

# TECUMSEH

TECHNICIAN'S HANDBOOK

This handbook covers VLV40 - 675.

Other illustrated Tecumseh 2 and 4-Cycle Engine and Transmission handbooks, booklets and wall charts are available from Tecumseh.

For complete listing write, call or check our website at [www.TecumsehPower.com](http://www.TecumsehPower.com)

## VLV (Vector) 4-CYCLE ENGINES



ENGINES & TRANSMISSIONS

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ENGINES & TRANSMISSIONS

## IMPORTANT NOTICE! SAFETY DEFINITIONS

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



or



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

### NOTE

*Refers to important information and is placed in italic type.*

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

Before operating this engine *it is your responsibility* to read this Operator's Manual. Follow these basic rules for your personal safety:

- Keep this manual handy at all times for future reference.
- Read it carefully and familiarize yourself with operating, maintenance, components and safety instructions

## Notice Regarding Emissions

### NOTE

*Engines which are certified to comply with California and U.S. EPA emission regulations for SORE (Small Off Road Equipment), are certified to operate on regular unleaded gasoline, and include the following emission control systems: (EM) Engine Modification and (TWC) Three-way Catalyst (if so equipped).*

## Tecumseh Website

Visit the Tecumseh website at:  
[www.TecumsehPower.com](http://www.TecumsehPower.com)

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## I. General Safety Precautions



### WARNING

Read equipment manufacturer's manual and this material thoroughly before using this engine. Failure to do so can result in serious injury or death. Call Tecumseh Products Company at 1-800-558-5402 if you have any questions.

### A. Avoid Carbon Monoxide Poisoning

All engine exhaust contains carbon monoxide, a deadly gas. Breathing carbon monoxide can cause headaches, dizziness, drowsiness, nausea, confusion and eventually death.



Carbon monoxide is a colorless, odorless, tasteless gas which may be present even if you do not see or smell any engine exhaust. Deadly levels of carbon monoxide can collect rapidly and you can quickly be overcome and unable to save yourself. Also, deadly levels of carbon monoxide can linger for hours or days in enclosed or poorly-ventilated areas. If you experience any symptoms of carbon monoxide poisoning, leave the area immediately, get fresh air, and SEEK MEDICAL TREATMENT.

To prevent serious injury or death from carbon monoxide:

- NEVER run engine indoors. Even if you try to ventilate engine exhaust with fans or open windows and doors, carbon monoxide can rapidly reach dangerous levels.
- NEVER run engine in poorly-ventilated or partially enclosed areas such as barns, garages, basements, carports, under dwellings, or in pits.
- NEVER run engine outdoors where engine exhaust can be drawn into a building through openings such as windows and doors.

### B. Avoid Gasoline Fires

Gasoline (fuel) vapors are highly flammable and can explode. Fuel vapors can spread and be ignited by a spark or flame many feet away from engine. To prevent injury or death from fuel fires, follow these instructions:



- NEVER store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.
- NEVER remove fuel cap or add fuel when engine is running.
- Allow engine to cool before refueling.
- NEVER fill fuel tank indoors. Fill fuel tank outdoors in a well-ventilated area.
- DO NOT smoke while refueling tank.
- Use only an approved red GASOLINE container to store and dispense fuel.
- DO NOT attempt to pour fuel from engine. Empty fuel tank by running engine.

### C. Transporting Engine

DO NOT transport engine with fuel in tank. Fuel vapor or spilled fuel may ignite.

### D. Avoid Other Fires

To reduce the risk of fire, keep all materials that can burn, including grass and leaves, away from muffler and the rest of the engine.

### E. Stay Away from Hot Surfaces

The muffler and other engine parts become extremely hot during operation and remain hot after the engine has stopped. To avoid severe burns on contact, stay away from these areas.



### F. Do Not Modify Engine

To avoid serious injury or death, DO NOT modify engine in any way. NEVER tamper with the factory setting of engine governor. Running the engine faster than the speed set at the factory can be dangerous and will VOID THE ENGINE WARRANTY.

### G. Avoid Accidental Starts

To prevent accidental starting when working on equipment, always disconnect spark plug wire and keep it away from spark plug.

### H. Stay Away from Rotating Parts

Never operate engine with covers or guards removed. Rotating parts can cause severe injury. Keep hands, feet, hair, jewelry and clothing away from all moving parts.



For Discount Tecumseh Engine Parts Call 606-678-9623 or 606-561-4983

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## Chapter 1 General Information

### Engine Identification

Tecumseh engine model, specification and serial numbers are stamped or on a decal on the blower housing. The decal also contains any emission compliance information.

The letters which precede the model numbers indicate the basic type of engine:

VLV - Vector Lightweight Vertical

### Prior to 1999

The numbers which followed the engine type letters indicated the basic engine horsepower:

40 - 4.0 Horsepower

50 - 5.0 Horsepower

The current designation indicates cubic inch displacement

126 - 12.6 cubic inches

Following the engine model numbers are the engine specifications numbers.

The specification number is used when identifying engine parts. Example 502012A.

The serial or D.O.M. Number is the production date code.

2039 - serial number (example)

2 - Year in decade of manufacture (2002)

39 - The last 3 digits of date code represent the calendar (the 39th day of 2002)

D - represents the shift and line on which the engine was built at the factory.

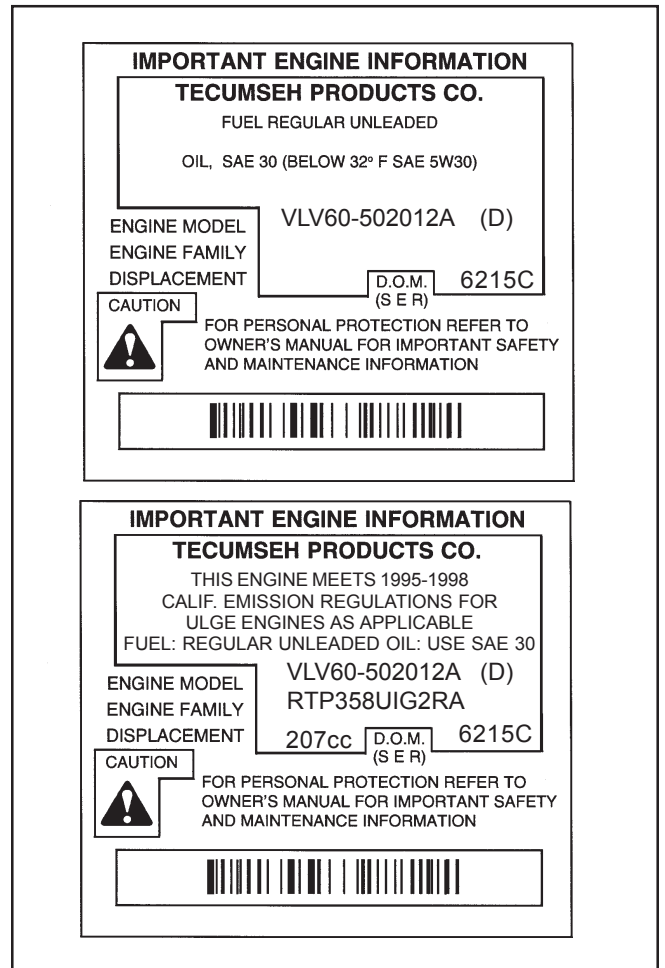
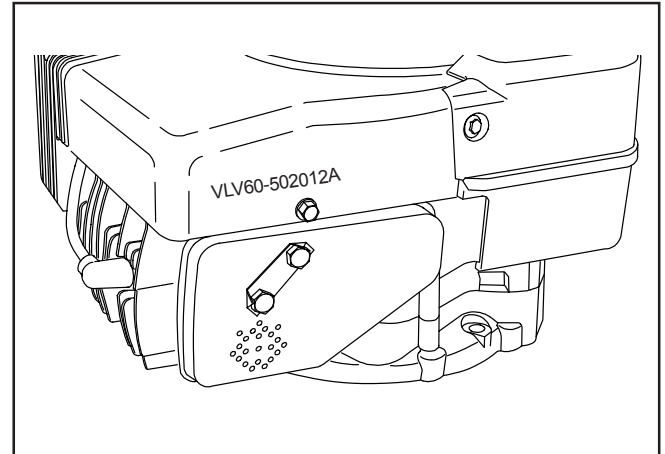
Emitted engines that meet the California Air Resource Board (C.A.R.B.) or the Environmental Protection Agency (E.P.A.) Standards will include additional required engine information on the engine decal.

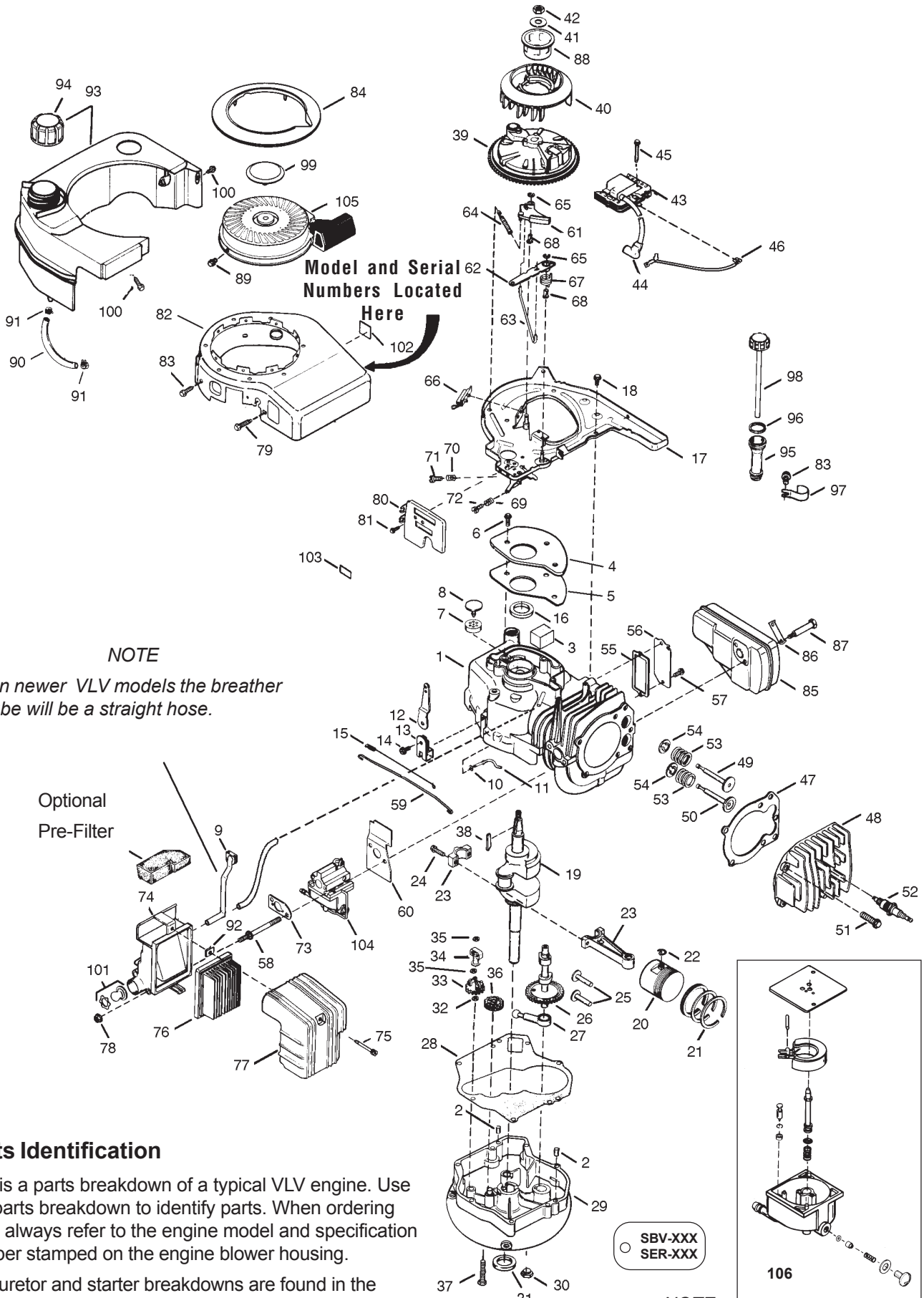
#### NOTE

*To maintain best possible emission performance, use only Genuine Tecumseh Parts.*

### Short Blocks

New short blocks are identified by a tag marked SBH (Short Block Horizontal) or SBV (Short Block Vertical). These tags are used to properly identify the correct parts if service is required. They are attached to either the sump bolts or valve box cover.





**Model and Serial Numbers Located Here**

**NOTE**

On newer VLV models the breather tube will be a straight hose.

Optional Pre-Filter

**Parts Identification**

This is a parts breakdown of a typical VLV engine. Use this parts breakdown to identify parts. When ordering parts always refer to the engine model and specification number stamped on the engine blower housing.

Carburetor and starter breakdowns are found in the chapters referring to their repair.

SBV-XXX  
SER-XXX

**NOTE**

If the short block has been replaced, an identification tag for service parts is located on the valve box cover.



