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

CONTENTS

CHAPTER 1 GENERAL INFORMATION

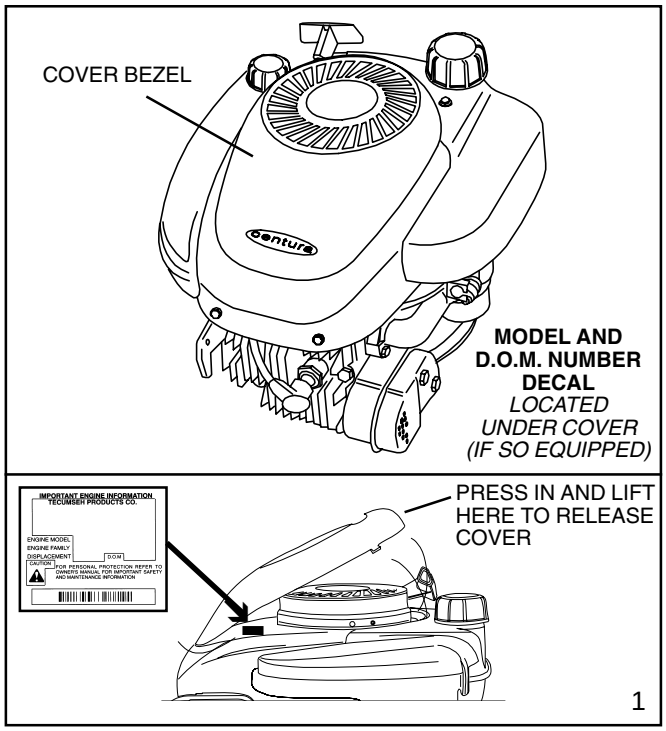
ENGINE IDENTIFICATION

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).

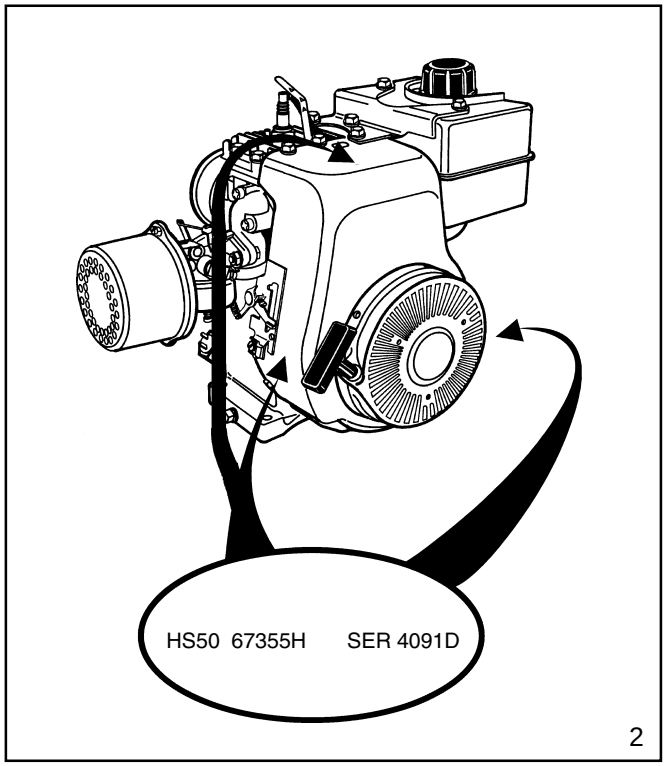


1

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

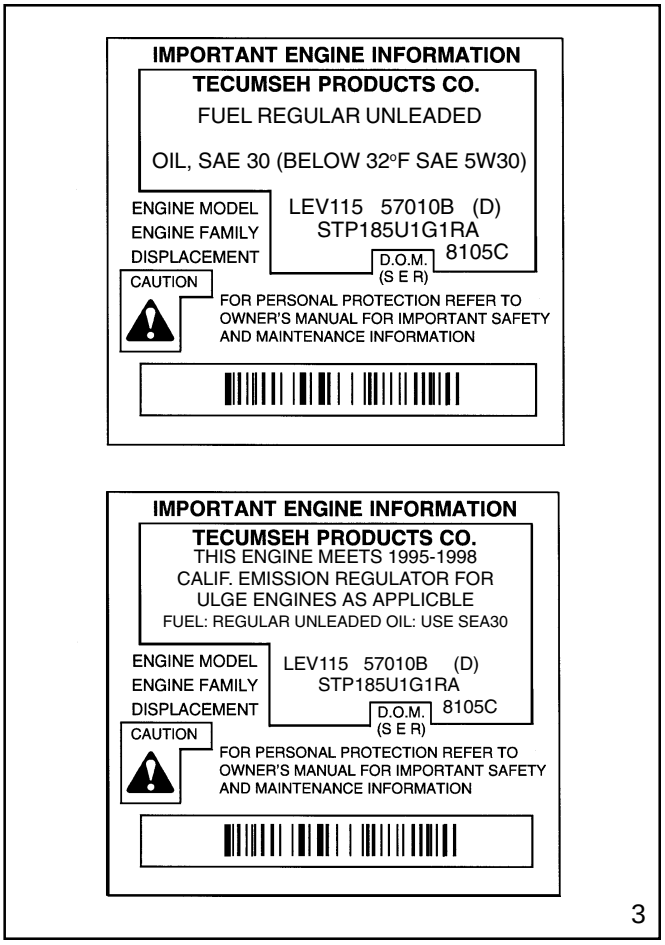
8105C is the serial number or D.O.M. (Date of Manufacture)

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

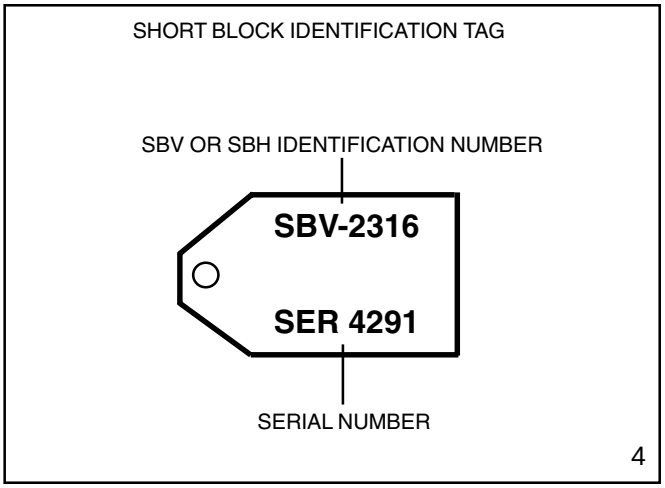


3

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.

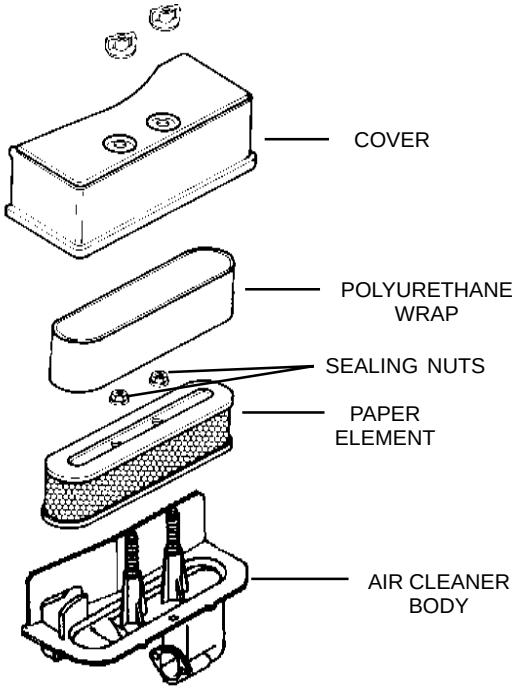
COMPONENTS (diag 1 & 2)

The **cover** holds the filter element and prevents large debris from entering the filter element.

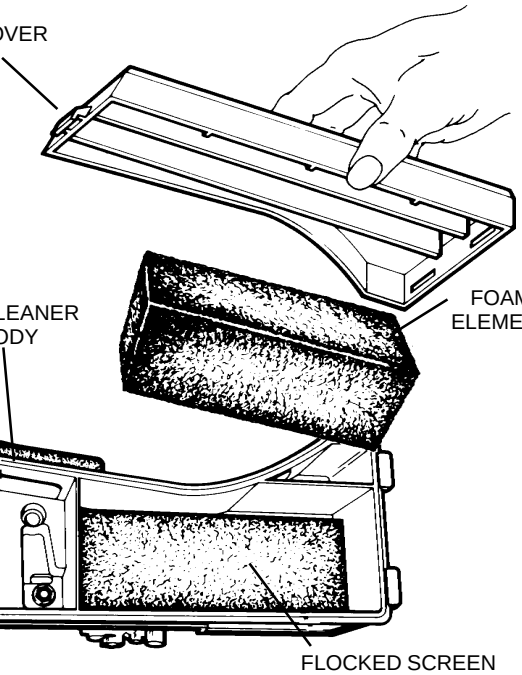
The **polyurethane wrap pre-filter** is used on XL or XL/C engine models with paper filter elements.

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.



1



2

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

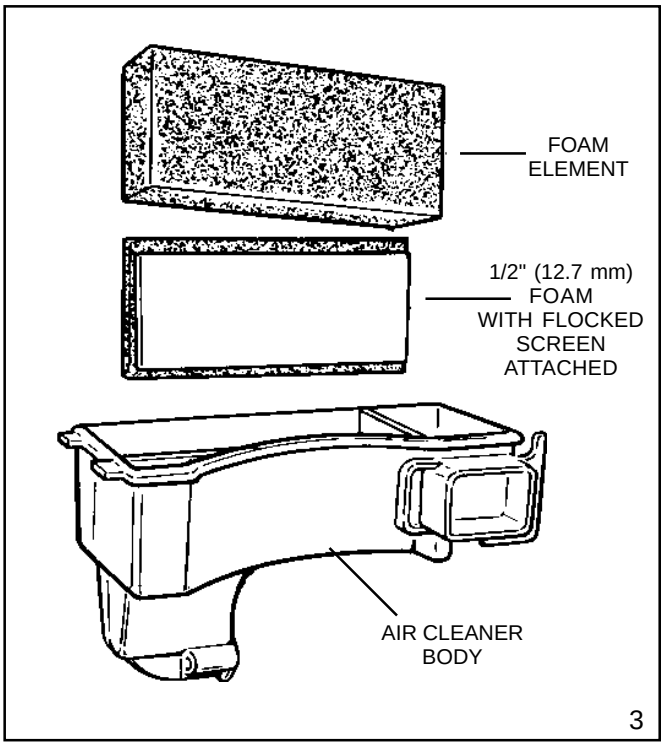
Service on the polyurethane element (cleaning and oiling) is recommended every three months or every twenty five operating hours, whichever comes first. Extremely dirty or dusty conditions may require daily cleanings.

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.



3

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

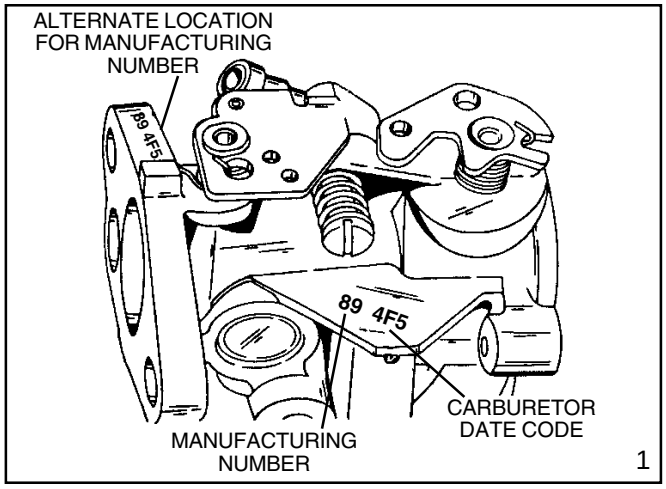
Tecumseh uses two basic types of carburetors, float and diaphragm type carburetors. Float type carburetors use a hollow float to maintain the operating level of fuel in the carburetor. Diaphragm type carburetors use a rubber-like diaphragm. One side is exposed to intake manifold pressure and the other 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.



1

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.

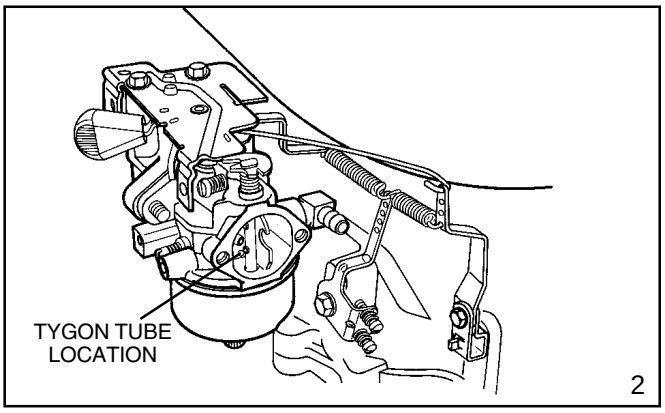
NOTE: Dual system carburetors do not have an idle circuit.

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.

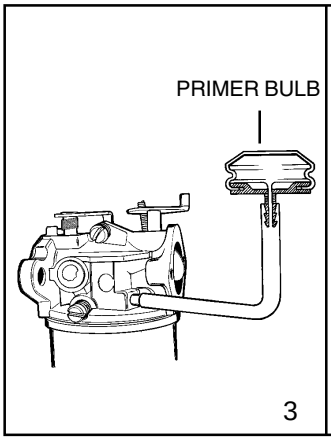


2

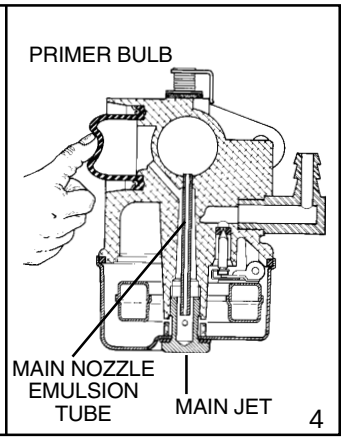
FUEL PRIMERS

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.



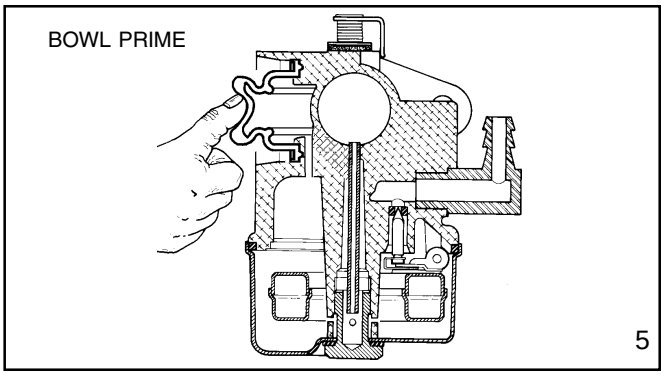
3



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.

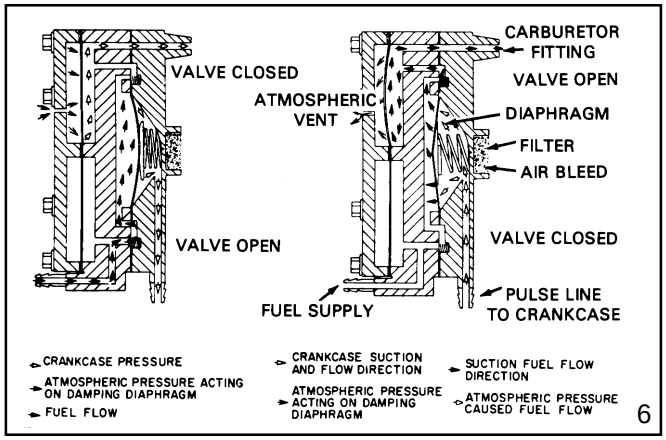


5

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.

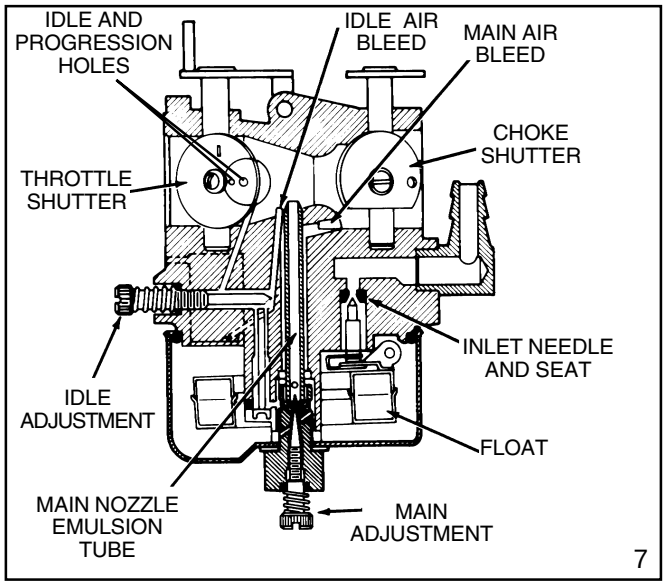
Impulse fuel pumps are operated by crankcase impulses created by the up and down movement of the piston. A hose called a pulse line connects the fuel pump diaphragm chamber to the crankcase and transmits these impulses to the pump diaphragm. The impulses actuate the diaphragm and flap valves to lift 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.



7

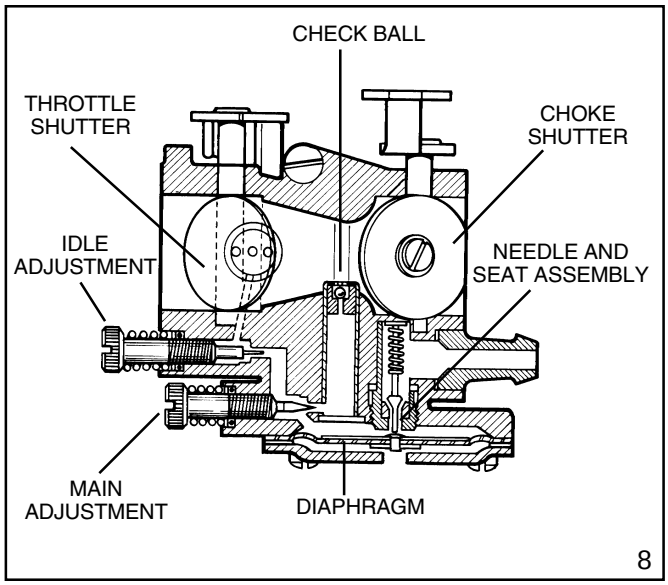
DIAPHRAGM (PRESSURE DIFFERENTIAL) CARBURETORS

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.

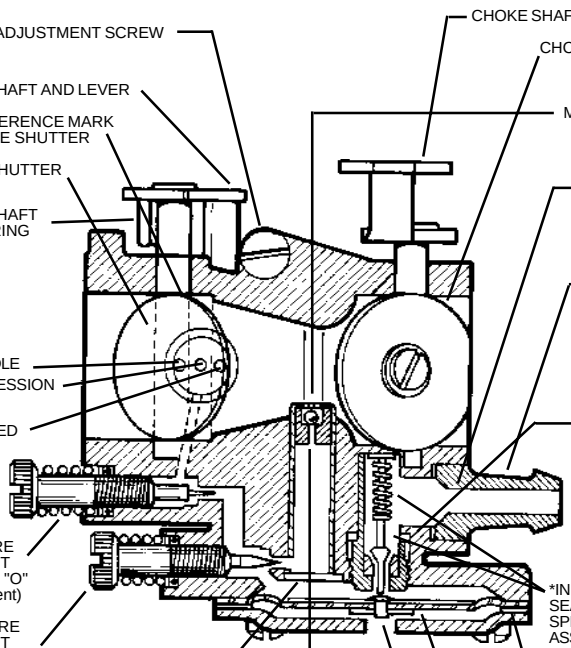
The main nozzle contains a ball check valve. The main purpose of this ball check is to eliminate air being drawn down the main nozzle during idle speeds and leaning the idle mixture.

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.



8

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

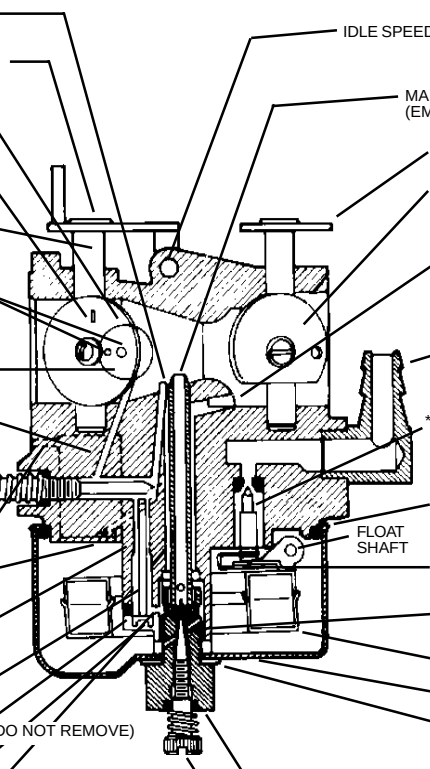
Gasket and diaphragm sequence may be reversed on some models. Head of rivet must touch inlet needle. Rivet is hooked into inlet needle control lever on some models.

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

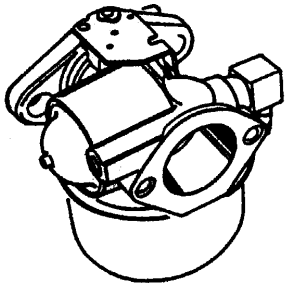
10

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).

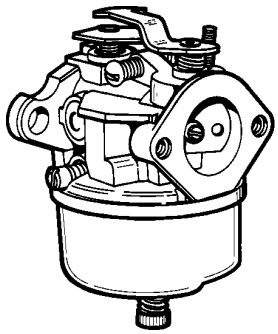


11

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).

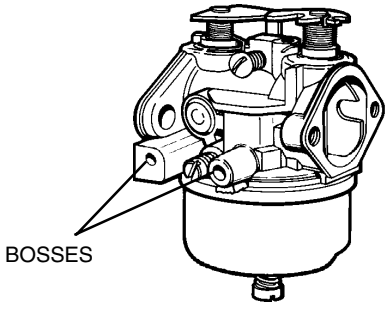
NOTE: Emissionized carburetors will have a fixed jet.



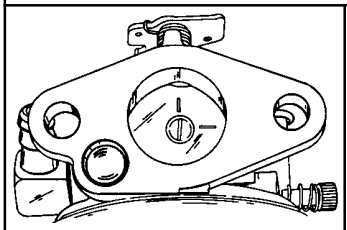
12

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)

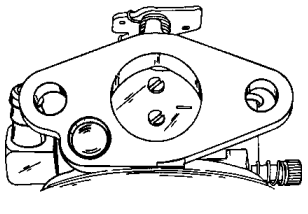


13



SERIES 3

14



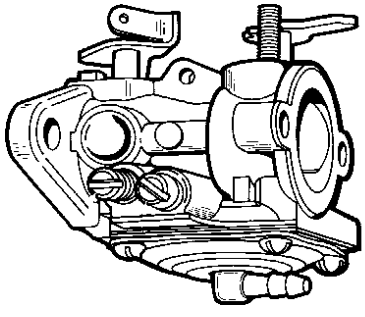
SERIES 4

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).

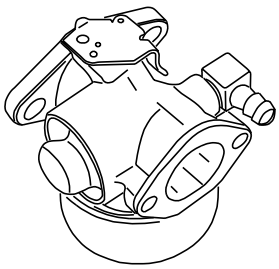
NOTE: Emissionized carburetors will have a fixed jet.



16

SERIES 6 CARBURETORS 4-CYCLE

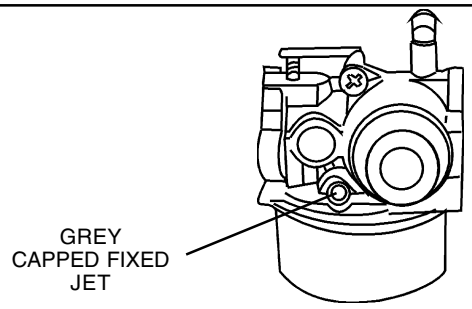
Series 6 carburetors are used on 2 and 4-cycle engines. They have a larger venturi than the dual system carburetor and use a simple fixed idle system. Series 6 carburetors used on both vertical and horizontal applications are nonadjustable. The 4 cycle version pictured has a stepped primer bulb. (diag. 17).



17

SERIES 8

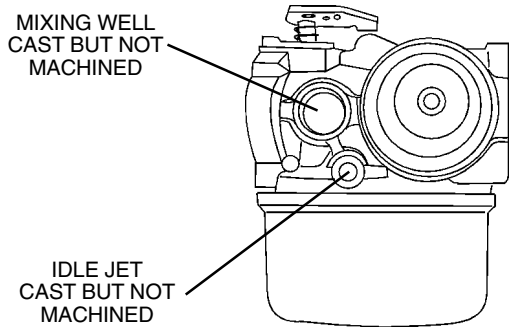
The Series 8 carburetor has both a fixed main and idle circuit. The fixed idle system uses a restricted jet that meters the fuel. The idle restrictor jet will be capped to prevent access unless removed. The fixed main jet is part of the bowl nut. A ball plug is visible from the bottom, which seals the 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

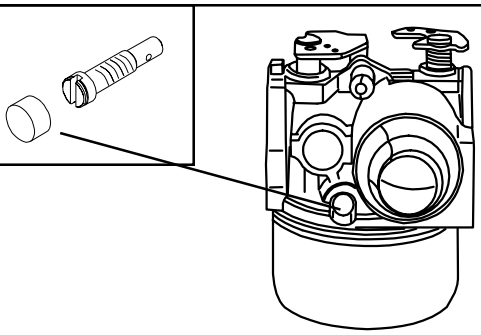
The Series 9 carburetor uses the same body as the Series 8 but has a simple fixed idle system, identical to the one used on the Series 6 carburetor. It has the idle discharge port located at the 7 o'clock position on the throttle end of the carburetor. Identify this carburetor by the stepped primer bulb, the presence of a non-drilled idle mixing well and a serviceable main nozzle emulsion tube. (diag. 19)



19

SERIES 10 (EMISSION)

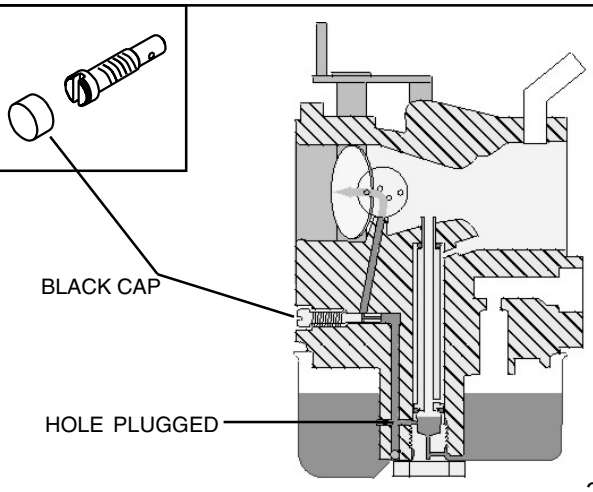
The Series 10 carburetor is identical to the Series 8 carburetor with the addition of a choke to assist in cold weather starts. It also has a fixed idle and main. The idle restrictor jet is capped to prevent access unless the cap is removed. The fixed main jet is part of the bowl nut. A ball plug is 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

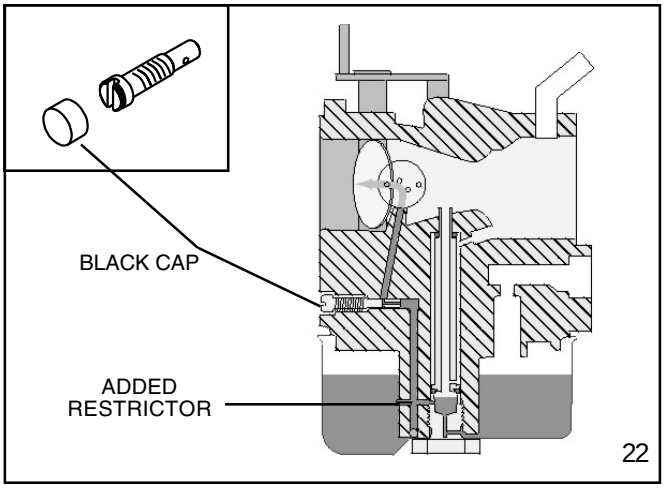
The Series 11 carburetor is used on most LEV model engines. This carburetor contains a patented auto-enrichment system for improved starting and performance of a cold engine. The system contains a fuel well that is filled as part of the priming procedure and emptied as the engine runs in the first minute. 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).

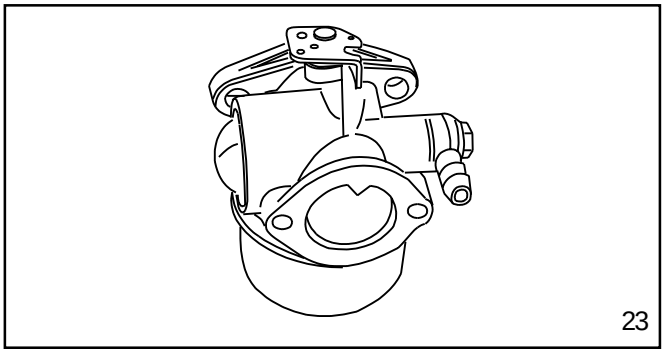


22

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.

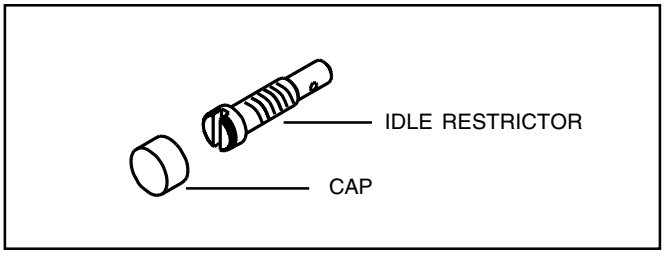
8. Replace the air filter if restricted or oil soaked. Replace the spark plug if questionable. Install the spark plug and high tension lead and retry starting the engine.
9. If the engine floods and fails to start, the carburetor may require service. See the preceding "Carburetion Troubleshooting" chart 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.

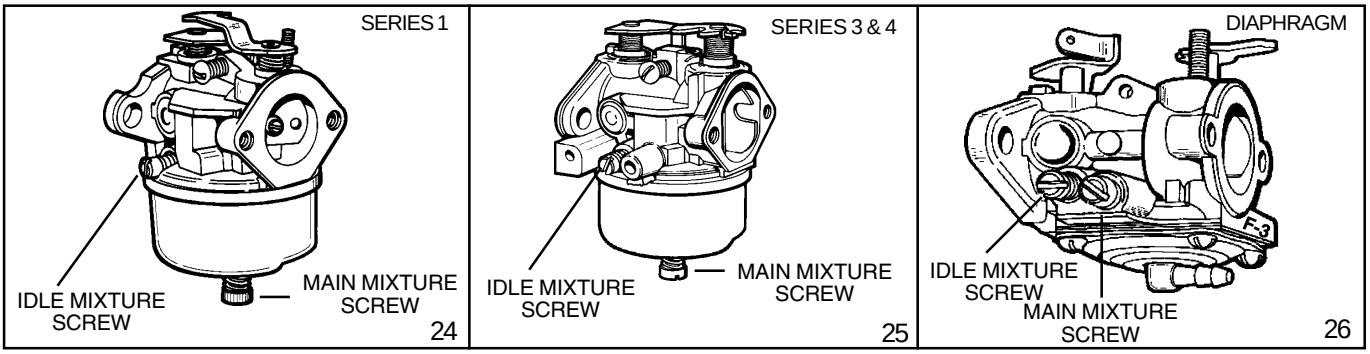
Tecumseh Carburetors		
Engine Model	Main Pre-set	Idle Pre-set
All models with float-type carburetors	1-1/2 turn	1 turn
All models with diaphragm-type carburetors	1 turn	1 turn
Walbro Carburetors		
Carburetor Model Number		
LMH	1-1/2 turn	1-1/2 turn
WHG & LME	1-1/4 turn	1-1/4 turn
LMK	Fixed	1 turn

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.

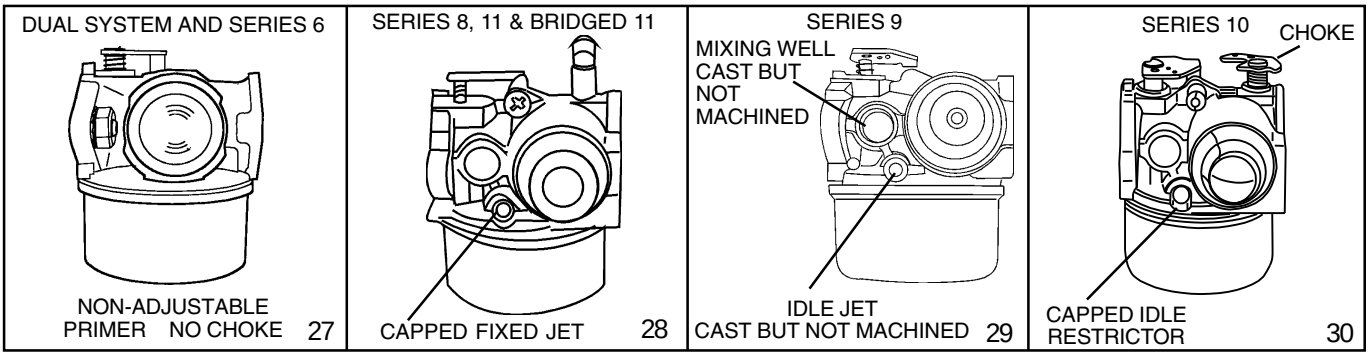
If the engine stops or hesitates while engaging the load (lean), turn the main mixture adjusting screw out (counterclockwise) 1/8 turn at a time, testing each setting with the equipment under load, until this condition is corrected.

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

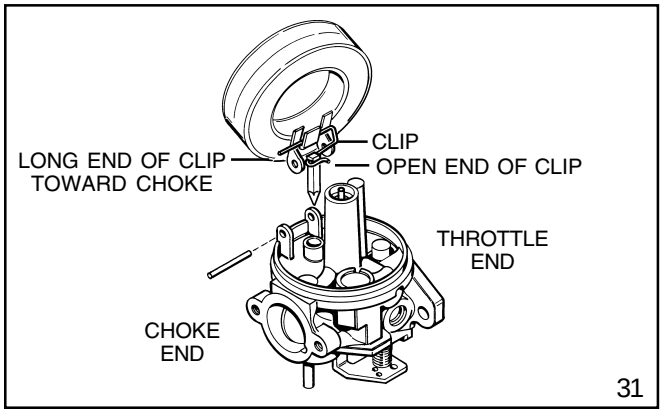


DISASSEMBLY PROCEDURE

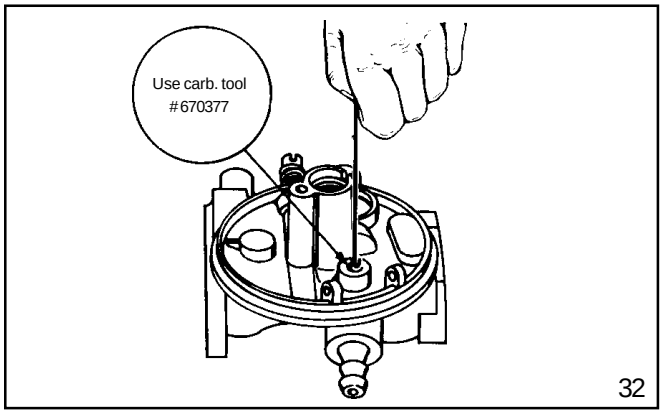
NOTE: Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from the factory settings unless specifically authorized.

