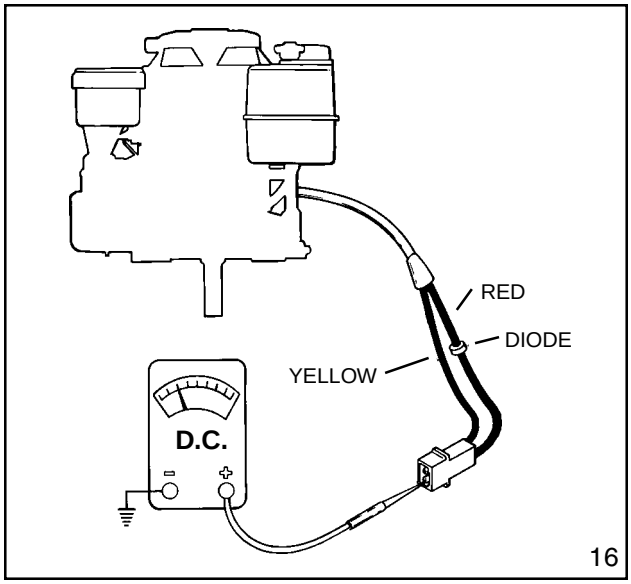
3 Amp D.C. 5 Amp A.C. Alternator

This unit combines a 3 Amp D.C. system used to charge a battery with a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

A wire harness(part # 36588) may be added to the 3 Amp D.C. / 5 Amp A.C. charging system to power an electric clutch without the use of a battery. Test the charging system using the applicable " Checking the System " procedure listed in this section. Test the diode in the harness by using a continuity test (diag. 15) Continuity should exist in one direction only. Replace the diode if continuity exists after reversing tester leads or no continuity is found. Use the procedure for diode replacement found in the 3 AMP alternator test (diag. 12).



CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 16). Measure the A.C. voltage at the yellow wire terminal. With the engine running, the minimum values should be:



MODELS OVM/OVXL/OHV12.5

3 Amp D.C. (Red wire)

2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C
3600 R.P.M. - 13.0 Volts D.C.

5 Amp A.C. (Yellow wire)

2500 R.P.M. - 8.5 Volts A.C.
3000 R.P.M. - 11.0 Volts A.C.
3600 R.P.M. - 13.0 Volts A.C.

MODELS OHV 13.5 - 17.0 (3/5 amp split)

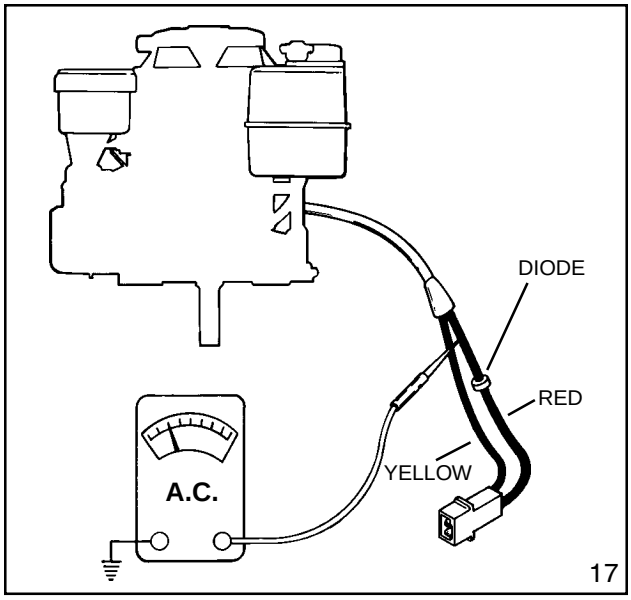
3 Amp D. C. (Red wire)

2500 R.P.M. - 6.5 Volts D. C.
3000 R.P.M. - 9.0 Volts D. C.
3600 R. P.M. - 11.0 Volts D. C.

5 Amp A.C. (Yellow wire)

2500 R.P.M. - 15.0 Volts A.C.
3000 R.P.M. - 18.0 Volts A.C.
3600 R.P.M. - 22.0 Volts A.C.

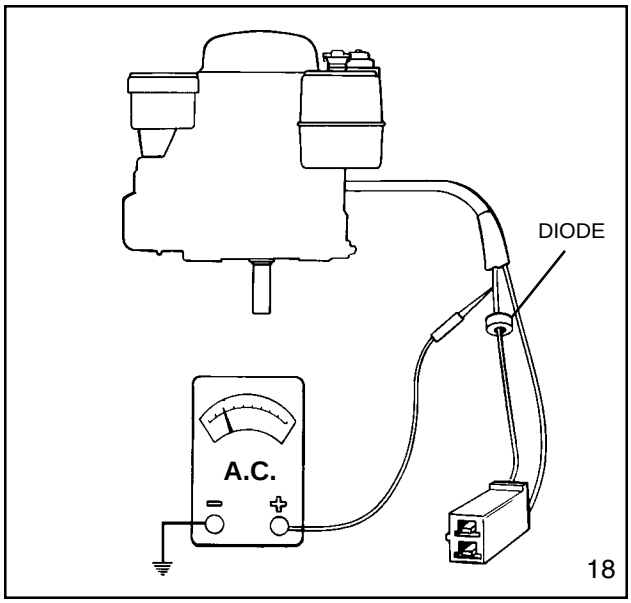
If the above minimum values are noted, the system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage going into the diode from alternator, at the lead on the alternator side of the diode (diag.17). If low or no voltage is experienced, replace the alternator.



Models OVM/OVXL/OHV12.5 (Red between Engine and Diode)

With the engine running, the minimum values should read:

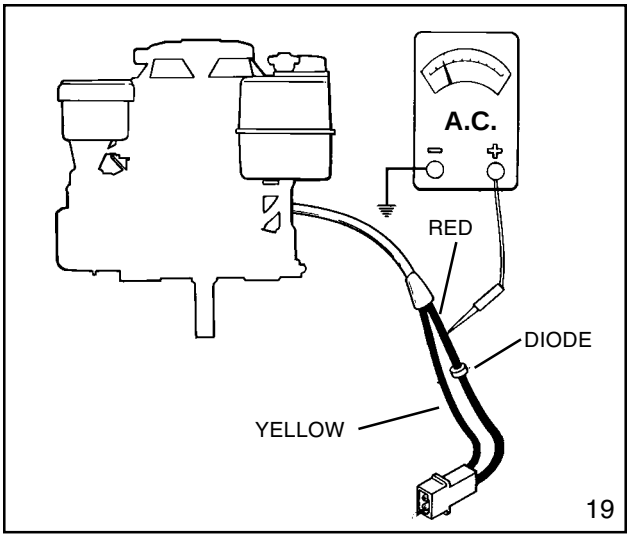
2500 R.P.M. - 20.0 Volts A.C.
3000 R.P.M. - 25.0 Volts A.C.
3300 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 29.0 Volts A.C.



Models OHV 13.5 - 17
(Read between Engine and Diode)

2500 R.P.M. - 17.0 Volts A.C.
3000 R.P.M. - 21.0 Volts A.C.
3600 R.P.M. - 24.5 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



19

7 Amp D.C. Alternator System Regulator-Rectifier Under Engine Housing

In this system, the regulator and rectifier are combined in one solid state unit mounted under the blower housing of the engine.

Various types of regulator-rectifiers have been used on different applications. Test procedures for all types are the same. However, regulator styles are not interchangeable (diag. 20).

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.

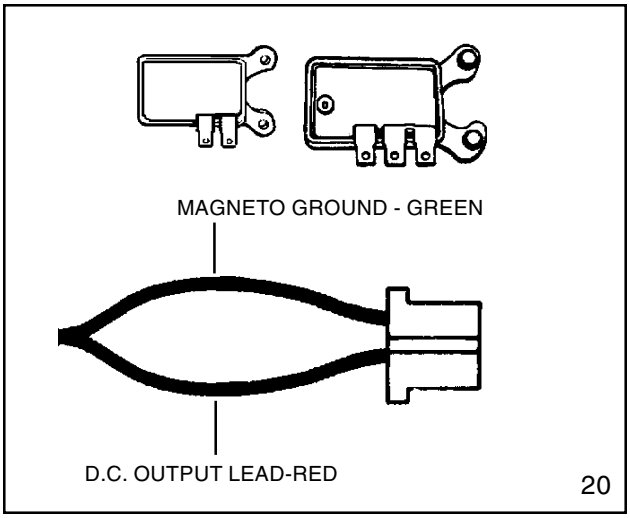
Keep the A.C. leads attached to the regulator-rectifier. Install the blower housing with the regulator-rectifier outside the housing. With an A.C. voltmeter probe the regulator as shown (diag. 21)

CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.

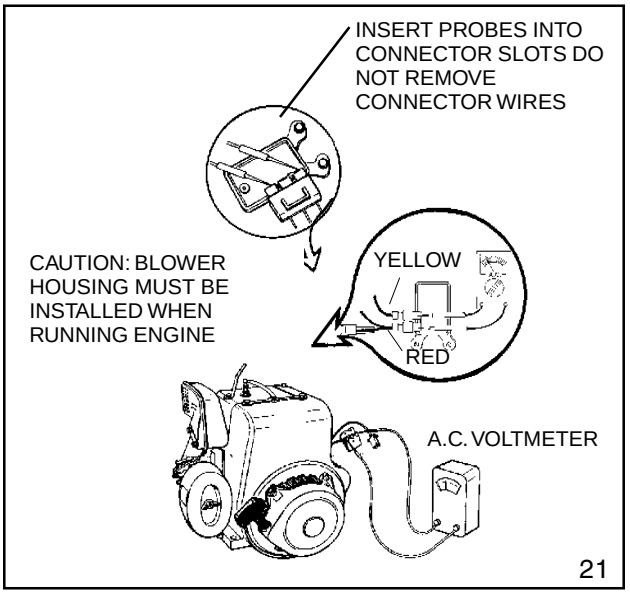
With engine running, minimum A.C. voltage from lead to lead should be:

2500 R.P.M. - 16.0 Volts A.C.
3000 R.P.M. - 19.0 Volts A.C.
3300 R.P.M. - 21.0 Volts A.C.
3600 R.P.M. - 23.0 Volts A.C.

If the minimum readings are noted, the alternator is okay. If the system fails to charge a known good battery, the regulator-rectifier is defective.



20



21

10 Amp A.C. Alternator

CHECKING THE SYSTEM: Unplug the connector at the wiring harness supplied by the OEM. Proceed to make an A.C. output check. Place one lead of the A.C. voltmeter on the center plug of the connector. Place the other lead to engine ground (diag. 22).

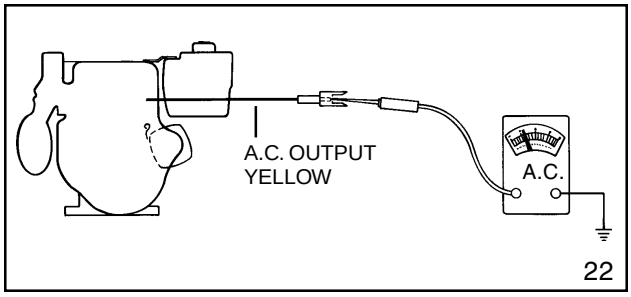
With the engine running, minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 20.0 Volts A.C.

3300 R.P.M. - 22.0 Volts A.C.

If less than above output, the alternator assembly is defective. See Chapter 9 for "Disassembly Procedure".



22

16 Amp Alternator System with External Regulator

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

Disconnect the red D.C. output connector at the wiring harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier.

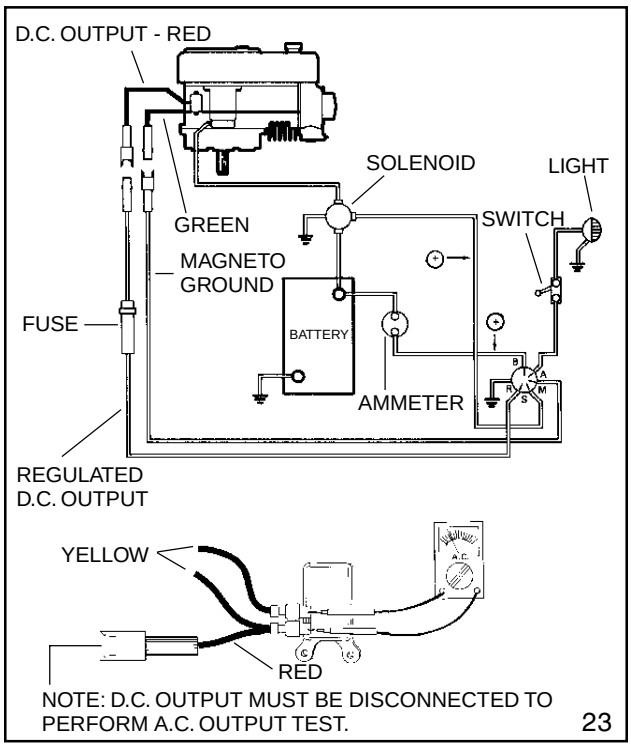
With the engine running, minimum values should read:

2500 R.P.M. - 21 Volts A.C.
3000 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 31.0 Volts A.C.

If the minimum values are noted, the alternator is operating properly. If less than the above values are noted, the alternator is defective.

VOLTAGE REGULATORS

If a known good or load tested battery fails to maintain a charge, the charging system and the regulator can be checked using a voltmeter. Set the voltmeter on the 0-20 Volt D.C. scale and connect the probes across the battery terminals. Note the battery voltage. Start the engine, the voltage reading should increase from the noted battery voltage but not exceed 15 Volts D.C. If no voltage increase is noted, proceed to make an A.C. voltage check using the applicable procedure. If the battery voltage exceeds 15 Volts D.C., or the proper minimum A.C. voltage is noted during the check, replace the regulator (diag. 23).

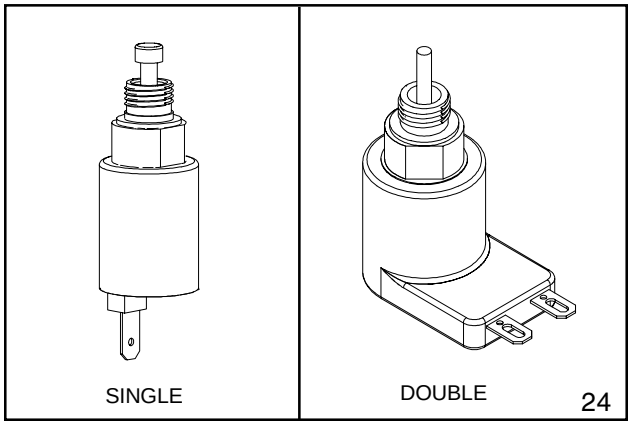


23

FUEL SHUT-DOWN SOLENOIDS

If the engine is running, the solenoid can be checked by removing the electrical plug-in at the base of the solenoid. Almost immediately the engine should shut down, if not replace the solenoid.

Test the solenoid off the carburetor by applying 12 volt D.C. from the battery positive terminal to the (or one) solenoid terminal. Connect a jumper wire from the metal housing (or other terminal) to a negative battery terminal. The plunger should retract the full travel distance. Disconnect the negative jumper lead and the plunger should return to the extended position. Replace if necessary (diag. 24).

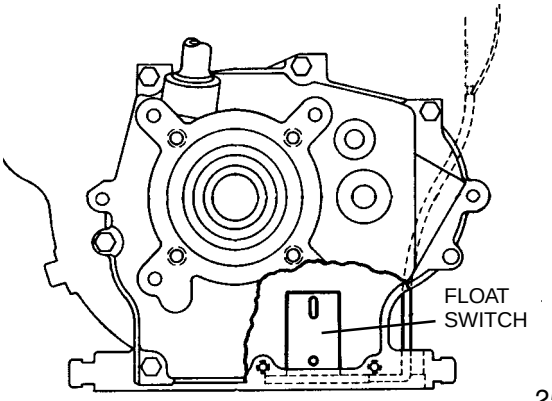


24

LOW OIL SHUTDOWN SWITCHES

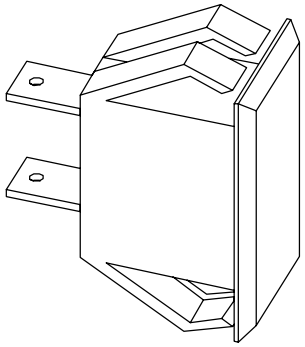
Check the LOS switch while it is in the engine. The engine must be level, and the oil level at the full mark. Place the speed control in the run position. Remove the spark plug wire from the spark plug. Install a gap type tester connected to the spark plug wire and a good engine ground. Spin the engine over using the electric or recoil starter. A bright blue spark should be seen at the tester. If not, remove the blower housing and disconnect the LOS lead from the ignition module. Reinstall the blower housing and spin the engine over. If spark occurs now, replace the LOS switch. If no spark is seen, replace the ignition module.

If equipped, the indicator light will flash if the oil level is at or below the add mark and the engine is turned over while attempting to start. Test by turning the engine over with the oil level below the add mark. If the indicator light does not flash, replace the indicator light.

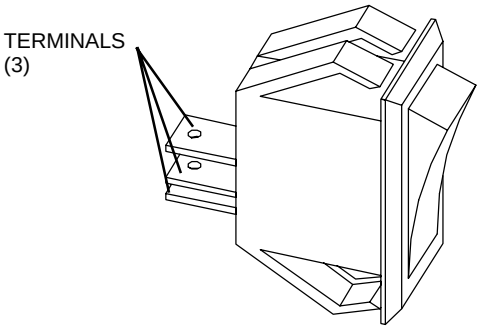


25

INDICATOR LIGHT

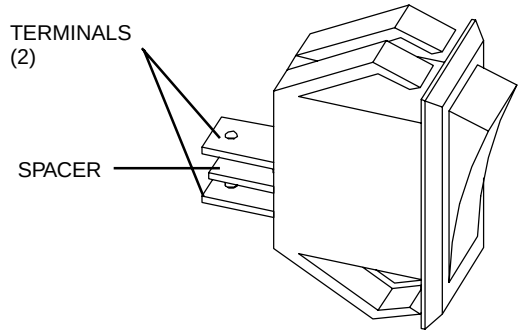

26

LIGHTED ENGINE ON/OFF ROCKER SWITCH W/LOW OIL SHUTDOWN



27

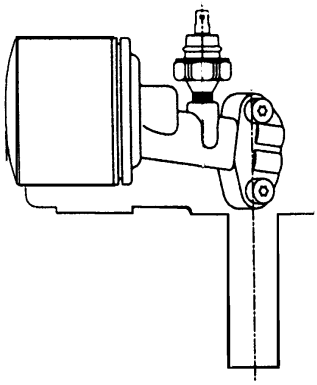
ENGINE ON/OFF ROCKER SWITCH



28

LOW OIL PRESSURE SENSOR

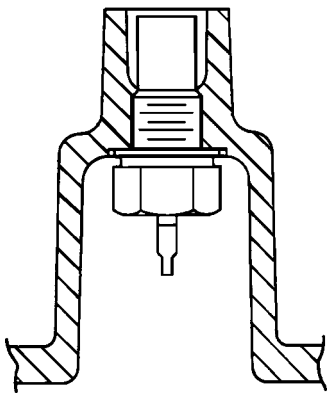
Test the sensor on a running engine using an ohmmeter or continuity tester with one tester lead connected the sensor terminal (with lead wire removed) and the other to an engine ground. An open circuit should be found with the engine running and continuity should exist when the engine is shut off. If continuity is found or the tractor oil pressure indicator light is on or comes on at low engine RPM's, remove the sensor and check engine oil pressure with a master oil pressure gauge. The oil pressure of a running engine should be above 10 p.s.i. (.700 bar). If lower than 10 p.s.i. (.700 bar), an internal engine problem exists (diag. 29).



29

LOW OIL SENSOR

This sensor must use a # 194 bulb in series with the sensor for proper operation and to prevent sensor damage. Remove the sensor from the engine and attach the electrical plug. Attach a jumper lead from an engine ground to the threaded portion of the sensor. Place the keyswitch in the run position. The indicator light should come on with the tip of the sensor in air and go off when oil covers the sensor tip. The response time of the sensor is between 5 and 15 seconds with 13 volts D.C. at the battery. Lower battery voltage will result in a longer response time. Use teflon-type pipe sealant on the sensor threads to prevent oil leakage when reinstalling (diag. 30).



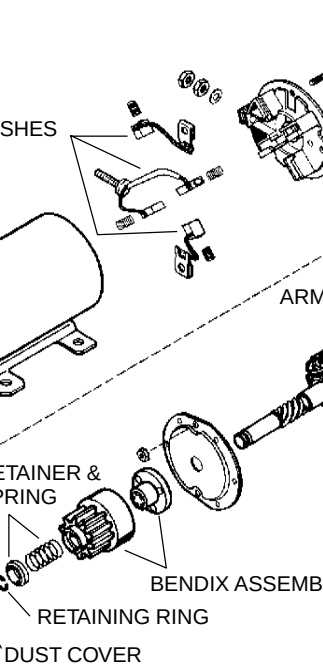
30

ELECTRIC STARTER SERVICE

This section covers the service procedures for the 12 and 120 volt electric starters. For diagnosis of the starting circuit see "Electrical Starter Troubleshooting" in this chapter. Illustrations may not be identical in configuration to the starter being serviced, but procedures and tests apply unless otherwise stated. Starters labeled UL listed/ CSA approved are serviceable. Starters labeled CSA cannot be serviced, only replaced. If a starter is serviced, the "O" rings on each end of the housing must be replaced.

12 VOLT or 120 VOLT ELECTRIC STARTERS

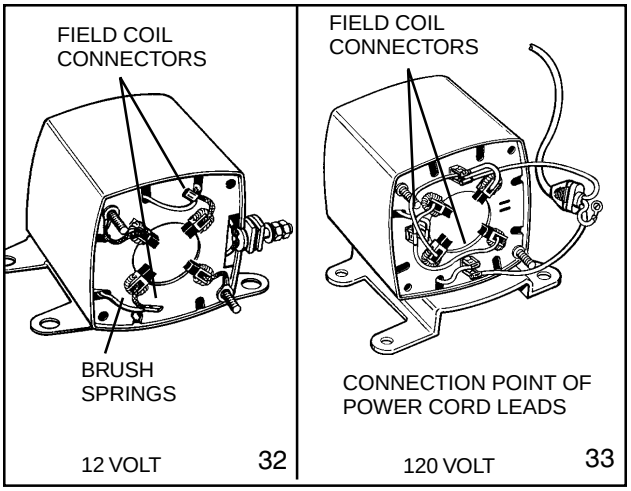
1. Remove the plastic dust cover on the bendix end (diag. 31).
2. Push down the spring retainer and remove the retainer ring.
3. Slide off the spring retainer, anti-drift spring, gear, and drive nut.
4. If internal service is necessary (non-CSA) starters only, scribe a line across the cap assemblies and armature housing to aid in reassembly.
5. Remove the two or four retaining nuts from the through bolts holding the cap assembly.
6. Slide off the cap assembly. The terminal insulator slides out of the commutator cap (some models).
7. Remove the armature.
8. Inspect and replace as necessary, see the section "Inspection and Repair" later in this chapter. Use the reverse procedure for assembly. (For ease of assembly, place the armature into the brush end of the frame first.)

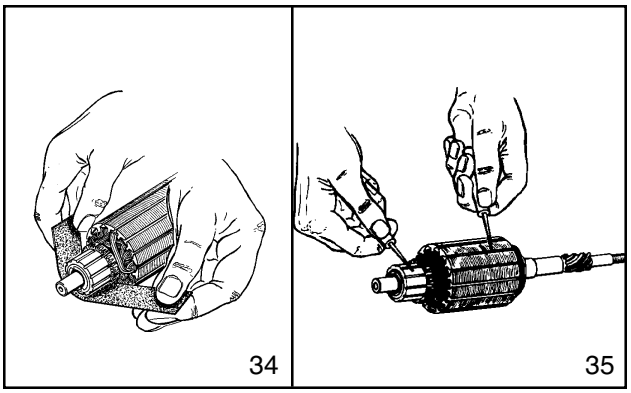


31

Inspection And Repair

1. The pinion gear parts should be checked for damage or wear. If the gear does not engage or slips, it should be washed in solvent (rubber parts cleaned in soap and water) to remove dirt and grease, and dried before reassembly. Also check the armature and drive nut splines for wear or damage. Replace parts as necessary.
2. The brushes and brush card holder should be checked for wear. With the armature in place and the brushes engaging the commutator surface, check the brushes for wear. Brushes should be replaced if the brush wire approaches the bottom of the brush holder slot. Brush springs must exhibit enough strength to keep tension on the brushes and hold them on the commutator.
3. The field windings can be checked using a continuity light or ohmmeter. Attach one lead to each field coil connection. Continuity should exist between each field coil connection, and no continuity should exist between the field coil connections and the starter housing (diag. 32 & 33).
4. The armature should be checked for glazing or wear. If necessary the armature can be turned down in a lathe. While rotating, polish the commutator bars using a piece of 00 sandpaper (diag. 34). Light pressure and back and forth movement should be used. Recut the commutator bars to a depth equal to the width of the insulators between the bars. Check for continuity between the copper commutator bars and the iron of the armature, none should exist (diag. 35).





Brush Card Replacement

1. Loosen but do not remove the two nuts on the starter terminal post.
2. Remove the nuts holding the end cap in place. Remove the end cap and the thrust washer.
3. Grasp the thru bolts using a vise grip positioned as close to the flanged end as possible to prevent thread damage. Remove the two nuts holding the driving end cap in place. Remove the armature and driving cap assembly, followed by the two thru bolts. Notice the position of the brush ground eyelet under the thru bolt flange.
4. Note or mark the position of the connectors of the brush wires. Use a wire cutter to clip the solid field wires as close to the connectors as possible.
5. Note or mark the brush card in the starter housing, and remove the brush card assembly. Clean the accumulated dirt off all starter parts. Scrape the insulating varnish off the last 1/2" (12.7 mm) of the solid field wires.
6. Insert the new brush card into position while guiding the solid field wires through the proper slots in the brush card.
7. Crimp and solder the brush leads to the solid field wires. Use a needle nose pliers or vise grip to hold the woven brush lead close to the connector while soldering. This prevents solder and heat from flowing up the brush lead. Insulate the crimped connection nearest the starter terminal post using electrical tape or heat shrink tubing. Route the wires to prevent damage during assembly.
8. Install the armature into the housing while spreading the brushes. Install the thru bolts while checking to make sure the bolts go thru the ground brush eyelet terminals. Install and tighten the drive end thru bolt nuts, but do not overtighten.
9. Install the thrust washer on the end of the armature and the install the starter end cap. Secure the cap with the locking nuts and tighten the nut on the starter terminal post. Rotate the armature by hand to check for binding before installation on the engine.

CHAPTER 7 FLYWHEEL BRAKE SYSTEMS

GENERAL INFORMATION

Tecumseh's brake systems are required to meet compliance standards which has become a federal law as of June 30, 1982. Listed below are two methods used by original equipment manufacturers to meet compliance standards.

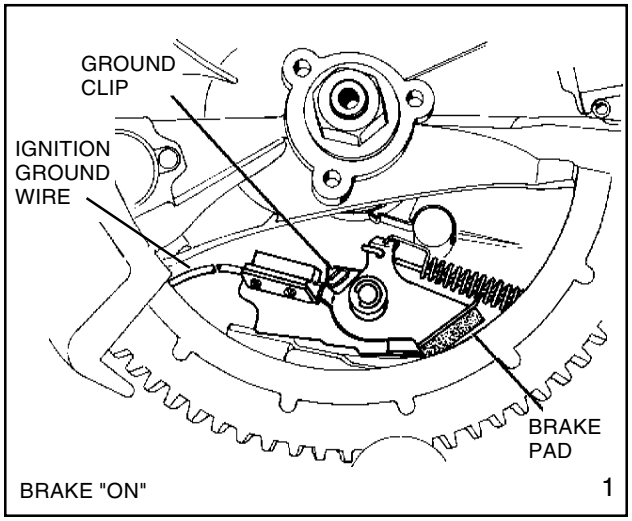
1. Use of the blade brake clutch in conjunction with a top mounted recoil starter or 12 volt electric starter. The blade must stop within three seconds after the operator lets go of the blade control bail at the operator position and the engine continues to run. Starter rope handle is either on the engine or on the equipment handle.
2. Use of a recoil starter with the rope handle on the engine as opposed to within 24 inches (61 cm) of the operator position. This method is acceptable if the mower deck passes the 360 degree foot probe test. A specified foot probe must not contact the blade when applied completely around the entire blade housing. This alternative can be used with engine mounted brake systems and typical bail controls. The blade must stop within three seconds after the operator lets go of the engine/blade control bail at the operator position and the engine is stopped.

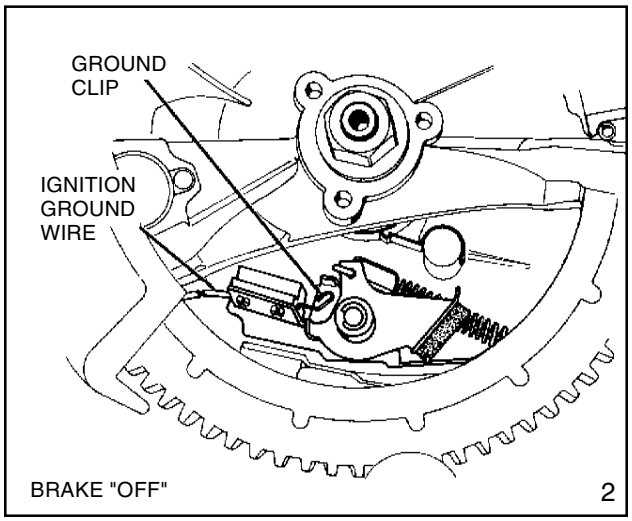
Tecumseh's flywheel brake system provides consumer safety by killing the engine and stopping the lawnmower blade within three seconds after the operator releases the engine/blade control bail at the handle of the lawnmower. This system is available on recoil and electric start models. The engine stopping time is affected by the engine R.P.M. Consult microfiche card # 30, the Plus 1 or Parts Smart Look-up system, or Service Bulletin # 107 to determine the correct engine speed or blade tip speed.

OPERATION

In the stop position the brake pad is applied to the inside edge of the flywheel, at the same time the ignition system is grounded out (diag. 1).

In order to restart the engine, the engine/blade control bail must be applied. This action pulls the brake pad away from the inside edge of the flywheel and opens the circuit to the ignition ground out terminal. On electric start systems the starter is energized by an ignition/start switch or a two motion control. On nonelectric start systems, the recoil starter rope must be pulled to start the engine (diag. 2).





COMPONENTS

The brake bracket assembly consists of a replaceable brake lever and pad, an ignition kill switch, and a tension spring (diag. 3). Late production brake brackets are serviced as a complete assembly.

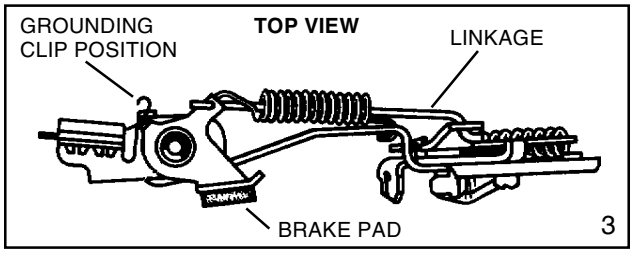
The **ignition ground terminal** is a plastic block with a wire extending out of it. The wire is connected to the ignition ground out spade on the solid state module. The brake lever contacts the wire of the ignition ground terminal when the engine/blade control bail is released, and the ignition module is grounded. This stops the solid state module from firing the spark plug (diag. 3).

The **interlock switch** is a push button switch that is activated by the brake lever when the engine/blade control is actuated. If there is a electric starter switch used to start the engine, the interlock switch acts as a safety switch and will not allow the starter to crank unless the engine/blade control bail is depressed.

Where a two motion control is used the interlock switch is utilized as the starter switch.

The **brake spring** supplies the pressure to the brake lever and brake pad to stop the flywheel.

The **control cable** transfers the motion of the engine/blade control bail to the brake system.



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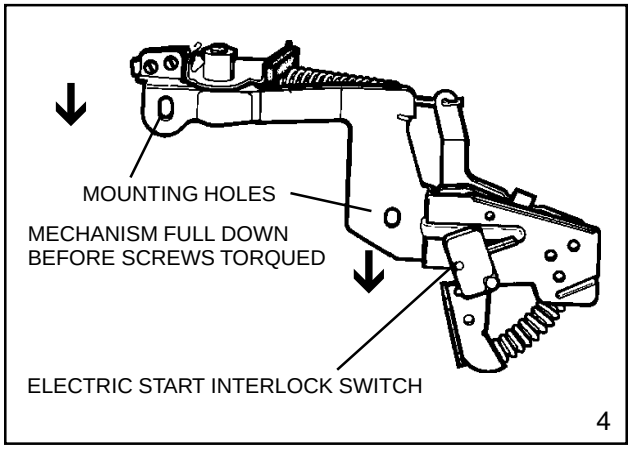

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SERVICE

Service on part or all of the flywheel brake assembly will require a partial disassembly of the engine to allow the flywheel and brake bracket to be removed.

Remove the necessary components using steps 1-8 as outlined in Chapter 9 under "Disassembly".

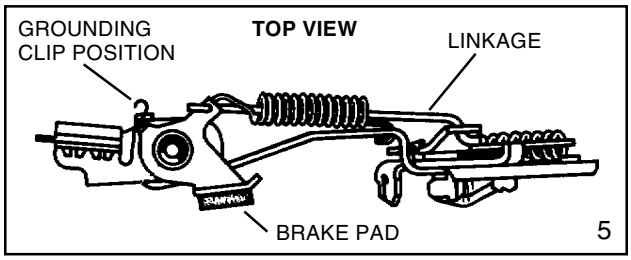
BRAKE BRACKET ASSEMBLY

Late production brake brackets are serviceable only by installing a complete brake bracket assembly.

On serviceable brake brackets, continue by removing the alignment tool. Release the spring tension by unhooking the short end of the spring from bracket with a pliers. Remove the “E” clip from the brake pad shaft. Slide the pad lever from the shaft and unhook the link. Inspect the brake pad for dirt, oil or grease contamination. If the pad is contaminated, or if there is less than .060" (1.524 mm) thickness of brake pad material at the pad's thinnest point, replacement is necessary. The brake pad is bonded to the brake lever and must be replaced as an assembly. Rehook the link, install the brake lever and pad assembly, install the "E" clip, rehook the short end of the spring and continue to reassemble the brake system in the reverse order of disassembly.

IGNITION GROUNDOUT TERMINAL

Inspect the terminal grounding wire for proper alignment and contact with the brake arm. Insure that all electrical connections are clean and secure (diag. 5).



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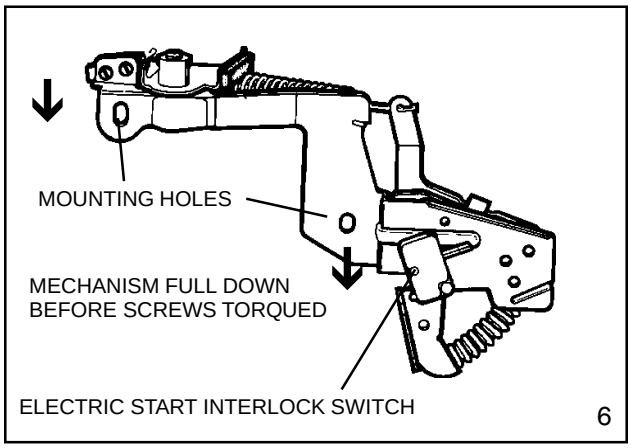
STARTER INTERLOCK SWITCH

The engine/blade control must close the interlock switch before the starter can be engaged. To check the interlock switch, use an ohmmeter or continuity light to perform a continuity check. Disconnect the wires off the switch before performing a continuity check. Continuity should exist between the two terminals when the interlock switch button is completely depressed. No continuity should exist when the button is released. If the switch fails replace the switch (diag. 6).

To replace the interlock switch, carefully grind the heads off of the rivets that fasten the interlock switch to the brake bracket. Remove the rivets from the back side of brake bracket. Use the self-tapping screws supplied with the new switch to make threads in the bracket. Install the interlock switch onto the brake bracket in the proper position and secure the switch to the brake bracket with the machine screws supplied. Be careful not to overtighten the screws as switch breakage can occur (diag. 6).



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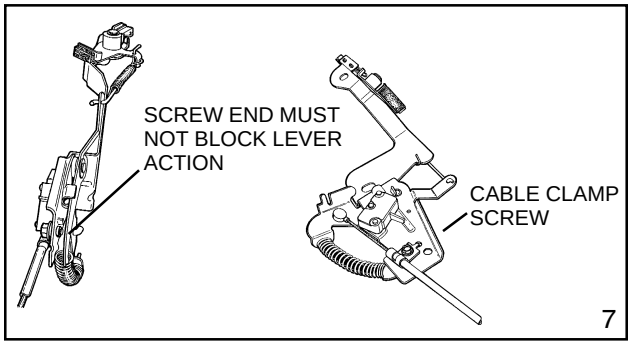
CONTROL CABLE

If replacing the cable conduit screw with a screw other than a service part replacement, be certain that the screw length is not too long as to prevent free travel of the lever.

Make sure the button on the starter interlock switch is completely depressed when the control is fully applied. The cable must provide enough travel so the brake will contact the flywheel. Some slack should exist in the cable adjustment to compensate for brake pad wear (diag. 7).



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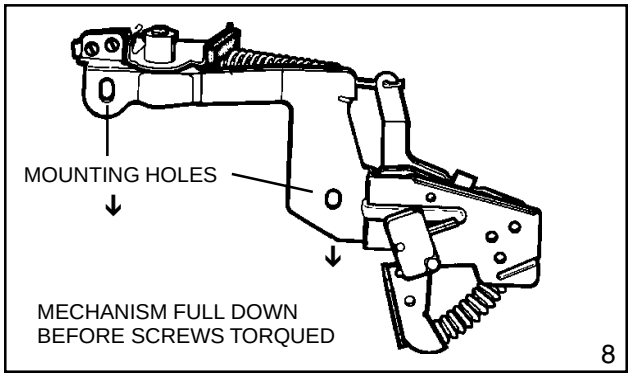
BRAKE BRACKET REPLACEMENT

When installing a inside edge brake bracket assembly, be sure the slotted holes in the brake bracket are all the way down on the fasteners. This will properly align the brake bracket to the flywheel brake surface (diag. 8).

When completed, check for less than 3 second stop time.



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CHAPTER 8 IGNITION

GENERAL INFORMATION

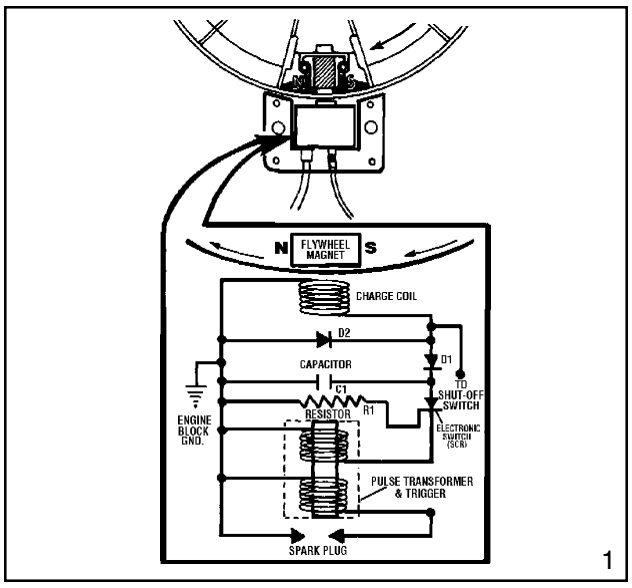
Overhead valve four cycle Tecumseh engines use solid state capacitor discharge modules to provide high voltage to fire the spark plug. This is an all electronic ignition system with all the components located outside the flywheel. The modules look similar but are not interchangeable. If necessary, the correct replacement module should be found using the Master Technician's Parts Manual.

The solid state ignition system consists of flywheel magnets and a flywheel key, charge coil, capacitor, a silicon controlled rectifier, pulse transformer, trigger coil, high tension lead, and a spark plug. Everything except the flywheel magnets, key and the spark plug are located in a encapsulated ignition module. This solid state (CDI) module is protected by epoxy filler from exposure to dirt and moisture. This system requires no maintenance other than checks of the high tension lead and spark plug.

OPERATION

SOLID STATE IGNITION SYSTEM (CDI)

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. The energy is stored in the capacitor (approx. 200 volts) until it is released by an electrical switch (SCR). As the magnet continues to rotate, it passes past a trigger coil where a low voltage signal is produced. This low voltage signal closes the SCR switch, allowing the energy stored in the capacitor to flow to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage follows along the high tension lead to the spark plug where it arcs across the electrodes and ignites the air-fuel mixture (diag. 1).



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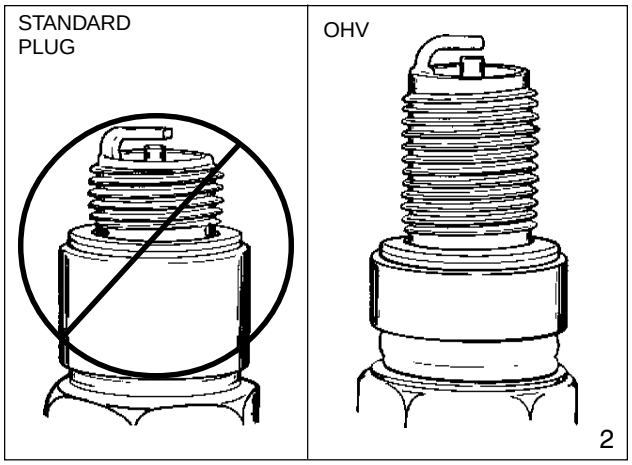
COMPONENTS

The **solid state module** is a complete unit that includes the laminations and spark plug wire.

The **spark plug** is made up of two electrodes. The outside electrode is grounded and secured to the threaded sleeve. The center electrode is insulated with porcelain. The two are separated by an air gap which creates a resistance. A large voltage from the module arcs the air gap which causes a spark and ignites the air-fuel mixture in the cylinder (diag.2).

NOTE: Always consult parts manual for correct plug and reach.



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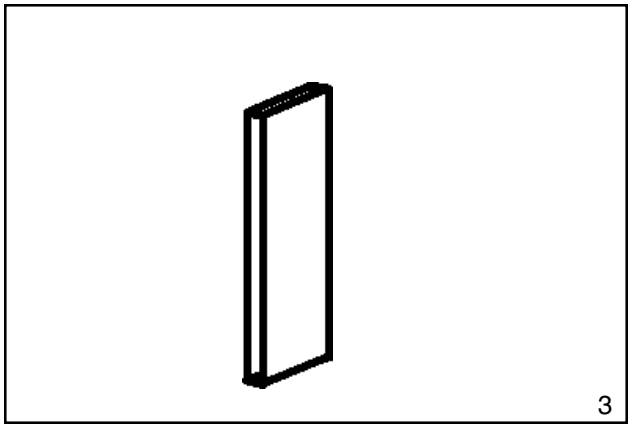
The **flywheel** with magnets provide the magnetic flux (or field) which is necessary to induce voltage and trigger the module to provide spark.
The **flywheel key** locates the flywheel to the crankshaft in the proper position for ignition timing. If a flywheel key is sheared, or partially sheared, the engine will not start or can be difficult to start (diag. 3).

NOTE: Always replace flywheel keys by Model and Specification Number. Tecumseh has some keys that look similar but affect ignition timing.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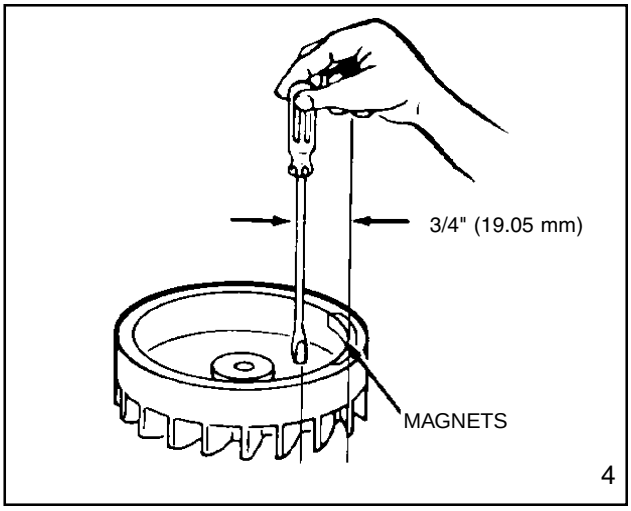
TESTING PROCEDURE



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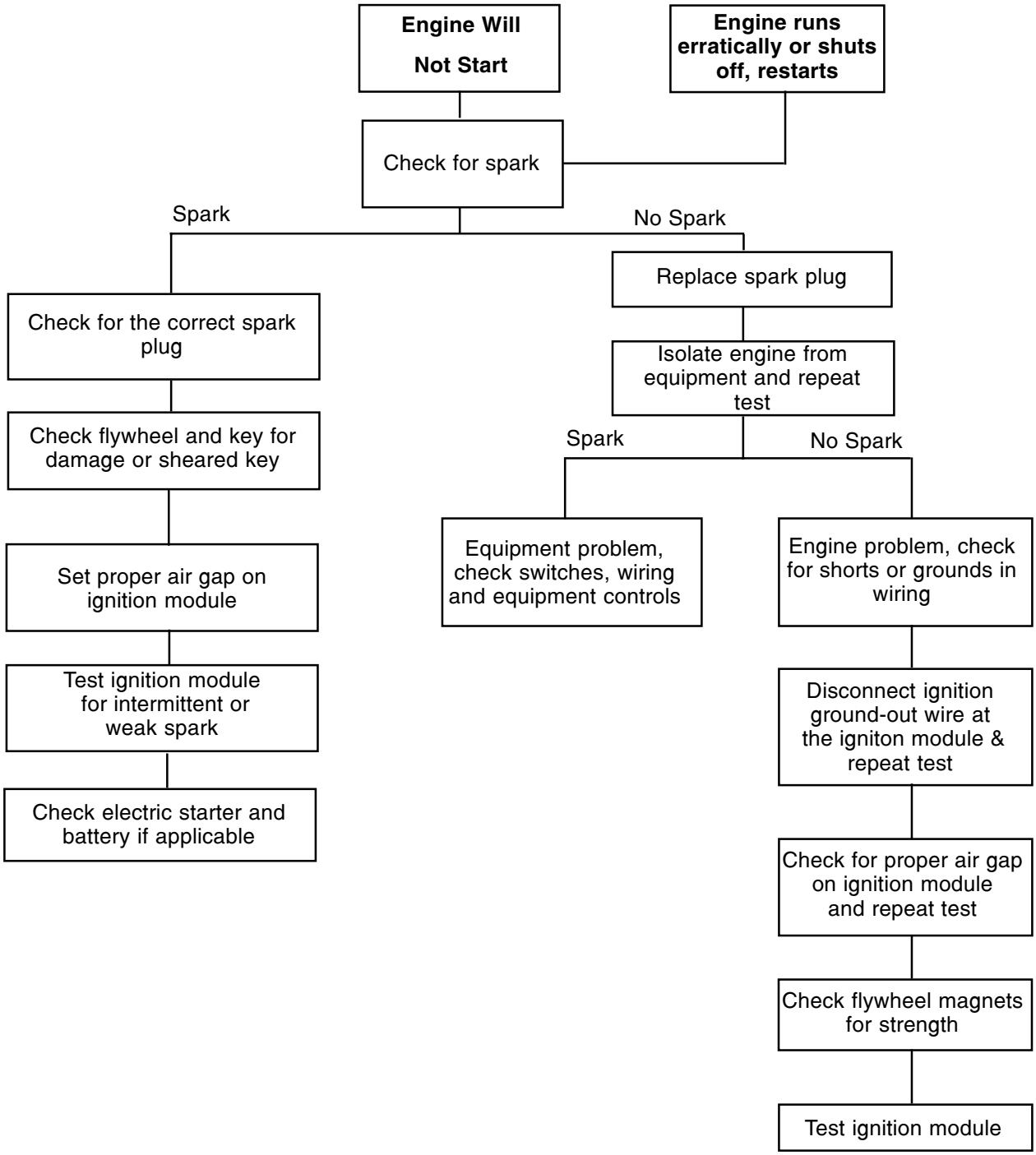
1. Check for spark using a commercially available spark tester and following the tester's recommended procedure.
2. Check the spark plug for cracks in the porcelain, pitted or burned electrodes, excessive carbon buildup, and proper .030" (.762 mm) air gap setting. Replace if questionable. Try to start and run the engine. If the engine will not start or run properly proceed to step #3.
3. Attach the spark plug wire to the spark plug tester and ground the tester as in step #1. Remove the blower housing, disconnect the ignition grounding lead at the ignition module. Reinstall the blower housing and crank the engine over. If spark occurs, check the ignition switch, safety interlock switches, or electrical wiring for shorting to ground.
4. Check the air gap between the flywheel magnets and the laminations of the ignition module. It should be .0125" (.3175 mm) or use gauge part # 670297.
5. Check the flywheel magnets for the proper strength using this rough test. Hold a screwdriver at the extreme end of the handle with the blade down, move the blade to within 3/4 inch (19.05 mm) of the magnets. If the screwdriver blade is attracted to the magnets, the magnetic strength is satisfactory (diag. 4).
6. Examine the ignition module and lamination assembly for cracks in insulation or other damage, which would cause shorts or leakage of current.
7. Check the operation of the ignition module using an approved tester following the instructions furnished with the test unit, or booklets offered by the Tecumseh Products Co. Engine and Transmission Group Service Division.

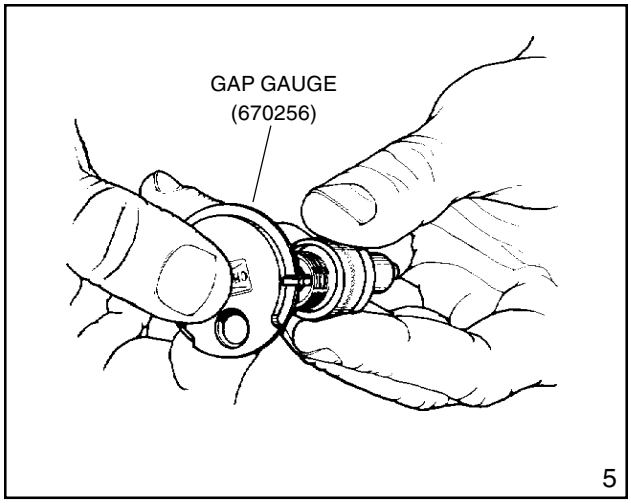
Ignition modules are permanently attached to the lamination and must be serviced as an assembly.

FOUR CYCLE IGNITION TROUBLESHOOTING



SERVICE

To remove the ignition module or the flywheel from the engine, see Chapter 9 under "Disassembly".



5

SPARK PLUG SERVICE

Spark plugs should be removed, cleaned, and adjusted periodically.

Check the air gap with a spark plug gap gauge and adjust accordingly. Set the spark plug gap at .030" (.762 mm) (diag. 5).

Replace the plug if the points on the base of the plug are pitted or burned, or if the porcelain is cracked anywhere.

When reinstalling the plug make sure it is clean of all foreign material.

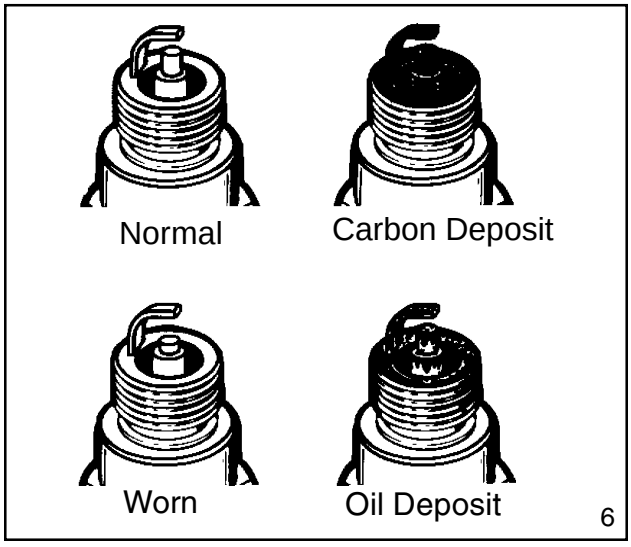
NOTE: DO NOT USE A SAND BLASTER TO CLEAN PLUGS, MICROSCOPIC PARTICLES LEFT IN THE PLUG CAN SCORE THE ENGINE CYLINDER DURING OPERATION. USE A SOLVENT AND A WIRE BRUSH TO CLEAN, AND USING EYE PROTECTION, BLOW OUT THOROUGHLY WITH COMPRESSED AIR.

When replacing a spark plug consult the parts breakdown for the correct spark plug to be used in the engine being serviced.

Install the spark plug in the engine and tighten it to 180 inch pounds (20.5 Nm) torque. If a torque wrench is not available, screw the spark plug in as far as possible by hand, and use a spark plug wrench to turn the spark plug 1/8 to 1/4 of a turn further if using the old spark plug, or 1/2 of a turn further if using a new spark plug.

CONDITIONS CAUSING FREQUENT SPARK PLUG FOULING

1. Carburetor setting is too rich or the air cleaner is restricted.
2. Partially closed choke shutter.
3. Poor grade of gasoline.
4. Improper fuel.
5. Restricted exhaust system.
6. Incorrect spark plug.
7. Incorrect spark plug gap.
8. Oil level is too high, or the breather is restricted.
9. Faulty piston rings.
10. Weak ignition system.

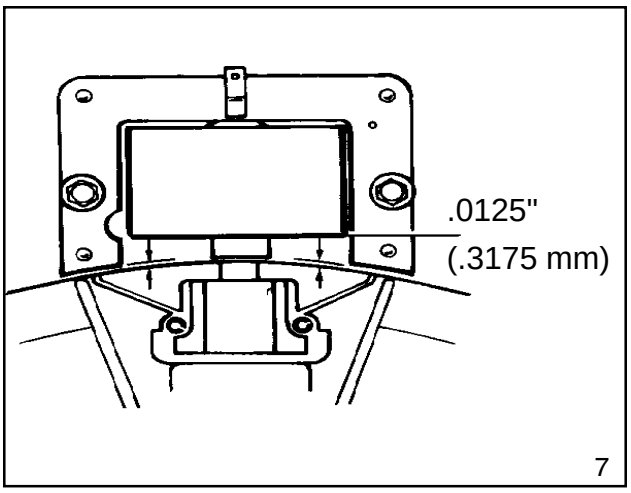


6

IGNITION TIMING CHECK

In order for an engine to run effectively and efficiently, the spark must ignite the compressed air-fuel mixture when the piston is in a specific position to deliver maximum power. This position is known as Before Top Dead Center (BTDC). If the mixture is ignited too soon, kickback can be experienced due to preignition. If the mixture is ignited too late, loss of power can be experienced due to retarded spark. A partially sheared or the wrong flywheel key can cause kickback, loss of power, or an inability to start the engine with a good spark. Check the flywheel key if one of these symptoms exist. See Chapter 9 under "Service" for the disassembly procedure.

Timing on a solid state module is not adjustable. The air gap check consists of having the proper .0125" (.3175 mm) air gap gauge, part # 670297 between the flywheel magnets and the laminations of the module while tightening the mounting screws to the proper torque. Remove the air gap gauge and rotate the flywheel to check for any possible striking points. If none are found, the air gap is set correctly and the air gap check is completed (diag. 7).



7

SERVICE TIPS

DO NOT:

Interchange flywheels, flywheel keys, or spark plugs.

Use flywheels with cooling fins that are broken off.

Use a standard business card as an air gap gauge.

Attempt to reglue the spark plug lead back into a solid state module.

Store a solid state module within 20 feet (6.1 meters) of an unshielded welder.

CHAPTER 9 INTERNAL ENGINE AND CYLINDER

GENERAL INFORMATION

This chapter covers the cylinder block, piston and rod assemblies, cylinder head, crankshaft, camshaft, valve train, breather, cylinder cover, flywheel, counterbalance systems, and lubrication systems. The governors and the governor systems are covered in Chapter 4.

All Tecumseh engines covered in this manual are four cycle engines with the valves in the engine head. The crankshaft position is designated as either horizontal or vertical as the engine rests on its base. The engines identified by decals or model as XL (Extra Life) or XL/C (Extra Life / Commercial) are made using aluminum alloy diecast around a cast iron cylinder liner. However, not all engines with cast iron cylinder liners are identified as XL or XL/C.

OPERATION

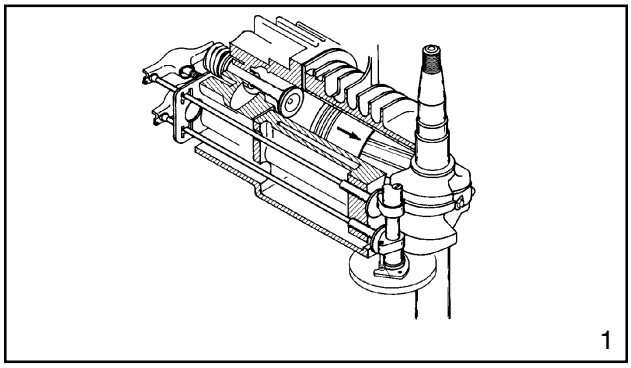
4-CYCLE ENGINE THEORY

All 4-cycle engines require four piston strokes or cycles to complete one power cycle. The flywheel or the equipment load on the crankshaft provides the inertia to keep the engine running smoothly between power strokes.

The engine camshaft gear is twice as large as the mating gear on the crankshaft to allow proper engine valve timing for each cycle. The crankshaft makes two revolutions for every camshaft revolution.

1. **INTAKE**. The intake valve is open and the exhaust valve is closed. The piston is traveling downward creating a low pressure area, drawing the air-fuel mixture from the carburetor into the cylinder area above the piston (diag. 1).
2. **COMPRESSION**. As the piston reaches Bottom Dead Center (BDC) the intake valve closes. The piston then rises, compressing the air-fuel mixture trapped in the combustion chamber due to both valves being closed (diag. 2).
3. **POWER**. During this piston stroke both valves remain closed. As the piston reaches the Before Top Dead Center (BTDC) ignition point, the spark plug fires, igniting the air-fuel mixture. In the time it takes to ignite all the available fuel, the piston has moved to Top Dead Center (TDC) ready to take the full combustive force of the fuel for maximum power during downward piston travel. The expanding gases force the piston down (diag. 3).
4. **EXHAUST**. The exhaust valve opens. As the piston starts to the top of the cylinder, the exhaust gases are forced out (diag. 4).

After the piston reaches Top Dead Center (TDC), the four cycle process will begin again as the piston moves downward and the intake valve opens.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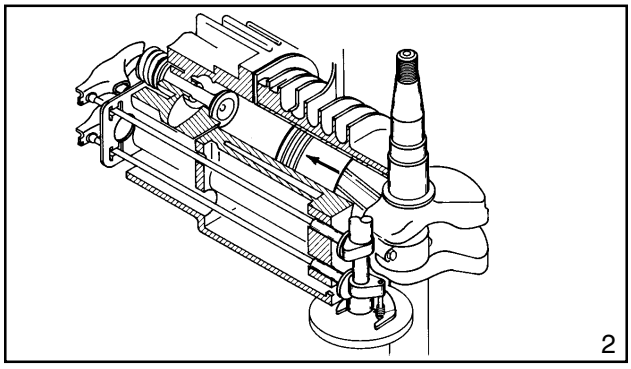
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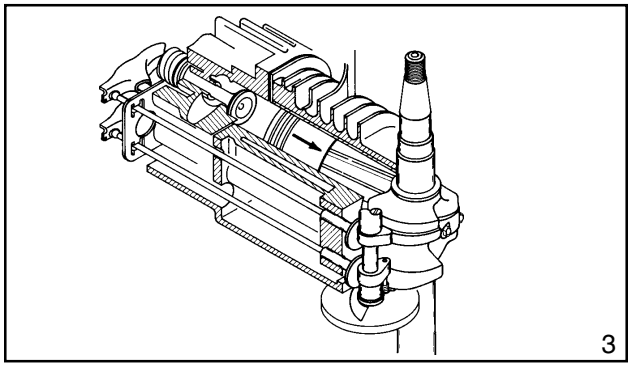
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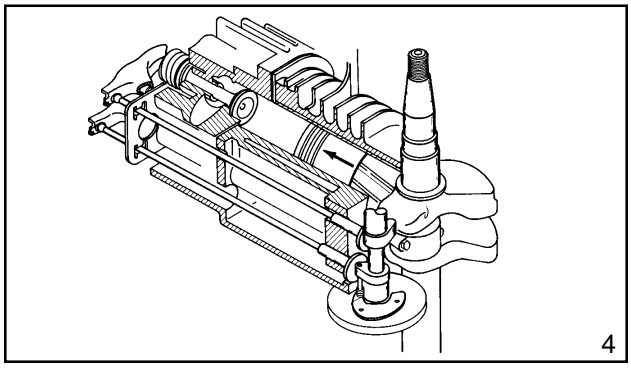
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LUBRICATION SYSTEMS

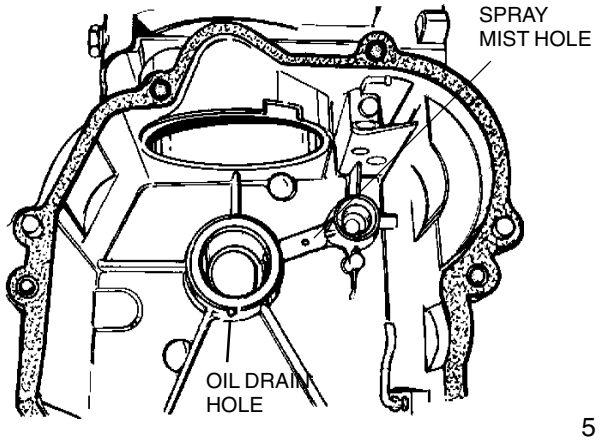
The lubrication system used with all Tecumseh horizontal crankshaft engines covered in this manual utilize a splash type system. An oil dipper on the connecting rod splashes oil in the crankcase to lubricate all internal moving parts. The oil dipper is either bolted on or may be cast on to the cap with one of the rod bolts (diag. 6).

All vertical shaft engines use a positive displacement plunger oil pump or a rotary oil pump. Oil is pumped from the bottom of the crankcase, up through the camshaft and over to the top main bearing. Oil under pressure lubricates the top crankshaft main bearing and camshaft upper bearing (diag. 7). A crankshaft drilling also provides oil to the crankpin journal on engine models OHV 13.5 -16.5.

On all Tecumseh vertical shaft 4-cycle engines, the oil is sprayed out under pressure through a small hole between the top camshaft and crankshaft bearing to lubricate the piston, connecting rod, and other internal parts (diag. 5).

The plunger style oil pump is located on an eccentric on the camshaft. As the camshaft rotates, the eccentric moves the barrel back and forth on the plunger forcing oil through the hole in the center of the camshaft. The ball on the end of the plunger is anchored in a recess in the cylinder flange (diag. 8).

The rotary pump is driven by the camshaft. It uses a lobed gear in a rotating ring to provide positive oil displacement (diag. 9).

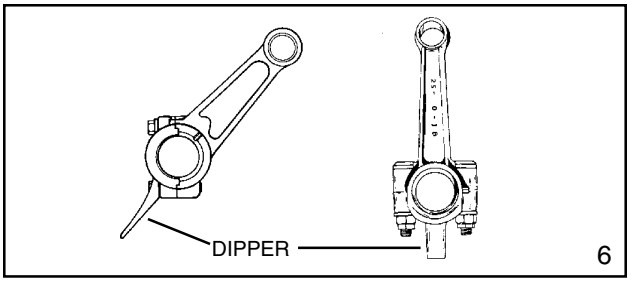


5

COUNTERBALANCE SYSTEMS

Some Tecumseh engines may be equipped with an Ultra-Balance® counterbalance system. This system uses a single weighted shaft that is driven off the crankshaft. This shaft's function is to counteract the imbalance caused by the counterweights on the crankshaft (diag. 10).

A dual shaft counterbalance is also used on some engine models. A gear on the crankshaft drives the counterbalance with the thicker gear, which in turn drives the second counter balance shaft. For timing of either counterbalance system, see " Engine Assembly Procedure " in the Service section of this chapter.



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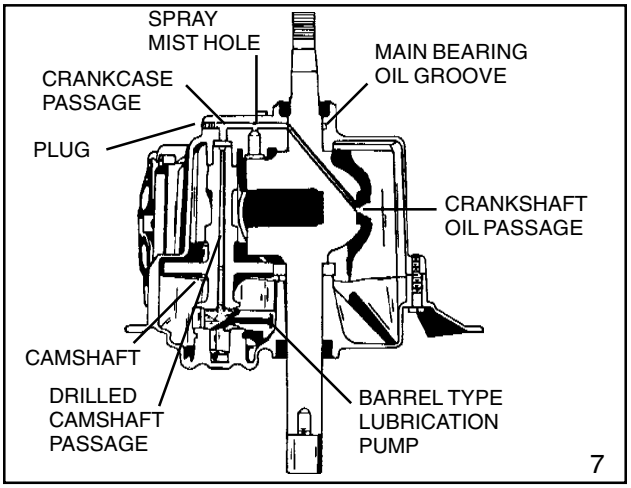

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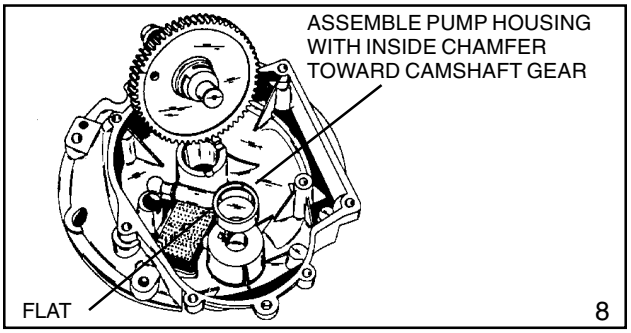

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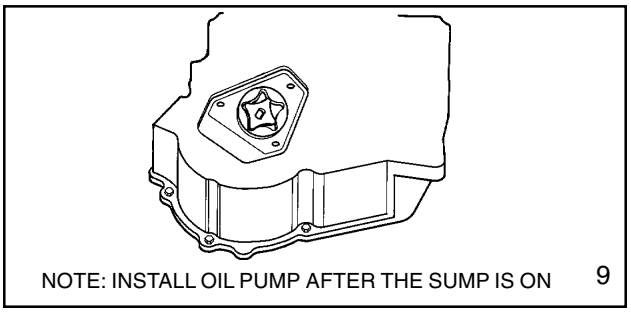

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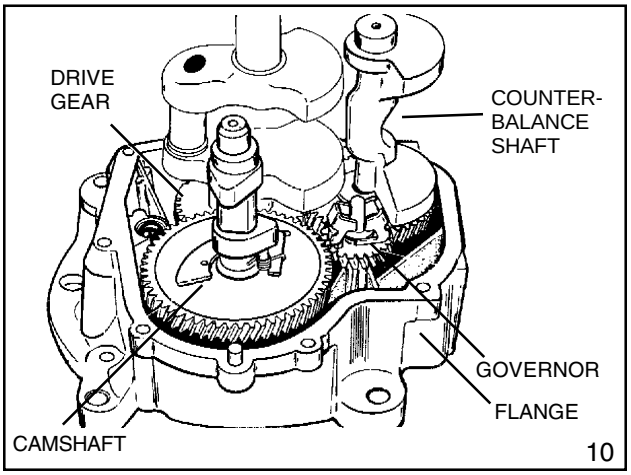


10

COMPONENTS

The **cylinder block** houses the piston, crankshaft, and along with the cylinder cover all the internal components. The block is a one piece diecast aluminum alloy cylinder casting which may have a cast iron liner (diag. 10).

The **piston** transmits the force of the burning and expanding gases through the connecting rod to the crankshaft.

The **piston rings** provide the seal between the cylinder wall and the piston. The rings keep the combustion pressures from entering the crankcase and also wipe the oil off the cylinder wall and return it to the sump.

The **connecting rod** assembly is the link between the piston (piston pin) and the crankshaft.

The **cylinder head** is a one piece aluminum alloy casting that is bolted to the top of the cylinder block. The overhead design contains all of the valve train except for the camshaft, lifters, and push rods.

The **crankshaft** converts the up and down piston movement to the rotational force (torque) by an offset crankpin or rod journal.

The **camshaft** lobes push the lifters at the proper time to allow air and fuel in and exhaust out of the cylinder. Teeth on the camshaft gear time the camshaft to the crankshaft.

The **valves** allow air-fuel mixture to enter the cylinder and exhaust gases to exit. The valves provide a positive seal when closed.

The **valve springs** return the valves to the closed position and must be strong enough to maintain valve lifter and cam lobe contact. The valve retainers lock the spring to the valve stem.

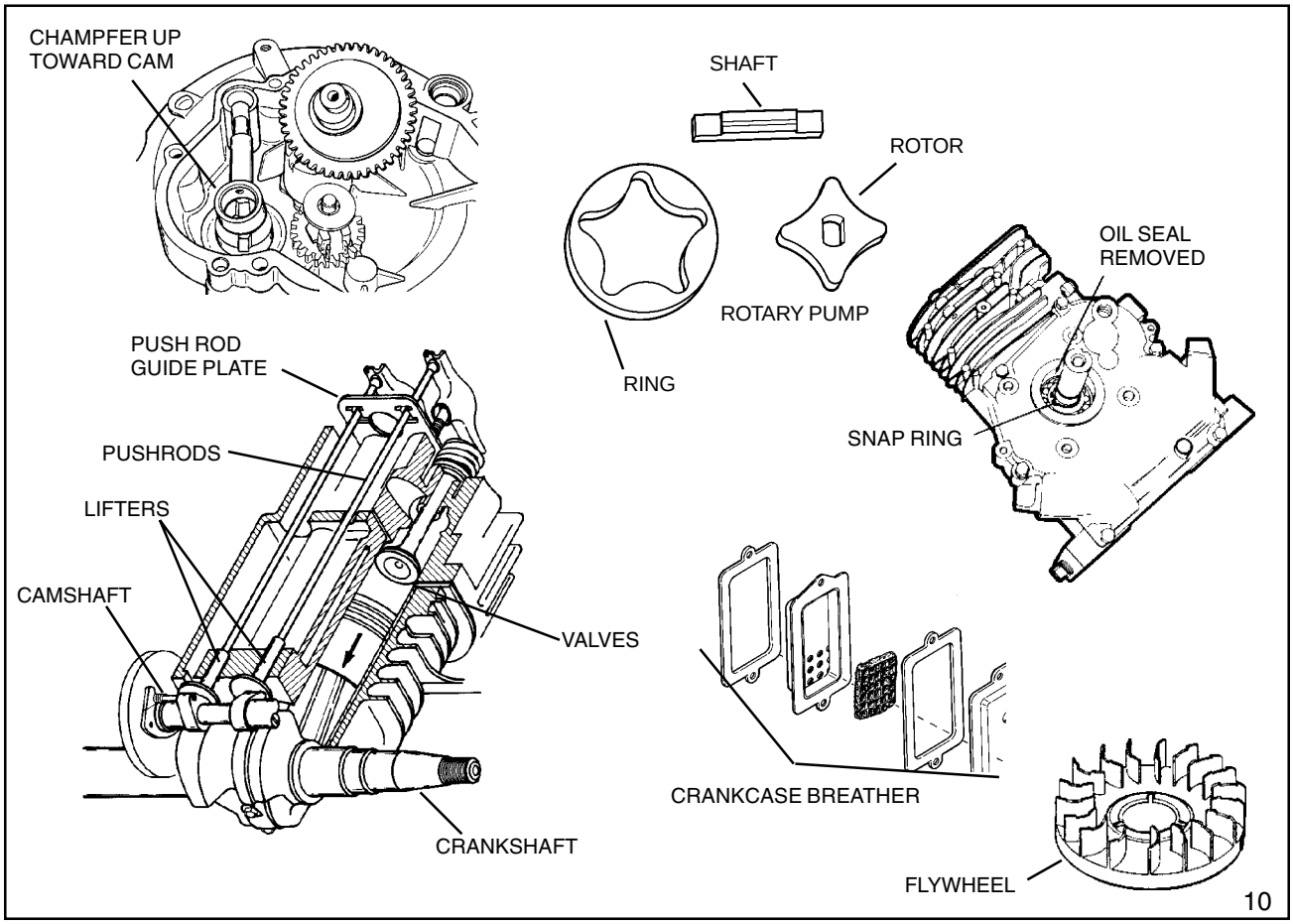
The **valve lifters** maintain contact on the camshaft, move the **push rods** to pivot the **rocker arms** and move the valves.

The **crankcase breather** is a one way check valve that allows air out and prevents air from coming in. It allows the engine to develop a partial vacuum in the crankcase during operation.

The **cylinder cover** provides the bearing surface for the power take off (P.T.O.) end of the crankshaft and camshaft. This bolted on cover is removed to provide access to all internal components.

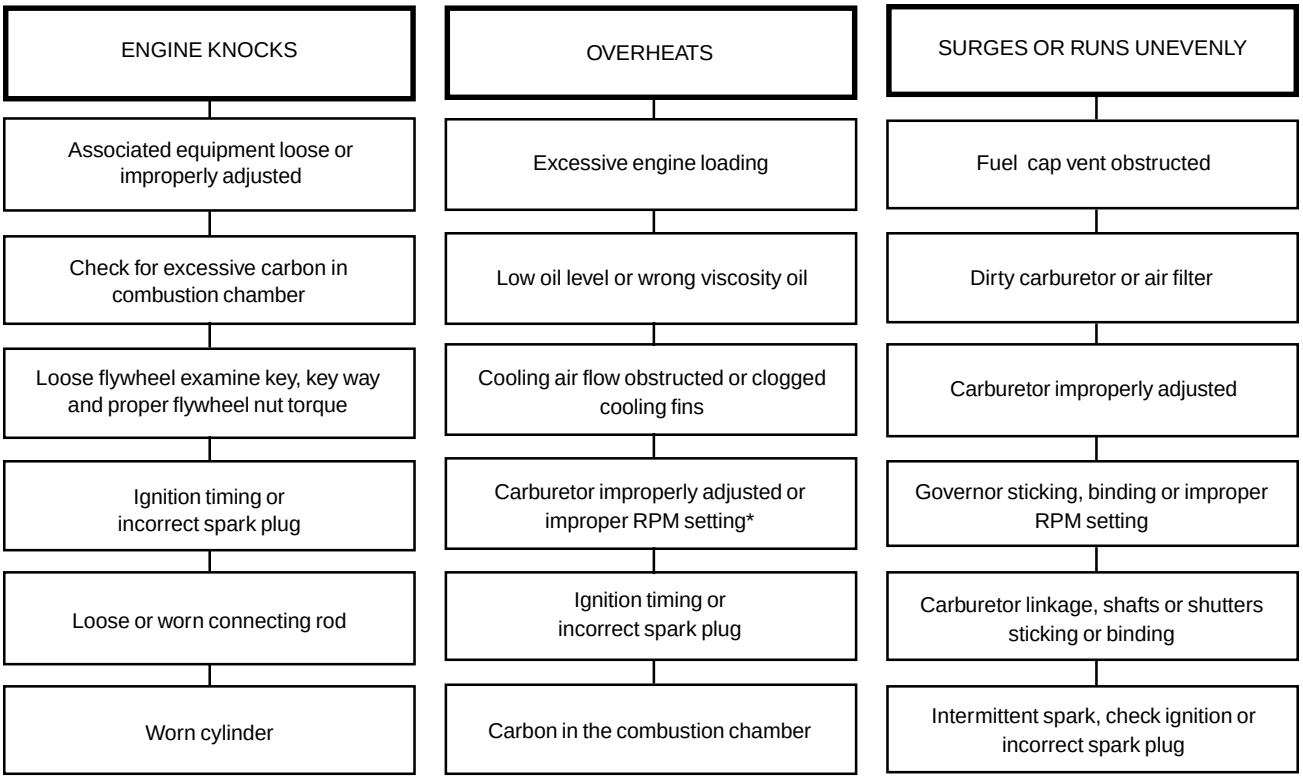
The **oil pump** (vertical shaft only) consists of a steel plunger and a nylon or aluminum housing that rides an offset on the camshaft. The rotary pump consists of a lobed gear in a rotating ring that is driven by the camshaft.

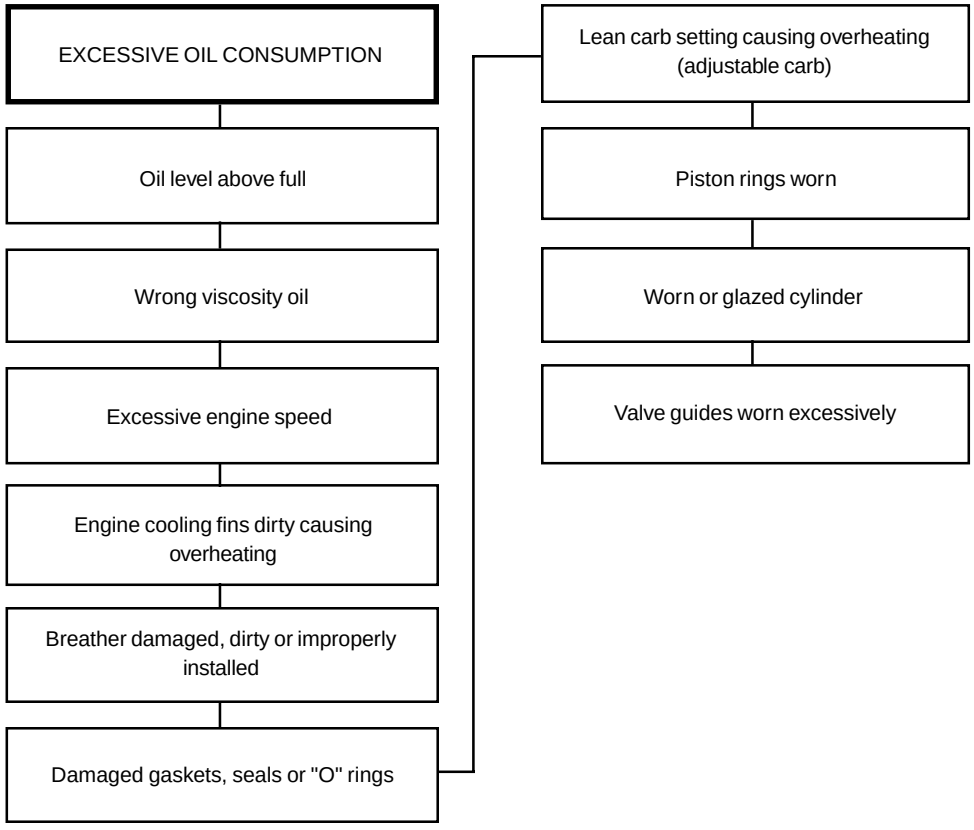
The **flywheel** provides the mass to smooth the effects of one power stroke every other crankshaft revolution. Flywheels are made of aluminum alloy or cast iron. The flywheel fins act as a fan to cool the engine.



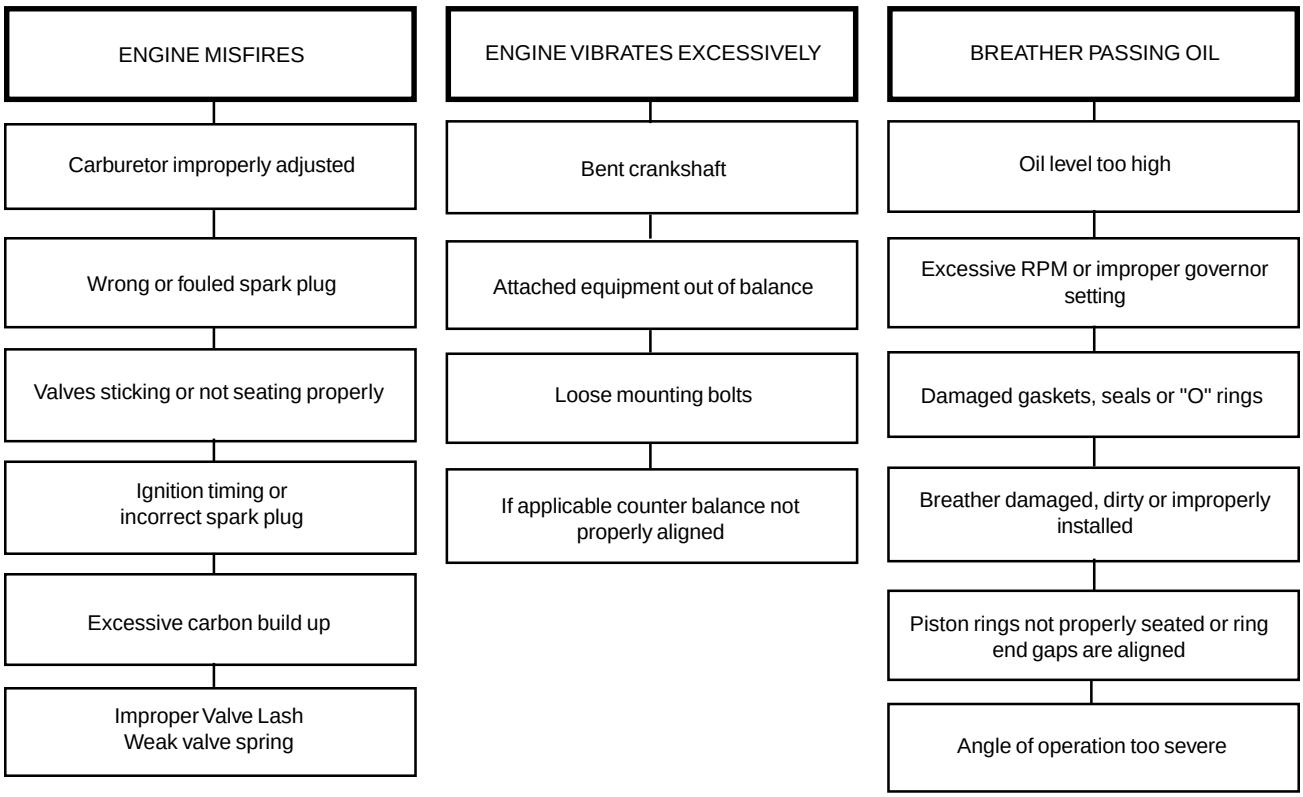
10

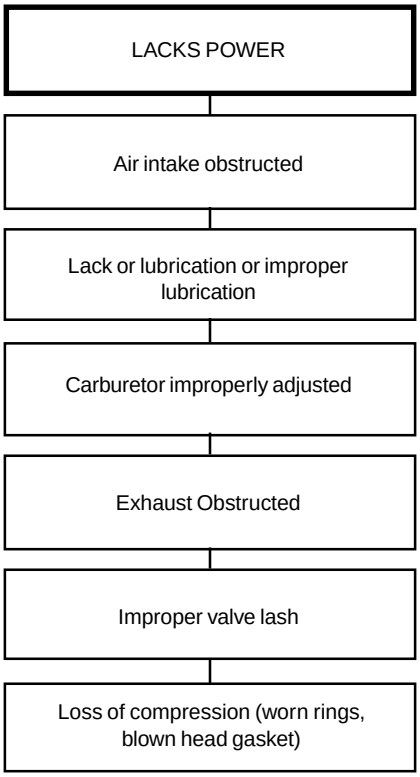
ENGINE OPERATION PROBLEMS





ENGINE OPERATION PROBLEMS





TESTING

ENGINE KNOCKS

1. Check the blade hub, blade adapter, or crankshaft coupler for loose fit, loose bolts, or crankshaft key damage. Remove, inspect, replace if necessary. Reinstall and re-torque the bolts to the proper torque.
2. Check the flywheel key and the flywheel and crankshaft keyway for wear or partial shearing. Replace if any damage is evident. Tighten the flywheel nut to the proper torque.
3. Check for the correct ignition module air gap.
4. Remove the cylinder head and check for excessive carbon in the combustion chamber. Also check that the head gasket fit is correct, and the spark plug for proper reach and heat range (correct spark plug for the engine).
5. Check for the proper valve lash using a feeler gauge.
6. Check the internal components (piston, cylinder, connecting rod, crankshaft journal) for excessive clearance. See Chapter 10 under "Specifications".

ENGINE OVERHEATS

1. Make sure the engine is not being overloaded. Remove excess load (sharpen blades, limit operation speed, process less material).
2. Check the oil level and viscosity. Add or replace as necessary.
3. Check for clogged cooling fins or obstructions to the air flow. Remove the blower housing, clean and reinstall.
4. Check the carburetor for correct adjustment or remove and clean the carburetor using tag wire and compressed air. See Chapter 3 under "Service."
5. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card #30 according to the engine model and specification number. Adjust as necessary.
6. Check the ignition timing. See Chapter 8 "Ignition - Service."
7. Remove the cylinder head to check for excessive carbon buildup or a leaking head gasket. Clean or replace as necessary.

SURGES or RUNS UNEVENLY

1. Check the fuel cap to make sure it is venting. Loosen the cap and retry engine operation.
2. Replace or clean the air filter.
3. Check the carburetor adjustment or clean the carburetor. See Chapter 3 under "Service."
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 according to the engine model and specification number. Adjust as necessary.
5. Visually check all linkages. Check the governor shaft, throttle shaft, or pivot points for binding.
6. Check the ignition module operation using a gap type tester installed between the high tension lead and spark plug. Check for intermittent spark.

ENGINE MISFIRES

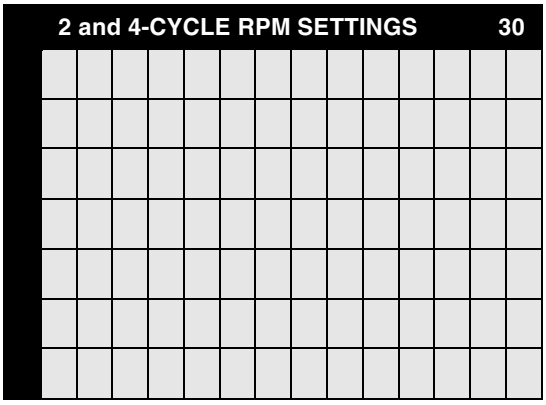
1. Check the spark plug for the proper application or a fouled condition. Replace if questionable.
2. Reset the carburetor following the adjustment procedure or clean the carburetor. See Chapter 3 under "Service."
3. Check the ignition timing. See Chapter 8 under "Service."
4. Check for carbon buildup in the combustion chamber.
5. Check valve lash. Inspect the valves and valve seats for leakage. Check for scoring or discoloration on the valve stem in the valve guide area. Recut the valves and seats if questionable. See "Valve Service" in this chapter.

ENGINE VIBRATES EXCESSIVELY

1. Remove the spark plug wire. Check the engine crankshaft on the PTO end for bends using a straight edge, square or a dial indicator. Blades or adapters must be removed. Significant deflection will cause a vibration problem.
2. Check the engine mounting bolts, make sure they are tight.
3. Remove and check the attached equipment for an out of balance condition.
4. If the engine is equipped with a counterbalance shaft, check the gear timing to determine if the counterbalance is out of time.

BREATHER PASSING OIL

1. Check the oil level, make sure the engine is not overfilled. Also verify that the viscosity rating on the container of the oil being used is to specification.
2. Check the angle of operation. Avoid prolonged use at a severe angle.
3. Check the engine R.P.M. setting for excessive R.P.M. using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 according to the engine model and specification number. Adjust the high and low R.P.M. as necessary.
4. Check for leaking or damaged gaskets, seals, or "O"-rings. External leaks may not be evident; however, the leak may prevent the engine from achieving a partial crankcase vacuum.
5. Check the breather for damage, dirty condition, or improper installation. The oil return hole(s) must face down.
6. Check the engine compression using a compression tester. If the engine has weak compression, determine the cause of weak compression: worn rings, leaking head gasket, or leaking valves. Follow the compression tester's procedure.



NOTE: MICROFICHE CARD 30 RPM'S ARE NOT ON PAPER
NOTE: RPM SETTINGS CAN ALSO BE FOUND ON THE COMPUTERIZED PARTS LOOK UP SYSTEMS.

11

EXCESSIVE OIL CONSUMPTION

1. Check the oil level, oil viscosity on the container of the oil being used, and oil condition. Replace and fill to the proper level.
2. Check the angle of operation. Avoid prolonged use at a severe angle.
3. Check for leaking or damaged gaskets, seals, or "O"-rings. External leaks may not be evident, however, the leak may prevent the engine from achieving a partial crankcase vacuum.
4. Check the engine R.P.M. setting using a vibratach or other tachometer and compare it to the R.P.M. settings found on microfiche card # 30 according to the engine model and specification number. Adjust as necessary. The computer parts lookup systems also have RPM information listed in each individual engine parts list.
5. Check the breather for damage, dirty condition, or improper installation. The oil return hole(s) must face down.
6. Clean the cooling fins to prevent overheating.
7. Check the carburetor setting causing a lean running condition, overheating the engine.
8. Check the engine compression using a compression tester. If the engine has weak compression, determine the cause of weak compression: worn rings, leaking head gasket, or leaking valves. Follow the compression tester's procedure.
9. Check the valve guide clearance for excessive wear.

LACKS POWER

1. Check the air intake for an obstruction (dirty filter, oil saturated filter, other debris).
2. Check the oil level, oil viscosity on the container of the oil being used and oil condition. Replace and fill to the proper level.
3. Readjust the carburetor or remove the carburetor for cleaning. See Chapter 3 under "Service."
4. Check the exhaust port or muffler for a restriction preventing proper exhaust flow.
5. Check the engine valve lash. Reset the valves at the proper lash.
6. Check the valves for proper seating and valve guide clearance. Recondition the valves and seats. Replace the valves if necessary. See "Cylinder Head and Valve Train Service" in this chapter.
7. Check the ignition timing. Check the flywheel key for partial shearing.

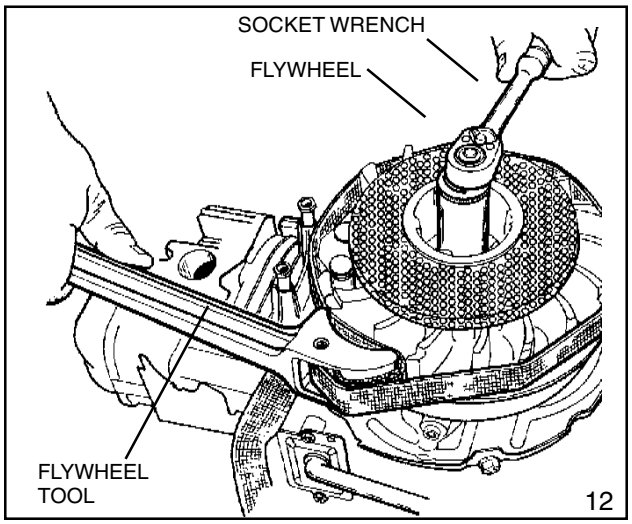
SERVICE

DISASSEMBLY PROCEDURE

The following procedures apply to most engine models. Actual procedure may vary.

1. Disconnect the high tension lead from the spark plug. Remove the spark plug.
2. Drain the oil from the crankcase. Drain or shut off the fuel supply.
3. Remove the air cleaner assembly.
4. Remove the fuel tank if it is attached to the engine. Fuel tanks may be held on with bolts, screws, or some models require taps upward with a soft face hammer loosening the plastic tank wedges in the blower housing slots.
5. Remove the blower housing by first unscrewing the screw holding the dipstick tube to the blower housing and removing the remaining bolts holding on the blower housing.
6. Unplug the ignition kill wire from the terminal on top of the ignition module and unbolt the ignition module.
7. Locate the piston at Top Dead Center (TDC) on the compression stroke for easier valve train service.
8. Relieve the compliance brake pressure on the flywheel if applicable. Compress the spring by moving the lever toward the spark plug end and when the hole in the lever aligns with the hole in the bracket secure the lever in this position with alignment tool part # 670298.
9. Remove the flywheel nut, washer, and starter cup. Use a part # 670305 strap wrench to hold the flywheel from turning (diag. 12). Thread the appropriate flywheel knock-off tool (7/16" / 11.112 mm use part # 670103, 1/2" / 12.7 mm use part # 670169, 5/8" / 15.875 mm use part # 670314, 11/16" / 17.462 mm use part # 670329) on the crankshaft until it bottoms out, then unthread it one complete turn. Lift upward under the flywheel using a large screwdriver while avoiding contact with the alternator coils or magnets, and tap sharply and squarely on the knock-off tool to break the flywheel loose. If necessary, rotate the flywheel a half turn and repeat until it loosens (diag. 13). A flywheel puller (part # 670306) may be used on flywheels with cored holes (diag. 14).

   NOTE: DO NOT USE A JAW TYPE PULLER.



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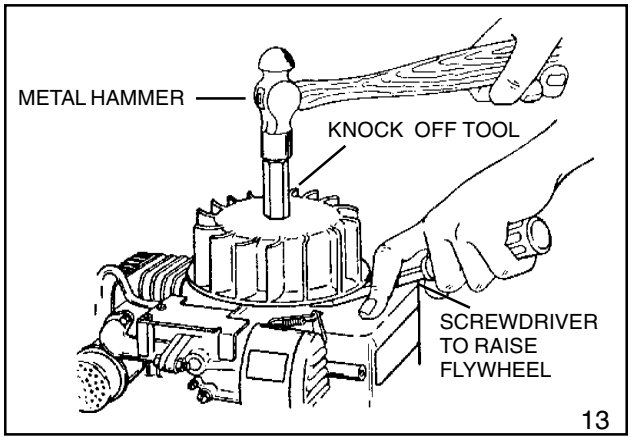

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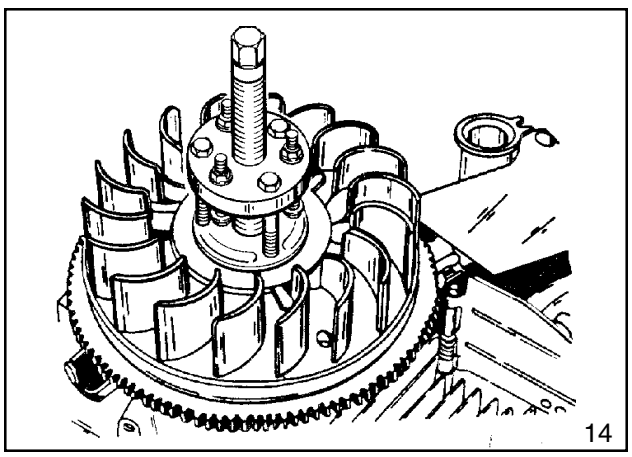

14

10. Remove the flywheel key and alternator if equipped, and baffle plate.

11. Remove the muffler.

12. Remove the intake pipe, spacer if equipped, and the carburetor. Be careful not to bend or damage the linkage when removing. Mark the hookup points or diagram the linkage arrangement to aid in reassembly.

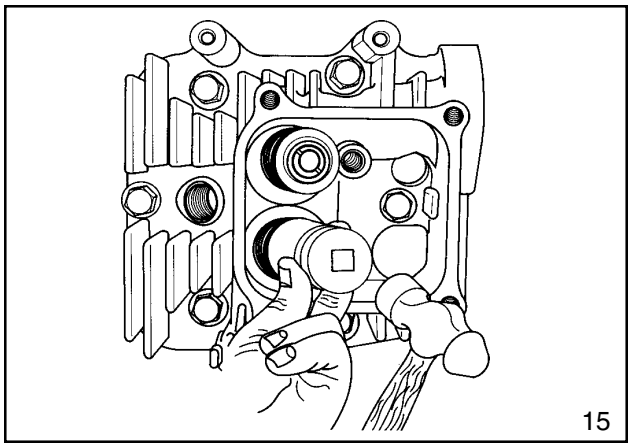
13. Remove the head by first removing the valve cover. The push rod guide plate must be removed to access one of the head bolts. Remove the rocker arms by loosening the two locking nuts or allen head screws. Use a 3/16" Allen wrench and a 7/16" wrench on OHH, OVRM and OHV 11-13 use a 1/2 wrench, OHV13.5 - 17 use a 3/16" allen and 1/2" wrench. Remove the rocker arm nuts or rocker arm bearings followed by the rocker arms, rocker arm studs, guide plate, and push rods. Remove the head bolts, head, and head gasket.

    NOTE: ON SOME OHV ENGINES THE EXHAUST PUSH ROD CAN ONLY BE REMOVED AFTER THE HEAD IS OFF. YOU MUST HAVE IT BACK IN BEFORE RE-ASSEMBLY.

    On engine models OHM, OHSK120, OVM, OVXL and OHV, with independent cylinder head and rocker box, the valve springs, caps, retainers, and retainer screw must be removed to allow the rocker box to separate from the head. Remove the jam nut, adjusting nut, rocker arm bearings, rocker arms, push rods, guide plate, and the rocker arm retainer screw.

    Next to prevent valve or piston damage turn the piston down in the cylinder. Then place a 3/4" (19.05 mm) deep socket over the valve cap and strike the top with a steel hammer (diag. 15). This action loosens the cap. Remove the cap, retainers, and valve springs. Remove the rocker arm housing, head bolts, head, head gasket and valves. Notice the "O"rings used to seal the rocker box , valve stems, and push rod tubes.

14. Remove the crankcase breather if necessary.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15. Remove the cylinder cover or mounting flange using a seal protector positioned on the seal to prevent seal damage. The crankshaft must be free of rust or scale to slide the cover or flange off the crankshaft. OHH engines with a ball bearing on the P.T.O. end of the crankshaft require the oil seal and the snap ring to be removed prior to the cylinder cover removal. For engines equipped with 8-1/2:1 gear reduction, turn the crankshaft to roll the reduction shaft gear off the crankshaft worm gear when removing the cylinder flange (diag. 16, 17, 18, 19).

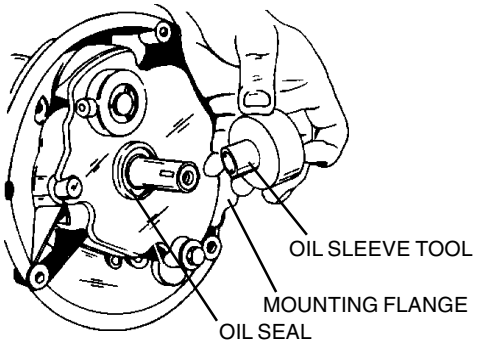
16. On engines equipped with 8-1/2 :1 gear reduction, remove the auxiliary shaft from the cover by removing the retaining ring and sliding the shaft out of the washers and drive gear.

17. Align the timing marks on the camshaft and crankshaft gears and remove the internal components (diag. 20).

18. Remove the lifters, rod cap, and counterbalance shaft or gears if applicable.

19. Before removing the piston, remove any carbon from the top of the cylinder bore to prevent ring breakage. Push the piston out the top of the cylinder bore.

20. Remove the valves from the head on models OHH and OVRM by supporting the valves with fingers while compressing the valve springs, one at a time, with thumbs. Slide the large opening in the retainer toward the valve stem to remove (diag. 21). On all other overhead valve engine models, place a 3/4" (19.05 mm) deep socket over the valve cap and strike the top with a steel hammer. This action loosens the cap. Remove the cap, retainers, and valve springs. The valve springs must be assembled on the same valve they are removed from (diag. 15).



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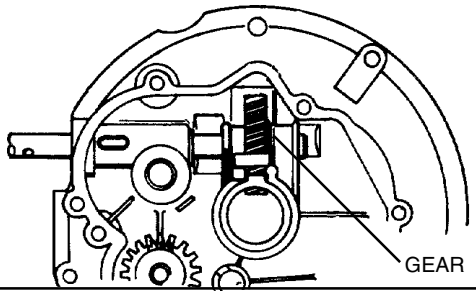

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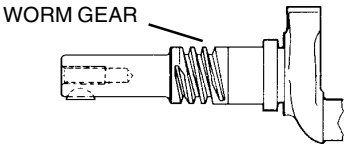

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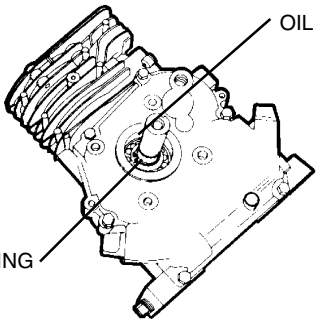

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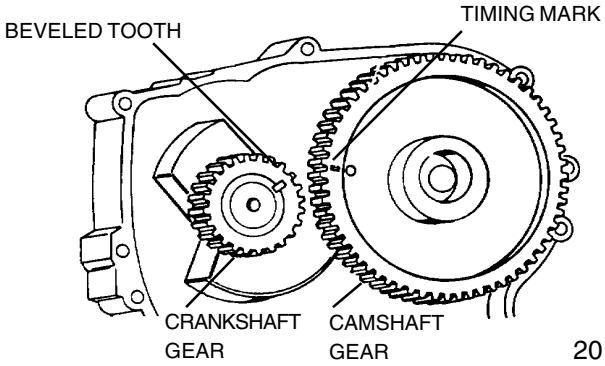

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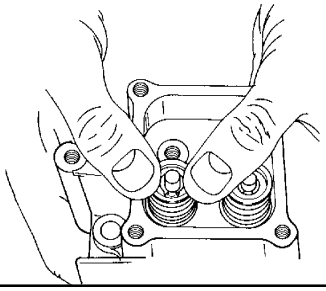
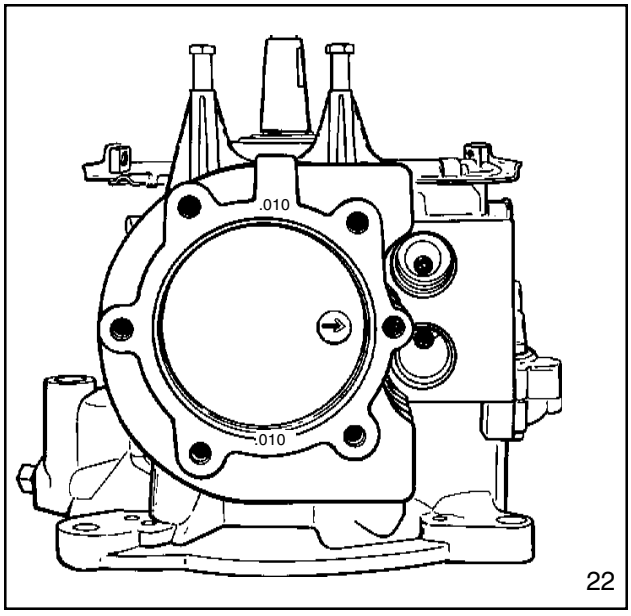

21

CYLINDERS

Visually check the cylinder for broken or cracked fins or a scored cylinder bore. Check the main bearing for wear or scoring. If the main bearing is worn or scored it can be replaced on some models. See "Crankshaft Bearing Service" in this chapter.

Use a dial bore gauge or transfer gauge with a micrometer to accurately measure the cylinder bore. Measure in the piston travel area approximately 1/2" to 3/4" (12.7-19.05 mm) from the top and the bottom . Measure at 90 degrees to the piston pin, 45 degrees to the piston pin, and even with the piston pin as the piston would appear when assembled. A rigid hone is recommended to "true" any cylinder irregularities. If the cylinder bore is worn more than .005" (.127 mm) oversize, out of round or scored, it should be replaced or re-sized to .010" or .020" (.254-.508 mm) oversize. In some cases engines are built with oversize cylinders. If the cylinder is oversize, the oversize value will be imprinted in the top of the cylinder (diag. 22).



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To recondition a cylinder, use a commercially available hone of the proper size . Chuck the hone in a drill press with a spindle speed of about 600 R.P.M. Tecumseh recommends 380 grit for finish in a standard cross hatch.

Start with coarse stones and center the cylinder under the drill press spindle. Lower the hone so the lower end of the stones contacts the lowest point in the cylinder bore.

Rotate the adjusting nut so that the stones touch the cylinder wall and begin honing at the bottom of the cylinder. A light honing oil should be used to lubricate and cool while honing. Move the hone up and down at a rate of 50 strokes per minute to avoid putting ridges in the cylinder wall. Every fourth or fifth stroke, move the hone far enough to extend the stones one inch beyond the top and bottom of the cylinder bore.

Check the bore diameter every twenty or thirty strokes for size and a 35^0 - 45^0 crosshatch pattern. If the stones collect metal, clean the stones with a wire brush when the hone is removed.

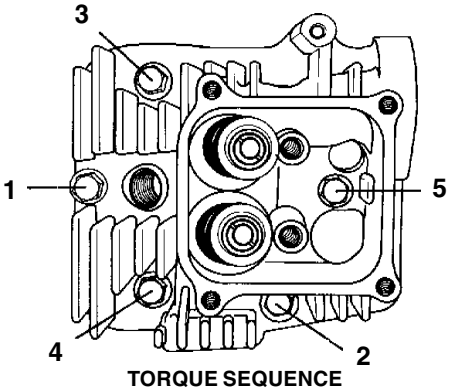
If cylinder oversizing is needed we recommend boring the cylinder. This service is offered by many Service Dealers. You also may wish to contact a local machine shop.

Clean the cylinder and crankcase with warm, soapy water, rinse with clean water, and dry thoroughly. Continue the cleaning procedure until a clean white cloth wiped on any internal surface reveals no honing residue or dirt.

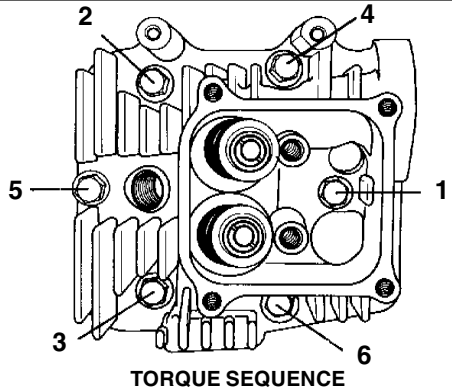
Replace the piston and the piston rings with the correct oversize parts as indicated in the parts manual.

CYLINDER HEAD AND VALVE TRAIN SERVICE

Check the cylinder head for warpage by placing the head on a precision flat surface. If warped in excess of .005" (.127mm), replace the head. Slight warpage can be corrected by placing a sheet of #400 wet /dry sandpaper on a precision flat surface and rubbing the head gasket surface in a circular pattern until the entire gasket surface shows evidence of sanding. A small amount of honing oil on the sandpaper will make it easier to slide the head. Always replace the head gasket and torque the head bolts in 60 inch pound (6.7 Nm) increments in the numbered sequence torques in specification section (diag. 23 & 24).



TORQUE SEQUENCE
OVRM / OHH, OHSK50 - 70
23



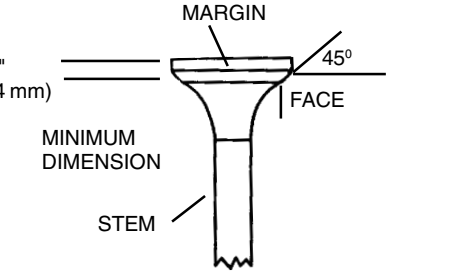
TORQUE SEQUENCE
OHV 11 - 17, OHM, OHSK80 - 130
24

Valves, Springs, And Push Rods

The valves should be checked for proper lash, sealing, and wear. Valve condition is critical for proper engine performance. Valve lash should be checked before removal of the engine head if any of the following conditions are experienced; a popping is heard through the intake or exhaust, an engine kickback is experienced, or when excessive valve train noise is heard.

Valve lash (between the rocker arm and valve stem) should be set or checked when the engine is cold. The piston should be at T.D.C. on the compression stroke (both valves closed). See specification section.

When servicing the valves, all carbon should be removed from the valve head and stem. If the valves have been checked and are in a usable condition, the valve face should be ground using a valve grinder to a 45 degree angle. If after grinding the valve face the margin is less than 1/32 of an inch (.794 mm), the valve should be replaced (diag. 25).



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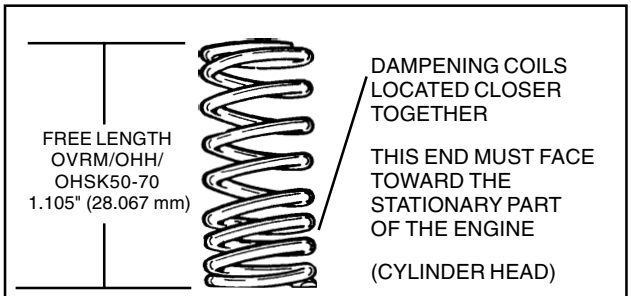
Valves are not identical. Valves marked "EX" or "X" are installed in the exhaust valve location. Valves marked "I" are installed in the intake valve location. If the valves are unmarked, the smaller valve (head) is installed in the exhaust valve location.

If the spring has dampening coils, the valve spring should be installed with the dampening coils away from the valve cap and retainers (diag. 26).



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The valve springs should be checked for both ends being parallel and the free length being at least 1.105" (28.067 mm) for OHH and OVRM engines, 1.980" (50.292 mm for OHM, OVM, OHSK, OVXL, and OHV engines when the valves are removed for service. Replace the springs if necessary.

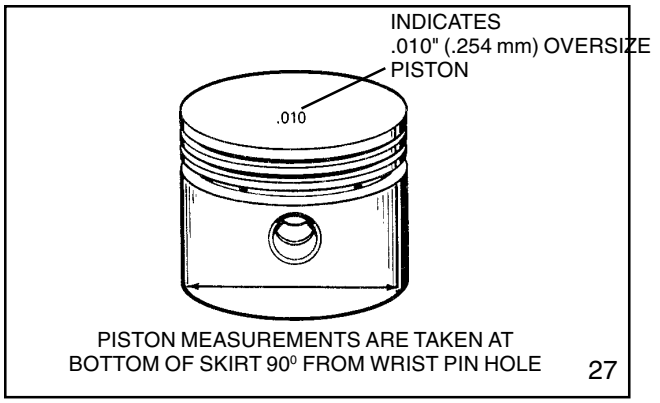
The push rods should be checked for straightness and the ends for wear. If the push rod ends are worn or damaged, inspect the corresponding rocker arm socket or valve lifter for wear. Replace if necessary.

PISTONS, RINGS, AND CONNECTING RODS

Piston

The piston should be checked for wear by measuring near the bottom of the skirt 90 degrees from the piston pin hole with a micrometer. Check the ring side clearance using a feeler gauge with a new ring. Clean all carbon from the piston top and the ring grooves before measuring. Visually inspect the piston skirt area for scoring or scratches from dirt ingestion. If scoring or deep scratches are evident, replace the piston.

If the cylinder bore needs re-sizing, an oversize piston will be necessary. Oversize pistons are identified by the imprinted decimal oversize value imprinted on the top of the piston (diag. 27).

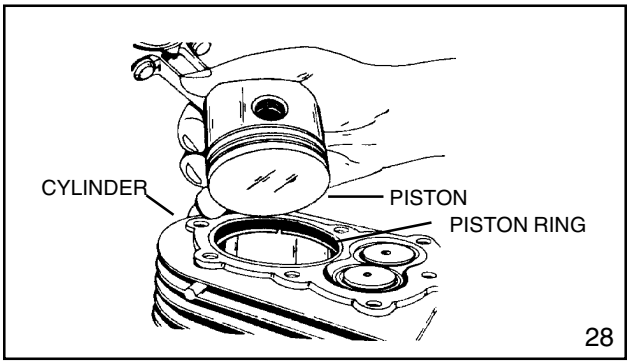


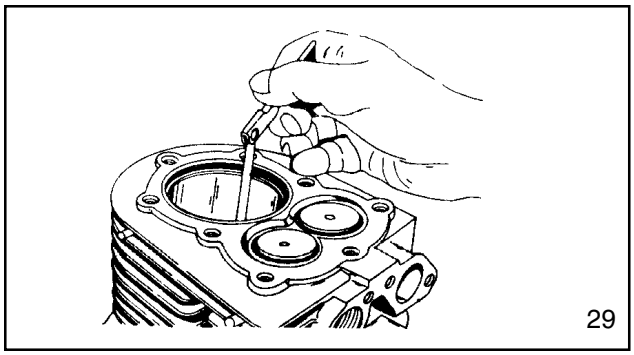
Piston Rings

After the cylinder bore diameter has been checked and is acceptable to rebuild, the ring end gap should be checked using new rings. Place a new compression ring squarely in the center of the ring travel area. Use the piston upside down to push the ring down (diag. 28) and measure the gap with a feeler gauge. The ring end gap must be within the specification to have adequate oil control (diag. 29). This procedure will assure correct piston ring end gap measurement. Ring side clearance should also be checked with a feeler gauge when using new rings with an old piston (diag. 30).

Replace the rings in sets and install the piston, rings, and rod assembly in the cylinder bore with the ring end gaps staggered. When installing new rings in a used cylinder, the cylinder wall should be de-glazed using a commercially available de-glazing tool or hone.

Use a ring expander to remove and replace the rings. Do not spread the rings too wide or breakage will result.



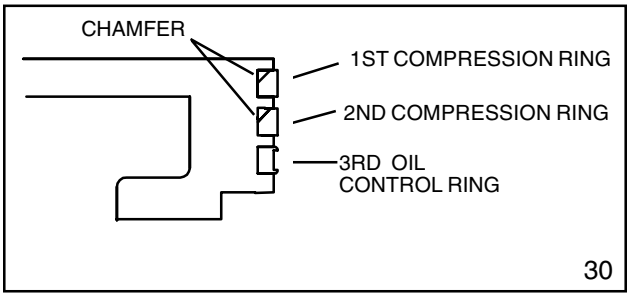


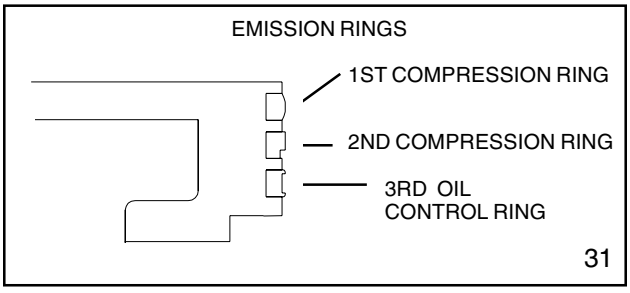
Piston Ring Orientation

If the top compression ring has an inside chamfer, this chamfer must face UP. The second compression ring will have either an inside chamfer or an outside notch. The rule to follow is an inside chamfer always faces up. An outside notch (diag. 31) will face down or towards the skirt of the piston.

The oil control ring can be installed with either side up. The expander (if equipped) end gap and the ring end gap should be staggered (diag. 31).

NOTE: Always stagger the ring end gaps on re-assembly.

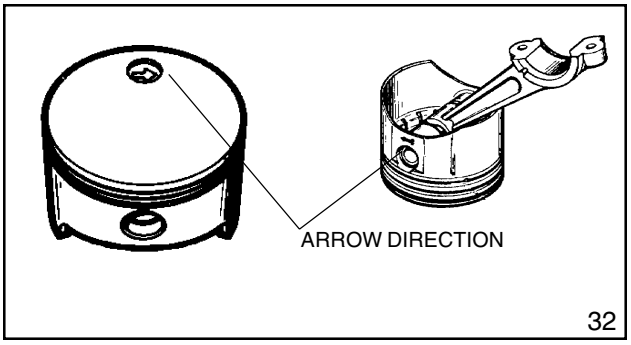




CONNECTING RODS

Some engine models have offset piston pins (not centered) to centralize the combustion force on the piston. When installing the connecting rod to the piston it is imperative that the rod be installed correctly. On engine models OVM, OHM, OHSK120 - 130, and OVXL, the piston will have an arrow stamped on the top of the piston. On OHV 13.5 - 17 engines, an arrow is found on the piston skirt. The arrow on the top of piston or on the piston skirt must point toward the push rods or the carburetor side of the engine when installing it in the cylinder. (diag. 32) If the piston does not have an arrow, the piston can be installed either direction on the connecting rod. **On all engine models, the match marks on the connecting rod and cap must align and face out when installing the piston assembly into the engine (diag. 33 & 34).**

On horizontal shaft engines, oil dippers are attached to the bottom connecting rod bolt. Some engines have the oil dipper cast in the rod cap. Consult the specification chart for the proper rod bolt torque when installing the cap. The rod bolts should be torqued in 50 inch pound (5.65 Nm) increments until the specified torque is achieved.



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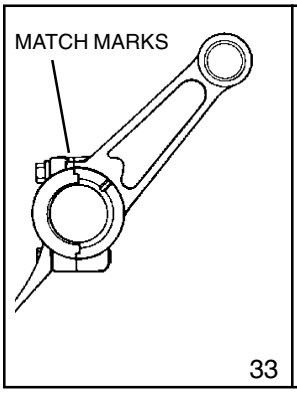

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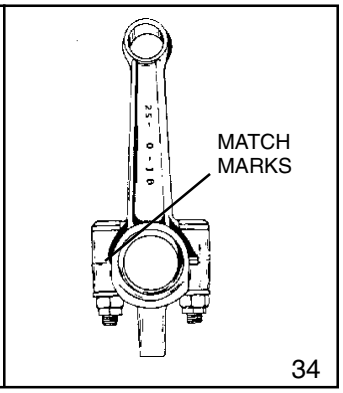


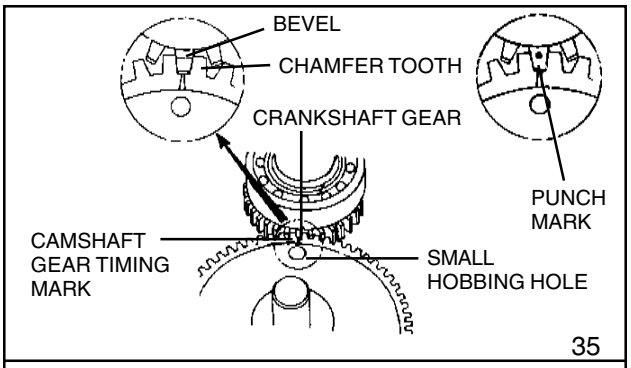
34

CRANKSHAFTS AND CAMSHAFTS

Inspect the crankshaft visually and with a micrometer for wear, scratching, scoring, or out of round condition at the bearing surfaces. Check for bends on the P.T.O. end using a straight edge, square or a dial indicator.

CAUTION: NEVER TRY TO STRAIGHTEN A BENT CRANKSHAFT.

The timing marks on the camshaft and the crankshaft gears must be aligned for proper valve timing. (diag. 35 & 36).



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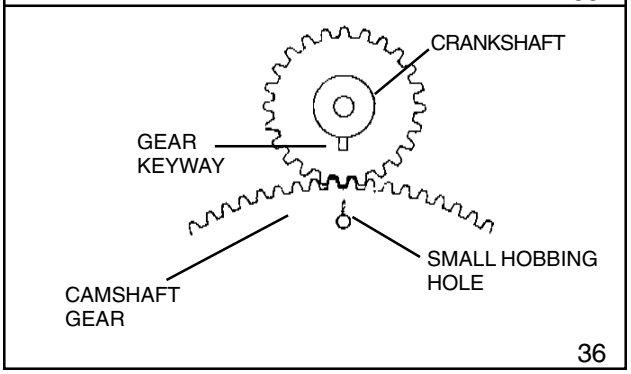

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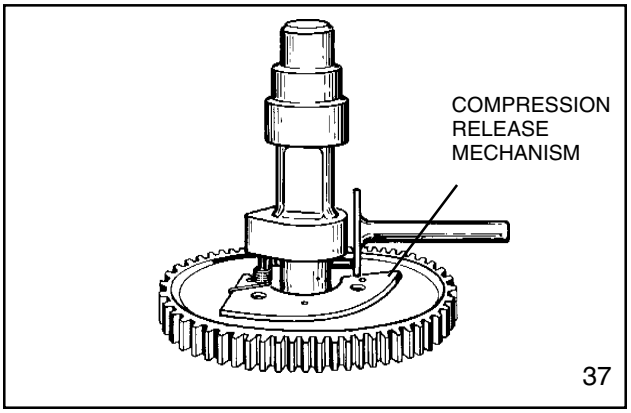
Camshafts

Check the camshaft bearing surfaces for wear using a micrometer. Inspect the cam lobes for scoring or excessive wear. If a damaged camshaft is replaced, the mating crankshaft and governor gear should also be replaced. If the crankshaft gear is pressed on it is not serviceable and the crankshaft must also be replaced.

Clean the camshaft with solvent and blow all parts and passages dry with compressed air, making sure that the pins and counterweights are operating freely and smoothly on mechanical compression relief types.

OHH and OHSK50 - 70 engines use serviceable MCR components and must be assembled as illustrated in "Assembly" with a thrust washer placed on the camshaft next to the compression release weight.

NOTE: Some OHH models used on chipper/ shredders may not require a compression release.



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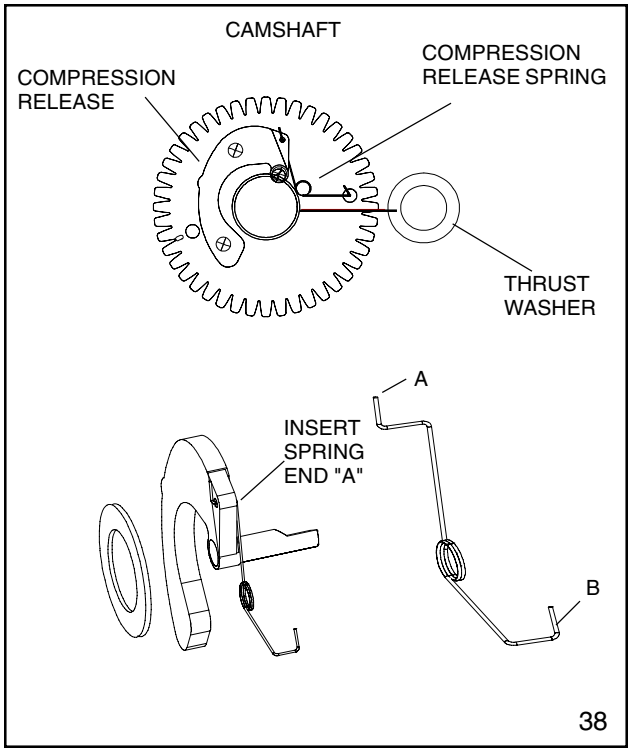
Mechanical Compression Release (MCR) camshafts have a pin located in the camshaft, that extends above the intake or exhaust cam lobe, to lift the valve to relieve the engine compression for easier cranking. When the engine starts, centrifugal force moves the weight outward and the pin will drop back down. The engine will now run at full compression (diag. 38).

Some OHH engines use a composite camshaft. This camshaft is used on OHH/OHSK 50-70 engines that have been manufactured after DOM (date of manufacture) 7048. This change that took place in February of 1997 and is basic on the OHH engines, except those units that use extended camshafts which will continue to use a cast iron camshaft. A camshaft kit replaces the old camshaft and includes compression release components and two light tension valve springs. It is **CRITICAL** that the new valve springs be installed or lobe damage will occur on the camshaft.

NOTE: You must install the thrust washer between the cover and cam to prevent wear.

Some OVRM engines use a ramp compression release (RCR) system that works with the intake valve. The ramp is located on the backside of the intake cam lobe. The ramp delays the intake valve closure, resulting in lower emissions and reduced compression for easier pull starting (diag. 39).



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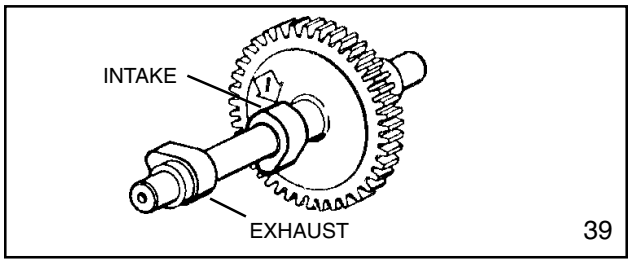

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Valve Seats

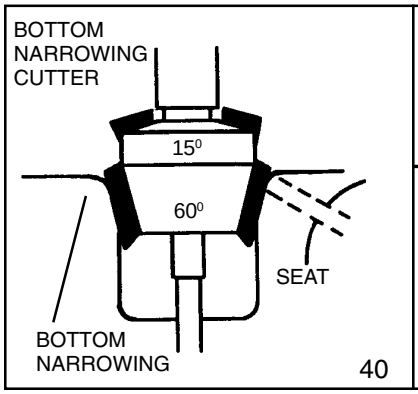
Valve seats are not replaceable. If they are burned, pitted, or distorted they can be regrounded using a grinding stone or a valve seat cutting tool. Valve seats are ground to an angle of 46 degrees to a width of 3/64" (1.91 mm).

The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different cutters. OVRM and OHH engines have a small combustion chamber and require the use of a special Neway cutter #103 for the 46 and 31 degree combination cutter. The 60 degree cutter is Neway cutter # 111. The tapered pilots required are; Neway # 100-1/4-1 for the .249" (6.325 mm) exhaust guide, and Neway #100-1/4 for the .250" (6.35 mm) intake guide. Consult the cutter's complete procedure guide for additional information.

First, use the 60 degree cutter to clean and narrow the seat from the bottom to the center (diag. 40).

Second, use the 31 degree cutter to clean and narrow the seat from the top toward the center (diag. 41).

Third, use the 46 degree cutter to cut the seat to a width of 3/64" (1.191 mm) (diag. 42). Check the contact area of a new or reconditioned valve face on a finished valve seat. Using fingers, snap the valve sharply against the corresponding valve seat and view the line imprinted on the valve face. The contact area or line should be continuous and appear on the upper 1/3 of the valve face. Re-cut the seat to move the contact area higher or lower if necessary and recheck the contact area.



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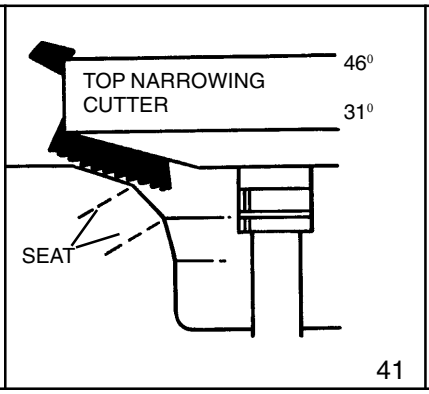

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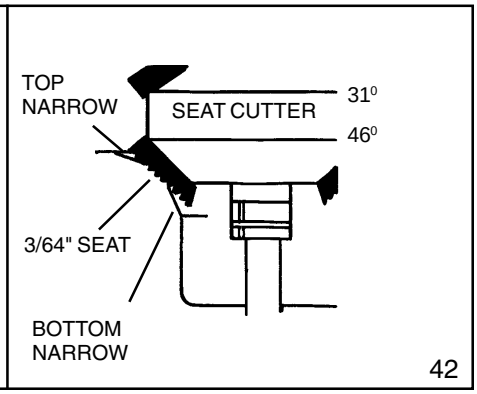

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VALVE LIFTERS

When removing the lifters, mark the lifters to install the lifter in the same position as it was removed from. The valve lifters may be slightly different lengths. Visually check the lifter for wear on the cam contact surface and push rod contact surface.

VALVE GUIDES

Engine models OVM, OHM, OHSK80 - 130, and OVXL have valve guides that can be reamed 1/32" (.794 mm) oversize or be replaced as service parts. All other overhead valve engines have valve guides that are permanently installed in the cylinder head. If the guides get worn excessively, they can be reamed oversize to accommodate a 1/32" (.794 mm) oversize valve stem.

The guides should be reamed oversize with a straight shanked hand reamer or low speed drill press. Refer to the "Table of Specifications" (Chapter 10) to determine the correct oversize dimension. Reamers are available through your local Tecumseh parts supplier. Consult the tool section in Chapter 11 for the correct part numbers.

The upper and lower valve spring caps must be redrilled to accommodate the oversize valve stems.

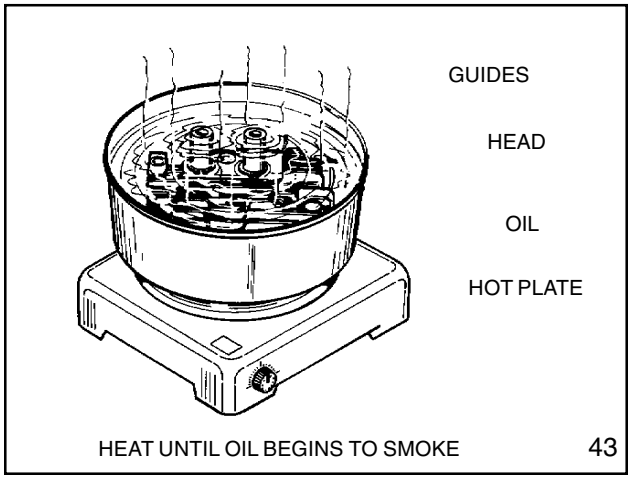
After oversizing the valve guides, the valve seats must be recut to align the valve seat to the valve guide.

VALVE GUIDE REMOVAL (WHERE APPLICABLE, CONSULT PARTS MANUAL)

1. Submerge the head in a container of oil so that both guides are completely covered with oil.
2. Heat the oil on a hot plate approximately 15-20 minutes until the oil begins to smoke. Oil temperature must be 375° - 400°F (190° - 204°C).

CAUTION : USE PROTECTION FOR EYES AND HANDS, BE CAREFUL ! THE HOT OIL AND HEAD CAN EASILY CAUSE BURNS.

3. Using a pliers, remove the head from pan of oil. Carefully drain the excess oil out of the head. Quickly work the next two steps while the head is hot to prevent pressing the guides out with the head too cool. Guides removed too cool will permanently damage the head by removing aluminum necessary to hold the new guides in place.



HEAT UNTIL OIL BEGINS TO SMOKE 43

4. Place the head on the bed of an arbor press on parallels with the snap rings on the long ends of the guides facing down.
5. Using a 1/2" (12.7 mm) diameter, 6" (15.24 cm) drift punch located in the center of the old valve guide, push the guide out of the head with the arbor press. Do not allow the drift punch to contact the head during this step.

VALVE GUIDE INSTALLATION

1. Install the snap rings on the new replacement valve guides. Place the valve guides in a freezer for an hour or longer to ease assembly.
2. Submerge the head in a container of oil so that the valve guide bores are completely covered with oil. Heat the container on a hot plate approximately 15-20 minutes until the oil begins to smoke. Oil temperature must be 375° - 400°F (190° - 204°C).

CAUTION : USE PROTECTION FOR EYES AND HANDS, BE CAREFUL ! THE HOT OIL AND HEAD CAN EASILY CAUSE BURNS.

3. Using a pliers, remove the head from pan of oil. Carefully drain the excess oil out of the head. Quickly work the next two steps while the head is hot to prevent damage to the guides or the head.
4. Place the head on a 6" x 12" (15.24 x 30.5 cm) piece of wood with the head gasket surface down.
5. Insert the new guides in the head with the long end of the guides up. It may be necessary to use a rubber or rawhide mallet to fully seat the new guide to the snap ring.

   NOTE: DO NOT USE A STEEL HAMMER TO SEAT THE NEW GUIDE, GUIDE OR HEAD DAMAGE WILL RESULT.
6. Allow the head to cool and re-cut both valve seats using a Neway cutter to align the new guides to the valve seats.

CRANKCASE BREATHERS

The breather element and case can be cleaned using cleaning solvent. Make sure the small drain hole or holes are clean and installed down to allow return of oil back into the crankcase.

Top Mounted Breather

This type of breather is mounted in the top and rear of the cylinder block in vertical shaft engines. The umbrella check valve allows positive pressure to be vented through the element and out the tube. Most engines have the breather tube connected to the air cleaner assembly (diag. 44).

Late production OVRM engines use the rubber boot and breather tube as a "pop in" design. Mark or note the location of the breather tube. Use a large flat blade screwdriver to pry the boot up and lift the breather assembly out. Be careful not to drop the breather body out of the rubber boot when removing (diag. 45).

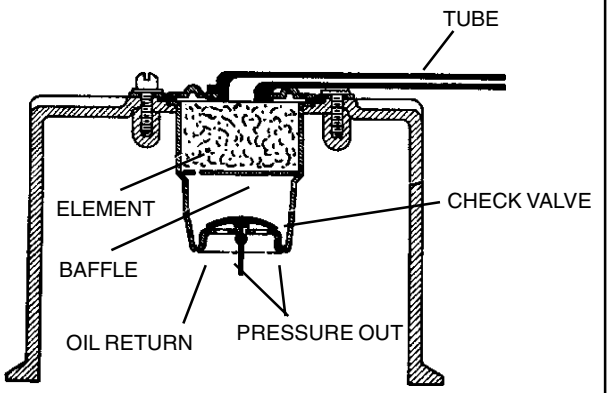
A new breather tube boot is recommended for replacement to assure proper crankcase seal. Apply engine oil to the breather tube boot and push the breather in until the top shoulder of the boot contacts the crankcase.

OHH engines use an umbrella valve type breather that is found in the rocker arm cover. Use solvent and compressed air to clean the area if necessary. Individual components are serviced only by the replacement of the complete cover.

Side Mounted Breather

This type of breather mounts over the valve compartment and uses a reed style check valve. Clean the internal element or reed area with solvent and compressed air if necessary. When installing, the drain holes must be open and be on the bottom.

On OHV13.5 - 17 engines, align the reed valve and plate parallel to the top surface of the breather opening in the crankcase. If the plate has a notched corner, install the notch toward the P.T.O. side of the engine. If the plate is marked, install the plate with the mark facing out. Hold the reed valve and plate in this position while tightening the screw.



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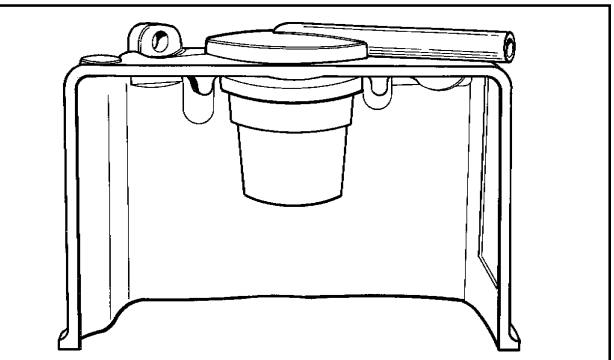
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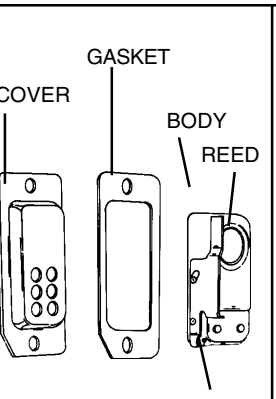

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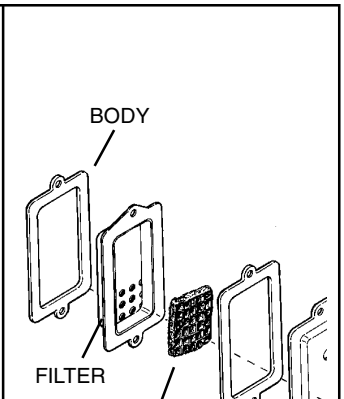

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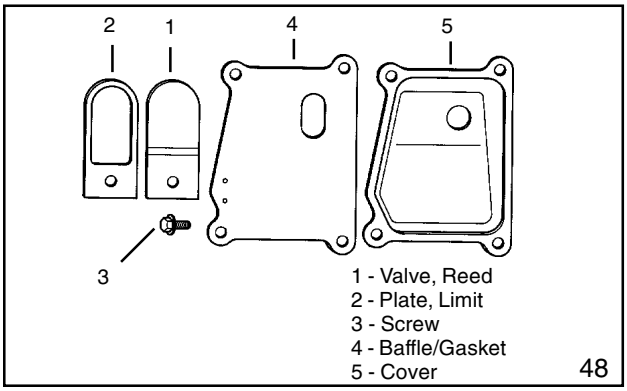

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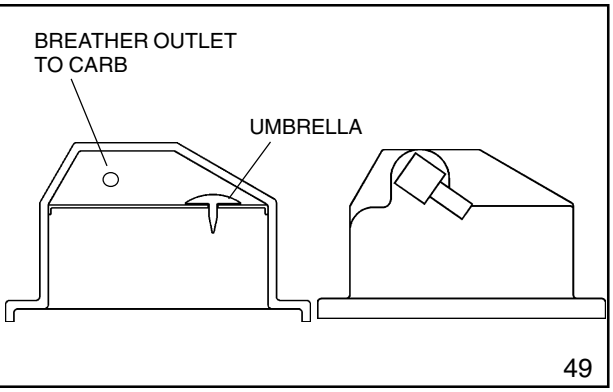

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CYLINDER COVER, OIL SEAL, AND BEARING SERVICE

The following procedures, except oil seal replacement, require the engine to be disassembled. See "Engine Disassembly Procedure" in this chapter.

Cylinder Cover

Clean and inspect the cover, looking for wear and scoring of the bearing surfaces. Measure the bearing surface diameters using a micrometer and check the specifications for worn or damaged parts. Replace as necessary.

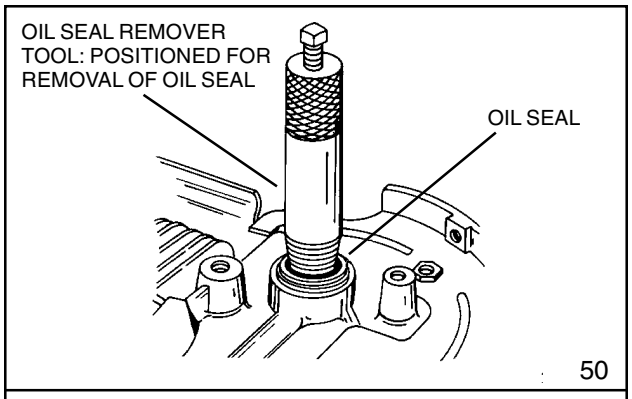
When reinstalling the cover, apply a drop of Loctite 242 to the cover screw threads and torque the cover screws to the recommended specification. Always use new gaskets and new oil seals installed using seal protectors after the cover is removed.

Oil Seal Service

NOTE: BEFORE REMOVING THE OIL SEAL, CHECK TO SEE IF THE SEAL IS RAISED OR RECESSED. WHEN INSTALLING A NEW OIL SEAL, TAP IT INTO POSITION GENTLY UNTIL IT IS SEATED INTO ITS BOSS. SOME SEALS ARE NOT POSITIONED FLUSH TO THE CYLINDER COVER. ATTEMPTING TO INSTALL THE SEAL TOO FAR IN CAN CAUSE DAMAGE TO THE OIL SEAL AND ENGINE.

If the crankshaft is removed from the engine, remove the old oil seals by tapping them out with a screwdriver or punch from the inside. If the crankshaft is in place, remove the seal by using the proper oil seal puller (diag. 50).

Select the proper seal protector and driver from the tool list in Chapter 11 to install a new oil seal. Place the oil seal over the protector and place it over the crankshaft. Drive the seal into position using the universal driver part no. 670272. The seal protector will insure that the seal is driven in to the proper depth (diag. 51).



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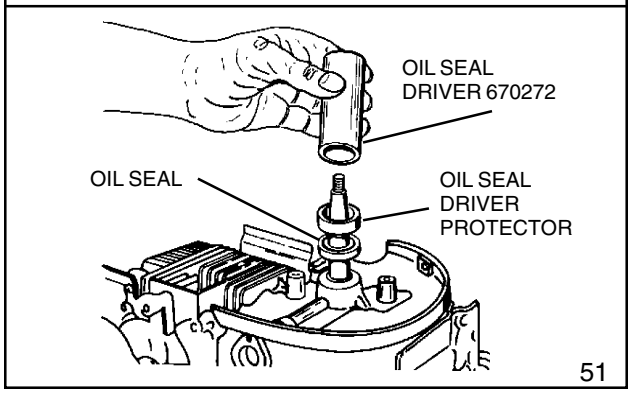

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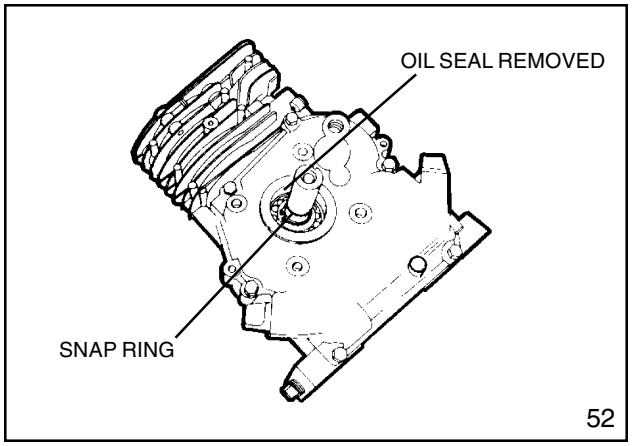
CRANKSHAFT BEARING SERVICE

Ball Bearing Service

Remove the two bearing retainer screws and washers. Remove the ball bearing in the cylinder cover by pressing the bearing from the outside of the cover toward the inside using an arbor press.

Install a new ball bearing by pressing the bearing from the inside of the cover toward the outside until the bearing contacts the shoulder. Install the two bearing retainer screws with washers and tighten to 45 in. lbs. (5.0 Nm) of torque.



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SERVICE BUSHING

We are supplying this bushing for service repair. After the bushing has been installed, it requires line reaming to the proper size.

Following the chart below, have a reputable machine shop do this work for you.

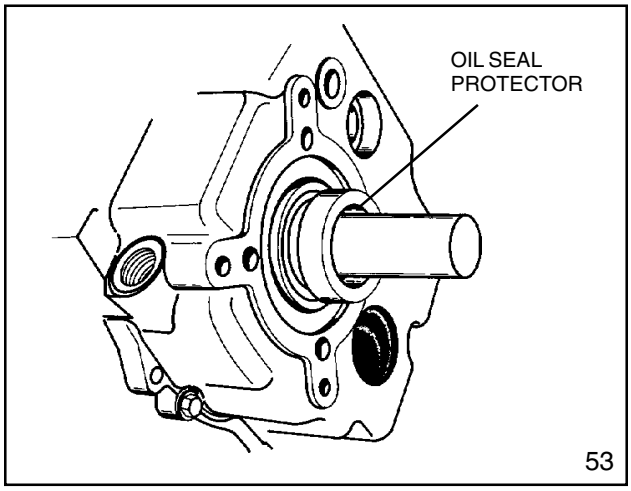
BUSHING SIZE CHART

BUSHING SERVICE PART NUMBER	FINISHED REAM BORE DIAMETER
30979	.8755 - .8760" (22.226 - 22.250 mm)
31461	1.0000 - 1.0005" (25.4 - 25.413 mm)
31462	1.0000 - 1.0005" (25.4 - 25.413 mm)
31546	1.0000 - 1.0005" (25.4 - 25.413 mm)
33368	1.1880 - 1.1890" (30.175 - 30.2 mm)
34836	1.0005 - 1.0010" (25.413 - 25.425 mm)
34837	1.0005 - 1.0010" (25.413 - 25.425 mm)
35377	1.3765 - 1.3770" (34.950 - 34.976 mm)
35400	1.3765 - 1.3770" (34.950 - 34.976 mm)

ENGINE ASSEMBLY

The following procedures apply to most engine models. Actual procedure may vary.

1. Use new gaskets and seals at all locations. Clean all internal engine parts with solvent and blow dry with compressed air or allow to dry.
2. Using the correct seal protector (see Chapter 11 under "Tools"), apply engine oil to the crankshaft bearing surfaces and insert the tapered end of the crankshaft in the crankcase. Slide the crankshaft in until it bottoms.
3. Apply engine oil to the piston skirt, rings, connecting rod bearing surface, and the cylinder bore. Using a band type ring compressor, stagger the ring end gaps, compress the rings, and push the piston assembly into the cylinder with the match marks on the connecting rod facing out of the crankcase and the arrow on the top of piston or on the piston skirt pointing toward the push rod location or the carburetor side of the engine if applicable. Push the piston assembly in until the rod is positioned on the crankshaft rod journal surface.
4. Align the match marks on the rod cap and rod, install the rod cap bolts and dipper if applicable and tighten the bolts in equal increments to the specified torque.



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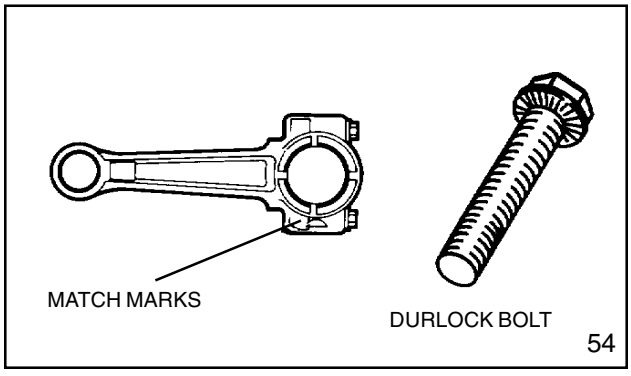

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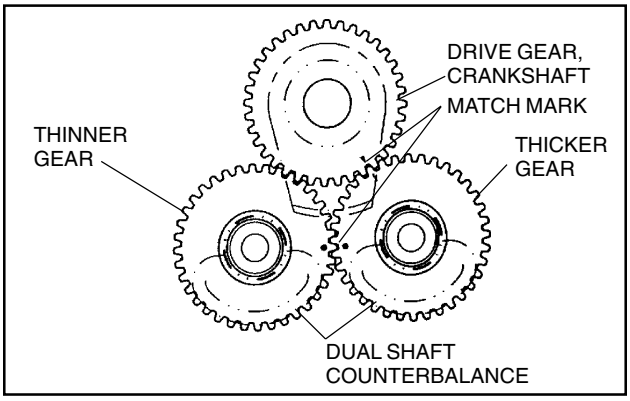
5. Assemble the compression release components to the camshaft on engine models OHH and OHSK50-70. Install spring end "A" through the release from the pin side, insert spring end "B" through the camshaft gear, and slide the release pin in the small hole near the center of the cam gear. Assemble the thrust washer on the camshaft next to the compression release. (diag. 55)

   NOTE: Some OHH models used on chipper/shredders may not require compression release mechanisms.

6. Some OHV11 - 17 engines come equipped with a spin on oil filtration system. If the engine is not equipped with a filter, one may be added IF THE SUMP HAS AN OIL PASSAGE COVER. The kit part number 36435A should be ordered to upgrade the engine if desired.

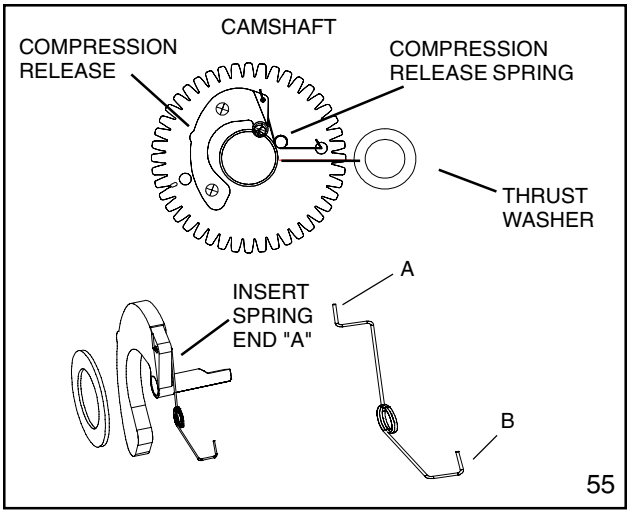
7. Install the lifters, camshaft, barrel and plunger style oil pump (chamfered side toward the gear) if applicable, ultra-balance shaft or dual balance shafts if applicable. Align the timing mark or notched tooth on the crankshaft gear to the mark or hole in the camshaft gear. If equipped, time the Ultra-balance® with the piston at Top Dead Center (T.D.C.). Slide the drive gear over the keyway in crankshaft while aligning the timing marks on the gears.



a. **Dual Balance Shaft**

   Time the dual shaft counterbalance system with the piston at T.D.C. Install the counterbalance with the thicker gear in the far right boss in the crankcase and the other counterbalance shaft with the thinner gear in the far left boss while aligning the timing marks. Slide the drive gear over the keyway in the crankshaft while aligning the timing mark with the thicker counterbalance gear.

   NOTE: Engines equipped with rotary oil pumps must have the drive shaft and pump assembled after the sump cover is installed.



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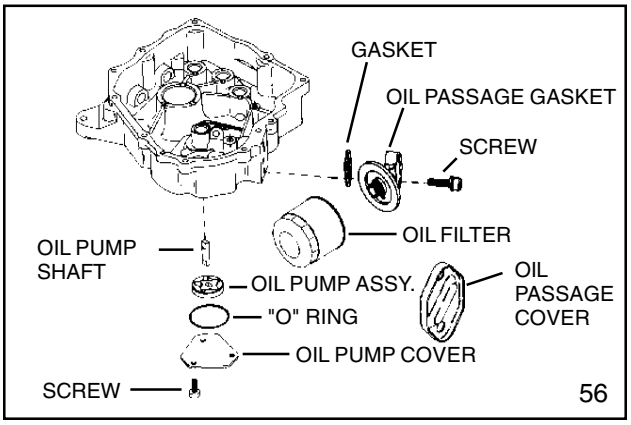

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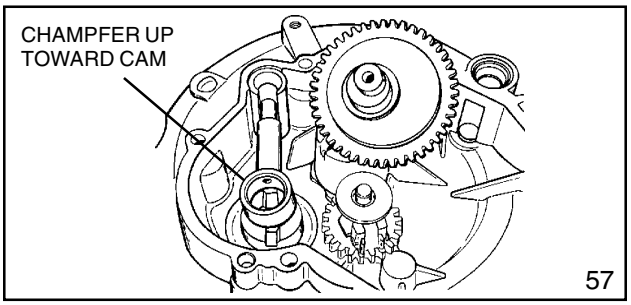

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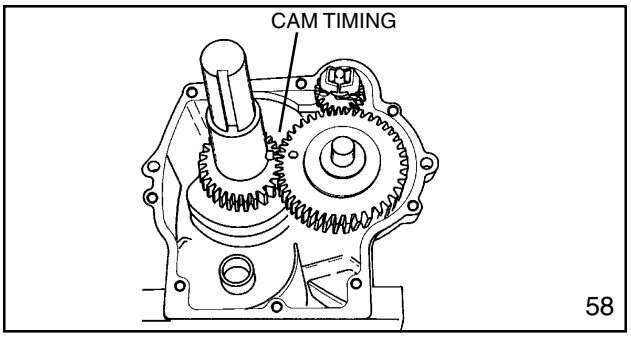

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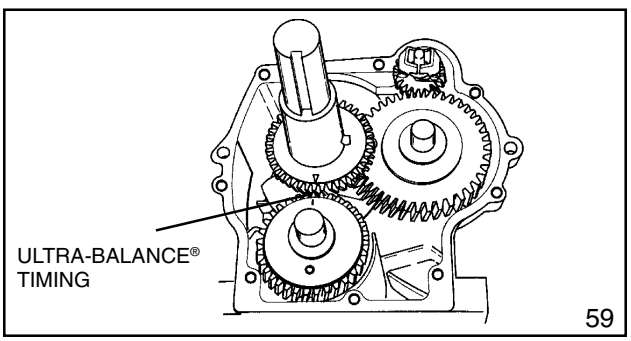

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8. Mount the cylinder cover or flange with the governor gear assembly installed to the crankcase using dowel pins to position the cover and a new gasket. Install the cover down onto the crankcase and slightly rotate the crankshaft to allow the governor gear to mesh. Do not force. Apply a drop of blue Loctite 242 to the cover screw threads and tighten to the specified torque.

   On engines with ball bearings in the cover, install a thrust washer (if applicable) over the crankshaft, followed by the retaining ring.

   On OHV 13.5 -17 engines, install the oil pump drive shaft into the slot in the end of the camshaft. Apply engine oil and install the oil pump ring and rotor, followed by a new "O" ring and the pump cover. Tighten the screws to 50-70 inch pounds (5.5 - 8 Nm) torque.

9. Install the breather assembly.

10. Rotate the crankshaft to place the piston at Top Dead Center (TDC) on the compression stroke.

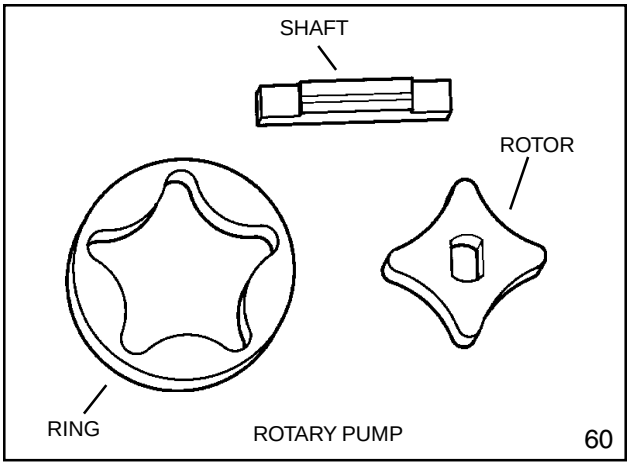
    NOTE: Always cut the valve seats, never only lap the seats.

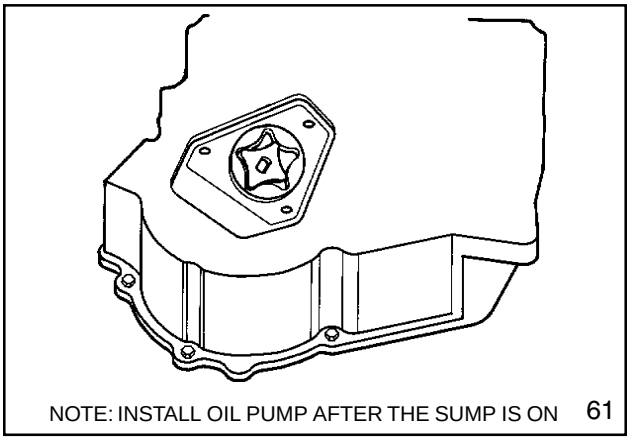
11. Pre-assemble the valves and spring assemblies into the cylinder head on all engine models **EXCEPT** OHM, OHSK80-130, OVM, OVXL (diag. 65 on page 79). Use a small block to support the valves tight to their seats while placing the head on a flat surface. For models OHH and OVRM, install the springs (dampening coils toward the head) and retainers on the valves and use fingers to compress the springs until the notch in the retainer is located in the notch in the valve stem. Repeat the procedure for other valve.

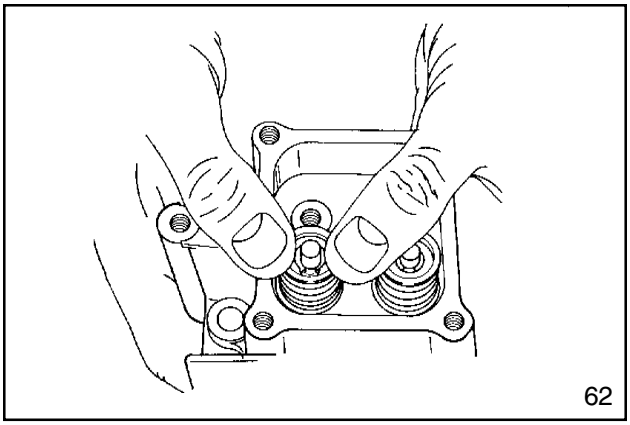
    For OHV models, place the springs (dampening coils toward the head) over the valve guide and place the valve caps on the springs with the larger opening away from the springs. Use spring compressor tool part # 670315A installed on a rocker arm stud, and either turn the stud in or secure with a locking nut as shown so about 1-1/2" (38.1 mm) of the stud is exposed. Compress the spring and install the valve retainers to lock the valve to the valve cap. Repeat the procedure for other valve.

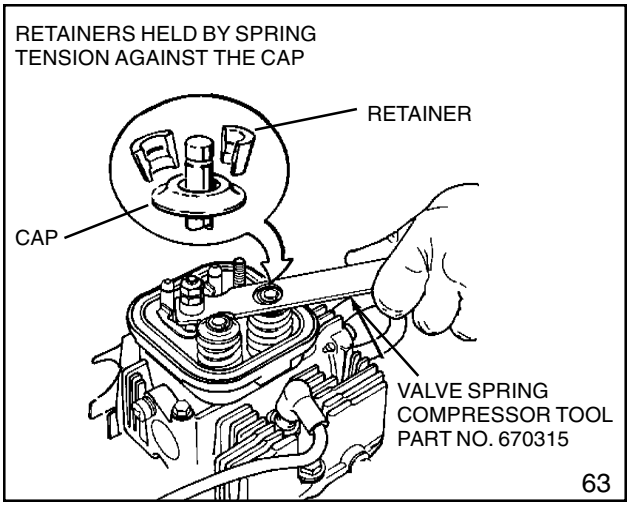
    Install the cylinder head using a new head gasket. On OHV 11-13 models, place the push rods in the block before installing the head and head gasket. Tighten the head bolts in the numbered sequence using 60 inch pound (6.8 Nm) increments to the specified torque.

    NOTE: Tecumseh strongly recommends you order a complete seal kit. Replace all "O" ring and gaskets in kit.









12. **STEPS 12A -12G APPLY ONLY TO EARLY PRODUCTION ENGINE MODELS OHM, OHSK120, OVM AND OVXL.** CONTINUE WITH STEP 13 FOR CURRENT PRODUCTION MODELS.

a. Install the push rods with the cupped ends of the rods placed on top of the lifters. Visually check correct placement through the valve box opening. Use lubricated new "O" ring seals for both ends of the push rod tubes and install the push rod tubes in the crankcase.

b. Install the valves into the head, and using a new head gasket, place the head on the cylinder block. Tighten the head bolts in the numbered sequence using 60 inch pound (6.8 Nm) increments to the specified torque.

c. Install the rocker arm housing, push rod guide plate with the legs facing up, new rocker arm studs with "O" rings under the guide plate. Install the valve box to head retaining screw using a flat washer and a new "O" ring. Tighten the screw and the studs to the specified torque.

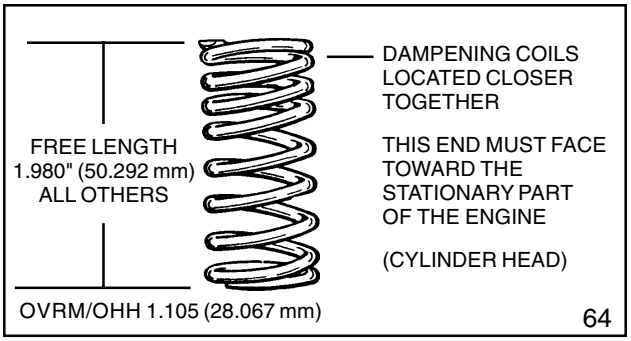
d. Lift each valve up until it contacts the seat and hold the valve in this position. Use a 12 inch (30.5 cm) piece of fuel line and wedge one end on each side of the valve stem through the port opening to hold the valve.

e. Bolt the valve spring compressor tool part # 670315A on a rocker arm stud using the rocker arm bearing and locking nut (diag. 66).

f. Install the new o-rings (white o-ring on the exhaust guide) followed by valve spring caps, valve springs with the dampening coils toward the head, (diag. 64) and valve spring retainers with the larger opening away from the engine.

g. Compress the valve spring with the tool and insert the two retainers into the keeper so the inside ridge of the retainer locks into the valve stem groove. Repeat the procedure for the other valve (diag. 66).

NOTE: TORQUE THE CYLINDER HEAD FOLLOWING THE SEQUENCE ON PAGE 69.



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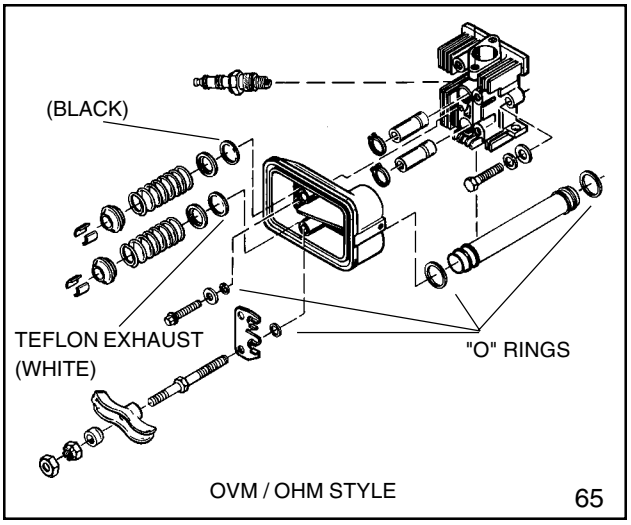

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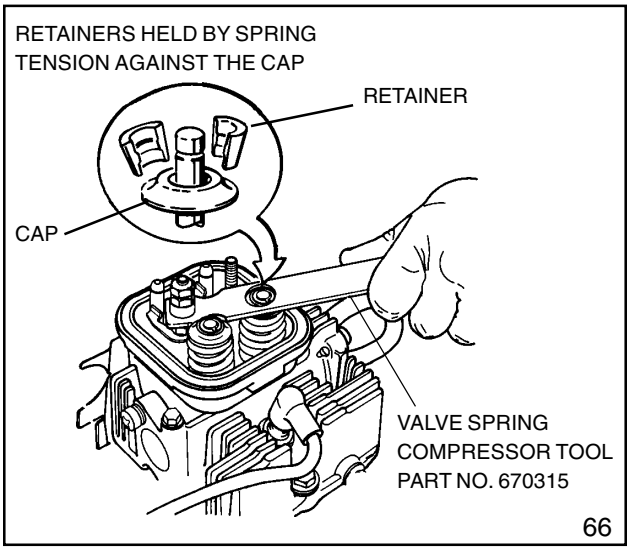

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13. On engine models OHH and OVRM, install the push rods on the lifters, and rocker arms and lock nuts on the rocker arm pivot screws. Fasten the screw to the head with the push rod guide plate tabs facing up. Turn the screws in until slight play exists between the valve stem and rocker arm.

    On OHM, OHSK120, OVM, and OVXL models, install the rocker arms, rocker arm bearings, and new rocker arm adjusting nuts on the studs. Tighten the adjusting nut until slight play exists.

    On OHV 11-13, OHSK80-130, OHV110-145 models, install the push rods on the lifters, place the rocker arms on the rocker arm screws followed by the locking nut, washer, and push rod guide plate (with the tabs up). Turn the screws in until slight play exists between the valve stem and rocker arm.

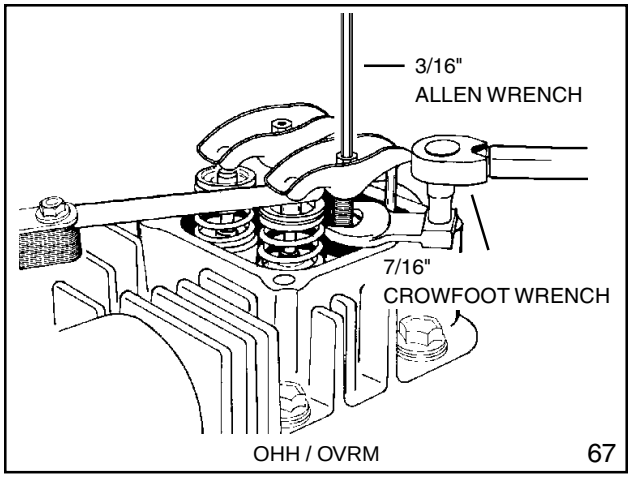
    On OHV13.5 -17 models, install the guide plate with the rocker arm studs and torque to 190 in. lbs. (21.5 Nm). Insert the push rods in the lifter sockets with the longer steel end toward the rocker arms. Place the rocker arms onto the studs with the socket end toward the push rod and thread the rocker arm bearings on until excessive play is removed.

14. Set the valve lash with the engine cold, the piston at T.D.C., and both valves closed. Insert the specified feeler gauge between the rocker arm and valve stem. Adjust until a slight sliding drag is felt.

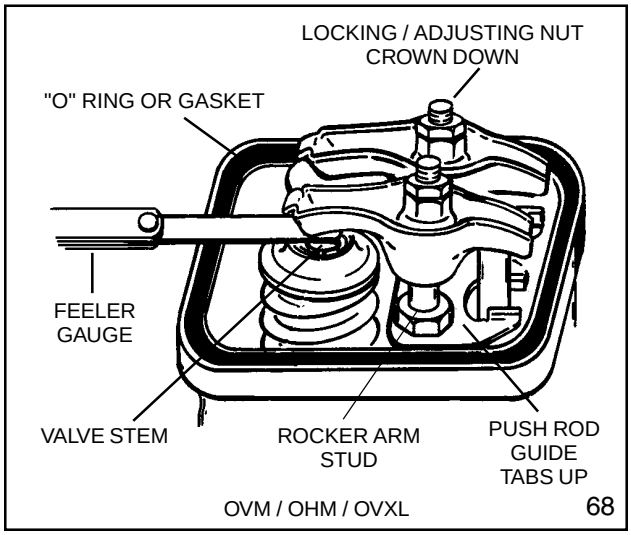
    On models OHH and OVRM, lock this position by holding an 3/16" Allen wrench on the pivot ball screw while tightening the lock nut to 120 in. lbs. (13.5 Nm) of torque. A 7/16" crowfoot will be needed to torque the lock nut. Rotate the crankshaft at least one full turn to check push rod movement and valve lash (diag. 67).

    On models OVM, OHM, OHSK120 and OVXL, with a 1/2" crowfoot, tighten down the rocker arm studs to 190 in. lbs. (21.5 Nm). Adjust the rocker arm hex nut with a 1/2" wrench to set the correct valve lash and tighten the locking jam nut to 18 in. lbs. (2 Nm). Rotate the crankshaft at least one full turn to check push rod movement and valve lash (diag. 68).

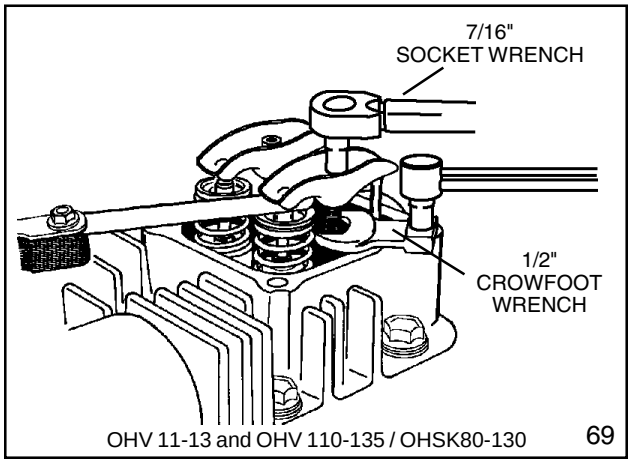
    On models OHV 11-13, OHSK80-130, OHV110-145, hold the rocker arm pivot bearing using a 7/16" wrench or socket while using a 1/2" crowfoot to tighten the lock nut to 120 in. lbs (13.5 Nm) of torque. Rotate the crankshaft at least one full turn to check push rod movement and valve lash (diag. 69).



OHH / OVRM 67



OVM / OHM / OVXL 68

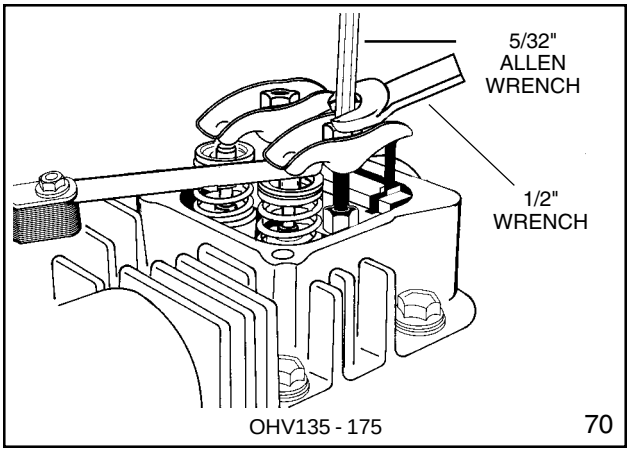


OHV 11-13 and OHV 110-135 / OHSK80-130 69

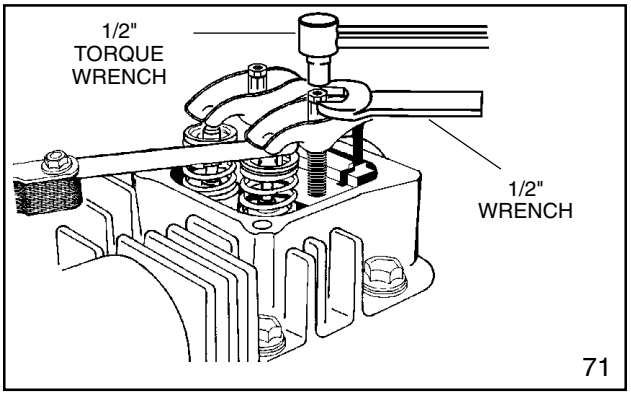
On models OHV 135 - 175 hold a 1/2" wrench on the rocker arm bearing while tightening the 5/32" Allen head set screw to 75 in. lbs. (8.5 Nm) of torque. Rotate the crankshaft at least one full turn to check push rod movement and valve lash (diag. 70).

Current production models OHV135 - 175 use a 1/2" wrench to tighten the rocker arm bearing to the correct valve lash. Once adjusted use a 1/2" socket and torque the jam nut to 130 inch pound (14.7 Nm). Rotate the crankshaft one full turn to check push rod movement and correct valve lash (diag. 71).

15. Install the rocker arm cover using a new gasket or o-ring and tighten the screws to the specified torque. Connect the breather hose to the valve cover fitting on model OHH.
16. Attach the backing plates or baffles. Attach the governor arm lever if removed.
17. Attach the alternator coil if applicable and route the wires away from the flywheel area.
18. Install the flywheel spacer if applicable, flywheel key, flywheel, starter cup (if applicable), bevelled washer (concave surface in), and flywheel nut. Use strap wrench part # 670305 to hold the flywheel and tighten the nut to the specified torque.
19. Install the ignition module using a part # 670297 .0125" (.3175 mm) air gap tool between the flywheel magnets and the laminations of the module (diag. 72). Tighten the mounting screws, remove the tool, and check for contact while rotating the flywheel. None should be found. Attach the ignition ground lead to the module terminal.
20. Install the blower housing on all engines with the speed control mounted on the blower housing or engine block, and attach the ignition groundout lead at the control if applicable.
21. Install the intake pipe, speed control, carburetor, and air cleaner assembly while hooking the throttle and governor linkage. Install the blower housing on all engines with intake pipe mounted speed control brackets. Check the governor and speed control hook-up and adjustment - see Chapter 4 under "Service".



OHV135 - 175 70



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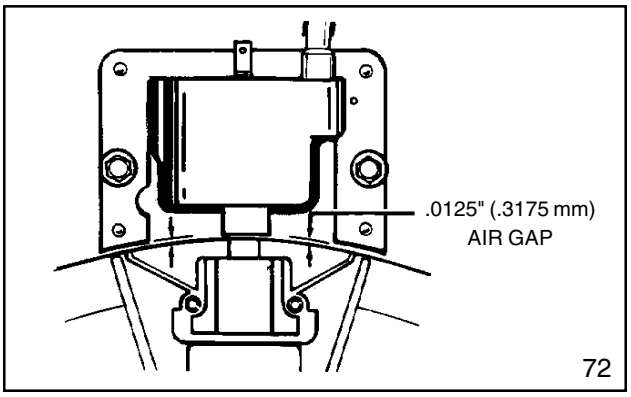

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22. Attach the fuel tank (if applicable) using bolts or wedging the tank in the blower housing slots provided. Attach the fuel line and secure with clamps.

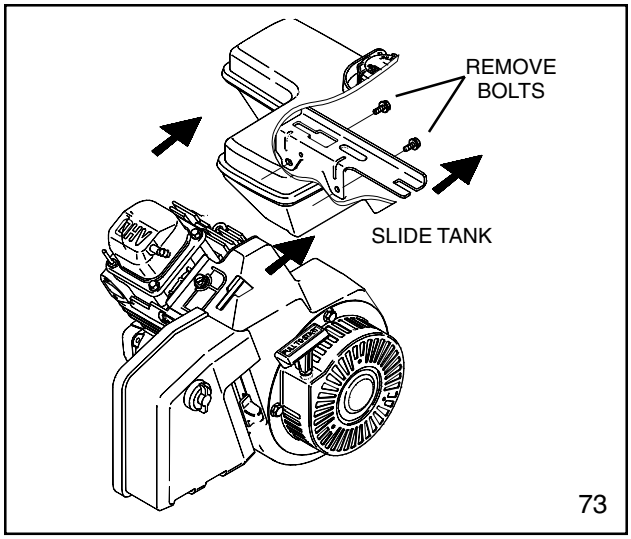
23. Slide the fuel line on the carburetor fitting and secure with a clamp. Slide the breather tube on the carburetor or air cleaner fitting if applicable.

    NOTE: If the tank is supplied by the O.E.M. replace the fuel filter. Tecumseh's tanks have a fuel filter in the tank and service is not necessary.

24. Fill the engine with oil to the full mark on the dipstick. Add fresh fuel to the fuel tank and secure the cap.

25. Install the spark plug and high tension lead. Mount the engine to the equipment and connect wiring and control cables. OVRM rotary mower engines require the blade to be secured to the blade hub adapter and crankshaft before attempting to start the engine.

26. Start the engine and allow it to run approximately five minutes to reach operating temperature. Optimize the carburetor if adjustable, verify top no load and idle RPM settings.



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CHAPTER 10

ENGINE SPECIFICATIONS AND

SEARS CRAFTSMAN CROSS-REFERENCE

The engine specifications listed on the following pages include tolerances that are considered acceptable to achieve normal engine operation. Observed values inside the listed tolerance range are satisfactory and require no adjustments.

OVERHEAD VALVE SEARS CRAFTSMAN CROSS REFERENCE

Craftsman	Tecumseh
143.366012	OVM120-200004
143.366072	OVM120-200006
143.366202	OVM120-200012
143.366212	OVM120-200014A
143.366232	OVM120-200015A
143.376012	OVM120-200017A
143.376032	OVM120-200012A
143.376072	OVM120-200006A
143.376082	OVM120-200018A
143.384132	OVRM905-42002
143.384142	OVRM905-42003
143.384152	OVRM905-42001
143.384162	OVRM905-42004
143.384182	OVRM905-42005
143.384192	OVRM905-42006
143.386012	OVM120-200020B
143.386032	OVM120-200006B
143.386092	OVM120-200014B
143.386102	OVM120-200018B
143.386152	OVM120-200015B
143.386162	OVM120-200022A
143.394092	OVRM905-42008
143.394102	OVRM905-42010
143.394112	OVRM905-42011
143.394192	OVRM905-42007
143.394202	OVRM905-42009
143.394212	OVRM905-42012
143.396012	OVXL120-202031C
143.396032	OVXL120-202036C
143.396062	OVXL120-202034C
143.396072	OVXL120-202035C
143.396092	OVM120-200023C
143.396112	OVXL120-202039C
143.396132	OVXL120-202040C
143.404112	OVRM50-52901
143.406012	OVXL120-202040D
143.406052	OVXL120-202034D
143.406062	OVXL120-202035D
143.406072	OVXL120-202047D
143.406132	OVXL120-202039D
143.406142	OVXL120-202049D
143.406152	OVXL120-202050D
143.406162	OVXL125-202051D
143.414432	OVRM50-52901A
143.416012	OVXL120-202056D
143.416042	OVXL125-202401
143.416082	OVXL125-202403
143.426092	OVXL120-202063E
143.426112	OVXL120-202062E
143.426122	OVXL125-202064E
143.426142	OVXL120-202034E
143.426152	OVXL120-202039E
143.426172	OVXL125-202067E
143.436032	OHV125-203013A
143.436042	OHV125-203012A
143.436092	OHV125-203015A
143.436102	OHV125-203018A
143.436132	OHV125-203020A
143.436152	OHV125-203023A
143.796112	OHSK120-222005
143.806062	OHSK120-222005A
143.816042	OHSK120-222007B
143.836052	OHSK120-222015C
143.941200	OHV125-203023B
143.941201	OHSK120-222015D
143.951600	OHV165-204402B
143.951602	OHV165-204403B
143.951602	OHV165-204403B
143.955003	OHH50-68001A
143.955007	OHH50-68004A
143.961201	OHSK120-222026E
143.965007	OHH50-68001B
143.965009	OHH50-68036B
143.965011	OHH50-68044B
143.965013	OHH50-68004B
143.965015	OHH50-68060B
143.965017	OHH50-68060C
143.965019	OHH50-68044C
143.965021	OHH50-68036C
143.965023	OHH50-68004C
143.965501	OHH55-69020A
143.965503	OHH55-69020B
143.971200	OHV125-203023C
143.971201	OHSK120-222026F
143.971300	OHV135-206901A
143.975003	OHH50-68044D
143.975005	OHH50-68004D
143.975009	OHH50-68113D
143.975501	OHSK55-69507A
143.975503	OHSK55-69509A
143.976001	OHH60-71101A
143.981200	OHV125-203023D
143.981201	OHSK120-223609A
143.985001	OHH50-68036F
143.985005	OHH50-68113F
143.985501	OHH55-69020E
143.985503	OHSK55-69514B
143.985505	OHSK55-69514C
143.986001	OHH60-71101C
143.986003	OHH60-71116C
143.986702	OVRM65-22016B
143.986704	OVRM65-22017B
143.986714	OVRM65-22020B
143.986716	OVRM65-22026B
143.986718	OVRM65-22029B
143.991200	OHV125-203050D
143.991201	OHSK125-223701A
143.991203	OHSK125-223702A
143.991300	OHV13-203211B
143.995007	OHH50-68004F
143.996001	OHH60-71138C
143.996005	OHH60-71140C
143.996007	OHH60-71146C
143.996009	OHH60-71167C
143.996501	OHSK65-71901A
143.996503	OHSK65-71902A
143.996505	OHH65-71702A
143.996507	OHH65-71704A
143.996702	OVRM105-21024E

ENGINE SPECIFICATIONS

Specifications	OVRM40		OVRM50-6.75 OVRM105		OVRM120		OHH50 OHSK50	
	Standard English	Metric mm	Standard English	Metric mm	Standard English	Metric mm	Standard English	Metric mm
Displacement (in^2) (cc)	9.06	148.50	10.49 Note (A)	171.93 Note (A)	11.9 Note (A)	195.04 Note (A)	10.49	171.93
Stroke	1.844	46.838	1.938	49.225	1.938	49.225	1.938	49.225
Bore	2.500 2.501	63.500 63.525	2.625 2.626 Note (B)	66.675 66.700 Note (B)	2.795 2.796 Note (B)	70.993 71.018 Note (B)	2.625 2.626	66.675 66.700
Ignition Module Air Gap	.0125	.3175	.0125	.3175	.0125	.3175	.0125	.3175
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762
Valve Clearance In./Ex.	.004 .004	.1016 .1016	.004 .004	.1016 .1016	.004 .004	.1016 .1016	.004 .004	.1016 .1016
Valve Seat Angle	46^0		46^0		46^0		46^0	
Valve Seat Width	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143
Valve Guide Oversize Dimension	INT. EX. .2807 .2787 .2817 .2797	INT. EX. 7.130 7.079 7.155 7.104	INT. EX. .2807 ..2787 .2817 .2797	INT. EX. 7.130 .7.079 7.155 7.104	INT. EX. .2807 ..2787 .2817 .2797	INT. EX. 7.130 .7.079 7.155 7.104	.2807 .2817	7.135 7.155
Crankshaft End Play	.006 .027 Note (C)	.1524 .6858 Note (C)	.006 .027 Note (C)	.1524 .6858 Note (C)	.006 .027 Note (C)	.1524 .6858 Note (C)	.006 .027 Note (C)	.1524 .6858 Note (C)
Crankpin Journal Dia.	.8610 .8615	31.869 21.882	.9995 1.000	25.362 25.400	.9995 1.000	25.362 25.400	.9995 1.000	25.362 25.400
Crankshaft Dia. Flywheel End Main Brg.	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375	.9985 .9990	25.362 25.375
Crankshaft Dia. P.T.O. Main Brg.	.9985 .9990	25.362 25.375	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	.9985 .9990	25.362 25.375
Conn. Rod Dia. Crank Brg.	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Camshaft Bearing Diameter	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4975 .4980	12.637 12.649	.4970 .4975	12.624 12.637
Piston Dia. Bottom of Skirt	2.4950 2.4520	63.373 63.378	2.6204 2.6220	66.558 66.599	2.6204 2.6220	66.558 66.599	2.6204 2.6220	66.558 66.599
Ring Groove Side Clearance 1st & 2nd Comp.	.0020 .0050	.051 .127	.0020 .0050	.051 .127	.0020 .0050	.051 .127	.0020 .0050	.051 .127
Ring Groove Side Clearance Bottom Oil	.0050 .0035	.013 .089	.0050 .0035	.013 .089	.0050 .0035	.013 .089	.0050 .0035	.013 .089
Piston Skirt to Cylinder Clearance	.0040 .0058	.102 .147	.0030 .0056	.076 .142	.0030 .0056	.076 .142	.0030 .0056	.076 .142
Ring End Gap	.010 .020	.254 .508	.010 .020	.254 .508	.010 .020	.254 .508	.007 .017	.178 .432
Cylinder Main Bearing Diameter	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425	1.0005 1.0010	25.413 25.425
Cylinder Cover / Flange Main Brg. Diameter	1.0050 1.0010	25.413 25.425	1.0050 1.0010	25.413 25.425	1.0050 1.0010	25.413 25.425	1.0050 1.0010	25.413 25.425

Note A: OVRM60, 21000 spec. numbers with a "B" suffix and all OVRM 65, 22000 spec. numbers have a displacement of 11.9 (195.04).

Note B: All OVRM 60, 21000 spec. numbers with a "B" suffix and all OVRM 65, 22000 spec. numbers have a 2.795"/2.796 (70.993/71.018) Bore.

Note C: All engines equipped with a ball bearing will have "0" End Play.

ENGINE SPECIFICATIONS (Continued)

Specifications	OHH and OHSK55 - 70		OHSK80 - 110 Note (D)		OHM, OHSK, OVM, OVXL120,130 & OHV11-13		OHV13.5 - 17	
	Standard English	Metric mm	Standard English	Metric mm	Standard English	Metric mm	Standard English	Metric mm
Displacement (in^2) (cc)	11.9	195.04	19.43	318.46	21.82	357.63	29.9	490.06
Stroke	1.938	49.225	2.532	70.993	2.532	70.993	3.00	76.6
Bore	2.795 2.796	70.993 71.018	3.125 3.126	79.375 79.400	3.312 3.313	84.125 84.150	3.562 3.563	90.475 90.500
Ignition Module Air Gap	.0125	.3175	.0125	.3175	.0125	.3175	.0125	.3175
Spark Plug Gap	.030	.762	.030	.762	.030	.762	.030	.762
Valve Clearance In./Ex.	.004 .004	.1016 .1016	.004 .004	.1016 .1016	.004 .004	.1016 .1016	.004 .004	.1016 .1016
Valve Seat Angle	46^0		46^0		46^0		46^0	
Valve Seat Width	.035 .045	.889 1.143	.035 .045	.889 1.143	.035 .045	.889 1.143	.042 .052	1.0671 1.321
Valve Guide Oversize Dimension	.2807 .2817	7.130 7.155	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743	.3432 .3442	8.717 8.743
Crankshaft End Play	.006 .027 Note (C)	.1524 .6858 Note (C)	.002 .042	.051 .067	.002 .042	.051 .067	.0025 .0335	.064 .851
Crankpin Journal Dia.	.9995 1.000	25.362 25.400	1.3740 1.3745	34.900 34.912	1.3740 1.3745	34.900 34.912	1.6223 1.6228	41.206 41.219
Crankshaft Dia. Flywheel End Main Brg.	.9985 .9990	25.362 25.375	1.3745 1.3750	34.912 34.925	1.3745 1.3750	34.912 34.925	1.6245 1.6250	41.262 41.275
Crankshaft Dia. P.T.O. Main Brg.	.9985 .9990	25.362 25.375	1.3745 1.3750	34.912 34.925	1.3745 1.3750	34.912 34.925	1.6245 1.6250	41.206 41.275
Conn. Rod Dia. Crank Brg.	1.0005 1.0010	25.413 25.425	1.3775 1.3780	34.988 35.001	1.3775 1.3780	34.988 35.001	1.6234 1.6240	41.234 41.250
Camshaft Bearing Diameter	.4970 .4975	12.624 12.637	.6230 .6235	15.824 15.837	.6230 .6235	15.824 15.837	.6235 .6240	15.837 15.850
Piston Dia. Bottom of Skirt	2.7904 2.7920	70.876 70.917	3.1195 3.1205	79.235 79.261	3.3095 3.3105	84.061 84.087	3.5595 3.5605	90.411 90.437
Ring Groove Side Clearance 1st & 2nd Comp.	.0020 .0050	.051 .127	.0020 .0040	.051 .127	.0020 .0040	.051 .127	.0020 .0040	.051 .127
Ring Groove Side Clearance Bottom Oil	.0050 .0035	.013 .089	.0010 .0030	.0254 .076	.0010 .0030	.0254 .076	.0009 .0029	.0229 .074
Piston Skirt to Cylinder Clearance	.0030 .0056	.076 .142	.0015 .0035	.038 .089	.0015 .0035	.038 .089	.0015 .0030	.038 .089
Ring End Gap	.007 .017	.178 .432	.010 .020	.254 .508	.010 .020	.254 .508	.012 .022	.305 .559
Cylinder Main Bearing Diameter	1.0005 1.0010	25.413 25.425	1.3765 1.3770	34.963 34.976	1.3765 1.3770	34.963 34.976	1.6265 1.6270	41.313 41.326
Cylinder Cover / Flange Main Brg. Diameter	1.0050 1.0010	25.413 25.425	1.3765 1.3770	34.963 34.976	1.3765 1.3770	34.963 34.976	1.6265 1.6270	41.313 41.326

Note A: OVRM60, 21000 spec. numbers with a "B" suffix and all OVRM 65, 22000 spec. numbers have a displacement of 11.9 (195.04).

Note B: All OVRM 60, 21000 spec. numbers with a "B" suffix and all OVRM 65, 22000 spec. numbers have a 2.795"/2.796 (70.993/71.018) Bore.

Note C: All engines equipped with a ball bearing will have "0" End Play.

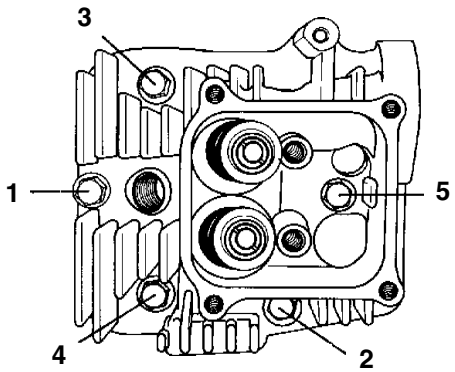
Note D: For OHSK110 models with specification number starting with 223000 have a displacement of 21.82 (357.63 cc).

OVERHEAD VALVE TORQUE SPECIFICATIONS

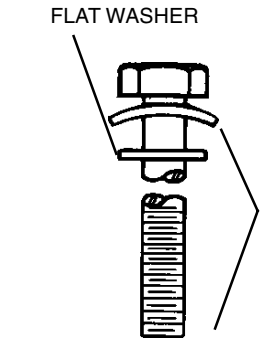
The torque specifications listed in this chart are to be used for replacing components after disassembly, not for checking an existing engine bolt torque. Checking a torque value on a new or used engine may be lower due to torque relaxation that occurs on all engines from thermal expansion and contraction. However, sufficient clamping force exists and a re-torque is not necessary.

Specifications below ten ft. lbs. torque are listed only as in. lb. measurements to encourage the use of an inch pound torque wrench for greater torque accuracy.

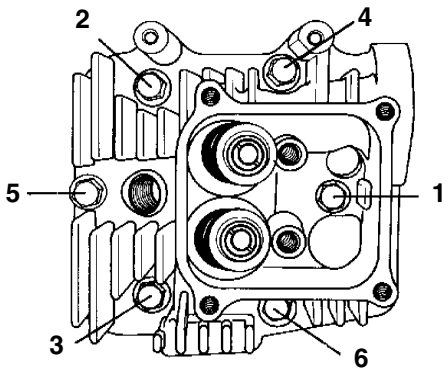
	In. lbs.	ft. lbs.	Nm	OVRM	OHH50-65 OHSK50-70	OVXL, OHM, OVM, & OHSK	OHV 11-13	OHV 110-135 206 Series	OHV135-145 203 Series OHV15-17.5 204 Series
Cylinder Head Bolts	230	19	26	X	X	X	X	X	X
Conn. Rod Bolts	105	-	12	X	X				
Conn. Rod Bolts	220	18.3	24.8			X	X	X	X
Cyl. Cover or Flange	115	9.5	13	X	X				
Cyl. Cover or Flange	125	10.5	14			X	X	X	X
Flywheel Nut	450	35	51	X	X				
Flywheel Nut Cast Iron	550	46	62		X				
Flywheel Nut	700	58	79			X	X	X	X
Spark Plug	250	21	28	X	X	X	X	X	X
Ign. Mounting (Direct to Cyl.)	45	-	5	X	X				
Ign. Mounting (Direct to Stud)	45	-	5			X	X	X	X
Ign. Mounting Stud to Cyl.	40	-	4.5			X	X	X	X
Intake Pipe to Head	115	-	13	X	X	X	X	X	X
Carburetor to Intake Pipe	70	-	8	X	X	X	X	X	X
Fuel Shut Off Solenoid to Carb.	17	-	2				X	X	X
Muffler Mtg. (Flanged)	75	-	8.5	X					
Muffler Mtg. (Rect.)	65	-	7.5	X					
Muffler Mtg. (Oval)	45	-	5	X					
Muffler Mtg.	100	-	11.5		X				
Muffler (Flanged) to Manifold (Flanged)	200	16.5	22.5			X		X	
Muffler Clamp to Manifold	80	-	9						X



TORQUE SEQUENCE
OVRM / OHH, OHSK



BELLEVILLE WASHER
(CROWN TOWARD BOLT HEAD)



TORQUE SEQUENCE
OHV 11 - 17, OHM, OVM, OHSK110 - 120

OVERHEAD VALVE TORQUE SPECIFICATIONS

The torque specifications listed in this chart are to be used for replacing components after disassembly, not for checking an existing engine bolt torque. Checking a torque value on a new or used engine may be lower due to torque relaxation that occurs on all engines from thermal expansion and contraction. However, sufficient clamping force exists and a re-torque is not necessary.

Specifications below ten ft. lbs. torque are listed only as in. lb. measurements to encourage the use of an inch pound torque wrench for greater torque accuracy.

	In. lbs.	ft. lbs.	N/M	OVRM	OHH50-65 OHSK50-70	OVXL, OHM, OVM	OHSK & OHV 11-13	OHV 110-135 206 Series	OHV135-145 203 Series OHV15-17.5 204 Series
Manifold Mtg. (Shoulder Bolt)	160	13.5	18			X	X	X	X
Recoil Starter	25	-	3	X					
Recoil Starter	50	-	5.5		X	X	X		
Recoil Starter	40	-	4.5						X
Recoil Starter	80		9			X	X	X	X
Electric Starter to Cylinder	100	-	11	X	X	X	X		
Electric Starter to Cylinder	150	12.5	17					X	X
Rocker Arm Hex Jam Nut	18	-	2			X	X 1		
Rocker Arm Lock Allen Screw	75	-	8.5						X
Rocker Adjusting Jam Nut	130	10.8	14.7						X 1
Rocker Arm Stud Lock Nut	120	10	13.5	X	X	X	X 1	X 1	
Rocker Arm Studs	190	15.8	21.5			X	X		X
Rocker Box Cover	40	-	4.5	X	X				
Rocker Box Cover	18	-	2			X			
Rocker Box Cover (4 screws)	55	-	6				X	X	X
Alt. Coil Assy. to Cylinder	25	-	3						X
Alt. Coil Assy. to Cylinder	65	-	7		X				
Alt. Coil Assy. to Cylinder	90	-	10			X	X	X	
Alt. Coil Assy. to Lamination	30	-	3.5	X					

NOTE 1: A jam nut is described as a nut which is placed above the rocker arm and bearing. A lock nut is positioned below the rocker arm and bearing.

CHAPTER 11. EDUCATIONAL MATERIALS AND TOOLS

AVAILABLE TECHNICIAN'S HANDBOOKS

692508
Covers the diagnosis and repair of Tecumseh 2-cycle engines. Except the TC Engine and TVS840.

692509
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

691462A
Covers the diagnosis and repair of Tecumseh 4-cycle large frame engines.

691218
Covers the diagnosis and repair of Peerless® power train components.

694782
Contains technical information for the repair of the TC series, 2-cycle engines.

694988
Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.

695244A
Covers the diagnosis and repair of the OVRM/OVM/OHM/OHV 4-cycle overhead valve engines.

695578
Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

AVAILABLE FOREIGN TECHNICIAN'S HANDBOOKS

694732 Spanish
This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

695555 Spanish
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695657 German
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

695562 French
Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

VIDEO PROGRAMS

695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS

INSTRUCTIONAL GUIDE

692738
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS

695590
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

CARBURETOR TROUBLESHOOTING BOOKLET

695907
This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903
This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

SPECIAL TOOLS BOOKLET

694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET

695933
This booklet contains the quick reference information found on Tecumseh wall charts.
This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

TESTER BOOKLETS

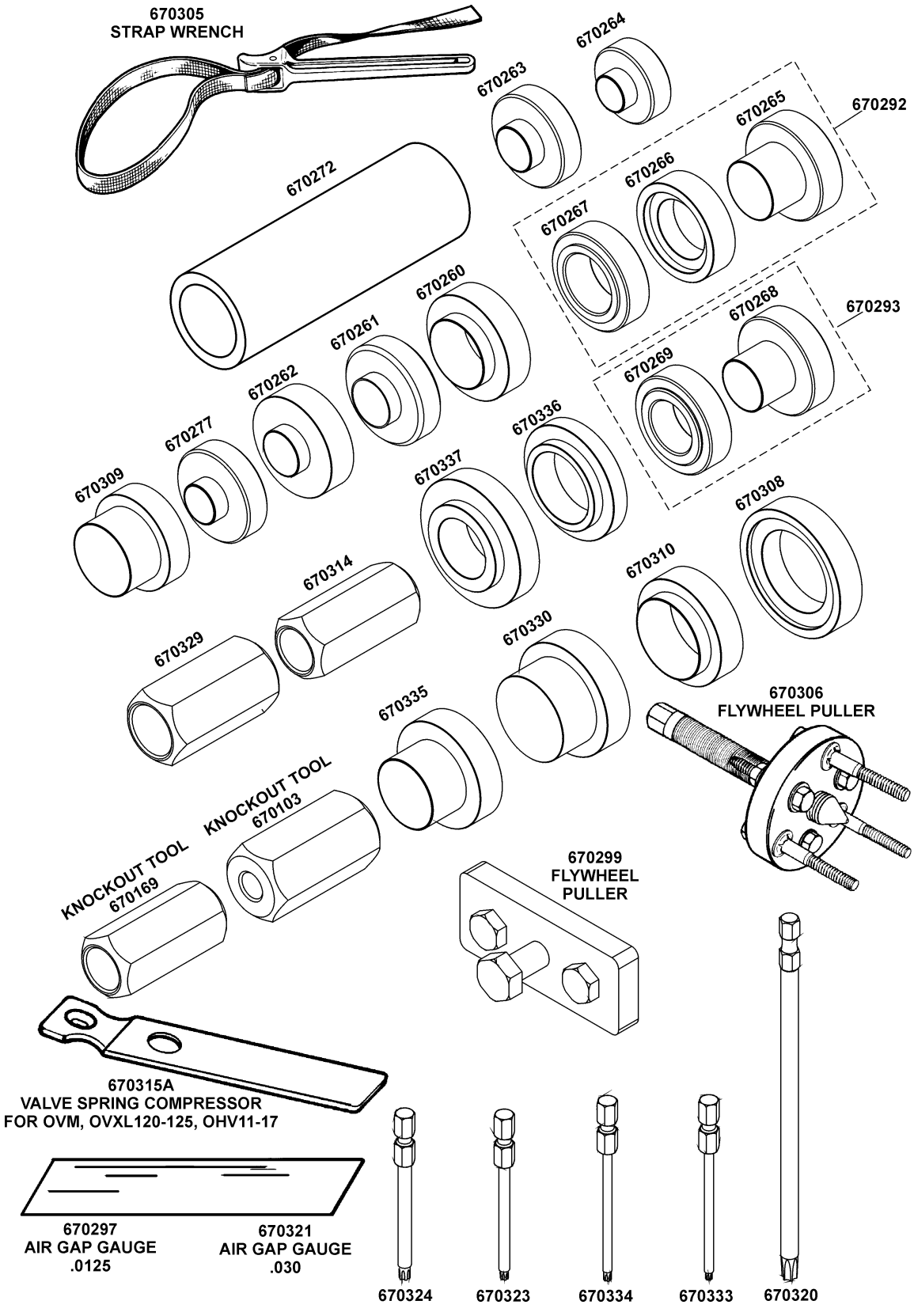
694529
Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

694530
Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

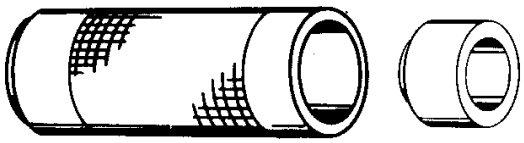
TOOL KIT 670195E

Kit contains tools for 2- and 4-cycle engines.

Includes all items on this page but items may be purchased separately.



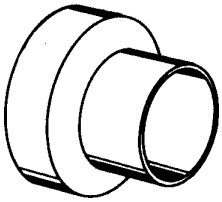
OIL SEAL DRIVER



No. 670195D Tool Kit. Contains special tools commonly used in servicing 2 and 4 cycle engines.

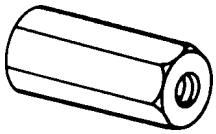
OIL SEAL PROTECTOR/INSTALLER

Consult the specification chart or measure the shaft diamteter to determine the correct tool.



Use with:
No. 670260. 1-3/16" crankshaft bearing diameters.
No. 670261. 13/16" crankshaft bearing diameters.
No. 670262. 3/4" Crankshaft bearing diameters.
No. 670263. 5/8" extended camshaft.
No. 670264. 1/2" extended camshaft.
No. 670277. 35/64" 8-1/2:1 Aux. Shaft.
No. 670292. 1" crankshaft bearing diameters assy. for recessed, raised, or flush seal position.
No. 670293. 7/8" crankshaft bearing diameters assy.for recessed or flush seal position.
No. 670308. Adapter for raised or flush seal position, used with 670309.
No. 670309. 1-3/8" crankshaft bearing diameters protector, use with 670308.
No. 670310. 1-3/8" crankshaft bearing diameter for recessed seal position.
No. 670330. 1-1/2" extended camshaft.
No. 670335. 1-1/8" crankshaft bearing diameters.
No. 670336. 1-1/8" crankshaft bearing diameter recessed seal.
No. 670337. 1" to be used with 670265 and 670266 recessed and raised.

FLYWHEEL KNOCK-OFF TOOL



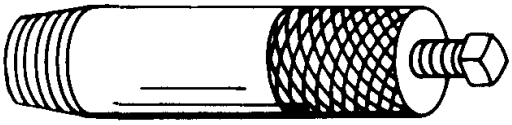
†No. 670103 - Knock-off tool (right hand) (7/16").

†No. 670169 - Knock-off tool (right hand) (1/2").

†No. 670314 - Knock-off tool (right hand) (5/8").

†No. 670329 - Knock-off tool (right hand) (3/4").

OIL SEAL REMOVER



Consult the specification chart or measure the shaft diamteter to determine the correct tool.

Use with:

No. 670287. 7/8" crankshaft bearing diameters.

No. 670288. 3/4" crankshaft bearing diameters.

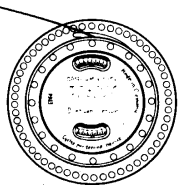
No. 670289. 13/16" crankshaft bearing diameters.

No. 670290. 1" crankshaft bearing diameters.

No. 670312.1-3/8" crankshaft bearing diameters.

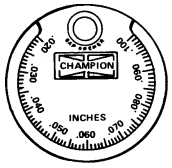
No. 670331.1.5" crankshaft bearing diameters.

VIBRATION TACHOMETER



No. 670156 Vibration tachometer.

TAPER GAP GAUGE

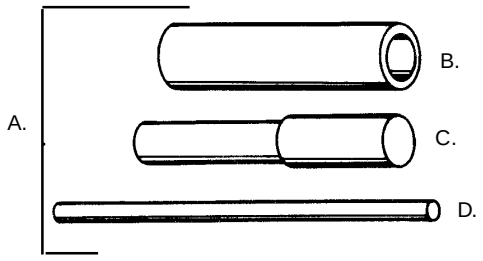


No. 670256 Taper Gap Gauge

VALVE LAPPING TOOL

No. 670154A Valve lapping tool.

BUSHING TOOL KIT



Rebushing tool kit for use on OHM, OHSK110, 120, OVM, OHV11-13 AND OVXL. 1-3/8" main bearing.

A. None

B. None

C. No. 670311 - Bushing Driver/Installer.

No. 670317 - Bushing Driver/Installer.

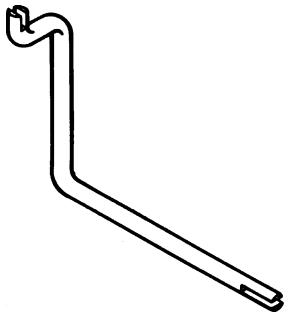
No. 670298 Alignment Tool.

1/32" (.794 mm)
OVERSIZE VALVE GUIDE REAMER

No. 670283. Used on OHH on Intake and Exhaust, and OVRM40-60 Intake valve guide. Oversize diameter .2807/.2817 (7.130 - 7.155 mm)

No. 670328. Used on OVRM40-60 Exhaust valve guide. Oversize diameter .2787/.2797 (7.079 - 7.104 mm).
No. 670284. Used on OVXL/OVM/OHM120, OVXL125 and OHV11-16.5 Intake and Exhaust. Oversize diameter .3432/.3442 (8.717 - 8.743 mm).

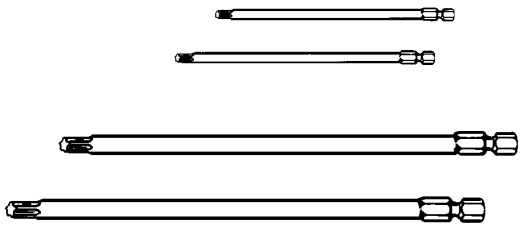
OVRM AND OHV11-16.5 SPEED ADJUSTMENT TOOL



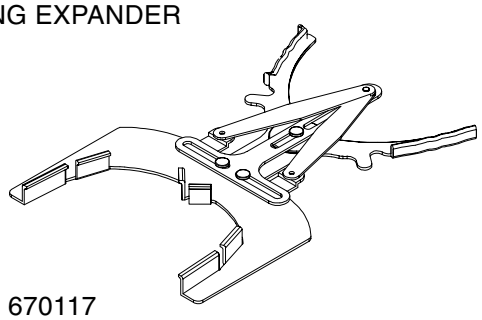
No. 670326

TORX DRIVERS

Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320



RING EXPANDER



No. 670117

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers VLV40 - 675.

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

VLV (VECTOR) 4-CYCLE ENGINES

TECUMSEH®

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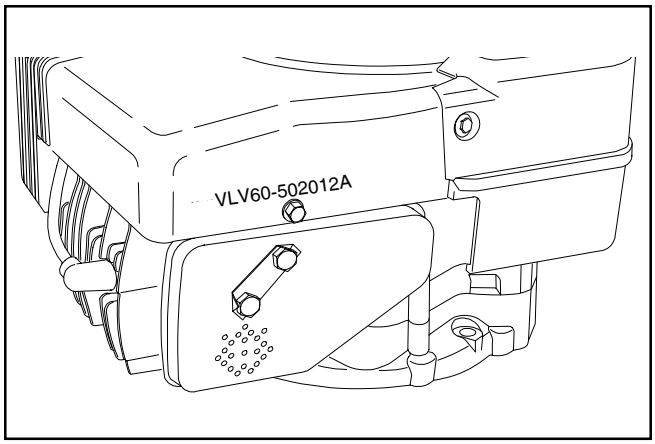
Chapter 1
GENERAL INFORMATION

ENGINE IDENTIFICATION

Tecumseh engine model, specification and serial numbers are stamped or decaled on the blower housing. The decal also contains any emission compliance information.



The letters which precede the model numbers indicate the basic type of engine:

VLV - Vector Lightweight Vertical

The numbers which follow engine type letters indicate the basic engine horsepower:

40 - 4.0 Horsepower

50 - 5.0 Horsepower

Following the engine size numbers are the engine specifications numbers.

The specification number is used when identifying engine parts example 502012A.

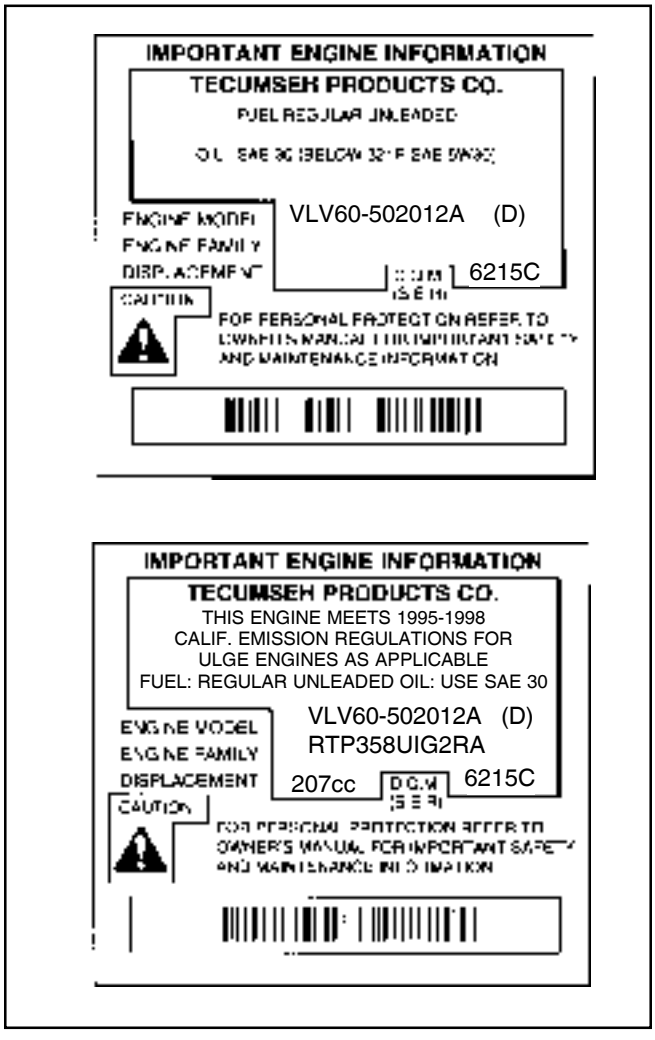
The serial number is the production date code.

7040 - serial number (example)

7 - Year in decade of manufacture (1997)

40 - The last 3 digits of date code represent the calendar (the 40th day of 1997)

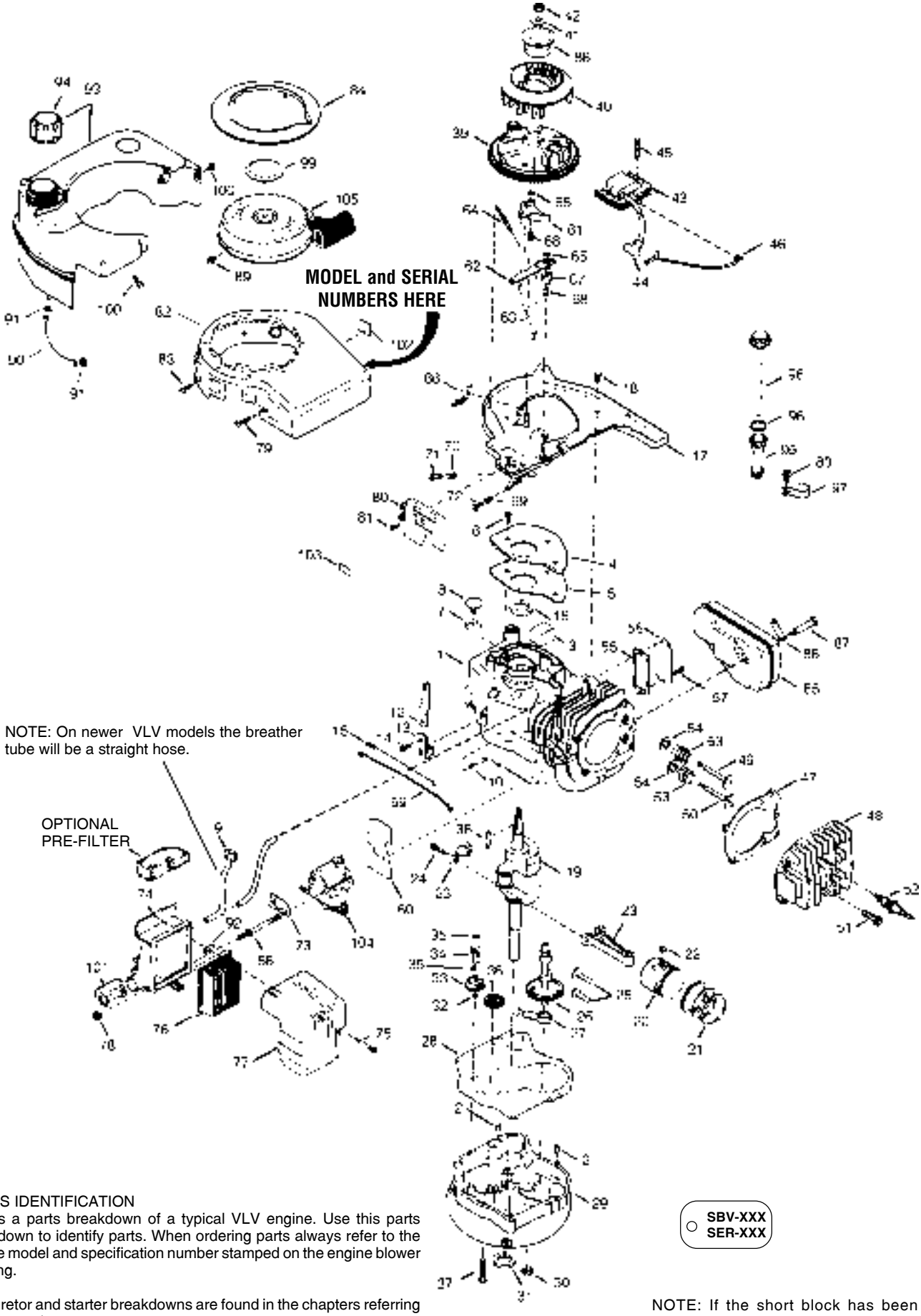
D - represents the shift and line on which the engine was built at the factory.



Emissionized engines that meet the California Air Resource Board (C.A.R.B.) or the Environmental Protection Agency (E.P.A.) standards will include additional required engine information on the engine decal.

NOTE: To maintain best possible emission performance, use only Genuine Tecumseh Parts.

SHORT BLOCKS. New short blocks are identified by a tag marked SBH (Short Block Horizontal) or SBV (Short Block Vertical). These tags are used to properly identify the correct parts if service is required. They are attached to either the sump bolts or valve box cover.



PARTS IDENTIFICATION

This is a parts breakdown of a typical VLV engine. Use this parts breakdown to identify parts. When ordering parts always refer to the engine model and specification number stamped on the engine blower housing.

Carburetor and starter breakdowns are found in the chapters referring to their repair.

SBV-XXX
SER-XXX

NOTE: If the short block has been replaced, an identification tag for service parts is located on the valve box cover.

Ref. No.	Part Name	Ref. No.	Part Name
1	Cylinder Assy.	54	Cap, Valve spring
2	Pin, Dowel	55	Gasket, Valve cover
3	Element, Breather	56	Cover, Valve spring box
4	Cover, Breather	57	Screw, 10-24 x 1/2
5	Gasket, Breather cover	58	Stud, Carburetor mounting
6	Screw, Thread forming, 10-24 x 1/2	59	Link, Governor
7	Body, Breather valve	60	Spacer, Carburetor mounting gasket
8	Valve, Breather check	61	Lever Assy., Brake
9	Breather, Tube	62	Lever, Brake control
10	Washer, Flat	63	Link, Brake control lever
11	Rod, Governor	64	Spring, Brake
12	Lever, Governor	65	Ring, Retaining
13	Clamp, Governor lever	66	Terminal
14	Screw, 8-32 x 5/16	67	Spring, Brake control lever
15	Spring, Governor extension	68	Bushing, Brake control leer & brake lever
16	Seal, Oil	69	Spring, Compression
17	Baffle, Blower housing (Incl. No. 195)	70	Spring, Compression
18	Screw, 1/4-20 x 5/8	71	Screw, 5-40 x 7/16
19	Crankshaft Assy.	72	Screw, 6-32 x 21/32
20	Piston & Pin Assy.	73	Gasket, Carburetor to air cleaner
21	Ring Set, Piston	74	Body, Air cleaner (Incl. Nos. 239, 299 & 350)
22	Ring, Piston pin retaining	75	Screw, 10-32 x 2-3/32
23	Rod Assy., Connecting	76	Filter, Air cleaner (Paper)
24	Bolt, Connecting rod	77	Cover, Air cleaner
25	Lifter, Valve	78	Nut, Lock, 1/4-20
26	Camshaft Assy.	79	Screw, 1/4-20 x 11/16
27	Pump Assy., Oil	80	Plate, Control Assy., cover
28	Gasket, Mounting flange	81	Screw, 8-32 x 1/2
29	Flange, Mounting	82	Housing, Blower
30	Plug, Oil drain	83	Screw, 1/4-20 x 1/2
31	Seal, Oil	84	Ring, Starter
32	Washer, Flat	85	Muffler
33	Gear Assy., Governor	86	Plate, Muffler locking
34	Spool, Governor	87	Screw, 5/16-18 x 2-11/32
35	Ring, Retaining	88	Cup, Starter
36	Gear, Idler	89	Screw, 8-32 x 21/64
37	Screw, 1/4-20 x 1-9/16	90	Line, Fuel
38	Key, Flywheel	91	Clamp, Fuel line
39	Flywheel	92	Clip, "U" Type Nut, 10-32
40	Fan, Flywheel	93	Tank Assy., Fuel
41	Washer, Belleville	94	Cap, Fuel
42	Nut, Flywheel	95	Tube, Oil fill
43	Solid State Assy.	96	"O" Ring
44	Cover, Spark plug	97	Clip, Fill tube
45	Screw, 10-24 x 1	98	Dipstick, Oil
46	Wire Assy., Ground	99	Plug, Starter
47	Gasket, Cylinder head	100	Screw, 10-32 x 35/64
48	Head, Cylinder	101	Primer
49	Valve, Exhaust	102	Decal, Instruction
50	Valve, Intake	103	Decal, Primer
51	Screw, 5/16-18 x 1-1/2	104	Carburetor
52	Spark Plug (Champion RJ-19LM or equivalent)	105	Starter, Rewind
53	Spring, Valve		

ENGINE CARE

FUELS. Tecumseh Products Company strongly recommends the use of fresh, clean, UNLEADED regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life and promotes good starting by reducing the build-up of combustion chamber deposits. Gasoline, gasohol containing no more than 10% ethanol, 15% M.T.B.E. or ETBE, leaded fuel can be used if regular unleaded is not available.

Never use gasoline containing METHANOL, gasohol containing more than 10% ethanol, gasoline additives, or white gas because engine/fuel system damage could result. If engine is to be unused for 30 days or more see "STORAGE" instructions.

ENGINE OIL:

USE A CLEAN, HIGH QUALITY DETERGENT OIL. Be sure original container is marked: A.P.I. service "SF" or "SG".

DO NOT USE SAE 10W40 OIL.

FOR SUMMER (ABOVE 32°F) USE SAE 30 OIL.

Using multigrade oil may increase oil consumption.

FOR WINTER (BELOW 32°F) USE SAE 5W30 OIL.
(SAE 10W is an acceptable substitute.)

(BELOW 0°F ONLY): SAE 0W30 is an acceptable substitute.

OIL CHANGE INTERVALS. Change oil after first two (2) hours of operation and every 25 hours thereafter, or more often if operated under dusty or dirty conditions.

OIL CHECK. Check oil every 5 hours or each time the equipment is used. Position equipment so the engine is level when checking the oil.

STORAGE

NEVER STORE ENGINE WITH FUEL IN TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED ENCLOSURES, WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

If engine is to be unused for 30 days or more, prepare as follows:

DRAIN INTO APPROVED CONTAINER OUTDOORS, AWAY FROM OPEN FLAME.

1. **DRAIN FUEL SYSTEM:**
   Remove all gasoline from carburetor and fuel tank to prevent gum deposits from forming on these parts and causing possible malfunction of engine.
   NOTE: VLV engines are equipped with a bowl drain screw. See Chapter 2 for removal procedure.

   A. Run engine until fuel tank is empty and engine stops due to lack of fuel.

   B. Disconnect fuel line at carburetor or fuel tank. Be very careful not to damage fuel line, fittings or fuel tank.

      Drain any remaining fuel from system. Properly reconnect the fuel line.

      NOTE: If gasohol has been used, complete preceding instructions "A" and "B" and then put a small amount of unleaded (or leaded regular) gasoline into fuel tank and repeat preceding instructions "A" and "B".

      NOTE: Fuel stabilizer (such as STA-BIL) is an acceptable alternative in minimizing the formation of fuel gum deposits during storage. Add stabilizer to gasoline in fuel tank or storage container. Always follow mix ratio found on stabilizer container. Run engine at least 10 minutes after adding stabilizer to allow it to reach carburetor.

2. If oil has not been changed recently, this may be a good time to do it. See "CHANGE OIL" instructions in "MAINTENANCE" section of the Owner's Manual.

3. Remove spark plug and put 1/2 oz. (15 ml) of clean engine oil into spark plug hole. Crank engine over, slowly, several times.

   AVOID SPRAY FROM SPARK PLUG HOLE WHEN CRANKING ENGINE OVER SLOWLY.

   Reinstall spark plug.

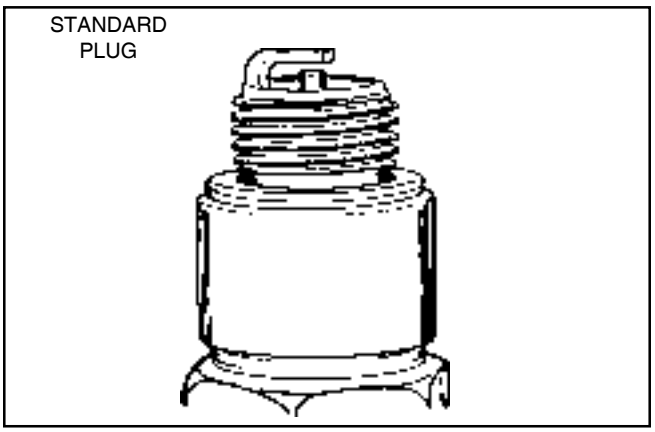
4. Clean engine by removing any clippings, dirt, or chaff from exterior of engine.

TUNE-UP PROCEDURE

CAUTION: Remove spark plug wire before doing any service work on engine.

1. Service or replace air cleaner as necessary. (See Chapter 2 Air Cleaners)
2. Inspect level and condition of oil, change or add oil as required.
3. Remove blower housing, clean all dirt, grass or debris from intake screen, head and cylinder cooling fins and carburetor governor levers and linkage.
4. Make sure fuel tank, fuel filters and fuel lines are clean. Replace any worn or damaged governor springs or linkage. Make proper governor adjustments where required. (See Chapter 3)

   NOTE: If the engine is equipped with a Tecumseh fuel tank, an integral filter is molded inside.

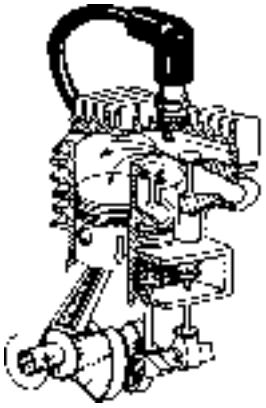


5. Replace the spark plug with the proper spark plug. Consult the parts breakdown for the spark plug to be used in the engine being serviced. The spark plug air gap is .030''. Install spark plug in engine and tighten to 15 foot pounds torque. If a torque wrench isn't available, screw spark plug in as far as possible, by hand, and use a spark plug wrench to turn spark plug 1/8 to 1/4 turn further when reusing spark plug, or 1/2 turn further if using a new spark plug.
6. Make sure all ignition wires are free of abrasions, breaks and are properly routed so they will not rub on flywheel.
7. Properly reinstall the blower housing, gas tank, and fuel lines, then properly check for spark as stated in the ignition section of this manual.
8. Make sure all cables are adjusted for proper operation.
9. Run engine and allow it to warm up for 5 minutes. After the engine is warm, set the engine governed RPM to specifications. This information is located only on Micro Fiche Card 30 or the Plus One and Parts Smart computer look-up systems.

4-CYCLE ENGINE THEORY

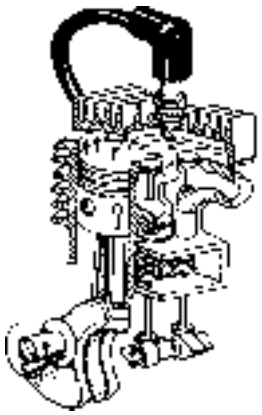
Tecumseh four-cycle engines require four strokes or cycles to complete one power cycle.

1. INTAKE. Intake valve is open, exhaust valve is closed. Piston is traveling downward creating a suction action, drawing the fuel-air mixture from the carburetor into the cylinder area above the piston.



1. INTAKE

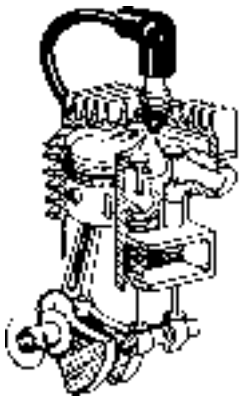
2. COMPRESSION. As the piston reaches Bottom Dead Center, the INTAKE valve closes. The piston then rises, compressing the fuel and air mixture trapped in the combustion chamber, because both valves are closed.



2. COMPRESSION

NOTE: Some emission compliance engines may use a RCR (Ramp Compression Relief) system. This system opens the intake valve during the compression stroke allowing a small amount of the intake charge back down the intake pipe. This eliminates unburned fuel going out the exhaust during normal compression relief cycle typically used on the exhaust valve.

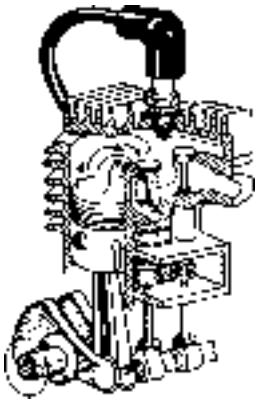
3. POWER. Both valves remain closed. As the piston reaches the Before Top Dead Center (BTDC) ignition point, the spark plug fires, igniting the fuel-air mixture. In the time it takes to ignite all the available fuel, the piston has moved to TDC (Top Dead Center), ready to take the full combustive force of the fuel for maximum power and piston downward travel. The expanding gases force the piston down.



3. POWER

4. EXHAUST. Exhaust valve opens. As the piston starts to the top of the cylinder, the exhaust gases are forced out.

After the piston reaches Top Dead Center (TDC), the four cycle process will begin again as the piston moves downward and the intake valve opens.



4. EXHAUST

Chapter 2
AIR CLEANERS

CAUTION: Before removing air cleaner, make sure ALL excess dirt is removed from around it.

NOTE: If the engine is equipped with an optional poly pre-filter always remove it first, to prevent dirt falling into the filter body.

Air cleaners must be serviced frequently, to prevent dust and dirt from entering the engine. Dust mixed with the engine oil forms an extremely abrasive compound which quickly wears out an engine.

A clogged air cleaner will affect engine performance.

Replacing a restricted (clogged) air filter should restore engine performance.

AIR CLEANER SERVICE. The engine utilizes a treated paper element with a foam rubber-like sealing edge. The seal must fit properly to prevent dirt ingestion.

Replace air filter once a year or more often in extremely dusty or dirty conditions.

DO NOT ATTEMPT TO CLEAN OR OIL THE PAPER FILTER.

Be sure to clean base and cover thoroughly before installing new paper filter.

NEVER RUN THE ENGINE WITHOUT THE COMPLETE AIR CLEANER INSTALLED ON THE ENGINE.

NOTE: Serious damage to the engine may result from using any other but the specified part number filter. Use factory recommended parts only.

Some models use a dual stage air cleaner. This air cleaner uses a polyurethane-type foam pre-filter along with the paper element.

POLYURETHANE-TYPE PRE-FILTERS. These serviceable air filters utilize a polyurethane element which will clog up with use. The element should be cleaned and serviced in the following manner.

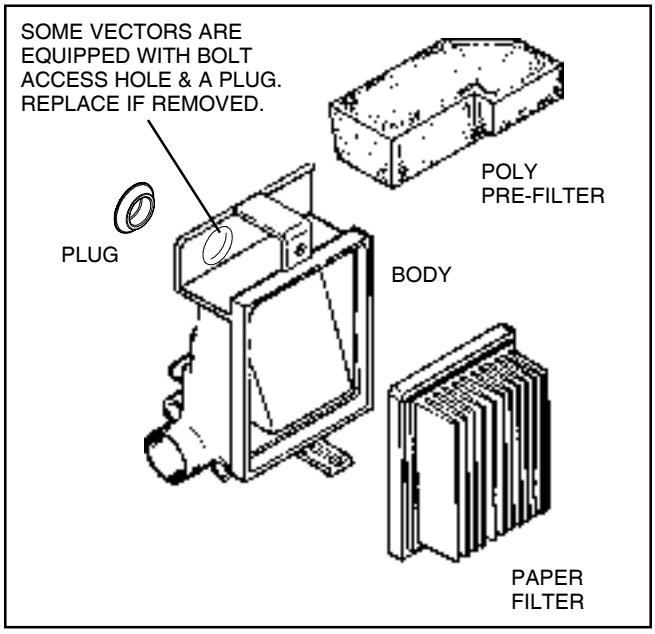
Wash element in a detergent and water solution and squeeze (don't twist) until all dirt is removed. Rinse thoroughly.

Wrap in a clean cloth and squeeze (don't twist) until completely dry.

Re-oil element by applying a generous quantity of oil to all sides. Squeeze vigorously to distribute oil and to remove excess oil.

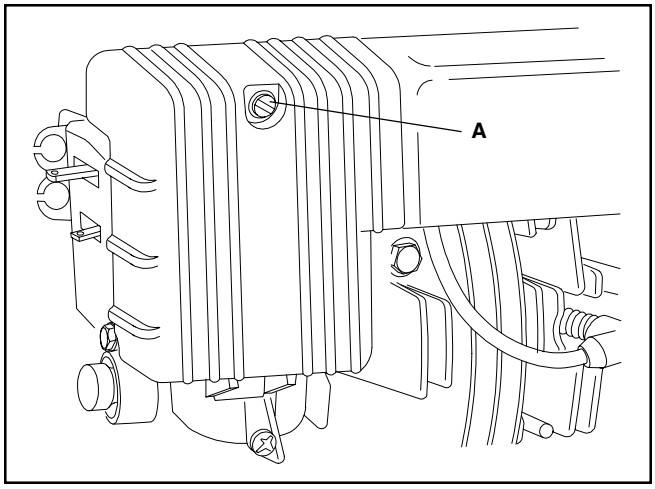
Clean air cleaner housing and cover. Dry thoroughly.

Reinstall pre-cleaner in air filter body.

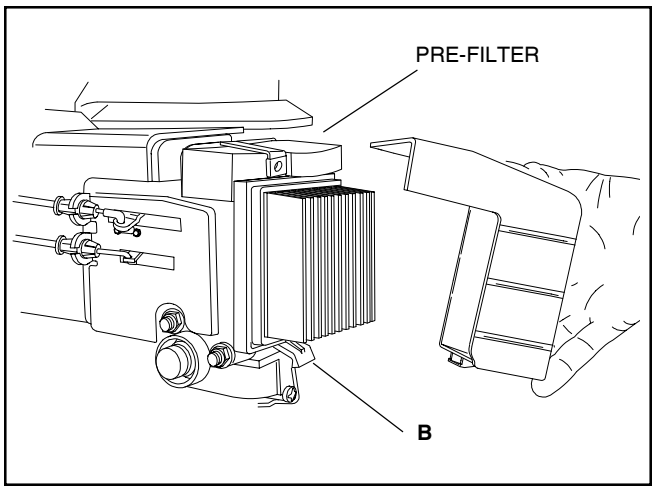


TO SERVICE AIR CLEANER

1. Loosen cover screw (A).

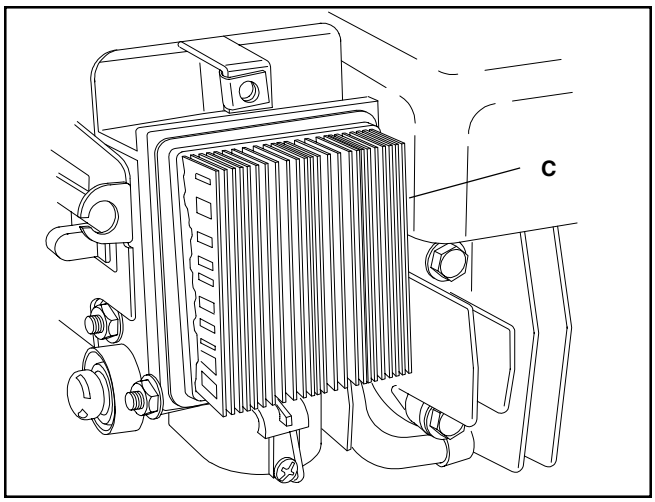


2. Swing cover down and remove from hinge (B).
3. Pull foam pre-filter out of air cleaner body (if equipped with pre-filter).
4. Pull air filter out of air cleaner body.
5. Clean air cleaner cover and body.



6. Install a new paper filter (part no. 36046) (C).
7. Clean and install pre-filter (if so equipped).
8. Reinstall cover to air cleaner body.

   Be sure hinge is assembled properly.
9. Swing cover up and tighten cover screw. (Do not over tighten).



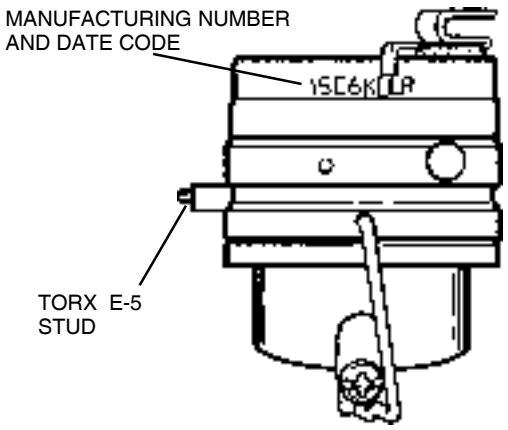
CARBURETION

Proper Carburetion Function is dependent on clean fresh fuel and a well maintained air cleaner system. Most causes of carburetion problems are directly related to stale fuel and dirt ingestion. Inspection of the carburetor for dirt wear and fuel deposits should always be done before servicing the carburetor.

Carburetor Identification:

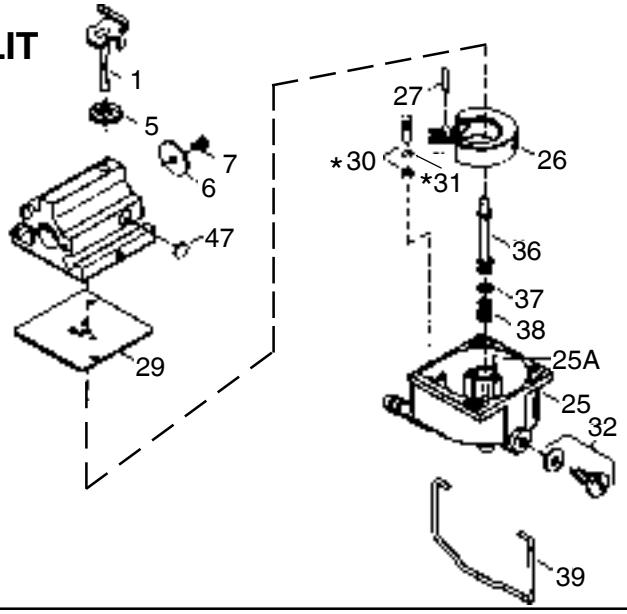
Tecumseh carburetors are identified by a manufacturing number and date code stamped on the carburetor as shown. When servicing carburetors, use the engine model number or the manufacturing number on the carburetor to find repair parts in the Master Parts Manual.

The engine has used both a split system and married system carburetor. Below are the parts breakdowns for the two carburetor's.



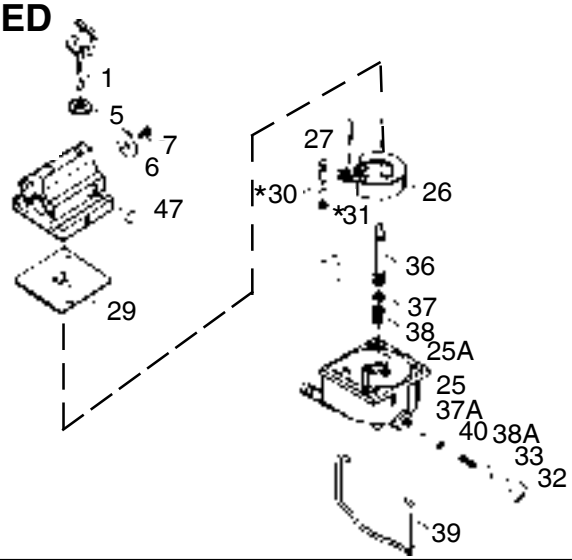
NOTE: LATER MODEL VECTOR CARBURETOR BODIES ARE HELD ON WITH TORX E-5 STUDS. YOU WILL NEED THIS SOCKET FOR REMOVAL. TECUMSEH PART NO. 670339.

SPLIT



Ref. No.	Part Name
1	Throttle Shaft & Lever Assy.
5	Dust Seal (Throttle)
6	Throttle Shutter
7	Throttle Shutter Screw
25	Float Bowl
25A	Idle Restrictor
26	Float
27	Shaft, Float
29	Gasket, Float Bowl to Body
* 30	Inlet Needle, Seat & Seat Retainer (Incl. 31)
* 31	Seat Retainer
32	Bowl Drain Assy.
36	Tube, Main Nozzle
37	O Ring, Main Nozzle Tube
38	Spring, Main Nozzle Tube
39	Float Bowl Retainer
47	Welch Plug, Idle Mixture Well

MARRIED



Ref. No.	Part Name
1	Throttle Shaft & Lever Assy.
5	Dust Seal
6	Throttle Shutter
7	Throttle Shutter Screw
25	Float Bowl
25A	Idle Restrictor
26	Float
27	Float Shaft
29	Gasket, Float Bowl to Body
*30	Inlet Needle, Seat & Seat Retainer (Incl. 31)
*31	Seat Retainer
32	Bowl Drain Screw
33	Bowl Drain Washer
36	Tube, Main Nozzle
37	O Ring, Main Nozzle Tube
37A	O Ring
38	Spring, Main Nozzle Tube
38A	Spring
39	Float Bowl Retainer
40	Main Fuel Jet
47	Welch Plug, Idle Mixture Well

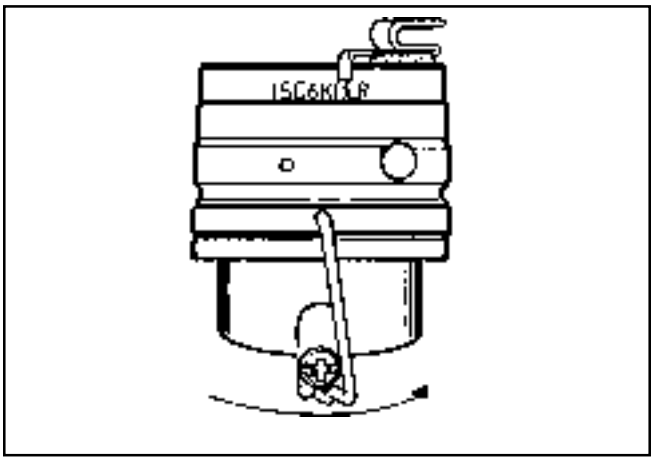
* NOTE: The seat retainer may not be present on some engines. If you receive a retainer as a service part, install it.

The carburetor is a float feed, nonadjustable type, with a 1 piece extruded aluminum body. The float bowl, float, nozzle, and venturi are nonmetallic, minimizing the corrosion and varnishing problems. Common service areas of the carburetor are contained in the fuel bowl. These areas are the float, needle, seat and main nozzle. All of these parts can be serviced without removing the carburetor body from the engine.

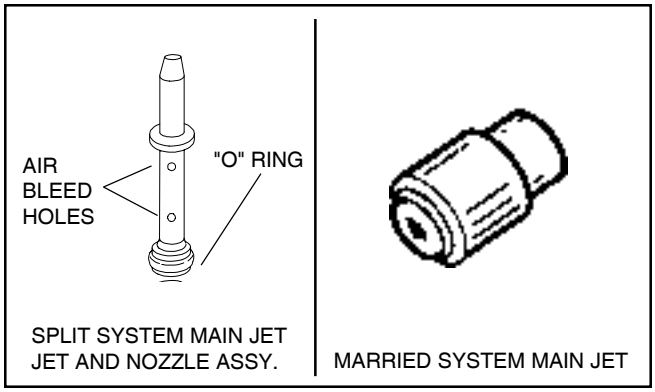
⚠ DRAIN INTO APPROVED CONTAINER OUTDOORS, AWAY FROM OPEN FLAME.

FLOAT BOWL SERVICE. Disconnect and plug the fuel line. Remove the bowl drain screw. Remove the float bowl by snapping the bale spring towards the throttle end of the carburetor.

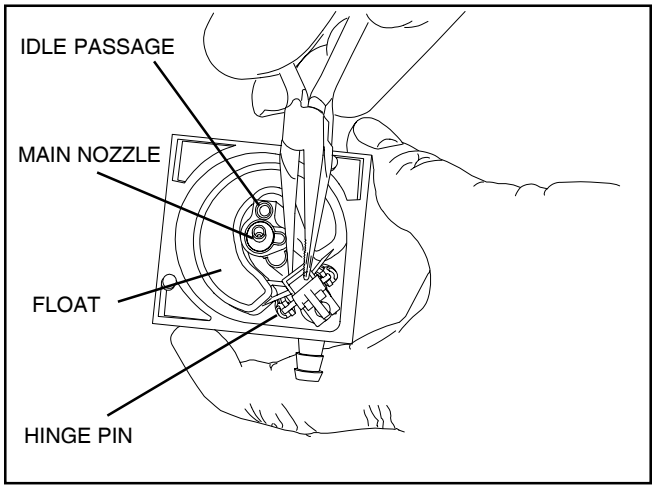
IF A SCREW DRIVER OR SIMILAR TOOL IS USED TO AID IN THE BAIL REMOVAL, CARE MUST BE TAKEN NOT TO PERMANENTLY BEND THE RETAINER.



After the bowl gasket is removed, the parts contained in the bowl can be inspected and serviced. Pull out the main nozzle and spring. Inspect the main nozzle for deposits, be sure to check the cross holes on the body of the nozzle and the main orifice in the bottom of the nozzle. Use compressed air or monofilament fishing line to remove any deposits in the main jet or cross holes. Remove the drain screw to access the spring, jet and "O" ring. The main jet should be inspected and cleaned if deposits exist.

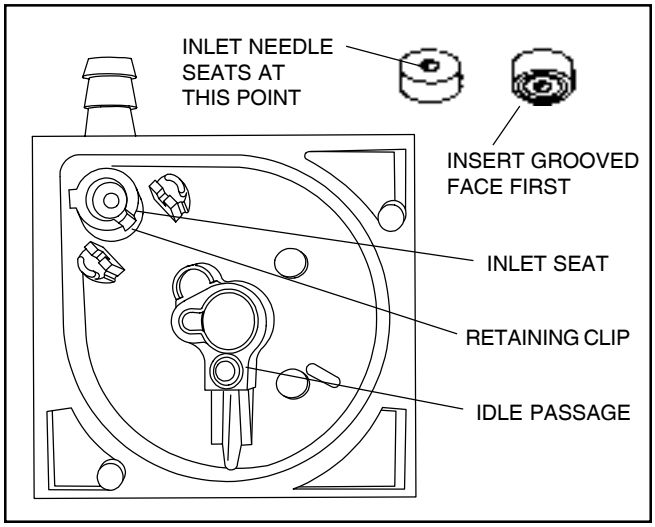


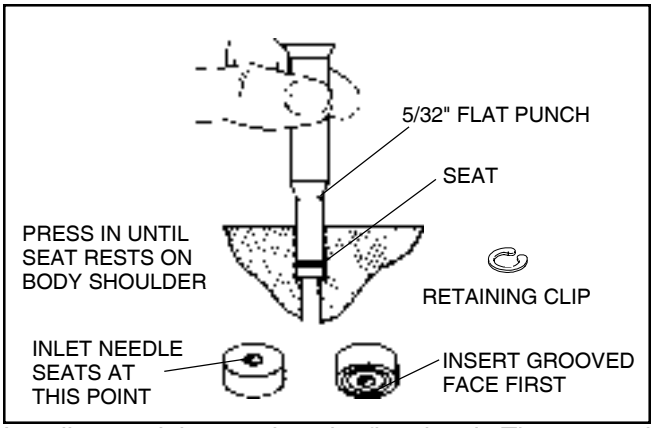
The float is held in the float bowl by the float pin which is pressed into tabs on top of the float support towers. **NOTE:** To prevent damage to the float bowl, pull straight up with a needle nose pliers in the pocket closest to the main fuel well. Carefully lift the float out of the float bowl and inspect for damage or deposits. Clean the idle passageway with compressed air, or with tag wire.



NOTE: The inlet needle is attached to the float and should also be inspected for damage or deposits.

The inlet seat can be removed with a small wire hook or a #2 crochet hook. Inspect the float bowl and main nozzle area for sediment and deposits. Use a carburetor cleaner to loosen and remove deposits and sediment.





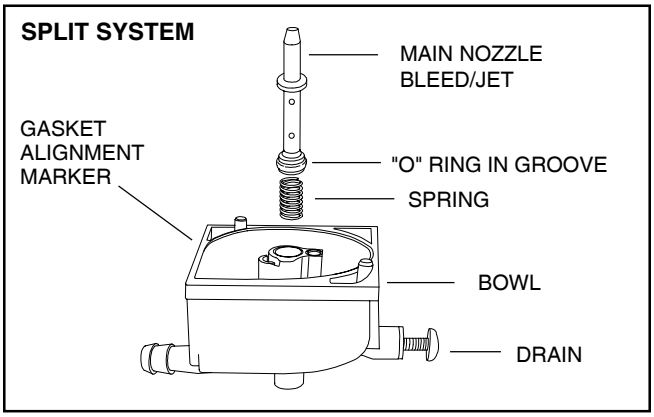
Install a new inlet seat into the float bowl. The grooved side of the inlet seat goes into the float bowl first. Place a drop of oil on the seat and press it in with a flat punch until it seats. Do not scratch the inlet bore.

NOTE: Some models are equipped with a fuel inlet seat retaining ring. If your replacement seat set comes with a retaining clip install it on top of the seat.

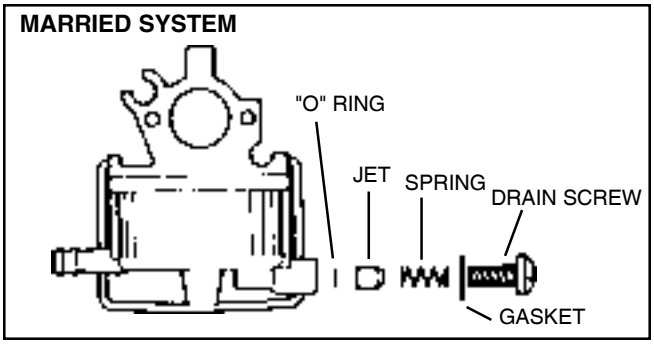
Slide the inlet needle into the tabs on the float and put the float pin into the hinge on the float. Carefully set the float into position in the float bowl.

Be sure the needle drops into the fuel inlet. Snap the float shaft into the tabs in the float bowl. It is not necessary to adjust the float height even if the float has been replaced.

Drop the main nozzle spring into the main nozzle well in the float bowl. Put a small amount of oil on the main nozzle “O” ring and push the nozzle into the main nozzle well, “O” ring end first.



In addition to this, the married system carburetor has the "O" ring, main jet, and spring located behind the drain system.



Place a new gasket on top of the float bowl with the notch on the gasket aligned with the bump on the bowl edge (the gasket will only fit onto the float bowl one way.) Hold the float bowl to the carburetor body and snap the retainer into position. Reinstall the bowl drain screw, do not over tighten, reattach the fuel line.

NOTE: Bowl service is all that is normally required for routine carburetor maintenance.

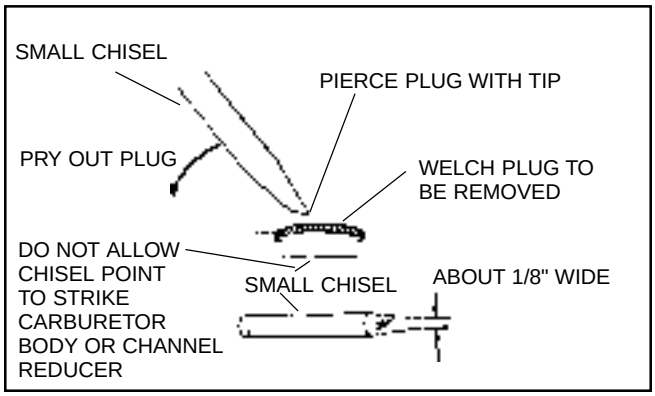
Rebuilding the carburetor body:

Before disassembling the carburetor body, check the throttle shaft and body for excessive wear. If there is excessive wear to the throttle body, it should be replaced.

To rebuild the carburetor body it is necessary to remove the carburetor from the engine.

1. Remove the speed control plate.
2. Remove the air cleaner body from the carburetor.
3. Disconnect and plug the fuel line.
4. Remove the carburetor mounting studs.
5. Remove the governor link.
6. Drain the carburetor float bowl.
7. Disassemble the float bowl (see bowl service).

To properly clean the carburetor body, the welch plugs should be removed to expose drilled passages. To remove welch plug, sharpen a small chisel to a sharp wedge point. Drive the chisel into the welch plug, push down on chisel and pry plug out of position.



After the welch plug is removed from the carburetor it can be soaked in a commercial carburetor cleaner no longer than 30 minutes. Be sure to follow the directions on the container.

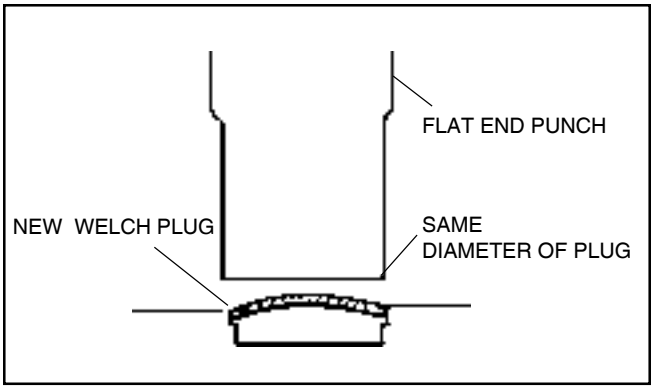
NOTE: Always pull the non metallic slip in venture out before soaking in carburetor cleaner.

Reinstall the venture using the main nozzle to align it correctly. The air bleed passages face the air filter.

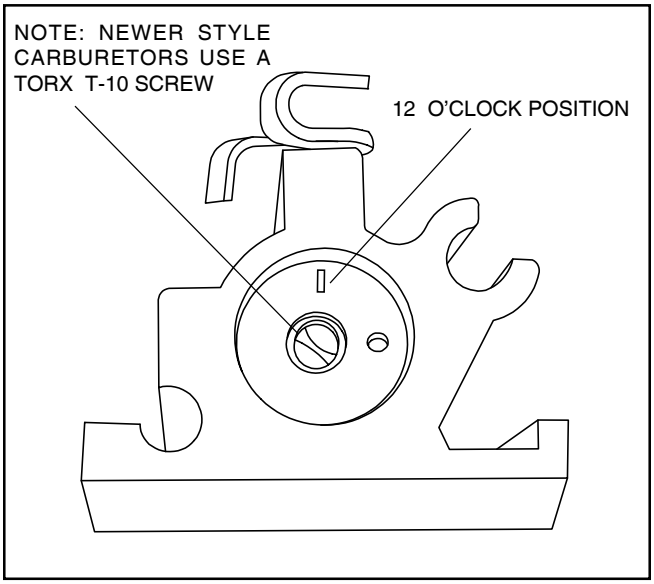
After the carburetor has been soaked, all passages may be probed with monofilament fishing line and compressed air to open plugged or restricted passages.

Install a new welch plug over the idle fuel chamber with the raised portion up. Use a punch equal to the size of the plug, to flatten the plug. Do not dent or drive the center of the plug below the top surface of the carburetor.

NOTE: To insure a good seal on this plug, we recommend coating the seam with nail polish which is gas resistant.



Install the throttle shaft and shutter (use a new shutter screw and dust seal). The scribe mark on the shutter must be in the 12 o'clock position.

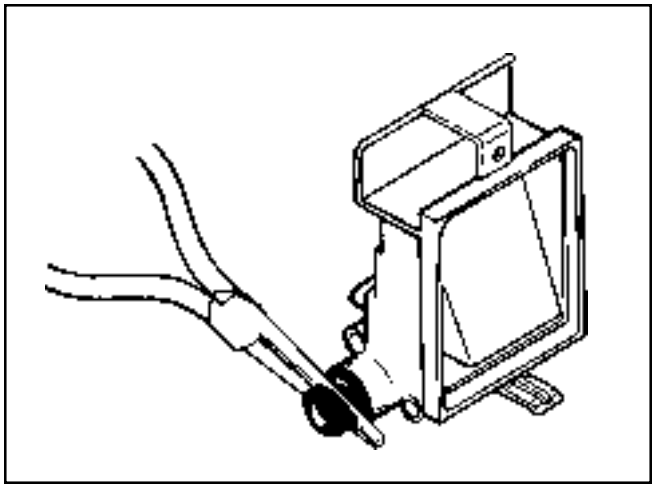


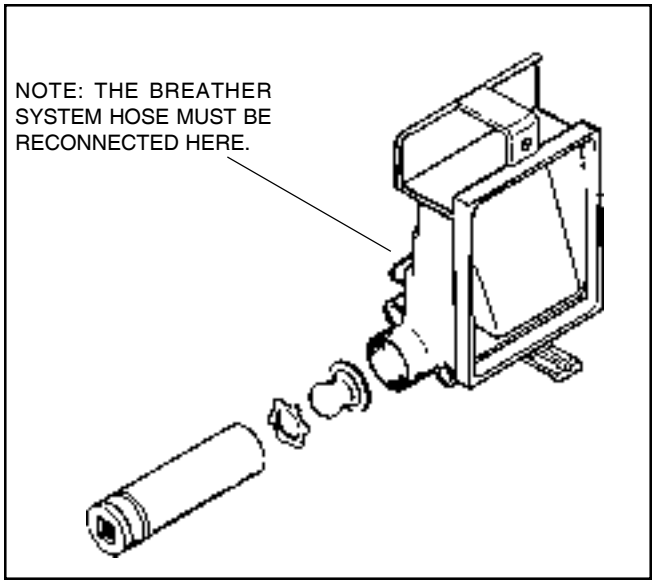
NOTE: If the scribe mark is out of position the shutter may stick.

To rebuild the Float Bowl, refer to the previous section on float bowl service.

Install the carburetor to the engine using a new gasket. The primer passage in the air cleaner body should be cleaned before it is reinstalled over the carburetor.

Primer Bulb Service: To remove the primer bulb, grasp the primer bulb with a needle nose pliers and roll the pliers along the air cleaner body. After removing the primer bulb, the retaining ring must be removed. Use a screwdriver to carefully pry the retainer out of the air cleaner body. Do not reuse old bulb or retainer.





After the primer bulb is removed, clean the primer passages thoroughly.

Press the new bulb and retainer into position using a deep reach socket as shown.

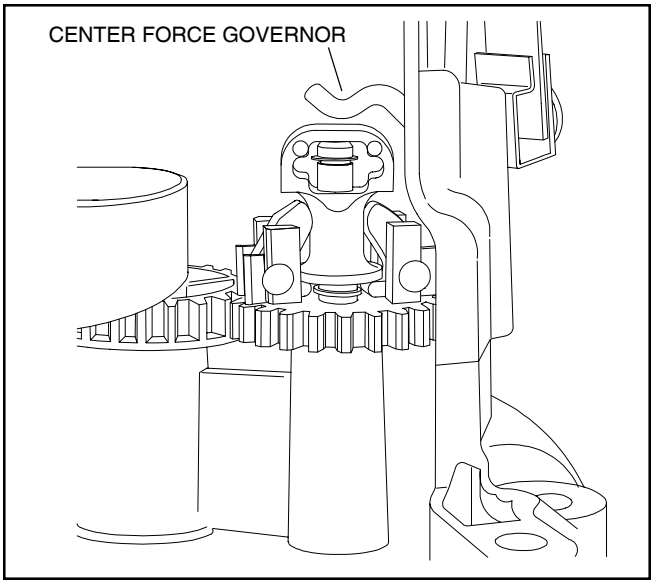
CAUTION: Wear safety glasses or goggles when removing retainer.

Install air cleaner body over the carburetor using a new gasket.

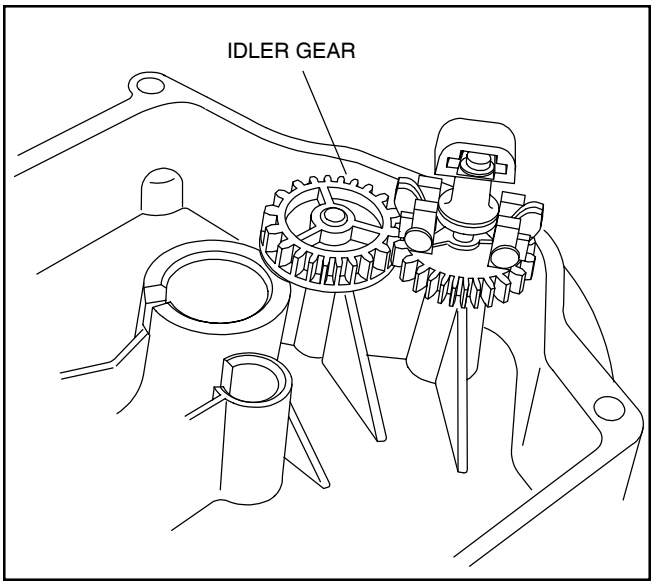
NOTE: The VLV models use a closed loop breather system. The crankcase breather tube must be reconnected to the air filter body

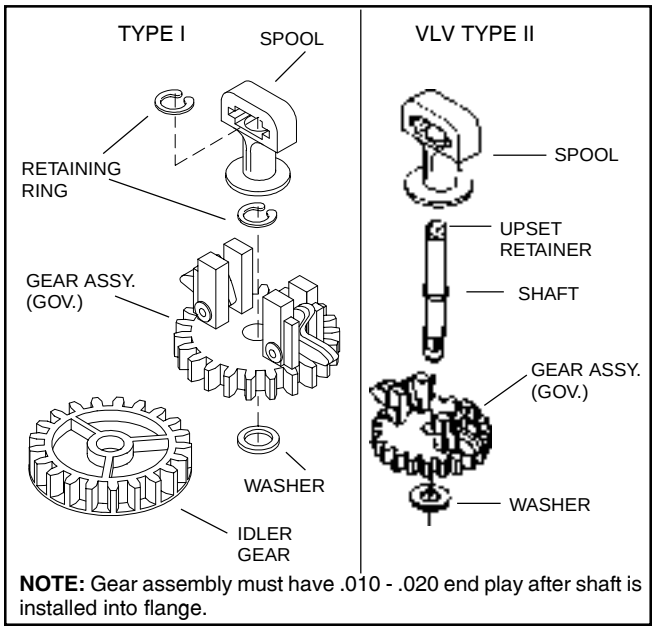
Chapter 3
GOVERNORS AND LINKAGE

All Tecumseh 4-cycle engines of recent manufacture are equipped with mechanical type governors. As the speed of an engine increases, centrifugal force moves the weights outward, lifting up the governor spool which contacts the governor shaft; this in turn closes the throttle. As engine speed decreases, the weights are pulled inward by the spring which opens the throttle. Thus, the engine speed controls the throttle opening and maintains a certain governed speed.



The governor gear on this engine is driven by the crankshaft through an idler gear as shown below.

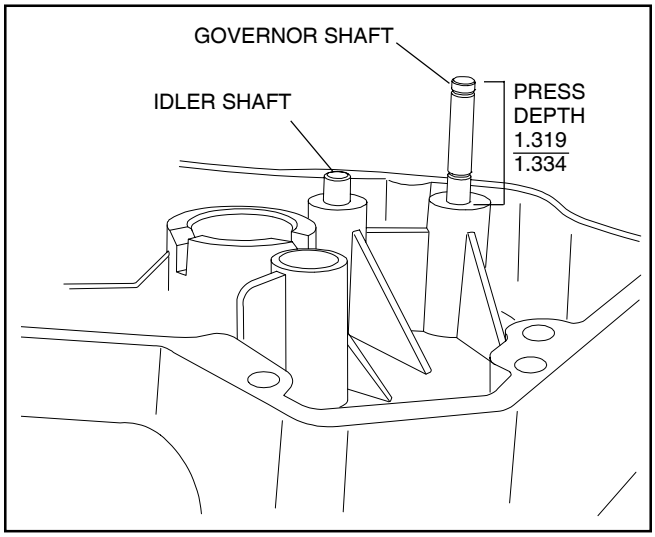




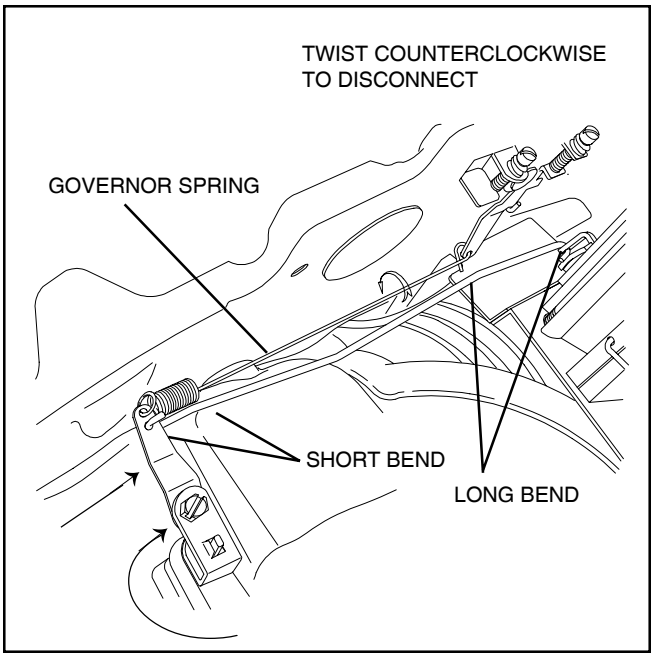
NOTE: Gear assembly must have .010 - .020 end play after shaft is installed into flange.

TYPE II governors do not use governor retainer clips. The spool is retained by a raised upset on the shaft.

The governor shaft is pressed into the flange or cover to a specific dimension as shown below.

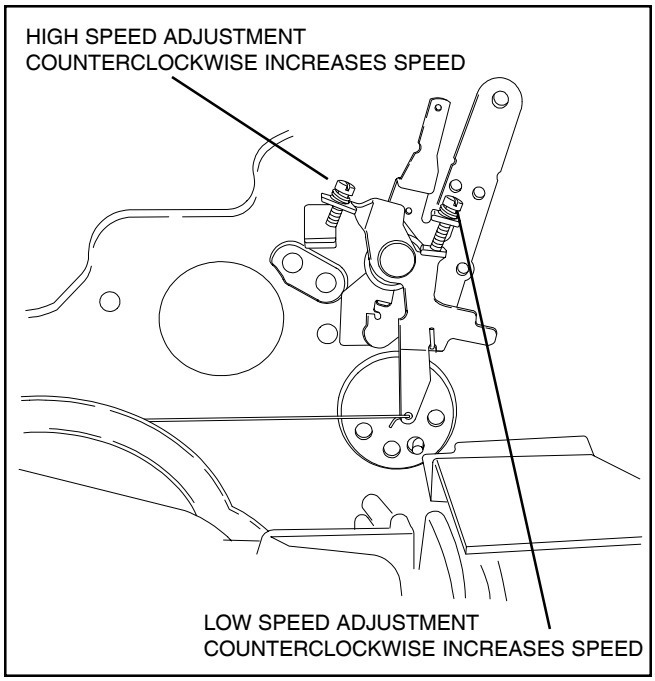


Linkage Installation: The solid link is always connected from the throttle lever on the carburetor to the lower hole on the governor lever. The shorter bend has to be toward the governor. The governor extension spring is connected with the spring end hooked into the upper hole of the governor lever and the extension end hooked through the speed control lever. To remove the governor spring, carefully twist the extension end counterclockwise to unhook the extension spring at the speed control lever. Do not bend or distort governor extension spring.



Governor Adjustment. With engine stopped, loosen the screw holding the governor clamp and lever. Turn the clamp clockwise, then push governor lever connected to the throttle to a full wide open throttle position. Hold the lever and clamp in this position and tighten the screw.

Speed Controls: This engine has an adjustable speed control. Never exceed the manufacture's recommended speeds.



NOTE: Governor adjustment screw will be Torx head (T-10) effective August 1, 1996 for E.C. Compliance.

Chapter 4
STARTERS

REWIND STARTER

DISASSEMBLY PROCEDURE.

1. After removing the rewind assembly from the engine, remove the starter handle by first pulling a length of rope out using the handle, tie a temporary knot in the exposed rope, then untie the knot in handle or pry out the staple.
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Place a 3/4'' deep reach socket under the retainer pawl. Set the rewind on a bench, supported on the socket.
4. Using a 5/16'' roll pin punch, drive out the center pin.
5. All components that are in need of service should be replaced.

THIS REWIND SPRING IS NOT IN A CANISTER.

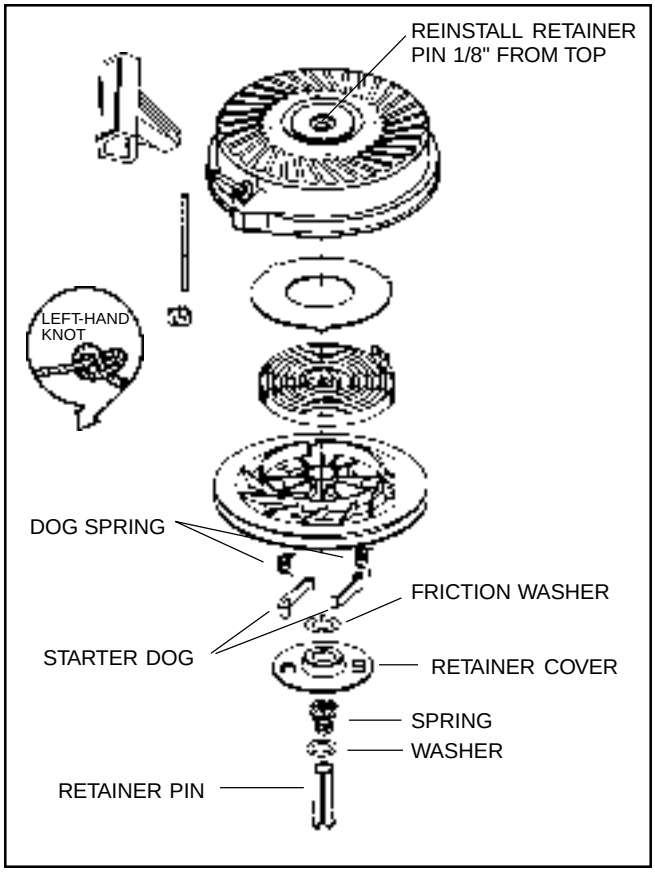
Care must be used when handling the pulley because the rewind spring and cover are held together by the bosses in the pulley.

ASSEMBLY PROCEDURE.

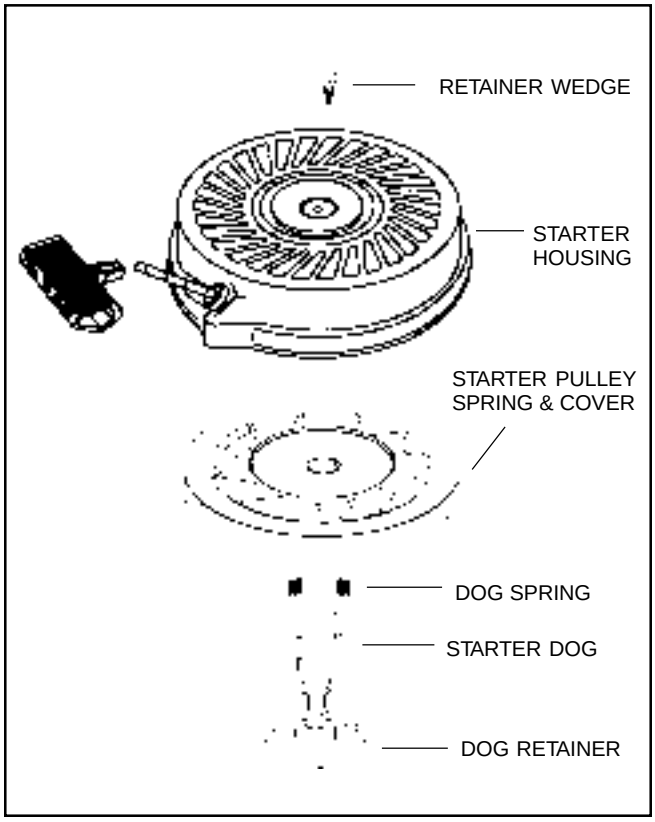
1. Reverse the above listed procedure keeping in mind that the starter dogs with the dog springs must snap back to the center of the pulley.
2. Always replace the center pin with a new pin upon reassembly. Also place the two new plastic washers between the center leg and retainer pawl. Discard old plastic washer. The new plastic washers will be provided along with the new center pin.
3. Check retainer pawl. If it is worn, bent or damaged in any manner replace upon reassembly.

   Install the new center pin in until it is within 1/8 of an inch of the top of the starter.

CAUTION: Driving the center pin in too far will cause the retainer pawl to bend and the starter dogs will not engage the starter cup.



NOTE: Always replace the decal or plug over the roll pin or wedge to prevent moisture infiltration.



STYLIZED REWIND STARTER WITH PLASTIC RETAINER

Disassembly Procedure

1. After removing the rewind assembly from the engine, remove the starter handle by first pulling a length of rope out using the handle, tie a temporary knot in the exposed rope, then either untie the knot in handle or pry out the staple.

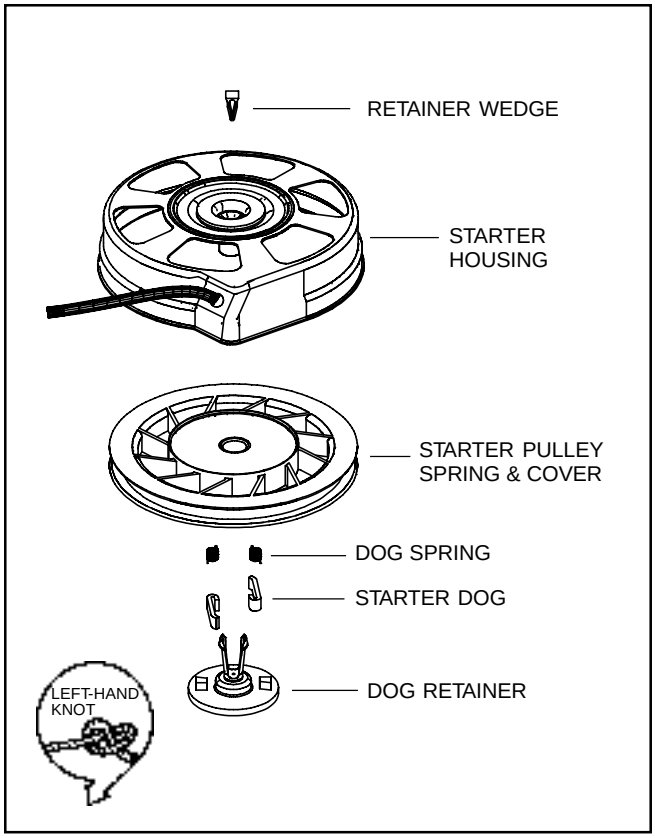
2. Untie the temporary knot and slowly allow the rope to fully retract into the starter housing and the recoil spring to fully unwind.
3. Remove the decal from the center of the starter housing.
4. Use a small Phillips screwdriver or similar tool to pry the retainer legs apart and lift out the retaining wedge.
5. Pinch the legs of the retainer together and pull on the head of the retainer to remove it from the housing.
6. Remove the pulley assembly from the recoil housing.
7. Repair or replace as necessary.

Assembly

1. If replacing the starter rope, see Step 8.

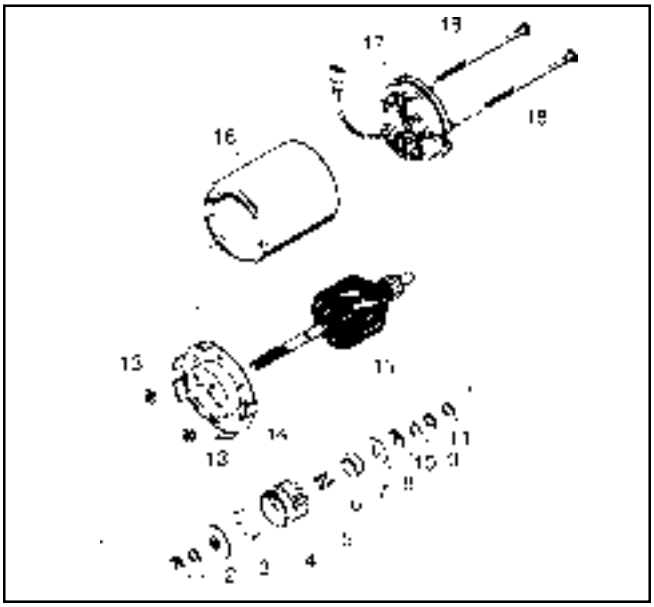
   NOTE: EXTREME CAUTION AND APPROPRIATE SAFETY EQUIPMENT MUST BE USED WHEN WORKING WITH RECOIL SPRINGS.

2. Install a new recoil spring if necessary by pushing the new spring out of the holder into the pulley cavity while aligning the outside spring hook into the deep notch in the pulley. Push the spring cover in until seated.
3. Apply a small amount of lithium grease to the inner bore of the center shaft.
4. Replace or check that both starter dogs are in the pulley pockets and that the dog springs are hooked on the outer surface of the dog.
5. Pinch the two legs of the plastic retainer together and start into the center shaft hole.
6. Rotate the retainer so the two tabs on the bottom of the part fit between the dog and pulley hub (left side of the dog). Push the retainer in until the leg prongs pop out of the center shaft.
7. Turn the starter over and snap the locking tab between the retainer legs, replace the top decal.
8. Carefully turn the pulley counterclockwise until it stops. Then back the pulley up until the recoil grommet hole and the pulley hole are aligned. Next using a rope with a cauterized end, feed it into the pulley hole. Tie a left handed knot and allow the rope to be drawn into the recoil slowly.



12 Volt Electric Starters

ELECTRIC STARTER REMOVAL. Remove face plate, air cleaner assembly and gas tank. Compress plastic grommet and pull it out of the blower housing. Slide the wire through slot, being careful not to cut the wire insulation. Remove blower housing, remove flywheel (see flywheel section) and inspect ring gear for wear or damage. Replace if necessary (see flywheel section). Remove nuts on both sides of pinion. Drop starter out of back plate and remove ground wire.

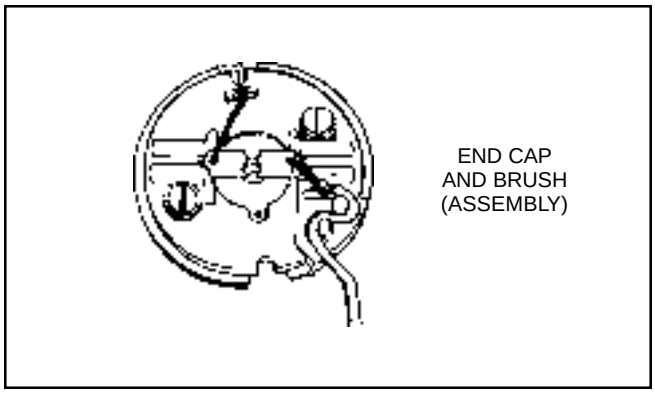


DRIVE ASSEMBLY SERVICE. Pinion gear parts should be checked for damage or wear. If the gear does not engage or slips, it should be washed in solvent (rubber parts cleaned with soap and water) to remove dirt and grease, and dried thoroughly. If damaged, replace parts.

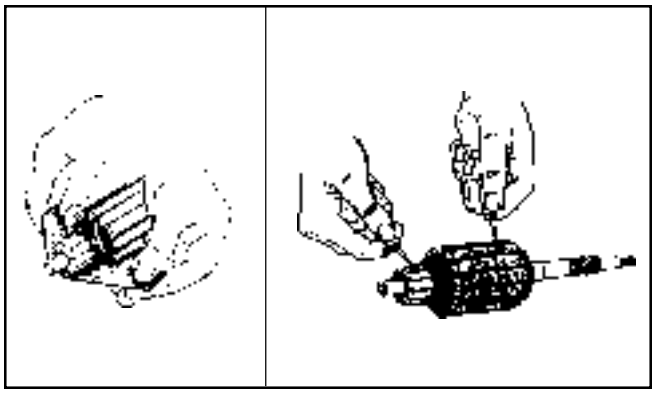
PARTS LIST:

1. Retainer ring
2. Dust washer
3. Drive nut
4. Pinion driver
5. Gear
6. Anti-drift spring
7. Spring retainer (spring collapses into retainer)
8. Cup washer (cup washer cupped over retainer spring)
9. Washer (metal)
10. Retainer ring
11. Thrust washer (metal)
12 Washer (plastic)
13. Lock nuts
14. Cap assembly drive end
15. Armature
16. Housing
17. End cap and brush card assembly
18. Bolts

Remove, inspect and replace as necessary. Use reverse procedure for assembly. (For ease of assembly assemble armature into brush end frame first.) Place a small amount of light grease such as lubriplate between the drive nut (3) and helix on armature shaft. DO NOT apply lubricant to pinion driver.



CHECK BRUSHES. Before removing armature, check brushes for wear. Make sure brushes are not worn to the point where brush wire bottoms out in the slot of brush holder. Brush springs must have enough strength to keep tension on the brushes and hold them against the commutator. If brushes are in need of change, replace the entire end cap assembly.



ARMATURE CHECK. If commutator bars are glazed or dirty, they can be turned down in a lathe. While rotating, hold a strip of 00 sandpaper lightly on the commutator, moving it back and forth. (Do not use emery cloth.) Recut grooves between commutator bars to depth equal to the width of the insulators.

Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature, rotate armature and check out all commutator bars.

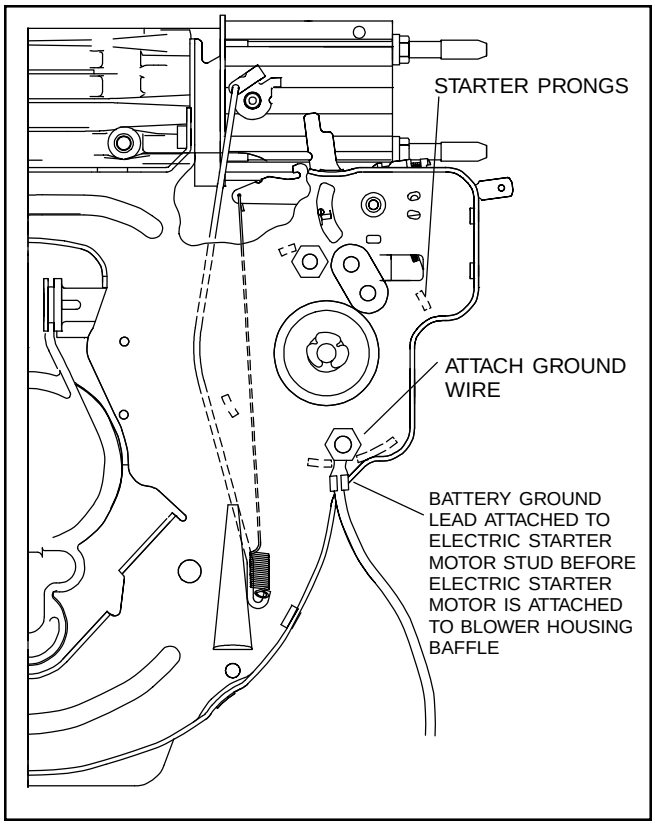
The armature can be thoroughly checked with a growler if available.

ELECTRIC STARTER ASSEMBLY

ATTACH THE GROUND WIRE prior to assembling the electric starter to the baffle, attach the black ground wire to the electric starter through bolt so the the wire extends between the two adjacent end cap prongs (illustration).

Place the starter into the back plate with the ground wire bolt away from carburetor (see picture). Note that the throttle linkage is routed around starter while the governor spring is routed through the end cap prongs (illustration).

Tighten nuts on starter bolts (see specifications). Place blower housing on engine and slide wires through slot making sure not to cut insulation. Press grommet into hole. Reassemble gas tank, air cleaner assembly and face plate.

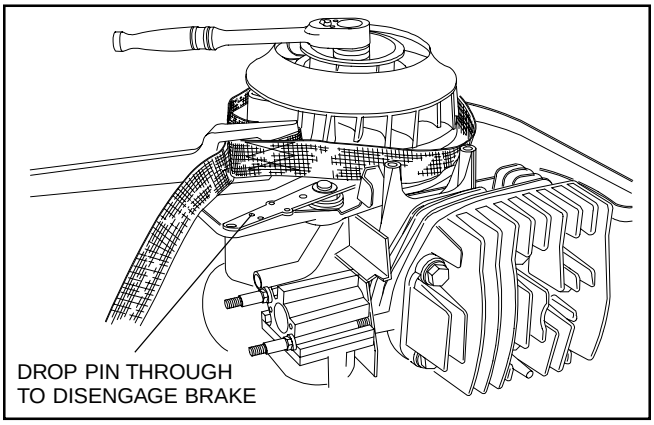


Chapter 5
FLYWHEELS

This engine uses one of two types of flywheels. The first type is a cast iron high inertia flywheel. This type of flywheel will have a pressed on steel ring gear if the engine is equipped with an electric starter. The steel ring gear is nonserviceable. The second and most popular style of flywheel is diecast aluminum. The aluminum flywheel features a replaceable plastic fan and a nonserviceable plastic ring gear when equipped with an electric stater. Disconnect battery before servicing.

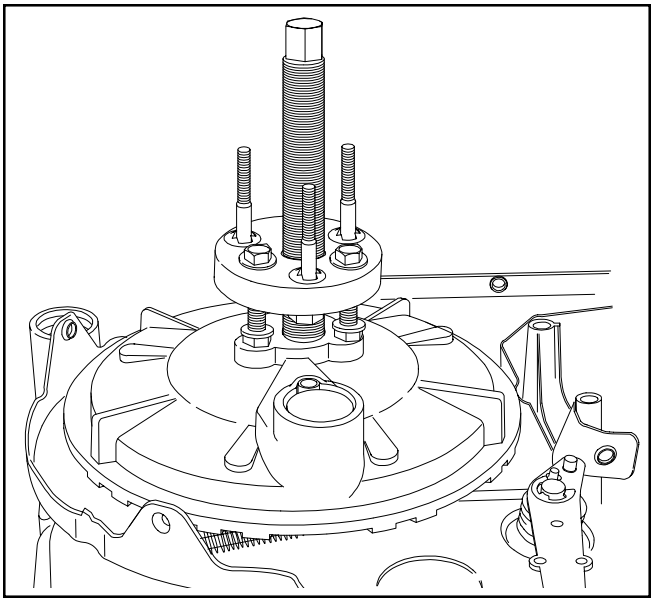
FLYWHEEL REMOVAL. Remove the ignition module. Remove the brake pressure from the flywheel. The brake can be locked in the disengaged position by placing a pin into one of the aligned holes in the backing plate lever assy.

To remove the flywheel nut, use a flywheel strap wrench (670305) to hold the flywheel, while turning the flywheel nut counterclockwise.



Lift the starter cup and fan off of the flywheel. (Aluminum flywheel only)

Remove the flywheel using a flywheel puller or knock-off tool.

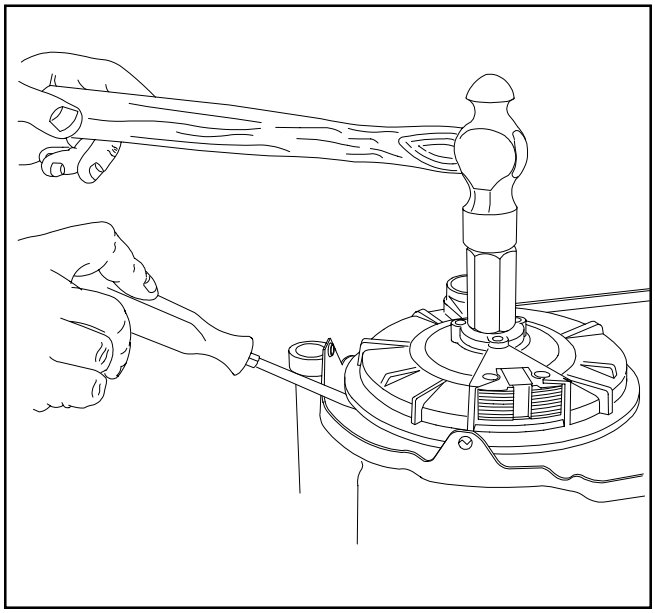


On engines with cored holes (not tapped) use flywheel puller Part No. 670306.

Screw the knock-off (no. 670169) tool down until it touches the flywheel, then back off 1 turn. Using a large screwdriver, pry upward under the flywheel (side opposite the brake) and tap sharply and squarely on the knock-off tool to break the flywheel loose. If necessary rotate flywheel a half turn and repeat until it loosens.

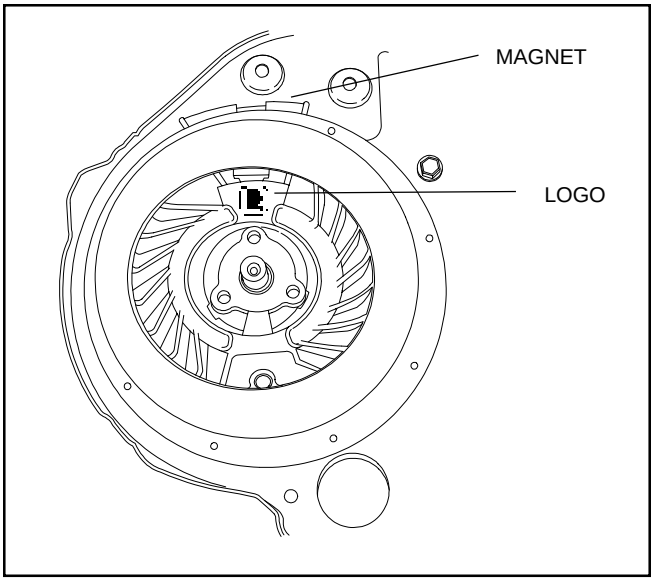
NOTE: Do not attempt to remove flywheel using a jaw type puller on the outer diameter of the flywheel or flywheel breakage will occur.

NOTE: Never use a pry bar with any type of curve on the end. Breather cover damage can result.



FOR FLYWHEEL REASSEMBLY (INSTALLATION).

1. Inspect brake pad to be free of dirt, oil or grease. If pad is contaminated, or less than .060'' at the narrowest point, replace. See flywheel brake section for procedure.
2. Compress brake lever
3. Install flywheel key
4. Install flywheel
5. Install the fan onto the flywheel so the Tecumseh logo on the fan is on the magnet side of the flywheel.
6. Place starter cup into position and torque flywheel nut to specification. Use a strap wrench to hold the flywheel.



BRAKE SYSTEM

Tecumseh's brake system provides a method of meeting compliance standards which became law as of June 30, 1982. There are two additional methods used by equipment manufacturers that also meet compliance standards and they are as follows:

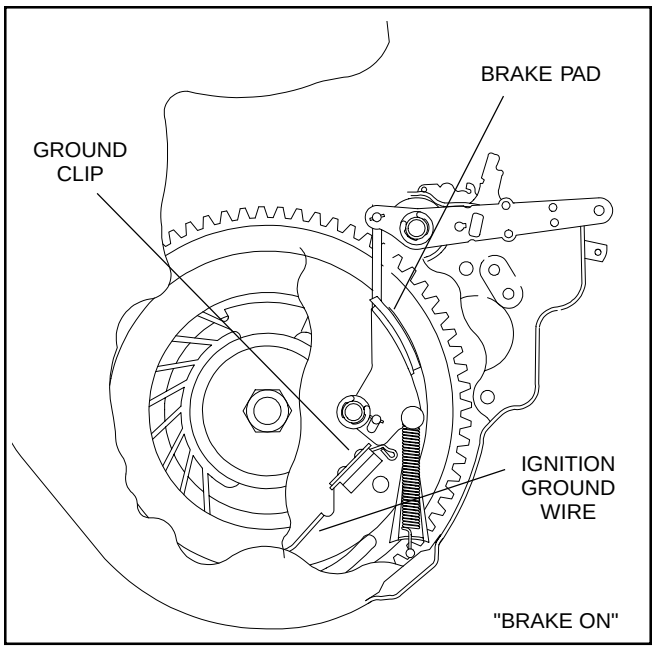
1. **B.B.C. Blade Brake Clutch**: This system is designed to stop the blade from rotating, in compliance with the 3 second stopping regulation, after operator lets go of the safety bail. This system allows the engine to continue running while stopping the blade. B.B.C. systems are installed by various O.E.M.'s all parts are supplied by them.
2. Use of a recoil starter (top or side mounted) with the rope handle on the engine as opposed to within 24 inches of the operator position. This method is acceptable if the mower deck passes the 360 degree foot probe test. A specified foot probe must not contact the blade when applied completely around the entire blade housing. This alternative can be used with engine mounted brake systems and typical bail controls. The blade stops within three seconds after the operator lets go of the blade control bail at the operator position and the engine is stopped.

Tecumseh's Flywheel Brake System provides consumer safety by shutting down the engine and lawnmower blade within seconds after the operator releases an Engine/Blade control at the handle of the lawnmower.

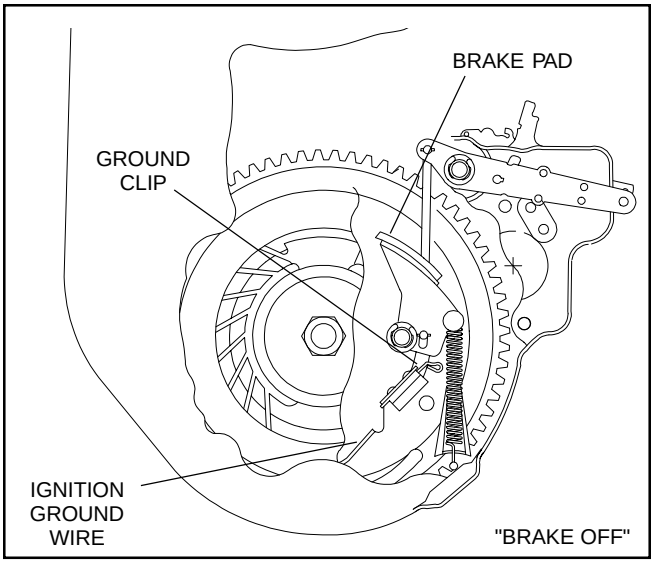
The Brake Starter Mechanism may be used with either of two options for starting:
1. Manual Rope Start
2. 12 Volt Starter System

Each system requires the operator to start unit behind mower handle in operator zone area. The electric start system also provides a charging system for battery recharge when engine is running.

NOTE: Electric start systems equipped with a charging system **WILL NOT RECHARGE** a dead battery. This system is designed to maintain the charge. Before storage and again in spring the battery should be charged with the O.E.M. supplied charger.



STOPPING THE ENGINE. In the stop position the brake pad is applied to the inside edge of the flywheel; at the same time the ignition system is grounded out.

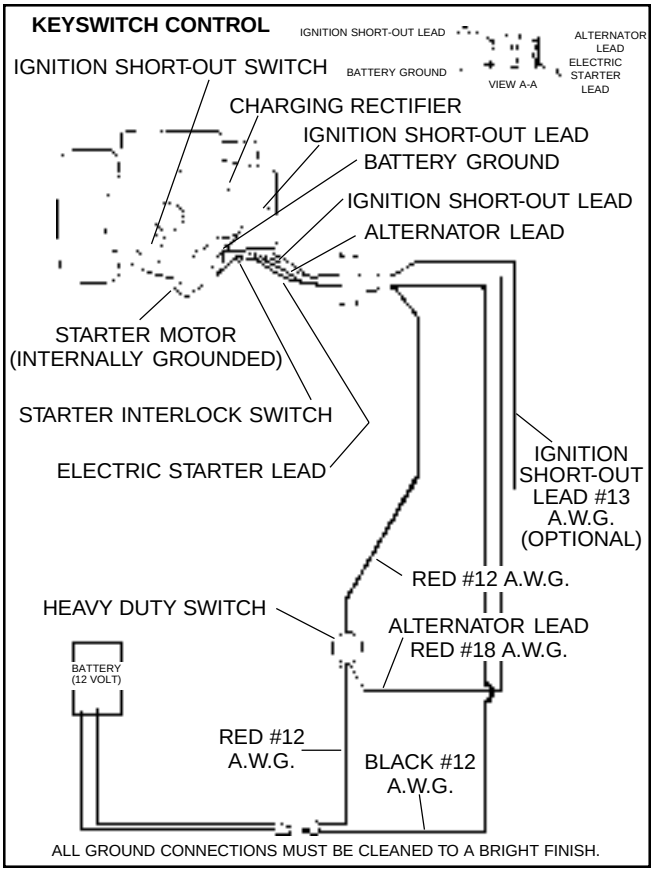


TO START THE ENGINE. In order to restart the engine, the control must be applied. This action pulls the brake pad away from the inside edge of the flywheel and opens the ignition ground switch.

On electric start systems the starter is energized to start the engine.

On non-electric start systems, recoil starter rope must be pulled to start engine.

WIRING DIAGRAMS (Electric Start Systems). All wiring beyond the connectors on the engine are supplied by the equipment manufacturer. Check all terminals and connectors for corrosion and adequate contact, and all wiring for damage and proper size.

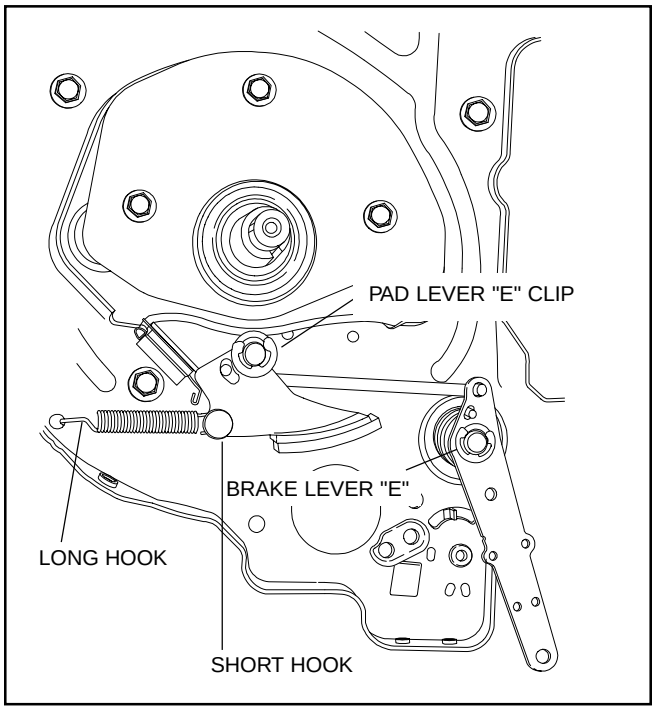


BATTERY. Check battery per manufacturer's recommendations. The charging system on the engine maintains the battery during normal use.

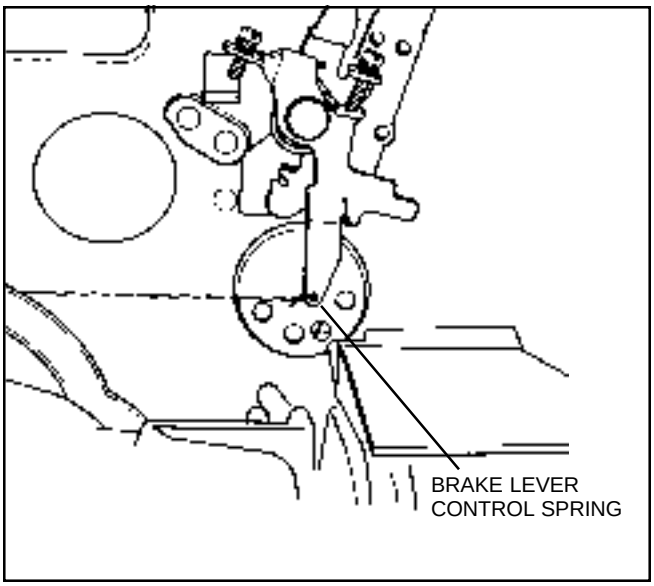
When battery is low, use the 120 volt auxiliary charger (usually supplied by the equipment manufacturer).

TO REPLACE BRAKE PAD:

1. If equipped with electric starter, locate wire routing through blower housing. Compress the grommet and pull out of the blower housing. Carefully slide wires through the slot. DO NOT cut the wire insulation on the blower housing.
2. Remove flywheel (see flywheel removal.)
3. Remove pad lever "E" clip. Lift pad lever, and unhook spring and link.
4. Attach the link to the new pad lever, install pad lever and "E" clip.
5. Attach spring to lever first. Use a needle nose pliers to hook the spring into the baffle.



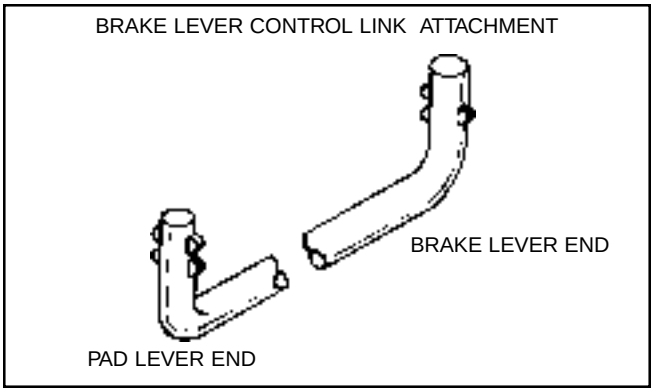
NOTE: It is important to attach the pad lever spring with the short hook on the pad lever and the long hook to the blower housing baffle.



TO REPLACE BRAKE CONTROL LEVER:

1. Mark hole that spring is installed into baffle.
2. Remove “E” clip from brake lever shaft.
3. Lift brake control lever and unhook link. Replace with new lever and reassemble in reverse order.
4. Replacement springs must be the same size and color.
5. Be sure control lever spring is in proper hole in blower housing baffle before reassembly.

When removing the brake lever with a reverse pull brake, the pad lever must be removed to unhook the brake link from the brake lever.

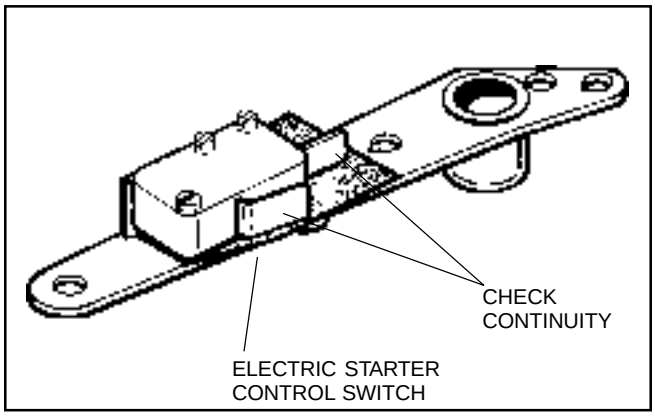


CONTROL SWITCH. The brake lever must close the switch before the starter can be engaged.

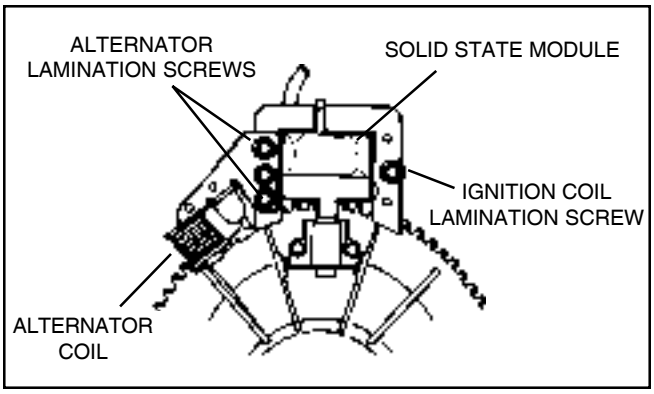
Disconnect battery from circuit before making check.

Engines equipped with an electric starter have a control switch that is attached to the brake lever. The brake lever must close the switch before the starter can be engaged.

CHECKING THE CONTROL SWITCH. Disconnect the battery from the circuit. Use a continuity light or meter to check control switch operation. Disconnect the wire harness at the engine. Attach one continuity light lead to the electric starter lead (see illustration on previous page.) Attach the other continuity light lead to the battery ground lead. With leads attached, press the control switch lever and the continuity light should go on, if not replace switch.



Chapter 6
ALTERNATOR



ALTERNATOR. The 350 Milliamp charging system consists of a single alternator coil mounted to one side of the solid state module.

NOTE: This charging system is designed to maintain a charged battery. Most O.E.M.'s supply a trickle charger, which should be used before and after off season storage. Then this system will maintain the charge level under normal use conditions.

Do not operate engine with charging system disconnected. Damage to diode may occur.

CHECKING THE SYSTEM. Connect voltmeter at the battery (should read battery voltage). The battery MUST BE IN CIRCUIT for test to perform properly. Next, start engine -voltage should read higher than when engine is off. If there is a change upward in voltage, the charging system is working. If there is no change in voltage, the alternator should be replaced.

NOTE: Set volt/ohm meter to 0-20 volt D.C. scale for test.

TROUBLESHOOTING ELECTRIC START ENGINES.

Following is a list of possible problems and causes.

DEAD BATTERY
Extended storage without charging
Excessive cranking
Faulty starter
Faulty wiring
Faulty alternator
Faulty battery

BATTERY O.K., ENGINE WON'T CRANK
Brake cable defective
Faulty starter switch
Poor electrical connections
Faulty starter. See starter section

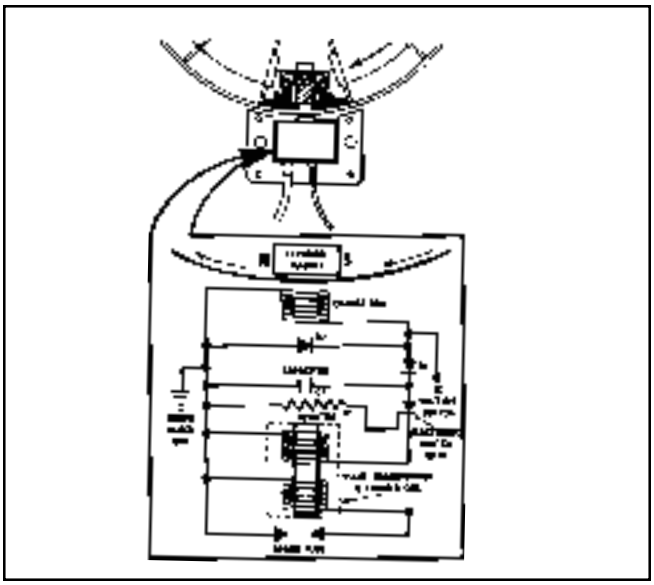
ENGINE CRANKS SLOWLY
Weak or discharged battery
Faulty starter

TROUBLESHOOTING FOR BOTH MECHANICAL AND ELECTRIC START SYSTEMS

IF ENGINE PULLS OR CRANKS HARD
Excessive engine drag due to obstructions under deck.
Mower traction drive misadjusted
Valve clearance too wide
Compression release not functioning
Compliance brake is still applied

Maximum compression should be 90 PSI. If compression is higher, de-carbon the valve seat and head area and check valve clearances. Exhaust valve clearance may be set as low as .004'' if necessary to gain more compression relief. If compression is still above 90 PSI, check compression relief part of camshaft.

Chapter 7
IGNITION



SOLID STATE IGNITION. Tecumseh's solid state capacitor discharge ignition (CDI) is an all electronic ignition system and is encapsulated in epoxy for protection against dirt and moisture.

SOLID STATE IGNITION OPERATION. As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. This energy is transferred to a capacitor where it is stored until it is needed to fire the spark plug.

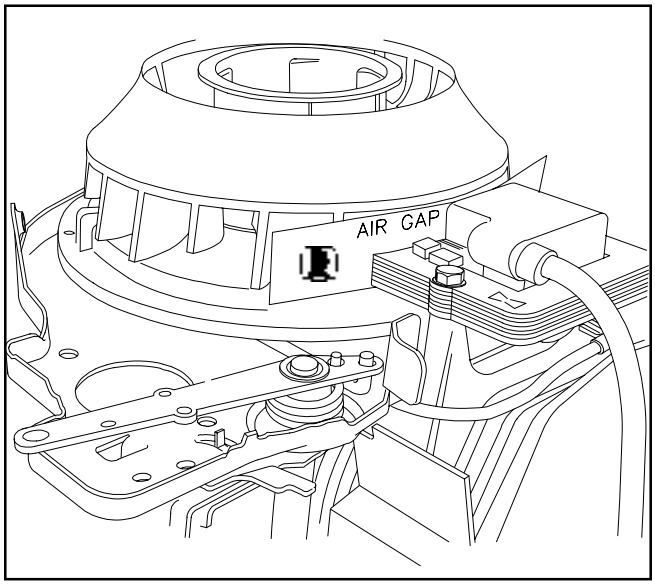
The magnet continues rotating past a trigger coil where a low voltage signal is produced and closes an electronic switch (SCR).

The energy which was stored in the capacitor is now transferred through the switch (SCR) to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage is transferred by means of the high tension lead to the spark plug, where it arcs across the electrode of the spark plug and ignites the fuel-air mixture.

SPARK PLUG SERVICE. Spark plugs should be replaced periodically. Check electrode gap with wire feeler gauge and adjust gap to .030". Replace if electrode is pitted, burned or the porcelain is cracked. Refer to Master Parts Manual for correct replacement number. Use a spark plug tester to check for spark.

If spark plug fouls frequently, check for the following conditions:

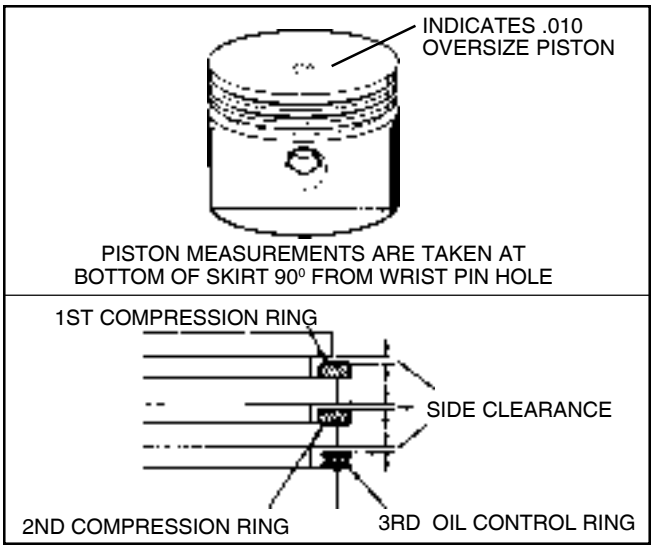
1. Incorrect spark plug
2. Poor grade gasoline
3. Breather plugged
4. Oil level too high
5. Engine using excessive oil
6. Clogged air cleaner

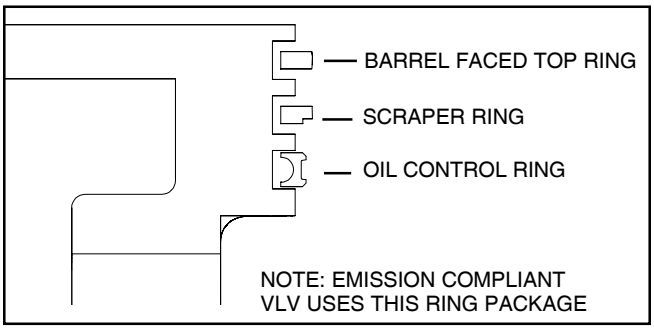


The proper air gap setting between magnets and the laminations on CDI systems is .0125''. Place .0125'' gauge, Part No. 670297 between the magnets and laminations and tighten mounting screws to a torque of 30-40 inch pounds. Recheck gap setting to make certain there is proper clearance between the magnets and laminations. NOTE: Due to variations between pole shoes, air gap may vary from .005/.020'' when flywheel is rotated. There is no further timing adjustment on external lamination systems.

IGNITION TIMING. The flywheel key is what times the ignition for the engine. If this key is partially sheared from striking an object with the blade. The timing and engine performance could be affected. The key should be inspected if a performance problem exists.

Chapter 8
PISTON, RINGS AND CONNECTING ROD





PISTON. Before removing piston, clean any carbon from the top of the cylinder bore to prevent ring breakage when removing the piston. Push the rod and piston out through the top of the cylinder.

Oversize pistons are identified by the size imprinted on the piston as shown. Check the piston for wear by measuring at the bottom of the skirt 90° from the wrist pin hole. Clean the carbon from the piston ring grooves, install new rings and measure side clearance. Tolerances are listed in the table of specifications (page 40).

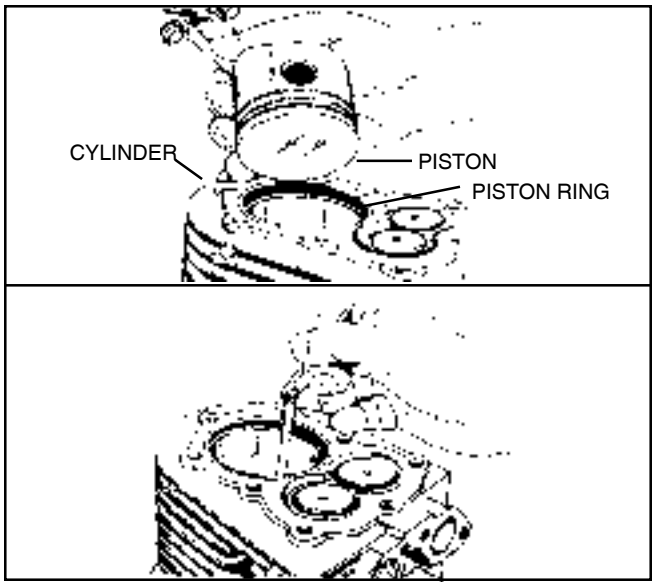
Replace rings in sets and always stagger ring gaps. When in stalling new rings, deglaze cylinder wall, using a commercially available deglazing tool.

Use a ring expander to remove and replace rings. Do not spread the rings too wide or breakage will result.

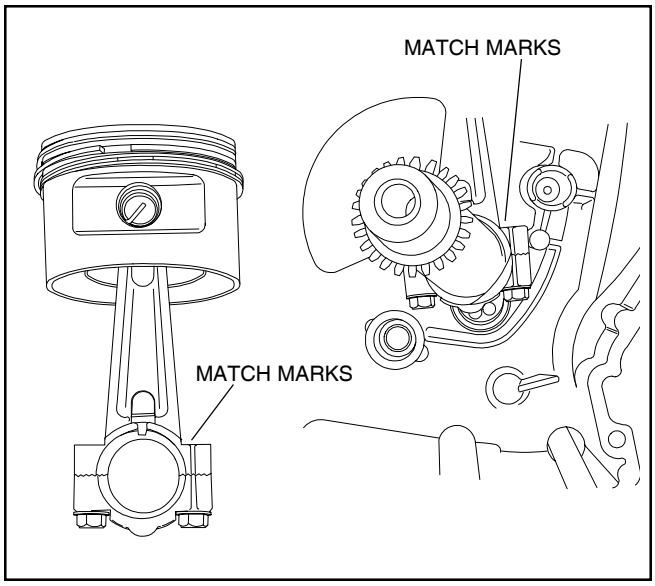
The top compression ring will have a chamfer on the inside edge. The ring must be installed with the chamfer up.

To check ring end gap, place ring squarely in center of ring travel area. Using the piston to push the ring down into the cylinder at least one inch.

Check ring gap on new ring to determine if cylinder should be rebored to take oversize parts. See Table of Specifications (page 40).



CONNECTING RODS. Match marks on connecting rods must always align and must face outward toward the mechanic when installed in an engine.



A new piston can be installed on to the connecting rod in either direction.

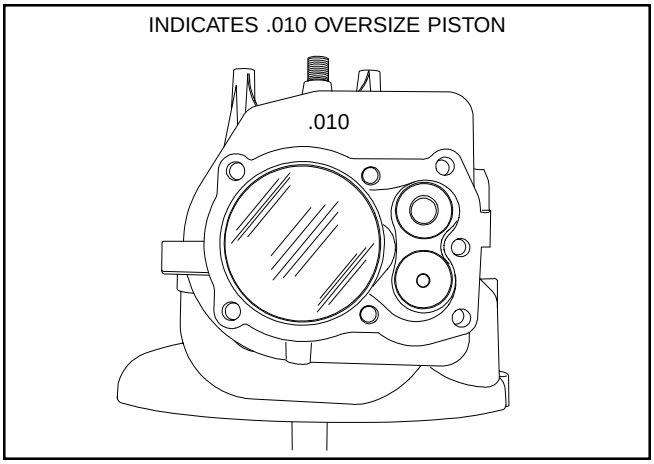
If the old piston is reused, install the piston to the connecting rod so that the piston will be in the same position when reinstalled in the engine.

If it is necessary to replace the connecting rod be sure to mark the valve side of the piston.

Chapter 9
CYLINDERS AND CYLINDER HEADS

CYLINDER SERVICE. Check cylinder for dirty, broken or cracked fins, worn or scored bearings or scored cylinder bore surface, and warped head mounting surface.

If cylinder bore is worn more than .005'' oversize, out-of round or scored, it should be replaced or rebored to .010 or .020 oversize. In some cases engines are built with an oversize cylinder; in these instances they are identified with the oversize value imprinted on the cylinder as pictured. Service pistons have the oversized valve marked on the dome.



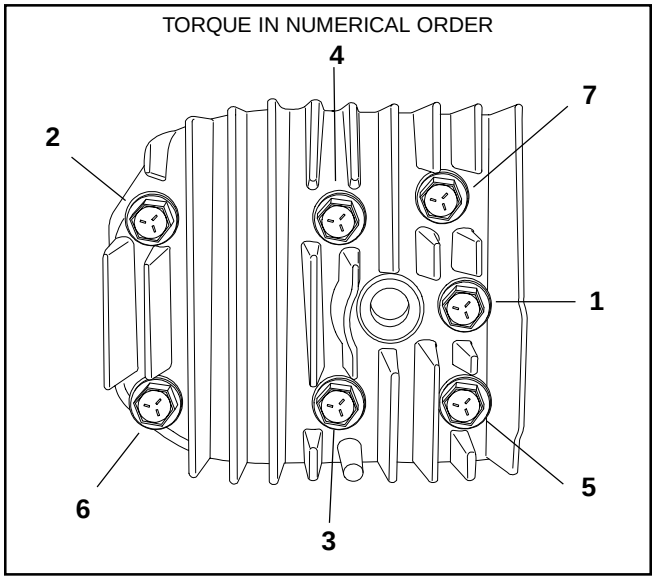
REBORING CYLINDER. To rebore cylinder we recommend using a reputable machine shop or service center.

Then hone the cylinder with 380 grit stone to obtain a good cross hatch pattern for proper ring seating.

Clean cylinder with soap and water, and dry thoroughly.

Replace piston and piston rings with correct oversize parts as indicated in parts manual.

CYLINDER HEADS. Check cylinder heads for warpage by placing on a flat surface. If the cylinder head gasket surface is warped in excess of .005 inches (.13 mm), replace head. Always replace head gasket and torque head bolts in 50 inch lb. increments in the numbered sequence to a torque of 180-220 inch lbs. (20.3 - 25 nm)



Chapter 10
CRANKSHAFTS, CAMSHAFTS AND LUBRICATION

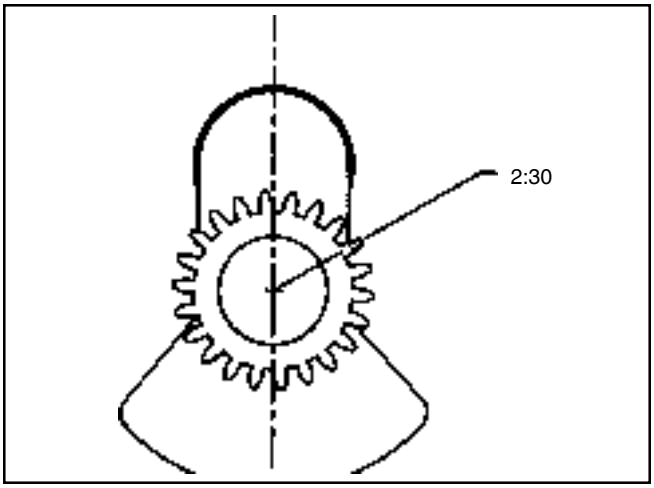
CRANKSHAFTS. Inspect crankshaft for worn, scratched or damaged bearing surfaces, out-of-round or flat spots on the journal area, or a bent P.T.O. end.

CAUTION: Never try to straighten a bent crankshaft.

When installing a crankshaft, lubricate all bearing surfaces and use oil seal protector part no. 670327.

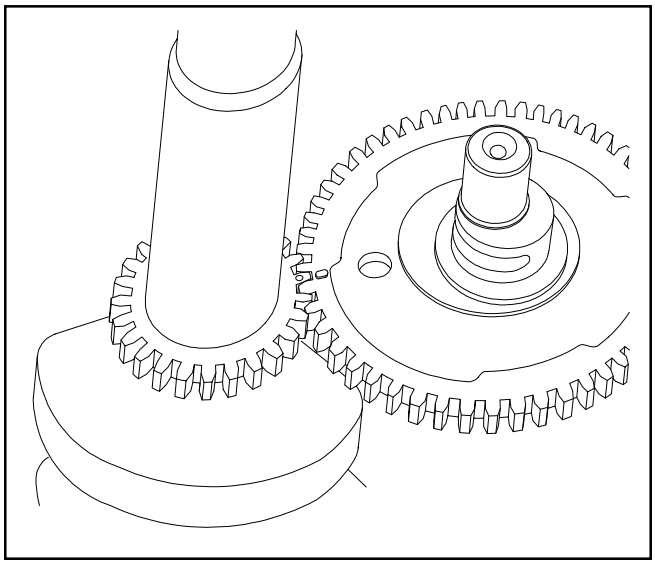
CRANKSHAFT TIMING MARK

The crankshaft has a pressed on timing gear. This gear has a small dimple punched on one of the teeth on this gear. This dimple is a timing mark. With the crankpin at top dead center, the timing mark should be in the 2:30 position.



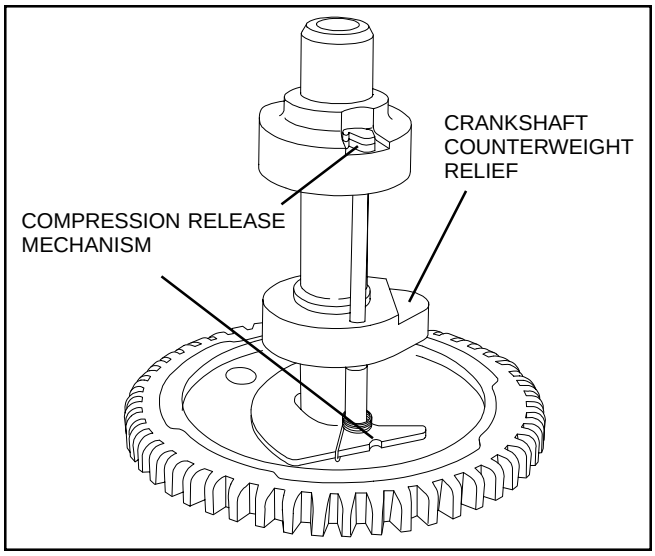
The camshaft has an aligning mark in line with the timing hole on the camshaft gear. Line this mark up with the dimple on the crankshaft gear.

Timing marks on crankshaft gear and camshaft gear must be aligned for proper valve timing.



CAMSHAFT REMOVAL:

Align timing marks to relieve valve train pressure. Lift out cam.



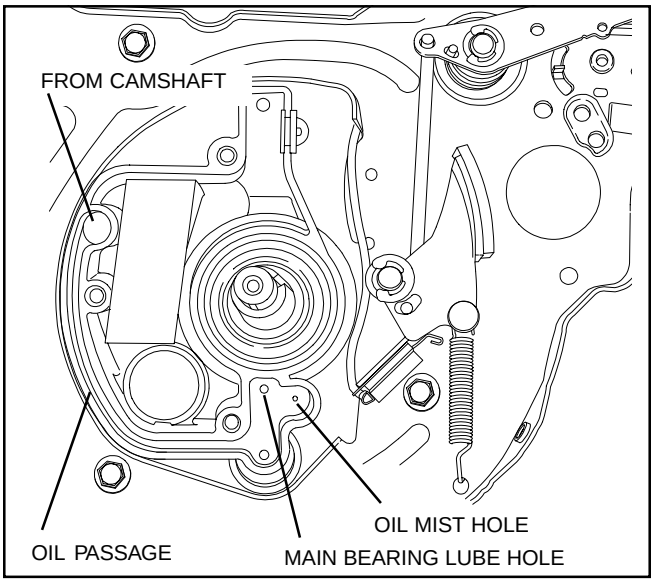
The camshaft has a mechanical compression release mechanism. A pin which runs through both cam lobes extends past the exhaust lobe and lifts the valve to relieve compression for easier starting. When the engine starts, centrifugal force moves the flyweight outward, moving the pin below the lobe, allowing full compression. The compression release mechanism is nonserviceable (replace camshaft assy. if damaged or worn.)

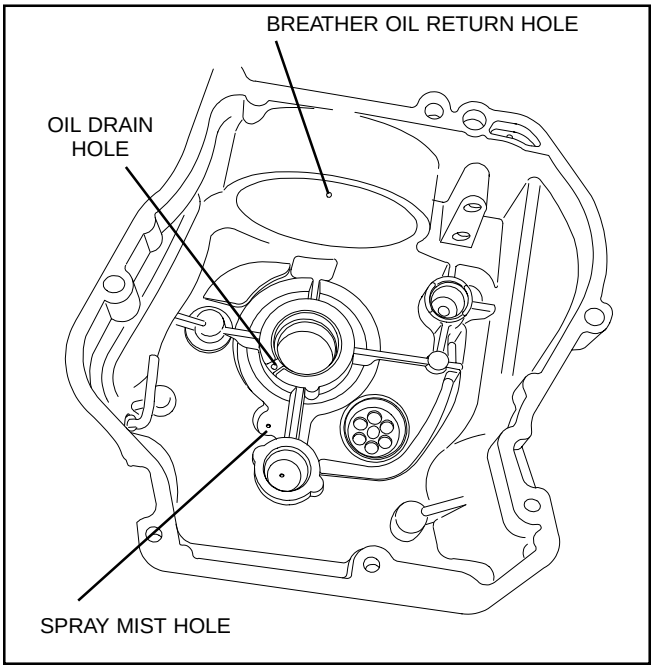
The camshaft has been relieved in the intake lobe area. This change was made to accommodate added crankshaft counterweight material for improved engine balance.

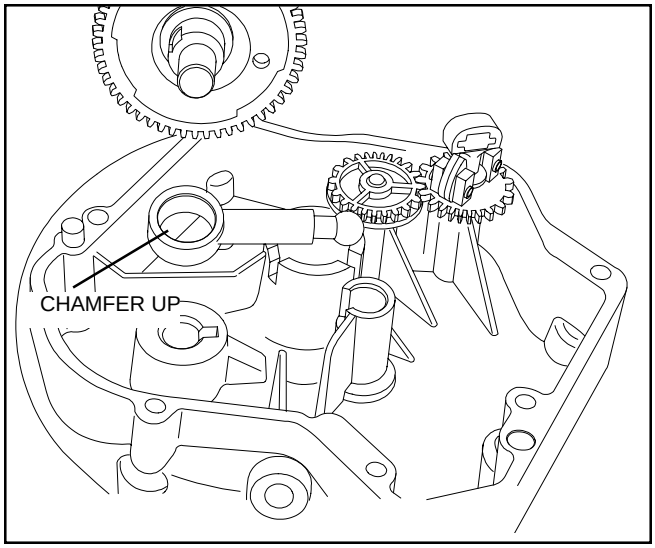
LUBRICATION SYSTEM:

All Tecumseh Vertical shaft 4-cycle engines use a positive displacement plunger oil pump to pump oil from the crankcase, up through the camshaft to a passage in the breather box to the top crankshaft main bearing, and ultra balance bearings.

Oil is pressure sprayed out of a small hole between the crankshaft and ultra-balance bearing, to lubricate the connecting rod journal area. If a heavy leakage is noted from the breather cover check for plugged mist hole.

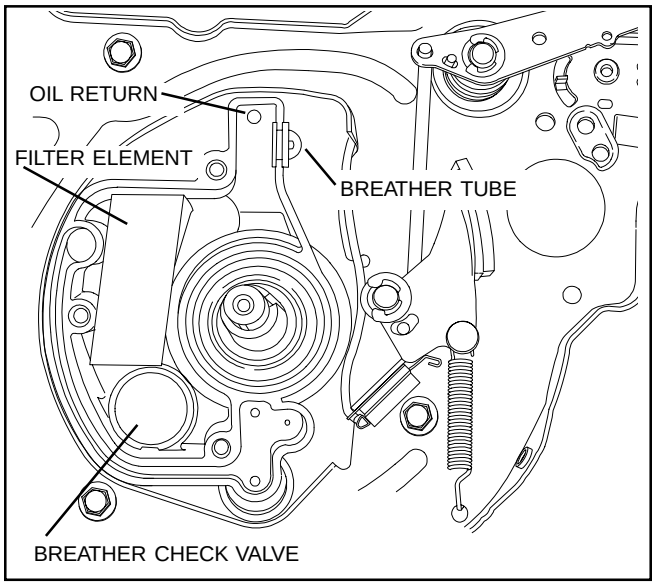




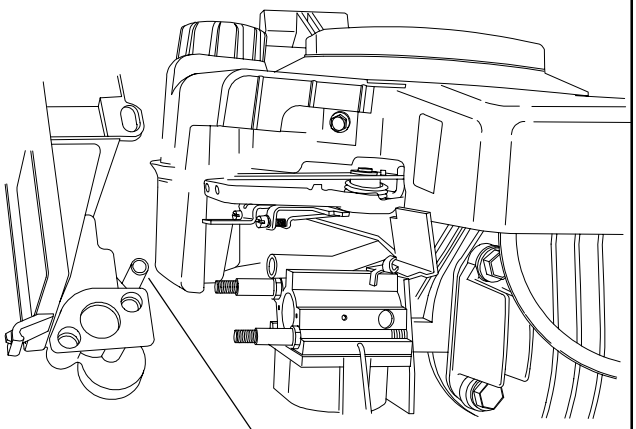


OIL PUMP. An eccentric on the camshaft works the plunger in the barrel back and forth, forcing oil up the center of the camshaft. A ball on the end of the plunger locates in a recess in the flange cover. When installing oil pump, make certain the chamfered side of the pump barrel faces the camshaft, and the plunger ball seats in the recess of the flange cover.

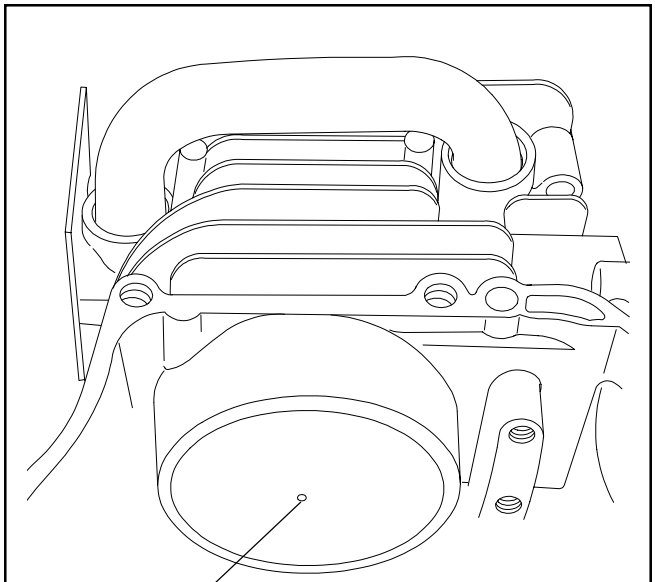
This engine has a top mounted integral breather.



The breather compartment is located under the flywheel. A check valve allows excess crankcase pressure to be vented through the element and out the breather tube. The breather tube is connected to the air cleaner body. When reassembling the breather, DO NOT pinch the filter element under the breather cover or leak may occur.



NOTE: ALWAYS RECONNECT THE BREATHER TUBE



Condensed oil vapors are returned to the crankcase by means of the oil return hole. The oil return hole is opened and closed in the cylinder by the piston.

The breather filter element can be cleaned using solvent.

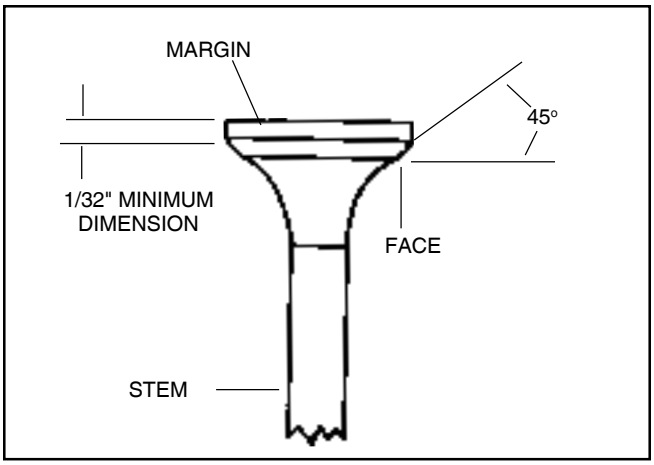
When reinstalling the check valve, apply oil to aid in assembly. A new breather valve body can be pressed into the block to replace a damaged breather valve body.

Chapter 11
VALVES, LIFTERS, SPRING & VALVE SEATS

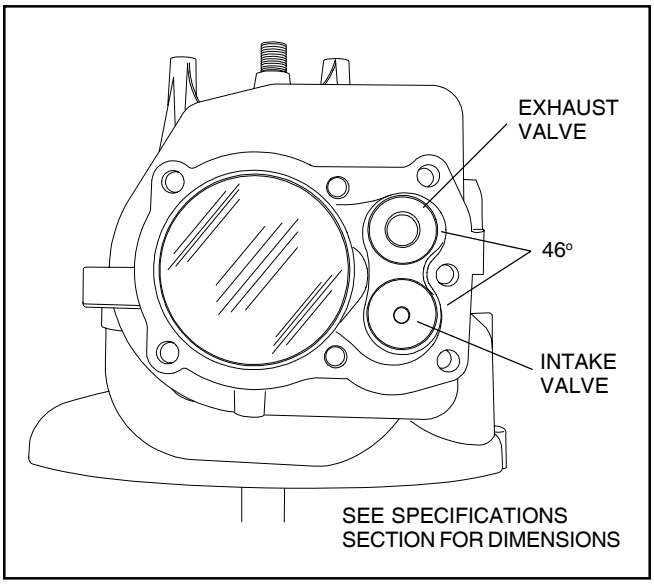
VALVES. Valves must be in good condition, proper sealing and proper gap must be maintained for full power, easy starting and efficient operation.

VALVE REMOVAL. To remove valves, use a commercially available valve spring compressor. Move the lower cap, so it will slip off the end of the valve.

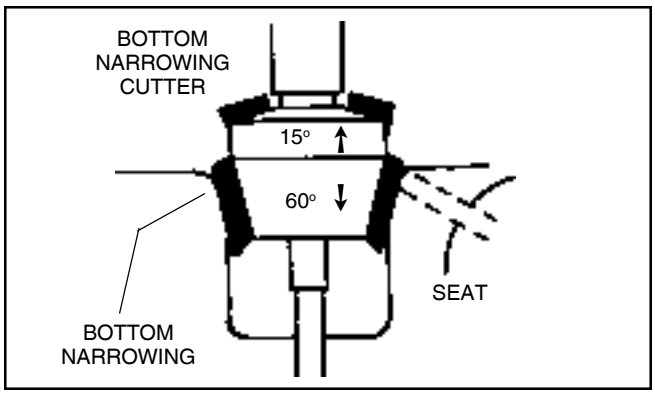
Clean all parts and remove carbon from valve heads and stems. If valves are in usable condition, grind the valve faces to a 45° angle. Replace valves if they are damaged, distorted or if the margin is ground to less than 1/32''.



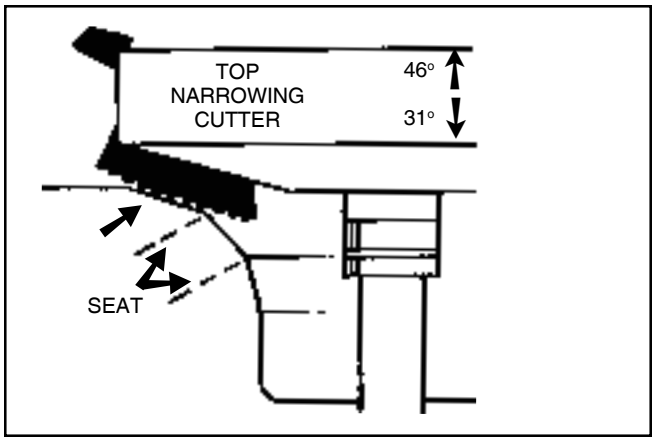
VALVE SEATS. Valve seats are not replaceable. If they are burned or pitted, they can be reground using a grinding stone or valve seat cutter.



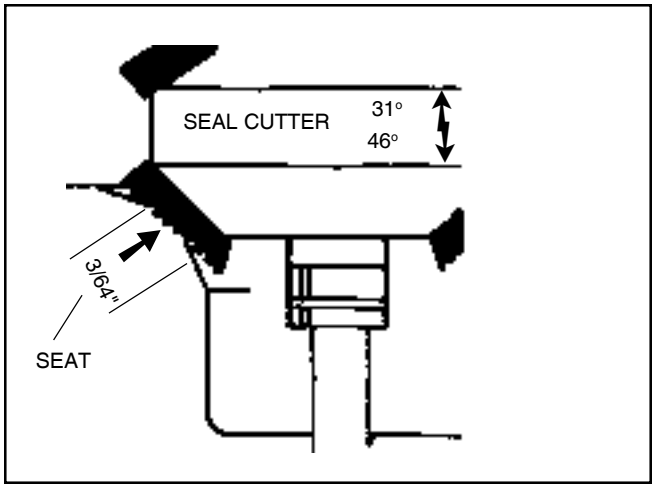
The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different degree-cutters. First, use the 60° cutter to clean and narrow the seat from the bottom toward the center.



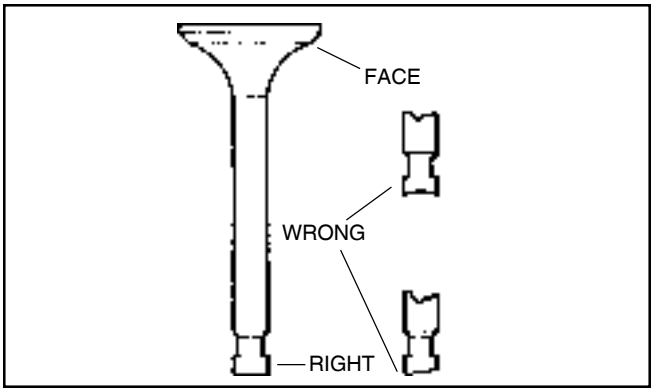
Second, use the 31° cutter to clean and narrow the seat from the top toward the center.



Seats are ground at an angle of 46°, to a width of 3/64''.



Valves are not identical. Make sure the valve marked "EX" or "X" is installed in the exhaust valve location, and the valve marked "I" is installed in the intake valve location. If the valves are unmarked, the nonmagnetic valve is installed in the exhaust valve location.



VALVE ADJUSTMENT. Clearance between the valve stem and lifter must be set to the recommended specifications when the engine is cold (see page 40). Check these clearances with the piston T.D.C. on the compression stroke. Grind end of valve stem with a valve grinder, or use a "V" block to hold the valve square on grinding wheel, grinding to the proper .004" to .008" clearance.

NOTE: Some emissionized engines use intake valve stem seals to maintain proper oil control and emission compliance, they must be replaced if the valve has been removed.

VALVE INSTALLATION. To reinstall valves, position valve caps and spring in the valve compartment. Install valves in guides with valve marked "I" in the intake port. The valve stem must pass through the spring. The valve spring cap should sit around the valve lifter exposed end. Use a valve spring compressor to compress the valve spring. Position the valve spring cap onto the valve stem and release valve spring tension to lock cap in place.

VALVE LIFTERS. It is a good practice not to interchange lifters, even though they are identical, once a wear pattern has been established.

OVERSIZE VALVE GUIDES. Valve guides are permanently installed in the cylinder. If they become worn excessively, they can be reamed oversized to accommodate a 1/32'' over size valve stem.

Ream guides with a straight shanked hand reamer or low speed drill press. Refer to Table of Specifications to determine correct oversize dimension. Reamers are available through your Tecumseh parts suppliers. See Tool Section for correct part numbers.

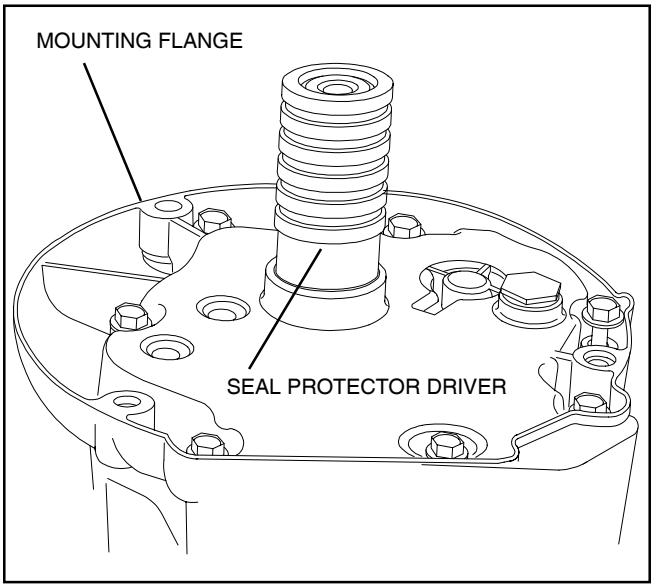
After oversizing valve guides the seats must be recut to align with the valve guides.

Chapter 12
OIL SEAL SERVICE AND MOUNTING FLANGE

OIL SEAL SERVICE. Drain oil from crankcase. If the crankshaft end is rusty or pitted, polish the crankshaft with emery cloth so it will not damage the bearings when the cover is removed.

Remove mounting bolts and slide seal protector-driver tool (Part No. 670327) into the oil seal. If necessary, tap edge of flange or cover lightly with a soft hammer to remove cover.

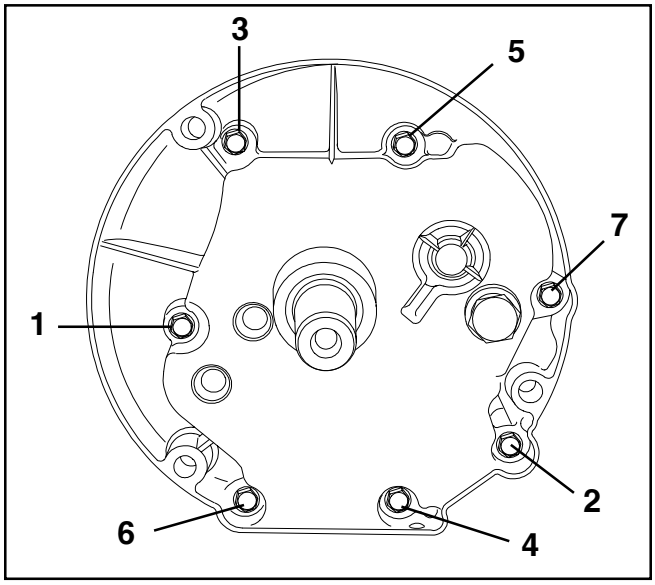
Clean and inspect the cover for wear and scoring of bearings. Inspect crankshaft bearings. Replace any worn or damaged parts.



If crankshaft is out of engine, remove old oil seals by tapping them out with a screwdriver or punch from the inside. To remove a seal with the crankshaft in the engine, insert a screwdriver between the seal and the crankshaft and pry the seal out.

TO REPLACE SEALS: Lubricate the outside of the new oil seal with oil prior to installation. Use seal driver-protector tool Part No. 670327. Place oil seal over the driver-protector and place over crankshaft, driving it into position using universal driver No. 670272. The seal will automatically be driven into the proper depth.

Torque flange bolts in numerical order as shown in illustration. See page 41 for torque specifications.



Chapter 13
TROUBLESHOOTING

A. COMMON TROUBLES AND REMEDIES.

The following charts list the most common troubles experienced with gasoline engines. Possible causes of trouble are given along with probable remedy.

B. 4-CYCLE ENGINE TROUBLESHOOTING CHART

Cause	Remedy and Reference
ENGINE FAILS TO START OR STARTS WITH DIFFICULTY	
No fuel in tank	Fill tank with clean, fresh fuel.
Shut-off valve closed	Open valve.
Obstructed fuel line	Clean fuel screen and line. If necessary, remove and clean carburetor.
Incorrect Timing	Flywheel key has sheared or partially sheared. Replace key.
Tank cap vent obstructed	Clean the vent or replace the cap.
Water in fuel	Drain tank. Clean carburetor and fuel lines. Dry spark plug points. Fill tank with clean, fresh fuel.
Engine flooded	Close fuel shut-off, if so equipped, and pull starter until engine starts. Reopen fuel shut-off for normal fuel flow.
Loose or defective ignition wiring	Check ignition wiring for shorts or grounds; repair if necessary.
Spark plug fouled	Replace spark plug.
Spark plug porcelain cracked	Replace spark plug.
Poor Compression	Overhaul engine.
No spark at plug	Check ignition air gap. If air gap is correct and there is no spark at plug replace ignition.
Electric starter does not crank engine	See 12 volt starter troubleshooting chart.
ENGINE KNOCKS	
Carbon in combustion chamber	Remove cylinder head and clean carbon from head and piston.
Loose or worn connecting rod	Replace connecting rod.
Loose flywheel	Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to proper torque.
Worn cylinder	Replace cylinder.
Improper ignition timing	Flywheel key has sheared or partially sheared. Replace key.

4-CYCLE ENGINE TROUBLESHOOTING CHART (Cont.)

Cause	Remedy and Reference
ENGINE MISSES UNDER LOAD	
Spark plug fouled	Replace spark plug.
Spark plug porcelain cracked	Replace spark plug.
Improper spark plug gap	Regap spark plug.
Improper valve clearance	Adjust valve clearance to recommended specifications.
Weak valve spring	Replace valve spring.
ENGINE LACKS POWER	
Ignition improperly timed	Replace flywheel key.
Worn rings	Replace rings.
Lack of lubrication	Fill crankcase to the proper level.
Air cleaner fouled	Service air cleaner.
Valves leaking	Grind valves and set to recommended specifications.
ENGINE OVERHEATS	
Engine improperly timed	Replace flywheel key if sheared.
Air flow obstructed	Remove any obstructions from air passages in shrouds.
Cooling fins clogged	Clean cooling fins.
Excessive load on engine	Check operation of associated equipment. Reduce excessive load.
Carbon in combustion chamber	Remove cylinder head and clean carbon from head and piston.
Lack of lubrication	Fill crankcase to proper level.
ENGINE SURGES OR RUNS UNEVENLY	
Fuel tank cap vent hole clogged	Open vent hole.
Governor parts sticking or binding	Clean, and if necessary repair governor parts.
Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking	Clean, lubricate, or adjust linkage and deburr throttle shaft or butterfly.
Intermittent spark at spark plug	Disconnect ignition cut-off wire at the engine. Crank engine. If spark, check ignition switch, safety switch and interlock switch. If no spark, check ignition air gap. Check wires for poor connections, cuts or breaks.
Dirty carburetor	Clean carburetor.
ENGINE VIBRATES EXCESSIVELY	
Engine not securely mounted	Tighten loose mounting bolts.
Bent crankshaft	Replace crankshaft.
Associated equipment out of balance	Check associated equipment.

4-CYCLE ENGINE TROUBLESHOOTING CHART (Cont.)

Cause	Remedy and Reference
ENGINE USES EXCESSIVE AMOUNT OF OIL	
Engine speed too fast.	Using tachometer adjust engine RPM to spec.
Oil level too high.	To check level turn dipstick cap tightly into receptacle for accurate level reading.
Oil filler cap loose or gasket damaged causing spillage.	Replace ring gasket under cap and tighten tube securely.
Breather mechanism damaged or dirty causing leakage.	Replace breather assembly.
Drain hole in breather box clogged causing oil to spill out of breather.	Clean hole with wire to allow oil to return to crankcase.
Gaskets damaged or gasket surfaces nicked causing oil to leak out.	Clean and smooth gasket surfaces. Always use new gaskets.
Valve guides worn excessively thus passing oil into combustion chamber.	Ream valve guide oversize and install 1/32'' oversize valve and new valve seal if equipped.
Cylinder wall worn or glazed, allowing oil to bypass rings into combustion chamber.	Bore cylinder for oversized piston & rings.
Piston rings and grooves worn excessively.	Reinstall new rings and check land clearance and correct as necessary.
Piston fit undersized.	Measure and replace as necessary.
Piston oil control ring return holes clogged.	Remove oil control ring and clean return holes.
Oil passages obstructed.	Clean out all oil passages.
Breather tube not connected to air cleaner.	Reconnect tube.
Using 10W30 oil under high load/high temperature conditions.	Replace with SAE 30 oil.
OIL SEAL LEAKS	
Crankcase breather plugged.	Clean or replace breather.
Seal/Main brg drain hole plugged.	Clean out hole.
Old seal hardened and worn.	Replace seal.
Crankshaft seal contact surface is worn undersize causing seal to leak.	Check crankshaft size and replace if worn excessively.
Crankshaft bearing under seal is worn excessively, causing crankshaft to wobble in oil seal.	Check crankshaft bearings for wear and replace if necessary.
Seal outside seat in cylinder or side cover is damaged, allowing oil to seep around outer edge of seal.	Visually check seal receptacle for nicks and damage. Replace P.T.O. cylinder cover, or small cylinder cover on the magneto end if necessary.

4-CYCLE ENGINE TROUBLESHOOTING CHART (Cont.)

Cause	Remedy and Reference
OIL SEAL LEAKS	
New seal installed without correct seal driver and not seating squarely in cavity.	Replace with new seal, using proper tools and methods.
New seal damaged upon installation.	Use proper seal protector tools and methods for installing another new seal.
Bent crankshaft causing seal to leak.	Check crankshaft for straightness and replace if necessary.
Oil seal driven too far into cavity.	Remove seal and replace with new seal, using the correct driver tool and procedures.
BREATHER PASSING OIL	
Engine speed too fast.	Use tachometer to adjust correct RPM.
Loose oil fill cap or gasket damaged or missing.	Install new ring gasket under cap and tighten securely.
Oil level too high.	Check oil level Turn dipstick cap tightly into receptacle for accurate level reading. DO NOT fill above full mark.
Breather mechanism damaged.	Replace umbrella valve/seat in Vector engine and TVS engines.
Breather mechanism dirty.	Clean thoroughly in solvent. Use new gaskets when reinstalling unit.
Drain hole in breather box clogged.	Clean hole with wire to allow oil to return to crankcase.
Breather mechanism installed upside down.	Small oil drain holes must be down to drain oil from mechanism.
Breather mechanism loose or gaskets leaking.	Install new gaskets and tighten securely.
Damaged or worn oil seals on end of crankshaft.	Replace seals.
Rings not properly seated.	Check for worn, or out of round cylinder. Replace rings. Break in new rings with engine working under a varying load. Rings must be seated under high compression, or in other words, under varied load conditions.
Breather assembly not assembled correctly.	See section on Breather Assembly.
Cylinder cover gasket leaking.	Replace cover gasket.

C. TROUBLESHOOTING CARBURETION.

POINTS TO CHECK FOR CARBURETOR MALFUNCTION

TROUBLE	CORRECTIONS
Engine will not start	1, 2, 3, 4, 5, 6, 8, 14, 15, 17
Engine will not accelerate	2, 3, 17
Engine hunts (at idle or high speed)	3, 4, 8, 9, 14
Engine will not idle	4, 8, 9, 14
Engine lacks power at high speed	2, 3, 6, 8, 17
Carburetor floods	4, 7, 16
Carburetor leaks	6, 7
Engine overspeeds	8, 9, 14, 15
Idle speed is excessive	8, 9, 14, 15
Choke does not open fully	8, 9, 15
Engine starves for fuel at high speed (leans out)	1, 3, 4, 6, 15, 16, 17
Carburetor runs rich with main adjustment needle shut off	7, 16
Performance unsatisfactory after being serviced.	1, 2, 3, 4, 5, 6, 7, 8, 9, 15, 16, 17

1. Open fuel-shut off valve at fuel tank—Fill tank with fuel.
2. Check ignition, spark plug.
3. Clean air cleaner—Service as required.
4. Dirt or restriction in fuel system—Clean tank and fuel strainers, check for kinks or sharp bends.
5. Check for stale fuel or water in fuel - - Fill with fresh fuel.
6. Examine fuel line and pick-up for sealing at fittings.
7. Check and clean atmospheric vent holes.
8. Examine throttle for binding or excessive play- - Remove all dirt or paint, replace shaft.
9. Examine throttle return spring for operation.
10. Check for bent throttle plate.
11. Adjust control cable or linkage, to assure carburetor control.
12. Clean carburetor after removing all nonmetallic parts that are serviceable. Trace all passages.
13. Check inlet needle and seat for condition and proper installation.
14. Check sealing of welch plugs, and gaskets.
15. Adjust governor linkage.
16. Check float shaft for wear and float for leaks or dents.
17. Check flywheel key for damage.

D. TROUBLESHOOTING 12 VOLT STARTERS

PROBLEM	PROBABLE CAUSE	FIX
Does not function	Weak or dead battery	Check charge and/or replace battery.
	Corroded battery terminals and/or electrical connections	Clean terminals and/or connections.
	Brushes sticking	Free brushes. Replace worn brushes and those which have come in contact with grease and oil.
	Dirty or oily commutator	Clean and dress commutator.
	Armature binding or bent	Free armature and adjust end play, replace armature, or replace starter.
	Open or shorted armature	Replace armature.
	Shorted, open or grounded field coil	Repair or replace housing.
	Loose or faulty electrical connections	Correct.
	Load on engine	Disengage brake.
	Electric starter cranks, but no spark at spark plug	Disconnect ignition cut-off wire at the engine. Crank engine. If spark at spark plug, ignition switch, safety switch is in operative. If no spark, check air gap. Check wires for poor connections, cuts or breaks.
	Electric starter does not crank engine	Remove starter wire. Use a jumper battery and cables and attach directly to starter wire. If starter cranks engine the starter is okay, check solenoid, starter switches, safety switches and interlock switch. Check wires for poor connections, cuts or breaks.
	Electric starter cranks, but engine does not turn over.	Check flywheel ring gear for broken teeth. Replace flywheel if necessary.
Low RPM	Unit controls engaged	Insure all unit controls are in neutral or disengaged.
	Worn bearings in cap assemblies	Clean bearings or replace cap assemblies.
	Bent armature	Replace armature.
	Binding armature	Free up armature. Adjust armature end play.
	Brushes not seated properly	Correct.
	Weak or annealed brush springs	Replace springs.
	Incorrect engine oil	Ensure the correct weight of oil is being used.
	Dirty armature commutator	Clean commutator.
	Shorted or open armature	Replace armature.
	Loose or faulty electrical connections in motor	Correct.

TROUBLESHOOTING 12 VOLT STARTERS (Cont.)

PROBLEM	PROBABLE CAUSE	FIX
Motor stalls under load	Shorted or open armature	Replace armature.
	Shorted field coil	Correct, or replace housing assembly.
Intermittent operation	Brushes binding in holders	Free up brushes. Replace worn brushes and those which have come in contact with grease and oil.
	Dirty or oily commutator	Clean and dress commutator.
	Loose or faulty electrical connections	Correct
	Open armature	Replace armature and interlock switch.
	Break in electrical circuit	Disconnect ignition cut-off wire at the engine. Crank engine, if spark, check ignition switch, safety switch and interlock switch. Check wires for poor connections, cuts or breaks.
Sluggish disengagement of the drive assembly pinion gear	Dirt and oil on assembly and armature shaft	Clean drive assembly and armature shaft and relubricate shaft splines.
	Bent armature	Replace armature.

Chapter 14
ENGINE SPECIFICATIONS

Displacement	VLV40 11.19	183.4 cc	VLV50, 55, 60, 65 12.6	207 cc
Stroke	2.047	51.993 mm	2.047	51.993 mm
Bore	2.6390 2.6380	67.031 mm	2.796 2.795	71.018 mm 70.993 mm
Air Gap Dimension Ignition	.0125	.30 mm	.0125	.30 mm
Spark plug gap	.030	.70 mm	.030	.70 mm
Valve Clearance Intake and Exhaust	.004 .008	.101 mm .203 mm	.004 .008	.101 mm .203 mm
Valve Seat Angle	46°		46°	
Valve Seat Width	.047	1.2 mm	.047	1.2mm
Valve Guide Oversize Dia.	.2807 .2817	71.297 mm 71.551 mm	.2807 .2817	71.297 mm 71.551 mm
Crankshaft End Play	.005 .027	.127 mm .685 mm	.005 .027	.127 mm .685 mm
Crankpin Journal Dia.	1.0235 1.0230	25.996 mm 25.984 mm	1.0235 1.0230	25.996 mm 25.984 mm
Crankshaft Magneto Main Brg. Dia	1.0242 1.0237	26.014 mm 26.001 mm	1.0242 1.0237	26.014 mm 26.001 mm
Crankshaft P.T.O. Main Brg. Dia	1.0242 1.0237	26.014 mm 26.001 mm	1.0242 1.0237	26.014 mm 26.001 mm
Camshaft Bearing Dia.	.4980 .4975	12.649 mm 12.636 mm	.4980 .4975	12.649 mm 12.636 mm
Conn. Rod Dia. Crank Brg.	1.0246 1.0240	26.024 mm 26.009 mm	1.0246 1.0240	26.024 mm 26.009 mm
Piston Diameter	2.6340 2.6330	66.903 mm 66.878 mm	2.6340 2.6330	66.903 mm 66.878 mm
Ring Groove Side Clearance 1st & 2nd Comp.	.002 .005	.050 mm .127 mm	.002 .005	.050 mm .127 mm
Side Clearance (Bot.) Oil	.0005 .0035	.012 mm .088 mm	.0005 .0035	.012 mm .088 mm
Piston Skirt Clearance measured 90° from pin at the bottom of the skirt	.004 .006	.101 mm .152 mm	.004 .006	.101 mm .152 mm
Ring End Gap	.007 .020	.177 mm .508 mm	.007 .020	.177 mm .508 mm
Cylinder Main Brg. Dia	1.0262 1.0257	26.065 mm 26.052 mm	1.0262 1.0257	26.065 mm 26.052 mm
Cylinder Cover/Flange Main Bearing Diameter	1.0262 1.0257	26.065 mm 26.052 mm	1.0262 1.0257	26.065 mm 26.052 mm

TORQUE SPECIFICATIONS

	Inch-Lbs.	Nm
Governor Rod Clamp to Lever	7-12	1.4 - 1.4
Breather Cover	40-50	4.5 - 5.7
Valve Box Cover	25-35	3.1 - 4.0
Connecting Rod	95-110	10.7 - 12.4
Cylinder Head	180-220	20.3 - 25
Mounting Flange or Cylinder Cover	100-130	11.3 - 14.7
Housing Baffle to Cylinder	80-120	9.0 - 13.6
Solid State Ignition to Cylinder	30-50	3.4 - 5.7
Alternating Coil Assembly to Lamination	25-35	2.8 - 4.0
Flywheel Nut	400-440	45.2 - 49.7
Housing to Baffle	35-45	4.0 - 5.1
Carburetor Stud to Cylinder	50-75	5.7 - 8.5
A/C Hex Nut to Stud	35-45	4.0 - 5.1
Control Face Plate to Baffle	30-40	3.4 - 4.5
Starter Top Mounting	20-30	2.3 - 3.4
Electric Starter to Baffle	25-35	2.8 - 3.9
5/8-18 Plug (Hex Flange) Drain plug	90-150	10.2 - 17.0
Plastic Tank to Housing	12-20	1.4 - 2.3
Threaded Fill Tube (Plastic)	45-65	4.0 - 7.3
Large Diameter Oil Fill Plug	Hand Tight	
Muffler Mounting (Shoulder Screw)	100-165	11.3 - 18.7
A/C Body & Housing to Baffle	35-45	4.0 - 5.1
Conduit Clip Screw (Throttle Cable)	5-15	.6 - 1.7
Muffler Deflector	10-15	1.1 - 1.7

Chapter 15
TRAINING AIDS AND TOOLS

VIDEO PROGRAMS

695015
Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. VHS only.

695059
Understanding Tecumseh Ignition Systems. A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs to it. VHS only.

695148
Teardown and reassembly of the 900 series transaxles. This video will show a complete step-by-step procedure for teardown and reassembly of the 900, 910 and 920 series transaxles.

695185
Electrical Troubleshooting. This video training program will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285
An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

SPECIAL BOOKLETS INSTRUCTIONAL GUIDE

692738
Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

4-CYCLE ENGINE FAILURE ANALYSIS

695590
This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

ELECTRICAL TROUBLESHOOTING BOOKLET

693505A
This booklet contains schematic drawings of Tecumseh direct current and alternating current systems and how to check them when problems occur.

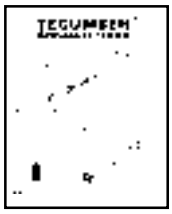
CARBURETOR TROUBLESHOOTING BOOKLET

695907
This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903
This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

SPECIAL TOOLS BOOKLET



694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

QUICK REFERENCE CHART BOOKLET

695933
This booklet contains the quick reference information found on Tecumseh wall charts.
This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

TESTER BOOKLETS

694529
Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

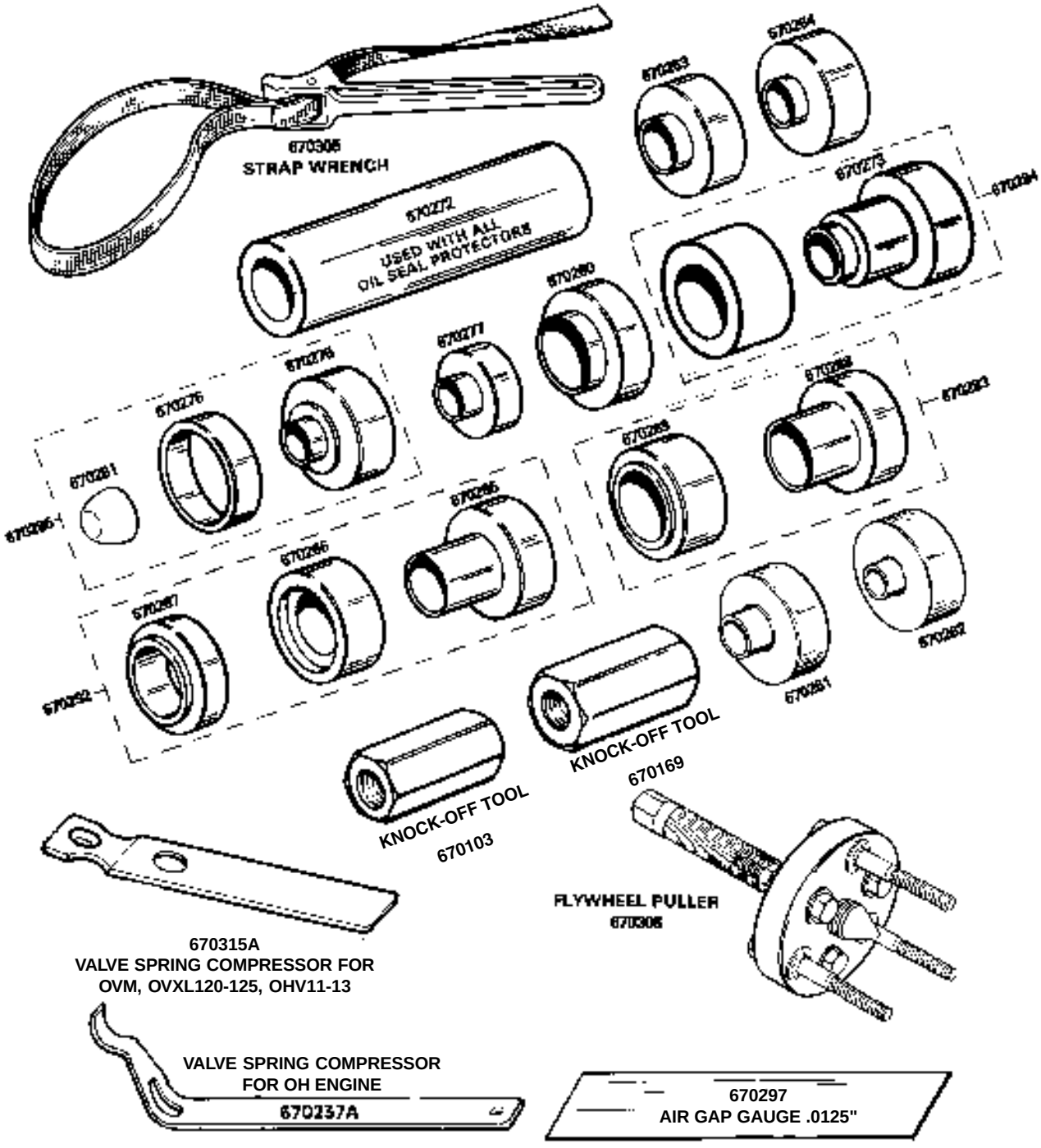
694530
Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

TOOLS

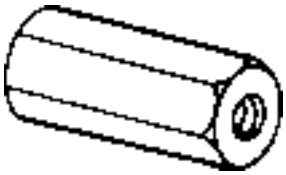
TOOL KIT 670195C

Kit contains tools for 2- and 4-cycle engines.

Includes all items on this page but items may be purchased separately.

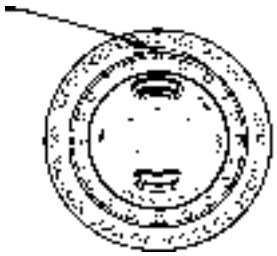


FLYWHEEL KNOCK-OFF TOOL

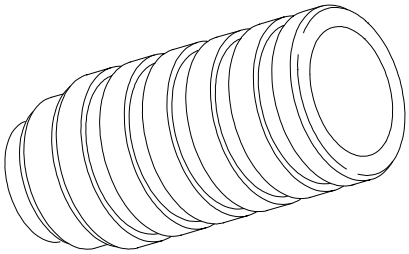


No. 670169

VIBRATION TACHOMETER

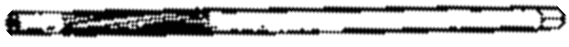


No. 670156 - Vibration tachometer.



No. 670327 - Seal Protector Driver

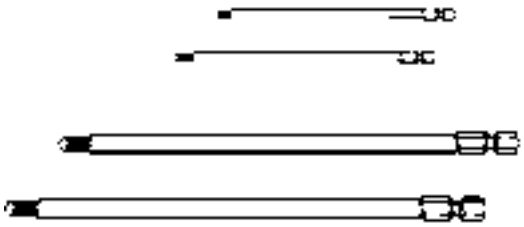
No. 670339 - E-5 Socket

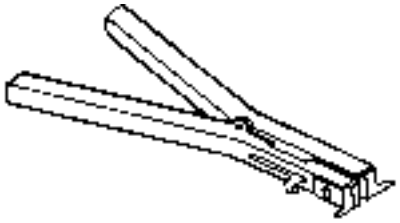


No. 670283 - Valve Guide Reamer

TORX DRIVERS

Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320





No. 670117 - Ring Expander

Chapter 16
SEARS CRAFTSMAN
CROSS REFERENCE CHART

143.434112	VLV55-501004
143.434252	VLV55-501008
143.945500	VLV55-501004A
143.956000	VLV60-502003A
143.956002	VLV60-502004A
143.956006	VLV60-502012A
143.966000	VLV60-502015B
143.966006	VLV60-502023B
143.966008	VLV60-502024B
143.966500	VLV65-502501A
143.966502	VLV65-502502A
143.966504	VLV65-502503A
143.966506	VLV65-502504A
143.966508	VLV65-502505A
143.976000	VLV60-502015C

DECIMAL/FRACTION CONVERSIONS

.016	=	1/64
.031	=	1/32
.047	=	3/64
.063	=	1/16
.078	=	5/64
.094	=	3/32
.109	=	7/64
.125	=	1/8
.141	=	9/64
.156	=	5/32
.172	=	11/64
.188	=	3/16
.203	=	13/64
.219	=	7/32
.234	=	15/64
.25	=	1/4
.266	=	17/64
.281	=	9/32
.297	=	19/64
.312	=	5/16
.328	=	21/64
.344	=	11/32
.359	=	23/64
.375	=	3/8
.391	=	25/64
.406	=	13/32
.422	=	27/64
.438	=	7/16
.453	=	29/64
.469	=	15/32
.484	=	31/64
.50	=	1/2
.516	=	33/64
.531	=	17/32
.547	=	35/64
.563	=	9/16
.578	=	37/64
.594	=	19/32
.609	=	39/64
.625	=	5/8
.641	=	41/64
.656	=	21/32
.672	=	43/64
.688	=	11/16
.703	=	45/64
.719	=	23/32
.734	=	47/64
.75	=	3/4
.766	=	49/64
.781	=	25/32
.797	=	51/64
.813	=	13/16
.828	=	53/64
.844	=	27/32
.859	=	55/64
.875	=	7/8
.891	=	57/64
.906	=	29/32
.922	=	59/64
.938	=	15/16
.953	=	61/64
.969	=	31/32
.984	=	63/64

Tecumseh Quick Reference Service Information

Covers Engine and Transmission Product

Form No.695933 R 7/00

Introduction

This booklet contains the quick reference and basic trouble-shooting information previously found on Tecumseh wall charts and in the Technician's Handbooks.