Ref. No.	Part Name	Ref. No.	Part Name
1	Cylinder Ass'y.	54	Cap, Valve spring
2	Pin, Dowel	55	Gasket, Valve cover
3	Element, Breather	56	Cover, Valve spring box
4	Cover, Breather	57	Screw, 10-24 x 1/2
5	Gasket, Breather cover	58	Stud, Carburetor mounting
6	Screw, Thread forming, 10-24 x 1/2	59	Link, Governor
7	Body, Breather valve	60	Spacer, Carburetor mounting gasket
8	Valve, Breather check	61	Lever Ass'y., Brake
9	Breather, Tube	62	Lever, Brake control
10	Washer, Flat	63	Link, Brake control lever
11	Rod, Governor	64	Spring, Brake
12	Lever, Governor	65	Ring, Retaining
13	Clamp, Governor lever	66	Terminal
14	Screw, 8-32 x 5/16	67	Spring, Brake control lever
15	Spring, Governor extension	68	Bushing, Brake control lever & brake lever
16	Seal, Oil	69	Spring, Compression
17	Baffle, Blower housing (Incl. No. 195)	70	Spring, Compression
18	Screw, 1/4-20 x 5/8	71	Screw, 5-40 x 7/16
19	Crankshaft Ass'y.	72	Screw, 6-32 x 21/32
20	Piston & Pin Ass'y.	73	Gasket, Carburetor to air cleaner
21	Ring Set, Piston	74	Body, Air cleaner (Incl. Nos. 239, 299 & 350)
22	Ring, Piston pin retaining	75	Screw, 10-32 x 2-3/32
23	Rod Ass'y., Connecting	76	Filter, Air cleaner (Paper)
24	Bolt, Connecting rod	77	Cover, Air cleaner
25	Lifter, Valve	78	Nut, Lock, 1/4-20
26	Camshaft Ass'y.	79	Screw, 1/4-20 x 11/16
27	Pump Ass'y., Oil	80	Plate, Control Ass'y., cover
28	Gasket, Mounting flange	81	Screw, 8-32 x 1/2
29	Flange, Mounting	82	Housing, Blower
30	Plug, Oil drain	83	Screw, 1/4-20 x 1/2
31	Seal, Oil	84	Ring, Starter
32	Washer, Flat	85	Muffler
33	Gear Ass'y., Governor	86	Plate, Muffler locking
34	Spool, Governor	87	Screw, 5/16-18 x 2-11/32
35	Ring, Retaining	88	Cup, Starter
36	Gear, Idler	89	Screw, 8-32 x 21/64
37	Screw, 1/4-20 x 1-9/16	90	Line, Fuel
38	Key, Flywheel	91	Clamp, Fuel line
39	Flywheel	92	Clip, "U" Type Nut, 10-32
40	Fan, Flywheel	93	Tank Ass'y., Fuel
41	Washer, Belleville	94	Cap, Fuel
42	Nut, Flywheel	95	Tube, Oil fill
43	Solid State Ass'y.	96	"O" Ring
44	Cover, Spark plug	97	Clip, Fill tube
45	Screw, 10-24 x 1	98	Dipstick, Oil
46	Wire Ass'y., Ground	99	Plug, Starter
47	Gasket, Cylinder head	100	Screw, 10-32 x 35/64
48	Head, Cylinder	101	Primer
49	Valve, Exhaust	102	Decal, Instruction
50	Valve, Intake	103	Decal, Primer
51	Screw, 5/16-18 x 1-1/2	104	Carburetor
52	Spark Plug (Champion RJ-17LM or equivalent)	105	Starter, Rewind
53	Spring, Valve	106	Carb Fix Kit

## Oil and Fuel Specifications

### Oil

To operate engine you need to use a clean, high quality, detergent oil. For recommended engine oil, See Table 1.

#### NOTES

Be sure original container is marked A.P.I. Service "SL/SJ".

Using multigrade oil above 32°F (0°C) will increase oil consumption. SAE10W40 is not recommended.

The oil sump capacity is 21 ounces or 1-1/4 U.S. Pints (.62 liters). Tecumseh special-formulated oils are available at your Authorized Tecumseh Servicing Dealer.

### Fuel

Use unleaded regular, unleaded premium or reformulated automotive fuel only. You may use gasoline containing the following components identified in Table 2.

- DO NOT use leaded fuel.
- Fuel must be fresh and clean. NEVER use fuel left over from last season or stored for long periods.
- NEVER mix oil with fuel.
- DO NOT use fuel containing Methanol (Wood Alcohol).

### Filling Fuel Tank

**⚠ WARNING** Gasoline (fuel) vapors are highly flammable and can explode. Fuel vapors can spread and be ignited by a spark or flame many feet away from engine. To prevent injury or death from fuel fires, follow these instructions:

1. Stop engine and allow it to cool before refueling.
2. Be sure engine is outdoors and in a well-ventilated area.
3. Clean area around fuel fill cap and remove fuel fill cap. See Figure 2.
4. Using an approved red GASOLINE container, add fuel slowly, being careful to avoid spilling. DO NOT overfill fuel tank. Leave space in the tank to allow fuel to expand without overflowing.
5. Replace fuel fill cap securely and wipe up spilled fuel before starting engine. If fuel is spilled DO NOT start engine. Move machine away from area of spillage. Avoid creating any source of ignition until fuel vapors are gone.

Oil Type	Temperature	Recommended Oil
Straight Grade	Above 32°F (0°C)	Tecumseh Part No. 730225A OR SAE30W
Multi Grade	0°F to 32°F (-18°C to 0°C)	Tecumseh Part No. 730226A OR SAE5W30 SAE10W
	Below 0°F (-18°C)	SAE 0W30

Fuel Component	Percentage
Ethanol	10%
Grain Alcohol ("Gasohol")	10%
MTBE (Methyl Tertiary Butyl Ether)	15%
ETBE (Ethyl Tertiary Butyl Ether)	15%

### Stopping the Engine and Short-Term Storage

Stop engine according to equipment manufacturer's instructions.

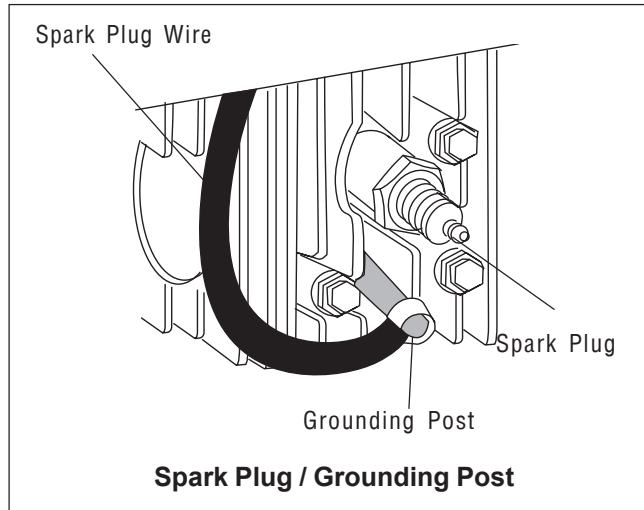
**⚠ WARNING** Never store the engine with fuel in the fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.



## Maintenance and Adjustments

**WARNING** To prevent accidental starting when working on equipment, always disconnect spark plug wire and keep it way from spark plug by attaching it securely to grounding post.

**WARNING** The muffler and other engine parts become extremely hot during operation and remain hot after the engine has stopped. To avoid severe burns on contact, stay away from these areas.



## Checking and Changing Oil

To avoid engine damage, it is important to:

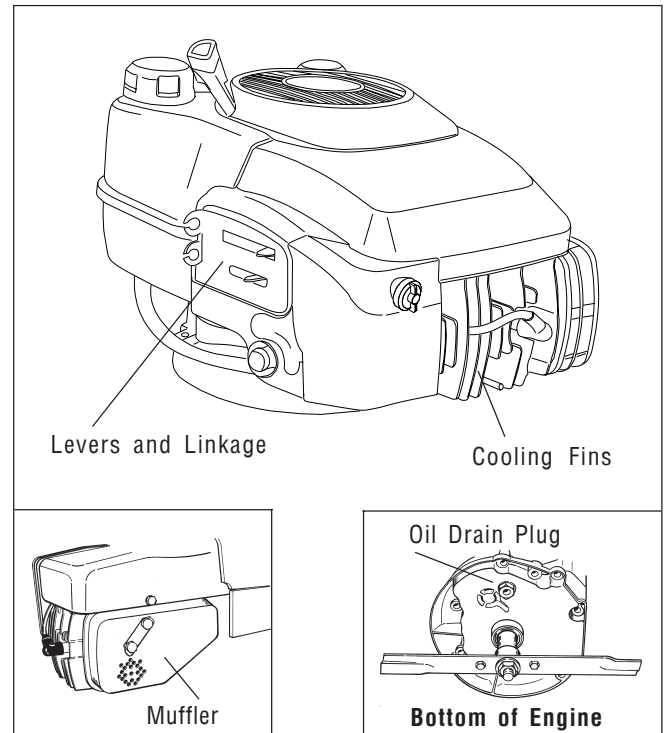
- Check oil level after every 5 operating hours when engine is warm and before each use.
  - Change oil after first 2 operating hours and every 25 operating hours thereafter; more often if operated in extremely dusty or dirty conditions. Engine should still be warm but not hot from recent use.
1. Be sure you find the correct drain plug location if present. (See equipment manufacturer's instructions).
  2. Disconnect spark plug wire and keep it away from spark plug by attaching it securely to grounding post.
  3. Make sure the gas cap is on and is tightened securely.
  4. Clean area around oil drain plug.
  5. Place approved recyclable oil container under oil drain plug, tipping engine to position the oil drain plug at the lowest point on the engine. (See equipment manufacturer's instructions).
  6. Remove oil drain plug and drain oil.
  7. Install oil drain plug and tighten securely.
  8. Fill with recommended oil. See Table 2.
  9. Wipe away any spilled oil.

## Removing Debris from Engine

Before each use, remove grass clippings, dirt and debris from the following areas:

- Cooling fins
- Air intake screen
- Levers
- Linkage

Removing debris will insure adequate cooling, correct engine speed and reduce the risk of fire.



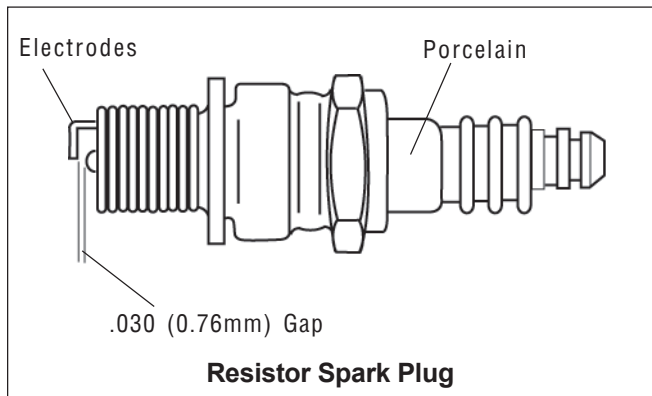
## Spark Plug

Check spark plug yearly or every 100 operating hours.

1. Clean area around spark plug.
2. Remove and inspect spark plug.
3. Replace spark plug if porcelain is cracked or if electrodes are:
  - Pitted
  - Burned
  - Fouled with deposits
4. Check electrode gap with wire feeler gauge and set gap to .030 (0.76mm) if necessary.
5. Install spark plug and tighten securely.

### NOTE

A resistor spark plug must be used for replacement (Tecumseh part no. 33636, or Champion part no. RJ-17LM).



Resistor Spark Plug

## Cleaning/Replacing Air Cleaner

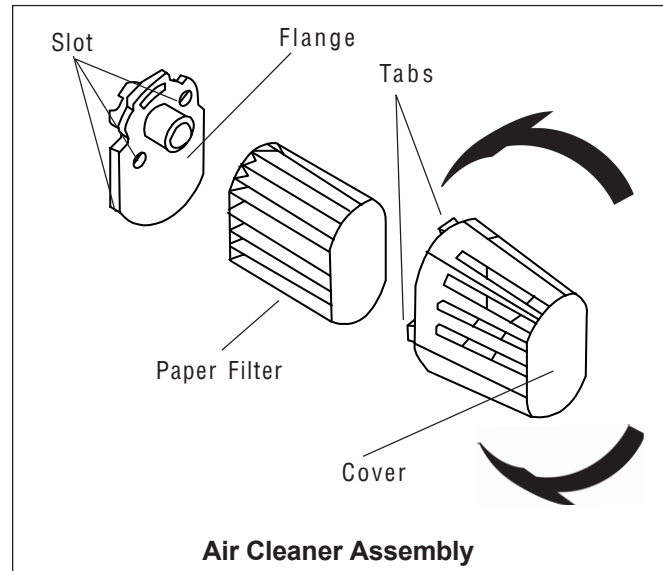
Your engine has an air cleaner which helps prevent premature engine wear and failure. NEVER run engine without complete air cleaner installed on engine. Your air cleaner periodically needs to be replaced.

## Servicing Paper Filters

Paper filters cannot be cleaned and must be replaced once a year or every 100 operating hours; more often if used in extremely dusty conditions. Replacement filters are available at a Authorized Tecumseh Servicing Dealer. Follow the instructions next to the drawing of your air cleaner to remove and replace it.

### NOTE

DO NOT put oil on or clean paper filter.



Air Cleaner Assembly

## Carburetor

If you think your carburetor needs adjusting, see your nearest Authorized Tecumseh Servicing Dealer. Engine performance should not be affected at altitudes up to 7,000 feet (2,134 meters). For operation at higher elevations, contact your Authorized Tecumseh Servicing Dealer.

## Engine Speed

**WARNING** To avoid serious injury NEVER tamper with the factory setting of engine governor. Running the engine faster than the speed set at the factory can be dangerous and will void the engine warranty.

## Engine Stopping Mechanism

**WARNING** Some engines are equipped with a federally-mandated mechanism which stops the engine and mower blade. To avoid serious injury or death as a result of contact with the mower blade, do not interfere with or bypass this mechanism. Parts of the mechanism may be subject to wear and must be checked once a year by an Authorized Tecumseh Servicing Dealer. In the event the mechanism fails for any reason, you must not use the engine until corrected by an Authorized Tecumseh Servicing Dealer.