FLOAT STYLE CARBURETORS

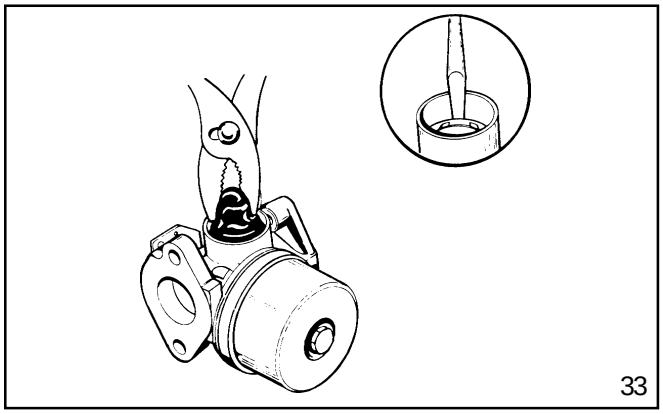
1. Note or mark the high and low mixture adjusting screws to aid in reassembly (if applicable). Remove the high speed adjusting screw, bowl nut, and float bowl. Remove the idle mixture screw assembly.
2. Note the position of the spring clip on the inlet needle and float, the long end of the clip must 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)

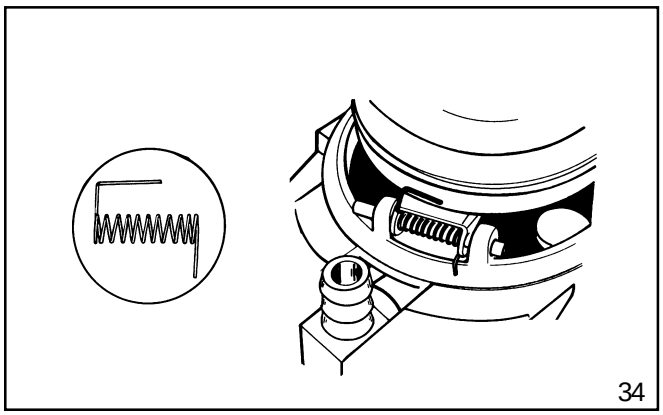


31



32


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).

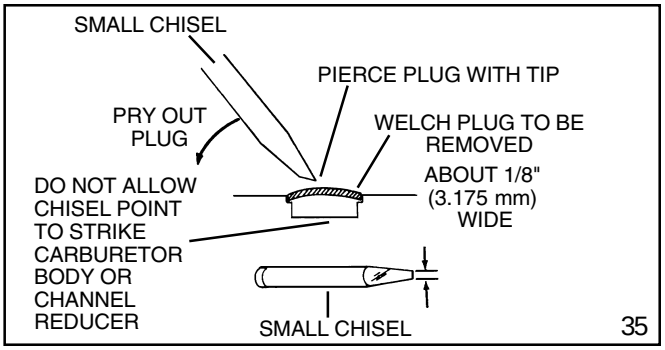
9. Note the direction of the inlet fitting. If necessary the inlet fitting can be removed. (See page 24).

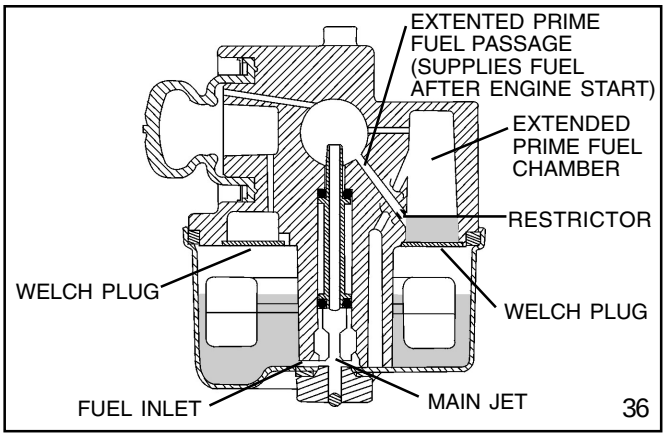
10. The main nozzle on Series 8 and Series 9 carburetors can be removed by pressing the tube outward from the venturi thru the center leg. This nozzle is non-metallic and has an "O" ring seal on the top and bottom end of the tube. Do not remove a main nozzle that is made of brass from any Tecumseh carburetor. 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)

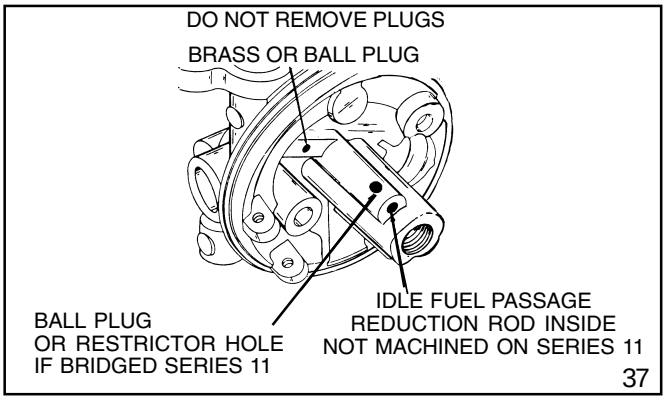
11. **Servicing the standard series eleven and bridged model.**
When servicing the series eleven DO NOT soak it in dipping type carburetor cleaners, use only spray cleaner or standard solvent tank cleaners. Proper cleaning requires removal of both welch plugs and cleaning of the restictor(s) as equipped.

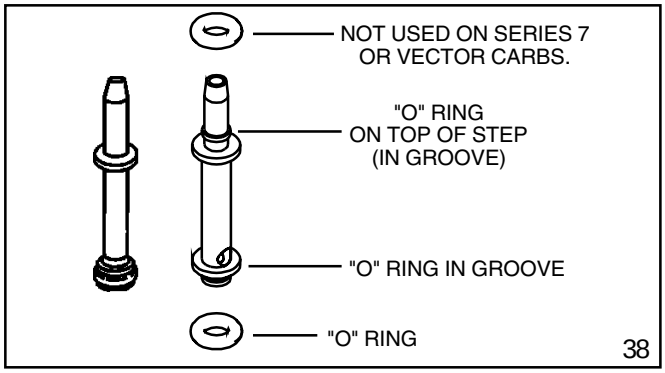
The standard series eleven has one restictor in the extended prime well as shown (diag. 36). The Bridged series eleven has an additional restrictor on the idle leg of the carburetor as shown (diag. 37). Both are cleaned using spray carburetor cleaner, compressed air and soft tag wire no larger than .012 inch (.3mm) or damage will occur.

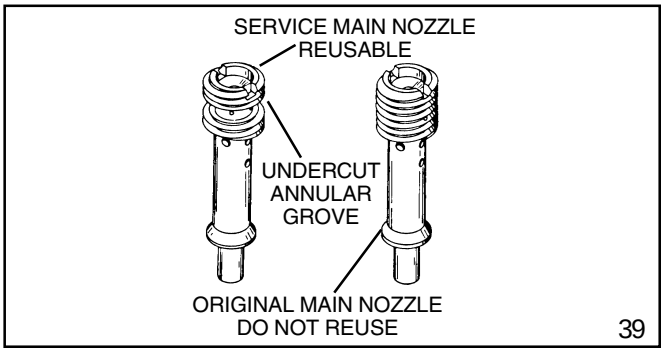
The main nozzle on some Walbro carburetors are removable for service. If you remove it, a service nozzle with the under cut fuel passage must be installed or problems will occur (diag. 39).











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.

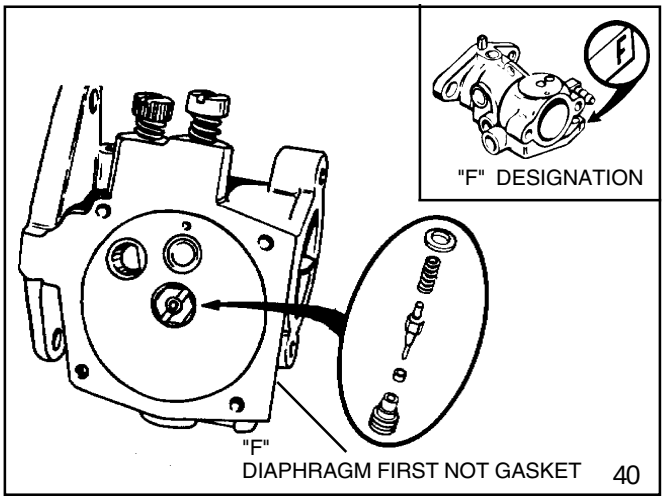
IMPULSE FUEL PUMP

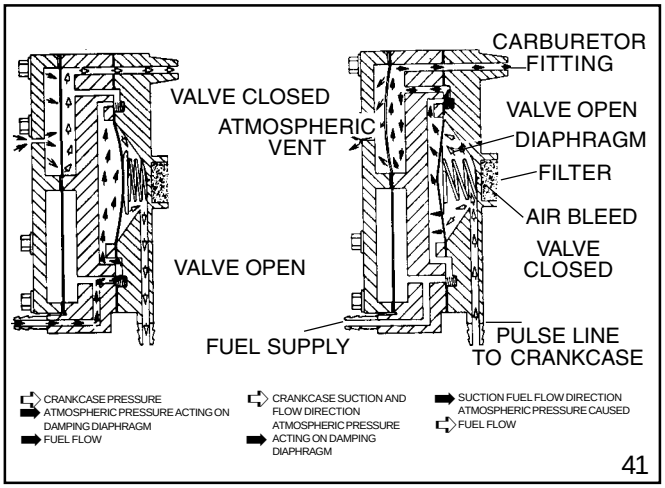
To service, disassemble the pump by removing the four (4) screws. Clean all parts with a solvent and install a new kit which consists of a coil spring, gaskets and diaphragms (diag. 41 & 42).

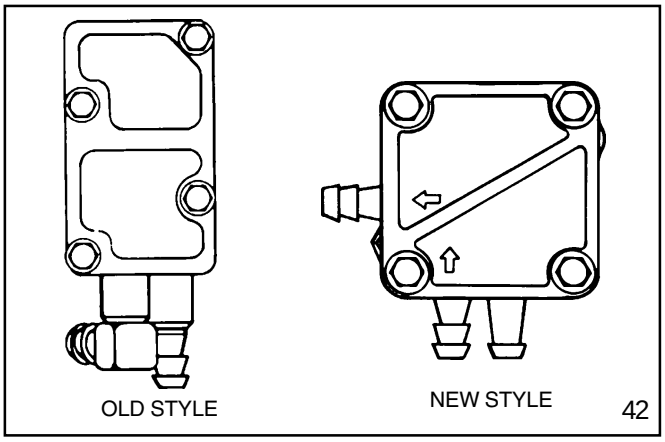
FLOAT ADJUSTING PROCEDURE

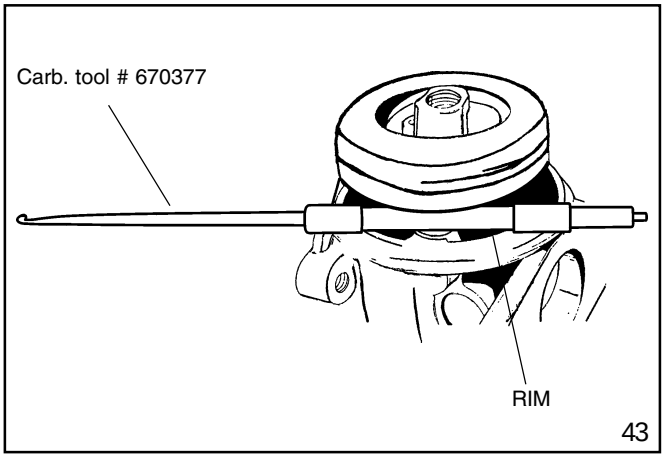
All Tecumseh carburetors with an adjustable float require a specific float height adjustment to achieve proper operation and easy engine starts. To check the float height, hold the carburetor in an upside down position. Remove the bowl nut, float bowl, and "O" ring. Place the Tecumseh carburetor tool #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.

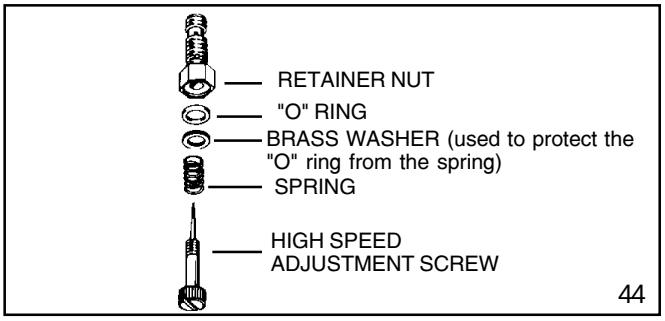
NOTE: The nylon check balls used in some diaphragm carburetors are not serviceable. Nylon can be damaged if subjected to harsh cleaners for prolonged periods.

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.

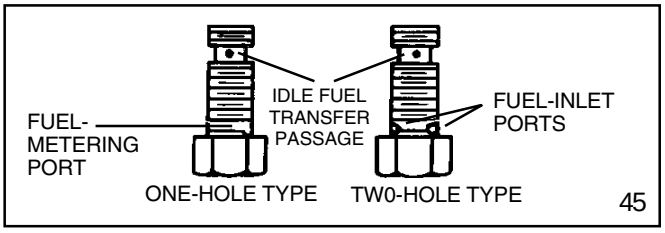
Idle and High Speed Mixture Adjusting Screw

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.

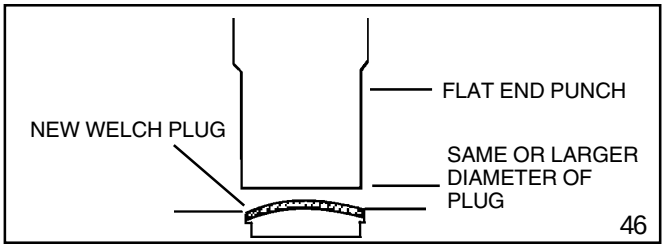
Diaphragms, Pulse Pumps, and Primer Bulbs

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

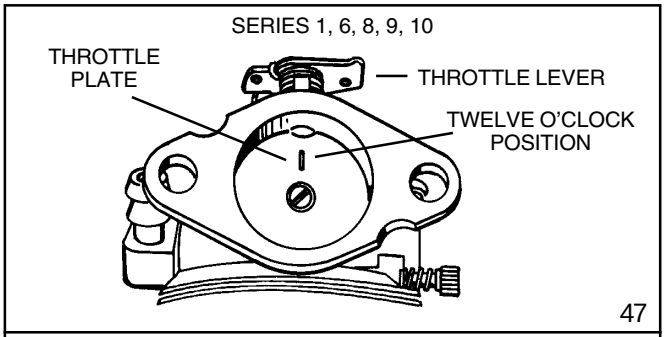
Throttle Shaft and Plate

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).

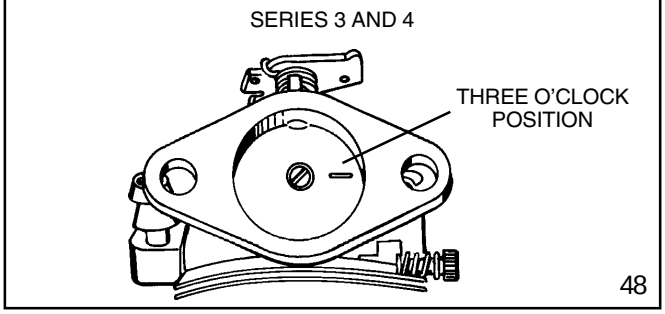
Test the operation of the throttle and return spring (if equipped). If binding occurs, correct by loosening screws and repositioning throttle plate.

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.



47



48

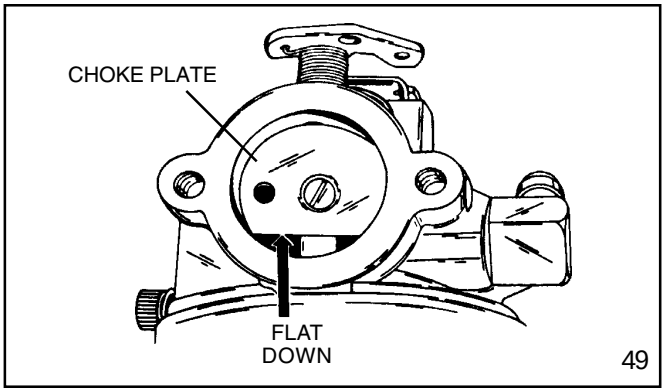
Choke Shaft and Plate

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.

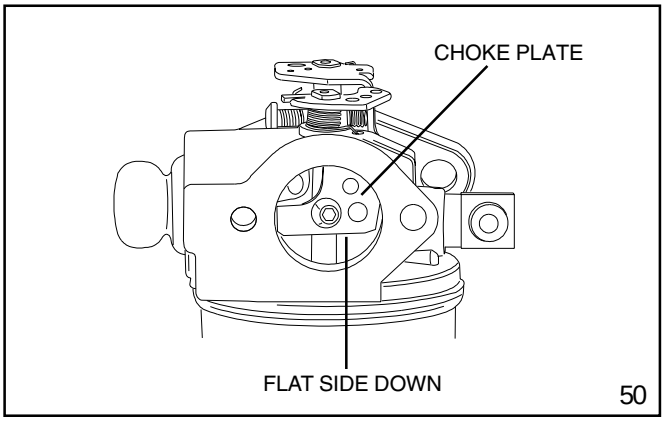
The choke shaft and plate must be in the closed position prior to tightening the screws. Hard starting may be due to insufficient choking action because of a misaligned choke plate. Correct by readjusting the choke plate to close completely. Note the cut-out position of choke shutter if applicable.



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.



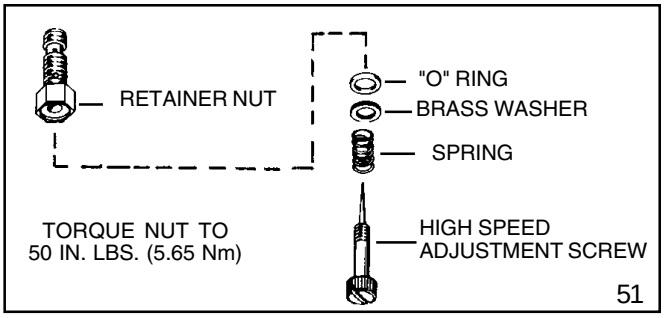
50

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.



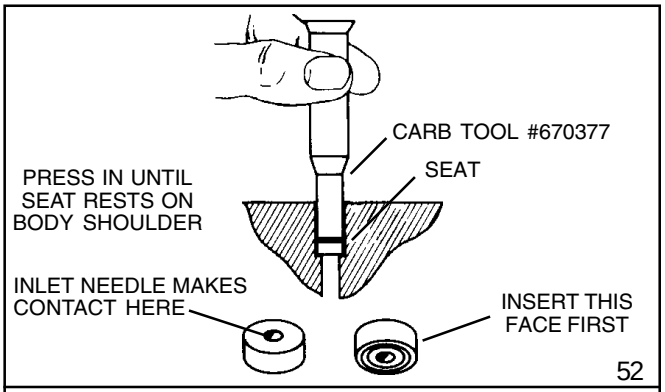
51

Inlet Needle and Seat

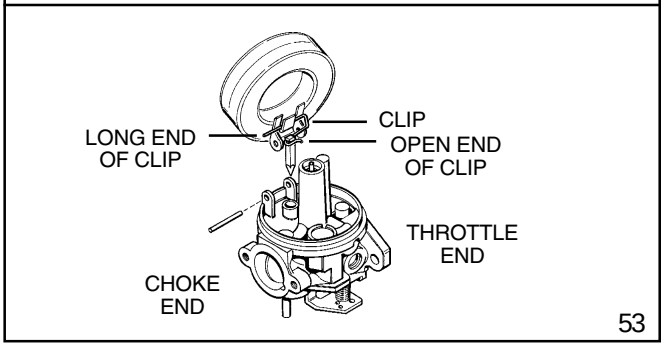
On float type carburetors, make sure the seat cavity is clean. Moisten the seat with oil and insert the seat with the grooved side down and away from the inlet needle. Press the seat into the cavity using the Tecumseh carburetor tool #670377 making sure it is firmly seated (diag. 52).

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.



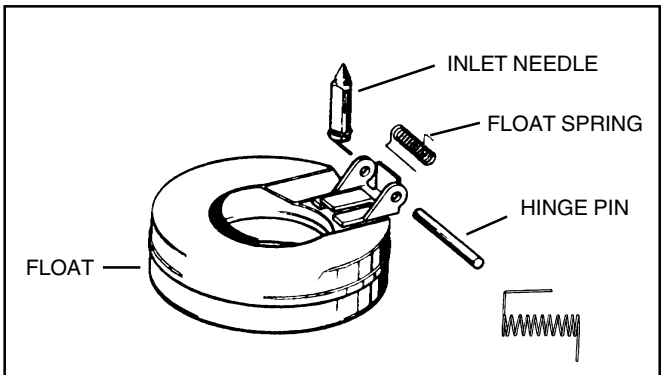
52



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.

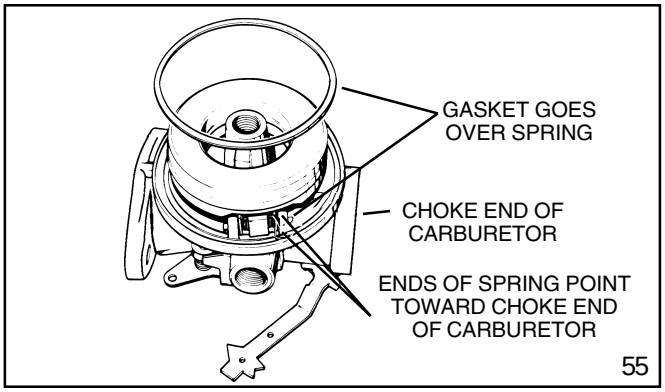
Occasionally, on engines equipped with the dual system carburetor, some rich starting conditions have occurred when the engine is warm. This condition can be corrected by inserting a non-metallic spacer in the center leg of the carburetor, as shown (part # 632158). This spacer is designed to reduce the 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

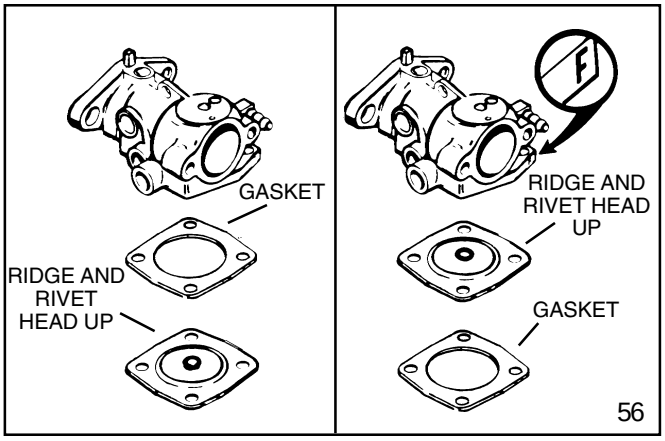
The diaphragms must be installed against the center body with the gaskets against the outside covers. The parts are designed so they cannot be misassembled without damage (diag. 58).

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.

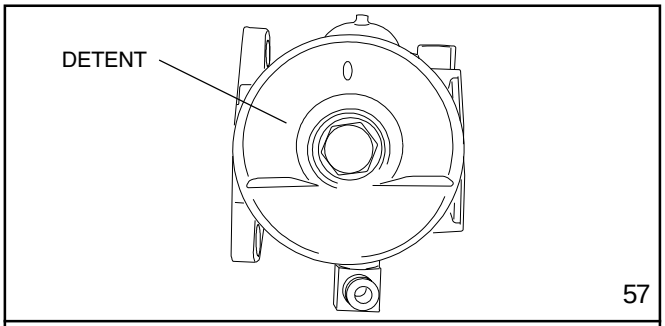
If the flow is erratic or intermittent, the pump needs repair or replacement.



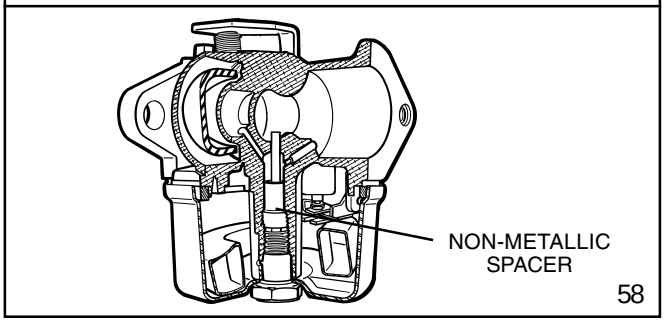
55



56



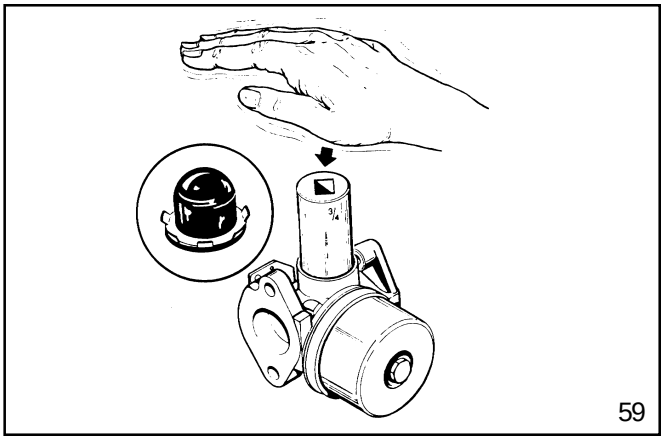
57



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

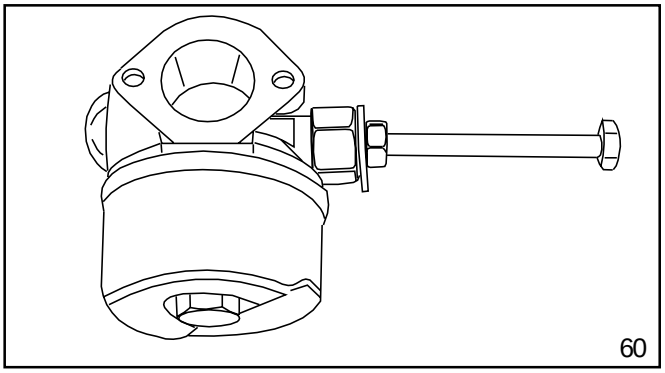
NOTE: MOST SERVICE CARBURETORS ARE MARKED “SVC CARB NF” IN THE PRICE LIST. THIS MEANS THAT THE CARBURETOR COMES WITH NO FUEL FITTING.

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.

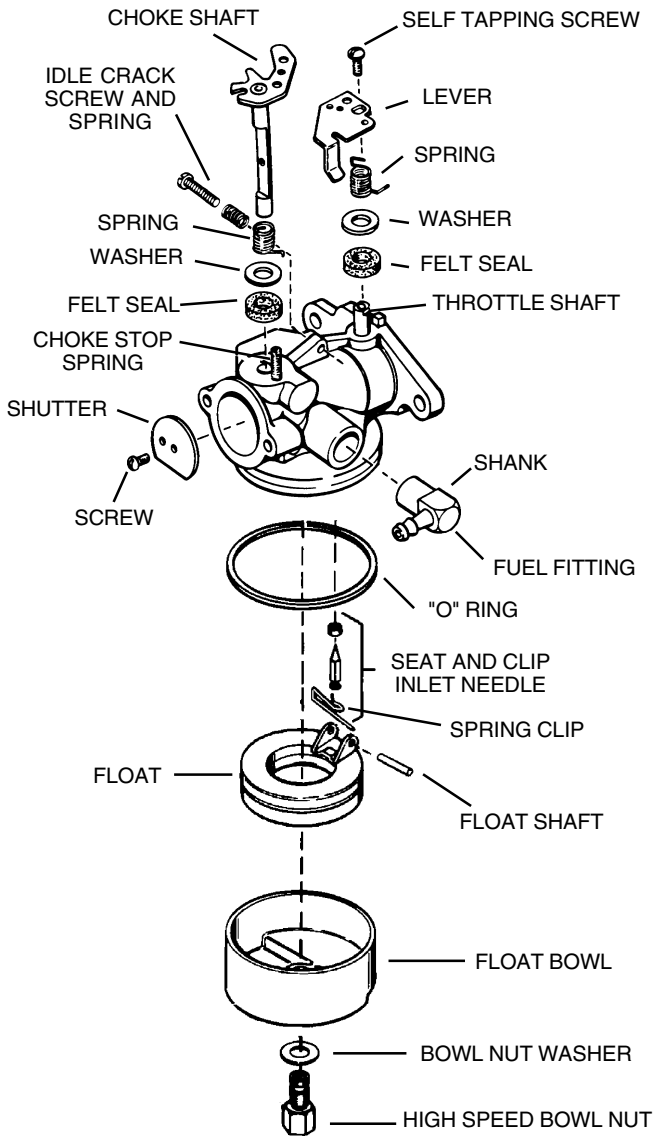
Idle Speed Adjustment Screw

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

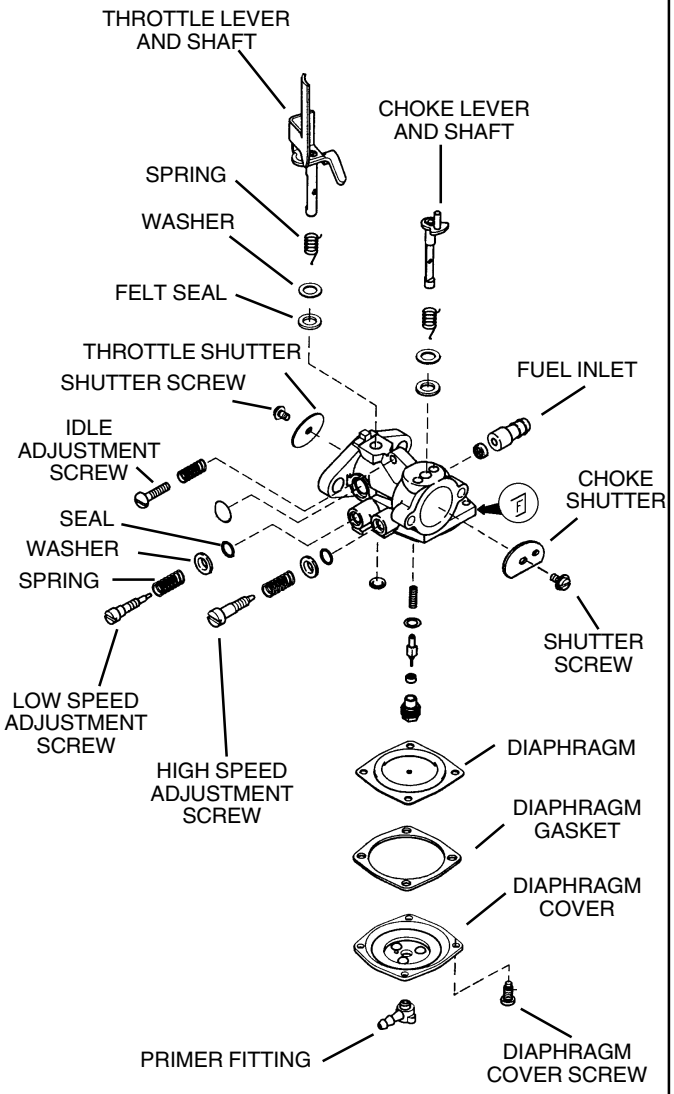
Consult the service section under “Pre-sets and Adjustments” and follow the adjustment procedures before placing the carburetor on the engine.

FLOAT TYPE CARBURETOR



61

DIAPHRAGM TYPE CARBURETOR



62

CHAPTER 4 GOVERNORS AND LINKAGE

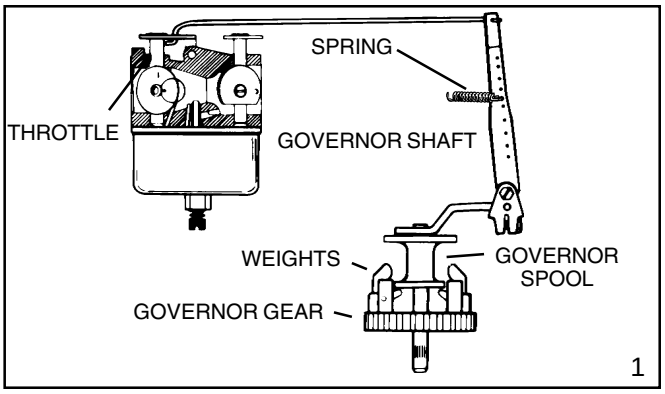
GENERAL INFORMATION

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.

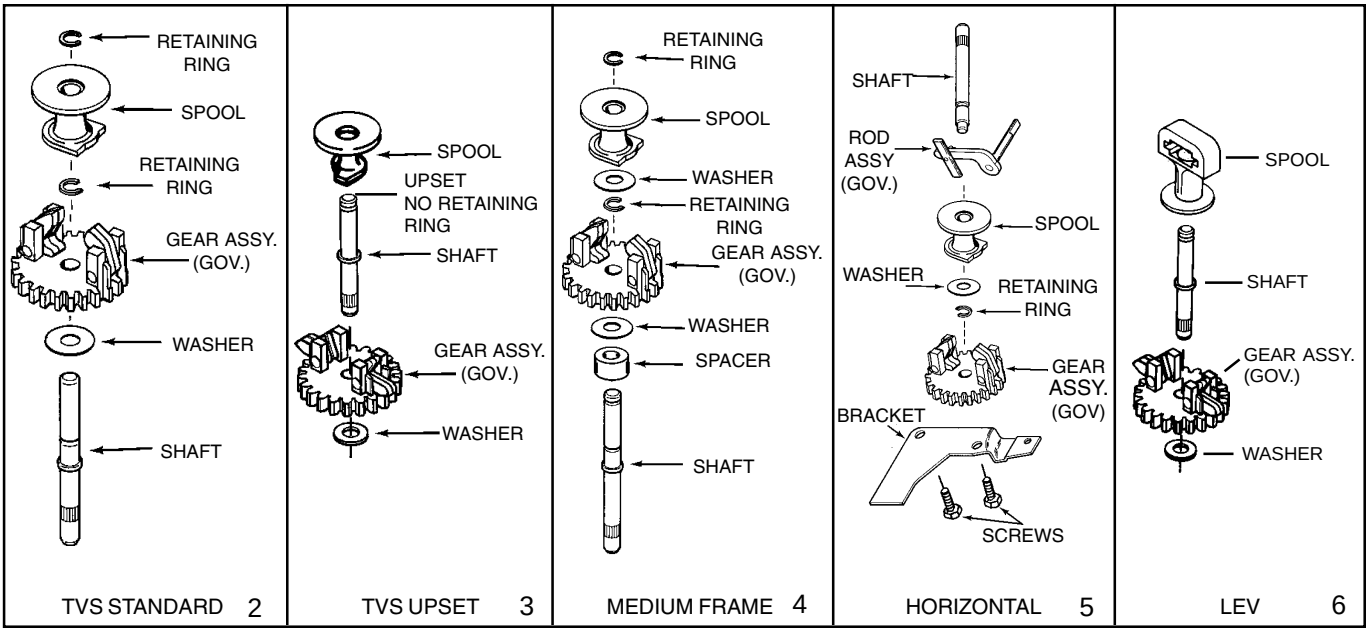
OPERATION

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.