This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

Technician's Note:

Tecumseh engines are manufactured to meet EPA and CARB standards. As a technician, it is unlawful to re-calibrate or replace a fuel nozzle or jet (bowl nut) with a part from any other carburetor that was not originally designed for that engine. All speed adjustments must remain within the limits that are specified for each engine and are not to exceed the maximum. This can only be deviated from if specifically approved by Tecumseh Products, EPA and CARB.

Note: Torque specifications listed should not be confused with the torque value observed on engines which have been run.

The Torque specifications take relaxation into account so sufficient clamping force exists after an engine has reached operating temperature.

Torques listed are intended to cover highly critical areas. More extensive torques are found in the respective repair manual.

Torque Specifications

TWO-CYCLE ENGINE SERIES

840 - 850 TWO-CYCLE ENGINE SERIES

Location	Inch lbs. Torque	Nm	Engine Designation			
			TVS	TVXL	HSK	HXL
Crankcase to Cylinder	120-204	13.5-23	●	●	●	●
Flywheel Nut	360-420	41-47.5	●	●	●	●
Adapter Plate to Cylinder	160-220	18-25	●	●		

TC TWO-CYCLE ENGINE SERIES

Location	Inch lbs. Torque	Nm	Engine Designation		
			TC200	TC300	TCH200/300
Cylinder to Crankcase	80-95	9-11	●	●	●
Crankcase Cover to Crankcase	70-100	8-11	●	●	●
Flywheel Nut	190-250	21.5-28.5	●	●	●

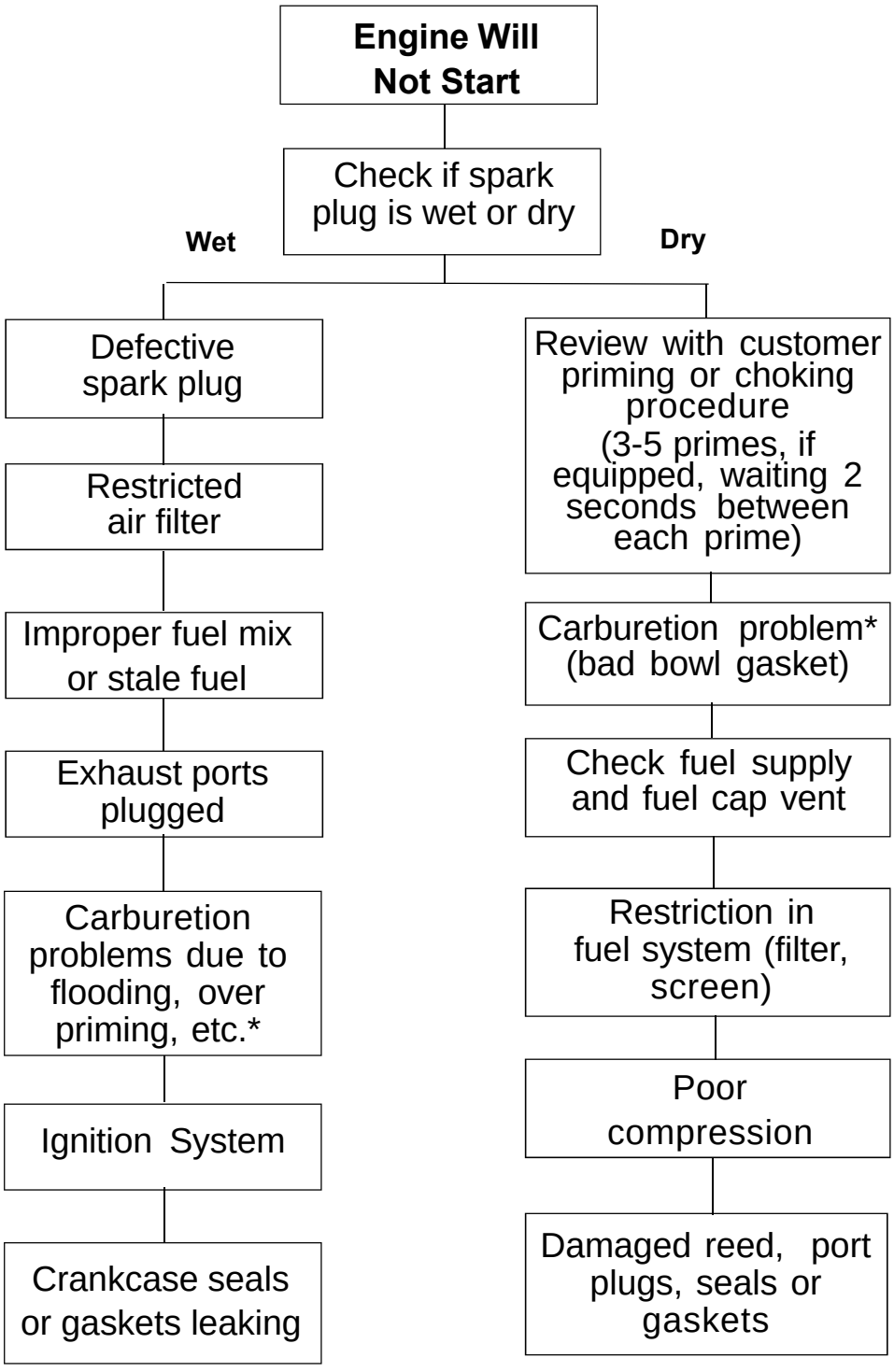
TWO-CYCLE ENGINE SERIES (AV520/600, TVS600, AH520, AH/HSK600)

Location	Inch lbs. Torque	Nm	Engine Designation			
			AV520/600	TVS600	AH/HSK600	AH520
Connecting Rod	40-50	4.5-5.5	●	●	●	●
Housing Base to Cylinder	80-120	9-13.5	●	●	●	●
Cylinder Head to Cylinder	100-140	11-16	●	●	●	●
Flywheel Nut AV Industrial (Point Ignition) (670 Series AV 520 and All AV 600)	216-300	24.5-34	●			●
Flywheel Nut (C.D. Ignition)	264-324	30-36.5	●	●	●	●

Two Cycle Troubleshooting

As an aid in troubleshooting any piece of equipment, interview the customer, and review conditions and symptoms of the problem. Examine exterior for clues: leaks, excessive dirt, damaged or new parts.

FUEL SYSTEM



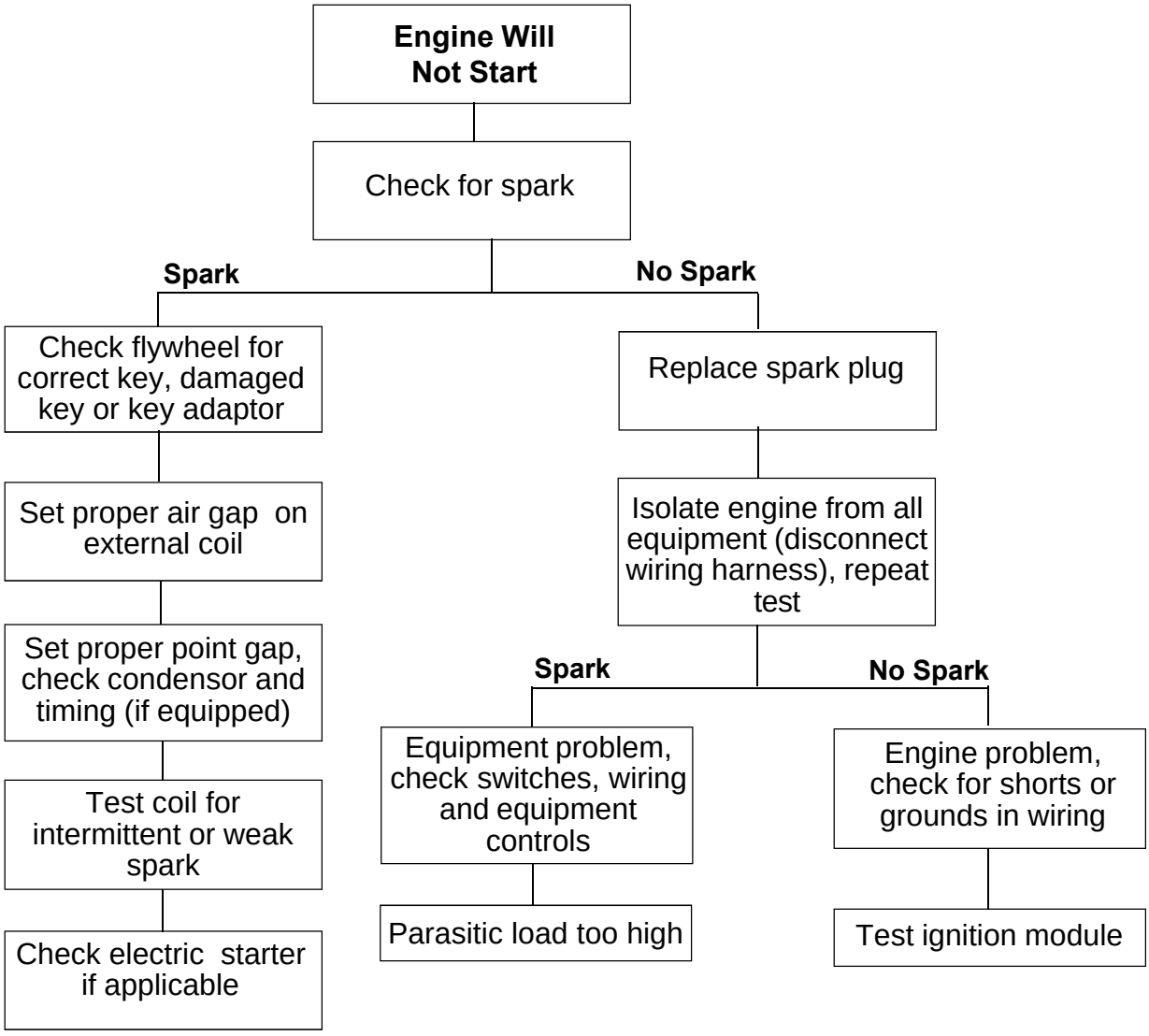
NOTE: Refer to Technician's Handbook for a more detailed list of remedies.

*Carburetor Troubleshooting use Technician's Handbook or Carburetor Troubleshooting Booklet, Form No. 695907. Video No. 695015.

(CONTINUED ON NEXT PAGE)

Two Cycle Troubleshooting - *continued*

IGNITION SYSTEM



NOTE: Refer to Technician's Handbook for a more detailed list of remedies.

Note: Torque specifications listed should not be confused with the torque value observed on engines which have been run.

The Torque specifications take relaxation into account so sufficient clamping force exists after an engine has reached operating temperature.

Torques listed are intended to cover highly critical areas. More extensive torques are found in the respective repair manual.

Torque Specifications

FOUR-CYCLE LIGHT FRAME ENGINE SERIES (TVS, TNT, ECV, LAV, LEV, H, HS, OHH, OVRM and VLV)

Location	Inch lbs. Torque	Nm	Engine Designation									
			TVS	TNT	ECV	LAV	H/HSK	HS/HSSK	OVRM	VLV	LEV	OHH
Rocker Arm Stud Lock Nut	100-140	11-16							•			•
Connecting Rod	95-110	11-12.5	•	•	•	•	•	•	•	•	•	•
Cylinder Head	160-210	18-24	•	•	•	•			•			
Cylinder Head	220-240	25-27							•			•
Cylinder Head	180-220	20.5-25								•		
Mounting Flange or Cylinder Cover	100-130	11-14.5	•	•	•	•	•	•	•	•	•	•
Flywheel Nut (Cast Iron)	500-600	42-50	•	•	•	•	•	•	•	•	•	•
Flywheel Nut (Aluminum)	400-500	45-56.5	•	•	•	•	•	•	•	•	•	•

FOUR-CYCLE MEDIUM FRAME ENGINE SERIES (TVM, TVXL, H, V, HM, OVM, OVXL, OHM, OHSK and OHV)

Location	Inch lbs. Torque	Nm	Engine Designation									
			TVM125, 140	H50-60	V70	H70	TVM & TVXL 170-195-220	HM/HMSK70-100	OVM/OVXL, OHV120-125	OHSK80-130 OHM120	OHV11-13,OHV110-135, 206 Series	OHV135-145 203 Series OHV15-17.5 204 Series
Connecting Rod	160-180	18-20.5	•	•								
Connecting Rod	200-220	22.5-25			•	•	•	•	•	•		
Connecting Rod	200-240	22.5-27										•
Cylinder Head Bolts	220-240	25-27									•	•
Cylinder Head Bolts	180-240	20.5-27							•	•		
Cylinder Head Bolts	160-210	18-24	•	•	•	•	•	•				
Rocker Adj. Lock Screw	65-80	7-9										•
Rocker Arm Stud Lock Nut	110-130	12.5-14.5									•	
Rocker Arm Hex Jam Nut	15-20	2							•	•		
Rocker Arm Studs	170-210	19-24							•	•		•
Rocker Arm Box to Head	75-130	8.5-14.5							•	•		
Rocker Box Cover	15-20	2							•	•		
Rocker Box Cover (Four Screw)	40-65	4.5-7								•	•	•
Mounting Flange or Cylinder Cover	100-130	11-14.5	•	•	•	•						
Mounting Flange or Cylinder Cover	110-140	12.5-16					•	•	•	•	•	•
Flywheel Nut	400-550	45-62	•	•	•	•						
Flywheel Nut (External Ignition)	600-800	68-90					•	•	•	•	•	•

Torque Specifications - *continued*

FOUR-CYCLE LARGE FRAME ENGINE SERIES (CAST IRON BLOCK HH, VH and OH)

Location	Inch lbs. Torque	Nm	Engine Designation		
			HH	VH	OH
Connecting Rod	86-110	10-12.5	●	●	●
Cylinder Head	180-240	20.5-27	●	●	●
Mounting Flange & Cylinder Cover	100-130	11-14.5	●	●	●
Rocker Arm Shaft to Box	180-220	20.5-25			●
Rocker Arm Box to Cylinder Head	80-90	9-10			●
Flywheel Nut	600-660	68-74.5	●	●	●

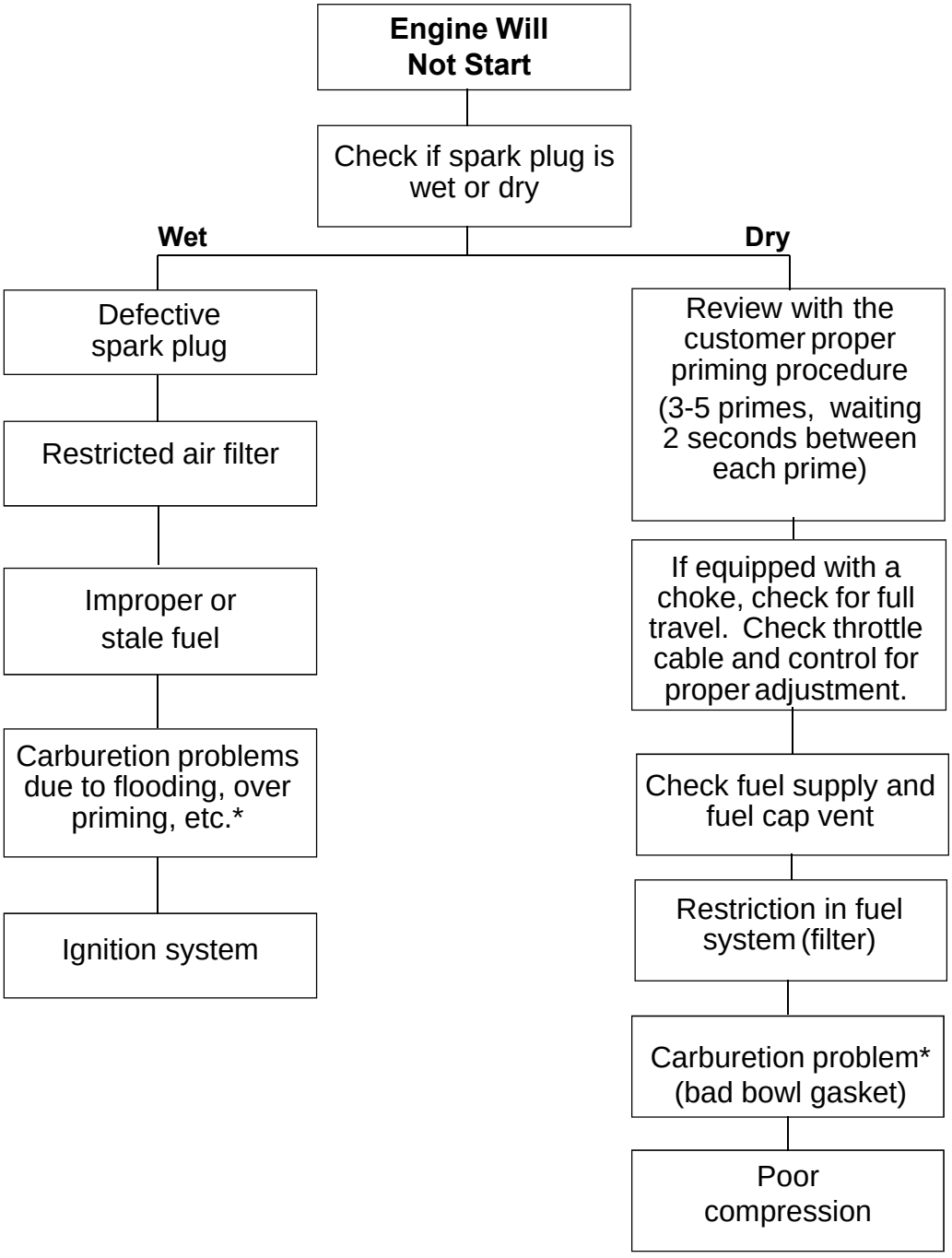
FOUR-CYCLE HEAVY FRAME ENGINE SERIES (V-TWIN)

Location	Inch lbs. Torque	Nm	Engine Designation	
			TVT	
Connecting Rod	200-220	22.5-25	●	
Cylinder Head Bolts	220-240	25-27	●	
Rocker Arm Jam Nut	110-130	12.5-14.5	●	
Rocker Arm Cover Mounting Screw	52	6	●	
Mounting Flange/Cylinder Cover	240-260	27-29	●	
Flywheel Nut	600-800	68-90	●	

Four Cycle Troubleshooting

As an aid in troubleshooting any piece of equipment, interview the customer, and review conditions and symptoms of problem. Examine exterior for clues: leaks, excessive dirt, damaged or new parts.

FUEL SYSTEM

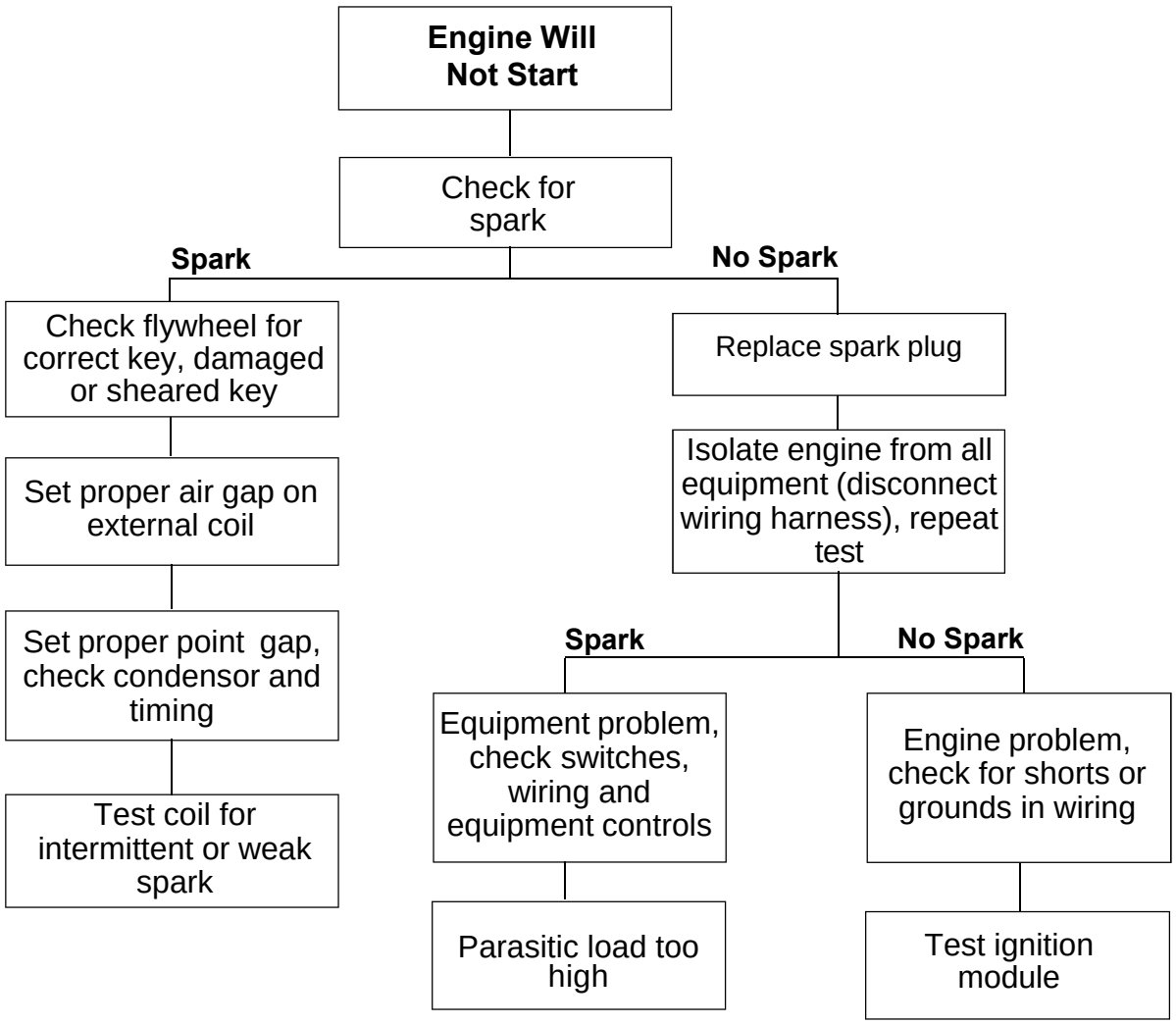


NOTE: Refer to Technician's Handbook for a more detailed list of remedies.

*Carburetor Troubleshooting, use Technician's Handbook or Carburetor Troubleshooting Booklet, Form No. 695907. Video No. 695015.

Four Cycle Troubleshooting - *continued*

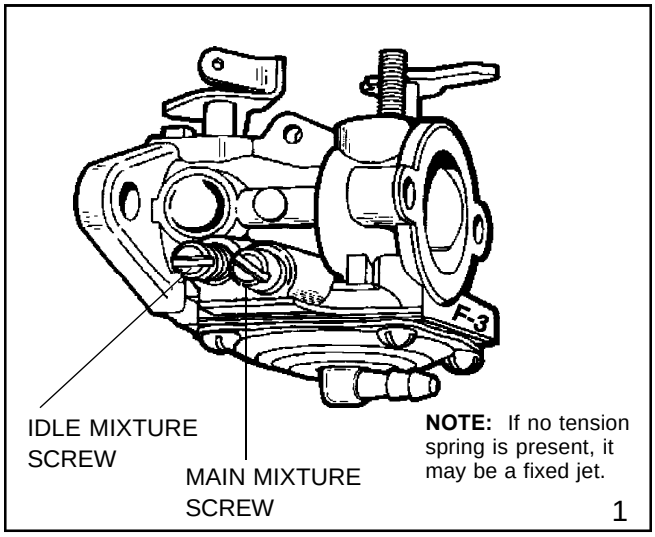
IGNITION SYSTEM



NOTE: Refer to Technician's Handbook for a more detailed list of remedies.

Tecumseh 2 Cycle Diaphragm Adjustments

NOTE: For meeting emission requirements, some carburetors have fixed-main or idle jets. The absence of the adjustment screw indicates fixed jets and no adjustment is necessary.



Diaphragm-Dual Adjustment.

Turn mixture adjusting screws in finger tight to the closed position, then one (1) turn out from closed position. This setting is approximate. This will allow the engine to be started so the carburetor can be fine tuned.

Start the engine and let it warm up for approximately 3-5 minutes. **Do not adjust the carburetor when the engine is cold.**

Set the throttle control to idle. If it is a fixed speed type, manually hold the throttle against the idle speed adjustment screw.

The throttle lever must be held against the crack screw for low speed adjustments or all adjustments will be incorrect and cause poor performance and unsatisfactory operation.

With the engine idling and throttle lever against the idle speed regulating screw, turn the low speed adjustment screw slowly clockwise from the NORMAL setting until the engine falters. Remember this location. Turn the screw counterclockwise until engine just starts to sputter or drops in R.P.M.. Remember this location. Turn the screw clockwise until it is halfway between your first position where the engine faltered and your last position where the engine started to sputter. This will be the optimum low speed setting on your carburetor.

Next run the engine at governed speed. The high speed adjustments are made basically the same as the low speed adjustments, with the exception of the settings being made 1/8 of a turn at a time, from the NORMAL settings. **NOTE:** It may be necessary to re-check the idle mixture adjustment after performing the high speed adjustment.

Diaphragm-Single Adjustment.

Turn the mixture adjustment screw finger tight to the closed position, then one (1) turn out from the closed position. This setting is approximate and will allow the engine to be started so the carburetor can be fine-tuned.

Start the engine and let it warm up for approximately 3-5 minutes. Do not adjust the carburetor when the engine is cold.

Set the throttle control to idle. If it is a fixed speed type, manually hold the throttle against the idle speed adjustment screw.

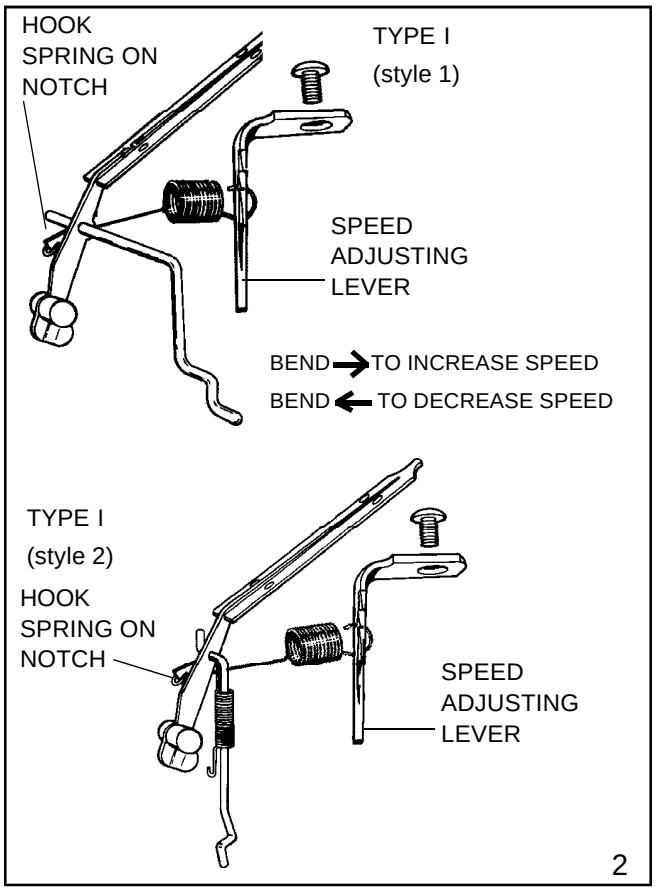
NOTE: If the engine falters or stops after the choke lever is moved to the "OFF" position, open the mixture adjusting screw 1/4 turn (counterclockwise) and restart the engine.

With the engine running, place the speed control in the "slow" position to make mixture adjustments. Turn the mixture screw slowly clockwise from the NORMAL setting until the engine falters. Remember this location. Turn the screw counterclockwise until the engine just starts to sputter or drops in R.P.M. Remember this location. Turn the screw clockwise until it is halfway between your first position where the engine faltered and your last position where the engine started to sputter. This will be the optimum setting on your carburetor.

TC Series Governor Adjustment

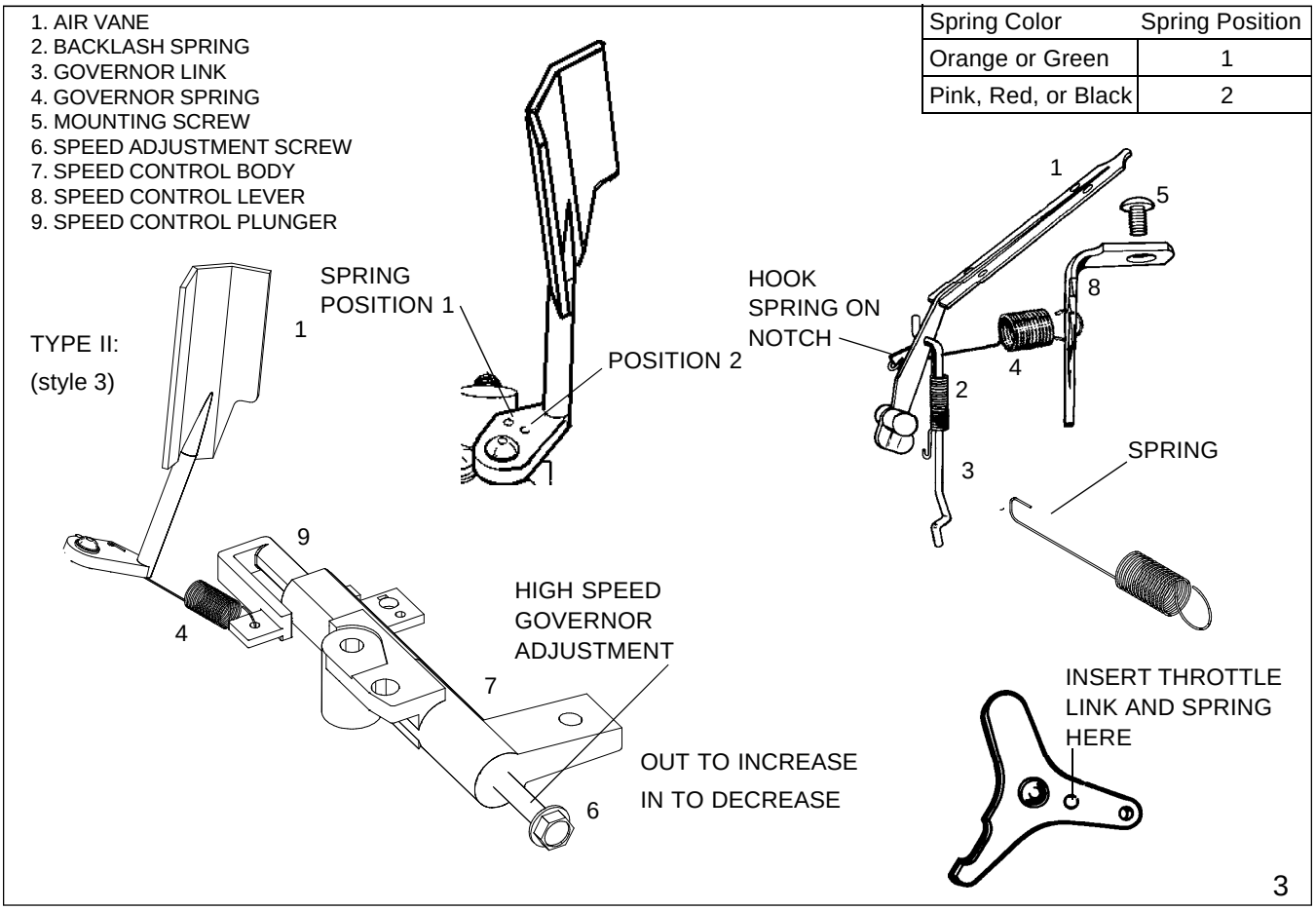
Three different styles of governor systems are used on TC engines. Use the following illustrations (diags. 2 and 3) to identify the governor system used and the following procedure to adjust the governed engine speed.

1. Allow the engine to run for at least 5 minutes to reach operating temperature. Make sure the air filter (if equipped) is clean and the choke is in the off position.
2. Using a Vibratach (part# 670156) or other tachometer, determine the engine's R.P.M. at idle and wide open throttle. Refer to Microfiche card 30, or a computer parts look-up program to obtain the recommended engine speeds.
3. Using the applicable illustration, either bend the speed adjusting lever toward the spark plug end of the engine to decrease high speed R.P.M., or bend the lever in the opposite direction to increase R.P.M. On TC Type II engines, turn the speed adjusting screw out to increase or in to decrease engine high speed R.P.M. If the speed adjustment screw is turned out to increase the engine R.P.M., the speed control lever must be moved to allow the speed control plunger to contact the speed adjustment screw.
4. The low speed is set by moving the throttle control to the lowest speed position and adjusting the low speed adjustment screw on the carburetor.



1. AIR VANE
2. BACKLASH SPRING
3. GOVERNOR LINK
4. GOVERNOR SPRING
5. MOUNTING SCREW
6. SPEED ADJUSTMENT SCREW
7. SPEED CONTROL BODY
8. SPEED CONTROL LEVER
9. SPEED CONTROL PLUNGER

Spring Color	Spring Position
Orange or Green	1
Pink, Red, or Black	2



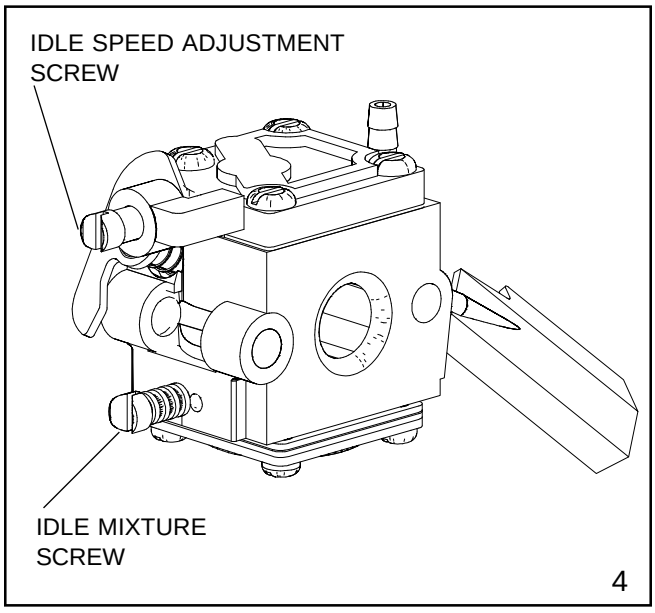
Walbro (WTA, WT) and Tillotson (HU) Diaphragm Adjustment

Carburetor Pre-Set and Adjustment

Both the Walbro and the Tillotson carburetors used on TC engines have non-adjustable main mixture jets. Only the idle mixture is adjustable by turning the idle mixture screw. Use the following procedure to pre-set the idle mixture screw. Turn the idle mixture screw (clockwise) finger tight to the closed position, then turn the screw counterclockwise to obtain the proper preset (diag. 4).

Walbro Model WTA, WT 1 - 1-1/8 turns

Tillotson Model HU 1-1/4 - 1-3/8 turns



4

Final Idle Mixture Adjustment

Start the engine and allow it to reach normal operating temperature (after 3-5 minutes). As the speed control is set at the idle position, turn the idle mixture screw slowly clockwise until the engine R.P.M. just starts to decrease. Stop and note this screw position. Turn the idle mixture screw slowly counterclockwise, the engine will increase in R.P.M. Continue to slowly turn the screw until the engine R.P.M. starts to decrease. Note this position and turn the mixture screw back clockwise halfway between the two engine R.P.M. drop off positions. The idle mixture adjustment is complete.

Some carburetors came equipped with a main mixture adjusting screw. To adjust the main mixture, follow the steps for idle adjustment.

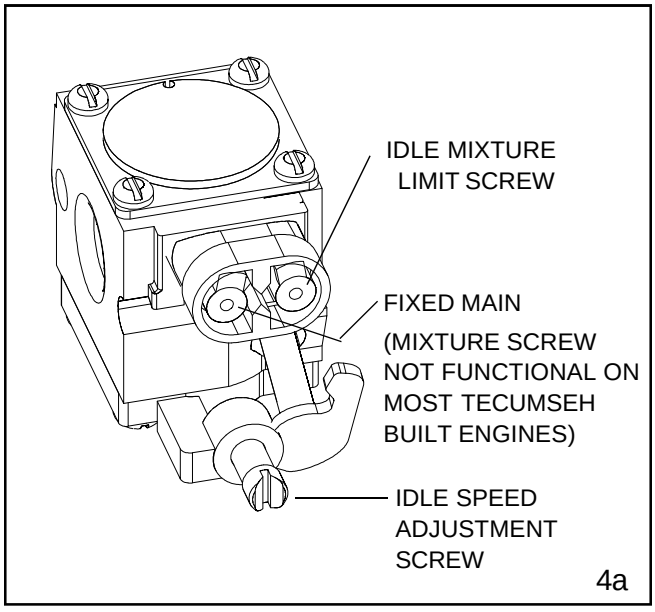
Emissionized Tillotson

Similar in design and operation, the Tillotson emission carburetor uses a fixed main jet with an adjustable idle. The idle circuit has a limiter cap to prevent over richening. The cap is locked onto the adjustment screw in a rich position, allowing only a leaner adjustment. The main is fixed on these, which means that the main mixture limiter is non-functional on Tecumseh built engines (diag. 4a).

In compliance with E.P.A. and C.A.R.B. regulations the following procedure must be followed.

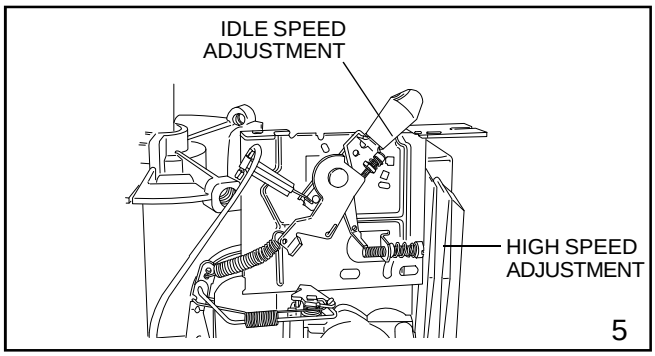
NOTE: These caps can be removed for servicing of the carburetor. Follow these steps.

1. Turn the caps clockwise until they hit the stops.
2. Remove the caps with a pointed instrument such as an awl.
3. Then turn the screws in until softly seated, note the number of turns. The screws must be reinstalled to this same static setting. Replacement of the caps is required to maintain E.P.A. and C.A.R.B. emission compliance.



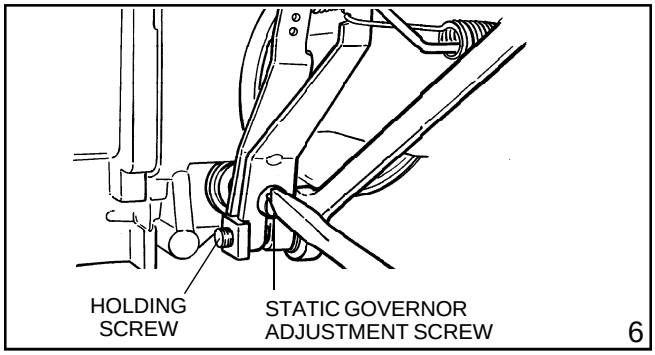
4a

2-Cycle Engine Speed and Mixture Adjustments: TVS/TVXL840



Linkage Location

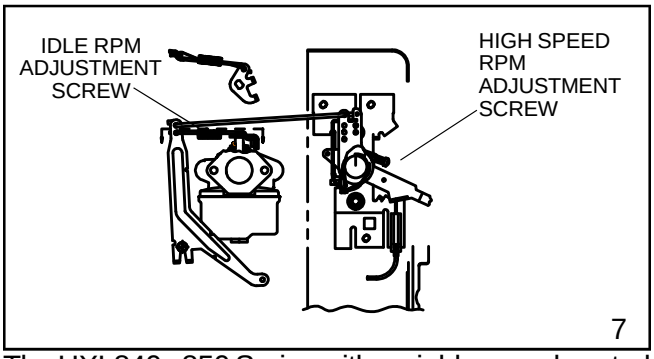
To aid in the proper reassembly of the governor linkage, mark the linkage locations.



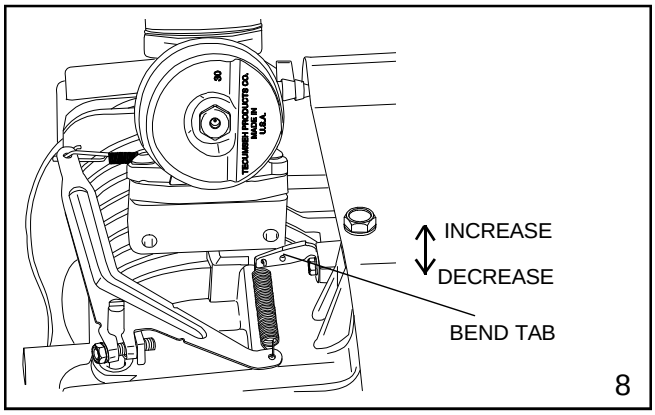
Static Governor Adjustment

To adjust the static governor, loosen the holding screw, rotate the governor arm and slotted shaft in the direction that will open the throttle to the wide open position, and then re-tighten the holding screw.

HSK/HXL840-850

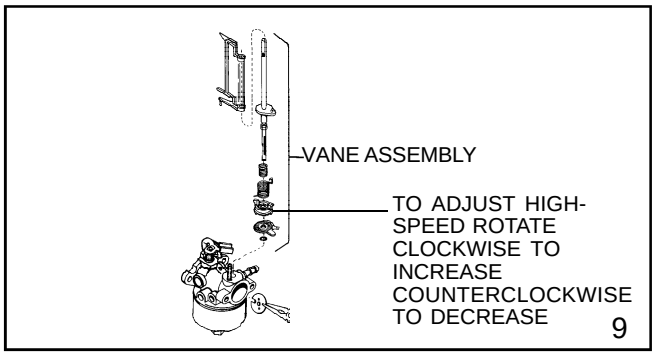


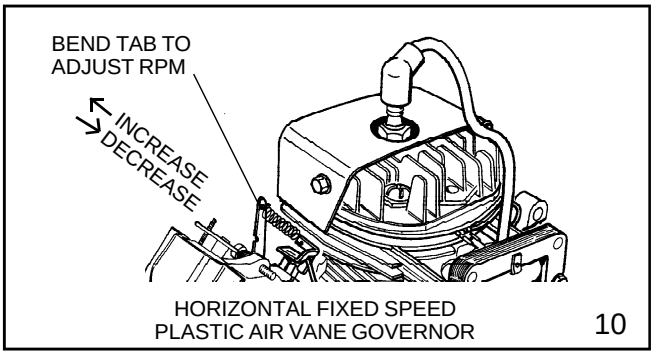
The HXL840 - 850 Series with variable speed control have the following adjustments. Idle speed is set at the carburetor crack screw. High speed is set with the screw shown above. Always check Microfiche card 30 or Parts Smart computer program for correct speed settings.



R.P.M. adjustment of fixed speed models is done by bending the tab as shown.

Governor and Linkage for Air Vane



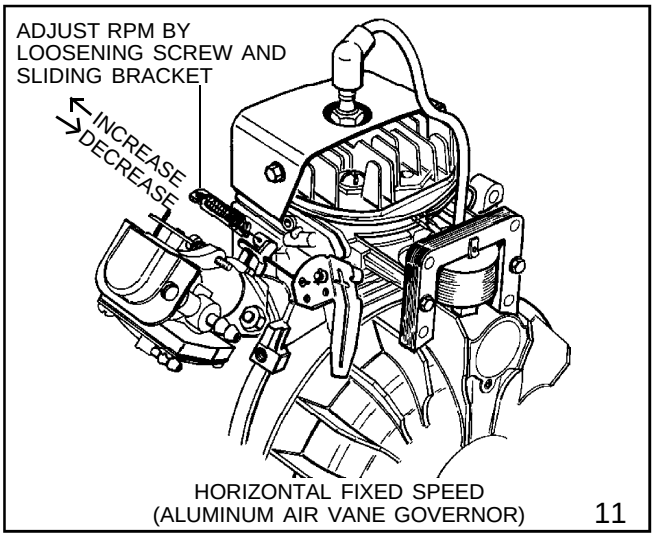


Rotate sleeve clockwise to increase R.P.M., counterclockwise to decrease R.P.M.

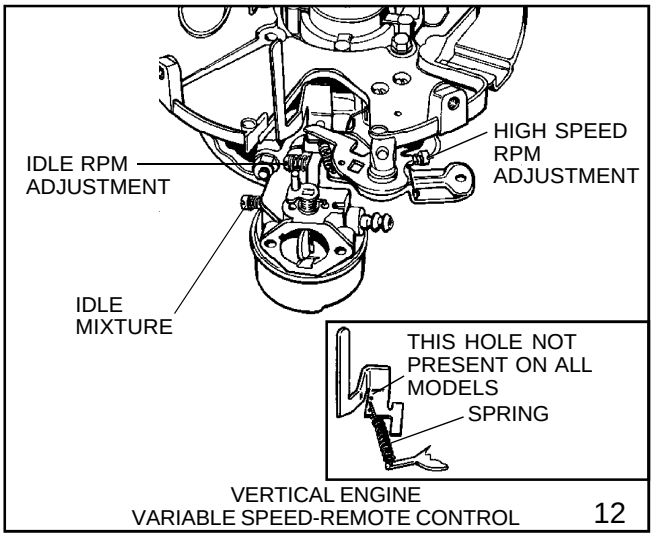
NOTE: The sleeve is serrated to rotate in a clockwise direction and must be raised using the sleeve tabs before it can be rotated counterclockwise.

To disassemble, remove choke shutter with needle-nose pliers; the vane assembly may then be removed from the carburetor.

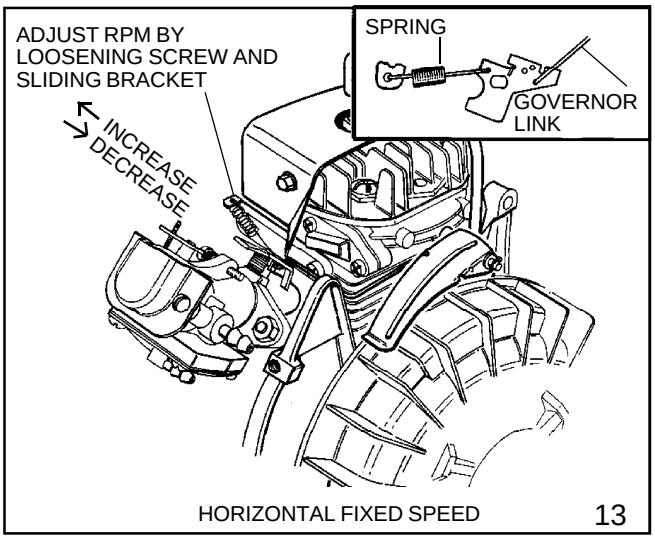
Governors and Linkage for Air Vane - *continued*



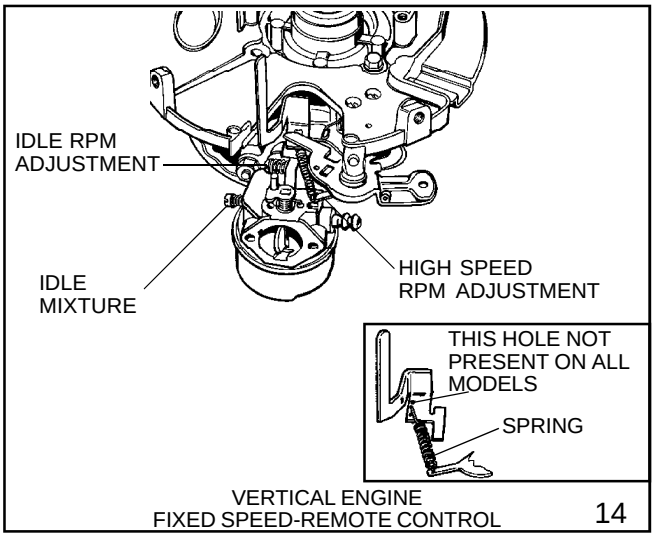
HORIZONTAL FIXED SPEED
(ALUMINUM AIR VANE GOVERNOR) 11



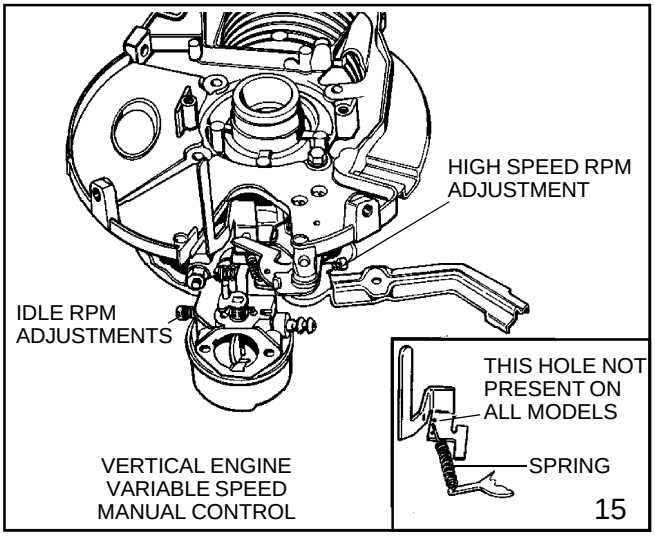
VERTICAL ENGINE
VARIABLE SPEED-REMOTE CONTROL 12



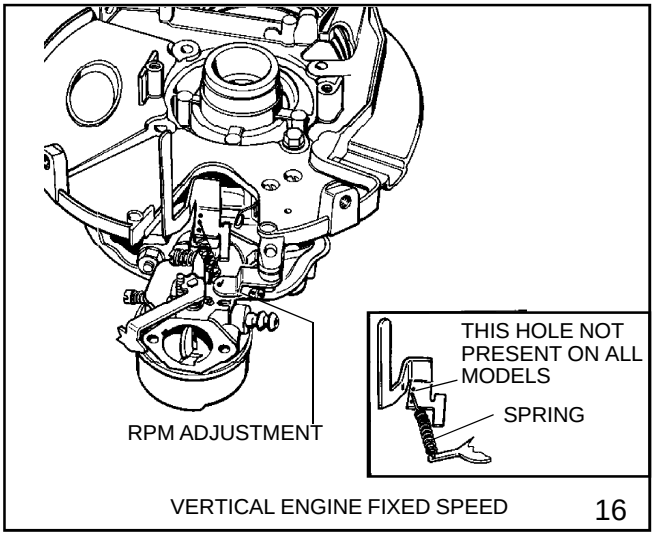
HORIZONTAL FIXED SPEED 13



VERTICAL ENGINE
FIXED SPEED-REMOTE CONTROL 14



VERTICAL ENGINE
VARIABLE SPEED
MANUAL CONTROL 15



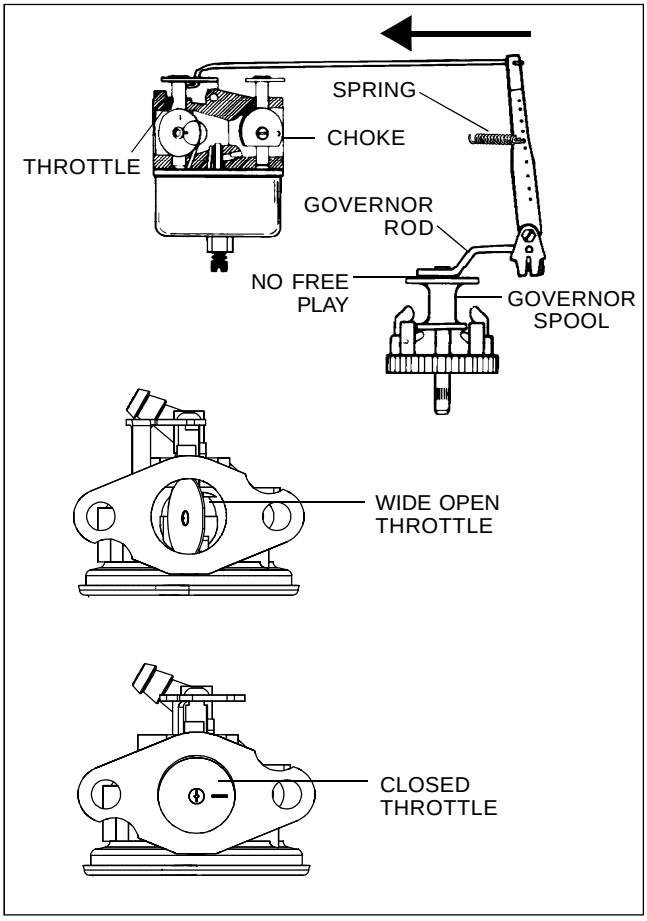
VERTICAL ENGINE FIXED SPEED 16

Static Governor Adjustments

The purpose of making a static governor adjustment is to remove all free-play between the governor spool and the carburetor (see illustration). Any free-play here will result in hunting/surging or erratic running. After completing this procedure, always re-check the engine speeds using the steps outlined in the following pages.

To set the static governor, do the following:

1. Be sure the engine is stopped or damage may occur.
2. If equipped with a throttle control, place the throttle in the high speed position.
3. Loosen the governor clamp or screw.
4. Hold the governor arm and link in the W.O.T. (wide open throttle) position, then rotate the shaft or shaft/clip assembly in the same direction and tighten the screw.
5. If engine speed adjustments are needed, follow the steps described in following pages.



Governor Shaft Pressed In Depth

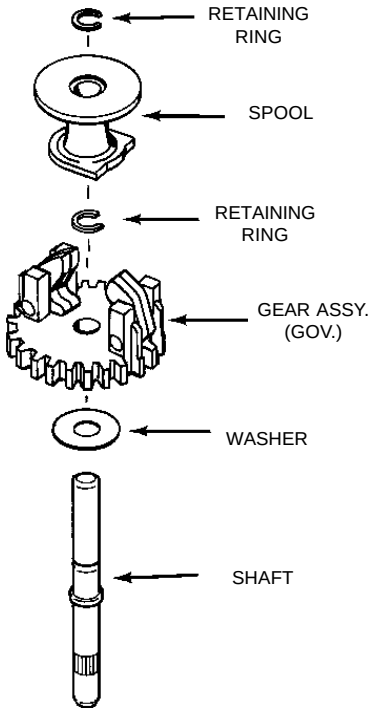
When assembling governor shaft into a flange or cover mounting boss, refer to this chart for exposed shaft length.

Engine Model	Exposed Shaft Length
ECH 90 ECV 100 H 30, 35 HS 40, 50 LAV (all) LEV (all) OHH (all) OVRM (all) TNT 100, 120 TVS (all) VLV (all)	Mounting flange to top 1.319 - 1.334" (33.502 - 33.883 mm)
TVM (all) V 50, 60, 70 VH 50, 60, 70	Mounting flange to top 1.581 - 1.596" (25.806 - 26.314mm)
HH 100, 120 VH 100	Mounting flange to top 1.016 - 1.036" (25.806 - 26.314 mm)

Engine Model	Exposed Shaft Length
H 50, 60, 70 HH 60, 70 HHM 80 HM 70, 80, 100	Mounting flange to shoulder 1.283 - 1.293" (32.588 - 32.842 mm)
OHV 11-17 OVM 120 OVXL 120, 125	Mounting flange to top 1.350 - 1.365" (34.290 - 34.671 mm)
OHM 90-120 OHSK 90-130	Mounting flange to top 1.085 - 1.100" (27.559 - 27.940mm)
OH 120-180	Mounting flange to top 1.00" (25.400mm)
TVT - V -Twin	Mounting flange to top 1.196 (3.969 mm)

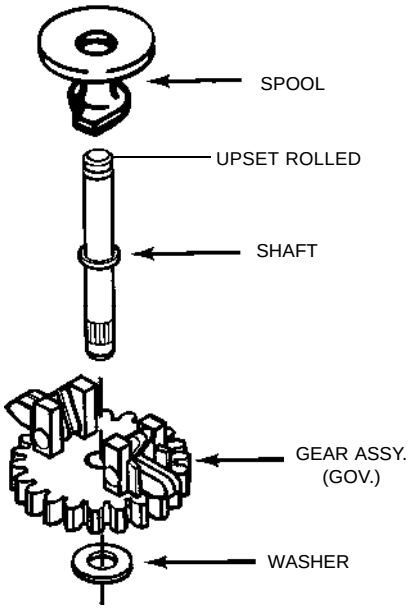
Small Frame, Vertical and Horizontal*

Models: LAV35,40,50 - H25,30,35 - HS40,50 - HSK - HSSK - TNT100,120 - ECH90 - TVS75,90,105,115,120 - OVRM ALL - ECV100,105,110,120



* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

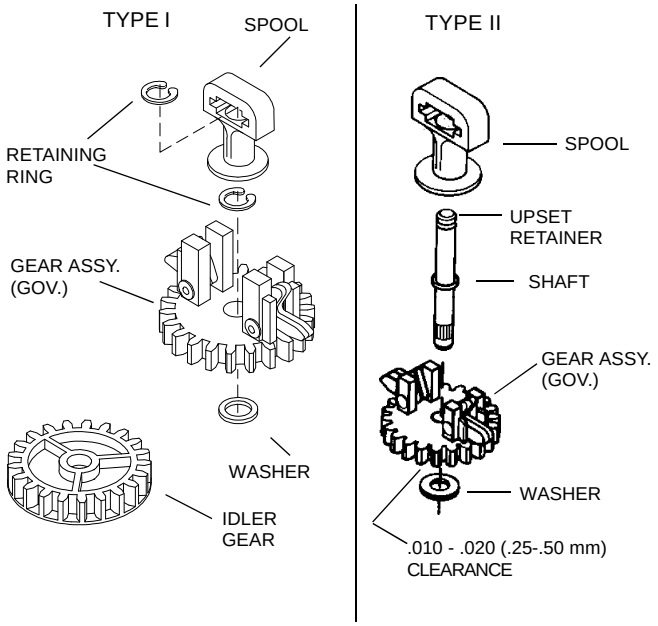
Retainerless Governor System for Small Frames*



NOTE: Gear assembly must have .010 - .020 (.25 - .50 mm) end play after shaft is installed into flange.

* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

VLV*40, 50, 55, 60, 65, 66

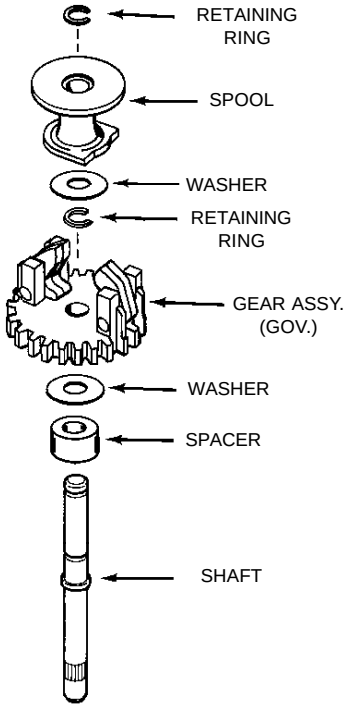


NOTE: Gear assembly must have .010 - .020 (.25 - .50 mm) end play after shaft is installed into flange.

* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

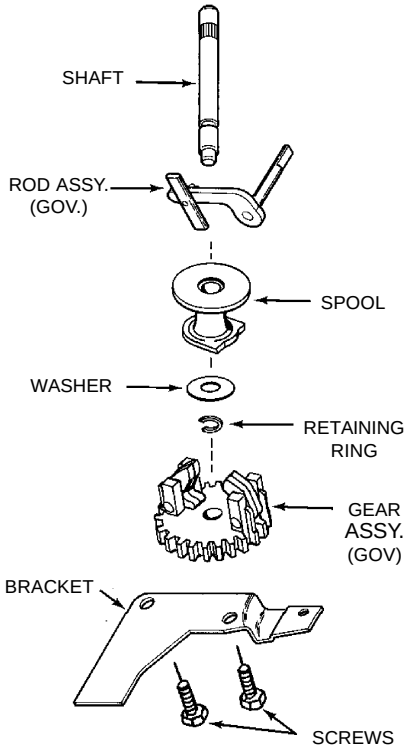
Medium Frame Vertical

Models: TVM125, 140, 170, 195, 220 - V50,60,70 - VH50,60,70

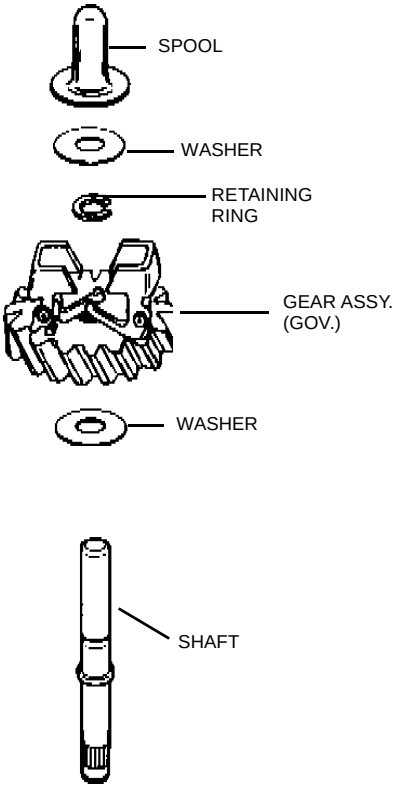


Medium Frame Horizontal

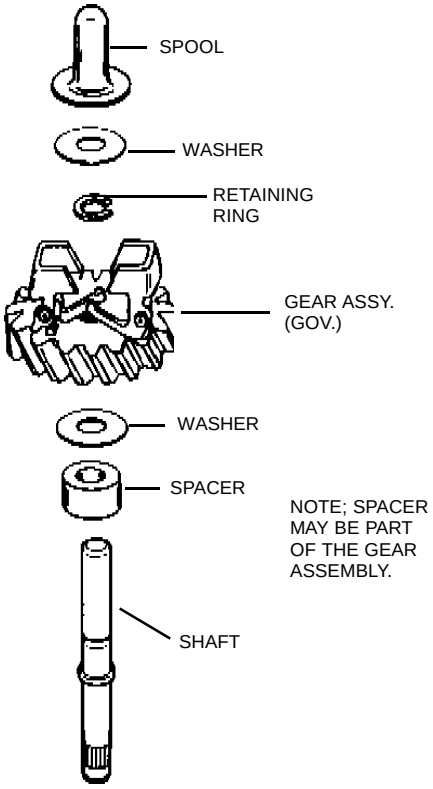
Models: HH60,70 - H50,60,70 - HM70,80,100 - HMSK



OHM120 - OHSK 80-130

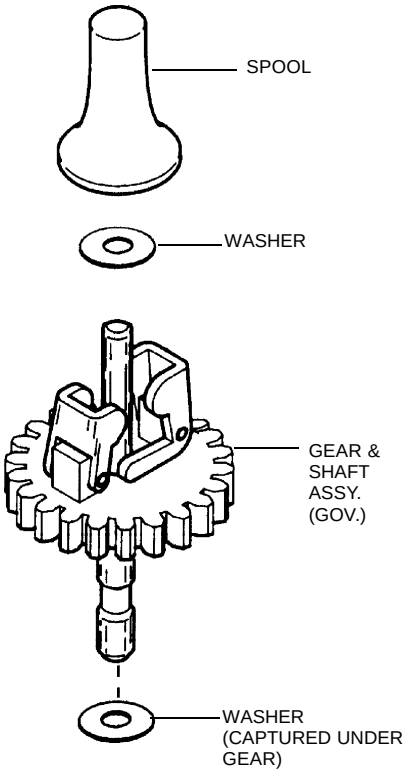


OVM120, OVXL120, 125 - OHV11-17



NOTE: On models OHV13.5-17, the spacer is cast as part of the governor gear with the washer placed below the gear assembly.

OH120, 140, 160, 180



Engine Speed and Mixture Adjustments

3-5 H.P. Vertical Shaft Engines

NOTE: Starting and operating problems may exist when engines are used at high elevations (over 4,000 feet above sea level). In cases where a fixed main carburetor is used, refer to Bulletin 110 for correction. **Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from their factory jetting unless specifically authorized.**

Before making any speed or carburetor adjustments be sure to adjust the governor and control bracket. See Governor Section of the Booklet.

To adjust the speed control bracket, determine whether the carburetor is an adjustable type, then proceed.

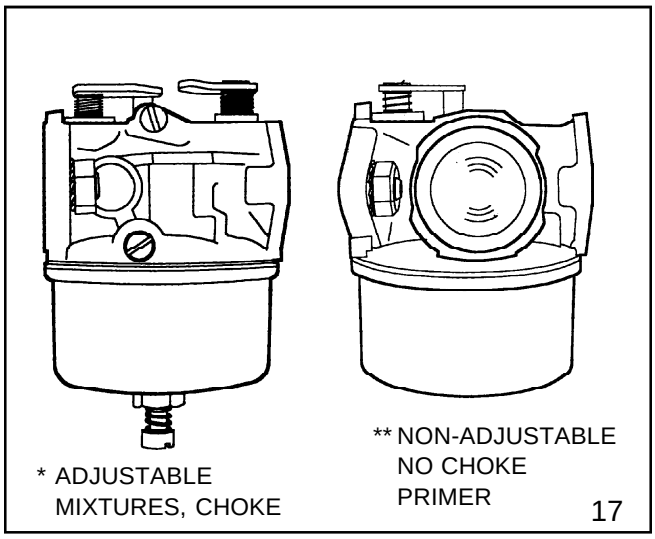
Some carburetors may have a choke lever which is operated by the speed control bracket. To adjust the speed control bracket for full choke operation, loosen the speed control bracket mounting bolts and move the speed control lever to the high speed/full choke position. Next insert a small piece of wire through the hole in the speed control bracket, choke actuating lever, and the choke lever (diag. 18). When all three holes are aligned tighten the mounting bolts.

Once the speed control bracket is adjusted, the main and idle fuel mixtures can be adjusted. Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the HIGH or FAST position, then turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic (lean). Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic (rich). Turn the screw in (clockwise) midway between these two positions. This will be the best setting.

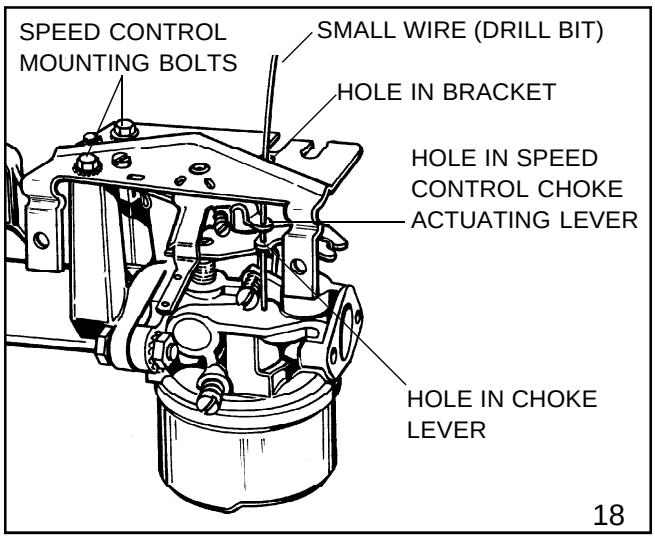
Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment.

NOTE: SOME CARBURETORS HAVE FIXED MAIN JETS. THE ABSENCE OF THE ADJUSTING SCREW INDICATES A FIXED JET AND NO ADJUSTMENT IS NECESSARY.

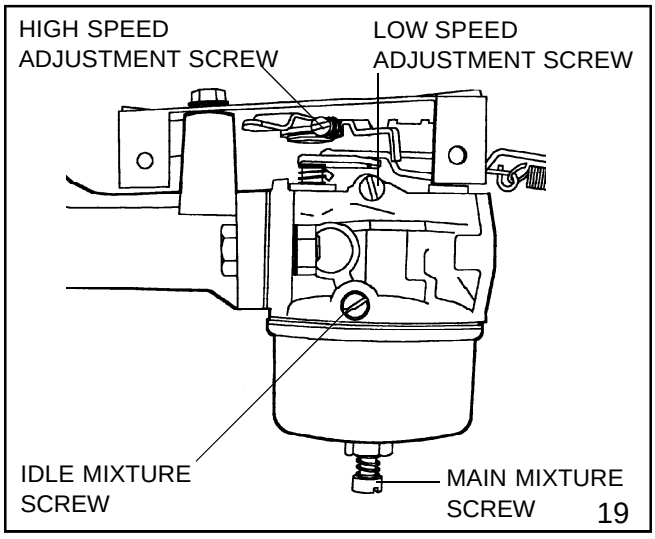
After adjusting the fuel mixtures, engine speeds can be adjusted. The correct operating speeds are found on Microfiche card 30 of the Tecumseh Master Parts Manual, or the computer parts look-up program (Part Smart). On engines with adjustable carburetors (diag. 19 and 20) the high speed adjustment will be in one of two places. The first location is on the speed control lever (diag. 19).



17



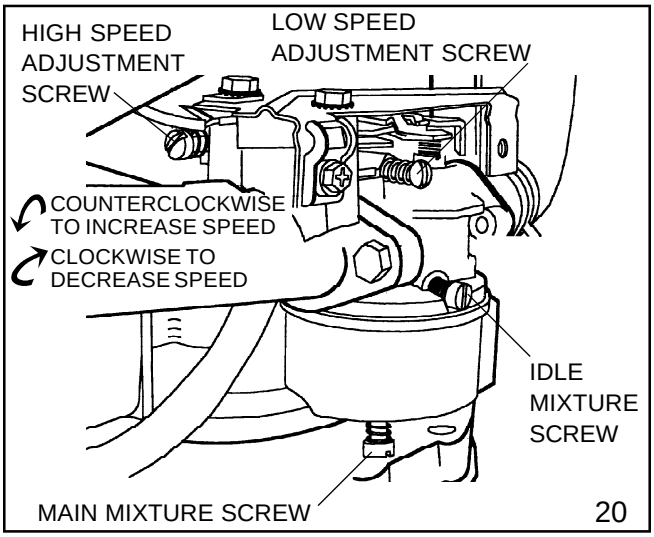
18



19

Engine Speed and Mixture Adjustments - *continued*

3-5 H.P. Vertical Shaft Engines



The second is on a bracket located between the blower housing and the speed control (diag. 20). Low speed is adjusted by the throttle crack screw on the carburetor (diag. 19 and 20).

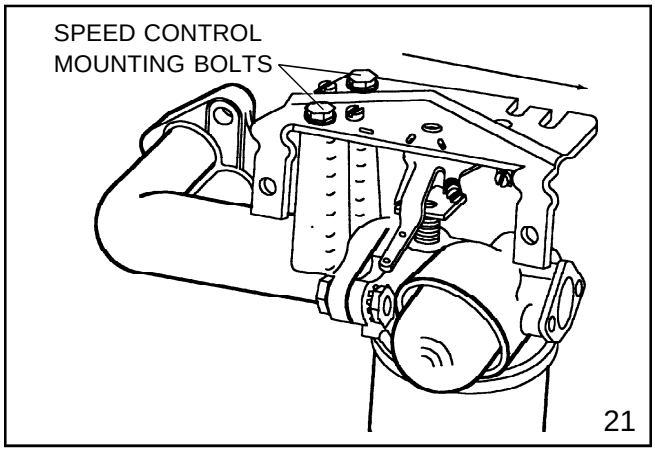
It may be necessary to preset the carburetor mixture screws.

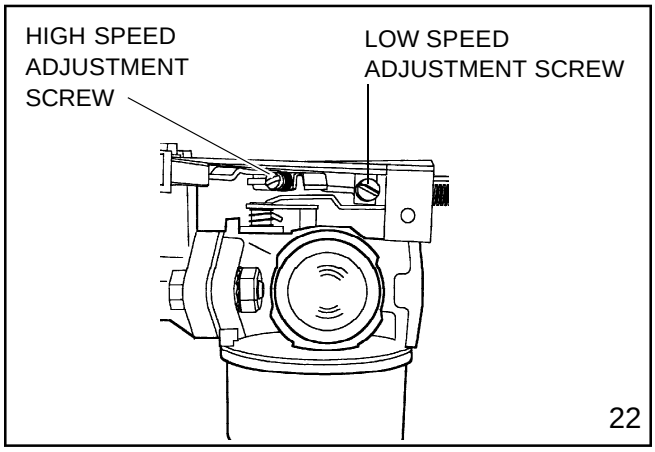
Tecumseh Carburetors

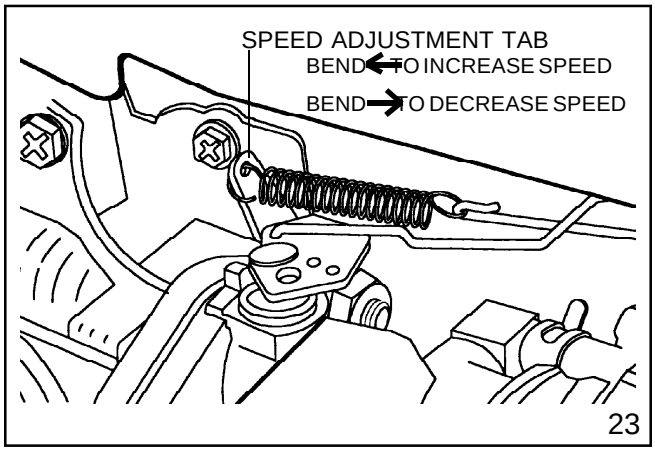
Engine Model	Main Pre-set	Idle Pre-set
All models with float-type carburetors	1-1/2 turn	1 turn
All models with diaphragm-type carburetors	1 turn	1 turn

Some speed control brackets are adjusted by loosening the speed control bracket mounting bolts and sliding the bracket all the way to the right and re-tightening the mounting bolts (diag. 21). The high speed adjustment screw is located on the speed control lever (diag.22) Some carburetors are fixed speed and are adjusted by bending the adjusting tab attached to the intake manifold (diag. 23).

After setting the engine speeds recheck the fuel mixtures, then recheck the engine speeds.

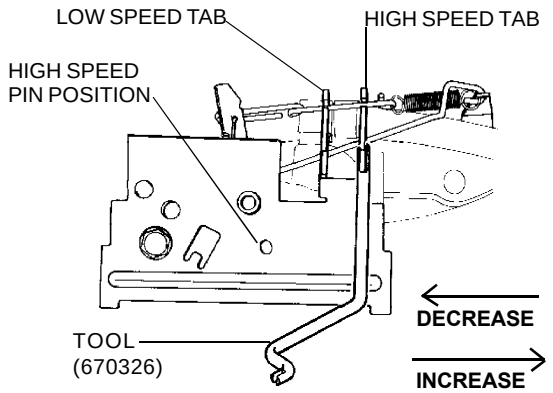




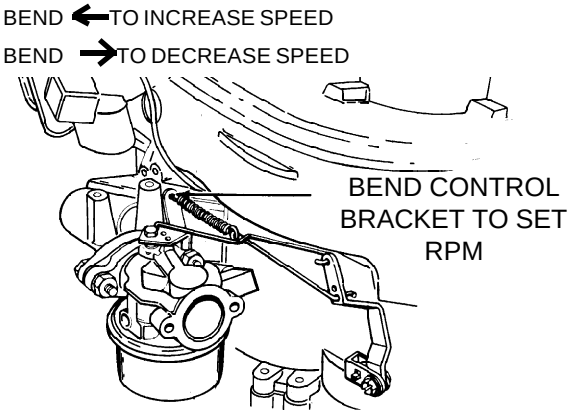


Engine Speed and Mixture Adjustments - *continued*

3-5 H.P. Vertical Shaft Engines



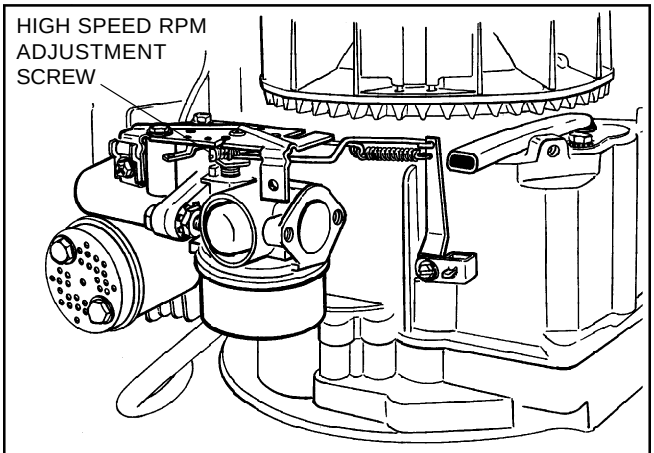
SNAP IN CONTROL 24



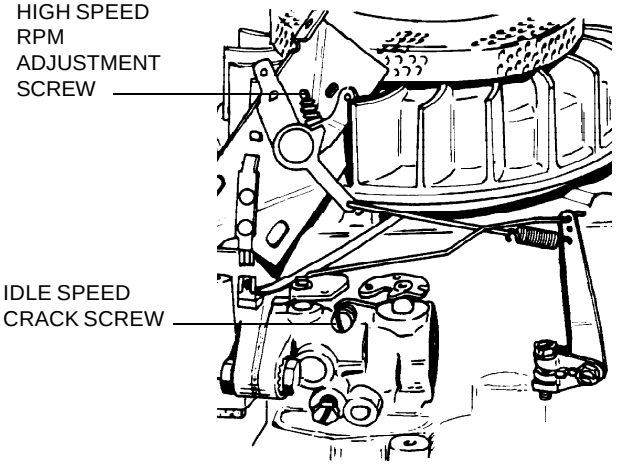
VERTICAL ENGINES 25

GOVERNED / NON-GOVERNED IDLE

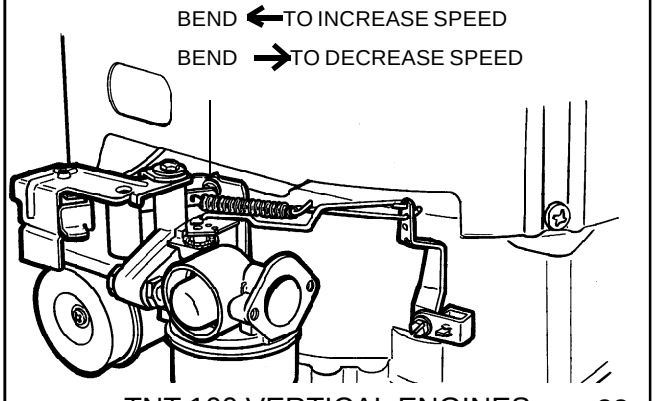
With the engine running at its lowest speed, set the governed idle at the designated R.P.M. by bending the idle R.P.M. tab. Next set the non-governed idle by pushing the bottom of the governor lever away from the control brackets, so the throttle lever contacts the idle speed screw. Hold the lever in this position and turn the idle adjustment screw clockwise to increase or counterclockwise to decrease engine idle speed. The setting on the carburetor screw should be set at 600 R.P.M. below the governed idle setting. This setting prevents the throttle plate from closing when going from high speed R.P.M. to low speed R.P.M. If improperly adjusted, the engine could experience an over lean condition.



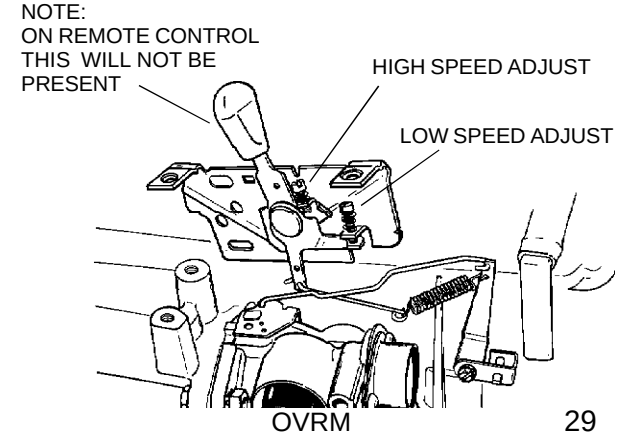
TVS 115 ENGINE WITH DUAL SYSTEM CARBURETOR 26



VERTICAL SHAFT ENGINES 27



TNT 100 VERTICAL ENGINES 28



OVRM 29

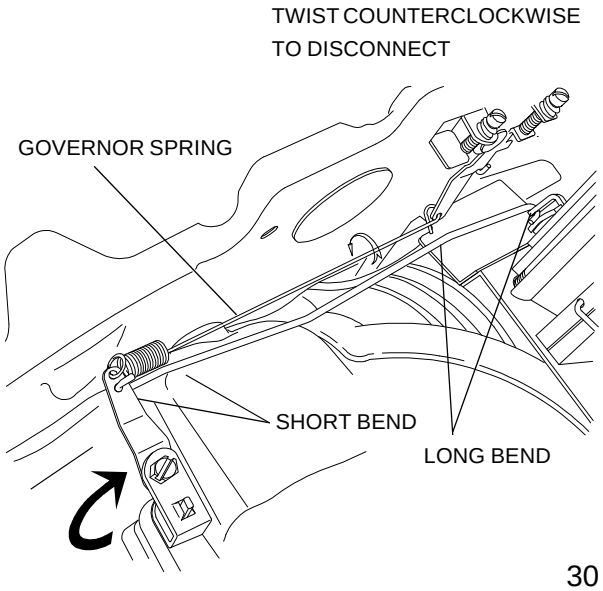
VLV Governor and Linkage

Governor Adjustment

With the engine stopped, loosen the screw holding the governor clamp and lever. Turn the clamp clockwise, then push the governor lever (connected to the throttle) to a full wide open throttle position. Hold the lever and clamp in this position and tighten the screw.

Linkage Installation

The solid link is always connected from the throttle lever on the carburetor to the lower hole on the governor lever. The shorter bend has to be toward the governor. The governor extension spring is connected with the spring end hooked into the upper hole of the governor lever and the extension end hooked through the speed control lever. To remove the governor spring, carefully twist the extension end counterclockwise to unhook the extension spring at the speed control lever. Do not bend or distort the governor extension spring (diag. 30).

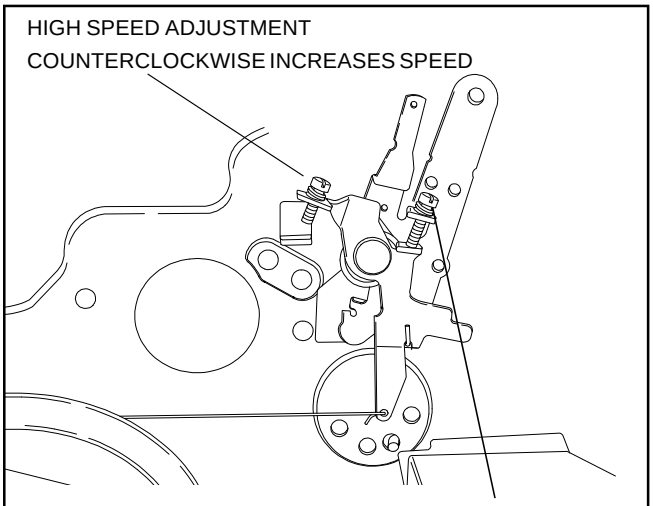


30

Speed Controls

This engine has an adjustable speed control. Never exceed the manufacturer's recommended speeds.

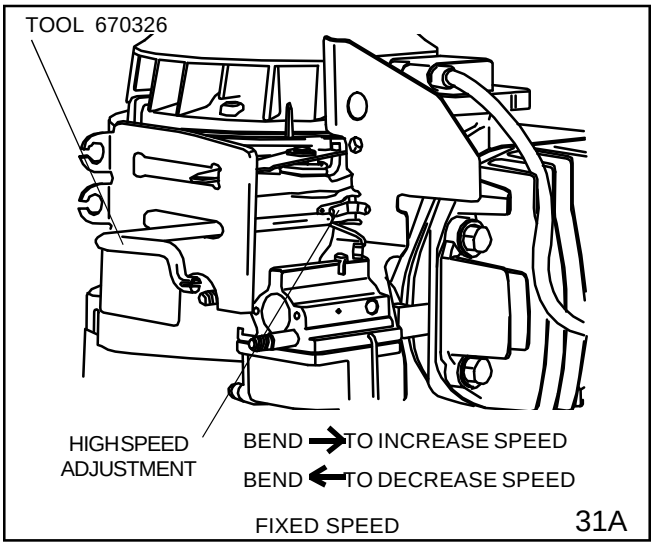
NOTE: Governor adjustment screw will be a Torx head (T-10) effective August 1, 1996 for E.C. Compliance.



31

Fixed Speed

High speed governor adjustment is accomplished by bending a tab to increase and decrease engine R.P.M. Effective August 1997 (diag. 31a).

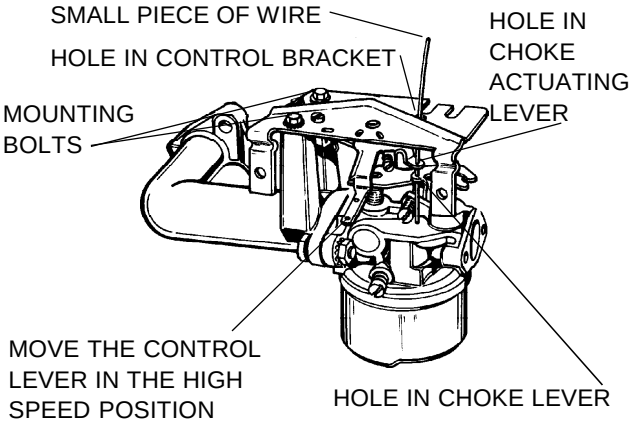


31A

Engine Speed and Mixture Adjustments

5-15 HP Vertical Shaft Engines

The first step is adjusting the speed control bracket for full choke operation. Loosen the two speed control bracket mounting bolts and move the control lever to the full high speed/full choke position. Insert a piece of wire through the hole in the speed control bracket, the choke actuating lever, and the choke lever (diag. 32). When all three holes are in alignment retighten the speed control bracket mounting bolts.

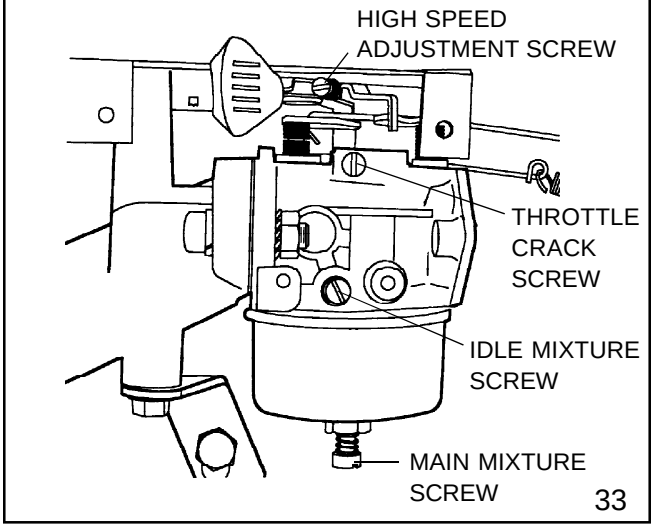


32

The second step is adjusting the main and idle fuel mixtures. Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed controls to the HIGH or FAST position, then turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic (lean). Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic (rich). Turn the screw in (clockwise) midway between these two positions. This will be the best setting.

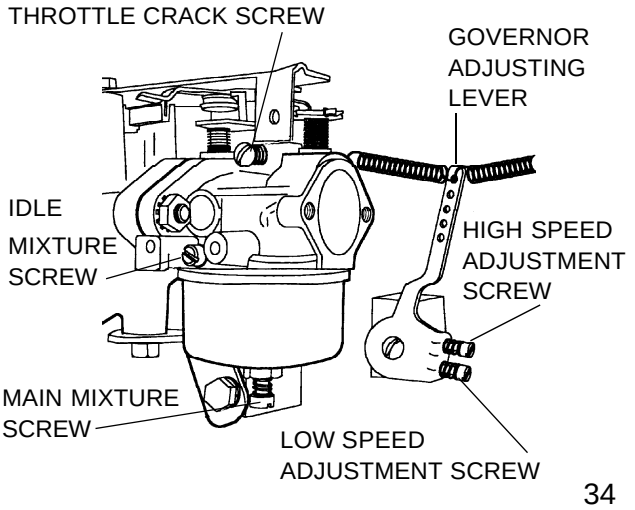
Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment screw.

NOTE: SOME CARBURETORS HAVE FIXED MAIN JETS. THE ABSENCE OF THE ADJUSTING SCREW INDICATES A FIXED JET AND NO ADJUSTMENT IS NECESSARY.



33

The third step is setting engine speeds. The correct engine operating speeds are listed on card 30 of the Tecumseh Master parts manual microfiche, or the computer parts look-up program (Part Smart or Plus One). The most common speed control bracket (diag. 33) has the high speed adjustment screw located on the speed control lever. The low speed adjustment screw is the throttle crack screw on the carburetor body. Another common speed control is the governor override system (diag. 34). This system has a similar speed control bracket along with a governor adjustment lever which is attached to the engine block. Both the high speed and low speed adjustment screws are located on the governor adjusting lever.



34

Engine Speed and Mixture Adjustments - *continued*

2.5-17.5 HP Vertical Shaft Engines

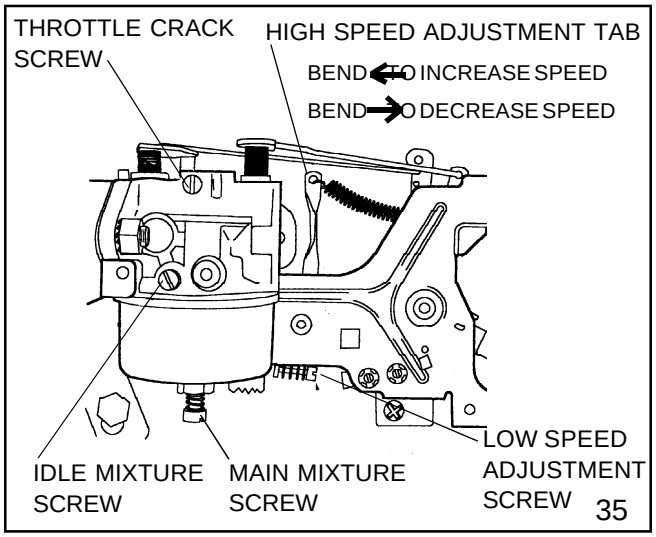
To adjust high speed on an up/down control (diag.35) bend the adjustment tab. Low speed is adjusted by a screw at the bottom of the control bracket. Both the governor override system and the up/down speed control have a governed idle. On these systems it is important to also adjust the throttle crack screw. To adjust the throttle crack screw use your finger to hold the throttle shutter tight against the throttle crack screw and adjust the engine speed to approximately 600 R.P.M. less than the recommended low speed.

After setting the engine speeds recheck the fuel mixtures and double check the engine speeds.

NOTE: Not all engines have fully adjustable carburetors.

It may be necessary to preset the carburetor mixture screws.

Tecumseh Carburetors		
Engine Model	**Main Pre-set**	**Idle Pre-set**
All models with float-type carburetors	1-1/2 turn	1 turn
All codels with diaphragm-type carburetors	1 turn	1 turn



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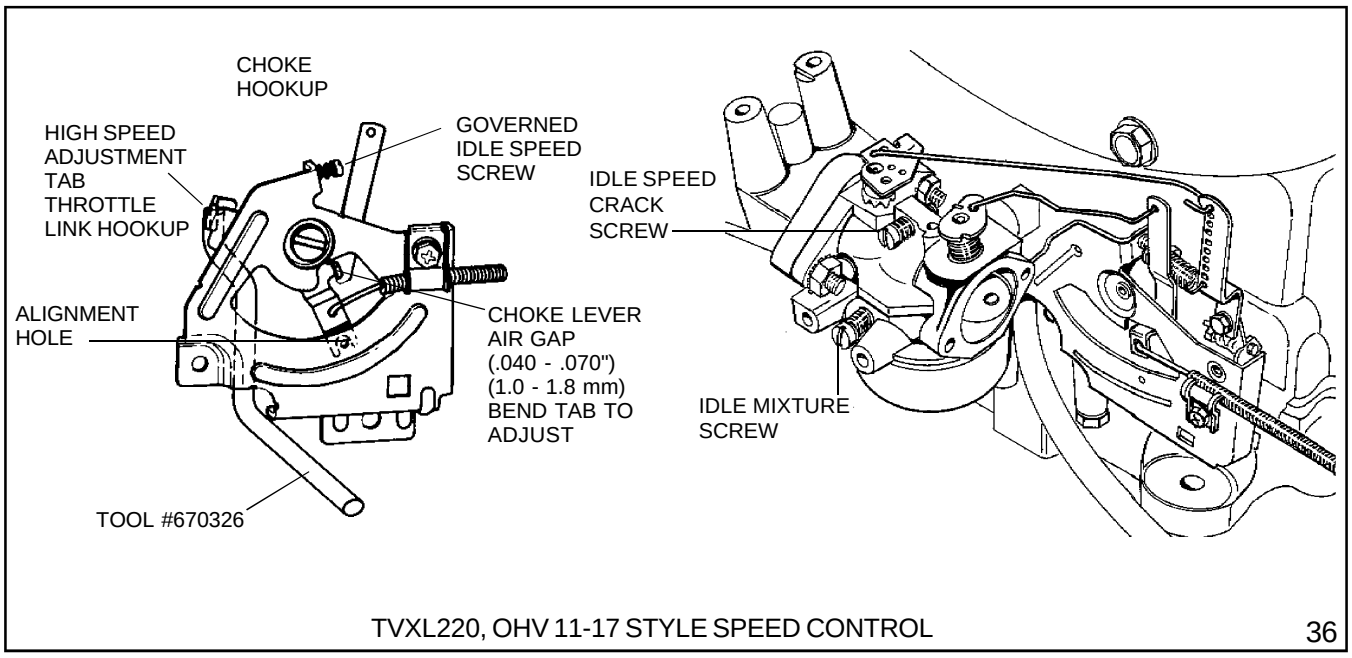
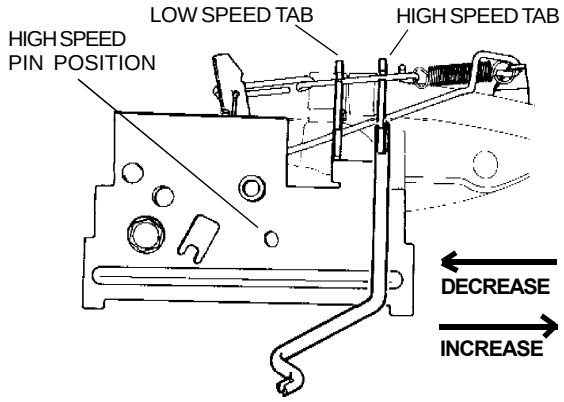


TVXL220, OHV 11-17 STYLE SPEED CONTROL 36

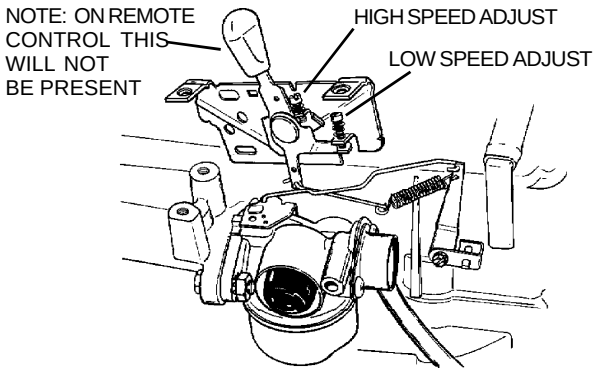
The idle speed is adjusted by turning the idle speed screw clockwise to increase engine R.P.M. and counterclockwise to decrease R.P.M. Use tool part # 670326 to adjust the high speed engine R.P.M. Place the slotted end of the tool onto the adjustment tab and bend the tab to the left (toward the spark plug end) to increase engine R.P.M. (diag. 36).

NOTE: Be sure that the throttle cable has full travel from wide open throttle to full choke. **Hard Starting** could result if the cable is not properly adjusted to allow for full choke.

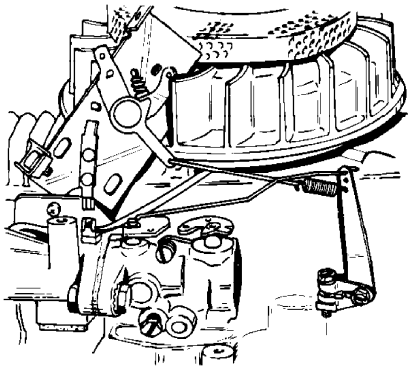
Engine Speed and Mixture Adjustments - *continued*



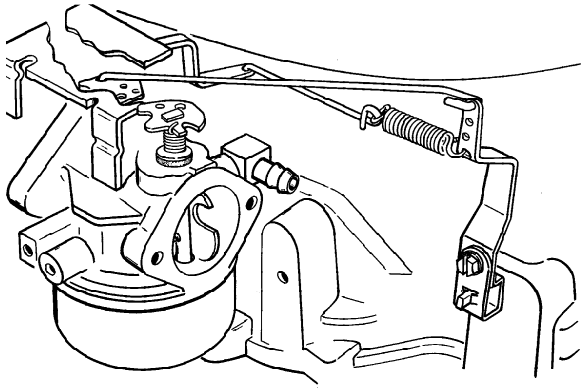
OVRM SNAP IN CONTROL 37



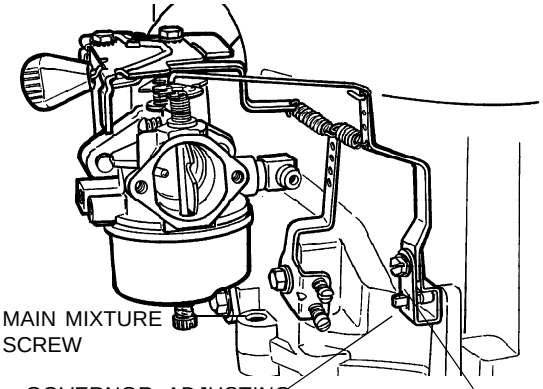
OVRM 38



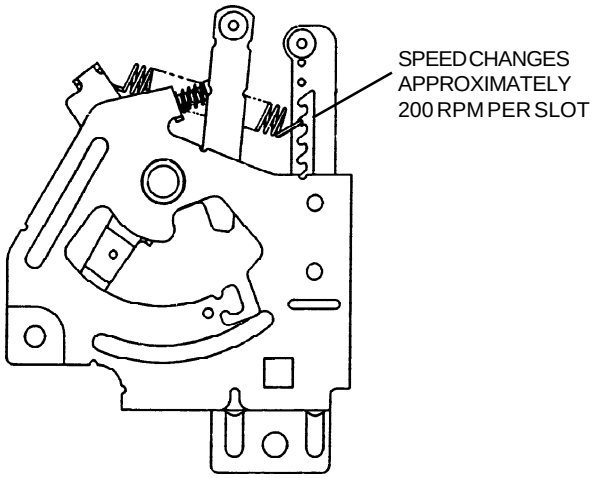
OVRM 39



STANDARD TVM ENGINE WITHOUT
GOVERNOR OVERRIDE 40



OVM/OVXL,TVM 170, 195 & 220 41

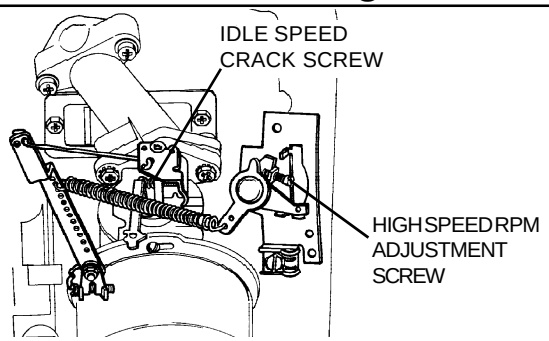


OHV 11-17

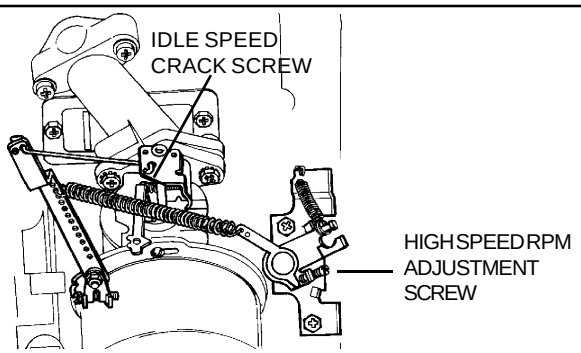
Governor Override System for TVM170, 195 and 220 Engines (diag. 41)

This system will be found starting on 1985 production models and will not retrofit onto older engines. It is designed to allow the governor to regulate the low and high speeds of the engine. The high speed is adjusted at the top screw of the override lever; to increase R.P.M. turn the screw out (counterclockwise), to decrease R.P.M. turn the screw in (clockwise). The low speed is adjusted at the bottom screw of the override lever; to increase R.P.M. turn the screw in or clockwise, to decrease R.P.M. turn the screw out or counterclockwise (diag. 41).

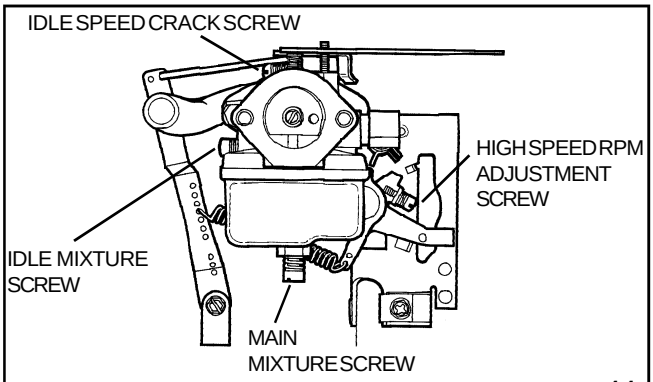
Engine Speed and Mixture Adjustments -
Horizontal Shaft Engines



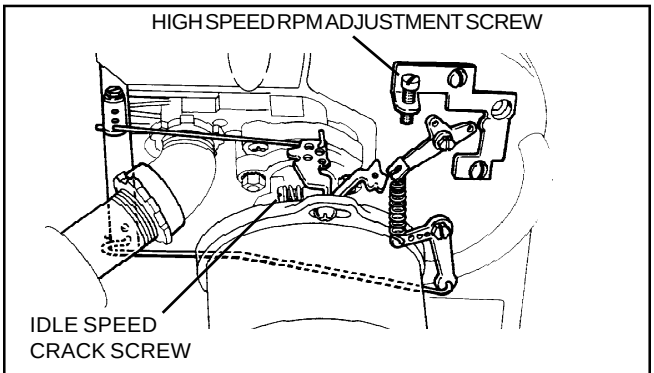
HORIZONTAL LIGHTWEIGHT 42



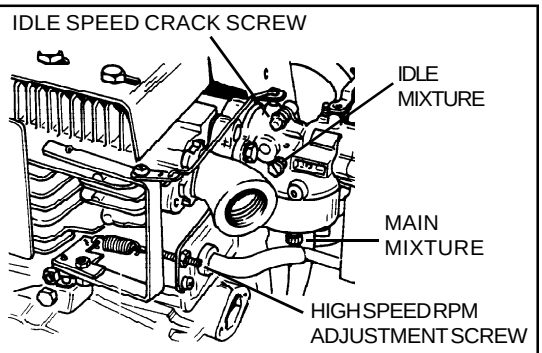
LIGHTWEIGHT R.V. TYPE 43



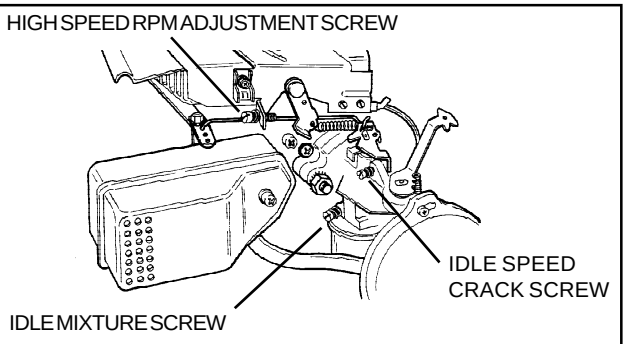
SMALL FRAME GOVERNED IDLE 44



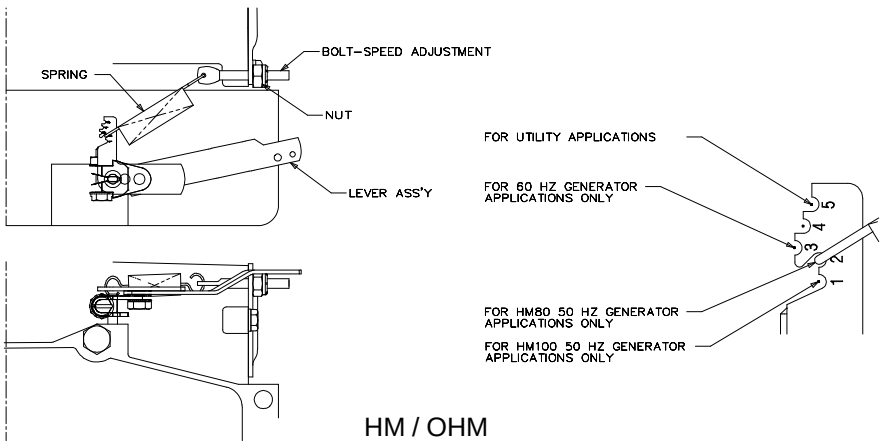
HORIZONTAL MEDIUM FRAME 45



CONSTANT SPEED APPLICATIONS 46



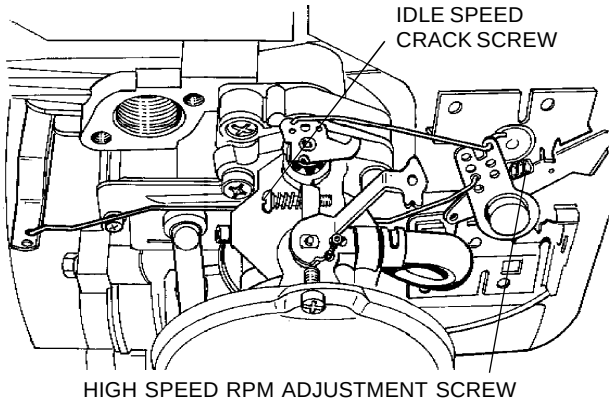
HORIZONTAL MEDIUM FRAME 47



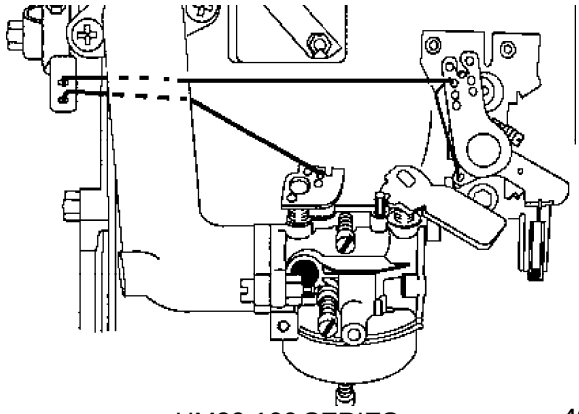
HM / OHM

NOTE: Since 1996, all speed adjustment screws will have a torx head.

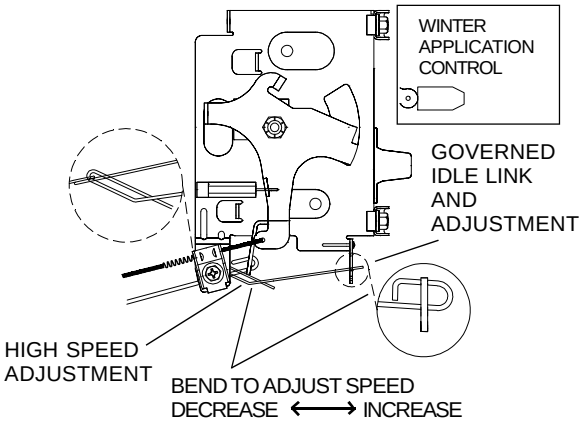
Horizontal Shaft Engines - *continued*



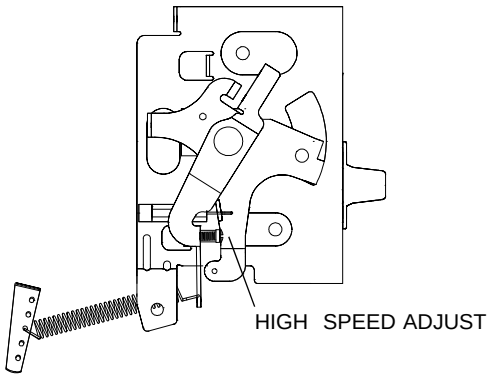
MEDIUM FRAME 48



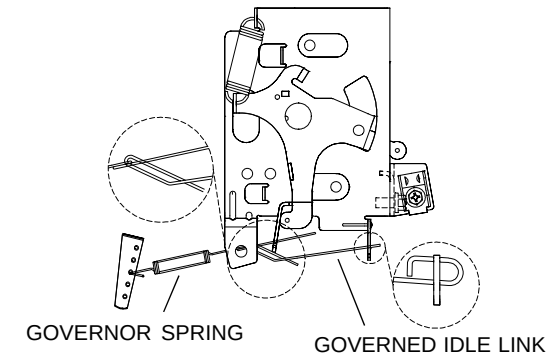
HM80-100 SERIES 49



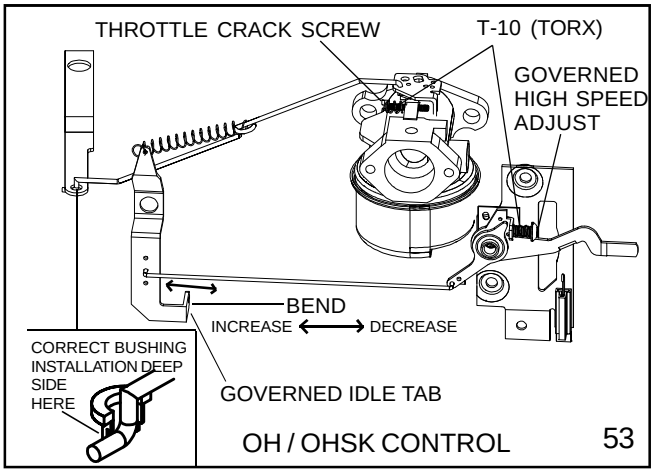
OHH REMOTE & MANUAL 50



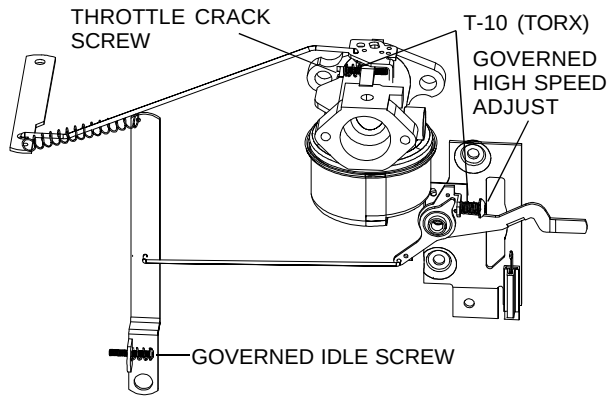
OHH FIXED SPEED 51



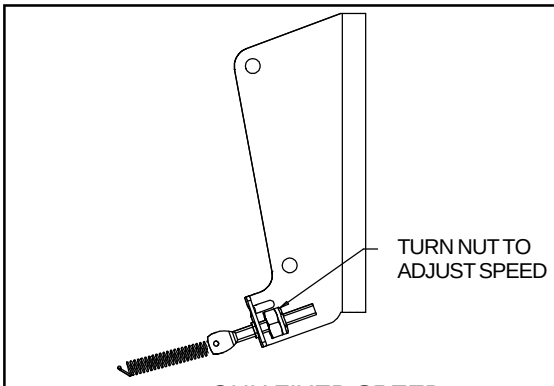
OHH RV CONTROL 52



OH / OHSK CONTROL 53



OHSK / OHM CONTROL 54



OHH FIXED SPEED

Engine Speed Adjustments - 8-18 HP, Cast Iron

Governor Adjustment for Horizontal Engines

Move the remote controls to the RUN position.

Loosen Screw "A".

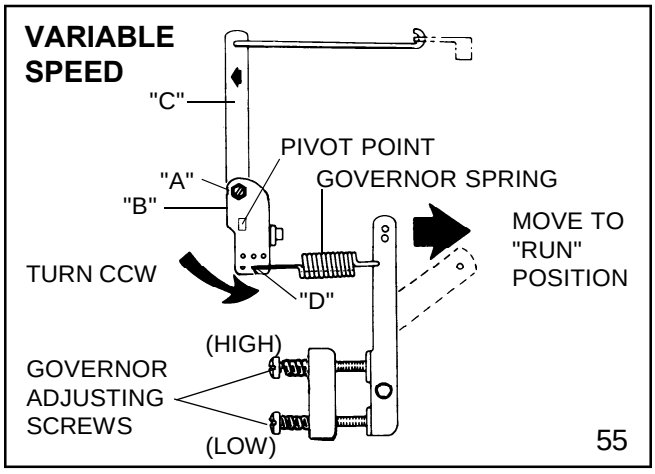
Pivot plate "B" counterclockwise and hold.

Move lever "C" to left.

Tighten screw "A" securely.

When the governor is properly set the carburetor throttle lever will be in a wide open position when the controls are set for starting.

The governor spring is to be anchored in the bottom center hole (D) of plate "B". Do not stretch or cut the governor spring. Above adjustments will correct any variations in governor control (diag. 55).

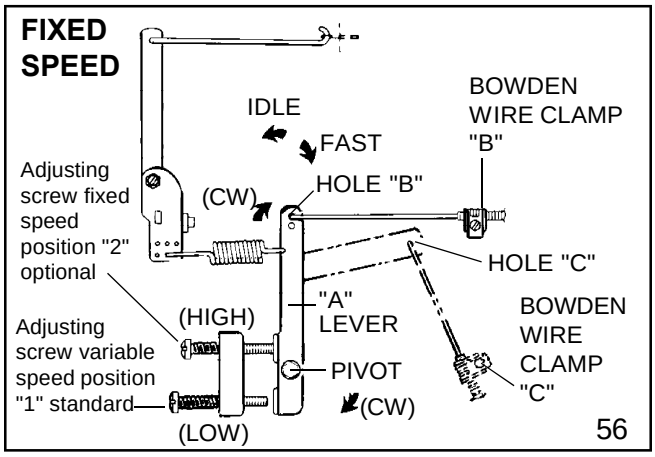


1. **Setting Variable Speed Adjusting Screw**. Before attaching the bowden wire, set the engine for maximum R.P.M. (See Mfg. specifications) with engine running. Use a good tachometer. Move lever "A" clockwise until lower end strikes the adjusting screw at position "1" (diag. 56).

   Loosen lock nut on adjusting screw and turn in to decrease R.P.M. Turn out to increase R.P.M.

   CAUTION: DO NOT EXCEED RECOMMENDED R.P.M.

2. **Adjusting Fixed Speed**. The fixed speed adjusting screw is the optional position "2". Adjust it by starting the engine, then loosening the locknut. Turn the screw in to increase R.P.M. and out to decrease R.P.M.

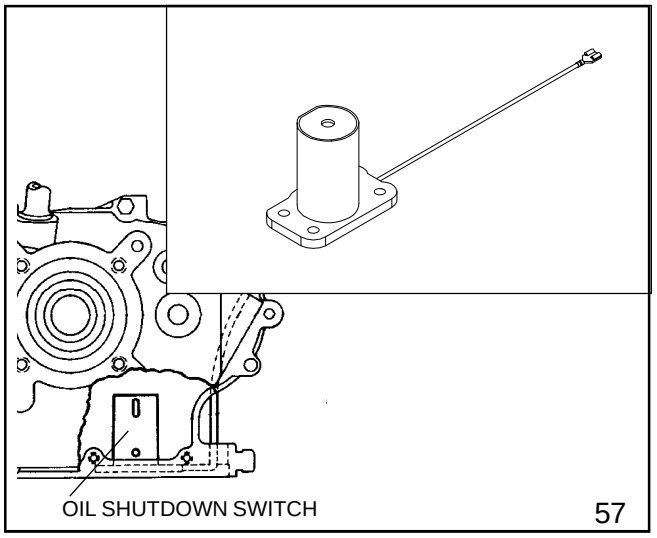


NOTE: The TVT-control system is shown only in the 696325 Technician's manual.

Switches, Sensors, and Solenoids

Low Oil Shutdown Switches

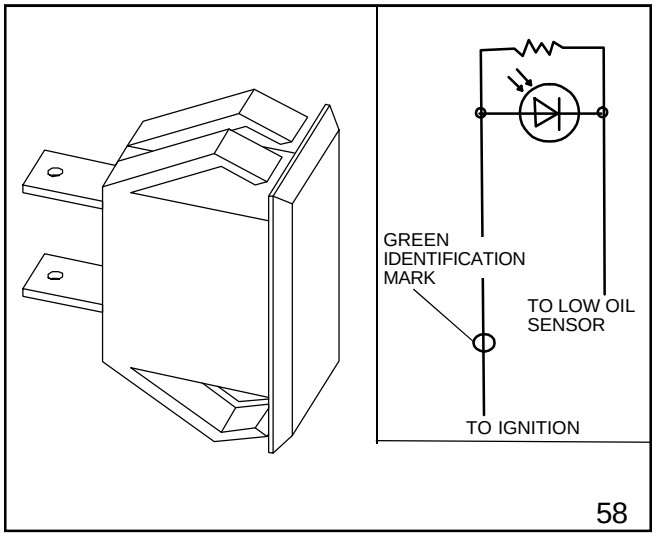
Check the LOS switch while it is in the engine. The engine must be level, and the oil level at the full mark. Place the speed control in the run position. Remove the spark plug wire from the spark plug. Install a gap type tester connected to the spark plug wire and a good engine ground. Spin the engine over using the electric or recoil starter. A bright blue spark should be seen at the tester. If not, remove the blower housing and disconnect the LOS lead from the ignition module. Reinstall the blower housing and spin the engine over. If spark occurs now, replace the LOS switch. If no spark is seen, replace the ignition module (diag. 57).



57

Low Oil Shutdown Indicator Light

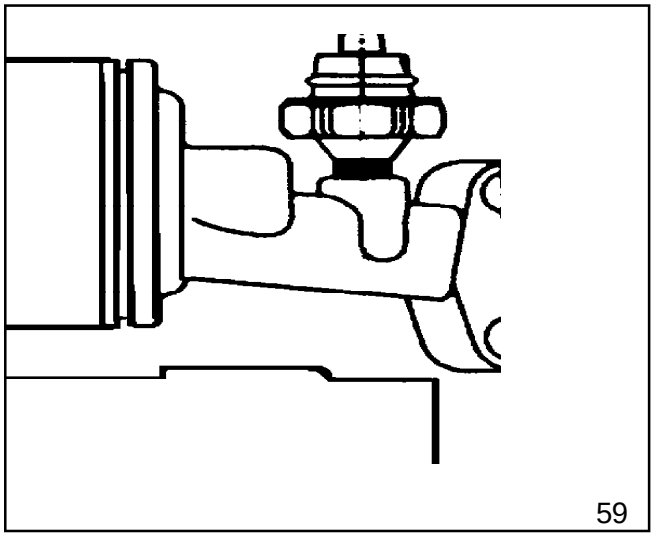
If equipped, the indicator light will flash if the oil level is at or below the add mark when the engine is turned over while attempting to start. Test by turning the engine over with the oil level below the add mark. If the indicator light does not flash, replace the indicator light (diag. 58).



58

Low Oil Pressure Sensor

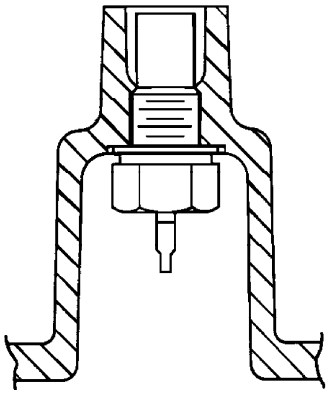
Test the sensor on a running engine using an ohmmeter or continuity tester with one test lead connected to the sensor terminal and the other to an engine ground. An open circuit should be found with the engine running and continuity should exist when the engine is shut off. If continuity is found or the oil pressure indicator is on at low engine R.P.M.'s, remove the sensor and install a master oil pressure gauge. The oil pressure of a running engine should be 7 p.s.i. (.500 bar) or higher, if lower an internal engine problem exists (diag. 59).


59

Switches, Sensors, and Solenoids - *continued*

Low Oil Sensor

This sensor must use a #194 bulb, resistance of the bulb MUST be .27 ampere in series with the sensor for proper operation and to prevent sensor damage. Remove the sensor from the engine and attach the electrical plug. Attach a jumper lead from an engine ground to the threaded portion of the sensor. Place the keyswitch in the run position. The indicator light should come on with the tip of the sensor in air (uncovered) and go off when oil covers the sensor tip. The response time of the sensor is between 5 and 15 seconds with 13 volts D.C. at the battery. Lower battery voltage will result in a longer response time. Use teflon-type pipe sealant on the sensor threads to prevent oil leakage when reinstalling (diag. 60).

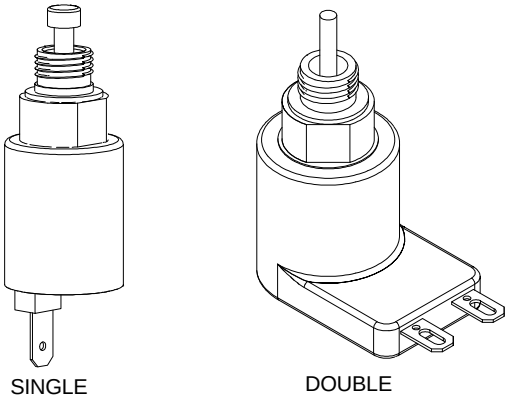


60

Fuel Shutdown Solenoids

If the engine is running, the solenoid can be checked by removing the electrical plug-in at the base of the solenoid. Almost immediately the engine should shutdown, if not replace the solenoid (diag. 61).

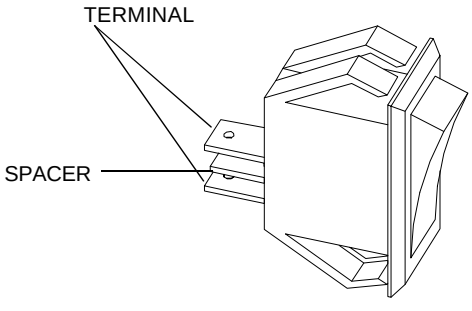
Test the solenoid off the carburetor by applying 12 volt D.C. from the battery positive terminal to a solenoid terminal. Connect a jumper wire from the metal housing (or other terminal) to a negative battery terminal. The plunger should retract the full travel distance. Disconnect the negative jumper lead and the plunger should return to the extended position. Replace if necessary (diag. 61).



61

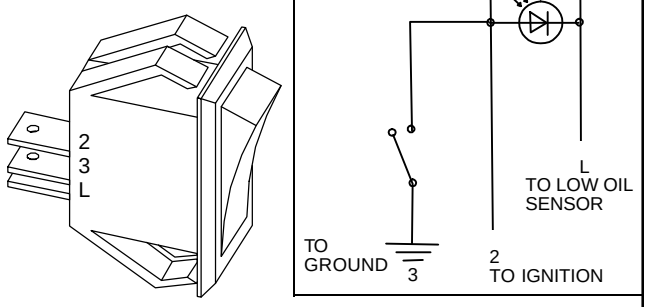
On/Off Switches

Engine On/Off Rocker Switch



2 TERMINALS 62

Lighted Engine On/Off Rocker Switch w/ Low Oil Shutdown



3 TERMINALS 63

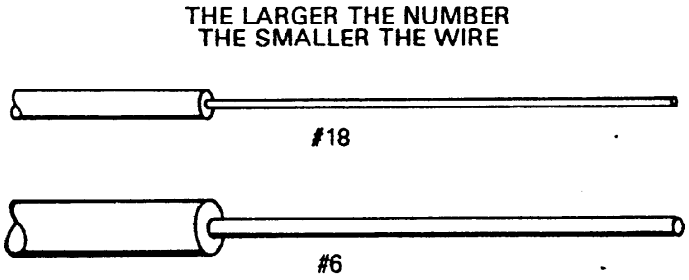
Wiring

CONDITION. All wiring must be fully insulated between connection points, securely fastened and free of foreign material (such as rust and corrosion) at the connection points. This is especially important in the use of batteries where much of the potential may be lost due to loose connections or corrosion. Remember to check the insulation on the wire. All it takes is a pin hole for a wire to "ground out" on the engine or frame. This is of special concern when moisture or water is present. This may cause the engine to run erratically or be impossible to start.

WIRE GAUGE: Proper thickness of wire is necessary in all electrical circuits. Wire diameter is measured in increments of gauge numbers. The larger the number, the smaller the diameter of the wire. The smaller the number, the larger the diameter of the wire.

1. Starter circuit wiring must be rated at #6 or lower gauge number.
2. Charging circuit wiring must be rated at #16 or lower gauge number. (20 amp system requires #14 or lower gauge number).
3. Magneto circuit wiring (ground circuit) must be rated at #18 or lower gauge number.

Color Codes



Tecumseh Products Company standard wiring color codes effective August, 1992 are as follows:

Code		Product
Yellow	-	Alternator A.C. Leads
Red	-	Alternator D.C. + Leads
Brown	-	Alternator D.C. - Leads
Black	-	Alternator Ground Leads, Battery Ground Leads
Orange	-	12 Volt Starter B + Leads
Dark Green	-	Ignition Shut-Off Leads

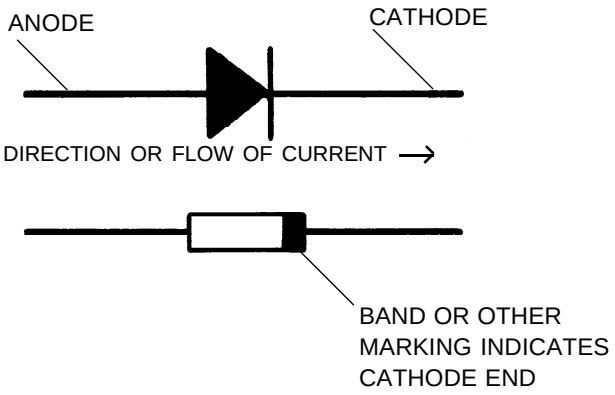
NOTE: Prior to August 1992, wire codes changed according to model and specification numbers.

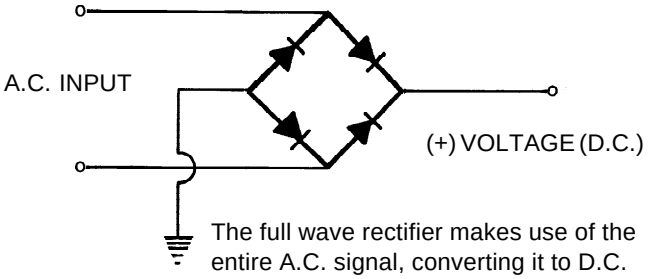
Ammeters

An ammeter is used to measure the rate of current flow from the alternating system to the battery. If no current flow is indicated by the ammeter, remove the ammeter from the circuit and check all other components in the system. Use the ohmmeter to check continuity across the ammeter. If no continuity exists, replace the ammeter.

Diodes

In order to charge a battery it is necessary to convert alternating current (A.C.) to direct current (D.C.) This is accomplished by using a diode or rectifier. Using a single diode will make use of one half of the A.C. signal and is known as HALF WAVE RECTIFICATION. This is acceptable in certain applications. In certain situations it is necessary to make use of the entire A.C. signal. To accomplish this we use multiple diodes in a bridge configuration which produces FULL WAVE RECTIFICATION.





The full wave rectifier makes use of the entire A.C. signal, converting it to D.C.

Solenoids

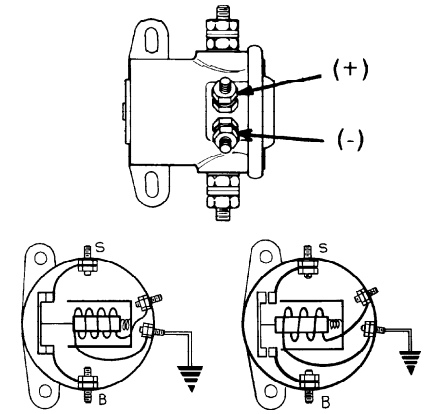
A solenoid is a heavy duty switching mechanism used to handle large amounts of current. It consists of a heavy strip of metal activated by an electromagnet. The metal strip connects two contact points and "makes" or "breaks" the electric circuit. Because the metal strip is heavier than most switch contacts, it does not pit or burn away as lighter switch contacts will.

To test a grounded solenoid, connect positive (+) solenoid terminal (next to solenoid ground) to the positive (+) battery terminal. Connect negative ground (-) terminal of the solenoid to the negative (-) battery terminal. If solenoid is in good condition, the plunger will "snap" and close the main contacts (diag. 64).

NOTE: With a grounded solenoid, battery B+ is supplied to activate. With insulated solenoid, battery B- is supplied to activate.

To test an insulated solenoid, connect the terminal marked "B" to the positive (+) battery terminal. Connect terminal marked "G" to the negative (-) battery terminal. If the solenoid is in good condition, the plugger will "snap" and close the main contacts.

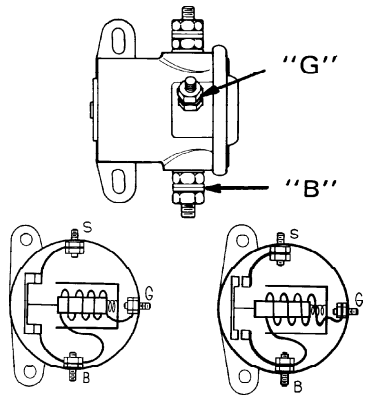
GROUNDED SOLENOID



START POSITION CIRCUIT CLOSED — RUNNING AND STOP POSITION

64

INSULATED SOLENOID



START POSITION CIRCUIT CLOSED — RUNNING AND STOP POSITION CIRCUIT

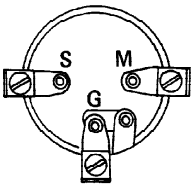
65

Key Switches

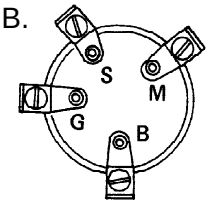
Switches are the common point on the vehicle where most of the wiring centrally comes together. There are many varieties of switches available. Replace damaged or failed switches according to the equipment manufacturer's specifications. NEVER substitute an automotive switch for a switch replacement on a small engine application, or a switch from an engine with a battery ignition.

The more common switches are shown below:

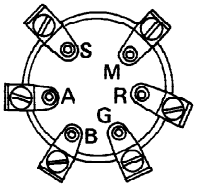
A.



B.



C.



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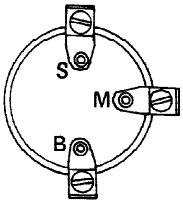

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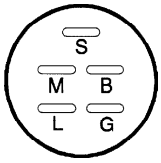

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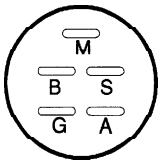
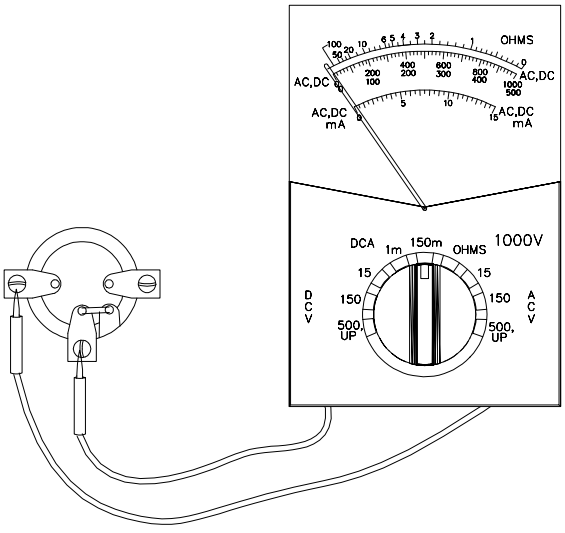


IMPORTANCE OF USING CORRECT SWITCH

Some switches are too small to take the continual "make" and "break" without burning the electrical contacts. This is when it is advisable to install the recommended manufacturers switch.

*****NOTE:** WARRANTY IS VOID FOR THE ENGINE COMPONENTS BEING BURNED OUT DUE TO A FAULTY SWITCH.

EXAMPLE:



Continuity Check for Switches

NOTE: This is only a generic test, manufacturer's may differ in switch terminals and functions.

Switch A

Connect Ohmmeter Leads to:	Continuity w / key in start position	Continuity w / key in off position	NO Continuity in ***any*** key position	Continuity w / key in run position
S & G	X			
M & G		X		
M & S			X	

Switch B (metal case)

Connect Ohmmeter Leads to:				
S & G			X	
S & B	X			
S & A, S & metal case			X	
M & B			X	
M & A, M & metal case		X		
B & A				X
B & metal case			X	
A & metal case		X		
with 5th terminal				
R & S, R & M			X	
R & B, R & A				X
R & metal case			X	

Switch C

Connect Ohmmeter Leads to:				
A & S			X	
A & M, A & G (3)		X		
A & R, A & B				X
S & M, S & R, S & G (3)			X	
S & B	X			
M & R, M & B			X	
M & G (3)		X		
R & G (3)			X	
R & B				X
B & G (3)			X	

Switch D (metal case)

Connect Ohmmeter Leads to:	Continuity w / key in start position	Continuity w / key in off position	NO Continuity in ***any*** key position	Continuity w / key in run position
S & B	X			
M & Switch Case		X		
M & B			X	
M & S			X	

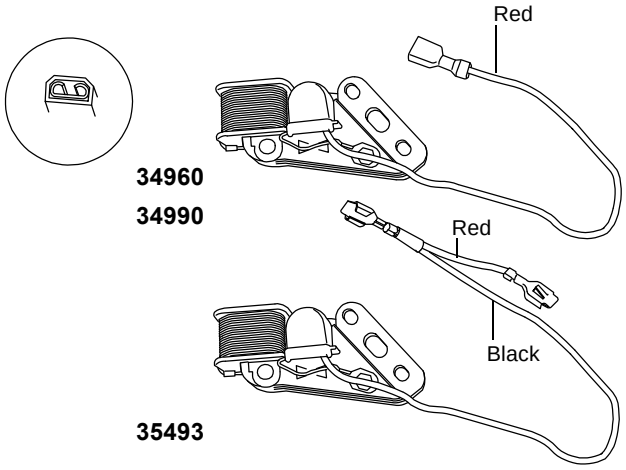
Switch E

Connect Ohmmeter Leads to:				
M & S			X	
M & B			X	
M & G		X		
M & L			X	
S & B	X			
S & G			X	
S & L	X			
G & L			X	
B & G			X	
B & L	X			X

Switch F

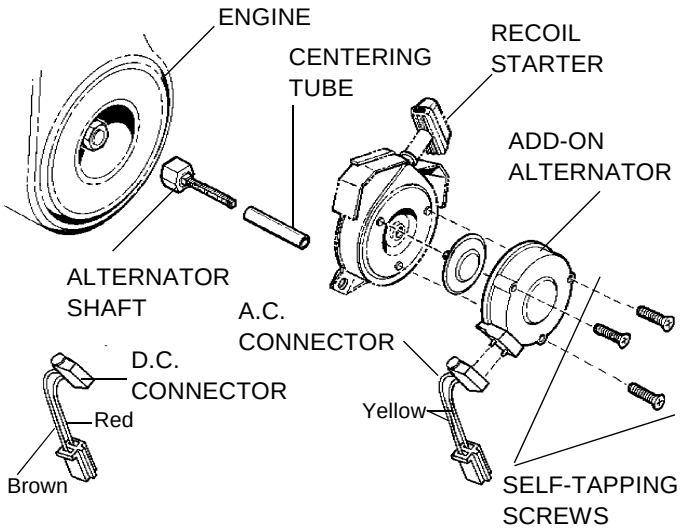
Connect Ohmmeter Leads to:				
A & G		X		
A & B				X
A & M			X	
A & S			X	
G & B			X	
G & M		X		
G & S			X	
B & M			X	
B & S	X			
M & S			X	

350 Milliamp

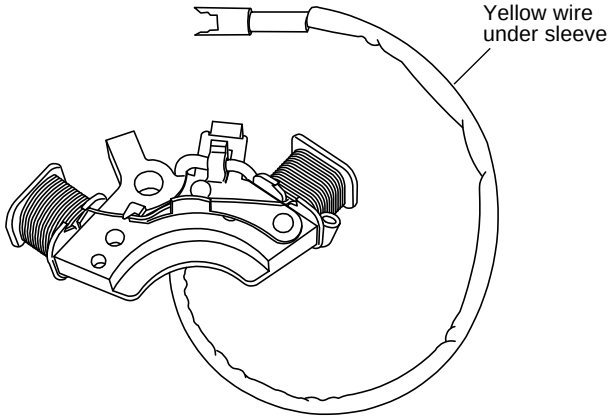


1 AMP (18 WATT) A.C. - ADD-ON ALTERNATOR

611077 (Alternator Only)

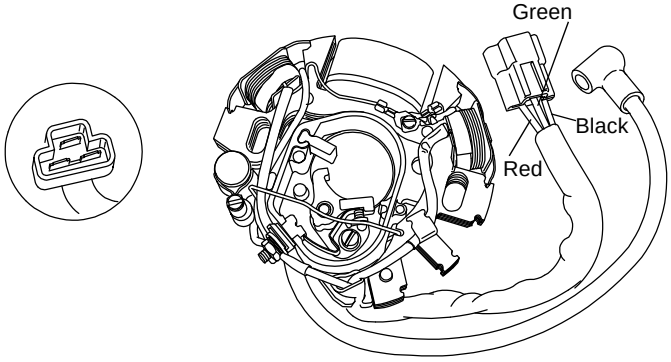


18 Watt A.C. Lighting



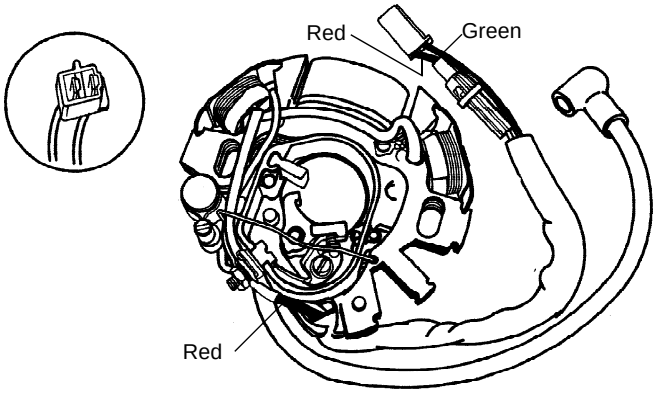
611111

3 Amp A.C.



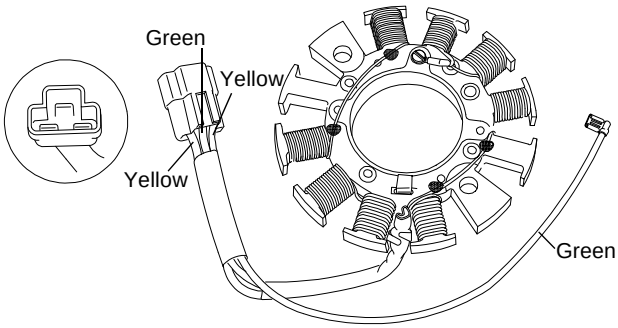
610981

3 Amp D.C.



610968

3 Amp A.C.

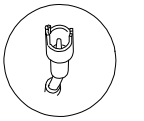


611095

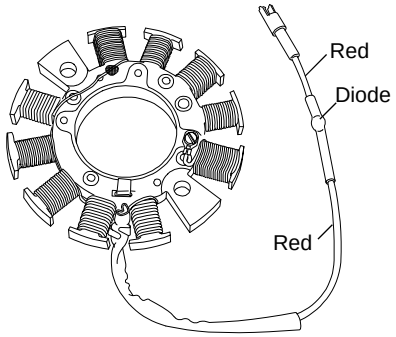
Yellow - Alternator A.C. Leads	Black - Alternator Ground/Battery Ground
Red - Alternator D.C. (+) Leads	Orange - 12 Volt Starter (+) Leads
Brown - Alternator D.C. (-) Leads	Dark Green - Ignition Shut-off Leads

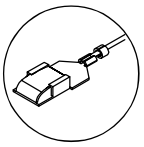
Charging System
Charging System - *continued*

2 and 3 Amp D.C.



3 Amp

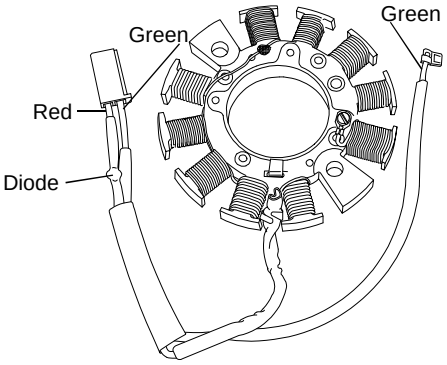




2 Amp
(requires optional flywheel)

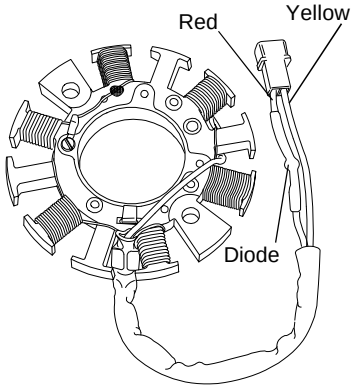
611116 (3 Amp)

3 Amp D.C.



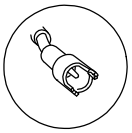
611113

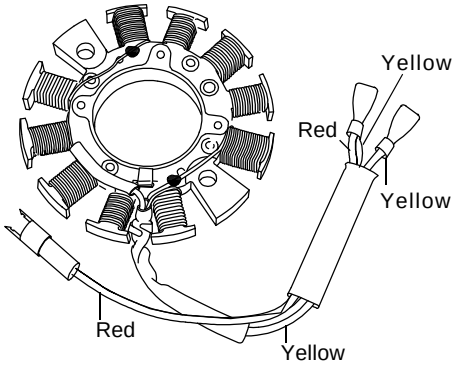
3 Amp D.C. - 5 Amp A.C.



611104

5 Amp D.C.

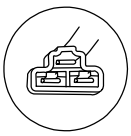


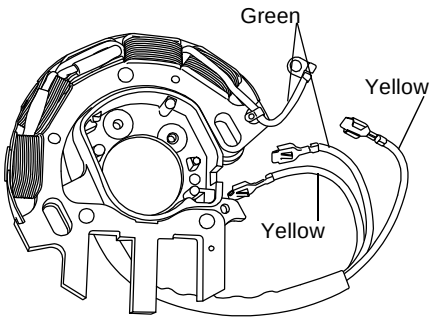


611176

*Uses regulator / rectifier 611175A

7 Amp D.C.

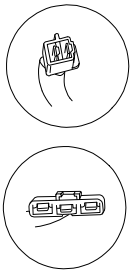


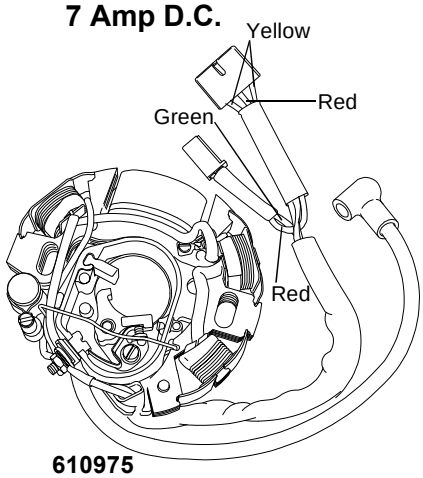


610818

*Uses regulator/rectifier 610749

7 Amp D.C.





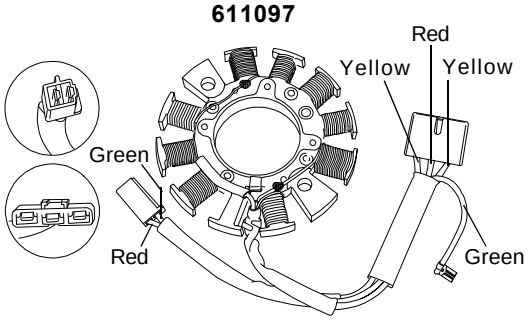
610975

*Uses regulator / rectifier 610938

Yellow - Alternator A.C. Leads	Black - Alternator Ground/Battery Ground
Red - Alternator D.C. (+) Leads	Orange - 12 Volt Starter (+) Leads
Brown - Alternator D.C. (-) Leads	Dark Green - Ignition Shut-off Leads

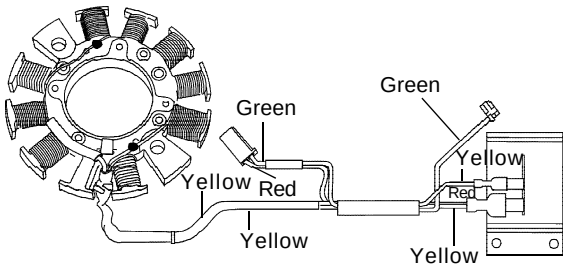
Charging System - *continued*

7 Amp D.C.
611097

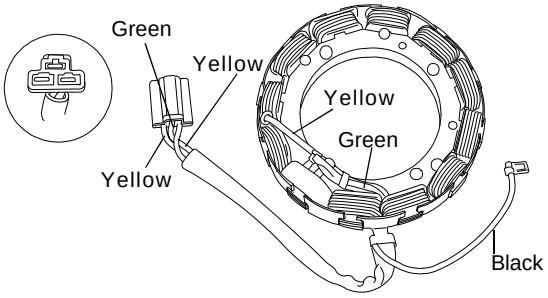


*Uses regulator/rectifier 611098; an open circuit D.C. voltage check cannot be made.

7 Amp D.C.
611256

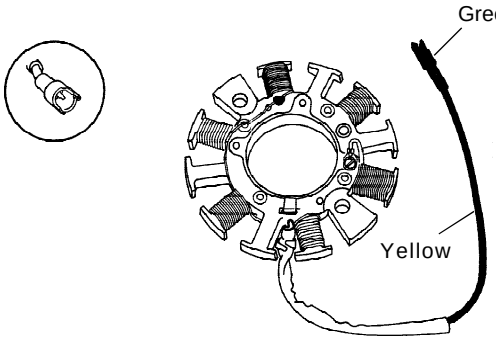


10 Amp D.C.
610761

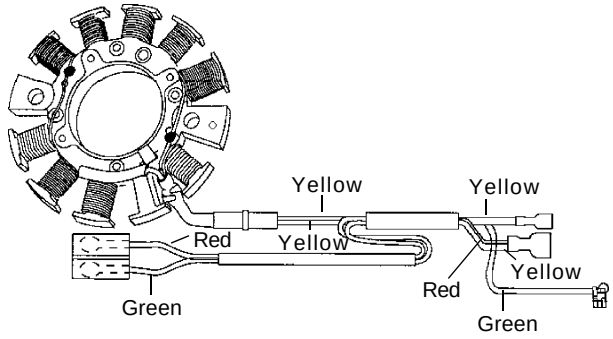


*Uses regulator/rectifier 610749

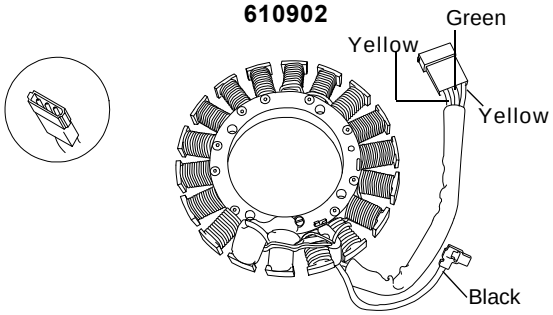
10 Amp Alternator
611159



12 Amp D.C.

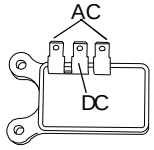


20 Amp Alternator
610902

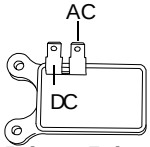


*Uses regulator/rectifier 610996 or 610907A; depending on spec number an open circuit D.C. voltage check cannot be made.

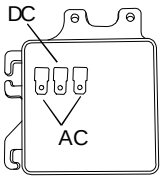
Regulator/Rectifiers



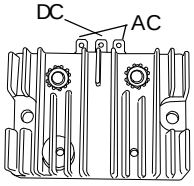
7 Amp
611098



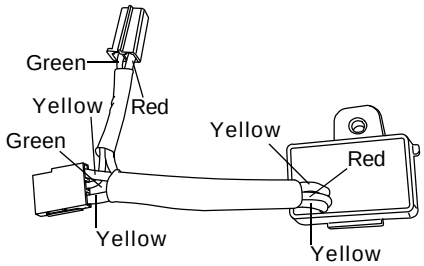
5 Amp, 7 Amp
611175



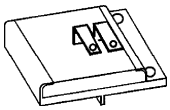
7 Amp
610938



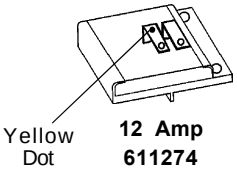
7 Amp, 10 Amp
610749



20 Amp
610996
610907A



5 Amp, 7 Amp
611175A



12 Amp
611274

Yellow - Alternator A.C. Leads	Brown - Alternator D.C. (-) Leads	Orange - 12 Volt Starter (+) Leads
Red - Alternator D.C. (+) Leads	Black - Alternator Ground/Battery Ground	Dark Green - Ignition Shut-off Leads

CAUTION: When testing Alternator/Charging System:
DO NOT disconnect positive lead(s) from the battery while the engine is running. With the engine stopped, disconnect lead(s), then perform test and stop engine before re-connecting. Connecting or disconnecting while the engine is running will send a voltage surge through the regulator, causing damage.

Testing Procedures

D.C. Charging Adaptor

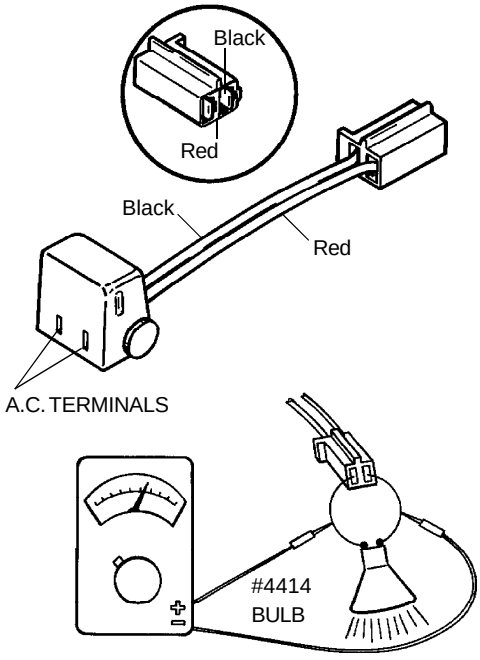
Rectifier Bridge Check With Ohmmeter for D.C. Adaptor

Continuity should exist during one of the two following tests. No continuity should exist while performing the opposite test.

If continuity exists during both tests, or if no continuity exists during both tests, the D.C. adaptor is defective.

TEST NO. 1 - Connect negative probe of meter to red output lead. Connect positive probe of meter to both A.C. terminals and black output lead (diag. 66).

2000 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 12.0 Volts A.C.



66

TEST NO. 2 - Connect positive probe of meter to red output lead. Connect negative probe of meter to both A.C. terminals and black output lead.

Connect negative probe of meter to black output lead. Connect positive probe of meter to both A.C. terminals and red output lead.

If the D.C. adaptor is not defective and a known good battery fails to hold a charge, then perform an A.C. output voltage test.

NOTE: PRIOR TO AUGUST 1992, THE BLACK WIRE WAS BROWN.

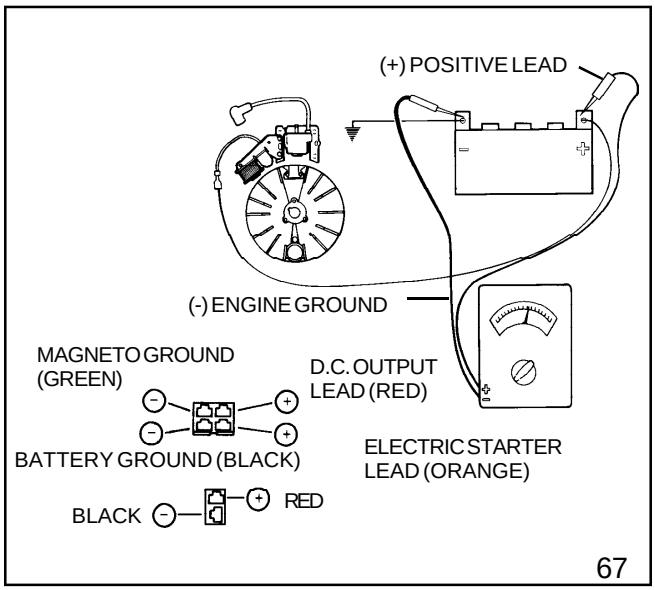
CHECKING THE SYSTEM: To check the system, disconnect the D.C. adaptor from the add-on alternator. Connect a No. 4414, 18 watt bulb in line with each terminal in the alternator. Start engine and test circuit using an A.C. voltmeter as shown.

With the engine running, minimum A.C. voltage values across the bulb should be:
2000 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 12.0 Volts A.C.

If the minimum values are noted, alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective.

350 Milliamp Charging System

CHECKING THE SYSTEM: The battery must be in the circuit to perform the test properly. Set the voltmeter to the 0-20 D.C. volt scale. Connect a voltmeter across the battery. The voltmeter should read battery voltage. Start the engine. With the engine running, there should be an increase in the voltage reading. If there is no change in the voltage reading, the alternator is defective and should be replaced (diag. 67).



18 Watt A.C. Lighting Alternator Models H35, HS & HSSK 40-50, HM & HMSK 70-80-100

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a wire lead from the single pin connector coming out of the engine to one terminal of a No. 4414, 18 watt bulb. Connect another wire to the remaining terminal of the bulb and run it to a good ground on the engine. Start the engine and test the circuit using the A.C. voltmeter as shown (diag. 68).

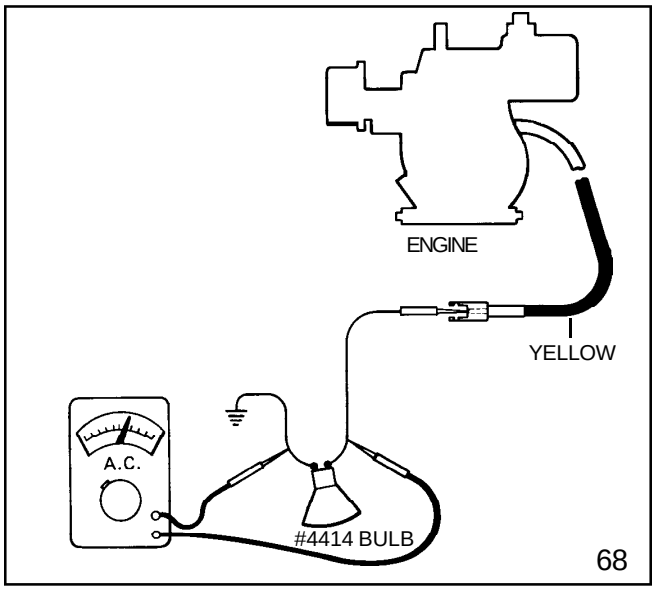
With the engine running the minimum A.C. voltage across the bulb should be:

2000 R.P.M. - 6.0 Volts A.C.

3000 R.P.M. - 8.5 Volts A.C.

3600 R.P.M. - 10.0 Volts A.C.

If minimum values are noted, the alternator is okay. If less than the minimum values, the alternator is defective.



35 Watt A.C.

Before making any exterior tests, check for an inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground at each yellow wire (diag. 69).

With engine running, minimum values should read:

2500 R.P.M. - 8.0 Volts A.C.

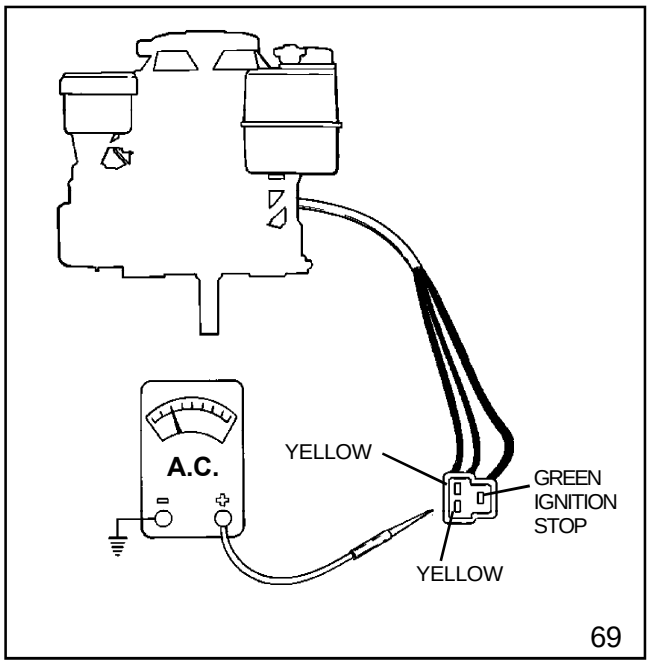
3000 R.P.M. - 9.5 Volts A.C.

3300 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 11.5 Volts A.C.

If the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches, if less than the above readings, the alternator is defective.

NOTE: ON OLDER POINT IGNITION SYSTEMS, THE A.C. OUTPUT LEADS ARE BLACK AND RED.



69

1 Amp (18 Watt) Add-on Alternator

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a No. 4414, 18 watt bulb in line with each terminal in the plug. Start the engine and test the circuit using a voltmeter as shown (diag. 70).

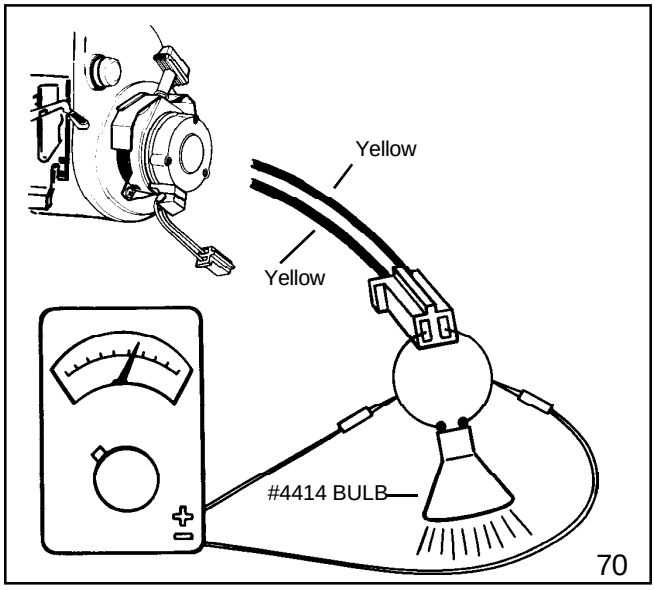
With the engine running the minimum A.C. voltage values across the bulb should be:

2000 R.P.M. - 8.0 Volts A.C.

3000 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 12.0 Volts A.C.

If minimum values are noted, the alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective.



70

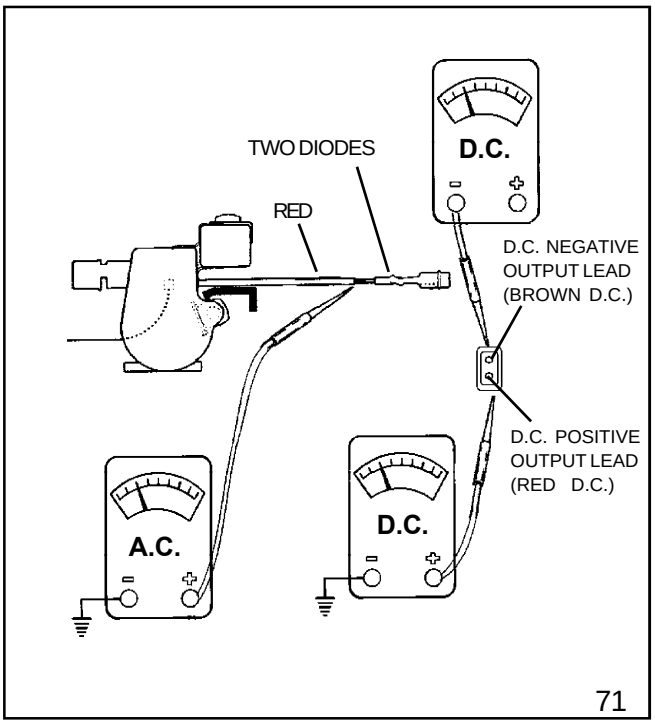
2.5 Amp D.C., 35 Watt Lighting

If output is below standard listed, pull back protective coating in front of the diode and check A.C. output. If A.C. is good check each diode it services as required (diag. 71).

D.C. value (+) or (-); check both sides of A.C. outputs.

R.P.M. D.C. Volts	R.P.M. Volts A.C.
2500 - 8.0 Volts D.C.	2500 - 18 Volts A.C.
3000 - 9.5 Volts D.C.	3000 - 22 Volts A.C.
3300 - 10.5 Volts D.C.	3600 - 26 Volts A.C.
3600 - 11.5 Volts D.C.	

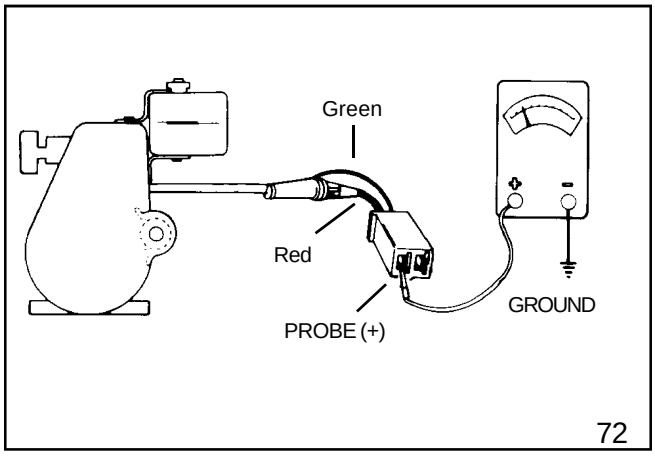
NOTE: These minimum numbers should be obtained by your meter and will often be higher.



71

2 and 3 Amp DC Alternator System - Diode in Harness Models: H30-35, HS40, H50-60, HH50-60, HM70-80-100, HMSK, HHM80, HSK, HSSK, Rotary Mower Engines

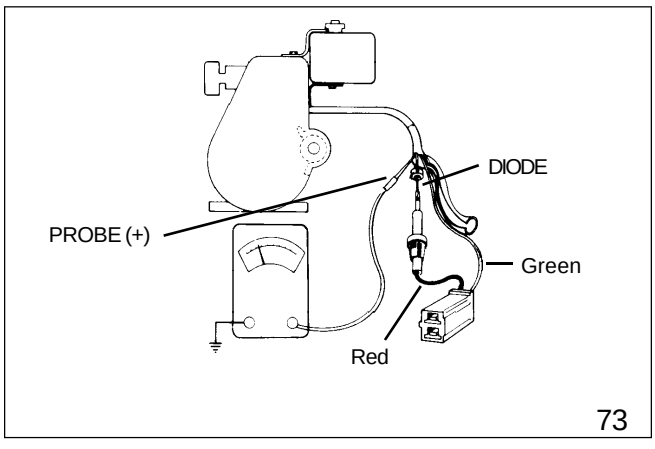
This system has a diode included in the red wire which converts the alternating current (A.C.) to direct current. The direct current (D.C.) is used to provide a trickle charge for the battery. The leads from the alternator and the type of connector may vary, but the output readings will be the same.



72

CHECKING THE SYSTEM: Remove the fuse (if equipped) from the fuse holder and check the fuse to make certain it is good. If faulty, replace with a six (6) AMP fuse.

To check D.C. output, separate the connectors at the engine. Place the probe (+) in the red wire lead connector. Ground the other probe to the engine (diag. 72).



73

With the engine running the minimum values should read:

2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 9.5 Volts D.C.
3300 R.P.M. -10.5 Volts D.C.
3600 R.P.M. -11.5 Volts D.C.

If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

(Continued on Next Page)

If less than the above readings, proceed in making an A.C. output check by pulling back the protective coating from the fuse holder and diode. Using an A.C. voltmeter, check voltage from a point between the engine and the diode as shown in the diagram (diag. 73).

With the engine running the minimum values should read:

2500 R.P.M. - 18.0 Volts A.C.
3000 R.P.M. - 22.0 Volts A.C.
3300 R.P.M. - 24.0 Volts A.C.
3600 R.P.M. - 26.0 Volts A.C.

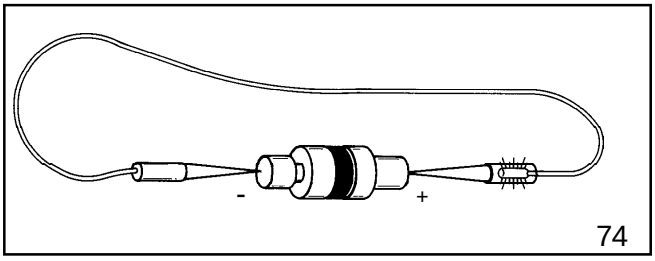
If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.

3 Amp D.C. Alternator System - Rectifier Panel

This 3 amp system is readily identified by the rectifier panel in the circuit. The panel includes two diodes and a fuse for overload protection. The rectifier panel does not regulate the output of this system.

CHECKING THE SYSTEM: Check the fuse to determine if it is good. A continuity light or ohmmeter can detect a faulty fuse. Replace with a six (6) amp fuse if necessary. Determine if the diodes are functioning properly. A continuity light may be used to check diodes (diag. 74).

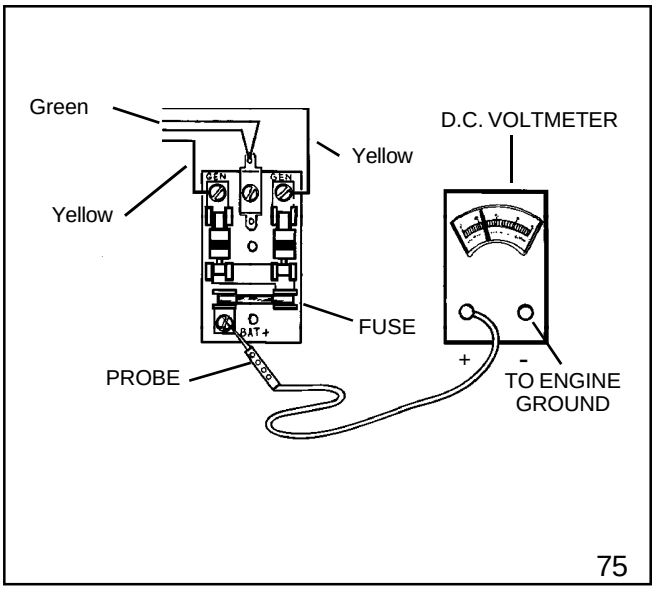
When replacing the diode in the rectifier panel, locate the undercut on one end of the diode and match it to the detent on terminal clip of the rectifier panel.



74

Test the D.C. output of the rectifier panel as follows:

Disconnect the battery lead from the terminal of the rectifier panel. Use a D.C. voltmeter probe on the + battery terminal (diag. 75). Connect negative lead to engine ground.



75

Minimum values should read:
2500 R.P.M. - 12.0 Volts D.C.
3000 R.P.M. - 14.0 Volts D.C.
3300 R.P.M. - 16.0 Volts D.C.
3600 R.P.M. - 18.0 Volts D.C.

If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

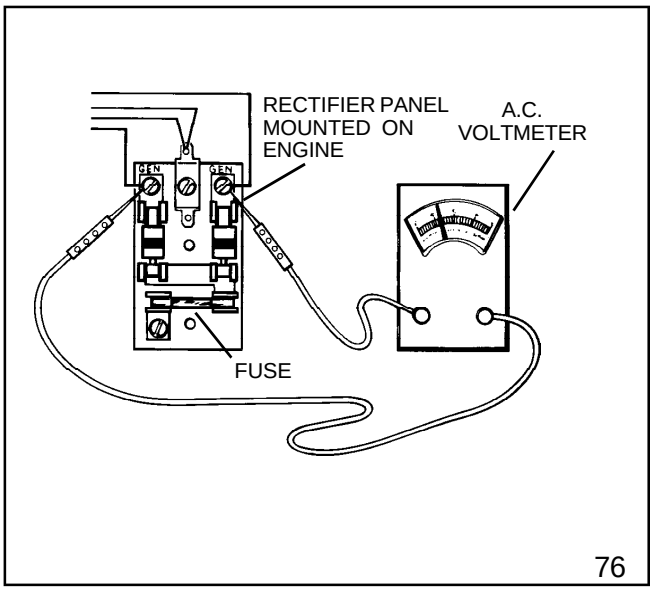
If reading is less, proceed to make an A.C. output check. With the battery lead disconnected from rectifier panel, probe the A.C. terminals with the voltmeter on the A.C. scale (diag. 76).

(Continued on Next Page)

Minimum values should read:
2500 R.P.M. - 24.0 Volts A.C.
3000 R.P.M. - 29.0 Volts A.C.
3300 R.P.M. - 32.0 Volts A.C.
3600 R.P.M. - 35.0 Volts A.C.

If less than above output, generating coil assembly is defective.

NOTE: If there is no regulator in this system. The total output of the two diodes is three (3) AMPS. If the battery is overcharging (boiling and bubbling), reduce the D.C. input by one-half by removing one of the diodes.



76

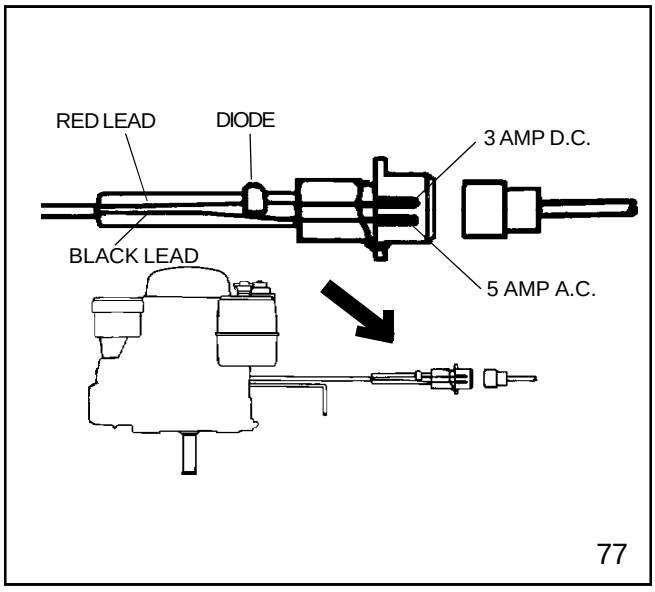
3 Amp D.C. 5 Amp A.C. Alternator Models OVM/OVXL 12.5, OHV12.5-17.0

This unit combines a 3 Amp D.C. system used to charge a battery and a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

A wire harness (part# 36588) may be added to the 3 Amp D.C./5 Amp A.C. charging system to power an electric clutch without the use of a battery. Test the diode in the harness by doing a continuity test (diag. 77).

Replace the diode if continuity exists after reversing tester leads or if no continuity is found.

CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 75). Measure the A.C. voltage at the yellow wire terminal. With the engine running the minimum values should be:



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(Continued on Next Page)

MODELS OVM/OVXL/OHV

3 Amp D.C. (Red wire)

2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 13.0 Volts D.C.

5 Amp A.C. (Yellow wire)

2500 R.P.M. - 8.5 Volts A.C.
3000 R.P.M. - 11.0 Volts A.C.
3600 R.P.M. - 13.0 Volts A.C.

MODELS OHV 13.5 - 17.0 (3/5 Amp split)

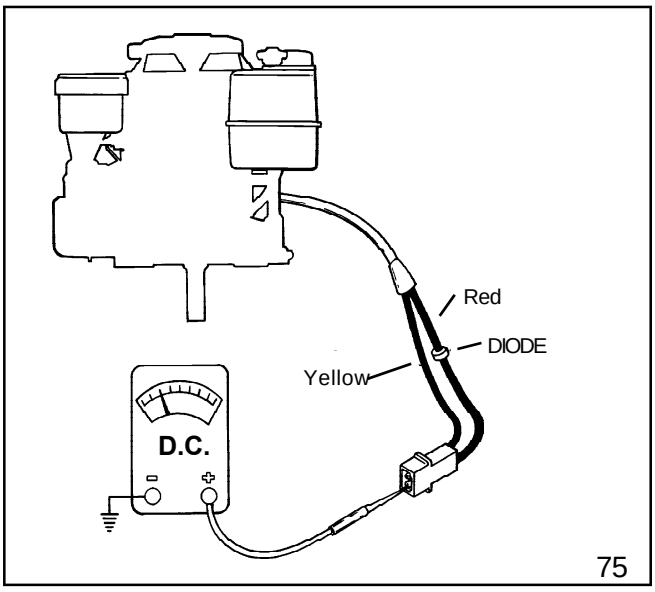
3 Amp D.C. (Red wire)

2500 R.P.M. - 6.5 Volts D.C.
3000 R.P.M. - 9.0 Volts D.C.
3600 R.P.M. - 11.0 Volts D.C.

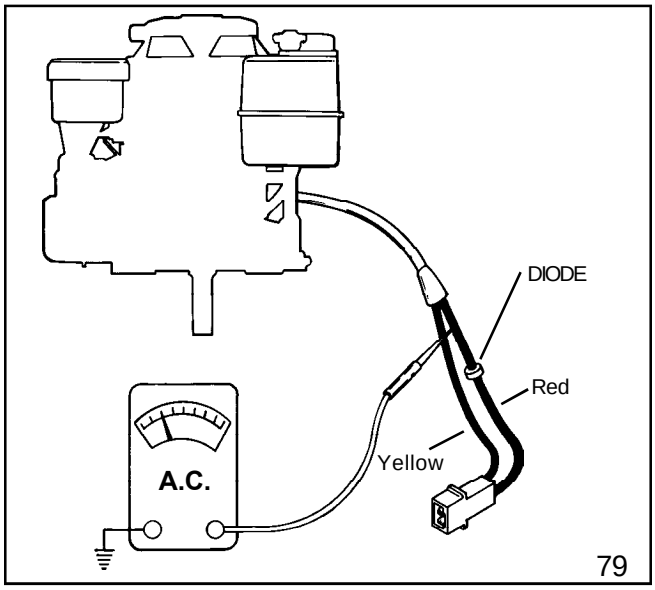
5 Amp A.C. (Yellow wire)

2500 R.P.M. - 15.0 Volts A.C.
3000 R.P.M. - 18.0 Volts A.C.
3600 R.P.M. - 22.0 Volts A.C.

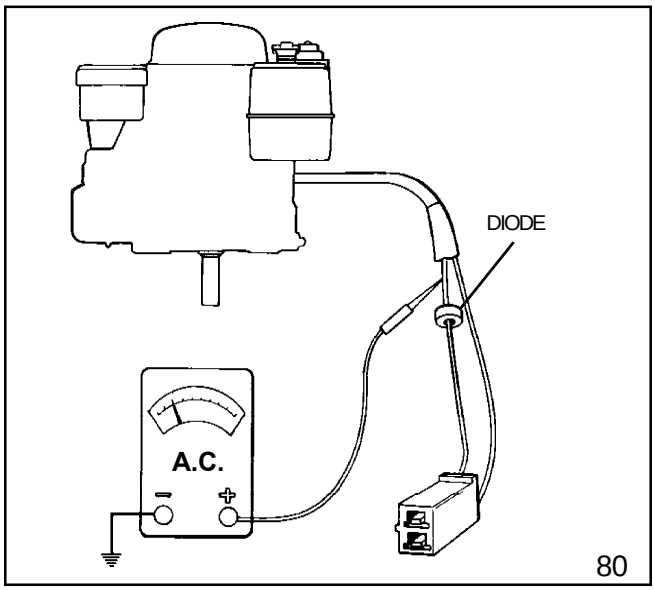
If the above minimum values are noted, the system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage between the alternator and diode as shown (diag. 79). If low or no voltage is experienced, replace the alternator.



75



79



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(Continued on Next Page)

Models OVM/OVXL/OHV

(Read between Engine and Diode, diag. 81 & 82)

With the engine running the minimum values should read:

2500 R.P.M. - 20.0 Volts A.C.

3000 R.P.M. - 25.0 Volts A.C.

3300 R.P.M. - 26.5 Volts A.C.

3600 R.P.M. - 29.0 Volts A.C.

Models OHV13.5-17.0

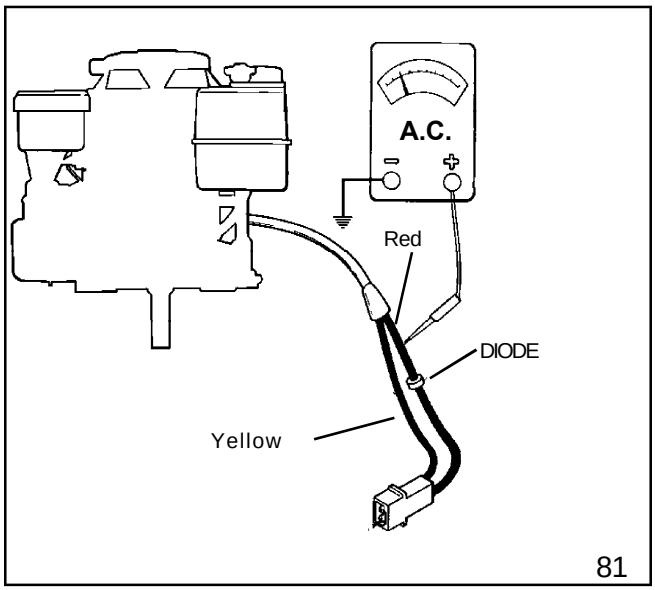
(Read between Engine and Diode)

2500 R.P.M. - 17.0 Volts A.C.

3000 R.P.M. - 21.0 Volts A.C.

3600 R.P.M. - 24.5 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



81

3 Amp D.C. 5 Amp A.C. Alternator Models: H & HSK 50-60, HH50-60, HM & HMSK 70-80-90-100, TVM125-140-170-195-220, TVXL195-220

This unit combines a 3 Amp D.C. system used to charge a battery and a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 82). Measure the A.C. voltage at the yellow wire terminal. With the engine running the minimum values should be:

3 Amp D.C.

2500 R.P.M. - 8.0 Volts D.C.

3000 R.P.M. - 11.0 Volts D.C.

3600 R.P.M. - 13.0 Volts D.C.

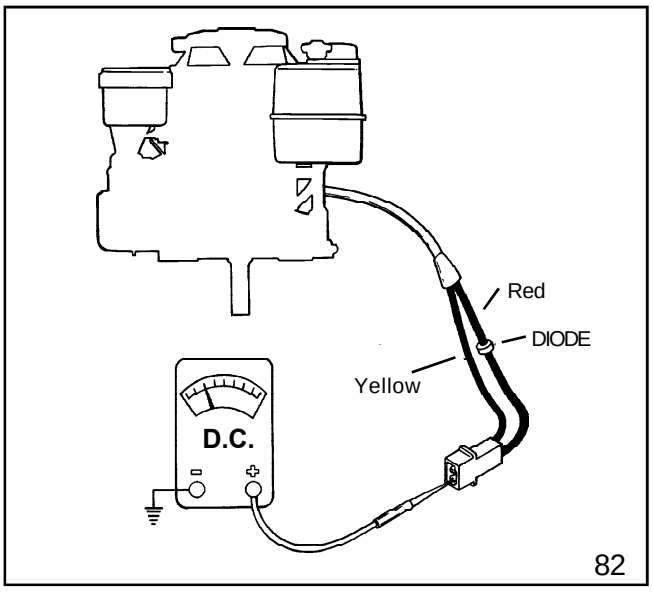
5 Amp A.C.

2500 R.P.M. - 8.0 Volts A.C.

3000 R.P.M. - 11.0 Volts A.C.

3600 R.P.M. - 13.0 Volts A.C.

If the above minimum values are noted, system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage between the alternator and diode as shown (diag.83).



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(Continued on Next Page)

All Models

With the engine running the minimum values should read:

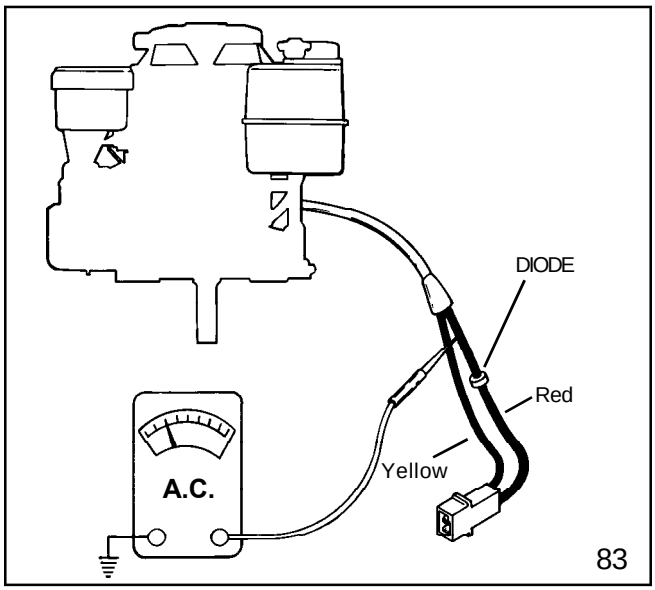
2500 R.P.M. - 20.0 Volts A.C.

3000 R.P.M. - 25.0 Volts A.C.

3300 R.P.M. - 26.5 Volts A.C.

3600 R.P.M. - 29.0 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



3 Amp A.C. Lighting Alternator Models: H & HSK 30- 35, HS & HSSK 40, H & HSK 50-60, HH50-60, HM & HMSK 70-80-100, HHM80

Before making any exterior tests, check for an inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground (diag. 84).

With engine running the minimum values should read:

2500 R.P.M. - 8.0 Volts A.C.

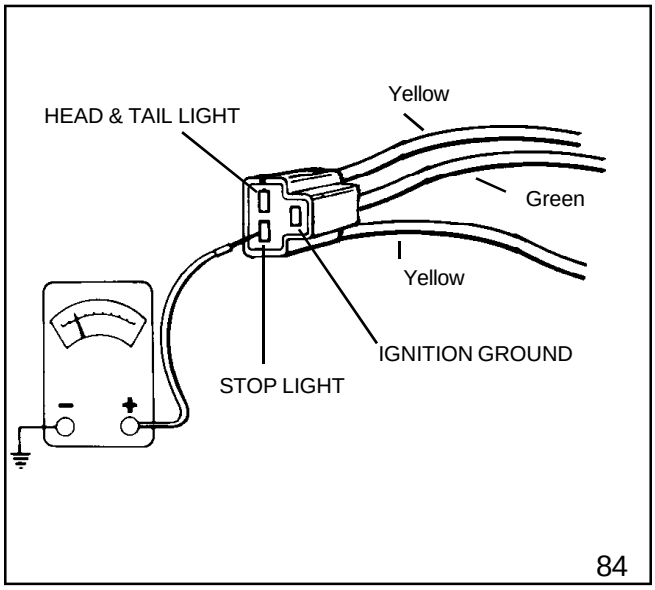
3000 R.P.M. - 9.5 Volts A.C.

3300 R.P.M. - 10.5 Volts A.C.

3600 R.P.M. - 11.5 Volts A.C.

If the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches. If less than the above readings, the alternator is defective.

NOTE: ON OLDER POINT IGNITION SYSTEMS, THE A.C. OUTPUT LEADS ARE BLACK AND RED.



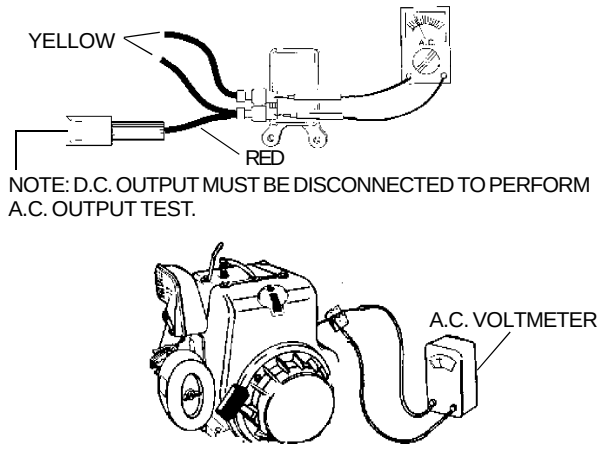
5 Amp Alternator System Regulator-Rectifier Under Blower Housing

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.

Disconnect the red D.C. output connector at the wiring harness **(not at the regulator/rectifier)** and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 85).

CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.



85

With the engine running the minimum values should read:

2500 R.P.M. - 19.0 Volts A.C.

3000 R.P.M. - 23.0 Volts A.C.

3300 R.P.M. - 26.0 Volts A.C.

3600 R.P.M. - 28.0 Volts A.C.

If the minimum values are noted; the regulator-rectifier is defective. If less than above readings, the alternator is defective.

7 Amp Alternator System Regulator-Rectifier External to Engine

CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B (+) wire at the switch end and measure D.C. voltage between the lead and ground (diag. 86).

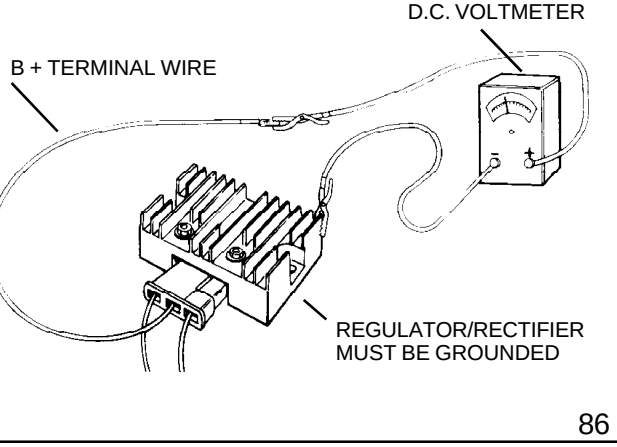
With the engine running the minimum values should read:

2500 R.P.M. - 9.0 Volts D.C.

3000 R.P.M. - 11.0 Volts D.C.

3600 R.P.M. - 14.0 Volts D.C.

If the minimum readings are noted, system is okay.



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Check for a defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 87).

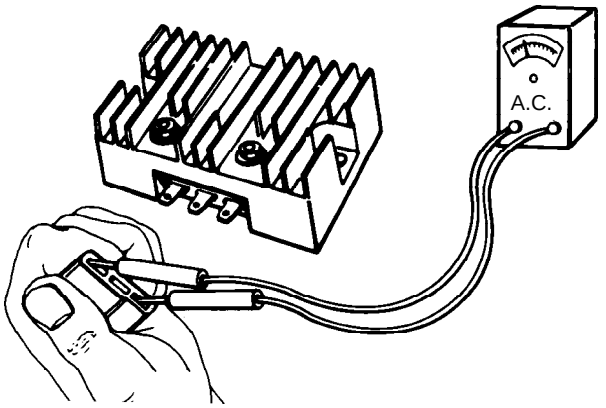
With the engine running the minimum values should read:

2500 R.P.M. - 12.0 Volts A.C.

3000 R.P.M. - 14.0 Volts A.C.

3600 R.P.M. - 18.0 Volts A.C.

If the minimum readings are noted, the regulator-rectifier is defective. If less than the above readings, the alternator is defective.



87

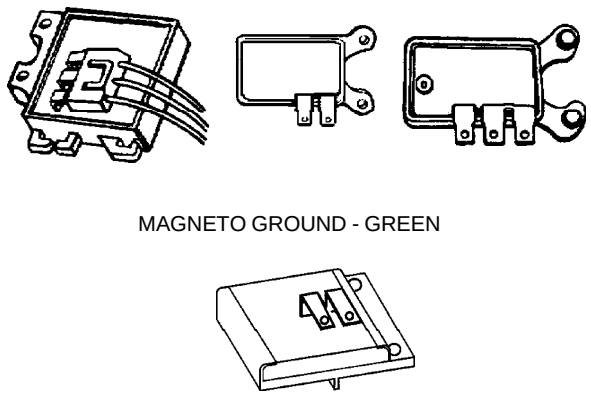
7 Amp Alternator System Regulator-Rectifier Under Engine Block Housing, Models: H50-60, HH50-60, HM70-80-100, HHM80, TVM125-140-170-195-220

In this system, the regulator and rectifier are combined in one solid state unit mounted under the blower housing of the engine.

Various types of regulator-rectifiers have been used on different applications. Test procedures for all types are the same. However, regulator styles are not interchangeable (diag. 88).

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.



88

Keep the A.C. leads attached to the regulator-rectifier. Install the blower housing with the regulator-rectifier outside the housing. With an A.C. voltmeter probe the regulator as shown (diag. 89).

CAUTION: AT NO TIME SHOULD THE ENGINE BE STARTED WITH THE BLOWER HOUSING REMOVED.

With engine running, minimum A.C. voltage from lead to lead should be:

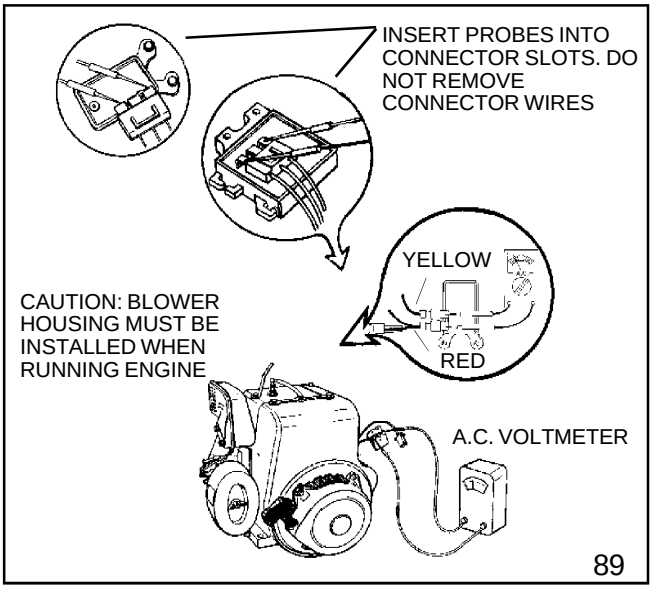
2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 19.0 Volts A.C.

3300 R.P.M. - 21.0 Volts A.C.

3600 R.P.M. - 23.0 Volts A.C.

If the minimum readings are noted, the alternator is okay. If the system fails to charge a known good battery, the regulator-rectifier must be defective.



89

10 Amp A.C. Alternator

CHECKING THE SYSTEM: Unplug the connector at the wiring harness supplied by the OEM. Proceed to make an A.C. output check. Place one lead of the A.C. voltmeter into the center of the connector. Place the other lead to engine ground (diag. 90).

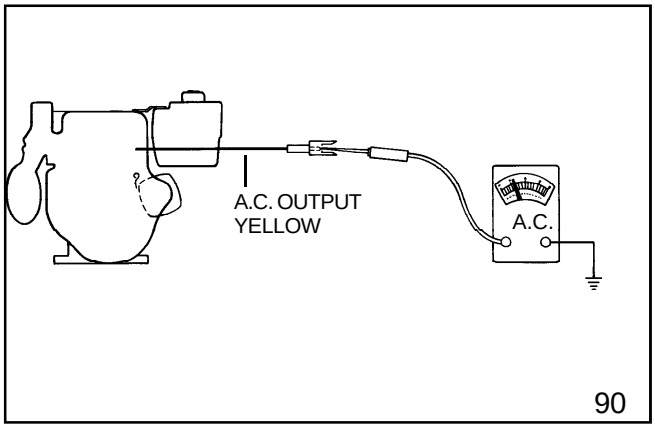
With the engine running the minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 20.0 Volts A.C.

3300 R.P.M. - 22.0 Volts A.C.

If less than above output, the alternator assembly is defective.



90

10 Amp Alternator System - Regulator - Rectifier-External to Engine

In this system, the regulator and rectifier are combined in one solid state unit.

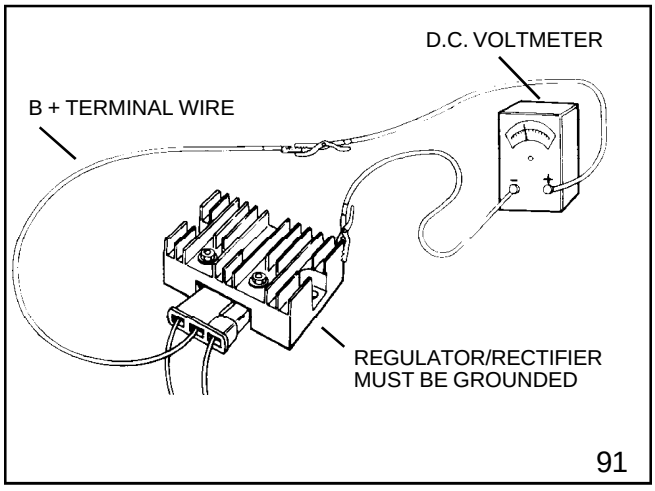
CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B (+) wire at the switch end and measure D.C. voltage between the lead and ground (diag. 91).

With the engine running the minimum values should read:

2500 R.P.M. - 13.0 Volts D.C.

3000 R.P.M. - 16.0 Volts D.C.

3600 R.P.M. - 20.0 Volts D.C.



91

If the minimum values are noted, the system is okay. Check for a defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 92).

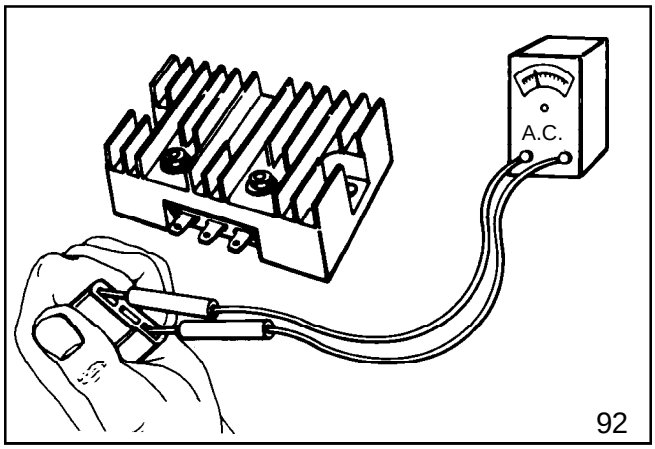
With the engine running the minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.

3000 R.P.M. - 19.0 Volts A.C.

3600 R.P.M. - 24.0 Volts A.C.

If the minimum readings are noted, the alternator is okay.



92

16 Amp Alternator System with External Regulator

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

Disconnect the red D.C. output connector at the wire harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 93).

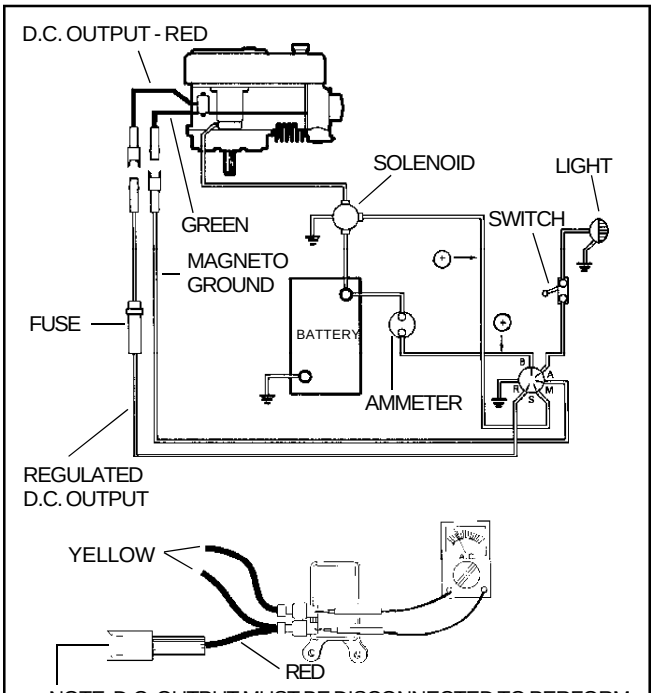
With the engine running the minimum values should read:

2500 R.P.M. - 21 Volts A.C.

3000 R.P.M. - 26.5 Volts A.C.

3600 R.P.M. - 31.0 Volts A.C.

If the minimum values are noted, the alternator is operating properly. If less than the above values are noted, the alternator is defective.



93

20 Amp Alternator System

In this system, the regulator and rectifier are combined in one solid state unit which is mounted into the blower housing of the engine.

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

Disconnect the plug leading to the regulator rectifier, and insert the A.C. voltmeter probes into the two outside terminals.

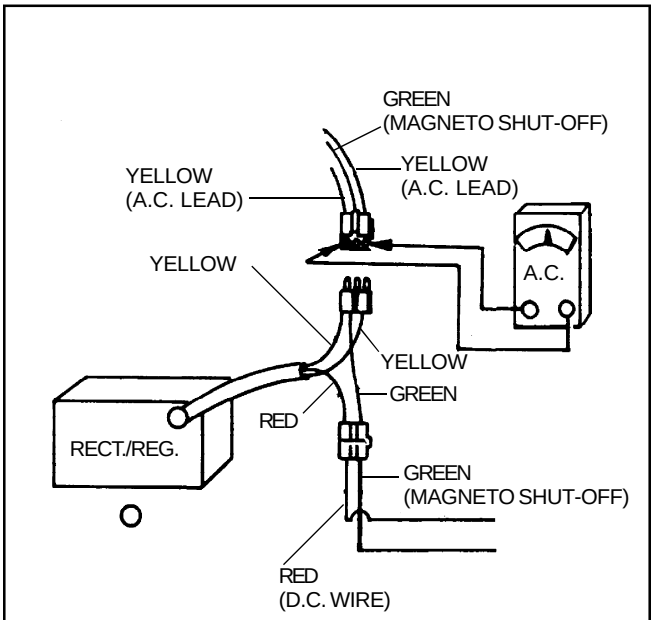
With the engine running the minimum values should read:

2500 R.P.M. - 32.0 Volts A.C.

3000 R.P.M. - 38.0 Volts A.C.

3600 R.P.M. - 45.0 Volts A.C.

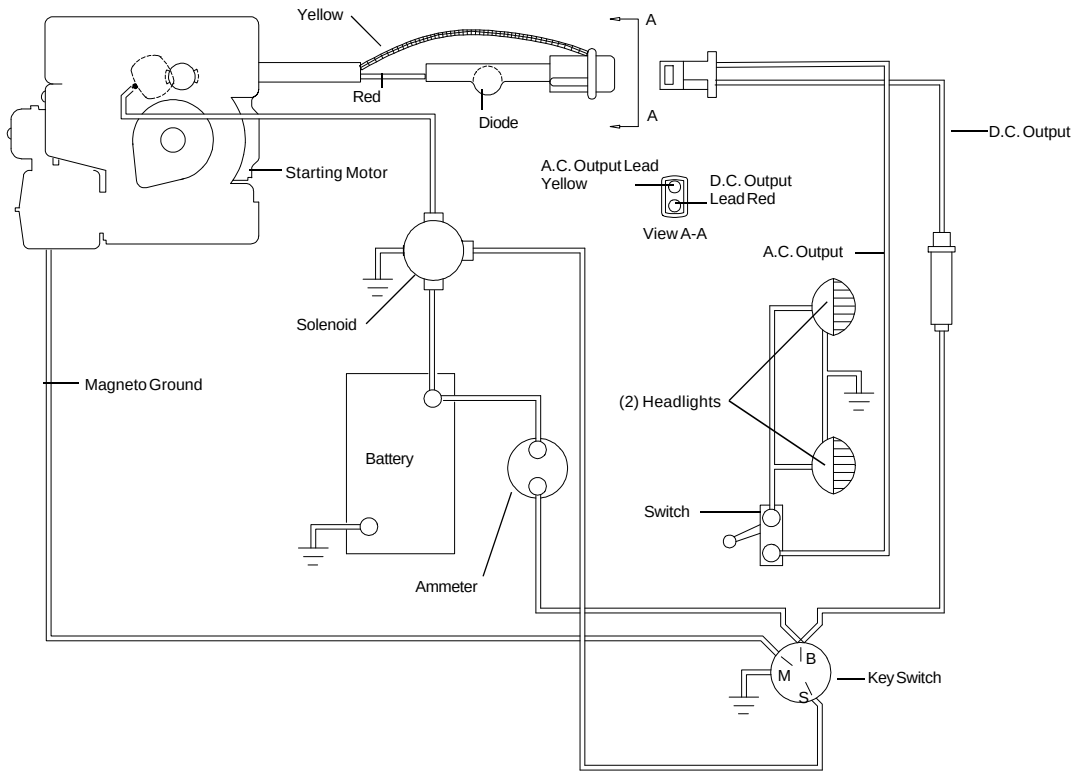
If the minimum readings are noted, alternator is okay. If the system fails to charge a known good battery, regulator-rectifier must be defective.



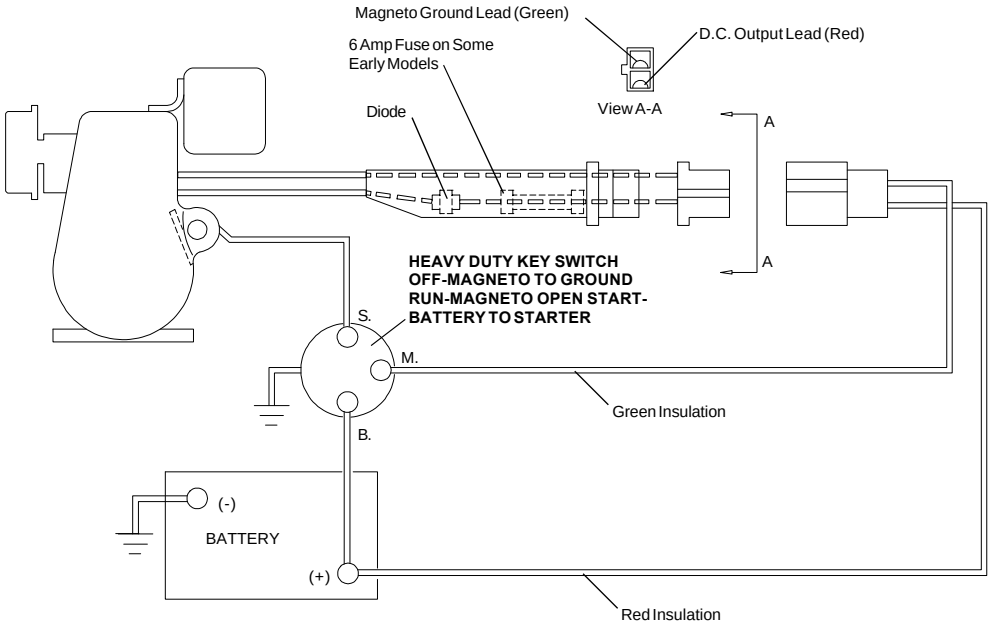
94

Typical Wiring Circuits

3 Amp D.C. / 5 Amp A.C. Alternator

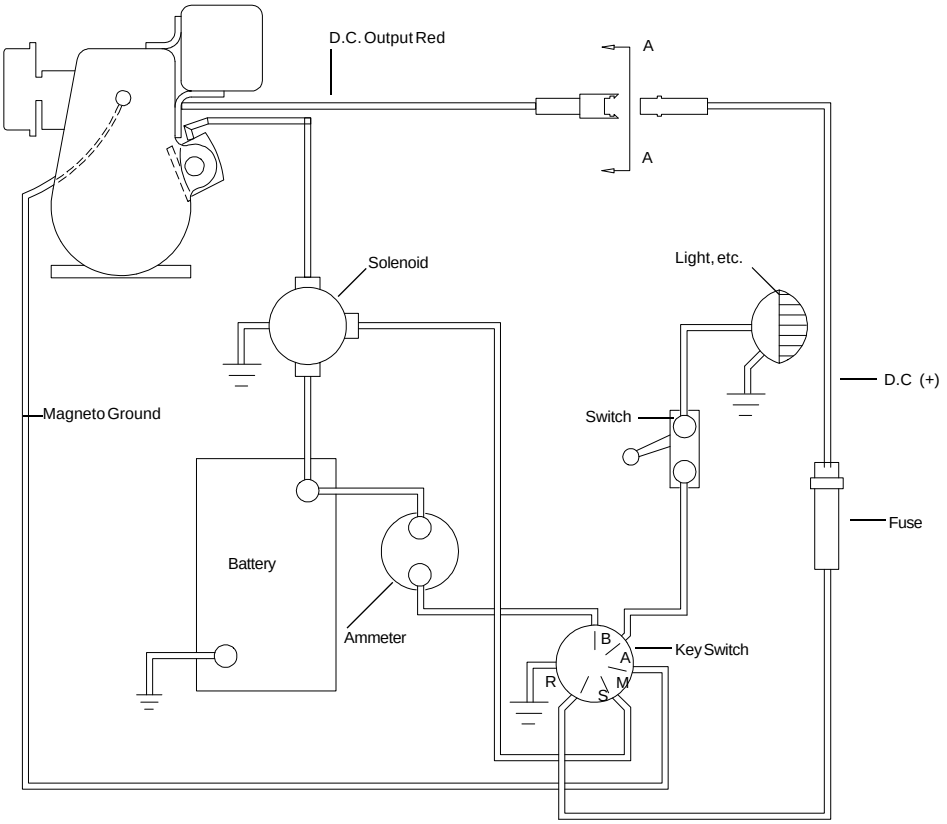


3 Amp Alternator (D.C.)

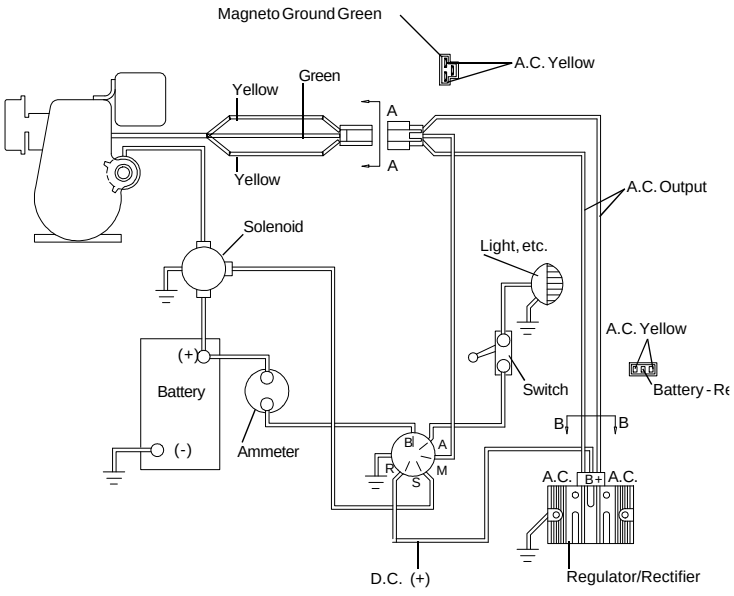


Typical Wiring Circuits - *continued*

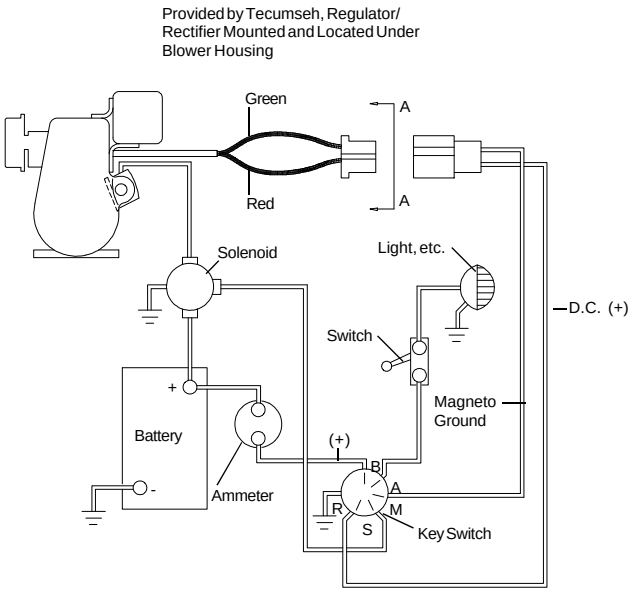
5 Amp Alternator System



7 AMP ALTERNATOR SYSTEMS EXTERNAL REGULATOR-RECTIFIER

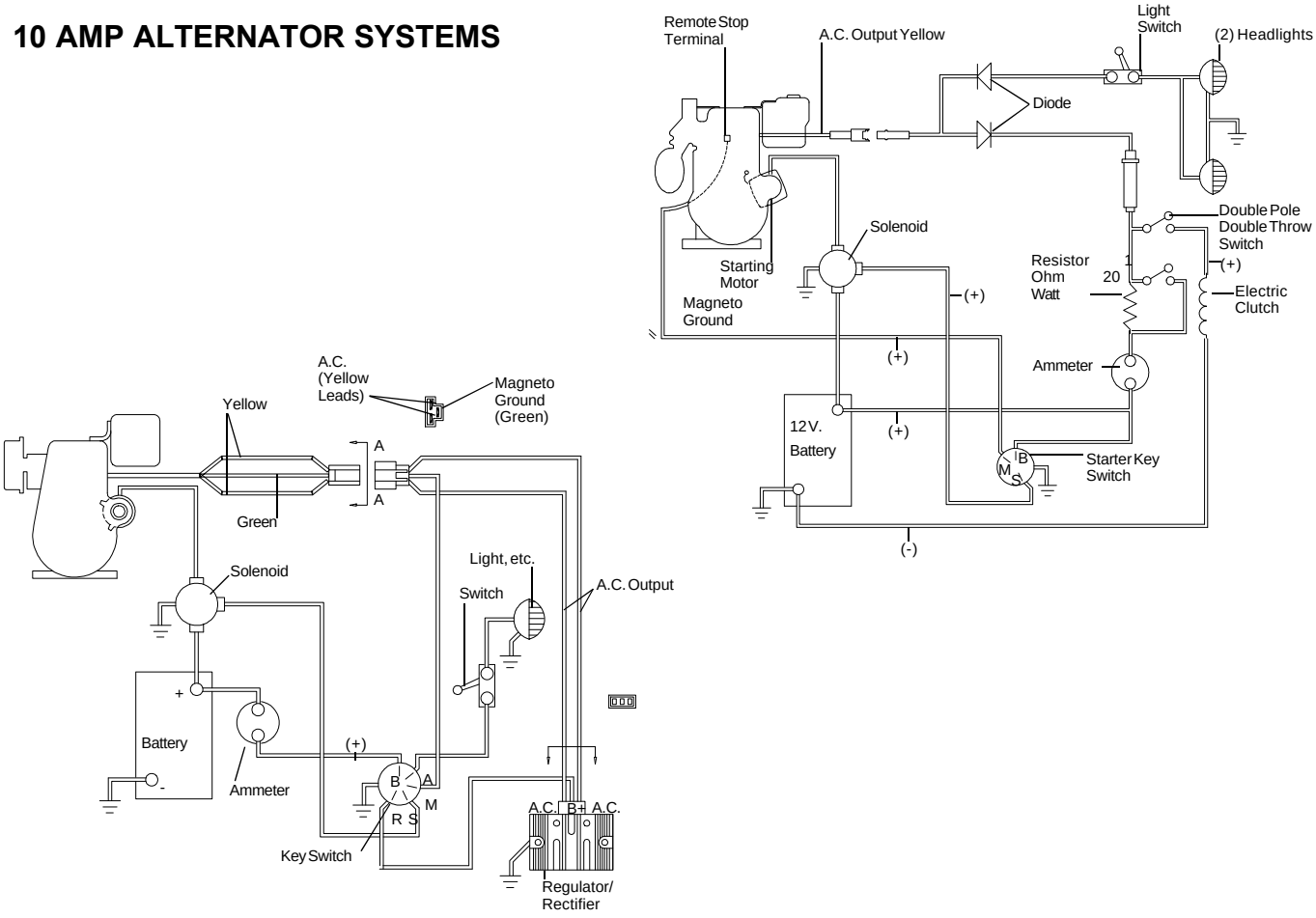


7 AMP & 12 AMP D.C. REGULATED ALTERNATOR

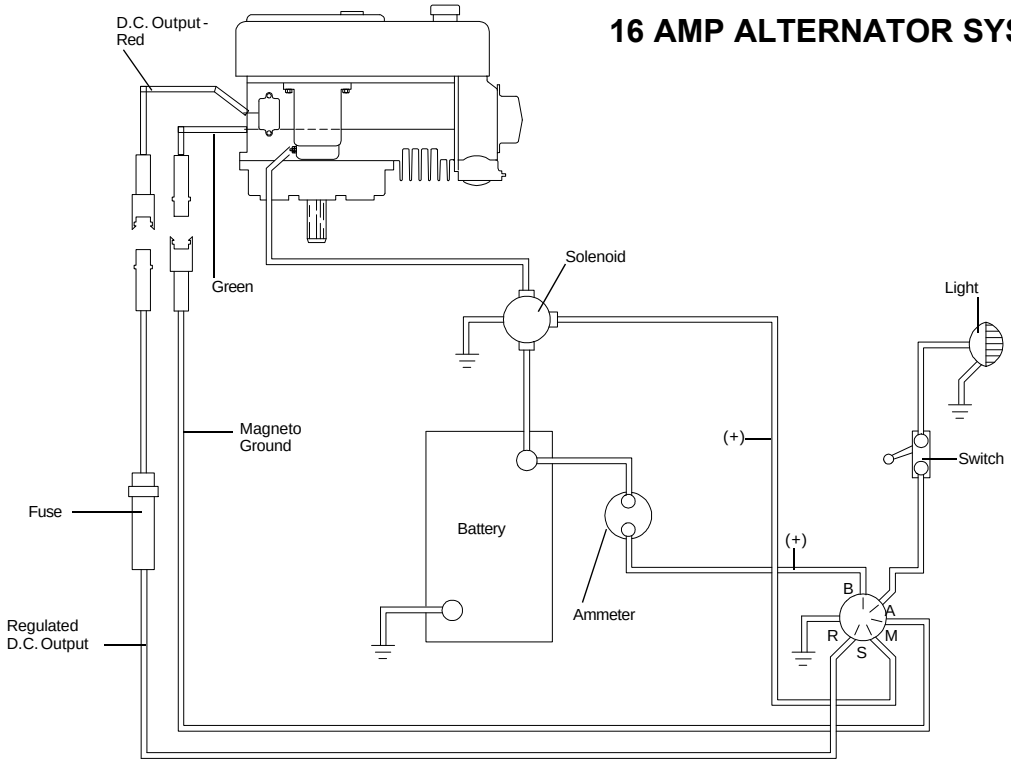


Typical Wiring Circuits - *continued*

10 AMP ALTERNATOR SYSTEMS

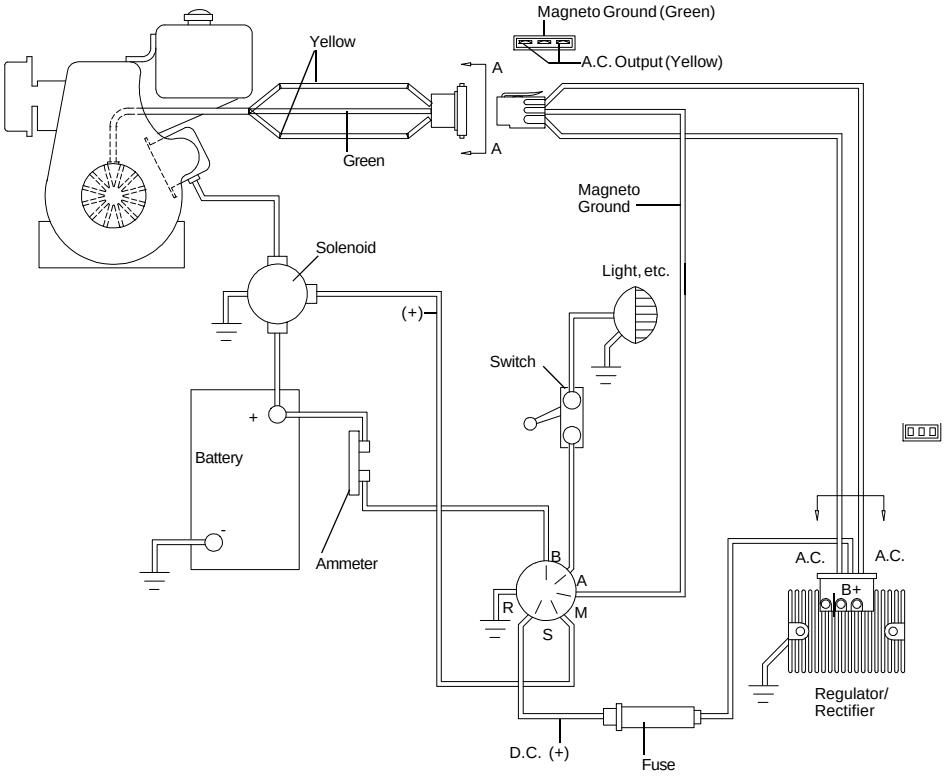


16 AMP ALTERNATOR SYSTEMS

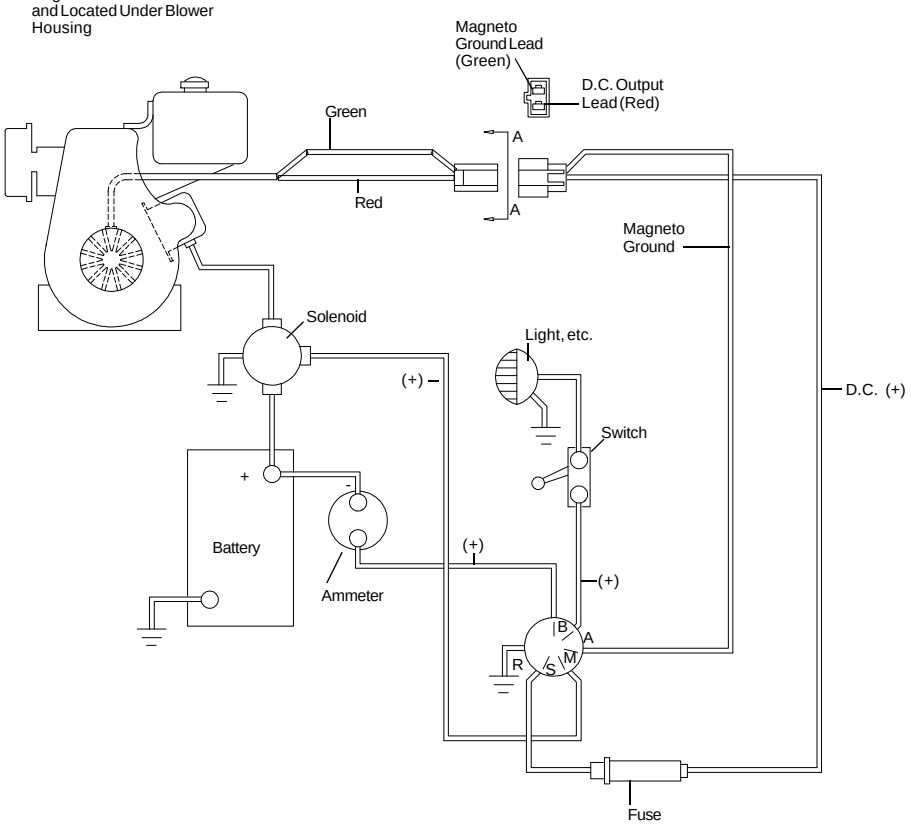


Typical Wiring Circuits - *continued*

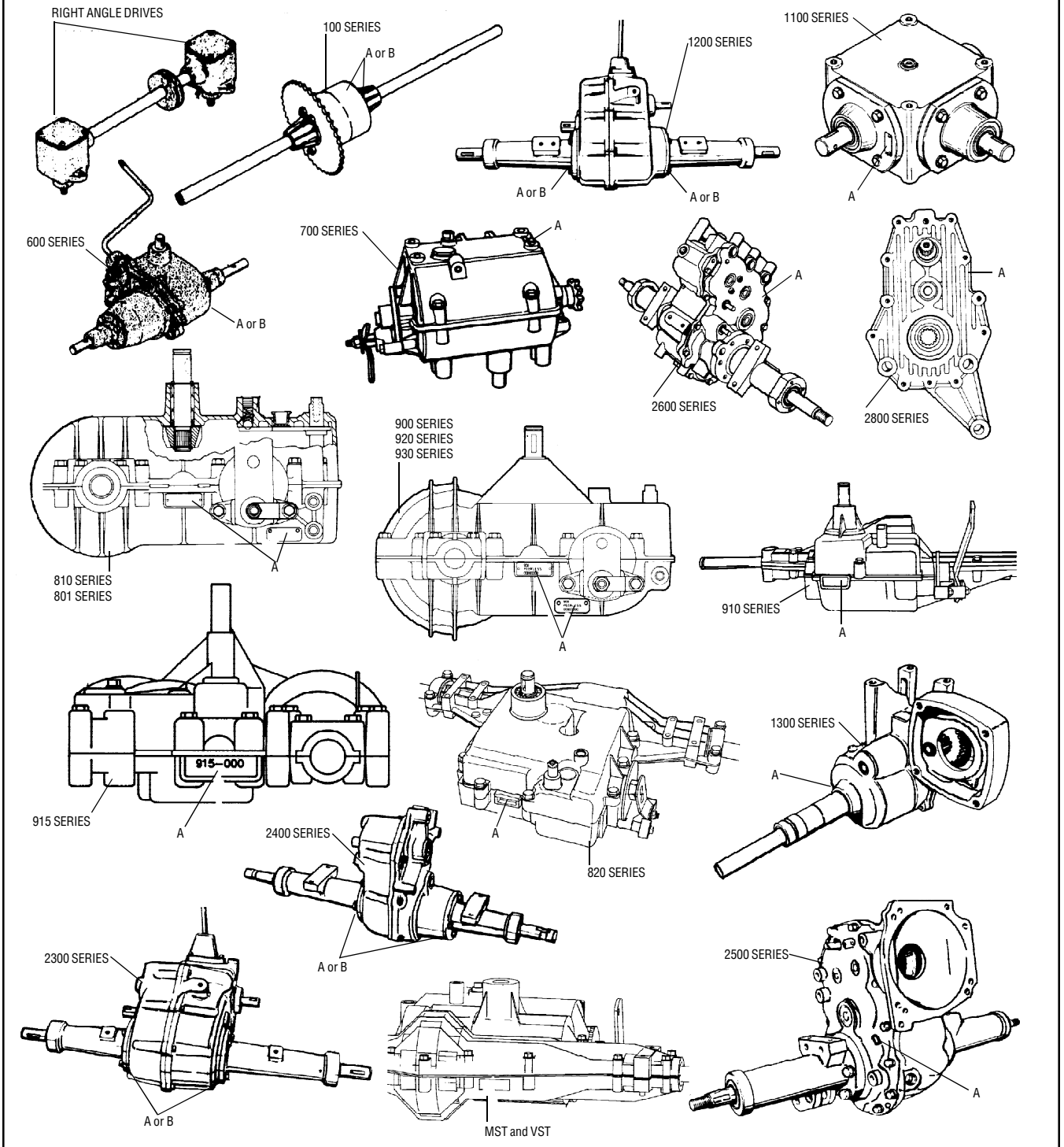
20 AMP ALTERNATOR SYSTEMS



Provided by Tecumseh, Regulator/Rectifier Mounted and Located Under Blower Housing



Peerless Identification



SAMPLE (OLD STYLE)

MOD 506
PEERLESS
1 275 1374

- Individual Serial Number
- Manufactured on the 275th Day
- Manufactured in 1991

SAMPLE (NEW STYLE)

MST205- □□□
| | | | | | | | | | |
SERIAL 6 0 0 2

- Specification Number Manufacturers Requested Features
- Serial Number Julian Date (The Second Day of 1996)

Identification Number Locations
Early Models were not identified with a model number on the unit.
THE MODEL NUMBER WILL BE FOUND ON: A. Metal tag or decal attached to unit as illustrated.
B. Stamped on unit as illustrated.

Peerless Identification - continued

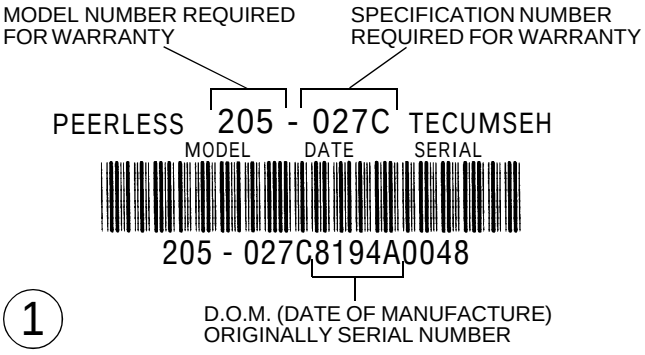
The recent warranty audit referenced in bulletin number "**123**" suggested we review the way our new Tecumseh/Peerless® models are identified. The review found improvements were needed in the identification system to make them standard with the new emission regulation's requirements covering engine product and the "New ESA 157 Claim Form".

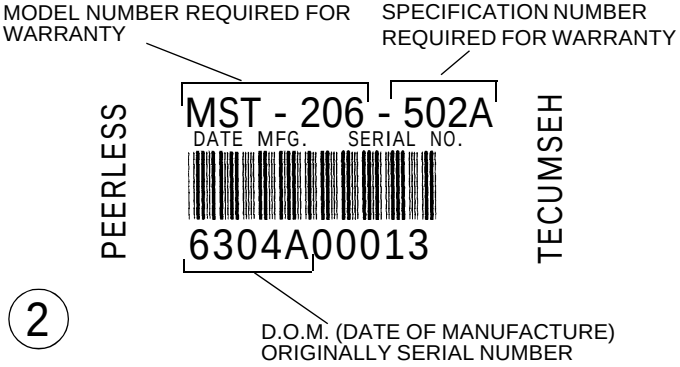
As a result, we have changed the product ID tag to make it easier to read. Should this data be needed for service or warranty situations these improvements will make locating the needed model and specification information easier.

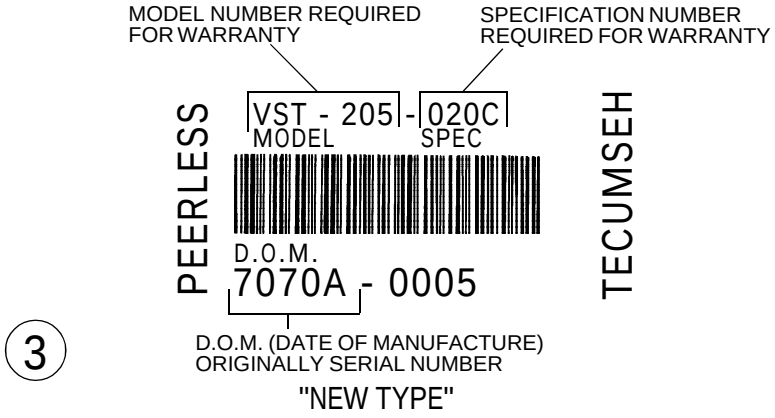
Example Numbers 1 and 2 below, show the present bar code labels currently being used. We have identified the important fields of information that is required for warranty claims.

In addition, a new easier to read bar code label (No. 3 below) is being introduced on all units provided after October 1, 1998. Again we have highlighted the information you are required to supply.

This information is critical for prompt warranty reimbursement to your shop, please pay close attention to this number.







Transaxle Troubleshooting

In-Line Shift Models (i.e. 800, 820, 915, 920, 930 MST)

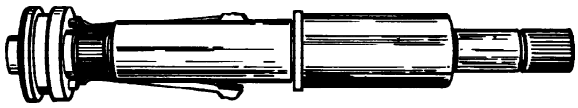
Transaxle troubleshooting can be a mystery to many technicians, but by using a common sense approach that most technicians use for engine troubleshooting, the mystery will disappear and be replaced with confidence, skill and eventually, mastery of transaxle service.

Before you begin to take off the wheels (the hardest part of transaxle repair) check the associated equipment.

A. Check belts for proper adjustment.
B. Check for proper adjustment of brake, clutch, shifter and related linkages, etc.
C. Check pulleys for sheared keys and proper belt disengagement.
D. Check for proper shifting by removing drive belt. If transaxle does not shift freely it would indicate an internal transaxle problem.

After you have made all preliminary checks it may now become necessary to remove the transaxle from the equipment.

The first area to check after removing the transaxle cover is the shifting keys. The keys are the safety link to protect against serious gear damage. Check keys for breaks, cracks, stress marks, worn shift key ends and proper spring tension (diag. 95).

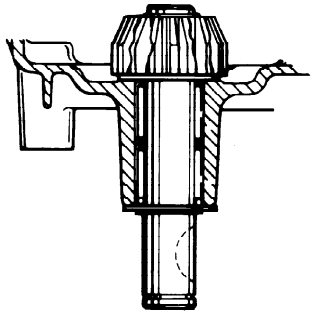


95

Check input bevel gears for excessive wear. If gears are damaged, the cover should be checked for distortion (diag. 96).

To properly troubleshoot and inspect the transaxle further, it is necessary to clean grease from parts during disassembly.

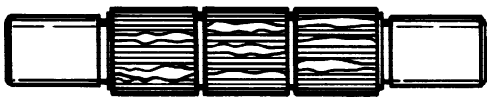
During disassembly check shifting gears and washers for proper assembly.



96

Check countershaft splines and splines on inner diameter of countershaft gears (diag. 97).

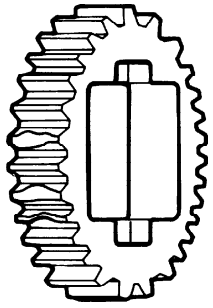
Check reverse sprockets for damaged teeth and if applicable, inner diameter spline area. Check chain for damage or excessive stretching.



97

Check differential ring gear and bevel gears for excessive wear. Bevel gears should be replaced as a set if any gear is damaged. When replacing snap rings, put flat side of snap ring against the thrust side of gear. Do not over stretch the snap rings when removing and installing (diag. 98).

Check axles and as applicable, axle bearings or transaxle case/cover for wear or damage.



98

Hard Shifting Transaxles and Drive Belts

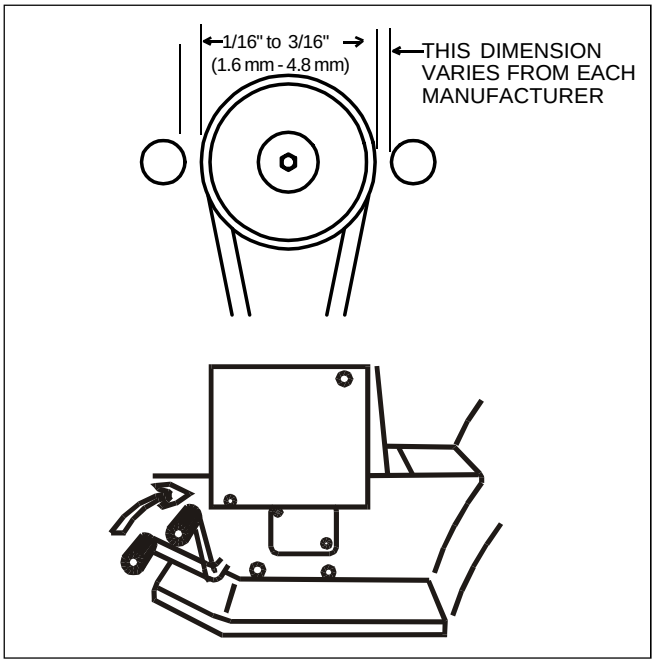
Often hard shifting is blamed on an internal problem in the transaxle.

To determine if the problem is transaxle or equipment related make these simple checks.

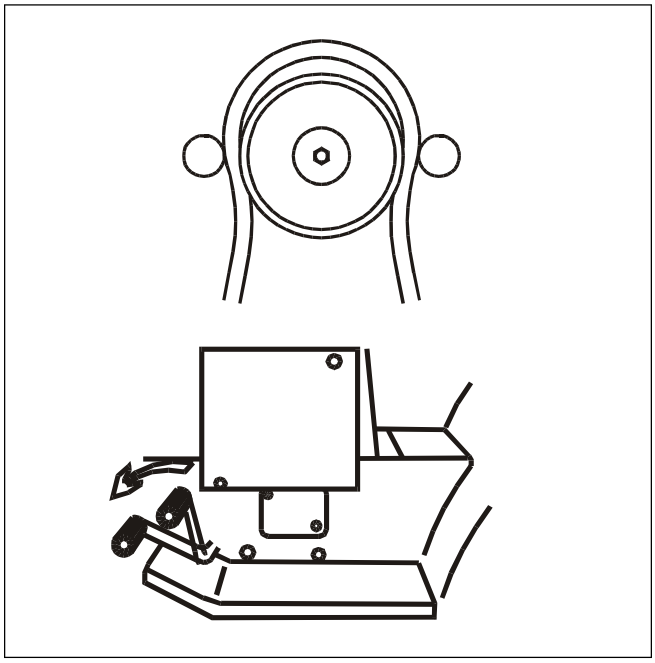
1. Turn the unit off so that all power is removed to the transaxle
2. With the unit off move the shift lever through the shift gate. Movement of the lever should have only slight resistance. The shifting effort should be equal when the engine is off and when running. If the unit is difficult to shift the problem would be internal and the transaxle would need to be removed and repaired
3. If the unit shifts with ease, check the following areas that would be equipment related. Check to see if the belt is releasing from the pulley on the engine and transmission / transaxle, it may require that the belt guides be repositioned. The distance required from the pulley to the guide is typically 1/16" to 3/16" (1.6 mm - 4.8 mm), always check the O.E.M. specs.
4. Check to see if the pulley is damaged and may not be releasing the belt.
5. Make sure that the belt is the correct belt in case the customer has replaced it with a non original, possibly more aggressive belt.
6. Check the brake/clutch pedal to make sure that when the pedal is depressed that the idler pulley is releasing the belt tension before it applies the brake. If this does not happen the unit will still be under a load and be impossible to shift
7. The final area to check would be for damaged or binding shift linkage.

Hard shifting with the engine off could be caused by:

1. Shift linkage out of adjustment.
2. Corrosion in the transaxle or transmission.
3. Damaged shift keys, gears, or shifter brake shaft.
4. Belt guides missing or improperly adjusted (see equipment manufacturer specs.)



For proper declutching to occur, it is very important that the engine belt guide be set at a predetermined gap (set by the manufacturer) and away from the belt with the belt engaged.



With clutch disengaged, it is very important that the belt blossoms away from the engine pulley. Belt must stop turning before transaxle shifting can occur.

VST Troubleshooting

The information on this page has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs. Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, Tecumseh would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 of the travel distance from neutral to forward.
3. Place the tractor on a 17 degree grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and / or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may have the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.
3. **Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows, with a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

   The second chamber is for the output gears including the differential. FIRST make sure the tractor is level, then remove the drain/fill plug. NOTE: Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. With a small pocket rule insert until you touch bottom of case. You can then remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact, this is full at its 8 oz. capacity.
4. **Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

   To determine absolute neutral, the hole in the tapered control shaft must face straight up and down, at this point make sure the OEM linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 Nm) of torque with the shaft and the lever in neutral.

   When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16 bolt in the hole of the shaft. Hold the bolt until the tapers are locked and the nut torque is correct.

   To make sure that the brake is not binding, drive the unit up a slight grade.. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.
5. **Hard to shift:** Typically hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Approximately 40-50 inch lbs. (4.48 - 5.6 Nm) at the transaxle for foot pedal units or 150-200 inch lbs. (16.8 -22.4 Nm) for hand operated units. This varies depending on the type of linkage. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.

Peerless Torque Chart

TORQUE VALUE				
PART	**MODELS AFFECTED**	**IN-LBS**	**FT-LBS**	**Nm**
Bolt 5/16-18 (Housing)	100 Series	228-264	19-22	25.8 - 29.9
Nut 5/16-18 (Drive Gear)	100 Series	120-156	10-13	13.6 - 17.7
Bolt 1/4-20 (Case to Cover)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 5/16-18 (Axle Support Housing)	600 Series	156-180	13-15	17.7 - 20.4
Bolt 1/4-20 (Shift Lever Housing)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Brake-Disc)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Case to Cover)	800 & 900 Series (Except 820)	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Brake-Disc)	800, 900 & MST Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16-18 (Case to Cover)	820 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Bearing Cap)	820 Series	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Differential)	820 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Brake Disc)	820 Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16 x 18	1100 Series	180-216	15-18	20.4 - 24.5
Bolt 5/16 x 18	2800 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Case to Cover)	1200 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1200 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1200 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1300 Series	90-110	7.5-9.2	10.2 - 12.5
Bolt 1/4-20 (Differential)	1300 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1400 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1400 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 5/16-18 (Axle Support Housing)	2300 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Differential)	2300 Series	84-120	7-10	9.5 - 13.6
Bolt 3/8-16 (Axle Support Housing)	2300 Series	240-312	20-26	27.2 - 35.4
Bolt 1/4-20 (Case to Cover)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Axle Support Housing)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Differential)	2400 Series	84-120	7-10	9.5 - 13.6
Bolt 5-16/18 (Case to Cover)	2500 Series	180-216	15-18	20.4 - 24.5
Bolt 3/8-16 (Differential)	2500 & 2600 Series	420-480	35-40	47.6 - 54.4
Bolt 1/2-13 (Axle Support Housing)	2500 & 2600 Series	720-780	60-65	81.6 - 88.4
Screws No. 10-24 (Cover)	R.A.D.	20-24	1.6-2	2.2 - 2.7
Bolts 1/4-20 (Retainer Cap)	R.A.D.	90-110	7.5-9.2	10.2 - 12.5

NOTE: On all units containing two jam nuts securing brake lever, hold bottom nut and torque top nut to 100 in. lbs.

Differential Bolts	7 ft. lbs. - 9.5 Nm
"T" Drive Bolt	8-11 ft. lbs. - 10.9 - 15.0 Nm
"T" Drive Cover Screw	20-24 in. lbs. - 2.24 - 3.7 Nm

Lubrication Requirement

PEERLESS LUBE CHART

TRANSAXLES

Model No.	Quantity
600	24 oz./710 ml Oil
800	30 oz./887 ml Grease
801	36 oz./1065 ml Grease
820	36 oz./1065 ml Grease
900	26 oz./769 ml Grease
910	18 oz./532 ml Grease
915	10 oz./296 ml Grease
920	30 oz./887 ml Grease
930	30 oz./887 ml Grease
1200	48 oz./1420 ml Oil ††
1301 1305 1309 1313	32 oz./946 ml Oil
1302 1303 1304 1306 1307 1308 1310 1311 1312 1314 1315 1316 1317 1318 1320 1321 1322 1325 1328 1329 1319	44 oz./1301 ml Oil
1323 1326 1327	24 oz./710 ml Oil
LTH	8 oz./240 ml Oil
MST200 VST205 and 1800's	16 oz./473 ml Oil ††††
2300	64 oz./1892 ml Oil
2400 2500	32 oz./946 ml Oil †

TRANSMISSIONS

Model No.	Quantity
2600	†
700	12 oz./355 ml Grease
700H	12 oz./355 ml Grease
2800	†

RIGHT ANGLE AND T DRIVES

Model No.	Quantity
All Models Except *	4 oz./118 ml Grease
*1408-P91 *1409-P91 *1410-P91 *3002 *3003 *3028 *3029 *3035	3 oz./89 ml Grease
1000 Series	6 oz. / 180 ml Oil †††
1100	16 oz./473 ml Oil

DIFFERENTIALS

All Models	3 oz./89 ml Grease

TWO SPEED AXLE

All Models	2 oz./59 ml Grease

THREE SPEED AXLE

All Models	2 oz./59 ml Grease

NOTICE

Grease: Bentonite Grease
Part Number 788067B

Oil: SAE E.P. 80W90 Oil
Part Number 730229A

† Refer to O.E.M. Mechanic's Manual for type of lubricant

†† To be filled through shift lever opening

††† Some 1000 Right Angle and T-Drives use Bentonite Grease.

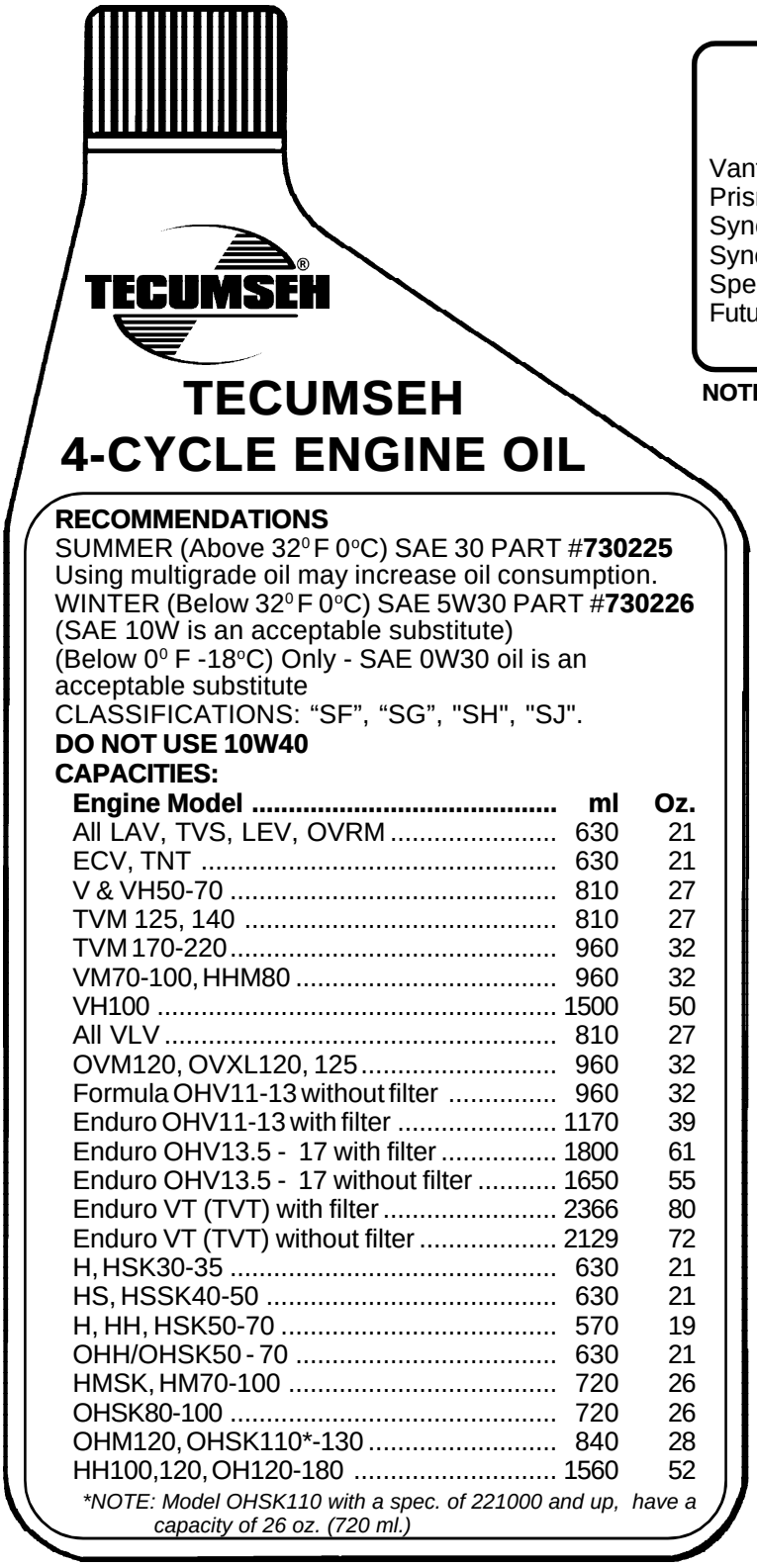
†††† Tecumseh's current policy on hydrostatic transaxles with internal failure, is to replace the complete unit. VST and 1800's have two separate reservoirs which can be checked for diagnostic purpose only. The output gear reservoir can be checked with a small pocket rule as outlined in the Motion Drive Systems Book.

Refer to Motion Drive Systems Book, 691218.

TECUMSEH 4-CYCLE LUBRICATION REQUIREMENTS

We often get questions from both customers and dealers regarding the type and brand of oil we recommend.

Tecumseh recommends the use of a high quality, brand name petroleum based oil in our engines. Very few air cooled engines have any type of oil filtration system, making regular oil changes critical to remove impurities from the engine and maximize engine life. **Consult the operators or repair manual for the oil change interval and viscosity base on equipment operating temperature.**



RECOMMENDATIONS
SUMMER (Above 32^0 F 0^{o}C) SAE 30 PART #**730225**
Using multigrade oil may increase oil consumption.
WINTER (Below 32^0 F 0^{o}C) SAE 5W30 PART #**730226**
(SAE 10W is an acceptable substitute)
(Below 0^0 F -18^{o}C) Only - SAE 0W30 oil is an acceptable substitute
CLASSIFICATIONS: “SF”, “SG”, "SH", "SJ".
DO NOT USE 10W40
CAPACITIES:

Engine Model	**ml**	**Oz.**
All LAV, TVS, LEV, OVRM	630	21
ECV, TNT	630	21
V & VH50-70	810	27
TVM 125, 140	810	27
TVM 170-220	960	32
VM70-100, HHM80	960	32
VH100	1500	50
All VLV	810	27
OVM120, OVXL120, 125	960	32
Formula OHV11-13 without filter	960	32
Enduro OHV11-13 with filter	1170	39
Enduro OHV13.5 - 17 with filter	1800	61
Enduro OHV13.5 - 17 without filter	1650	55
Enduro VT (TVT) with filter	2366	80
Enduro VT (TVT) without filter	2129	72
H, HSK30-35	630	21
HS, HSSK40-50	630	21
H, HH, HSK50-70	570	19
OHH/OHSK50 - 70	630	21
HMSK, HM70-100	720	26
OHSK80-100	720	26
OHM120, OHSK110*-130	840	28
HH100,120, OH120-180	1560	52

**NOTE: Model OHSK110 with a spec. of 221000 and up, have a capacity of 26 oz. (720 ml.)*

EUROPA MODELS *

VERTICALS	oz.	ml	VERTICALS (CONT.)	oz.	ml
Vantage	21	630	Centura	21	630
Prisma	21	630	HTL	21	630
Synergy	21	630	BVS	21	630
Synergy "55"	27	810	**HORIZONTALS**		
Spectra	21	630	BH Series	21	630
Futura	21	630	Geotec Series 35 - 50	21	630

NOTE: Vertical shaft engines with auxiliary PTO: 26 oz. / 700 ml

TECUMSEH 2-CYCLE ENGINE OIL REQUIREMENTS

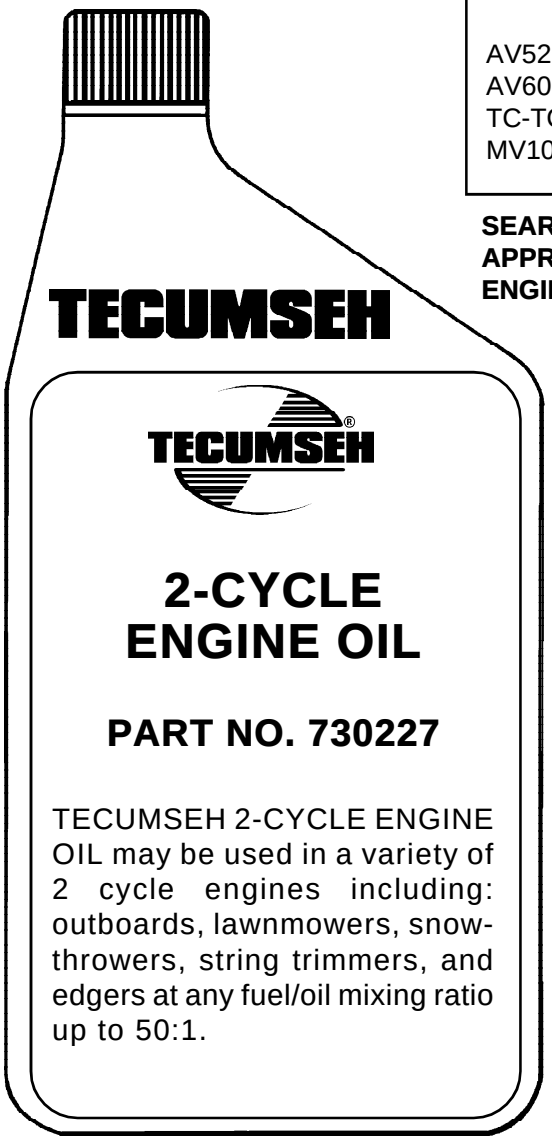
The proper type and ratio of two cycle oil is critical to long life and low maintenance of the engine. The use of non certified oils and improper mix ratio's can cause severe engine damage and possibly void warranty consideration.

The following is a list of 2 cycle engine oil classifications which are certified for use in Tecumseh 2 cycle engines:

- National Marine Manufactures Association, (NMMA), TC-WII or TC-W3
- American Petroleum Institute, (API), TC
- Japanese Automobile Standard Organization, (JASO), FB or FC

TWO-CYCLE FUEL/OIL MIX RATIOS		
24:1 AV520 Types 670 & 653 AV600 Type 600-10 & Up TC-TCH 200/300 MV100S	**32:1** TVS600 All Types AH600	**50:1** TVS / TVXL HSK840 - 850 HSK600 - 635

SEARS CRAFTSMAN TWO CYCLE OIL HAS BEEN TESTED AND APPROVED. ALL MODELS USE A 40:1 MIX RATIO ON ALL 2-CYCLE ENGINES EXCEPT TC'S WHICH USE A 24:1

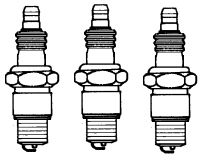


MIXES EASY
DOES NOT SEPARATE

PREMIUM BLEND FOR BOTH AIR AND WATER COOLED ENGINES ENSURES CYLINDER WALL LUBRICATION

ENGINE FUEL MIX				
	U.S. Gasoline	U.S. Amount of Oil To Be Added	METRIC Petrol	METRIC Amount of Oil To Be Added
24:1	1 Gallon 2 Gallons	5.3 oz. 10.7 oz.	4 Liters 8 Liters	167 ml 333 ml
32:1	1 Gallon 2 Gallons	4 oz. 8 oz.	4 Liters 8 Liters	125 ml 250 ml
50:1	1 Gallon 2 Gallons	2.5 oz. 5.0 oz.	4 Liters 8 Liters	80 ml 160 ml

Spark Plug Replacement



4-CYCLE SPARK PLUG

Service Number 34046

RL86C

† OHM120
‡ OHSK110-130
OVM120
* OVXL120,
* OVXL/C120
* OVXL125

Note:

***OVXL models with specification nos. 202700, 203000 and up, use RN4C.**

† OHM 120 models with specification nos. 224000 and up, use RN4C.

‡ OHSK 110, 120, 130 models with specification nos. 223000 and up, use RN4C.

Service Number 33636

RJ17LM

H30-80
HM70-100
HS40-50
VLV-all

Service Number 35552

RL82C

HH140-160
OH120-160

Service Number 34645

RN4C

† OHM120
‡ OHSK110-130
OVM120
* OVXL120,
* OVXL/C120
* OVXL125
OH180
OHH/OHSK40-130
OHV110-17
OVRM All
TVT (V-Twin)
OHM90-110

***OVXL models with specification nos. below 202700 use RL86C.**
† OHM 120 models with specification nos. below 224000 use RL86C.
‡ OHSK 110, 120, 130 models with specification nos. below 223000 use RL86C.

Service Number 34277

RJ8C

H22
H25
HH40-120
HHM80
HMXL70
HT30
HT35
HXL35
LAV25-50
TVM125-220
TVXL170-220
V40-80
VH40-100
VM70-100

Service Number 35395

RJ19LM

ECV100-120
HMSK70-100
HSK30-70
HSSK40-50
LEV80-120
TNT100
VSK100-120
TNT120
TVS75-120
TVXL105
TVXL115

2-CYCLE SPARK PLUG

Service Number 611100

RCJ6Y

TC300
TCH300

Service Number 35395

RJ19LM

TVS840
TVXL840

Service Number 611049

RCJ8Y

AH520
AH600
HSK600
HSK840
HSK845
HSK850 HXL840
TC200
TCH200
Type 1500

Service Number 33636

RJ17LM

AV520
AV600
TVS600

EUROPA MODELS

4-CYCLE SPARK PLUG

Service Number 29010007

J17LM

All Horizontal Models
BV
BVL
BVS
Futura
HTL
LAV
Premier 153/173
Prisma
Spectra
Synergy
Vantage
Centura
Legend

Service Number 29010023

RN4C

Premier 45/55
Geotec OHV
Synergy OHV
Centrua OHV
Futura OHV

2-CYCLE SPARK PLUG

Service Number 29010007

J17LM

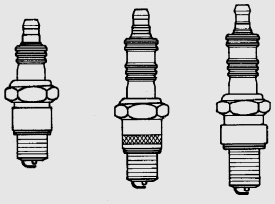
AV85/125
AV520/600
MV100S
TVS600

NOTE: THE SERVICE NUMBERS LISTED BELOW WILL GIVE CORRESPONDING CHAMPION AND AUTOLITE SUBSTITUTIONS.

		Champion	Autolite
35395	**-**	**RJ-19LM**	**458**
35552	**-**	**RL-82C**	**4092**
34046	**-**	**RL-86C**	**425**
34645	**-**	**RN-4C**	**403**
33636	**-**	**J-17LM**	**245**
34277	**-**	**RJ-8C**	**304**
611100	**-**	**RCJ-6Y**	**2974**
611049	**-**	**RCJ-8Y**	**2976**

**NON CANADIAN APPLICATION*

SPARK PLUG AIR GAP ON ALL MODELS IS .030 (.762 mm)

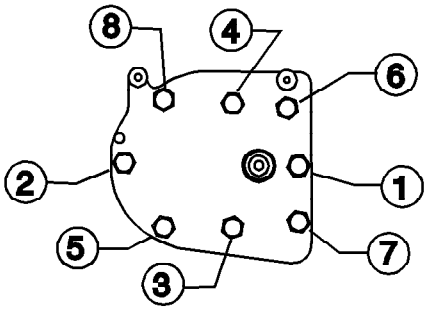


3/8" 9.525 mm
1/2" 12.700 mm
3/4" 19.050 mm

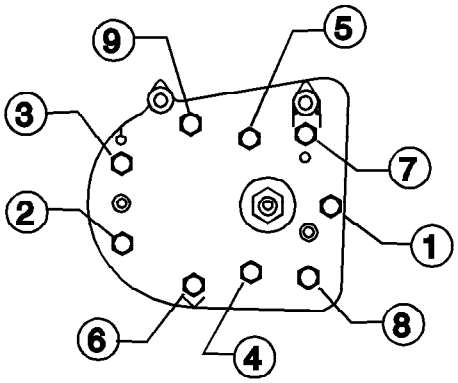
NOTE:

Not all spark plugs have the same heat range or reach. Using an incorrect spark plug can cause severe engine damage or poor performance. Tecumseh uses all three of the reaches shown.

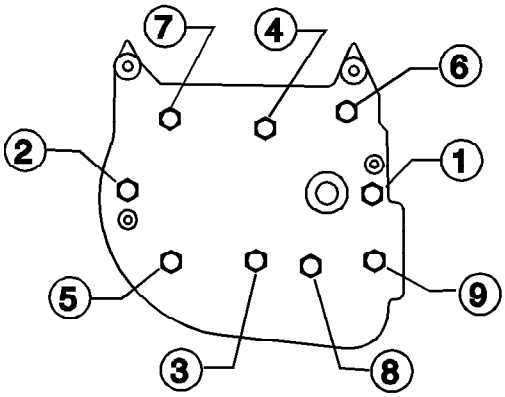
Head Bolt Torque Sequence



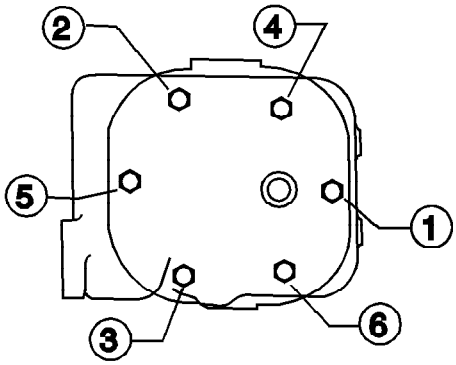
LEV, TVS75-120, H, HSK30-70, HS, HSSK40-50, V50-70, TVXL105-115, TVM125-140
Torque bolts in 50 in. lb. (5.5 Nm) increments.



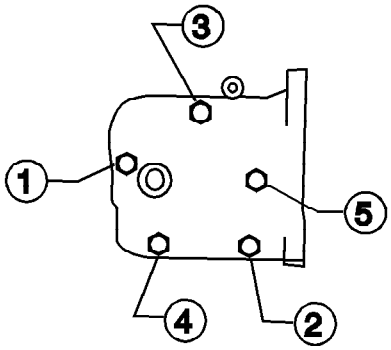
TVM-TVXL170-220, VM, HM, HMSK80-100
Torque bolts in 50 in. lb. (5.5 Nm) increments.



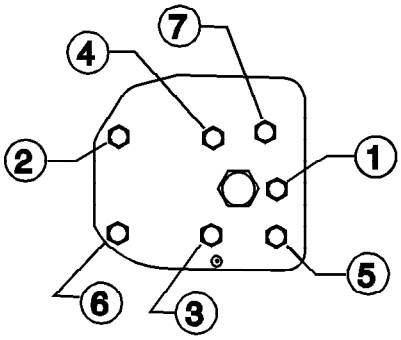
HH, VH80-120
Torque bolts in 50 in. lb. (5.5 Nm) increments.



OHV11-17, OH120-180, OHM, OHSK, OVM, OVXL
Torque bolts in 60 in. lb. (7 Nm) increments.



OVRM40-60, OHH, OHSK50-70
Torque bolts in 60 in. lb. (7 Nm) increments.



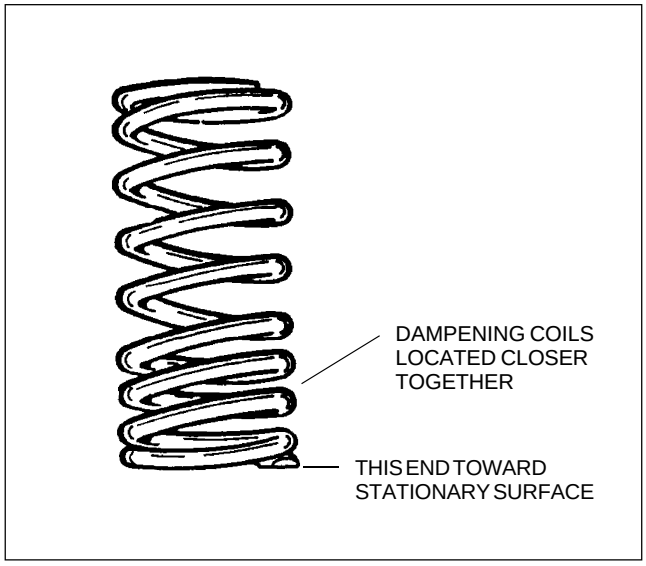
VLV40-6.75
Torque bolts in 50 in. lb. (5.5 Nm) increments.

Valve Clearance

Engine Model	Valve Clearance (Cold) * ±.002 (.05 mm) Intake Valve	Exhaust Valve
LAV35,50 LEV80-120 TVS75-120 ECV & TNT100-120 H30-35 & HS40-50	.006" (.004" - .008") .15 mm (.10 - .20 mm)	.006" (.004" - .008") .15 mm (.10 - .20 mm)
VLV40-6.75	.006"* (.15 mm)	.006"* (.15 mm)
TVT (V-Twin)	.004 (.10 mm)	.004 (.10 mm)
TVM125-220 V & VH50-70 H & HH50-70 HM70-100 & HHM80	.010"* (.25 mm)	.010"* (.25 mm)
OHSK80-130, OHM, OVM120 OVXL120 & OHV11-17	.004"* (.10 mm)	.004"* (.10 mm)
HH100-120	.010"* (.25 mm)	.020"* (.5 mm)
OH120-180	.005"* (.13 mm)	.010"* (.25 mm)
OVRM40-6.75 OHH/OHSK50-70	.004"* (.10 mm)	.004"* (.10 mm)
HSK60-70 HMSK80-100	.006"* (.15 mm)	.006"* (.15 mm)

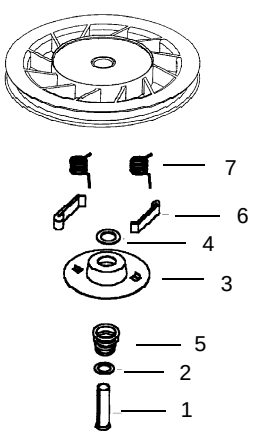
Valve clearance is checked with engine cold and piston at T.D.C. of compression stroke.

NOTE: If the valve spring has dampening coils, it should be installed with the dampening coils away from the valve cap and retainers (opposite the keepers) or towards stationary surface.

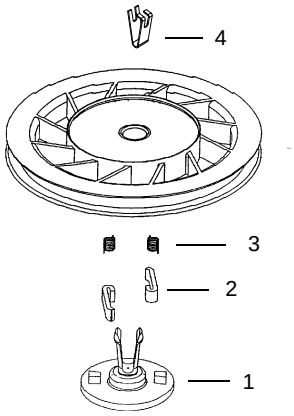


Recoil Quick Reference Parts

During the past few years we have introduced you to several new styles of recoil assemblies. These recoils are used on all small and medium frame series engines. To assist you in making repairs, we have developed the quick reference illustrations below. By looking at the direction and style of ribs between the inner and outer parts of the pulley, you can use this chart to obtain the correct parts. Due to various ropes and housings, these parts will not be shown. Please consult the regular parts list for a complete illustration or replacement.



NOTE: The pulleys are identical but the retaining system changes between these two.

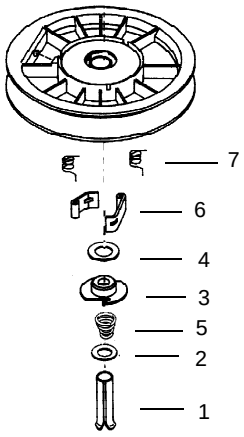


TYPE I

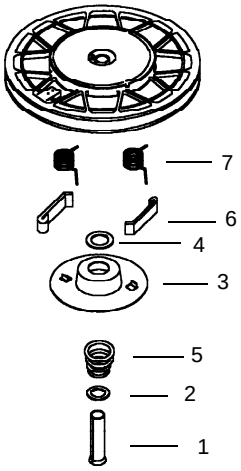
1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590696	Retainer
4	590601	Washer
5	590697	Brake Spring
6	590698	Starter Dog
7	590699	Dog Spring

TYPE II

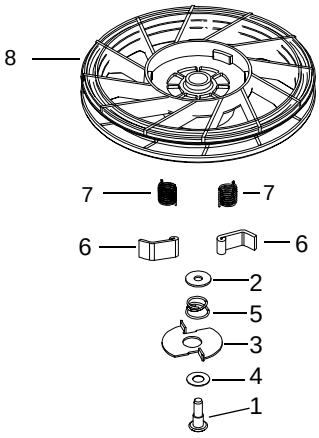
1	590740	Retainer
2	590616	Starter Dog
3	590617	Dog Spring
4	590760	Locking Tab



1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590679	Retainer
4	590601	Washer
5	590678	Brake Spring
6	590680	Starter Dog
7	590412	Dog Spring



1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590696	Retainer
4	590601	Washer
5	590697	Brake Spring
6	590698	Starter Dog
7	590699	Dog Spring

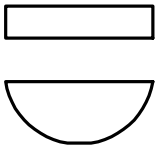


1	590409A	Center Screw
2	590755	Washer
3	590754	Washer
4	590753	Washer
5	590482	Brake Spring
6	590680	Starter Dog
7	590412	Dog Spring
8	590757	Pulley

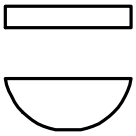
Tecumseh Flywheel Key Quick Reference

Identification Chart

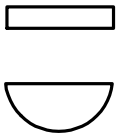
Keys are drawn to full scale.



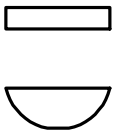
29410009
Steel



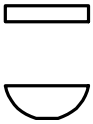
32589
Steel



611191
Steel

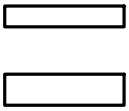


8446
Steel

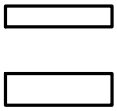


650455
Steel

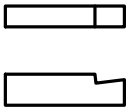
611054
Steel



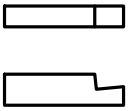
610995
Steel



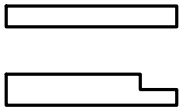
650496
Steel



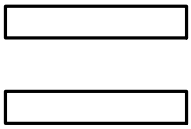
610951
Steel



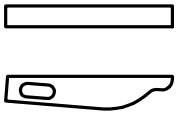
610961
Aluminum
Alloy



30884
Steel

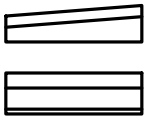


27902
Aluminum
Alloy

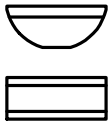


611154
Aluminum
Alloy

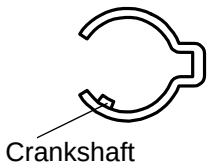
650592
Aluminum
Alloy



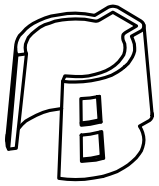
611004
Aluminum
Alloy



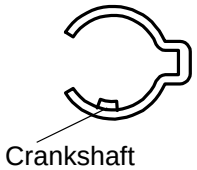
611107
Aluminum
Alloy



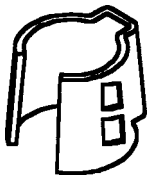
Crankshaft
Timing Tabs



611014A
Point Ignition



Crankshaft
Timing Tabs

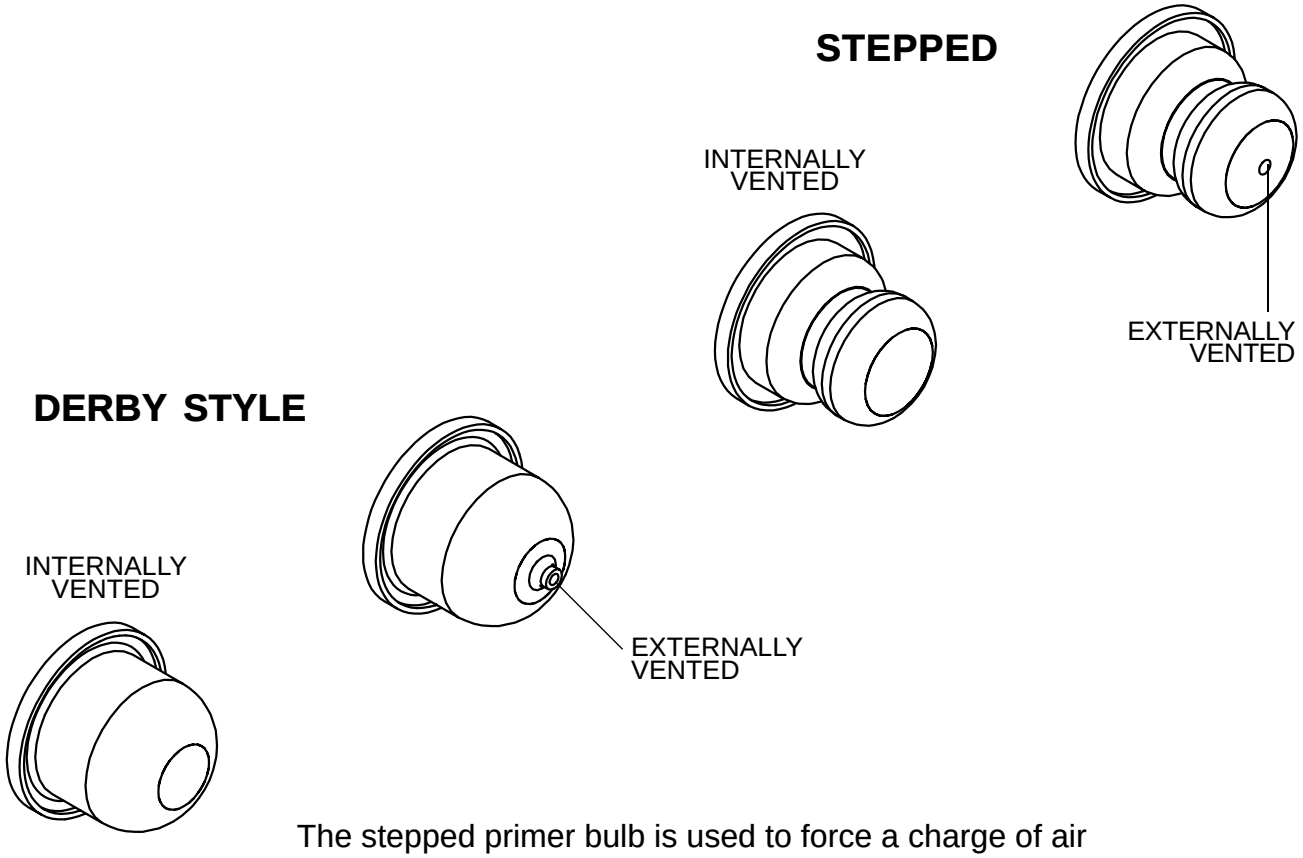


611032
Solid State
Ignition

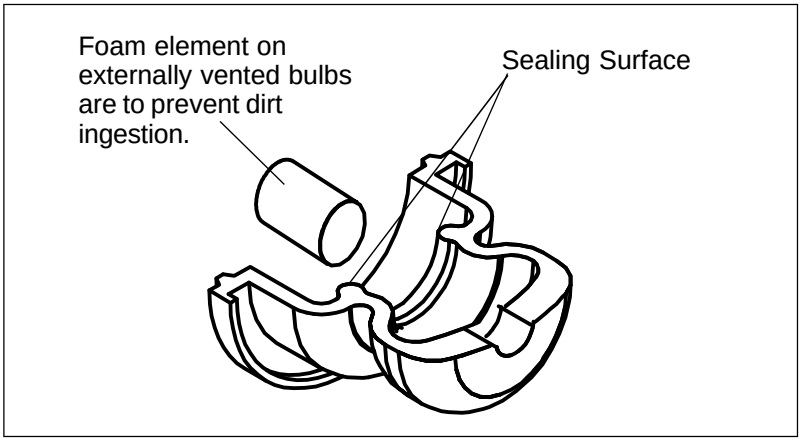
Primer Bulb Identification

Caution must be used when replacing carburetor primer bulbs. Using the wrong primer bulb could cause hard starting and operating problems. Currently, Tecumseh uses five different carburetor mounted bulbs. To avoid problems, use the Master Parts Manual for the correct application.

The primer bulbs offered feature two different shapes; derby and stepped (or hourglass).

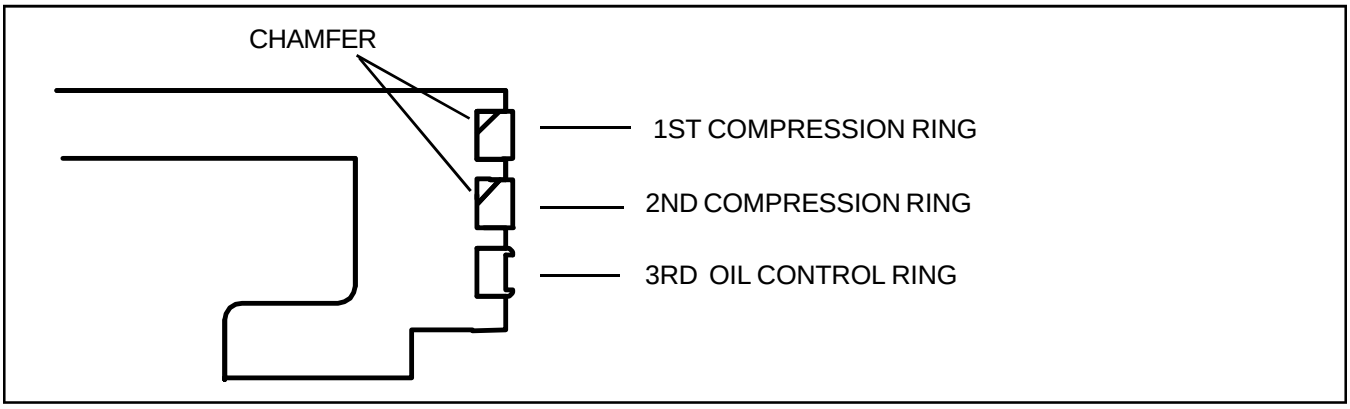


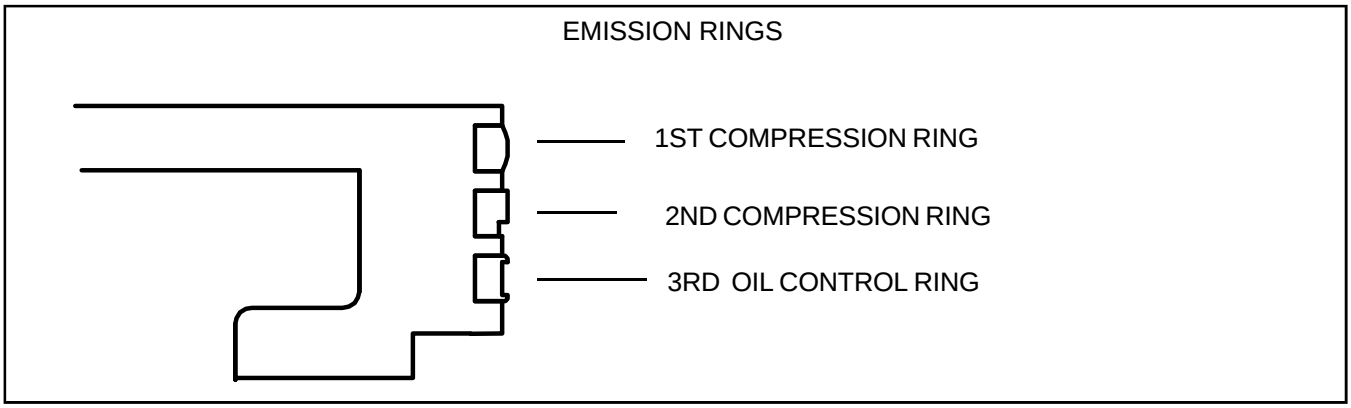
The stepped primer bulb is used to force a charge of air into the bowl through the atmospheric vent chamber. The sealing surface (as pictured), prevents air from going back into the air filter while priming.



Piston Ring Installation

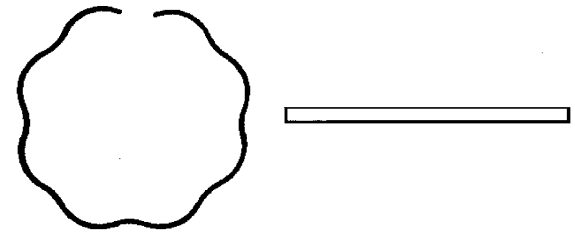
Piston ring orientation: Compression rings may have either an inside chamfer or an outside notch. Inside chamfers always face up towards the top of the piston. Outside notches, which are generally the second compression ring always face down towards the skirt of the piston.



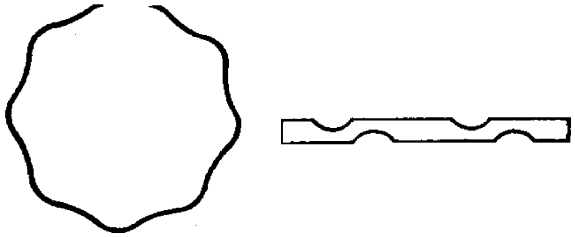


The following is the two types of ring expanders used by Tecumseh:

Top View Side View



This expander is always used behind the second compression ring.



This expander is always used behind the oil control ring.

Quick Reference for Dipsticks

SCREW-IN DIPSTICK FEMALE THR'D, PLASTIC TUBE	
SERVICE NO.	**ID NO.**
35507	104
35556	115
35561	116
35576	108
35578	106 or 125
35582	105
35583 (OBS)	111
35594	113
35595	114
35598	110
35599	83
35611 use 35507	104
35639	106
35648	107
35658	14
35700	117
35706 (OBS)	118
35822	96 or 124
35835	88
35843 (OBS)	103
35925	129
35931	94
35940	130
35973	131
35984	132
36064	123
36147	123
36205	133
36223	134
36259	124
36366	135
36593	137
36640 use 36902	139
36801	125
36878	141
36902	139
37246	91
37421	143
37426	125

LARGE SCREW-IN DIPSTICK MALE THR'D, METAL TUBE	
SERVICE NO.	**ID NO.**
30140	21
30272 (OBS)	92
30787 (OBS)	25
31569A	85
31904 (OBS)	86
32206 (OBS)	29
32909 (OBS)	42
33055 (OBS)	42
33068	45
33258 (OBS)	48
33336 (OBS)	76
33358 (OBS)	88
33469 use 33764	54
33760 (OBS)	18
33761 (OBS)	63
33764	54
34012	65
34201 (OBS)	72
34227 (OBS)	84

TUBE & GAUGE ASSY. SERVICE NO.	DIPSTICK
35836	35835
35837	35576
35842	35599
36879	35582

LARGE TWIST-LOCK	
SERVICE NO.	**ID NO.**
33894A	76
33950A (OBS)	74
33984A	82
34011A	81
34048 (OBS)	25
34053A (OBS)	76
34122A	79
34178A	75
34249	90 or 101
34267	84
34313 (OBS)	89
34319 (OBS)	86
34675	92
34676	94
34763 (OBS)	95
34933	18
35163	99
35347	102

SMALL SCREW-IN DIPSTICK	
SERVICE NO.	**ID NO.**
29668	18
29760	14
30924A (OBS)	24
31297	25
31986 (OBS)	29
32969	40
33069	76
33070 (OBS)	88
33604 (OBS)	86
33758 (OBS)	48
34165	68
34245	73
35112 (OBS)	98
35368 use 36879	76
35888	120
35941	126
35942	127
36678	138

NOTE: OBS abbreviation stands for obsolete

4 Cycle Quick Reference - Model Letter Designation

ECH - Exclusive Craftsman Horizontal

ECV - Exclusive Craftsman Vertical

H - Horizontal Shaft

HH - Horizontal Heavy Duty (Cast Iron)

HHM - Horizontal Heavy Duty (Cast Iron) (Medium Frame)

HM - Horizontal Medium Frame

HMSK - Horizontal Medium Frame (Snow King)

HMXL - Horizontal Medium Frame (Extra Life)

HS - Horizontal Small Frame

HSSK - Horizontal Small Frame (Snow King)

HXL - Horizontal (Extra Life)

LAV - Lightweight Aluminum Frame Vertical

LEV - Low Emissions Vertical

OH - Overhead Valve Heavy Duty (Cast Iron)

OHH - Overhead Valve Horizontal

OHM - Overhead Valve Heavy Duty Horizontal (Medium Frame)

OHSK - Overhead Valve Horizontal (Snow King)

OHV - Overhead Valve Vertical (Medium Frame)

OVM - Overhead Valve Vertical (Medium Frame)

OVRM - Overhead Valve Vertical (Small Frame) (Rotary Mower)

OVXL - Overhead Valve Vertical (Medium Frame) (Extra Life)

TNT - Toro 'N' Tecumseh (Toro Exclusive Series)

TVEM - Tecumseh Vertical European Model

TVM - Tecumseh Vertical (Medium Frame) (Replaces V & VM)

TVS - Tecumseh Vertical Styled

TVT - Tecumseh Vertical Twin

TVXL - Tecumseh Vertical (Extra Life)

V - Vertical Shaft

VH - Vertical Heavy Duty (Cast Iron)

VLV - Vector Lightweight Vertical

VLXL - Vector Lightweight Vertical (Extra Life)

VM - Vertical Shaft (Medium Frame)

VSK - Vertical Snow King

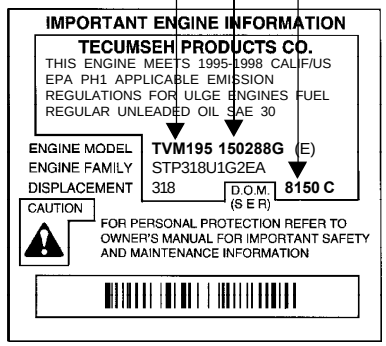
LOCATING AND READING ENGINE MODEL AND SPECIFICATION

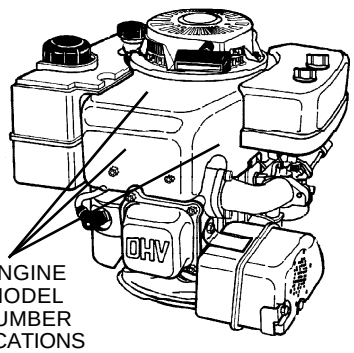
THE FOLLOWING WILL BE NEEDED TO LOCATE PARTS FOR YOUR ENGINE.

	Model	Specification	Serial (DOM)
ENGINE:	TVM195	150288G	8150C

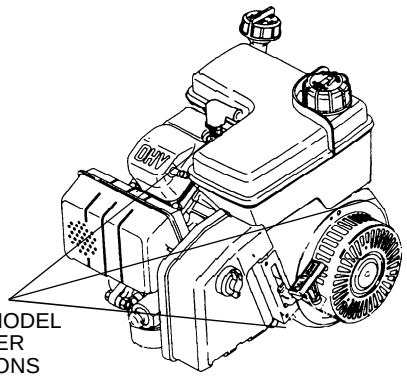
ENGINE MODEL	SPEC NO.	D.O.M (SERIAL NO)
TVM195	150288G	8150C

Typical Engine I.D. Label





ENGINE MODEL NUMBER LOCATIONS



ENGINE MODEL NUMBER LOCATIONS

4 Cycle Quick Reference for Spec. Numbers-To-Model Designation

HORIZONTAL 4-CYCLE ENGINES

15000 - H22
25000 - H25
26000 - OHH45
35000 - H30
35400 - HSK30
45000 - H & HT35
45400 - HSK35
47000 - HXL35
55000 - H40
55200 - HS & HSSK40
55500 - HSK40
55700 - H40
55800 - H40
55900 - HSSK40
65000 - H50
65300 - HSK50
67000 - HS & HSSK50
68000 - OHH50
68500 - OHSK50
69000 - OHH55
69500 - OHSK55
71100 - OHH60
71500 - OHSK60
71700 - OHH65
71900 - OHSK65
72500 - OHSK70
75000 - H60
76000 - HSK60
85000 - HH40
95000 - HH50
105000 - HH60
110000 - HH80
115000 - HH100
120000 - HH120
130000 - H70
130200 - HSK70
132000 - HM & HMSK70
132500 - HMXL70
140000 - HH70
146000 - ECH90
155000 - H & HM80
155000 - HMSK80
155800 - HM85
155900 - HM & HMSK85
156000 - HM90
156500 - HMSK90
159000 - HM & HMSK100
159900 - HMSK105
159950 - HMSK110
160000 - HH & OH140
170000 - HH150 & 160
170000 - OH160
175000 - OH120
180000 - OH180
190000 - HHM80
220000 - OHM120
221000 - OHSK110
222000 - OHSK120
223000 - OHSK90
223400 - OHSK110
223600 - OHSK120
223700 - OHSK125
223800 - OHSK130
224600 - OHM120

VERTICAL 4-CYCLE ENGINES

10000 - TNT100
12000 - TNT120
20000 - LAV25, OVRM55
20500 - OVRM105
21000 - OVRM60
21800 - OVRM60
22000 - OVRM65
30000 - LAV30
33000 - TVS75
40000 - LAV35
42000 - OVRM905 (SearsOnly)
42600 - OVRM40, OVRM45 (PremierEngine)
42900 - OVRM40 (HighTechLook)
43000 - TVS90
43600 - TVS90 (PremierEngine)
43700 - TVS90, TVXL90
43900 - TVS90 (HighTechLook)
44000 - TVS100
44600 - TVS100 (PremierEngine)
44800 - TVS100
46000 - TVS90, TVXL90
46600 - TVS90
48000 - TVS90
50000 - V40
50200 - LAV40
52600 - OVRM50, OVRM55 (PremierEngine)
52800 - OVRM50, OVRM55
52900 - OVRM50, OVRM55 (HighTechLook)
53000 - TVS105
53600 - TVS105 (PremierEngine)
53800 - TVS105
53900 - TVS105 (HighTechLook)
54000 - TVXL105
56000 - TVS105, TVS & TVXL115
56600 - TVS105, TVS115 (PremierEngine)
56800 - TVS115
56900 - TVS105, TVS115 (HighTechLook)
57000 - TVS & TVXL115
57600 - TVS115 (PremierEngine)
57800 - TVS115
57900 - TVS115 (HighTechLook)
60000 - V50, TVM125
61000 - TVS & TVXL115
61600 - TVS & TVXL115
61800 - TVS115
61900 - TVS115
62000 - LAV50
62100 - LAV50 & TVS115
63000 - TVS120
63200 - TVS120, TVEM120
63600 - TVS120 (PremierEngine)
63900 - TVS120 (HighTechLook)
66000 - TVS120
66100 - TVS120
70000 - V60, TVM140
80000 - VH40
90000 - VH50
100000 - VH60
125000 - V70
127000 - VM70, TVM170
127200 - TVXL170
135000 - VH70
145000 - ECV100
147000 - ECV105
148000 - VH80
149000 - VH100
150000 - V & VM80, TVM195
150200 - TVM & TVXL195
150500 - TVM195
151000 - ECV110, TVM195
151500 - TVM220
152000 - ECV120
157000 - VM100, TVM220
157200 - TVM & TVXL220
157400 - TVM220
200000 - OVM120
202000 - OVXL120, OVXL125
202200 - OVXL120 (I/C)
202300 - OHV11, OHV115
202400 - OVXL125
202500 - OHV115
202600 - OVXL125 (I/C)
202700 - OHV12, OVXL120 (Tec.1200)
203000 - OHV125, OVXL125 (Tec1250)
203200 - OHV13
203500 - OVXL125 (Tec.1250I/C), OHV13/135
203600 - OHV14/140
203800 - OHV145
204000 - OHV15/150
204200 - OHV16/160
204400 - OHV165
204500 - OHV155
204600 - OHV17/170
204800 - OHV175
206000 - OHV110
206200 - OHV115
206400 - OHV120
206600 - OHV125
206800 - OHV130
206900 - OHV135
335000 - LEV100
338000 - LEV100
338500 - VSK100
340000 - LEV100
345000 - LEV100
350000 - LEV115
355000 - LEV115
360000 - LEV115
361000 - LEV120
361400 - VSK120
400000 - VLV40
500000 - ULT, VLV B24, VLXL50, & VLV126
501000 - ULT, VLV, VLXL55, & VLV126
502000 - ULT, VLV60, VLV65, & VLV126
502500 - VLV65, VLV66
600400 - TVT691

Metric Conversions Factors (approximate)

Conversions **TO** Metric Measures

	Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH	in.	inches	25.4	millimeters	mm
	in.	inches	2.54	centimeters	cm
	ft.	feet	30	centimeters	cm
	yd.	yards	0.9	meters	m
	mi.	miles	1.6	kilometers	km
MASS	oz.	ounces	28	grams	g
(weight)	lb.	pounds	0.45	kilograms	kg
VOLUME	tsp.	teaspoons	5	milliliters	ml
	Tbsp.	tablespoons	15	milliliters	ml
	fl. oz.	fluid ounces	30	milliliters	ml
	c	cups	0.24	liters	l
	pt.	pints	0.47	liters	l
	qt.	quarts	0.95	liters	l
	gal.	gallons	3.8	liters	l
	in^3	cubic inch	16.39	cubic centimeters	cc
TORQUE	in./lbs.	inch/pounds	.113	Newton meters	Nm
	ft./lbs.	foot/pounds	1.36	Newton meters	Nm
TEMP.	°F	Fahrenheit Temp.	subtract 32 then x .555	Celsius	°C

Conversions **FROM** Metric Measures

	Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH	mm	millimeters	0.04	inches	in.
	cm	centimeters	0.4	inches	in.
	m	meters	3.3	feet	ft.
	m	meters	1.1	yards	yd.
	km	kilometers	0.6	miles	mi.
MASS	g	grams	0.035	ounces	oz.
(weight)	Kg	kilograms	2.2	pounds	lb.
VOLUME	ml	milliliters	0.0338	fluid ounces	fl. oz.
	l	liters	2.1	pints	pt.
	l	liters	1.06	quarts	qt.
	l	liters	0.26	gallons	gal.
	cm^3	cubic centimeters	0.061	cubic inches	in^3
TORQUE	Nm	Newton meters	8.85	inch/pounds	in./lb.
	Nm	Newton meters	.738	foot/pounds	ft./lb.
TEMP	°C	Celsius Temp.	x 1.8 then add 32	Fahrenheit Temp.	°F

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers the DC-24 Volt Battery Unit.

24 VOLT CORDLESS ELECTRIC MOTOR

TECUMSEH

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1996

CHAPTER 1 GENERAL INFORMATION

ELECTRICAL TERMS

AMPERE (AMP) is an amount of electron flow or "current" past an imaginary point.

ELECTRONS are negatively charged particles of conductive atoms that move from one atom to another when stimulated by an electromotive force (battery, alternator, etc ...).

A VOLT is the amount of electrical push or force.

MAGNETISM is a property contained by certain materials to exert mechanical force on a neighboring magnetic material. A measurement of magnetism is called "Flux" and is similar to current flow in an electrical circuit.

A CONDUCTOR is a material that easily supplies free electrons to produce an electric current when stimulated by an electromotive force.

An **INSULATOR** is a material that contains no free electrons and does not allow an electric current to flow through it.

HEAT is an energy loss produced as electrical energy is converted into mechanical energy in a D. C. motor. The higher the efficiency of the motor, the smaller the amount of heat produced.

SPEED is the number of rotations of the armature shaft which is controlled by altering the armature voltage.

A **BATTERY** is a device that converts chemical energy into electrical energy. Battery operation and performance can be grouped into four critical elements. Discharge characteristics, overall life, cycle life, and shelf life.

The **AMP/HOUR** rating is a test to indicate how long a battery is able to supply a constant current for a 20 hour period.

OVERALL LIFE is how long a battery is still usable after the date of manufacture even if it is unused. With proper maintenance the typical overall life is 4 to 5 years.

The **CYCLE LIFE** is the number of times the battery can be charged and discharged before it begins to lose its capacity. The batteries in the Tecumseh power package should last approximately 150 cycles before they begin to lose capacity.

SHELF LIFE is how long a battery can be stored before it needs to be recharged. Shelf life depends heavily on ambient air temperature. Typically at 60° F (15° C), the battery must be recharged every six months: however at 95° F (35° C) it must be recharged every 2 months.

BATTERY CHARGING is accomplished by converting 120 volt A.C. into 24-30 volts D.C. The Tecumseh charger is a two step charger that supplies correct voltage until the overcharge voltage level is achieved, and then a lower "float" voltage completes the charge. Faster charging and extended battery life are a result of this charge method. This is why Tecumseh recommends keeping the charger plugged in when the mower is not in use. The charger also uses a temperature compensation circuit to increase the charging voltage at lower temperatures and decrease the charging voltage in higher temperatures.

CHARGING TIME is the amount of time it takes to restore a battery to a fully charged condition. During normal use batteries will typically take 12 - 16 hours to recharge. **NOTE:** If batteries have been fully discharged it could take up to 20 hours for recharging.

RUN TIME is the amount of time a fully charged battery pack will operate the motor until the combined battery voltage drops below 19.25 volts for at least ten seconds and the automatic shutdown occurs. Run time is typically over an hour or it can be as short as 40 minutes. Run time is influenced by variables like blade sharpness, type and amount of material cut, air temperature, ground speed, etc...

The **FLOAT CHARGE** is the lower voltage charging cycle that automatically starts after the batteries have reached full charge. Battery run time and life is maximized during this charge cycle. The green charger indicator light will be on during this charge cycle.

MOTOR IDENTIFICATION

The Tecumseh motor is identified by the type and model number, specification number, and date of manufacture (D.O.M.). This information is imprinted on a decal that is found on the metal shroud.

The letter designations indicate the basic type of motor.

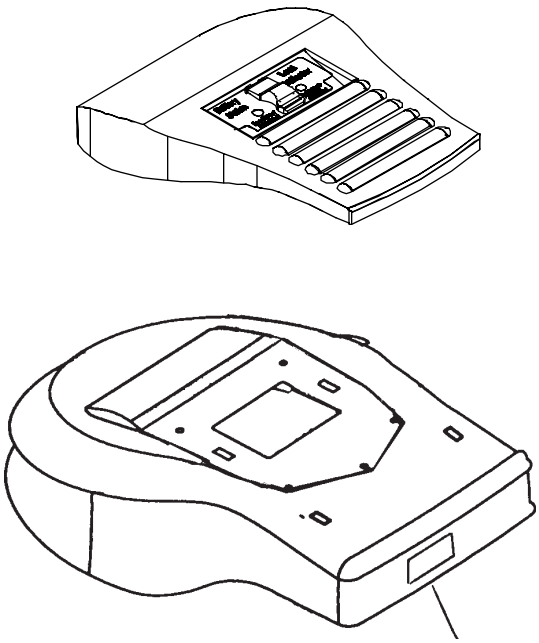
The number designations following the letters indicate the voltage requirement of motor.

The date of manufacture (D.O.M.) includes the year, Julian date, and the assembly line the motor was produced on.

Using model DCV 24 - 5001A - D.O.M. 6105C as an example, interpretation is as follows.

DC	**V**	**24**	**- 5001A**
Direct Current	Vertical	Voltage	OEM's Specification

D.O.M.	**6**	**105**	**C**
Date of Manufacture	Year of 1996	105th day 1996	Line or Shift made on.



MOTOR IDENTIFICATION

CAUTION: THIS SYMBOL INDICATES IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED CAN RESULT IN SERIOUS PERSONAL INJURY. FOLLOW ALL INSTRUCTIONS.

SAFETY GUIDELINES

1. **Read and fully understand the operator's manual before attempting any maintenance or repair to the motor or controls.**
2. **Always remove 40 amp safety fuse to prevent accidental starting under the following conditions: TRANSPORTATION, SET-UP, CLEANING, ADJUSTING, OR MAKING REPAIRS.**
3. **Unplug the charging unit from the 120 volt outlet and the mower before performing any service procedures.**
4. **Do not expose the charging unit or electrical wiring to rain or washing.**

MAINTENANCE

Maintenance on the motor, controller, and battery pack is limited. The charger should be plugged into the charge port and a 120 volt A.C. source whenever the unit is not in use, including in season storage. Cleaning the motor, charger, battery pack, or controller should only be done by compressed air or by wiping with a clean cloth. Consult the Original Equipment Manufacture (O.E.M.) operator's manual for other maintenance to the mower including: blade sharpening, cleaning the deck, height adjustments, and operator presence control and motor start switch operation.

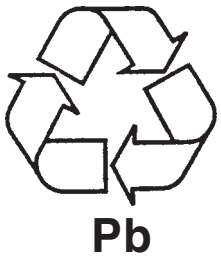
IN SEASON STORAGE

Whenever the mower is not in use, it is considered in a stand-by or storage mode. Storage or stand-by requires the charger to be plugged in to restore and maintain battery voltage and extend battery life. **NOTE**: ALWAYS PLUG THE BATTERY CHARGER INTO THE CHARGE PORT BEFORE PLUGGING INTO THE 120 VOLT A.C. SOURCE. Batteries left off the charger during storage will slowly lose charge and the service life will not be maximized. The mower and charger should be stored inside a garage, shed, or other area where it is dry and protected from the elements and out of the reach of children.

OFF SEASON STORAGE

When the mower is not to be used for an extended period beginning at 30 days but not more than 6 months, the following procedure is to be followed for temperatures below 60° F (15° C).

1. Charge batteries following procedure previously listed for at least 20 hours.
2. When the batteries are completely charged the unit can be stored out of the weather in a garage or shed without fear of battery freezing for up to 6 months. Battery can not be stored below -30° F (-35° C) or damage will occur.
3. If the unit is stored in an area with temperatures above 60° F (15° c) you will need to keep the charger plugged into the system to maximize battery life.



THIS PRODUCT CONTAINS A SEALED LEAD ACID BATTERY. MUST BE DISPOSED OF PROPERLY. Local, state, or federal laws may prohibit disposal of lead-acid batteries in ordinary trash. Consult your local waste authority for information regarding available recycling and/or disposal options.

CHAPTER 2 BATTERIES & CHARGING SYSTEM

GENERAL INFORMATION

The energy source used to power the motor is two 12 volt 17 AMP/HR lead acid maintenance free batteries. The two batteries are hooked in series to increase the voltage to the motor to 24 volts D.C. The batteries use a gel type electrolyte and are completely sealed. The batteries come fully charged from the factory. However, before the initial use or when not in use the batteries should be recharged fully by the charger (see charging operation).

CAUTION: DO NOT EXPOSE THE CHARGER TO RAIN OR SNOW.

BATTERY AND CHARGER OPERATION THEORY

The batteries are charged as a set using a series connection between the batteries. The battery charger converts 120 A.C. voltage into 24-30 volts D.C. and plugs into the charge port located in the indicator panel.

TO BE ABLE TO PROPERLY SENSE BATTERY CONDITION, THE BATTERY CHARGER MUST BE PLUGGED INTO THE CHARGE PORT BEFORE IT IS PLUGGED INTO THE 120 VOLT A.C. SOURCE. The two step Tecumseh charger must "read" battery voltage before selecting either a high voltage charge mode or a lower "float" charge mode. If the charger is plugged into the charge port after the 120 volt A. C. source, the charger will display a false signal that the battery is fully charged and will only charge the battery at the lower "float" voltage. The charge mode can be seen at the indicator lights: green indicates charging at the float voltage and the batteries are fully charged, the red light indicates charging at the higher rate and the batteries are discharged.

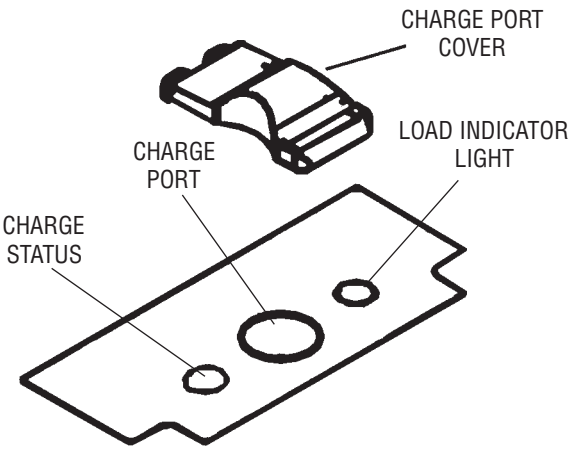


ILLUSTRATION 1

NOTE: When the charger is plugged in the charge port, the switching circuit is disabled and the motor will not start. The 40 Amp. safety fuse must be plugged in to charge the battery.

The charger also features temperature compensation to obtain the best charge based on the ambient air temperature. The charger voltage compensates for temperature variation by increasing or decreasing charge voltage. Without this feature the batteries could be overcharged in elevated temperatures and not fully charged in low temperatures.

The charger is recommended to be left on continuously whenever the mower is not in use except during Off Season storage. (See Off Season Storage)

REMEMBER, PLUG THE CHARGER INTO THE CHARGE PORT FIRST BEFORE THE POWER SUPPLY.

COMPONENTS

24 Volt Motor

Ref. #	Description	Ref. #	Description
1	Motor Assembly	11	Charger Port Cover
2	Battery Assembly (Includes 13 & 15)	12	Grill
3	Controller Board	13	Screw - Battery
4	Indicator Board / Charge Port	14	Wire Assembly
5	Lead Wire Assembly	15	Clip - Battery
6	Bracket - Battery Support	16	Shroud
7	Bracket - Lower	17	Battery Charger
8	Screw - Shroud	18	Fuse - 40 Amp
9	Screw - Beveled	19	Decal (Indicator Panel / Charge Port)
10	Battery Box	20	Screw, Controller board

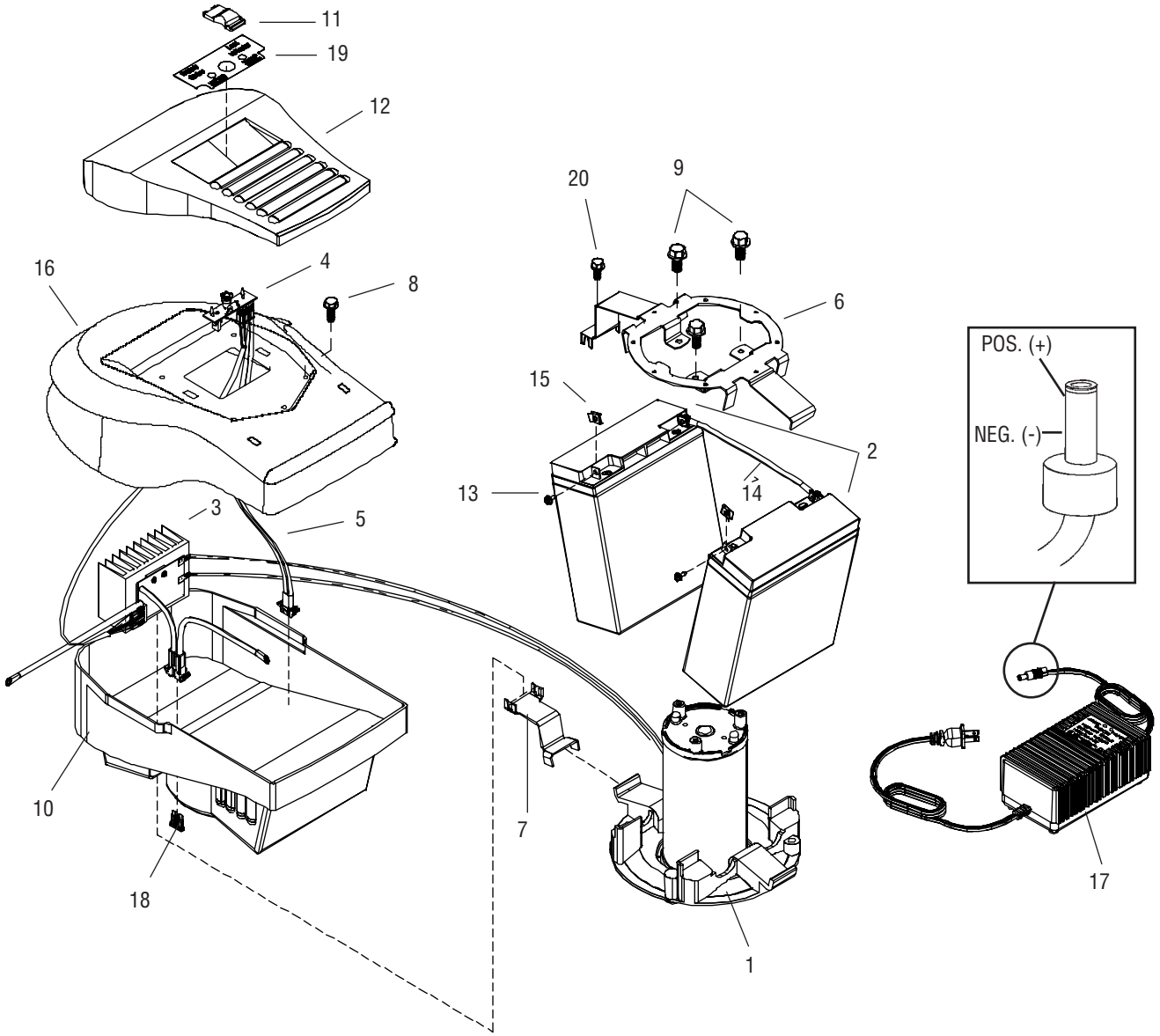


ILLUSTRATION 2

TEST PROCEDURES

If the batteries do not provide sufficient run time or fail to recharge fully, the batteries and charger can be checked to determine if the charger is working properly or if batteries are no longer rechargeable. Before testing, the batteries must be charged the maximum time (20 hours) to achieve the fully charged state. Use the load test found on the troubleshooting chart only as a guideline of the batteries condition. Performance of the complete unit must be considered before battery replacement. Review with the operator how the machine is being used; height of cut, blade condition (sharpness), is grass dry or wet.

CHAPTER 3 ELECTRIC MOTOR AND CONTROLS

GENERAL INFORMATION

The Tecumseh electric motor is a simple device that converts the electrical energy supplied by a battery pack to mechanical energy in the form of a rotating shaft. The direct current (D.C.) motor uses high strength permanent magnets instead of field stator windings to provide a strong magnetic field. This results in reduced battery draw, lower motor operating temperature and higher motor efficiency.

The Tecumseh motor is completely sealed to prevent any dirt or moisture from entering the unit.

The motor is controlled by a handlebar mounted operator presence control and electric motor start switch. When the control is depressed and the start switch activated, the motor will continue to run until one of the following occurs. The control is released, the battery voltage drops below 19.25 volts for ten seconds, or there is an excessive load for more than six seconds. The motor controller has many functions such as; stopping the blade within three seconds, motor startup, current limiting, battery protection and thermal protection.

ELECTRIC MOTOR THEORY AND OPERATION

The theory of electricity and magnetism explains why the motor turns. The housing of the motor contains permanent magnets with magnetic fields running from one pole to the other. The armature in close proximity has coils of wire wound around the laminations. When a conductor (coil of wire) cuts a magnetic field (from the permanent magnets), a current is induced in that wire. Electric motors use this principle in reverse. When the motor start switch is activated, the motor controller allows battery current to flow through the brushes and the coil on the armature. This current flow in the armature creates a strong magnetic field around the coil and lamination. The magnetic fields of the permanent magnets alternately attract and repel the magnetic forces of the windings in the armature when current is applied. This continuous series creates rotation of the armature.

The motor controller protects the motor by shutting the motor off if a high load condition exists for more than ten seconds. The 40 Amp fuse provides a safety system for the mower during service as well as an emergency shut off.

INDICATOR OR DISPLAY PANEL

The indicator or display panel is a small circuit board that contains two light emitting diodes (LED) and the battery charge port. The load LED will come on and indicate when the load on the motor exceeds 28 Amps. The low battery LED indicates when the battery voltage has dropped below 21.5 volts and the battery is nearly discharged. If the motor shuts itself down at any time, one of the LED indicator lights will be on to inform the operator what triggered the automatic shutdown. If the load light is on, the load on the motor has reached 50 Amps for more than six seconds. Remedy the cause for excessive loading, reset the operator presence control, and press the motor start switch to continue operation. If the battery indicator is on, the battery voltage dropped below 19.25 volts for at least ten seconds the light also indicates that the batteries are discharged (See Illustration 1). Recharge the batteries as long as required and continue operation.

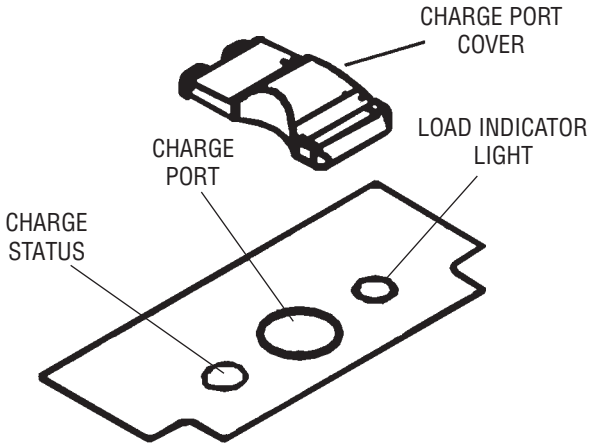


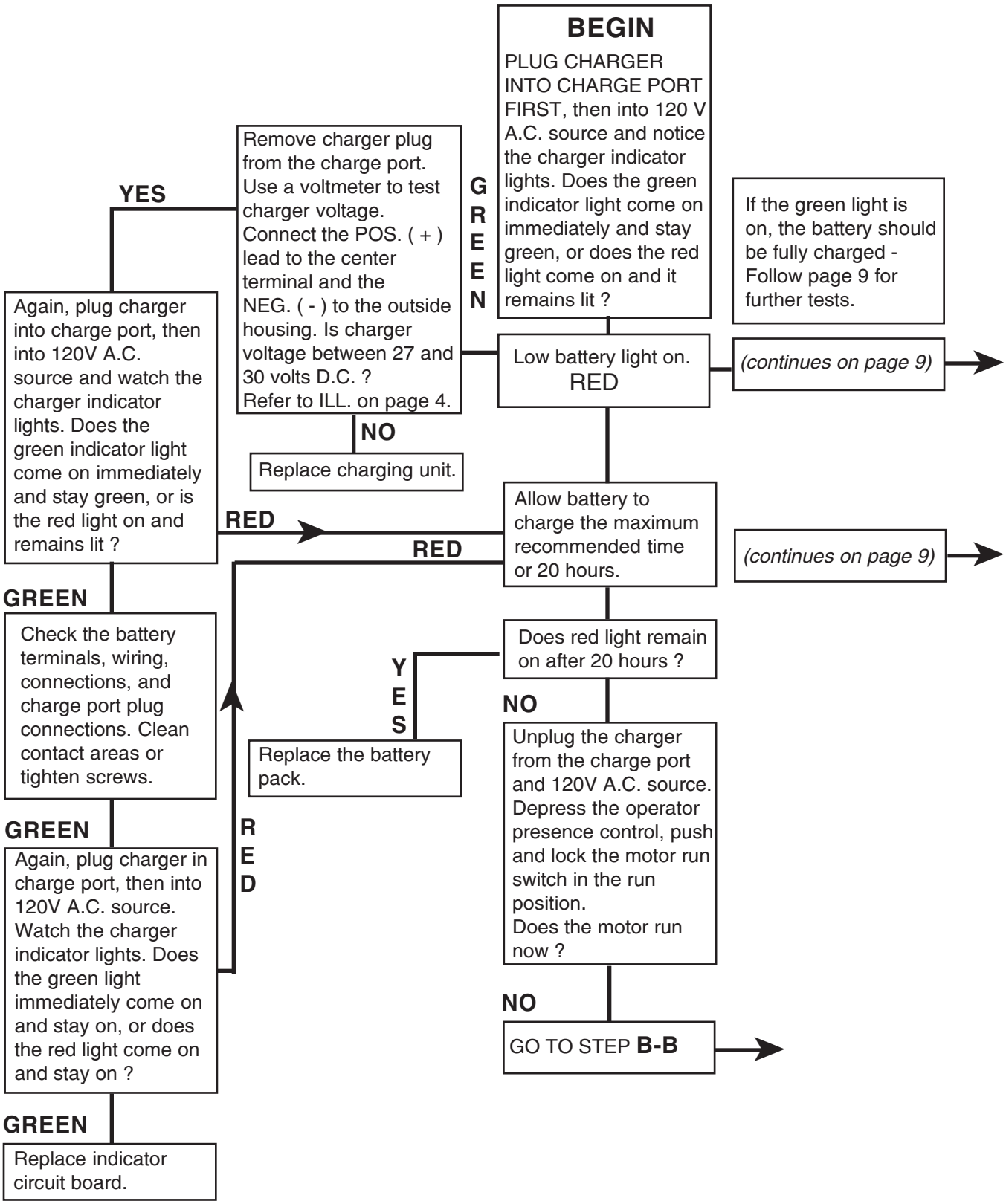
ILLUSTRATION 1

SERVICE

Service on the motor, indicator panel, or motor controller is limited to replacement of the failed part. Use the trouble-shooting charts to find the correct cause of failure.

CHARGER AND BATTERY CIRCUIT

CHART 1A



MOTOR, CONTROLLER, INDICATOR PANEL
CHART 1B

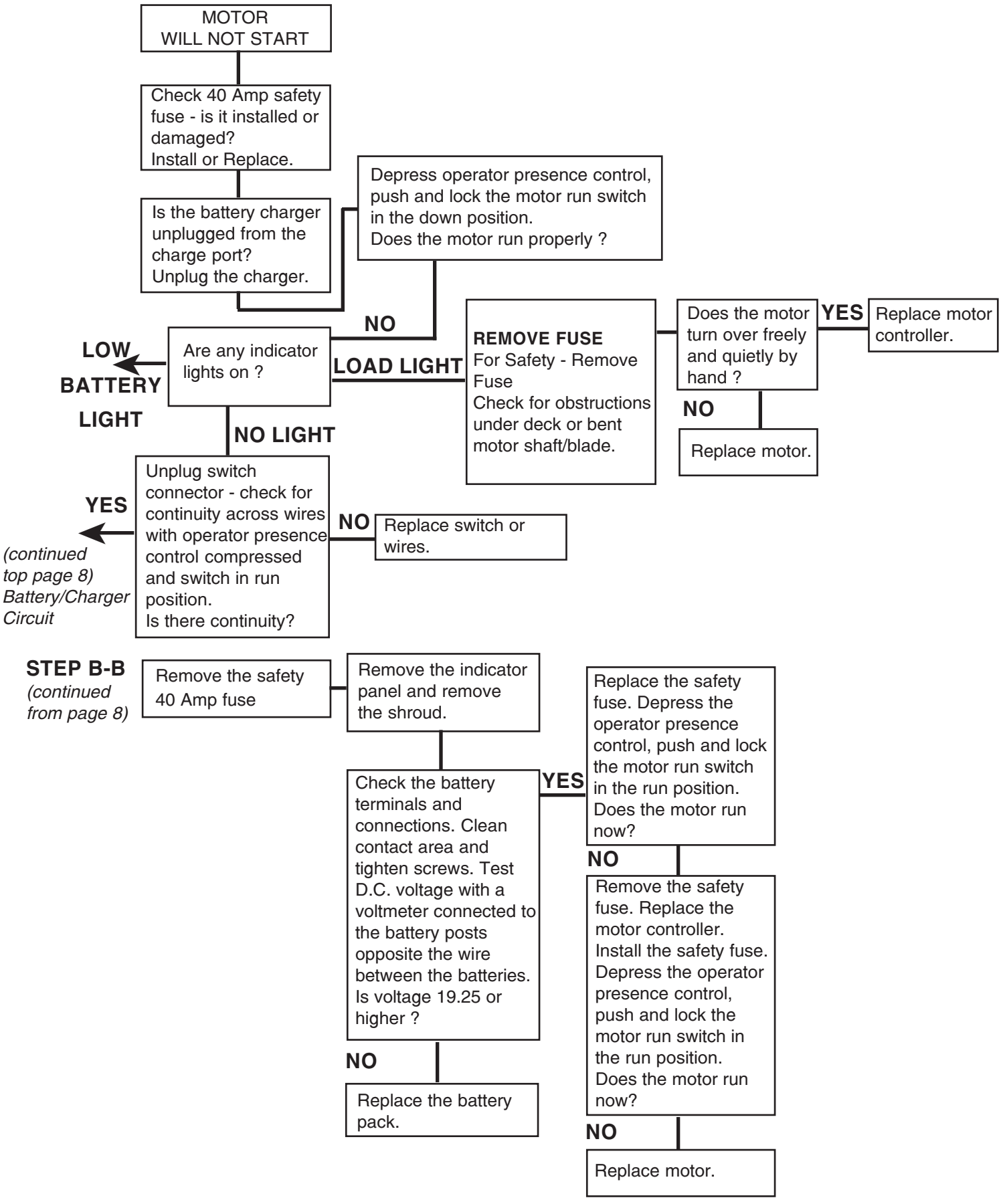


CHART 2

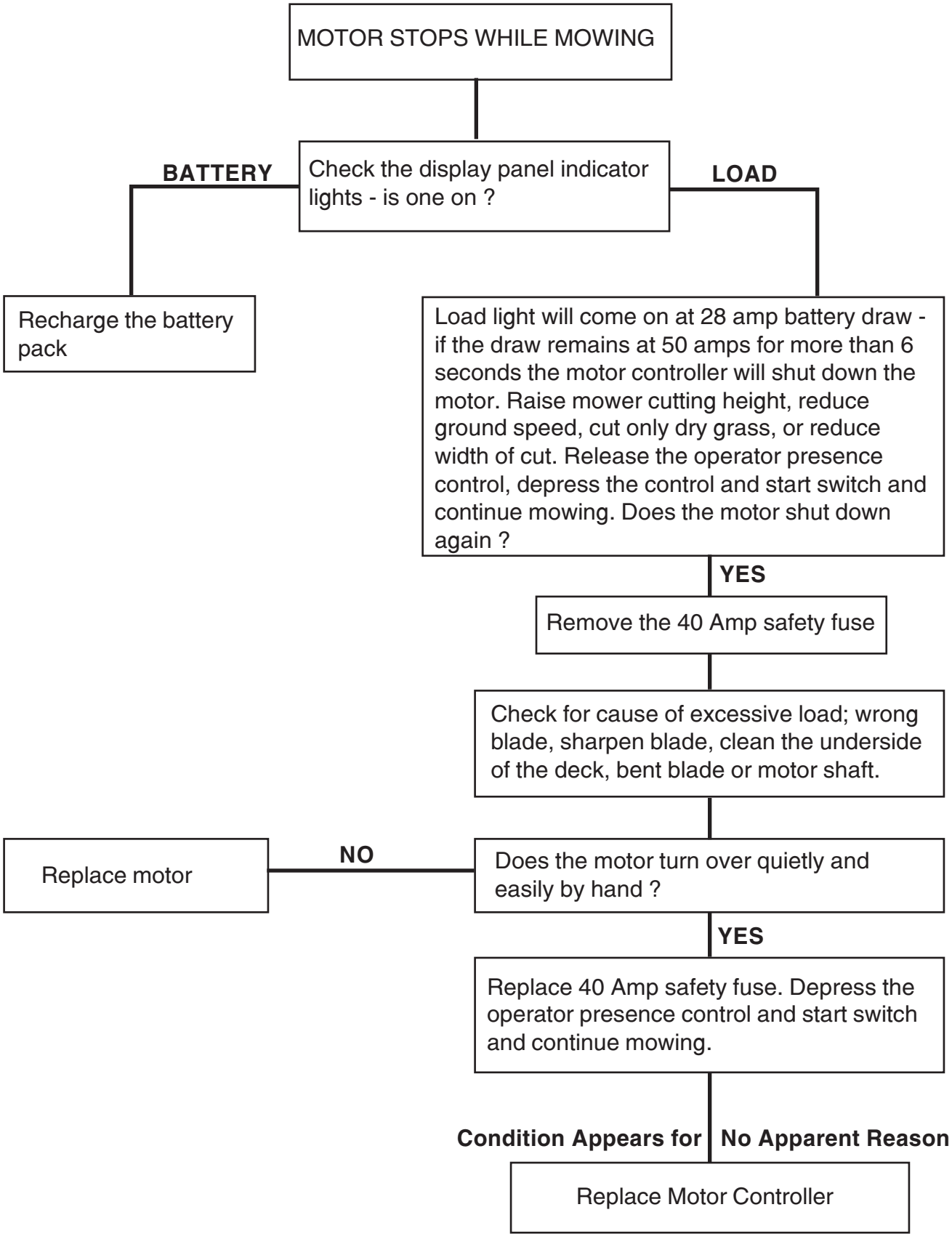
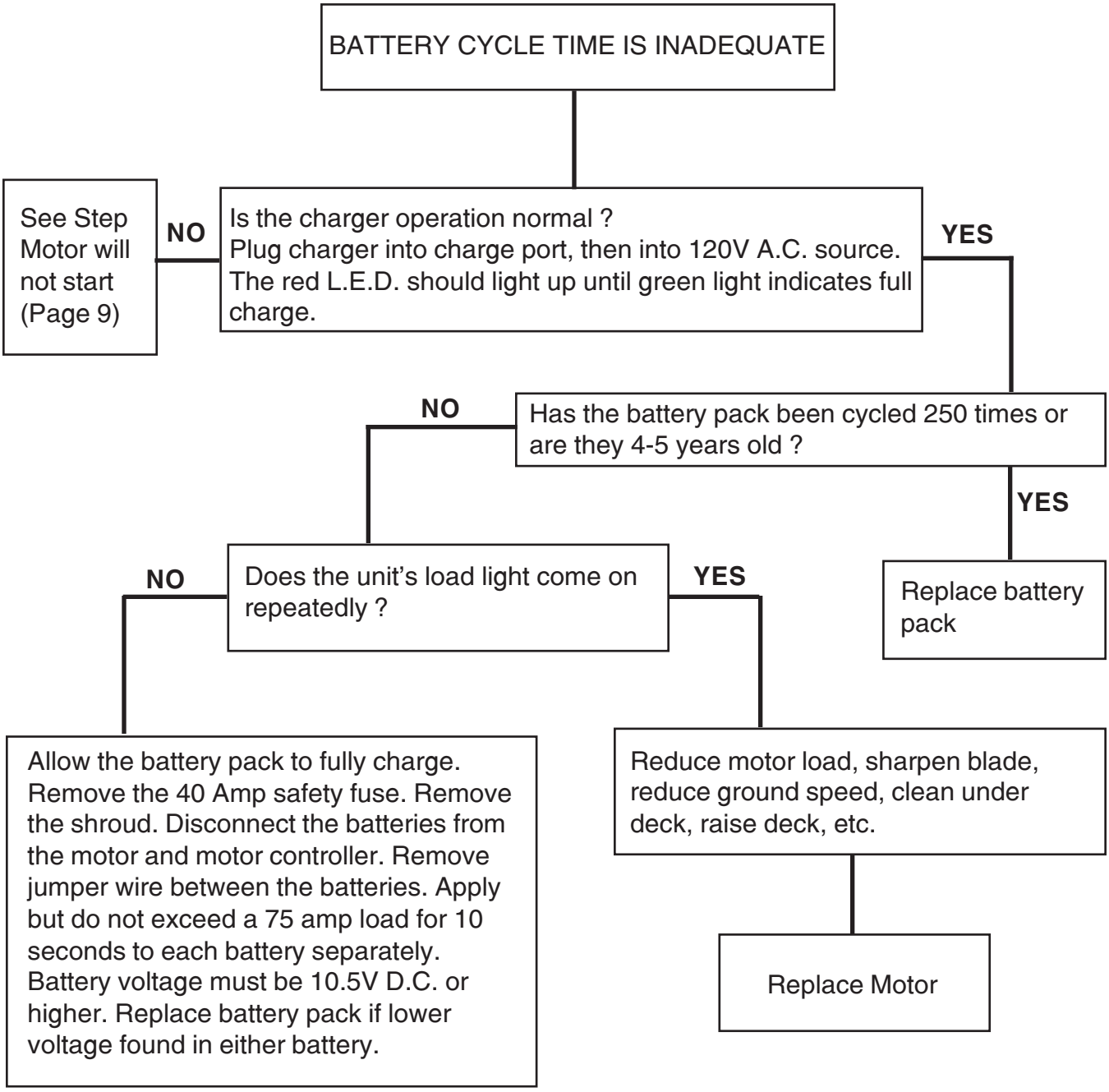

MOTOR STOPS WHILE MOWING
Check the display panel indicator lights - is one on ?
BATTERY
LOAD
Recharge the battery pack
Load light will come on at 28 amp battery draw - if the draw remains at 50 amps for more than 6 seconds the motor controller will shut down the motor. Raise mower cutting height, reduce ground speed, cut only dry grass, or reduce width of cut. Release the operator presence control, depress the control and start switch and continue mowing. Does the motor shut down again ?
YES
Remove the 40 Amp safety fuse
Check for cause of excessive load; wrong blade, sharpen blade, clean the underside of the deck, bent blade or motor shaft.
Does the motor turn over quietly and easily by hand ?
NO
Replace motor
YES
Replace 40 Amp safety fuse. Depress the operator presence control and start switch and continue mowing.
Condition Appears for
No Apparent Reason
Replace Motor Controller

CHART 3



CAUTION: If you choose the option of load testing batteries do not exceed a 70 Amp load. Automotive testers are typically 100-150 Amp load which is excessive and will give a FALSE reading of battery condition. Tecumseh recommends commercially available Motorcycle testers that draw 75 Amps or less draw.

CHART 4

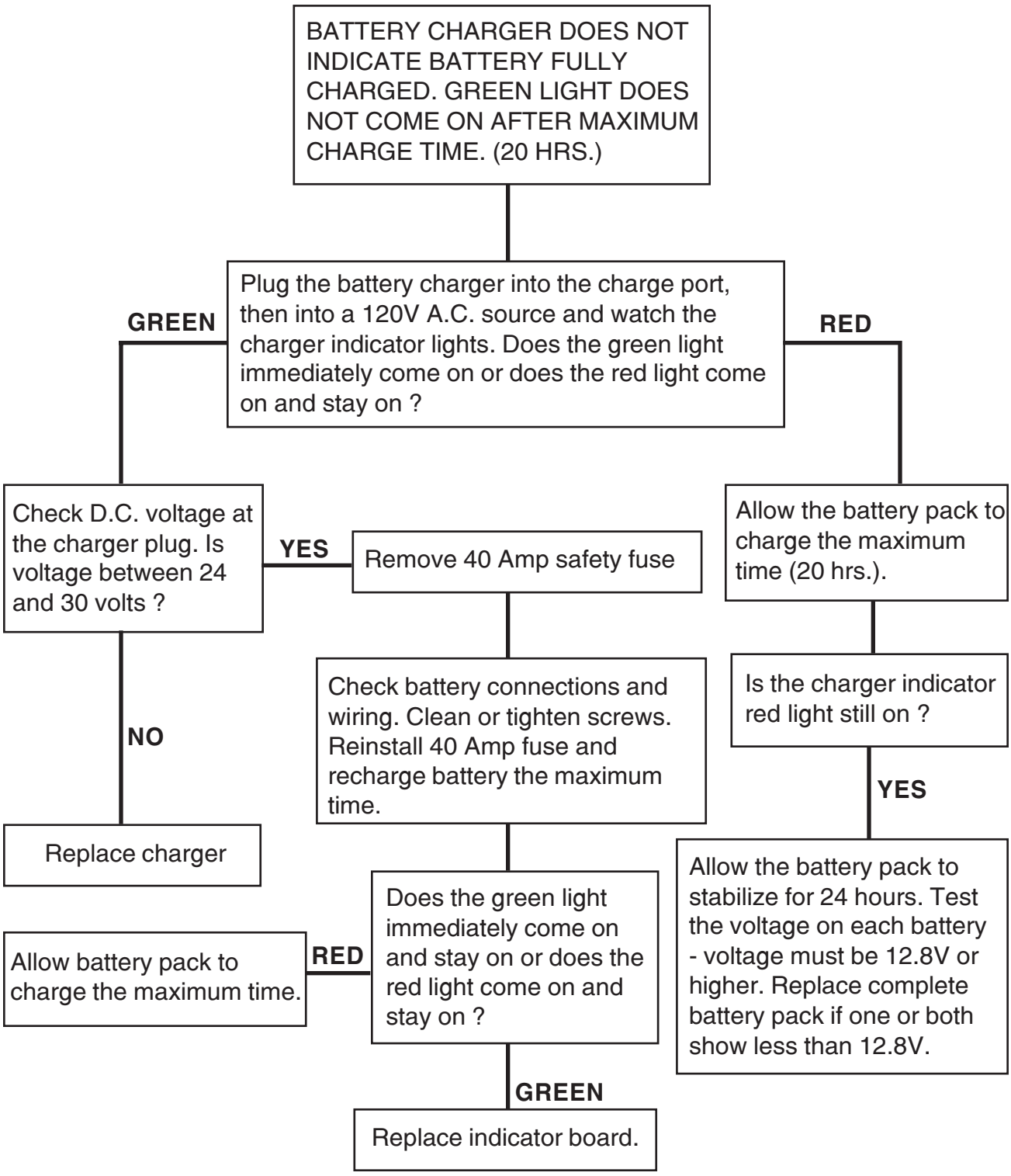

BATTERY CHARGER DOES NOT INDICATE BATTERY FULLY CHARGED. GREEN LIGHT DOES NOT COME ON AFTER MAXIMUM CHARGE TIME. (20 HRS.)
Plug the battery charger into the charge port, then into a 120V A.C. source and watch the charger indicator lights. Does the green light immediately come on or does the red light come on and stay on ?
GREEN
RED
Check D.C. voltage at the charger plug. Is voltage between 24 and 30 volts ?
YES
Remove 40 Amp safety fuse
Allow the battery pack to charge the maximum time (20 hrs.).
NO
Check battery connections and wiring. Clean or tighten screws. Reinstall 40 Amp fuse and recharge battery the maximum time.
Is the charger indicator red light still on ?
YES
Replace charger
Does the green light immediately come on and stay on or does the red light come on and stay on ?
Allow battery pack to charge the maximum time.
RED
Allow the battery pack to stabilize for 24 hours. Test the voltage on each battery - voltage must be 12.8V or higher. Replace complete battery pack if one or both show less than 12.8V.
GREEN
Replace indicator board.

CHART 5

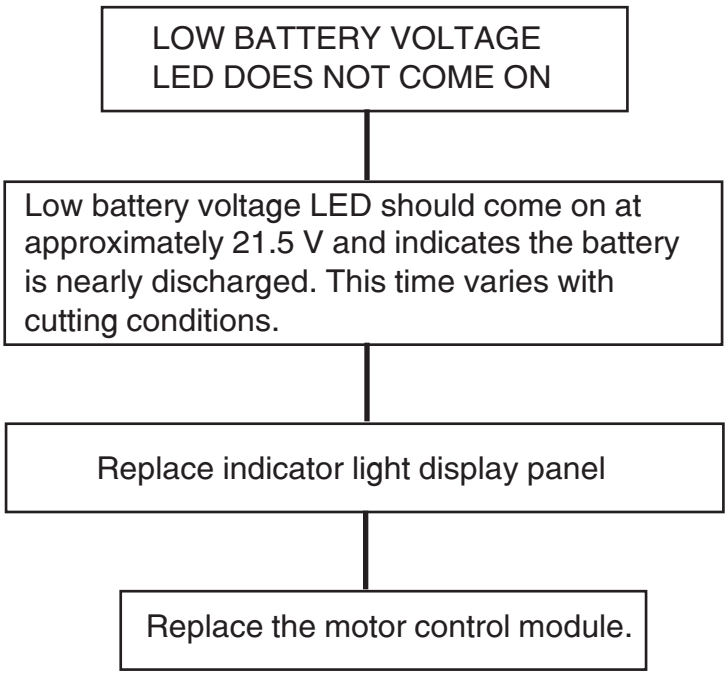


CHART 6

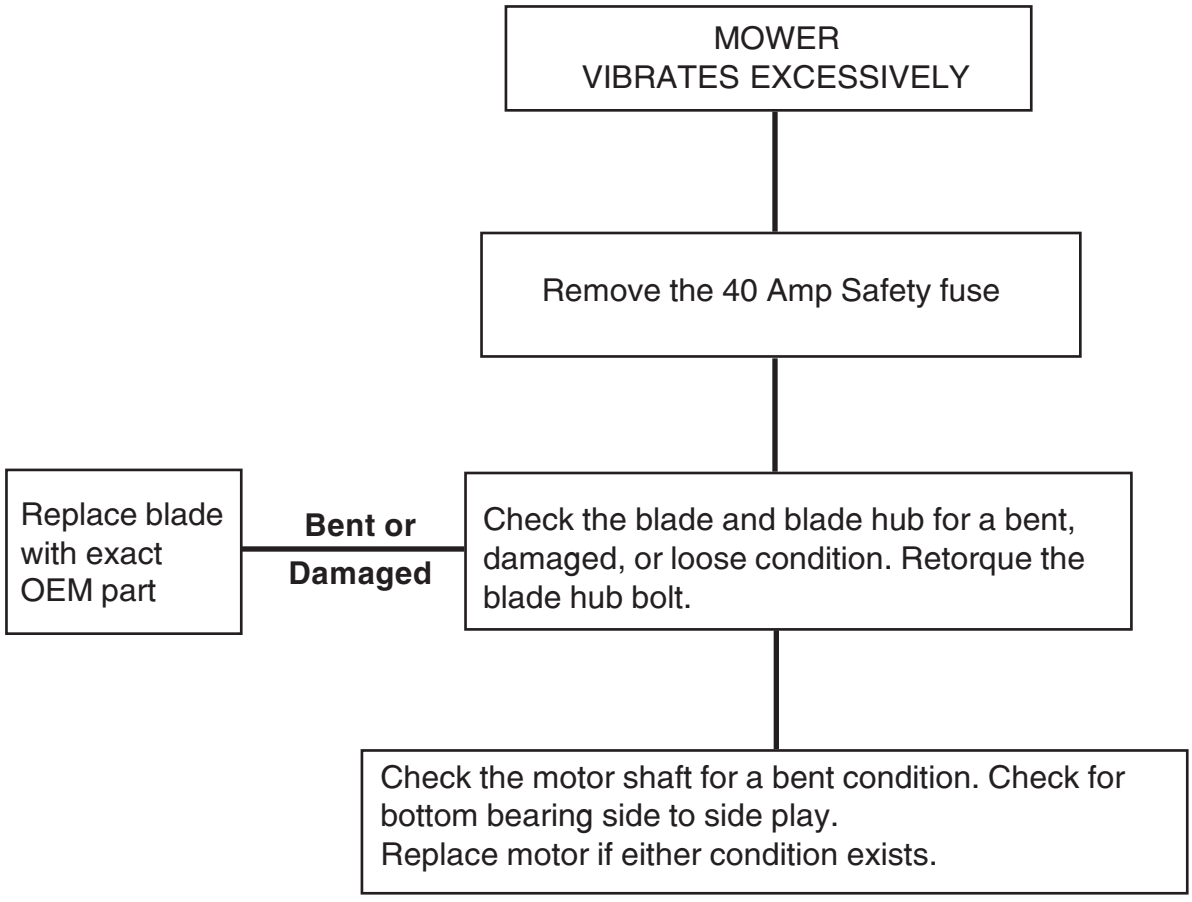


CHART 7

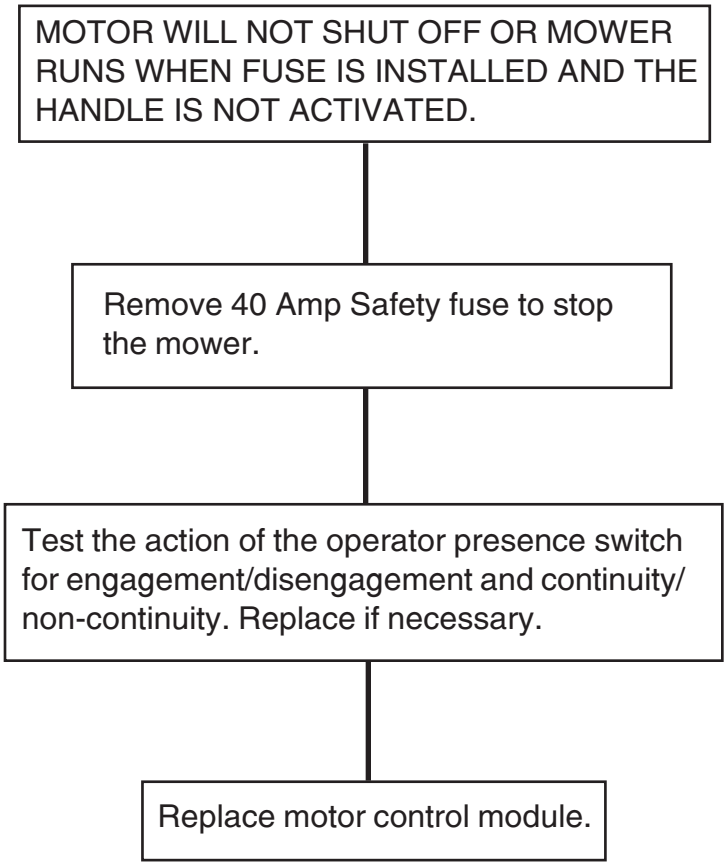


CHART 8

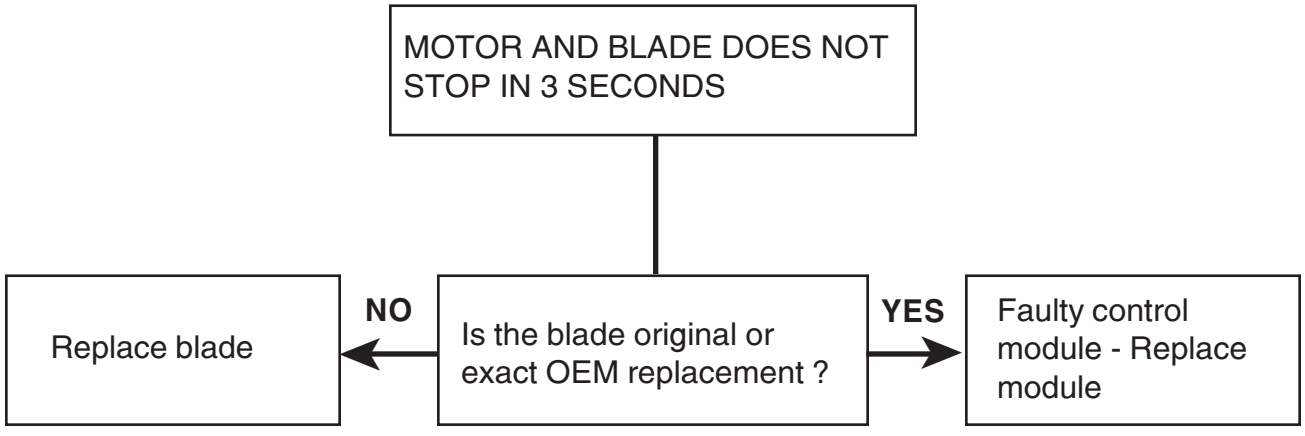
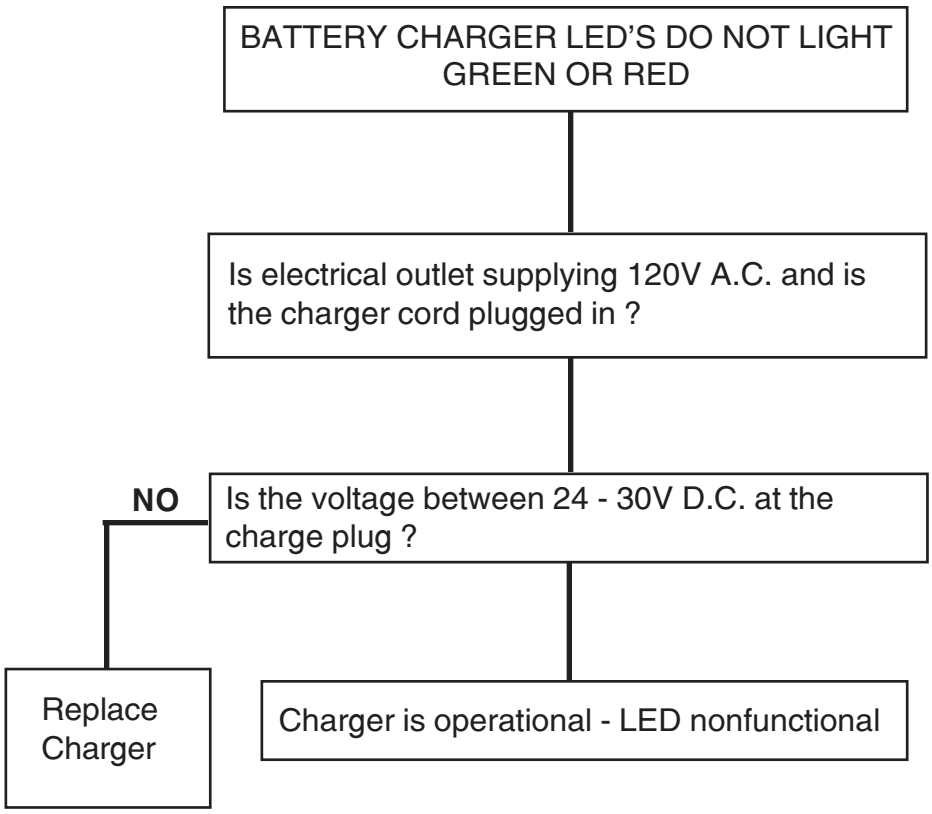


CHART 9


BATTERY CHARGER LED'S DO NOT LIGHT GREEN OR RED
Is electrical outlet supplying 120V A.C. and is the charger cord plugged in ?
NO
Is the voltage between 24 - 30V D.C. at the charge plug ?
Replace Charger
Charger is operational - LED nonfunctional

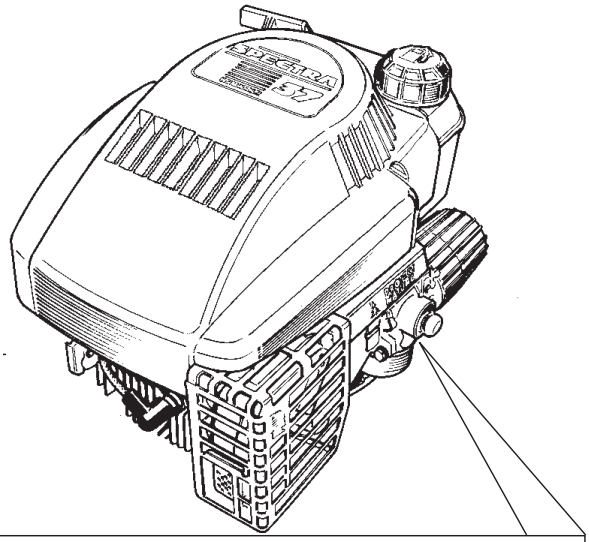
CHAPTER 4 TORQUE SPECIFICATIONS

BATTERY POST SCREWS	15 - 20 inch lbs.	1.7 - 2.2 Nm
CONTROLLER BOARD SCREW	20 inch. lbs.	2.2 Nm
BATTERY BRACKET SCREWS	70-100 inch lbs.	7.8 - 11.2 Nm
SHROUD SCREWS	20 inch lbs.	2.2 Nm

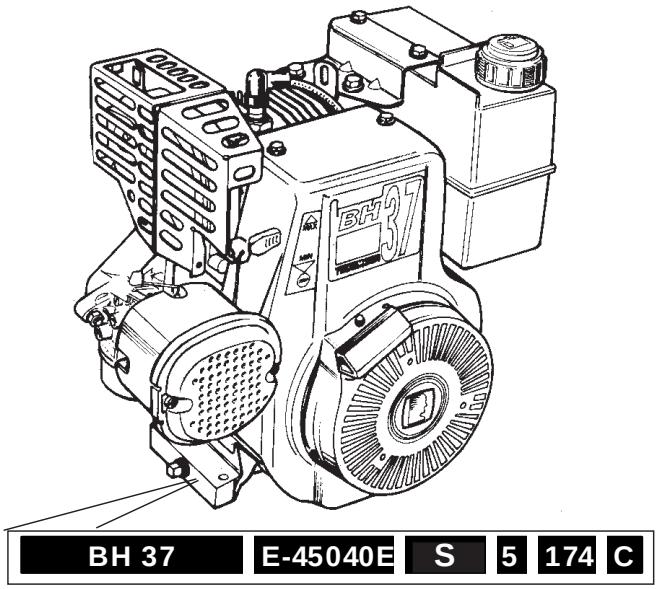
A. FOREWORD

This manual contains information required to service or repair all Tecumseh Italian built engines.
For exploded views of particular engines or component part numbers, refer to the Tecnamotor and Tecumseh Europa Spare Parts Catalogue.
When ordering spares from your authorized Tecumseh Dealer, please quote the entire model and specification number. These numbers are stamped on the engine as shown below.
Always insist on genuine Tecumseh replacement parts.

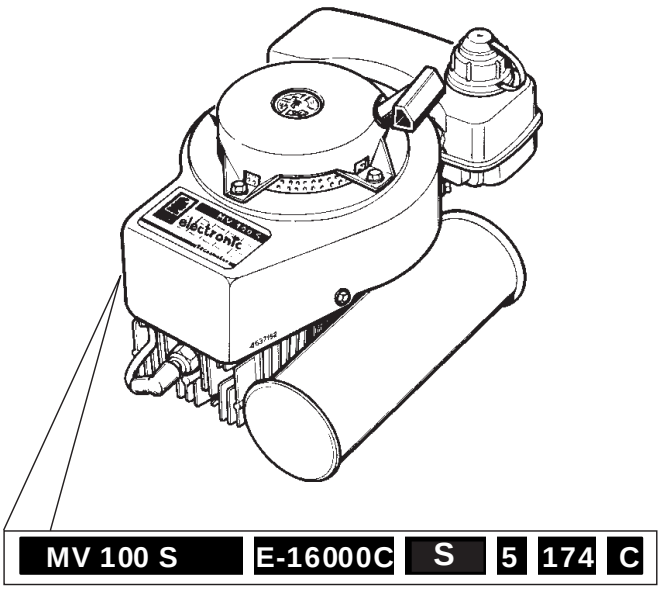
ENGINE CODE



SPECTRA 37	E-38000	S	5	174	A
MODELLO	SPECIFICA	NUMERO DI SERIE	ANNO DI COSTR.	GIORNO DI COSTR.	TURNO



BH 37	E-45040E	S	5	174	C
MODELLO	SPECIFICA	NUMERO DI SERIE	ANNO DI COSTR.	GIORNO DI COSTR.	TURNO



MV 100 S	E-16000C	S	5	174	C
MODELLO	SPECIFICA	NUMERO DI SERIE	ANNO DI COSTR.	GIORNO DI COSTR.	TURNO

SERVICE BULLETIN

Subject: 2-stroke engines - running in and oil requirements

Tecumseh now requires that all 2-stroke engines with a recommended fuel/oil mix greater than 25 : 1 should be run with the first tank of fuel mixed at double the recommended ratio. This gives increased protection during the piston ring seating process.

We also highly recommend the use of Tecumseh smokeless oil (part number 26980003), which is an extremely high quality and environmentally friendly product.

The use of alternative oils which may be of a lower quality will invalidate the warranty.

B. CHECK-UP BEFORE REPAIR

1. GENERAL

If a customer complains of an engine “non-starting”, it is a good rule to make an accurate check by first pulling the starter to ensure that there are no internal breakages. Ascertain that the correct fuel/oil mixture is being used. (2-stroke engines).
Check the carburettor and governor controls, remote control, air cleaner, spark plug, oil level (4-stroke engines). Drain and refill fuel tank with fresh, clean fuel.
For 2-stroke engines, AV and MV, use a 4% (25:1) or 2% (50:1) petrol/oil mixture. Refer to the operator's manual for correct mix for each engine.

USE CLEAN FRESH FUEL FOR TESTING

NOTE *- If engine is fitted with remote control and choke, check that:*

- *With the lever in the choke or start position, the choke is fully closed and the throttle open. This is important for starting from cold.*
- *With the lever in the max position, make sure that the throttle is fully open. If full throttle is not being attained, maximum power will not be obtained from the engine.*

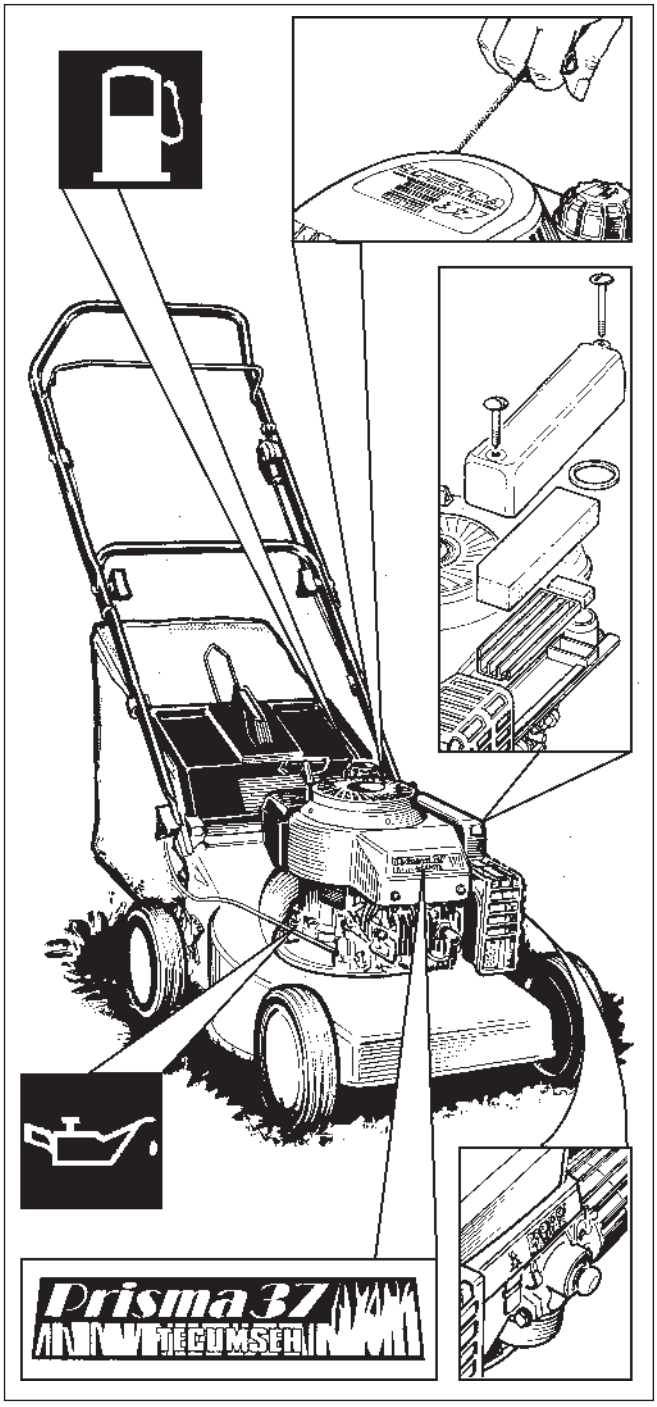


Fig. 1

2. RECOIL STARTER (CHOKE)

a - Move control lever (Fig 2) on engine or remote control (Fig 2) on equipment to choke or start.
b - Operate mower control to release engine brake (if any).
c - Pull starter handle (Fig 2-2) with a quick firm action. Allow the rope to recoil back into its housing whilst retaining grip on handle.
d - Repeat preceding instructions B and C until engine starts. Then gradually move control lever on engine or remote control on equipment away from choke or start to max position.

***NOTE** - If engine fires, but fails to start, move control lever on engine or remote control on equipment to MAX position and repeat preceding instructions B and C until engine starts.*

***NOTE** - Warm engine normally starts without choking. Move control lever (Fig 2) on engine or remote control (Fig 2) on equipment to MAX position; then follow 'b' 'c' and 'd' instructions.*

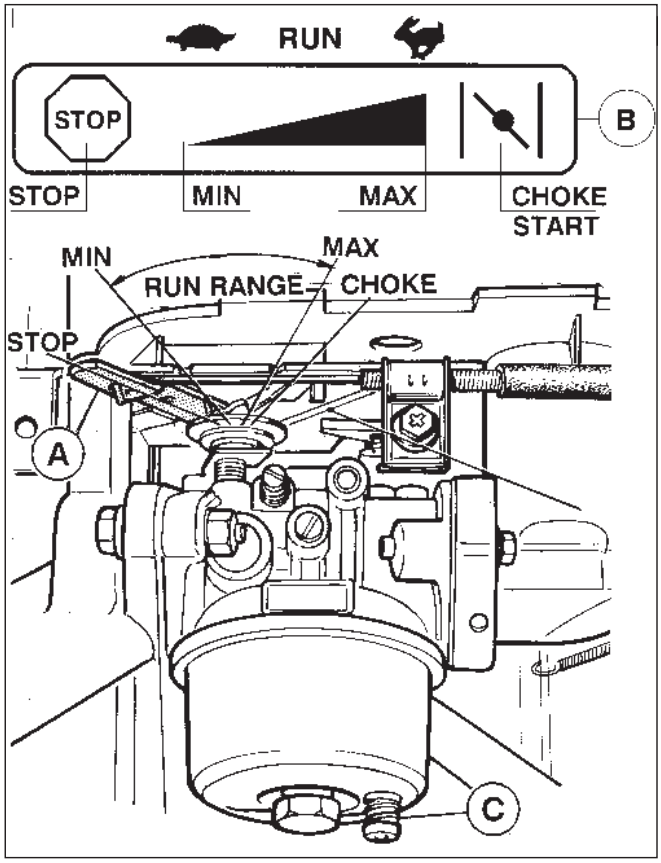


Fig. 2

RECOIL STARTER (PRIMER)

a - Move control lever (Fig 2-1) to "FAST" or "START" (see equipment manufacturer's instructions).
b - Push primer (Fig 2-1) three (**3**) times. Wait about two (**2**) seconds between each push. In cold weather (55F/ 13°C or below) push five (**5**) times.

***NOTE** - Do not use primer to restart a warm engine*

c - Operate mower control to release engine brake (if any).
d - Grasp starter handle (Fig 2-2) and slowly pull rope out until a slight resistance is felt. Let rope rewind slowly. Then pull rope with a rapid full arm stroke.

***NOTA** - If engine fails to start after three (3) pulls, repeat instructions 'b', 'c' and 'd'.*

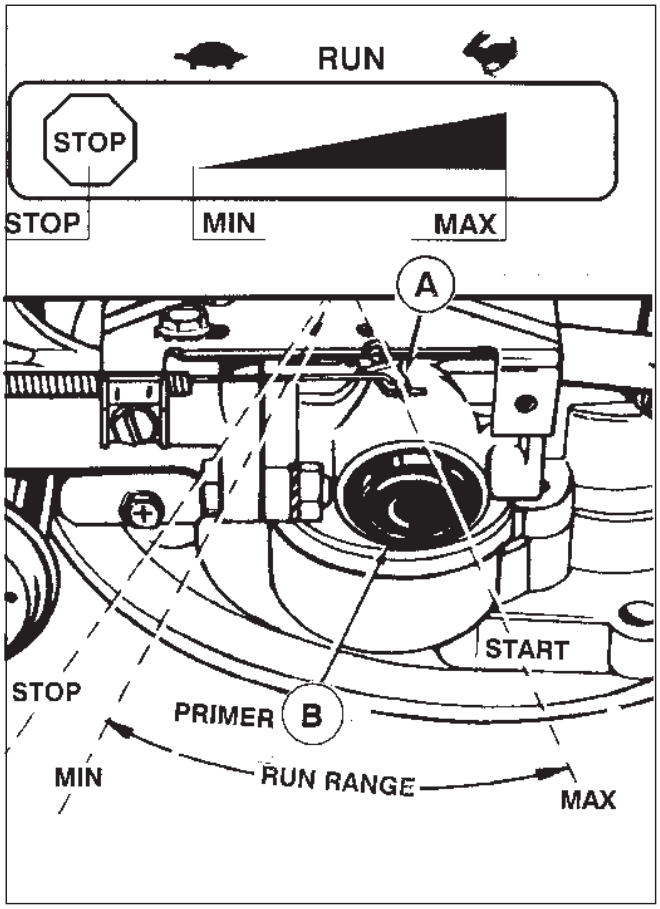


Fig. 2-1

RECOIL STARTER (PRIMER FIXED SPEED)

a - Push primer (Fig 2.1) three (**3**) times. Wait about two (**2**) seconds between each push. In cold weather (55°F/13°C or below) push five (**5**) times.

NOTE *- Do not use primer to restart a warm engine.*

b - Operate mower control to release engine brake.

c - Grasp starter handle (Fig 3) and slowly pull rope out until a slight resistance is felt. Let rope rewind slowly. Then pull rope with a rapid full arm stroke.

NOTE *- If engine fails to start after three (**3**) pulls, repeat instructions 'a','b' and 'c'.*
If the engine starts and runs satisfactorily, the customer should be instructed on starting and maintenance procedure, otherwise continue engine fault check.

ELECTRIC STARTER (Fig 2-2)

To start engine with electric start option, follow the above procedure except use the key to activate the starter motor.

NOTE *- Ensure engine has stopped rotating before re-engaging the starter motor.*

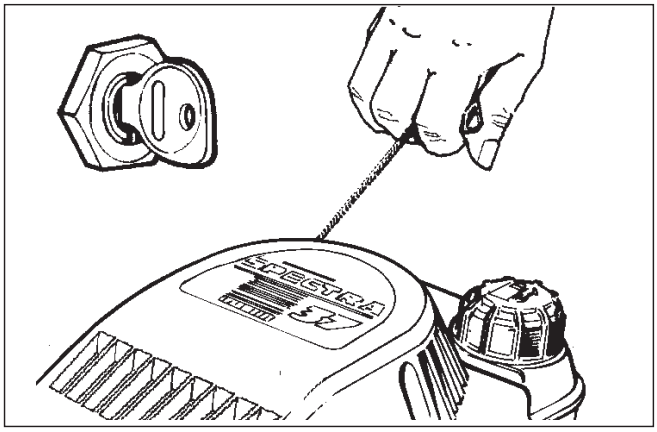


Fig. 2-2

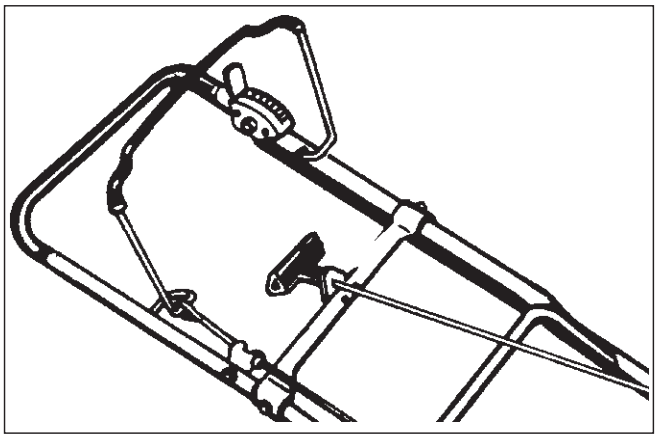


Fig. 3

3. CHECK-UP

A general systematic check can usually locate the fault in a matter of minutes. The following five points cover this operation:

- Starter
- Compression
- Ignition
- Carburetion
- Equipment

a) STARTER

Pull starter and ensure that the starter dog engages and turns the engine. If not, see chapter **C**, Starter Repair Methods, ensure that the rope has not been shortened, thus reducing the number of starting revolutions. The compression may also be checked by this operation.

b) COMPRESSION

If compression is poor, check for:
- Flywheel slipping on crankshaft.
- Loose spark plug.
- Loose cylinder head bolts.
- Damaged cylinder head.
- Warped cylinder head.
- Insufficient tappet clearance (4-stroke engines).
- Broken connecting rod.
- Loose or worn crankshaft seals (2-stroke).

If engine is fitted with compression release, it is necessary to remove cylinder head and check components visually if a leak tester is not available.

***NOTE** - With the compression leak tester faults can be found easily within minutes (Fig 4).*

c) IGNITION

Remove spark plug and connect a new one to the HT lead, earth plug body to cylinder head, turn the engine and check that a strong spark occurs between the plug electrodes. If no spark occurs see chapter **E** for service and repair instructions.
If spark occurs, fit new spark plug and attempt to start engine. Remember that spark failure can also be due to such faults as:
- Broken flywheel key.
- Crankshaft bearing worn, thus preventing cam from opening (breaker point ignition).
- Incorrect air gap setting (electronic ignition).

***NOTE** - When using the compression leak tester (Fig 4) and the ignition tester (Fig 5), faults may quickly be located. If no fault can be found, the defect must be within the carburation system or the equipment.*

Fig. 4

Compression Leak Tester. Tests for leakage of valves, rings and cylinder head in situ.

Fig. 5

Tests standard ignition system in situ. Solid state units must be removed for test.

d) CARBURATION

After having drained and cleaned fuel tank, refill with fresh fuel and check (float carburettors) that fuel flows from the bowl when the drain valve is pressed.
On diaphragm carburettors without primer, remove high speed jet and operate diaphragm. Fuel should then flow from jet seat.
If fuel does not flow, check fuel line and filters, re-set carburettor as in chapter **G** and carry out starting procedure.
If engine still fails to start, remove sparking plug and pour a small quantity of fuel into the cylinder, replace sparking plug and attempt to start. If engine fires a few times it may be assumed that the carburettor is at fault. Check completely the carburettor as in chapter **G**.