### Seasonal Storage

If engine is to be unused for more than a month, prepare engine as indicated below:

#### Fuel System

Fuel stored in the tank will gradually deteriorate, leaving gum deposits which will clog the carburetor or fuel system. To avoid these problems, treat the fuel system in one of the two following methods:

##### Method 1

**NOTE**

*Tecumseh recommends using **ULTRA-FRESH™** gasoline stabilizer as an acceptable method of minimizing formation of fuel gum deposits during storage; This product is available from your Authorized Tecumseh Servicing Dealer.*

1. Add fuel preservative/stabilizer according to manufacturers instructions.
2. Run engine at least 10 minutes after adding stabilizer to allow it to reach carburetors.

**NOTES**

*Always follow mix ratio found on stabilizer container. Failure to do so may result in equipment damage.*

*DO NOT drain stabilizer from carburetor. Doing so may result in gum deposits and/or corrosion and cause equipment malfunction.*

Instead of using a fuel preservative/stabilizer, you can empty the fuel tank as follows:

##### Method 2

1. To prevent serious injury from fuel fires, empty fuel tank by running engine until it stops from lack of fuel. DO NOT attempt to pour fuel from engine.
2. Drain remaining fuel from carburetor by pressing up on bowl drain if present.

#### Oil

Change oil if not changed within the last 3 months. See "Checking and Changing Oil" instructions under "Maintenance and Adjustments".

### Lubricating Cylinder Bore

**WARNING** When lubricating cylinder bore, fuel may spray from the spark plug hole. To prevent serious injury from fuel fires, follow these instructions:

1. Disconnect spark plug wire and keep it away from spark plug by attaching it securely to grounding post.
2. Remove spark plug.
3. Squirt 1oz. (30ml) of clean engine oil into spark plug hole.
4. Cover spark plug hole with rag to prevent fuel from spraying from spark plug hole when starter rope is pulled.
5. Grasp starter cord handle and pull out *slowly* using a full arm stroke. Repeat once. (This will distribute oil throughout the cylinder to prevent corrosion during storage.)
6. Install spark plug.

**NOTE**

*Connect spark plug wire before attempting to start engine once engine is out of storage.*

### Quick Maintenance Chart

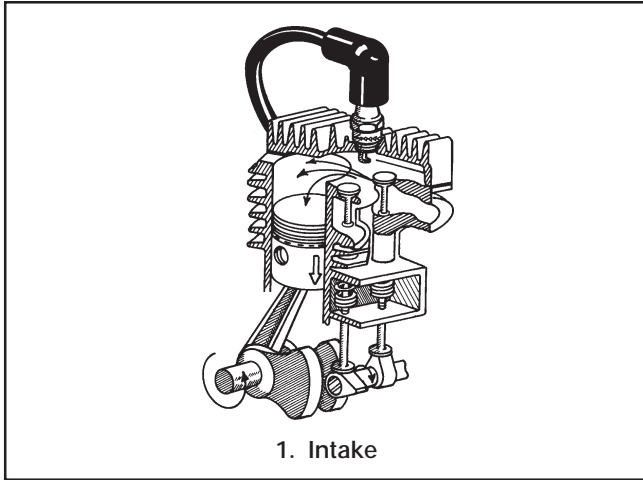
PROCEDURE:	After first two hours	Every 5 hours or daily	Every 25 hours/3 months	Every 100 hours/seasonally	Every 200 hours/seasonally
Check oil level	•				
Change oil	•	•			
Clean foam filter		•			
Replace paper filter			•		
Check spark plugs			•		
Replace spark plug					•
	•				

## 4-Cycle Engine Theory

Tecumseh four-cycle engines require four strokes or cycles to complete one power cycle.

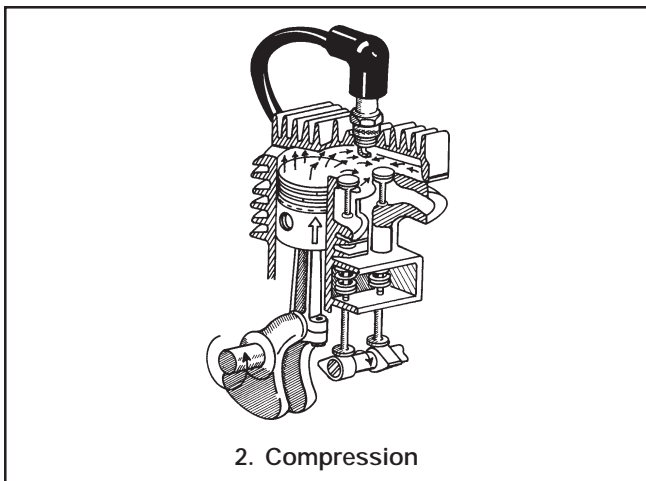
### Intake

Intake valve is open, exhaust valve is closed. Piston is traveling downward creating a suction action, drawing the fuel-air mixture from the carburetor into the cylinder area above the piston.



### Compression

As the piston reaches Bottom Dead Center, the INTAKE valve closes. The piston then rises, compressing the fuel and air mixture trapped in the combustion chamber, because both valves are closed.

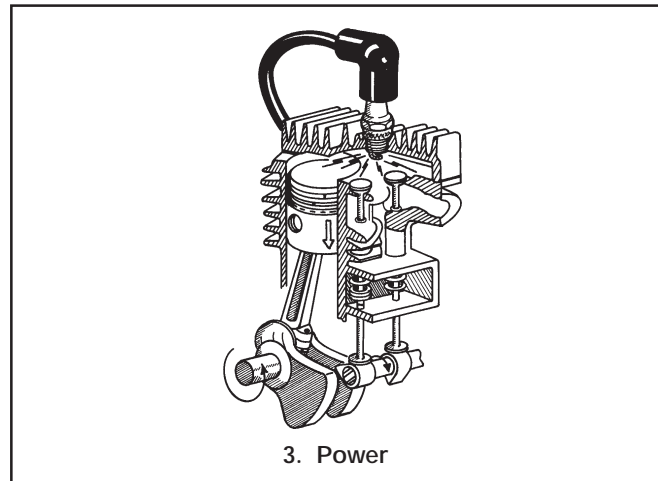


#### NOTE

*Some emission compliance engines may use an RCR (Ramp Compression Relief) system. This system opens the intake valve during the compression stroke allowing a small amount of the intake charge back down the intake pipe. This eliminates unburned fuel going out the exhaust during normal compression relief cycle typically used on the exhaust valve.*

### Power

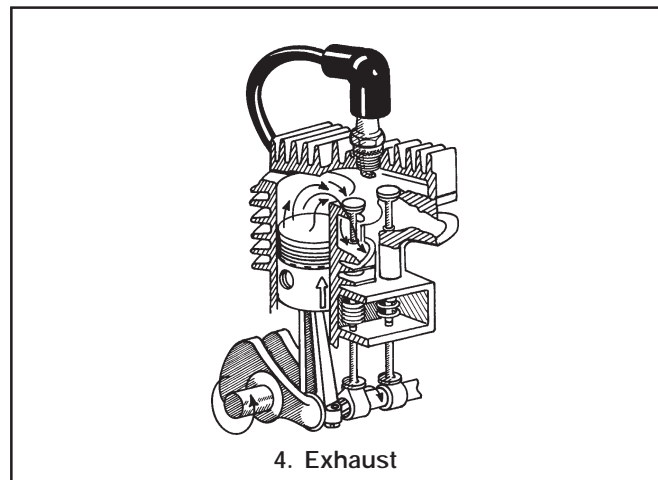
Both valves remain closed. As the piston reaches the Before Top Dead Center (BTDC) ignition point, the spark plug fires, igniting the fuel-air mixture. In the time it takes to ignite all the available fuel, the piston has moved to TDC (Top Dead Center), ready to take the full combustive force of the fuel for maximum power and piston downward travel. The expanding gases force the piston down.



### Exhaust

Exhaust valve opens. As the piston starts to the top of the cylinder, the exhaust gases are forced out.

After the piston reaches Top Dead Center (TDC), the four cycle process will begin again as the piston moves downward and the intake valve opens.



## Chapter 2 Air Cleaners

### General Information

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

**CAUTION** Be sure dirt and debris surrounding air cleaner is removed before servicing. Failure to do so may result in carburetor and/or engine damage.

#### NOTE

If the engine is equipped with an optional poly pre-filter always remove it first, to prevent dirt falling into the filter body.

Air cleaners must be serviced frequently, to prevent dust and dirt from entering the engine. Dust mixed with the engine oil forms an extremely abrasive compound which quickly wears out an engine.

A clogged air cleaner will affect engine performance.

Replacing a restricted (clogged) air filter should restore engine performance.

### Air Cleaner Service

The engine utilizes a treated paper element with a foam rubber-like sealing edge. The seal must fit properly to prevent dirt ingestion.

Replace air filter once a year or more often in extremely dusty or dirty conditions.

#### NOTE

*Do not put oil on or clean a paper filter.*

Be sure to clean base and cover thoroughly before installing new paper filter.

**CAUTION** DO NOT run engine without complete air cleaner installed on engine. Doing so may result in equipment damage and WILL VOID the engine WARRANTY.

#### NOTE

*Serious damage to the engine may result from using any other but the specified part number filter. Use factory recommended parts only.*

Some models use a dual stage air cleaner. This air cleaner uses a polyurethane-type foam pre-filter along with the paper element.

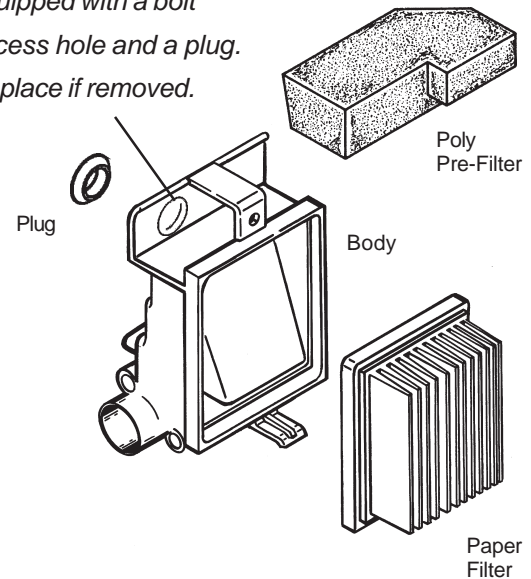
### Polyurethane Pre-Filters

These serviceable air filters utilize a polyurethane element which will clog up with use. The element should be cleaned and serviced in the following manner.

1. Wash element in a detergent and water solution and squeeze (don't twist) until all dirt is removed.
2. Rinse thoroughly.
3. Wrap in a clean cloth and squeeze (don't twist) until completely dry.
4. Re-oil element by applying a generous quantity of oil to all sides. Squeeze vigorously to distribute oil and to remove excess oil.
5. Clean air cleaner housing and cover. Dry thoroughly.
6. Reinstall pre-cleaner in air filter body.

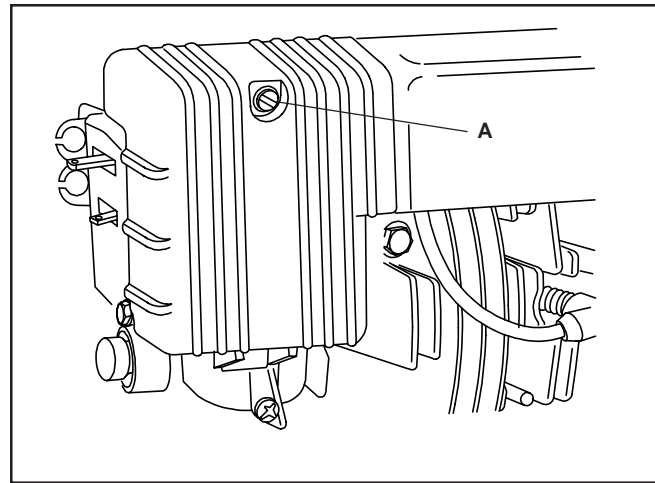
#### NOTE

*Some vectors Are equipped with a bolt access hole and a plug. Replace if removed.*

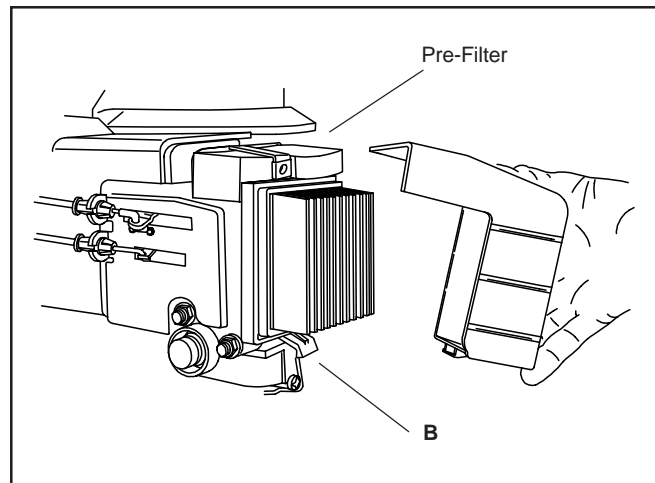


**To Service Air Cleaner**

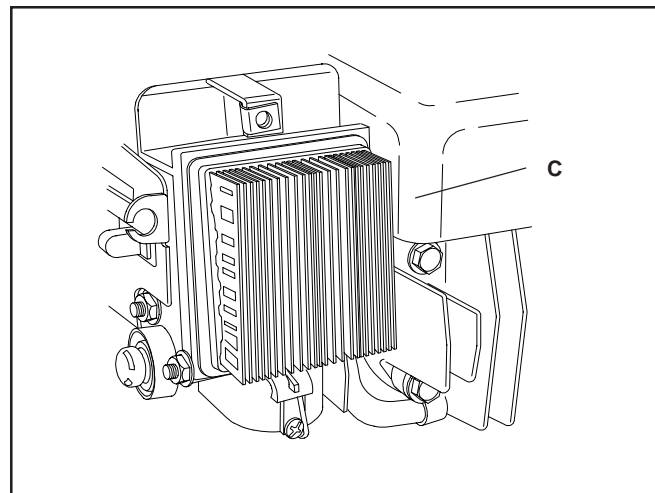
1. Loosen cover screw (A).