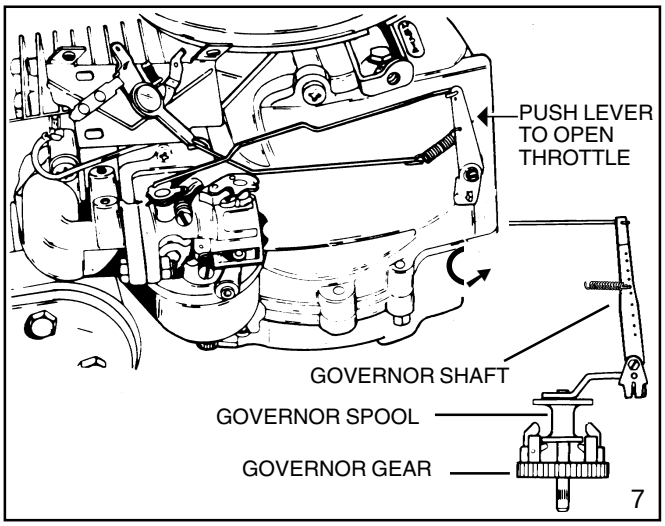
SERVICE

GOVERNOR ADJUSTMENT

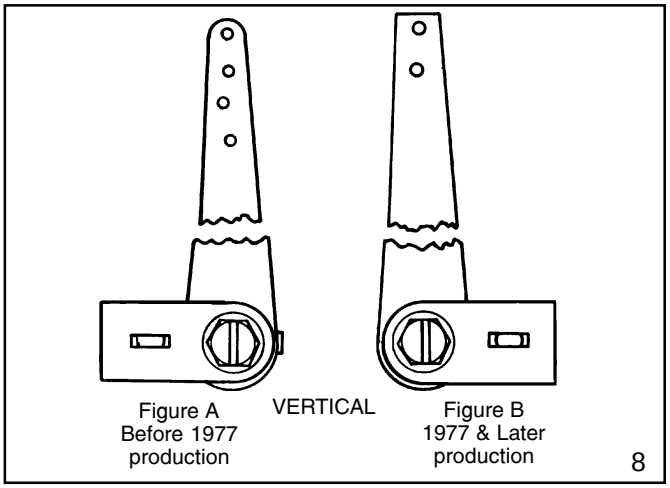
With the engine stopped, loosen the screw holding the governor clamp on the governor lever. Rotate the clamp in a direction that will force the throttle shaft open and allow the governor follower arm to rest on the governor spool. Push the governor lever connected to the throttle to the wide open throttle 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)



7



8

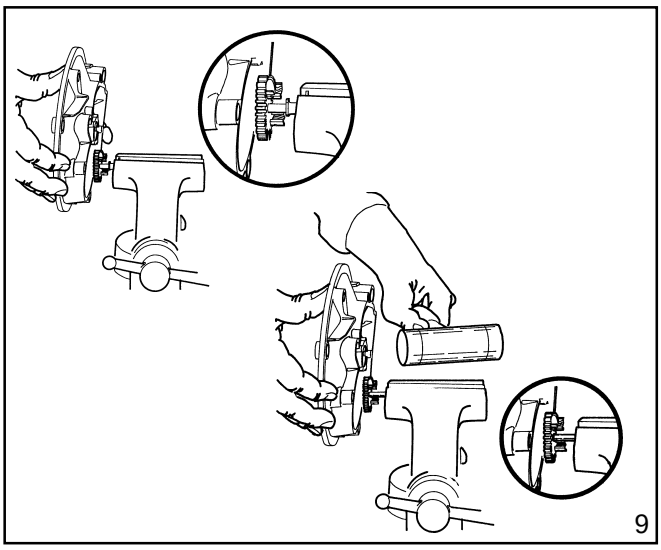
GOVERNOR GEAR AND SHAFT SERVICE

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)

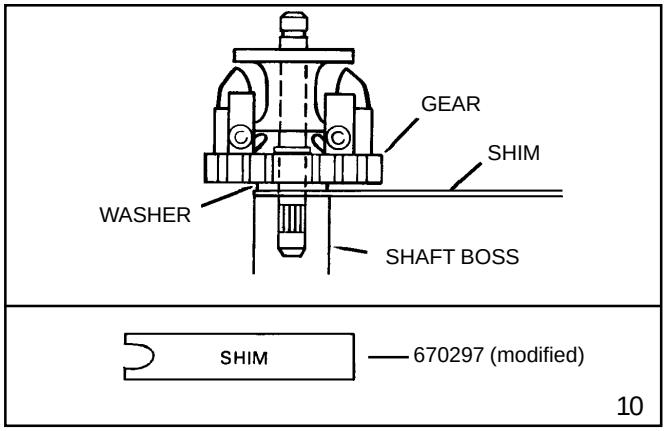

9

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

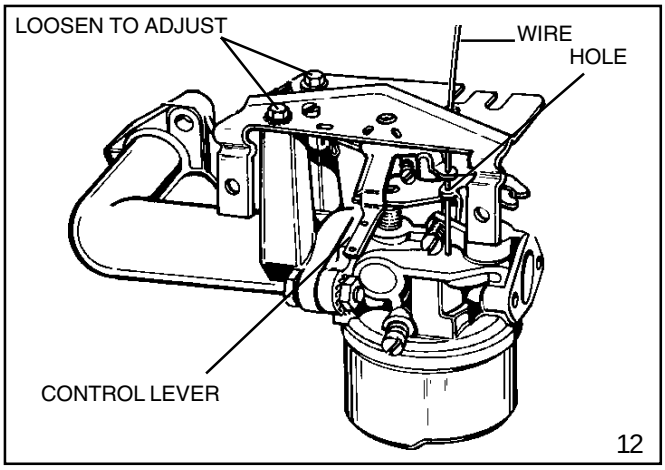
SPEED CONTROLS AND LINKAGE

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.

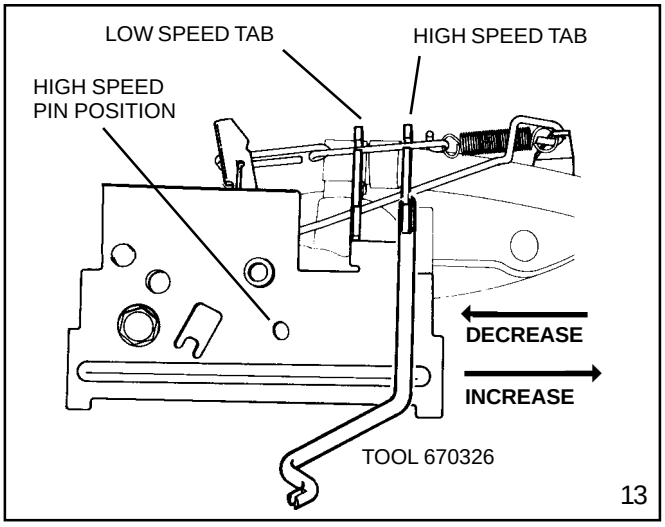


12

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.

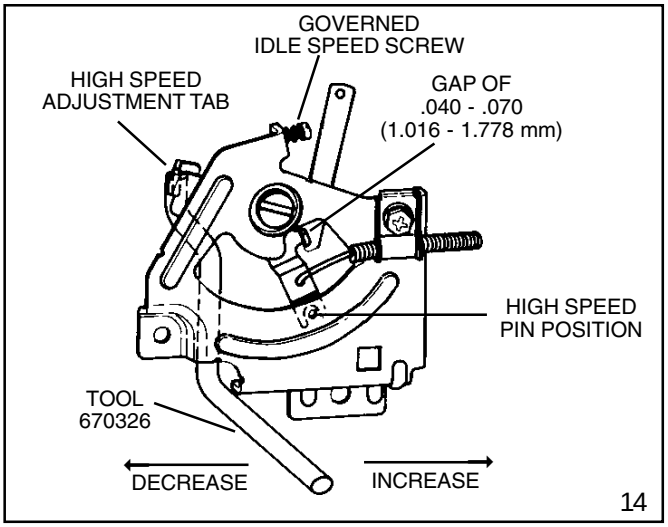
To adjust high speed, move the speed control lever to the high speed position and align the high speed pin holes. Place the adjustment tool on the high speed tab and move the tab to achieve the correct engine speed. Move the speed control lever to the low speed position, place the adjustment tool on 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.



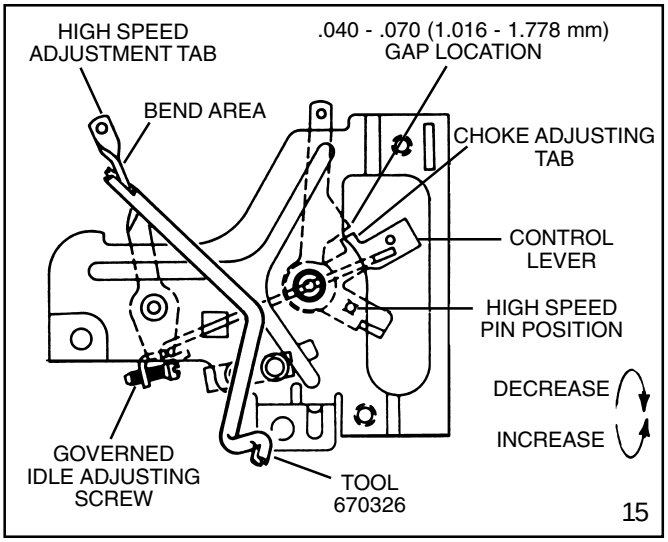
14

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.

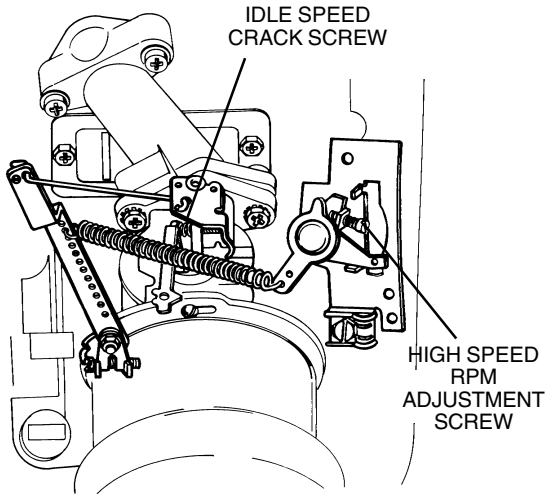


15

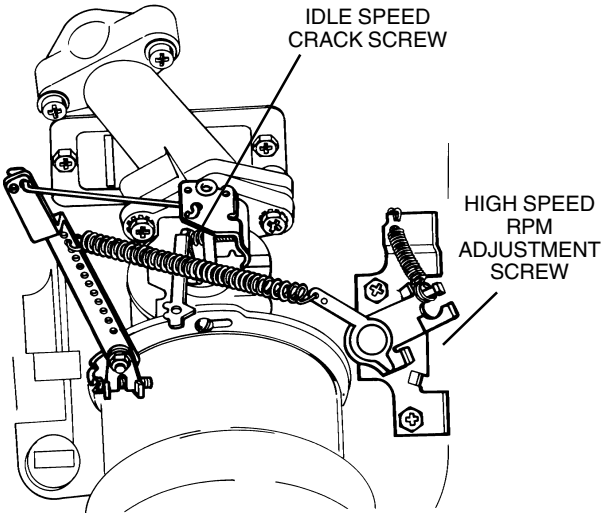
ADJUSTING RPM ON MEDIUM FRAME VERTICAL (up/down speed control)

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).

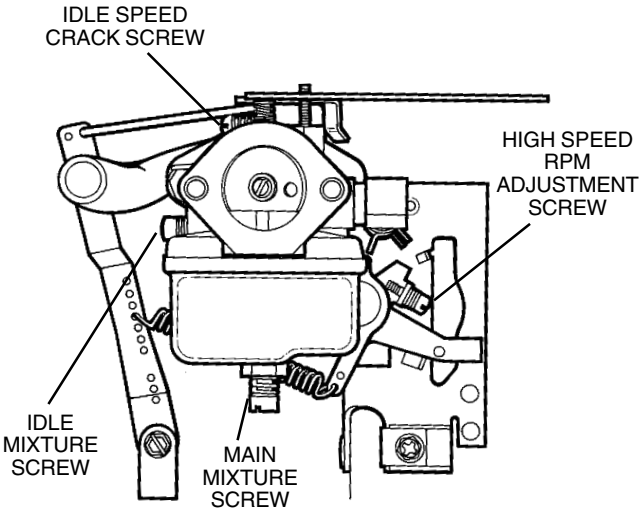
HORIZONTAL SHAFT ENGINES



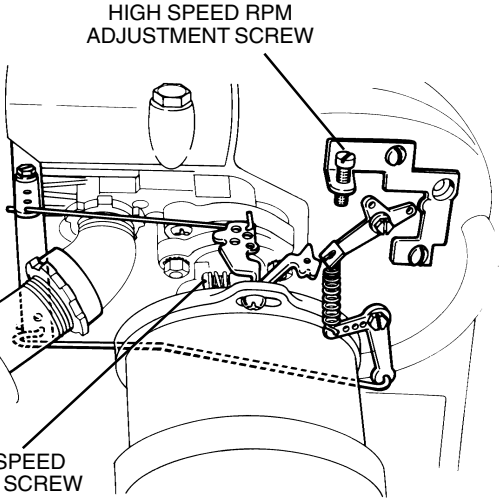
HORIZONTAL LIGHTWEIGHT 16



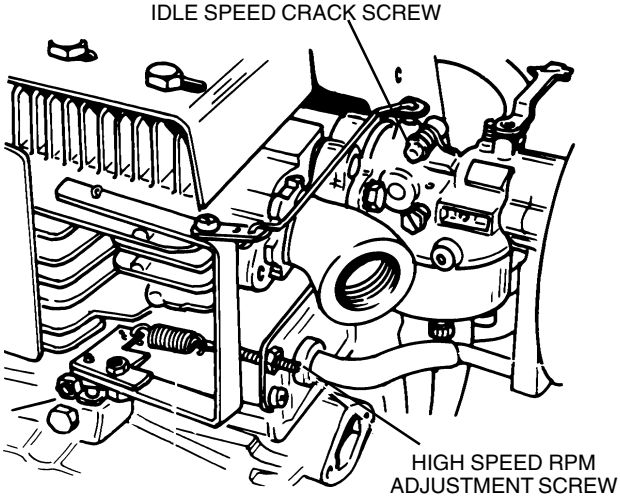
LIGHTWEIGHT R.V. TYPE 17



SMALL FRAME 18

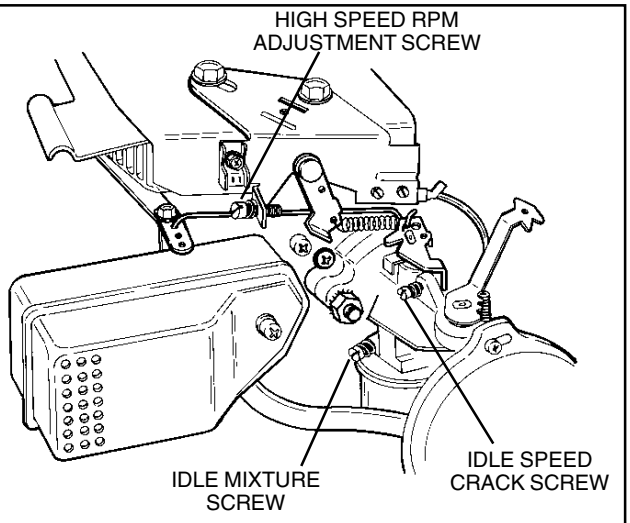


HORIZONTAL MEDIUM FRAME 19

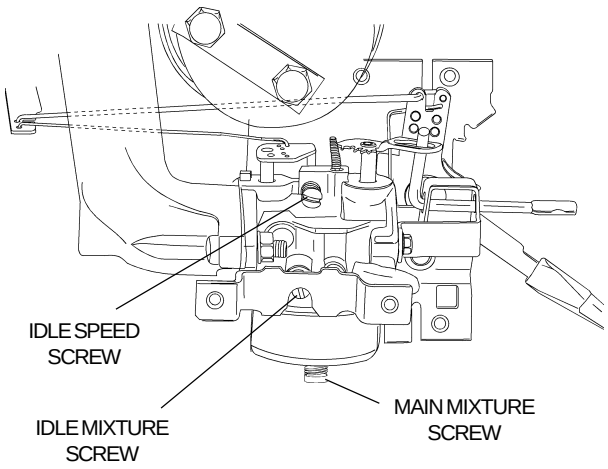


CONSTANT SPEED APPLICATIONS 20

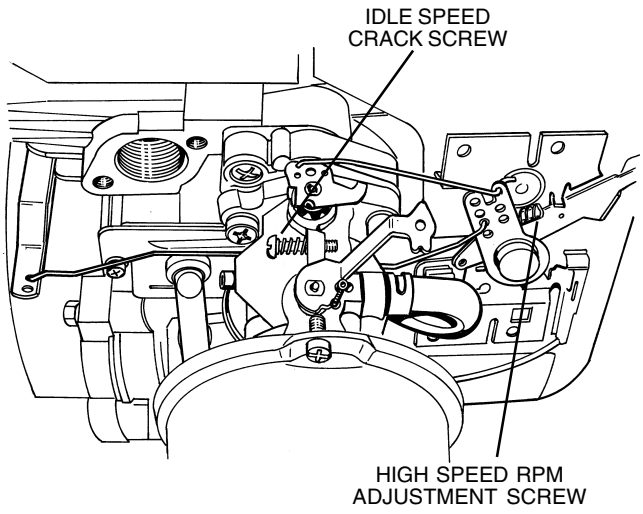
HORIZONTAL SHAFT ENGINES (CONTINUED)



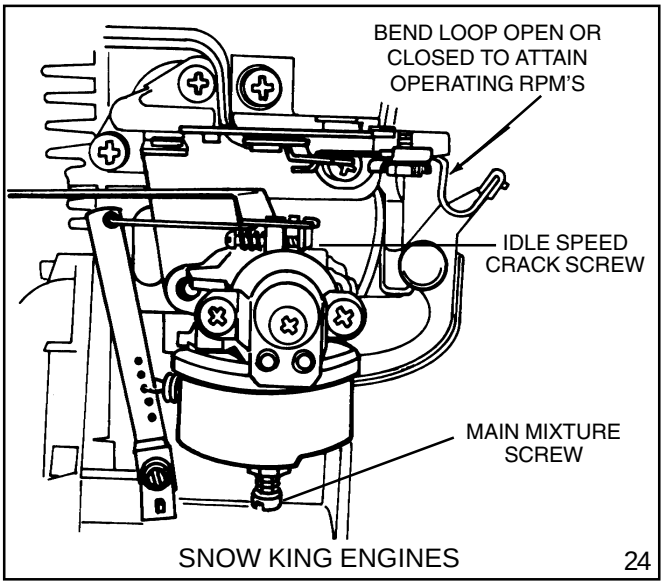
HORIZONTAL MEDIUM FRAME 21



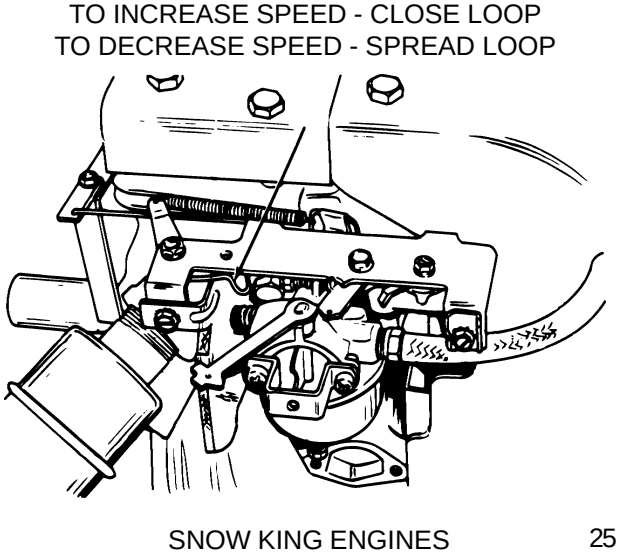
HMSK80-100 22



MEDIUM FRAME 23

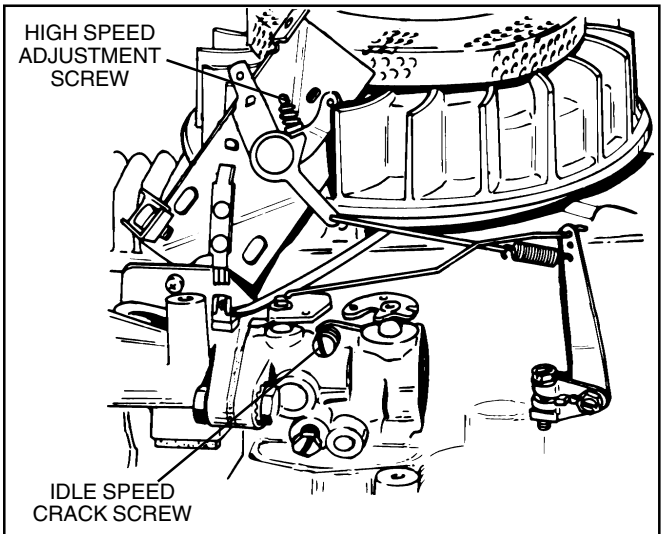


SNOW KING ENGINES 24

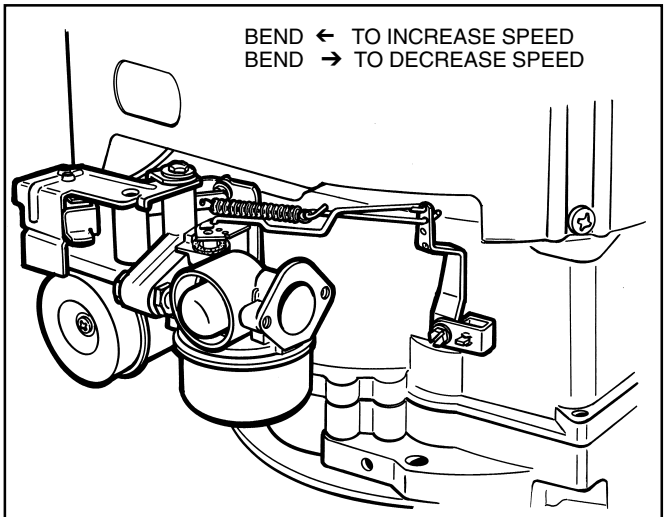


SNOW KING ENGINES 25

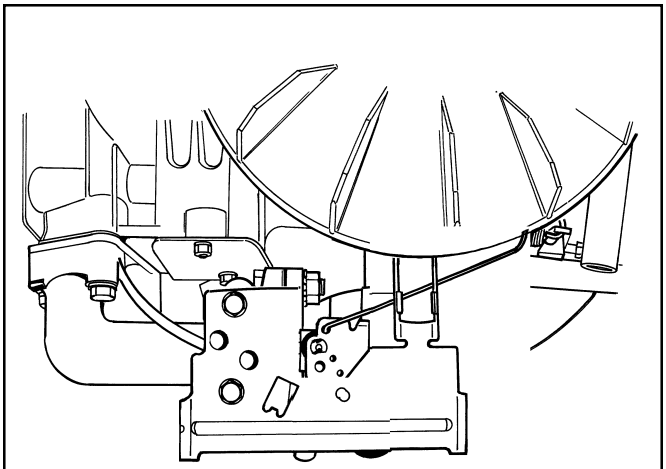
VERTICAL SHAFT ENGINES



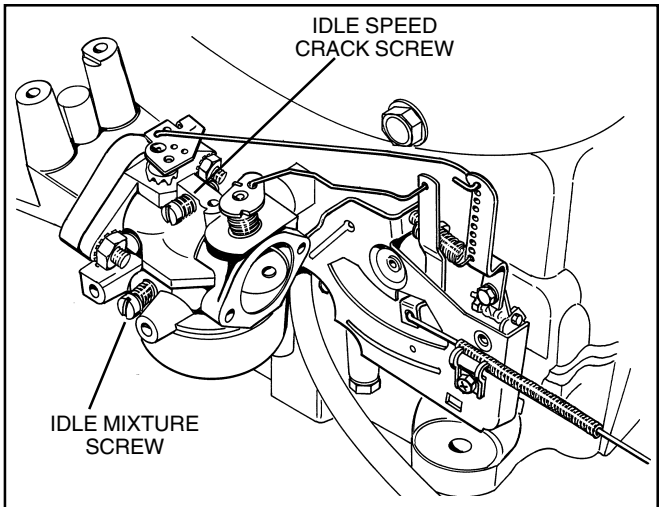
VERTICAL SHAFT ENGINES 26



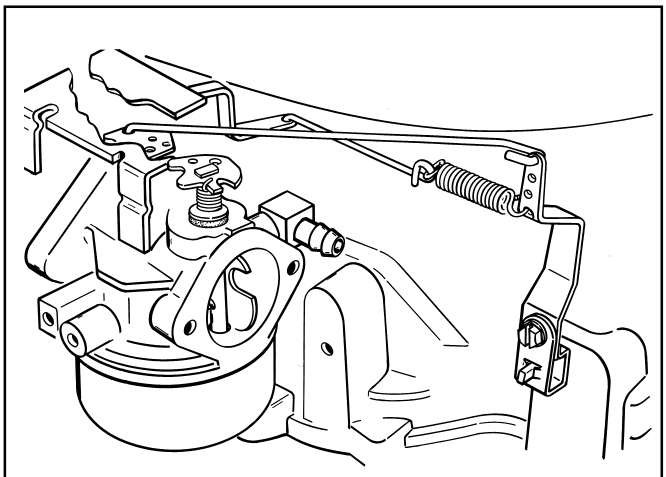
TNT 100 VERTICAL ENGINES 27



TVS 115/LEV ENGINE
SPEED CONTROL 28



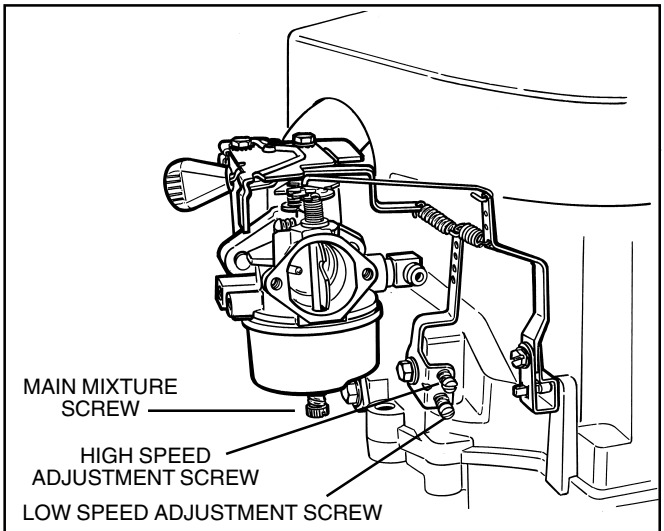
TVXL 220 WITH HORIZONTAL SPEED CONTROL
29



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

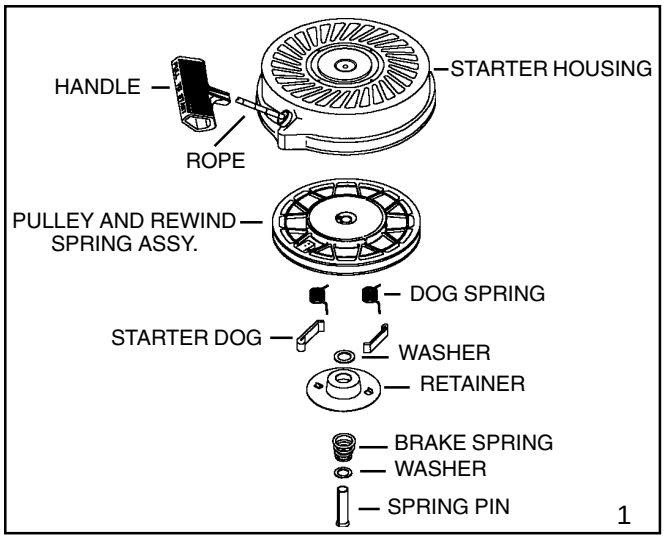
GENERAL INFORMATION

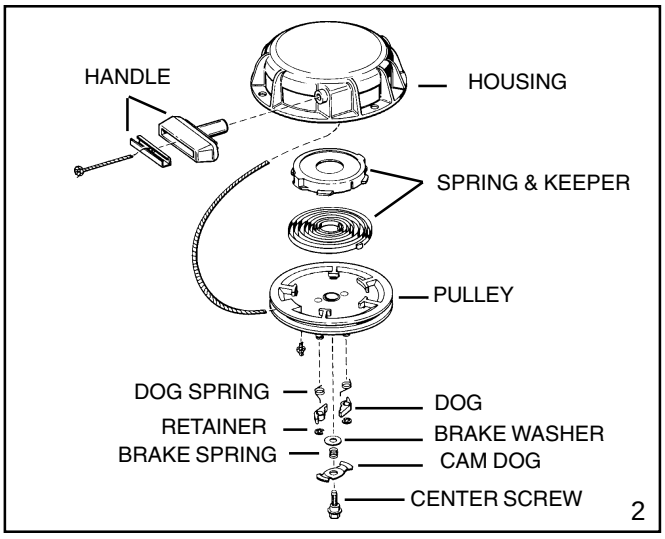
Rewind starters used on vertical shaft Tecumseh engines are top mount horizontal pull style or side mount vertical pull style. Horizontal shaft engines use side mounted starters which can be mounted to pull either vertically or horizontally. All rewind starters except the vertical pull style turn the 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.

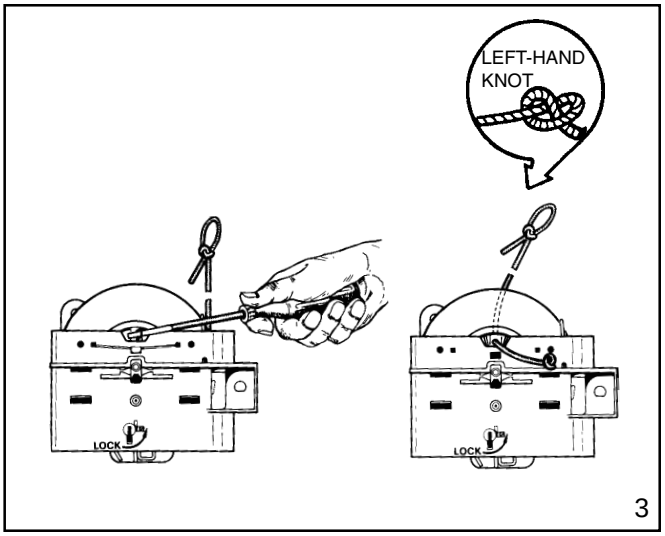
RETAINER REPLACEMENT (DIAGRAM 4)

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.

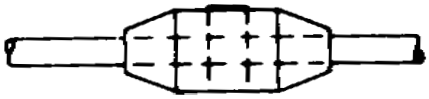
STYLIZED REWIND STARTER (TVS, HM, TVM, TVXL), AND STAMPED STEEL STARTER (HM, VM, TVM, TVXL)

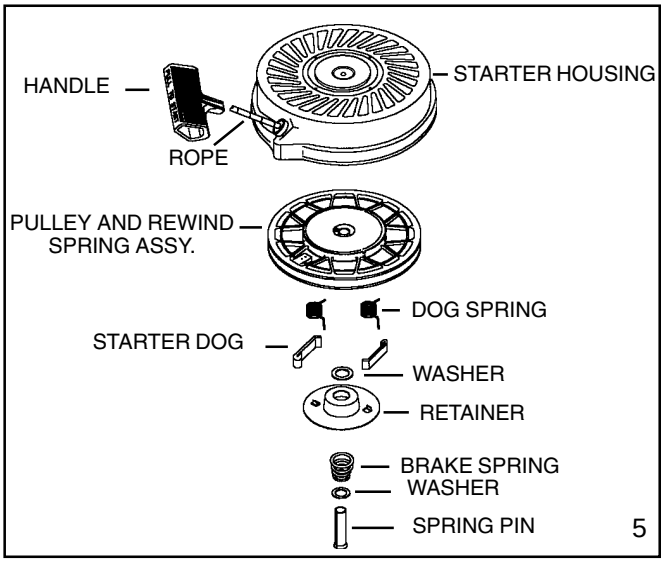
Disassembly Procedure

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.

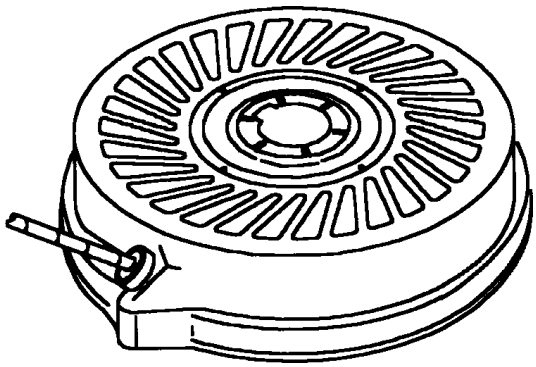


3


ONE PIECE ROPE RETAINER
4



5


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

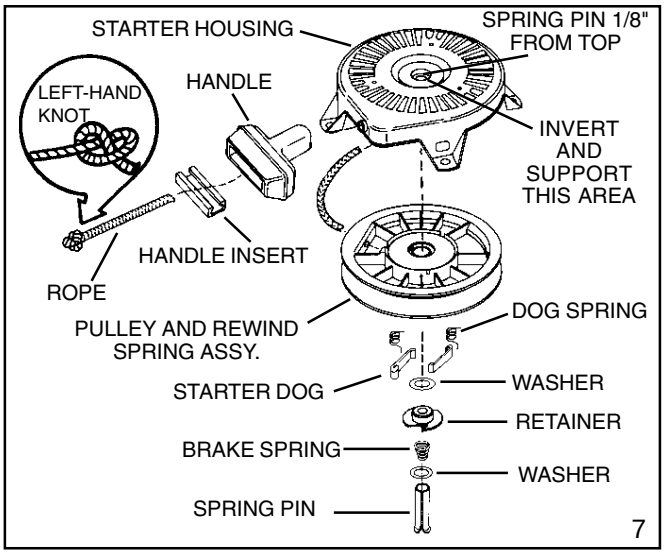
NOTE: It is critical to support the starter on a deep well socket to prevent damage.