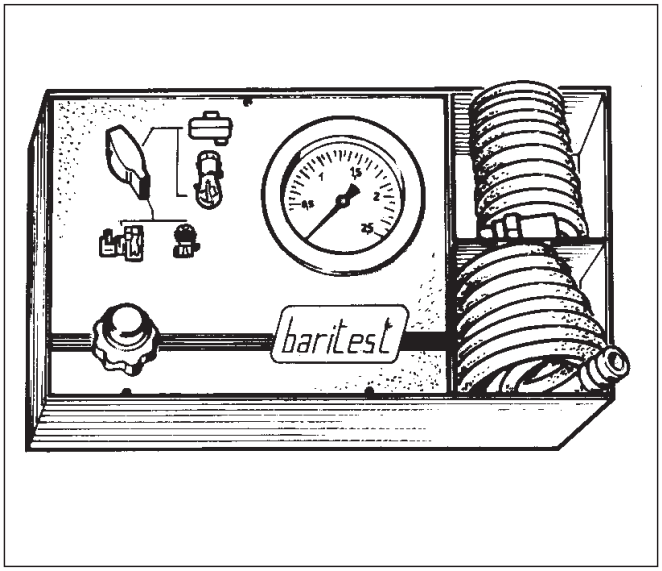


Fig. 4

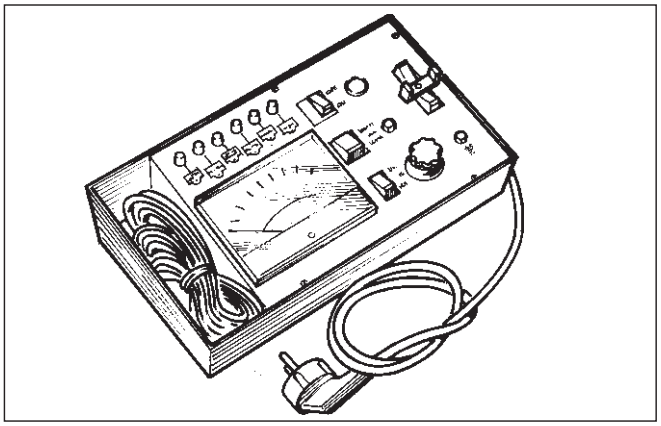


Fig. 5

***NOTE** - On 2-stroke engines a broken or damaged reed plate will prevent starting.*

e) EQUIPMENT

What may initially appear to be an engine fault, such as a starting difficulty or engine vibration, may possibly be the fault of the equipment rather than the engine.
Owing to the great number of machines in use, it is not possible to list these separately. The following is a list of the more common problems:

Hard Starting, Kickback, Failure to Start

- Loose blade. The blade must be tight on shaft or adaptor.
- Loose belt. A loose belt, as with a loose blade, can cause a backlash effect which will counteract the engine cranking effort.
- Starting under load; ascertain that the equipment is disengaged if the unit has a heavy starting load.
- Check remote control assy for proper adjustment with the lever **A** in choke or start position. The carburettor choke should be fully closed (Fig 6).
- Grass cuttings building up under deck may cause difficulties. Clean deck.
- Check that grass collectors are empty. An overfilled collector could cause engine malfunction.

Vibration

- Damaged or out of balance blade
- Damaged or out of balance impellor
- Loose mounting bolts, engine to deck
- Worn blade mounting; replace if mounting allows blade to move causing unbalance.

Noise

- Cutter blade coupling or pulley, an oversize or worn coupling can result in knocking, particularly under acceleration. Check for fit and tightness.

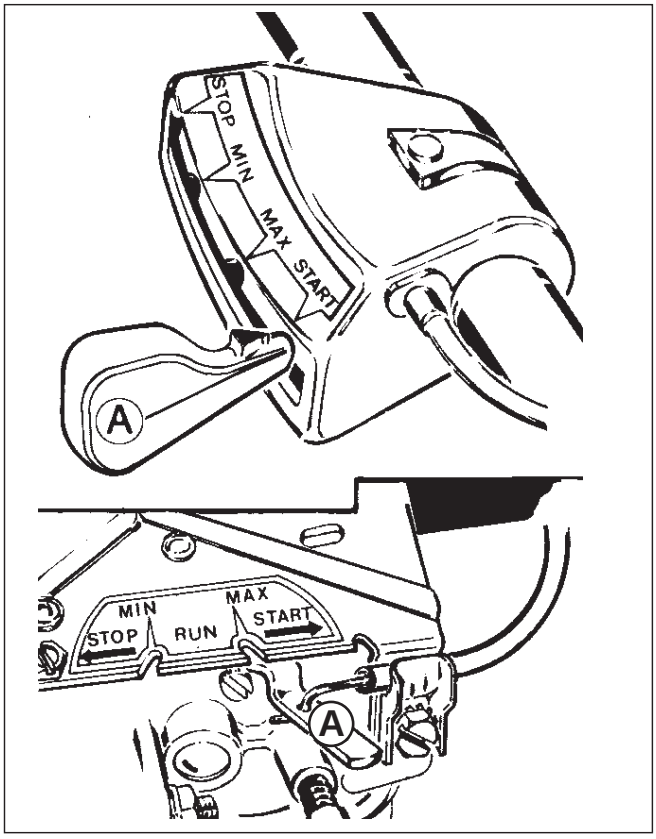


Fig. 6

C. STARTER

NON-STYLIZED STARTERS LAV - BV - BVS - VANTAGE - HBL - BH - AV - MV

1. RECOIL STARTER

In the event of starter failure, remove the unit from the engine and check the following items:

- That dog **A** (Fig 1) protrudes when the rope is slowly pulled. If the rope cannot be pulled, check the retainer hub locking screw **B** for correct tightening torque, which should be kgm 0.5 - 0.6 (45/55 inch lbs).
- If, after correct tensioning of screw **B** (Fig 1), the dog does not function, disassemble the starter as follows, referring to exploded view shown in Fig 2.

Fig 2 - Exploded View Standard Top Starter

1. Retaining Screw
2. Retainer
3. Brake Spring
4. Dog
5. Dog Return Spring
6. Rope Pulley
7. Rewind Spring
8. Starter Housing
9. Rope
10. Handle

To disassemble starter

Release spring tension. Slightly extend rope and lock pulley . Untie knot or remove staple securing handle and release pulley (Fig 3).

- Remove centre locking screw.
- Remove retainer hub, brake spring and dog.
- Remove dog return spring **B**, bearing in mind its position for correct replacement. (Fig 6).
- Remove pulley and spring container assembly.
- Once the damaged parts have been replaced, lubricate spring container with soft grease (Fig 4) and proceed with reassembly.

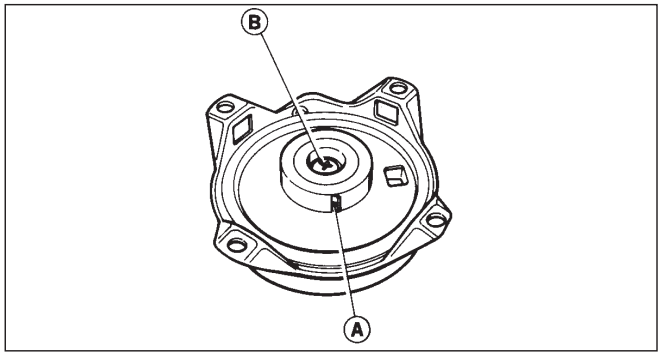


Fig. 1

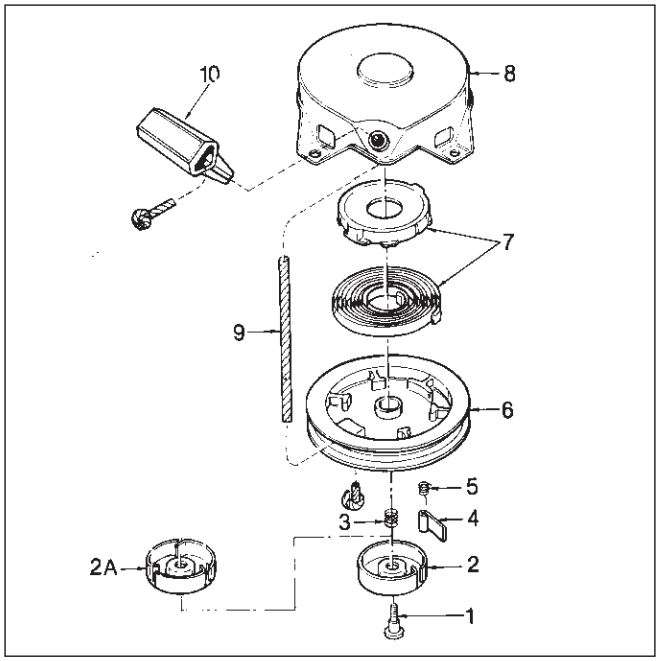


Fig. 2

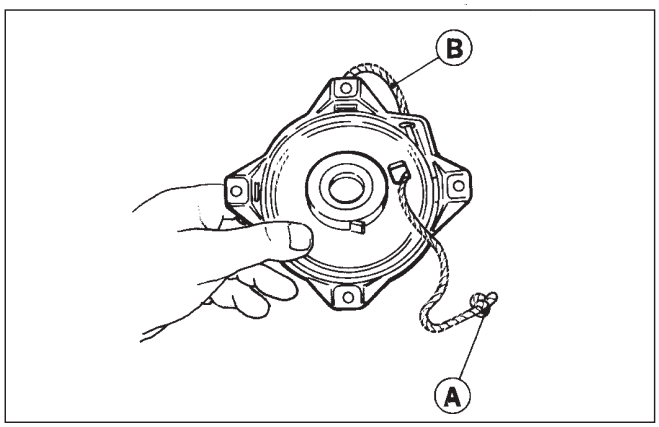


Fig. 3

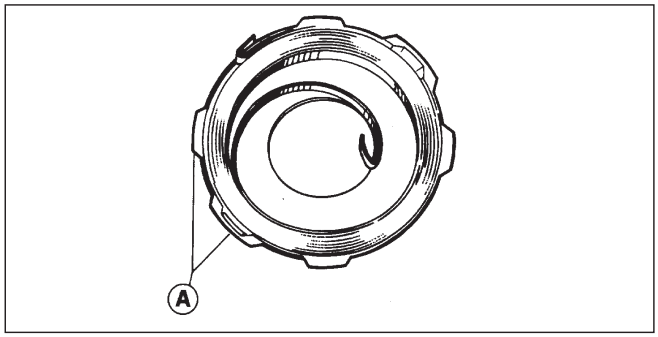


Fig. 4

To reassemble starter

- Accurately position spring container on pulley (Fig 5).
- Reposition the pulley assembly into container lubricating shaft and bushing of plastic pulley.

Fig. 5

A. Spring Engagement
B. Spring Disengagement

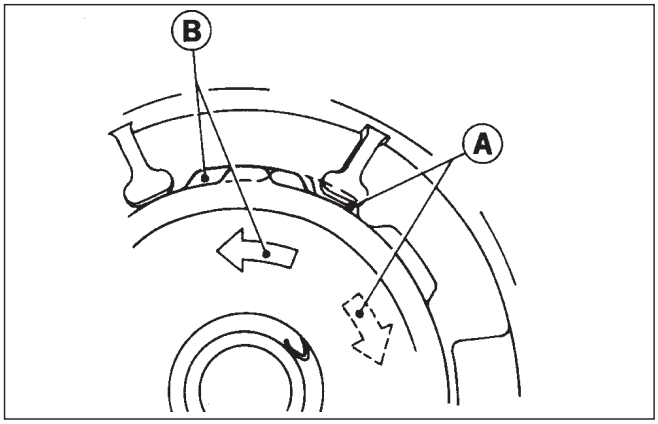


Fig. 5

- Refit retainer spring, place dog and brake spring in position (Fig 6).
- Accurately position retainer hub and secure with the screw.
- Re-tension recoil spring.
- Wind pulley clockwise until tight, then allow to unwind until the hole in the pulley lines up with the eyelet in the housing. Lock pulley. Install rope and handle. Tie knot in rope to secure to pulley. Release pulley. (Fig 3).
- After reassembling starter, always make sure that by pulling the rope slightly the starter dog operates, and that the rope can be fully extended. When released, the handle should be held firmly against the starter housing.
- The correct tension of the spring is obtained after approximately 5 turns of the pulley.

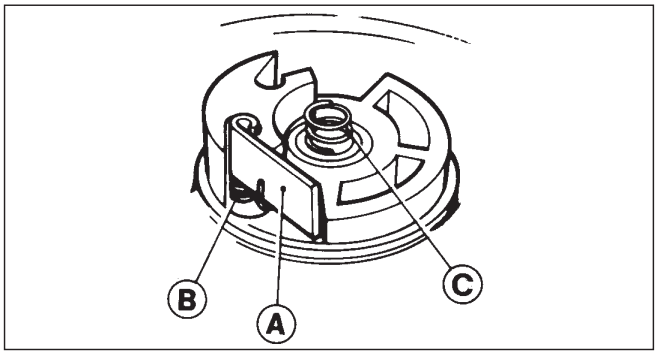


Fig. 6

2. SIDE MOUNTED STARTER HORIZONTAL ENGAGEMENT TYPE (LAV, BV)

The side mounted starter was developed for use on machines in which engines are mounted in a low position. (Fig 7).

Fig 8 - System of Engagement

A. Flywheel gear
B. Pulley gear

The starter operates the engine by engaging a gear into teeth on the underside of flywheel. (Fig 8). When the engine starts, the flywheel speed disengages the starter gear.

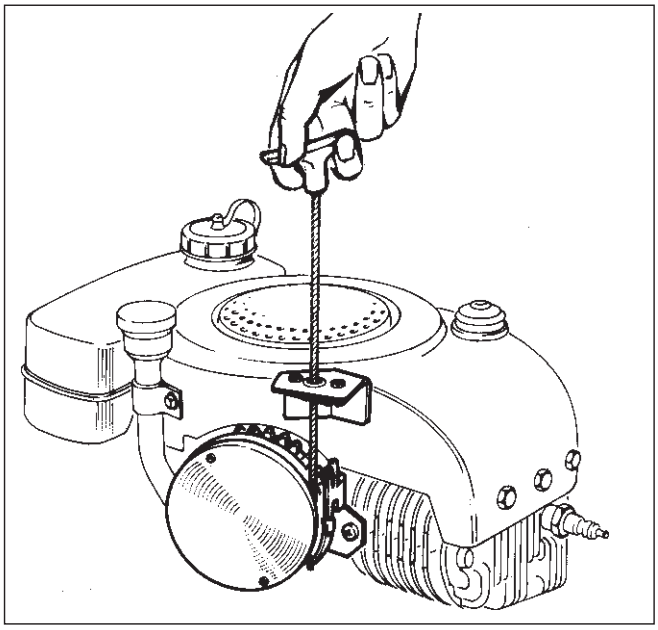


Fig. 7

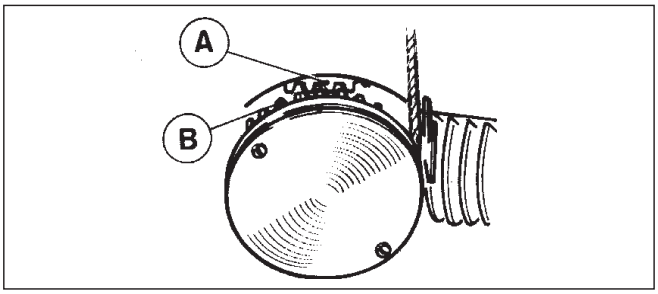


Fig. 8

Disassembly

Disassemble starter as follows. Refer to Fig 9.

- Release main spring tension (**5**) by removing the handle and sliding the rope (**12**) out of the rope clip (**16**). (Fig 10).
- Remove rope clip and replace if necessary.
- Remove the two screws (**1**) and spring cover (**2**). The spring (**5**) may be replaced at this point without further disassembly.
- Carefully remove old spring and place new spring complete with keeper in position and push spring into place in the container. (Fig 11).
- For further disassembly remove central fixing screw (**3**) and remove pulley assy. (Fig 12).
- Remove brake spring (**10**) and washer (**8**) - only early type starters, and separate gear (**7**) from pulley (**6**). If necessary, replace rope (**12**) referring to Fig 13.
- Untie knots **A** and remove rope from handle (**14**) and pulley (**6**).
- Fit a new rope of the same dimensions and retie knots.
- Check all parts before reassembly.

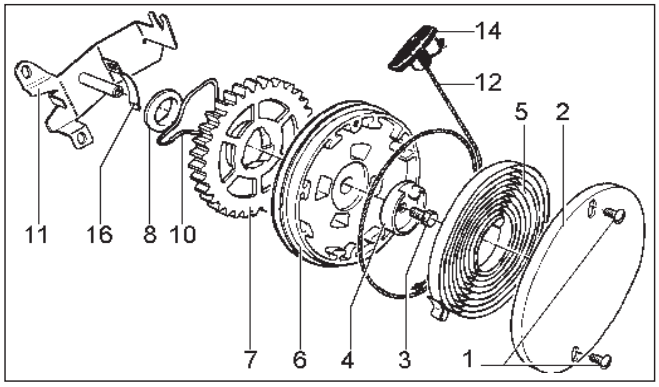


Fig. 9

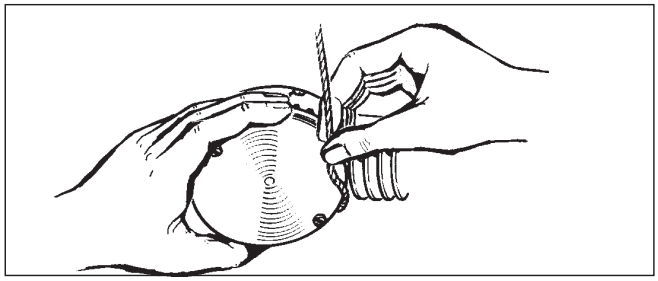


Fig. 10

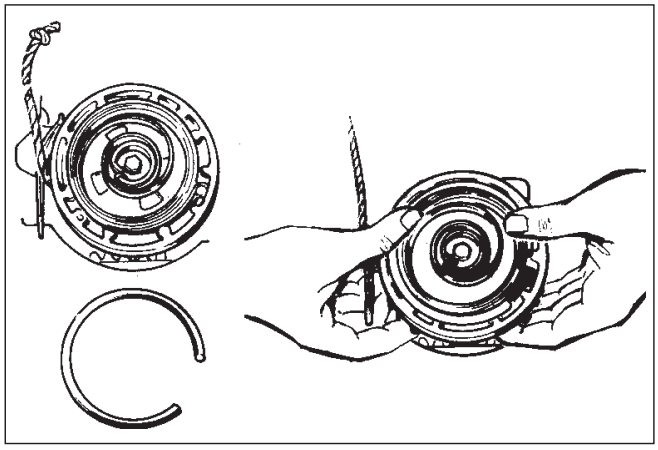


Fig. 11

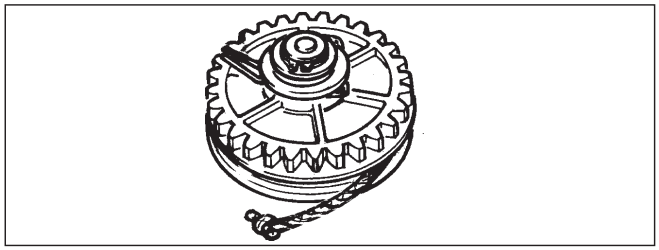


Fig. 12

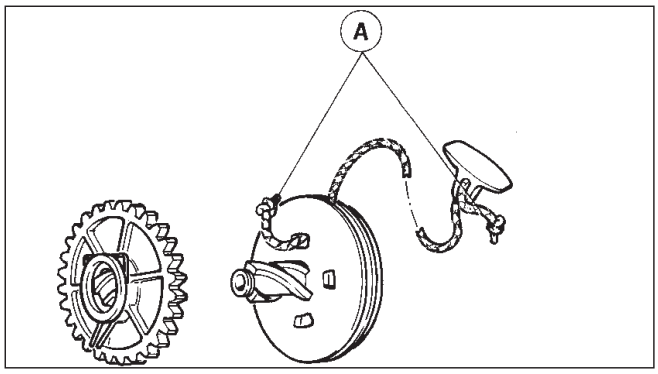


Fig. 13

Reassembling

- Refit gear (**7**) on pulley (**6**).
- Wind the rope onto the pulley and fit the gear and pulley assy onto the bracket pin (**11**).
- Secure the assy with spring hub (**4**) and screw (**3**) (Fig 14).
- Fit re-wind spring.
- Fit new brake spring (**10**) in its seat (Fig 15) being careful to fit the side extension of the spring on its seat.
- Refit the spring cover and secure with its two screws.

***NOTE** - Originally the screw (3) (Fig 14,3) had a right hand thread. Late type left hand thread which is indicated by 'S' stamped on head.*

- Pre-tension the spring by completely winding the rope onto the pulley in the direction of the arrow. (Fig 16).
- When the rope is fully wound give the pulley one more complete turn to obtain correct spring tension. (Fig 17).
- The correct tension of the spring is obtained by approximately 2 turns of the pulley.

***NOTE -** Only the main spring and spindle must be greased. Do not grease the brake spring etc, in order to prevent the accumulation of dust.*

Fault checking.

- When the rope does not recoil check:
  The spring hub (4), if this rotates, tighten the centre screw (**3**). If the centre pin is loose, replace the bracket (**11**).
- When the gear does not engage, check:
  The distance between the gear and flywheel teeth should not be greater than 1.5 mm (1/16") (Fig 18). To adjust, slacken clamp screws and adjust to correct distance, retighten screw; if the brake spring is a loose fit, replace and check the breaking action on the gear.
- Pull the starter rope and check that the rope clip is not loose and that the rope is of the correct length and diameter.

Refitting to engine

The distance between the gear teeth and the flywheel teeth must be 1.5 mm (1/16"), the bracket mounting holes are elongated to provide this adjustment (Fig 18).

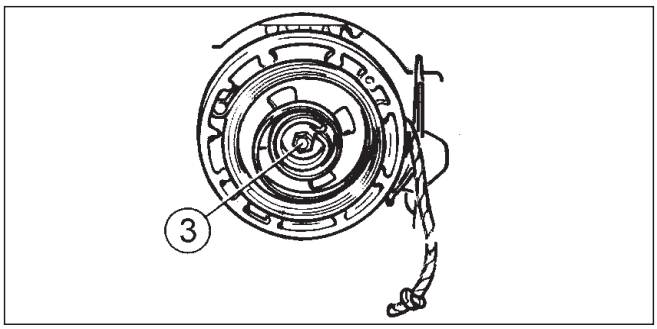


Fig. 14

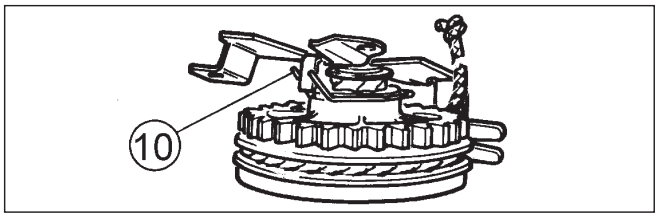


Fig. 15

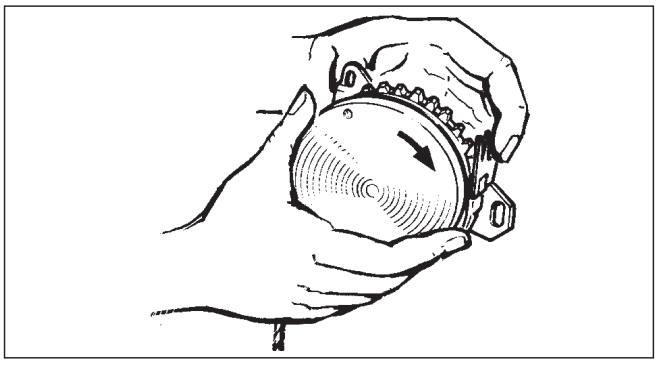


Fig. 16

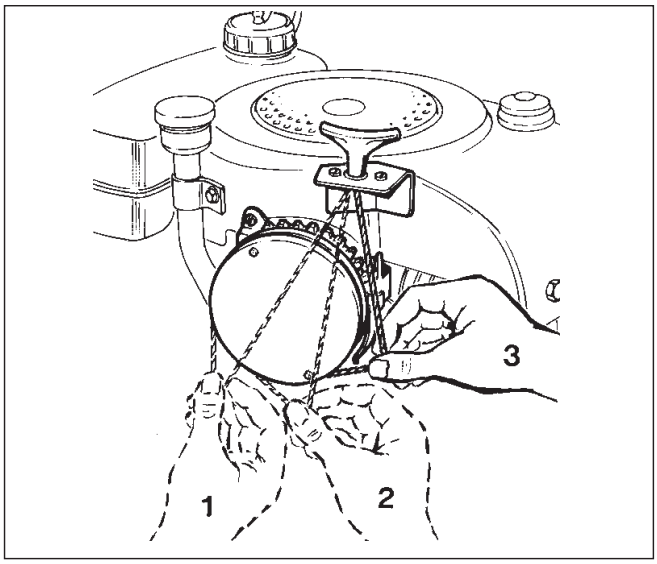


Fig. 17

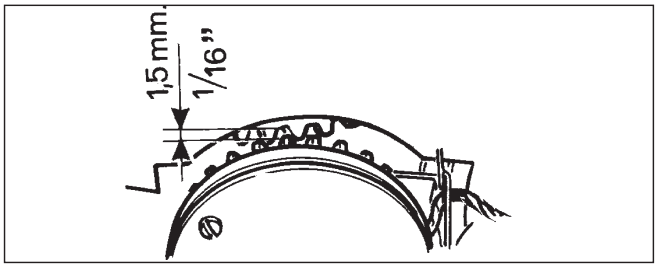


Fig. 18

3. SIDE MOUNTED STARTER VERTICAL ENGAGEMENT USA TYPE

***NOTA** - Alternative type starter above may also be fitted.*

Disassembly:

- Before dismantling, the recoil spring must be locked by inserting pin **C.** (Fig 20).
- Next remove taper pin as per Fig 21.
- Remove centre pin by means of a drift and hammer.
- The spring/gear assy may now be removed. (Fig 2). Remove locking pin (Fig 20-**C**) and slowly release spring.

To replace:

- **Spring:** The new spring is supplied complete with container and new taper pin, the old pin should never be re-used.
- To detach rope, remove clip **A** (not to be used again). (Fig 23).

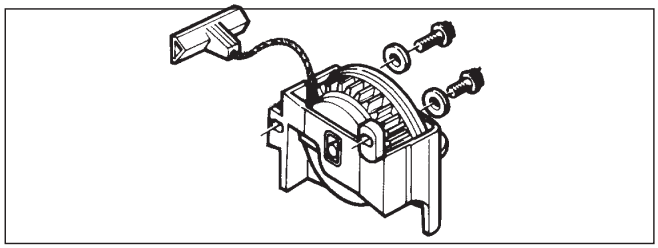


Fig. 19

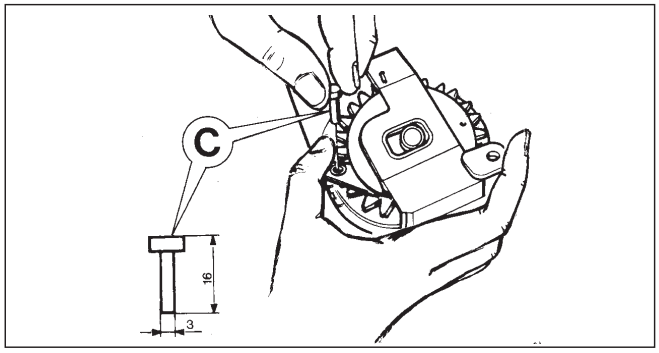


Fig. 20

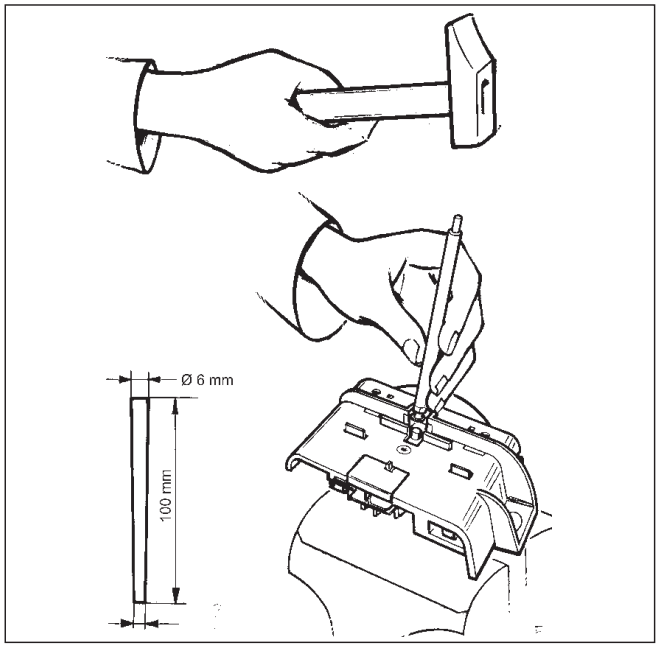


Fig. 21

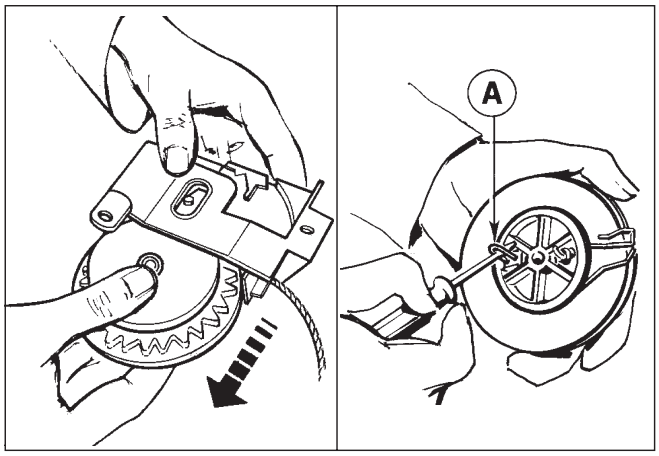


Fig. 22

Fig. 23

Assembly

- To fit new rope, thread end through hole in gear and knot.
- Rewind rope as per Fig 24.
- Place spring on gear and preload two turns. Lock by inserting locking pin. (Fig 25).
- The assembly can now be fitted into the body paying particular attention to position of the rope **C** and the brake spring **M.** (Fig 26).

Fig 26. Correct assembly of rope

C. Rope passage
M. Spring brake

- Replace taper pin and remove locking pin. Checking operation of starter.
- The gear should now move up and down the slot when the rope is pulled and released. (Fig 27).

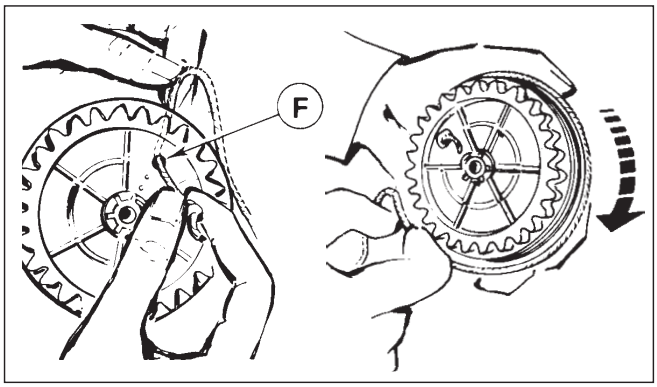


Fig. 24

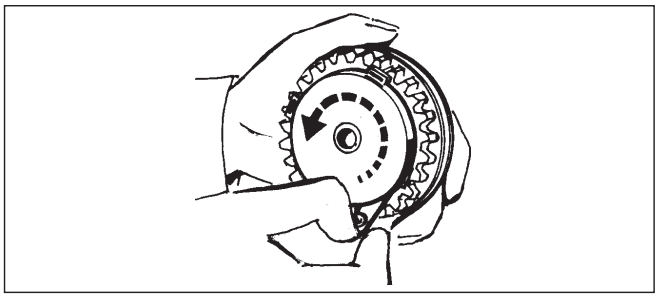


Fig. 25

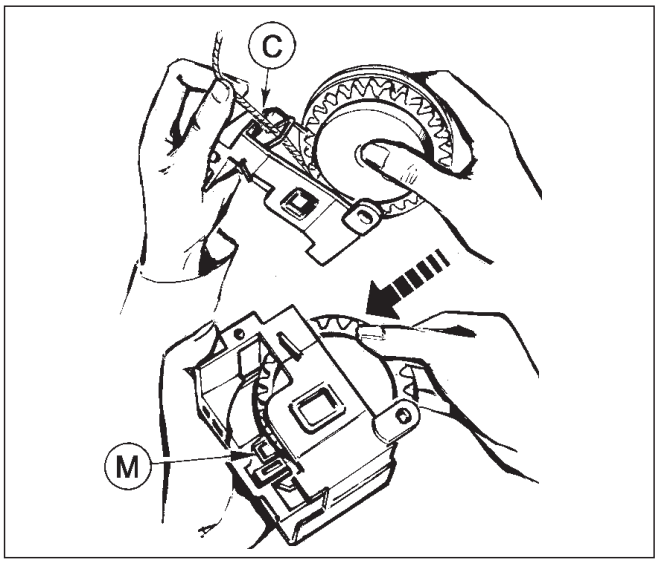


Fig. 26

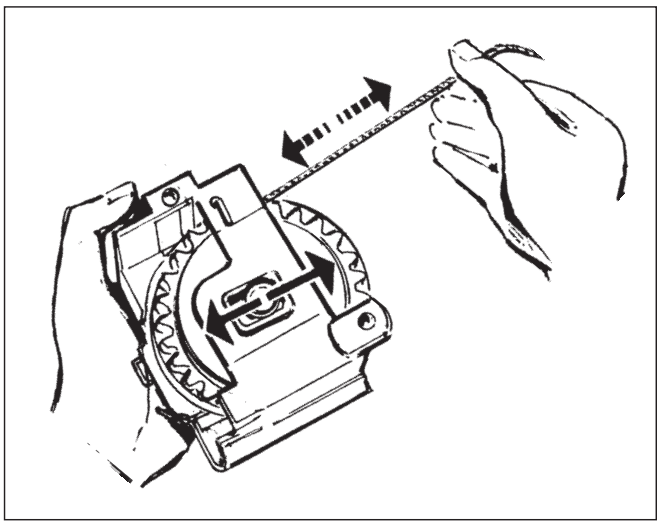


Fig. 27

4. A - STYLIZED RECOIL STARTER (Fig 28-A) VANTAGE, PRISMA, SYNERGY, BH, SPECTRA & FUTURA

B - INTEGRAL RECOIL STARTER (Fig 28-B) VANTAGE & PRISMA Index Figs 28A & 28B.

1. Retaining Pin
2. Washer
3. Pawl Retainer
4. Washer
5. Brake Spring
6. Starter Dog
7. Dog Spring
8. Rope Pulley
9. Rewind Spring
10. Cover
11. Housing (28A) Shroud Assy (28B)
12. Rope
13. Handle

Disassembly procedure

1. After removing the starter assembly from the air conveyor, release the tension on the rewind spring by removing handle and allowing rope to feed back into starter housing.
2. Place a ¾" (19 mm) deep reach socket inside the retainer pawl. Set the rewind on a bench supported on the socket.
3. Using a 5/16" (8 mm) roll pin punch, drive out the centre pin.
4. All components that are in need of service should be replaced.

CAUTION ! *REWIND SPRING IS NOT IN A CANISTER. Care must be used when handling the pulley containing spring because the rewind spring and cover is held by the bosses in the cover.*

Assembly procedure

1. Reverse the above listed procedure keeping in mind that the starter dogs with the dog springs must snap back to the centre of the pulley.
2. Always replace the centre pin with a new pin upon reassembly. Also place the two new plastic washers between the centre leg and retainer pawl.
   Discard old plastic washer. The new plastic washers will be provided along with the new centre pin.
3. Check retainer pawl. If it is worn, bent or damaged in any manner, replace upon reassembly.
   Tap the new centre pin in until it is within 1/8" (3 mm) of the top of the starter.

CAUTION ! *Driving the centre pin in too far will cause the retainer pawl to bend and the starter dogs will not engage the starter cup.*

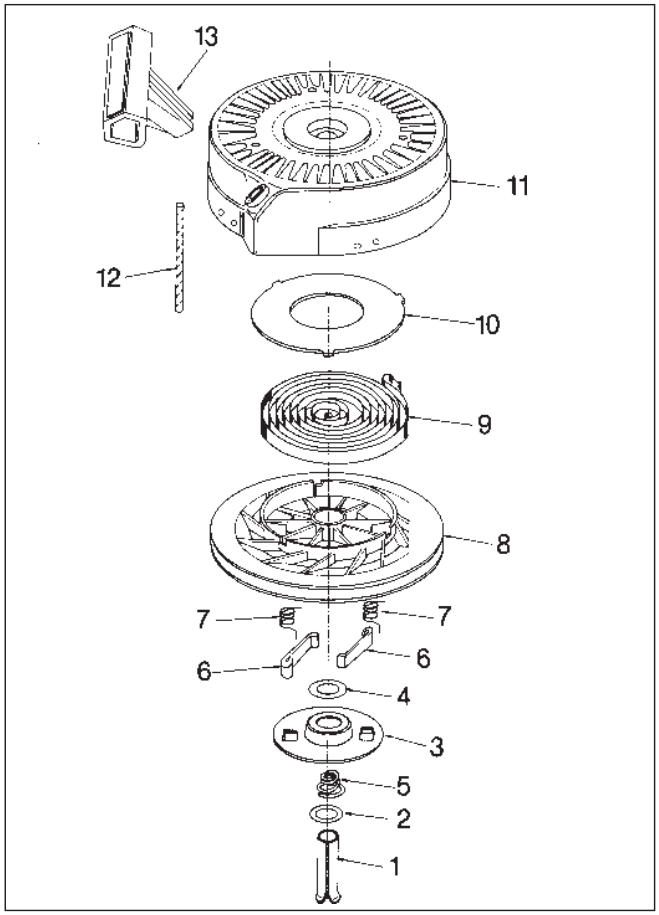


Fig. 28 - A

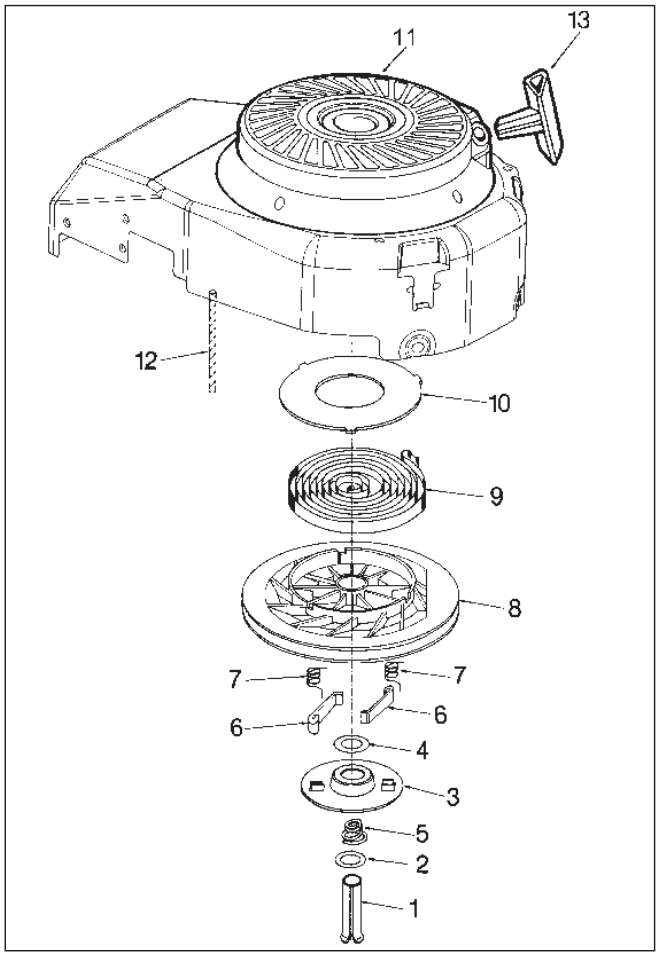


Fig. 28 - B

C - STYLISED STARTER WITH PLASTIC WEDGE (Fig. 28-C)

This starter is similar to previous 'Stylised' starters except that the Pawl Retainer (**2**) is now plastic, and has extended lugs which pass through the starter and hold the assembly together.
These lugs are locked in position by a plastic wedge (**1**) which is inserted between the lugs from the top of the starter.

***NOTE** - The plastic wedge may be covered by a decal, which has to be carefully removed to gain access to the wedge.*

Fig. 28 - C

1. Plastic Wedge
2. Pawl Retainer
3. Pawls
4. Pawl Springs
5. Pulley
6. Spring
7. Cover
8. Housing
9. Rope
10. Handle

***NOTE** - Pulley (**5**), Spring (**6**), and Cover (**7**), are supplied as an assembly when purchased for spare parts purposes.*

DISASSEMBLY/REASSEMBLY

- Release spring tension by unwinding rope.
- Remove decal (if fitted) and pry out the plastic wedge.
- Holding starter assembly together in hand, squeeze lugs together.
- Carefully remove pawl retainer.
- Inspect as for previous stylised starter.
- Re-assembly is the reverse of the above procedure taking care to correctly locate the Pawl Retainer in the Pawls.

***NOTE** - Parts for this starter are not interchangeable with other starters.*

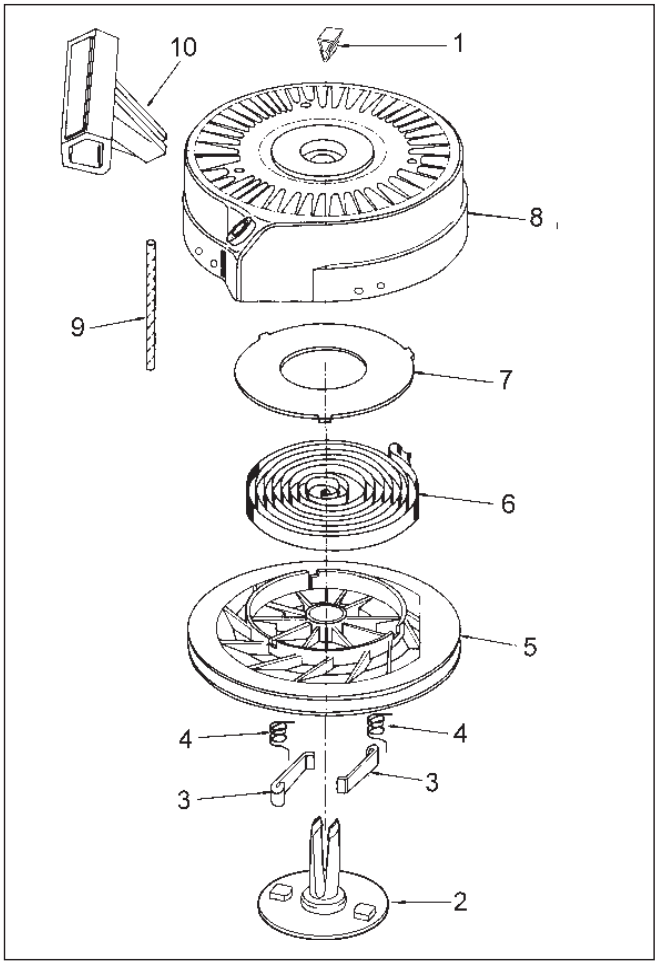


Fig. 28 - C

5. 12 VOLT ELECTRIC START SYSTEM

ELECTRICAL CIRCUIT (Fig 29)

1. Charging Alternator
2. Alternator Lead
3. Ignition Cut-out Lead
4. Battery Earth Cable
5. Alternator Lead, Red, 18AWG
6. Alternator Lead (see 2)
7. Connector Body
8. Electric Starter Lead
9. Starter Motor (internally earthed)
10. Starter Motor Lead (see 8)
11. Battery Earth Lead
12. View **A-A** of Female Connector Body
13/14. Battery
15. Connector
16. Cable, Black, 12 AWG
17. Heavy Duty Switch

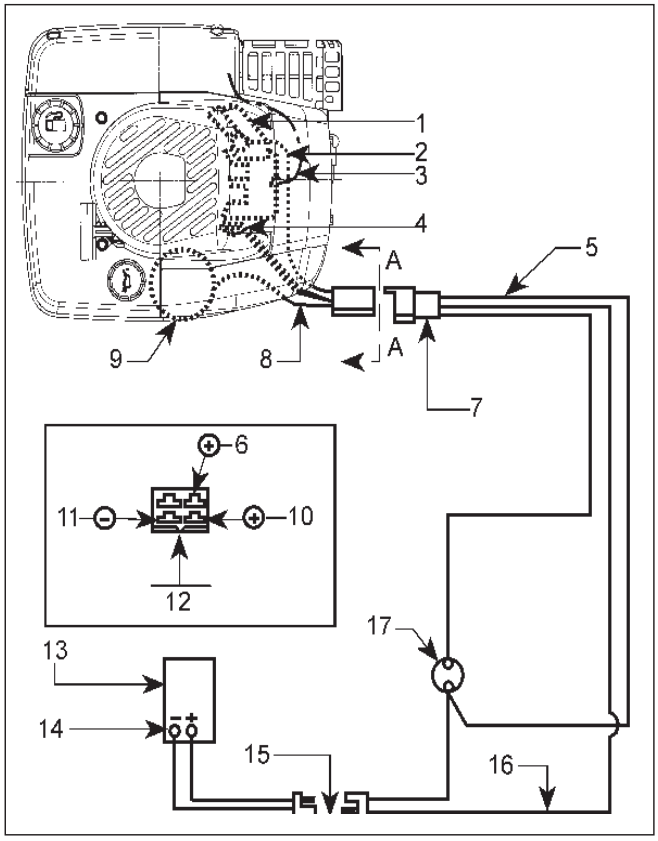


Fig. 29

a) BATTERY

The battery is a part of two circuits, starting and charging. Therefore before going into any extensive alternator or starter checks, the battery itself should be checked first. Ensure that it is fully charged by recharging for 24 hours with charger supplied. In low temperatures battery power reduces whilst power required to crank engine increases.

NOTE *- Loss of charge is normal and temporary during off season storage.*

Sealed Lead Acid Type Batteries

When not in use, store in a cool dry place. After storage, charge with charger unit supplied for 24 hours. Automotive type chargers must not be used as these can overcharge the battery causing extensive damage. The operation of the charger supplied can be checked by feel, it should be warm to the touch whilst in use. The charger has an output of approximately 100-150 mA, i.e. 1/10 of an Amp at 12V DC.

Maintenance instructions for sealed batteries

- Store battery in dry and ventilated area, disconnecting the battery from the wiring harnesses.
- Avoid storing discharged batteries. It is extremely important that it is fully charged before storing.
- If battery has discharged, it should be put immediately on recharge.
- Use only the charger supplied with the battery, or one with the following features:
- maximum current output 100-200 mA at 15 Volts DC.
- Before prolonged lawnmower storage, disconnect battery from engine wiring harnesses and ensure battery is fully charged.
- Avoid shorting battery terminals. The high current delivered by batteries can overheat and destroy the insulation and internal connections.

b) ALTERNATOR

A single coil alternator is fitted alongside the ignition coil (Fig 30) and utilises the same flywheel magnets as the ignition coil. The air gap is 0.30 mm and is set in conjunction with the HT coil assembly. The alternator has an output of 325-350 mA at 3000 rpm which is sufficient to keep the battery charged under normal working conditions.

Air gap setting

Loosen all lamination screws, turn flywheel so magnet is centred across from solid state module using air gap gauge, part no. 26990003 (gauge for 0.30 mm air gap). Tighten ignition coil screw (right side). Rotate flywheel and repeat procedure setting 0.30 mm air gap between alternator coil laminations and magnet. Tighten all alternator screws

To check the system, remove the plastic connector housing by inserting a small bladed screwdriver or similar device to release the spade connector. (Fig 31).

Connect one probe of a continuity meter to the lead of the alternator, the other probe to an unpainted surface on the engine for ground. Reverse the meter probes. If continuity exists in both probe positions, the alternator assembly must be replaced. (Continuity should exist in one of two probe positions only). If there is no continuity in both probe positions, the assembly must be replaced.

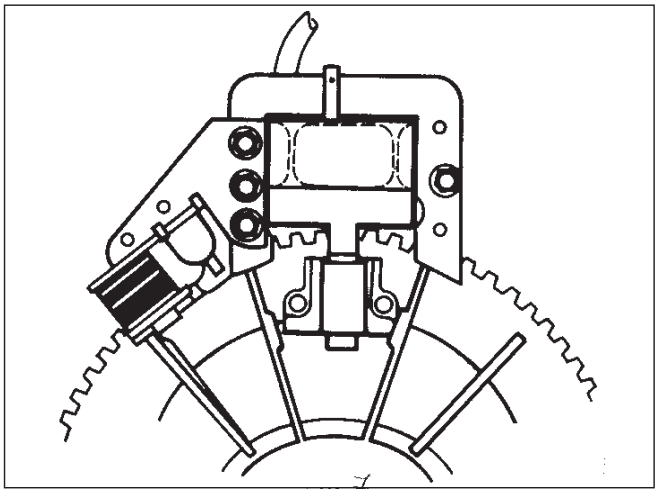


Fig. 30

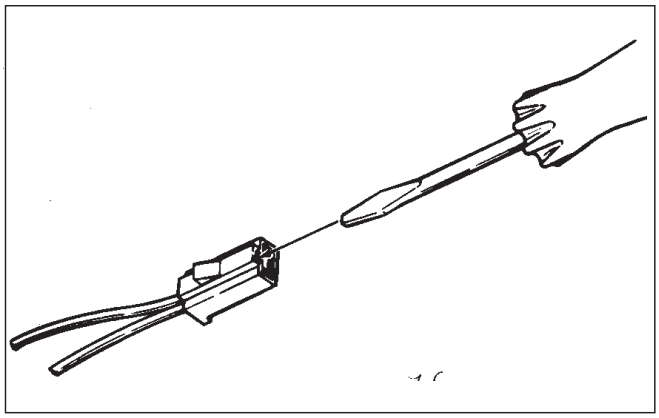


Fig. 31

c) STARTER MOTOR TROUBLESHOOTING STARTERS

STARTER DOES NOT FUNCTION

Check for:
- No current to the starter caused by faulty connections or dead battery.
- Faulty safety switches, ignition or starter switch or solenoid.
- Engine locked up or parasitic load on engine.
- Shorted open or grounded field coil.
- Open, shorted or bent armature.
- Brushes sticking or damaged.
- Dirty or oily brushes or commutator.

STARTER CRANKS ENGINE SLOWLY

Check for:
- Battery discharged or weak.
- Parasitic load or "tight" engine.
- Worn brushes or weak brush springs.
- Dirty, oily or worn commutator.
- Worn bearings in cap assemblies.
- Defective armature.

STARTER SPINS, ENGINE DOES NOT CRANK.

Check for:
- Pinion gear sticking on shaft.
- Damaged pinion or flywheel ring gear.

DRIVE ASSEMBLY SERVICE

Pinion gear parts should be checked for damage or wear. If the gear sticks on the shaft it should be washed in solvent to remove dirt and grease and dried thoroughly. If damaged, replace parts.
The unit is disassembled by removal of the two end cap screws, the bendix gear is secured by a snap ring at the shaft end.
If starter is sluggish in operation, remove end cap and check condition of armature and brushes; if brushes require replacing the complete end cap must be replaced. (Fig 32).

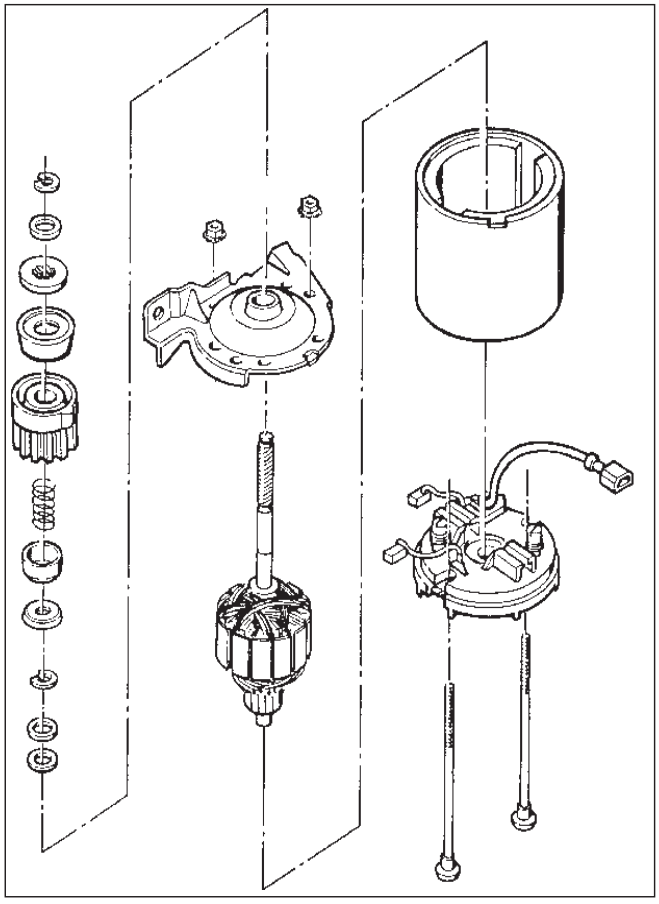


Fig. 32

ARMATURE CHECK

If commutator bars are glazed or dirty, they can be turned down in a lathe. While rotating hold a strip of “00” grade abrasive paper lightly on the commutator, moving it back and forth. **Do not use emery cloth.** (Fig 33).
Recut grooves between commutator bars to a depth equal to the width of the insulators.

Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature. Rotate armature and check all commutator bars (Fig 34).

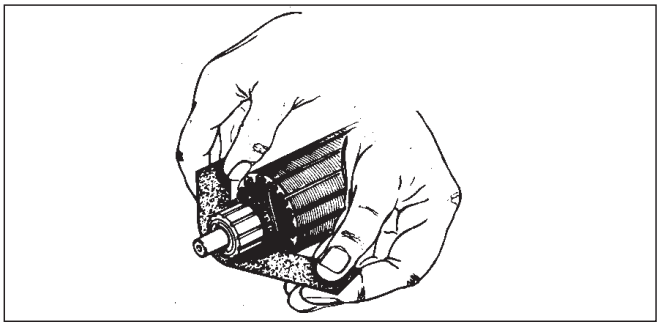


Fig. 33

Re-torque starter mounting bolts to 80÷90 inch lbs (9.0÷10 Nm).

NOTE *- If it is necessary to replace either the starter pinion and/or the flywheel due to damaged teeth, it is essential that the starter pinion to flywheel ring gear mesh is checked on re-assembly. The correct mesh is 1.5 mm (1/16") between the head of the pinion gear tooth and the base of the flywheel gear tooth. Correct adjustment can be accomplished by de-forming the starter mounting bracket accordingly.*

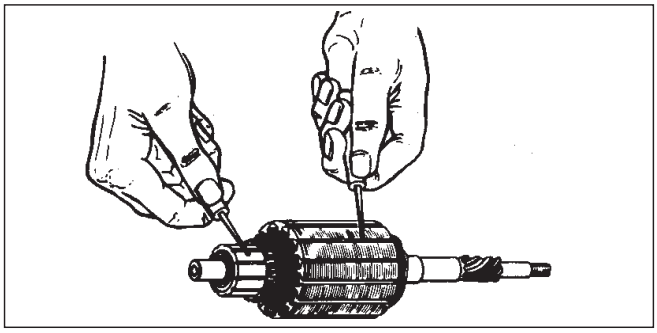


Fig. 34

D. FLYWHEEL BRAKE SYSTEM

Tecumseh's Flywheel Brake System provides consumer safety by shutting down the engine and lawnmower blade within seconds after the operator releases the engine/ blade control at the handle of the lawnmower.
The Brake Starter Mechanism may be used with either of two options for starting:

1. Manual Rope Start
2. 12 Volt Starter System

Each system requires the operator to start unit behind mower handle in operator zone area. The electric start system also provides a charging system for battery recharge when engine is running.

- TO STOP ENGINE (Fig 1). In the stop position the brake pad (**A**) is applied to the inside edge of the flywheel; at the same time the ignition system is grounded out (**B**).
- TO START THE ENGINE (Fig 2). In order to restart the engine, the brake control must be applied. This action pulls the brake pad (**A**) away from the inside edge of the flywheel and opens the ignition ground switch (**B**). On electric start systems the starter is energized to start the engine.
  On non-electric start systems, recoil starter rope must be pulled to start engine.

WIRING DIAGRAMS (Electric Start Systems) (Fig 3).

All wiring beyond the connectors on the engine are supplied by the equipment manufacturer. Check all terminals and connectors for corrosion and adequate contact, and all wiring for damage and proper size.

BATTERY

Check battery following the manufacturer's recommendations. The charging system on the engine maintains the battery during normal use.

***CAUTION**:*

- *Disconnect battery from engine before servicing.*
- *Before removing flywheel, remove brake pressure from flywheel to make removal of flywheel easier.*
- *Compress spring by moving lever toward spark plug and when hole in lever (**A**) aligns with hole in bracket (**B**), secure lever in this position with alignment tool 670298 (Fig 4). Remove flywheel per normal service procedure as outlined under IGNITION section of this manual.*
  Do not damage brake pad or brake mechanism.

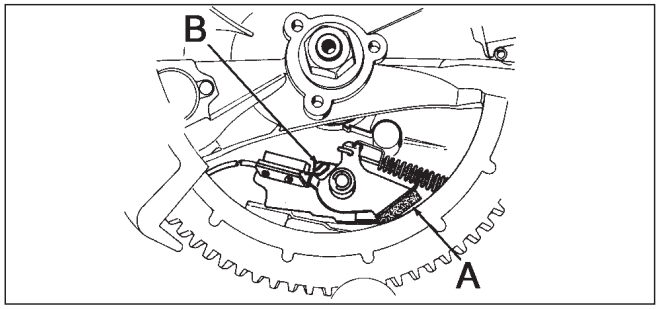


Fig. 1

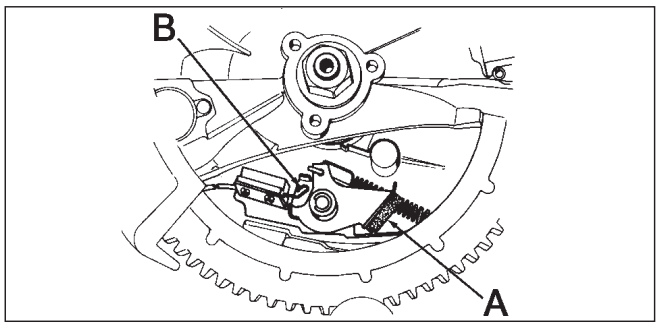


Fig. 2

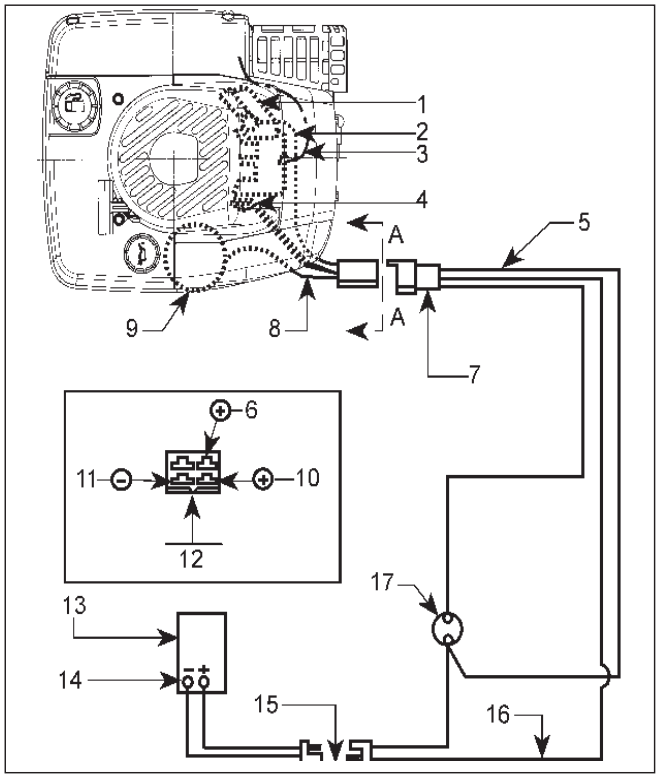


Fig. 3

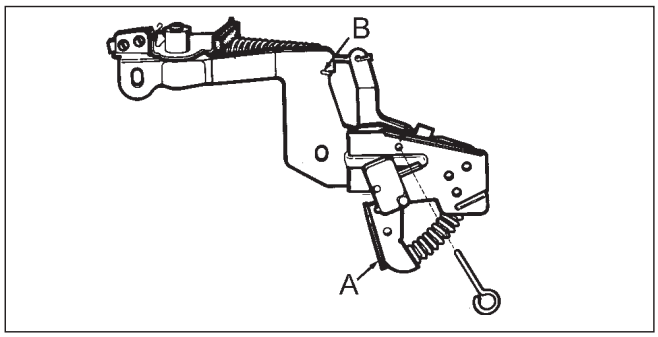


Fig. 4

FLYWHEEL REASSEMBLY (Fig 5)

1. Brake lever compressed with alignment pin in place. Inspect brake pad (**A**) to be free of dirt, oil or grease. If pad is contaminated, or less than 1.5 mm (.060") at narrowest point, replace.
2. Determine if grounding clip is in correct position (**B**).
3. Install flywheel. Be certain that ground wire to grounding clip does not touch flywheel.
4. Torque flywheel nut to 50Nm (35 foot pounds).

BRAKE MECHANISM INSTALLATION (Fig 6)

If the brake assembly is removed during service to the engine, reassemble the brake mechanism in the lowest position on the mounting holes (**A**). Re-torque screws to 10Nm (90 inch pounds).

CONTROL CABLE CONDUIT CLAMP SCREW (Fig 8,A).

If not using a service part screw, be certain the screw length does not extend to prevent free travel of lever.

CONTROL SWITCH (Fig 7,A)

The brake lever must close the switch before the starter can be engaged.

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED, COULD ENDANGER THE PERSONAL SAFETY AND/OR PROPERTY OF YOURSELF AND OTHERS. READ AND FOLLOW ALL INSTRUCTIONS.

- DISCONNECT BATTERY FROM CIRCUIT BEFORE MAKING CHECK.
- To perform a continuity check of the switch, use a continuity light or meter. Remove starter wire from starter terminal of switch. With one of the continuity unit's probes inserted in the brake start mechanism's terminal red wire connector and the other lead to the starter terminal (on switch), press the switch button; the light or meter should indicate continuity. If not, replace switch. If continuity exists without pressing switch button, replace switch.

To replace switch (Fig 9).

Carefully grind off the heads of rivets, remove the rivets from the backside of brake bracket. Use the self-tapping screw to make threads in the bracket, install the switch to the brake bracket in the proper position and secure the switch to the bracket with the machine screws.

- Be careful, over-tightening of the screws could break the switch.

- For electric starter maintenance see Starter Section, Chapter C.

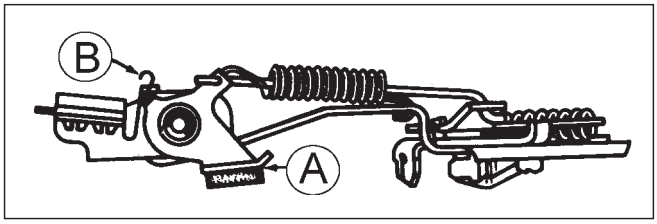


Fig. 5

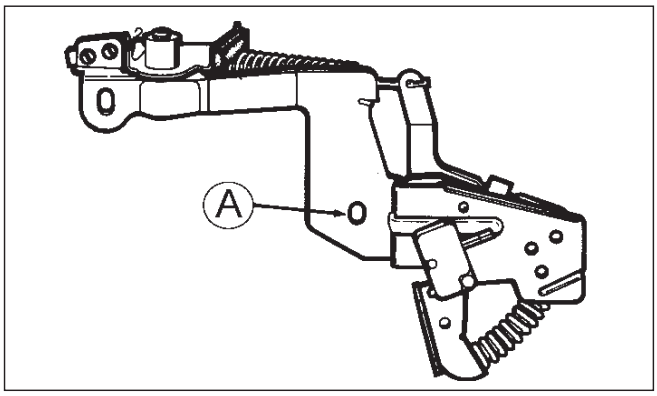


Fig. 6

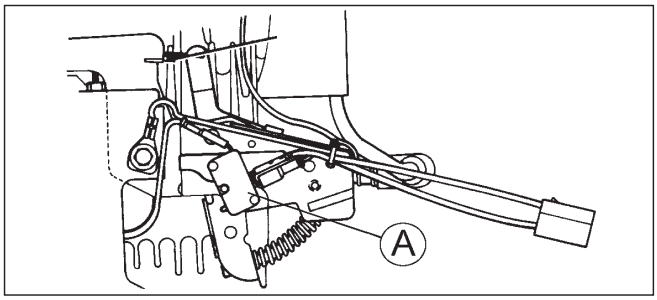


Fig. 7

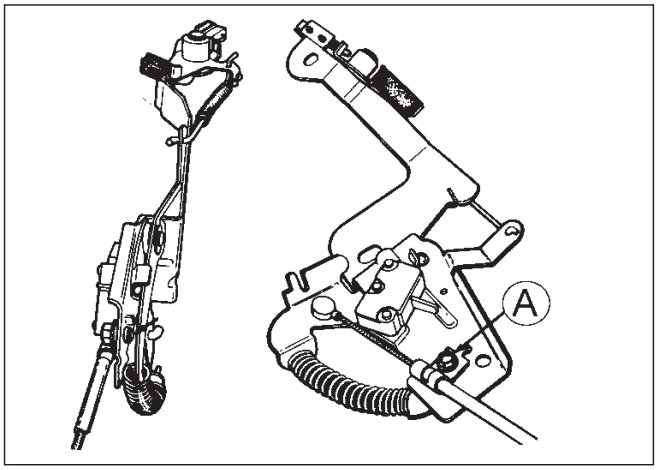


Fig. 8

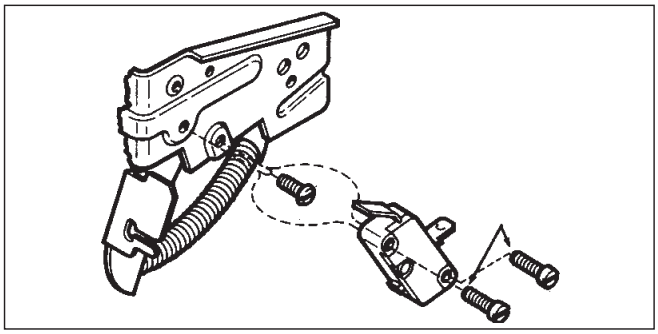


Fig. 9

E. IGNITION SYSTEM

GENERAL

Two types of ignition systems have been used:

- CONVENTIONAL IGNITION SYSTEM consisting of flywheel with built in magnets, ignition coil, condenser and breaker points. Depending on the model and year of production, the configuration will vary but service on these systems is identical.

- SOLID STATE SYSTEM (CDI) consisting of flywheel with built in magnets and a solid state electronic module.

Fig. 1. CONVENTIONAL IGNITION SYSTEM (Internal coil) LAV - HBL - AV - MV

REMOVAL OF FLYWHEEL (NOT MV OR BH TYPE)

- Remove air shroud complete with starter (Fig 2).
- Remove flywheel nut and starter hub using strap wrench part number 670305 or '**C**' spanner 670217 to prevent flywheel from turning (Fig 3).
- Using special tool 670103 for 7/16 UNF crankshaft or 670169 for 1/2 UNF crankshaft screw fully on and back off one turn.
- Supporting the flywheel underneath, strike the tool squarely with a sharp blow from a hammer to break the flywheel loose. (Fig 4).

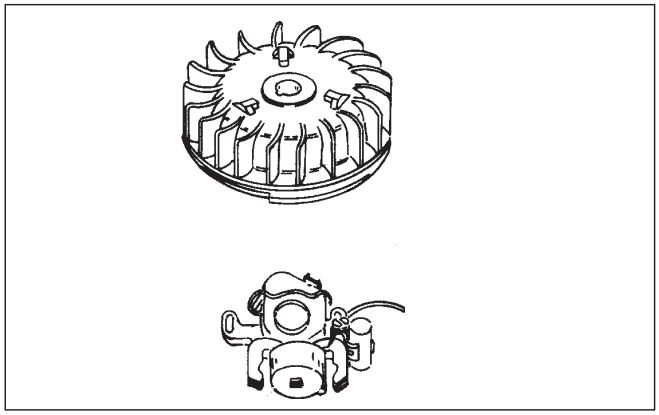


Fig. 1

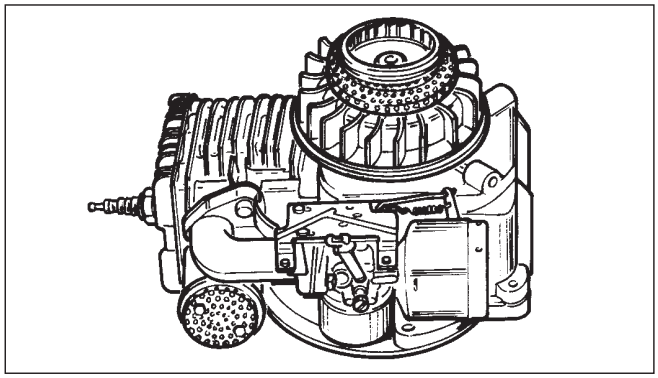


Fig. 2

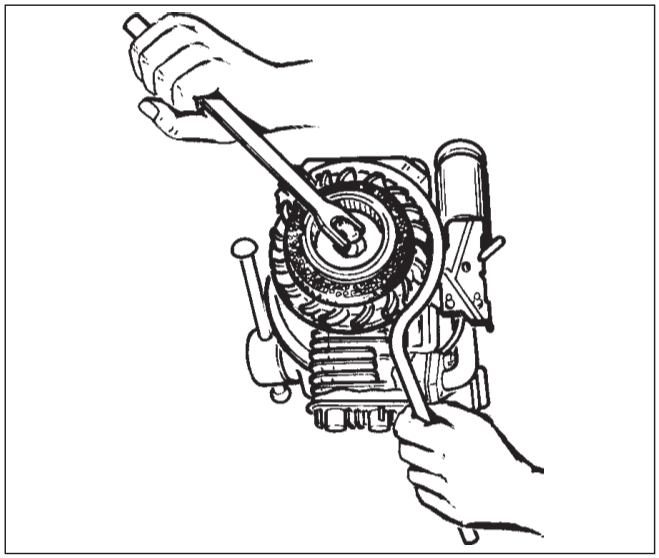


Fig. 3

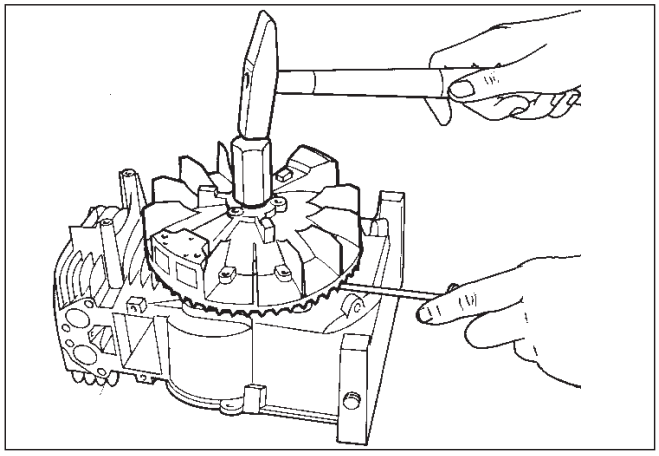


Fig. 4

The standard method of flywheel removal used on other engines can damage the main bearing ball races.
In order to remove the flywheel in the correct way, proceed as follows:

- Remove the other parts in the standard way (air shroud, flywheel nut, starter cup etc.)
- Place tool 670306 as per Fig 5 locating the centre bolt on to the crankshaft.
- Place the 3 self threading screws of the tool in the 3 holes of the flywheel and tighten to at least 2 turns.

***NOTE** - The screws should be tightened an equal number of turns.*
By using a 11/16 wrench, the centre bolt can now be tightened. In this way the flywheel can be removed (see Fig 5). For remounting the flywheel, proceed as usual.

***NOTE** - SUBSEQUENT REMOVAL*
In this case, the flywheel holes will already be threaded. To ensure sufficient grip on the flywheel, the self threading screws should be inserted at least one turn more than the existing threads.

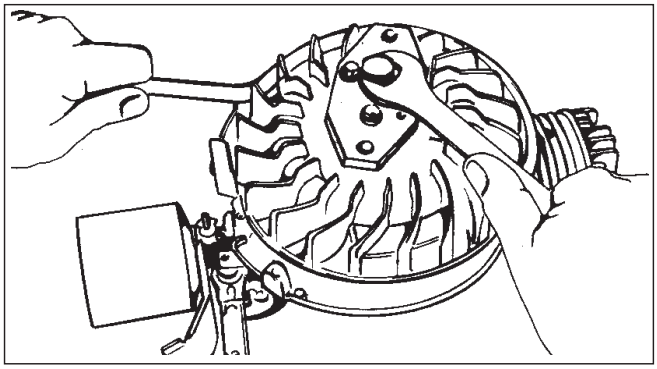


Fig. 5

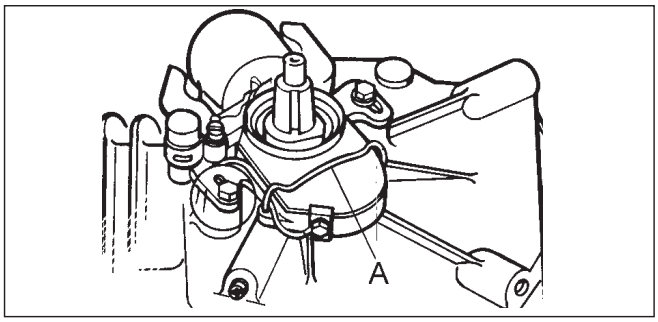


Fig. 6

CHECKING INTERNAL PARTS

- Remove retaining clip **A**, and breaker box cover, and make visual check. (Fig 6).
- Points gap - see table, if adjustment is necessary loosen screw securing static point and reset using feeler gauge.
- Clean contacts with fine emery or contact file.
- Remove all traces of oil, if oil is present in the breaker box it will be necessary to renew the crankshaft oil seal.
- Check all wires and connections.
- With an ignition tester check the efficiency of the coil and condenser (if a tester is not available it may be necessary to test with new units).
- Reassemble and carry out spark test. If engine does not run correctly, the condenser may be suspect; this is usually indicated by burning of the contacts. (Always replace a condenser if points are burned).

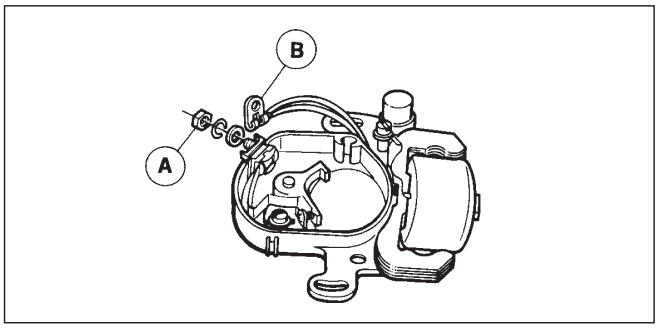


Fig. 7

To replace breaker points

- Remove nut '**A**' securing terminal to breaker points. (Fig 7).
- Remove breaker by lifting out and simultaneously easing insulator block '**A**' from box. (Fig 8).
- Detach static point by removing securing screw **A**. (Fig 9).
- Inspect points and replace as necessary.
- Position static point in box and locate with securing screw leaving screw loose for adjustment.
- Fit moving point, secure with nut and reconnect wires.

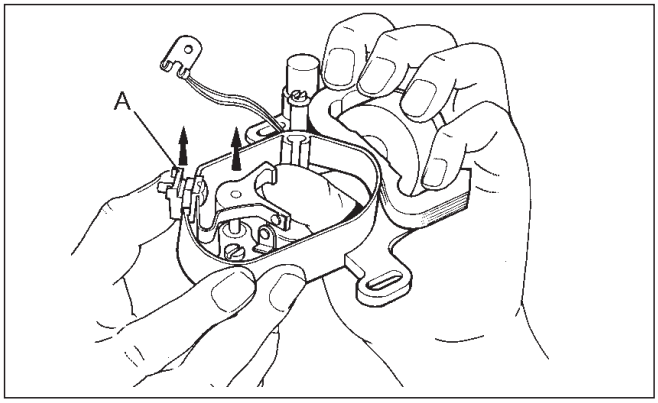


Fig. 8

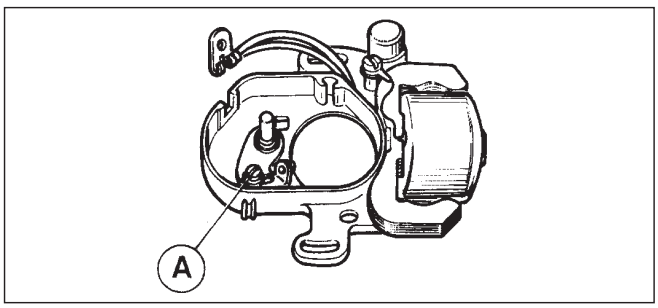


Fig. 9

Cleaning points

To clean the points in position:

- Rotate engine until points are open. Insert a piece of smooth emery.
- Close points in order to grip emery and clean.
- Open points and remove all traces of dust. (Fig 10).

To adjust points

- Adjust points gap to 0.45 ÷ 0.50mm (.020") as follows (see Breaker point setting table).
- Turn engine to bring cam heel to widest opening point.
- Insert feeler gauge and with the aid of a screwdriver fitted in slot '**A**' (Fig 11), gently close points until a «drag» is felt on the feeler.
- Tighten points securing screw.

COIL INSPECTION

- Inspect coil for damage, cracks, bad insulation or signs of overheating. Check all leads, particularly at point of entry to coil.
- Check coil efficiency on a tester with coil mounted on stator (Fig 12).
- Check coil outer insulation for leaks with tester (Fig 12). If a tester is not available, the engine may be tested with a new coil.

COIL REPLACEMENT

- Remove coil by releasing retainer spring '**A**' or by straightening the lamination of the core '**B**' (Fig 13).
- Disconnect all leads and unsolder terminal '**A**' (Fig 14).
- Completely detach coil (Fig 15).
- Reverse the procedure for refitting.

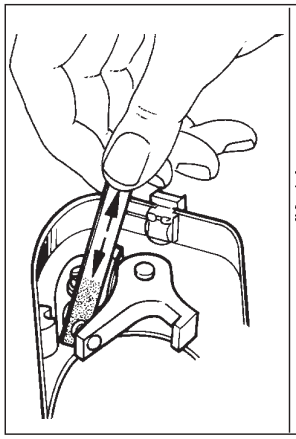


Fig. 10

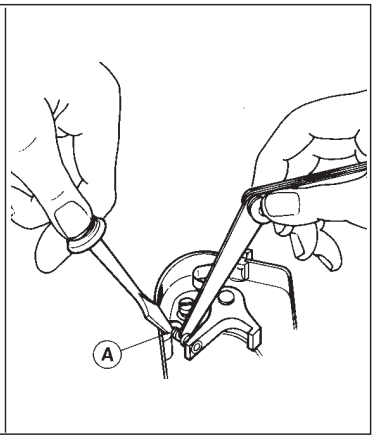


Fig. 11

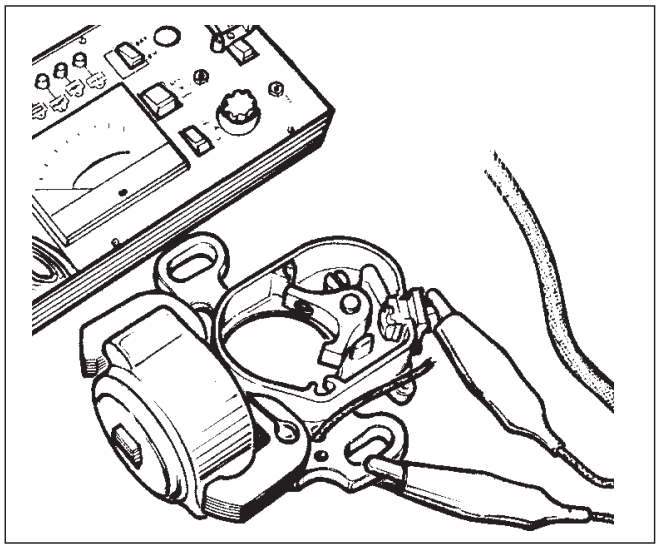


Fig. 12

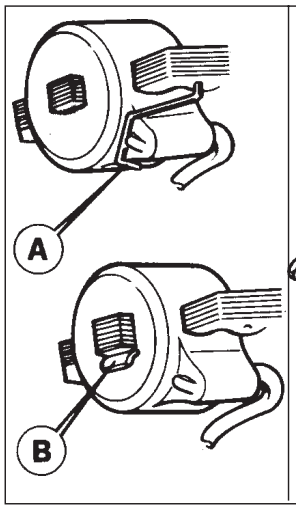


Fig. 13

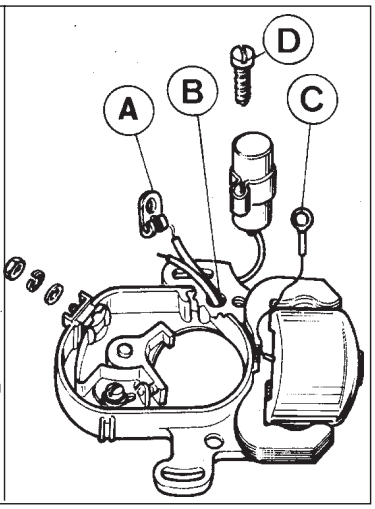


Fig. 14

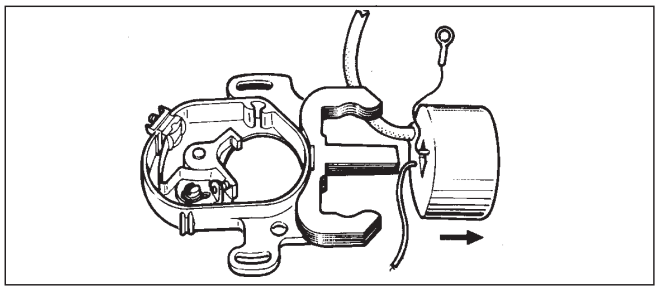


Fig. 15

CONDENSER CHECKING:

- Check for external damage
- Check condenser efficiency with tester.

CONDENSER REPLACEMENT (Fig 14).

- Unsolder wire from terminal '**A**'
- Remove wire from hole '**B**'.
- Remove condenser securing screw '**D**'.
- Reverse procedure for refitting.

***NOTE** - During soldering operations, remove terminal '**A**' from screw in order to prevent damage to insulator.*

2. CONVENTIONAL IGNITION SYSTEM EXTERNAL COIL BV SERIES

On BV engines an external coil ignition system is fitted. On this model the coil assembly is mounted on two pillars cast on the cylinder (Fig 16).

***NOTE** - Attention should be paid to the routing of wires and of HT lead.*

The flywheel fitted to this system has the magnetic mass located on the outside of the flywheel (Fig 17-B).

The technical advantages of this system are:
- More consistent spark at low rpm
- Fixed timing
- Adjustable air gap (set to 0.38 mm) - .015"

BREAKER POINTS

The points are accessible by removal of the flywheel and adjustment is the same as the internal coil system (0.5 mm .020")

LAMINATION/FLYWHEEL AIR GAPS

To set air gap, proceed as follows:
- Set coil at maximum gap
- Position flywheel magnets **B** as per Fig 16
- Place a 0.30 mm gauge or metal strip of at least 100 mm in length across the magnets. (Fig 18).
- Rotate the flywheel to position the magnets opposite the coil, slacken the coil securing bolts, following which the coil should be attracted to the gauge; tighten the securing bolts and remove gauge.

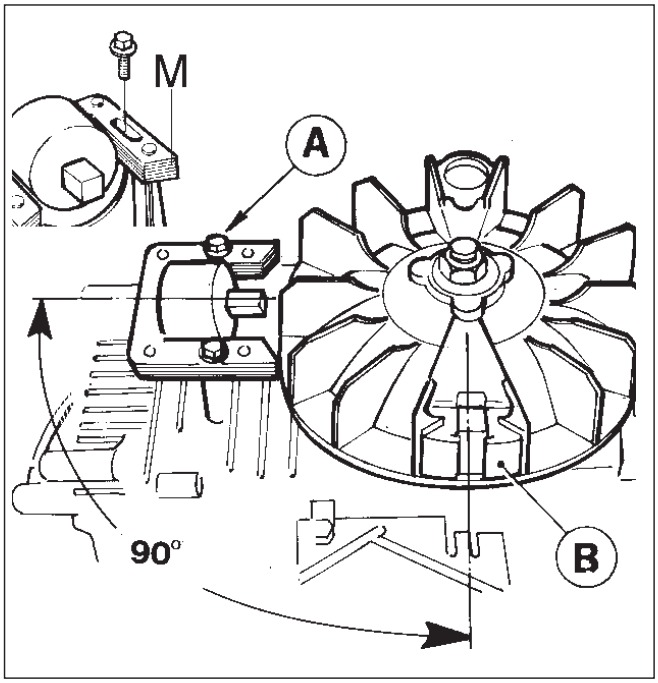


Fig. 16

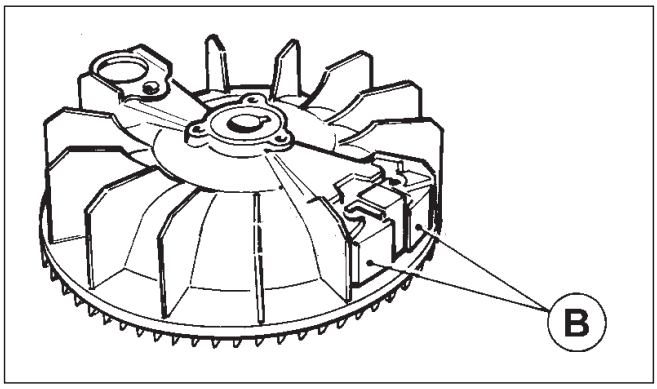


Fig. 17

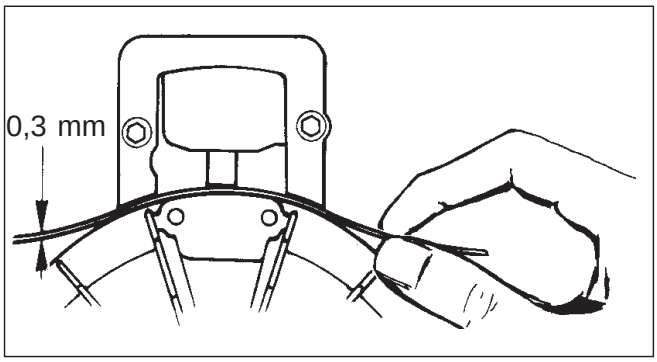


Fig. 18

3. IGNITION TIMING

GENERAL

All engines are correctly timed before delivery and the timing marked as in Fig 19 (Points Ignition).
On engines with outside coil and solid state, ignition timing is fixed.

TWO STROKE TIMING (Points Ignition)

- Set breaker points to 0.45 ÷ 0.50 mm (.20”).
- Remove sparking plug, insert a narrow rule on to piston top, place a straight edge across top of cylinder. (A special tool is available for this operation), (Fig 20).
- Turn crankshaft in direction of rotation and bring piston to top dead centre indicated by position of rule against edge or on scale of special tool.
- Refer to table for correct amount of advance. Turn engine in reverse direction until this is obtained, denoted by rule position against straight edge or scale on special tool.
- Slacken stator securing bolts and turn until points are just about to open. If a test light is not available for this operation, insert a piece of cigarette paper between the points and turn until paper just becomes free; at this point lock stator.

FOUR STROKE TIMING (Points Ignition)

- Set points to 0.45 - 0.50 mm (.020”).
- Accurate timing is best achieved by removing the cylinder head and gasket, turn engine to top dead centre and using gauge (Fig 22) set timing following the procedure for two stroke engines; special tools are available for this operation (Figs 21 and 22).
- Dial gauge timing tool - part no. 670241 (Fig 21) may be used without removal of the cylinder head.

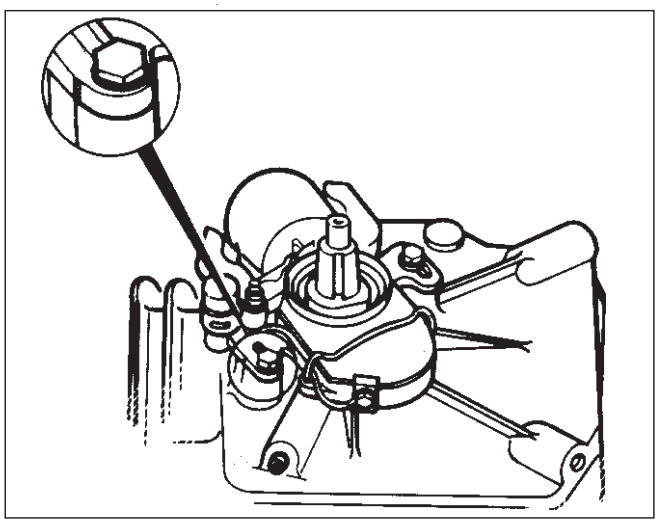


Fig. 19

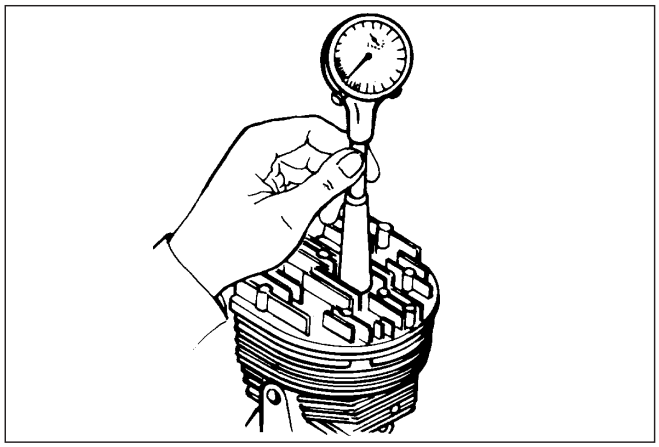


Fig. 20

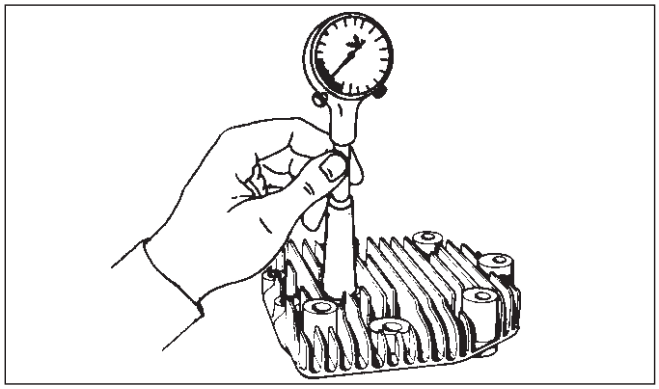


Fig. 21

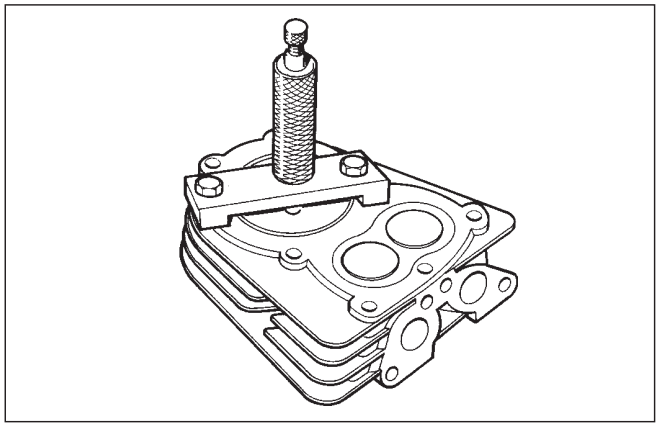


Fig. 22

4. SOLID STATE IGNITION SYSTEM (CDI) BVS - VANTAGE - PRISMA - SYNERGY - HTL - SPECTRA - FUTURA - BH - MV

This is an all electronic ignition system with all the components sealed in a module and is located outside the flywheel. There are no components under the flywheel, except a collar to hold the flywheel key in position.
It can be identified by the square configuration of the module and a stamping “Gold Key” to identify the proper flywheel key on early units. (Fig 23).

- The correct air gap setting between the flywheel magnets and the laminations of the solid state module is 0.30 - 0.40mm (Fig 24).
- Place gauge between the magnets and laminations, and tighten mounting screws to a torque of 30 ÷ 40 inch lbs (3.3 ÷ 4.5 N m).
- Recheck gap setting to make certain there is proper clearance between the magnets and laminations.

The solid state (CDI) module is protected by epoxy filler from exposure to dirt and moisture. This system requires no maintenance other than checks of the high tension lead and sparking plug.

SOLID STATE IGNITION OPERATION

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. This energy is transferred to a capacitor where it is stored until it is needed to fire the spark plug.
The magnet continues rotating past a trigger coil where a low voltage signal is produced and closes an electronic switch (SCR).
The energy which was stored in the capacitor is now transferred through the switch (SCR) to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage is transferred by means of the high tension lead to the spark plug, where it arcs across the electrode of the spark plug and ignites the fuel air mixture. (Fig 25).

Index Fig. 25

1. Flywheel Magnet
2. Loaded Coil
3. Silicone Controlled Rectifier (SCR)
4. Diodes
5. Secondary Coil
6. Spark Plug
7. Earth Connection
8. Condensor

Air gap settings

RPM	GAUGE TYPE Tolerance (mm)	Part No.	Size mm.
3000/3150	.20÷.30	670297	.30
3350/3850	.30÷.40	88841550	.40

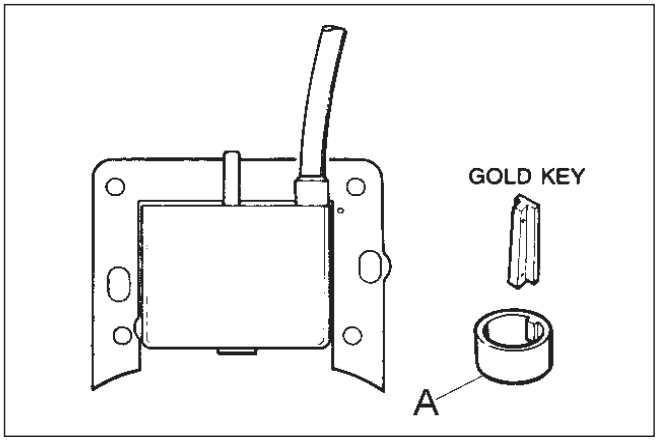


Fig. 23

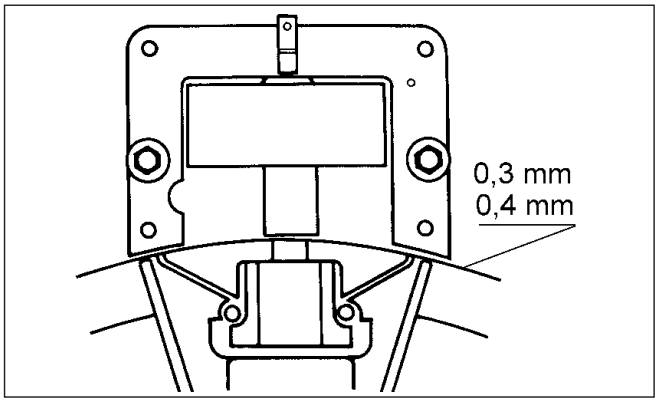


Fig. 24

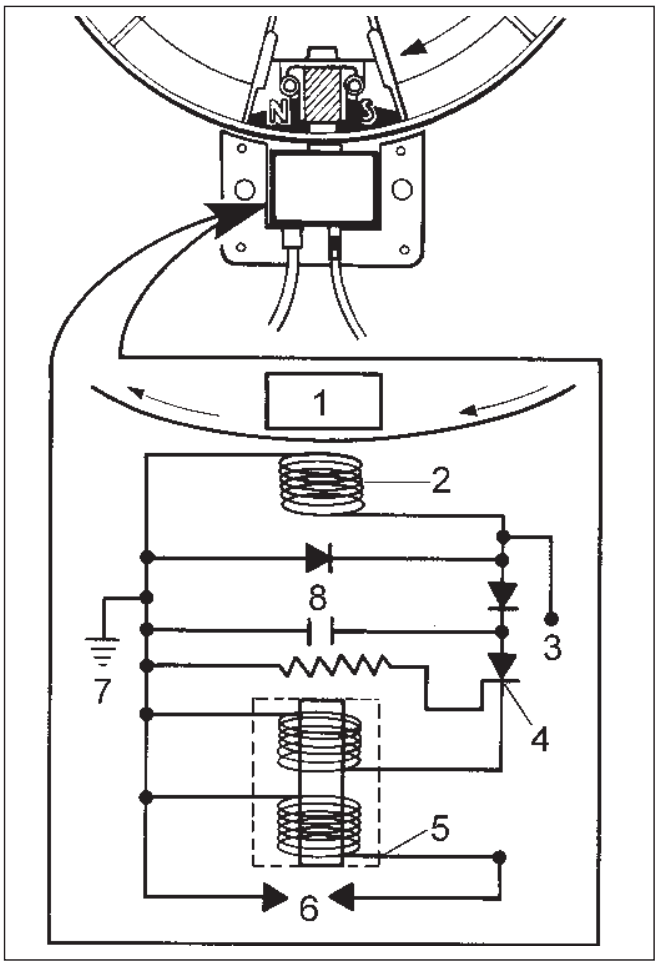


Fig. 25

4A. GROUND TO GO IGNITION UNIT (FLYMO MV100S)

Some Flymo Pilot machines (L47) have been built with an electronic ignition unit which operates the opposite way to conventional units.
This unit has to be earthed to start the engine and can be identified by a green collar at the base of the High Tension lead.

***NOTE** - This unit must not be used on any other application unless specified, or accidental starting when control is in "off" position could occur. always refer to the master spare parts list when ordering parts.*

5. SPARK PLUG (Fig. 26)

Check spark plug every year, or every 100 hours of operation.

- Clean area around spark plug.
- Remove and inspect spark plug.
- Replace spark plug if electrodes are pitted or burned, or if the porcelain is damaged.

For replacement use :

Champion RJ17LM or RJ19 LM for Side Valve & MV engines
Champion RN4C for OHV engines

***NOTE** - Side valve engines are fitted with a spark plug of 8mm reach (OHV 19 mm). The use of a spark plug with a longer thread will result in damage that is not covered by warranty.*

- If reusing the spark plug, clean it by carefully scraping the electrodes. (Do not wire brush or sand blast). Ensure entire spark plug is clean.

- Check electrode gap with feeler guage and set gap at 0.6 mm (.024") if necessary.

- Install spark plug in engine and torque to 2.1 kgm (15 ft lbs). If lacking torque wrench tighten securely.

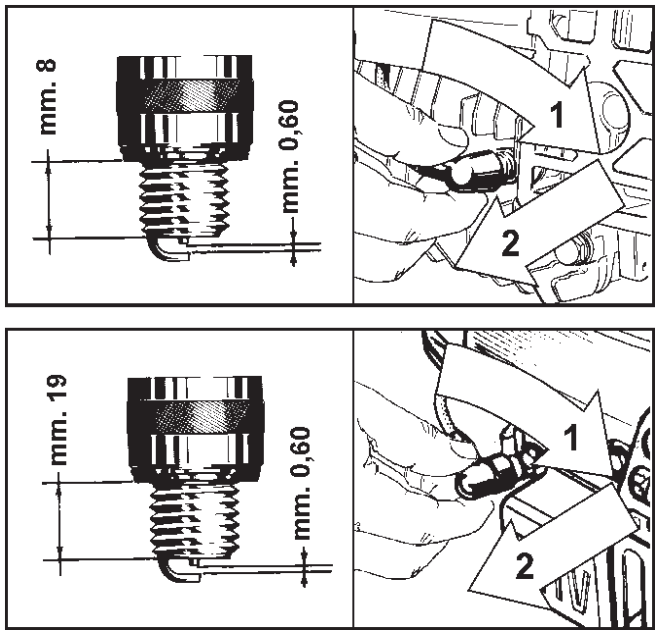
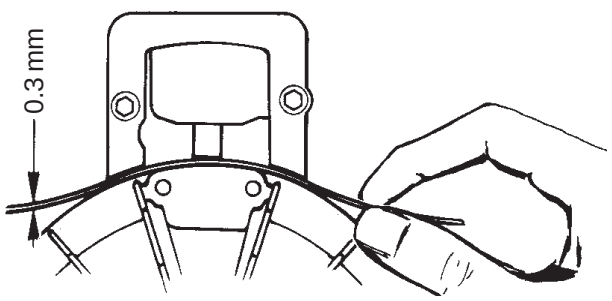


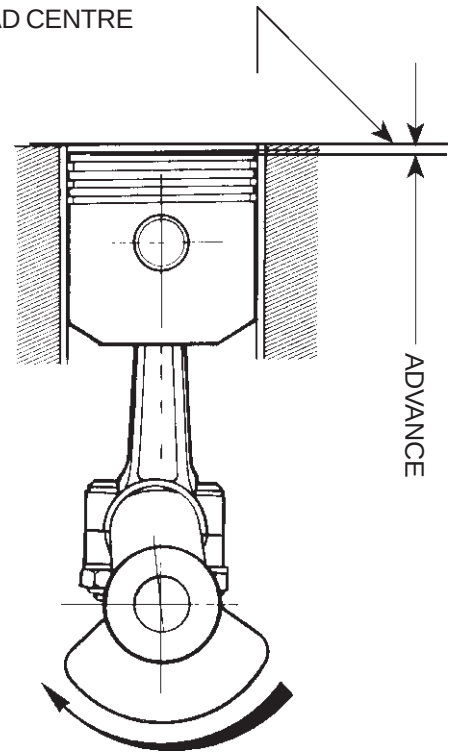
Fig. 26

4-STROKE ENGINE SPARK ADVANCE WITH SPARK IGNITION

ENGINE	SPARK ADVANCE	
	P.M.S. mm	P.M.S. inch
LAV-LAVR 30-35	1.070 - 1.770	3/64 - 1/16
LAV-LAVR 40-172	0.635 - 1.143	1/32 - 3/64
H 22 - 25 - 30	1.070 - 1.770	3/64 - 1/16
H 35	0.755 - 1.003	1/32 - 3/64
HS - HSB 40	0.635 - 1.143	1/32 - 3/64
HS - HBL 30	1.070 - 1.770	3/64 - 1/16
HS - HBL 35	0.755 - 1.003	1/32 - 3/64
HBL - HBP 40	0.635 - 1.143	1/32 - 3/64
BV 150 - BV 153 BVR 150	FIXED 0.635 - 1.143	FIXED 1/32 - 3/64
BV 172 - BVR 172 - BV 173	FIXED 0.635 - 1.143	FIXED 1/32 - 3/64

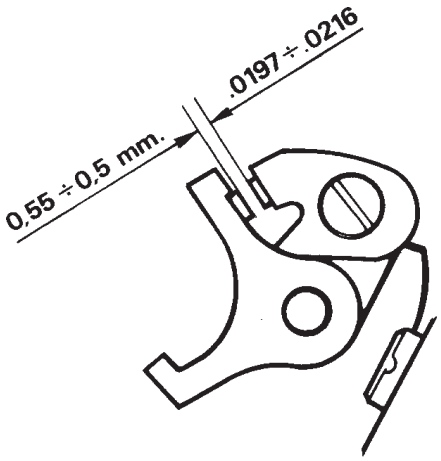


TOP DEAD CENTRE



DIRECTION OF ROTATION VIEWED FROM FLYWHEEL

DISTANCE BETWEEN POINTS



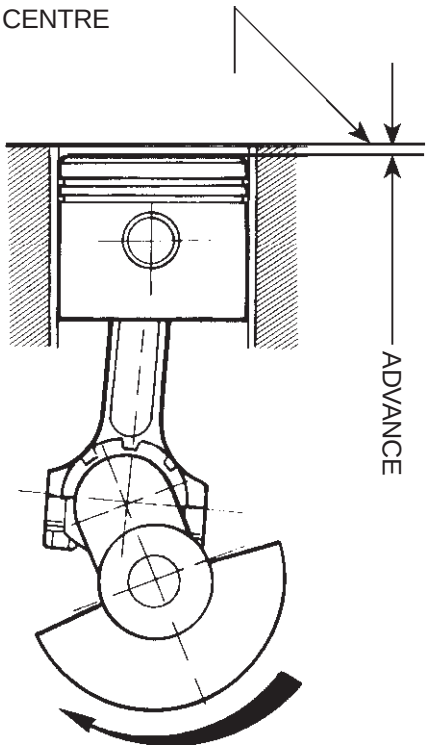
FIXED SPARK ADVANCE ON IGNITION SYSTEM WITH EXTERNAL COIL

The engines produced since 1984 are equipped with electronic ignition.

2-STROKE ENGINE SPARK ADVANCE

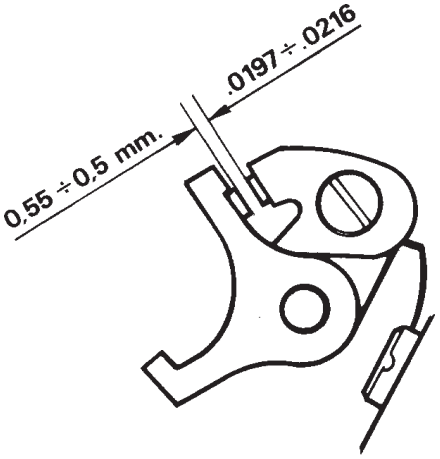
ENGINE	ADVANCE	
	P.M.S. mm	P.M.S. inch
TA	3.09 - 3.75	1/8 - 9/64
TA MARINO	3.99 - 4.48	5/32 - 11/64
VA	3.02 - 3.70	1/8 - 9/64
VA MARINO	4.05 - 4.55	5/32 - 11/64
AH 81 MARINO	3.78 - 4.75	5/32 - 3/16
AV 47	4.42 - 5.03	11/64 - 3/16
ZH	FISSO	FISSO
AV520 - 521 - 525 AV600 - 601 - 605	2.25 - 2.75	3/32 - 7/64
MV100 S	2.25 - 2.75	3/32 - 7/64
AV750 - 755 AV125	2.00 - 2.50	5/64 - 7/64
MV100 - MV100 S PRODUCED SINCE 1986	ELECTRONIC IGNITION	ELECTRONIC IGNITION

TOP DEAD CENTRE



DIRECTION OF ROTATION VIEWED FROM FLYWHEEL SIDE

DISTANCE BETWEEN POINTS



Engine models MV100-MV 100 S, produced since 1986, are equipped with electronic ignition.

F. AIR FILTERS

GENERAL

Owing to the nature of the work for which an air cleaner is designed, it follows that it must have a direct effect on the carburation. It is, therefore, essential that it is kept perfectly clean and correctly maintained at all times. Its function is to protect the inner parts of the engine from dust particles present in the air, a condition which is generally aggravated by the operation of the machine.
Should the air cleaner maintenance instructions not be strictly adhered to, dirt and dust collected in the cleaner could enter the engine or cause overchoking, resulting in too rich a fuel mixture. Both the above conditions reduce engine life.
These impurities in a 4 stroke engine or admitted in the mixture of a 2 stroke engine, form an abrasive which promotes excessive wear to moving parts.
When a 4 stroke engine becomes overchoked due to a dirty air cleaner, an excessive amount of petrol is drawn into the cylinder, flushing the cylinder wall, resulting in insufficient lubrication. It is therefore important that operators observe the instructions on air cleaner maintenance.
Engine operation is impaired by an air cleaner in bad condition and no warranty is granted to users who do not carefully follow the air cleaner servicing instructions.
Tecumseh engines are fitted with the following types of air cleaners:

1. POLYURETHANE TYPE AIR CLEANER

This consists of a polyurethane foam element retained in its housing by a cover (Fig 1). A metal grill is fitted in the base of the container to prevent the element being drawn into the engine.
Maintenance of this type is carried out by washing the polyurethane foam element in a mixture of water and household detergent, providing that the element is thoroughly dried before re-oiling.
(Should the foam element be excessively impregnated with dirt after prolonged use, replace it).
After this cleaning operation, wet the polyurethane foam with a spoonful of mineral oil and squeeze it lightly to obtain a uniform distribution of the lubricant through the element. Clean the container and re-fit the element.

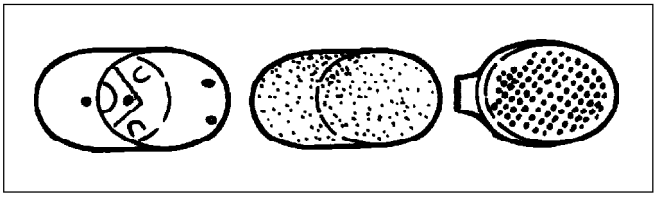


Fig. 1

2. MUFFLER ON POLYURETHANE AIR CLEANER

The intake muffler is fitted on the standard polyurethane air cleaner.
The cover has been modified by adding 3 holes (Fig 2) in order to secure the muffler by means of 3 self-threading screws.
The muffler consists of a plastic cover with 3 air vent tubes. These tubes are drilled and placed in such a way as to reduce intake noise (Fig 3).

DISASSEMBLY AND MAINTENANCE

- For disassembly, first remove the muffler cover group (Fig 4).
- Unscrew the 3 self-tapping screws and detach the 2 parts.
- Clean the inside of the muffler with petrol thoroughly.
- Clean the other elements of the air cleaner (foam, metal grill etc) as described before.
- Re-assemble the air cleaner and fit the muffler to the filter cover before the latter is secured to the filter body.

***NOTE** - The internal holes of the muffler (Fig 4) must be always perfectly clean and should not show any moulding defects (burrs) otherwise carburation may be affected.*

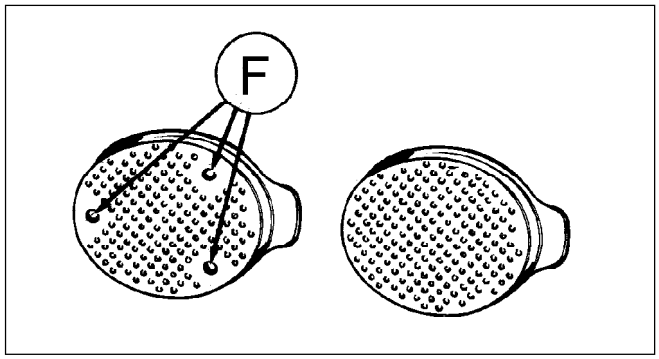


Fig. 2

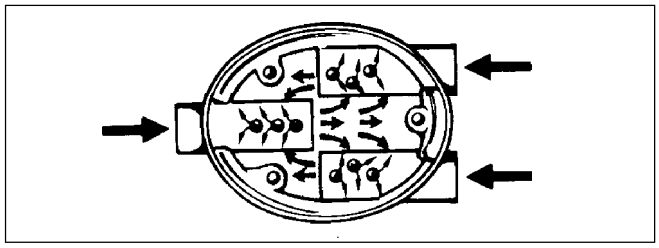


Fig. 3

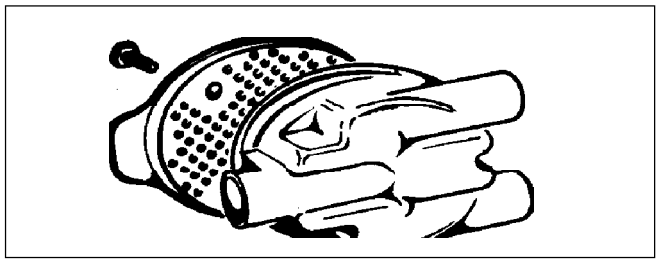


Fig. 4

3. POLYURETHANE AIR CLEANER WITH SNORKEL

A snorkel type pre-cleaner is available to meet the requirements of manufacturers of equipment operating in extremely dusty conditions. This consists (Fig 5) of a standard polyurethane filter with a specially shaped cover to which is attached a plastic hose, carrying at the intake end, a paper cartridge filter. The advantage of this type of filter is to take in air from a point where dust is at a minimum.
Servicing of this assembly is carried out in three stages:

- **Paper air cleaner.** Clean paper filter by compressed air or by tapping on a hard surface. Replace if excessively clogged.

- **Hose.** Wash hose from inside with a flow of water and detergent to remove any dust deposits, check hose for damage and loose connections.

- **Polyurethane element.** Service as for other types.

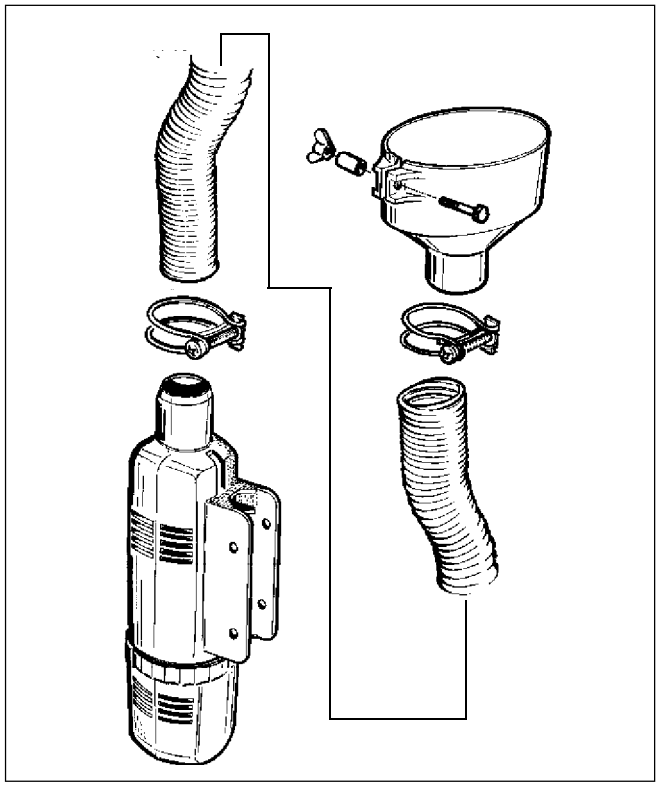


Fig. 5

4. CLEAN.ASP.AIR

LAV ENGINES

As illustrated in Fig 6, reverse flow air is taken from the flywheel fan so that by centrifugal effect, all dirt and dust and particles are removed from the intake pipe area.
The clean air enters tube **A** (Fig 7) and flows into a pre-cleaning chamber **B** before passing through a large dimension polyurethane air filter **C**.

Fig. 7

A Air enter tube
B Chamber
C Polyurethane filter

The maintenance of the polyurethane element must be carried out following the same instructions as for the previous type.
Essential points:
- Wash in petrol
- Dry out
- Impregnate element with a spoonful of SAE 30 oil
- Knead uniformly to distribute the oil

BV ENGINES STANDARD

The Clean-Asp-Air fitted on earliest BV engines has the same working and element maintenance of the Clean-Asp-Air filter on LAV range, but different design. (Fig 8).

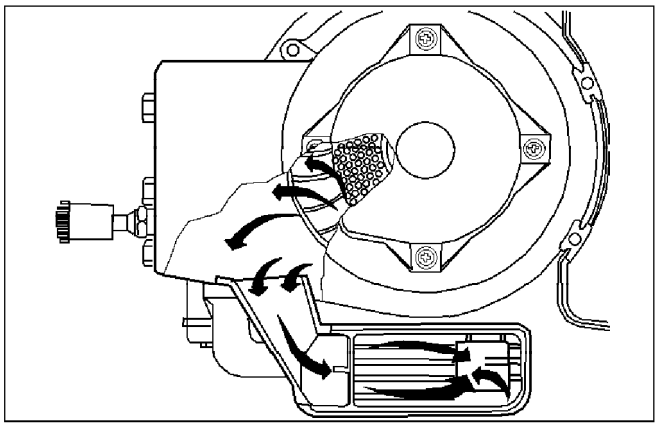


Fig. 6

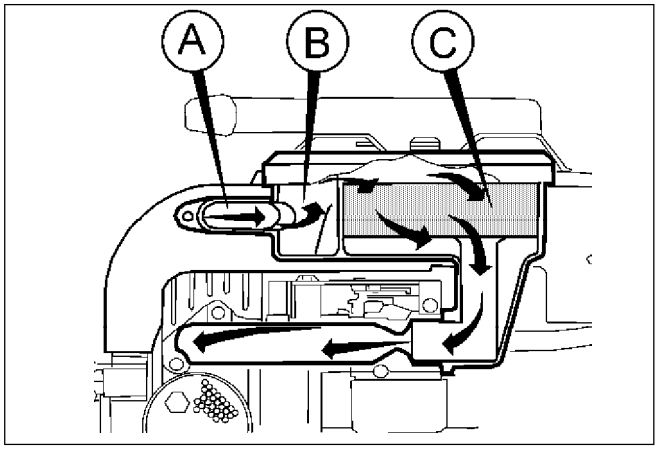


Fig. 7

5. OIL BATH FILTER (Fig. 9)

TO SERVICE FILTER:

The oil bath filter is only efficient when the oil is at the level indicated on the bottom of the container (Fig 9-D). Check oil level every five (5) hours. If not to correct level, refill container using a similar oil to that used in the engine. Change oil once a year or more often when operating in extremely dusty conditions.
Clean and re-oil foam every 10 operating hours and change it every 50 hours or more often if used in extremely dusty conditions.

FILTER MAINTENANCE

a. Remove the cover **A** from the filter body (twist counterclockwise).
b. Remove the foam filter (**B**) from the cover.
c. Wash in water and detergent solution and squeeze (don't twist) until all dirt is removed.
d. Rinse thoroughly in clear water.
e. Wrap in a clean cloth and squeeze (don't twist) until completely dry.
f. Saturate with engine oil and squeeze (don't twist) to distribute oil and remove excess oil.
g. Clean the filter body (**C**) and refill with clean oil up to level indicated (**D**).
h. Replace filter foam and refit cover ensuring this is correctly secured.

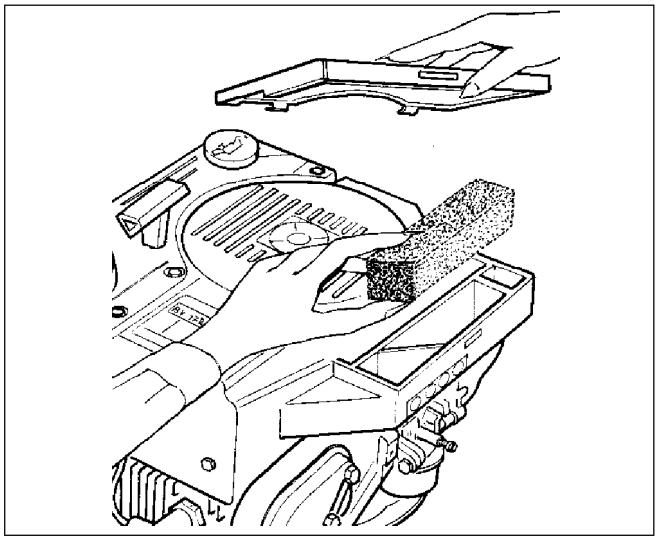


Fig. 8

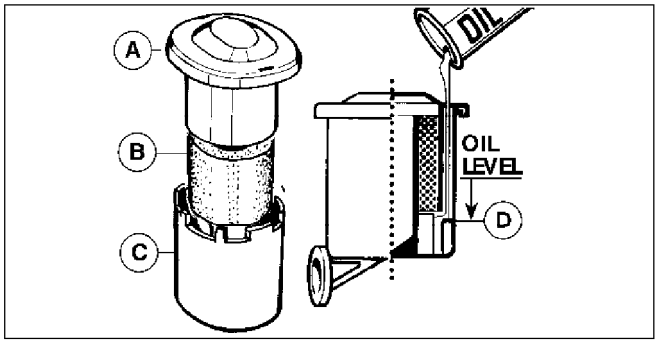


Fig. 9

6. AIR CLEANER FOR FLYMO

Two stroke engines fitted to Flymo Airborne Rotary lawnmowers (Hover mowers) are equipped with a “Turbo” air filter of Flymo design and origin. Parts for these filters should be obtained from your usual Flymo stockist.

Maintenance Instructions (Fig 10):

- Remove the two screws (**D**) which retain the filter cover. Take off the cover (**A**) and remove the two filters (**E**) and (**F**).
- Clean inside the filter cover (**A**) thoroughly
- Shake or tap the thick black filter (**E**) to remove any dirt or dust. If the thin white filter (**F**) is oil soaked and/ or covered with dust, replace it.
  DO NOT OIL THE FILTERS
- Replace the thicker filter (**E**) in the recess of the filter cover and the thinner one (F) on top, taking care not to crease them.
- Clean the plastic filter body (**G**) with a small brush.
- Replace the filter cover (**A**) and the two retaining screws.
- It will only be necessary to remove cap (**B**) by taking out the two screws (**C**) if there is visual evidence of grass or excess dust.

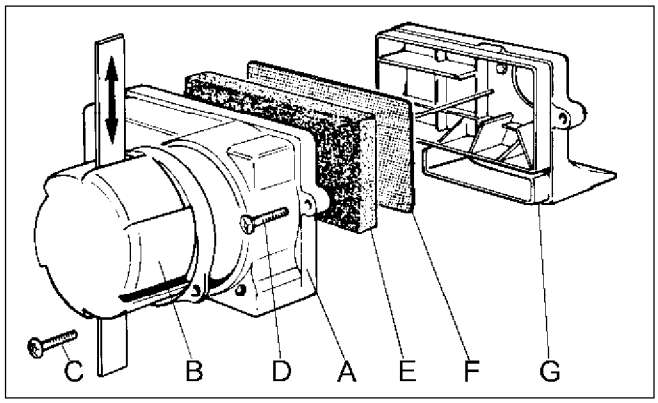


Fig. 10

7. DUAL POLYURETHANE AIR CLEANER WITH SNORKEL (Fig. 11)

OPERATION

Similar to polyurethane air cleaner with paper element and snorkel except in this instance there are two polyurethane filters.
One filter element is located in a housing before the carburettor and the other element is situated at the end of the snorkel flexible pipe usually fitted at the top of the machine handlebars. Again this system is used when equipment is used in extremely dusty conditions.

Fig. 11

1. Filter element
2. Filter body
3. Snorkel tube
4. Pre-filter body
5. Pre-filter element
6. Pre-filter cap

Service filter elements every 25 operating hours, or more often if conditions are extremely dusty.
Wash the polyurethane foam element in a mixture of water and household detergent ensuring that the element is thoroughly dried before re-oiling.
(Should the foam element be excessively impregnated with dirt after prolonged use, replace it).
After this cleaning operation, wet the polyurethane foam with a spoonful of mineral oil and squeeze it lightly to obtain a uniform distribution of the lubricant throughout the element.
Clean inside of element housing before refitting filters.
Wash snorkel pipe from inside with a flow of water and detergent to remove any dust deposits, check pipe for damage and loose connections.

***NOTE** - Snorkel pipe to be completely disconnected and cleaning to be carried out well away from engine.*

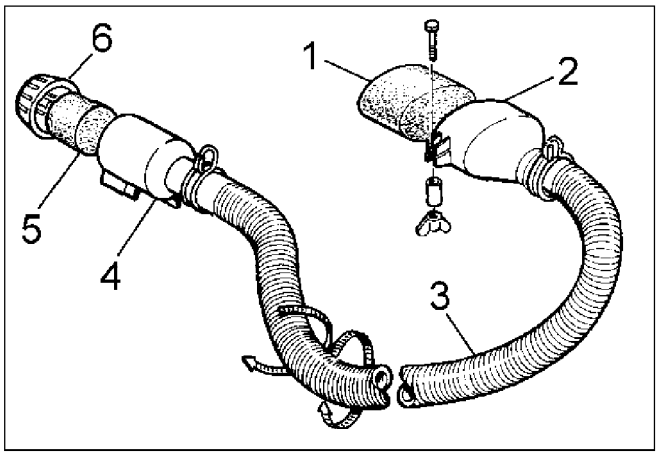


Fig. 11

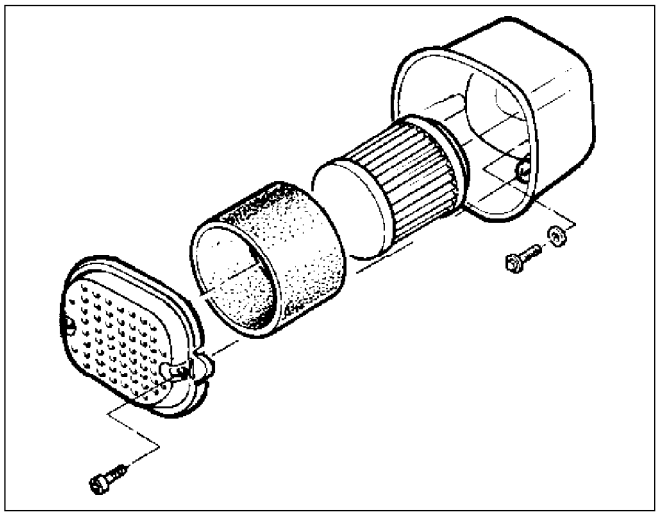


Fig. 12

8. DUAL DRY TYPE PAPER ELEMENT

This air cleaner consists of a paper type element with felt pad pre-cleaner around it. Fitting of air cleaner for horizontal crankshaft engines shown in Fig 12, for vertical crankshaft it is shown in Fig 13A and 13B.

Fig. 13

1. Locating tab
2. Cover
3. Pre-filter (round filters only)
4. Filter element
5. Filter base
6. Press here to release cover (tab)

- Every 25 hours replace felt pad (precleaner)
- Every 75 hours, or yearly, replace felt pad filter (paper cartridge)

If machine is used in a dusty environment, renew felt pad or filter more often. Do not attempt to clean or oil paper cartridge or felt pad.
Never run engine without complete air cleaner (felt pad and paper cartridge).

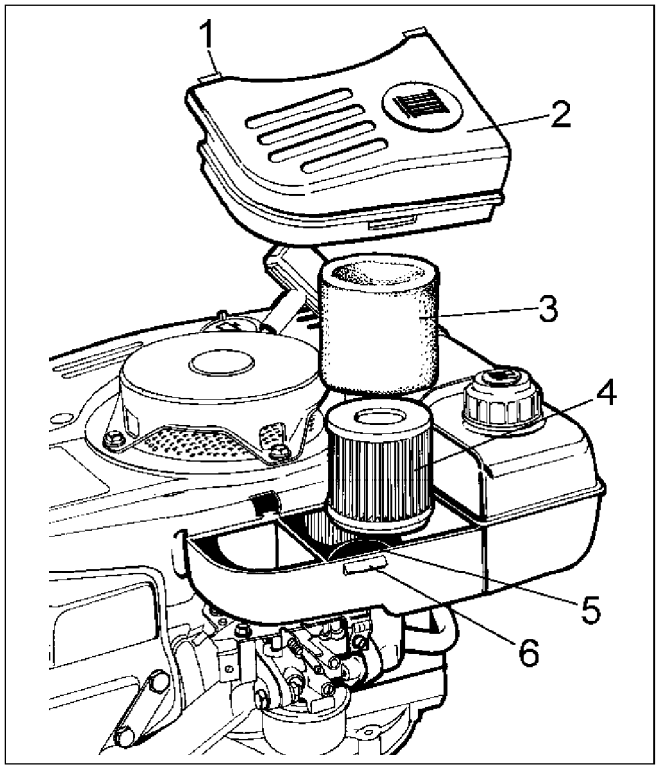


Fig. 13A

HORIZONTAL CRANKSHAFT ENGINES

- Loosen the two cover screws completely and remove cover from base (Fig 12)
- Remove complete air cleaning lifting and softly rotating the cartridge, being careful to prevent dirt from entering air intake.
- If the paper cartridge is still in good servicing conditions, proceed to replace the felt pad, otherwise proceed to replace the complete air filter.
- Clean carefully inside of filter base with a clean, soft cloth.
- Install the filter with new felt pad, or the complete air filter into base by pushing and rotating it. Make sure that filter is correctly seated in the base.
- Replace the cover and tighten the two screws securely. (Fig 12).

VERTICAL CRANKSHAFT ENGINES DUAL ROUND SHAPED AIR CLEANER (Fig 13A)

To install new felt pad or element proceed as follows:

1. Remove the cover by pressing the tab (6).
2. Remove the complete air cleaner taking care not to allow dirt and grass cuttings to enter air intake.
3. Remove the felt pad by sliding it off the paper cartridge.
4. Check the paper cartridge condition and replace if dirty. Clean carefully inside of filter base.
5. Install the new felt pad over the paper cartridge.
6. Install the complete air cleaner into base. Be sure it is correctly seated in the base. Refit the cover.

To install new complete air cleaner refer to preceding instructions.

Type 2 (Fig 13B) OVAL SHAPED AIR CLEANER REPLACEMENT

1. Remove the cover by pressing the tab.
2. Unscrew the wing nut and remove the metallic cover of the air cleaner.
3. Remove the old air cleaner taking care not to allow dirt and grass clippings to enter air intake.
4. Clean carefully inside of filter base.
5. Install the new air cleaner into base. Be sure it is correctly seated in the base.
6. Refit the metallic cover, the wing nut and the cover.

***NOTE** - carefully tighten the wing nut without forcing it. never wash the paper cartridge or attempt to brush dirt from it as this destroys its filtering ability.*

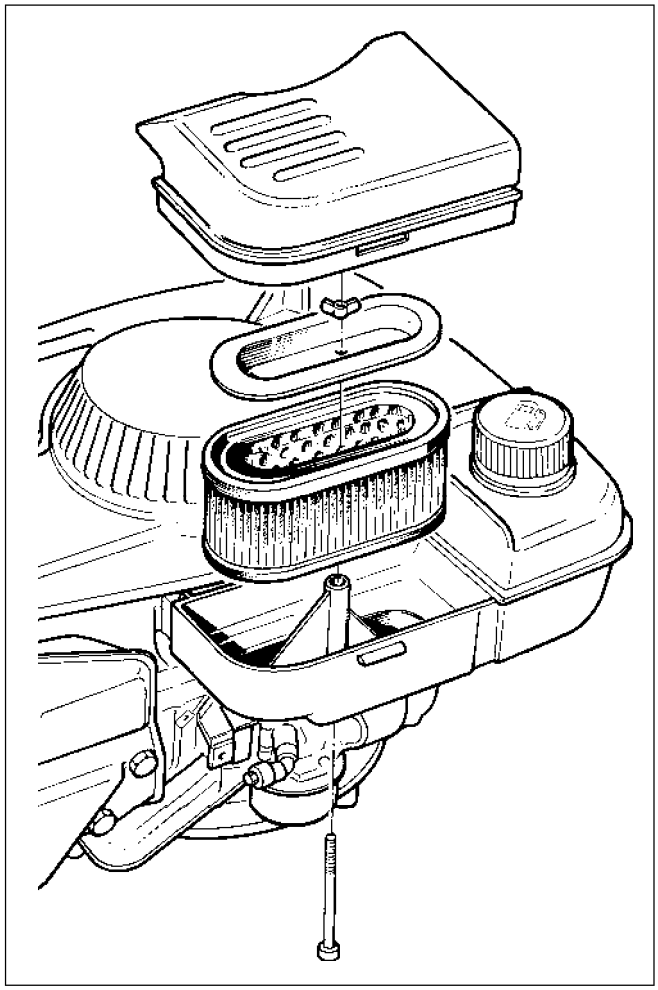


Fig. 13B

9. AIR CLEANER WITH AIR INTAKE FROM THE BLOWER HOUSING

Fig. 14

A. Filter Cover
B. Screws
C. Filter Element
D. Foam Gasket
E. Foam Support
F. Base
G. Breather Gas Recirculation Filter

Proceed as follows:

1. Remove filter body by unscrewing the two screws. Do not remove screws from the filter body.
2. Inspect the following areas for dirt accumulation: **a**, **e**, **f**.
   Remove the foam air filter and the breather gas recirculation foam. If the foams are dirty or clogged they must be replaced. Refer to “Filter Replacement”.
3. Check the gasket inside the filter body. Replace if it is damaged or deformed.

FILTER REPLACEMENT

To remove the foams from the body and from the base, follow instruction 1 in the preceding section; Then proceed as follows:

1. Clean inside the body, the foam support and the filter base.
2. Saturate the new foam with two table spoons (approx. 20 ml) of clean engine oil. Squeeze (do not twist) to evenly distribute the oil and remove excess oil. Do not oil the new breather gas recirculation foam.
3. Fit the new foam into the body making sure it is correctly seated into the body. Ensure the foam gasket (d) is fitted correctly in the body. Install the new breather gas recirculation foam into its proper seat on the base.
4. Position the foam support on the filter base. The bevelled part of the support must point towards the air intake. The fins of the support must face up.
5. Position the body and tighten the two screws securely. DO NOT OVERTIGHTEN.

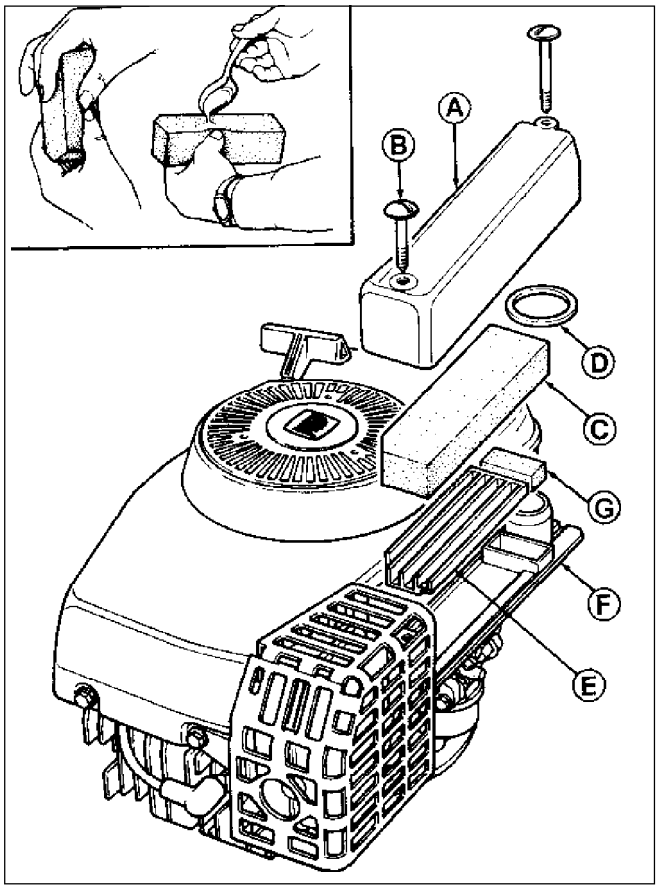


Fig. 14

10. AIR CLEANER INVERTED FLUX FOAM TYPE

Fig. 15

A. Filter Cover
B. Retaining Lugs
C. Filter Element
D. Foam Gasket
E. Base

CHECK PROCEDURE

Check the filter annually, or every 25 hours of use. More frequently if used in dusty environments.

1. Release filter body (**A**) by pressing the two lugs (**B**).
2. Inspect filter base (**E**) for dirt accumulation. Remove the foam from the body. If the foam is dirty or clogged, it must be replaced. Refer to “FOAM REPLACEMENT” instructions.
3. Check the gasket. Replace if it is damaged or deformed.

FOAM REPLACEMENT

To remove the foam from the body please follow instructions 1 and 2 in the preceding section. Then proceed as follows:

1. Clean inside the body and the filter base.
2. Saturate the new foam with two table spoons (approx. 20 ml) of clean engine oil. Squeeze (do not twist) to evenly distribute the oil and remove excess oil.
3. Fit the new foam into the body making sure it is correctly seated into the body.
4. Position the body so that the lugs on the base corresponds to the body openings.
5. Secure body to filter base by downward pressure.

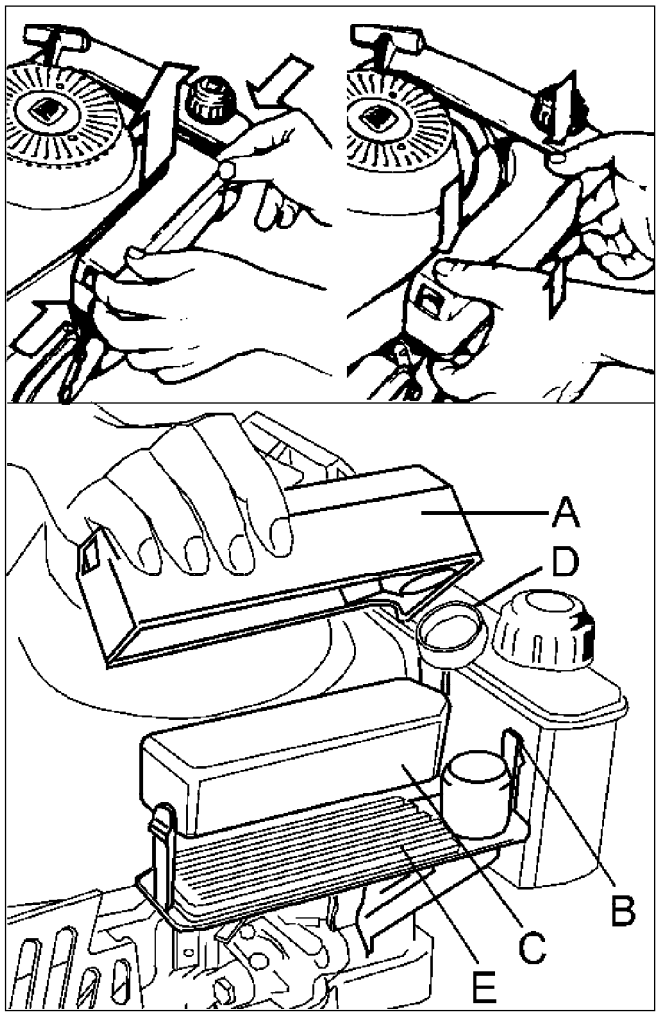


Fig. 15

11. CONICAL AIR CLEANER

Fig. 16

A . Cover
B. Filter Element
C. Flange
D. Location Tab
E. Location Slot
F. Retainer

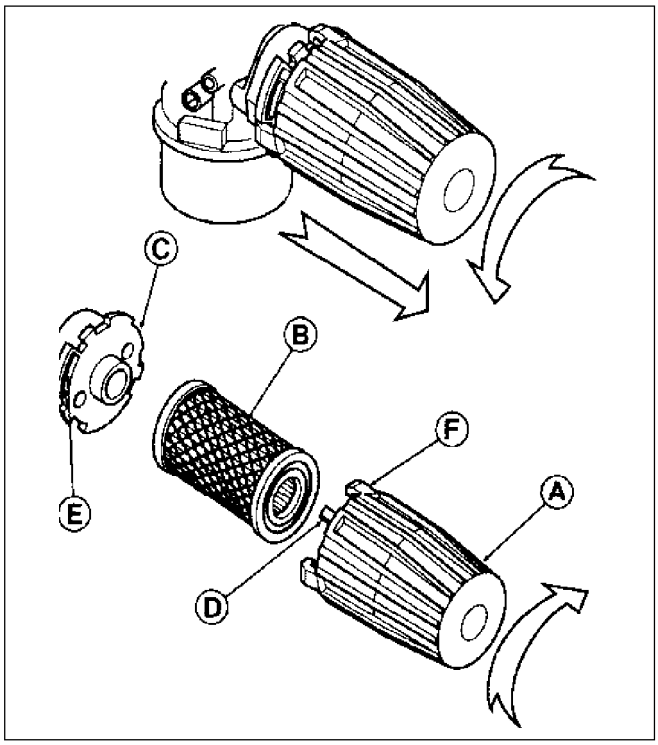


Fig. 16

PAPER CARTRIDGE REPLACEMENT

1. Turn cover to the left (counter-clockwise) and remove it and filter from flange. Discard filter.
2. Clean cover and flange thoroughly.
3. Insert new filter into cover.
4. Position cover and filter against flange with tab on cover inserted into lower left corner of slot in flange.
5. Push cover firmly against flange and turn it to the right (clockwise) as far as it will go. Be sure retainers are locked around flange.

12. PAPER AIR CLEANER WITH INTAKE FROM THE BLOWER HOUSING

Fig. 17

A. Cover
B. Screws
C. Optional Foam Pre-filter
D. Filter Element
E. Body

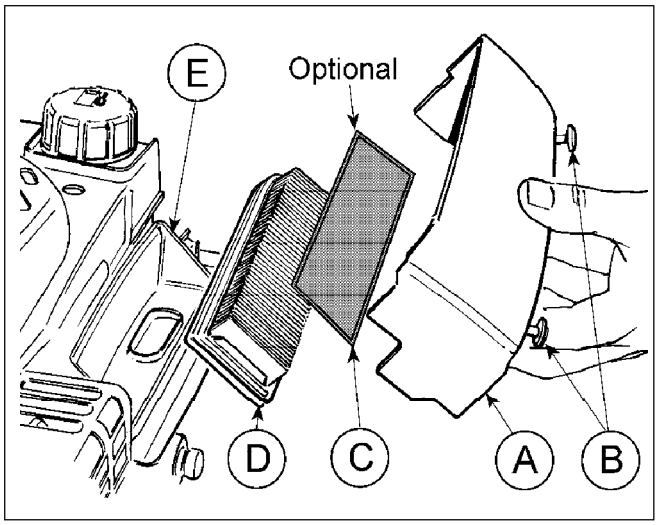


Fig. 17

PAPER FILTER

Check filter every 10 hours or more frequently if used in dry, dusty conditions.
Do not attempt to clean or oil filter.

FOAM PRE-FILTER (if any)

Do not attempt to oil filter.
Clean every three (3) months or every 25 operating hours.
Clean more often if used in extremely dusty conditions.

A. Wash in water and detergent solution.
B. Rinse thoroughly in clean water. Air dry.

TO REMOVE AND INSTALL FILTER

1. Remove cover from body by loosening cover screws. (Do not remove screws from cover).
2. Remove paper filter and foam filter (if any) from the cover.
3. Inspect filter for discolouration or dirt accumulation, if either is present, replace filter.
4. Clean inside of body and cover thoroughly.
5. Install paper filter and foam filter (if any) in cover.
6. Install cover on body. Tighten cover screws securely.

G. CARBURETTORS

1. GENERAL

Two basic types of carburettor are fitted to Tecumseh engines built in Italy.

- Diaphragm carburettor
- Float carburettor

The operating and constructional differences of these types of carburettor are as follows:

DIAPHRAGM CARBURETTOR (Fig. 1)

A - Choke
B - Idle
C - Intermediate speed
D - Full load

Inlet of petrol to carburettor is controlled by needle **P**. During operation of the engine, this needle is lifted by diaphragm **L**, when the fuel drawn from the jet nozzles cause a depression on the upper part of the diaphragm.

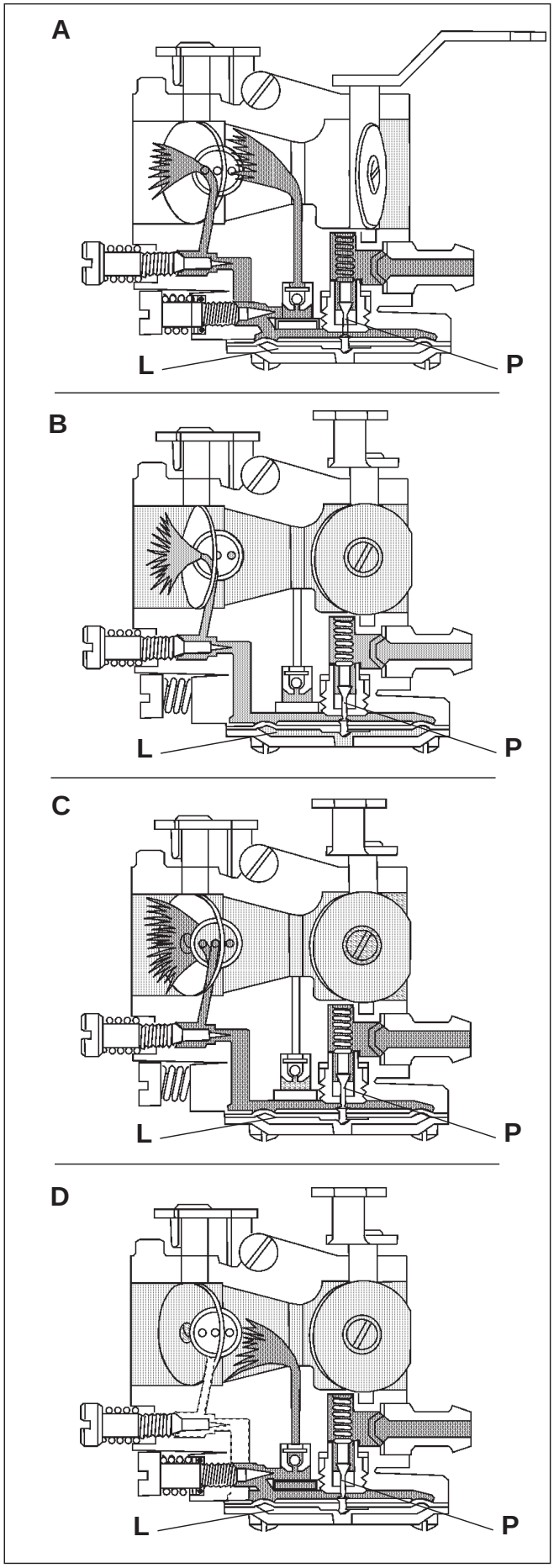


Fig. 1

FLOAT TYPE CARBURETTOR (FIG. 2)

E - Choke
F - Idle
G - Intermediate speed
H - Full load

Inlet of petrol to the carburettor is controlled by needle **P**. When the petrol level decreases, the float **G** falls and consequently the needle allows petrol to flow in and restore the level.

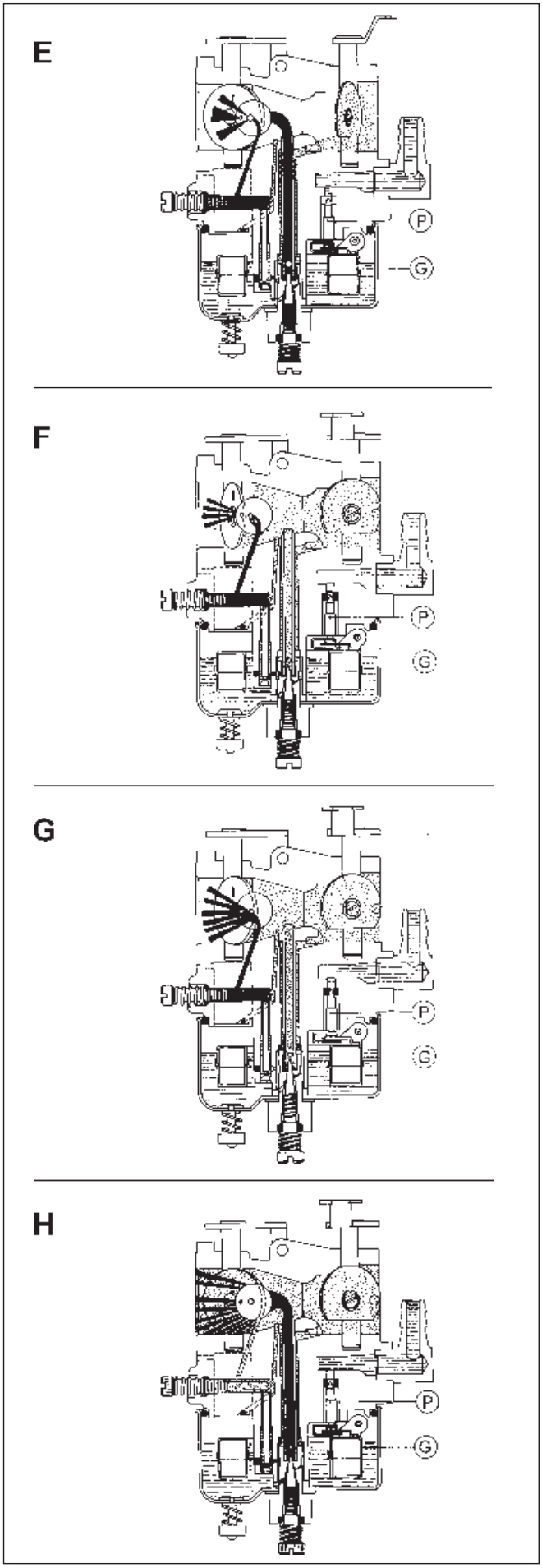


Fig. 2

2. DIAPHRAGM CARBURETTOR

There are 2 types of diaphragm carburettor :
- Standard carburettor
- Carburettor with primer

a) ADJUSTMENT OF DIAPHRAGM CARBURETTOR

For carburettors with variable main and idle jets, proceed as follows (see Fig 3).

A. High speed adjusting screw (See E & Text)
B. Low speed adjusting screw
C. Idle speed regulating screw
D. Choke lever
E. Fixed main jet (high speed)

- Tighten the main adjustment needle **A** and idle adjustment needle **B**. (Do not use force or the needle seats may be damaged).
- Turn main adjustment needle A (hex head) 1.1/4 turns anticlockwise. Turn idle adjustment needle **B** (knurled head) 1 turn anticlockwise. Back off idle speed regulating screw **C** so that it is out of contact with the throttle stop lever (fully closed throttle), then screw in one full turn to hold throttle slightly open.
- Move control lever to full choke, or actuate primer. Start engine and allow to warm up. Make sure choke, when provided, is fully open after warm up.
- Run engine at full operating speed and, by final careful adjustment, set main adjustment needle **A** to position that will give smoothest performance. Final adjustment should range between one and one and a half turns open.
- Run engine at idle speed and adjust idle screw **B** to position that will give the smoothest idle operation.
- Adjust idle speed regulating screw **C** to give an idling speed of 1.800 rpm. Use a tachometer to check speed. Carburettors fitted with a fixed main jet **E** are now standard, and the only adjustments possible are to the idle jet and slow running screws.

NOTE *- The final setting should give a slightly richer mixture.*

b) DIAPHRAGM CARBURETTOR WITH THE MAIN JET INSIDE THE FUEL CHAMBER

From Fig 4 it can be observed that the main jet, instead of being located in its normal position, i.e. at the side of the idle jet, is fitted inside the fuel chamber. This is a fixed main jet and thus does not require any adjustment. In the case of engine running at a fixed speed (for example Flymo) the jet will not have or require other parts. On the contrary, for engines running with variable rpm, a nylon ball valve will be located under the main jet.

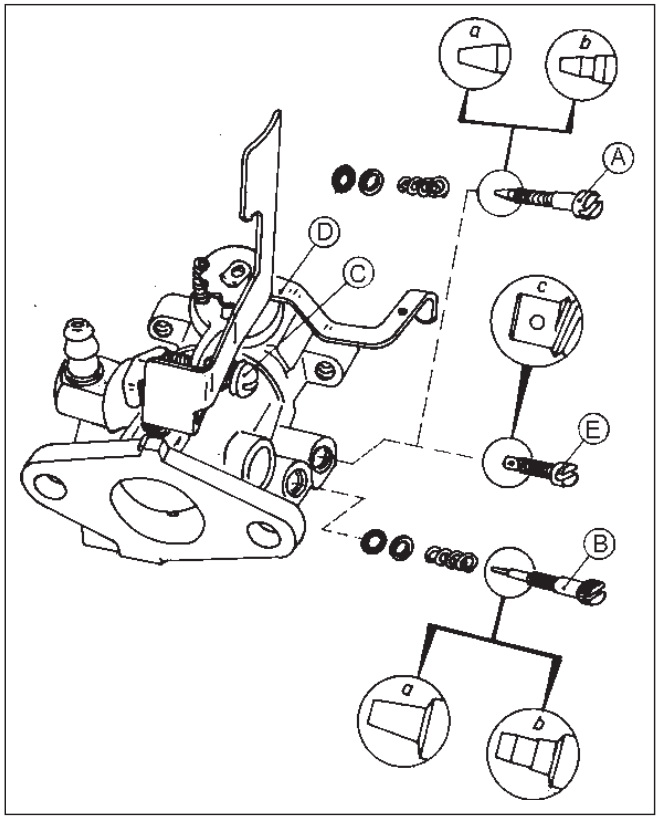


Fig. 3

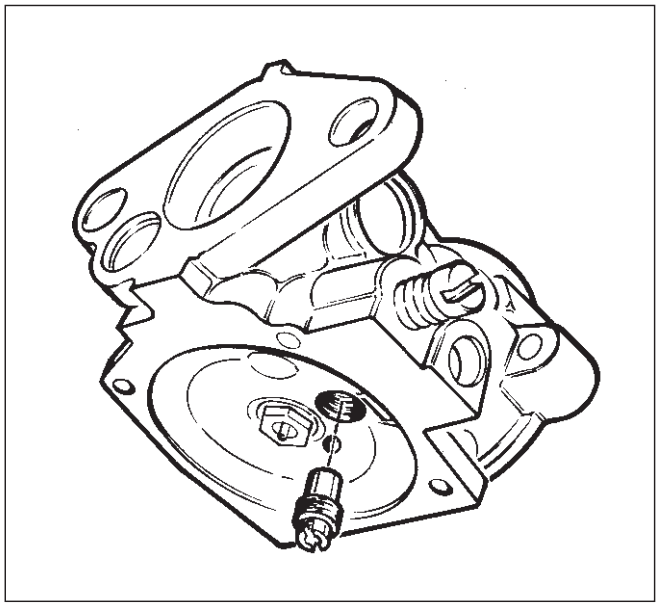


Fig. 4

c) SERVICING DIAPHRAGM CARBURETTOR

Standard diaphragm carburettor

To clean carburettor (Fig 5), proceed as follows:

- Remove main jet (nos. **14, 15, 16, 17**) and idle jet (nos. **10, 11, 12, 13**). Check these for serviceability, replace worn or damaged jets. On current carburettors, a fixed main jet is now fitted (8). This is fitted without seals etc, whereas the idle jet is adjustable and consists of a needle (**10**), spring (**11**), O-ring (**12**) and washer (**13**).
- Check that butterflys (**3** and **9**) and spindles (**1** and **7**) operate freely. If any sticking occurs, clean, and if necessary, replace defective parts.
- Replace the carburettor if the body is found damaged or broken.
- Remove the 4 screws (**26**) of cover (**25**), remove the gasket (**23**) and diaphragm (**24**). At this point, check visually the gasket and diaphragm. The latter should be in good condition and not cracked or hardened.
- Remove the valve assembly (**18, 19, 20, 21**) with a hexagonal 5/32 spanner (or with a slotted head screwdriver for valves of the old type), taking care to extract washer, spring etc. (Fig 6).

Compressed air may now be blown through the valve seat hole and through the two jet holes to remove any dirt or blockage.

- Reassemble, referring to Fig 5, making sure that valve (**21**) and needle (**19**) are not damaged or bent. The needle (**19**) should protrude approximately level with the carburettor face, (Fig 7). If needle is sunk, this denotes that gasket (**20**) has not been fitted or that the needle is worn. If needle projects, it is possible that two washers have been fitted.

Reassemble, install and adjust carburettor.

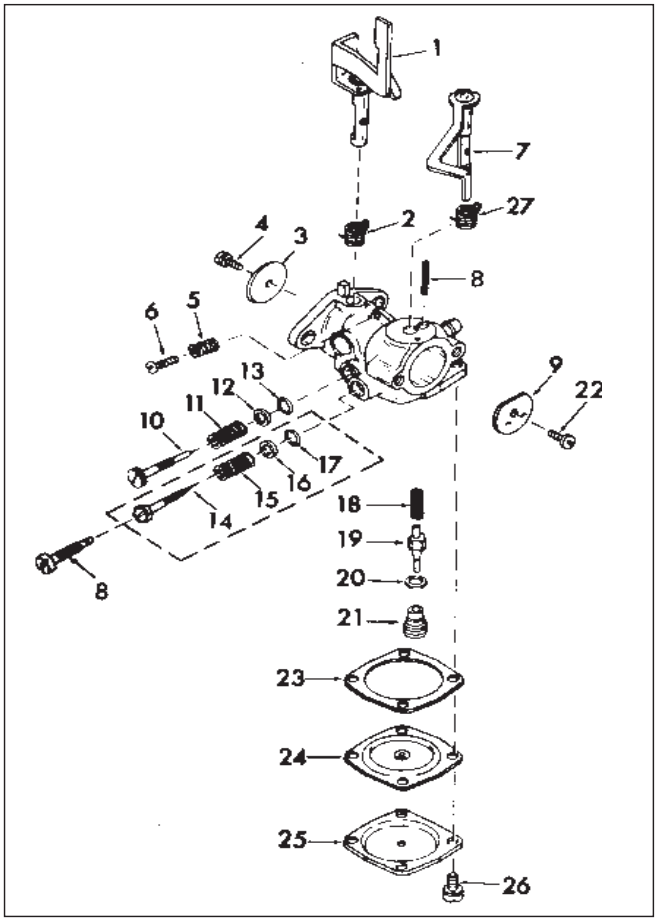


Fig. 5

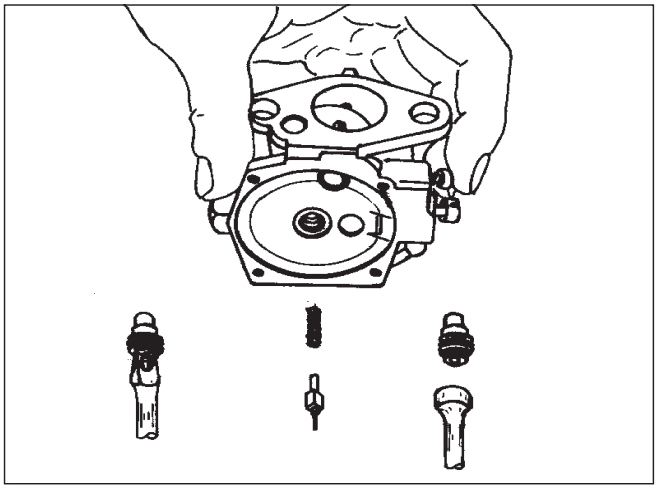


Fig. 6

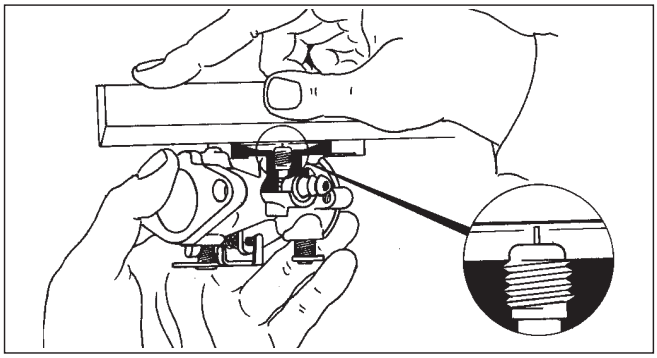


Fig. 7

d) DIAPHRAGM CARBURETTOR WITH PRIMER

The carburettor with primer is characterised by the absence of a choke and by the presence of a special rubber pump, connected to the carburettor base cover by means of a rubber tube (Fig 8).
The cover has a small hole (Fig 8, item A) to allow return movement of the diaphragm after the lifting action of the primer. Fitted immediately behind the inlet elbow is a non-return valve which prevents petrol from flowing back to the tank when the primer is used, thus ensuring that all the fuel is injected into the venturi.

NOTE - *(1) The use of compressed air may damage this valve.*

(2) The inlet needle should be held off its seat for this operation.

If the inlet elbow is obstructed and prevents the passage of air, remove the elbow by pulling and twisting motion, bearing in mind the initial position for reassembly. By blowing the reverse way to the petrol flow, it is possible to clean the fine filter located in the elbow.
Refit elbow. After tapping it in by about one third, use some Loctite or other adhesive, to ensure a petrol tight fit when the elbow is completely inserted. (Fig 9).

Non-return valve fails to operate (brass type pressed in valve).
After removal of the elbow, remove valve for replacement. For this operation proceed as follows: (Fig 10).
- Tap centre hole **A** of valve with a 5/32 tap.
- Remove tap and, with a 5/32 screw nut and washer (Fig 10), extract the valve by tightening screw in tapped hole, retain the screw with a screwdriver, turn the nut with a spanner. The valve will then be withdrawn by the screw.
- Refit the new valve, seating it with the aid of a punch which taps the valve squarely onto its seat. At this point, check operation of valve.
- Refit the needle valve seat (Fig 11). Supply petrol by means of a plastic pipe and check that petrol does not escape from the valve (**A** of Fig 11), but readily flows past the valve when the inner disc is held off its seat.

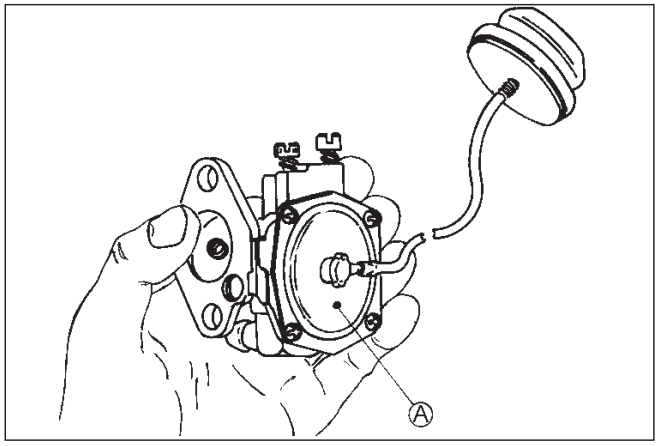


Fig. 8

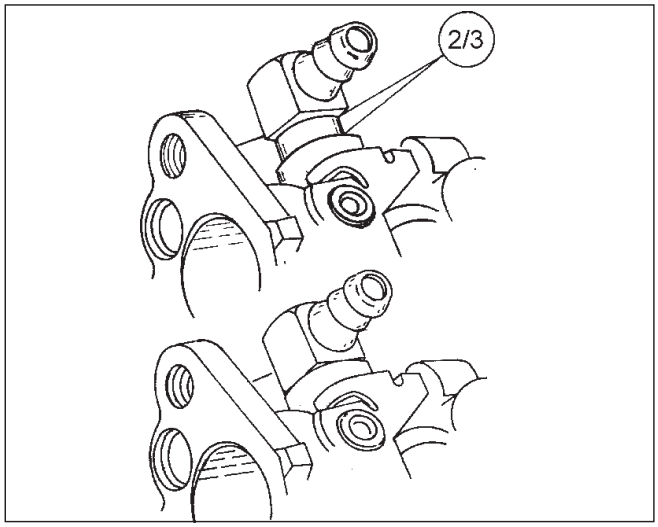


Fig. 9

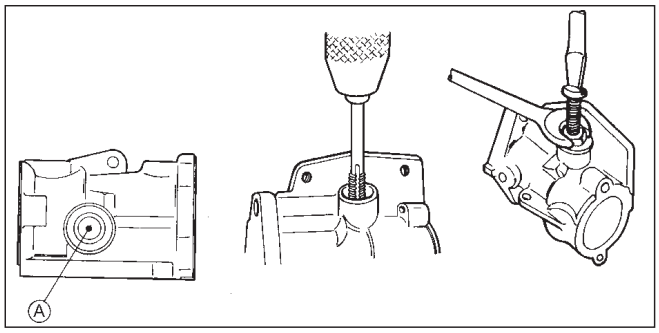


Fig. 10

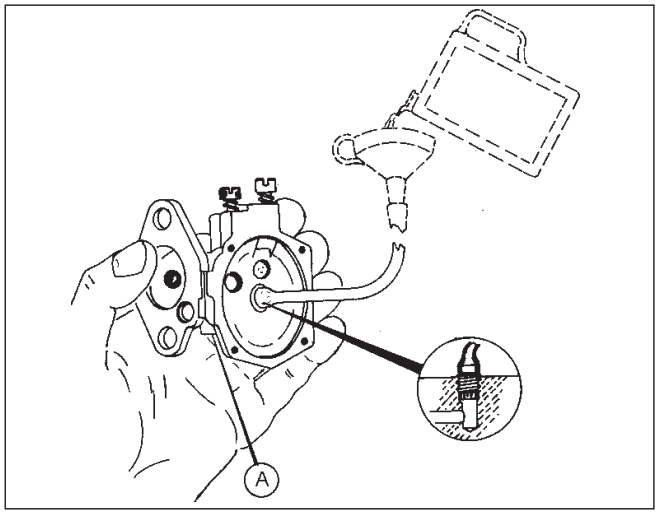


Fig. 11

e) BALL TYPE NON RETURN VALVE (FIG 12)

The brass valve, pressed into the carburettor body has been discontinued. The current non return valve consists of a steel ball which seats in a taper situated in the fuel inlet elbow.
This valve is not inter-changeable with the earlier brass type.
To change or clean the ball and seat, proceed as follows:

a. Remove the fuel inlet elbow (noting position of nozzle). CAUTION : do not lose the steel ball.
b. Check and clean the seat within the elbow, strip and inspect remainder of carburettor as normal.
c. Rebuild carburettor, reposition ball in inlet elbow and push into carb body. When the elbow is inserted approximately 2/3 distance, apply a Loctite or similar adhesive to obtain a good seal, and press elbow fully into place.

***NOTE** - Ensure elbow is positioned in the same manner as originally set.*

Fig 12, A - Steel ball, B - Inlet elbow

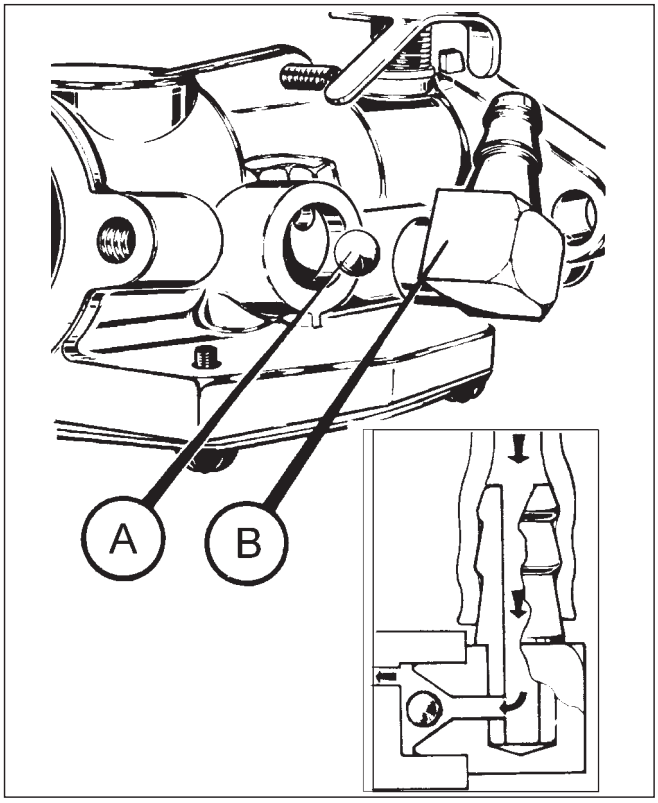


Fig. 12

3. FLOAT STYLE CARBURETTORS

These carburettors may be found in the following variants:
- Adjustable main jet
- Fixed jet choke start
- Fixed jet primer start

The carburettors may be found with fixed (Fig 13) or adjustable (Fig 14) jet.
Fixed jets do not only differ by their size (.68 or .82 etc), but also by the number of emulsion holes and by their length. The correct jet depends on engine type, carburettor and air cleaner type. Use your spare part catalogue to identify the correct jet for a given engine type and air cleaner execution, or consult the tables at the end of this chapter.

a) ADJUSTMENT (ADJUSTABLE JET) (FIG 14)

- Tighten the main adjustment screw (**e**) and idle adjustment screw (**d**) finger tight (adjustable jet type only).
- Turn adjustment screw (e) 1.1/2 anticlockwise and idle adjustment screw (**d**) one turn anticlockwise. Slacken idle speed regulating screw (**b**) so that it is just out of contact with the throttle lever (**a**) (throttle completely closed) then screw in one turn to hold throttle slightly open.
- Run engine at idle speed and adjust idle screw (**d**) until smooth running is obtained.
- Adjust position of idle speed regulating screw (**b**) so that engine idles to about 1,800 rpm. Use a tachometer to check speed.

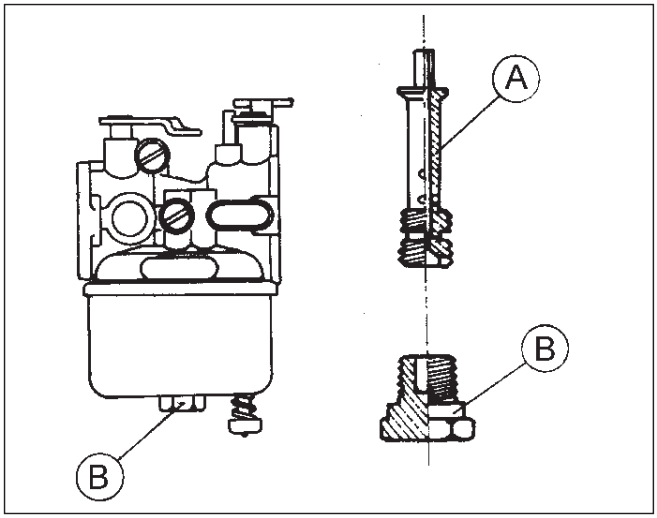


Fig. 13

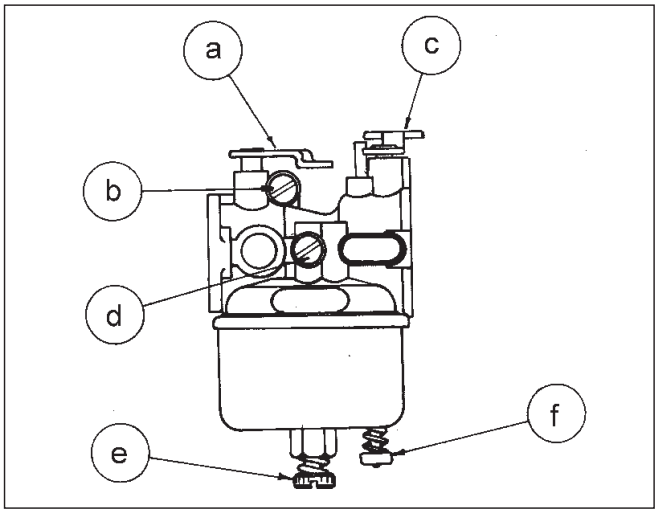


Fig. 14

b) OPERATIONS ON FLOAT CARBURETTORS

Removal and disassembly of the carburettor

- Remove air cleaner.
- Disconnect fuel pipe. Empty fuel bowl by means of the push button (f - Fig 14).
- Remove cover or control panel to allow access to the carburettor.
- Disconnect choke and throttle linkage.
- Remove carburettor from engine.

Checking carburettor parts.

After disassembly clean all metal parts of carburettor with solvent. Dry thoroughly with clean compressed air. Then check parts as follows:

- Check main and idle adjustment screws for wear. Should the tapers show excessive wear, replace. Check that gasket is free from defects - replace if any damage is apparent. To remove and replace main jet use special tool supplied by Tecumseh (Fig 15-**A**).
- Check that screwdriver cut in main nozzle (part **B**, Fig 15) is not damaged and that the main adjustment screw seat is not deeply stepped or otherwise damaged. Check that the fuel orifice in main jet (Fig 15, **e**) is not obstructed or the hole distorted. Replace if damaged.
- Check the carburettor body for damage, obstructed passages, or worn spindle bushes. Clean out obstructed passages with clean compressed air. Replace body if damaged.
- Check that petrol has not entered the float through damage caused by mishandling, dents etc, and that the float shaft is not worn. Replace float if damaged and shaft if worn.
- Check that petrol inlet needle works freely in its seat and its tapered portion is not stepped due to excessive wear. In case of any damage or wear, both on the needle or its seat, replace both parts.
- Check throttle and choke spindles for wear or the bearing surfaces for possible distortion or other damage. Replace if necesssary.

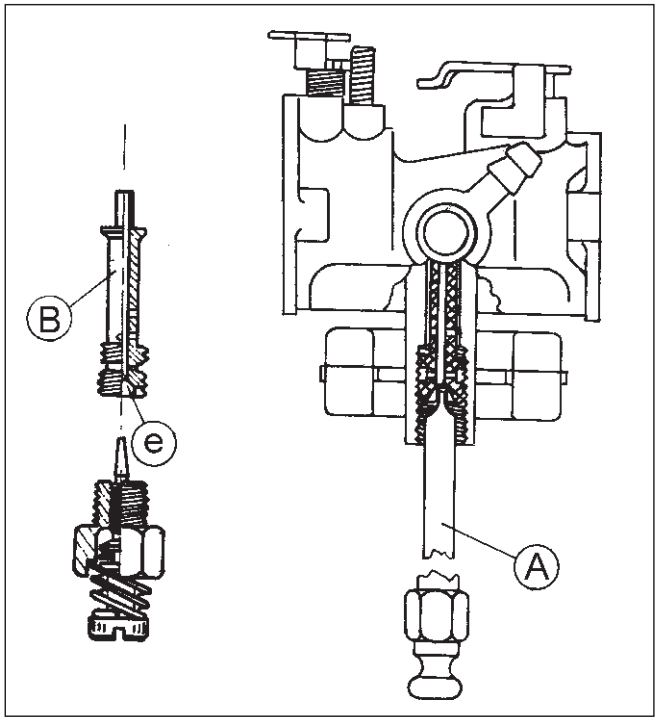


Fig. 15

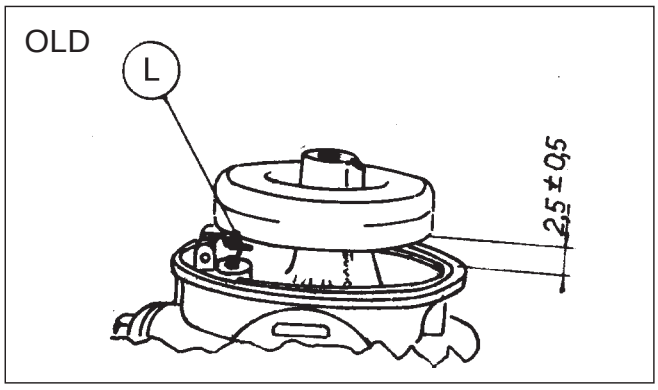


Fig. 16

Brass type float

- Check float level as follows:
  Invert assembled float and carburettor body and check clearance between body and float at portion of float opposite hinge. Clearance should be 3/32" (2,5 mm +/ - 0,5) (Fig 16). If adjustment is necessary, remove the float shaft and bend the tang (L) on float lever, raising or lowering it until correct clearance with the float mounted, is obtained.

Plastic (white) floats

If the carburettor is fitted with a white plastic float, the distance '**L**' (Fig 16) is pre-set and non adjustable. If this setting is not correct, or float is damaged, a new float must be fitted.

c) PRIMER CARBURETTORS

In the pre-start position, fuel fills the prime well in the bowl nut to the level maintained by the float. This will provide the rich mixture required to start a cold engine. It takes about 5 seconds for the prime well to refill after each starting attempt or when engine is stopped.
Push Pre-starting Primer 2 or 3 times. Pause about 2 seconds between each push.

***NOTE** - In cold weather (10C or below), push Pre-starting Primer 5 times. Do NOT use pre-starting Primer to re-start a warm engine which has stopped for a short period.*

If the engine is used in cool weather conditions, the primer can be used to force fuel through the main nozzle to provide a richer mixture.

When the engine starts and runs, the fuel level in the bowl and prime well stabilizes and air from the air bleed and fuel from the main jet are pulled up the main nozzle for engine operation.

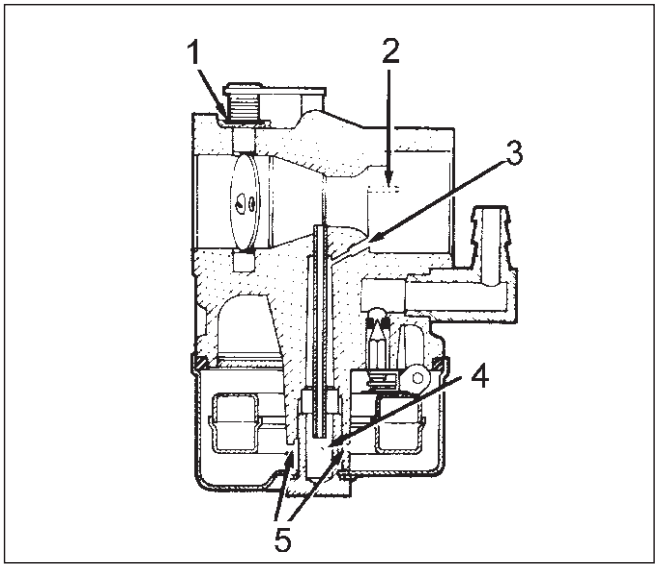


Fig. 17

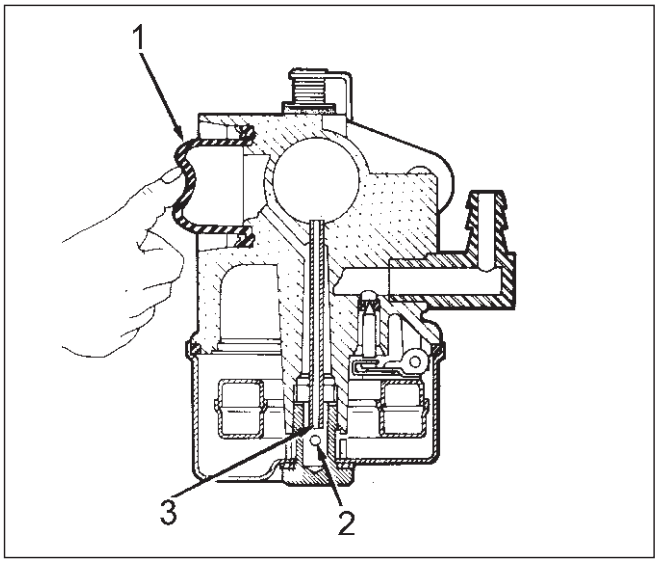


Fig. 18

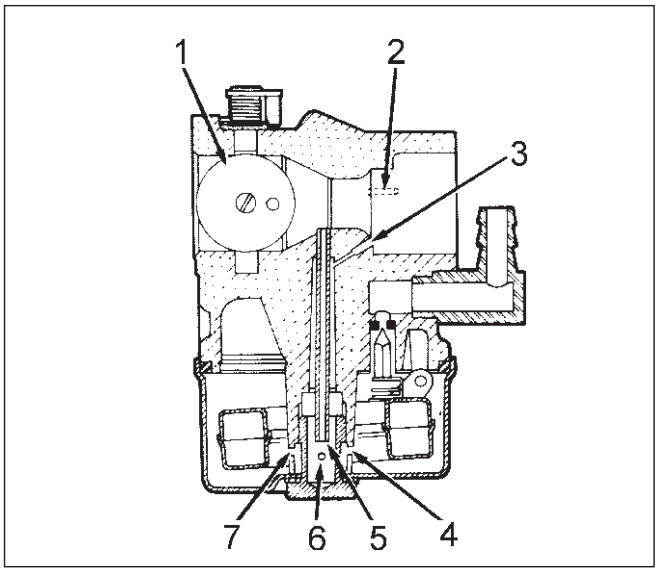


Fig. 19

Index Fig. 17 - Before start

1. Felt seal
2. Internal vent
3. Air bleed
4. Prime charge
5. Fuel inlets

Index Fig. 18 - Prime

1. Primer bulb
2. Main jet
3. Main nozzle

Index Fig. 19 - Run

1. Throttle shutter
2. Internal vent
3. Air bleed
4. Fuel inlet
5. Main nozzle
6. Main jet
7. Fuel inlets

These carburettors are float feed non-adjustable. Adjusting screws for final setting of rpm can be found on the control plate, if fitted. Screw **A** for high speed, screw **B** for low speed (Fig 21). Screw C on the governor lever is left hand thread, if cross head screw is fitted. (Fig 22).

If engine is fixed speed there will be no control plate, but a deformable tag will be attached to the inlet manifold screw. This tag can be adjusted for final setting of high speed only.

Clean, fresh fuel is vital to the operation of any engine. The device that meters the fuel to the engine is the carburettor. If the fuel is stale, sour or contains water, that creates a metering problem for the carburettor.

Good valves are essential for dependable starting. Burned valves, poor seats or improper valve stem clearance result in poor starting which is then incorrectly diagnosed as a carburettor problem.

The proper float height is very important to all Tecumseh carburettors and must be set by using the Tecumseh float setting tool part number 670253A. (Fig 23) - Brass floats only.

PRIMER BULBS (Figs 24 & 25)

These bulbs can be removed by grasping with pliers and pulling and twisting out of the body. Remove the retainer by prying and lifting out with a screwdriver.

Do not re-use old bulb or retainer. New primer bulb and retainer come in a kit.

Insert new bulb in to primer well, fit new retainer over bulb, press in with an appropriate sized socket.

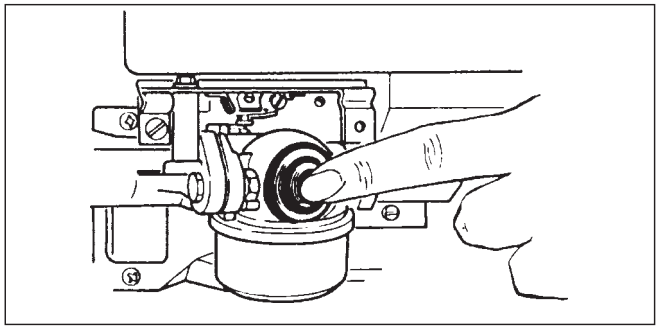


Fig. 20

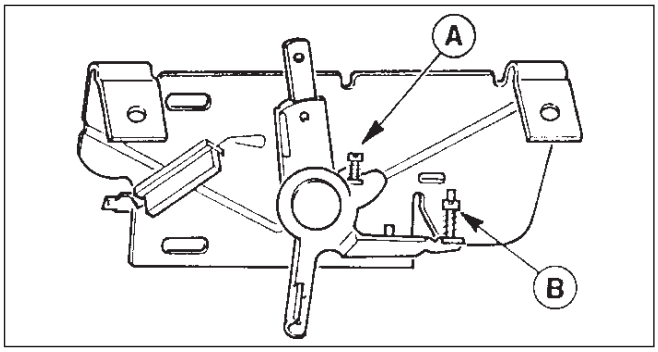


Fig. 21

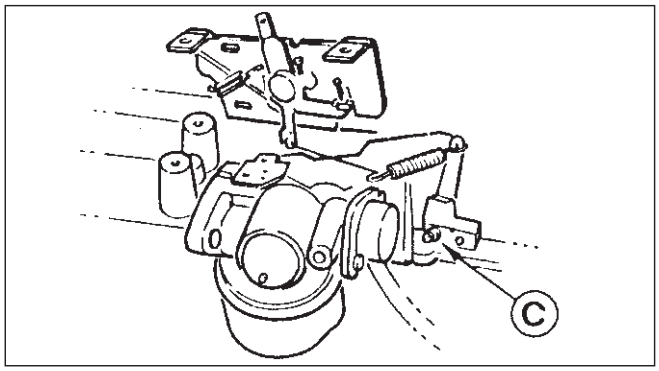


Fig. 22

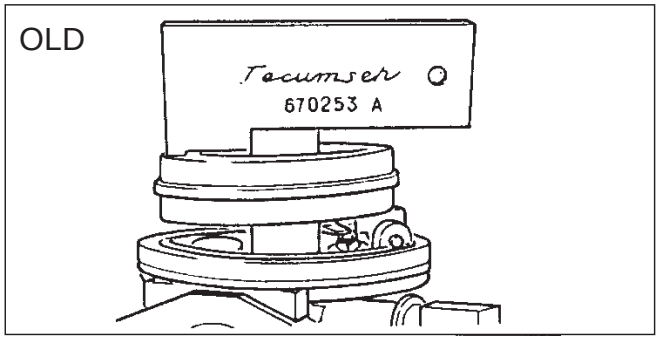


Fig. 23

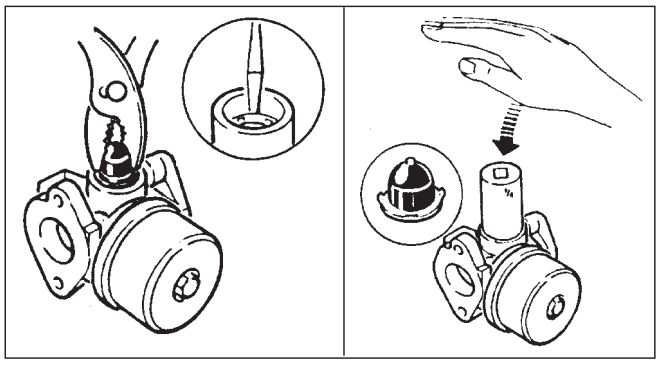


Fig. 24

Fig. 25

d) ALTERNATIVE STYLE PRIMER START FLOAT CARBURETTORS (Fig. 26)

With the advent of more stringent emission controls, carburettor technology is continually improving. Be aware that there are now many different types of Primer Carburettors, which at first glance may seem similar.

Always refer to the master spare parts listing, using the correct engine model, spec and serial number when ordering spare parts.

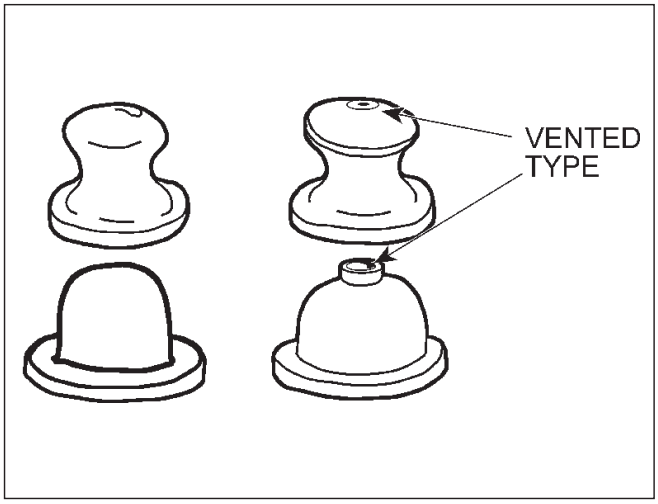


Fig. 26

PRIMER BULBS

There are different types of primer bulb fitted to float style, primer start carburettors.

Stepped bulb with vent
Stepped bulb without vent
Smooth bulb with vent
Smooth bulb without vent, etc.

Using the wrong primer bulb during repair will cause poor engine running and bad starting.

MAIN JET / BOWL NUT

Due to the different styles of primer carburettor, there are different types of Bowl Nut / Main Jet used. These jet types are not interchangeable.

NOTE *- Always refer to the master spare parts list, using the correct engine model and specification numbers when ordering spare parts.*

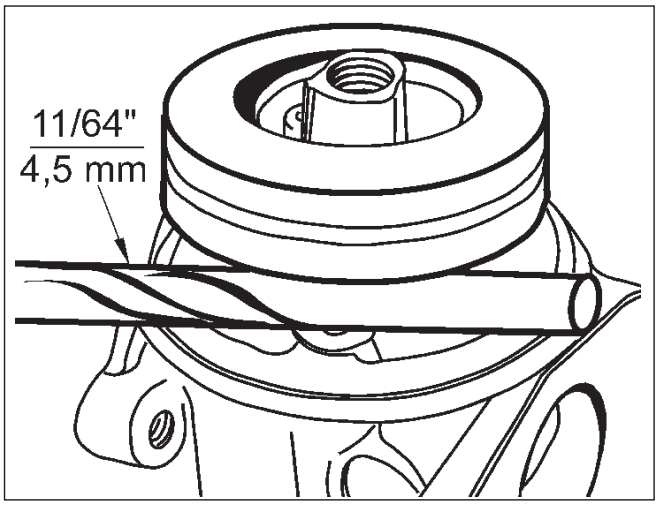


Fig. 27

e) NEW FLOAT (Height Adjustment)

The float height adjustment dimension indicated in Fig. 16 and in Fig. 23 was used on earlier carburettor models. Float height adjustment for new carburettor models requires use of a 11/16” (4.5 mm) insert.
Proceed as follows: Invert the carburettor with the float upwards. Position the insert on the carburettor body parallel to the fastening plug.
Adjust float height by letting it rest against the insert and bending the rear tab (See Fig. 27).

H. GOVERNORS

GENERAL

Engines currently fitted to lawnmowers, pumps etc, are generally fitted with a speed governor which controls the engine revolutions at a predetermined speed under varying load conditions.

TWO STROKE ENGINES

Two stroke engines are usually fitted with pneumatic governors.

FOUR STROKE ENGINES

Four stroke engines, horizontal and vertical crankshaft, are fitted with mechanical governors.

***NOTE** - When engines are fitted with a remote control lever, make sure that this allows the control to attain the full movement Max - idle - Choke and Stop.*
These positions marked on the handle of the machine should correspond to the same positions on the governor control. If full choke and full throttle are not attained, starting difficulties will be experienced.

1. PNEUMATIC GOVERNOR FOR 2 STROKES

The above engines are fitted with a pneumatic governor of the type shown in Fig 1. Air vane «**B**» attached to the throttle spindle draws air from the flywheel «**V**». This vane so under the air pressure from the flywheel tends to close the throttle until the spring «**M**» fastened between the control lever «**L**» and the vane opposes this movement. The balance between the two forces giving the desired throttle opening.

a) Variable control type (Fig. 2)

The control lever «**L**» secured to the bracket (Fig 1) may be moved between the choke position and the stop contact position. Between the max position (lever against but not operating the choke) and the min position (lever near but not touching stop contact), the speed range is obtained.
To increase or decrease the max speed, the spring «**M**» is moved to another hole in the lever «**L**» (Fig 2) by moving the spring to a hole further away from throttle the speed is increased and vice versa.
The maximum speed is checked with the lever in the position at which it contacts the choke control.

***NOTE** - Always check that the lever will fully close the choke.*

b) FIXED SPEED EXECUTION

A fixed speed type is available (Fig 3). This being fitted with a fixed bracket «**S**» on which is mounted the governor spring «**M**».
The speed adjustment is carried out loosening clamp screw «**P**» and moving the lever to increase or decrease the spring tension according to the speed desired.
On this type of governor the choke lever «**C**» may be a separate control and there may be a separate stop switch. Otherwise the lever «**L**» only operates the choke and the stop switch. (Fig 4).

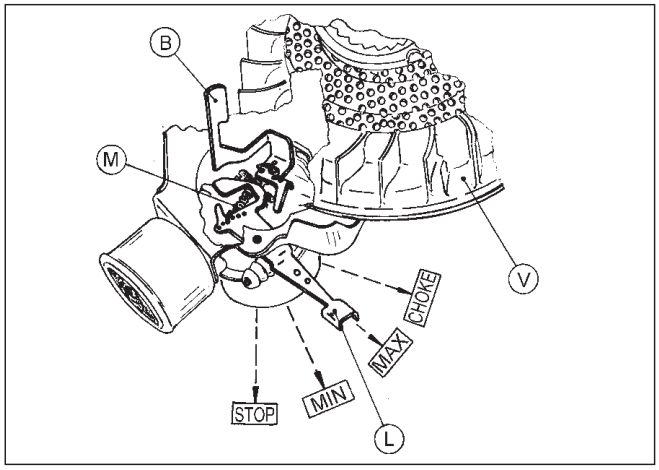


Fig. 1

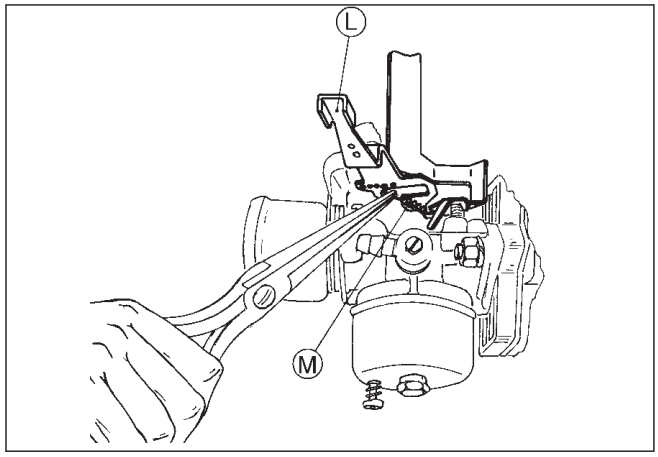


Fig. 2

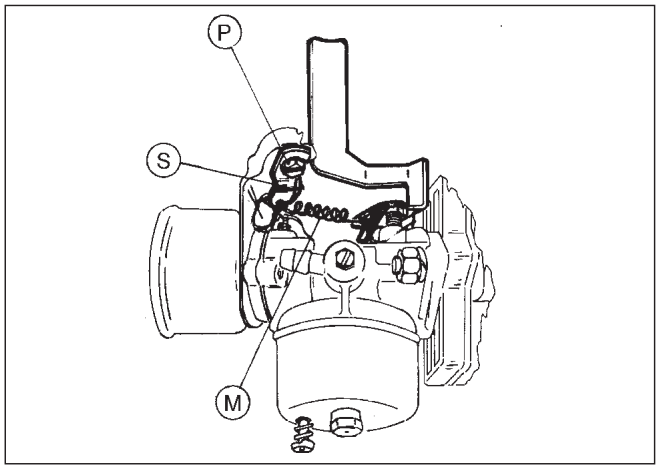


Fig. 3

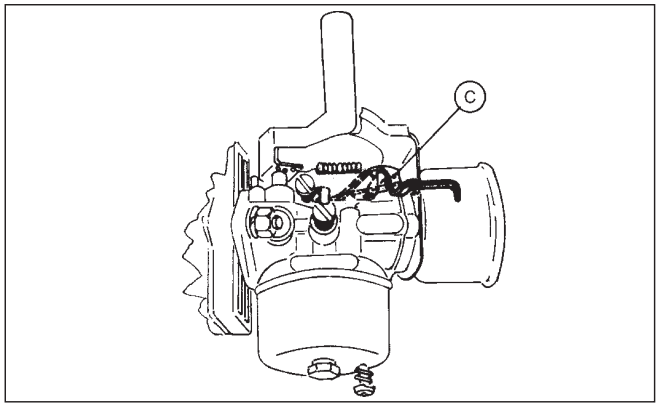


Fig. 4

c) GOVERNORS FOR AV AND MV MODELS

AV and MV engines are fitted with a pneumatic governor similar to the one already used on the previous TA and VA engines.
For the speed control on the governor for AV and MV engines, there is an adjusting screw for use on variable speed engines.
To adjust the speed operate as follows:
- Turn the screw in a clockwise position to increase the speed.
- Turn the screw in an anti-clockwise position to decrease the speed. (Fig 5).

On AV and MV engines the governor spring must be fitted (Fig 6) with the hooks inserted from the top.

The spring must be located in the second hole of the carburettor throttle lever (Fig 7) to allow the opening of the throttle in order to obtain maximum power.

MV engines with electronic ignition have only one hole in the governor vane to connect the spring to.

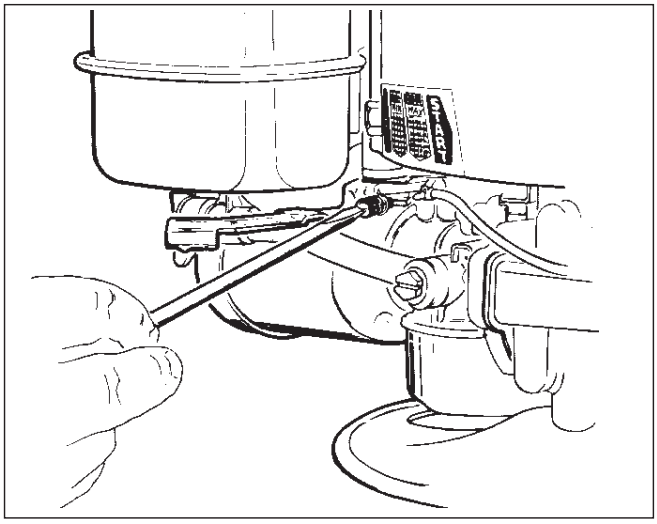


Fig. 5

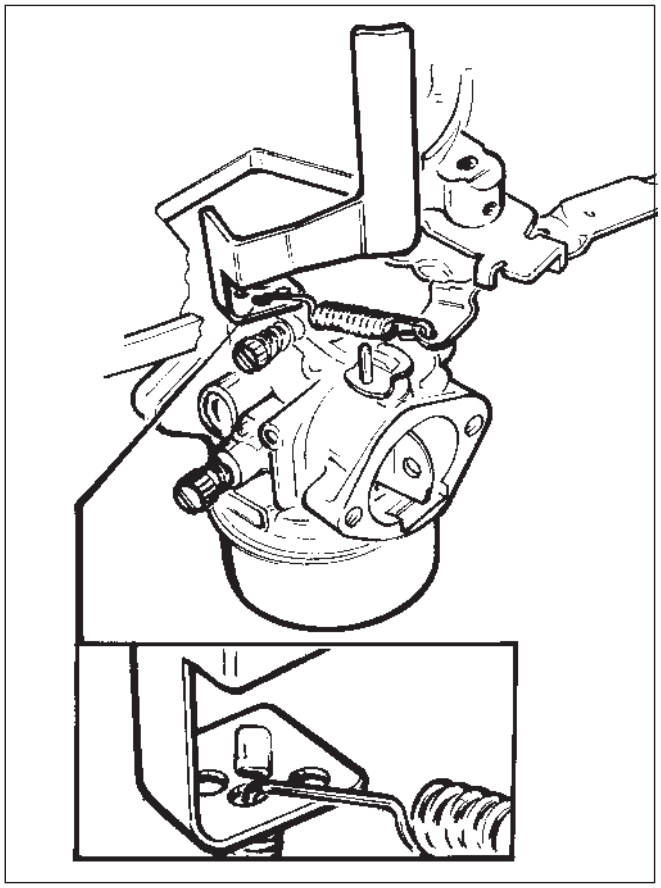


Fig. 6

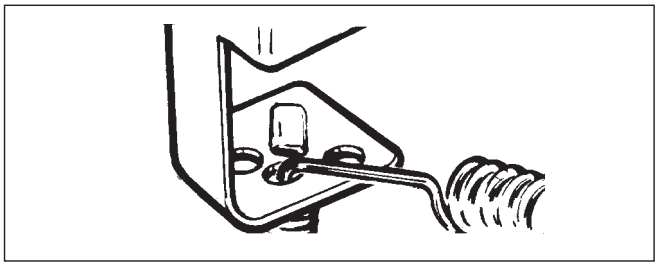


Fig. 7

2. MECHANICAL GOVERNORS FOR FOUR STROKE ENGINES

a) GENERAL

All four stroke engines are fitted with centrifugal type governor (Fig 8). This consists of a plastic gear «**A**» which is caused to rotate by the camshaft gear.

b) STANDARD GOVERNOR (FIG 8)

The gear carries links «**B**» which open under the action of a centrifugal force and move spool «**C**» away from the gear. The crank of governor rod «R» is in contact with the spool «**C**».
The other end of the rod projects through the crankcase and to this is connected a lever and spring which automatically adjusts the engine speed.

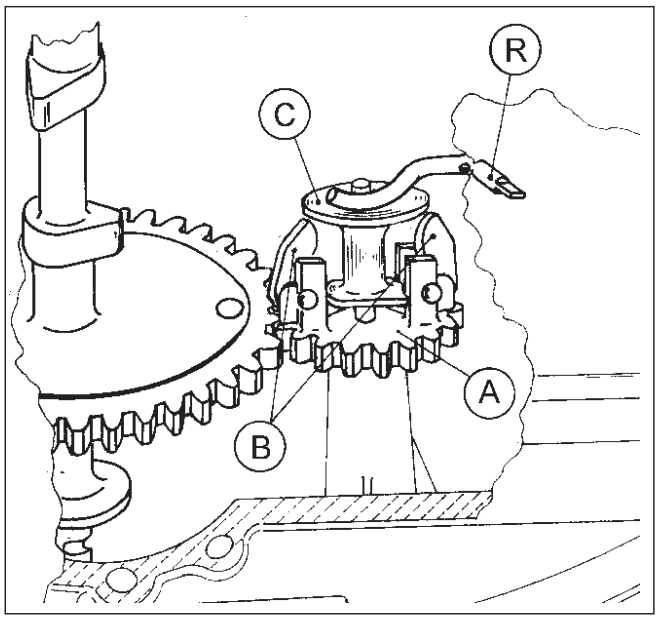


Fig. 8

c) OLEOMATIC GOVERNOR FOR HORIZONTAL ENGINES (FIG 9)

The governor spool (**A** - Fig. 9) is pushed by the centrifugal masses (**D**) and slides along the spindle (**B**) which has holes and allows oil to be drawn inside the spool. This gives a low pressure oil dampening effect which eliminates any slight governor fluctuation. This type of governor is used mainly in generator applications.
Besided the system shown in fig. 9, there is a simpler version with perforated spool.

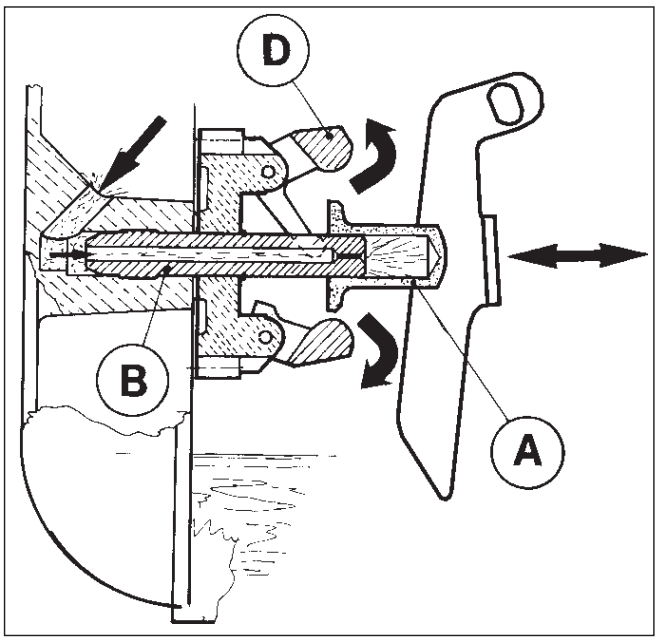


Fig. 9

3. GOVERNOR LINKAGE HORIZONTAL CRANKSHAFT ENGINES (HBL-BHK-BHT & P VERSIONS)

a) DESCRIPTION AND ADJUSTMENT (Fig. 10)

The link (**B**) positively connects the lever (**E**) with the governor lever (**A**). The link (**C**) connects the lever (**E**) with the main throttle lever (**D**). With engine running, governor rod (**P**) rotates CCW. The spring (**L**) is tensioned according to the position of lever (**G**) thus controlling the load applied to the throttle and the engine's speed. By bringing lever (**G**) completely upwards, the max speed is obtained.
Check for maximum speed in this position and adust the speed with the screw (**H**. Major speed adjustments are made by moving the hook of spring (**L**) to a different hole in lever. Moving the spring upwards increases the speed and vice versa.
Moving the lever (**G**) down obtains the idle speed. The idle speed is adjustable with the idle speed screw located on the carburettor in contact with the main throttle (**D**). Moving the lever (**G**) down further obtains the earth contact and the engine stop position.

b) ASSEMBLY

If a governor has been completely stripped proceed as follows:
Fix the clamp (**M**) on rod (**P**) and the lever (**A**) on the clamp (**M**) with the screw (**V**).
Mount the governor plate (**S**). Take care the link (**B**) is mounted on the lever (**E**) at the second hole from the internal side and the lever (**V**) at the first hole from the external side.
Before mounting the carburettor insert the link (**C**) in the first hole of lever (**E**) from the external side, and on the first hole close to the throttle rod of the main throttle.
The governor spring (**L**) has to be mounted at the first external hole on lever (**F**) of governor plate and on the governor lever (**A**) at the hole selected in accordance with the speed categories. (See engine specification).

c) SPEED ADJUSTMENT (Fig 10 & 11)

Ensure the spring (**L**) is mounted in the right hole on lever (**A**) for the required engine speed and lever (**G**) is in "max" speed position.
Adjust the screw (**H**) on the governor plate (**S**) for fine adjustment of the max speed.
For the idle speed (2000-2250 rpm) adjust the carburettor idle screw.

d) APPLICATION VARIANTS

Two different controls are available: Remote control and Manual control.
Remote control has governor plate (**S**) and a Bowden cable is fixed by clamp. (Fig 10)
For Manual control there is additional lever (**N**) and link (**Z**) which are mounted on governor plate (**S**). (Fig 11-1)

e) GOVERNOR ADJUSTMENT (Fig. 10)

Having screw (**V**) loose, move throttle control lever (**G**) into max position. Turn lever (**A**) and clamp (**M**) clockwise and tighten screw (**V**).

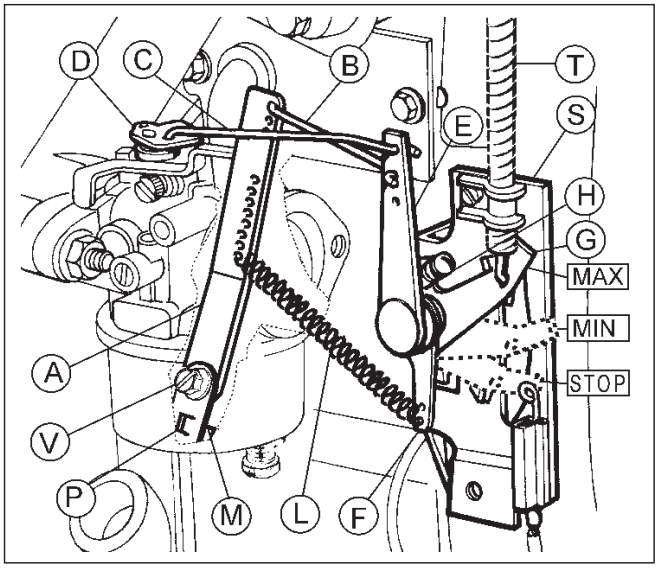


Fig. 10

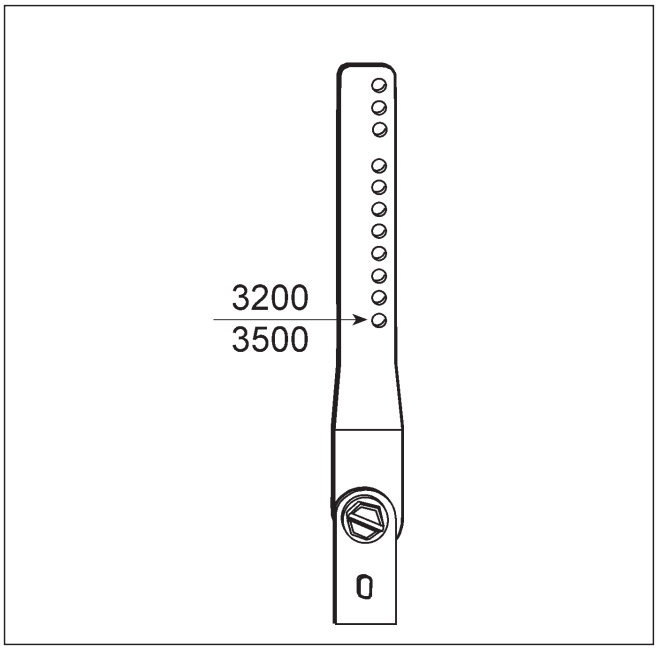


Fig. 11

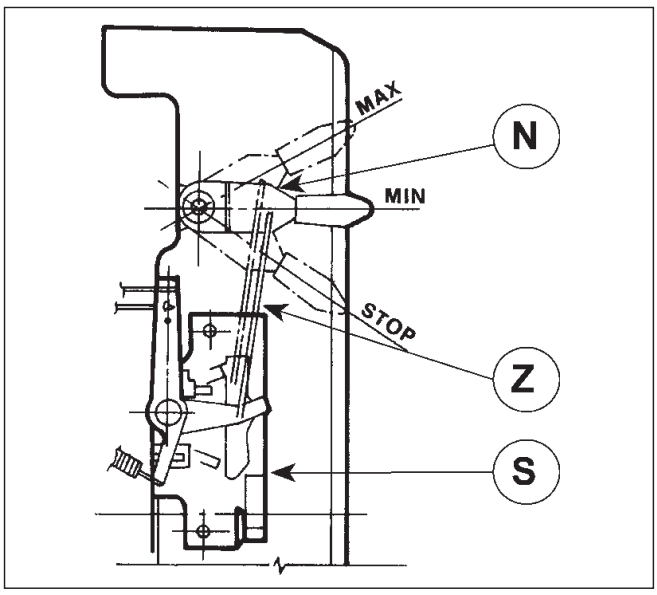


Fig. 11-1

4. GOVERNOR LINKAGE FOR HBP/G AND BHG ENGINES

a) DESCRIPTION

On above engines the position of the carburettor is different and therefore small changes on the governor linkage are necessary.
BHG & HBP/G engines are mainly used on generators and therefore usually run with fixed speed at 3.000 rpm. Fig 12 shows external assembly.

b) ASSEMBLY AND ADJUSTMENT

The particular difference for removal or reassembly between the standard governor linkage and the linkage on HBP/G and BHG engines are the following:

- The governor arm **A** has three holes at the top. The throttle control rod (**T**) being fitted to the lower of the three. (Fig 12).
- There are nine alternative holes at the bottom of the arm. The long control spring being fitted to the second hole (3.000 rpm). The opposite end of the spring is hooked to the third hole of the control lever in Fig 12. The shortest spring for carburettor butterfly is hooked to the (**S**) bracket as in Fig 13. The return spring differs also from the normal spring on other horizontal shaft engines. (Fig 14).

The generator engines have been fitted with plastic gears with heavy mass governor weights

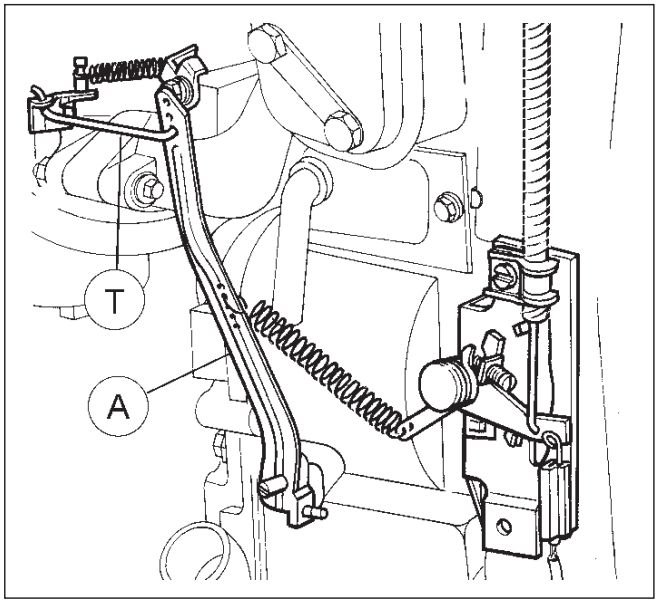


Fig. 12

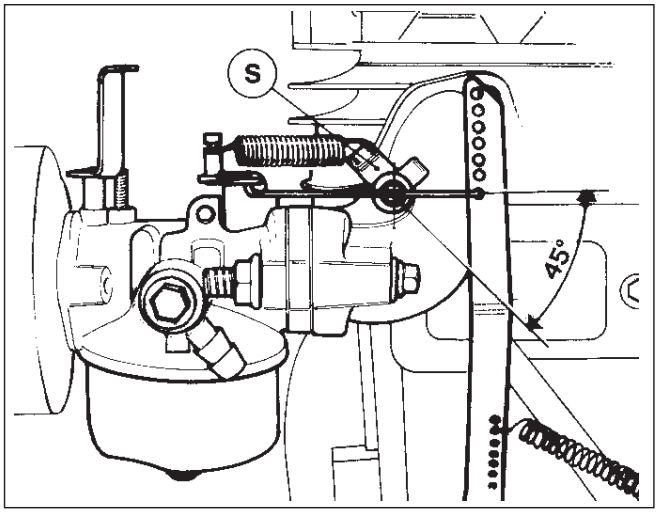


Fig. 13

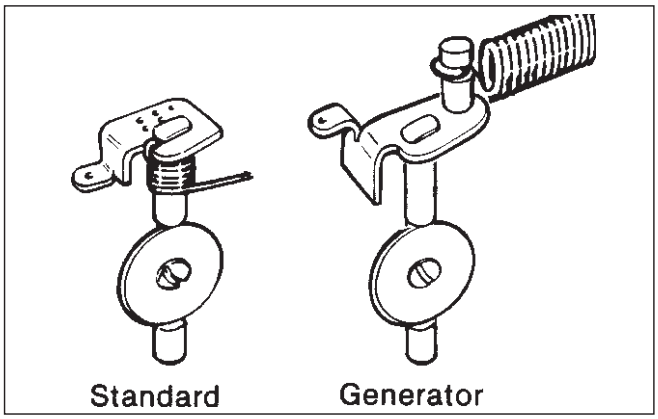


Fig. 14

5. GOVERNOR LINKAGE FOR FOUR STROKE ENGINES WITH VERTICAL CRANKSHAFT

a) DESCRIPTION

Link (T) positively connects lever (**A**) with main throttle lever (**F**). (Fig 15).
With the engine running the governor rod (**R**) rotates clockwise, spring (**W**) which may be tensioned by various amounts according to the position of lever (**L**) thus controls the load applied to the throttle and so determines the engine speed.
Having the hole (**a**) in lever (**L**) matched with the notch (**b**) in the control plate (Fig 16) maximum speed position is achieved and setting the lever (**L**) with the hole (**a**) matched to the notch (**O**) in the control plate idle speed position is achieved.

NOTE *- TThe style of the carburettor control has changed. (Fig 16). The new carburettor control plate is completely inter-changeable. Should however the control plate touch the carburettor linkages, fit two washers under the fixing screws. (Fig 17).*

b) ASSEMBLY AND PRIMARY ADJUSTMENT

To install this type of governor linkage (Fig 15) proceed as follows:
- With the carburettor mounted on the manifold insert link (**T**) in the respective holes connecting throttle to arm (**A**).
- Fit rod and spring assy (**W**) onto the arm (**A**) and control lever (**L**).
- Fit assembly plate with screws (**G**) and fit complete assy to engine.
- Fit arm (**A**) to clamp (**S**) with screw (**P**) leave screw slack and turn arm (**A**) anticlockwise and with throttle (**F**) fully open tighten screw (**P**).
- Locate the plate leaving the securing screws slack.
- Align inner hole (**A**) of control lever (**L**) with respective notch (**B**) on edge of plate. In this position choke control lever should be in contact with throttle lever without actually operating choke. In this position the three holes (**c-d-e**) in the control panel, secondary choke lever and throttle spindle should be aligned. The exact point can be obtained by inserting a pin through the three holes (**Z**). In this position lock plate with screw (**G**).

NOTE *- On engines fitted with diaphragm carburettor and primer, Automagic or Start-O-Matic carburettors the controls were slightly different. It is recommended to change carburettor and control plate when replacements are required.*

c) SPEED ADJUSTMENT (Fig. 15)

Hook spring (**W**) in the hole of lever (**A**) which corresponds to the required high speed. Final adjustment may then be made by screw (**M**). On the carburettor the idle speed is 2000 rpm adjusted by screw (**m**).

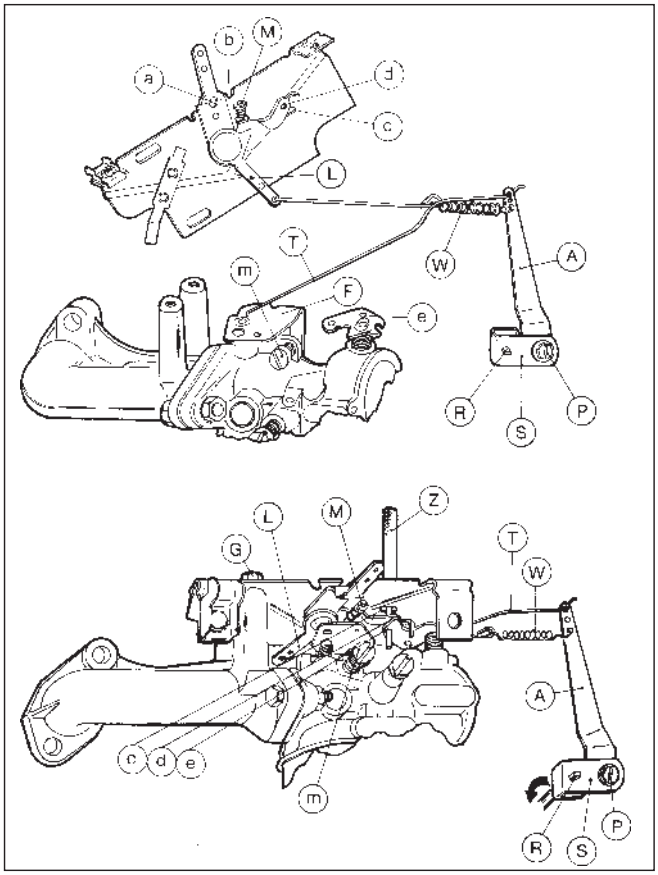


Fig. 15

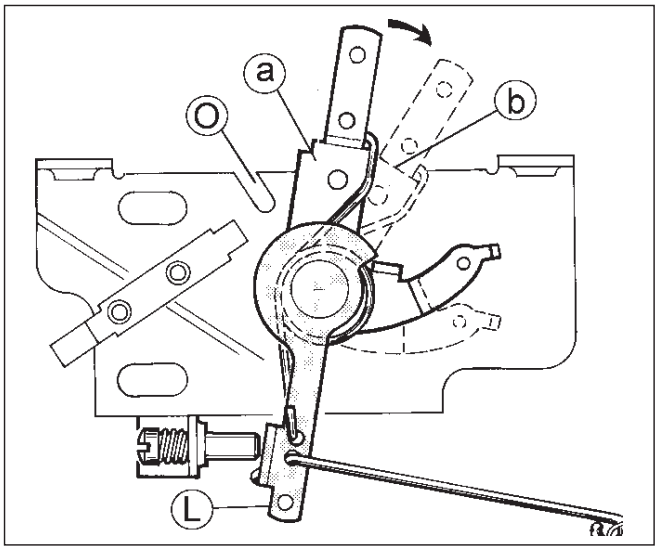


Fig. 16

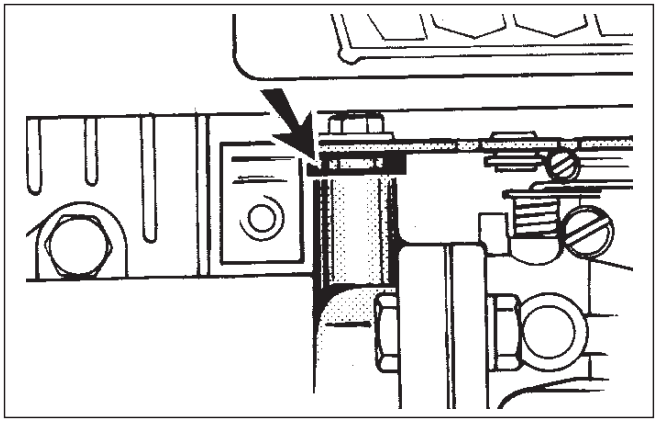


Fig. 17

d) NEW GOVERNOR LEVER AND CLAMP WITH PHILLIPS HEAD. LEFT HAND THREAD ON 4-STROKE VERTICAL SHAFT ENGINES

Starting from serial No. 3-307 D a new clamp No. 27410096 and a new left hand thread screw No. 2919157 have been introduced.
The engines with left hand thread clamp and screw can be easily recognised by Phillips cross head (Fig 19).
Old models have clamp and screw with straight cut head. (Fig 18). Furthermore, new governor lever "A" has 6 holes instead of 5 as in previous lever. (Fig 19).

Fig 18 - (early type)

A. Lever (5 holes)
B. Clamp
C. R-H thread with straight cut head

Fig 19 - (new type)

A. Lever (6 holes)
B. Clamp
C. L-H thread with Phillips head

e) GOVERNOR/PLATE FOR PRIMER CARBURETTOR

Because of the different configuration on the primer carburettor, the speed adjustments are made with the screws on the governor plate. Both speeds (high speed and idle speed) are under governor plate. (Fig 20).
The screw (**A**) is for high speed adjustment, the screw (**B**) is for idle speed adjustment. Usually the engines are set at 3000 rpm max speed, and idle at 2000.

***NOTE** - The screw (**C**) for the governor lever is a left hand thread screw. (Fig 21).*

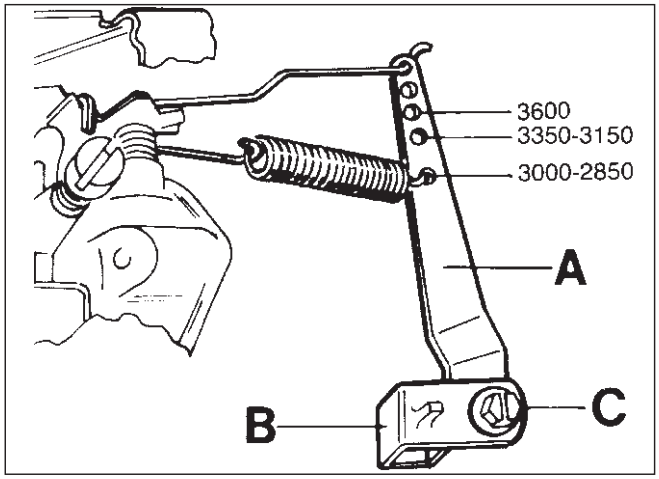


Fig. 18

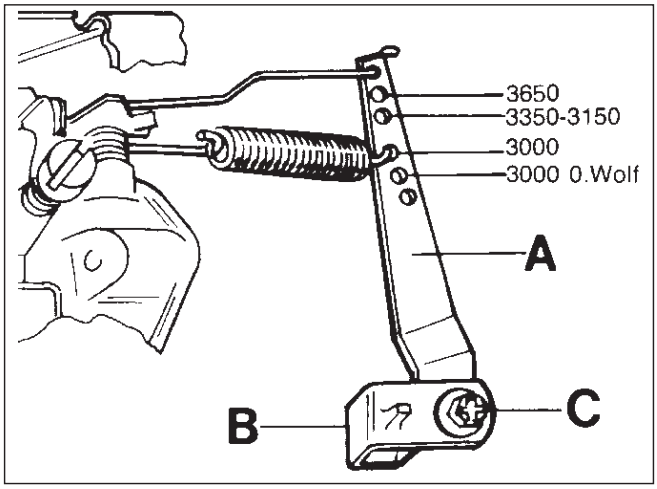


Fig. 19

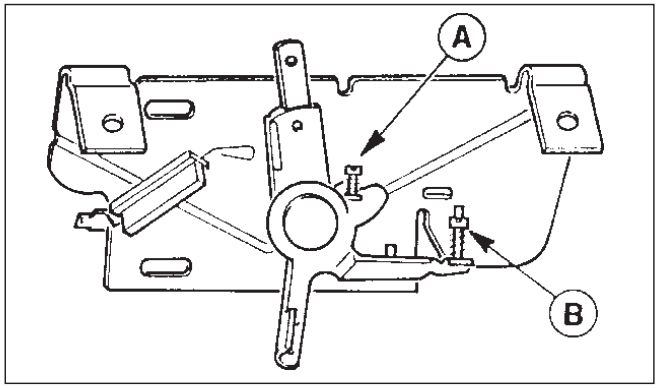


Fig. 20

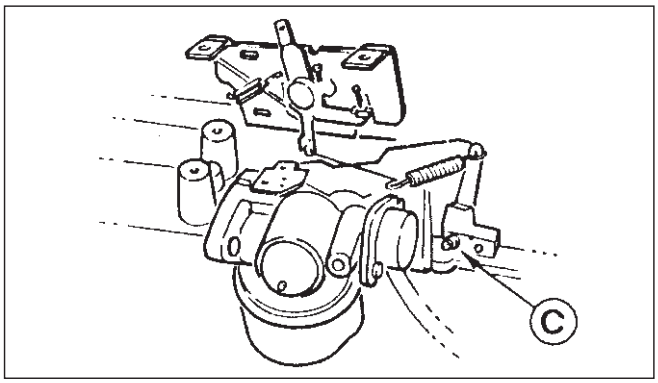


Fig. 21

f) HIGH SPEED CATEGORIES

Figs 22 and 23 show the position of the governor spring for different speeds.
The choke carburettor (Fig 22) is using the spring 27920010. For tiller version the spring is mounted on the 3rd hole. For lawnmower version the spring is mounted on the 5th hole.
The primer carburettor is using the spring 27920123 or 27920161. (Fig 23) in the 2nd hole.

g) GOVERNOR LEVER MOUNTING SYSTEM

There are two different governor lever mounting systems, type **A** and type **B.** (Fig 24).
In type A the linkage is longer, in type **B** the linkage shorter, but both are interchangeable.

h) GOVERNOR PLATE MOUNTING

For the governor plate mounting proceed as follows:
- Install the plate on the intake pipe.
- Insert the two fixing screws.
- Push the plate to the end of the slots towards the filter side.
- Tighten the screws

***NOTE** - If it is not possible to obtain the correct high speed setting using the adjustment screws, move the governor plate towards the spark plug and readjust screws to correct rpm settings.*

i) FIXED SPEED CARBURETTORS. (Fig 24-1)

Adjustment of maximum rpm is achieved by moving tab (**A**) using special tool part number 670326.
Moving the tab towards the spark plug increases the rpm, the opposite decreases rpm.
There is no adjustment of low speed as the engine always runs in high speed mode.

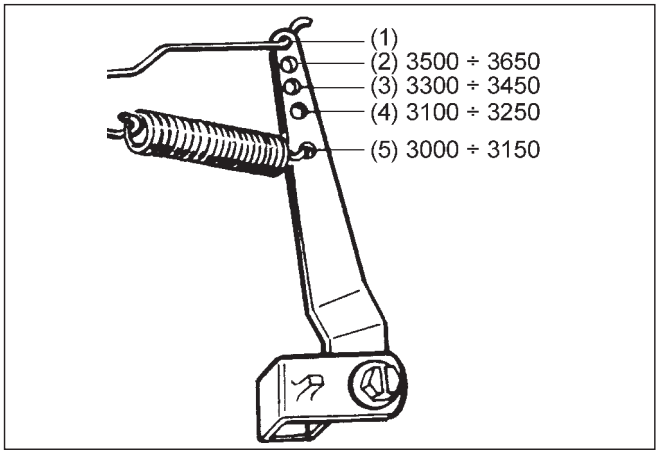


Fig. 22

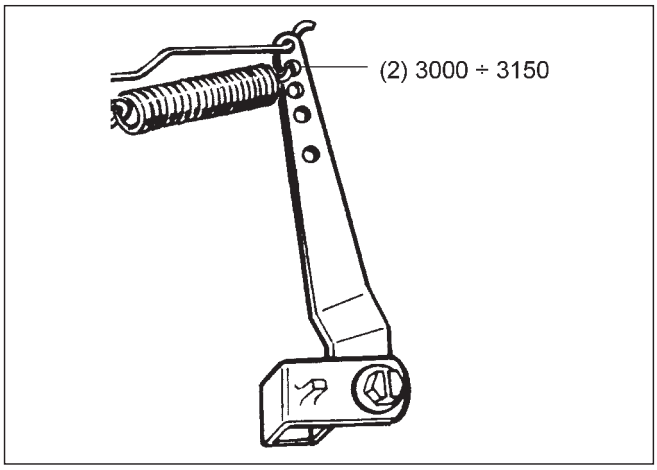


Fig. 23

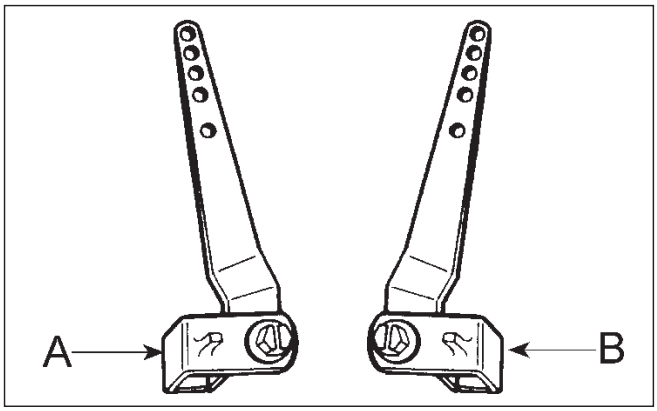


Fig. 24

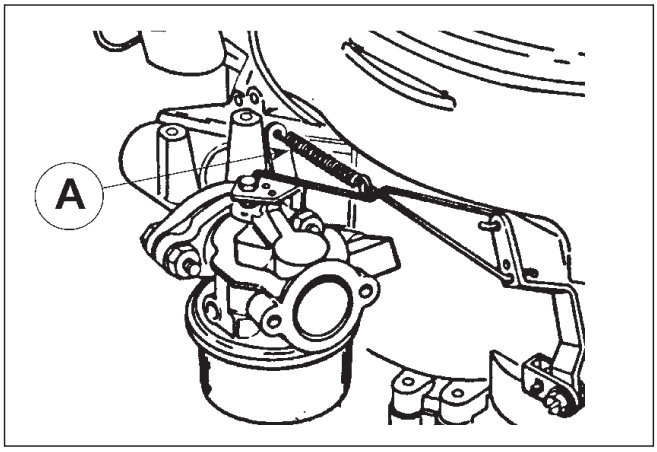


Fig. 24-1

I. TWO-STROKE MECHANICAL ENGINE PARTS

1. UNIBLOCK ENGINES (AV520-600-750-125)

a) INTRODUCTION

Fig. 1 shows the short block.
Fig. 2 shows an exploded view of the engine.
As may be seen the momoblock is compact (combined crankcase and cylinder) and it is sealed in the upper part by the shroud mounting base.

b) EXTERNAL INSPECTION REED PLATE

Fig 3 shows the reed plate. In case of a broken or damaged reed it is necessary to change the two reeds (**A**) by removing the two screws (**B**).

***NOTE** - Use Loctite or similar for sealing when fitting the two screws (**B**).*

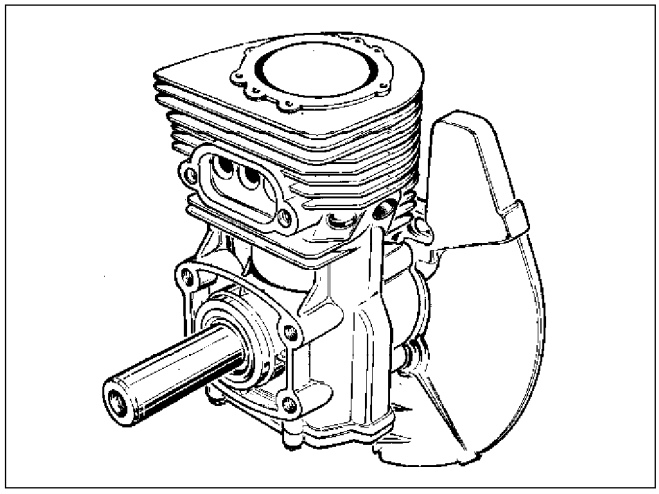


Fig. 1

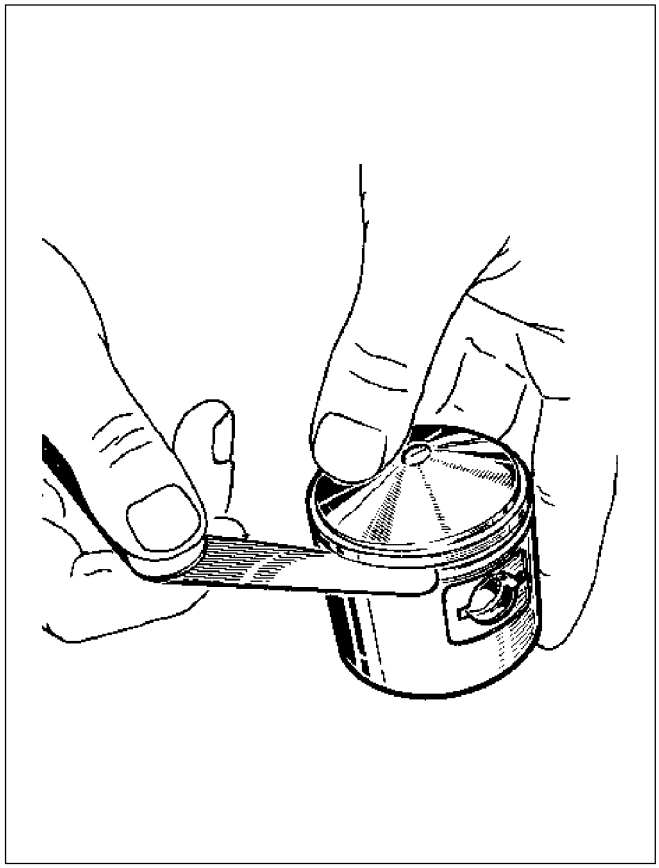


Fig. 2

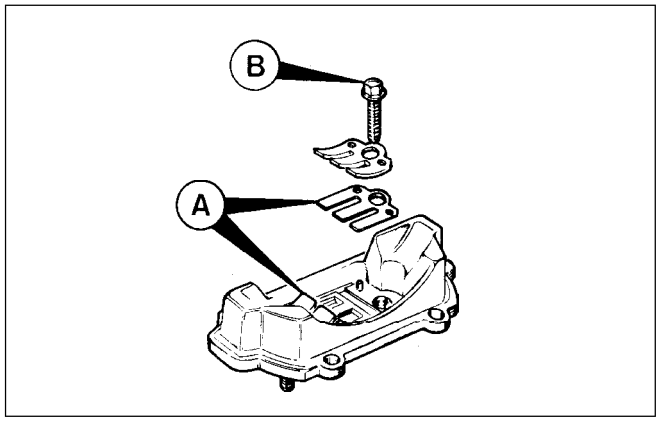


Fig. 3

Inspection of seals

Fig 4 shows the points to which are fitted the gaskets and oil seals that must always be checked to ensure good running of the engine. On a 2 stroke engine all the seals are very important for correct operation.

***NOTE** - On the short block it is important to ensure that the 4 transfer port plugs are perfectly sealed (Fig 4 **A**). When replacing the plugs, seal with Loctite or similar.*

Gaskets

Gaskets fitted to points **B** - **C** - **D** (Fig 4) must be fitted without the aid of any adhesive.
Grease may be used every time the engine is stripped.
Replace the above gaskets when servicing.

Crankshaft seals

Visually check both crankshaft seals (Fig 4 **E** and **F**) and replace if oil is apparent on the outside of the seal.
The crankshaft seals may be removed with the crankshaft in position with the aid of special tool Part No. 670286.

c) INTERNAL INSPECTION

If compression loss occurs after inspection of the seals and gaskets, dismantle the short block as follows:
- Remove cylinder head
- With the cylinder head removed a first visual check on the cylinder condition can be made by turning piston to BDC.
- Remove shroud base (Fig 5)

***NOTE** - During disassembling take care the 27 needles of the top main bearing do not get lost as they are not caged.*

- *Remove the reed plate assy*

At this point the conrod may be removed as follows:
- Turn the piston to BDC
- Remove the two conrod screws with a 3-16" hexagonal head key
- Remove big end cap taking care not to lose the 37 needles
- After having removed the big end cap rotate the crankshaft until the piston is turned to TDC.

***NOTE** - Before carrying out this operation clean carbon from the upper part of the cylinder. Then remove the piston and the conrod.*

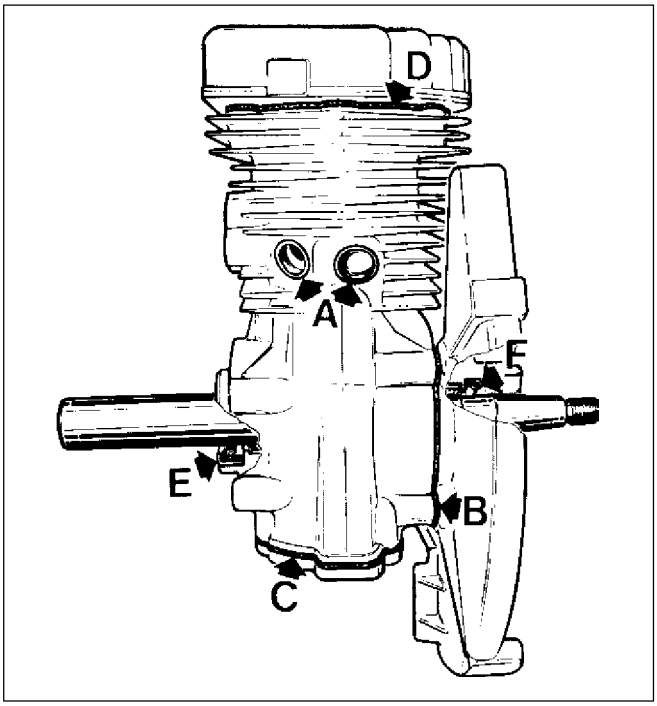


Fig. 4

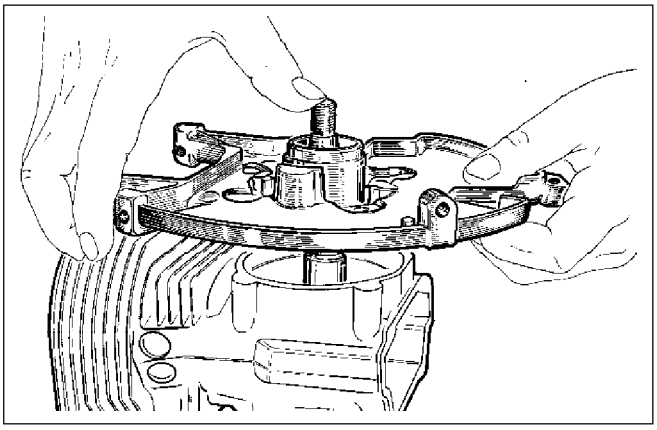


Fig. 5

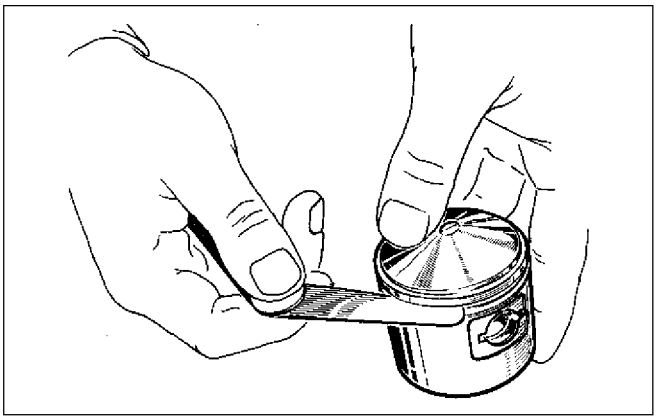


Fig. 6

- Remove the crankshaft taking care not to lose the 29 needles of the bottom main bearing.

The engine is now completely disassembled. Check bore for cylinder wear and ovality. This should not exceed 0.10 mm or 0.0039" over the size given in table. Cylinders with wear outside these limits should be replaced. Measure piston for wear or ovality. This should not exceed 0.05 mm or 0.0020" over the size given in table.

Check the piston ring groove clearance does not exceed 0.12 mm or 0.0047" (Fig 6).

Renew the piston if the wear is outside these limits.

Insert rings into bore about 15 mm from the top and check ring gap (Fig 7)

See table for wear limits. Replace ring if the distance exceeds the table limits.

To replace the piston take off the two retaining rings (Fig 8).

NOTE *- The piston has a hole on the piston pin boss (Fig 9).*

Ensure that this hole is fitted to flywheel side (opposite to the exhaust).

With the use of a micrometer, check also the different diameters of the crank pin and of the main bearings for wear or ovality.

This should not exceed 0.013 mm (0.0005") main bearing journals and 0.025 mm (0.001") big end bearing journal.

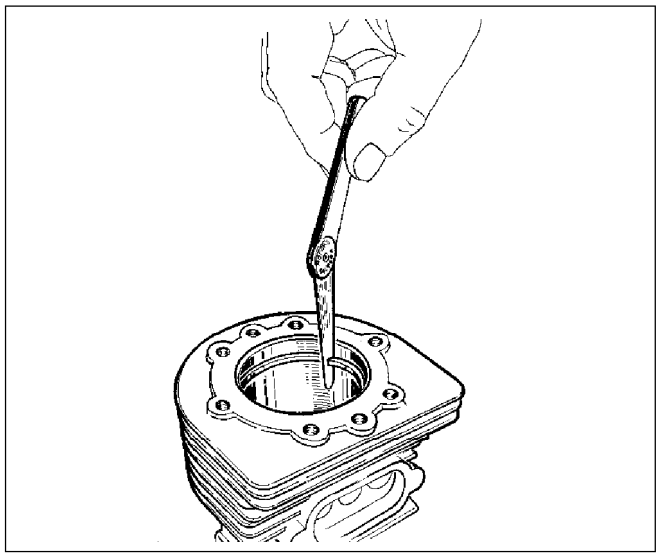


Fig. 7

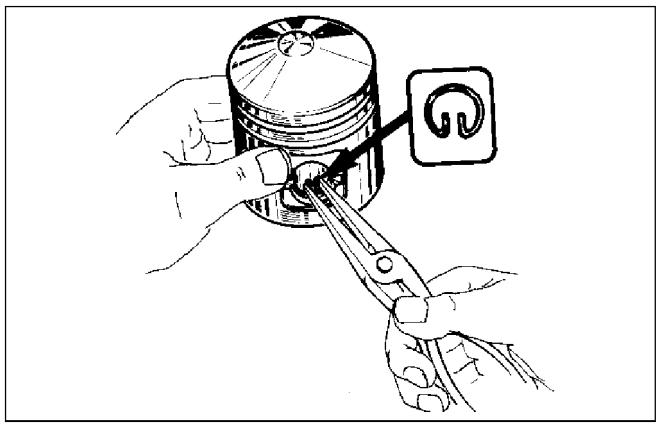


Fig. 8

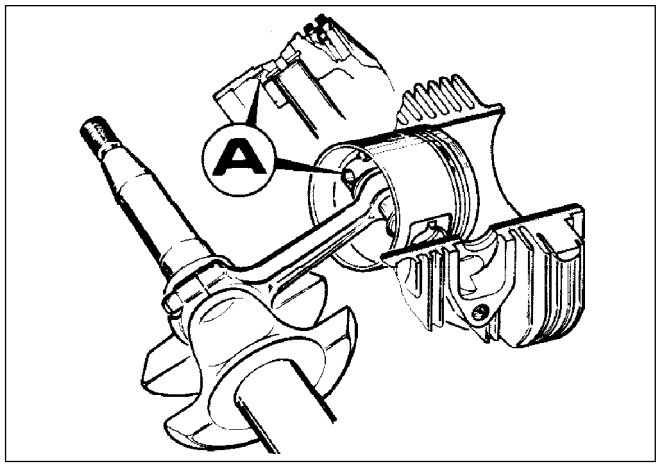


Fig. 9

d) MAIN BEARING

The needle bearings can be replaced using Tecumseh tools (Fig 10).
Use tool 88841026 for flywheel side and tool 88841027 for PTO side to remove bearings.
To refit bearings use tool 88841530 for flywheel side and tool 88841529 for PTO side.

NOTE *- To remove or refit bearings, heat cylinder or shroud base.*

Reassembly of engine

- After having assembled the piston on the conrod, ensure that the steel bearing halves match and insert on the conrod and cap, ensuring that the two bearing shells are correctly located.
  Ensure that the alignment marks on the conrod cap and conrod are matched. (Fig 12).
- Fit the crankshaft protecting the oil seal
- Fit the piston conrod assembly ensuring that hole in the piston pin boss is on the flywheel side (opposite to the exhaust).
- Place the cylinder-piston-conrod-crankshaft block on a flat surface (Fig 13) and turn piston to BDC.
- Fit the 37 needles around crank pin leaving some tolerance between conrod and crankshaft.
- Fit the conrod cap ensuring that the needles are retained in their correct position.
- Progressively tighten the screws turning a few times to ensure that the needles are located in place.
- Tighten conrod according to torque limits.
- Fit the shroud base ensuring that the gasket is fitted correctly.

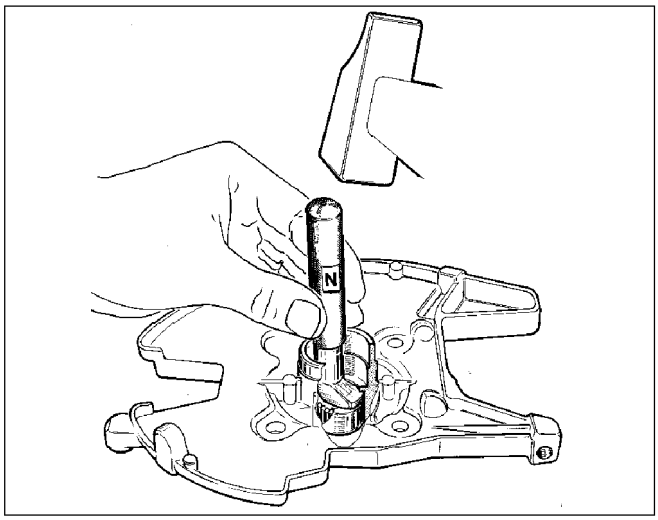


Fig. 10

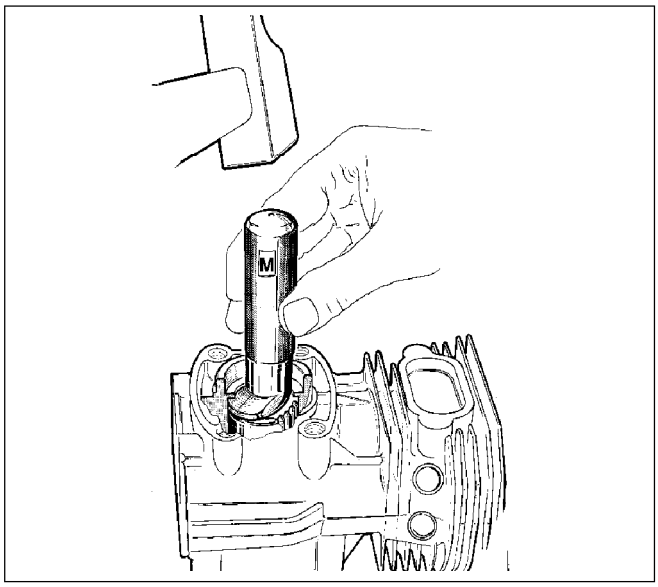


Fig. 11

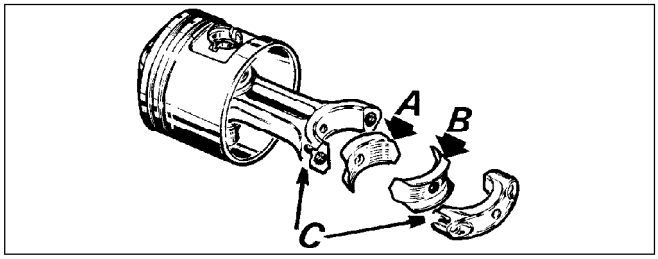


Fig. 12

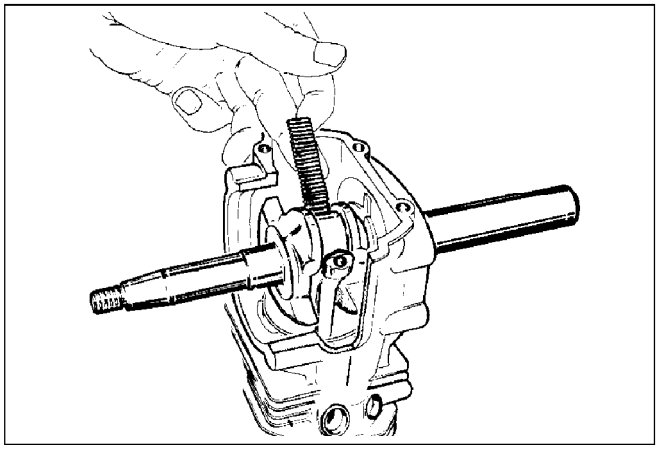


Fig. 13

e) OVERSIZED PISTONS FOR 2 STROKE ENGINES

As in all engine production, Tecumseh occasionally produce cylinders bored above maximum allowable tolerance. In this case .010" oversize pistons and rings will be fitted. These components may be identified by the figure 1 stamped on both cylinder and piston. (Fig 14 shows location of these marks.

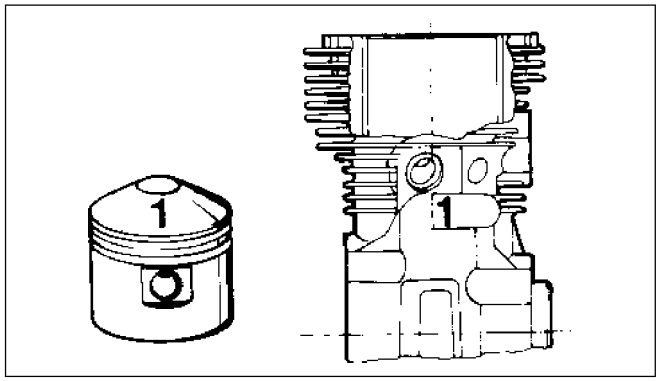


Fig. 14

2. MONO BLOCK ENGINES - MV100S

a) GENERAL

The MV100S is fitted with a ball bearing on both top and bottom main bearings (Fig 15, **A**) and retains the 37 needle bearings in the conrod as per earlier models.
The cylinder has two posts cast onto it, for mounting the electronic ignition module. (Not shown)

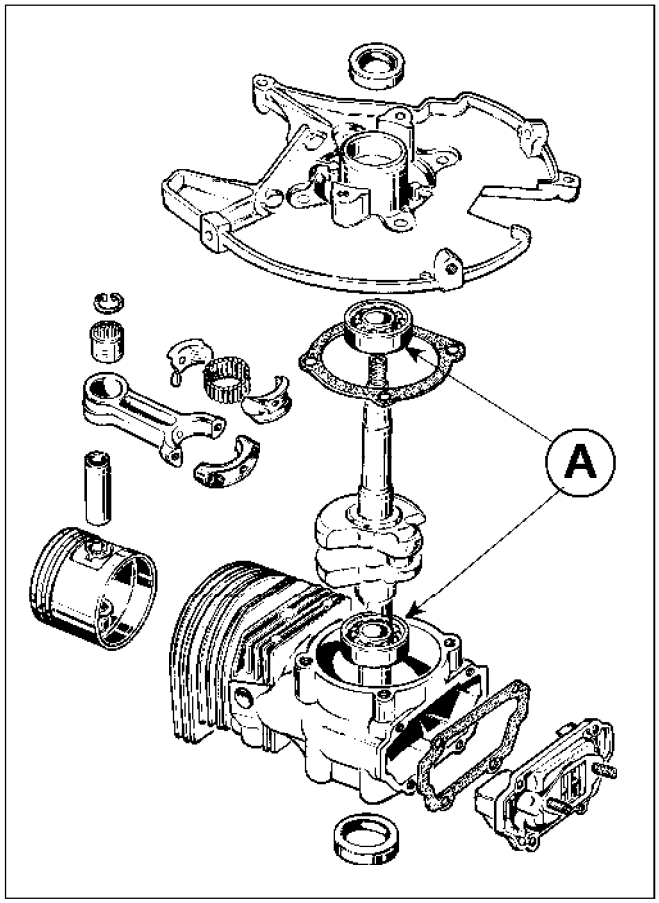


Fig. 15

b) REMOVAL OF FLYWHEEL

The standard method of flywheel removal used on other engines can damage the balls and bearing tracks (Fig 16). In order to remove the flywheel in the correct way, proceed as follows:

- Remove the other parts in the standard way (air shroud, fixing bolt, screen).
- Place the tool **670306** as per Fig 17 locating the screw '**A**' on to the crankshaft.
- Place the 3 self-threading screws of the tool in the 3 holes of the flywheel and tighten to at least 2 turns.

***NOTE** - The bolts should be placed in the correct way and each tightened the same number of turns.*

- The centre bolt (**A**) should not yet be tightened on the crankshaft.
- By using the tool 670306 and an 11/16 wrench the centre bolt can now be tightened (A). In this way the flywheel can be removed (Fig 17).
- For reassembling the flywheel, proceed as usual.

***NOTE** - Subsequent removal is made easier as the flywheel holes are already threaded. It is now necessary to screw the self-threading screws up to at least one thread more than those already tapped.*

c) ENGINE BLOCK DISASSEMBLY

The engine block consists of 3 main groups of parts fitted into the cylinder (Fig 18).

1 Reed valve/carburettor
2 Conrod/Piston
3 Crankshaft/Bearing/Shroud base

In order to disassemble these groups proceed as follows:

Shroud Base Disassembly

Remove external parts (air shroud, flywheel, ignition system), then unscrew the 4 screws fixing the base (Fig 19, **A**).
The air shroud base cannot be easily removed as it is fixed by the ball bearing. For removal use the tool 88841044 with the relevant bolts (Fig 19, **B**)

***NOTE** - These are the same bolts used for fixing some types of muffler to 4 stroke engines.*

Screw fixing bolts '**B**' in an equal number of turns (Fig 19). With an 11/16 wrench tighten centre bolt and pull off base.

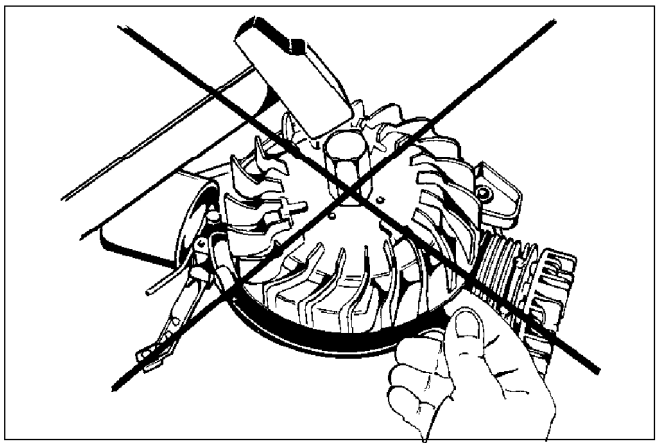


Fig. 16

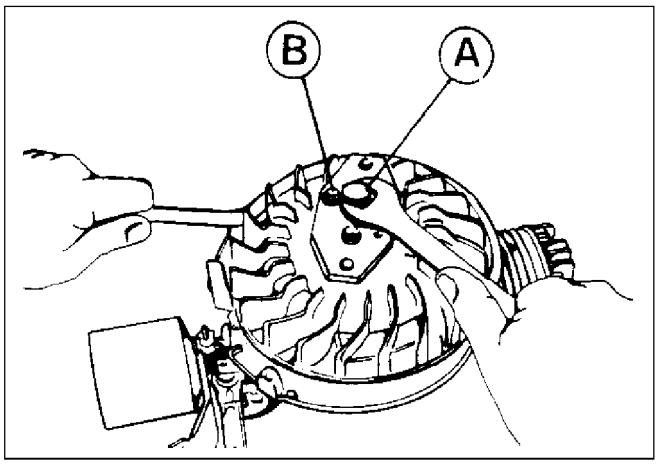


Fig. 17

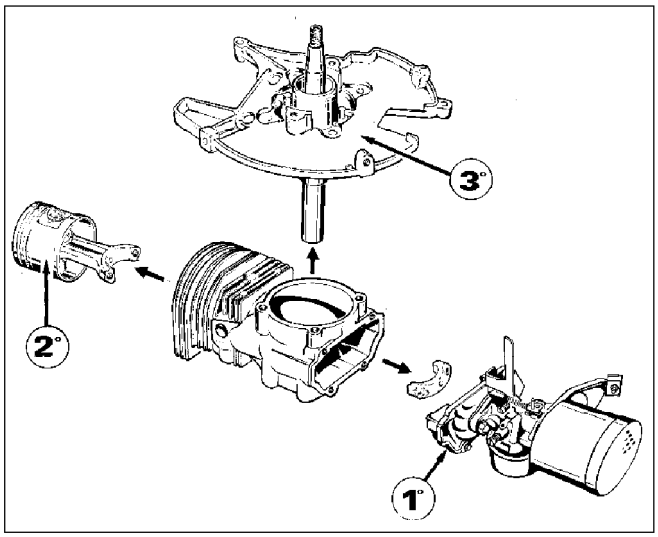


Fig. 18

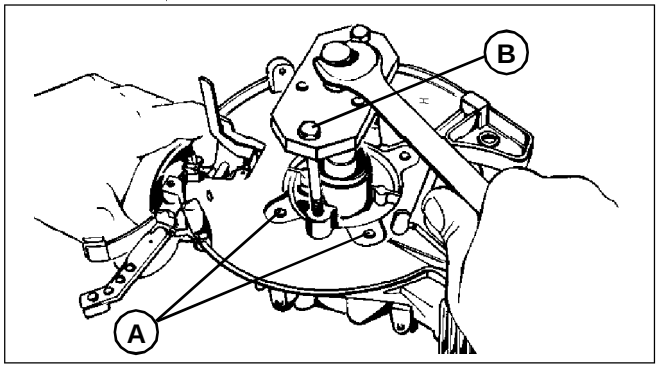


Fig. 19

d) REMOVAL AND REFITTING OF CONNECTING ROD & PISTON ASSEMBLY

This procedure is the same as for earlier engines.

e) REMOVAL AND REFITTING OF CRANKSHAFT (INCLUDING BALL BEARING)

- In order to remove or replace the bearing, the shroud base must be pre-heated to 80/100 deg C. (Fig. 20)
- The shaft and bottom bearing may also be removed by heating the cylinder as above.
- The bottom bearing may be removed from the shaft with the aid of a standard puller.

***NOTE** - This operation renders the ball race unserviceable and a new bearing should always be fitted. hen fitting a new bearing ensure that both shaft and bearing faces are clean.*

***NOTE** - Support the crankshaft webbs when driving on new PTO bearing (FIG 21, **A**)*

- Heat block as per above and refit the crankshaft

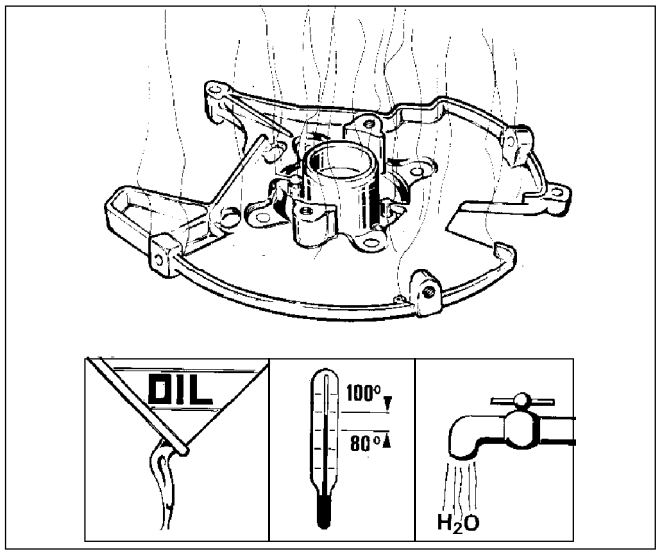


Fig. 20

f) SHROUD BASE REASSEMBLY

Assembly should be made only after expanding the base.

- Place the gasket on the cylinder.
- Heat the shroud base by immersing in oil or water at a temperature of about 80/100 deg **C** (Fig 20).
- Support the base and press in new bearing.
- Press bearing and base assy on to crank (Fig 22)
- Replace the 4 screws
- If the crankshaft does not turn easily, strike p.t.o. end with a copper hammer in order to fully seat bearing.
- Assemble the oil seal as per instructions for earlier engines.

***NOTE** - Should the base be heated in water, after assembly start the engine and let it run for a few minutes in order to dry and so avoid internal oxidation.*

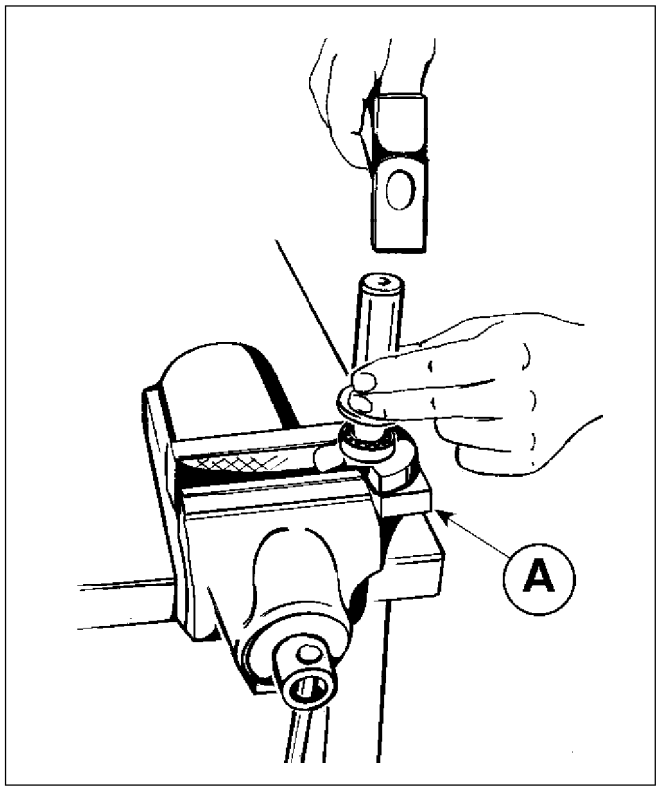


Fig. 21

3. ALTERNATIVE VERSIONS (AV85S, EARLIER MV100S).

For a short period, alternative versions to the two previously mentioned were built. Some versions had a top main ball bearing, bottom bush bearing and bushed connecting rod bearing. Other versions had ball bearings for top and bottom main, and a bushed bearing on the conrod. Refer to previous instructions for disassembly and reassembly except the bushed conrod big end cap is fitted with two retaining screws and one piece lock tab. On assy ensure that lock tabs are securely located on screw heads.
Ensure that screws are torqued to correct specification as follows:

- Torque setting Big end screws (bushed bearing)
  Nm 6,8 - 7,4 (60 - 67 inch/lbs)

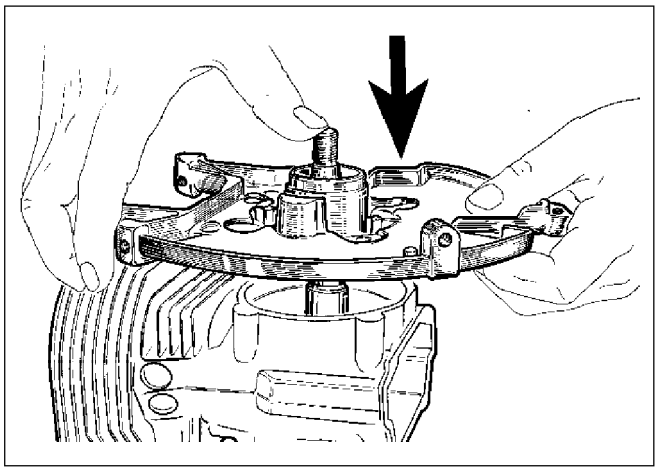


Fig. 22

2 - STROKE ENGINE - SPECIFICATIONS

DESCRIPTION	AV 125		MV 100 S		MV 100 SB HIGH RPM	
	mm	Inch	mm	Inch	mm	Inch
Engine displacement	cm^3 123.19	cu.Inch 7.5	cm^3 98.49	cu.Inch 6.01	cm^3 98.49	cu.Inch 6.01
Stroke	50.15	1.974	44.5	1.752	44.5	1.752
Boring	sel. 56.000 A 56.012	2.2047 2.2052	53.061 53.086	2.089 2.090	53.061 53.086	2.089 2.090
	sel. 56.012 B 56.024	2.2052 2.2056				
Profiled piston skirt diam.	sel. 55.91 A 55.92	2.2011 2.2015				
	sel. 55.92 B 55.93	2.2015 2.2019				
Piston skirt diam.			53.070 53.079	2.0893 2.0897	53.070 53.079	2.0893 2.0897
Width of snap ring groove	2.09 2.11	.0822 .0830	1.638 1.664	.0644 .0656	1.638 1.664	.0644 .0656
Axial clearance of snap ring in groove	0.100 0.132	.00394 .00520	0.051 0.082	.00201 .00323	0.051	.00201
Distance between ring points	0.20 0.35	.0078 .0137	0.152 0.279	.0059 .0109	0.152 0.279	.0059 .0109
Diam. of piston pin seats on piston	12.698 12.703	.499 .500	12.698 12.703	.499 .500	12.698 12.703	.499 .500
Piston pin diam.	12.697 12.692	.4998 .4996	12.697 12.692	.4998 .4996	12.697 12.692	.4998 .4996
Diam. of conrod at end of engine shaft	24.097 24.114	.9480 .9493	21.457 21.464	.8447 .8450	21.457 21.464	.8447 .8450
Diam. of conrod roller track on engine shaft side	25.387 25.400	.986 1.000	25.385 25.406	.9994 1.0002		

2-STROKE ENGINE -SPECIFICATIONS

DESCRIPTION	AV 125		MV 100 S		MV 100 SB High RPM	
	mm	Inch	mm	Inch	mm	Inch
Conrod bearing diam. - piston pin side	17.450 17.475	.6870 .6879	– –	– –	– –	– –
Internal diam. of conrod roller bearing - piston pin side	12.712 12.746	.500 .501	– –	– –	– –	– –
Conrod bearing diam. piston pin side	– –	– –	12.720 12.711	.5007 .5004	12.720 12.711	.5007 .5004
Crankshaft journal diam.	19.269 19.277	.7580 .7589	21.400 21.408	.842 .842	21.400 21.408	.8425 .8428
Conrod roller diam. - engine shaft side	2.400 2.395	.0945 .0943	– –	– –	– –	– –
No. of rollers	28		–	–	37	
Crankshaft bearing seat diam. - power intake side	25.387 25.400	.999 1.000	25.385 25.395	.9994 .9998	25.008 25.017	.9845 .9849
Crankshaft bearing seat diam. - flywheel side	17.009 17.001	.6694 .6693	17.009 17.001	.6694 .6693	17.009 17.001	.6694 .6693
Bearing seat diam. - flywheel side	Ball bearings 39.955 39.971	 1.5730 1.5736	Ball bearings 39.955 39.971	 1.5730 1.5736	Ball bearings 39.955 39.971	 1.5730 1.5736
Bearing seat diam. - power intake side	33.299 33.317	1.3109 1.3116	– –	– –	Ball bearings 46.951 46.935	 1.8484 1.8478
Internal bearing diam. - power intake side	25.4	– 1.000	–	25.000	.9842 24.990	 .9838
No. of rollers			29	–	–	—
Diam. of bearing installed on cylinder - power intake side	– –	– –	25.456 25.466	1.0022 1.0025		
Shaft-engine threading - flywheel side	**7/16 - 20 UNF - 2A**		**7/16 - 20 UNF - 2A**		**7/16 - 20 UNF - 2A**	

2-STROKE ENGINES PRODUCED FROM 1985/86 TO PRESENT

2-STROKE ENGINE SPECIFICATIONS							
DESCRIPTION		mm	Inch				
		MV 100 MV 100-S	MV 100 MV 100.S				
Boring		53.061 53.086	2.089 2.090				
Stroke		44.5	1.752				
Engine displacement		cm^3 98.49	cu. inch. 6.01				
Air gap between	N/1						
elect. ignition coil	3000/3150	0.20 ÷ 0.30	.008 ÷ .012				
and flywheel	3350/3650/3850	0.30 ÷ 0.40	.012 ÷ .016				
Spark advance		Electronic	Electronic				
Distance between spark plug electrodes		0.55 0.60	.022 .024				
Distance between ring points		0.20 0.35	.008 .014				
Piston skirt diam.		52.781 52.857	2.078 2.081				
Width of snap ring groove		1.638 1.664	.0644 .0655				
Width of snap rings		1.562 1.587	.0614 .0624				
Piston pin diam.		12.692 12.697	.4996 .4998				
Crank journal diam.		21.399 21.412	.8424 .8429				

2-STROKE ENGINES PRODUCED FROM 1985/86 TO PRESENT

2-STROKE ENGINE SPECIFICATIONS						
DESCRIPTION	**mm**	**Inch**				
	MV 100 MV 100-S	**MV 100 MV 100.S**				
Crankshaft bearing seat diam. - power intake side	25.400 25.387	1.0000 .9994				
Crankshaft bearing seat diam. - flywheel side	17.009 16.989	.6692 .6688				
Crankshaft bearing - flywheel side	Ball bearings	Ball bearings				
Cuscinetto di banco lato presa di potenza	Ball bearings	Ball bearings				
Piston pin diam.	No	No				
Engine-shaft axial clearance	12.692 12.697	.4996 .4998				
Conrod bearing - piston side	Roller bearings	Roller bearings				
Conrod bearing - shaft engine side No. of rollers	Roller bearings 37	Roller bearings 37				
Shaft engine threading - flywheel side	7/16-20 UNF 2.A	7/16-20 UNF 2.A				

2-STROKE ENGINE CLOSING TORQUE SPECIFICATIONS							
DESCRIPTION	**SCREW SIZES**	**N x m**	**kgm**	**Inch x Lbs**	**AV-MV TYPE ENGINES**		
					520 85S	**600 100S**	**750 125**
Cylinder head screw	1/4-20 x 18	10.1 - 11.28	1.029 - 1.15	90 - 100	X	X	X
Conrod screw	10-24 x 19.05	6.77 - 7.41	0.69 - 0.75	60 - 67	X	X	
Conrod screw	10-32 x 15.87	9.61 - 10.69	0.98 - 1.09	85 - 95			X
Reed plate screws	1/4-28 x 22.2	7.36 - 8.4	0.75 - 0.86	65 - 75	X	X	X
Carburettor fastening bolts	1/4-28	7.36 - 8.4	0.75 - 0.86	65 - 75	X	X	X
Conveyor/cylinder base fastening screws	1/4-20 x 16	14.7 - 18	1.5 - 1.84	130 - 160	X	X	X
Conveyor/cylinder fastening screws	1/4-20 x 12.7	9.02 - 10.1	0.92 - 1.03	80 - 90	X	X	X
Filter container fastening screws	10-32 x 18	3.33 - 4.51	0.34 - 0.46	30 - 40	X	X	X
Filter container fastening screws	10-32 x 11.1	3.33 - 4.51	0.34 - 0.46	30 - 40	X	X	X
Side starter rope guide fastening screws	8-32 x 9	1.67 - 2.26	0.17 - 0.23	15 - 20	X	X	
Reed plate to cylinder fastening screws	10-24 x 15	6.18 - 6.77	0.63 - 0.69	55 - 60	X	X	X
Starter to conveyor fastening screws	1/4-28 x 10	5.69 - 6.77	0.58 - 0.69	50 - 60	X	X	X
Side starter to cylinder fastening screws	1/4-20 x 12.7	7.95 - 9.61	0.81 - 0.97	70 - 85	X	X	X
Earthing terminal fastening screw	8-32 x 12.7	1.67 - 2.84	0.17 - 0.29	15 - 25	X	X	X
Spark plug	M14	20.30 - 33.94	2.07 - 3.46	180 - 300	X	X	X
Flywheel fastening screw	7/16-20	45.22 - 51.99	4.61 - 5.30	400 - 460	X	X	X
Cylinder stator fastening screws	1/4-20 x 16	8.44 - 10.1	0.86 - 1.02	75 - 90	X	X	X
2-liter tank fastening screws	1/4-20 x 22	2.85 - 3.92	0.29 - 0.4	25 - 35	X	X	X
Remote-control fastening screws	10-32 x 9	2.26 - 3.33	0.23 - 0.34	20 - 30	X	X	X
Cylinder silencer fastening screws	1/4-20 x 60	4.51 - 5.69	0.46 - 0.58	40 - 50	X	X	X
Ring silencer	5/16-18 x 48	11.87 - 13.73	1.21 - 1.4	105 - 120	X	X	X

L. MECHANICAL PARTS OF 4 STROKE ENGINES

1. GENERAL

The engine block/assemblies supplied for the vertical shaft and horizontal shaft engines are similar in construction (apart from mounting differences). The disassembly and inspection of these is therefore almost the same. (Fig 1).

2. COMPRESSION CHECK

Check compression by hand or with a compression gauge, for compression details see table. If compression is weak, check:
- spark plug threads
- cylinder head gasket for leaks
- valve seat condition
- cylinder, piston and rings

***NOTE** - If engine is fitted with compression release, it is necessary to remove the cylinder head and check components visually.*

HEAD AND GASKET

If leaking occurs at cylinder head, remove and check for distortion or damage to sparking plug threads, if necessary replace the head using a new gasket.

***NOTE** - With the SIC compression tester checking can be done without disassembling the cylinder head.*

3. VALVES

After removal of the head visually check the valves and seats. If removal is necessary remove breather assembly and parts with special tool 88841012 (Fig 2) lift valve spring. The securing cap may then be removed, the same procedure applies to both valves. Withdraw the valves and remove all carbon deposits from the seats and cylinder. The valves may now be “lapped” in.
In case of badly burned or pitted seats it will be necessary to re-cut the seats to an angle of 45 degrees using special tool 26990002 and 26990001 (Fig 3).

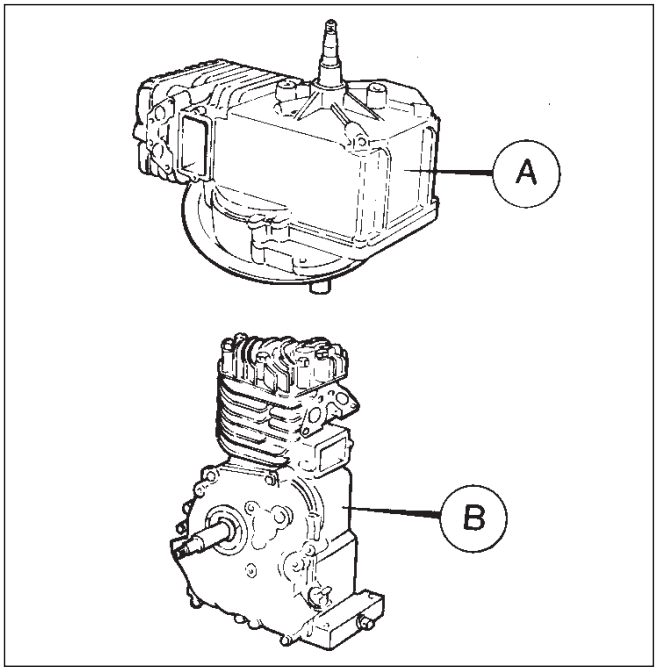


Fig.1

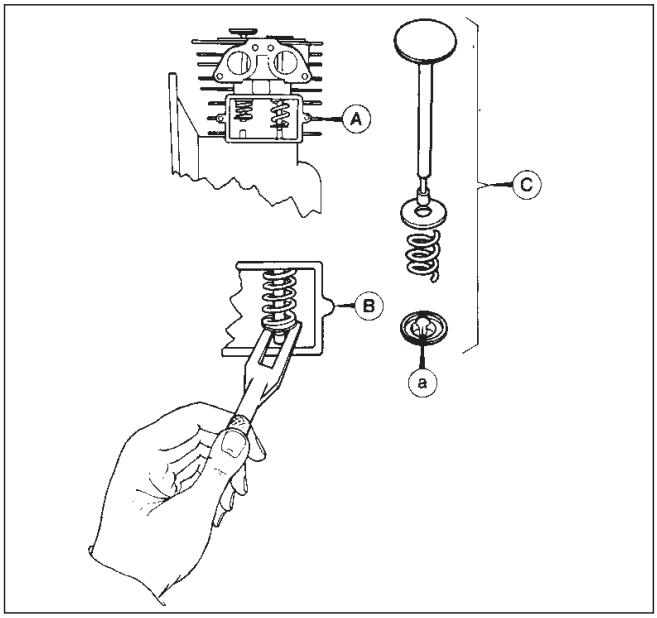


Fig. 2

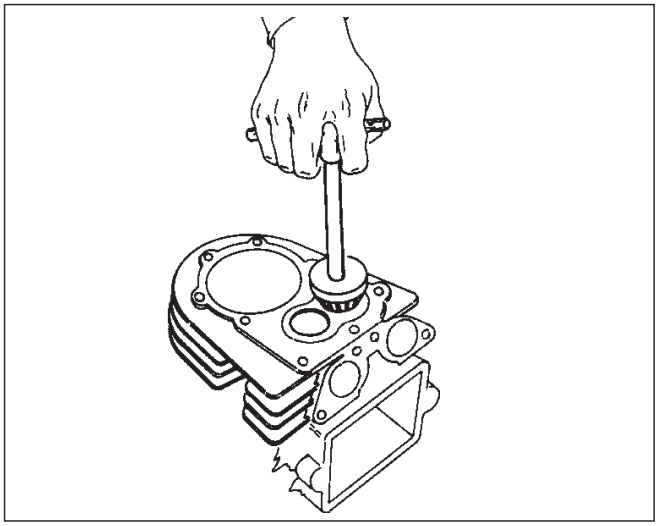


Fig. 3

If seats are beyond repair, it is necessary to change the complete cylinder as the seats are not replaceable.

Check the valve seats for pitting etc, the valves are marked '**E**' (exhaust) and '**I**' (inlet). If the valve guides are worn, valves with oversize stems are available and the guides should be reamed out to take these. Grind in the valve using tool no. 88841015 (Fig 4).

Check that the valve head is within dimensions shown in Fig 5.

Thickness '**A**' should not be less than 0,8 mm.

Valve seat should not exceed 1-2 mm (0.039"-0.078") in depth.

Check that the valve springs are not cracked or broken and that free, length is not less than 24 mm (15/16"). Replace springs if necessary.

Remove all traces of grinding paste and refit valves in their correct position, refit springs and securing caps (Fig 6).

Check the tappet clearance and set to 0,10-0,20 mm (.006"-.009"). The clearance is obtained by carefully grinding the stem to shorten valve length.

When checking the valve clearance on engines fitted with compression release, care must be taken to ensure that the reading is taken with the camshaft at the point where the cam is not in contact with the tappet (i.e. TDC compression stroke).

Check valve sealing by holding block in position (Fig 7) and filling the ports with petrol and checking the valve seats for leaks.

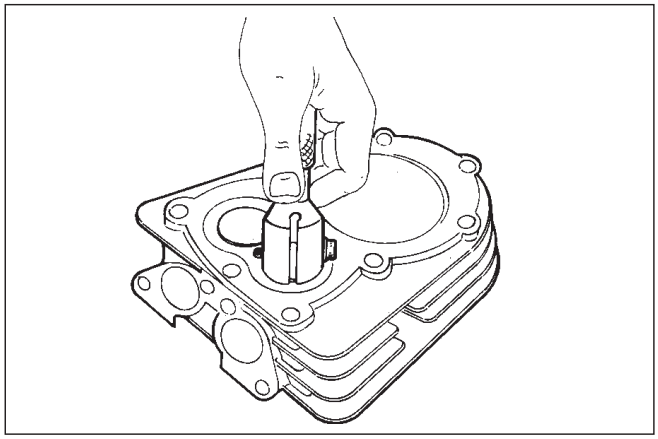


Fig. 4

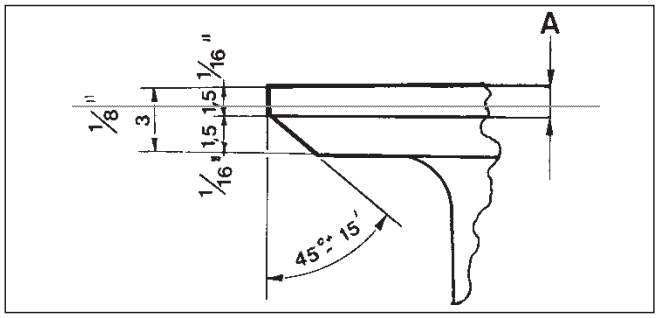


Fig. 5

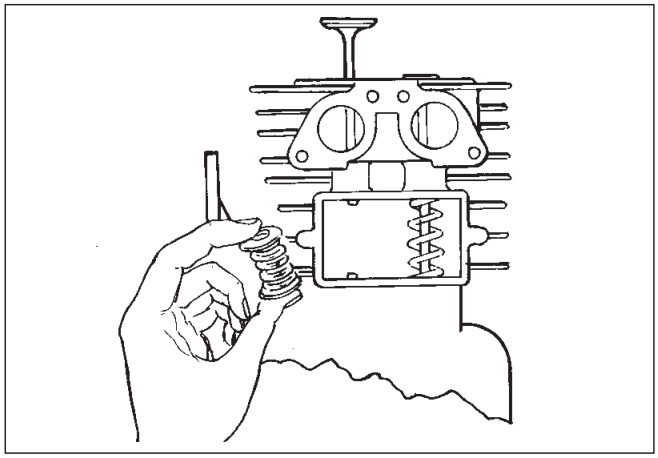


Fig. 6

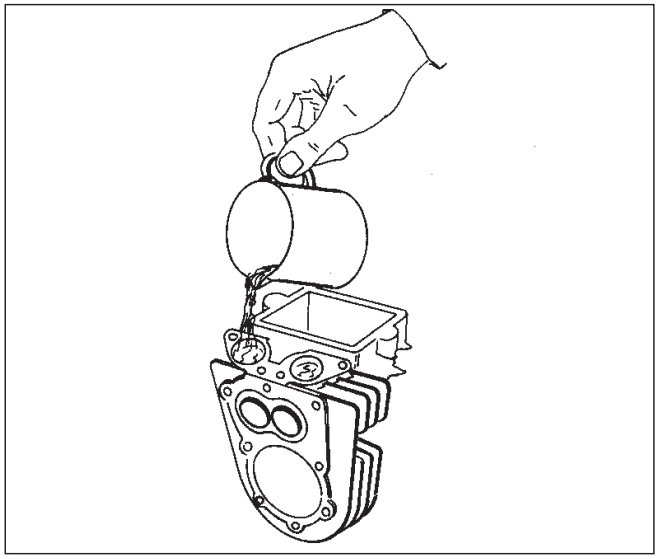


Fig. 7

***NOTE** - Early type valves were secured by a pin fitted through a hole in the valve stem and secured by the spring cap. This type can be removed by lifting the spring and removing the pin with a pair of long nosed pliers (Fig 8).*

4. DISASSEMBLING CYLINDER, PISTON AND RINGS

For removal and checking of piston and rings, drain oil from crankcase by removing plugs '**H**' for horizontal shaft engine and plug '**V**' for vertical shaft (Fig 9).

At this point check crankshaft for main bearing wear and, according to engine type, proceed as follows:

a) ENGINES LAV-BV-HS BVS VANTAGE PRISMA SYNERGY SPECTRA, FUTURA

Remove key from crankshaft (PTO end) and in order to prevent damage to bearing surface during removal, thoroughly clean shaft end and remove crankcase cover. Oil seal damage may be prevented by the use of special tool 670261 (Fig 10-a).

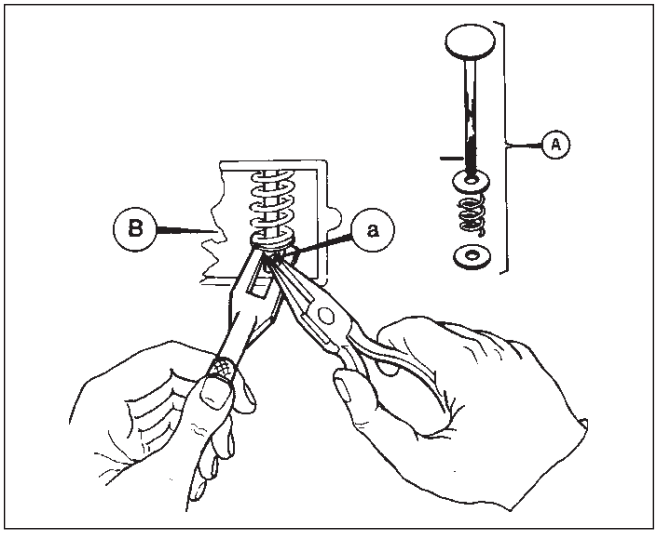


Fig. 8

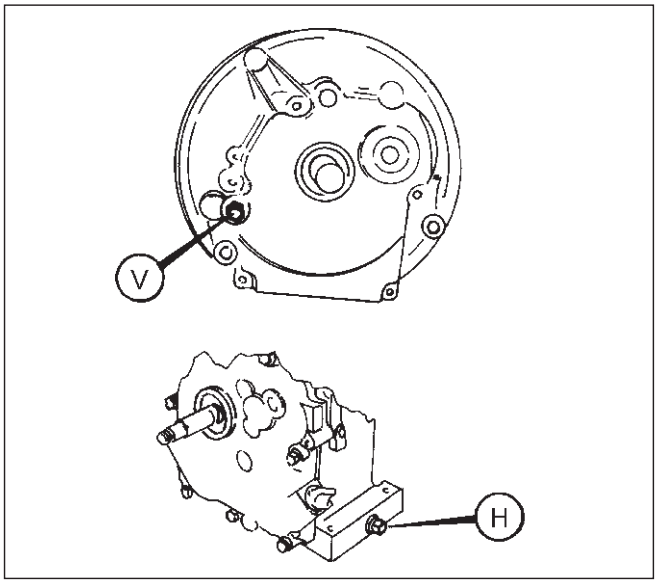


Fig. 9

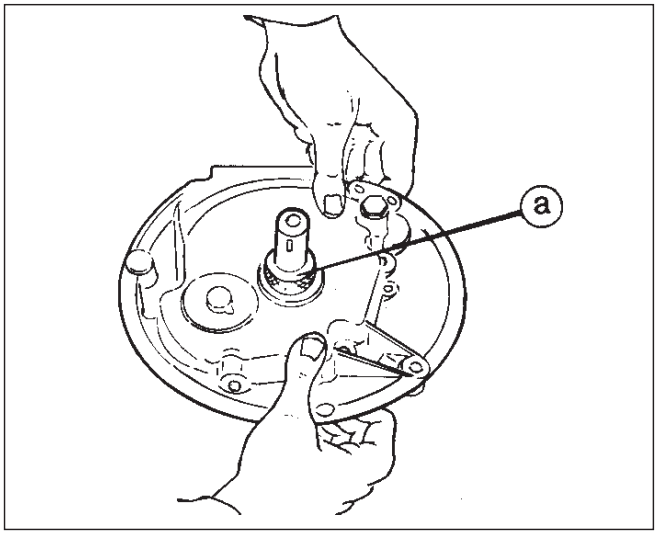


Fig. 10

b) ENGINES HTB-HCB-HSB-HBP-BH WITH BALL BEARING ON PTO

These engines are fitted with a ball race at the PTO end of the crankshaft and removal is as follows:

Remove crankshaft key and any dirt or rust present on the shaft.

On early engines remove oil seal (Fig 11) and with thin nose pliers, remove bearing circlip.

BH engines - the side plate can be removed complete with bearing and seal.

All types - remove crankcase cover bolts and withdraw cover.

With PTO end uppermost remove gasket, dowel pins, and oil pump (vertical shaft engines), camshaft and tappets, (mark tappets for refitting in same position).

Remove big end nuts, big end cap and dipper (H engines), remove carbon deposits from cylinder bore and withdraw piston and conrod.

Remove crankshaft, clean all components and check for wear or damage. (Fig 12 &13).

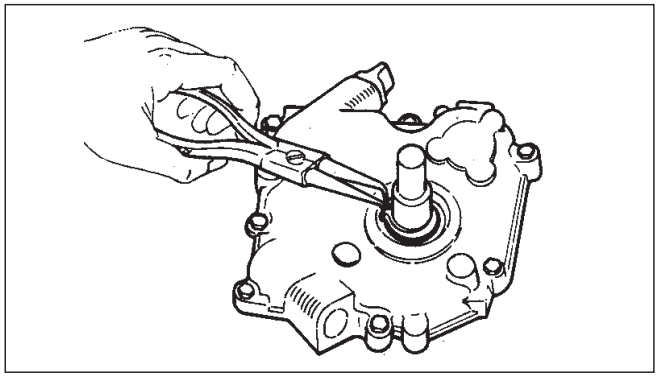


Fig. 11

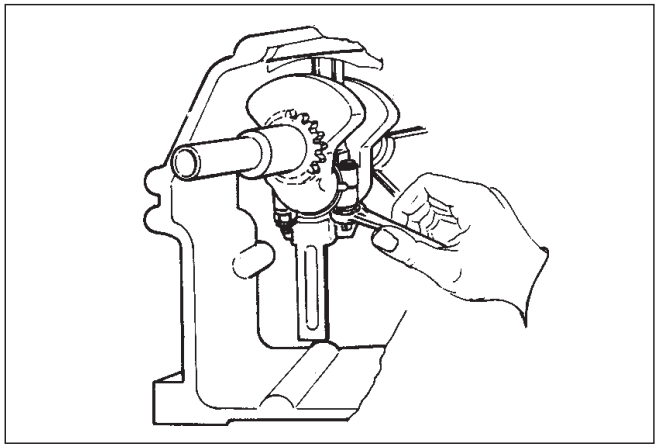


Fig. 12

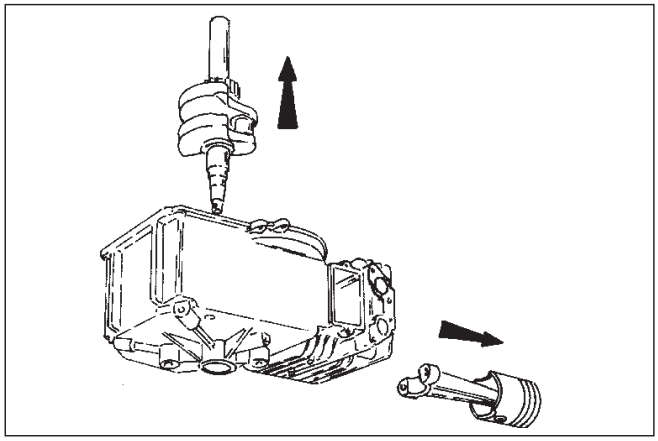


Fig. 13

5. INTERNAL INSPECTION

a) CYLINDER

Check with suitable instruments the wear on the following:

Cylinder bore (Fig 14-A)

(Fig 14). This should not exceed 0,15 mm (.006”). Ovality should also not exceed 0,15 mm (.006”). (See table for piston sizes).

Flywheel side bearing (Fig 14-B)

Check oil feed holes for obstruction, max diameter of bearing should not exceed size given in table.

Camshaft bearings (Fig 14-C)

Check oil feed holes (vertical shaft engines) and check that bearing conform to sizes given in table.

b) CRANKCASE COVER

Check the side cover or base plate for damage or distortion.

PTO side bearing (Fig 15)

On engines with ball bearing check the condition of the ball race.
On other engines check the bearing diameter for wear according to dimensions given in table.

c) CRANKSHAFT

Check crankshaft for size as in Fig 16.
Check main bearings for wear against dimensions given in table, max should not exceed:

- Flywheel side ..... 0,02 mm (0.0008”)
- PTO side ..... 0,03 mm (0.0012”)
- big end ..... 0,02 mm (0.0008”)

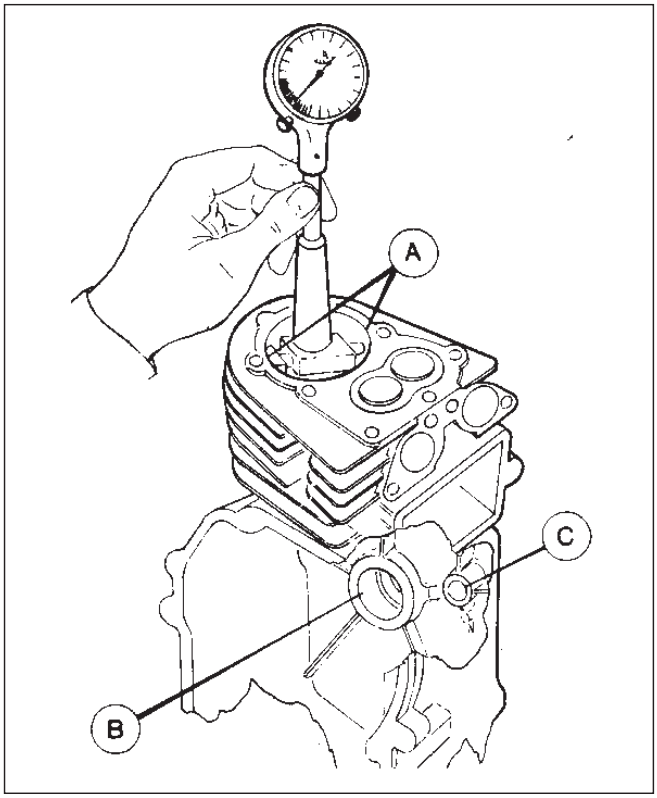


Fig. 14

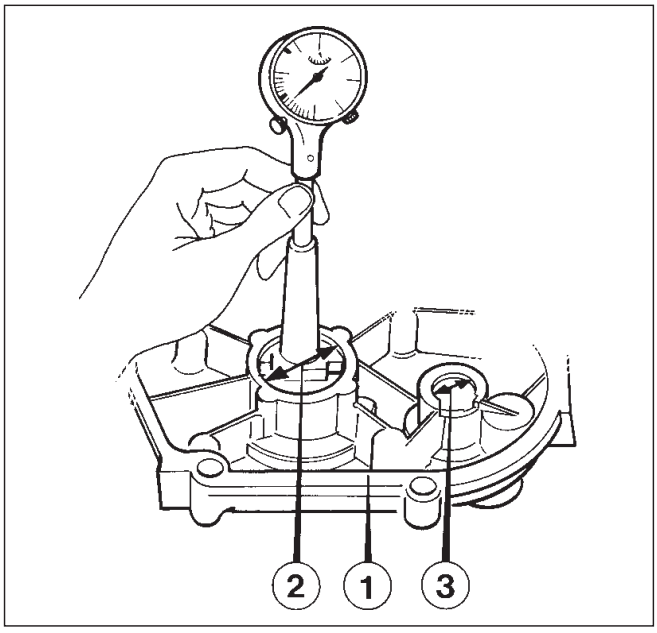


Fig. 15

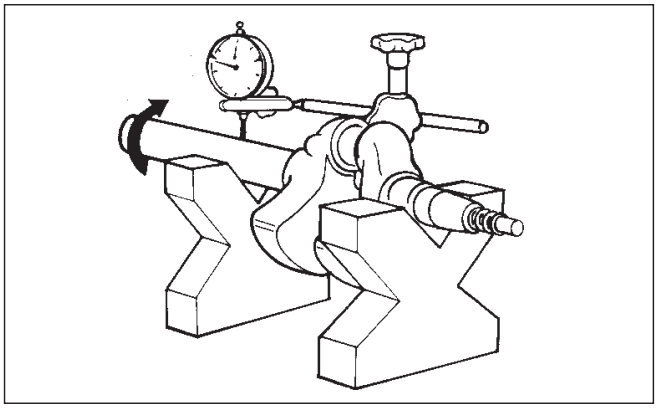


Fig. 16

d) CONNECTING RODS (Fig. 17)

Different types of conrods are fitted to the different engines. Some characteristics are common.
All conrods have match marks which must always be assembled together and when fitted onto the engine the marks must face outwards (towards the PTO).

Fig. 17

A. Vertical shaft conrod
B. Horizontal shaft conrod
X. Match marks
a. Oil passage
C. Oil dipper
D. Nuts

Conrods for engines with horizontal crankshaft have an oil dipper (**C**) and a lubricating hole (**a**).
Con Rod caps may be retained by one of the following methods:

- Lock Nut - (**D**-Fig 17)
- Bolt and Lock Tab - (Fig 18)
- Locking Bolt - (Fig 19)

Always renew lock nuts, lock tabs and locking bolts when removed. It is not recommended to re-use them.

- Lock tabs should be bent up securely around the bolt heads.
- If con-rod bearing surfaces are worn or scored, the complete con-rod must be replaced. Undersize bearings are not availble.

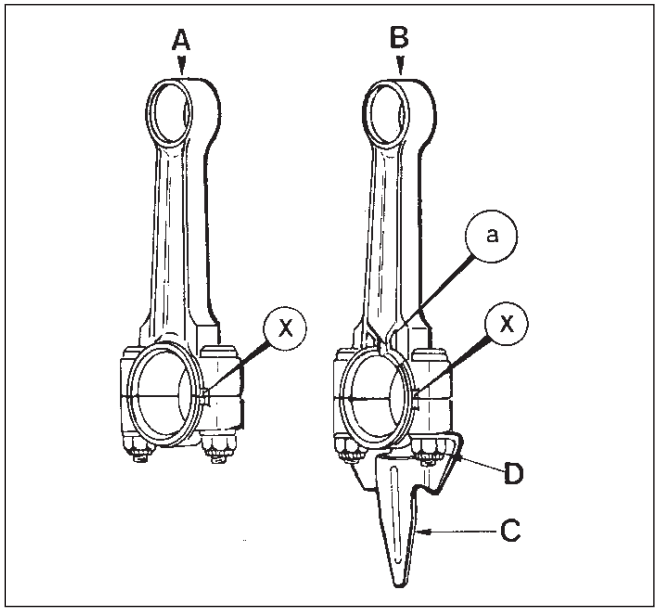


Fig. 17

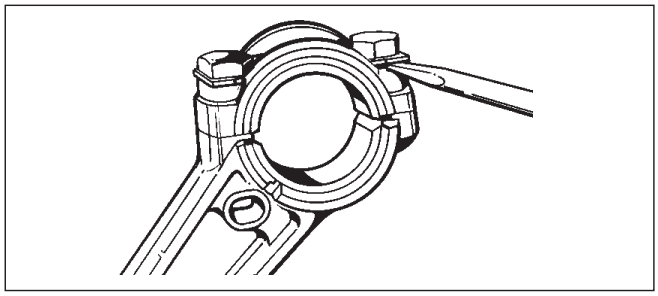


Fig. 18

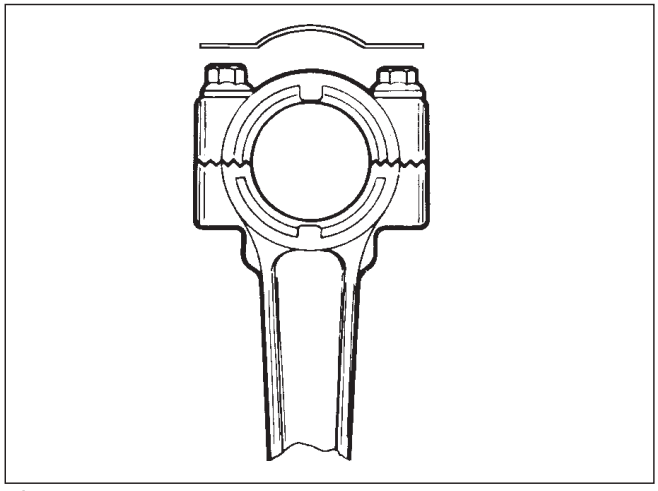


Fig. 19

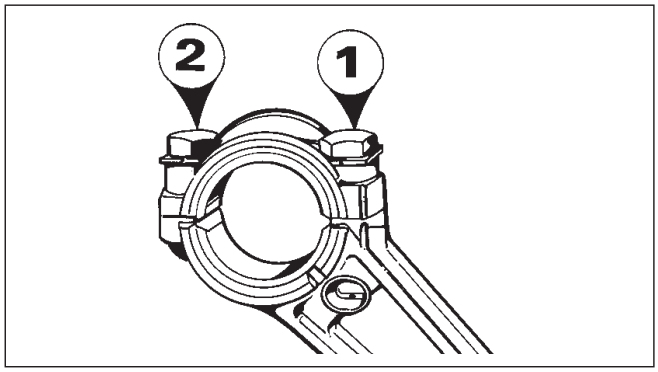


Fig. 20

e) PISTON RINGS AND PIN

Remove rings from piston and clean all carbon from ring grooves with the aid of a piece of old piston ring (Fig 21).

Check piston for damage. Piston wear and ovality should not exceed 0,15 mm (.006”). Refer to table for dimensions.

With a feeler gauge, measure ring clearance in groove (Fig 22). This should not exceed 0,15 mm (.006”).

Insert rings into cylinder bore pushing down about 25 mm or 1” with the piston top. Measure ring gap, replace rings if gap exceeds 0,5 mm (0.02”) (Fig 23).

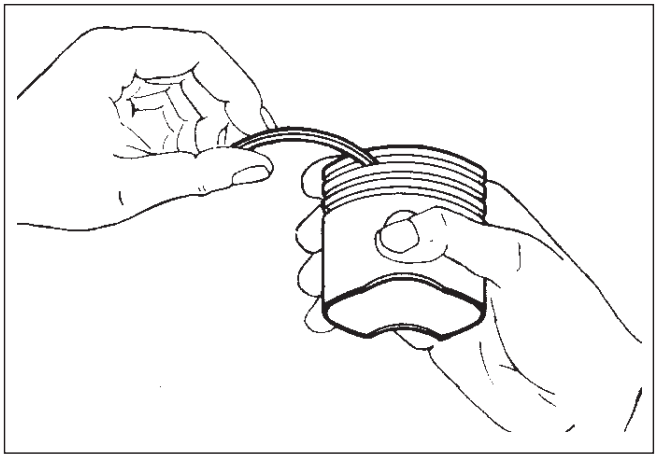


Fig. 21

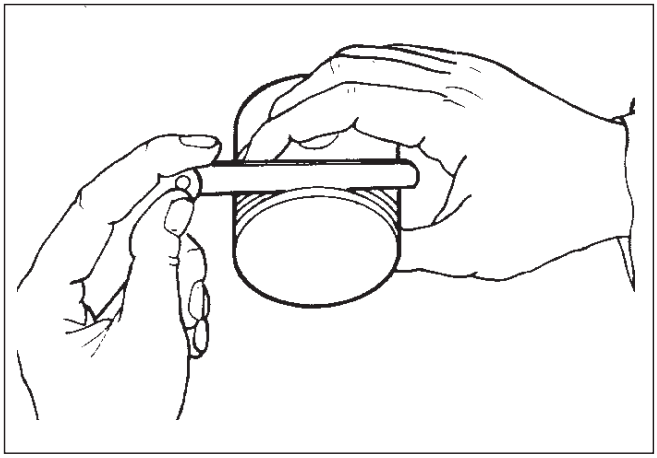


Fig. 22

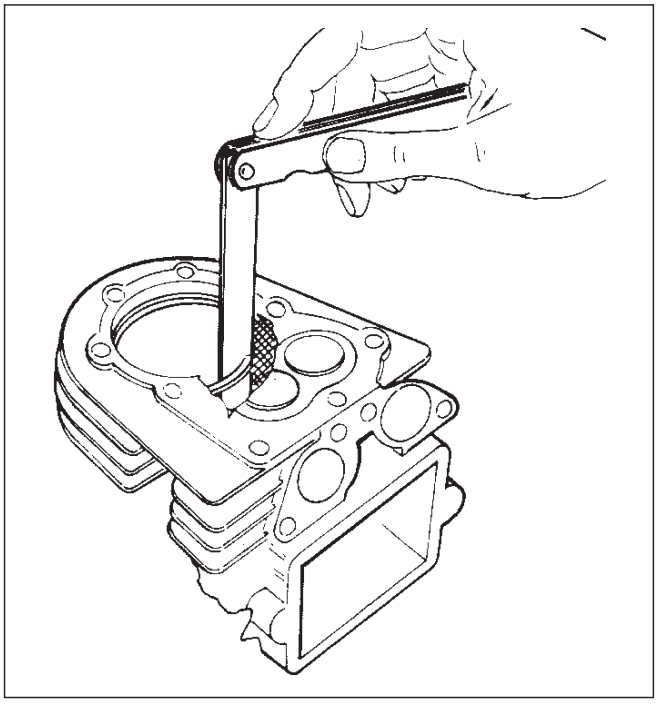


Fig. 23

Piston assembly (Figs 24 & 25)

For reassembly purposes there is a match mark on the piston pin boss (**A**). Depending on the engine type pistons may have an off-set piston pin. This must be fitted towards the magneto side.

Piston pin

Remove retaining rings (Fig 26) and withdraw pin from piston (Fig 27). Check for wear or damage and replace if necessary.

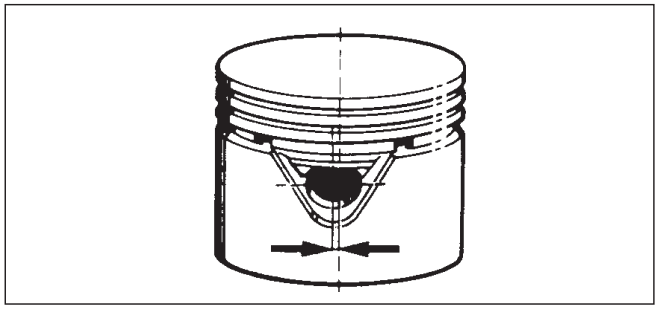


Fig. 24

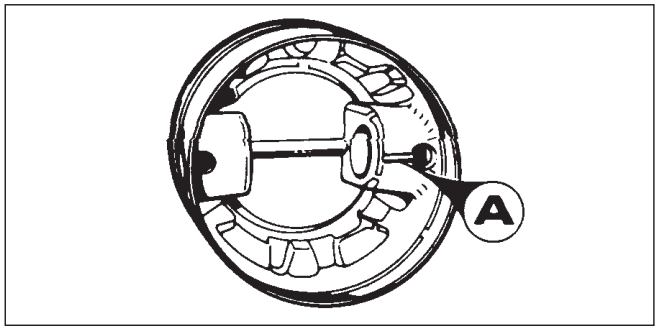


Fig. 25

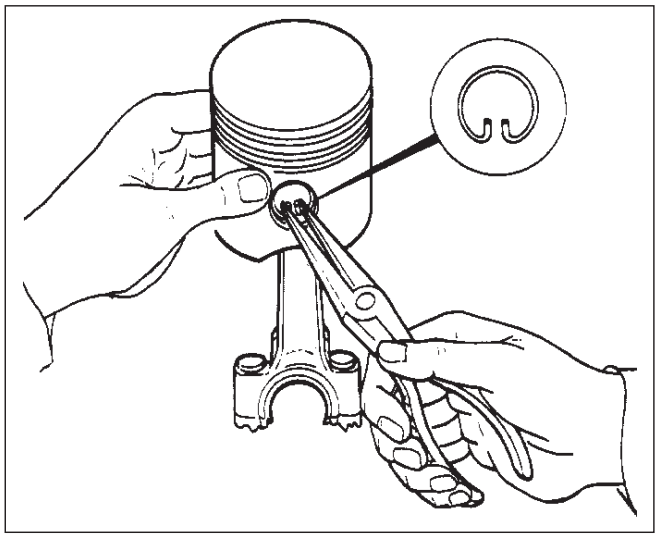


Fig. 26

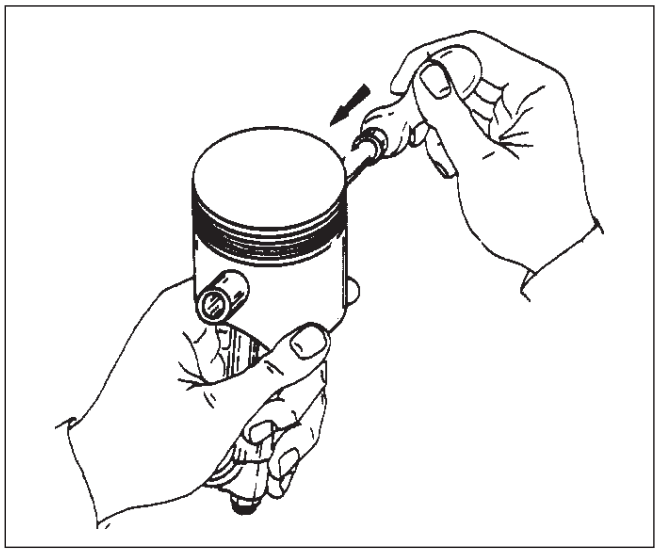


Fig. 27

f) CAMSHAFT

Check gear and cams for damage or wear. Check that shaft is not bent and that bearing dimensions conform to sizes given in table. On vertical shaft engines check that oil passages are clear, replace shaft if necessary.
Check dimension of cams (see tables).

Compression release

In order to assist in easy starting the 4-stroke engines may be fitted with a compression release, the function of which is to hold a valve off its seat at cranking speed thus lowering the compression ratio.

Mechanical compression release

The mechanical compression release is activated by a pin working through the crankshaft directly on the tappet (Fig 28).
When the engine reaches running speed, a centrifugal weight on the camshaft withdraws the pin thus allowing the valve to seat fully.

***NOTE** - Mechanical compression release usually operates on the inlet valve.*

Fig. 28 - Compression release assy

a. pin
b. rocker arm
c. centrifugal weight
d. return spring

Alternatively, the centrifugal weight has a ramp on it which lifts the valve at cranking speed. This ramp retracts at normal running speed. (Fig 28-1).

Lobe - cam (Fig 29)

Tecumseh has a compression release system called 'Lobe - Cam' which is not centrifugally operated as previously. The drawing illustrates the reshaped cam lobe which actuates the exhaust valve. It is important that the clearance of this valve is set at 0,10-0,20 mm (.006"-.010").

***NOTE** - Check valve clearance with piston at TDC compression stroke.*

Ramp type compression release (Fig 29-1)

Some engines now use a ramp type compression release system on the inlet valve.
Fig 29-1 Illustrates the new lobe profile
Decompressing on the inlet valve prevents unwanted emissions being expelled from the engine.

***NOTE** - Do not interchange Mechanical, Lobe or Ramp style camshafts, or poor starting and erratic engine running may occur.*

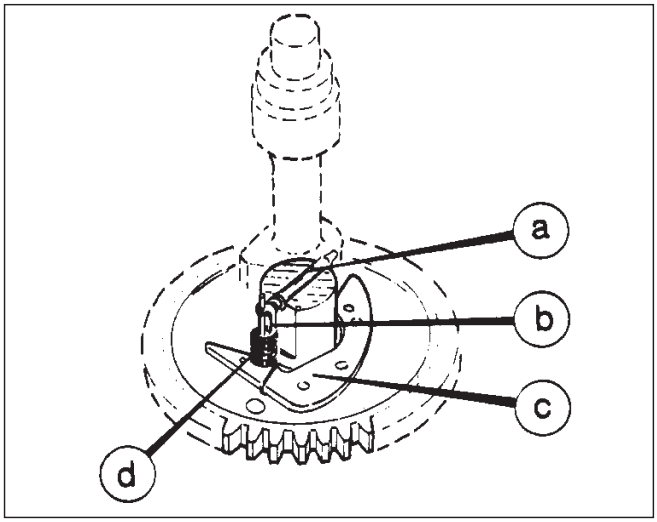


Fig. 28

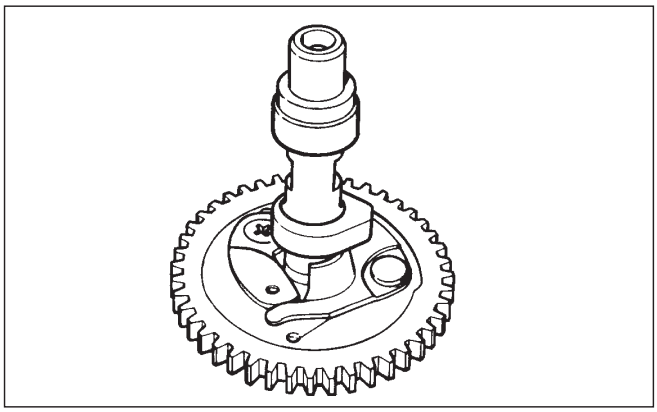


Fig. 28-1

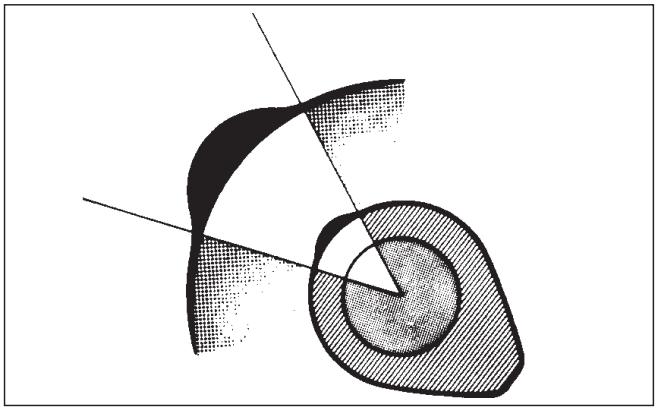


Fig. 29

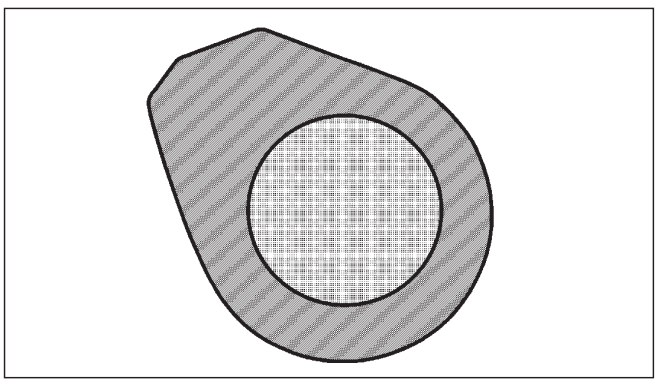


Fig. 29-1

g) LUBRICATION

On vertical shaft engines, lubrication is provided by a positive displacement type pump (Fig 30) which forces oil to the top main bearing via a drilling in the camshaft and a gallery in the crankcase (Fig 31).

The horizontal shaft engine is lubricated by means of a dipper (Fig 32) secured to the conrod by the big end bolts. After removal check the dipper for cracks or distortion; replace if necessary.

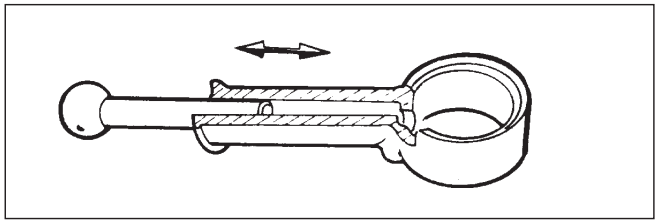


Fig. 30

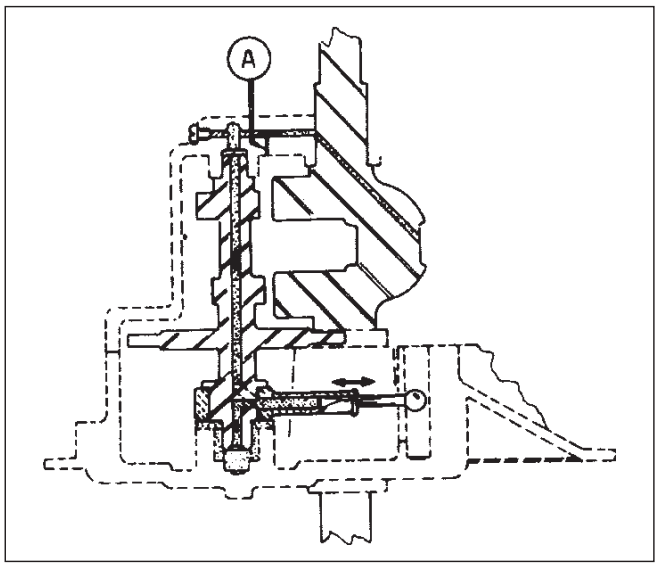


Fig. 31

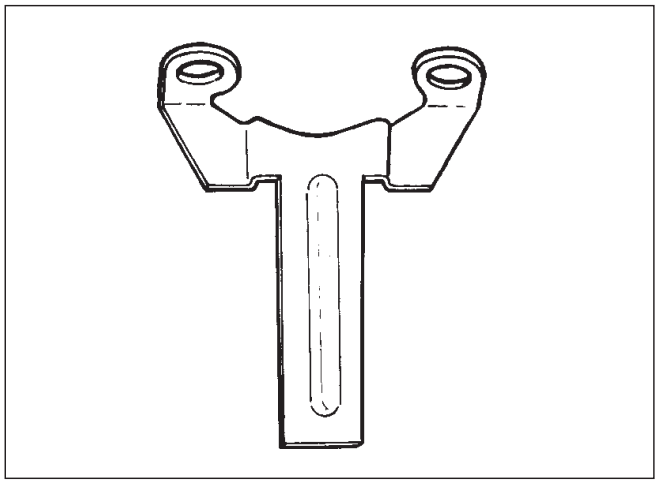


Fig. 32

h) MECHANICAL GOVERNOR

Standard Governor (Fig 33)

The mechanical speed governor is situated inside the crankcase and consists of three parts:
1 - Governor gear
2 - Flyweights
3 - Spool
a. - shaft
b. - retaining rings

The unit is mounted on shaft (**a**) and is secured by two rings (**b**). Remove spool and check both parts for wear or damage Replace if necessary.

Some later governors use a barb on shaft (**a**) to retain the spool (**3**). Removal is by gripping the spool firmly in a vice, and pulling the spool over the barb.

To remove the governor gears (**1**), shaft (a) must be removed from the flange. Grip shaft (**a**) in a vice and strike the flange gently with a soft mallet.

The original spool should not be re-used if removed.

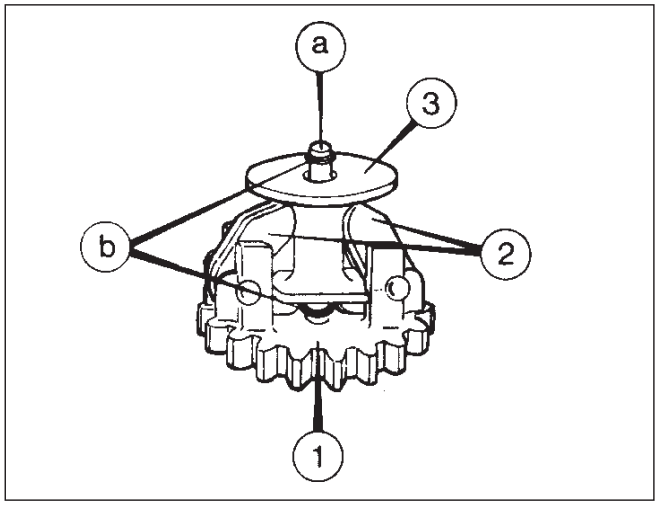


Fig. 33

Oleomatic Governor (Fig. 34)

A plastic sleeve (**A**) is actuated by two centrifugal weights (**D**), the plastic sleeve moving along the centre spindle; the spindle (**B**) being drilled through the centre to allow oil to be drawn in under the head of the sleeve.
This gives a low pressure oil damping effect which eliminates any slight governor fluctuation.

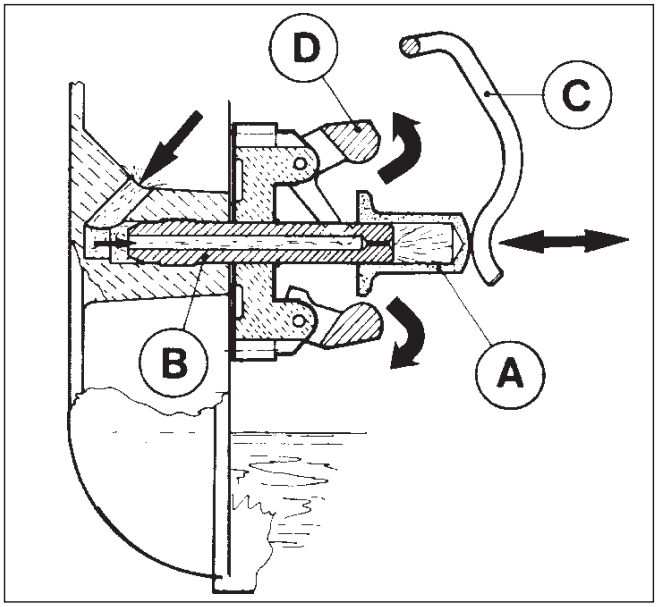


Fig. 34

i) CRANK CASE BREATHER

All four stroke engines are fitted with a crankcase breather, the body of which contains a small celeron valve (Fig 35).
Two body types are made, identified by the position of the oil drain hole :

Fig 35

A. Vertical type
B. Horizontal type

Check that valve moves freely and that seat is not damaged.

On earlier types the valve was of a metal spring type (Fig 36); this spring should be very resilient and sticking should not occur.

Some vertical crankshaft engines were also fitted with a filter between the breather cover and body (Fig 37).

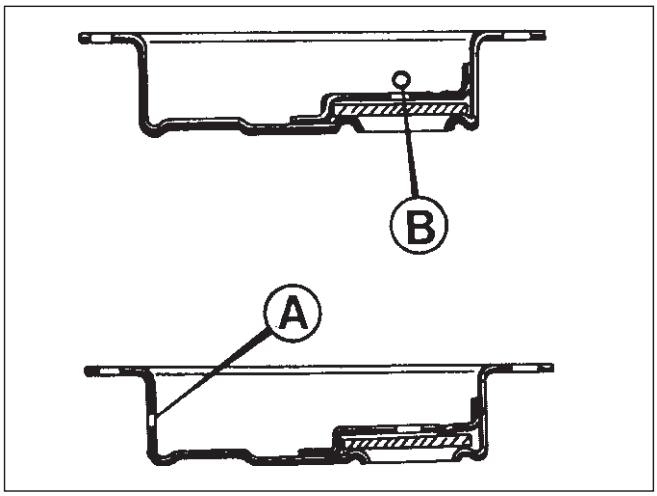


Fig. 35

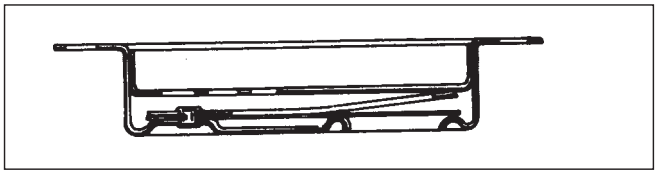


Fig. 36

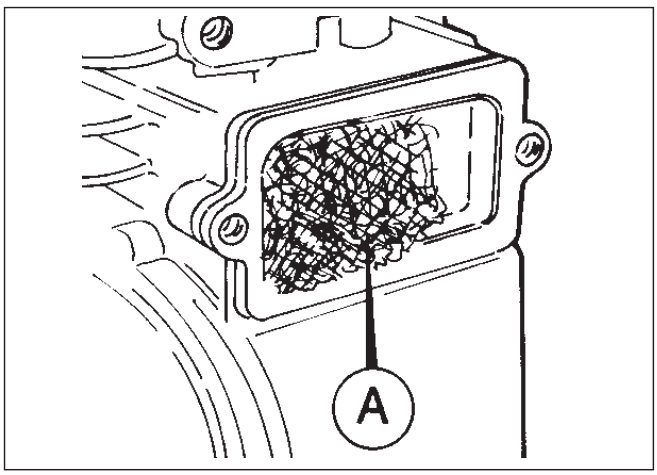


Fig. 37

Check the filter and replace if necessary. The valve breathes into a rubber pipe (Fig 38). This may be open to atmosphere (open type), or may be connected to the carburettor intake (closed type) (Fig 39).

k) TOP MOUNTED BREATHER

Fig. 40

1. Element
2. Baffle
3. Oil return
4. Pressure out
5. Check valve
6. Tube

A 4-cycle engine must be equipped with a crankcase breather in order to maintain a partial vacuum in the crankcase to prevent oil from being forced out of the engine oil seals, past the piston rings or any gasket area.

This type breather is mounted to the top rear of the cylinder block. The check valve allows excess pressure to be vented through the element and out the tube. Condensed oil vapour returns to the crankcase by means of the oil return holes. Some engines have the breather tubes connected to the air cleaner assembly.

The filter element can be cleaned using cleaning solvent. When reinstalling the check valve, apply oil to aid assembly.

***NOTE** - The check valve may expand if exposed to solvents for a period of time. This swelling will prevent correct operation of the breather.*

***NOTE** - The breather body may be retained by two screws, or may be a press fit into the crankcase. These two types are not interchangeable.*

l) OIL SEAL REPLACEMENT (Fig 41)

If oil leakage is apparent it is possible to change the oil seal with the crankshaft in position by the use of special tools for the flywheel side and for the PTO side, 670292 and 670272.
Always fit new seals.

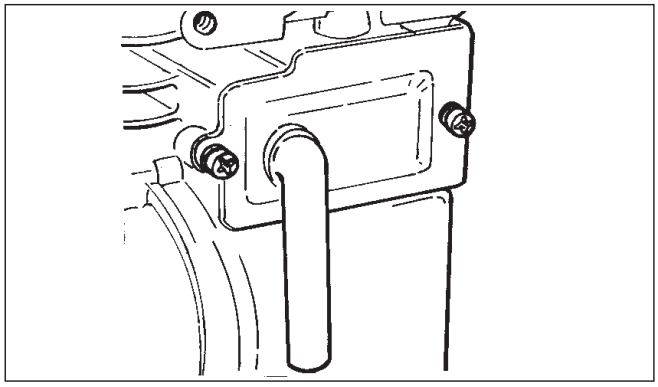


Fig. 38

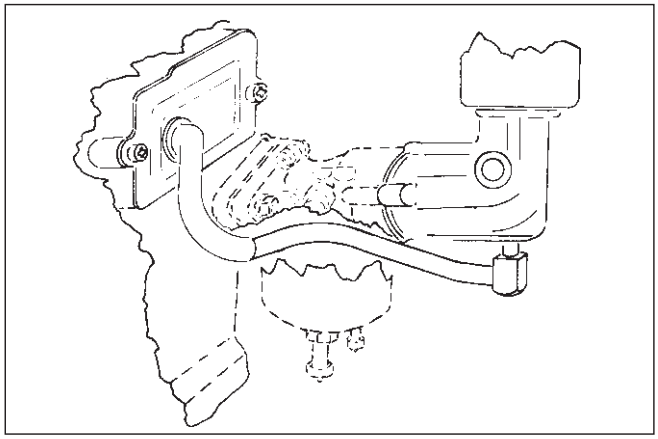


Fig. 39

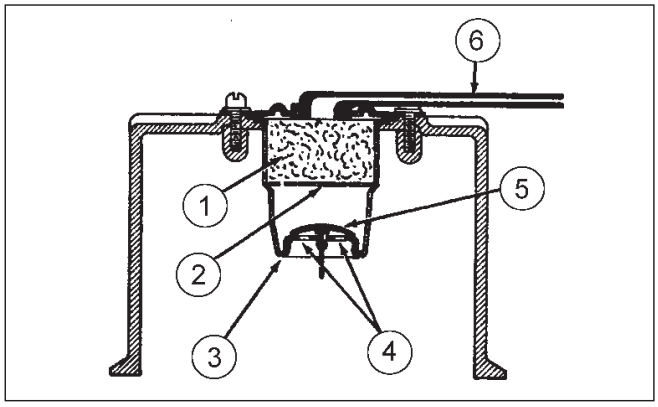


Fig. 40

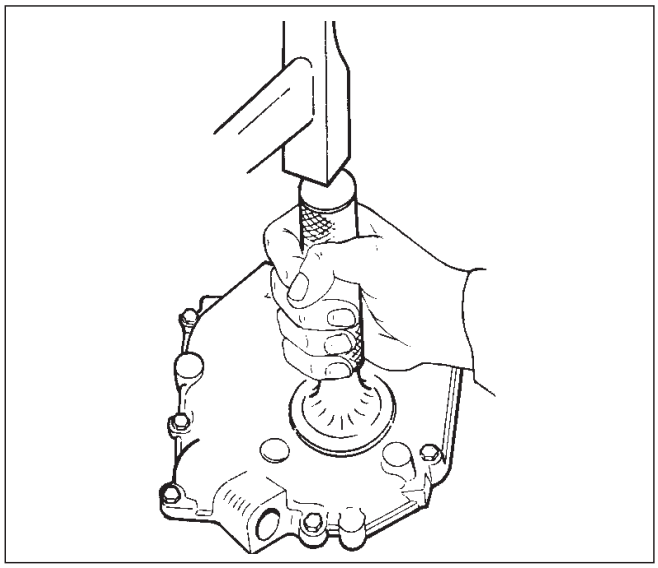


Fig. 41

6. REASSEMBLY

a) GENERAL

Reassembly should be carried out in the following order. After thoroughly cleaning all parts, position crankcase on bench (Fig 42). If replacement of flywheel side oil seal is necessary refit at this point.

b) CYLINDER

Cylinder with aluminium bearings (HTB, HSB and all vertical crankshaft engines)
Lubricate flywheel side bearing and install crankshaft with big end journal towards cylinder bore.

Cylinder with needle bearings (HBL 20-30-35-40)

Replacement of bearing. The needle bearing can be removed with the aid of special tool 88841026 (Fig 43) and a replacement bearing fitted using tools 88841531-670272 (Fig 44).

Lubricate flywheel side bearing and install crankshaft with big end journal towards cylinder bore.

the crankshaft runs in a needle bearing (flywheel side) and ball bearing (PTO side). The flywheel side crankshaft main bearing journal is hardened for use with needle bearings. It is therefore essential that the correct crankshaft is ordered and not confused with HTB or HSB.

Cylinder with ball bearing (BH)

Heat cylinder to 80-100 degrees C and drive out bearing. Bearing has a locating clip around the outer race, and must be driven into the crankcase. Use reverse procedure for replacement.

The bearing in the cylinder cover does not have the locating clip, but sits against a register in the cover. Heat the cover to 80-100 degrees C and drive bearing out of cover from the outside inwards.

Use reverse procedure for replacement.

Always refer to parts lists for correct identification.

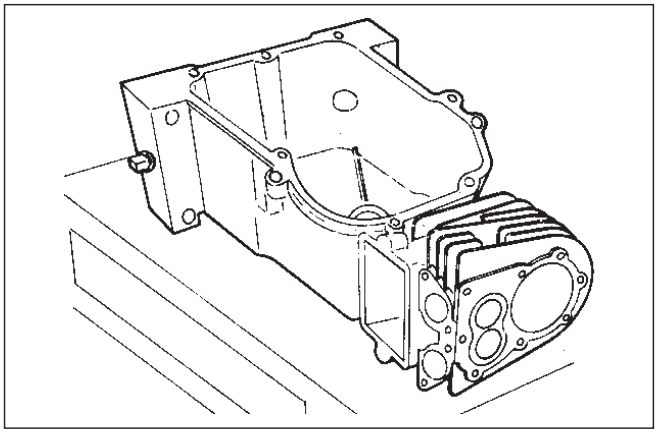


Fig. 42

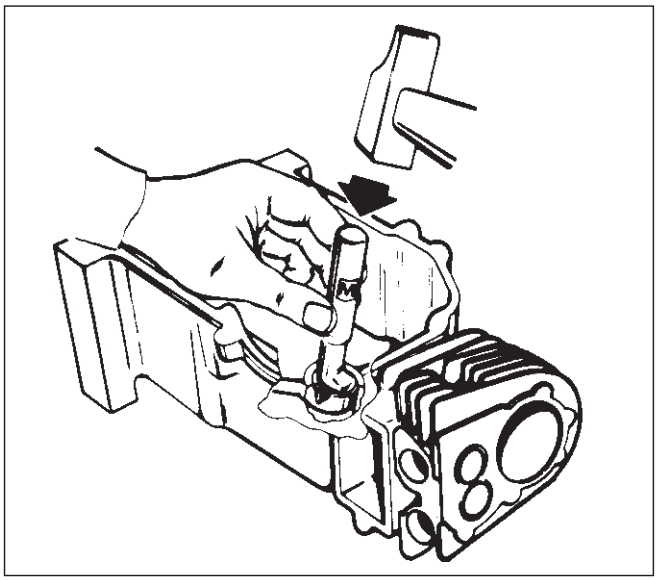


Fig. 43

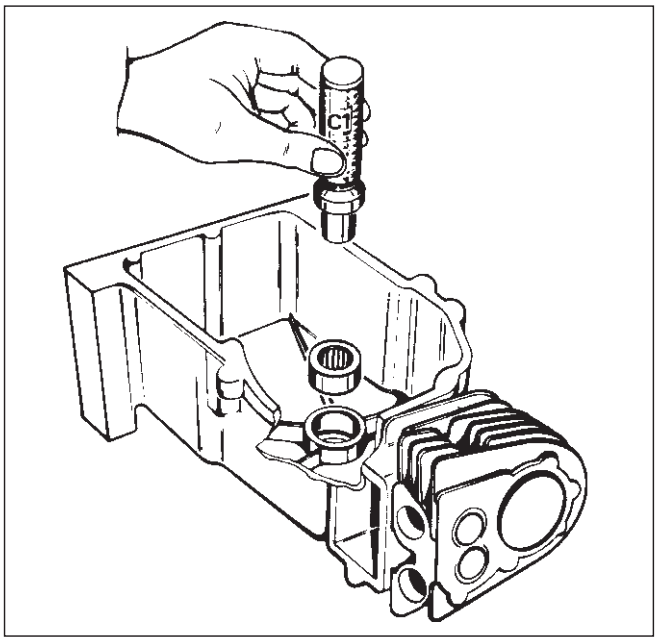


Fig. 44

c) OVERSIZED PISTONS FOR 4-STROKE ENGINES

As in all engine production Tecumseh occasionally produce cylinders bored above maximum allowable tolerance. In this case .010" oversize piston and rings will be fitted. These components may be identified by the figure 1 stamped on both cylinder and piston. The drawing shows location of these marks on 4-stroke engine components. (Fig 45).

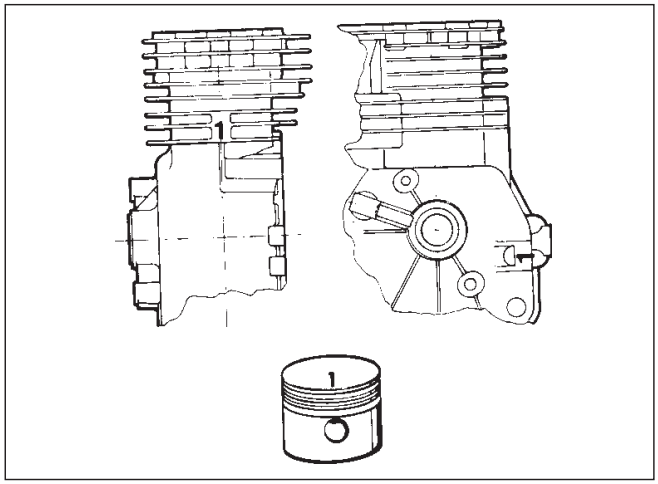


Fig. 45

d) PISTON AND RINGS

Piston rings must be fitted with tapers upwards (on compression rings) and expander under the scraper rings (Fig 46).

On some engines (LAV 172, HBP 40, BHG) the second compression ring is of L configuration and is fitted as per Fig 47.

On some types a spring is mounted under the oil scraper ring (HBP 40) in this case the third groove is deeper than normal (Fig 48).

***NOTE** - Always select parts according to correct parts list.*

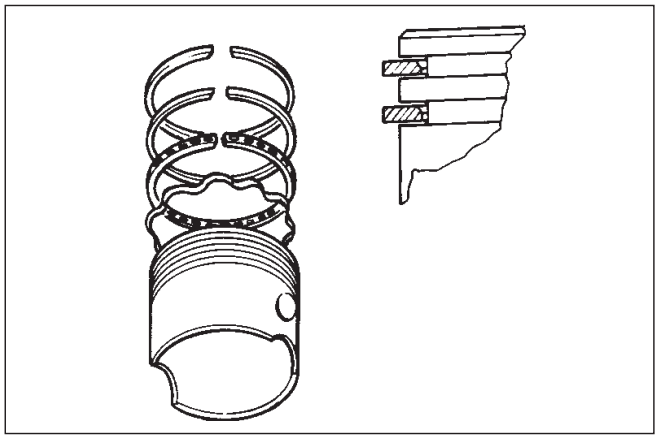


Fig. 46

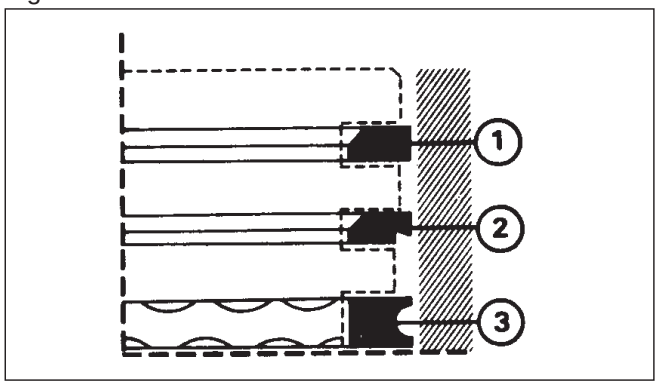


Fig. 47

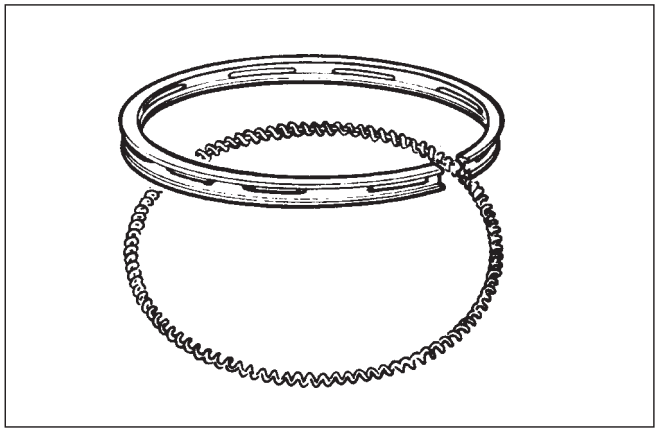


Fig. 48

e) PISTON AND CONNECTING ROD (FIG 49)

Fit conrod to piston by first fitting one retainer ring, lubricate conrod and secure with piston pin (Fig 51). Fit second retaining ring, if rings have been renewed rub cylinder wall with fine emery to remove “glaze” and assist the bedding of the rings.

Some pistons have match marks (**A**, Fig 50) and must be fitted so that match marks are toward magneto side (LAV 172, HBP 40).

Insert piston from top of bore with conrod match marks to open side of crankcase.

The piston match mark will then appear on the opposite side to those on the conrod (Fig 50-**B**).

Insert piston into bore from top, lubricate and enter rings with the aid of a ring compressor tool, push home until big end seats on crankshaft journal, lubricate well and fit big end cap (and dipper on horizontal shaft engines).

The cap and rod are marked for correct assembly. (**A** - Fig 52). These must be matched correctly.

For correct assembly, operate as follows:

- Locate conrod on crankshaft journal
- Align match marks and fit cap
- Fit lock tab and insert screws
- Hand tighten the two screws
- Screws should then be tightened by means of torque wrench to figures in table following the sequence shown on Fig 53.
- Secure screws with lock tab already fitted (Fig 54).

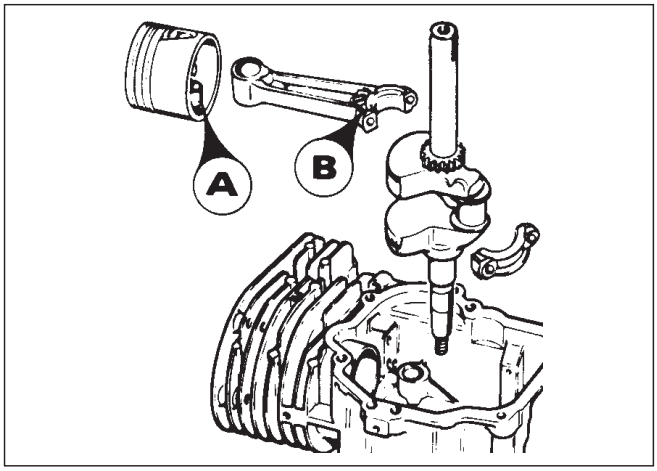


Fig. 49

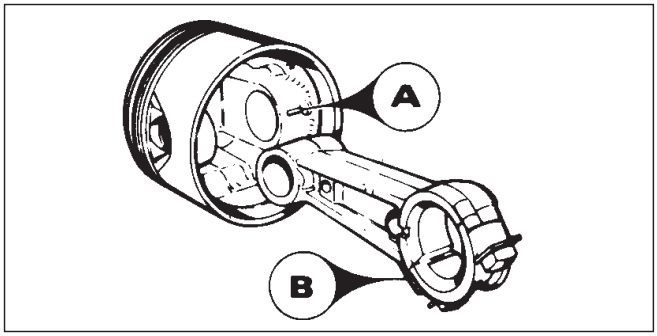


Fig. 50

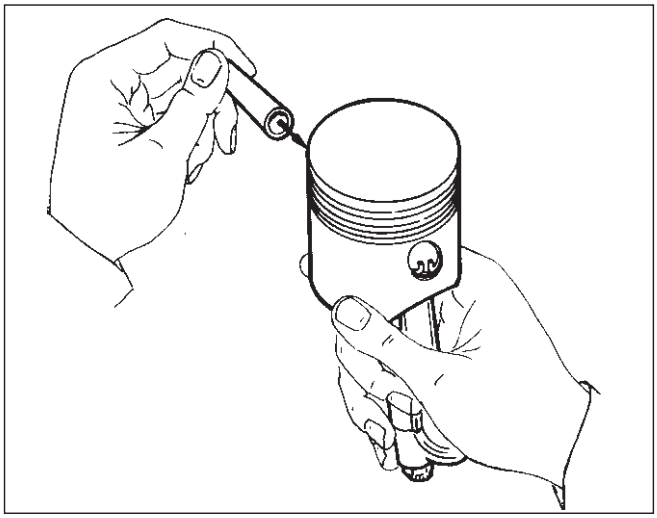


Fig. 51

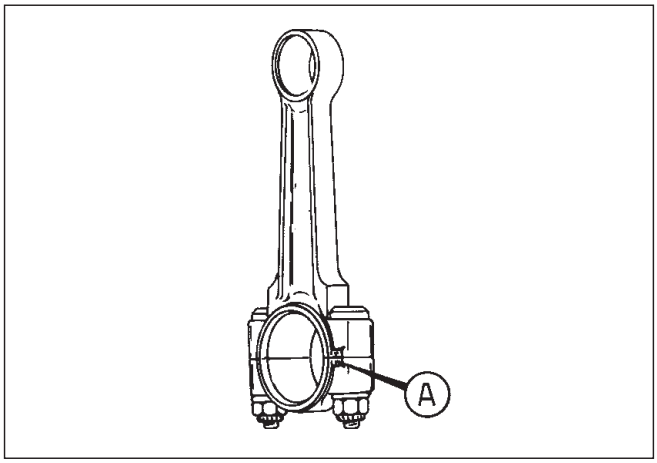


Fig. 52

f) CAMSHAFT - OIL PUMP - COVER

Position valve lifters in the correct order and fit camshaft with timing marks aligned as in Fig 55.
Check governor shaft and replace if worn or bent.
Install governor gear assembly.
Refit dowel pins in crankcase and fit a new gasket.

On engines with aluminium bearings

Place crankcase cover on crankshaft, position oil pump plunger in line with slot (vertical shaft engines) and push cover home, turning crankshaft to mesh governor gear, tighten securing bolts in sequence to torque figures in table.

On engines with ball bearings

Fit crankcase cover on crankshaft, turning crankshaft to mesh governor gear.
Push fully home and fit bolts in sequence (Fig 56), tighten to torque figures shown in table. On horizontal shaft engines fit snap ring to crankshaft and refit oil seal with special tool 88841533.

On BH models there is no circlip

To eliminate crankshaft end float a compressible washer is used on the magneto journal and of the crankshaft. This washer must be fitted prior to inserting the crankshaft into the magneto end bearing when assembling the engine.

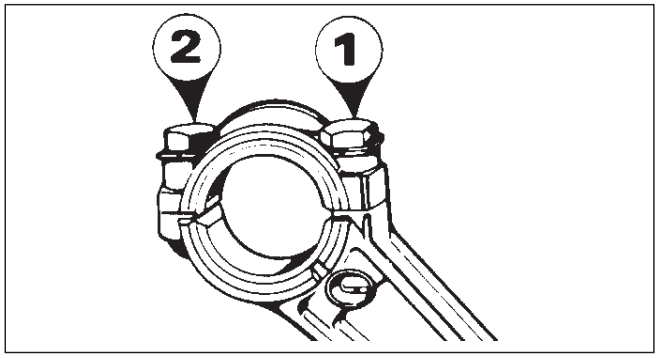


Fig. 53

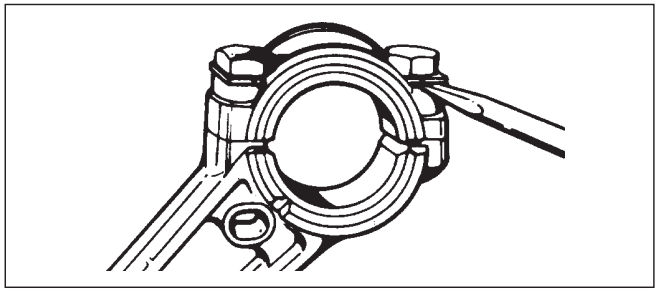


Fig. 54

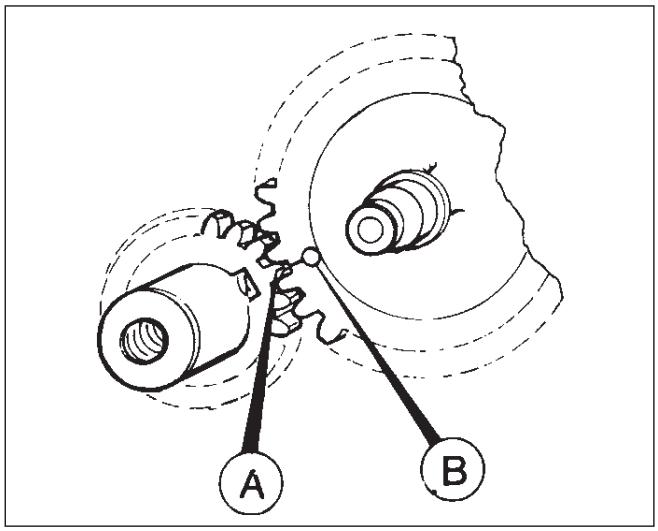


Fig. 55

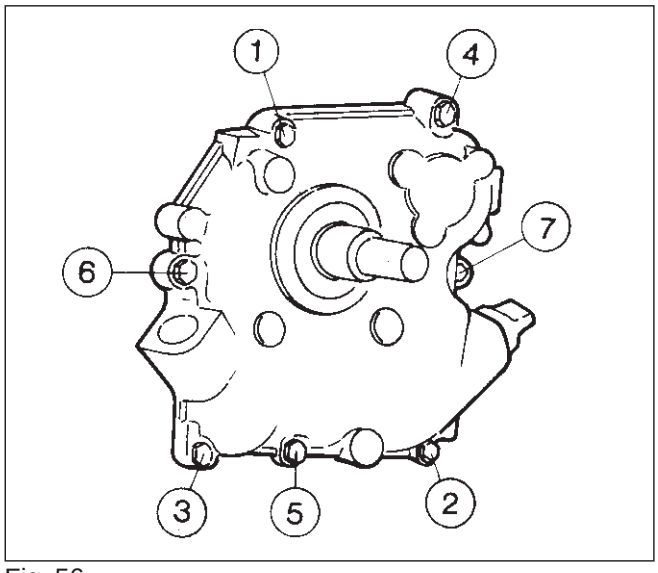


Fig. 56

g) MOUNTING FLANGE FOR ENGINES WITH LATERAL PTO

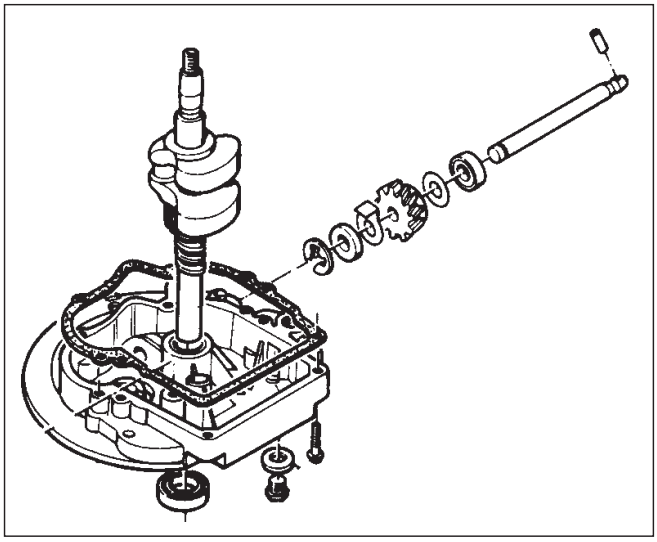


Fig. 57

Reduction shaft service

A retaining ring secures the 8,5 : 1 PTO shaft. The sequence of the washers is the most important factor to consider for reassembly.
Insert PTO (Power Take Off) shaft through seal and into flange bosses. Follow sequence of parts shown in Fig 57.

***NOTE** - If base does not slide on crankshaft freely do not force. Turn crankshaft 1/8 of a turn and repeat until reduction gear in base plate rolls down worm gear on crankshaft.*
Always use new oil seal protector cap using proper approved tools to install.

***NOTE** - If gasket surface of base plate does not contact gasket surface of cylinder block, DO NOT FORCE. This indicates oil pump gear, or governor gear, is not meshed with crankshaft gear. Turn crankshaft slowly while exerting light pressure on base plate until gears mesh, at the same time ensuring that oil pump plunger is located in base plate.*

Fitting external parts

Position cylinder head and gasket on cylinder and insert head bolts. Tighten as per torque figures given in tables. Fit the breather body and secure refit carburettor and ignition as in chapters G & E. Fit air shroud and starter.

7. OHV ENGINES

a) OH Valve Train Service (Fig 58)

The biggest difference between the OH engine compared to other rotary mower engines is the overhead valve concept. Many of the same procedures for repairing the OH engine are the same. The differences will be in servicing the valve train. This section will emphasize those changes.
The valve train consists of a cupped lifter. This cupped lifter enables the ball shaped end of the push rod to seat on the lifter. The push rod moves a valve rocker arm that opens the valve.

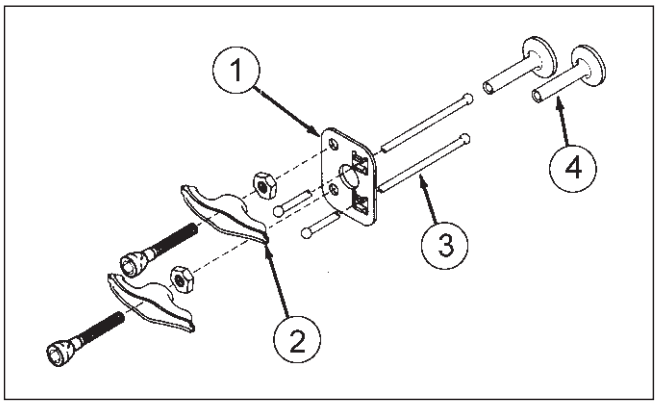


Fig. 58

Fig. 58 - Over Head Valve System.

1. Push rod guide plate
2. Valve rocker arm
3. Push rod
4. “Cupped” valve lifter

VALVE TRAIN SERVICE

Remove the rocker arm cover. The cover is secured with four bolts that are 3/8" external hex or a Torx 30 internal (Fig 59,A). The gasket between the rocker arm cover and the head should always be changed when the cover is removed to ensure proper sealing.

Loosen the two locking nuts (7/16”) on the rocker arm pivot screws. Loosen the two rocker arm pivot screws using a 3/16" AF Allen head wrench. Remove the screws, rocker arms and push rod guide plate. (Fig 60).

The push rods can be removed from the engine and the cylinder head bolts can be removed to take the head off the engine. (Fig 61).

The valve springs can be removed by supporting the valves with your fingers while compressing the valve springs, one at a time, with your thumbs. Then slide the larger part of the opening in the retainer towards the valve stem while the spring is compressed. (Fig 62).

CAUTION *- Proper safety equipment should be worn, such as safety glasses.*

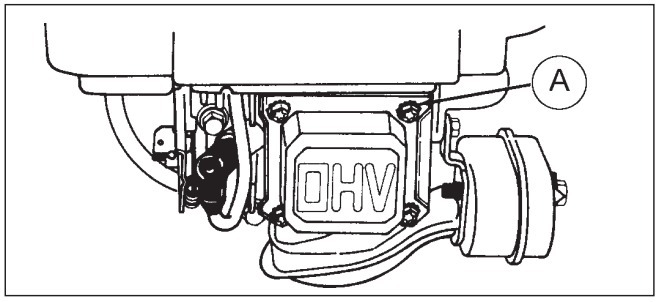


Fig. 59

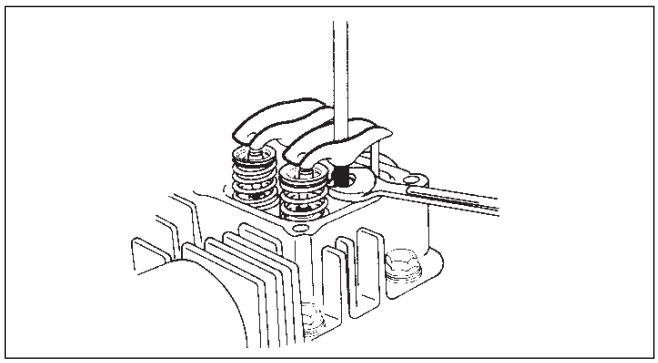


Fig. 60

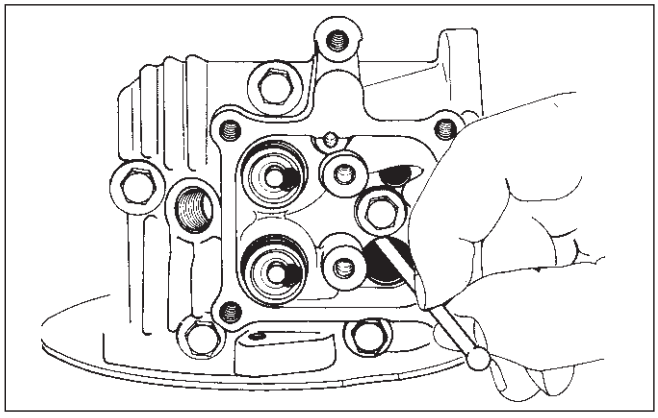


Fig. 61

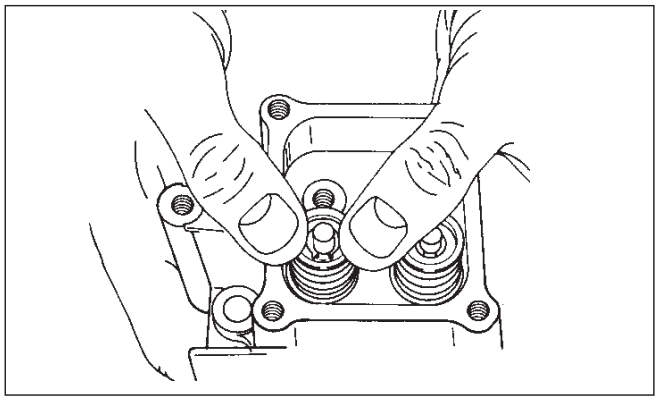


Fig. 62

The condition of the valves and valve seats can be inspected at this time and serviced accordingly. (Fig 63)

The all metal head gasket MUST be removed from the engine, and discarded (Fig 64). Always fit a new head gasket when Head is removed.

CAUTION *- Caution must be used so that there are no scratches or knicks in the cylinder or head gasket surfaces. This may cause a head gasket leak.*

Reassembly

The following procedures will show the proper steps to be taken to reassemble the valve train components into the engine.

After properly servicing the valves and valve seats, if so required, place the intake and exhaust valves into their proper position. Place the valve spring over the valve guide and install the retainer (Fig 65).

Compress the valve spring and retainer allowing the larger opening of the retainer to slide over the valve stem. Then slide the retainer towards the smaller opening when the retainer is pressed to the notch in the valve stem (Fig 66).

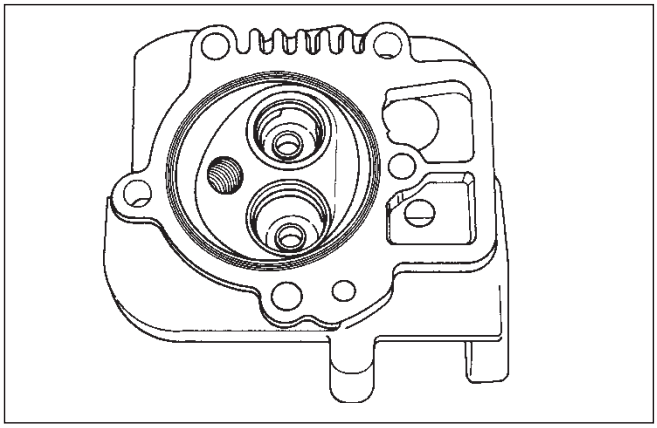


Fig. 63

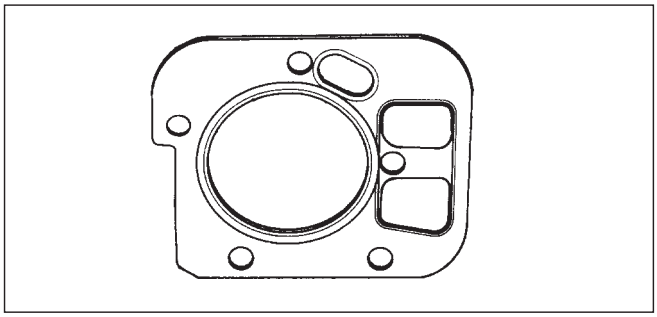


Fig. 64

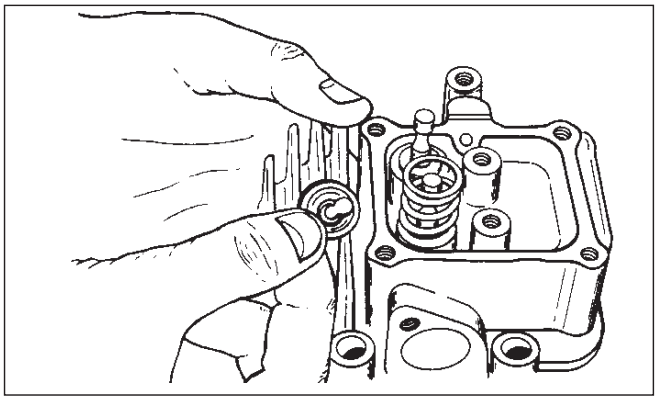


Fig. 65

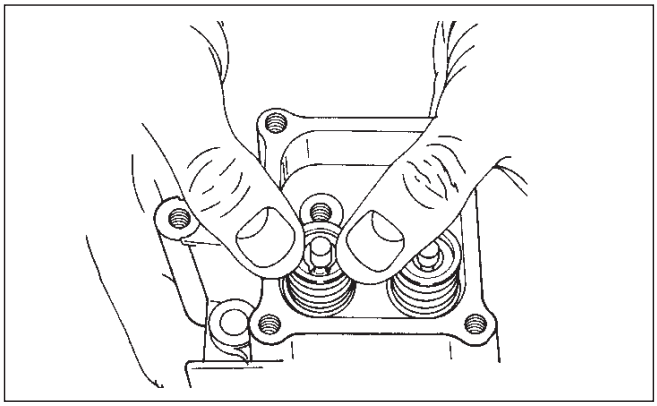


Fig. 66

When both valves have been installed back into the head, place a new head gasket into position and attach the cylinder head. (Fig 67).

NOTE *- The head gasket is coated. Any scratches or bending to the head gasket will require a new head gasket or leakage may occur.*

It is critical to the proper operation of the engine that the head bolts be torqued in the proper sequence and at 60 inch pound (6Nm) increments to 240 inch pound (24Nm). (5 ft. pound increments to 20 ft lbs. (Fig 68).

Place the guide plate in position on the head - the tabs on the guide plate face out. (Fig 69-1). Install the rocker arm and pivot ball screw with the lock nut on far enough to hold the guide plate in position. The valve lash will be adjusted later.

Insert the push rod into the engine. The block is designed so that the push rod will be guided onto the lifter. The push rod may be installed with either end sitting on the lifter. Place the push rod between the tabs on the guide plate and then place the rocker arm onto the push rod. The proper alignment is when the ball on the push rod sits in the socket of the rocker arm. (Fig 70).

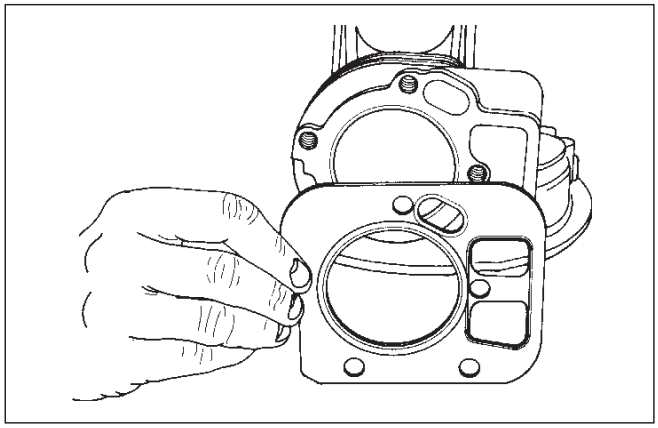


Fig. 67

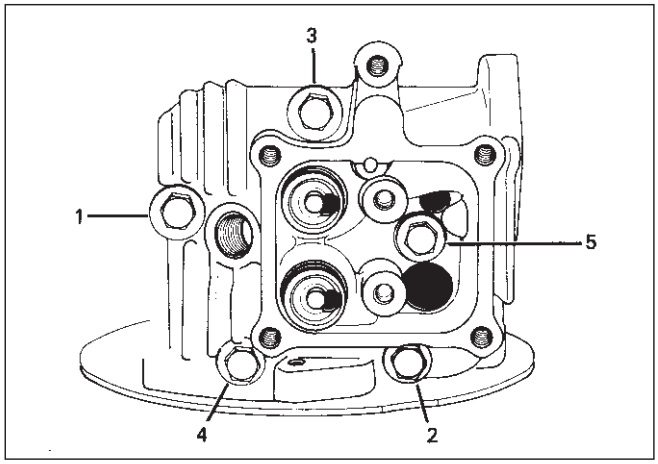


Fig. 68

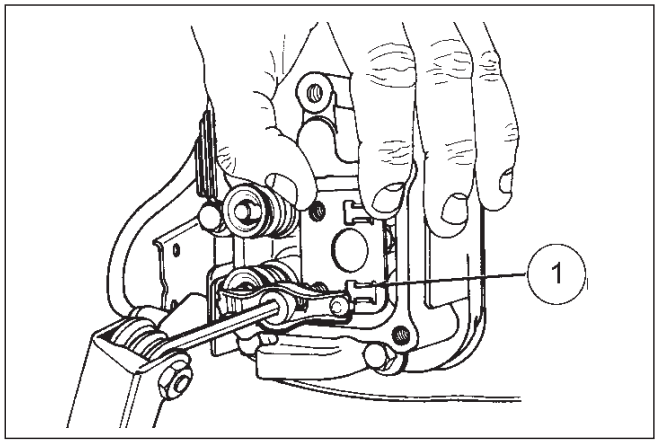


Fig. 69

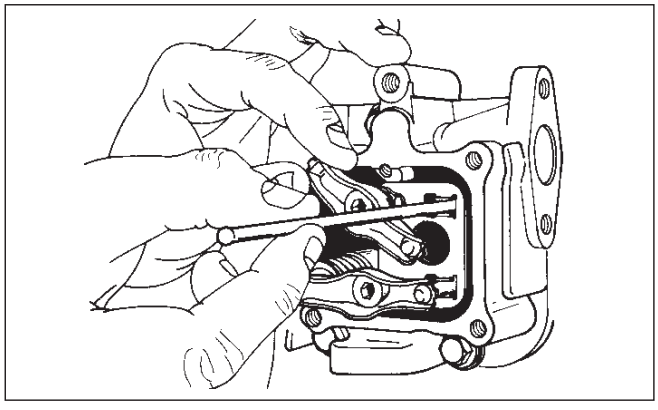


Fig. 70

SETTING THE VALVE LASH

To properly set valve lash on the OVRM engine make sure the engine is cold and at TOP DEAD CENTRE on the compression stroke (both valves are closed). The lash on both valves is 0.05-0.15 mm (.004") between the rocker arm and the valve stem. (Fig 71).