2. Swing cover down and remove from hinge (B).
3. Pull foam pre-filter out of air cleaner body (if equipped with pre-filter).
4. Pull air filter out of air cleaner body.
5. Clean air cleaner cover and body.
6. Install a new paper filter (part no. 36046) (C).



7. Clean and install pre-filter (if so equipped).
8. Reinstall cover to air cleaner body.  
Be sure hinge is assembled properly.
9. Swing cover up and tighten cover screw.  
(Do not over tighten).





## Carburetion

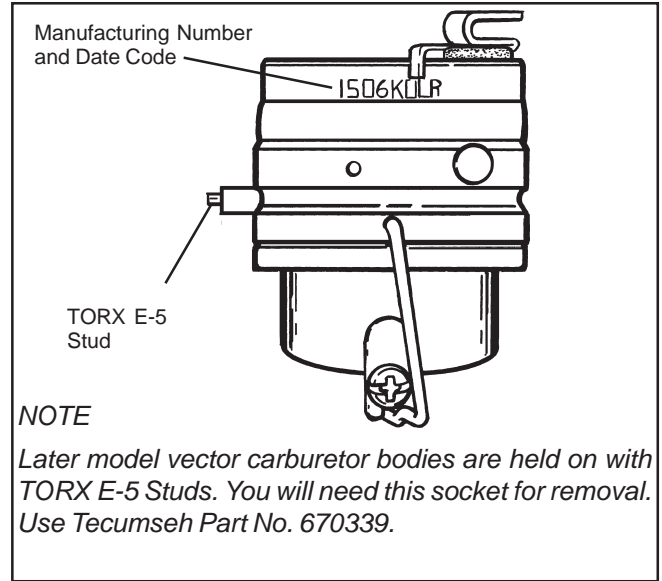
### General

Proper Carburetion Function is dependent on clean fresh fuel and a well maintained air cleaner system. Most causes of carburetion problems are directly related to stale fuel and dirt ingestion. Inspection of the carburetor for dirt wear and fuel deposits should always be done before servicing the carburetor.

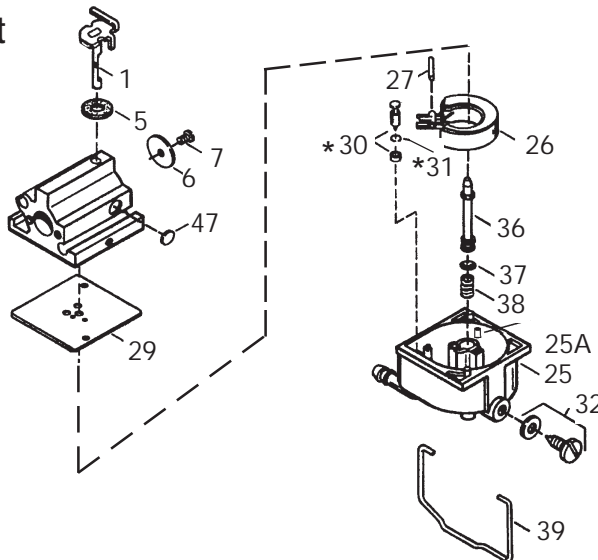
### Carburetor Identification

Tecumseh carburetors are identified by a manufacturing number and date code stamped on the carburetor as shown. When servicing carburetors, use the engine model number or the manufacturing number on the carburetor to find repair parts in the Master Parts Manual.

The engine has used both a split system and married system carburetor. Below are the part breakdowns for the two carburetors.

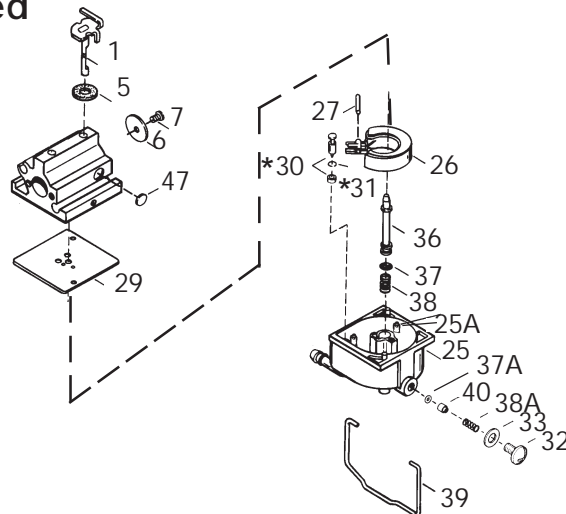


### Split



Ref. No.	Part Name
1	Throttle Shaft & Lever Ass'y.
5	Dust Seal (Throttle)
6	Throttle Shutter
7	Throttle Shutter Screw
25	Float Bowl
25A	Idle Restrictor
26	Float
27	Shaft, Float
29	Gasket, Float Bowl to Body
* 30	Inlet Needle, Seat & Seat Retainer (Incl. 31)
* 31	Seat Retainer
32	Bowl Drain Ass'y.
36	Tube, Main Nozzle
37	O Ring, Main Nozzle Tube
38	Spring, Main Nozzle Tube
39	Float Bowl Retainer
47	Welch Plug, Idle Mixture Well

### Married



Ref. No.	Part Name
1	Throttle Shaft & Lever Ass'y.
5	Dust Seal
6	Throttle Shutter
7	Throttle Shutter Screw
25	Float Bowl
25A	Idle Restrictor
26	Float
27	Float Shaft
29	Gasket, Float Bowl to Body
* 30	Inlet Needle, Seat & Seat Retainer (Incl. 31)
* 31	Seat Retainer
32	Bowl Drain Screw
33	Bowl Drain Washer
36	Tube, Main Nozzle
37	O Ring, Main Nozzle Tube
37A	O Ring
38	Spring, Main Nozzle Tube
38A	Spring
39	Float Bowl Retainer
40	Main Fuel Jet
47	Welch Plug, Idle Mixture Well

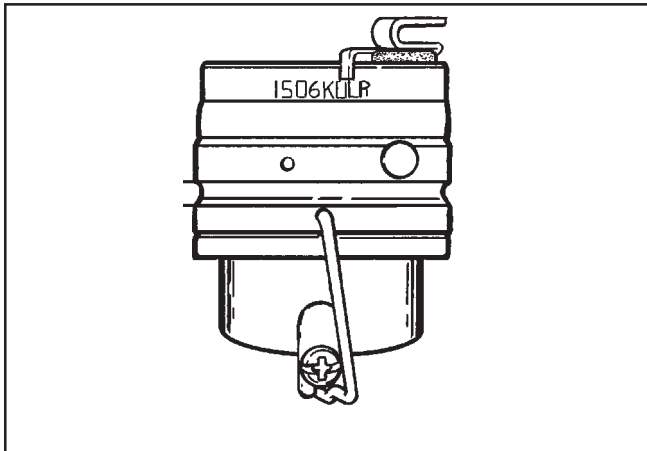
\*NOTE: The seat retainer may not be present on some engines. If you receive a retainer as a service part, install it.

The carburetor is a float feed, nonadjustable type, with a one piece extruded aluminum body. The float bowl, float, nozzle, and venturi are nonmetallic, minimizing the corrosion and varnishing problems.

**WARNING:** Gasoline (fuel) vapors are highly flammable and can explode. Fuel vapors can spread and be ignited by a spark or flame many feet away from engine. To prevent injury or death from fuel fires, follow these instructions:

- NEVER fill fuel tank indoors. Fill fuel tank outdoors in a well-ventilated area.
- Use only an approved red GASOLINE container to store and dispense fuel.
- If fuel is spilled, DO NOT start engine. Move machine away from area of spillage. Avoid creating any source of ignition until fuel vapors are gone.

Common service areas of the carburetor are contained in the fuel bowl. These areas are the float, needle, seat and main nozzle. All of these parts can be serviced without removing the carburetor body from the engine.



## Float Bowl Service

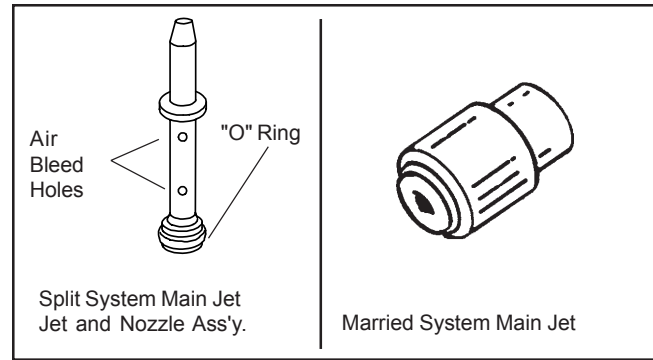
1. Be sure engine is outdoors and in a well-ventilated area.
2. Disconnect and plug the fuel line.
3. Remove the bowl drain screw.
4. Remove the float bowl by snapping the bale spring towards the throttle end of the carburetor.

### NOTE

Use care when using tools to remove the bail from the carburetor. Failure to do so may result in bending the retainer.

After the bowl gasket is removed, the parts contained in the bowl can be inspected and serviced.

5. Pull out the main nozzle and spring.
6. Inspect the main nozzle for deposits.



### NOTE

Be sure to check the cross holes on the body of the nozzle and the main orifice in the bottom of the nozzle.

**WARNING:** Compressed air can pierce the skin and cause injury. DO Not use your hand to check for leaks or to determine air flow rates. Wear safety glasses to shield from debris. Failure to do so could result in death or serious injury.

7. Use a rubber tipped tapered nozzle on air hose and apply low pressure compressed air or use a monofilament fishing line to remove any deposits in the main jet or cross holes.



- Remove the drain screw to access the spring, jet and "O" ring.

The main jet should be inspected and cleaned if deposits exist.

**NOTES**

*The float is held in the float bowl by the float pin which is pressed into tabs on top of the float support towers.*

*When removing float from float bowl, pull straight up with a needle nose pliers in the pocket closest to the main fuel well.*

- Carefully lift the float out of the float bowl and inspect for damage or deposits.
- Clean the idle passageway with compressed air, or with tag wire.

**NOTES**

*The inlet needle is attached to the float and should also be inspected for damage or deposits.*

*The inlet seat can be removed with a small wire hook or a #2 crochet hook.*

- Inspect the float bowl and main nozzle area for sediment and deposits.
- Use a carburetor cleaner to loosen and remove deposits and sediment.

**NOTES**

*The grooved side of the inlet seat goes into the float bowl first.*

*Use care when installing inlet seat into float bowl. Failure to do so may result in scratching the inlet bore.*

- Install a new inlet seat into the float bowl.
- Place a drop of oil on the seat and press it in with a flat punch until it seats.

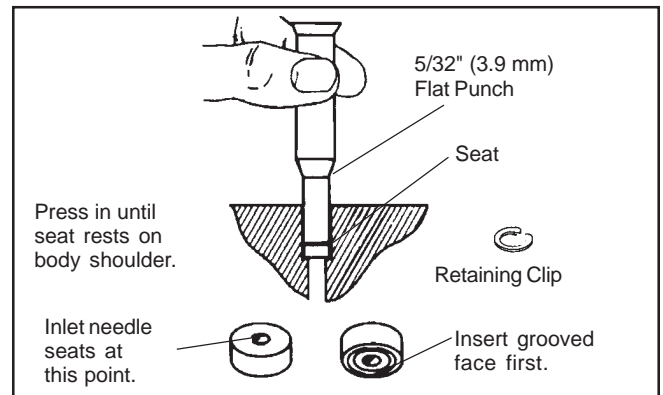
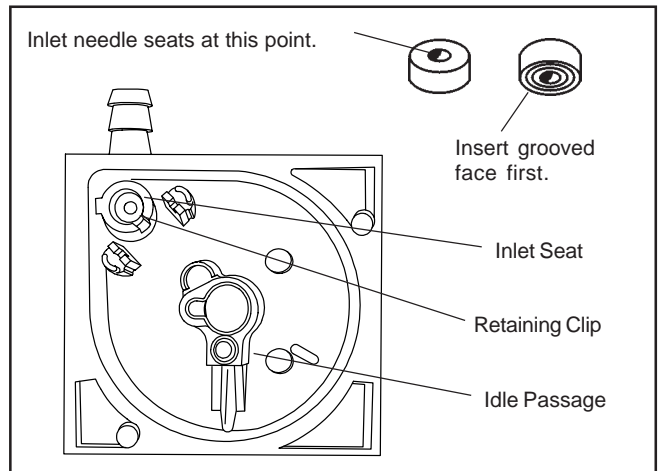
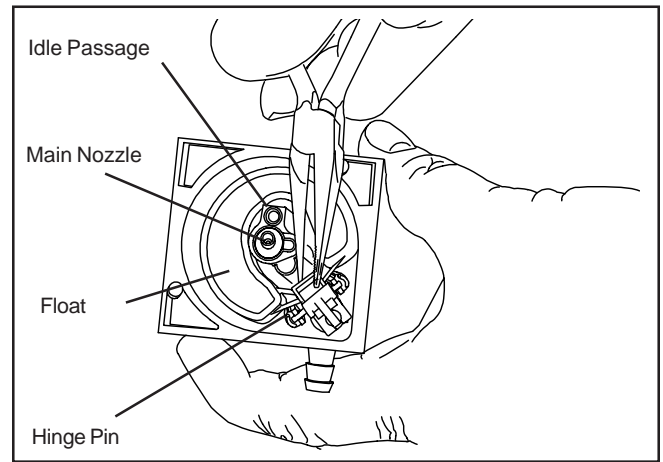
**NOTE**

*Some models are equipped with a fuel inlet seat retaining ring. If your replacement seat set comes with a retaining clip install it on top of the seat.*

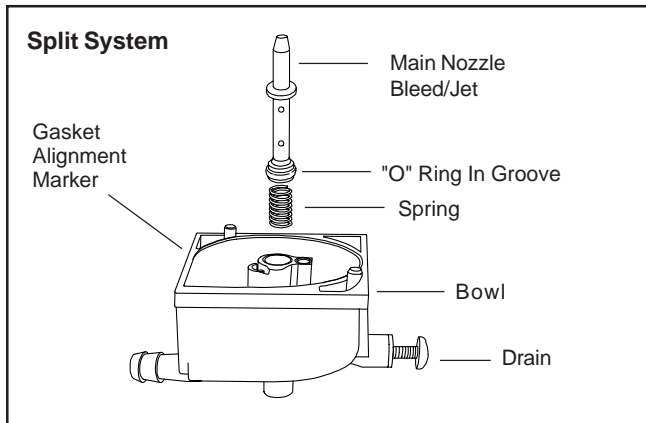
- Slide the inlet needle into the tabs on the float and put the float pin into the hinge on the float. Carefully set the float into position in the float bowl.
- Verify needle drops into the fuel inlet.
- Snap the float shaft into the tabs in the float bowl.