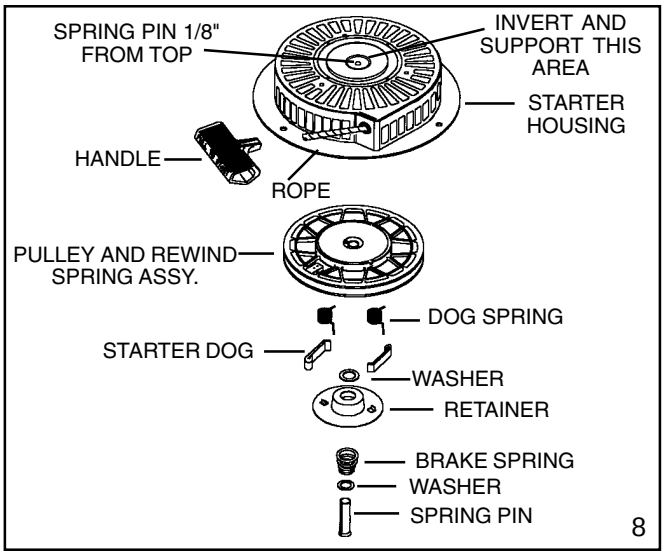
1. Reverse the disassembly procedure. The starter dogs with the dog springs must snap back to the center of the pulley (disengaged position). When the rope is pulled, the tabs on the retainer must be positioned so that they will force the starter dogs to engage the starter cup. (diag. 7 & 8)
2. Always 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.

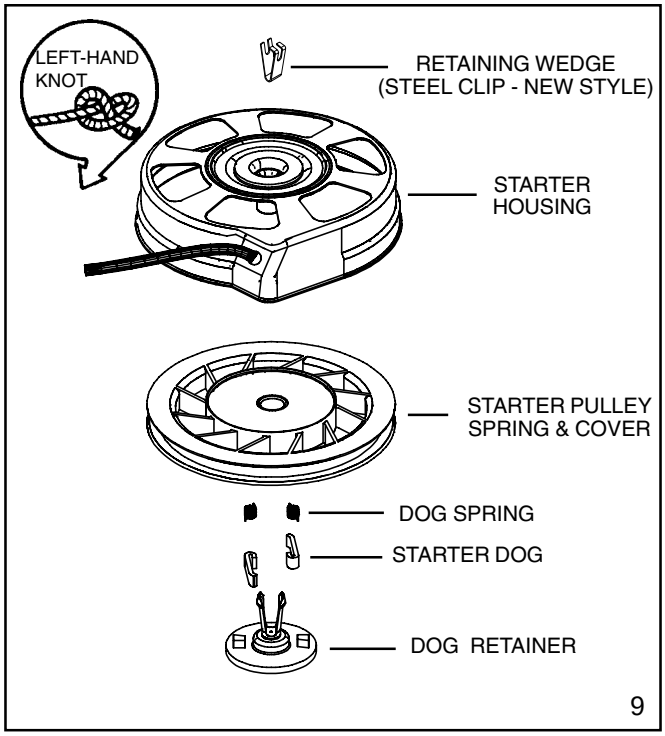
Assembly

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

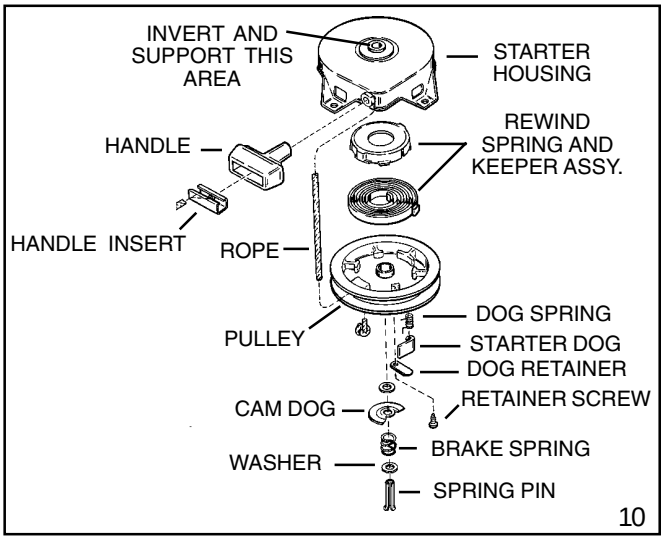
STANDARD STAMPED STEEL AND CAST ALUMINUM STARTER (HM, VM)

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.

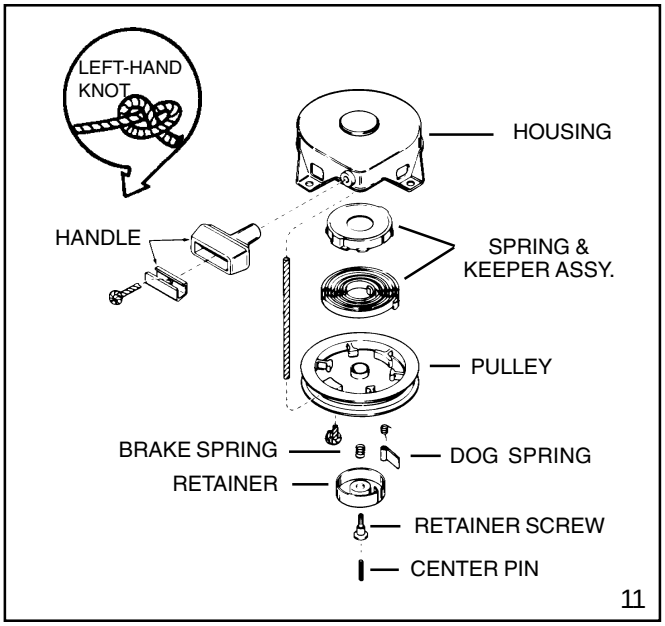
Assembly Procedure

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.

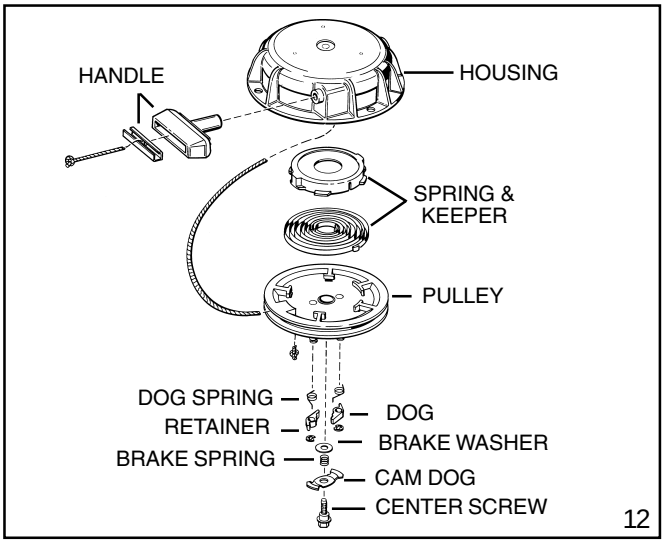


10

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.



11

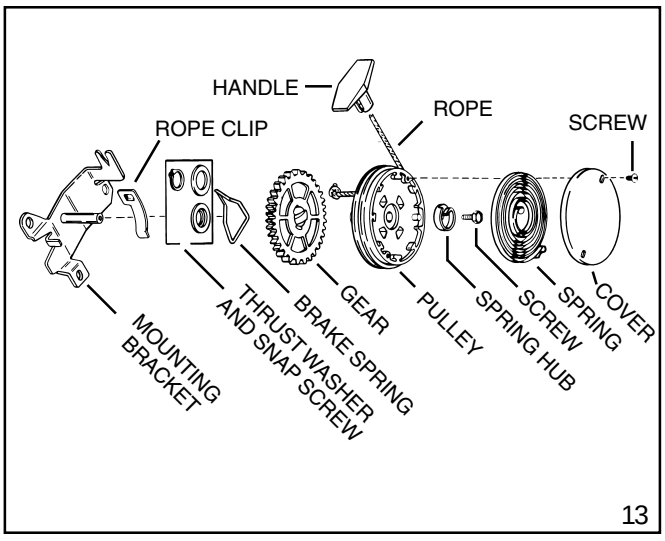


12

VERTICAL PULL STARTER HORIZONTAL ENGAGEMENT TYPE

Disassembly Procedure

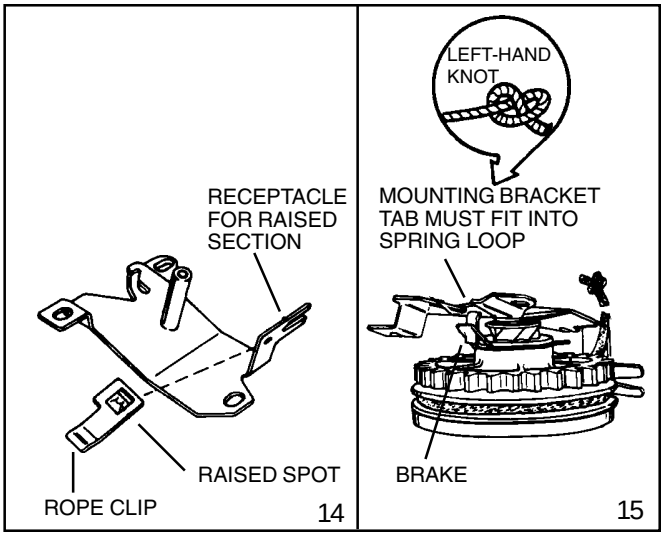
1. Remove the handle and relieve the starter spring tension by allowing the rope to slip past the rope clip.
2. Remove the spring cover by carefully removing the two small screws. Carefully take out the spring.
3. Remove the center hub screw and the spring hub.
4. Lift off the gear and pulley assembly. 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.



13

Assembly Procedure

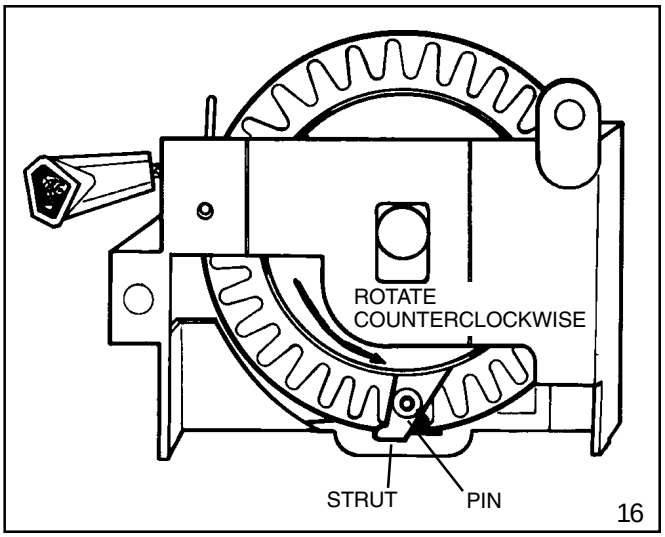
1. Insert the rope through the starter pulley.
2. Assemble the gear, pulley, washer, and snap ring.
3. Place a small amount of grease on the center shaft, place the gear and pulley into position making sure the brake spring loop is positioned over the metal tab on the bracket. The rope clip must fit 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.



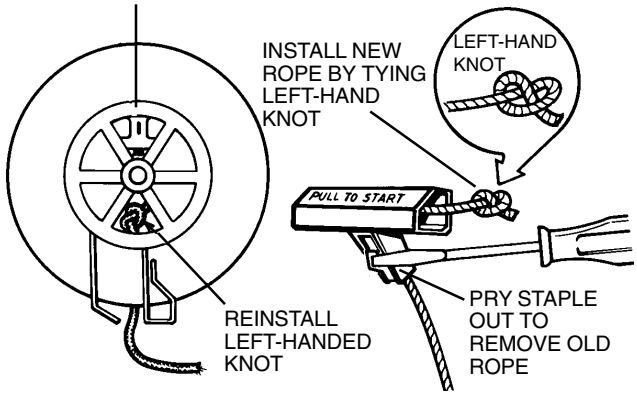
CAUTION: DO NOT ATTEMPT TO REMOVE THE SPRING CAPSULE FROM THE SHEAVE ASSEMBLY UNLESS THE SPRING IS FULLY UNWOUND.

6. Squeeze and hold tightly by hand the spring capsule at the outer edge against the gear sheave.

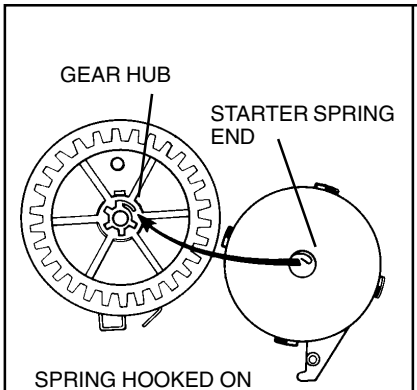
7. Remove the retainer pin from the strut and slowly relieve the spring tension by allowing the spring capsule to rotate slowly under control, until completely unwound. The spring capsule can now be removed from the gear sheave.

Assembly Procedure

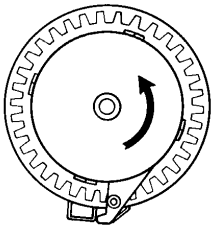
1. Feed the new rope through the hole and tie a left-handed knot on the rope end. Make sure the rope and knot do not protrude from the knot cavity and bind the pulley rotation (diag. 17).
2. Wind the rope on the sheave assembly clockwise, viewing the gear from the gear side of the sheave.
3. Reinstall 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).

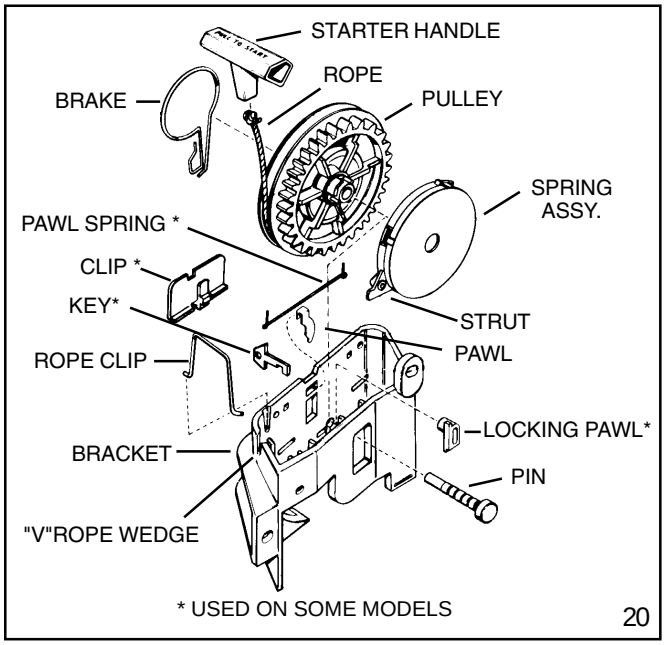


17

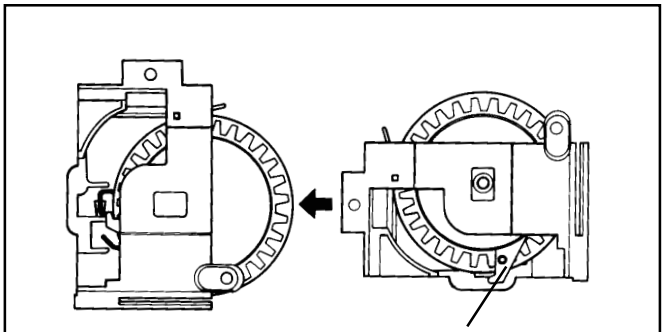


18


ROTATE SPRING 4 FULL TURNS
19



* USED ON SOME MODELS
20



21

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.

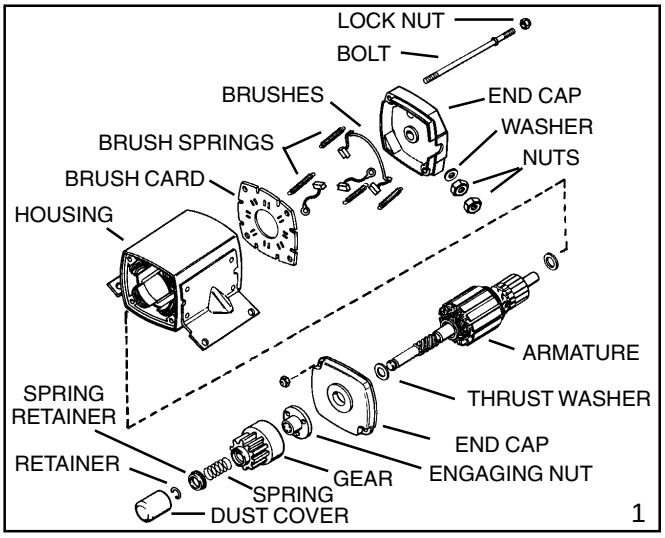
The starting circuit includes the battery, battery cables, starter or ignition switch, safety switches, and an electric starter motor.

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

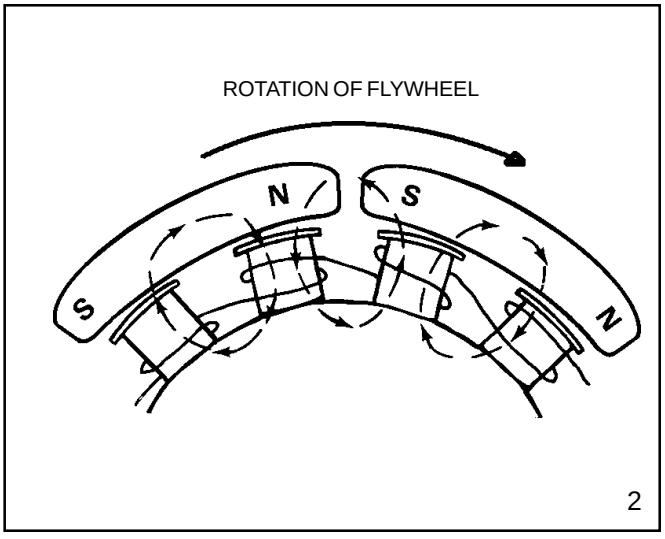
After all of the safety interlock switches have been activated, the starter switch will complete the circuit. A strong magnetic force is produced by the electrical current running through the armature windings. The armature magnetism repels the magnetism produced by the permanent field magnets of the 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

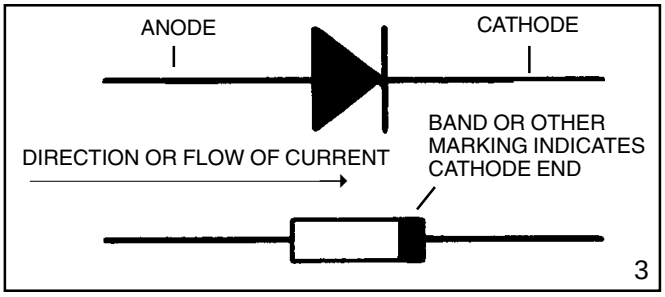
CHARGING CIRCUIT

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

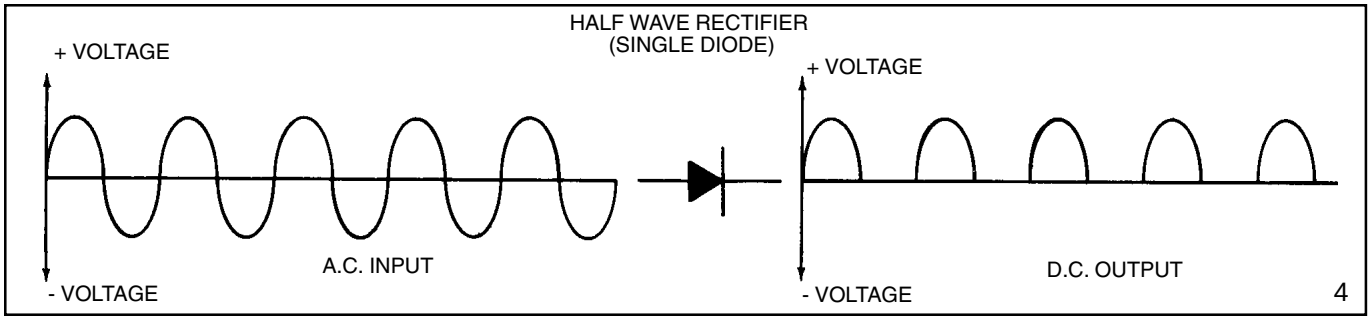


In order to charge a battery, it is necessary to convert alternating current (A.C.) to direct current (D.C.). This is accomplished by using a diode or rectifier (diag. 3). A single diode makes use of only one half of the A.C. signal and is known as HALF WAVE RECTIFICATION (diag. 4). This is acceptable 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.

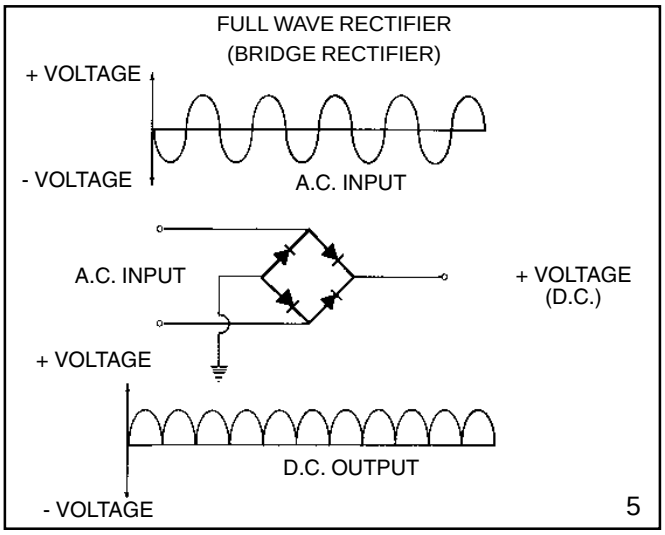
HALF WAVE RECTIFIER SINGLE DIODE

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

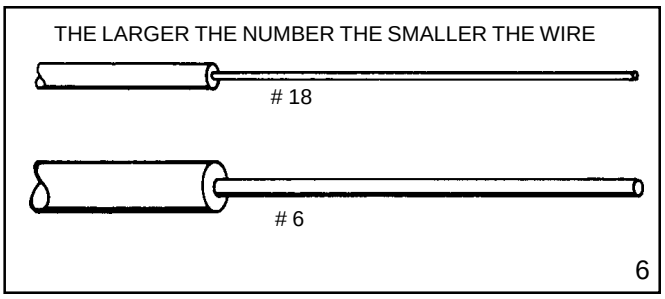
The batteries used in conjunction with Tecumseh engines are 12 volt lead acid or “maintenance free” style. The chemical energy produced by the dissimilar metals of the battery plates provides a electrical potential that is used to power the electric starter or unit accessories. Consult the original equipment 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.

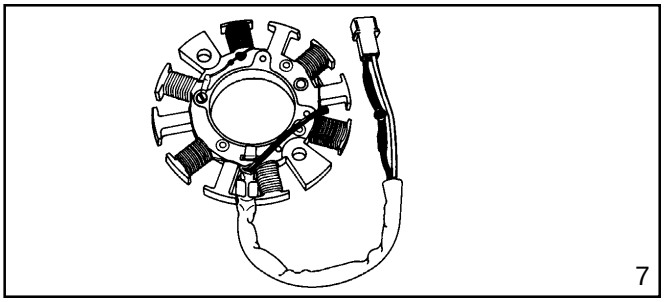
Tecumseh's standard engine wiring color codes, effective August, 1992 are as follows:

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.

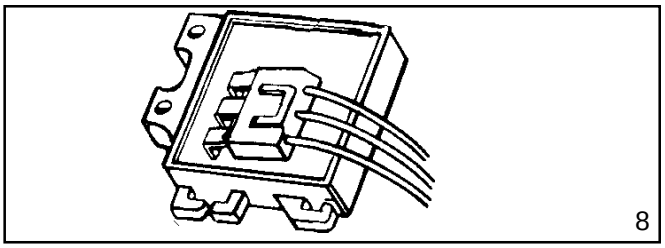
ELECTRICAL TERMS

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

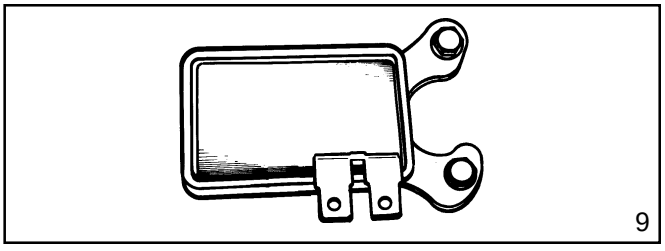
IGNITION COIL - The ignition coil is used to fire the spark plug. It is completely independent from the alternator coils.

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.

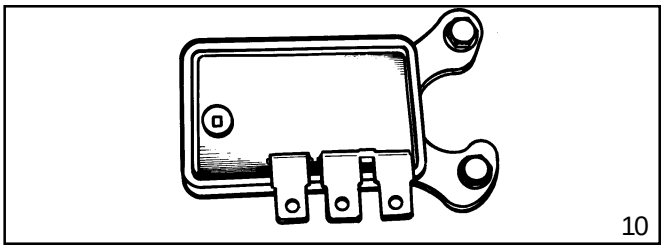

8

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

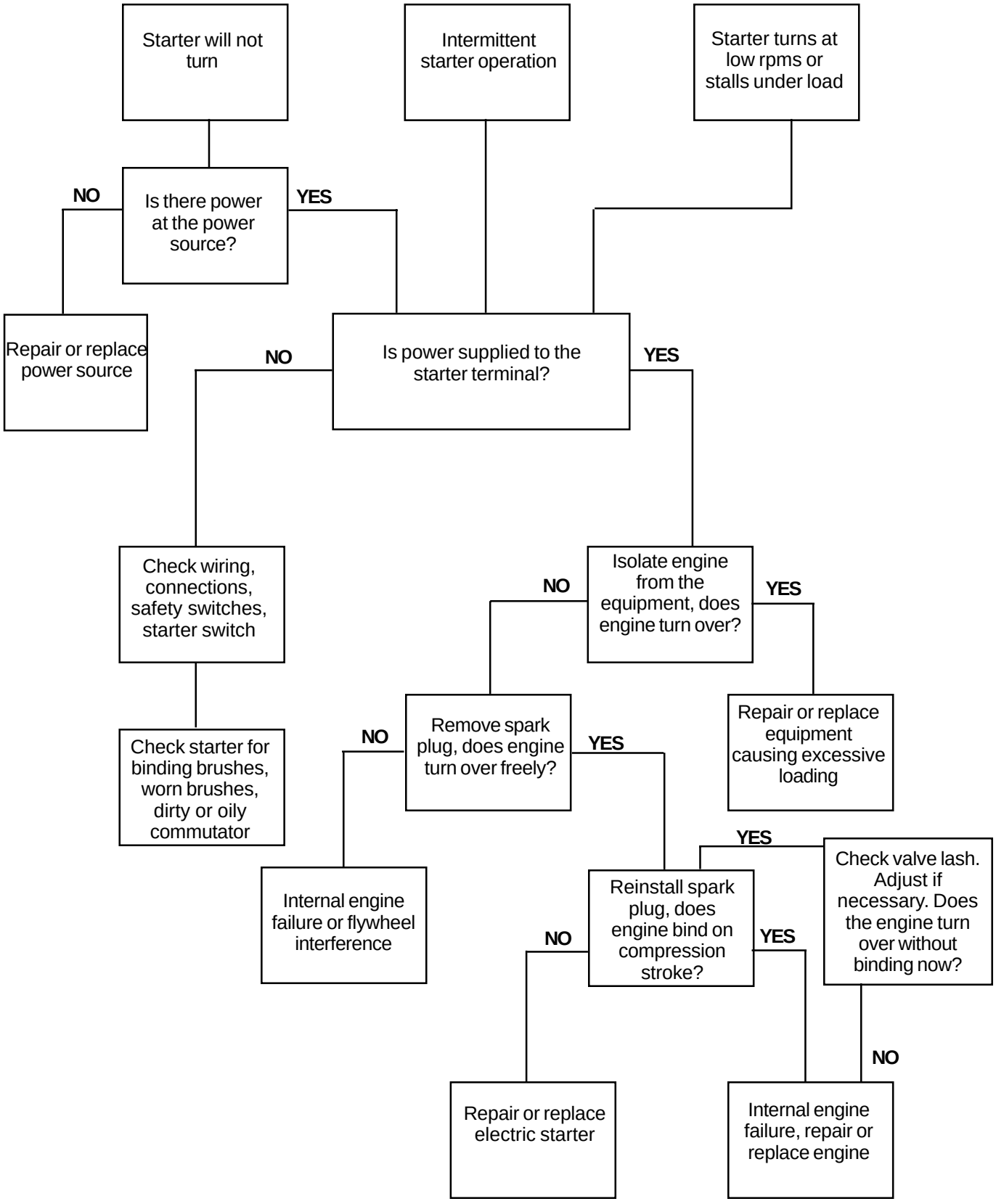
BASIC CHECKS

Before going into extensive checks, be sure to perform the more basic checks first, such as:

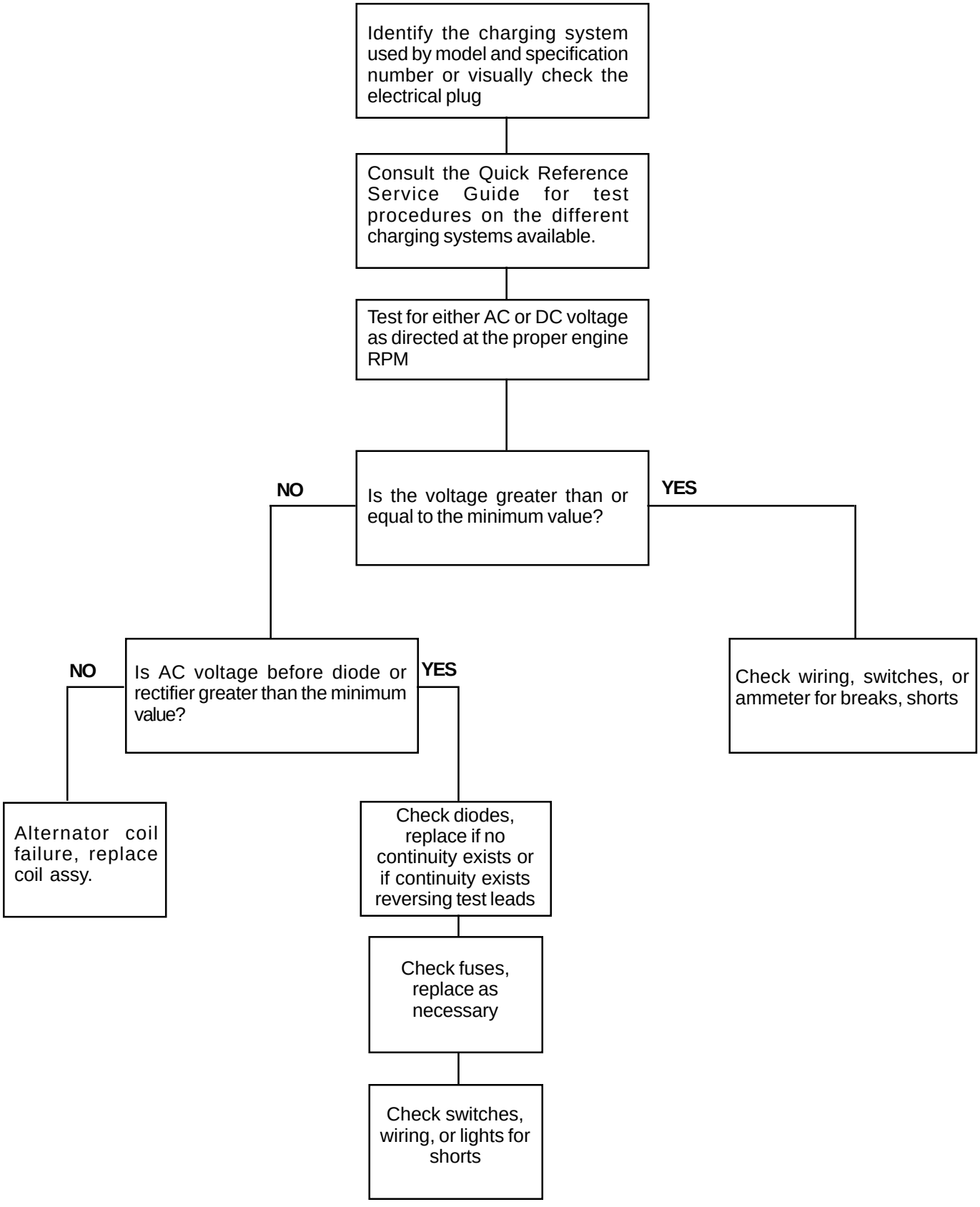
1. Battery defective or not charged.
2. Corroded or loose terminals and connections, or wrong connections.
3. Cracked insulation or broken wires.
4. A wire "grounding out" in the system.
5. Defective switch.
6. Operator presence system functioning properly.*

***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.

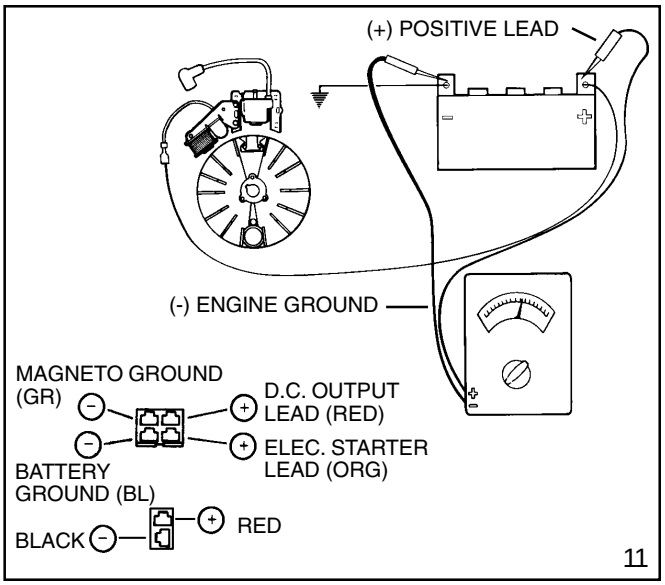
In some cases an open circuit D.C. check cannot be made. An SCR (Silicon Controlled Rectifier) is located in the circuit which requires a minimum "turn on" voltage to allow it to conduct. Without the battery in the circuit this "turn on" voltage is not present. The SCR "senses" this and there will be 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).

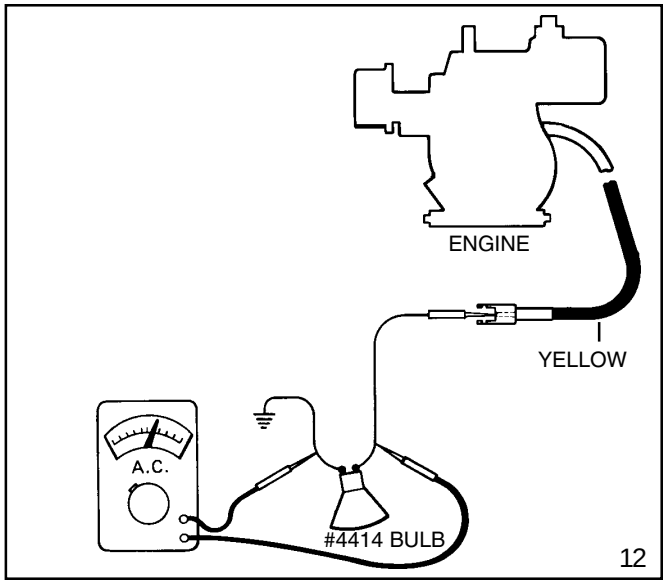
With the engine running, minimum A.C. voltage across the bulb should be:

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).