To lock this setting hold the Allen wrench on the pivot ball screw and tighten the lock nut to 65-85 inch pounds (6.5-8.5 Nm) of torque. Double check the setting to make sure that it did not change when the lock nut was tightened. (Fig 72).

Place a new rocker arm cover gasket in place and install the cover back onto the engine. (Fig 73). Torque the four screws to 30-50 inch pound (3-5 Nm).

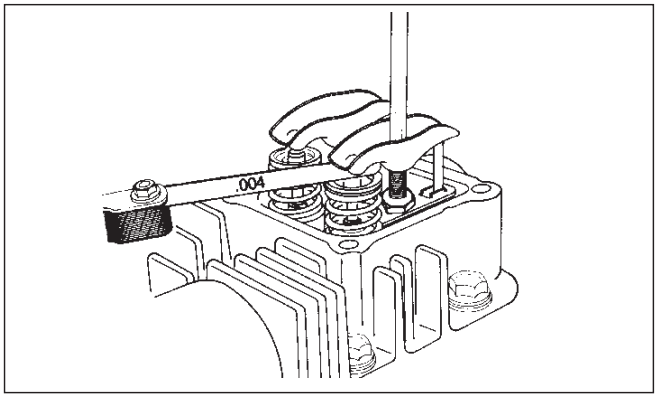


Fig. 71

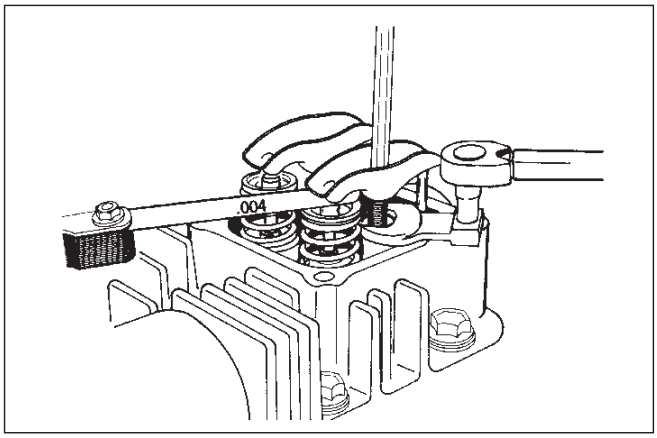


Fig. 72

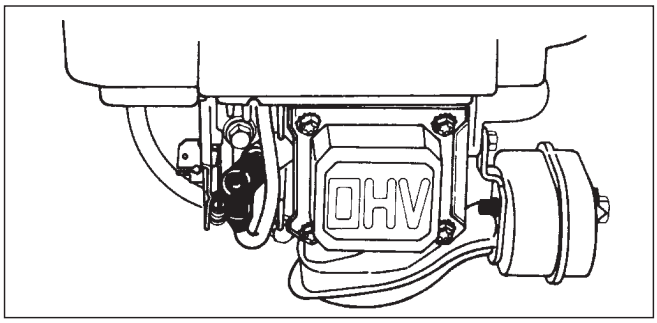


Fig. 73

b) VALVE SERVICE

Clean all parts and remove carbon from valve heads and stems. If valves are in usable condition, grind or cut the valve faces to 45 degrees angle using tools 26990002 and 26990001. Replace valves if they are damaged, distorted or if the margin is ground to less than 1/32" (0.8 mm) (Fig 74).

Valve seats

Valve seats are not replaceable. If they are burned or pitted they can be reground using a grinding stone or Neway Valve Reseater. Seats are ground at an angle of 46 degrees to a width of 3/64" (1.2 mm).

The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of different degree cutters. (88841013).

First use the 31 degree cutter to clean and narrow the seat from the top toward the centre (Fig 75).

Second use the 46 degree cutter to cut in the seat to a width of 3/64" (Fig 76).

Oversize valve guides

Valve guides are permanently installed in the head. If they become worn excessively they can be reamed to accommodate a 1/32" oversize valve stem.

You are recommended to bring guide diameter to 7 mm and then ream with reamer 670283 (670328 for exhaust valve guide). After oversizing the valve guide - the seats must be re-cut to align with the valve guides.

Valve lifters

It is a good practice not to interchange lifters, even though they are identical, once a wear pattern has been established.

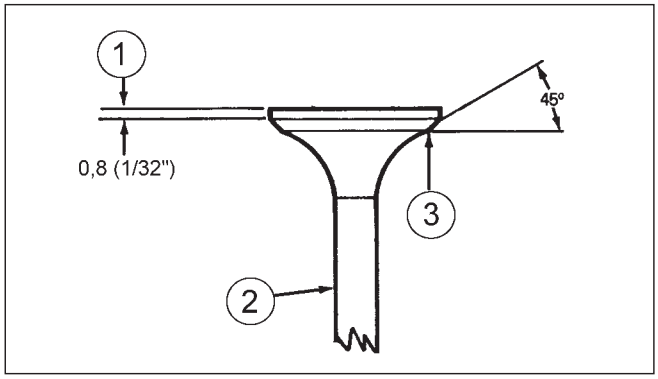


Fig. 74

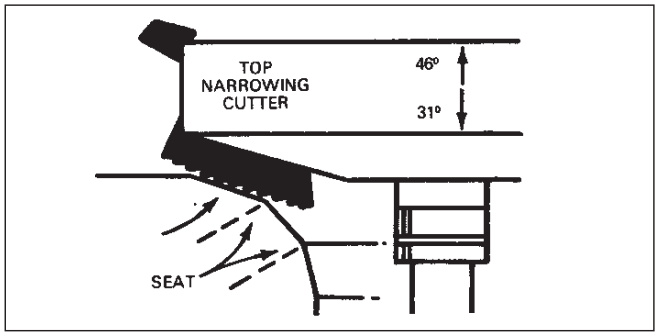


Fig. 75

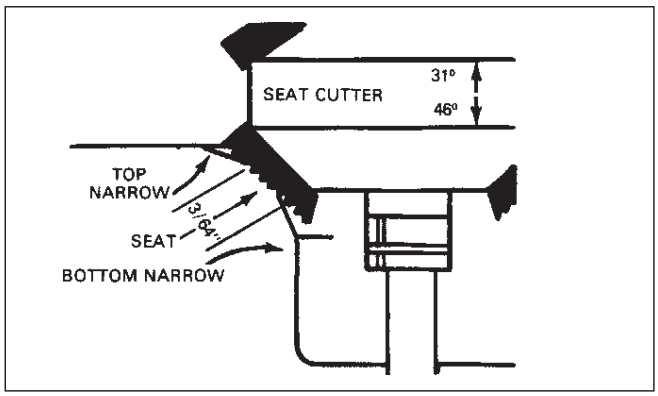


Fig. 76

4-STROKE ENGINE SPECIFICATIONS (BV – BVL – VANTAGE – PRISMA – SYNERGY – PREMIER – SPECTRA – FUTURA)									
Engine displacement	**cm³**	148	156	172	198	195	148 OHV	172 OHV	195 OHV
Boring		63.500	63.500	66.675	71.425	70.993	63.500	66.675	70.993
	mm	63.525	63.525	66.700	71.450	71.018	63.525	66.700	71.018
Stroke	**mm**	47.1	49.2	49.2	49.2		47.1	49.2	49.2
Advance (P.M.S.)		FIXED							
Coil – flywheel air gap	**mm**	0.30	0.30	0.30	0.30		0.30	0.30	0.30
Distance between electrodes and spark plugs	**mm**	0.60 0.70	0.60 0.70	0.60 0.70	0.60 0.70		0.60 0.70	0.60 0.70	0.60 0.70
Valve clearance (may also be 0.10÷0.20)	**mm**	0.15 0.25	0.15 0.25	0.15 0.25	0.15 0.25		0.05 0.10	0.05 0.10	0.05 0.10
Valve seat angle		46°	46°	46°	46°		46°	46°	46°
Crank journal diameter	**mm**	21.869 21.882	25.387 25.400	25.387 25.400	25.387 25.400		21.869 21.882	25.387 25.400	25.387 25.400
Engine shaft toe diameter (flywheel side)	**mm**	25.362 25.375	25.362 25.375	25.362 25.375	25.362 25.375		25.362 25.375	25.362 25.375	25.362 25.375
Engine shaft toe diameter (power intake side)	**mm**	25.362 25.375	25.362 25.375	25.362 25.375	25.362 25.375		25.362 25.375	25.362 25.375	25.362 25.375
Engine shaft axial clearance	**mm**	0.155 0.689	0.155 0.689	0.155 0.689	0.155 0.689		0.155 0.689	0.155 0.689	0.155 0.689
Piston skirt diamter	**mm**	63.383 63.395	63.383 63.395	66.520 66.530	71.298 71.310	70.866 70.891	63.383 63.395	66.520 66.530	70.866 70.891
Distance between compression ring points	**mm**	0.178 0.432	0.178 0.432	0.178 0.432	0.25 0.50		0.178 0.432	0.178 0.432	0.25 0.50
Crankshaft bearing diameter (flywheel side)	**mm**	25.413 25.425	25.413 25.425	25.413 25.425	25.413 25.425		25.413 25.425	25.413 25.425	25.413 25.425
Crankshaft bearing diameter (power intake side)	**mm**	25.413 25.425	25.413 25.425	25.413 25.425	25.413 25.425		25.413 25.425	25.413 25.425	25.413 25.425
Inlet valve guide diameter	**mm**	6.355 6.382	6.355 6.382	6.355 6.382	6.337 6.387	6.355 6.382			
Exhaust valve guide diameter	**mm**	6.303 6.331	6.303 6.331	6.303 6.331	6.337 6.387	6.303 6.331			
Inlet valve diameter (may also 6.261÷6.274)	**mm**	6.312 6.325	6.312 6.325	6.312 6.325	6.312 6.325				
Exhaust valve diameter	**mm**	6.197 6.210	6.197 6.210	6.197 6.210	6.197 6.210				
Valve seat diameter	**mm**	1.32 1.07	1.32 1.07	1.32 1.07	1.32 1.07				
1st and 2nd retaining ring side clearance	**mm**	0.05 0.125	0.05 0.125	0.05 0.125	0.05 0.125		0.05 0.125	0.05 0.125	0.05 0.125
Oil scraper ring side clearance	**mm**	0.025 0.10	0.025 0.10	0.025 0.10	0.025 0.10		0.025 0.10	0.025 0.10	0.025 0.10

4-STROKE ENGINE SPECIFICATIONS					
Engine displacement	**cm³**	148	156	172	195
Boring	**mm**	63.500 63.525		66.675 66.700	70.993 71.018
Stroke	**mm**	47.1	49.2	49.2	
Advance (P.M.S.)FIXED					
Coil-flywheel air gap	**mm**	0.30		0.30	
Distance between electrodes and spark plugs	**mm**	0.70		0.60 0.70	0.60
Valve clearance (may also be 0.10-0.20)	**mm**	0.15 0.25		0.15 0.25	
Valve seat angle		46°		46°	
Crank journal diameter	**mm**	21.869 21.882	25.387 25.400	25.387 25.400	
Engine shaft toe diameter (flywheel side)	**mm**	19.964 19.975		19.964 19.975	
Engine shaft toe diameter (power intake side)	**mm**	19.964 19.975		19.964 19.975	
Engine shaft axial clearance		NO		NO	
Piston skirt diameter	**mm**	63.383 63.395		66.520 66.530	
Distance between compression Ring points	**mm**	0.178 0.432		0.178 0.432	
Crankshaft bearing diameter (flywheel side)		Ball bearings			
Crankshaft bearing diameter (power intake side)		Ball bearings			
Inlet valve guide diameter	**mm**	6.355 6.382	6.355 6.382	6.355 6.382	6.355 6.382
Exhaust valve guide diameter	**mm**	6.303 6.331	6.303 6.331	6.303 6.331	6.303 6.331
Inlet valve diameter (may also be 6.261-6.274)	**mm**	6.312 6.325	6.312 6.325	6.312 6.325	6.312 6.325
Exhaust valve diameter	**mm**	6.197 6.210	6.197 6.210	6.197 6.210	6.197 6.210
Valve seat width	**mm**	1.32 1.07	1.32 1.07	1.32 1.07	1.32 1.07
1st and 2nd retaining ring side clearance	**mm**	0.05 0.125	0.05 0.125	0.05 0.125	0.05 0.125
Oil scraper ring side clearance	**mm**	0.025 0.10	0.025 0.10	0.025 0.10	0.025 0.10

4-STROKE ENGINE CLOSING TORQUES (BV-BVL-BVS-VANTAGE-PRISMA-SYNERGY- PREMIER-SPECTRA-FUTURA)			
DESCRIPTION	**Screw SIZE**	**N x m**	**Inch x Lbs**
Conrod fastening screws	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Oil drainage cap	5/8 - 18	13.5 ÷ 15.8	120 ÷ 140
Flange fastening screws	1/4 - 20	11.28 ÷ 13.53	100 ÷ 120
Breather cover screws	10 - 24	5.10 ÷ 6.18	45 ÷ 55
Regulating lever fastening screw (left-hand thread)	8 - 32	0.88 ÷ 1.08	8 ÷ 10
Cylinder head fastening screws	5/16 - 18	13.5 ÷ 18.1	120 ÷ 160
Screws for fastening inlet pipe to cylinder	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Control plate fastening screws (self-threading)	1/4 - 20	5.69 ÷ 9.02	50 ÷ 80
Conveyor fastening screw	10 - 24	4.51 ÷ 5.69	40 ÷ 50
Screws for fastening side starter or engine starter	1/4 - 20	8.44 ÷ 11.28	75 ÷ 100
Viti fissaggio avviat. later. o motorino elettrico	1/4 - 20	9.02 ÷ 10.10	80 ÷ 90
Oil expansion pipe fastening screw (self-threading)	10 - 32	1.67 ÷ 2.84	15 ÷ 25
Tank fastening screw (self-threading)	10 - 32	1.35 ÷ 2.26	12 ÷ 20
Silencer fastening screw	1/4 - 20	8.44 ÷ 10.10	75 ÷ 90
Screws for fastening lamination to cylinder	10 - 24	3.33 ÷ 4.51	30 ÷ 40
Flywheel bolt	1/2 - 20	45.22 ÷ 51.99	400 ÷ 460
Spark plug	M - 14	20.30 ÷ 33.94	180 ÷ 300
Exhaust gas deflector fastening screw	8 - 32	1.67 ÷ 2.26	15 ÷ 20
Screws for fastening filter shell to carburettor	10 - 32	2.26 ÷ 3.33	20 ÷ 30
Heat protection screw (self-threading)	Tipo A N° 10	2.8 ÷ 3.3	25 - 30
Heat protection screw	10 - 24	3.3 ÷ 4.5	30 - 40
ES screws	1/4 - 20	9.0 ÷ 10.1	80 ÷ 90
TOP starter screw	8 - 32	1.7 ÷ 2.8	15 ÷ 25
Brake screw	1/4 - 20	9.0 ÷ 10.1	80 ÷ 90

4-STROKE ENGINE CLOSING TORQUES
BH ALL TYPES

DESCRIPTION	Screw SIZE	N x m	Inch x Lbs
Conrod fastening screw	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Oil drainage cap	1/4 - 18	6.8 ÷ 9.0	60 ÷ 80
Screw for fastening electronic coil to cylinder	10 - 24	3.33 ÷ 4.51	30 ÷ 40
Breather cover screws	10 - 24	5.10 ÷ 6.18	45 ÷ 55
Cylinder head screws	5/16 - 18	13.5 ÷ 18.1	120 ÷ 160
Screws for fastening inlet pipe to cylinder	1/4 - 20	7.95 ÷ 9.02	70 ÷ 80
Screws for fastening carburettor to inlet pipe	1/4 - 28	6.18 ÷ 7.95	55 ÷ 70
Screws for fastening filter shell to carburettor	10 - 32	1.67 ÷ 2.84	15 ÷ 25
Silencer screws	1/4 - 20	8.44 ÷ 10.10	75 ÷ 90
Cylinder cover screws	1/4 - 20	11.28 ÷ 13.53	100 ÷ 120
Tank screws	1/4 - 15	2.84 ÷ 3.92	25 ÷ 35
Conveyor screws	1/4 - 20	9.02 ÷ 10.10	80 ÷ 90
Self-winding starter screws	1/4 - 28	5.69 ÷ 6.77	50 ÷ 60
Adjustment lever fastening screw	8 - 32	0.88 ÷ 1.08	8 ÷ 10
Flywheel bolt	1/2 - 20	45.22 ÷ 51.99	400 ÷ 460
Spark plug	M - 14	20.30 ÷ 33.94	180 ÷ 300

M. TROUBLESHOOTING

This section is designed to help the repairer identify the engine fault and perform the necessary repair.

The main symptoms of defective engines are listed below. The numbers listed under each defect indicate the causes and remedies contained in the following pages.

- ENGINE DOES NOT START OR HAS DIFFICULTY STARTING
  1/1, 1/4, 1/7, 2/4, 2/5, 2/6, 3/1, 3/4, 4/1, 4/2, 4/3, 4/4, 4/5, 5/1, 5/2, 5/6, 5/7, 5/8

- ENGINE DOES NOT GIVE
  1/2, 2/5, 2/8, 5/2, 5/3

- ENGINE DOES NOT SHUT OFF
  1/3

- ENGINE IS HARD AT START UP OR KICKS BACK
  1/4, 1/5, 1/7, 3/3, 4/3

- ENGINE STARTS BUT DOES NOT CONTINUE RUNNING
  2/1, 2/2, 2/3, 3/2

- ENGINE OPERATION IS FAULTY
  2/7, 2/8, 3/5

- ENGINE FALLS
  2/9

- ENGINE GIVES OFF OR CONSUMES OIL
  5/4, 5/5

- VIBRATIONS
  1/6

EQUIPMENT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
1/1 Engine does not start or is slow in starting.	1) 2) 3) The remote control cable is not adjusted well inside the appropriate clamp on the engine control plate.	1) The starter throttle is not completely closed, therefore, the engine has difficulty in starting due to lack of fuel enrichment, especially when cold.	1) 2) 3) Adjustment of ends of stroke of control cable.
1/2 Engine does not give.		2) The MAX machine setting does not correspond to the MAX engine position. The regulator is not completely connected, therefore, the engine supplies less power.	
1/3 Engine does not shut off.		3) The machine's STOP position does not correpsond to the engine's STOP position.	
1/4 Engine does not start or kicks back	4) The blade is loose. Be careful of frictioned bosses, the blade can slide due to wearing of friction washers or the boss's autting end may be worn.	4) Without the flywheel effect, the engine has difficulty in starting and sometimes appears to be out-of.-phase, kicks back and breaks the flywheel pin easily, which creates additional difficulty in starting.	4) Act on boss or by locking the blade or replacing used parts. Check flywheel pin and replace, if necessary.
1/5 Engine does not respond and is slow in starting.	5) In the case of a self-moving machine, the latter does not appear to be disconnected properly or makes resistance.	5) The engine must be started from neutral, therefore disengaged. If resistance is created by traction in this position, the engine will be harder to start up. ***ATTENTION*** *- This effect is also created when the machine is started up with the blade makes resistance against the grass.*	5) Adjust or act on traction. ***ATTENTION*** *- Lift machine or replace on already cut grass.*

EQUIPMENT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
1/6 The machine vibrates.	6) Blade is unbalanceds. Engine to machine fixing bolts are loose.	6) Blade balancing is more important than its sharpness. An unbalanced blade causes early wear of all engine and machine parts. **This type of damage is not covered by warranty.** The same holds true for loose fixing bolts which, in addition to being dangerous for the operator, will surely cause breakages not covered by warranty.	6) Blade balancing. Bolt tightening.
1/7 Engine does not start and responds with much difficulty.	7) Oil is present in cylinder head (only 4-stroke).	7) During machine cleaning and maintenance operations, avoid inverting the engine with head (spark plug side) facing downward. Avoid operating the machine with the engine head turned downward. On some versions of equipment, the engine's position at standstill is with head facing downward; we suggest positioning the machine with the engine level in order to avoid this inconvenience. **The defect is not covered by warranty.** When performing any under-body work, lift the machine so that the carburettor is the highest part of the machine.	7) Disassemble head and clean.

ENGINE – POWER SUPPLY UNIT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
2/1 The engine starts up and stops after a short time. It is left off, start-up is repeated and trouble occurs again.	1) The fuel tank cap's breather is obstructed, missing or defective.	1) Insufficient fuel flow. This problem result in the engine starting while the tank is late in in supplying the carburettor float chamber. Once the fuel in the float chamber is consumed, the engine stops. By leaving the engine off for a few minutes, the float chamber is able to fill up agaiin and the engine will start, but the problem repeats itself.	1) If clogged, it will be suffiicient to clean it. For other cases, replace cap.
2/2 Engine has difficulty starting or stops after short time.	2) Insufficient fuel flow to carburettor.	2) There is a fine metal net inside the tank that functions as a fuel filter. If the tank contains dirt or stale fuel, a film forms on the net that does not allow fuel to flow.	2) Clean the tank and blow air jets inside the fuel output coupling.
2/3 Same as item 2.	3) Same as item 2.	3) The problem could be due to the air bubble inside the fuel pipe caused by the drawing between one of the couplings and the pipe, or by too narrow a bend in the pipe or by a pipe that is too long.	3) Eliminate the air bubble.
2/4 Engine does not start, especially when warm, or has difficulty in starting and releases smoke from exhaust.	4) Air filter clogged.	4) If the air filter is excessively clogged, carburetion is enriched too much and the engine is flooded.	4) Clean or replace the filter element.
2/5 Engine does not start or gives very little.	5) Carburettor clogged by dirt or by residue of stale fuel.	5) If the jet and the internal carburettor holes become clogged, the engine will not operate. In some cases, the internal ducts of the carburettor body become clogged and cleaning is uneffective.	5) Wash, clean, blow. Replace carburettor.
2/6 Engine does not start because it becomes flooded, or because oil contains traces of petrol (oil level increases).	6) Badly sealed carburettor needle.	6) If the carburettor's needle valve does not close properly, the fuel level increases and fuel spills out through the manifold into the combustion chamber, thus flooding the engine. If this situation continues, it becomes dangerous for the engine because by drawing petrol through the rings and the cylinder it ennds up in the oil cup. Here it mixes with the oil, which loses its lubricating properties causing the engine to wear irremediably in a short time.	6) Clean seat and needle. Replace needle. Replace carburettor.

TROUBLE CAUSED BY ENGINE – POWER SUPPLY UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
2/7 Engine runs irregularly at no-load or does not keep up idling (2000 rpm).	7) Air is drawn inside carburettor.	7) Air may drawn in through the parts that connect with the carburettor-air filter-inlet manifold-check tightness of carburetion adjusting screw.	7) Replace defective or worn parts. Replace carburettor.
2/8 Engine does not give, stops under stress or runs irregularly.	8) The cause may be in the external linkage of regulator.	8) Regulator is not calibrated to end of stroke. MAX rpm adjustment too low. Regulating spring unset or deteriorated. Linkage that sets, not perfectly free. Incorrect adjustment of control plate. Seat on the adjustment rod circuit is excessively worn, transverse clearance is excessive.	8) Resetting of adjustments or replacement of detriorated parts.
2/9 Engine falls.	9) Regulator blocked.	9) The regulator on the external levers can become blocked due to excessive dirt or tampering. **This is not covered by warranty.**	9) Cleaning. Resetting.

TROUBLE CAUSED BY ENGINE – IGNITION UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
3/1 Engine does not start.	1) Spark plug is lacking current or current is very weak.	1) Spark plug. Spark plug hood not connected properly. If electronic ignition is defective, replace it. If spark ignition is used: points are too closed or too open, points are oxidized or have deteriorated, inefficient capacitor, coil deteriorated or inefficient.	1) Makes sure that the control is not set to STOP. Use tester for troubleshooting. Replace èarts.
3/2 Engine starts, stops once warmed up and does not restart.	2) See item 1.	2) See item 1.	2) See item 1.
3/3 Engine does not start or kicks back.	3) Breakage of flywheel pin, flywheel pin is slightly bent.	3) In this case, current is present, but it is out-of-phase, therefore engine does not start. This problem (not covered by warranty) is generally caused by: violent shocks caused by equipment tools, loose blade, unbalanced blade, engine to machine fastenings loose, strong vibrations caused by equipment.	3) Replacement of pin. If flywheel tapers and shaft become deteriorated, replace both. Eliminate the causes of breakage.
3/4 Engine does not start.	4) Earthing connector on earthing control plate.	4) Sometimes dirt and damp grass deposits between the connector and the control plate, causing a circuit earthing fault, or the connector has deteriorated and has an earthing fault.	4) In the first case, cleaning of the connector area will be sufficient. In the second case, when possible, replace connector, or plate.
3/5 Engine misfires or does not rev up.	5) If ignition is electronic, it could be adjusted too close to flywheel. Or see item 1.	5) In the case of electronic ignition, set coil-flywheel air gap at between 0.40-0.50 mm and if this does solve problem, replace the coil. It is necessary to point out that for electronic engines, the number of revolutions must not exceed that set by the manufacturer.	5) Adjust air gap. Or see item 1.

TROUBLE CAUSED BY ENGINE – ELECTRIC STARTER UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
4/1 Engine does not start with E.S., starts correctly with pull start-up.	1) Battery worn out.	1) If battery is below a certain charge, the engine starter cannot run engine, or else it idles but does not engage. **A battery that is worn out or deteriorated due to faulty maintenance is not covered by warranty.**	1) Charge battery with battery charger supplied with equipment. If the battery does not charge even after a charging period of 24-48 hours, check to make sure the battery charger is not defective, if so replace it.
4/2 Same as item 1.	2) Engine starter turns, but does not engage.	2) Either the battery is worn out, as in item 1, or the engine starter gear is weak because the wworm screw on which it must slide is dirty.	2) Clean and lubricate with graphited grease.
4/3 Engine does not start with E.S.. Starts with pull start-up, but with difficulty.	3) Centrifugal decompressor ineffective. Or inlet valve air gap is too wide.	3) If the centrifugal decompressor installed on the cam shaft does not function, compression is too high for the engine starter pickup. If the inlet valve clearance is greater than 0.35 mm, this definitely reduces the decompressiion effect. Valve clearance between 0.15 and 0.25.	3) Replace the cam shaft. Reset inlet valve clearance.
4/4 Engine does not start either with E.S. or with pull start-up.	4) The cause is not to be found in the E.S. system.	4) Faults are to be found in the power supply system, or in the ignition system, or in the engine block or equipment.	4) Troubleshooting and resetting.
4/5 Engine has difficulty in starting, presence of metallic noise.	5) Flywheel teeth broken.	5) This fault occurs due to the incorrect use of starter by the user. Engine kickback (e.g., loose blade). Incorrect positioning of engine starter.	5) Replace flywheel and eliminate causes.

TROUBLE CAUSED BY ENGINE – MONOBLOCK ENGINE UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
5/1 Engine does not start or starts with great difficulty.	1) Excessive scaling in the combustion chamber.	1) The excessive scaling acts like a sponge, and at start-up it absorbs most of the fresh fuel at input, thus causing starting difficulties. Moreover, scaling can prevent valves from closing perfectly.	1) Remove scaling.
5/2 Same as item 1. In addition, low power.	2) Low compression.	2) Lack of tightness in one or both valves due to scaling, burning, workmanship defects. Piston retaining rings usually wear out because penetration of dust due to inadequate air filter maintenance, or overheating due to engine not being kept clean or to its improper use or to insufficient oil level.	2) Restore valves by sanding or milling seats and replace valves. Replace rings or replace miniblock.
5/3 Engine has low power.	3) Loose head screw.	3) Loss of compression from head with burning of gasket; this problem is also accompanied by the slight dripping of burnt oil from the head.	3) Replacement of head and closure gasket.
5/4 Engine gives off oil from breather pipe.	4) Pressure inside engine crankshaft high than average.	4) Engine oil level is too high, higher than MAX. Breather pipe jammed or defective. Excessively worn out retaining rings.	4) Replace worn or defective parts.
5/5 Engine consumes too much oil.	5) Excessive wear or incorrectly positioned retaining rings.	5) Wearing of barrel-piston-rings for reasons listed in item 2. Excessive clearance between stem and inlet valve guide, oil goes through and wears it out. Retaining rings that were positioned at assembling with openings all in a row (generally facing downwards).	5) Replace worn parts. Restore valves. Correct positioning of rings (120° out-of-phase).
5/6 Engine does not start.	6) Breakage of camshaft. Valves do not move causing engine to run by hand.	6) This problem is caused by violent shocks against the equipment tool. Spark plug installation with long thread (in general, bent or marked valve is noticed) or usually, imprint on cylinder scaliing between the two valves. Weakness or defect in spindle, or excessive scaling in head, valves touch against this causing breakage.	6) Replace spindle.

TROUBLE CAUSED BY ENGINE – MONOBLOCK ENGINE UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
5/7 Engine does not start. It idles without compression.	7) Broken conrod.	7) Conrod breaks with seizure on crank journal = oil missing. Engine out of turn – regulator tampered with or blocked due to dirt. If broken conrod presents no signs of seizure, it is presumably defective (contact Tecnamotor).	7) Replace conrod. If crankshaft is broken, replace miniblock.
5/8 Engine does not start and remains blocked.	8) Engine seizure.	8) Engine seizes due to lack of lubrication: oil missing, oil at minimum level, use on gradients of over 60%. If only the flywheel side is seized, check if lubrication hole is missing; if camshaft is correctly perforated, if oil pump is missing or incorrectly positioned or broken. In this case, warranty is valid only if engine has never been repaired, engine is new (at most it will have turned 30 minutes). If it is seized: - only on conrod - on conrod and flywheel side - on conrod, flywheel side and piston - on conrod and piston - on conrod, piston, flywheel side and flange side. In such cases, warranty is not valid since cause is missing oil, as described above. In case of doubt or complaint, consult Tecnamotor who will determine the cause of problem.	8) Replace deteriorated parts. Miniblock. Miniblock + shaft. Replace engine.

WARRANTY POLICY

For the TECUMSEH Servicing Network Europe

VALIDITY MAY 1996

This warranty supersedes all previous versions.

WARRANTY DESCRIPTION

Tecumseh Europe S.p.A. guarantees the repair or replacement, at its own discretion, to the original purchaser of each product or product part whose material and/or workmanship is found to be defective after inspection by one of its Authorized Servicing Centres or one of our Centralized Dealers, and also by Tecumseh Europe S.p.A. itself.
If an Authorized Servicing Centre determines that the type of repair work is not covered by free warranty servicing, he must immediately inform the user of the machine of the reasons why the defect cannot be repaired under warranty.
This warranty exclusively covers defects in materials and/or workmanship.

VALIDITY OF WARRANTY

This warranty is valid starting from the date of purchase by the original purchaser of the product and/or the application on which the product is installed to the time specified in the instruction booklets of the various models: the repairer is responsible for verifying that the product is effectively under warranty.

WARRANTY PROCEDURE

If warranty servicing is necessary, immediately contact the closest Authorized Servicing Centre. Do not repeatedly attempt to operate the engine for which repair under warranty is being requested as this could result in further damage that will not be covered by warranty.
To obtain warranty servicing, it will be sufficient to present any document (invoice, tax receipt, tax voucher, etc.), that indicates the date of purchase of the equipment on which the product is installed. It is necessary to specify the product model, dressing code and serial number, as well as the number of hours of operation and the failure or defect noted.
If the Customer does not agree with the results of the examination by the Authorized Servicing Centre, he may request a further examination by the Centralized Dealer. If the Centralized Dealer or Tecumseh Europe recognizes that the fault is entitled to warranty, the Customer will be entirely refunded for the product or for the product parts whose materials and/or workmanship are defective. The new parts used for warranty servicing will be guaranteed for the remainder of the warranty period, up to the expiration of the entire warranty period.

Below is a list of the damages or circumstances not considered to be material and/or workmanship defects and for which warranty coverage is therefore not recognized.

- **Machine installation:** if the machine is supplied to the final user in its package, some items must be assembled by the user before the machine can be operated. In this case, we recommend that special care be placed in the regulation of the gas remote-control when allowed (see user and maintenance booklet supplied with the product), since incorrect regulation can seriously compromise machine start-up.
- Prolonged and/or incorrect restarts (for example, 4-stroke engines with spark plug turned downwards) can cause difficulties in starting up the engine due to the presence of oil in the combustion chamber and the soiling of spark plug electrodes. These inconveniences are not covered by warranty. In this case also, please strictly follow the instructions provided in the user's and maintenance booklet.
- **Improper use or negligence:** The user must scrupulously observe the usage and maintenance standards contained in the instructions booklet supplied with the engine. If this is not done, the engine may be subject to damages not covered by warranty.

Some examples of these are:

1. Broken or bent engine shaft: such damage is usually caused by the violent hitting of the lawnmower blade against heavy objects.
2. Repairs resulting from damages caused by the use of stale fuel: these damages include blockage of valves, clogging of carburettor or of the tank style carburettor couplings caused by sticky deposits that are formed by the use of stale fuel.
   Always use fresh and clean fuel.
3 Seizure of engine parts due to insufficient lubrication or to the use of unsuitable or unauthorized lubricants.
   Check oil as specified in the user and maintenance manual and restore correct level, if necessary.
   Change oil at recommended intervals. For two-stroke engines, use of the type of lubricant indicated in the user's and maintenance manual, and in the percentage specified, is compulsory.

4 Damages due to overheating or to speeds that are out of specifications. Usually an engine overheats or falls when its cooling and revolution regulation systems become clogged with grass, dust and dirt in general. Therefore it is necessary to clean the cooling fins on the cylinder and head, the flywheel and the adjustment linkage.
5. Damages and wear due to dust. These are caused by dust reaching the engine as a result of inadequate or incorrect air filter maintenance. Replace air filters regularly.
   Follow the instructions provided for each type of air filter.
6. Damages or loss of parts due to untightened engine nuts and bolts.
7. Engine tune-up or adjustment are not covered by warranty unless they become necessary following servicing performed under warrant. If the machine is assembled by the Customer, the operating and maintenance instructions provided in the manual are sufficient to allow anyone to be able to perform the small number of adjustments that may be required.
   These are not covered by warranty.
8. Parts broken as a result of excessive vibrations due to the inadequate fastening of engine to machine, to a loosened or unbalanced blade, to the engine being unsuitably connected to the equipment, to off-speed engines or to their excessive and/or improper use.
9. The repairing or adjustment of parts or assemblies such as: clutches, transmissions, remote controls, etc., that are not produced by Tecumseh Europe.
10. Spare parts and/or accessories that are not original, or those not approved by Tecumseh Europe.

NORMAL WEAR

The repairing of parts or engines that have become worn through normal operation is not covered by warranty. Like any mechanical device, to operate correctly, engines require routine maintenance, replacements and repairing of parts.

It is necessary to remember that tillers, land aerators and lawnmowers are very often used in particularly dusty and dirty environments. These conditions require more frequent maintenance operations and checks and may cause what could be considered early wear. Such wear, caused by the penetration of dust or dirt inside the engine as a result of incorrect maintenance, is not covered by warranty.

WARRANTY MANAGEMENT

If, after performing checks, the Authorized Servicing Centre verifies the presence of defects in the material or assembly, it must fill out the request for warranty servicing in four copies and have each copy signed by the Customer or by the person who has notified the defect. The repairer must completely fill out the form following the instructions provided below.

The Authorized Servicing Centre must perform small or medium repair work immediately. Defective parts must be kept at the disposal of Tecumseh Europe Turin until the file has been defined. Once the repair has been made, the duly filled out request for warranty, and the blue, white and pink copies, must be sent to the Centralized Dealer or to Tecumseh Europe Turin.

The Authorized Servicing Centres and other warranty repair locations must promptly forward the service forms directly to their spare parts supplier.

The forms received periodically will be examined promptly and divided into:

- **forms for which warranty servicing is approved:** in this case, Tecumseh Europe will calculate the cost of repairs, as specified below, and will request the Authorized Servicing Centre to issue a normal invoice;
- **forms whose main parts have been filled out incorrectly and/or incompletely:** in this case, Tecumseh Europe reserves the right to refuse requests, especially those in which it is impossible to verify the type of defect being reported.

REFUNDING OF WARRANTY

The warranty will be refunded according to the rules specified below:

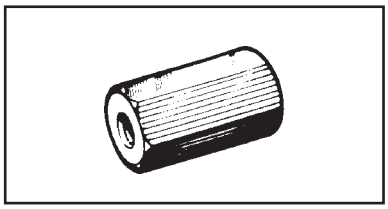
a) The prices for replaced parts will be calculated on the basis of the price list in force at the time of the net adjustment of the specific discount granted to the various Authorized Servicing Centres. The overall amount calculated will undergo the following price increases for warranty management expenses:
   15%, if parts parts have been replaced
   7.5%, if the repair involves replacements using new engines, short block, miniblocks and transmissions.
b) Labor expenses will be paid applying the price schedule currently in force. The resulting times will be paid by applying the fees that are notified annually in writing by TECUMSEH EUROPE TURIN.

TECUMSEH EUROPE will not acknowledge any other expenses except those for parts replacement and labor, as per the SCHEDULE.

TEMPARIO.

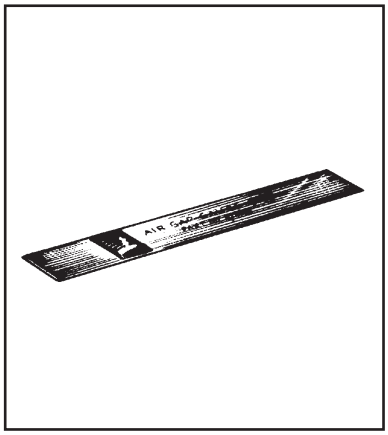
- If engine is seriously damaged, the advisability of replacing the engine completely will be considered.
  In this case also, any transportation, maintenance and cleaning costs are at the Customer's expense.

SPECIAL TOOLS



670103
flywheel removal bolt

shaft with 7/16" thread

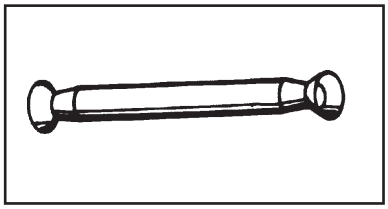


670297 (*)
thickness gauge for 0.3 mm flywheel air gap

Electronic ignition
3000/3150 rpm

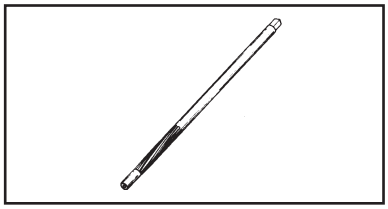
88841551
thickness gauge for 0.4 mm flywheel air gap

Electronic ignition
3350/3800 rpm



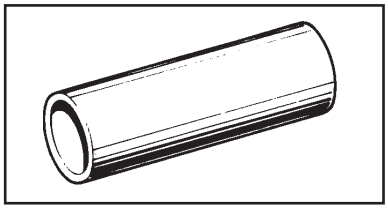
670154
valve lapping tool

all 4-stroke engines



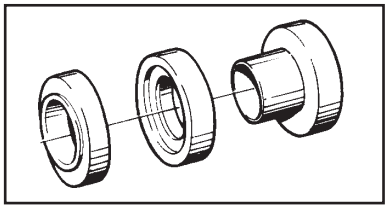
670328
borer for increasing OHV exhaust valve guides

all OHV engines



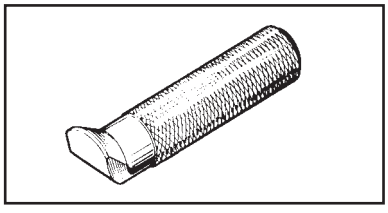
670272
tool for mounting retaining ring

all engines



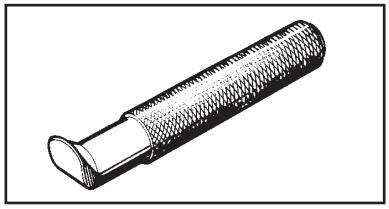
670292
tool for mounting retaining ring

1" diameter



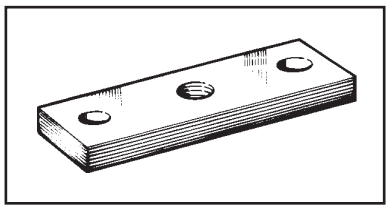
88841026
tool for disassembling roller bearings

2-stroke flywheel and H side



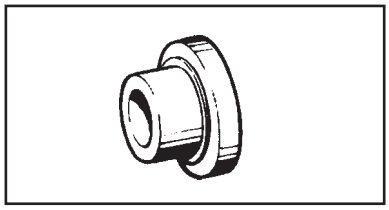
88841027
tool for disassembling roller bearings

2-stroke power intake side



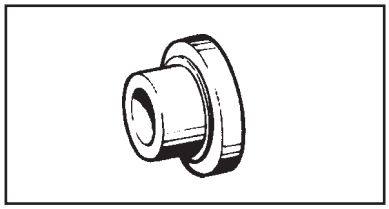
88841044
conveyor base removal mounting plate (see note)

2-stroke power intake side



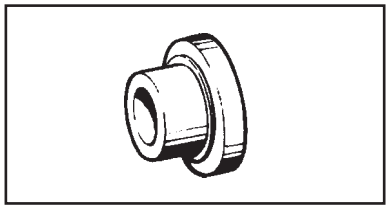
88841529
tool for mounting roller bearings

2-stroke power intake side



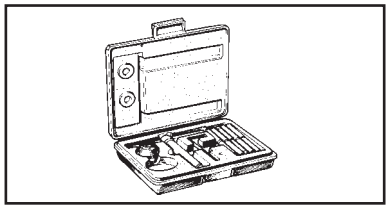
88841530
tool for mounting roller bearings

2-stroke flywheel side



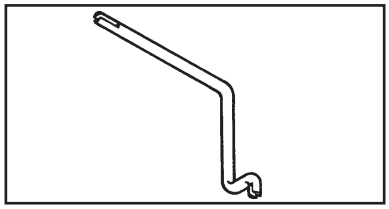
88841531
tool for mounting roller bearings flywheel side

H engines



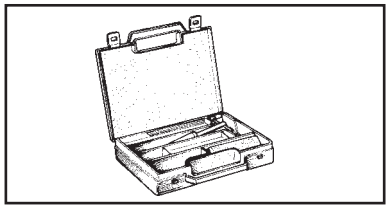
88841013
Neway method for grinding valve seats

all 4-stroke engines with side valves



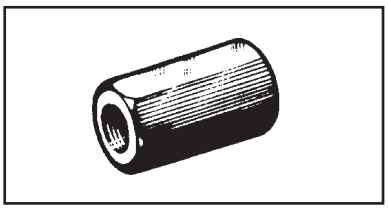
670326
tool for adjusting speed

fixed turn carburettors



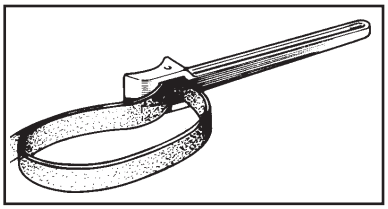
88841034
set Heli-coil
UNC ¼"x20x1.5d
88841035
set Heli-coil
UNC 5/16"x18x1.5d
88841036
set Heli-coil
UNC 3/8"x24x2d

All engines



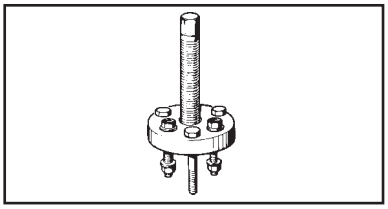
670169 (*)
flywheel removal bolt

shaft with ½" thread



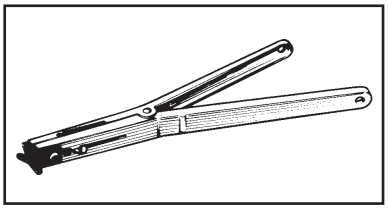
670305 (*)
flywheel locking belt

all engines



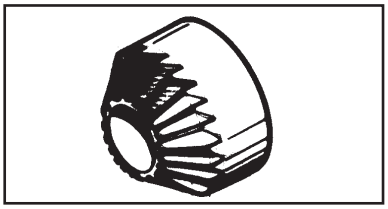
670306 (*)
tool for removing flywheel when there are roller bearings

2-stroke H engines



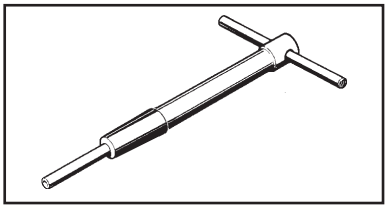
670117 (*)
pliers for retaining ring expansion

universal



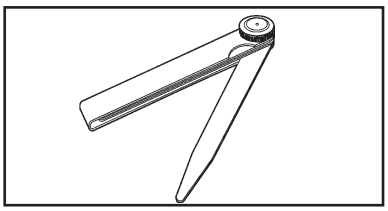
26990001 (*)
valve sanding miller

all 4-stroke engines



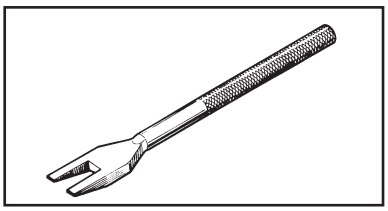
26990002 (*)
holder for valve sanding miller

all 4-stroke engines



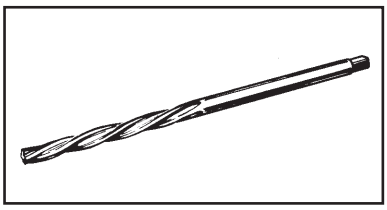
26995006
set of thickness gauges

all engines



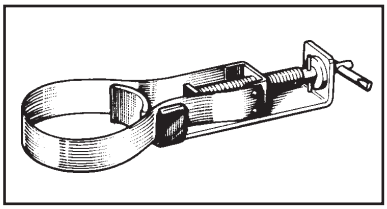
88841012 (*)
fork for valve spring

all 4-stroke engines



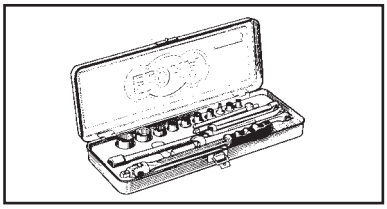
670283 (*)
borer for increasing valve guides

all 4-stroke engines



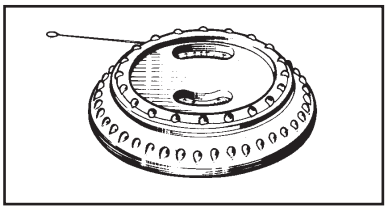
88841004 (*)
tool for mounting compression rings

all engines



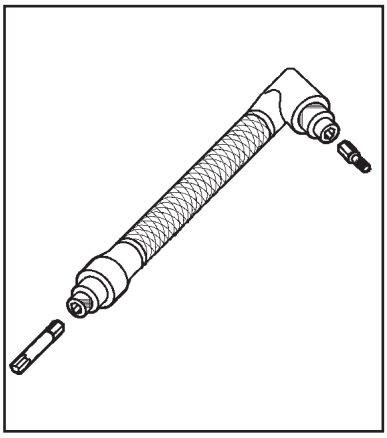
88840004 (*)
wrench set and bushings for inch measure

all engines



670156 (*)
wire rev counter

all engines

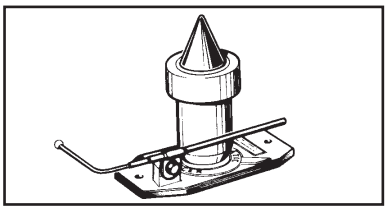


88841537 (*)
insert carrying key

888841538 (*)
inserto torx 10

88841539 (*)
max jet insert for carburettor

all engines



88841016 (*)
blade balancer

lawnmower equipment

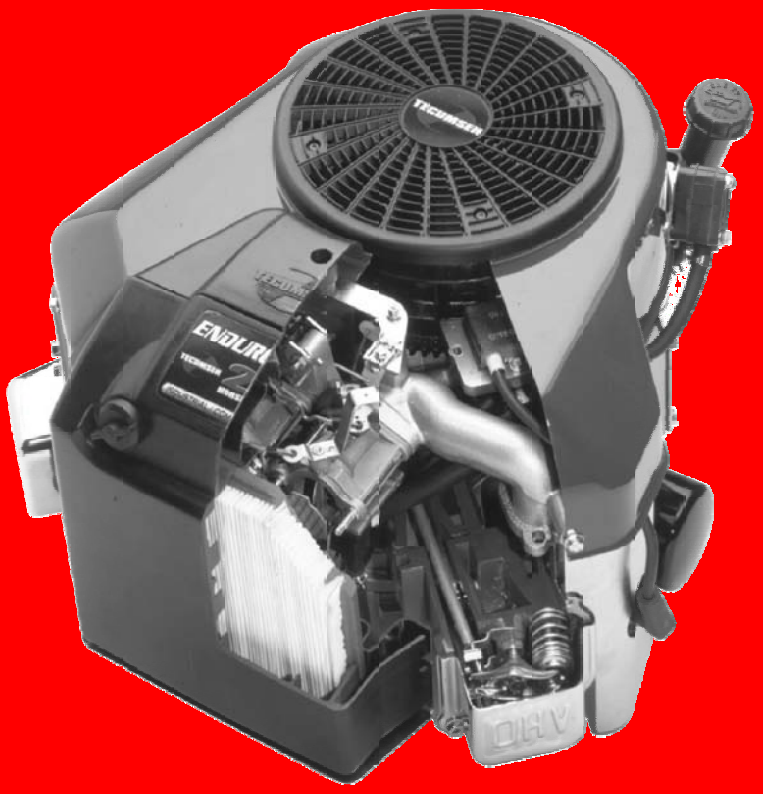
1ST LEVEL TOOLING KIT (TOOLS WITH *)

16990003

all engines

TECUMSEH

TECHNICIAN'S HANDBOOK



V-TWIN ENGINE

TECUMSEH®

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CHAPTER 1. GENERAL INFORMATION

ENGINE IDENTIFICATION

Tecumseh engine model, specification, and date of manufacture (D.O.M.) are located on decals attached to the blower housing of the engine. The engine identification decal also provides the applicable warranty code, oil and fuel recommendations, EPA (Environmental Protection Agency) and C.A.R.B. (California Air Resource Board) Emission Compliance Information. (Illust. 1-1)

1-1

INTERPRETATION OF ENGINE IDENTIFICATION

The letter designations (TVT) in a **model number** indicate the basic type of engine.

The number designations following the letters (691) indicate the basic engine model displacement in CC's (cubic centimeters). (Illust. 1-2)

1-2

The group of numbers following the model number is the **specification number**. The last three numbers indicate a variation to the basic engine specification. (Illust. 1-3)

1-3

The letter in parenthesis on the engine information decal is the **warranty code identification number**. This letter designates the length of time the engine is under warranty. A cross-reference may be found in the service warranty policy of the master repair manual or the engine operator's manual. (Illust. 1-4)

1-4

The D.O.M. (date of manufacture) indicates the production date of the engine by year and numerical day. (Illust. 1-5)

1-5

Using model **TVT691-600401A D.O.M. 9146** as an example, the interpretation is as follows:

TVT691- Is the model number.

60041A Represents the specification number used for properly identifying the parts of the engine.

TVT Tecumseh Vertical Twin.

691 Indicates the displacement in cubic centimeters.

9146 Is the D.O.M. (Date of Manufacture) formerly serial number.

9 Is the last digit in the year of manufacture (1999).

146 Indicates the calendar day of that year (146th day or May 26th of 1999).

A,B,C A letter following the D.O.M. number represents the line, shift and plant in which the engine was built.

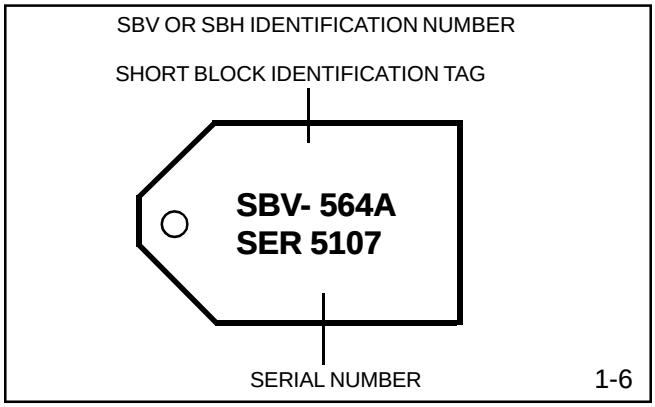
Emissionized engines that meet the California Air Resource Board (C.A.R.B.) or the Environmental Protection Agency (EPA) standards will include additional required engine information on the engine decal.

NOTE: To maintain the best possible emission performance, use only Genuine Tecumseh Parts.

This symbol points out important safety INSTRUCTIONS, WHICH IF NOT FOLLOWED, could endanger the personal safety of YOU and others. Follow all instructions.

SHORT BLOCKS

New short blocks are identified by a tag marked S.B.V. (Short Block Vertical) located on the engine block. When a short block repair is made, it is vital both the original engine and short block numbers are present on the repaired product for correct future parts identification. (Illust. 1-6)



1-6

FUELS

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build up of combustion chamber deposits. Unleaded regular, unleaded premium or reformulated gasoline containing no more than 10% Ethanol, 15% MTBE or 15% ETBE may be used.

Leaded fuel is not available in the United States and should not be used if any of the above options are available.

Never use gasoline, fuel conditioners, additives or stabilizers containing methanol, white gas, or fuel blends, which exceed the limits, specified above for Ethanol, MTBE, or ETBE because engine/fuel system damage could result.

CAUTION: THE USE OF SOME ANTI-ICING ADDITIVES MAY CREATE A METHANOL FUEL BLEND. DO NOT USE ADDITIVES THAT CONTAIN METHANOL. FUEL CONDITIONERS THAT CONTAIN ISOPROPYL ALCOHOL CAN BE USED IN CORRECT MIXTURE RATIOS.

Regardless of which of the approved fuels are used, fuel quality is critical to engine performance. Fuel should not be stored in an engine or container more than **30 days** prior to use. Time may be extended with the use of a **fuel stabilizer** like **TECUMSEH, part number 730245.** See “STORAGE” instructions in this Manual, Operators Manual, or Bulletin 111.

ENGINE OIL

TECUMSEH FOUR-CYCLE ENGINES REQUIRE THE USE OF CLEAN, HIGH QUALITY DETERGENT OIL. Be sure original container is marked: A.P.I. service "SF" thru "SJ" or "CD".

TECUMSEH RECOMMENDS USING ONE OF THE FOLLOWING FOUR CYCLE OILS THAT ARE SPECIALLY FORMULATED TO TECUMSEH SPECIFICATIONS.

DO NOT USE SAE 10W40 OIL.

FOR SUMMER (Above 32^0 F) (0^oC) USE SAE 30 OIL. **PART 730225**
Use SAE 30 oil in high temperature, high load applications. Using multigrade oil may increase oil consumption.

FOR WINTER (Below 32^0F) (0^oC) USE SAE 5W30 OIL. **PART 730226**
(SAE 10W is an acceptable substitute.)
(BELOW 0^0F (-18°C) ONLY): SAE 0W30 is an acceptable substitute.

Oil Capacity		
Engine Model	**oz.**	**ml.**
TVT691 with Filter	80	2366
TVT691 Oil Only	72	2129

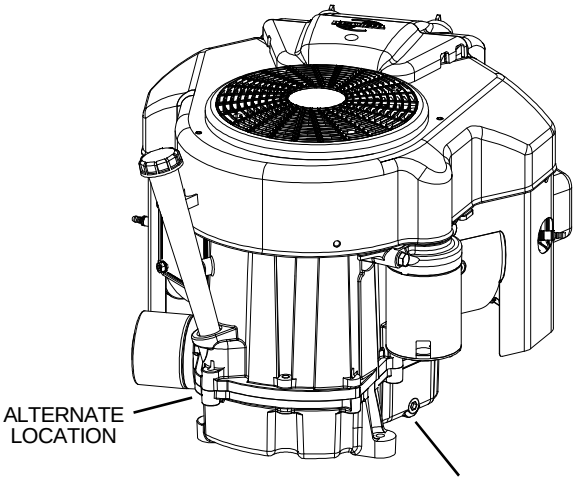
Change oil and filter after the first two operating hours. Standard oil change intervals are every 50 hours. Oil filter changes are recommended every 100 operating hours.

Oil Change Intervals: Change the oil and filter after the first 2 hours of operation. Thereafter oil change intervals are every 50 hours. Oil and oil filter changes are requested every 100 operating hours. Service should be performed more often if operated under extremely dusty or dirty conditions. The oil and filter (if equipped) should be changed yearly if operated less than 100 hours.

Oil Check: Check the oil each time the equipment is used or every five-(5) hours of operation. Position the equipment so the engine is level when checking the oil level.

CAUTION: A TWIN CYLINDER ENGINE MAY START AND RUN ON ONLY ONE CYLINDER. ALWAYS DISCONNECT **BOTH** SPARK PLUG WIRES FROM THE SPARK PLUGS AND GROUND TO THE DEDICATED RETAINING POSTS LOCATED ON THE VALVE COVER BOXES BEFORE ATTEMPTING ANY SERVICE OR MAINTENANCE WORK ON THE ENGINE OR EQUIPMENT.

Oil Change Procedure: Locate the oil drain plug in the mounting flange. The drain plug or cap on most units is located above the frame in one of the locations shown. (Illust. 1-7) The oil filter if equipped, can be removed with a commercially available filter wrench.



1-7

NOTE: An oil change is best performed after the engine is warm.

Remove the oil plug or cap and allow the oil to drain into a proper receptacle. Always make sure that drain oil and filter are disposed of properly. Contact your local governing authorities to find a waste oil disposal site. Once the oil is drained, reinstall the drain plug and fill the engine with new oil to the proper capacity.

BASIC MAINTENANCE CHART	
Pre-filter (Dry Poly)	Clean every 25 hours
Air filter (Paper Element)	Replace every 100 hours of operation
Oil change	Every 50 hours or annually
Oil filter	Every 100 hours or annually
Spark plug replacement	Every 100 hours or annually
Clean cooling fins	Every 200 hours or annually
Fuel Filter (Replace)	Every 100 hours or annually

BASIC TUNE-UP PROCEDURE:

NOTE: Today's fuels can cause many problems in an engines performance due to the fuel quality and short shelf life (as little as 30 days). Always check fuel as a primary cause of poor engine performance before performing any other service.

The following is a minor tune-up procedure. When this procedure is completed, the engine should operate properly. Further repairs may be necessary if the engine's performance remains poor.

CAUTION: REMOVE THE SPARK PLUG WIRES AND ATTACH TO THE DEDICATED RETAINING POSTS BEFORE DOING ANY SERVICE WORK ON THE ENGINE.

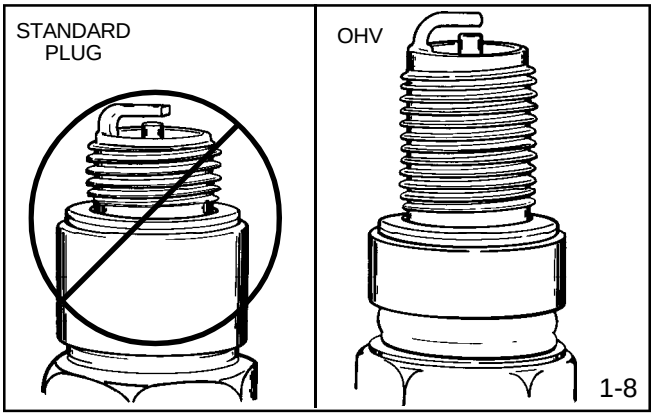
1. Service or replace the air cleaner. See **Chapter 2** under "Service".

2. Inspect the level and condition of the oil, change or add oil as required.

3. Remove the blower housing and clean all dirt, grass or debris from the intake screen, Cylinder head, cooling fins, carburetor, governor levers and linkage.

4. Check that the fuel filter, fuel tank, and fuel line are clean. We recommend replacing the fuel filter every 100 hours or annually.

5. Replace the spark plugs every 100 hours or annually, consult the parts breakdown for the correct spark plug to be used. Set the spark plug gap **(.030") (.762 mm)** and install the plug, being careful not to cross thread. Tighten the spark plug to **21 foot pounds (28 Nm) of torque**. If a torque wrench is not available, turn the spark plug in as far as possible by hand, then use a spark plug wrench to turn the plug 1/2 turn further. If installing a used plug, only 1/8 to 1/4 turn after seat is needed. Note: The correct plug reach must be used see (Illust. 1-8).



1-8

6. Make sure all ignition wires are free of abrasions or breaks and are properly routed so they will not rub on the flywheel.

7. Completely clean the cooling fins, intake screen and linkages of all dirt and debris. Reinstall the blower housing, fuel tank, fuel line, and air cleaner assembly if removed. **Be careful not to pinch any of the wires upon re-assembly.**

8. Make sure all remote cables are correctly routed and adjusted for proper operation. See **Chapter 4,** under "Speed Controls and Linkage".

9. Reinstall the spark plug wires, add fuel and oil as necessary, start the engine.

STORAGE

(IF THE ENGINE IS TO BE UNUSED FOR 30 DAYS OR MORE)

CAUTION: NEVER STORE THE ENGINE WITH FUEL IN THE TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED AREAS, WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

Gasoline can become stale in less than 30 days and form deposits that can impede proper fuel flow and engine operation. To prevent deposits from forming, all gasoline must be removed from the fuel tank and the carburetor. An acceptable alternative to removing all gasoline, is by adding **Tecumseh fuel stabilizer, part number 730245,** to the gasoline. Fuel stabilizer is added to the fuel tank or storage container. Always follow the mix ratio found on the stabilizer container. **Run the engine at least 10 minutes after adding the fuel stabilizer to allow it to reach the carburetor. (Illust. 1-9)**

1-9

CHAPTER 2. AIR CLEANERS

GENERAL INFORMATION

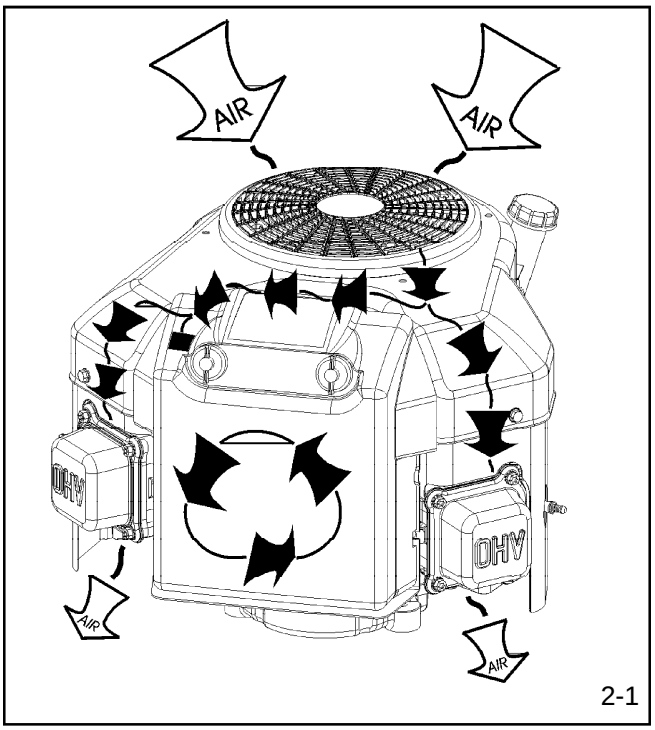
The air cleaner is the device used to eliminate dust and dirt from the air supply. Filtered air is necessary to assure that abrasive particles are removed before entering the combustion chamber. Dirt allowed into the engine will quickly wear the internal components and shorten engine life.

The TVT series engine uses a paper-type air filter system and also has a dry foam pre-filter.

Extremely dirty conditions require more frequent pre-filter cleaning or paper element replacement.

OPERATION

The air filter cover secures and seals the paper filter element in place. The cover also prevents large particles from entering the filter body and completes the Kleen-Aire® circuit. The air is first filtered through the flywheel and blower housing then enters the air filter cover. It travels through the pre-filter then the paper filter element. Pre-filters typically extend the paper filter life.
(Illust. 2-1)



2-1

COMPONENTS

The **cover** holds the poly pre-cleaner and clamps the paper filter in place, creating a dirt tight seal. The cover also prevents large debris from entering the filter body.

The **pre-cleaner** is made of a polyurethane foam and designed to pre-filter the air prior to it passing through the paper filter. This added stage, assures the operator of maximum air filtering and extends paper filter life.

The **paper filter element** is the main filter to stop impurities from entering the engine. This dry-type element is pleated paper for increased surface area maximizing its life. The filter has rubberized edges to assure sealing. (Illust. 2-2)

2-2

TROUBLESHOOTING AND TESTING

If the engine's performance is unsatisfactory (runs unevenly, starts smoking abnormally or loses power), the first engine component(s) to be checked are the air filter(s). A dirt restricted or oil soaked filter will cause noticeable performance problems. Polyurethane pre-filter can be cleaned following the service procedure listed under "Service" in this chapter. A paper-type air filter can only be replaced **NEVER attempt to clean a paper filter**. The paper-type filter must not have any oil film or residue present. Should the paper have a brown tint it may have been damaged by an excessively oiled pre-filter or crankcase breather problems. Follow the procedure listed in the "Service" section of this chapter for filter replacement or cleaning.

SERVICE

Cleaning of the polyurethane pre-filter element is recommended every twenty-five (25) operating hours or (3) months, whichever comes first. Extremely dirty or dusty conditions may require daily cleanings.

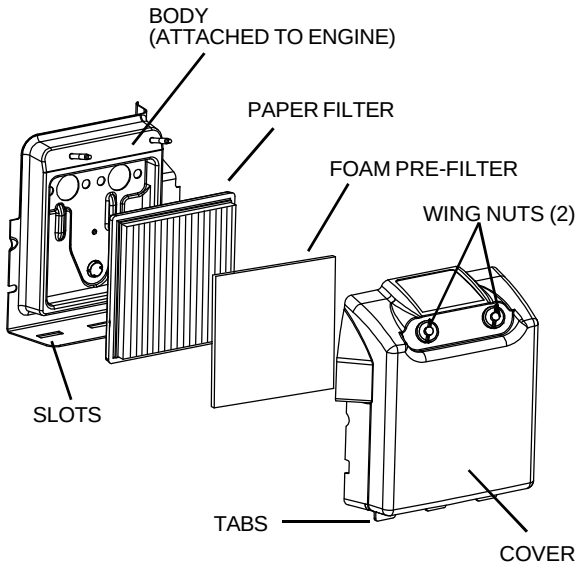
NOTE: Do not oil the pre-filter, paper element damage can occur.

The paper filter element should be replaced once a year or every 100 operating hours, more often if used in extremely dusty conditions.

NOTE: Never run the engine without the complete air cleaner assembly installed on the engine. Always replace the filter element with a Tecumseh original replacement part to maintain proper filtration, emissions compliance and long engine life.

Disassembly Procedure

1. Remove the wing nuts holding the air cleaner cover in place. Swing the cover out, then lift to remove. (Illust. 2-3)

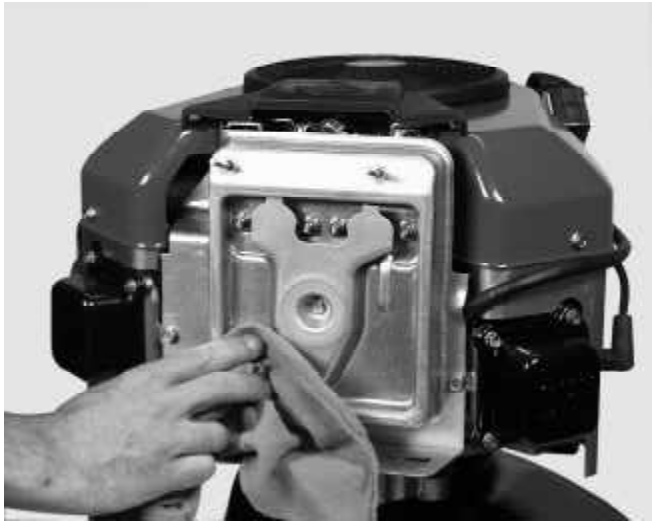


2-3

2. Remove the paper filter. **Note:** Paper filters must be replaced **NEVER attempt to clean a paper filter**.

3. Remove the polyurethane pre-cleaner from the cover.

4. Wipe or wash out the air filter cover and base. (Illust. 2-4)



2-4

5. Service the polyurethane pre-filter element by washing in liquid dish soap and warm water until clean. Squeeze out the excess water (**Never Twist**). Finish drying the element by squeezing it in a dry cloth or paper towel.

   NOTE: DO NOT OIL THE PRE-FILTER IT MUST BE INSTALLED DRY TO PREVENT SATURATION OF THE PAPER FILTER ELEMENT.

6. Install the pre-cleaner and new air filter in the cover. Replace the filter cover and tighten the wing nuts, be careful not to over-tighten it. **Note**: The air filter system on all models can be upgraded to include the pre-cleaner if the OEM did not originally request one.

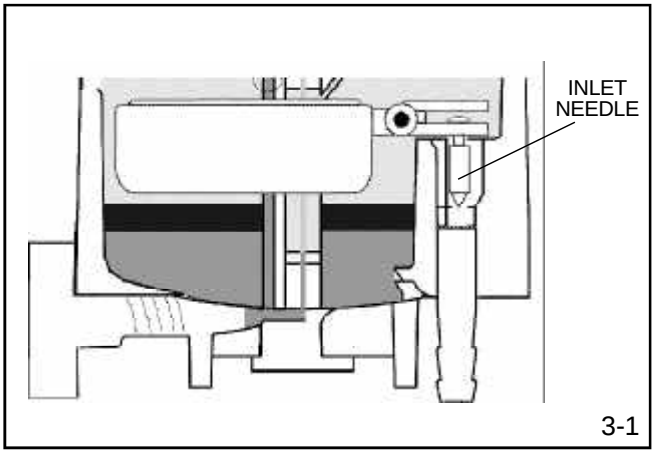
CHAPTER 3. CARBURETORS AND FUEL SYSTEMS

GENERAL INFORMATION

The TVT engine uses two series seven (7) float type carburetors. This carburetor uses a choke enrichment system to provide easy cold engine starting. To comply with emission standards, the carburetor idle and high-speed fuel mixtures are non-adjustable. Carburetor cleaning and related fuel system service is covered in this chapter.

FLOAT STYLE CARBURETORS

A float is used to maintain the operating level of fuel in the carburetor bowl. As the engine consumes fuel, the fuel level in the carburetor bowl drops and the float moves downward. This allows the inlet needle valve to move off the sealing seat, and fuel to enter the carburetor float bowl. As the fuel level in the bowl rises, it elevates the float. This upward float motion moves the inlet needle valve to the closed position. When the needle contacts the seat, the fuel flow is stopped. The tapered end of the inlet needle varies the fuel flow rate keeping the supply constant**.** (Illust. 3-1) The float height on the series 7 carburetor is fixed and may not be adjusted.

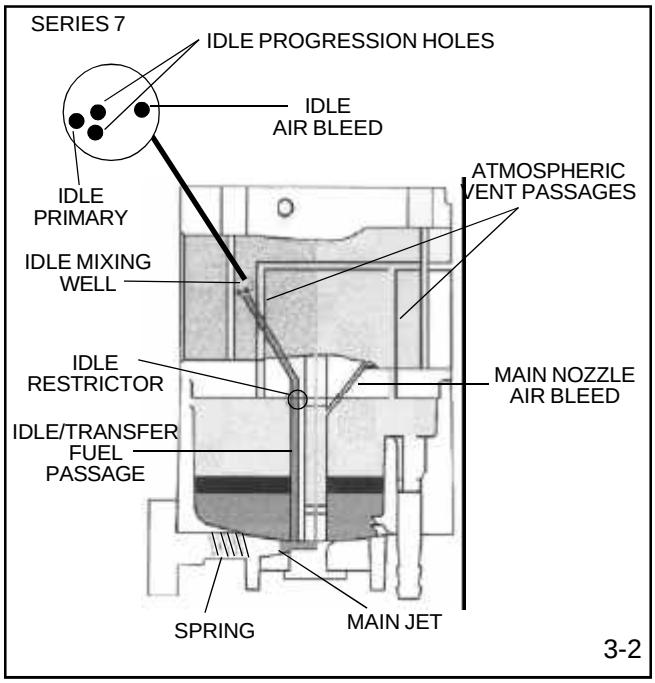


3-1

NOTE: Gravity fed systems must have the bottom of the fuel tank no lower than the fuel inlet of the carburetor**.**

When servicing carburetors, use the engine model and specification number to obtain the correct carburetor part number or parts. An alternate method is to use the manufacturing number stamped on the carburetor. Convert this number to a service part number in Div. 5 carburetor section of the Master Parts Manual. This method can also be used in microfiche and computer parts look-up systems.

OPERATIONAL CIRCUITS SERIES 7 CARBURETOR

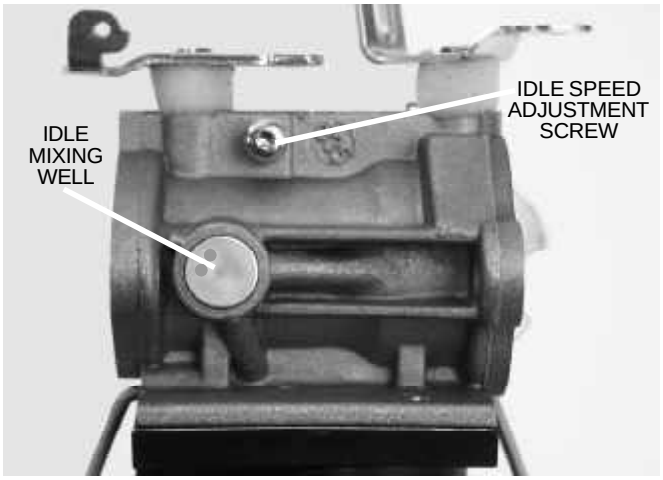


3-2

Choke Circuit: In the “CHOKE”/“START” position, the choke shutter is closed, and the only air entering the engine, enters through openings around the shutter. As the starting device cranks the engine over, the pistons travel downward on the intake stroke, creating a low-pressure area in the cylinder. High-pressure (atmospheric) air rushes into the cylinder to fill the low-pressure area created.

Since the choke shutter blocks the majority of the air passage, a relatively small quantity of air enters the carburetor. The main nozzle and idle fuel discharge ports are all supplying fuel at this point. This is due to the increased low air pressure in the intake system of the engine. A maximum fuel flow through the carburetor orifices combined with the reduced quantity of air that passes through the carburetor, creates a very rich fuel mixture needed to start a cold engine.

Governed Idle Circuit: The TVT series engine uses a governed idle system. In the low speed throttle position, engine speed is being maintained by the governor NOT the idle speed adjustment screw. The governed idle system improves throttle response when the engine load changes. The relatively small amount of fuel/air mixture is supplied through the primary idle orifice location under the idle mixing well welch plug. (Illust. 3-3)



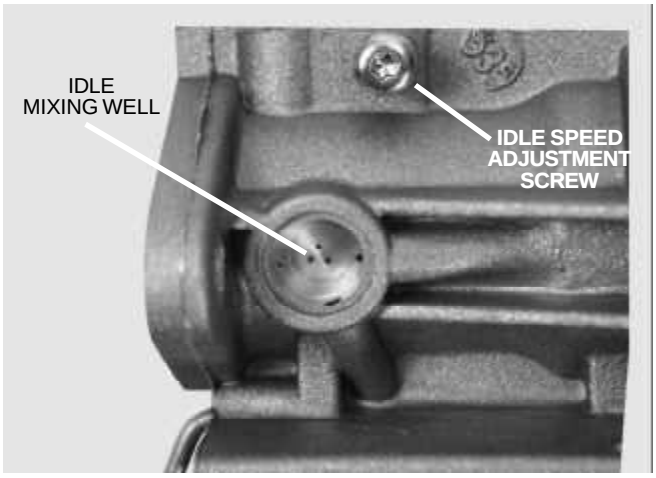
3-3

True Idle: The idle speed adjustment screw on governed idle engines perform as a stop to prevent complete closure of the throttle plate. This partial open throttle position is required for good starting performance. The idle adjustment screw is set 600 RPM lower than the governed idle speed. (Found on microfiche card #30 or the computer parts look-up systems.) See governed speed adjustment procedure **Chapter 4.**

CAUTION: DUAL CARBURETORS MUST BE PROPERLY SYCRONIZED. DO NOT ADJUST IDLE SPEED SCREW WITHOUT PROPER SYNCHRONIZATION.

Transfer/Intermediate Circuit: During Intermediate engine operation or light loads, additional orifices are uncovered in the idle mixing well, as the throttle shutter opens. The fuel being released from these jets is already pre-mixed (atomized) with air prior to entering the air stream in the venturi of the carburetor. When the fuel enters the air stream it further mixes with the air which maximizes combustibility.

Idle Mixing Well: The idle mixing well of the carburetor contains a series of metering holes. These metering holes are the primary and secondary idle circuit as well as the idle air bleed hole. Proper servicing of the carburetor requires removal of the welch plug and cleaning of these metering holes. (Illust. 3-4)



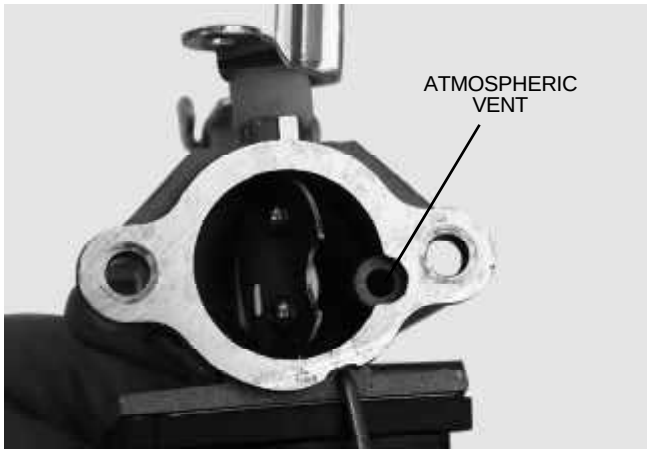
3-4

High Speed Circuit: During HIGH-SPEED engine operation, the throttle shutter is opened beyond the idle/ transfer discharge ports. Air is flowing through the carburetor(s) at a high rate. The venturi, which decreases the size of the air passage through the carburetor, causes the airflow to further accelerate. This rapidly moving air creates a low-pressure area at the main nozzle (Emulsion Tube) discharge opening.

Using air that is channeled to the emulsion tube through the main nozzle air bleed, a mixture of fuel and air is drawn up the emulsion tube.

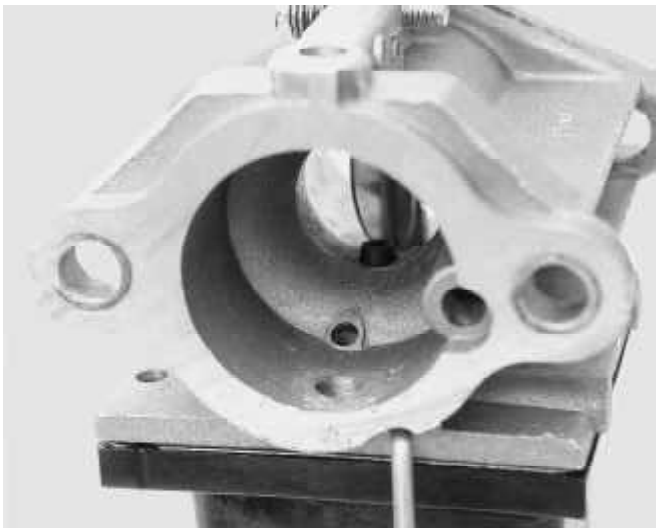
The addition of air creates an atomized mixture before being discharged into the venturi. Fuel flow is created by the difference in the atmospheric air pressure on the fuel in the carburetor bowl and the main nozzle opening.

Atmospheric Vent: For the fuel to flow out of the carburetor, the bowl must be vented to atmospheric pressure. The internal vent is located at the 4 o'clock position from the choke end of the carburetor. (Illust. 3-5) This passage should be checked for blockage if engine performance is in question.



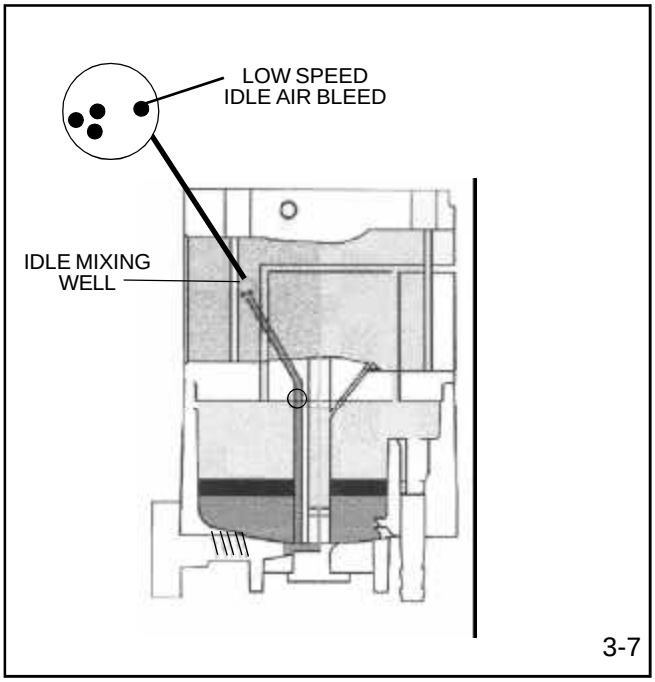
3-5

Main Nozzle Air Bleed: Air is bled into the main nozzle through the main nozzle air bleed passage located in the 6 o'clock position of the carburetor's choke end. (Illust. 3-6) This passage allows air to mix with the fuel traveling up the main nozzle creating a pre-atomized mixture. The fuel is then released into the venturi from the nozzle tip. Atomization occurs as the fuel mixture contacts the fast moving air stream in the venturi and flows into the intake of the engine.



3-6

Low Speed Idle Air Bleed: The low speed circuit of the carburetor has an idle air bleed passage which performs the same function as the high-speed air bleed. It pre-mixes fuel and air prior to entering the throat of the carburetor. This passage is located in the idle mixing well (Illust. 3-7)



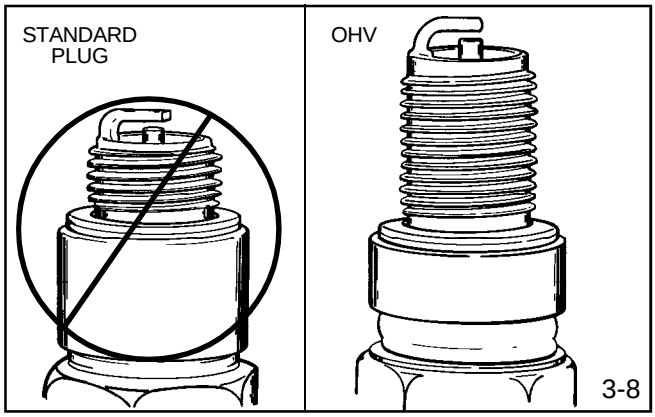
3-7

TESTING

1. Should repeated efforts to start the engine using the procedure listed in the operator's manual fail, check for spark by removing the high-tension lead. Install an ignition tester and check for spark. If the spark is bright blue and consistent, proceed to step 2. If no or irregular spark see **Chapter 6 under "Testing**".

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER AND MAKE SURE THE PLUG WIRES ARE PROPERLY GROUNDED TO THE DEDICATED RETAINING POSTS.

2. Remove and visually inspect the condition of each spark plug, a wet condition indicates the presence of gasoline in the cylinder. Although this indicates fuel is present the fuel condition regarding its combustibility should always be checked.
   NOTE: Check plug for correct reach. (Illust. 3-8)



3-8

3. If either spark plug is dry, check for restrictions in the fuel system, which supplies that cylinder. If both plugs are dry check the fuel supply system and continue with step #4. If the spark plug is wet, continue with step # 8.

4. **Dry Spark Plug**: Begin by checking the fuel cap for proper atmospheric venting. With the fuel cap in place and tightened, remove the fuel line prior to the pump allowing fuel to flow into a proper receptacle. Allow at least 1 gallon of fuel to flow out, noting the rate of flow. If it remains consistent the vent is performing properly. Re-connect the fuel line(s) to the pump.

   NOTE: Today's fuels can cause many problems in engine performance due to the fuels quality and short shelf life. Always check fuel as a primary cause of engine poor performance.

5. Remove the air filter, visually check the choke shutter(s) operation for complete closure when the throttle or independent choke control are in the full choke position.

6. **Fuel Supply** If the fuel flow to the carburetors is adequate and no fuel is evident at either spark plug, the carburetor bowl(s) will need to be removed for service. See “Service” in this chapter or consult the “Carburetor Troubleshooting” chart to diagnose carburetor symptoms. Improper fuel flow indicates the fuel, fuel line, filter or tank require cleaning or replacement.

7. **Compression Test** Most Tecumseh engines include a compression relief system. These systems make publishing compression values impractical. However, following is a **cylinder compression balance test**, which can be preformed to help diagnose a possible compression concern.

    1. Remove air filter cover, air filter and both spark plugs

    2. Ground out the spark plug wires to the engine.

    3. Install a compression tester into either of the spark plug holes of the cylinder head.

    4. Turn engine over until the highest reading is recorded on the compression tester.

    5. Write down the reading, remove the compression tester install it into the remaining cylinder head and repeat.

    Compare the two readings. The difference between the two cylinders should not exceed 20%. Example: Cyl #1 90 PSI, Cyl #2 75 PSI. There is 15-PSI difference between cylinders. Divide this number (15) into the highest compression reading (90) giving a 17% difference between cylinders. A difference above 20% or an extremely low compression reading (below 50 PSI) will require further leak testing or cylinder head removal for inspection.

Cylinder #1		Cylinder #2		Difference			
90 psi	**-**	75 psi	**=**	15 psi	**÷ 90**	**=**	**17%**

8. **Wet Plug(s)** A wet spark plug indicates fuel is being supplied by the carburetor. A restricted air filter, carbon shorted or defective spark plug, excessive choking or a defective carburetor, may have flooded the engine. With the spark plug(s) removed and the plug wire(s) grounded to the dedicated retaining posts, place a shop towel over the spark plug hole. Turn the engine over very slowly by hand to remove excess gasoline from the engine cylinder.

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER AND MAKE SURE THE PLUG WIRES ARE PROPERLY GROUNDED TO THE DEDICATED RETAINING POST.

9. Replace the air filter if restricted or oil soaked, if the paper filter has a brown color it may have been damaged by oil and should be replaced. Replace the spark plug if questionable then install the spark plugs and high tension leads. Attempt to start the engine.

10. If the engine floods and fails to start, the carburetor(s) will require service. See the “Carburetor Troubleshooting” chart for additional causes. If the carburetor is functioning properly the problem may be ignition or timing related. Reference “Troubleshooting” under “Ignition” for further assistance.

CARBURETOR DISASSEMBLY PROCEDURE

Before performing any carburetor service check the throttle/choke control(s) for proper adjustments. Make sure the unit is reaching full choke shutter position on both carburetors.

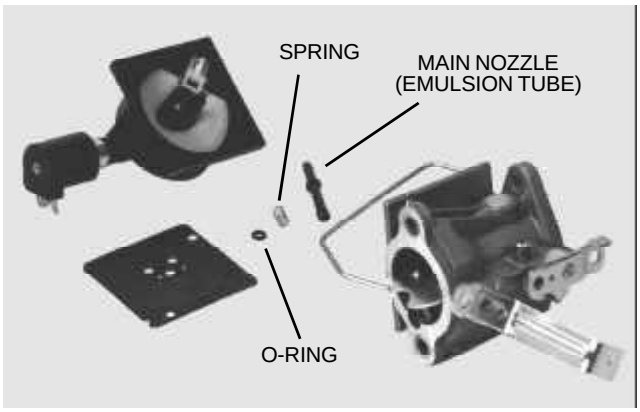
NOTE : The series seven carburetor uses FIXED IDLE AND MAIN JETS AND SHOULD BE SERVICED ONLY BY QUALIFIED TECHNICIANS TO PREVENT DAMAGE. It is a violation of both the U.S. EPA and CARB regulations to modify the carburetor from the original factory jetting unless specifically authorized.

⚠ CAUTION: DRAIN THE FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

1. Remove the fuel line. Use care not to damage the float bowl or retainer. Disconnect the wires from the fuel shut-off solenoids. Release the float bowl retainer bail. The float bowl assembly may now be removed by pulling straight down. (Illust. 3-9)

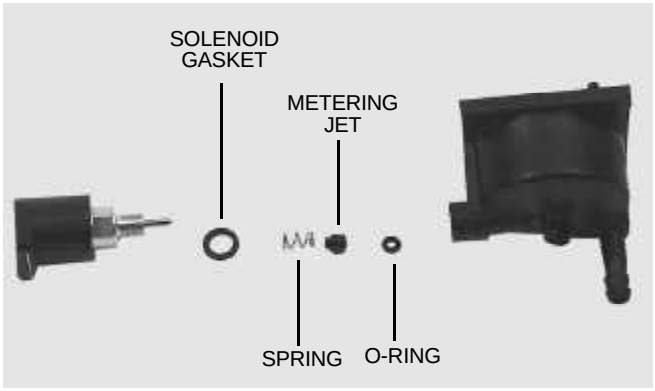
3-9

2. Remove the main nozzle (Emulsion) tube, “O” ring, and spring located in the center leg of the float bowl. (Illust. 3-10)



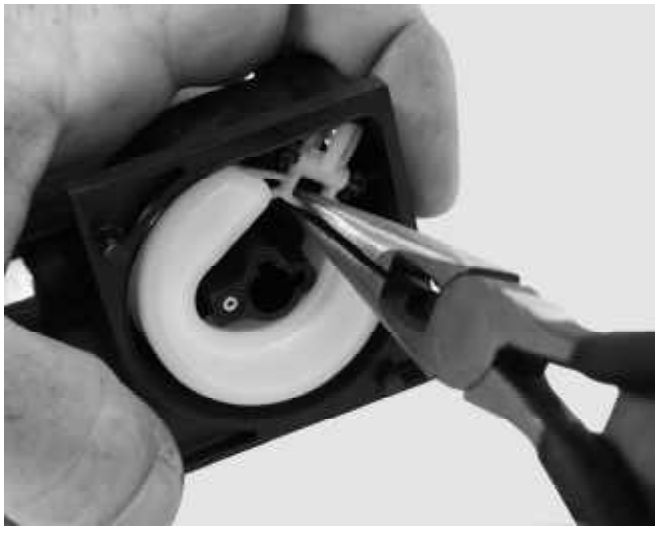
3-10

3. Next remove the bowl drain screw or fuel shut off solenoid and gasket. Remove the spring, metering jet, and “O” ring. (Illust. 3-11)



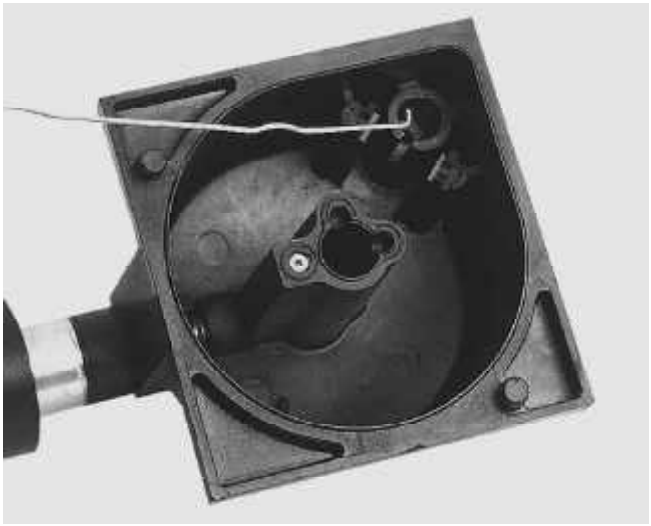
3-11

4. Float removal is done by grasping the cross-brace on the float with needle nose pliers. Then pulling in a horizontal motion to release the float assembly. (Illust. 3-12) Removal by any other method may cause damage.



3-12

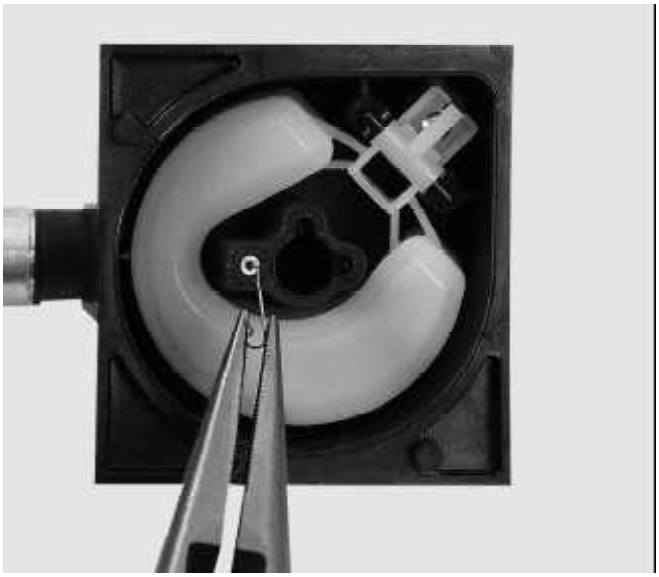
5. Remove the inlet needle seat using a No. 4 crochet hook or a paper clip with a **3/32" (2.38 mm)** hook end. Push the hook through the hole in the center of the seat and pull out to remove it. **NOTE:** A metal retaining ring may be present on top of the seat to aid in its retention, this will come out with the seat. If a ring is present or comes with the new seat reinstall it. (Illust. 3-13)



3-13

6. **Idle Restrictor:** The idle restrictor is located to the side of the center leg in the fuel bowl. (Illust. 3-14) Clean the passage using a piece of wire (maximum **.015, .0006 mm)**, carburetor spray and compressed air, verify it is open. If the restrictor remains plugged it can be serviced by replacement of the float bowl assembly only.

   NOTE: New service fuel bowls come with the restrictor installed.



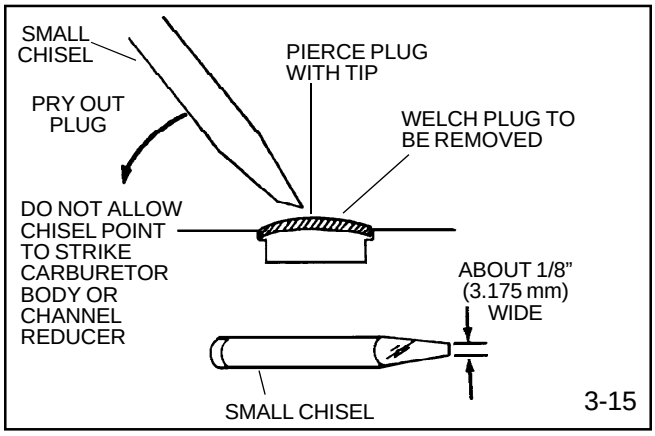
3-14

NOTE: Before removing the main carburetor body, mark or sketch the choke and throttle linkage connection points. Also MARK THE EDGES OF THE THROTTLE AND CHOKE SHUTTERS. THE SHUTTERS HAVE BEVELED EDGES AND MUST BE INSTALLED IN THE ORIGINAL POSITION.

7. Use a Torx T-10 to remove the choke and throttle shutters. Remove the throttle shaft, choke shaft and return springs.

8. Welch plug Removal: Secure the carburetor in a vise equipped with protective jaws. Use a small chisel sharpened to a **1/8" (3.175 mm)** wide wedge point **.** Drive the chisel into the plug to pierce the metal and push down on the chisel prying the plug out of the hole. (Illust. 3-15)

   NOTE: Be careful not to drive the chisel through the plug damaging the metering holes underneath.

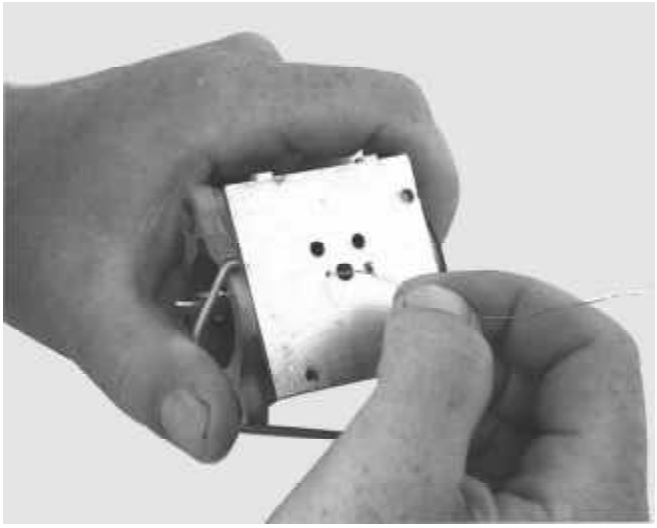


3-15

INSPECTION

After careful disassembly of the carburetor, clean the carburetor body and float bowl with solvent, or spray carburetor cleaner. Wearing eye protection, use compressed air and soft tag wire to clean internal carburetor passages. (Illust. 3-16) Examine the float for cracks or leaks. Check the float hinge bearing surfaces for wear, as well as the tab that contacts the inlet needle. Examine the throttle, choke shaft, and carburetor body at the bearing points and holes into which the linkage is fastened. If dust seals are present, check the seal condition and for correct placement next to the carburetor body. If the condition of any of these parts is worn or questionable replace them. The float can be checked for leakage by submersion in a clear jar filled with hot water. If any air bubbles are noted the float must be replaced.

NOTE: DO NOT INTERCHANGE MAIN NOZZLES OR METERING JETS FROM OTHER CARBURETORS.

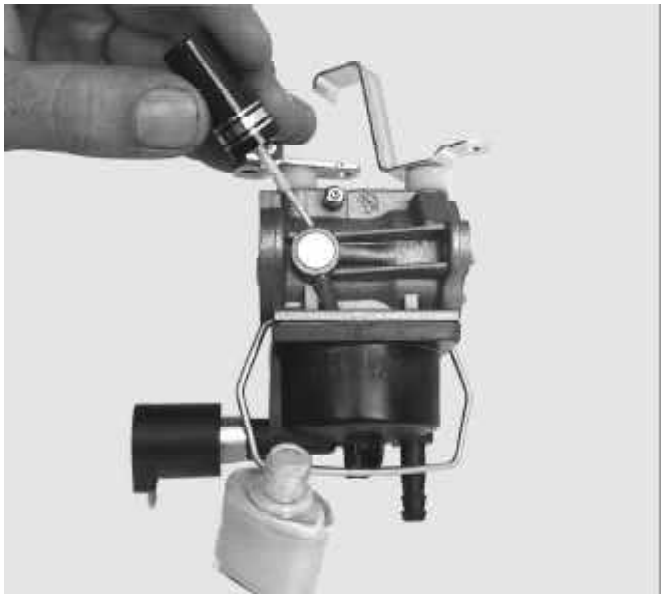


3-16

CARBURETOR RE-ASSEMBLY

WELCH PLUGS

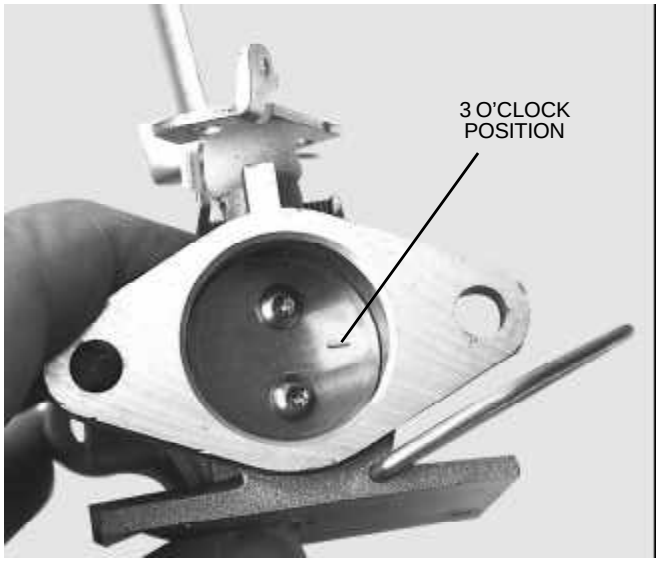
To install a new welch plug, secure the carburetor in a vise equipped with protective jaws. Place the welch plug into the mixing well pocket with the raised portion up. With a punch equal to the size of the plug-hole, flatten the plug. Do not dent or drive the center of the plug below the top surface of the carburetor. After installation of the welch plug, seal the outer diameter with fingernail polish. (Illust. 3-17)



3-17

THROTTLE SHAFT AND PLATE

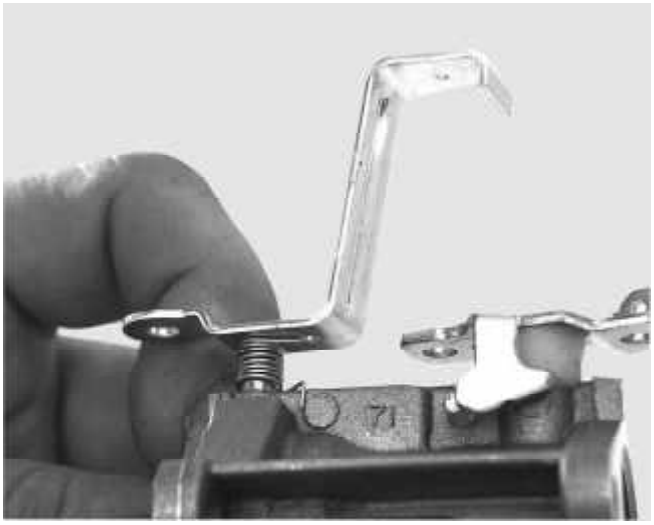
When reassembling the throttle plate on a series 7 carburetor, it is important that the marking on the plate be in the 3 o'clock position facing out with the throttle plate closed. (Illust. 3-18)



3-18

CHOKE SHAFT AND PLATE

Install the choke return spring on the choke shaft with the squared end up and hooked into the notch on the arm. Work the dust shield up around the spring and insert the choke shaft into the carburetor body. Rotate the shaft counterclockwise until the tang on the spring rests against the left side center boss on the carburetor body. (Illust. 3-19)



3-19

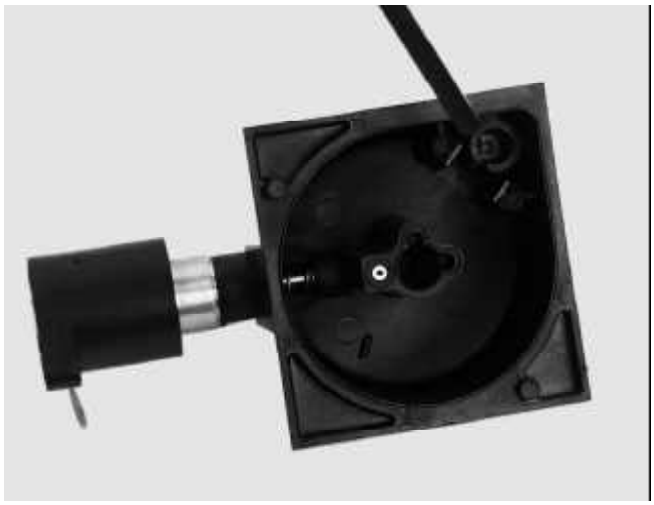
Always use new shutter screws part 650506 when reinstalling a shutter plate. Install the screws so they are slightly loose. Apply light downward pressure on the shaft and rotate it clockwise to seat the shutter in the bore, then tighten the shutter screws. Check for binding by rotating the shaft. If necessary, adjust the shutter by loosening and repositioning, then retighten the screws.

FUEL BOWL ASSEMBLY

Inlet Needle & Seat

When servicing the fuel bowl assembly, a new needle and seat should always be installed to reduce the possibility of leakage.

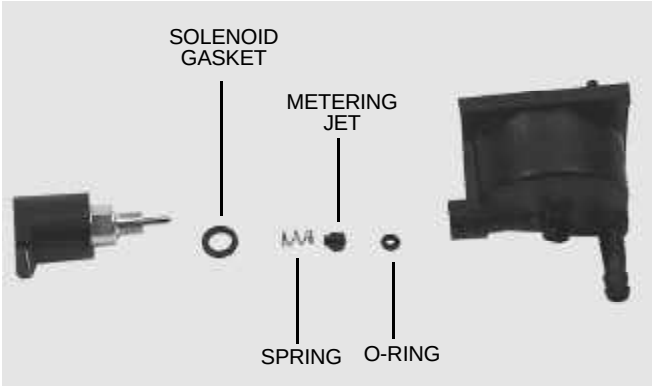
Make sure the seat cavity is clean. Moisten the seat with oil and insert the seat with the grooved side down and away from the inlet needle. Press the seat into the cavity using a **5/32" (3.969 mm)** an Allen wrench or a flat punch, making sure it is firmly seated. (Illust. 3-20) If the new needle and seat contains a retainer install it on top and in contact with the seat.



3-20

Main Jet Assembly

Install a new O-ring in the main jet cavity (verify the original o-ring has been removed). Place the spring over the shoulder of the main jet and insert into the cavity with the main jet towards the o-ring. Next install a new fiber gasket on the bowl drain screw or fuel shut-off solenoid and tighten to **25-30 In. lbs. (2.83 - 3.4 Nm)**. (Illust. 3-21)



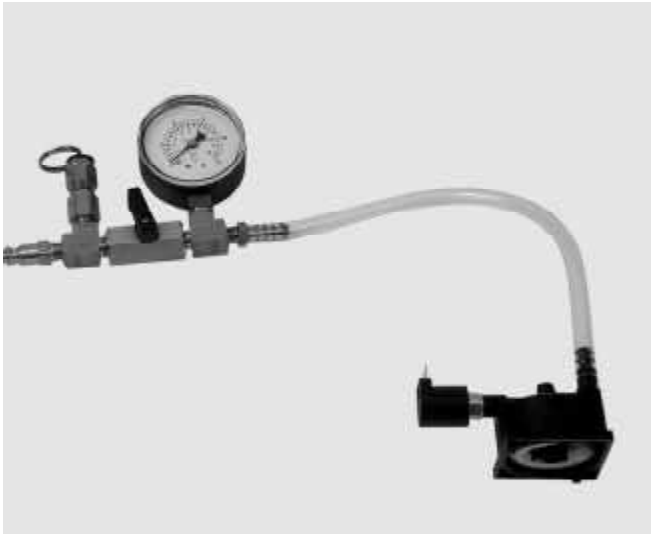
3-21

Main Nozzle (Emulsion Tube)
Place the main nozzle tension spring into the cavity of the float bowl. Apply a small amount of oil to the o-ring on the main nozzle and insert it into the float bowl cavity.

Float Installation
Install the float with a new inlet needle and float hinge pin onto the float bowl assembly. Carefully push the hinge pin into the retaining post using a small flat blade screwdriver. Check the float movement for complete travel.

NOTE: EMISSIONIZED ENGINES OPERATED WITHIN THE UNITED STATES MAY HAVE HIGH ATTITUDE JETS AVAILABLE, CONSULT SERVICE BULLETIN 110 FOR INFORMATION.

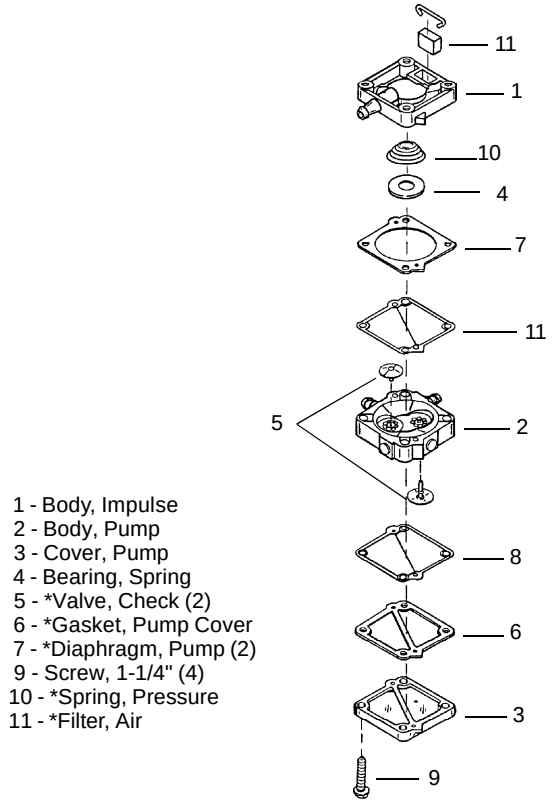
Final Checks
Test the inlet needle and seat sealing using Tecumseh service kit 670340 or a similar pop-off tester. To test the pop off pressure remove the float bowl, float and inlet needle. Place a drop of fuel on the seat and reinstall the needle and float. Hook up the pressure tester and apply approximately **6-9 PSI** of pressure or until the needle pops off the seat. Slowly release the pressure to not less than **1 ½ PSI**. The needle should seat between **1 ½ - 6 PSI** for a minimum of five minutes. If the minimum **1 ½ PSI** cannot be maintained the needle and seat will need to be serviced. (Illust. 3-22)



3-22

Fuel Bowl Retaining Bail
The retainer bail must hold adequate pressure on the float bowl to prevent air or fuel leakage during operation. When re-installed, the force should be adequate to securely clamp the bowl to the body of the carburetor. If damage occurred upon bowl removal replace the bail.

IMPULSE FUEL PUMPS

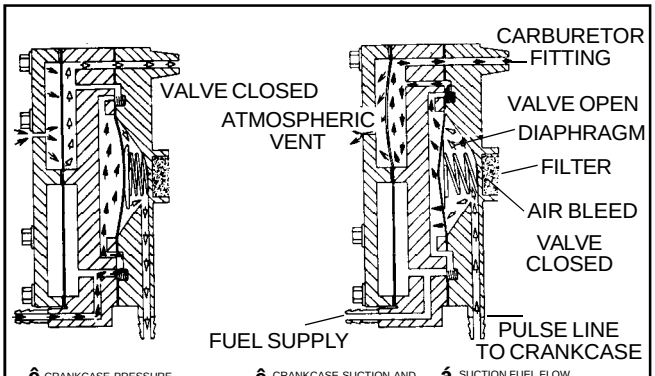


1 - Body, Impulse
2 - Body, Pump
3 - Cover, Pump
4 - Bearing, Spring
5 - *Valve, Check (2)
6 - *Gasket, Pump Cover
7 - *Diaphragm, Pump (2)
9 - Screw, 1-1/4" (4)
10 - *Spring, Pressure
11 - *Filter, Air

3-23

Impulse fuel pumps are externally mounted in the fuel circuit between the fuel supply and the carburetor. A fuel pump must be used if the fuel supply outlet is lower than the bowl inlet. There MUST be a in-line fuel filter installed prior to the pump to prevent system damage.

Impulse fuel pumps are operated by positive and negative pressure pulsation in the crankcase, which are created by the up, and down movement of the piston. A hose called a pulse line, connects the fuel pump diaphragm chamber to the crankcase and transmits the pulses to the pump diaphragm. These impulses actuate the diaphragm creating the pumping action to lift the fuel from the fuel tank to the carburetor(s). (Illust. 3-24) The pump body contains check valves, which open and close preventing the fuel from going backwards from the pump.



3-24

Fuel Pump Testing: The maximum lift is 24 inches (610 mm). A fuel pump may be tested with our leak test kit part number **670340** or a commercially available low pressure gauge. Connect the low pressure gauge to the fuel inlet fitting. Apply no more than **5 PSI (.35 Bar)** of pressure. The air pressure should pass freely through the pump and out of the fuel outlet fitting. Next, attach the low pressure gauge to the fuel outlet fitting. Apply less than **5 PSI (.35 Bar)** of pressure. Turn off the air valve and watch for any pressure drop. The fuel pump should hold a maximum of **5 PSI (.35 Bar)** for one minute.

NOTE: Do not exceed 5 PSI (.35 Bar) of pressure or fuel pump damage may occur.

CAUTION: DRAIN ALL FUEL INTO AN APPROVED CONTAINER OUTDOORS, AND AWAY FROM ANY OPEN FLAME OR COMBUSTION SOURCE. BE SURE THE ENGINE IS COOL.

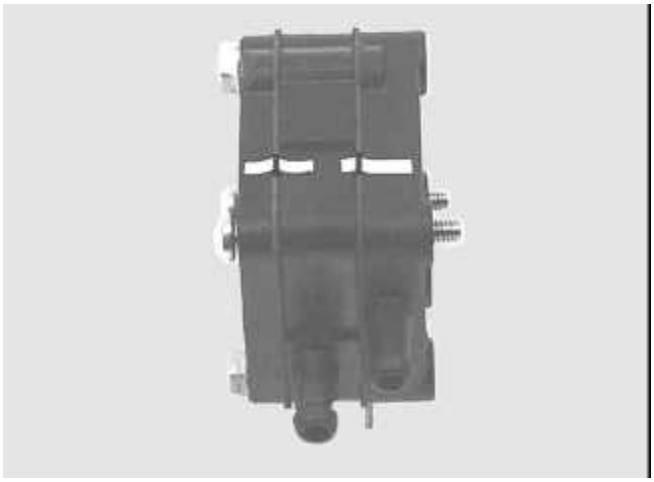
NOTE: A crankcase overfilled with engine oil can affect pump operation by splashing oil over the pulse line passage causing erratic pump operation.

IMPULSE FUEL PUMP SERVICE

The valve type impulse pump can be serviced using the following procedure.

1. Remove the pump from the engine noting its exact mounting location and position.

2. Note or mark the pump body alignment by lightly scribing lines at various mating joints. Remove the four screws and disassemble the pump. (Illust. 3-25)



3-25

3. Remove the gaskets, diaphragms, check valves, springs and air filter. (If equipped).

   NOTE: Retain the spring bearing. A replacement is not supplied in the fuel pump kit.

4. Clean the body parts with solvent and blow out all passages using compressed air.

5. After drying all parts, install the new check valves with the face of the valve facing the raised portion of the passage. (Illust. 3-26) After installation, cut off the extended portion of the check valve stems flush with the pump body.

3-26

6. Install the diaphragms against the center portion of the body with the gaskets against the outside covers. The parts can only be assembled one way without damage.

7. Install the spring bearing on the new spring and place into position. (Illust. 3-27)

8. Assemble the body sections, install the retaining screws, and torque the screws to **12 - 16 inch pounds (1.36 - 1.81 Nm).**

9. Install new filter in pump cavity if present**.**

3-27

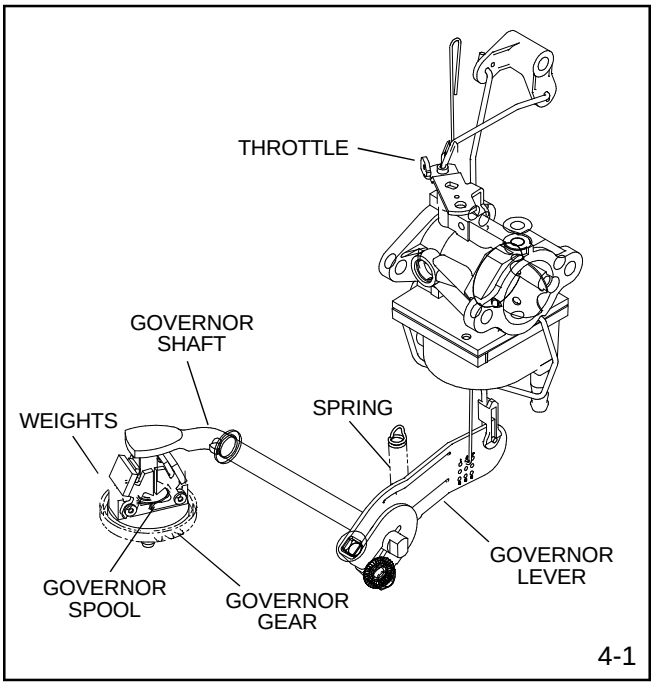
CHAPTER 4. GOVERNORS AND LINKAGE

GENERAL INFORMATION

The TVT engine is equipped with an internal mechanical governor. The governor's function is to maintain a R.P.M. setting when engine loads are added or taken away. This chapter includes governor assembly linkage illustrations to aid in governor or speed control assembly.

OPERATION

As the speed of the engine increases, the weights on the governor gear move outward from centrifugal force lifting the governor spool. The contact between the spool and governor rod causes the attached outer governor lever to push the solid link and close the throttle plate. When the engine speed decreases, the lower centrifugal force allows the governor weights to be pulled in by the governor spring. The governor rod rotates and the solid link moves the throttle plate to a more open position**.** (Illust. 4-1)



4-1

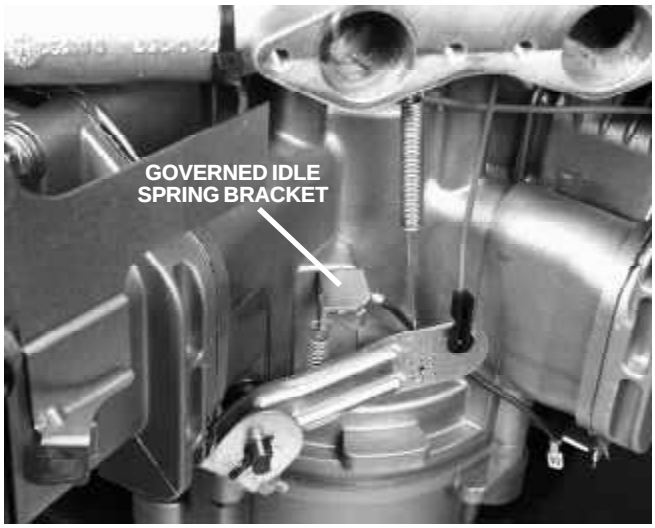
TROUBLESHOOTING

Engine overspeed must be corrected immediately, before serious engine damage occurs. Erratic engine operation where the governor is suspect, may be the result of other engine system problems. Hunting (engine R.P.M. surging up and down) can be an indication of fuel starvation or an air leak. Low power (engine will not hold RPM under load) can indicate, fuel, ignition or internal concerns. Use the following procedure to diagnose a suspected governor problem.

ENGINE SPEED ADJUSTMENTS

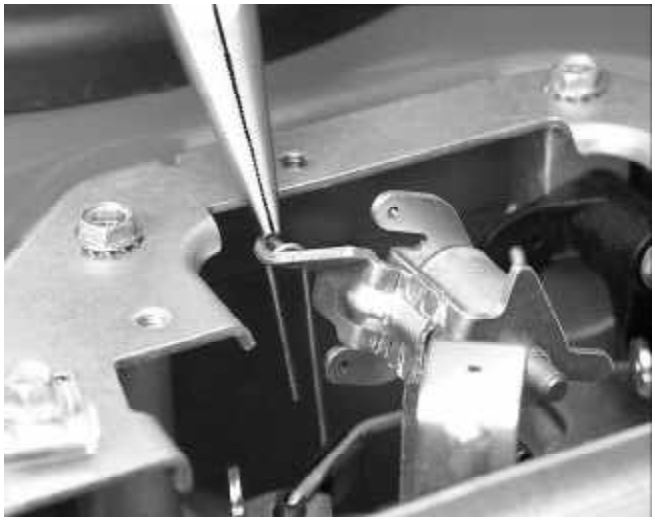
Before attempting to set the governed high or low RPM speeds, locate the recommended RPM setting according to the engine model and specification numbers. These specifications can be located on microfiche card # 30 or the computerized parts look-up system.

Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the low speed position. Check the governed idle speed **(not true idle).** Adjustment is made by bending the governor spring bracket upward to increase the idle RPM or downward to lower idle RPM. (Illust. 4-2)



4-2

Set the speed control to the HIGH or FAST position. Check engine speed. To adjust, bend the tang on the control lever upward to increase high speed R.P.M. or downward to lower high speed R.P.M. (Illust. 4-3)



4-3

ENGINE OVERSPEED

1. If the engine runs wide open (faster than normal), shut the engine off **immediately.**

2. Check the condition of the external governor shaft, linkage, governor spring, and speed control assembly for breakage or binding. Correct or replace binding or damaged parts.

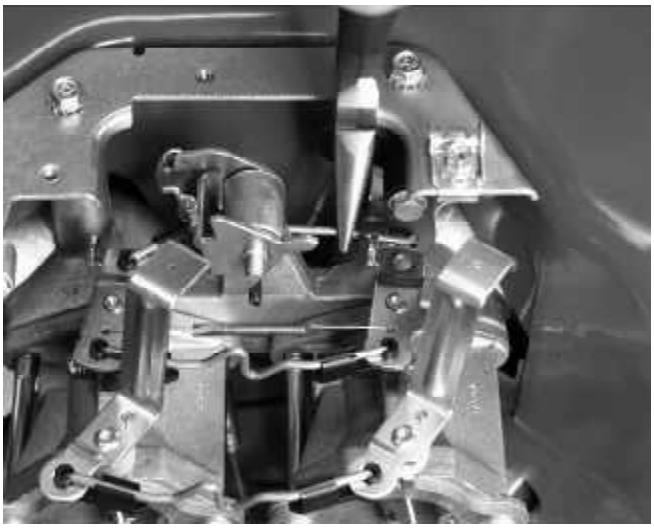
3. Follow the governor static adjustment procedure and reset the governor - see “Service” in this chapter.

4. Start the engine. Be ready to shut the engine off if an overspeed condition still exists. If the problem persists, attempt to hold the solid link between the governor arm and the carburetor throttle plate in one position. If this controls the condition, the engine will require disassembly to inspect the governor gear assembly for damage, binding, or wear. See **Chapter 7** under “Disassembly Procedure”.

5. Remove the governor gear assembly. Repair or replace as necessary.

ENGINE SURGING

1. Try to stabilize engine R.P.M. by holding the solid link between the bell crank lever and the carburetor throttle plate in a fixed position using a pliers or fingers. (Illust. 4-4)



4-4

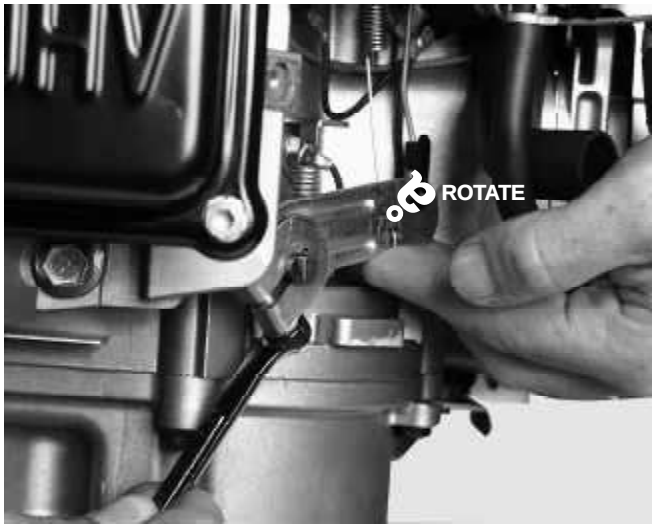
2. If the engine R.P.M. stabilizes, re-adjust the governor setting. Check the governor shaft, linkage, bushing clips and spring for binding, wear, or improper hookup. Replace as necessary. If none of these correct the problem it may be necessary to disassemble the engine for internal governor repair.

3. If the engine R.P.M. does not stabilize, it may require additional checks of the fuel system, see the fuel system trouble shooting section.

GOVERNOR SERVICE

STATIC ADJUSTMENT - GOVERNOR

With the engine stopped, loosen the screw holding the governor lever to the governor shaft. Push the governor lever up to move the carburetor throttle plate(s) to the wide-open throttle position. Rotate the governor rod counterclockwise. Hold the lever and rod in this position while tightening the screw. (Illust. 4-5)



4-5

GOVERNOR GEAR AND SHAFT SERVICE

After the cylinder cover is removed from the engine, the governor spool, gear, and governor shaft can be removed. A retaining ring must be removed to allow the gear to be removed from the shaft. (Illust. 4-6)

4-6

GOVERNOR SHAFT REPLACEMENT

1. Remove the spool, retaining ring, gear assembly and washer(s).

2. Clamp the shaft in a vise and pound gently on the flange with a wooden or plastic mallet to remove the shaft.

   NOTE: DO NOT TWIST THE SHAFT WHEN REMOVING. THE SHAFT BOSS MAY BECOME ENLARGED AND THE PRESS FIT WILL NOT SECURE THE NEW GOVERNOR SHAFT.

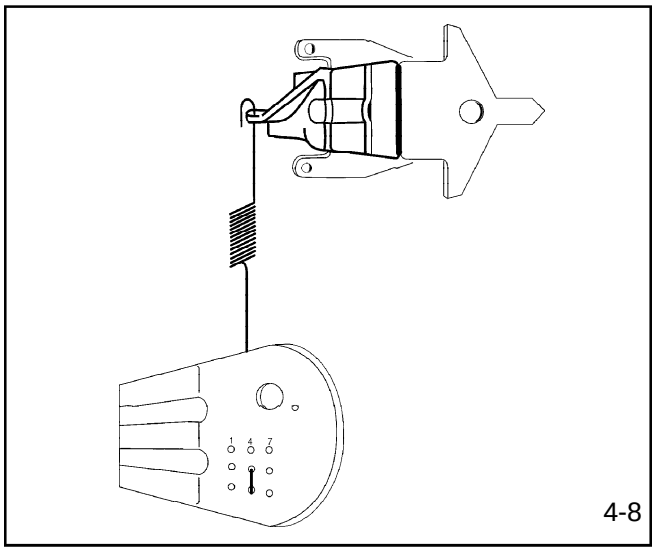
3. Start the new shaft into the flange boss by tapping with a soft faced hammer.

4. Apply a small amount of red loctite 271 to the lower governor shaft and using a press or vise push the governor shaft into the flange leaving an exposed length of **1.196" (3.969 mm).**

SPEED CONTROLS AND LINKAGE

The TVT series engine offers the adaptability of throttle cable connection from either side of the engine. Either cable position must pull against the governor spring force, to increase the engines speed. **NOTE:** Both the upper and lower governor spring connections, they must be installed correctly to prevent improper operation. (Illust. 4-7 & 4-8)

4-7



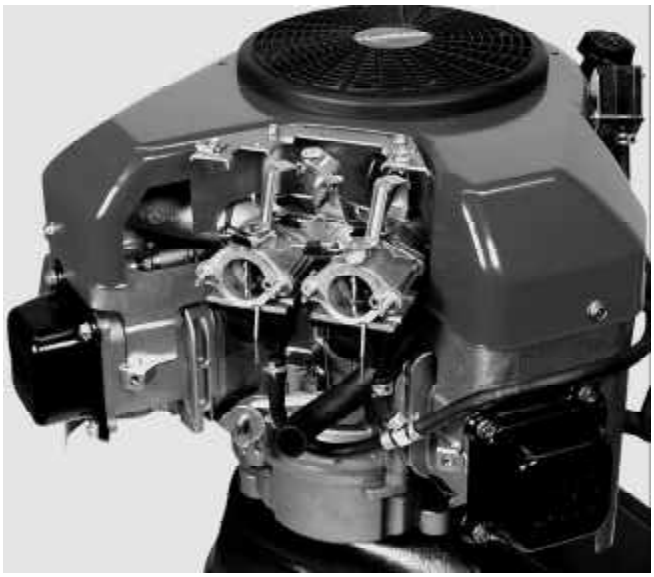
4-8

NOTE: Whenever the carburetor or the governor linkage is removed or replaced, the engines governed R.P.M.'s must be checked. Use microfiche card #30 or the computer parts look-up systems to locate the correct R.P.M. settings for the engine model and specification you are repairing.

SYNCHRONIZING THE CARBURETORS

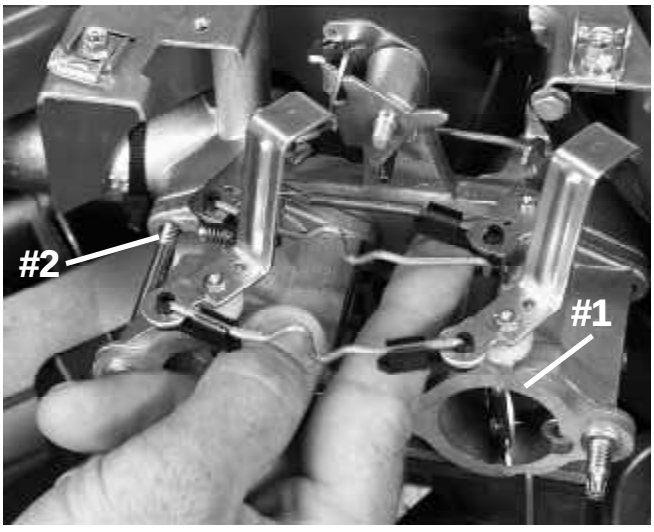
The TVT series uses twin carburetors, which **MUST** be synchronized if the linkage or carburetor body has been disturbed. The following step by step procedures must be followed to synchronize both the throttle and choke. Inspect all link connectors. If excessively worn or damaged replace them. To perform this service the carburetors must be mounted and all linkage must be connected.

1. Remove the control assembly cover, air cleaner cover, air cleaner, carburetor deflector and air cleaner body from the engine. (Illust. 4-9)



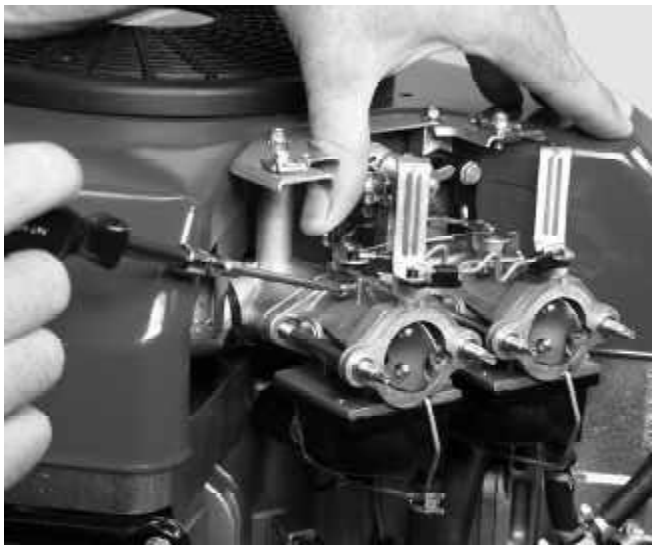
4-9

2. Remove the link connector bushing clip holding the throttle link to the #1 cylinder carburetor. (Illust. 4-10)



4-10

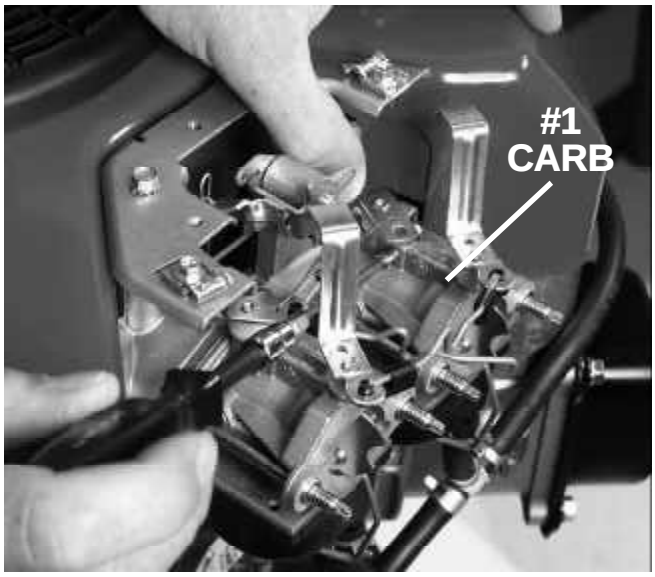
3. Manually rotate the throttle shaft on the number #2 carburetor to the idle position. Next back out the idle R.P.M. adjustment screw until it no longer contacts the throttle plate tang. (Illust. 4-11)



4-11

4. While holding the number #2 carburetor throttle shaft in the idle position turn in the idle R.P.M. adjustment screw to 1/4 turn past first contact. **NOTE: It is critical to find first contact of the R.P.M. adjustment screw to the throttle plate tang.**

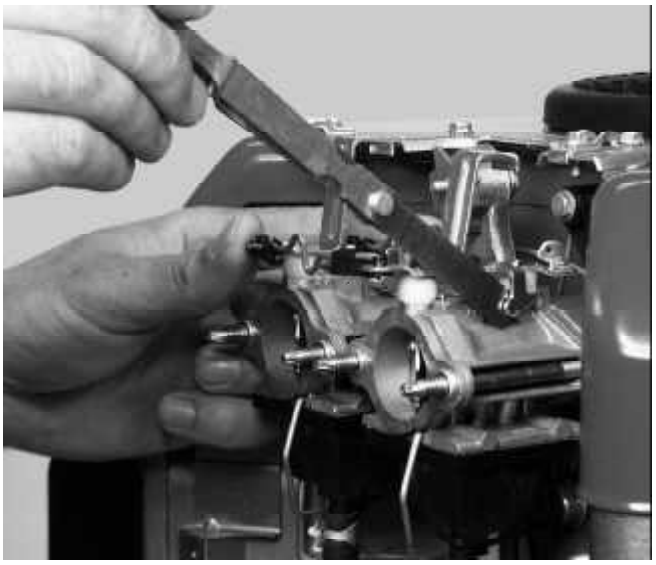
5. With the bushing clip still detached, back out the idle R.P.M. adjustment screw on the #1 carburetor. Hold the throttle plate in the idle position and turn the idle R.P.M. adjustment screw in until first contact with the tang is made. (Illust. 4-12)



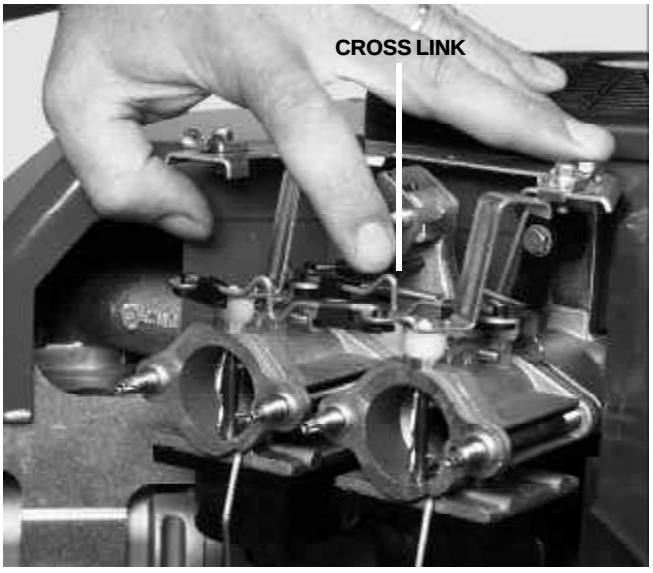
4-12

6. Connect both carburetors by attaching the link and link connector bushing clip to the # 1 carburetor.

7. Hold the throttle plate on the #2 carburetor in the true idle position. (Screw against the tang). **NOTE:** Do not set the gap using the idle R.P.M. adjustment screw.Use a **.010" (.254 mm)** feeler gauge to set the air gap between the idle R.P.M. adjustment screw and the throttle plate tang on the #1 carburetor. (Illust. 4-13) The throttle cross link will need to be bent inward (toward the engine) to increase the air gap or pulled outward to decrease. (Illust. 4-14)



4-13

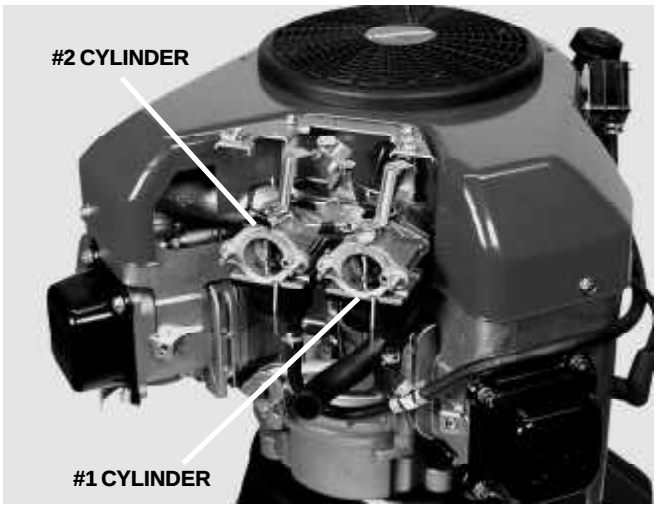


4-14

CHOKE SYNCHRONIZATION

1. Engage the choke control cable of the equipment to the full choke position.

2. Remove the control assembly cover, air cleaner cover, air cleaner and air cleaner baffle. (Illust. 4-15)



4-15

3. Visually inspect that the choke shutter plate on the # 2 carburetor is completely closed. If the plate is not completely closing, choke cable adjustment is necessary.

4. Apply and hold light pressure closing the choke lever on the #2 carburetor. Attempt to rotate or move the choke plate on the #1 carburetor. (Illust. 4-16) If movement can be found or the choke shutter is not completely closing, the choke cross-link will need to be adjusted. To adjust, bend the cross-link inward towards the cylinder block until both choke shutters completely close at the same time.

4-16

Re-assemble the components, ensure the cable clamps are tight. Start the engine and allow it to warm up (3-5 minutes). Set the governed idle and top no-load RPM. The correct RPM settings can be located on microfiche card #30 or the computer parts look-up systems. The use of a vibra-tach Tecumseh part **#670156** or a digital engine tachometer part **#670341** will aid in this procedure.

CHAPTER 5. ELECTRICAL SYSTEMS

GENERAL INFORMATION

The electrical system consists of three main elements: a battery, a starting circuit, and a charging circuit. The battery is part of both the starting and charging circuit. Battery voltage should be checked before going into any extensive starter or charging system checks. If a battery has a shorted cell, overcharging can result, and the regulator or rectifier may appear to be at fault. If a cell has an open or high resistance connection, the electric starter operation will be affected.

The power source used to provide the energy to turn an electric starter motor on the TVT series is 12 volt D.C. The 12-volt battery system requires a charging package to maintain proper battery charge.

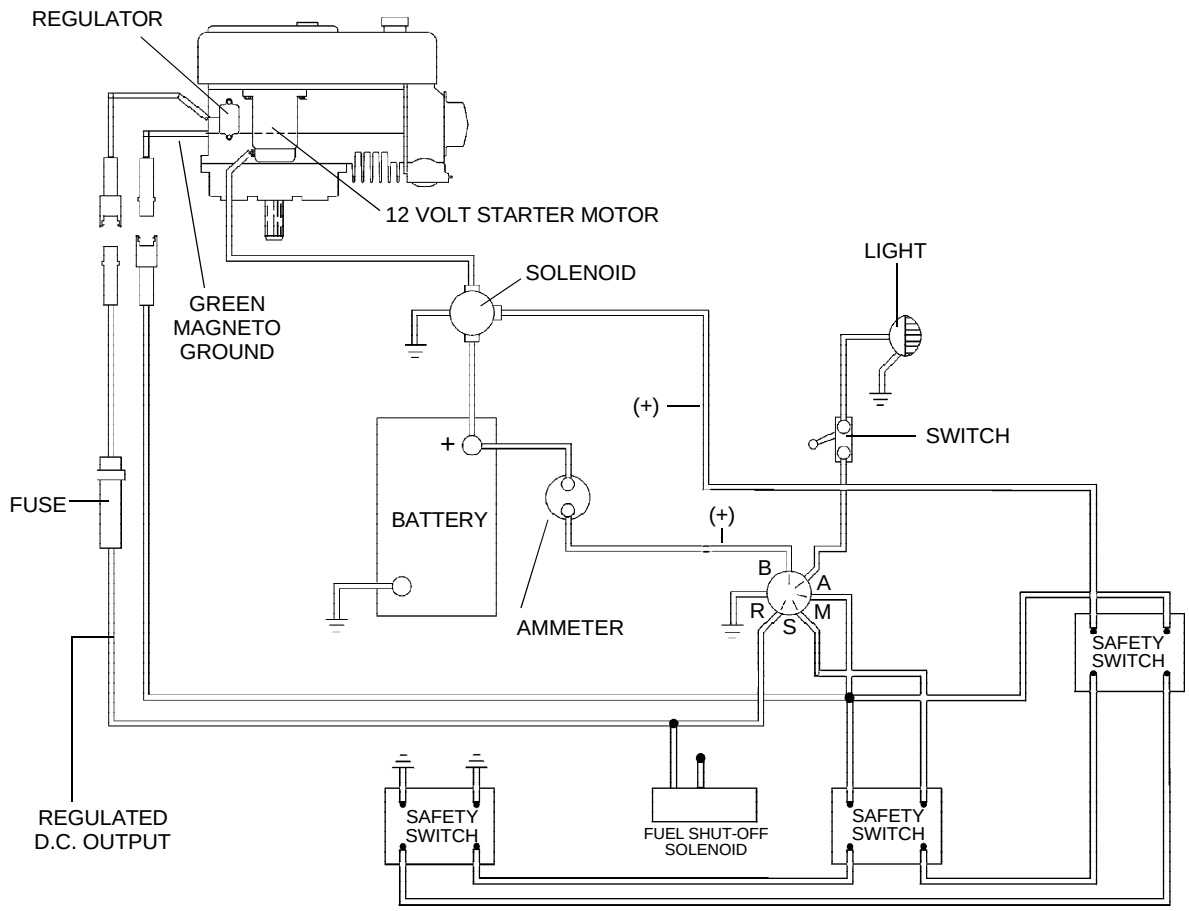
The starting circuit includes the battery, battery cables, ignition switch, safety switches, starter solenoid, and the electric starter motor.

The charging system consists of alternator charge coils, a diode or regulator, ignition switch, flywheel magnets, and a battery. All engines that have a charging system will use a combination of some or all of these features.

OPERATION

Although most equipment has an electrical system that consists of three main elements, (battery, starting circuit, and charging circuit) they can vary in layout and design form model to model as well as manufacturer to manufacturer.

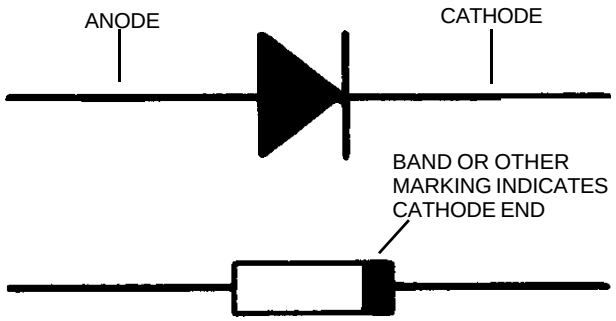
Within each element there are individual components (battery, wiring, safety switches, ignition switch, solenoid, etc.) which must be diagnosed separately. The illustration shown (Illust. 5-1) is a basic diagram which includes some of the elements used in an electrical system.



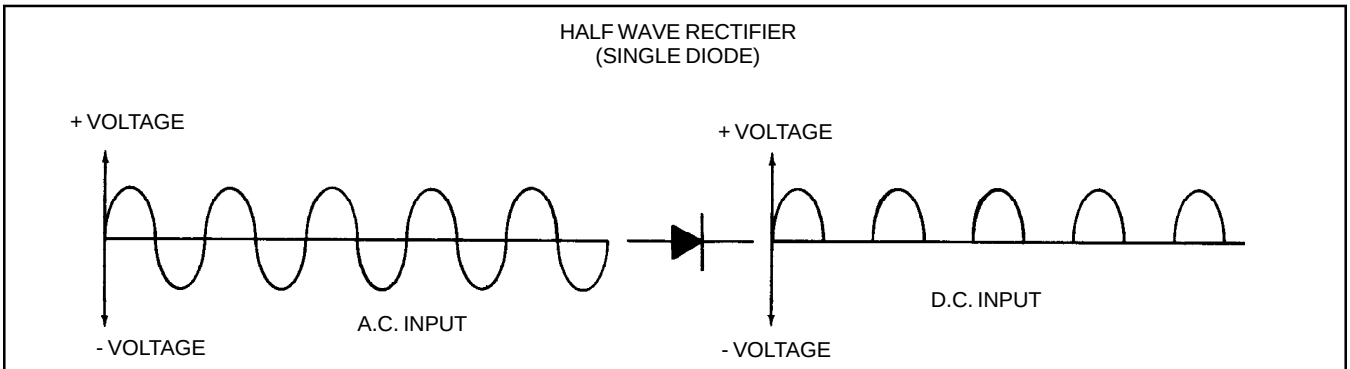
5-1

CONVERTING ALTERNATING CURRENT TO DIRECT CURRENT

In order to charge a battery, it is necessary to convert alternating current (A.C.) to direct current (D.C.). This is accomplished by using a diode or rectifier. (Illust. 5-2) A single diode makes use of only one half of the A.C. signal. This is known as HALF WAVE RECTIFICATION. (Illust. 5-3) In certain situations it is necessary to make use of the entire A.C. signal. To accomplish this, multiple diodes in a bridge configuration are used to produce FULL WAVE RECTIFICATION.



5-2



5-3

Current flows through a diode when the anode is more positive than the cathode. The cathode end of the diode should point toward the battery when a diode is used between a charging system and a battery.

Half Wave Rectifier Single Diode

The single diode allows only the positive half of the A.C. signal through. It does not allow the negative portion through.

Full Wave Rectifier Bridge Rectifier

The full wave rectifier makes use of the entire A.C. signal, converting it to D.C.

COMPONENTS

BATTERY

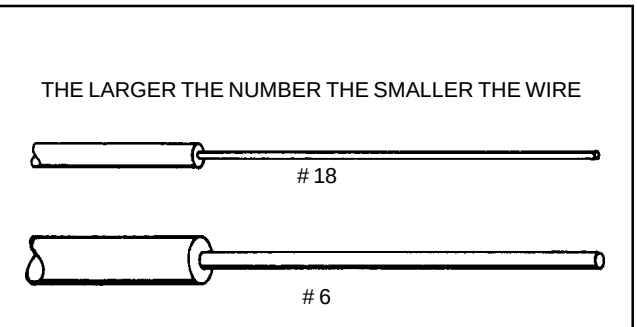
The batteries used in conjunction with Tecumseh engines are 12 volt lead acid or “maintenance free” style. The chemical energy produced by the dissimilar metals of the battery plates provides an electrical potential that is used to power the electric starter or unit accessories. Consult the original equipment manufacturer’s service manual for battery size, capacities, and testing procedure.

WIRING

The wires used in Tecumseh electrical systems are copper stranded with an insulated coating around the copper strands.

CONDITION: All wiring must be fully insulated, securely fastened and free of foreign materials (such as rust and corrosion) at the connection points. This is especially important with the use of batteries, as much of the potential may be lost due to loose connections or corrosion. Remember to check the insulation on the wire. All it takes is a pinhole for leakage to “ground out” on the engine or frame. This is of special concern when moisture or water is present.

WIRE GAUGE: The proper thickness of wire is necessary in all electrical circuits. Wire diameter is measured in increments of gauge numbers. As the gauge number of the wire increases, the wire diameter decreases in size. (Illust. 5-4)



5-4

1. The starter circuit wiring requires a rating of #6 or lower gauge number.

2. The charging circuit wiring requires a #16 or lower gauge number. (20 amp systems requires #14 or lower gauge number).

3. The magneto circuit wiring (ground circuit) requires #18 or lower gauge number.

Tecumseh Products Company's standard wiring color codes effective August, 1992 are as follows:

Code		Product
Yellow	-	Alternator A.C. Leads
Red	-	Alternator D.C. + Leads
Brown	-	Alternator D.C. - Leads
Black	-	Alternator Ground Leads, Battery Ground Leads
Orange	-	12 Volt Starter B + Leads
Dark Green	-	Ignition Shut-Off Leads

NOTE: Prior to August 1992, wire codes changed according to model and specification numbers.

ELECTRICAL TERMS

ALTERNATOR - An alternator consists of coils of wire wound around a metal lamination stack. When a magnet is moved past the coils, a current is induced in the coils. In general, the greater the number of coils and magnets in the flywheel, the greater the output of the alternator.

RECTIFIERS and DIODES - Charging a battery requires the A.C. (alternating current) produced by the alternator be changed to D.C. (direct current). This is accomplished by using a diode or rectifier.

REGULATOR/RECTIFIERS - This combines a regulator with a rectifier. The regulator controls the amount of current flowing to the battery based on the electrical system need. The rectifier changes the alternating current to direct current.

CONDUCTORS - A conductor is a material that allows an electric current to pass through it. All metals are conductors of electricity, but some are better conductors than others. Silver, copper and gold are some of the better known conductors.

INSULATORS - An insulator is a material that will not allow an electric current to pass through it. Some of the more common materials that are insulators are glass, plastic, rubber, ceramics and porcelain.

BASIC CHECKS

Before going into extensive diagnostics, be sure to perform the more basic checks first, such as:

1. Battery not fully charged or defective.

2. Terminals or connections that are loose or corroded.

3. Cracked insulation or broken wires grounding out.

4. Improper wire connections.

5. Defective ignition switch.

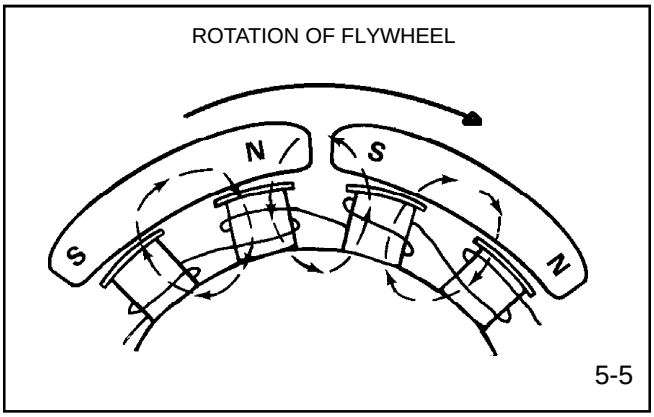
6. Properly functioning Operator Presence System. (Safety Interlocks)*****

7. Proper valve lash affecting compression relief.

***NOTE:** All lawn and garden tractors built after July of 1987 are required to have an operator presence system. Many came equipped with such a system prior to this date. If the tractor is "cutting out" or will not start, these switches are a PRIMARY area to check.

CHARGING CIRCUIT

The charging system works independently of any manual controls. The engine needs to be running to produce an electric current flow. When a conductor (alternating coils) cuts the magnetic field generated by the magnets in the flywheel, a current is induced in the alternator coil. The permanent magnets in the flywheel have a magnetic field in which the lines of magnetic force run from the North Pole to the South Pole. As the flywheel rotates and the position of the magnets change, the direction of the magnetic field changes or alternates. The alternating coils are wound in different directions to allow current to flow as an A.C. waveform. (Illust. 5-5)



5-5

CHARGING CIRCUIT

The charging systems used on the TVT engine is best identified by obtaining the engine model and specification number from the engine. Consult a Tecumseh dealer or a parts manual to correctly identify the charging system. Many of the tests require running the engine and measuring alternator output with a voltmeter. When making voltage tests with the engine running, it is not necessary to take readings at all of the listed R.P.M.'s. Checking at one of the speeds is sufficient.

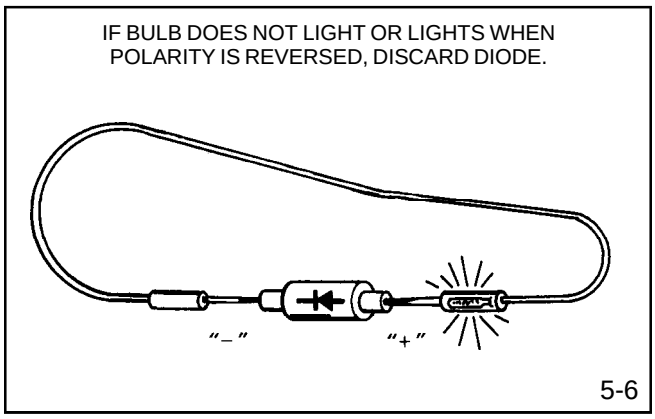
In some cases an open circuit D.C. check cannot be made. A SCR (Silicon Controlled Rectifier) is located in the circuit which requires a minimum "turn on" voltage to allow it to conduct. Without the battery in the circuit this "turn on" voltage is not present. The SCR "senses" this and there will be no D.C. output from the regulator/ rectifier.

Each charging system has its own testing procedure. Test the charging system using the applicable procedure found on the following pages.

3 AMP D.C. 5 AMP A.C. ALTERNATOR

This unit combines a 3 Amp D.C. system used to charge a battery with a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode, which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

A wire harness **(part 36588)** may be added to the 3 Amp D.C. / 5 Amp A.C. charging system to power an electric clutch without the use of a battery. Test the charging system using the applicable "Checking the System" procedure listed in this section. Test the diode in the harness by using a continuity test. (Illust. 5-6) Continuity should exist in one direction only. Replace the diode if continuity exists after reversing tester leads or no continuity is found.



5-6

DIODE REPLACEMENT

To replace the diode, disconnect at the plug (spade terminal) and cut the wire on the opposite end of the diode at the solderless (crimped) connector. Remove **1/4" (6.35 mm)** of insulation from the cut end of the wire and twist the strands together. Place the solderless connector from the new diode onto the exposed **1/4" (6.35 mm)** wire and crimp the connector with a standard electricians pliers. Reconnect the plug end or spade connector.

NOTE: DO NOT USE ACID CORE SOLDER. BE CAREFUL NOT TO APPLY HEAT DIRECTLY TO THE DIODE. USE HEAT SHRINK.

New heat shrink tubing can be installed by slipping over the wires and heating with a heat gun. If this is not available, tape the diode and connections with electrical tape.

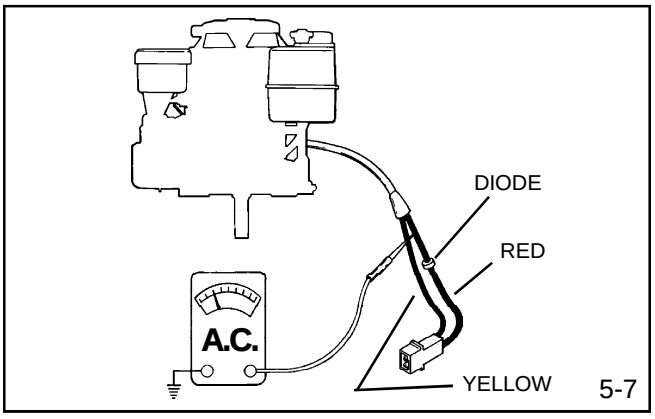
CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal. Measure the A.C. voltage at the yellow wire terminal. With the engine running, the minimum values should be:

CAUTION: Follow all Safety precautions when testing for A.C. Voltage, electrical shock can kill.

3 Amp D. C. (Red wire)
6.5 Volts D.C - 2500 R.P.M.
9.0 Volts D.C - 3000 R.P.M.
11.0 Volts D.C. – 3600 R.P.M.

5 Amp A.C. (Yellow wire)
15.0 Volts A.C. – 2500 R.P.M.
18.0 Volts A.C. – 3000 R.P.M.
22.0 Volts A.C. – 3600 R.P.M.

If the above minimum values are noted, the system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage going into the diode from alternator, at the lead on the alternator side of the diode. (Illust. 5-7) If low or no voltage is experienced, replace the alternator.



5-7

(Read between Engine and Diode)

17.0 Volts A.C. – 2500 R.P.M.
21.0 Volts A.C. – 3000 R.P.M.
24.5 Volts A.C. – 3600 R.P.M.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.

16 AMP ALTERNATOR SYSTEM WITH EXTERNAL REGULATOR

CAUTION: FOLLOW ALL SAFETY PRECAUTIONS WHEN TESTING FOR A.C. VOLTAGE, ELECTRICAL SHOCK CAN KILL.

CHECKING THE SYSTEM: Open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

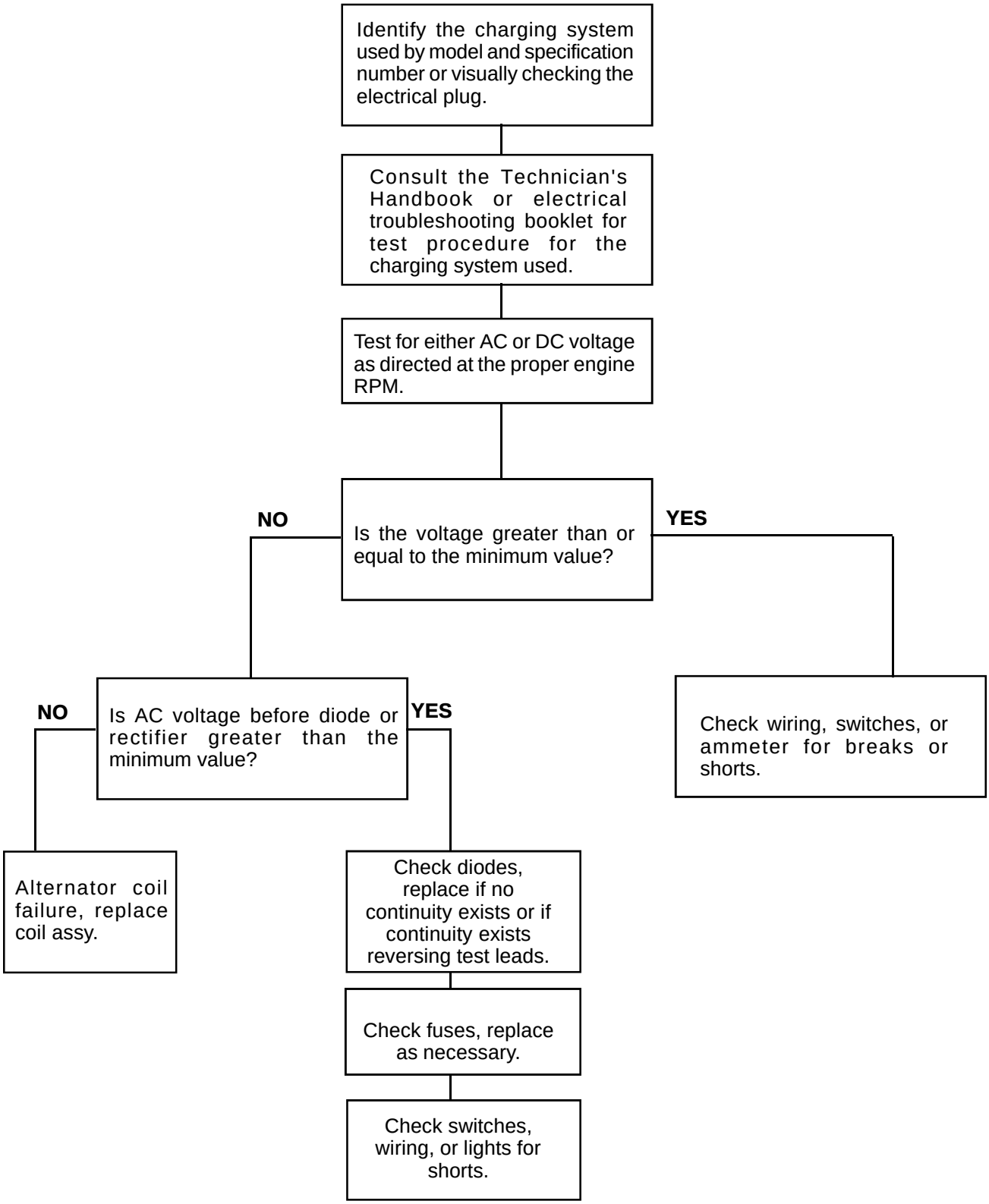
Disconnect the red D.C. output connector at the wiring harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier.

With the engine running, minimum values should read:

21.0 Volts A.C. – 2500 R.P.M.
26.5 Volts A.C. – 3000 R.P.M.
31.0 Volts A.C. – 3600 R.P.M.

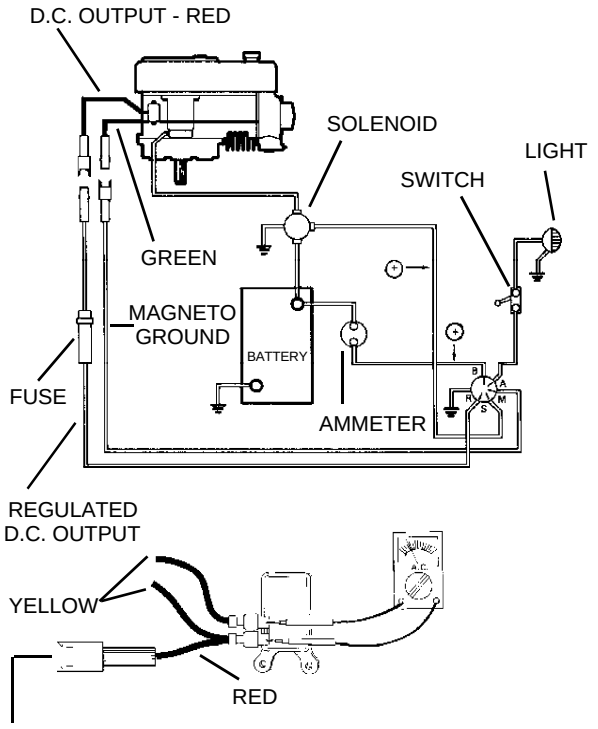
If the minimum values are noted, the alternator is operating properly. If less than the above values are noted, the alternator is defective.

TROUBLESHOOTING ELECTRICAL CHARGING CIRCUIT FLOW CHART



VOLTAGE REGULATORS

If a known good or load tested battery fails to maintain a charge, the charging system and the regulator can be checked using a voltmeter. Set the voltmeter on the 0-20 Volt D.C. scale and connect the probes across the battery terminals. Note the battery voltage. Start the engine, the voltage reading should increase from the noted battery voltage but not exceed 15 volts D.C. If no voltage increase is noted, proceed to make an A.C. voltage check using the applicable procedure. If the battery voltage exceeds 15 volts D.C., or the proper minimum A.C. voltage is noted during the check, replace the regulator. (Illust. 5-8)



NOTE: D.C. OUTPUT MUST BE DISCONNECTED TO PERFORM A.C. OUTPUT TEST.

5-8

FUEL SHUT-DOWN SOLENOIDS

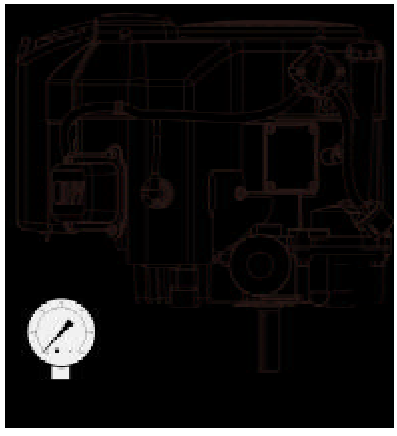
If the engine is running, the solenoid(s) can be checked by removing the electrical plug-in at the base of the solenoid. Almost immediately the engine should shut down, if not replace the solenoid.

Test the solenoid off the carburetor by applying 12 volt D.C. from the battery positive terminal to a solenoid terminal. Connect a jumper wire from the metal housing (or other terminal) to the negative battery terminal. The plunger should retract the full travel distance. Disconnect the negative jumper lead and the plunger should return to the extended position. (Illust. 5-9)

5-9

LOW OIL PRESSURE SENSOR TESTING

Test the sensor on a running engine using an ohmmeter or continuity tester. Disconnect the wire lead from the sensor. Connect one lead of the tester to the sensor terminal and the other to an engine ground. An open circuit should be found with the engine running and continuity should exist when the engine is shut off. If continuity is found with the engine running or the tractor oil pressure indicator light is on or comes on at low engine RPM's, remove the sensor and check engine oil pressure with a master oil pressure gauge. The oil pressure of a running engine should be above **10 p.s.i. (.700 bar)**. If below **10 p.s.i. (.700 bar)**, an internal engine problem may exist. (Illust. 5-10)



5-10

STARTING CIRCUIT

After all of the safety interlock switches have been activated, the starter switch closes the starting circuit. The electrical current running through the armature windings of the electric starter motor produces a strong magnetic force. The armature magnetism repels the magnetism produced by the permanent field magnets of the electric starter. The repelling magnetic forces cause the armature to rotate, moving the drive pinion laterally on the splined armature shaft. The rotating starter pinion gear then meshes with the flywheel ring gear. When the drive pinion contacts the stop at the end of the armature shaft, the pinion rotates along with the armature shaft to rotate the engine. The armature and pinion remain positively engaged until the engine fires and the flywheel rotates faster than the armature. The greater momentum of the flywheel throws the starter pinion gear out of mesh and forces the starter pinion back to the disengaged position. After the switch is released, the starting circuit is opened and the armature coasts to a stop. A small anti-drift spring holds the pinion in the disengaged position**.**

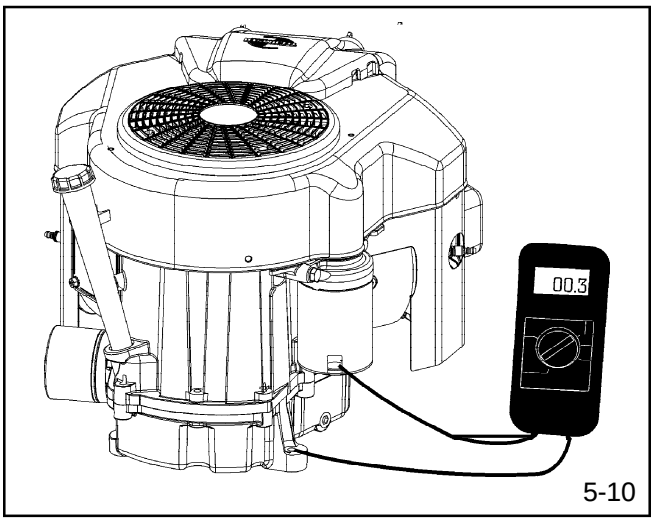
TESTING PROCEDURE STARTING CIRCUIT

⚠ CAUTION: FOLLOW ALL SAFETY PRECAUTIONS WHEN TESTING FOR A.C. VOLTAGE, ELECTRIC SHOCK CAN KILL.

1. Check the battery using an electrical load tester and following the tester's recommended procedure. Make sure the battery meets the minimum battery voltage requirements found in the original equipment manufacturer's service manual.

   NOTE: Load testers drawing no more than 50-60 amperes should be used.

2. Check the electric starter terminal for the required voltage (12 v D.C.) using a voltmeter. (Illust. 5-10)



5-10

3. Check wiring, connections, circuit breakers, fuses, ignition or starter switch, safety switches, and solenoid for continuity using an ohmmeter or continuity light. Repair or replace as necessary.

4. Isolate the engine from the equipment it is powering. Remove all equipment loads (belts, chains, and couplers). **TEMPORARILY** BY-PASS THE SAFETY INTERLOCK DEVISES.

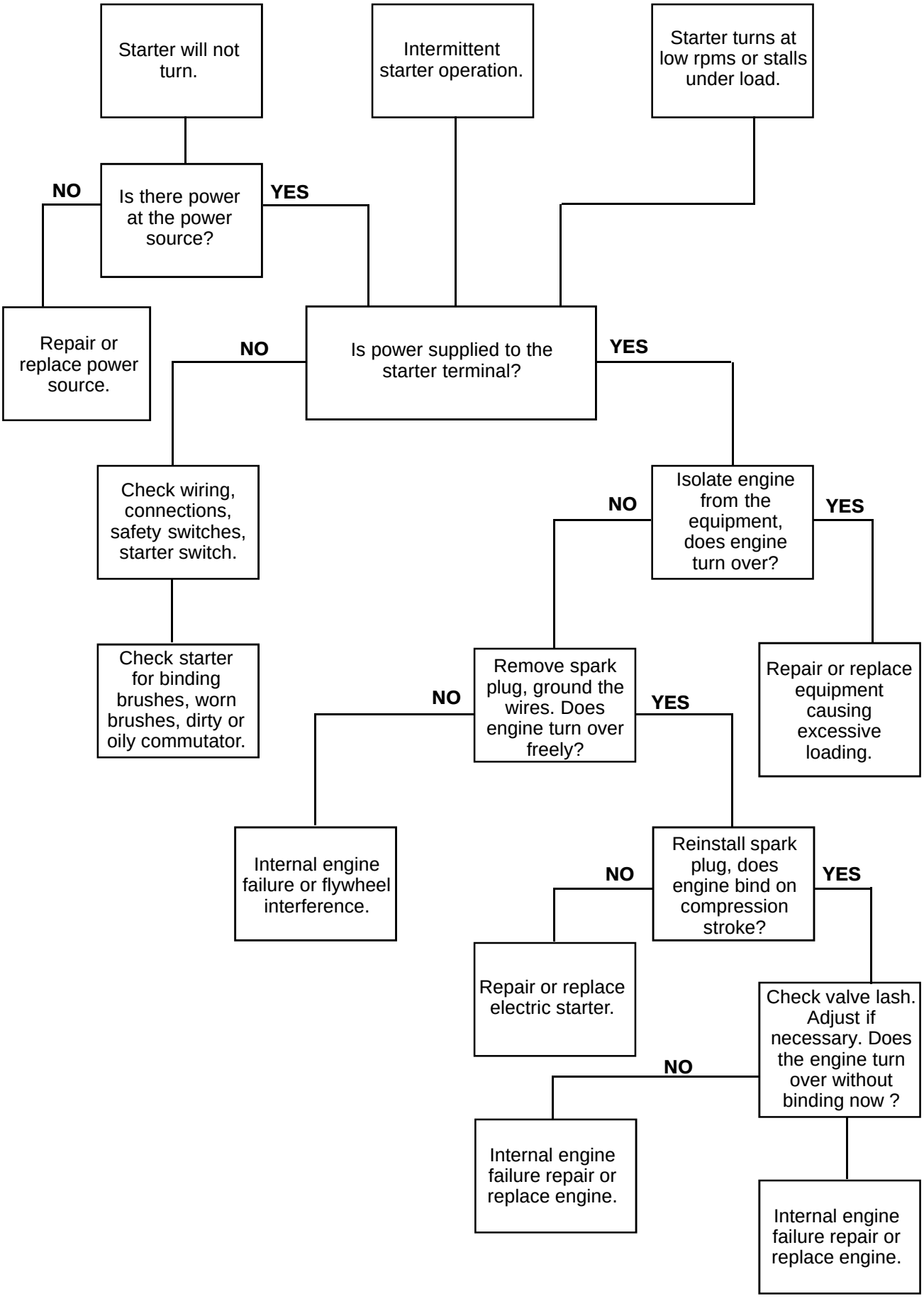
   NOTE: ALL safety switches must be in proper working condition. Repair or replace as needed.

5. If the engine binds only on the compression stroke, check the valve clearance per the specification table in Chapter 10. If the valve clearance is within the specifications, the compression release may require service. To diagnose the camshaft compression release, remove both valve covers and bring the engines number one cylinder up to TDC on the compression stroke. The exhaust valve should briefly open just before TDC. Repeat this procedure on the number two cylinder. If either of the exhaust valves do not open disassembly and removal of the camshaft will be required. See Chapter 7. Valve clearance not within the listed specifications will require adjustment of the rocker arms to obtain the proper clearance.

If the engine turns over freely, the electric starter should be replaced or disassembled and repaired if allowed under various country regulations. See "Service" in this chapter. If the preceding steps fail to correct the problem, the engine will require to be disassembled to find the mechanical failure. See Chapter 7 under "Disassembly Procedure".

If the engine does not turn over, a mechanical binding may be the cause. Check for proper lubrication, (oil level and viscosity) check the electric starter gear and flywheel ring gear interference. If no problem is discovered, the problem is an internal failure.

TROUBLESHOOTING ELECTRICAL STARTER CIRCUIT FLOW CHART



ELECTRIC STARTER SERVICE

This section covers the service procedures for 12 volt electric starters. For diagnosis of the starting circuit see **"Electrical Starter Troubleshooting"** in this chapter.

NOTE: Internal service may not be allowed under various country regulations. Outside the USA consult your local government authorities regarding servicing regulations.

12 VOLT ELECTRIC STARTERS

1. Remove the plastic dust cover on the bendix end. (Illust. 5-12)

5-12

2. Push down on the spring retainer and remove the retaining ring. (Illust. 5-13)

5-13

3. Slide off the spring retainer, anti-drift spring, gear, and drive nut. (Illust. 5-14)

5-14

4. If internal service is necessary (**non-CSA starters only**), scribe a line across the cap assemblies and armature housing to aid in reassembly. (Illust. 5-15)

5-15

5. Remove the through bolts holding the commutator end cap assembly on. (Illust. 5-16)

5-16

6. Slide off the end cap assembly. The starter terminal post insulator slides out of the commutator cap on some models. (Illust. 5-17)

5-17

7. Remove the armature.

8. Inspect and replace as necessary, see the section "Inspection and Repair" later in this chapter. Use the reverse procedure for assembly. For ease of assembly, place the armature into the brush end of the frame first.

INSPECTION AND REPAIR

1. The pinion gear parts should be checked for damage or wear. If the gear does not engage or slips, it should be washed in solvent (rubber parts cleaned in soap and water) to remove dirt and grease, and dried before reassembly. Also check the armature and drive nut splines for wear or damage.

2. The brushes and brush cardholder should be checked for wear. With the armature placed in the commutator end cap, and the brushes engaging the commutator surface, check the brushes for wear. Brushes should be replaced if the brush wire approaches the bottom of the brush holder slot. Brush springs must exhibit enough strength to keep tension on the brushes and hold them on the commutator.

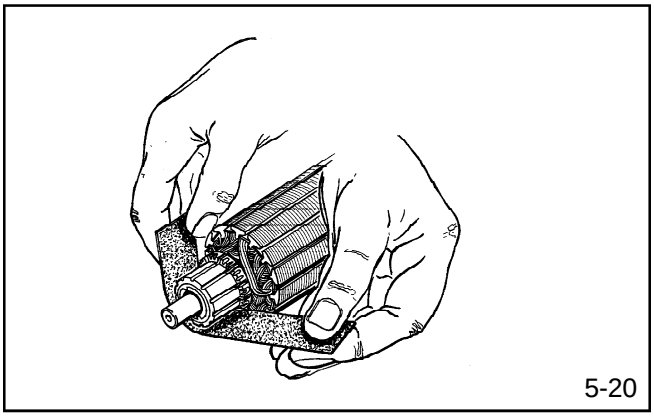
3. Using a continuity light or OHM meter, check field by attaching one lead to each of the field coil connections. Continuity should exist between these two points. (Illust. 5-18)

5-18

4. Use a continuity tester to make certain no continuity exists between the commutator copper and the iron of the armature. Rotate the armature and check out all of the commutator bars. (Illust. 5-19)

5-19

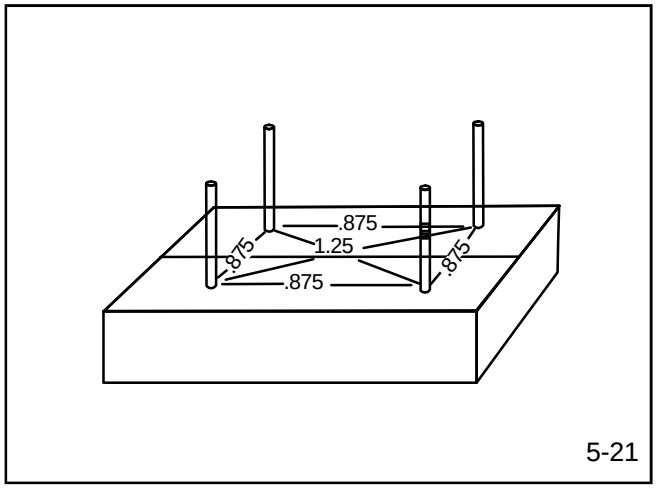
5. The armature should be checked for glazing or wear. If necessary the armature can be turned down in a lathe. While rotating, polish the commutator bars using a piece of 00 sandpaper. (Illust. 5-20) Light pressure and back and forth movement should be used. Re-cut the commutator bars to a depth equal to the width of the insulators between the bars.



5-20

BRUSH HOLDER

Install finishing nails into a block of wood according to the following diagram. (Illust. 5-21)



5-21

BRUSH REPLACEMENT

1. Remove the thru bolts holding the end cap in place.
2. Remove the end cap and thrust washer from the starter housing.
3. Note or mark the position of the brushes.
4. Remove the holding nut from the starter terminal post and remove the post and two brush leads.
5. Remove the remaining two brushes by sliding the retaining clips off the metal end cap.
6. Install the new brushes and springs onto the end cap.
7. Spread back the brushes and using the brush holder tool. Install the brush holder from the bottom up through the end cap.
8. Install the thrust washer on the end of the armature shaft.
9. Install the starter end cap. Secure with the thru bolts and remove the brush holder. Rotate the armature by hand to check for binding before installation on the engine.

CHAPTER 6. IGNITION

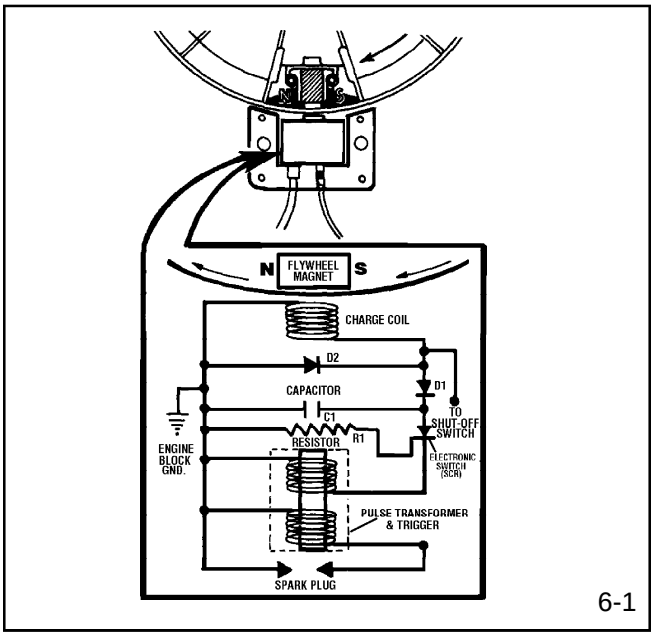
GENERAL INFORMATION

The ignition system consists of flywheel magnets, flywheel key, charge coil, capacitor, resistor, a silicon controlled rectifier, pulse transformer, trigger coil, high tension lead, and a spark plug. Everything except the flywheel magnets, flywheel key and spark plugs are located in an encapsulated solid state Capacitor Discharge Ignition module (CDI), outside of the flywheel. This system requires no maintenance other than periodic inspection of the spark plugs and high-tension leads.

OPERATION

SOLID STATE IGNITION SYSTEM (CDI)

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. The energy is stored in the capacitor (approx. 200 volts) until an electrical switch (SCR) releases it. As the magnet continues to rotate, it passes a trigger coil where a low voltage signal is produced. This low voltage signal closes the SCR switch, allowing the energy stored in the capacitor to flow to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage follows along the high-tension lead to the spark plug where it arcs across the electrodes and ignites the air-fuel mixture. (Illust. 6-1)



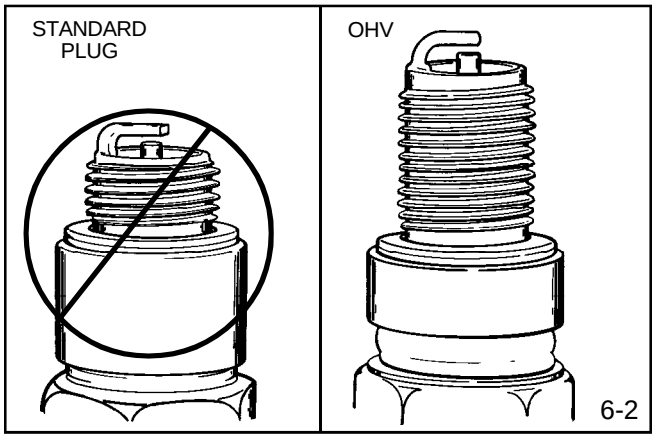
6-1

COMPONENTS

The **solid state module (CDI)** is a complete unit that includes the laminations, SCR, capacitor, resistor, pulse transformer, charge coil, trigger coil, and spark plug high tension lead.

The **spark plug** is made up of two electrodes. The outside electrode is grounded and secured to the threaded sleeve. The center electrode is insulated with porcelain. The two are separated by an air gap, which creates a resistance. A large voltage from the module arcs the air gap, which causes a spark and ignites the air-fuel mixture in the cylinder. (Illust. 6-2)

NOTE: Always consult parts breakdown for the correct spark plug and reach.



6-2

The **flywheel** holds the flywheel magnets in a constant position. It also provides rotational mass to smooth out the effects of the engines power stroke.

The **flywheel magnets**: provides the magnetic flux (or field) which is necessary to induce voltage and trigger the module to provide spark.

The **flywheel fins** create air flow to cool the engine.

The **flywheel key** locates the flywheel to the crankshaft in the proper position for ignition timing. **Note:** A sheared or partially sheared flywheel key can cause kickback or a No start condition.

NOTE: Always replace flywheel keys by model and specification number. Keys that look similar may have different timing dimensions or shear strengths.

TESTING PROCEDURE

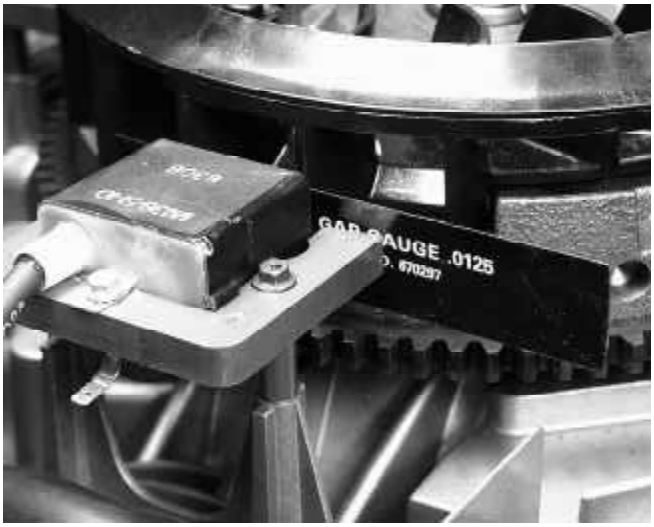
1. Check for spark using an ignition tester and following the tester's recommended procedure. **NOTE:** The ignition will have spark even with a sheared key, but the timing will not be correct.

CAUTION: KEEP ALL COMBUSTIVE SOURCES AWAY. AVOID THE SPRAY FROM THE SPARK PLUG HOLE WHEN CRANKING THE ENGINE OVER AND MAKE SURE THE PLUG WIRES ARE PROPERLY GROUNDED TO THE DEDICATED RETAINING POSTS.

2. Check the spark plugs for proper reach, cracks in the porcelain, pitted or burned electrodes, excessive carbon buildup, and proper **.030" (.762 mm)** air gap setting. Replace if questionable. Attempt to start and run the engine. If the engine will not start or run properly proceed to step #3.

3. Attach the spark plug wire(s) to an ignition tester and ground the tester(s) as in step #1. Remove the blower housing, disconnect the ignition grounding leads at the ignition modules. Reinstall the blower housing for safety and crank the engine over. If spark occurs, check the ignition switch, safety interlock switches, or electrical wiring for shorting to ground.

4. Check the air gap between the flywheel magnets and the laminations of the ignition modules. It should be **.0125" (.3175 mm)** use gauge part 670297. (Illust. 6-3)



6-3

5. Check the flywheel magnets for the proper strength. Hold a screwdriver at the extreme end of the handle with the blade down, move the blade to within **3/4 inch (19.05 mm)** of the magnets. If the screwdriver blade is attracted to the magnets, the magnetic strength is satisfactory. (Illust. 6-4)

6-4

6. Examine the ignition modules and lamination assembly for cracks in the insulation or other damage, which would cause shorts or leakage of current.

7. Check the operation of the ignition module using an approved tester following the instructions furnished with the test unit.

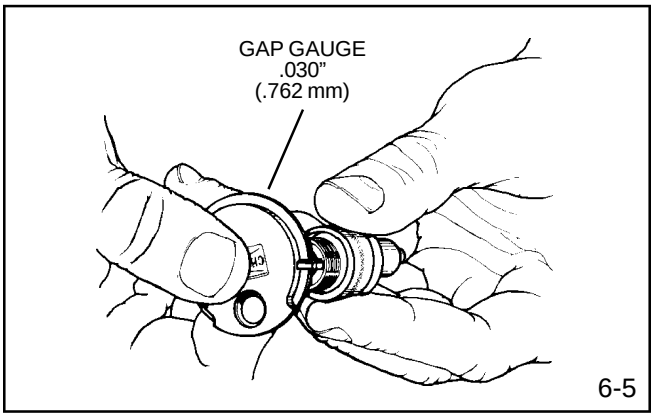
Ignition modules are permanently attached to the lamination and must be serviced as an assembly.

SERVICE

SPARK PLUG SERVICE

Spark plugs should be removed, inspected and adjusted periodically. Replace the spark plugs every 100 hours or annually.

Check the air gap(s) with a spark plug gap gauge and adjust accordingly. Set the spark plug gap at **.030" (.762 mm)**. (Illust. 6-5)



6-5

Replace the plug if the points on the base of the plug are pitted or burned, or if the porcelain is cracked anywhere. When reinstalling the plug make sure it is clean and free of all foreign material.

NOTE: NEVER use a sand blaster to clean plugs, microscopic particles left in the plug can score the engine cylinder during operation. Use a solvent and a wire brush to clean. Using eye protection, blow out thoroughly with compressed air.

Replace the spark plug with the proper spark plug. Consult the parts breakdown for the spark plug to be used in the engine being serviced.

Install the spark plug, being careful not to cross thread. Tighten the spark plug to **21 foot pounds (28 Nm) of torque**. If a torque wrench is not available, turn the spark plug in as far as possible by hand, then use a spark plug wrench to turn the plug 1/2 turn further. If installing a used plug, only 1/8 to ¼ turn after seat is needed.

CONDITIONS CAUSING FREQUENT SPARK PLUG FOULING

1. Air cleaner is restricted. (Replace)
2. Partially closed choke shutter. (Check operation)
3. Poor grade of gasoline. (87 octane minimum)
4. Improper fuel. (Old, stale or mixed)
5. Restricted exhaust system. (Remove and inspect muffler for restrictions or loose baffles)
6. Incorrect spark plugs. (Check reach and number)
7. Incorrect spark plug gap. (Adjust gap)
8. Oil level is too high, or the breather is restricted.
9. Worn piston rings.
10. Weak ignition system. (Air gap to wide, partially grounding wires or faulty safety switches)

IGNITION TIMING

In order for an engine to run efficiently, the spark must ignite the compressed air-fuel mixture when the piston is in a specific position to deliver maximum power. This position is known as Before Top Dead Center (BTDC). If the mixture is ignited too soon, kickback can be experienced due to pre-ignition. If the mixture is ignited too late, loss of power can be experienced due to retarded spark. A partially sheared or the wrong flywheel key can cause kickback, loss of power, or an inability to start the engine. Check the flywheel key if one of these symptoms exist. See Chapter 7 under “Service” for the disassembly procedure.

Timing on a solid state module is not adjustable. The proper air gap of **.0125" (.3175 mm)** using Tecumseh part 670297 and the correct flywheel key in good condition are the only timing variables. Set the gap by placing the gauge between the flywheel magnets and the laminations of the module. Tighten the mounting screws to **45-In. lbs. (5 Nm**). Remove the air gap gauge and rotate the flywheel slowly by hand to check for any possible striking points. (Illust. 6-6)

6-6

SERVICE TIPS

DO NOT:

- Interchange flywheels, flywheel keys, or spark plugs.
- Use flywheel fans with cooling fins that are damaged or broken off.
- Use a standard business card as an air gap gauge.
- Attempt to attach the spark plug lead back into a solid state module.
- Store a solid state module within **20 feet (6.1 meters)** of an unshielded welder.

CHAPTER 7. INTERNAL ENGINE AND DISASSEMBLY

GENERAL INFORMATION

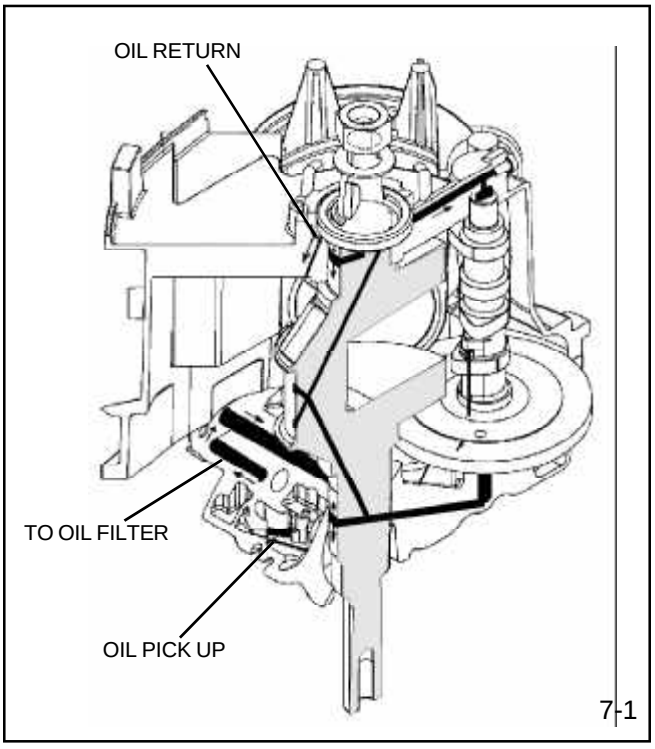
This chapter covers the cylinder block, piston and rod assemblies, cylinder heads, crankshaft, camshaft, valve train, breather, cylinder cover, flywheel, and lubrication systems. The internal governor systems are covered in Chapter 4.

The TVT series engines are made using aluminum alloy die cast around a cast iron cylinder liners.

LUBRICATION SYSTEMS

The TVT series engine uses an automotive type rotary pump. Oil is drawn up to the pump from the pump inlet screen area in the mounting flange cover/sump. Oil is then pressurized and directed through the oil filter (if equipped). This engine differs from OHV single cylinder models in that the flange cover/sump bearings are also pressure lubed.

From the oil filter the oil flows through the feed passages to all crankcase bearings starting with the lower cam and lower main bearing. The crankshaft has an undercut around the bearing surface, which aligns with the oil feed galley passage. The drilling of the crankshaft creates the passage to the connecting rod bearings and the upper main bearing. The upper camshaft bearing is fed oil by a passage from the upper main bearing. See flow passage (Illust. 7-1)



7-1

DISASSEMBLY PROCEDURE

1. Disconnect the high-tension leads from the spark plugs. Remove the spark plugs. Evaluate each of the spark plug(s) condition, for tips on areas specifically in need of repair.

2. Drain the oil from the crankcase. Drain or shut off the fuel supply and disconnect the fuel line at the pump or carburetors.

3. Remove the negative battery lead. Remove the positive cable to the starter. Unplug the charging/ ignition shut-off wires and the fuel shut-off solenoid wires.

4. Remove the electric starter motor from the engine.

5. Disconnect the exhaust system from the engine.

6. Remove the air cleaner assembly. (Cover, Filters, deflector, control cover and air filter body). (Illust. 7-2)

7-2

7. Remove the flywheel-rotating screen.

8. Remove the blower housing by first removing the screw holding the dipstick tube and fuel pump to the blower housing. Remove the remaining three bolts holding on the blower housing.

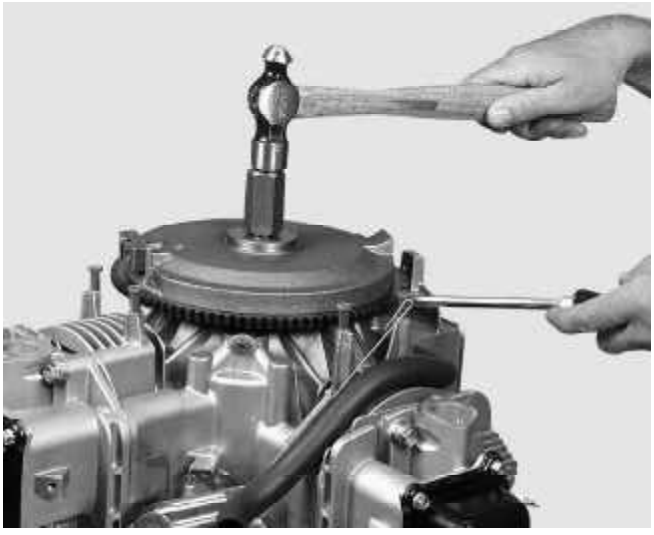
9. Unplug the ignition ground wire from the terminal on top of the ignition modules and remove the ignition modules.

10. Locate the piston at top dead center (TDC) on the number one cylinder (lowest cylinder) at the compression stroke for easier valve train service.

11. Remove the flywheel nut, washer, and fan. Use part 670305 strap wrench to hold the flywheel from turning. (Illust. 7-3) Thread a flywheel knock-off tool part 670329 (3/4") on the crankshaft until it bottoms out, then back-off one complete turn. Apply light upward pressure under the flywheel using a screwdriver or prybar. **NOTE:** Avoid contact with the alternator coils or internal flywheel magnets. Tap sharply and squarely on the knock-off tool to break the flywheel loose. If necessary, rotate the flywheel a half turn and repeat until loose. (Illust. 7-4)

    NOTE: Do not use a jaw type puller to remove flywheel.

7-3

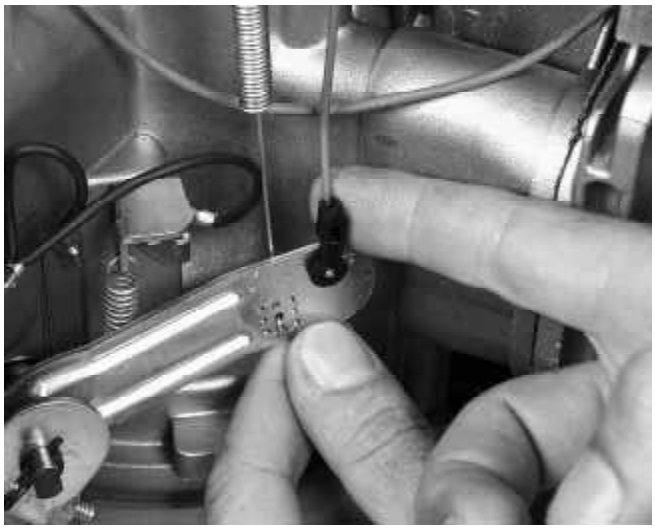


7-4

12. Remove the flywheel key and alternator charge coil.

13. Mark all governor linkage positions, or draw a sketch of their positions to help in re-assembly. See Chapter 4, Governor & Linkage.

14. Remove the governor spring. Separate the link connector bushing clip from the throttle link at the governor lever. (Illust. 7-5)

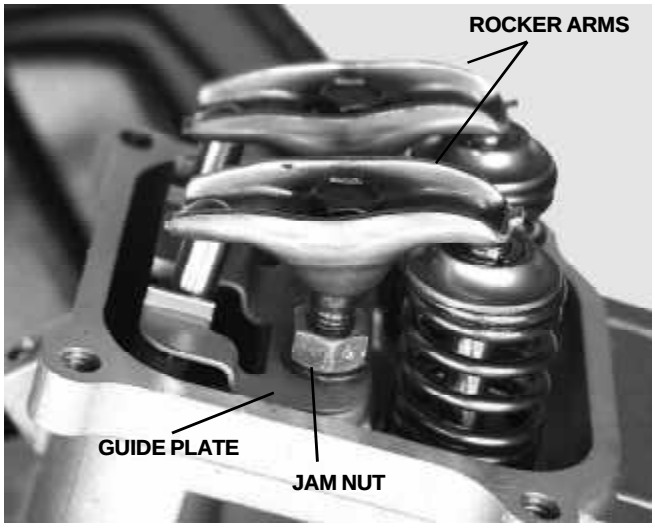


7-5

15. The intake manifold may now be removed as a complete assembly (manifold and carburetors). Disconnect the remaining wiring harness connections and remove the four intake mounting screws.

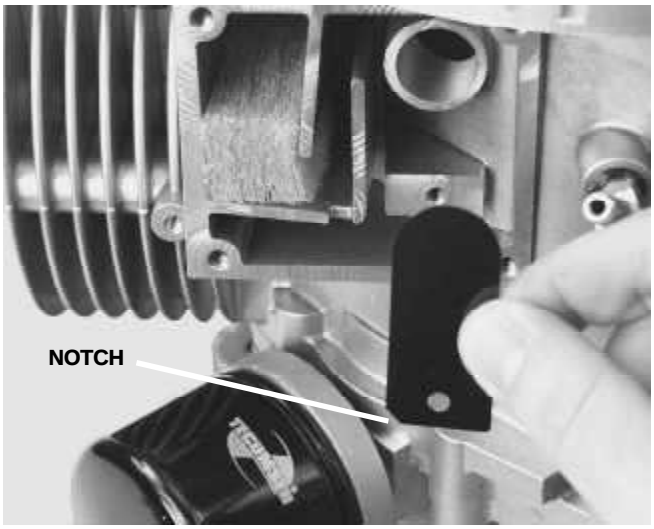
16. Remove the rocker arm covers exposing the valve train. The covers and cylinder head assembly are best removed one at a time to prevent a mixture of parts from one to another.

    Removal of the push rod guide plate is required to access one of the head bolts. Remove the rocker arms by first loosening the locking jam nut, then removing the rocker stud followed by the rocker arms, rocker guide plate, and push rods (Illust. 7-6). Remove the head bolts, head, and head gasket.



7-6

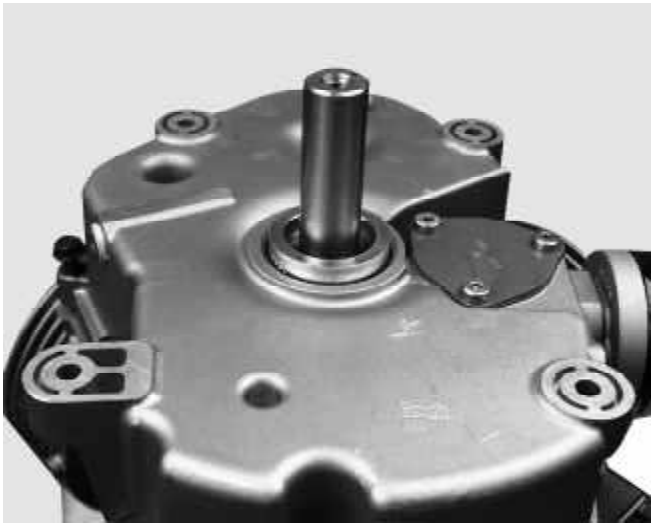
17. Remove the crankcase breather cover plate, reed valve and limit plate. **NOTE:** The reed valve is notched. This notch must face the cylinder head side of the engine for proper function. (Illust. 7-7)



7-7

Also note the breather element. It consists of three sections separated by blue lines. These lines must be in a vertical position when installed into the breather cavity.

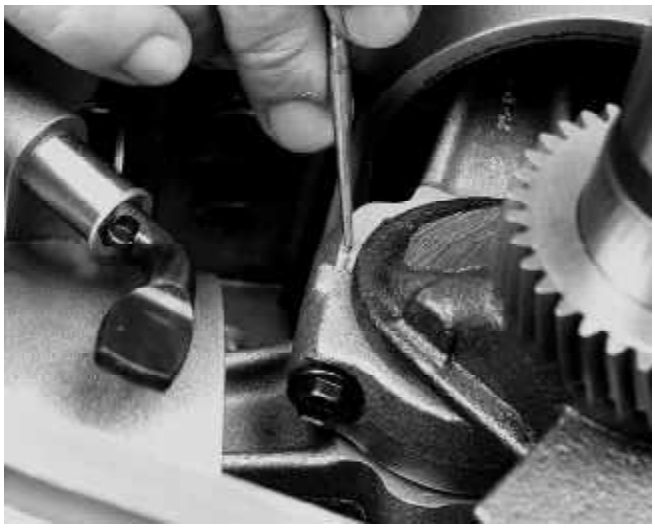
18. Using a 670330 seal protector remove the cylinder flange cover/sump with the oil pump in tact. The crankshaft must be free of rust or scale to slide the flange cover/sump over the crankshaft. (Illust. 7-8)



7-8

19. Remove the camshaft and lifters. It is not necessary to mark the lifters as to their original location.

20. Before removing the connecting rods and pistons, scribe a mark on both the connecting rod and rod cap of the assembly nearest the PTO side. This marking will aid in reassembly, assuring the correct rod cap is mated with the correct rod and cylinder bore. (Illust. 7-9) Also remember to remove any carbon build-up from the top of the cylinder bore before piston removal.



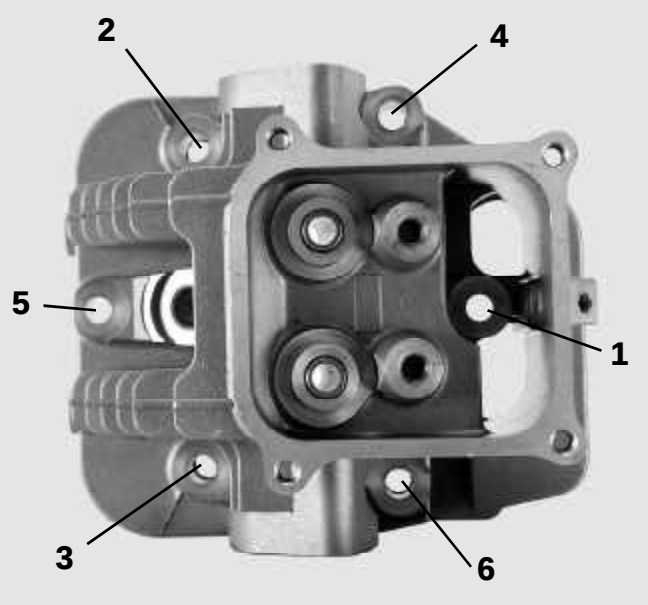
7-9

21. Use a **670330** seal protector on the flywheel end crankshaft seal, and remove the crankshaft.

NOTE: Removal of one piston and connecting rod assembly must be accomplished before the crankshaft can be removed.

DISASSEMBLY OF CYLINDER HEADS

Before beginning service of the cylinder head check for warpage by placing the head on a precision flat surface. If warped in excess of **.005" (.127 mm)**, replace the head. Slight warpage can be corrected by placing a sheet of #400 wet /dry sandpaper on a precision flat surface and rubbing the head gasket surface in a circular pattern until the entire gasket surface shows evidence of sanding. A small amount of honing oil on the sandpaper will make it easier to slide the head. Always replace the head gasket and torque the head bolts to specification in **60-inch pound (6.7 Nm)** increments, following the torque sequence in (Illust. 7-10).



7-10

NOTE: When servicing the valves, all carbon should be removed from the valve head and stem. Before attempting to remove the valves check that the top of the stem is free of burrs. If you find burrs or a lip use a file to break the edge then remove the valve.

Disassembly of the cylinder heads is best done one at a time to prevent mixing valves from one head to the other. Place a shop towel or other similar soft product under the valve heads to prevent damage. You may remove the valve spring retainers from the head using a commercially available valve spring compressor, (Illust. 7-11) or to release the valve keepers from the retainer, tap the retainer with a **3/4" (19 mm)** deepwell socket and hammer. (Illust. 7-12) Be careful not to strike to hard which could push the valve head into the surface causing damage.

7-11

7-12

VALVES

Specification	English	Metric
Min Valve Stem Dia.		
Intake	.3095	7.861
Exhaust	.3080	7.823
Min Valve Face	.031	.794
Max Valve Guide Inside Dia.	.316	8.026

Valve condition is critical for proper engine performance. The valves should be inspected for both sealing, and wear.

Clean and inspect each valve face for distortion or corrosion. Check the valve stem for wear. (Illust. 7-13) Replace valve if stem diameter is less than: Intake **.3095 (7.861 mm)** Exhaust **.3080 (7.823 mm).**

7-13

If the valves have been checked and are in a usable condition, the valve face should be ground at a 45 degree angle. If after grinding the valve face the top margin is less than **.03125 (.794 mm)**, the valve should be replaced. (Illust. 7-14)

7-14

The valves are not identical. Valves marked “EX” or “X” are installed in the exhaust valve location. Valves marked “I” are installed in the intake valve location. If the valves are unmarked, the smaller valve (head) is installed in the exhaust valve location.

VALVE GUIDES

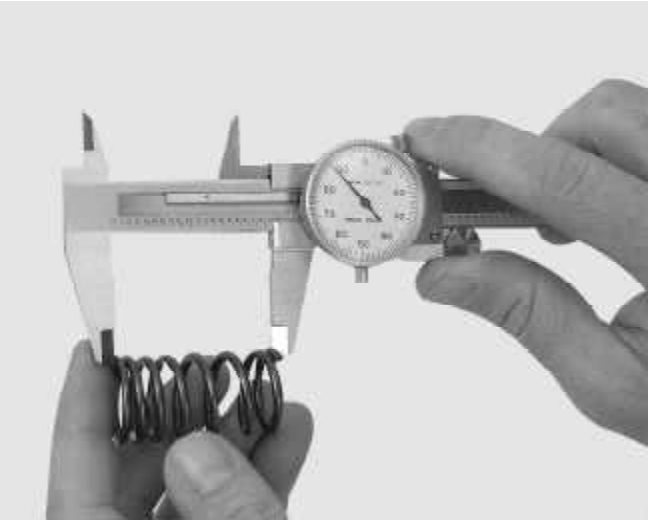
The valve guides are not replaceable but should be checked for wear. Using a split ball gauge and a micrometer, measure the inside diameter of the valve guides. (Illust. 7-15) This measurement should not exceed **.316 (8.026 mm)** If a guide is found to be out of specification the cylinder head will need to be replaced as a complete assembly.

7-15

VALVE SPRINGS

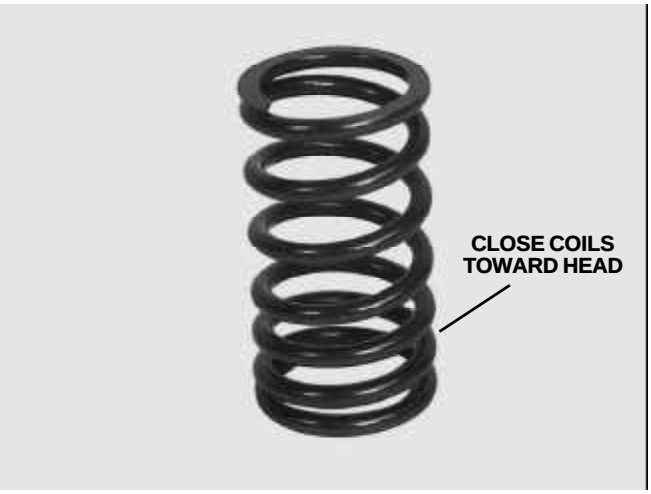
Specification	English Std.	Metric
Valve Spring Free Length	1.935 - 1.995	49.15 - 50.67

The valve springs should be checked for both ends being parallel and the free length being **1.935/1.995 (49.15/ 50.67 mm).** Replace the springs if less than the specification. (Illust. 7-16)



7-16

The valve springs are progressively wound. Meaning one end of the spring has the coils closer together. When installing the valve spring these coils must be opposite the cap and retainer. (Illust. 7-17)



7-17

PUSH RODS

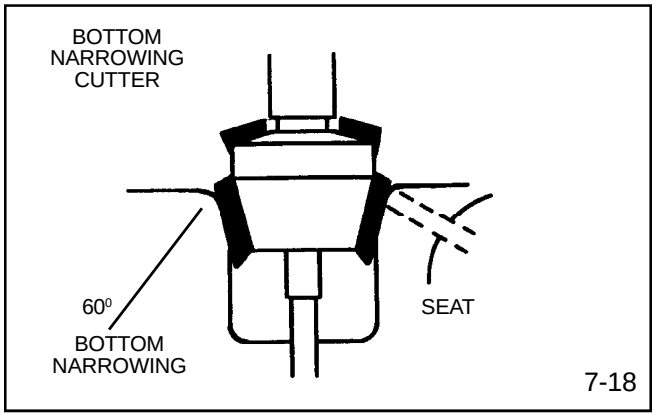
The push rods should be checked for straightness and the ends for wear. If the push rod ends are worn or damaged, inspect the corresponding rocker arm socket or valve lifter for wear. Replace if necessary.

VALVE SEATS

Valve seats are not replaceable. If they are burned, pitted, or distorted they can be reconditioned using a grinding stone or a valve seat cutting tool. Valve seats are ground to a width of **3/64" (1.191 mm)** at 46 degrees.

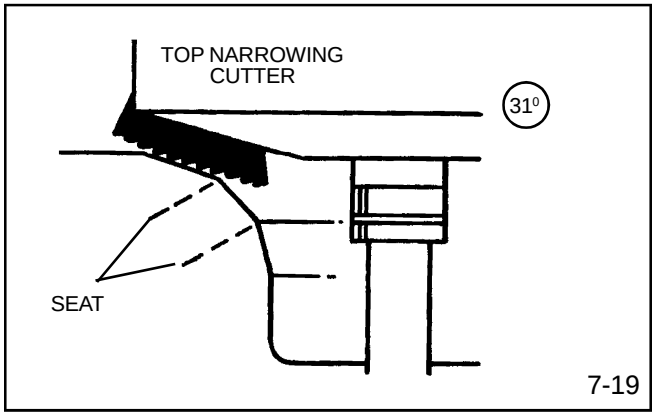
The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different cutters.

First, use the 60 degree cutter to clean and narrow the seat from the bottom to the center. (Illust. 7-18)



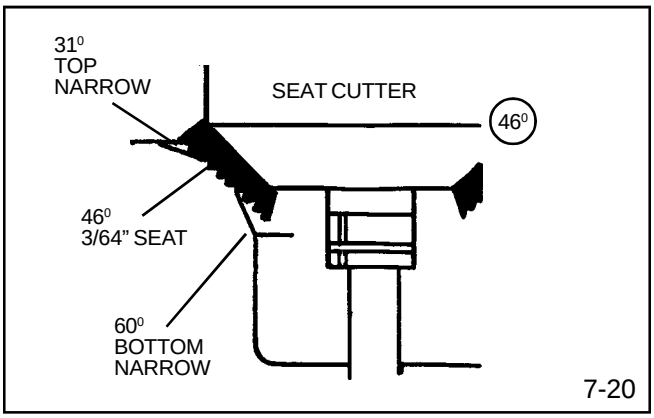
7-18

Second, use the 31 degree cutter to clean and narrow the seat from the top toward the center. (Illust. 7-19)



7-19

Third, use the 46 degree cutter to cut the seat to a width of **.078125 (1.191 mm)** (Illust. 7-20). Check the contact area of a new or reconditioned valve face on a finished valve seat. Cover the valve face with a black permanent marker. Insert the valve and turn back and forth in the seat about **1/8" (3mm)** with light pressure. A fine thin line should appear on the valve face. The contact area or line should be continuous on the upper 1/3 of the valve face.



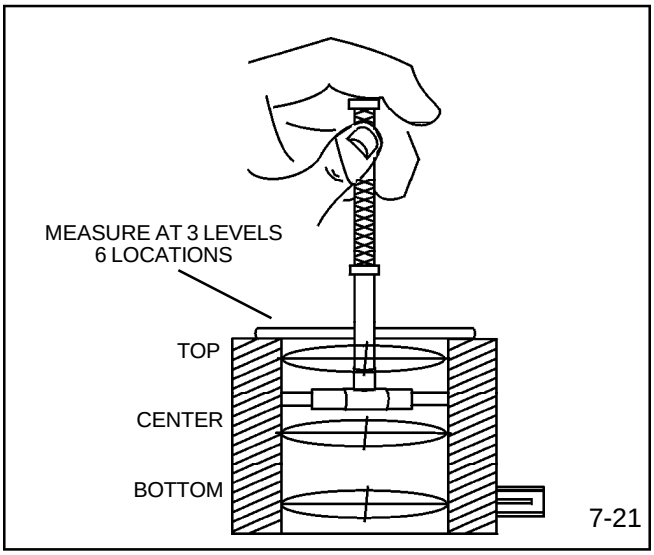
7-20

INTERNAL ENGINE COMPONENT INSPECTION

CYLINDERS

Visually check the cylinders for broken or cracked fins or a severely damaged cylinder bore. Check all bearing areas for wear or scoring.

Use a dial bore gauge or telescoping transfer gauge with a micrometer to accurately measure the cylinder bore condition. Measure the center of the piston travel area and approximately **1/2" to 3/4" (12.7 - 19.05 mm)** from the top and the bottom of each cylinder. Measure at 90 degrees to the piston pin, and even with the piston pin at each level. (Illust. 7-21)

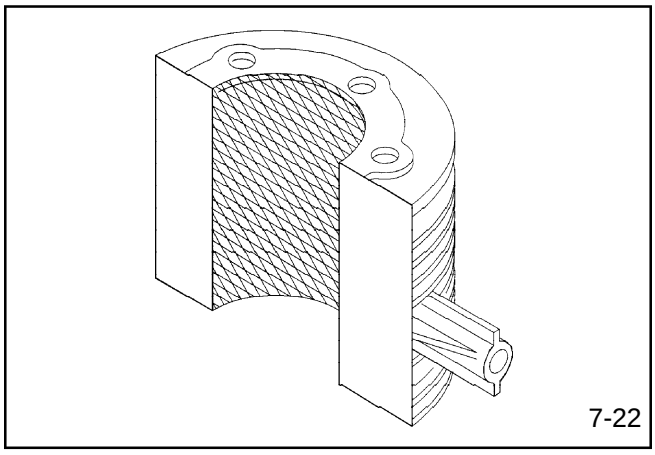


7-21

A rigid type hone is recommended to "true" any minor cylinder irregularities. If the cylinder bore is worn, scored or out of round more than **.005" (.127 mm)** oversize, it should be re-sized to **.010" or .020" (.254-.508 mm)** oversize. In some cases engines are built with oversize cylinders in manufacturing. If the cylinder is oversize, the oversize value will be imprinted in the top of the cylinder casting.

If you have determined the cylinders are within tolerance to hone, proceed as follows. Use a commercially available rigid hone of the proper size. Chuck the hone in a drill press with a spindle speed of approximately 600-RPM. Start with coarse stones and center the cylinder under the drill press spindle. Lower the hone so the lower end of the stone contacts the lowest point in the cylinder bore. Hone the cylinder using lubrication until you have full cylinder contact.

Change the stones to 380 grit for finish honing. Run the hone up and down the full length of the cylinder at approximately 50 strokes per minute. Every fourth or fifth stroke, move the hone far enough to extend the stones one inch beyond the top and bottom of the cylinder bore. At this rate you should achieve a crosshatch pattern between 35-45 degrees. (Illust. 7-22)


7-22

NOTE: Always use honing oil to lubricate and cool the stones. This will also help obtain the best finish.

If cylinder oversizing is needed we recommend boring the cylinders with a commercial boring bar. Many Authorized Service Dealers and machine shops offer this service. Before you choose this method we recommend costing out a short block replacement, which may be more cost effective.

Clean the cylinder and crankcase with warm, soapy water and a stiff brush. Rinse thoroughly with clean water, and dry. Continue the cleaning procedure until a clean white cloth wiped on any internal surface reveals no honing residue or dirt. Coat the cylinder bore lightly with oil.

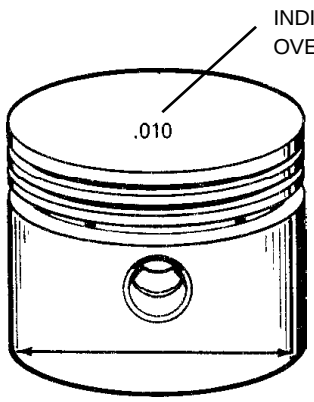
Replace the piston and the piston rings with the correct oversize parts as indicated in the parts manual, microfiche or computer parts look-up systems.

PISTONS, RINGS, AND CONNECTING RODS

PISTON

Specification	English Std.	Metric
Piston Diameter	3.1220 3.1235	79.2988 79.3369
Pin (Piston) Diameter	.6248	15.870
Piston Pin Bore Diameter	.6251 .6257	15.878 15.893
Piston Ring Grooves Top and Center	.0645 .0665	1.638 1.689
Piston Ring Groove Bottom	.1255 .1275	3.189 3.239

Clean all carbon from the piston top and the ring grooves before measuring. Visually inspect the piston skirt area for scoring or scratches. If scoring or deep scratches are evident, replace the piston. The pistons should be checked for wear by measuring near the bottom of the skirt 90 degrees from the piston pinhole. (Illust. 7-23)



PISTON MEASUREMENTS ARE TAKEN AT BOTTOM OF SKIRT 90^0 FROM WRIST PIN HOLE 7-23

If the cylinder bore needs re-sizing, an oversize piston will be necessary. Oversize pistons are identified by the decimal oversize value imprinted on the top of the piston. (Illust. 7-24)

7-24

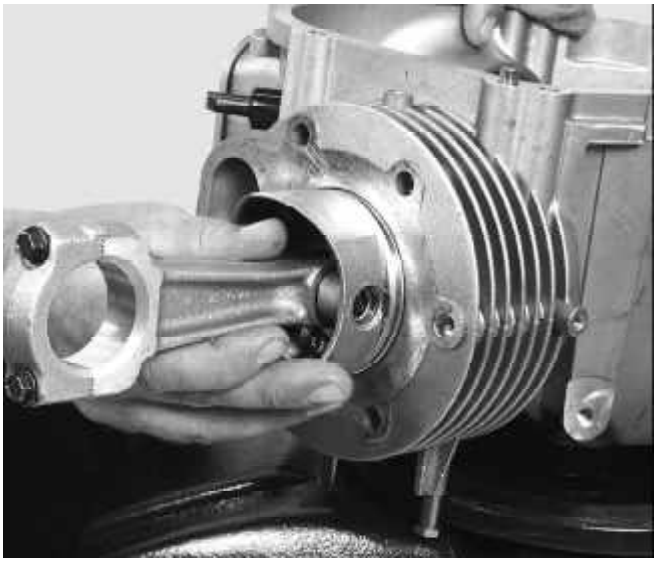
Check the piston ring, side clearance using a feeler gauge and a new ring. (Illust. 7-25)

7-25

RINGS

Specification	English Std.	Metric
Piston Ring Side Clearance	.002-.005 Top .001-.004 Center .001-.004 Bottom	.051-.127 Top .025-.102 Center .025-.102 Bottom
Piston Ring End Gap	.007-.015 Top .013-.021 Center .005-.013 Bottom	.178-.381-Top .330-.533 Center .127-.330 Bottom

After the cylinder bore diameter has been checked and is acceptable to rebuild, the ring end gap should be checked using new rings. Place a new compression ring squarely in the center of the ring travel area. Use the piston upside down without rings to push the ring down in the cylinder. (Illust. 7-26) Measure the gap with a feeler gauge. (Illust. 7-27) The ring end gap must be within specification to have adequate oil control.



7-26

7-27

NOTES:

1. A difference exists in piston ring end gaps between the upper and center compression rings. Check the specification table for the appropriate ring end gap.

2. Use a ring expander (Tecumseh tool part number 670117) to replace the piston rings. Do not spread the rings too wide or breakage will result.

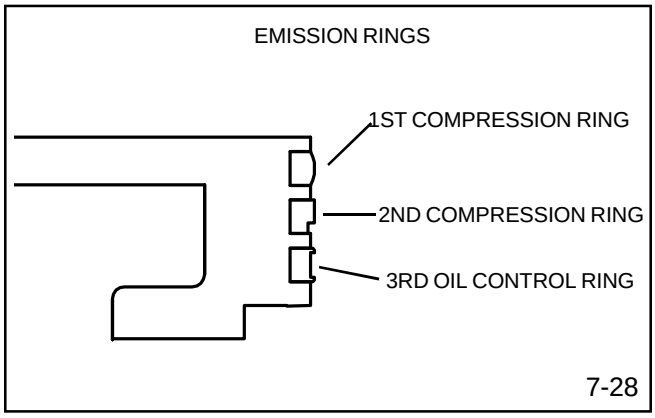
3. If installing new rings on a used piston, piston ring side clearance must be checked.

4. Always replace the rings in sets.

5. Always install the piston and ring assembly in the cylinder bore with the ring end gaps staggered.

6. When installing new rings in a used cylinder, the cylinder wall should be de-glazed using a commercially available de-glazing tool or hone with 380 grit stones. The crosshatch pattern should be 35-45 degree's.

The emission ring set used on the TVT consists of two compression rings and an oil control ring. The top compression ring is barrel faced on the outside. This ring can be installed with either side up. The second compression ring will have an outside notch, which must face down or towards the piston skirt. The oil control ring can be installed with either side up. (Illust. 7-28)



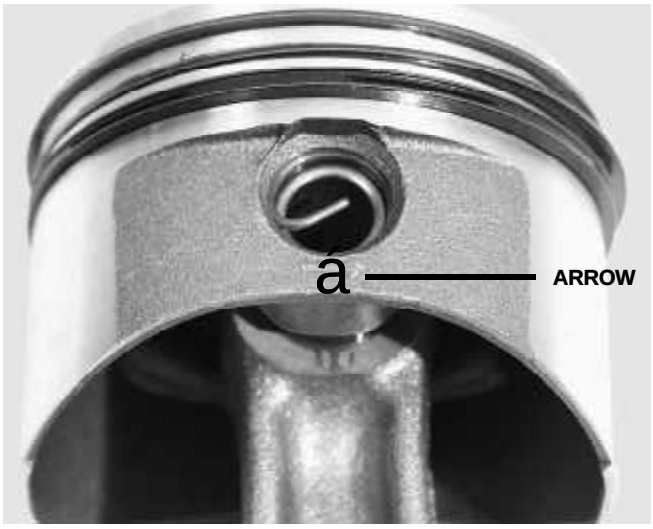
7-28

CONNECTING RODS

Specifications	English Std.	Metric
Connecting Rod Journal Diameter	1.6223 1.6228	41.206 41.219
Connecting rod Diameter Piston Pin End	.6251 .6256	15.878 15.890
Connecting Rod Thrust Face	.988 .996	25.095 25.299
Connecting Rod Thrust Clearance With Both Rods On Crankshaft	.006 .027	.1510 .6858

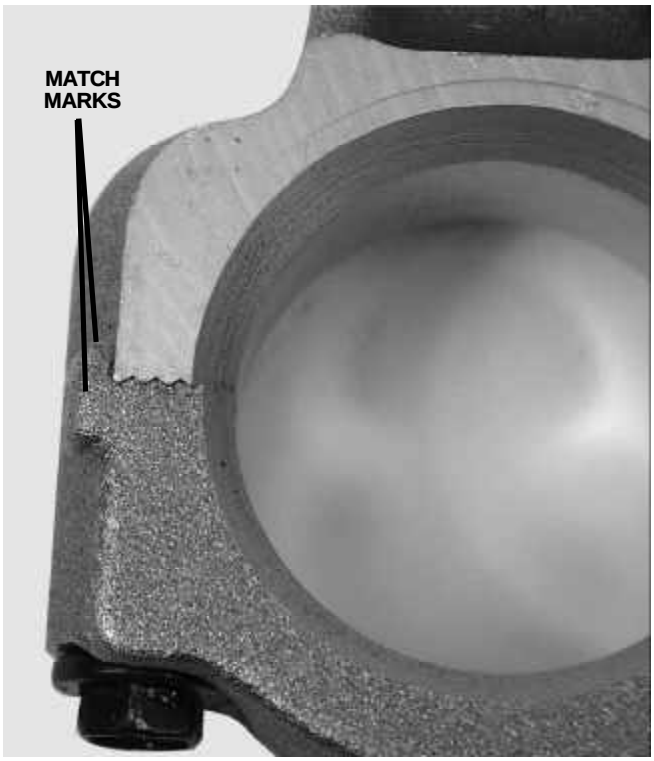
The TVT engine is designed with offset piston pins (not centered). This aids to centralize the combustion force on the piston. When installing the connecting rod to the piston it is critical that the rod be installed correctly.

1. Locate the marking (ARROW) on the side of the piston assembly. (Illust. 7-29)



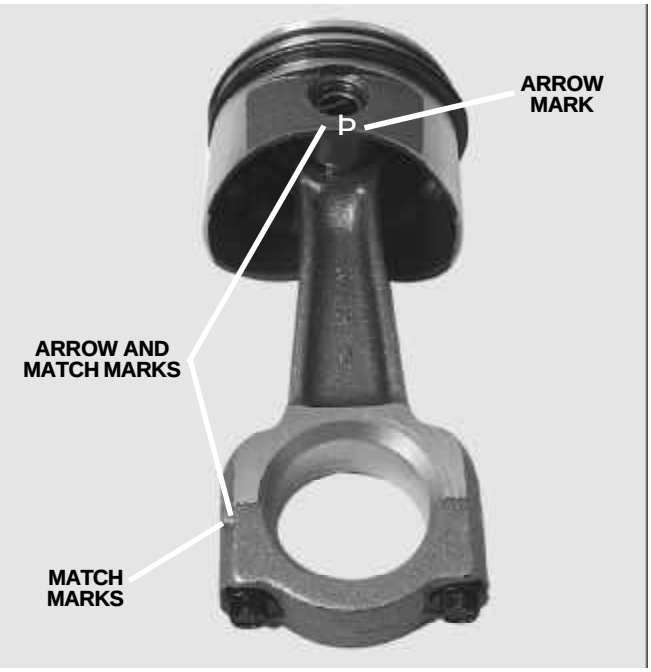
7-29

2. Locate the match marks on the connecting rod assembly. (Illust. 7-30)



7-30

3. Position the connecting rod match marks and the arrow on the piston assembly to be on the same side, and assemble. (Illust. 7-31)



7-31

4. When installing the piston and rod assembly in the engine the match marks must align and face out.

CRANKSHAFTS AND CAMSHAFTS

Inspect the crankshaft visually and with a micrometer for wear, scratching, scoring, or out of round condition at the bearing surfaces. Check for bends on the PTO end using a straight edge, square or a dial indicator.

Specifications	English Std.	Metric
Crankshaft end play	.0053 - .025	.1364 - .6350
Crankshaft connecting rod journal thrust width	1.998 2.003	50.749 50.876
Connecting rod bearing diameter crankshaft end	1.6234 1.6240	41.235 41.249
Main bearing journal dia. Flywheel and PTO end	1.6245 1.6250	41.263 41.275

CAUTION: NEVER ATTEMPT TO STRAIGHTEN A BENT CRANKSHAFT.

Inspect the crankshaft oil galleys for blockage or obstruction. (Illust. 7-32)

7-32

CAMSHAFTS

Check the camshaft bearing surfaces for wear using a micrometer. Inspect the cam lobes for scoring or excessive wear.

Specifications	English Std.	Metric
Camshaft Bearing Diameter	.6235 .6240	15.836 15.849
Cylinder and Flange Camshaft Bearing Diameter	.6245 .6255	15.862 15.887

MECHANICAL COMPRESSION RELEASE

The Mechanical Compression Release (MCR) incorporates pins located in the camshaft. The pins extend above the exhaust cam lobes, lifting the valve and relieving engine compression for easier starting. When the engine starts, centrifugal force moves the weight outward and the pin will drop back down. The engine will now run at full compression.

The components of the MCR except for the internal pins are serviceable. When servicing the MCR be cautious not to misplace the pins, as a new camshaft would be necessary.

Clean the camshaft with solvent and dry all parts with compressed air. Make sure that the pins, weight and shaft of the mechanical compression release are operating freely and smoothly. (Illust. 7-33)

7-33

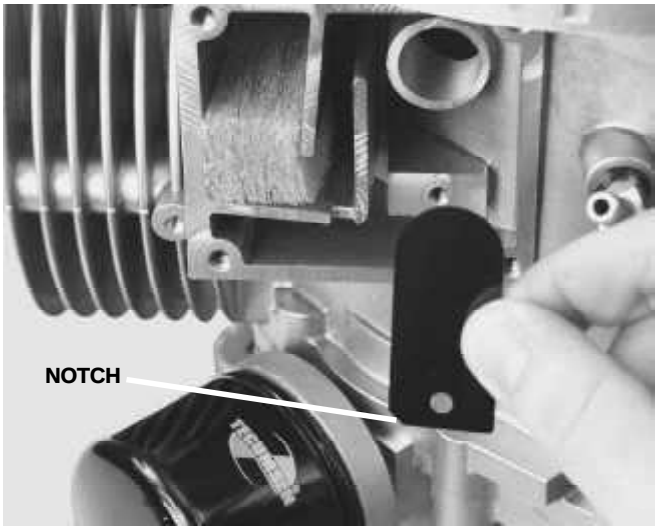
VALVE LIFTERS

Visually check the lifter for wear on the cam contact surface, the cylinder contact surface and push rod contact surface. If any damage is noted replace the lifters. (Illust. 7-34).

7-34

CRANKCASE BREATHER

The crankcase breather is located on the number one (lowest) cylinder side. It consists of a cover, cover gasket, breather element, reed valve and a limiter plate. The breather cavity may be cleaned with solvent. Inspect the reed plate for sealing. If an **.003" (.076 mm)** air gap exists between the reed plate and the cylinder boss, the reed plate must be replaced. When installing the reed plate the notched corner must face the cylinder head side of the engine. (Illust. 7-35) The cover plate mounts onto the cylinder with the outside lip facing out.



7-35

CYLINDER COVER

Specification	English Std.	Metric
Main Bearing Diameter	1.625 / 1.627	41.313
Cylinder and PTO	1.627	41.325

Clean and inspect the cover, looking for wear and scoring of the bearing surfaces. Measure the bearing surface diameters using a telescoping gauge and check the specifications for worn or damaged parts. Replace as necessary.

When reinstalling the cover, apply a drop of Loctite 242 to the cover screw threads and torque the cover screws to **250 inch lbs. (28 Nm)**. Always install a new gasket once the seating surface has been broken.

CHAPTER 8. ENGINE ASSEMBLY

ENGINE ASSEMBLY

The following procedures apply to most engine specs. Actual procedure may vary.

1. Use new gaskets and seals at all locations. Clean all internal engine parts with solvent and blow dry with compressed air or allow to air dry.

2. Apply engine oil to the crankshaft bearing surfaces. Using seal protector **670330**, insert the tapered end of the crankshaft into the crankcase. Slide the crankshaft in until it bottoms.

3. Assemble the piston and rod together. **The connecting rod match marks must be facing the same side as the arrow on the side of the pistons.**

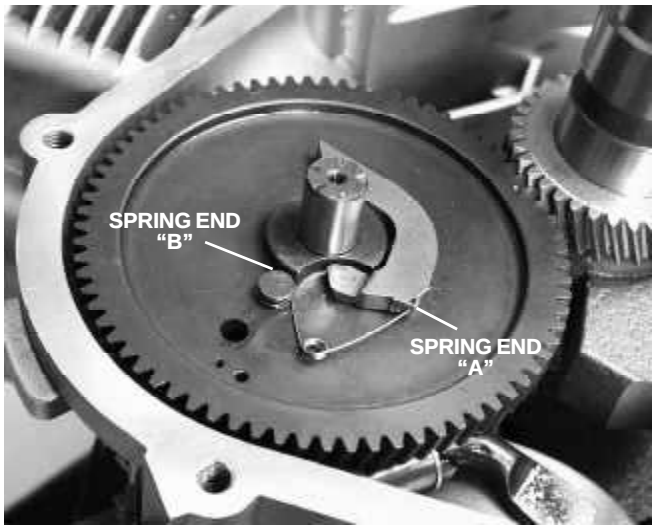
4. Apply engine oil to the piston skirt, rings, connecting rod bearing surface, and the cylinder bore. Having installed and staggered piston ring end gaps, use a band type ring compressor to compress the rings, and push the piston assembly into the cylinder (Illust. 8-1). **The match marks on the connecting rod(s) and the arrow on the side of piston(s) must be facing out of the crankcase.** Push the piston assembly(s) in until the rod is positioned on the crankshaft rod journal surface.

8-1

5. Align the match marks on the rod cap and rod. Install the rod cap bolts and tighten the bolts in equal increments to **210 inch lbs. (24Nm)**.

   NOTE: If reinstalling a connecting rod assembly, the original rod and cap must be assembled together. Do Not Interchange.

6. Assemble the compression release components to the camshaft. Install spring end “A” through the weight from the shaft side. Wrap spring end “B” over the rivet head as shown (Illust. 8-2).



8-2

7. Pre-lube and install the lifters and camshaft. Align the timing mark or notched tooth on the crankshaft gear to the mark or hole in the camshaft gear. (Illust. 8-3)

8-3

8. Install the oil pump shaft into the flange cover from the bottom up. The long end of the shaft inserts into the cover. (Illust. 8-4)

8-4

9. Slide on the oil pump gear so as the raised center portion is on top. (Illust. 8-5) Fasten the gear down with the retaining ring.

8-5

10. Use seal protector 670330 to install the mounting flange with the governor gear assembly installed to the crankcase. Use the dowel pins to position the flange and new gasket. Slightly rotate the crankshaft to allow the governor gear to mesh. Do not force. Apply a drop of blue Loctite 242 to the cover screw threads and torque to **250 in. lbs. (28 Nm)**.

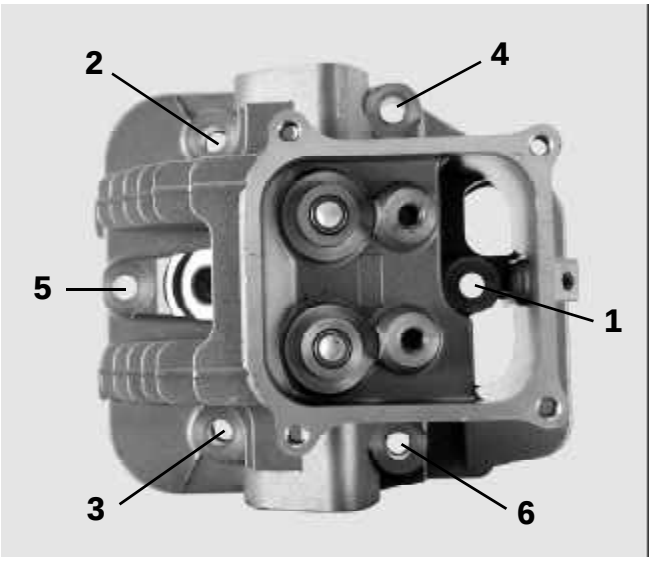
11. Apply a small amount of engine oil and install the oil pump rotor. Install a new "O" ring and the pump cover. Tighten the screws to **60 inch pounds (6.8 Nm)** torque.

12. Install the breather reed with the notched corner facing the cylinder head. Install the limiter plate, breather cover and a new gasket. The breather cover must have the outer lip facing out.

13. Rotate the crankshaft to place the piston in the #1 cylinder at Top Dead Center (TDC) on the compression stroke. (Cylinder nearest mounting flange).

14. Pre-assemble the valve and spring assemblies on the cylinder heads. Place the springs (dampening coils toward the head) over the valve guides. Install the valve caps on the springs with the larger opening away from the springs. Use spring compressor tool part 670315A to compress the spring and cap and install the retainers.

15. Install the cylinder head using a new head gasket. Torque the head bolts in **60 in. lbs. (6.7 Nm)** increments following the numbered sequence. (Illust. 8-6) Cylinder head bolt torque specification **230 in. lbs. (26 Nm)**.



8-6

16. Insert the push rods in the lifter sockets with the longer steel end towards the rocker arms. Install the rocker arms (socket end toward the push rod) and guide plate (with the arms facing up) onto the cylinder head. Thread the rocker arm stud on until excessive play is removed. (Illust. 8-7)

8-7

17. Set the valve lash with the engine cold, the piston at T.D.C. compression stroke and both valves closed. Insert a **.004" (.102mm)** feeler gauge between the rocker arm and valve stem. Adjust until a slight sliding drag is felt. Hold the rocker arm stud using a **7/16" (11.1125 mm)** wrench or socket while using a **1/2" (12.7 mm)** crowfoot to tighten the lock nut to **120 in. lbs. (13.5 Nm)** of torque. Rotate the crankshaft at least one full turn to check push rod movement and valve lash. Repeat for other cylinder head assembly.

18. Install the rocker arm cover(s) using a new gasket. Torque the cover screws to **80 in. lbs. (9 Nm).**

19. Attach the governor arm lever if removed.

20. Attach the alternator coil and route the wires away from the flywheel area.

21. Install the flywheel key, flywheel, flywheel fan, fan retainer, flat washer, lock washer, and flywheel nut. Use strap wrench part #670305 to hold the flywheel and torque to **700 in. lbs. (79 Nm)**.

22. Install the ignition mounting studs and torque to **40 in. lbs. (7 Nm)** Mount the ignition modules, use a **.0125" (.3175 mm)** air gap tool (part # 670297) between the flywheel magnets and the laminations of the module. Torque the mounting screws to 45-in. lbs. and remove the tool. Check for contact while rotating the flywheel. Attach the ignition groundout lead to the module terminal.

23. Install the intake pipe, carburetors and governor linkage. Check the governor and speed control hook-up and adjustment - see Chapter 4 Governors and Linkage.

24. Attach the wiring harness to the fuel shut-off solenoids.

25. Synchronize the carburetors. See Chapter 4 Governors and Linkage.

26. Install remaining engine shroud pieces. Blower housing, cylinder head covers and air filter assembly.

27. Attach the fuel line and secure with clamps.

    NOTE: Replace the fuel filter.

28. Install a new oil filter and fill the engine with oil to the full mark on the dipstick. Add fresh fuel to the fuel tank and secure the cap.

29. Install the spark plug and high-tension lead. Mount the engine to the equipment and connect wiring and control cables.

30. Start the engine and allow it to run approximately five minutes to reach operating temperature. Verify the idle and high speed R.P.M settings.

CHAPTER 9. TROUBLESHOOTING & TESTING

ENGINE KNOCKS

1. Check the crankshaft coupler or pulley for loose fit, loose bolts or crankshaft key damage. Remove, inspect, and replace as necessary. Re-install and re-torque the bolts to the proper specifications of the OEM.

2. Check the flywheel key and keyways for wear or partial shearing. Replace any damaged components. Tighten the flywheel nut to the proper torque.

3. Check for the correct air gap at the ignition modules. An improper setting may cause contact between the flywheel and laminations.

4. Remove the cylinder heads and check for excessive carbon in the combustion chamber. Also check that the head gasket fit is correct laying it over the cylinder **not the head.** Check the spark plugs for proper reach and heat range.

5. Check for proper valve lash.

6. Check internal components (pistons, cylinder bore, connecting rods and crankshaft) for wear or damage.

ENGINE OVERHEATS

Before checking any of the following remove and inspect the spark plugs one at a time. By reading the color of each plug you can quickly narrow down which cylinder is causing the problem. Spark plug color evaluation charts can usually be found in spark plug manufacturer books.

1. Make sure the engine is not being overloaded. Remove excessive loads by limiting operation speed, processing less material.

2. Check the oil level and viscosity. Add or replace as necessary.

3. Check for clogged cooling fins or obstructions to the airflow. Remove the blower housing and clean the cooling fins.

4. Check the carburetor for restricted metering jets, causing a lean fuel delivery. Remove and clean the carburetor using tag wire and compressed air. See **Chapter 3** under “Service.”

5. Check the engine R.P.M. setting using a vibra tach or other tachometer. Compare it to the R.P.M. settings found on microfiche card #30 or the computer Parts Look Up system.

6. Check the ignition system. Check the CDI module air gap and flywheel key condition.

7. Remove the cylinder head to check for excessive carbon buildup or a leaking head gasket(s). Replace head gasket(s).

8. Check for the correct spark plug and heat range. Consult the parts look-up systems for the correct plug.

SURGES OR RUNS UNEVENLY

1. Check the fuel cap for proper venting. Loosen the cap and retry engine operation.

2. Replace or clean the air filter(s).

3. Static Test the Governor system.

4. Visually check all linkages. Check the governor shaft, throttle link or link connector bushings for wear or binding. For adjustment see **Chapter 4.**

5. Check the condition of the carburetor jets and passages. Service as outlined in **Chapter 3.**

6. Verify engine R.P.M. setting using a vibra tach or other tachometer. Compare it to the R.P.M. settings found on microfiche card # 30. Adjust as necessary.

7. Check the ignition system operation using a gap type tester installed between the high-tension lead and spark plug. Check for intermittent spark.

ENGINE MISFIRES

1. Check the spark plugs for the proper reach and heat range. Diagnose their condition. Replace if questionable.

2. Replace the fuel and fuel filter if the condition is in question. Set up a remote fuel tank to supply known good fuel on a temporary basis. Test engine performance.

   NOTE: Questionable fuel should always be disposed of properly. Contact your local governing body regarding disposal options in your area.

3. Temporarily isolate the engine ground wires from safety system. Check the ignition system with an in-line ignition tester.

4. Check for carbon buildup in the combustion chamber.

5. Check valve lash. Inspect the valves and valve seats for leakage. Check for scoring or discoloration on the valve stem in the valve guides area. Recondition the valves and seats if questionable.

ENGINE VIBRATES EXCESSIVELY

1. Detach and ground the high-tension leads from the spark plugs. Check the PTO end of the crankshaft for bends. Use a straight edge, square or a dial indicator.

2. Check the engine mounting hardware for proper torque. Check the platform for rigidity.

3. Isolate the engine, remove and check any attached equipment for an out of balance condition. Start and run the engine without anything attached.

BREATHER PASSING OIL

1. Check the oil level. Ensure the engine is not overfilled. Verify the viscosity rating of the oil being used is to specification.

2. Check the angle of operation. Avoid prolonged use at severe angles.

3. Check for excessive engine R.P.M. Use a vibra-tach or other tachometer to adjust to the specified R.P.M. setting found on microfiche card # 30 or the computer Parts Look Up system.

4. Check the crankcase for leaking or damaged gaskets, seals, or “O”-rings. External leaks may not be evident; however, an atmospheric pressure leak may prevent the engine from achieving a crankcase vacuum. Check the crankcase vacuum using a water manometer or vacuum gauge.

5. Check the breather cover, cover gasket and reed for damage, or improper installation.

6. Check cylinder compression. If the engine has weak compression, determine the cause (worn rings, leaking head gasket, or leaking valves). A cylinder leak down tester can be used to further evaluate the problem cylinder(s).

   NOTE: Follow the tool manufacturer’s procedures to prevent further engine damage.

EXCESSIVE OIL CONSUMPTION

1. Check the oil level, oil viscosity, and oil condition. Drain and fill to the proper level.

2. Check the angle of operation. Avoid prolonged use at a severe angle.

3. Check for leaking or damaged gaskets, seals, or “O”-rings. External leaks may not be evident; however, a leak may prevent the engine from achieving a crankcase vacuum.

4. Check for excessive engine R.P.M. Use a vibra-tach or other tachometer to adjust to the specified R.P.M. setting found on microfiche card # 30 or the computer Parts Look Up system.

5. Check the breather cover, cover gasket and reed for damage or improper installation.

6. Clean the cooling fins to prevent overheating.

7. Check the carburetor for a lean running condition caused by restricted fuel passages.

8. Check the cylinder compression. If the engine has weak compression, determine the cause (worn rings, leaking head gasket, or leaking valves). A cylinder leak-down tester can be used to further evaluate the problem cylinder(s).

   NOTE: Follow the tool manufactures procedures to prevent further engine damage.

9. Check the valve guides for excessive wear.

10. Check the intake valve stem seal for wear or damage.

LACKS POWER

1. Check the air intake for an obstruction (plugged, dirty or oil-saturated air filter).

2. Check the oil level, oil viscosity, and oil condition. Replace and fill to the proper level.

3. Diagnose each of the spark plugs condition.

4. Check the carburetor(s) for improper choke plate engagement, or a restricted fuel passage(s).

5. Check the exhaust port for a restriction preventing proper exhaust flow. Thoroughly inspect the muffler for loose baffles or an obstruction.

6. Check the engine valve lash. Reset the valves at the proper clearance.

7. Check the valves for proper seating and valve guide clearance. Recondition the valves and seats. Replace the valves if necessary.

8. Check the ignition system operation. Use a gap type spark tester installed between the high-tension lead and the spark plug. Check the flywheel key for partial shearing and the CDI module air gap.

CHAPTER 10. ENGINE SPECIFICATIONS

TVT 691 ENGINE SPECIFICATIONS

	English Std.	Metric
Displacement	42.18 cubic inches	691cc
Stroke	2.75	69.85
Bore	3.126 3.125	79.4004 79.375
PISTONS		
Piston Diameter	3.1220 3.1235	79.2988 79.3369
Piston Pin Diameter	.6248	15.870
Piston Pin Bore Diameter	.6251 .6257	15.878 15.893
Piston , Top and Middle Ring Grooves	.0645 .0665	1.638 1.689
Piston, Lower Ring Groove	.1255 .1275	3.188 3.239
Piston Ring Side Clearance	.002 - .005 Top .001 - .004 Center .001 - .004 Bottom	.0890 .0640 .0640
Piston Ring End Gaps	.007-.015 – Top .013-.021 – Center .005 -.013 – Bottom	.178-.381 .330-.533 .127-.330
VALVES		
Valve lash	Both .004	Both .102
Valve Seat Angle - Cylinder Head	Both 46 Degrees	Both 46 Degrees
Valve Seat Width - Cylinder Head	Both .042 .052	Both 1.067 1.321
Valve Face Angle	Both 45 Degrees	Both 45 Degrees
Valve Stem Diameter Exhaust	.3080 .3085	7.823 7.836
Valve Stem Diameter Intake	.3095 .310	7.861 7.874
Standard Valve Guide Dia.	.312 .313	7.925 7.950
Valve Spring Free Length	1.935 1.995	49.15 50.67

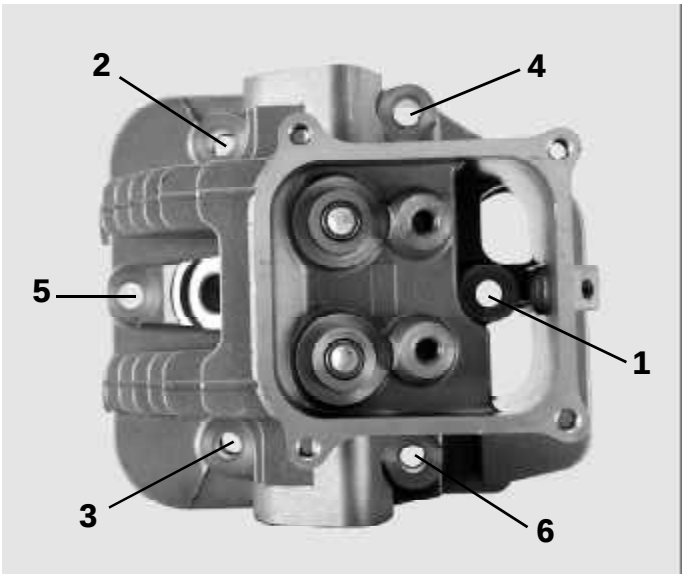
TVT 691 ENGINE SPECIFICATIONS (CONTINUED)

	English Std.	Metric
CRANKSHAFT		
Crankshaft End Play	.0053 .025	.1346 .6350
Crankshaft Connecting Rod Journal Thrust Width	1.998 2.003	50.749 50.876
Crankshaft Connecting Rod Journal Diameter	1.6223 1.6228	41.206 41.219
Main Bearing Journal Dia. Flywheel and PTO End	1.6245 1.625	41.263 41.275
CONNECTING ROD		
Connecting Rod Bearing Dia. Crankshaft End	1.6234 1.624	41.235 41.249
Connecting Rod Dia. Pin End	.6251 .6256	15.878 15.890
Connecting Rod Thrust Face	.988 .996	25.095 25.299
Connecting Rod Thrust Clearance With Both Rods on Crank	.006 .027	.1510 .6860
CYLINDER		
Main Bearing Diameter Cylinder and Flange	1.6265 1.627	41.3131 41.3258
Camshaft Bearing Diameter Block and Sump	.6245 .6255	15.8623 15.8877
Camshaft Bearing Journal Diameter	.6235 .624	15.8369 15.8496

TORQUE SPECIFICATIONS

Torque specifications below 10-ft lbs. will be listed in inch lbs. only to encourage the use of a inch lbs. torque wrench.

	In. lbs.	Ft. lbs.	Nm
Cylinder Head Bolts	230	19	26
Connecting Rod Bolts	210	17.5	24
Cylinder Cover (sump)	250	21	28
Flywheel Nut	700	58	79
Spark Plug	250	21	28
Ignition Module to Stud	45	—	5
Ignition Module Stud to Block	40		5
Intake Manifold to Head	120	10	14
Carburetor Studs to Manifold	60		7
Air Cleaner Body to Carburetor	42		5
Air Cleaner Body Screw to Cylinder	82		9
Oil Fill Tube to Blower Housing	82		9
Blower Housing to Cylinder	82		9
Deflector to Air Cleaner Body	32		4
Governor Lever Clamp Screw	95		11
Oil Pump Cover Screw	60		7
Oil Filter Adapter to Cylinder	105		12
Throttle Control Lever to Manifold (shoulder bolt)	42		5
Rocker Arm Jam Nut	120	10	14
Rocker Arm Cover Mounting Screw	52		6
Breather Cover Screws	52		6



Service Tool List

Special Service, Diagnostic, Measurement & Repair Tools	
Description	**Part Number**
Tachometer (Inductive or Vibratach)	670156 Vibratach or 670365 Inductive
Ignition Tester	670366
Multi Meter VOM & Temperature	670349
Compression Tester	670358
Outside Micrometers 0-1”	670350
Outside Micrometers 1-2:	670351
Outside Micrometers 2-3”	670352
Outside Micrometers 3-4:	670353
Telescoping Gauge Set	670357
Dial Indicator	670241
Inspection Plate (Plate Glass)	Obtain Locally
Feeler Gauge Set	670361
Inch Pound Torque Wrench 0-600 inch lbs.	670363
Valve Spring Compressor “C” Type	670362
Piston Ring Compressor	670359
Piston Ring Expander	670117
**Valve Seat (Neway LG3000 Kit or comparable)	670347
**Face Cutting Set (Neway 612 Gizmatic)	670348
Cylinder Hone (Flex)	670360

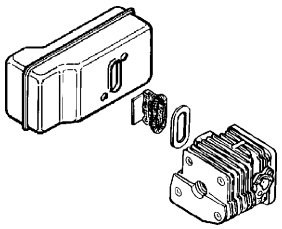
Special Service, Diagnostic, Measurement & Repair Tools	
Description	**Part Number**
Starter Bendix Ring Tool	670346
Crankcase Vacuum / Oil pressure adapter	670364
Hole Gauge Set	670356
Oil Vacuum System (110 Volt)	670354
Extreme Duty Oil Tank	670367
Leak Test Kit - Complete	670340
Leak Test Transaxle/Carburetor Adapter Kit	670345
Dial Caliper, 6”	670368
Air Gap Gauge	670297
Spark Plug Gap Gauge	670256
Oil Seal Remover	670331
Oil Seal Protector/Installer	670330
OIl Seal Driver	670272
Flywheel Knockoff Tool	670329
Flywheel Strap Wrench	670305
Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320
Torx E-5 Socket	670339
Torx E-6 Socket	670257
Torx E-8 Socket	670307

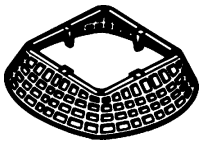
* See Tecumseh Form #694862 for Complete Tool Kit List

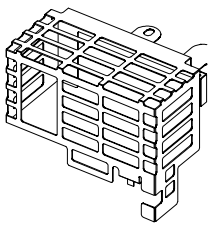
** Neway LG2000 or 102 kits can be upgraded by calling Neway direct: 1-800-248-3889

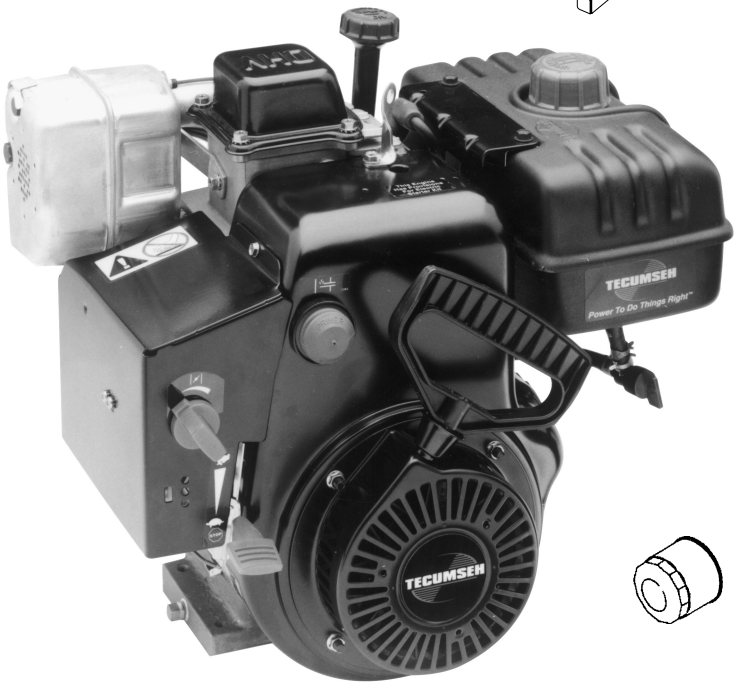
Service Engines and Accessories

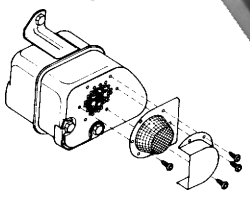
for **2000**











TECUMSEH®

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SELECTING A REPLACEMENT ENGINE BY COMPARING SPECIFICATIONS

If the model or type number of the old engine is not shown in the Engine Replacement List, or if the model or type number is unknown, proceed as follows:

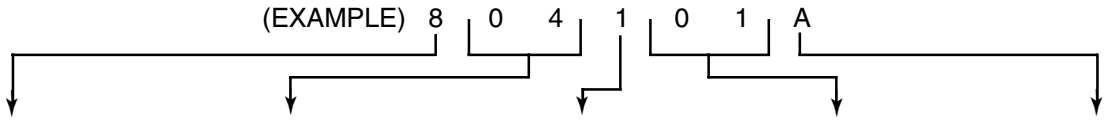
FIRST DIGIT - the number which represents the CRANKSHAFT POSITION.

SECOND & THIRD DIGITS - determine the HORSEPOWER required. (Two cycle is designated by 00 in the second and third digit position.)

FOURTH DIGIT - Determines PRIMARY FEATURES required.

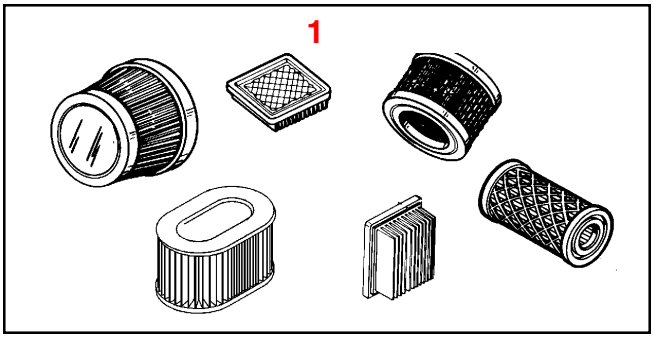
> Engines that are specially built for specific OEMs because of color, etc., are not suitable to be sold to an Assigned OEM.

TECUMSEH SERVICE NUMBER SYSTEM



1st DIGIT	2nd & 3rd DIGIT	4th DIGIT	5th & 6th DIGIT	7th DIGIT
CRANKSHAFT POSITION	HORSEPOWER OR 2 CYCLE	PRIMARY FEATURES	ENGINE VARIATION NUMBER	REVISION LETTER
8 - Vertical 9 - Horizontal	00 = 2 Cycle 02 = 3 H.P. 03 = 3.5, 3.8 H.P. 04 = 4, 4.8 H.P. 05 = 5, 5.5 H.P. 06 = 6 H.P. 07 = 7 H.P. 08 = 8 H.P. 09 = 9 H.P. 10 = 10 H.P. 11 = 11 H.P. 12 = 12, 12.5 H.P. 13 = 13 H.P. 14 = 14 H.P. 15 = 15 H.P. 16 = 16, 16.5 H.P. 17 = 17 H.P. 18 = 18 H.P.	1 = Rotary Mower 2 = Industrial 3 = Winter Application 4 = Mini Bike 5 = Tractor 6 = Tiller/Edger 7 = Rider 8 = Rotary Mower	00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99	

AIR CLEANERS



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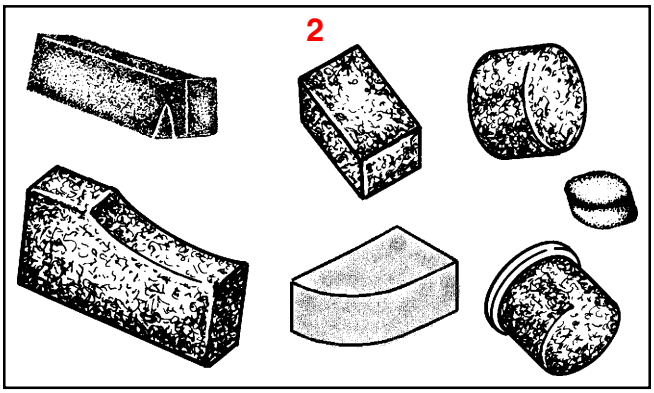

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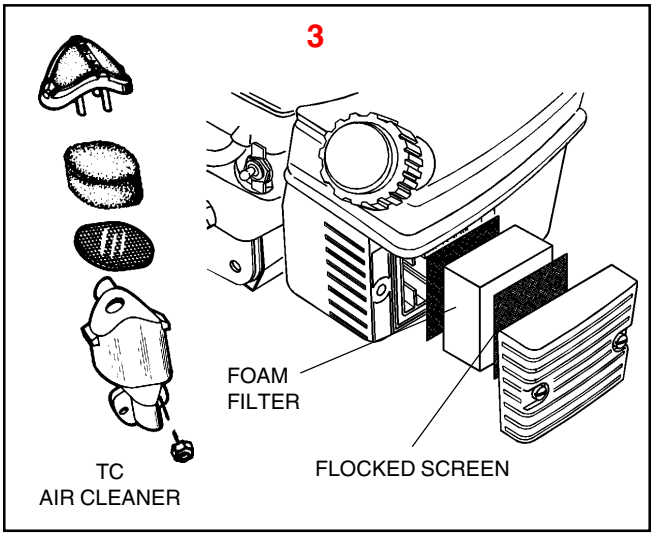
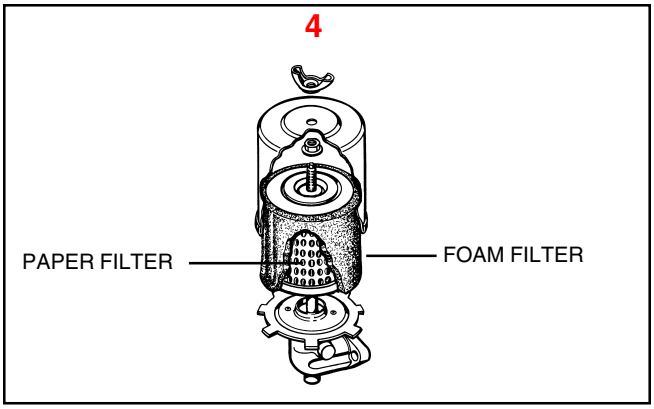


POLY - KLEEN-AIRE®



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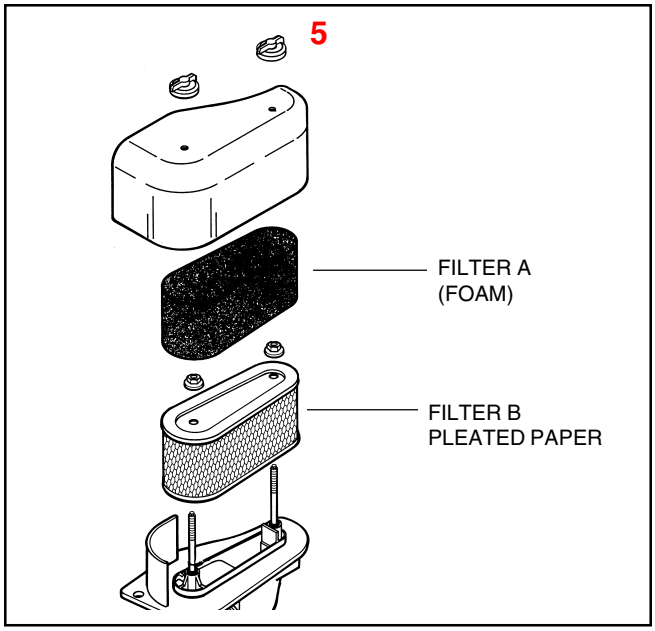
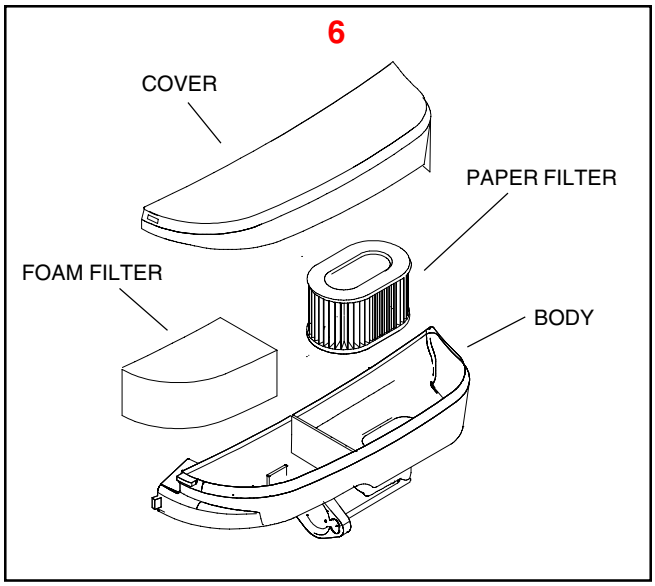


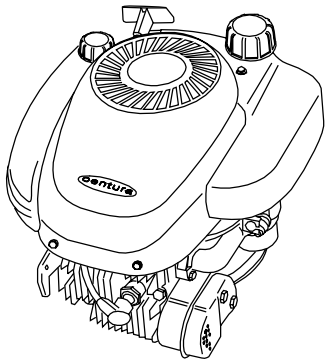
POLY PAPER TRI-STAGE KLEEN-AIRE®



CENTURA LE

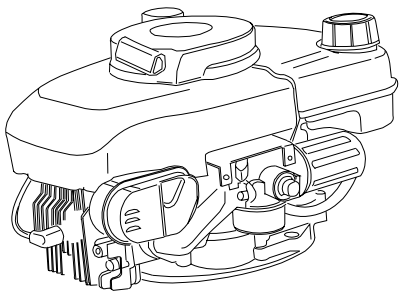
FUEL TANK MOUNTING

1



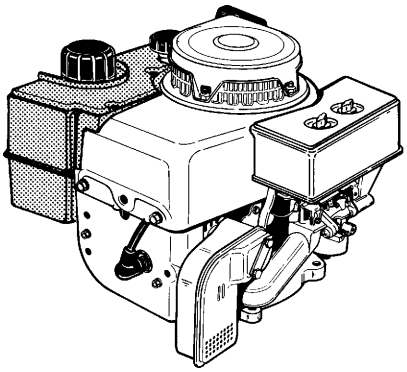
PREMIER STYLE TANK

2



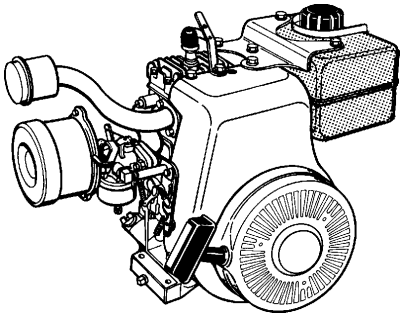
OPPOSITE SPARK PLUG

3



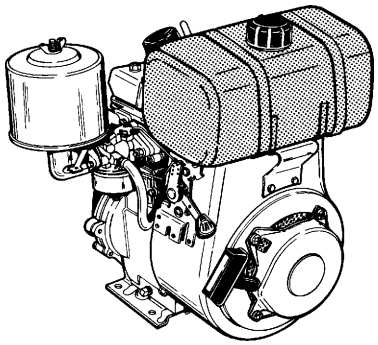
OPPOSITE CARBURETOR

4



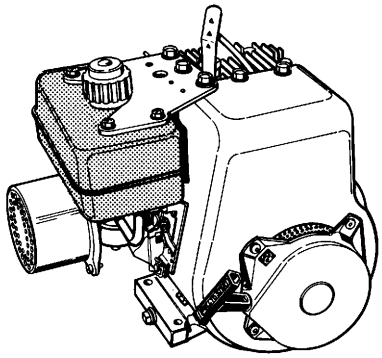
OPPOSITE CARBURETOR

5



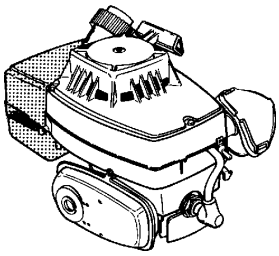
OVER RECOIL

6



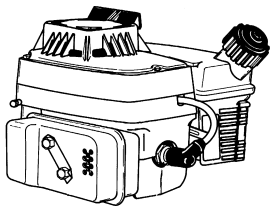
OVER CARBURETOR

7



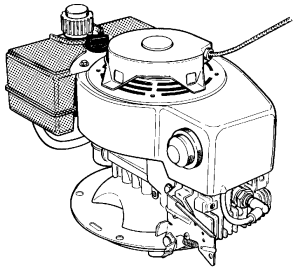
TC200/300

8



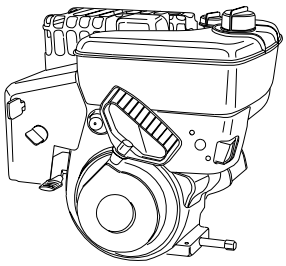
TC TYPE II

9



OPPOSITE SPARK PLUG

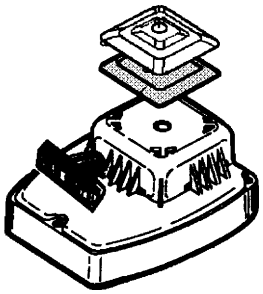
10



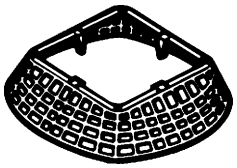
REGENCY STYLE

ACCESSORIES

STARTER SCREENS



590710
590711
Can be used on TC200/300



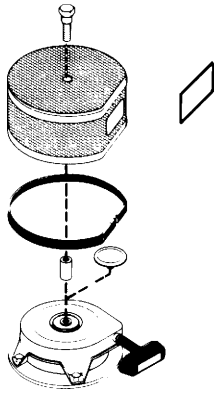
590570 - TC200 & 300
TCH200 & 300

730512 - Pre-cleaner - 6 & 7 H.P.

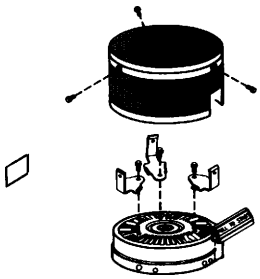
RECREATIONAL VEHICLE CONTROLS

34652A - H35 , Bottom Pull
34784 - HM80-100, Top Pull
35142 - H35, Top Pull Heavy Spring
36740A - OHH50-55
730136A - HS40, Mini-bike Top Pull

DEBRIS SCREEN KITS

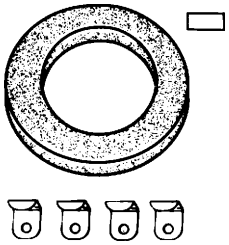


730573
Can be used on HM, TVM, TVXL, OVM and OVXL with stamped steel recoil starter.



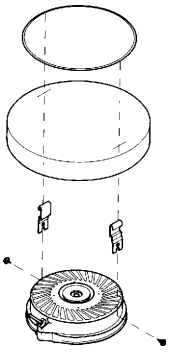
730574
Can be used on TVS75-120, TVS840 with E-Z pull starter.

STARTER MUFF KITS



730571
Can be used on TVS75, H35-H70 with stamped steel starter.

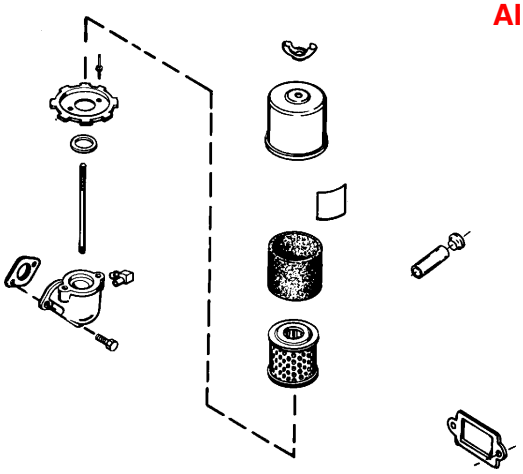
730572
Can be used on TVM170-OVXL120, HM70-100 with die cast starter.



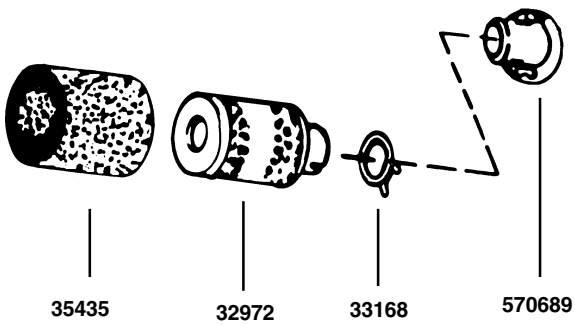
730604 used on TVS90-120, TVS840, TVM125-140, H30-H70 with E-Z pull starter.

730619 used on TVM, TVXL195-220, HM70-100, OHM, OVXL, OHV12 thru 125 with E-Z pull starter.

AIR CLEANER KITS

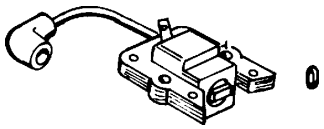


730561 - Can be used on H50-60-70 and HH70 (Use only on engines with an externally vented fully adjustable carburetor).
730575C - Can be used on 2-cycle TVS-TVXL840
730630 - HM80-100 Climate Guard

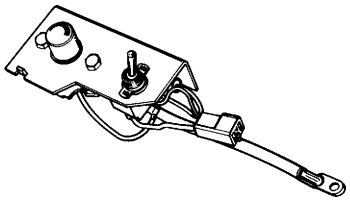


TC / TCH200-300

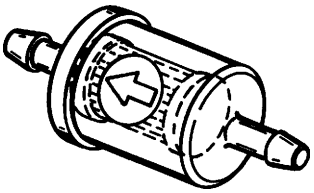
ACCESSORIES (Cont.)



730207 - Solid State Conversion Kit For all models TVS75, TVS90, TVS105, TVS120, TVS600, AV520, TNT100 & TNT120 engines with external magneto ignition.

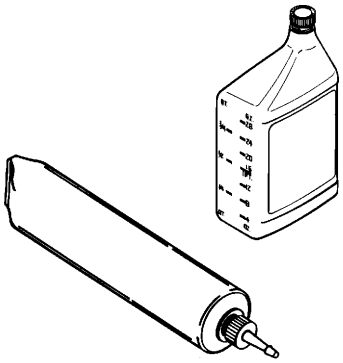


730198 - Panel, Switch - All models with 20 amp system



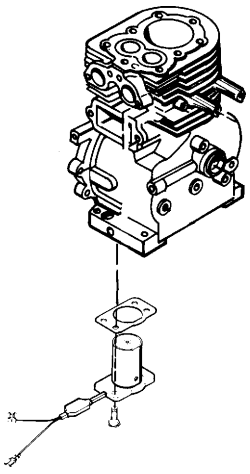
34279B - Fuel Filter - For all engines

ENGINE OIL



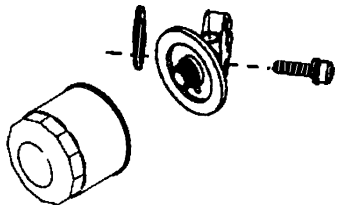
730225B - 4 cycle - SAE30
730226A - 4 cycle - SAE5W30
730227B - 2 cycle (8 oz.)
730229B - Gear Lube - 80W90
730238A - 21 oz. Twin Pack - SAE30
788067C - Grease (32 oz.) Bentonite

LOW OIL SHUTDOWN



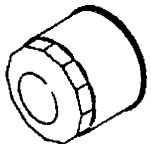
611206 - Can be used on HM80, HM90, HM100 when cylinder is equipped with provisions.

OIL FILTER ADAPTER KIT

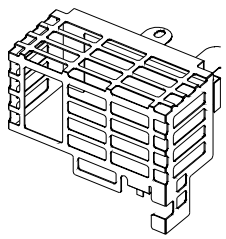


36435A - Can be used on OHV130, 135, 14, 15, 16, 16.5, 17, 17.5

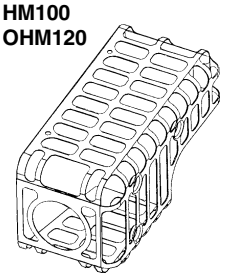
OIL FILTER 36563



HEAT SHIELDS

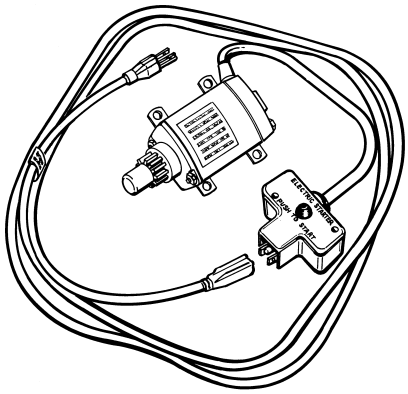


730622A - Kit, OHH Side and End Discharge
36090 - VLV Side Discharge
36197 - VLV Front (end) Discharge
36293 - HSSK40-50
36294 - HMSK80-100
36510 - TVS Euro Style Side Discharge
36554 - TVS Euro Style Front (end) Discharge
36799A - Can be used on HM80-HM100
37224 - OHM120



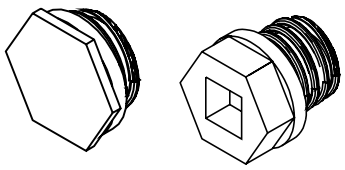
37352 - OHM120, OHSK90-130

SNOW KING® STARTER MOTOR KITS 110 - 120 VOLT



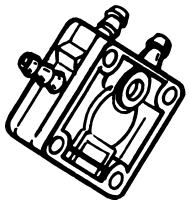
33290E - H30-35, HS40-50, HSK35, HSSK40-50, OHSK50 - 55-60-70
33328D - TVM125, TVM140, H50-60-70
33329D - TVM170-220, HM70-100, HMSK70-100, OHSK120
NOTE: Must have starter provisions to install on engines.

BOTTOM OIL DRAIN PLUG FOR RM's



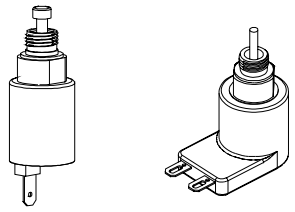
30572 - Steel
36083 - Plastic

PULSE FUEL PUMP 35787



ACCESSORIES (Cont.)

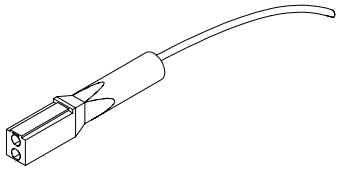
FUEL SHUT-OFF SOLENOIDS



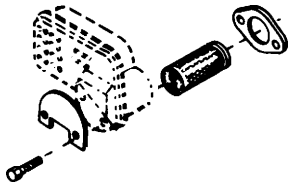
611204A - Walbro Carb.
611221 - Tecumseh Carb.

FUEL SHUT-OFF VALVE 35857

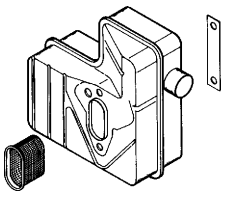
ELECTRIC CLUTCH WIRE FOR 3/5 SPLIT SYSTEM 36588



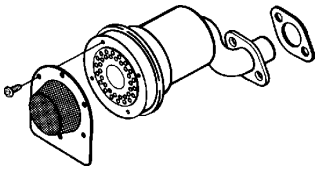
SPARK ARRESTOR KITS



34427 - Can be used on TVM125-140, H50-60.
34479A - Can be used on TVM170-220, HM70-100, HHM80.

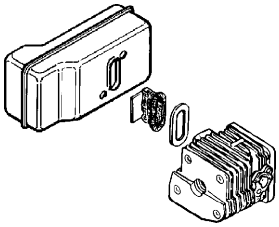


390309 - Can be used on TVS840 & TVXL840

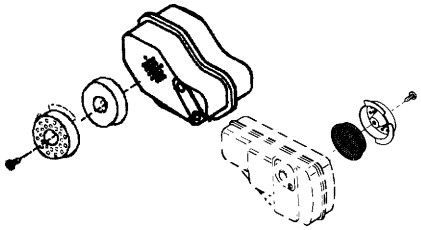


36220 - Muffler Quiet
35352 - Screen Kit

Can be used on H50 & H60

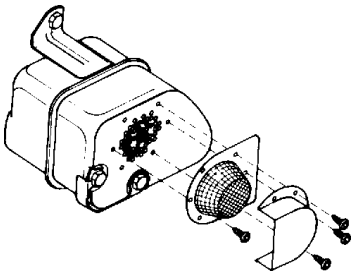


390301A - Can be used onTC200/300, TCH200/300



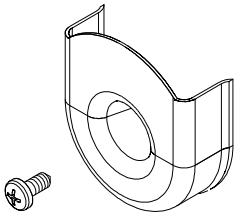
36085 - Can be used on TVS90-120
Can be used on VLV50 - VLV60

SPARK ARRESTOR SCREEN

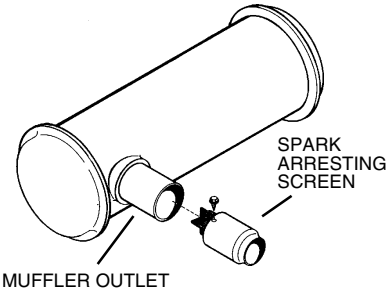


35352 - Can be used on OHV11-13

EXHAUST DEFLECTOR 36663

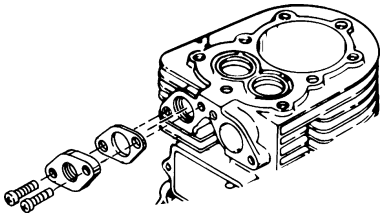


QUIET MUFFLER



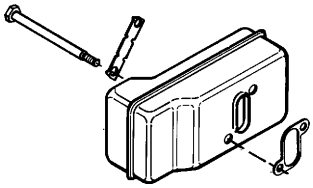
35824 - Can be used on TVM170-220, TVXL170-220, HM70-100, HMXL70-100

MUFFLER ADAPTER KIT



730130 V, VH, H and HH40 thru 80, HM70-100
730162 LAV and H25 thru 35
730165 LAV50 and HS30 thru 50
730178A OH120 thru OH180

BOLT ON MUFFLER



390322 - TC200 & 300
If cylinder is drilled and tapped

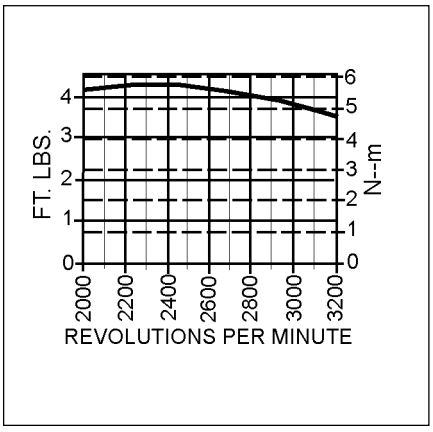
EPA AND CARB CERTIFIED

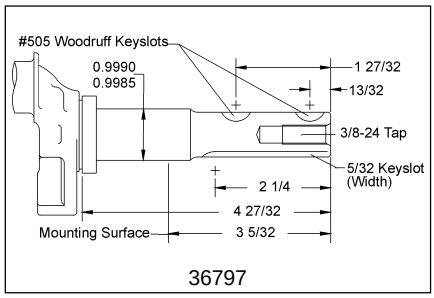
3.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV100
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-5/8 x 1-27/32 in. 66.69 x 46.84 mm
DISPLACEMENT	9.98 C.I. 163 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Poly Kleen-Aire® System Air Cleaner
- Float Carburetor with Easy Start Primer





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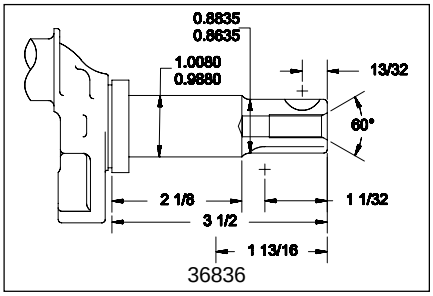


36836

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803195	Murray	36797	Remote Snap-In	Ref. 1 36116/36117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	
803198	Murray	36836	Fixed Speed	Ref. 1 36116/36117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	

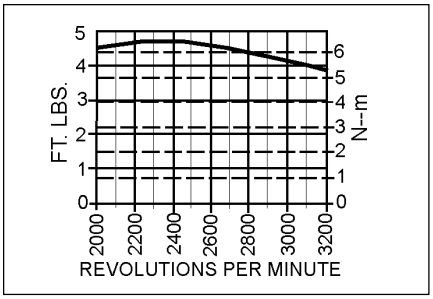
EPA AND CARB CERTIFIED

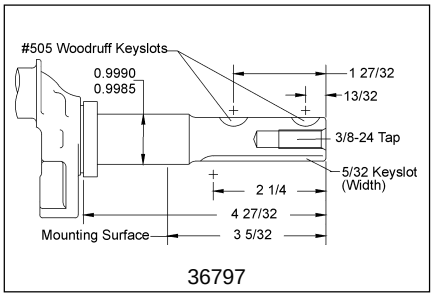
3.8 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV115
HORSEPOWER	3.8 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Kleen-Aire® System Air Cleaner
- Float Carburetor with Easy Start Primer





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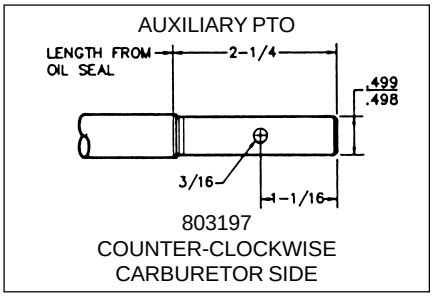
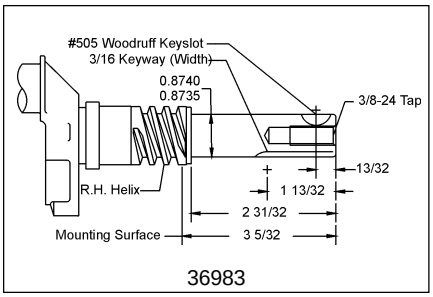


803197
COUNTER-CLOCKWISE
CARBURETOR SIDE



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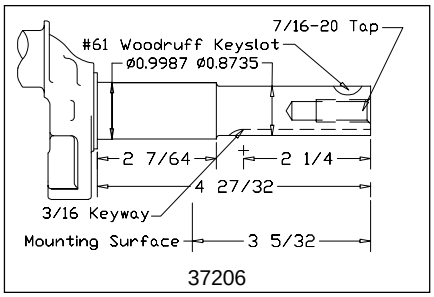
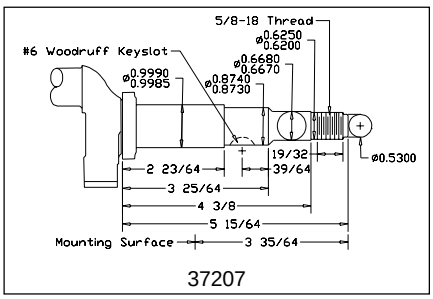


37206



37207

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803192	Murray	36797	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2	36559A	3200	
803197A	Murray	36983	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2	36559A	3200	*
804187A	Toro	37206	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		2900	
804188A	Toro	37207	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		3150	

* 8-1/2:1 Auxiliary P.T.O.

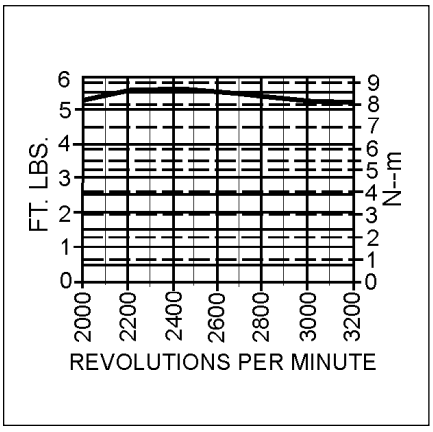
EPA AND CARB CERTIFIED

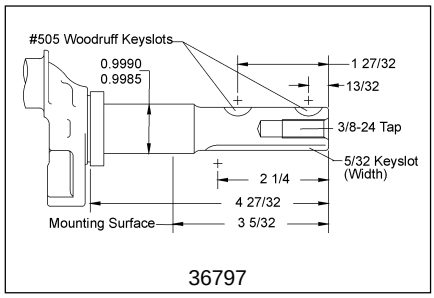
4.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV115
HORSEPOWER	4.0 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Poly Kleen-Aire® System Air Cleaner
- Float Carburetor with Easy Start Primer





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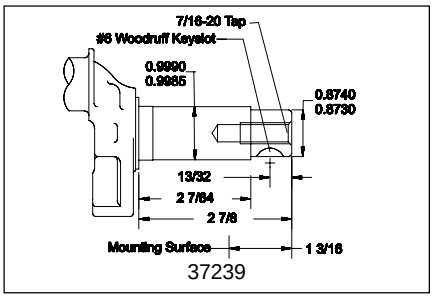


37239

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803194A	MTD	36797	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3350	
803196	Toro	37239	Remote	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2		3450	

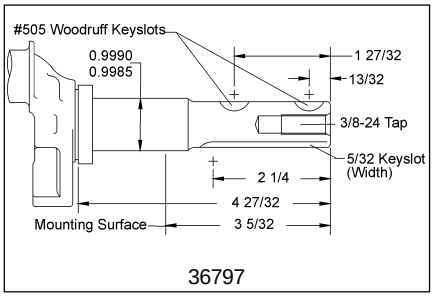
EPA AND CARB CERTIFIED

5.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV115
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire® Air Cleaner
- Poly Kleen-Aire® Air Cleaner



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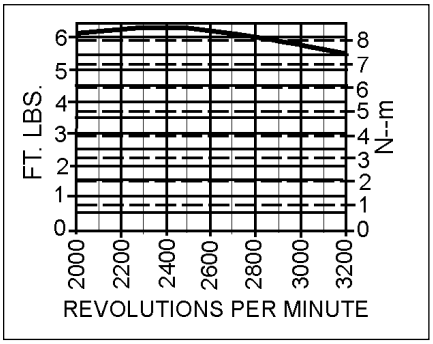

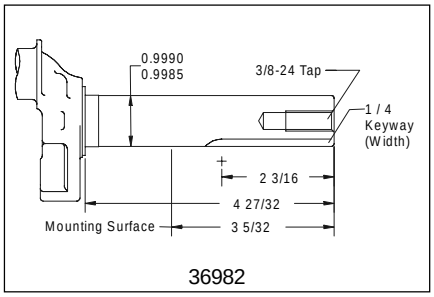

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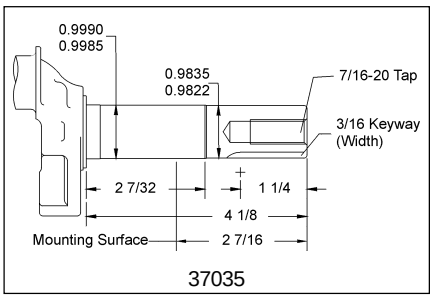


37035

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
804218B	Standard ■	36797	Manual	Ref. 1 35066 (Paper)	Side & Bottom	2 Qt. Ref. 2		3750	▲
804219B	Toro	37035	Remote	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	35015B	3150	
805176B	Garden Way	36982	Manual	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	36559A * Reverse Pull	3750	
805179A	Murray	36797	Remote Snap-In	Ref. 2 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	
805180A	Murray	36797	Remote Snap-In	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	36559A	3200	

■ This engine is not eligible for return.
▲ Heavy flywheel
* Equipped with brake lock-out device

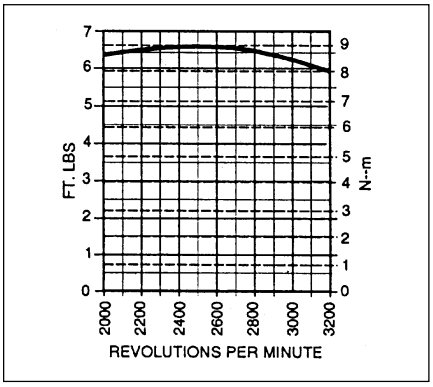
EPA AND CARB CERTIFIED

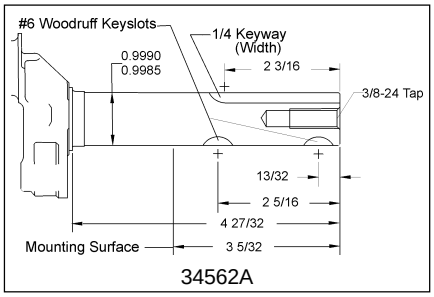
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV120
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

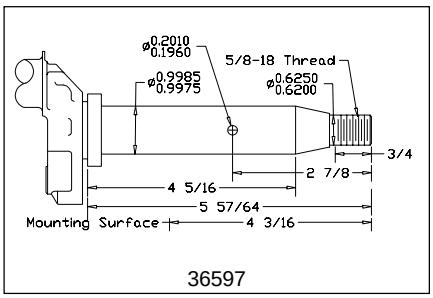
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire® Air Cleaner





34562A



36597

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806165	Ariens	34562A	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	35015B	2950	
806166	Ariens	34562A	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	35015B	2950	*
806167	Toro	36597	Remote Snap-In	Ref. 1 35066 (Paper)	Bottom	1 Qt. Ref. 2	36559A Reverse Pull	3200	

* Equipped with electric start provisions.

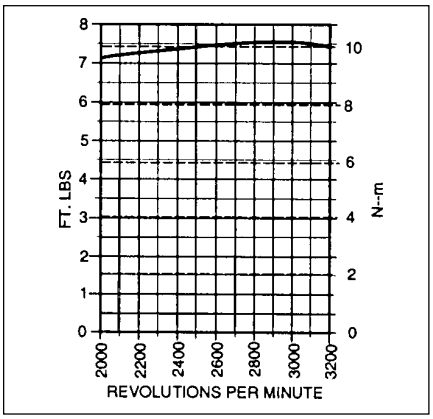
EPA AND CARB CERTIFIED

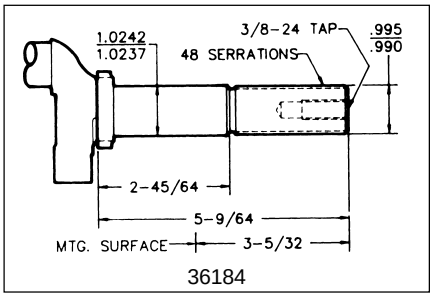
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	VLV126
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 2-3/64 in. 71.0 x 52 mm
DISPLACEMENT	12.6 C.I. 206 cc
OIL CAPACITY	27 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer





36184

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806164	Ariens	36184	Fixed Speed	Ref. 1 36046 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		3100	

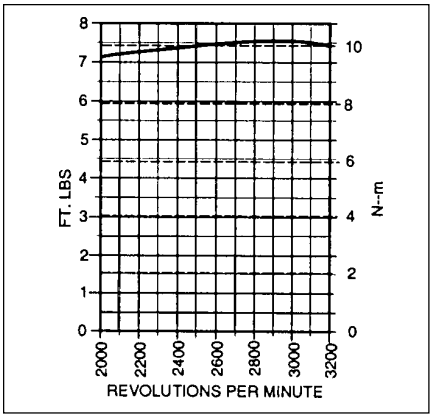
EPA AND CARB CERTIFIED

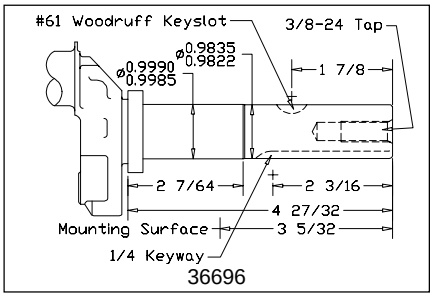
6.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	OVRM65
HORSEPOWER	6.5 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	12.00 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized End-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer



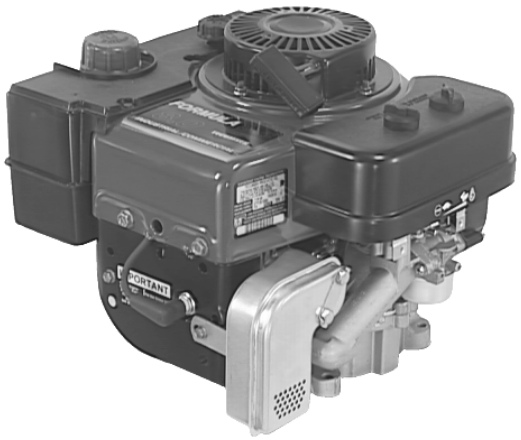


	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806163	Snapper	36696	Remote Snap-In	Ref. 1 35500 (Paper)	Side & Bottom	1.5 Qt. Ref. 2	36734	3450	

EPA AND CARB CERTIFIED

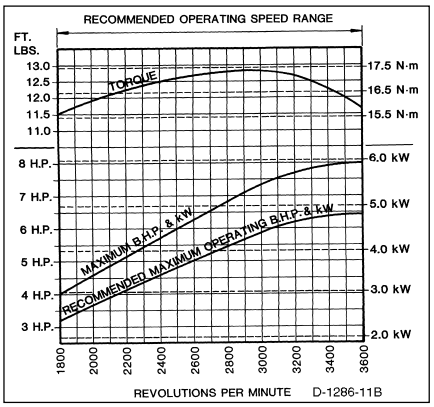
8.0 HORSEPOWER RIDER APPLICATION TVM195

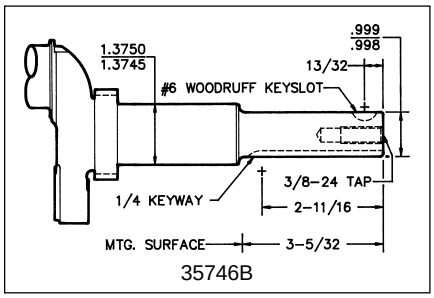
MODEL	TVM195
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm



FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain Ref. No.	Fuel Tank (pg. 3)	Top Governed Speed
808768	Standard ■	35746B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Front	3 Qts. Ref. 3	3400
808769	Standard ■	35746B		Manual	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600
808770	Snapper	35746B	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400
808771	Toro	35746B	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Dual Sides	None	3350
808772	Ariens	35746B	3 amp D.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3250

■ This engine is not eligible for return.
† 36680 - 12 volt electric starter can be installed.

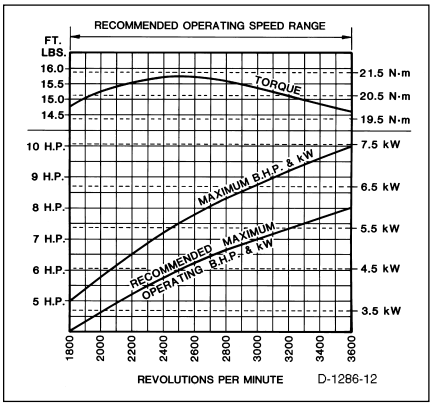
EPA AND CARB CERTIFIED

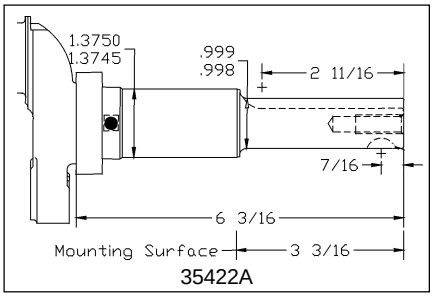
10 HORSEPOWER RIDER APPLICATION TVM220

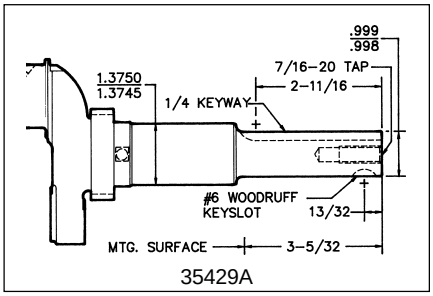
MODEL	TVM220
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release







	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
810762	Murray	35429A	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810763	Murray	35429A	3 amp D.C.	Remote w/override	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810764	Standard ■	35422A	7 amp D.C. w/regulator	Remote	Electric Starter	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400

† 36680 - 12 volt electric starter can be installed.

■ This engine is not eligible for return.

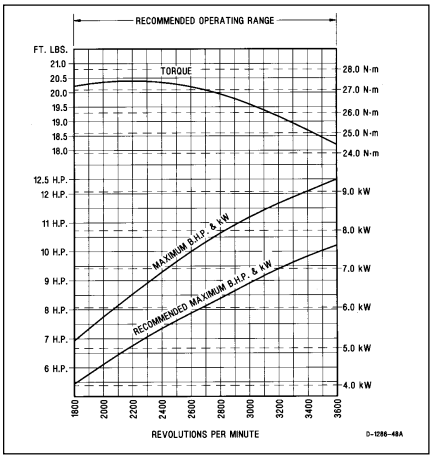
EPA AND CARB CERTIFIED

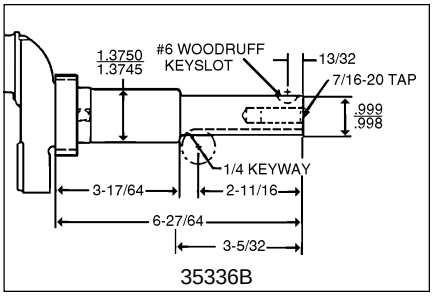
12.5 HORSEPOWER RIDER APPLICATION OHV125

MODEL	OHV125
HORSEPOWER	12.5 9.32 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
812708	Standard ■	35336B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600
812763	Standard ■	35336B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3250
812764	Standard ■	35336B	3 amp D.C.	Remote	† Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3250

† 36680 - 12 volt electric starter can be installed.

■ This engine is not eligible for return.

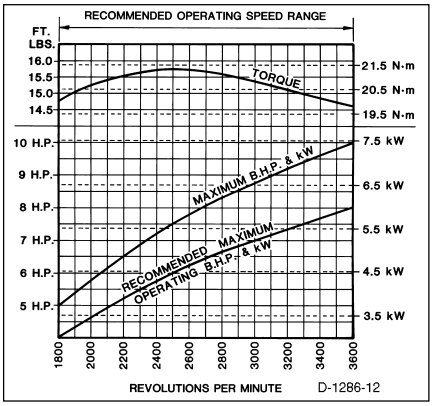
EPA AND CARB CERTIFIED

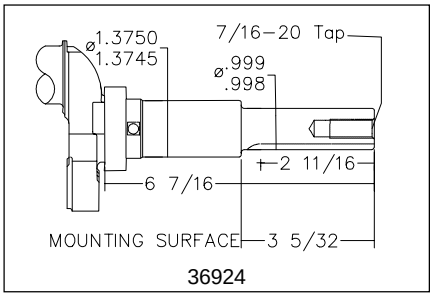
13 HORSEPOWER OHV13 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV130
HORSEPOWER	13.0 9.69 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. 39 oz. w/oil filter .95 ltr. 1.17 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Rotary Pump with Oil Filter





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813700	MTD	36924	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3250	● ▲
813701	Swisher	36924	3 amp D.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3600	▲
813702	Frig. Home Prod.	36924	3 amp D.C. 5 amp A.C.	Remote	Electric Starter	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3300	● ▲

● Muffler omitted
▲ Fuel tank omitted
† 37425 - 12 volt electric starter can be installed.

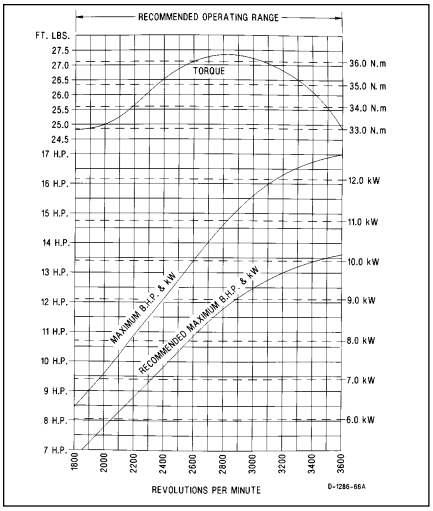
EPA AND CARB CERTIFIED

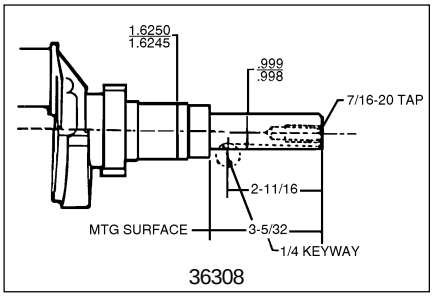
13.5 HORSEPOWER OHV13.5 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV135
HORSEPOWER	13.5 9.69 kW
BORE & STROKE	3-9/16 x 3.00 in. 90.49 x 76.2 mm
DISPLACEMENT	29.9 C.I. 490.00 cc
OIL CAPACITY	55 oz. 62 oz. w/oil filter 1.65 ltr. 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire® System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813703	Ransomes	36308	Remote	†Electric	Ref. 5 Provisions w/Rewind	Side 36356 (Paper) 36357 (Poly)	3600	▲

▲ Fuel tank omitted
† 37425 - 12 volt electric starter can be installed.

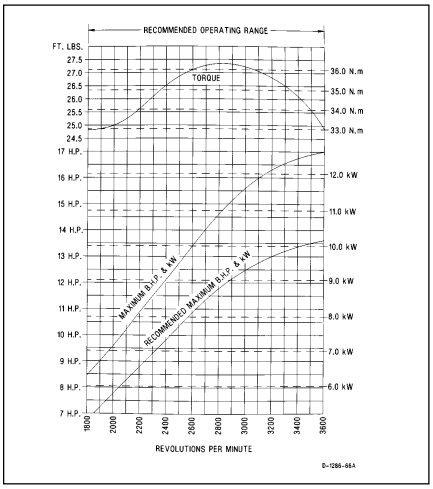
EPA AND CARB CERTIFIED

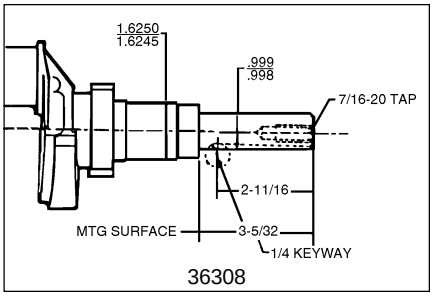
17 HORSEPOWER OHV17 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV175	
HORSEPOWER	17.0 12.67 kW	
BORE & STROKE	3-9/16 x 3.00 in. 90.49 x 76.2 mm	
DISPLACEMENT	29.9 C.I. 490.0 cc	
OIL CAPACITY	55 oz. 1.65 ltr.	62 oz. w/oil filter 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg	

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire® System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





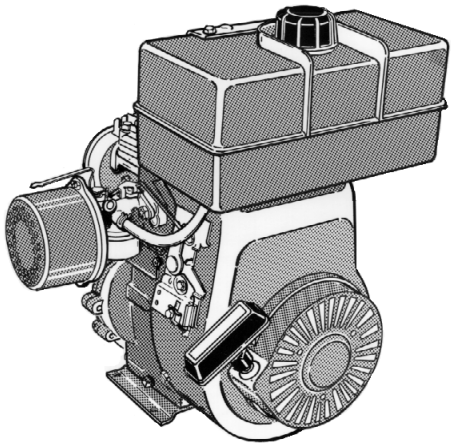
	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
*	**817060A** Noma CB	36308	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3400
	817061A Ariens CB	36308	16 amp D.C. w/Regulator	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3200

† 36795 - 12 volt electric starter can be installed.
* 36435A - Oil filter kit can be installed.
CB Counterbalanced

EPA AND CARB CERTIFIED

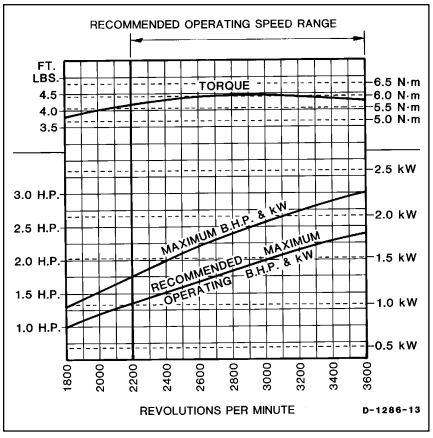
3.0 HORSEPOWER TILLER APPLICATION

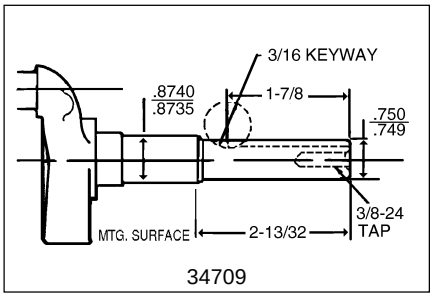
MODEL	H30
HORSEPOWER	3.0 2.24 kW
BORE & STROKE	2-1/2 x 1-27/32 in. 63.51 x 46.84 mm
DISPLACEMENT	9.06 C.I. 148 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





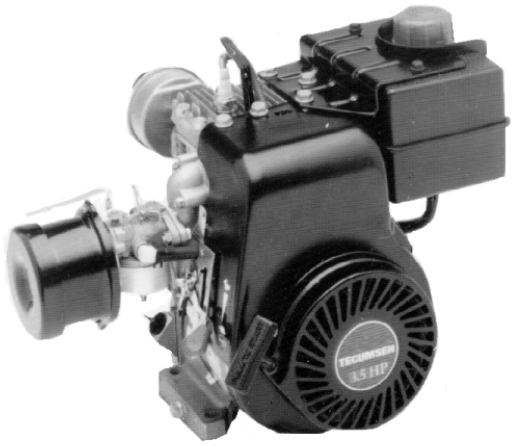
34709

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903666A	Garden Way	34709	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	PTO Side	2 Qts. Ref. 5	3750

EPA AND CARB CERTIFIED

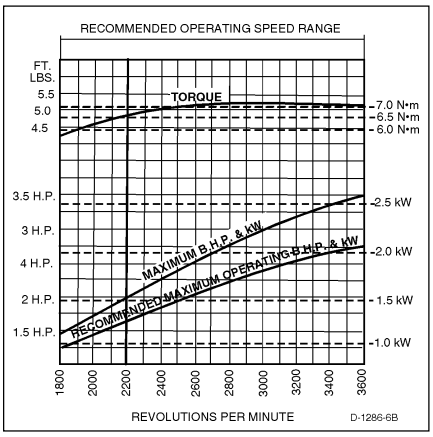
3.5 HORSEPOWER TILLER APPLICATION

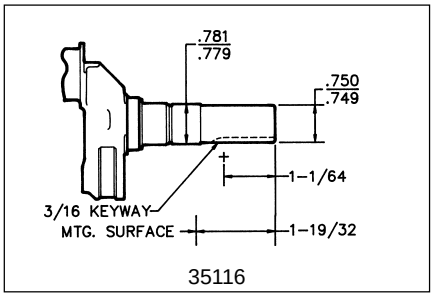
MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





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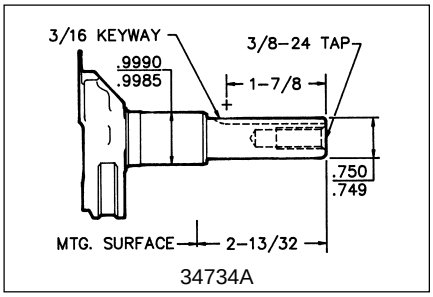
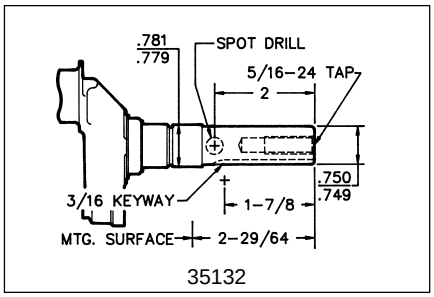


34734A



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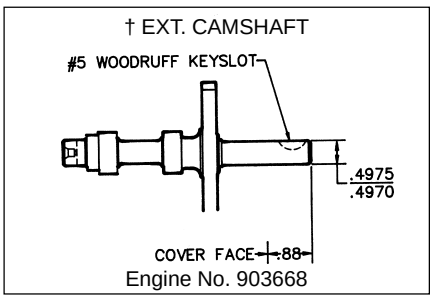


Engine No. 903668

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Exhaust Direction	Top Governed Speed	Note
903667A	Toro	35116	Remote/Manual Convertible	Ref. 2 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	PTO Side	3150	▲ ●
903668	Garden Way	34734A	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	PTO Side	3750	†
903669	Standard ■	35132	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	Carb. Side	3750	●

■ This engine is not eligible for return.
▲ Cast Iron Sleeve
● Ball Bearing, PTO side only.
† 2:1 Extended camshaft.

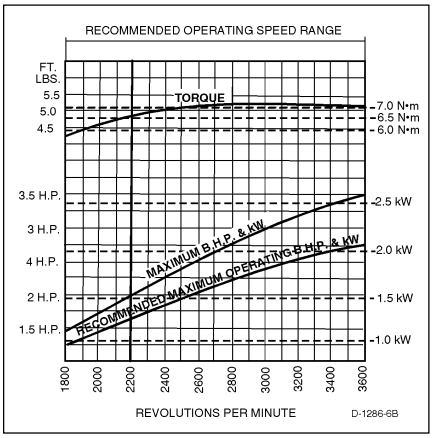
EPA AND CARB CERTIFIED

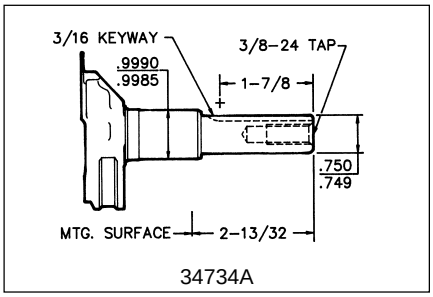
3.5 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





34734A

	Customer Service No.	Crankshaft	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903451	Standard ■	34734A	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

■ This engine is not eligible for return.

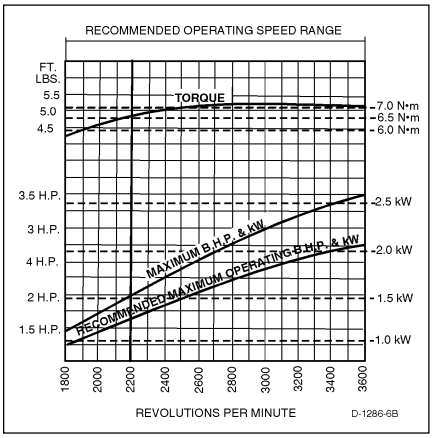
EPA AND CARB CERTIFIED

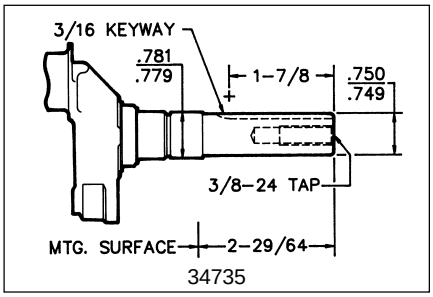
4.0 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H40
HORSEPOWER	4.0 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
904416	Standard ■	34735	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

■ This engine is not eligible for return.

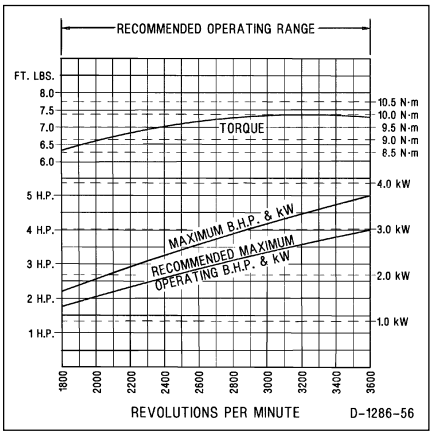
EPA AND CARB CERTIFIED

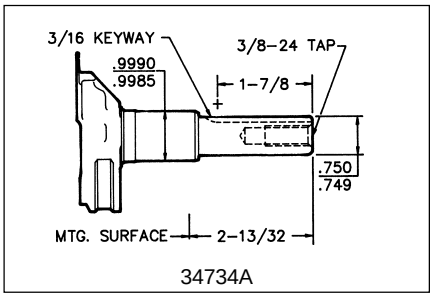
5.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-5/8 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	10.49 C.I. 172 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34734A

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905241A	Standard ■	34734A	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Black	3600

■ This engine is not eligible for return.

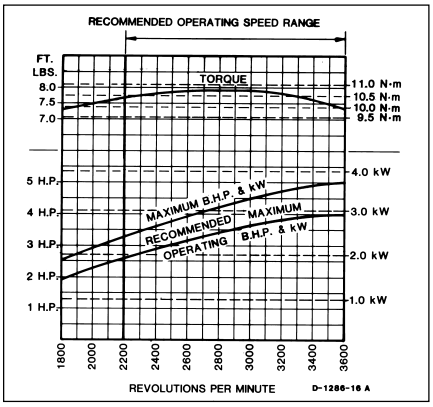
EPA AND CARB CERTIFIED

5.0 HORSEPOWER WINTER APPLICATION

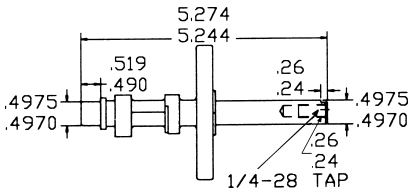
MODEL	HSSK50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	33 lbs. 15.0 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

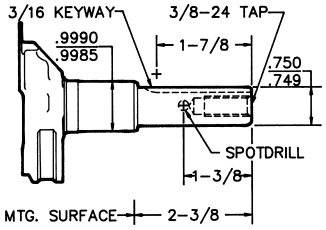
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Start with Mitten Grip
- Easy Start Primer
- Float Carburetor with Choke
- Electronic CDI Ignition
- Oil Fill Tube with Dipstick
- Aluminized Side Discharge Muffler



† EXT. CAMSHAFT



Engine No. 905363



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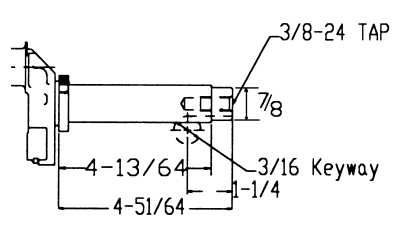
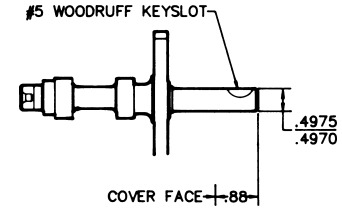


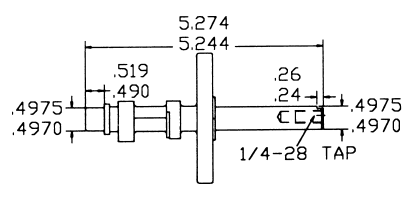
35975

† EXT. CAMSHAFT



Engine No. 905364

† EXT. CAMSHAFT



Engine No. 905365

	Customer	Crankshaft Service No.	Provisions for Electric Starter	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Note
905363	MTD	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905364	Standard ■	34740	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905365	Standard ■	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†

■ This engine is not eligible for return.
* No. 33290E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft.

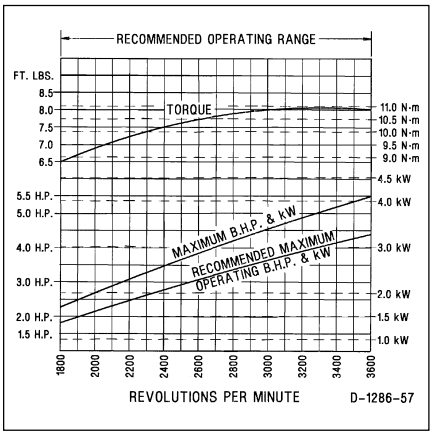
EPA AND CARB CERTIFIED

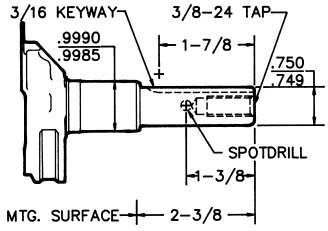
5.5 HORSEPOWER OVERHEAD VALVE

MODEL	OHH55
HORSEPOWER	5.5 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34740

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905242A	Standard ■	34740	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3600

■ This engine is not eligible for return.

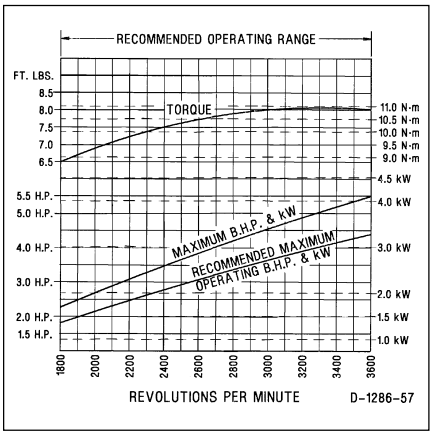
EPA AND CARB CERTIFIED

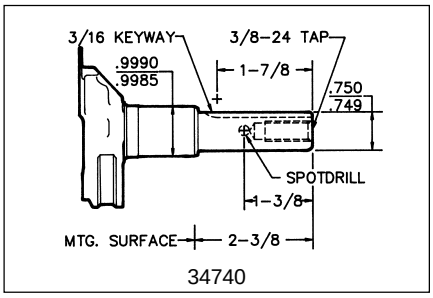
5.5 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK55
HORSEPOWER	5.5 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Starter w/Mitten Grip
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34740

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905366	Standard	34740	Manual	X *	Front	3.5 Qts. Ref. 4	Platinum	3600

* No. 33290E - 120 volt electric starter kit can be installed.

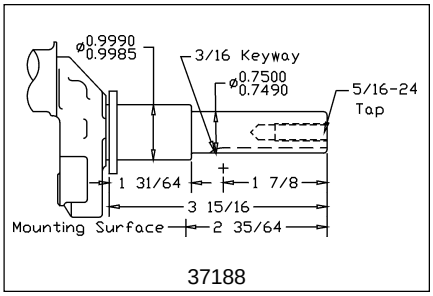
EPA AND CARB CERTIFIED

6.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH60
HORSEPOWER	6.0 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube



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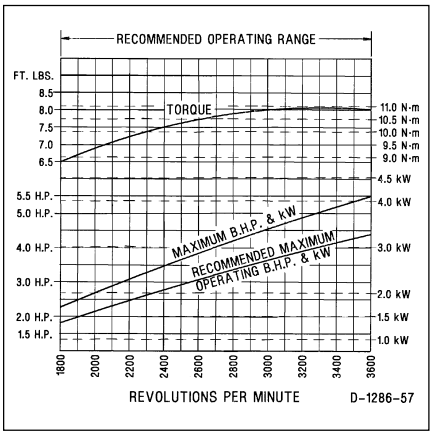

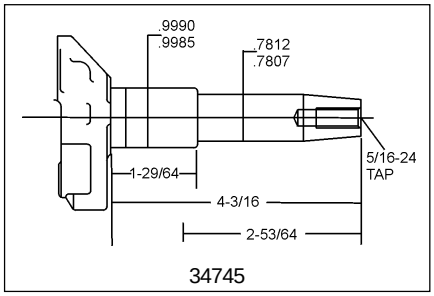

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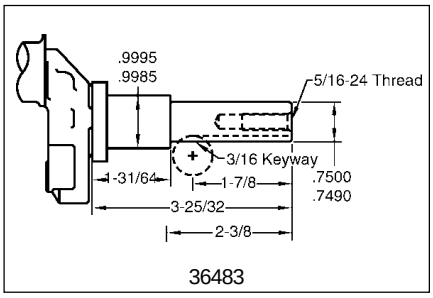


36483

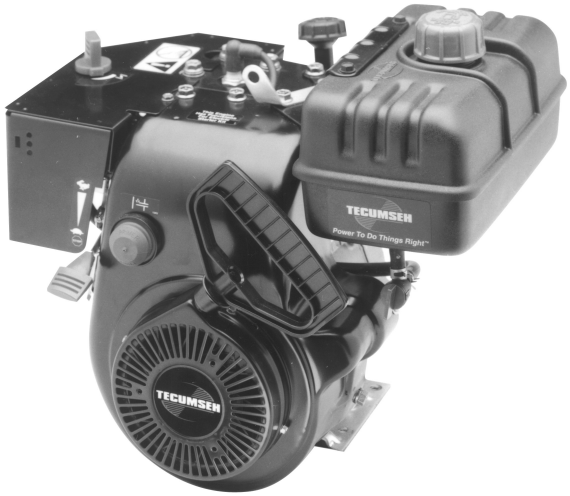
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
906221A	Murray	37188	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350
906222	Generac	34745	Fixed Speed	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3350
906223		36483	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350

■ This engine is not eligible for return.

EPA AND CARB CERTIFIED

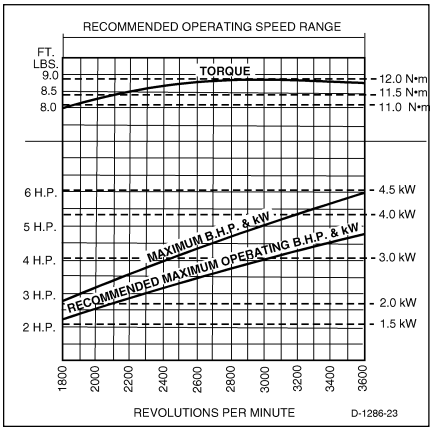
6.0 HORSEPOWER WINTER APPLICATION

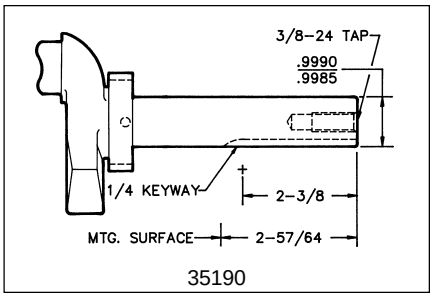
MODEL	HSK60
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-5/8 x 2-1/2 in. 66.69 x 63.50 mm
DISPLACEMENT	13.53 C.I. 221.8 cc
OIL CAPACITY	19 oz. .56 ltr.
(APPROX.) WEIGHT	48 lbs. 21.81 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions





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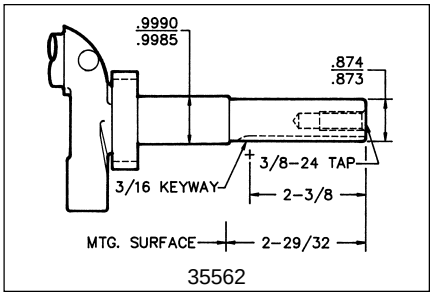


35562

	Customer	Crankshaft Service No.	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
906362	Toro	35190	Manual	X *	Dual Side	2 Qts. Ref. 4	3300
906363	Toro	35562	Manual	X *	Dual Side	4 Qts. Ref. 4	3300

* No. 33328D - 120 volt electric starter can be installed.

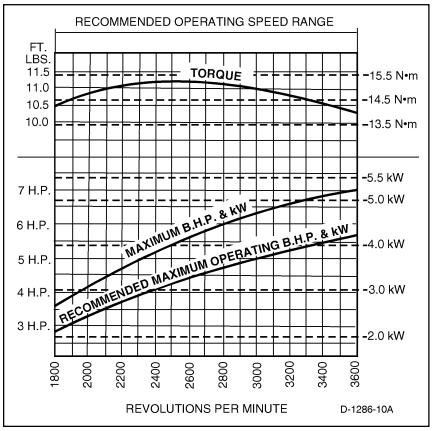
EPA AND CARB CERTIFIED

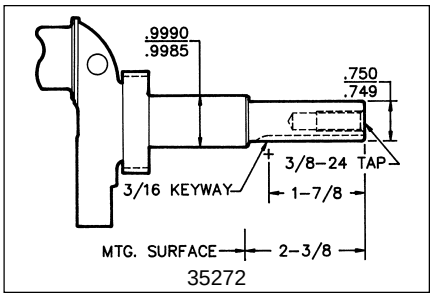
7.0 HORSEPOWER WINTER APPLICATION

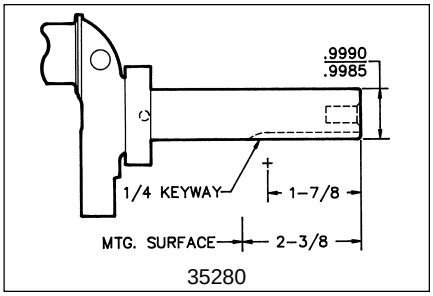
MODEL	HSK70
HORSEPOWER	7.0 5.22 kW
BORE & STROKE	2-3/4 x 2-17/32 in. 69.86 x 64.31 mm
DISPLACEMENT	15.04 C.I. 246.54 cc
OIL CAPACITY	19 oz. .56 ltr.
(APPROX.) WEIGHT	47 lbs. 21.36 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions







	Customer	Crankshaft Service No.	Controls	Provisins for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
907306	Standard ■	35272	Manual	X *	Dual Side	4 Qts. Ref. 4	3800
907363	Ariens	35280	Manual	X *	Dual Side	4 Qts. Ref. 4	3600

■ This engine is not eligible for return.
* No. 33328D - 120 volt electric starter can be installed.

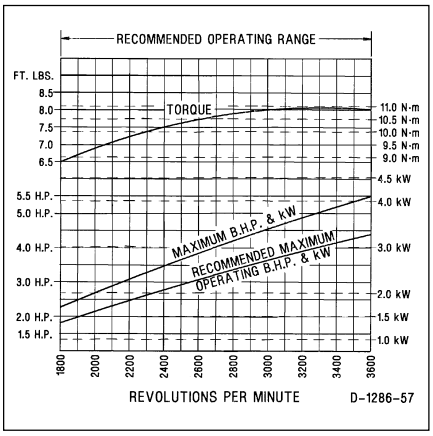
EPA AND CARB CERTIFIED

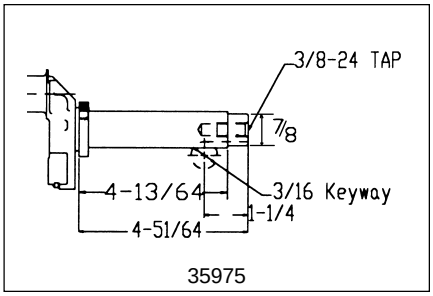
7.0 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

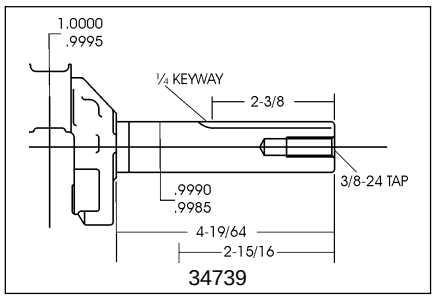
MODEL	OHSK70
HORSEPOWER	7.0 5.22 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

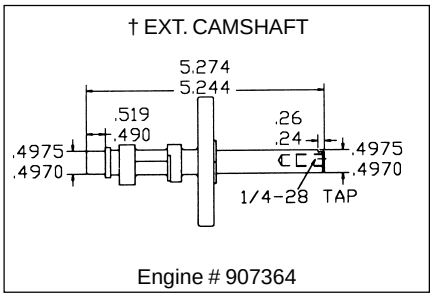
FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Starter w/Mitten Grip
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube









	Customer	Crankshaft Service No.	Controls	Provisions for Electric Start	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed	Note
907364	MTD Products	35975	Manual	X *	Front	3.5 Qts. Ref. 4	Black	3750	†
907365		34739	Manual	X *	Front	3.5 Qts. Ref. 4	Black	3750	

* No. 33290E - 120 volt electric starter kit can be installed.
† 2:1 extended camshaft

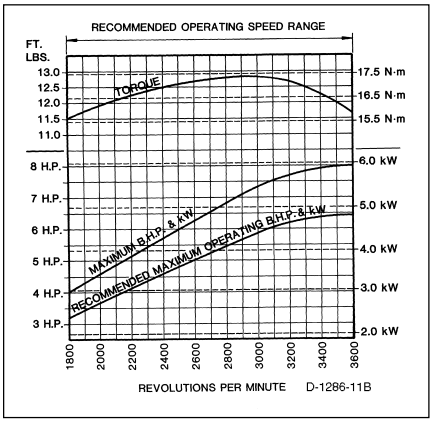
EPA AND CARB CERTIFIED

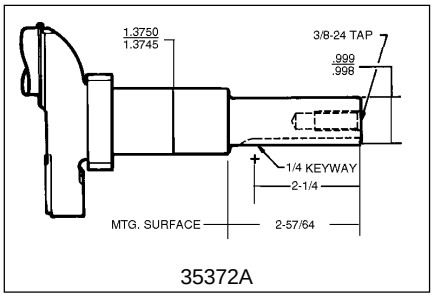
8.0 HORSEPOWER MEDIUM FRAME - M SERIES INDUSTRIAL APPLICATION

MODEL	HM80
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





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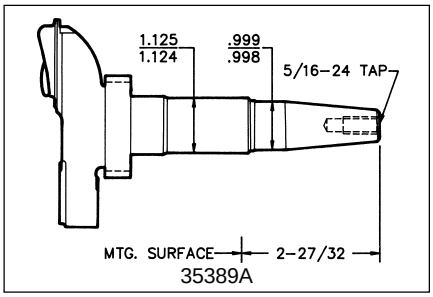

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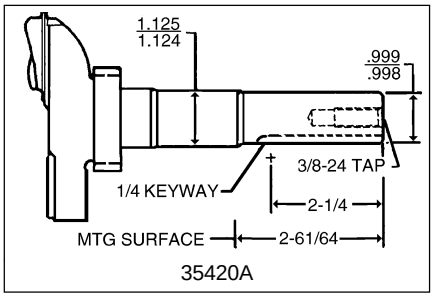

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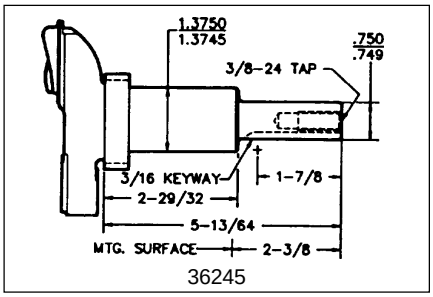


36245

	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
908202	Standard ■ BB	35420A		Manual	Rewind	Ref. 5 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
908204	Standard ■	35372A		Remote	Rewind	Ref. 2 33268 (Paper)	Dual Side	4 Qts. 4	3600
908212	Standard ■ BB	35389A		Fixed Speed	Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3600
908213	Garden Way	36245	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 5 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600

■ This engine is not eligible for return.
BB Ball Bearing
† 36680 - 12 volt electric starter can be installed.

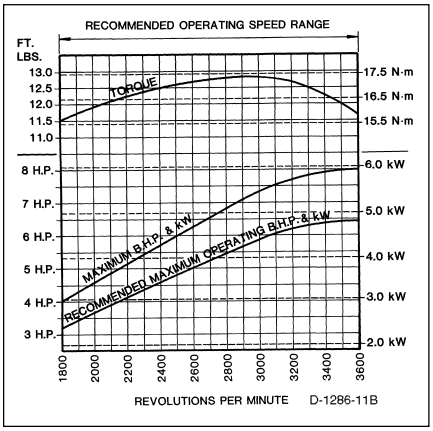
EPA AND CARB CERTIFIED

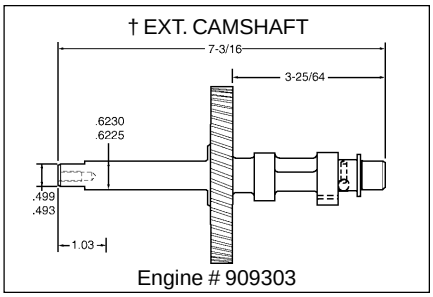
9.0 HORSEPOWER WINTER APPLICATION

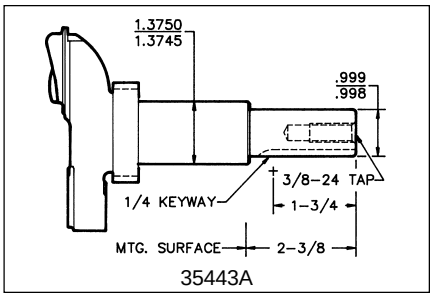
MODEL	HMSK90
HORSEPOWER	9.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

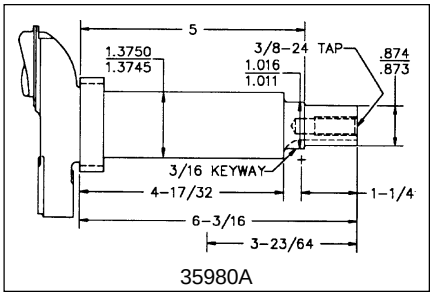
FEATURES

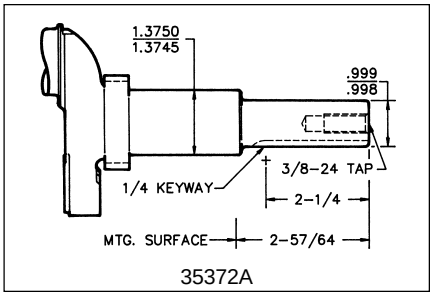
- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve











	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909300	Standard ■	35372A	3 amp A.C.	Manual	X *	Dual Side	4 Qts. Ref. 4	3450
909301	Standard ■	35443A		Manual	X *	Dual Side	4 Qts. Ref. 4	3250
†909303	MTD	35980A	18 Watt	Manual	X *	Front Dual Side	4 Qts. Ref. 4	3600

■ This engine is not eligible for return.
* No. 33329E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft

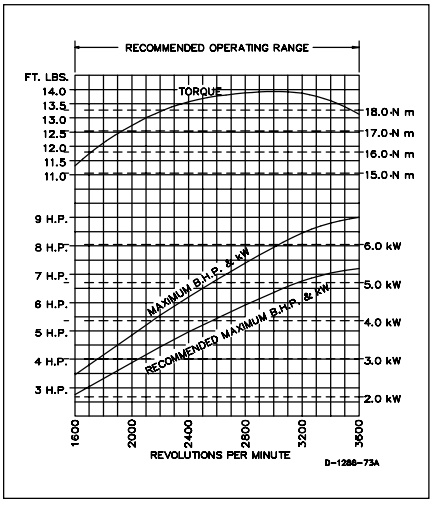
EPA AND CARB CERTIFIED

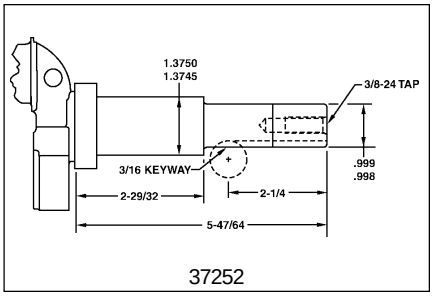
9 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK90
HORSEPOWER	9.0 6.7 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





37252

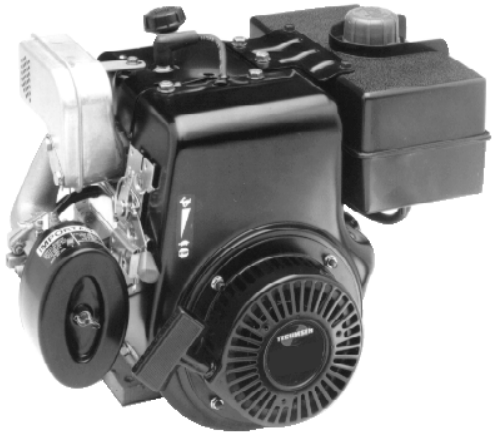
	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909302	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

EPA AND CARB CERTIFIED

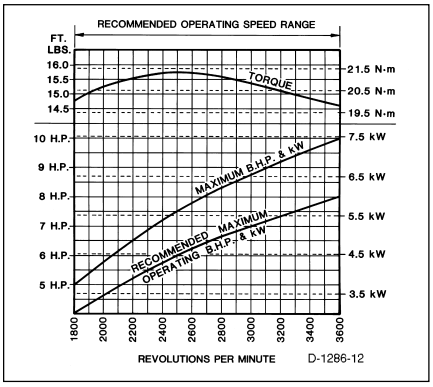
10 HORSEPOWER MEDIUM FRAME - M SERIES INDUSTRIAL APPLICATION

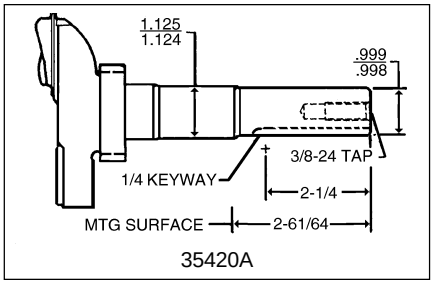
MODEL	HM100
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm



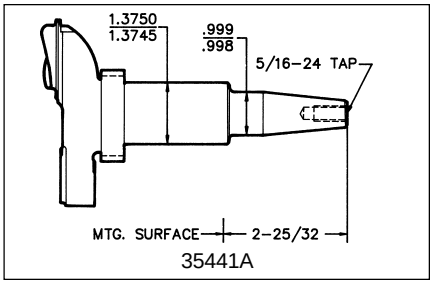
FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





35420A



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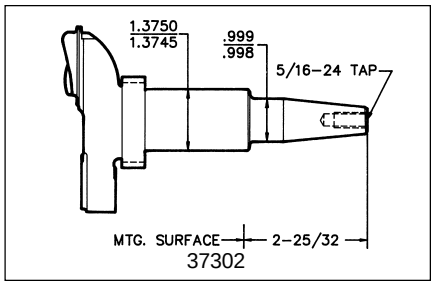
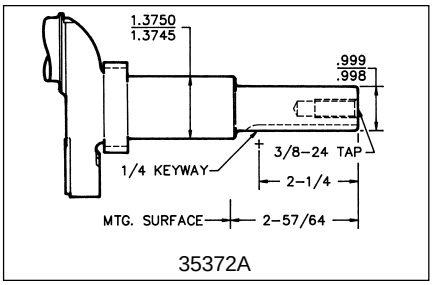


37302



35372A

	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
910205	Standard ■ BB	35420A	3 amp D.C. 5 amp D.C.	Manual	Electric Starter w/Rewind	Ref. 5 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
910206	MTD Ltd. BB	35420A		Manual	Rewind	Ref. 5 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3400
910207	Standard ■	35372A		Manual	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3600
910263A	Coleman	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3600
910264A	Generac †	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3750
910265	Devilbiss †	37302		Fixed Speed	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3750

■ This engine is not eligible for return.
* 36680 - 12 Volt electric starter can be installed.
† Low oil shutdown.

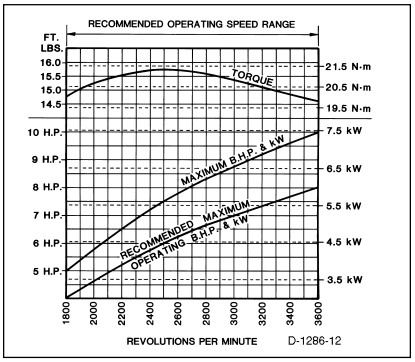
EPA AND CARB CERTIFIED

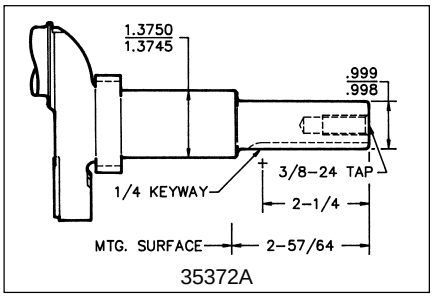
10 HORSEPOWER WINTER APPLICATION

MODEL	HMSK100
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 90 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve





	Customer	Crankshaft Service No.	Charging System	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Notes
910309	Standard ■	35372A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
910310	Standard ■	35372A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3450	✱

■ This engine is not eligible for return.
✱ 33329D - 120 volt electric starter can be installed.
† 2:1 extended camshaft

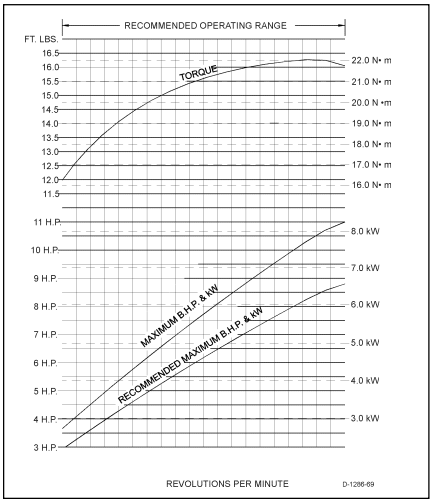
EPA AND CARB CERTIFIED

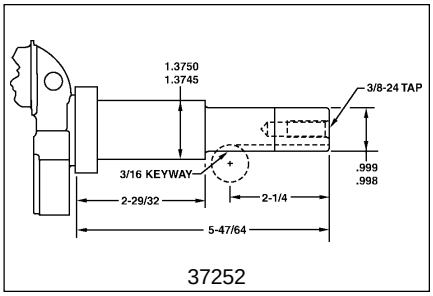
10 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK110
HORSEPOWER	10.0 8.2 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





37252

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
911306	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

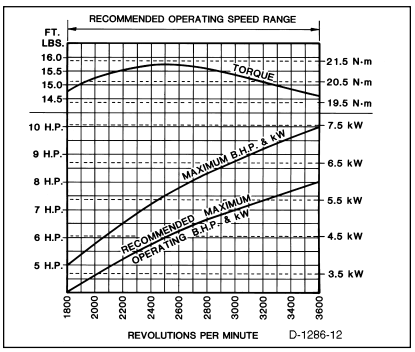
EPA AND CARB CERTIFIED

11 HORSEPOWER WINTER APPLICATION

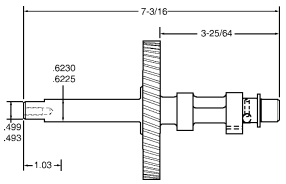
MODEL	HMSK110
HORSEPOWER	11.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 90 mm

FEATURES

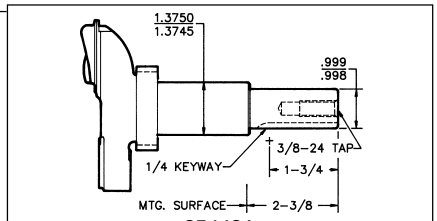
- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve



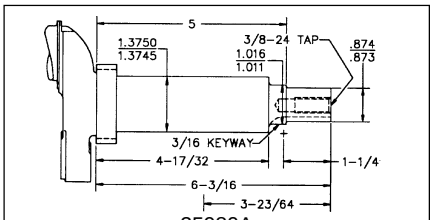
† EXT. CAMSHAFT



Engine No. 911361



35443A



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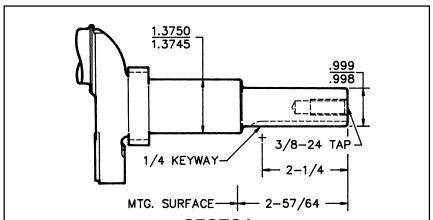

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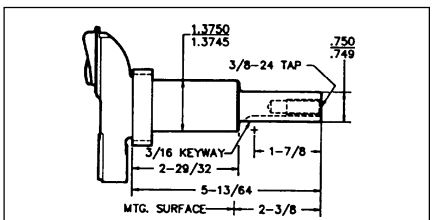
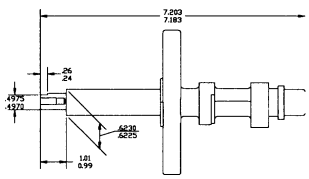


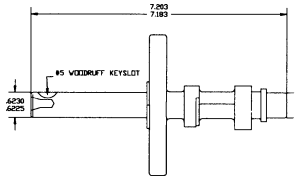
36245

† EXT. CAMSHAFT



Engine No. 911360

† EXT. CAMSHAFT



Engine No. 911300

	Customer	Crankshaft Service No.	Charging System	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Notes
911300	Standard ■	36245	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱ †
911301	Standard ■	35443A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3250	✱
911302	Standard ■	35372A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911303	Standard ■	35372A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911304	Standard ■	36425	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱
911305	Standard ■	35443A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911360	MTD LTD.	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †
911361	Standard ■	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †

■ This engine is not eligible for return.

✱ 33329D - 120 volt electric starter can be installed.

† 2:1 extended camshaft

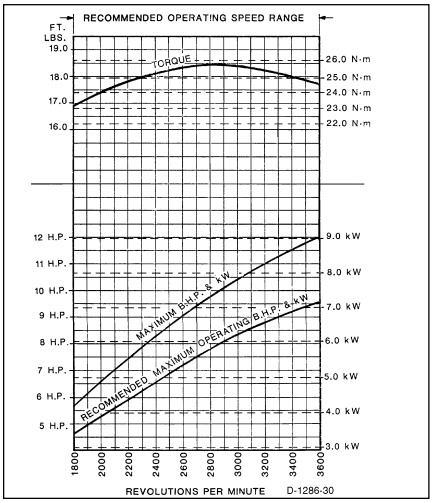
EPA AND CARB CERTIFIED

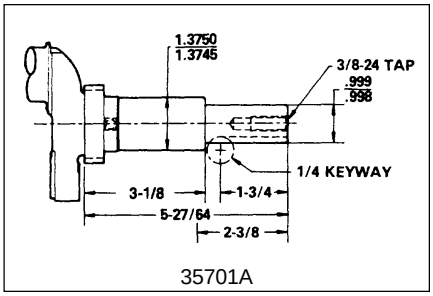
12 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK120
HORSEPOWER	12.0 8.95 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.29 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design





35701A

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
912301	Standard ■	35701A	18 Watt	Manual	X *	Dual Side	6 Qt. Ref. 4	3700

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

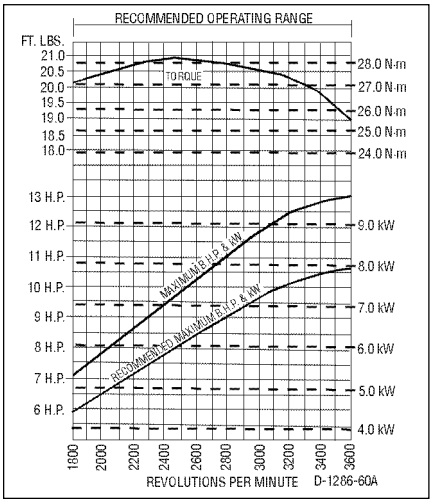
EPA AND CARB CERTIFIED

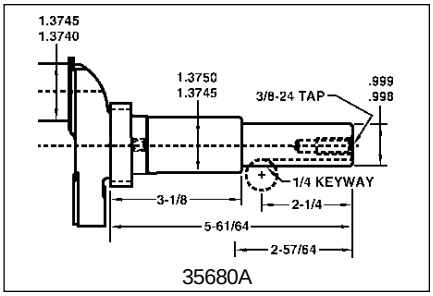
13 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK130
HORSEPOWER	13.0 9.7 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
913300	Standard ■	35680A	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

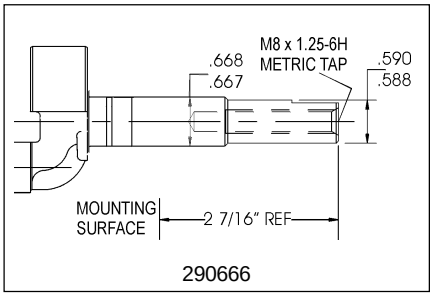
EPA AND CARB CERTIFIED

2 HORSEPOWER TWO CYCLE AUGER APPLICATION

MODEL	TC300
HORSEPOWER	2.0 1.49 kW
BORE & STROKE mm	1.75 x 1.25 in. 44.5 mm x 31.8
DISPLACEMENT	3.0 C.I. 49.2 cc
OIL / FUEL MIXTURE	24:1
(APPROX.) WEIGHT	7 lbs. 3.2 kg

FEATURES

- Aluminum Cylinder Bore
- Poly Air Filter with Flocked Screen
- Ball / Needle Bearing Construction
- Integral Recoil Starter
- Responsive Air Vane Governor



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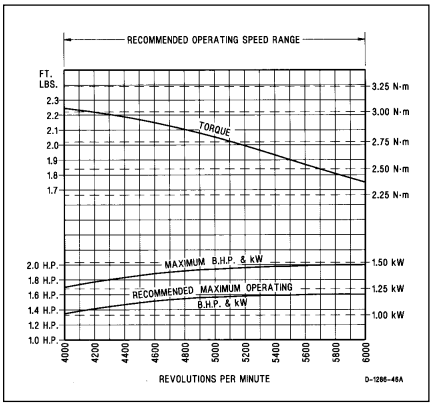

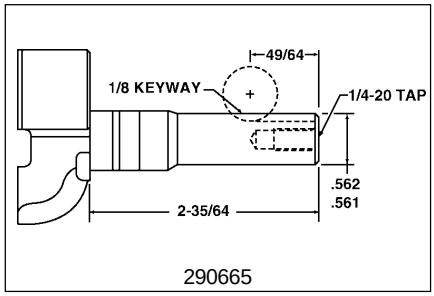

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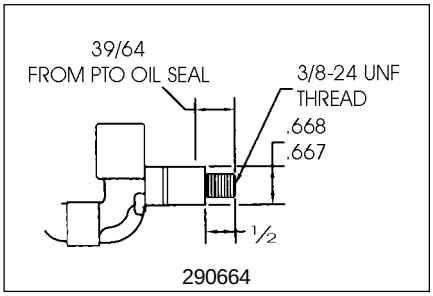


290664

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Carburetor	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
800174A	Flymo	290666	Remote	Ref. 1 35066 (Paper)	Diaphragm w/choke	16 oz. Ref. 7	3800
800264A	Active Technology	290665	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	6000
800662A	Feldman	290664	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	6000
800664A	Hoffco	290664	Remote	Ref. 3 450255 (FLocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	5400

EPA AND CARB CERTIFIED

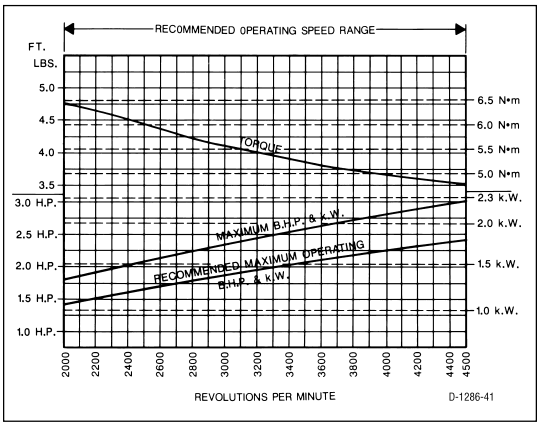
TECUMSEH

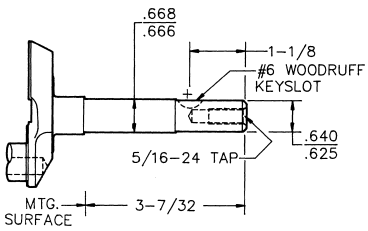
3 HORSEPOWER TWO CYCLE WINTER APPLICATION

MODEL	HSK600
HORSEPOWER	3.00 2.24 kW
BORE & STROKE	2.09 x 1.75 in. 53 x 38 mm
DISPLACEMENT	6.0 C.I. 98 cc
OIL / FUEL MIXTURE	32:1
(APPROX.) WEIGHT	12 lbs. 5.44 kg
BOLT MTG. CIRCLE	5.562 in.

FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Responsive Air Vane Governor
- Float Carburetor with Choke





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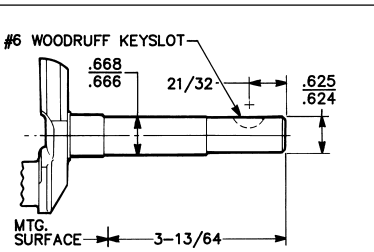

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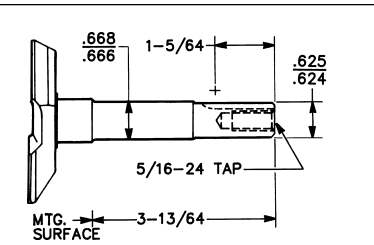


290609

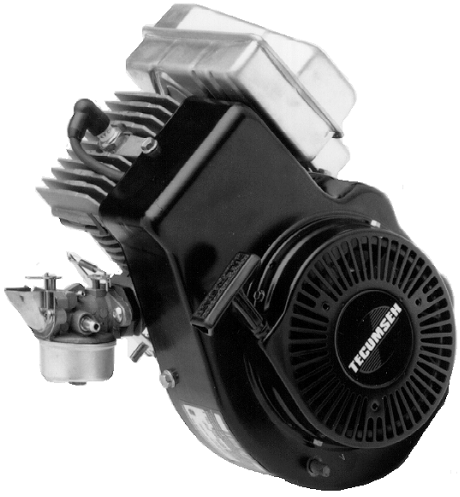
	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed	Notes
900389	Toro	290607	X *	Fixed Speed	4500	▲ ★
900390	MTD Mont. Ward	290609	X *	Fixed Speed	4500	▲
900391	Snapper	290607	X *	Fixed Speed	4300	▲
900392	Toro	290602	X *	Fixed Speed	4500	▲
900393	Murray Outdoor	290607	X *	Fixed Speed	4300	▲

* No. 590556 - 120 volt electric starter kit can be installed.
▲ Fuel tank omitted.
★ Muffler OEM supplied.

EPA AND CARB CERTIFIED

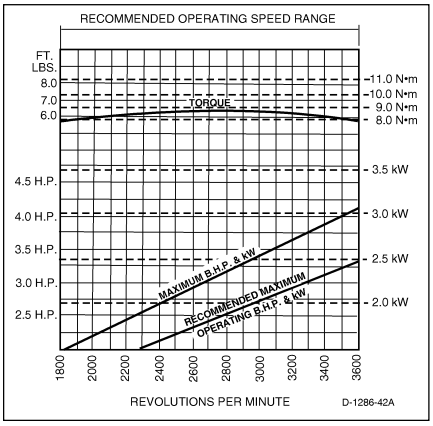
4.5 HORSEPOWER TWO CYCLE WINTER APPLICATION

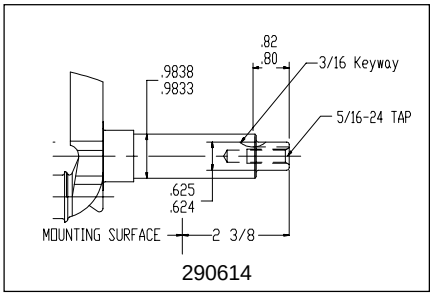
MODEL	HSK845
HORSEPOWER	4.5 3.35 kW
BORE & STROKE	2.44 x 1.81 in. 61.9 x 46 mm
DISPLACEMENT	8.46 C.I. 139 cc
OIL / FUEL MIXTURE	50:1
(APPROX.) WEIGHT	20 lbs. 9.1 kg
BOLT MTG. CIRCLE	3.625 in.



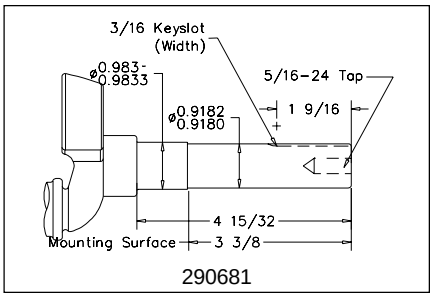
FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Quick Response Mechanical Governor
- Float Carburetor with Choke





290614



290681

	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed Speed	Notes
900394	MTD	290614	X *	Fixed Speed	3700	▲
900395	Toro	290681		Fixed Speed	3700	▲

* No. 590670 - 120 volt electric starter kit can be installed.
▲ Fuel tank omitted.