**NOTE**

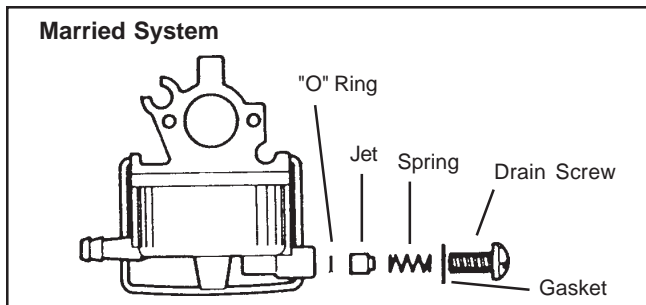
*It is not necessary to adjust the float height even if the float has been replaced.*



- Drop the main nozzle spring into the main nozzle well in the float bowl. Put a small amount of oil on the main nozzle "O" ring and push the nozzle into the main nozzle well, "O" ring end first.



In addition to this, the married system carburetor has the "O" ring, main jet, and spring located behind the drain system.



- Place a new gasket on top of the float bowl with the notch on the gasket aligned with the bump on the bowl edge.

**NOTE**

*The gasket will only fit onto the float bowl one way*

- Hold the float bowl to the carburetor body and snap the retainer into position.
- Reinstall the bowl drain screw, do not over tighten.
- Reattach the fuel line.

**NOTE**

*Bowl service is all that is normally required for routine carburetor maintenance.*

**Rebuilding The Carburetor Body**

Before disassembling the carburetor body, check the throttle shaft and body for excessive wear. If there is excessive wear to the throttle body, it should be replaced.

To rebuild the carburetor body it is necessary to remove the carburetor from the engine.

- Remove the speed control plate.
- Remove the air cleaner body from the carburetor.

- Disguard gasket.
- Disconnect and plug the fuel line.
- Remove the carburetor mounting studs.
- Remove the governor link.
- Drain the carburetor float bowl.
- Disassemble the float bowl
- See Float Bowl Service.

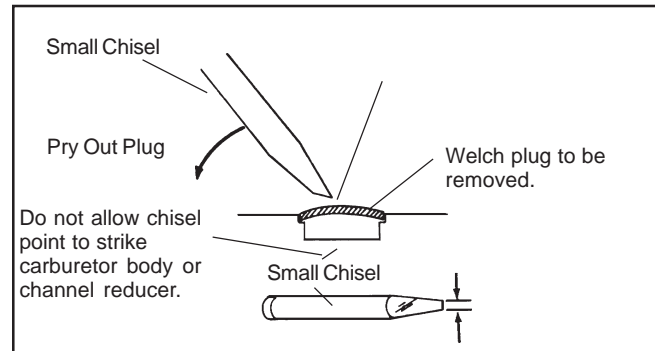
**NOTE**

*To properly clean the carburetor body, the welch plugs should be removed to expose drilled passages.*

**Removing Welch Plug**

- Sharpen a small chisel to a sharp wedge point.
- Remove welch plug.
- Drive the chisel into the welch plug.
  - Push down on chisel
  - Pry plug out of position.

**NOTE**



*Always pull the non metallic venturi out before soaking in carburetor cleaner.*

After the welch plug is removed from the carburetor it can be soaked in a commercial carburetor cleaner no longer than 30 minutes. Be sure to follow the directions on the container.

- Reinstall the venture using the main nozzle to align it correctly.

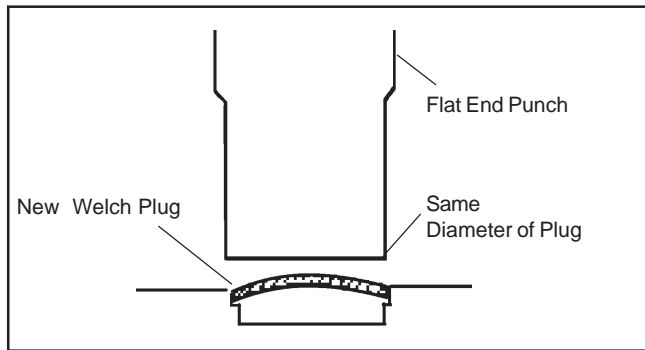
**NOTE**

*The air bleed passages face the air filter.*

**WARNING** Compressed air can pierce the skin and cause injury. DO Not use your hand to check for leaks or to determine air flow rates. Wear safety glasses to shield form debris. Failure to do so could result in death or serious injury.

After the carburetor has been soaked, all passages may be probed with monofilament fishing line and compressed air to open plugged or restricted passages.

5. Install a new welch plug over the idle fuel chamber with the raised portion up. Use a punch equal to the size of the plug, to flatten the plug.



**CAUTION** Do not dent or drive the center of the plug below the top surface of the carburetor. Doing so will result in damage to the plug and/or carburetor malfunction.

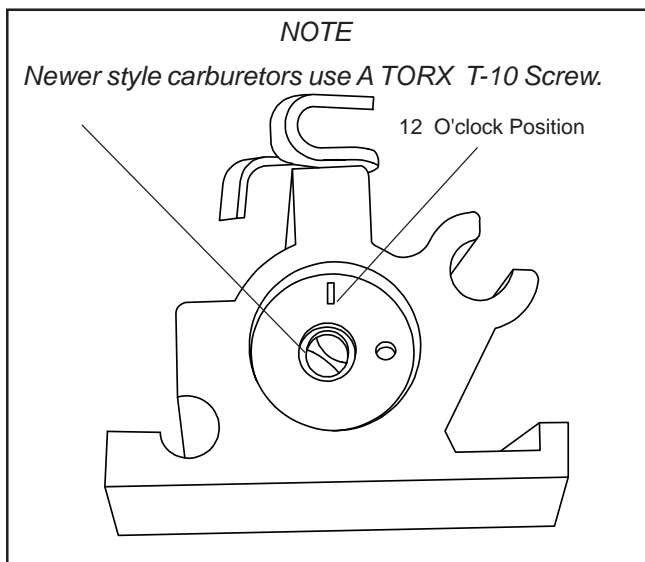
**NOTES**

To insure a good seal on this plug, we recommend coating the seam with nail polish which is gas resistant.

Use a new shutter screw and dust seal when installing the throttle shaft and shutter.

**CAUTION** Verify scribe mark on shutter is in the 12 o'clock position when installing the throttle shaft and shutter. Failure to do so may result in a shutter that sticks.

6. Install the throttle shaft and shutter.
7. Verify the scribe mark on the shutter is in the 12 o'clock position.

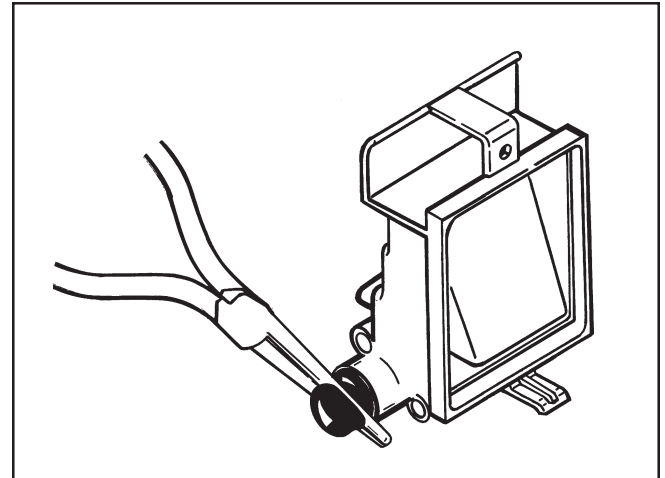


**NOTE**

To rebuild the Float Bowl, refer to the previous section on Float Bowl Service.

**CAUTION** Always discard gaskets after removal. We do not recommend using the same gasket twice. Failure to do so may result in improper mating of parts and equipment malfunction.

8. Grasp primer bulb with a pair of needle nose pliers. Twist and pull bulb outward to remove.
9. Carefully remove retaining ring with a screwdriver.



10. Discard bulb and retaining ring.

**NOTE**

Always thoroughly clean primer passages after servicing primer bulb and/or air cleaner body.

11. After the primer bulb is removed, clean the primer passages thoroughly.

12. Install the carburetor to the engine using a new gasket.

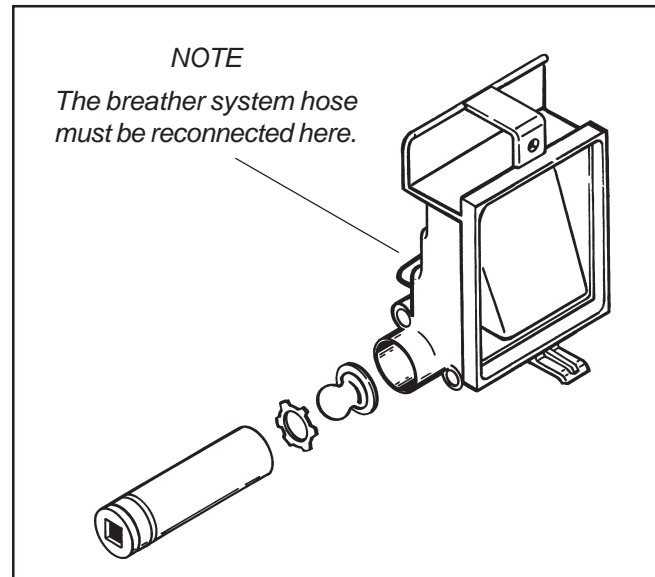
*NOTE*

*Always replace the primer bulb when servicing carburetor.*

13. Press the new bulb and the new retainer into position using a deep reach socket as shown.
14. Install the air cleaner body over the carburetor.

*NOTE*

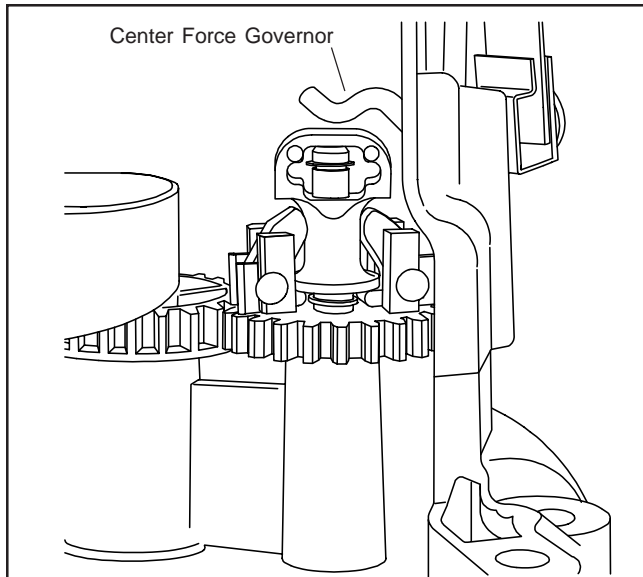
*The VLV models use a closed loop breather system. The crankcase breather tube must be reconnected to the air filter body.*



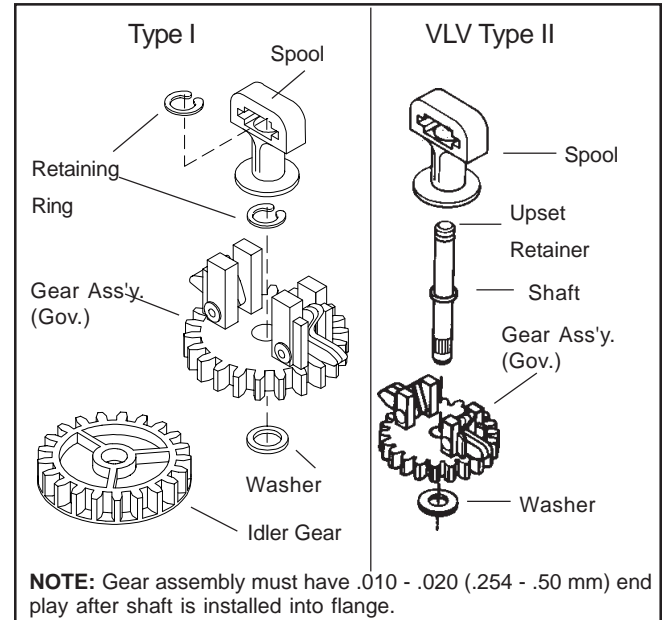
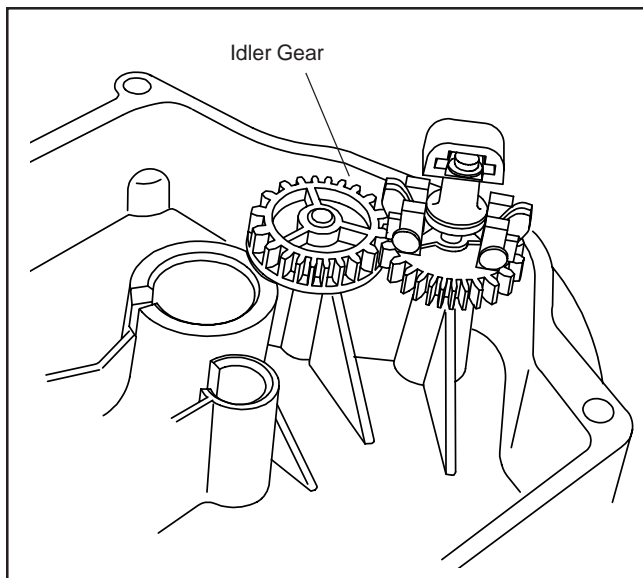
## Chapter 3 Governors and Linkage

### General Information

All Tecumseh 4-cycle engines of recent manufacture are equipped with mechanical type governors. As the speed of an engine increases, centrifugal force moves the weights outward, lifting up the governor spool which contacts the governor shaft; this in turn closes the throttle. As engine speed decreases, the weights are pulled inward by the spring which opens the throttle. Thus, the engine speed controls the throttle opening and maintains a certain governed speed.