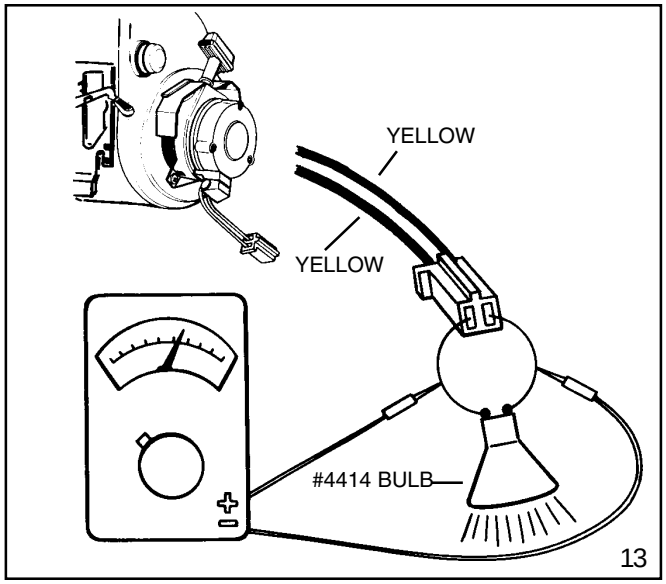
With the engine running, minimum A.C. voltage values across the bulb should be:

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

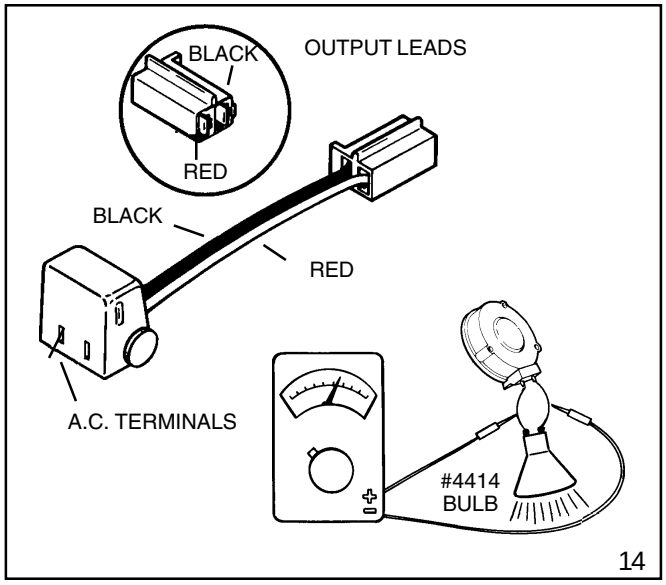
Rectifier Bridge Check With Ohmmeter for D.C. Adaptor

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).



14

(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.

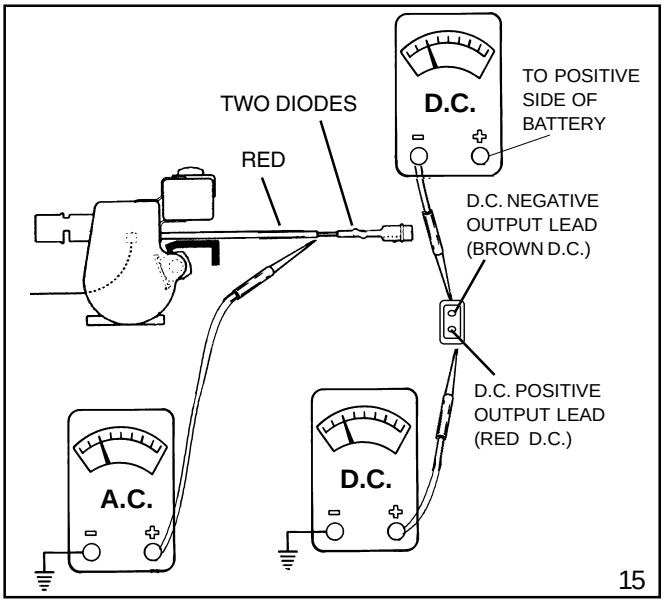
2.5 Amp D.C., 35 Watt Lighting

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.



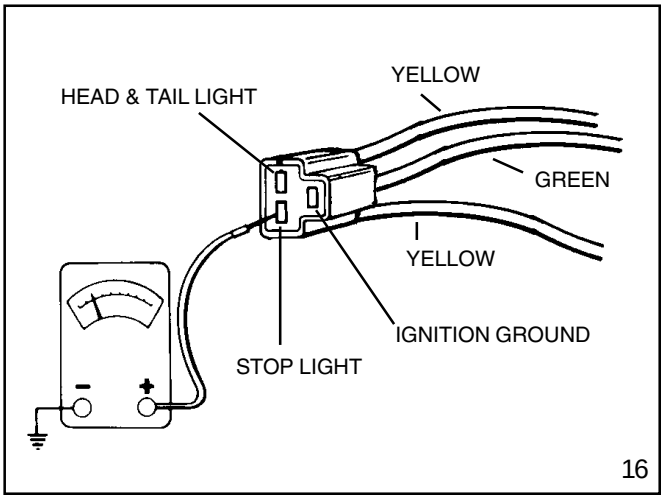
3 Amp A.C. Lighting Alternator Models: H & HSK 30- 35, HS & HSSK 40, H & HSK 50-60, HH50-60, HM & HMSK 70-80-100, HHM80

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.

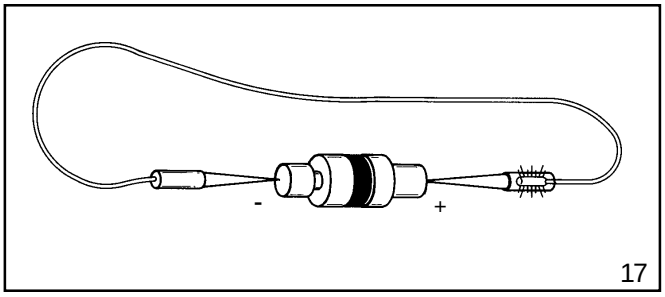
3000 R.P.M. - 29.0 Volts A.C.

3300 R.P.M. - 32.0 Volts A.C.

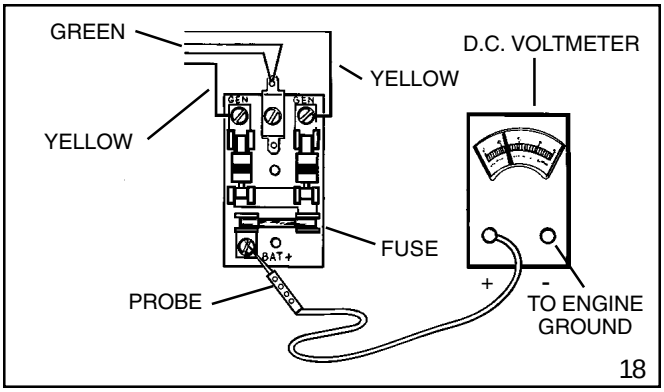
3600 R.P.M. - 35.0 Volts A.C.

If less than above output, generating coil assembly is defective. See Chapter 9 for "Disassembly Procedure".

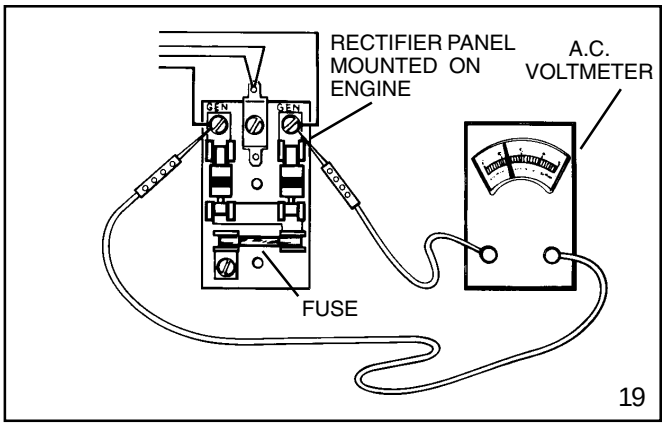
NOTE: There is no regulator in this system. The total output of the two diodes is three (3) AMPS. If the battery is overcharging (boiling and bubbling), reduce the D.C. input by one-half by removing one of the diodes.



17



18



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.

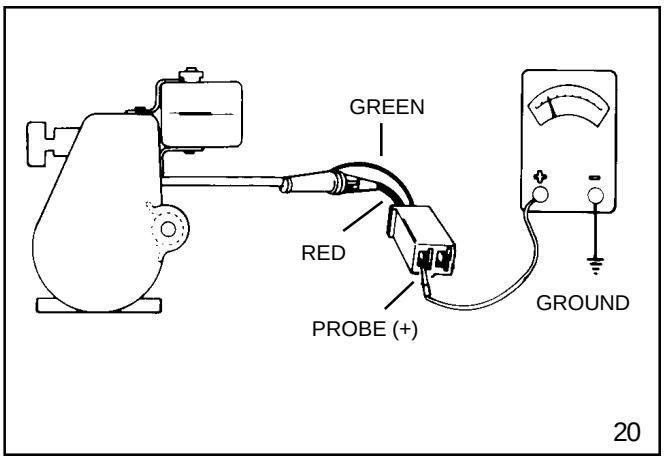
3000 R.P.M. - 22.0 Volts A.C.

3300 R.P.M. - 24.0 Volts A.C.

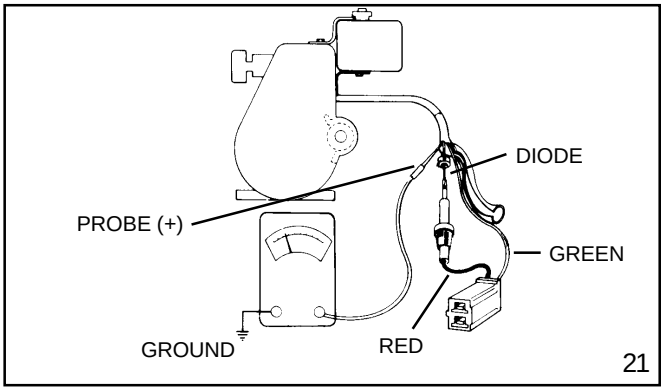
3600 R.P.M. - 26.0 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.

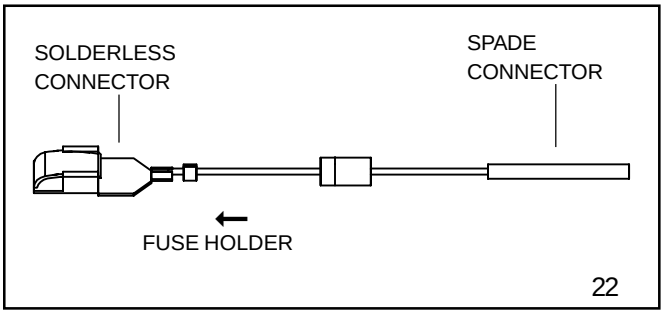
To replace the diode, disconnect at plug (spade terminal) and cut the wire on the opposite end of the diode at the solderless (crimped) connector. Remove 1/4" (6.35 mm) of insulation from the cut end of the wire and twist the strands together. Place the solderless connector from the new diode onto the exposed 1/4" (6.35 mm) wire and crimp the connector with a standard electricians pliers. Reconnect plug end (or spade connector (diag. 22).



20



21



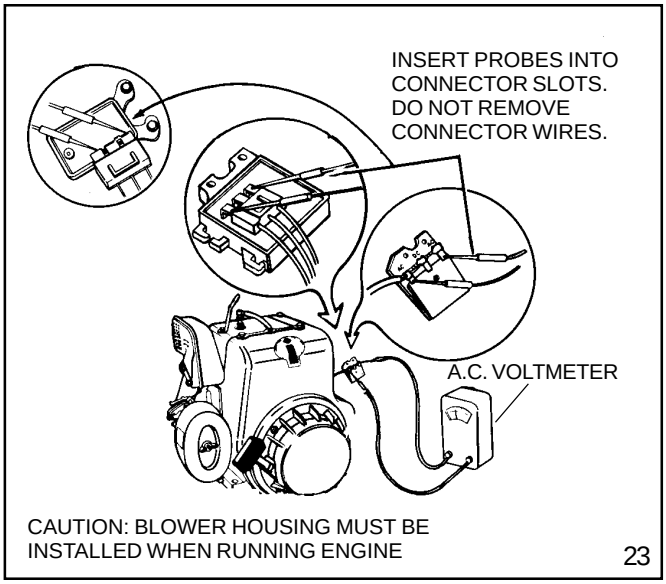
22

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.

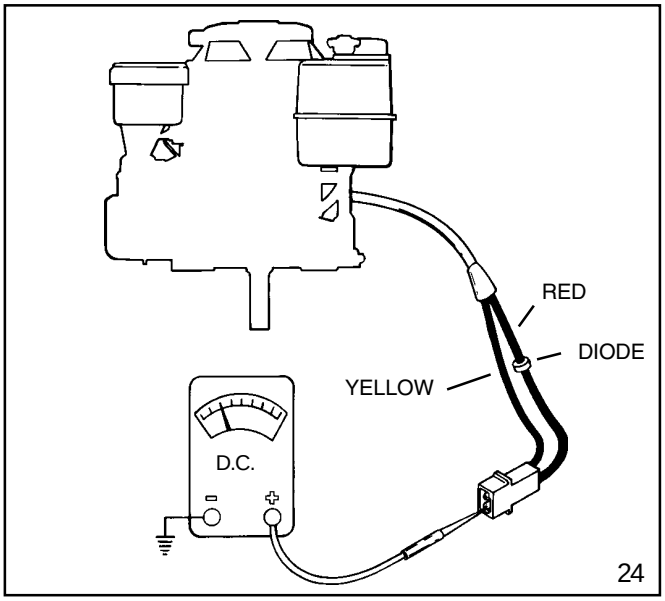
3600 R.P.M. - 28.0 Volts A.C.

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.



(continued on top of next page)

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:

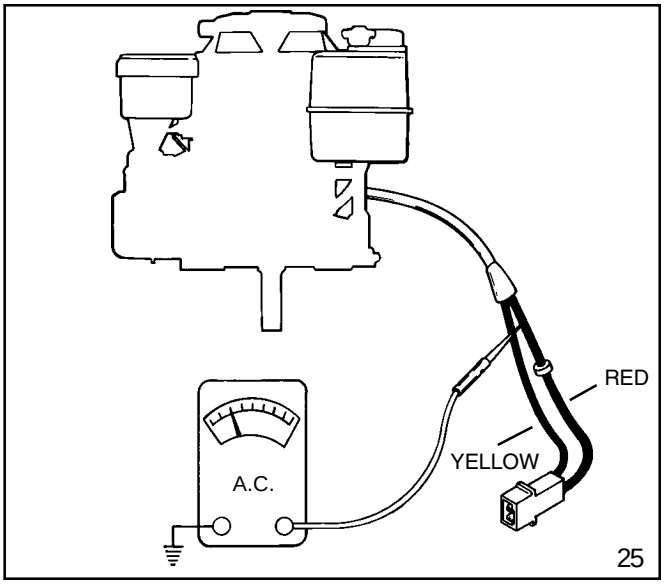
3 Amp D.C.

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.

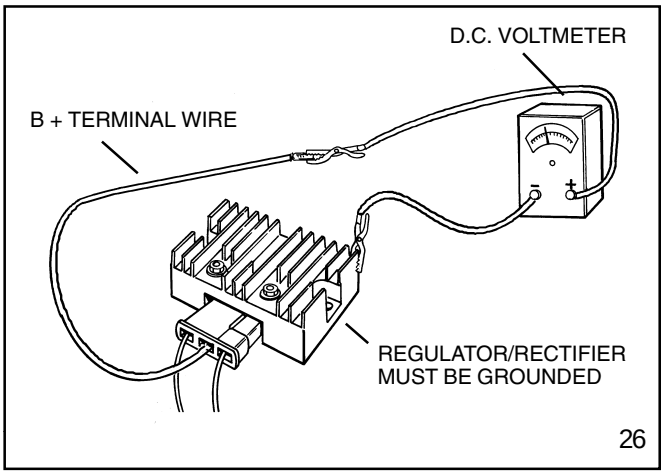
If the above minimum values are noted, system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage going into the diode from alternator, at the lead on the alternator 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.



26

7 Amp Alternator System Regulator-Rectifier External to Engine

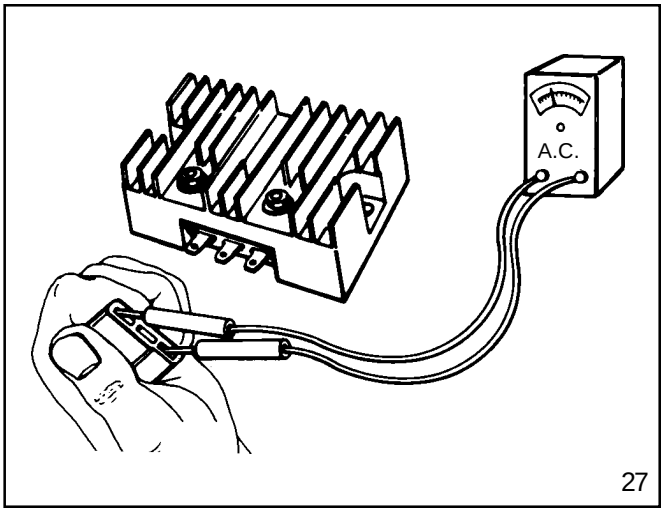
CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B+ wire at the switch end and measure D.C. voltage between the lead and ground (diag. 26).

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

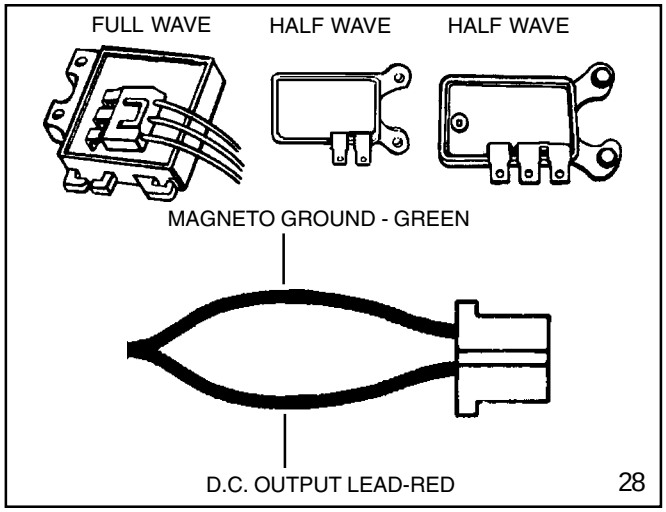
In this system, the regulator and rectifier are combined in one solid state unit.

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).

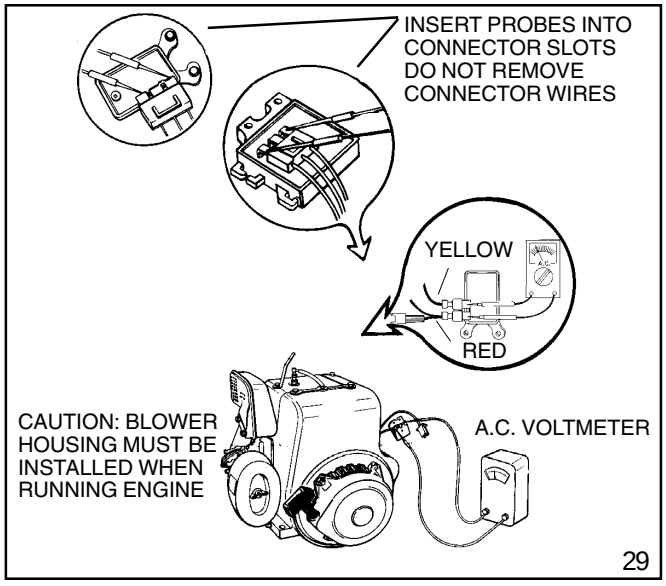
With the engine running, minimum values should read:

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.

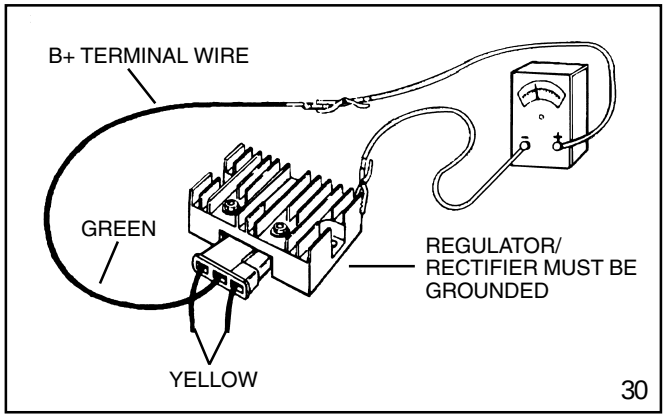
If the minimum values are noted, the system is okay. Check for defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 31).



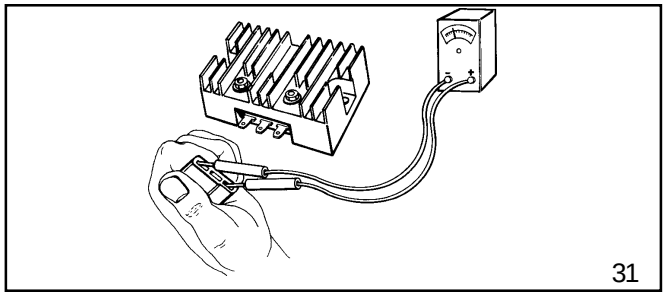
28



29



30


31

(continued on top of next page)

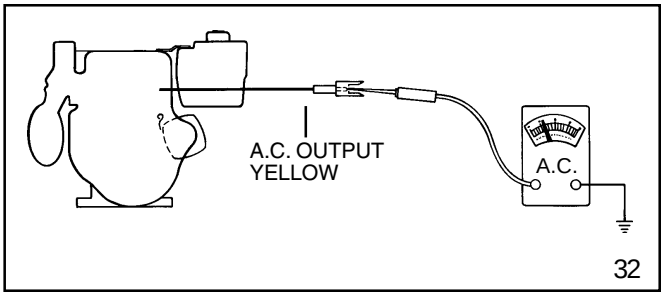
With the engine running, minimum values should read:

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".



32

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.

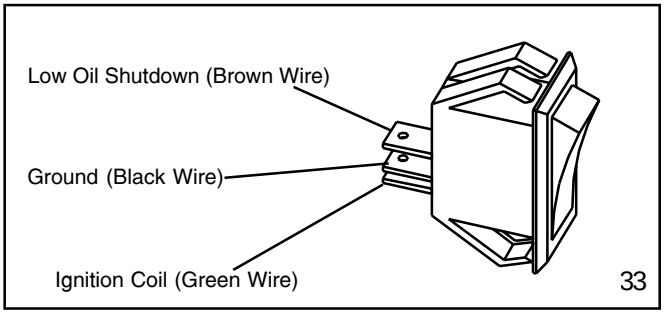
If less than above output, the alternator assembly is defective. See Chapter 9 for "Disassembly Procedure".

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.



33

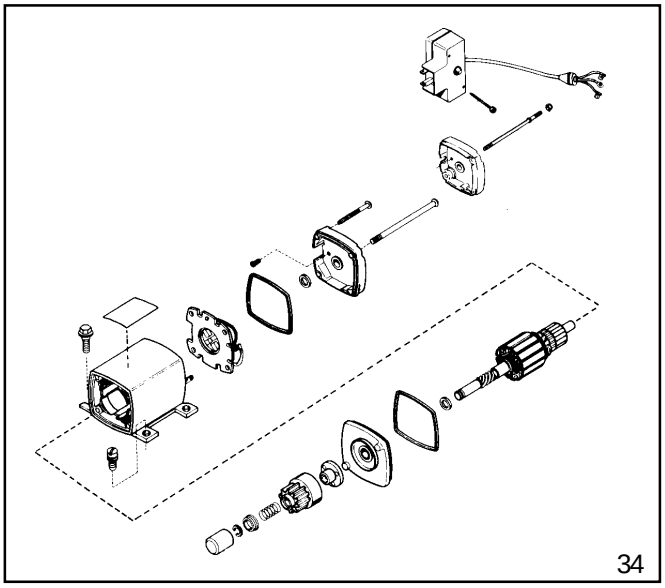
ON/OFF LIGHTED ROCKER SWITCH WITH LOW OIL SHUTDOWN (LOS)

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.

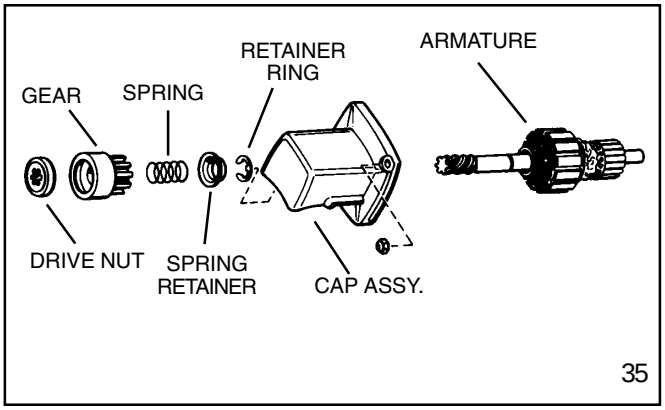
12 VOLT OR 120 VOLT ELECTRIC STARTERS WITH EXPOSED SHAFT

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.**


34

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.**

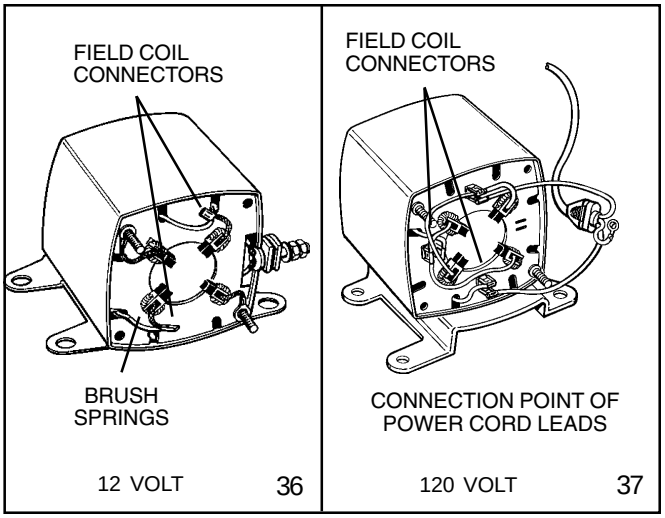


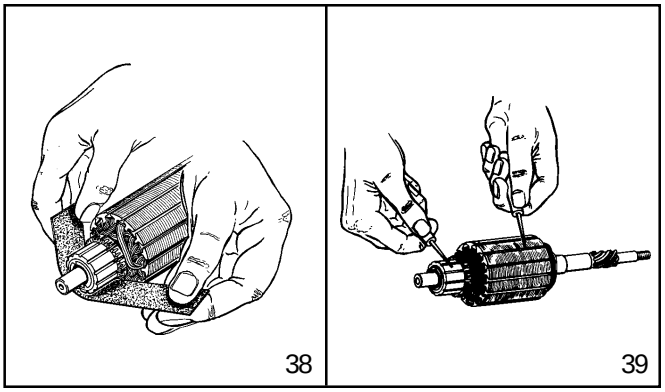
35

(continued on top of next page)

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.

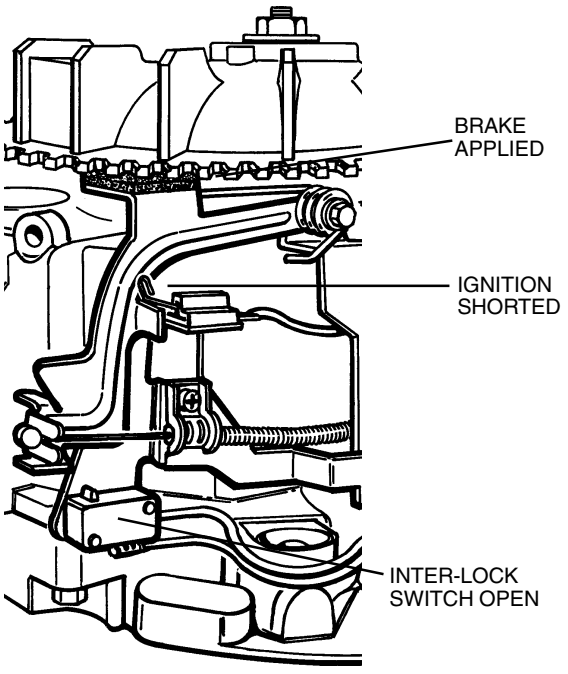
Tecumseh's Flywheel Brake system provides consumer safety by stopping the engine and blade within three seconds after the operator releases the engine/blade control bail at the handle of the lawnmower. These systems are available on both recoil and electric start models. The engine stopping time is affected 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

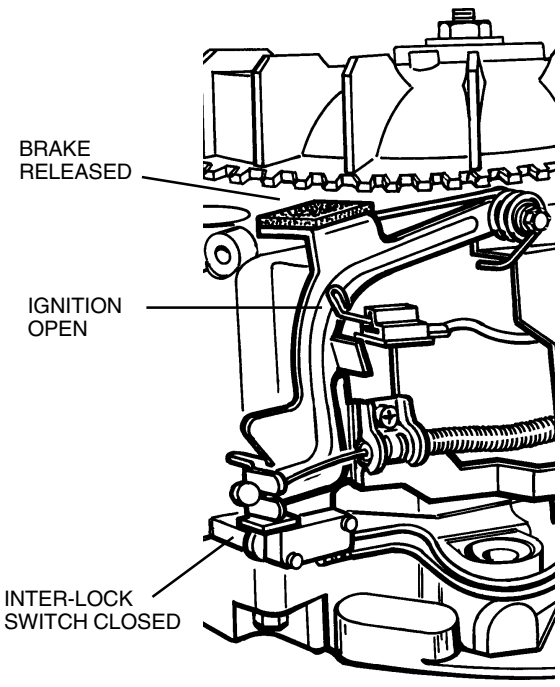
BOTTOM SURFACE SYSTEM

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).



1



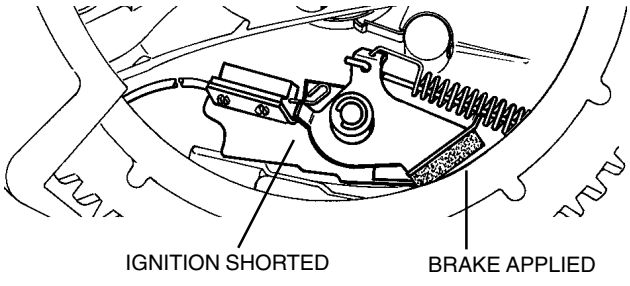
2

OPERATION (CONTINUED)

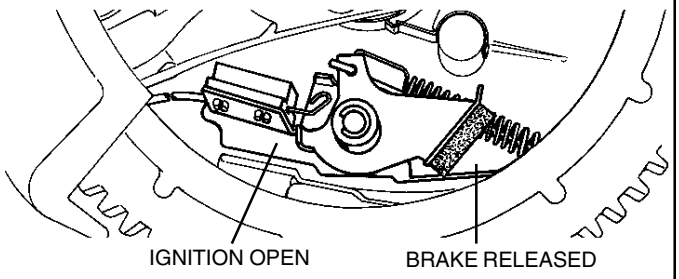
INSIDE EDGE SYSTEM

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).



3



4

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).

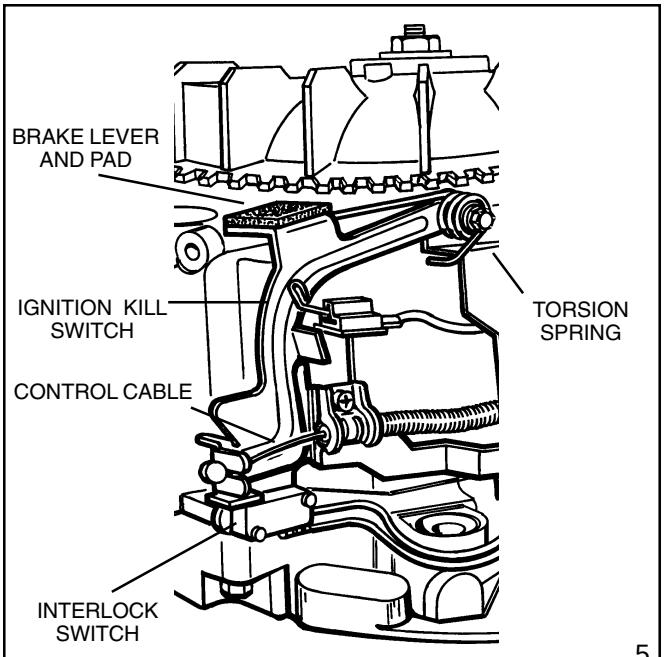
The **ignition kill switch** is a plastic block with a wire extending out of it. The wire is attached to a terminal which is connected to the ignition kill wire. The brake lever contacts and grounds the wire of the switch when the engine / blade control is released, and the ignition module is grounded. 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.



5

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.

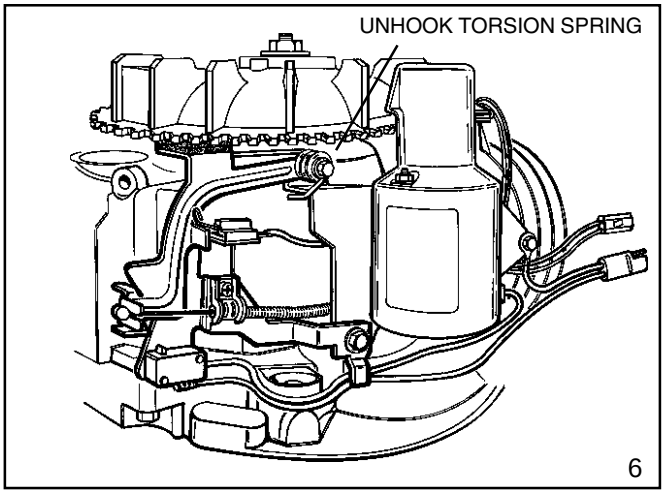
NOTE: WHEN REMOVING THE BRAKE BRACKET THE TORSION SPRING MUST BE RELEASED BEFORE THE TOP STARTER BOLT IS REMOVED OR THE THREADS IN THE CYLINDER BLOCK WILL BE DAMAGED.