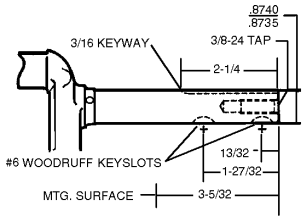
OUT OF PRODUCTION ENGINES

Quantity Limited to Factory & Distributor Stock

Refer to 1996-97 Service Engine Specification Book for Details

3.8 HP
Model TVS90

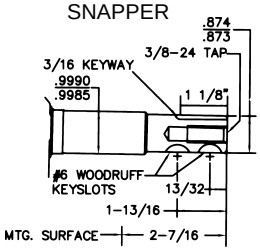
MURRAY / MTD



Engine No. 803189

4.0 HP
Model TVS115

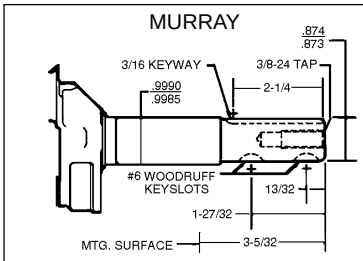
SNAPPER



Engine No. 804177A

5 HP
Model TVS115 Premier

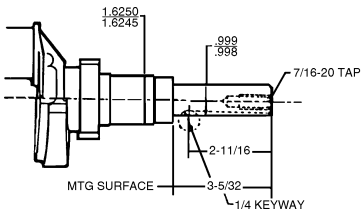
MURRAY



Engine No. 805171

15 HP
Model OHV15

NOMA



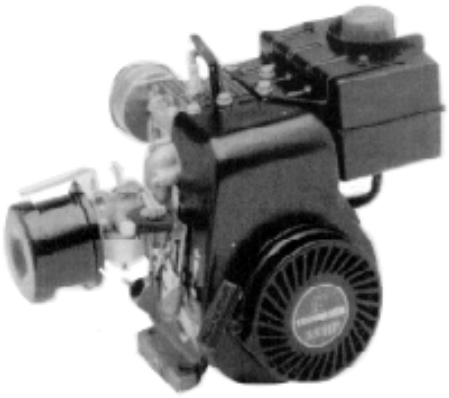
Engine No. 815060

OUT OF PRODUCTION ENGINES

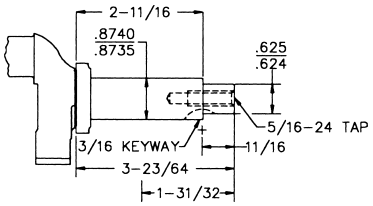
Quantity Limited to Factory & Distributor Stock

Refer to 1996-97 Service Engine Specification Book for Details

3.5 HP
Model H35



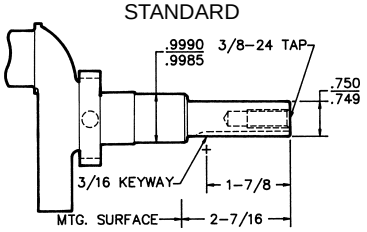
MURRAY



Engine No. 903611

5 HP
Model H50

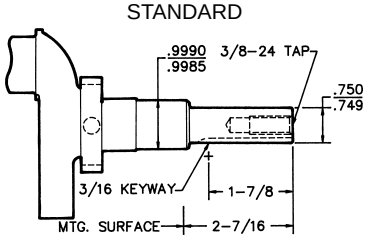
STANDARD



Engine No. 905225B

6 HP
Model H60

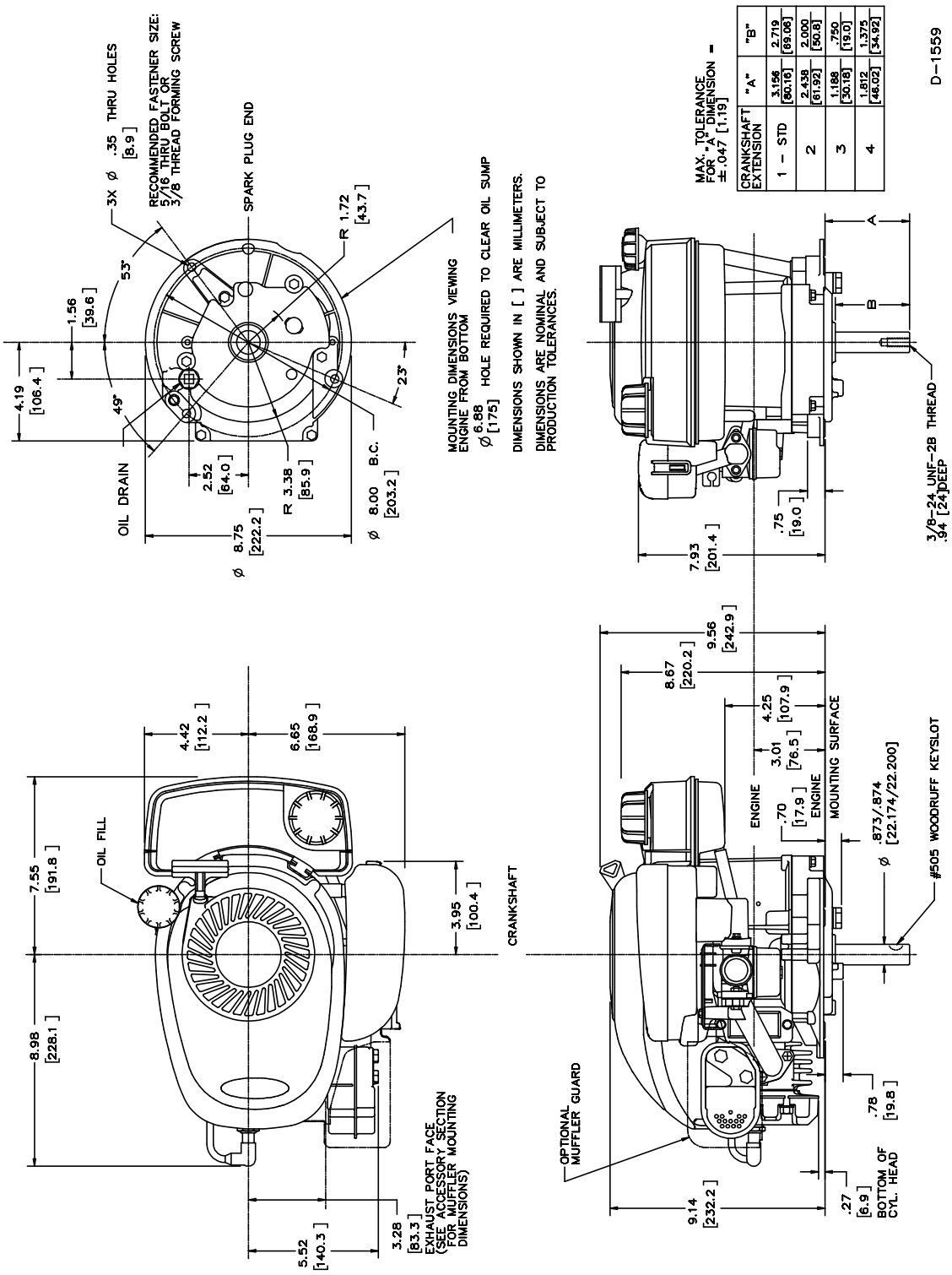
STANDARD



Engine No. 906201

DIMENSIONAL DRAWING

LEV100, LEV115, LEV120



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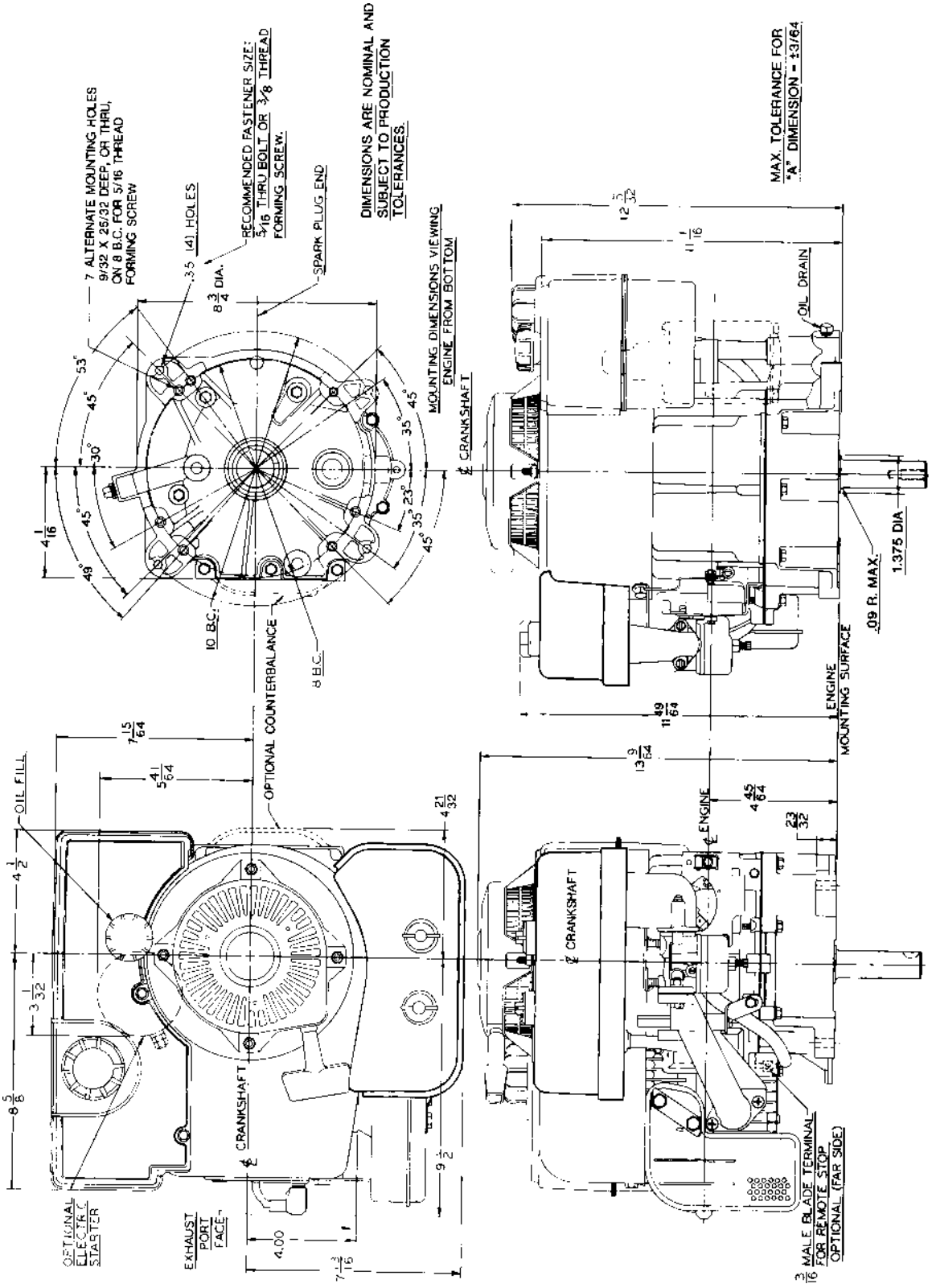
TVM195 - TVM220



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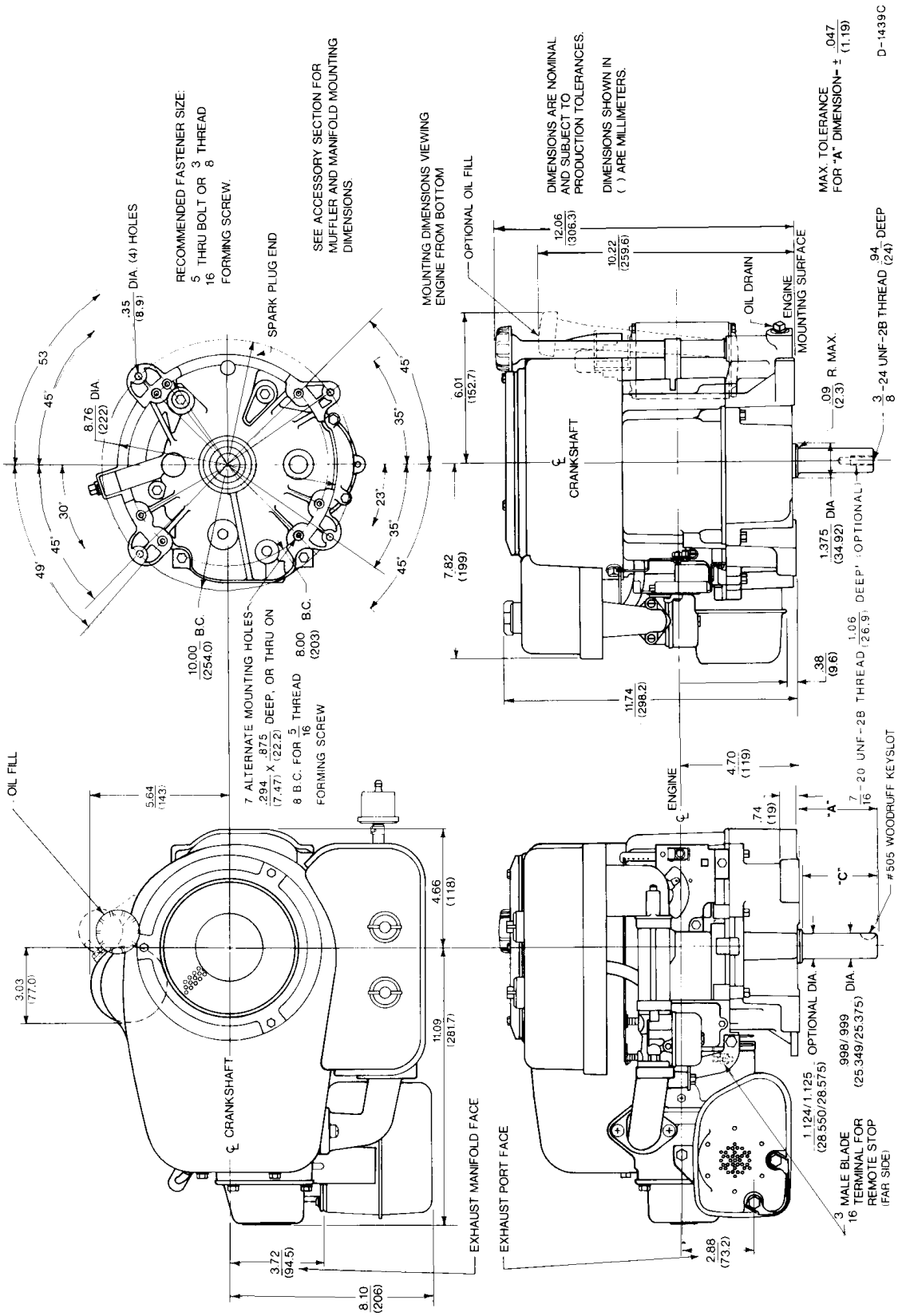
OHV125



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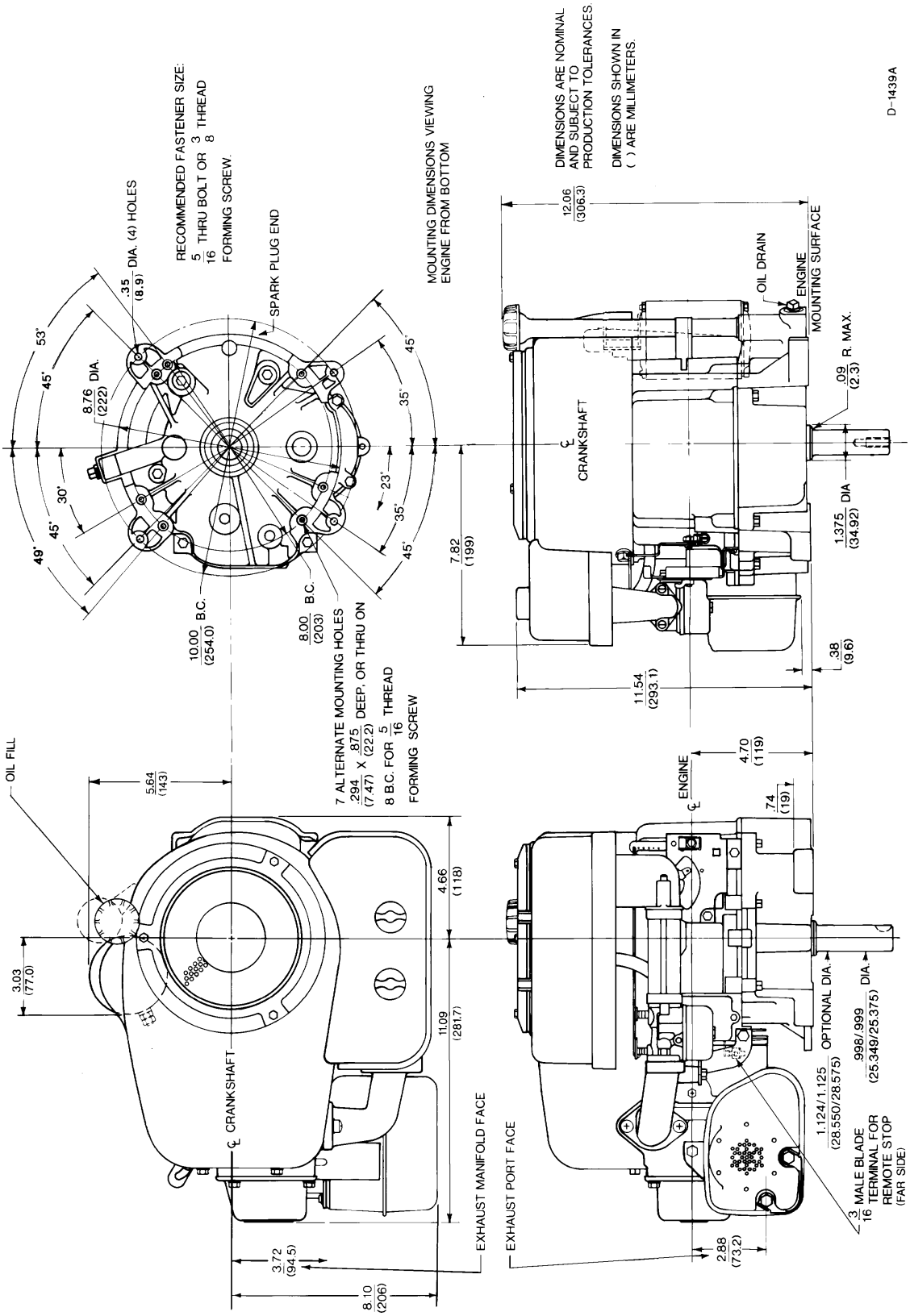
OHV13



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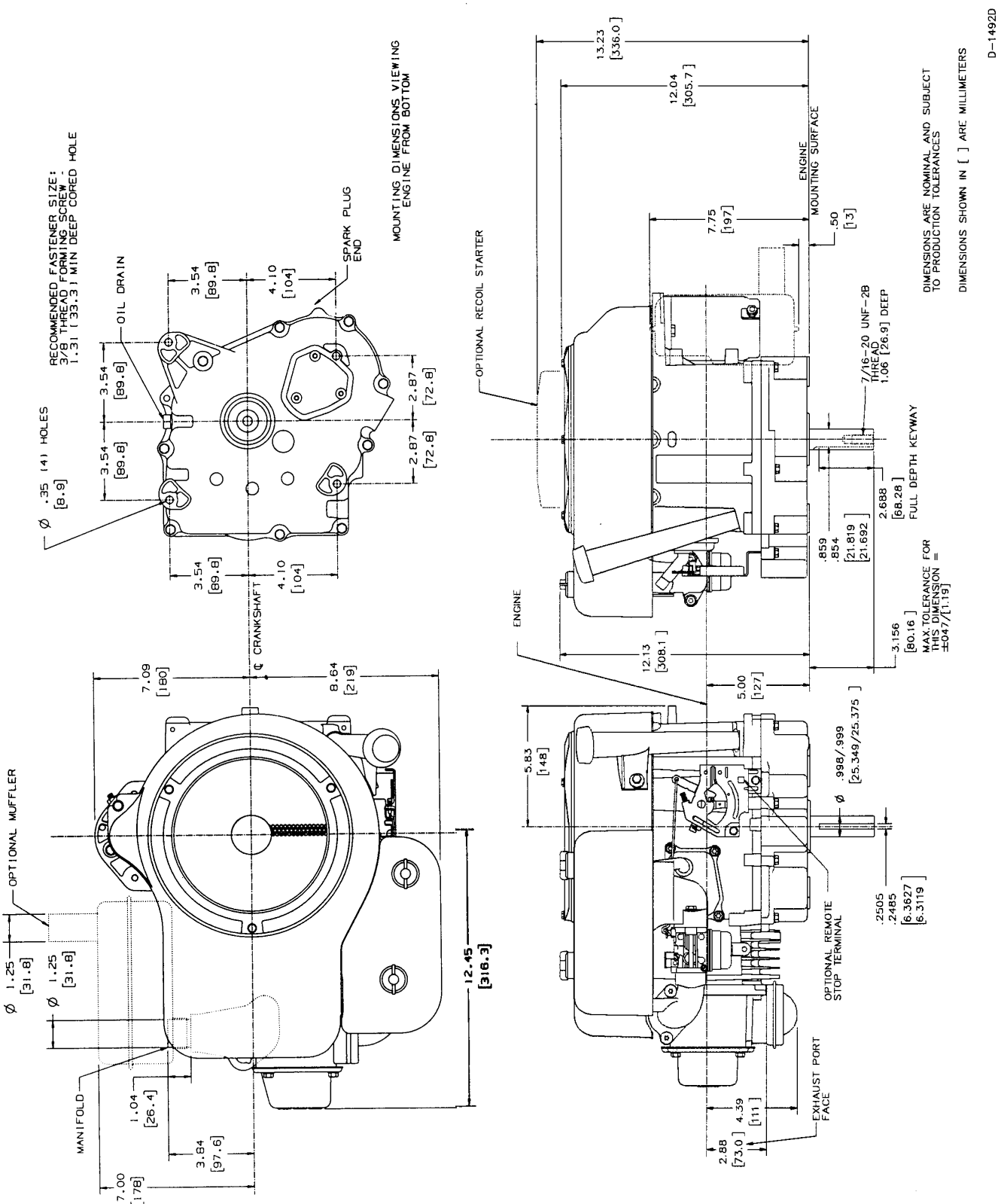
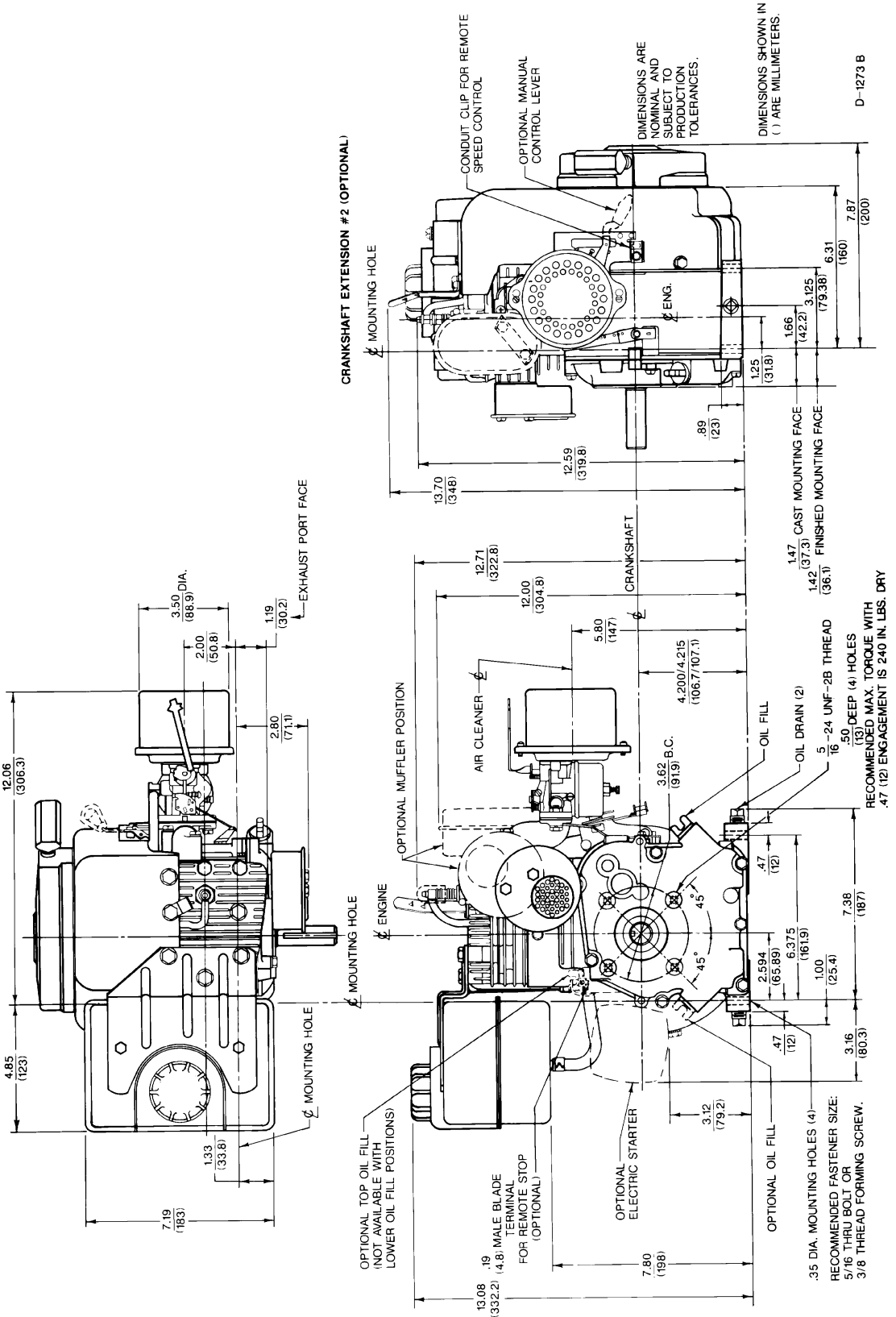
OHV17



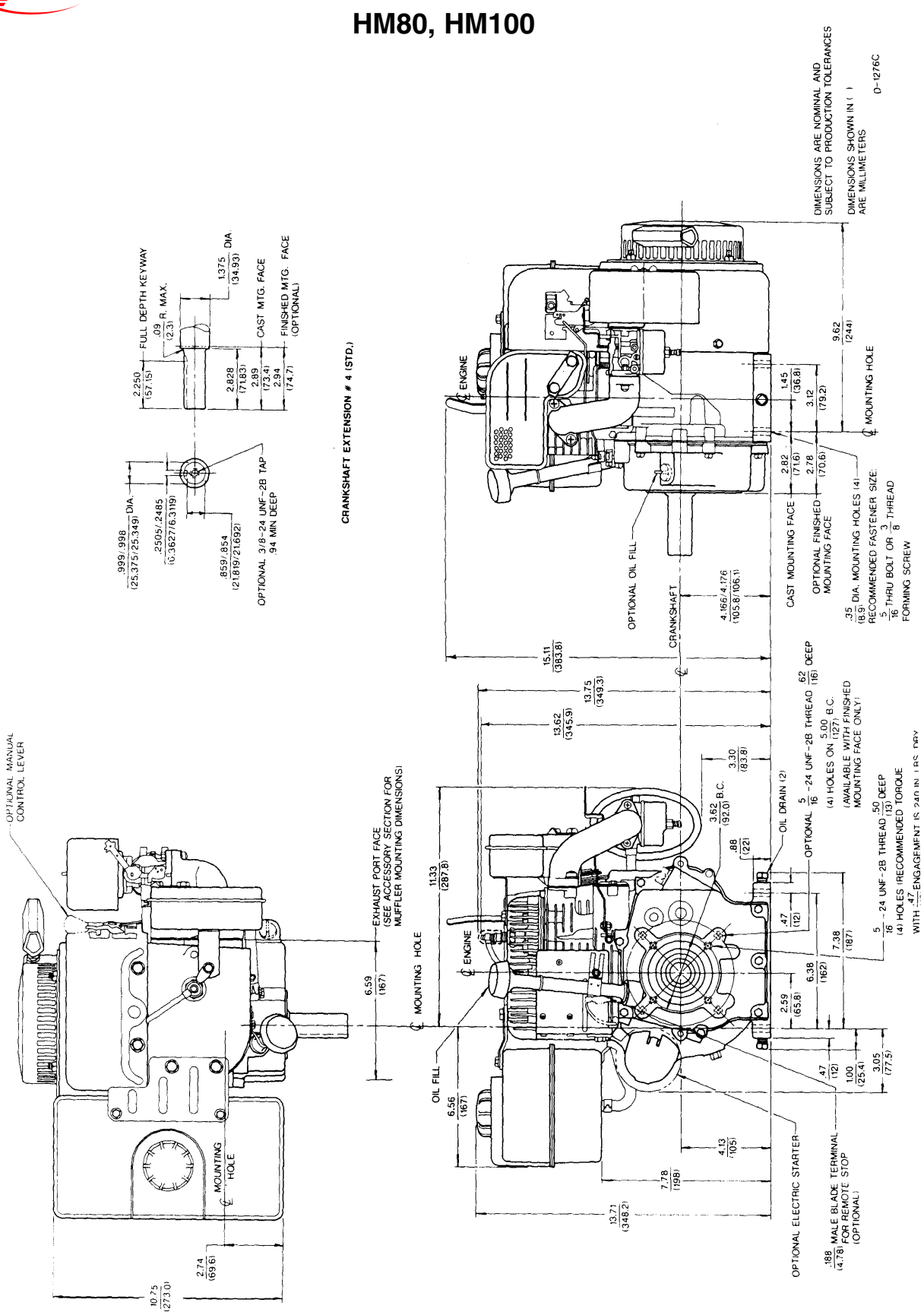
DIMENSIONAL DRAWING

H30, H35



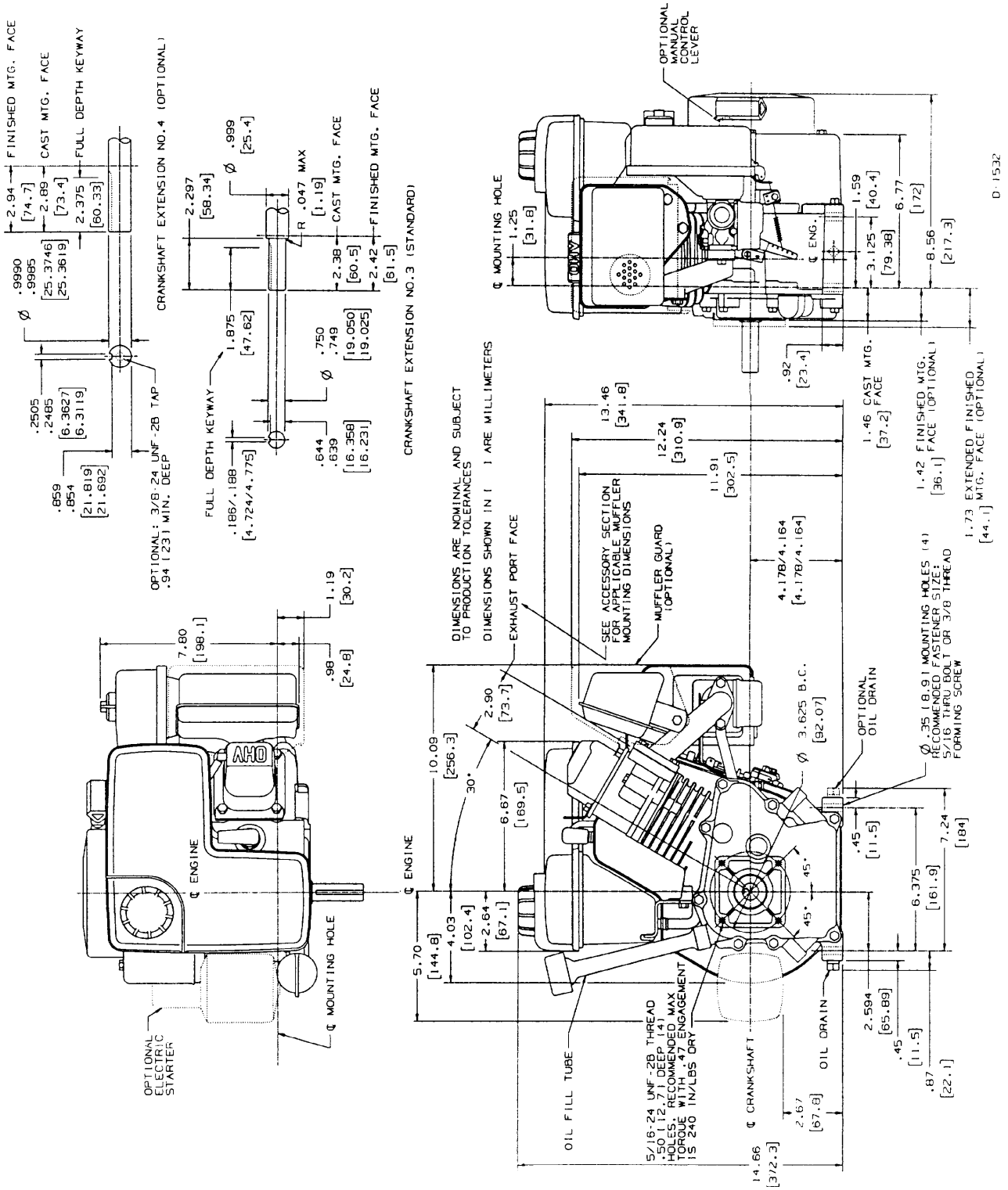
DIMENSIONAL DRAWING

HM80, HM100



DIMENSIONAL DRAWING

OHH50, OHH55, OHH60



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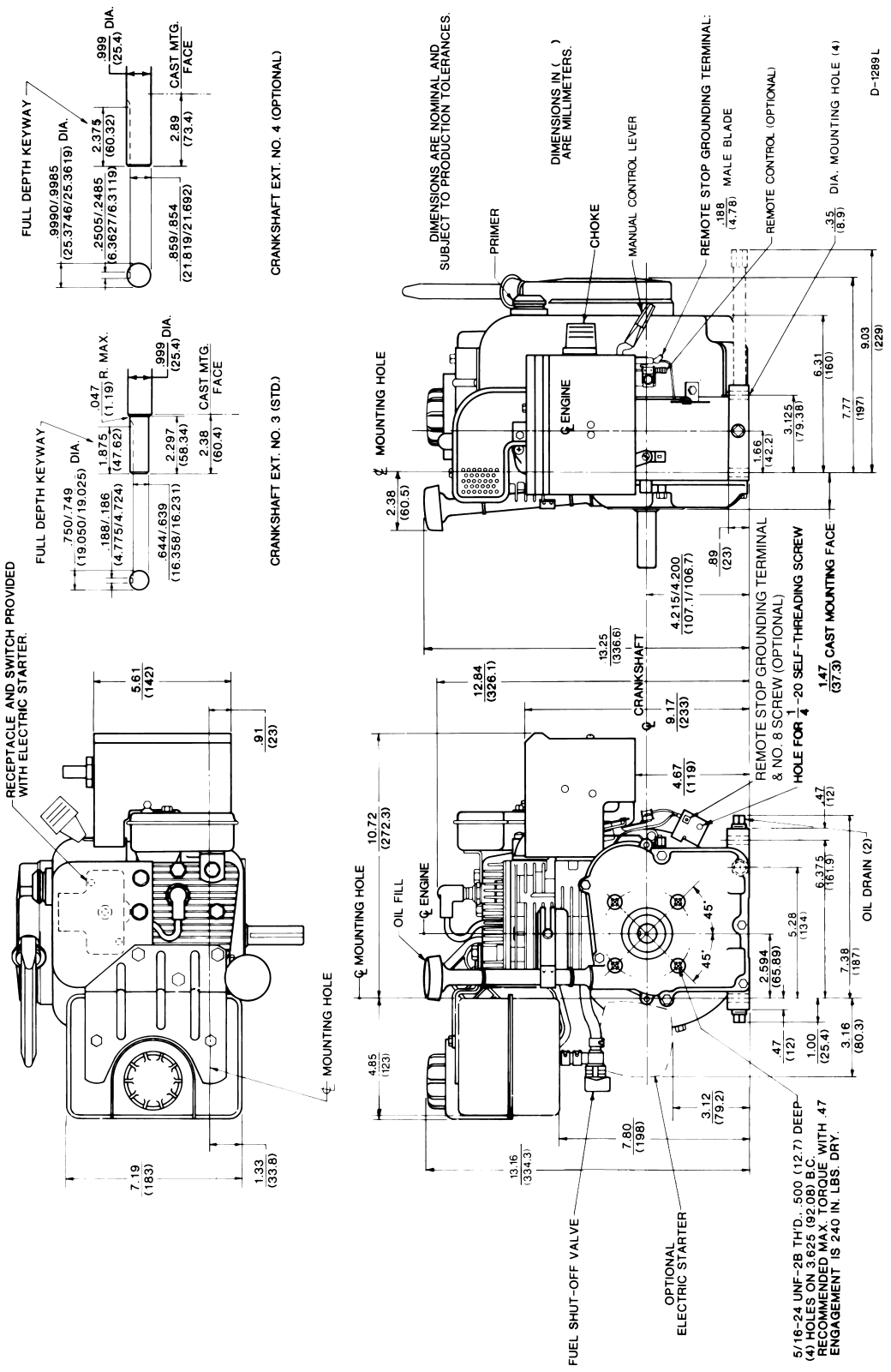
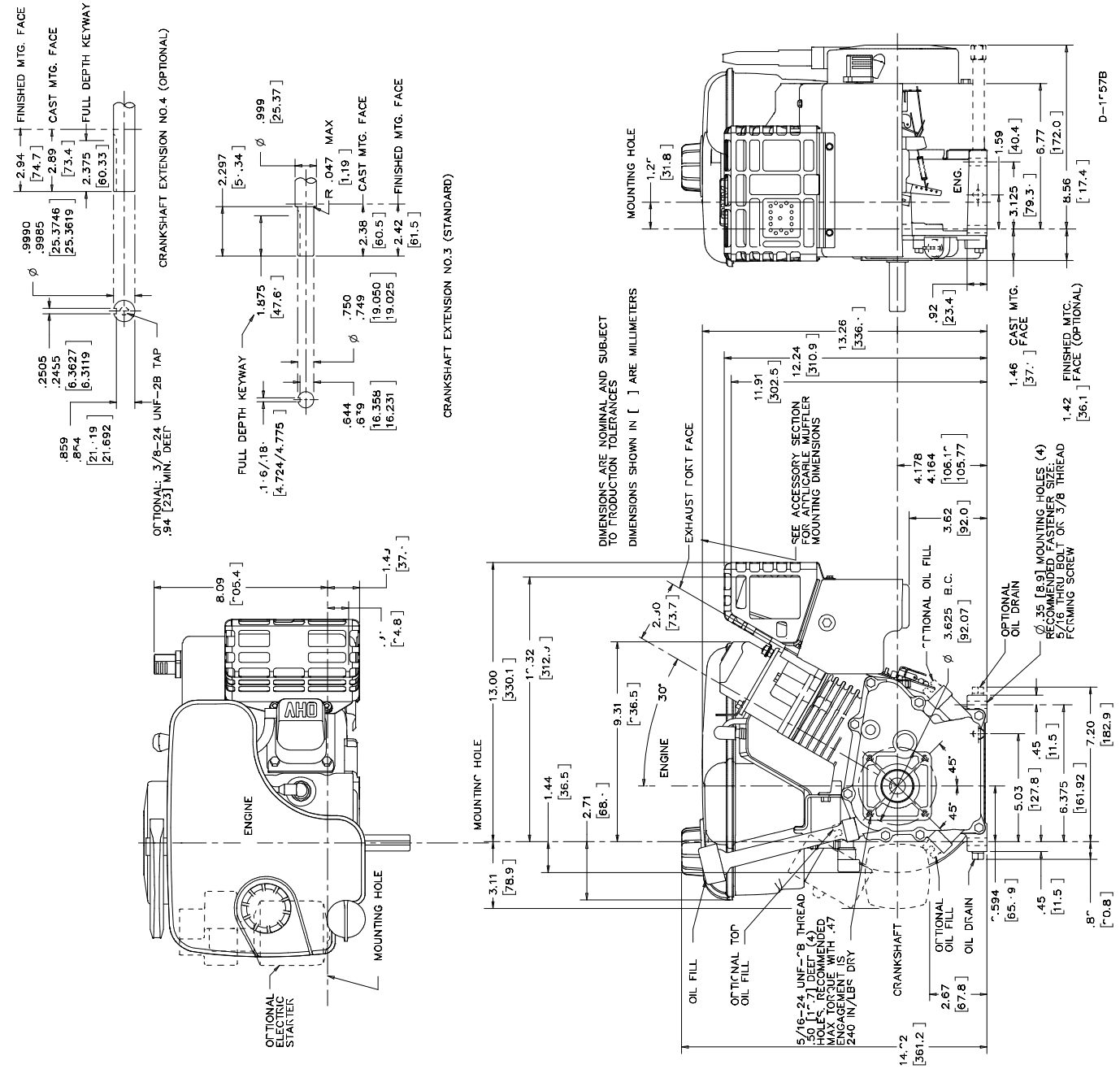
HSSK50



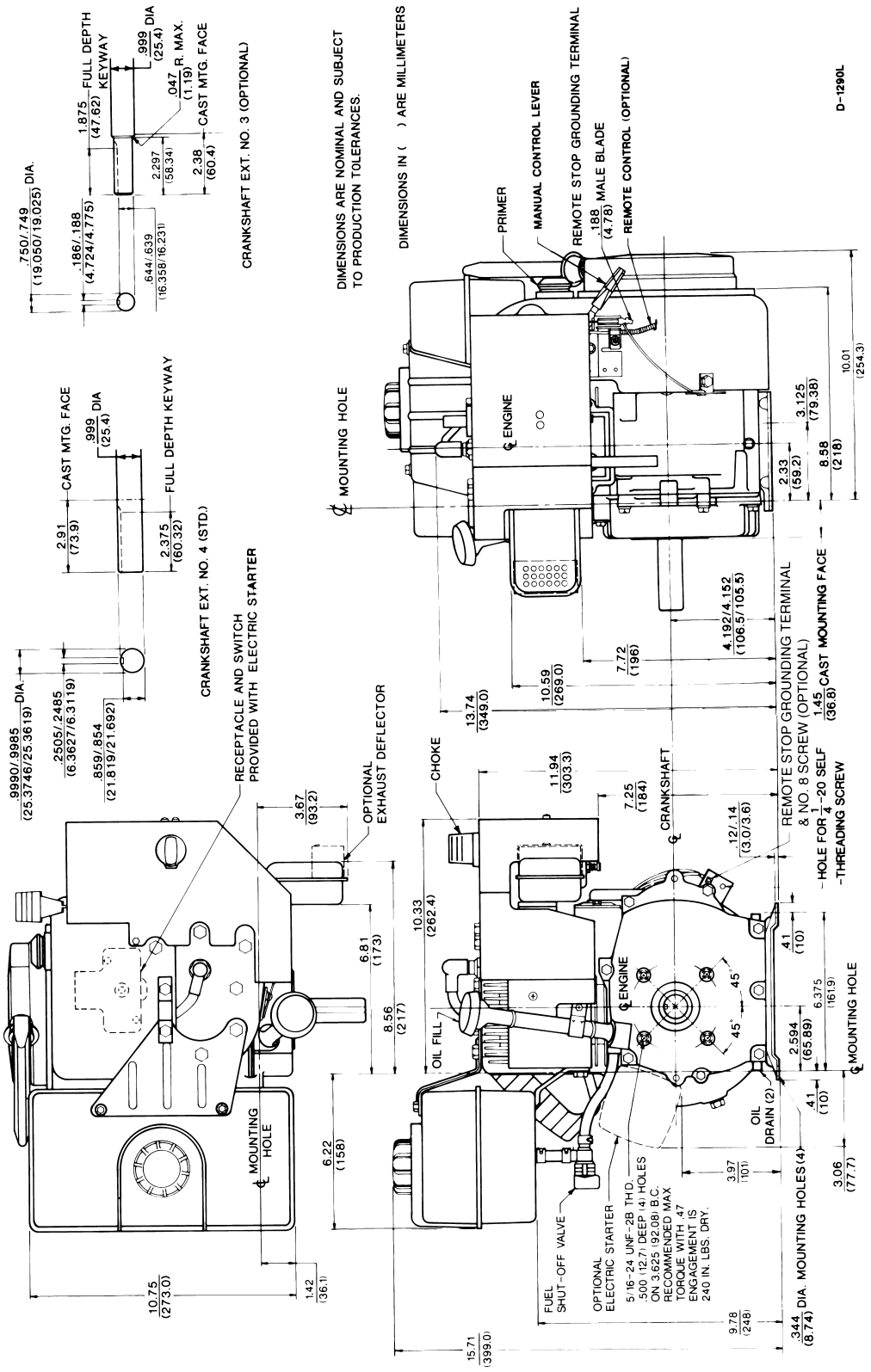
DIMENSIONAL DRAWING

OHSK55, OHSK70



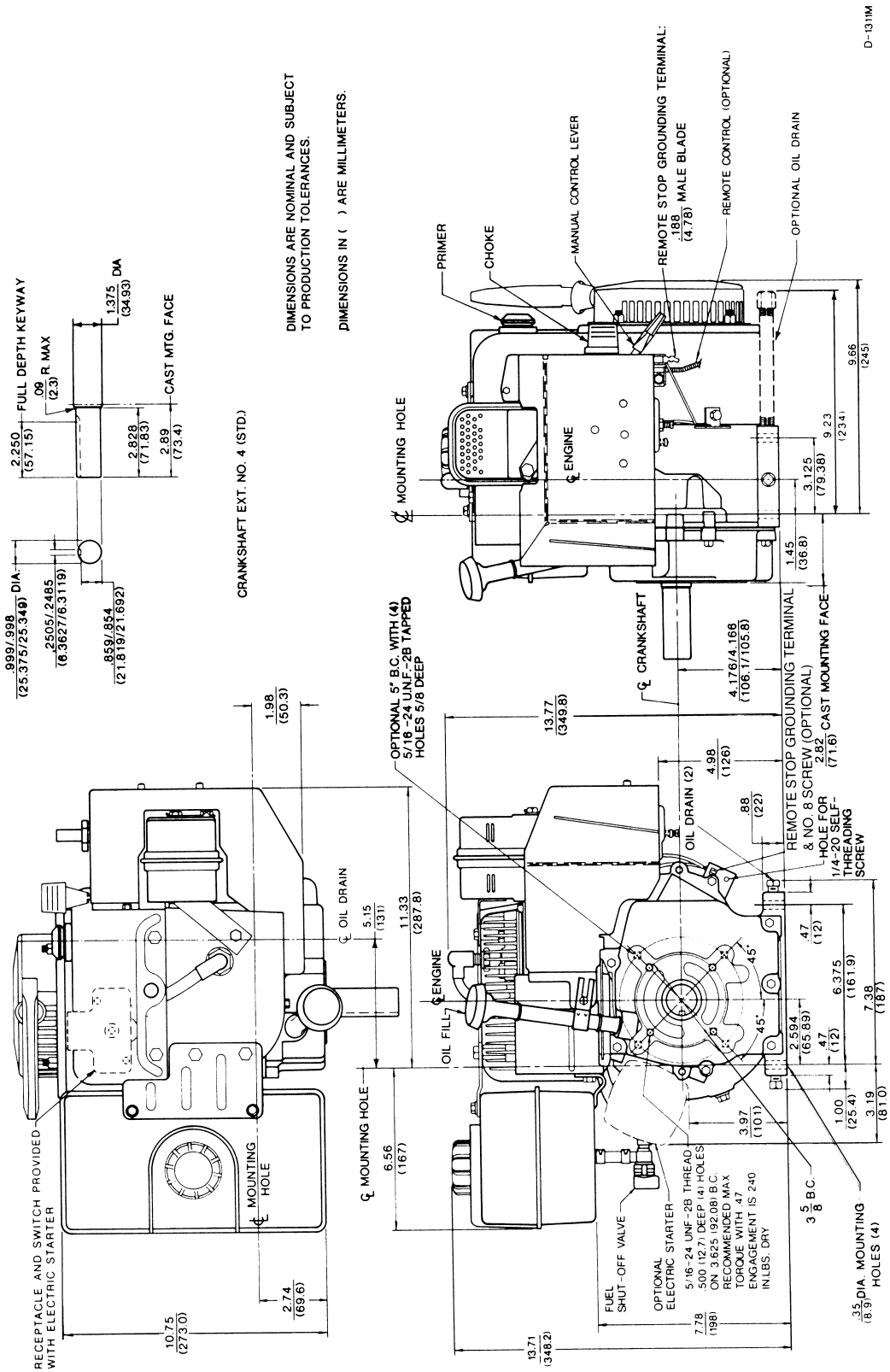
DIMENSIONAL DRAWING

HSK60, HSK70



DIMENSIONAL DRAWING

HMSK80, HMSK90, HMSK100, HMSK110



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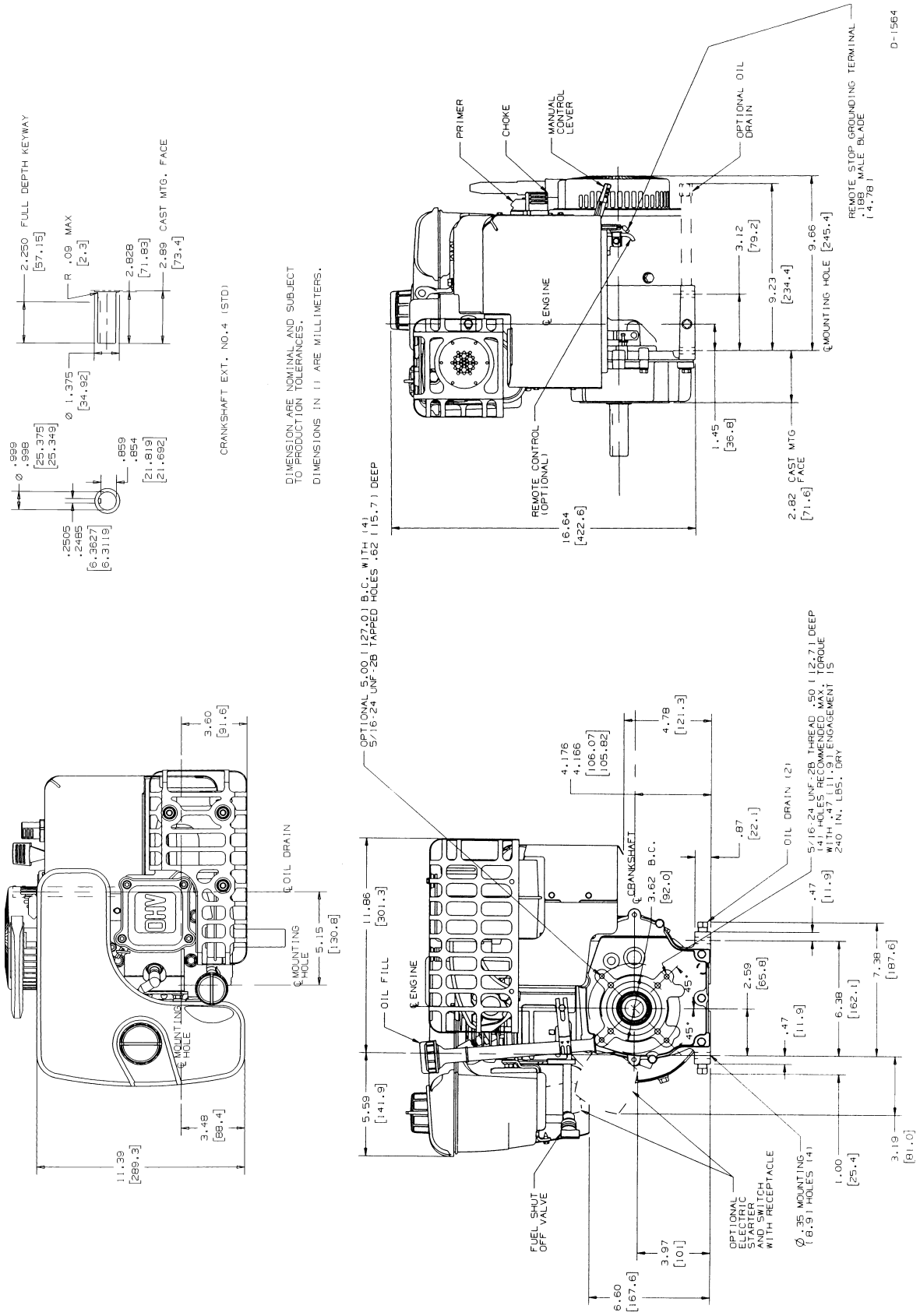
OHSK90 - 110



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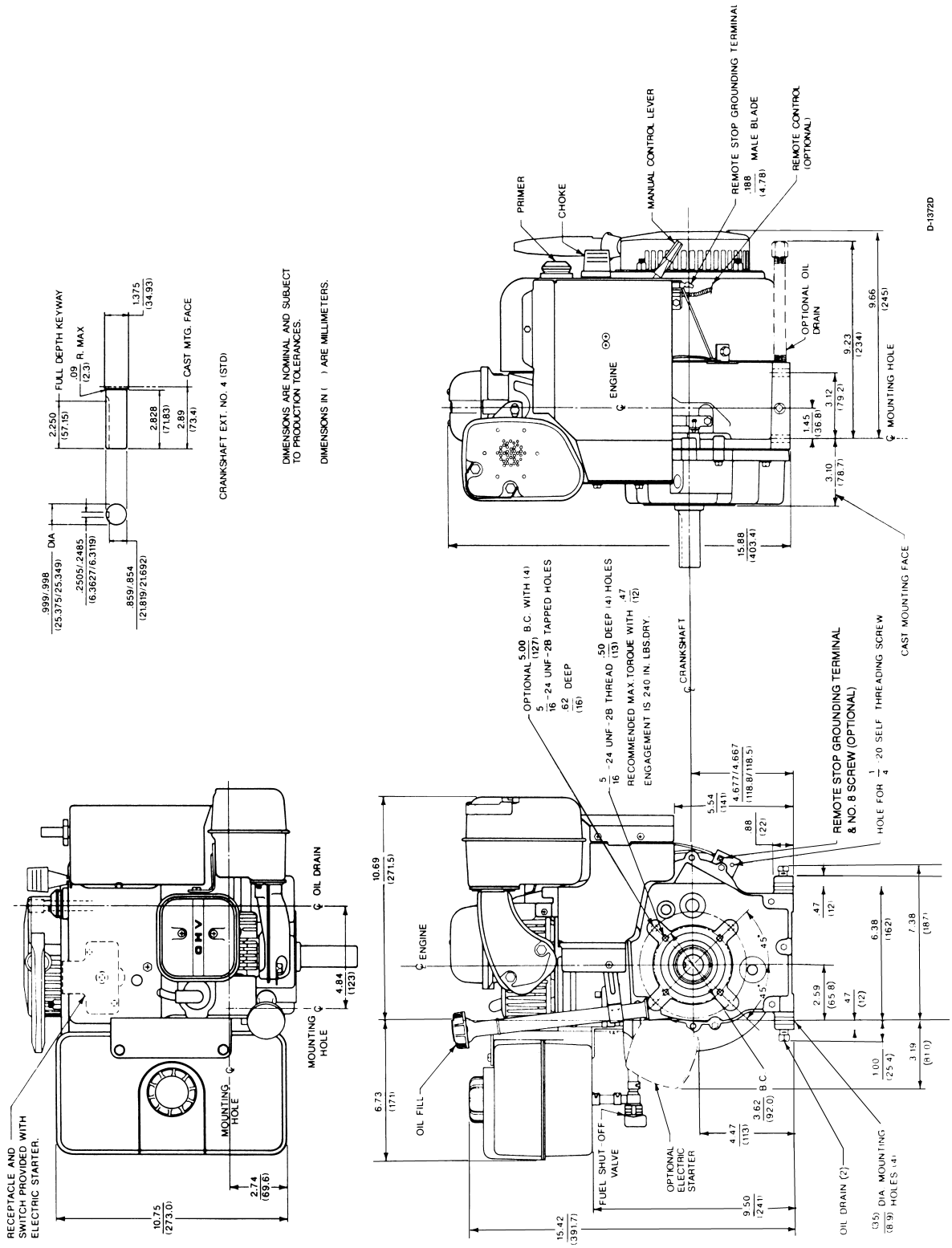
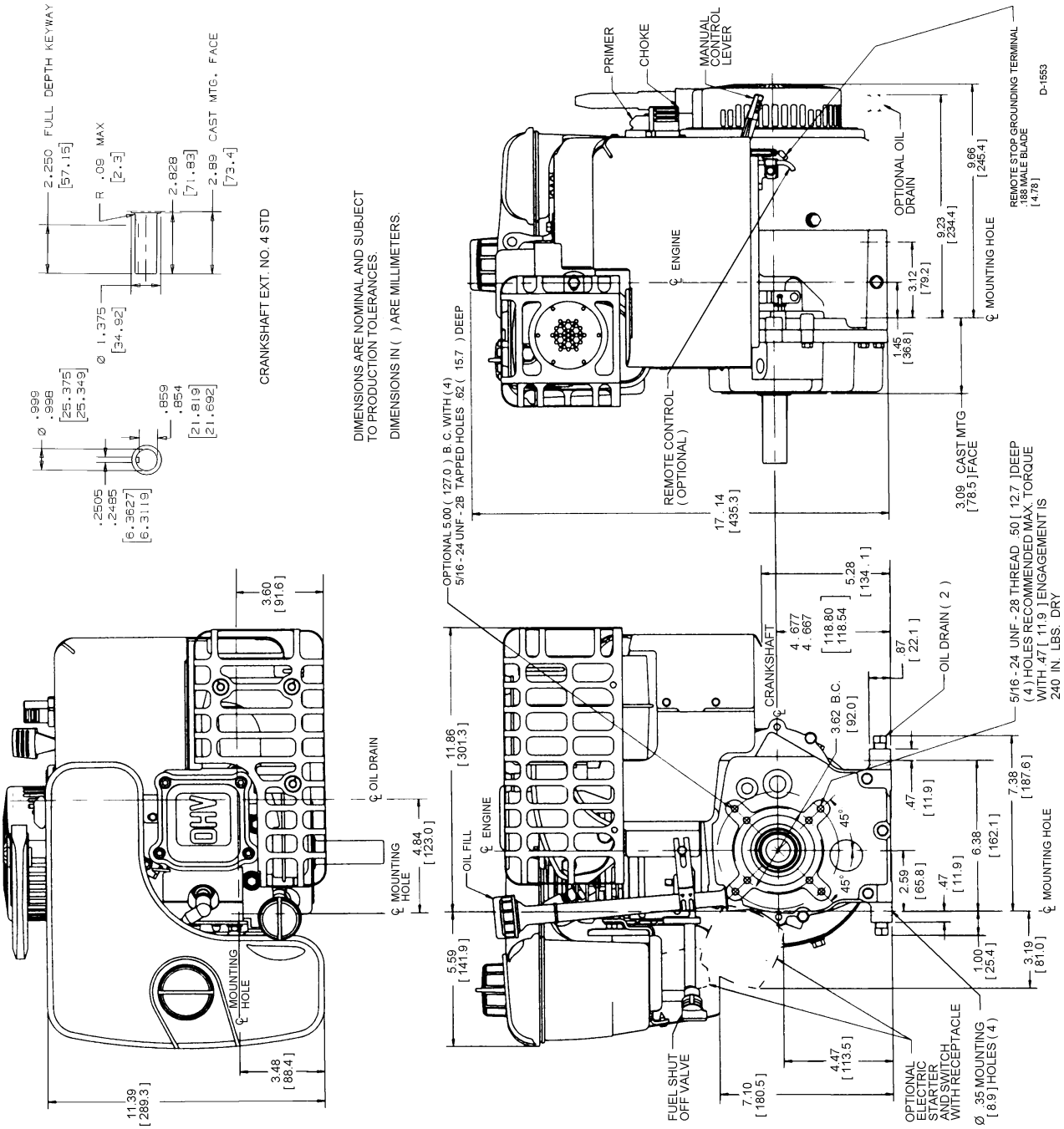
OHSK120



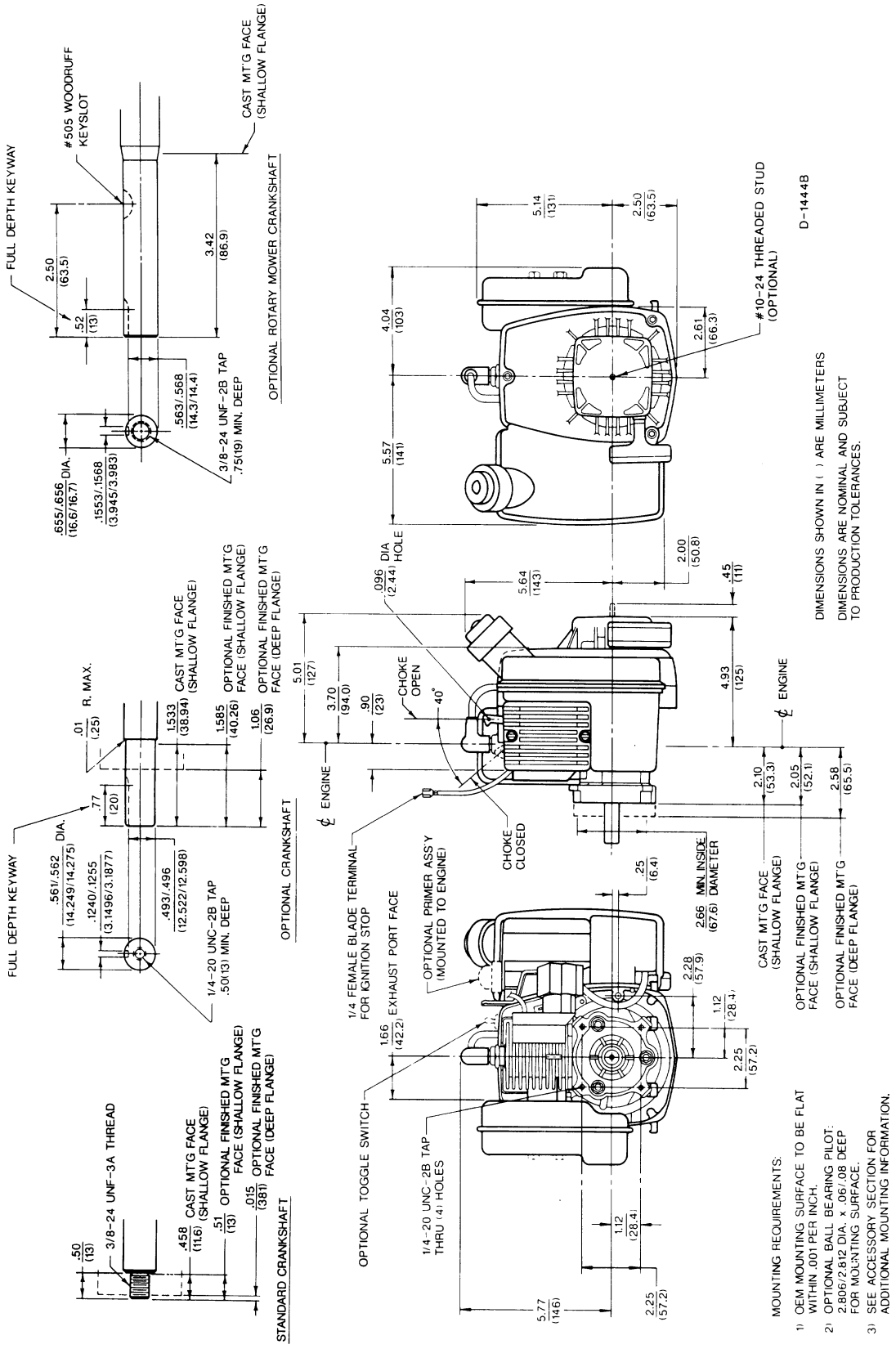
DIMENSIONAL DRAWING

OHSK130



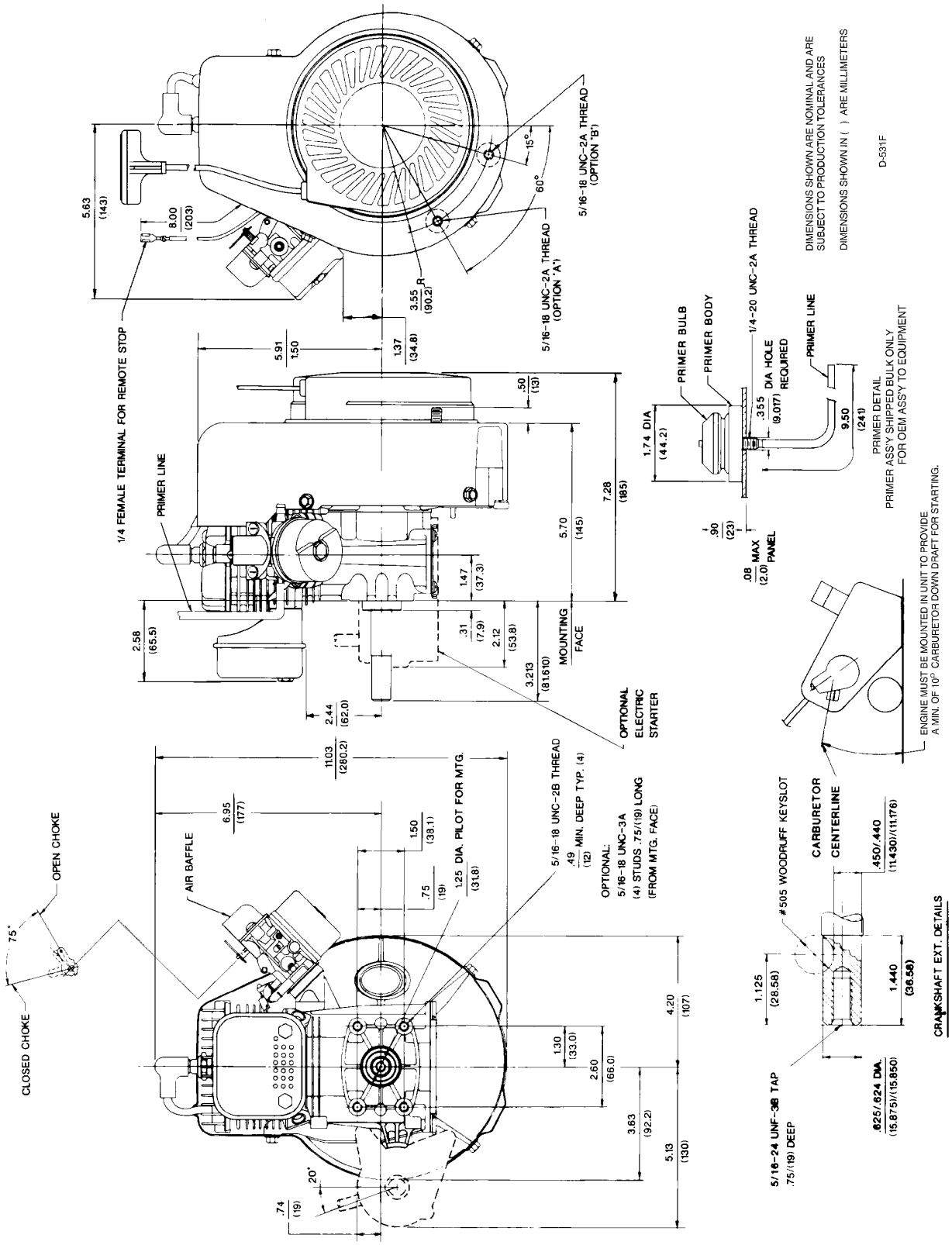
DIMENSIONAL DRAWING

TC300



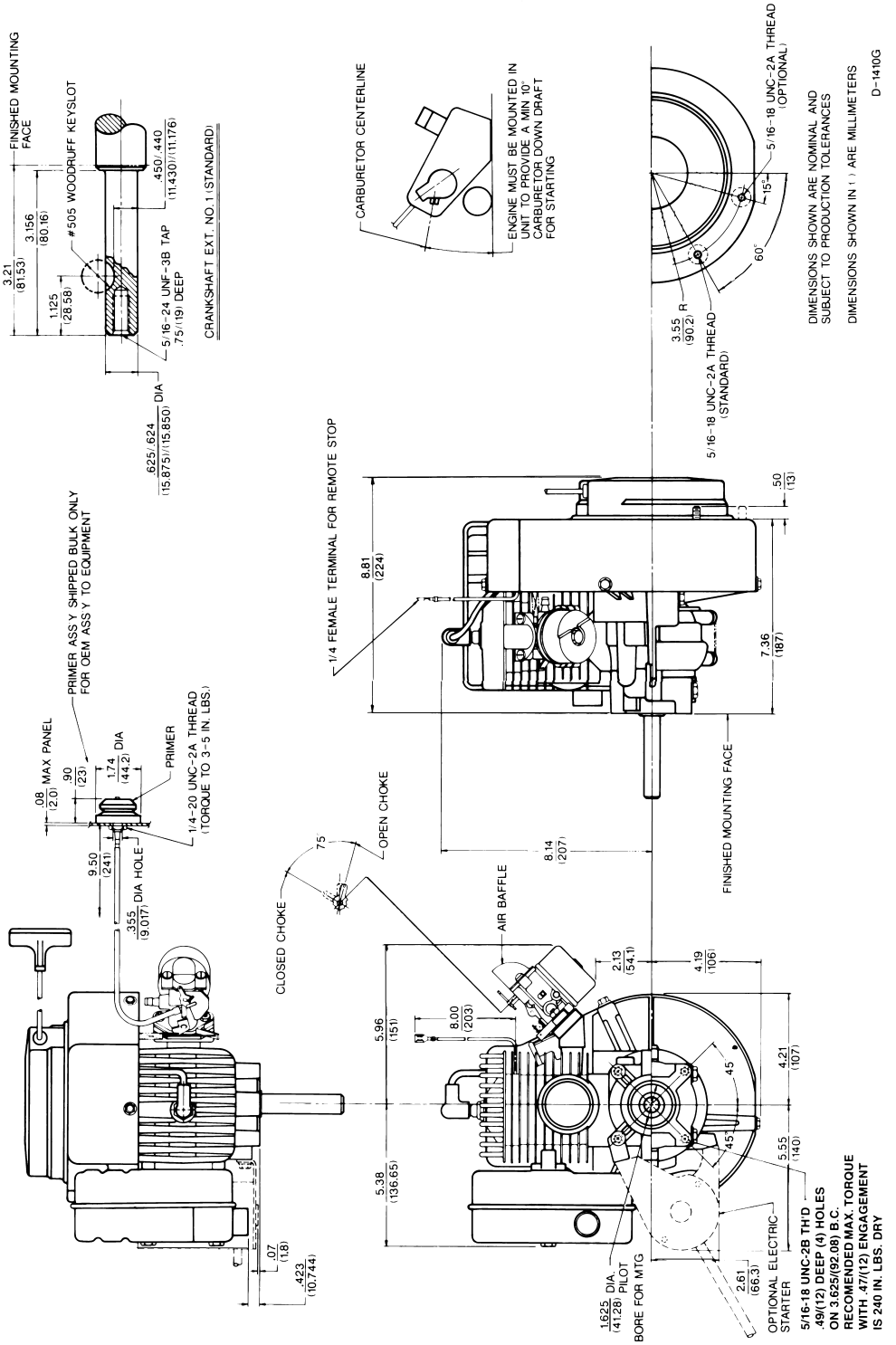
DIMENSIONAL DRAWING

HSK600



DIMENSIONAL DRAWING

HSK845



ENGINE SERVICE

"Customer service support is our foremost responsibility." This has always been our policy and now, more than ever, we feel that this and an equal commitment to quality are very important to our continued growth. Tecumseh's efficient service network is continually stocked with computer selected in-depth parts and manned by factory trained engine service mechanics. Over 150 internal factory personnel are exclusively committed to service support. Factory representatives are located in regional territories and each region is further supported by the finest Central Warehouse Distributors in the industry. Parts stocking service distributors supply all trade areas through a network of over 16,000 service dealers, conveniently located throughout the USA and Canada plus thousands more in our worldwide service organization. Factory service coordinators, who handle direct telephone communications and mail inquiries, are unique in our industry. All this adds up to a total Tecumseh commitment to unparalleled service excellence to and for all of our customers - and we back that commitment with a worldwide service organization that gets the job done.

- **Exclusive**, no limit / no penalty stock return program.
- **Profitable**, timely service parts programs.
- **Emergency** order system via factory / CWD WATS line.
- **24 hours** shipment of emergency orders.
- The **most liberal** warranty program in the industry.
- **Full** shop labor rate, plus profit on parts.
- **Yellow Page** and sign identification programs.
- **Factory** and **CWD field school dealer education.**
- **Pre-Season** computerized parts stocking.
- The **most complete** line of 4-cycle and 2-cycle engines available.
- USA and Canada Service Program.

TECUMSEH®

yellow pages

Tecumseh Service is as close to the Tecumseh powered equipment owner as his telephone. Service listings are found under the heading "Engine, Gasoline" in the telephone book yellow pages.

Notes

Notes

Service Engines & Accessories

2001

TECUMSEH®

Form No. 692531 R 1/01

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SELECTING A REPLACEMENT ENGINE BY COMPARING SPECIFICATIONS

If the model or type number of the old engine is not shown in the Engine Replacement List, or if the model or type number is unknown, proceed as follows:

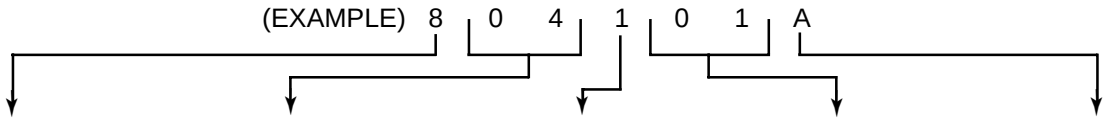
FIRST DIGIT - the number which represents the CRANKSHAFT POSITION.

SECOND & THIRD DIGITS - determine the HORSEPOWER required. (Two cycle is designated by 00 in the second and third digit position.)

FOURTH DIGIT - Determines PRIMARY FEATURES required.

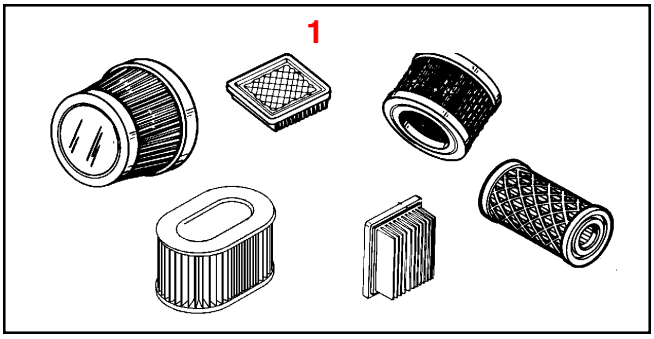
> Engines that are specially built for specific OEMs because of color, etc., are not suitable to be sold to an Assigned OEM.

TECUMSEH SERVICE NUMBER SYSTEM



1st DIGIT	2nd & 3rd DIGIT	4th DIGIT	5th & 6th DIGIT	7th DIGIT
CRANKSHAFT POSITION	HORSEPOWER OR 2 CYCLE	PRIMARY FEATURES	ENGINE VARIATION NUMBER	REVISION LETTER
8 - Vertical 9 - Horizontal	00 = 2 Cycle 02 = 3 H.P. 03 = 3.5, 3.8 H.P. 04 = 4, 4.8 H.P. 05 = 5, 5.5 H.P. 06 = 6 H.P. 07 = 7 H.P. 08 = 8 H.P. 09 = 9 H.P. 10 = 10 H.P. 11 = 11 H.P. 12 = 12, 12.5 H.P. 13 = 13 H.P. 14 = 14 H.P. 15 = 15 H.P. 16 = 16, 16.5 H.P. 17 = 17 H.P. 18 = 18 H.P. 22 = 22 H.P.	1 = Rotary Mower 2 = Industrial 3 = Winter Application 4 = Mini Bike 5 = Tractor 6 = Tiller/Edger 7 = Rider 8 = Rotary Mower	00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99	

AIR CLEANERS



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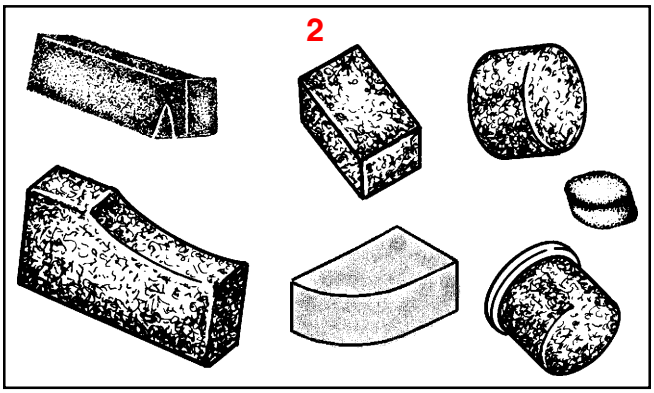
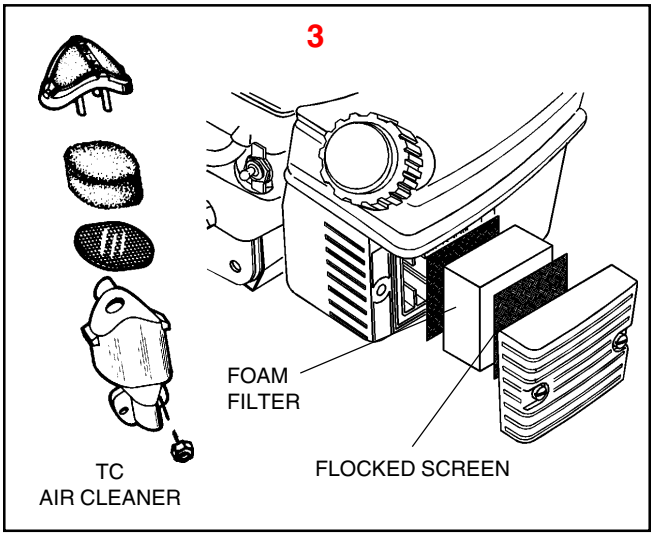
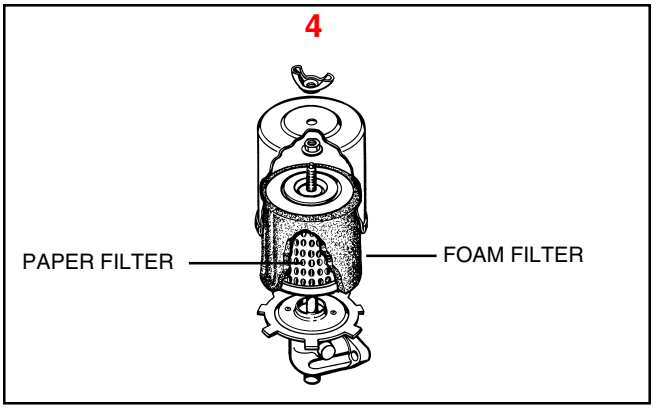


POLYURETHANE TYPE



POLY - KLEEN-AIRE®



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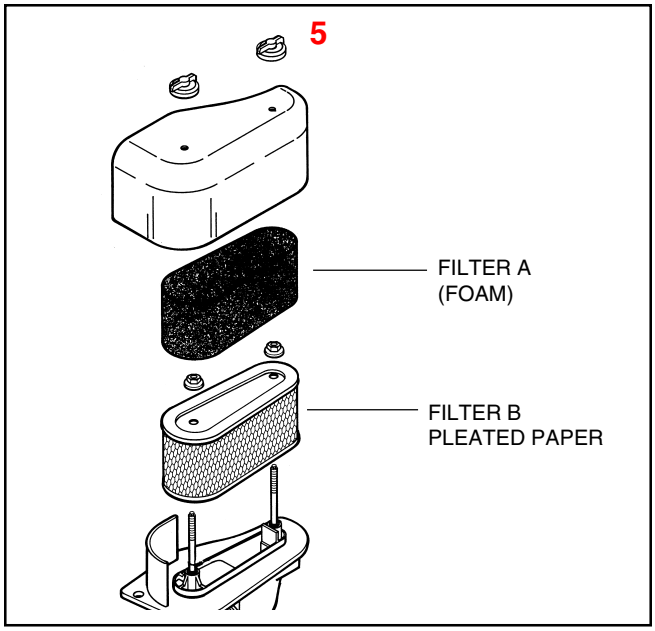
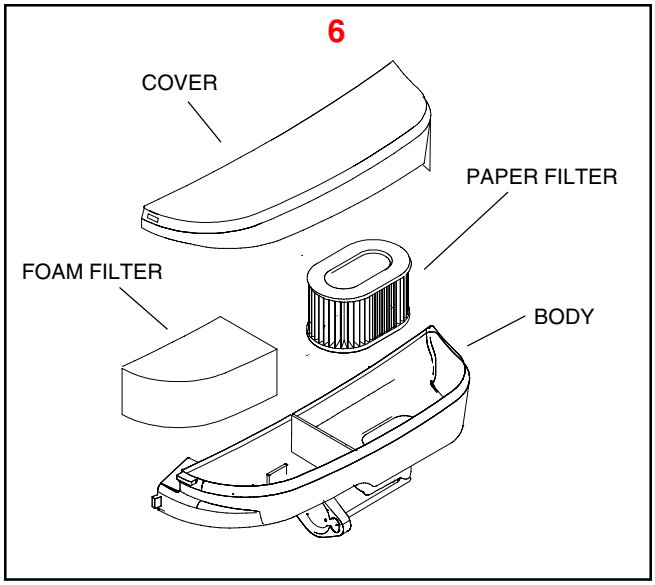
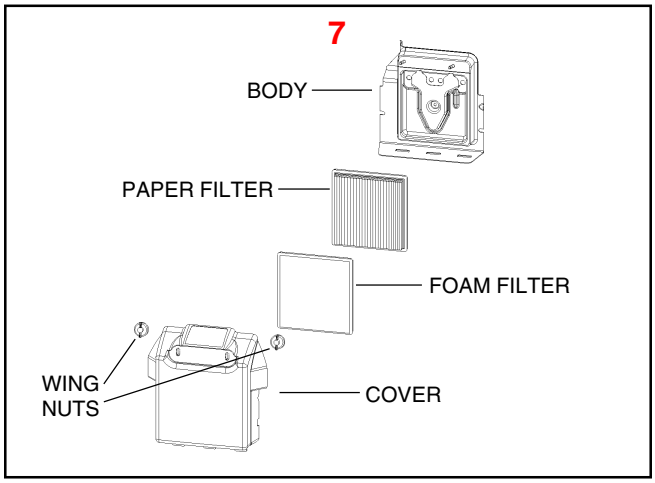


POLY PAPER TRI-STAGE KLEEN-AIRE®



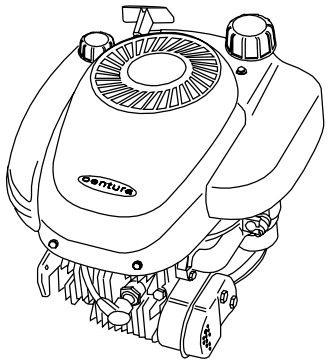
CENTURA LE



ENDURO VT

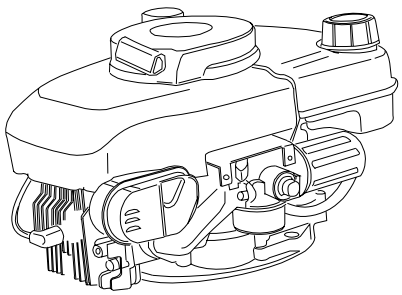
FUEL TANK MOUNTING

1



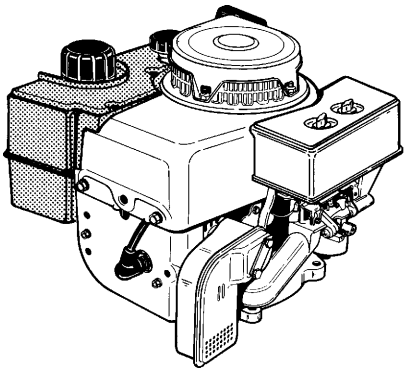
PREMIER STYLE TANK

2



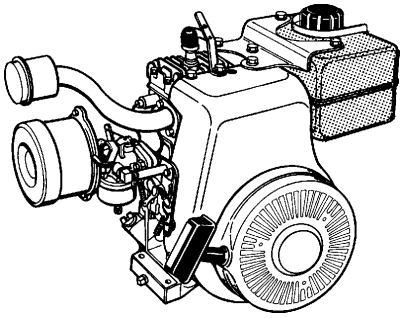
OPPOSITE SPARK PLUG

3



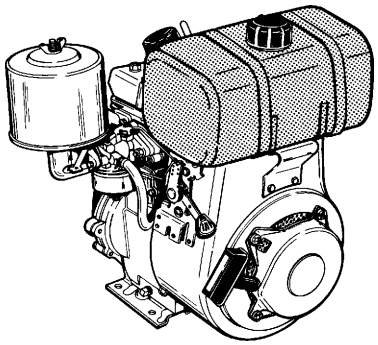
OPPOSITE CARBURETOR

4



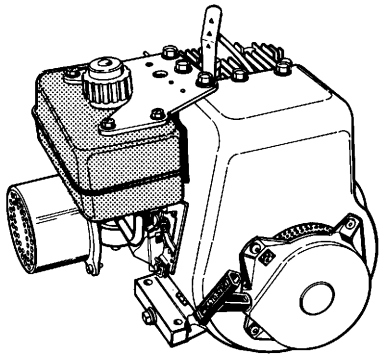
OPPOSITE CARBURETOR

5



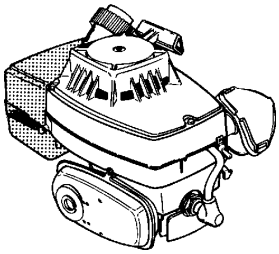
OVER RECOIL

6



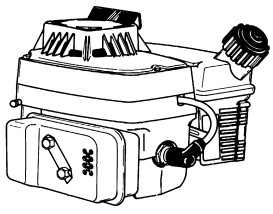
OVER CARBURETOR

7



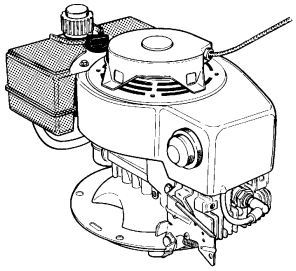
TC200/300

8



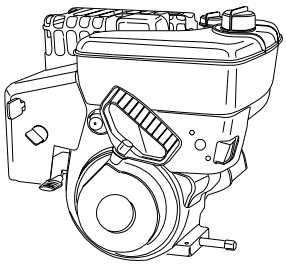
TC TYPE II

9



OPPOSITE SPARK PLUG

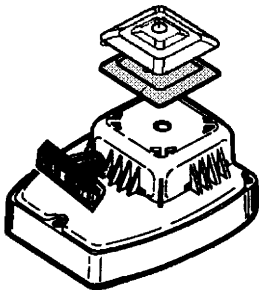
10



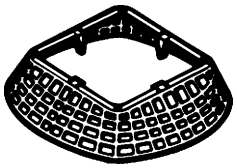
REGENCY STYLE

ACCESSORIES

STARTER SCREENS



590710
590711
Can be used on TC200/300



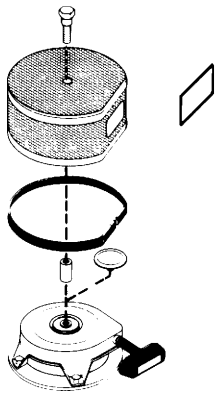
590570 - TC200 & 300
TCH200 & 300

730512 - Pre-cleaner - 6 & 7 H.P.

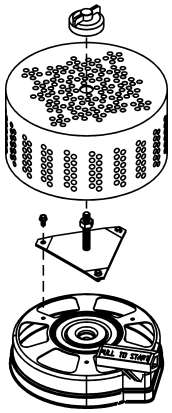
RECREATIONAL VEHICLE CONTROLS

34652A - H35 , Bottom Pull
34784 - HM80-100, Top Pull
35142 - H35, Top Pull Heavy Spring
36740A - OHH50-55
730136A - HS40, Mini-bike Top Pull

DEBRIS SCREEN KITS

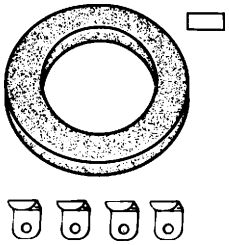


730573
Can be used on HM, TVM, TVXL, OVM and OVXL with stamped steel recoil starter.



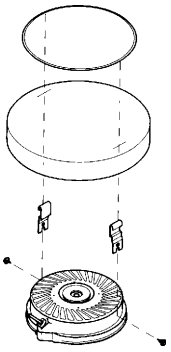
730627
Can be used on TVS75-120, TVS840 with E-Z pull starter.

STARTER MUFF KITS



730571
Can be used on TVS75, H35-H70 with stamped steel starter.

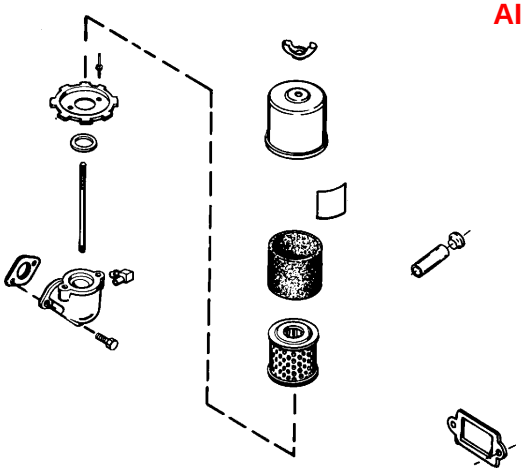
730572
Can be used on TVM170-OVXL120, HM70-100 with die cast starter.



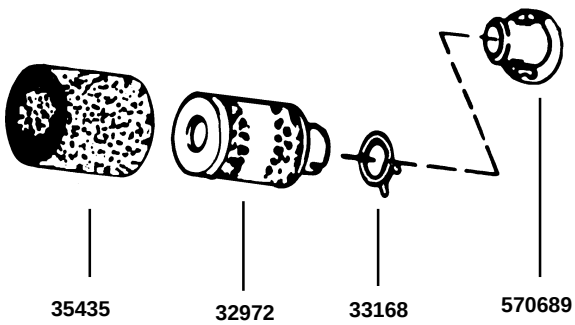
730604 used on TVS90-120, TVS840, TVM125-140, H30-H70 with E-Z pull starter.

730619 used on TVM, TVXL195-220, HM70-100, OHM, OVXL, OHV12 thru 125 with E-Z pull starter.

AIR CLEANER KITS

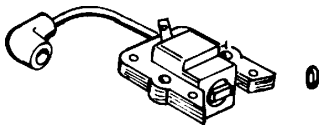


730561 - Can be used on H50-60-70 and HH70 (Use only on engines with an externally vented fully adjustable carburetor).
730575C - Can be used on 2-cycle TVS-TVXL840
730630 - HM80-100 Climate Guard

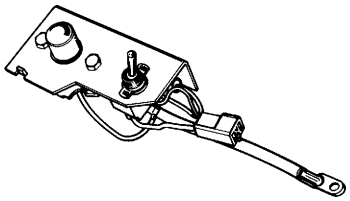


TC / TCH200-300

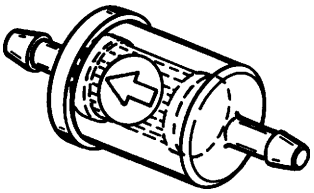
ACCESSORIES (Cont.)



730207 - Solid State Conversion Kit For all models TVS75, TVS90, TVS105, TVS120, TVS600, AV520, TNT100 & TNT120 engines with external magneto ignition.

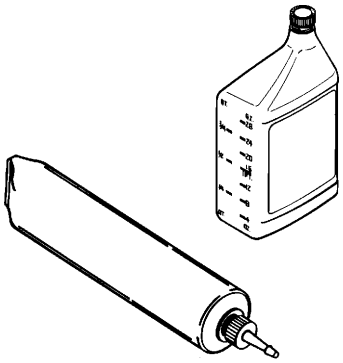


730198 - Panel, Switch - All models with 20 amp system



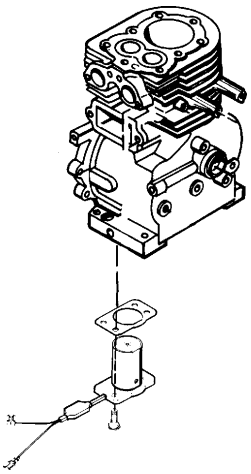
34279B - Fuel Filter - For all engines

ENGINE OIL



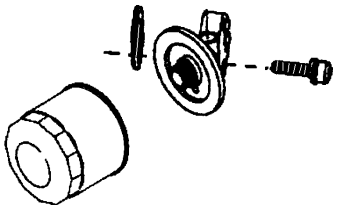
730225A - 4 cycle - SAE30
730226A - 4 cycle - SAE5W30
730227B - 2 cycle (8 oz.)
730229B - Gear Lube - 80W90
730238A - 21 oz. Twin Pack - SAE30
788067C - Grease (32 oz.) Bentonite

LOW OIL SHUTDOWN



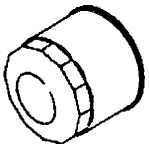
611206 - HM80, 90, 100 without light
611207 - OHH50, 55, 60
611220 - HM80, 90, 100 with light

OIL FILTER ADAPTER KIT

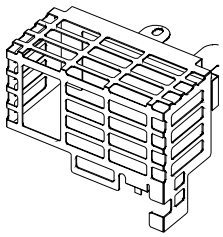


36435A - Can be used on OHV130, 135, 14, 15, 16, 16.5, 17, 17.5

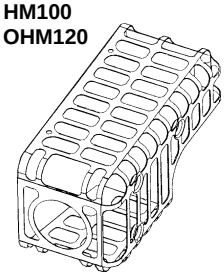
OIL FILTER 36563



HEAT SHIELDS

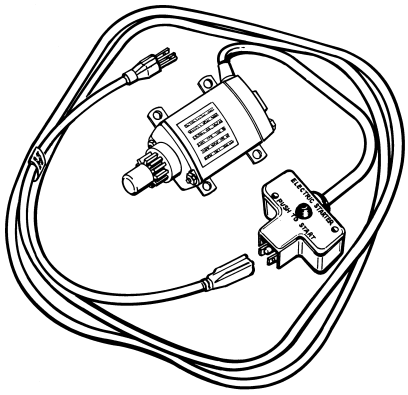


730622A - Kit, OHH Side and End Discharge
36090 - VLV Side Discharge
36197 - VLV Front (end) Discharge
36293 - HSSK40-50
36294 - HMSK80-100
36510 - TVS Euro Style Side Discharge
36554 - TVS Euro Style Front (end) Discharge
36799A - Can be used on HM80-HM100
37224 - OHM120



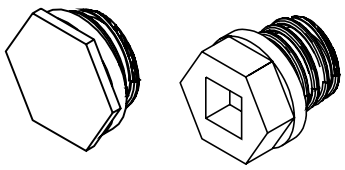
37352 - OHM120, OHSK90-130

SNOW KING®
STARTER MOTOR KITS
110 - 120 VOLT



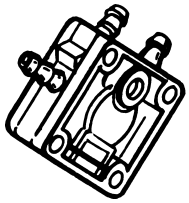
33290E - H30-35, HS40-50, HSK35, HSSK40-50, OHSK50 - 55-60-70
33328D - TVM125, TVM140, H50-60-70
33329E - TVM170-220, HM70-100, HMSK70-100
37105 - OHM-OHSK110-120-130
NOTE: Must have starter provisions to install on engines.

BOTTOM OIL DRAIN PLUG FOR RM's



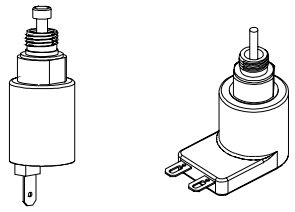
30572 - Steel
36083 - Plastic

PULSE FUEL PUMP 35787



ACCESSORIES (Cont.)

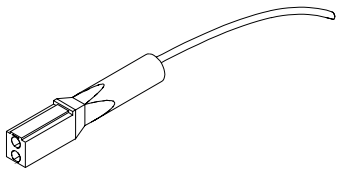
FUEL SHUT-OFF SOLENOIDS



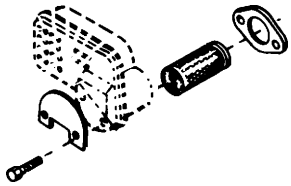
611204A - Walbro Carb.
611221 - Tecumseh Carb.

FUEL SHUT-OFF VALVE 35857

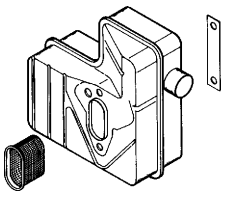
ELECTRIC CLUTCH WIRE FOR 3/5 SPLIT SYSTEM 36588



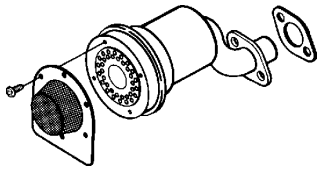
SPARK ARRESTOR KITS



34427 - Can be used on TVM125-140, H50-60.
34479A - Can be used on TVM170-220, HM70-100, HHM80.

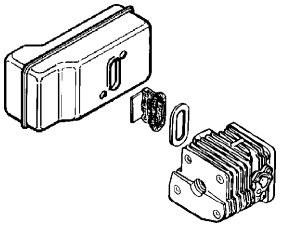


390309 - Can be used on TVS840 & TVXL840

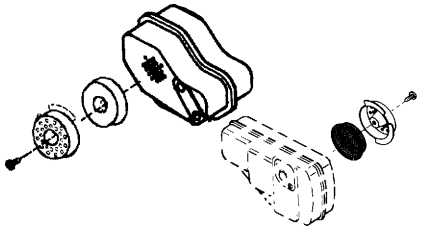


36220 - Muffler Quiet
35352 - Screen Kit

Can be used on H50 & H60

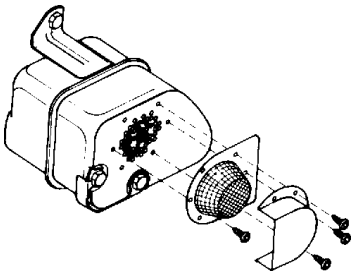


390301A - Can be used onTC200/300, TCH200/300



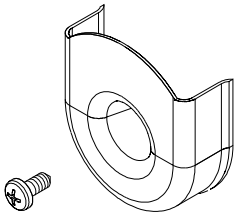
36085 - Can be used on TVS90-120
Can be used on VLV50 - VLV60

SPARK ARRESTOR SCREEN

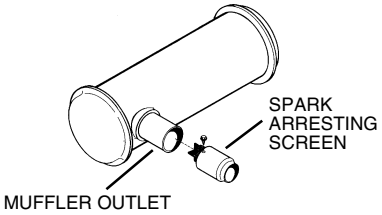


35352 - Can be used on OHV11-13

EXHAUST DEFLECTOR 36663

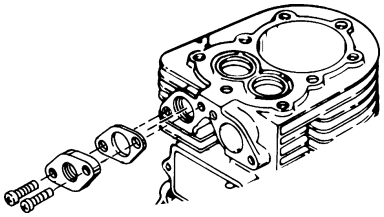


LOW TONE MUFFLER



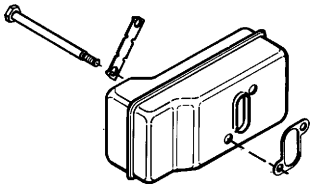
35824 - Can be used on TVM170-220, TVXL170-220, HM70-100, HMXL70-100 NOTE: Does not replace catalytic mufflers.
37350 - Can be used on HM80-100 generators.

MUFFLER ADAPTER KIT



730130 V, VH, H and HH40 thru 80, HM70-100
730162 LAV and H25 thru 35
730165 LAV50 and HS30 thru 50

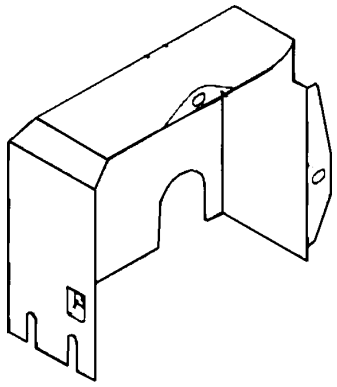
BOLT ON MUFFLER



390322 - TC200 & 300
If cylinder is drilled and tapped

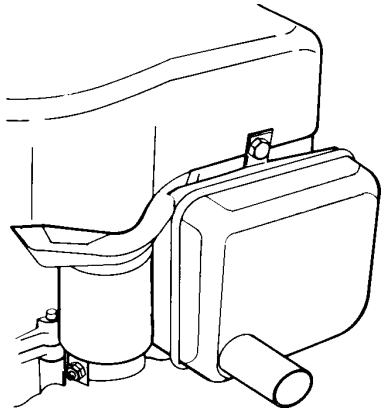
ACCESSORIES (Cont.)

MUFFLER HEAT DEFLECTOR



36373 - Can be used on OHV14-175

MUFFLER



36372 - Can be used on OHV14-175

SPARK ARRESTOR SCREEN

36411 - Can be used on OHV14-175

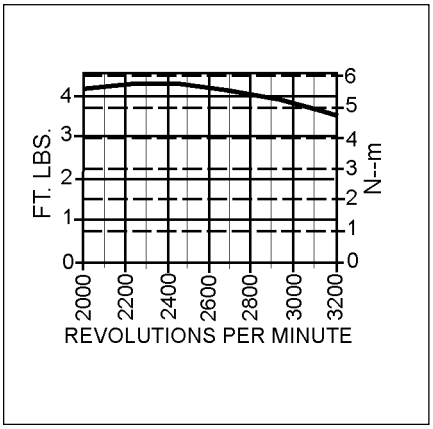
EPA AND CARB CERTIFIED

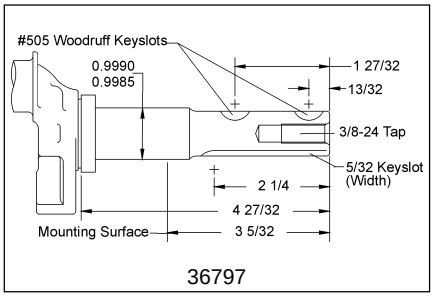
3.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV100
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-5/8 x 1-27/32 in. 66.69 x 46.84 mm
DISPLACEMENT	9.98 C.I. 163 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

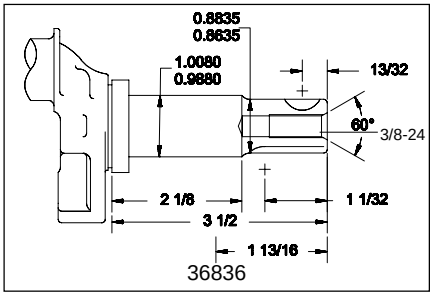
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Poly Kleen-Aire® System Air Cleaner
- Float Carburetor with Easy Start Primer





36797



36836

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803194A	MTD	36797	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3350	
803195A	Murray	36797	Remote Snap-In	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	
803198A	Murray	36836	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	

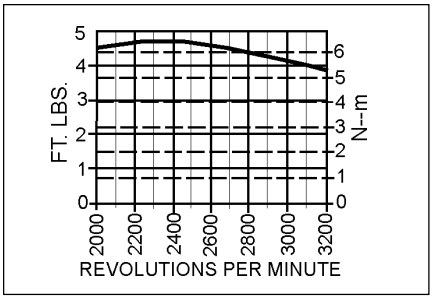
EPA AND CARB CERTIFIED

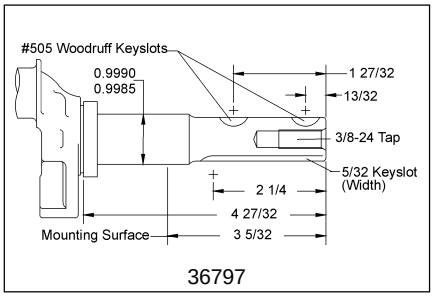
3.8 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV115
HORSEPOWER	3.8 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

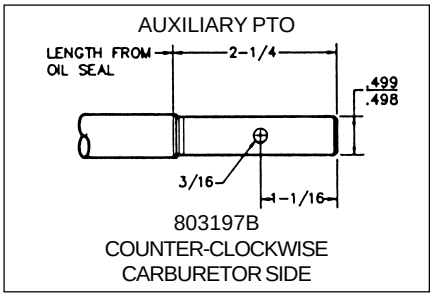
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Kleen-Aire® System Air Cleaner
- Float Carburetor with Easy Start Primer

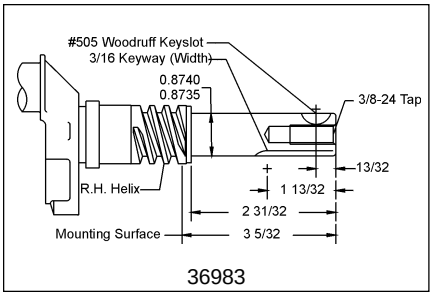




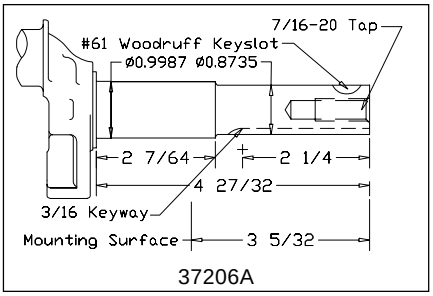
36797



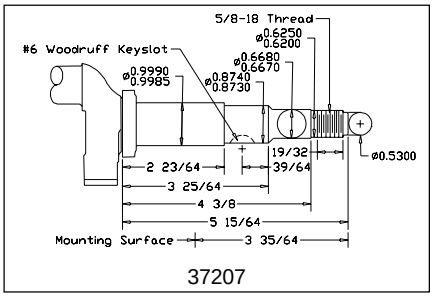
803197B
COUNTER-CLOCKWISE
CARBURETOR SIDE



36983



37206A



37207

	Customer Service No.	Crankshaft	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803192	Murray	36797	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2	36559A	3200	
803197B	Murray	36983	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2	36559A	3200	*
804187A	Toro	37206A	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		2900	
804188B	Toro	37207	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		3150	

* 8-1/2:1 Auxiliary P.T.O.

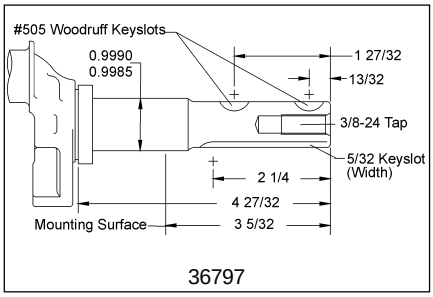
EPA AND CARB CERTIFIED

5.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

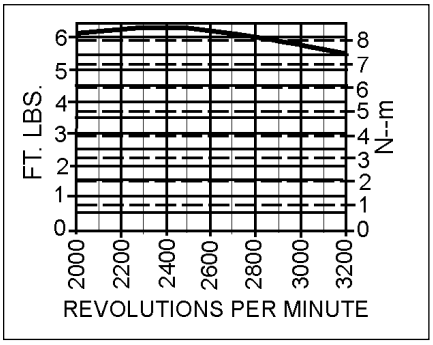
MODEL	LEV115
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

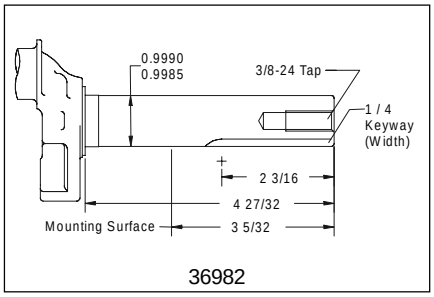
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire® Air Cleaner
- Poly Kleen-Aire® Air Cleaner



36797





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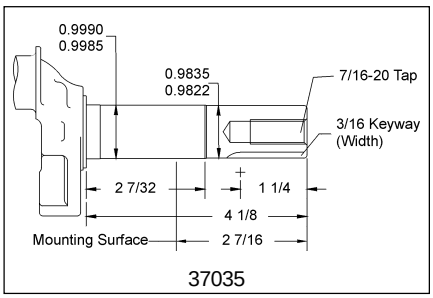


37035

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
804218C	Standard ■	36797	Manual	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2		3750	▲
804219C	Toro	37035	Remote	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	35015B	3150	
805176C	Garden Way	36982	Manual	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	36559A * Reverse Pull	3750	
805179B	Murray	36797	Remote Snap-In	Ref. 2 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A	3200	
805180B	Murray	36797	Remote Snap-In	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	36559A	3200	

■ This engine is not eligible for return.
▲ Heavy flywheel
* Equipped with brake lock-out device

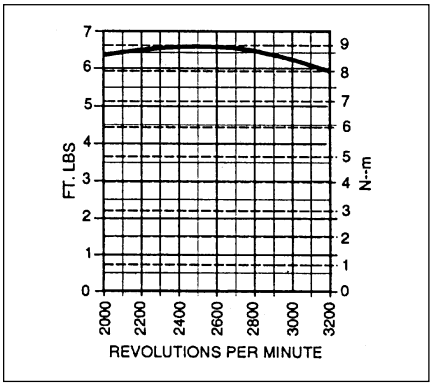
EPA AND CARB CERTIFIED

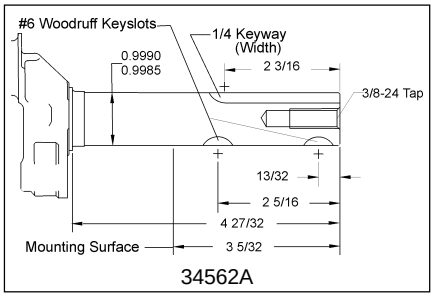
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV120
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire® Air Cleaner





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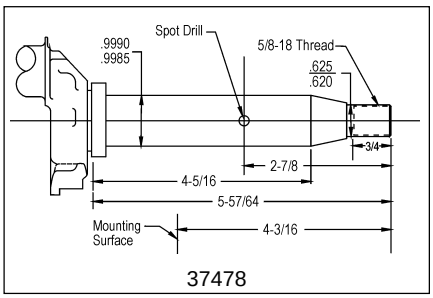


37478

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806165A	Ariens	34562A	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	35015B	2950	
806166A	Ariens	34562A	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 2	35015B	2950	*
806167A	Toro	37478	Remote Snap-In	Ref. 1 35066 (Paper)	Bottom	1 Qt. Ref. 2	36559A Reverse Pull	3200	

* Equipped with electric start provisions.

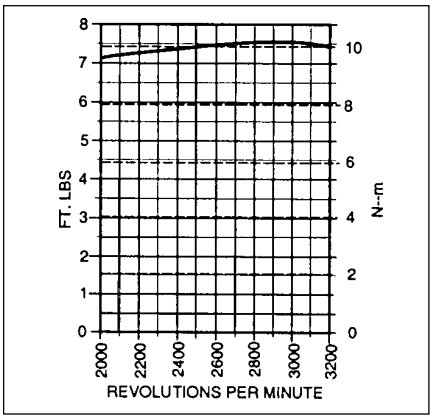
EPA AND CARB CERTIFIED

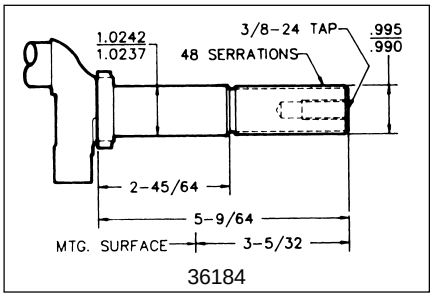
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	VLV126
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 2-3/64 in. 71.0 x 52 mm
DISPLACEMENT	12.6 C.I. 206 cc
OIL CAPACITY	27 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer





36184

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806164	Ariens	36184	Fixed Speed	Ref. 1 36046 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		3100	

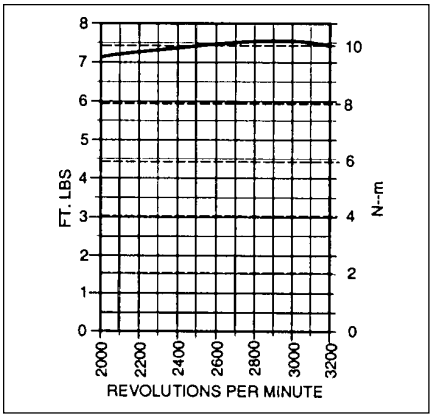
EPA AND CARB CERTIFIED

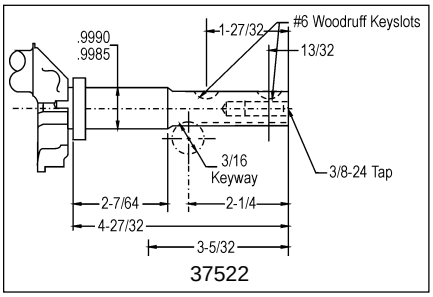
6.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	OVRM120
HORSEPOWER	6.5 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	12.00 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

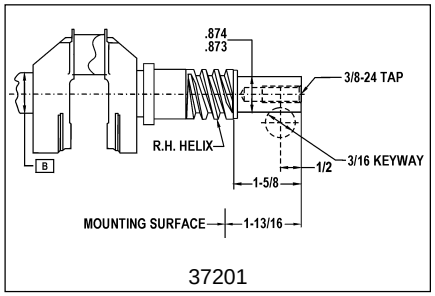
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized End-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer





37522



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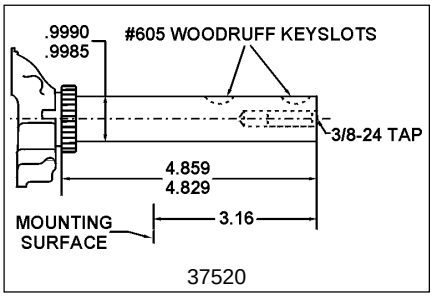


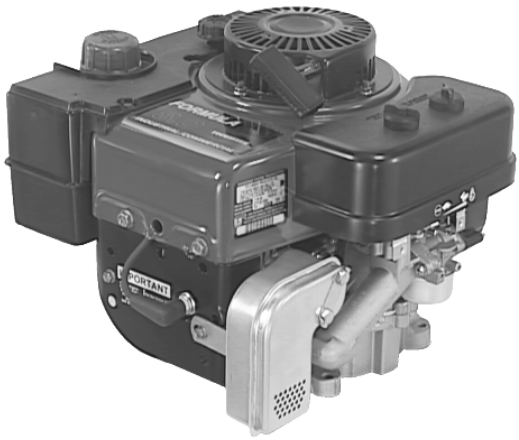
37520

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806163A	Snapper	37520	Remote Snap-In	Ref. 1 35500 (Paper)	Side & Bottom	1.1 Qt. Ref. 2	36559A (Reverse Pull)	3450	
806168	Murray	37522	Manual Control	Ref. 1 36905	Side & Bottom	1.5 Qt. Ref. 2	36559A (Reverse Pull)	3200	
806169	Murray	36729	Manual Control	Ref. 1 36905	Side & Bottom	1.5 Qt. Ref. 2	36559A (Reverse Pull)	3200	

EPA AND CARB CERTIFIED

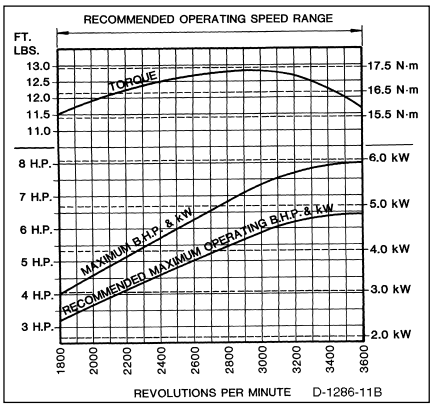
8.0 HORSEPOWER RIDER APPLICATION TVM195

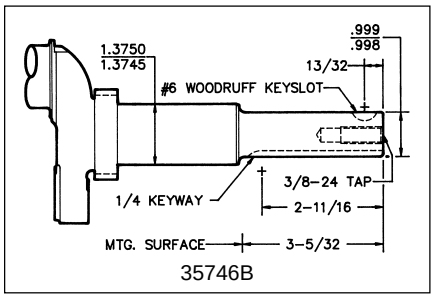
MODEL	TVM195
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm



FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain Ref. No.	Fuel Tank (pg. 3)	Top Governed Speed
808768	Standard ■	35746B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Front	3 Qts. Ref. 3	3400
808769	Standard ■	35746B		Manual	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600
808770	Snapper	35746B	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400
808771	Toro	35746B	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Dual Sides	None	3350
808772	Ariens	35746B	3 amp D.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3250

■ This engine is not eligible for return.
† 36680 - 12 volt electric starter can be installed.
33635C - Blower housing is needed to mount recoil starter.

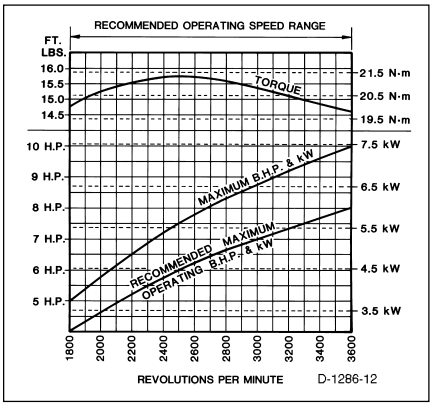
EPA AND CARB CERTIFIED

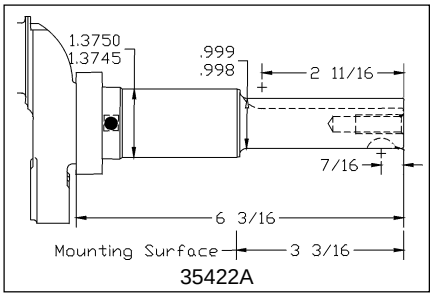
10 HORSEPOWER RIDER APPLICATION TVM220

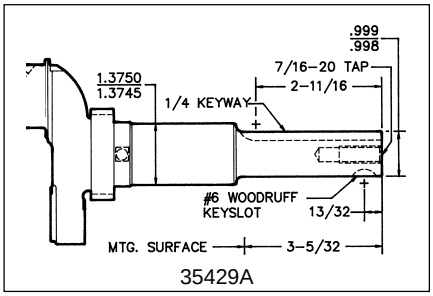
MODEL	TVM220
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release







	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
810762	Murray	35429A	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810763	Murray	35429A	3 amp D.C.	Remote w/override	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810764A	Standard ■	35422A	7 amp D.C. w/regulator	Remote	Electric Starter	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400

† 36680 - 12 volt electric starter can be installed.

■ This engine is not eligible for return.

33635C - Blower housing is needed to mount recoil starter composite with 8 studs.

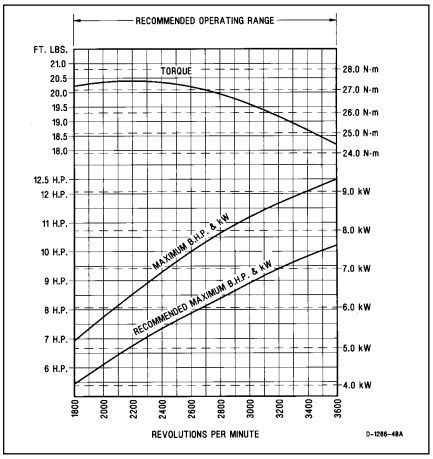
EPA AND CARB CERTIFIED

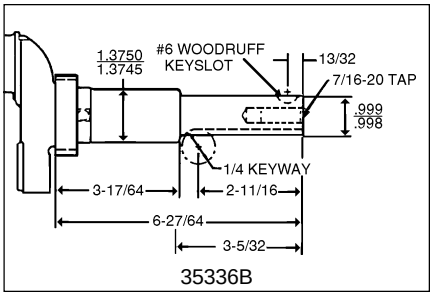
12.5 HORSEPOWER RIDER APPLICATION OHV125

MODEL	OHV125
HORSEPOWER	12.5 9.32 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
812708	Standard ■	35336B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600
812763	Standard ■	35336B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3250
812764	Standard ■	35336B	3 amp D.C.	Remote	† Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3250

† 36680 - 12 volt electric starter can be installed.

■ This engine is not eligible for return.

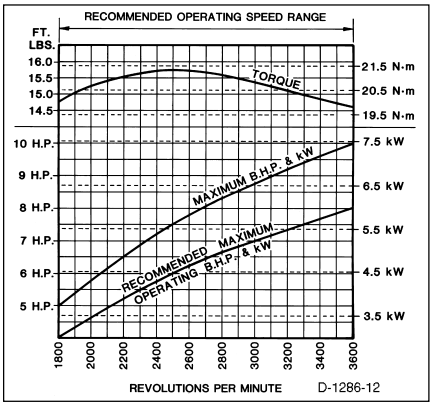
EPA AND CARB CERTIFIED

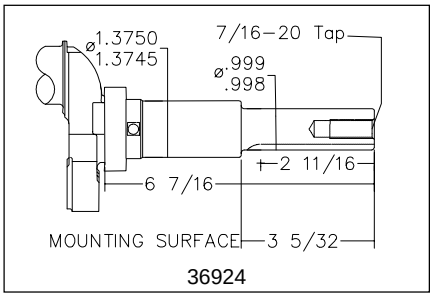
13 HORSEPOWER OHV13 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV130
HORSEPOWER	13.0 9.69 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. 39 oz. w/oil filter .95 ltr. 1.17 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire® System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813700A	MTD	36924	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3250	● ▲ ✻
813701A	Swisher	36924	3 amp D.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3600	▲ ✻
813702	Frig. Home Prod.	36924	3 amp D.C. 5 amp A.C.	Remote	Electric Starter	Ref. 5 36356 (Paper) 36357 (Poly)	Side Does not have oil filter rotary pressure lubricant.	3300	● ▲ ■

● Muffler omitted
▲ Fuel tank omitted
† 37425 - 12 volt electric starter can be installed.
✻ Rotary pump with oil filter.
■ Does not have oil filter.

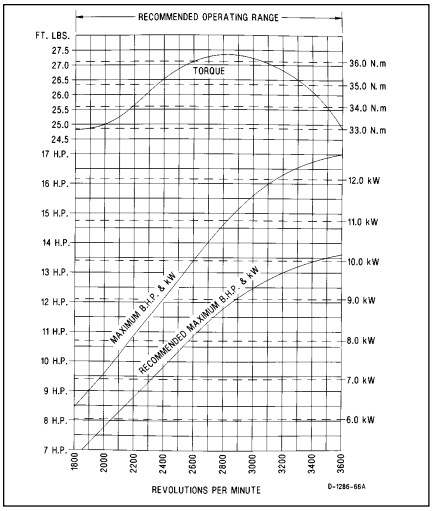
EPA AND CARB CERTIFIED

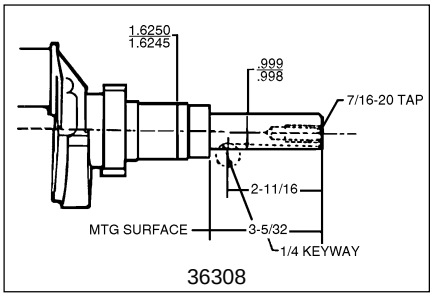
13.5 HORSEPOWER OHV13.5 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV135
HORSEPOWER	13.5 9.69 kW
BORE & STROKE	3-9/16 x 2-17/32 in. 90.49 x 64.31 mm
DISPLACEMENT	29.9 C.I. 490.00 cc
OIL CAPACITY	55 oz. 62 oz. w/oil filter 1.65 ltr. 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire® System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





36308

	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813703	Ransomes	36308	Remote	†Electric Provisions w/Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3600	▲

▲ Fuel tank omitted
† 36795 - 12 volt electric starter can be installed.

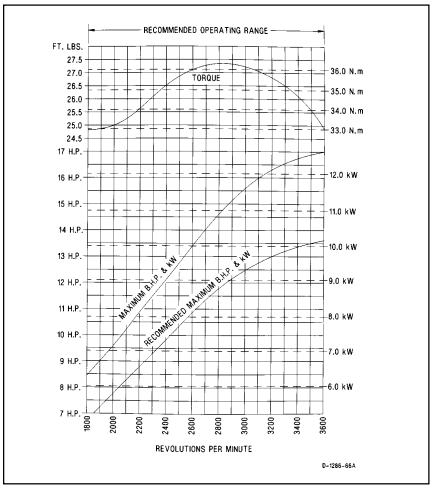
EPA AND CARB CERTIFIED

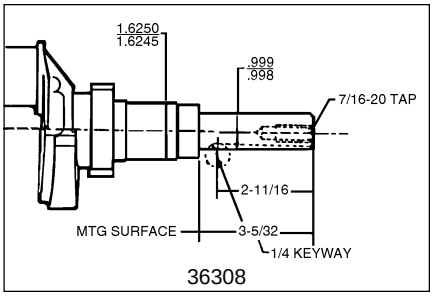
17.5 HORSEPOWER OHV17 OVERHEAD VALVE RIDER APPLICATION INDUSTRIAL/COMMERCIAL

MODEL	OHV175	
HORSEPOWER	17.5 12.67 kW	
BORE & STROKE	3-9/16 x 2-17/32 in. 90.49 x 64.31 mm	
DISPLACEMENT	29.9 C.I. 490.0 cc	
OIL CAPACITY	55 oz. 1.65 ltr.	62 oz. w/oil filter 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg	

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire® System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
*	**817060A** Noma CB	36308	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3400
	817061A Ariens CB	36308	16 amp D.C. w/Regulator	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3200

† 36795 - 12 volt electric starter can be installed.
* 36435A - Oil filter kit can be installed.
CB Counterbalanced

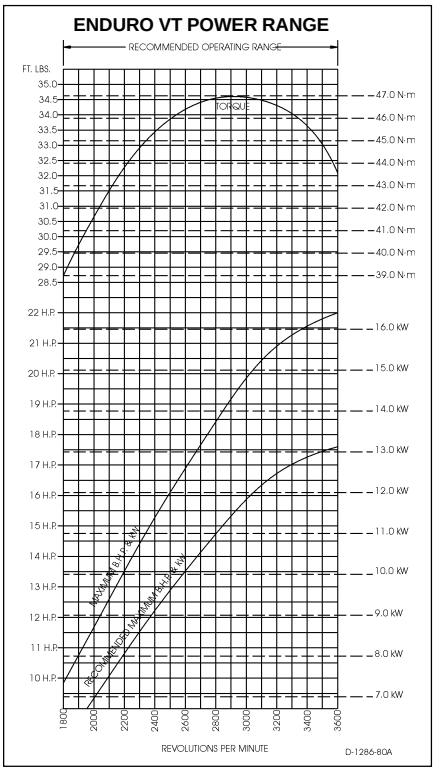
EPA AND CARB CERTIFIED

22 HORSEPOWER TVT691 OVERHEAD VALVE RIDER APPLICATIONS INDUSTRIAL/COMMERCIAL

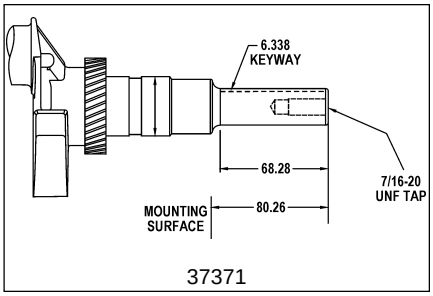
MODEL	TVT691	
HORSEPOWER	22.0	
BORE & STROKE	3.125 x 2.750 in. 79.375 x 69.85 mm	
DISPLACEMENT	42.15 C.I. 691 cc	
OIL CAPACITY	72 oz. 2.16 ltr.	80 oz. w/oil filter 2.4 ltr.
(APPROX.) WEIGHT	90 lbs. 40.5 kg	

FEATURES

- 90° V-Twin Configuration
- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Dual Carburetor (Float)
- Dual Element Air Cleaner
- Rotary Oil Pump
- Spin On Oil Filter



Enduro VT22



37371

	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2)	Oil Drain Service Part No.	Fuel Tank (pg. 3)	Top Governed Speed
822500	Standard	37371	Remote	Electric w/o rewind	Ref. 7 37360 (Paper) 37361 (Poly)	Side	None	3350

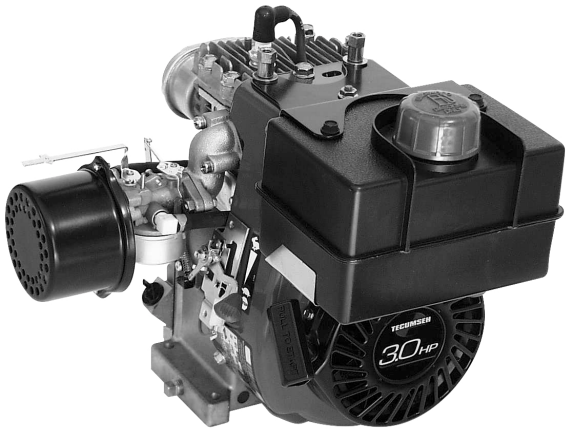
EPA AND CARB CERTIFIED

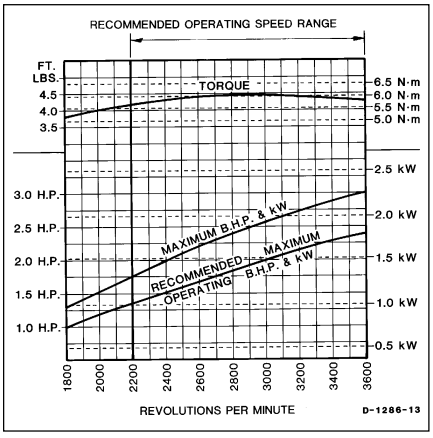
3.0 HORSEPOWER TILLER APPLICATION

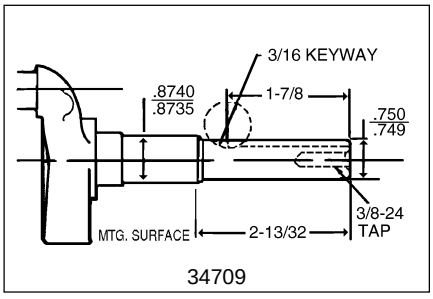
MODEL	H30
HORSEPOWER	3.0 2.24 kW
BORE & STROKE	2-1/2 x 1-27/32 in. 63.51 x 46.84 mm
DISPLACEMENT	9.06 C.I. 148 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





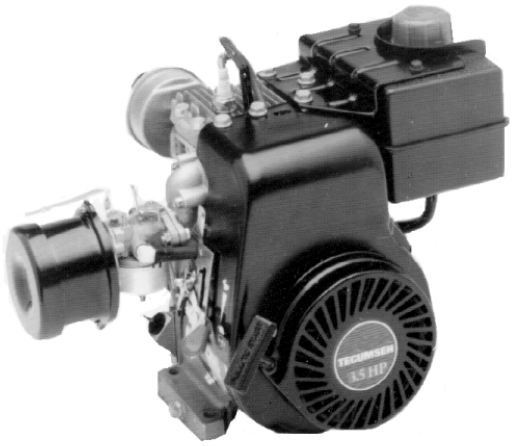


	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903666	Garden Way	34709	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	PTO Side	2 Qts. Ref. 5	3750

EPA AND CARB CERTIFIED

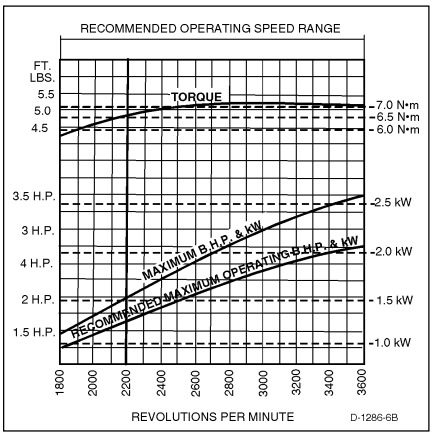
3.5 HORSEPOWER TILLER APPLICATION

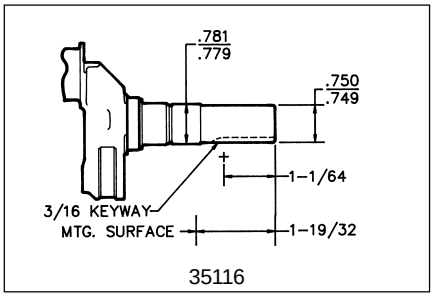
MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





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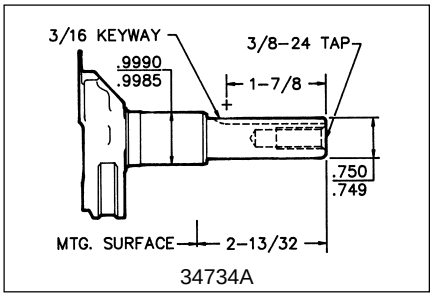
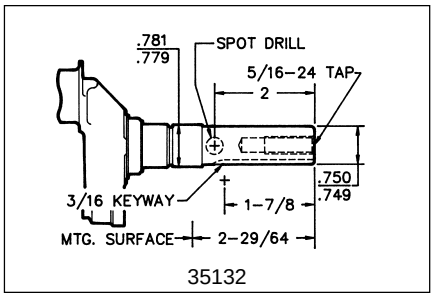


34734A



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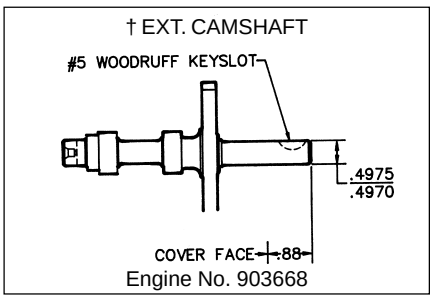


Engine No. 903668

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Exhaust Direction	Top Governed Speed	Note
903667	Toro	35116	Remote/Manual Convertible	Ref. 2 30727 (Paper)	Dual Sides	4 Qts. Ref. 4	PTO Side	3150	▲ ●
903668	Garden Way	34734A	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	PTO Side	3750	†
903669	Standard ■	35132	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	Carb. Side	3750	●

■ This engine is not eligible for return.
▲ Cast Iron Sleeve
● Ball Bearing, PTO side only.
† 2:1 Extended camshaft.

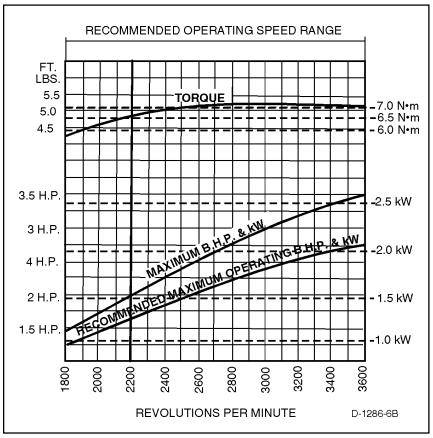
EPA AND CARB CERTIFIED

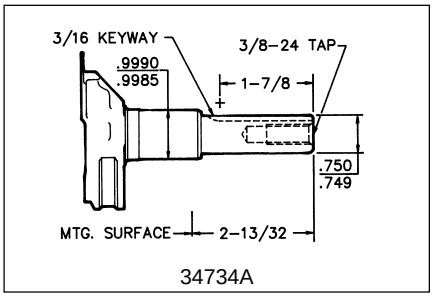
3.5 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





34734A

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903451	Standard ■	34734A	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

■ This engine is not eligible for return.

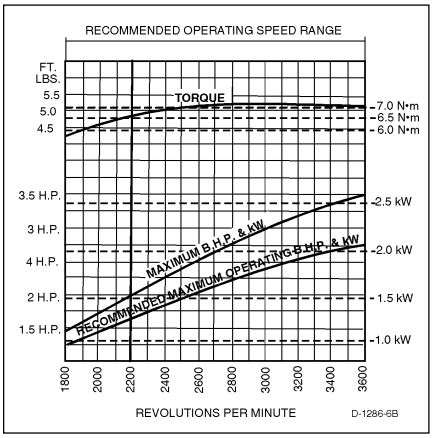
EPA AND CARB CERTIFIED

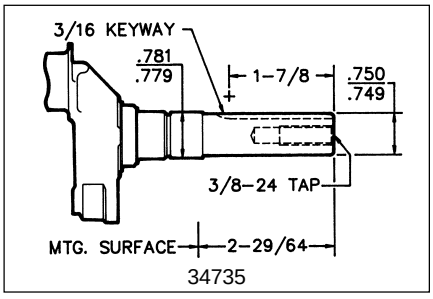
4.0 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H40
HORSEPOWER	4.0 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





34735

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
904416	Standard ■	34735	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

■ This engine is not eligible for return.

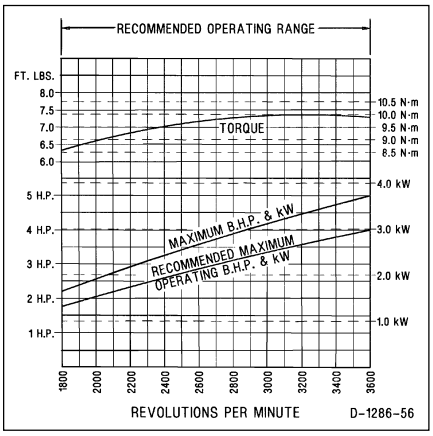
EPA AND CARB CERTIFIED

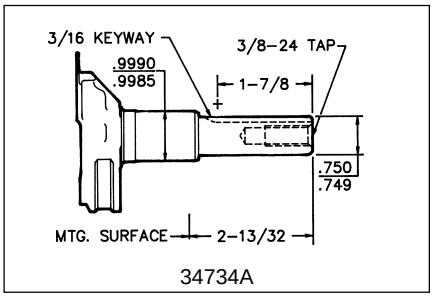
5.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-5/8 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	10.49 C.I. 172 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34734A

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style) (pg. 2 Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905241B	Standard ■	34734A	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Black	3600

■ This engine is not eligible for return.

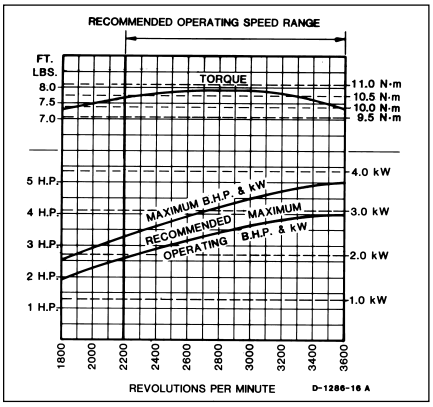
EPA AND CARB CERTIFIED

5.0 HORSEPOWER WINTER APPLICATION

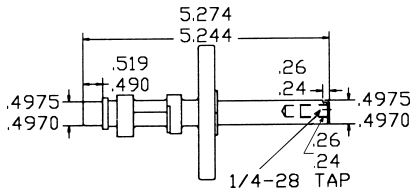
MODEL	HSSK50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	33 lbs. 15.0 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

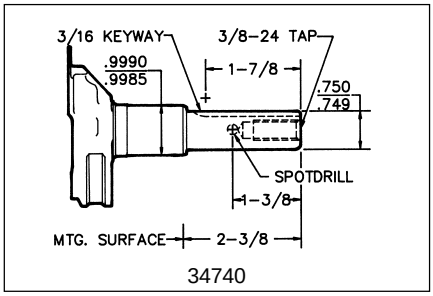
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Start with Mitten Grip
- Easy Start Primer
- Float Carburetor with Choke
- Electronic CDI Ignition
- Oil Fill Tube with Dipstick
- Aluminized Side Discharge Muffler



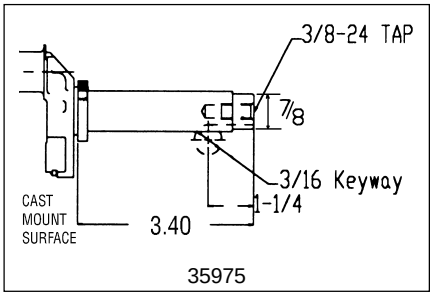
† EXT. CAMSHAFT



Engine No. 905363

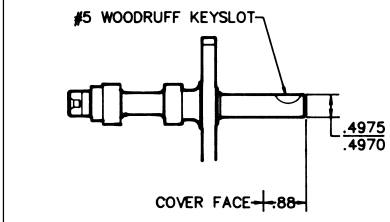


34740



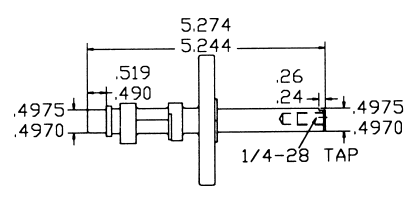
35975

† EXT. CAMSHAFT



Engine No. 905364

† EXT. CAMSHAFT



Engine No. 905365

	Customer	Crankshaft Service No.	Provisions for Electric Starter	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Note
905363	MTD	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905364	Standard ■	34740	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905365	Standard ■	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†

■ This engine is not eligible for return.
* No. 33290E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft.

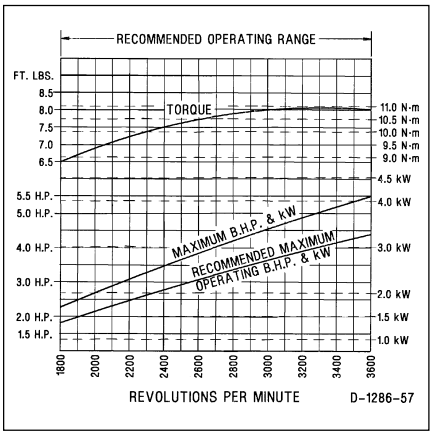
EPA AND CARB CERTIFIED

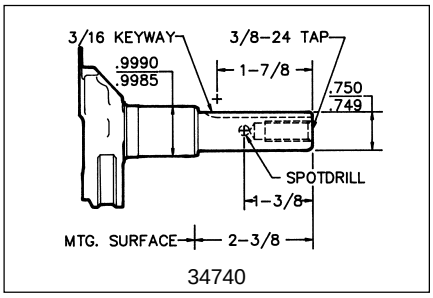
5.5 HORSEPOWER OVERHEAD VALVE

MODEL	OHH55
HORSEPOWER	5.5 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34740

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint Top	Governed Speed
905242B	Standard ■	34740	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3600

■ This engine is not eligible for return.

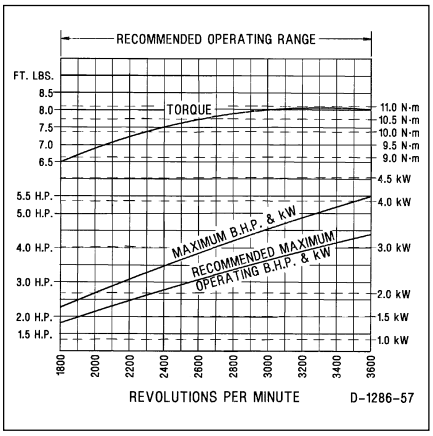
EPA AND CARB CERTIFIED

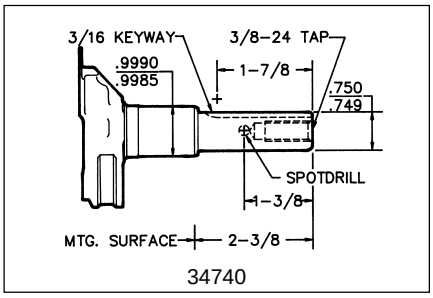
5.5 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK55
HORSEPOWER	5.5 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Starter w/Mitten Grip
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34740

	Customer	Crankshaft Service No.	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905366A	Standard	34740	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Platinum	3600

* No. 33290E - 120 volt electric starter kit can be installed.

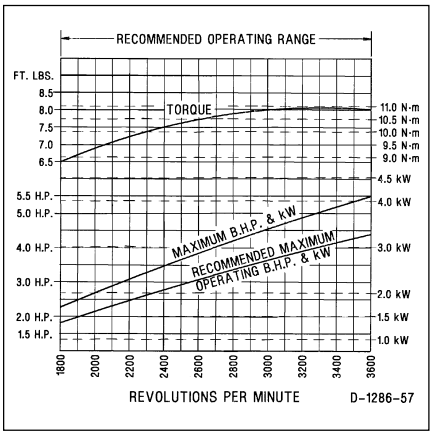
EPA AND CARB CERTIFIED

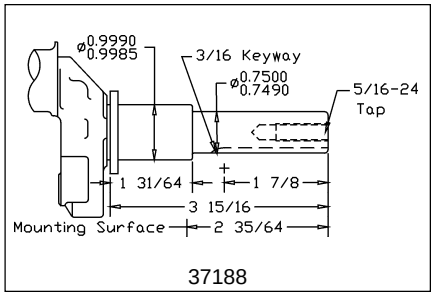
6.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH60
HORSEPOWER	6.0 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





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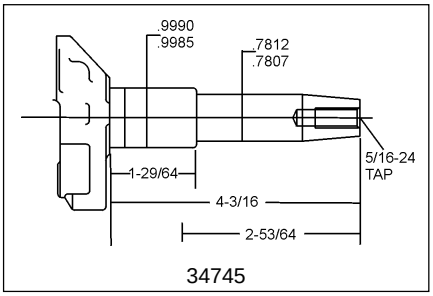

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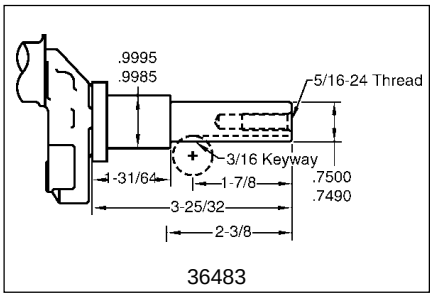


36483

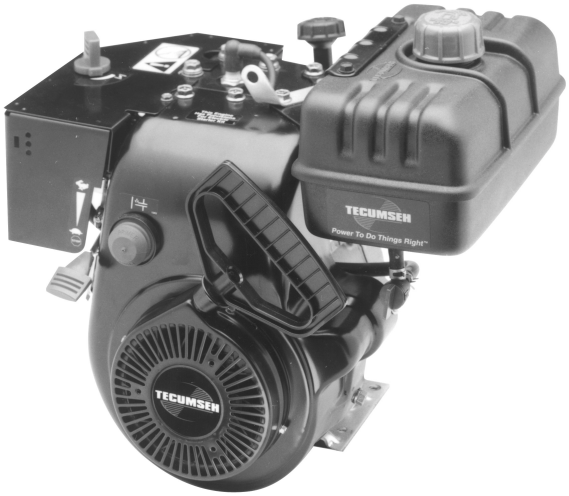
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
906221A	Murray	37188	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350
906222A	Generac	34745	Fixed Speed	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3350
906223A	Murray	36483	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350

■ This engine is not eligible for return.

EPA AND CARB CERTIFIED

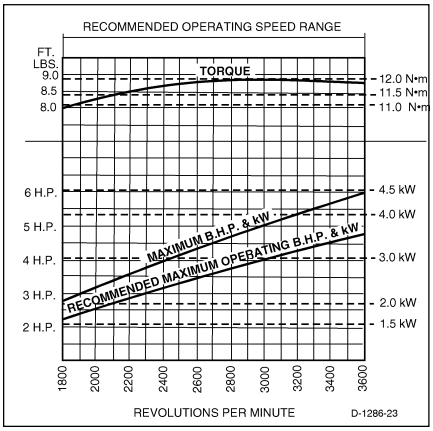
6.0 HORSEPOWER WINTER APPLICATION

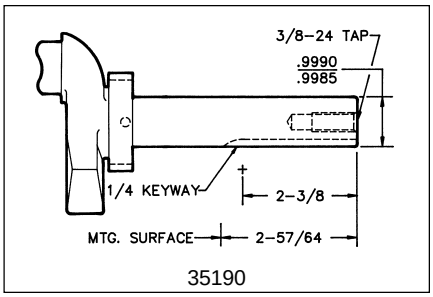
MODEL	HSK60
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-5/8 x 2-1/2 in. 66.69 x 63.50 mm
DISPLACEMENT	13.53 C.I. 221.8 cc
OIL CAPACITY	19 oz. .56 ltr.
(APPROX.) WEIGHT	48 lbs. 21.81 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions





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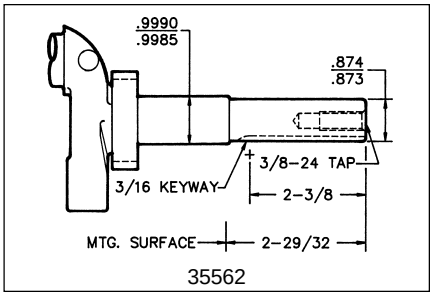


35562

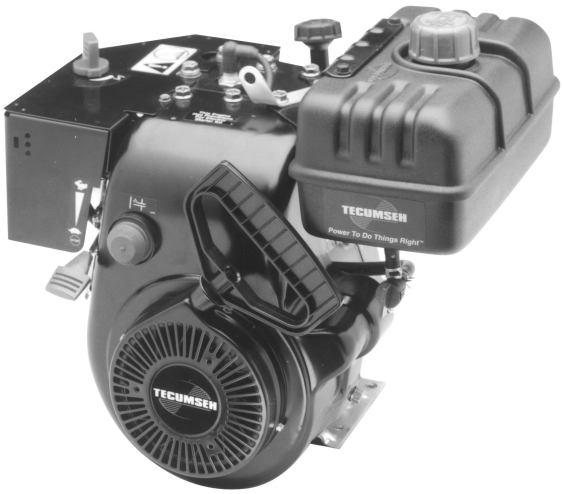
	Customer	Crankshaft Service No.	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
906362	Toro	35190	Manual	X *	Dual Side	2 Qts. Ref. 4	3300
906363	Toro	35562	Manual	X *	Dual Side	4 Qts. Ref. 4	3300

* No. 33328D - 120 volt electric starter can be installed.

EPA AND CARB CERTIFIED

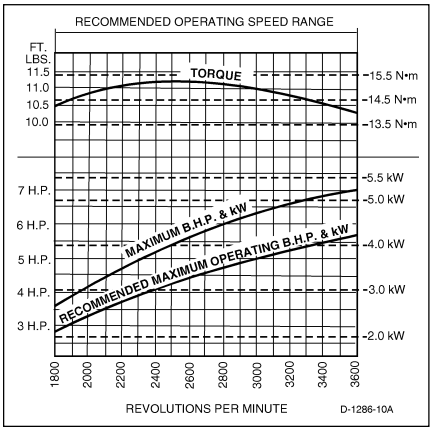
7.0 HORSEPOWER WINTER APPLICATION

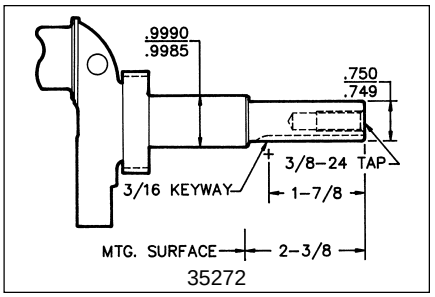
MODEL	HSK70
HORSEPOWER	7.0 5.22 kW
BORE & STROKE	2-3/4 x 2-17/32 in. 69.86 x 64.31 mm
DISPLACEMENT	15.04 C.I. 246.54 cc
OIL CAPACITY	19 oz. .56 ltr.
(APPROX.) WEIGHT	47 lbs. 21.36 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

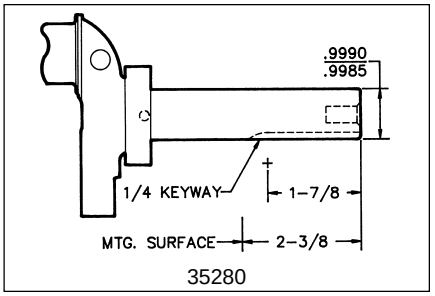


FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions







	Customer	Crankshaft Service No.	Controls	Provisins for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
907306	Standard ■	35272	Manual	X *	Dual Side	4 Qts. Ref. 4	3800
907363	Ariens	35280	Manual	X *	Dual Side	4 Qts. Ref. 4	3600

■ This engine is not eligible for return.
* No. 33328D - 120 volt electric starter can be installed.

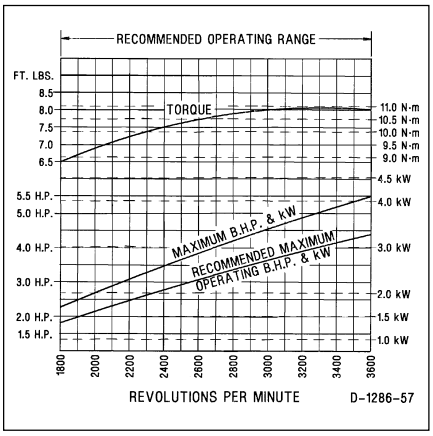
EPA AND CARB CERTIFIED

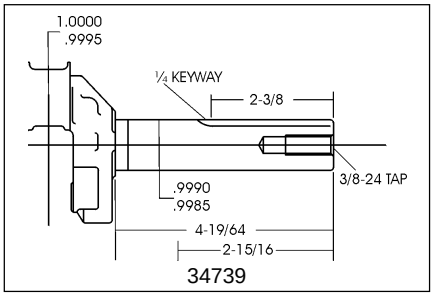
7.0 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK70
HORSEPOWER	7.0 5.22 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Starter w/Mitten Grip
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





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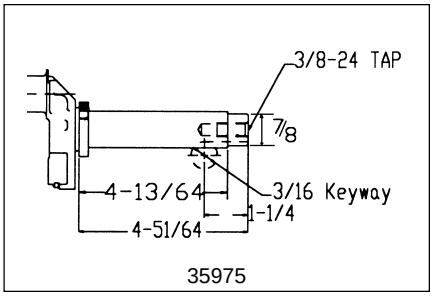

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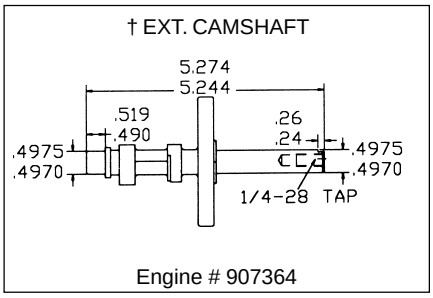


Engine # 907364

	Customer	Crankshaft Service No.	Controls	Provisions for Electric Start	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed	Note
907364A	MTD Products	35975	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Black	3750	†
907365		34739	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Platinum	3750	

* No. 33290E - 120 volt electric starter kit can be installed.
† 2:1 extended camshaft

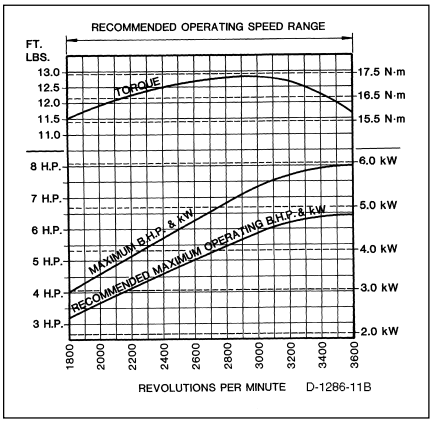
EPA AND CARB CERTIFIED

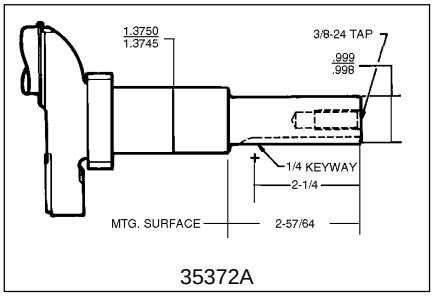
8.0 HORSEPOWER MEDIUM FRAME - M SERIES INDUSTRIAL APPLICATION

MODEL	HM80
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





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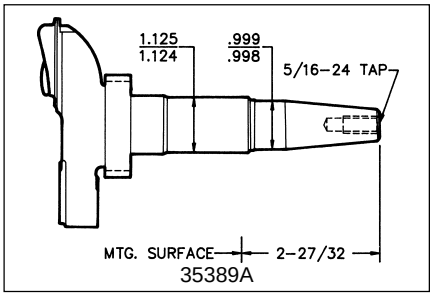

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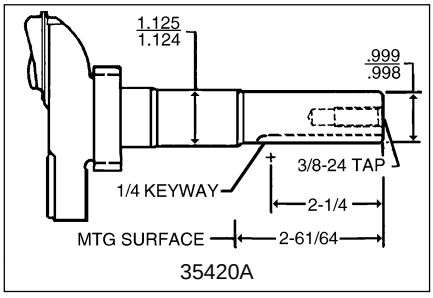

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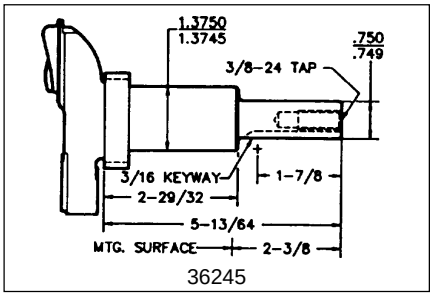


36245

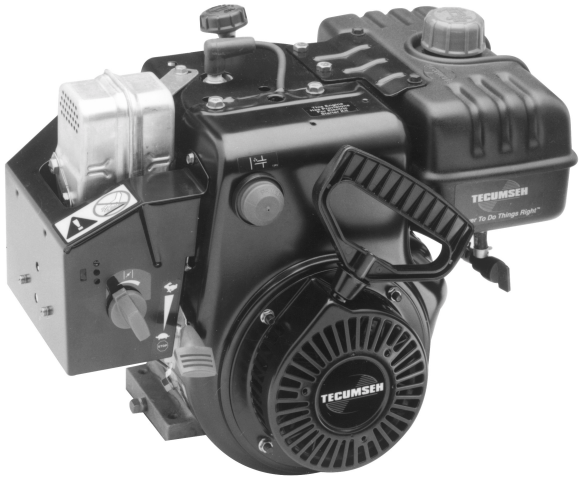
	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
908202	Standard ■ BB	35420A		Manual	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
908204	Standard ■	35372A		Remote	Rewind	Ref. 2 33268 (Paper)	Dual Side	4 Qts. 4	3600
908212B	Standard ■ BB ✱	35389A		Fixed Speed	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
908213	Garden Way	36245	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600

■ This engine is not eligible for return.
BB Ball Bearing
† 36680 - 12 volt electric starter can be installed.
✱ Climate Guard

EPA AND CARB CERTIFIED

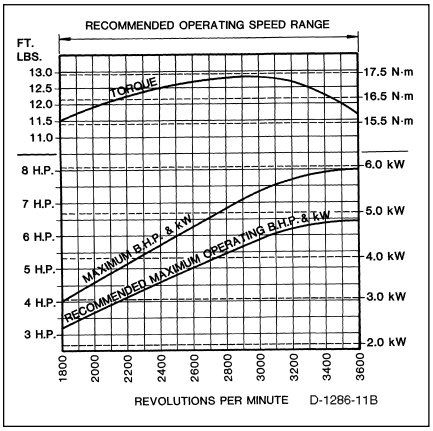
9.0 HORSEPOWER WINTER APPLICATION

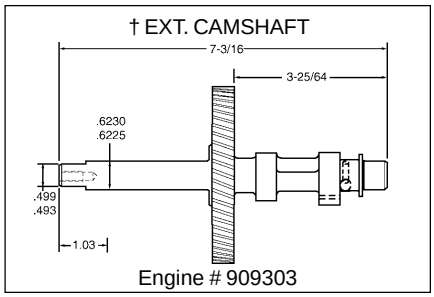
MODEL	HMSK90
HORSEPOWER	9.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

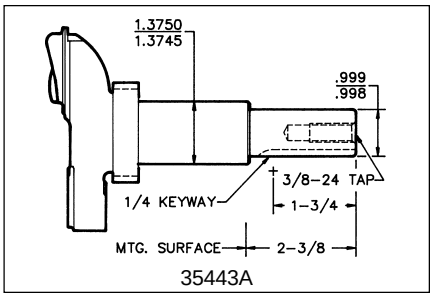


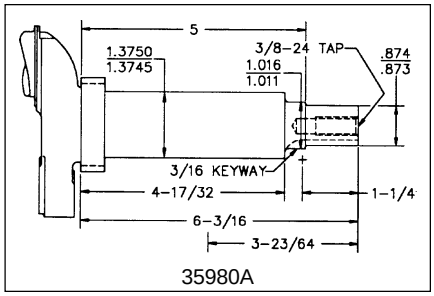
FEATURES

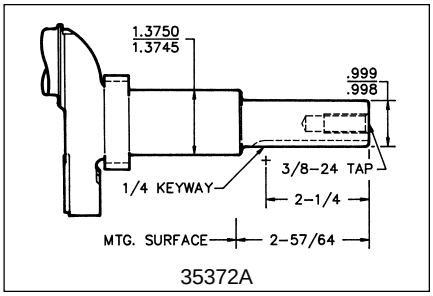
- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve











	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909300	Standard ■	35372A	3 amp A.C.	Manual	X *	Dual Side	4 Qts. Ref. 4	3450
909301	Standard ■	35443A		Manual	X *	Dual Side	4 Qts. Ref. 4	3250
†909303	MTD	35980A	18 Watt	Manual	X *	Front Dual Side	4 Qts. Ref. 4	3600

■ This engine is not eligible for return.
* No. 33329E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft

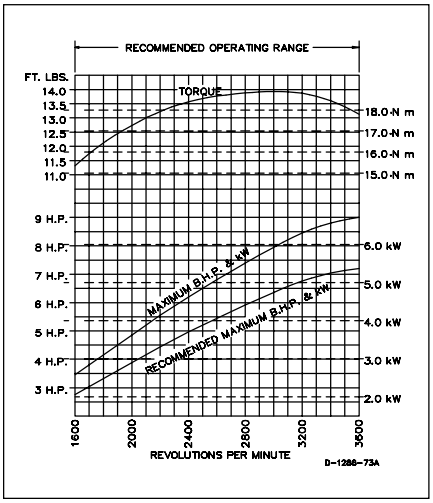
EPA AND CARB CERTIFIED

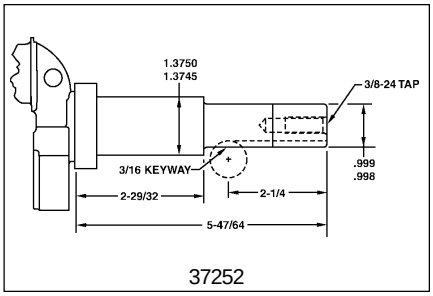
9 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK90
HORSEPOWER	9.0 6.7 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





37252

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909302A	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

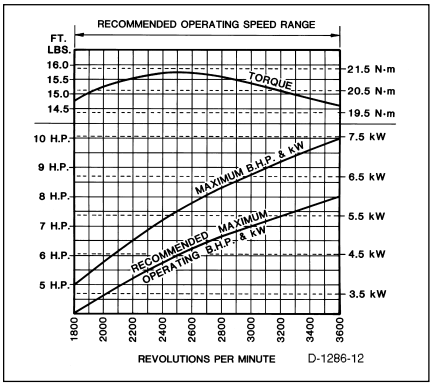
EPA AND CARB CERTIFIED

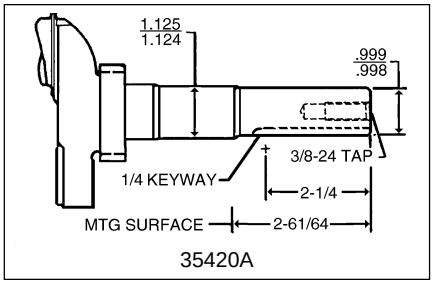
10 HORSEPOWER MEDIUM FRAME - M SERIES INDUSTRIAL APPLICATION

MODEL	HM100
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





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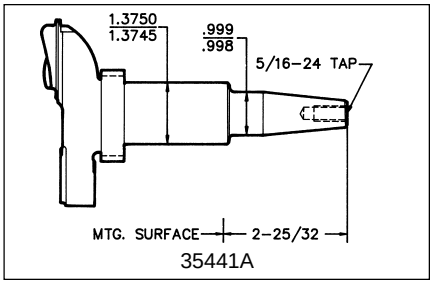

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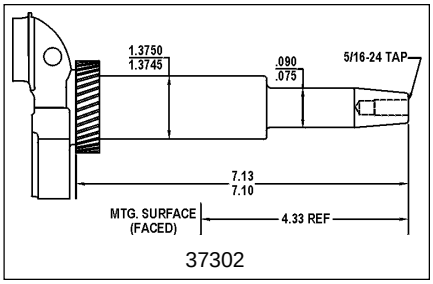
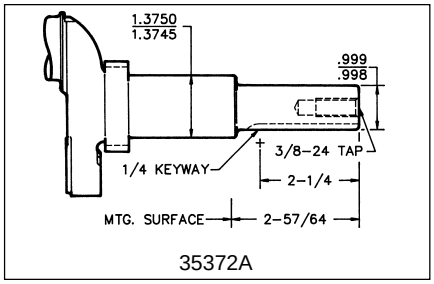


37302



35372A

	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
910205A	Standard ■ BB	35420A	3 amp D.C. 5 amp D.C.	Manual	Electric Starter w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
910206A	MTD Ltd. BB	35420A		Manual	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3400
910207A	Standard ■	35372A		Manual	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3600
910263A	Coleman ▲	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
910264C	Generac † ▲	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3750
910265B	Devilbiss † ▲	37302		Fixed Speed	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	None	3750

■ This engine is not eligible for return.
* 36680 - 12 Volt electric starter can be installed.
† Low oil shutdown.
▲ Climate guard.

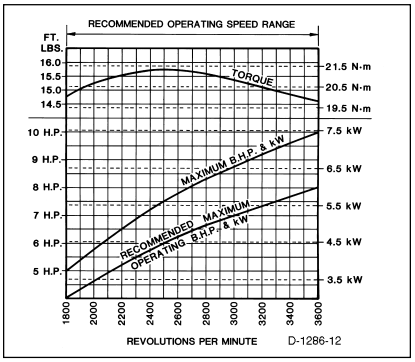
EPA AND CARB CERTIFIED

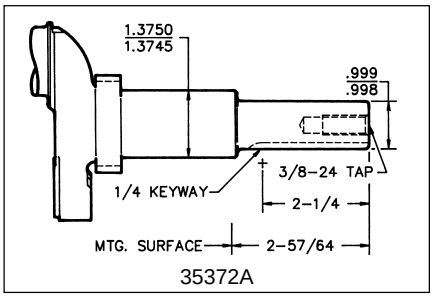
11 HORSEPOWER WINTER APPLICATION

MODEL	HMSK110
HORSEPOWER	11.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 90 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve





	Customer	Crankshaft Service No.	Charging System	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Notes
911302	Standard ■	35372A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911303	Standard ■	35372A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3450	✱

■ This engine is not eligible for return.
✱ 33329E - 120 volt electric starter can be installed.
† 2:1 extended camshaft

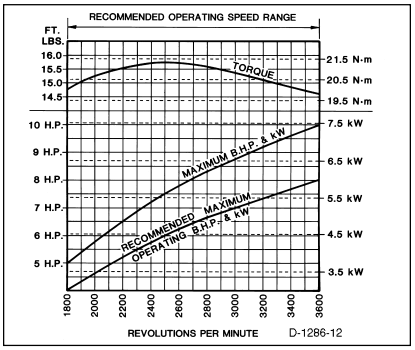
EPA AND CARB CERTIFIED

11 HORSEPOWER WINTER APPLICATION

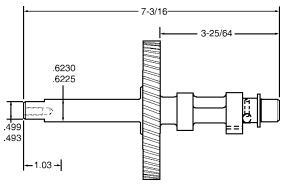
MODEL	HMSK110
HORSEPOWER	11.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 90 mm

FEATURES

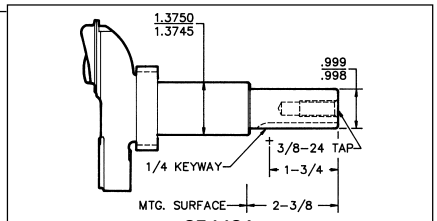
- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve



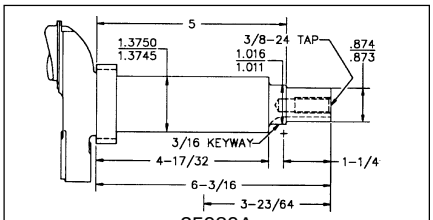
† EXT. CAMSHAFT



Engine No. 911361



35443A



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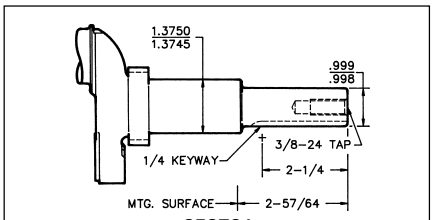

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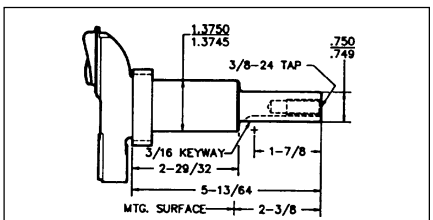
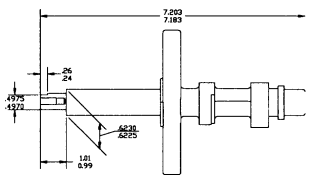


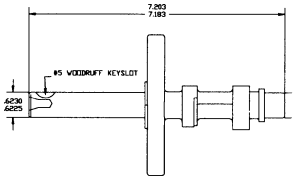
36245

† EXT. CAMSHAFT



Engine No. 911360

† EXT. CAMSHAFT



Engine No. 911300

	Customer	Crankshaft Service No.	Charging System	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Notes
911300	Standard ■	36245	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱ †
911301	Standard ■	35443A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3250	✱
911302	Standard ■	35372A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911303	Standard ■	35372A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911304	Standard ■	36245	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱
911305	Standard ■	35443A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911360	MTD LTD.	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †
911361	Standard ■	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †

■ This engine is not eligible for return.

✱ 33329E - 120 volt electric starter can be installed.

† 2:1 extended camshaft

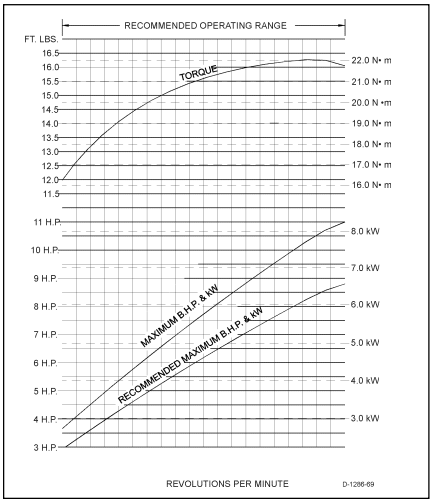
EPA AND CARB CERTIFIED

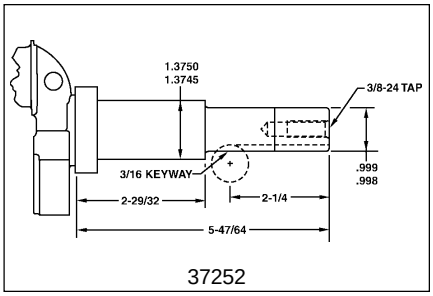
11 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK110
HORSEPOWER	11.0 8.2 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





37252

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
911306A	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

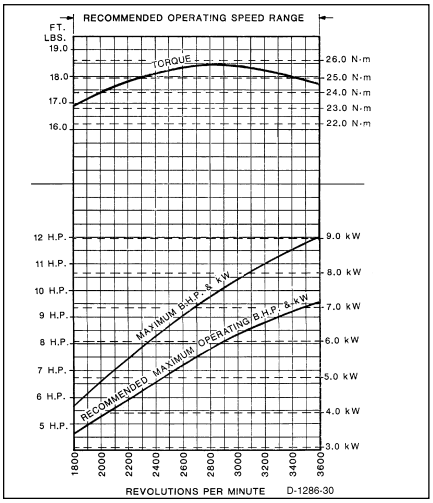
EPA AND CARB CERTIFIED

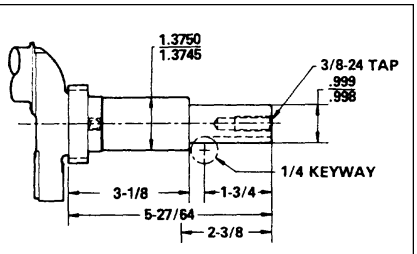
12 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK120
HORSEPOWER	12.0 8.95 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.29 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design





35701A

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
912301A	Standard ■	35701A	18 Watt	Manual	X *	Dual Side	6 Qt. Ref. 4	3700

■ This engine is not eligible for return.
* 37105 - 120 volt electric starter can be installed.

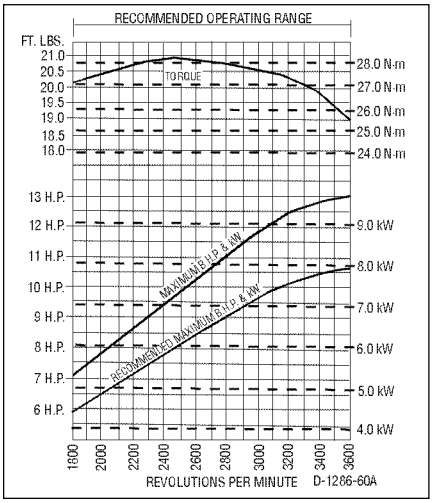
EPA AND CARB CERTIFIED

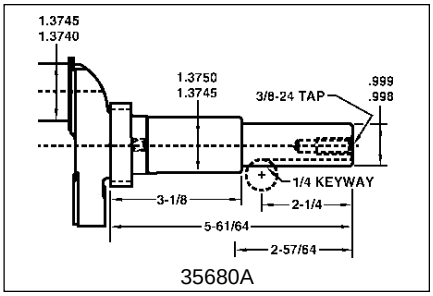
13 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK130
HORSEPOWER	13.0 9.7 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





35680A

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
913300B	Standard ■	35680A	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 37105 - 120 volt electric starter can be installed.

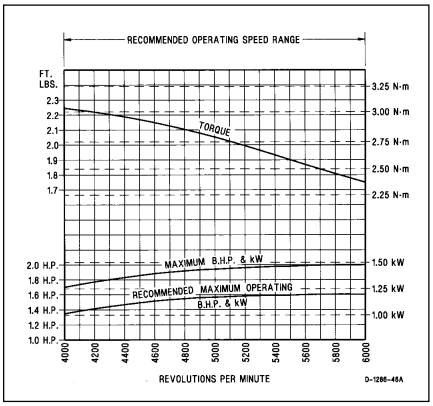
EPA AND CARB CERTIFIED

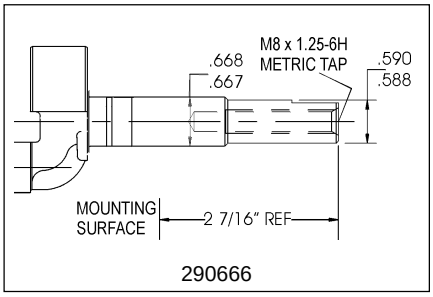
2 HORSEPOWER TWO CYCLE AUGER APPLICATION

MODEL	TC300
HORSEPOWER	2.0 1.49 kW
BORE & STROKE	1.75 x 1.25 in. 44.5 mm x 31.8 mm
DISPLACEMENT	3.0 C.I. 49.2 cc
OIL / FUEL MIXTURE	24:1
(APPROX.) WEIGHT	7 lbs. 3.2 kg

FEATURES

- Aluminum Cylinder Bore
- Poly Air Filter with Flocked Screen
- Ball / Needle Bearing Construction
- Integral Recoil Starter
- Responsive Air Vane Governor





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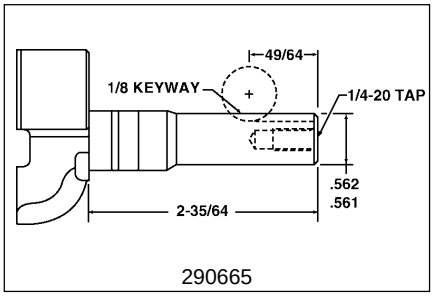

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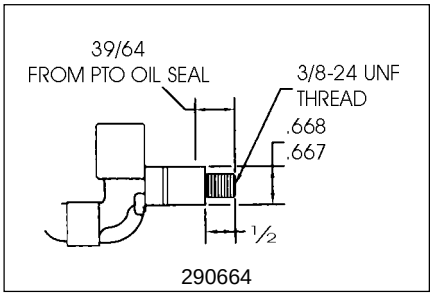


290664

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Carburetor	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
800174A	Flymo	290666	Remote	Ref. 1 35066 (Paper)	Diaphragm w/primer	16 oz. Ref. 7	3800
800264A	Active Technology	290665	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/primer	20 oz. Ref. 8	6000
800662A	Feldman	290664	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	6000
800664A	Hoffco	290664	Remote	Ref. 3 450255 (FLocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	5400

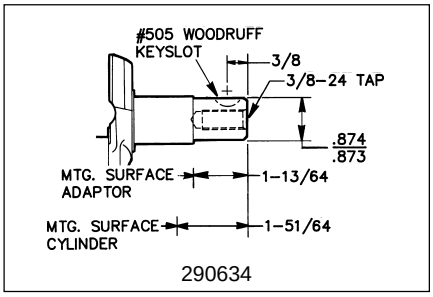
EPA AND CARB CERTIFIED

3 HORSEPOWER TWO CYCLE VARIOUS APPLICATIONS AV520

MODEL	AV520
HORSEPOWER	3.0
BORE & STROKE	2.09 x 1.50 in. 53 x 38 mm
DISPLACEMENT	5.2 C.I. 85 cc
OIL / FUEL MIXTURE	24:1
(APPROX.) WEIGHT	13.2 lbs. 5.9 kg
Bolt Mtg. Circle	4.0 in. 102 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ball/Needle Bearing Construction
- Diaphragm Carburetor with Choke



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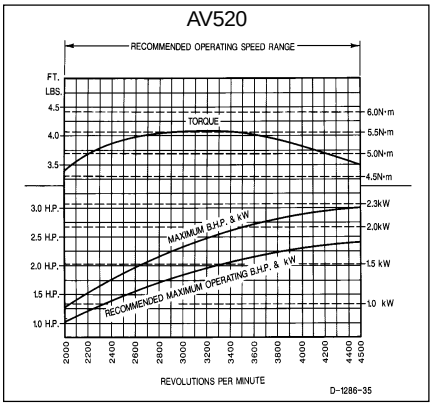

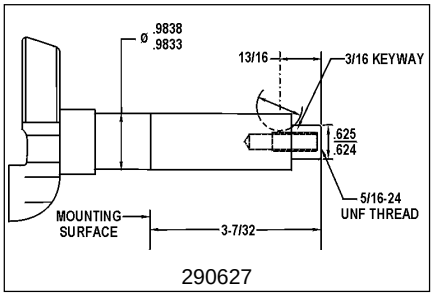

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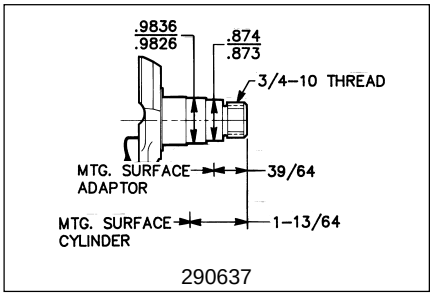


290637

	Customer	Application	Crankshaft	Controls	Air Cleaner Style (pg. 2)	Fuel Tank (pg. 3)	Top Governed Speed
800265A	Feldman	Auger	290634	Remote	None	1 Qt. (Ref. 9)	4500
800266	Hoffco	Scythe	290637	Remote	450233 (Flocked Screen) 450205 (Flocked Screen) 450215 (Poly) (Ref. 2)	None	4600

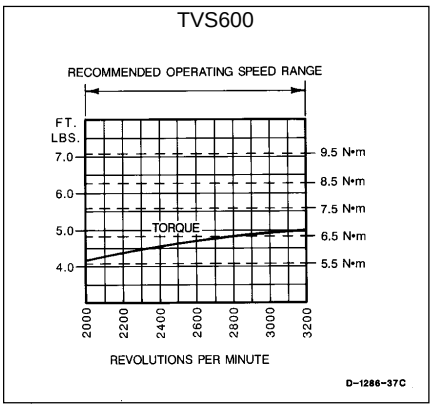
EPA AND CARB CERTIFIED

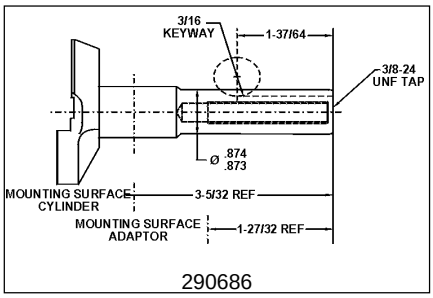
3.5 HORSEPOWER TWO CYCLE ROTARY LAWN MOWER APPLICATION

MODEL	TVS600
HORSEPOWER	3.5
BORE & STROKE	2.09 x 1.75 in. 53 x 44 mm
DISPLACEMENT	6.0 C.I. 98 cc
OIL / FUEL MIXTURE	32:1
(APPROX.) WEIGHT	16 lbs. 73 kg
Bolt Mtg. Circle	2.59 x 1.50 in. 65.8 x 38.1 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ball/Needle Bearing Construction
- Float Carburetor with Choke





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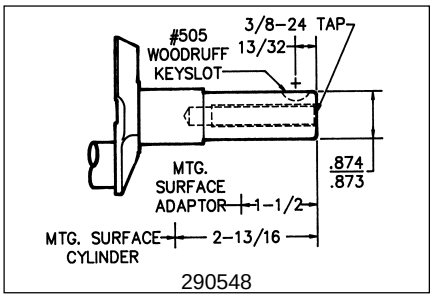


290548

	Customer	Crankshaft	Controls	Air Cleaner Style (pg. 2)	Fuel Tank (pg. 3)	Top Governed Speed
800175	Flymo	290686	Manual	None (OEM supplied)	1.3 Qt. (Ref. 9)	3850
800176	Flymo	290548	Manual	None (OEM supplied)	1.3 Qt. (Ref. 9)	3850

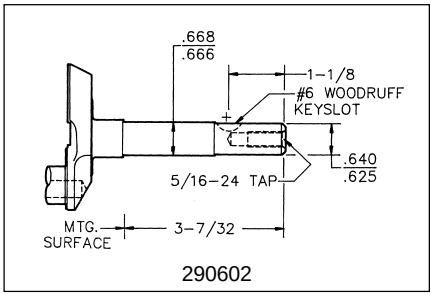
EPA AND CARB CERTIFIED

3 HORSEPOWER TWO CYCLE WINTER APPLICATION

MODEL	HSK600
HORSEPOWER	3.00 2.24 kW
BORE & STROKE	2.09 x 1.75 in. 53 x 38 mm
DISPLACEMENT	6.0 C.I. 98 cc
OIL / FUEL MIXTURE	32:1
(APPROX.) WEIGHT	12 lbs. 5.44 kg
BOLT MTG. CIRCLE	5.562 in.

FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Responsive Air Vane Governor
- Float Carburetor with Choke



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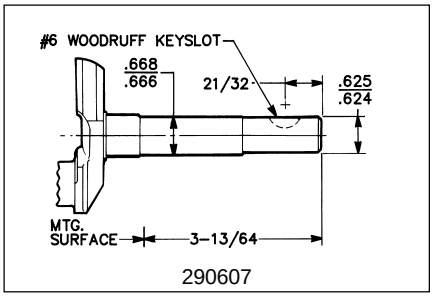

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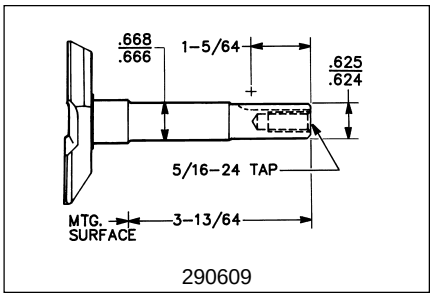

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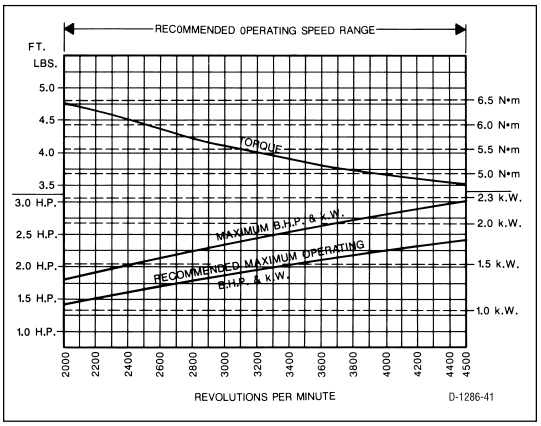


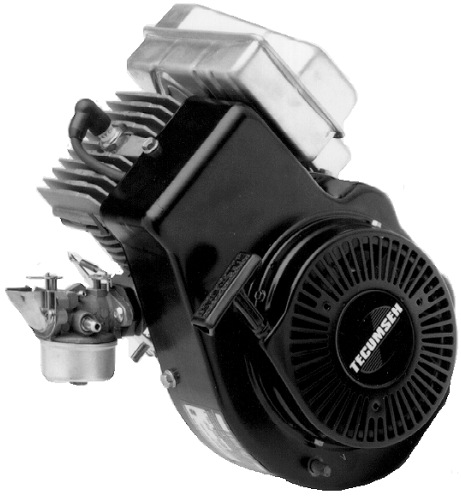
	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed	Notes
900389	Toro	290607	X *	Fixed Speed	4500	▲ ★
900390	MTD Mont. Ward	290609	X *	Fixed Speed	4500	▲
900391	Snapper	290607	X *	Fixed Speed	4300	▲
900392	Toro	290602	X *	Fixed Speed	4500	▲
900393	Murray Outdoor	290607	X *	Fixed Speed	4300	▲

* No. 590556 - 120 volt electric starter kit can be installed.
▲ Fuel tank omitted.
★ Muffler OEM supplied.

EPA AND CARB CERTIFIED

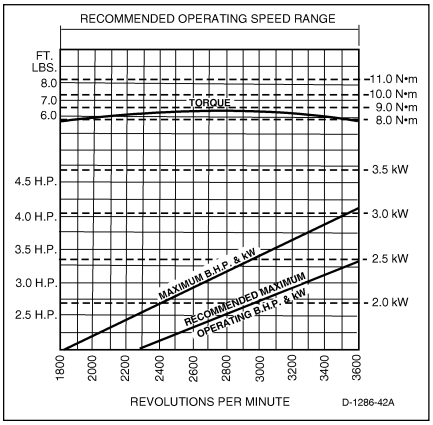
4.5 HORSEPOWER TWO CYCLE WINTER APPLICATION

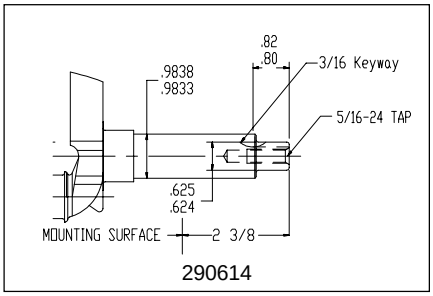
MODEL	HSK845
HORSEPOWER	4.5 3.35 kW
BORE & STROKE	2.44 x 1.81 in. 61.9 x 46 mm
DISPLACEMENT	8.46 C.I. 139 cc
OIL / FUEL MIXTURE	50:1
(APPROX.) WEIGHT	20 lbs. 9.1 kg
BOLT MTG. CIRCLE	3.625 in.



FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Quick Response Mechanical Governor
- Float Carburetor with Choke





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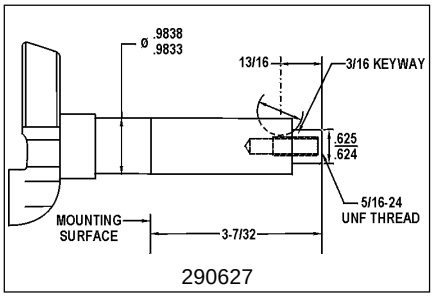

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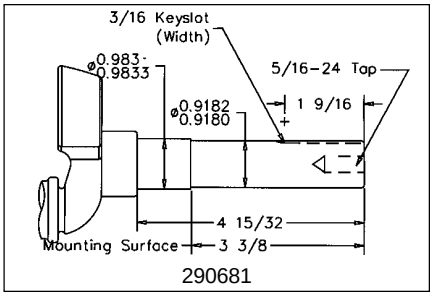


290681

	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed Speed	Notes
900394	MTD	290614	X *	Fixed Speed	3700	▲
900395	Toro	290681		Fixed Speed	3700	▲
900397	Service	290627	X *	Fixed Speed	3700	▲

* No. 590670 - 120 volt electric starter kit can be installed.

▲ Fuel tank omitted.

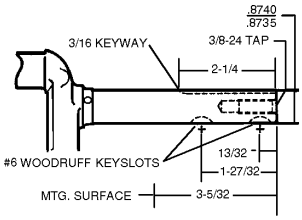
OUT OF PRODUCTION ENGINES

Quantity Limited to Factory & Distributor Stock

Refer to 1996-97 Service Engine Specification Book for Details

3.8 HP
Model TVS90

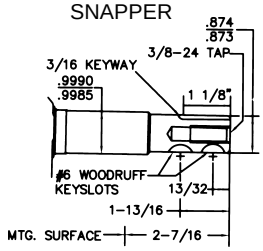
MURRAY / MTD



Engine No. 803189

4.0 HP
Model TVS115

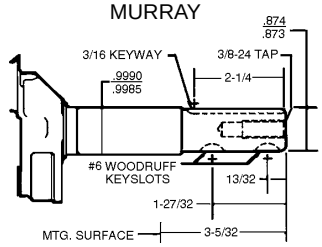
SNAPPER



Engine No. 804177A

5 HP
Model TVS115
Premier

MURRAY



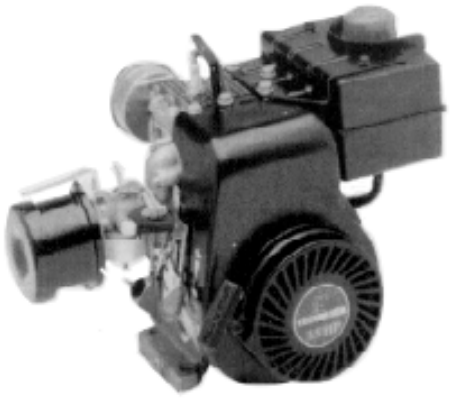
Engine No. 805171

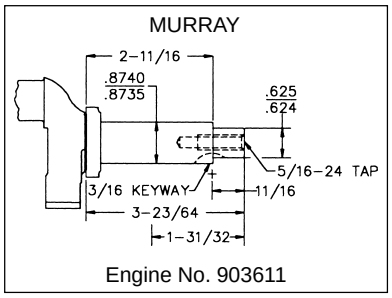
OUT OF PRODUCTION ENGINES

Quantity Limited to Factory & Distributor Stock

Refer to 1996-97 Service Engine Specification Book for Details

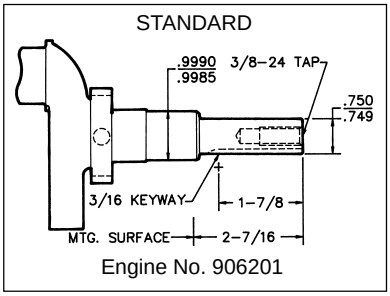
3.5 HP
Model H35





Engine No. 903611

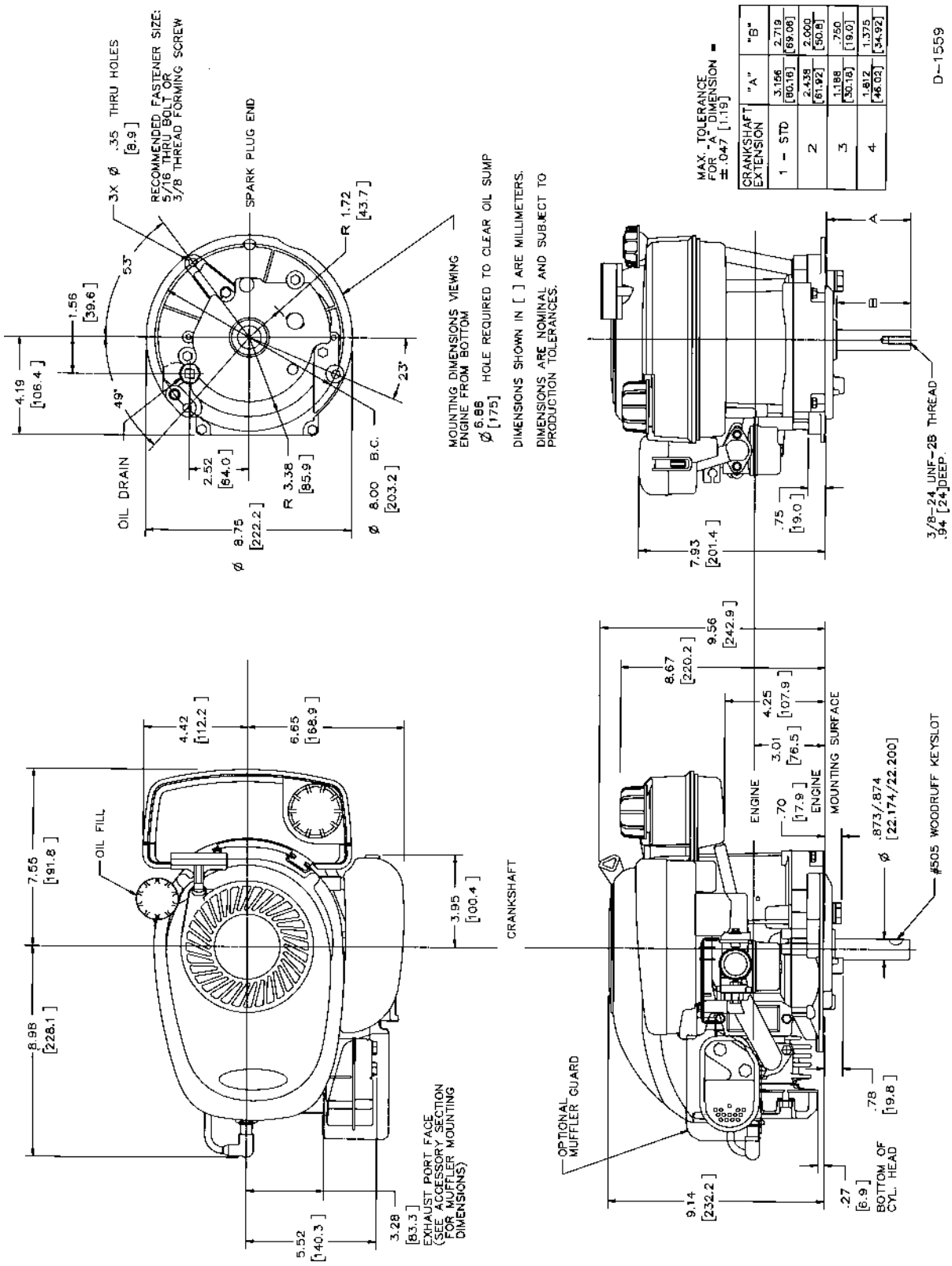
6 HP
Model H60



Engine No. 906201

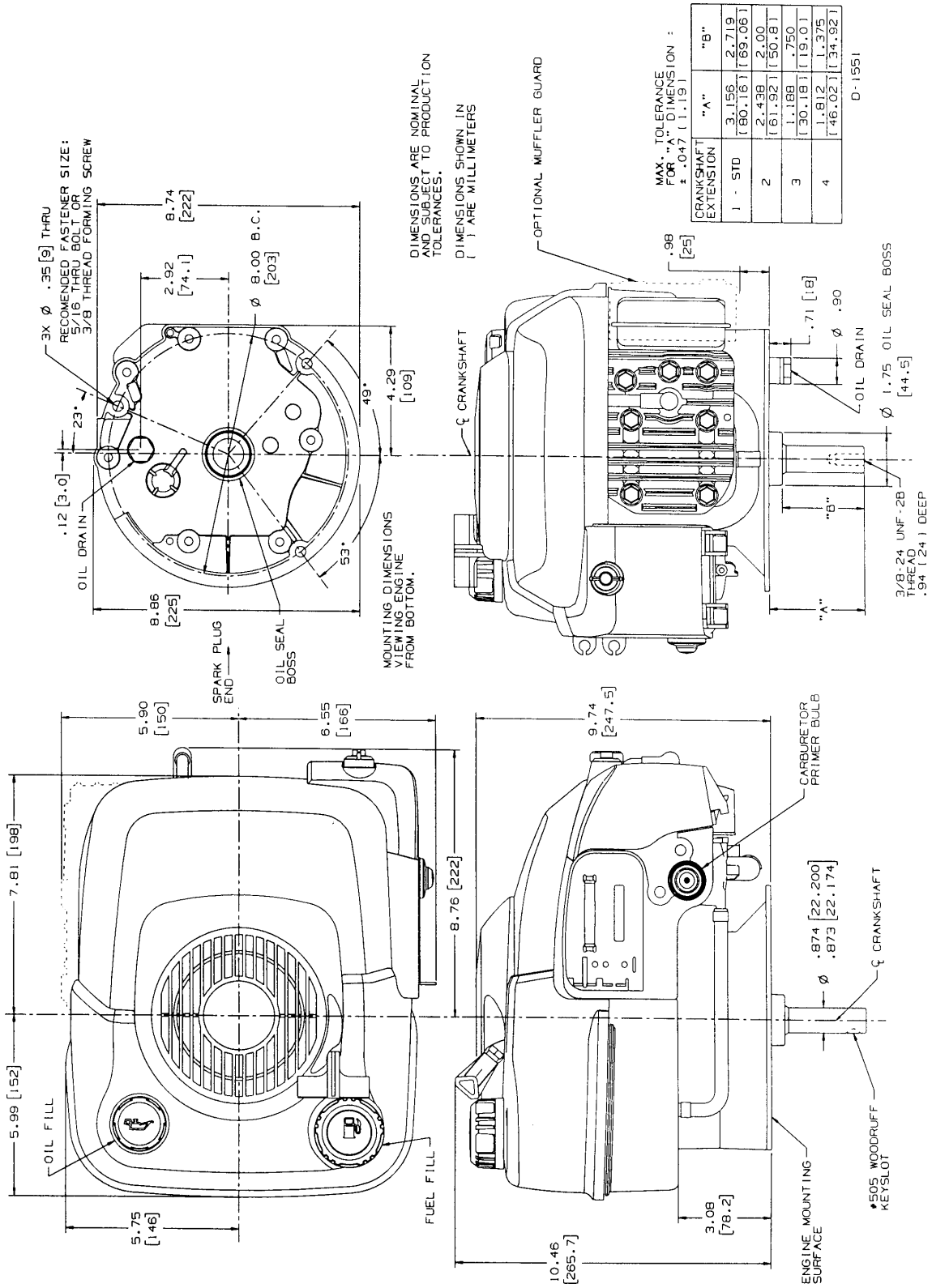
DIMENSIONAL DRAWING

LEV100, LEV115, LEV120



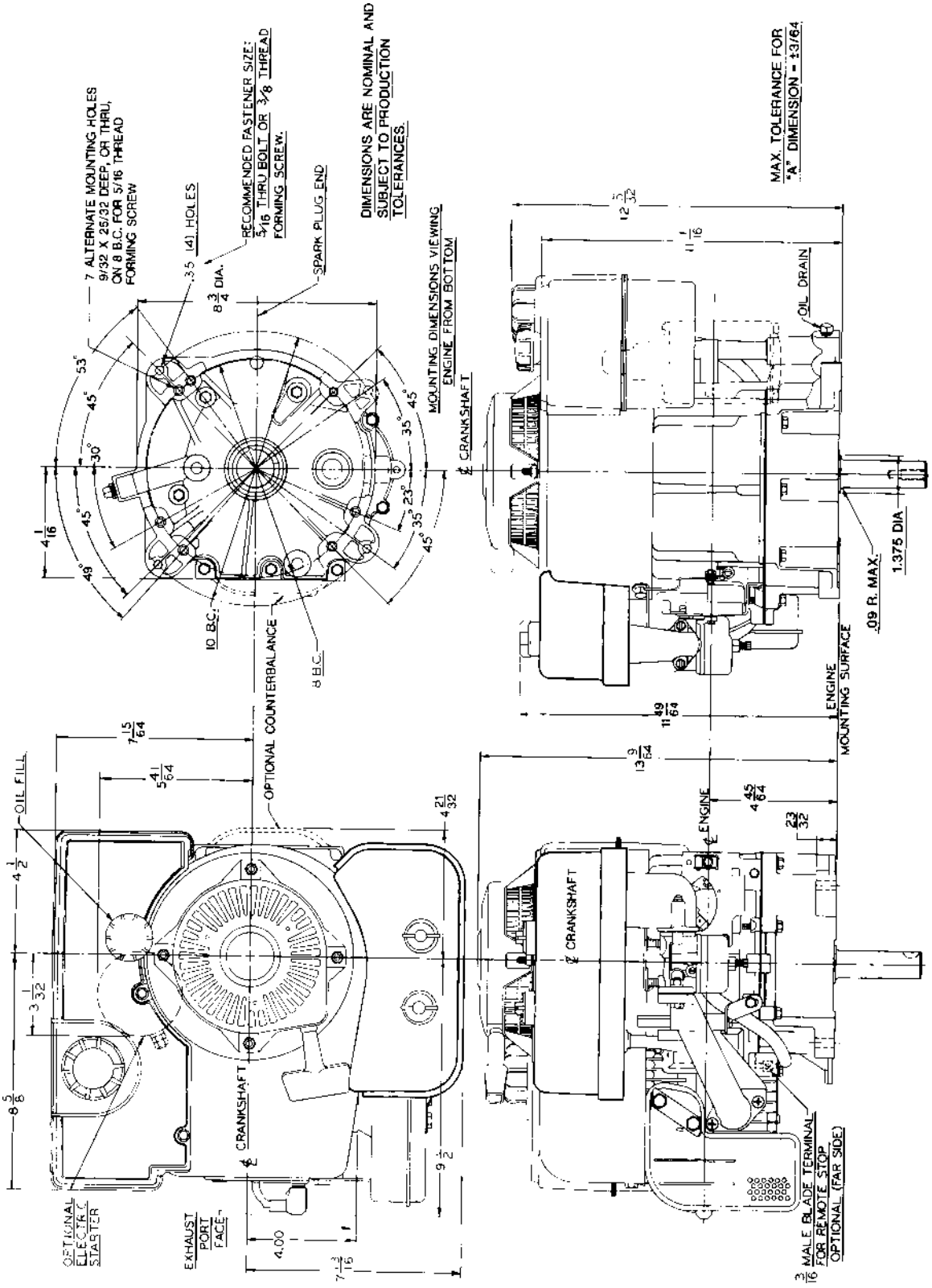
DIMENSIONAL DRAWING

VLV 126



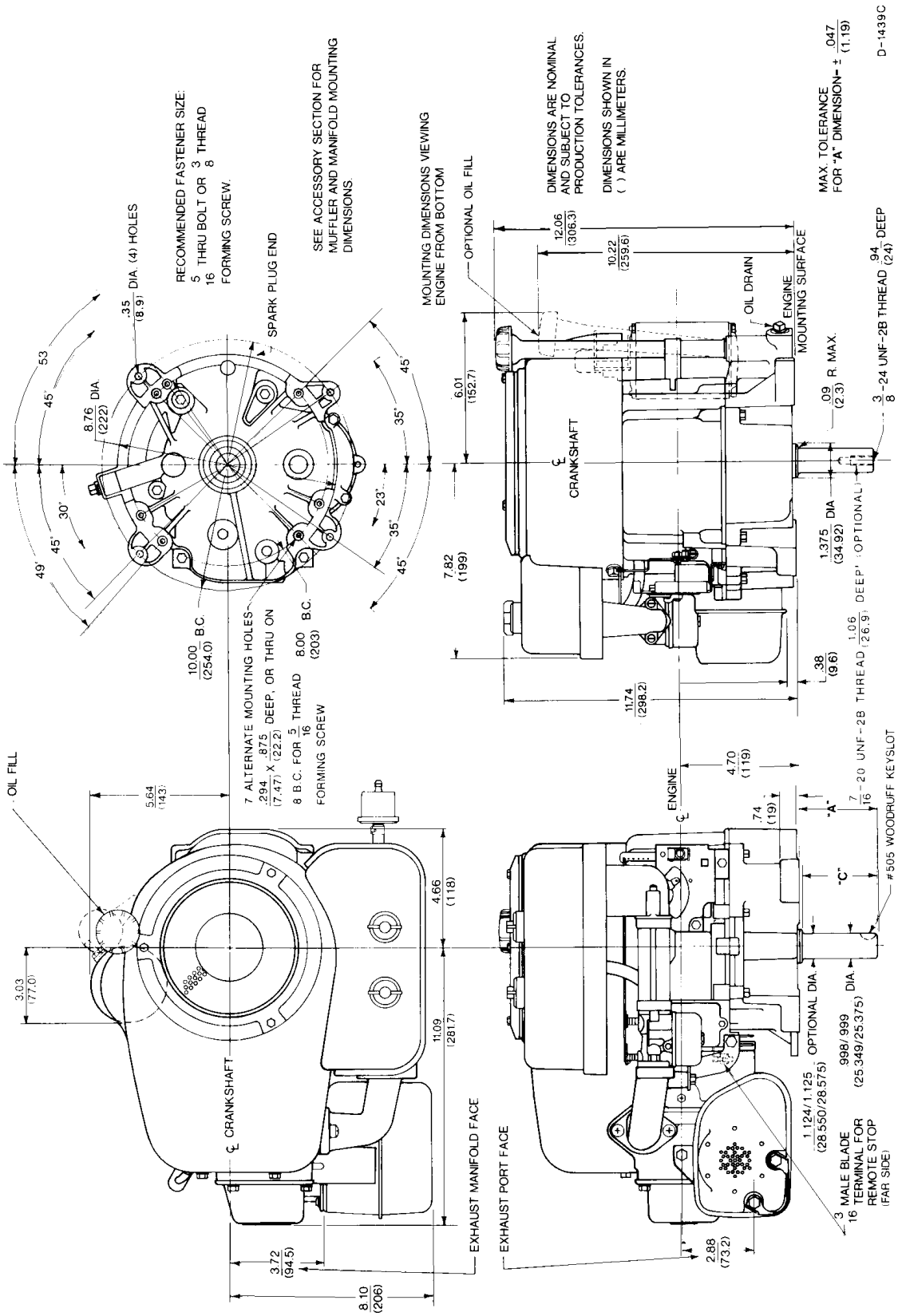
DIMENSIONAL DRAWING

TVM195 - TVM220



DIMENSIONAL DRAWING

OHV125



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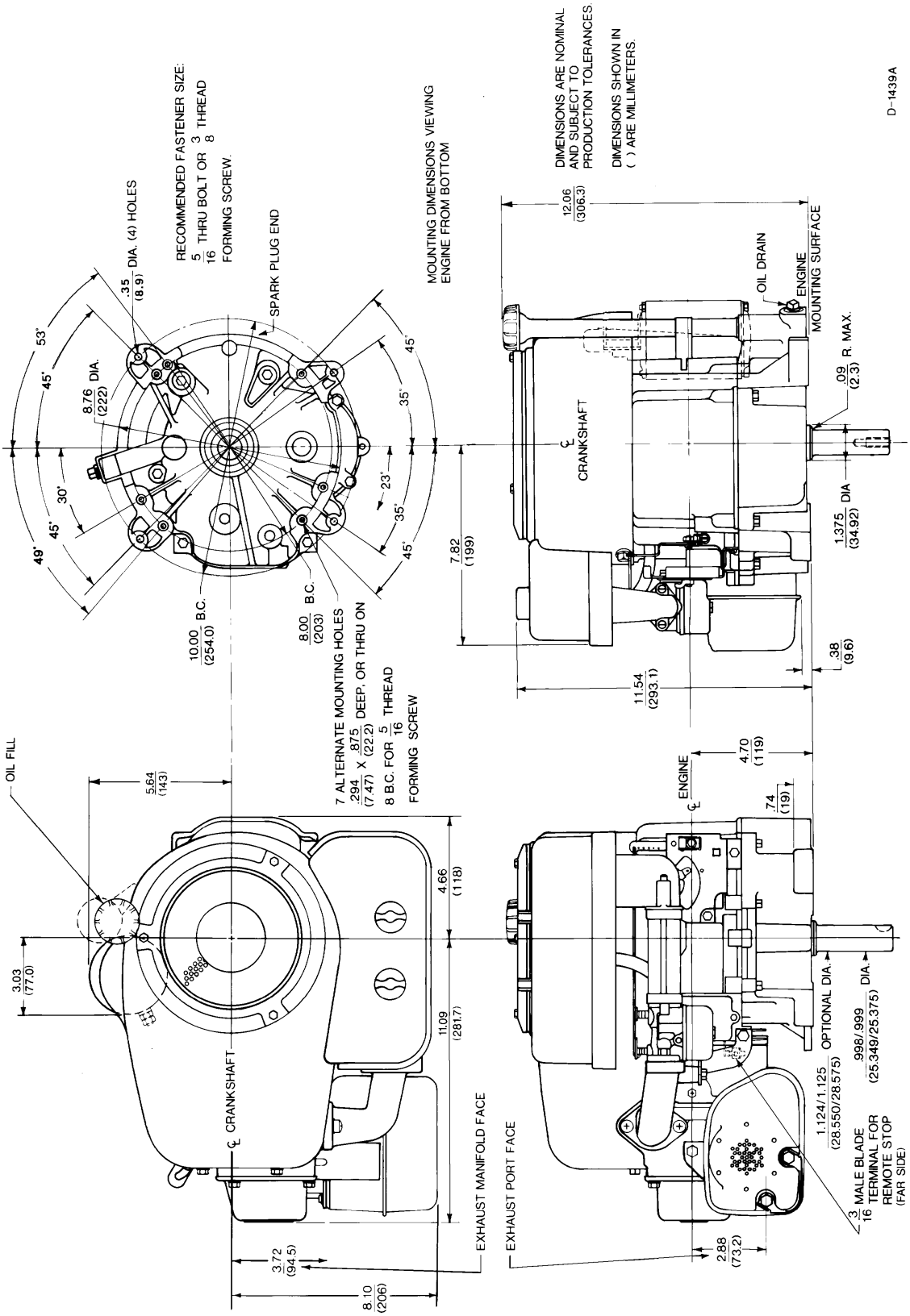
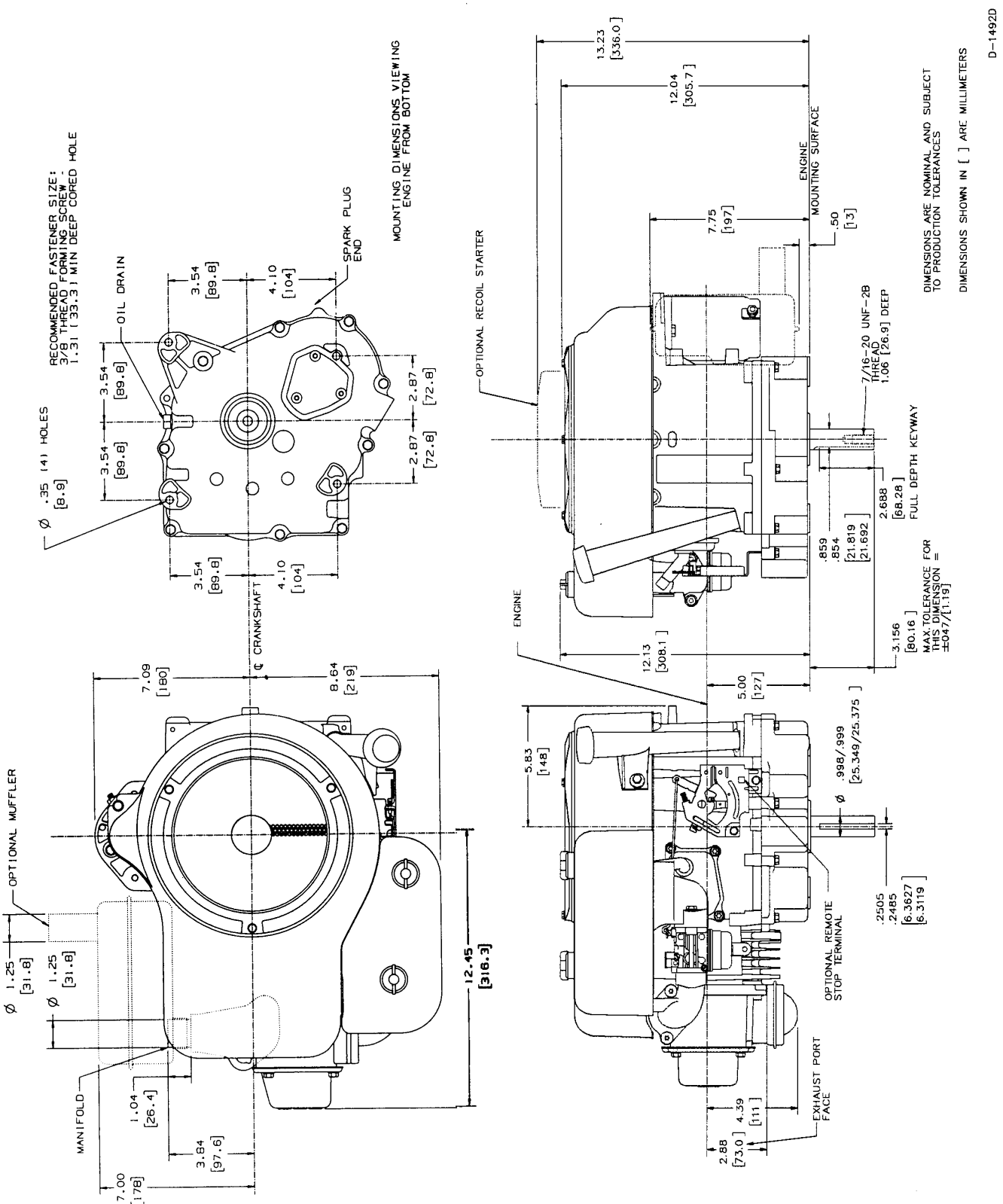
OHV130



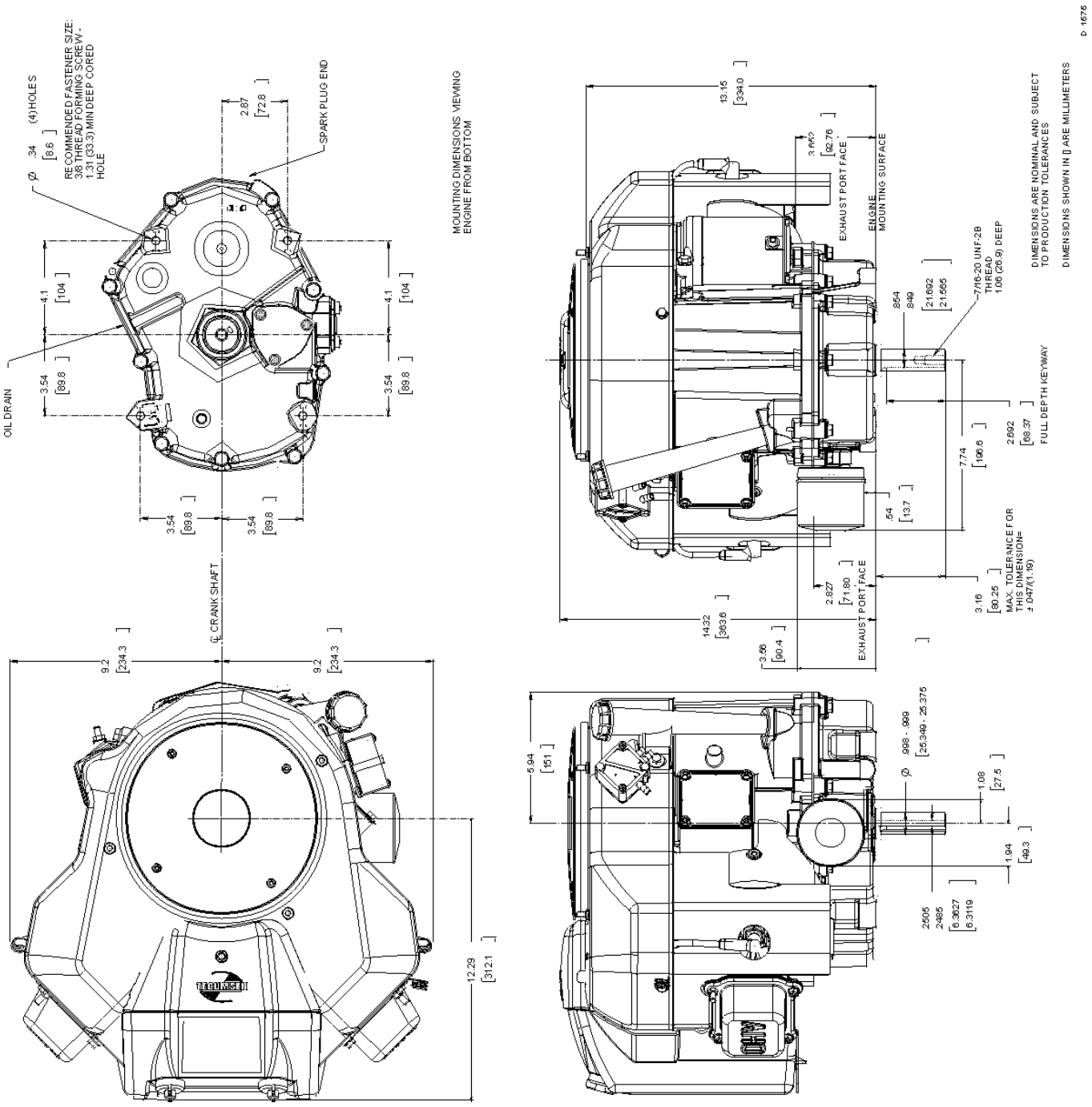
DIMENSIONAL DRAWING

OHV135, OHV175



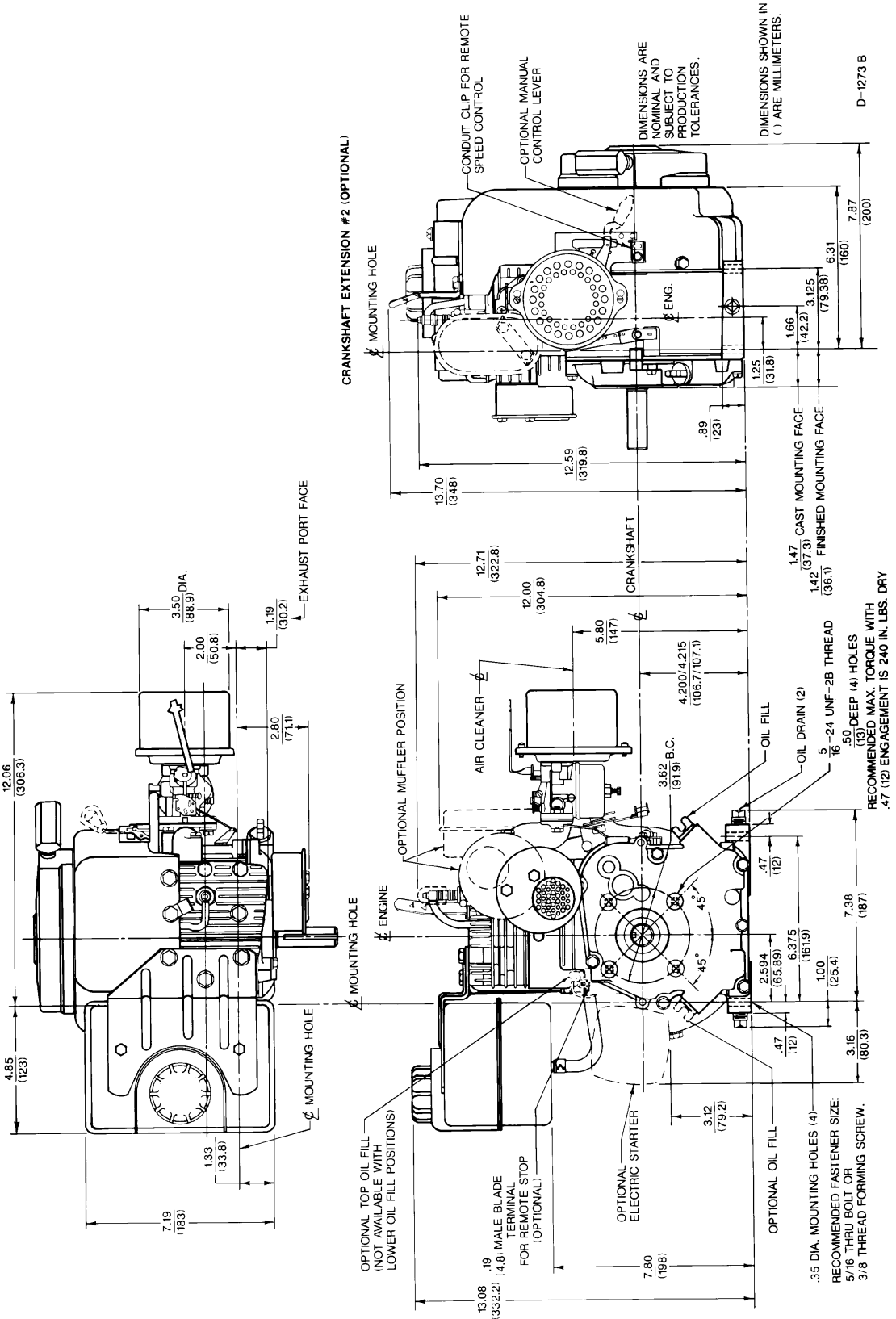
DIMENSIONAL DRAWING

TVT691



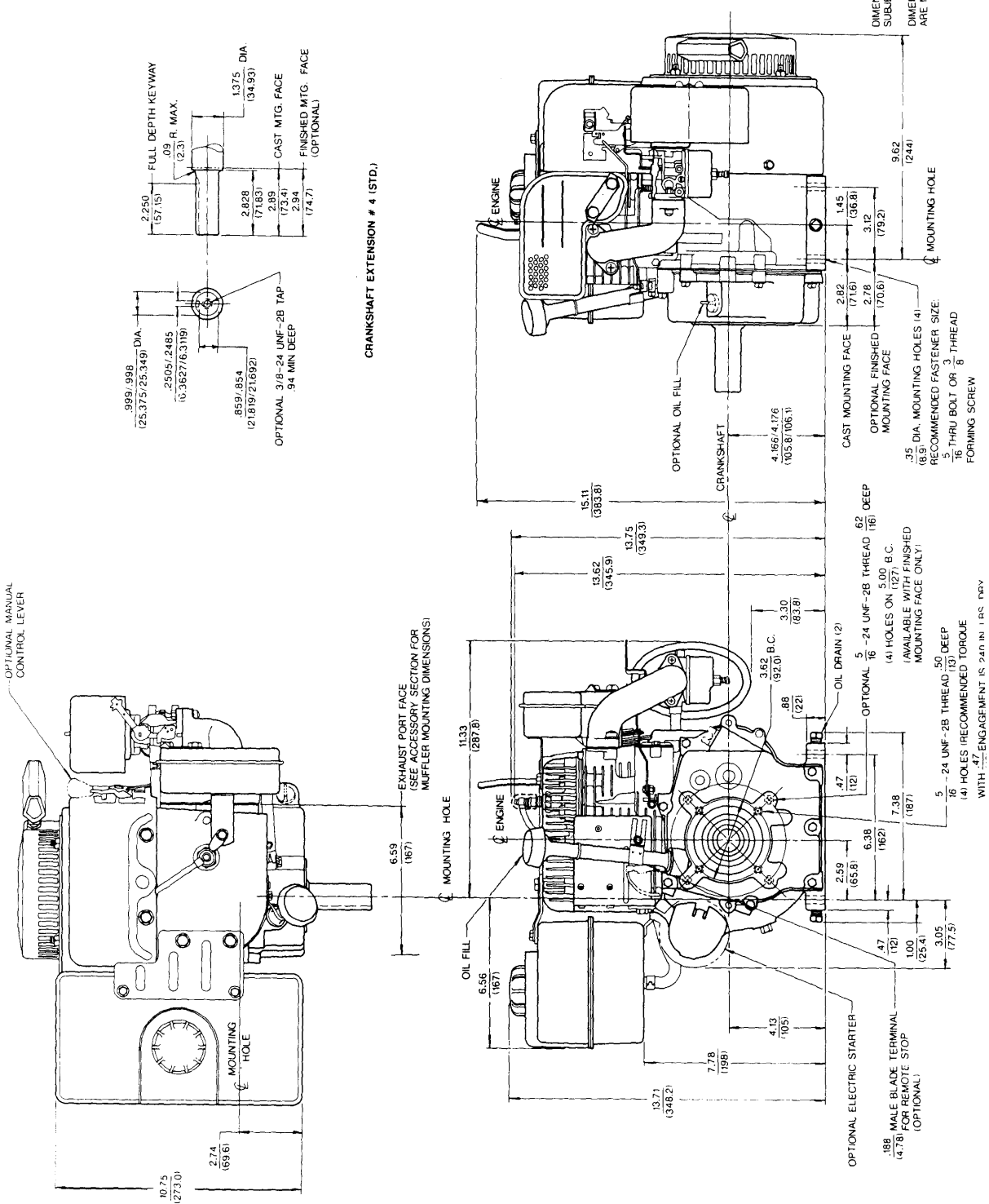
DIMENSIONAL DRAWING

H30, H35



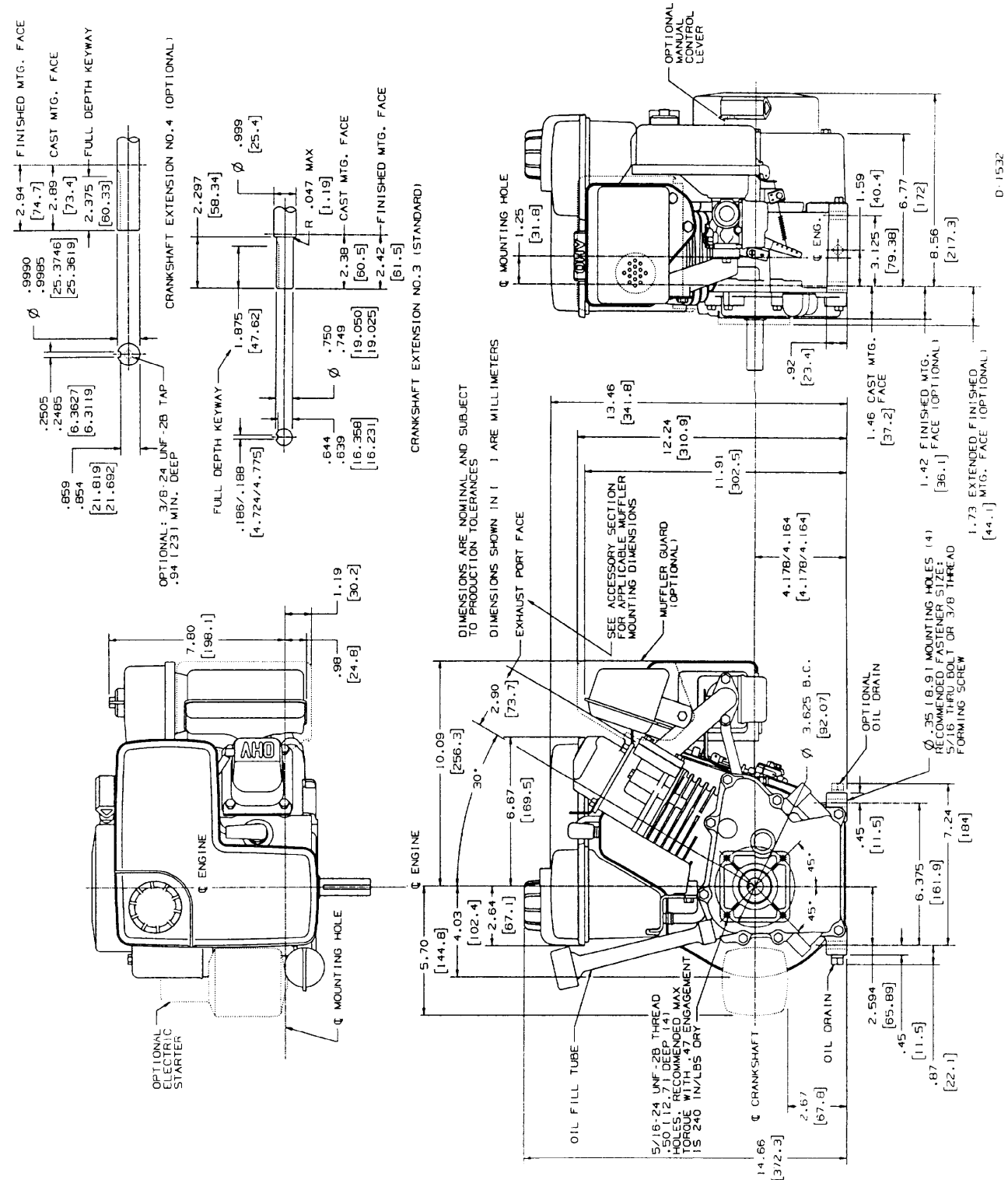
DIMENSIONAL DRAWING

HM80, HM100



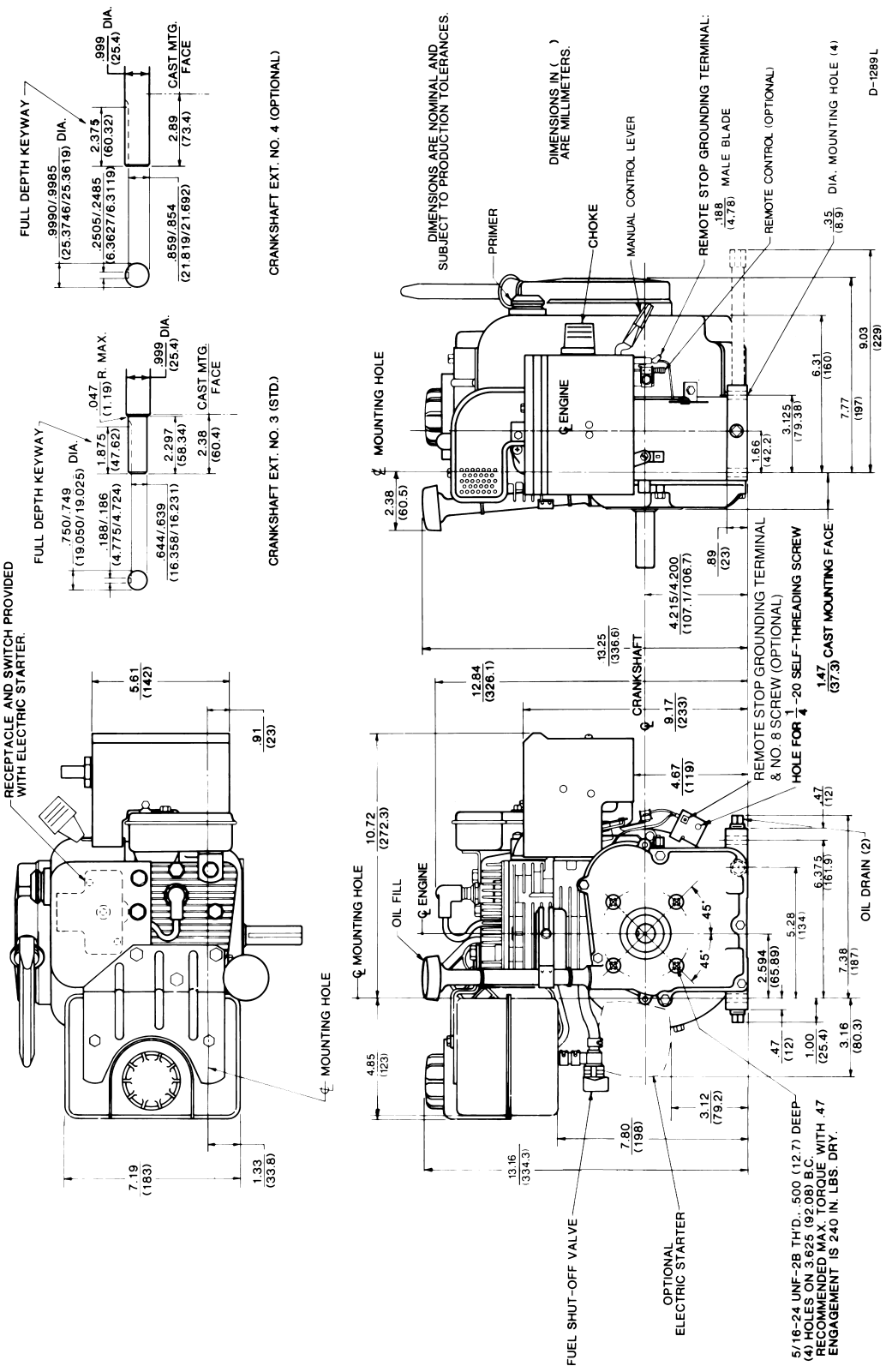
DIMENSIONAL DRAWING

OHH50, OHH55, OHH60



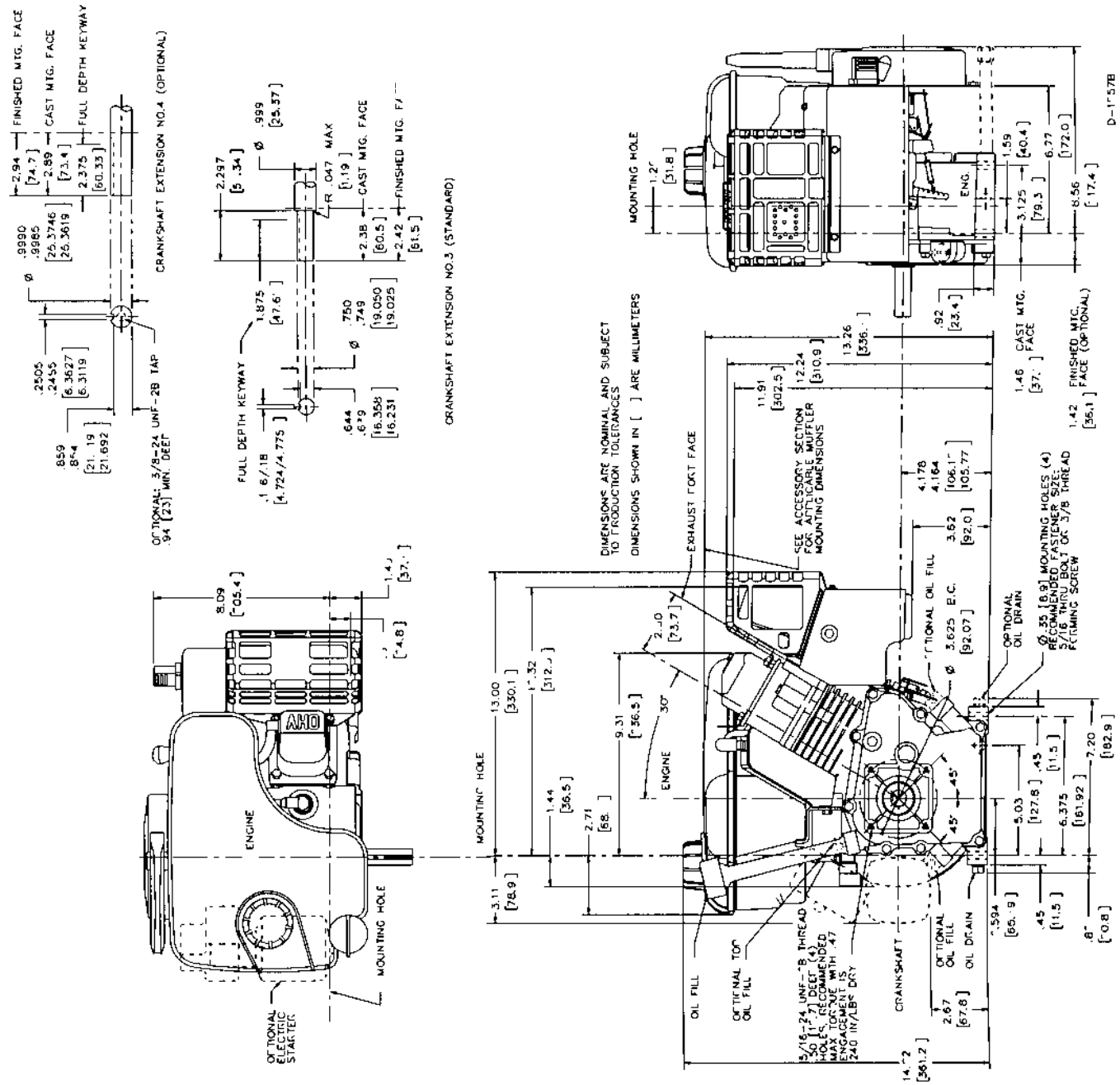
DIMENSIONAL DRAWING

HSSK50



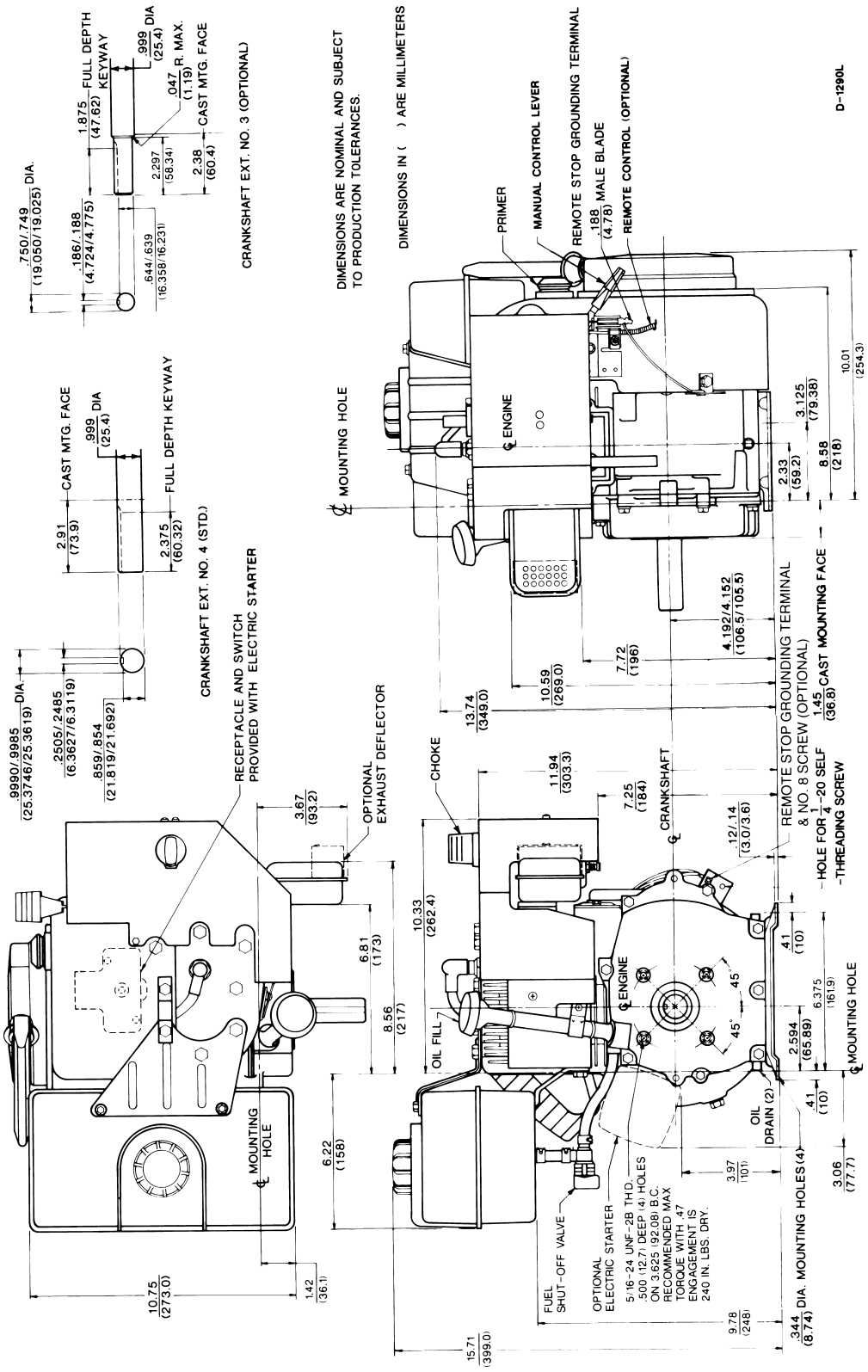
DIMENSIONAL DRAWING

OHSK55, OHSK70



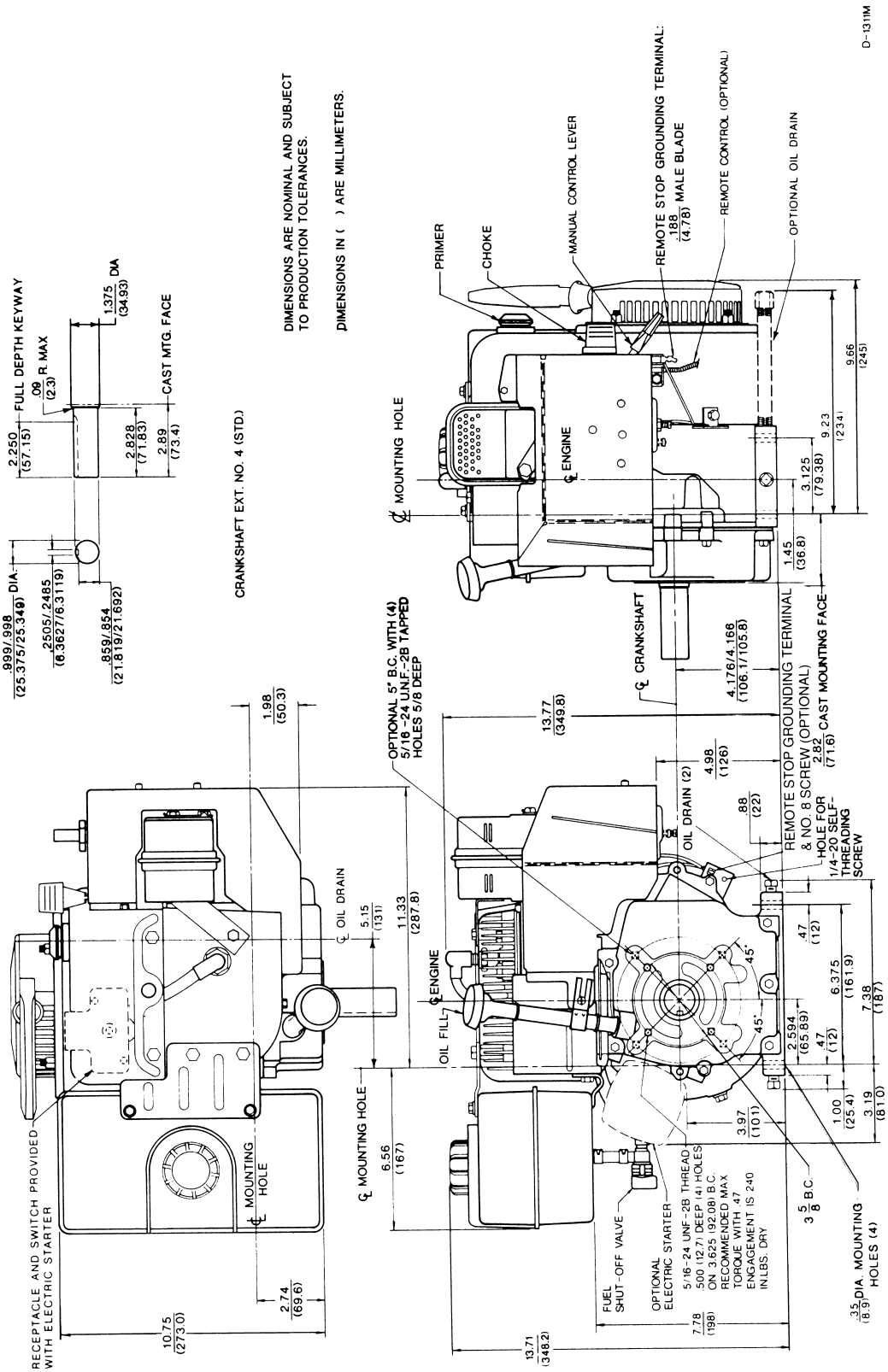
DIMENSIONAL DRAWING

HSK60, HSK70



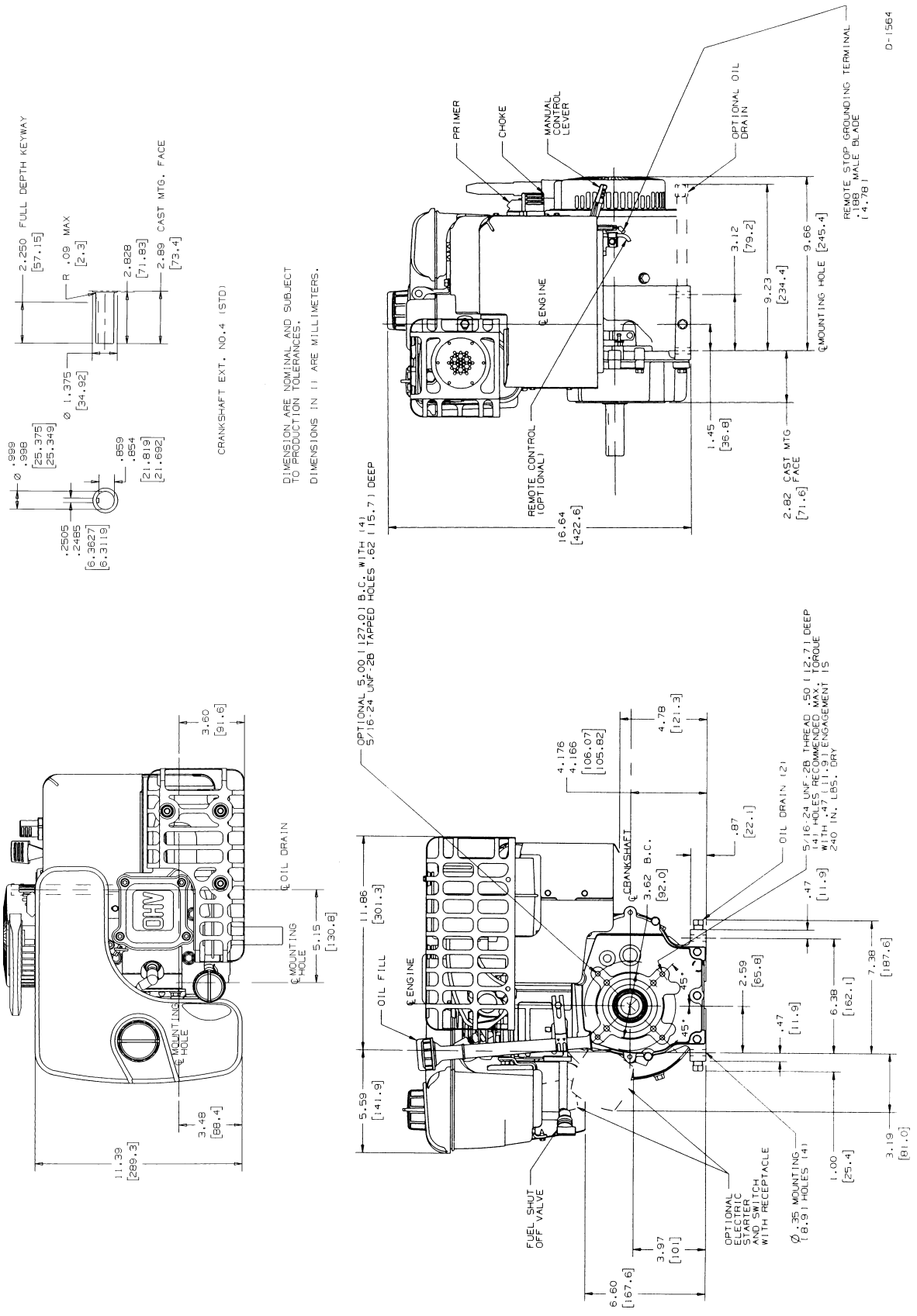
DIMENSIONAL DRAWING

HMSK80, HMSK90, HMSK100, HMSK110



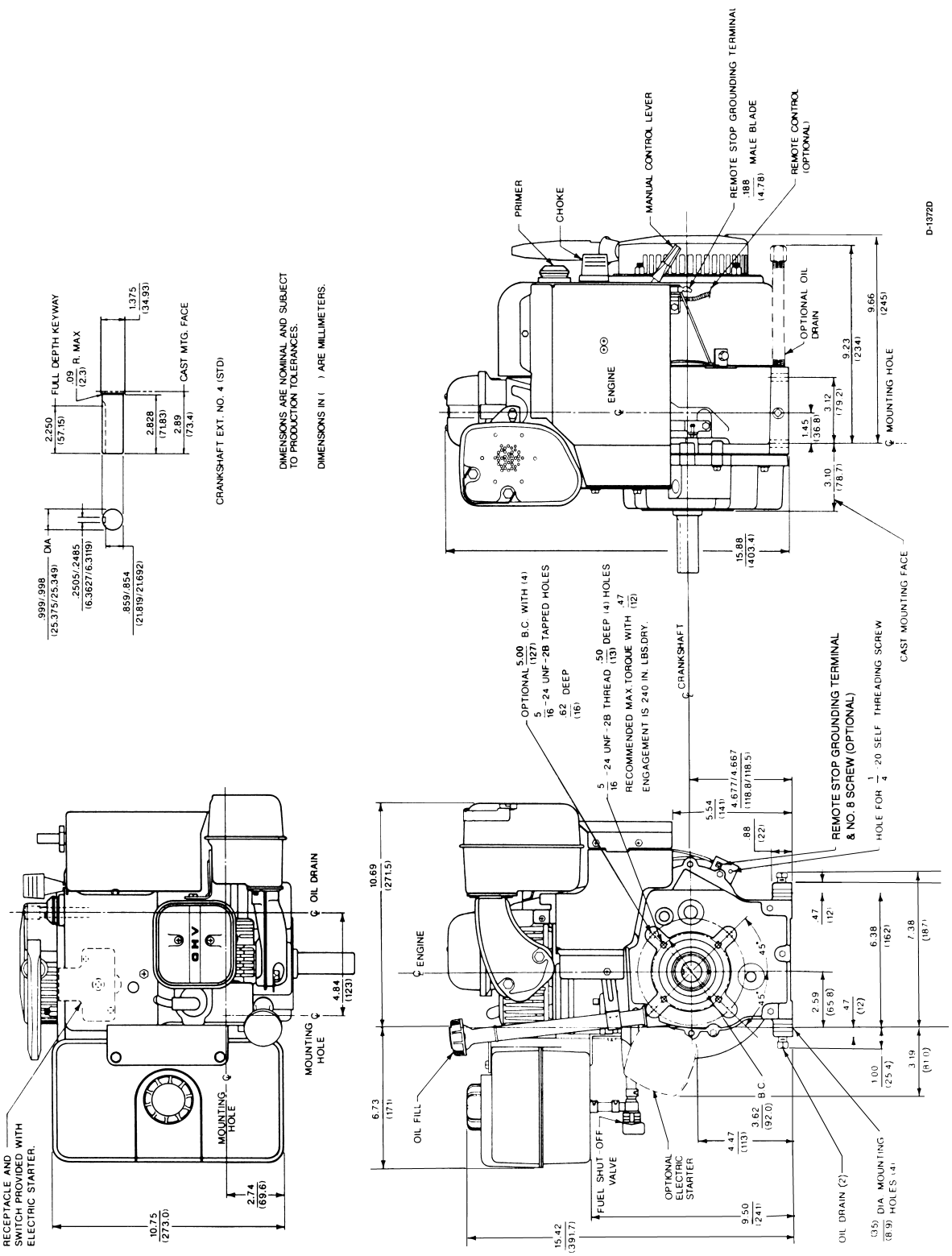
DIMENSIONAL DRAWING

OHSK90 - 110



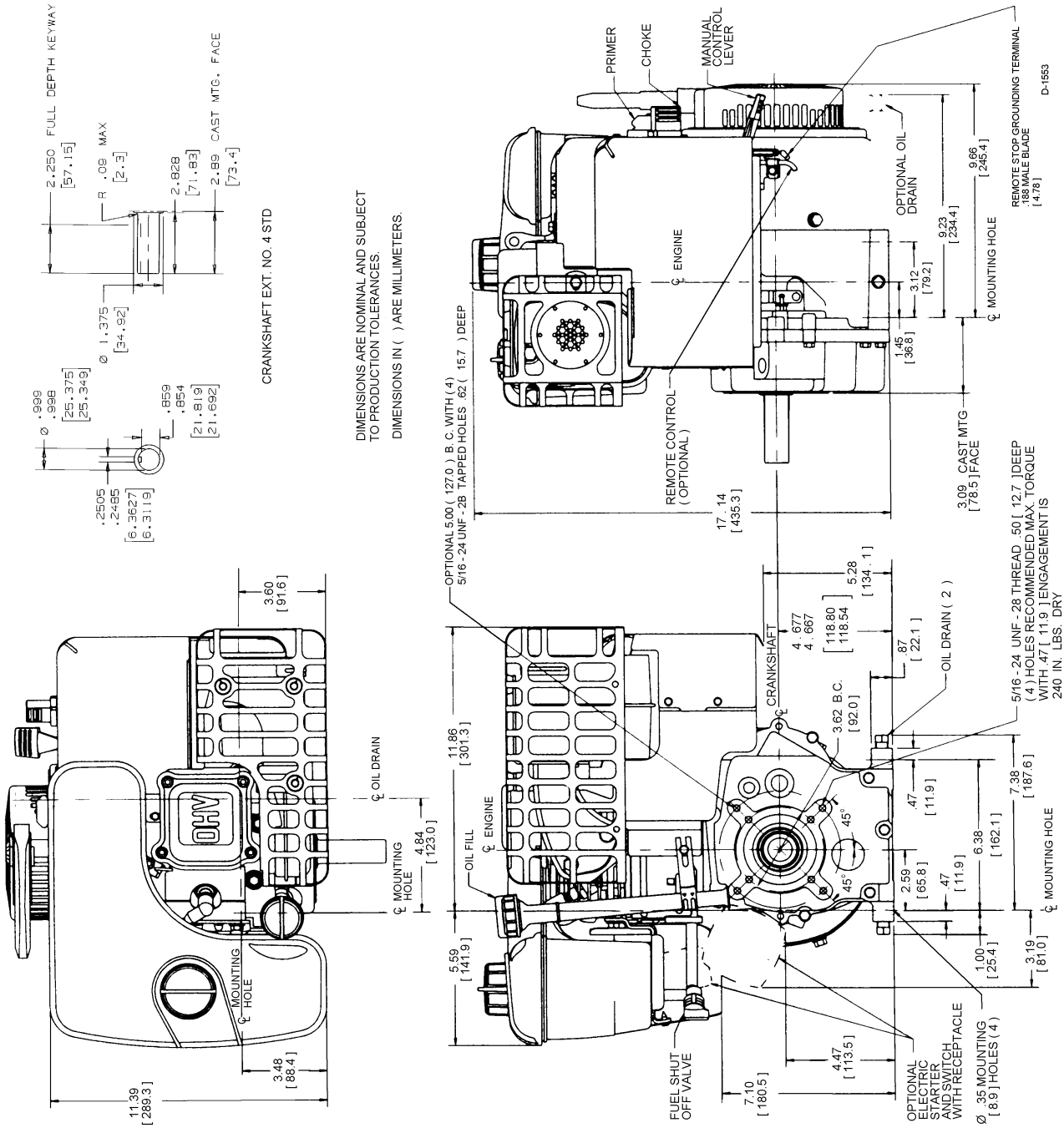
DIMENSIONAL DRAWING

OHSK120



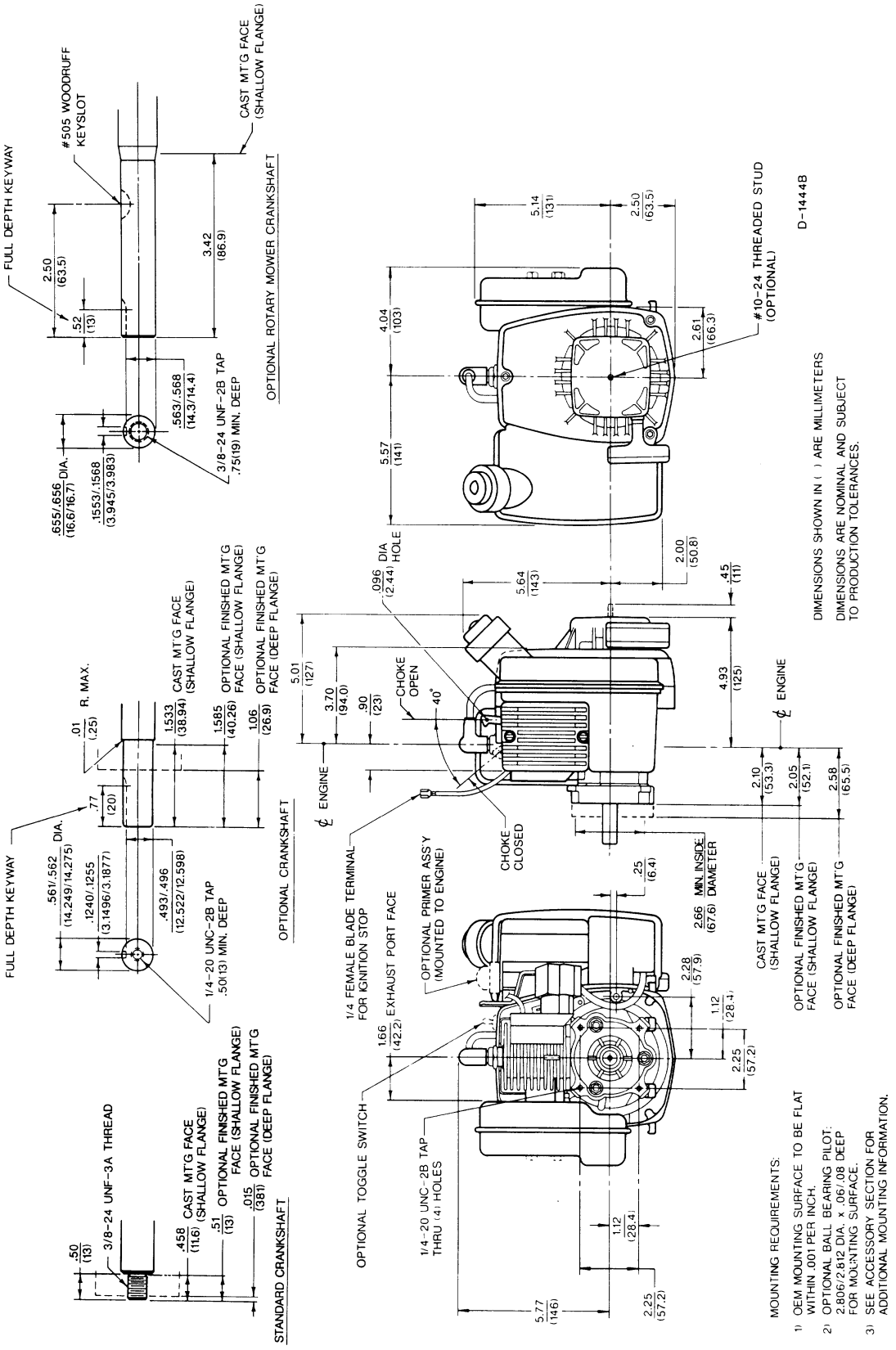
DIMENSIONAL DRAWING

OHSK130



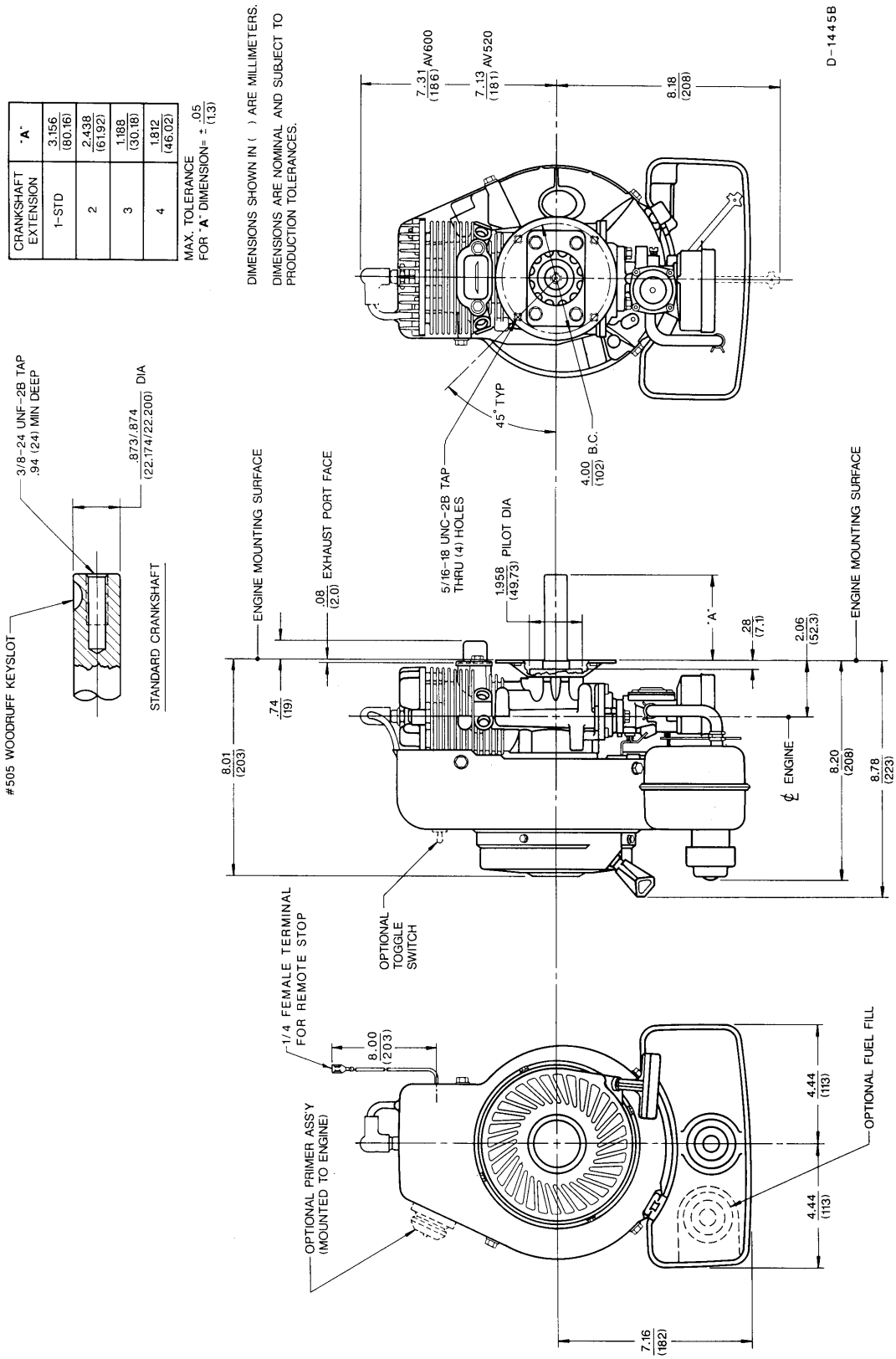
DIMENSIONAL DRAWING

TC300



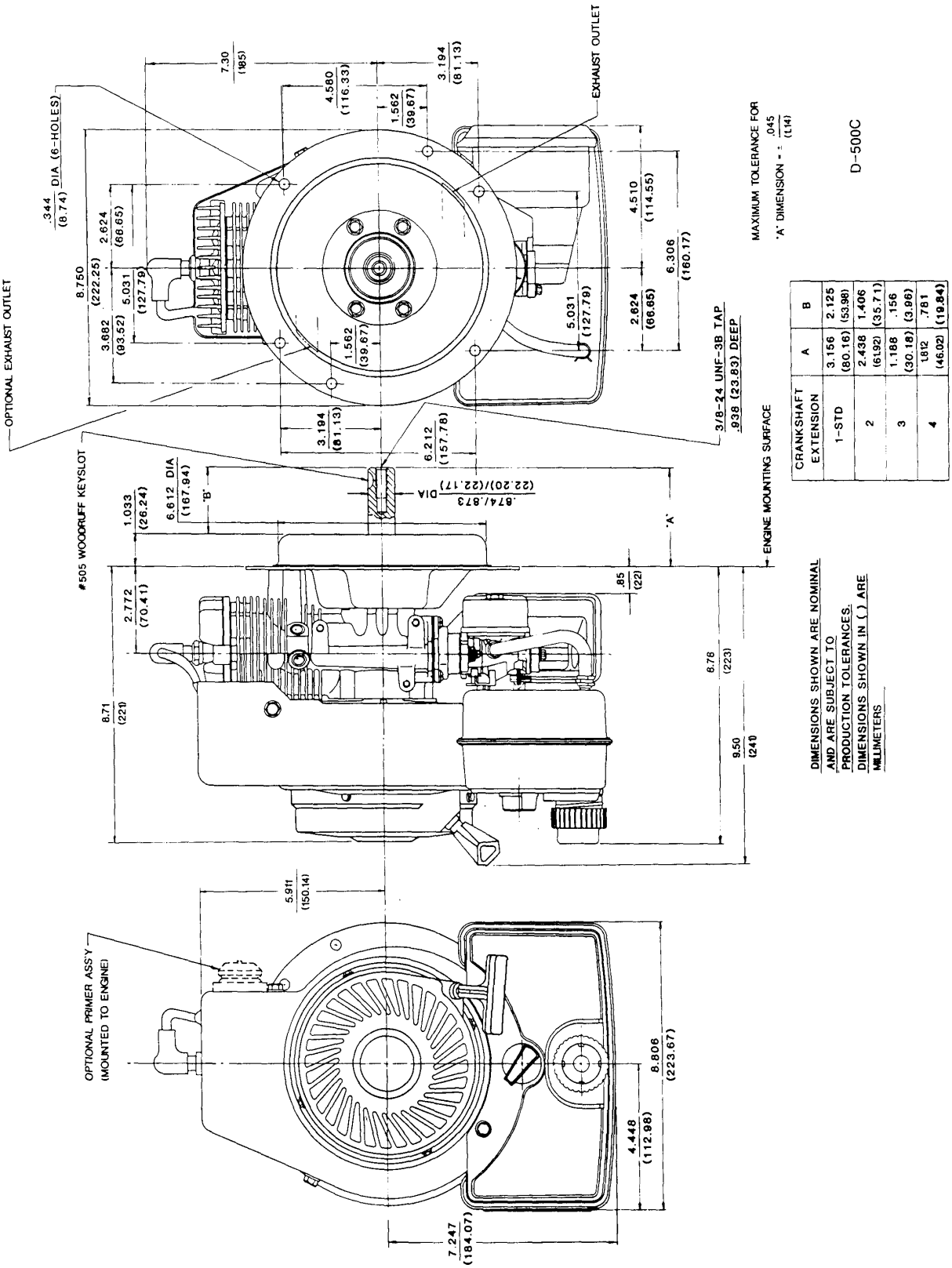
DIMENSIONAL DRAWING

AV520



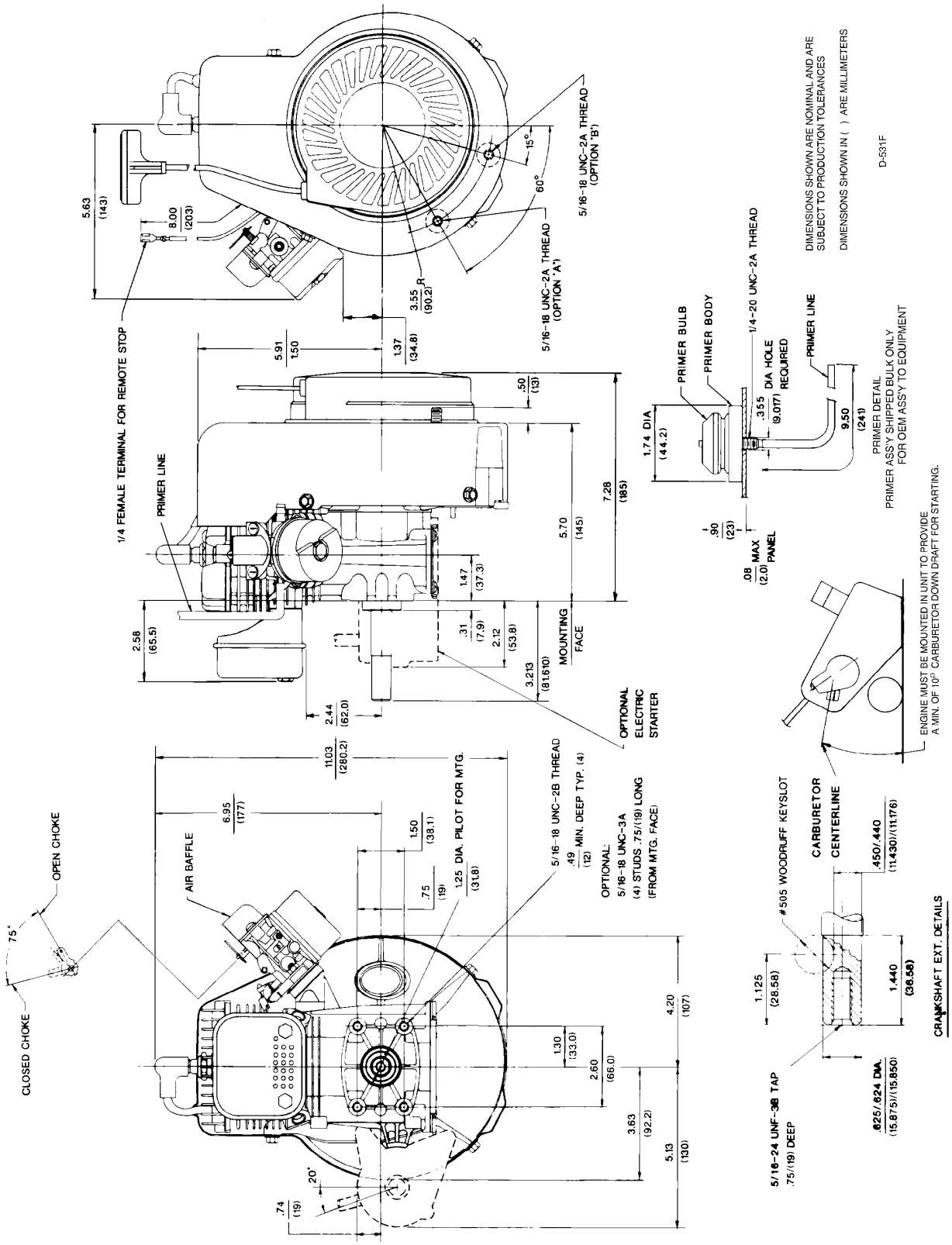
DIMENSIONAL DRAWING

TVS600



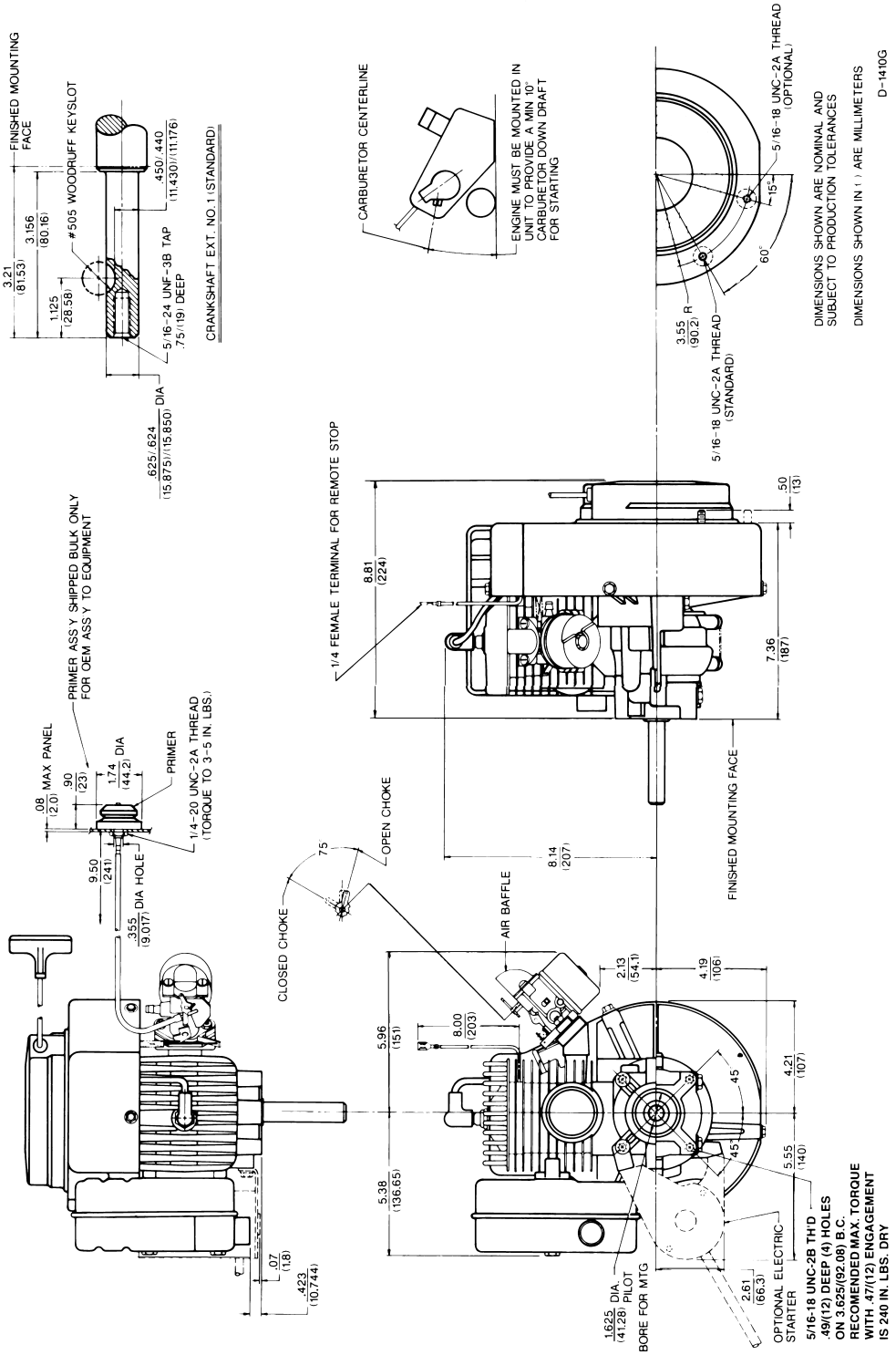
DIMENSIONAL DRAWING

HSK600



DIMENSIONAL DRAWING

HSK845



ENGINE SERVICE

"Customer service support is our foremost responsibility." This has always been our policy and now, more than ever, we feel that this and an equal commitment to quality are very important to our continued growth. Tecumseh's efficient service network is continually stocked with computer selected in-depth parts and manned by factory trained engine service mechanics. Over 150 internal factory personnel are exclusively committed to service support. Factory representatives are located in regional territories and each region is further supported by the finest Central Warehouse Distributors in the industry. Parts stocking service distributors supply all trade areas through a network of over 16,000 service dealers, conveniently located throughout the USA and Canada plus thousands more in our worldwide service organization. Factory service coordinators, who handle direct telephone communications and mail inquiries, are unique in our industry. All this adds up to a total Tecumseh commitment to unparalleled service excellence to and for all of our customers - and we back that commitment with a worldwide service organization that gets the job done.

- **Exclusive**, no limit / no penalty stock return program.
- **Profitable**, timely service parts programs.
- **Emergency** order system via factory / CWD WATS line.
- **24 hours** shipment of emergency orders.
- The **most liberal** warranty program in the industry.
- **Full** shop labor rate, plus profit on parts.
- **Yellow Page** and sign identification programs.
- **Factory** and **CWD field school dealer education.**
- **Pre-Season** computerized parts stocking.
- The **most complete** line of 4-cycle and 2-cycle engines available.
- USA and Canada Service Program.

TECUMSEH®

yellow pages

Tecumseh Service is as close to the Tecumseh powered equipment owner as his telephone. Service listings are found under the heading "Engine, Gasoline" in the telephone book yellow pages.

Notes

2002

Service Engines & Accessories

TECUMSEH

Form No. 692531 R 3/02

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SELECTING A REPLACEMENT ENGINE BY COMPARING SPECIFICATIONS

If the model or type number of the old engine is not shown in the Engine Replacement List, or if the model or type number is unknown, proceed as follows:

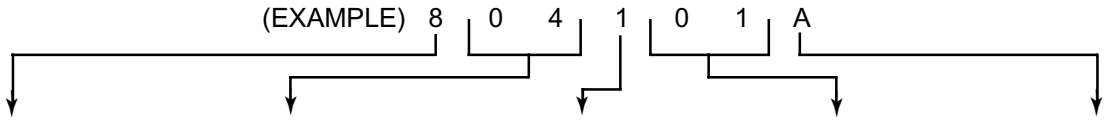
FIRST DIGIT - the number which represents the CRANKSHAFT POSITION.

SECOND & THIRD DIGITS - determine the HORSEPOWER required. (Two cycle is designated by 00 in the second and third digit position.)

FOURTH DIGIT - Determines PRIMARY FEATURES required.

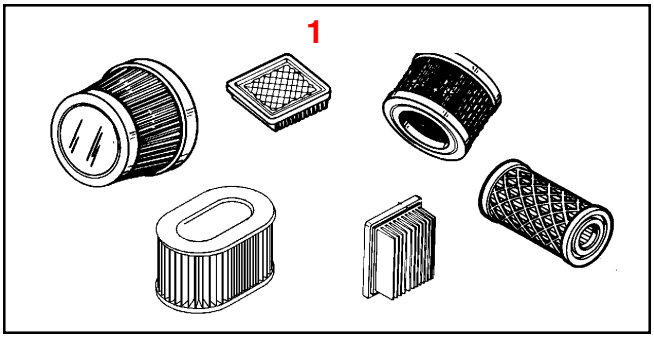
> Engines that are specially built for specific OEMs because of color, etc., are not suitable to be sold to an Assigned OEM.

TECUMSEH SERVICE NUMBER SYSTEM

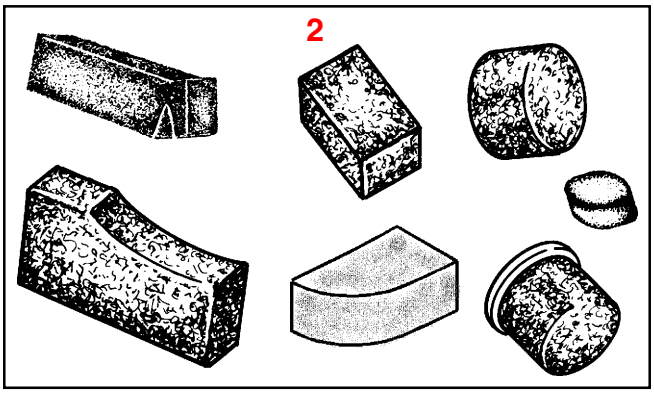


1st DIGIT	2nd & 3rd DIGIT	4th DIGIT	5th & 6th DIGIT	7th DIGIT
CRANKSHAFT POSITION	HORSEPOWER OR 2 CYCLE	PRIMARY FEATURES	ENGINE VARIATION NUMBER	REVISION LETTER
8 - Vertical 9 - Horizontal	00 = 2 Cycle 02 = 3 H.P. 03 = 3.5, 3.8 H.P. 04 = 4, 4.8 H.P. 05 = 5, 5.5 H.P. 06 = 6 H.P. 07 = 7 H.P. 08 = 8 H.P. 09 = 9 H.P. 10 = 10 H.P. 11 = 11 H.P. 12 = 12, 12.5 H.P. 13 = 13 H.P. 14 = 14 H.P. 15 = 15 H.P. 16 = 16, 16.5 H.P. 17 = 17 H.P. 18 = 18 H.P. 22 = 22 H.P.	1 = Rotary Mower 2 = Industrial 3 = Winter Application 4 = Mini Bike 5 = Tractor 6 = Tiller/Edger 7 = Rider 8 = Rotary Mower	00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99 00 thru 99	

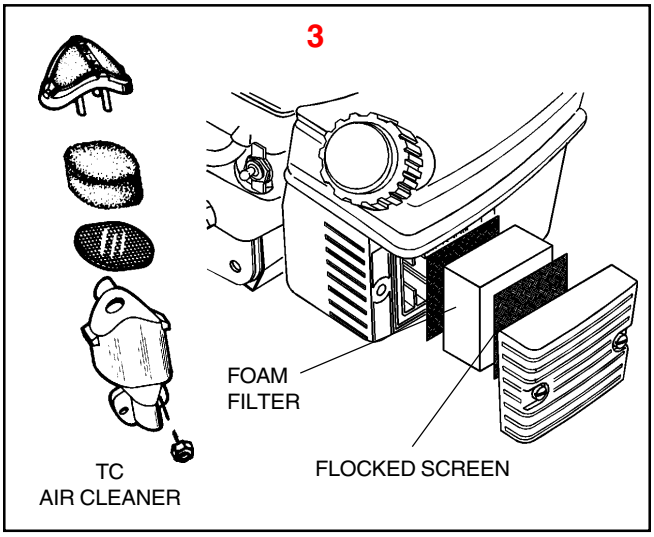
AIR CLEANERS



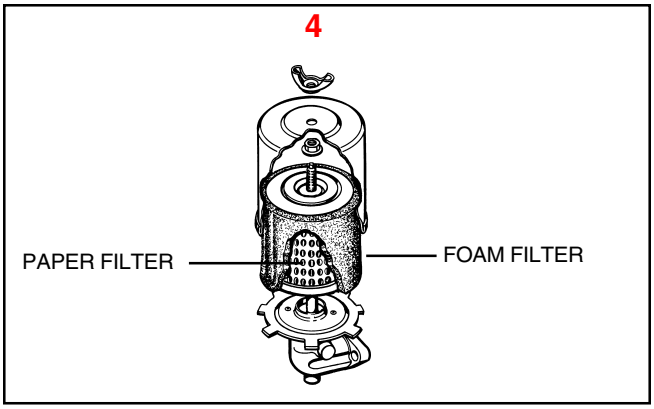
PLEATED PAPER TYPE



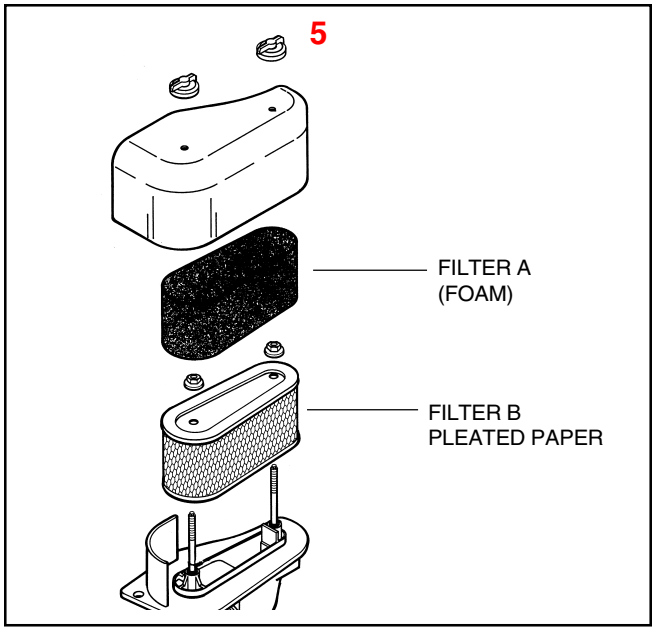
POLYURETHANE TYPE



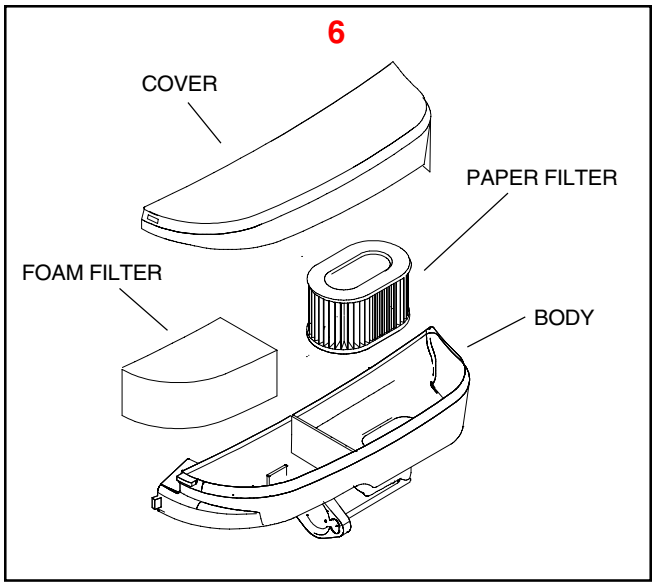
POLY - KLEEN-AIRE



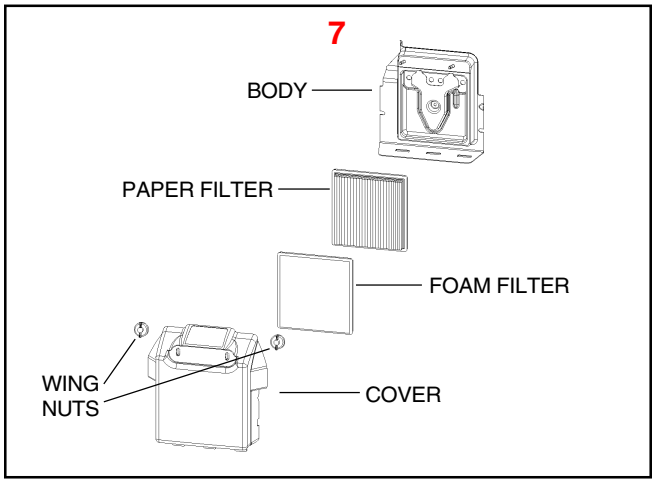
PAPER POLY DUAL STAGE



POLY PAPER TRI-STAGE KLEEN-AIRE



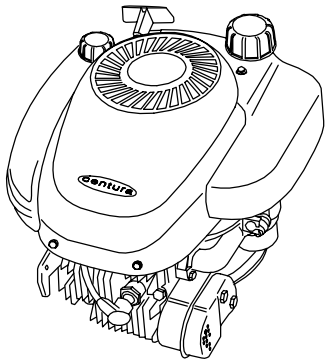
CENTURA® LE



ENDURO® VT

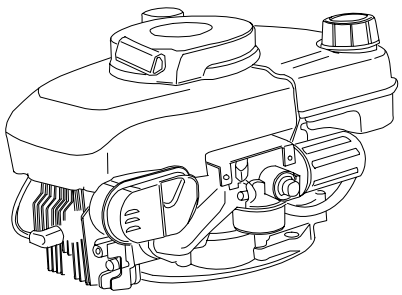
FUEL TANK MOUNTING

1



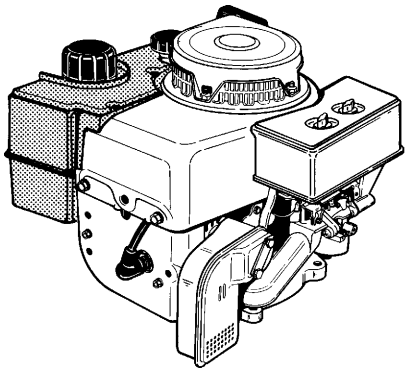
CENTURA® LE STYLE TANK

2



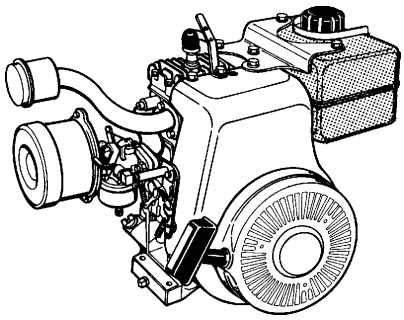
OPPOSITE SPARK PLUG

3



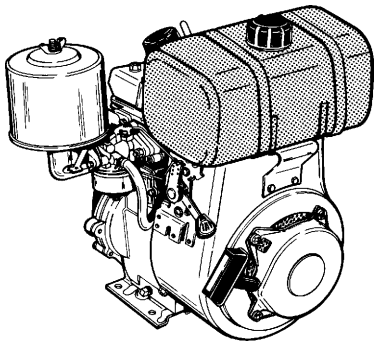
OPPOSITE CARBURETOR

4



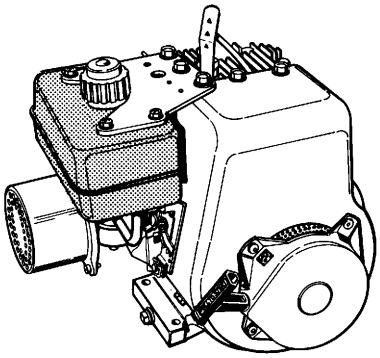
OPPOSITE CARBURETOR

5



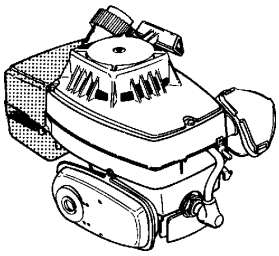
OVER RECOIL

6



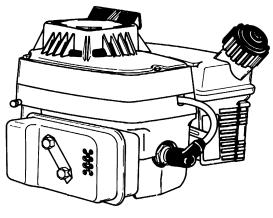
OVER CARBURETOR

7



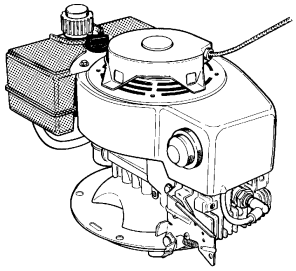
TC200/300

8



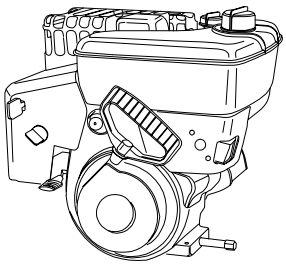
TC TYPE II

9



OPPOSITE SPARK PLUG

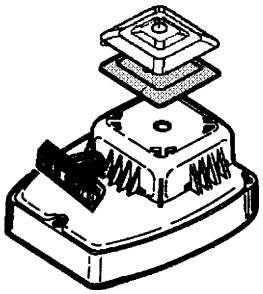
10



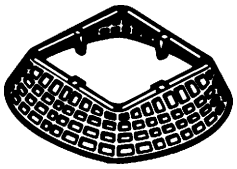
REGENCY STYLE

ACCESSORIES

STARTER SCREENS



590710
590711
Can be used on TC200/300

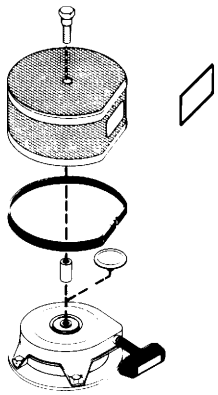


590570 - TC200 & 300
TCH200 & 300

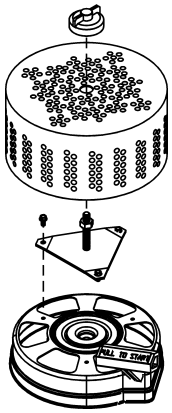
RECREATIONAL VEHICLE SPEED CONTROLS

34652A - H35 , Bottom Pull
34784 - HM80-100, Top Pull
35142 - H35, Top Pull Heavy Spring
36740A - OHH50-60
730136A - H30, 35, 40, HS40, 50, Mini-bike Top Pull

DEBRIS SCREEN KITS

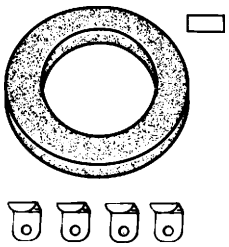


730573
Can be used on HM, TVM, TVXL, OVM and OVXL with stamped steel recoil starter.



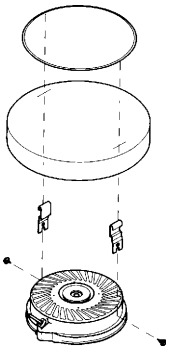
730627
Can be used on LEV, OVRM, TVS75-120, TVS840 with E-Z pull starter.

STARTER MUFF KITS



730571
Can be used on TVS75, H35-H70 with stamped steel starter.

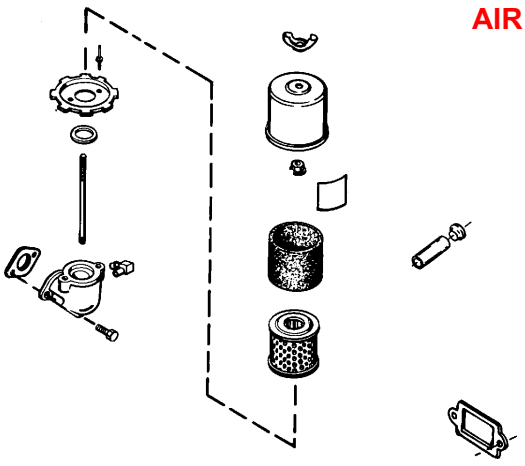
730572
Can be used on TVM170-OVXL120, HM70-100 with die cast starter.



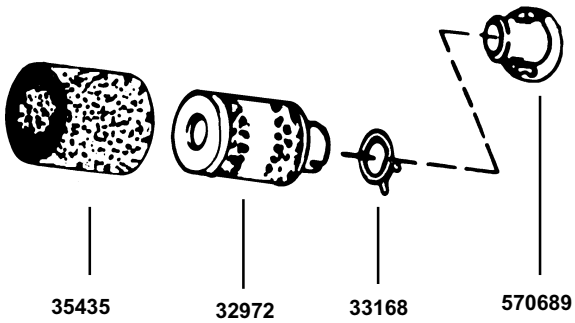
730604 used on TVS90-120, TVS840, TVM125-140, H30-H70 with E-Z pull starter.

730619 used on TVM, TVXL195-220, HM70-100, OHM, OVXL, OHV12 thru 125 with E-Z pull starter.

AIR CLEANER KITS

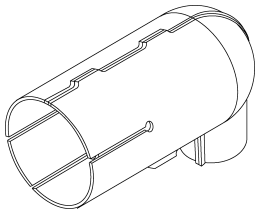


730561 - Can be used on H50-60-70 and HH70 (Use only on engines with an externally vented fully adjustable carburetor).
730575C - Can be used on 2-cycle TVS-TVXL840
730630 - HM80-100 Climate Guard
730643 - HM80-100 Carburetor Cover Kit used on engines located on page 40.

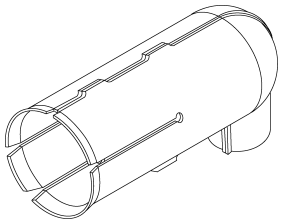


TC / TCH200-300

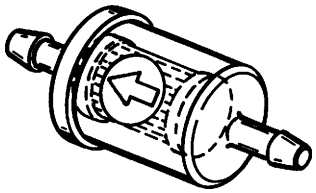
ACCESSORIES (Cont.)



611283 - Spark Plug Shield
Standard Plug

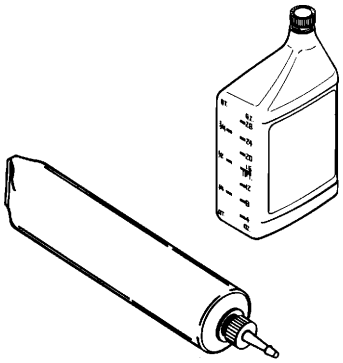


611284 - Spark Plug Shield
OHV Plug



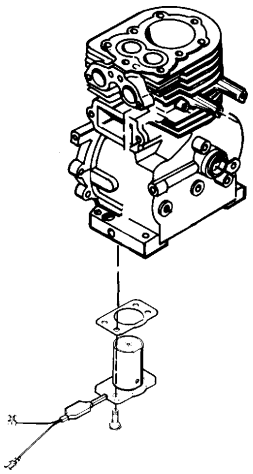
34279B - Fuel Filter - For all engines

ENGINE OIL



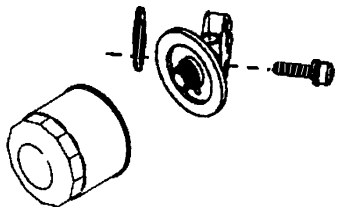
730225A - 4 cycle - SAE30
730226A - 4 cycle - SAE5W30
730227B - 2 cycle (8 oz.)
730229B - Gear Lube - 80W90
730238A - 21 oz. Twin Pack - SAE30
788067C - Grease (32 oz.) Bentonite

LOW OIL SHUTDOWN



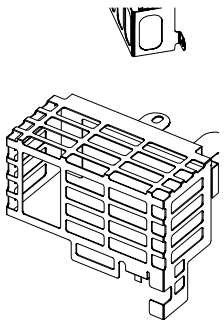
611206 - HM80, 90, 100 without light
611207 - OHH50, 55, 60
611220 - HM80, 90, 100 with light

OIL FILTER ADAPTER KIT

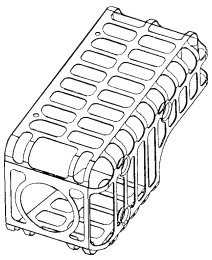


36435A - Can be used on OHV135-17.5

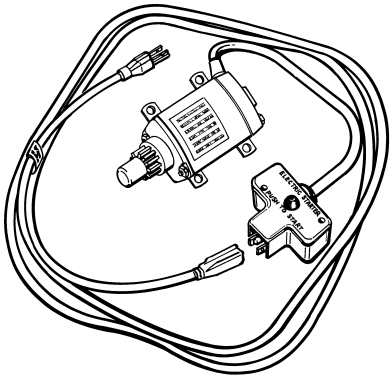
HEAT SHIELDS



730622A- Kit, OHH Side and End Discharge
730647 - OVRM Magna-Torque™
36090 - VLV Side Discharge
36197 - VLV Front (end) Discharge
36293 - HSSK40-50
36294 - HMSK80-100
36510 - TVS Euro Style Side Discharge
36554 - TVS Euro Style Front (end) Discharge
36799A - Can be used on HM80-HM100
37352 - OHM120, OHSK90-130
36373 - OHV140-175



SNOW KING®
STARTER MOTOR KITS
110 - 120 VOLT



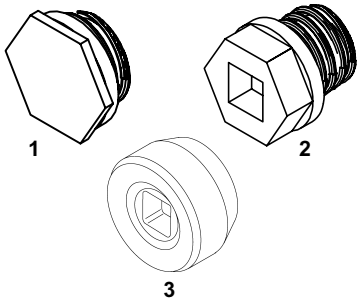
33290E - H30-35, HS40-50, HSK35, HSSK40-50, OHSK50 - 55-60-70
33328D - TVM125, TVM140, H50-60-70
33329E - TVM170-220, HM70-100, HMSK70-100
37105 - OHM-OHSK110-120-130

<u>220 Volt</u>

37217 - HSK35-40, HSSK50 OHSK50-55-60-70-75
37102 - TVM220, HM70-100, HMSK70-100

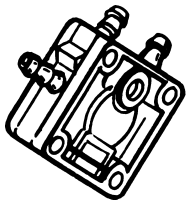
NOTE: Must have starter provisions to install on engines.

BOTTOM OIL DRAIN PLUG FOR RM's



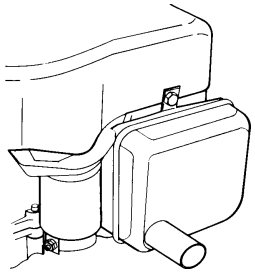
1 - 30572 - Steel
2 - 36083 - Plastic
3 - 37614 - Pipe Plug

PULSE FUEL PUMP 35787



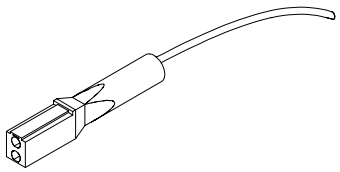
ACCESSORIES (Cont.)

MUFFLER

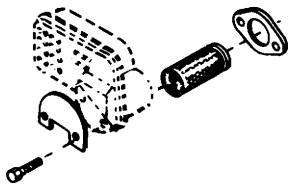


36372 - Can be used on OHV14-175

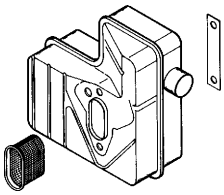
ELECTRIC CLUTCH WIRE FOR 3/5 SPLIT SYSTEM 36588



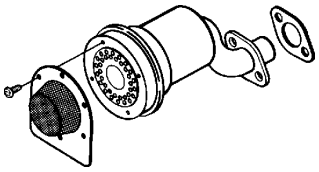
SPARK ARRESTOR KITS



34427 - Can be used on TVM125-140, H50-60.
34479A - Can be used on TVM170-220, HM70-100, HHM80.

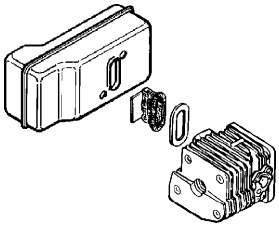


390309 - Can be used on TVS840 & TVXL840

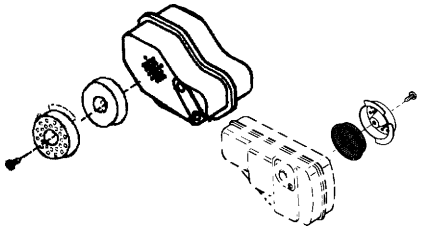


36220 - Muffler Quiet
35352 - Screen Kit

Can be used on H50 & H60



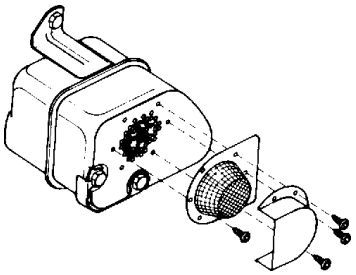
390301A - Can be used onTC200/300, TCH200/300



36085 - Can be used on TVS90-120
Can be used on VLV50 - VLV60

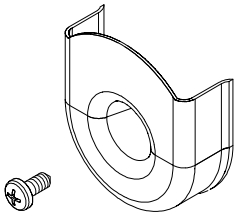
36411 - Can be used on OHV14 - OHV175

SPARK ARRESTOR SCREEN

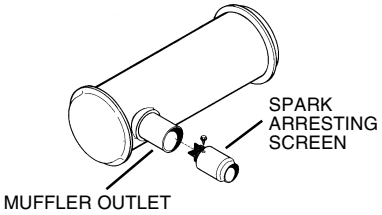


35352 - Screen OHV11-13
35428 - Deflector OHV11-13

EXHAUST DEFLECTOR 36663

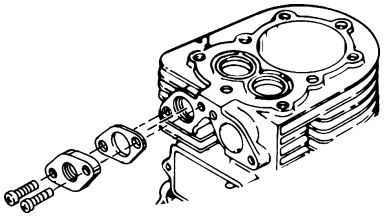


LOW TONE MUFFLER



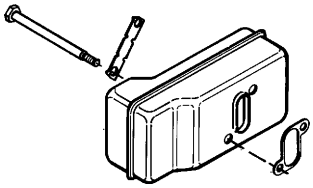
35824 - Can be used on TVM170-220, TVXL170-220, HM70-100, HMXL70-100 NOTE: Does not replace catalytic mufflers.
37350 - Can be used on HM80-100 generators.

MUFFLER ADAPTER KIT



730130 V, VH, H and HH40 thru 80, HM70-100
730162 LAV and H25 thru 35
730165 LAV50 and HS30 thru 50

BOLT ON MUFFLER



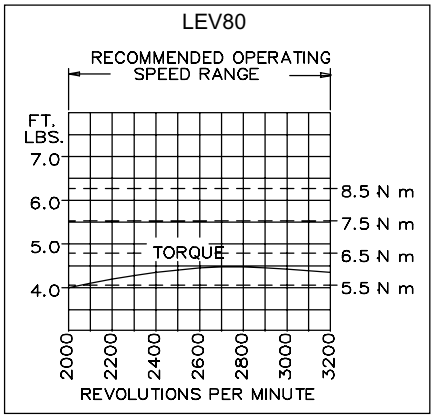
390322 - TC200 & 300
If cylinder is drilled and tapped

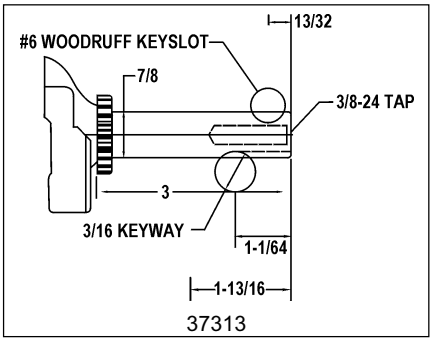
3.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER/TRIMMER APPLICATIONS

MODEL	LEV80
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-5/16 x 2-27/32 in. 74.62 x 46.84 mm
DISPLACEMENT	7.75 C.I. 128 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Poly Kleen-Aire System Air Cleaner
- Float Carburetor with Easy Start Primer





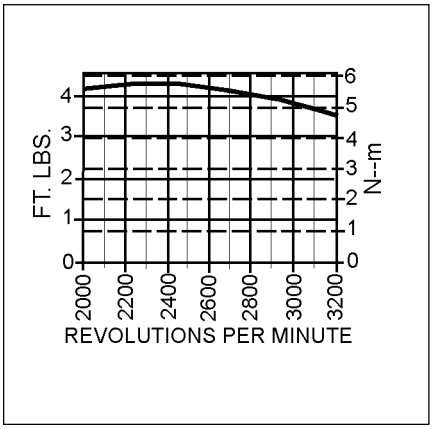
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
804190	MTD	37313	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3400	

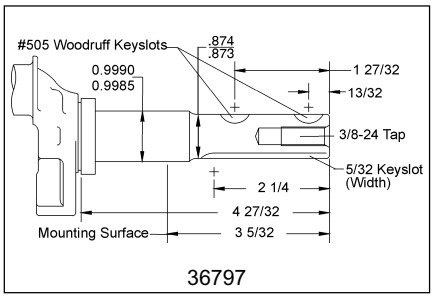
3.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV100
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-5/8 x 1-27/32 in. 66.69 x 46.84 mm
DISPLACEMENT	9.98 C.I. 163 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

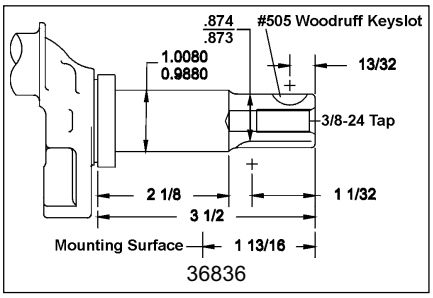
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Poly Kleen-Aire System Air Cleaner
- Float Carburetor with Easy Start Primer





36797



36836

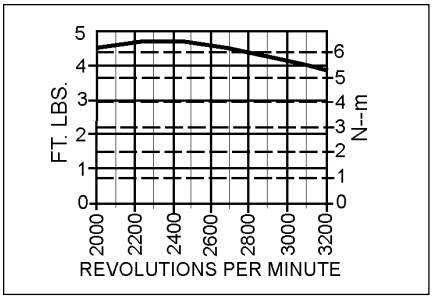
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803194B	MTD	36797	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3350	
803195A	Murray	36797	Remote Snap-In	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
803198B	Murray	36836	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
804191	Murray	36836	Fixed Speed	Ref. 1 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
804192	MTD	36797	Remote	Ref. 1 34340	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3400	

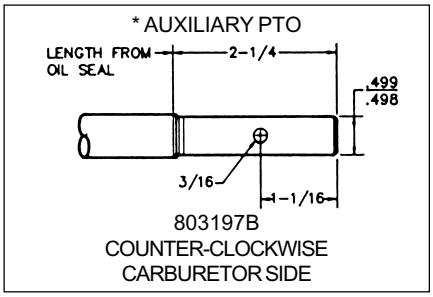
3.8 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

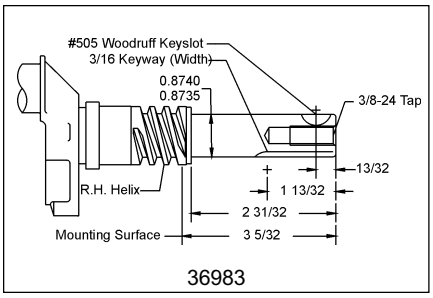
MODEL	LEV115
HORSEPOWER	3.8 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

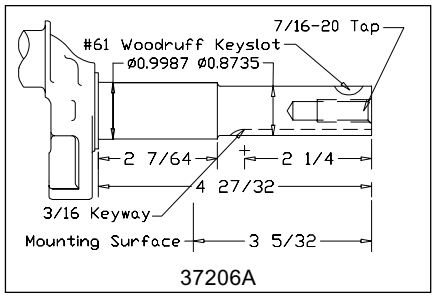
FEATURES

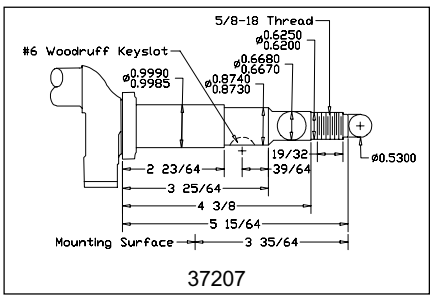
- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Kleen-Aire System Air Cleaner
- Float Carburetor with Easy Start Primer











	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
803197B	Murray	36983	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 1	36559A (Reverse Pull)	3200	*
804187A	Toro	37206A	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 1		2900	
804188B	Toro	37207	Remote	Ref. 1 36745 (Paper)	Side & Bottom	1.5 Qt. Ref. 1		3150	

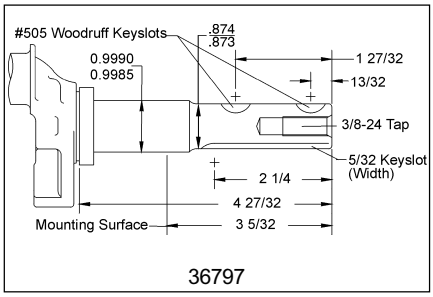
* 8-1/2:1 Auxiliary P.T.O.

5.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

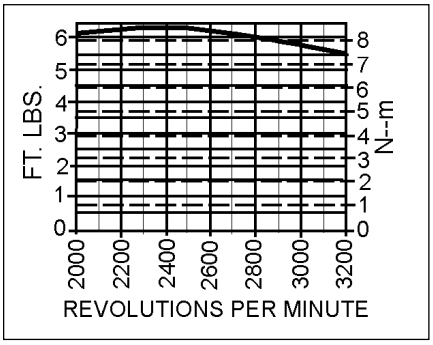
MODEL	LEV115
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-27/32 in. 71.0 x 46.84 mm
DISPLACEMENT	11.32 C.I. 186 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

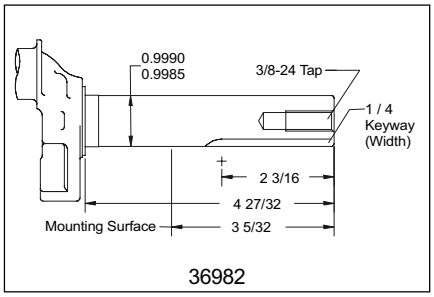
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire Air Cleaner
- Poly Kleen-Aire Air Cleaner

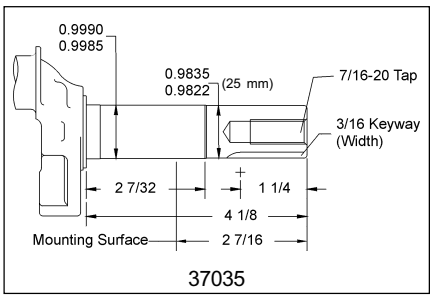


36797





36982



37035

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
804218D	Standard ■	36797	Manual	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2		3750	▲
804219C	Toro	37035	Remote	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	35015B	3150	
805176C	Garden Way	36982	Manual	Ref. 1 35066 (Paper)	Side & Bottom	1 Qt. Ref. 2	36559A * (Reverse Pull)	3750	
805179B	Murray	36797	Remote Snap-In	Ref. 2 37116/37117 (Poly)	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
805180A	Murray	36797	Remote Snap-In	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 1	36559A (Reverse Pull)	3200	

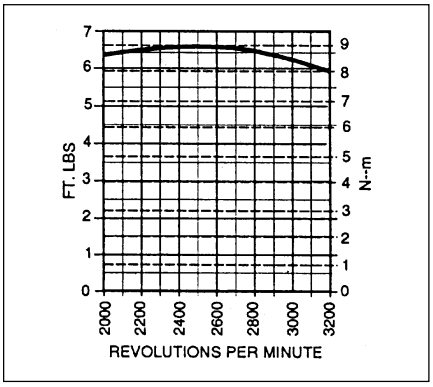
■ This engine is not eligible for return.
▲ Heavy flywheel
* Equipped with brake lock-out device

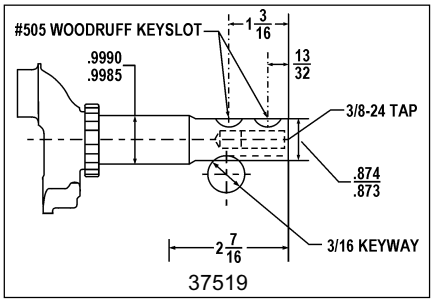
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV120
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

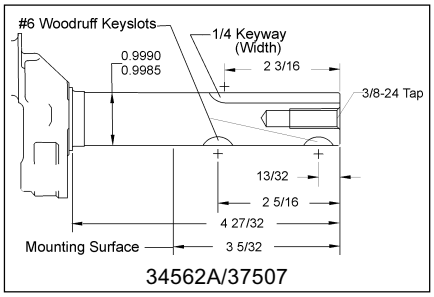
FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire Air Cleaner

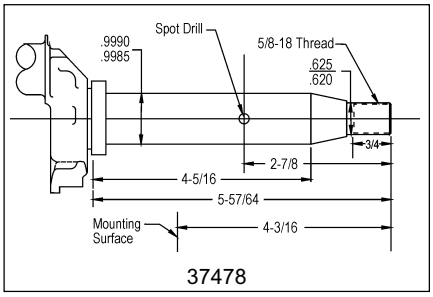




37519



34562A/37507



37478

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806165A	Ariens	34562A	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 1	35015B	2950	
806166A	Ariens	37507	Fixed Speed	Ref. 1 36745 (Paper)	Bottom	1.5 Qt. Ref. 1	35015B	2950	*
806167A	Toro	37478	Remote Snap-In	Ref. 1 35066 (Paper)	Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
806708A	Standard ■	37519	Remote	Ref. 1 36905 (Paper)	Bottom	1 Qt. Ref. 2		3750	

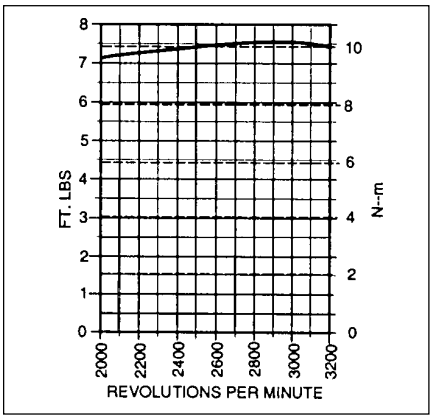
* Equipped with electric start provisions.
■ This engine is not eligible for return.

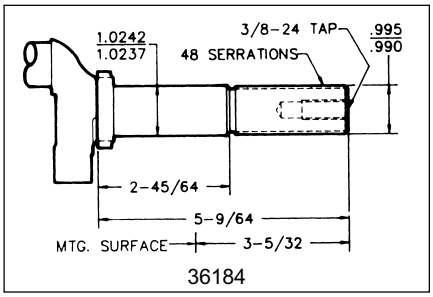
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	VLV126
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-51/64 x 2-3/64 in. 71.0 x 52 mm
DISPLACEMENT	12.6 C.I. 206 cc
OIL CAPACITY	27 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer





36184

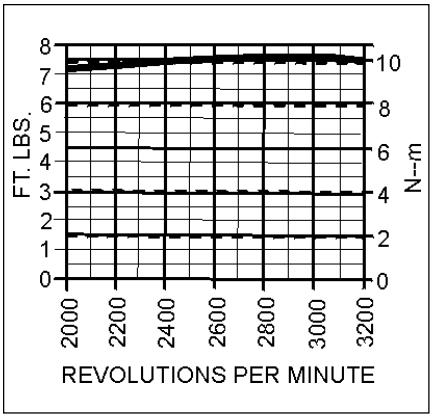
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806164	Ariens	36184	Fixed Speed	Ref. 1 36046 (Paper)	Side & Bottom	1.5 Qt. Ref. 2		3100	

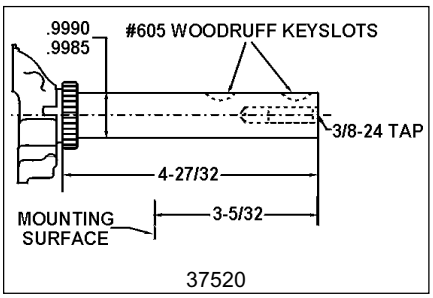
6.0 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

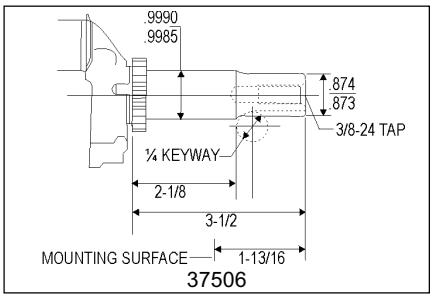
MODEL	OVRM105
HORSEPOWER	6.0 4.48 kW
BORE & STROKE	2-5/8 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	10.50 C.I. 172 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized End-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer







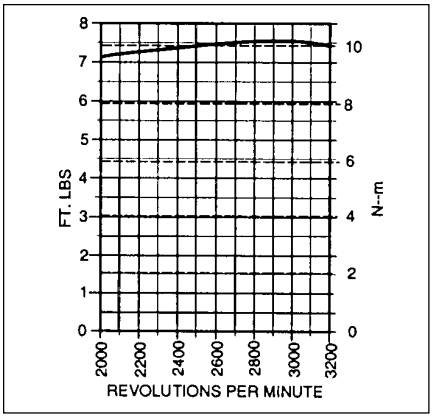
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806170	Murray	37506	Manual Control	Ref. 1 36905	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
806163B	Snapper	37520	Remote Snap-In	Ref. 1 36745 (Paper)	Side & Bottom	1.25 Qt. Ref. 1	36559A (Reverse Pull)	3450	

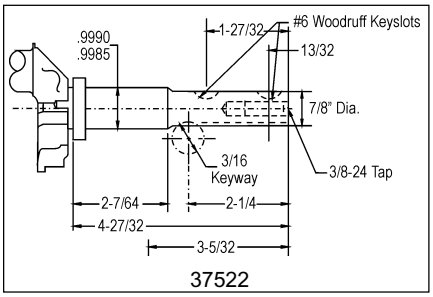
6.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	OVRM120
HORSEPOWER	6.5 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	12.00 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25.75 lbs. 11.6 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized End-discharge Muffler
- Paper Air Cleaner
- Float Carburetor with Easy Start Primer





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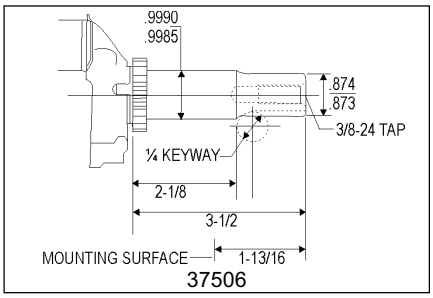

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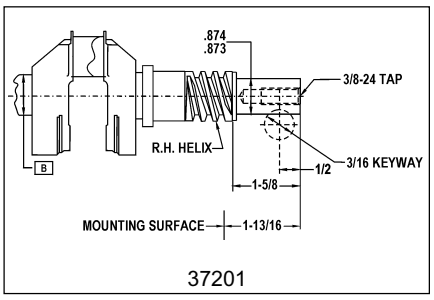


37201

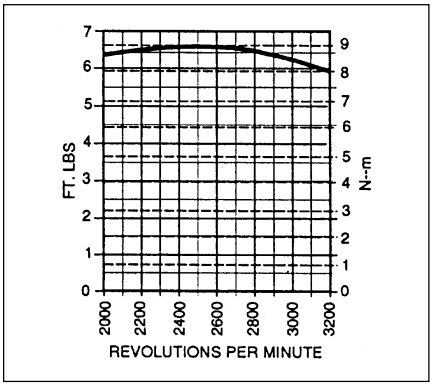
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806168	Murray Home Depot - Scotts	37522	Manual	Ref. 1 Control	Side & 36905	1.5 Qt. Bottom	36559A Ref. 2	3200 (Reverse Pull)	
806169	Murray	37201	Manual Control	Ref. 1 36905	Side & Bottom	1.5 Qt. Ref. 2	36559A (Reverse Pull)	3200	
806171	Murray Stanley	37522	Manual Control	Ref. 1 36905	Side & Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3200	
806172	Murray	37506	Manual Control	Ref. 1 36905	Side & Bottom	1 Qt. Ref. 2		3200	

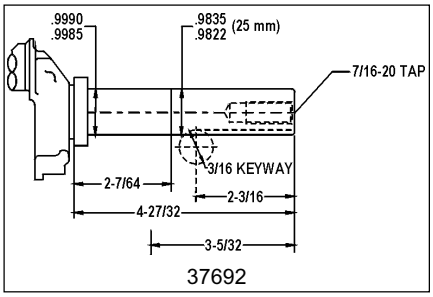
6.5 HORSEPOWER SMALL FRAME ROTARY LAWN MOWER APPLICATION

MODEL	LEV120
HORSEPOWER	6.5 4.47 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 71.0 x 49.23 mm
DISPLACEMENT	11.90 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	18.75 lbs. 8.5 kg
BOLT MTG. CIRCLE	8 in. 203 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Aluminized Side-discharge Muffler
- Conical Paper Air Cleaner
- Float Carburetor with Easy Start Primer
- Paper Kleen-Aire Air Cleaner





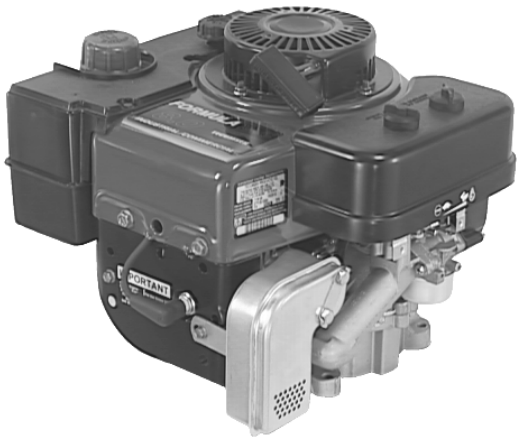
37692

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Compliance Engine	Top Governed Speed	Note
806173	Toro	37692	Fixed Speed	Ref. 1 36905	Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3050	
806174	Toro	37692	Fixed Speed	Ref. 1 36905	Bottom	1 Qt. Ref. 2	36559A (Reverse Pull)	3050	*

* Equipped with electric starter motor.

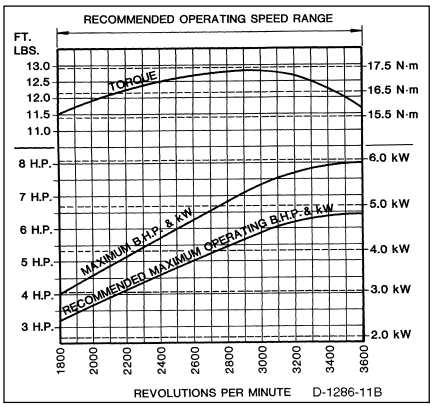
8.0 HORSEPOWER RIDER APPLICATION TVM195

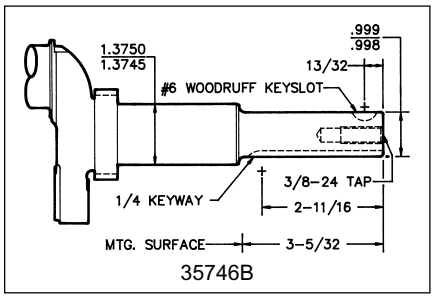
MODEL	TVM195
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm



FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release



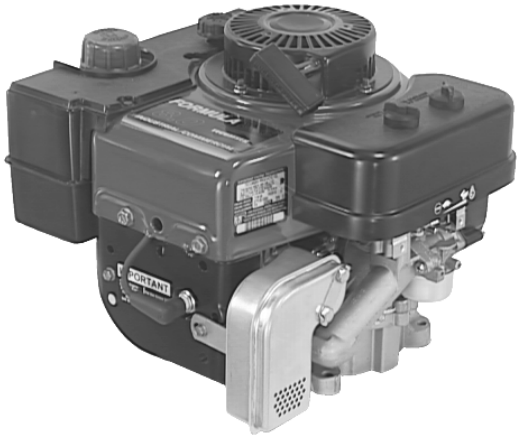


	Customer Service No.	Crankshaft	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain Ref. No.	Fuel Tank (pg. 3)	Top Governed Speed
808768	Standard ■	35746B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Front	3 Qts. Ref. 3	3400
808769	Standard ■	35746B		Manual	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600

■ This engine is not eligible for return.
† 36680 - 12 volt electric starter can be installed.
33635C - Blower housing is needed to mount recoil starter.

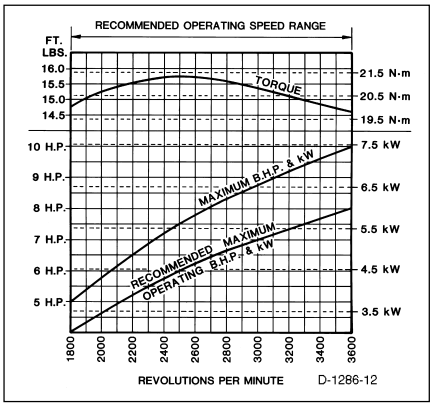
8.0 HORSEPOWER RIDER APPLICATION TVM220

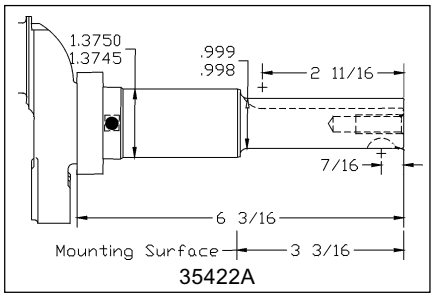
MODEL	TVM220
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm



FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release





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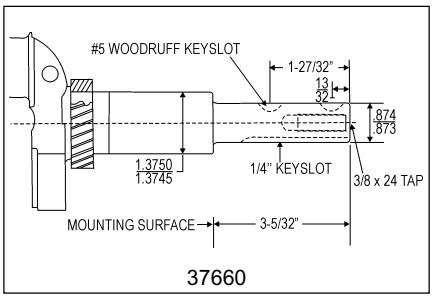

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	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain Ref. No.	Fuel Tank (pg. 3)	Top Governed Speed
808768A	Standard ■	35422A	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Front	3 Qts. Ref. 3	3400
808769A	Standard ■	35422A		Manual	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600
808770A	Snapper	35422A	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400
808771A	Toro	35422A	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Dual Sides	None	3350
808772A	Ariens	35422A	3 amp D.C.	Remote w/override	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3250

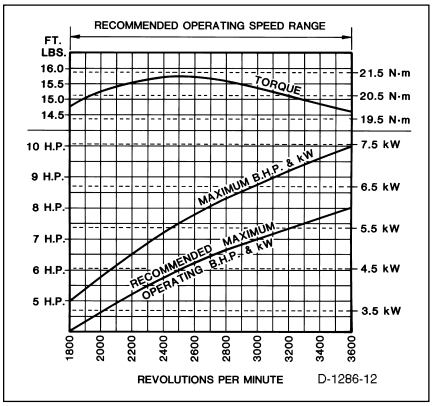
■ This engine is not eligible for return.
† 36680 - 12 volt electric starter can be installed.
33635C - Blower housing is needed to mount recoil starter.

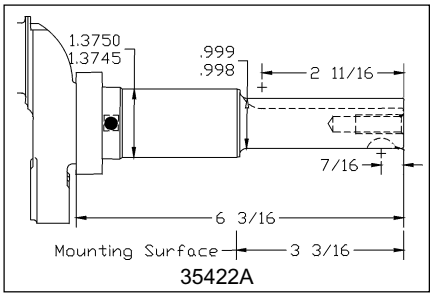
10 HORSEPOWER RIDER APPLICATION TVM220

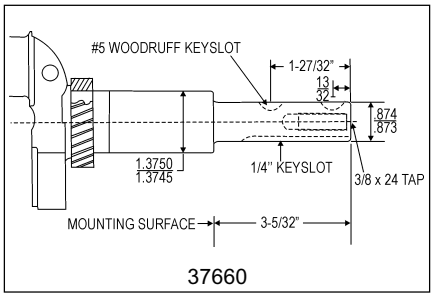
MODEL	TVM220
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	57 lbs. 25.9 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

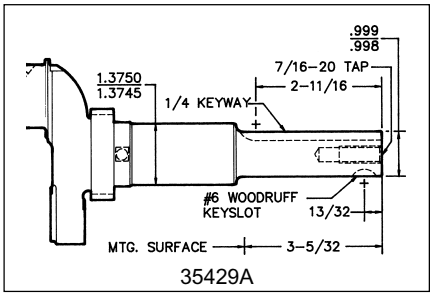
FEATURES

- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire System with Pre-Filter
- Float Carburetor with Choke
- Aluminized Muffler with Catalyst
- Mechanical Governor
- Electronic CDI Ignition
- Positive Displacement Oil Pump
- Oil Fill Tube with Dipstick
- Mechanical Compression Release









	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
810762	Murray	35429A	3 amp D.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810763	Murray	35429A	3 amp D.C.	Remote w/override	†Electric Provisions w/o Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3400
810764A	Standard ■	35422A	7 amp D.C. w/regulator	Remote	Electric Starter	Ref. 5 35403 (Paper) 35404 (Poly)	Side	None	3400

† 36680 - 12 volt electric starter can be installed.

■ This engine is not eligible for return.

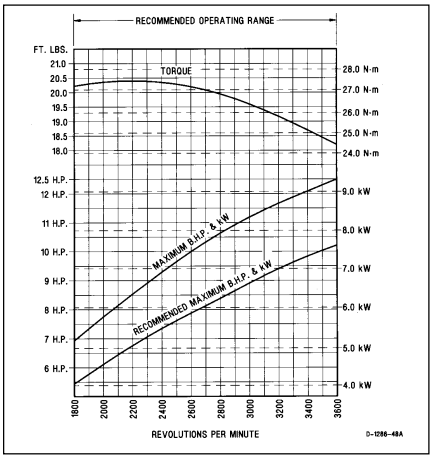
33635C - Blower housing is needed to mount recoil starter composite with 8 studs.

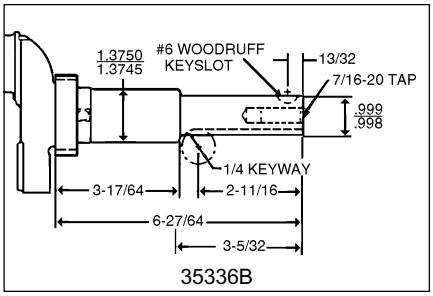
12.5 HORSEPOWER RIDER APPLICATION OHV125

MODEL	OHV125
HORSEPOWER	12.5 9.32 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	32 oz. .94 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick





	Customer Service No.	Crankshaft	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank Top (pg. 3)	Governed Speed
812708	Standard ■	35336B	3 amp D.C. 5 amp A.C.	Remote	Electric Starter w/Rewind	Ref. 5 35403 (Paper) 35404 (Poly)	Side	3 Qts. Ref. 3	3600

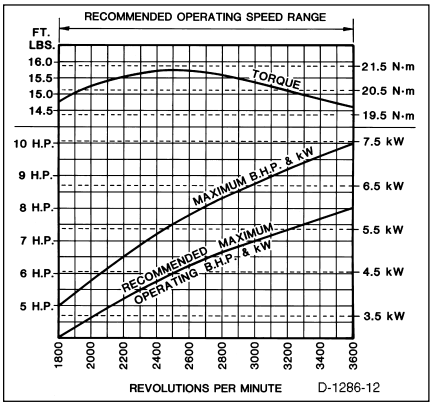
■ This engine is not eligible for return.

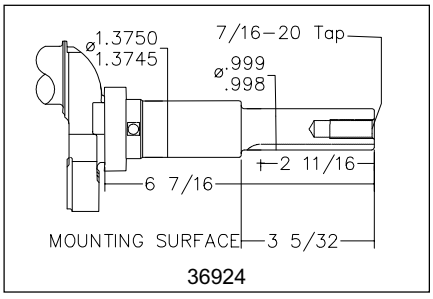
13 HORSEPOWER OHV130 OVERHEAD VALVE RIDER APPLICATION

MODEL	OHV130
HORSEPOWER	13.0 9.69 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	32 oz. 39 oz. w/oil filter .95 ltr. 1.17 ltr.
(APPROX.) WEIGHT	64 lbs. 28.8 kg
BOLT MTG. CIRCLE	8 & 10 in. 203.2 mm & 254.0 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Paper Kleen-Aire System with Pre-Filter
- Float Carburetor with Choke
- Mechanical Compression Release
- Mechanical Governor
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813700A	MTD	36924	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3250	● ▲ ❋
813701A	Swisher	36924	3 amp D.C.	Remote	†Electric Provisions	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3600	▲ ❋
813702	Frig. Home Prod.	36924	3 amp D.C. 5 amp A.C.	Remote	Electric Starter	Ref. 5 36356 (Paper) 36357 (Poly)	Side Does not have oil filter rotary pressure lubricant.	3300	● ▲ ■

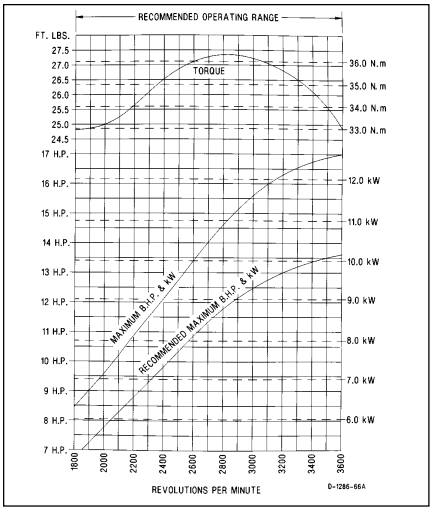
● Muffler omitted
▲ Fuel tank omitted
† 37425 - 12 volt electric starter can be installed.
❋ Rotary pump with oil filter.
■ Does not have oil filter.

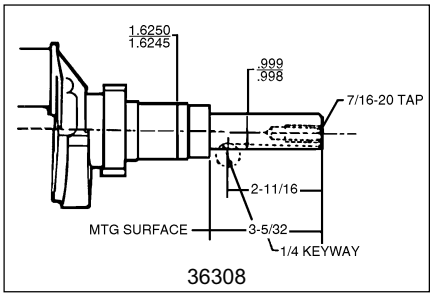
13.5 HORSEPOWER OHV135 OVERHEAD VALVE RIDER APPLICATION

MODEL	OHV135
HORSEPOWER	13.5 9.69 kW
BORE & STROKE	3-9/16 x 2-17/32 in. 90.49 x 64.31 mm
DISPLACEMENT	29.9 C.I. 490.00 cc
OIL CAPACITY	55 oz. 62 oz. w/oil filter 1.65 ltr. 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Top Governed Speed	Notes
813703	Ransomes	36308	Remote	†Electric Provisions w/Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	3600	▲

▲ Fuel tank omitted
† 36795 - 12 volt electric starter can be installed.

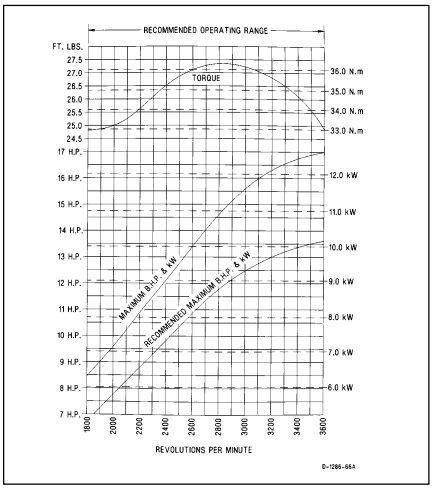
STELLITE is a registered trademark of Stoody Deloro Stellite, Inc.

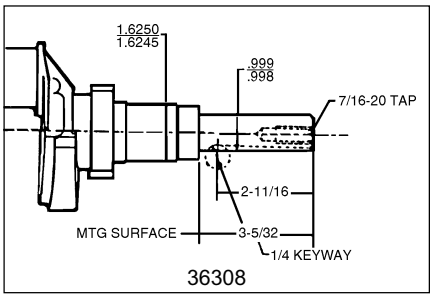
17.5 HORSEPOWER OHV175 OVERHEAD VALVE RIDER APPLICATION

MODEL	OHV175	
HORSEPOWER	17.5 12.67 kW	
BORE & STROKE	3-9/16 x 2-17/32 in. 90.49 x 64.31 mm	
DISPLACEMENT	29.9 C.I. 490.0 cc	
OIL CAPACITY	55 oz. 1.65 ltr.	62 oz. w/oil filter 1.86 ltr.
(APPROX.) WEIGHT	75 lbs. 33.8 kg	

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Ultra-Balance® and STELLITE® System
- Paper Kleen-Aire System with Pre-Filter
- Exhaust Manifold
- Rotary Oil Pump
- Oil Filter





	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
817061A	Ariens CB	36308	16 amp D.C. w/Regulator	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3200
817062A	Stanley CB	36308	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3400
817060A	Noma CB	36308	3 amp D.C. 5 amp A.C.	Remote	†Electric Provisions w/o Rewind	Ref. 5 36356 (Paper) 36357 (Poly)	Side	None	3400

† 36795 - 12 volt electric starter can be installed.
CB Counterbalanced
* 36435A - Oil filter can be installed.

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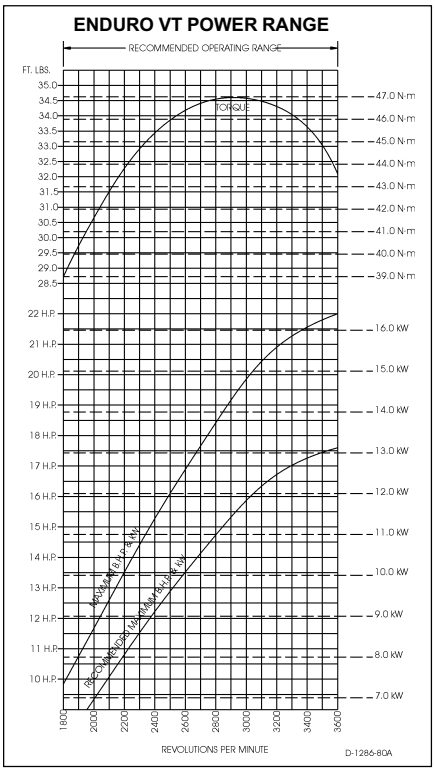
19 HORSEPOWER TVT691 OVERHEAD VALVE RIDER APPLICATIONS

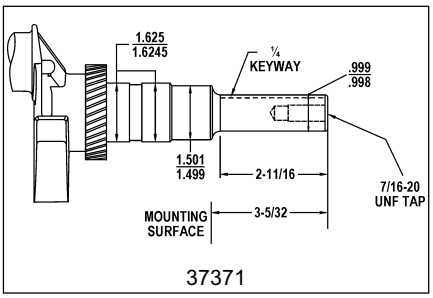
MODEL	TVT691	
HORSEPOWER	19.0	
BORE & STROKE	3.125 x 2.750 in. 79.375 x 69.85 mm	
DISPLACEMENT	42.15 C.I. 691 cc	
OIL CAPACITY	72 oz. 2.16 ltr.	80 oz. w/oil filter 2.4 ltr.
(APPROX.) WEIGHT	90 lbs. 40.5 kg	

FEATURES

- 90° V-Twin Configuration
- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Dual Carburetor (Float)
- Dual Element Air Cleaner
- Rotary Oil Pump
- Spin On Oil Filter
- Alternator 3/5 Split



Enduro® VT19



37371

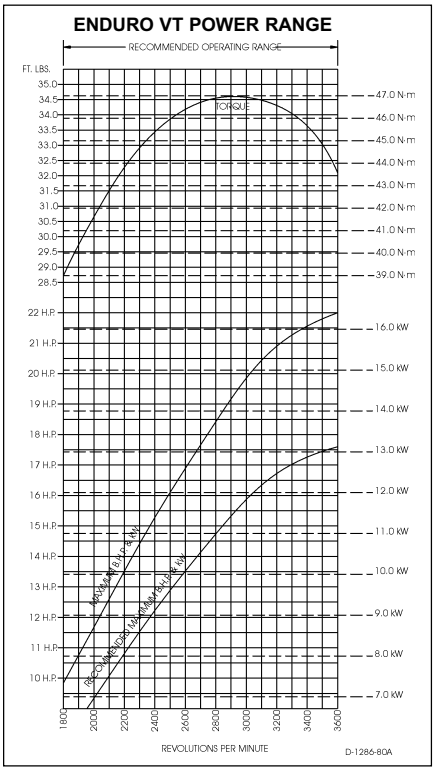
	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2)	Oil Drain Service Part No.	Fuel Tank (pg. 3)	Top Governed Speed
819500	Stanley	37371	Remote	Electric w/o rewind	Ref. 7 37360 (Paper) 37361 (Paper)	Side	None	3350

22 HORSEPOWER TVT691 OVERHEAD VALVE RIDER APPLICATIONS

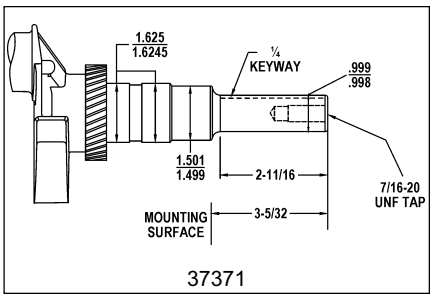
MODEL	TVT691	
HORSEPOWER	22.0	
BORE & STROKE	3.125 x 2.750 in. 79.375 x 69.85 mm	
DISPLACEMENT	42.15 C.I. 691 cc	
OIL CAPACITY	72 oz. 2.16 ltr.	80 oz. w/oil filter 2.4 ltr.
(APPROX.) WEIGHT	90 lbs. 40.5 kg	

FEATURES

- 90° V-Twin Configuration
- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Dual Carburetor (Float)
- Dual Element Air Cleaner
- Rotary Oil Pump
- Spin On Oil Filter
- Alternator 3/5 Split



Enduro® VT22

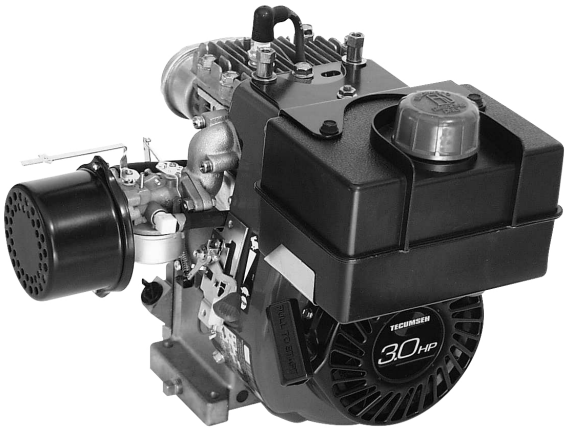


37371

	Customer	Crankshaft Service No.	Controls	Starter	Air Cleaner Style (pg. 2)	Oil Drain Service Part No.	Fuel Tank (pg. 3)	Top Governed Speed
822500	Standard	37371	Remote	Electric w/o rewind	Ref. 7 37360 (Paper) 37361 (Poly)	Side	None	3350
822501	Stanley	37371	Remote	Electric w/o rewind	Ref. 7 37360 (Paper) 37361 (Poly)	Side	None	3350

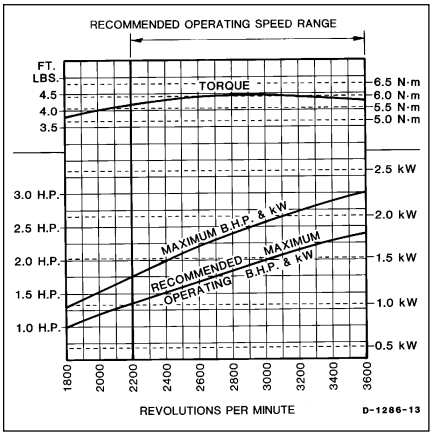
3.0 HORSEPOWER TILLER APPLICATION

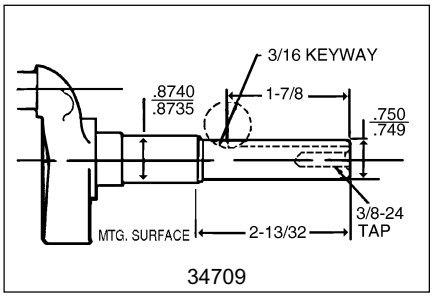
MODEL	H30
HORSEPOWER	3.0 2.24 kW
BORE & STROKE	2-1/2 x 1-27/32 in. 63.51 x 46.84 mm
DISPLACEMENT	9.06 C.I. 148 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst

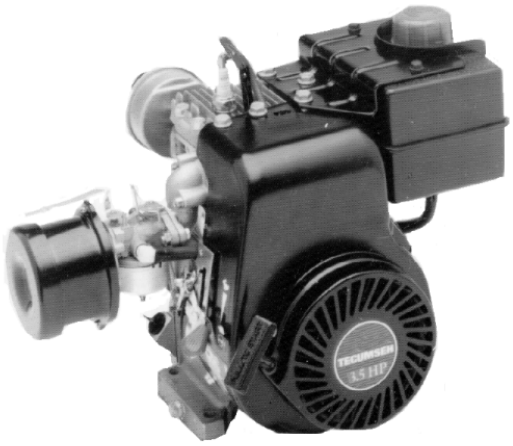




	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903666	Garden Way	34709	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	PTO Side	2 Qts. Ref. 5	3750

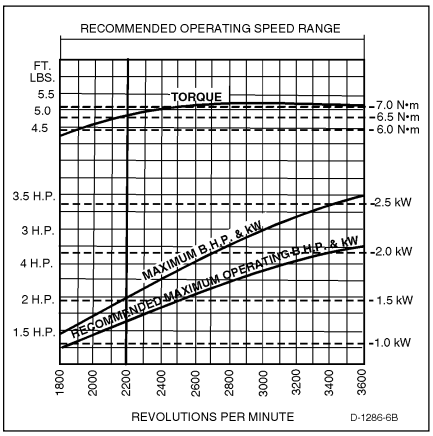
3.5 HORSEPOWER TILLER APPLICATION

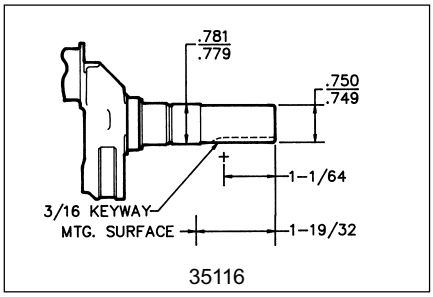
MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





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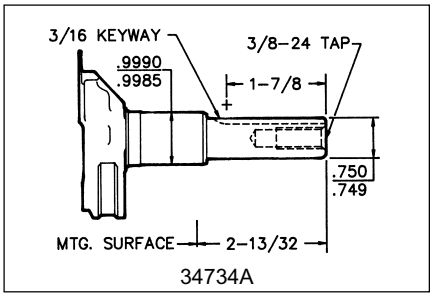

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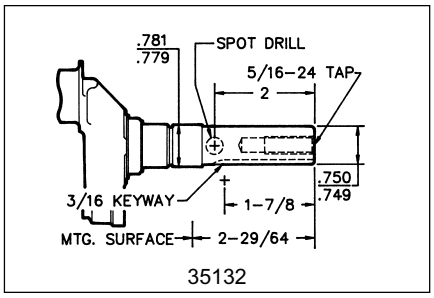

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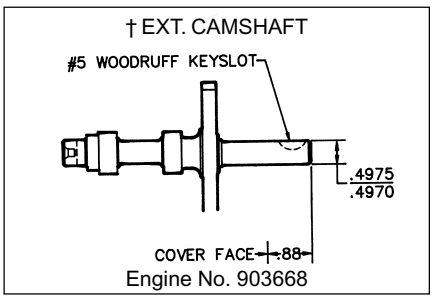


Engine No. 903668

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Exhaust Direction	Top Governed Speed	Note
903667	Toro	35116	Remote/Manual Convertible	Ref. 2 30727 (Paper)	Dual Sides	4 Qts. Ref. 4	PTO Side	3150	▲ ●
903668	Garden Way	34734A	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	PTO Side	3750	†
903669	Standard ■	35132	Remote/Manual Convertible	Ref. 1 30727 (Paper)	Dual Sides	2 Qts. Ref. 4	Carb. Side	3750	●

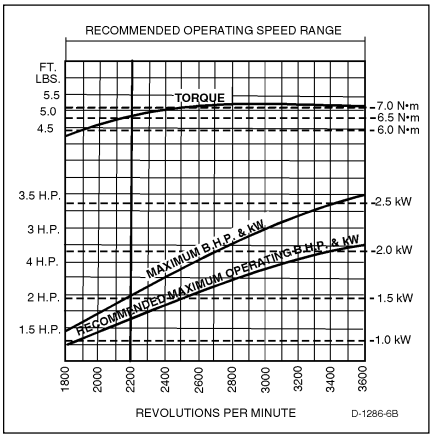
■ This engine is not eligible for return.
▲ Cast Iron Sleeve
● Ball Bearing, PTO side only.
† 2:1 Extended camshaft.

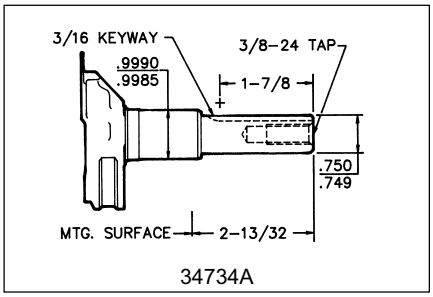
3.5 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H35
HORSEPOWER	3.5 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





34734A

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
903451A	Standard ■	34734A	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

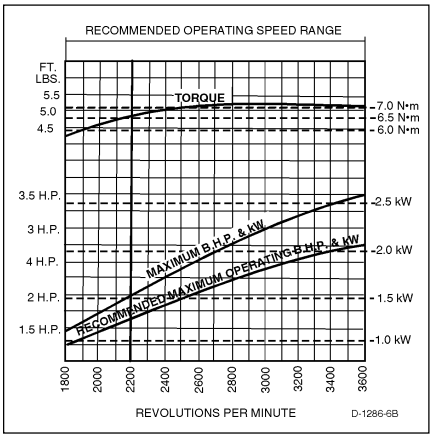
■ This engine is not eligible for return.

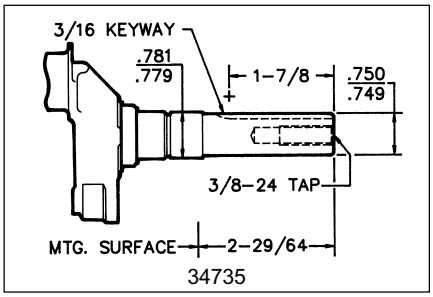
4.0 HORSEPOWER MINI-BIKE APPLICATION

MODEL	H40
HORSEPOWER	4.0 2.61 kW
BORE & STROKE	2-1/2 x 1-15/16 in. 63.51 x 49.23 mm
DISPLACEMENT	9.52 C.I. 156 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	25 lbs. 11.34 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Easy Pull Recoil Starter
- Electronic CDI Ignition
- Float Carburetor with Choke
- Muffler with Catalyst





	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Exhaust Direction	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
904416A	Standard ■	34735	Mini-Bike (Remote)	Ref. 1 30727 (Paper)	Dual Sides	Carb. Side	2 Qts. Ref. 4	4000

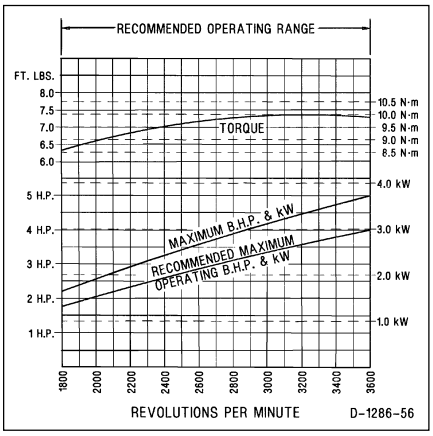
■ This engine is not eligible for return.

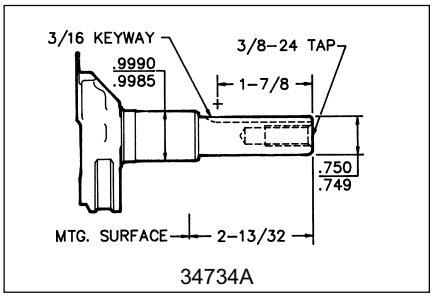
5.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-5/8 x 1-15/16 in. 66.69 x 49.23 mm
DISPLACEMENT	10.49 C.I. 172 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





	Customer	Crankshaft Service No.	Controls	Air Cleaner Style) (pg. 2 Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
905241B	Standard ■	34734A	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Black	3600

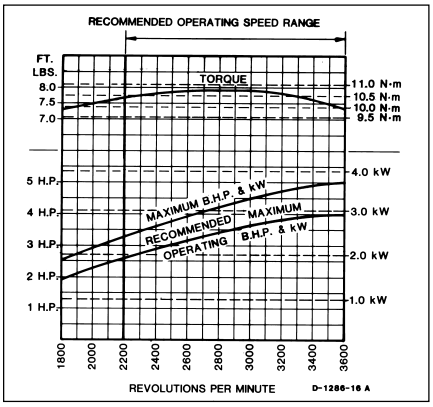
■ This engine is not eligible for return.

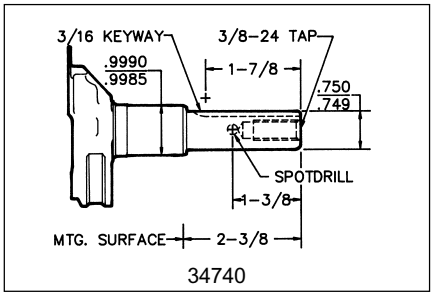
5.0 HORSEPOWER WINTER APPLICATION

MODEL	HSSK50
HORSEPOWER	5.0 3.73 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.20 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	33 lbs. 15.0 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Start with Mitten Grip
- Easy Start Primer
- Float Carburetor with Choke
- Electronic CDI Ignition
- Oil Fill Tube with Dipstick
- Aluminized Side Discharge Muffler





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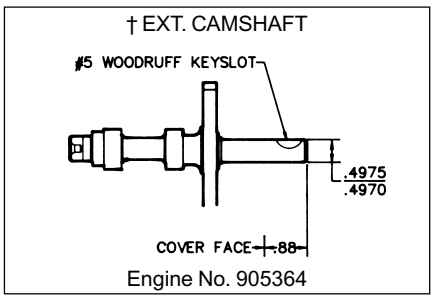
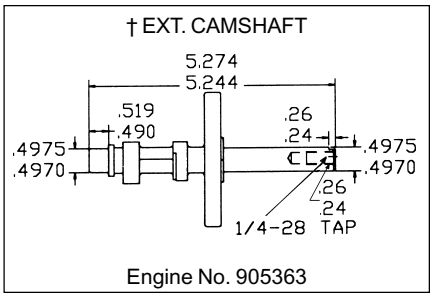
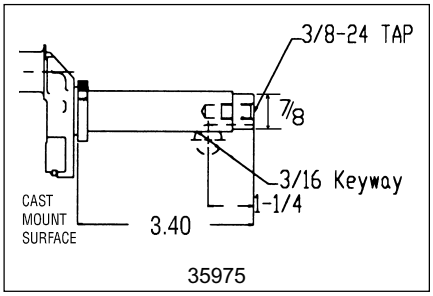


Engine No. 905364



Engine No. 905363



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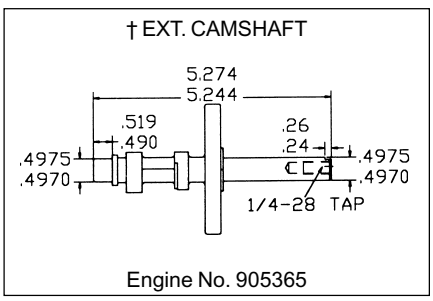


Engine No. 905365

	Customer	Crankshaft Service No.	Provisions for Electric Starter	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Note
905363	MTD	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905364	Standard ■	34740	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†
905365	Standard ■	35975	X *	Remote/Manual Convertible	Dual Sides & Front	2 Qts. Ref. 4	3750	†

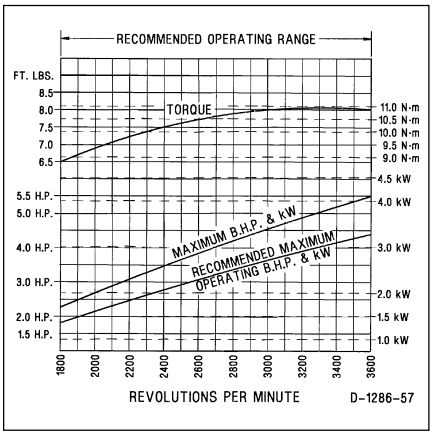
■ This engine is not eligible for return.
* No. 33290E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft.

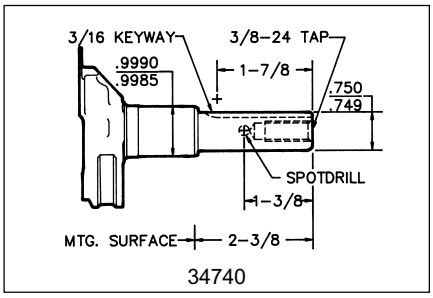
5.5 HORSEPOWER OVERHEAD VALVE

MODEL	OHH55
HORSEPOWER	5.5 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





34740

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint Top	Governed Speed
905242B	Standard ■	34740	Manual/Remote Convertible	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3600

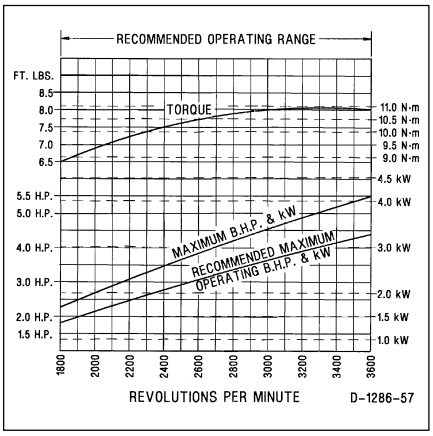
■ This engine is not eligible for return.

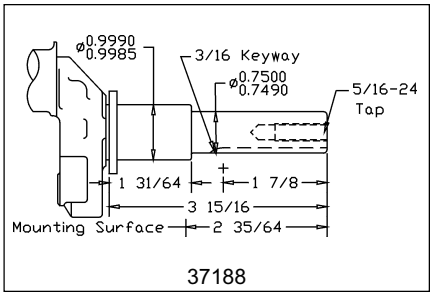
6.0 HORSEPOWER OVERHEAD VALVE

MODEL	OHH60
HORSEPOWER	6.0 4.10 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Pleated Paper Air Filter
- Easy Pull Recoil Starter
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





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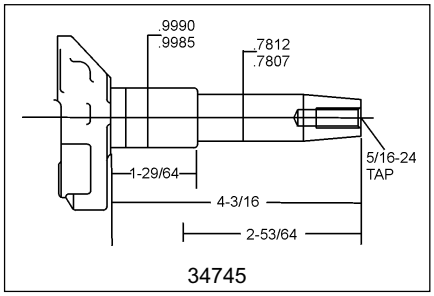

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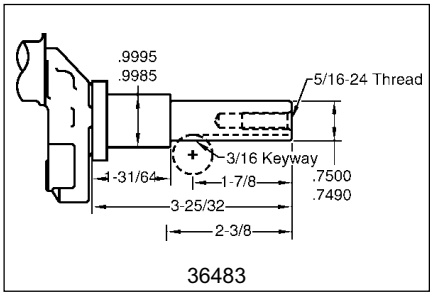


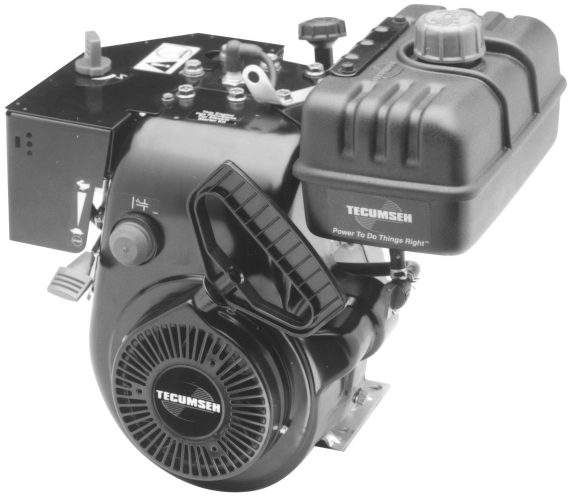
36483

	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed
906221A	Murray	37188	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350
906222A	Generac	34745	Fixed Speed	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Red	3350
906223A	Murray	36483	RV Control	Ref. 1 36046 (Paper)	Dual Side & Front	3 Qts. Ref. 4	Platinum	3350

■ This engine is not eligible for return.

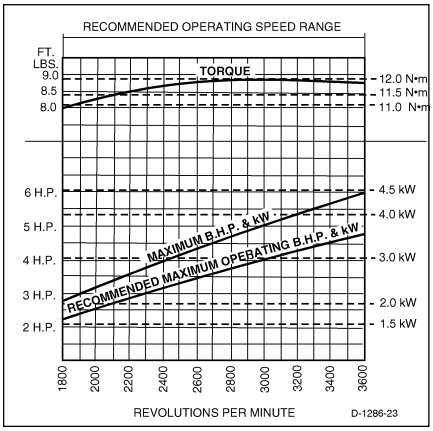
6.0 HORSEPOWER WINTER APPLICATION

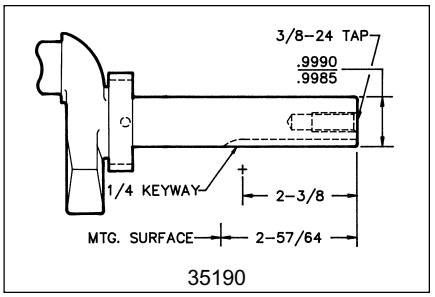
MODEL	HSK60
HORSEPOWER	6.0 4.47 kW
BORE & STROKE	2-5/8 x 2-1/2 in. 66.69 x 63.50 mm
DISPLACEMENT	13.53 C.I. 221.8 cc
OIL CAPACITY	19 oz. .56 ltr.
(APPROX.) WEIGHT	48 lbs. 21.81 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm



FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions





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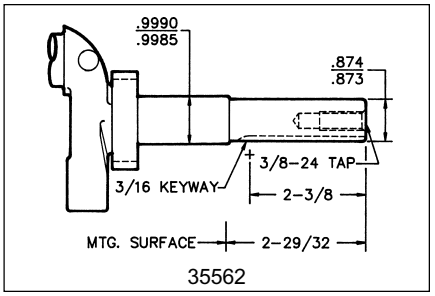


35562

	Customer	Crankshaft Service No.	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
906362	Toro	35190	Manual	X *	Dual Side	2 Qts. Ref. 4	3300
906363	Toro	35562	Manual	X *	Dual Side	4 Qts. Ref. 4	3300

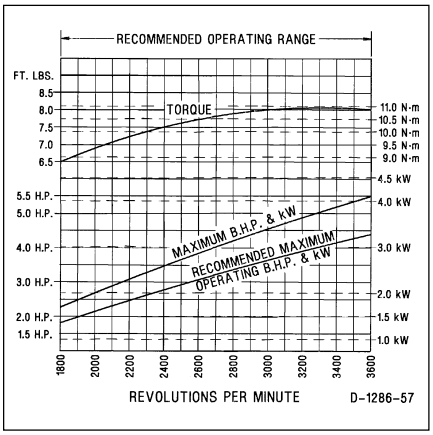
* No. 33328D - 120 volt electric starter can be installed.