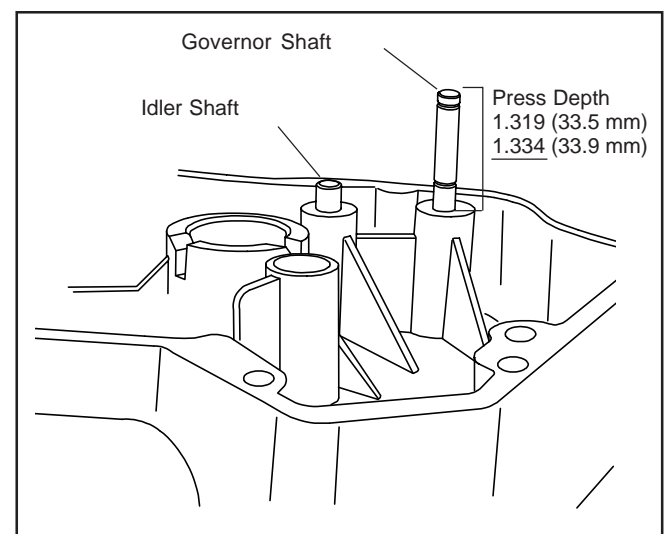
The governor gear on this engine is driven by the crankshaft through an idler gear as shown below.



TYPE II governors do not use governor retainer clips. The spool is retained by a raised upset on the shaft.

**⚠ WARNING** Wear eye protection and verify setup is stable when using a press. The pressure from the press could cause parts to fly out with great force. Inadequate safety precautions could result in death or serious injury.

The governor shaft is pressed into the flange or cover to a specific dimension as shown below.



## Linkage Assembly/Disassembly

### NOTES

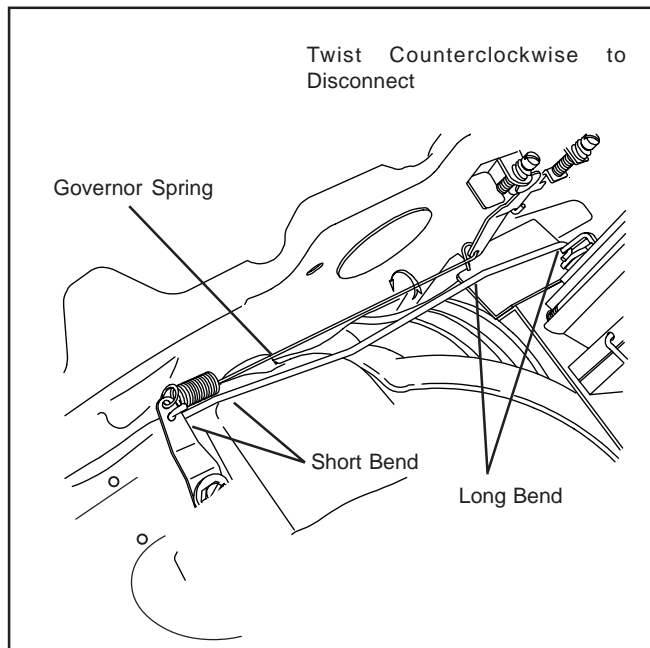
The solid link is always connected from the throttle lever on the carburetor to the lower hole on the governor lever.

The shorter bend has to be toward the governor.

The governor extension spring is connected with the spring end hooked into the upper hole of the governor lever and the extension end hooked through the speed control lever.

**CAUTION** Bending or distorting the governor extension spring may result in engine damage and require engine replacement.

To remove the governor spring, carefully twist the extension end counterclockwise to unhook the extension spring at the speed control lever.



## Governor Adjustment

1. Verify engine is stopped.
2. Loosen the screw holding the governor clamp and lever.
3. Turn the clamp clockwise.
  - a. Push governor lever connected to the throttle to a full wide open throttle position.
  - b. Hold the lever and clamp in this position.
  - c. Tighten the screw.

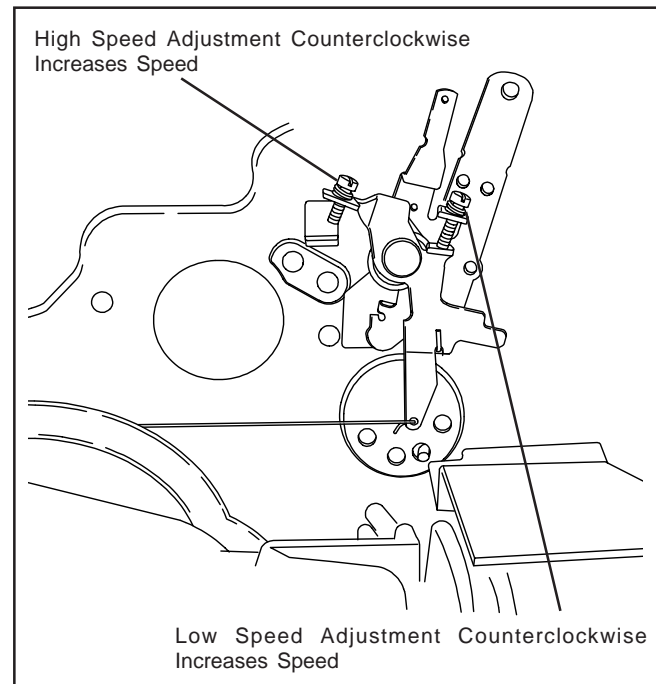
## Speed Controls

This engine has an adjustable speed control.

**WARNING** Never exceed the manufacturer's recommended speeds. Failure to do so may cause equipment damage and could result in death or serious injury.

### NOTE

Governor adjustment screw will be TORX Head T-10 (effective August 1, 1996 for E.C. Compliance).





## Chapter 4 Starters

### Disassembly and Inspection

1. Remove the rewind assembly from the engine.
2. Use the handle to pull a length of rope out.
3. Tie a temporary knot in the exposed rope.
4. Untie the knot in handle or pry out the staple.
5. *Slowly* allow the rope to fully retract into the starter housing.
6. Allow the recoil spring to fully unwind.
7. Remove the decal from the center of the starter housing
8. Place a 3/4" (19 mm) deep reach socket under the retainer pawl.
9. Set the rewind on a bench, supported on the socket.
10. Using a 5/16" (8 mm) roll pin punch, drive out the center pin.
11. Inspect all components.
12. Replace all components that are in need of service.

#### NOTE

*This Rewind Spring is not in a canister.*

Care must be used when handling the pulley; the rewind spring and cover are held together by the bosses in the pulley.

### Assembly and Inspection

1. Reverse the above listed procedure keeping in mind that the starter dogs with the dog springs must snap back to the center of the pulley.

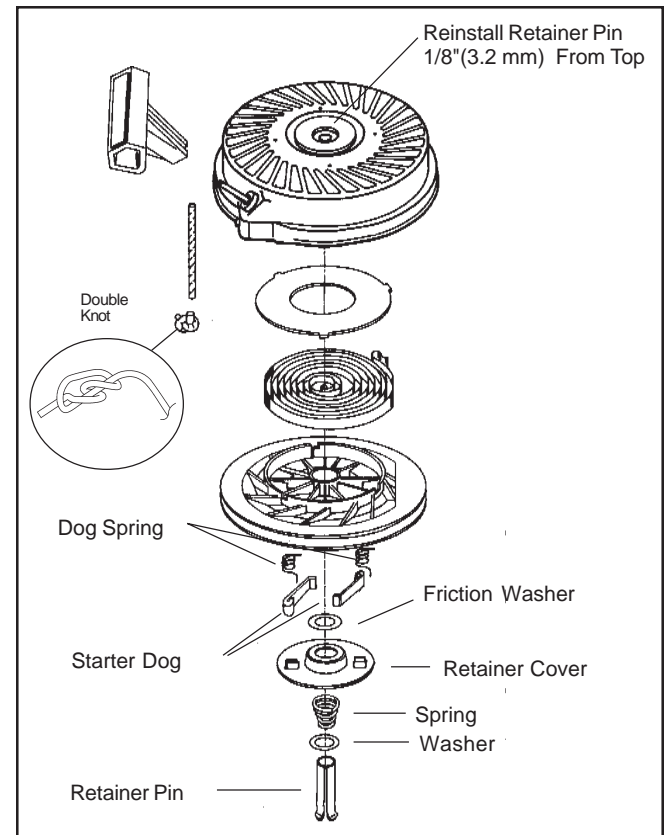
**CAUTION** Always discard center pin and plastic washers after disassembly. We do not recommend using these parts twice. Failure to do so may result in equipment failure.

2. Always replace the center pin with a new pin upon reassembly. Also place the two new plastic washers between the center leg and retainer pawl. Discard old plastic washer. The new plastic washers will be provided along with the new center pin.
3. Inspect retainer pawl. If it is worn, bent or damaged in any manner replace upon reassembly.

#### NOTE

*Driving the center pin in too far will cause the retainer pawl to bend and the starter dogs will not engage the starter cup.*

4. Install the new center pin in until it is within 1/8" (3.2 mm) of an inch of the top of the starter.



#### NOTE

*Always replace the decal or plug over the retainer pin or wedge to prevent moisture infiltration.*

## Stylized Rewind Starter with Plastic Retainer

### Disassembly and Inspection

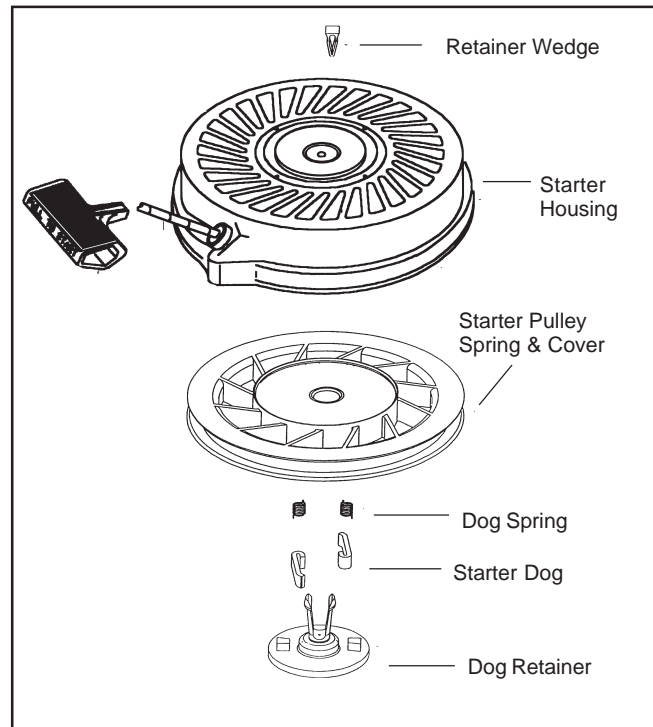
1. Remove the rewind assembly from the engine.
2. Use the handle to pull a length of rope out.
3. Tie a temporary knot in the exposed rope.
4. Untie the knot in handle or pry out the staple.
5. *Slowly* allow the rope to fully retract into the starter housing.
6. Allow the recoil spring to fully unwind.
7. Remove the decal from the center of the starter housing.
8. Use a small Phillips screwdriver or similar tool to pry the retainer legs apart and lift out the retaining wedge.
9. Pinch the legs of the retainer together and pull on the head of the retainer to remove it from the housing.
10. Remove the pulley assembly from the recoil housing.
11. Inspect all components.
12. Replace all components that are in need of service.