Inside Edge

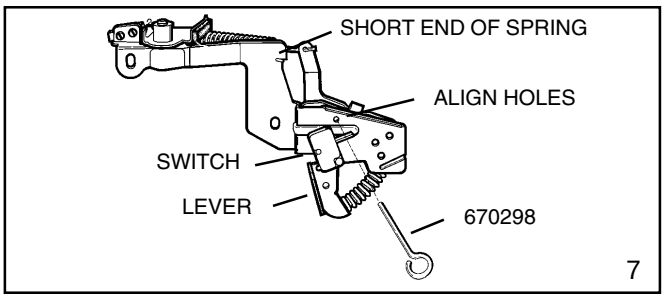
To relieve the brake pressure on the flywheel, compress the spring by moving the lever toward the spark plug, when the hole in the lever aligns with the hole in the bracket, secure the lever with alignment tool 670298 then remove the flywheel (diag. 7). Remove the alignment tool. Release the spring tension 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

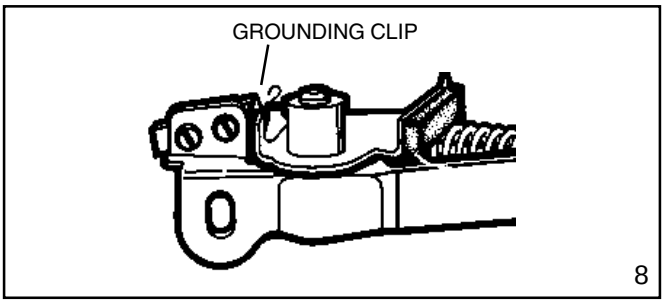
Inspect the ignition kill switch grounding clip for proper alignment and contact with the brake arm. Insure that all electrical connections are clean and secure (diag. 8 & 9).



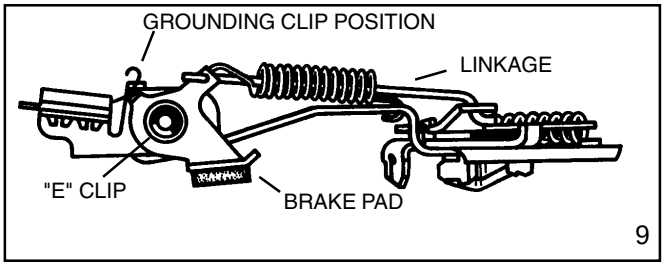
6



7



8

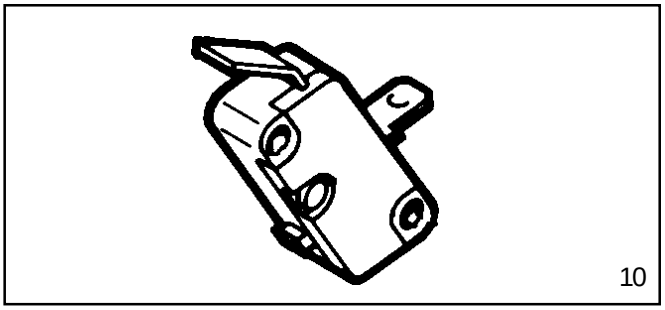


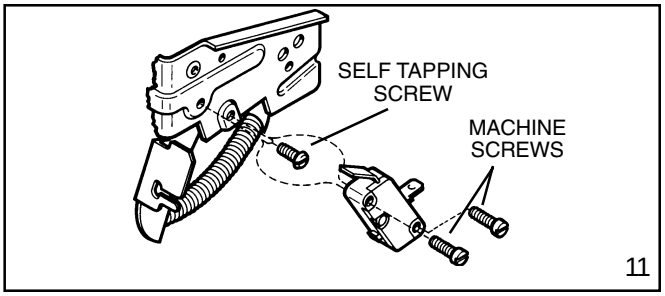
9

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).


10

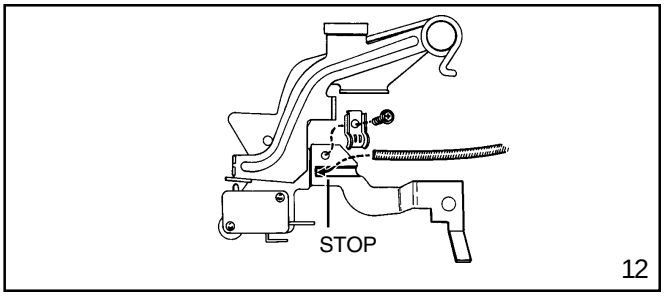


11

CONTROL CABLE

Bottom Surface

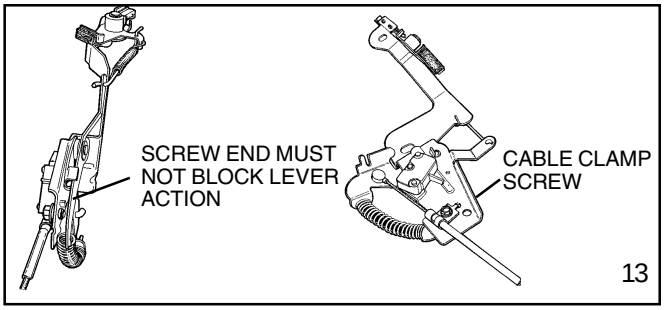
The control cable conduit must be assembled against the stop in the bracket. Make sure the bottom of the lever completely depresses the button on the starter interlock switch, if equipped, when the control is fully applied. The cable must provide enough travel so the brake will contact the flywheel. 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).

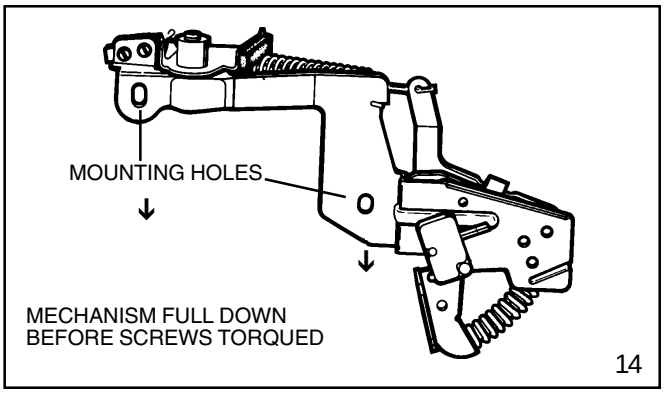


13

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.

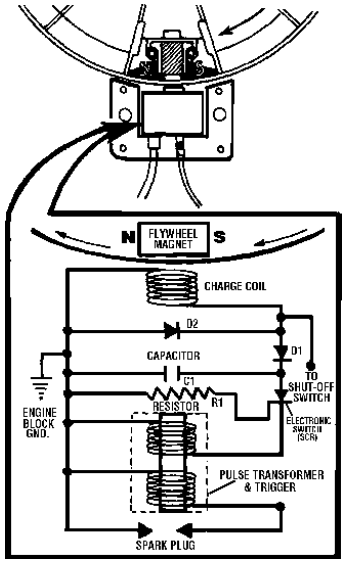
The solid state ignition system consists of a flywheel magnet and key, charge coil, capacitor, a silicon controlled rectifier, pulse transformer, trigger coil, high tension lead, and a spark plug. Everything except the flywheel magnet, key and the spark plug are located in a encapsulated ignition module. 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).



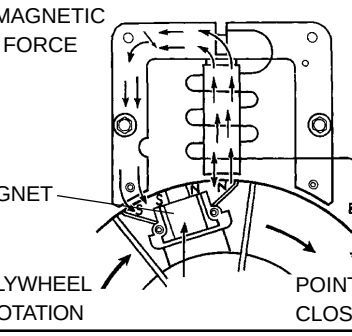
1

MAGNETO IGNITION SYSTEM (POINTS)

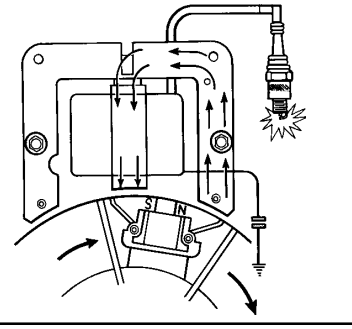
As the flywheel turns, the magnets that are mounted in the wheel, pass the coil mounted on the stator. As the magnet's North Pole enters the area of the center leg of the stator, a magnetic field is concentrated through the laminations to the magnet's South Pole. This causes a generation of current flow 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.

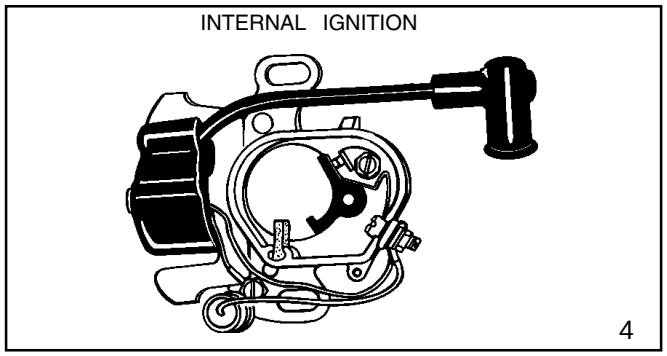


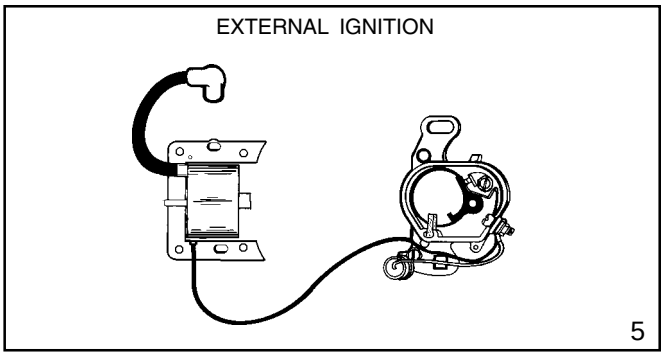
2

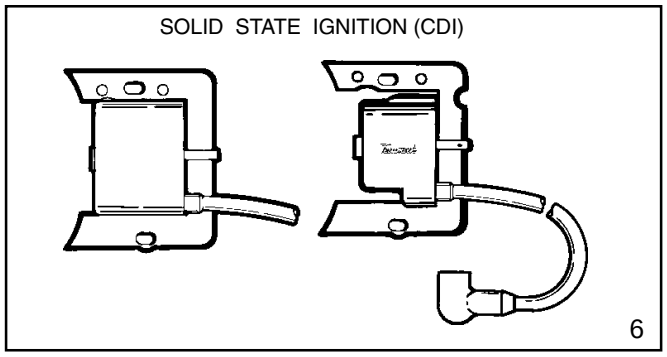


3

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

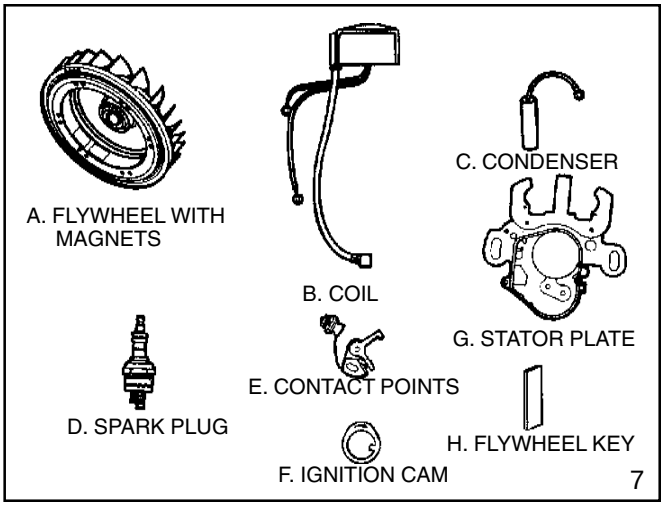
F. Ignition cam

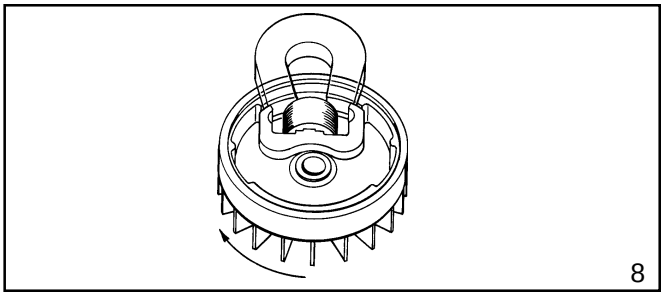
G. Stator plate (dust cover, cam wiper, and laminations.)

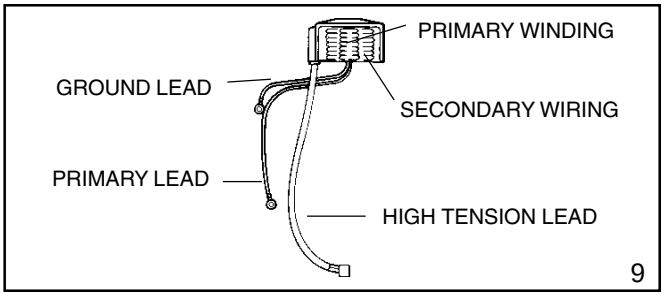
H. Flywheel key

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).

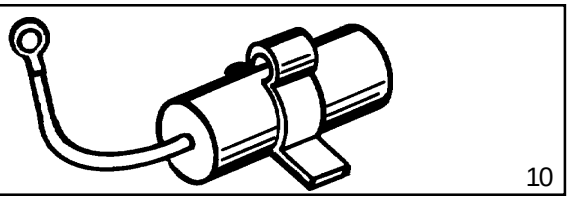
The ignition coil is used to increase the low voltage in the primary to high voltage in the secondary, capable of jumping the spark plug gap. The coil consists of a primary and a secondary winding of wire. The primary is the low voltage (200 - 300 volts) winding, consisting of approximately 150 turns 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).



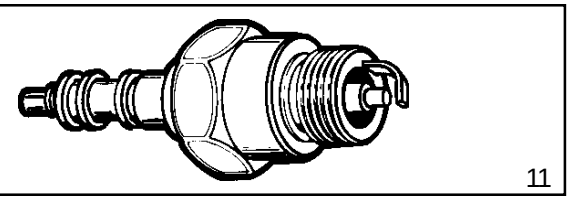




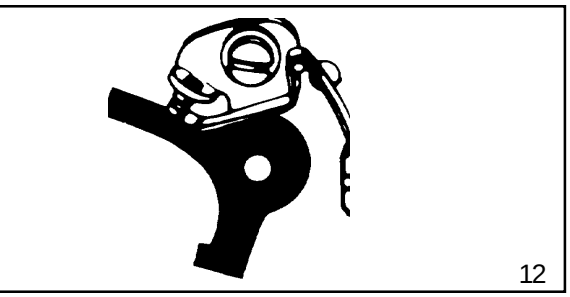
The condenser acts as an electrical shock absorber to prevent arcing between the contact points as they open. Arcing will lower the voltage at the spark plug, as well as burn and pit the contact points. The condenser is a replaceable item (diag. 10).


10

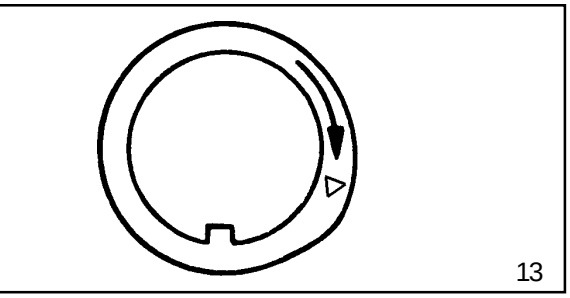
The spark plug is made up of two electrodes. The outside electrode is grounded and secured to the threaded sleeve. The center electrode is insulated with porcelain. The two are separated by an air gap which creates a resistance. A large voltage from the secondary arcs the air gap which causes a spark and ignites the air-fuel mixture in the cylinder (diag. 11).


11

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).

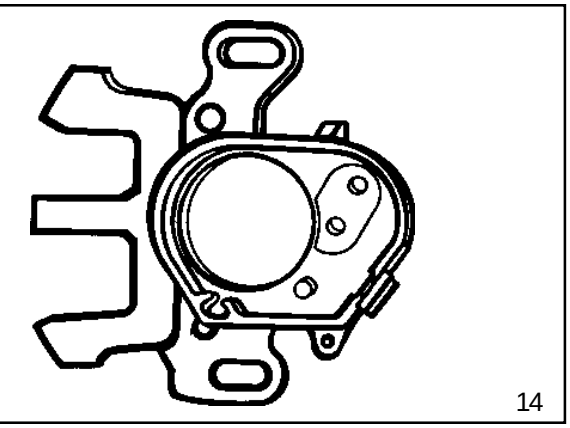

12

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).

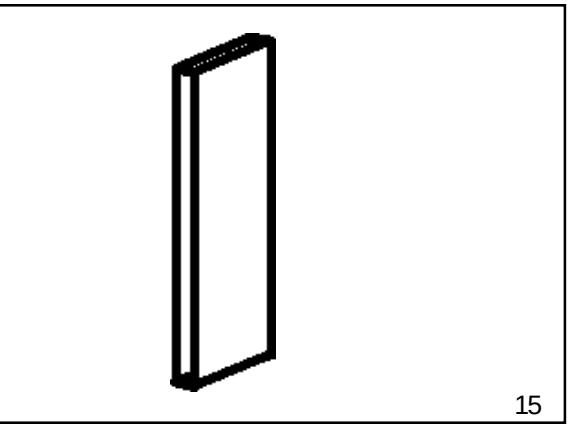

13

NOTE: SOME IGNITION CAMS ARE MACHINED DIRECTLY ONTO THE CRANKSHAFT AND ARE NOT REPLACEABLE.

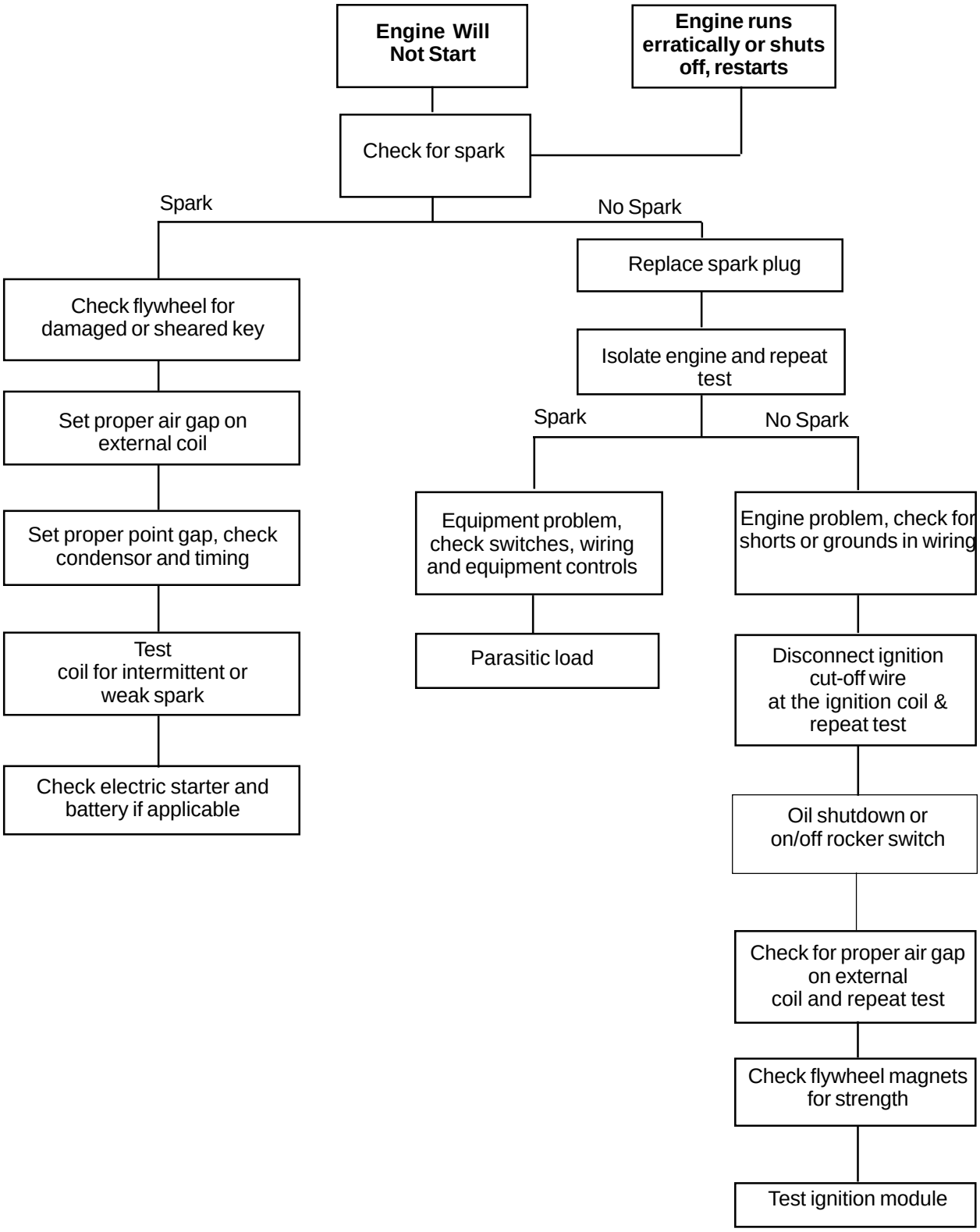
The stator plate is an aluminum fixture which houses the points, cam wiper, condenser, and has the laminations riveted to it. The laminations are strips of iron riveted together to form an iron core. Rust or debris in between the laminations will hamper the performance of the ignition system. If corrosion on the laminations is severe, the stator plate should be replaced (diag. 14).


14

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).


15

IGNITION TROUBLESHOOTING

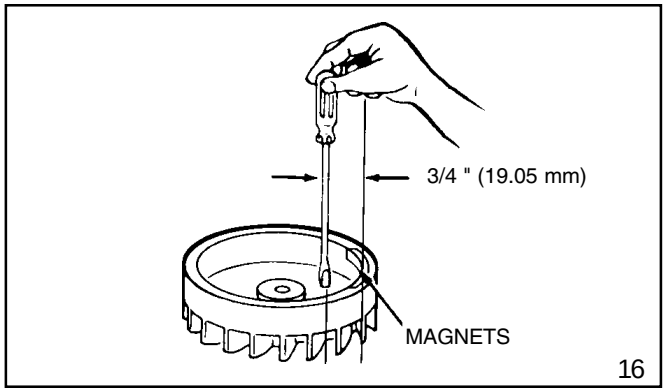


TESTING PROCEDURE

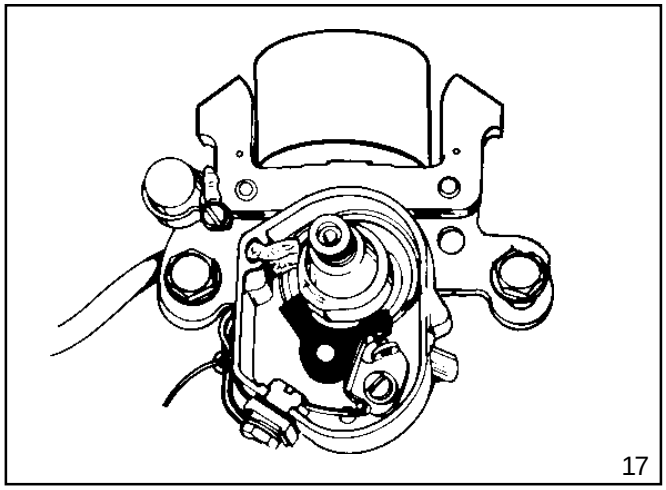
1. Check for spark using a commercially available spark tester and following the tester's recommended procedure.
2. Check for the correct spark plug and for cracks in the porcelain, pitted or burned electrodes, excessive carbon buildup, and proper air gap setting. Replace if questionable.
3. Remove the 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.

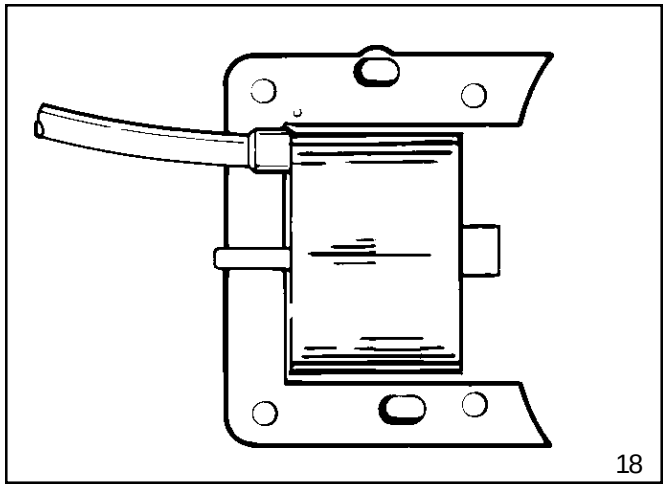
NOTE: STANDARD POINT IGNITION MAY HAVE TO BE DISCONNECTED AT THE IGNITION SHUTOFF (AT THE SPEED CONTROL).

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.



16


17


18

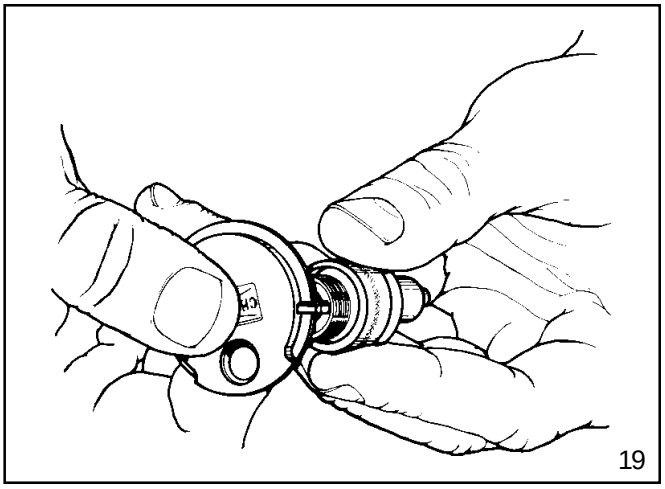
7. Examine the coil and lamination assembly (either internal or external) for cracks in the insulation or other damage which would cause shorts or leakage of current. Make sure the electrical leads are intact, especially where they enter the coil (diag. 18).
8. Check the operation of the coil using an 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".


19

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.

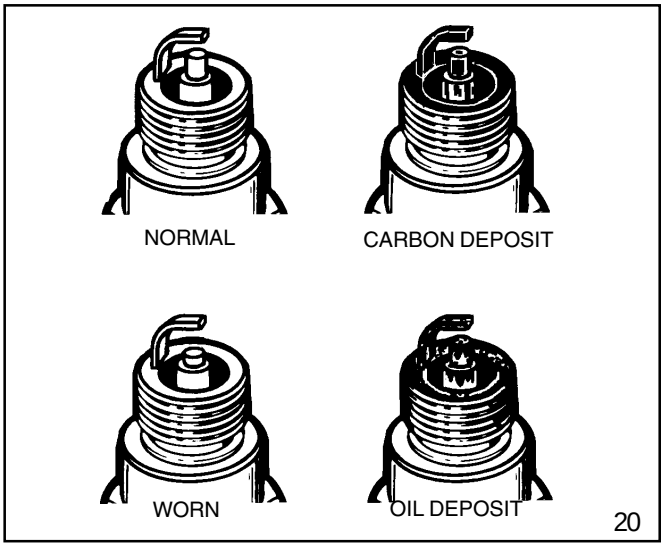
Replace the spark plug with the proper spark plug. Consult the proper parts breakdown for the spark plug to be used in the engine being serviced.

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.



20

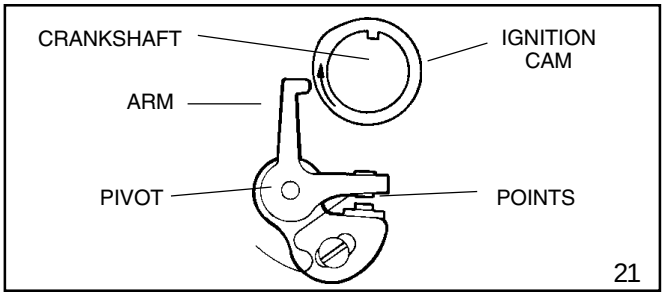
IGNITION TIMING PROCEDURE

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

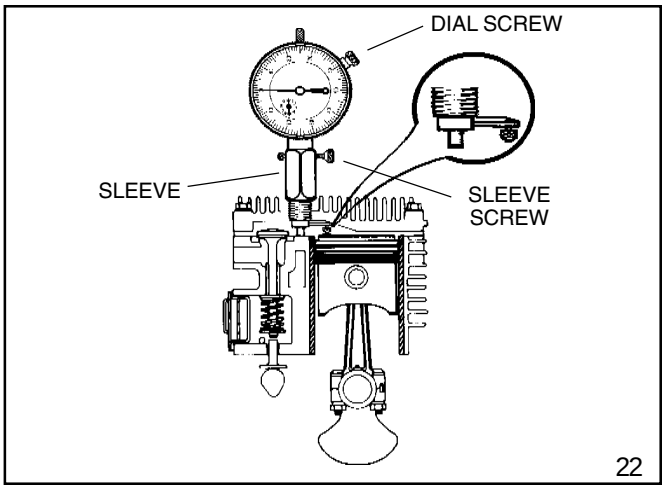
Internal coils are used on small and medium frame 4 cycle engines. First check the specification charts in the back of this manual or the quick reference chart for the correct ignition dimensions, (point gap setting and timing specification) depending on the model of engine.

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).



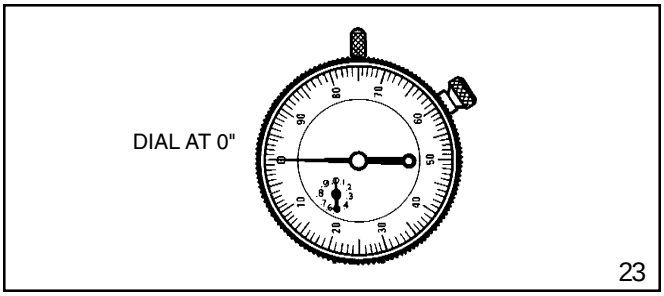
21

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).



22

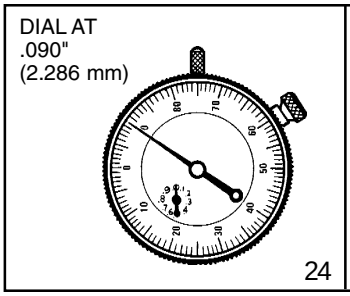
Find T.D.C. with both valves closed by rotating the crankshaft clockwise when looking at the magneto end of the crank, until the needle on the dial stops and reverses direction. Where the needle stops is T.D.C. Loosen the screw on the dial, and rotate the dial so that zero is lined up with the needle at T.D.C. Tighten the screw on the dial to secure it in place (diag. 23).



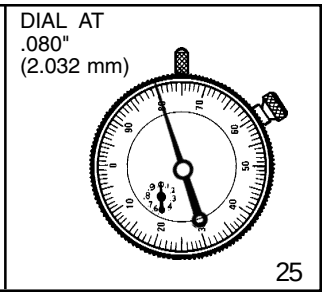
23

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).

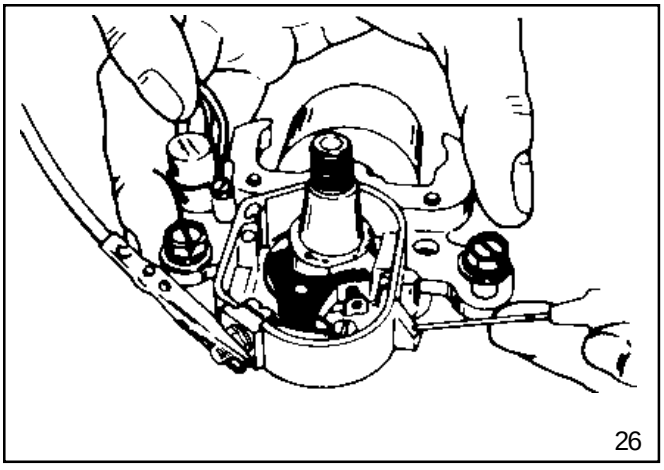


24



25

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).


26

(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).

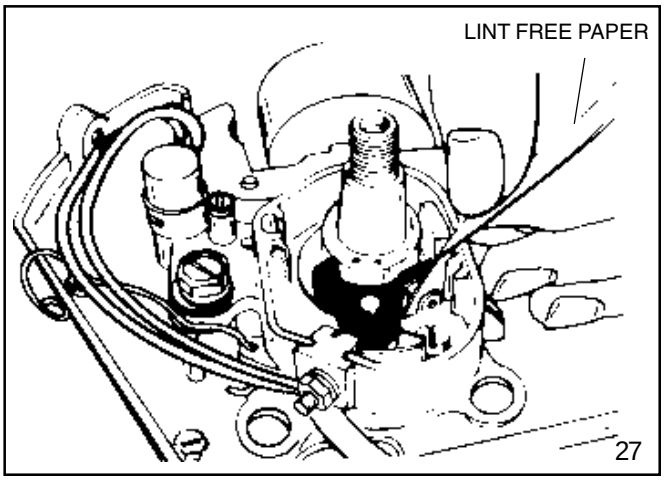
Torque down the stator bolts to secure the stator in place. Next, rotate the crankshaft until the point arm is resting on the high side of the ignition cam. Set the point gap at .020" (.508 mm), by loosening the screw on the movable point, and insert a .020" (.508 mm) feeler gauge between the contact 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).

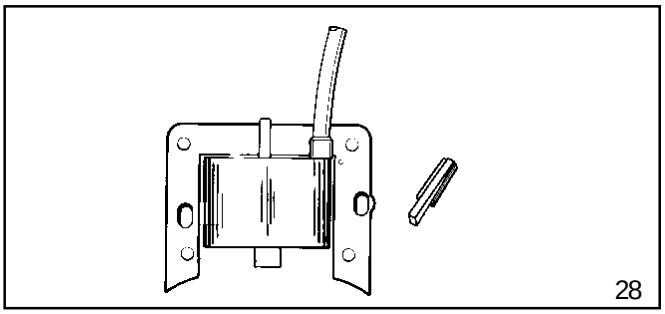
NOTE: The flywheel key used on engines with an external coil and points looks similar to the solid state key, however, timing will be effected if the wrong key is used.

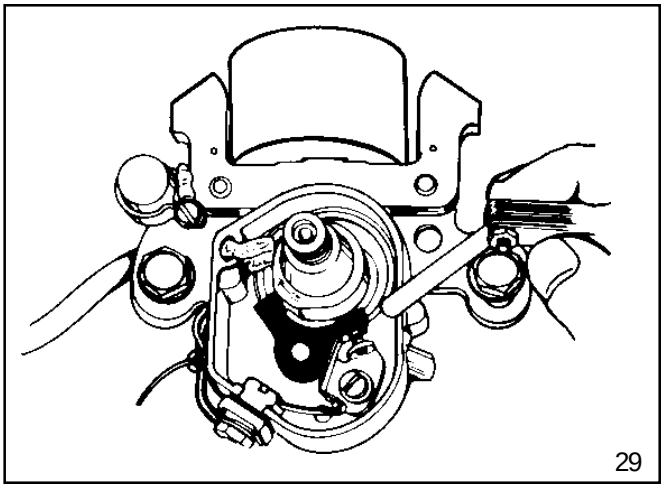
Reinstall the proper flywheel key, flywheel, washer and torque down the flywheel nut to specification. Reinstall the external coil and set the proper air gap to .0125" (.3175 mm) using air gap gauge, part # 670297 between the magnets and laminations and torque the mounting screws to specification. Remove 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).