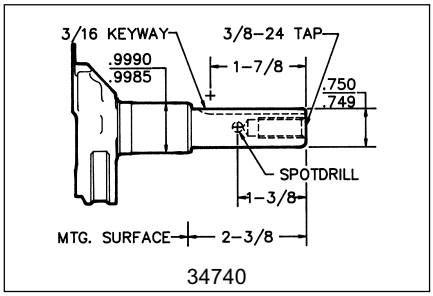
7.0 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK70
HORSEPOWER	7.0 5.22 kW
BORE & STROKE	2-51/64 x 1-15/16 in. 70.99 x 49.23 mm
DISPLACEMENT	11.88 C.I. 195 cc
OIL CAPACITY	21 oz. .62 ltr.
(APPROX.) WEIGHT	30 lbs. 13.5 kg
BOLT MTG. CIRCLE	3-5/8 in. 90 mm

FEATURES

- Overhead Valve Design
- Cast Iron Cylinder Sleeve
- Easy Pull Recoil Starter w/Mitten Grip
- Aluminized Muffler w/Guard
- Mechanical Compression Release
- Easy Start Primer
- Electronic CDI Ignition
- Extended Oil Fill Tube





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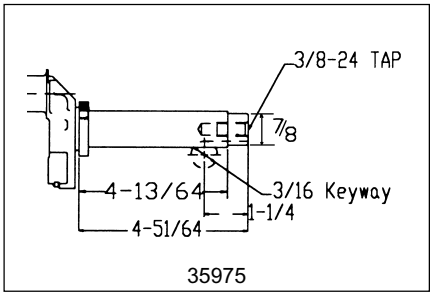

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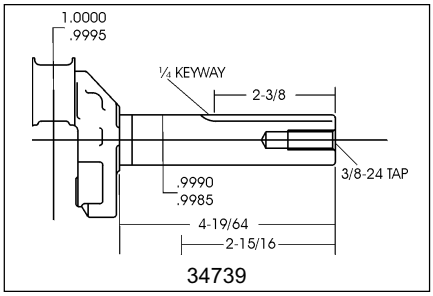

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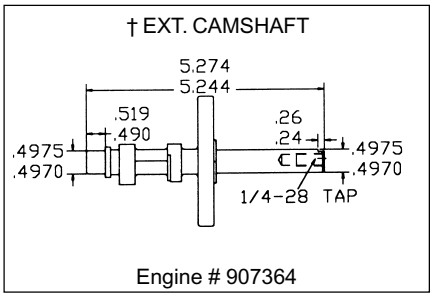


Engine # 907364

	Customer	Crankshaft Service No.	Controls	Provisions for Electric Start	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Paint	Top Governed Speed	Note
907364A	MTD Products	35975	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Black	3750	†
907365B	Standard	34739	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Platinum	3750	
907366	Standard	34740	Manual	X *	Front Dual Side	3.5 Qts. Ref. 4	Platinum	3750	

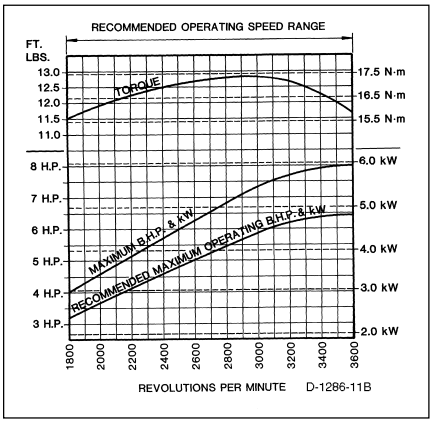
* No. 33290E - 120 volt electric starter kit can be installed.
† 2:1 extended camshaft

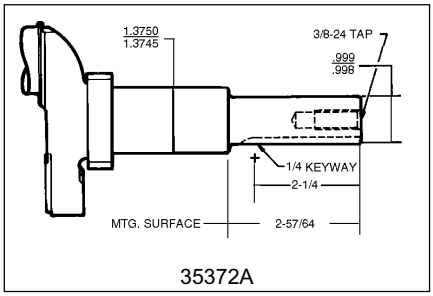
8.0 HORSEPOWER
MEDIUM FRAME - M SERIES

MODEL	HM80
HORSEPOWER	8.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





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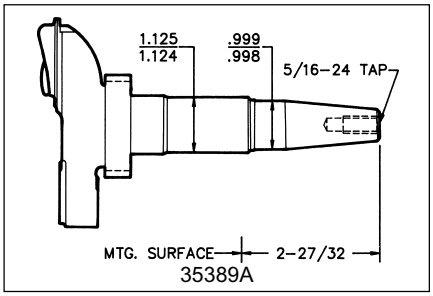

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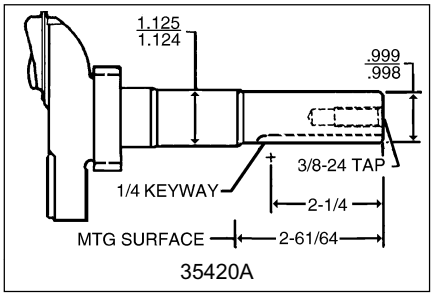

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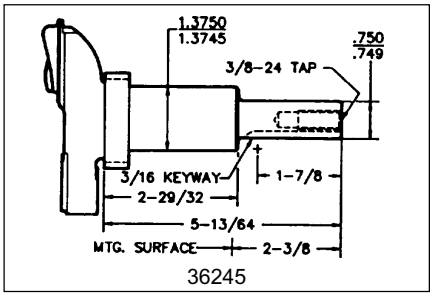


36245

	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
908202	Standard ■ BB	35420A		Manual	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
908204	Standard ■	35372A		Remote	Rewind	Ref. 2 33268 (Paper)	Dual Side	4 Qts. 4	3600
908212B	Standard ■ BB ✱	35389A		Fixed Speed	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
908213	Garden Way	36245	3 amp D.C.	Remote	†Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600

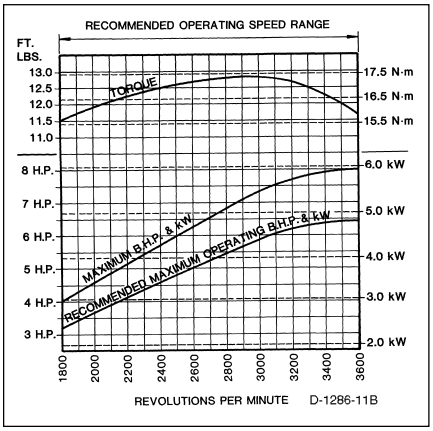
■ This engine is not eligible for return.
BB Ball Bearing
† 36680 - 12 volt electric starter can be installed.
✱ Climate Guard

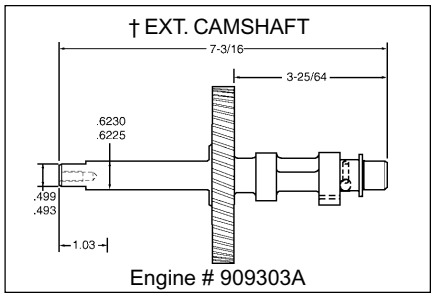
9.0 HORSEPOWER WINTER APPLICATION

MODEL	HMSK90
HORSEPOWER	9.0 5.97 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.27 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	55 lbs. 25.0 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

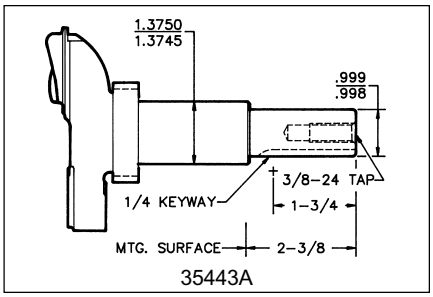
FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve





Engine # 909303A



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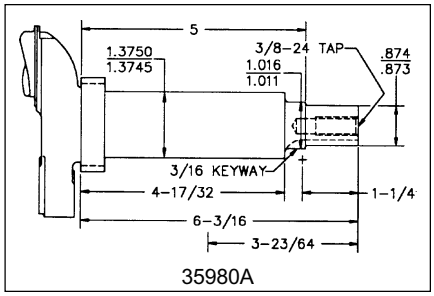
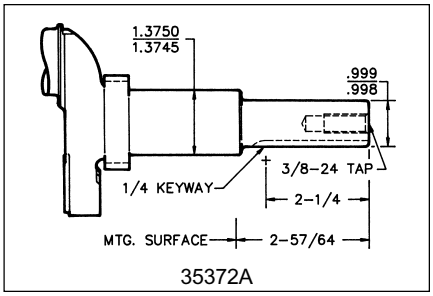


35980A



35372A

		Customer Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909300A	Standard ■	35372A	3 amp A.C.	Manual	X *	Dual Side	4 Qts. Ref. 4	3450
909301A	Standard ■	35443A		Manual	X *	Dual Side	4 Qts. Ref. 4	3250
†909303A	MTD	35980A	18 Watt	Manual	X *	Front Dual Side	4 Qts. Ref. 4	3600

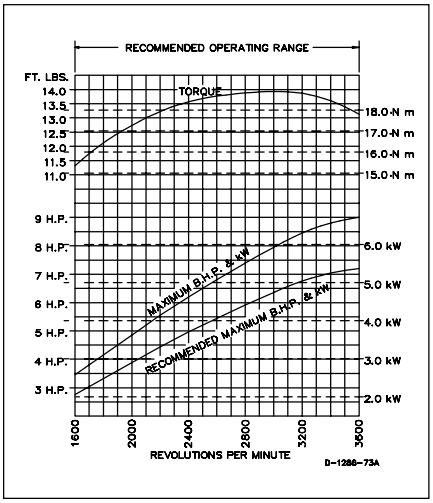
■ This engine is not eligible for return.
* No. 33329E - 120 volt electric starter can be installed.
† 2:1 Extended camshaft

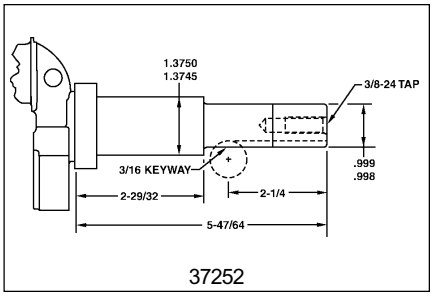
9 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK90
HORSEPOWER	9.0 6.7 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





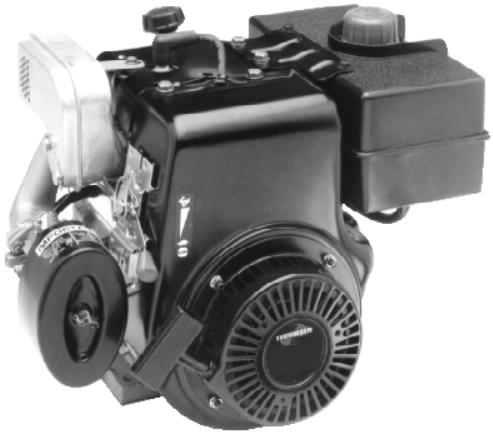
37252

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
909302A	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

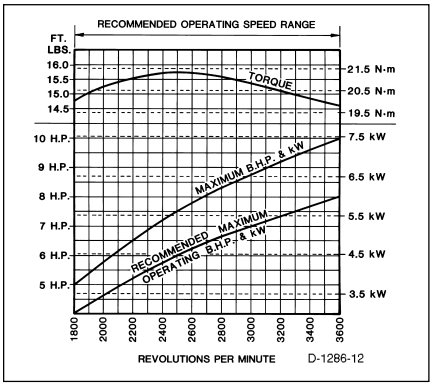
10 HORSEPOWER
MEDIUM FRAME - M SERIES

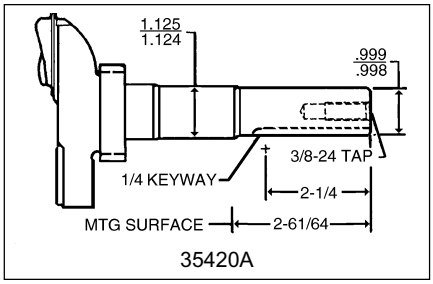
MODEL	HM100
HORSEPOWER	10.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 & 5 in. 90 mm & 130 mm



FEATURES

- Mechanical Compression Release
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter
- Cast Iron Cylinder Sleeve





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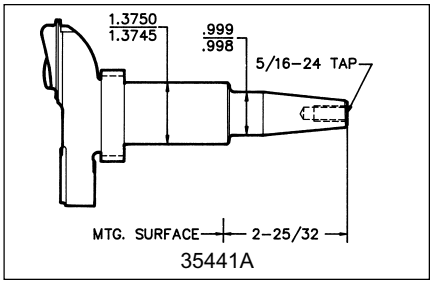

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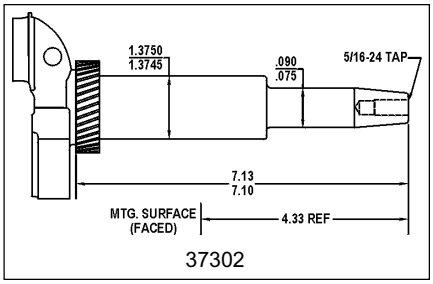

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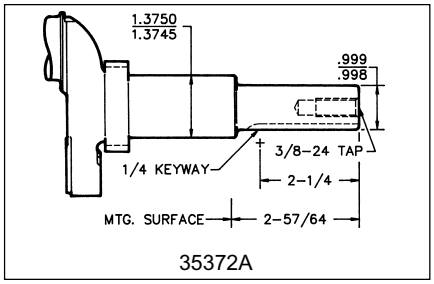


35372A

	Customer	Crankshaft Service No.	Charging System	Controls	Starter	Air Cleaner Style (pg. 2) Service Part No.	Oil Drain	Fuel Tank (pg. 3)	Top Governed Speed
910205A	Standard ■ BB	35420A	3 amp D.C. 5 amp A.C.	Manual	Electric Starter w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
910206A	MTD Ltd. BB	35420A		Manual	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3400
910207A	Standard ■	35372A		Manual	* Electric Provisions w/Rewind	Ref. 1 33268 (Paper)	Dual Side	4 Qts. 4	3600
910263A	Coleman ▲	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3600
910264C	Generac † ▲	35441A		Fixed Speed	* Electric Provisions w/Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	4 Qts. 4	3750
910265B	Devilbiss † ▲	37302		Fixed Speed	Rewind	Ref. 4 34700B (Paper) 34703 (Poly)	Dual Side	None	3750

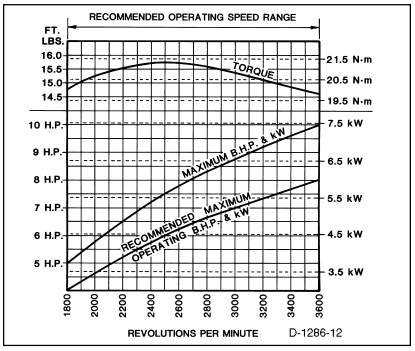
■ This engine is not eligible for return.
* 36680 - 12 Volt electric starter can be installed.
† Low oil shutdown.
▲ Climate guard.

11 HORSEPOWER WINTER APPLICATION

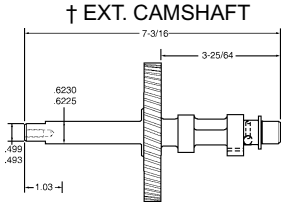
MODEL	HMSK110
HORSEPOWER	11.0 7.46 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.58 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	56 lbs. 25.45 kg
BOLT MTG. CIRCLE	3-5/8 90 mm

FEATURES

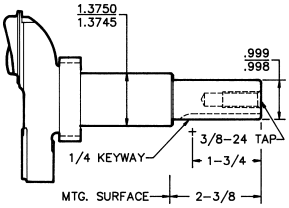
- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electronic CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve



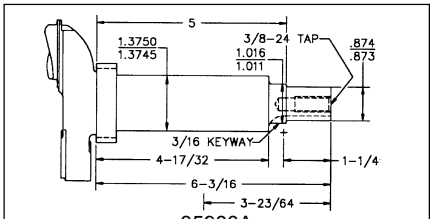
† EXT. CAMSHAFT



Engine No. 911361A



35443A



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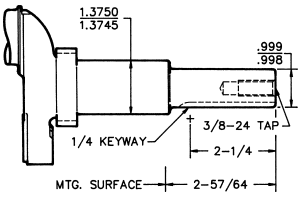

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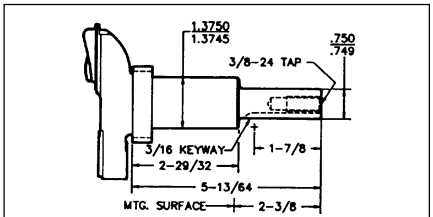
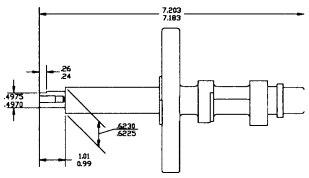


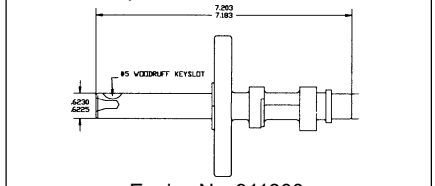
36245

† EXT. CAMSHAFT



Engine No. 911360A

† EXT. CAMSHAFT



Engine No. 911300

	Customer	Crankshaft Service No.	Charging System	Controls	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed	Notes
911300	Standard ■	36245	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱ †
911301	Standard ■	35443A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3250	✱
911302	Standard ■	35372A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911303	Standard ■	35372A	3 amp A.C.	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911304A	Standard ■	36245	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱
911305A	Standard ■	35443A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3450	✱
911360A	MTD LTD.	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †
911361A	Standard ■	35980A	18 watt	Manual	Dual Side	4 Qts. Ref. 4	3600	✱ †

■ This engine is not eligible for return.

✱ 33329E - 120 volt electric starter can be installed.

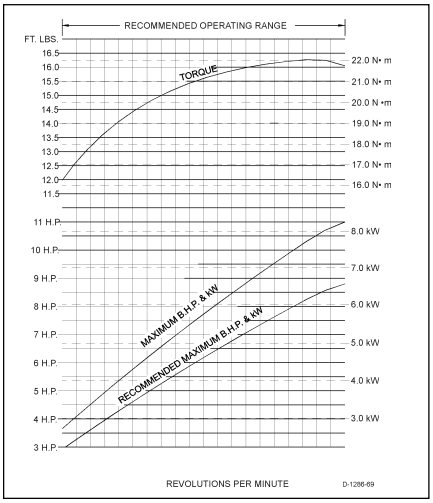
† 2:1 extended camshaft

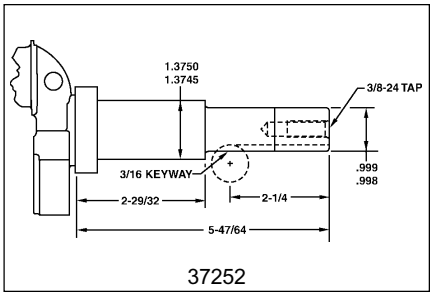
11 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK110
HORSEPOWER	11.0 8.2 kW
BORE & STROKE	3-1/8 x 2-17/32 in. 79.39 x 64.31 mm
DISPLACEMENT	19.43 C.I. 318.3 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





37252

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
911306B	Standard ■	37252	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

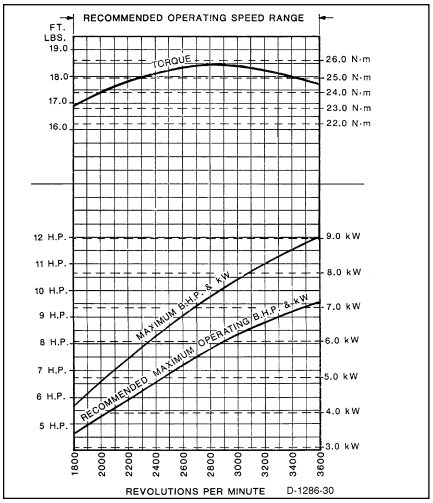
■ This engine is not eligible for return.
* 33329E - 120 volt electric starter can be installed.

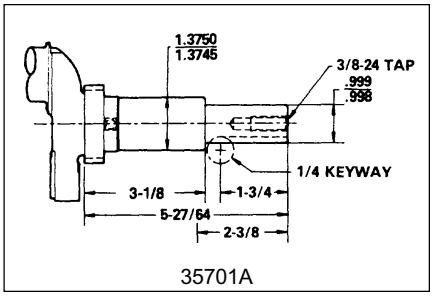
12 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK120
HORSEPOWER	12.0 8.95 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	26 oz. .77 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design





35701A

	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
912301A	Standard ■	35701A	18 Watt	Manual	X *	Dual Side	6 Qt. Ref. 4	3700

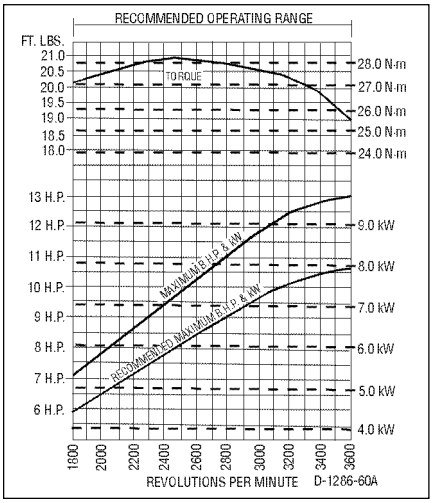
■ This engine is not eligible for return.
* 37105 - 120 volt electric starter can be installed.

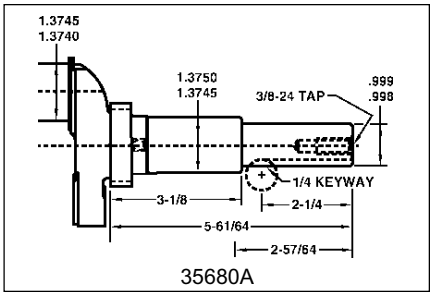
13 HORSEPOWER OVERHEAD VALVE WINTER APPLICATION

MODEL	OHSK130
HORSEPOWER	13.0 9.7 kW
BORE & STROKE	3-5/16 x 2-17/32 in. 84.14 x 64.31 mm
DISPLACEMENT	21.82 C.I. 357.6 cc
OIL CAPACITY	28 oz. .83 ltr.
(APPROX.) WEIGHT	60 lbs. 27.2 kg
BOLT MTG. CIRCLE	5 & 6.5 in. 130 mm & 170 mm

FEATURES

- Mechanical Compression Release
- Easy Start Primer
- Float Carburetor with Choke & Bowl Drain
- Electric CDI Ignition
- Aluminized Muffler
- Oil Fill Tube with Dipstick
- Easy Pull Recoil Starter with Mitten Grip
- Electric Start Provisions
- Cast Iron Cylinder Sleeve
- Ultra-Balance® System
- Overhead Valve Design
- Muffler Guard





	Customer	Crankshaft Service No.	Charging System	Controls	Provisions for Electric Starter	Oil Drain	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
913300B	Standard ■	35680A	18 Watt	Manual	X *	Dual Side	1 Gallon Ref. 10	3600

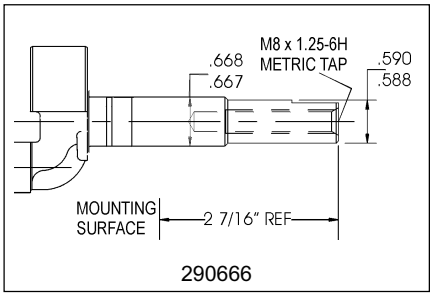
■ This engine is not eligible for return.
* 37105 - 120 volt electric starter can be installed.

2 HORSEPOWER TWO CYCLE AUGER APPLICATION

MODEL	TC300
HORSEPOWER	2.0 1.49 kW
BORE & STROKE	1.75 x 1.25 in. 44.5 mm x 31.8 mm
DISPLACEMENT	3.0 C.I. 49.2 cc
OIL / FUEL MIXTURE	24:1
(APPROX.) WEIGHT	7 lbs. 3.2 kg

FEATURES

- Aluminum Cylinder Bore
- Poly Air Filter with Flocked Screen
- Ball / Needle Bearing Construction
- Integral Recoil Starter
- Responsive Air Vane Governor



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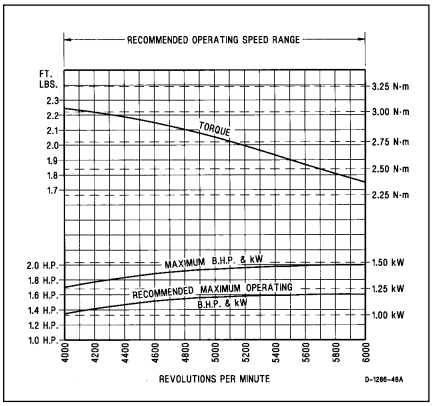
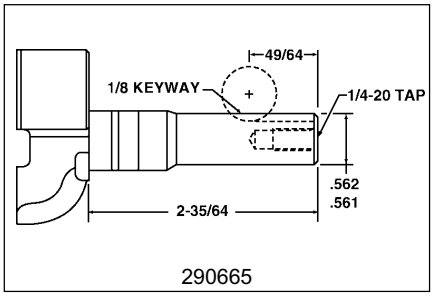
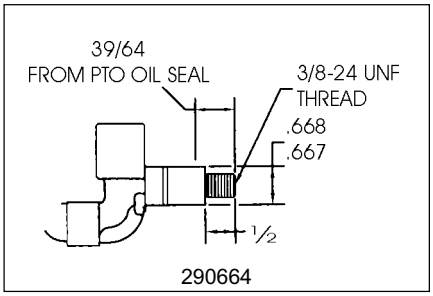




290665



290664

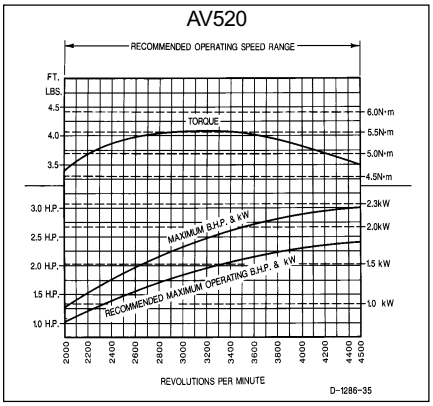
	Customer	Crankshaft Service No.	Controls	Air Cleaner Style (pg. 2) Service Part No.	Carburetor	Fuel Tank (pg. 3) Ref. No.	Top Governed Speed
800174A	Flymo	290666	Remote	Ref. 1 35066 (Paper)	Diaphragm w/primer	16 oz. Ref. 7	3800
800264A	Active Technology	290665	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/primer	20 oz. Ref. 8	6000
800662A	Feldman	290664	Remote	Ref. 3 450255 (Flocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	6000
800664A	Hoffco	290664	Remote	Ref. 3 450255 (FLocked Screen) 450252 (Poly)	Diaphragm w/choke	20 oz. Ref. 8	5400

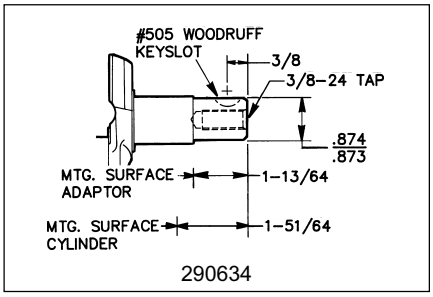
3 HORSEPOWER TWO CYCLE VARIOUS APPLICATIONS AV520

MODEL	AV520
HORSEPOWER	3.0
BORE & STROKE	2.09 x 1.50 in. 53 x 38 mm
DISPLACEMENT	5.2 C.I. 85 cc
OIL / FUEL MIXTURE	24:1
(APPROX.) WEIGHT	13.2 lbs. 5.9 kg
Bolt Mtg. Circle	4.0 in. 102 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ball/Needle Bearing Construction
- Diaphragm Carburetor with Choke





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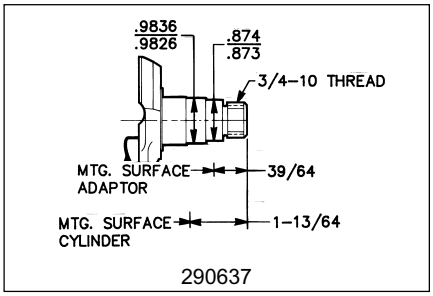


290637

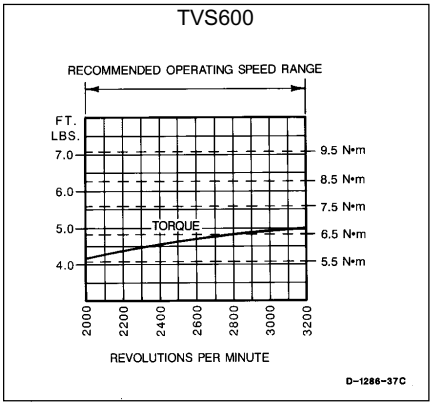
	Customer	Application	Crankshaft	Controls	Air Cleaner Style (pg. 2)	Fuel Tank (pg. 3)	Top Governed Speed
800265A	Feldman	Auger	290634	Remote	None	1 Qt. (Ref. 9)	4500
800266	Hoffco	Scythe	290637	Remote	450233 (Flocked Screen) 450205 (Flocked Screen) 450215 (Poly) (Ref. 2)	None	4600

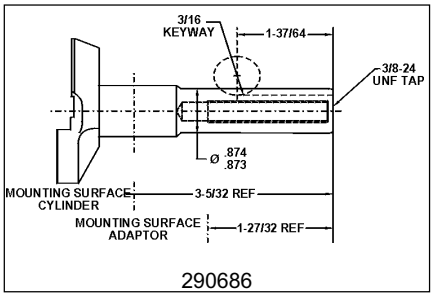
3.5 HORSEPOWER TWO CYCLE ROTARY LAWN MOWER APPLICATION

MODEL	TVS600
HORSEPOWER	3.5
BORE & STROKE	2.09 x 1.75 in. 53 x 44 mm
DISPLACEMENT	6.0 C.I. 98 cc
OIL / FUEL MIXTURE	32:1
(APPROX.) WEIGHT	16 lbs. 73 kg
Bolt Mtg. Circle	2.59 x 1.50 in. 65.8 x 38.1 mm

FEATURES

- Cast Iron Cylinder Sleeve
- Ball/Needle Bearing Construction
- Float Carburetor with Choke





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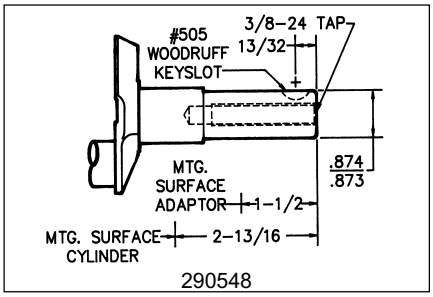


290548

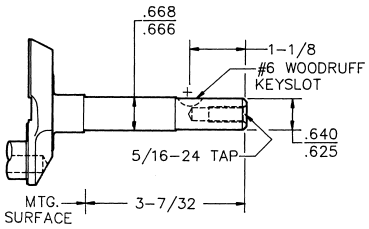
	Customer	Crankshaft	Controls	Air Cleaner Style (pg. 2)	Fuel Tank (pg. 3)	Top Governed Speed
800175	Flymo	290686	Manual	None (OEM supplied)	1.3 Qt. (Ref. 9)	3850
800176	Flymo	290548	Manual	None (OEM supplied)	1.3 Qt. (Ref. 9)	3850

3 HORSEPOWER TWO CYCLE WINTER APPLICATION

MODEL	HSK600
HORSEPOWER	3.00 2.24 kW
BORE & STROKE	2.09 x 1.75 in. 53 x 38 mm
DISPLACEMENT	6.0 C.I. 98 cc
OIL / FUEL MIXTURE	32:1
(APPROX.) WEIGHT	12 lbs. 5.44 kg
BOLT MTG. CIRCLE	5.562 in.

FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Responsive Air Vane Governor
- Float Carburetor with Choke



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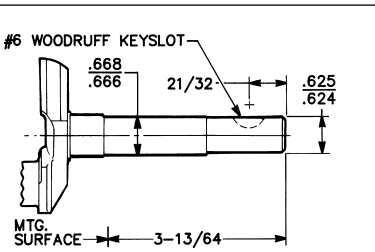

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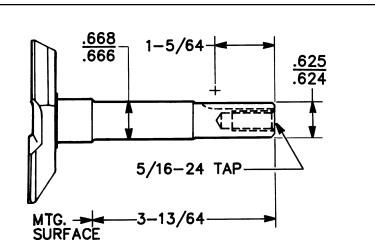

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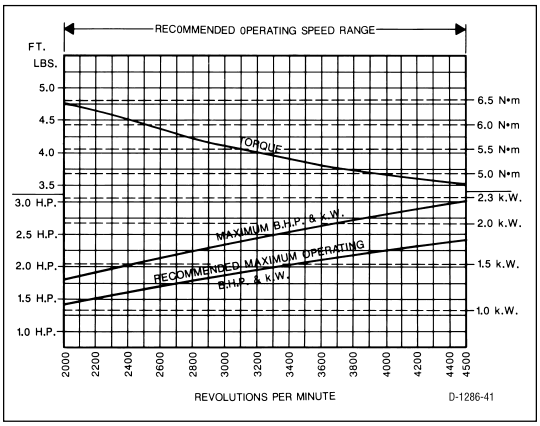


	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed	Notes
900389	Toro	290607	X *	Fixed Speed	4500	▲ ★
900390	MTD Mont. Ward	290609	X *	Fixed Speed	4500	▲
900391	Snapper	290607	X *	Fixed Speed	4300	▲
900392	Toro	290602	X *	Fixed Speed	4500	▲
900393	Murray Outdoor	290607	X *	Fixed Speed	4300	▲
900396	Snapper	290602	X *	Fixed Speed	4500	▲

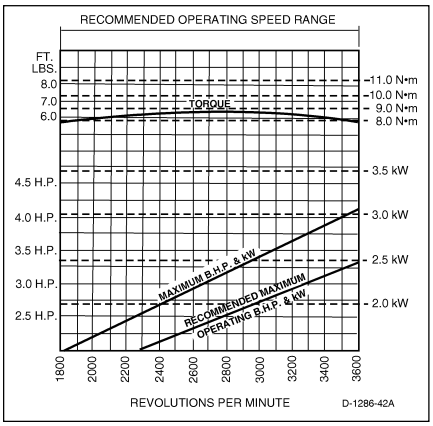
* No. 590556 - 120 volt electric starter kit can be installed.
▲ Fuel tank omitted.
★ Muffler OEM supplied.

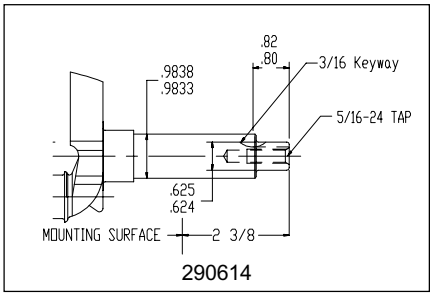
4.5 HORSEPOWER TWO CYCLE WINTER APPLICATION

MODEL	HSK845
HORSEPOWER	4.5 3.35 kW
BORE & STROKE	2.44 x 1.81 in. 61.9 x 46 mm
DISPLACEMENT	8.46 C.I. 139 cc
OIL / FUEL MIXTURE	50:1
(APPROX.) WEIGHT	20 lbs. 9.1 kg
BOLT MTG. CIRCLE	3.625 in.

FEATURES

- Cast Iron Cylinder Sleeve
- Ball / Needle Bearing Construction
- Easy Start Primer
- Electronic CDI Ignition
- Soft-Pull Recoil Starter
- Quick Response Mechanical Governor
- Float Carburetor with Choke





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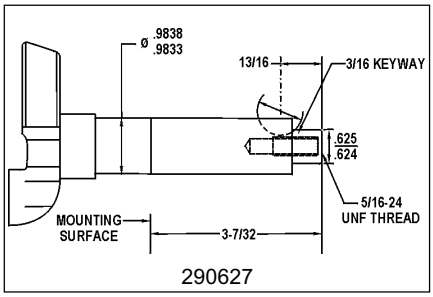

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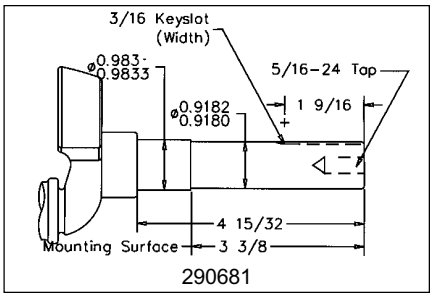


290681

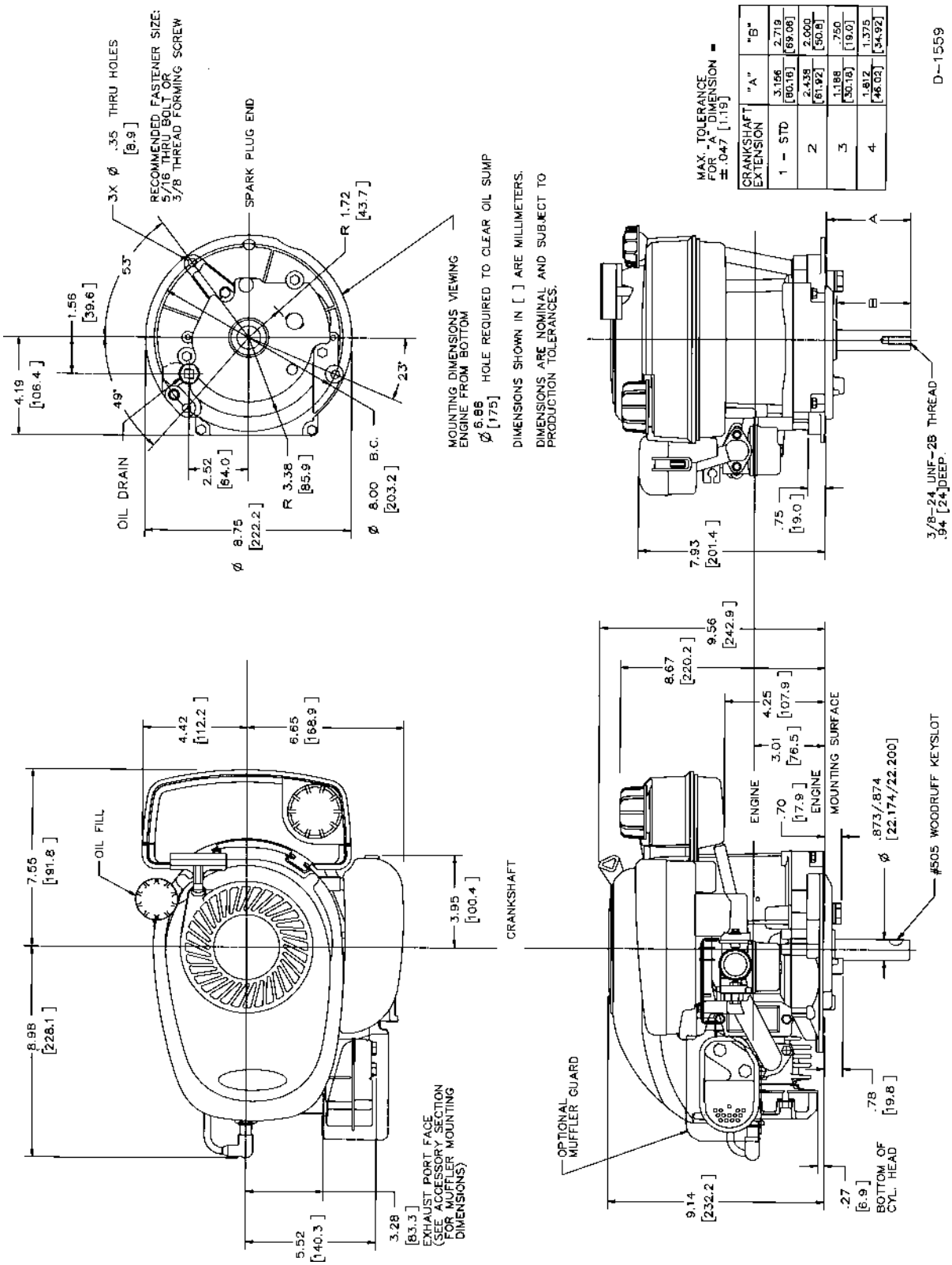
	Customer	Crankshaft Service No.	Provisions for Electric Start	Controls	Top Governed Speed	Notes
900394	MTD	290614	X *	Fixed Speed	3700	▲
900395	Toro	290681		Fixed Speed	3700	▲
900397	Service	290627	X *	Fixed Speed	3700	▲

* No. 590670 - 120 volt electric starter kit can be installed.

▲ Fuel tank omitted.

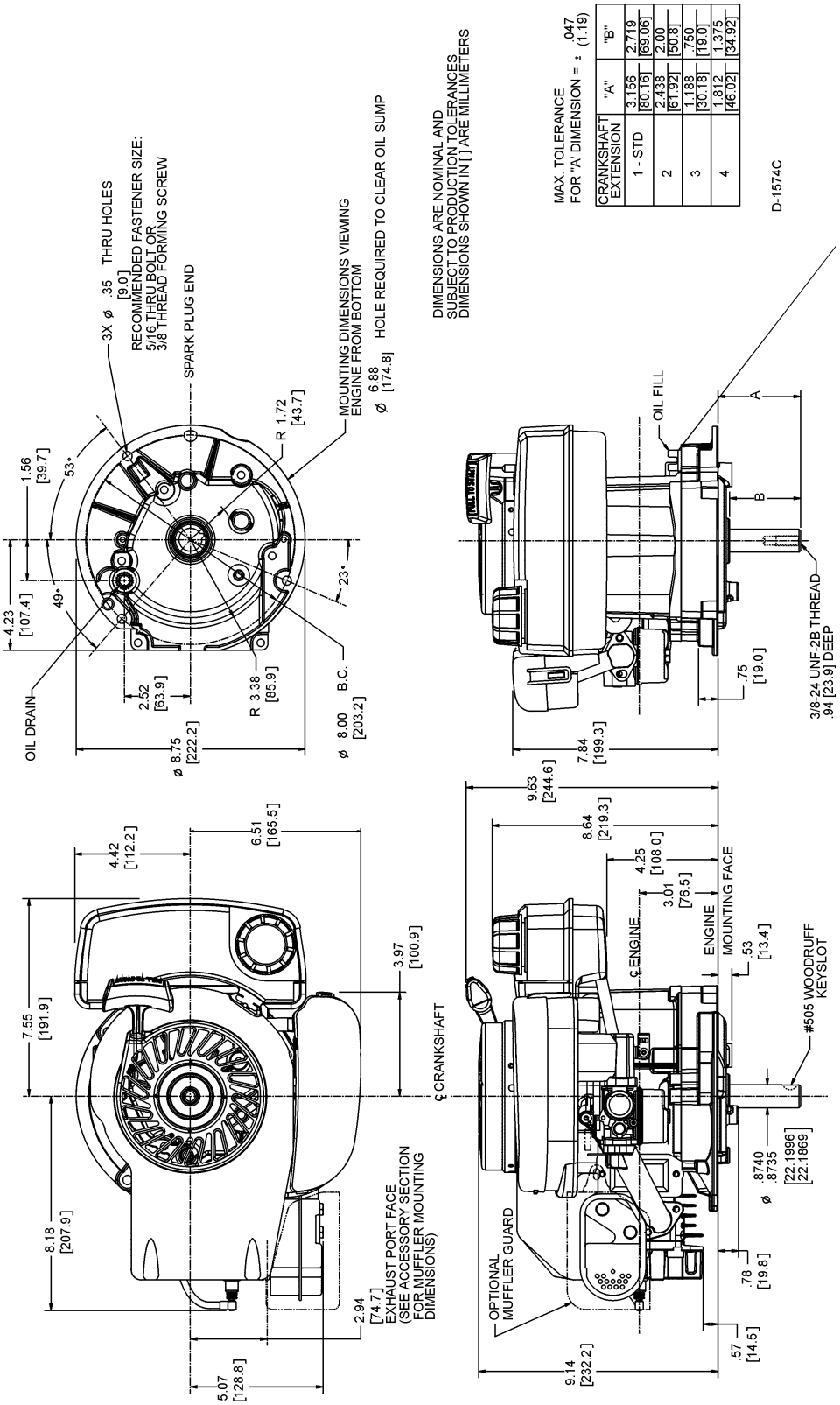
DIMENSIONAL DRAWING

LEV100, LEV115, LEV120



DIMENSIONAL DRAWING

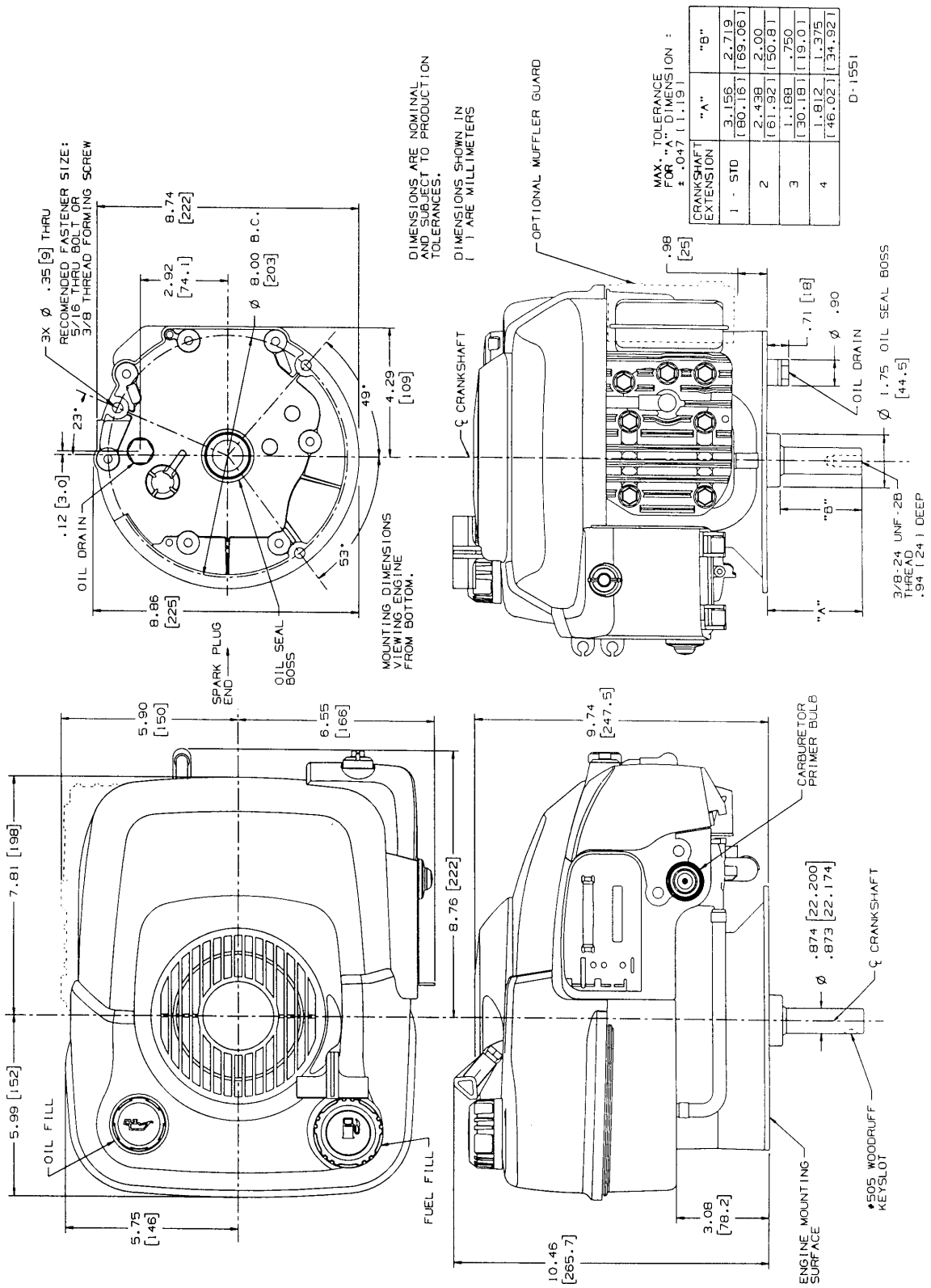
LEV 80



CRANKSHAFT EXTENSION	"A"	"B"
1 - STD	3.156 [80.16]	2.719 [69.06]
2	2.438 [61.92]	2.00 [50.8]
3	1.188 [30.18]	.750 [19.0]
4	1.812 [46.02]	1.375 [34.92]

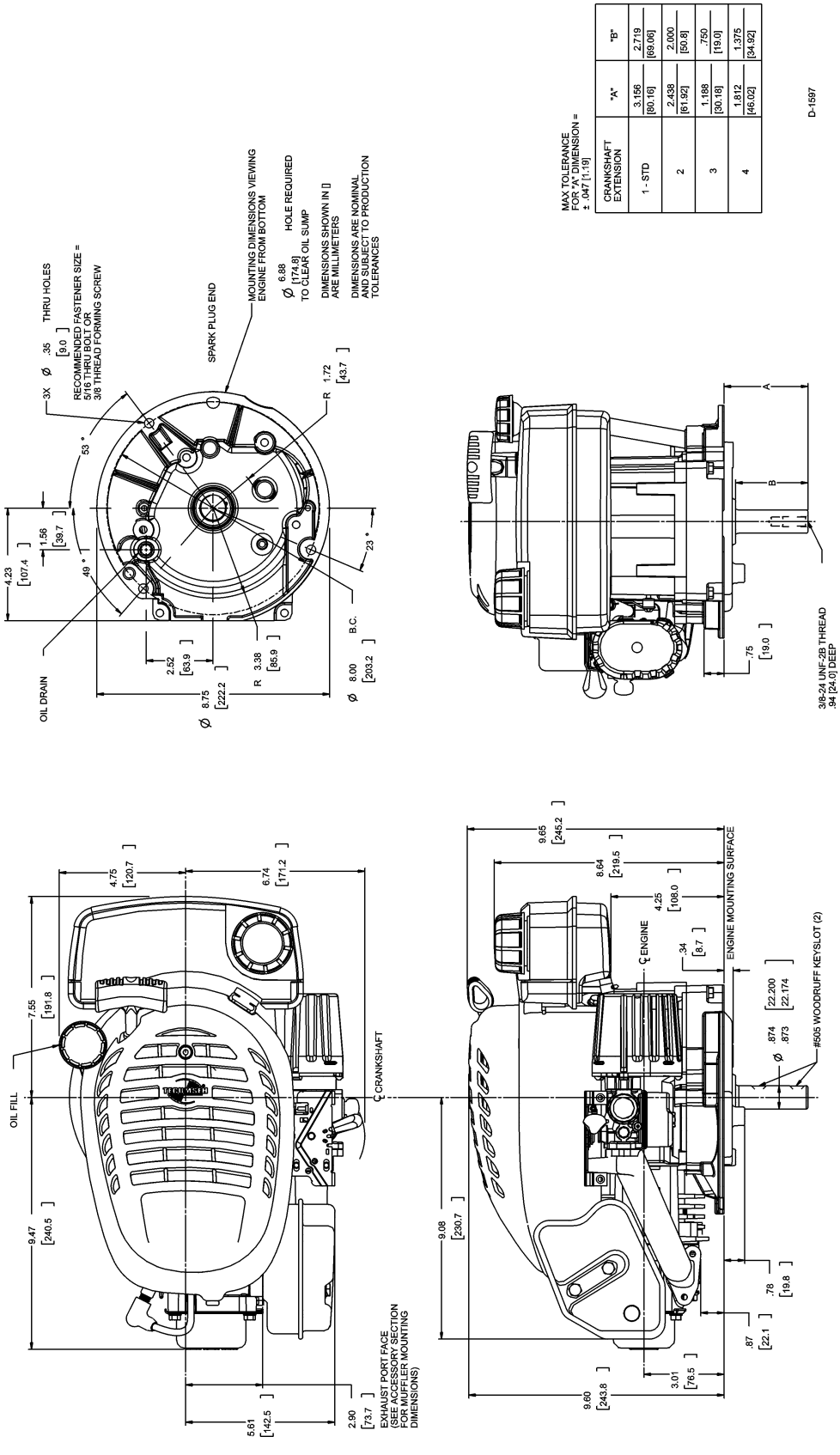
DIMENSIONAL DRAWING

VLV 126



DIMENSIONAL DRAWING

OVRM 105



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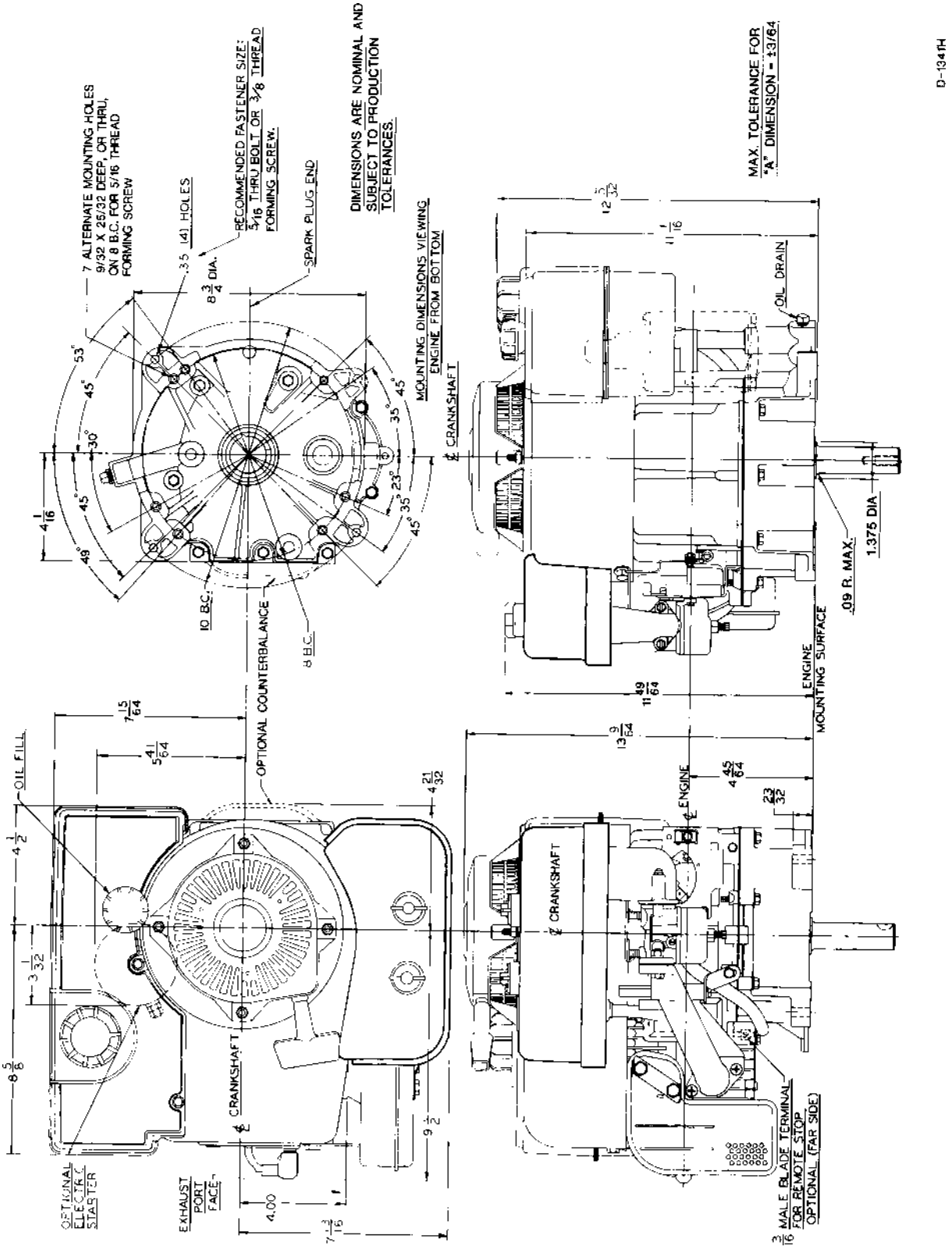

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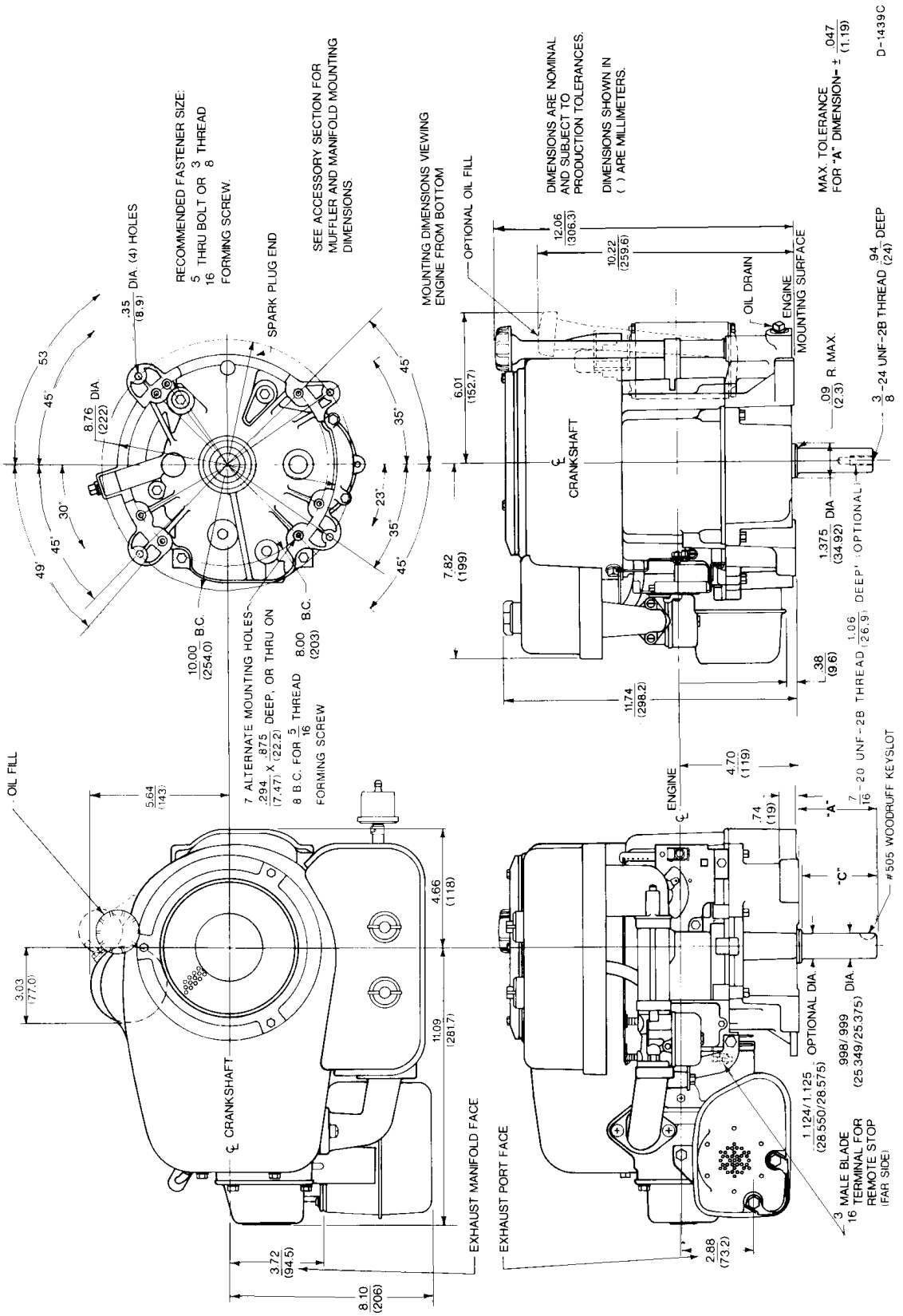
OHV125



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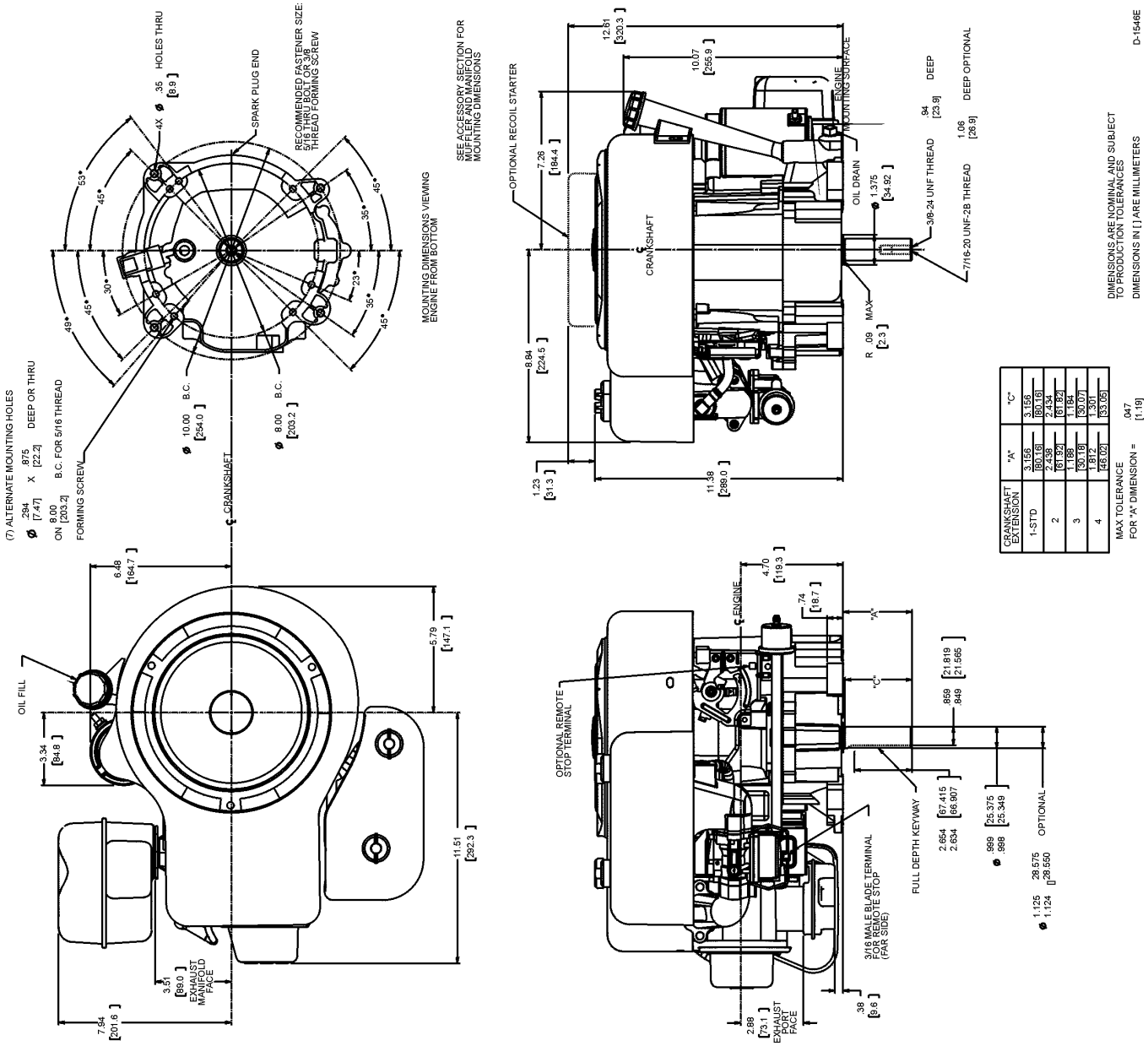
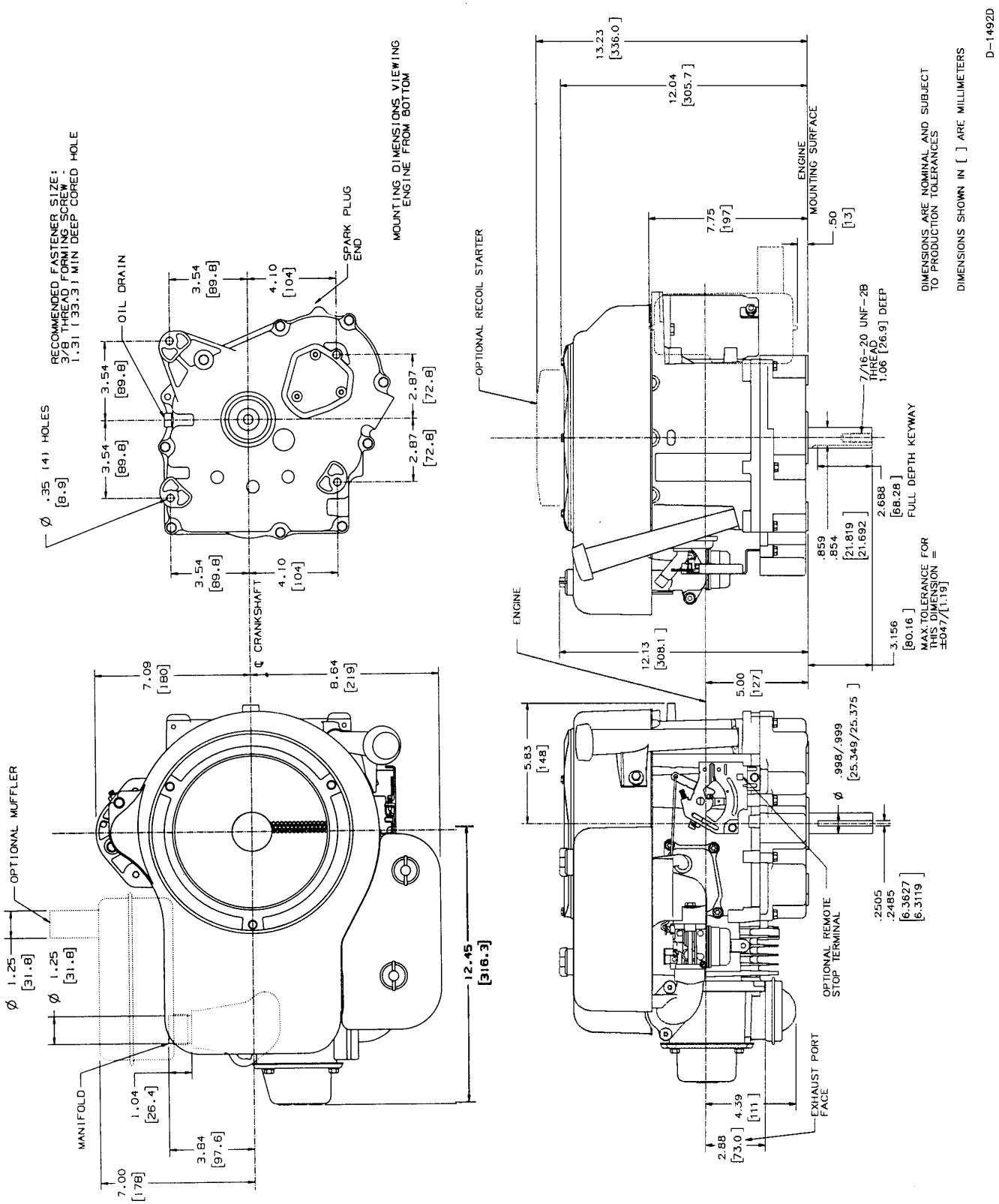


CRANKSHAFT EXTENSION	"A"	"C"
1-STD	3.156 [80.16]	3.156 [80.16]
2	2.438 [61.92]	2.438 [61.92]
3	1.187 [30.18]	1.187 [30.07]
4	1.812 [46.02]	1.301 [33.05]

DIMENSIONAL DRAWING

OHV135, OHV175



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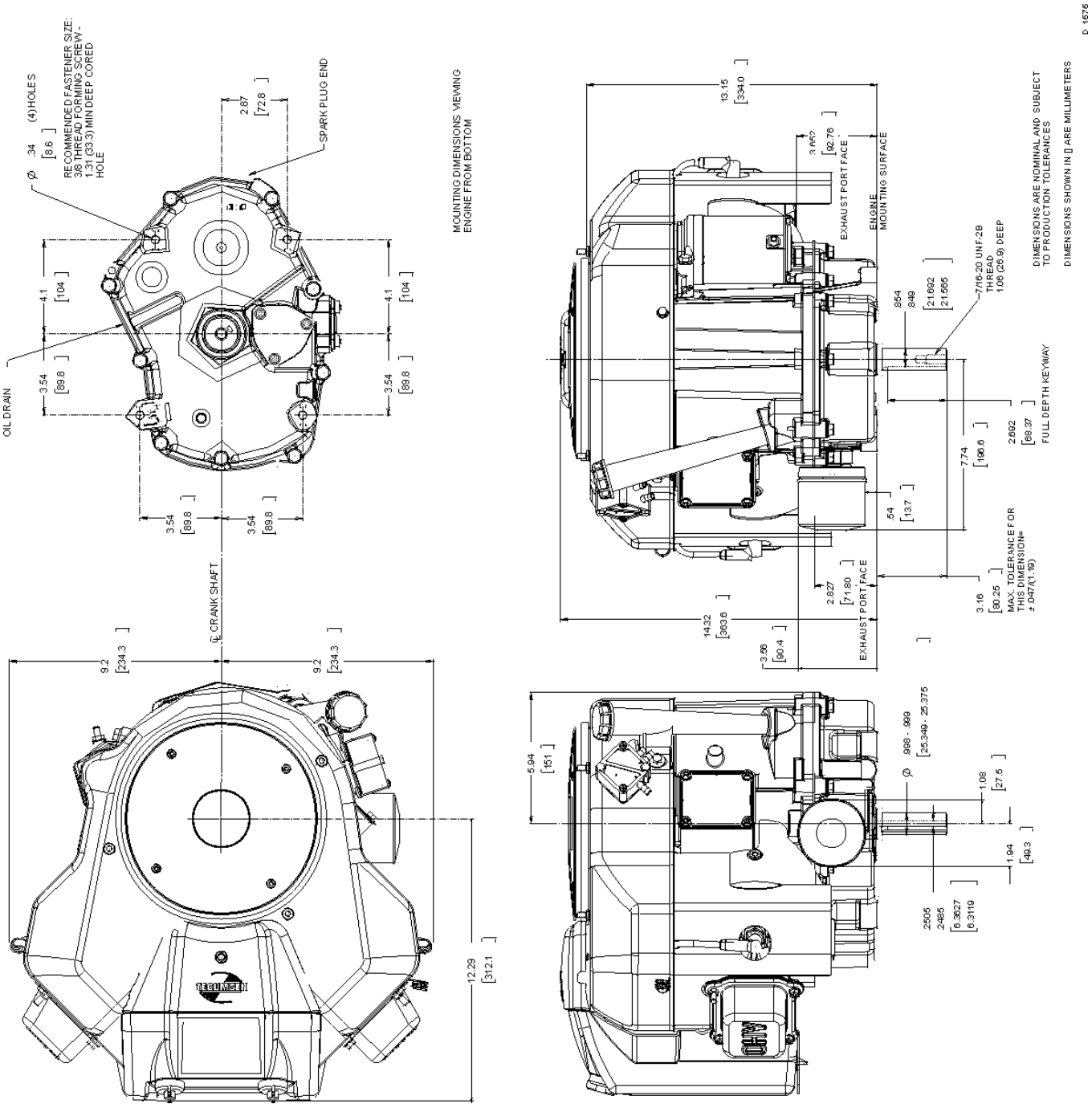
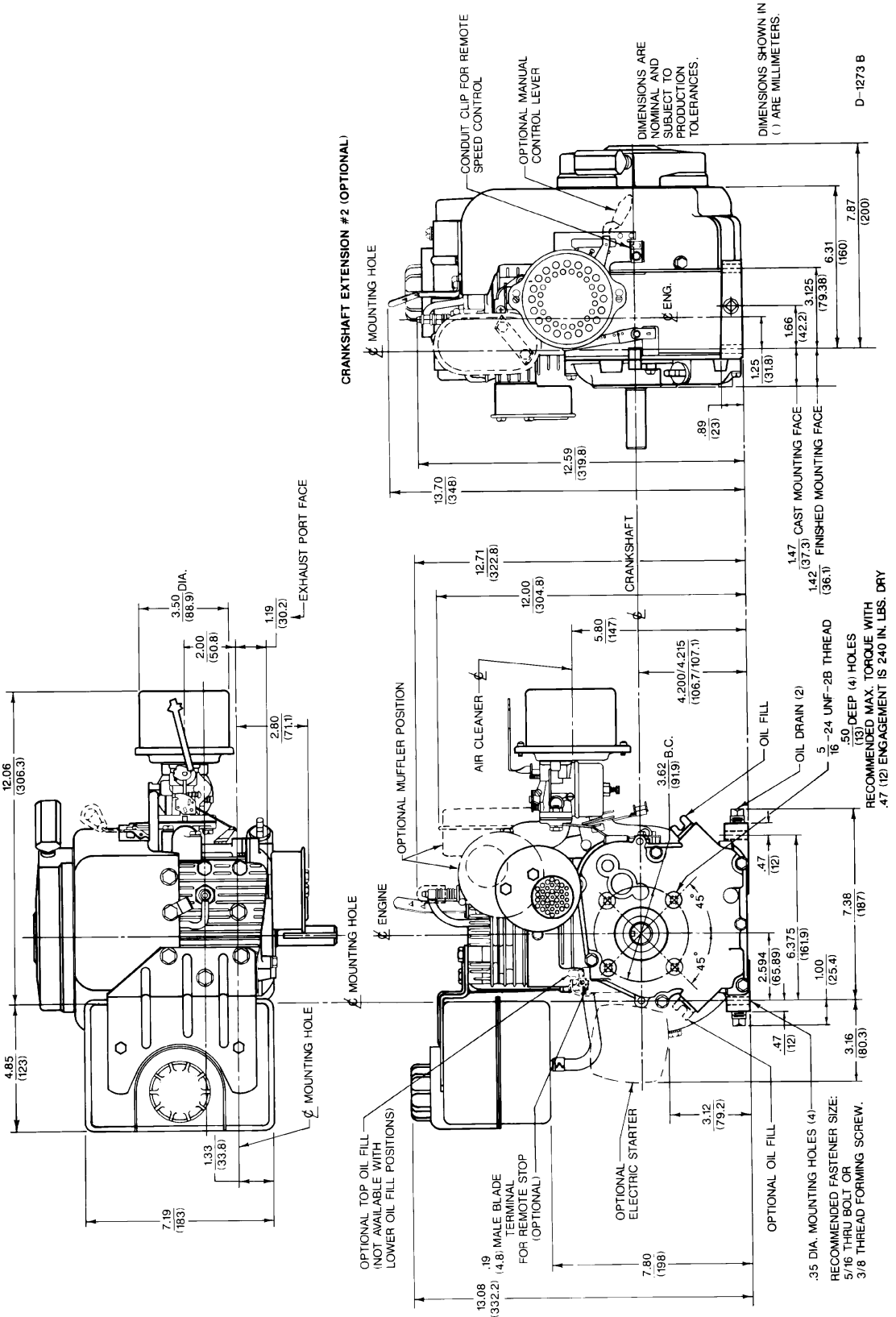


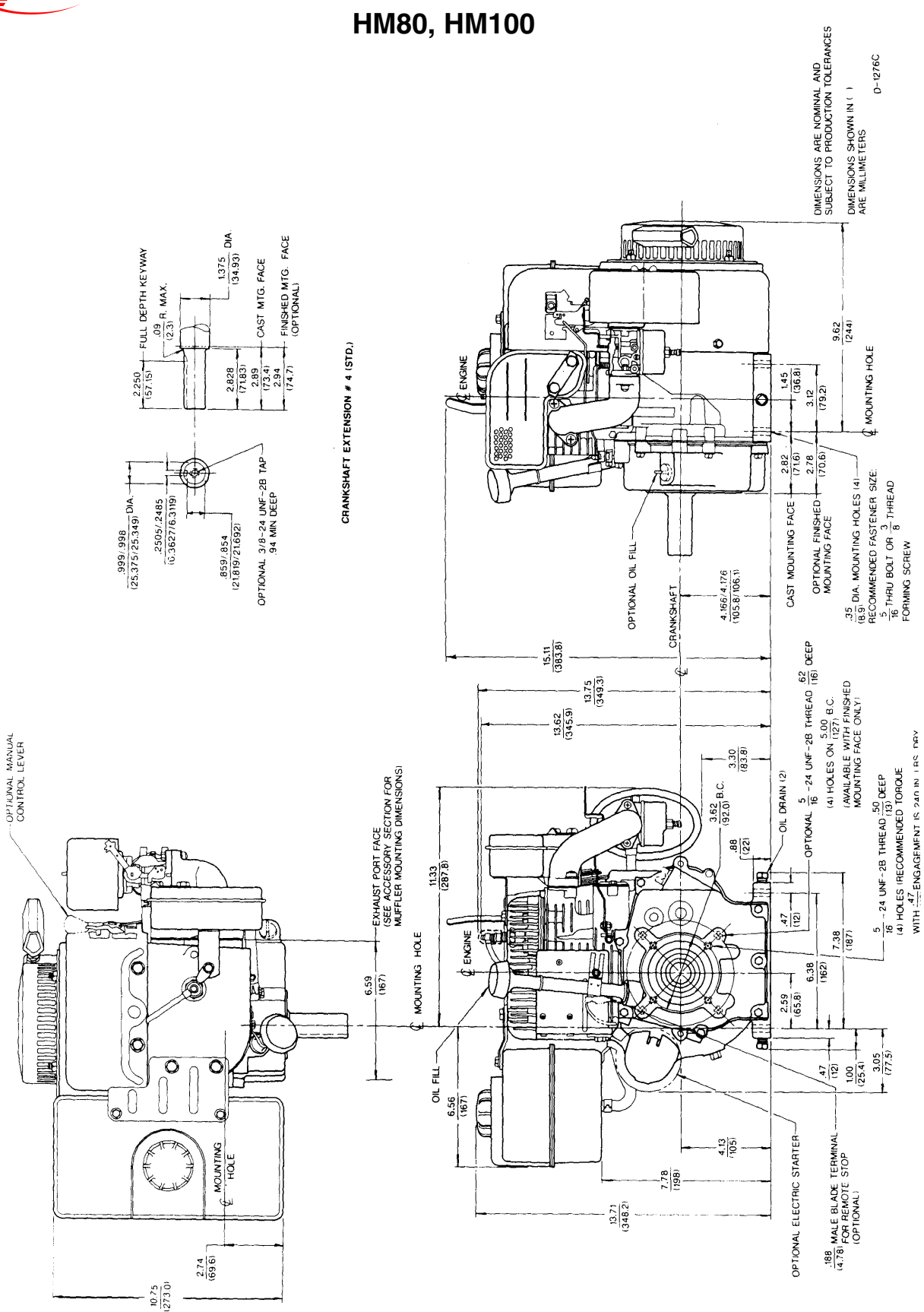
DIMENSIONAL DRAWING

H30, H35



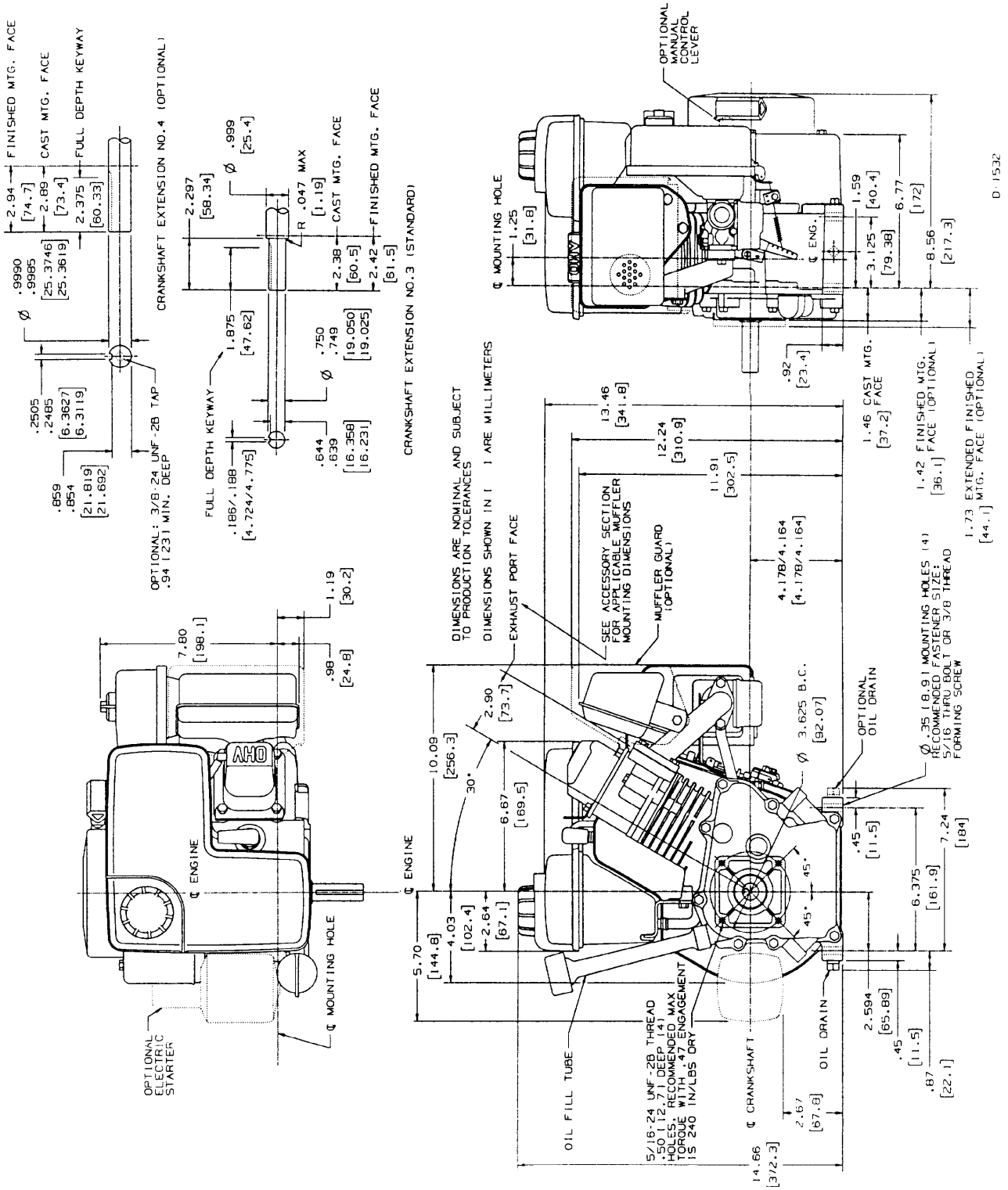
DIMENSIONAL DRAWING

HM80, HM100



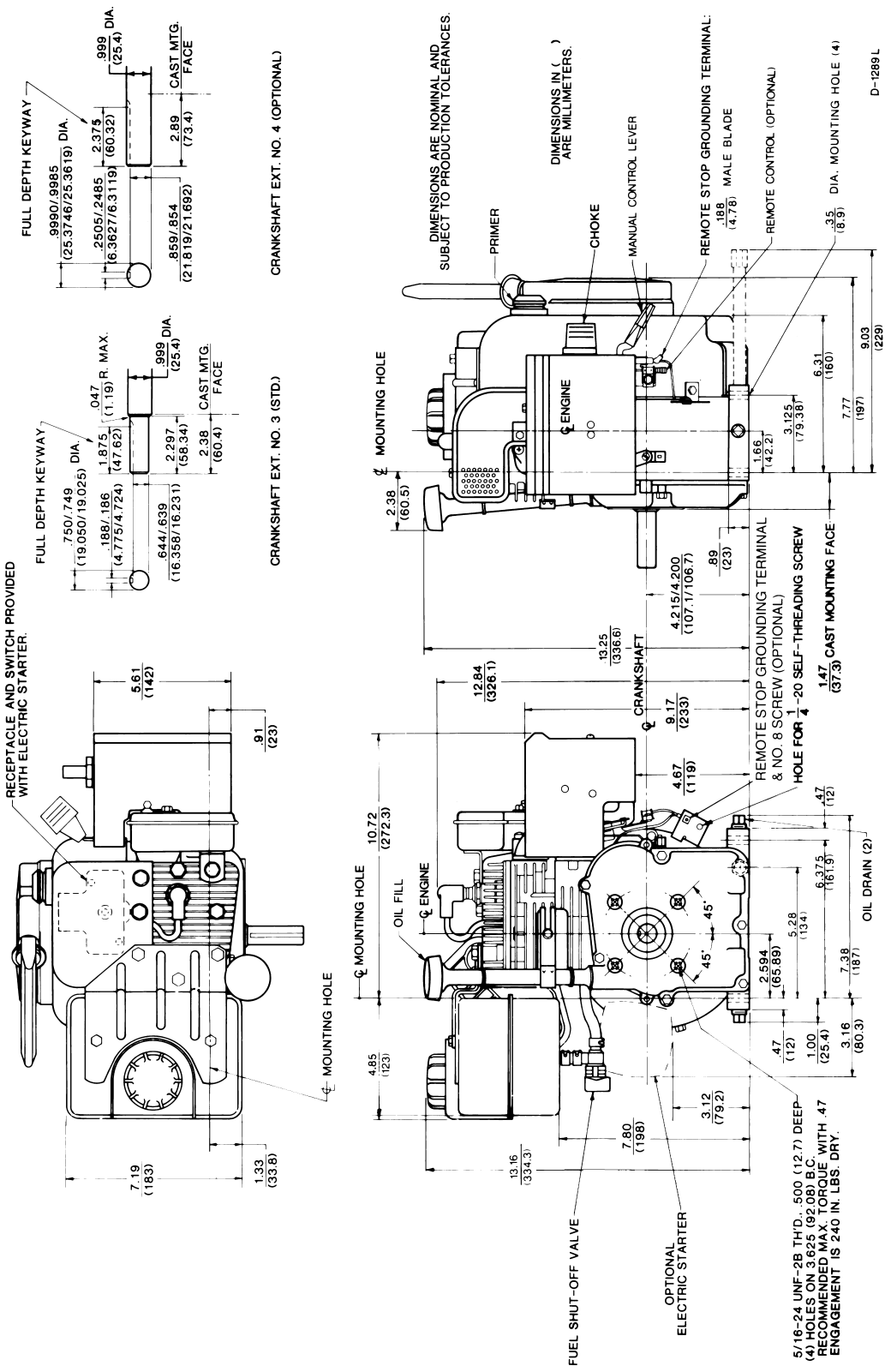
DIMENSIONAL DRAWING

OHH50, OHH55, OHH60



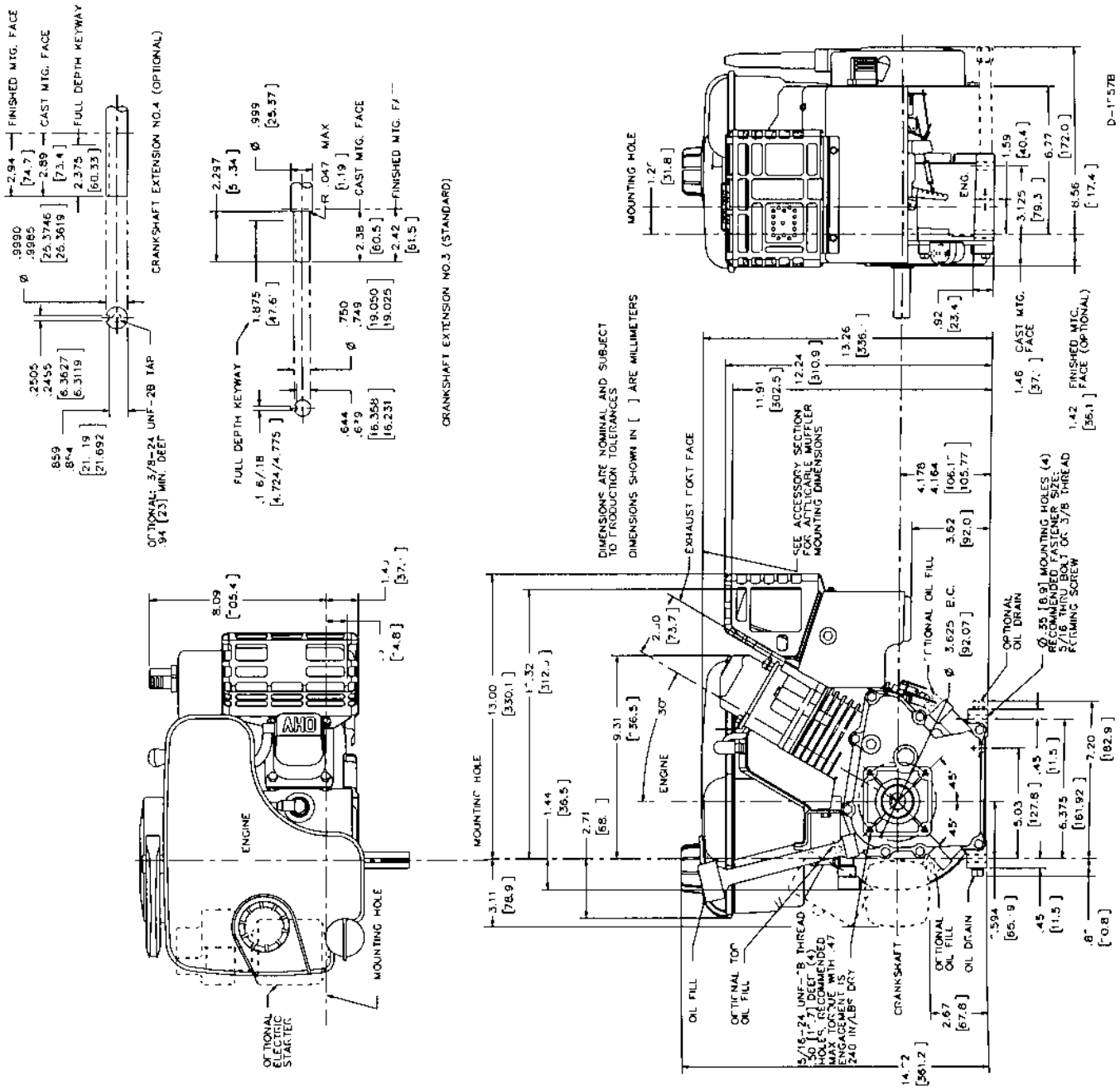
DIMENSIONAL DRAWING

HSSK50



DIMENSIONAL DRAWING

OHSK55, OHSK70



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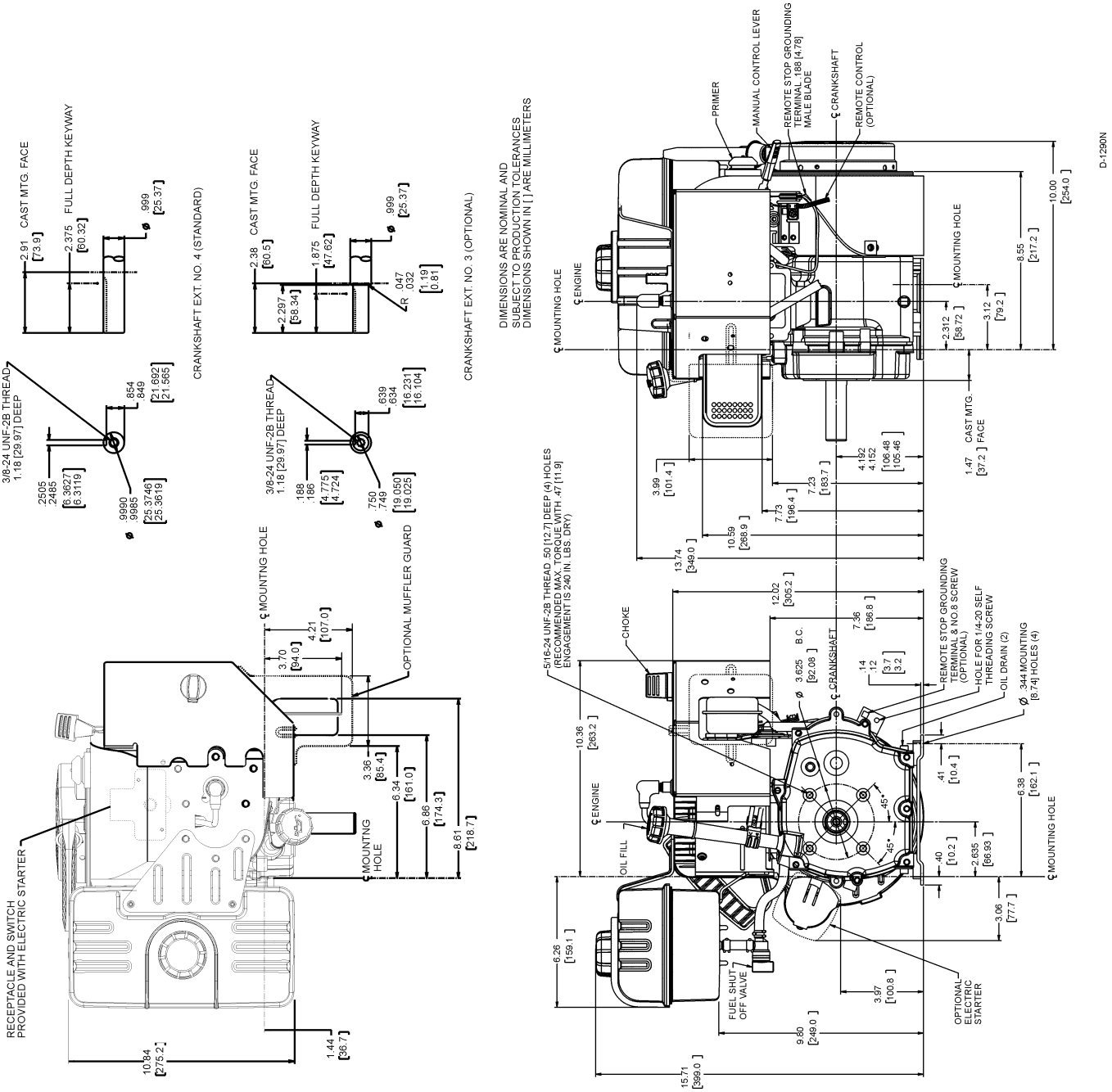
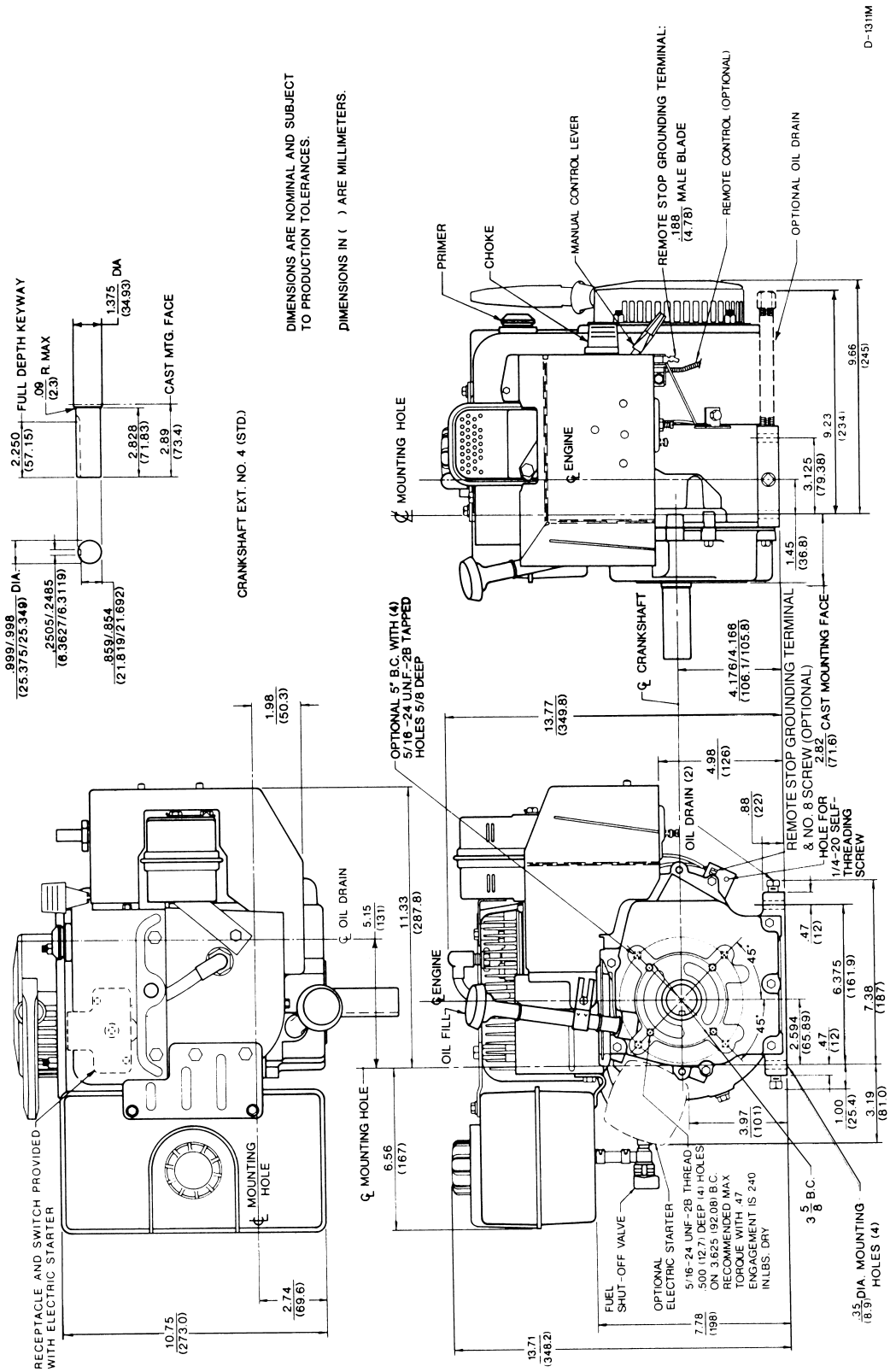


DIMENSIONAL DRAWING

HMSK80, HMSK90, HMSK100, HMSK110



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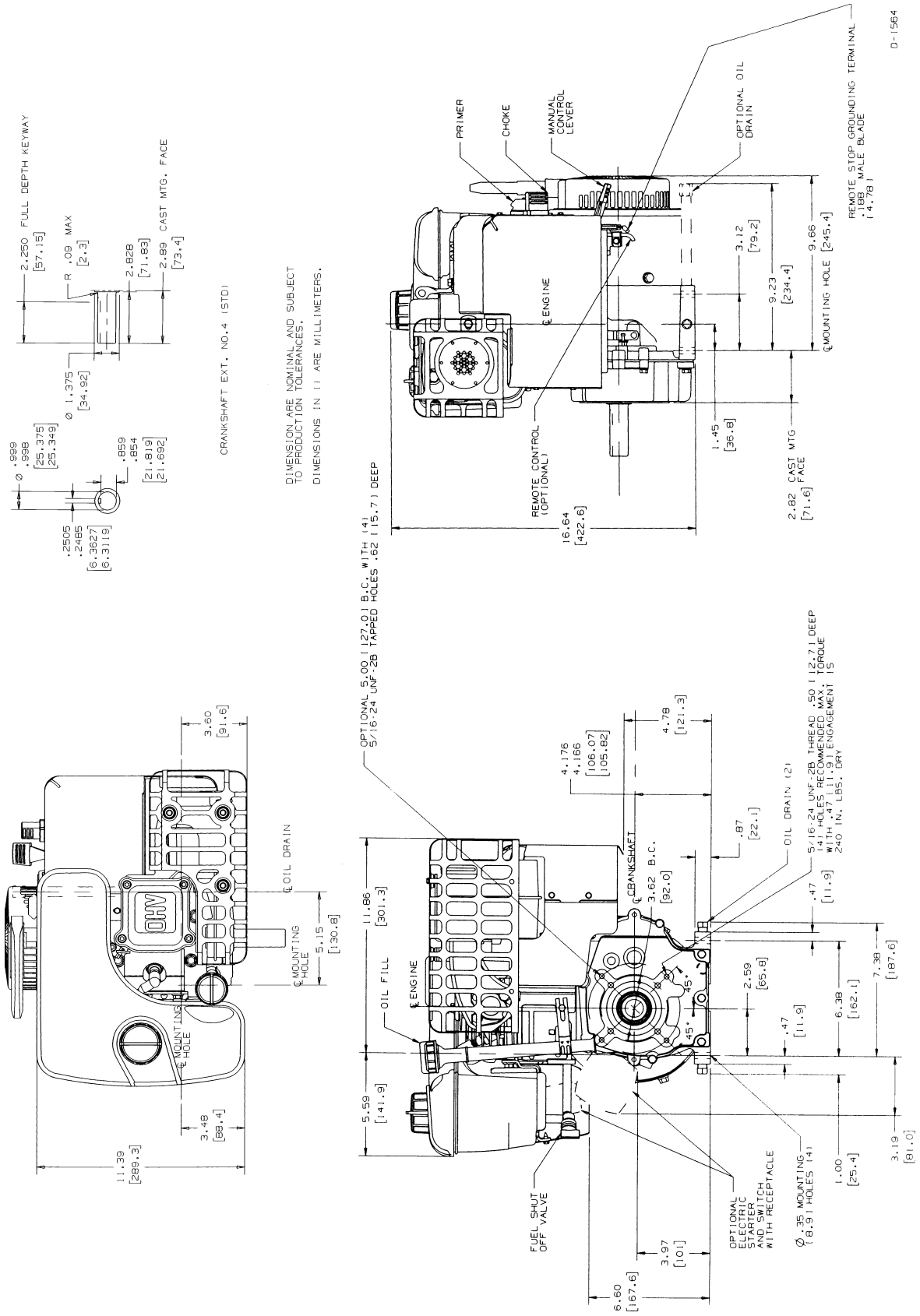
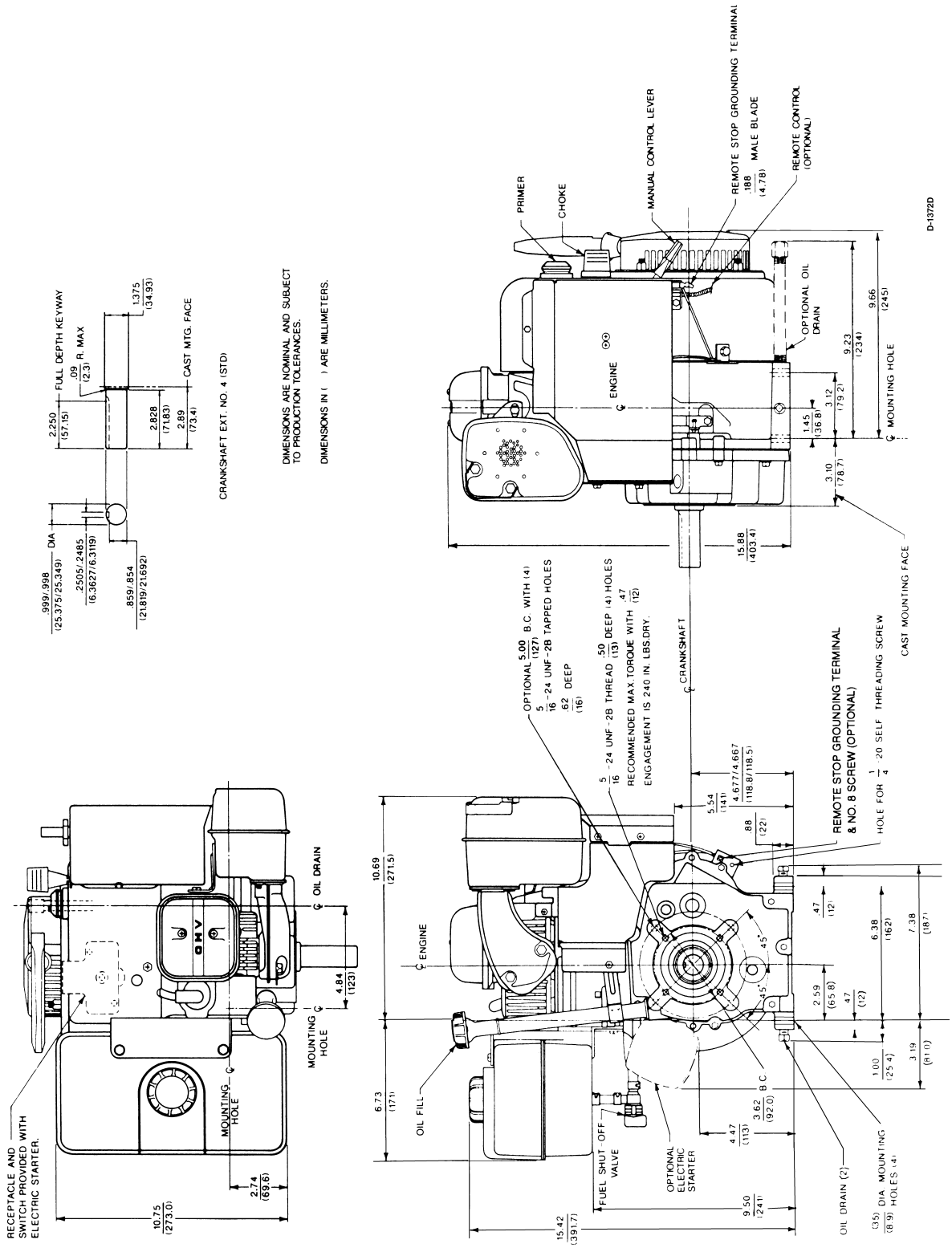
OHSK90 - 110



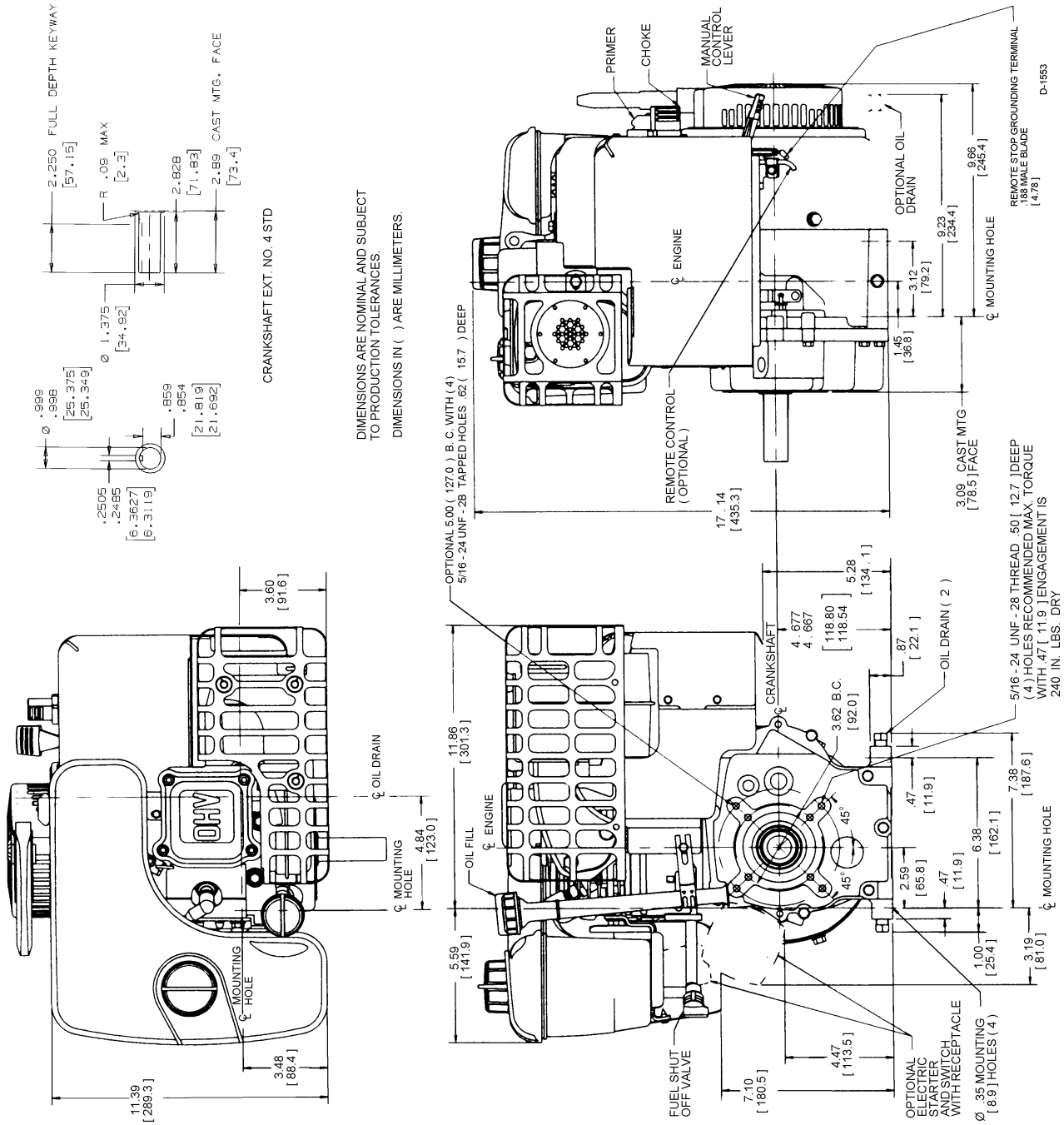
DIMENSIONAL DRAWING

OHSK120



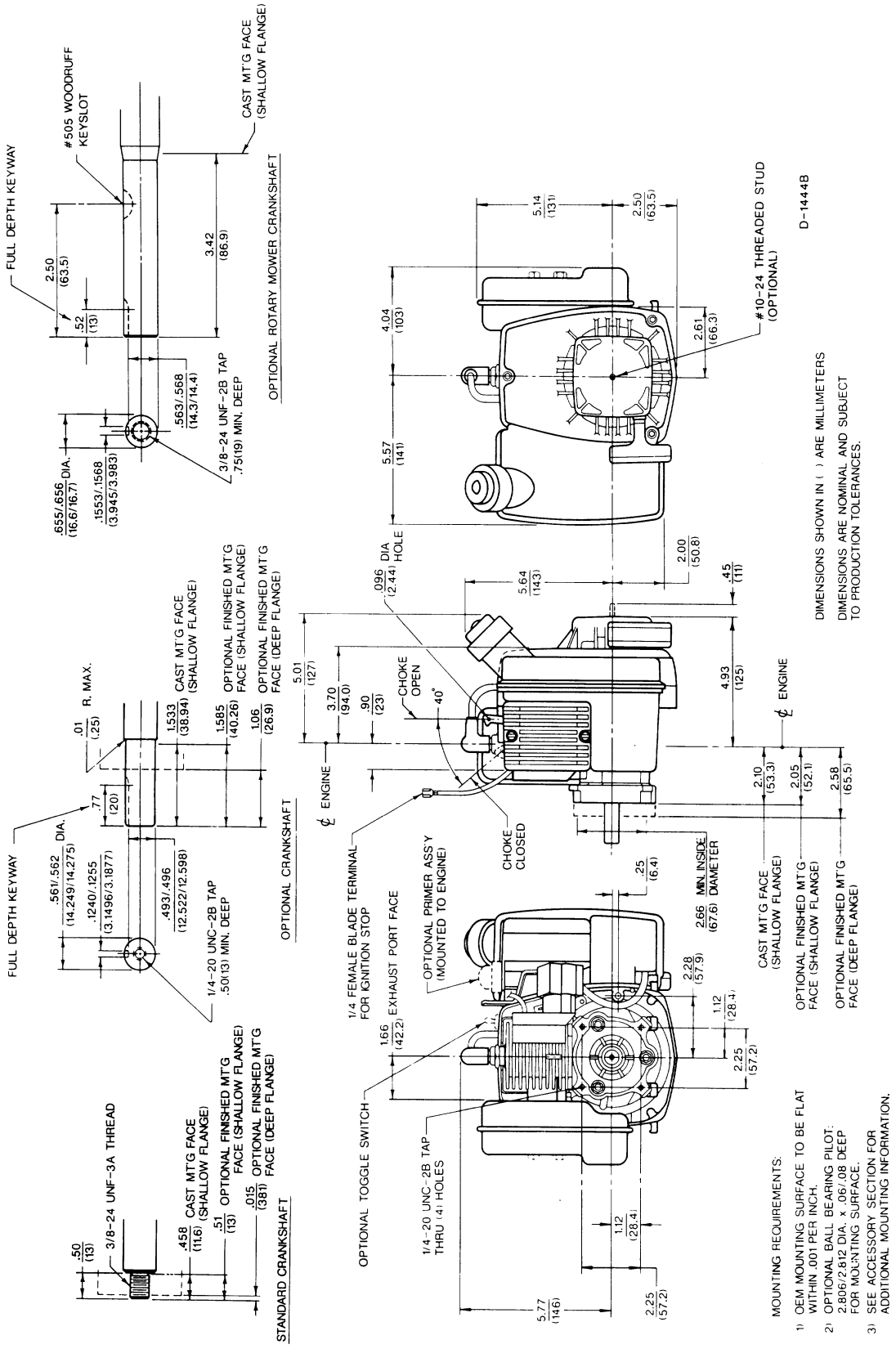
DIMENSIONAL DRAWING

OHSK130

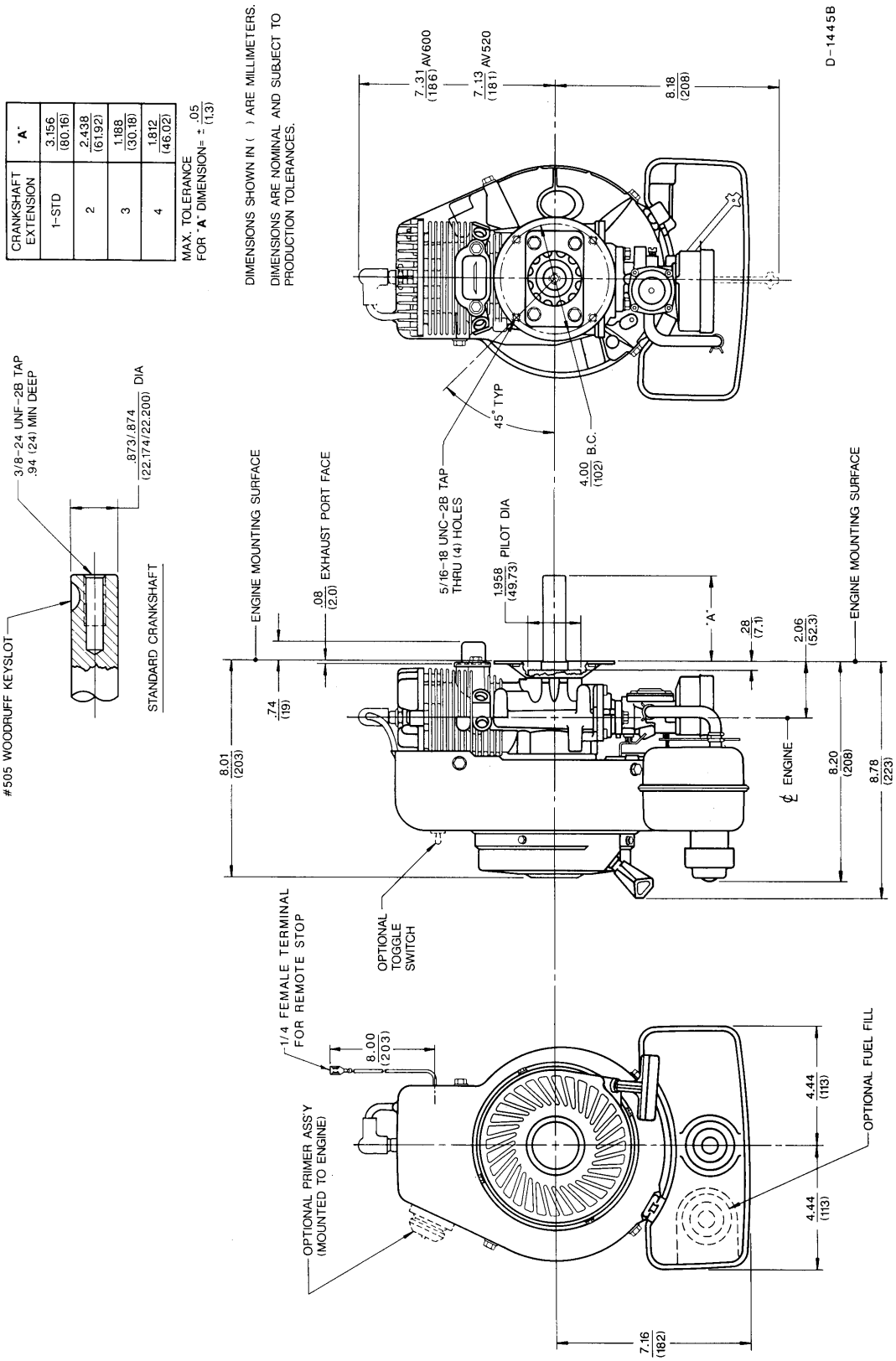


DIMENSIONAL DRAWING

TC300

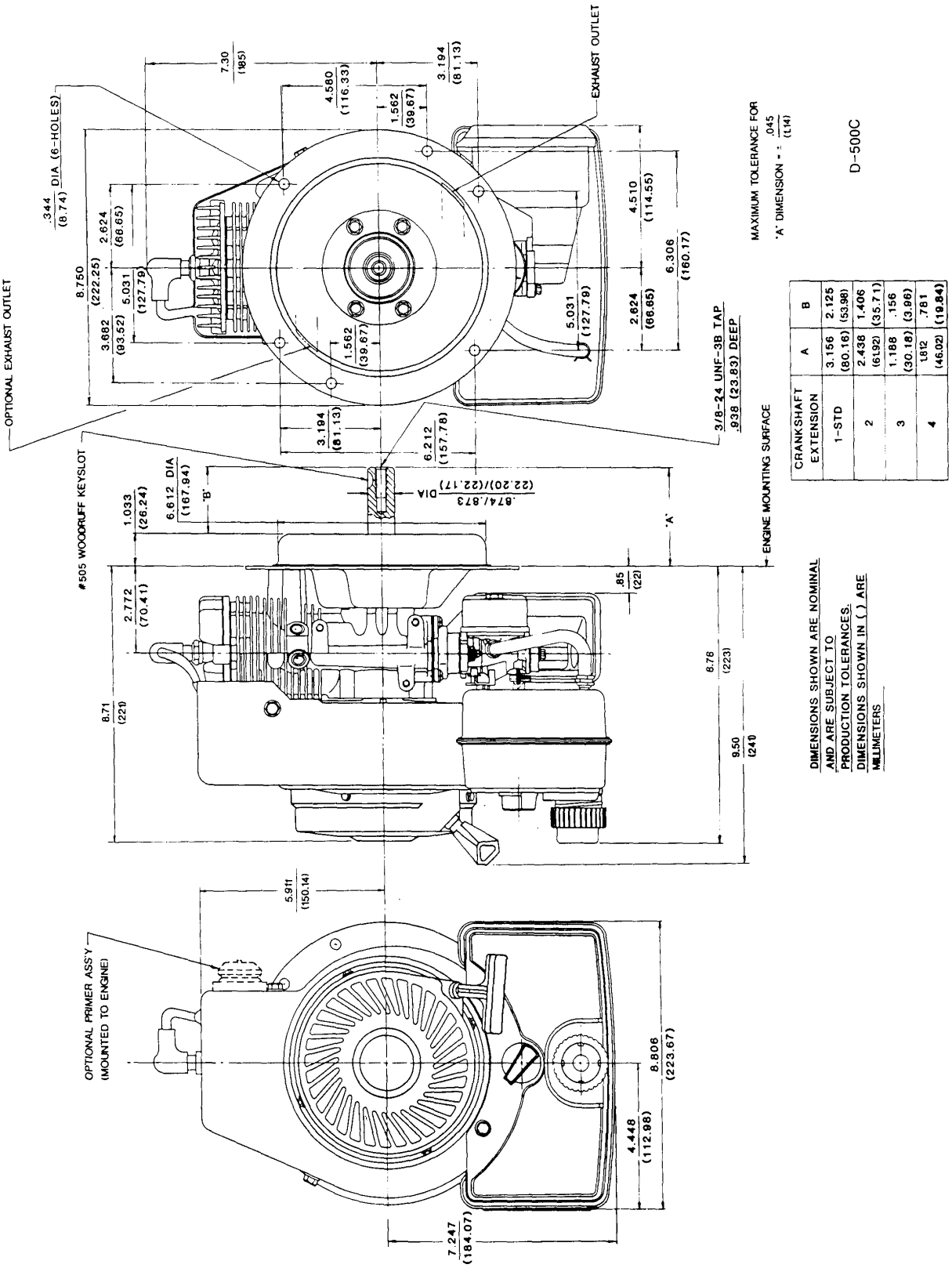


AV520


D-14458
DIMENSIONS SHOWN IN ( ) ARE MILLIMETERS.
DIMENSIONS ARE NOMINAL AND SUBJECT TO PRODUCTION TOLERANCES.
CRANKSHAFT EXTENSION
"A"
1-STD
3.156 (80.16)
2
2.438 (61.92)
3
1.188 (30.18)
4
1.812 (46.02)
MAX. TOLERANCE FOR "A" DIMENSION= ± .05 (1.3)
7.31 (186) AV600
7.13 (181) AV520
8.18 (208)
45° TYP
4.00 (102) B.C.
5/16-18 UNC-2B TAP THRU (4) HOLES
1.958 (49.73) PILOT DIA
.08 (2.0) EXHAUST PORT FACE
ENGINE MOUNTING SURFACE
"A"
.28 (7.1)
2.06 (52.3)
ENGINE MOUNTING SURFACE
.74 (19)
8.01 (203)
℄ ENGINE
8.20 (208)
8.78 (223)
3/8-24 UNF-2B TAP .94 (24) MIN DEEP
.873/.874 (22.174/22.200) DIA
#505 WOODRUFF KEYSLOT
STANDARD CRANKSHAFT
OPTIONAL TOGGLE SWITCH
1/4 FEMALE TERMINAL FOR REMOTE STOP
8.00 (203)
OPTIONAL PRIMER ASS'Y (MOUNTED TO ENGINE)
4.44 (113)
4.44 (113)
OPTIONAL FUEL FILL
7.16 (182)

DIMENSIONAL DRAWING

TVS600

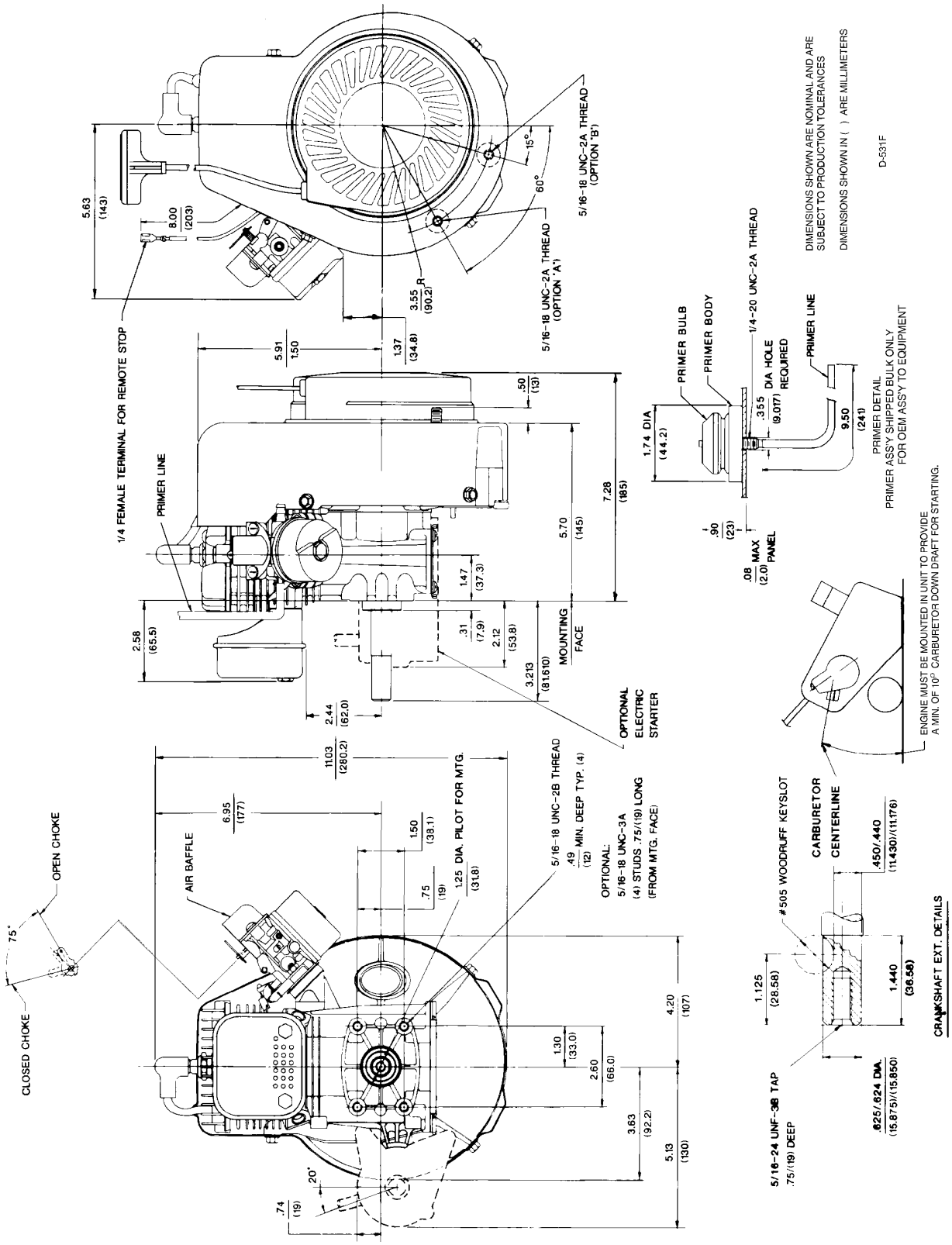


CRANKSHAFT EXTENSION	A	B
1-STD	3.156 (80.16)	2.125 (53.98)
2	2.438 (61.92)	1.406 (35.71)
3	1.188 (30.18)	.156 (3.96)
4	.812 (46.02)	.781 (19.84)

DIMENSIONS SHOWN ARE NOMINAL AND ARE SUBJECT TO PRODUCTION TOLERANCES. DIMENSIONS SHOWN IN ( ) ARE MILLIMETERS

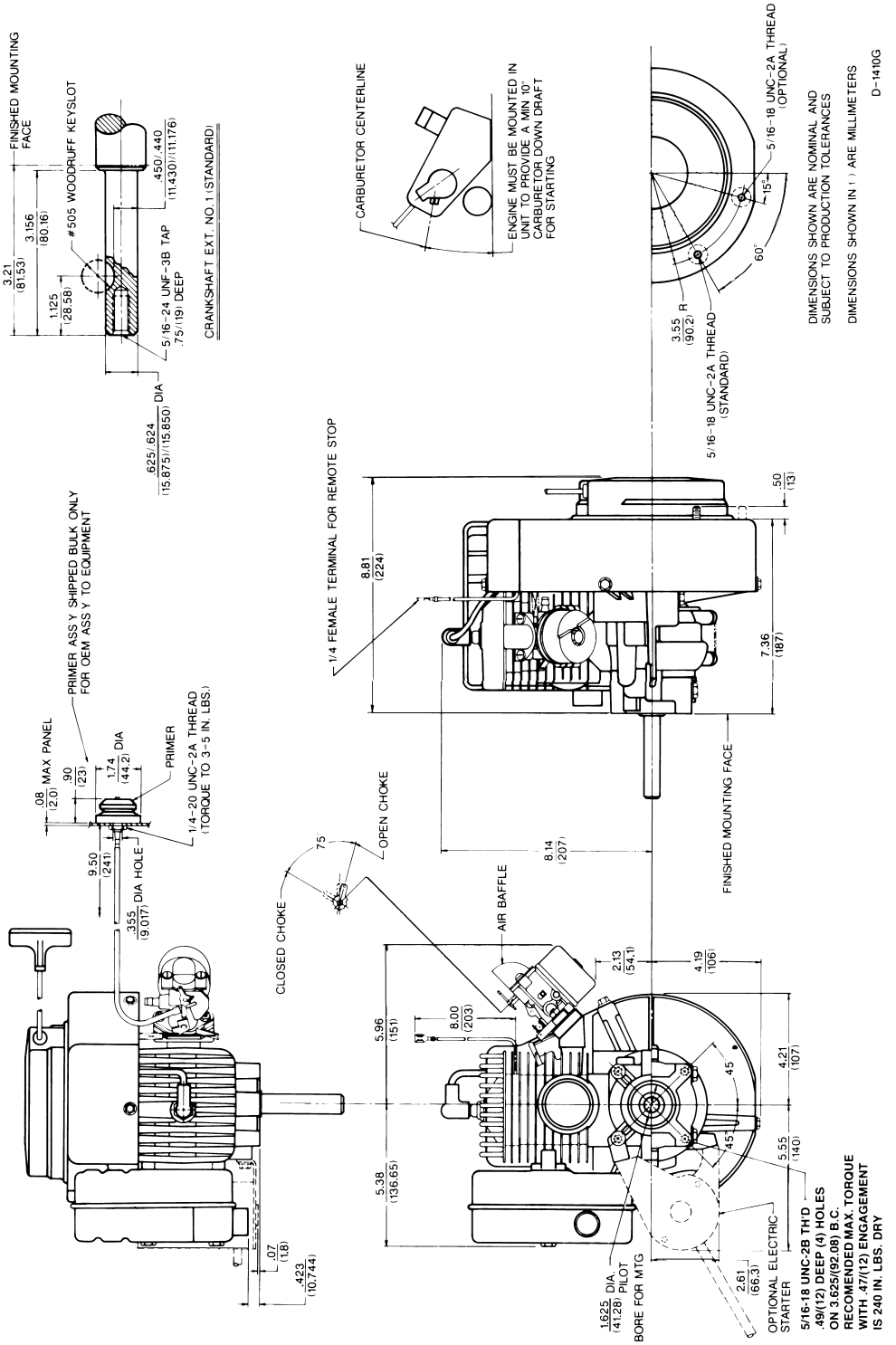
DIMENSIONAL DRAWING

HSK600



DIMENSIONAL DRAWING

HSK845



ENGINE SERVICE

"Customer service support is our foremost responsibility. Our mission is to provide our customers with the best solutions and tools available through first class Distribution, Education, Service, Sales and Marketing." Tecumseh's efficient service network is continually stocked with computer selected in-depth parts and manned by factory trained engine service mechanics. Over 150 internal factory personnel are exclusively committed to service support. Factory representatives are located in regional territories and each region is further supported by the finest Central Warehouse Distributors in the industry, the Tecumseh Support Network (TSN). Parts stocking service distributors supply all trade areas through a network of over 16,000 service dealers, conveniently located throughout the USA and Canada plus thousands more in our worldwide service organization. Factory service coordinators, who handle direct telephone communications and mail inquiries, are unique in our industry. All this adds up to a total Tecumseh commitment to unparalleled service excellence to and for all of our customers - and we back that commitment with a worldwide service organization that gets the job done.

- **Exclusive**, no limit / no penalty stock return program.
- **Profitable**, timely service parts programs.
- **24 hours** shipment of emergency orders.
- The **best** warranty program in the industry.
- **Full** shop labor rate, plus profit on parts.*
- **Tecumseh Servicing Dealer** identification programs.
- **Factory** and **TSN field school dealer education.**
- **Pre-Season** computerized parts stocking.
- The **most complete** line of transmissions, 4-cycle and 2-cycle engines available.
- USA and Canada Service Program.

*Premier and standard dealers only.

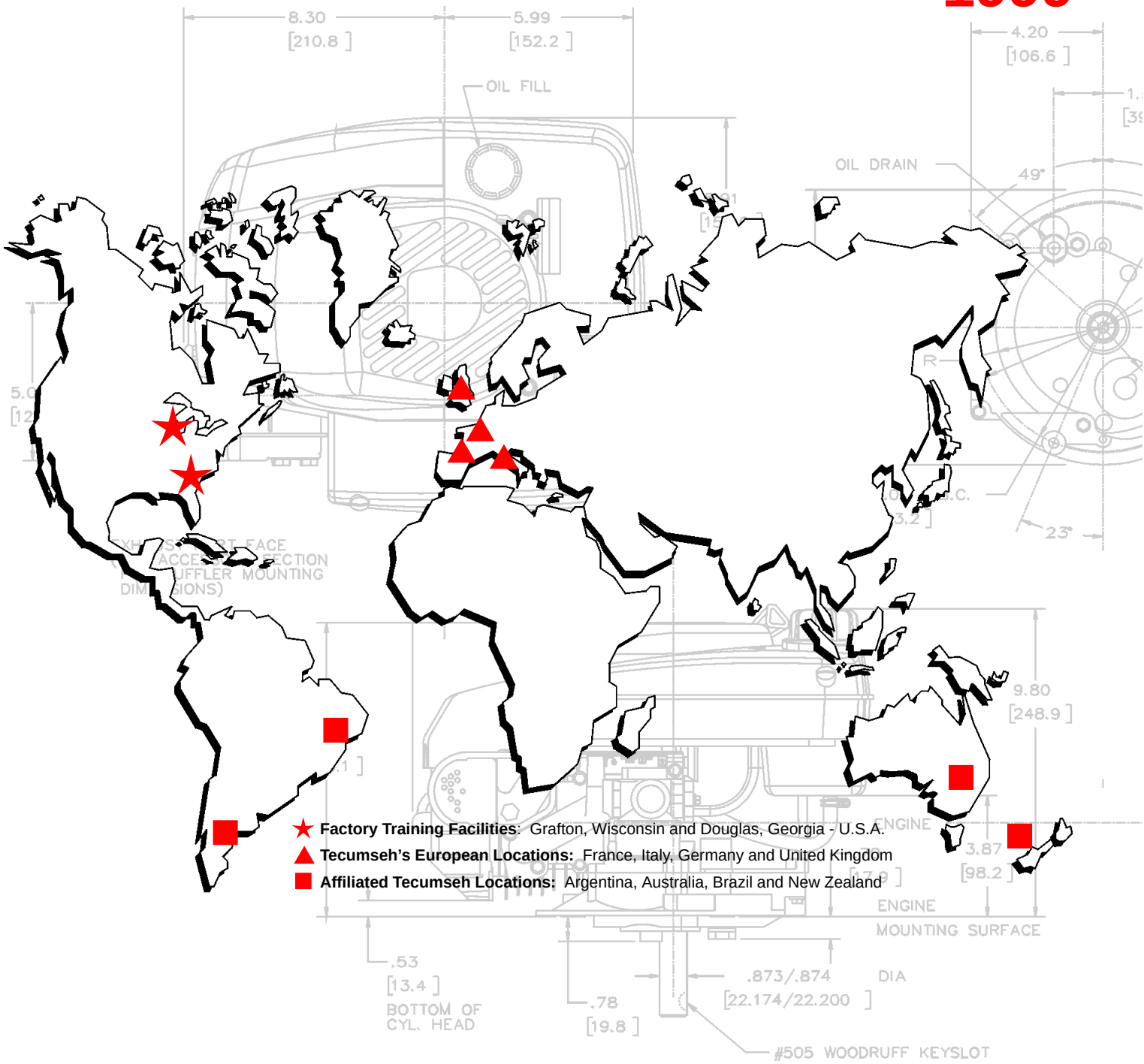
TECUMSEH®

Tecumseh Service is as close to the Tecumseh powered equipment owner as his telephone or computer. Phone 1-800-558-5402 or check out www.TecumsehPower.com for the nearest authorized Tecumseh Servicing Dealer.

F A C T O R Y T R A I N I N G

Technicians Update Seminar

1999



Technician's name: _____

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REVIEW OF EMISSION STANDARD EFFECTIVE DATES

CARB: August 1, 1995

All Lawn and Garden/Utility Engines less than 25 HP produced for sale into California after August 1, 1995 (D.O.M. of 5213) must be CARB certified and labeled to indicate compliance. There are several applications which utilize engines typically thought to be in this category that are exempt from California regulations because they are considered Farm and/or Construction equipment.

U.S. EPA: (Phase 1) September 1, 1997

All Lawn and Garden/Utility Engines less than 19kw (25 HP) produced after September 1, 1997 (D.O.M. 7244) must be EPA certified and labeled to indicate compliance. All engines used on equipment considered Farm and/or Construction exempt in California must meet EPA requirements.

Our complete snow engine product line will be certified for both CARB and EPA beginning with the 1997 model year.

CALIFORNIA & US EPA EMISSION CONTROL WARRANTY STATEMENT

The U. S. Environmental Protection Agency ("EPA"), the California Air Resources Board ("CARB") and Tecumseh Products Co. are pleased to explain the Federal and California Emission Control Systems Warranty on your new utility or lawn and garden equipment engine. In California, new 1995 and later utility and lawn and garden equipment engines must be designed, built and equipped to meet the State's stringent anti-smog standards. In other states, new 1997 and later model year engines must be designed, built and equipped, at the time of sale, to meet the U.S. EPA regulations for small non-road engines. Tecumseh Products Co. will warrant the emission control system on your utility or lawn and garden equipment engine for the periods of time listed below, provided there has been no abuse, neglect, unapproved modification, or improper maintenance of your utility or lawn and garden equipment engine.

Your emission control system may include parts such as the carburetor, ignition system and exhaust system. Also included may be the compression release system and other emission-related assemblies.

Where a warrantable condition exists, Tecumseh Products Co. will repair your utility or lawn and garden equipment engine at no cost to you for diagnosis, parts and labor.

MANUFACTURER'S EMISSION CONTROL SYSTEM WARRANTY COVERAGE

Emission control systems on 1995 and later model year California utility and lawn and garden equipment engines are warranted for two years as hereinafter noted. In other states, 1997 and later model year engines are also warranted for two years. If, during such warranty period, any emission-related part on your engine is defective in materials or workmanship, the part will be repaired or replaced by Tecumseh Products Co.

OWNER'S WARRANTY RESPONSIBILITIES

As the utility or lawn and garden equipment engine owner, you are responsible for the performance of the required maintenance listed in your Owner's Manual, but Tecumseh Products Co. will not deny warranty solely due to the lack of receipts or for your failure to provide written evidence of the performance of all scheduled maintenance.

As the utility or lawn and garden equipment engine owner, you should, however, be aware that Tecumseh Products Co. may deny you warranty coverage if your utility or lawn and garden equipment or a part thereof has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your utility or lawn and garden equipment engine to a Tecumseh Authorized Service Outlet (any Tecumseh Registered Service Dealer, Tecumseh Authorized Service Distributor or Tecumseh Central Warehouse Distributor) as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

Warranty service can be arranged by contacting either a Tecumseh Authorized Service Outlet or by contacting Tecumseh Products Co., c/o Service Manager, Engine and Transmission Group Service Division, 900 North Street, Grafton, WI 53024-1499. Telephone 1-414-377-2700, or see your local telephone yellow pages under "Engines, Gasoline" for the name, address and telephone number of a Tecumseh Authorized Service Outlet near you.

IMPORTANT NOTE

This warranty statement explains your rights and obligations under the Emission Control System Warranty ("ECS Warranty") which is provided to you by Tecumseh Products Co. pursuant to California law. Tecumseh Products Co. also provides to original purchasers of new Tecumseh Products Co. engines. The Tecumseh Products Co. Limited Warranties for New Tecumseh Engine and Electronic Ignition Modules ("Tecumseh Products Co. Warranty") which is enclosed with all new Tecumseh Products Co. engines on a separate sheet. The ECS Warranty applies only to the emission control system of your new engine. To the extent that there is any conflict in terms between the ECS Warranty and the Tecumseh Products Co. Warranty, the ECS Warranty shall apply except in any circumstances in which the Tecumseh Products Co. Warranty may provide a longer warranty period. Both the ECS Warranty and the Tecumseh Products Co. Warranty describe important rights and obligations with respect to your new engine.

Warranty service can only be performed by a Tecumseh Products Co. Authorized Service Outlet, or by Tecumseh Products Co. at its factory in Grafton, WI. At the time of requesting warranty service, evidence must be presented of the date of sale to the original purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the products to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of any engine or any part(s) thereof submitted for inspection and/or warranty work.

If you have any questions regarding your warranty rights and responsibilities, you should contact Tecumseh Products Co. at 1-414-377-2700.

EMISSION CONTROL SYSTEM WARRANTY

Emission Control System Warranty ("ECS Warranty") for 1995 and later model year California utility and lawn and garden equipment engines (for other states, 1997 and later model year engines):

A. **APPLICABILITY:** This warranty shall apply to 1995 and later model year California utility and lawn and garden equipment engines (for other states, 1997 and later model year engines). The ECS Warranty Period shall begin on the date the new engine or equipment is delivered to its original, end-use purchaser, and shall continue for 24 consecutive months thereafter.

B. **GENERAL EMISSIONS WARRANTY COVERAGE:** Tecumseh Products Co. warrants to the original, end-use purchaser of the new engine or equipment and to each subsequent purchaser that each of its utility and lawn and garden equipment engines is:

   1. Designed, built and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code, and

2. Free from defects in materials and workmanship which, at any time during the ECS Warranty Period, will cause a warranted emissions-related part to fail to be identical in all material respects to the part as described in the engine manufacturer's application for certification.

C. The ECS Warranty only pertains to emissions-related parts on your engine, as follows:

1. Any warranted, emissions-related parts which are not scheduled for replacement as required maintenance in the Owner's Manual shall be warranted for the ECS Warranty Period. If any such part fails during the ECS Warranty Period, it shall be repaired or replaced by Tecumseh Products Co. according to Subsection 4 below. Any such part repaired or replaced under the ECS Warranty shall be warranted for any remainder of the ECS Warranty Period.
2. Any warranted, emissions-related part which is scheduled only for regular inspection as specified in the Owner's Manual shall be warranted for the ECS Warranty Period. A statement in such written instructions to the effect of "repair or replace as necessary", shall not reduce the ECS Warranty Period. Any such part repaired or replaced under the ECS Warranty shall be warranted for the remainder of the ECS Warranty Period.
3. Any warranted, emissions-related part which is scheduled for replacement as required maintenance in the Owner's Manual, shall be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by Tecumseh Products Co. according to Subsection 4 below. Any such emissions-related part repaired or replaced under the ECS Warranty, shall be warranted for the remainder of the ECS Warranty Period prior to the first scheduled replacement point for such emissions-related part.
4. Repair or replacement of any warranted, emissions-related part under this ECS Warranty shall be performed at no charge to the owner at a Tecumseh Authorized Service Outlet.
5. The owner shall not be charged for diagnostic labor which leads to the determination that a part covered by the ECS Warranty is in fact defective, provided that such diagnostic work is performed at a Tecumseh Authorized Service Outlet.
6. Tecumseh Products Co. shall be liable for damages to other original engine components or approved modifications proximately caused by a failure under warranty of an emission-related part covered by the ECS Warranty.
7. Throughout the ECS Warranty Period, Tecumseh Products Co. shall maintain a supply of warranted emission-related parts sufficient to meet the expected demand for such emission-related parts.
8. Any Tecumseh Products Co. authorized and approved emission-related replacement part may be used in the performance of any ECS Warranty maintenance or repair and will be provided without charge to the owner. Such use shall not reduce Tecumseh Products Co. ECS Warranty obligations.
9. Unapproved add-on or modified parts may not be used to modify or repair a Tecumseh Products Co. engine. Such use voids this ECS Warranty and shall be sufficient grounds for disallowing an ECS Warranty claim. Tecumseh Products Co. shall not be liable hereunder for failures of any warranted parts of a Tecumseh Products Co. engine caused by the use of such an unapproved add-on or modified part.

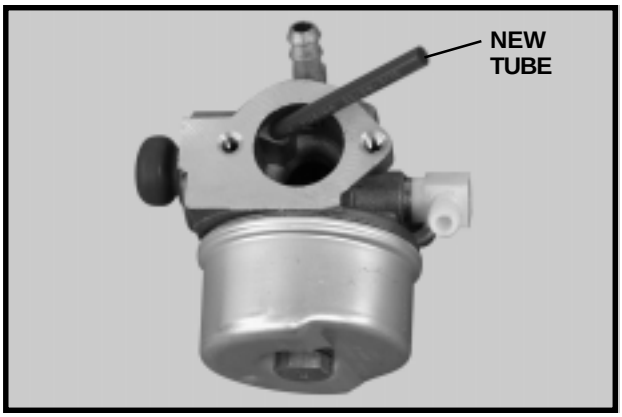
EMISSION-RELATED PARTS INCLUDE THE FOLLOWING:

1. Carburetor Assembly and its Internal Components
   a) Fuel filter
   b) Carburetor gaskets
   c) Intake pipe
2. Air Cleaner Assembly
   a) Air filter element
3. Ignition System, including:
   a) Spark plug
   b) Ignition module
   c) Flywheel assembly
4. Catalytic Muffler (if so equipped)
   a) Muffler gasket (if so equipped)
   b) Exhaust manifold (if so equipped)
5. Crankcase Breather Assembly and its Components
   a) Breather connection tube

4 Cycle Product News

VENT TUBE EXTENSION

The Series “8” carburetor used on many LEV and OVRM series engines has a new extension tube added to the atmospheric vent passage. This tube part number **632766** was added to stabilize the atmospheric pressure in the bowl, improving the run quality. This was done in combination with carburetor calibration changes. This tube is serviceable and must be installed to a precise depth using tool part number **670343** to maintain emission standards and prevent blockage of the atmospheric vent passage. Do not use this tube on applications that it was not originally on. Always verify that the engine requires this tube by checking the parts list.

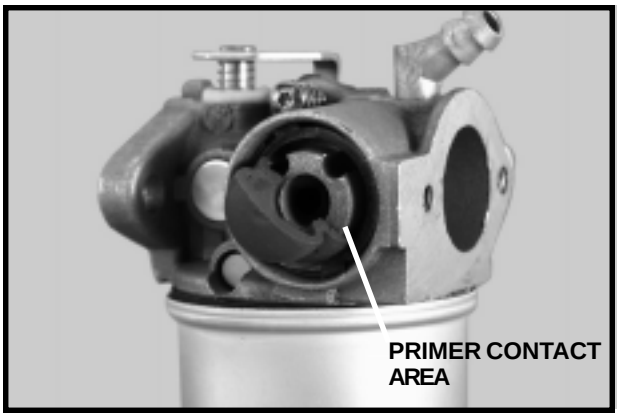


COLD START HANG TAG

Tecumseh has gone through extensive efforts to educate the customer in the proper procedures used to prime today’s emissions engine. If a customer comments about an engine that is hard to start, it may be helpful to ask them to demonstrate the method they use when priming. In most cases there is not any engine problem and we have found improper priming is the cause. Most recently we have created a hang tag with instructions on the **“Thumbs Up”** five prime technique. This cold start procedure is outlined in the owners manuals and is illustrated by the use of a decal on the blower housing or fuel tank on some engines. It requires that the thumb be used to prime because the thumbs larger surface area covers the primer bulb better. **Remember always to wait two seconds between primes.**

HOW THE NEW EMISSIONS PRIMER WORKS

The primer used on emission grade carburetors has been designed to provide the precise amount of fuel being delivered with each compression. This style of primer must squarely make contact with the inside casting surface of the carburetor before any prime occurs. This will prevent air from being forced back into the air filter and send the prime charge into the carburetor. A brief delay of two seconds between each prime will assure that the primer has recovered ample air to provide an adequate prime charge.

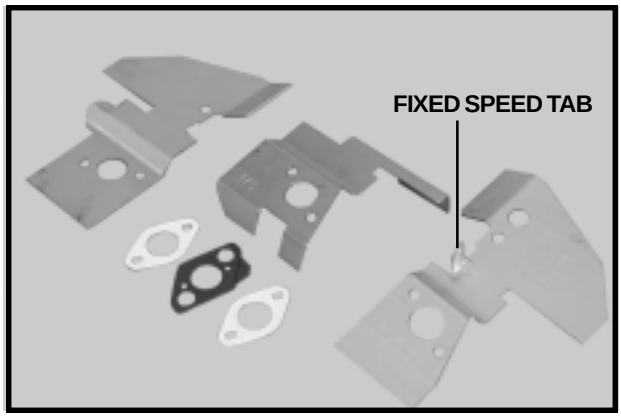


LEV/VLV VALVE STEM SEAL CHANGE

A design change has been made to the intake valve stem seal used on LEV and VLV engines. The seal area which makes contact with the casting surface in the valve box has been enlarged to improve sealing. A better seal on the valve stem will allow the elimination of an o-ring that had been used on engines prior to this. We have also reissued Service Bulletin **"406"** which references kit number **730617** to include the new seal. Removal of the intake valve may cause damage to the seal, always install a new seal when this type of repair work is done.

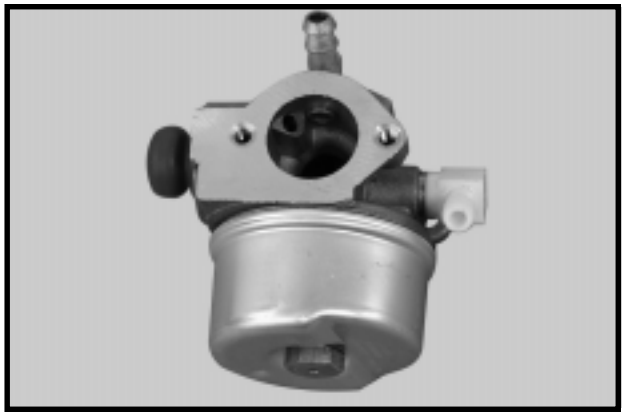
VLV AIR BAFFLE CHANGE

The fiber baffle/gasket used between the carburetor and cylinder block on the VLV engine has been changed to a metal baffle. A gasket is used on each side of the metal baffle which replaces the fiber gasket (an instruction sheet is included for installation). This baffle allows for cooler running carburetor bowl temperatures eliminating the occasional carburetor popping during high ambient temperature operation. We also created a bendable high speed adjustment tab as part of the baffle for fixed speed applications. Speed adjustments if necessary are done by bending the tab to the right to increase speed and to the left to decrease speed.



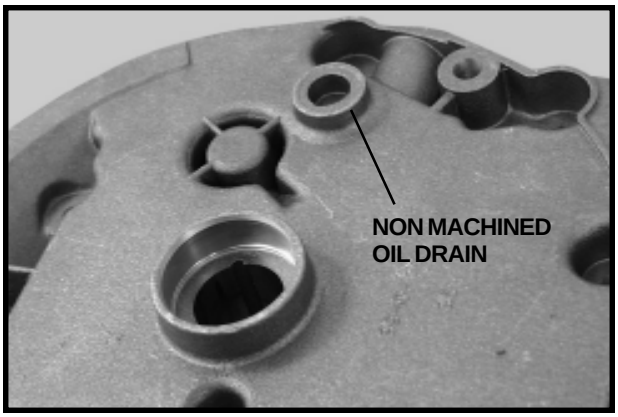
SERIES 11 CARBURETOR

This is possibly the most innovative and exciting primer type carburetor to be introduced since emissions standards were established. The series **"11"** carburetor is being released in limited quantities this year. Its design helps to eliminate the cold blooded nature of emissions engines by drawing fuel from a reservoir during the first minute of operation giving it smoother start up and warm up characteristics. This will give the engines using this carburetor the personality of one built prior to the emissions standards. The external physical package is identical to that of a series "8" carburetor. Removing the bowl will expose the welch plug used to cover the extended prime fuel chamber. There is also an **additional passage way** along side the center leg which feeds the fuel into this chamber when the carburetor is primed. During start up operation, the fuel is drawn from this chamber into the venturi until the chamber is empty, at which time normal operation is resumed. When cleaning an emissions carburetor remember the passages are extremely small. The best method for cleaning this carburetor is to remove all welch plugs and use carburetor cleaner and compressed air to clean the passages. It is not recommended to soak the carburetor in carburetor cleaner.



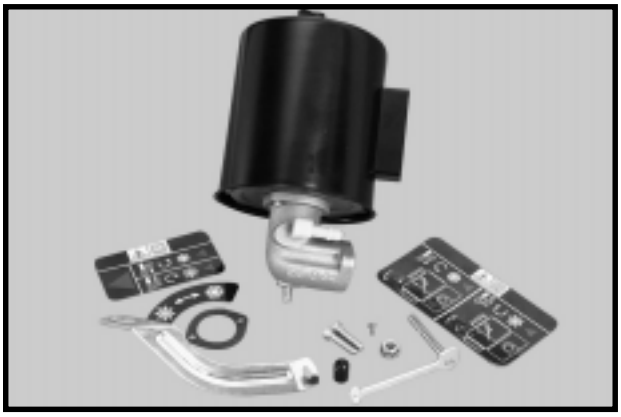
VLV NO BOTTOM DRAIN FLANGE

The VLV engine now has an option available to OEM's with no oil drain on the bottom of the mounting flange. This will be available for applications such as generators, pumps and pressure washers. In place of the bottom drain there is an optional side drain. If an OEM would choose to use this flange on a rotary lawnmower application, removing the oil may be accomplished by draining the oil out of the fill tube. This flange has been available since July 1998.



HM CLIMATE GUARD™ KIT

Climate Guard™ for HM engines is available on original equipment and will be used exclusively on Generac product for 1999. However, there is now a kit available for existing engines. If you have emissions or non-emissions engines that are used during both summer and winter seasons, you can now convert it to the Climate Guard™ system by using part number **730630**. Typical applications that could use this system are log splitters and generators.

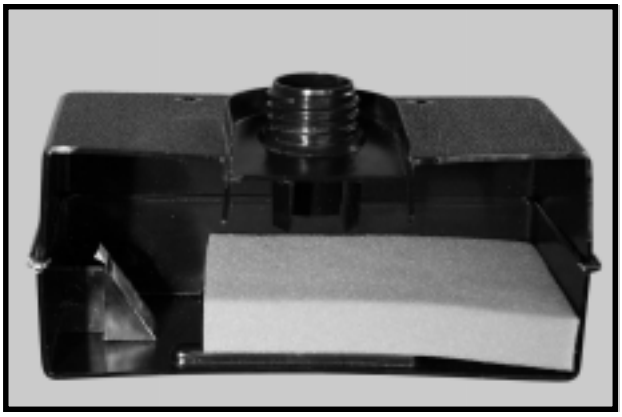


LEV 80 NEW OFFERING

The LEV 80 is a new 3.5 hp engine being offered this year. It has been designed using the technology developed in the LEV engine with the straight valve train used in the TVS engines. This engine has the same cylinder fin design and flow through valve cooling system that allows the LEV to run at reduced cylinder block temperatures. It is being used on opening price point units and puts an offering in the market place that has the quality, and durability of the higher price units.

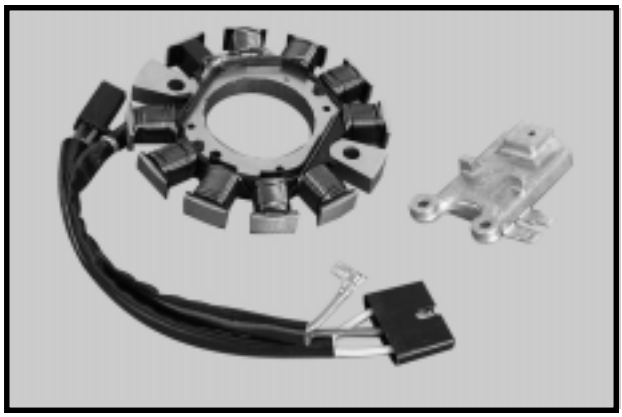
TORO FUEL TANK BAFFLE

The OHSK 120 used on Toro snow throwers has a foam baffle added to the fuel tank. This will prevent splashing and inconsistent fuel flow when there is less then an inch of fuel inside the tank. The foam baffle stabilizes the fuel supply to prevent the occasional fuel starvation situation. The material is similar to that used in race car fuel cells and is impervious to all of today's fuels within our standard fuel guidelines. The part number for the complete tank assembly is 37290.



OHH 7 AMP D.C. CHARGING SYSTEM

This series of engines has quickly become one of the most popular engines in the industry. It is now poised to expand into markets that require a higher output charging system. A 7 Amp D.C. charging system is now available on OHH/OHSK 50-70 model engines. This reliable compact power plant can now be applied to those applications that require higher battery starting capabilities. The alternator part number is **611233.** Upgrading existing equipment will require that the flywheel be changed to accommodate the alternator which uses internal magnets.

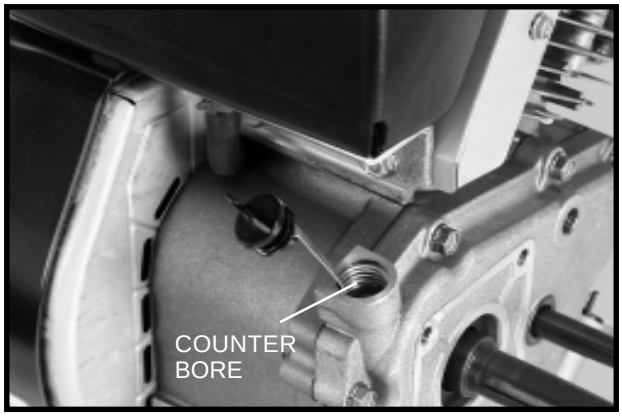


220 VOLT STARTERS

There is now a 220 volt 50 hertz starter available for countries outside the US and Canada. These starters, part number **37102** (H30-35, HS40-50, HSK34, HSSK40-50, OHSK50-70) and **37217** (HM70-100, HMSK70-100, OHSK80-120) have only a limited number of parts that are serviceable due to European Community regulation. None of the internal parts can be serviced. Only the parts from the engagement nut to the cap are serviceable externally. The starter does not include a power cord because of the multiple options used in different countries.

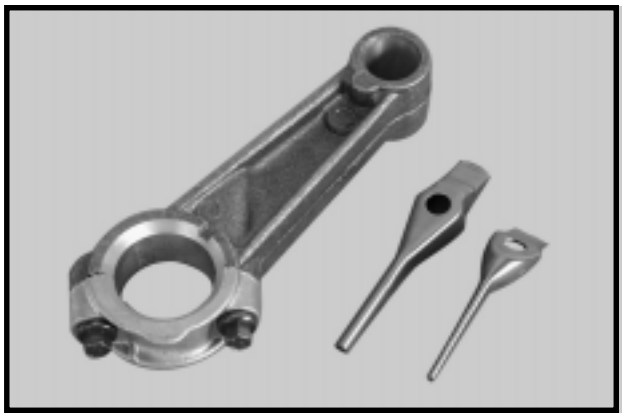
DIPSTICK COUNTER BORE OHH

On many applications the OHH engine uses a dipstick gauge that threads directly into the cylinder cover. Checking the oil has been a challenge at times because of difficulty reinstalling the oil gauge without cross threading. This situation has been corrected by machining a counter bore in the oil gauge hole and adding a 45° chamfer to the lead in thread making reinstallation easier. **Remember to instruct the customer to clean the area around the dipstick prior to removal.**



ONE CONNECTING ROD FOR ALL

In our continuing effort to reduce the inventory required to service our engines, a change has occurred to the small frame connecting rod. When you order connecting rod part number **32875A,** you will receive an instruction sheet explaining which oil dipper, if any, is used. An example is the H30-HS50 which uses dipper number **32654.** The same connecting rod is used on small frame overhead valve engines but uses the longer **36611** dipper. Please follow the instruction sheet carefully. Remember always assemble the rod and cap with the match marks facing out.



OHSK NEW HORSEPOWER

We are very pleased to expand our overhead valve engine line with three new models based on the HM series engine. There are three horsepower offerings being used in this seasons snow product. They are OHSK 80, 90 and 110.

NEW RE-POWER PACKAGES

With the change to emission product, several models of engine have been obsoleted. We have worked with our applications group to develop replacement for several application. The following kits are available from your engines source:

Troy Bilt Pony - Part Number **205128 OHH 50**, with features including 3/4" crankshaft, extended cam, mounting instructions and reverse belt.

Troy Bilt Pony - Part Number **205130 OHH 50**, with features including 3/4" crankshaft, extended cam, mounting instructions, reverse belt and electric start and harness.

Troy Bilt Horse - Part Number **208106 HM 80**, with features including 3/4" crankshaft and special rear tine tiller dipstick.

Ariens Rocket Tiller - Part Number **208120 HM 80**, with features 1" crankshaft, extended cam, special rear tine tiller dipstick and mounting template.

REPOWER PACKAGES

205128 - OHH50

205130 - OHH50

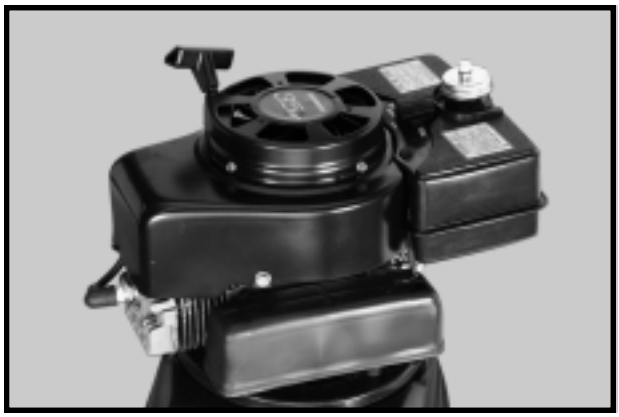
208106 - HM80

208120 - HM80

Two Cycle Products

FLYMO REPLACEMENTS AVAILABLE

There are now Service Replacement Engines available for the Flymo hover mower application. They are available in all states with the exception of California. These engines are able to meet the E.P.A. emissions standards for hand-held equipment through use of a fixed jet carburetor and cylinder port timing changes. The engines will be available in early 1999, under service part number's **800175 and 800176.** Please consult your parts lookup system or the service engine specification book to locate the correct one.

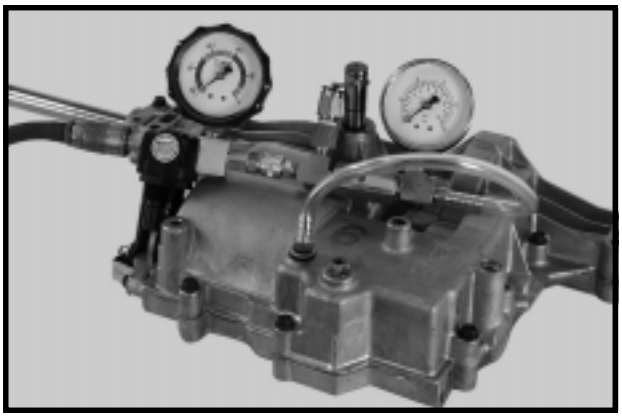


EMISSIONIZED AV520/600

The AV series engines used on post hole diggers and ice augers has been changed in several areas to meet the E.P.A. emissions regulations for hand-held product. These improvements include changes to cylinder port timing and the carburetor being made customer tamper-proof. The carburetor changes involve fixed jets in both the idle and high speed circuits. The idle restrictor jet can be removed for service but the idle restrictor cap (**640053**) must be re-installed to maintain compliance. All fixed jets that screw in seal against the taper, it is critical that you do not over tighten the jet when re-installing or damage to the metering hole will occur. Tighten to **5-8 inch lbs. (.5-1.0 NM)**

Peerless® Products News

MST LEAKING AXLE SEALS



Last year we advised you of the running change made to the axle seals used on all MST Series transaxles to improve sealing. We still hear about the occasional seal leakage on some MST's. Our evaluations have found that when the unit was serviced and then re-assembled the old seals were re-used with sealant placed around the perimeter of the seal. This sealant will get into the seal spring, harden and cause it to not function properly and leak. Always replace the seals if the transmission is serviced and **DO NOT** use sealant in the seal pockets. When re-assembly is complete we recommend **a low** pressure leak down testing of the unit. The test pressure must not exceed **15 PSI (1 Bar)** or seal damage will occur. We have developed a test kit part number **670345** as an add on for an existing leak down tester or our **complete kit 670340.** Both are available from your normal supplier.

NEW MST SERVICE VIDEO 696250

We have released the latest video in our series to help technicians understand the new MST transaxles. This video covers complete disassembly and re-assembly with tips such as not blocking the oil galley to the axles and proper assembly of both "A" and "B" inputs. This video and others available at $15.00 each (US price) are a great way to increase your knowledge or help a new technician you may have recently hired. Other videos available are:

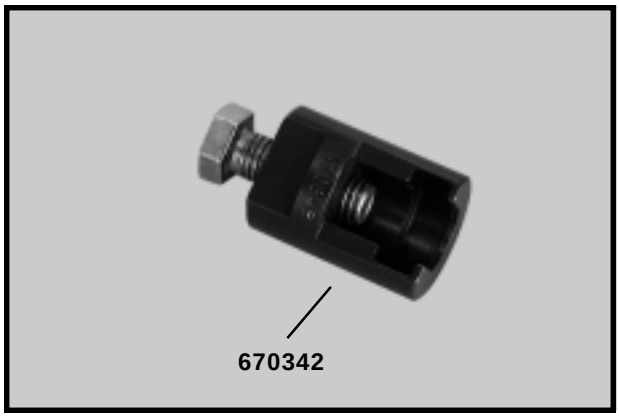
Ignition Systems - 695059
800 Series-Transaxle - 695285
Carburetor Troubleshooting - 695015
900 Series-Transaxle - 695148
Electrical Systems - 695185

820 SERIES SEALANT

The 820 series transaxle has been changed from Loctite 515 Gasket Eliminator to Loctite Ultra Gray RTV Silicone, Tecumseh Part Number **788093A.** This change improves the perimeter seal reducing the chance of water entering the case during cleaning by the operator. When service is needed on older models, please re-seal the case using the Loctite Ultra Gray RTV which is resistant to oil and grease.

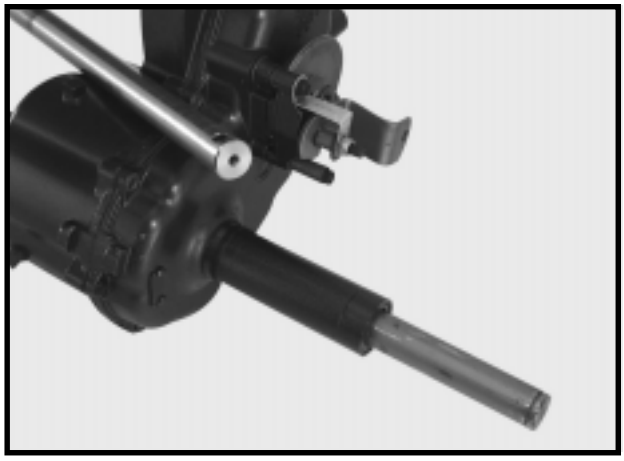
NEW VST SERIES PULLER

The directional control arm on the VST205 hydrostatic series transaxle is attached using a tapered shaft or taper and key combination and then secured with a nut and lock washer. Should this arm need to be removed, a puller is required. Removal without using a puller can severely damage the internal parts of the transaxle, which is not repairable, causing replacement of the entire assembly. We have developed a special puller, Tecumseh Part Number **670342** to remove this arm. When the control arm is re-installed on the unit, it must be tightened in the neutral position, the nut is torqued to **25 to 30 ft. lbs. (33.9 - 40.7 Nm).** Should you still have questions consult the 691218 Motion Drives Technician's Handbook.



1310 SERIES AXLES 1 1/8

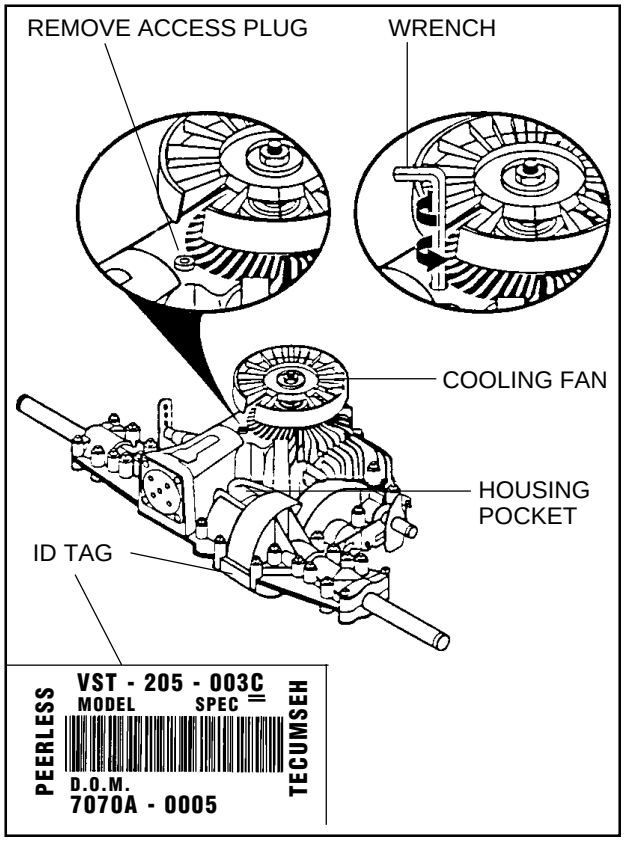
At the request of the Toro Company, we have increased the axle diameter of their 1310 series unit to 1-1/8 inches. This diameter change increases the durability of this model for their application. Service replacements for this model have been upgraded to this new axle diameter as well.



NEW EXTERNAL SNUBBER FORCE ADJUSTMENT BULLETIN 308

We have issued Service Bulletin 308 to review a change made to the "**C**" versions of the VST series transaxle (example VST205-024**C**) This bulletin outlines the adjustment of the shift force required to move the control lever. **Never** automatically assume the hydro is the problem, our evaluations of several units returned found no defect at all. In these situations we found a slipping belt (extremely glazed) from low tension to be the problem.

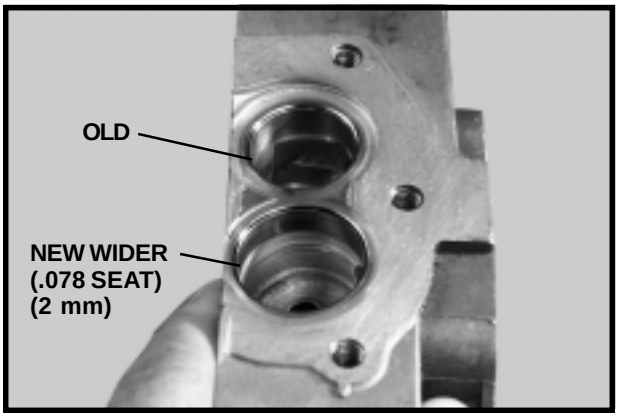
The bulletin outlines first cleaning the unit then the procedure for removing an access plug and adjusting the snubber screw which controls the shifting forces. You should **NEVER** need to turn the screw more than **one turn**. If you turn beyond this limit, the screw could come out of the case, this screw cannot be re-installed in the field and will require complete unit replacement. Please use extreme caution if performing this procedure and follow the bulletin exactly.



Service Tips

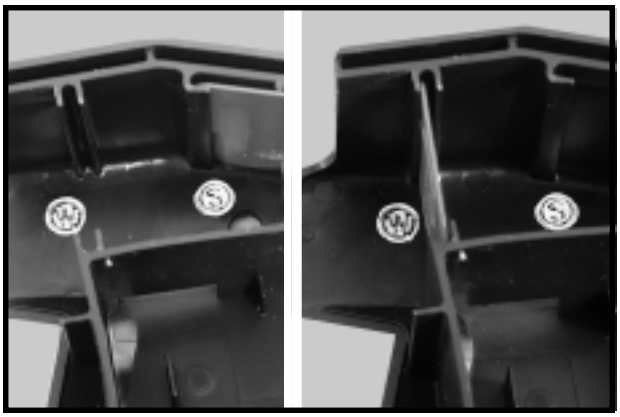
LEV WIDER VALVE SEATS

The valve seats on LEV engines (except the LEV 80) are being widened to help increase valve and seat durability. The width is being nearly doubled from **.040 (1 mm) to .078 (2 mm).** This can be done on the LEV engine because of the unique design of the valve seats and cylinder block. This design helps remove heat from the valve seat area by distributing it into the cylinder block and then dissipating it in its flow through design. This is also being done in conjunction with the use of heavier valve springs. The combination of the two may also help eliminate the light to no load popping that sometimes occurs when engines are running at low speeds.



CLIMATE GUARD™ OHH

Although it was introduced last year, it now has a title, “Climate Guard™”. The official name for the air filter system used on emissions engines that are run in both warm and cold weather environments. This system has a baffle, that when placed in the winter position blocks cold air from the blower housing. Warmer air is then drawn through the air filter backing plate, this warmer air prevents the possible icing of the breather tube inlet to the carburetor. The icing is caused by crankcase vapor/condensation from the breather system required on emissions engines. When placed in the summer position it allows the cooling air from the blower housing to function normally, maximizing air filter life through our Kleen Aire® system.



EMISSIONS INTEGRITY

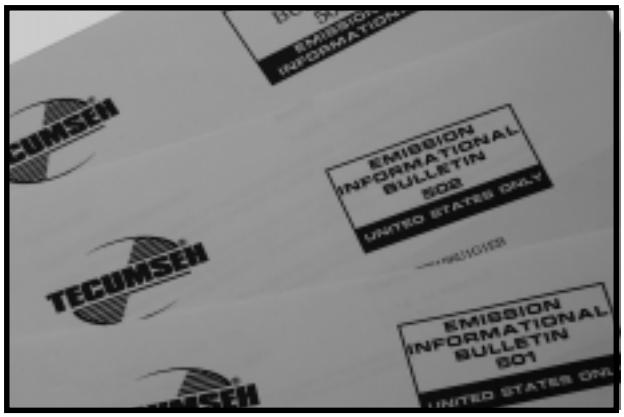
Just a reminder to you and your customer that it is required to maintain EPA and CARB compliance to use “as built” factory original or approved parts. This means parts used in, fuel metering systems, air induction systems, ignition systems, exhaust systems and crankcase breather systems must be Genuine Original Tecumseh factory parts or their equivalent. Ask your distributor about the Real Ones Parts program to prevent any possibility of violating compliance regulations by using less than OEM quality after market parts.

FUEL CAP TETHER

The fuel cap tether has made a come back in recent years especially on recreational vehicles. This cap tether may come in handy for the customer that has lost their fuel cap while mowing or forgot to put it on. The part number is **35480** and can be retrofitted to most newer style fuel caps with the standard 1.750 (44.45 mm) opening.

EMISSIONS SERVICE BULLETINS

A new series of bulletins have been earmarked to deal specifically with emissions related concerns. These bulletins will be designated by the **"500"** series classification. The headings listed on these bulletins will include, Date Issued; Engine Model Concerned, Family; and D.O.M. (Date Of Manufacture) affected. The body of the bulletin will contain information concerning; Potential Emission Control System Problem; Affected Specifications Numbers; and Warranty Inspection and Repair Procedure.



BULLETIN 501

Some LEV 115 engines built between date codes **8091** through **8166** have the incorrect bowl nut in the carburetor. The suspect units will have the bowl nut on the carburetor stamped with the number **174**. This jet should be replaced with part number **640087** which will have the number **169** stamped on it. There are 30 different specifications involved. Check the bulletin to determine if any units you may work on qualify.

BULLETIN 501

BULLETIN 502

The following three model and spec numbers H35-45690Z, H35-45726Z, and H40-55701A with D.O.M s of 8079 through 8201 have been built with the incorrect carburetor. You will need to locate and identify the manufacturing number on the carburetor mounting flange. If the number on the flange is stamped with the number **5161** the unit has already been changed and no repair is necessary. If the number is **5015** you need to replace it by ordering part number **640172.** This carburetor will have the manufacturing number **5161** stamped on the flange.

BULLETIN 502

HEAD GASKETS ARE BACK WITH SHORT BLOCKS

Back in 1994 we removed the head gaskets from short blocks. This was done because of thickness differences between the gaskets used on older engines versus newer product. The decision has been made to standardize on the thicker gaskets on most short blocks. This will have very little effect on engine power and will make the short block procedure much simpler. The exceptions will be the medium frame (HM and TVM) 8 and 10 hp engines which will include both gaskets and allow you to select dependent on its original gasket. This will be a running change as inventories are upgraded.

MODEL NUMBER STANDARDIZATION

An effort is being made to standardize on the model number designations used on lightweight vertical shaft engines. In the past this designation has bounced back and forth from horse power to cubic inch displacement. Three more models have been brought into the cubic inch displacement group. The VLV and OVRM series engines are adding a VLV 126 (12.6 C.I./206.5cc) an OVRM 105 (10.5 C.I./172cc) and a OVRM120 (12 C.I./196.7cc). Previous designations used in these Models will not be affected.

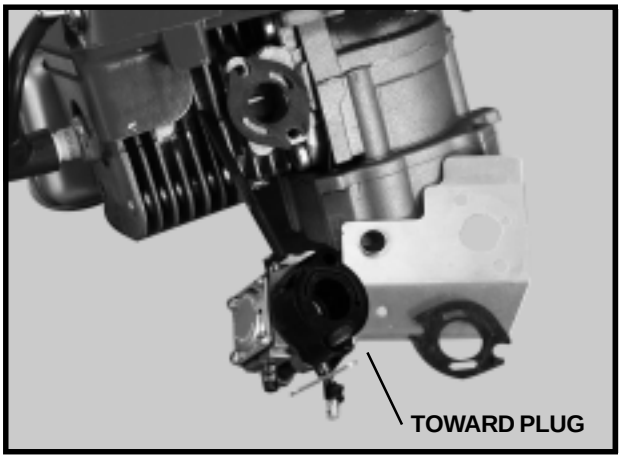
VLV 126 (12.6 C.I./206.5cc)

OVRM 105 (10.5 C.I./172cc)

OVRM120 (12 C.I./196.7cc)

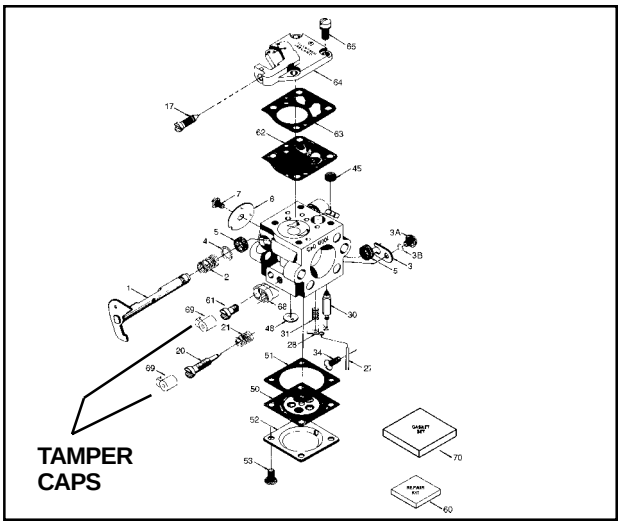
TC SERIES CARBURETOR SPACER BLOCK

We repeatedly receive calls from technicians regarding TC series engines not starting after servicing of the carburetor. During these evaluations we usually find one of two things have occurred. The first is an incorrectly installed insulator block causing the vacuum passage to not be aligned with the carburetor. The correct position is to have the impulse hole located in the spacer block facing toward the spark plug end. The transfer passage in the spacer block has to face toward the cylinder. The second is sealant or adhesive blocking the passage from previous improper service. Always check that these passages are open and use new gaskets during service, no sealant or adhesive is needed.



TC EMISSION CARBURETORS

The TC series carburetor has been changed to meet emission standards for E.P.A. hand-held equipment. This upgrade has been made to all service inventory for previously built product as well. When you order a new carburetor, you will receive instructions explaining how to optimize the carburetor settings and install tamper-proof caps.



PROPER TRANSAXLE WARRANTY INFORMATION BULLETIN 124

We have been evaluating transaxle warranty claims which we have returned to service dealers for lack of proper information. This evaluation has shown some improvements could be made to our identification tag. We have published and sent all manual holders Bulletin **124** explaining how to locate and read this information. This information reviews both older models and the improvements made to newer I.D. Tags. Tecumseh wants to reimburse our dealers promptly, however, we cannot without proper filing of the **ESA-157R** Claim form. Please supply the needed information when sending in claims.

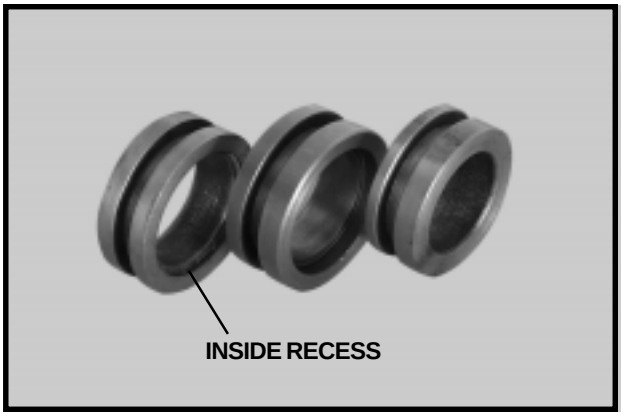
Beginning this March of 1999 Tecumseh is implementing a pilot warranty return program through selected CWD's. This new procedure will return warranty claims **not containing** the needed information through your distributor rather than directly to you. Your distributor will work with you to obtain the needed information and answer any questions, then re-submit the claim signed by the distributor representative for prompt payment.

BULLETIN
124

IMPROVED GEAR
PRODUCT IDENTIFICATION

PROPER SHIFT COLLAR INSTALLATION

We regularly receive calls from technicians regarding proper installation of the shifting key collar on transaxles. The following tips should help you during servicing: Shift collars will generally have one of several variations. If the collar has an offset on one side, the thicker side must face in toward the tips of the shift keys. If the collar has no offset, check to see if there is a recess on the inside diameter. If there is, the recess must face toward the inside. A combination of offset and recess always has both facing in.



VST DIAGNOSTIC PROCEDURE

The information on the following pages has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs. Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, Tecumseh would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 of the travel distance from neutral to forward.
3. Place the tractor on a 17 degree grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and / or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may have the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.
3. **Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows, With a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

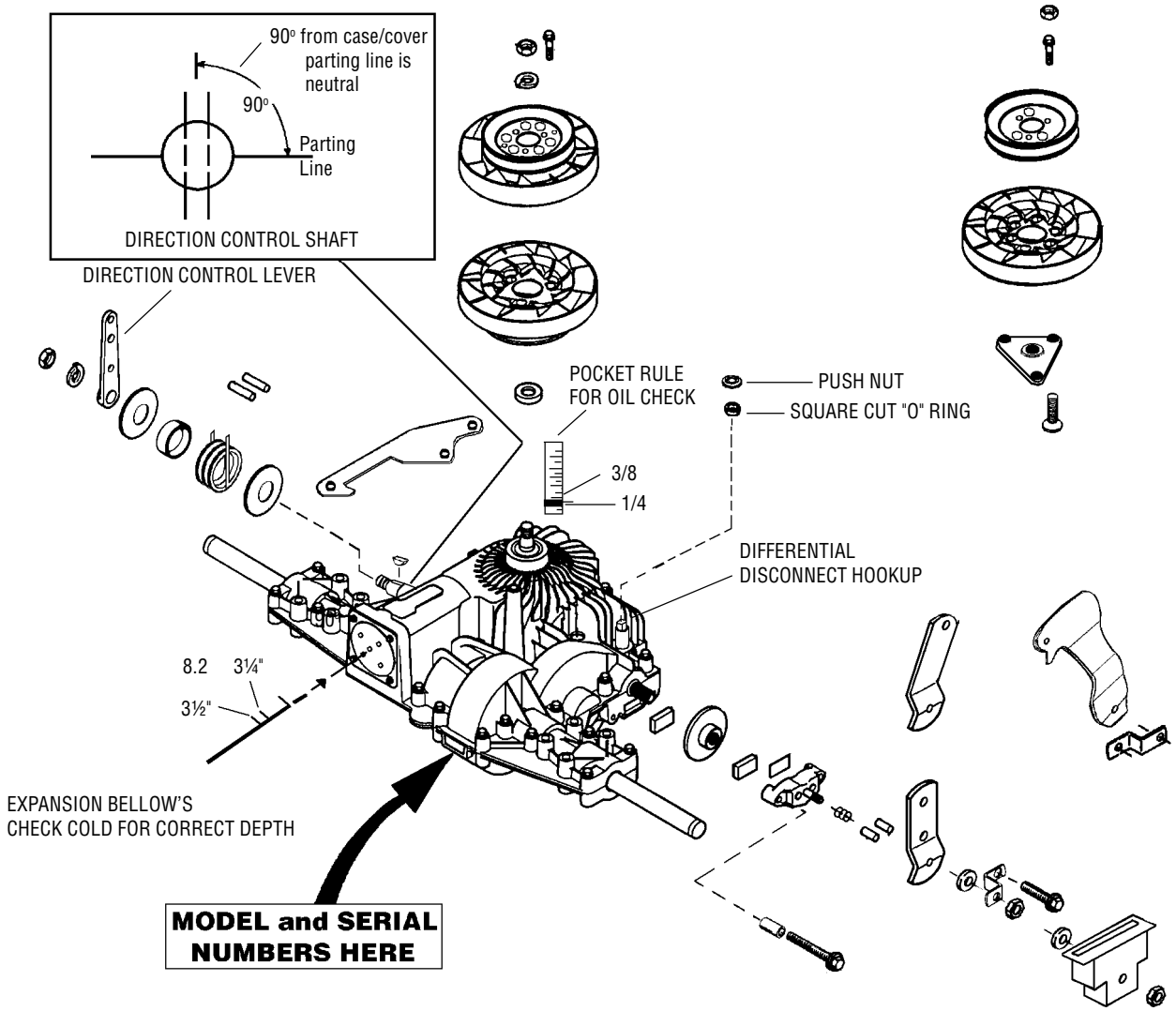
   The second chamber is for the output gears including the differential. FIRST make sure the tractor is level, then remove the drain/fill plug. NOTE: Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. With a small pocket rule insert until you touch bottom of case. You can then remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact this is full at its 8 oz. capacity.
4. **Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

   To determine absolute neutral, the hole in the tapered control shaft must face straight up and down, at this point make sure the OEM linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 NM) of torque with the shaft and the lever in neutral.

   When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16 bolt in the hole as shown in Illustration. Hold the bolt until the tapers are locked and the nut torque is correct.

   To make sure that the brake is not binding, drive the unit up a slight grade. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.
5. **Hard to shift:** Typically hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Approximately 40-50 inch lbs. (4.48 - 5.6 NM) at the transaxle for foot pedal units or 150-200 inch lbs. (16.8 - 22.4 NM) for hand operated units. This varies depending on the type of linkage. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.

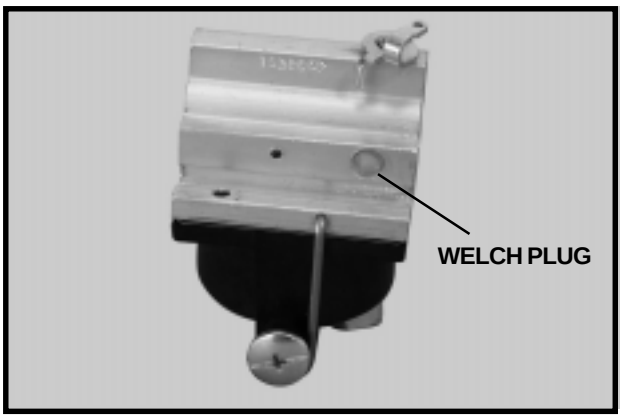
PRODUCT CONTAINS PATENTED FEATURES



NOTE: The above illustration is of a foot control unit with differential disconnect. Consult your parts list by model and specification number to get correct parts for your unit. ALL PARTS SHOWN MAY NOT BE ON YOUR UNIT.

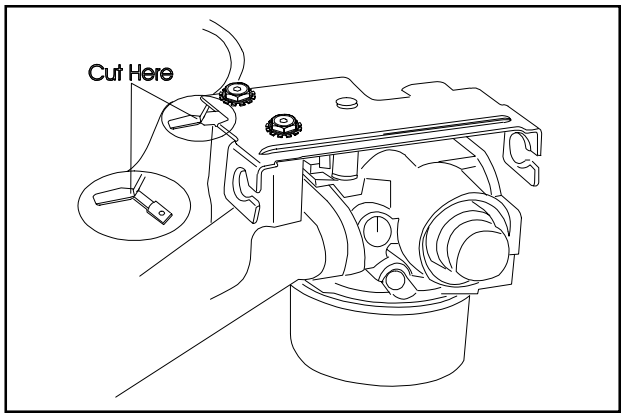
VLV WELCH PLUGS

We have received comments from technicians regarding VLV series engines hunting/surging, running erratic or popping at low speed. The evaluation of these units has revealed some poor sealing idle mixing chamber welch plugs. After first checking the fuel condition, air filter and spark plug, the engine still exhibits one of these conditions. We suggest that while the engine is running you spray the welch plug area with spray carburetor cleaner. If the run quality changes it would indicate a leak around the welch plug requiring repair. Completely clean the welch plug area, then re-seal the plug using fingernail polish which should eliminate the problem. If the run condition does not change when you spray the welch plug area, further inspection will be needed.



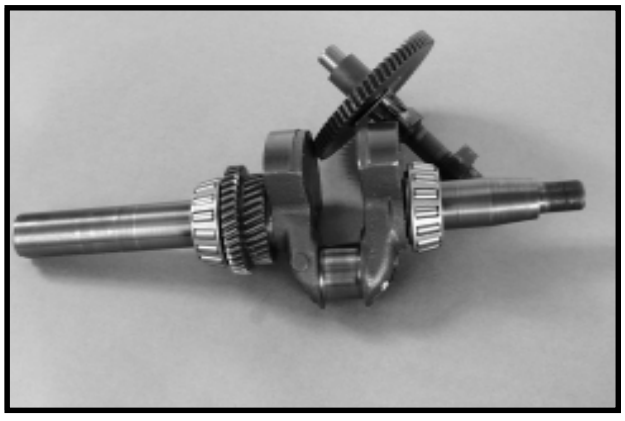
LEV ENGINES MIS-FIRING FIXED LINE TRIMMERS

We have been evaluating field comments regarding LEV engines popping or mis-firing out of the muffler. These particular models of LEV are used on the new fixed line trimmer applications equipped with a remote throttle stop in the control. We have found some production models where the ignition ground tab on the throttle control plate was positioned very close to the blower housing causing intermittent grounding. Should you encounter this condition remove the extra blade from the wire terminal as shown. This is done using a side cutter to trim the extra blade away. This procedure may require the removing of the blower housing to access the speed control.



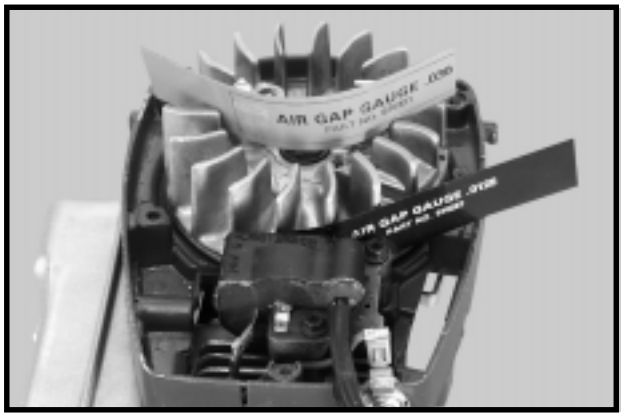
HH AND OH CAST IRON CRANKSHAFT AND CAM GEARS

In an effort to keep parts available for the OH and HH cast iron series engines, we have decided to obsolete the straight cut gears and will make available only crankshafts with helical cut gears. When using this crankshaft to repair older cast-iron units equipped with straight cut crankshaft, camshafts and governor gears, it will be necessary to order new helical cut camshaft and governor gears to match tha crankshaft. When repairing the OH Cast Iron series engine you will need a 34751 helical governor gear and 34752 helical camshaft gear. If you are repairing a HH Series engine, order 34691 helical governor gear and 34692 helical camshaft gear.



TC AIR GAP REMINDER

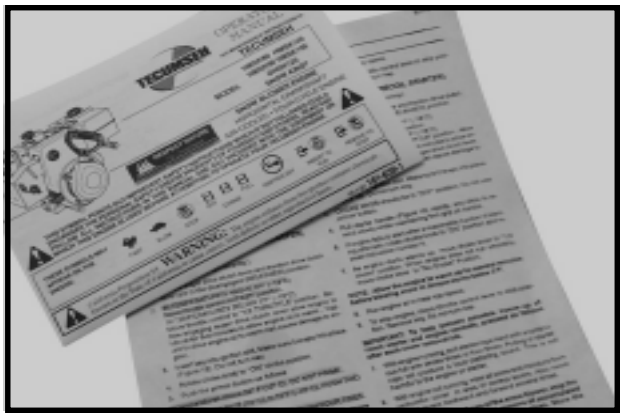
We occasionally hear complaints of poor or hard starting TC engines used on post hole diggers, ice augers and cultivator tillers. In addition to the normal checks for fresh fuel, good spark plug and a clean filter, check the CDI ignition module air gap. The TC series uses two different settings dependent on application and model which effect proper ignition timing. All TC200 and 300 rotary mowers applications use a .0125 gap (.317 mm), gap tool 670297. All other TC300 models use a gap of .030 (.762 mm), gap tool 670321.



Miscellaneous Product News

SNOW PRODUCTS STARTS

There are times when dealers are confronted with customers who purchase snow equipment when the ambient temperature is above 50° F (10°C) The starting procedures at these temperatures should not require priming the engine. Therefore we have included the number of primes needed to start the engine at different temperature ranges in the operators manual. This will possibly prevent the over priming and flooding of engines at warmer temperatures, and eliminate this situation. The guidelines are as follows. With the choke on and temperatures below **15° F (-9°C) three primes, 15° F (-9°C) to 50° F (10°C) one prime, and above 50° F (10°C) zero primes** choke only.



NEW SMART START PACKAGING

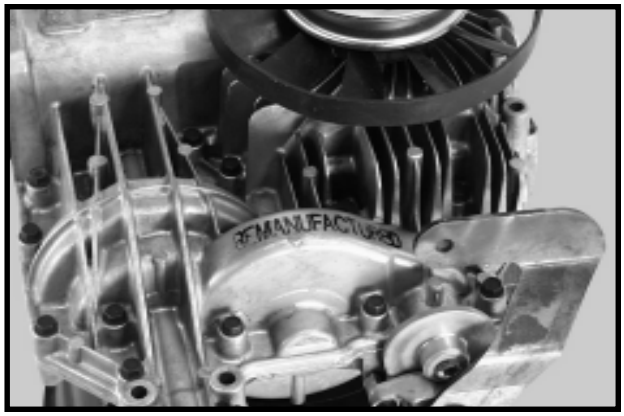
This product has been extremely popular in its inaugural year and has established itself firmly in the market place. This was done primarily through the counter display part number **730255**. This fuel stabilizer is now available in a three packet bubble pack display part number **740063**. This product has made fuel stabilization so easy that many consumers and shop owners use it year round, not just for off season storage. Just one packet stabilizes up to 21/2 gallons (10 Litres) of fresh fuel. This dry type stabilizer dissolves rapidly and does not create a mess or stain like many liquid varieties and requires no complicated mixing formulas.

VST REPLACEMENT PROGRAM BULLETIN 307

We have again reviewed the issue of possible field service of the VST series transaxle. We have decided that Bulletin **307** must stay in effect for an indefinite period of time in the United States only. We would like to review some of the key issues that are driving this decision. The VST series transaxles used in this program are manufactured using the following stringent program:

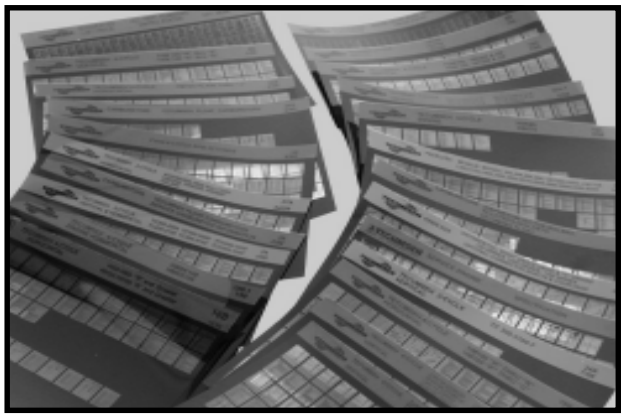
1. Initial review of your warranty claim filed with the unit describing the condition.
2. Complete disassembly, cleaning and inspection of all components.
3. Replacement of any parts not meeting original manufacturing specifications.
4. Reassembly in a clean room environment (dust and dirt free) to original new specifications. Re-filling the pump and motor side with a special synthetic oil used in the aviation industry. All air is the removed through a bleeding off process.
5. After re-assembly the unit is pressure tested insuring unit integrity.
6. We then load test the unit checking axle output torque and speed on a special test machine to assure the customer of trouble-free operation. This test bench alone would cost a service center $20,000 US dollars to duplicate, adding to the complexity of field service.

BULLETIN 307



MICROFICHE UPDATES

During the past several months we have increased the number of Microfiche cards per mailing in an effort to keep your data as current as possible. During 1998 you should have received the following card numbers 1, 3A, 3B, 8A, 8F, 9B, 10C, 12A-1, 12B, 16B, 16C, 18B, 18B-1,18B-2, 24, 24A, 27A, 30, 31, 33, 35, 35A and 35b. We have also sent out an up to date paper version of the index card dated **8/98** with the mechanic's mailing which began in December of 1998. Please use this card to verify that your microfiche is current, should you have any damaged or missing cards please send us a written request only for the needed replacements. If your registration is current we will send you up to two free cards. Should your deck need more than two we suggest you order a new set from your distributor.



ELECTRONIC PARTS LOOK-UP

Many of you have probably heard that ARI Network Services, owners of Plus One Parts Look-up has purchased Power Com. The acquisition of this company should make available additional data that you may need. Tecumseh Products Company, believes very strongly in healthy competition in all aspects of our industry which helps you keep operating costs down. This acquisition will eliminate our previous concern regarding our competition owning a company we supply our data to. We will continue to supply data to both Parts Smart and Plus One. We suggest you contact both companies to determine which one fits your needs. The phone numbers are:
Parts Smart **1-800-296-8771**
Plus One: **1-800-755-6040**

ENGINE I.D. BULLETIN 123

With the implementation of emissionized engines, we were required to change the engine identification system we used. This new system has caused many warranty claims to be rejected for a lack of proper information. We have published Bulletin **123** to help you understand the needed information. Please make sure you supply the information so we can reimburse you promptly.

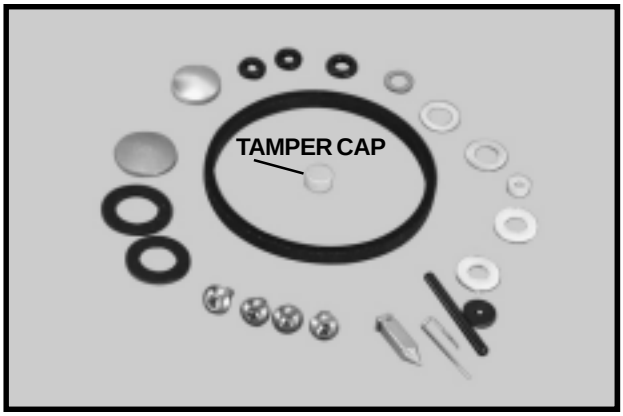
Beginning this March of 1999 Tecumseh is implementing a pilot warranty return program through selected CWD's. This new procedure will return warranty claims **not containing** the needed information through your distributor rather than directly to you. Your distributor will work with you to obtain the needed information and answer any questions, then re-submit the claim signed by the distributor representative for prompt payment.

BULLETIN 123

ACCURATE WARRANTY CLAIM INFORMATION

QUICK FIX CARB KIT

This kit was released late this year and we want to remind you of its availability. The part number is 632760 and can be ordered from your normal supplier. This one kit now replaces several previous kits and has been upgraded to include the idle restrictor cap. Please remember this kit does not service the series "7" or the Vector (VLV) non metallic bowl carburetors. When you service a carburetor, please order this kit and always remove and clean all Welch plug cavities before replacing them.



NO METHANOL

We have added a caution to our Owner's Manual regarding a zero tolerance level for any methanol blended fuel or additives. We have reviewed some carburetors returned from service and found the damage to have occurred from methanol based fuel and or fuel dryers. Should the customer feel they need a fuel dryer in their snow product use only isopropyl based dryers at the correct ratio to prevent freeze up**.** Remember if a little is good a lot is NOT better.

BULLETIN 108

FUEL ADDITIVES

Only fuel additives such as Tecumseh's fuel stabilizer Smart Start™ part number 730245 or liquid varieties can be used when mixed properly. **For winter applications, Isopropyl alcohol** fuel dryers may be used in the fuel system but must be mixed at the proper ratio recommended by the manufacturer.

NEVER USE METHANOL BASED DRYERS.

STARTER CLIP BULLETIN 122

In Spring of 1998 we issued this Bulletin **122** regarding starters not engaging principally on rotary mower product. We recently re-sent this to all manual holders. Should you encounter one of these situations, please order part number **590760**. This kit includes a replacement disc to prevent water migration into the starter. Then file an ESA-157R claims with us if warranty applies.

BULLETIN 122

RECOIL STARTER WILL NOT ENGAGE WHEN PULLED

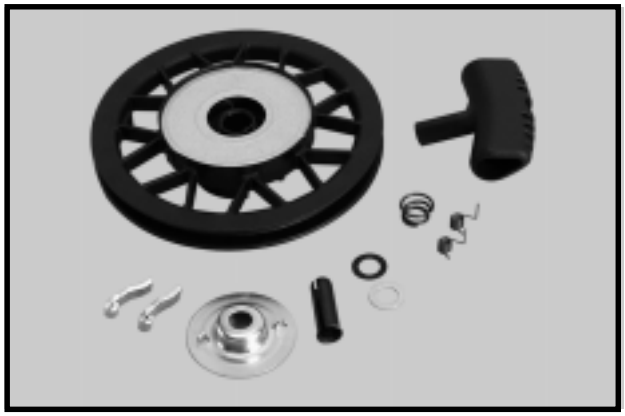
Europa News

REVISED SOFT PULL STARTER

From production starting September 1998, a revised soft pull starter will be used. Although the design is very similar to existing product, improvements have been made to the housing, the pulley material, design, and the pawls. These improvements have been aimed at improving the durability of the unit, and to improve the way in which the rope is held on the pulley. Individual spare parts for this starter will be made available, and the repair procedures are identical to the existing product which uses the roll pin to secure the pulley to the housing.

STARTER REPAIR KIT

Utilizing the parts used in the new soft pull starter, a repair kit will be made available to service existing soft pull starters. This kit, which is available under part number **16630041**, will consist of pulley, recoil spring and retainer, pawls, pawl springs and retainer, together with new roll pin assembly.

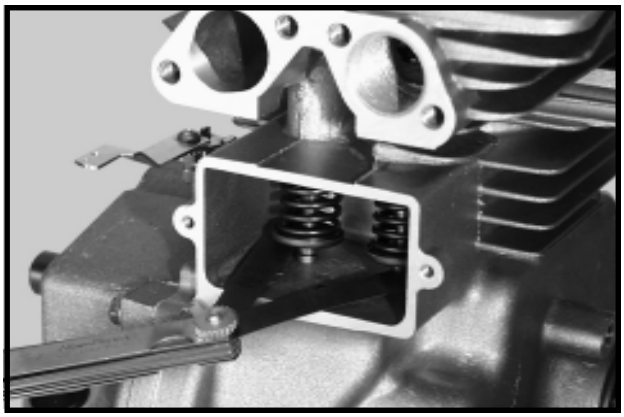


VALVE CLEARANCE CHECK

Since July 1998 the valve clearance on Europa manufactured engines has been revised to the following:

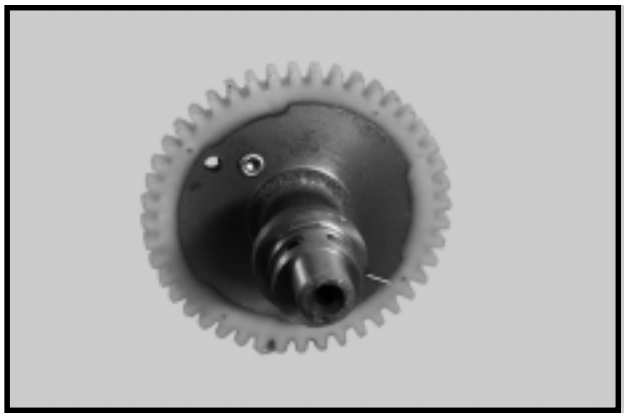
4-cycle vertical shaft side valve (L'head)
0.15-0.25 mm (.006 - .010)
4-cycle horizontal shaft side valve (L'head)
0.10-0.20mm (.004 - .008)
4-cycle OHV engines(vertical & horizontal crankshaft)
0.050-0.15mm (.002 - .006)

Valve clearances are now as shown above irrespective of the decompression system used.



REVISE CAMSHAFT

Over the past 12 months some engines have been equipped with a camshaft manufactured with plastic lobes as well as the plastic timing gear. These camshafts are interchangeable with the standard camshaft. Valve clearances should be set as listed above.



ELECTRIC START ENGINES

Electric start engines are now equipped with a flywheel that features a plastic ring gear in place of the aluminum ring gear that was cast as part of the flywheel. This is more robust than the original but also provides much quieter operation. It is however essential that the clearance between the flywheel ring gear and the starter pinion is set correctly. There should be a clearance of **1/16" (1.6 mm)** between the tip of one tooth and the root of another. This can easily be checked using a sized piece of wire. It is essential to check this clearance when replacing a flywheel that has broken teeth, as it is possible that when the failure occurred, the starter mounting has become distorted, increasing the clearance. Failure to check this clearance will result in premature ring gear failure.

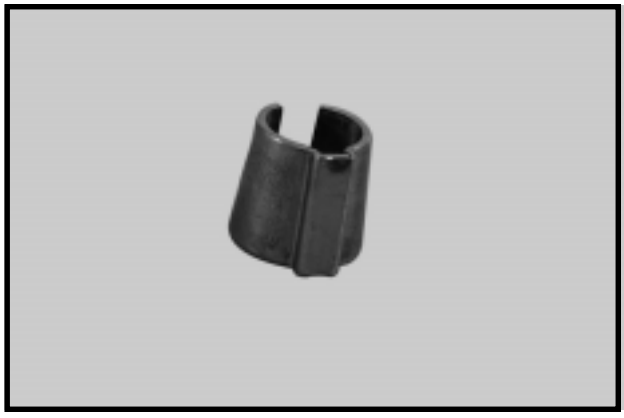
1/16" (1.6 mm) Between Flywheel and Starter

INLET VALVE OIL SEAL

Most premium engines are now equipped with an inlet valve oil seal which acts as a top valve spring retainer. This seal, which is part number **19610001**, should be replaced whenever it has been removed from the valve stem. The correct installation is shown on the adjacent drawing.

FLYWHEEL ATTACHMENT MV100S ENGINES

Some MV100S engines utilize an adapter collar to locate them to the crankshaft as opposed to the standard flywheel key. The engine specification number will identify which system is used. When reinstalling the flywheel that utilizes this collar, it is necessary to press the collar into the flywheel taper flush to the inside hub before installing the flywheel to the crankshaft. The pressed ridge in the collar will align with the flywheel keyway.



3 AMP CHARGING SYSTEM

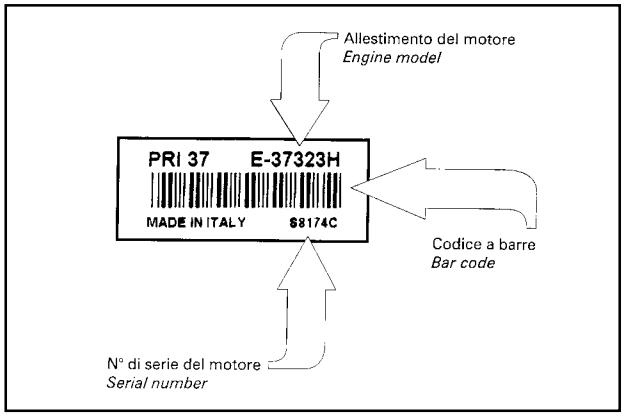
Some Futura 60 engines are now equipped with a 3 amp DC charging system to enable the use of an electric clutch. Should the charging be in doubt, it should be checked in the following way.

1. Start the engine and let it run at high speed.
2. Disconnect the engine from the machine's wiring loom by disconnecting the black multi connector.
3. Set the engine speed to 3000 rpm.
4. Check the DC voltage output by connecting a voltmeter between the red wire on the 4-way connector to earth. Minimum reading should be 9.5 volt DC. At this minimum reading the system is working correctly.
5: If this minimum reading is not achieved check the AC voltage output by pulling back the sheathing covering the diode and connecting the voltmeter (set on AC scale) between ground and output wire prior to the diode. The reading should be 22 volts AC at 3000 rpm. If this minimum reading is achieved the diode at fault must be replace.
6. If this minimum reading is not achieved than the alternator coils are at fault and require replacement.
7. Do not forget to reconnect the connector to the machine wiring harnes when repair has been completed. (If the machine still exhibits electrical problems and the charging system checks out OK, then the machine should be checked for a poor battery, poor connections, failed relays etc).

3 Amp D.C. Charging System Futura 60

ENGINE IDENTIFICATION

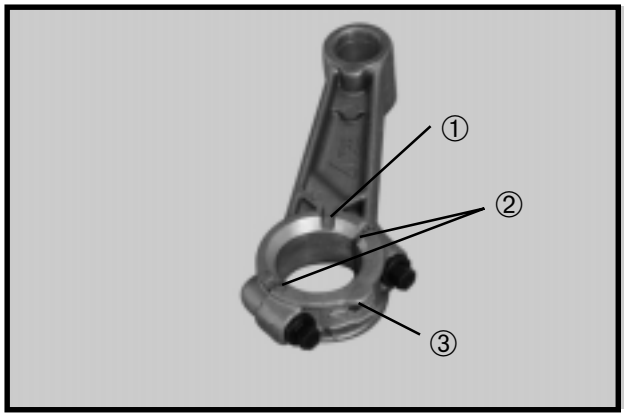
Starting September 1997 all Tecumseh Europa engines were identified by an adhesive label affixed to the blower housing. The actual positioning of this label varies according to engine model. On vertical shaft engines it can usually be found on the oil filler side towards the spark plug. On horizontal shaft engines it can usually be found adjacent to the spark plug. A sample of this label is shown opposite. These labels are in addition to the existing information stamped on the crankcase.



CATALYTIC CONVERTERS

Many of our engines can now be specified with catalytic converter which takes the form of a tablet or wire mesh which is installed within the muffler. These mufflers can be identified by the word “KAT” pressed into them. As with automotive catalytic converters, it is necessary to follow certain ruler if the catalytic converter is to remain effective for a reasonable period. Obviously the customer must be advised only to use unleaded fuel. In addition they should be made aware that the engine should not be over-filled with oil, or tipped in a way to allow oil to flood into the combustion chamber (spark plug down). Catalytic equipped engines are only supplied with primer carburetors, but the customer should also be made aware of the danger of unnecessary over-priming of the engine. With a little care the catalytic converters will be effective for many seasons.

CONNECTING ROD



The connecting rod used in our European manufactured engines ranging from 3.7 - 5.5 HP has been modified in the following areas.

1. Added oil feed channel to the beam of the connecting rod.
2. Added chamfer to the connecting rod/cap parting line.
3. Added oil groove to connecting rod cap.

This is a running change to service part numbers **16110010** and **16110011** and will occur as inventories change.

TECUMSEH®

SERVICE BULLETIN 108

INFORMATIONAL

ISSUED: May 1971

REVISED: October 1998

SUBJECT: Gasoline and Engine Oil Recommendations for 2 and 4-Cycle Engines

GASOLINE

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build-up of combustion chamber deposits. Leaded gasoline, gasohol containing no more than 10% ethanol, premium gasoline, or unleaded gasoline containing no more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, can be used if unleaded regular gasoline is not available.

Reformulated gasoline that is now required in several areas of the United States is also acceptable.

NEVER USE gasoline, fuel conditioners, additives or stabilzers containing methanol, gasohol containing more than 10% ethanol, unleaded regular gasoline containing more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, gasoline additives, or white gas because engine/fuel system damage could result.

See “STORAGE” instructions in Technician’s Manual, Operator’s Manual, or Bulletin 111.

For year round fuel stability in and out of season, use "Smart Start" part number 730245.

FUEL ADDITIVES

Only fuel additives such as Tecumseh’s fuel stabilizer Smart Start™ part number 730245 or liquid varieties can be used when mixed properly. **For winter applications, Isopropyl alcohol** fuel dryers may be used in the fuel system but must be mixed at the proper ratio recommended by the manufacturer. **NEVER USE METHANOL BASED DRYERS.**

OILS

2-CYCLE

Tecumseh two cycle engines require the use of a NMMA TC-W3 or TC-WII certified oil.

TECUMSEH RECOMMENDS USING TWO CYCLE OIL PART #730227, which is a premium blend that ensures cylinder wall lubrication, mixes easy, does not separate and is specially formulated for use in air or water cooled two cycle engines.

The proper fuel mixture ratio of oil to gasoline for specific engines will be found in the owners operating instructions and on the decal attached to the blower housing or fuel tank of the engine.

FOR NEW ENGINES: USE TWICE THE NORMAL OIL QUANTITY FOR THE FIRST GALLON OF FUEL ACCEPT ON TC SERIES WHERE THE STANDARD MIX RATIO IS SUFFICIENT.

4-CYCLE

TECUMSEH FOUR CYCLE ENGINES REQUIRE THE USE OF A CLEAN, HIGH QUALITY DETERGENT OIL. Be sure original container is marked: A.P.I. service “SF” thru "SJ" or “CD”.

TECUMSEH RECOMMENDS USING ONE OF THE FOLLOWING FOUR CYCLE OILS THAT ARE SPECIALLY FORMULATED TO TECUMSEH SPECIFICATIONS.

DO NOT USE SAE10W40 OIL.

FOR SUMMER (Above 32^0F) USE SAE30 OIL. PART #730225

(SAE10W30 is an acceptable substitute.)

Use SAE30 oil in high temperature, high load applications. Using multigrade oil may increase oil consumption.

FOR WINTER (Below 32^0F) USE SAE5W30 OIL. PART #730226

(SAE10W is an acceptable substitute.)

(BELOW 0^0F ONLY): SAE0W30 is an acceptable substitute.

NOTE: For severe, prolonged winter operation of HH120 model, SAE10W oil is recommended.

TECUMSEH®

SERVICE BULLETIN 110

INFORMATIONAL

ISSUED: May 1985

REVISED: July 1997

SUBJECT: High Altitude Carburetor Kits for Fixed Main Carburetors

Engines built to O.E.M. specifications may experience starting and operating problems when used in areas of the country where the altitude is four thousand feet above sea level or higher. A leaner fuel/air mixture is more desirable at higher elevations to sustain good engine startability and operating characteristics. Engines built with adjustable idle and main circuit carburetors can be adjusted (or fine tuned by adjusting).

The following will assist you in selecting the correct high altitude/leaner jetted bowl nut for engines equipped with fixed main or dual system carburetors. Order your requirements from your source of supply.

4 CYCLE

ENGINE	STANDARD BOWL/NUT STAMPED	Over 4,000 Ft.
LEV115	Jet	*
TVS90-120/ECV90,100/TNT100	64, 65, 75, 79, 103,-108, 126, 127, 137	632455
TVS90-120 / OHH50 / 55	158, 161, 164, 165, 166, 171, 172, 177	632737
TVS90 -120, OVRM40-60	124, 125,133, 135, 136	631026
OVM & OVXL120, OHV11-13 (Formula)	120, 141	632239
Dellorto	69	633017
VLV40, 50, 55, 60, 65, 66	Jet	632648
VLV40, 50, 55, 60, 65, 66	Nozzle	632638
TVM170-195	83, 132	632239
TVM220	109, 131	631973
OHV15 - Walbro LMK26	Jet	632688
OHV11 - 17 (Enduro)	Jet	*

2 CYCLE

AH/AV520 & 600, HSK600	101	632368
TVS/TVXL840	L118, L119	632463
HSK840, 845, 850/HXL840	124, 125	631026
TC200/TC300 Tillotson carburetor only.	Jet	632940
TC200/TC300 Tillotson HU112 and HU114	Jet	N/A

Do Not install leaner jetted bowl nuts on engines used below four thousand feet as starting and operating problems will occur. **WARRANTY DOES NOT APPLY**.

NOTE: Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from the factory unless specifically authorized.

*** Altitude compensation not required due to use of emissions type carburetors.**

SERVICE BULLETIN 122

INFORMATIONAL

Issued: June 1998

Subject: RECOIL STARTER WILL NOT ENGAGE WHEN PULLED

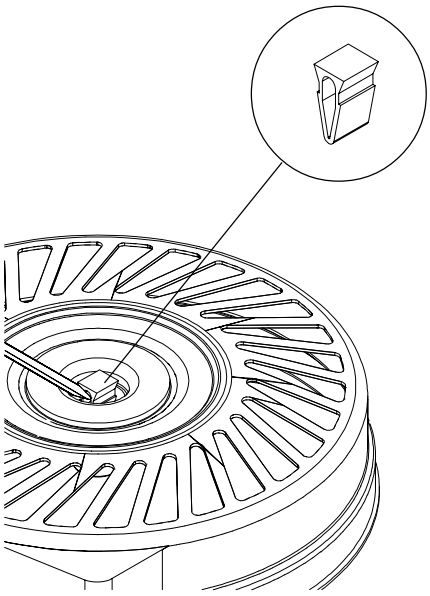
Models Effected: Small Frame (3 thru 6 HP) Horizontal and Vertical Engines with DOM 7335 thru 8150

If you have experienced an occasion where the recoil starter will not engage when the rope is pulled, a simple repair may solve the problem. This repair will only affect starters that have the white plastic locking tab located in the top/center of the starter. The locking tab may be covered by a round protective decal or could be located in the recoil under a decorative cover. The decorative cover will have to be removed to allow for repair. However, it is not necessary to remove the recoil starter from the engine to make the repair.

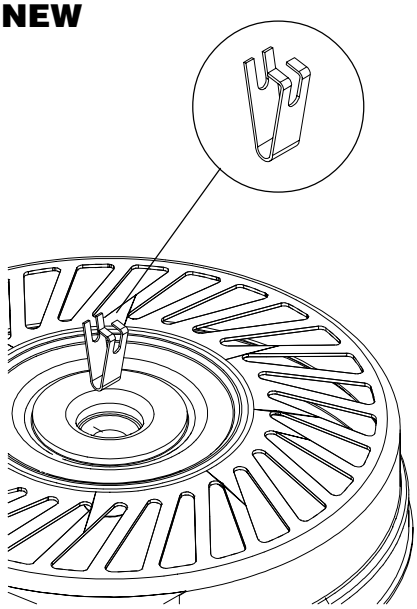
To make the repair you need to remove the protective decal to expose the white plastic locking tab. Use a small flatblade screwdriver or needlenose pliers to pry up on the tab and remove it from the starter. Discard the old tab and replace it with a new metal locking tab part #590760, which also includes a new protective decal. Press the new metal locking tab down into the retainer until it snaps into place. Place the new protective decal over the tab hole to prevent any water or debris from entering the starter.

This procedure and paperwork should take approximately 15 minutes to complete. An ESA 157R warranty claim form should be filed through normal channels.

OLD



NEW



SERVICE BULLETIN 123

INFORMATIONAL

ISSUED: SEPTEMBER 1998

SUBJECT: ACCURATE WARRANTY CLAIM INFORMATION

Models Effected: All Models

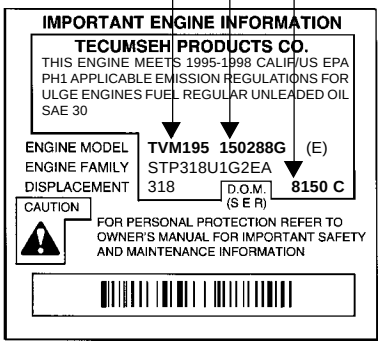
In a recent audit of claims submitted from January through July of this year we have learned that almost 20% of the total claims have been returned to dealers due to lack of accurate information. Further research has identified that the majority of these returns are due to lack of or incorrect information being submitted in "Box 5", "D.O.M. or Serial No". Most often, the incorrect information furnished is the engine Family number sequence. The correct information to submit is the D.O.M. or date of manufacture or Engine serial number from the Engine I.D. label. See Example"

Example of "Box 5" ESA157R Claim Form

Model	Specification	**Serial (DOM)**
ENGINE:TVM195	150288G	**8150C**

5) ENGINE/TRANSMISSION	SPEC NO.	**D.O.M (SERIAL NO)**
TVM195	150288G	**8150C**

Typical Engine I.D. Label



All claim information is extremely important for record keeping purposes. In fact, any missing or incorrect information results in the claim being returned. We ask that you help us by furnishing accurate and correct information in "Box 5" and all the other "Boxes" on the claim form.

Failure to help in this effort results in added expense and work for you and Tecumseh. It also results in delayed payments to you and that affects your receivables. Lastly, unless we can eliminate claims submitted with lack of accurate information we may consider having your Tecumseh source of supply receive your claims for editing prior to submitting claims to Tecumseh.

SERVICE BULLETIN 124

INFORMATIONAL

ISSUED: September 1998

SUBJECT: Improved Gear Product Identification

MODELS OR TYPES AFFECTED: All Models

The recent warranty audit referenced in bulletin number "**123**" suggested we review the way our new Tecumseh/Peerless® models are identified. That review found improvements where needed in the identification system to make them standard with the new emission regulation's requirements covering engine product and the "New ESA 157R Claim Form".

As a result of this review, we have changed the product ID tag to make it easier to read. Should this data be needed for service or warranty situations these improvements will make locating the needed model and specification information easier.

Example Numbers 1 and 2 below, show the present bar code labels currently being used. We have identified the important fields of information that is required for warranty claims.

In addition, a new easier to read bar code label (No. 3 below) is being introduced on all units provided after October 1, 1998. Again we have highlighted the information you are required to supply.

This information is critical for prompt warranty reimbursement to your shop, please pay close attention to this number.

SERVICE BULLETIN 307

PEERLESS

ISSUED: October 1997

SUBJECT: Peerless® Model VST 205 **WARRANTY** Replacement Program

The Service and Engineering groups of Tecumseh have reviewed extensively the servicing of the VST 205 Hydrostatic Transaxle. After review of the complex issues of servicing this unit, we have decided on a unique approach for Tecumseh to handle IN WARRANTY servicing by complete replacement, if needed, with factory furnished units. These units may be Tecumseh re-manufactured units or new units at our discretion.

Effective November 15, 1997, the following procedure is to be followed by all Authorized Tecumseh Service Centers if an Internal Failure occurs WITHIN THE WARRANTY PERIOD. We are enclosing the revised Warranty Policy reflecting this change.

1. Be sure you have reviewed the trouble shooting section of the Peerless® Technicians Handbook, No. 691218, to insure the problem is internal and not a linkage problem. All external components serviceable previously such as pulley, brakes, and levers are still serviceable as before.
2. If you have identified the trouble as internal, contact your distributor for replacement authorization under the normal warranty authorization procedure.
3. You will then need to look up the replacement transaxle using the attached list of replacements or the parts look up system you have chosen (i.e., microfiche, computer or paper). NOTE: Place an **"R"** on the end of the service replacement part number when ordering from your normal source. The unit will be shipped N/C with freight prepaid direct to your dealership. Example: Part #794667 (R). If your replacement model had an "A" suffix, change it to an **"R"** as referenced.
4. Ordering is done through your normal source of supply. DO NOT attempt to combine any **"R"** number with a regular order. Only the **"R"** will be shipped N/C Prepaid. Any added orders will be kicked out (not shipped).
5. You then file your **DISTRIBUTOR AUTHORIZED, COMPLETELY FILLED OUT** ESA157 warranty claim with us for the R&R of the transaxle. Upon receipt of the warranty claim in Grafton, Wisconsin, Tecumseh will issue a recall tag through UPS to pick up the unit for return to us.
6. When your claim is matched up with your returned transaxle, we will process it for prompt payment.
7. Before returning the defective transaxle, place a COPY of the ESA157 warranty claim in the original box, which should be used for return shipment of the transaxle.
8. This program will be in effect for the United States only.

We appreciate your assistance in this warranty replacement procedure.

SERVICE BULLETIN 308

PEERLESS

ISSUED: December 1998

SUBJECT: Hydrostatic Transaxle Shift Force

MODELS AFFECTED: VST205

We have made a change to the VST series transaxle cover. This allows for external adjustment if necessary, of the shift force required to move the control lever. This adjustment can be accomplished on all **"C"** series and later model units. To determine if this adjustment can be made on the unit in for repair, locate the ID tag as shown in the illustration below**.**

When a "C" or newer unit is found, use the adjustment procedure as outlined below. **Remember to disconnect and check the equipment linkage first, before performing this adjustment or replacing the transaxle on early production units.**

TO ADJUST MOTION CONTROL LEVER (See Insert)
The motion control lever has been preset at the factory and adjustment should not be necessary.
If for any reason the motion control lever will not hold its position while at a selected speed or is difficult to move, it may be adjusted as follows:

- Park tractor on a level surface. Stop tractor by turning key to the "OFF" position and engage parking brake.

NOTE: The transmission should not be warm when making this adjustment. Allow it to cool to room temperature before making this adjustment.

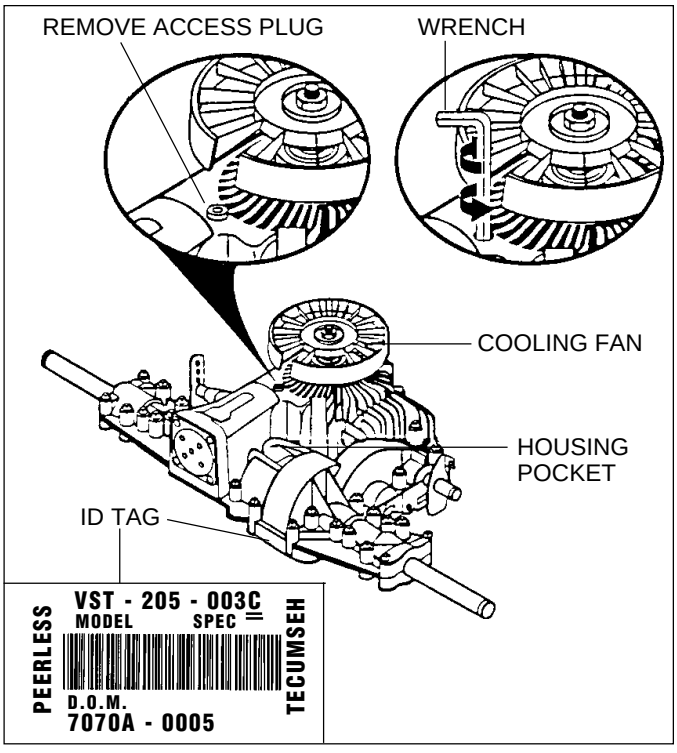
The plug may be accessible through the battery box area, however, each manufacturer may be different.

If access can be gained through the battery area, it will be necessary to remove the battery and the battery box from the tractor.

The most extreme case may require transaxle removal from the frame.

- Raise the seat and open battery box door. Disconnect BLACK battery cable first, then the RED cable.

- Remove battery and battery box from tractor.



(continued on next page)

NOTE: When reinstalling battery box, ensure that battery acid drain tube is routed toward the rear and is clear of the cooling fan.

- Locate the access plug under the cooling fan. This plug and surrounding area must be cleaned to prevent contamination of internal parts during this procedure. Before removing the plug, pack a cloth in the housing pocket to absorb excess oil.
- Clean the bellows cover plate.
- Place a piece of masking tape over the hole located in the center of cover plate. This will prevent air from entering the bellows area when access plug is removed, and prevent oil from coming out access hole when plug is removed.
- Using a needle nose pliers, remove the access plug described above. When the plug is removed, a small, quantity of oil will flow out of the transaxle. This is normal and will not effect its function.
- Insert a #30 torx or 5/32 allen wrench into the access hole and locate the adjustment screw. Adjust the screw clockwise 1/4 turn at a time to increase motion control effort.

NOTE: If for any reason the effort to move the motion control lever becomes too excessive, reverse the above procedure by turning the adjustment screw counterclockwise 1/4 turn.

- Clean the access plug and insert it into position using the torx or allen wrench.
- Clean spilled oil from transaxle and reinstall battery box and battery into tractor. When connecting battery be sure to connect the RED battery cable first.
- An effort of 150-200 in-lbs. of torque to move the transaxle motion control lever is required for hand control units and an effort of 40-50 in-lbs. of torque to move the transaxle motion control lever on foot control units.
- An effort of 15 - 18 lbs. at the motion control lever knob is normal.

Road test tractor after adjustment and repeat procedure if necessary.

NOTE: The neutral spring must be removed to check the force on foot pedal control units.

SERVICE BULLETIN 406

4 CYCLE

ISSUED: October 1998

SUBJECT: Smoking Out of Muffler on Initial Start Up

MODELS AFFECTED: VLV 50 through 66

SERIAL NO'S AFFECTED: 7002 through 7128

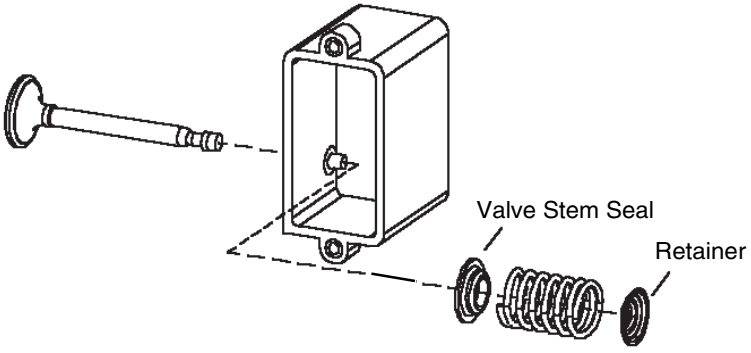
We have received comments from the service system regarding instances of NEW VLV model engines exhibiting smoke from the muffler during initial engine operation. These instances of smoke from the muffler in a new engine may be caused by storage or shipment with the spark plug pointing down.

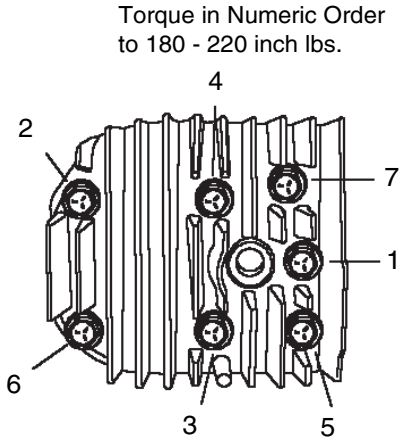
BEFORE performing the procedure below please make sure the engine has been run for at least 30 minutes to burn out any oil residue inside the muffler. If the smoking continues after this time period proceed below.

After investigation we have determined the cause of the smoking. This is the result of an irregular casting surface in the valve spring box, which does not allow proper seating of the seal allowing oil to pass.

PROCEDURE:

1. Remove the muffler, cylinder head and valve box cover.
2. Remove the Intake valve spring, valve and seal.
3. Install the NEW valve stem seal part no. 40016A as shown (see illustration).
4. Replace the cylinder head gasket part no. 36061 and valve box cover gasket part no. 27234A.
5. Re-torque the cylinder head to 180-220 inch Lbs following the sequence below.
6. A kit containing all the above parts can be ordered under part no. **730617**.





The time to perform this repair procedure is typically 45 minutes. We thank you in advance for correcting this problem and request you submit a claim to us for reimbursement.

TECUMSEH®

EMISSION INFORMATIONAL BULLETIN 501

UNITED STATES ONLY

Date Issued: June, 1998 **Family: STP185U1G1RA**

Engine Model(s) Concerned: LEV115 **D.O.M. (s) Affected: 8091-8166**

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and the US Environmental Protection Agency (EPA), needs your assistance.

Potential Emission Control System Problem:

The testing of engines manufactured in compliance with these regulations has identified a potential emission control system problem. The potential area of concern (outlined below) should be inspected when equipment is received for normal servicing.

Should the inspection reveal the engine has the concern outlined, repair the unit as instructed. After completion of the repair, file for warranty reimbursement, using the ESA 157R claim form.

Affected specifications numbers are:

350007A,B,C,	350010B,	350013B,	350041B,C,	350042C,	350063C,
350064C,	350075C,	350083C,	350086C,	350087C,	350089C,
350098C,	350099C,	350110C,	350112C,	355001A,	355003A,B,C,
355004B,	355010C,	355011C,	360002A,	360003A,	360004A,
360006A,	360009A,B,	360010B,	360011B,	360017B,	360018B

Warranty Inspection and Repair Procedure:

Inspect models in stock or that come in for service to determine high speed bowl nut number (stamped on bottom).

If stamped with #174, replace high speed bowl nut with #169 (part number 640087).

If stamped with #169, no change is required.

TECUMSEH®

EMISSION INFORMATIONAL BULLETIN 502

UNITED STATES ONLY

Date Issued: August, 1998

Family: TTP156U1G1EB

Engine Model(s) Concerned:
Compact H35 & H40

D.O.M. (s) Affected:
8079-8201

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and the US Environmental Protection Agency (EPA), needs your assistance.

Potential Emission Control System Problem:

The testing of engines manufactured in compliance with these regulations has identified a potential emission control system problem. The area of concern (outlined below) should be inspected when equipment is received for normal servicing or if the customer complains of poor engine performance.

Should the inspection reveal the engine has the concern outlined, repair the unit as instructed. After completion of the repair, file for warranty reimbursement, using the ESA 157R claim form.

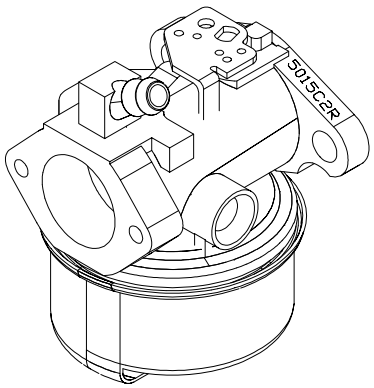
Affected specifications numbers are:
H35-45690Z, H35-45726Z, H40-55701A

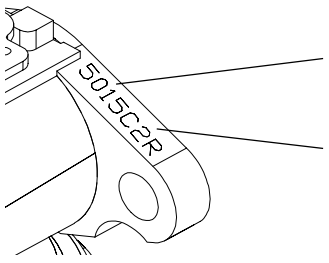
Warranty Inspection and Repair Procedure:

Should you have one of the above mentioned units please check for previous repair. This is accomplished by locating the carburetor model number as shown (see illustration.) If the carburetor model number is **5015** it will be necessary to replace the carburetor.

If the engine has already been repaired the carburetor model number **5161** will be present in the same location, and this **bulletin does not apply**.

To complete the repair order replacement carburetor number **640172** from your usual source of supply. The usual time for this repair is 30-45 minutes which includes completely filling out the ESA 157R warranty claim.





Engine Service Association, Inc.
WARRANTY CLAIM

NO. SAMPLE

2 WARRANTY CODE NO.

PLEASE TYPE OR PRINT CLEARLY

1 TYPE OF CLAIM (CHECK ONLY ONE)

☐ Warranty Repair ☐ New Defective Service Parts
☐ Policy Adjustment ☐ Questionable/Disputed

✓ *FOR*
☐ **Kohler**
☐ **Tecumseh**
☐ **US Motor Power**

4 WARRANTY PERFORMED BY ☐ CD ☐ SD ☐ DEALER

Firm Name

Address

City State

Phone Zip Code

Signed

3 OWNER'S LAST NAME COMMERCIAL USER ☐ YES ☐ NO

FIRST MI

ADDRESS

CITY STATE

PHONE ZIP

Purchased Date			Failure Date			Repair Date		
Mo.	Day	Yr.	Mo.	Day	Yr.	Mo.	Day	Yr.

6 HOURS USED

7 UNIT ORIGINALLY SOLD BY

Customer Signature

5 Engine/Transmission Short/Block/Model No

Spec. No.

D.O.M. or Serial No.

Equipment Manufacturer

Type of Equipment

Engine Received

☐ Mounted ☐ Detached

8 PARTS HAVE BEEN

☐ Returned to Factory ☐ Returned to Central ☐ Retained & Tagged

9 DEFECTIVE PART NUMBER

10 FAILURE SUFFIX

FAILURE SUFFIXES

AW- Assembled Wrong	FM- Foreign Material	SD- Shipping Damage
BC- Broken/Cracked	IF- Improper Fit	SG- Scored/Galled
BL- Blown	LK- Leaked	SS- Stuck/Seized
BT- Bent/Twisted	MI- Missing	ST- Stripped
CD- Porous/Casting Deficiency	ML- Magnet Loose	UO- Unknown/Other
	NA- Not Seating	VC- Valve/Clearance
CL- Came Loose/Off	NY- Noisy	WN- Worn
CP- Corroded/Pitted	OA- Out of Adjustment	WP- Wraped
EF- Electric Failure	PM- Part Made/ Machined Incorrectly	

11 Condition Found/Probable Cause of Failure (Word "Defective" Not Sufficient)

12 Job Number/Work Performed. If Necessary to Remove & Replace (R&R) Engine from Equipment, then Show R&R Separately.

13 Miscellaneous	Dollars	Cents
Freight/Postage Allowance Attach Freight Bill		

14 Labor	HRS.	MINS./TENTHS	JOB #
Repair 1			
Repair 2			
Repair 3			
Misc. Labor			
R & R			
TOTAL			

16 Part Number	Qty.	Description

15 FACTORY USE ONLY

OEM Code	
Defect Code #	
End Use Code #	
Division	

17 Engine/Short Block/Transmission (Authorized Signature

Authorized By:

Firm Name:

WE SUPPORT OPE TECHNICIAN CERTIFICATION

ENGINE I.D. BULLETIN 123

With the implementation of emissionized engines, we were required to change the engine identification system we used. This new system has caused many warranty claims to be rejected for a lack of proper information. We have published Bulletin **123** to help you understand the needed information. Please make sure you supply the information so we can reimburse you promptly.

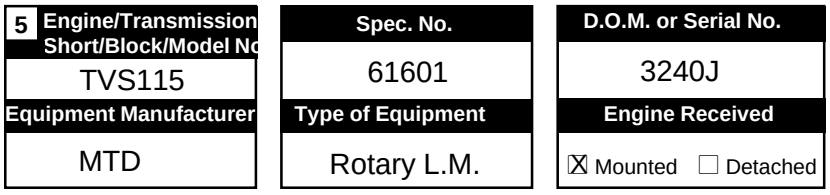
Beginning this March of 1999 Tecumseh is implementing a pilot warranty return program through selected CWD's. This new procedure will return warranty claims **not containing** the needed information through your distributor rather than directly to you. Your distributor will work with you to obtain the needed information and answer any questions, then re-submit the claim signed by the distributor representative for prompt payment.

BOX 5 ENGINE/TRANSMISSION INFORMATION:

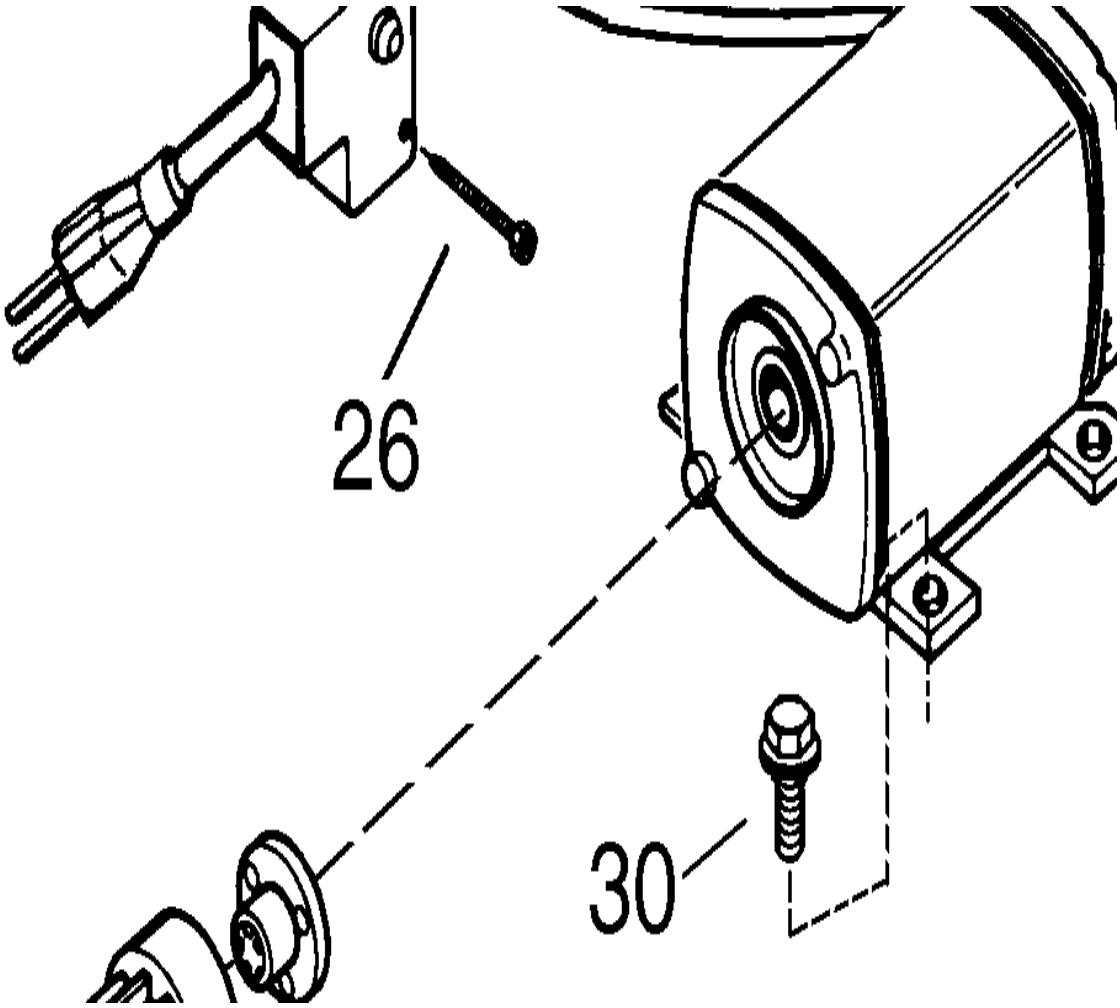
Enter the entire model, specification, serial (DOM) number of the engine/transmission being repaired. When a repair is performed to a short block, enter the short block model and serial number. Check the appropriate box to indicate if the equipment was received mounted or detached from the OEM's equipment.

EXAMPLES:

	MODEL	**SPECIFICATION**	**SERIAL (DOM)**
ENGINE:	TVS115	61601	3240J
TRANSMISSION:	930	011	3071-7308
SHORT BLOCK:	SBV	2308	1198F



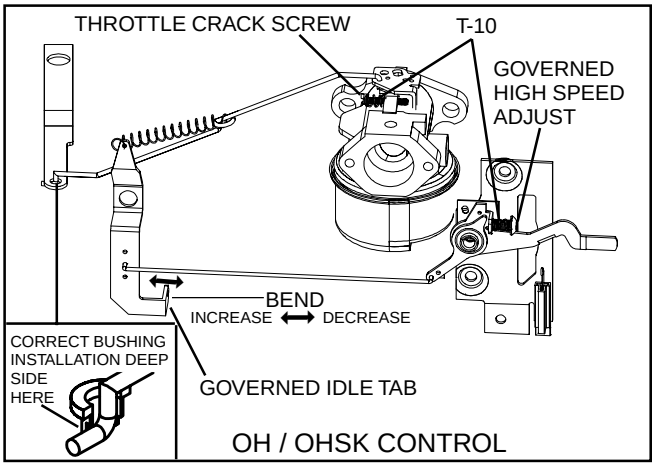
Starter No. 37102



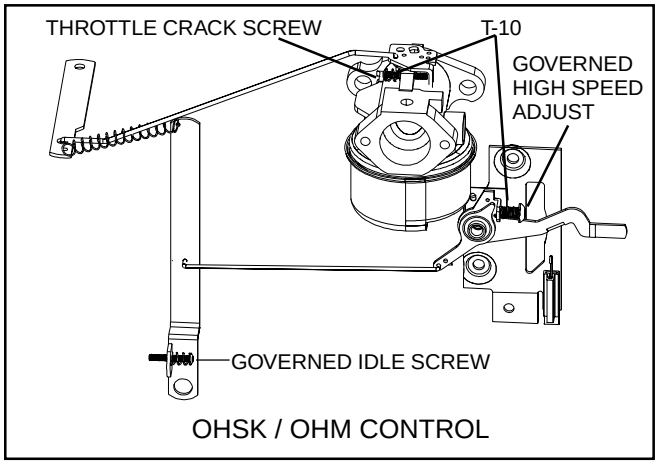
Note: Engines built with the 37000 electric starter motor are identified by the service part number located on the motor's label. Refer to Division 5, Section D, for service part information.

Ref.	Part No.	Description
1	33451	Dust Cover
2	33842	Retainer Ring
3	33430	Spring Retainer
4	33431	Anti-drift Spring
5A	37050	Gear & Nut (Incl. 2)
26	650819	Screw, 6-32 x 2-1/2"
30	30063	Screw, Torx T-30, 1/4-20 x 1/2"
31	650820	Screw, 1/4-20 x 1/2"

OHH GOVERNED IDLE SYSTEMS

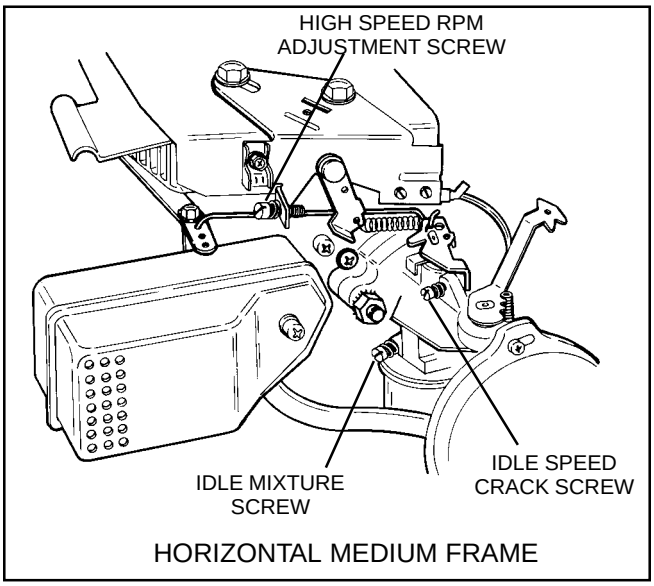


OH / OHSK CONTROL

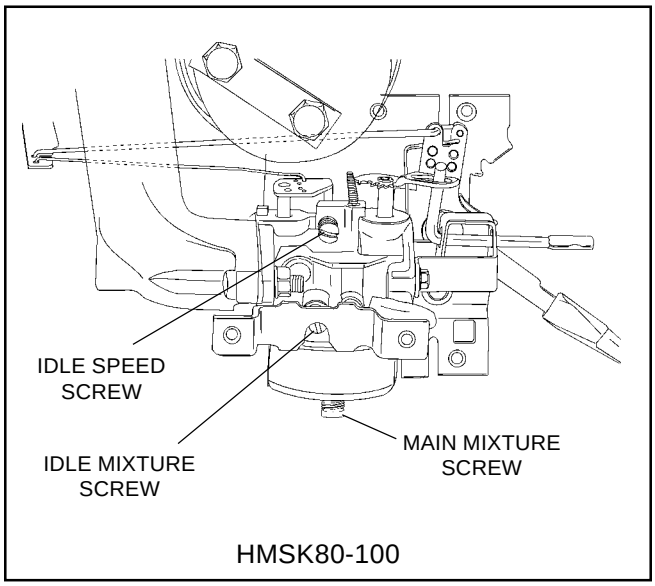


OHSK / OHM CONTROL

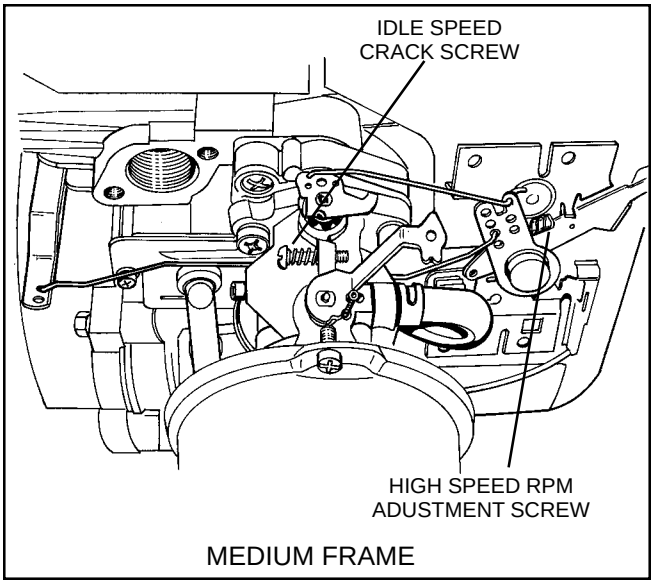
COMMON HORIZONTAL SHAFT MEDIUM FRAME ENGINES



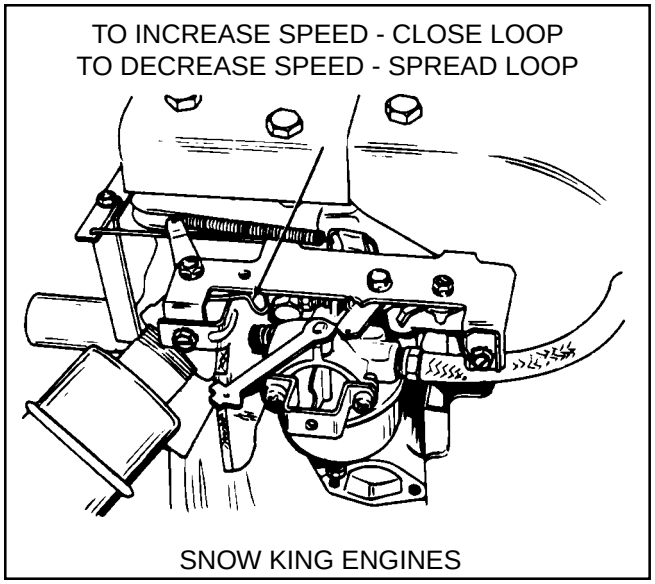
HORIZONTAL MEDIUM FRAME



HMSK80-100

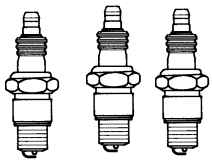


MEDIUM FRAME



SNOW KING ENGINES

SPARK PLUG REPLACEMENT



4-CYCLE SPARK PLUG

Service Number 34046

RL86C

† OHM120
‡ OHSK110-130
OVM120
* OVXL120,
* OVXL/C120
* OVXL125

Note:

*OVXL models with specification nos. 202700, 203000 and up, use RN4C.

† OHM 120 models with specification nos. 224000 and up, use RN4C.

‡ OHSK 110, 120, 130 models with specification nos. 223000 and up, use RN4C.

Service Number 33636

RJ17LM

H30-80
HM70-100
HS40-50

Service Number 35552

RL82C

HH140-160
OH120-160

Service Number 34645

RN4C

OH180 OHH/OHSK50-100 OHV110-17 OVRM40-all

Service Number 34277

RJ8C

H22	HXL35
H25	LAV25-50
HH40-120	TVM125-220
HHM80	TVXL170-220
HMXL70	V40-80
HT30	VH40-100
HT35	VM70-100

Service Number 35395

RJ19LM

ECV100-120	TNT120
HMSK70-100	TVS75-120
HSK30-70	TVXL105
HSSK40-50	TVXL115
LEV80-120	VLV-all
TNT100	

2-CYCLE SPARK PLUG

Service Number 611100

RCJ6Y

TC300
TCH300

Service Number 35395

RJ19LM

TVS840
TVXL840

Service Number 611049

RCJ8Y

AH520	HSK850
AH600	HXL840
HSK600	TC200
HSK840	TCH200
HSK845	Type 1500

Service Number 33636

RJ17LM

AV520
AV600
TVS600

EUROPA MODELS

4-CYCLE SPARK PLUG

Service Number 29010008

J17LM

All Horizontal Models	LAV
BV	Premier 153/173
BVL	Prisma
BVS	Spectra
Futura	Synergy
HTL	Vantage

Service Number 29010023

N4C

Premier 45/55

2-CYCLE SPARK PLUG

Service Number 29010008

J17LM

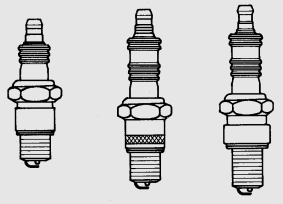
AV85/125
AV520/600
MV100

NOTE: THE SERVICE NUMBERS LISTED BELOW WILL GIVE CORRESPONDING CHAMPION AND AUTOLITE SUBSTITUTIONS.

		Champion	Autolite
35395	-	RJ-19LM	458
33657	-	RL-82C	
35552	-	L-82C *	2654
34046	-	RL-86C	425
34645	-	RN-4C	403
33636	-	J-17LM	245
34277	-	RJ-8C	304
611100	-	RCJ-6Y	

**NON CANADIAN APPLICATION*

SPARK PLUG AIR GAP ON ALL MODELS IS .030 (.762 mm)



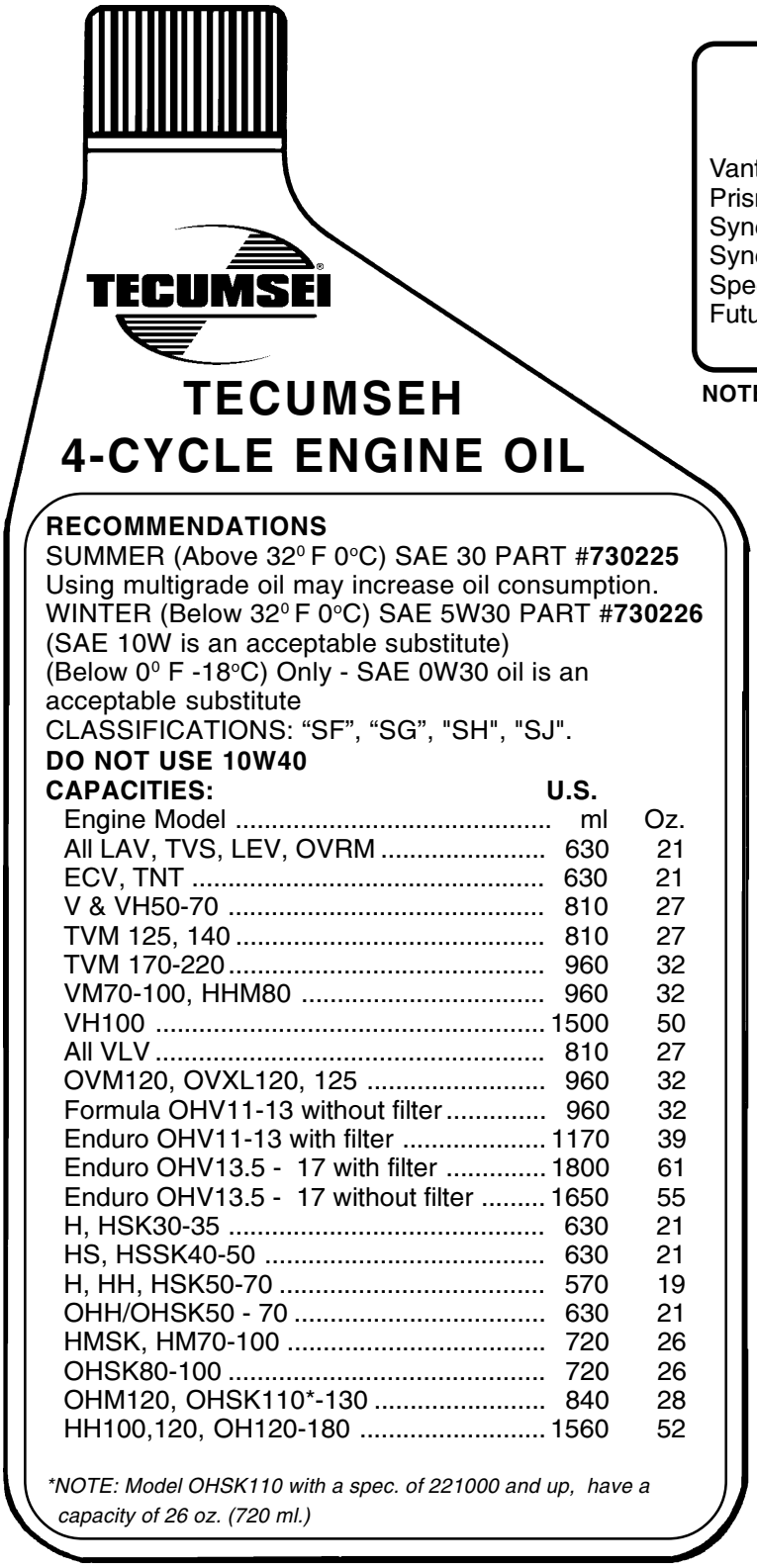
3/8" 9.525 mm | 1/2" 12.700 mm | 3/4" 19.050 mm

NOTE:
Not all spark plugs have the same heat range or reach. Using an incorrect spark plug can cause severe engine damage or poor performance. Tecumseh uses all three of the reaches shown.

TECUMSEH 4-CYCLE LUBRICATION REQUIREMENTS

We often receive questions from both customers and dealers regarding the type and brand of oil we recommend.

Tecumseh recommends the use of a high quality, brand name petroleum based oil in our engines. Very few air cooled engines have any type of oil filtration system, making regular oil changes critical to remove impurities from the engine and maximize engine life. **Consult the operators or repair manual for the oil change interval and viscosity based on equipment operating temperature.**



EUROPA MODELS *

VERTICALS	oz.	ml	VERTICALS (CONT.)	oz.	ml
Vantage	21	630	Centura	21	630
Prisma	21	630	HTL	21	630
Synergy	21	630	BVS	21	630
Synergy "55"	27	810	**HORIZONTALS**		
Spectra	21	630	BH Series	21	630
Futura	21	630	Geo Tech Series 35 - 50	21	630

NOTE: Vertical shaft engines with auxiliary PTO: 26 oz. / 720 ml

TECUMSEH 2-CYCLE ENGINE OIL PART NO. 730227

We also receive calls regarding what type or brand of two cycle oil to use in mini tillers and snow products. The proper type and ratio of two cycle oil is critical to long life and low maintenance of the engine. Tecumseh tests engines using NMMA (National Marine Manufacturers Association) certified oil such as Tecumseh part number 730227, but any NMMA certified two cycle oil will provide adequate lubrication for long life. The use of non certified oils and improper mix ratio's can cause severe engine problems and possibly void warranty consideration if the damage was the result of poor lubrication.

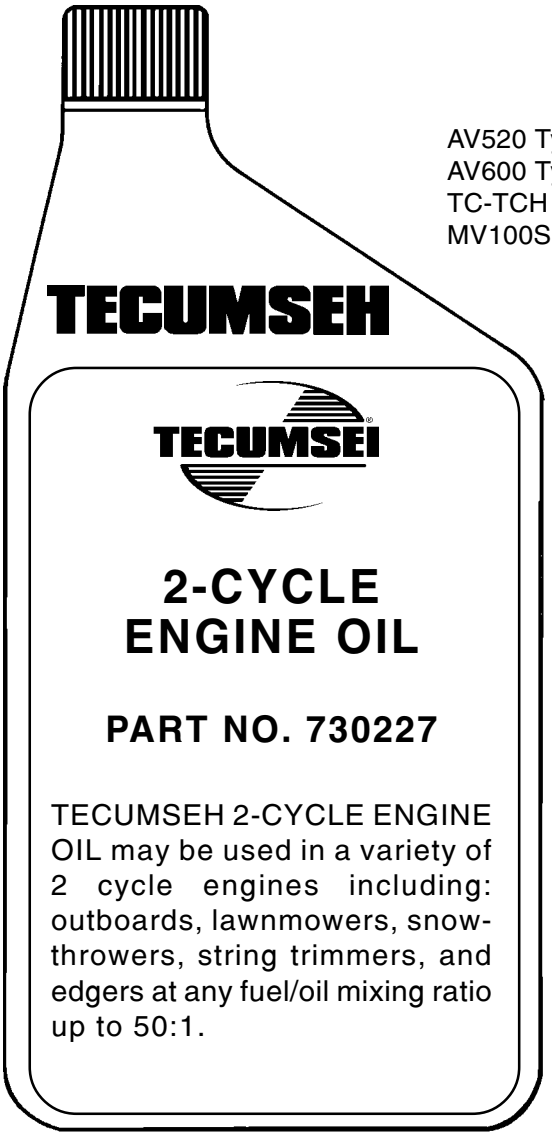
Our position regarding two cycle lubrication is simple, use only NMMA certified oil or Tecumseh two cycle oil mixed at our recommended ratio and your engine will be properly lubricated. Please do not recommend using anything else to your customer, this will avoid getting you caught in the middle, should problems occur.

TECUMSEH 2-CYCLE ENGINES REQUIRE THE USE OF BIA, NMMA, TC-WII OR TC-W3 CERTIFIED OIL, NON-BIODEGRADABLE.

NOTE: DOUBLE THE OIL QUANTITY FOR FIRST GALLON OF FUEL/OIL MIXTURE TO ASSIST BREAK-IN.

NOTE: FOR TC AND CRAFTSMAN ENGINES, DOUBLING OF THE MIX IS NOT REQUIRED.

SEARS CRAFTSMAN TWO CYCLE OIL HAS BEEN TESTED AND APPROVED. ALL MODELS USE A 40:1 MIX RATIO ON ALL 2-CYCLE ENGINES EXCEPT TC'S WHICH USE A 24:1



(acceptable substitute, a high quality SAE30 or SAE40 two cycle oil, outboard type if applicable)

TWO-CYCLE FUEL/OIL
MIX RATIOS

24:1	32:1	50:1
AV520 Types 670 & 653	TVS600 All Types	TVS / TVXL
AV600 Type 600-10 & Up	AH600	HSK840 - 850
TC-TCH 200/300		HSK600
MV100S		

MIXES EASY
DOES NOT SEPARATE

PREMIUM BLEND FOR BOTH AIR AND WATER COOLED ENGINES ENSURES CYLINDER WALL LUBRICATION

ENGINE FUEL MIX				
	U.S. Gasoline	U.S. Amount of Oil To Be Added	METRIC Petrol	METRIC Amount of Oil To Be Added
24:1	1 Gallon	5.3 oz.	4 Liters	167 ml
	2 Gallons	10.7 oz.	8 Liters	333 ml
32:1	1 Gallon	4 oz.	4 Liters	125 ml
	2 Gallons	8 oz.	8 Liters	250 ml
50:1	1 Gallon	2.5 oz.	4 Liters	80 ml
	2 Gallons	5.0 oz.	8 Liters	160 ml

Tecumseh's Education Department welcomes the challenges facing our industry from emission controls to market changes. We believe that education is a vital part of meeting these challenges. This season, we will again be using the Parts Smart and Plus One computer parts look up system's as an interactive part of the class.

Friday mornings at the Douglas facility or Friday afternoons at the Grafton facility, will be reserved for the Master Technician Testing at no additional charge. ***THE TESTING WILL BE AVAILABLE ONLY IF PRE REGISTERED ON THIS APPLICATION. NOTE: YOU MUST HAVE PASSED THE ESA / OPE TECHNICIAN 4 CYCLE TEST AS A PREREQUISITE. You can only be scheduled for the test by submitting proof of holding this certification.***

Both Course I and Advance Course utilize engine and transmission product for teardown and re-assembly extensively. The following are highlights and available school dates for your consideration.

We look forward to seeing you in Grafton, Wisconsin or our Douglas, Georgia school.

If you have any further questions, please call us.

COURSE SCHEDULE

November 15-20, 1998	WI	Course I
December 6-11, 1998	GA	Course I
January 10-15, 1998	WI	Course I
February 1-6, 1999	GA	Course I
February 21-26, 1999	WI	Course I
March 7-12, 1999	WI	Course I
March 21-25, 1999	GA	Course I
February 7-11, 1999	GA	Advance Course
March 14-19, 1999	WI	Advance Course
June 13-18, 1999	GA	Teachers School
August 8-13, 1999	WI	Teachers School

COURSE I

Updating you on Tecumseh engines is complemented with a current mixture of our transmissions and transaxles.

Education is an ongoing process to ensure you and your customers of the best possible service repair.

Course I is not a “basic” course. It is designed to assist new technicians and those crafty veterans with current repair procedures.

Advance Course is available only after you have completed a Course I School.

COURSE I OVERVIEW

Computer Parts Look-up

Technician’s Manual

Master Parts Manual

Warranty

Ignition Timing

Electrical Systems

Carburetion System

New Product Update

Failure Analysis

2-Cycle Engine Teardown

4-Cycle Engine Teardown

Overhead Valve Engine Teardown

Tecumseh/Peerless Transmission/Transaxle Teardown

Service Bulletins

Running and Adjustment of a Reassembled Engine

Servicing Emission Product

ADVANCE COURSE

After having completed Course I you are eligible for Advance Course.

Advance Course attendance does not assure you of a diploma. Tests, homework and performance during the class earn you a diploma and a technical position above your competition.

More time is spent on the practices of troubleshooting and failure analysis. This “Hands On” approach allows you to sharpen skills and procedures.

ADVANCE COURSE OVERVIEW

Computer Parts Look-up

Micrometers

Dial Calipers

Electrical Testers -

Electrical Systems Diagnosis

Carburetion Systems

Valve Train

New Product Update

Troubleshooting and Failure Analysis of

- 2-Cycle Engines
- 4-Cycle L-Head and OHV Engines
- Tecumseh/Peerless Transmissions and Transaxles

TUITION COST AND HOTEL RESERVATIONS

	Program Only	Program and Double Occupancy Hotel	Program and Single Occupancy Hotel
Course I	$200.00	$325.00	$450.00
Advance Course	$200.00	$325.00	$450.00
Teachers School	$200.00	$325.00	$450.00

All checks and money orders must be in U.S. Funds.
Make checks payable to Tecumseh Products Company and must be submitted with your application.
Master Charge, Visa or Discover Card is now being accepted. Please fill in the information required listed below.

The tuition costs covers the following items:

- Hotel fee (as indicated above) from Sunday night through Thursday night.
- Noon lunches Monday through Thursday.
- All class materials.
- Thursday night banquet.
- Daily bus service to and from class.
- Includes breakfast at the hotel (Monday thru Friday).

Classes in Grafton will run until 12 noon Fridays. Douglas classes are completed after the Thursday night banquet.

Tuition fee applies for all students. Cancellation must be received in writing at Tecumseh 10 days prior to week scheduled to obtain refund.

NOTE: INDIVIDUALS UNDER THE AGE OF 18 MUST BE ACCOMPANIED BY AN ADULT.
Mail this application along with the tuition fee to:

Tecumseh Products Company
900 North Street • Grafton, Wisconsin 53024-1499
ATTN: School Reservation
To check for availability call 1-414-377-2700

To make payment using a credit card, please fill out the following information:

(Check One)
☐ Master Charge ☐ Visa ☐ Discover

Print Name (as it appears on card)

Account Number: _____

Signature of Card Holder

Exp. Date _____ Phone Number: _____

Please check *all* that apply.

☐ Single accommodations $450.00 ☐ Smoker ☐ Non-smoker ☐ No Room Needed

Student's Signature _____

Employer's Signature _____

SEE OTHER SIDE FOR FACTORY TRAINING APPLICATION.

TECUMSEH FACTORY TRAINING APPLICATION

Please Print

Student Name _____

Address _____ City _____

State _____ Zip _____ Phone Number ___/____-_____

Dealership Name _____

Address _____ City _____

State _____ Zip _____ Code No. _____ Phone Number ___/____-_____

COURSE I ☐ Application to attend

ADVANCE COURSE ☐ Application to attend - please fill out ALL information on application

OPTIONAL

Master Technician Testing will only be offered for pre-registered applicants with proof of holding OPE 4-Cycle certification.

Master Technician Test ☐ I would like to take the Master Technician Test given on Friday

School Dates: 1st choice _____ 2nd choice _____

Applicants for Advance Course must fill out this part of application, or the application will be returned to you. ***You MUST have attended a Course I school before being accepted into a Advance Course session.***

Course I was completed at ☐ Factory ☐ Central Warehouse Distributor

☐ Other, please list _____

The dates of the school were _____ to _____ 19 __.

The instructor was _____.

For registration information call: 414-377-2700.

The Central Warehouse Distributors in your area may hold in-house Dealer Schools. Please contact them for further information.

Form No. 694565 9/98 Litho in U.S.A.

SEND US YOUR TIPS

Many of the bits of information that we pass along in our schools come from our dealer network. We want to give you the opportunity to contribute to next year's Technicians Seminar Booklet. Please write down your tip(s) and send it to:

Tecumseh Products Company
900 North Street
Grafton, WI 53024-1499

Attn: Education Department

Name: _____
Company: _____
Address: _____
City, State, Zip Code _____

The Top 5 responses will receive a prize from Tecumseh.

Thank you in advance for your input.

Dear Technician

Thank you for choosing the **"NEW"** technician video update seminar format for the 1999 service information. By completing this test and receiving a passing grade you have completed the agreement your dealership made with your distributor(s) and Tecumseh Products Company to regularly attend factory training schools. You or your dealership will be entitled to a credit or rebate based on the program that applies from your distributor dependent on territory or country. The amount will be approximately 50% of the purchase price per set of video's purchased, contact them for prices.

You must return a copy of the test and receive a passing grade of at least 75% from their education director to receive your attendance certificate and any rebate to be issued. **DO NOT** return the test to Tecumseh. All tests must be returned to your **central warehouse distributor by May 15, 1999** to qualify as having attended and be eligible to receive a rebate. If a passing test is not received by date, your refund is forfeited.

This test can be used for self-testing of technicians not taking the package. Dealers and or technicians not purchasing the complete package as outlined or attending a group update are not eligible for any rebate. Dealers and or technicians outside the United States, should contact your distributor regarding program availability.

DO NOT REMOVE THIS TEST FROM THE BOOK, SUBMIT ONLY A COPY TO YOUR DISTRIBUTOR. KEEP THE ORIGINAL FOR YOUR RECORDS AND REFERENCE.

Please Print

Technician Name _____ Dealership Name _____ Date _____

Dealership Location, Street Address _____ City _____

State, Country or Province _____ Phone Number _____

Update Seminar Technician Video Test

1. With the exception of the LEV80, what is the new valve seat width recommendation for all other LEV's?
   A. .078" C. .040
   B. .027" D. .012

2. What is the air gap setting on TC300 non-rotary mower applications?
   A. .015" C. .030"
   B. .0125" D. .025"

3. Correct priming is very critical to the start-up of an engine. How long of a delay should there be between each prime?
   A. 1 second
   B. 2 seconds
   C. 3 seconds
   D. Doesn't matter, rapid fire

4. What is one new method used to emissionize the two-cycle engine?
   A. Fuel / oil mixture improvement
   B. Cylinder port timing change
   C. Fuel injection
   D. Unrestricted air filter

5. What short blocks will come with two head gaskets?
   A. LEV/TVS
   B. OVRM/VLV
   C. HM/TVM
   D. OH/OHV

6. What series carburetor can not be serviced with kit number 632760?
   A. Series 3
   B. Dual System
   C. Series 7
   D. Series 11

7. What is stamped on catalytic mufflers to identify them?
   A. "CAT"
   B. "EMISSION"
   C. "TECUMSEH"
   D. "KAT"

8. When completing an ESA157R, which section can be left blank?
   A. Purchased date
   B. Failure Date
   C. Repair Date
   D. None of the above

9. How is the speed adjusted on a VLV with a fixed speed application?
   A. Bendable tab
   B. Assorted length spring kit
   C. Screw
   D. Non-adjustable

10. What is the diameter of the axle on 1300 series transaxle?
    A. 1-1/8"
    B. 1"
    C. 15/16"
    D. 1-1/4"

11. How many primes are recommended for snow engines below 15^0F (-9^0C)
    A. 1 prime
    B. 2 primes
    C. 3 primes
    D. Choke only, no primes

12. What year did the US EPA Phase 1 go into effect?
    A. 1995
    B. 1996
    C. 1997
    D. 1998

13. What special feature is incorporated on the Series 11 carburetor?
    A. Leaner main jet
    B. Larger venturi
    C. Power valve
    D. Fuel reservoir

14. What is the maximum psi for doing a leak down test on the MST?
    A. 15 psi
    B. 10 psi
    C. 20 psi
    D. 5 psi

15. What is the proper installation/orientation of the pulse hole on TC carburetor spacer block?
    A. Towards the PTO
    B. Towards the spark plug
    C. Towards the flywheel
    D. Doesn't matter

16. What is the part number for the soft-pull starter kit?
    A. 590760
    B. 730245
    C. 16630041
    D. 670297

17. Who can sign the authorization in box #17 of the ESA157R?
    A. Dealer
    B. Customer
    C. Leave blank, for factory use only
    D. Central Warehouse Distributor

18. How long can a Series 11 carburetor be soaked in carburetor cleaner?
    A. 30 minutes
    B. 15 minutes
    C. 5 minutes
    D. Not recommended

19. The fuel cap tether can be retrofitted to most standard 1.750" (44.45mm) caps.
    A. True
    B. False

20. What is the part number for a three pack of Smart Start™?
    A. 730255
    B. 740063
    C. 730525
    D. 740036

21. What does ECS stand for?
    A. Emission Compliance Standards
    B. Environmental Control Standards
    C. Emission Control System
    D. Effective Consumer Safety

22. VLV's will only be made without drain plugs.
    A. True
    B. False

23. What is the part number for the helical governor gear on OH cast iron series engine?
    A. 34751
    B. 34691
    C. 34692
    D. 34752

24. What is the clearance between the starter pinion gear and the flywheel ring gear?
    A. 3/32" (.09 mm)
    B. 5/64" (1.98 mm)
    C. 1/16" (1.6 mm)
    D. 1/32" (.79 mm)

25. Never use gasoline containing more than _ % ethanol.
    A. 5
    B. 10
    C. 12
    D. 15

26. What model year did Tecumseh's complete snow engine product line become certified for both CARB and EPA?
    A. 1995
    B. 1996
    C. 1997
    D. 1998

27. The HM Climate Guard™ kit can only be used on non-emission engines.
    A. True
    B. False

28. What is the correct fuel bowl nut number for LEV 115's with a DOM between 8091 and 8166
    A. 174
    B. 166
    C. 169
    D. 172

29. Up to 10% methanol can be used in a fuel dryer.
    A. True
    B. False

30. Which Service Bulletin was re-issued to cover valve stem seals?
    A. 501
    B. 123
    C. 110
    D. 406

31. What is the part number for the new 7 amp charging system on OHH model engines?
    A. 611210
    B. 622311
    C. 611233
    D. 621011

32. What is the new VST puller used for?
    A. Pintle shaft
    B. Pump retaining ring
    C. Input shaft
    D. Directional control arm

33. How much fuel will one packet of Tecumseh's fuel stabilizer treat?
    A. 1 gallon
    B. 1-1/2 gallons
    C. 2 gallons
    D. 2-1/2 gallons

34. What is the AC output voltage for the 3 amp charging system?
    A. 21 volts
    B. 22 volts
    C. 13 volts
    D. 14 volts

35. What weight oil is an acceptable substitute for below 0^0F?
    A. SAE 10W30
    B. SAE 5
    C. SAE 0W30
    D. SAE 5W20

36. Emission control systems are warranted for ___ under Phase 1.
    A. 1 year
    B. 2 years
    C. 3 years
    D. life of the engine

37. Existing OHH model engines can be upgraded to a 7 amp DC charging system.
    A. True
    B. False

38. What engine model is designated by 126 (12.6 C.I.)?
    A. LEV
    B. TVS
    C. OVRM
    D. VLV

39. Some Europa engines utilize an adaptor collar to locate the flywheel to the crankshaft.
    A. True
    B. False

40. The fuel tank baffle is made from a material similar to what is used in a race car fuel cell.
    A. True
    B. False

41. What series number is used on Emission Service Bulletins?
    A. 400 Series
    B. 500 Series
    C. 900 Series
    D. 1000 Series

42. What tool is used to adjust the shift force on the VST?
    A. #25 torx
    B. #28 torx
    C. 5/32" allen wrench
    D. 1/4" allen wrench

43. Can the vent tube extension be installed into any existing carburetor?
    A. True
    B. False

44. What is the part number for the oil dipper on H30-HS50 model engines?
    A. 32875A
    B. 32654
    C. 36611
    D. 32645

45. What corrective action should be taken on fixed line trimmers that exhibit a mis-fire?
    A. Replace ignition coil
    B. Replace flywheel key
    C. Replace carburetor
    D. Cut off extra ignition ground tab

46. What fuel bowl nut can be used on a Dellorto carbuetor above 4,000 ft.?
    A. 633017
    B. 632239
    C. 632648
    D. 632368

47. Which specification may be effected by a potential emission control system problem?
    A. H35-456912
    B. H40-55107A
    C. H35-457252
    D. H40-55701A

48. An O-ring is still required with the new LEV/VLV valve stem seal.
    A. True
    B. False

49. What type of sealant is recommended for the 820 transaxle?
    A. Loctite 515
    B. Loctite 242 Blue
    C. Loctite 404 Quick Set
    D. Loctite Ultra Grey

50. When adjusting the shifting force on a VST205, the transmission must be at operating temperature.
    A. True
    B. False

TECUMSEH

Answer Sheet for Video Test

1.	A	B	C	D	26.	A	B	C	D
2.	A	B	C	D	27.	A	B	C	D
3.	A	B	C	D	28.	A	B	C	D
4.	A	B	C	D	29.	A	B	C	D
5.	A	B	C	D	30.	A	B	C	D
6.	A	B	C	D	31.	A	B	C	D
7.	A	B	C	D	32.	A	B	C	D
8.	A	B	C	D	33.	A	B	C	D
9.	A	B	C	D	34.	A	B	C	D
10.	A	B	C	D	35.	A	B	C	D
11.	A	B	C	D	36.	A	B	C	D
12.	A	B	C	D	37.	A	B	C	D
13.	A	B	C	D	38.	A	B	C	D
14.	A	B	C	D	39.	A	B	C	D
15.	A	B	C	D	40.	A	B	C	D
16.	A	B	C	D	41.	A	B	C	D
17.	A	B	C	D	42.	A	B	C	D
18.	A	B	C	D	43.	A	B	C	D
19.	A	B	C	D	44.	A	B	C	D
20.	A	B	C	D	45.	A	B	C	D
21.	A	B	C	D	46.	A	B	C	D
22.	A	B	C	D	47.	A	B	C	D
23.	A	B	C	D	48.	A	B	C	D
24.	A	B	C	D	49.	A	B	C	D
25.	A	B	C	D	50.	A	B	C	D

Should you need a new label for any reason such as replacing a recoil housing, please fill out a copy and fax it to us. We will promptly mail you a new engine I.D. Tag.

When replacing the blower housing on an EPA/CARB certified engine with the serial number of 7213 or greater (6001 or greater if in California), use this form to fax an order for a replacement engine identification label. This label is supplied no-charge. Fill in the required information below and fax it in to the Tecumseh Customer Service Department at (414) 377-4485. If you have any questions, feel free to call a Service Representative at (414) 377-2700.

ENGINE INFORMATION REQUIRED:

Engine Model/Spec: _____

Family Number: _____

Displacement: _____

DOM (Date of Manufacture): _____

SHIP TO LABEL INFORMATION:

Send to: _____

Address: _____

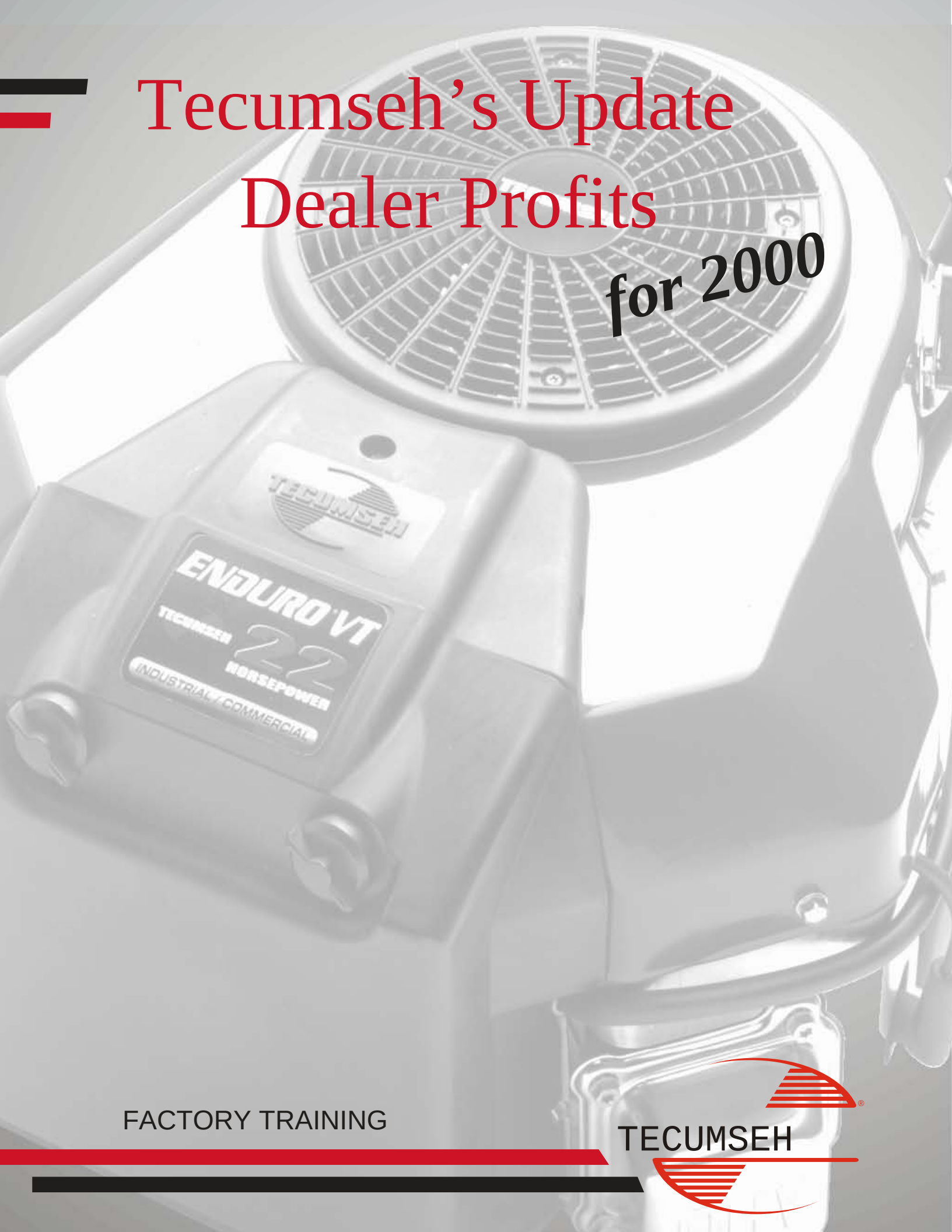
City: _____ **State:** _____ **Zip:** _____

Phone No.: _____

Please allow 7-10 days for shipping & handling. Thank you.

FAX TO: (414)-377-4485

Tecumseh's Update Dealer Profits for 2000



FACTORY TRAINING

TECUMSEH®

4-DAY TECHNICIAN EDUCATION PROGRAMS

Tecumseh has been working with our distributor education team to develop a completely updated factory level, school program. This new program has been engineered to meet the needs of today's dealers and the technicians they employ.

On your behalf an extensive commitment has been made by all of us to you, the educational programs offered at the CWD level. Using their facilities, the course is now the equivalent to that of being educated at one of our factory facilities. These extensive hands on programs will be available starting this January, 2000 in the USA and Canada through your regional Tecumseh distributors.

The following program outline will give you a taste of what you can expect from all of these classes. At the end of the 4-Day session, testing will be offered in both the OPE (Outdoor Power Equipment) and TMT (Tecumseh Master Technician) certifications. During the coming months, you will be hearing from your Tecumseh salesperson about the special benefits that are a part of being TMT certified. All certifications stay with the technician and dependent on your level of proficiency should increase your value to the dealership.

Best of all, the course itself may be free or available to you at reduced cost. Your distributor sales person can give you more details regarding this special offer.

Day One Information Retreival Systems Computer, Microfiche and Paper Two Cycle Engine Theory and hands on covering TC and HSK and AV Product	**Day Three** Enduro VT Twin Teardown/ Reasssembly Fuel Systems New Emissions Carburetors Electrical/ChargInG Systems
Day Two 4-Cycle Overview L-Head and Overhead Valve OHH Enduro Teardown/Rebuild and Running Adjustments LEV Teardown/Reassembly	**Day Four** Failure Analysis Warranty Procedures Transaxle Teradown/Reasssembly MST, 800 Series, 900 Series and a VST Overview Re-Powering with Emission Grade Engines

Inside the back cover page we have listed all of the training directors at your regional distributor. These Team Tecumseh educators can supply you with a complete list of classes available to you.

Please contact them directly.

Tecumseh Dealer Profit 2000

As we go into the next Millennium, Tecumseh has been examining how we can be a more integral part of your business and grow our business together. The changes to the market place have caused us to examine both the dealer structure and the training we provide to you. As you will see in the New Dealer structure presented today, we are putting the full financial resources of Tecumseh into this effort. Your attendance at service training programs like this update class and teardown sessions offered regionally are a key part of this.
Effective this year many of our Central Warehouse Distributor training facilities have been upgraded to factory certified facilities. This means that through uniform programs and facilities you get the same high degree of technical training previously reserved for the factory facilities only. This is part of our distributors and Tecumseh's commitment to your business. This will allow you maximum chance at passing the TMT (Tecumseh Master Technician) test.

As part of these yearly sessions we have also decided to begin including Profit making tips so we can all be successful in the new Millennia. Some of you may feel that business tips and facts do not belong in this type of class. We hope that after this session you have changed your mind. It is our intent to get both technicians and owners to review how your business can be Profitable through added shop efficiency.

In this session we will review how either as the owner or technician in a business you effect the future growth. During this years school we have decided to add a few financial tips to your normal program.

How Can I Become A TMT

Tecumseh has begun offering the most in depth Master Technician certification test in our industry. This test is broken into two main sections that cover all areas that are involved in your normal daily repair of our products. The 2.5-Hour test is comprised of the following.

- A 100 question multiple choice, covering Four-cycle, Two-cycle and our Gear Train product.
- Hands on failure analysis of a failed product drawn at random. This could be any of our products.
- Completion of a warranty claim with all parts required for repair. And a decision as to whether the repair is warrantable or filed as disputed. If the unit is warranty you will be responsible to sign the claim in the area previously reserved for distributor representative.
- Once certified you will receive a special code reserved for you alone not a dealership. When you are employed by one of our new Premier dealers you are empowered to authorize Engine, Short Block or Transmission replacements without distributor approval.
- Recertification is required every four years

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REVIEW OF EMISSION STANDARD EFFECTIVE DATES

CARB: August 1, 1995

All Lawn and Garden/Utility Engines less than 25 HP produced for sale into California after August 1, 1995 (D.O.M. of 5213) must be CARB certified and labeled to indicate compliance. There are several applications which utilize engines typically thought to be in this category that are exempt from California regulations because they are considered Farm and/or Construction equipment.

U.S. EPA: (Phase 1) September 1, 1997

All Lawn and Garden/Utility Engines less than 19kw (25 HP) produced after September 1, 1997 (D.O.M. 7244) must be EPA certified and labeled to indicate compliance. All engines used on equipment considered Farm and/or Construction exempt in California must meet EPA requirements.

Our complete snow engine product line will be certified for both CARB and EPA beginning with the 1997 model year.

CALIFORNIA & US EPA EMISSION CONTROL WARRANTY STATEMENT

The U. S. Environmental Protection Agency ("EPA"), the California Air Resources Board ("CARB") and Tecumseh Products Co. are pleased to explain the Federal and California Emission Control Systems Warranty on your new utility or lawn and garden equipment engine. In California, new 1995 and later utility and lawn and garden equipment engines must be designed, built and equipped to meet the State's stringent anti-smog standards. In other states, new 1997 and later model year engines must be designed, built and equipped, at the time of sale, to meet the U.S. EPA regulations for small non-road engines. Tecumseh Products Co. will warrant the emission control system on your utility or lawn and garden equipment engine for the periods of time listed below, provided there has been no abuse, neglect, unapproved modification, or improper maintenance of your utility or lawn and garden equipment engine.

Your emission control system may include parts such as the carburetor, ignition system and exhaust system. Also included may be the compression release system and other emission-related assemblies.

Where a warrantable condition exists, Tecumseh Products Co. will repair your utility or small off-road engine at no cost to you for diagnosis, parts and labor.

MANUFACTURER'S EMISSION CONTROL SYSTEM WARRANTY COVERAGE

Emission control systems on 1995 and later model year California small off-road engines are warranted for two years as hereinafter noted. In other states, 1997 and later model year engines are also warranted for two years. If, during such warranty period, any emission-related part on your engine is defective in materials or workmanship, the part will be repaired or replaced by Tecumseh Products Co.

OWNER'S WARRANTY RESPONSIBILITIES

As the small off-road engine owner, you are responsible for the performance of the required maintenance listed in your Owner's Manual, but Tecumseh Products Co. will not deny warranty solely due to the lack of receipts or for your failure to provide written evidence of the performance of all scheduled maintenance.

As the small off-road engine owner, you should, however, be aware that Tecumseh Products Co. may deny you warranty coverage if your small off-road engine or a part thereof has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your small off-road engine to a Tecumseh Authorized Service Outlet (any Tecumseh Registered Service Dealer, Tecumseh Authorized Service Distributor or Tecumseh Central Warehouse Distributor) as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

Warranty service can be arranged by contacting either a Tecumseh Authorized Service Outlet or by contacting Tecumseh Products Co., c/o Service Manager, Engine and Transmission Group Service Division, 900 North Street, Grafton, WI 53024-1499. Telephone 1-262-377-2700, or see your local telephone yellow pages under “Engines, Gasoline” for the name, address and telephone number of a Tecumseh Authorized Service Outlet near you.

IMPORTANT NOTE

This warranty statement explains your rights and obligations under the Emission Control System Warranty (“ECS Warranty”) which is provided to you by Tecumseh Products Co. pursuant to California law. Tecumseh Products Co. also provides to original purchasers of new Tecumseh Products Co. engines. The Tecumseh Products Co. Limited Warranties for New Tecumseh Engine and Electronic Ignition Modules (“Tecumseh Products Co. Warranty”) which is enclosed with all new Tecumseh Products Co. engines on a separate sheet. The ECS Warranty applies only to the emission control system of your new engine. To the extent that there is any conflict in terms between the ECS Warranty and the Tecumseh Products Co. Warranty, the ECS Warranty shall apply except in any circumstances in which the Tecumseh Products Co. Warranty may provide a longer warranty period. Both the ECS Warranty and the Tecumseh Products Co. Warranty describe important rights and obligations with respect to your new engine.

Warranty service can only be performed by a Tecumseh Products Co. Authorized Service Outlet, or by Tecumseh Products Co. at its factory in Grafton, WI. At the time of requesting warranty service, evidence must be presented of the date of sale to the original purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the products to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of any engine or any part(s) thereof submitted for inspection and/or warranty work.

If you have any questions regarding your warranty rights and responsibilities, you should contact Tecumseh Products Co. at 1-262-377-2700.

EMISSION CONTROL SYSTEM WARRANTY

Emission Control System Warranty (“ECS Warranty”) for 1995 and later model year California small off-road engines (for other states, 1997 and later model year engines):

A. **APPLICABILITY:** This warranty shall apply to 1995 and later model year California small off-road engines (for other states, 1997 and later model year engines). The ECS Warranty Period shall begin on the date the new engine or equipment is delivered to its original, end-use purchaser, and shall continue for 24 consecutive months thereafter.

B. **GENERAL EMISSIONS WARRANTY COVERAGE:** Tecumseh Products Co. warrants to the original, end-use purchaser of the new engine or equipment and to each subsequent purchaser that each of its small off-road engines is:
   1. Designed, built and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code, and
   2. Free from defects in materials and workmanship which, at any time during the ECS Warranty Period, will cause a warranted emissions-related part to fail to be identical in all material respects to the part as described in the engine manufacturer’s application for certification.

C. The ECS Warranty only pertains to emissions-related parts on your engine, as follows:

1. Any warranted, emissions-related parts which are not scheduled for replacement as required maintenance in the Owner's Manual shall be warranted for the ECS Warranty Period. If any such part fails during the ECS Warranty Period, it shall be repaired or replaced by Tecumseh Products Co. according to Subsection 4 below. Any such part repaired or replaced under the ECS Warranty shall be warranted for any remainder of the ECS Warranty Period.
2. Any warranted, emissions-related part which is scheduled only for regular inspection as specified in the Owner's Manual shall be warranted for the ECS Warranty Period. A statement in such written instructions to the effect of "repair or replace as necessary", shall not reduce the ECS Warranty Period. Any such part repaired or replaced under the ECS Warranty shall be warranted for the remainder of the ECS Warranty Period.
3. Any warranted, emissions-related part which is scheduled for replacement as required maintenance in the Owner's Manual, shall be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by Tecumseh Products Co. according to Subsection 4 below. Any such emissions-related part repaired or replaced under the ECS Warranty, shall be warranted for the remainder of the ECS Warranty Period prior to the first scheduled replacement point for such emissions-related part.
4. Repair or replacement of any warranted, emissions-related part under this ECS Warranty shall be performed at no charge to the owner at a Tecumseh Authorized Service Outlet.
5. The owner shall not be charged for diagnostic labor which leads to the determination that a part covered by the ECS Warranty is in fact defective, provided that such diagnostic work is performed at a Tecumseh Authorized Service Outlet.
6. Tecumseh Products Co. shall be liable for damages to other original engine components or approved modifications proximately caused by a failure under warranty of an emission-related part covered by the ECS Warranty.
7. Throughout the ECS Warranty Period, Tecumseh Products Co. shall maintain a supply of warranted emission-related parts sufficient to meet the expected demand for such emission-related parts.
8. Any Tecumseh Products Co. authorized and approved emission-related replacement part may be used in the performance of any ECS Warranty maintenance or repair and will be provided without charge to the owner. Such use shall not reduce Tecumseh Products Co. ECS Warranty obligations.
9. Unapproved add-on or modified parts may not be used to modify or repair a Tecumseh Products Co. engine. Such use voids this ECS Warranty and shall be sufficient grounds for disallowing an ECS Warranty claim. Tecumseh Products Co. shall not be liable hereunder for failures of any warranted parts of a Tecumseh Products Co. engine caused by the use of such an unapproved add-on or modified part.

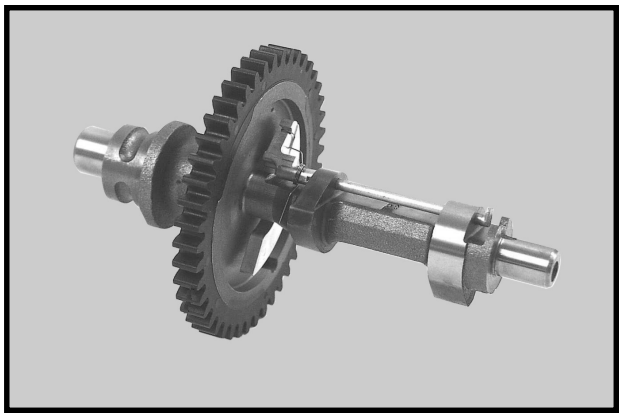
EMISSION-RELATED PARTS INCLUDE THE FOLLOWING:

1. Carburetor Assembly and its Internal Components
   a) Fuel filter
   b) Carburetor gaskets
   c) Intake pipe
2. Air Cleaner Assembly
   a) Air filter element
3. Ignition System, including:
   a) Spark plug
   b) Ignition module
   c) Flywheel assembly
4. Catalytic Muffler (if so equipped)
   a) Muffler gasket (if so equipped)
   b) Exhaust manifold (if so equipped)
5. Crankcase Breather Assembly and its Components
   a) Breather connection tube

4-CYCLE

EXHAUST MCR IS BACK

Tecumseh had initially gone away from offering compression release on the exhaust camshaft lobe due to emission regulations. This change affected the One Pull Starting we have become famous for. Through research and development we have found a way to change back to the exhaust compression release without drastically affecting emissions. This offering will begin with the LEV and OVRM engines and eventually be brought back through-out the entire 4-cycle line.

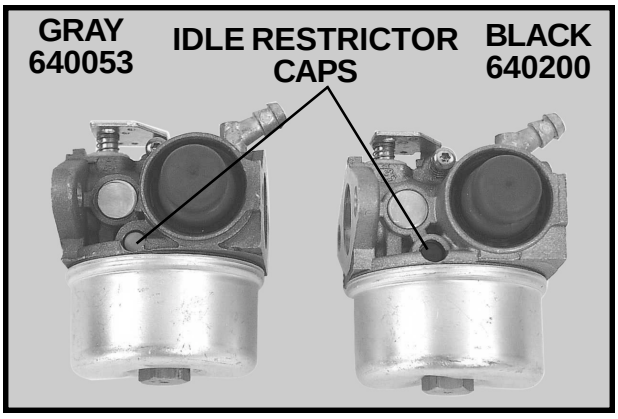


NEW SERIES “11” PRIMER

Over the years we have tried to drive home the practice of always ordering parts by model and specification number. We have also emphasized that primer bulbs are not interchangeable. Here is another example. A new primer bulb, part number **640259** looks like the other red primers used on the Series 8, 9, 10, and 11 carburetors. It is not the same. It has about 30% more volume than other primer bulbs. It will be used on series 11 carburetors for LEV 80,100,115, and OVRM 105, and 120 engines built with the new exhaust valve mechanical compression release or no compression release. This returns Tecumseh to a 3 prime start at temperatures above 55°F (13°C). If the primer bulb is used on the wrong carburetor it could cause a flooded condition, making the engine difficult to start.

SERIES “8” VS “11” EASY ID

Last year Tecumseh Products Co. introduced the revolutionary new Series “11” carburetor. This carburetor adds a fuel chamber, built into the carburetor body that feeds fuel into the venturi of the carburetor during the initial warm up period. This patented feature eliminates, hunting, surging and false starts inherent to emissions engines. However external identification of the Series “11” carburetor has been a challenge. To make this ID simple, the Series “11” carburetor idle restrictor cap will be black, and all others will be gray. The part number for the black cap is **640200** and the gray is **640053**.



COMPOSITE FLOAT

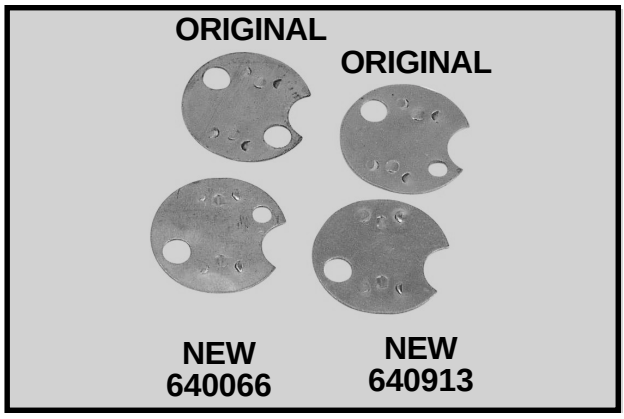
A new adjustable composite float is being used on some applications. Its predecessor the snap-in composite float has now been used successfully on the Vector and Series “7” carburetors for several years. This adjustable version will provide the same reliable consistency as seen on those applications. The float, part number **632765** has a bendable tab like its brass counterpart. The composite float can not be used on applications that require a dampening spring. It must also be used in conjunction with the new style float bowl that has the elongated float rest. Today’s fuels will not affect this material.

BOWL CHANGE

After many years of the same reliable fuel bowl, Tecumseh Products Co. has redesigned the old metal fuel bowl. This change was made to allow the bowl to be used with both the brass and composite floats, which have slightly different profiles. It has a raised channel, which is used as a float rest preventing the float from becoming stuck in varnished fuel. The part number is **631951.**

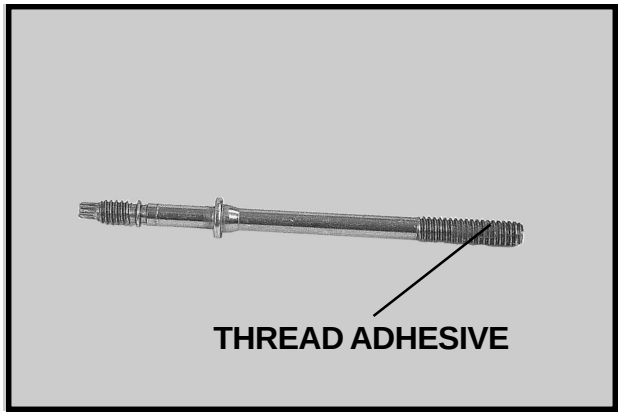
BETTER COLD STARTS

We have received comments from the field regarding poor cold weather starting on recoil starter equipped OHV and “M” series engines. A more aggressive choke plate has been designed to help aid in correcting this situation. The hard start occurs only on engines that use a recoil starter and does not affect electric start models. The part number for this choke plate is **640261** for “M’ series engines, **640913** for OHV 11-13 and **640066** for OHV 13.5-17.5. They have been available since October of 1999.



CARBURETOR STUDS NOW HAVE ADHESIVE

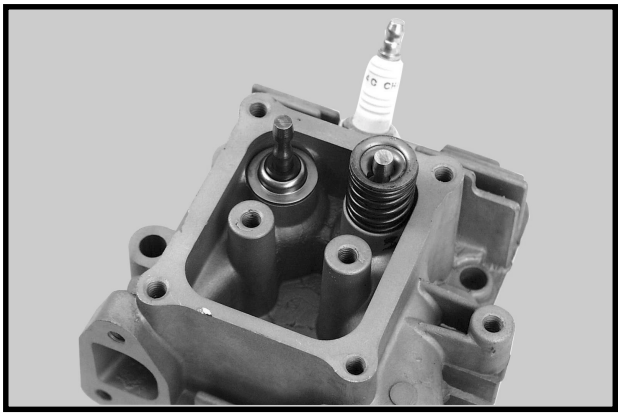
The carburetor studs that fasten the series seven and VLV carburetors to the engine now have a dry adhesive added to the threads of the stud. This was done to assure that the stud does not come loose while servicing the air filter. It is suggested that when servicing these studs, a blue thread locker adhesive be used to secure them to the block. The change occurred in April of 1999.



OVRM / OHH GET VALVE STEM SEAL

Effective October of 1999 cylinder heads of the OVRM and OHH series engines will be machined to accept an intake valve stem seal. This seal will help control the emissions of these engines for Carb Tier II and EPA Phase II regulations. Due to this machining change, the intake valve seals will not retrofit previously built engines. The **40016A** valve stem seal has been in our parts system for several years for use on the VLV series engines.

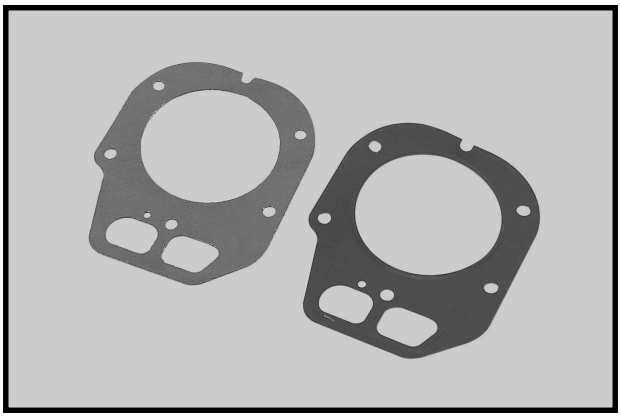
NOTE: In order to maintain emission compliance, valve stem seals must be replaced whenever valve train service is required**.** Also remember to debur the valve stem in the retainer area to prevent seal damage during installation.



NEW OHV HEAD GASKET

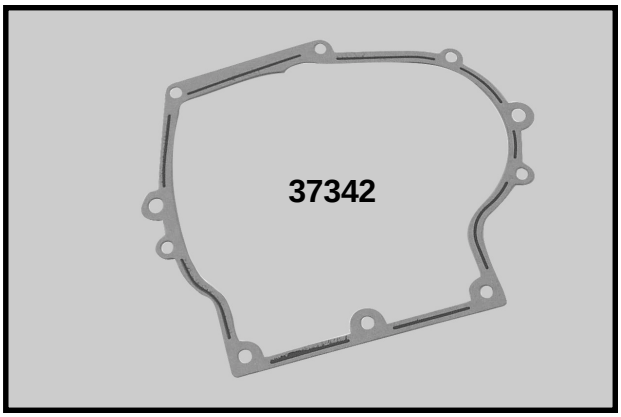
A graphite gasket has been designed to replace the 36337 metal gasket. This gasket is used on the OHV 13.5 through 17.5. The graphite is less sensitive to damage during handling and provides a better seal due to its high density and better thermal properties.

The cylinder head has been machined down to maintain the compression ratio. Therefore the gaskets are not interchangeable.



SILICONE BEAD HM FLANGE GASKET

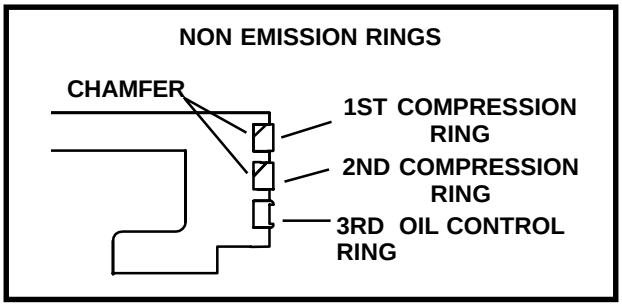
The HM 80/100-flange gasket has been redesigned to include a small bead of silicone to help in sealing. This change will eliminate oil leaks on high load applications such as generators. This gasket is standard on all generator applications beginning in July 1999. The new gasket part number **37342** will also be used as the service replacement part.

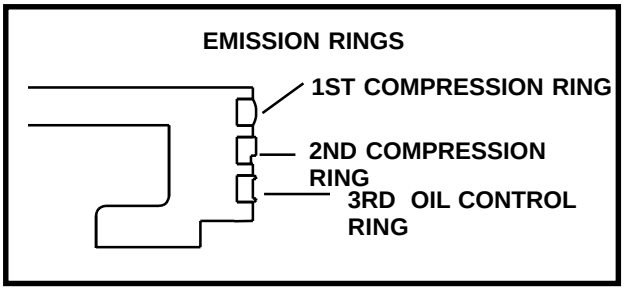


STANDARDIZED RINGS FOR “8” H.P. MEDIUM FRAME ENGINES

The standard non-emissions piston and ring assemblies used on medium frame eight horsepower engines have been made obsolete. They will be superceded to the current emissionized piston/ring assembly; part number **40011**.

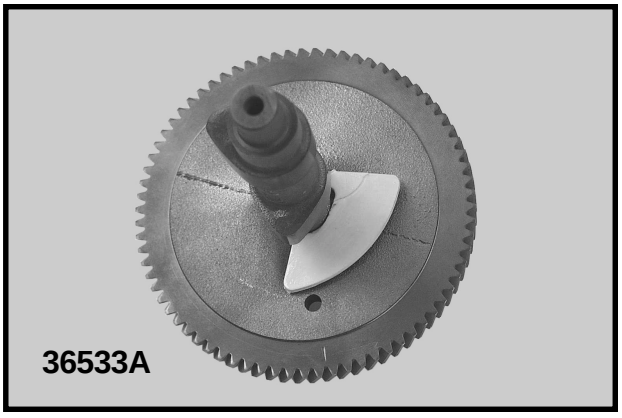
The ring lands on emissions piston/ring assemblies are noticeably narrower than pre-emissions assemblies. The top compression ring on a emissions piston is barrel faced and does not have a chamfered edge. It can be installed in either direction. The second ring is stepped on the outside edge and must face down. The rings are not interchangeable from one style to the other.





NEW MCR FOR OHV 13.5-17.5

A new high-density mechanical compression release yoke has been developed to help strengthen this part of the MCR. Occasionally some distortion of the yoke had occurred rendering the compression release mechanism inoperable. Some of the symptoms caused by this damage are hard starting or slow turnover of the electric starter, if this occurs check the MCR immediately. Dramatic improvement has been seen since this change was made in October 1998. This camshaft assembly part number **36533A** is used on Enduro OHV13.5 - 17.5.



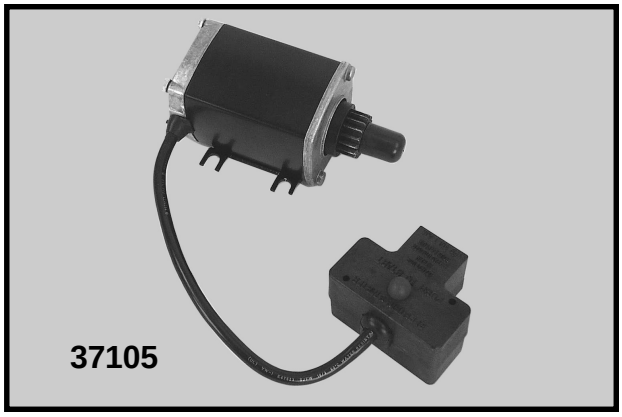
ELECTRIC STARTER CHANGE

The electric starter 36914 used on OHV110 - 135 has been changed to a improved starter, part number 37425. The visual differences between the two are very noticeable. The previous starter mounted via a stamped steel bracket. The new starter mounts using a die cast upper end frame, giving a significant increase in strength. This change took place in July of 1999. The **37425** includes an instruction sheet to assist in making the change.

NEW 120V ELECTRIC STARTER

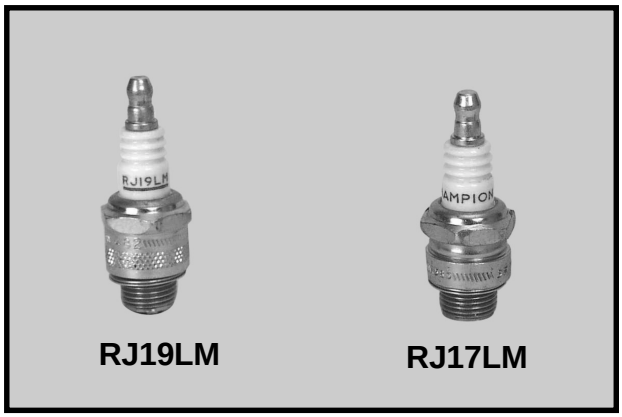
With last years introduction of the re-designed OHM & OHSK 120 – 130, we have developed a high output 120v electric starter to meet the demands of these engines in cold weather starting. The **37105** electric starter looks identical to the 33329E externally but internally has been changed. When installing a new electric starter on a customers Snow King engine which is above 11 Hp remember to use the 37105 starter to ensure trouble-free operation.

Part No.	Description	Models Used ON
33329E	120v Electric Starter	HM,HMSK 70-100 OHSK80-110
37105	120v Electric Starter	OHM & OHSK120-130



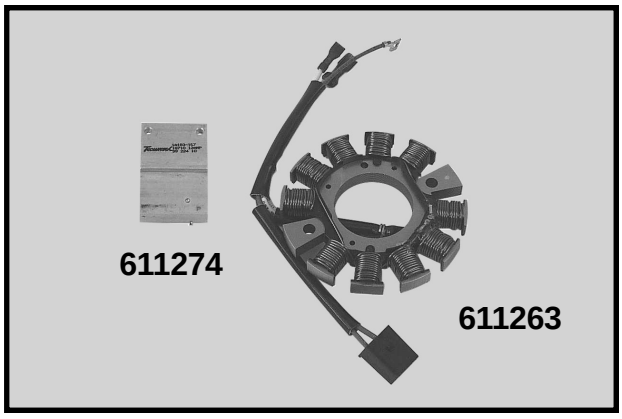
VLV SPARK PLUG CHANGE

To increase the run performance of the VLV series engine, we have made a change to the suggested spark plug used. Beginning October 1999, ALL VLV engines will use the RJ17LM champion spark plug. As the parts information and quick reference guides are updated this change will be reflected. Please make note of this change. When spark plug service is required on any VLV engine use only the Champion RJ17LM.



NEW ALTERNATOR

Tecumseh has developed a new 12 AMP D.C. alternator coil (**611263)** for the OHV and OHM engines. This regulated alternator will supply 12 amps @ 3600. Enough to power electric clutches, lights and maintain a peak battery charge. Since the 12-amp alternator very closely resembles the 16-amp alternator we have visually distinguished the two systems by placing a yellow marking on both the alternator coil and the regulator-rectifier terminal of the 12-amp system. To further aid in the clarification the regulator-rectifier **(611274)** has been stamped on the body with the 12-amp designation.



RE-STYLED 4-QT FUEL TANK

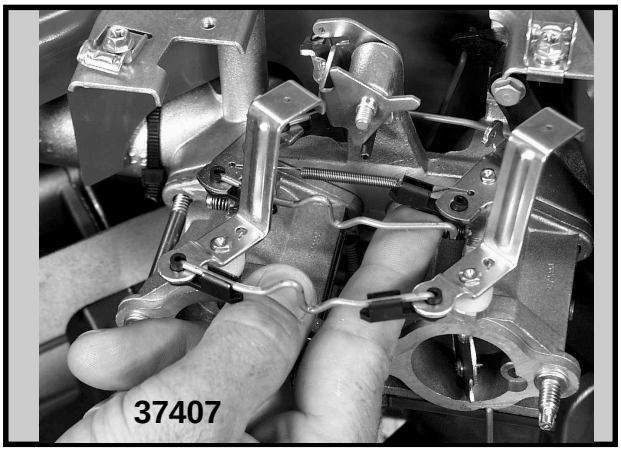
Tecumseh has re-styled the 4-quart fuel tank used on the H / HM / HMSK / OHM and OHSK engines. The new tank incorporates features such as a large fuel inlet for ease of refueling and a spill dam for the occasional overflow. Internal debris screen for cleaner fuel going into the carburetor. And a stylish exterior with the Tecumseh logo embossed into the top of the tank. This restyled tank will help set us apart from the competition, and complete an overall stylish exterior.

ENDURO VT VIDEO

A Video has been produced that provides a complete teardown and reassembly guide for the TVT 691 twin cylinder engine. This video discusses the essential details of the internal workings of the Enduro VT engine. Information such as governor spring hook ups, static governor settings, RPM adjustments and many other details critical to your understanding of this engine are part of this tape. The tape will be included with the update seminar video at no additional charge, or can be ordered separately as part number **696333**. Availability of the video is set for January 2000.

BUSHING CLIPS ON TVT

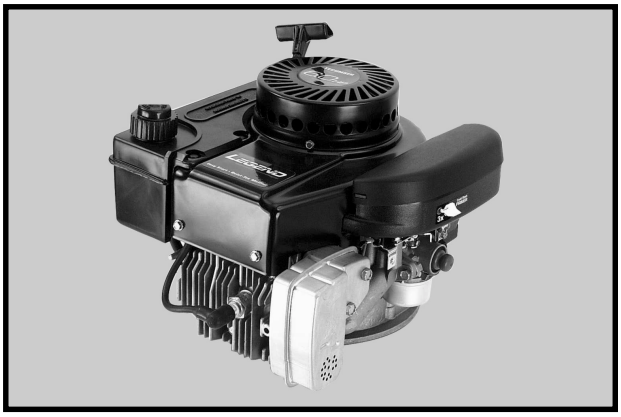
Bushing clips are being used to fasten linkages for the governor and carburetor systems on the TVT engine. These clips help reduce linkage vibration allowing for smother governor operation. They also make access to these systems quick and easy when necessary, and are easily replaced if worn. Stocking of service part number **37407** is suggested. This system is being considered for other engine series.



LEGEND STYLE LEV 120 H.O.

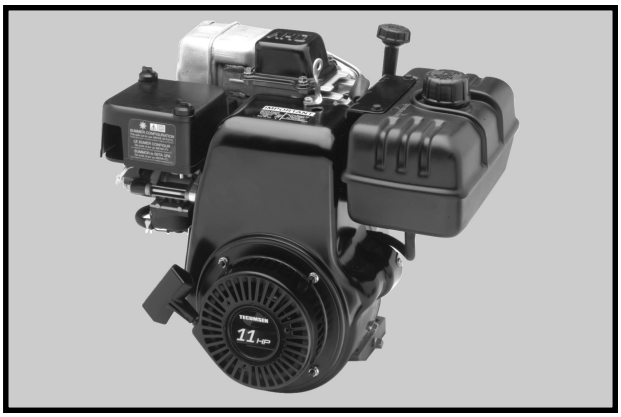
We are pleased to introduce you to the new, largest displacement (12 cubic inch displacement) member of the LEV (lightweight emissionizable vertical) engine family. The H.O. stands for the High Output, and has been developed to meet the customers demands in applications such as pressure washers and generators.

This engine features improvements such as a high flow intake pipe, special port machining, a Series 10 carburetor with choke, new exhaust MCR, a new piston design, ultra quiet muffler, and an improved balance crankshaft.



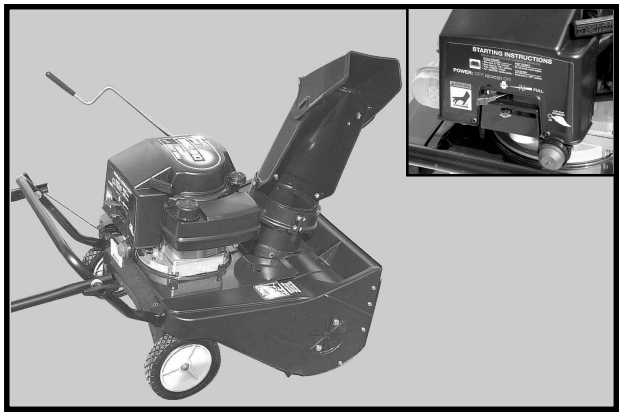
NEW OHM 110

This new engine has been developed to meet the emission standards of tier II all 50-state standards. The engine incorporates the easy service Series "7" carburetor. The engine also incorporates the patented climate Guard™ system introduced on the OHH engines. This feature allows the customer to operate the engine in temperatures down to freezing. With a simple rotation of the filter cover 180°, the passage is blocked and intake air is drawn past the muffler preheating it, preventing freeze up of the closed breather system.



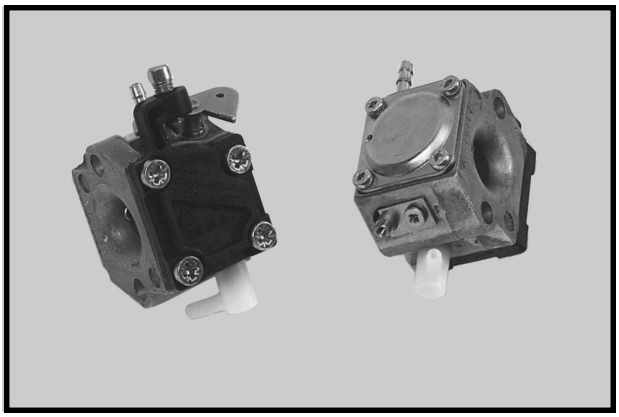
NEW ENGINE MODEL DESIGNATION

There is a new model being added to the engine family at Tecumseh. It is the VSK 100. The VSK stands for vertical snow king. The introductory model is a 3.8 horsepower engine being used on a single stage snow thrower sold by Sears. This engine incorporates some new component parts not previously seen on vertical shaft engines.

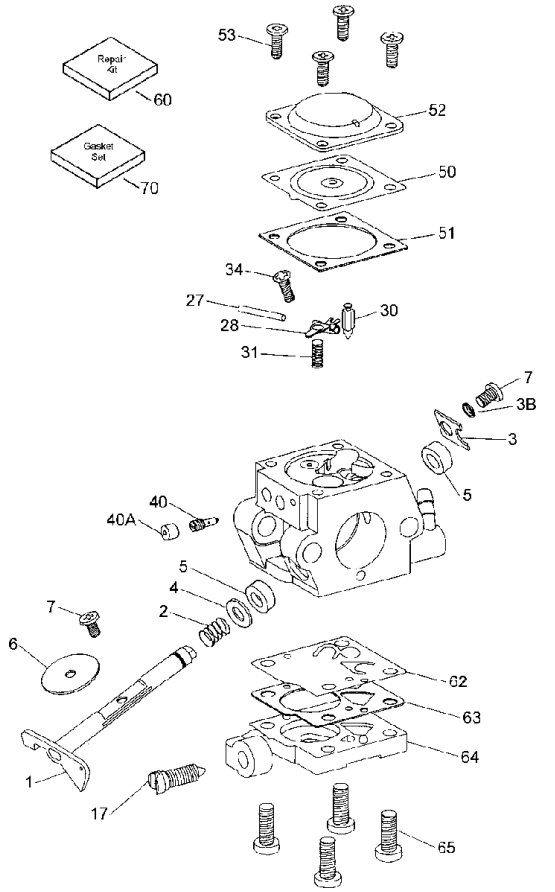


TC 300 NEW CARBURETOR

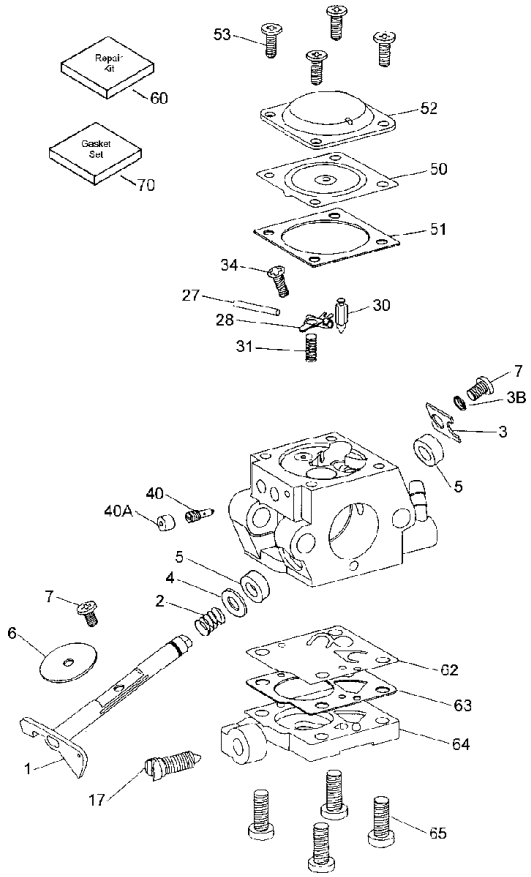
Tecumseh has come up with a diaphragm carburetor of its own for the TC 300, product line. The carburetor has a fixed idle and main which meets the emissions standards for two cycle engines. It currently is available as part numbers **640230** and **640231** and was first used in production in September, 1999. The main jet is serviceable and can be accessed by removing the plastic cap. The jet is removed for cleaning purposes only, and must be covered after servicing to maintain compliance with emissions regulations.



640230



640231



Ref. No.	Part No.	Description
1	640232	Throttle Shaft & Lever Ass'y.
2	640233	Throttle Return Spring
3	640234	Dust Seal Retainer
3B	640236	Spacer
4	640237	Dust Seal Washer
5	640238	Dust Seal
6	640239	Throttle Shutter
7	640235	Screw, Throttle Shutter & Dust Seal Retainer
17	640240	Idle Speed Screw
27	640241	Hinge Pin
28	*640242	Metering Lever
30	*640243	Inlet Needle
31	640244	Metering Lever Spring

Ref. No.	Part No.	Description
34	640245	Screw, Metering Lever Pin
40	640246	High Speed Jet
40A	640247	High Speed Jet Sealer Cap
50	640248	Diaphragm (Included in Gasket Set)
51	640249	Cover Gasket (Included in Gasket Set)
52	640250	Cover
53	640251	Cover Screw
60	640256	Repair kit (Incl. Items Marked *)
62	640252	Pump Diaphragm (Incl. in Gasket Set)
63	640253	Pump Gasket (Included in Gasket Set)
64	640255	Pump Cover
65	640254	Pump Cover Screw
70	*640257	Gasket Set Incl. (1) each of part #'s 640248, 640249, 640252, 640253

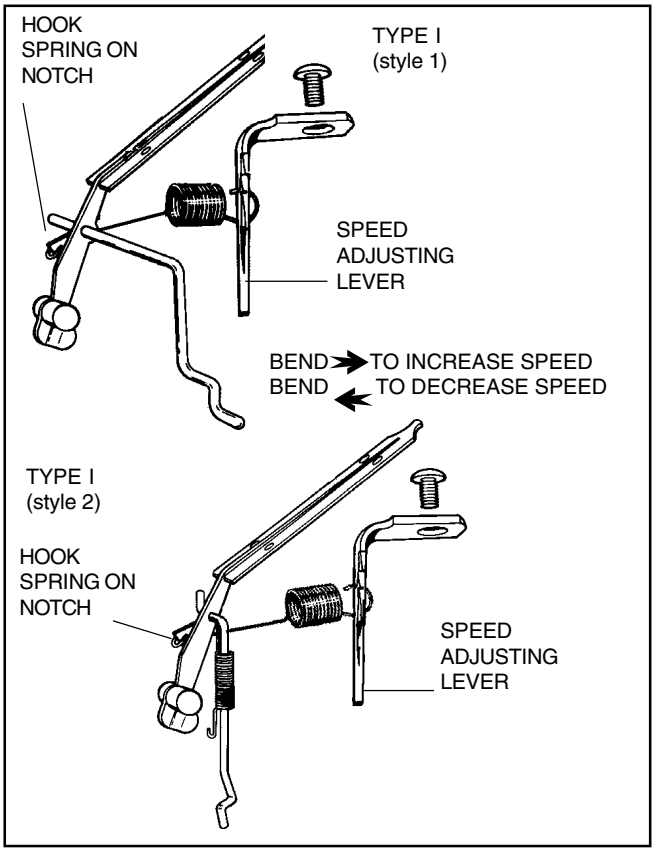
TC GOVERNORS

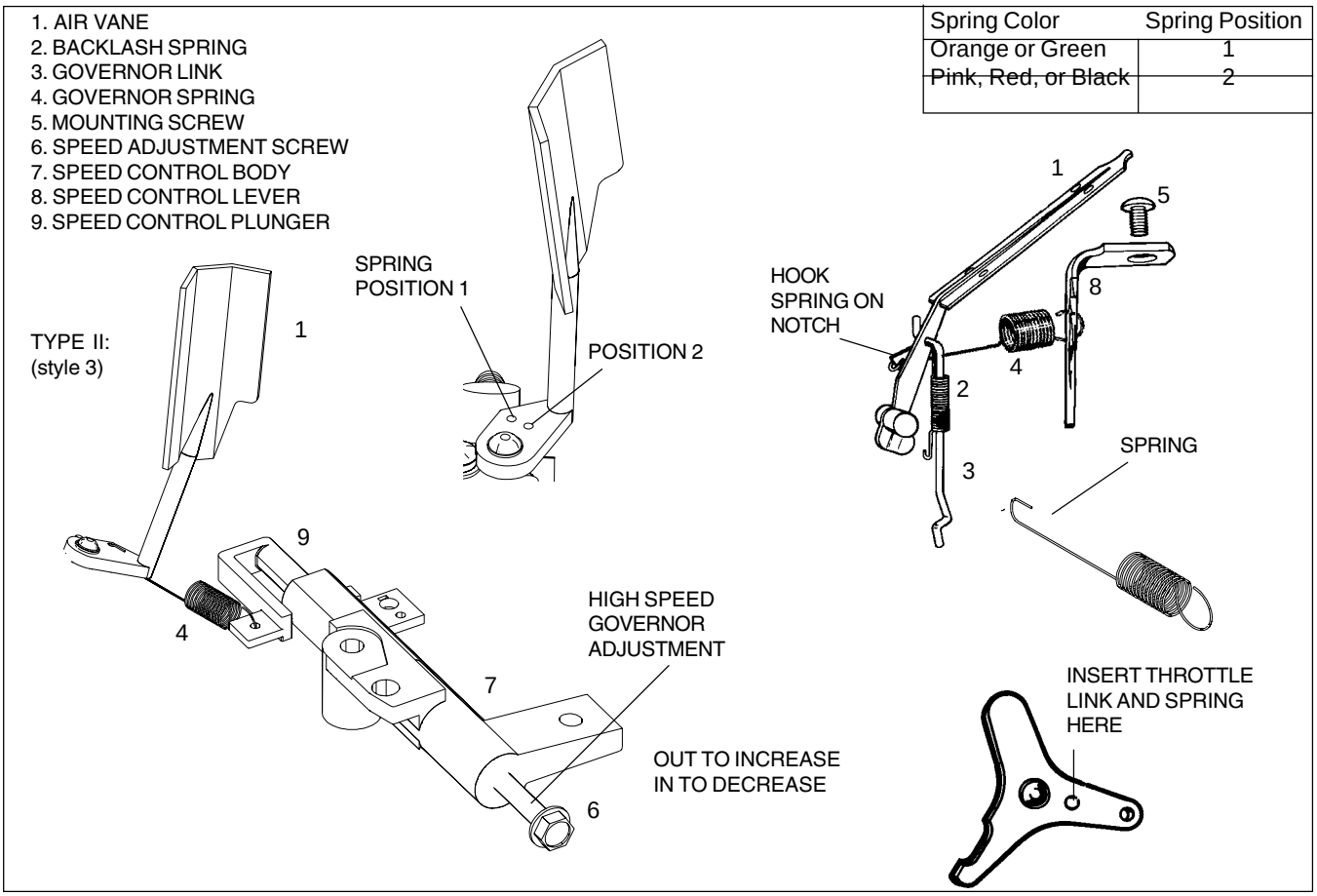
Most of the phone contact received regarding the TC Series engine concerns governor hook-up and/or adjustments. To help with these questions we have included diagrams and instructions for adjustments.

TC SERIES GOVERNOR ADJUSTMENT

Three different styles of governor systems are used on TC engines. Use the following illustrations (diags. 2 and 3) to identify the governor system used and the following procedure to adjust the governed engine speed.

1. Allow the engine to run for at least 5 minutes to reach operating temperature. Make sure the air filter (if equipped) is clean and the choke is in the off position.
2. Using a Vibratach (part# 670156) or other tachometer, determine the engine's R.P.M. at idle and wide open throttle. Consult microfiche card #30, or the computer parts look-up program (Part Smart or Plus One) to obtain the recommended engine speeds.
3. Using the applicable illustration, either bend the speed adjusting lever toward the spark plug end of the engine to decrease high speed R.P.M., or bend the lever in the opposite direction to increase R.P.M. On TC Type II engines, turn the speed adjusting screw out to increase or in to decrease engine high speed R.P.M. If the speed adjustment screw is turned out to increase the engine R.P.M., the speed control lever must be moved to allow the speed control plunger to contact the speed adjustment screw.
4. The low speed is set by moving the throttle control to the lowest speed position and adjusting the low speed adjustment screw on the carburetor.



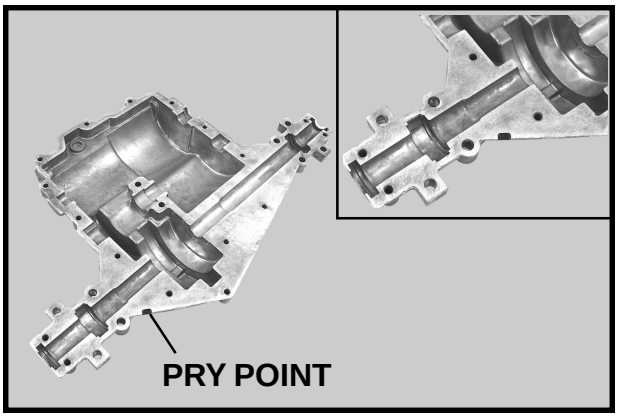


Spring Color	Spring Position
Orange or Green	1
Pink, Red, or Black	2

MST PRY POINTS

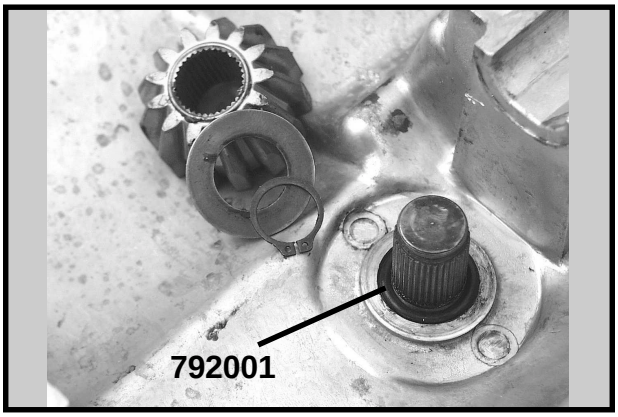
The MST transaxle now has a dedicated pry point between the case and cover to help separate them. The point is located near the differential portion of the transaxle on the short axle side. Silicone sealant is used as a gasket on this transaxle, and makes it difficult to pry them apart. This will help the technician separate the two and prevent damage to the gasket surface. This change which has taken place on a limited number of units since April is set to go across the board beginning October of 1999.

NOTE: Always remember to remove the two (2) bottom case bolts before attempting to separate the case halves.



NEW INPUT SHAFT O-RING ON MST

To increase durability and help prevent contamination, all MST units have been changed to accept an O-ring on the input shaft. The **792001** O-ring is located inside the transaxle cover directly under the lower needle bearing. To make room for the O-ring, the inside needle bearing pocket was recessed, so Upgrades of older units cannot be made because of this change to the cover. This process took effect January of 1999. When servicing the MST series transaxles, always remove the input shaft and inspect the bearings. DO NOT forget to repack the bearings with E.P. grease.

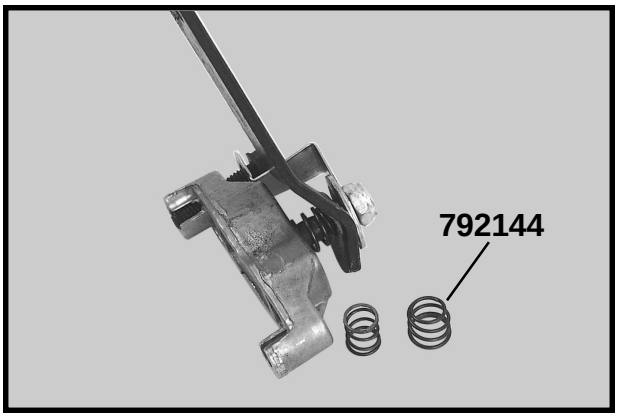


MST / VST BRAKE BOLT CHANGE

The hardened bolts which attach the brake assemblies to the cases have been increased in length from ¼ -20 x 1 ¼" to ¼ - 20 x 1 3/8" The change was made for additional brake retention and reduced bolt stripping. This change only effects the MST and VST product lines. Other model series have not been changed to accept the longer bolt. Order part number **792177** to upgrade.

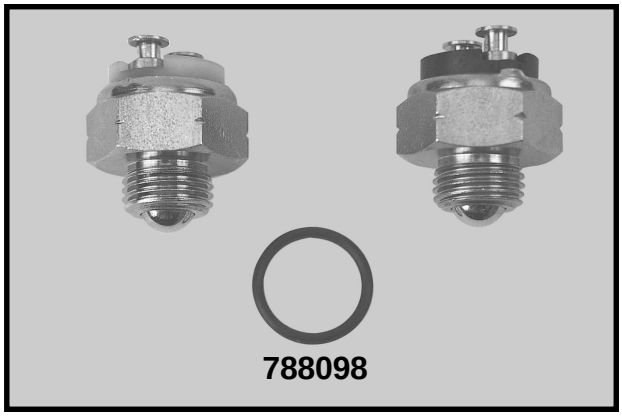
IMPROVED BRAKE SPRING

The brake spring used between the brake housing and the brake lever has been redesigned to help release the brake lever more consistently. The change to part number **792144** took place in July 1999.



STARTING IN NEUTRAL

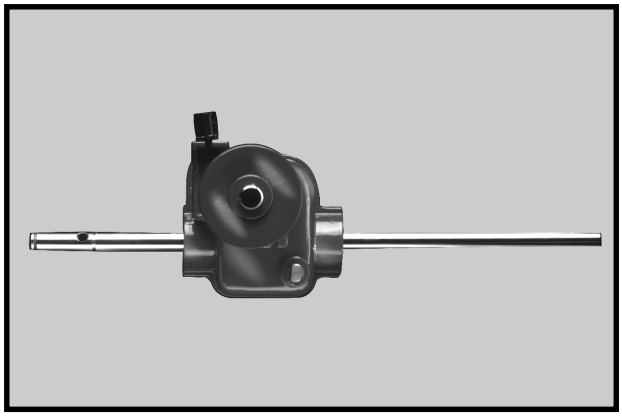
Tecumseh / Peerless® offers a wide selection of Neutral Start Switches for there transmissions products. They differ mostly in the electrical connection hook up or a normally open or closed switch. When ordering a replacement neutral start switch remember to include a **788098** O-ring on all MST models. All greased filled units do not require a O-ring.



NEW TECUMSEH/PEERLESS® MODEL 301

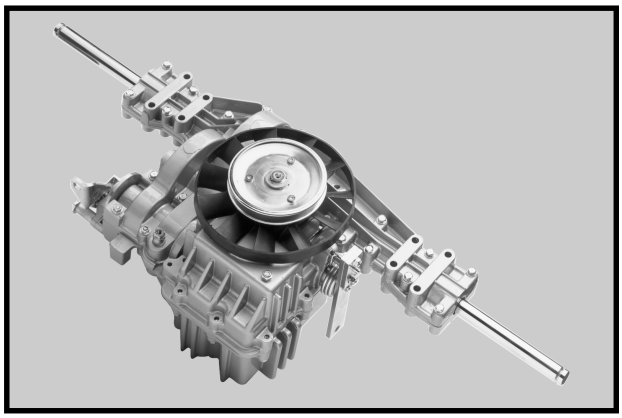
We are excited to expand our role as the world leader in manufacturing engine and gear train products. With this in mind, we have developed a new value packed walk behind mower transmission, the **SilentTrac 301**. The 01 stands for one forward speed and will be used in some rotary mower product you see this coming year.

This unit is clearly identified from other manufacturers models by its unique permanent **Red** colored case and is oil filled. The unit permanently sealed requiring No Maintenance. Service when eventually required is done through replacement as a complete unit.



NEW SILENTTRAC™ 200

Tecumseh has been developing a new hydrostatic Transaxle to replace the current VST product. The primary goals were to allow internal service of the output side of the unit, and reduce shift force eliminating the need to perform field adjustments for various customers. The pump/motor portion will be serviced through a core exchange program from your normal distributor. Some other benefits of the new design are reduced noise through separation of the pump/motor from the output drive portion. Regular gear oil and dedicated pry points for convenient case splitting if service is ever needed. This product is currently in its final test stage and is slated for production by September 2000.

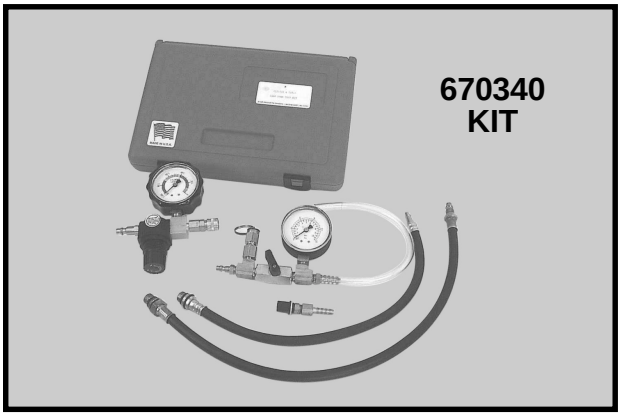


LEAK PREVENTION

If a leaking carburetor inlet needle and seat, transaxle case seam or axle seal has ever frustrated you, this tool is for you. The MST series transaxle was our first new model in fifteen years to use 80/90 EP oil instead of grease. When a repair is needed proper resealing is CRITICAL. If you do not pressure test for leaks the unit could slowly run low of oil, causing a total unit failure. This tool makes a low, pressure leak down test quick and easy. Using the tool simple, apply no more than **5 PSI (.25 Bar)** to the unit, turn off the air valve and watch for any pressure drop. I no drop is noted, the unit is ready to be re-installed. Should a drop be noted open the air valve and apply no more than **5 PSI (.35 Bar)** pressure back into the transaxle and brush a soap/ water solution on all the joints and seals to find the trouble spot.

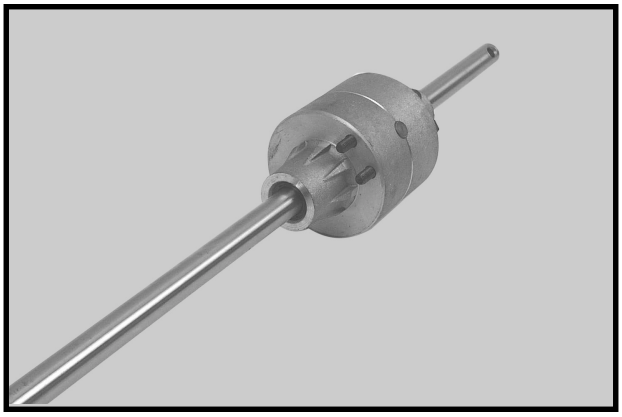
Carburetor Needle and Seat Pop-Off can also be checked with this same low-pressure tool. Simply wet the inlet seat with a drop of oil, and then slowly turn up the primary regulator until the needle pops-off the seat. Then turn off the shut-off valve between the primary regulator and the low pressure gauge. The seat should hold at least 1-1/2 PSI for a minimum of 5 minutes.

Two kits are available the first is a complete kit including the primary regulator, low pressure gauge and all adaptation equipment. This kit is available through your distributor as service part number **670340**. The second kit is designed to be an add-on unit for a standard leak down tester and contains only the low-pressure part of the system. Order service part number **670345** from your distributor.



100 SERIES GET RTV SEALANT

Tecumseh/Peerless® has improved the sealing on all Heavy-Duty 100 Series Differential housings. These models incorporate a spider gear drive pin that extends to the outside edge of the housing for added strength. RTV is now being applied to the housing edge focusing all around the pin area to insure grease retention on these units. Effective immediately we suggest using RTV on All 100 Series differential housing's regardless of specific model.



MISCELLANEOUS PRODUCT NEWS

NEW PARTS AND ENGINE DISPLAY RACKS

Tecumseh is proud to offer two new display racks for next season. One will be for our expanded line of packaged parts, Tire Sealant, Lubricants and Cleaners. The other will be for engines. The new display racks will allow the do it yourself customer to sell himself on these fast moving attractively packaged parts. Contact your distributor sales person for additional information and complete details on the program.

UPDATED PACKAGED PARTS PROGRAM

Tecumseh has extensively reviewed the items offered in the program this year. We have replaced older low volume parts with some new fast moving items. For the first time the items will also be listed in a special section of the price list. You will see this in your next update mailing of the advanced price list. The package parts program can save you and your counter person valuable time looking up parts, and generate increased sales when the customer can visually recognize the part that's needed. Ask your distributor sales person for a complete listing of all the items available in this program.

TECUMSEH CLEANERS AND LUBRICANTS

Tecumseh is pleased to announce and present to you our new line of high performance Lubricants and cleaners. These products are designed for use in the shop as well as for retail sales. The Program gives you a full range of products attractively packaged with a Motorsports theme. Ask your Distributor for information on our introductory packages and programs.

all cases are 12 cans per case
* 32 oz. Liquid, 14oz. aerosol

Product Description	Part	UPC#
Battery Protector, Case	696407	00202
Battery Neutralizer, Case*	696417	00213
H/D Parts Cleaner, Case*	696408	00203
Hand Cleaner, Case*	696411	00206
Lithium Grease, Case	696409	00204
Carburetor Cleaner, Case	696410	00205
Rubber Lube, Case*	696418	00214
Penetrating Oil, Case	696412	00207
Dry Teflon Lubricant, Case	696413	00208
Contact Cleaner, Case	696414	00209
Aerosol Degreaser, Case	696415	00210
Spray Teflon Grease, Case	696416	00212

NOT JUST ANOTHER SEALANT

Tecumseh is please to introduce to you our new line of Tecumseh tire sealant. We are not just selling another tire sealant. We have worked with our supplier to create a unique profit building opportunity for your business. A dealer installed **Flat Tire Prevention Program.** This is a lifetime flat tire protection program that the dealer can offer to homeowners and commercial customers. Should a tire go flat after the sealant is installed the program would reimburse the dealer for the parts and labor, it takes to make the repair, including a service call if needed. Claims are submitted directly to Tecumseh assuring your business of prompt re-imbursement. Ask your distributor sales person for complete detail on the program.

Product Description	Part #	UPC #
16 ounce bottle, Each	696401	00197
32 ounce bottle, Each	696402	00196
2.5 Gallon Pail	696403	00198
5 Gallon Pail	696404	00199
30 Gallon Drum	696405	00200
55 Gallon Drum	696420	N/A
Transfer Pump	696419	00215
Metered Dispenser	696406	00201

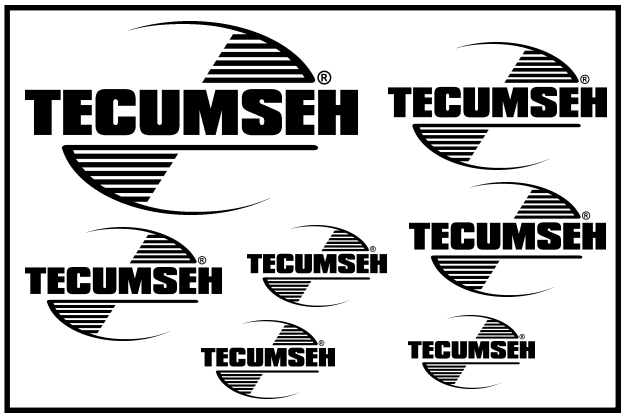
ULTRA FRESH™ GASOLINE PRESERVATIVE

Tecumseh's latest gasoline stabilizer, Ultra-Fresh™, offers more value than traditional liquid fuel additives. Ultra-Fresh™ is non-toxic, non-staining, and non-flammable. Its granular formula dissolves quickly into gasoline and performs better than major brands for up to 24 months. As gasoline turns bad in less than 30 days and sometimes faster (with clear gas tank), it is important to educate the consumer about the benefits of using Ultra-Fresh™. Tecumseh offers multiple merchandising options (see below). At the request of many dealers, we now offer a shop canister that includes its own dispenser. The shop jar treats up to 96 gallons. Treating each customer's engine coming into your shop will keep your customers satisfied while having a safe product in your work area. Ask your distributor sales person about profit opportunities from Ultra-Fresh™.

Merchandising Options	Part #
Counter display consists of 5 g (0.2 oz) packet (each packet treats 2.5 gallons (10 litres of fresh gasoline.	**730255A**
Shop canister	**730260**
3-packet bubble pack (5 card pkg)	**740063**

CAMERA READY EMBLEMS

We have placed a page of camera ready emblems in this book for use by registered dealers in any advertisements you place (see page 40). Please pass this page on to any Companies or Advertising media you are currently using such as Yellow Pages, News Paper etc., This will update their information as we have discontinued use of the Indian Logo. Additional single page copies are available from your distributor sales person.



TECUMSEH LUBRICANTS

With the need for multi-lingual packaging, we have consolidated and changed some of our existing lubricant part numbers. We have also added a number of new product available to the servicing dealer.

OLD NUMBER	Description	New Number
788067B	BENTONITE GREASE	**788067C**
730225F	SAE 30 OIL (32oz)	**730225A**
730226F	SAE 5W30 OIL (32oz)	**730226A**
730238F	SAE 30 OIL (21oz)	**730238A**
730229F	80W90 OIL (32oz)	**730229B**
730227A	2-Cycle OIL (8oz)	**730227B**

TOOL KIT 670195E

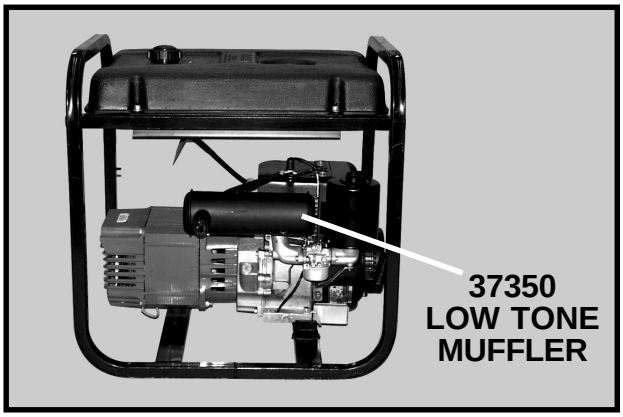
In an effort to help maintain costs Tecumseh has decided to remove a few low usage tools from its basic tool kit. These tools will still remain available by individual order. Removed are the

670237A Cast Iron OH Valve Spring Compressor
670294 AH520 & AH600 Seal Protector & Installer for One Piece Seals
670319 Torx 25 Driver
670327A Seal Protector & Installer (VLV Models)

This effort allows us to continue to offer the service technician the most commonly used specialty tools at an affordable price.

NEW LOW TONE MUFFLER FOR GENERATOR APPLICATIONS

From listening to our customers suggestions Tecumseh has introduced a new Low Tone Muffler for the HM80 thru HM100 engine. The muffler part # **37350** was specifically designed to fit Generators with Extended Run Fuel tanks, but also works great for Logsplitters, Chipper shredders and more. This muffler, maintains emission compliance, contains a USDA approved spark arrestor, and was designed to work with our Climate Guard (730630) conversion kit.



NEW OIL VACUUM SYSTEM

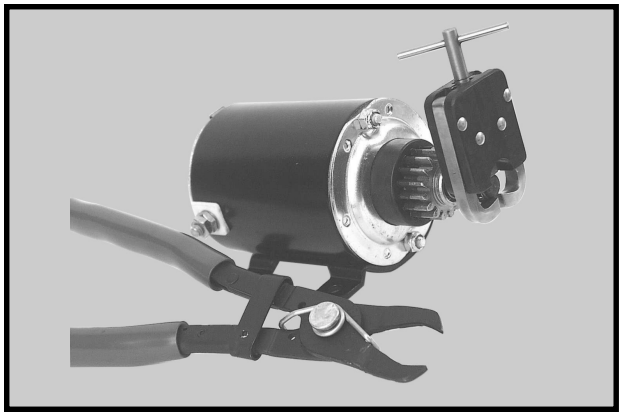
We are very pleased to have exclusive distribution rights for a product that will make changing your customer's oil a snap. This pump eliminates the hassle of finding the drain plug, eliminates spills on your floor and the customer's equipment. To change oil on cold to warm, **NEVER HOT** engine simply put the suction tube into the oil fill hole. The discharge line is then connected to the optional Extremely Heavy Duty Three (3) gallon tank available under Service part number **670367** or your own tank. Next turn the pump on, and in a few short minutes you're done. The pump is available under Tecumseh part number **670354**.

NEW SERVICE TOOLS

To meet world market needs and the request of our customers we have dramatically expanded our service tool offering. These tools are all net priced and available from your Tecumseh distributor. We have placed a complete listing of the items in the back of this book. Watch for your next price update or contact your distributor sales person regarding pricing.

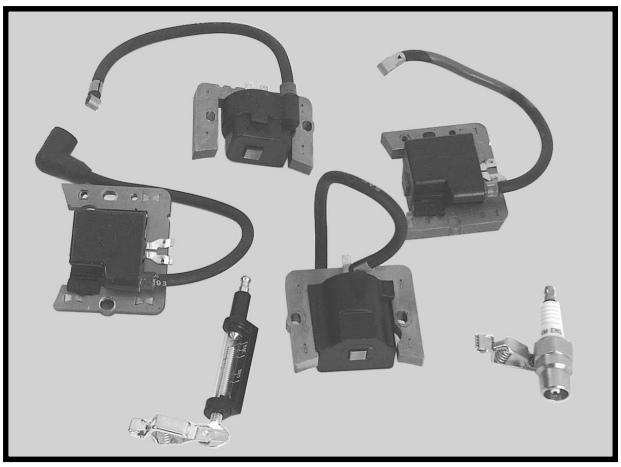
A TOOL THAT REALLY WORKS

After two years of work by one of our tool suppliers, we are pleased to introduce a time and injury saving bendix retainer ring removal tool. This new tool removes not only all Tecumseh retainer rings, but also most others in the industry. And it takes only seconds, The kit includes the retainer ring removal tool and a special retainer ring installation tool. This kit is available from your distributor under service part number **670346**.



SERVICE TIPS

GOOD BUT WARRANTED SOLID STATES

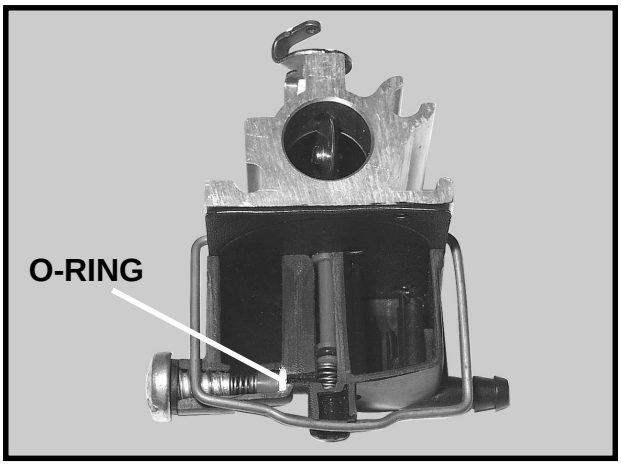


This past year we have been monitoring our solid state CDI modules replaced under warranty. Through our evaluation of these units both on running engines and test equipment we have discovered that 80% of the modules replaced were in fact, NOT defective. In order to continue with our normal warranty payment process for these parts, we need your assistance in insuring proper diagnostic procedures are followed. Before replacing any solid state CDI module under warranty, check the following by using a standard ignition tester such as our tester service part number **670366**.

1. Install the spark tester in the wire and ground it to a non-painted surface. Test Spark. If spark is present continue to next step. If spark is lost, continue to step three and repeat.
2. Next connect the tester ground to the spark plug post, and check spark. If spark is lost, replace the plug.
3. Isolate the engine ignition from the equipment's wiring harness. Test Spark, if spark is present review the equipment wiring harness system. No spark continue with the next step.
4. Remove blower housing and disconnect the ground wire at the module. Test spark. If spark is present check for pinched wires or grounded wires at all connection points, including the compliance brake if so equipped. You have a short.

After you have followed the above procedure and no spark is present replace the module.

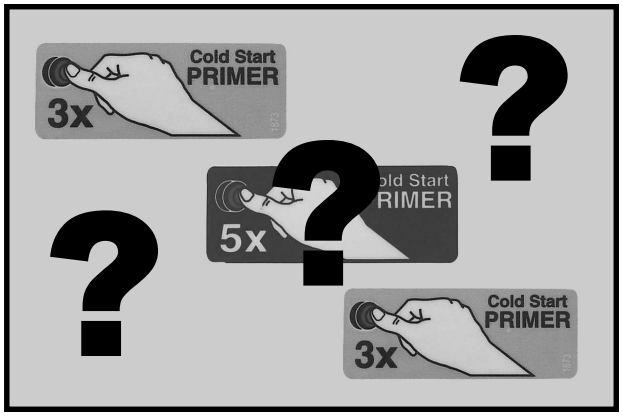
VLV CARBURETOR SERVICE



We continue to here comments from technicians regarding no fuel reaching the venturi even after cleaning the fuel bowl on the VLV engine. During Expo 99 one technician brought us a carburetor to look at. The inspection found they had forgotten to remove the main jet O' ring shown here prior to cleaning. The O' ring swelled when soaked with carburetor cleaner and completely blocking fuel flow. This story is just a reminder to remove and replace ALL 'O' ring's particularly this one which is sometimes difficult to see.

HOW MANY PRIMES 3-5-3?

During the past few years of emission regulated engines we have been changing the number of primes required on various models. With our developments in carburetor and engine design we are going to 3 Primes on all LEV, VLV and OVRM engines at temperatures above 55°F (13°C). This is accomplished through the combination of a new exhaust MCR (mechanical compression release) and an increase in the primer bulb volume. The 3 prime start returns us to a pre-emissions starting procedure.



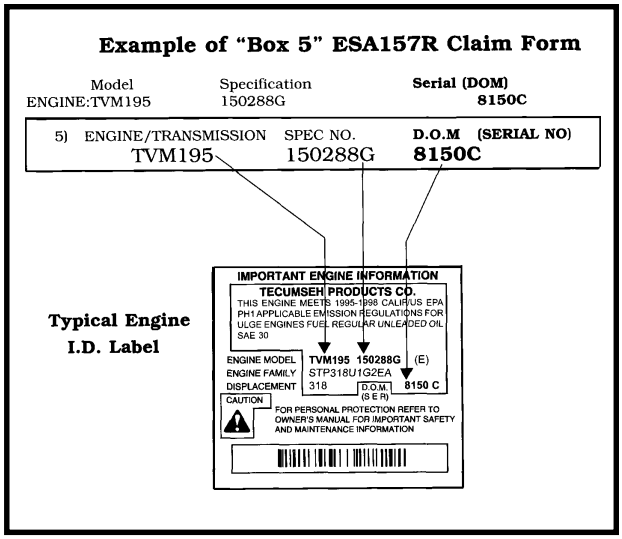
HARMLESS CONCERN

We occasionally receive reports from technicians claiming carburetors on brand new engines having debris found inside the float bowl. This substance may not be harmful at all. During manufacturing we use a powdered graphite on the inlet needle seat to aid in installation. Once fuel is introduced into the system it will wash the graphite away and deposit it in the bottom of the fuel bowl. This material will eventually “run through” with no adverse effects to the engine.

INCOMPLETE DATA FORCING A NEW WARRANTY POLICY

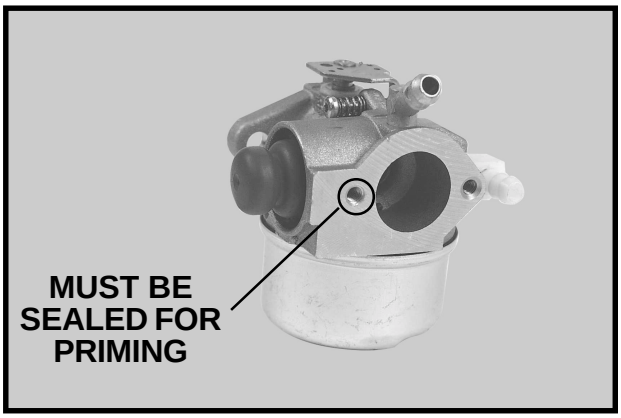
For several years now we have attempted to stress through these meetings the need for complete information warranty claim forms. The result of this effort has been only a small reduction to the number of returned claims. We regret that we must now take stronger action. Effective January of 2000 we will begin to return a high percentage of incomplete claims through our distributors to you. Once they have been reviewed with you and signed by that distributor, they will be processed.

Your dealership can avoid this delay in payment by completely filling in the required information before submitting the claim to Tecumseh Products Company. For guidance regarding this procedure, please follow Service Informational Bulletins 123 and 124.



NO PRIME CHARGE AFTER REBUILD

We receive calls from technicians commenting that after a carburetor rebuild they push the primer and see no fuel coming out of the main nozzle. They believe the carburetor is defective. The correction for this is often a simple screw installation. During the manufacturing process the screw hole that retains the air filter base is drilled through into the primer pocket. When the air filter is installed the screw seals this hole. Before checking the primer function ALWAYS remember to plug this hole with the screw.



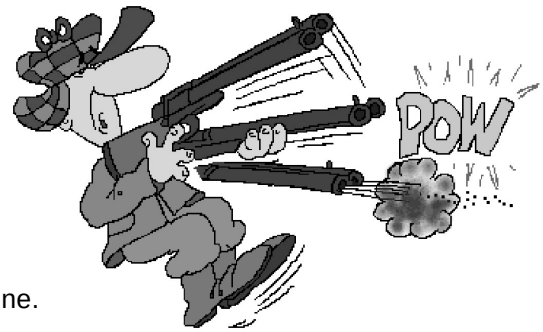
UPDATE VIDEO SET AVAILABLE

This year we again are offerring the Update Seminar Program on video. This format will alllow you to present or review the information with your entire team, at time(s) which is convenient for all. The video is available under Part No. **696334** from your normal source of supply.

One for all the Hunters out there

Possibly the most frequent question we receive from technicians deals with engines hunting and surging. The immediate diagnose is to static test the governor system. But where do we go from there? We have put together a short instruction sheet for your use.

Hunting and Surging at True Idle



Engine hunting and surging at true idle is caused by a fuel delivery problem or an air leak. True idle is the carburetor setting when the throttle plate linkage is against the idle speed adjusting screw after idle mixture adjustment. Because the throttle plate is held stationary during true idle, hunting and surging must be caused by an improper air-fuel mixture related to an air leak or an obstruction in the idle circuit. At true idle, the governor spring applies no force on the throttle plate and has no effect on the idle characteristics of the engine.

Hunting and Surging at Governed Idle

An engine hunting and surging only at governed idle and equipped with an idle mixture adjustment has a governor system or carburetor problem. The idle mixture must be adjusted correctly. Hold the throttle plate linkage against the idle speed adjusting screw and increase the idle speed to the specified governed idle speed. If the engine operates without hunting or surging, the problem is the governed idle spring or linkage. If the engine continues to hunt and surge, the problem is in the carburetor. After testing, return the engine to the correct idle speed.

Hunting and Surging at Top No Load Speed

Troubleshoot hunting and surging at top no-load speed using the same sequential steps used to isolate a governor system or carburetor problem during true idle and governed idle. Once the idle mixture is adjusted and the engine idles smoothly, increase the engine speed using the idle speed adjusting screw. Hold the throttle plate linkage against the idle speed adjusting screw until the engine reaches the specified top no-load speed. Without any appreciable load, fuel is provided by the idle circuit.

If the engine continues to hunt and surge, the carburetor is the probable cause. In this test condition, the governor system has no effect on engine speed. The idle speed adjusting screw control the throttle plate position, which affects engine speed. If the engine operates properly when controlled by the idle speed adjusting screw but hunts and surges when controlled by the governor spring, the governor system is suspect. Check the governor linkage for resistance and binding, and replace the governed idle spring and the main governor spring.

Hunting and Surging Under Load

Hunting and surging under load usually indicates a carburetor or fuel delivery system problem rather than a governor system problem. Fuel fed under load is primarily fed through the main jet and emulsion tube. Most loads are constant enough to maintain the rpm of the engine. The governor system has very little additional effect on the performance of an engine under load except for applications with sizable varying loads such as a generator.

Poor Performance Under Load

Poor performance under load requires first eliminating compression component problems. If the problem is isolated to the fuel system, the cause is usually debris in the main jet or air bleeds. To isolate the problem component, examine the exhaust gas when the engine is under load. If black smoke is present, there is an excess of fuel. This condition may be caused by an incorrect float level setting, a partially clogged main air bleed, or debris lodged between the needle and the seat. If black smoke is not present, and there is no black residue on the muffler deflector, the main air bleed or main jet is probable obstructed.

A primer bulb system or choke can also be used to quickly troubleshoot carburetor problems related to a lean or rich condition. After making carburetor adjustments, slowly close the choke plate when the engine is operating poorly. If performance improves, the air-fuel mixture is too lean. If performance worsens, the air-fuel mixture is too rich. A primer bulb system can also be used to test for a lean or rich condition. Depressing the primer bulb injects extra gas into the carburetor. If the engine air-fuel mixture is too lean, the injection of the extra fuel should improve engine performance. If the engine air-fuel mixture is too rich, the injection of the extra fuel should worsen engine performance.

ENDURO VT SECTION

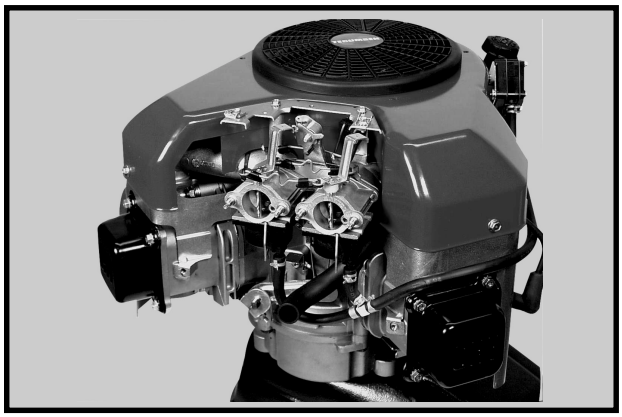
This year we are introducing our first V-Twin engine. In addition to the many standard features you have come to expect from Tecumseh, such as, Cast Iron Cylinder Liners, Full Pressure Gerotor oil pump, CDI electronic ignition, Mechanical Compression Release, Kleen-Aire filtration, the Enduro VT incorporates some exciting changes.

A complete new service manual covering the VT, will be shipped in December of 1999. It is Part Number 696325.

DUAL CARBURETORS

This feature provides superior responsiveness to changes in load and rapid adjustment to changes in speed settings.

To maintain this type of performance, both carburetors MUST be synchronized. Carburetor synchronization must be performed anytime the carburetor body has been disturbed or removed from the intake manifold. Since the Enduro VT utilizes dual series 7 carburetors most carburetor servicing can be accomplished by the simple removal of the carburetor float bowl. This eliminates the need to disturb the carburetor body from the intake manifold.

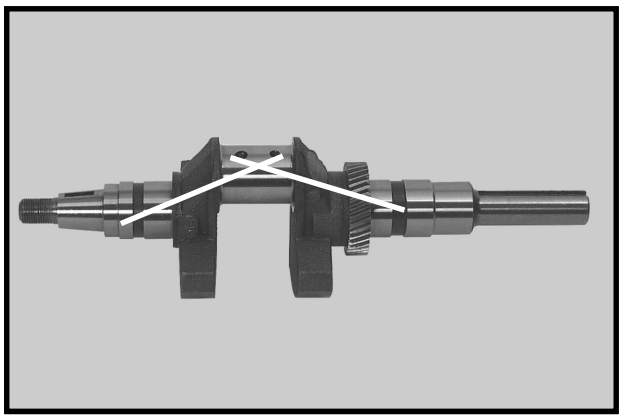


LOWER MAIN BEARING – PRESSURIZED LUBRICATION

The Gerotor oil pump supplies pressurized lubrication to all critical bearing surfaces now including the lower main bearing surface located in the engine mounting flange. A pressure relief port is also built into the flange.