### Assembly and Inspection

1. If replacing the starter rope, see Step 8.

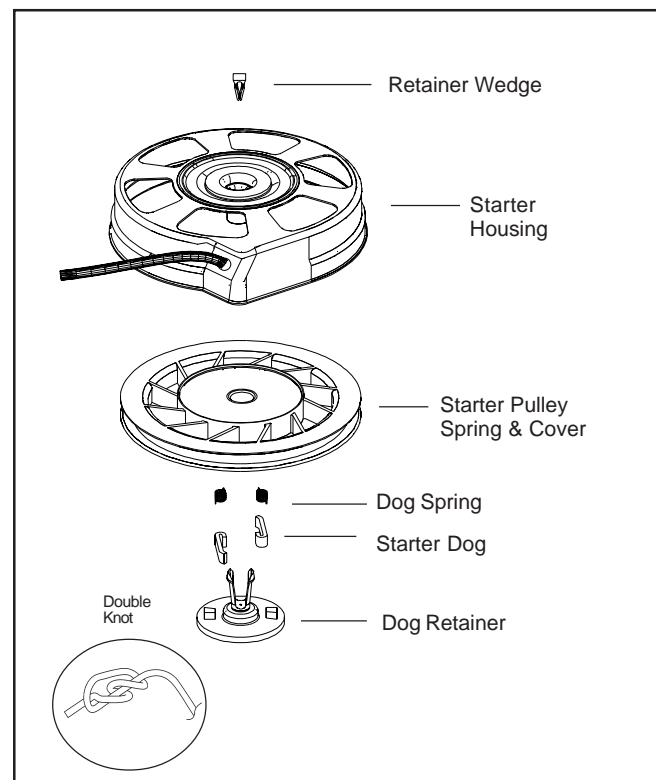
**WARNING** It is recommended that you use extreme care when servicing recoil springs and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

2. Install a new recoil spring if necessary by pushing the new spring out of the holder into the pulley cavity while aligning the outside spring hook into the deep notch in the pulley.
3. Push the spring cover in until seated.
4. Apply a small amount of lithium grease to the inner bore of the center shaft.
5. Replace or check that both starter dogs are in the pulley pockets and that the dog springs are hooked on the outer surface of the dog.
6. Pinch the two legs of the plastic retainer together and start into the center shaft hole.
7. Rotate the retainer so the two tabs on the bottom of the part fit between the dog and pulley hub (left side of the dog). Push the retainer in until the leg prongs pop out of the center shaft.
8. Turn the starter over and snap the locking tab between the retainer legs, replace the top decal.



#### NOTE

*Always replace the decal or plug over the retainer pin or wedge to prevent moisture infiltration.*



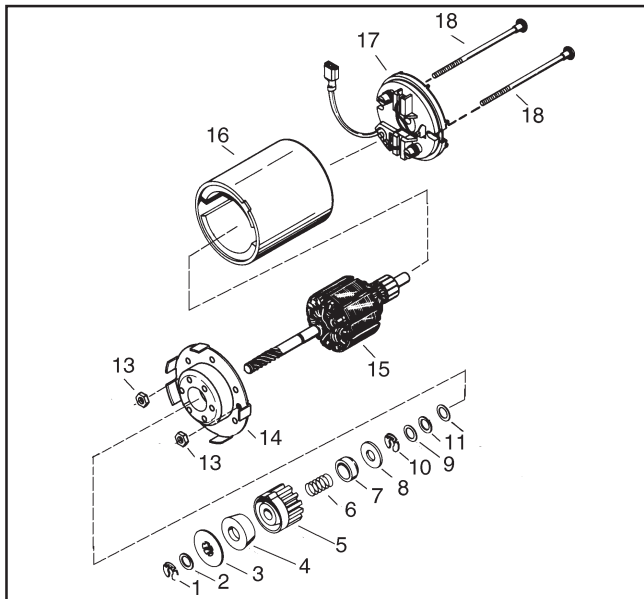
9. Carefully turn the pulley counterclockwise until it stops. Then back the pulley up until the recoil grommet hole and the pulley hole are aligned. Next using a rope with a cauterized end, feed it into the pulley hole. Tie a double handed knot and allow the rope to be drawn into the recoil slowly.



## 12 Volt Electric Starters

### Removal

1. Remove face plate, air cleaner assembly and gas tank.
2. Compress plastic grommet and pull it out of the blower housing.
3. Slide the wire through slot, being careful not to cut the wire insulation.
4. Remove blower housing, remove flywheel (see flywheel section) and inspect ring gear for wear or damage. Replace if necessary. See Flywheel Section.
5. Remove nuts on both sides of pinion.
6. Drop starter out of back plate and remove ground wire.



### Parts List:

1. Retainer ring
2. Dust washer
3. Drive nut
4. Pinion driver
5. Gear
6. Anti-drift spring
7. Spring retainer (spring collapses into retainer)
8. Cup washer (cup washer cupped over retainer spring)
9. Washer (metal)
10. Retainer ring
11. Thrust washer (metal)
12. Washer (plastic)
13. Lock nuts
14. Cap assembly drive end
15. Armature
16. Housing
17. End cap and brush card assembly
18. Bolts

### Drive Assembly Service

Pinion gear parts should be checked for damage or wear. If the gear does not engage or slips, it should be washed in solvent. Rubber parts are to be cleaned with soap and water to remove dirt and grease, and dried thoroughly. If any parts are damaged, discard and replace with new parts.

Use reverse of Electric Starter Removal procedure for assembly.

#### NOTE

*Assemble armature into brush end frame first.*

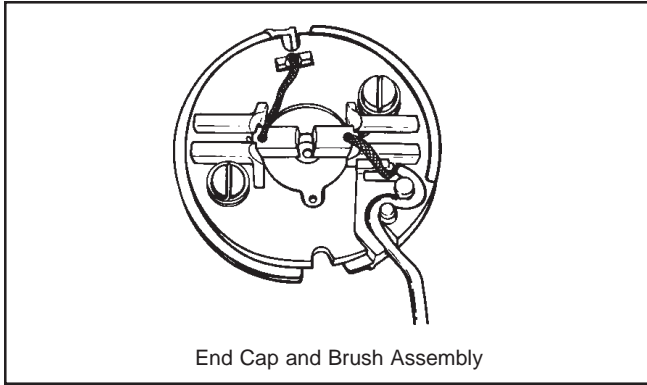
**CAUTION** DO NOT apply lubricant to pinion driver (4). Doing so may result in equipment malfunction.

Place a small amount of light grease such as lubriplate between the drive nut (3) and helix on armature shaft.

### Check Brushes

Before disassembling armature, check brushes for wear.

- Make sure brushes are not worn to the point where brush wire bottoms out in the slot of brush holder.
- Brush springs must have enough strength to keep tension on the brushes and hold them against the commutator.
- If brushes are in need of change, replace the entire end cap assembly.



End Cap and Brush Assembly

### Armature Check

If commutator bars are glazed or dirty, they can be turned down in a lathe.

- While rotating, hold a strip of 00 sandpaper lightly on the commutator, moving it back and forth.

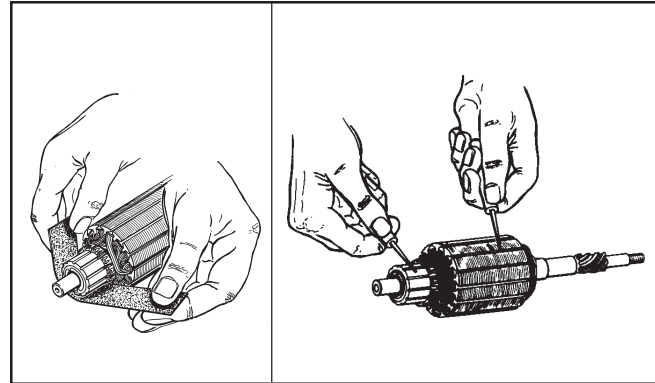
#### NOTE

*Do not use emery cloth.*

- Recut grooves between commutator bars to depth equal to the width of the insulators.
1. Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature
  2. Rotate armature and check out all commutator bars.

#### NOTE

*The armature can be thoroughly checked with a growler if available.*



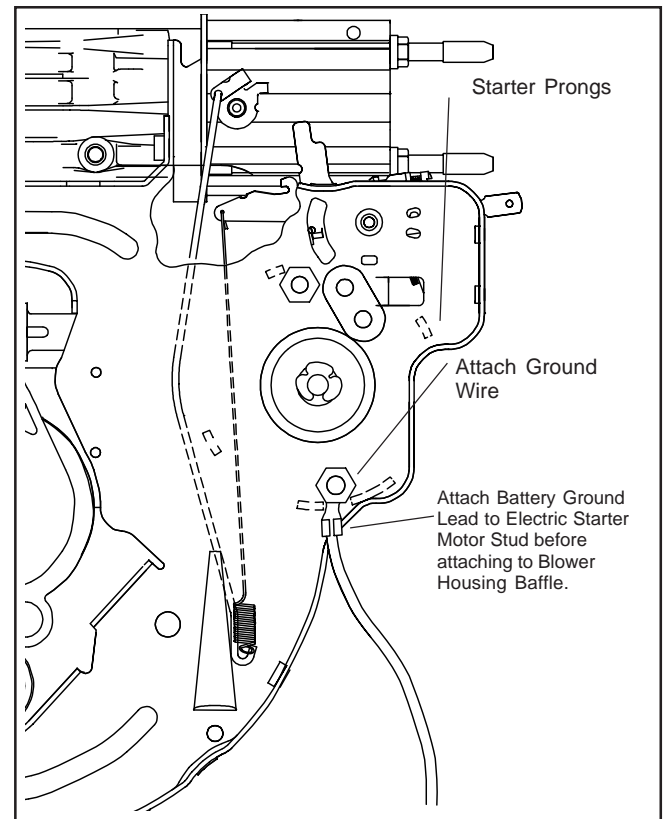
### Assembly

1. Attach the ground wire prior to assembling the electric starter to the baffle.
2. Attach the black ground wire to the electric starter through bolt so the wire extends between the two adjacent end cap prongs.
3. Place the starter into the back plate with the ground wire bolt away from carburetor.

#### NOTE

*The throttle linkage is routed around starter while the governor spring is routed through the end cap prongs.*

4. Tighten nuts on starter bolts (see Specifications).
5. Place blower housing on engine and slide wires through slot making sure not to cut insulation.
6. Press grommet into hole.
7. Reassemble gas tank, air cleaner assembly and face plate.



**NOTES**

## Chapter 5 Flywheels

### General Information

**⚠ WARNING** Disconnect negative battery cable before servicing. If the positive battery cable contacts ground with the negative cable connected it may cause a battery explosion which could result in death or serious injury.

This engine uses one of two types of flywheels.

#### High Inertia Flywheel

The first type is cast iron. This type of flywheel will have a pressed-on steel ring gear.

*NOTE*

*If the engine is equipped with an electric starter the steel ring gear is nonserviceable.*

#### Diecast Aluminum Flywheel

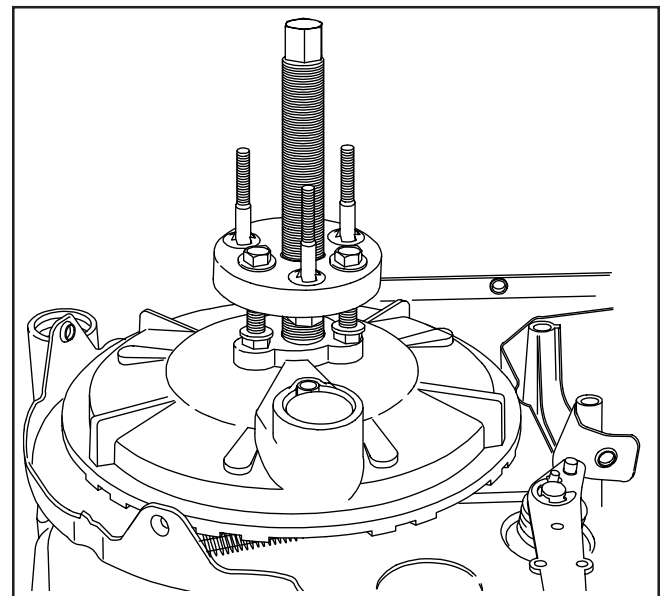
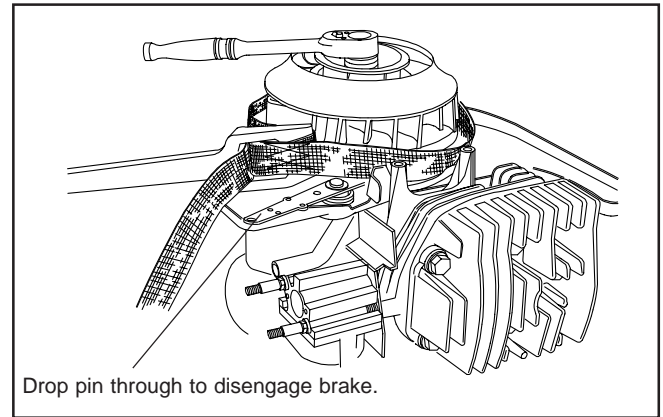
The second and most popular style of flywheel is diecast aluminum. The aluminum flywheel features a replaceable plastic fan.

*NOTE*

*If the engine is equipped with an electric starter the plastic ring gear is nonserviceable.*

### Removal

1. Remove the ignition module.
2. Remove the brake pressure from the flywheel.  
The brake can be locked in the disengaged position by placing a pin into one of the aligned holes in the backing plate lever assembly.
3. To remove the flywheel nut, use a flywheel strap wrench (Part No. 670305) to hold the flywheel, while turning the flywheel nut counterclockwise.
4. Lift the starter cup and fan off of the flywheel. (Aluminum flywheel only)
5. Remove the flywheel using a flywheel puller or knock-off tool.



### Cored Holes

On engines with cored holes (untapped) use flywheel puller Part No. 670306.