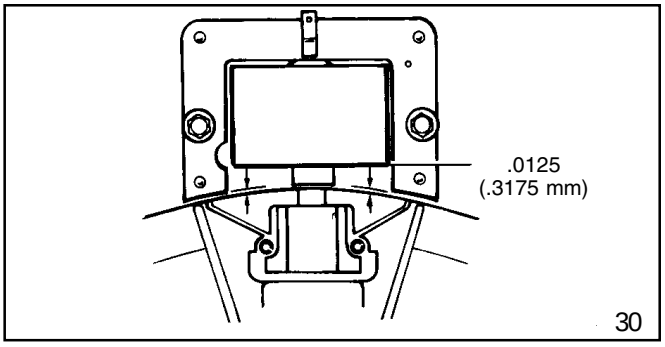
Solid State Ignition Timing

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).





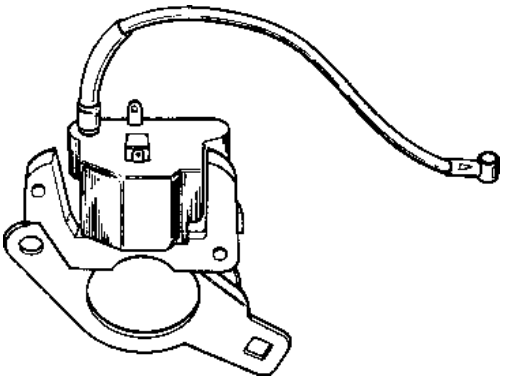




Other Solid State Systems

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.



31

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.

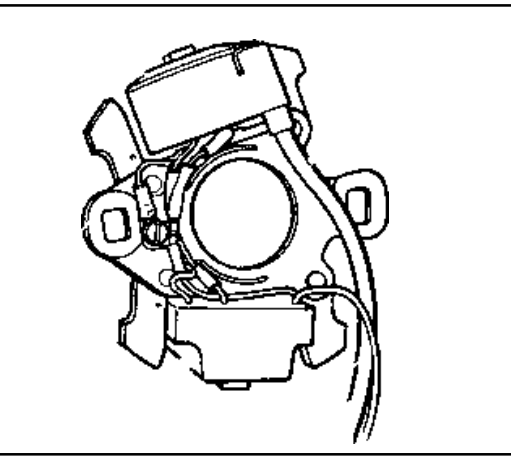
Re-oil the cam wiper in a magneto system.

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.



32

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.

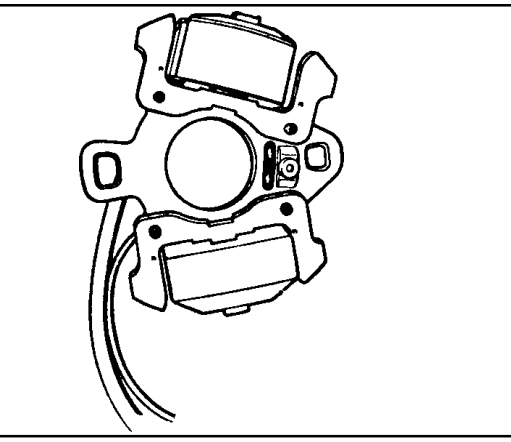
Clean points with lint free paper after setting gap.

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.



33

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

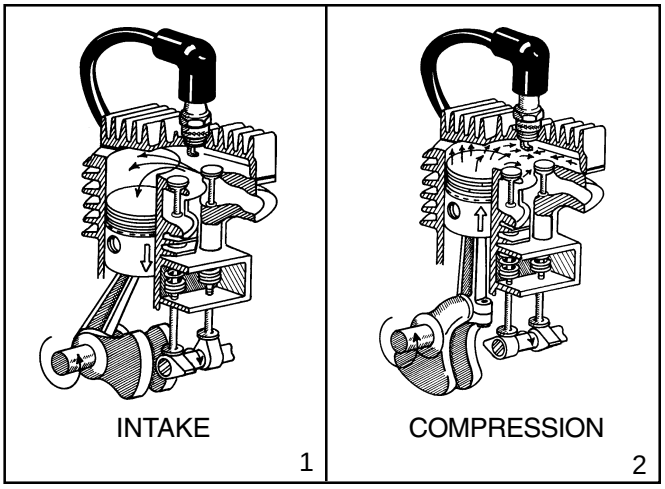
4-CYCLE ENGINE THEORY

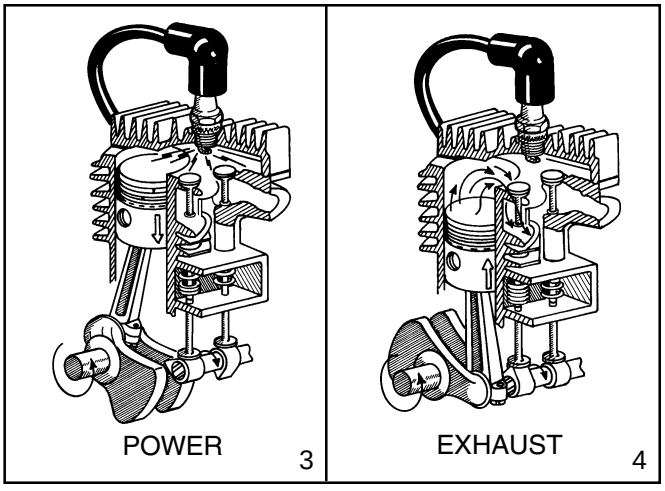
All 4-cycle engines require four piston strokes to complete one power cycle. The flywheel on one end of the crankshaft provides the inertia to keep the engine running smoothly between power strokes.

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.





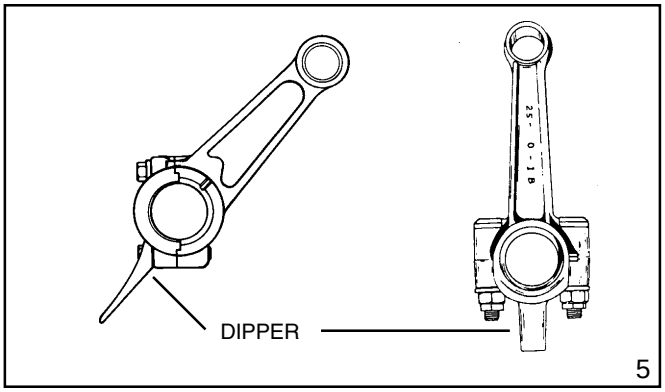
LUBRICATION SYSTEMS

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).

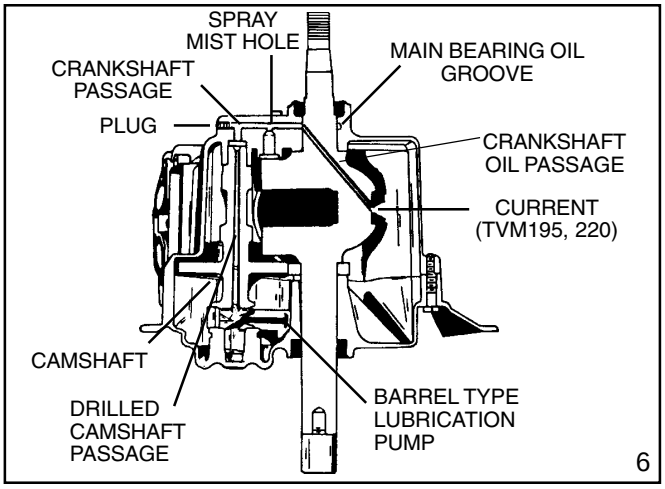
All vertical shaft engines use a positive displacement plunger oil pump or rotary type oil pump. Oil is pumped from the bottom of the crankcase, up through the camshaft and over to the top main bearing. Oil under pressure lubricates the top crankshaft main bearing and camshaft upper bearing (diag. 6).

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).

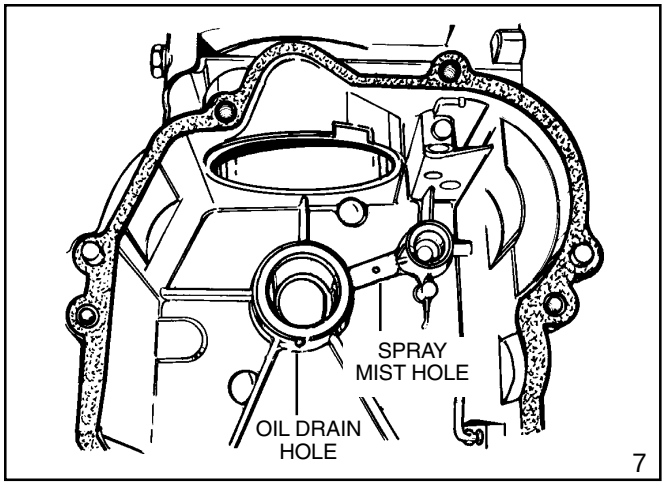
The plunger style oil pump is located on an eccentric on the camshaft. As the camshaft rotates, the eccentric moves the barrel back and forth on the plunger forcing oil through the hole in the center of the camshaft. The ball on the end of the plunger is anchored in a recess in the cylinder cover (diag. 8).



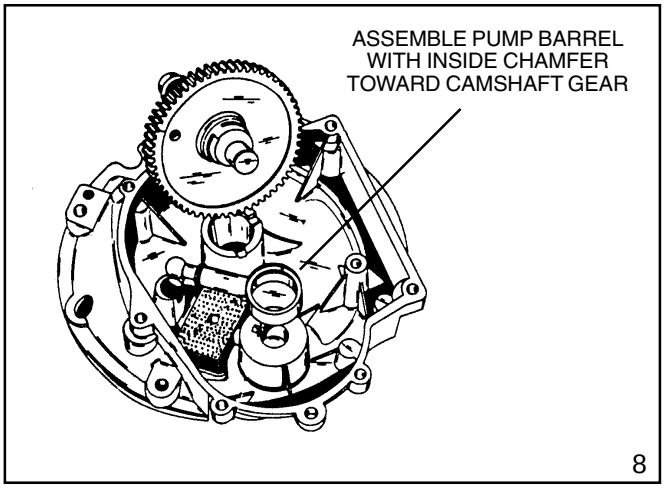
5



6



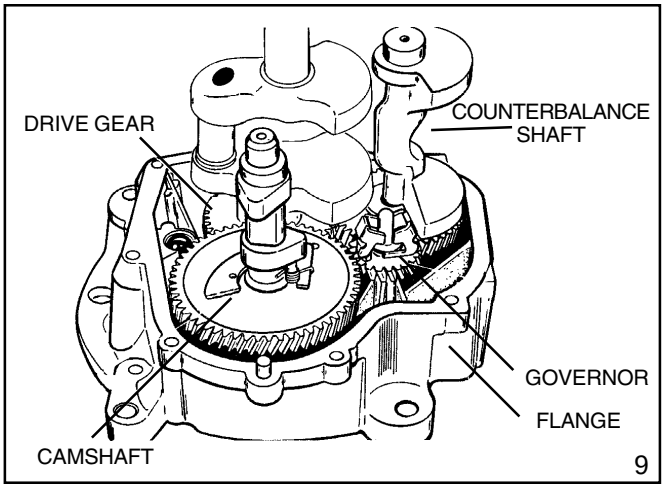
7



8

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).



9

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.

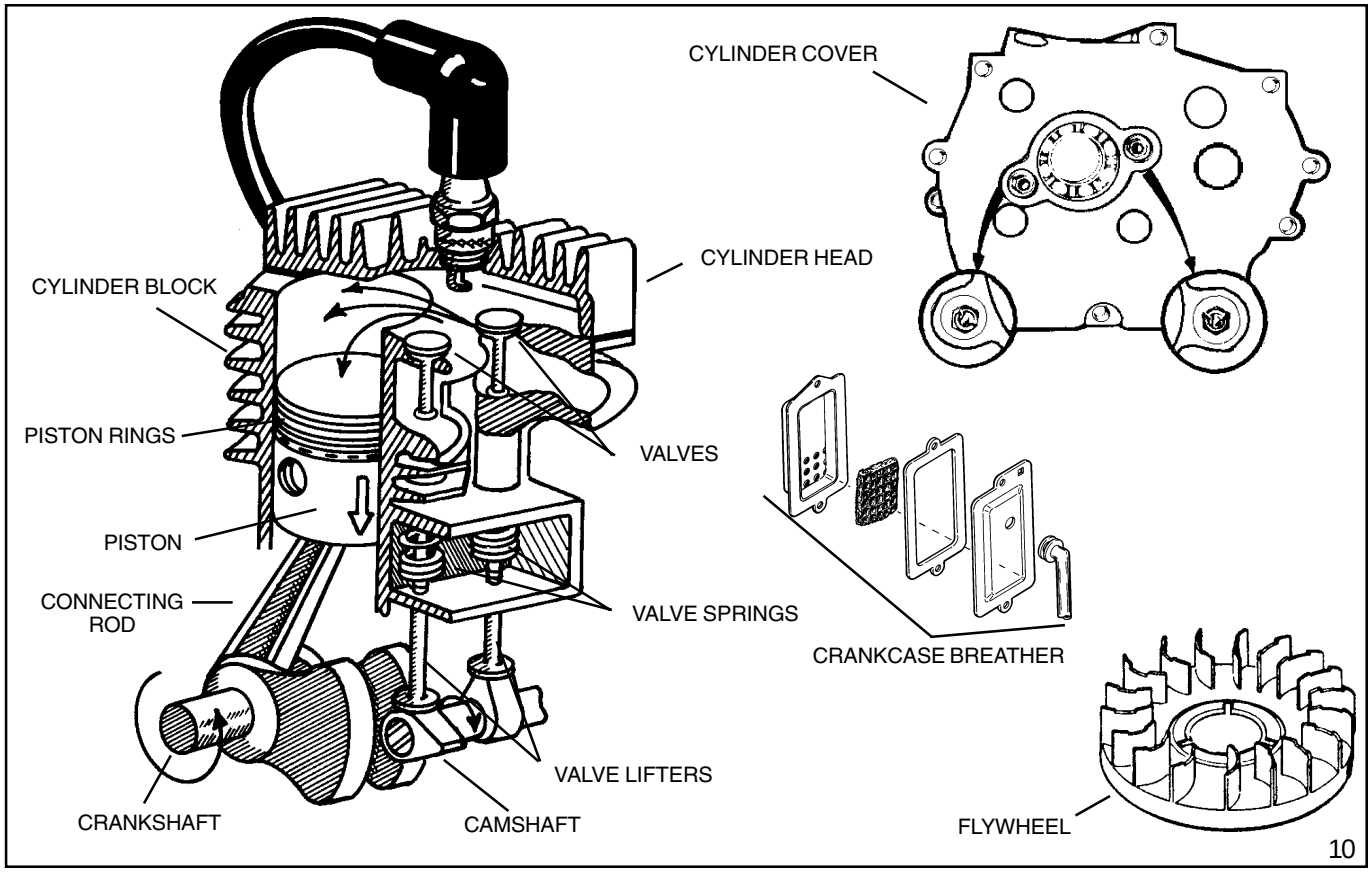
The **valve lifters** maintain contact on the camshaft and push the valves open.

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.

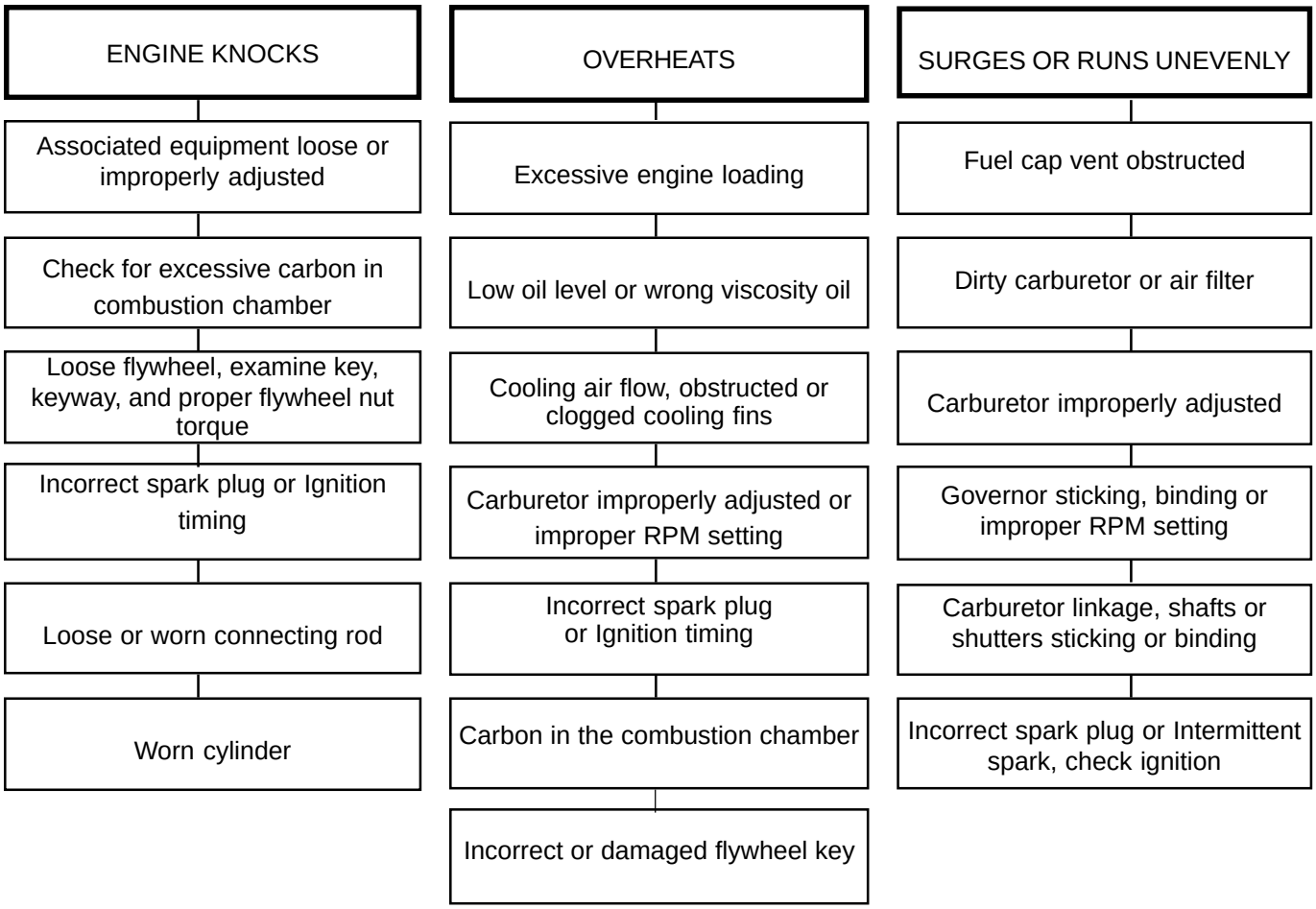
The **oil pump** (vertical shaft only) consists of a steel plunger and a nylon housing that rides on the camshaft eccentric.

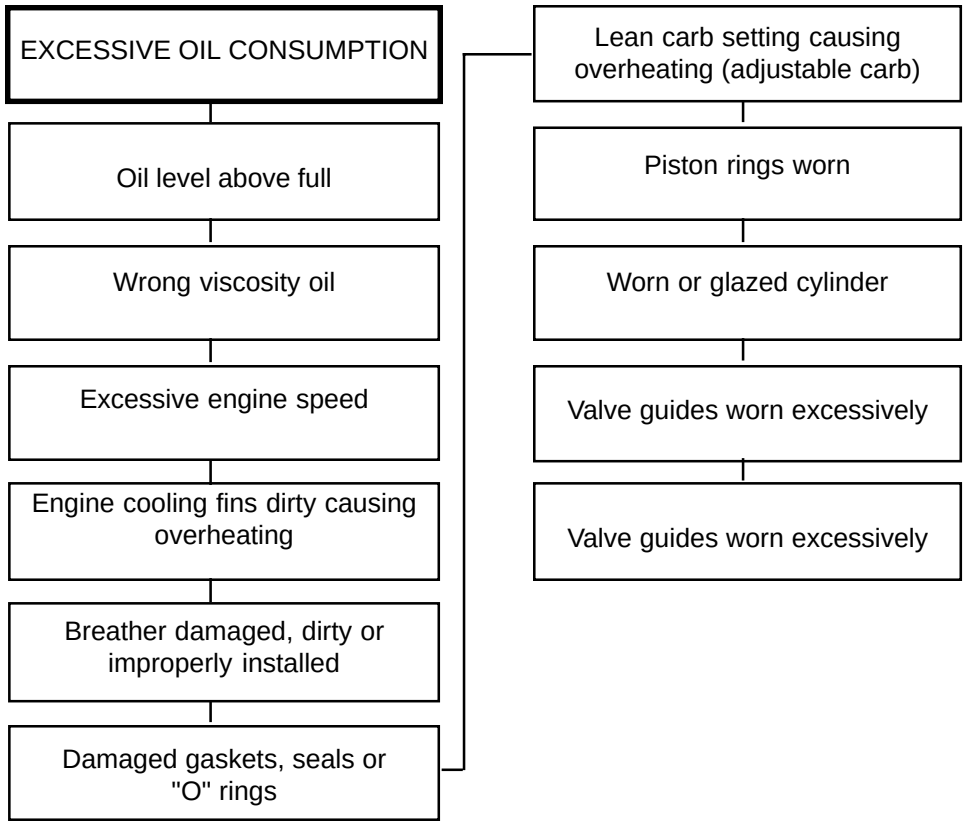
The **flywheel** provides the mass to smooth the effects of one power stroke every other crankshaft revolution. Flywheels are made of aluminum alloy or cast iron. The flywheel fins act as a fan to cool the engine.



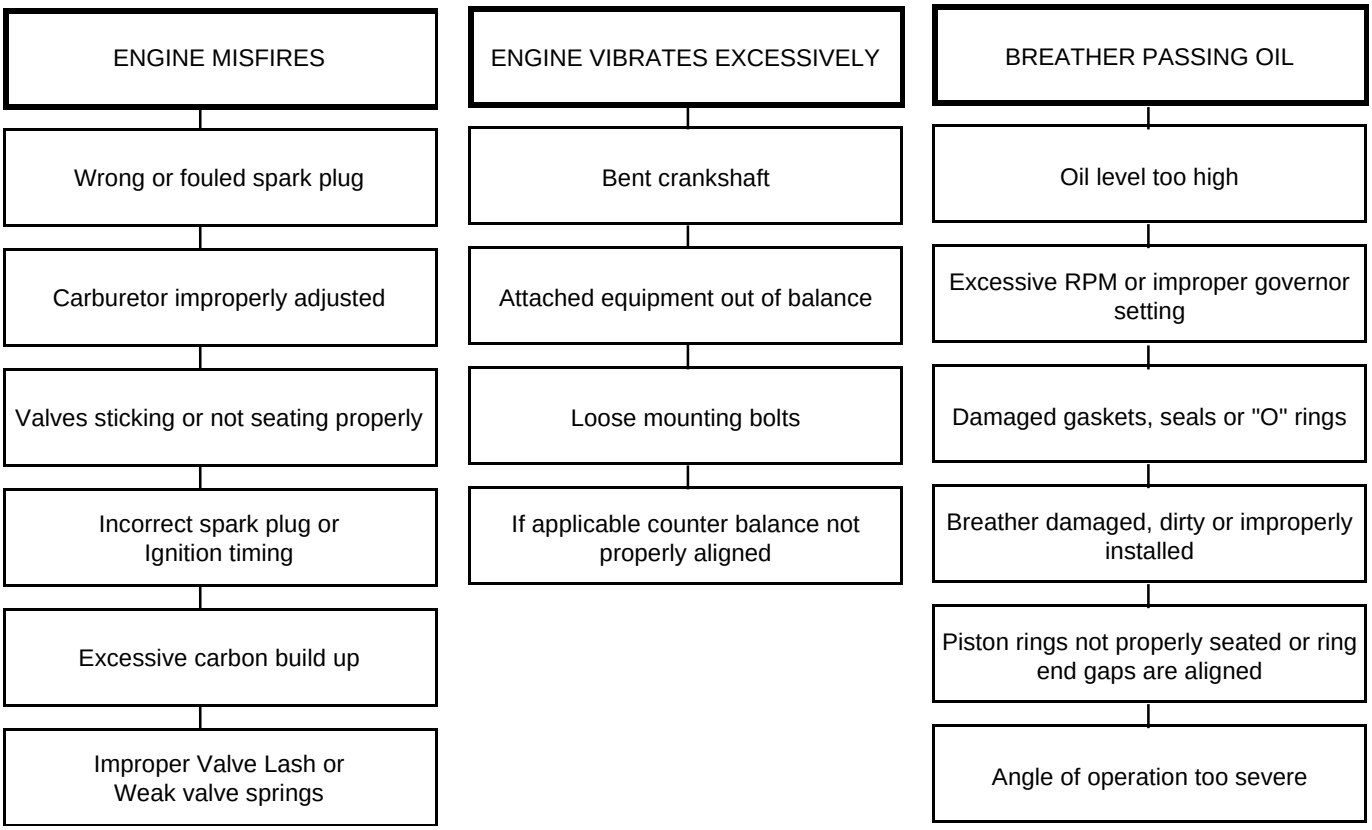
10

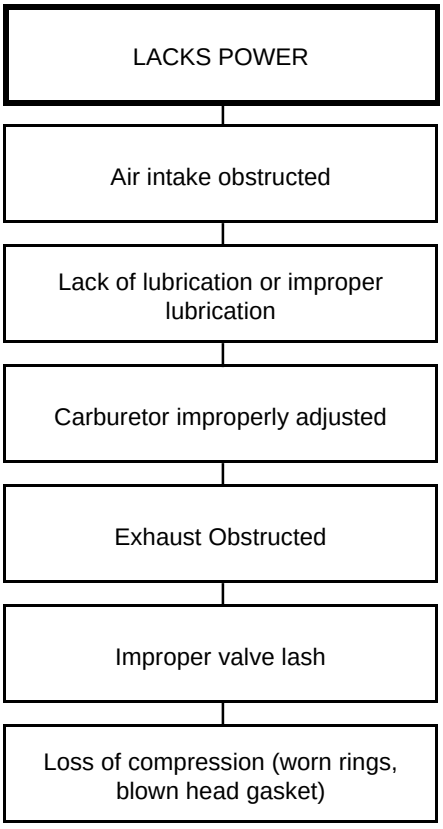
ENGINE OPERATION PROBLEMS





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 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.

(continued on top of next page)

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

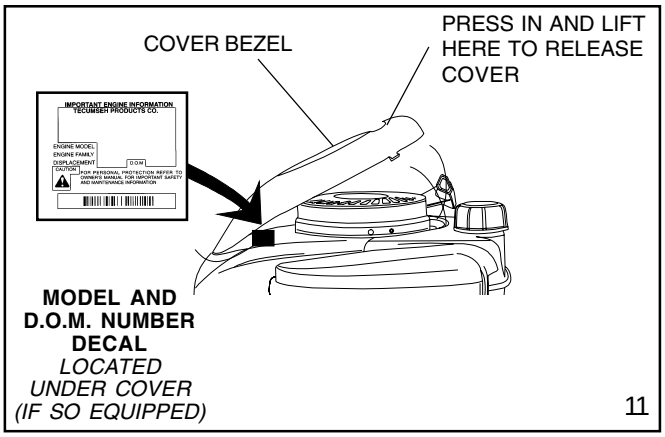
The following procedures apply to most engine models. Actual procedure may vary.

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.

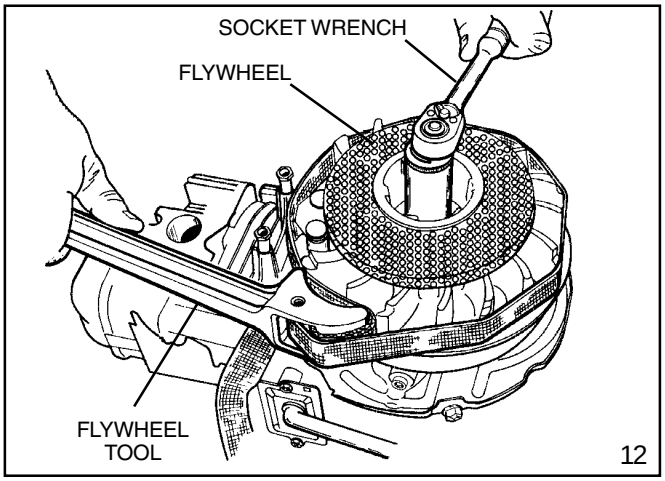
   On some LEV engine models, removal of the bezel cover is necessary to view the engine identification or to provide access to the recoil assembly screws. Push in toward the spark plug end (as shown), lift up to clear the recoil, then pull the cover away from the spark plug to remove. (diag. 11)
5. Remove 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.

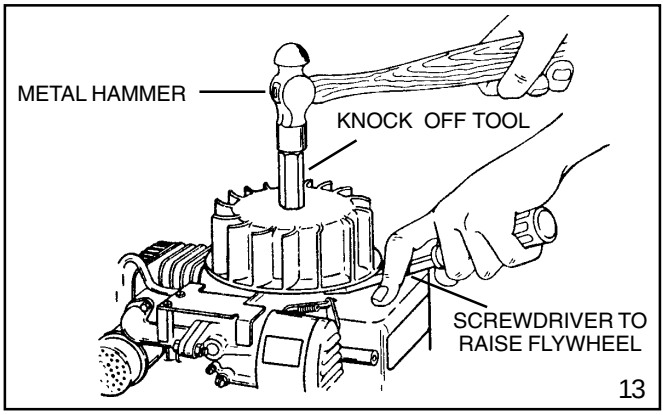
8. Remove the flywheel key, stator, and baffle plate.
9. Remove the muffler.
10. Remove the intake pipe and the carburetor. Be careful not to bend or damage the linkage when removing. Mark the hookup points or diagram the linkage arrangement to aid in reassembly.
11. Remove the cylinder head.
12. Remove the crankcase breather.



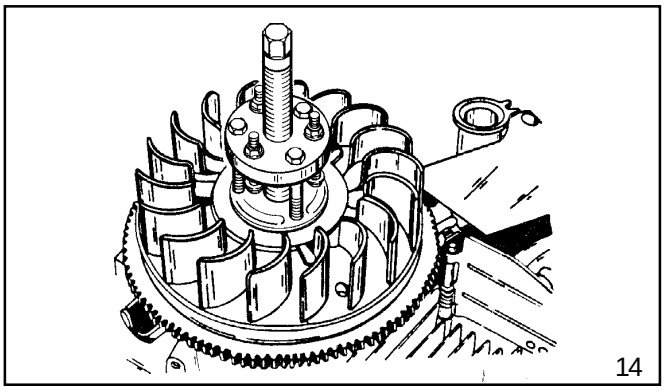
11



12

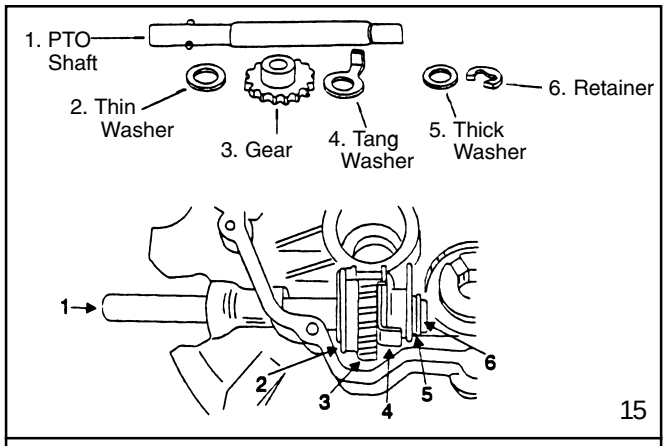


13

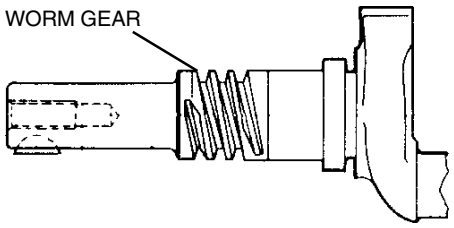

14

(continued on top of next page)

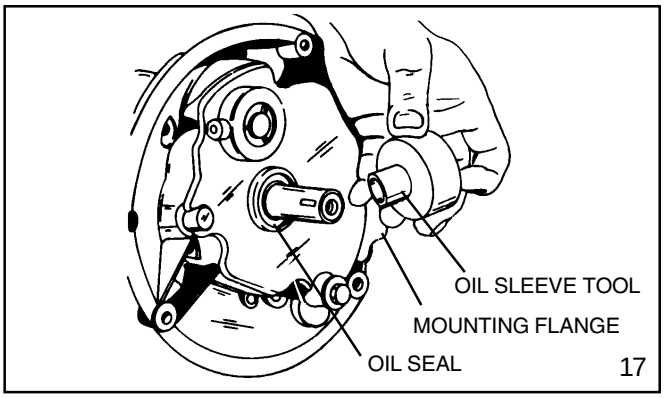
13. Remove the cylinder cover or mounting flange using a seal protector positioned in the seal to prevent seal damage. The crankshaft must be free of rust or scale to slide the cover off the crankshaft. H30-HS50 horizontal crankshaft engines with ball bearings on the crankshaft require the oil seal and 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).



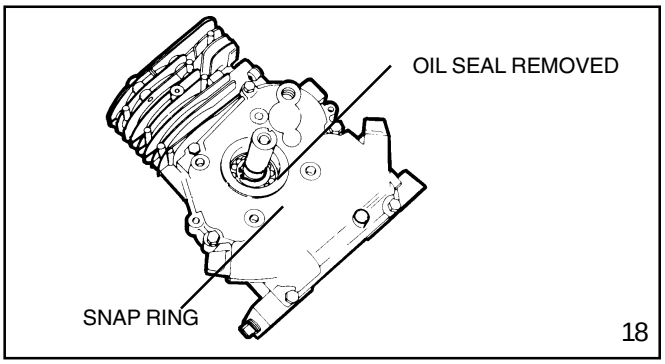
15



16

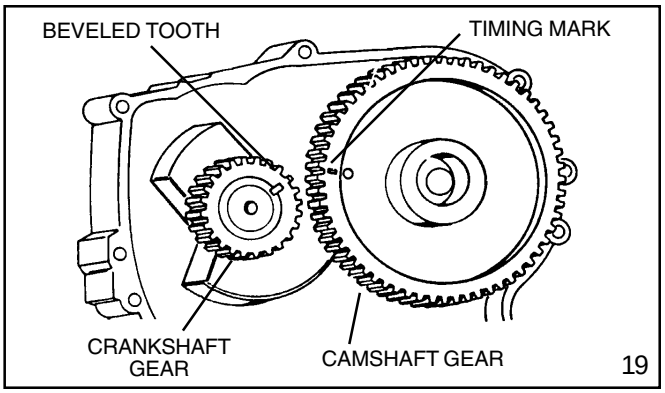


17



18

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).