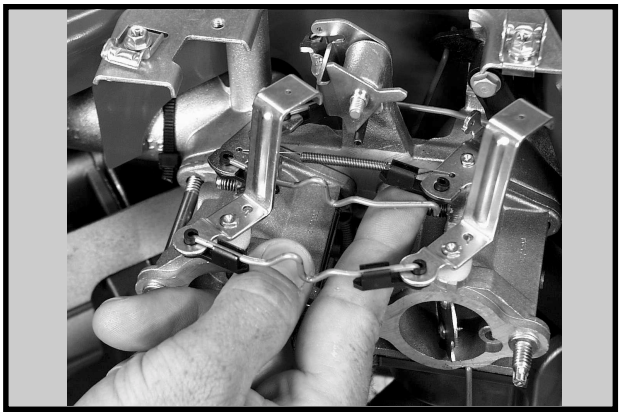
The lubrication path on the TVT differs slightly from the single-cylinder Enduro. Instead of the oil being picked up by the oil pump and being sent directly up through the camshaft to feed the upper bearings, the TVT sends the oil first to the oil filter, next to the lower main bearing and the lower camshaft bearing. The Crankshaft has been drilled to provide the oil passage feeding the connecting rods, upper main bearing and camshaft bearing surfaces.

The 80 oz (2366 ml.) high capacity oil system aids in the lubrication process.



QUICK CONNECT LINKAGE

We have attempted to make the need for servicing even easier by using one size connector link bushing clips on all governor and throttle linkage. This should aid in less downtime for the customer and better productivity for the technician.



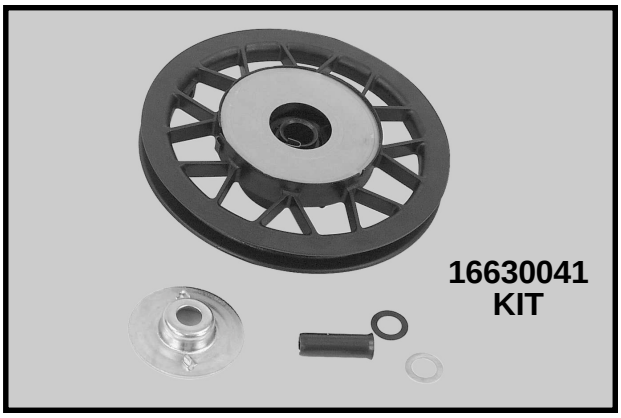
GOVERNED IDLE SYSTEM

For our customers to receive a smooth and constant idle, the Enduro VT has been manufactured with a governed idle system. This system uses the governor to regulate the ever changing load demands at idle. With a governed idle system, all adjustments to the idle RPM are made at the governor spring bracket and NOT the idle RPM adjustment (crack) screw.

EUROPA NEWS

RECOIL STARTERS

We would remind you that individual components for these starters are no longer available. On engines utilizing the integral starter/blower housing, the starters may be serviced by using the pulley repair kit part number **16630041**. This kit includes all internal starter parts (with the exception of the rope) and will upgrade the starter unit to the latest design as used in current production. When replacing the rope, ensure that the length of the new rope is 90" (2,300 mm). This is to avoid the possibility of the rope reaching the end during normal use, which could result in damage to the pulley.

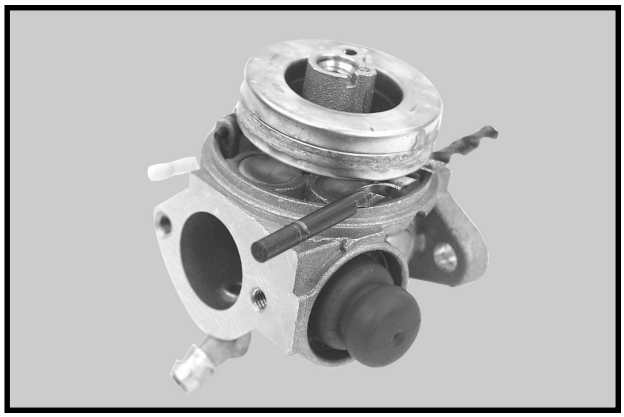


HOT STARTING DIFFICULTIES

From time to time we hear reports of difficult hot starting. First confirm that the customer is not unnecessarily priming or choking the carburetor when the engine is hot. If this is not the case we would suggest that all engines equipped with a brass float, the float level is checked as follows:

- Invert the carburetor with the float bowl and 'O' ring removed.
- Place the shank of a 5.0 - 5.5 mm (7/32") drill bit on the carburetor body opposite and parallel to the float hinge pin. At this position the float should just touch the drill bit. Adjustment can be made by bending the tab on the float.

NOTE: If a plastic float is fitted these are non adjustable.

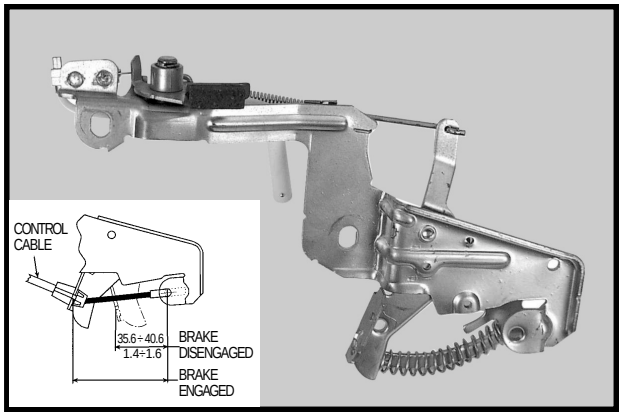


NO COMPRESSION RELEASE

Certain engines are now manufactured without any compression relief device due to either the engine or the application not requiring it. For example, the LEV80 is a small capacity engine, and used with the high ratio soft pull starter, decompression is not required. Since early 1999 the AQ148 engine, which is especially produced for Atco Qualcast, has been manufactured with a camshaft featuring plastic lobes and no compression release (NCR). In this instance the heavy flywheel over rides the use of a decompressor. Alternatively, some chippers using the OHH50 have sufficient inertia in the chipping disk as to negate the use of the compression release device.

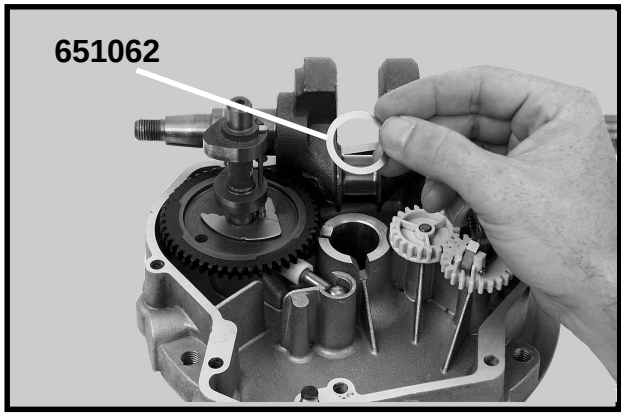
MACHINE BRAKES

During the season our customer services staff received many calls relating to engine starting or engine misfiring, which after investigation proves to be the fault of insufficient travel on the brake cable. Remember that the operation of the brake first removes the brake pad from the flywheel, and then switches on the ignition. If the inner cable is too long, or the cable has been fitted incorrectly, it will result in the ignition circuit not being made correctly preventing a spark, or causing an intermittent spark. With the machine handle held in the operating position and the brake disengaged, check that the measurement is between 1.4 in. - 1.6 in. (35.6 mm - 40.6 mm).



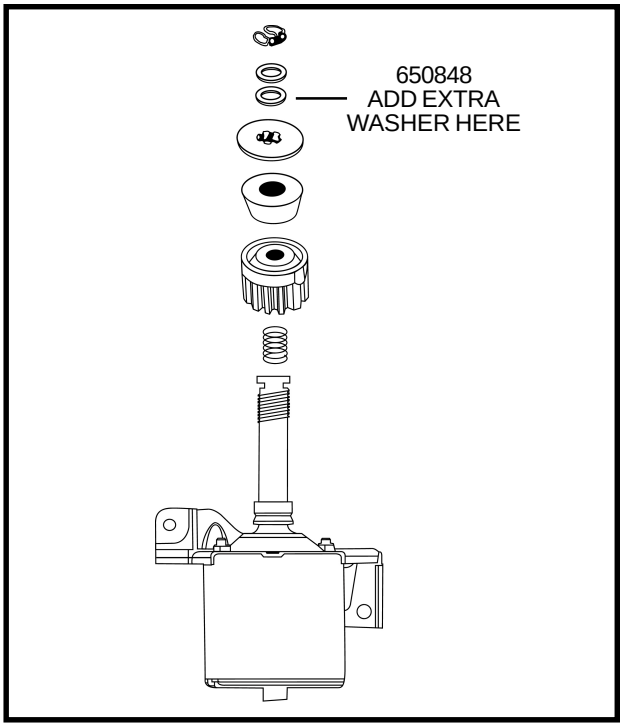
VLV60 (126) AL-KO RIDER (Specification 50216B)

We have received reports of excessive wear to the bottom thrust bearing on the VLV engine fitted to this machine. This is the result of the clutch spring causing a load to the thrust surface. If this problem is found, repair the engine using a new flange assembly and new crankshaft if the timing gear that acts as a thrust bearing is scored. In addition add thrust washer part number **651062** between the timing gear and the flange to prevent reoccurrence of the failure. If warranty applies, file a claim in the usual manner. This engine has been updated to specification 502016E, which included the thrust washer.



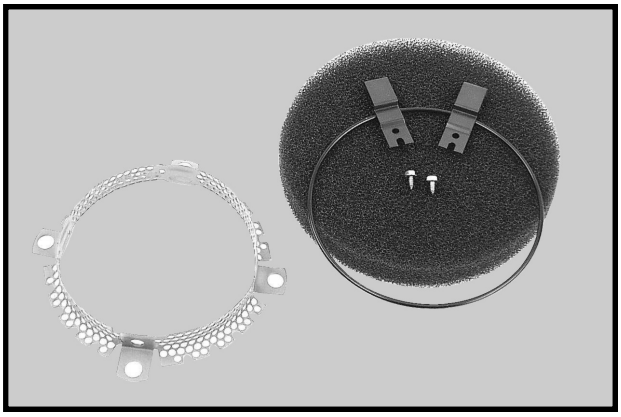
JAMMED BENDIX DRIVE NUTS - ELECTRIC START ENGINES

Occasionally we see Bendix drive nuts jammed as a result of the return spring becoming trapped between the drive nut and the armature shaft. This was the result of a machine tolerance problem on the shaft. An easy fix is to add washer part number **650848** at the top of the shaft between the drive nut and the 'C' clip. This will reduce the travel of the drive nut and prevent the return spring from becoming trapped.



OVERHEATING ENGINES

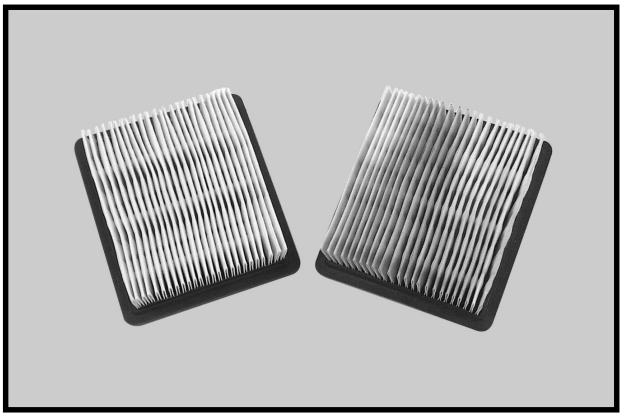
During the last couple of seasons, we have seen an increased incidence of both two and four stroke engines overheating as a result of the air intake and cooling fins being blocked by grass debris. This is prevalent on hover mowers and nylon filament trimmers, probably because these machines do create a large amount of airborne debris.



Please point out to customers who are using these machines the importance of keeping air intakes, cooling fins and other areas, free from grass and other debris. We can offer some optional grass screens if this helps the customer. Machines using the MV100S can be retrofitted with an intake screen, part number 100.41.003.000. when fitting this screen, which is mounted underneath the starter, it will be necessary to remove the spinning screen which is mounted on the flywheel. On machines using TVXL840 and VLV engines, a starter muff, part number 730604 is available for retrofitting. When fitting these optional screens it is necessary again to point out to your customer that they must be kept clear of grass.

Flymo hover machines L400 and L470 - both use foam elements to pre-clean air for the cooling system. Again these must be in place and in good condition, and kept clear from debris if the engine is to cool properly.

ENGINES EQUIPPED WITH PAPER ELEMENT FILTERS

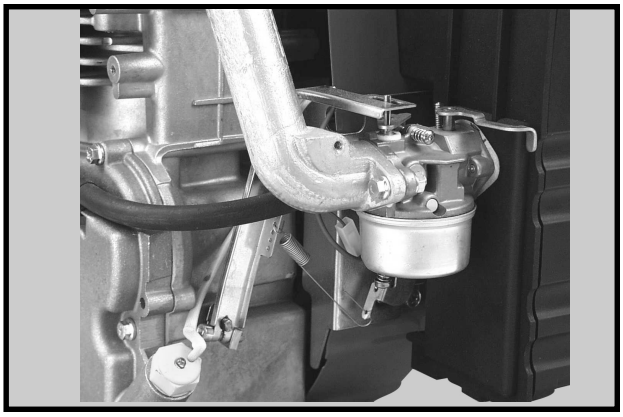


Many engines are now produced utilizing automotive style paper element filters. Of course these filter elements should automatically be changed during service. It is worth while to note that if the paper element becomes saturated, either with oil or fuel, the porosity of the paper can change, therefore changing the carburetion.

If the customer reports poor starting or running of the engine, it is always worth the while renewing the filter elements first of all. This will eliminate any possibility of a damaged air filter causing the problem. If, for instance, the air cleaner element has become soaked in fuel, due perhaps to the customer turning the machine on its side, this would not necessarily be obvious when inspecting the filter.

GEO-TEC GOVERNOR OPERATION/ ADJUSTMENT

During 1999 the Geo-Tec range of horizontal shaft engines have been introduced into the market place. These engines all feature a new 'D' governor system whereby the governor lever is directly connected to the carburetor throttle without the use of a loose link. By deleting the loose link, lost movement in the system is reduced, so reducing the governor droop and providing improved performance. The setting and adjustment procedures for this system are exactly the same as existing systems used on horizontal shaft engines.

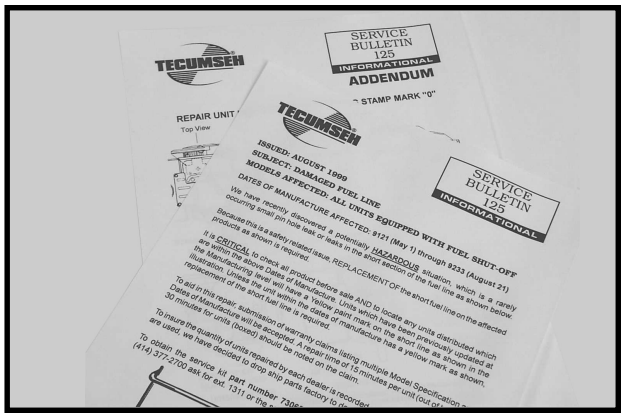


SERVICE BULLETINS

125

Fuel Line Recall

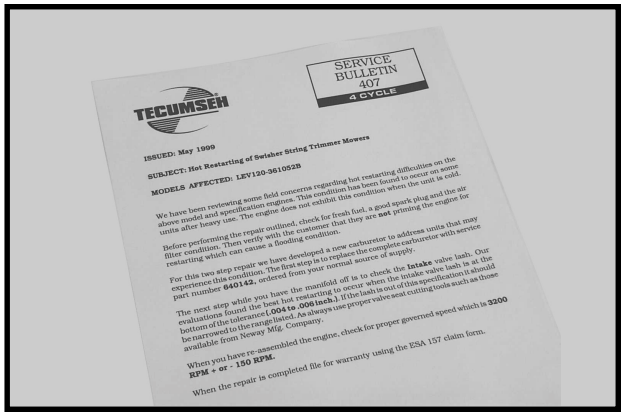
In cooperation with the US Consumer Product Safety Commission (CPSC), Tecumseh Products Company is voluntarily recalling about 118,000 engines with a fuel shut-off valve on various brands of outdoor power equipment. This bulletin covers in detail the units effected and repair procedures.



407

Hot Restart on LEV 120 – 361052B

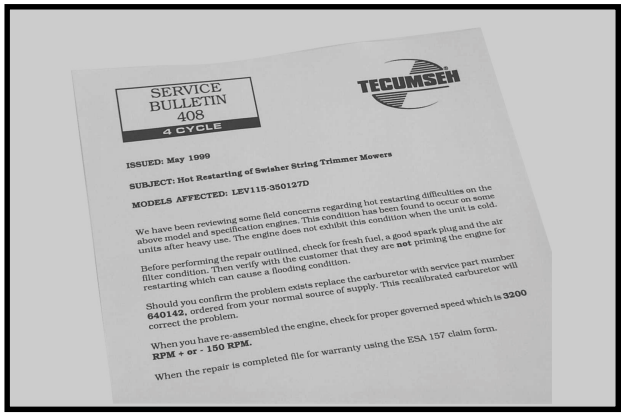
Service bulletin 407 was released after receiving field concerns regarding hot restarting difficulties on the above model and specification engines. The bulletin instructed the technician to check and set the intake valve lash between .004 and .006 and also to install a new carburetor part # 640142.



408

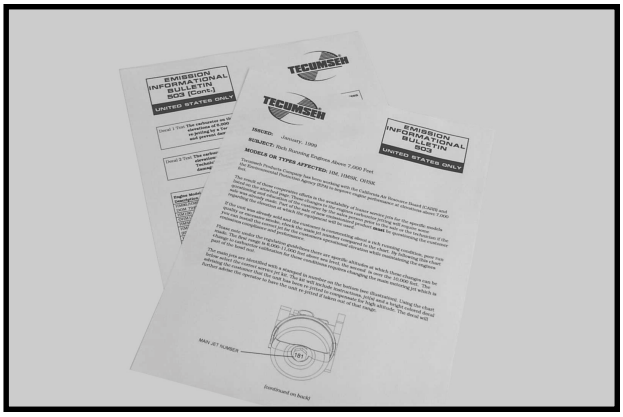
Hot Restarting of Swisher String Trimmer Mowers

This bulletin pertains to an LEV115-350127D mounted on a Swisher String Trimmer Mower having hot restart difficulties. A carburetor part # 640142 would correct the problem.



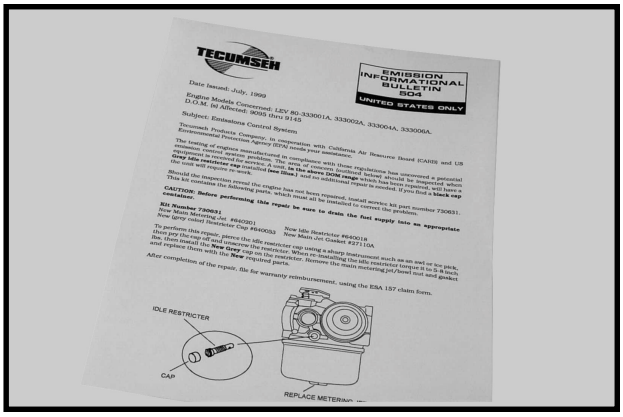
503
Rich Running HM, HMSK, OHSK above 7,000 Feet.

A cooperative effort between the California Air Resource Board, Environmental Protection Agency and Tecumseh Products Company has resulted in the availability of leaner service jets for specific model engines being run above 7000 feet. A matrix chart listing the models and available service kits is given.



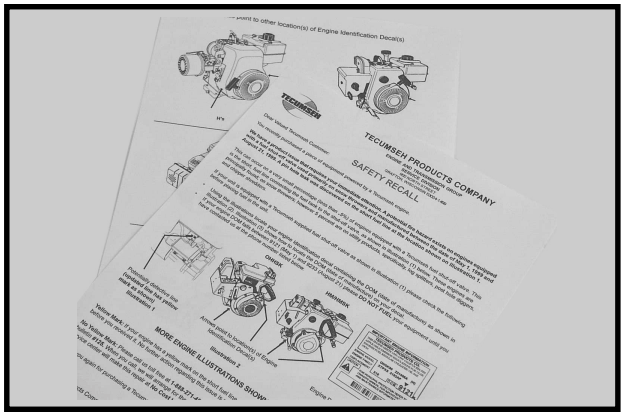
504
Emission Control Systems

Testing of LEV80 engines manufactured between the D.O.M. of 9095 and 9145 revealed a possible emission control system problem. If the engine possesses a black restrictor cap and fell into the D.O.M. range, a repair kit part # 730631 is to be installed.



Safety Recall Letter

This recall letter was sent to all customers of record from data supplied by manufacturers and retailers. Please assist and repair all equipment affected by this recall.



Service Tool List and Order Form

Special Service, Diagnostic, Measurement & Repair Tools Description	Part Number	User Cost	Premier Dealer	Standard Dealer	Limited Dealer	On Hand	On Order
*Tool Kit	670195E		M	M	M		
Tachometer (Inductive or Vibratach)	670156 Vibratach or 670365 Inductive		M or R	M or R	M or R		
Ignition Tester	670366		M	M	M		
Multi Meter VOM & Temperature	670349		M	M	M		
Compression Tester	670358		M	M	M		
Outside Micrometers 0-1"	670350		M	R	R		
1-2:	670351		M	R	R		
2-3"	670352		M	R	R		
3-4:	670353		M	R	R		
Telescoping Gauge Set	670357		M	R	R		
Dial Indicator	670241		M	R	R		
Inspection Plate (Plate Glass) - Obtain Locally			R	R	R		
Feeler Gauge Set	670361		M	M	M		
Inch Pound Torque Wrench 0-600 inch lbs.	670363		M	M	M		
Valve Spring Compressor "C" Type	670362		M	M	M		
Piston Ring Compressor	670359		M	M	M		
Piston Ring Expander	670117		M	M	M		
**Valve Seat (Neway LG3000 Kit or comparable)	670347		M	M	M		
**Face Cutting Set (Neway 612 Gizmatic)	670348		R	R	R		
Cylinder Hone (Flex)	670360		M	M	M		
Starter Bendix Ring Tool	670346		M	R	R		
Crankcase Vacuum / Oil pressure adapter	670364		M	R	R		
Hole Gauge Set	670356		M	M	M		
Oil Vacuum System (220 Volt)	670355						
Extreme Duty Oil Tank	670367		R	R	R		
Leak Test Kit - Complete	670340		R	R	R		
Leak Test Transaxle / Carburetor Adapter Kit	670345		R	R	R		
Dial Caliper, 6"	670368		R	R	R		
Total Cost of Mandatory Tools							

* See Tecumseh Form #694862 for Complete Tool Kit List
** Neway LG2000 or 102 kits can be upgraded by calling Neway direct: 1-800-248-3889
M = Mandatory Tools (Must have or place order)
R = Recommended Tools
NOTE: Prices subject to change
Equivalent tools may be used.

Dealer Name _____
Address _____
City, State, Zip _____
Phone _____
Account No. _____

SEND US YOUR TIPS

Many of the bits of information that we pass along in our schools come from our dealer network. We want to give you the opportunity to contribute to next year's Technician's Seminar Booklet. Please write down your tip(s) and fax or send it to:

Tecumseh Products Company
900 North Street
Grafton, WI 53024-1499

Attn: Education Department

FAX NO. 262-377-4485

Name: _____

Company: _____

Address: _____

City, State, Zip Code _____

The Top 5 responses will receive a prize from Tecumseh.

Thank you in advance for your input.

TECUMSEH
KEEPING YOUR SHOP PROFITABLE

If you don't know what your repair shops efficiency or productivity is, you may be losing money.

In most outdoor power equipment service centers the repair shop is where the real money is made. Even though this is true, some questions need to be answered.

- ***Could we be making more money ?***
- ***If the repair shop is not making money, why not ?***
- ***Are the technicians always being productive ?***
- ***Is my service shop as efficient as it should be ?***

When you come to work tomorrow and you see that your service shop is jammed. Customers are lined up at the counter, and you realize you must try to satisfy them. Your parts shelves seem to be empty of the fast moving items, and the phone just never stops ringing.

Along with the customers, you also have your mechanics looking all over for tools and waiting to use the fiche reader or waiting for you look up parts for them. Some equipment is not tagged properly and it also looks like technicians are just standing around wasting time.

At this busy time of year, you may realize and see some of the efficiency and productivity problems but are just too busy to deal with them. To succeed in this industry these problems must be dealt with. Many dealers just ignore these problems and just raise the labor rate and adjust up the repair charges. Manufacturers and the public will not always go along with this in the future.

If some of this sounds like your shop, you may be losing money. If this is true it is very important to start measuring and controlling you shop's efficiency and productivity immediately. Remember this is the time of year when the profits need to be made and some **PUT AWAY** to cover the **LEAN TIMES** in the off season. This liquidity can also put you in a position to get cash discounts on parts purchases improving your profit margin.

In this section we will deal only with the repair shop side of your business.

Shop efficiency refers to the technicians ability to perform quality work in relation to a set time rate schedule. This means: Do your technicians perform repairs in the amount of time allowed or does it take longer? There are three types of time that should be considered when measuring your shop productivity and efficiency.

1. ***Average time*** This is the time allowed for a specific labor task, and is used to determine the charges. If this is a warranty repair this must be within the guidelines of Tecumseh Products Company.
2. ***Actual time*** The time really spent to perform the work on a repair order.
3. ***Available time*** This is the actual time a technician is physically present during working hours, excluding official break periods.

Measuring shop efficiency compares your flat rate time to the true time it takes the mechanic to do the specific job. This efficiency can vary and depends on a mechanic's skill, experience, motivation, and training. The importance of attending factory tear down schools and update meetings can be a large part of this proper training.

An example of how you figure out your percentage of efficiency for a job, is to divide the flat-rate time by the actual time, then multiply that by 100.

EXAMPLE:

$$\frac{\textbf{Scheduled time}}{\textbf{Actual time}} \quad \textbf{X} \quad \textbf{100} \quad = \quad \textbf{Percent of Efficiency}$$

4.0 billable hours / **4.9 actual hours worked** **X 100 = 82% Efficiency**

In most cases your efficiency rate should fall between 110 to 125% range. You will have to determine what this level should really be for your business. As you can see by the example the percent is considerably below the proper level. Taking one example is also accurate or true, but if your level is averaging below 100 you need to re-examine your business. Becoming more efficient means more money. As we all know some jobs just go bad for uncontrollable reasons. But if a trend of low efficiency is found, the manager or owner plus the technician must work together to focus on the problem areas.

Low efficiency can come from any of the following areas:

- *Work given to a technician not qualified for the specific job*
- *Service shop not equipped with proper service tools and equipment*
- *Inefficient time allowed by manufactures rate guide or dealers*
- *Personal or health problems of technician*
- *The need for more technical training on product lines*
- *Dealer not stocking enough popular service parts*
- *Delays at the parts counter in looking up parts*
- *Poor system of locating & storing of equipment for repairs*

Now lets look at how Productivity is measured. Productivity compares the actual time a technician works to the available time he should be able to work. This tells you if the technician is using his time productively or wasting time. Productivity can be expressed in a percentage for ease of looking at in this way:

Actual time / **Available time** **X 100 = % of productive time**

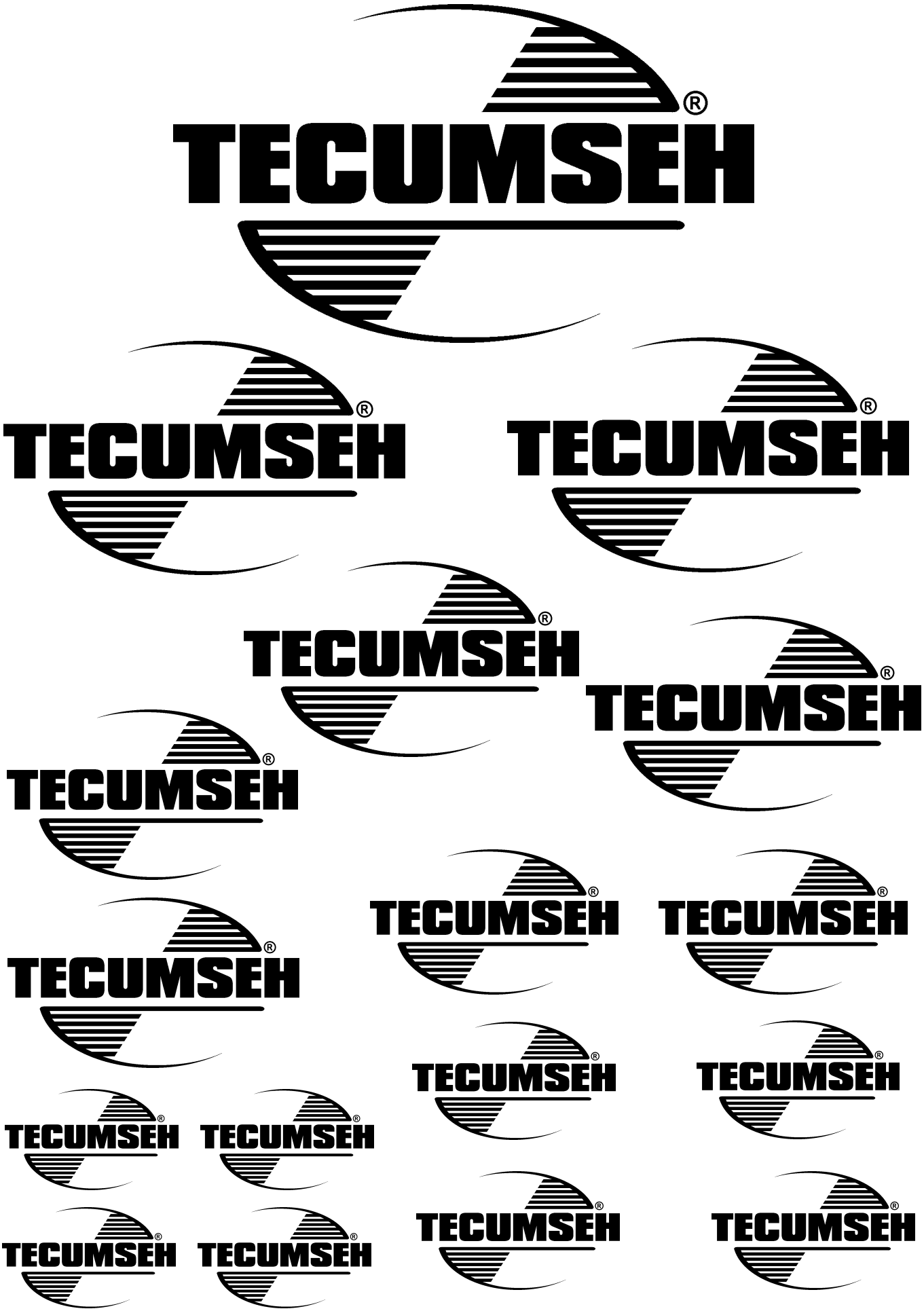
7.2 Actual hours / **8.0 Available hours** **X 100 = 90% productive**

Most experts say that your productivity should be 90% or above. Obtaining or demanding 100% productivity is not realistic or fair when dealing with human beings. But low productivity could come from:

- *Poorly matching work with skills*
- *Lack of work*
- *Talking and wasting time*
- *Lack of motivation*
- *Poorly trained technicians*
- *Unorganized & messy repair shop*
- *Having technician doing non technician jobs*

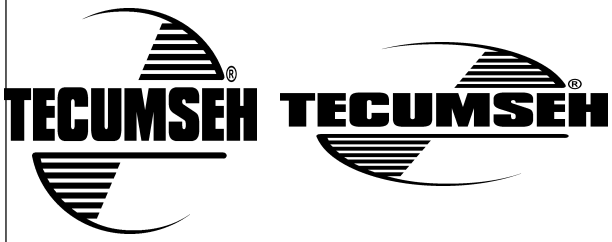
In order to put efficiency and productivity together and give you effective and truthful information, you should record actual time for every technician on every labor job and verify this information. Many efficient shops use time cards or a time clock to log in and out on a job to get a better handle on actual times.

To really get a handle on your shop you would need to record and keep daily records of efficiency, productivity, available time, actual time and flat-rate times for every repair order in your shop. At the end of every day you should do the calculations for available time, actual time and flat rate for each of your technicians. These items should be recorded on a ledger or chart so you really see your efficiency and productivity percentage calculations in your repair shop and then start to improve the weak areas. Some of the changes you make may not show up right away, but over the long run you will see profitable improvements.


TECUMSEH®

Incorrect Ways of Using Emblem

DO NOT stretch emblem out of proportion



WRONG

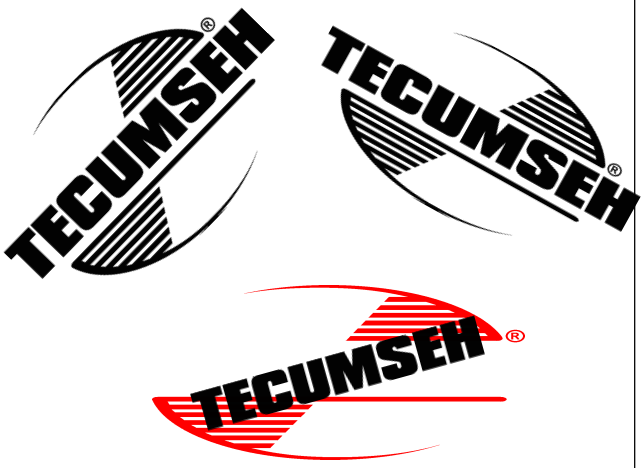
DO NOT place words inside the emblem

WRONG

DO NOT change color of emblem in any way other than approved color schemes

WRONG

DO NOT angle the emblem in any way



WRONG

DO NOT change emblem in any way

WRONG

TECUMSEH®

SERVICE BULLETIN 125

INFORMATIONAL

ISSUED: AUGUST 1999

SUBJECT: DAMAGED FUEL LINE

MODELS AFFECTED: ALL UNITS EQUIPPED WITH FUEL SHUT-OFF

DATES OF MANUFACTURE AFFECTED: 9121 (May 1) through 9233 (August 21)

We have recently discovered a potentially **HAZARDOUS** situation, which is a rarely occurring small pin hole leak or leaks in the short section of the fuel line as shown below.

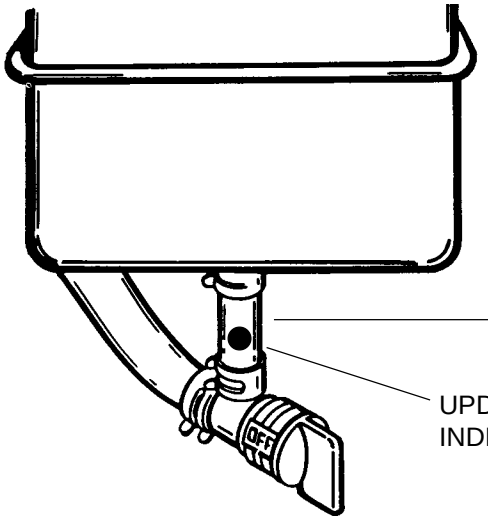
Because this is a safety related issue, REPLACEMENT OF the short fuel line on the affected products as shown is required.

It is **CRITICAL** to check all product before sale AND to locate any units distributed which are within the above Dates of Manufacture. Units which have been previously updated at the Manufacturing level will have a Yellow paint mark on the short line as shown in the illustration. Unless the unit within the dates of manufacture has a yellow mark as shown, replacement of the short fuel line is required.

To aid in this repair, submission of warranty claims listing multiple Model Specification and Dates of Manufacture will be accepted. A repair time of 15 minutes per unit (out of box) and 30 minutes for units (boxed) should be noted on the claim.

To insure the quantity of units repaired by each dealer is recorded and only the correct parts are used, we have decided to drop ship parts factory to dealer direct.

To obtain the service kit **part number 730632** within the United States please call (262) 377-2700 ask for ext. 1311 or the service bulletin desk ref. #125.



TECUMSEH®

SERVICE BULLETIN 125

INFORMATIONAL

ADDENDUM

REVISION DATE: August 31, 1999

SUBJECT: ADDENDUM - Service Bulletin 125 has been amended.
MODELS: Only those listed below.

The following list of model and specification engines, **ARE THE ONLY ONES AFFECTED BY** the potentially defective fuel line:

H35-45492Y	HMSK105-159904A	HMSK90-156533D	OHH60-71112C	OHSK55-69516C
H35-45717Y	HMSK105-159906A	HSK40-55510V	OHSK100-221606A	OHSK55-69519C
H35-45746Y	HMSK105-159907A	HSK60-76005C	OHSK100-221607A	OHSK55-69520C
HM100-159298P	HMSK110-159953A	HSK60-76011C	OHSK110-221701A	OHSK70-72500B
HM100-159350P	HMSK110-159957A	HSK60-76012C	OHSK110-221703A	OHSK70-72501B
HM100-159351P	HMSK110-159958A	HSK60-76013C	OHSK110-221708A	OHSK70-72505B
HM100-159383P	HMSK110-159962A	HSK60-76016C	OHSK110-221709A	OHSK70-72506B
HM100-159400P	HMSK80-155527V	HSK70-130208U	OHSK110-221710A	OHSK70-72507B
HM80-155522S	HMSK80-155545V	HSK70-130283U	OHSK110-221712A	OHSK70-72508B
HM80-155593S	HMSK80-155635V	HSK70-130302U	OHSK110-221713A	OHSK70-72511B
HM80-155653S	HMSK80-155640V	HSSK50-67002S	OHSK120-223601A	OHSK70-72512B
HM80-155664S	HMSK80-155645V	HSSK50-67261S	OHSK130-223801B	OHSK70-72513B
HMSK100-159001W	HMSK80-155667V	HSSK50-67366S	OHSK130-223802B	OHSK80-221202A
HMSK100-159295W	HMSK80-155668V	HSSK50-67368S	OHSK130-223803B	OHSK90-221401A
HMSK100-159303W	HMSK80-155669V	HSSK50-67390S	OHSK130-223804B	OHSK90-221404A
HMSK100-159426W	HMSK80-155670V	HSSK50-67395S	OHSK130-223808B	OHSK90-221406A
HMSK100-159432W	HMSK80-155671V	HSSK50-67401S	OHSK130-223814B	OHSK90-221407A
HMSK100-159433W	HMSK80-155672V	LEV115-350126D	OHSK130-223815B	OHSK90-221408A
HMSK100-159434W	HMSK80-155684V	OHH55-69040E	OHSK130-223816B	OHSK90-221410A
HMSK100-159439W	HMSK85-155902A	OHH55-69058E	OHSK130-223818B	OHSK90-221411A
HMSK100-159440W	HMSK90-156519D	OHH55-69073E	OHSK130-223819B	OHSK90-221412A
HMSK100-159441W	HMSK90-156528D	OHH55-69085E	OHSK50-68500C	OHSK90-221413A
HMSK105-159903A	HMSK90-156532D	OHH55-69103E	OHSK55-69513C	OHV130-206854C
				VLV126-502052E

Note these units:

- are equipped with the Tecumseh supplied, in line shutoff valve.
- were produced between May 1, 1999 and August 21, 1999.
- are principally found on snow throwers, however 5% are on chore product specifically, log splitters, post hole diggers and chipper shredders.

Marking updated product: (Change effective immediately)
Please mark all updated product with a **"0" ZERO** in the location referenced on the following page of this addendum. If necessary, purchase the appropriate punch and place the description and cost on your first warranty claim.

Tracking Repaired Units: Effective immediately it is **CRITICAL** you record the equipment manufactures unit serial number(s) as part of the procedure. If the space provided on the ESA-157 warranty claim form is insufficient you can attach a separate sheet listing these numbers.

TECUMSEH®

SERVICE BULLETIN 407

4 CYCLE

ISSUED: May 1999

SUBJECT: Hot Restarting of Swisher String Trimmer Mowers

MODELS AFFECTED: LEV120-361052B

We have been reviewing some field concerns regarding hot restarting difficulties on the above model and specification engines. This condition has been found to occur on some units after heavy use. The engine does not exhibit this condition when the unit is cold.

Before performing the repair outlined, check for fresh fuel, a good spark plug and the air filter condition. Then verify with the customer that they are **not** priming the engine for restarting which can cause a flooding condition.

For this two step repair we have developed a new carburetor to address units that may experience this condition. The first step is to replace the complete carburetor with service part number **640142,** ordered from your normal source of supply.

The next step while you have the manifold off is to check the **Intake** valve lash. Our evaluations found the best hot restarting to occur when the intake valve lash is at the bottom of the tolerance **(.004 to .006 inch.)**. If the lash is out of this specification it should be narrowed to the range listed. As always use proper valve seat cutting tools such as those available from Neway Mfg. Company.

When you have re-assembled the engine, check for proper governed speed which is **3200 RPM + or - 150 RPM.**

When the repair is completed file for warranty using the ESA 157 claim form.

SERVICE
BULLETIN
408
4 CYCLE

TECUMSEH®

ISSUED: May 1999

SUBJECT: Hot Restarting of Swisher String Trimmer Mowers

MODELS AFFECTED: LEV115-350127D

We have been reviewing some field concerns regarding hot restarting difficulties on the above model and specification engines. This condition has been found to occur on some units after heavy use. The engine does not exhibit this condition when the unit is cold.

Before performing the repair outlined, check for fresh fuel, a good spark plug and the air filter condition. Then verify with the customer that they are **not** priming the engine for restarting which can cause a flooding condition.

Should you confirm the problem exists replace the carburetor with service part number **640142,** ordered from your normal source of supply. This recalibrated carburetor will correct the problem.

When you have re-assembled the engine, check for proper governed speed which is **3200 RPM + or - 150 RPM.**

When the repair is completed file for warranty using the ESA 157 claim form.

TECUMSEH®

EMISSION INFORMATIONAL BULLETIN 503

UNITED STATES ONLY

ISSUED: January, 1999

SUBJECT: Rich Running Engines Above 7,000 Feet

MODELS OR TYPES AFFECTED: HM, HMSK, OHSK

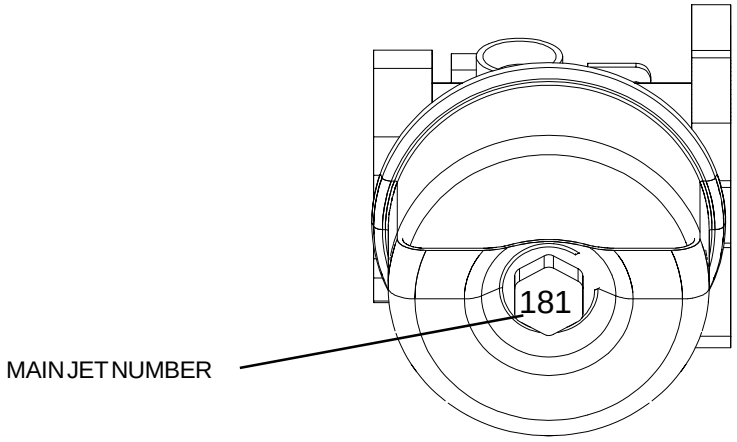
Tecumseh Products Company has been working with the California Air Resource Board (CARB) and the Environmental Protection Agency (EPA) to improve engine performance at elevations above 7,000 feet.

The result of these cooperative efforts is the availability of leaner service jets for the specific models listed on the attached page. These changes to the engines carburetor jetting will require some questioning and education of the customer by the sales person prior to the sale or the technician if the sale was already made. Part of the sale of new emissionized product **must** be questioning the customer regarding the elevation at which the equipment will be used.

If the unit was already sold and the customer is commenting about a rich running condition, poor run quality or excessive smoke, check the main jet number compared to the chart. By following this chart you can install the correct jet for the customers operational elevation while maintaining the engines emissions compliance and performance.

Please note under the regulation guidelines there are specific altitudes at which these changes can be made. The first range is 6,000-11,000 feet above sea level, the second is over the 10,000 feet. The change to carburetor calibration for these conditions requires changing the main metering jet which is part of the bowl nut.

The main jets are identified with a stamped in number on the bottom (see illustration). Using the chart below select the correct service jet kit. The kit will include instructions, jet(s) and a bright colored decal advising the customer that the unit has been re-jetted to compensate for high altitude. The decal will further advise the operator to have the unit re-jetted if taken out of that range.



(continued on back)

EMISSION INFORMATIONAL BULLETIN 503 (Cont.)

UNITED STATES ONLY

TECUMSEH®

Decal 1 Text **The carburetor on this engine has been re-jetted to improve performance between elevations of 6,000-11,000 feet. Operation above or below this range requires re-jetting by a Technician / Dealer to maintain the engines emission certification and prevent damage to the engine.**

Decal 2 Text **The carburetor on this engine has been re-jetted to improve performance at elevations above 10,000 feet. Operation below this range requires re-jetting by a Technician / Dealer to maintain the engines emission certification and prevent damage to engine.**

Engine Model / Description	Original Bowl Nut Number	Service Kit Part Number for use at elevation's of 6,000-11,000 Ft.	Service Kit Part Number for use above 10,000 Ft.
HM80/HM90 After DOM 7245	183	640189 (207)	640194 (206)
HM100 After DOM 7199	183	640189 (207	640194 (206)
OHM120	183	640189 (207)	640194 (206)
HMSK80/85/90	167	640186 (205)	640202 (203)
HM80/90/100 (RV Package)	163	640185 (149)	640193 (204)
HMSK100/105/110	163	640185 (149)	640193 (204)
OHSK 80/90/100/110	188	640187 (163)	640192 (167)
OHSK120/130	181	640188 (167)	640191 (148)
HM80/90 Prior to DOM 7245	162	640190 (148)	640203 (149)
HM100 Prior to DOM 7199	162	640190 (148)	640203 (149)

TECUMSEH®

EMISSION INFORMATIONAL BULLETIN 504

UNITED STATES ONLY

Date Issued: July, 1999

Engine Models Concerned: LEV 80-333001A, 333002A, 333004A, 333006A.
D.O.M. (s) Affected: 9095 thru 9145

Subject: Emissions Control System

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and US Environmental Protection Agency (EPA) needs your assistance.

The testing of engines manufactured in compliance with these regulations has uncovered a potential emission control system problem. The area of concern (outlined below) should be inspected when equipment is received for service. A unit, **in the above DOM range** which has been repaired, will have a **Gray idle restricter cap** installed **(see Illus.)** and no additional repair is needed. If you find a **black cap** the unit will require re-work.

Should the inspection reveal the engine has not been repaired, install service kit part number 730631. This kit contains the following parts, which must all be installed to correct the problem.

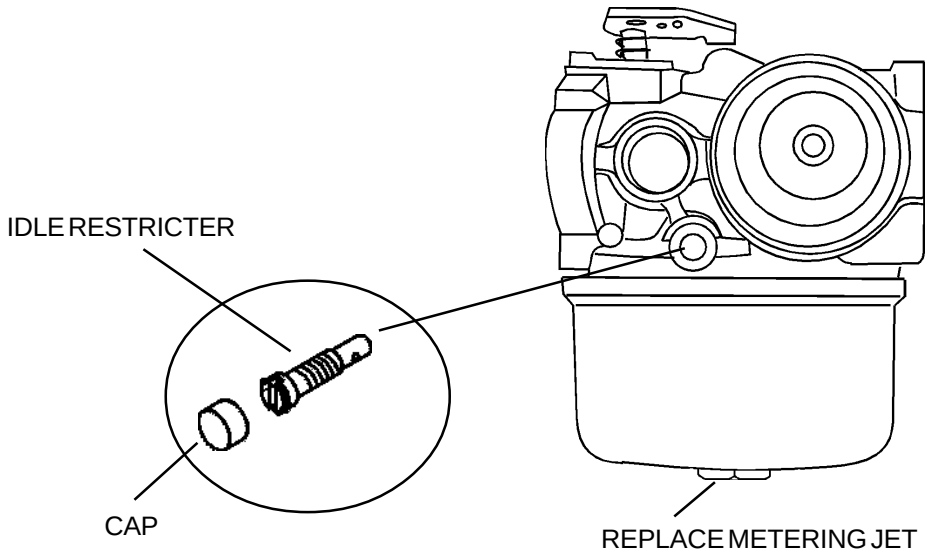
CAUTION: Before performing this repair be sure to drain the fuel supply into an appropriate container.

Kit Number 730631

New Main Metering Jet #640201	New Idle Restricter #640018
New (grey color) Restricter Cap #640053	New Main Jet Gasket #27110A

To perform this repair, pierce the idle restricter cap using a sharp instrument such as an awl or ice pick, then pry the cap off and unscrew the restricter. When re-installing the idle restricter torque it to 5-8 inch lbs, then install the **New Grey** cap on the restricter. Remove the main metering jet/bowl nut and gasket and replace them with the **New** required parts.

After completion of the repair, file for warranty reimbursement, using the ESA 157 claim form.



TECUMSEH PRODUCTS COMPANY

ENGINE AND TRANSMISSION GROUP
SERVICE DIVISION
900 NORTH STREET
GRAFTON, WISCONSIN 53024-1499

SAFETY RECALL

Dear Valued Tecumseh Customer:

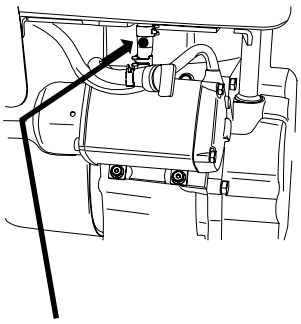
You recently purchased a piece of equipment powered by a Tecumseh engine.

We have a product issue that requires your immediate attention. A potential fire hazard exists on engines equipped with a fuel shut-off valve used primarily on snow throwers and manufactured between the date of May 1, 1999 and August 21, 1999. A pin hole leak was discovered on the short fuel line at the location shown on Illustration 1.

This can occur on a very small percentage (less than .5%) of engines equipped with a Tecumseh fuel shut-off valve. This is the short, fuel line connecting the fuel tank to the shut-off valve, as shown in illustration (1) below. These engines are principally found; on snow throwers; however 5 percent are on utility products, specifically, log splitters, post hole diggers, and chipper shredders.

If your unit is equipped with a Tecumseh supplied fuel shut-off valve as shown in illustration (1) please check the following before placing fuel in the unit.

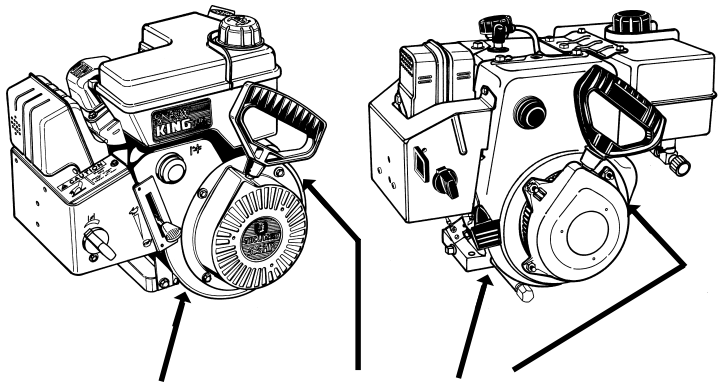
- Using the illustrations locate your engine identification decal containing the DOM (date of manufacture) as shown in illustration (2). Illustration (3) shows how to locate the DOM (date of manufacture) on your decal.
- If your engine DOM falls between 9121 (May 1) and 9233 (August 21) please **DO NOT FUEL** your equipment until you have contacted us at the phone number listed below.



Potentially defective line **(updated line has yellow mark as shown)**

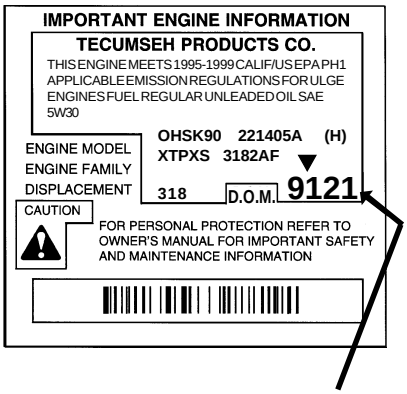
Illustration 1

OHHSK **HM/HMSK**



Arrows point to location(s) of Engine Identification Decal(s)

Illustration 2



Engine DOM (date of manufacture)

Illustration 3

MORE ENGINE ILLUSTRATIONS SHOWN ON BACK SIDE

Yellow Mark: If your engine has a yellow mark on the short fuel line as shown in illustration (1) it has already been repaired before you received it. No further action regarding this issue is required on your part.

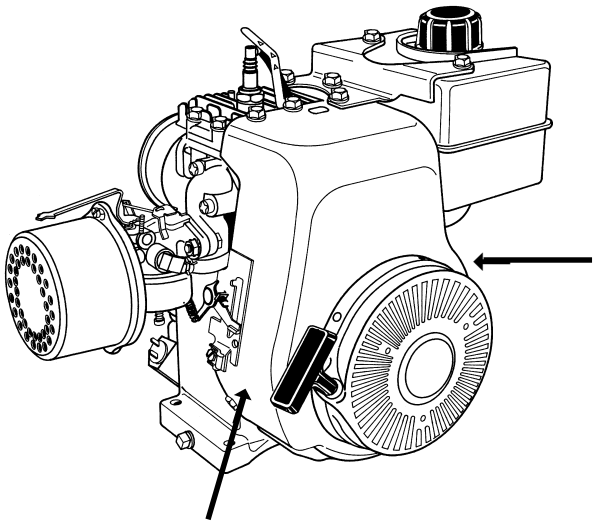
No Yellow Mark: Please call us toll free at **1-888-271-4048** ask for **ext. 1311** or the service bulletin desk reference service bulletin **#125.** When you call, we will arrange for the repair through one of our service centers in the USA or Canada. The service center will make this repair at **No Cost** to you. The desk is open Monday thru Saturday from 6 AM to 6 PM CST.

Thank you again for purchasing a Tecumseh powered product, and we apologize for any inconvenience this may cause you.

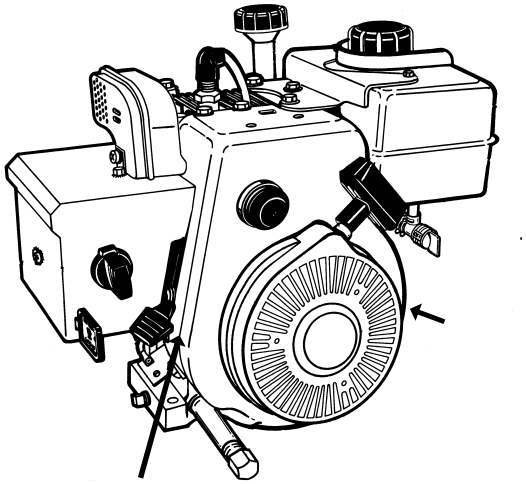
Regards,

Tecumseh Products Company

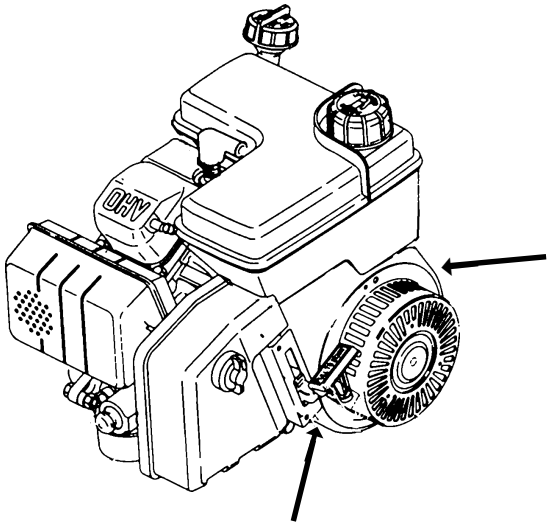
Arrows point to other location(s) of Engine Identification Decal(s)



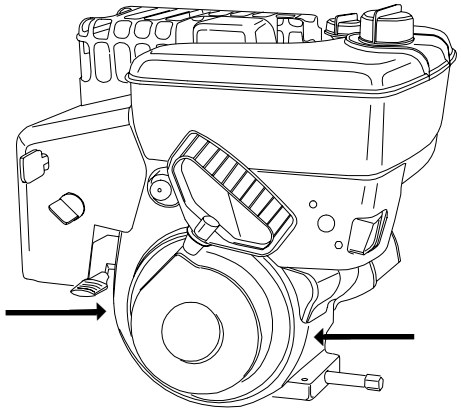
H's



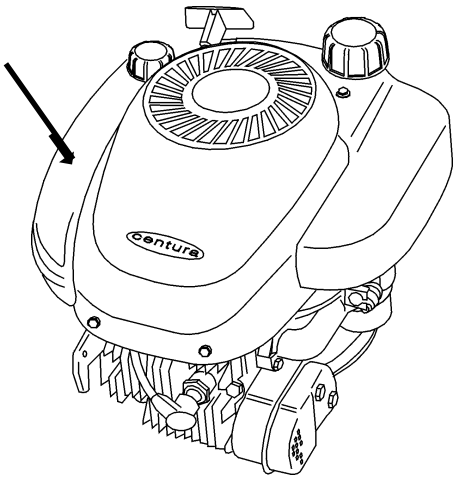
HSK/HSSK



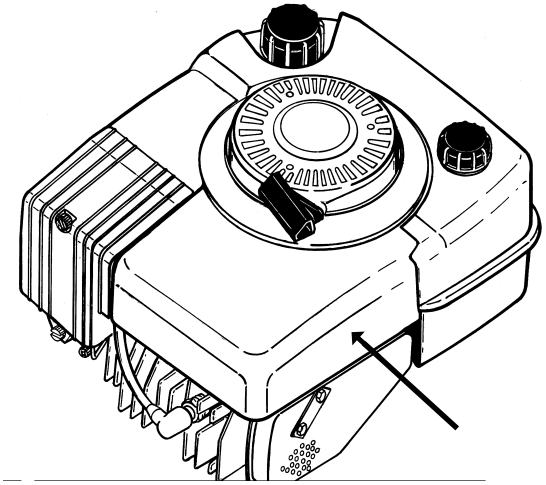
OHH



OHSK



LEV



VLV

The OPE Umbrella

Tecumseh Products Company, is a proud member of the Engine and Equipment Training Council (**EETC**). This Council is the organization that creates and updates the **OPE** test's. The tests are regularly administered by your regional, Engine Service Association (ESA) member and have become the industry's basic standard for qualified technicians. Please contact your Tecumseh Distributor to obtain a testing schedule.

OUTDOOR POWER EQUIPMENT
OPE TESTING

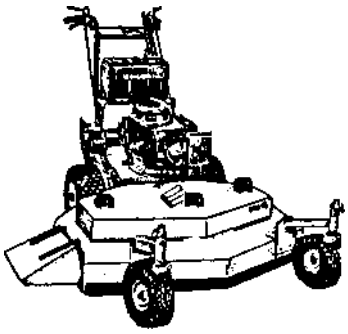
The benchmark standard for qualified technicians in the outdoor power equipment trade. These tests are developed by the EETC and administered by the ESA members.

EETC
Engine and Equipment Training Counsel

This Professional Organization is made up of outdoor power equipment manufacturers, dealers, distributors, service and training personnel, vocational and technical schools, national educational associations, and other interested industry and educational leaders. The council has established and promoted an industry sanctioned technician certification process for basic entry level certification.
The certification test are regularly administered through the regional ESA members.

ESA
Engine Service Association

The organization which administers OPE testing. They also developed and distribute the ESA-157 Warranty Service Claim form for the Outdoor Power Equipment market.



TECHNICIAN SHORTAGE

Skilled service technicians in the equipment and engine industry are in short supply. Prospects are not good for improving this shortage through traditional educational channels and with current educational processes. At a recent industry meeting, one equipment manufacturer indicated that their dealers were short more than 2,500 technicians to service their products. It is conceivable that the real numbers for the whole industry may be many times this figure.

The technician shortage is due to a number of complicated problems. A study done by a major university for the automotive service industry regarding why young people choose not to become service technicians, found these critical reasons:

- Mom and Dad
- Guidance Counselors
- Perception that it is a "dead-end" job
- Limited pay and benefits
- Lack of knowledge about what the industry has to offer

CHANGING THE PERCEPTION

You certainly can't blame parents for wanting the best future for their children. We must take the lead in changing their perception of our industry If the image of the technical service technician remains negative, then we have very little hope of developing a new generation of skilled service professionals.

Did you know that the average age of a service technician in a dealership today is 5 I years old? The challenge is clear. In order to change the perception of our profession and attract young people to our industry, we must begin to develop a career path for the young, entry level service technician. He needs to understand the potential in the industry – not just in terms of salary and benefits, but also in terms of increasing responsibility within a company and the industry. He also needs to have pride as well as self-esteem for his professionalism and knowledge of complex technical products and processes.

We, as an industry, must take advantage of the growth in the service sector by educating parents and counselors in the benefits of becoming a professional service technician. We must also insure that educational institutions offer the exact competencies our industry needs today and in the future.

YOUR CHALLENGE...

We need your help to insure that skilled professional service is available for the products we are selling today and developing for tomorrow. For as little as $175.00 a year, you can support the industry's efforts in insuring the availability of skilled service technicians and the availability and professionalism of the industry-approved educational institutions to teach industry-required competencies. Won't you please join us in this worthwhile endeavor and become a member of the Equipment and Engine Training Council. Your industry needs your support.

For More Information Call (512) 442-1788 or E-mail: eetc@eetc.org

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COMPLETE THE MEMBERSHIP FORM BELOW AND MAIL WITH YOUR CHECK TO:

Equipment & Engine Training Council
1946 So. IH-35, Suite 100-A
Austin, TX 78704
(512) 442-1788 • Fax (512) 442-1789

General Membership: $195.00
Dealer Membership $125.00

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

Email: _____

Update Seminar Technician
Video Test

1. The New exhaust MCR camshaft will initially be used on the following models.
   A. HM & OHM C. OVRM & LEV
   B. VLV & OVM D. OHH & HMSK

2. The New 640259 high volume primer will need only ____ primes due to its ____ % increase in volume.
   A. 5 & 15 C. 3 & 20
   B. 3 & 30 D. 5 & 50

3. The new VSK engine is being introduced as:
   A. 3.8 HP
   B. 4 HP
   C. 3.5 HP
   D. 5.0 HP

4. The New composite float (632765) can be retrofitted to all applications where the original brass 632019 float was:
   A. True
   B. False

5. Piston ring lands and rings on the new emission piston are noticeably different from the standard non-emission piston:
   A. They are wider
   B. They are made of porcelain
   C. They are narrower
   D. There is no difference

6. The reason Tecumseh has redesigned the standard metal float bowl was:
   A. The original float bowl did not fit the Series 11 carburetor
   B. The original float rest was not large enough to prevent varnished fuel to stick
   C. The metal was not holding up with todays reformulated fuels
   D. To work with the new composite float which has a different profile

7. The new aggressive choke plate part number for an OHV13.5 - 17.5 would be:
   A. 640066
   B. 640261
   C. 640913
   D. 640011

8. The 40016A Intake valve stem seal for the OHH Series engine will not fit previously manufactured engines because:
   A. The valve stem dimension has also changed
   B. The cylinder head has been machined to accept
   C. The valve spring length has been changed
   D. It will hit the piston

9. Claims filed under the Flat Tire Prevention Program are sent to and reimbursed directly from Tecumseh?
   A. True
   B. False

10. The reason the new graphite head gasket for the large frame OHV will not interchange with the original 36737 metal gasket is:
    A. It is thinner and will cause valve damage
    B. The graphite gasket bolt pattern is different
    C. The metal gasket is in stock
    D. The cylinder head has been machined down to maintain compression ratio

11. The new 37342 Silicone Bead flange gasket has become standard on _____ applications.
    A. Snow King®
    B. Generator
    C. Walk Behind Mowers
    D. Tractor

12. The new OHV110-135 12V electric starter is noticeably different then its predecessor. It uses _____ bolts to fasten ?
    A. 4
    B. 2
    C. 3
    D. 0

13. One of the easiest ways to determine the difference between a Series 8 and a Series 11 is:
    A. The Series 8 idle restrictor cap will be black
    B. The Series 11 idle restrictor cap will be gray
    C. The Series 11 will have the larger volume primer
    D. The Series 11 idle restrictor cap will be black

14. The 120 Volt 37105 electric start was designed to fit on engines above _____ horsepower?
    A. 10
    B. 8
    C. 11
    D. 20

15. To distinguish the new 12 amp D.C. alternator from the 16 amp we have:
    A. Imprinted a 12 amp designation on both the alternator and regulator-rectifier
    B. Placed a yellow marking on both the alternator coil and regulator-rectifier
    C. Made it look completely different so we did not need to mark it.
    D. Made the connector end with a 4 wire plug in.

16. The new restyled fuel tank has a capacity of:
    A. 4 liters
    B. 4 quarts
    C. 2.5 gallons
    D. 3 quarts

17. Adhesive thread locker is now being recommended on the following series carburetor studs:
    A. Series 8 & 9
    B. Series 11 & VLV
    C. Series 7 & VLV
    D. Series 3 & 4

18. The Enduro VT video will be available:
    A. December 1999
    B. August 1875
    C. February 2001
    D. January 2000

19. The new 37407 bushing clips are being considered for other engine series:
    A. True
    B. False

20. What carburetor is being installed on the new OHM100:
    A. Series 8
    B. Series 7
    C. Series 6
    D. Series 3

21. On the new TC300 carburetors, both the idle and main jets are fixed and cannot be serviced:
    A. True
    B. False

22. What feature was added to the MST transaxle to aid in disassembly ?
    A. Quick release latched
    B. Internal relief
    C. Longer bolts
    D. Pry points

23. The new longer 792177 brake bolts can be installed on all MST and VST transaxles ?
    A. True
    B. False

24. All greased filled transaxles require a 788098 o-ring to be installed on the neutral start switch?
    A. True
    B. False

25. The substance which may be found inside the float bowl of a brand new carburetor may be ?
    A. Tri-Flow
    B. Machining Oil Residue
    C. A powdered graphite
    D. Lead shaving

26. The first step used to diagnose a hunting or surging engine is to ?
    A. Replace the spark plug
    B. Remove the float bowl to inspect the carburetor
    C. Adjust the idle and high speed mixture screws
    D. Static test the governor system

27. To add lubricant to the new 301 transmission you must?
    A. Remove the fill plug and fill completely to the top
    B. Remove the fill plug and fill unit half way
    C. Remove the fill plug and fill 1/4" below the first thread
    D. None of the above

28. The new SilentTrac 200 will allow internal service to some of its components?
    A. True
    B. False

29. Ultra Fresh Gasoline preservative will help reduce fuel varnish and gum deposits for up to?
    A. 1 year
    B. 2 years
    C. 3 years
    D. 50 months

30. The H.O. in the LEV 120 HO stands for:
    A. Horizontal Overhead Valve
    B. High Output
    C. Heavy Operation
    D. High Option

31. The part number of the basic Tecumseh Tool Kit is?
    A. 670195E
    B. 671025
    C. 671275
    D. 672115D

32. The 792144 brake spring was introduced to?
    A. Make it easier to engage the brakes
    B. Help release the brake lever more consistently
    C. Aid in the retention of the parking brake
    D. Apply an even pressure for more consistent brake pad wear

33. The two engine features our new 37350 Low-Tone muffler works with is?
    A. Low oil sensor and governed idle
    B. Remote throttle control and illuminated rocker
    C. Extended run fuel tank and climate guard
    D. Only with climate guard

34. The new oil vacuum (part No. 670354) is available with an optional heavy duty 3 gallon tank. What is the Part No. for the optional tank ?
    A. 670367
    B. 670368
    C. 670354
    D. 670381

35. The change made to the MCR on the OHV13.5 - 17.5 camshaft was:
    A. A new stronger spring
    B. Hardened cam lobes
    C. A larger pin
    D. A higher density yoke

36. What percentage of returned solid state CDI modules were not found to be defective ?
    A. 50%
    B. 70%
    C. 60%
    D. 80%

37. When cleaning the VLV carburetor what item is commonly overlooked before soaking?
    A. Removal of the main nozzle (emulsion tube)
    B. Removal of the o-ring behind the main jet
    C. Removal of the inlet needle seat
    D. Removal of the float

38. Tecumseh Products has now returned to a _____ prime start on all LEV, VLV and OVRM with exhaust MCR engines at temperatures above 55^0F (13^0C)?
    A. 1
    B. 5
    C. 3
    D. 2

39. What type of lubricant is used on the input needle bearing on MST model transaxles ?
    A. Bentonite
    B. EP grease
    C. 10W40
    D. Kryptonite

40. Service Bulletin 125 was released regarding the following information.
    A. Rich running HM, HMSK, OHSK above 7000 feet
    B. Hot restarting on LEV120-361052B engines
    C. Emission Control Systems
    D. A fuel line safety recall

41. The suggested spark plug to be used in all VLV engines is ?
    A. J8C
    B. RJ19LM
    C. RN4C
    D. RJ17LM

42. All Tecumseh manufactured engines have a compression release of one type or another (MCR, BCR, RCR).
    A. True
    B. False

43. The 792001 MST o-ring is located ?
    A. On the axle shaft
    B. On the input shaft above the lower needle bearing
    C. On the input shaft directly under the lower needle bearing
    D. The 792001 does not fit in the MST

44. If a VLV engine mounted to a AL-KO rider is found to have excessive wear to the bottom thrust bearing, repair using a new flange, crankshaft and
    A. A new designed flange gasket which is thicker
    B. A new cylinder and crankshaft assembly
    C. A thrust washer
    D. Both A and C

45. If an electric starter is received with the return spring becoming trapped between the drive nut and armature shaft, a quick fix is to
    A. Replace the entire Bendix assy.
    B. Replace the starter assy.
    C. Add washer part number 650848
    D. Clean and lubricate the components

46. When installing the Europa 16630041 starter kit, a new _____ rope should also be installed.
    A. 90" (2300 mm)
    B. 42" (1067 mm)
    C. 100" (2540 mm)
    D. 36" (914 mm)

47. One of the main causes of an overheating engine is
    A. Use of the incorrect grade of engine oil
    B. The fuel had become old and stale
    C. Excessive engine R.P.M.
    D. The intake and cooling fins being blocked by grass and debris

48. The one and only function of the flywheel brake assembly is to reduce the amount of time the engine needs to come to a complete stop.
    A. True
    B. False

49. The new "D" governor system on GEO-TEC horizontal shaft engines differ from conventional systems by?
    A. Connecting the governor spool directly to the governor shaft.
    B. Connecting the governor lever directly to the throttle shaft without a link
    C. The governor gear flyweights are made from a polymer material
    D. The governor system is completely electronic

50. Dirty or saturated air filter elements may cause erratic engine running ?
    A. True
    B. False

Answer Sheet for Video Test

1.	A	B	C	D	26.	A	B	C	D
2.	A	B	C	D	27.	A	B	C	D
3.	A	B	C	D	28.	A	B	C	D
4.	A	B	C	D	29.	A	B	C	D
5.	A	B	C	D	30.	A	B	C	D
6.	A	B	C	D	31.	A	B	C	D
7.	A	B	C	D	32.	A	B	C	D
8.	A	B	C	D	33.	A	B	C	D
9.	A	B	C	D	34.	A	B	C	D
10.	A	B	C	D	35.	A	B	C	D
11.	A	B	C	D	36.	A	B	C	D
12.	A	B	C	D	37.	A	B	C	D
13.	A	B	C	D	38.	A	B	C	D
14.	A	B	C	D	39.	A	B	C	D
15.	A	B	C	D	40.	A	B	C	D
16.	A	B	C	D	41.	A	B	C	D
17.	A	B	C	D	42.	A	B	C	D
18.	A	B	C	D	43.	A	B	C	D
19.	A	B	C	D	44.	A	B	C	D
20.	A	B	C	D	45.	A	B	C	D
21.	A	B	C	D	46.	A	B	C	D
22.	A	B	C	D	47.	A	B	C	D
23.	A	B	C	D	48.	A	B	C	D
24.	A	B	C	D	49.	A	B	C	D
25.	A	B	C	D	50.	A	B	C	D

Should you need a new label for any reason such as replacing a recoil housing, please fill out a copy and fax it to us. We will promptly mail you a new engine I.D. Tag.

When replacing the blower housing on an EPA/CARB certified engine with the serial number of 7213 or greater (6001 or greater if in California), use this form to fax an order for a replacement engine identification label. This label is supplied no-charge. Fill in the required information below and fax it in to the Tecumseh Customer Service Department at (262) 377-4485. If you have any questions, feel free to call a Service Representative at (262) 377-2700.

ENGINE INFORMATION REQUIRED:

Engine Model/Spec: _____

Family Number: _____

Displacement: _____

DOM (Date of Manufacture): _____

SHIP TO LABEL INFORMATION:

Send to: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone No.: _____

Please allow 7-10 days for shipping & handling. Thank you.

FAX TO: (262)-377-4485

Tecumseh Factory Education Facilities

BILLIOU'S INC.
1343 S. Main
Porterville, CA 93257
Phone No. 559-784-4102
Fax No. 559-781-1875
EDUCATION DIRECTOR: RICK GROVES

CENTRAL POWER DISTRIBUTORS
1101 McKinley St.
Anoka, MN 55303
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

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8181 Washington Church Rd.
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Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

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Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

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Foxboro, MA 02035
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Fax No. 508-543-8394
EDUCATION DIRECTOR: BRIAN O'NEIL

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Shreveport, LA 71107-7108
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Fax No. 318-425-4638
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2644 S. 96th Street
Edwardsville, KS 66111-3483
Phone No. 636-282-2300
Fax No. 1-800-695-9530
EDUCATION DIRECTOR: GARY FIEBIG & BRIAN JONES

MEDART - ST. LOUIS
124 Manufacturers Drive
Arnold, MO 63010-4727
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1645 Salem Industrial Dr., NE
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Salem, OR 97303
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Fax No. 800-637-9243
EDUCATION DIRECTOR: WAYNE WENDLAND

SMITH ENGINES INC.
4205 Golf Acres Dr.
P.O. Box 668985
Charlotte, NC 28266-8985
Phone No. 704-392-3100
Fax No. 704-392-5208
EDUCATION DIRECTOR: HARRY WILLIAMS

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2303 Premier Row
Orlando, FL 32809
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Fax No. 407-855-4736
EDUCATION DIRECTOR: BILL ROBERTS

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Lawrence, GA 30243
Phone No. 770-237-0707
Fax No. 770-237-0210
EDUCATION DIRECTOR: JOHN VANEK

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Fax No. 262-377-4485
CONTACT: PAUL BECHWAR

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Tecumseh Products Company
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Douglas, GA 31535
Phone No. 262-377-2700
Fax No. 262-377-4485
CONTACT: PAUL BECHWAR

CPT CANADA POWER TECH. LTD.
161 Watline Ave.
Mississauga, ON L4Z 1P2
Phone No. 905-890-6900
Fax No. 905-890-0147
EDUCATION DIRECTOR: ROBERT BARTON

CPT CANADA POWER TECH. LTD.
#101 - 10411 0 178 Street
Edmonton, AB T5S 1R5
Phone No. 780-453-5791
Fax No. 780-454-8377
EDUCATION DIRECTOR: BILL BERNARD

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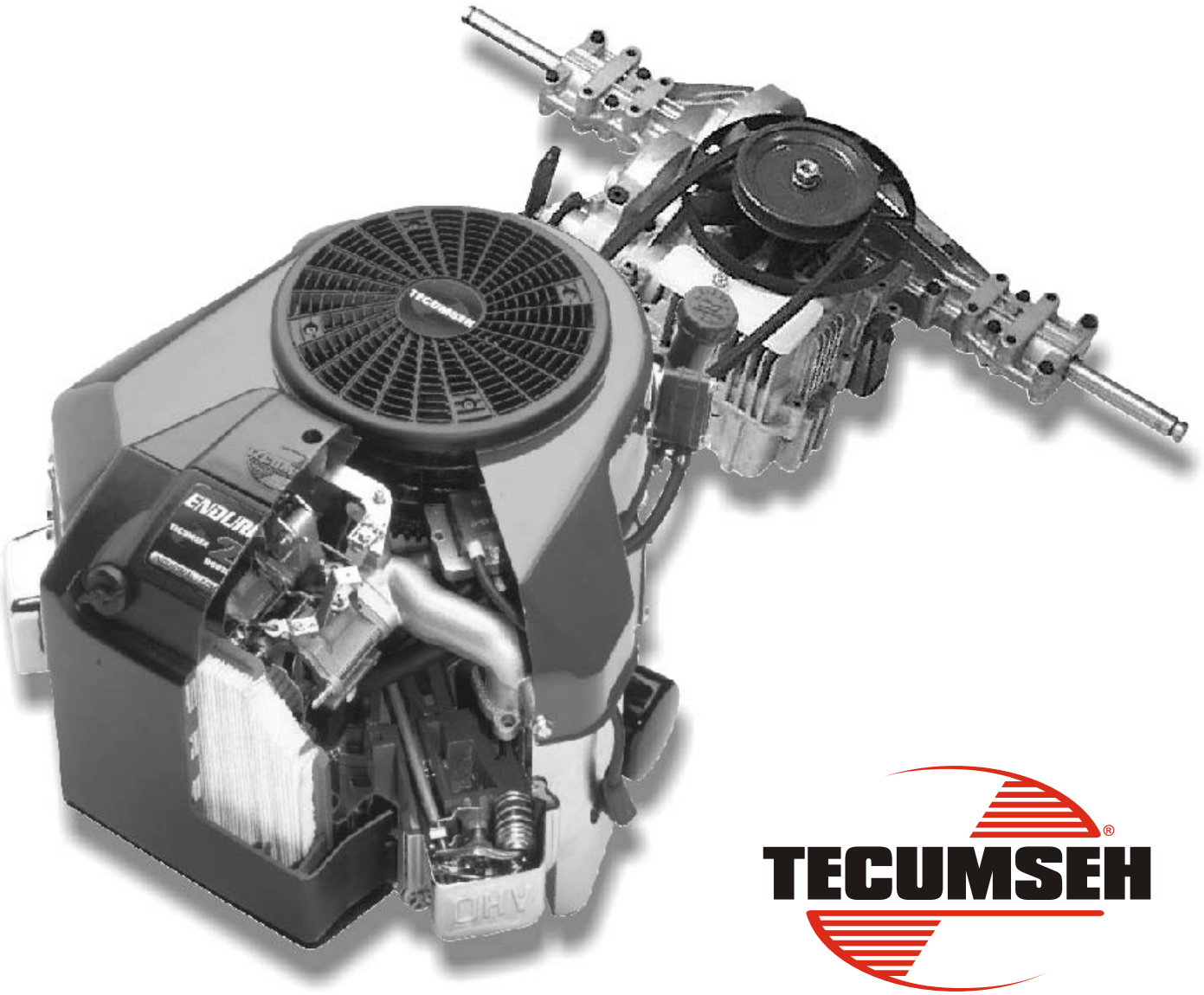
MONTREAL BRANCH
226 Migneron
St. Laurent, PQ H4T 1Y7
Phone No. 514-731-3559
Fax No. 514-731-0064
EDUCATION DIRECTOR: MICHAEL BOISVERT

Tecumseh Update 2001



TECUMSEH®

FACTORY TRAINING

Welcome to the 2001 Technician's Update Seminar presented by your Tecumseh representative.

WELCOME! We are glad to have you with us today. The Education Department would like to welcome you to the 2001 Update Seminar. We are excited to share with you some new changes to our Engines and Motion-Drive systems as well as brand new and innovative products that we are rolling out during the 2001 season.

We would especially like to welcome our Tecumseh Master Technicians (TMTs) to the 2001 Update Seminar. Remember the full benefits of being a TMT are only in effect when you are employed by a Premier Service Dealer. Your TMT number and Dealer Code number must be in our records for warranty decisions to be accepted by Tecumseh.

We have also listened to your feedback regarding more "Hands-On" demonstrations to improve shop efficiency. These demonstrations will include some new tools to further that goal.

This year's update will introduce you to the "NEW" limited service LTH hydrostatic transaxle, which will be used by several OEMs this season. We also review policy changes made to the VST serviceability and "R" (remanufactured) program.

We look forward to hearing your continued feedback regarding Tecumseh's educational approach and content as well as seeing you at one of the training schools. Remember that if you choose to attend a Tecumseh factory school or a Tecumseh Service Network (TSN) school, dependent on the dealer level you have chosen, you may be eligible for tuition reimbursement under Tecumseh's scholarship program.

TMT TESTING AND BENEFITS

Tecumseh has begun offering the most in-depth Master Technician certification test in our industry. This test covers all areas that are involved in normal daily repair of our products. The 2.5-hour test is comprised of the following:

- 100 questions- multiple choice, covering Four-cycle, Two-cycle, Warranty, Carburetion and Motion-Drive products.
- Hands on failure analysis of two failed products drawn at random, one Engine and one Motion-Drive failure. An ESA warranty claim form needs to be properly filled out listing your decision as to whether the repair is warrantable and listing all parts required for the repair. If the repair is warrantable you will be responsible to sign the claim in the area previously reserved for your distributor representative.
- Once certified, you will receive a special code reserved for you alone, not a dealership. When you are employed by a Premier Dealer you are empowered to replace Engine, Short Block or Motion-Drive units without distributor approval.
- Recertification is required every four years.
- Proof of holding the OPE Four-cycle certification must be supplied prior to taking the TMT test.

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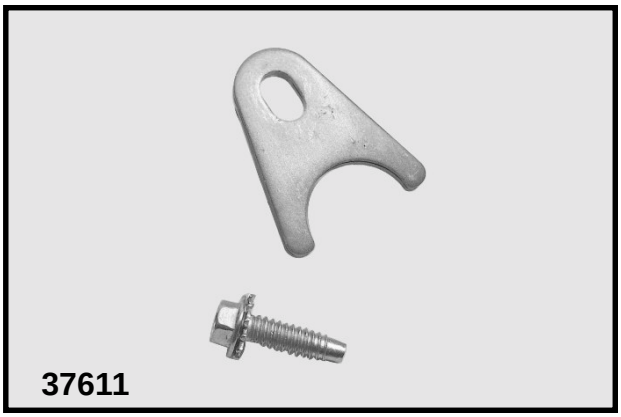
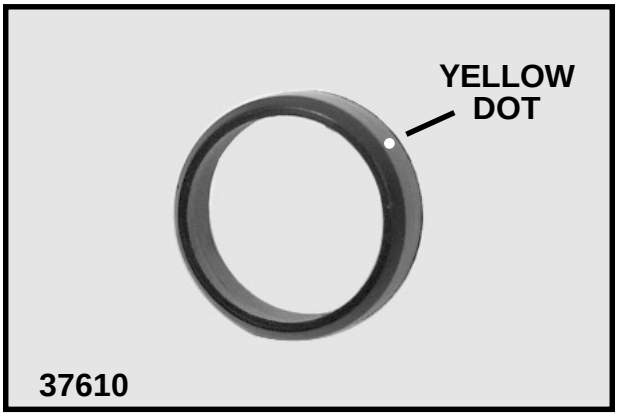
New Fill Tube Clamp

We have developed a new fork style retainer part **# 37611** to increase the oil fill tube sealing force on LEV and OVRM engine applications. This new system requires changes to the oil sump casting and therefore is not retrofitable. You will see it rolled out per OEM request on our lightweight vertical engines during the 2001 model year.



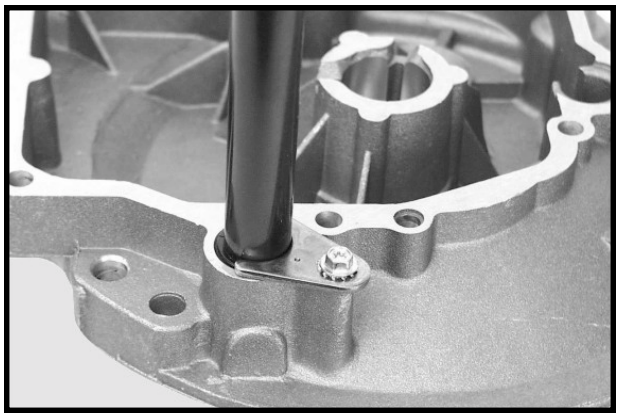
Improved Fill Tube Seal

We have developed a new oil-fill tube seal also for lightweight vertical engines. This Viton rubber seal can be used on lightweight flanges that utilize the deeper oil fill tube seal which is referenced in our 97'-98' update book. String trimmers and similar applications are susceptible to customer neglect by not keeping the cooling air inlet free of debris. If the cooling air inlet becomes blocked with debris, the oil temperature can increase to such a level causing this seal to deteriorate. The engineering group made a running change to this Viton seal, which can better handle these higher temperature applications. This seal part **# 37610** will have a yellow dot on it for identification purposes and will supersede the old seal part **# 36996**.



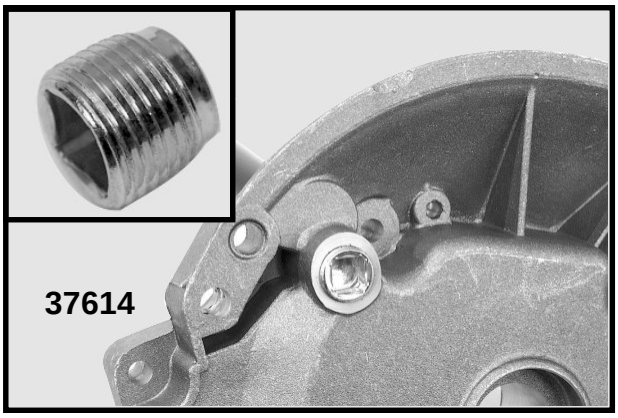
Flange change for lightweights

The lightweight flange has been changed to add an additional mounting boss to accommodate the oil-fill tube clamp and screw. You will see this new flange in 2001 production.



Pipe thread drain plug

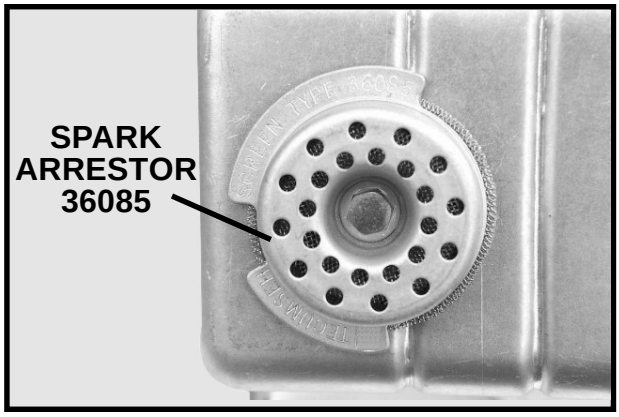
Another change to our lightweight verticals is the addition of the new oil drain plug. This plug part **# 37614** has the better sealing capability than the plastic style plug and will be an across the board change starting to be used in production late spring 2001. After an oil change, we recommend applying pipe sealant to the threads. Torque this plug to 100 lbs. (135.58 Nm).



OHH/OHSK Low Tone Muffler

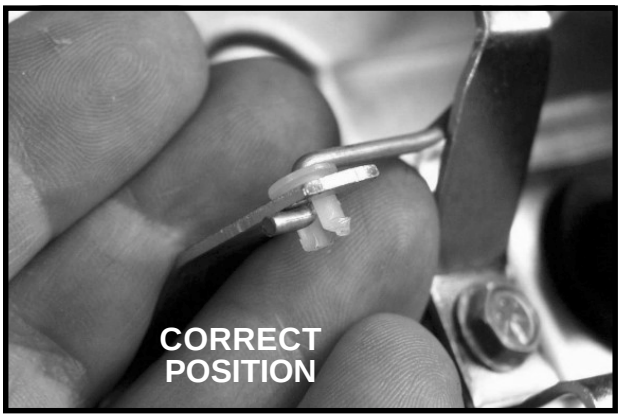
At the request of several of our generator and pressure washer customers, we have developed a new low tone muffler. This noise reduction is very noticeable at full power on this horizontal engine. The new muffler was an OEM option and will now supersede the original mufflers to offer both side and rear discharge designs. These mufflers are available under service part # **37595** for the side discharge and # **37596** for the rear discharge, should your customer request one for any OHH/OHSK engine.

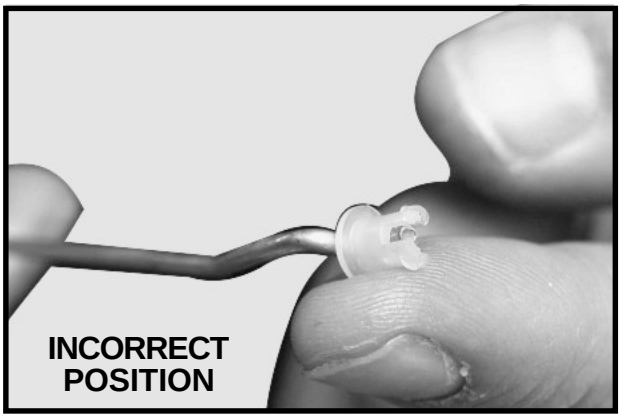
The spark arrestor service kit # **36085** can be added to either muffler. Spark arrestors for other models are listed in the service engine specification book part # **692531**.



Expanded Use of Link Bushings

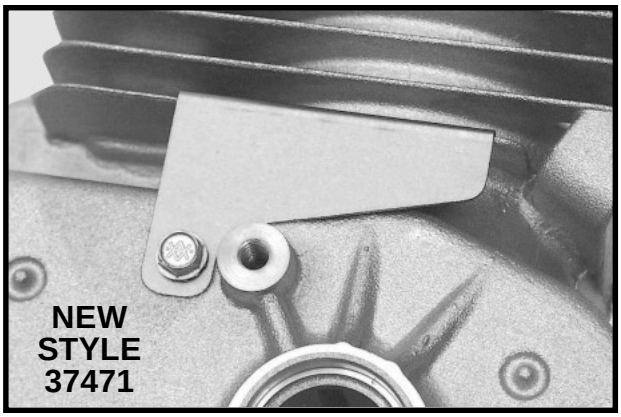
We have further expanded the use of throttle link bushings to the HM and OHM product. These bushings are used to reduce free play in the linkage, which improves governor response. We suggest that you stock these bushings part # **36288** in case they are lost during service. It is critical these be re-installed properly when repairs are done. The illustration shown to the right shows proper installation.



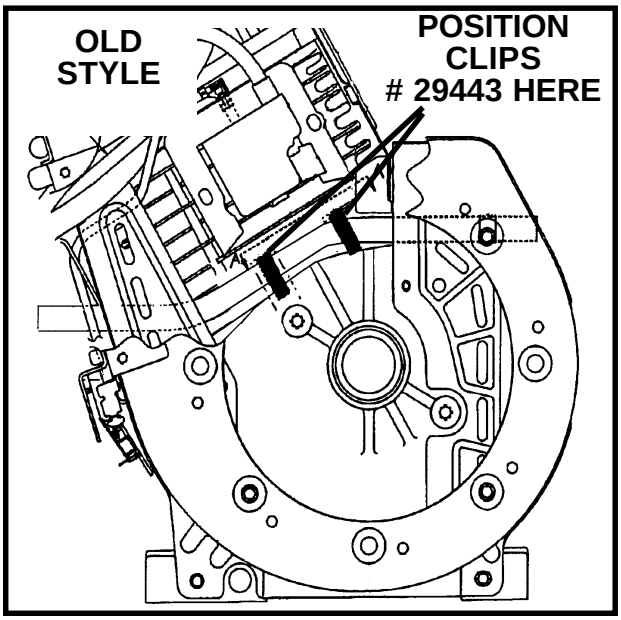


Improved Fuel Line Retention

Beginning with the 2000 model year, we have installed a fuel line guide bracket on the OHH and OHSK 5-7 HP engines. If you replace a fuel line on this family of product, be sure to cut the fuel line to the exact length and install under the new retainer bracket**.** If not retained, the flywheel could cut the fuel line causing a leak. This new bracket has a part **# 37471** and cannot be retrofitted to the older style OHH/OHSK cylinder.



Earlier models used the clips shown, part **# 29443.** Make sure fuel line is installed during service, and always check for these clips to be in place. This older style OHH cylinder needs the two clips shown and doesn't have the threaded hole to accept the new fuel line bracket.



Rocker Switch Now Basic

Effective with the 2001 product line changes, we are making the on/off rocker switch basic on all recreational vehicle applications. Should you encounter a lack of spark, you will need to isolate the switch from the ignition module as a possible problem area before replacing the module. The addition of the switch complies with the American Society For Testing Measures (ASTM).

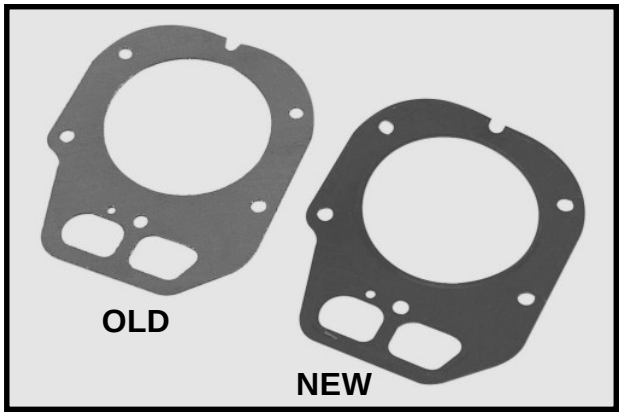
We have also received customer calls regarding the international symbols required by the European Union. We have included on page 48 in this booklet an explanation of the various symbols. Regarding the rocker switch, the '0' represents "off" and the 'I' represents a "run" position.

New Rope Guide

We have been evaluating failed recoil starter ropes returned from many of you. This evaluation has shown the rope at times can bind between the pulley and housing causing wear and eventual failure. This can occur if the customer allows the rope to fly back into the starter housing. To prevent this, we have added an additional rope guide, which is welded to the recoil housing. This guide directs the rope back onto the pulley, preventing wear and binding of the rope. We will start implementing the new recoil starters on all engines for the 2001 model year.

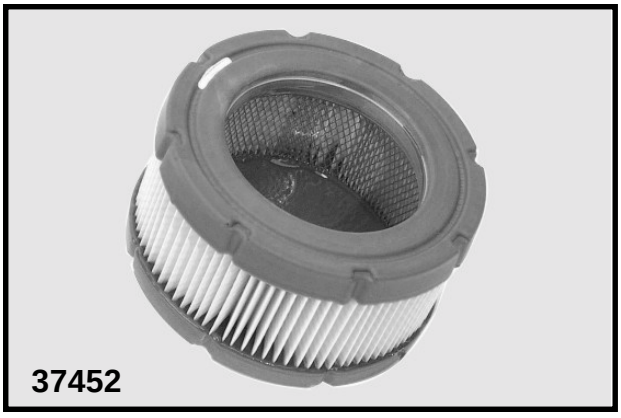
New OHV Head Gasket

A graphite gasket part **# 37493** has been designed to replace the **# 36337** metal gasket. This gasket is used on the OHV 13.5 through 17.5 hp engine. The graphite is less sensitive to damage during handling and provides a better seal due to its high density and better thermal properties. The cylinder head has been machined down to maintain compression ratio. Therefore, the gaskets are not interchangeable.



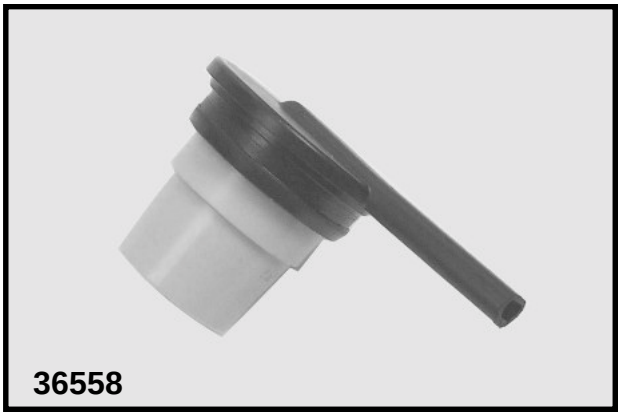
OHM Air Filter Improvement

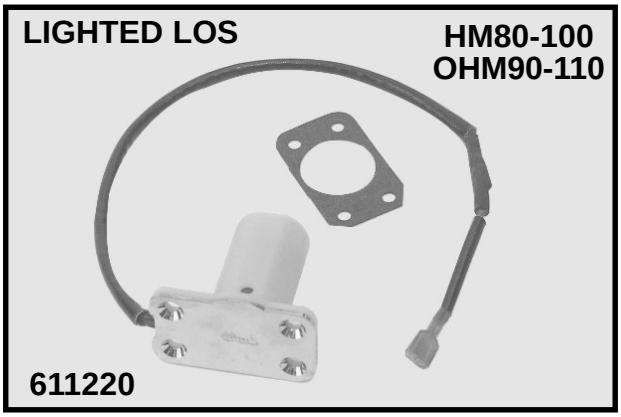
On certain applications, the top of the air filter for OHM 80-110 engines would pulse at high speeds. This would cause a low pressure condition in the filter cavity and pump oil to the filter through the breather. The thickness of the material on the top of the filter has been increased to eliminate this pulsing and oil saturation. This filter, **# 37452** will be a running change, which will be implemented in the 2001 production year.

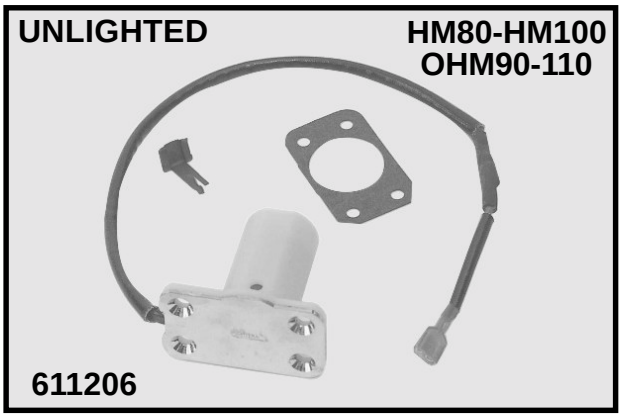


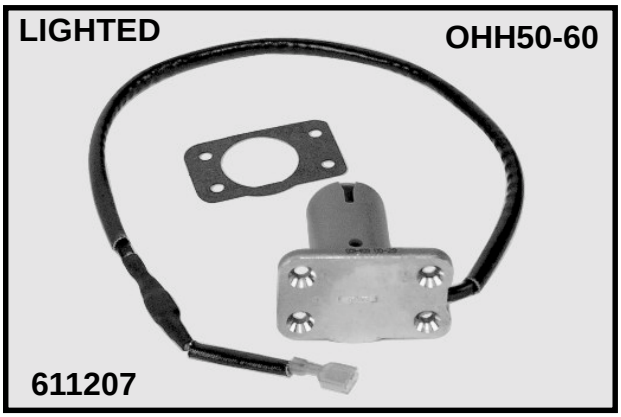
Breather Material changed

We have made a running change to the breathers on our small frame engines. High wheel string trimmers can develop heavy concentrations of flying debris, which can accumulate on the cool air inlet of the starter housing. This will cause higher than normal engine temperatures. These high temperatures may cause the older style breather grommet material to lose its sealing capability and leak. We have successfully tested this new breather material at temperatures exceeding 300°F. (148.88^{0}C).







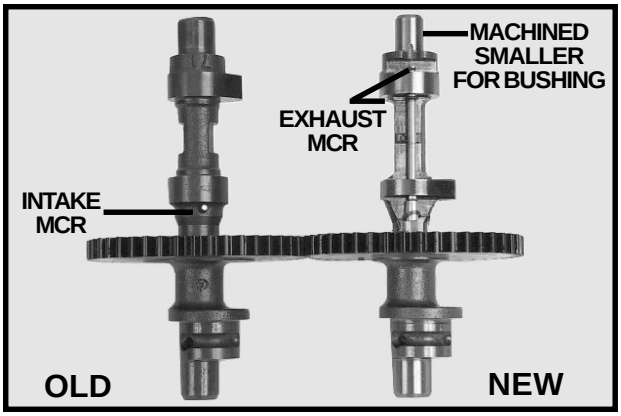


Low Oil Shutdown Improvements and Reed Switch Improvements

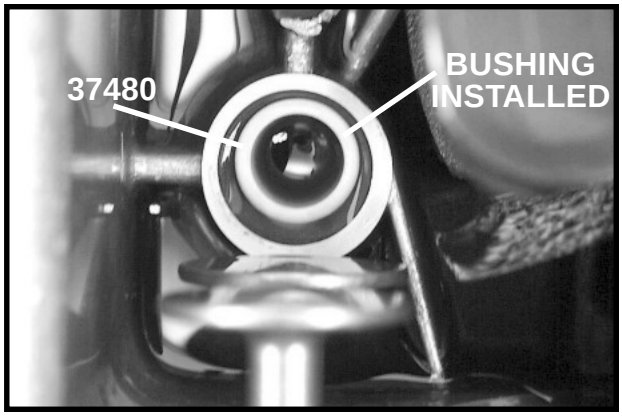
The three LOS systems that we use on OHH, HM and OHM products have received some internal changes. These switch part numbers # **611206,** # **611220** and # **611207** were previously manufactured with a neoprene rubber lining which has been changed to an adhesive style and secured with epoxy. This has provided an improved run performance by reducing problems caused by shock load.

LEV / OVRM Camshaft bushing = Easier Starts?

Yes it's true, starting in late 1999 an across the board change was made from an intake MCR (mechanical compression release) design to an exhaust MCR on the LEV/OVRM camshafts. This cam and plastic sleeve are retrofitable to engines manufactured prior to 11-15-99. The cylinder's cam bearing pocket did not change in size. The change from intake MCR to the exhaust MCR was made to improve startability. With the MCR back on the exhaust side, the camshaft end needed to be machined smaller to provide clearance for the exhaust MCR pin. The plastic sleeve is serviceable under part # **37480**.



If you need to remove the bushing, use an easy-out and position cylinder on the edge of a workbench with the flywheel side up. The reason for this is to prevent any possible chips from the plastic bushing from getting in the oil galley. To install, lubricate the bushing and bearing pocket and insert the bushing into place using the corresponding end of the camshaft. If necessary, lightly tap the end of the cam with a non-metallic hammer until bushing is flush with the casting.



New "Hot Plugs"

In an effort to further maximize our CDI ignition coil, we have decided to partner with Sears and offer two new spark plugs for the rotary engine line. The Champion RN4C4 part # **37599** will be gapped at **.045" (1.14 mm)**. This "Hot Plug" will be featured on OVRM engines for Sears. Sears LEV engines will be built with a Champion RJ19LM4 plug part # **37598** which will also be gapped at **.045" (1.14 mm).** These are new spark plugs, not just re-gapped. They improve starting with marginal quality fuel because of the longer arc length from the larger plug gap. The older style plugs can be used, but MUST be gapped at .030" (1.143 mm).

New Magnetic Oil Drain Plug

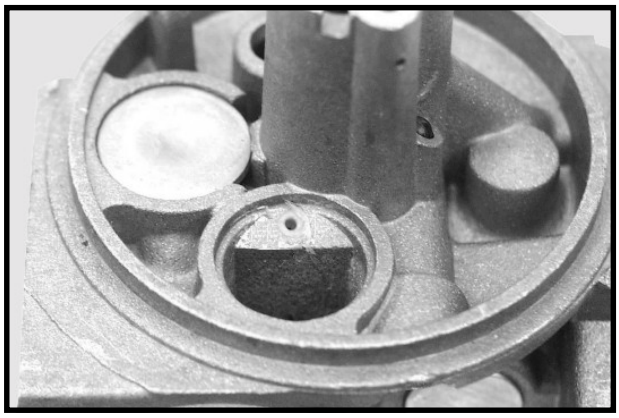
A further enhancement to the LEV 120 H.O. 6.75 hp engine is a new "pipe-thread style" magnetic drain plug for the 2001 season. This plug is an exclusive to Sears and will be used on propelled models only. Production using this magnetic plug # **37615** starts December 2000.

DEMONSTRATION

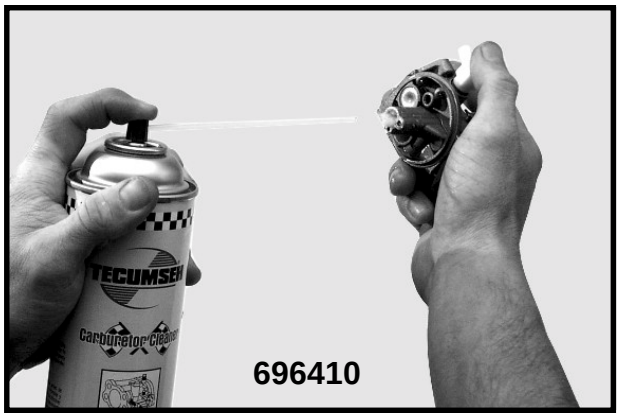
Carburetion

Carburetor Cleaning - Series 11

Note to the instructor: Please have removed idle circuit and additional fuel welch plugs. Have technicians remove emulsion tube, O-rings, and float needle assembly with carburetor tool # 670377. Have the students clean all passages with .012" (.304 mm) wire. Finish cleaning procedure with Tecumseh carb cleaner.



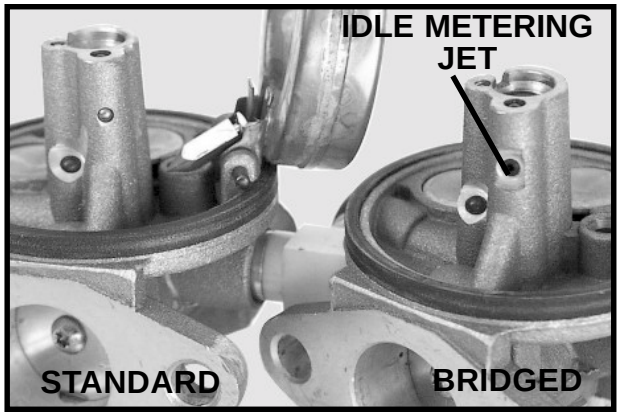
With the additional fuel well welch plug removed, you can see the small plastic metering jet, which can be distorted if left to soak in a carb dip tank. Currently, this metering jet is not a serviceable part. Our position has been to soak a carburetor no more than ½ hour but the exception is the Series 11 carburetor. To be safe, service all our carburetors with Carburetor Spray **# 696410** along with a .012" (.304 mm) gauge wire. Guitar strings are sold in this dimension as well as larger gauge for minimal cost.



2 Series 11 Carburetors

There are two versions of this carburetor, the standard and the bridged style. Both Series 11 carburetors have an additional fuel well so that at start up, performance results are non-surging and smooth running. The standard Series 11 has replaced the Series 8 on all lightweight vertical engines.

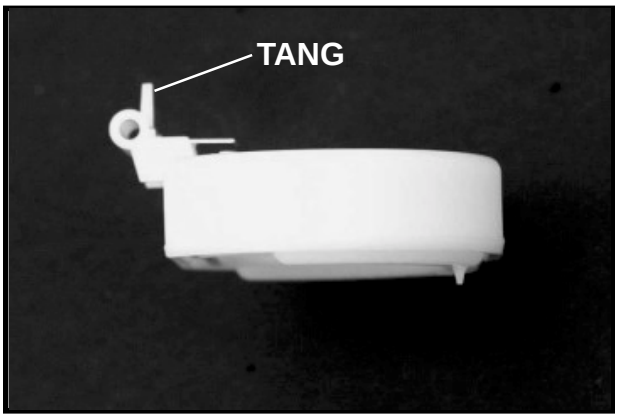
The Bridged Series 11 is built exclusively for the OVRM 120. It has a metering jet on the side of the center leg of the carburetor body. The Bridged 11 will draw fuel to the idle circuit from two sources; the main nozzle/idle route as well as the metering jet on the side of the center leg. This metering jet is a plastic composite and can be cleaned with a .012" (.304 mm) gauge wire. Both the inner well metering jet under the welch plug and the side metering jet on the Bridged Series 11 are .0125" (.317 mm) in diameter.



Plastic Float Implemented

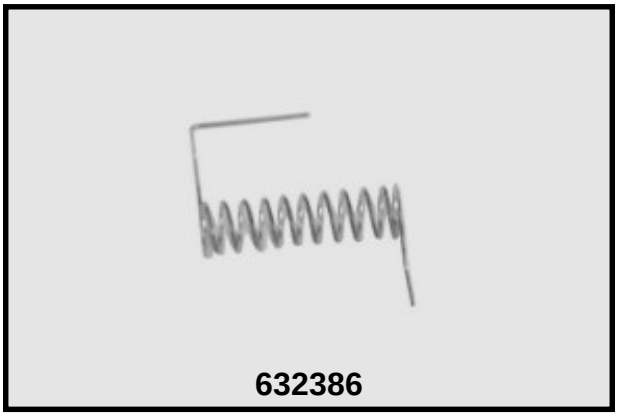
Last year we introduced the plastic float to reduce corrosion in the float bowl brought on by re-formulated gasoline. Based on the success of this limited release, we eliminated the brass float in our horizontal medium frame engines and a majority of the latest OVRM 120 specs. The part number for the float is **# 632802** and the float height adjustment is the same as the brass-style floats. This plastic float can be used on any aluminum bowl carburetor with the exception of RV specifications, which utilize brass floats with dampening springs.

Please note the tang shown in the photo to the right. If you try to flip back the float for needle/seat service, you could break off the tang and possibly crack the float. The hinge pin has to be removed to lift the float straight out of the carb body for servicing. Use the new carburetor tool **# 670377** to perform this service.

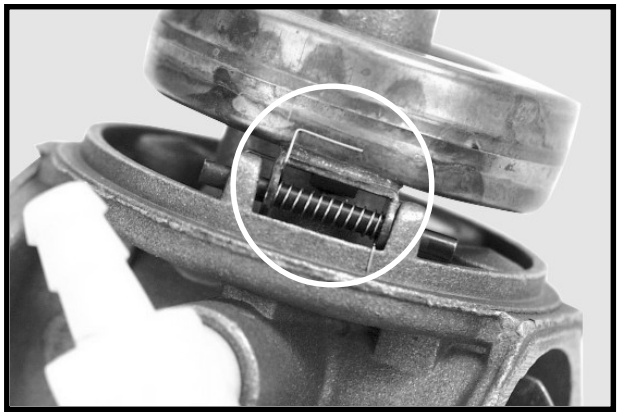


Float Return/Dampening Spring standard for RV Carbs

The float return spring has been standard for H series PowerSport® carburetors and soon will be introduced on the OHH slant series engines for the 2001 model year. As in the H series PowerSport engines, run quality in rough terrain is improved with this float dampening spring part **# 632386.**

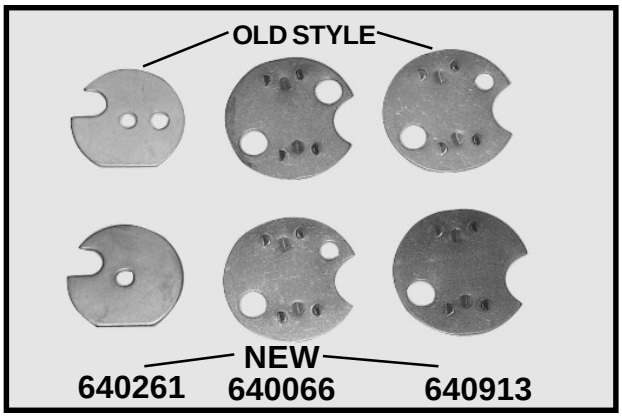


This photo shows proper installation.



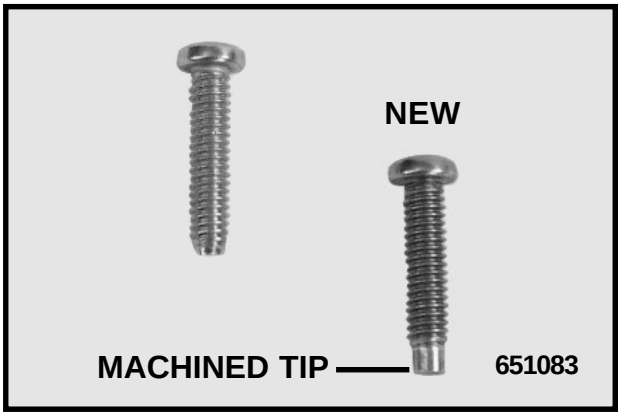
Better Cold Starts

We continue to receive comments from the field regarding poor cold weather starting on recoil starter-equipped OHV and medium frame series engines. A more aggressive choke shutter was made across the board for these engines as of December 1999. The part number for the TVM/HM series engine choke shutter is # **640261**, # **640913** for OHV 11-13 hp. engines and # **640066** for OHV 13.5-17.5 hp engines. These more aggressive shutters dramatically improve starting.



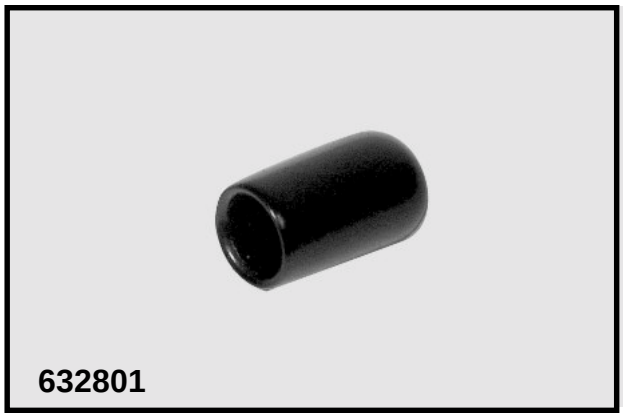
New True-idle screw

We have changed the true idle screw on some applications. The fine thread screw has been machined with a chamfer around the end. The tip has also been machined smooth. This idle screw has been included on engines that use a diaphragm carburetor or that do not have a governed idle system. The PowerSport® (non-governed idle) carburetor will now have a more precise adjustment to the idle speed on applications that require greater sensitivity at idle operation.



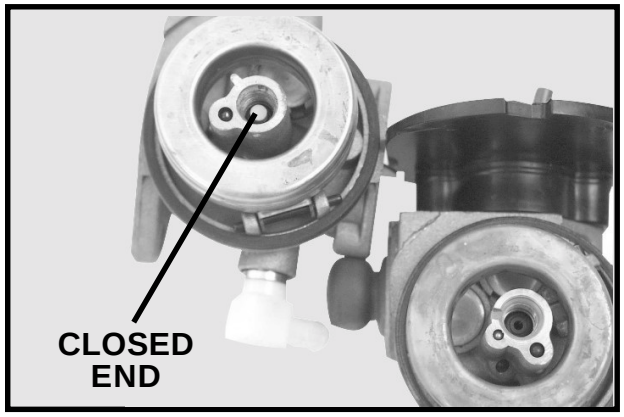
Tamper Resistant cap

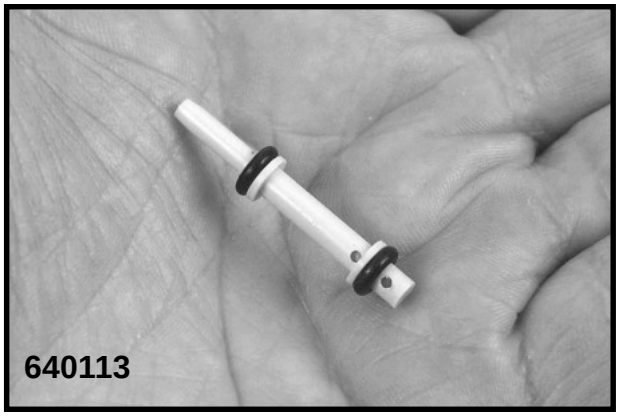
A tamper resistant cap is being used to prevent changes to the true-idle RPM on recreational, PowerSport engines. This is being done to eliminate the possibility of tampering with the idle speed, causing the clutch to engage at an inappropriate time. The part number for this cap is # **632801**.



Pink Emulsion Tube

The Series 3-emissionized carburetor used on many Summer HM's, Formula® OHV 120 engines and TVM engines are being built with a pink colored emulsion tube. This carburetor incorporates a new pink main nozzle/emulsion tube that does ***not*** have an open end on the bottom but instead utilizes two additional pick-up holes below the bottom "O"-ring. Because this is the only main nozzle/emulsion tube we have that is closed on the end it may appear defective. Closer examination after its removal reveals two metering holes on either side as shown. This new type of emulsion tube improves the engine run quality at light to no load conditions. This new nozzle requires the use of a new bowl nut with more clearance to allow fuel to enter the emulsion tube. When service is needed, please follow the parts look-up system closely to obtain the correct parts.





All Primer Bulbs are Not Created Equal

This is just a reminder that we introduced a high volume primer for the Series '11' carburetor part **# 640259** in late 1999. This bulb ***CANNOT*** be used on older carburetors or it will cause an over-primed condition. The bulbs shown here are all in production today. The original bulb **# 36045A** shown, is used on our OHH Series 8 carburetors today. Please follow the parts look-up system to obtain the correct primer bulb for your carburetor.

Improved VLV (High Torque) Float Bowl Kits

In our continuous effort to improve your dealership efficiency, we have created the following kits to make carburetor service literally a snap! Bowl kits are complete and ready to install.

Technicians advised us that when they removed the bowl drain screw to remove stale fuel they still had problems when they found tiny pieces of threading coming loose; these sometimes caused the jets to be plugged. To prevent this, we now form the thread as part of the mold process. This 'molded in' feature was part of the Series 7 float bowl. This was a running change that took place mid-2000. Please see Bulletin 126 regarding these kits. Please remember that it is a violation of both EPA and CARB regulations to install a non-emission grade bowl kit on an emissionized engine.

Descriptions of our Vector® new carb kits

Emissionized Engines

Model	Kit number
VLV Yellow Nozzle, Yellow Jet	730637A

Non-emissionized Engines

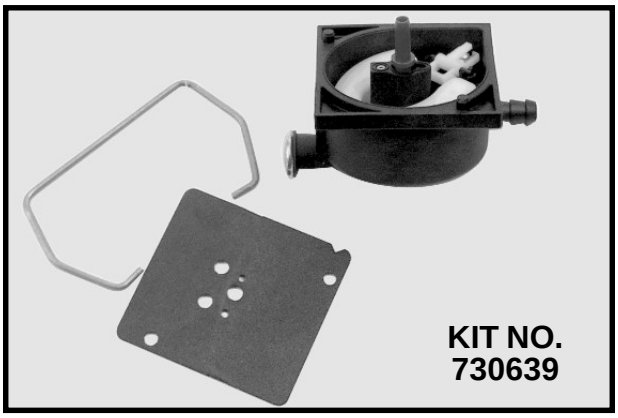
Models	Kit Number
VLV Red Nozzle, Red main Jet	730235B
VLV (Victa model) Green Nozzle	730641

Series 7 Fuel Bowl Standardized

We have standardized the float bowl on the Series 7 carburetor with the Vector bowl. This change required a new float bowl retainer that will come with every Series 7 kit. This change took place in Spring 2000.

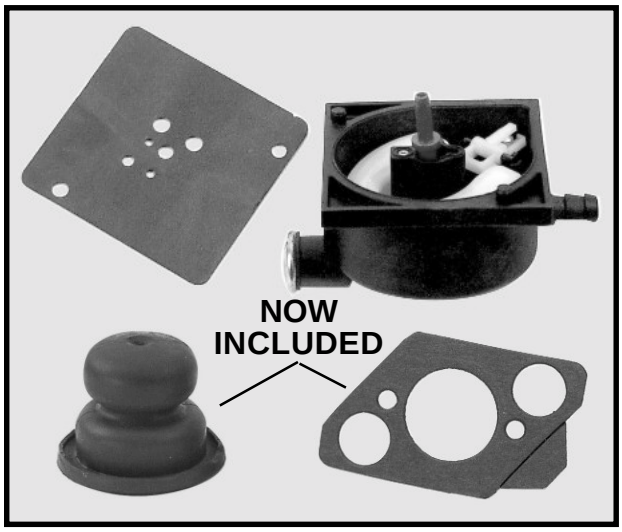
Series 7
OHV 110-135* Black Nozzle, Pink Jet 730638
Series 7
OHV 140*-175 Blue Nozzle, Brown Jet 730639

*Note: Model OHV135 with spec numbers ranging from 203500 thru 203599 use kit number 730639.



VLV (High Torque) tip:

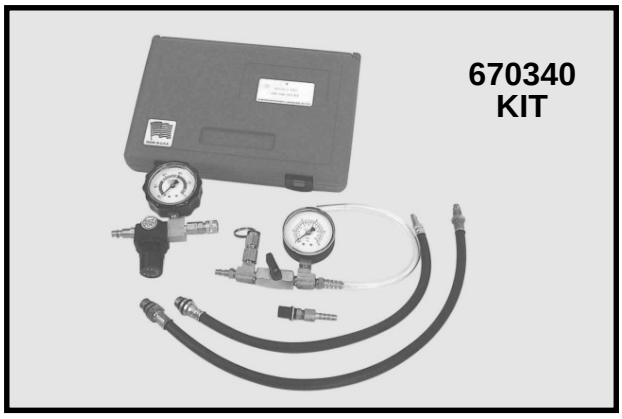
We have been hearing from technicians that after installation of a bowl kit they still have a leaking/ flooding carburetor. Our evaluation of this situation has found one of two issues caused the problem. These are either a damaged filter box gasket and/ or a shrunken primer bulb. Either can cause a closure of the atmospheric vent. When this passage is blocked, it can cause a siphoning effect and appear to be a defective needle and seat. To insure a complete repair is performed, we will be including both the primer bulb and the air filter box gasket in the bowl kits. When servicing the VLV (High Torque) you should install all the parts contained in the kit to insure a satisfied customer. Parts may also be ordered separately.



Leak Test Kits

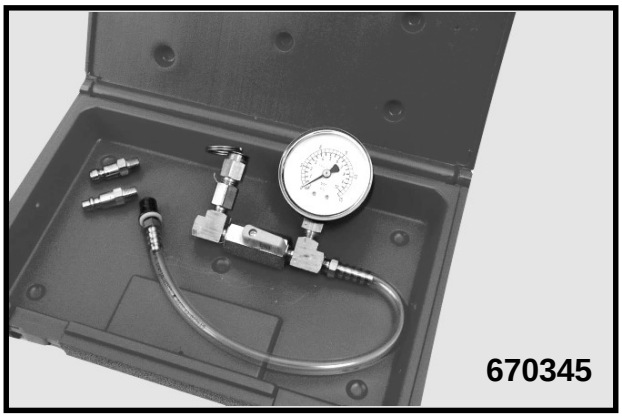
If you have a need to check ring and valve seal on an engine, needle to seat seal, or an MST transaxle case seal this tool is for you.

For example, the MST series transaxle was our first new model in fifteen years to use 80/90 EP oil instead of grease. When a repair is needed, proper resealing is CRITICAL. If you do not pressure test for leaks, the unit could slowly run low of oil, causing a failure. This tool makes a low pressure leak-down test quick and easy.



Two kits are available; the first is a complete kit including the primary regulator, low pressure gauge and all necessary adaptors. This kit is available through your distributor as service part # **670340**. The second kit is designed to be an add-on unit for a wide variety of leak down testers and contains only the low-pressure part of the system. Order service part # **670345** from your distributor. Both kits include a pressure relief valve to prevent excessive pressure buildup.

The following pages show this important tool in action.



Engine Leak Down Test

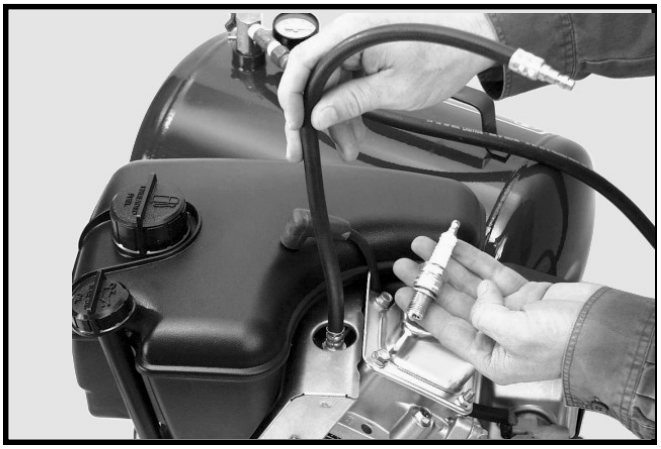
DEMONSTRATION

Step One: To perform this test, remove spark plug and make sure the crankshaft is held in place firmly at **TOP DEAD CENTER** on the compression stroke. John Klas demonstrates how to retain the crankshaft with a holding device that none other than he himself designed for us in the education department.

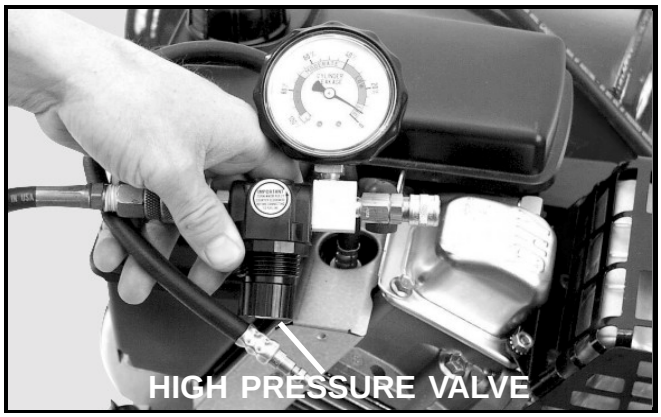
John machined the first prototypes of our new carb tool and countless other tools and parts to help us teach more effectively. John is now in his 40th. year serving Tecumseh Grafton Operations as an expert machinist.

Step Two: With the spark plug removed, insert the spark plug adaptor provided in the leak down kit **# 670340.**

CAUTION: To prevent possible damage to the gauges **ALWAYS** turn the high pressure valve off (counter clockwise).



Step Three: With the high pressure regulator connected to the shop air line, open the high pressure regulator valve until needle is in the "SET" position.



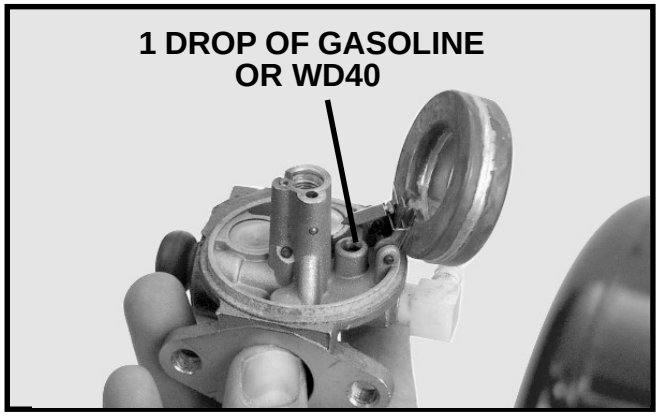
Step Four: Connect the regulator to the spark plug adaptor and watch the needle. If the needle is in the green area, you have an acceptable 40% (or less) leak down. (If 100% leak down occurs, check to see if air is escaping from the muffler or air cleaner). This test **MUST** be performed on Top Dead Center (TDC) on the compression stroke.

Isolate valve or rings: If excessive leakage is noted, you should next add several drops of oil into the cylinder. Then slowly turn the engine over several times to wet the bore and rings. Then perform the test again. If the percentage of leakage changes more than a few percent, you need to completely inspect the piston, rings and bore. If little change is seen, the valves or a blown head gasket is the problem.

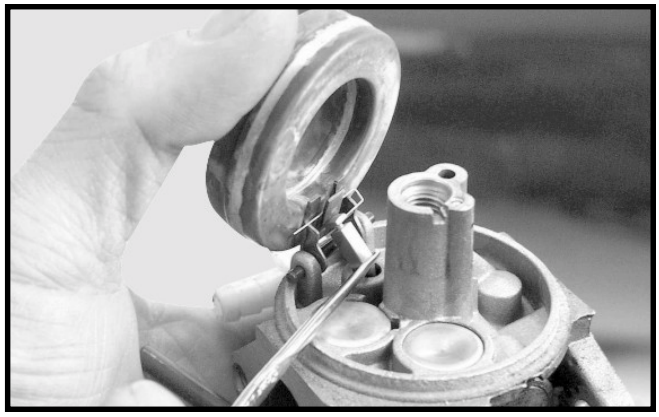
DEMONSTRATION

Carburetor Needle Pop-Off Test

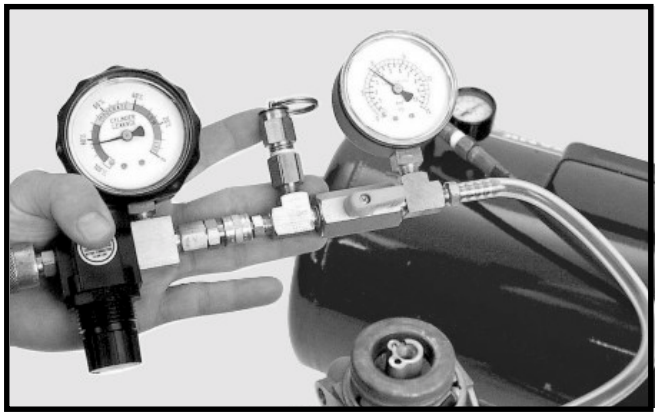
Step One: Remove carburetor bowl and open float all the way to remove needle from the seat orifice. Then apply one drop of WD40 or gasoline to wet the seat.



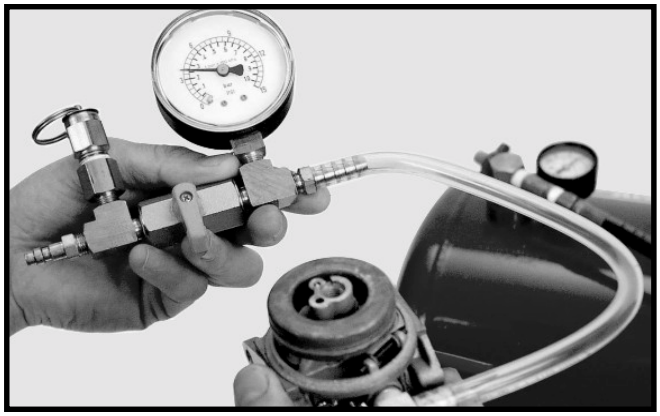
Step Two: Next, insert needle back to it's original position. Now with air valves closed on both regulators, connect them to each other and the air tank with the clear plastic air line to the low pressure regulator and the fuel inlet on carburetor.



Step Three: With carburetor held in a level position, open the gate valve on the low pressure regulator. Then begin adjusting the high pressure regulator valve to obtain a reading of 5 PSI (.34 Bars) on the low pressure regulator.

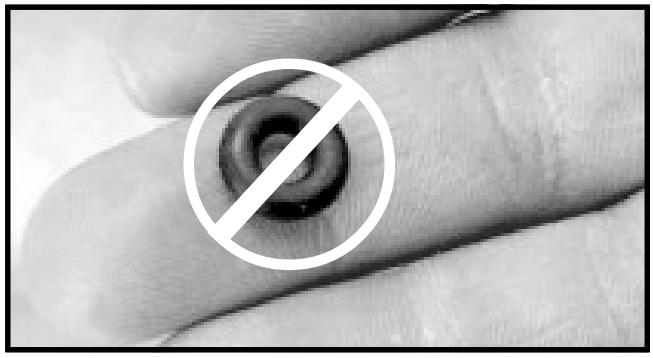


Step Four: Take care to keep carburetor level then close the gate valve on the low pressure regulator and disconnect from the high pressure regulator. Observe the needle, the leak-down should not go below 1.5 PSI (.1 Bars) in a one minute time frame. If a lower reading is noted, replace needle and seat.



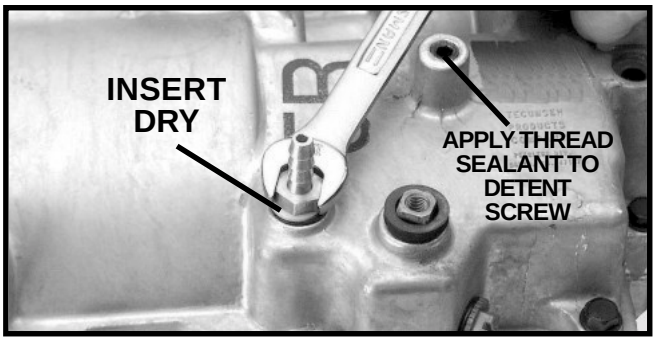
MST Pressure Test **DEMONSTRATION**

Using pressure leak test kit 670340 the O-ring pictured is not necessary.

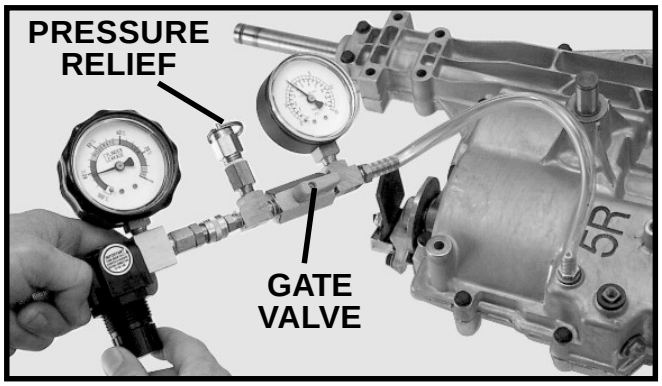


Turn the fitting with a 1/2" wrench a turn or two while holding the rubber end of the air fitting. This will enlarge the fitting to fit snug in the case cover.

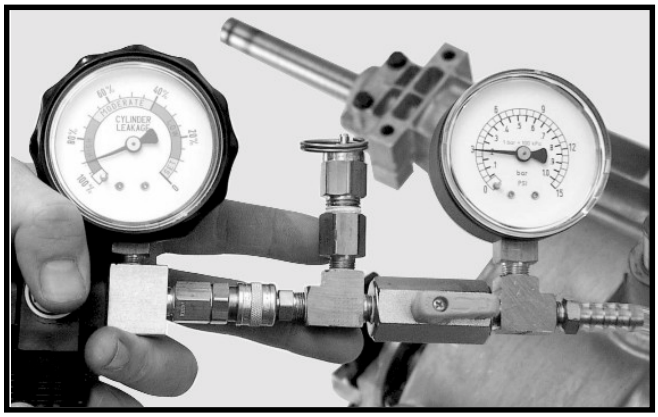
Once installed in the case cover, you may have to turn the fitting a few turns to make a snug fit.



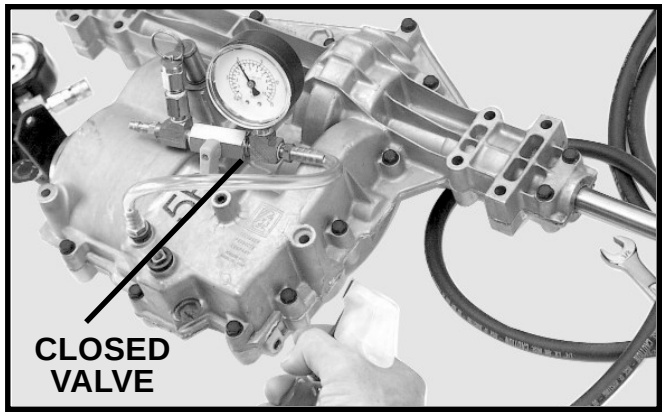
Making sure the high pressure gauge is closed and both high and low pressure gauges are connected open gate valve on the low pressure gauge. Slowly open high pressure valve until low pressure gauge reads 6 PSI (.4 Bars).



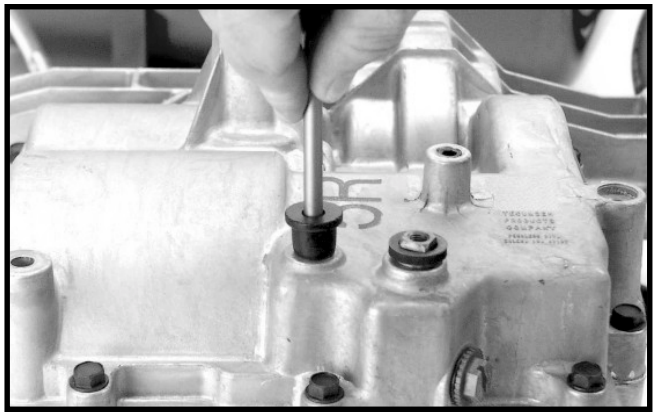
WARNING: Pressure beyond 9 PSI (.62 Bars) can cause a seal failure on the MST. Fresh RTV will not seal nearly as well as that applied and cured for 24 hours. With fresh RTV **DO NOT** pressurize above 3 PSI (.2 Bars).



Close the gate-valve and watch the pressure for one minute, if no pressure drop is noted, the unit is ready for re-installation. Should a drop occur repressurize the unit, then apply a soap/water solution to the perimeter of the unit until the trouble area is found. Reapply RTV to the cover and retest the unit before it leaves the shop.



Lubricate the plug then use the blunt end of a Torx 30 to reinstall the oil fill plug.



Tecumseh Starter Ring Tool
Part Number 670346
Instructions

DEMONSTRATION

Always work in a safe environment and WEAR SAFETY GLASSES.

1. Remove the starter motor from the engine.
2. Rotate the starter bendix up on the armature shaft (Fig 1).
3. Using the Starter Ring Tool (SRT) crimping pliers, remove the dust cover from the end of the armature shaft (fig 2).
4. The SRT has two separate usable sides. When installing it on all TECUMSEH starters the deep recess must face up. Use the SRT to press down the spring retainer. Make sure the jaws of the SRT are located in the split of the ring and the v-groove is aligned with the backside of the ring (fig 3).
5. Slowly tighten the handle in a clockwise direction until the split ring is open enough to be removed from the armature shaft.
6. Service the starter components as necessary.
7. Use the SRT crimping pliers to securely crimp a new split ring back into position (Fig 4).
8. Replace the dust cover by snapping it back over the spring retainer.

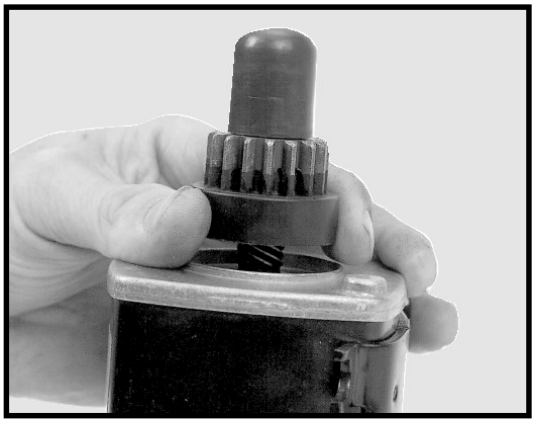


Fig 1

Fig 2

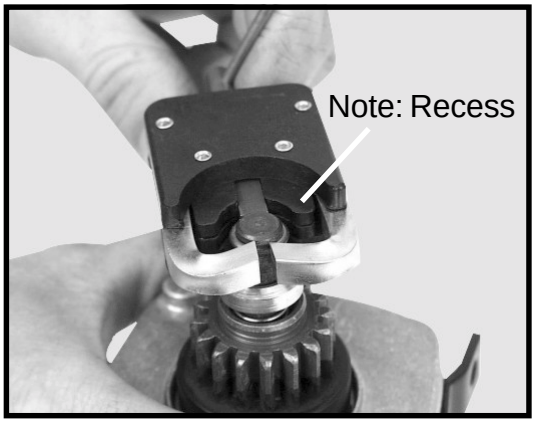


Fig 3

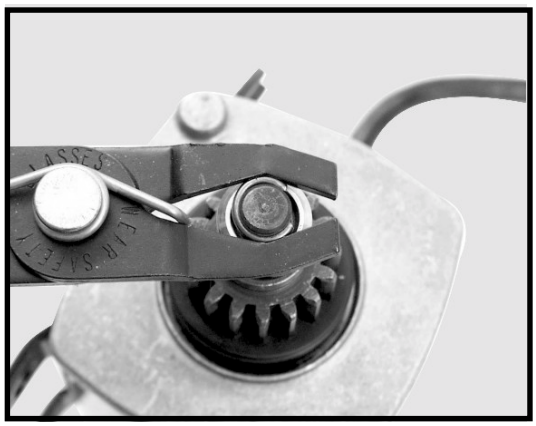
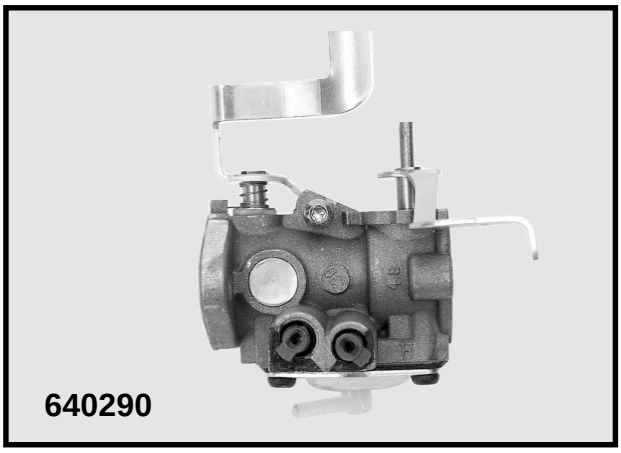


Fig 4

Limited Adjust AV Carburetor

The AV 520/600-diaphragm carburetor now has a limited-adjust cap system similar to the one used on the TC diaphragm carburetor. This system is for winter use only and consists of two metering screws part # **640291, # 640292** and caps part # **640293.**

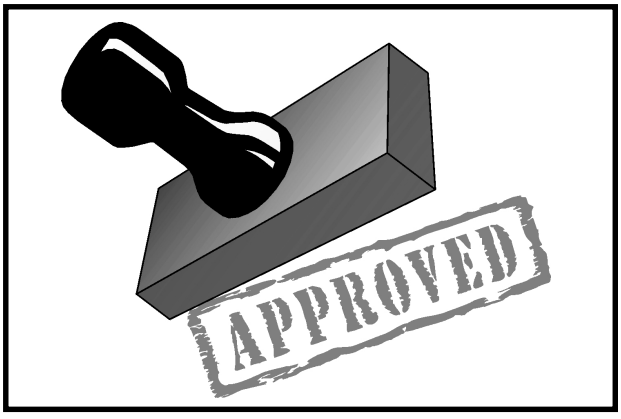
For extreme cold weather, the engine will run better by using varying degrees of the choke. This carburetor will be ready to install and pre-set with limiter caps placed over adjustment screws. This carburetor will function in high altitudes as they are set in production on the “richer” end of the mixture range thus limiting the technician to adjust in the “lean” direction only. The new limited adjust AV carburetor part **# 640290** replaces the current, non-adjustable emission carburetor.



Oil Classification

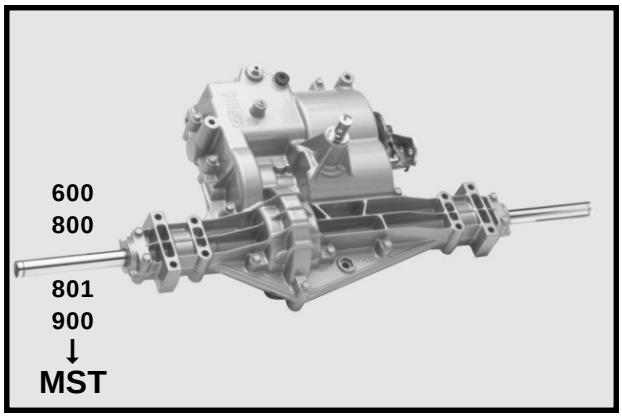
Tecumseh Products Company has approved the use of JASO (Japanese Automobile Standards Organization) FB & FC 2-cycle oil classifications. JASO is a well established organization and their FB & FC classifications are comparable to the present NMMA TC-W3 or API TC two cycle oils we recommend. This approval was official February 2000.

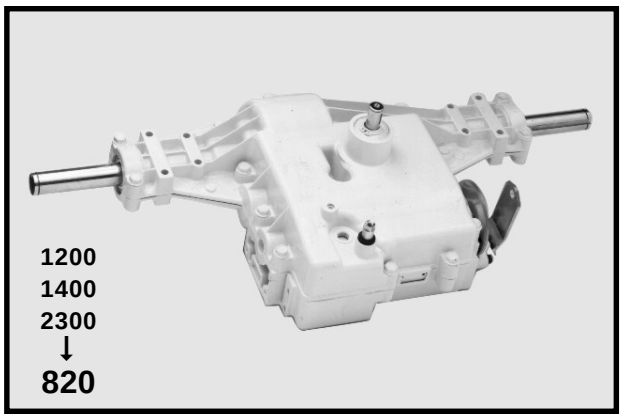
Remember all certified oils MUST be mixed to Tecumseh's recommended ratio. Tecumseh will not be responsible for engine damage if our mix ratios are not used.

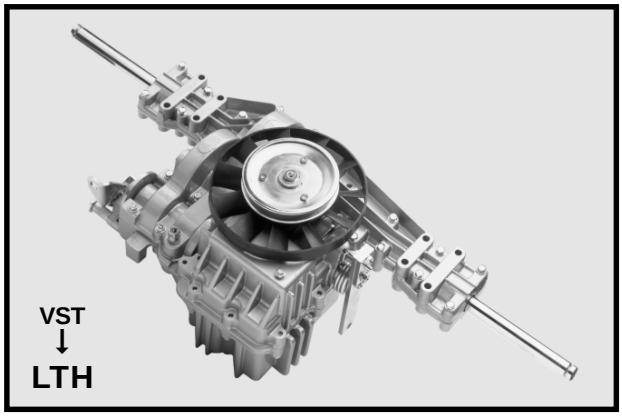


Evolution

Tecumseh has been building the following motion-drive units since 1966. Over the years, customer needs have changed and Tecumseh has embraced those needs with three high-quality motion-drive products. There has been an evolution of the 600, 800, 801, and 900 series transaxles into the MST transaxle. The 1200, 1400, 2300 have evolved into the 820 series transaxle. The 2800 series production has ceased but we will continue to service this unit and all fore-mentioned transaxles listed above. The VST Hydrostatic transaxles are replaced by the new easy-to-service LTH (Lawn Tractor Hydro). Tecumseh has listened to the Technician and we are building motion-drive products that are of the highest quality in the field. We trust that when servicing and maintaining these units, our new designs will be gladly embraced by all in the power equipment industry.

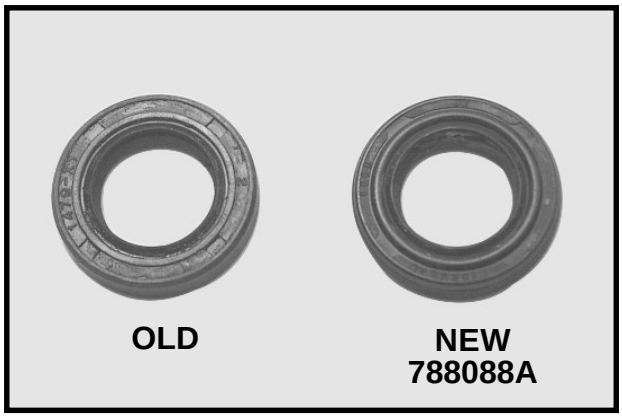






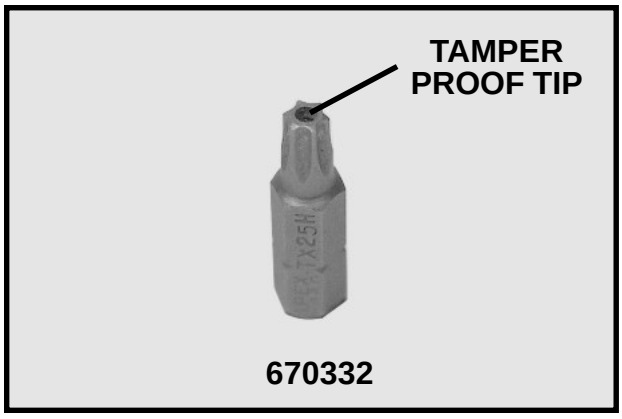
New MST Seals

Since September of 1999, we have been using a new style of seal on the axle and shifter/brake shafts. It is called a balloon seal, which uses a softer and more flexible rubber that adapts to the shaft and also seals the pocket in the case and cover better. The part numbers are **# 788088A** - axle seals and **#788089A** - brake shaft seals. The axle seals are already in production and the brake shaft seals will be implemented during the 2001 production year. This was a running change. When sealing the two case halves, remember to take care and not block the oil passage in the cover when applying the RTV sealant. Also be careful to ensure the axle shafts are free from sealant as this could create a leak at the seal when the RTV cures.



VST Baffle Cover Tool

This hollow point Torx 25 is now available through your normal source of supply under part **# 670332.** It is used to remove the bellows cover on the VST. The bellows is now a serviceable part of the VST. Because it was fastened with tamper proof screws it will be necessary to have this torx bit in your tool box for cover removal.



Miscellaneous Product News

Tecumseh Cleaners and Lubricants

Tecumseh is pleased to announce and present to you our new line of high performance lubricants and cleaners. These products are designed for use in the shop as well as for retail sales. The Program gives you a full range of products attractively packaged with a motorsports theme. Ask your distributor for information on our introductory packages and programs.

All cases are 12 cans per case
* 32 oz. (960 ml) Liquid, 14 oz. (420 ml) aerosol

Product Description	Part	UPC#
Battery Protector, Case	696407	00202
Battery Neutralizer, Case	696417	00213
H/D Parts Cleaner, Case	696408	00203
Hand Cleaner, Case	696411	00206
Lithium Grease, Case	696409	00204
Carburetor Cleaner, Case	696410	00205
Rubber Lube, Case	696418	00214
Penetrating Oil, Case	696412	00207
Dry Teflon Lubricant, Case	696413	00208
Contact Cleaner, Case	696414	00209
Aerosol Degreaser, Case	696415	00210
Spray Teflon Grease, Case	696416	00212

Ultra Fresh™ Gasoline Preservative

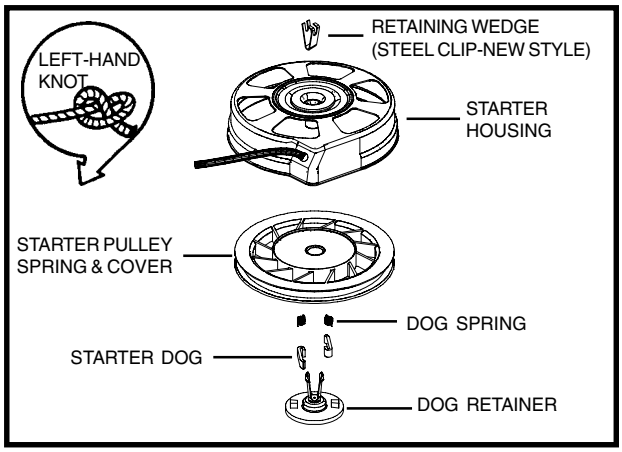
Tecumseh's latest gasoline stabilizer, Ultra-Fresh™, offers more value than traditional liquid fuel additives. Ultra-Fresh™ is nontoxic, nonstaining, and nonflammable. Its granular formula dissolves quickly into gasoline and performs better than major brands for up to **24 months**. As today's fuels may start deteriorating in 30 days, it is important to educate the consumer about the benefits of using Ultra-Fresh™. Tecumseh offers multiple merchandising options (see below). At the request of many dealers, we now offer a shop canister that includes its own dispenser. The shop jar treats up to **96 gallons** (364 liters). Treating each customer's engine coming into your shop will keep your customers satisfied while having a long lasting product in your work area. Ask your distributor sales person about profit opportunities from Ultra-Fresh™.

Merchandising Options	Part #
Counter display consists of 5 g (0.2 oz) packet (each packet treats 2.5 gallons (10 liters of fresh gasoline.	**730255A**
Shop canister	***730260***
GREAT FOR LANDSCAPERS	
3-packet bubble pack (5 card pkg)	**740063**

Service Tips

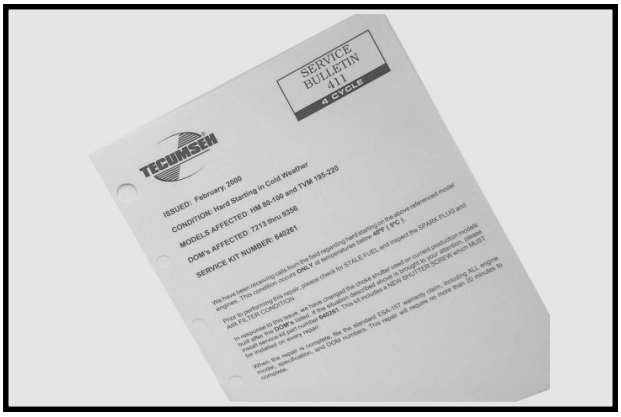
Quick Starter Service DEMONSTRATION

We have been receiving calls from technicians regarding servicing of the new style recoil starters. These calls revolve around two issues. The first is how many turns on the pulley spring; and second how to install the rope on the pulley. We are changing the text in all repair manuals to read; turn spring tight on the pulley then back off no more than ***1 turn*** to install a new replacement rope. Cauterizing the end to a point insures ease of installation while going through the grommet hole for rope replacement.



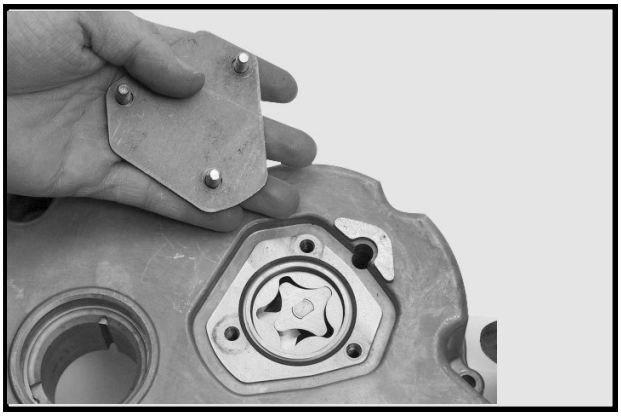
Hard Starting Engines

We continue to receive phone calls from customers regarding hard starting HM and TVM engines at temperatures below 40°F degrees 5°C. This is a reminder to carefully read service **Bulletin 411** to obtain a more aggressive choke shutter for all affected HM and TVM models. Provided the choke linkage and cable are adjusted properly to allow 'full-travel' of the choke, this new shutter brings us back to one or two pull starts at temperatures below 40°F (5°C).



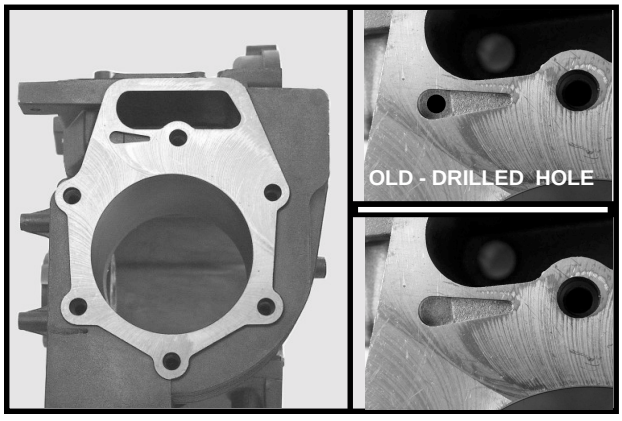
G-Rotor Pump Included

We have made an across the board change to the oil pump used in the OHV Enduro engines. This new pump will be included with the oil sump as an assembly should you require a new flange. The new G-Rotor pump produces less volume of oil compared to the older-style pump. Our studies have shown that our older style G-Rotor pumps created too high of volume being circulated in the engine. The oil pump included in a new flange is a better match for current production OHV's. These pumps will not interchange with older-style flanges.



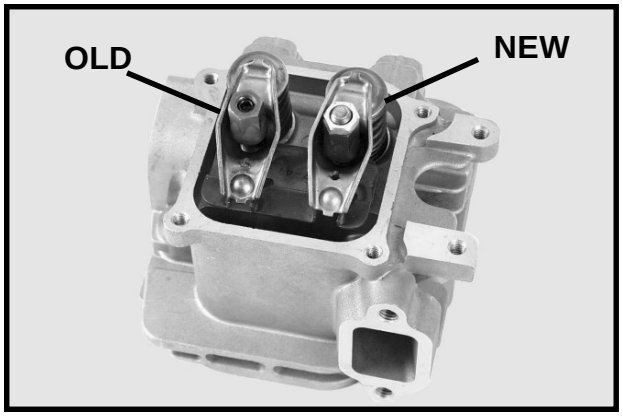
Don't be Fooled

Just a reminder to those service technicians who are observant. When replacing a shortblock for an OHV 15-17.5 engine, the original block may have a small hole drilled from the upper cam bearing to the cylinder head; this passage is no longer drilled. Its purpose was to lubricate the rocker arm bearings in the valve box. They still get lubrication; but through what means? TSIM ROPAV



OHV 13.5-17 Rocker Arm Adjusters

We have changed the system previously used on this family of engines. The new system shown here is addressed in service **Bulletin 127** and available under service part # **730636**. This new system will eliminate adjuster breakage, which was caused by over-tightening during adjustment. The kit includes all parts needed for both rocker arms.

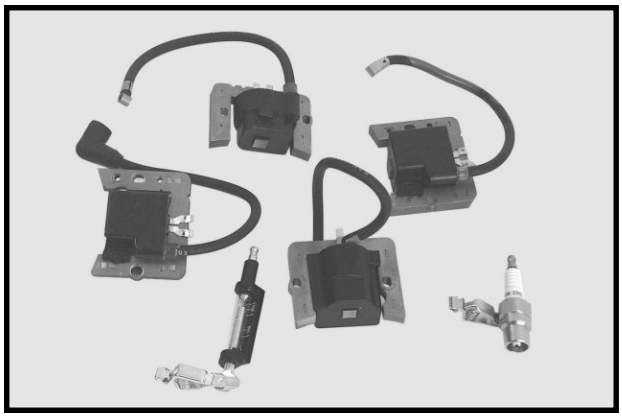


No Spark

We continue to recall solid state ignition modules that test as good working modules. We have decided to review again the step-by-step diagnostic procedure to check before replacing any ignition component. We now regret that beginning 2001 we will return these modules and reject warranty claims if the modules test out as good units.

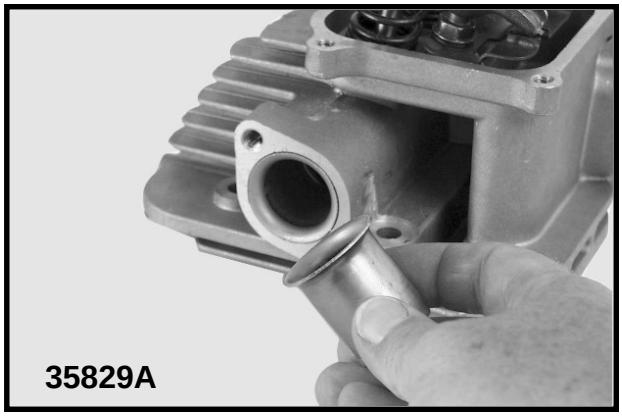
These are:

1. Using our spark tester service part # **670366**, install tester in spark plug wire and ground to a non-painted surface. Test Spark. If spark is present, continue to the next step. If spark is lost, continue to step three and repeat.
2. Next, connect the tester ground to the spark plug post, and check spark. If spark is lost, replace the plug.
3. Isolate the engine ignition from the equipment's wiring harness. Test for spark, if spark is present, review the equipment wiring harness system. If no spark, continue with the next step.
4. Remove blower housing and disconnect the ground wire at the module. Then test for spark. If spark is present, check for pinched wires or grounded wires at all connection points, including the compliance brake if so equipped. If no spark exists, this step proves that a short circuit is present-you need to replace the defective module.



OHV Cylinder Port Liner # 35829A

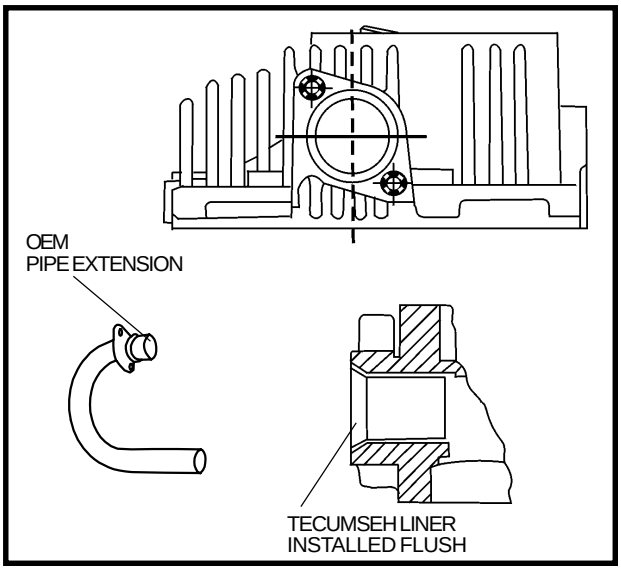
We have been evaluating service cylinder heads that have been returned as warranty defective. This evaluation found that the exhaust port liner was not installed as needed. The absence of this port liner will cause head temperatures to run high increasing wear and oil consumption. If cylinder head service is necessary, the OEM muffler must have the port liner included as an extension into the exhaust port. If this liner is not present, it is **CRITICAL** that the port liner be installed. We have now included the port liner with the purchase of a new cylinder head. **To install, simply lubricate exhaust port and liner and lightly tap into the cylinder head until flush.**



Cylinder Head Port Liner Installation Instructions Form # 696460

The enclosed cylinder head port liner is vital to proper cylinder head temperature control.

If the OEM supplied muffler does NOT have an extension as shown, this port liner **MUST** be installed. Press it in until flush with the flange surface.

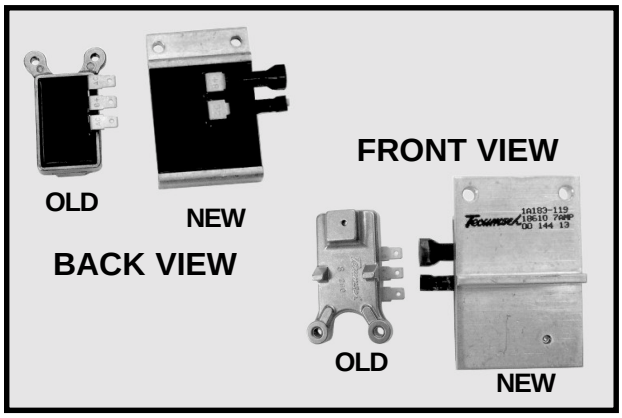


New Engine Smokes

We have received calls from customers that their new engine smokes, and an oil leak is presumed to be the problem. The smoking of a new engine is simple to explain. We use a sealant as the final curing process of non-painted parts to prevent corrosion of the aluminum cylinders. As you are aware, we run all our engines on the assembly line, but not long enough to completely cure the protective sealant. Should you encounter this concern please advise the customer this will go away after a few hours of operation and that it is normal.

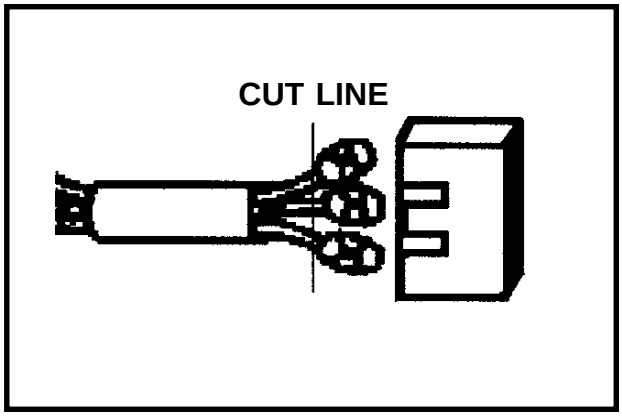
Upgrading to the New Style 7 amp Regulator

We have obsoleted the original 3 wire 7 amp regulator and replaced it with a new design. If servicing an older model engine, you will need to modify the wire harness coming out of the charging system. The new two-wire connector and instructions are included with the **# 611098B**-regulator kit.



1. Remove wires from the electrical connector as illustrated, cut the wires as close to the terminal connections as possible. IT IS IMPORTANT NOT TO CUT THE WIRES TOO SHORT

2. Strip approximately 3/16" (4.7 mm) of insulation off each wire. Using the two insulated female terminals included, make the new terminal ends as follows:

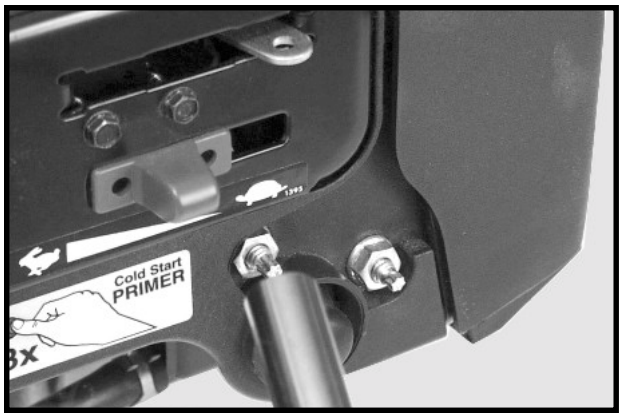


3. Using the larger ¼" terminal, insert (1) yellow wire (either one) and the red wire. Crimp together. Next, using the smaller 3/16" terminal, insert the remaining yellow wire and crimp. MAKE CERTAIN THESE CONNECTIONS ARE SECURE BY PULLING ON THE TERMINAL.

4. Mount the new regulator and make your connection by matching the female terminals to their corresponding sized male blades on the regulator. Secure all wires so they do not contact moving parts.

VLV (High Torque) Filter Box

Please take caution not to over-tighten the mounting nuts on the air filter box as it could warp, causing a bad seal which has potential to dirt wash the engine. The mounting nuts should be torqued no more than 35-45 inch pounds (3.9 - 5 Nm) which can be found in the VLV technician manual part **# 695578.**

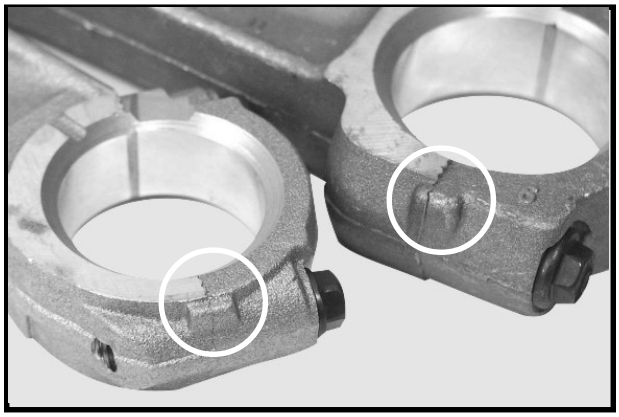


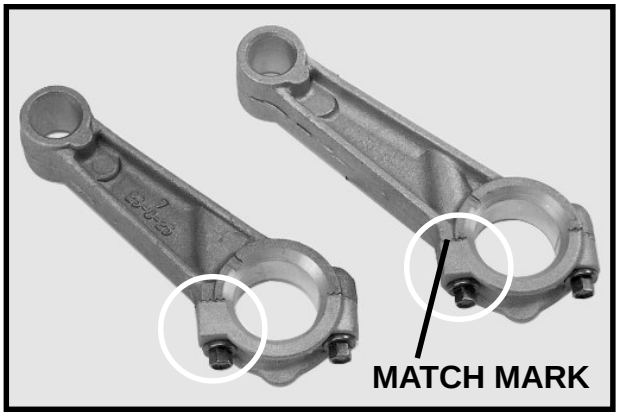
Chemicals Hotline

Should a situation arise where you or a customer have questions about any of our chemicals please call Chem-Tel. Customers from the United States, Canada, Virgin Islands and Puerto Rico should call **1-800-255-3924,** this is a 24-hour, 7 days-a-week service. All other International customers may call **813-248-0585**. Depending on location, appropriate international access codes to the United States would apply.

Improved Rod Match Marks

We have received calls from technicians stating “the match marks are difficult to find.” The photos to the right demonstrate a variety of connecting rods to show the match marks inside the white circles. While servicing, please take care to install these correctly by positioning the match marks facing toward the PTO/flange side of the engine.



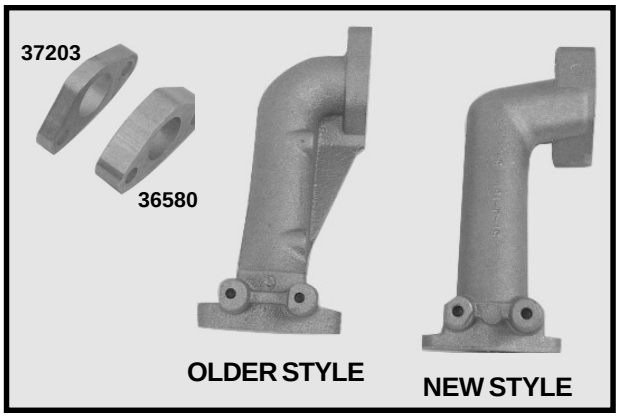


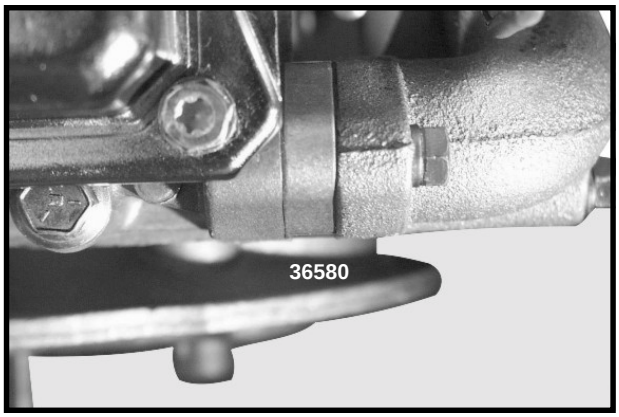
OVRM Intake Improvements

Specification numbers for the OVRM 105-21033F, OVRM 105-21034F, OVRM 120-22032D, and OVRM 120-22033D built prior to March 22, 2000 (DOM 0082) were built with spacer **# 36580** which is assembled between the sand-cast intake pipe part **# 36579** and the cylinder head. Assembly using the older style intake pipe and forgetting the spacer will cause the fuel line to be pinched by the air filter housing, cause the carburetor bowl to rub on the cylinder and the muffler guard will not fit properly.

All rotary application OVRM engines built after a DOM of 3-22-00 (0082) use the new intake pipe without the spacer. In case a spacer is lost a new intake kit is available **# 37532** which includes the new intake pipe **# 37531,** intake gasket **# 36581**, a new intake mounting screw **# 651043**, and the instruction sheet **# 696377.**

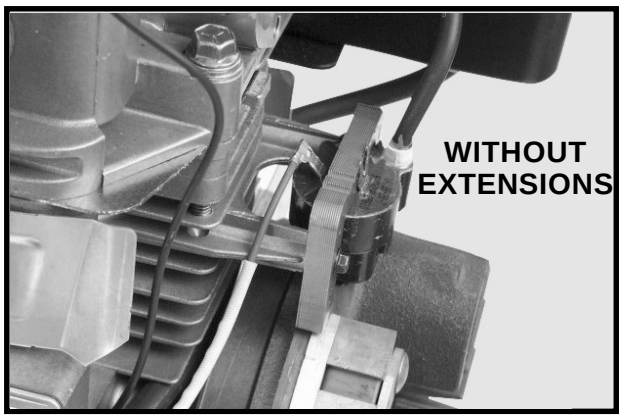
NOTE: We are continuing to build OVRM engines using the sand-cast intake pipe and two different spacers for utility applications. The Centura® styling uses the narrow spacer. All other styling packages use the wide spacer.

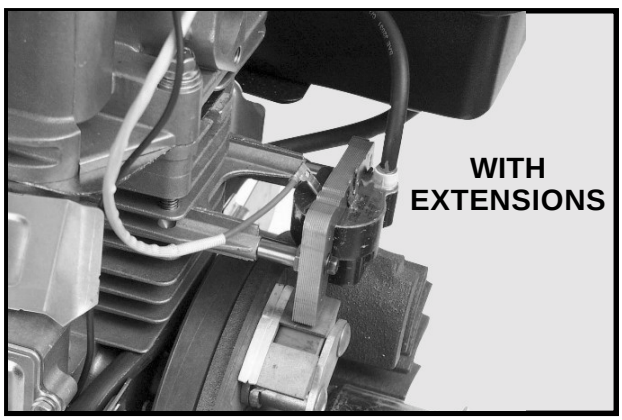




No Spark After Short Blocking

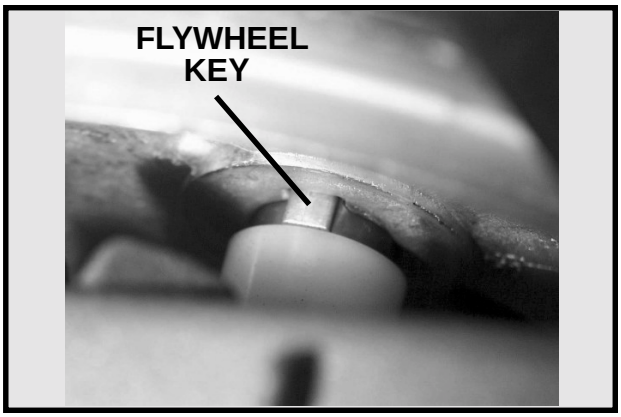
The following may sound hard to believe but we regularly get calls from technicians that get no spark after a short block is installed!?! The answer is simple on HM, OHM, and OHV engines. We use post extensions / spacers when mounting the solid-state CDI ignition coil, these often are forgotten when the new short block is installed. If these are left off the engine, the magnets do not pass the module and no spark is generated.





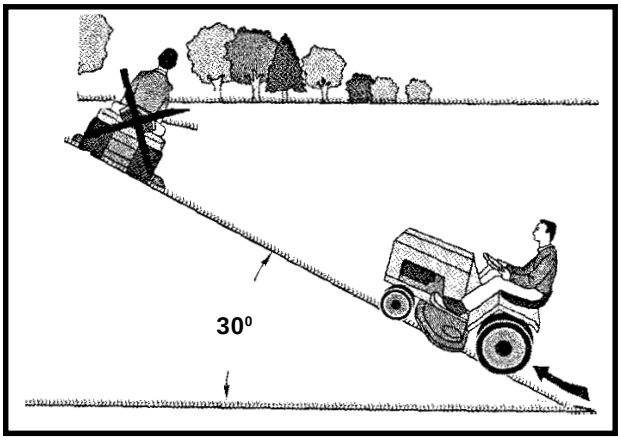
Quick Check for Flywheel Key Damage

We received a great timesaving tip from a Sears technician to check for flywheel key damage on most rotary mower applications. First remove air filter and use a small flashlight to look up through the underside opening of the blower housing as shown. You then can see if the flywheel key is sheared or bent. It is not required that the engine be removed from the mower deck to accomplish this check.



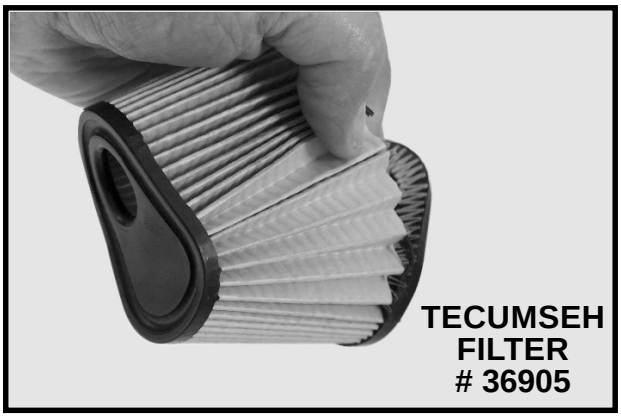
Engine Operational Angle Limits

We have seen an increased failure rate of engines on High Wheel String Trimmer products. Through discussions with dealers and customers, we have found operators using this product at excessive angles. Another finding shows operators are not cleaning the debris from the air intake screen nor the cylinder fins on the engine. We have asked the OEMs, no matter what the application, to install warning labels not to exceed 20 degrees continuous duty and 30 degrees ***ONLY*** for intermittent operation. Should you encounter a failure because of operation beyond this angle or debris build up; no warranty applies.



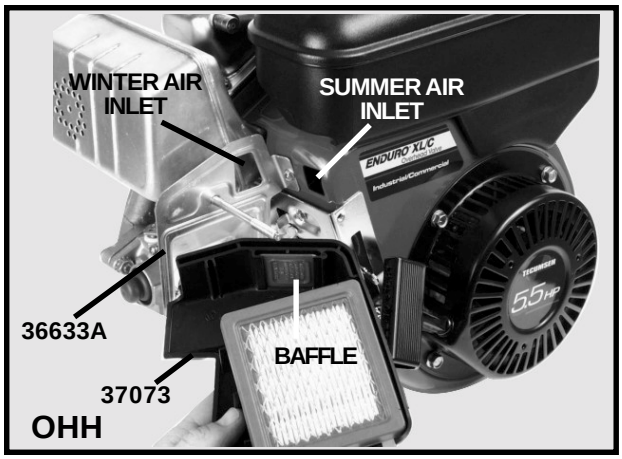
Air Filters-Are they all the same?

Tecumseh Products recommends only original service parts. We have received complaints of newer engines getting dirt washed inside. When inquiring about which air filters were used, the following was discovered by our engineering group. The evaluations show that the after-market filters that were analyzed do not meet Tecumseh's dust-room tests. The filter shown illustrates the seams on our filters are glued not just overlapped with one pleat. Our engineering standard is a multiple pleat over lap or a glued seam. Should an engine failure occur from dirt ingestion due to a non-Tecumseh air filter, Tecumseh will deny the claim.



OHH Conversion To Climate Guard®

The parts listed can upgrade the OHH with the Climate Guard feature which will provide all season reliability.



OHH Climate Guard Conversion
A/C Body # 36633A
A/C Cover Kit # 37073 (Includes Baffle)

High Oil Consumption at Cold Temperature OHH/HM/OHM

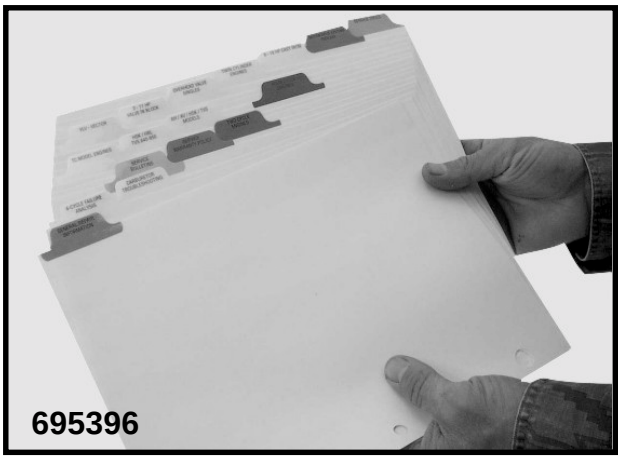
During early spring and late fall we receive calls from customers about oil soaked air filters or high oil use. Both of these situations will occur if the customer has not put the Climate Guard in the correct position to prevent breather **freeze-up.** If they have an emissions grade engine the Climate Guard kit is needed, please note the parts listed underneath each picture to convert to Climate Guard.

HM Climate Guard Conversion
Kit # 730630

Climate Guard is a Standard Feature on the OHM

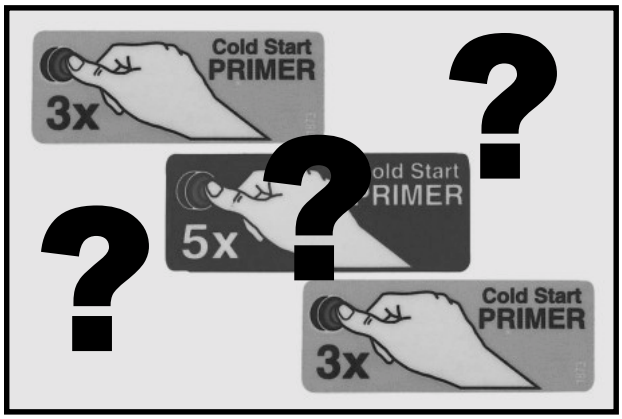
New Tabs for the Technician Manual Binders

We have dramatically enhanced the tabbing system to more easily find information in our Technical manuals. We have added a color coded version with more specific verbiage to assist you in finding information on Warranty, Two Cycle, Four Cycle, Motion Drive, and Service Tools sections more easily. This tab set is part # **695396**. New manual will include these tabs.



How Many Primes 3-5-3?

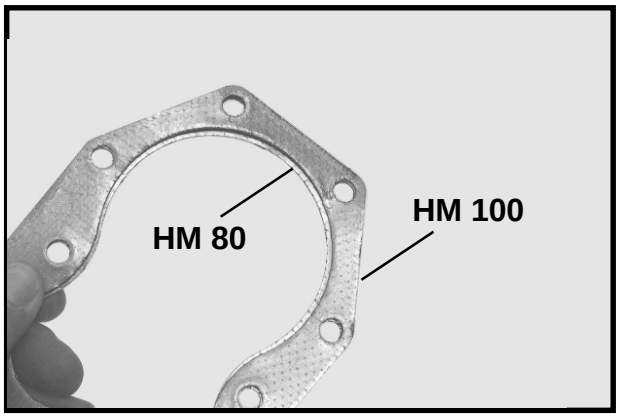
During the past few years of emission regulated engines we have been changing the number of primes required on various models. With our developments in carburetor and engine design we are going to 3-primes on all LEV, VLV and OVRM engines at temperatures above 55°F (13°C). This is accomplished through the combination of a new exhaust MCR (mechanical compression release) and an increase in the primer bulb volume. With 3-primes the exhaust MCR will return Tecumseh to 1 or 2 pull starts.

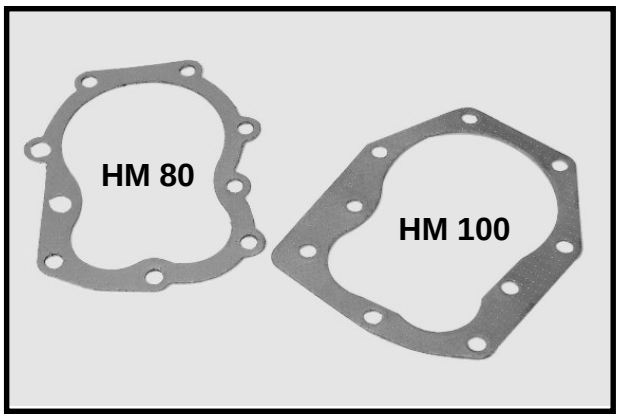


Getting the Correct Head Gasket

This is a reminder that technicians need to follow the parts lookup system to locate the correct head gasket for their engine which is **CRITICAL** to proper engine performance. With a variety of gaskets in use, it is not enough to physically "eyeball" gaskets that have the same shape. Tecumseh Products Company uses a variety of materials and thickness in our head gaskets, which can greatly affect emissions and compression ratios.

As seen in the photo, gaskets can look identical but can produce not-so-pleasant results if the incorrect one is used. Technicians in the field have mistakenly used a HM 80 head gasket for the HM 100 gasket. The bolt pattern is the same but the inside diameter of the gasket is slightly smaller on the HM 80 version. If used on a HM 100 engine, substantial engine noise will result from the piston contacting the edge of the gasket. The middle photo shows the smaller HM 80 gasket overlaid by the HM 100 gasket.





New VST Service Policy and Limited Service Effective November 2000

Effective August 1, 2000 Tecumseh stopped the manufacturing of the VST model transaxle. The new, serviceable LTH Model is replacing this model. Where possible we will be making available retrofit kits to the LTH in cooperation with OEM manufacturers. However due to the complexity of upgrading, we expect limited availability of such kits.

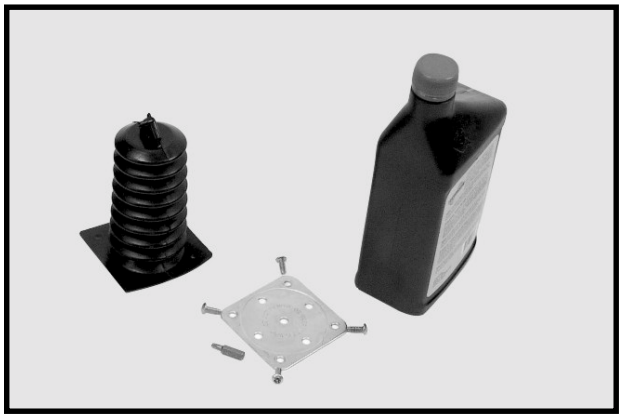
With this change, we are revising two key areas of service on the VST. The first is a change to the in warranty policy covered under service bulletin 307 Revised November 2000. The second is to allow limited service of OUT OF WARRANTY units.

In Warranty Replacement: The changes for in warranty repair are the addition of a **NEW** core exchange program and availability of "**R**" units from your normal Tecumseh parts supplier. The core(s) have a value of $100 US dollars per unit and must be returned freight prepaid to your Tecumseh distributor, **NOT TECUMSEH DIRECTLY.** When the core is returned, freight prepaid, you will be issued credit for the core, in the amount paid. The freight both ways should be listed on the warranty claim.

Out of Warranty Replacement: As most of you are aware the VST model has remained sealed because the unit does not contain a filter to capture any impurities allowed in during service. For this reason should an internal failure occur, it would continue to require replacement. However this replacement can now be with a remanufactured unit.

The core exchange program as listed above is available to QUALIFYING models with a **B or C** suffix **ONLY.** Earlier models of 1800, VST plain or "A" Suffix letter **DO NOT** qualify for the program and should be replaced with a NEW unit. Example: VST 205-011 **"B"** qualifies for the program. NO refund will be given on the 1800 model, a VST plain unit or "A" models.

Repair: Effective November, 2000 we are making available the following parts to enable repair of a leaking bellows or to add oil as the result of a leak. Should a major internal failure occur, it would require a remanufactured or new unit be installed. It should be noted that use of any oil other than the special synthetic oil part **# 730228** would result in potential problems.



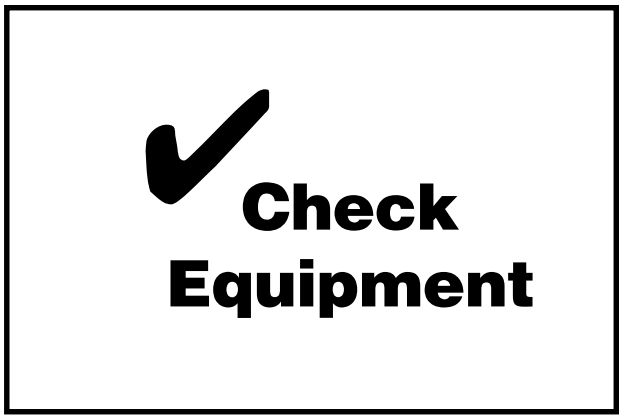
Parts Available:

- ❑ Expansion chamber bellows,
  Service Part Number 798003
- ❑ Bellows cover,
  Service Part Number 798007
- ❑ Tamper proof torx screws,
  Service Part Number 792155
- ❑ Tamper proof torx bit,
  Service Part Number 670332

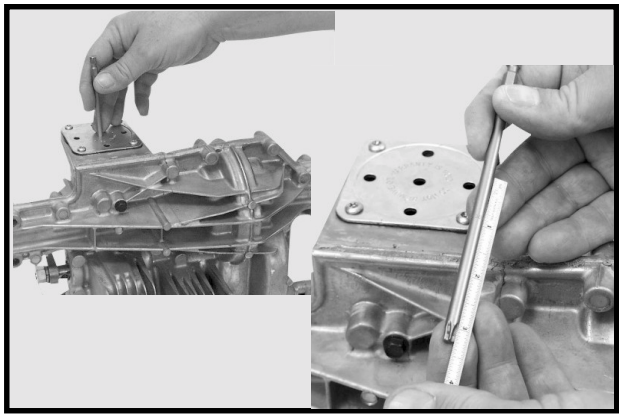
Special synthetic oil, 32 oz (.95 liter),
Service Part Number 730228

Replacing Bellows or Adding Oil: The following step by step procedure **MUST** be followed exactly if a proper repair is to be done.

Step One: Before assuming the transaxle has an internal problem causing low power or slow speed, it is critical to check the belt system. Many problems of this nature are in fact a glazed or worn belt, a damaged pulley or a tension problem requiring service.

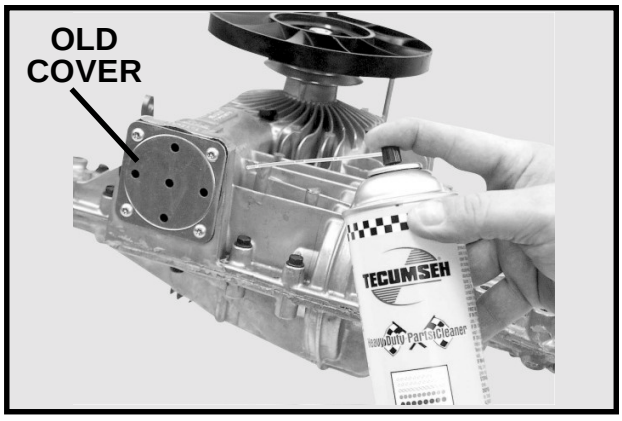


Step Two: Before adding oil, it is critical to determine if it is low. This is done by using a blunt instrument as shown. The depth should be 3-1/4 to 3-1/2 inches (8.25-8.9 cm)

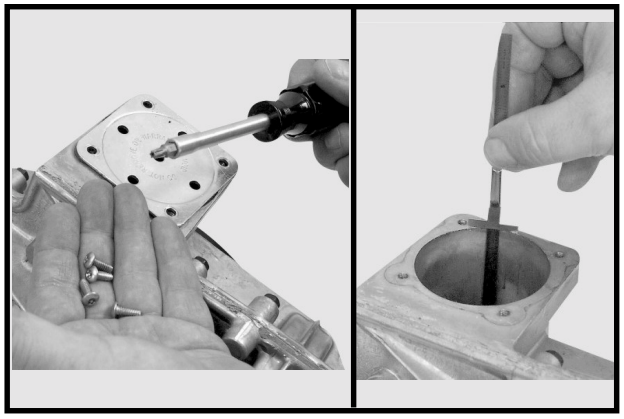


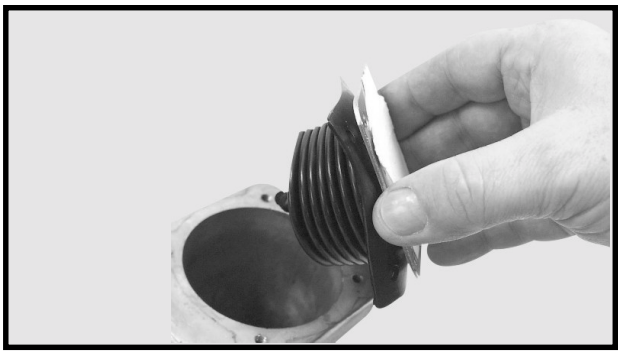
Step Three: If the measurement is beyond the dimensions listed, the next step is to remove the transaxle from the frame. Then thoroughly wash and blow dry the bellows cover area as shown. Remove all impurities before removing the bellows cover.

CAUTION! ANY IMPURITIES ALLOWED INTO THE UNIT CAN CAUSE UN-REPAIRABLE DAMAGE.

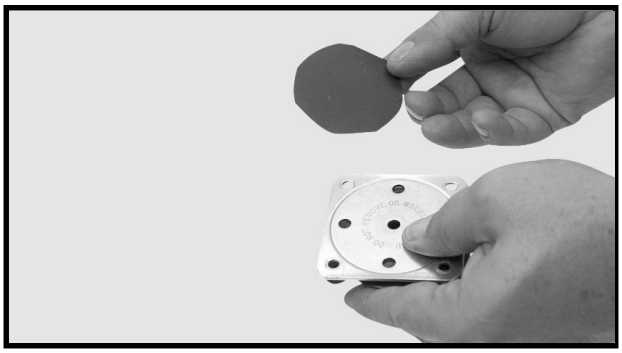


Step Four: Turn the unit so that the bellows chamber faces up as shown. Remove the bellows cover screws using Tecumseh tool part # **670332** torx bit. Then add oil part # **730228** until the amount present measures 1-29/32 inch (48.41 mm) from the top edge of the bellows housing.

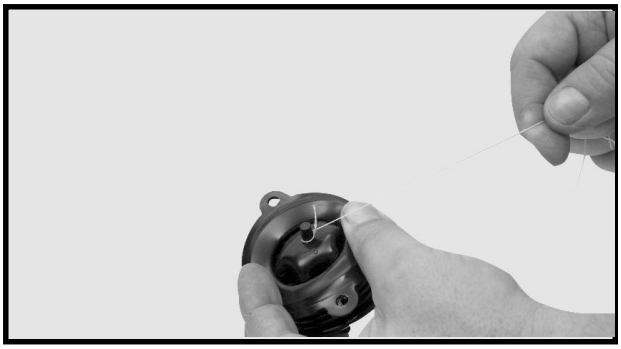




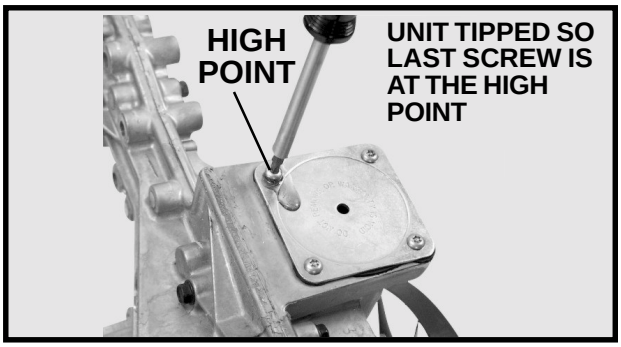
Step Five: To prepare the "**NEW"** bellows for installation, place the bellows on the cover as shown. Then compress the bellows and place a piece of tape over the hole to keep it compressed during installation. This can also be done by using a refrigerator magnet cut to cover the hole. (The new bellows cover comes with only one hole in the center and seals very easily).



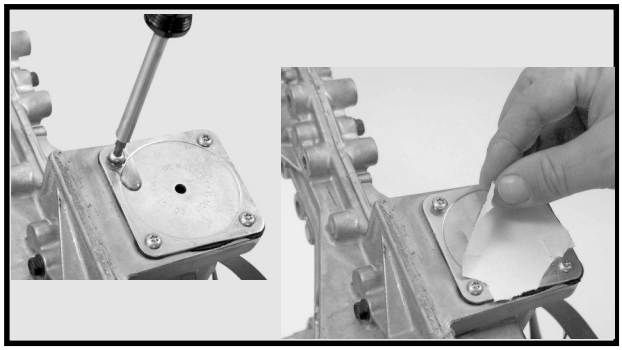
When reusing the old cover it is difficult to seal all five holes. One other way to compress the bellows is to invert the inside tab and place a slip knot made from thin string over it. Push the end of the bellows back to its original form and pull the string through the cover. When step six is complete, cut the string.



Step Six: Install the bellows snugging down three of the four screws, DO NOT tighten them completely. Install the fourth screw a few threads then tip the unit slightly so the highest point is at the loose screw.

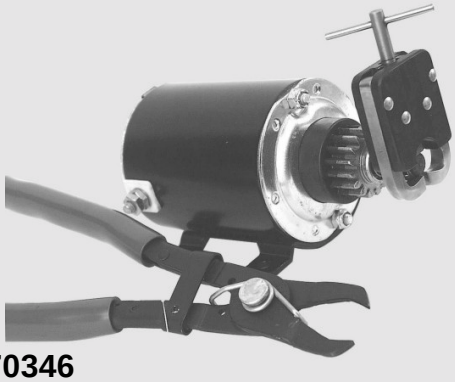


Step Seven: Remove the tape or cut the string allowing the bellows to expand into the oil. This expansion into the oil will push out most of the air from the chamber. When oil comes out from the loose screw tighten it and all other screws in a "X" pattern to a torque of 18-30 inch lbs. (2-3Nm). The unit is ready for installation.



Best Tools We Have Seen

Starter bendix ring removal tool
This has been designed to work on all electric starters. Saves time and reduces risk of injury.


670346

DEMONSTRATION

Oil Vacuum Pump
Pump can be used with the **# 670367** oil tank or with your own home-made airtight system. The pump will do all the work while you perform other repairs or maintenance on the equipment. Saves time by not having to remove drain plugs. At the request of our distribution system, we have upgraded the oil tank and pump to a complete it. The kit part # is **670379**.

670354

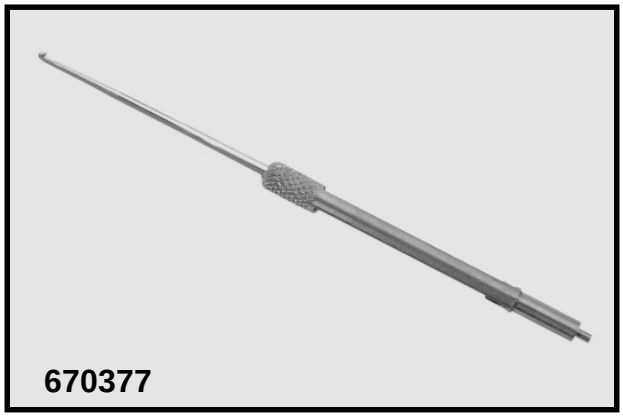
New Magnet
This quality, telescoping magnet is made for us by Snap-On Tools. Extendable to 26 inches (66 cm) long, this magnet also has a non-magnetic shield which surrounds the tip, so that faster retrieval from tight spots is now made easy!

670378

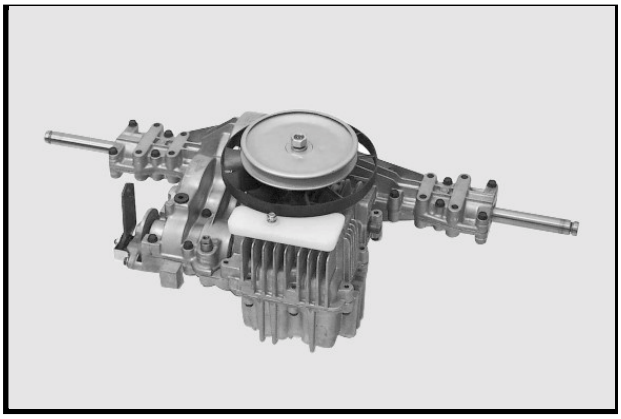
DEMONSTRATION

Carburetor Tool
A multifunctional tool that allows the technician to perform many tasks on the carburetor during cleaning.

- Removes/Installs Seat
- Removes/Installs Float Hinge Pin
- Removes/Installs Emulsion Tube
- Removes O-Rings
- Gauges Float Height


670377

Explore The SilentTrac™ LTH

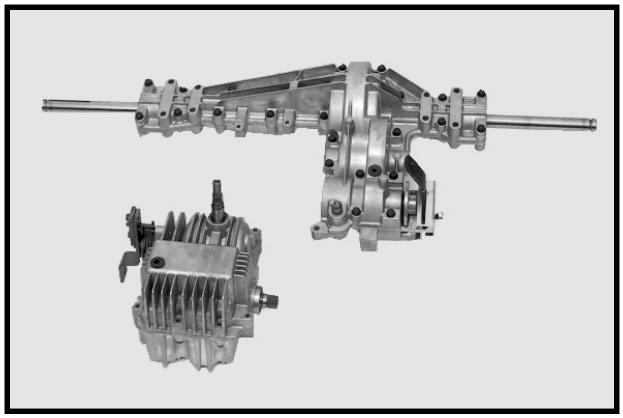


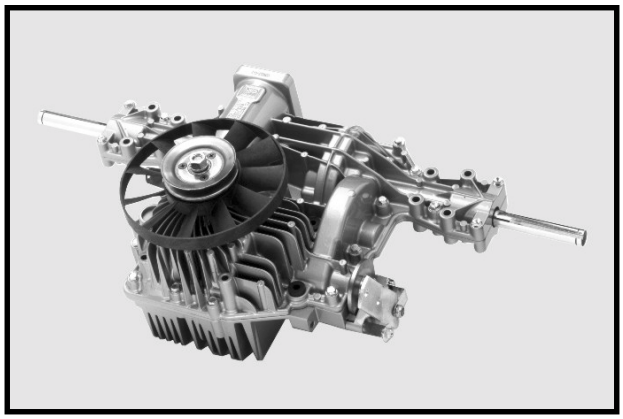
What Is It?

Automatic: No Shifting into gears with fluid power transmissions

Modular: Only manufacturer that uses two separate sealed units

Ultra Low Noise: Smaller castings reduce noise transfer

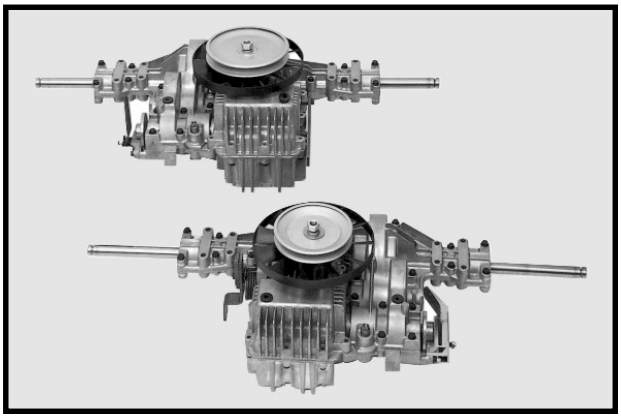




Where can it be used:

Replaces VST in product line - has same footprint but not shift mechanism

The LTH is available with either a “A” or “B” input. The “B” input may be needed on applications such as rear engine riders or all-wheel steer units. These two options allow the OEM the ability to forward or reverse mount the transaxle in the equipment.

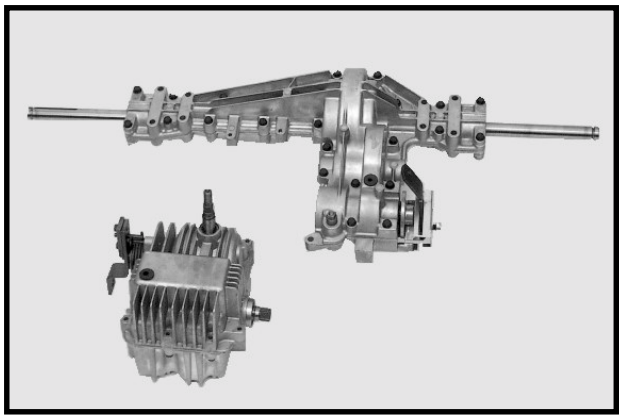


Up to 22" (55.88 cm) rear tires - expanded opportunity

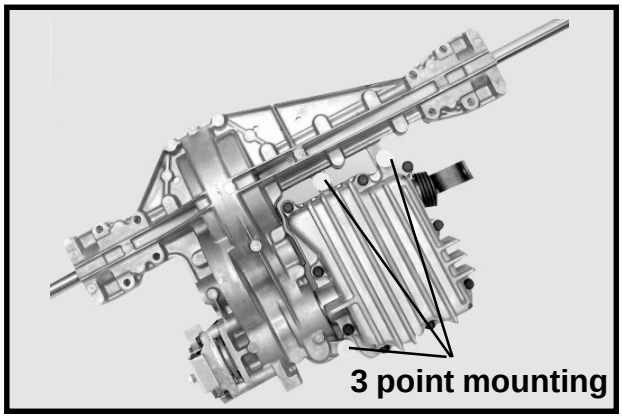
165 ft. lbs. (223.71 Nm) output torque - nothing better in its class

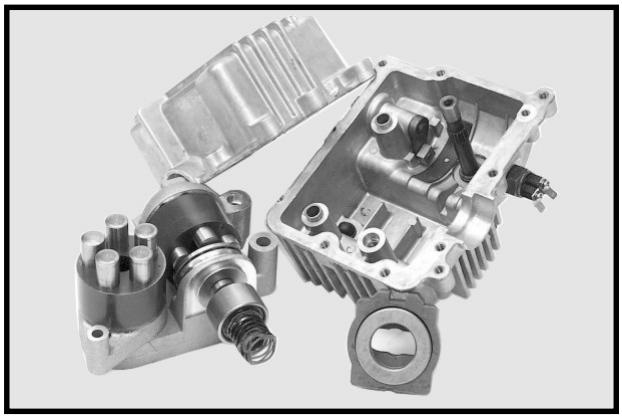
New Components

- Modular Casting
  - Noise reduction
  - Isolates hydraulic fluid from gear lube
  - Very low temperature

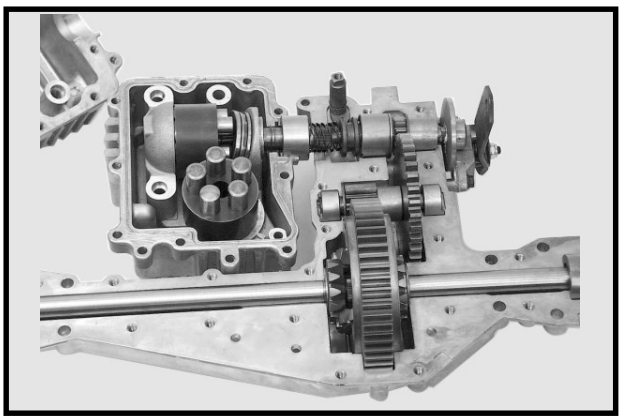


- No need to remove complete transaxle should pump service be required



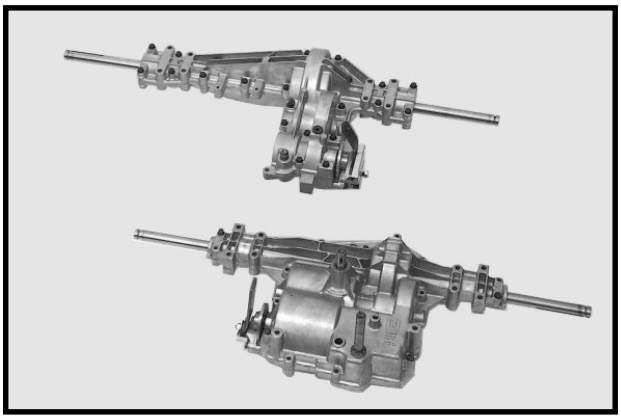


- Axial piston motor and pump
  Smooth quiet performance

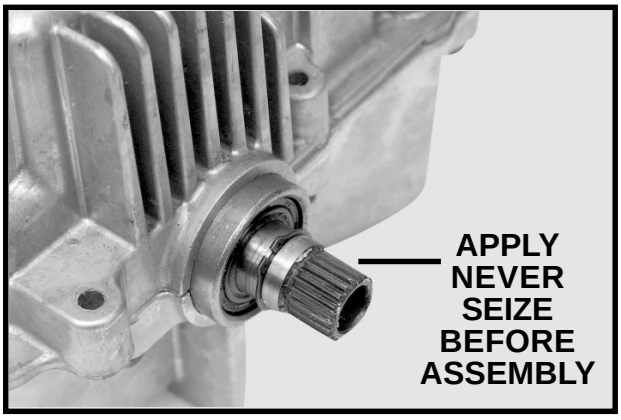


Components with proven reliability

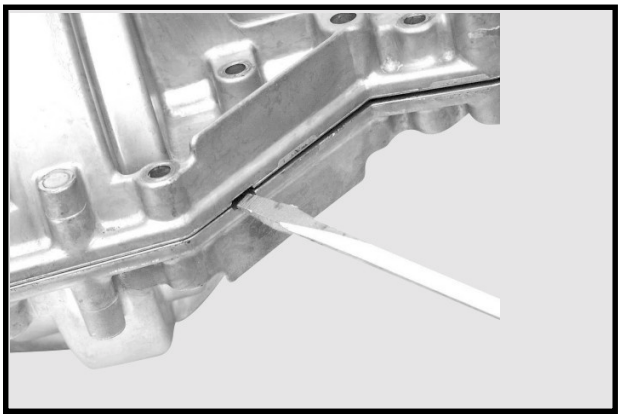
- Drive train design from the MST200



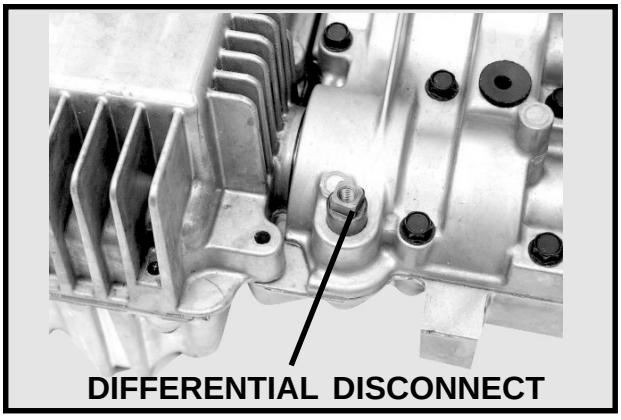
- Large Splines
  Easy removal and attachment
  Durability and strength

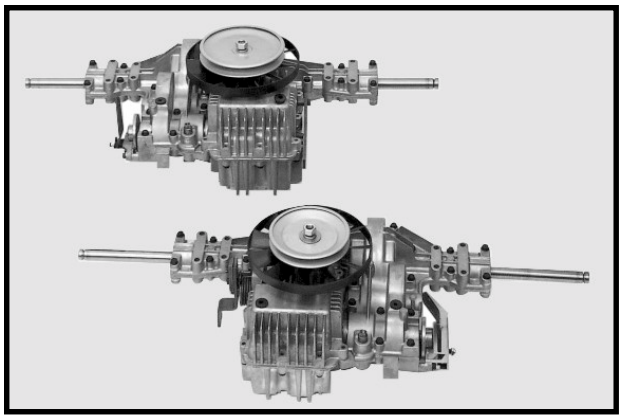


- Pry points on differential casting
  Preserves integrity of split line for sealing



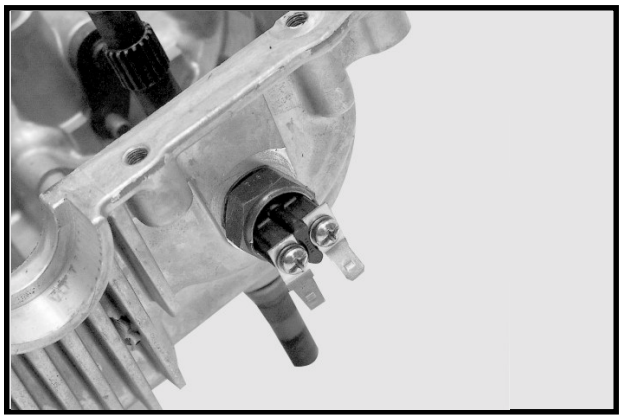
- Internal mechanical disconnect
  Easy to move





Advantages:

- Quietest LT transaxle
  Extremely low effort controls
  Greater operator safety - Less variation in speed up and down hill
  Mirror image versions
  No filter



- Optional internal neutral safety switch

Welded Pulley

The older style recoil starter pulley had the spring retainer *pressed* on the pulley assembly. Manufactured up to Jan '00 Serial number S0031.

The new recoil starter pulley assembly has the spring retainer pressed and *welded* onto the pulley to prevent the retainer from becoming dislodged because of spring tension. Manufactured starting Feb. '00 Serial number S0032.

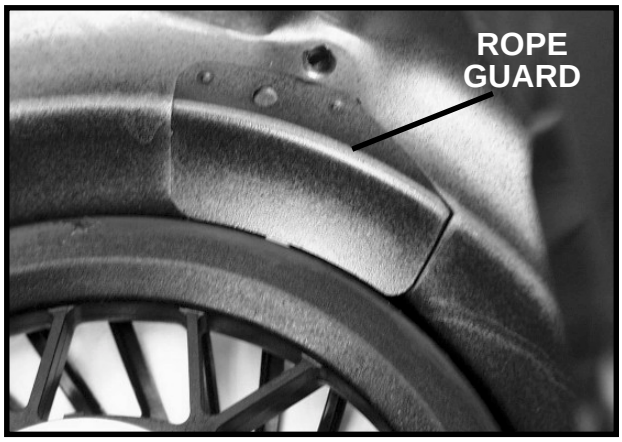
Cool-Air inlet/starter improvement

Starter housings have been enhanced to feature alternatively punched and extruded slots to improve rigidity. This modification was done in January '00. Serial number S0001

Integral blower housing and starter with rope protection

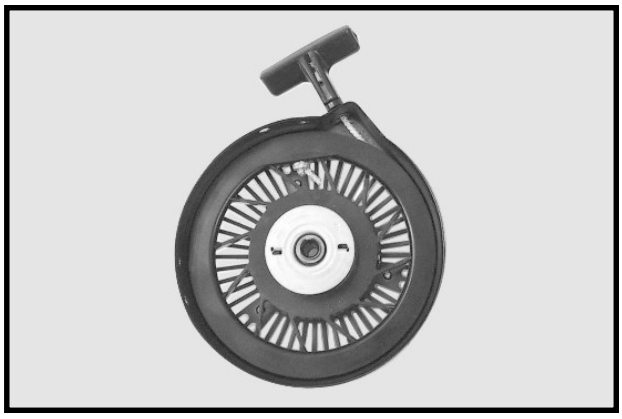
Old style blower housing without rope protection was manufactured through May ‘00. Serial number S0152.

The new style blower housing *with* rope protection was introduced for production engines starting June ‘00. The serial number S0153. This change was to ensure that the rope feeds back onto the pulley in the event that the customer releases the rope when it is completely extended.



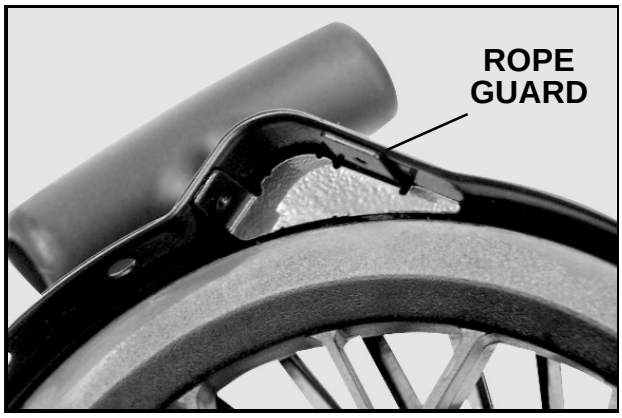
Separate recoil starter without rope protection

Similar modification has taken place with the separate recoil starter. The old starter without rope protection was built through April '00, serial number S0121. The starter shown on the left is without rope protection.



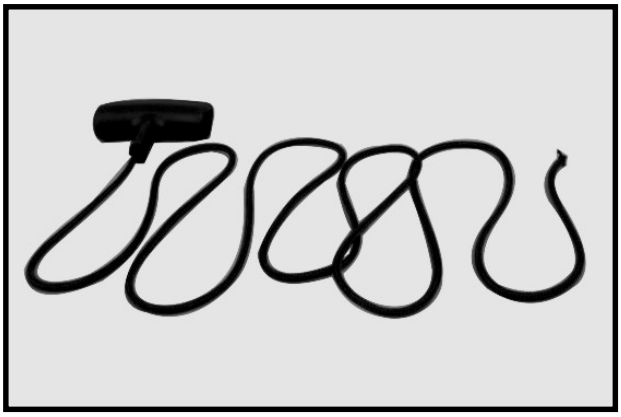
New separate starter *with* rope protection

Built from May '00, serial number S0122. Housing is shown *with* rope protection. As mentioned above, the added rope protection ensures that the rope feeds back onto the pulley in the event the rope is released abruptly after being fully extended.

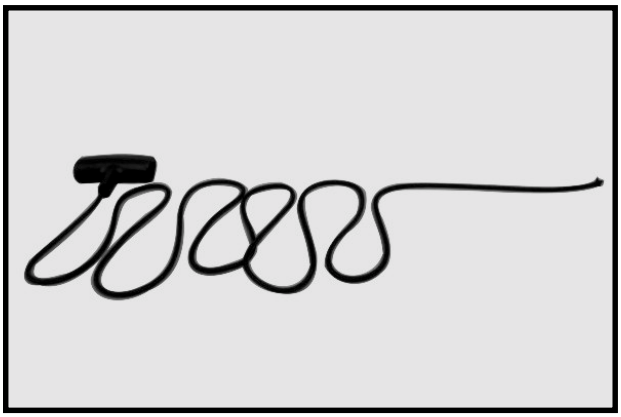


New length on starter ropes

Old style rope assembly built up until Jan. 15 '00.
Serial number S0015 Rope length is 2,13 m (7.03 ft.)

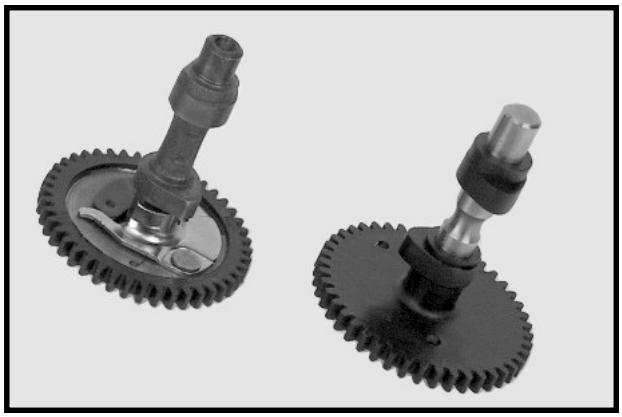


New rope assembly built since Jan. 17 '00.
Serial number S0017 Rope length is 2,33 m (7.60 ft.)
The longer rope was added to avoid pulley stress in certain applications.



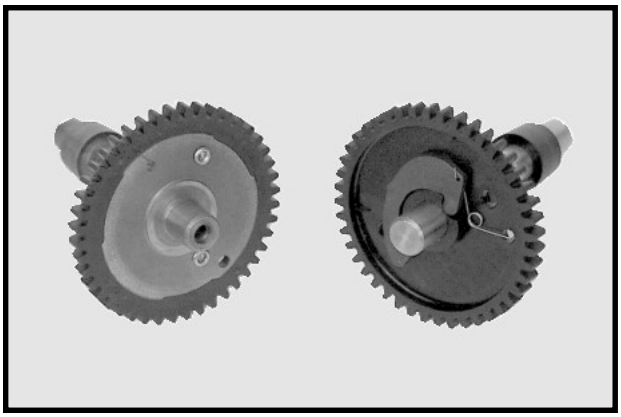
New Camshaft for Horizontals

Following a successful program of utilizing plastic cam lobes on our vertical shaft engines, we have now introduced a camshaft featuring plastic lobes for our horizontal shaft engine line. The main advantage of these camshafts is an appreciable reduction in engine noise.



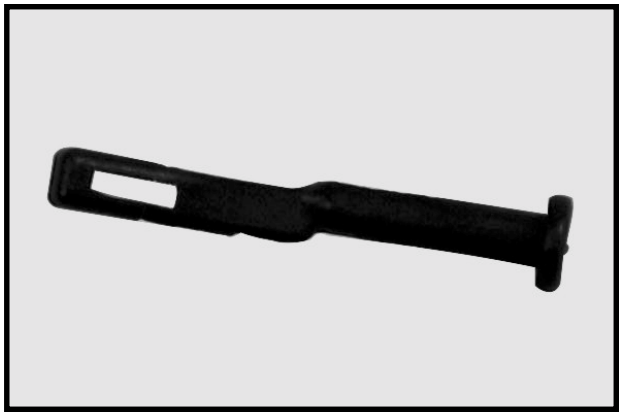
Present MCR used on horizontal engines features cast iron cam lobes.

"*New*" style MCR used on horizontal engines will feature plastic cam lobes for more quiet operation.

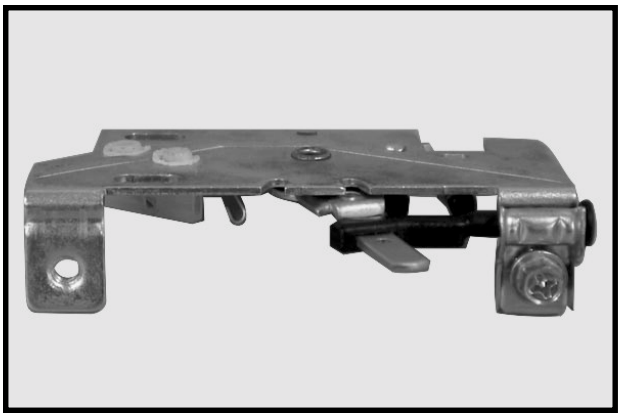


Convert variable speed to fixed speed

Retainer has been in production since Jan ’00. Now vertical engines with variable speed throttle controls can be converted to a fixed speed control.



Introduced in January ’00 was a plastic retainer which locks the throttle control in the high-speed position. This is used to convert a variable speed primer carburetor to that of a fixed-speed style. This retainer part **# 27250058,** is especially useful to service, as in-stock variable speed replacement engines can easily be converted to fixed-speed if needed. **CAUTION:** With this fixed-speed retainer installed, customers need to make sure their equipment has a ignition stop switch or flywheel brake lever and that it is working properly.



Geotec® Changes

Two changes have been introduced to the Geotec range of engines this season. In an effort to stay ahead of upcoming safety regulations by the European Union, Tecumseh Europa has made a change to shorten the back side of the fuel tank. This allows even more air space between the muffler and the fuel tank. This is to ensure the tank from damage by excessive heat in extreme conditions. The mounting of the tank has also been improved by the introduction of a new bracket at the front of the tank.

Secondly, the ‘D’ type directly linked governor system featured on the Geotec series has proven to be very successful in reducing governor “droop” to minimum levels. To further improve the durability of this system, the governor and governor rod have been modified.

These modifications were introduced in June ’00, engine serial number S0164. The new components, being interchangeable with the original parts, retain the existing part numbers.

Lever	27240145
Governor Rod	22750017

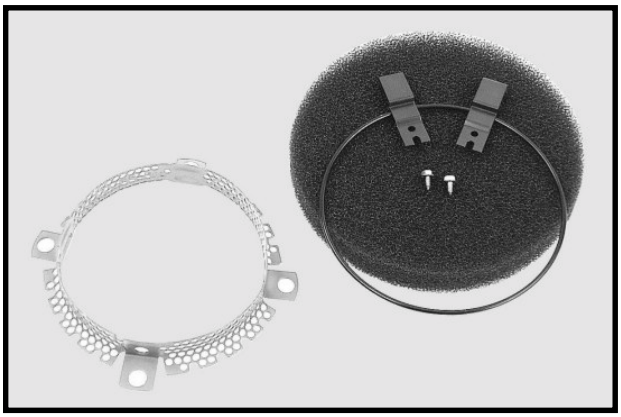
Centura® Air Filter

The filter assembly used on the LX models which uses a paper element air filter, has been modified to improve the location of the air filter cover. This revised version now also uses a paper gasket to seal against the carburetor flange in place of the 'O' ring. Parts are not interchangeable. Check the engine specification number to identify the correct parts.

Overheating Engines

During the last couple of seasons, we have seen increased incident of both two and four stroke engines overheating as a result of the air intake and cooling fins being blocked by grass debris. This is prevalent on hover mowers and nylon filament trimmers, because these machines do create a large amount of airborne debris.

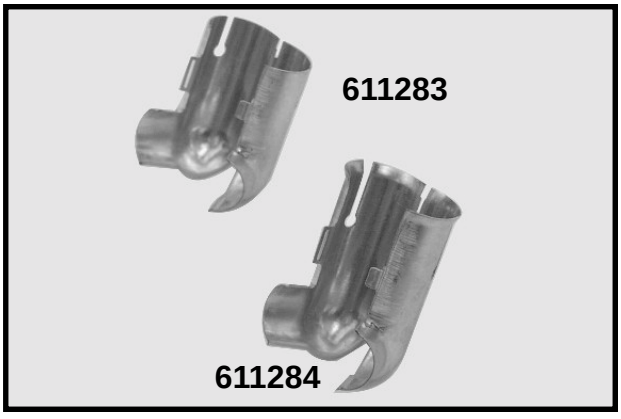
Please point out to customers who are using these machines the importance of keeping air intakes, cooling fins and other areas, free from grass and other debris. We can offer some optional grass screens if this helps the customer. Machines using the MV100S can be retrofitted with an intake screen, part # **100.41.003.000**. When fitting this screen, which is mounted underneath the starter, it will be necessary to remove the spinning screen which is mounted on the flywheel. On machines using TVXL840 and VLV engines, a starter muff, part # **730604** is available for retrofitting. When fitting these optional screens it is necessary again to point out to your customer that they must be kept clear of grass.



Flymo hover machines L400 and L470 - both use foam elements to pre-clean air for the cooling system. Again these must be in place and in good condition, and kept clear from debris if the engine is to cool properly.

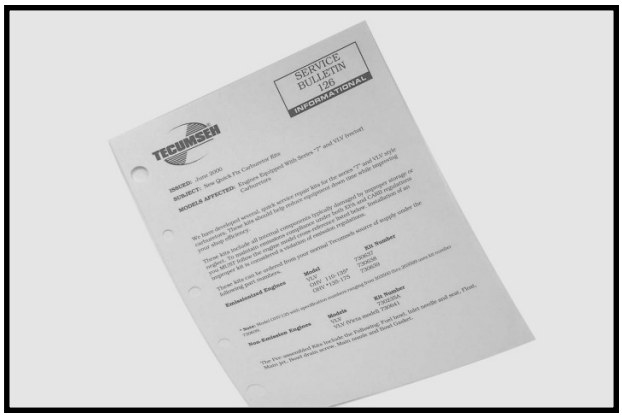
Spark Plug Shields-Basic for Export

In order to comply with Radio Frequency Interference (RFI) Standards mandated by the European Union, Australia, and Canadian markets; we have developed two Spark plug shields part # **611283** for small frame and part # **611284** for medium to large frame. These shields encapsulate our Capacitor Discharge Ignition (CDI) rubber boot and attach to the base of the spark plug. RFI's emitted around the spark plug are grounded out to the plug base. This standard is voluntary in the United States.

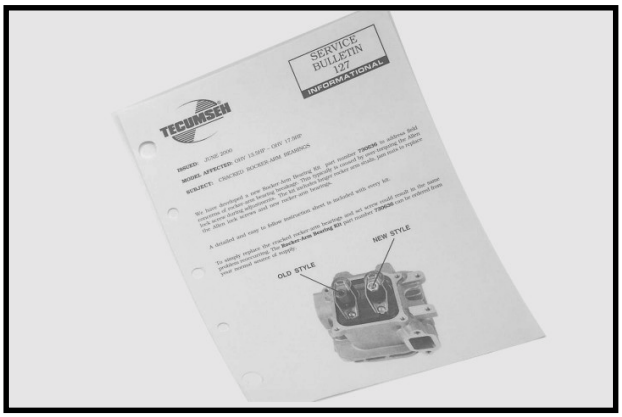


Service Bulletins

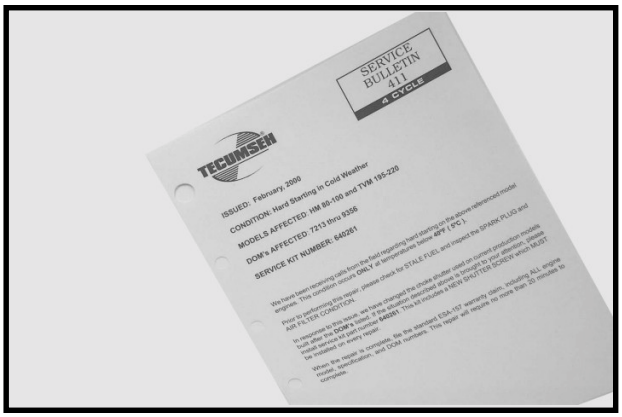
Bulletin 126
Quick Fix Carburetor Kits
This bulletin lists the quick service repair kits for Series "7" and "VLV" style carburetors. These kits can be used when the damage to the internal components caused by neglect or improper storage is extensive. This will help reduce downtime and improve shop efficiency. The kits include the fuel bowl, inlet needle and seat, float, main jet, bowl drain screw, main nozzle and bowl gasket.



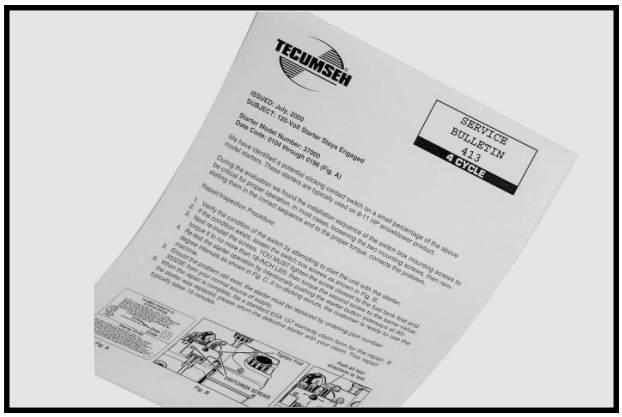
Bulletin 127
Cracked Rocker-Arm Bearings
This bulletin covers the installation of a kit developed to address rocker-arm breakage caused by over-torquing the Allen head lock screw. The kit includes longer rocker arm studs, jam nuts to replace the Allen head lock screws and new rocker arm bearings. The kit part number is **730636.**



Bulletin 411
Hard Starting in Cold Weather
This bulletin introduces a kit part **# 640261** designed to resolve cold starting problems at below 40°F (5°C). The kit includes a more aggressive choke plate and a new shutter screw to complete the repair. If you have an engine that is an HM80-100 or TVM195-220 built between the date codes 7213 thru 9356 this should resolve any cold start problems. Before replacing any parts, always inspect the spark plug, check for stale fuel and/or plugged air filters and be sure that the throttle or choke cable is positioned properly to allow for full-travel into the choke position.



Bulletin 413
This bulletin was issued to address a concern with the electric starter engagement button sticking on 8-11 hp engines. This does not occur on every unit, and loosening the screws, re-tightening them in the proper sequence and to the correct torque will resolve the majority of these instances. The bulletin details the corrective actions required should this situation persist.



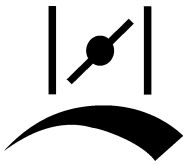
EXPLANATION OF INTERNATIONAL SYMBOLS

This rocker switch identification is based on the binary code with the number 1=ignition on and 0=ignition off.

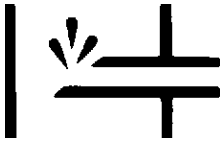
A throttle speed range with the rabbit symbolizing fast and the turtle designating slow.

STOP is stopping the ignition of the engine, or moving parts, or blades of a particular application.

The choke symbol, symbolizes the choke plate in the carburetor body from a vertical view. The “swoosh” line increasing in thickness to right side indicates more choke to the right.



Primer symbol displays gasoline coming out of an emulsion tube (on it’s side) inside the carb Venturi when the primer button is pressed.



Ignition key symbol, simply displaying spark only possible when the key is used.

The large plastic key most common in snow applications, when the key inserted will allow the engine to run and when key is removed it is STOPPED.

Service Tool List and Order Form

Special Service, Diagnostic, Measurement & Repair Tools Description	Part Number	User Cost	Premier Dealer	Standard Dealer	Limited Dealer	On Hand	On Order
*Tool Kit	670195E		M	M	M		
Tachometer (Inductive or Vibratach)	670156 Vibratach or 670365 Inductive		M or R	M or R	M or R		
Ignition Tester	670366		M	M	M		
Multi Meter VOM & Temperature	670349		M	M	M		
Compression Tester	670358		M	M	M		
Outside Micrometers 0-1"	670350		M	R	R		
1-2:	670351		M	R	R		
2-3"	670352		M	R	R		
3-4:	670353		M	R	R		
Telescoping Gauge Set	670357		M	R	R		
Dial Indicator	670241		M	R	R		
Inspection Plate (Plate Glass) - Obtain Locally			R	R	R		
Feeler Gauge Set	670361		M	M	M		
Inch Pound Torque Wrench 0-600 inch lbs.	670363		M	M	M		
Valve Spring Compressor "C" Type	670362		M	M	M		
Piston Ring Compressor	670359		M	M	M		
Piston Ring Expander	670117		M	M	M		
**Valve Seat (Neway LG3000 Kit or comparable)	670347		M	M	M		
**Face Cutting Set (Neway 612 Gizmatic)	670348		R	R	R		
Cylinder Hone (Flex)	670360		M	M	M		
Starter Bendix Ring Tool	670346		M	R	R		
Crankcase Vacuum / Oil pressure adapter	670364A		M	R	R		
Hole Gauge Set	670356		M	M	M		
Oil Vacuum 110 Volt Pump only	670354		R	R	R		
Extreme Duty Oil Tank	670367		R	R	R		
Oil Vacuum Kit (Includes vac and tank)	670379		R	R	R		
Leak Test Kit - Complete	670340		R	R	R		
Leak Test Transaxle / Carburetor Adapter Kit	670345		R	R	R		
Dial Caliper, 6"	670368		R	R	R		

* See Tecumseh Form #694862 for Complete Tool Kit List
** Neway LG2000 or 102 kits can be upgraded by calling Neway direct: 1-800-248-3889
M = Mandatory Tools (Must have or place order)
R = Recommended Tools
NOTE: Prices subject to change
Equivalent tools may be used.

Dealer Name _____
Address _____
City, State, Zip _____
Phone _____
Account No. _____

SEND US YOUR TIPS

Many of the bits of information that we pass along in our schools come from our dealer network. We want to give you the opportunity to contribute to next year's Technician's Seminar Booklet. Please write down your tip(s) and fax or send it to:

Tecumseh Products Company
900 North Street
Grafton, WI 53024-1499
Attn: Education Department

FAX NO. 262-377-4485

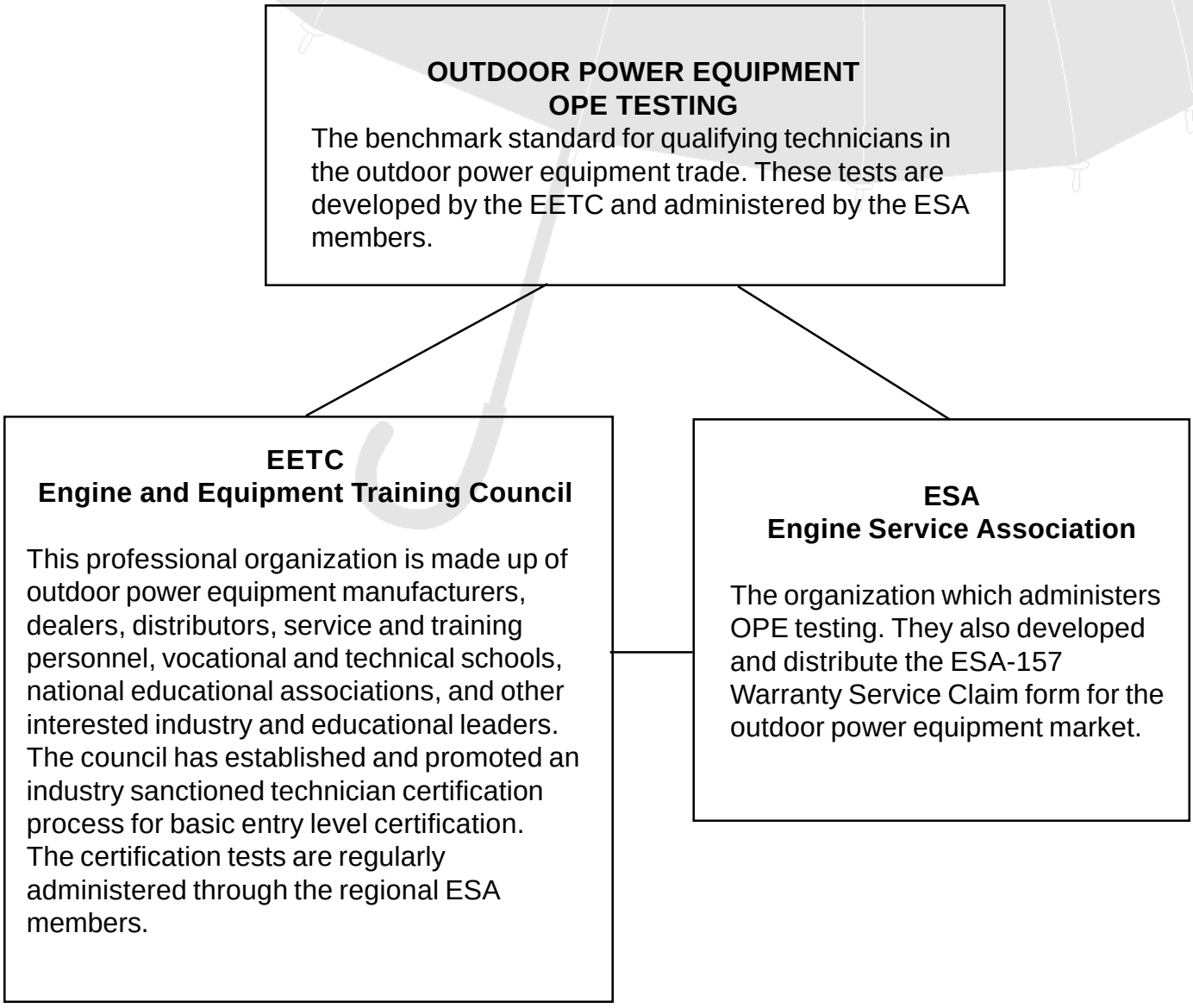
Name: _____
Company: _____
Address: _____
City, State, Zip Code _____

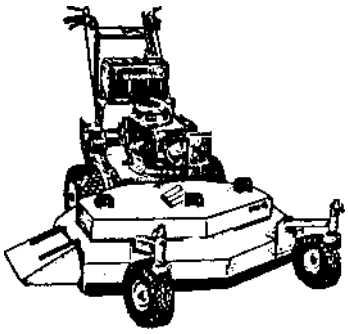
The Top 5 responses will receive a prize from Tecumseh.

Thank you in advance for your input.

The OPE Umbrella

Tecumseh Products Company is a proud member of the Engine and Equipment Training Council (**EETC**). This Council is the organization that creates and updates the **OPE** tests. The tests are regularly administered by your regional, Engine Service Association (ESA) member and have become the industry's basic standard for qualifying technicians. Please contact your Tecumseh Distributor to obtain a testing schedule.





TECHNICIAN SHORTAGE

Skilled service technicians in the equipment and engine industry are in short supply. Prospects are not good for improving this shortage through traditional educational channels and with current educational processes. At a recent industry meeting, one equipment manufacturer indicated that their dealers were short more than 2,500 technicians to service their products. It is conceivable that the real numbers for the whole industry may be many times this figure.

The technician shortage is due to a number of complicated problems. A study done by a major university for the automotive service industry regarding why young people choose not to become service technicians, found these critical reasons:

- Mom and Dad
- Guidance Counselors
- Perception that it is a "dead-end" job
- Limited pay and benefits
- Lack of knowledge about what the industry has to offer

CHANGING THE PERCEPTION

You certainly can't blame parents for wanting the best future for their children. We must take the lead in changing their perception of our industry. If the image of the technical service technician remains negative, then we have very little hope of developing a new generation of skilled service professionals.

Did you know that the average age of a service technician in a dealership today is 51 years. The challenge is clear. In order to change the perception of our profession and attract young people to our industry, we must begin to develop a career path for the young, entry level service technician. He/she needs to understand the potential in the industry – not just in terms of salary and benefits, but also in terms of increasing responsibility within a company and the industry. Along with pride and self- esteem for professionalism and knowledge of complex technical products and processes.

We, as an industry, must take advantage of the growth in the service sector by educating parents and counselors in the benefits of becoming a professional service technician. We must also insure that educational institutions offer the exact competencies our industry needs today and in the future.

YOUR CHALLENGE...

We need your help to insure that skilled professional service is available for the products we are selling today and developing for tomorrow. For as little as $175.00 a year, you can support the industry's efforts in insuring the availability of skilled service technicians. Also your membership supports the availability and professionalism of industry-approved educational institutions to teach industry-required skills. Won't you please join us in this worthwhile endeavor and become a member of the Equipment and Engine Training Council. Your industry needs your support.

For More Information Call (512) 442-1788 or E-mail: eetc@eetc.org

COMPLETE THE MEMBERSHIP FORM BELOW AND MAIL WITH YOUR CHECK TO:

Equipment & Engine Training Council
1946 So. IH-35, Suite 100-A
Austin, TX 78704
(512) 442-1788 • Fax (512) 442-1789

General Membership: $195.00
Dealer Membership $125.00

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

Email: _____

Update Seminar Technician Video Test

1. Which statement is true about improvements made to Tecumseh small frame vertical shaft engines?
   A. New Viton Oil-fill seal and clamp, a new oil drain plug
   B. A new flange with a mounting boss to accommodate clamp
   C. Longer stroke connecting rod
   D. Both A and B are correct

2. Throttle/Governor link bushings for HM/OHM engines can be installed in any direction.
   A. TRUE B. FALSE

3. The ignition rocker switch symbol **"0"** designates a complete circuit with the engine running.
   A. TRUE B. FALSE

4. The OHH/OHSK horizontal engine line has been improved how?
   A. It now comes with a “stroker” style crankshaft and new connecting rod.
   B. Includes a wider gapped / hotter spark plug.
   C. It comes with a new soft-pull starter.
   D. It features a new quiet tone muffler.

5. Regardless of the material in head gaskets, compression ratios will not change no matter which gasket is used because this is only dependent on combustion chamber size.
   A. TRUE B. FALSE

6. Tecumseh’s recoil starters have changed how?
   A. They use Bentonite grease in the pulley
   B. Use an improved nylon rope
   C. Have a new welded-in rope guide
   D. Features the new ‘Easy-Grip’ handle made from Viton rubber

7. The new spark plugs are gapped at .045”in. (.1143cm) and offer which of the following to the customer?
   A. Gives a 5 horsepower improvement
   B. Provides a cleaner exhaust/better emissions
   C. Easier starting on marginal quality fuel
   D. All of the above

8. The ‘pipe style’ oil drain plug for small frame vertical shaft engines are retrofitable on all older-style flanges.
   A. TRUE B. FALSE

9. To insure a safe cleaning of all Tecumseh carburetors; it’s best to . . .
   A. Soak carb in a carb-dip tank overnight
   B. Soak in a carb-dip tank for 1 hour and use tag wire
   C. Use Tecumseh Carburetor cleaner spray along with .012” tag wire
   D. Soak Carburetor for ½ hour in a carb-dip tank and then use .012” tag wire

10. What are the differences between the two Series 11 carburetors?
    A. The Bridged version connects the emulsion tube to the primer bulb and the Standard Series 11 uses strictly a gas-prime prime system.
    B. The Bridged version draws fuel to the idle circuit from two sources; the main jet/center leg and the outside metering jet while the Standard version does not.
    C. The Bridged version has an additional fuel well and the Standard does not.
    D. The Bridged version utilizes a closed end emulsion tube and the Standard has the normal style open end emulsion tube.

11. The new Power Sport® carburetors will include which features?
    A. Float return/dampening spring and a Tamper Resistant Cap on the idle adjustment screw
    B. True-Idle adjustment screw for PowerSport carbs with a non-governed idle
    C. The new plastic float
    D. A & B

12. The Series 11 carburetor uses which type of primer bulb to insure a 3 prime start?
    A. LARGER B. SMALLER

13. The Vector/Series 7 carburetor bowl kits have changed to a standardize bowl which features molded threads for the fuel drain screw.
    A. TRUE B. FALSE

14. New engines that smoke slightly during the first hours of operation most likely are. . .
    A. Experiencing blow-by past the rings.
    B. 4-cycle engines and must be burning a 2-cycle fuel/oil mixture instead of straight unleaded fuel.
    C. Finalizing the curing process of the anticorrosive sealant we put on cylinders during assembly.
    D. Have a breather leak of oil onto the muffler

15. It’s not that important how tight the mounting nuts are on the VLV air filter box.
    A. TRUE B. FALSE

16. The only importance of lining up match marks is the following. . .
    A. It aligns rod cap with connecting rod as they were machined from Tecumseh
    B. Rod cap only fits on the connecting rod one way
    C. Provides correct orientation of the piston/rod assembly in the cylinder when facing out toward the PTO end of the crankshaft
    D. Both A and C

17. OVRM engines with a date of manufacture (DOM) later than 3-22-00 (0082-Julian calendar) could use the spacer and sand-cast intake pipe?
    A. TRUE B. FALSE

18. Why are some mechanics loosing spark after short-blocking an HM, OHM or an OHV engine as stated in this book?
    A. They must have forgotten to reconnect the fuel line.
    B. They have a plugged carburetor.
    C. Ignition module spacers were not installed.
    D. The Capacitor Discharge Ignition (CDI) just all-of-a-sudden "went bad."

19. What is the quick check for flywheel key damage on rotary mower applications?
    A. Quickly lift up deck with flywheel pinned by a large screwdriver. Move blade and check if it's loose.
    B. Quickly disconnect the air filter and look under the shroud with a flashlight.
    C. Quickly remove the tank, shroud, and flywheel then inspect the flywheel key.
    D. Shine a flashlight through the cool air inlet of the starter recoil housing and inspect the flywheel key.

20. The angle which to operate a Tecumseh engine is 30° continuously and 40° intermittently.
    A. TRUE B. FALSE

21. The new "pipe-thread" style oil drain plug will be an across the board change to Tecumseh's small frame vertical engines.
    A. TRUE B. FALSE

22. How is the new Viton oil-fill tube seal identified?
    A. It doesn't look any different from the old seal, so it isn't identified.
    B. It has an extra 'balloon-type' lip on the seal.
    C. It has a yellow dot.
    D. It's wider than the old seal.

23. Why is exhaust MCR (mechanical compression release) important?
    A. It makes starting easier.
    B. It provides increased horsepower while the engine is cold.
    C. It's better for the environment.
    D. It prevents kickback more than the intake MCR system.

24. The Bridged Series 11 Carburetor is built exclusively for the OVRM 120.
    A. TRUE B. FALSE

25. The new plastic float will help reduce corrosion in the float bowl brought on by stale fuel.
    A. TRUE B. FALSE

26. Currently the float return/dampening spring will be a standard feature on the . .. .
    A. Vertical shaft medium frame engines for small riding tractors.
    B. Horizontal shaft small frame engines for snow blowers.
    C. Horizontal shaft 20 hp. V-Twins for generators.
    D. Horizontal shaft PowerSport® engines.

27. Regarding pink emulsion tubes, which statement is true?
    A. The pink tubes offer low emission ratings and are retrofitable to all TCP carburetors.
    B. The pink tube/main nozzle has a closed end and two additional fuel pick-up holes.
    C. The pink tube provides smooth running at high speed/no load conditions and utilizes an exclusive bowl nut.
    D. B & C True statements.

28. If I as a technician install the larger primer bulb on an OHH Series 8 carburetor, a flooded condition most likely will develop.
    A. TRUE B. FALSE

29. To leak test the carburetor's needle and seat, you need to wet the seat with a drop of fuel or WD 40.
    A. TRUE B. FALSE

30. To leak test a MST transaxle it will handle 11 PSI (.76 Bars) of air pressure before blowing out a seal.
    A. TRUE B. FALSE

31. What is a true statement about the new Limited Adjust AV carburetor for 2-Cycle engines?
    A. The carburetor can be adjusted to a richer mixture.
    B. It is against CARB and EPA regulations to remove the limiter caps and it can be used in high altitude regions.
    C. It can be used in extreme cold, possibly needing to apply a small amount of the choke.
    D. B & C are true statements.

32. With the new LTH, to service the pump the technician needs to remove the entire transaxle from the tractor and then send in the pump through the Central Warehouse Distributor (CWD) exchange program.
    A. TRUE B. FALSE

33. Our new small frame engines have received an improvement in the breather. What does this do for the customer?
    A. It provides sealing capability of temperatures up to 400° F (204^0 C).
    B. The softer umbrella seal releases crankcase pressure faster.
    C. The rubber hose that connects to the carburetor has a longer tube which is tied in to the carburetor and accommodates engine vibration better.
    D. The new breather material seals with temperatures exceeding 300° F (148^0 C).

34. The LTH has 80/90 gear lube in the differential portion of the unit.
    A. TRUE B. FALSE

35. The LTH pump has more moving parts in it than the VST Hydro.
    A. TRUE B. FALSE

36. What criteria does the Cylinder Leakdown test demand?
    A. The Oil-fill cap be on tight and the engine to be at TDC on the intake stroke.
    B. That the engine needs to have its crankshaft retained.
    C. That the engine needs to be at TDC on the compression stroke.
    D. Both B and C.

37. On a Cylinder Leakdown test what does 100% leakdown most likely indicate?
    A. The engine is not on the compression stroke at TDC.
    B. The oil in the engine is of a thinner grade than SAE 30.
    C. The pressure in the air line is too high.
    D. That you are not servicing a Tecumseh engine!

38. Before reinstalling the cover on the MST transaxle, I need to . . .
    A. Remember to inspect the paper gasket.
    B. Apply 32 ounces of Bentonite Grease to all moving parts.
    C. Apply RTV around the cover but not in the oil galley nor axles shafts.
    D. Both A and C.

39. When servicing a recoil starter, how many turns against the spring do you turn the pulley when installing a new rope?
    A. Turn until tight then back off no more than 1 turn to thread rope.
    B. Turn 6-8 times and then thread the new rope.
    C. Turn 4-6 times and thread rope, because more than 6 turns will eventually break the spring.
    D. Turn until tight and thread a new rope.

40. Why is the torque spec. of 35-45 inch pounds (4 - 5 Nm) important when working on a VLV?
    A. This is the torque spec. of the connecting rod cap bolts.
    B. This is the torque spec. of the carburetor/intake pipe mounting bolts.
    C. This is the torque spec. of the mounting flange cover mounting bolts.
    D. This is the torque spec. of the air filter box mounting nuts.

41. What can occur when an atmospheric vent/bowl vent passage is blocked by a shrunken primer bulb or an air filter box gasket?
    A. Nothing, the engine will run fine.
    B. The carb will siphon gas from the tank out of the carb and into the cylinder.
    C. The gas will not drain from the tank into the bowl without the bowl vented.
    D. The engine will surge and then correct to a smooth steady sound.

42. For rotary mower applications, the OVRM engine does not use the spacer and sand-cast pipe if the DOM is after 3-22-00?
    A. TRUE B. FALSE

43. The Series 11 Carburetor is unique because...
    A. It has a larger Venturi
    B. Its additional fuel well delivers smooth running at start-up.
    C. Its primer bulb only needs to be pressed one time.
    D. Its durability allows soaking in a parts tank overnight.

44. The exhaust port liner is important for keeping engine temps cooler.
    A. TRUE B. FALSE

45. Which statement is true regarding the new carb tool # 670377?
    A. It installs & removes seat and it guides needle when installing a float/needle assembly.
    B. Removes emulsion tubes and O' rings and it gauges float height.
    C. It makes a nice gift for a Tecumseh Master Technician who truly understands carburetion.
    D. All of the above

46. The Tecumseh Oil Vac system works well if?
    A. You draw solvent into the vac once a week to clean out the dirty oil.
    B. A technician doesn't draw oil directly into the vacuum pump, but uses a tank.
    C. One hose is used to create a vacuum in the tank and the other to draw out the oil from the engine.
    D. Both B and C

47. When short-blocking a Medium Frame engine, as discussed in this book, that once had spark and now doesn't you might . . .
    A. Change the flywheel key
    B. Clean the carburetor
    C. Make sure your CDI mounting spacers are in place
    D. Change the air filter

48. Many of our head gaskets have the same bolt pattern, look similar, but still might contact the piston and make substantial noise when running.
    A. TRUE B. FALSE

49. According to Bulletin 127, which is a true statement ?
    A. The older style rocker-arm adjusters did not hold adjustment.
    B. Valve lash used to change radically because of steel push rods.
    C. The rocker-arm adjusters cracked at high speeds.
    D. The Allen type adjusters were a good design but were over-torqued and broken by many Technicians in the field.

50. The MST already has the new balloon type seal on the axles and will be getting the shifter/brake shaft seals during the 2001 production period.
    A. TRUE B. FALSE

Notes

Answer Sheet for Video Test

Return to Your Distributor for Scoring NOT Tecumseh

1.	A	B	C	D		26.	A	B	C	D
2.	A	B	C	D		27.	A	B	C	D
3.	A	B	C	D		28.	A	B	C	D
4.	A	B	C	D		29.	A	B	C	D
5.	A	B	C	D		30.	A	B	C	D
6.	A	B	C	D		31.	A	B	C	D
7.	A	B	C	D		32.	A	B	C	D
8.	A	B	C	D		33.	A	B	C	D
9.	A	B	C	D		34.	A	B	C	D
10.	A	B	C	D		35.	A	B	C	D
11.	A	B	C	D		36.	A	B	C	D
12.	A	B	C	D		37.	A	B	C	D
13.	A	B	C	D		38.	A	B	C	D
14.	A	B	C	D		39.	A	B	C	D
15.	A	B	C	D		40.	A	B	C	D
16.	A	B	C	D		41.	A	B	C	D
17.	A	B	C	D		42.	A	B	C	D
18.	A	B	C	D		43.	A	B	C	D
19.	A	B	C	D		44.	A	B	C	D
20.	A	B	C	D		45.	A	B	C	D
21.	A	B	C	D		46.	A	B	C	D
22.	A	B	C	D		47.	A	B	C	D
23.	A	B	C	D		48.	A	B	C	D
24.	A	B	C	D		49.	A	B	C	D
25.	A	B	C	D		50.	A	B	C	D

TECUMSEH FACTORY TRAINING APPLICATION

Please Print

Dealership Name _____ Phone No. _____ Code No. _____

Address _____ City _____ State _____ Zip _____

Student's Name _____ Student's Signature _____

Employer's Name _____ Employer's Signature _____

4-DAY 2001 SCHOOL SCHEDULE - Factory Facilities

Douglas, Georgia
Date
Dec. 3-8, 2000
Jan. 7-12, 2001
Feb. 4-9
March 4-9
Nov. 11-16

Grafton, Wisconsin
Date
Nov. 5-10, 2000
Feb. 18-23, 2001
March 18-23
April 1-6
April 22-27
Dec. 9-14

2001 TEACHER'S SCHOOL

Douglas, Georgia
Date
June 10-15, 2001

Grafton, Wisconsin
Date
Jul. 29-Aug. 3, 2001

FACTORY CERTIFIED TRAINING ☐ Application to attend

TEACHER'S SCHOOL ☐ Application to attend

Master Technician Testing will only be offered for pre-registered applicants with proof of holding OPE 4-Cycle certification.

Master Technician Test ☐ I would like to take the Master Technician Test at the reduced cost of $45.00.

School Dates: 1st choice _____ 2nd choice _____

Please check *all* that apply

☐ Single Accommodations **$475.00**

☐ Double Accommodations **$350.00**

☐ Tecumseh Master Technician Test **$45.00**

☐ Smoker

☐ Non-Smoker

☐ No Room Needed

To make payment using a credit card, please fill out the following information:

(Check One)

☐ Master Charge ☐ Visa ☐ Discover

Print Name (as it appears on card):

_____

Account Number: _____

_____

Signature of Card Holder

Exp. Date: _____ Phone Number: _____

For registration information call the Education Department: 262-377-2700 or fax your application: 262-376-8238.
The Central Warehouse Distributors in your area may hold in-house Factory Certified Training.
Please contact them for further information.

FOUR-DAY TECHNICIAN EDUCATION PROGRAM

Tecumseh has been working with our distributor education team to develop a completely updated factory level school program. This new program has been engineered to meet the needs of today's dealers and the technicians they employ.

On your behalf, an extensive commitment has been made by all of us to you, with educational programs offered by the Tecumseh Network Support level. Using their facilities, the course is now the equivalent to that of being educated at one of our factory facilities. These extensive hands-on programs will be available starting this January, 2001 in the USA and Canada through your regional Tecumseh distributors.

The following program outline will give you a taste of what you can expect from all of these classes. At the end of the Four-Day session, testing will be offered in both the Outdoor Power Equipment (OPE) and Tecumseh Master Technician (TMT) certifications. During the coming months, you will be hearing from your Tecumseh sales person about the special benefits that are a part of being TMT certified. All certifications stay with the technician and dependent on your level of proficiency should increase your value to the dealership.

Best of all, the course itself may be free or available to you at reduced cost. Your distributor sales person can give you more details regarding this special offer.

Day One Information Retrieval Systems Computer, Microfiche and Paper 2-Cycle Engine Theory and hands on covering TC, HSK and AV Product	**Day Three** Enduro VT Twin Teardown/ Reassembly Fuel Systems New Emissions Carburetors Electrical/Charging Systems
Day Two 4-Cycle Overview L-Head and Overhead Valve OHH Enduro Teardown/Rebuild and Running Adjustments LEV Teardown/Reassembly	**Day Four** Failure Analysis Warranty Procedures Transaxle Teardown/Reassembly MST, 800 Series LTH and VST Overview

Inside the back cover page we have listed all of the training directors from your regional distributors. These Team Tecumseh educators can supply you with a complete list of classes available to you.

Please contact them directly.

The Tecumseh Factory School Schedule and Application is on page 58.

Tecumseh Factory Education Facilities

BILLIOU'S INC.
1343 S. Main
Porterville, CA 93257
Phone No. 559-784-4102
Fax No. 559-781-1875
EDUCATION DIRECTOR: RICK GROVES

CENTRAL POWER DISTRIBUTORS
1101 McKinley St.
Anoka, MN 55303
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

CPD-OH
8181 Washington Church Rd.
Dayton, OH 45458
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

CENTRAL POWER DISTRIBUTORS
N90W14635 Commerce Dr.
Menomonee Falls, WI 53051
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

W.J. CONNELL CO.
65 Green St.
Foxboro, MA 02035
Phone No. 508-543-3600
Fax No. 508-543-8394
EDUCATION DIRECTOR: BRIAN O'NEIL

ENGINES SOUTHWEST
1255 N. Hearne
P.O. Box 67 (Zip Code 71161-0067)
Shreveport, LA 71107-7108
Phone No. 318-222-3871
Fax No. 318-425-4638
EDUCATION DIRECTOR: BRYAN CLARK

MEDART - KANSAS CITY
2644 S. 96th Street
Edwardsville, KS 66111-3483
Phone No. 636-282-2300
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Tecumseh Update 2002

TECUMSEH®

FACTORY TRAINING

featuring

LEAP™

LOW EMISSION, ADVANCED PERFORMANCE

Welcome to the 2002 Technician's Update Seminar presented by your Tecumseh Support Network representative.

The Tecumseh Education Department would like to welcome you to the 2002 Update Seminar, and a special welcome to our ever-growing number of Tecumseh Master Technicians (TMTs). We are excited to share with you some changes to our Engines and Motion-Drive systems as well as new and innovative products we will be rolling out during the 2002 season.

This year, we are providing more "hands-on" demonstrations to improve shop efficiency. These demonstrations will include some new tools that we trust will cut your diagnostic time to a minimum. With that in mind, this year's update will explain procedures on servicing the LTH hydrostatic transaxle, which is rapidly growing in popularity among Original Equipment Manufacturers.

One change this year is more "live" seminars through our TSN distributors instead of providing an Update Video. Everyone should now have an opportunity to come to a live Update Seminar to receive all of the update training. Please be sure to fill out the questionnaire to receive credit for attending this Update Seminar. We want to hear your opinions and make sure that our Nationwide Education Team is doing their best. ***Please submit the questionnaire to your meeting host.***

To provide you more training options , Tecumseh, in cooperation with the TSN, is adding more four-day factory schools in 2002. Tecumseh Master Technician certification tests are offered at the end of each four-day school. When you attend a Tecumseh factory school or a TSN school, you may be eligible for tuition reimbursement under Tecumseh's scholarship program, depending on the dealer agreement level of your dealership. Your dealership can only reap the full benefits of you as a TMT when you are employed by a Tecumseh *Premier* Service Dealer.

TMT TESTING AND BENEFITS

Tecumseh is now offering the most in-depth Master Technician certification test in our industry. This test covers all areas that are involved in normal daily repair of our products. The 2.5-hour test is comprised of the following:

- 100 questions- multiple choice, covering Four-cycle, Two-cycle, Warranty, Carburetion and Motion-Drive products.

- The heavily weighted, failure analysis section of the test involves two failed products drawn at random, one Two or Four-Cycle Engine and one Motion-Drive. An ESA warranty claim form needs to be properly filled out listing your decision as to whether the repair is warrantable or not and listing all parts required for the repair. If the repair is warrantable, you will be responsible to sign the claim in the area previously reserved for your distributor representative. A working knowledge of the warranty claim form is a MUST.

- Once certified, you will receive a special code reserved for you alone, not a dealership. When you are employed by a Premier Dealer you are authorized to replace Engine, Short Block or Motion-Drive units without distributor approval. Please note that your TMT number and Dealer Code number must be in our records for warranty decisions to be accepted by Tecumseh.

- Re-certification is required every four years.

- Proof of holding the OPE Four-cycle certification must be supplied prior to taking the TMT test.

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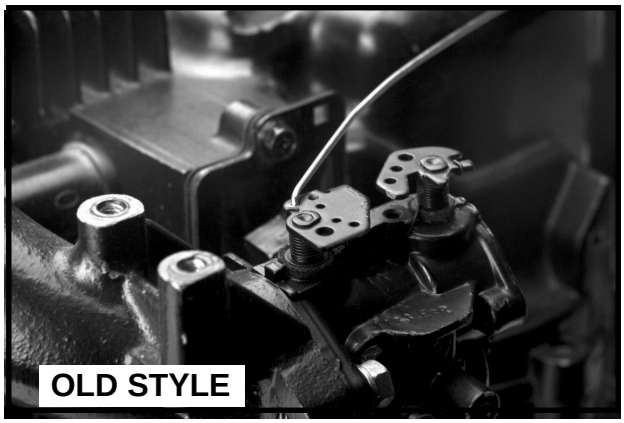
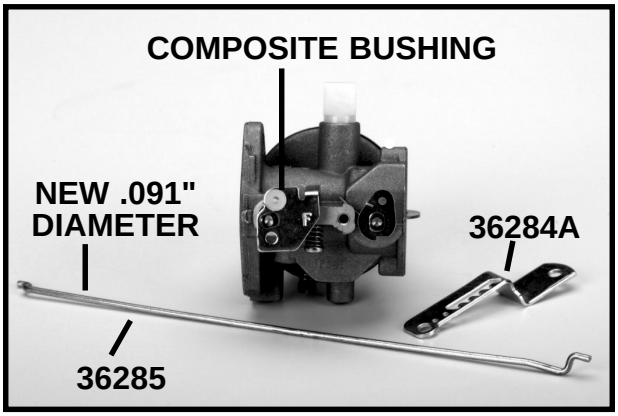


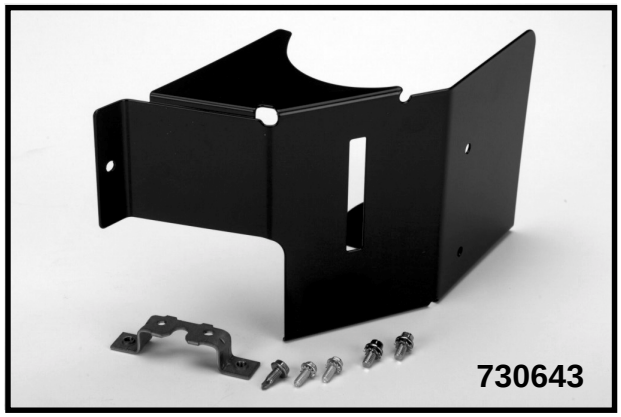
OVM/OHV Throttle Link Change

Beginning with the 1993 model year, we improved the throttle linkage on the OHV/OVM family of engines by reducing free play through installation of composite bushings. This change enhanced governor response between the carburetor and the governor arm. We have upgraded the service carburetor used on older models to the new style containing the bushing. If you replace the carburetor on models built prior to 1993, you will need to order the new link part # **36285** and the governor arm part # **36284A** to make the new style carburetor work properly.

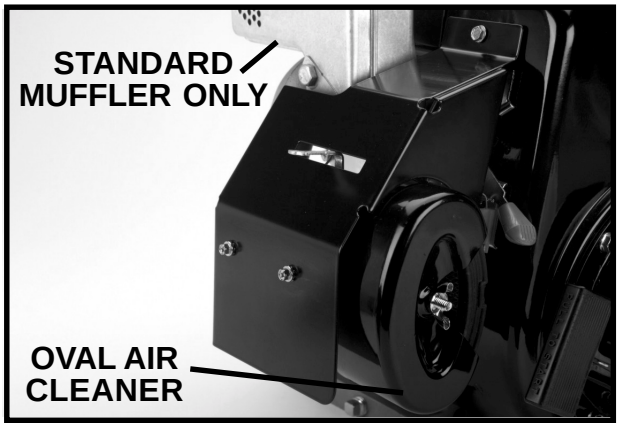


HM Series Climate Guard Retrofit Kit

Beginning with the 2002 model year, this feature will be required on all applications that can be operated in freezing temperatures such as generators and log splitters. This unique system is designed as an add on kit on earlier production units used to prevent carburetor icing on engines that use a standard muffler and oval air cleaner as shown. The Climate Guard Kit is designed to draw air from the muffler area. This pre-heated air prevents carburetor and breather icing on emissionized engines. Because this Climate Guard has been available to the OEM for several years, damage occurring from a frozen breather without this kit will not be considered warranty. The part number for the kit is # **730643** and is available through your local distributor.



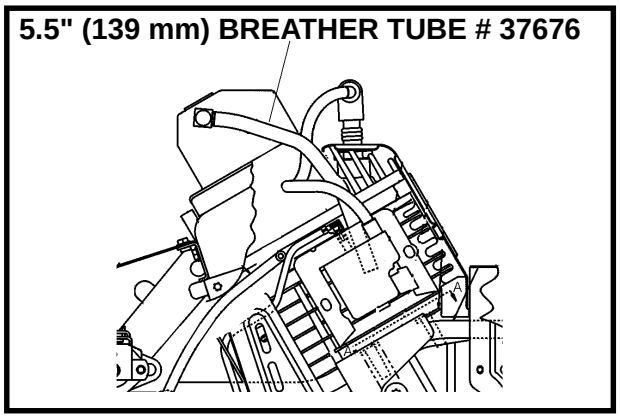
CAUTION: ***This system cannot be used on engines that have the # 37350 Low-Tone muffler. They require the original Climate Guard system part # 730630.***



NOTE: ***When applying this kit to earlier manufactured engines, it will be necessary to check for clearance of both throttle linkage and choke lever. Should interference be found, you may need to modify the shroud to obtain clearance.***

OHSK 50-70 New Service Breather Tube

The replacement breather tube for the OHSK 50-70 engines was changed from a cut-to-size tube to a pre-cut tube in July-01. This was done to prevent a kink or bend from occurring that might block the release of engine crankcase pressure and cause seal damage, excessive oil consumption or leakage. The kit, part **# 37676** now has the pre-cut tube 5.5 inches (139 mm) with routing instructions. These routing instructions are critical and must be followed if a OHSK50-70 needs a new breather tube.



Oil Vac Repair Kit

Over the past few years, the Tecumseh Oil Vac part **# 670354** has been an extremely popular tool with our service dealers. If however, they need to be serviced, we now have a repair kit available. The kit part # is **670380** and includes a new diaphragm, reeds, gaskets and "O" rings.

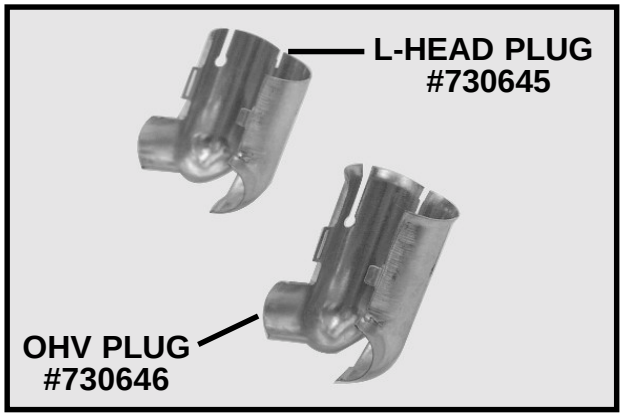
We have also added a **HOSE REPLACEMENT** kit part **# 670383.**

If needed, warranty repair should be performed by Thomas Industries. To locate your nearest service center, call **1-800-558-7721 or 920-457-4891.**

R.F.I. for U.S.

Last year we introduced Radio Frequency Interference (R.F.I.) shields for international products. We now have kits available for U.S. engines. They are part **# 730645** used on "L" head engines (short spark plugs) and **# 730646** for "OHV" engines (long spark plugs). Each kit includes a shield and sparklug boot. These kits have been available since 8-1-01.

Solid state ignition modules **# 34443C** and **# 35135A** have been upgraded to include spark plug boots that are compatible with the R.F.I. shields.

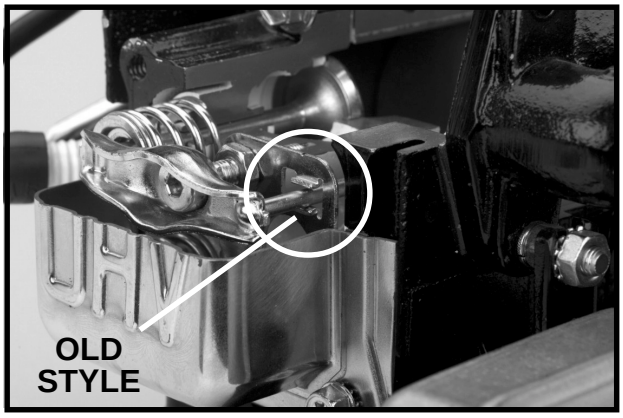


OHV Flywheel Washer Change

The split lock washer previously used on OHV135-175 and TVT engines between the flywheel and flywheel nut has been changed to a Belleville washer. This was done to reduce the possibility of damage to the thread on the crankshaft. The part number for the washer is **#651082**. The change should be apparent on all 2001 production. Always remember that the crown on the Belleville washer must face up or away from the flywheel when placing it between the flywheel and the nut. Proper torque and orientation of belleville washers is required during service. This holds the appropriate spring pressure on the flywheel down onto the tapered crankshaft.

OHH Guide Plate Change

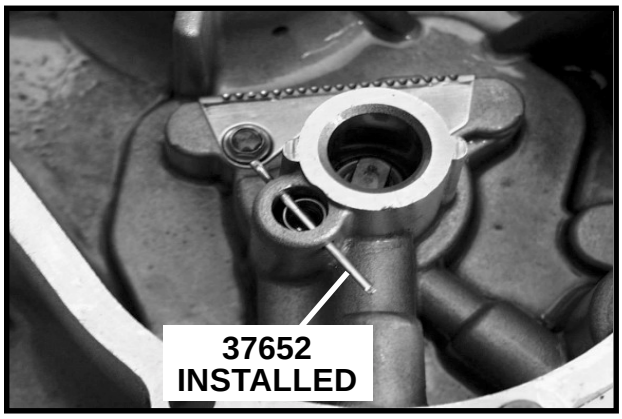
The guide plate used to direct the push rods on OHH and OVRM engines is being changed. They were previously assembled with the tabs facing up. The new plate improves push rod alignment during operation. You cannot just flip the old plate over because the fastener holes in the plateare offset. The new guide plates will have a location identity stamped on it. The words “side up” will appear on the plate and this stamping must face the cover. The part # **36649** does not change, and the new plate can be used where the old plate was. This plate has been in production on engines starting August 26, 2001.

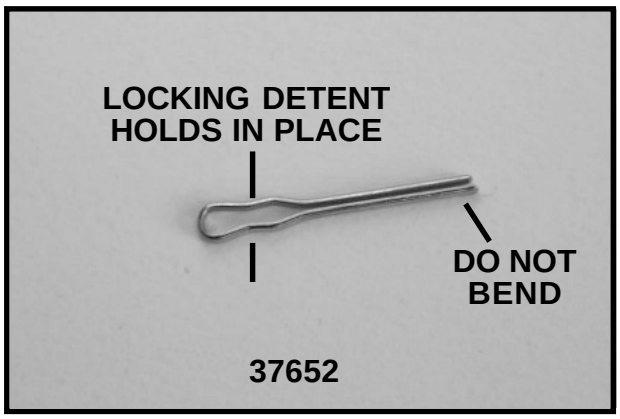


OHV 11-17 Oil Pressure Relief Change

The internal pressure relief system found on the OHV 11-17.5 hp engines that use oil filters are now more easily serviced. A cotter pin instead of a roll pin is now used to retain the check ball and spring. The roll pin was difficult to remove when cleaning this area. The cotter pin can be removed by hand or with a needle nose pliers and simply snaps into place due to the detent in the cotter pin. During service do not bend this cotter pin. The pin is part **# 37652** and does not need to have any particular orientation when assembled. This change has been basic since March of 2001 production.

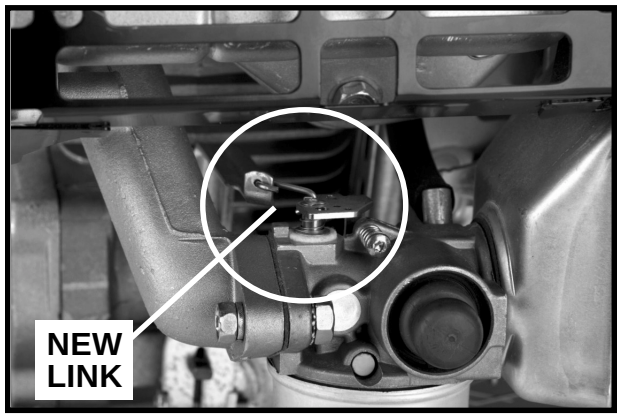
CAUTION: ***DO NOT bend the ends or they may contact the gears and be sheared off, introducing metal into the oil supply.***





OHH Link Material Change

The link that connects the governor to the throttle plate has under gone a material change. This part previously made of galvanized steel has been changed to stainless steel which gives it a more consistent dimensional control. This improvement will provide guaranteed smooth governor response. The part **# 36632** does not change.



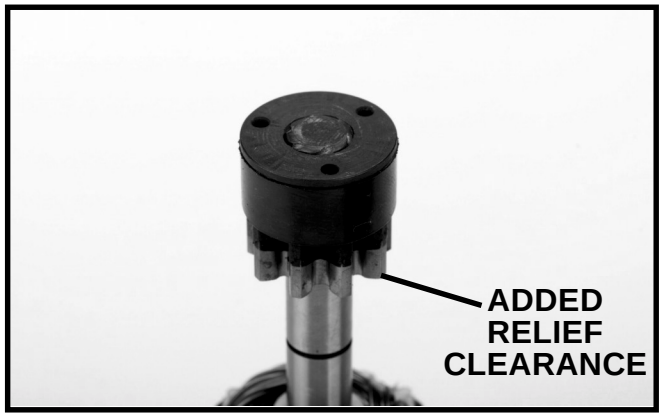
TVT Identification

Here is a little help for the dealer trying to figure out what horse power twin cylinder engine they have. All engine model numbers begin with the designation TVT 691 which stands for "Tecumseh Vertical Twin" 691 cc. The specification number sequence to horsepower rating is displayed to the right.

600000 series = 18 hp
600100 series = 18.5hp
600200 series = 19 hp
600400 series = 20 hp
600600 series = 21 hp
600800 series = 22 hp

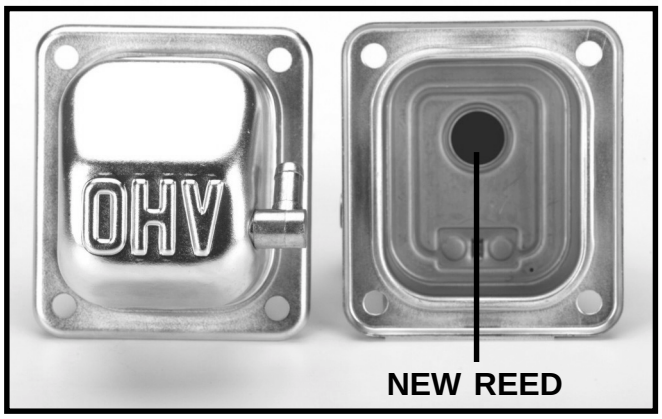
OHH/OHSK 50-70 Starter Pinion

There have been changes made to the 120 Volt A.C. and the 12 Volt D.C. starters used on these engines. The starter pinion has been given additional relief to eliminate some occasional binding that has occurred. This happened when the pinion engaged the flywheel. With the tolerance loosened up on these components, we have seen positive results without reducing the integrity of the starter. These changes were made in February of this year.



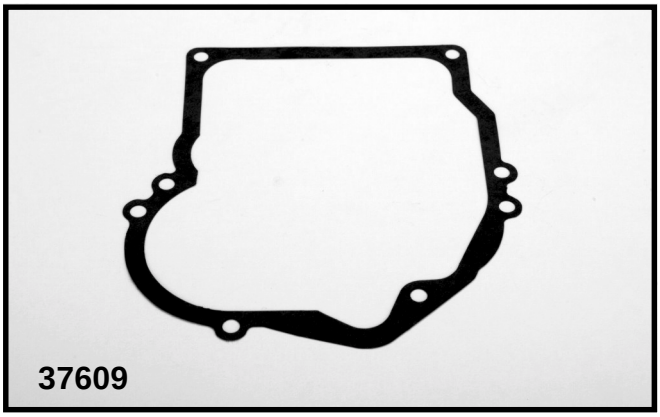
OHH/OHSK Breather Change

We have improved the breather system used on this family of engines. The original system was an umbrella seal that was changed to a reed breather system a few years ago. A heavier reed has been put in the breather to help increase crankcase vacuum. This has spun off some additional benefits. Increased crankcase vacuum helps reduced oil consumption making an already great engine even better. The part number only changes an alpha character to # **36630B** and occurred in July of 2001.



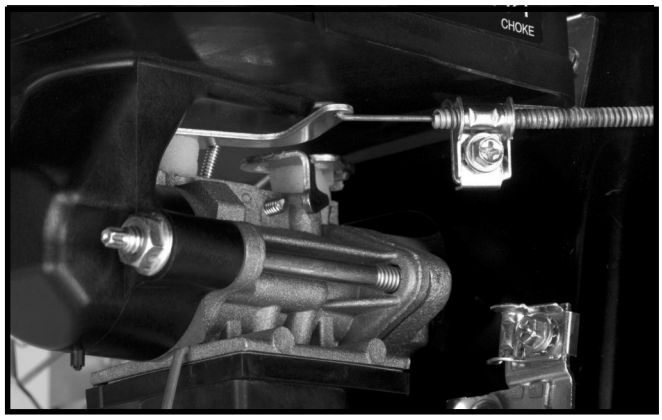
LEV/OVRM Rotary Mower Gasket

The flange gasket used on rotary mower LEV/OVRM's, has been improved to reduce the possibility of weeping at the gasket surface. This was done by increasing the amount of fiber in the gasket. This new gasket, part **# 37609** has been used in production since February 2001.



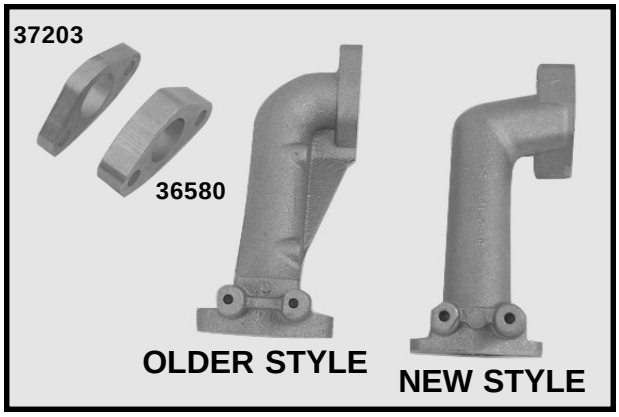
OHM 90-110 Choke Option

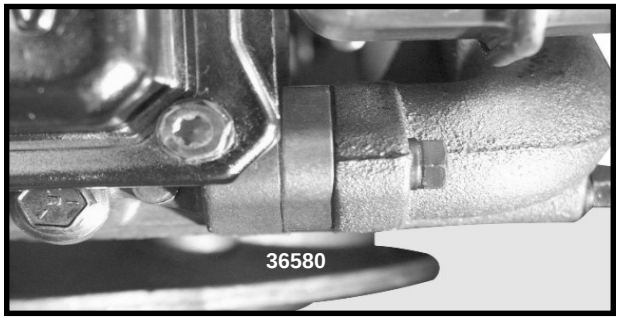
An optional feature for the Power Sports 9 and 11hp engines has been added to the product line. A remote choke is now available on these engines. They are typically used in conjunction with an electric start and allows the go-kart to be started from the drivers seat. We have created a new service engine that has this feature, the OHM 110. The 11 HP service engine part # is **211108**.



OVRM-105 Intake Pipe

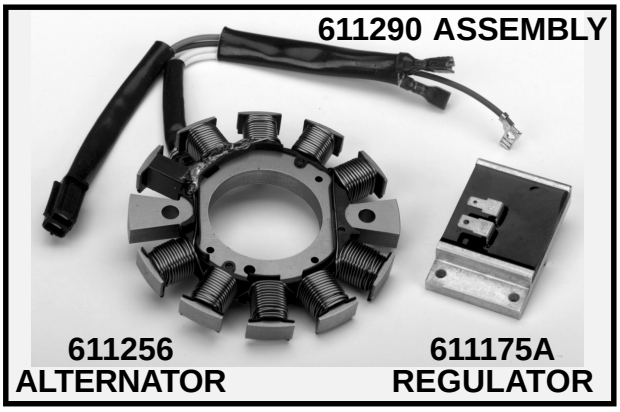
Last year we discussed the situation with spacers and intake pipes for OVRM engines. A kit was developed to change a two piece system to a one piece system. There are some exceptions to this rule. We have found OVRM-105 engines that use either a conical or oval air filter, have an improved run performance using the two piece pipe. If you order by model and specification number you will find that the repair kit will have the parts needed to make the repair.





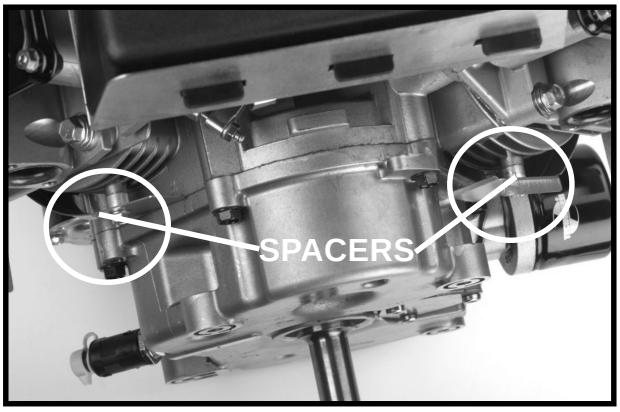
M Series Alternator Upgrade

The # **611097** seven Amp alternator used on medium frame engines back in the mid 80's is being replaced and upgraded to the newer replacement, part # **611290**. This assembly consists of two components, the **611256** alternator coil and the **611175A** regulator. There are also two connectors in the kit to resolve any wiring harness concerns. These changes have been in affect since October 2000.



TVT Air Baffle Improves Cooling

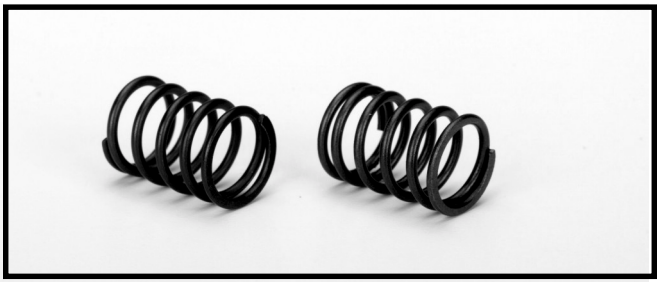
Some changes have been made to our V-Twin engine that have significantly reduced engine temperatures. Commercial lawn care professionals have much higher demands on their equipment which warranted this change. A reduction of 25 degrees has been noted when a spacer was placed between the two cylinder air baffles. This requires four spacers part # **37629** and four longer screws part # **651015**. These changes occurred on the 2001 model year and will be reflected in die changes to make this a permanent feature not requiring spacers.



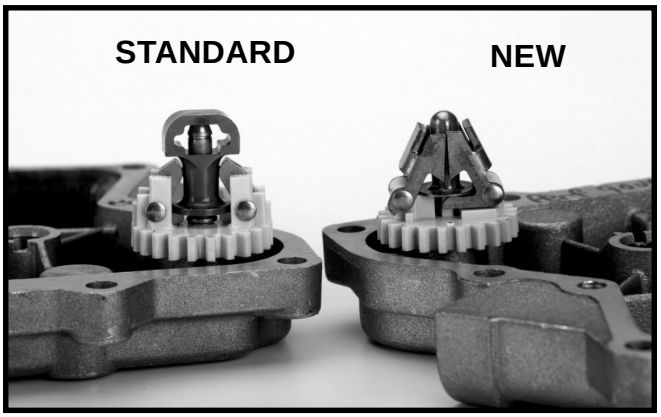
OHH/OHSK 65 is Powered Up!

Across the board the OHH/OHSK 65 has undergone some exciting enhancements on various engine components.

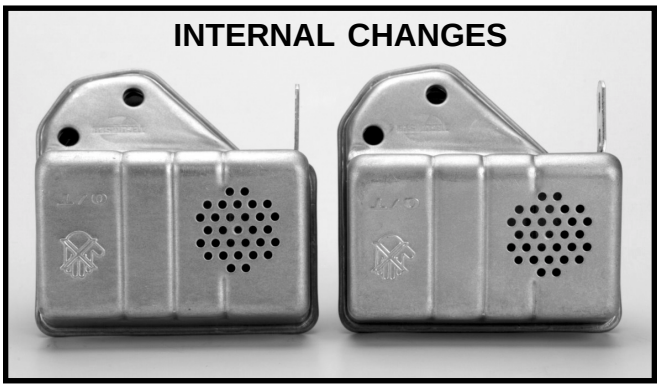
The engine features a new cast iron camshaft for added performance.



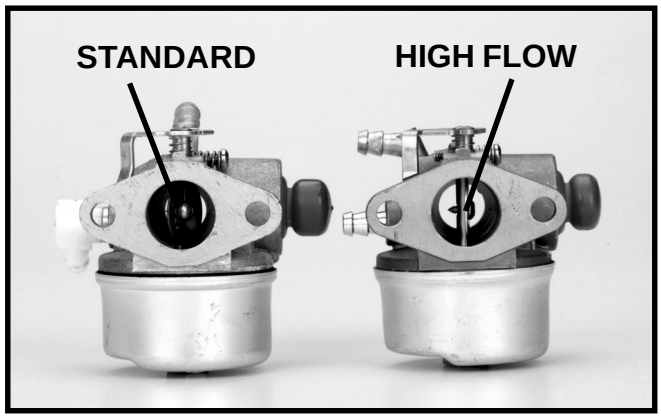
Valve spring rates have been increased.



There is a new quick response governor that will produce more power under varying loads.

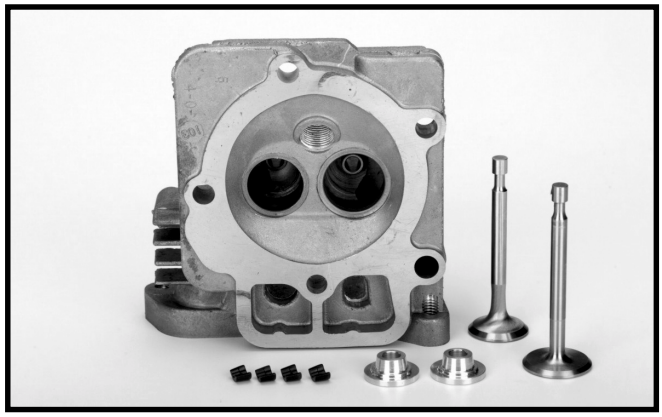


If that wasn't enough we added a higher flow muffler which produces a lower, more pleasing tone and more power.



The carburetor has been adjusted in it's design to produce an increased flow of fuel/air mixture by opening the throttle plate.

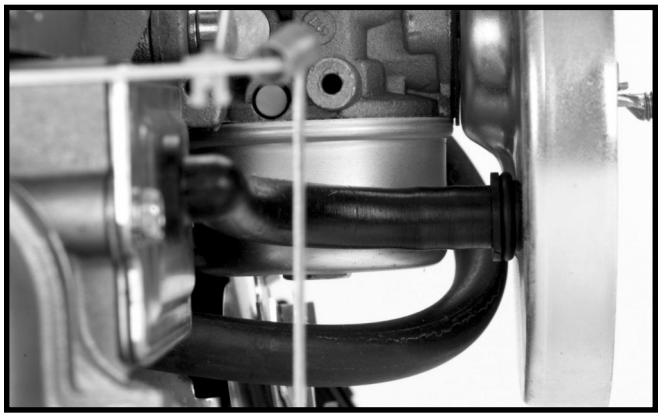
To accommodate this increased flow, the cylinder head utilizes larger valves.



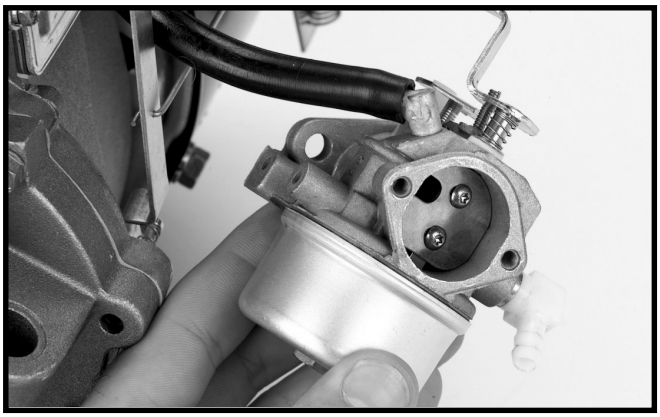
The valve keepers are new this year and are of automotive design. They have been changed to handle the additional spring tension. New automotive style valve keepers greatly improve valve retention and overall reliability.

OHM 120 Breather Tube Relocation

Since we began using closed breather systems on engines to aid in emission standards compliance, we have used two different methods of accomplishing that task. The engine would have a barbed fitting either on the carburetor where the breather hose is attached or on the air filter backing plate. The “OHM” series engine has used the backing plate method. All breathers emit some vapor so there is potential for some to go into the paper element and possibly restrict air flow if the filter gets saturated. Replacement carburetors will be equipped with a new fitting location. A plug will be provided with the new carburetor to plug the air filter backing plate hole. **NOTE:** The tube must be connected to the carburetor fitting to maintain emission compliance.



Connected to Air Filter Backing Plate



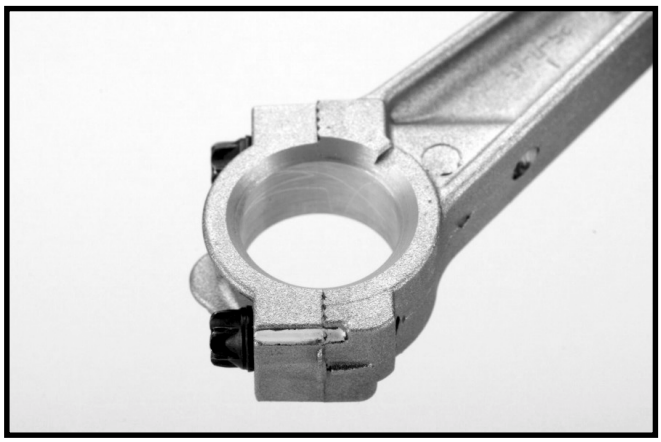
Connected to Carburetor

OVRM/LEV Utility Shroud Improvement

The OVRM/LEV engine shroud for utility specifications has undergone quite a face-lift. The shroud features larger air inlet holes of 1/4" in diameter. This design will be more esthetically pleasing and provide more cooling for high demand utility applications such as Pressure Washers, Pumps and Generators.

100-120 LEV Rod - Match Mark Change

The rod has beveled match marks to make service much easier during reassembly. The fasteners holding the rod cap use a 5/16" 12 point socket and are still torqued to 105 inch pounds/ 11.5Nm.



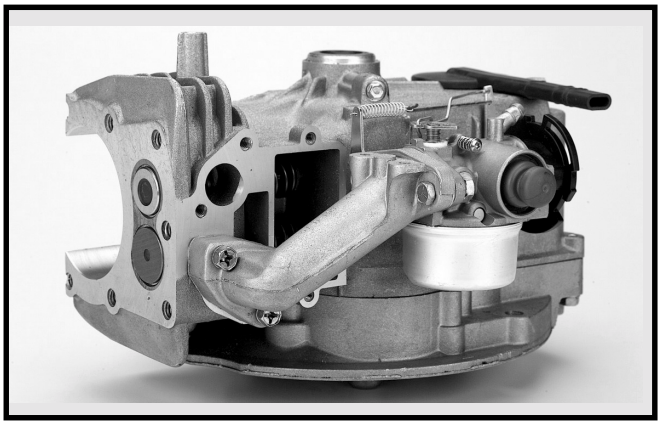
Quick Release Oil Drain

This quick release oil drain valve is a handy feature to have on your engine. Although it comes on some TVT engines, it can be added to many more. The threaded end of this drain is a 3/8-18 and can be used on TVM and OHV engines. If you apply it to an OHH, HM or OHM you need to use it with a reducer to adapt it to the 1/4-18 drain plug used on these engines. Use pipe tape to properly seal all threaded areas. The oil drain part # **37651** is available from your normal source of supply.

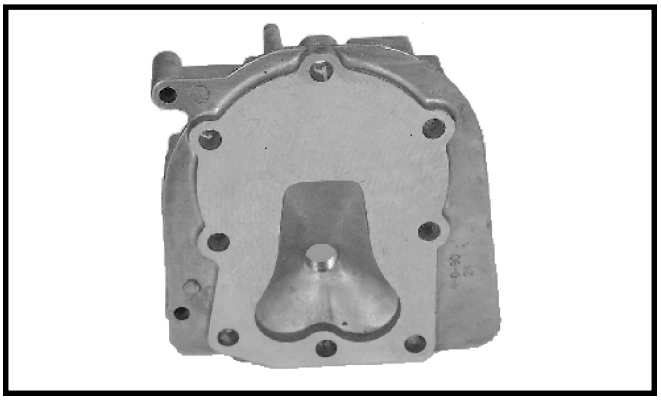
LOW EMISSION, ADVANCED PERFORMANCE

LEAP Technology

This term can only be applied to the Tecumseh "L" head engine. There is no other manufacturer that has an emissions compliant, 50-state approved, "L" head engine design. What does LEAP mean ? It means Low Emissions, Advanced Performance. How is it achieved ? Through technology that has been developed using automotive style piston, rod, and ring design, inverted cylinder porting, and a patented carburetion system. These features combined with other technological advances available on the LEV engines, produce 70% less emissions then engines from 10 years ago. The LEV 120 HO engine meets the EPA's stringent 2006 nationwide standards.

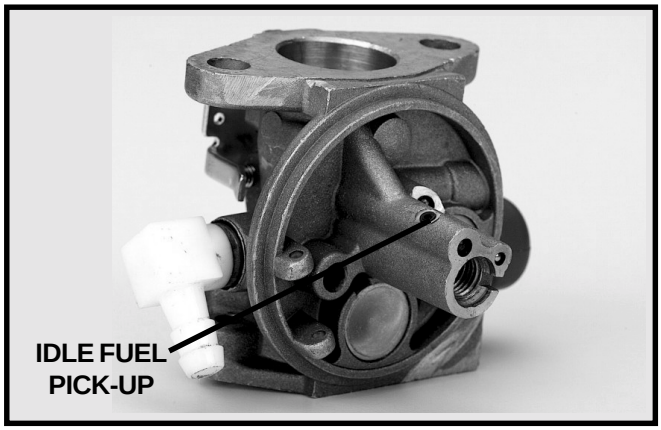


Inverted porting positions the exhaust port over the intake. This way the hottest part of the engine is in a direct line with the cooling air generated by the flywheel.

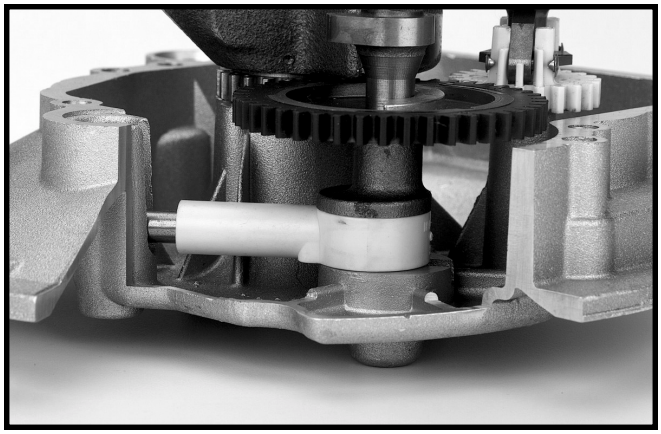


The combustion chamber concentrates air/fuel mixture directly at the spark plug for an efficient controlled burn.

Tecumseh Products Company prides itself by offering new blower housing design to compliment OEM equipment for the 21st century.

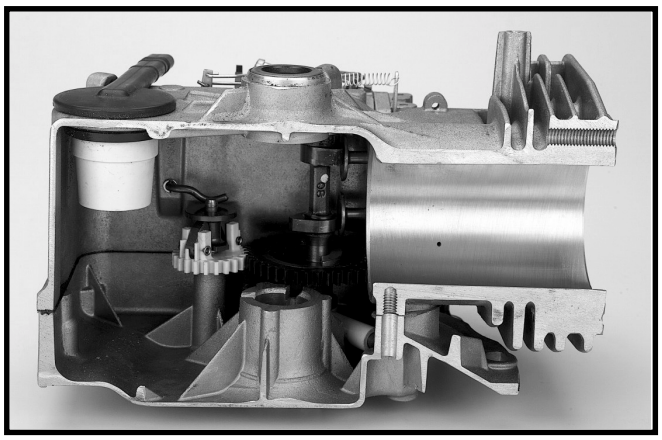


Series 11 Bridge carburetor provides sure starts and efficient operation.

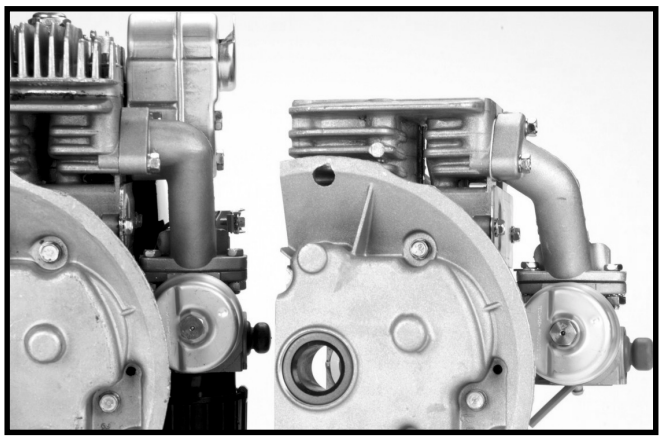


Oil pump lubrication to all critical bearing surfaces is a premium system.

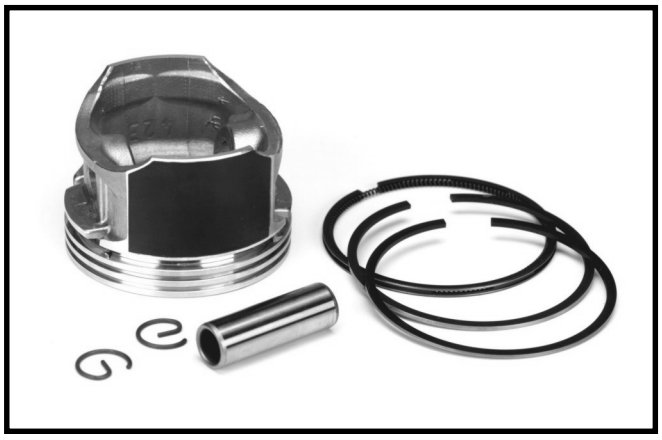
LEAP TECHNOLOGY



Tecumseh's mechanical governor responds instantly to varying loads to maintain smooth operation.

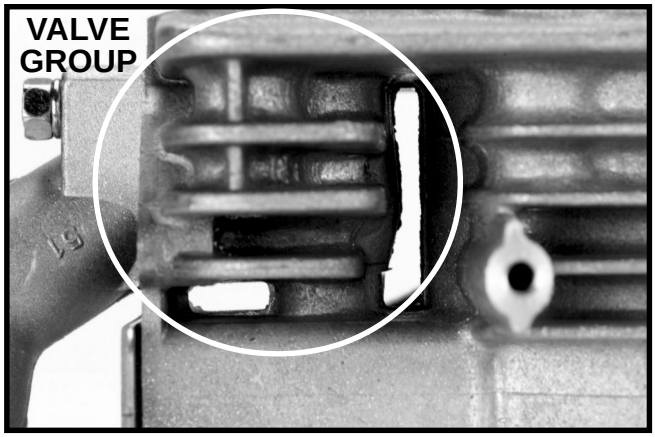


The leap engine produces more power with its high flow intake pipe. With 195 cc's of power working for you, the LEV120 HO is up to the task.



Leap engines have Automotive style piston/ring assemblies with Teflon skirts. The piston is elliptical in its shape and swells perfectly round when the engine warms to operating temperature. This means tighter tolerances can be held which provides better ring seal on the cylinder wall.

Tecumseh valve seats are cast iron and cast into the cylinder during ***the molding*** process. They never move or come loose.

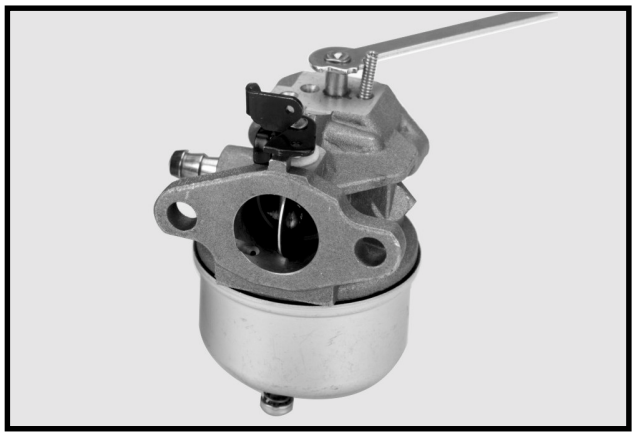


The valve group is separated from the cylinder by the cast design. This helps keep the cylinder thermally balanced.

Carburetion

HSK 600

For the HSK 600 two-cycle engines, we have made a change to the carburetors by changing the idle fuel circuit. These new carbs will be drawing idle fuel separately, not through the high speed circuit. The result is a smoother running engine at light to no load conditions. The HSK600 with specification numbers ending in “U” and the HSK635 specification numbers ending in “B” will have the updated carb. The new carb was first used in production in July of 2001.



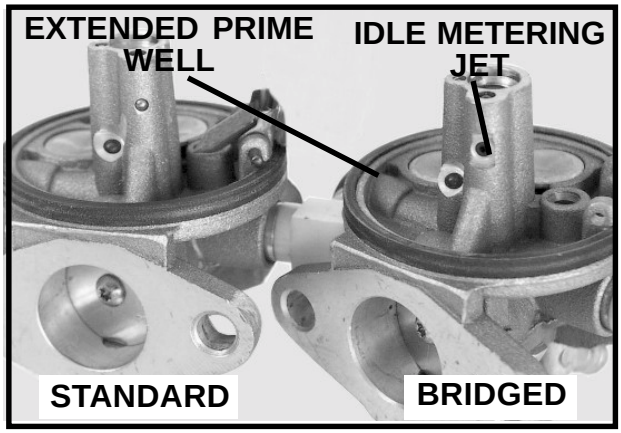
These HSK 600 carburetors have been upgraded with an "A" designation

OLD	NEW
640086	**640086A**
640122	**640122A**
640097	**640097A**
640092	**640092A**
640098	**640098A**
640090	**640090A**
640099	**640099A**

The HSK 870 carburetor is part # **640300.**

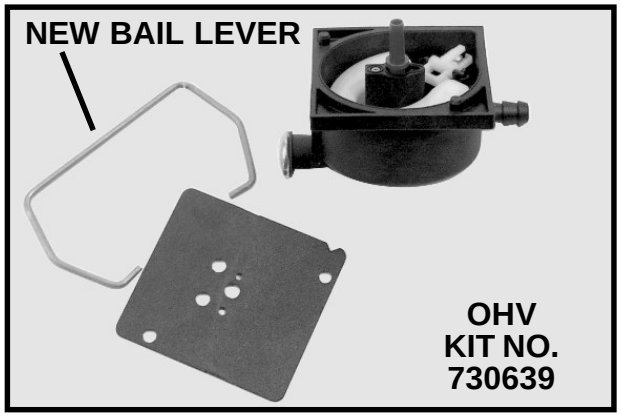
Bridged Series 11 Carburetor for LEV's

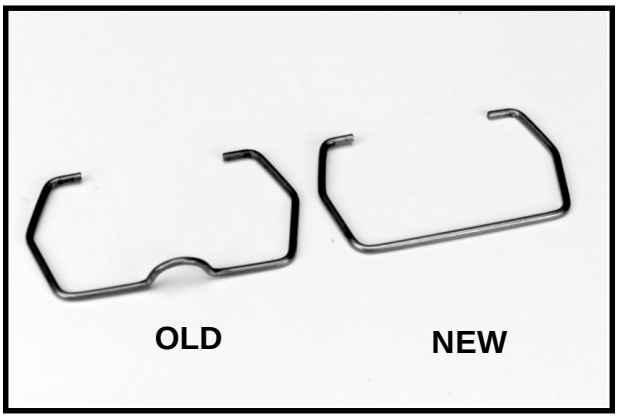
The Bridged Series 11 was originally designed for the OVRM 120. Based on the consistent reliability and run quality, the Bridged Series 11 carburetor will be taking a greater presence in our small frame product line with the Low Emissions Vertical (LEV) L-Head Engines. The carburetor receives fuel from inside the center leg through the main jet, and the metering jet located on the outside of the center leg of the carburetor body. After priming the carburetor three times the extended prime well located under the a welch plug (shown) is filled with fuel which provides a rich fuel mixture for sure, one pull starts in wide variation of temperatures. This carburetor incorporates two composite jets, that can only be cleaned with spray carburetor cleaner such as Tecumseh part # **696410** and tag wire not exceeding .012 inch (.3mm) diameter.



TVT and OHV Carburetor Bail Improvement

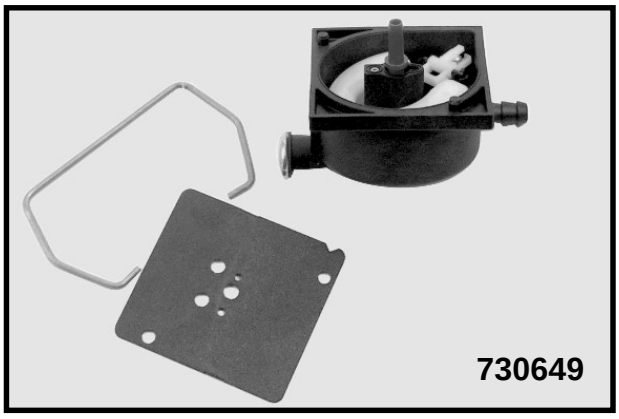
These engines use a series “7” carburetor that has a convenient bail that snaps open and allows the dealer to inspect and repair most of the parts involved in the fuel delivery function. This bail is critical to retaining the bowl and sealing the gasket. From time to time the bail has been distorted due to deflection caused by its removal. A stronger bail has been incorporated into production since January 2001. The OHV carburetor quick fix kits have been upgraded to include the bail and have been superceded with the same part # **730639**.





New TVT Series "7" Quick Fix Kit

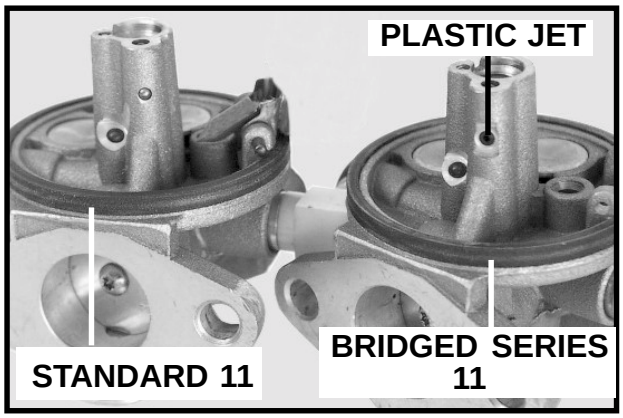
We have developed a quick repair kit for the TVT series 7 carburetor used on this engine. The kit includes all the item typically used in carburetor repair.



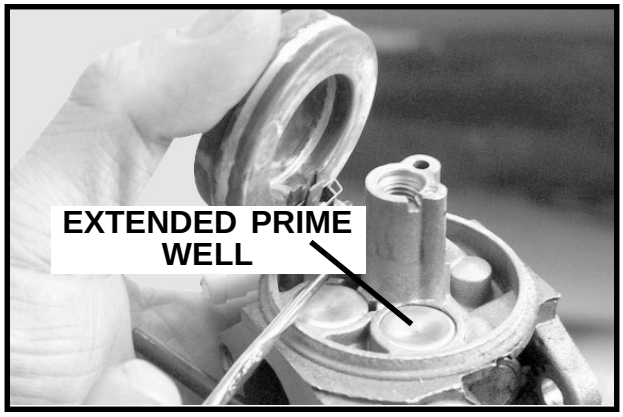
Carburetor Cleaning

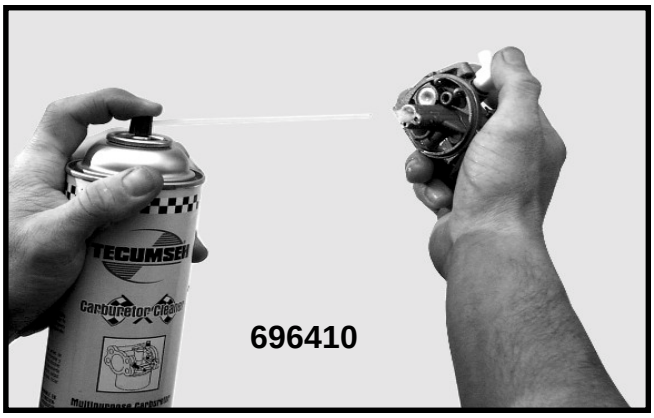
Carburetor Cleaning - Series 11

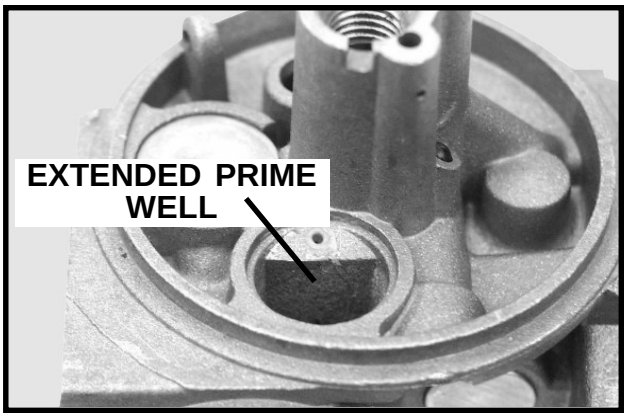
With the additional fuel well welch plug removed, you can see the small plastic metering jet, which can be distorted if left to soak in a carb dip tank. Currently, this metering jet is not a serviceable part. Our position has been to soak a carburetor no more than ½ hour but the exception is the Series 11 carburetor. To be safe, service all our carburetors with Carburetor Spray **# 696410** along with a .012" (.304 mm) gauge wire.



Make sure to carefully seal this extended prime well with fingernail polish.

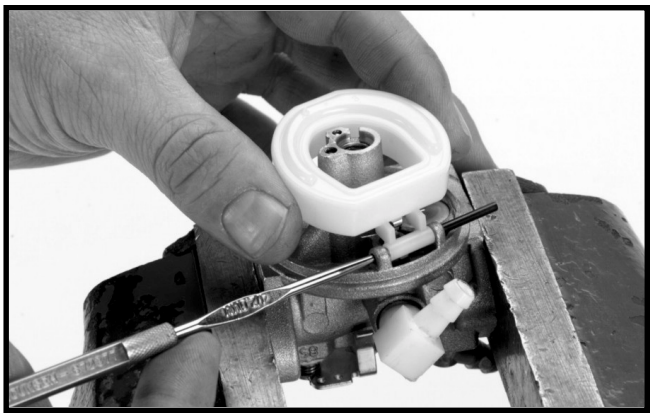




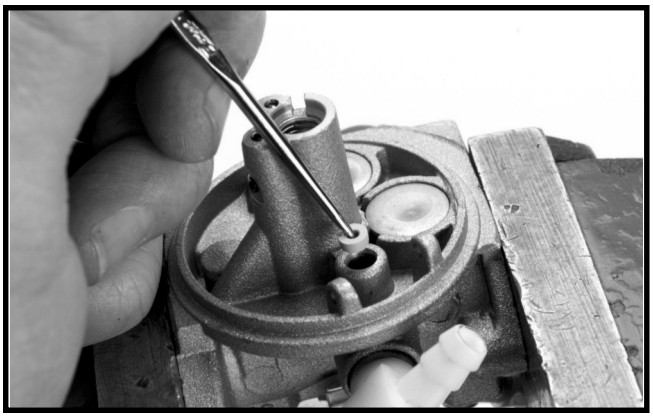


Always use the Tecumseh Carburetor tool when servicing carburetors. Part **# 670377**.

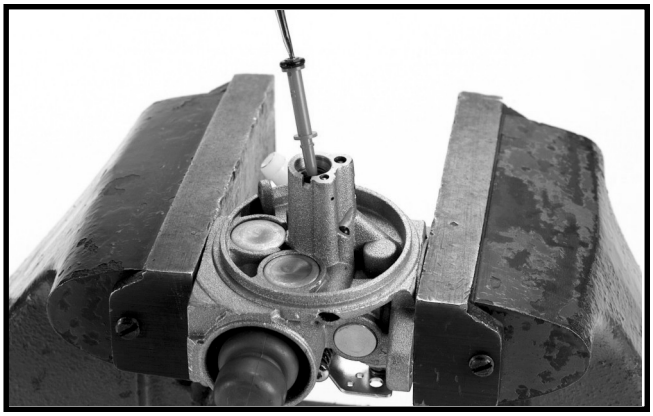
Carburetor Cleaning Series 11



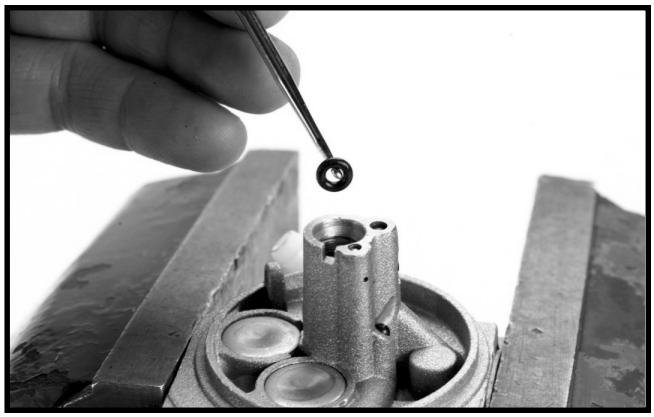
1. Remove bowl and push the float hinge pin out with carb tool part # **670377**. The float cannot be rotated upward.



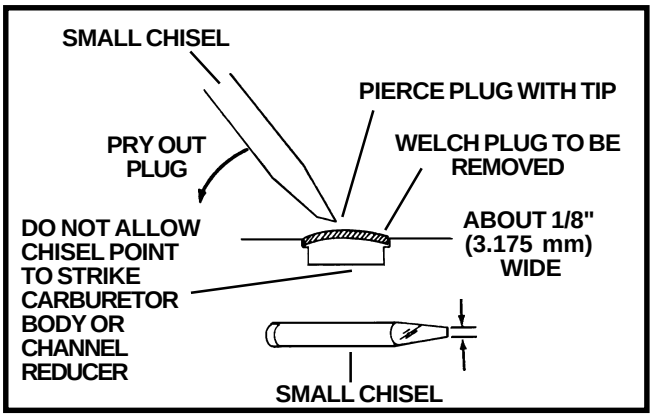
2. Remove the seat with the carb tool.



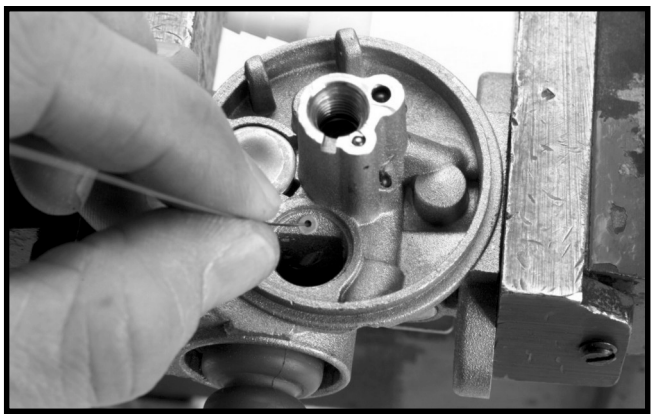
3. Remove the emulsion tube by gently inserting the carb tool. Rotate the hook end until you locate the air bleed passage. Then with hook in place, pull the tube out.



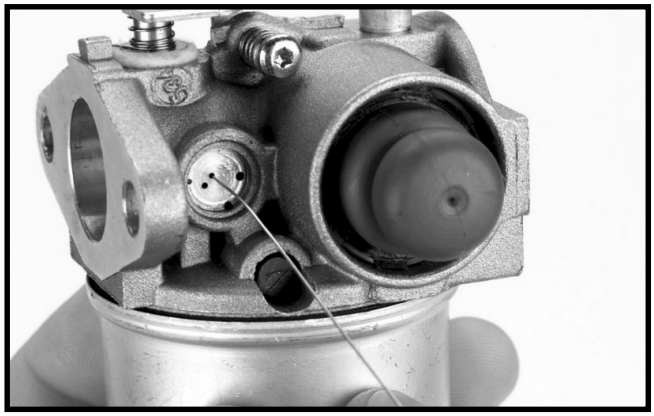
4. Remember there are two "O" rings on the emulsion tube. You may have to go into the center leg a second time to remove the upper second "O" ring.



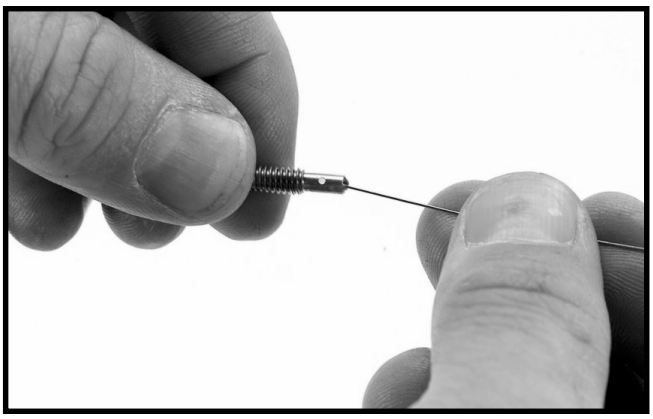
5. Remove the extended prime well welch plug with a sharpened chisel. When piercing through the extended prime well welch plug, pound close to the red primer bulb side as not to mar the casting.



6. Clean the extended prime well w/.012" tag wire and carb spray.

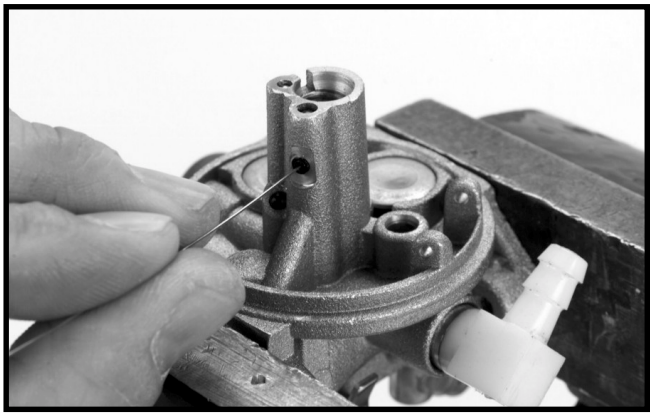


7. Remove the idle prime well welch plug. Using a sharpened chisel or punch. Clean the progression holes and the idle air bleed hole using tag wire and carb spray. If damage occurs in progression holes, replace with a new carburetor.

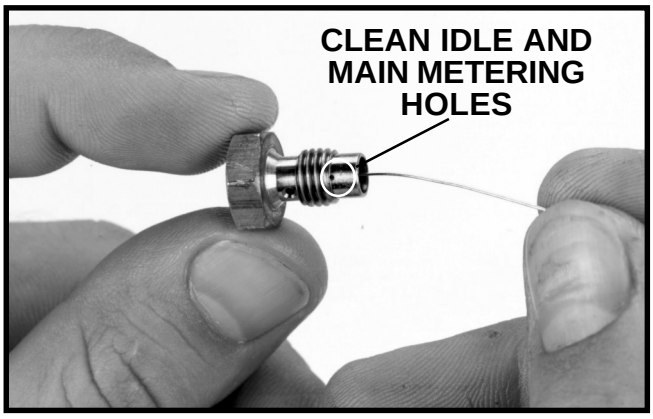


8. Remove the idle restrictor cap and clean the idle jet with tag wire and carb spray.

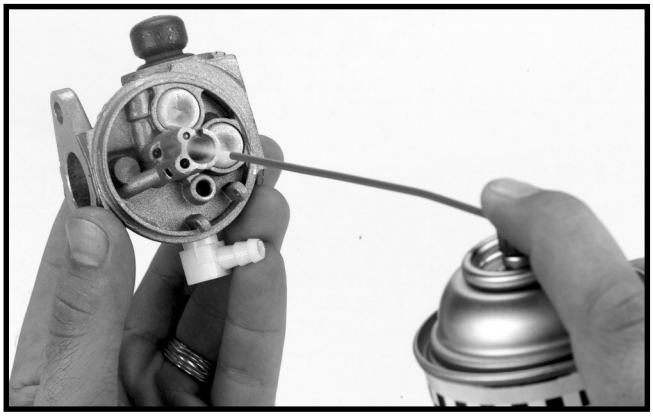
9. Clean the idle circuit fuel pick-up located in the center leg using tag wire.



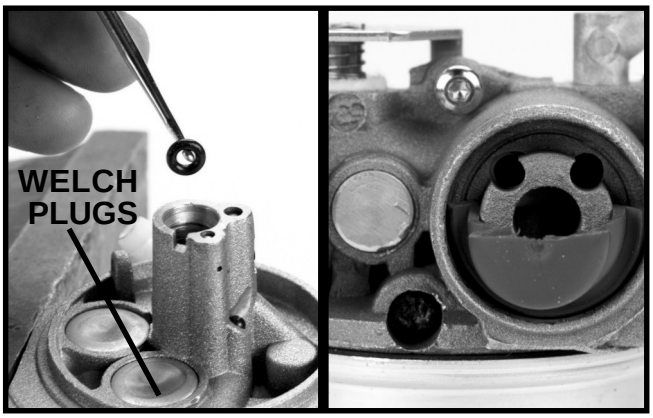
10. The Series 11 bridged carburetor has an additional idle circuit fuel pick-up jet or the side of the center leg. Clean this with .012" (.3 mm) tag wire.



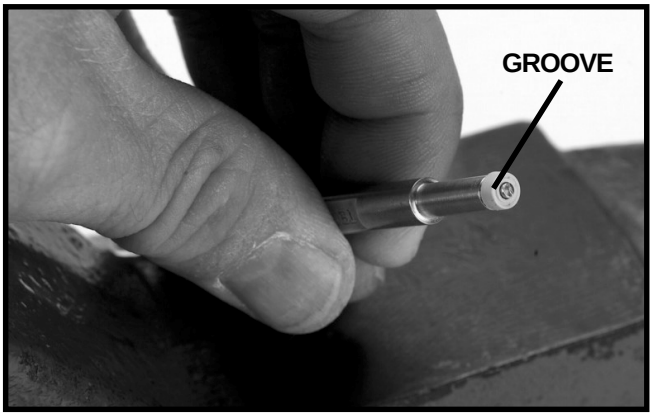
11. Clean main jet (bowl nut) with tag wire. Remember there are three drilled passages. The fuel pick-up, the main jet and the idle delivery hole.



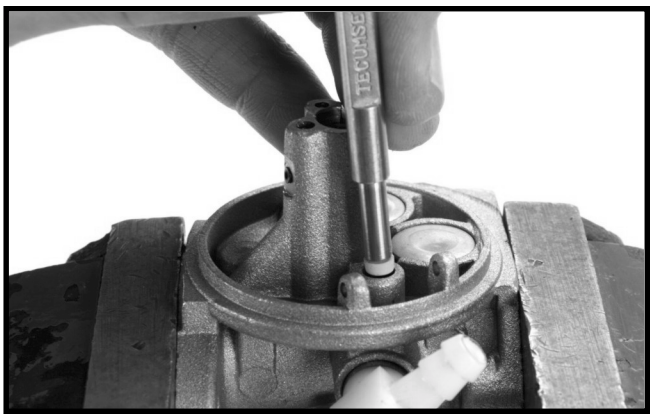
12. Spray all cavities with Tecumseh carburetor spray part # **696410**.



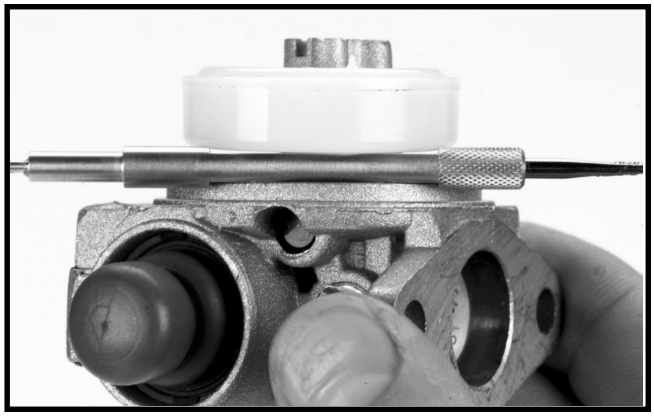
13. Replace both idle welch plugs included in carb kit with a flat punch and apply fingernail polish to the edge where the plug meets the casting.



14. Note that a seat has a grooved end (shown) which is installed first into the carburetor casting.



15. Install seat into the orifice with the carb tool until it bottoms on the casing.

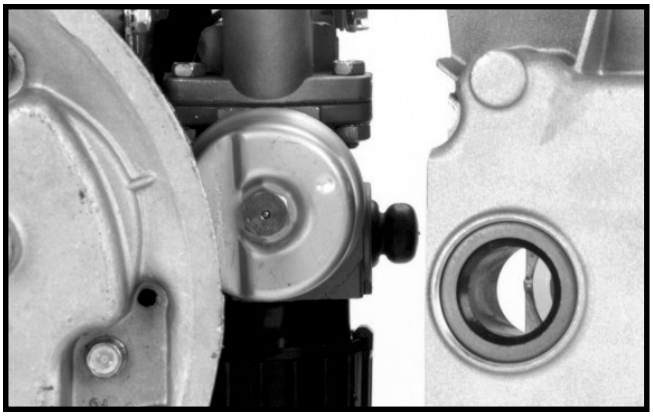


16. Check the float height with the carb tool. When the carb tool is removed, the float should remain in position. The dimension of the carb tool flats are 11/64".

17. Adjust the float if necessary by bending the middle tang.

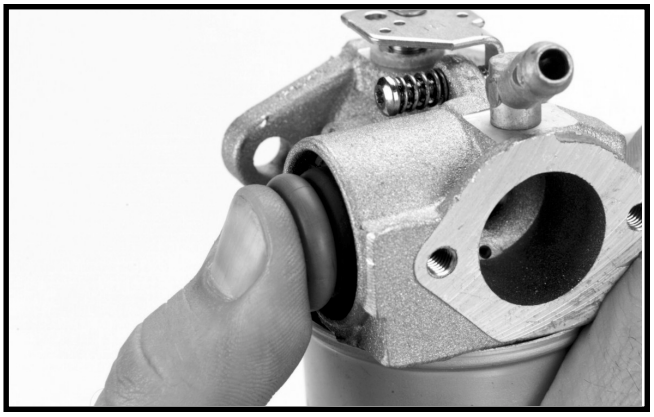
18. Bring the float/needle assembly down into position, then insert the float hinge pin.

Always remember the open end of the needle clip on a Tecumseh carburetor, faces out toward the air cleaner side.



19. Install a new float bowl, bowl "O" ring, and the bowl nut with a new bowl nut gasket.

    Remember to place the shallow part of the float bowl in line and beneath the hinge pin. This will allow the float full travel in the bowl.



20. Remember that a Tecumseh carburetor is best primed when using the thumb as shown. Wait a second between each fully depressed prime. Three primes will ensure one or two pull starts with outdoor temperatures above 60ºF. Colder temperatures may need an additional prime or two.

Anatomy of a Prime

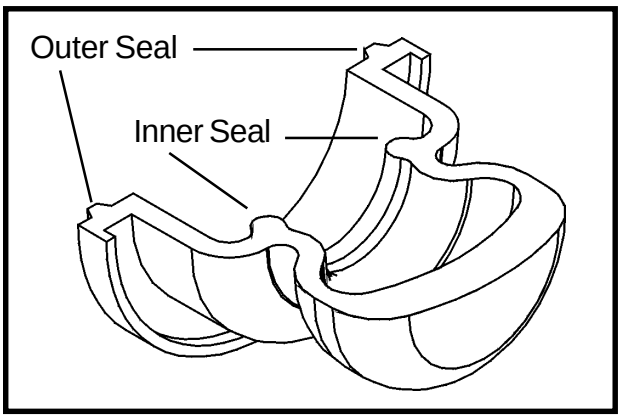
This section will review all the circuits and seals in the carburetor that are critical to a properly functioning priming circuit. If you suspect a priming problem check all areas listed.

The Ideal Prime

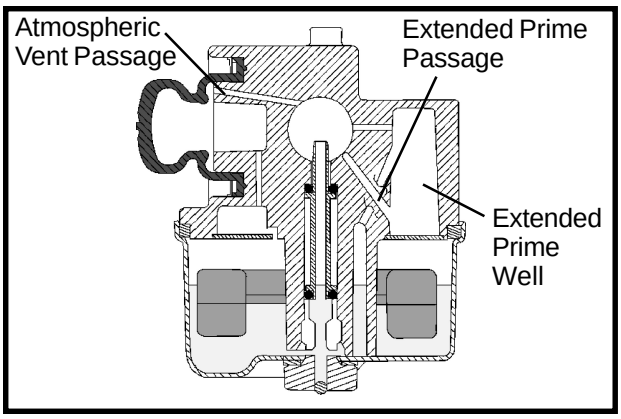
The cutaway view of the carburetor body underneath the primer displays the ledge against which the primer seals.

Primer Seals

The primer bulb has an inner and outer seal. Both seals must come in contact with the body of the carburetor when depressed to ensure sealing. If a seal is not created, the carburetor will not prime properly.

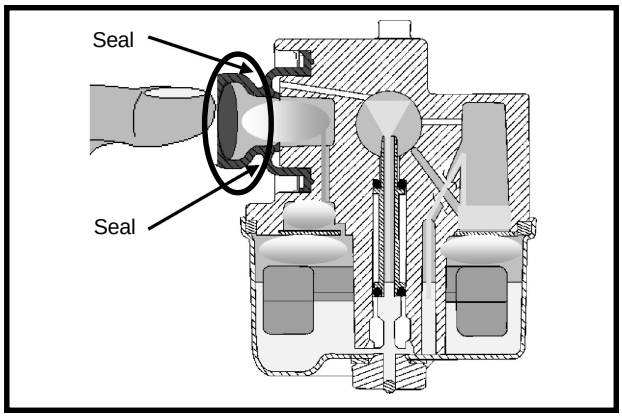


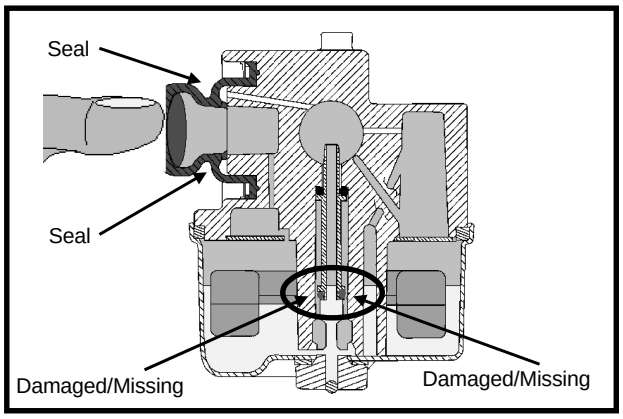
Side view of a Series Eleven "11" carburetor showing all key passages.



Pressing the primer bulb will force air through the bowl vent, which pressurizes the float bowl.

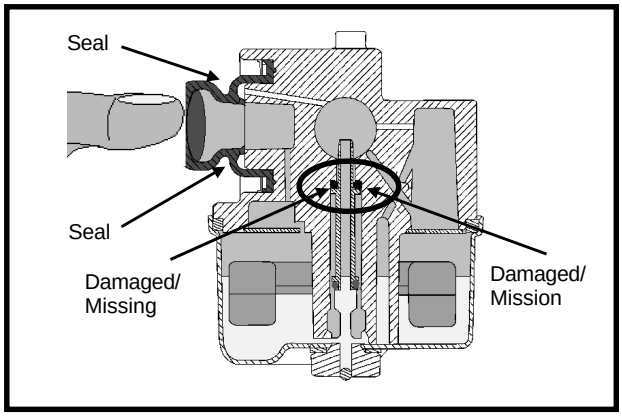
During priming, the fuel will travel into the extended prime well and main jet.





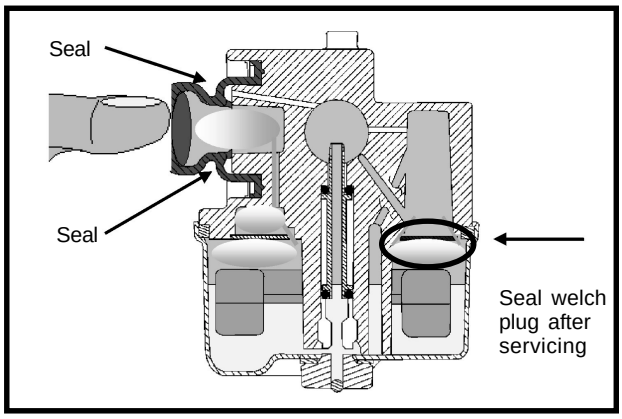
When performing service or evaluating possible trouble spots for poor priming, check for damaged "O" rings on the main nozzle. This area should also be inspected if the customer or another dealer had previously done repairs on the unit and not repaired it properly.

Technician Tip: The best way to check if the "O" ring is still in the upper center leg is by using a mini flash light.



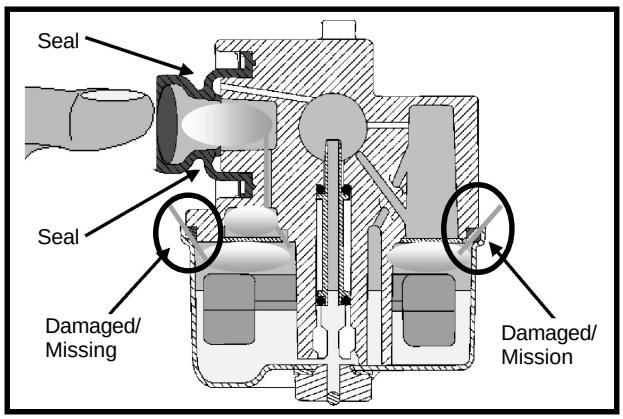
After servicing the extended prime well, remember to replace the welch plug and seal it with nail polish. If this welch plug is not sealed, the air from the prime charge will not pressurize the float, instead it will leak into the extended prime well.

NOTE: New production carburetors DO NOT have sealant because the area is tested in assembly.



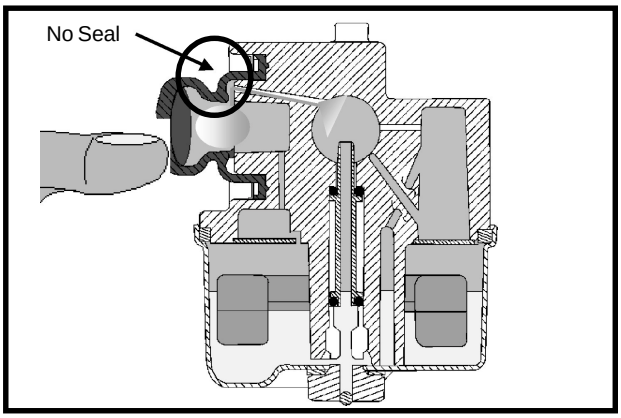
If the bowl gasket is missing or damaged, the air from the prime charge will leak out of the bowl and fail to pressurize the float.

ALWAYS REPLACE the gasket if the bowl is removed or disturbed.



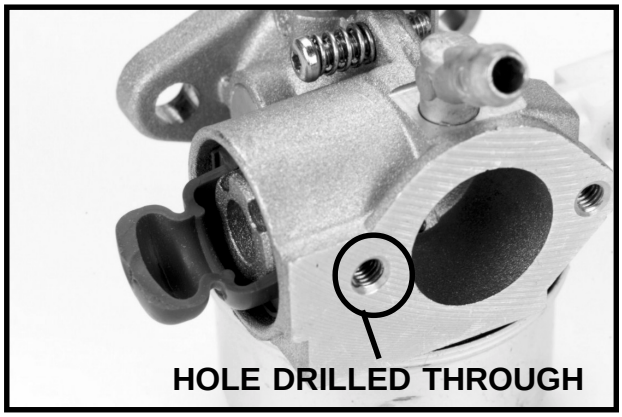
If the operator depresses the primer bulb in such a manner that it does not seal against the body of the carburetor, then the air from the prime charge will exit the carburetor through the atmospheric vent hole. The prime charge will not pressurize the float bowl.

NOTE: If the bulb feels stiff or hard replace it.



On some carburetors, the hole for mounting the air filter assembly is drilled through to the primer passage. If this hole is uncovered the prime charge will exit the carburetor through the drilling instead of pressurizing the fuel in the float bowl.

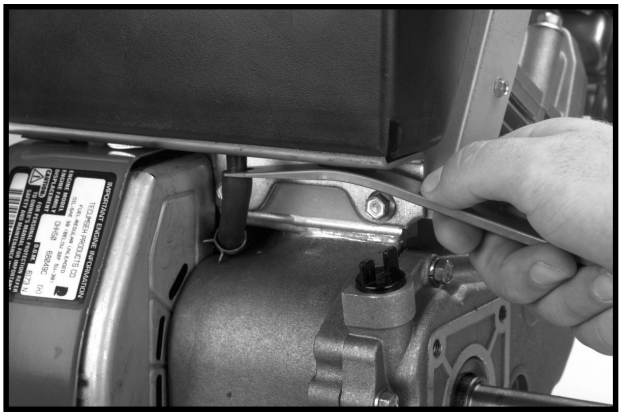
If you check for fuel coming from the main nozzle prior to re-assembly, make sure the hole is plugged using one of the filter box screws.

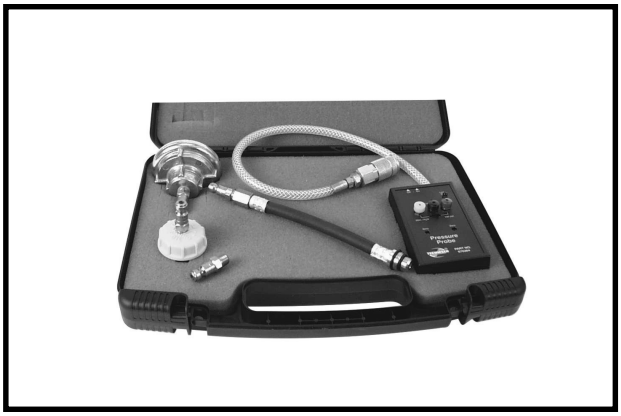


Tools

Fuel Line Tool

A new tool has been designed to remove the fuel line. This tool makes fuel line easy and safe to remove and eliminates potential damage to the fuel tank outlet and the fuel line itself . Using pliers can occasionally cause damage to the outlet spud or fuel line during removal. The tool part # **670382** makes this procedure a snap.

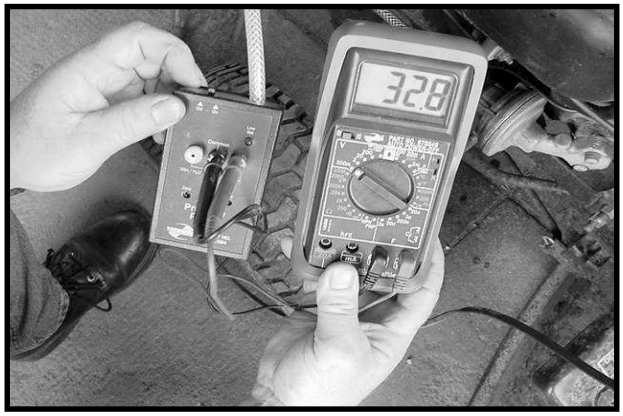




Vacuum, Oil Pressure and Compression Tester in One!

This tool will help speed up engine diagnosis. The pressure probe is meant to operate with any millivolt (mV) scale equipped Multimeter. Vacuum reads out in inches of water. The pressure side of the unit reads in Pounds per Square Inch (PSI) for oil pressure and compression testing. The kit part # is **670364A**. The kit includes the following items.

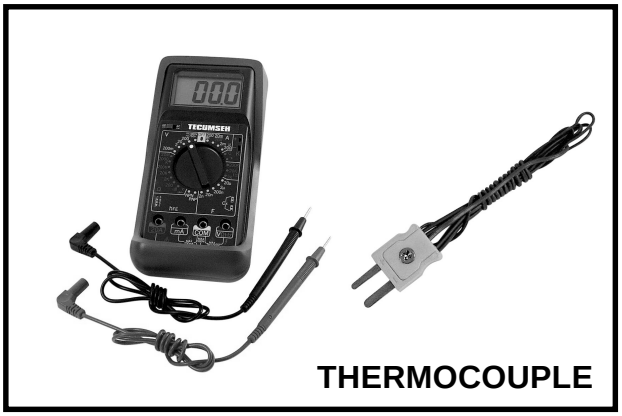
- Vacuum Pressure Probe
- Oil Fill Tube Adapter
- Spin-On Oil Filter Adapter # **670369**
- Compression Adapter Line
- Durable Storage Case



Digital Multimeter

This digital multimeter has a variety of functions that assist the technician in troubleshooting an engine. It comes with one thermocouple wire standard and will read both Fahrenheit and Celsius. Part # **670349** will measure. . .

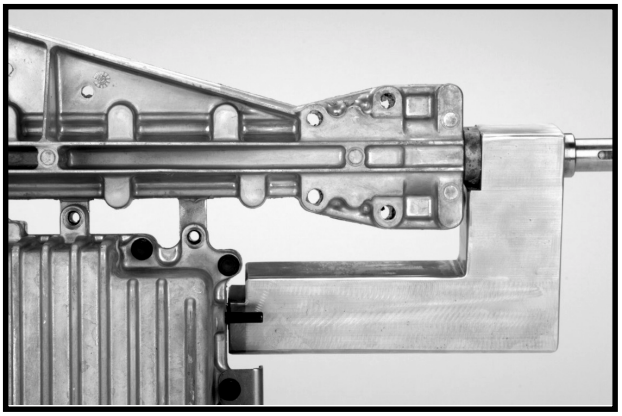
- DC Volts
- AC Volts
- DC Amps
- AC Amps
- Temperature (C° & F°)
- Frequency (Hz)
- Capacitance
- Ohms Resistance
- Diode Test
- hFE (Transistor)
- Battery

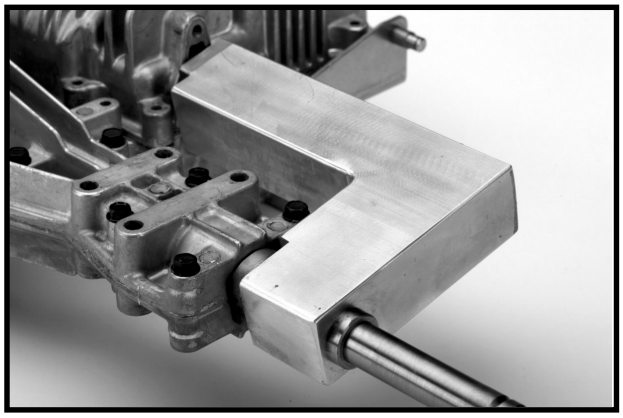


LTH Alignment Tool

This new tool is required for proper alignment of the pump/motor module to the final drive of the LTH. The tool sets the distance from center of Final Drive Axle Shaft to the center of Pump/ Motor Module Control Shaft to a predetermined dimension. The tool is necessary so the final drive and pump/motor shafts are not placed in a bind during service installations. If the shafts are placed in a bind, the shafts could experience galling which could lead to a premature failure or prevent the differential disconnect from working properly. Tool part # **670383**.

The tool you will receive will be slightly different than the one shown. The redesigned tool will allow easier use with the unit mounted in the frame.



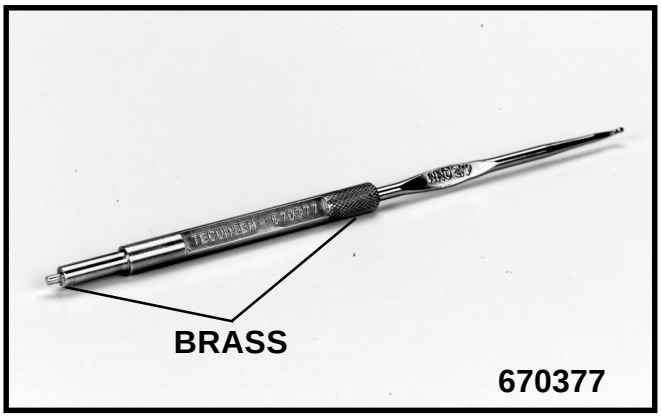


Telescoping Magnet

Tecumseh's handy telescoping magnet has a non magnetic shield. Order part **# 670378.**

Carb Tool # 670377 Gets A Lift!

The carb tool that was introduced last year (part **# 670377)** has undergone a few face lifts. The main body is now made of brass and works better than ever. We have also shortened the two flats used to set the float height. This was done to make access in tight areas easier.



Service and Shop

TecumsehPower.com

Visit us at our website which features a new dealer locator feature. During the coming year we will continue to enhance the web site so keep looking.

www.TecumsehPower.com

tecumsehwarranty.com

This electronic warranty claim system has been active since early 2000. This time and money saving program is available to all United States and Canadian Dealers. This program cuts warranty claim response time down to 2-3 weeks. See the tecumsehwarranty.com request form in the back of the book. Submit this form to your Distributor to be allowed access -**NOT TECUMSEH.** Upon the distribution approval we will send you a password to access the system. Once approved remember to fill out the claim accurately, and retain and tag all warranted items until you receive payment from Tecumseh Products Company.

www.tecumsehwarranty.com

New Snow Tune-Up Kits

We are pleased to introduce two NEW Snow King® Tune-Up Kits. These are designed to allow the customer to self service the product. The kits include:

- 1 Quart 5W30 winter oil
- 3 packs of Ultra-Fresh fuel stabilizer (treats 7.5 gallons)
- Resistor Spark Plug
- Spare Ignition Key

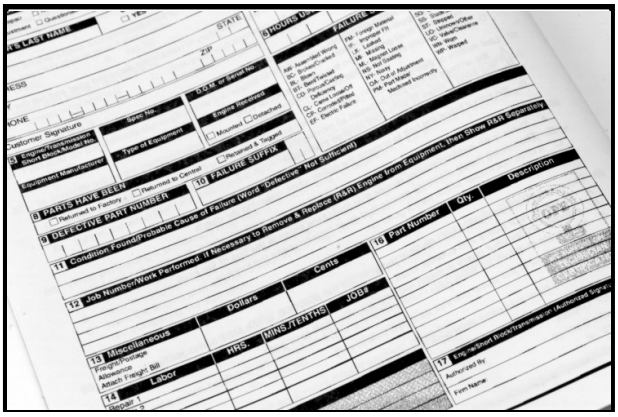
Kit No. **730281** for all L-Heads
Kit No. **730286** for all OHSK's

TMT Testing

Tecumseh's Service Division is shipping more and more copies of the TMT Test to our distributor network. The Premier dealers are quickly realizing that their time is up and they need a TMT on staff at their dealership.

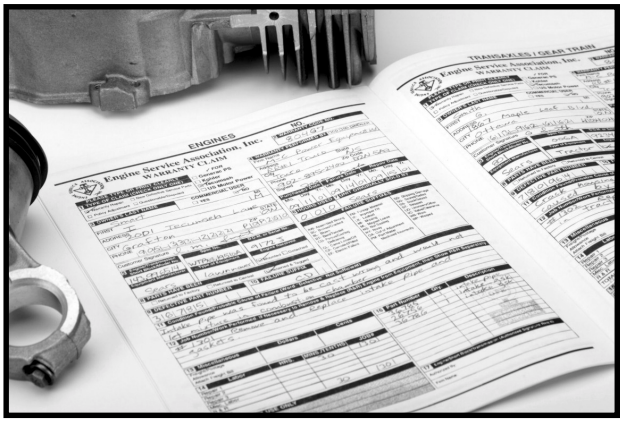
The TMT Test is a Tecumseh specific 100 question multiple choice test combined with a "hands-on" diagnostic section involving one engine and one transmission or Motion-Drive product.

The diagnostic portion of the test requires two ESA Warranty claim forms to be accurately completed. Some misconceptions potential TMT's have had is in Boxes 11 and 12 on the claim form. Box 11 needs to be an accurate and detailed description of what the Technician found as the source problem (inside the engine or Motion-Drive). Too often the technician does not go far enough and wants to describe to us what the customer states as the possible problem. Box 12 needs to specifically describe what work was performed on the Engine or Motion-Drive product to repair what Box 11 describes. If these two boxes are not correct there is a good chance of failing the test even if you scored high on the multiple choice section.



Each multiple choice question is worth 1.5 points and the diagnostic section is worth 50 points. The time allowed to complete the TMT test is 2.5 hours.

Tecumseh Products Company has decided to assist our dealership base even further by holding the cost of the test to $45.00 U.S until June 1, 2002. The prerequisite for taking the TMT test is the ESA 4-Cycle test. All of our technical handbooks are fair game and the current passing grade is 75%. The best way to successfully pass the TMT test is to attend a four-day Factory/TSN tear-down school.



Upon receiving a passing grade, the newly inducted TMT receives 3 embroidered TMT Patches, a framed Certificate, a Black and Red TMT Cap and a high quality engraved TMT Plaque to hang on the dealership wall.

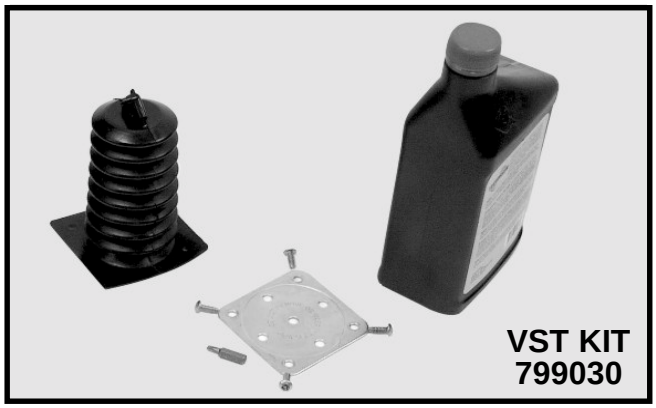
Not everyone can be a TMT. We encourage you to rise to the challenge and become certified. Remember that a TMT employed by a Premier Dealer has the authority to make their own warranty decisions. Also remember that the TMT status follows the Technician not the dealership.

Fuel Saver Plus

This tablet is a new, revolutionary fuel stabilizer and fuel systems cleaner in one! Fuel Saver Plus keeps fresh gasoline fresh for up to two years. This is a safe, non-toxic, easy to use tablet that dissolves in minutes. One tablet treats up to five gallons (19 liters) of fuel with regular use, it cleans the existing fuel system of gum and varnish buildup that is so common in todays reformulated fuels. Combustion chambers, valves and the entire carburetor benefit from the use of this product. The four tablet card treats 20 gallons of gasoline. You cannot overuse Fuel Saver Plus, part # **730275**.

VST 205 / 705 Service Kit

The bellows repair that was rolled out last year to repair the VST Hydrostatic Transaxle has been made into a kit # **799030**. Included in the kit is a new rubber bellows, a new style cover, 4 screws, 1 tamper-proof Torx 25 Bit, and a quart of synthetic hydrostatic oil. The VST 205 pump holds 56 oz. of oil. If you drain the oil completely, you will need to order an additional quart of synthetic oil, part # **730228**.

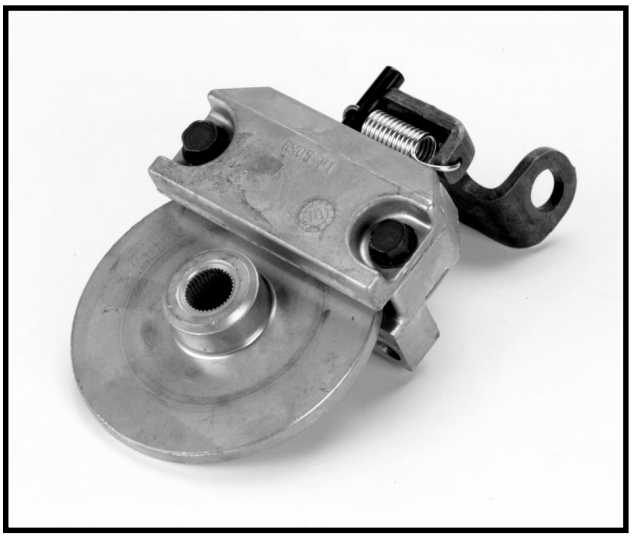


TecPub is a GO!

Our highly anticipated and long awaited TECPUB CD is coming to a Central Warehouse Distributor near you! This power packed CD features all Technicians repair manuals, Service bulletins, our most recent Update books and the History of Tecumseh Products Company in a movie format. Just pop it in your computer and take advantage of a wide variety of Tecumseh publications. The CD works with Adobe Acrobat Reader to view the variety of Tecumseh publications and pages can be printed from any of our books . The part # is **696130**.

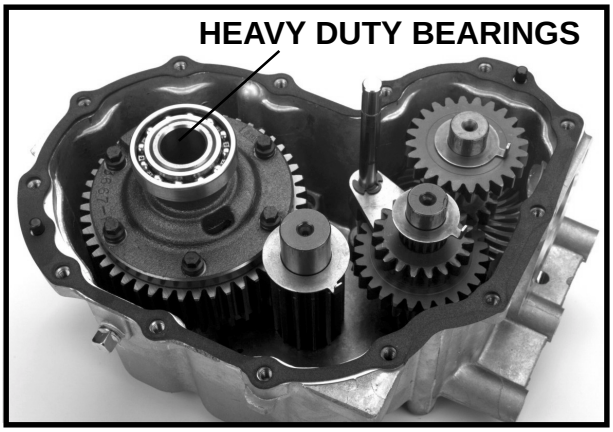
LTH New Transaxle Brake

We have developed a new brake system that is available to all OEM customers using the LTH series transaxle. This new brake mechanism is a dramatic improvement to the standard system used in the past. The system eliminates the sometimes complicated adjustment procedure for both the OEM and you the technician. The system includes a neutral return spring to help return the NEW horizontal lever to the off position. This feature is available with the 2002 season and makes service a snap.



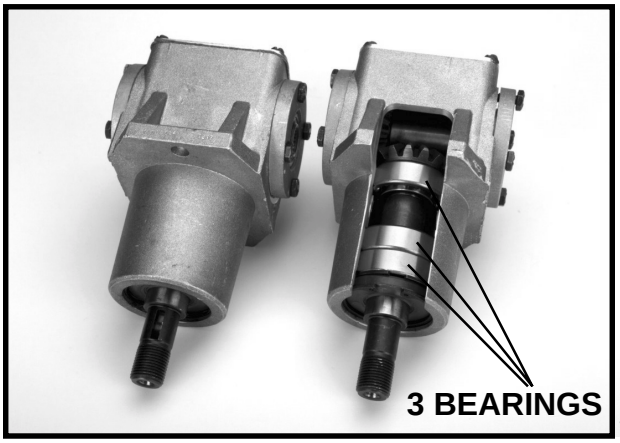
2600 New Series Heavy Duty Bearings

Based on customer requests and increasing the size of commercial turf equipment, we are offering a new carrier bearing set for the 2600 series. This extra heavy duty bearing set is now in production and available to all customers. The typical application using this product is a gang mower used on golf courses.



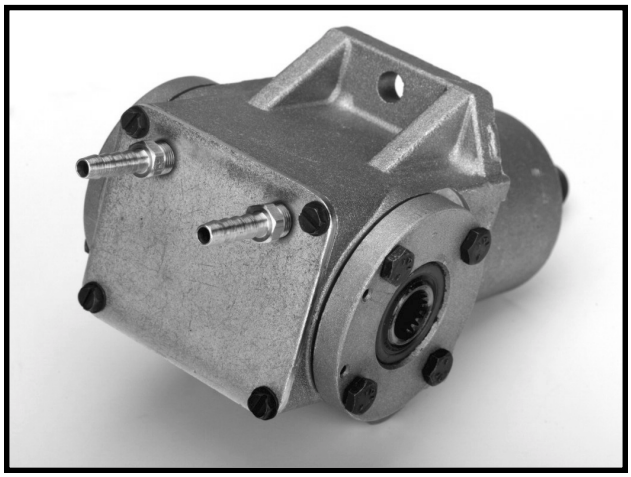
Heavy Duty 1000 New Series

We have developed a new longer housing that allows us to incorporate a third bearing on the input shaft. Look for this improvement on many commercial applications which have higher belt loads and torque going through the unit.



1000 Series New Lubrication

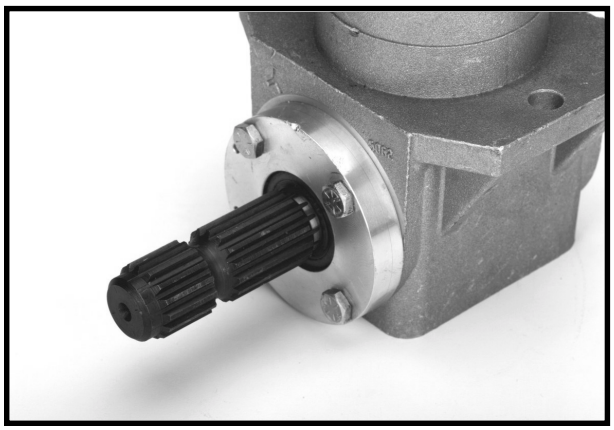
Based on commercial customer needs we have developed a new cover assembly for the 1000 series. This ported cover allows the OEM to circulate oil from the hydraulic system through the gearbox, dramatically extending the life of the unit through cooler filtered and fresh oil.



1000 Series New Bearing Retainers

As with the other options now available for this model, we have developed new bearing/seal caps for the output shafts. These new caps allow for a new oil seal and a larger load carrying bearing as needed by the OEM.

The new retainers also allow for a larger diameter output end of the shaft as requested by many of the commercial customers. This new style retainer allows for assembly from the outside in, the reverse of standard model 1000's.



Engine I.D. Decal Improvement

Identification decals on all engine specifications will be now much easier to read. The new layout will assist dealers in filling out warranty claims accurately by listing the model and engine specification more clearly. Another benefit is that customers who have lost their owners manual will be able to obtain one by calling the automated 1-800 #. This number also gives the customer a automated dealer location option. Tecumseh is making this change to reduce phone calls from consumers to their local dealers and at the same time meet the need of the end-user as quickly as possible. Another benefit of the change is that each engine will have it's own serial number, located directly after the D.O.M.

The D.O.M. is now two digits to display decade and the specific year in that decade it was manufactured.

NOTE: Claims not properly filled out will be returned to your Tecumseh distributor for review. When they have been completed and signed by that distributor, they will be processed.

Canadian Warranty Dollars

This is a reminder to our Canadian friends that Tecumseh pays out warranty claims in U.S. Dollars never Canadian. This has caused much confusion among dealers thinking they have been shorted for their repairs.

Educational Requirements for Dealers

(This replaces page 34 of the 2002 Update Book)

Educational requirements, for dealer re-classification, are as follows:

Dealer Level	Premier	Standard	Limited
Annual Update	Required	Required	Required
TMT on Staff	Required within 12 months of becoming a dealer	Recommended	Recommended
4-Cycle, OPE certification	TMT must have 4-Cycle certification	OPE 4-Cycle Required	Recommended
2-Cycle, OPE certification	Recommended	Recommended	Recommended
Driveline, OPE certification	Recommended	Recommended	Recommended
CWD or Factory four day school (unless test-out option is taken)	Required every 4 years	Required every 4 years	Required every 4 years

Additional Information:

- Tecumseh requires OPE 4 cycle certification before the TMT test can be taken.
- TMT Test Price: $45.00
- Test-Out option: Must be declared before taking the TMT test. This option is available to both new and existing dealers. It allows a dealer or prospective dealer to forgo the four day school requirements.
- If dealer fails to pass the test after choosing the Test Out option, there is no free retest and the four day school is then mandatory.
- For those not testing-out, there is a free retest if the first test was failed.
- All CWD's provide testing for OPEESA on the first Thursday of every month. They will provide additional testing by appointment. Contact your CWD for further information.
- TMT certification goes with the technician. If that technician changes employers, the dealership no longer meets Premier Dealer status and will have to test another technician.
- Verification of the employed TMT will be monitored by your distributor.

Removal of Broken Bolts in Aluminum and Cast Iron Cylinder Blocks

Wayne LeBlanc, one of our Southern dealers had this shop tip to share with us.

1. Place a flat washer over the broken bolt.
2. Weld a bead around the washer connecting the bolt to the washer.
3. Use a vise grip and work the washer back and forth.
4. If it is too difficult to loosen, weld a nut to the flat washer, put the weld in the center of the nut as well as around the perimeter leaving two perpendicular sides free of weld so access with the corresponding open end wrench may be possible.

By welding the washer and nut to the broken bolt, it causes heat to transfer down the bolt and loosens the oxidized fastener. With the extra leverage of the washer and nut it can break the fastener loose rather easily. Its a safer method than drilling and using easy-outs.