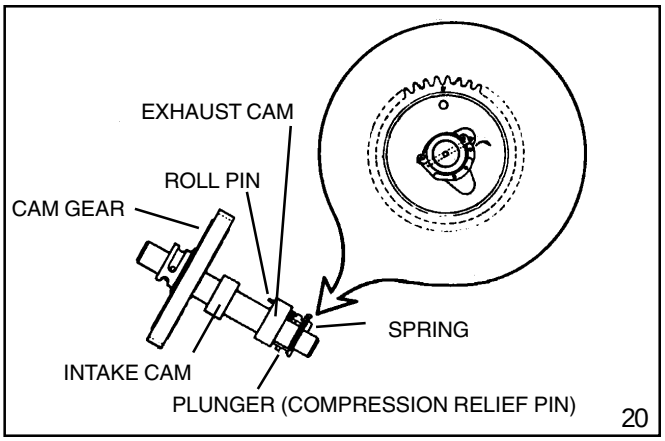


19

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.



20

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.

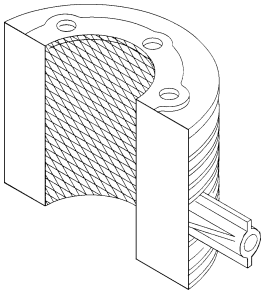
Check the bore diameter every twenty or thirty strokes for size and a 35° - 45° crosshatch pattern. If the stones collect metal, clean the stones with a wire brush when the hone is removed. (diag. 21).

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.

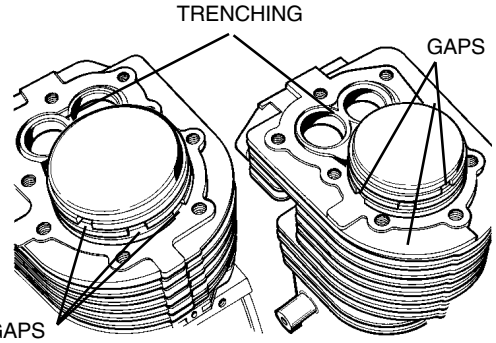
Clean the cylinder and crankcase with soap and water and dry thoroughly.

Replace the piston and the piston rings with the correct oversize parts as indicated in the parts manual.

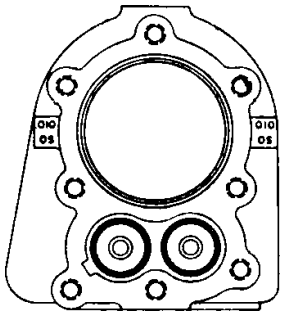
Trenching has been incorporated in the cylinders of the H50, H60, HHM80, and HM100 series of engines, as well as the TVM125,140, and 220 models. Trenching improves air/fuel flow and results in increased horsepower in these engines. When reinstalling the piston, rings, and rod assembly in these engines, 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).



21



STAGGER RING END GAPS AWAY FROM TRENCHING 22



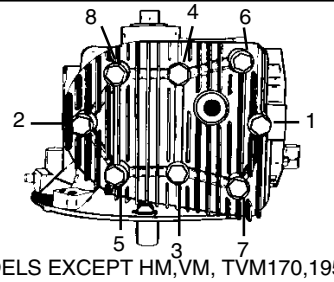
23

CYLINDER HEADS

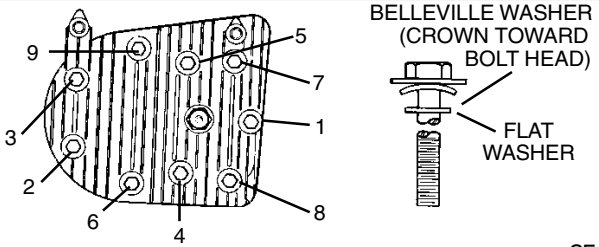
Check the cylinder head for warpage by placing the head on a precision flat surface. If warped in excess of .005" (.13 mm) replace the head. Slight warpage can be corrected by placing a sheet of #400 wet /dry sandpaper on a precision flat surface and rubbing the head gasket surface in a circular pattern 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



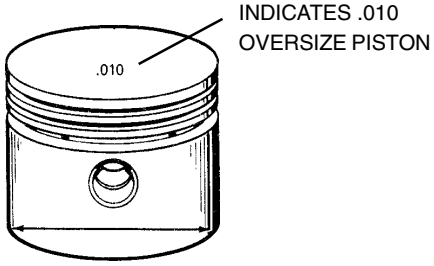
TVM170,195,220,VM & HM MODEL ENGINES 25

PISTONS, RINGS, AND CONNECTING RODS

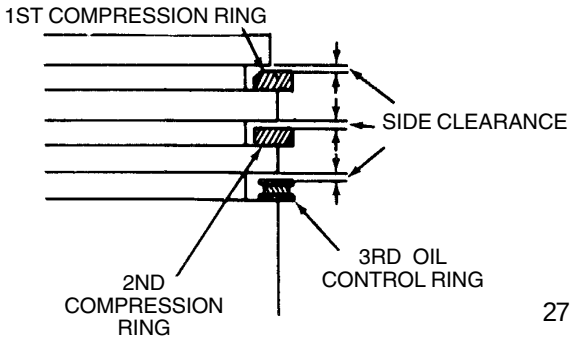
Piston

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

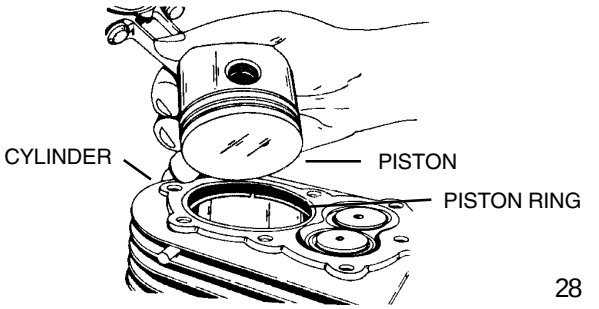


27

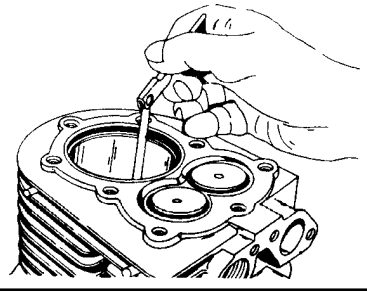
Rings

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.



28


29

(continued on top of next page)

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.

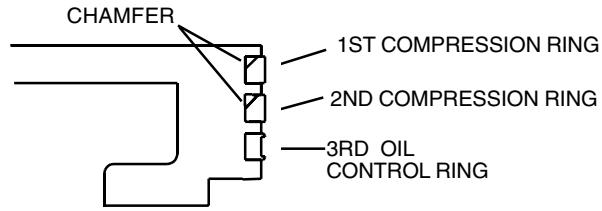
These rings conform better to the cylinder allowing for better oil control by wiping the cylinder wall cleaner. The coiled expander ring helps create a more uniform load on the cylinder wall which gives a more consistent distribution of oil. NOTE: The use of these rings on a standard non-emission piston will cause ring breakage due to its wider ring grooves.

Connecting Rods

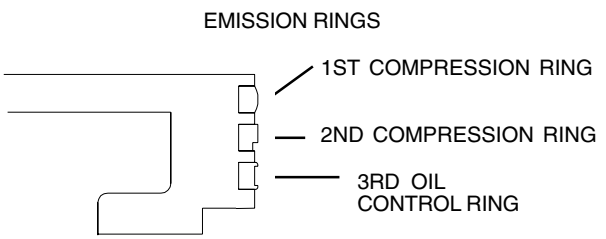
Some engine models have offset piston pins (not centered) to centralize the combustion force on the piston. Engine models LAV50, HM70, HM80, HHM80, HM100, TVM170,195, 220, have offset pistons. When installing the connecting rod to the piston it is imperative that the rod be installed correctly. The piston 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).

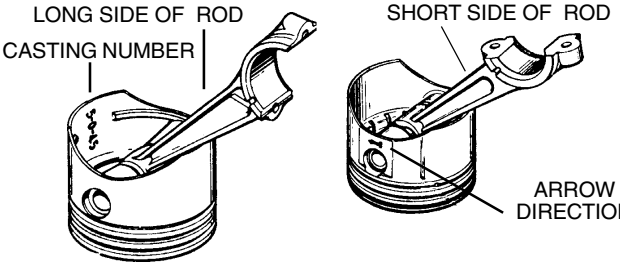
On horizontal shaft engines, oil dippers are attached to the bottom connecting rod bolt. Some engines have the oil dipper cast in the rod cap. Consult the specification chart for the proper rod bolt torque when installing the cap. The rod bolts should be torqued in 50 inch pound (5.5 Nm) increments until the specified torque is achieved.



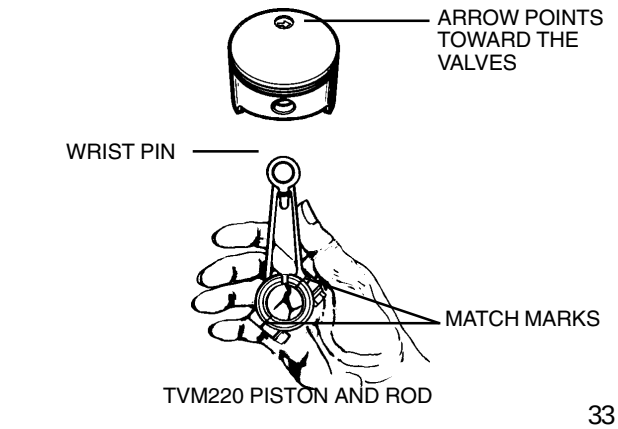
30



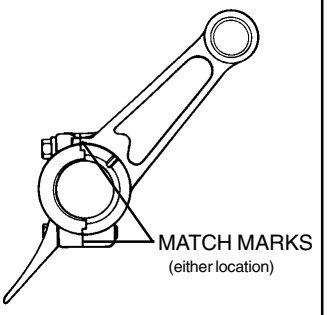
31



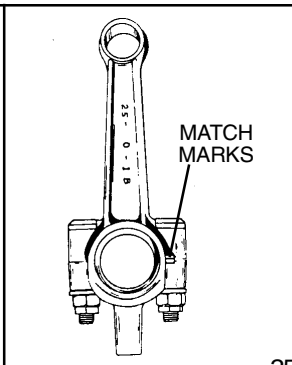
VM70, VM100, HM70-100, V80, H80, HHM80, AND TVM SERIES PISTON AND CONNECTING ROD ASSEMBLIES
32



TVM220 PISTON AND ROD
33



34



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).

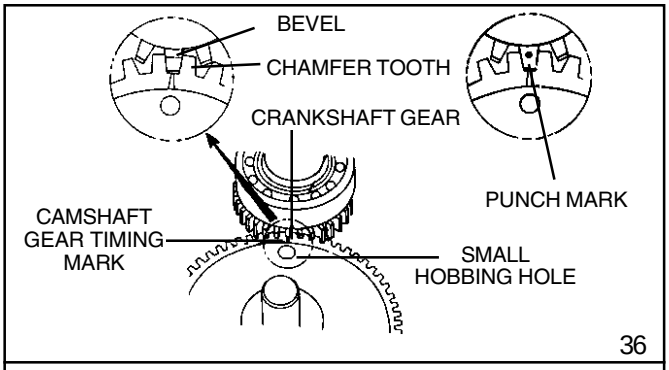
Some engines are equipped with Bump Compression Release (BCR) camshafts that have a small bump ground on the exhaust lobe of the camshaft to relieve compression (diag. 39).

Newer camshafts are designated as Ramp Compression Release (RCR) and utilize a less aggressive ramp than what is used on the BCR camshaft.

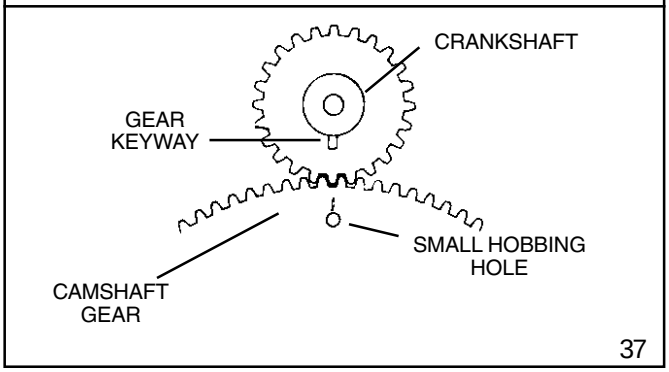
LEV Exhaust Mechanical Compression Release (MCR) Cam Bushing Service (Used in production October 1999)

Removal

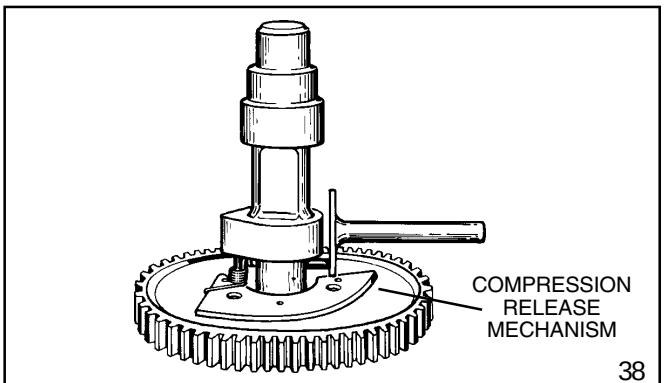
1. Place an LEV cylinder in a soft jawed vice and using a nonmetallic mallet, tap a #6 easy-out into the bushing so the easy-out makes a solid contact with the cam bushing.
2. Turn counterclockwise until the easy-out goes into the bushing a sufficient amount so that the bushing can be removed without 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.



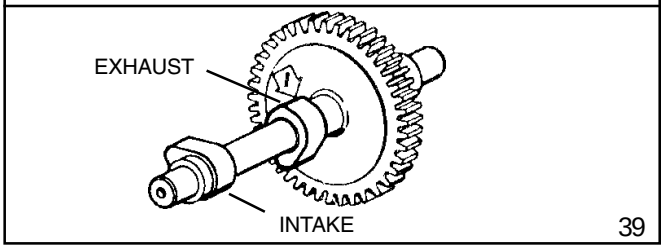
36



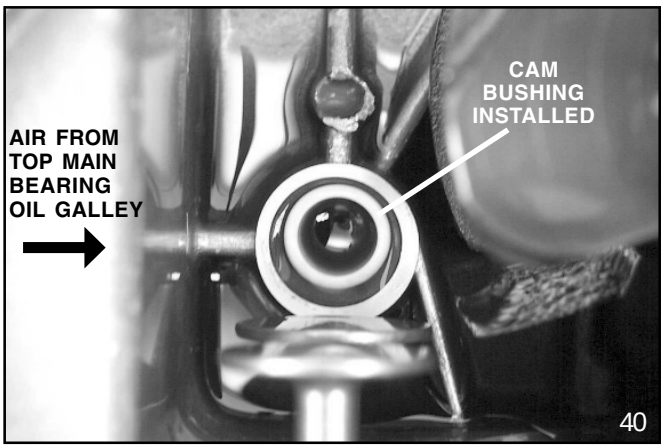
37



38



39



40

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.

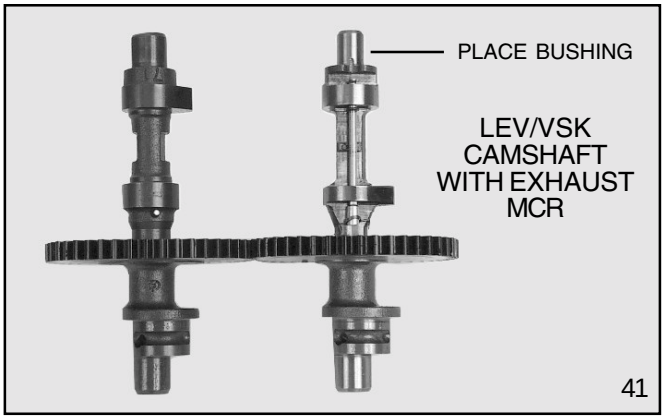
To reinstall the valves, position the valve caps and springs in the valve compartment. If the spring has dampening coils, the valve spring should be installed with the dampening coils away from the valve cap and retainer (diag. 44).

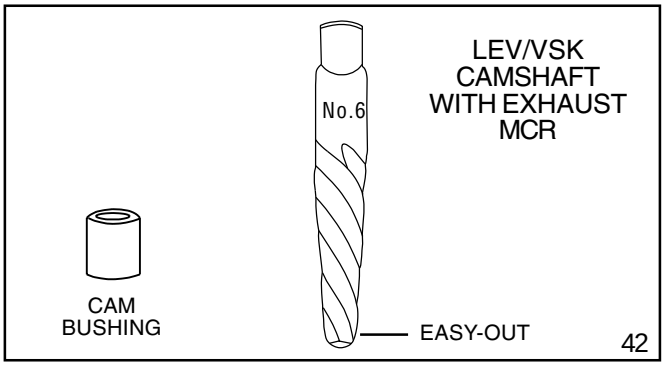
Install the valves into the guides making sure the correct valve is in the proper port. The valve stem must pass through the upper valve cap and spring. Hook the valve spring retainer on the groove in the valve stem and release the spring tension to lock the cap in place. Early models may have a pin 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.

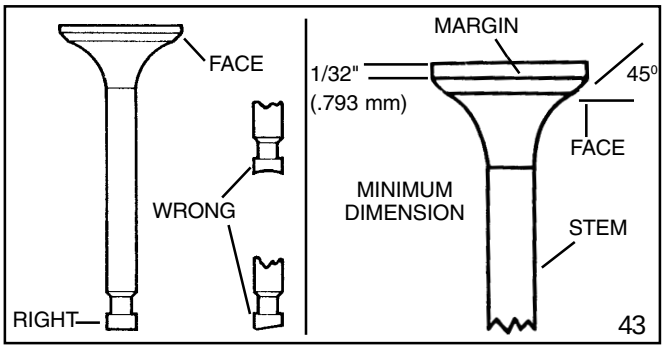
Emissionized engines have a valve stem seal on the intake valve which prevents excess oil vapor from entering the combustion chamber. This vapor would produce an unsatisfactory exhaust emission and fail today's CARB and EPA emission standards.

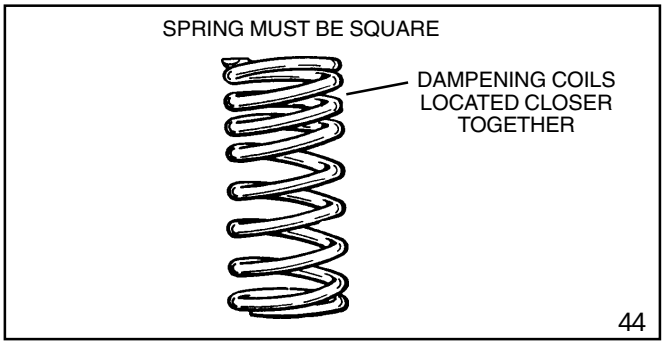
Tecumseh's position on emissionized engines is that oversized valves are not necessary. The emissionized valve with the valve stem seal should last the life of the engine. Therefore, seals for oversized valves do not exist for our small frame engines. Replacement of this seal is necessary if valves have been removed for service.

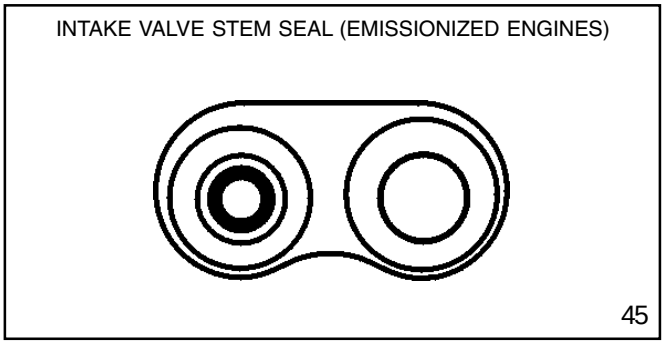
NOTE: If the spring has dampening coils, they always go toward the stationary surface.











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.

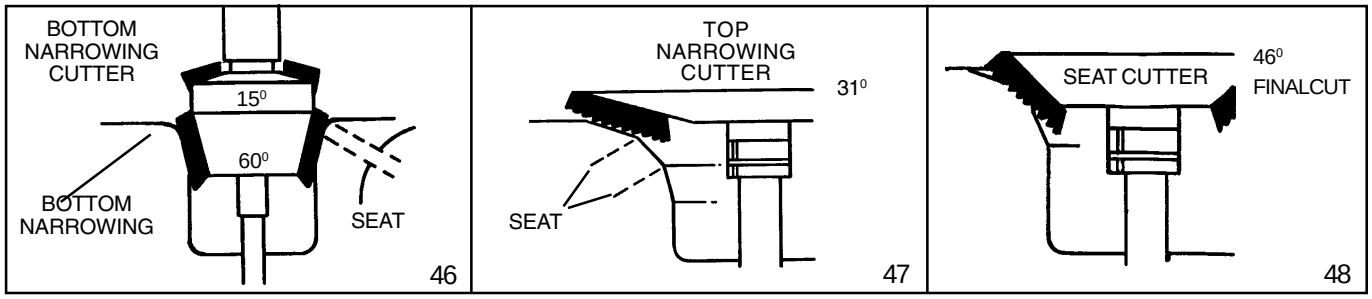
The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different cutters. LEV engines have a small combustion chamber and require the use of a special Neway cutter #103 for the 46 and 31 degree combination cutter. The 60 degree cutter 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.

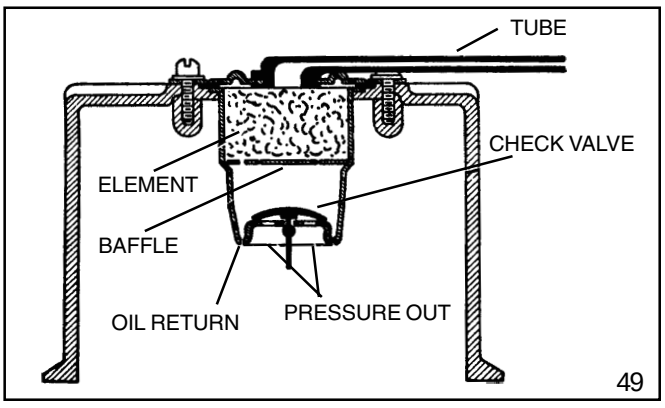
The guides should be reamed oversize with a straight shanked hand reamer or low speed drill press. Refer to the "Table of Specifications" (Chapter 10) to determine the correct oversize dimension. Reamers are available through your local Tecumseh parts supplier. Consult the tool section in Chapter 11 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.

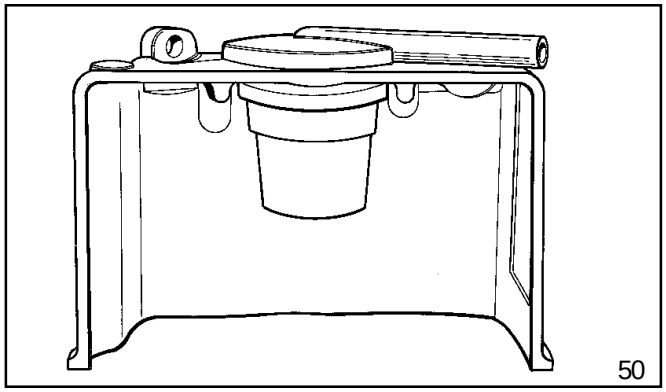


Top Mounted Breather

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).

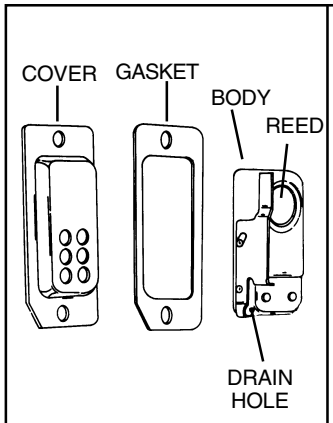
A new breather tube boot is recommended for replacement to assure proper crankcase seal. Apply engine oil to the breather tube boot and push the breather in until the top shoulder of the boot contacts the crankcase.


50

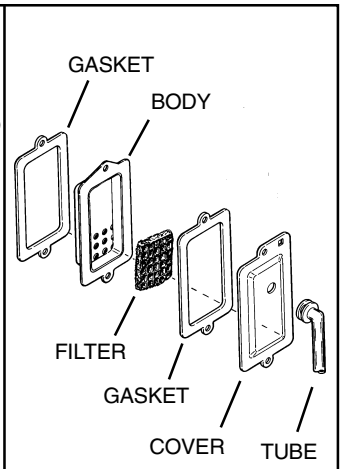
Side Mounted Breather

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).



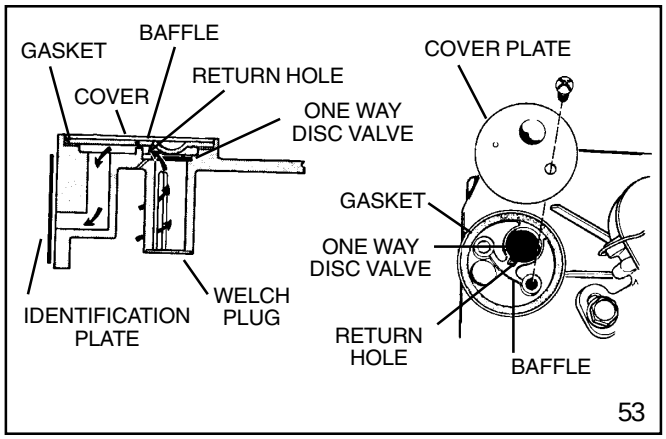
51



52

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).



53

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)

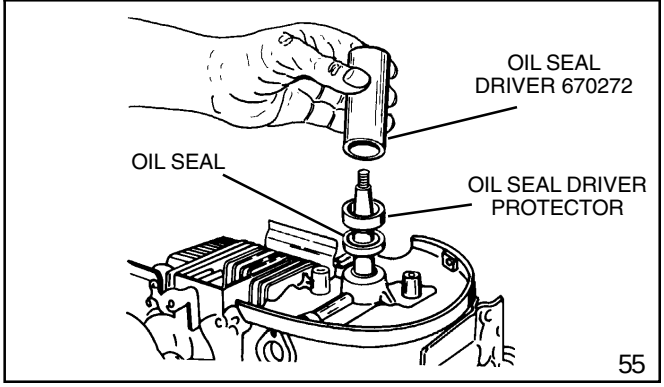
To remove the ball bearing from the cylinder cover, the bearing locks will have to be rotated out of the way. First loosen the locking nuts with a socket. Turn the retainer bolts counterclockwise to the unlocked position with a needle nose pliers (diag. 56). The flat side of the retainer will face away 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).

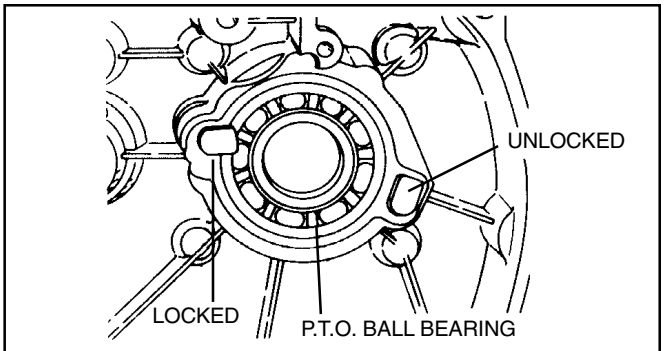
To remove a ball bearing from the crankshaft, use a bearing splitter and a puller (diag. 58).

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.

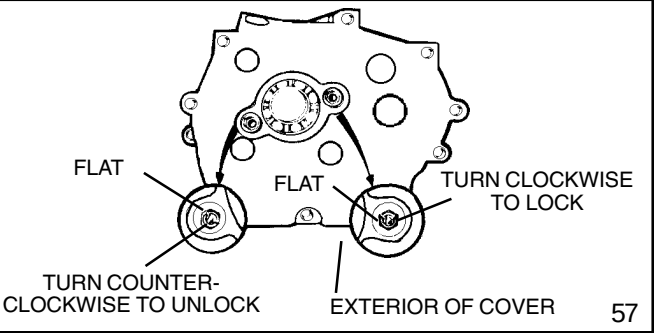
54



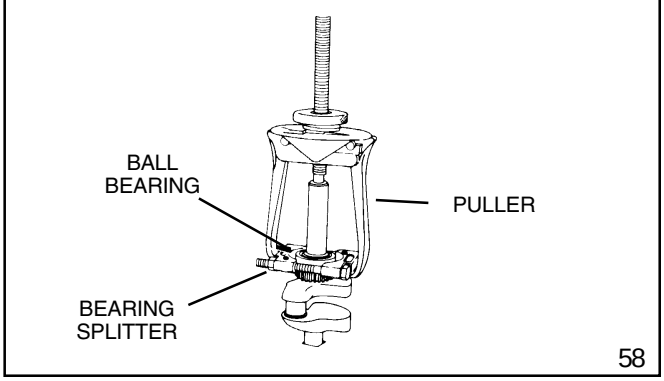
55



56



57

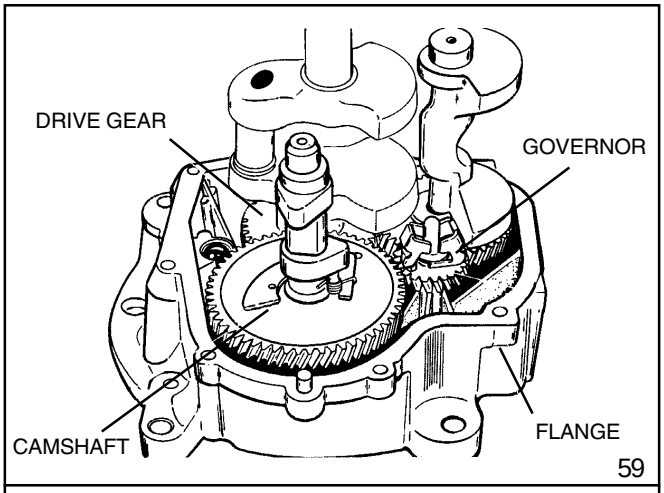


58

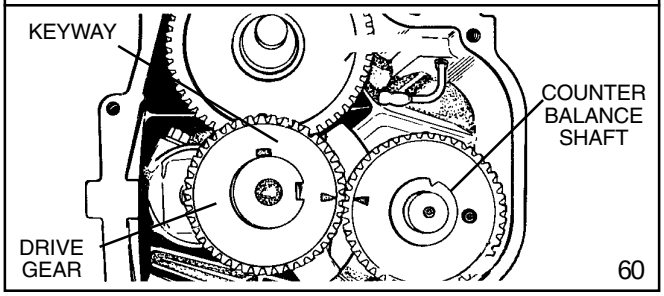
COUNTERBALANCE SERVICE

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).



59



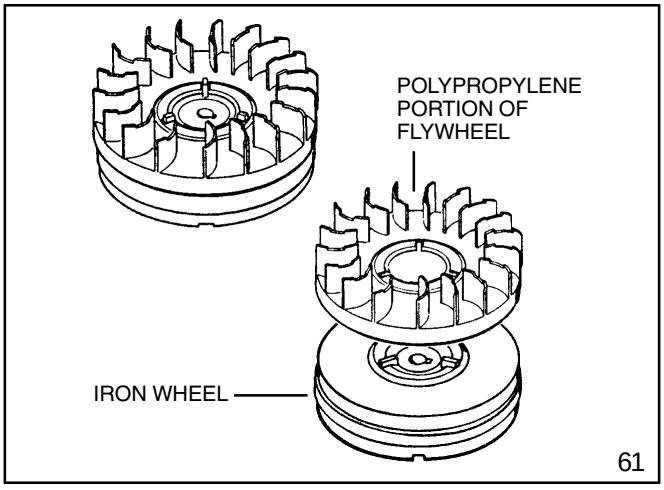
60

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.



61

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.

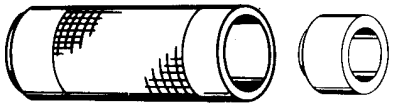
SPECIAL TOOLS BOOKLET
694862
This booklet depicts all specialty tools offered by Tecumseh which can be used on 2 and 4 cycle engines and Peerless units.

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.)

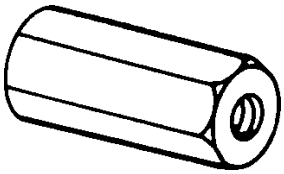
OIL SEAL DRIVER



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



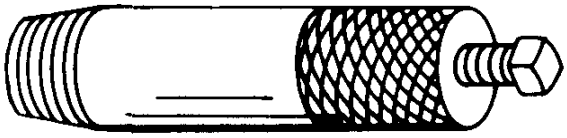
No. 670103 - Knock-off tool (right hand) (7/16").

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

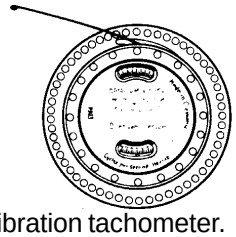
No. 670289. 13/16" Crankshaft bearing diameters

No. 670290. 1" Crankshaft bearing diameters

No. 670312. 1-3/8" Crankshaft bearing diameters

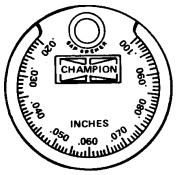
No. 670331. 1-1/2" Crankshaft bearing diameters

VIBRATION TACHOMETER



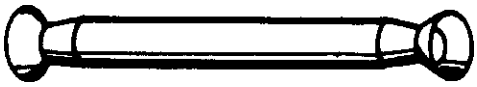
No. 670156 Vibration tachometer.

TAPER GAP GAUGE



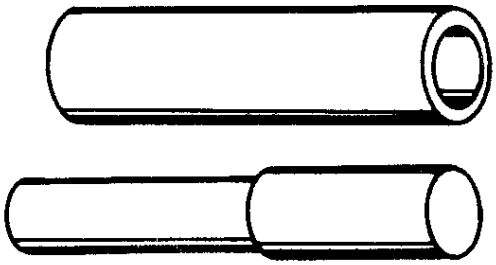
No. 670256 Taper Gap Gauge

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

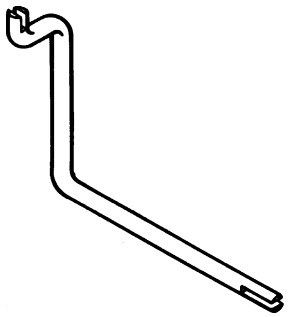
No. 670298 Alignment Tool.

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

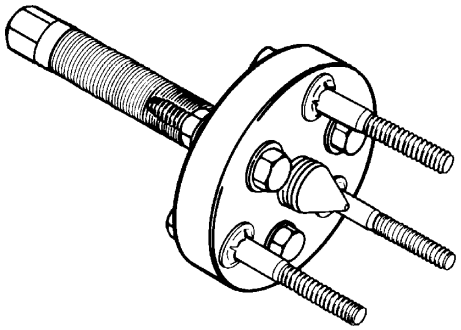
No. 670284. Used on medium and large frame 4 cycle engines on Intake and Exhaust. Oversize diameter .3432 .3442

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

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

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

SEARS CRAFTSMAN CROSS REFERENCE CHARTS

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
143.965502	TVS120-63920M
143.965504	TVS115-62901A
143.965506	LEV115-355002A
143.965508	TVS115-62902A
143.966001	H60-75469V
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