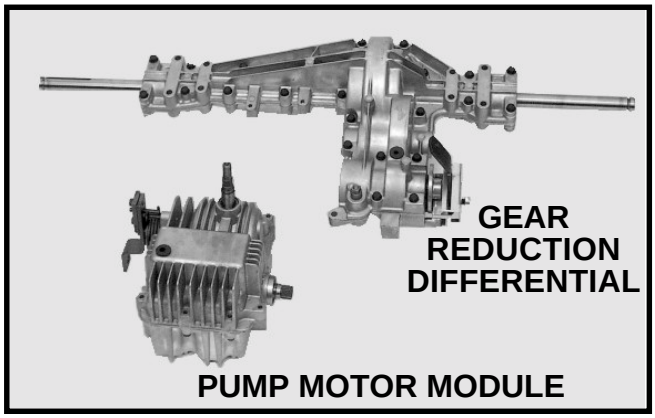
⚠ **Remove or shield any electronic component on or near the engine while welding.**

⚠ **Eliminate any flammable materials from the area while welding.**

LTH Service Instructions

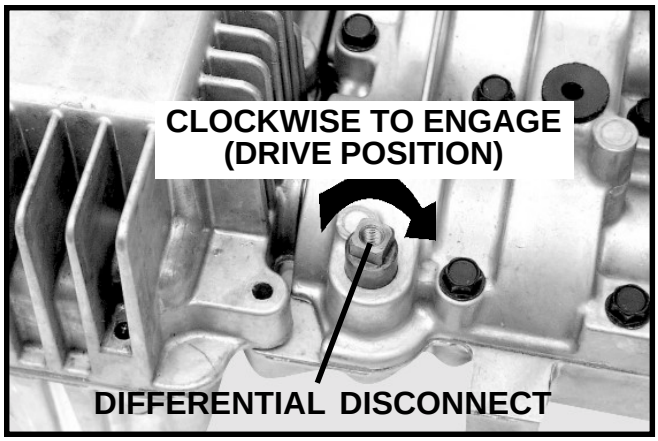
Prior to release of the repair manual covering the Lawn Tractor Hydrostatic Transaxle (LTH), we are including the servicing procedures for this latest addition to the Tecumseh/Transmission family of product. Should repair be needed, it is CRITICAL you follow the steps listed or a repeat failure could occur.

The LTH has been designed as a modular unit for easy service. In most applications, the pump can be removed from the transaxle without removing the complete assembly from the equipment. The following steps will guide you through replacement of the NON SERVICEABLE pump/motor module.

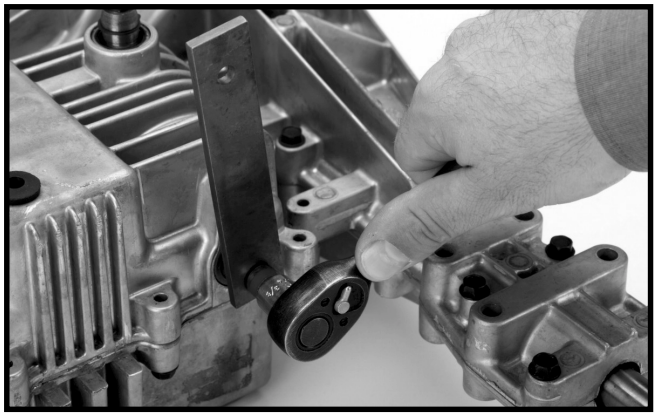


Removal - Pump & Motor Module

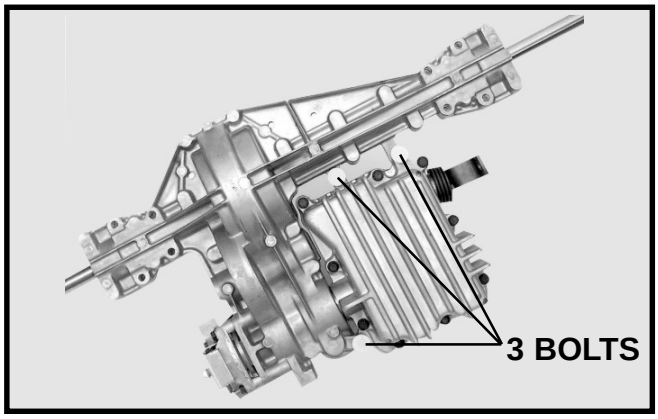
1. Begin by removing the drive belt and the control shaft linkage. Leave the differential disconnect lever in the drive position.



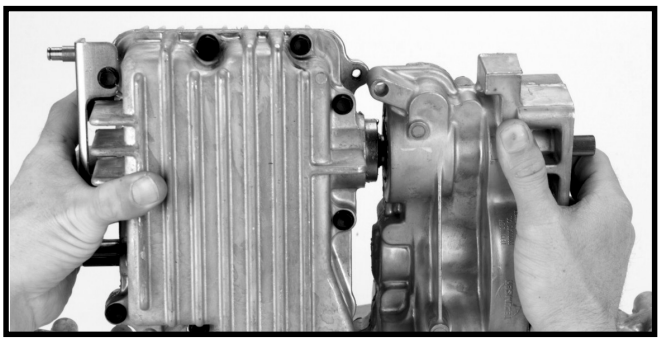
2. Remove the control lever and neutral return spring and transfer to the new module. You will also need to remove and transfer the pulley assembly.



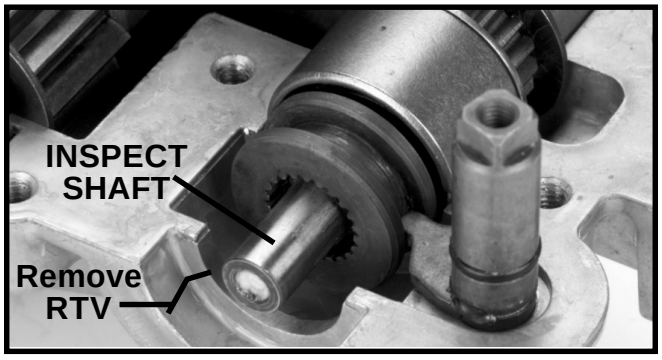
3. Remove the three hex head bolts using a 3/8" socket, which connects the pump/motor module to the transaxle.

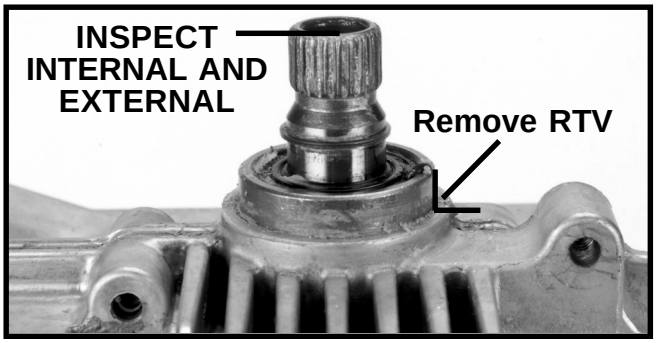


4. Rotate the pump motor module to break the RTV sealant at the joint, then remove the pump. Note the thrust washer and spring locations as shown on page 40. The thrust washer and spring position is CRITICAL on re-assembly. The flat washer goes against the snap ring on the pump.



5. Next inspect the reduction gear differential-input shaft for damage and the external splines on the output shaft of the pump/motor module. Should damage be present in either area removal of the transaxle assembly to replace the damaged shaft will be required. If both areas look undamaged, scrape any residual RTV sealant from the joint.





Installation - New Pump/Motor Module

1. Position the sleeve onto the splined input shaft of the gear reduction differential. This will open up space to receive Tecumseh Lubriplate grease as well as properly position the sleeve. Use Tecumseh small telescoping magnet part **# 670378** and a small screw-driver to work it on to the spline.

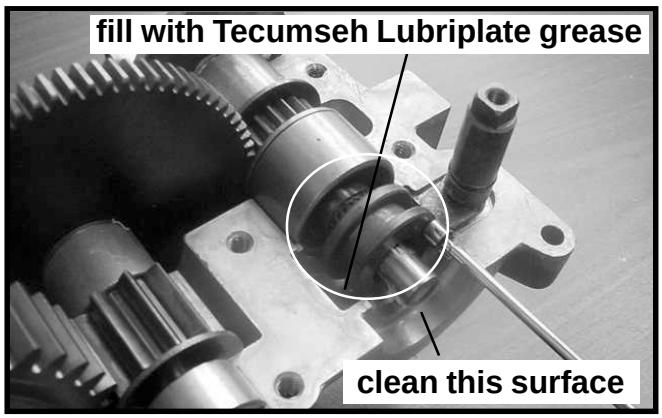


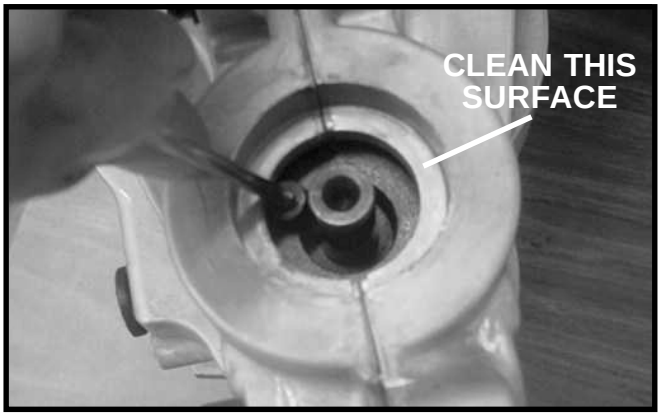
Photo showing cavity w/cover removed

2. If completely dry from differential service, fill the disconnect pocket with 1/3 oz. of Lithium grease.

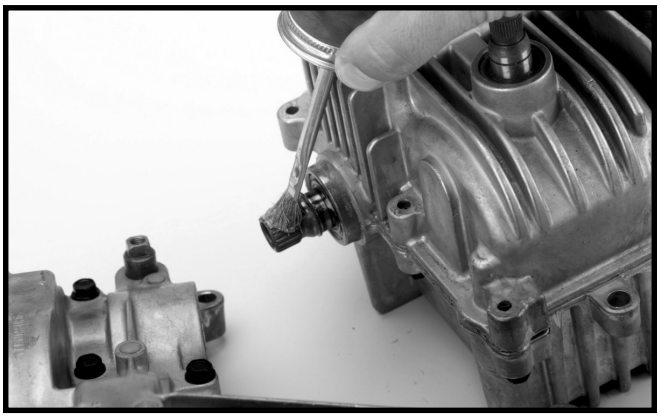
   NOTE: If you are replacing the pump/motor module you will only need to check for grease in the pocket. Add only a small amount if it appears low. Tecumseh Lubriplate part **# 730272.**

3. Wipe the sealing surface of excess Lithium grease from the previous step. Then wipe a second time with a rag with brake cleaner applied as you must have a residue free surface for the RTV sealer. (Step 6)

NOTE: Make sure the differential disconnect collar is still in the engaged position (on the spline).

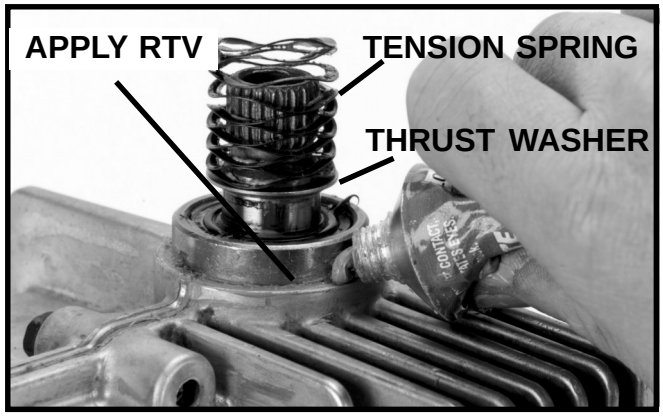


4. Next apply anti-seize lubricant to the external extension shaft and its mating internal shaft on the pump.

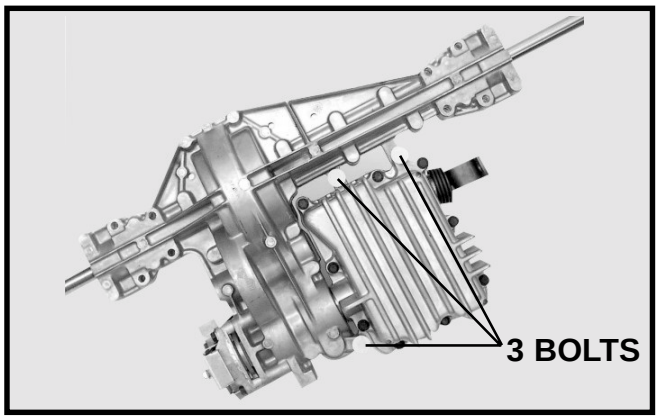


5. You are now ready to install the pump. Install the thrust washer and coil spring on the output shaft of the pump/motor module. The thrust washer will sit on the snap ring from the output shaft with the coil spring to follow.

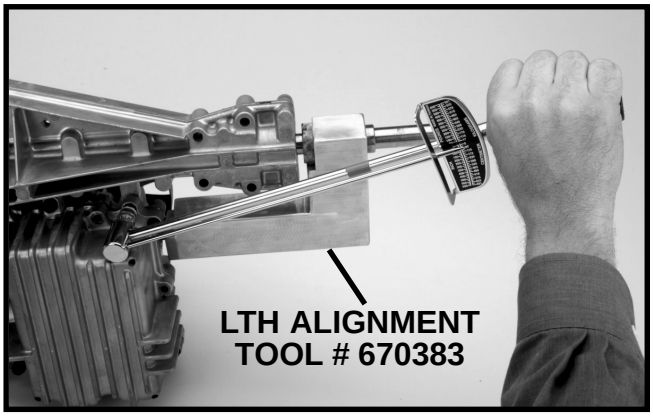
6. Apply a 1/4 inch (6mm) bead of RTV silicone on the shoulder of the pump housing that makes contact with the transaxle as shown. RTV sealant prevents moisture and impurities from entering the disconnect cavity.



7. Carefully install the pump/motor module back on the transaxle. Twist the module until the spline slides into the disconnect collar. Install the three bolts, but **DO NOT** tighten them.

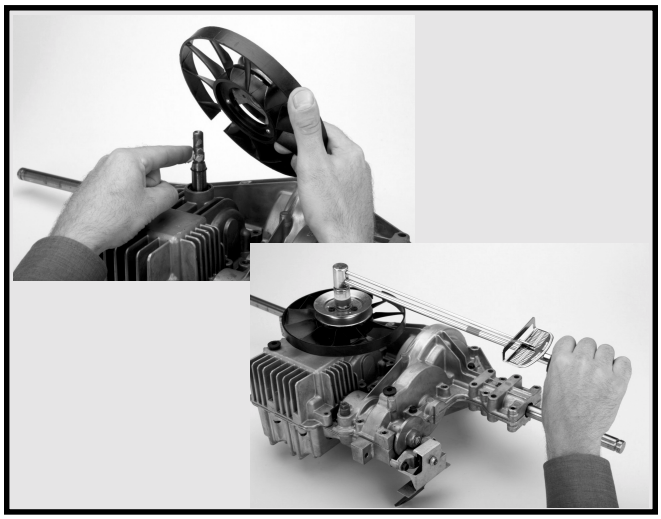


8. Install the REQUIRED alignment tool part # **670383** over the axle and the control shaft. With the alignment tool installed, torque the three bolts to 90 inch Lbs. (10 Nm) then remove.



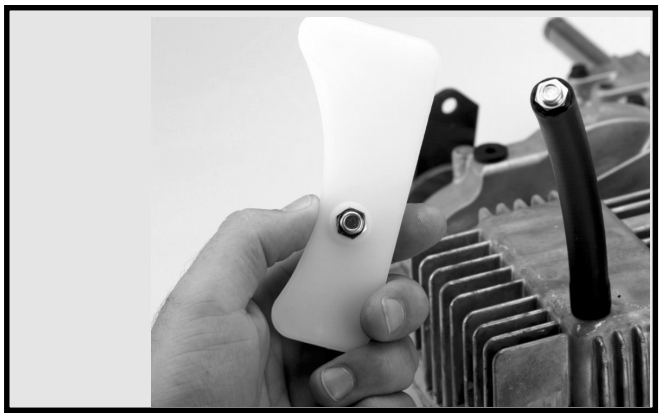
9. Apply anti-seize to the splines of the input shaft. Transfer the drive pulley/fan assembly and carefully torque the nut to 30 ft lbs./360 in. lbs. (40 Nm).

   CAUTION: ***Excessive torque could break the shaft ALWAYS use a torque wrench***.



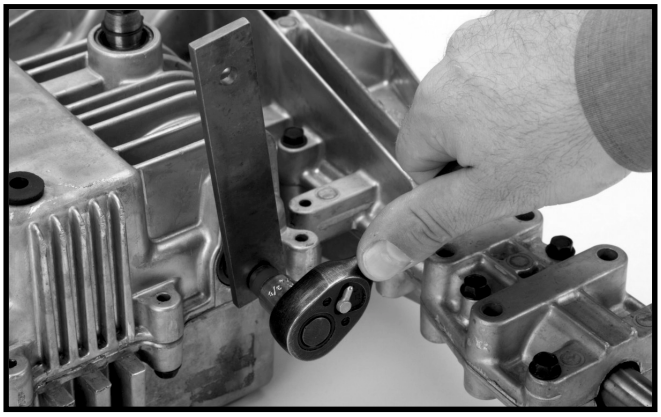
10. Position the pump/motor module on a level surface and remove the rubber oil fill plug. Install the new grommet and expansion tank supplied with the NEW pump.

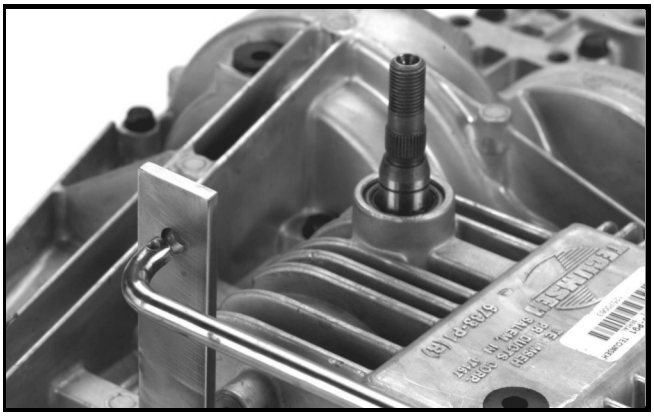
    CAUTION: ***DO NOT allow any contamination into the pump or FAILURE will occur.***



11. Install the neutral return spring (if equipped) and the control lever. Apply a small amount of blue Loctite (thread lock) to the bolt; install and torque it to 90 inch lbs. (10 Nm).

    NOTE: The bolts that hold the control lever and disconnect arm are 1/4" fine thread.





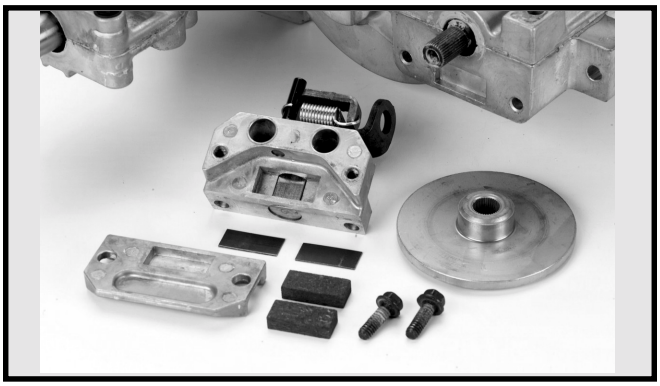
12. Next with the control shaft still in the neutral position, install the OEM linkage and drive belt. If the differential disconnect linkage was removed, it is CRITICAL to check for NO pre-load in the drive position. The OEM linkage rod MUST fall in at this point. If the link does not fall, linkage adjustment or repair is required as severe transaxle damage will occur.

Servicing the LTH Gear Reduction Differential

The Gear Reduction Differential part of the LTH has many of the time tested parts previously used in the 900 and MST models.

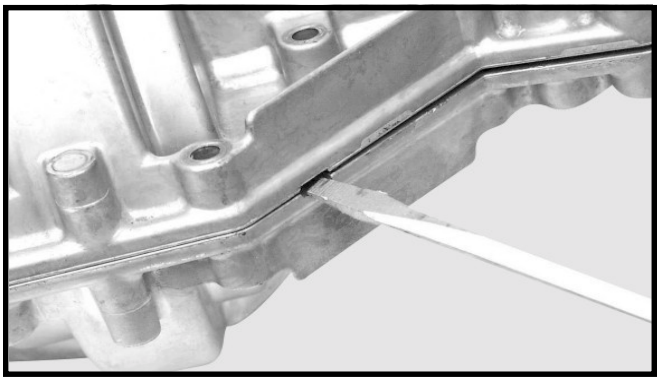
The following steps will review the disassembly/ assembly procedures and any areas that may need inspection.

Disassembly of Transaxle

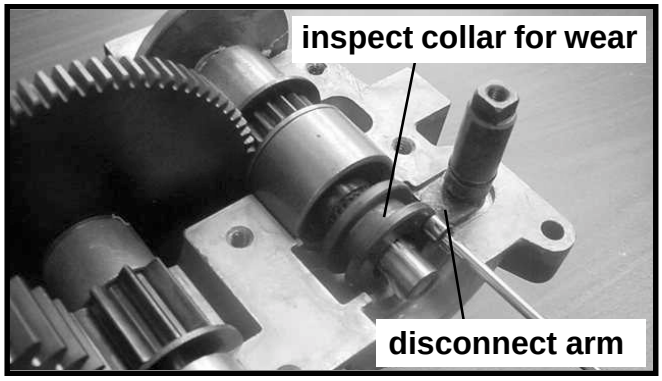


1. With the Pump/Motor module removed, remove the break assembly and inspect the pads for excessive wear.

2. Now remove the oil fill plug with a needle nose pliers and rolling motion as shown. With the plug removed, tip the unit over and drain the oil.

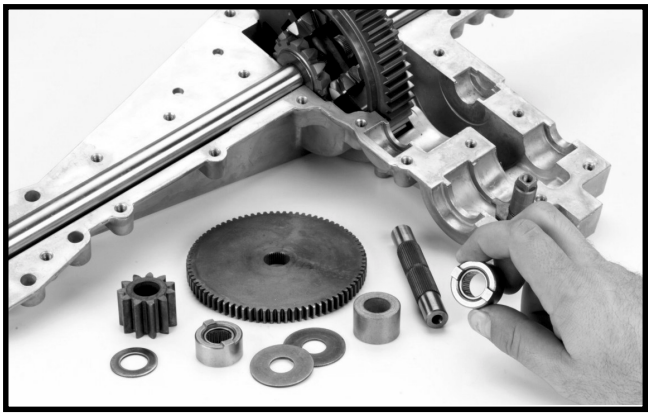


3. Next remove all the cover bolts. Then using the dedicated pry points, insert a screwdriver and twist to break the sealant between the case and cover.

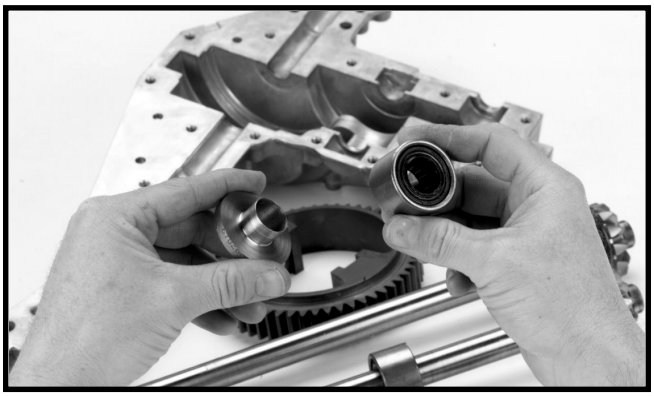


4. Next inspect the differential disconnect arm and collar for wear. Should excessive wear be found the OEM linkage was most likely misadjusted or damaged holding pressure on the brakeshaft and disconnect collar, causing wear. After damaged parts are replaced, follow the OEM linkage adjustment procedure upon installation. If the linkage was improperly assembled causing damage to the mechanical disconnect collar and arm, file a warranty claim with the OEM (if within the warranty period).

5. Inspect the bearing seal on the brake shaft assembly for wear or damage and replace as necessary.



6. Now remove the output shaft assembly. Inspect the bearings and gears for signs of excessive wear or damage and replace any worn or damaged parts.

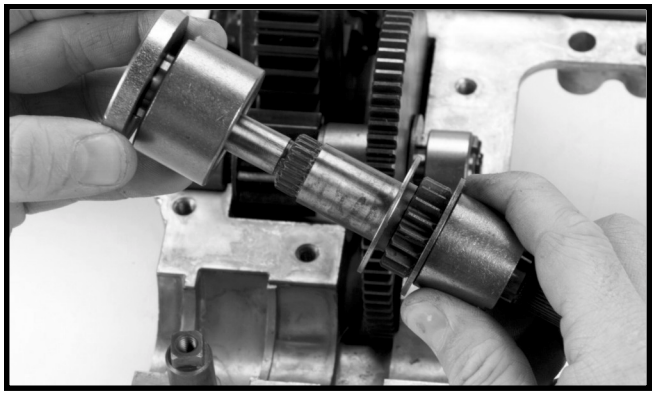


7. Next remove the differential assembly and inspect the gears and the axle bearing/seal assemblies for wear or damage. Clean all parts.

   Tech Tip: Prior to final sealing of the unit re-check for thrust washers between all rotating and any stationary surfaces. Also verify all bearing/seal assembly locator tabs are in the proper positions.

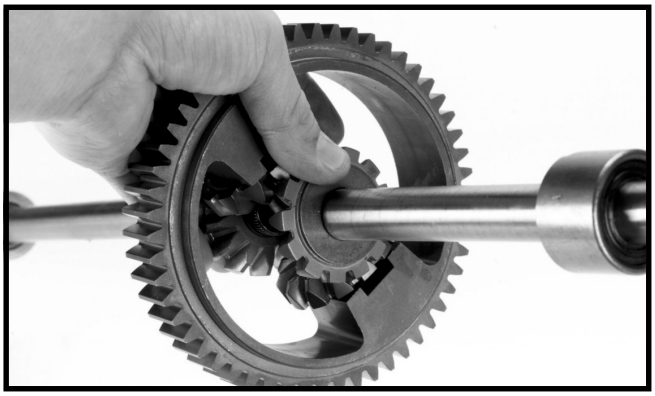
Assembly LTH Gear Reduction Differential

ASSEMBLY TIP: Always make sure there is a thrust washer between rotating and stationary surfaces (see picture).



NOTE: Protect all seal/bearing assemblies by using seal protector part # **670262A** or seal damage will occur.

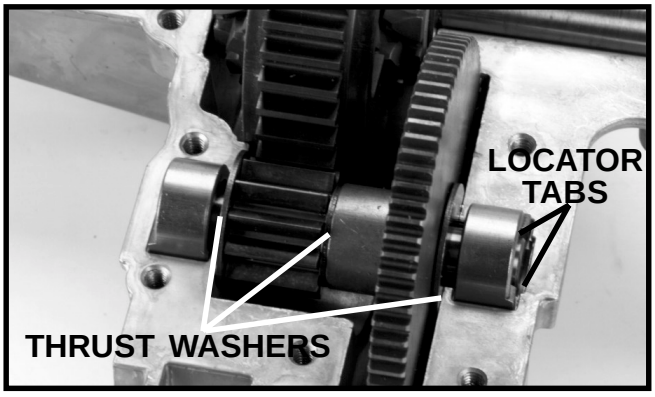
The "A" version of this seal protector has been modified to work on these seal/bearing packs. The standard **# 670262** will NOT work.



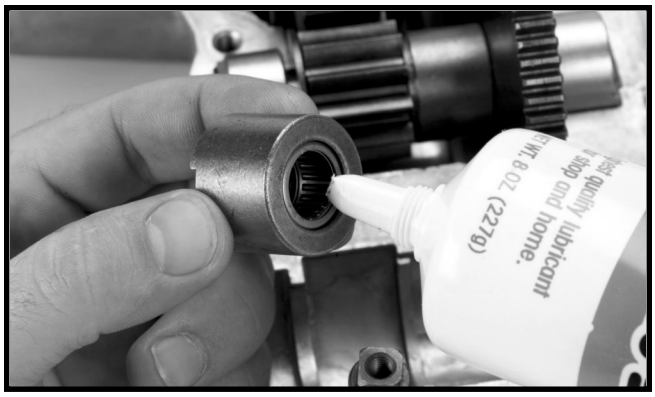
1. Start by installing the differential assembly and ensure the axles lay flat in both bearing pockets. Now rotate the axle bearings into their locked position. If you question that the differential assembly is not properly installed, spin axles by hand. The differential assembly should turn freely and not "climb" out of the case.

   CAUTION: ***Axle keyways can be extremely sharp.***

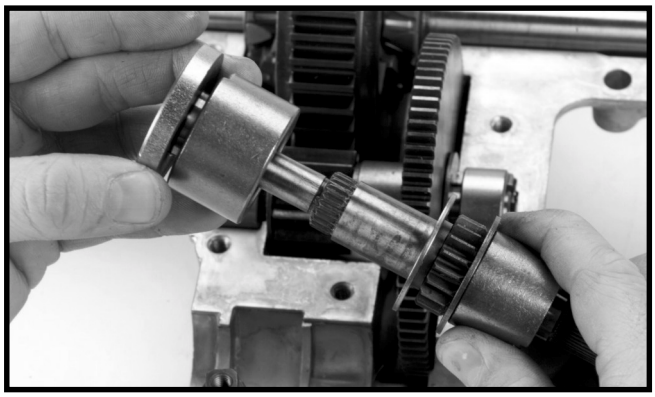
2. Install the output shaft assembly as shown. Rotate the bearings into their dedicated lock positions.



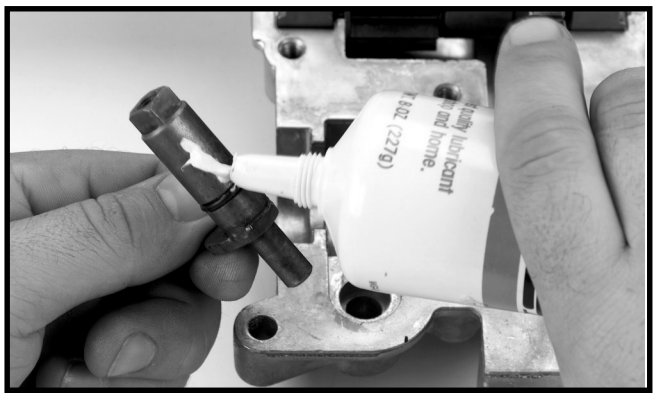
3. Assemble the brake shaft using the seal protector # 670262A. Apply Lubriplate to the brake shaft assembly.



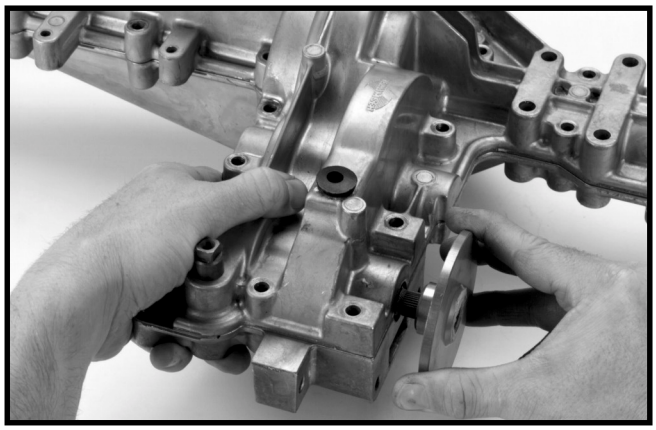
4. Before installing the disconnect lever and collar, place the bearing seal assembly on the brake shaft. Then lubricate the top and bottom of the disconnect lever with Lubriplate and install the disconnect lever and collar. Leave the disconnect collar in the engaged position. Fill the pocket with Lubriplate grease part **# 730272,** use the whole tube.



CAUTION: DO NOT apply excessive grease that could contaminate the sealing surface on assembly.



5. Before applying RTV sealant to the cover, it is a good idea to install the cover and perform a rock test to insure all the bearings and axle assemblies are installed correctly. The cover should be seated tightly to the case and the axles should rotate freely. Place the brake disc backwards on the brake shaft and rotate while holding the cover down on the case. Turning the brake disc by hand should easily turn all axle gears.



6. You are now ready to apply Loctite 598 RTV sealant to the cover and bearing seal pockets as shown. Install and torque the cover bolts to 90 inch lbs (10Nm).

NOTE: ***A small bead must be applied to the bearing/seal housing in the cover prior to assembly.***

7. Use the Tecumseh small telescoping magnet part # **670378** and a small screwdriver to work the disconnect collar onto the spline. Fill the disconnect pocket with Tecumseh Lubriplate **# 730272**, use the whole 3/8 oz. tube. This ensures that no oxidation will occur on the disconnect spline.

8. Wipe the sealing surface of excess Tecumseh Lubriplate grease from the previous step. Then wipe a second time with a clean rag with brake cleaner on the rag as you must have a residue free surface for the RTV sealer to be applied.

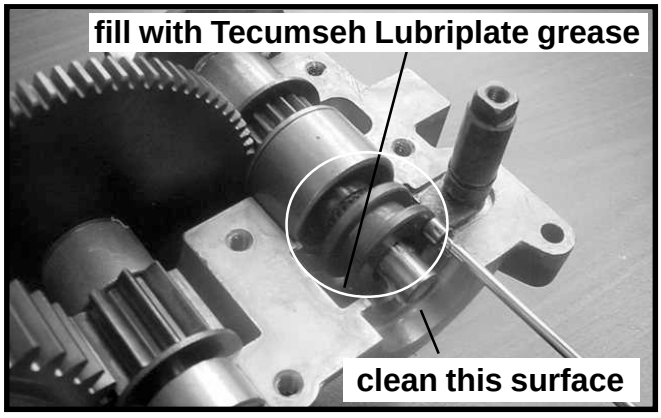
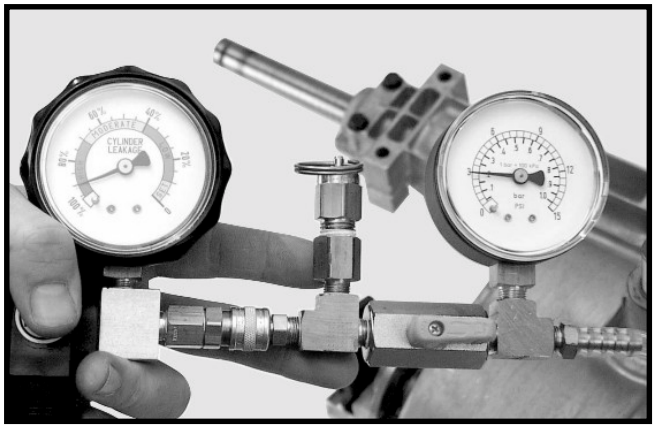


Photo showing cavity w/cover removed

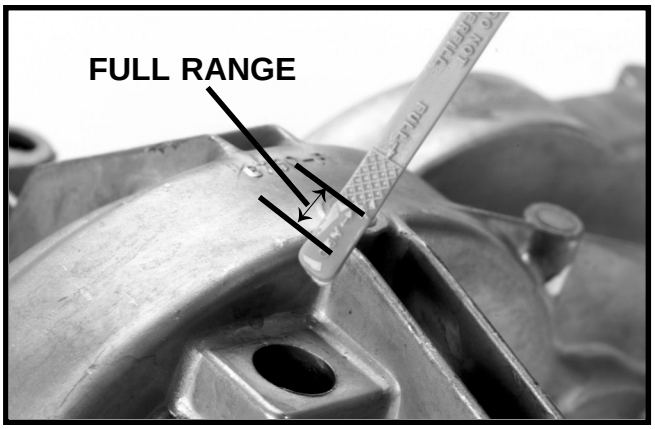
NOTE: ***Make sure the differential disconnect collar is still in the engaged position (on the spline).***

9. To insure customer satisfaction and no returns for a leaky unit, you should pressure test the unit. Use Tecumseh pressure tester part # **670340**. Remember do no exceed 3 PSI on fresh sealant or the RTV could be blown out causing a leak.

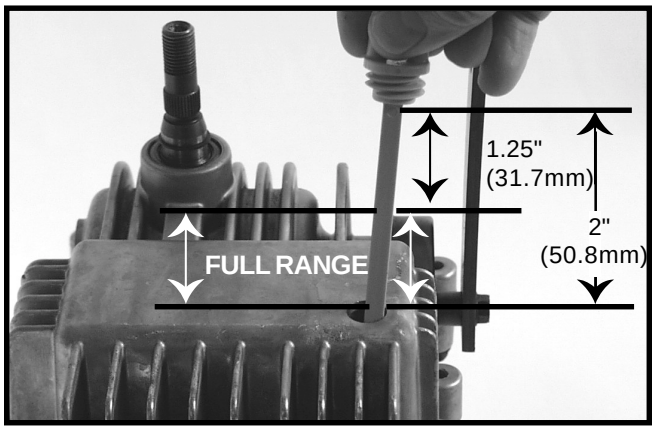
   NOTE: All checks are made on a cold unit



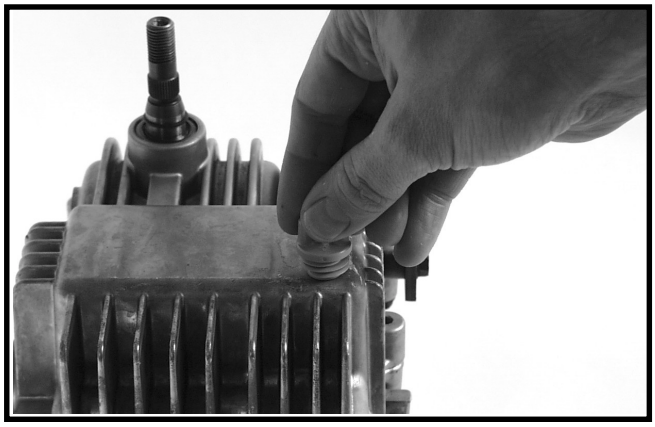
10. **Checking/Filling the Differential Oil Level**
    Fill the unit with 8 oz. (236 ml) of 80W90 Tecumseh part # **730229B**. Checking the differential oil level: To check the oil level in the differential we recommend using dipstick part # **35941**. THROUGHLY clean the area around the fill plug, and then remove it using a needle nose plier. Insert the dipstick at slight angle as shown and remove. The oil level should be between the first "D" from the end in the "add" word and the add line. If the oil level is low and a leak not be obvious, you should pressure test the unit to locate the leak and repair as needed.



11. **Checking the Pump/Motor Oil Level**
    If you suspect a low or excessive oil level in the pump/motor pack it can be checked using a RE-MARKED dipstick part # **35941**. Before removing the expansion tube or tank it is **CRITICAL** you completely clean the area around the plug.
    NOTE: Any contamination allowed in the unit will cause unit failure.



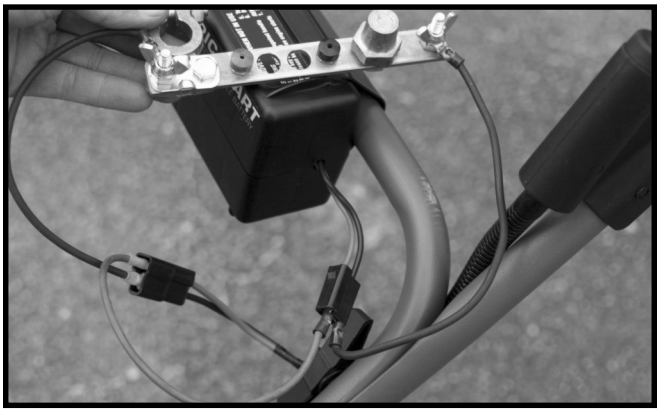
12. Next mark the dipstick at 1.25 and 2.0 inches (31.7-50.8mm) as shown to create a capacity range. Now install the gauge until it stops on the top of the pump surface as shown. The oil level should be between the lines. If the oil level is low and no leak is obvious you should pressure test the unit, using leak test kit part # **670340** or similar tool, DO NOT exceed 10 PSI pressure. If no leak is found you can add oil use ONLY Tecumseh's synthetic hydraulic oil part # **730228**. If the unit is within warranty, pump replacement will be required.



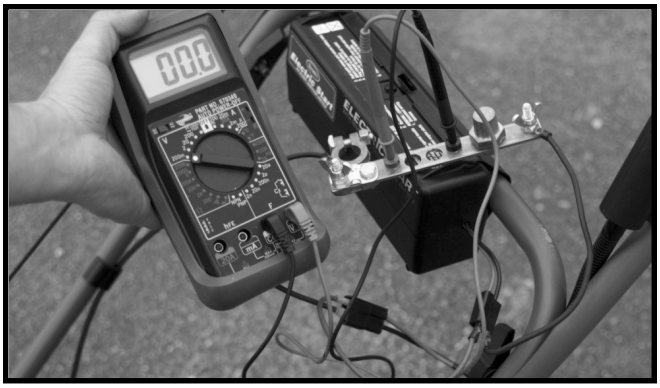
Rotary Mower Testing

Starter Draw Test, Alternator Output Test, Battery Capacity Test

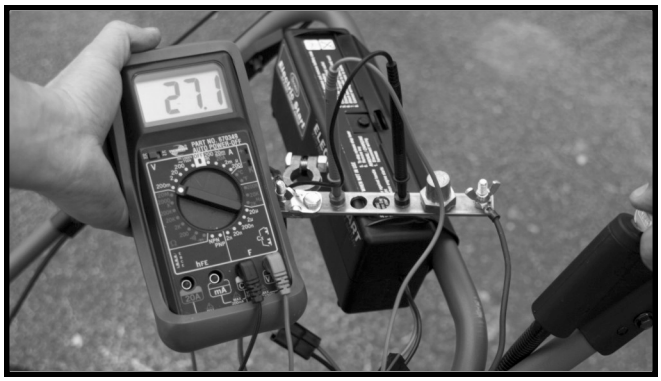
*Tools needed: Multimeter and shunt Tecumseh part # **670385** with three jumper wires.*



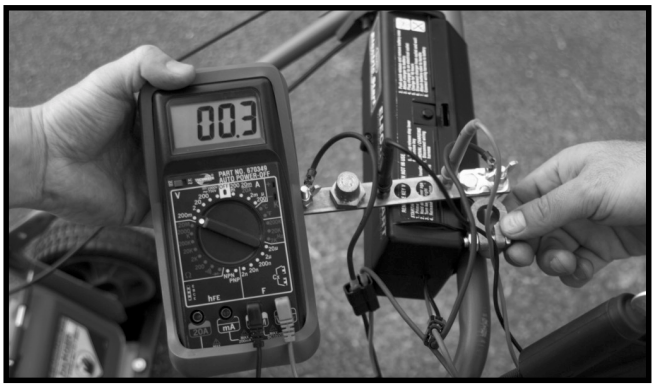
1. Disconnect the battery connection on an electric start rotary mower and place the shunt between the black wire from the mower's wire harness by plugging in the black jumper wire to one end of the shunt and the other black jumper wire on the opposite end of the shunt to the battery connection. Reconnect the positive (red wires) with the red jumper wire.



2. Turn on the Multimeter placing the dial to the Millivolt Scale (mV) with the AC/DC measurement in the DC position. Plug the black lead into the “COM” input and the red lead into the V/Hz input on the meter. Plug corresponding leads into the shunt, red to red and black to black as shown. Readings will be in Amps with the shunt connected and the meter dialed to the millivolt scale.



3. The meter will read the current in Amps that the starter is drawing from the battery. Watch as the starter is cranking. If the mower starts before you can get a reading, discount the spark plug boot.



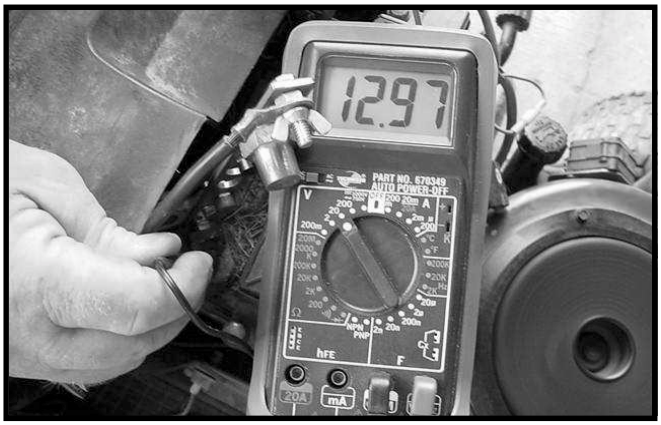
4. Once running, the current that the alternator is producing will be seen as 00.3 Amps or 300 milliamps on the meter.

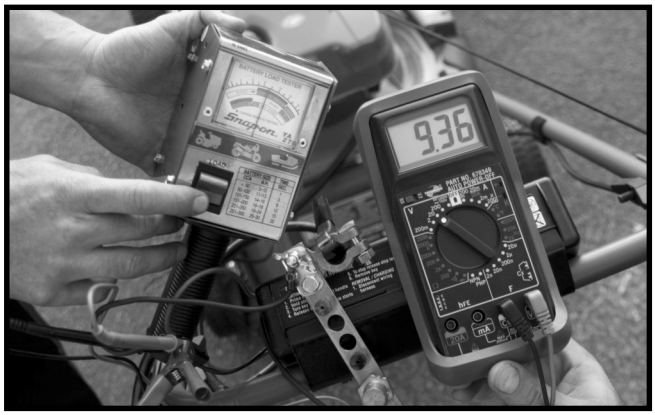
5. With the shunt connected as in step 4 you can see the maximum output of the alternator 400 milliamps as you load the battery with a load tester.

Battery Capacitance Test

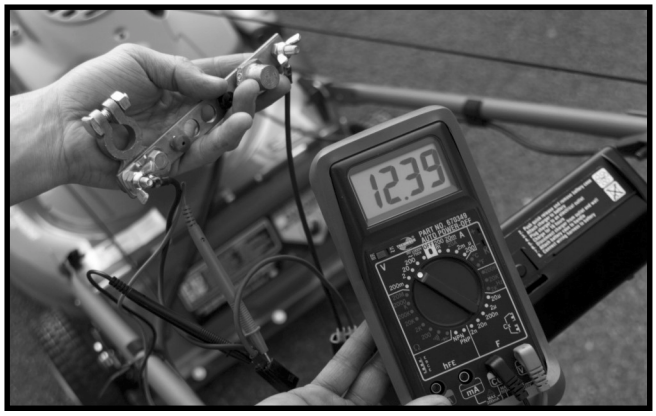
Battery testers come in a variety of capacities. Tecumseh recommends no more than a 75 Amp load model. A higher load will be excessive for industry batteries.

To test for battery capacitance on a tractor, touch a battery load tester to the battery leads at the connector. Turn meter to the 20 volt scale, load the battery and watch the meter while the load is being applied. If voltage goes down and then up past 12 volts immediately, (as this one did) the capacitance of the battery is full and it should be replaced. If good, the battery should **SLOWLY** rise in volts up to a reading above 12 volts.





To test for battery capacity on a walk behind mower, unplug the red and black meter leads from the shunt and plug them into the battery connector. Place a battery load tester to the battery leads at the connector. Turn meter to the 20 volt scale, load the battery and watch the meter while the load is being applied. If voltage goes down and then up past 12 volts immediately, the capacitance of the battery is full and should be replaced. It can no longer receive a charge. If good, the battery should **SLOWLY** rise in volts up to a reading above 12 volts.



Tractor Testing

Starter Draw Test, Alternator Output Test, Battery Capacity Test

Tools needed: Multimeter and shunt

1. Disconnect the negative battery cable on the tractor and place the shunt in series between the negative battery post and the negative cable.

2. Turn on the Multimeter placing the dial to the Millivolt Scale (mV) with the AC/DC measurement in the DC position. Plug the black lead into the “COM” input and the red lead into the V/Hz input on the meter. Plug corresponding leads into the shunt, red to red and black to black as shown. The meter will read the current in Amps that the alternator is producing.

3. The meter will read the current in Amps that the tractor starter is drawing from the battery at start up. If the tractor starts before you can get a reading, disconnect the spark plug boot. Once running, the Amps that the alternator is producing will be seen.

4. With the shunt connected you can see the maximum output of the alternator as you load the battery as seen in the photo on the right.

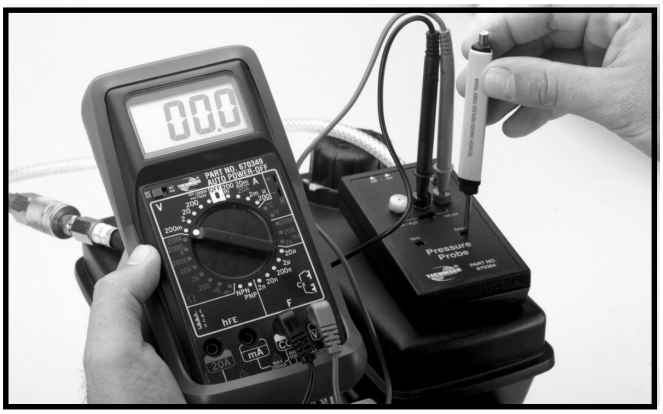
Compression Testing

Compression Test

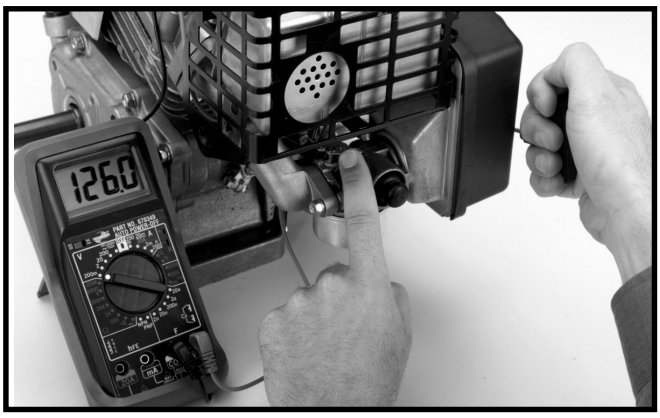
Tools needed: Multimeter and Pressure Probe

1. Turn on the Tecumseh Pressure Probe. Notice the Low Battery light should flicker once, which indicates a good battery. Turn probe selector to the 100 PSI position.

2. Turn on the Multimeter placing the dial to the Millivolt Scale (mV) with the AC/DC measurement in the DC position. Plug the black lead into the "COM" input on the meter and the "Common" black input on the Pressure Probe. Plug the red lead into the V/Hz input on the meter and the red "100 PSI" input on the Pressure Probe. Look at the meter, make sure to Zero the adjustment located directly below the Red 100PSI input with a small flat blade screw driver.



3. Install the compression hose into the spark plug hole and connect the probe to the compression hose. While holding the throttle in the Wide Open Position pull over or attempt to start the engine with the electric starter. If pulling by the recoil, pull the engine four to five times. Record your reading, lbs per square inch of compression.



Vacuum Testing

Crankcase Vacuum Test

Tools needed: Multimeter and Pressure Probe

NOTE: The most important part of any crankcase pressure test is to have some vacuum. If positive pressure is present it indicate one of the following.

- Defective breather assembly
- Leaking gasket(s), defective "O" ring(s) or seals
- Extreme cylinder/piston ring wear

NOTE: If pressure is above the maximum range as listed, inspect the air filter assembly for restrictions.

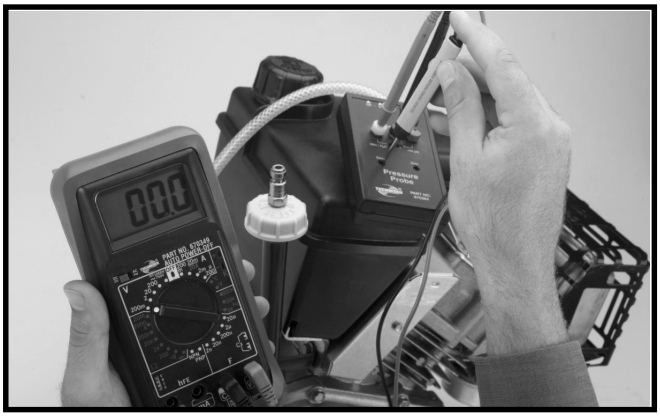
1. Turn on the Tecumseh Pressure Probe. Notice the Low Battery light should flicker once, which indicates a good battery. Turn the probe selector to the 30in/H_2O position.

2. Turn on the Multimeter placing the dial to the Millivolt Scale (mV) with the AC/DC measurement in the DC position. Plug the black lead into the “COM” input on the meter and the “Common” black input on the Pressure Probe. Plug the red lead into the V/Hz input on the meter and the Yellow 30in/H_2O input on the Pressure Probe. Look at the meter, with a small flat blade screw driver make sure to zero the adjustment located directly below the Yellow 30in/H_2O input.

   NOTE: Insert the "O" ring and replace as needed to insure a good seal on the oil fill tube.

3. Connect the supplied Oil tube cap adaptor to the top of the oil fill tube and connect with the vacuum/pressure probe.

4. Start the engine and note the reading which will be vacuum in inches of water.



Crank Case Vacuum Chart

VERTICAL SHAFT ENGINES

Displacement	Engine Model	CCV Max	CCV Min
127 cc	LEV80	12	5
163 cc	LEV100	16	8
185 cc	LEV115	12	4
195 cc	LEV120	20	5
172 cc	OVRM105	15	5
195 cc	OVRM120	16	5
358 cc	OHV110/115/120/125/130	27	6
490 cc	OHV14/15/16/17	11	7
691 cc	VT18/20/22	16	6
318 cc	TVM195	25	9
358 cc	TVM220	27	8
163 cc	VSK100	15	7

HORIZONTAL SHAFT ENGINES

Displacement	Engine Model	CCV Max	CCV Min
156 cc	H30/35/40	23	5
172 cc	OHH50	8	2
195 cc	OHH55/60/65	12	2
318 cc	OHM90/110	25	10
358 cc	OHM120	16	2
318 cc	HM80/90	18	9
358 cc	HM100	22	9
172 cc	OHSK50	14	2
195 cc	HSSK50/55	29	3
195 cc	OHSK55/60/65/70	15	2
222 cc	HSK60	20	9
247 cc	HSK70	20	8
318 cc	OHSK80/90/110	23	10
318 cc	HMSK80/90	25	10
358 cc	OHSK110/120/130	22	2
358 cc	HMSK100/110	28	7

NOTE: All measurements must be taken at high speed no-load.

Oil Pressure Testing

Oil Pressure Test

Tools needed: Multimeter and Pressure Probe

CAUTION: The probe MUST be kept above the oil level or damage will occur.

1. Turn on the Tecumseh Pressure Probe. Notice the Low Battery light should flicker once, which indicates a good battery. Turn the probe selector to the 100 PSI position.

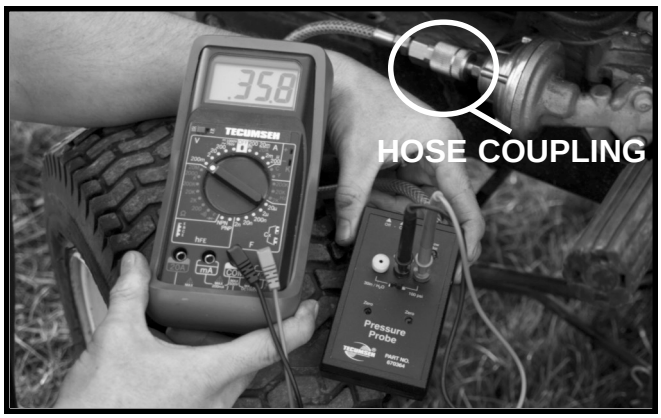
2. Turn on the Multimeter placing the dial to the Millivolt Scale (mV) with the AC/DC measurement in the DC position. Plug the black lead into the "COM" input on the meter and the "Common" black input on the Pressure Probe. Plug the red lead into the V/Hz input on the meter and the red "100 PSI" input on the Pressure Probe. Connect the oil pressure adapter nipple/oil filter pressure adapter on the engine. Look at the meter, make sure to Zero the adjustment with a small flat blade screw driver located directly below the Red 100PSI input.

3. Holding the pressure probe above the engine, start the engine and note the reading. Oil pressure less than 10 PSI suggests a system issue that will require disassembly and repair.

1997 MODEL OHV 170 @ IDLE SPEED

4. Once the pressure test is complete, disconnect the pressure probe hose from the engine and allow to thoroughly drain away from the pressure probe.

Tech. Tip: After removing the filter adapter you can reconnect it to the meter hose and allow any art in the line to drain out.



1997 MODEL OHV 170 @ HIGH SPEED

Europa News

The following issues regarding Bulletins or Policies apply to Europa only.

OHC (overhead cam) New Engine

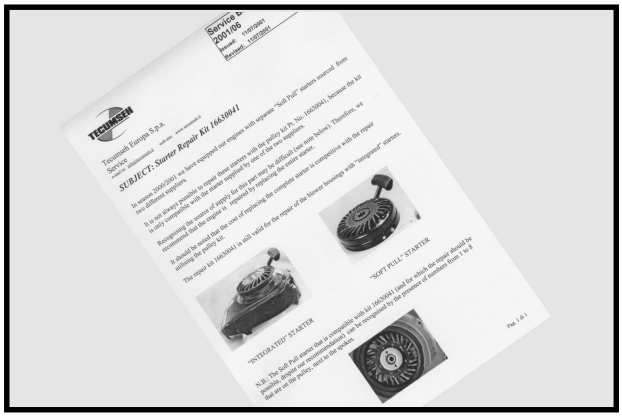
We are pleased to introduce our latest engine to the Tecumseh horizontal family of products. This engine features overhead cam technology, producing 7.5 HP and will be available this year.

* *Dual Ball Bearings flywheel/PTO end*
* *Extra quiet muffler*
* *Optional Low Oil Sensor*
* *Large triple stage air filter*
* *Cast iron cylinder sleeve basic*
* *Large 5 litre (5.6 quarts) fuel tank*

Starter Service Bulletin 2001/06

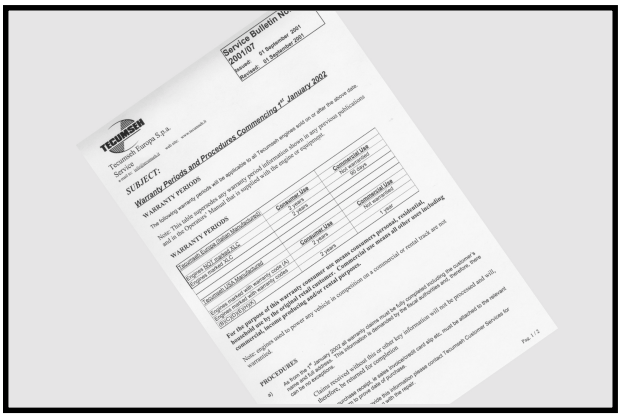
We have issued this European ONLY service bulletin to address the proper repair procedures for the bolt-on recoil. The NEW recommended procedure is to replace (NOT repair) this style with a complete assembly.

Please note the service pulley kit part number **16630041** would still be used on the integral starter/blower housing assembly.



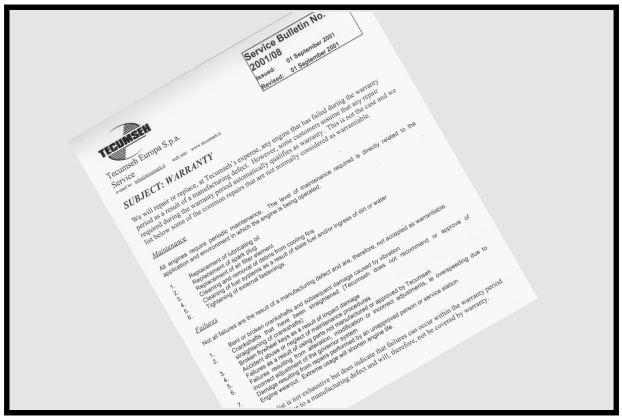
Service Bulletin 2001/07

This bulletin covers the new warranty policy regarding all engines sold in the European marketplace and will be in effect as of January 1, 2002.



Service Bulletin 2001/08

This bulletin clarifies those items that are covered by warranty and those considered as customer maintenance and, therefore, NOT warranty. The bulletin also reviews typical types of failures caused by neglect and, therefore, NOT warrantable.

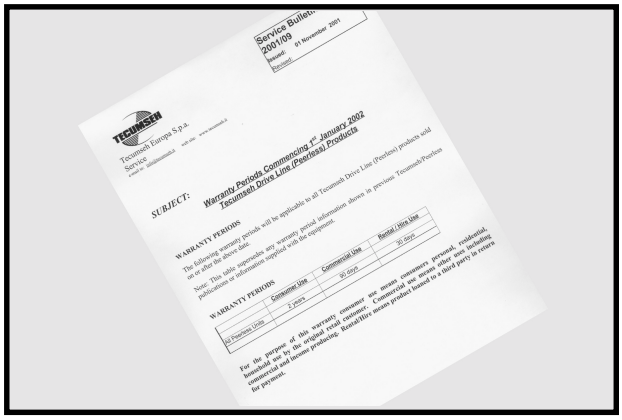

Service Bulletin No.
2001/08
Issued: 01 September 2001
Revised: 03 September 2001

Tecumseh Europa S.p.a.

SUBJECT: WARRANTY

Drive Line Bulletin

This bulletin reviews the warranty periods that apply to all drive train products sold in the European market, effective January-02. This reflects the changes in accordance with European law. If you do not have a copy, please contact your distributor.


Service Bulletin
2001/09
Issued: 01 November 2001
Revised:

Tecumseh Europa S.p.a.

SUBJECT: Warranty Periods Commencing 1st January 2002 Tecumseh Drive Line (Peerless) Products

WARRANTY PERIODS

The following warranty periods will be applicable to all Tecumseh Drive Line (Peerless) products sold on or after the above date.

Note: This table supersedes any warranty period information shown in previous Tecumseh/Peerless publications or information supplied with the equipment.

WARRANTY PERIODS	Consumer Use	Commercial Use	Rental / Hire Use
All Peerless Units	2 years	12 months	12 months

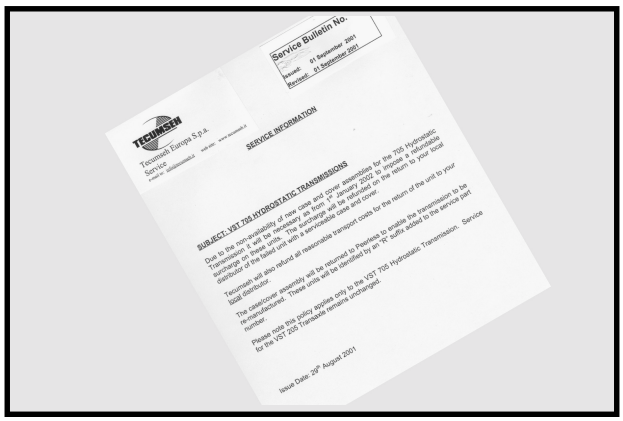
For the purpose of this warranty consumer use means consumers personal, residential, recreational use by the original retail consumer. Commercial use means any use including commercial and income producing. Rental/Hire means product leased to a third party or future for payment.

VST 705 Service Policy New Europe ONLY

The VST 705 transmission has principally been used in products manufactured and sold in the European market place. This large concentration of product has produced the need for a NEW replacement unit policy.

Effective January 1, 2002 we are establishing a refundable core surcharge program on these units. We will also refund any reasonable return freight cost through your distributor to you.

When the inventory of new service units has been depleted only remanufactured units will be available.


Service Bulletin No.
2001/08
Issued: 01 September 2001
Revised: 01 September 2001

Tecumseh Europa S.p.a.

SERVICE INFORMATION

SUBJECT: VST 705 HYDROSTATIC TRANSMISSIONS

Issue Date: 30th August 2001

Aspen Fuel Approved

This alternative fuel is now approved for use in our 4-Cycle engines in place of the standard unleaded fuel in the European market place.

Service Tool List and Order Form

Special Service, Diagnostic, Measurement & Repair Tools Description	Part Number	User Cost	Premier Dealer	Standard Dealer	Limited Dealer	On Hand	On Order
*Tool Kit	670195E		M	M	M		
Tachometer (Inductive or Vibratach)	670156 Vibratach or 670365 Inductive		M or R	M or R	M or R		
Ignition Tester	670366		M	M	M		
Multi Meter VOM & Temperature	670349		M	M	M		
Compression Tester	670358		M	M	M		
Outside Micrometers 0-1"	670350		M	R	R		
1-2:	670351		M	R	R		
2-3"	670352		M	R	R		
3-4:	670353		M	R	R		
Telescoping Gauge Set	670357		M	R	R		
Dial Indicator	670241		M	R	R		
Inspection Plate (Plate Glass) - Obtain Locally			R	R	R		
Feeler Gauge Set	670361		M	M	M		
Inch Pound Torque Wrench 0-600 inch lbs.	670363		M	M	M		
Valve Spring Compressor "C" Type	670362		M	M	M		
Piston Ring Compressor	670359		M	M	M		
Piston Ring Expander	670117		M	M	M		
**Valve Seat (Neway LG3000 Kit or comparable)	670347		M	M	M		
**Face Cutting Set (Neway 612 Gizmatic)	670348		R	R	R		
Cylinder Hone (Flex)	670360		M	M	M		
Starter Bendix Ring Tool	670346		M	R	R		
Crankcase Vacuum / Oil pressure adapter	670364A		M	R	R		
Hole Gauge Set	670356		M	M	M		
Oil Vacuum 110 Volt Pump only	670354		R	R	R		
Extreme Duty Oil Tank	670367		R	R	R		
Oil Vacuum Kit (Includes vac and tank)	670379		R	R	R		
Leak Test Kit - Complete	670340		R	R	R		
Leak Test Transaxle / Carburetor Adapter Kit	670345		R	R	R		
Dial Caliper, 6"	670368		R	R	R		

* See Tecumseh Form #694862 for Complete Tool Kit List
** Neway LG2000 or 102 kits can be upgraded by calling Neway direct: 1-800-248-3889
M = Mandatory Tools (Must have or place order)
R = Recommended Tools
NOTE: Prices subject to change
Equivalent tools may be used.

Dealer Name _____
Address _____
City, State, Zip _____
Phone _____
Account No. _____

TECUMSEH®

SERVICE BULLETIN 116

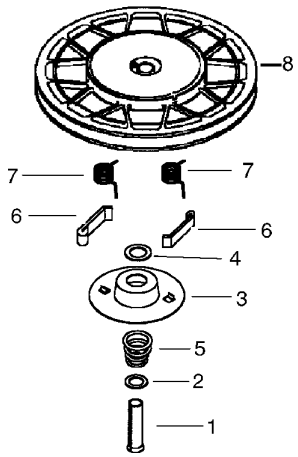
INFORMATIONAL

ISSUED: September 1993

REVISED: June 2001

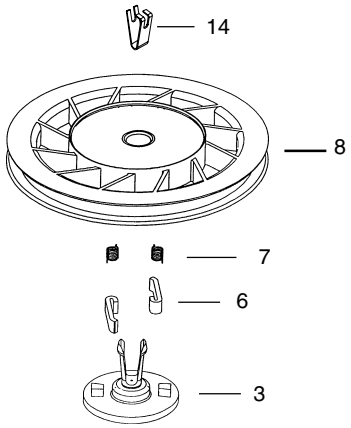
SUBJECT: Recoil Identification

During the past few years we have introduced you to several new styles of recoil assemblies. These recoils are used on all small and medium frame series engines. To assist you in making repairs, we have developed the quick reference illustrations below. By looking at the direction and style of ribs between the inner and outer parts of the pulley, you can use this chart to obtain the correct parts. Due to various housings, these parts will not be shown. **When parts are needed in addition to the ones shown in these illustrations, complete replacement should be considered.**



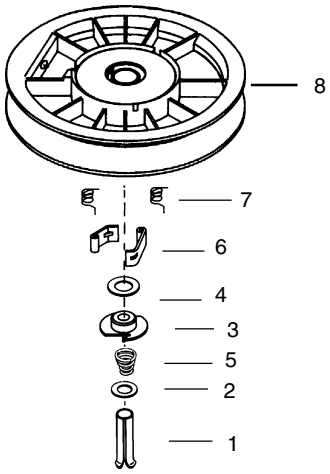
TYPE 1

1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590696	Retainer
4	590601	Washer
5	590697	Brake Spring
6	590698	Starter Dog
7	590699	Dog Spring
8	590700	Pulley & Rewind Spring Assy. (non-snow)
8	590709	Pulley & Rewind Spring Assy. (snow)



TYPE 2

3	590740	Retainer
6	590616	Starter Dog
7	590617	Dog Spring
8	590618A	Pulley & Rewind Spring Assy. (non-snow)
8	590645A	Pulley & Rewind Spring Assy. (snow)
14	590760	Locking Tab



TYPE 3

1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590679	Retainer
4	590601	Washer
5	590678	Brake Spring
6	590680	Starter Dog
7	590412	Dog Spring
8	590681	Pulley & Rewind Spring Assy. (non-snow)
8	590682	Pulley & Rewind Spring Assy. (snow)

TYPE 1, 2 & 3

590535 - Starter Rope (Length 98" - 9/64" diameter)
590701 - Starter Handle (non-snow)
590574 - Mitten Grip Handle (snow)

TECUMSEH®

SERVICE BULLETIN 415

4 CYCLE

ISSUED: June, 2001

SUBJECT: Defective Push Rods

Models Affected: All OHH and OHSK Engines

D.O.M.'s (date of manufacture) Affected: 0348 through 1073

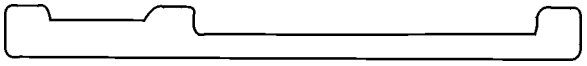
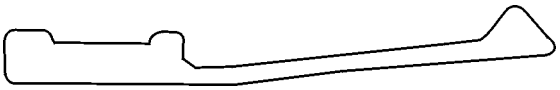
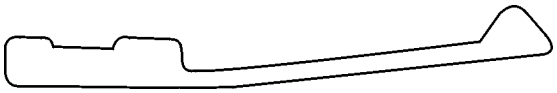
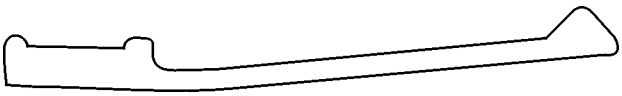
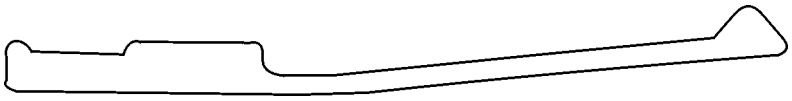
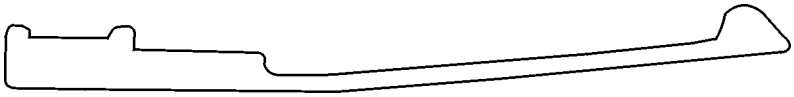
The engines listed above were manufactured with push rods that have an aluminum body with steel tips. These push rods have the potential to cause the engine to stop running. Any unit that is within the date codes listed should have the aluminum body push rods replaced even if they appear to be in good condition.

The repair requires the replacement of both push rods with the standard all steel rods, order two of service part number **36629** from your normal source of supply**.** When the push rods have been replaced pull the engine through one complete revolution to insure they are properly installed and seated.

Then with the engine at TDC on the compression stroke, set the cold valve clearance at .004 inch (.102 mm) on both valves. Install a new rocker box cover gasket (part number **35626**) and torque in a X pattern to 40 inch lbs (4.5 Nm).

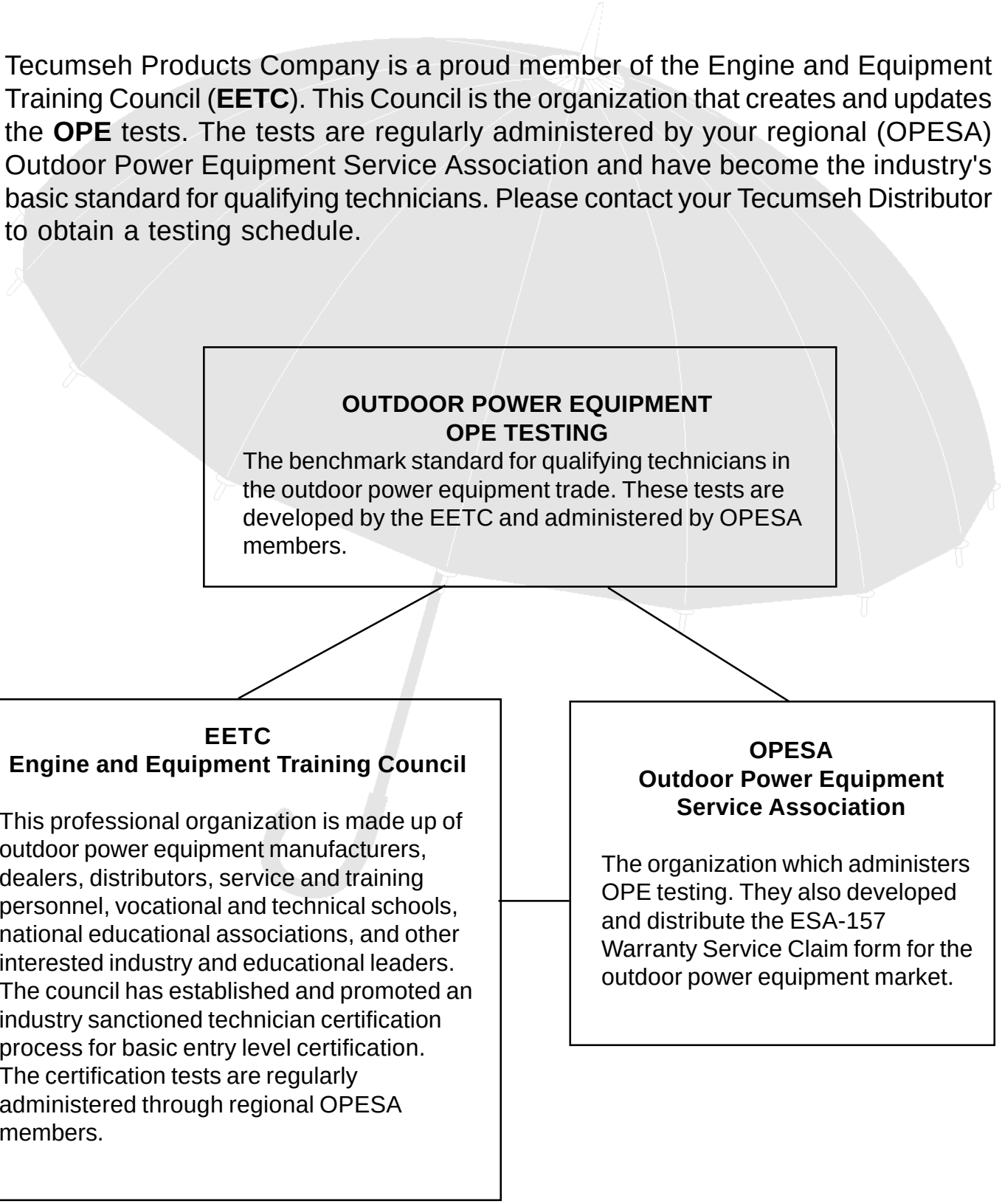
When the repair is completed file an ESA 157R warranty claim for the parts and 30 minutes labor.

Tecumseh Transmissions
Shift Key Quick Reference Guide

Service No.	Length	Where Used	Shape and Size (shown actual size)
792071	2.950" 7.493 cm	500s	
792089A	2.625" 6.668 cm	700/800/801/910	
792094	2.812" 7.142 cm	728/A/729/A/757/A/759/780/792	
792018	3.165" 8.039 cm	900s	
792123A	3.980" 10.109 cm	820/920/930	
792136A	3.980" 10.109 cm	820/930/MST	
792131	4.040" 10.262 cm	820-014/A	

The OPE Umbrella

Tecumseh Products Company is a proud member of the Engine and Equipment Training Council (**EETC**). This Council is the organization that creates and updates the **OPE** tests. The tests are regularly administered by your regional (OPESA) Outdoor Power Equipment Service Association and have become the industry's basic standard for qualifying technicians. Please contact your Tecumseh Distributor to obtain a testing schedule.



Technician Shortage

Yes, there is a shortage! Skilled service technicians in the power equipment industry are in short supply. At a recent industry meeting, one equipment manufacturer indicated that their dealers were short more than **3,500** technicians to service their products. It is conceivable that the real numbers for the whole industry may be many times higher. The U.S. Bureau of Labor indicates that **70% of jobs by the year 2005** will require **technically trained** professionals. So we've got to get going if we are to have the technicians we need for our future.

Changing the Perception

You certainly can't blame parents for wanting the best future for their children. However, we must take the lead in changing their perception of our industry. If the image of the service technician remains negative, then we have very little hope of developing a new generation of skilled service professionals.

We, as an industry, must take advantage of the growth in the service sector by educating parents and counselors in the benefits of becoming a professional service technician. Through our school accreditation program, technician certification, and student recruitment video we can make a difference.

Your Challenge...

This is where **Tecumseh dealers** come in. We need your help to insure that skilled professional service technicians are available to repair the power equipment products you sell. You can support the industry's efforts in insuring the availability of skilled technicians by becoming a member of EETC. Won't you please join other Tecumseh dealers who are already members in this worthwhile endeavor.

For more information call (262) 367-6700 or e-mail us at eetc@eetc.org

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COMPLETE THE MEMBERSHIP FORM BELOW AND MAIL WITH YOUR CHECK TO:

Equipment & Engine Training Council
PO Box 648
Hartland, WI 53029
(262) 367-6700 · Fax (262) 367-9505

Tecumseh Dealer Membership: $50.00
Please make checks payable to Equipment & Engine Training Council

Name: _____ Title: _____

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

E-mail: _____

2002 Update Seminar Technician Test

1. How many multiple choice questions are there on the TMT test?
   A. 75 B.100 C.25 D. None its all essay

2. To file electronic warranty you must fill out a Warranty Web Site Access Request form and send it to?
   A. Central Warehouse Distributor
   B. Tecumseh Products Company
   C. ESA
   D. There is no form needed

3. Why did the OVM/OHV throttle link change in 1993?
   A. To compensate for a change in the intake pipe.
   B. It changed in 1995 not 1993
   C. Because of the use of composite bushings.
   D. None of the above

4. Can the Climate Guard Kit part # 730643 be used on any HM engine?
   A. Yes B. No

5. What is the length of the new breather tube used on OHSK 50-70's ?
   A. 3.5" B. 5.3" C. 5.5" D. 5"

6. What is all included in the oil vac repair kit?
   A. Diaphragm, reeds, gaskets and "O" rings
   B. Reeds and gaskets
   C. Reeds gaskets and "o" rings
   D. Pump motor

7. Which RFI kit is used on OHV engines
   A. 730645 B. 730646 C. 730647 D.730648

8. Why did the OHV and TVT change to using a Belleville Washer rather the a lock washer?
   A. To reduce thread damage on the crankshaft.
   B. Belleville washers hold torque better
   C. Cost
   D. Lock washer breakage

9. What words will appear on the new guide plate used on OHH and OVRM engines.
   A. Tabs down B. New plate
   C. Side down D. Side up

10. How is the cotter pin on the OHV oil pressure relief system held in place?
    A. Bending the ends of the cotter pin
    B. Slightly bending the center with a punch
    C. Held in place by the detent on the cotter pin
    D. Held in place by gravity

11. What material is the OHH throttle link made of?
    A. Galvanized steel B. Magnesium
    C. Carbon steel D. Stainless steel

12. What is the horse power of an engine with the specification number of TVT 691-600430D?
    A)18 hp B.18.5 hp C. 20 hp D. 22 hp

13. What problem was solved with the added relief given to the pinion on the AC & DC starters used on OHH engines?
    A. False starts B. Non engagement
    C. Binding D. Over heating

14. What was one additional benefit spun off by putting in a heavier reed in the OHH/OHSK breather?
    A. Reduced oil consumption B. Easier starting
    C. Hotter Spark D. No backfire

15. Did the part number of the gasket change on the OVRM/LEV when the increase of fiber was made?
    A. Yes B. No

16. What is the part # of the spacer used between the block and the intake pipe on the OVRM 105?
    A. 37203 B. 37302 C. 35680 D. 36580

17. What is the part # of the seven amp alternator that is being replaced on the medium frame engines?
    A. 611290 B. 611097 C.611256 D. 611175A

18. What was the reduction in temperature (degrees) when the spacers were added to the TVT cooling system?
    A. 25 B. 15 C.40 D.30

19. How does the 6.5 OHH accommodate increased fuel flow into the combustion chamber?
    A. Higher flow mufflers
    B. Increased spring rate tension
    C. Automotive style valve keepers
    D. Larger valves

20. Why was the breather tube relocated on the OHM engine?
    A. To prevent oil from saturating the air filter.
    B. To clean out the carburetor
    C. The tube had been shortened
    D. Enhance engine performance

21. What is the practical advantage of the redesigned shroud used on OVRM utility applications?
    A. Increased horse power
    B. Better appearance
    C. Dent proof
    D. Better Cooling

22. What does the word LEAP stand for?
    A. Low emissions Arctic Pressure
    B. Large Enhanced Auto Prime
    C. Jump
    D. Low Emissions Advanced Performance

23. Certified TMT Technician may make judgement calls on Warranty decisions when employed by a Standard dealer.
    A. TRUE B. FALSE

24. The best way to successfully pass the 2.5 HR. TMT test is by attending a Factory/TSN 4-Day (32 hour) teardown school.
    A. TRUE B. FALSE

25. Emissionized carburetors such as the Bridged Series 11 carburetor may be soaked in a carburetor dip for no longer than 1/2 hour.
    A. TRUE B. FALSE

26. The positive or negative Pressure Probe tester shown in the book can be safely used in any angle.
    A. TRUE B. FALSE

27. Newly sealed transaxle case/cover assemblies should be tested at _____ PSI.
A. 5 PSI B.7 PSI
C. 3 PSI D. 10 PSI

28. When servicing the series “7” bowl assembly you should replace the bail lever only if it is damaged ?
A. TRUE B. FALSE

29. The HSK 600 series engine carburetor was changed to eliminate the ___.
A. High speed eratic running
B. Low speed no-load erratic running
C. Mid range surging
D. Poor performance

30. When servicing the series eight through eleven model carburetors you must always locate and replace all three main nozzle/air bleed "O" Rings ?
A. TRUE B. FALSE

31. During service of the series “11” Bridged, carburetor you must clean which of the following passages?
A. The idle passage through the side leg
B. The main metering jet
C. The Main metering jet idle passage
D. All of the above

32. The open end of the fuel inlet needle ALWAYS faces the air intake side of the carburetor?
A. TRUE B. FALSE

33. Emissionized engines that use a closed breather system are all connected to the air filter backing plate and the hole plugged if disconnected if removed.
A. TRUE B. FALSE

34. The extended prime well on both the standard and bridged series “11” carburetor performs what function.
A. Holds some of the prime charge for initial cold start-up and performance.
B. Improves hot restarting through a ready supply of fuel.
C. Improves the engine high speed operation.
D. All of the above.

35. Proper service of the LTH differential assembly requires the use seal protector part number ____
A. 670260 B. 670262A C. 670195E D. 670377

36. Both of the restrictors used in the bridge series “11” carburetor are replaceable using part number 34443A.
A. TRUE B. FALSE

37. When checking crankcase pressure you should always find a positive pressure which prevents oil leakage.
A. TRUE B. FALSE

38. The rounded brass portion of carburetor tool 670377 is used to set float height at Tecumseh's recommended height.
A. TRUE B. FALSE

39. The differential and Hydrostatic oil levels on the LTH transaxle can be checked using a modified engine dipstick service part number _____.
A. 640241 B. 35621 C. 670262A D. 35941

40. Tecumseh has introduced three new Snow King Tune-up Kits.
A. TRUE B. FALSE

41. Tecumseh’s new customer friendly Fuel Stabilizer/ Cleaner “Fuel Guard Plus” has how many pills per package _____.
A. One B. Three C. Four D. Six

42. The new brake system available for the LTH improves the _____.
A. Transaxle performance
B. Braking force
C. Need for adjustment
D. None of the above

43. Rotary mower charging systems typically have a built in 12 volt alternator on the engine that charges at a rate of_____
A. 1 Ampere B. .5 Ampere
C. 3 Ampere D. .3 Ampere

44. The synthetic fluid level on a “spotlessly clean” properly filled and COLD, LTH Pump/Motor must be _____from the casting surface.
A. 1.0 - 2.0 inch B. 1.5- 2.0 inch
C. 1.25-2.0 inch D. .5-1.25 inch

45. A compression test can be used as a quick check for basic troubleshooting a reading below 50 PSI suggests which areas to pursue _____.
A. Cylinder Head Gasket
B. Valves
C. Piston Rings/Cylinder Condition
D. All the above

46. Effective January, 2002 warranty claims within the United States and Canada that are not properly filled will be returned to your distributor for handling.
A. TRUE B. FALSE

47. The diagnostic section of the TMT test involves accurately completing a ESA warranty claim form. In the test and when working at your dealership Box 11 (labeled Condition Found/Probable Cause of Failure) is where the customers interpretation of the problem is to be recorded. I can fill in this box while the customer is telling me their story.
A. TRUE B. FALSE

48. To properly prime a Tecumseh carburetor I need to instruct my customers to depress the primer bulb with the thumb waiting .5 seconds between primes. For a total of 3. In colder weather it may be higher.
A. TRUE B. FALSE

49. The sealant applied at the joint of the pump/motor and the final drive of the LTH transaxle to ____.
A. Prevent oil from leaking out of the pump
B. Seals moisture and impurities out of the pocket
C. Eliminates loss of final drive oil
D. All of the above

50. Battery load testers used for lawn and garden batteries should not exceed ___ amps load.
A. 120 Amps B. 75 Amps C. 100 Amps D.50 Amps

Notes

TECUMSEH FACTORY TRAINING APPLICATION

Please Print

Dealership Name _____ Phone No. _____ Code No. _____

Address _____ City _____ State _____ Zip _____

Student's Name _____ Student's Signature _____

Employer's Name _____ Employer's Signature _____

4-DAY SCHOOL SCHEDULE - Factory Facilities

Grafton, Wisconsin
Date

Dec. 9-14, **2001**
Jan. 6-11, **2002**
Jan. 13-18
Feb. 10-15
March 10-15
March 24-29
Nov. 3-8
Dec. 1-6

Douglas, Georgia
Date

Nov. 4-9, **2001**
Nov. 11-16
Jan. 27-Feb.1, **2002**
Feb. 24-March 1

TEACHER'S SCHOOL

Grafton, Wisconsin
Date

Jul. 29-Aug. 3, **2001**
Aug. 4-9, **2002**

Douglas, Georgia
Date

July 7-12, **2002**

FACTORY CERTIFIED TRAINING ☐ Application to attend

TEACHER'S SCHOOL ☐ Application to attend

Master Technician Testing will only be offered for pre-registered applicants with proof of holding OPE 4-Cycle certification.

Master Technician Test ☐ I would like to take the Master Technician Test at the reduced cost of $45.00.

School Dates: 1st choice _____ 2nd choice _____

Please check *all* that apply

☐ Single Accommodations **$475.00**
☐ Double Accommodations **$350.00**
☐ Factory School Only **$200.00**
☐ Tecumseh Master Technician Test **$45.00**

☐ Smoker
☐ Non-Smoker

To make payment using a credit card, please fill out the following information:

(Check One)
☐ Master Charge ☐ Visa ☐ Discover

Print Name (as it appears on card):

Account Number: _____

Signature of Card Holder

Exp. Date: _____ Phone Number: _____

For registration information call the Education Department: 262-377-2700 or fax your application: 262-376-8238.
The Tecumseh Network Support Distributors in your area may hold in-house Factory Certified Training.
Please contact them for further information.

FOUR-DAY TECHNICIAN EDUCATION PROGRAM

Tecumseh has been working with our distributor education team to develop a completely updated Technician Education Program, designed to meet the needs of today's dealers and the technicians they employ. Throughout the coming years the Tecumseh Support Network, consisting of all Central Warehouse Distributors in the USA and Canada, will offer four-day schools at their facilities. This training will be equivalent to being educated at one of our Tecumseh factory facilities.

The following program outline is a sample of what you can expect from these classes. At the end of the Four-Day session, testing will be offered in both the Outdoor Power Equipment (OPE) and Tecumseh Master Technician (TMT) certifications. During the coming months, you will be hearing from your Tecumseh sales representative about the special benefits that are part of being TMT certified. All certifications stay with the technician and, depending on your level of proficiency, should increase your value to the dealership.

Best of all, the course itself may be free or available to you at reduced cost. Your distributor sales representative can provide the details.

Day One Information Retrieval Systems Computer, Microfiche and Paper 2-Cycle Engine Theory and hands on covering TC, HSK and AV Product	**Day Three** Enduro VT Twin Teardown/Assembly Fuel Systems New Emissions Carburetors Electrical/Charging Systems
Day Two 4-Cycle Overview L-Head and Overhead Valve OHH Enduro Teardown/Rebuild and Running Adjustments LEV Teardown/Reassembly	**Day Four** Failure Analysis Warranty Procedures Transaxle Teardown/Reassembly MST, 800 Series LTH and VST Overview

We have listed all of the training directors from your regional distributors. These Team Tecumseh educators can supply you with a complete list of classes available. Please contact them directly.

The Tecumseh Factory School Schedule and Application are located in the back of the book.

Tecumseh Factory Education Facilities

BILLIOU'S INC.
1343 S. Main
Porterville, CA 93257
Phone No. 559-784-4102
Fax No. 559-781-1875
EDUCATION DIRECTOR: RICK GROVES

CENTRAL POWER DISTRIBUTORS
1101 McKinley St.
Anoka, MN 55303
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

CPD-OH
8181 Washington Church Rd.
Dayton, OH 45458
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

CENTRAL POWER DISTRIBUTORS
N90W14635 Commerce Dr.
Menomonee Falls, WI 53051
Phone No. 612-576-0901
Fax No. 612-576-0920
EDUCATION DIRECTOR: BILL TORGERUD

W.J. CONNELL CO.
65 Green St.
Foxboro, MA 02035
Phone No. 508-543-3600
Fax No. 508-543-8394
EDUCATION DIRECTOR: MARK DIAS

ENGINES SOUTHWEST
1255 N. Hearne
P.O. Box 67 (Zip Code 71161-0067)
Shreveport, LA 71107-7108
Phone No. 318-222-3871
Fax No. 318-425-4638
EDUCATION DIRECTOR: BRYAN CLARK

MEDART - KANSAS CITY
2644 S. 96th Street
Edwardsville, KS 66111-3483
Phone No. 636-282-2300
Fax No. 1-800-695-9530
EDUCATION DIRECTOR: GARY FIEBIG & BRIAN JONES

MEDART - ST. LOUIS
124 Manufacturers Drive
Arnold, MO 63010-4727
Phone No. 636-282-2300
Fax No. 1-800-695-9530
EDUCATION DIRECTOR: GARY FIEBIG & BRIAN JONES

POWER EQUIPMENT SYSTEMS
1645 Salem Industrial Dr., NE
PO Box 669 (Zip Code 97308)
Salem, OR 97303
Phone No. 503-585-6120
Fax No. 800-637-9243
EDUCATION DIRECTOR: WAYNE WENDLAND

SMITH ENGINES INC.
4205 Golf Acres Dr.
P.O. Box 668985
Charlotte, NC 28266-8985
Phone No. 704-392-3100
Fax No. 704-392-5208
EDUCATION DIRECTOR: HARRY WILLIAMS

SMITH ENGINES INC.
2303 Premier Row
Orlando, FL 32809
Phone No. 407-855-4288
Fax No. 407-855-4736
EDUCATION DIRECTOR: BILL ROBERTS

SMITH ENGINES INC.
1665 Lakes Parkway Suite 116
Lawrenceville, GA 30243
Phone No. 770-237-0707
Fax No. 770-237-0210
EDUCATION DIRECTOR: JOHN VANEK

TECUMSEH PRODUCTS COMPANY
900 North Street
Grafton, WI 53024
Phone No. 262-377-2700
Fax No. 262-377-4485
CONTACT: PAUL BECHWAR

TECUMSEH DOUGLAS FACILITY
Tecumseh Products Company
1545 Kellog Drive
Douglas, GA 31535
Phone No. 262-377-2700
Fax No. 262-377-4485
CONTACT: PAUL BECHWAR

CPT CANADA POWER TECH. LTD.
161 Watline Ave.
Mississauga, ON L4Z 1P2
Phone No. 905-890-6900
Fax No. 905-890-0147
EDUCATION DIRECTOR: ROBERT BARTON

CPT CANADA POWER TECH. LTD.
#101 - 10411 0 178 Street
Edmonton, AB T5S 1R5
Phone No. 780-453-5791
Fax No. 780-454-8377
EDUCATION DIRECTOR: BILL BERNARD

CPT CANADA POWER TECH. LTD.
MONTREAL BRANCH
226 Migneron
St. Laurent, PQ H4T 1Y7
Phone No. 514-731-3559
Fax No. 514-731-0064
EDUCATION DIRECTOR: MICHAEL BOISVERT

Tecumseh Update 2002 Test
Answer Sheet for Test

Return to Your Distributor for Scoring NOT Tecumseh

1.	A	B	C	D	26.	A	B	C	D
2.	A	B	C	D	27.	A	B	C	D
3.	A	B	C	D	28.	A	B	C	D
4.	A	B	C	D	29.	A	B	C	D
5.	A	B	C	D	30.	A	B	C	D
6.	A	B	C	D	31.	A	B	C	D
7.	A	B	C	D	32.	A	B	C	D
8.	A	B	C	D	33.	A	B	C	D
9.	A.	B	C	D	34.	A.	B	C	D
10.	A	B	C	D	35.	A	B	C	D
11.	A	B	C	D	36.	A	B	C	D
12.	A	B	C	D	37.	A	B	C	D
13.	A	B	C	D	38.	A	B	C	D
14.	A	B	C	D	39.	A	B	C	D
15.	A	B	C	D	40.	A	B	C	D
16.	A	B	C	D	41.	A	B	C	D
17.	A	B	C	D	42.	A	B	C	D
18.	A	B	C	D	43.	A	B	C	D
19.	A	B	C	D	44.	A	B	C	D
20.	A	B	C	D	45.	A	B	C	D
21.	A	B	C	D	46.	A	B	C	D
22.	A	B	C	D	47.	A	B	C	D
23.	A	B	C	D	48.	A	B	C	D
24.	A	B	C	D	49.	A	B	C	D
25.	A	B	C	D	50.	A	B	C	D

Tecumseh's Report Card & Customer Survey

TECUMSEH ENGINES & TRANSMISSIONS

Please let us know if we're meeting your needs and expectations. Grade us in the categories below and offer suggestions for improvement. After all, YOU are the only reason we're here.

Date: _____

City Attended: _____

Instructor: _____

Class Topic: ❒ Tecumseh

Class Type: ❒ Update ❒ Sales & Service ❒ Teardown

(Circle the appropriate letter grade)

Grade the Instructor	+				–
Instructor's knowledge of material	A	B	C	D	F
Instructor's clarity and ease of understanding	A	B	C	D	F
Instructor's pacing of the class (Did it move along well?)	A	B	C	D	F
Instructor's appropriate responses to class comments/questions	A	B	C	D	F
Instructor's overall performance in class	A	B	C	D	F
Grade the Class					
Was the class informative?	A	B	C	D	F
Was the class enjoyable?	A	B	C	D	F
How were our Audio/Visual Materials?	A	B	C	D	F
How were our books/handouts?	A	B	C	D	F

The best things about this class were....

The things I would change about the class in the future are....

One topic to drop (why?) _____

One topic to keep (why?) _____

What other class topics might help you do your job better?

Anything else on your mind? _____

How relevant or practical to your work situation did you find the material presented?	A	B	C	D	F
Did the class cover the topics in the appropriate depth?	A	B	C	D	F
Please rate the overall quality of the class itself	A	B	C	D	F
Was the class the right length of time?	Way Too Short	Too Short	Just Right	Too Long	Way Too Long
Grade the Facility					
Quality/Comfort of room	A	B	C	D	F
How well could you see and hear?	A	B	C	D	F
Quality of food	A	B	C	D	F
Quality of facility's service	A	B	C	D	F
Overall rating of facility	A	B	C	D	F

Job Title: _____

Length of Time in Industry: _____

Are you OPE Certified? ❒ Yes ❒ No
❒ 2-Stroke ❒ 4-Stroke
❒ Electrical ❒ Driveline/Hydraulics
❒ Generator ❒ Compact Diesel

Are you Briggs & Stratton certified? ❒ Yes ❒ No

Name (optional): _____

Company (optional): _____

City (optional): _____

Gender	❒ Male ❒ Female	*Any Additional Comments?*
Age Group	❒ 16-25 ❒ 26-32 ❒ 33-38 ❒ 39-45 ❒ 45-52 ❒ 52-55 ❒ 55+	
Do you use a computer in your business?	❒ Yes ❒ No ❒ Adding within 6 months	
Do you place orders via the Internet?	❒ Yes ❒ No ❒ Adding within 6 months	
Do you use EDI to place orders?	❒ Yes ❒ No ❒ Adding within 6 months	
Do you have a Business Web Site?	❒ Yes ❒ No ❒ Adding within 6 months	Web Address:
Business E-mail Address		❒ Yes ❒No Would you like to receive occasional informative E-mails from Tecumseh?
Rate your favorite sales incentive (10-most favorite, 1-least favorite)	Free Merchandise (hats, shirts, etc.) Free Shipping Additional Discounts Extended Dating Terms Program Marketing Plan (print/radio ads, displays) Weekend Trips Gift Certificates (for tools, sun glasses, food, etc.) Other	(most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion (most) 10 9 8 7 6 5 4 3 2 1 (least) ❒ No opinion
Please rate Distributor service (10-great, 1-poor):	Customer Service Sales Promotions Technical Support Product Knowledge Territory Manager Education / Training	(great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion (great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion (great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion (great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion (great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion (great) 10 9 8 7 6 5 4 3 2 1 (poor) ❒ No opinion
Please rate your top three distributors in descending order:	1st _____ 2nd _____ 3rd _____	Why? _____ Why? _____ Why? _____

Note: All personally identifiable information is treated as strictly confidential and will not be shared with others

Warranty Web Site Access Request Form

United States and Canada ONLY

The following information must be submitted through your Tecumseh Products Company, Central Warehouse Distributor. **DO NOT** send it directly to the factory or it will be returned and delay your access to the website.

All information must be completed by your Company's owner and submitted for approval.

Company Name _____
Mailing Address _____
City _____ State _____
Phone _____ Fax _____
E-mail Address _____
Authorized Person (print) _____
Signature _____

Tecumseh Dealer I.D. Number _____

TSN/CWD ONLY

Approving TSN/CWD _____
Signature _____

Upon completion and approval by your Tecumseh Central Warehouse Distributor we will mail your I.D. and password within 4-6 weeks.

TECUMSEH

Service Tools

TECUMSEH®

Form No. 694862 R5/00

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2000

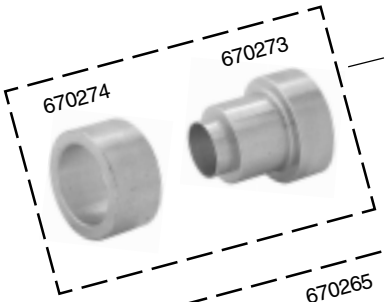
TOOL KIT 670195E

670305
STRAP WRENCH

670272

670263

670264



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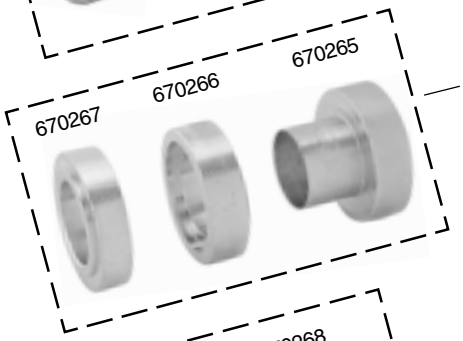

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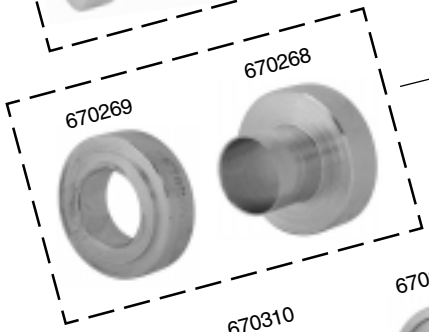


670268
670269
670293

670309

670277

670262

670261

670260

670329

670314

670337

670336

670327A

670310

670308

670169

670103

670335

670330

670306
FLYWHEEL
PULLER

670299
FLYWHEEL
PULLER

670315A
VALVE SPRING COMPRESSOR
FOR OVM, OVXL 120-125, OHV 11-17

670297
AIR GAP GAUGE
.0125

670321
AIR GAP GAUGE
.030

670324 670323 670334 670333 670320 670324

TOOL KIT 670195E

All Tools Listed Below Can Also Be Purchased Individually

TOOL NUMBER	DESCRIPTION	USE ON
670103	Flywheel knockoff	7/16 ” x 20 thread
670169	Flywheel knockoff	1/2 ” x 20 thread
670314	Flywheel knockoff	5/8" x 20 thread
670329	Flywheel knockoff	3/4" x 16 thread
670305	Flywheel strap wrench	All Tecumseh engines
670306	Flywheel puller	All Tecumseh engines (except TC)
670297	Air gap gauge .0125	Set air gap on external ignition (except some TC’s)
670260	Seal protector	PTO & Magneto w/dia. of 1.187”-1.875” (30.149mm - 47.625mm) HH80-120, VH80-120, OH120-180, VM70-100, HM70-100
670261	Seal protector	PTO & Magneto w/dia. of .811”-.815” (20.599mm - 20.70mm) OHH45-65, OHSK55-70, All LEV External ignition lightweight engines
670262	Seal protector	PTO & Magneto w/dia. of .749”-.750” (19.024mm - 19.050mm) Standard ignition lightweight engines
670308	Seal Adaptor	PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750" (34.912mm - 34.925mm)
670309	Seal Protector	PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750" (34.912mm - 34.925mm)
670310	Seal Protector / Installer	PTO & Magneto on HM70-100, TVM170-220, OVM120, TVXL195-220, HMSK100, w/shaft dia. of 1.3745"-1.3750" (34.912mm - 34.925mm)
670263	Seal protector driver	Oil seal on extended camshaft medium frame engines w/dia. of .6248”-.6253” (15.869mm - 15.882mm) Extended 5/8" camshaft medium frame engines
670264	Seal protector driver	Oil seal on 1/2" extended camshaft small frame engines w/dia. of .4998”-.5001” (12.694mm - 12.702mm)
670272	Seal driver	Used with all oil seal installers
670277	Seal protector	Oil seal on 8-1/2:1 1/2” shaft on light weight vertical crankshaft engines
670292	Seal protector & installer assy.	Includes 670265, 670266, & 670267 I.D. 1.002", 1.052" and 1.050" (25.450mm, 26.720mm, 26.670mm) for V70, VM70-100, H70, HM70-100, V50-70, H50-70, HS40-50, LAV40-50, TVS105-120, TNT120, LAV80-120
670293	Seal protector & installer assy.	Includes 670268 & 670269 I.D. .875" - .935" (22.225mm - 23.749mm) H30-35, LAV30-35, TNT100, TVS75-90, ECV90-100
670315A	Valve spring compressor	For OVM, OVXL120-125, OHV 11-17 engines
670330	Seal protector- installer	OHV13.5-17 w/ 1-1/2” extended camshaft
670335	Seal protector - installer	HM70-100 PTO & Magneto w/dia. of 1.1870”-1.1875” (30.149mm - 30.162mm)

Tools Continued On Next Page

TOOL KIT 670195E [continued]
All Tools Listed Below Can Also Be Purchased Individually

TOOL NUMBER	DESCRIPTION	USE ON
670336	Seal installer- adapter	HM70-100 w/ 1-1/8” crankshaft
670337	Seal installer w/ ball bearing, PTO end Also for flywheel end	OHH/OHSK engines, use w/ tool 670265 Use tool 670266
670299	Flywheel puller	TC engines only
670321	Air gap gauge .030”	TC non-rotary engines only
670320	Torx 30 bit	2 and 4 cycle engines - Minimum length 6 inches (152 mm)
670333	Torx 10 bit	2 and 4 cycle engines - Minimum length 3 inches (76 mm)
670334	Torx 8 bit	2 and 4 cycle engines - Minimum length 3 inches (76 mm)
670323	Torx 15 bit	2 and 4 cycle engines - Minimum length 2-3/4 inches (70mm)
670324	Torx 20 bit	2 and 4 cycle engines - Minimum length

NOTE: Due to shaft bearing diameter changes in the last 20 years, some model engines may have 2 different diameters requiring a different size seal protector or installer.

GENERAL REPAIR TOOLS

	Part Number	Description	Use on:
	670103	Flywheel Knockoff	7/16’’ x 20 Thread
	670169	Flywheel Knockoff	1/2’’ x 20 Thread
	670314	Flywheel Knockoff	5/8’’ x 20 Thread
	670329	Flywheel Knockoff	3/4" x 16 Thread
	670257	Torx E-6 Socket	Torx sockets and drivers needed for servicing 2 cycle and 4 cycle engines.
	670307	Torx E-8 Socket	
	670339	Torx E-5 Socket	
	670332	Torx 25H Socket	Special tamper-proof torx socket for 1800/VST bellows cover.
	670319	Torx 25	Minimum length of 6" (152 mm)
	670320	Torx 30	Minimum length of 6" (152 mm)
	670323	Torx 15	Minimum length of 2-3/4" (70 mm)
	670324	Torx 20	Minimum length of 2-3/4" (70 mm)
	670333	Torx 10	Minimum length of 3" (76 mm)
	670334	Torx 8	Minimum length of 3" (76 mm)

GENERAL REPAIR TOOLS

670366: Ignition/Spark tester. Can be used in series with the spark plug on a running engine or connected to ground for a standard cranking test.

670349: Digital Multimeter. The meter reads: Ohms, 20-ampere current draw, Transistor/Diode tests, Volts and mV scales. It comes with one thermocouple wire standard and will read both Fahrenheit and Celsius.

Measures:

- DC Volt
- AC Volt
- DC Amps
- AC Amps
- OHMS Resistance
- Diode Test
- hFE (Transistor)
- Battery
- Temperature
- Frequency (Hz)
- Capacitance

670358: Compression tester. Fits all-standard plug threads. Reads in PSI and bars.

670364A: Crankcase Vacuum / Oil Pressure and Compression Tester. This digital read out attachment can be used with any mV scale equipped DVOM (digital volt ohmmeter). Vacuum reads out in inches of water. The pressure side reads out in PSI for use in oil pressure testing.

- Oil Fill Tube Adapter
- Spin On Oil Fill Adapter (Part #670369)
- Compression Adapter Line
- Convenient Storage Case

670369: Oil Filter Adapter. This adapter uses a standard fitting which allows it to be used with existing pressure test kits. Fits standard spin on oil filter threads with a 3/4-16 UNS thread. Can be used with 670364 kit or existing pressure gauges.

670363: 0-600 in/lb. (0-67.8 Nm) 3/8" drive. Beam type torque wrench used for torquing connecting rod bolts, head bolts, etc.

GENERAL REPAIR TOOLS

670117: Piston ring expander. Wraps around the ring evenly distributing pressure to minimize risk of breakage. Works on 2 ¾ inches (69.85 mm) through 4 ¼ inches (107.95 mm).

670360: Flex hone. Equipped with 3-inch stones. Designed for cylinder diameters 2 inch (51 mm) through 7 inch (178 mm).

670346: Starter bendix ring removal tool. This has been designed to work on all electric starters. Saves time and reduces risk of injury.

The kit includes a special ring installation pliers and the removal tool.

670365: Tachometer (Inductive). Works on 2 and 4 cycle engines and single or two cylinder. Solid state ignitions only.

670216: Air Gap Gauge .0075. All Cast Iron.

670297: Air Gap Gauge .0125. Used on 2 and 4 cycle engines with external ignition, except some TC engines.

670321: Air Gap Gauge .030 TC non-rotary engines.

670377: Carburetor Tool. A multifunctional tool that allows the technician to perform many tasks on the carburetor during cleaning.

- Installs Seat
- Removes Seat
- Pilots Seat
- Removes Emulsion Tube
- Removes O-Rings
- Sets Float Height

GENERAL REPAIR TOOLS

670359: Standard band type piston ring compressor. Works on pistons from 2 inches (50.8 mm) through 5 inches (125 mm) diameters.

670306: Flywheel Puller. Aluminum Flywheels. All engines except TC's.

670156: Tachometer (Vibratach). Can be used with all engines. Measures 800 to 50,000 RPM's and 14 to 750 cycles (Hertz).

670305: Strap Wrench. Holds all flywheels for nut removal. Will also aid in removing oil filters.

670298: Alignment Pin. Compliance brake systems and other uses on engines for alignments.

670256: Spark Plug Gap Tool. Sets spark plug electrode gap. Measures both inches and millimeters.

MEASURING INSTRUMENTS

Micrometers: All micrometers are equipped with carbide tips and read to .0001" accuracy with ratchet thimble for constant force. Micrometers above 1 inch come with a calibration gauge and storage case.

670350: 0-1 inch

670351: 1-2 inch

670352: 2-3 inch

670353: 3-4 inch

670357: Telescoping gauge set. Measures ½ inch (12.7 mm) through 6 inch (152.4 mm). With some practice these can be as accurate as using a bore gauge.

670241: Dial Indicator. Makes point ignition timing easier, eliminating the need to remove the cylinder head. Special extended reach tip.

670361: Feeler gauge set. Equipped with both narrow and wide blades. The set ranges from .004 inch (.102 mm) through .040 inch (1.02 mm).

MEASURING INSTRUMENTS

670356: Small Hole Gauge. Used for measuring inside small holes such as valve guides. Diameter range from .125 inch (3.175 mm) through .500 inch (12.75 mm).

670340: Pressure Test Kit. For testing of carburetor inlet needle pop-off, transmission sealing and cylinder leak down. The kit includes a primary pressure regulator, low pressure gauge with pressure release valve, hose and adaptors.

670345: Low Pressure Adapter Kit. This kit will enhance a single purpose leak down tester to allow the technician to perform carburetor inlet needle pop off and transmission sealing tests. The kit includes a low pressure gauge with pressure relief valve, a transaxle adaptor plug and hardware.

670368: Dial Vernier. Six-inch dial vernier caliper reads out in .001 inch accuracy. Comes with storage case.

4 CYCLE TOOLS

	Part Number	Description	Use on:
	670154	Valve Lapping Tool	All four cycle engines. Used to check seat contact only.
	670315A	Valve Spring Compressor Tool	OVM, OVXL120,125, OHV12,12.5, 13, 17.5 TVT691, 18-22
	670237A	Valve Spring Compressor Tool	OH120 - 180 (Cast Iron Engine)
	670328	Valve Guide Reamer (Exhaust)	OVRM40-50 to obtain .2787"/.2797" (7.078mm/ 7.104mm) oversize
	670283	Valve Guide Reamer	Small frame 4 cycle engines to obtain .2807"/.2817" (7.129mm/7.155mm) oversize
	670284	Valve Guide Reamer	Medium and Large frame 4 cycle engines to obtain .3432"/.3442" (8.717mm/ 8.742mm) oversize
	670287	Oil Seal Remover (I.D. .880") (22.34mm)	PTO end w/dia. of .8735" - .8740" (22.186mm - 22.199mm) for most H25-35, LAV30-35, ECV90-100, TNT100, TVS75
	670288	Oil Seal Remover (I.D. .755") (19.18mm)	PTO & Magneto w/dia. of .7495" - .7500" (19.037mm - 19.05mm) for most H25-35, TVS, TNT, ECH, ECV w/external ignition
	670289	Oil Seal Remover (I.D. .817") (20.75mm)	Magneto end w/dia. of .8105" - .8110" (20.586mm - 20.599mm) for most V, H, VH, VH70, VM & HM70-100, HHM80
	670290	Oil Seal Remover (I.D. 1.003") (25.48mm)	Magneto end w/dia. of .9985" - 1.0003" (25.36mm - 25.48mm) engines without external ignition for most H25-35, LAV30-35, TVS, TNT
	670312	Oil Seal Remover (I.D. 1.384")	Magneto end w/dia. of 1.3745" - 1.3750" (34.91mm - 34.93mm) for most HM70-100, TVM170-220, OVM120, OVXL120
	670278	Lag screw	All removers
	670331	Oil Seal Remover	1-1/2" OHV13.5 - 17 with I.D. of 1.504" (38.21mm) TVT18-22

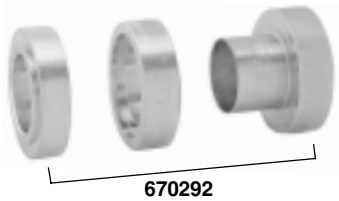
4 CYCLE TOOLS

	Part Number	Description	Use on:
	670326	Speed Adjustment Tool. Adjusts high and idle RPM settings.	OVM, OVXL, OHV, OHH TVM220, TVS, OVRM
	670362	"C" Type Valve Spring Compressor	All 4 cycle engines except OVM and OVXL
	670347	Carbide blade, valve seat cutting system. Produced by Neway Mfg. (Neway kit LG3000). Set includes the small cutter heads designed for today's overhead valve engines.	All 4 cycle engines
	670348	Valve refacer. Carbide valve face cutting system. Designed for both 45º and 30º degree valve faces. Tool automatically adjusts to all valve stem diameters. Product is made by Neway as the GIZMATIC 3.	All 4 cycle engines
	670367	Reservoir tank. Extreme duty three gallon oil tank designed for use with our oil vacuum pump, part number 670354. The tank has a float shut-off in the outlet.	All 4 cycle engines
	670354	Oil Vacuum Pump. Pump can be used with the 670367 oil tank or with your own home made airtight system. The pump will do all the work while you perform other repairs or maintenance on the equipment. Saves time by not having to remove drain plugs.	All 4 cycle engines

REBUSHING DRIVERS

Tool Number	Description	Use with:
A. 670158	Bearing Driver	7/8'' (22.225mm) Main Bearings where bushings are available
B. 670159	Bushing Driver	
A. 670162	Bearing Driver	1'' (25.4mm) Main Bearings where bushings are available
B. 670163	Bushing Driver	
A. NONE		
B. 670311	Bushing Driver	1-3/8'' (34.925mm) HM70 100, TVM170 220 and OVM120.
670317	Bushing Driver	1-3/16'' (30.175mm) HM70, HM80 and HM100 Cylinder cover

2 CYCLE TOOLS

	Tool Number	Description	Use on:
	670318	EGR Installation Tool	TVS and TVXL 840's
	670297	Air Gap Gauge .0125'' (.318mm)	All 2 and 4 cycle engines with external ignition except TC300 non-rotary mower applications.
	670321	Air Gap Gauge .030 (.76mm)	Used on TC300 non-rotary mower applications.
	670299	Flywheel Puller	TC200 and TC300
	670300	Engine Holder	TC200 and TC300
	670325	Needle Setting Tool	Walbro WTA and WT diaphragm carburetors on TC's
 670292	**670292**	Seal Protector Assembly I.D. 1.050" (26.67mm)	P.T.O. Oil Seal TVS and TVXL840
670301 670303	**670301**	Seal Protector and Installer I.D. .501" (12.72mm)	Magneto Oil Seal TC200
	670303	Seal Protector and Installer I.D. .626" (15.90mm)	P.T.O. Oil Seal TC200
	670286	Oil Seal Remover I.D. .827" (21.00mm)	P.T.O. end of the single cylinder AV520, 600 and 817 outboards with the one piece oil seal.

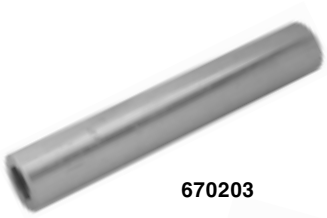
2 CYCLE TOOLS

	Tool Number	Description	Use with:
	670302	Bearing Installer I.D. .500" (12.70mm)	Magneto bearing on TC200
	670304A	Bearing Installer I.D. .625" (15.88mm)	P.T.O. bearing on TC200
	670275	Seal Protector and Installer I.D. .678/.682" (17.22mm/17.31mm)	PTO end of AV520, 600, 817 Outboard engines
	670276	Seal Driver / Spacer	PTO end of AV520, 600 817 Outboard engines
	670281	Seal Pilot I.D. .714/.710" (18.13mm/18.03mm)	PTO end of AV520, 600 817 Outboard engines

OUTBOARD ENGINE TOOLS

	670238A	Timing Gauge	Solid State outboards, Type 640
	670243	Flywheel Advance Tool	Twin Cylinder Outboard
	670244	Stator Timing Tool	Twin Cylinder Outboard

PEERLESS TOOL KIT 670254A


670203

670209

670211

670204

670252

670251

670234

670207A

670210

670213

670206

670205

670263

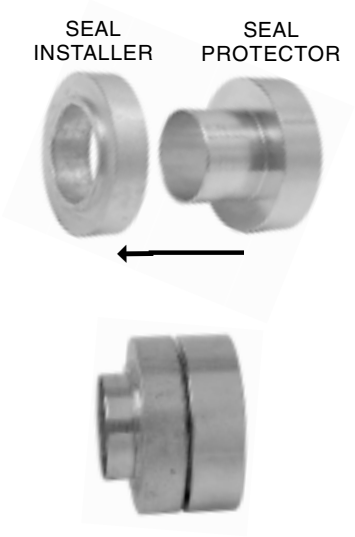
Tool Number	Description	Use with:
670203	Oil Seal Installer	Seal with 13/16'' I.D.
670204	Bushing Driver and Installer	Bushing with 3/4'' I.D.
670205	Bushing Driver and Installer	Bushing with 1-1/2'' I.D.
670206	Oil Seal Protector	Seal with 1/2'' I.D.
670207A	Bearing Driver and Installer	Bearing with 5/8'' I.D.
670209	Oil Seal Installer	Seal with 21/32'' I.D.
670210	Bearing Driver and Installer	Bearing with 1/2'' I.D.
670211	Oil Seal Installer	Seal with 1/2'' I.D.
670213	Bearing Driver and Installer	Bearing with 9/16'' I.D.
670234	Bearing Driver and Installer	Bearing with 5/8'' I.D.
670251	Bearing Installer	Input Bearing on 800 Series
670252	Bearing Driver	Bearing with 11/16'' I.D. 800 Series
670263	Oil Seal Protector	Seal with 5/8'' I.D.

NOTE: All Tools listed above can also be purchased individually.

670342: VST Control Arm Puller: Removal of the control arm on the VST transaxle without this tool can cause severe internal damage. This one is suggested for any dealer working on VST models.

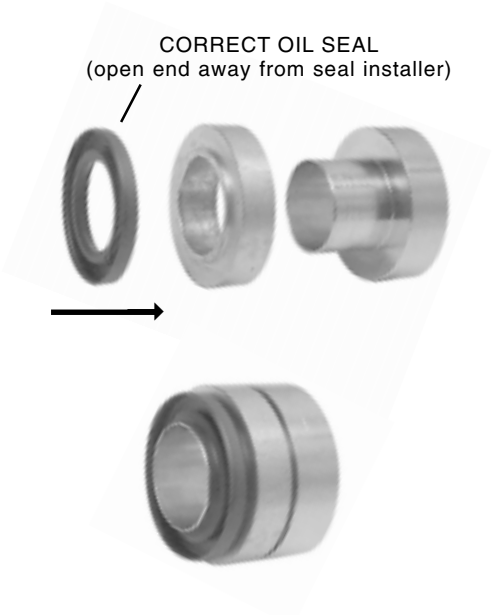
HOW TO REPLACE A SEAL USING A SEAL PROTECTOR AND SEAL INSTALLER

1



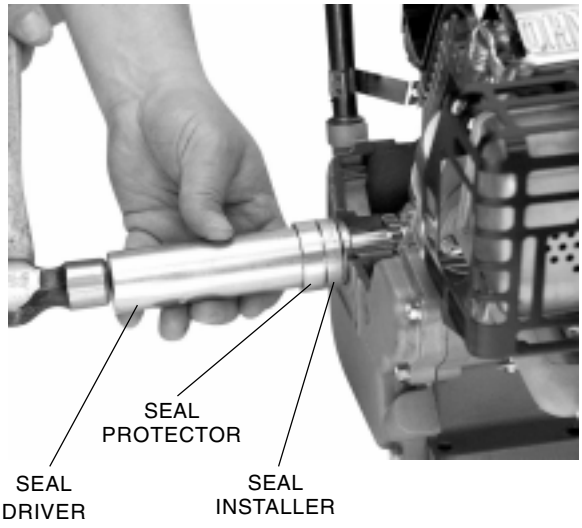
Place the seal protector inside the seal installer and push them together.

2



Slide the new oil seal onto the seal protector until it is flush with the seal installer.

3



Slide the assembly over the crankshaft, then place seal driver over the assembly (as shown above). Tap squarely on the driver with a hammer until the seal installer bottoms out on the engine.

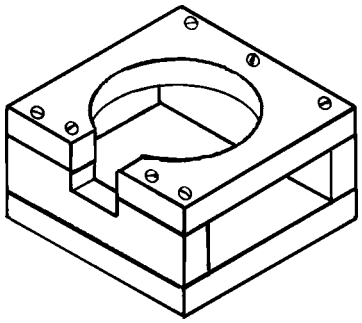
4

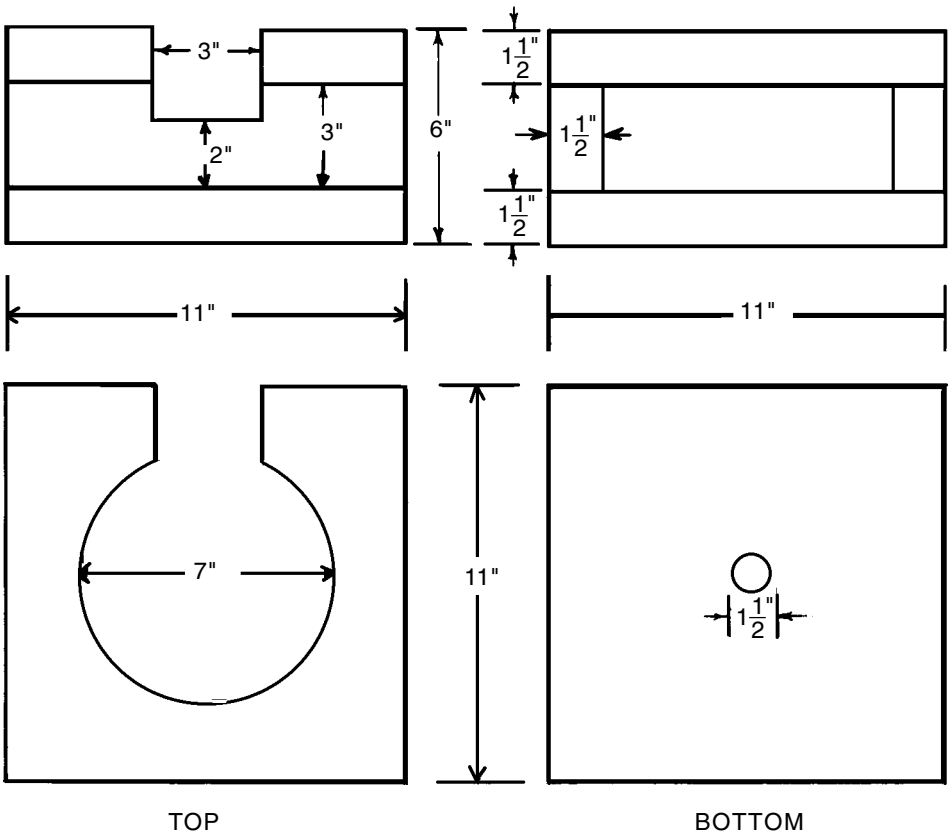
Remove the driver, protector and installer. The procedure is complete.

DO IT YOURSELF
Engine Repair Stand

This engine stand should be made of hardwood and assembled with wood screws. This stand is NOT available from the factory.

1.5" = 38.1mm
2" = 50.8mm
3" = 76.2mm
6" = 152.4mm
7" = 177.8mm
11" = 279.4mm





TOOL SHOPPING LIST

(Purchase Tools through your Local Distributor)

QUANTITY			
_____	670195E		Engine Tool Kit
_____	670260	*	Seal Protector
_____	670261	*	Seal Protector
_____	670262	*	Seal Protector
_____	670308	*	Oil Seal Adapter OVM120
_____	670309	*	Seal Protector OVM120
_____	670310	*	Seal Protector - Installer OVM120
_____	670263	*	Seal Protector - Driver
_____	670264	*	Seal Protector - Driver
_____	670272	*	Seal Driver
_____	670277	*	Seal Protector
_____	670292	*	Seal Protector & Installer Assy.
_____	670293	*	Seal Protector & Installer Assy.
_____	670330	*	Seal Protector - Installer
_____	670335	*	Seal Protector - Installer
_____	670336	*	Seal Installer - Adapter
_____	670337	*	Seal Installer w/ Ball Bearing, PTO End
	General Repair Tools:		
_____	670298		Alignment Pin
_____	670103	*	Flywheel Knockoff Tool (7/16" x 20 thread)
_____	670169	*	Knock-Off Small/Medium Frame (1/2" x 20 thread)
_____	670314	*	Knock-Off Tool for OVM120
_____	670329	*	Flywheel Knockoff Tool (3/4" x 16 thread)
_____	670257		Torx E6 Socket
_____	670307		Torx E8 Socket
_____	670339		Torx E5 Socket
_____	670319		Torx 25 Driver - 6 inch (152 mm)
_____	670320	*	Torx 30 Driver - 6 inch (152 mm)
_____	670323	*	Torx 15 Driver - 2-3/4 inch (70 mm)
_____	670324	*	Torx 20 Driver - 2-3/4 inch (70 mm)
_____	670333	*	Torx 10 Driver - 3 inch (76 mm)
_____	670334	*	Torx 8 Driver - 3 inch (76 mm)

QUANTITY			
	General Repair Tools (continued):		
_____	670366		Ignition/Spark Tester
_____	670349		Digital Multimeter
_____	670358		Compression Tester
_____	670361		Feeler Gauge Set
_____	670363		Torque Wrench 0-600 in/lb. (67.8 Nm) 3/8" drive
_____	670359		Piston Ring Compressor
_____	670117		Ring Expander
_____	670360		Flex Hone
_____	670346		Starter Bendix Ring Remover Tool
_____	670365		Tachometer (Inductive)
_____	670306	*	Flywheel Puller
_____	670156		Tachometer (Vibratach)
_____	670216		.0075" (.1905mm) Air Gap Gauge
_____	670297	*	.0125" (.3175mm) Air Gap Gauge
_____	670321	*	.030" (.762mm) Air Gap Gauge
_____	670305	*	Flywheel Strap Wrench
_____	670256		Spark Plug Gap Tool
_____	670377		Carburetor Tool
	Measuring Instruments:		
_____	670350		0-1" Micrometer
_____	670351		1-2" Micrometer
_____	670352		2-3" Micrometer
_____	670353		3-4" Micrometer
_____	670357		Telescoping Gauge Set
_____	670241		Dial Indicator
_____	670340		Pressure Test Kit
_____	670345		Low Pressure Adapter Kit
_____	670368		Dial Vernier
_____	670356		Small Hole Gauge
_____	670364A		Crankcase Vacuum
_____	670369		Oil Filter Adapter
	4 Cycle Tools:		
_____	670154		Valve Lapping Tool
_____	670315A	*	OVM Valve Spring Compressor
_____	670237A		OH Valve Spring Compressor
_____	670328		Valve Guide Reamer (Exhaust)
_____	670283		Valve Guide Reamer
_____	670284		Valve Guide Reamer

NOTE: Items marked with * are in 670195E Kit

TOOL SHOPPING LIST
[continued]

(Purchase Tools through your Local Distributor)

QUANTITY

4 Cycle Tools (continued):

_____	670287	Oil Seal Remover 7/8" P.T.O.
_____	670288	Oil Seal Remover 1" and some 7/8" magneto end
_____	670289	Oil Seal Remover
_____	670290	Oil Seal Remover Magneto End, External Ignition
_____	670312	Oil Seal Remover 1-3/8" P.T.O. End Magneto End Bearings
_____	670278	Lag Screw
_____	670331	Oil Seal Remover
_____	670326	Speed Adjustment Tool
_____	670362	"C" Type Valve Spring Compressor
_____	670347	Valve Seat Cutting System
_____	670348	Valve Refacer
_____	670367	Reservoir Tank
_____	670354	Oil Vacuum Pump

2 Cycle Tools:

_____	670318	EGR Installation Tool
_____	670297	.0125" Air Gap Gauge
_____	670321	.030" Air Gap Gauge
_____	670299 *	Flywheel Puller - TC
_____	670300	Engine Holder - TC
_____	670325	Needle Setting Tool (152 mm)
_____	670292	Seal Protector Assembly
_____	670301	Seal Protector - Installer - TC
_____	670303	Seal Protector - Installer - TC
_____	670286	Oil Seal Remover
_____	670302	Bearing Installer - TC
_____	670304A	Bearing Installer - TC
_____	670275	Seal Protector & Installer
_____	670276	Seal Driver/Spacer
_____	670281	Seal Pilot

Outboard Engine Tools:

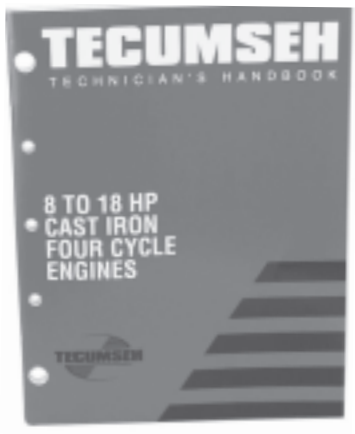
_____	670238A	Timing Gauge
_____	670243	Flywheel Advance Tool
_____	670244	Stator Timing Tool

NOTE: Items marked with * are in 670195E Kit

TECUMSEH®

We make it work.™

Educational Materials



Educational Materials

MASTER PARTS AND TECHNICIAN'S MANUAL SET

690166

This set is a combination of two hard copy (paper) manuals. The Master Parts Manual (covers 1988 to present), plus Technician's Manual. (Annual Supplement Charge)

MICROFICHE FOR MASTER PARTS AND TECHNICIAN'S MANUALS

693029

This set is a combination of the Microfiche Parts Manual, Part No. 693030 and the Technician's Manual, (HARD COPY) Part No. 691630. (Supplements - no charge for authorized accounts only.)

MASTER PARTS MANUAL ONLY

691626

This manual makes up one half of the Master Parts Manuals Set containing the replacement units and parts information (covers 1988 to present). (Annual Supplement Charge)

MASTER PARTS MANUAL INSERT

691629

A complete Master Parts Manual without the binder (covers 1988 to present). (If Registered, annual supplement charge)

BINDER OR DIVIDER REPLACEMENTS FOR MANUALS.

691627 Parts Dividers
691628 Parts Binder
695396 Parts Sub-Tabs

TECHNICIAN'S MANUAL ONLY

691630

This manual contains technical information for the repair of engines and power train components. (Supplements - no charge for authorized accounts only.)

TECHNICIAN'S MANUAL INSERT

691633

Technician's Manual pages without the binder. (If registered - annual supplement charge for non-authorized accounts only.)

BINDER OR DIVIDER REPLACEMENTS FOR MANUALS.

691631 Technician's Divider
691632 Technician's Binder

MICROFICHE MASTER PARTS MANUAL

693030

The Microfiche set, replacing the hard copy Master Parts Manual, contains complete cross reference information for Tecumseh four-cycle engines, two-cycle engines and Peerless Power train components (covers 1962 to present). (Supplements-no charge for authorized accounts only.)

INSTRUCTIONAL GUIDE FOR THE USE OF THE MASTER PARTS MANUAL

692738

This booklet was prepared to help make the master parts manual easier to use.

EARLY PRODUCTION PARTS LISTS

These are no longer included in the Tecumseh Master Parts Manual. Early production parts lists prior to 1962 are available on microfiche only. (No supplements)
693634A Microfiche (Prior 1962)

AVAILABLE TECHNICIAN HANDBOOKS

692508

This manual covers the following basic type or model numbers dependent on age of product: AH520, AH600, AV520, AV600, HSK600, TVS600.
This manual covered many engines under an Old form of Identification which will need to be reviewed as well.
TYPE / SPECIFICATION NUMBER 638-670 1398-1642 and Craftsman (200)-183-692.

692509

This manual covers engine models: ECV100 - 120, H22 - 80, HH40 - 70, HHM80, HM70 - 100, HMSK70 - 100, HMXL70, HS40 - 50, HSK30 - 70, HSSK40 - 50, HT30 - 35, HXL35, LAV30 - 50, LEV80 - 120, TNT100 - 120, TVM125 - 220, TVXL170 - 220, TVS75 - 120, TVXL105 - 115, V40 - 80, VH40 - 70, V60 - 70, VM70 - 100
Model numbers are located on the engine shroud.

691462A

This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

691218

This manual covers all Peerless® Gear models as follows: Right Angle and T Drives (P-91), 100, 600, 601, 700, 800, 801, 820, 900, 910, 915, 920, 930, 940, 1000, 1100, 1200, 1300, 2300, 2400, 2500, 2600, 2800, MST, VST.

694782

Contains technical information for the repair of the TC series, 2-cycle engines.

694988

Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.

695244A

This manual covers engine models:
OHH50 - 70, OHHSK50 - 70, OHM120, OHSK80 - 130, OHV115 - 17, OVM120, OVRM40 - 65, OVXL/C120, OVXL120 - 125

695578

Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

AVAILABLE FOREIGN TECHNICIAN'S HANDBOOKS

694732 Spanish

This manual covers the following models:
VH80, VH100, HH80, HH100, HH120, OH120-180
Model numbers are located on the engine shroud.

695555 Spanish

This manual covers engine models: ECV100 - 120, H22 - 80, HH40 - 70, HHM80, HM70 - 100, HMSK70 - 100, HMXL70, HS40 - 50, HSK30 - 70, HSSK40 - 50, HT30 - 35, HXL35, LAV30 - 50, LEV80 - 120, TNT100 - 120, TVM125 - 220, TVXL170 - 220, TVS75 - 120, TVXL105 - 115, V40 - 80, VH40 - 70, V60 - 70, VM70 - 100
Model numbers are located on the engine shroud.

695657 German

This manual covers engine models: ECV100 - 120, H22 - 80, HH40 - 70, HHM80, HM70 - 100, HMSK70 - 100, HMXL70, HS40 - 50, HSK30 - 70, HSSK40 - 50, HT30 - 35, HXL35, LAV30 - 50, LEV80 - 120, TNT100 - 120, TVM125 - 220, TVXL170 - 220, TVS75 - 120, TVXL105 - 115, V40 - 80, VH40 - 70, V60 - 70, VM70 - 100
Model numbers are located on the engine shroud.

695562 French

This manual covers engine models: ECV100 - 120, H22 - 80, HH40 - 70, HHM80, HM70 - 100, HMSK70 - 100, HMXL70, HS40 - 50, HSK30 - 70, HSSK40 - 50, HT30 - 35, HXL35, LAV30 - 50, LEV80 - 120, TNT100 - 120, TVM125 - 220, TVXL170 - 220, TVS75 - 120, TVXL105 - 115, V40 - 80, VH40 - 70, V60 - 70, VM70 - 100
Model numbers are located on the engine shroud.

SPECIAL TOOLS BOOKLET

694862

This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 & 4-cycle engines and Peerless units.

TESTER BOOKLETS

694529

Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

694530

Test procedures for Tecumseh electrical components using Merc-O-Tronic Tester 9800. (Tests similar for 98, 98A and 79.)

Educational Materials

CARBURETOR TROUBLESHOOTING BOOKLET

695907

This booklet is designed as a quick reference to carburetion problems and related repair procedures.

IGNITION SYSTEMS TROUBLESHOOTING BOOKLET

694903

This booklet contains information on the identification, possible problems, and related repair procedures of Tecumseh Ignition Systems.

4-CYCLE ENGINE FAILURE ANALYSIS "THE EVALUATION PROCESS"

695590

This booklet will enable the examiner to evaluate problems and assist in determining the cause of failure. (Color Pictures)

REFERENCE CHARTS BOOKLET

695933

This booklet covers various engine and motion drive systems quick reference charts.

SLIDE SETS

690141G

Engine Slide Set with Script covering theory and repair of 2- and 4-cycle engines. Contains 127 35mm slides.

693499C

Carburetion Theory Slide Set with Cassette Tape. This set covers carburetor description and troubleshooting. This set is made up of 80 color 35mm slides.

694611B

Warranty Slide Set with cassette tape. Covers Tecumseh and Peerless Warranty and how to file for Warranty work (contains 50 slides.)

694739

C.P.S.C. 58 color 35mm slides with cassette tape describing the Consumer Products Safety Commission's 1982 compliance brake law. The program deals with the importance of proper servicing procedures.

694821

How to read a dial caliper and micrometer. 36 color 35mm slides and script. The program shows how to use a dial caliper and micrometer and associated tools to measure engine and transaxle components.

694832

Tecumseh Microfiche - 53 color 35mm slides with script showing how to use the Tecumseh Microfiche system.

694998A

Contains 83 color 35mm slides with script covering the teardown and reassembly of the TVS840, 2-cycle engine.

694999A

Contains 79 color 35mm slides with script covering the teardown and reassembly of the 4-cycle engine.

695533

2-cycle and Peerless failure analysis slide set with script shows examples of 2-cycle and Peerless gear train failures. Solve the mystery of failures. Set consists of 73 color 35mm slides.

695607

4-cycle failure evaluation process, step by step procedure. This program utilizes the 695590 booklet. Set consists of 48 color 35mm slides and 10 of 695590 booklets.

WALL CHARTS

GASKET WALL CHART SET WITH HEAD TORQUE SPECS.

691233A

A set of six wall charts 17" x 22" showing all gaskets for both two- and four-cycle engines. Also gives 4-cycle engine head torque specifications.

TECUMSEH QUICK REFERENCE SPECIFICATIONS WALL CHART SET

695468

This set of three 17½'' x 22½'' multi-colored wall charts lists all the necessary engine specs for both two- and four-cycle engines.

MISCELLANEOUS WALL CHARTS

695648

Tecumseh/Peerless® motion drive systems transaxle troubleshooting for in-line shift models (i.e 800, 820, 920, 930)

VIDEO PROGRAMS (VHS ONLY)

695015 - Carburetor Troubleshooting.

Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them.

695059 - Ignition Systems

A basic program designed to give the small engine technician first hand knowledge of Tecumseh ignition systems so the technician can understand the system and perform repairs.

695148 - 900 Series Transaxles

Teardown and Reassembly of the 900 series transaxles. This video will show a complete step by step procedure for teardown and reassembly of the 900, 910, 920 and 930 series transaxles.

695185 - Electrical Troubleshooting

This video training program is an excellent entry level that will assist the small engine technician in the proper procedures for troubleshooting electrical systems on outdoor power equipment.

695285 - 800 Series Transaxles

An in-depth look at the 800 series transaxles, detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

696250 - MST Transaxle

An in depth look at the newest Tecumseh/Peerless® Gear drive transaxle, the MST Series. This film will help you understand correct disassembly, repair and reassembly procedures.

CUT-A-WAY ENGINE INSTRUCTIONS BOOKLET

692799

An informative booklet showing the steps necessary to create a cut-a-way engine. The use of this student handout, combined with a small vertical shaft 4-cycle, Overhead valve can make an interesting and informative class project.

TOOLS

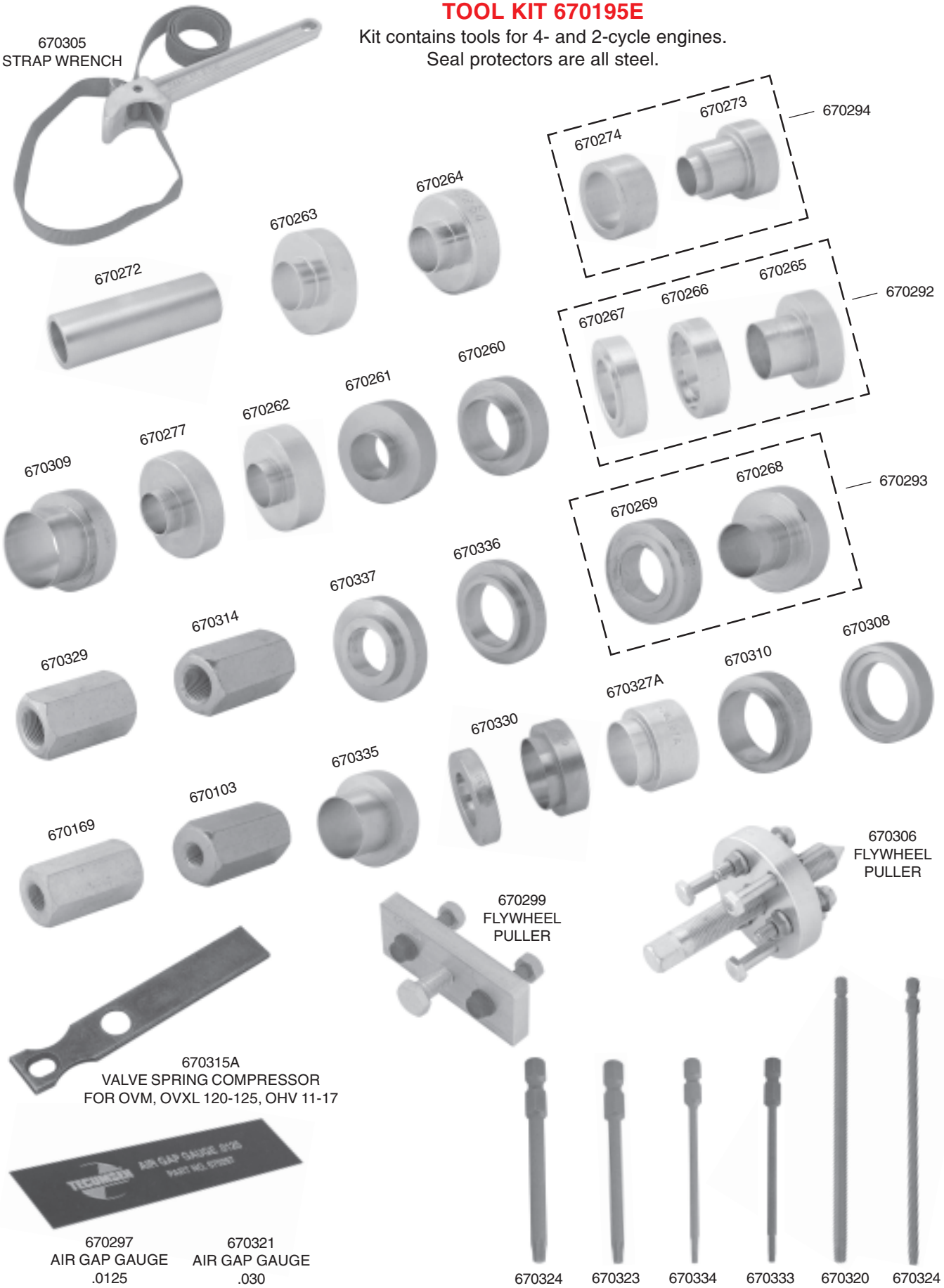
670241

Engine Timing Dial Indicator. Used to measure B.T.D.C. piston dimensions for accurate ignition timing.

Extra tips for leg available
-Large Head Part -670250
-Thin Head Part -670249
-Leg and Screw Part -670296

TOOL KIT 670195E

Kit contains tools for 4- and 2-cycle engines.
Seal protectors are all steel.



Ordering Procedure

* All Suggested Prices F.O.B. Grafton, Wisconsin
* Orders are Subject to Additional Taxes, Where Applicable.

Contact the Central Warehouse Distributor nearest you before placing your order.

Orders sent to the Factory (United States only) MUST include total payment of order plus 15% handling and shipping charge ($3.00 minimum charge), submitted with the order.

BILLIOU'S INC.
1343 S. MAIN
PORTERVILLE, CA 93257
PHONE 559-784-4102
FAX 559-781-1875
WEB SITE www.billious.com

CENTRAL POWER DISTRIBUTORS
1101 MC KINLEY ST.
ANOKA, MN 55303
PHONE 763-576-0901
FAX 763-576-0920
WEB SITE www.cpdonline.com

CPD - OHIO
8181 WASHINGTON CHURCH RD.
DAYTON, OH 45458
PHONE 937-438-5548
FAX 937-438-5633
WEB SITE www.cpdonline.com

CENTRAL POWER DISTRIBUTORS
N90W14635 COMMERCE DR.
MENOMONEE FALLS, WI 53051-2336
PHONE 262-250-1977
FAX 262-250-1966
WEB SITE www.cpdonline.com

W. J. CONNELL CO.
65 GREEN ST.
FOXBORO, MA 02035
PHONE 508-543-3600
FAX 508-543-8394
WEB SITE www.wjconnell.com

ENGINES SOUTHWEST
1255 N. HEARNE
PO BOX 67 (ZIP CODE 71161-0067)
SHREVEPORT, LA 71107-7108
PHONE 318-222-3871
FAX 318-425-4638
WEB SITE www.enginessw.com

MEDART - KANSAS CITY
2644 S. 96TH. ST.
EDWARDSVILLE, KS 66111-3483
PHONE 636-282-2300
FAX 888-510-3100
WEB SITE www.medartengine.com

MEDART - ST. LOUIS
124 MANUFACTURERS DR.
ARNOLD, MO 63010-4727
PHONE 636-282-2300
FAX 888-510-3100
WEB SITE www.medartengine.com

POWER EQUIPMENT SYSTEMS
1645 SALEM INDUSTRIAL DR., NE
PO BOX 669 (ZIP CODE 97308)
SALEM, OR 97303
PHONE 503-585-6120
FAX 800-637-9243
WEB SITE www.pesnet.com

SMITH ENGINES INC.
2303 PREMIER ROW
PO BOX 593162 (32859)
ORLANDO, FL 32809
PHONE 407-855-4288
FAX 407-855-4736
WEB SITE www.smithengines.com

SMITH ENGINES INC.
4205 GOLF ACRES DR.
PO BOX 668985
CHARLOTTE, NC 28266-8985
PHONE 704-392-3100
FAX 704-392-5208
WEB SITE www.smithengines.com

SMITH ENGINES INC.
1665 LAKES PARKWAY, SUITE 116
LAWRENCEVILLE, GA 30043
PHONE 770-237-0707
FAX 770-237-0210
WEB SITE www.smithengines.com

CPT CANADA POWER TECH. LTD.
#101 - 10411 - 178 STREET
EDMONTON, AB T5S 1R5
PHONE 780-453-5791
FAX 780-454-8377
WEB SITE www.canadapowertech.com

CPT CANADA POWER TECH. LTD.
161 WATLINE AVE.
MISSISSAUGA, ON L4Z 1P2
PHONE 905-890-6900
FAX 905-890-0147
WEB SITE www.canadapowertech.com

CPT CANADA POWER TECH. LTD.
MONTREAL BRANCH
234 RUE MIGNERON
ST. LAURENT, PQ H4T 1Y7
PHONE 514-731-3559
FAX 514-731-0064
WEB SITE www.canadapowertech.com

ENGINE AND TRANSMISSION GROUP

Engine & Transmission Sales Office

900 North Street
Grafton, WI 53024
Phone: 262-377-2700
FAX: 262-377-4485

European Sales Office

Tecumseh Europa S.p.A.
Via Delle Cacce, 99
10135 Torino, Italy
Tel. 011 39 11 391-8411
Telefax 011 39 11 391-0031

Service Division & Group Offices

900 North Street
Grafton, WI 53024
Phone: 262-377-2700
FAX: 262-377-4485

Form No. 692798A R9/2000

Litho in U.S.A.

QUICK FACTS
Service Information

Mini-Version of Quick Reference Book (695933)

For more detailed information, check the Quick Reference Book (Form No. 695933) or purchase a complete repair manual from your local Tecumseh Dealer.

TECUMSEH®

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GENERAL ENGINE

The following information is being provided to assist you in locating and recording your engine model and specification numbers. This information will be needed to use this book or obtain parts from a local Tecumseh dealer.

4-Cycle Quick Reference - Model Letter Designation

ECH -	Exclusive Craftsman Horizontal
ECV -	Exclusive Craftsman Vertical
H -	Horizontal Shaft
HH -	Horizontal Heavy Duty (Cast Iron)
HHM -	Horizontal Heavy Duty (Cast Iron) (Medium Frame)
HM -	Horizontal Medium Frame
HMSK -	Horizontal Medium Frame (Snow King)
HMXL -	Horizontal Medium Frame (Extra Life)
HS -	Horizontal Small Frame
HSSK -	Horizontal Small Frame (Snow King)
HXL -	Horizontal (Extra Life)
LAV -	Lightweight Aluminum Frame Vertical
LEV -	Low Emissions Vertical
OH -	Overhead Valve Heavy Duty (Cast Iron)
OHH -	Overhead Valve Horizontal
OHM -	Overhead Valve Heavy Duty Horizontal (Medium Frame)
OHSK -	Overhead Valve Horizontal (Snow King)
OHV -	Overhead Valve Vertical (Medium Frame)
OVM -	Overhead Valve Vertical (Medium Frame)
OVRM -	Overhead Valve Vertical (Small Frame) (Rotary Mower)
OVXL -	Overhead Valve Vertical (Medium Frame) (Extra Life)
TNT -	Toro 'N' Tecumseh (Toro Exclusive Series)
TVEM -	Tecumseh Vertical European Model
TVM -	Tecumseh Vertical (Medium Frame) (Replaces V & VM)
TVS -	Tecumseh Vertical Styled
TVT -	Tecumseh Vertical Twin
TVXL -	Tecumseh Vertical (Extra Life)
V -	Vertical Shaft
VH -	Vertical Heavy Duty (Cast Iron)
VLV -	Vector Lightweight Vertical
VLXL -	Vector Lightweight Vertical (Extra Life)
VM -	Vertical Shaft (Medium Frame)
VSK -	Vertical Snow King

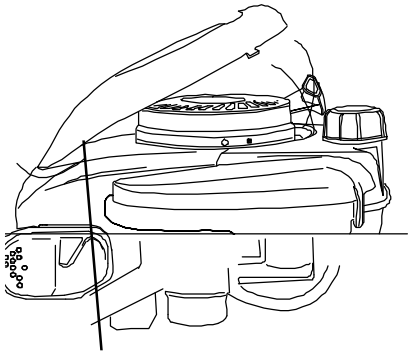
LOCATING AND READING ENGINE MODEL AND SPECIFICATION

THE FOLLOWING WILL BE NEEDED TO LOCATE PARTS FOR YOUR ENGINE.

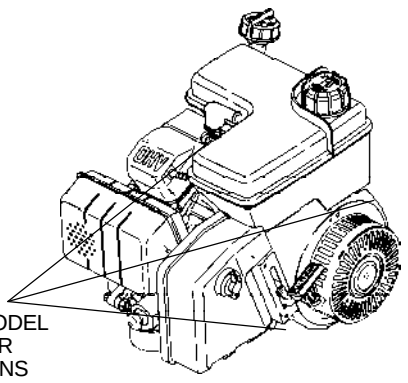
	Model	Specification	Serial (DOM)
ENGINE:	TVM195	150288G	8150C

ENGINE MODEL	SPEC NO.	D.O.M (SERIAL NO)
TVM195	150288G	8150C

Typical Engine I.D. Label



ENGINE MODEL NUMBER LOCATED UNDER COVER



ENGINE MODEL NUMBER LOCATIONS

4-Cycle Quick Reference for Spec. Numbers-To-Model Designation

The following information is being provided to assist you in locating and recording your engine model and specification numbers. This information will be needed to use this book or obtain parts from a local Tecumseh dealer.

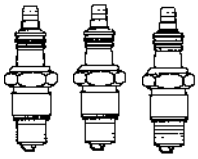
HORIZONTAL 4-CYCLE ENGINES

15000 - H22
25000 - H25
26000 - OHH45
35000 - H30
35400 - HSK30
45000 - H & HT35
45400 - HSK35
47000 - HXL35
55000 - H40
55200 - HS & HSSK40
55500 - HSK40
55700 - H40
55800 - H40
55900 - HSSK40
65000 - H50
65300 - HSK50
67000 - HS & HSSK50
68000 - OHH50
68500 - OHSK50
69000 - OHH55
69500 - OHSK55
71100 - OHH60
71500 - OHSK60
71700 - OHH65
71900 - OHSK65
72500 - OHSK70
75000 - H60
76000 - HSK60
85000 - HH40
95000 - HH50
105000 - HH60
110000 - HH80
115000 - HH100
120000 - HH120
130000 - H70
130200 - HSK70
132000 - HM & HMSK70
132500 - HMXL70
140000 - HH70
146000 - ECH90
155000 - H & HM80
155000 - HMSK80
155800 - HM85
155900 - HM & HMSK85
156000 - HM90
156500 - HMSK90
159000 - HM & HMSK100
159900 - HMSK105
159950 - HMSK110
160000 - HH & OH140
170000 - HH150 & 160
170000 - OH160
175000 - OH120
180000 - OH180
190000 - HHM80
220000 - OHM120
221000 - OHSK110
222000 - OHSK120
223000 - OHSK90
223400 - OHSK110
223600 - OHSK120
223700 - OHSK125
223800 - OHSK130
224600 - OHM120

VERTICAL 4-CYCLE ENGINES

10000 - TNT100
12000 - TNT120
20000 - LAV25, OVRM55
20500 - OVRM105
21000 - OVRM60
21800 - OVRM60
22000 - OVRM65
30000 - LAV30
33000 - TVS75
40000 - LAV35
42000 - OVRM905 (Sears Only)
42600 - OVRM40, OVRM45 (Premier Engine)
42900 - OVRM40 (High Tech Look)
43000 - TVS90
43600 - TVS90 (Premier Engine)
43700 - TVS90, TVXL90
43900 - TVS90 (High Tech Look)
44000 - TVS100
44600 - TVS100 (Premier Engine)
44800 - TVS100
46000 - TVS90, TVXL90
46600 - TVS90
48000 - TVS90
50000 - V40
50200 - LAV40
52600 - OVRM50, OVRM55 (Premier Engine)
52800 - OVRM50, OVRM55
52900 - OVRM50, OVRM55 (High Tech Look)
53000 - TVS105
53600 - TVS105 (Premier Engine)
53800 - TVS105
53900 - TVS105 (High Tech Look)
54000 - TVXL105
56000 - TVS105, TVS & TVXL115
56600 - TVS105, TVS115 (Premier Engine)
56800 - TVS115
56900 - TVS105, TVS115 (High Tech Look)
57000 - TVS & TVXL115
57600 - TVS115 (Premier Engine)
57800 - TVS115
57900 - TVS115 (High Tech Look)
60000 - V50, TVM125
61000 - TVS & TVXL115
61600 - TVS & TVXL115
61800 - TVS115
61900 - TVS115
62000 - LAV50
62100 - LAV50 & TVS115
63000 - TVS120
63200 - TVS120, TVEM120
63600 - TVS120 (Premier Engine)
63900 - TVS120 (High Tech Look)
66000 - TVS120
66100 - TVS120
70000 - V60, TVM140
80000 - VH40
90000 - VH50
100000 - VH60
125000 - V70
127000 - VM70, TVM170
127200 - TVXL170
135000 - VH70
145000 - ECV100
147000 - ECV105
148000 - VH80
149000 - VH100
150000 - V & VM80, TVM195
150200 - TVM & TVXL195
150500 - TVM195
151000 - ECV110, TVM195
151500 - TVM220
152000 - ECV120
157000 - VM100, TVM220
157200 - TVM & TVXL220
157400 - TVM220
200000 - OVM120
202000 - OVXL120, OVXL125
202200 - OVXL120 (I/C)
202300 - OHV11, OHV115
202400 - OVXL125
202500 - OHV115
202600 - OVXL125 (I/C)
202700 - OHV12, OVXL120 (Tec.1200)
203000 - OHV125, OVXL125 (Tec1250)
203200 - OHV13
203500 - OVXL125 (Tec.1250I/C), OHV13/135
203600 - OHV14/140
203800 - OHV145
204000 - OHV15/150
204200 - OHV16/160
204400 - OHV165
204500 - OHV155
204600 - OHV17/170
204800 - OHV175
206000 - OHV110
206200 - OHV115
206400 - OHV120
206600 - OHV125
206800 - OHV130
206900 - OHV135
335000 - LEV100
338000 - LEV100
338500 - VSK100
340000 - LEV100
345000 - LEV100
350000 - LEV115
355000 - LEV115
360000 - LEV115
361000 - LEV120
361400 - VSK120
400000 - VLV40
500000 - ULT, VLV B24, VLXL50, & VLV126
501000 - ULT, VLV, VLXL55, & VLV126
502000 - ULT, VLV60, VLV65, & VLV126
502500 - VLV65, VLV66
600400 - TVT691

TECUMSEH Spark Plug Replacement



4-CYCLE SPARK PLUG

Service Number 34046

RL86C

†OHM120
‡OHSK110-130
OVM120
*OVXL120,
*OVXL/C120
*OVXL125

Note:

***OVXL models with specification nos. 202700, 203000 and up, use RN4C.**

† OHM 120 models with specification nos. 224000 and up, use RN4C.

‡ OHSK 110, 120, 130 models with specification nos. 223000 and up, use RN4C.

Service Number 33636

RJ17LM

H30-80
HM70-100
HS40-50
VLV-all

Service Number 35552

RL82C

HH140-160
OH120-160

Service Number 37598

RJ19LM4 (RJ19LM acceptable substitute .030 gap)

LEV80 - 120
gapped at .045 (1.143 mm)

Service Number 37599

RN4C4 (RN4C acceptable substitute .030 gap)

OVRM All
gapped at .045 (1.143 mm)

Service Number 34645

RN4C

†OHM120
‡OHSK110-130
OVM120
*OVXL120,
*OVXL/C120
*OVXL125
OH180
OHH/OHSK40-130
OHV110-17
TVT (V-Twin)
OHM90-110

*** OVXL models with specification nos. below 202700 use RL86C.**
† OHM 120 models with specification nos. below 224000 use RL86C.
‡ OHSK 110, 120, 130 models with specification nos. below 223000 use RL86C.

Service Number 34277

RJ8C

H22
H25
HH40-120
HHM80
HMXL70
HT30
HT35
HXL35
LAV25-50
TVM125-220
TVXL170-220
V40-80
VH40-100
VM70-100

Service Number 35395

RJ19LM

ECV100-120
HMSK70-100
HSK30-70
HSSK40-50
TNT100
VSK100-120
TNT120
TVS75-120
TVXL105
TVXL115

2-CYCLE SPARK PLUG

Service Number 611100

RCJ6Y

TC300
TCH300

Service Number 35395

RJ19LM

TVS840
TVXL840

Service Number 611049

RCJ8Y

AH520
AH600
HSK600
HSK840
HSK845
HSK850
TC200
TCH200
Type 1500
HXL840

Service Number 33636

RJ17LM

AV520
AV600
TVS600

EUROPA MODELS

4-CYCLE SPARK PLUG

Service Number 29010007

J17LM

All Horizontal Models
BV
BVL
BVS
Futura
HTL
LAV
Premier 153/173
Prisma
Spectra
Synergy
Vantage
Centura
Legend

Service Number 29010023

RN4C

Premier 45/55
Geotec OHV
Synergy OHV
Centrua OHV
Futura OHV

2-CYCLE SPARK PLUG

Service Number 29010007

J17LM

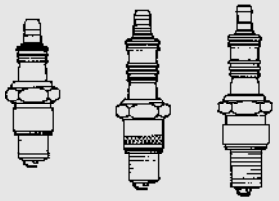
AV85/125
AV520/600
MV100S
TVS600

NOTE: THE SERVICE NUMBERS LISTED BELOW WILL GIVE CORRESPONDING CHAMPION AND AUTOLITE SUBSTITUTIONS.

		Champion	Autolite
35395	**-**	**RJ-19LM**	**458**
37598	**-**	**RJ-19LM4**	**458**
35552	**-**	**RL-82C**	**4092**
34046	**-**	**RL-86C**	**425**
34645	**-**	**RN-4C**	**403**
37599	**-**	**RN-4C4**	**403**
33636	**-**	**J-17LM**	**245**
34277	**-**	**RJ-8C**	**304**
611100	**-**	**RCJ-6Y**	**2974**
611049	**-**	**RCJ-8Y**	**2976**

**NON CANADIAN APPLICATION*

SPARK PLUG AIR GAP IS .030 (.762 mm) UNLESS OTHERWISE NOTED



3/8" 9.525 mm
1/2" 12.700 mm
3/4" 19.050 mm

NOTE:
Not all spark plugs have the same heat range or reach. Using an incorrect spark plug can cause severe engine damage or poor performance. Tecumseh uses all three of the reaches shown. Some plugs require .045 gap.

Note: If you need assistance locating your engine model numbers please check page 2 & 3

FUEL RECOMMENDATIONS

Today's fuels have a short shelf life and it is recommended you buy no more than a two week supply at a time.

GASOLINE

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build-up of combustion chamber deposits. Leaded gasoline, gasohol containing no more than 10% ethanol, premium gasoline, or unleaded gasoline containing no more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, can be used if unleaded regular gasoline is not available.

Reformulated gasoline that is now required in several areas of the United States is also acceptable.

NEVER USE gasoline, fuel conditioners, additives or stabilizers containing methanol, gasohol containing more than 10% ethanol, unleaded regular gasoline containing more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, gasoline additives, or white gas because engine/fuel system damage could result.

Specialty Fuels: Fuels being marketed for use on small engines can have a significant affect on starting and engine performance. Prior to using any specialty fuel, the Reid Vapor Pressure (RVP) must be determined. Fuels with a rating of less than 50 kPa (7psi) should not be used in summer, and fuel with a rating of 85 kPa (12psi) should not be used during winter.

Storage: For year round fuel stability in and out of season, use "Ultra Fresh™" part number 730245A.

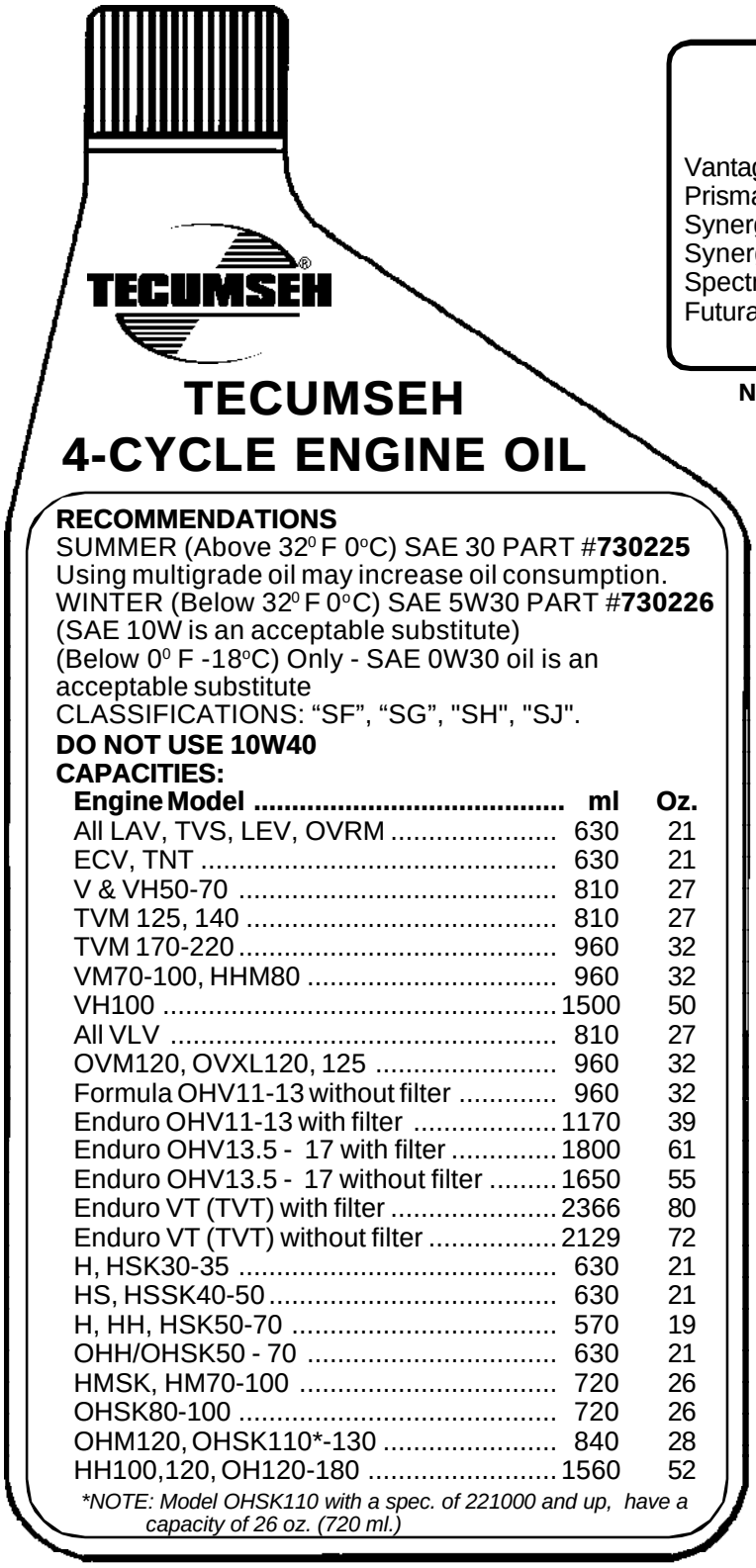
FUEL ADDITIVES

Only fuel additives such as Tecumseh's fuel stabilizer Ultra Fresh™ part number 730245A or liquid varieties can be used when mixed properly. For winter applications, Isopropyl alcohol fuel dryers may be used in the fuel system but must be mixed at the proper ratio recommended by the manufacturer. **NEVER USE METHANOL BASED DRYERS.**

TECUMSEH 4-CYCLE LUBRICATION REQUIREMENTS

We often get questions from both customers and dealers regarding the type and brand of oil we recommend.

Tecumseh recommends the use of a high quality, brand name petroleum based oil in our engines. Very few air cooled engines have any type of oil filtration system, making regular oil changes critical to remove impurities from the engine and maximize engine life. **Consult the operators or repair manual for the oil change interval and viscosity base on equipment operating temperature.**



RECOMMENDATIONS
SUMMER (Above 32^0 F 0^{o}C) SAE 30 PART #**730225**
Using multigrade oil may increase oil consumption.
WINTER (Below 32^0 F 0^{o}C) SAE 5W30 PART #**730226**
(SAE 10W is an acceptable substitute)
(Below 0^0 F -18^{o}C) Only - SAE 0W30 oil is an acceptable substitute
CLASSIFICATIONS: “SF”, “SG”, "SH", "SJ".
DO NOT USE 10W40
CAPACITIES:

Engine Model	**ml**	**Oz.**
All LAV, TVS, LEV, OVRM	630	21
ECV, TNT	630	21
V & VH50-70	810	27
TVM 125, 140	810	27
TVM 170-220	960	32
VM70-100, HHM80	960	32
VH100	1500	50
All VLV	810	27
OVM120, OVXL120, 125	960	32
Formula OHV11-13 without filter	960	32
Enduro OHV11-13 with filter	1170	39
Enduro OHV13.5 - 17 with filter	1800	61
Enduro OHV13.5 - 17 without filter	1650	55
Enduro VT (TVT) with filter	2366	80
Enduro VT (TVT) without filter	2129	72
H, HSK30-35	630	21
HS, HSSK40-50	630	21
H, HH, HSK50-70	570	19
OHH/OHSK50 - 70	630	21
HMSK, HM70-100	720	26
OHSK80-100	720	26
OHM120, OHSK110*-130	840	28
HH100,120, OH120-180	1560	52

**NOTE: Model OHSK110 with a spec. of 221000 and up, have a capacity of 26 oz. (720 ml.)*

EUROPA MODELS *

VERTICALS	oz.	ml	VERTICALS (CONT.)	oz.	ml
Vantage	21	630	Centura	21	630
Prisma	21	630	HTL	21	630
Synergy	21	630	BVS	21	630
Synergy "55"	27	810	**HORIZONTALS**		
Spectra	21	630	BH Series	21	630
Futura	21	630	Geotec Series 35 - 50	21	630

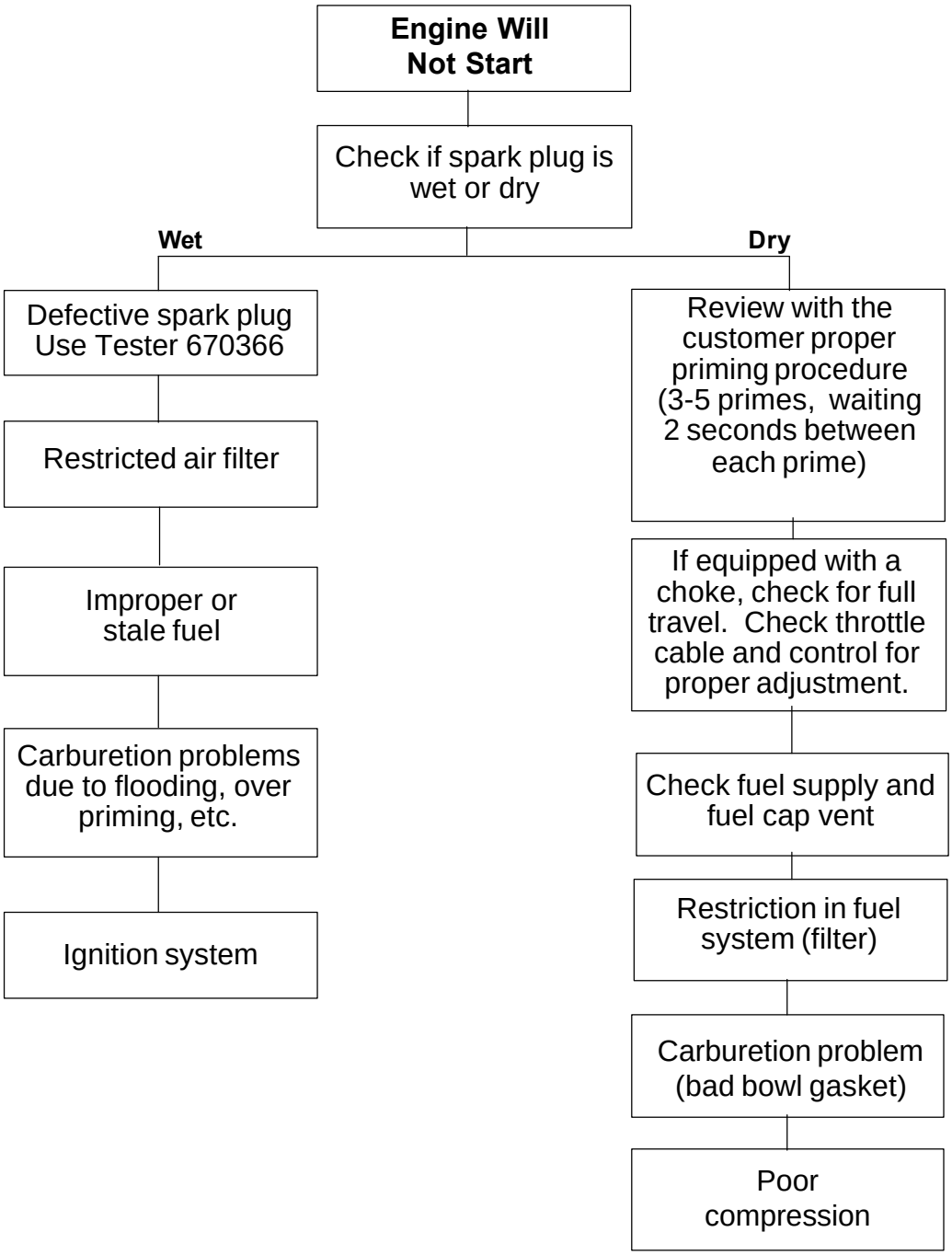
NOTE: Vertical shaft engines with auxiliary PTO: 26 oz. / 700 ml

Four-Cycle Troubleshooting

The following is provided as a basic trouble shooting guide to any piece of equipment. Its use requires a complete review of all conditions and symptoms. Always examine the exterior for clues: leaks, excessive dirt, or obvious damage. Some repairs will require the assistance of a Tecumseh service dealer.

WARNING: ALWAYS USE APPROPRIATE SAFETY EQUIPMENT BEFORE ATTEMPTING ANY REPAIR.

FUEL SYSTEM



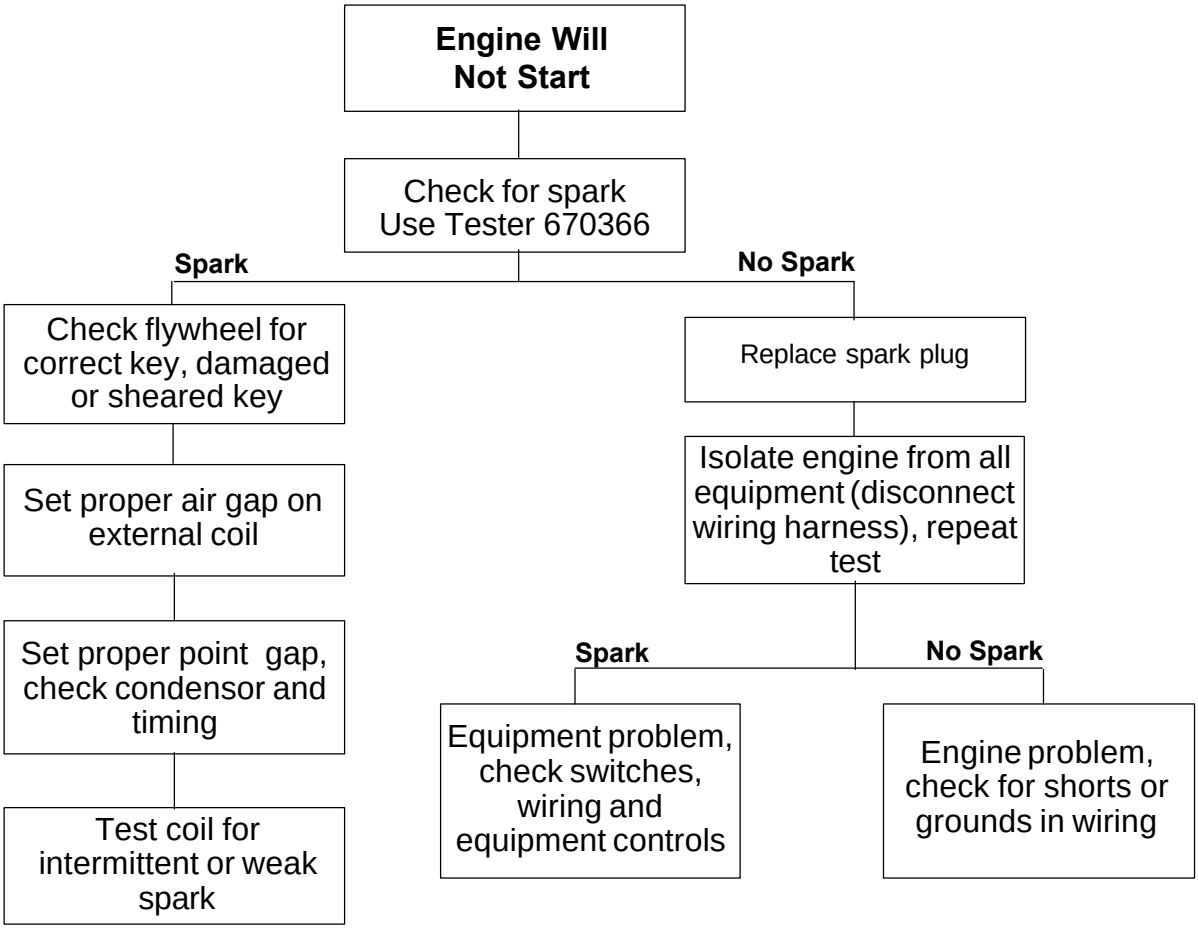
Beyond this point contact a Tecumseh Dealer or purchase a repair manual (see educational materials)

NOTE: Refer to Technician's Handbook for a more detailed list of remedies.

Four-Cycle Troubleshooting - *continued*

WARNING: ALWAYS USE APPROPRIATE SAFETY EQUIPMENT BEFORE ATTEMPTING ANY REPAIR.

IGNITION SYSTEM



Beyond this point contact a Tecumseh Dealer or purchase a repair manual (see educational materials)

TECUMSEH 2-CYCLE ENGINE OIL REQUIREMENTS

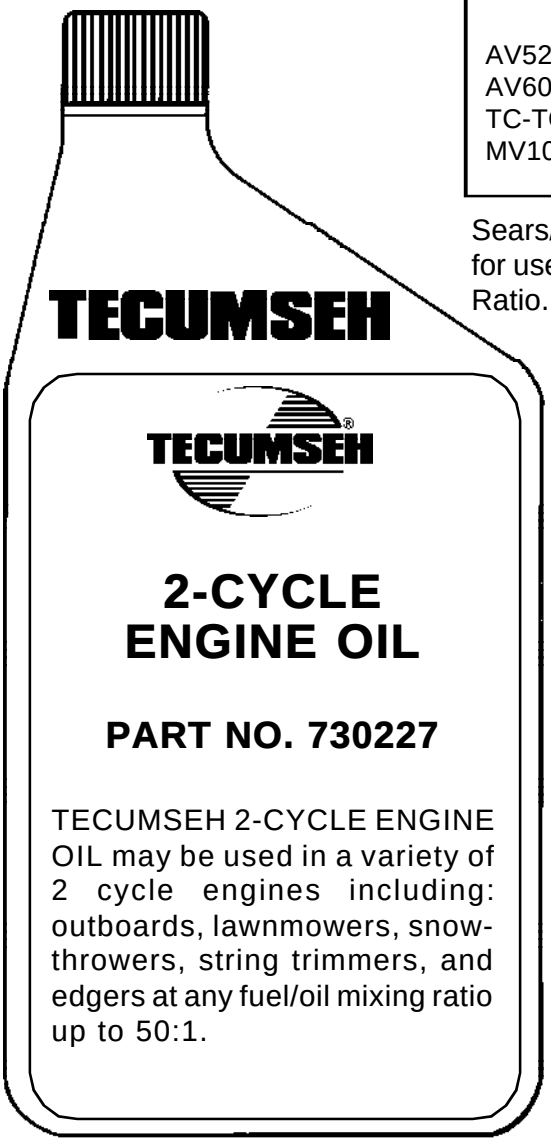
The proper type and ratio of two cycle oil is critical to long life and low maintenance of the engine. The use of non certified oils and improper mix ratio's can cause severe engine damage and possibly void warranty consideration.

The following is a list of 2 cycle engine oil classifications which are certified for use in Tecumseh 2 cycle engines:

- National Marine Manufactures Association, (NMMA), TC-WII or TC-W3
- American Petroleum Institute, (API), TC
- Japanese Automobile Standard Organization, (JASO), FB or FC

TWO-CYCLE FUEL/OIL MIX RATIOS		
24:1 AV520 Types 670 & 653 AV600 Type 600-10 & Up TC-TCH 200/300 MV100S	**32:1** TVS600 All Types AH600	**50:1** TVS / TVXL HSK840 - 850 HSK600 - 635

Sears/Craftsman 40:1 Two Cycle Oil has been tested and approved for use in all engines, ACCEPT the TC Models which require a 24:1 Ratio.



MIXES EASY
DOES NOT SEPARATE

PREMIUM BLEND FOR BOTH AIR AND WATER COOLED ENGINES ENSURES CYLINDER WALL LUBRICATION

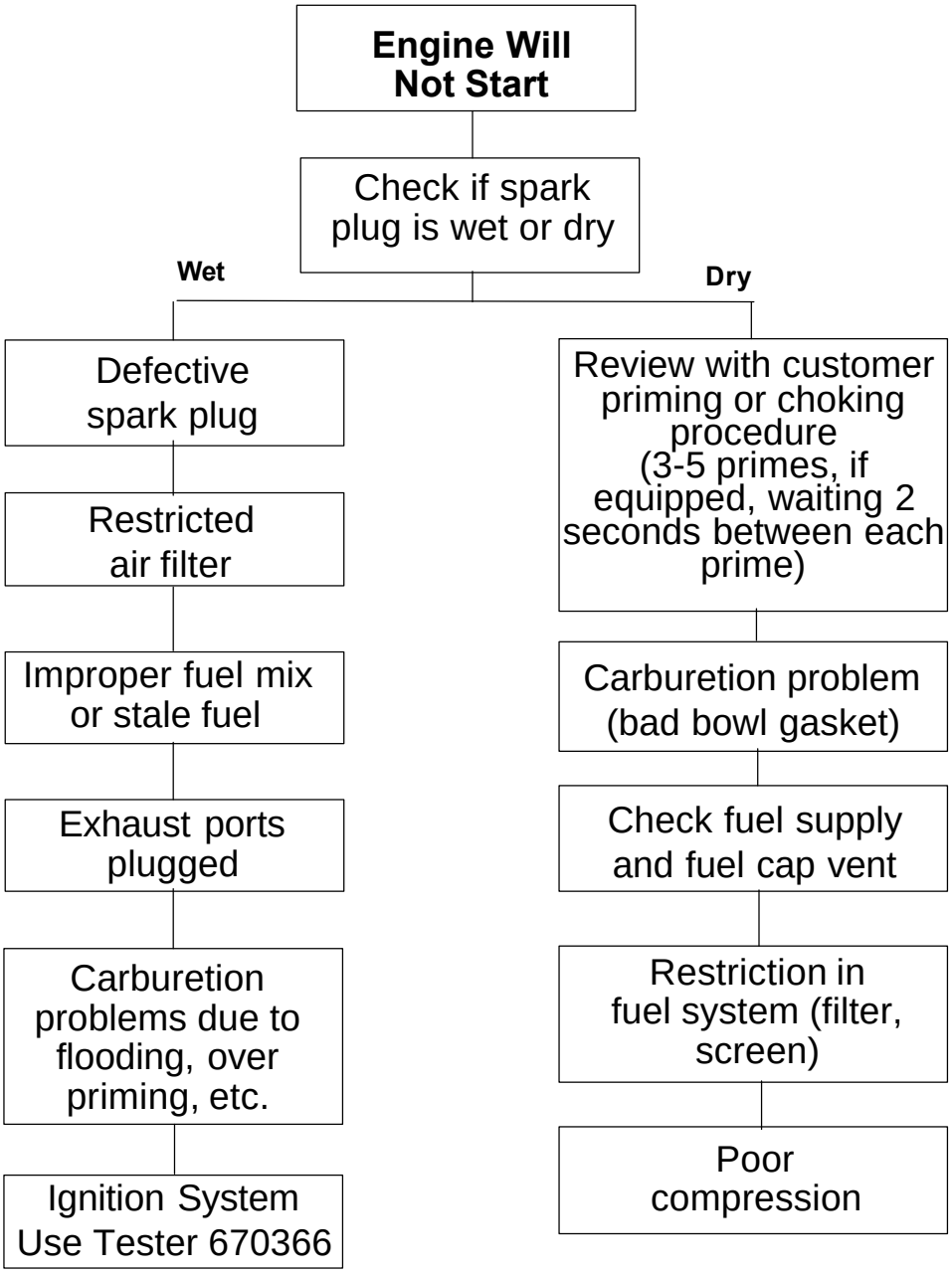
ENGINE FUEL MIX				
	U.S. Gasoline	U.S. Amount of Oil To Be Added	METRIC Petrol	METRIC Amount of Oil To Be Added
24:1	1 Gallon 2 Gallons	5.3 oz. 10.7 oz.	4 Liters 8 Liters	167 ml 333 ml
32:1	1 Gallon 2 Gallons	4 oz. 8 oz.	4 Liters 8 Liters	125 ml 250 ml
50:1	1 Gallon 2 Gallons	2.5 oz. 5.0 oz.	4 Liters 8 Liters	80 ml 160 ml

Two-Cycle Troubleshooting

The following is provided as a basic trouble shooting guide to any piece of equipment. Its use requires a complete review of all conditions and symptoms. Always examine the exterior for clues: leaks, excessive dirt, or obvious damage. Some repairs will require the assistance of a Tecumseh service dealer.

WARNING: ALWAYS USE APPROPRIATE SAFETY EQUIPMENT BEFORE ATTEMPTING ANY REPAIR.

FUEL SYSTEM

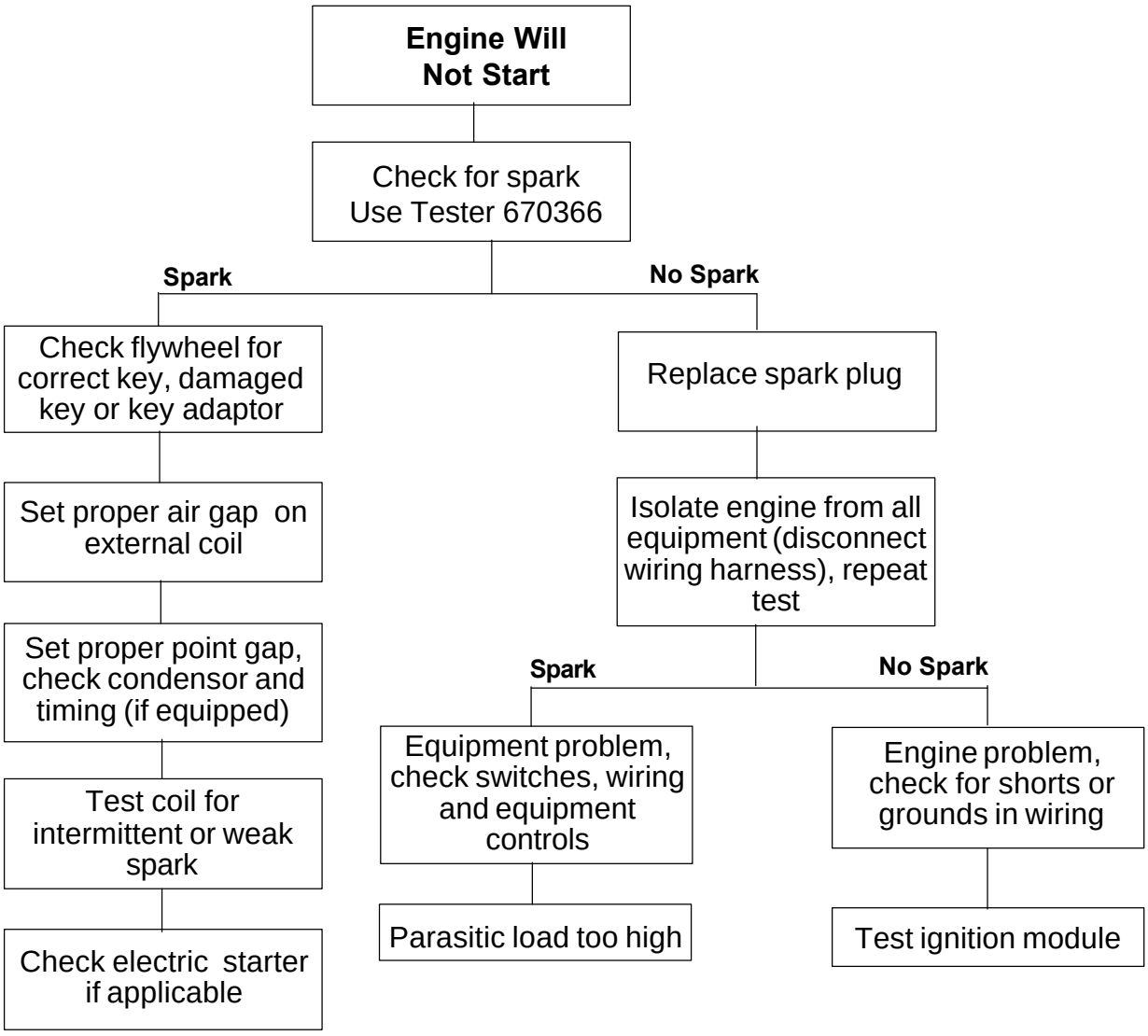


Beyond this point contact a Tecumseh Dealer or purchase a repair manual (see educational materials)

Two-Cycle Troubleshooting - *continued*

WARNING: ALWAYS USE APPROPRIATE SAFETY EQUIPMENT BEFORE ATTEMPTING ANY REPAIR.

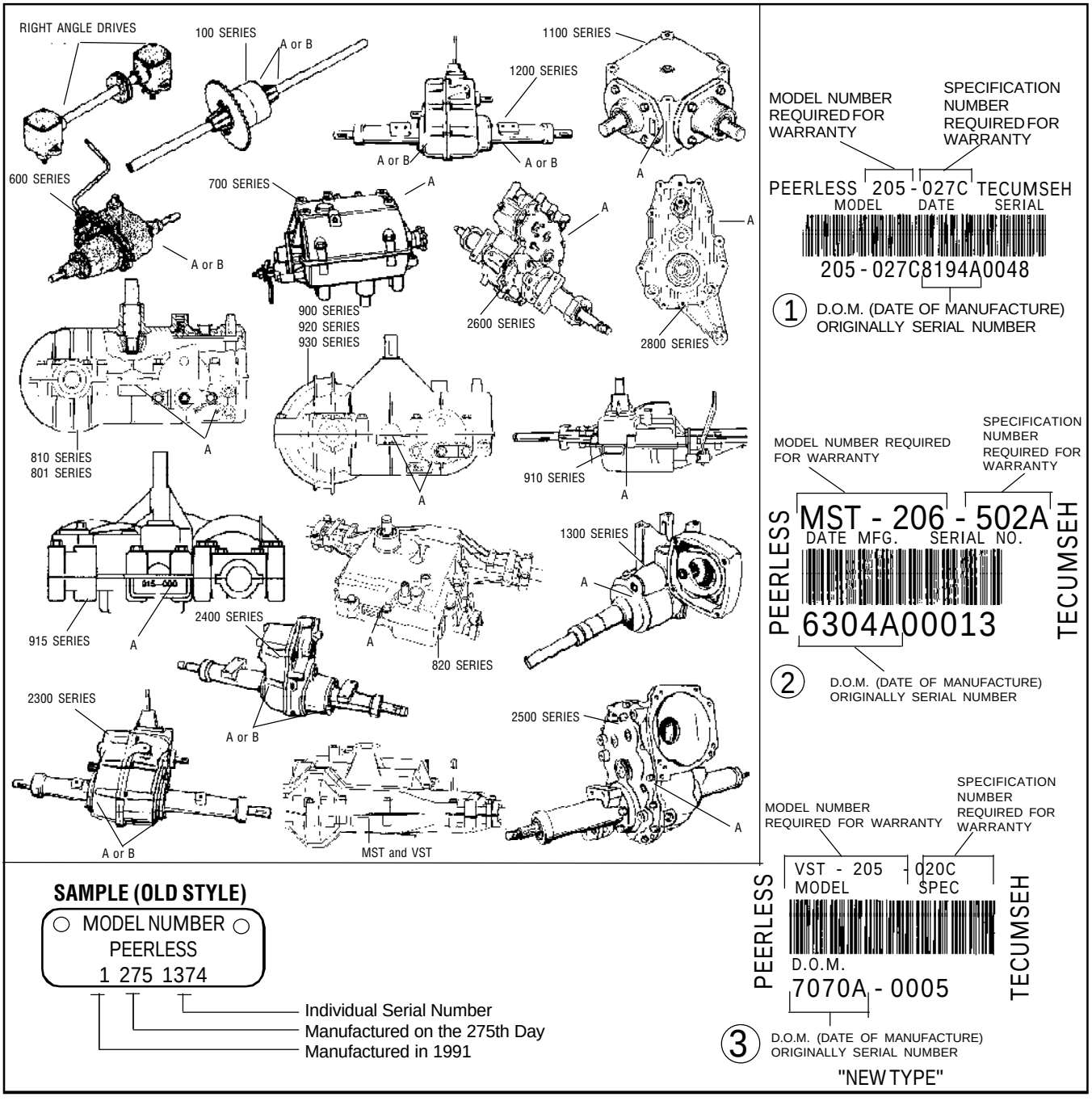
IGNITION SYSTEM



Beyond this point contact a Tecumseh Dealer or purchase a repair manual (see educational materials)

TECUMSEH / PEERLESS® DRIVE TRAIN

The following information is being provided to assist you in locating and recording your Tecumseh Drive Train components model and specification numbers. This information will be needed to use this book or obtain parts from a local Tecumseh dealer.



BASIC GEAR DRIVE TROUBLESHOOTING

Hard Shifting Transaxles and Drive Belts

Often hard shifting is blamed on an internal problem in the transaxle.

To determine if the problem is transaxle or equipment related make these simple checks.

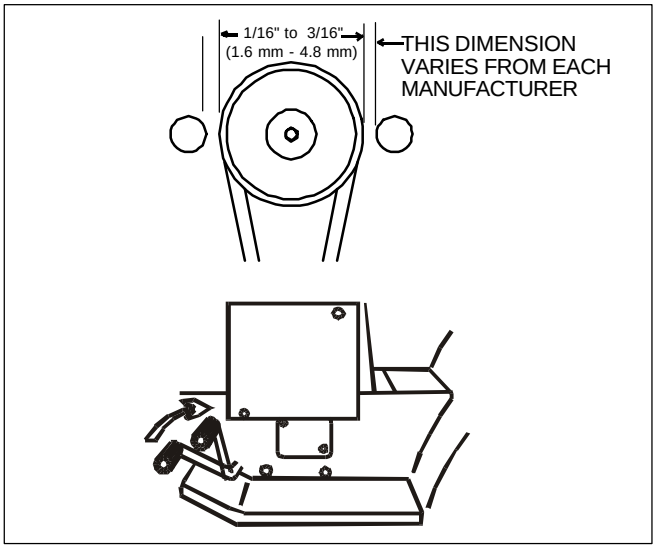
1. Turn the unit off so that all power is removed to the transaxle
2. With the unit off move the shift lever through the shift gate. Movement of the lever should have only slight resistance. The shifting effort should be equal when the engine is off and when running. If the unit is difficult to shift the problem would be internal and the transaxle would need to be removed and repaired
3. If the unit shifts with ease, check the following areas that would be equipment related. Check to see if the belt is releasing from the pulley on the engine and transmission / transaxle, it may require that the belt guides be repositioned. The distance required from the pulley to the guide is typically 1/16" to 3/16" (1.6 mm - 4.8 mm), always check the O.E.M. specs.
4. Check to see if the pulley is damaged and may not be releasing the belt.
5. Make sure that the belt is the correct length and type in case it was replaced with a non original, possibly more aggressive belt.
6. Check the brake/clutch pedal to make sure that when the pedal is depressed that the idler pulley is releasing the belt tension before it applies the brake. If this does not happen the unit will still be under a load and be impossible to shift
7. The final area to check would be for damaged or binding shift linkage.

Hard shifting with the engine off could be caused by:

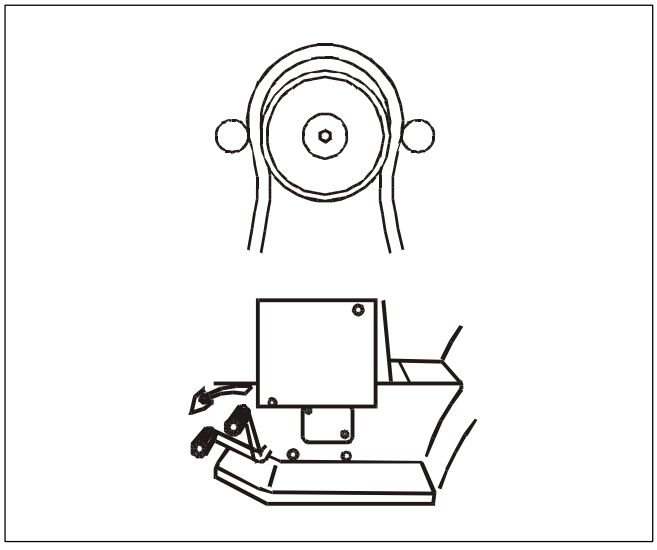
1. Shift linkage out of adjustment.
2. Corrosion in the transaxle or transmission.
3. Damaged shift keys, gears, or shifter brake shaft.
4. Belt guides missing or improperly adjusted (see equipment manufacturer specs.)

Unit Seems to Slip:

1. Check for proper belt adjustment (consult OEM operator's manual).
2. Check for proper clutch/brake adjustment (consult OEM operator's manual).
3. Check pulley condition and wheels for sheared or damaged keys.
4. Check drive belt condition, if glazed or worn replace it.



For proper declutching to occur, it is very important that the engine belt guide be set at a predetermined gap (set by the manufacturer) and away from the belt with the belt engaged.



With clutch disengaged, it is very important that the belt blossoms away from the engine pulley. Belt must stop turning before transaxle shifting can occur.

VST Hydrostatic Model Troubleshooting

The information on this page has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs. Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, Tecumseh would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 of the travel distance from neutral to forward.
3. Place the tractor on a 17 degree grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and / or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may have the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.
3. **Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows, with a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

   The second chamber is for the output gears including the differential. FIRST make sure the tractor is level, then remove the drain/fill plug. NOTE: Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. With a small pocket rule insert until you touch bottom of case. You can then remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact, this is full at its 8 oz. capacity.
4. **Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

   To determine absolute neutral, the hole in the tapered control shaft must face straight up and down, at this point make sure the OEM linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 Nm) of torque with the shaft and the lever in neutral.

   When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16 bolt in the hole of the shaft. Hold the bolt until the tapers are locked and the nut torque is correct.

   To make sure that the brake is not binding, drive the unit up a slight grade.. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.
5. **Hard to shift:** Typically hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Approximately 40-50 inch lbs. (4.48 - 5.6 Nm) at the transaxle for foot pedal units or 150-200 inch lbs. (16.8 -22.4 Nm) for hand operated units. This varies depending on the type of linkage. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.

Tecumseh/ Peerless® Lubrication Requirements

Note: It is **CRITICAL** to your units long life that you use ONLY the recommended lubricant in all models as listed.

TRANSAXLES

Model No.	Quantity
600	24 oz./710 ml Oil
800	30 oz./887 ml Grease
801	36 oz./1065 ml Grease
820	36 oz./1065 ml Grease
900	26 oz./769 ml Grease
910	18 oz./532 ml Grease
915	10 oz./296 ml Grease
920	30 oz./887 ml Grease
930	30 oz./887 ml Grease
1200	48 oz./1420 ml Oil ††
1301 1305 1309 1313	32 oz./946 ml Oil
1302 1303 1304 1306 1307 1308 1310 1311 1312 1314 1315 1316 1317 1318 1320 1321 1322 1325 1328 1329 1319	44 oz./1301 ml Oil
1323 1326 1327	24 oz./710 ml Oil
LTH	8 oz./240 ml Oil
MST200 VST205 and 1800's	16 oz./473 ml Oil ††††
2300	64 oz./1892 ml Oil
2400 2500	32 oz./946 ml Oil †

TRANSMISSIONS

Model No.	Quantity
2600	†
700	12 oz./355 ml Grease
700H	12 oz./355 ml Grease
2800	†

RIGHT ANGLE AND T DRIVES

Model No.	Quantity
All Models Except *	4 oz./118 ml Grease
*1408-P91 *1409-P91 *1410-P91 *3002 *3003 *3028 *3029 *3035	3 oz./89 ml Grease
1000 Series	6 oz. / 180 ml Oil †††
1100	16 oz./473 ml Oil

DIFFERENTIALS	
All Models	3 oz./89 ml Grease

TWO SPEED AXLE	
All Models	2 oz./59 ml Grease

THREE SPEED AXLE	
All Models	2 oz./59 ml Grease

Grease: Bentonite Grease
Part Number 788067B

Oil: SAE E.P. 80W90 Oil
Part Number 730229A

† Refer to O.E.M. Mechanic's Manual for type of lubricant

†† To be filled through shift lever opening

††† Some 1000 Right Angle and T-Drives use Bentonite Grease.

†††† Tecumseh's current policy on hydrostatic transaxles with internal failure, is to replace the complete unit. VST and 1800's have two separate reservoirs which can be checked for diagnostic purpose only. The output gear reservoir can be checked with a small pocket rule as outlined in the Motion Drive Systems Book.

Refer to Motion Drive Systems Book, 691218.

Tecumseh Recall Hotline: (888) 271-4048
CPSC Hotline: (800) 638-2772
CPSC Media Contact: Scott Wolfson (301) 504-0580 Ext. 1189

CPSC, Tecumseh Products Co. Announce Recall of Power Equipment Engines

WASHINGTON, D.C. – In cooperation with the U.S. Consumer Product Safety Commission (CPSC), Tecumseh Products Co., Tecumseh, Mich., is voluntarily recalling about 25,000 engines used in various outdoor power equipment. Products equipped with the recalled engines were sold by retailers and dealers nationwide from June 2002 through November 2002. A misrouted fuel line in the engine can become damaged, allowing gasoline to leak out, posing a fire hazard to consumers.

Tecumseh has not received any reports of incidents. This recall is being conducted to prevent the possibility of injuries

The recalled engines, which were manufactured in the United States, have model numbers HMSK 80 through 110 and HM 80 through 100, which can be found on the lower left side of the engine housing. The recalled engines also have a date of manufacture code (DOM) between 02175 and 02268 followed by the letter "C", which can be found on the engine identification decal. The HMSK models are 8 to 11 horsepower Snow King® snowthrower engines, while the HM models are 8 to 10 horsepower Utility engines.

The power equipment, brand names, and retailers involved in this recall include:

POWER EQUIPMENT	BRAND NAME	MODELS	RETAILERS AND DEALERS
8 – 11 HP Snowthrowers	Ariens	932101, 924116 924550	Home Depot Ariens Dealers, Blain's Farm & Fleet
	Simplicity	169398S	Simplicity Dealers
	Snapper	84924	Snapper Dealers
	Toro	38078	Toro Dealers
8 – 10 HP Chipper-Shredders	Mighty Mac Merry Mac	VCB258 VCB258M	Mackissic Dealers Northern Tool
	MTD Yard Machines	24A-465A-097 24A-465E-129 24A-465A-000	Menards, Northern Tool Home Depot Northern Tool Catalog, Dealers
	Baker, Earthquake	8/14	Ardisam Dealers
	Simplicity	8/14	Simplicity Dealers
8 HP Generators	Coleman	PM0524000	Menards
	NorthStar	165960	Northern Tool
8 HP Pressure Washers	Tilton Aqua Stripper	8300TCO, 8300TCOQ, 8300TCOQ-50	Tilton Dealers
	Tilton Hydra Storm	Force 96TCO, 96TCOQ	Hydra Storm Dealers
8 HP Wheeled Leaf Blowers	MTD Yard Machines	24A-655A-129	Home Depot

Consumers should stop using the power equipment immediately and contact Tecumseh at (888) 271-4048 between 8 a.m. and 7 p.m. ET Monday through Friday to schedule a free engine repair.

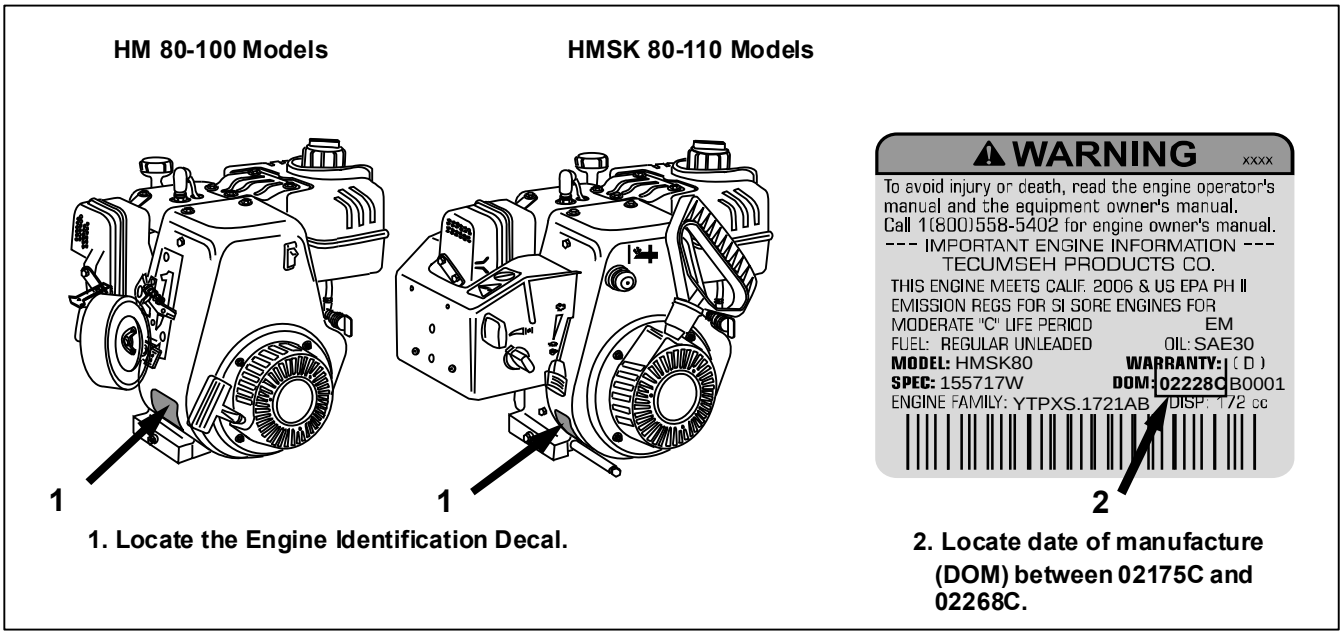


Figure 1

Figure 2

Engines that have a dot painted on the fuel line have already been inspected or repaired and are not included in this recall. Please note some of the units may not be equipped with a fuel shut-off valve, as shown.

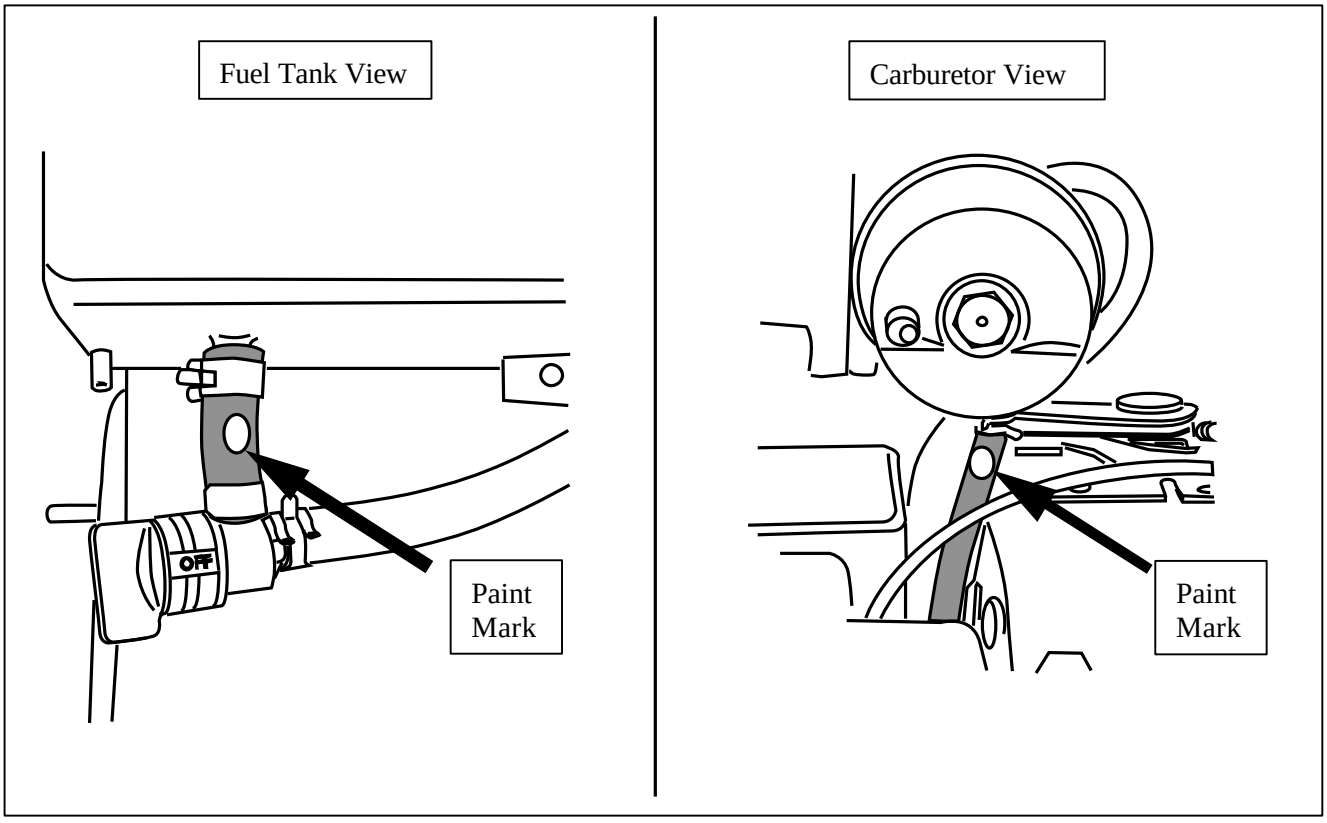


Figure 3

The U.S. Consumer Product Safety Commission protects the public from unreasonable risks of injury or death from 15,000 types of consumer products under the agency's jurisdiction. To report a dangerous product or a product-related injury, call CPSC's hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270, or visit CPSC's web site at www.cpsc.gov/talk.html. Consumers can obtain this release and recall information at CPSC's web site at www.cpsc.gov.

TECUMSEH

SERVICE BULLETIN 101

INFORMATIONAL

ISSUED: November 1966

REVISED: June 1995

SUBJECT: Cracked Flywheels

MODELS OR TYPES AFFECTED: All Tecumseh Models and Types

Illustrations A and B are to be used as a guide to determine reasons for cracked flywheels.

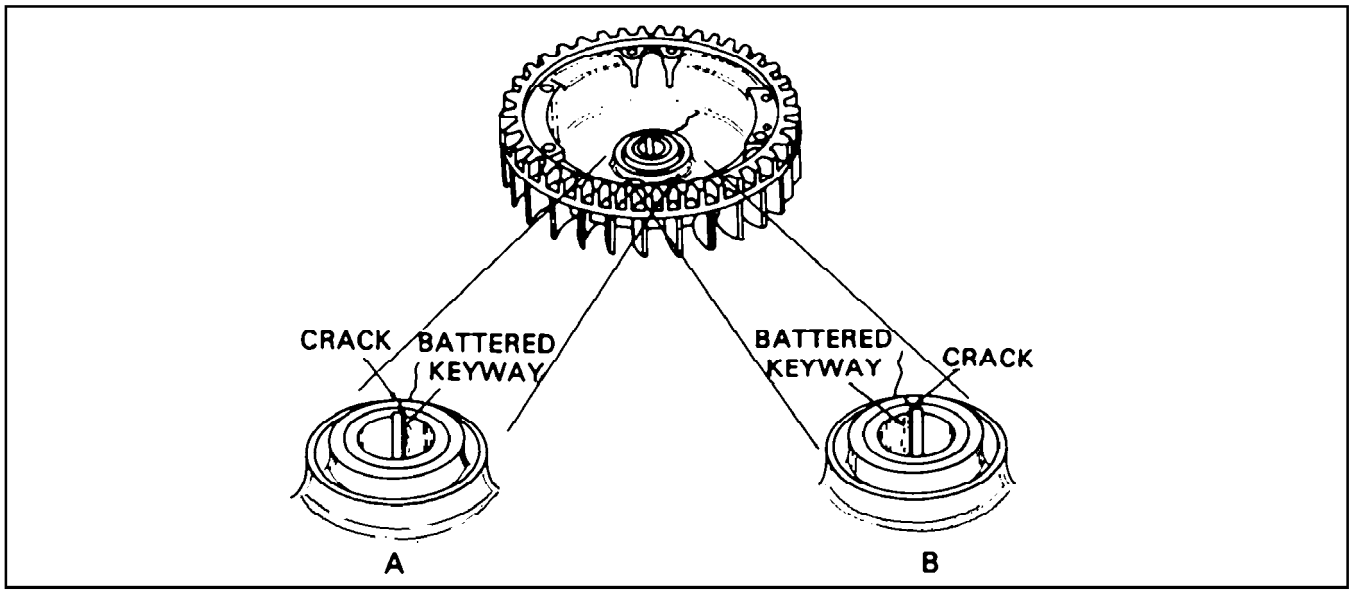
Illustration A:

Cracks appearing in the position as illustrated are the results of sudden stopping of the crankshaft. For example; rotary mower blades hitting a solid object. NOT WARRANTY.

Illustration B:

Flywheels that are loose will crack as illustrated. This comes from constant pounding of the key in the keyway. With each power stroke of the piston the key will batter the side of the keyway. Look for rust on crankshafts as another indication of loose flywheels. Flywheels that have not been previously removed and reinstalled and fail for this reason are subject to Standard Warranty.

Flywheel and crankshaft tapers should be clean and dry and torqued to specs listed in Mechanics manual.



The use of soft aluminum flywheel keys and adapters has reduced flywheel damage by shearing. Sudden crankshaft stoppage or a loose flywheel will damage the flywheel key or adapter without typically damaging the flywheel.

SERVICE BULLETIN 102

INFORMATIONAL

ISSUED: November 1966

REVISED: June 1995

SUBJECT: Crankshaft Straighteners

Periodically we are asked whether we approve of straightening crankshafts in the field and our answer is definitely NO, and for very good reasons.

A bent crankshaft is caused by hitting a solid object and almost invariably involves a rotary type mower. It takes a terrific force to bend a relatively short shaft 3/4" to 1" in diameter and when this occurs the possibility of creating undetectable cracks in the metal are most likely. Even if "straightened" eventual metal fatigue can result with the possibility of serious injury to the user.

Those straightening devices which use the engine bearing as a fulcrum while bending the shaft, subject the bearing to forces which it was never designed to stand.

Use of these devices is, of course, a personal decision but it is to be clearly understood the Lauson-Power Products will assume no liability as a result of a crankshaft being presumably straightened and the customer should be so informed.

TECUMSEH

SERVICE BULLETIN 103

INFORMATIONAL

ISSUED: November 1966

REVISED: June 1995

SUBJECT: Accessories Installed to Tecumseh Engines by Original Equipment Manufacturers

On occasion an equipment manufacturer will elect to install an accessory such as an electric starter not of our design and manufacture to a Tecumseh engine.

Parts or assemblies in this category are not warranted by Tecumseh Products Company, Engine and Transmission Group, Service Division. If the engine itself has been damaged because of a malfunction of the accessory, the cost of this repair also becomes the owner's responsibility.

We suggest you refer the owner of the equipment to the equipment dealer who sold it for relief in warranty. Otherwise failure of the engine itself within the warranty period is covered by our standard warranty policy and procedure.

If you are in doubt as to whether an accessory is of our manufacture, you can determine this by referring to the appropriate exploded view drawing in your Master Parts Manual. If it is shown and referenced to our part numbers, then it is factory installed and should be serviced.

SERVICE BULLETIN 104

INFORMATIONAL

ISSUED: January 1969

REVISED: June 1995

SUBJECT: Gas Tanks on Tecumseh Powered Equipment Not supplied by Tecumseh Products but Supplied and Installed by the Original Equipment Manufacturer.

Tecumseh warranty covers any defects in Tecumseh supplied and installed fuel tanks. Fuel tanks that are supplied and installed by an Original Equipment Manufacturer (OEM) are the responsibility of the OEM or the owner of the equipment, not Tecumseh Products Company.

Rust or foreign material that is traceable to the contents or deterioration of an OEM installed fuel tank and caused the malfunction of the fuel system, is not covered under Tecumseh Warranty.

Check the Tecumseh Master Parts Manual to determine if the fuel tank is supplied by an OEM or Tecumseh. If the engine specification number is listed under a part number, the fuel tank is supplied by Tecumseh. If a part number is not listed for the engine specification number, the fuel tank is OEM supplied.

TECUMSEH

SERVICE BULLETIN 105

INFORMATIONAL

ISSUED: March 1969

REVISED: June 1995

SUBJECT: Warranty Repair or Replacement Does Not Extend Warranty Period.

Some owners are under the impression that a warranty repair of an engine or Peerless power train automatically extends the warranty period. Our warranty is from the original date of sale of the unit to the final consumer, whatever warranty time period is involved.

The fact that our product is repaired or replaced during the original warranty period does not alter the expiration date of the original warranty.

Example: If a product having a 12 month warranty fails during the 10th month, a total of two months remains under the warranty.

SERVICE BULLETIN 106

INFORMATIONAL

ISSUED: May 1969

REVISED: June 1995

SUBJECT: Vibration

On occasion, you may be presented with a unit by an owner who complains of vibration.

In evaluating vibration, the equipment should always be in the environment for which it was designed to operate. For instance, a rider should be checked in the grass, cutting.

First, it should be determined that the vibration is not being caused by a condition such as a loose or unbalanced blade, overspeeding of the engine, out-of-line drive, pulleys, loose or worn belts, loose engine mounting or other loose hardware, or over-inflated tires on larger equipment. These conditions, if found, are not considered engine warranty and arrangements for the expense of correction should be made with the owner.

If no external condition can be found, such as above, then advise the owner to contact the dealer from which the unit was originally purchased and request him to contact the manufacturer of the unit for further instructions.

TECUMSEH

SERVICE BULLETIN 107

INFORMATIONAL

ISSUED: May 1970

REVISED: June 1995

SUBJECT: Revised Safety Specifications for Rotary Type Power Lawnmowers

MODELS OR TYPES AFFECTED: All Tecumseh engines used to power a rotary type lawnmower.

The United States of America Standards Institute, sponsored by the Outdoor Power Equipment Institute has recently revised the maximum blade tip speed of 21,000 Ft./Min. downward to 19,000 Ft./Min.

As blade tip speed of a rotary type lawn mower is always in relation to engine RPM, it is extremely important that before delivery to an owner the maximum RPM is set so the maximum blade tip speed will not exceed the new 19,000 Ft./Min. specification.

The following chart gives the maximum blade RPM which will produce a blade tip speed of 19,000 Ft./Min. for the various blade lengths commonly found.

BLADE TIP SPEED	BLADE LENGTH	BLADE RPM	BLADE TIP SPEED	BLADE LENGTH	BLADE RPM
19,000 Ft./Min.	18”	4031	19,000 Ft./Min.	23	3154
19,000 Ft./Min.	19”	3819	19,000 Ft./Min.	24	3023
19,000 Ft./Min.	20”	3627	19,000 Ft./Min.	25	2903
19,000 Ft./Min.	21”	3454	19,000 Ft./Min.	26	2903
19,000 Ft./Min.	22”	3298			

The manufacturer of the equipment may have a recommended maximum blade RPM lower than the above maximum and in those cases follow the equipment manufacturer’s recommendation for the lower maximum blade RPM.

If the cutter blade is mounted directly to the engine crankshaft, the blade and engine RPM will be the same. In this situation proceed as follows:

NOTE: Engine should always be mounted to mower deck with blade attached. Always operate mower on a clean hard surface to eliminate any cutting load on the blade.

1. Determine blade length measured diagonally across the cutting tips. (Detach spark plug high tension lead to avoid accidentally starting engine.)
2. Start engine and allow it to reach normal operating temperature.
3. Set carburetor control to “High” or “Run” for maximum speed.
4. Adjust carburetor for optimum operation.
5. Determine maximum allowable RPM for length of blade attached from chart above.
6. Determine engine RPM with a suitable tachometer and adjust the top governed speed of engine as necessary. (Refer to your Mechanics Handbook for proper method of adjusting the particular governor found on the engine being adjusted.)

(Continued on Next Page)

TECUMSEH

7. It is suggested as an added safety measure that the top governed engine speed be set at 200 RPM less than chart shows.
8. After all adjustments are completed, recheck the top governed engine speed to be sure it is correct.

If the cutting blade is not directly mounted to the engine crankshaft, but is driven by means of belts and pulleys or through a gear box, the engine RPM and blade RPM may not be the same and the ratio will have to be determined. In this situation proceed as follows:

1. Determine blade length measured diagonally across cutting tips. (Detach spark plug high tension lead to avoid accidentally starting engine.)
2. If the top end of the shaft to which the blade is mounted is exposed, the blade RPM can be determined by use of a dial type tachometer and the same procedure should be used as set forth above for a direct mounted blade.
3. If a dial type tachometer is not available or the top end of blade shaft is not exposed, then the relation of engine RPM to blade RPM must be determined, which is easily done as follows:
   A. Disconnect spark plug high tension wire to avoid accidentally starting engine.
   B. Rotate engine one (1) full turn and observe the amount of blade rotation. If it is also one (1) full turn then proceed as if blade is directly mounted to engine crankshaft.
   C. If for example the blade rotates 1-1/4 turns for each full turn of the engine, divide the blade rotation figure by 1.25. This will give you the maximum engine RPM which will not exceed the 19,000 Ft./Min. blade RPM.
   D. Proceed to adjust engine top governed speed as set forth above.

IT IS IMPERATIVE THAT YOUR SHOP BE EQUIPPED WITH A SUITABLE TACHOMETER TO ACCURATELY DETERMINE ENGINE RPM AND BLADE TIP SPEEDS WHENEVER YOU SERVICE ENGINES ON LAWN MOWERS MANUFACTURED TO COMPLY WITH U.S.A.S.I. SAFETY SPECIFICATIONS.

IT IS ALSO IMPERATIVE THAT ALL MECHANICS BE MADE AWARE OF THE INFORMATION CONTAINED IN THIS BULLETIN AND THAT PROPER SHOP PROCEDURE BE ESTABLISHED TO CONFORM TO THE ABOVE.

TECUMSEH

SERVICE BULLETIN 108

INFORMATIONAL

ISSUED: May 1971

REVISED: May 1998

SUBJECT: Gasoline and Engine Oil Recommendations for 2 and 4-Cycle Engines

GASOLINE

Tecumseh Products Company strongly recommends the use of fresh, clean, unleaded regular gasoline in all Tecumseh engines. Unleaded gasoline burns cleaner, extends engine life, and promotes good starting by reducing the build-up of combustion chamber deposits. Leaded gasoline, gasohol containing no more than 10% ethanol, premium gasoline, or unleaded gasoline containing no more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, can be used if unleaded regular gasoline is not available.

Reformulated gasoline that is now required in several areas of the United States is also acceptable.

NEVER USE gasoline containing methanol, gasohol containing more than 10% ethanol, unleaded regular gasoline containing more than 15% MTBE (Methyl Tertiary Butyl Ether), 15% ETBE (Ethyl Tertiary Butyl Ether) or 10% ethanol, gasoline additives, or white gas because engine/fuel system damage could result.

See “STORAGE” instructions in Technician’s Manual, Operator’s Manual, or Bulletin 111.

OILS

2-CYCLE

Tecumseh two cycle engines require the use of a NMMA TC-W3 or TC-TWII certified oil.

TECUMSEH RECOMMENDS USING TWO CYCLE OIL PART #730227, which is a premium blend that ensures cylinder wall lubrication, mixes easy, does not separate and is specially formulated for use in air or water cooled two cycle engines.

The proper fuel mixture ratio of oil to gasoline for specific engines will be found in the owners operating instructions and on the decal attached to the blower housing or fuel tank of the engine.

FOR NEW ENGINES: USE TWICE THE NORMAL OIL QUANTITY FOR THE FIRST GALLON OF FUEL ACCEPT ON TC SERIES WHERE THE STANDARD MIX RATIO IS SUFFICIENT.

4-CYCLE

TECUMSEH FOUR CYCLE ENGINES REQUIRE THE USE OF A CLEAN, HIGH QUALITY DETERGENT OIL. Be sure original container is marked: A.P.I. service “SF” - "SJ" or “CD”.

TECUMSEH RECOMMENDS USING ONE OF THE FOLLOWING FOUR CYCLE OILS THAT ARE SPECIALLY FORMULATED TO TECUMSEH SPECIFICATIONS.

DO NOT USE SAE10W40 OIL.

FOR SUMMER (Above 32^0F) USE SAE30 OIL. PART #730225

(SAE10W30 is an acceptable substitute.)

Use SAE30 oil in high temperature, high load applications. Using multigrade oil may increase oil consumption.

FOR WINTER (Below 32^0F) USE SAE5W30 OIL. PART #730226

(SAE10W is an acceptable substitute.)

(BELOW 0^0F ONLY): SAE0W30 is an acceptable substitute.

NOTE: For severe, prolonged winter operation of HH120 model, SAE10W oil is recommended.

SERVICE BULLETIN 109

INFORMATIONAL

TECUMSEH

ISSUED: September 1976

REVISED: June 1995

SUBJECT: Explaining Engine Neglect to Customers

For the most part, engine neglect in some customers' eyes is non-existent when major engine repairs have to be made and paid for. It is a necessity to convince the customer that poor maintenance and neglect are the reasons for his problems and that they could have been prevented.

Sometimes just showing the customer what you call common conditions, such as, scoring or discoloration of parts, does not seem very dramatic at this point. The customer wants to see something he understands, something simple yet something more convincing.

Using a magnet to check for metal transfer caused primarily by dirt particles going through the engine is a simple and convincing test to show neglect due to poor owner maintenance. Remove some carbon deposits from the cylinder head or spark plug and place these deposits on a piece of paper. By moving a magnet around under the paper the metal particles will be attracted to the magnet and move with it. It should be explained to the customer that when dirt goes through the engine and comes in contact with the valves, rings, cast iron cylinders, cylinder liners, and other parts it acts like sand paper and will erode or wear engine parts until they fail.

It should also be explained that dirt can get into the engine, for the most part, two ways. One, through the air filter system and two, through the fuel system. The air filter system is the easiest to visually inspect and maintain accordingly.

The fuel system requires more care, such as making sure all fuel containers are clean. In some cases this may require actual flushing or rinsing, because fine dirt particles often cannot be seen, especially in the bottom of a five gallon safety can. This is an extra step and not often practiced because of the inconvenience. Dirt can come from an unclean filler spout or funnel, maybe from a fuel cap that fell on the ground or from the area not cleaned around the filler neck. There are many ways dirt can get into the fuel system, but it's up to the customer to keep it out.

A complete explanation of the reason for engine failure and pointing out methods for preventing future problems can only add to our credibility when dealing with a skeptical customer.

TECUMSEH

SERVICE BULLETIN 110

INFORMATIONAL

ISSUED: May 1985

REVISED: July 1997

SUBJECT: High Altitude Carburetor Kits for Fixed Main Carburetors

Engines built to O.E.M. specifications may experience starting and operating problems when used in areas of the country where the altitude is four thousand feet above sea level or higher. A leaner fuel/air mixture is more desirable at higher elevations to sustain good engine startability and operating characteristics. Engines built with adjustable idle and main circuit carburetors can be adjusted (or fine tuned by adjusting).

The following will assist you in selecting the correct high altitude/leaner jetted bowl nut for engines equipped with fixed main or dual system carburetors. Order your requirements from your source of supply.

4 CYCLE

ENGINE	STANDARD BOWL/NUT STAMPED	Over 4,000 Ft.
LEV115	Jet	*
TVS90-120/ECV90,100/TNT100	64, 65, 75, 79, 103,-108, 126, 127, 137	632455
TVS90-120 / OHH50 / 55	158, 161, 164, 165, 166, 171, 172, 177	632737
TVS90 -120, OVRM40-60	124, 125,133, 135, 136	631026
OVM & OVXL120, OHV11-13 (Formula)	120, 141	632239
Dellorto	69	633017
VLV40, 50, 55, 60, 65, 66	Jet	632648
VLV40, 50, 55, 60, 65, 66	Nozzle	632638
TVM170-195	83, 132	632239
TVM220	109, 131	631973
OHV15 - Walbro LMK26	Jet	632688
OHV11 - 17 (Enduro)	Jet	*

2 CYCLE

AH/AV520 & 600, HSK600	101	632368
TVS/TVXL840	L118, L119	632463
HSK840, 845, 850/HXL840	124, 125	631026
TC200/TC300 Tillotson carburetor only.	Jet	632940
TC200/TC300 Tillotson HU112 and HU114	Jet	N/A

Do Not install leaner jetted bowl nuts on engines used below four thousand feet as starting and operating problems will occur. **WARRANTY DOES NOT APPLY**.

NOTE: Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from the factory unless specifically authorized.

*** Altitude compensation not required due to use of emissions type carburetors.**

SERVICE BULLETIN 111

INFORMATIONAL

ISSUED: February 1989

REVISED: June 1995

SUBJECT: Storage

NEVER STORE ENGINE WITH FUEL IN TANK INDOORS OR IN ENCLOSED, POORLY VENTILATED AREAS, WHERE FUEL FUMES MAY REACH AN OPEN FLAME, SPARK OR PILOT LIGHT AS ON A FURNACE, WATER HEATER, CLOTHES DRYER OR OTHER GAS APPLIANCE.

If engine is to be unused for 30 days or more, prepare as follows:

FUEL SYSTEM:

Remove fuel from carburetor and fuel tank to prevent deposits from forming on these parts and causing possible malfunction of engine.

DRAIN FUEL INTO APPROVED CONTAINER OUTDOORS, AWAY FROM OPEN FLAME.

Run engine until fuel tank is empty and engine stops due to lack of fuel.

NOTE: If gasohol has been used, complete preceding instructions and then put a small amount of unleaded (or leaded regular) gasoline into fuel tank and repeat preceding instructions.

NOTE: Fuel stabilizer is an acceptable alternative in minimizing the formation of fuel deposits during storage. Add stabilizer to gasoline in fuel tank or storage container. Always follow mix ratio found on stabilizer container. Run engine at least 10 minutes after adding stabilizer to allow it to reach carburetor.

CYLINDER BORE: 2 CYCLE ENGINES

A. Pull starter handle slowly until resistance is felt due to compression pressure, then stop.

B. Release starter tension slowly to prevent engine from reversing due to compression pressure. This position will close both the intake and exhaust ports to prevent corrosion of the piston and cylinder bore.

CYLINDER BORE: 4 CYCLE ENGINES

A. Remove spark plug. Squirt one (1) oz. (30 ml) of clean engine oil into spark plug hole.

B. Cover spark plug hole with a rag.

C. Crank engine over, slowly, several times.

AVOID SPRAY FROM SPARK PLUG HOLE WHEN CRANKING ENGINE OVER SLOWLY.

D. Install spark plug. Do not connect spark plug wire.

CLEAN ENGINE:

Remove any clippings, dirt, or chaff from exterior of engine.

TECUMSEH

SERVICE
BULLETIN
112

INFORMATIONAL

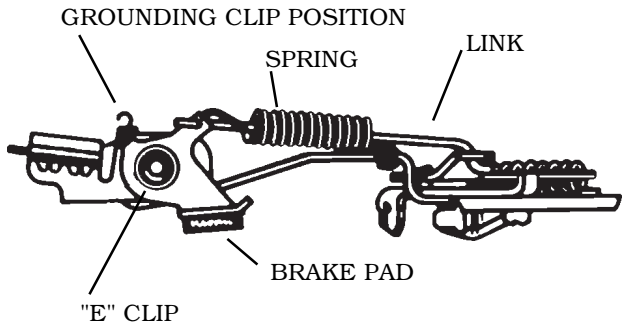
INSPECTION OF BRAKE-ASSIST SAFETY COMPONENTS ON TECUMSEH ENGINES MANUFACTURED IN COMPLIANCE WITH CPSC REGULATION PART 1205 and CANADIAN VOLUNTARY COMPLIANCE STANDARD

As a regular Customer Service, the brake-assist safety components should be inspected whenever a compliance walk-behind lawn mower is brought to you for service. If any of these safety-related parts are worn or operating improperly at any time during the life of the engine, such part(s) should be repaired or replaced under warranty.

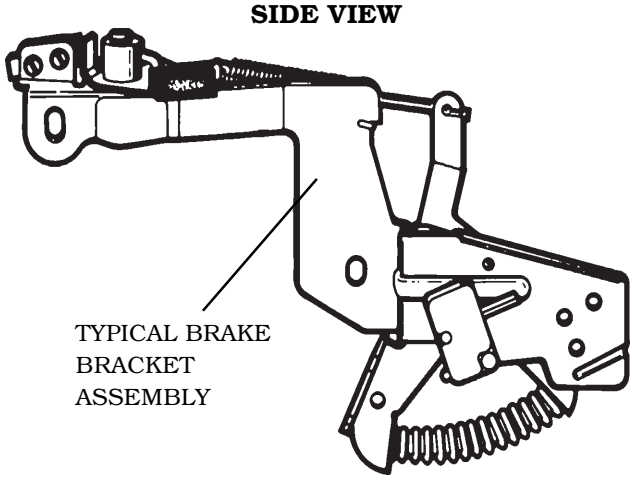
OLD

Individual components can be replaced.

TOP VIEW



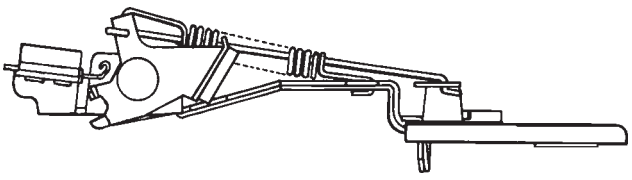
SIDE VIEW



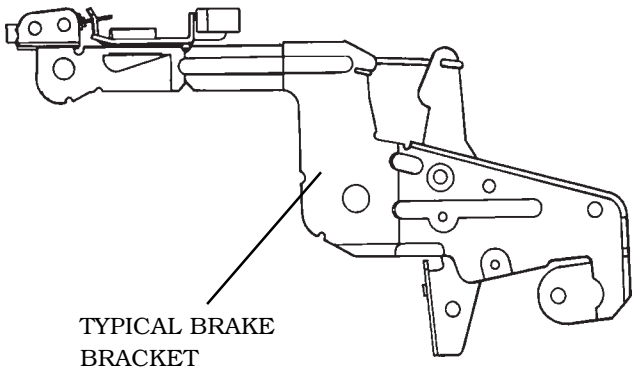
NEW

Complete brake bracket assembly is replaced if worn or damaged.

TOP VIEW



SIDE VIEW



SERVICE BULLETIN 113

INFORMATIONAL

ISSUED: September 1987

REVISED: June 1995

SUBJECT: Analysis of Field Failure Exhaust Valves

Tecumseh has recommended the use of unleaded gasoline for many years to reduce carbon build-up. Since July 1, 1984 all production engines have used an austenitic steel exhaust valve.

An evaluation of field returned exhaust valves, found that majority of the valves had carbon build-up only. The valve could have been cleaned and placed back into the engine. The valve seat must also be cleaned and inspected and recut if necessary.

The quality and durability of the austenitic steel exhaust valves have increased valve life significantly. When performing valve service be sure to clean and inspect the valve carefully. Tecumseh will continue to provide warranty coverage for any valve defect, however, carbon buildup alone will not be considered a warrantable reason for exhaust valve replacement.

Should the valve be burned, pitted or refaced, it then becomes necessary to complete a proper valve job. The valve seat must be recut whenever a new or refaced valve is installed into the engine. Proper procedure for valve, seat refacing and setting valve lash can be found in the Mechanic's Manual.

TECUMSEH

SERVICE BULLETIN 114

INFORMATIONAL

ISSUED: March 1989

REVISED: June 1995

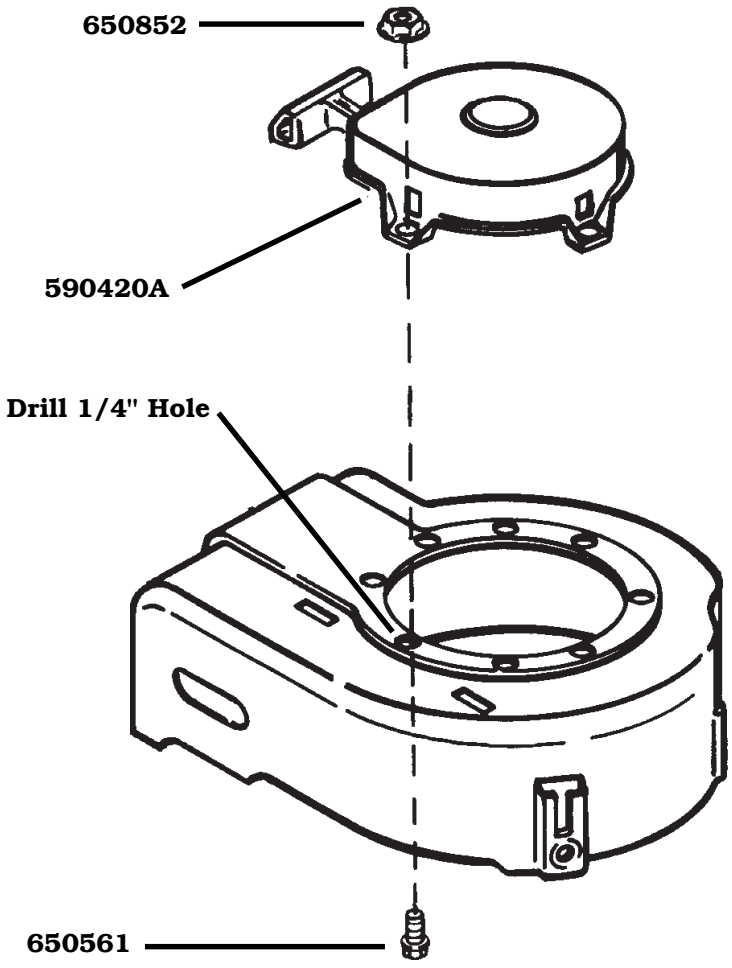
SUBJECT: Replacement of 590420A Rewind Starter

In the past when using recoil starter 590420A as the replacement, some engines required pop riveting the replacement starter to the blower housing.

Substitution of the pop rivet can be accomplished in the following manner: order bolt part number 650561 (1/4-20 x 5/8) and nut part number 650852 (1/4-20) through your regular source of supply.

This will require the blower housing to be removed and the old starter mounting holes to be drilled out to 1/4" dimension.

The bolts must be inserted into the blower housing from the inside. The starter is placed on top of the blower housing and the nuts are placed on the bolts to secure it.



SERVICE BULLETIN 115

INFORMATIONAL

ISSUED: September 1989

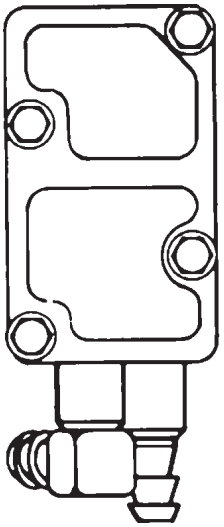
REVISED: June 1995

SUBJECT: New Walbro Fuel Pump

Walbro has discontinued their previous line of fuel pumps. Walbro has developed an improved design to replace all of the previous fuel pumps. The new style of fuel pump will be used in production.

PART NUMBER

32959
33100
33715
33981
34812
35018
34392A
35468

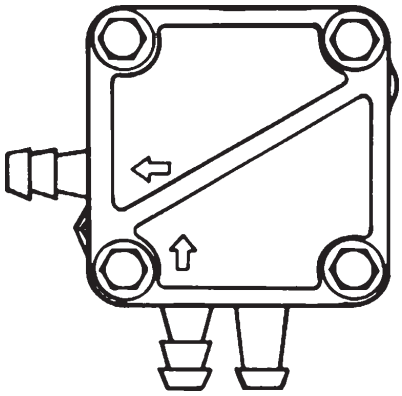


34385

PREVIOUS STYLE

KIT NUMBER

35800



35813

NEW STYLE

The Pulse Fuel Pump Assembly Kit Part No. 35800 (Kit Part No. 35813 for Part No. 34385 Fuel Pump) supplies all the parts needed to convert the engine from the previous style fuel pump to the new style pump. An instruction sheet explaining the proper installation will be included in each kit.

NOTE: REPAIR KITS STILL AVAILABLE

If replacement of old style fuel pump is not necessary, a repair kit Part No. 33010 is still available for repair of all old style fuel pumps.

TECUMSEH

SERVICE BULLETIN 116

INFORMATIONAL

ISSUED: September 1993

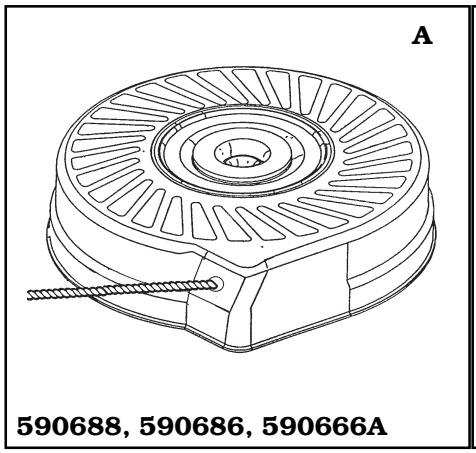
REVISED: October 1996

SUBJECT: Recoil Identification

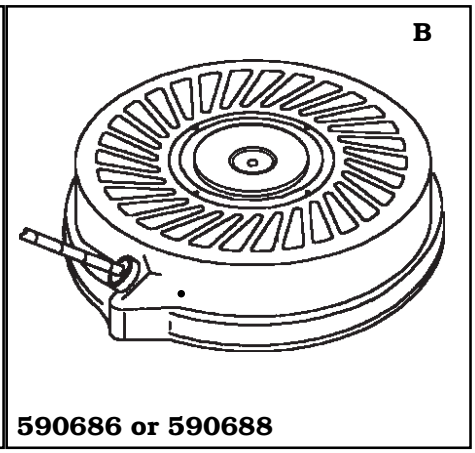
Engines built after serial number 3152 can be built with 2 or 3 different starters. These starters can be identified by the direction of the scroll in the housing of the starter, or a dimple in the housing located near the rope grommet.

The complete starters interchange but not the individual parts, such as: dogs, dog springs, retainers, etc. Therefore the individual starters need to be identified for the proper parts list.

The exact starter number will first be determined by the model and specification number. Each manual section will then list the alternative starter that could have been used in the production of that specification.



590688, 590686, 590666A

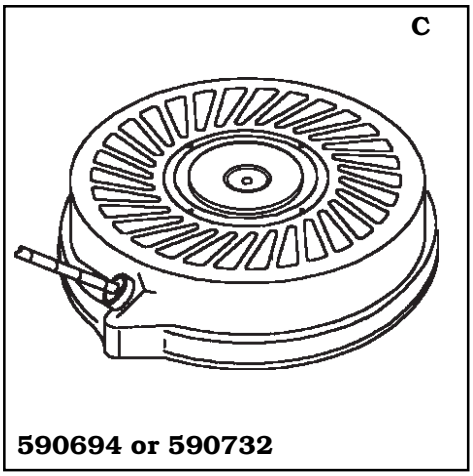


590686 or 590688

590686, 590666A, 590688, 590694 or 590732

These starters are used on a variety of TVS series engines. The easiest way to tell the difference in these starters is by the direction of the scroll of the louvers on the top of the starter. The scrolls run in opposite directions as pictured. Starter part #590686 and 590688 have two different directions of scrolling on the housing. The internal parts are the same. Starter #590686 is used for compliance applications, while starter #590688 is used in non-compliance applications.

The way to determine the correct part # of the two counterclockwise scrolled starters (illustration B and illustration C) is by the dimple located near the rope grommet. Starter part #590694 or #590732 will not have this dimple. Starter #590732 is the non-compliance version of the #590694 starter.

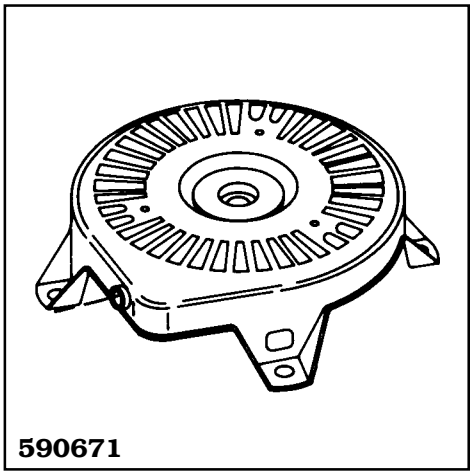


590694 or 590732

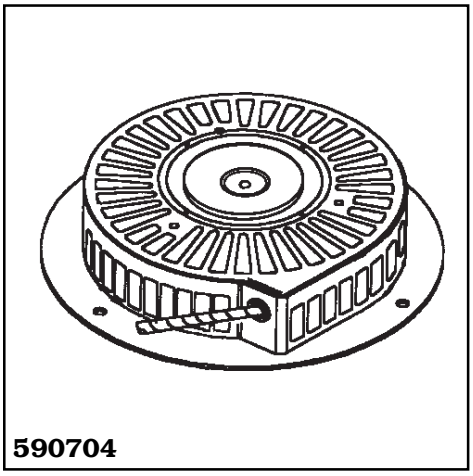
SERVICE BULLETIN 116 (Cont.)

INFORMATIONAL

TECUMSEH



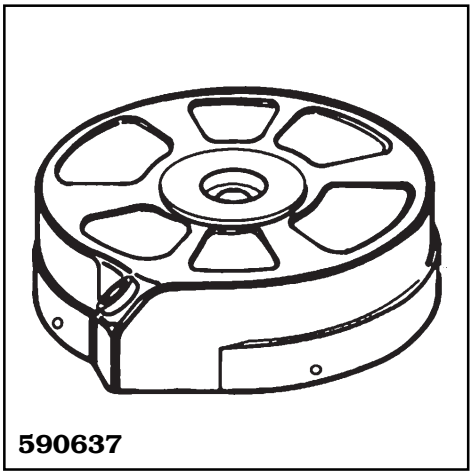
590671



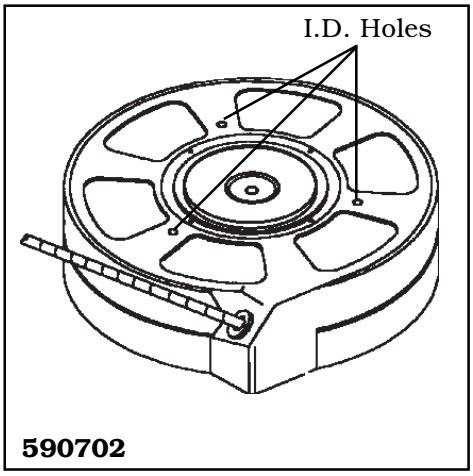
590704

590671 or 590704

These starters are used on both vertical and horizontal engines in the 7 through 12 horsepower range. The 590671 has for mounting legs and requires the use of a finger guard, Part No. 35446, on the engine. The 590704 has a full contact mounting surface as slots in the sides of the recoil body.



590637



590702

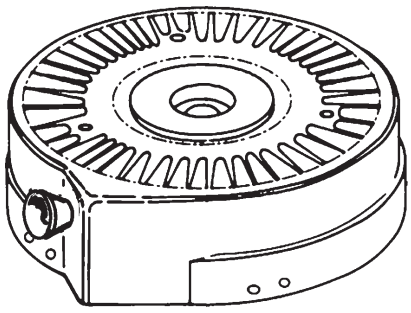
590637 or 590702

These starters are used with engines that have a stylized recoil cover in the TVS series of engines. The easiest way to identify the difference between these starters is by the three holes on the top of the 590702 starter.

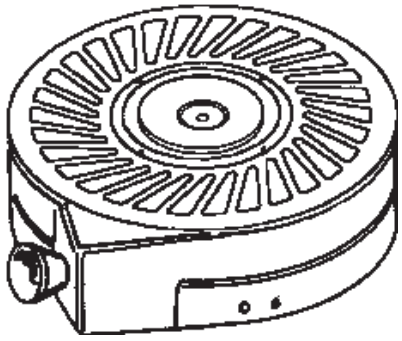
TECUMSEH

SERVICE BULLETIN 116 (Cont.)

INFORMATIONAL



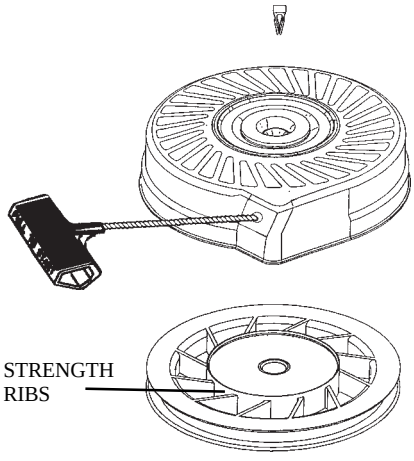
590646



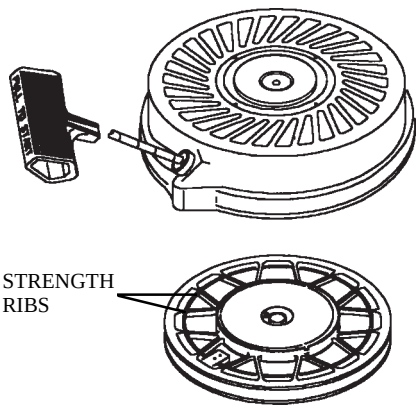
590707

590646 or 590707

These starters will be used on the AV520 and AV600 series of engines. The 590646 has louvers in the top that are straight. The 590707 louvers are spiraled in a counterclockwise direction.



590737, 590738, 590739, 590742, 590743, 590745



590694 or 590732

590737 or 590738 or 590694 or 590732

These recoils will appear to be identical according to the design of the louvers on the housings. However their internal components do not interchange therefor it will be necessary to identify the starters by the rope pulley design. Notice that the strength ribs on the 590737, 590738, 590739, 590742, 590743 and 590745 are curved like the louvers on the housing. The strength ribs on the other pulley form a triangle. These differences can be seen through the grill work of the housing without removing. The other identificationis the wedge and retainer illustrated above.

TECUMSEH

SERVICE BULLETIN 117

INFORMATIONAL

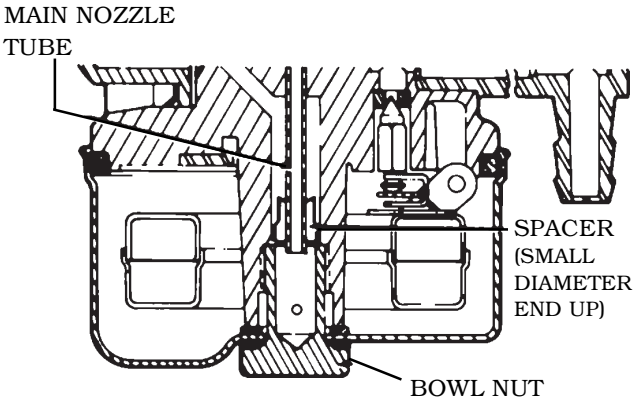
ISSUED: May 1985

REVISED: June 1995

SUBJECT: Hot Restart Difficulty and/or Hard Starting on Ariens Rotary Mowers

MODELS OR TYPES AFFECTED: TVS105-53038C, TVS105-53039C
TVS105-53038D, TVS105-53039D

Field complaints of hard starting or restarting a warm engine on the subject engine models have been occasionally reported by the field organization. In order to eliminate these starting problems we recommend the installation of Tecumseh service kit, part number 730219, which consists of a carburetor fuel spacer and a new bowl nut. This kit can be obtained from your Tecumseh source of supply. Remove the old bowl nut (do not remove carburetor bowl or disturb bowl O ring), install the fuel spacer into the carburetor and install the new nut. Instructions below will also be furnished in the box with the parts.



INSTRUCTIONS FOR 730219 BOWL NUT KIT

Before considering installing the bowl nut, the engine should be checked out for any other problems such as proper fuel, ignition, compression or even some type of equipment difficulty which may inhibit starting. To install the kit, proceed as follows:

A. Disconnect spark plug wire.

B. Drain fuel from fuel tank.

C. Tip lawnmower on its side, carburetor side up.

D. With a box end wrench, remove the original bowl nut & gasket. Install spacer per reverse illustration. Position original gasket on new bowl nut and install. Tighten bowl nut.

E. Set mower up, fill fuel tank and connect spark plug wire.

Form No. 694980

If the hard starting condition persists, it may be necessary to remove the engine head to check the condition of the exhaust valve. If the exhaust valve is carboned, not seating or burned, a new exhaust valve should be installed. Prior to installing the new valve, the exhaust valve seat in the cylinder must be recut with a “Neway” valve seat cutter. Valve seat cutting is necessary to insure the new exhaust valve will be properly seated.

SERVICE BULLETIN 118

INFORMATIONAL

ISSUED: February 1972

REVISED: June 1995

SUBJECT: Safety Switches Installed in Starter and/or Ignition Circuit

MODELS OR TYPES AFFECTED: All Tecumseh Engines

Because of safety regulations for lawn and garden equipment, most manufacturers are incorporating some type of safety switch in their designs to prevent the operator from starting the engine if the unit is in gear and/or the mower blade or other attachment is engaged.

Methods and circuitry vary from manufacturer to manufacturer but the following are basic methods most usually found.

1. A switch installed so the transmission or transaxle must be in a neutral position before the engine can be started. This can be wired in the starter circuit or the ignition circuit.
2. In addition to the neutral, an additional switch is added to the cutting or other attachment control lever so the engine cannot be started with the mower blade or other attachment engaged. This switch can be in the same circuits as a neutral position switch.
3. A switch is installed on the clutch pedal which will not allow the operator to start engine unless clutch pedal is in a disengaged position. This switch would generally be wired in the starter circuit.

REMEMBER Tecumseh does not supply safety switches or assume any responsibility for their proper adjustment or operation. The purpose of this bulletin is merely to alert you that a safety switch may not be functioning properly resulting in the engine not starting.

To determine whether the problem is in the engine itself, refer to the following Troubleshooting Chart.

TROUBLESHOOTING SAFETY-START SWITCHES

FAILURE	**CHECK**
(Electric Start Engine) Electric starter cranks but no spark at spark plug.	Disconnect ignition cut-off wire at the engine. Crank engine. If spark at spark plug, ignition switch or safety switch is inoperative. If no spark, check ignition module or magneto. See Mechanic's Manual.
(Non-Electric Start Engine)	Disconnect ignition cut-off wire at the engine. Crank engine. If spark, check ignition switch and safety switch. If no spark, check ignition module or magneto. See Mechanic's Manual.
Electric starter does not crank engine	Remove wire from starter. Use a jumper battery and cables and attach directly to starter. Attach the negative clamp to an engine ground as the last connection to prevent sparks at the battery. If starter cranks engine, the starter is okay; check solenoid, starter switches and safety switches.

ALWAYS CHECK WIRES FOR POOR CONNECTIONS, CUTS OR BREAKS BEFORE CONDEMNING A PART

IMPORTANT - TO AVOID ANY POSSIBLE PERSONAL LIABILITY In the event you are not able to repair or replace a faulty safety switch, do not by-pass or remove it from circuit. Rather, fully advise the owner of the situation and direct him to contact the party from whom the unit was purchased for proper repair or replacement.

TECUMSEH

SERVICE BULLETIN 119

INFORMATIONAL

ISSUED: October 1996

SUBJECT: 120 Volt Starter Switch Repair Kit No. 730623
Starter Model Numbers Effected: 33290D, 33328D, 33329D, 590556, 590670

Tecumseh Products Company has been reviewing warranty claims filed for 120 Volt starter replacements this past snow season. After review, we have found many unnecessary replacements of complete starters for only a defective switch.

Tecumseh Products Company is changing the procedure of 120 Volt starter switch service. Previously this switch was serviced as an assembly. The following procedure will give you test and repair instructions if service is necessary.

NOTE: DO NOT REPLACE THE STARTER FOR A DEFECTIVE SWITCH.

When a piece of equipment comes in for repair, follow the steps below to determine if servicing of the switch is necessary.

1. Check for starter button operation. You should feel a spring movement and release.
2. Plug in starter, activate the button and check for proper starting and stopping when the button is compressed. If not, service the switch following this procedure.

***CAUTION: MAKE SURE THE SWITCH BOX IS DISCONNECTED FROM 120V A.C. POWER SUPPLY.**

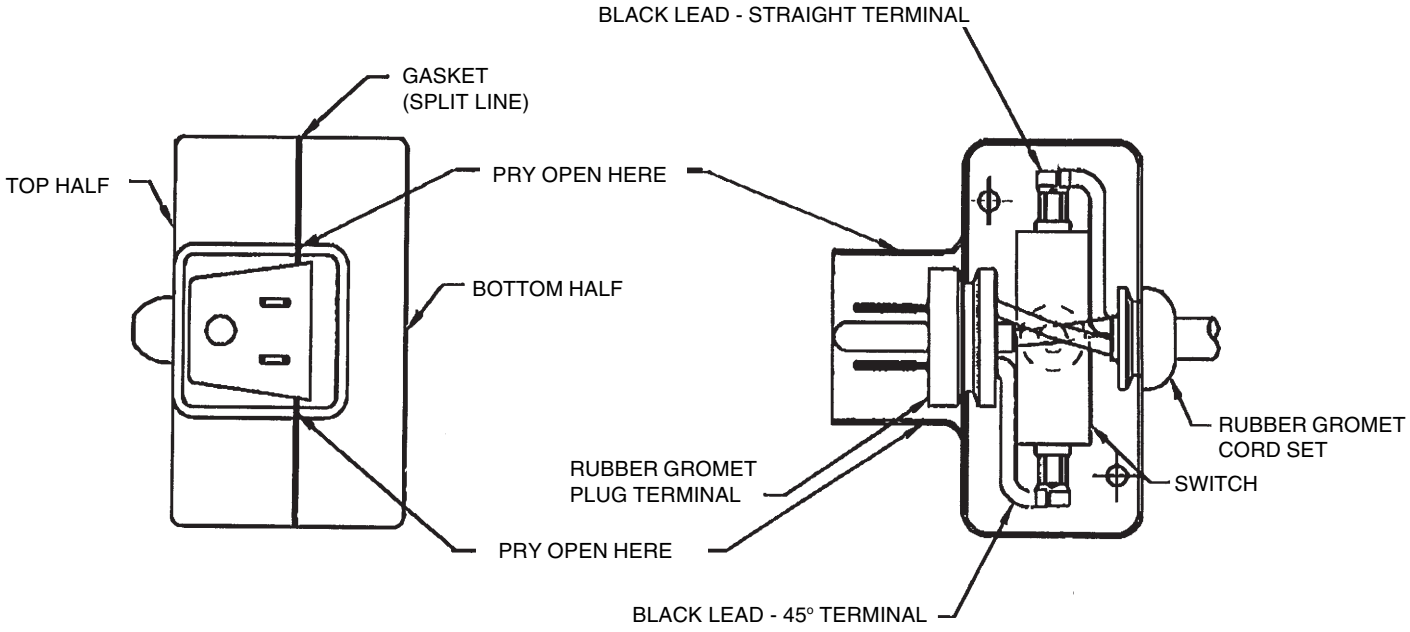
1. Detach switch box from engine housing only. Do not remove the starter from the engine.
2. Split open existing switch box.
   A. Start by inserting a flat blade screwdriver into slotted openings near terminals (see attached illustration.)
   B. Pry until top and bottom are open far enough to pull by hand.
   C. Do not worry about breaking switch box.
3. Discard bottom half of switch box. (Part with posts).
4. Remove rubber grommets from front and back of switch box by prying upwards with fingers.
5. Remove rubber button cover from top half of switch box and save. Discard top half of switch box. SAVE RUBBER BUTTON COVER FOR REUSE.
6. Carefully disconnect the two black leads from the switch tabs. Discard switch.
7. If wires or connectors are burnt, install corresponding new cord kit. Look this up in your parts manual by starter model number.

SERVICE BULLETIN 119 (Cont.)

INFORMATIONAL

RECONSTRUCTION STEPS:

8. Place top half of new switch box (the half with the round hold and lettering) in front of you with the open side up and the U-shaped slot toward you. Install the rubber button cover in hole in top of switch box. Place the new switch between the two small posts in the switch box with the button centered in the round hole and the 45 degree terminal to the left.
9. Connect black lead from the plug terminal to the straight tab on the switch.
10. Connect the other black lead from the cord set to the 45 degree tab on the switch.
11. Carefully push rubber grommets into the front and back of top half of the switch box.
12. Carefully route the wires from the cord and the plug under the switch (the side opposite the button). Keep the wires to the center of the switch so that the hold down bars on the bottom half of the switch box do not pinch the wires.
13. Place gasket over the pins in the bottom half of the switch.
14. Match top and bottom half of switch boxes and press together by hand. Seat the two halves using a soft mallet by lightly tapping on cover with a support under the switch box. Once the halves are together, do not attempt to reopen.
16. Check switch for proper operation by depressing button and listening for an audible click.



SERVICE BULLETIN 120

INFORMATIONAL

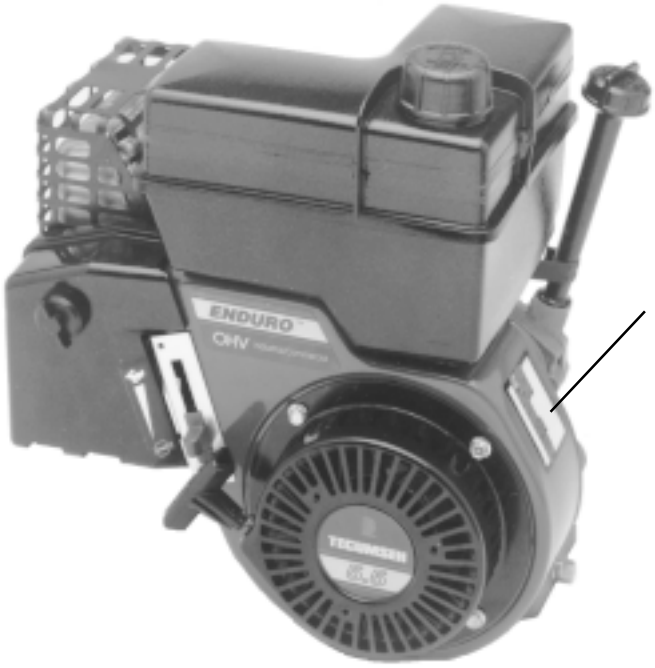
ISSUED: October 1996

SUBJECT: Incorrect Specification Numbers on MTD Products' Chipper/Vacuum

MODEL EFFECTED: OHH50/55

Tecumseh Products has produced approximately 800 OHH55's for MTD Products with incorrect specification numbers. These engines have a D.O.M. (Date of Manufacture) code of 6213 and have been put on MTD's Chipper/Vac model number 247-203B100. The CORRECT specification number should read OHH55-69024C,and some engines could read OHH50-68024C.

If you receive one of these units for service, please order decal number 34028 and place it on the blower housing. Print the CORRECT number OHH55-69024C. Then use a permanent marker to block out the incorrect specification number on the original identification label. See Illustration below.



SERVICE BULLETIN 121

INFORMATIONAL

Issued: January 16, 1998

Subject: Excessive Oil Usage

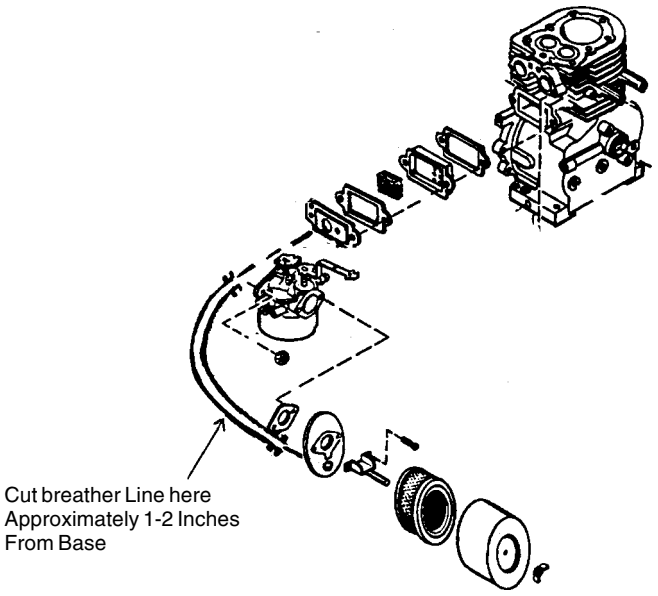
Models Effected: HM 80,90 and 100

We have been receiving reports of excessive oil consumption or leakage on the engine models listed above. This situation has been found to only occur when certain weather conditions prevail.

Those conditions are an ambient temperature below **35 degrees F,** combined with high humidity. When these conditions do exist they can cause the crankcase breather system to freeze up. This freeze up can block the tube causing excessive smoking from the muffler, oil leakage from the seals or gaskets and air filter damage.

This blockage of the breather system can cause **severe engine damage** if not addressed promptly. The procedure to correct this problem is as follows:

As a temporary fix you will need to cut the breather hose 1-2 inches (see illust. below) in front of the connection to the air filter, allowing it to vent to the atmosphere. This temporary modification will make the engine **Non-Compliant with the E.P.A.** (Environmental Protection Agency) regulation's covering this product. The engines crankcase breather system must be repaired using Tecumseh service part no. 730626 when the temperature stays above 35 Degrees F. This repair part will be made available at no charge to the customer.



Warning; This modification if not repaired will severely damage the engine.

If you have any questions please contact your local Tecumseh source of supply.

SERVICE BULLETIN 122

INFORMATIONAL

Issued: June 1998

Subject: RECOIL STARTER WILL NOT ENGAGE WHEN PULLED

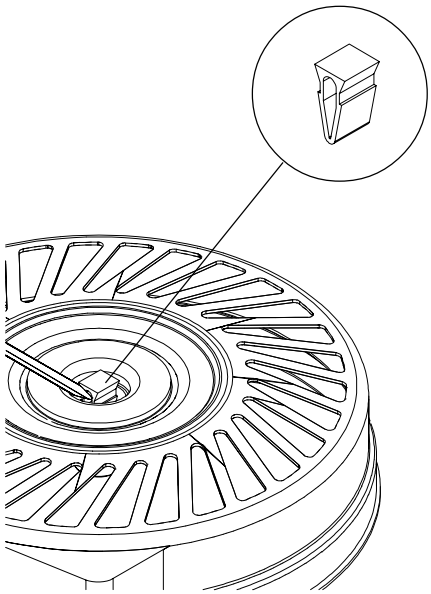
Models Effected: Small Frame (3 thru 6 HP) Horizontal and Vertical Engines with DOM 7335 thru 8150

If you have experienced an occasion where the recoil starter will not engage when the rope is pulled, a simple repair may solve the problem. This repair will only affect starters that have the white plastic locking tab located in the top/center of the starter. The locking tab may be covered by a round protective decal or could be located in the recoil under a decorative cover. The decorative cover will have to be removed to allow for repair. However, it is not necessary to remove the recoil starter from the engine to make the repair.

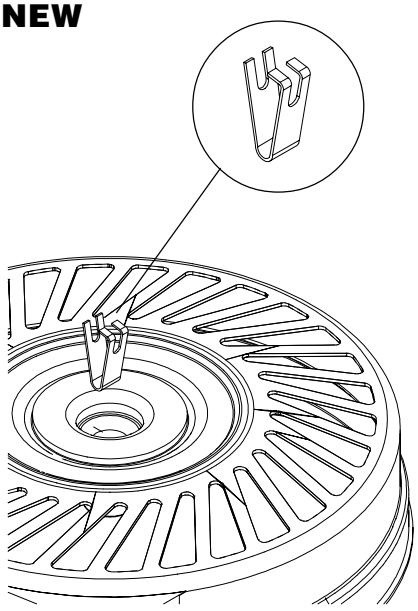
To make the repair you need to remove the protective decal to expose the white plastic locking tab. Use a small flatblade screwdriver or needlenose pliers to pry up on the tab and remove it from the starter. Discard the old tab and replace it with a new metal locking tab part #590760, which also includes a new protective decal. Press the new metal locking tab down into the retainer until it snaps into place. Place the new protective decal over the tab hole to prevent any water or debris from entering the starter.

This procedure and paperwork should take approximately 15 minutes to complete. An ESA 157R warranty claim form should be filed through normal channels.

OLD



NEW



SERVICE BULLETIN 123

INFORMATIONAL

ISSUED: SEPTEMBER 1998

SUBJECT: ACCURATE WARRANTY CLAIM INFORMATION

Models Effected: All Models

In a recent audit of claims submitted from January through July of this year we have learned that almost 20% of the total claims have been returned to dealers due to lack of accurate information. Further research has identified that the majority of these returns are due to lack of or incorrect information being submitted in "Box 5", "D.O.M. or Serial No". Most often, the incorrect information furnished is the engine Family number sequence. The correct information to submit is the D.O.M. or date of manufacture or Engine serial number from the Engine I.D. label. See Example"

Example of "Box 5" ESA157A Claim Form

Model	Specification	**Serial (DOM)**
ENGINE: TVM195	150288G	**8150C**

5) ENGINE/TRANSMISSION	SPEC NO.	**D.O.M (SERIAL NO)**
TVM195	150288G	**8150C**

Typical Engine I.D. Label

All claim information is extremely important for record keeping purposes. In fact, any missing or incorrect information results in the claim being returned. We ask that you help us by furnishing accurate and correct information in "Box 5" and all the other "Boxes" on the claim form.

Failure to help in this effort results in added expense and work for you and Tecumseh. It also results in delayed payments to you and that affects your receivables. Lastly, unless we can eliminate claims submitted with lack of accurate information we may consider having your Tecumseh source of supply receive your claims for editing prior to submitting claims to Tecumseh.

SERVICE BULLETIN 124

INFORMATIONAL

ISSUED: September 1998

SUBJECT: Improved Gear Product Identification

MODELS OR TYPES AFFECTED: All Models

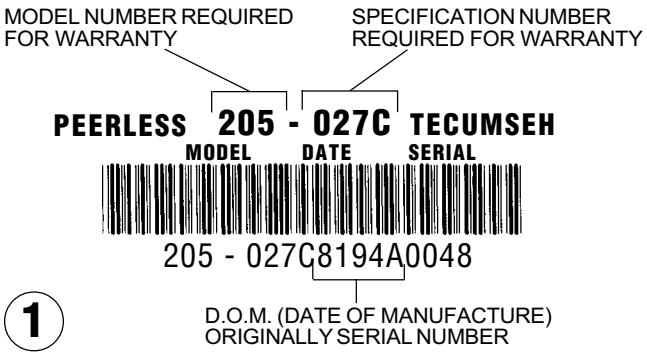
The recent warranty audit referenced in bulletin number "**123**" suggested we review the way our new Tecumseh/Peerless® models are identified. That review found improvements where needed in the identification system to make them standard with the new emission regulation's requirements covering engine product and the "New ESA 157 Claim Form".

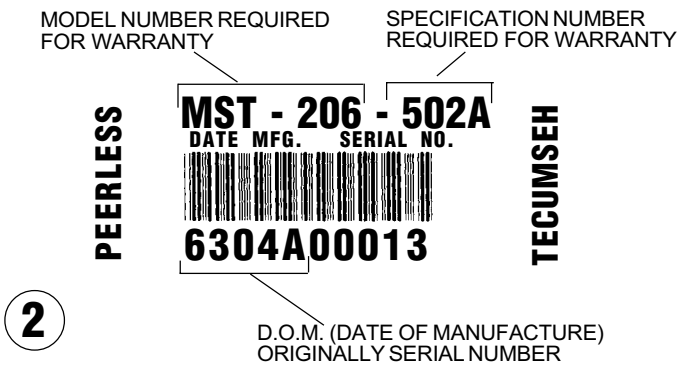
As a result of this review, we have changed the product ID tag to make it easier to read. Should this data be needed for service or warranty situations these improvements will make locating the needed model and specification information easier.

Example Numbers 1 and 2 below, show the present bar code labels currently being used. We have identified the important fields of information that is required for warranty claims.

In addition, a new easier to read bar code label (No. 3 below) is being introduced on all units provided after October 1, 1998. Again we have highlighted the information you are required to supply.

This information is critical for prompt warranty reimbursement to your shop, please pay close attention to this number.





TECUMSEH®

SERVICE BULLETIN 125

INFORMATIONAL

ISSUED: AUGUST 1999

SUBJECT: DAMAGED FUEL LINE

MODELS AFFECTED: ALL UNITS EQUIPPED WITH FUEL SHUT-OFF

DATES OF MANUFACTURE AFFECTED: 9121 (May 1) through 9233 (August 21)

We have recently discovered a potentially **HAZARDOUS** situation, which is a rarely occurring small pin hole leak or leaks in the short section of the fuel line as shown below.

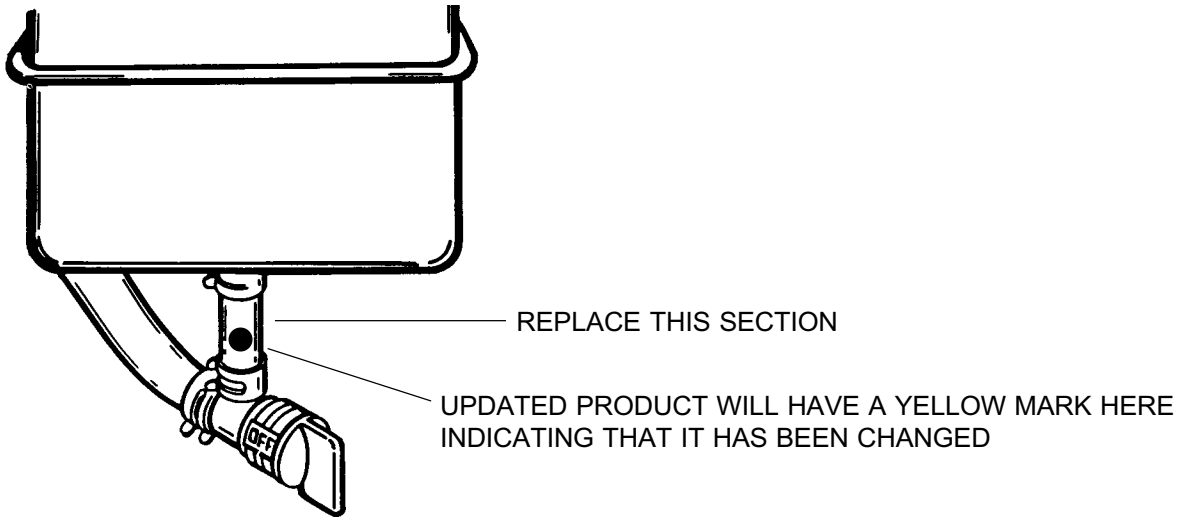
Because this is a safety related issue, REPLACEMENT OF the short fuel line on the affected products as shown is required.

It is **CRITICAL** to check all product before sale AND to locate any units distributed which are within the above Dates of Manufacture. Units which have been previously updated at the Manufacturing level will have a Yellow paint mark on the short line as shown in the illustration. Unless the unit within the dates of manufacture has a yellow mark as shown, replacement of the short fuel line is required.

To aid in this repair, submission of warranty claims listing multiple Model Specification and Dates of Manufacture will be accepted. A repair time of 15 minutes per unit (out of box) and 30 minutes for units (boxed) should be noted on the claim.

To insure the quantity of units repaired by each dealer is recorded and only the correct parts are used, we have decided to drop ship parts factory to dealer direct.

To obtain the service kit **part number 730632** within the United States please call (414) 377-2700 ask for ext. 1311 or the service bulletin desk ref. #125.



TECUMSEH®

SERVICE BULLETIN 125

INFORMATIONAL

ADDENDUM

REVISION DATE: August 31, 1999

SUBJECT: ADDENDUM - Service Bulletin 125 has been amended.

MODELS: Only those listed below.

The following list of model and specification engines, **ARE THE ONLY ONES AFFECTED BY** the potentially defective fuel line:

H35-45492Y	HMSK105-159904A	HMSK90-156533D	OHH60-71112C	OHSK55-69516C
H35-45717Y	HMSK105-159906A	HSK40-55510V	OHSK100-221606A	OHSK55-69519C
H35-45746Y	HMSK105-159907A	HSK60-76005C	OHSK100-221607A	OHSK55-69520C
HM100-159298P	HMSK110-159953A	HSK60-76011C	OHSK110-221701A	OHSK70-72500B
HM100-159350P	HMSK110-159957A	HSK60-76012C	OHSK110-221703A	OHSK70-72501B
HM100-159351P	HMSK110-159958A	HSK60-76013C	OHSK110-221708A	OHSK70-72505B
HM100-159383P	HMSK110-159962A	HSK60-76016C	OHSK110-221709A	OHSK70-72506B
HM100-159400P	HMSK80-155527V	HSK70-130208U	OHSK110-221710A	OHSK70-72507B
HM80-155522S	HMSK80-155545V	HSK70-130283U	OHSK110-221712A	OHSK70-72508B
HM80-155593S	HMSK80-155635V	HSK70-130302U	OHSK110-221713A	OHSK70-72511B
HM80-155653S	HMSK80-155640V	HSSK50-67002S	OHSK120-223601A	OHSK70-72512B
HM80-155664S	HMSK80-155645V	HSSK50-67261S	OHSK130-223801B	OHSK70-72513B
HMSK100-159001W	HMSK80-155667V	HSSK50-67366S	OHSK130-223802B	OHSK80-221202A
HMSK100-159295W	HMSK80-155668V	HSSK50-67368S	OHSK130-223803B	OHSK90-221401A
HMSK100-159303W	HMSK80-155669V	HSSK50-67390S	OHSK130-223804B	OHSK90-221404A
HMSK100-159426W	HMSK80-155670V	HSSK50-67395S	OHSK130-223808B	OHSK90-221406A
HMSK100-159432W	HMSK80-155671V	HSSK50-67401S	OHSK130-223814B	OHSK90-221407A
HMSK100-159433W	HMSK80-155672V	LEV115-350126D	OHSK130-223815B	OHSK90-221408A
HMSK100-159434W	HMSK80-155684V	OHH55-69040E	OHSK130-223816B	OHSK90-221410A
HMSK100-159439W	HMSK85-155902A	OHH55-69058E	OHSK130-223818B	OHSK90-221411A
HMSK100-159440W	HMSK90-156519D	OHH55-69073E	OHSK130-223819B	OHSK90-221412A
HMSK100-159441W	HMSK90-156528D	OHH55-69085E	OHSK50-68500C	OHSK90-221413A
HMSK105-159903A	HMSK90-156532D	OHH55-69103E	OHSK55-69513C	OHV130-206854C
				VLV126-502052E

Note these units:

- are equipped with the Tecumseh supplied, in line shutoff valve.
- were produced between May 1, 1999 and August 21, 1999.
- are principally found on snow throwers, however 5% are on chore product specifically, log splitters, post hole diggers and chipper shredders.

Marking updated product" (Change effective immediately)
Please mark all updated product with a **"0" ZERO** in the location referenced on the following page of this addendum. If necessary, purchase the appropriate punch and place the description and cost on your first warranty claim.

Tracking Repaired Units: Effective immediately it is **CRITICAL** you record the equipment manufactures unit serial number(s) as par of the procedure. If the space provided on the ESA-157 warranty claim for is insufficient you can attach a separate sheet listing these numbers.

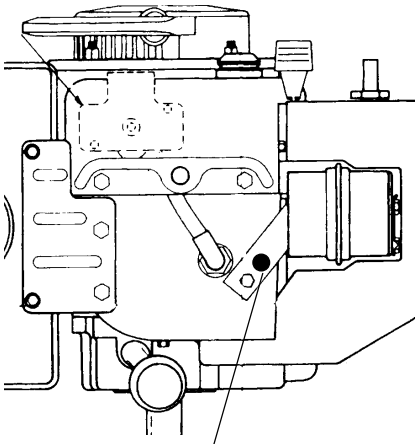
SERVICE
BULLETIN
125

INFORMATIONAL

ADDENDUM

REPAIR UNIT LOCATION OF IDENTIFYING STAMP MARK "0"

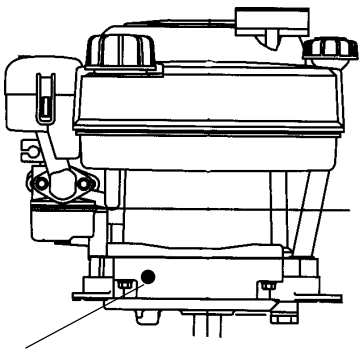
Top View



STAMP "0" ON MUFFLER STRAP

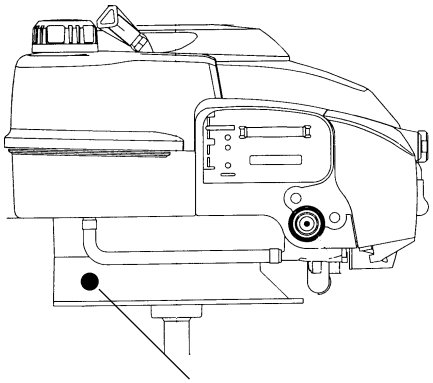
HM/HMSK80-110

Side View



STAMP "0" ON FLANGE

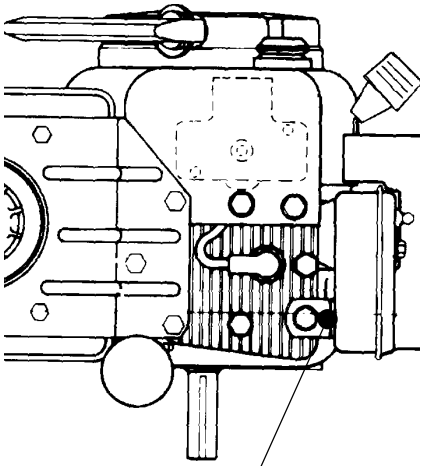
LEV115



STAMP "0" ON FLANGE

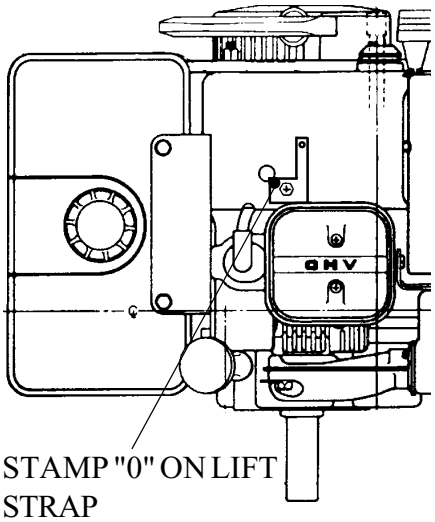
VLV126

Top View



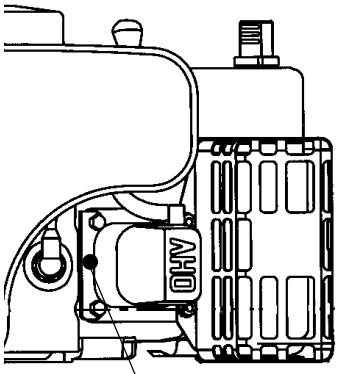
STAMP "0" ON MUFFLER STRAP

H/HS/HSSK35-70



STAMP "0" ON LIFT STRAP

OHSK80-130



STAMP "0" ON LIFT STRAP

OHSK50-70

Note: Some updated units will be identified as follows: The "0" will be stamped into the engine mounting flange, underneath the fuel tank, next to the oil drain plug.

TECUMSEH®

SERVICE BULLETIN 126

INFORMATIONAL

ISSUED: June 2000

SUBJECT: New Quick Fix Carburetor Kits

MODELS AFFECTED: Engines Equipped With Series “7” and VLV (vector) Carburetors

We have developed several, quick service repair kits for the series “7” and VLV style carburetors. These kits should help reduce equipment down time while improving your shop efficiency.

These kits include all internal components typically damaged by improper storage or neglect. To maintain emissions compliance under both EPA and CARB regulations you MUST follow the engine model cross-reference listed below. Installation of an improper kit is considered a violation of emission regulations.

These kits can be ordered from your normal Tecumseh source of supply under the following part numbers.

Emissionized Engines	**Model**	**Kit Number**
	VLV	730637
	OHV 110-135*	730638
	OHV *135-175	730639

*** Note:** Model OHV135 with specification numbers ranging from 203500 thru 203599 uses kit number 730639.

Non-Emission Engines	**Models**	**Kit Number**
	VLV	730235A
	VLV (Victa model)	730641

The Pre-assembled Kits Include the Following: Fuel bowl, Inlet needle and seat, Float, Main jet, Bowl drain screw, Main nozzle and Bowl Gasket.

TECUMSEH®

SERVICE BULLETIN 127

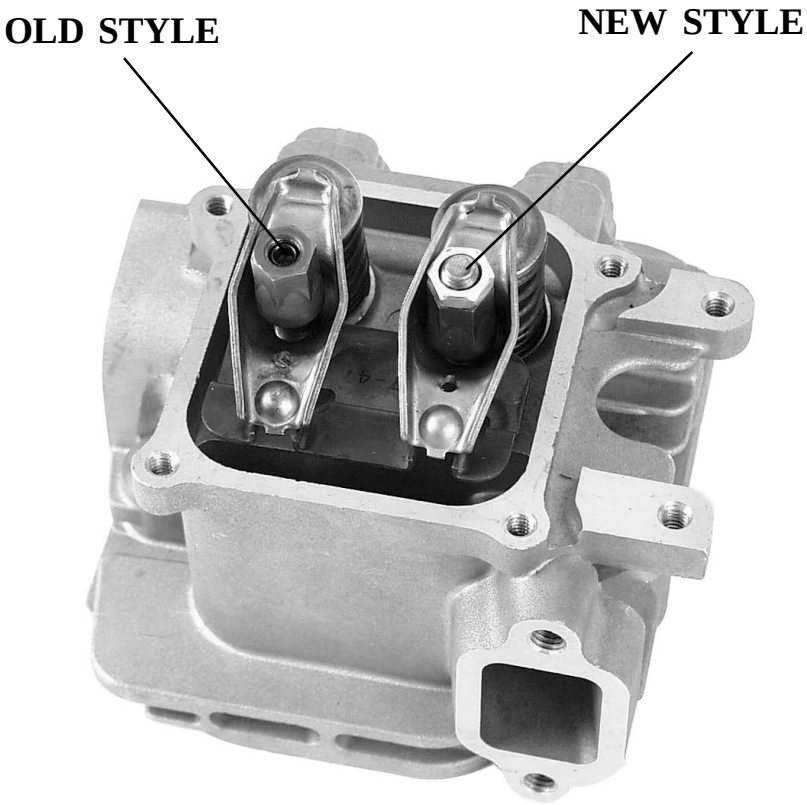
INFORMATIONAL

ISSUED: June 2000
MODELS OR TYPES AFFECTED: OHV 13.5HP – OHV 17.5HP
SUBJECT: Cracked Rocker-Arm Bearings

We have developed a new Rocker-Arm Bearing Kit part number **730636** to address field concerns of rocker-arm bearing breakage. This typically is caused by over-torquing the Allen lock screw during adjustments. The kit includes longer rocker arm studs, jam nuts to replace the Allen lock screws and new rocker-arm bearings.

A detailed and easy to follow instruction sheet is included with every kit.

To simply replace the cracked rocker-arm bearings and set screw could result in the same problem reoccurring. The **Rocker-Arm Bearing Kit** part number **730636** can be ordered from your normal source of supply.



TECUMSEH®

SERVICE BULLETIN 128

INFORMATIONAL

ISSUED: December 2001
MODEL AFFECTED: OHSK70
SPECIFICATION NUMBER: 72523D
DOM's AFFECTED: 1221 THROUGH 1309

Simplicity Model : 755 Snowthrower
Simplicity Manufacturer Number: 1693983

We have identified a potential problem with the primer line routing on the above model engines.

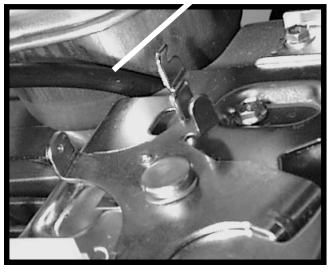
Photograph 1 shows the **INCORRECT** routing with the primer line pinched between the housing and muffler. If the engine is started with the line located in this position, the line will melt immediately on start-up causing the primer to no longer function, which results in hard starting.

There is **NO DANGER** of fuel leaking from the primer line should it melt as it uses air to prime the carburetor.

Prior to sale of any 2002 Simplicity model **1693983 755 snowthrower,** please inspect them for improper routing of the line as shown in photo 1. If the line is not properly located as shown in photo 2, use a blunt object or your hand to move the line to the correct location as shown. Also check that the line routing is behind and under the fuel line as shown.

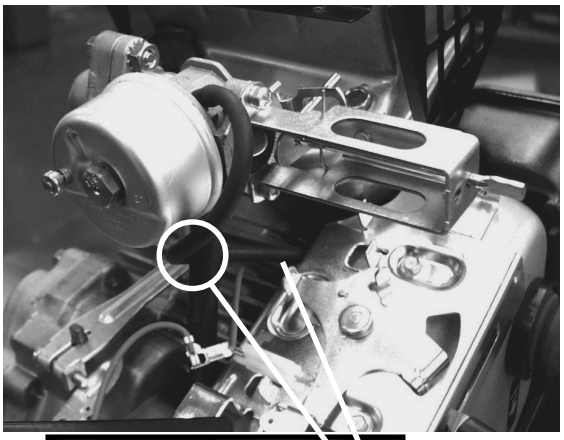
File a claim with Tecumseh using a completely filled out ESA–157 claim form for 15 minutes labor referencing this bulletin number. If the primer line was damaged order part number 32180C. If you are not a Tecumseh Servicing Dealer, submit warranty to Simplicity Manufacturing Inc.

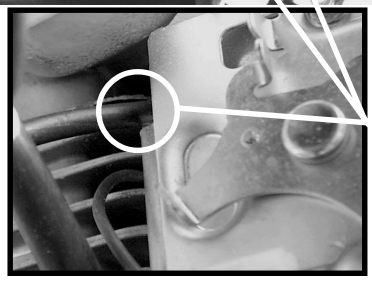
PHOTO 1



INCORRECT

PHOTO 2





CORRECT

TECUMSEH

SERVICE BULLETIN 201

2 CYCLE

ISSUED: August 1993

REVISED: June 1995

SUBJECT: Muffler Bolt Torque Retention

MODELS OR TYPES AFFECTED: Toro CCR-1000 Snow Thrower
Models 38190, 38191, 38195, 38196
Serial No. 3900001 thru 3999999
Tecumseh Model No. HSK600 1659R, 1667R, 1671R, 1681R
Serial No. 2213 thru 2273

We have received reports from the field that after a short running time, the muffler bolts can become loose and occasionally will back out. This is caused by a deterioration of the gasket between the muffler and cylinder block. If left unchecked or unrepaired, the muffler could fall off and damage other plastic parts on the equipment. Corrections should also be made to all unsold units. To correct this condition you must:

1. Remove the (3) carriage bolts that secure the discharge chute to the chute handle and pull these pieces from the unit.
2. Remove the two (2) pan head screws, washers and locknuts that secure the front of the upper shroud to the rotor housing.
3. Remove the two (2) screws that secure the front panel to the upper shroud and remove the panel.
4. Remove the fuel cap; then the shroud can be pulled up and away from the unit and pivoted toward the handle without disconnecting the ignition switch wires from the switch. It may be easiest to disconnect the primer bulb line from the primer before pivoting the shroud. This will expose the engine portion of the thrower.
5. Remove the muffler and the old gasket (inspect the muffler for enlarged bolt holes on units that have been run with the muffler loose). Replace the gasket with Tecumseh part number 510346A, which can be identified as having a graphite material on one side and metal on the other. The grey graphite side should face the block. **DO NOT USE PART NUMBER 510346**. This gasket has a metal core with a paper gasket material outside.
6. Install the new gasket making sure that both the block surface and muffler surface are clean. Place the muffler in position and insert the bolts through the muffler holding the gasket in place. Thread the bolts into the block until tight. Torque the muffler bolts to 110 inch pounds using 50 inch pound increment.
7. To reinstall all components, reverse the order described above. The repair time for this repair is .3 of an hour.

Warranty applies, submit an ESA claim form for the part and gasket. If any non-Tecumseh parts are replaced, submit a copy of the invoice with the claim.

SERVICE BULLETIN 202

2 CYCLE

ISSUED: October 1993

REVISED: June 1995

SUBJECT: Low Power on Feldmann Model 30's

MODELS OR TYPES AFFECTED: Tecumseh Model AV520 670 119L,M
Serial Numbers 1160 thru 3160

Field reports have indicated that some equipment with the model and serial numbers listed, have exhibited low power tendencies. To resolve these symptoms, proper evaluation must be done using the following steps.

A. Run the engine to verify the carburetor's optimum setting.

1. The main adjustment screw should be adjusted 1/2 to 3/4 of a turn out from seat. While performing this operation, the engine must be under load.
2. Turn the idle adjustment screw 7/8 to 1-1/8 of a turn out from seat. A load on the engine is not required for this adjustment.
3. At these settings the engine should run clean (neither rich nor lean). If an adjustment of more than 1/8 turn from the stated adjustment (above or below maximum or minimum setting) is required, remove the adjustment needles and inspect them for damage. Refer to Carburetor Troubleshooting Booklet, Form No. 695907, to aid in evaluation. Also, check for leaking seals, sticking throttle plate, or binding linkages.

B. If the engine still exhibits low power:

1. Remove the carburetor and the reed plate assembly.
2. Replace the reed plate with a new assembly.
3. Attach the new reed plate assembly and carburetor to the engine using new gaskets.
4. Retest the engine and adjust the carburetor as instructed in step "A".

C. If the above steps fail to correct the low power tendencies, replace the carburetor as a complete assembly.

TECUMSEH

SERVICE BULLETIN 203

2 CYCLE

ISSUED: April 1994

REVISED: June 1995

SUBJECT: Low Power on Strike Master Cobra

MODELS OR TYPES AFFECTED:

Tecumseh Model AV520 670-134N, AV600 660-50J
Serial Numbers for AV520 model: 2232 thru 2280
Serial Numbers for AV600 model: 2233 thru 2357

Field reports have indicated that some equipment with the model and serial numbers listed, have exhibited low power tendencies. To resolve these symptoms, proper evaluation must be done using the following steps.

A. Run the engine to verify the carburetor's optimum setting.

1. The main adjustment screw should be adjusted 1/2 to 3/4 of a turn out from seat. While performing this operation, the engine must be under load.
2. Turn the idle adjustment screw 7/8 to 1-1/8 of a turn out from seat. A load on the engine is not required for this adjustment.
3. At these settings the engine should run clean (neither rich nor lean). If an adjustment of more than 1/8 turn from the stated adjustment (above or below maximum or minimum setting) is required, remove the adjustment needles and inspect them for damage. Refer to Carburetor Troubleshooting Booklet, Form No. 695907, to aid in evaluation. Also, check for leaking seals, sticking throttle plate, or binding linkages.

B. If the engine still exhibits low power:

1. Remove the carburetor and the reed plate assembly.
2. Replace the reed plate with a new assembly.
3. Attach the new reed plate assembly and carburetor to the engine using new gaskets.
4. Retest the engine and adjust the carburetor as instructed in step "A".

C. If the above steps fail to correct the low power tendencies, replace the carburetor as a complete assembly.

SERVICE BULLETIN 204

2 CYCLE

ISSUED: April 1994

REVISED: June 1995

SUBJECT: Carburetor and Adapter Gaskets on TC style engines.

MODELS OR TYPES AFFECTED: All TC Engines Built Prior to Serial No. 4074

It has been found that there are occasions when the adhesive holding the carburetor gasket to the heat shield or the carburetor spacer can migrate to the pulse passage.

This can restrict or plug the pulse passage in either the cylinder or the carburetor adapter. This does not allow the diaphragm in carburetor to perform properly leading to the following conditions:

1. Engine will not continue to run after priming (if so equipped).
2. Engine may not start.
3. Poor acceleration or performance.

All TC engines built after March 15, 1994 (4074) have had the adhesive removed. Service stock will be changed accordingly.

TECUMSEH

SERVICE BULLETIN 301

PEERLESS

ISSUED: January 1984

REVISED: June 1995

SUBJECT: Peerless Gear Lubricant - Bentonite Grease

The Engine and Transmission Group Service Division of Tecumseh Products Company has recommended that Bentonite grease to be used in all 900 series transaxles. Bentonite grease has displayed superior characteristics for lubrication and, therefore, is recommended for all 100, 700, 800, 900 series differentials, transmissions, transaxles, and right angle and T-drives using grease as a lubricant. **NOTE: DO NOT USE OR MIX E.P. LITHIUM GREASE IN ANY PEERLESS DRIVE UNIT.**

For easier use of the Bentonite grease, it is packaged in a 32 ounce (net weight) resealable plastic bottle. Consult your Mechanics Manual for proper greasing procedures and the amount of grease to be used. The new bottle of Bentonite grease can be ordered under part number 788067B from your normal source of supply.

SERVICE BULLETIN 302

PEERLESS

ISSUED: September 1992

REVISED: June 1995

SUBJECT: Peerless Hydrostatic Drive Units

MODELS OR TYPES AFFECTED: All 1800 Series, All VST Transaxles and Transmissions

All hydrostatic drive units that experience operating difficulties should be checked using the following diagnostic check list to determine if the cause is equipment related or hydrostatic drive related.

DIAGNOSTIC CHECK LIST

Check for dump valve engagement if equipped. Is the hydro dumped?
If yes, turn lever to not dumped position.
If no, continue.

Is the parking brake on?
If yes, release the parking brake.
If no, continue.

Is the brake adjusted properly? Is the brake releasing?
If no, adjust to specification.
If yes, continue.

Do the axles turn when the control lever is moved to a drive position with the engine running?
If yes, inspect wheels, hubs, and axle drive keys for damage or missing parts. Repair as needed.
If no, continue.

Does the control handle move the transaxle control lever?
If no, inspect the control linkage for damage.
If yes, continue.

Does the control lever turn the control rod coming out of the transaxle? The rod should turn with 150 to 200 inch pounds of torque, approximate.
If no, inspect and repair.
If yes, continue.

(over)

Does the input turn with the clutch released?
If no, inspect for cause and correct.

Inspect the tractor's belt drive system for the following:
Is the drive belt installed correctly?
If no, repair per manufacturer's instructions.
If yes, continue.

Check the condition of the drive belt. Is the belt broken, frayed, stretched or cut?
If no, continue.
If yes, remove the old belt. With the drive belt removed turn the input pulley to ensure that it turns freely in the neutral position. If so, replace the drive belt.
If no, remove the unit for bench testing.

Is the belt tension within manufacturer's specification?
If no, inspect all clutch components for worn or broken parts. Repair and adjust to manufacturer's specification.
If yes, continue.

Inspect engine pulley. Is it loose? Is the drive key sheared?
If yes, repair or replace as necessary.
If no, continue.

Inspect hydro input drive coupling for loose or sheared bolts. Inspect the coupling for stripped serrations. Repair if necessary.

If after performing this inspection and repairing all broken parts and adjusting all components the tractor still will not drive, remove transaxle for bench testing.

External parts (brake components, control lever, input pulley, fan and hardware) can be serviced as usual.

After following the diagnostic check procedure and a defective hydro is indicated, any internal failure should be serviced as a complete hydro replacement. If the unit has failed during the warranty period, obtain replacement authorization as usual and order a new hydrostatic drive unit from your source of supply. Submit a valid authorized warranty claim addressed to Tecumseh Products Company, Service Division in Grafton, Wisconsin, for reimbursement under Tecumseh's Limited Warranty Procedure.

SERVICE BULLETIN 303

PEERLESS

ISSUED: June, 1995

SUBJECT: Assembly Discrepancy

MODEL: 801-059B Ser 5048
Simplicity Broadmoor Series, Manufacturer No. 1692418 or
Agco Allis 1600 Series, Manufacturer No. 1692434 Lawn Tractors

SYMPTOM: Excessive Noise and/or Vibration

We have received reports from the field regarding 801-059B transaxle used on Simplicity Broadmoor Series or the Agco Allis 1600 Series.

These units have exhibited excessive noise and vibration when started. If the transaxle exhibits this condition, remove the transaxle from the tractor and order Part No. 794582A from your normal source of supply. Normal warranty applies.

After installing the new transaxle, please return the failed unit prepaid postage to: Tecumseh Products Company, Peerless Gear Division, ATTN: Mark Koshco, R.R. 1 Box 178, Salem, IN 47167.

SERVICE BULLETIN 304

PEERLESS

ISSUED: June 1996

SUBJECT: Peerless Transaxles and Transmissions Shifting Problems

MODELS OR TYPES AFFECTED: All In-Line Shift Models 700, 800, 900, or MST Series

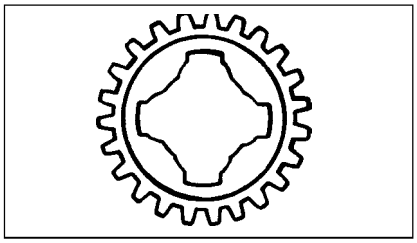
Shifting force or effort should be the same with the engine running or not running. If not equal, check the following area's: clutch adjustment, brake adjustment, belt release and belt guide positioning.

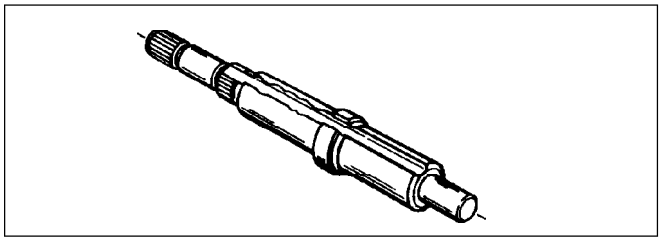
The transaxle and transmission models listed above are in-line shift mechanical gear drive models that use shift keys to engage a desired gear to lock and rotate with the shaft. This type of unit requires the transaxle or transmission to be in a no load condition (de-clutched) when gear selection occurs. Declutching allows the unit to have the input and brake forces removed from the gears and shift keys, which allows the unit to turn freely. Improper shifting (shifting while on an incline, shifting while towing any type of load, or shifting without de-clutching) forces the shift keys to engage into a gear that is in a loaded condition. Improper shifting is considered abuse because it leads to premature wear and failure of the shift keys and drive gears. Tecumseh's limited warranty covers only transaxle or transmission failures that are the result of a defect in the material or workmanship of the unit, not failures caused by abuse or wear.

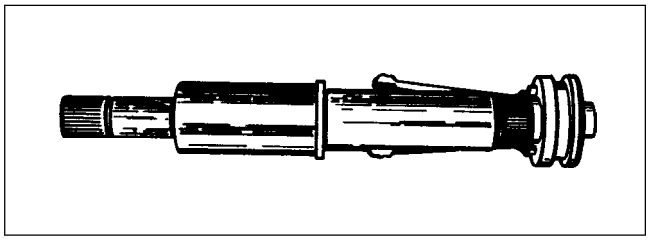
Some Original Equipment Manufacturers (OEMS) use these transaxles and transmissions in lawn tractors that do not use a foot operated clutch. These lawn tractors combine the clutch release mechanism with the hand operated gear shift lever. When the gear shift lever is moved through the shift gate from the gear engagement position toward the neutral position, the attached clutch linkage moves the idler pulley to release all input drive belt tension from the transaxle input pulley. With the drive belt released from the transaxle input pulley (de-clutched), the transaxle is free to turn under a no load condition while another gear selection can be made.

Improper shifting on this type of OEM equipment: such as, shifting while on an incline or shifting the unit while towing any type of load, is considered abuse, The result of which is premature shift key and gear wear, not a defect in the material or workmanship of the Peerless unit and is not covered under Tecumseh's limited warranty.

The following illustrations show gear, shaft and key damage caused by improper shift and / or linkage out of adjustment. These examples show evidence of wear or damage that is not considered a defect.







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SERVICE BULLETIN 304 (Cont.)

PEERLESS

Use the following procedure to determine if a hard shifting condition is caused by the shifter/clutch linkage or an internal problem in transaxle or transmission.

On level ground, start the engine and allow the engine to run. Using the OEM supplied linkage, de-clutch the foot operated clutch and shift the gear shifter, or on units equipped with a hand operated gear/clutch shift lever, shift the transaxle or transmission. If shifting is difficult, try shifting the unit with the engine shut off.

If the unit shifts freely through each gear with the engine shut off, the cause of the shifting problem is external to the unit. DO NOT REMOVE THE TRANSAXLE. Check the clutch, shifter, and brake linkage for the proper adjustment. Use the guidelines provided by the OEM to check for the correct linkage positioning.

Hard shifting with the engine shut off can be caused by:

1. Bent or binding shift lever or linkage
2. Shift linkage out of adjustment
3. Missing belt guides or improper clearance between belt and belt guides preventing proper belt release from the pulley. (Consult OEM's specifications).
4. Corrosion in the transaxle or transmission
5. Damaged shift keys, gears, or shifter brake shaft

NOTE: DO NOT REMOVE TRANSAXLE UNTIL YOU HAVE CHECKED ITEMS IL, 2 AND 3.

If the cause is internal, remove the unit from the tractor, disassemble, and determine the cause of the failure.

TECUMSEH

SERVICE BULLETIN 306

PEERLESS

ISSUED: June 1997

SUBJECT: Axle Spline Failure

MODELS AFFECTED: Toro Grounds Master units with Tecumseh a 1310 - 001 A series transaxles.

Tecumseh has received field reports concerning damage to the serrated spline section of the axles on some 1310 - 001A series transaxles. This unit is used on the Toro Grounds Master.

To correct this situation a design change has been made implementing a heavy duty 13 tooth spline system. This will give the added strength needed to improve the wear characteristics on this unit.

A kit part number 799025 has been assembled to convert from the serrated style to the 13 tooth spline system. This kit includes two new axles, bevel gears, pinion gears, oil seals, retaining rings, a case to cover gasket and two quarts of 80w90 gear oil. To replenish the transaxle it will only require 44 ounces of oil. The kit can be ordered through your normal source of supply.

Follow the instructions included in the kit to complete the conversion and submit a warranty claim through the normal channels.

SERVICE BULLETIN 307

PEERLESS

ISSUED: October 1997

SUBJECT: Peerless® Model VST 205 **WARRANTY** Replacement Program

The Service and Engineering groups of Tecumseh have reviewed extensively the servicing of the VST 205 Hydrostatic Transaxle. After review of the complex issues of servicing this unit, we have decided on a unique approach for Tecumseh to handle IN WARRANTY servicing by complete replacement, if needed, with factory furnished units. These units may be Tecumseh re-manufactured units or new units at our discretion.

Effective November 15, 1997, the following procedure is to be followed by all Authorized Tecumseh Service Centers if an Internal Failure occurs WITHIN THE WARRANTY PERIOD. We are enclosing the revised Warranty Policy reflecting this change.

1. Be sure you have reviewed the trouble shooting section of the Peerless® Technicians Handbook, No. 691218, to insure the problem is internal and not a linkage problem. All external components serviceable previously such as pulley, brakes, and levers are still serviceable as before.
2. If you have identified the trouble as internal, contact your distributor for replacement authorization under the normal warranty authorization procedure.
3. You will then need to look up the replacement transaxle using the attached list of replacements or the parts look up system you have chosen (i.e., microfiche, computer or paper). NOTE: Place an **"R"** on the end of the service replacement part number when ordering from your normal source. The unit will be shipped N/C with freight prepaid direct to your dealership. Example: Part #794667 (R). If your replacement model had an "A" suffix, change it to an **"R"** as referenced.
4. Ordering is done through your normal source of supply. DO NOT attempt to combine any **"R"** number with a regular order. Only the **"R"** will be shipped N/C Prepaid. Any added orders will be kicked out (not shipped).
5. You then file your **DISTRIBUTOR AUTHORIZED, COMPLETELY FILLED OUT** ESA157 warranty claim with us for the R&R of the transaxle. Upon receipt of the warranty claim in Grafton, Wisconsin, Tecumseh will issue a recall tag through UPS to pick up the unit for return to us.
6. When your claim is matched up with your returned transaxle, we will process it for prompt payment.
7. Before returning the defective transaxle, place a COPY of the ESA157 warranty claim in the original box, which should be used for return shipment of the transaxle.
8. This program will be in effect for the United States only.

We appreciate your assistance in this warranty replacement procedure.

SERVICE BULLETIN 308

PEERLESS

ISSUED: December 1998

SUBJECT: Hydrostatic Transaxle Shift Force

MODELS AFFECTED: VST205

We have made a change to the VST series transaxle cover. This allows for external adjustment if necessary, of the shift force required to move the control lever. This adjustment can be accomplished on all **"C"** series and later model units. To determine if this adjustment can be made on the unit in for repair, locate the ID tag as shown in the illustration below**.**

When a "C" or newer unit is found, use the adjustment procedure as outlined below. **Remember to disconnect and check the equipment linkage first, before performing this adjustment or replacing the transaxle on early production units.**

TO ADJUST MOTION CONTROL LEVER (See Insert)
The motion control lever has been preset at the factory and adjustment should not be necessary.
If for any reason the motion control lever will not hold its position while at a selected speed or is difficult to move, it may be adjusted as follows:

- Park tractor on a level surface. Stop tractor by turning key to the "OFF" position and engage parking brake.

NOTE: The transmission should not be warm when making this adjustment. Allow it to cool to room temperature before making this adjustment.

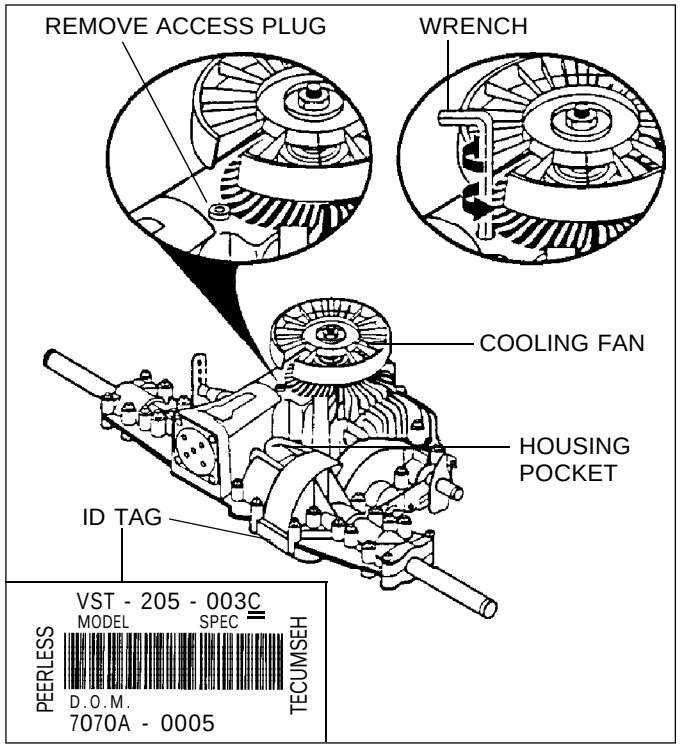
The plug may be accessible through the battery box area, however, each manufacturer may be different.

If access can be gained through the battery area, it will be necessary to remove the battery and the battery box from the tractor.

The most extreme case may require transaxle removal from the frame.

- Raise the seat and open battery box door. Disconnect BLACK battery cable first, then the RED cable.

- Remove battery and battery box from tractor.



(continued on next page)

SERVICE BULLETIN 308 (Cont.)

PEERLESS

NOTE: When reinstalling battery box, ensure that battery acid drain tube is routed toward the rear and is clear of the cooling fan.

- Locate the access plug under the cooling fan. This plug and surrounding area must be cleaned to prevent contamination of internal parts during this procedure. Before removing the plug, pack a cloth in the housing pocket to absorb excess oil.
- Clean the bellows cover plate.
- Place a piece of masking tape over the hole located in the center of cover plate. This will prevent air from entering the bellows area when access plug is removed, and prevent oil from coming out access hole when plug is removed.
- Using a needle nose pliers, remove the access plug described above. When the plug is removed, a small, quantity of oil will flow out of the transaxle. This is normal and will not effect its function.
- Insert a #30 torx or 5/32 allen wrench into the access hole and locate the adjustment screw. Adjust the screw clockwise 1/4 turn at a time to increase motion control effort.

NOTE: If for any reason the effort to move the motion control lever becomes too excessive, reverse the above procedure by turning the adjustment screw counterclockwise 1/4 turn.

- Clean the access plug and insert it into position using the torx or allen wrench.
- Clean spilled oil from transaxle and reinstall battery box and battery into tractor. When connecting battery be sure to connect the RED battery cable first.
- An effort of 150-200 in-lbs. of torque to move the transaxle motion control lever is required for hand control units and an effort of 40-50 in-lbs. of torque to move the transaxle motion control lever on foot control units.
- An effort of 15 - 18 lbs. at the motion control lever knob is normal.

Road test tractor after adjustment and repeat procedure if necessary.

TECUMSEH

SERVICE BULLETIN 401

4 CYCLE

ISSUED: February 1988

REVISED: June 1995

SUBJECT: OVM/OVXL120 engines that are hard to crank when starting or require valve lash adjustment because of lack of power or performance.

It's possible that there has been some improper diagnosis of electric starter problems and/or bad batteries in the startability of some OVM/OVXL120 engines. Symptoms that are associated with this condition may include hard starting, excessive noise or clatter in the valve box area and low power. If an engine is suspect of this condition, the valve box cover should be removed and the valve clearance should be checked.

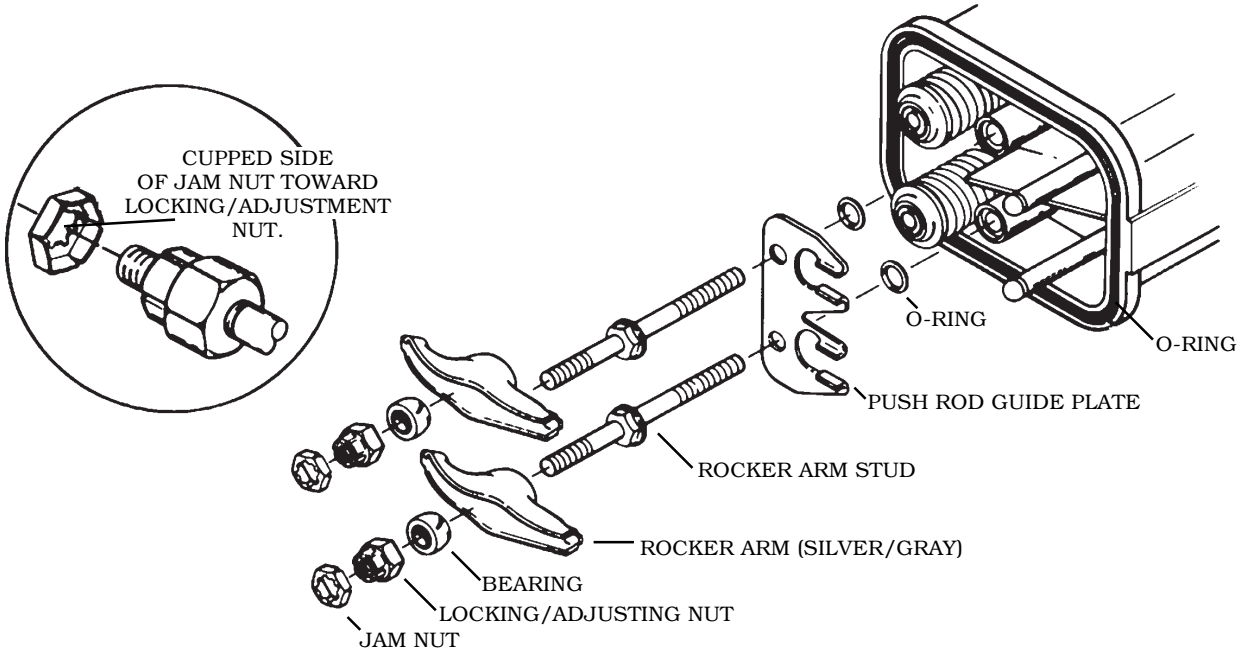
The engine in question will have black colored rocker arms. Any engines exhibiting the above problems should have the rocker arms replaced with kit 730221A. The rocker arms in this kit will be silver/gray in color. A detailed instruction sheet is included with the kit (730221A).

Engines manufactured after serial number 8000 will have these silver/gray rocker arms. Should any of these engines exhibit the same symptoms, as of 1/1/89 kit 730221A contains rocker arm studs with an epoxy lock applied to assure proper valve lash setting. Refer to the instructional sheet enclosed with kit for proper servicing.

NOTE: Valve clearance settings for the OVM and OVXL120 are .002" intake and .004" exhaust. These settings should be made when the engine is cold and with the piston to Top Dead Center on the compression stroke.

General Service Requirement: A one time adjustment of the valve lash after 200 hours use should be the only adjustment required for the normal life of the engine.

It will be good service practice to check valve lash on any 12 H.P. overhead valve engine when it requires any service for the first time after any reasonable period of use. This action will satisfy the one time valve lash check and adjustment even when done well before the 200 hours.



SERVICE BULLETIN 402

4 CYCLE

ISSUED: January 1991

REVISED: June 1995

SUBJECT: Procedure for Addressing High Altitude on OH Engines

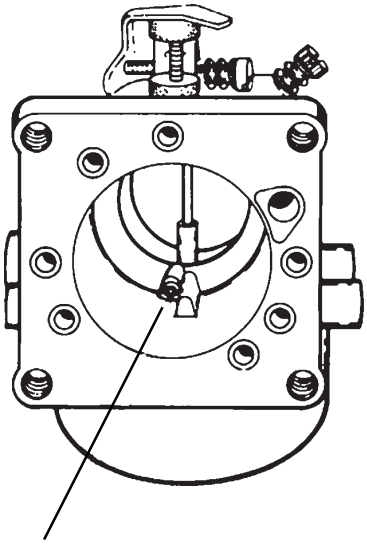
MODELS OR TYPES AFFECTED: All Fixed Jet Walbro Carburetors on OH120 thru OH180 Engines.

On occasions high altitude has affected the operation of high and low speed performance.

1. Remove air cleaner assy.
2. Remove choke shaft assy.
3. Using an ice pick type tool with a small hook on the end remove the brass cup plug out of the nozzle well vent.

NOTE: DO NOT USE A THREAD TAP AS CHIPS MAY ENTER THE CARBURETOR

4. Reassemble choke shaft assy.
5. Reinstall air cleaner assy.



REMOVE CHOKE LEVER ASSY.
NOTE BRASS CUP PLUG

TECUMSEH

SERVICE BULLETIN 403

4 CYCLE

ISSUED: April 1994

REVISED: June 1995

SUBJECT: VLV50, 55 Fuel Starvation

MODELS OR TYPES AFFECTED: VLV50, 55 engines with date codes between 2306 and 3213

SYMPTOMS: The engine stops after running a short time. The engine will restart after sitting a few seconds.

CORRECTION: Kit #730235

- **DO NOT REMOVE THE CARBURETOR**
- Drain the fuel from the tank and carburetor
- Release the carburetor bowl retaining bail and remove the bowl assembly. Release the fuel line clamp and remove the fuel line.
- Install the new bowl assembly (in kit).
- Install in-line fuel filter (in kit) by cutting a section from the middle of the fuel line (approximately 1-1/4"). The arrow on the filter must point towards the carburetor.
- **USE THE FUEL LINE CLAMPS PROVIDED WITH FILTER.**

SERVICE BULLETIN 404

4 CYCLE

ISSUED: February 1997

SUBJECT: OHH/OHSK Composite Camshaft Replacement

MODELS OR TYPES AFFECTED: OHH/OHSK 50 - 60 with a DOM (Date of Manufacture) of **7048** and higher.

A running change has been made to the camshaft on OHH/OHSK 50 - 60 engines with a D.O.M. (Date of Manufacture) of 7048 and higher. The result of this change is a substantial overall noise reduction in the engine.

A composite camshaft replaces the cast iron type. If the cast iron cam is replaced for any reason, new valve springs **MUST** be installed or lobe damage will occur. All parts needed for this direct replacement camshaft come in kit part number 37040.

This kit includes:

(1) Camshaft
(1) Yoke 36701
(1) Spring 36702
(2) Valve springs 37039

Refer to the Instruction Sheet included in the kit or the Overhead Valve Mechanic's Handbook (695244A) for disassembly and assembly procedures for proper removal and installation of camshaft and valve springs.

SERVICE BULLETIN 405

4 CYCLE

ISSUED: April 1997

SUBJECT: OHV16 thru 17 Falters Due To Lean Fuel Mixture (With fuel shut-off solenoid)

MODELS AFFECTED: OHV16 thru 17 Specification Nos. 204216D, 204217D, 204224D, 204228D, 204604A, 204605A, D.O.M. (Date of Manufacture) Affected 6280 - 7091 Located on ID Tag.

We have received field comments regarding faltering or a lean condition on OHV16 thru 17 HP engines equipped with fuel shut-off solenoids. The manufacturers affected are Ariens and MTD products.

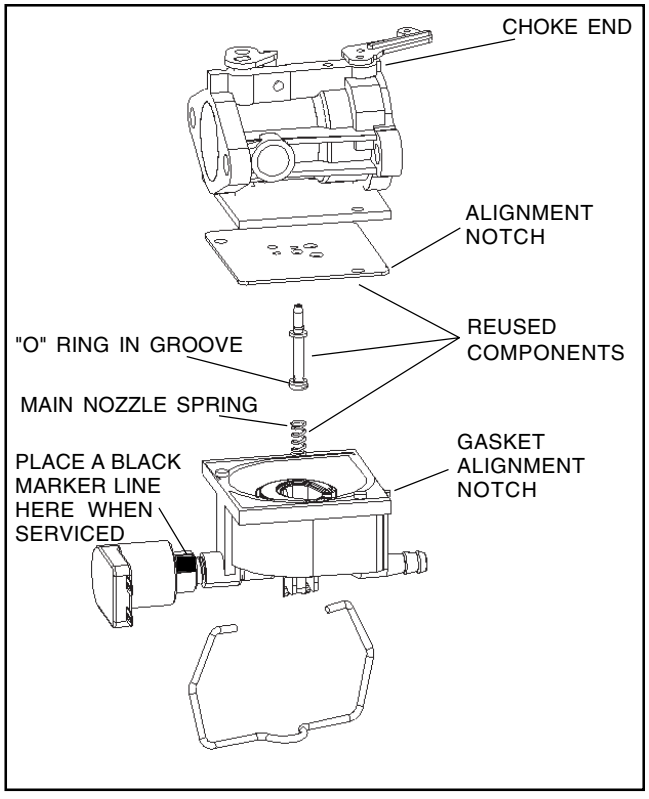
The engineering department has investigated this concern and verified this could occur after 20 - 30 minutes of warm up under the following conditions:

1. Winter/Spring fuel blends which are sensitive to warmer temperatures.
2. Under no load or light cutting conditions.

If you receive a customer comment regarding this condition please order carburetor bowl kit Part No. 730624. To minimize any possible mis-assembly, the kit will include a complete bowl assembly less the main nozzle tube, nozzle spring and gasket. These parts are to be transferred from the old bowl assembly to the new one.

PROCEDURE:

1. Turn off fuel supply or clamp line off from the tank stopping the fuel flow.
2. Remove fuel line clamp and hose from carburetor.
3. Disconnect solenoid wires from terminal on fuel shut-off.
4. Unclip and rotate the bowl retainer arm to the side.
5. Carefully drop the bowl assembly and dispose of the fuel into an approved safe container.
6. Remove the gasket, main nozzle tube, and main nozzle spring from the bowl. These parts will be transferred to the new assembly.



Install the bowl kit with transferred parts as noted in Item 6 above. NOTE the gasket has a notch which lines up with the "V" mark on the fuel bowl. The bowl must be reinstalled as shown with the locating pins properly engaged into the carburetor body. To identify repaired units look for or place a permanent black magic marker line across the flat steel portion of the solenoid facing out as shown. (See Illustration)

When the repair is complete, return the parts and a properly filled out ESA157 claim form to the address listed on the back of the claim form. The repair time is typically 20 minutes or less on a tractor with side panels and 10 minutes for standard tractors.

Thank you for your usual fine assistance in handling warranty if they occur.

SERVICE BULLETIN 406

4 CYCLE

ISSUED: May 1997

SUBJECT: Smoking Out of Muffler on Initial Start Up

MODELS AFFECTED: VLV 50 through 66

SERIAL NO'S AFFECTED: 7002 through 7128

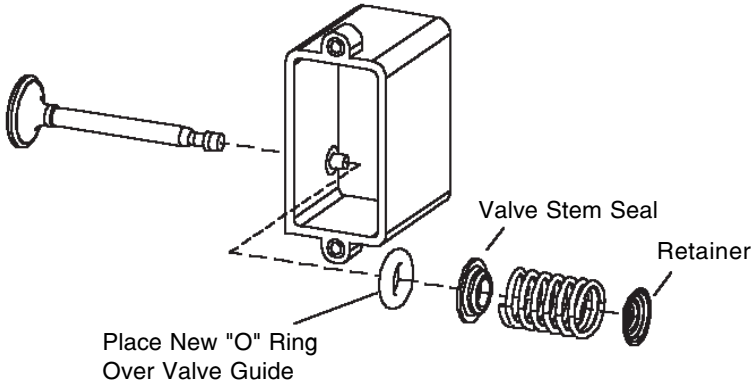
We have received comments from the service system regarding instances of NEW VLV model engines exhibiting smoke from the muffler during initial engine operation. These instances of smoke from the muffler in a new engine may be caused by storage or shipment with the spark plug pointing down.

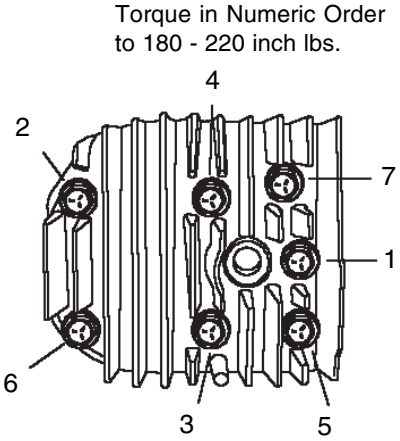
BEFORE performing the procedure below please make sure the engine has been run for at least 30 minutes to burn out any oil residue inside the muffler. If the smoking continues after this time period proceed below.

After investigation we have determined the cause of the smoking. This is the result of an irregular casting surface in the valve spring box, which does not allow proper seating of the seal allowing oil to pass. The installation of an O'Ring corrects this condition.

PROCEDURE:

1. Remove the muffler, cylinder head and valve box cover.
2. Remove the Intake valve spring, valve and seal.
3. Install the NEW O'RING Part No. 37075 and a new valve stem seal part no. 40016 as shown (see illustration).
4. Replace the cylinder head gasket part no. 36061 and valve box cover gasket part no. 27234A.
5. Re-torque the cylinder head to 180-220 inch Lbs following the sequence below.
6. A kit containing all the above parts can be ordered under part no. **730617**.





The time to perform this repair procedure is typically 45 minutes. We thank you in advance for correcting this problem and request you submit a claim to us for reimbursement.

TECUMSEH®

SERVICE BULLETIN 407

4 CYCLE

ISSUED: May 1999

SUBJECT: Hot Restarting of Swisher String Trimmer Mowers

MODELS AFFECTED: LEV120-361052B

We have been reviewing some field concerns regarding hot restarting difficulties on the above model and specification engines. This condition has been found to occur on some units after heavy use. The engine does not exhibit this condition when the unit is cold.

Before performing the repair outlined, check for fresh fuel, a good spark plug and the air filter condition. Then verify with the customer that they are **not** priming the engine for restarting which can cause a flooding condition.

For this two step repair we have developed a new carburetor to address units that may experience this condition. The first step is to replace the complete carburetor with service part number **640142,** ordered from your normal source of supply.

The next step while you have the manifold off is to check the **Intake** valve lash. Our evaluations found the best hot restarting to occur when the intake valve lash is at the bottom of the tolerance **(.004 to .006 inch.)**. If the lash is out of this specification it should be narrowed to the range listed. As always use proper valve seat cutting tools such as those available from Neway Mfg. Company.

When you have re-assembled the engine, check for proper governed speed which is **3200 RPM + or - 150 RPM.**

When the repair is completed file for warranty using the ESA 157 claim form.

SERVICE BULLETIN 408

4 CYCLE

ISSUED: May 1999

SUBJECT: Hot Restarting of Swisher String Trimmer Mowers

MODELS AFFECTED: LEV115-350127D

We have been reviewing some field concerns regarding hot restarting difficulties on the above model and specification engines. This condition has been found to occur on some units after heavy use. The engine does not exhibit this condition when the unit is cold.

Before performing the repair outlined, check for fresh fuel, a good spark plug and the air filter condition. Then verify with the customer that they are **not** priming the engine for restarting which can cause a flooding condition.

Should you confirm the problem exists replace the carburetor with service part number **640142,** ordered from your normal source of supply. This recalibrated carburetor will correct the problem.

When you have re-assembled the engine, check for proper governed speed which is **3200 RPM + or - 150 RPM.**

When the repair is completed file for warranty using the ESA 157 claim form.

SERVICE BULLETIN 409

4 CYCLE

EUROPE

ISSUED: SEPTEMBER 1999

SUBJECT: 220 Volt Electric Starters

MODEL AND SERIAL NUMBERS AFFECTED:

Model 37102 SERIAL NUMBERS 7305-9156

Model 37217 SERIAL NUMBERS 9020-9156

We have been evaluating 220 volt starters, replaced within the warranty period. These evaluations have found possible power cord failures. To avoid further damage, we have created a starter cord strain relief kit, **service part number 730640.**

Before installing this kit, completely inspect the starter's power cord for any cracks or breaks in the casing. If any damage is noted to the power cord replace the starter.

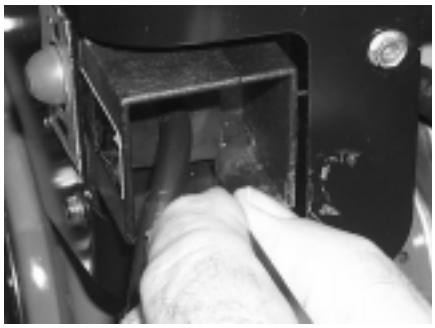
This kit includes two decals warning the customer not to cut or remove the straps. These decals must be placed on both the starter button box and the fuel tank or shroud reference (illustration M). The kit also includes two stainless steel self-locking straps. These straps when properly installed (see Illustrations) reduce the cord strain and risk of wear. **YOU MUST** tighten the straps securely around the plug using an easily created tool as shown in illustration M or it will not hold.

Please order these kits as needed to update any units within the above affected model and serial range. Then file warranty through your normal method.

Standard Snow King® models have the starter plug facing left as shown above

Regency style Snow King® have the plug facing down as shown above

STEP A
Pre-bend strap for ease of installation



STEP B
Insert tie strap into rear right or left hand corner as needed for proper cable position.

STEP C
After tie strap insertion, loop tie strap

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4 CYCLE

TECUMSEH®

STEP D
Push tie strap thru gap between starter switch box and tank skirt

STEP E
Insert tab in catch and push through

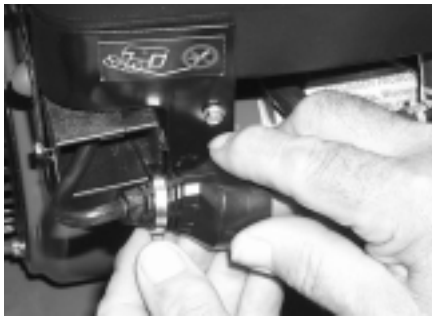
STEP F
Reference picture showing correct placement of strap

STEP G
Push catch into gap between starter switch box and tank skirt

STEP H
Insert second strap behind first strap on front right hand corner of starter switch box

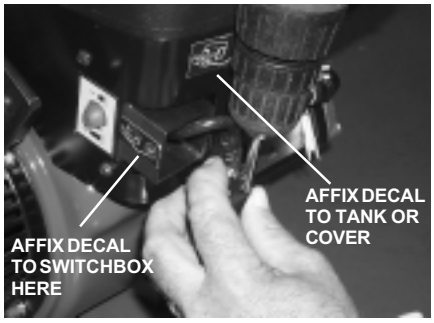
STEP I
Loop second strap around plug cord and insert end into catch

STEP J
Push tab through catch and trim the end of the tab by one half inch



STEP K
Position strap around plug as shown

STEP L
Hold plug end in position with connector body facing down



STEP M
Insert tool and twist tab until connector body is securely fastened. You can make your own tool by slotting a standard screwdriver

STEP N
Reference picture showing correct placement of connector body after strap is fastened

STEP O
Insert tool and twist first strap until slack is removed

TECUMSEH®

SERVICE BULLETIN 410

4 CYCLE

ADDENDUM

EUROPE PRODUCT ONLY

ISSUED: OCTOBER, 1999

SUBJECT: <u>220- VOLT ONLY !</u> ELECTRIC STARTERS RECALL

STARTER MODELS AFFECTED: 37102 and 37217

USED ON ENGINE MODELS: HSSK/HS 40-50, OHSK 55-70, HM/HMSK 80-100, OHSK/OHM 90-130

This Bulletin is an Addendum to Bulletin 410 which was issued October 1999.

To prevent possible power cord failures, we request your assistance in the removal of all 220 volt starters from product in your inventory. The request for removal also applies to any product equipped with these starters previously sold to consumers, or starter kits under the above part numbers that have been installed on consumer's machines.

The authorized repair facilities, listed below, have been established to rework this starter by replacing the power cord and switch box assembly. These starter units from your inventory or kits and machines, together with the units that have been fitted to consumer's machines, must be removed and returned, carriage paid, to the repair centre closest to you. Please ensure that these starters are appropriately packaged and are tagged with your name and address, together with a reference.

The repair facility will, by return, despatch to you on a one to one basis and at no cost, a repaired and tested starter together with a new hardware kit.

Upon receipt of the returned starter, follow the 4 step installation procedure provided to install the starter assembly.

(See back side for installation procedure)

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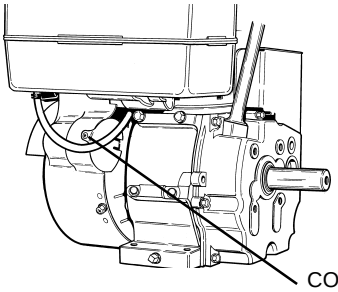
4 CYCLE

ADDENDUM

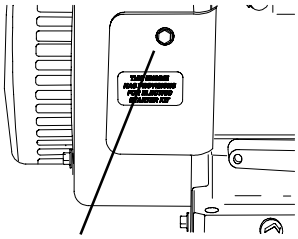
EUROPE PRODUCT ONLY

STARTER INSTALLATION INSTRUCTIONS

STYLE A



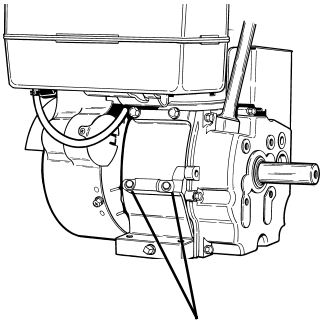
STYLE B



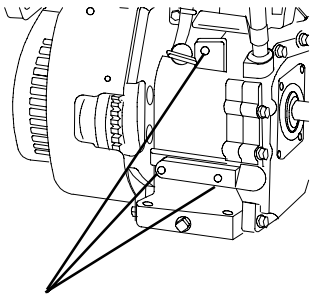
COVER PLATE AND MOUNTING SCREW LOCATIONS

STEP 1: REMOVE THE COVER PLATE AND MOUNTING SCREW FROM THE ENGINE (IF PRESENT)

STYLE A

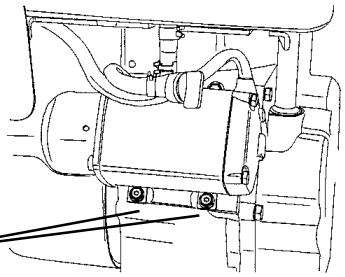


STYLE B



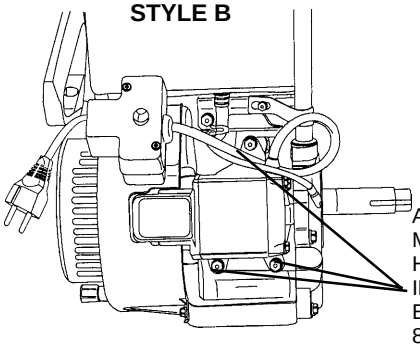
STEP 2: IF PRESENT, REMOVE THE STARTER MOUNTING BOLTS FROM THE ENGINE. (SHOWN ABOVE)

STYLE A



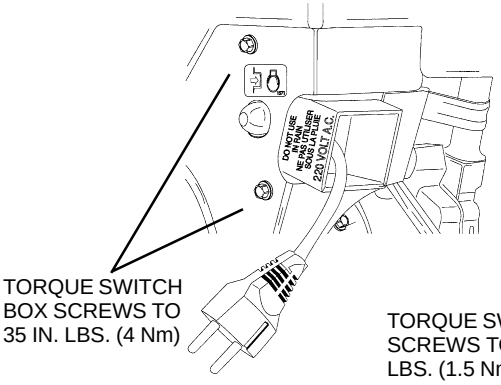
SLIDE THE STARTER UP UNDER THE UPPER (2) SHOULDER BOLTS. TORQUE LOWER MOUNTING BOLTS TO 95 IN. LBS. (10.7 Nm)

STYLE B

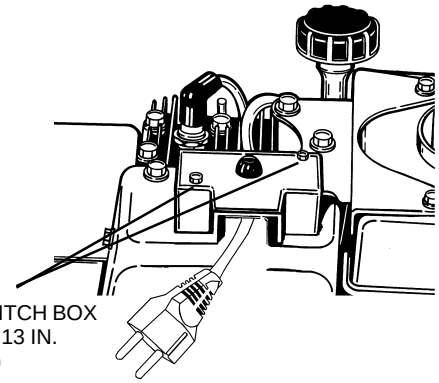


ALIGN THE STARTER MOUNTING BRACKET HOLES WITH THE ENGINE. INSTALL THE MOUNTING BOLTS AND TORQUE TO 80 IN. LBS. (9 Nm)

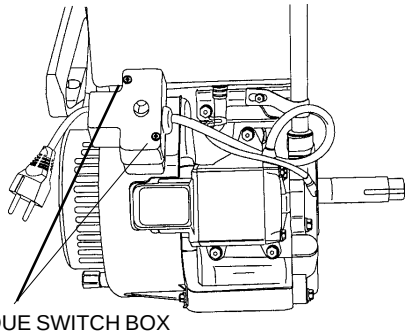
STEP 3: INSTALL THE NEW STARTER TO THE ENGINE. TORQUE THE MOUNTING SCREWS



TORQUE SWITCH BOX SCREWS TO 35 IN. LBS. (4 Nm)



TORQUE SWITCH BOX SCREWS TO 13 IN. LBS. (1.5 Nm)



TORQUE SWITCH BOX SCREWS TO 13 IN. LBS. (1.5 Nm)

STEP 4: INSTALL THE SWITCH BOX AND (2) MOUNTING SCREWS TO THE ENGINE. TORQUE MOUNTING SCREWS TO THE ABOVE VALUES.

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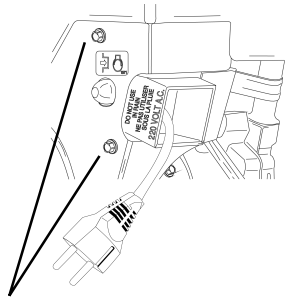
ADDENDUM

EUROPE PRODUCT ONLY

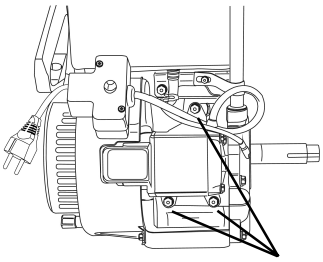
INSTRUCTIONS FOR 730633 COVER KIT

Starter No. 37217

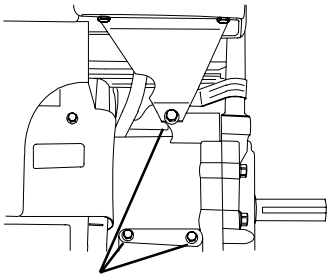
With the starter removed, place the tabbed starter cover in the position shown in the diagram. Place the tabs from the cover into the slots on blower housing baffle. Use the screw provided with the kit to fasten the cover to the blower housing and torque the screw to 15 inch pounds (1.6 Nm).



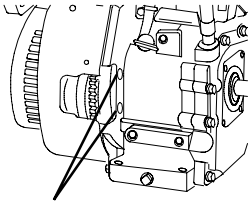
STEP 1: REMOVE THE TWO SCREWS ATTACHING THE SWITCH BOX TO THE HOUSING.



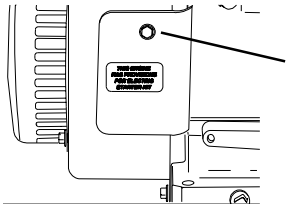
STEP 2: REMOVE 3 SCREWS



STEP 3: RE-INSTALL SCREWS



STEP 4: INSTALL FLYWHEEL SHIELD TABS HERE



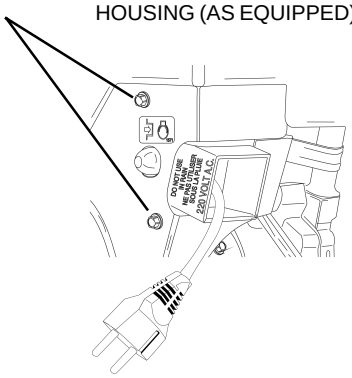
STEP 5: INSTALL SCREW SUPPLIED AND TIGHTEN TO 15 INCH POUNDS (1.6 Nm)

NOTE: Starter mounting screws should be reinstalled for reuse later.

INSTRUCTIONS FOR 730634 COVER KIT

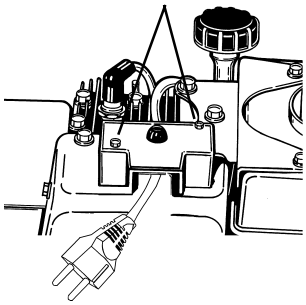
Starter No. 37102

STEP 1: REMOVE THE TWO SCREWS ATTACHING THE SWITCH BOX TO THE BRACKET OR HOUSING (AS EQUIPPED)

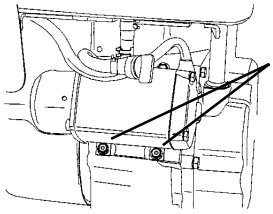


OHSK 80-130

STEP 1A: REMOVE THE TWO SCREWS AS SHOWN, TO RELEASE SWITCH BOX.

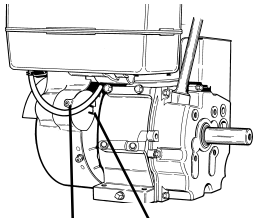


HMSK 80-110



STEP 2:

REMOVE THE TWO LOWER SCREWS THEN SLIDE THE STARTER DOWN TO RELEASE IT FROM THE UPPER SHOULDER BOLTS.



STEP 3: TORQUE TO 15 INCH POUNDS (1.6 Nm)

INSTALL STARTER SHIELD WITH TAB BEHIND PLATE.

TECUMSEH®

SERVICE BULLETIN 411

4 CYCLE

ISSUED: February, 2000

CONDITION: Hard Starting in Cold Weather

MODELS AFFECTED: **HM 80-100 and TVM 195-220**

DOM's AFFECTED: **7213 thru 9356**

SERVICE KIT NUMBER: 640261

We have been receiving calls from the field regarding hard starting on the above referenced model engines. This condition occurs **ONLY** at temperatures below **40ºF (5ºC).**

Prior to performing this repair, please check for STALE FUEL and inspect the SPARK PLUG and AIR FILTER CONDITION.

In response to this issue, we have changed the choke shutter used on current production models built after the **DOM's** listed. If the situation described above is brought to your attention, please install service kit part number **640261**. This kit includes a NEW SHUTTER SCREW which MUST be installed on every repair.

When the repair is complete, file the standard ESA-157 warranty claim, including ALL engine model, specification, and DOM numbers. This repair will require no more than 20 minutes to complete.

TECUMSEH®

SERVICE BULLETIN 412

4 CYCLE

ISSUED: June 9, 2000

MODELS AFFECTED: LEV 100

SPECIFICATIONS AFFECTED: 335000C,D, 335004C,D, 335005C,D, 335006C, D, 335019C, D, 335027C, D, **338000C, D**, 338008C, D, 338009C, D, 338014C, D, 338017C, D, 338019C,D, 338020C, D, **340000C, D,** 340018C, D, 340020C, D, 340038C, D, 340039C,D, 340042C, D, 340044C, D, 340045C, D, 340046C, D, 340049C, D, 340050C,D, 340051C, D, **345000 C, D,** 345001C, D, 345005C, D, 345008C, D, 345016C, D, 345017C, D

SUBJECT: Hard Starting Engine and poor performance

DOM's AFFECTED: 8213 through 0164

We have been receiving reports of hard starting or poor performance on the above listed LEV 100 model engines.

Please review the following.

- Check the fuel condition in the carburetor bowl and tank. If at all questionable replace the fuel.
- Check the spark plug for proper type and gap replace if needed.
- Check the air filter condition replace or service as needed.
- Now try starting the engine by first pushing the primer button firmly with your thumb, use **three** times on **"D"** specifications and **five** times on **"C"** specifications. Remember to allow the bulb to completely return before pushing again.
- With the engine running check the high and low governed speeds, adjust if needed.

If the engine still does not start or perform properly, order carburetor part number **640288** from your normal source of supply. As always with a carburetor replacement, be sure to check the governor linkage static setting. Then check the high and low running speeds, adjusting as necessary.

Note: If you are repairing a **"C"** version the **"3" Prime** decal, included with the carburetor must be installed over the current decal.

When the repair is complete file a totally filled in ESA-157 warranty claim form for payment.

TECUMSEH®

SERVICE BULLETIN 412

4 CYCLE

ISSUED: June 9, 2000

MODELS AFFECTED: LEV 100

SPECIFICATIONS AFFECTED: 335000C,D, 335004C,D, 335005C,D, 335006C, D, 335019C, D, 335027C, D, **338000C, D**, 338008C, D, 338009C, D, 338014C, D, 338017C, D, 338019C,D, 338020C, D, **340000C, D,** 340018C, D, 340020C, D, 340038C, D, 340039C,D, 340042C, D, 340044C, D, 340045C, D, 340046C, D, 340049C, D, 340050C,D, 340051C, D, **345000 C, D,** 345001C, D, 345005C, D, 345008C, D, 345016C, D, 345017C, D

SUBJECT: Hard Starting Engine and poor performance

DOM's AFFECTED: 8213 through 0164

We have been receiving reports of hard starting or poor performance on the above listed LEV 100 model engines.

Please review the following.

- Check the fuel condition in the carburetor bowl and tank. If at all questionable replace the fuel.
- Check the spark plug for proper type and gap replace if needed.
- Check the air filter condition replace or service as needed.
- Now try starting the engine by first pushing the primer button firmly with your thumb, use **three** times on **"D"** specifications and **five** times on **"C"** specifications. Remember to allow the bulb to completely return before pushing again.
- With the engine running check the high and low governed speeds, adjust if needed.

If the engine still does not start or perform properly, order carburetor part number **640288** from your normal source of supply. As always with a carburetor replacement, be sure to check the governor linkage static setting. Then check the high and low running speeds, adjusting as necessary.

Note: If you are repairing a **"C"** version the **"3" Prime** decal, included with the carburetor must be installed over the current decal.

When the repair is complete file a totally filled in ESA-157 warranty claim form for payment.

SERVICE BULLETIN 413

4 CYCLE

ISSUED: July, 2000
SUBJECT: 120-Volt Starter Stays Engaged
STARTER MODEL NUMBER: 37000
DATE CODE: 0104 through 0196 (Fig. A)

We have identified a potential sticking contact switch on a small percentage of the above model starters. These starters are typically used on 8-11 HP snowblower product.

During the evaluation we found the installation sequence of the switch box mounting screws to be critical for proper operation. In most cases, loosening the two mounting screws, then reinstalling them in the correct sequence and to the proper torque, corrects the problem.

Repair/Inspection Procedure:

1. Verify the condition of the switch by attempting to start the unit with the starter.
2. If the condition exists, loosen the switch box screws as shown in Fig. B.
3. Next re-install the screws. YOU MUST tighten the screw closest to the fuel tank first and torque it to no more than 18-INCH LBS; then torque the second screw to the same value.
4. Re-test the starter operation by intentionally pushing the starter button sideways at 90-degree intervals as shown in Fig. C. If no sticking occurs, the customer is ready to use the machine.
5. Should the problem still exist, the starter must be replaced by ordering part number 33329E from your normal source of supply.
6. When the repair is complete, file a standard ESA 157 warranty claim form for the repair. If the starter was replaced, please return the defective starter with your claim. This repair typically takes 15 minutes.

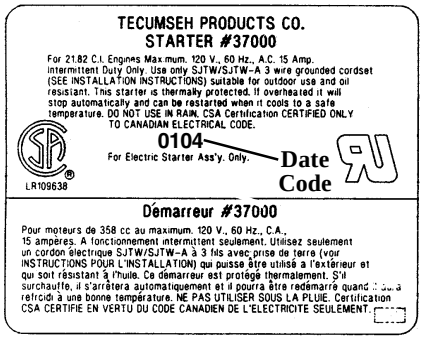


Fig. A

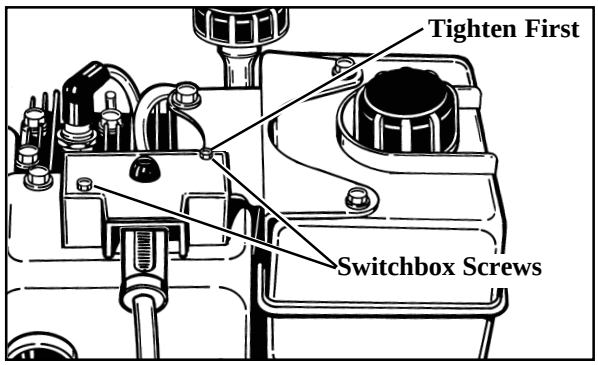


Fig. B

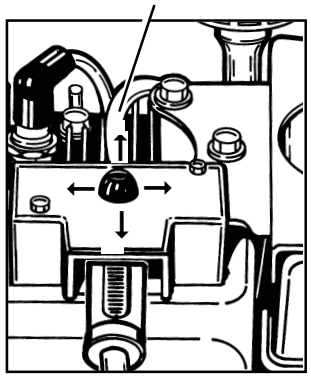


Fig. C

SERVICE BULLETIN 414

4 CYCLE

SUBJECT: Seeping Oil Drain Plug (below deck)
AFFECTED MODELS: All LEV and OVRM Engines
DOM'S (date of manufacture) **AFFECTED:** 0312 thru 1015
SERVICE KIT PART NUMBER: 730642

We have identified the potential for oil seepage from the drain plug on the above models with the DOM's listed. This seepage may cause concern by the customer.

We have performed repairs to many of the units at the manufacturers involved. However we believe some engines may have reached stores or may be in consumer's hands. Previously repaired units are easily identified by the new style plug which uses a 5/16 internal allen hex drive (see photo). The original plug used a standard 3/8 inch internal square drive (see photo).

If you identify one of these units still in need of the repair proceed as follows:

1. Disconnect and ground the spark plug wire
2. Remove the old style plug using a 3/8 square ratchet
3. Wipe excess oil from the threads in the flange
4. Install the new plug using the Loctite number 565 sealant included in the kit, apply as shown
5. Torque the 5/16 internal allen hex plug to 150 inch lbs (17 Nm)
6. Re-install the plug wire
7. Allow one-hour cure time before adding oil to the engine

Original Plug

New Plug

Loctite 565

When complete file the standard ESA-157 warranty claim form for 15 minutes labor and cost of the repair kit. We will allow batch claim filing in this case, when multiple repairs are performed. If you choose this option it is **CRITICAL** that you attach a separate page to your claim listing all Model, Specification and DOM numbers repaired.

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SERVICE BULLETIN 415

4 CYCLE

ISSUED: June, 2001

SUBJECT: Defective Push Rods

Models Affected: All OHH and OHSK Engines

D.O.M.'s (date of manufacture) Affected: 0348 through 1073

The engines listed above were manufactured with push rods that have an aluminum body with steel tips. These push rods have the potential to cause the engine to stop running. Any unit that is within the date codes listed should have the aluminum body push rods replaced even if they appear to be in good condition.

The repair requires the replacement of both push rods with the standard all steel rods, order two of service part number **36629** from your normal source of supply**.** When the push rods have been replaced pull the engine through one complete revolution to insure they are properly installed and seated.

Then with the engine at TDC on the compression stroke, set the cold valve clearance at .004 inch (.102 mm) on both valves. Install a new rocker box cover gasket (part number **35626**) and torque in a X pattern to 40 inch lbs (4.5 Nm).

When the repair is completed file an ESA 157R warranty claim for the parts and 30 minutes labor.

TECUMSEH®

EMISSION INFORMATIONAL BULLETIN 501

UNITED STATES ONLY

Date Issued: June, 1998 **Family: STP185U1G1RA**

Engine Model(s) Concerned: LEV115 **D.O.M. (s) Affected: 8091-8166**

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and the US Environmental Protection Agency (EPA), needs your assistance.

Potential Emission Control System Problem:

The testing of engines manufactured in compliance with these regulations has identified a potential emission control system problem. The potential area of concern (outlined below) should be inspected when equipment is received for normal servicing.

Should the inspection reveal the engine has the concern outlined, repair the unit as instructed. After completion of the repair, file for warranty reimbursement, using the ESA 157 claim form.

Affected specifications numbers are:

350007A,B,C,	350010B,	350013B,	350041B,C,	350042C,	350063C,
350064C,	350075C,	350083C,	350086C,	350087C,	350089C,
350098C,	350099C,	350110C,	350112C,	355001A,	355003A,B,C,
355004B,	355010C,	355011C,	360002A,	360003A,	360004A,
360006A,	360009A,B,	360010B,	360011B,	360017B,	360018B

Warranty Inspection and Repair Procedure:

Inspect models in stock or that come in for service to determine high speed bowl nut number (stamped on bottom).

If stamped with #174, replace high speed bowl nut with #169 (part number 640087).

If stamped with #169, no change is required.

EMISSION INFORMATIONAL BULLETIN 502

UNITED STATES ONLY

Date Issued: August, 1998

Family: TTP156U1G1EB

Engine Model(s) Concerned:
Compact H35 & H40

D.O.M. (s) Affected:
8079-8201

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and the US Environmental Protection Agency (EPA), needs your assistance.

Potential Emission Control System Problem:

The testing of engines manufactured in compliance with these regulations has identified a potential emission control system problem. The area of concern (outlined below) should be inspected when equipment is received for normal servicing or if the customer complains of poor engine performance.

Should the inspection reveal the engine has the concern outlined, repair the unit as instructed. After completion of the repair, file for warranty reimbursement, using the ESA 157 claim form.

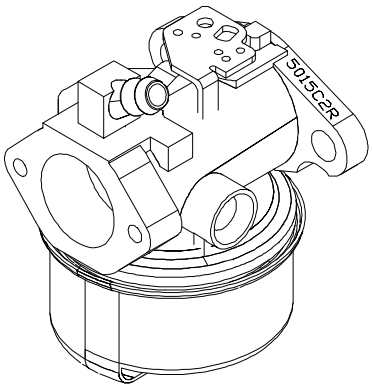
Affected specifications numbers are:
H35-45690Z, H35-45726Z, H40-55701A

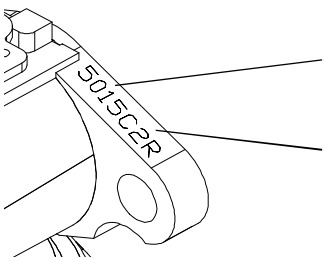
Warranty Inspection and Repair Procedure:

Should you have one of the above mentioned units please check for previous repair. This is accomplished by locating the carburetor model number as shown (see illustration.) If the carburetor model number is **5015** it will be necessary to replace the carburetor.

If the engine has already been repaired the carburetor model number **5161** will be present in the same location, and this **bulletin does not apply**.

To complete the repair order replacement carburetor number **640172** from your usual source of supply. The usual time for this repair is 30-45 minutes which includes completely filling out the ESA 157 warranty claim.





MANUFACTURING NUMBER (5015)

CARBURETOR DATE CODE

EMISSION INFORMATIONAL BULLETIN 503

UNITED STATES ONLY

ISSUED: January, 1999

SUBJECT: Rich Running Engines Above 7,000 Feet

MODELS OR TYPES AFFECTED: HM, HMSK, OHSK

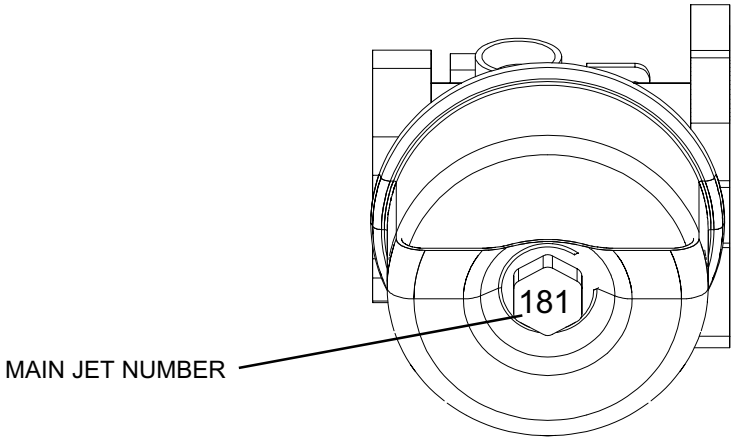
Tecumseh Products Company has been working with the California Air Resource Board (CARB) and the Environmental Protection Agency (EPA) to improve engine performance at elevations above 7,000 feet.

The result of these cooperative efforts is the availability of leaner service jets for the specific models listed on the attached page. These changes to the engines carburetor jetting will require some questioning and education of the customer by the sales person prior to the sale or the technician if the sale was already made. Part of the sale of new emissionized product **must** be questioning the customer regarding the elevation at which the equipment will be used.

If the unit was already sold and the customer is commenting about a rich running condition, poor run quality or excessive smoke, check the main jet number compared to the chart. By following this chart you can install the correct jet for the customers operational elevation while maintaining the engines emissions compliance and performance.

Please note under the regulation guidelines there are specific altitudes at which these changes can be made. The first range is 6,000-11,000 feet above sea level, the second is over the 10,000 feet. The change to carburetor calibration for these conditions requires changing the main metering jet which is part of the bowl nut.

The main jets are identified with a stamped in number on the bottom (see illustration). Using the chart below select the correct service jet kit. The kit will include instructions, jet(s) and a bright colored decal advising the customer that the unit has been re-jetted to compensate for high altitude. The decal will further advise the operator to have the unit re-jetted if taken out of that range.



(continued on back)

EMISSION INFORMATIONAL BULLETIN 503 [Cont.]

UNITED STATES ONLY

TECUMSEH®

Decal 1 Text **The carburetor on this engine has been re-jetted to improve performance between elevations of 6,000-11,000 feet. Operation above or below this range requires re-jetting by a Technician / Dealer to maintain the engines emission certification and prevent damage to the engine.**

Decal 2 Text **The carburetor on this engine has been re-jetted to improve performance at elevations above 10,000 feet. Operation below this range requires re-jetting by a Technician / Dealer to maintain the engines emission certification and prevent damage to engine.**

Engine Model / Description	**Original Bowl Nut Number**	**Service Kit Part Number for use at elevation's of 6,000-11,000 Ft.**	**Service Kit Part Number for use above 10,000 Ft.**
HM80/HM90 After DOM 7245	183	640189 (207)	640194 (206)
HM100 After DOM 7199	183	640189 (207	640194 (206)
OHM120	183	640189 (207)	640194 (206)
HMSK80/85/90	167	640186 (205)	640202 (203)
HM80/90/100 (RV Package)	163	640185 (149)	640193 (204)
HMSK100/105/110	163	640185 (149)	640193 (204)
OHSK 80/90/100/110	188	640187 (163)	640192 (167)
OHSK120/130	181	640188 (167)	640191 (148)
HM80/90 Prior to DOM 7245	162	640190 (148)	640203 (149)
HM100 Prior to DOM 7199	162	640190 (148)	640203 (149)

EMISSION INFORMATIONAL BULLETIN 504

UNITED STATES ONLY

Date Issued: July, 1999

Engine Models Concerned: LEV 80-333001A, 333002A, 333004A, 333006A.
D.O.M. (s) Affected: 9095 thru 9145

Subject: Emissions Control System

Tecumseh Products Company, in cooperation with California Air Resource Board (CARB) and US Environmental Protection Agency (EPA) needs your assistance.

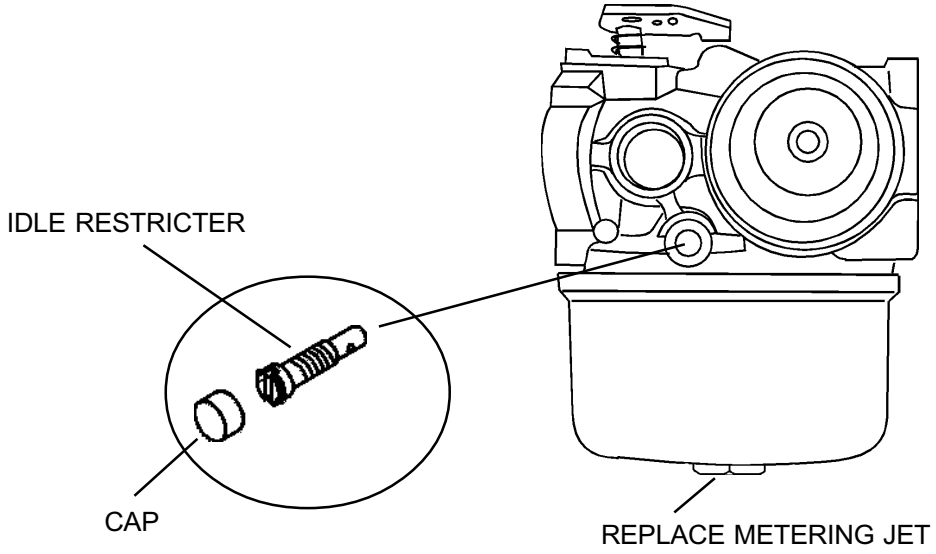
The testing of engines manufactured in compliance with these regulations has uncovered a potential emission control system problem. The area of concern (outlined below) should be inspected when equipment is received for service. A unit, **in the above DOM range** which has been repaired, will have a **Gray idle restricter cap** installed **(see Illus.)** and no additional repair is needed. If you find a **black cap** the unit will require re-work.

Should the inspection reveal the engine has not been repaired, install service kit part number 730631. This kit contains the following parts, which must all be installed to correct the problem.

CAUTION: Before performing this repair be sure to drain the fuel supply into an appropriate container.

Kit Number 730631

New Main Metering Jet #640201	New Idle Restricter #640018
New (grey color) Restricter Cap #640053	New Main Jet Gasket #27110A

To perform this repair, pierce the idle restricter cap using a sharp instrument such as an awl or ice pick, then pry the cap off and unscrew the restricter. When re-installing the idle restricter torque it to 5-8 inch lbs, then install the **New Grey** cap on the restricter. Remove the main metering jet/bowl nut and gasket and replace them with the **New** required parts.

After completion of the repair, file for warranty reimbursement, using the ESA 157 claim form.