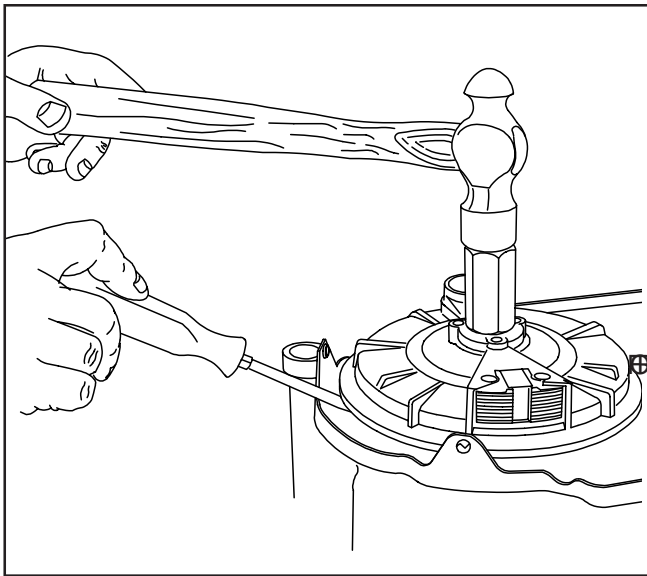
1. Screw the knock-off (Part No. 670169) tool down until it touches the flywheel.
2. Back off one turn.
3. Using a large screwdriver, pry upward under the flywheel (side opposite the brake) and tap sharply and squarely on the knock-off tool to break the flywheel loose.

#### NOTE

If necessary, rotate flywheel a half turn and repeat until it loosens.

**CAUTION** Do not attempt to remove flywheel using a jaw type puller on the outer diameter of the flywheel. Doing so may result in flywheel breakage.

**CAUTION** Never use a pry bar with any type of curve on the end. Doing so may result in Breather cover damage.



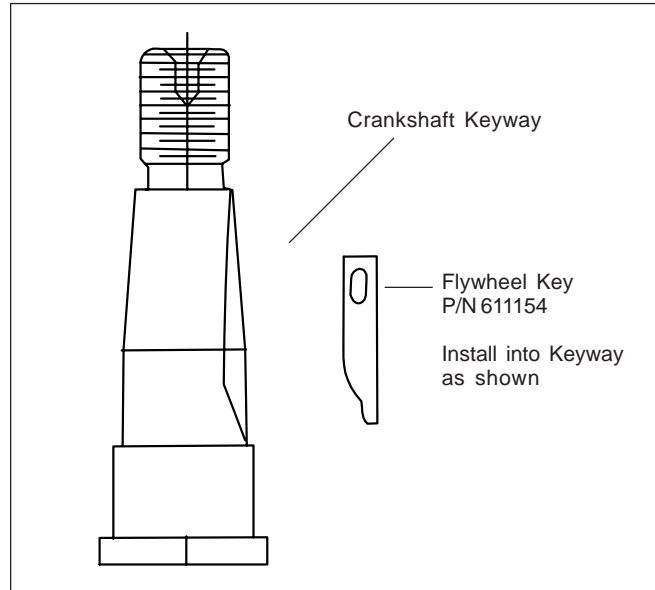
### Installation

1. Inspect brake pad to be free of dirt, oil or grease.

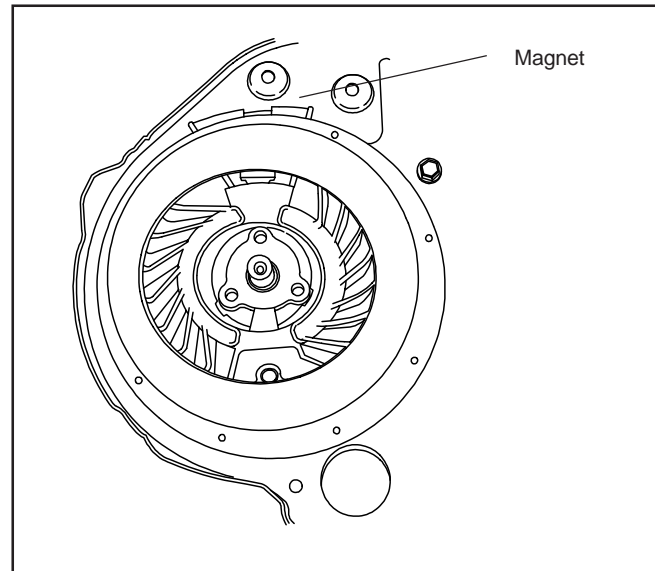
#### NOTE

If pad is contaminated, or less than .060" (1.52 mm) at the narrowest point, replace pad. See Brake Pad Replacement Section.

2. Compress brake lever
3. Install flywheel key



4. Install flywheel
5. Install the fan onto the flywheel so the Tecumseh logo on the fan is on the magnet side of the flywheel.



6. Place starter cup into position and torque the flywheel nut to specification. Use a strap wrench to hold the flywheel.

## Brake System

Tecumseh's Flywheel Brake System provides consumer safety by shutting down the engine and lawn mower blade within seconds after the operator releases an engine/blade control at the handle of the lawn mower.

The Brake/Starter Mechanism is used with either of two options for starting:

1. Manual Recoil Start
2. 12 Volt Electric Starter System

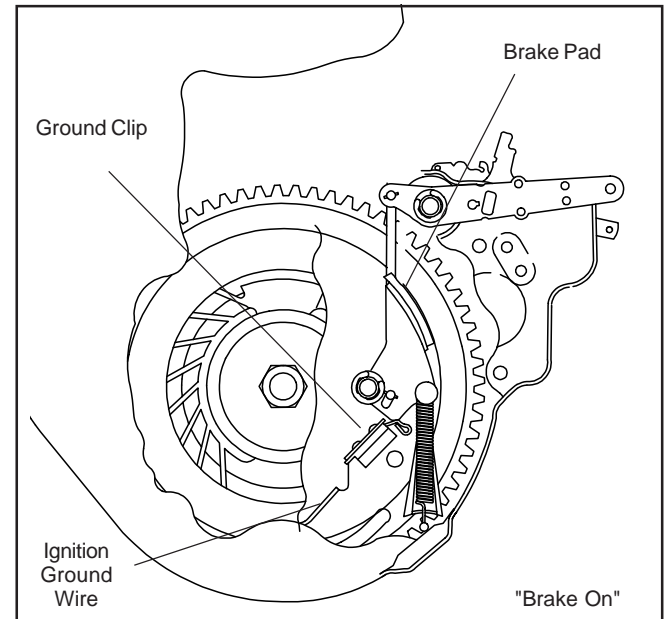
Each system requires the operator to start unit behind mower handle in operator zone area. The electric start system also provides a charging system for battery recharge when engine is running.

### NOTE

*Electric start systems equipped with a charging system **WILL NOT RECHARGE** a dead battery. This system is designed to maintain the charge. Before storage and again in spring the battery should be charged with the O.E.M. supplied charger.*

## Stopping the Engine

In the stop position the brake pad is applied to the inside edge of the flywheel; at the same time the ignition system is grounded out.



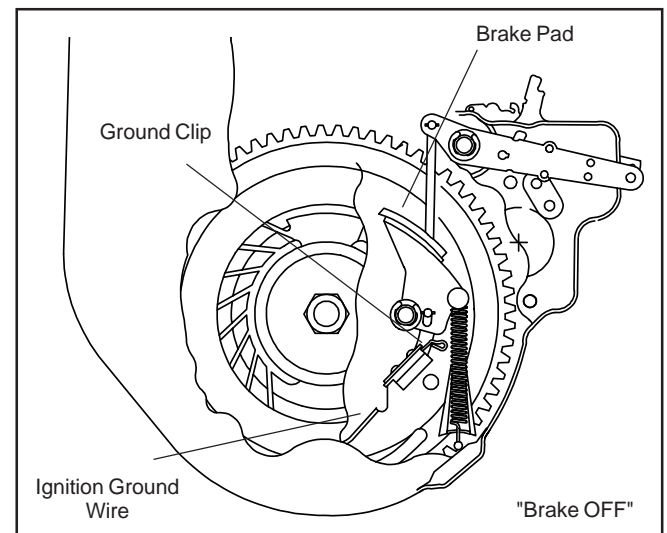
## To Start Engine

In order to restart the engine, the engine/blade control must be activated. This action pulls the brake pad away from the inside edge of the flywheel and opens the ignition ground switch.

### NOTES

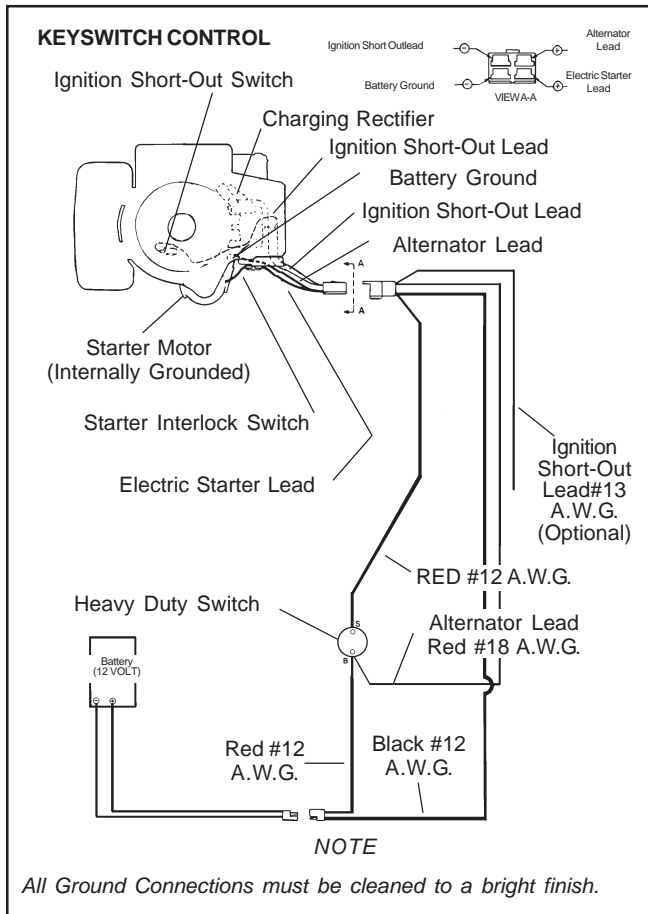
*On electric start systems the starter is energized to start the engine.*

*On recoil start systems, recoil starter rope must be pulled to start engine.*



## Wiring Diagrams

(Electric Start Systems). All wiring beyond the connectors on the engine are supplied by the equipment manufacturer. Check all terminals and connectors for corrosion and adequate contact, and all wiring for damage and proper size.



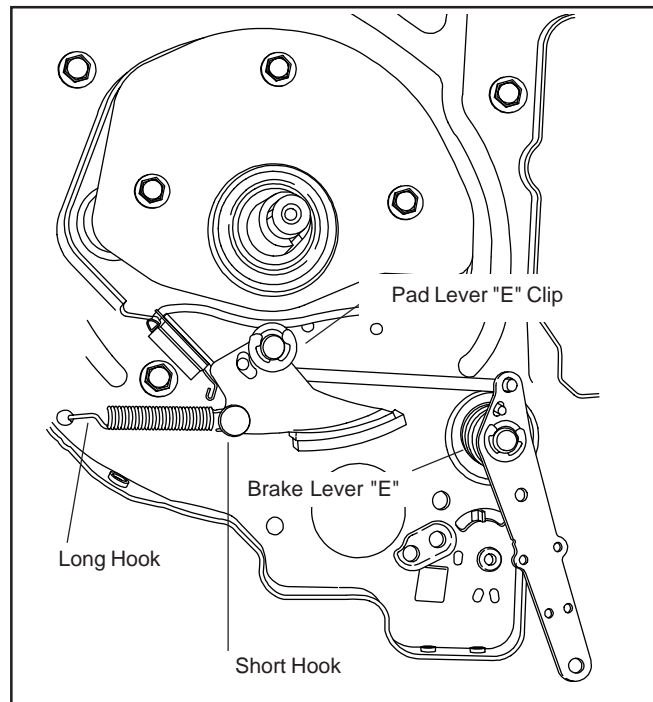
## Battery

Check battery per manufacturer's recommendations. The charging system on the engine maintains the battery during normal use.

When battery is low, use the 120 volt auxiliary charger (usually supplied by the equipment manufacturer).

## Brake Pad Replacement

1. If equipped with electric starter, locate wire routing through blower housing. Compress the grommet and pull it out of the blower housing. Carefully slide wires through the slot. DO NOT cut the wire insulation on the blower housing.
2. Remove the flywheel (see flywheel removal.)
3. Remove pad lever "E" clip. Lift pad lever, and unhook spring and link.
4. Attach the link to the new pad lever; install pad lever and "E" clip.
5. Attach spring to lever first. Use a needle nose pliers to hook the spring into the baffle.



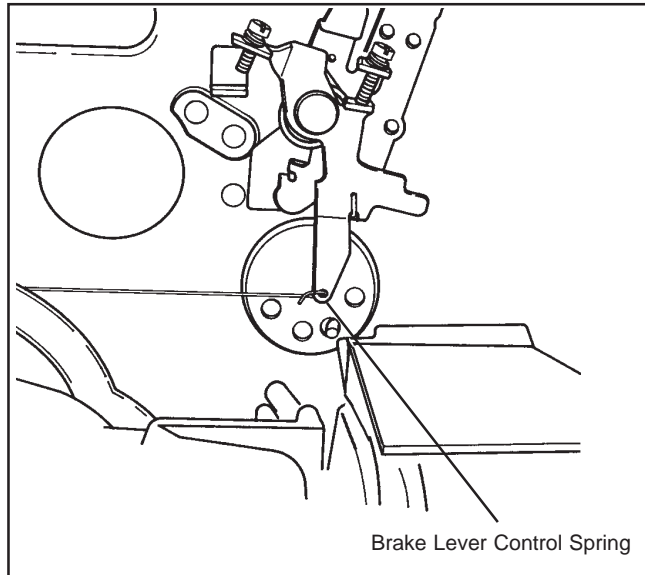
**NOTE**

It is important to attach the pad lever spring with the short hook on the pad lever and the long hook to the blower housing baffle.

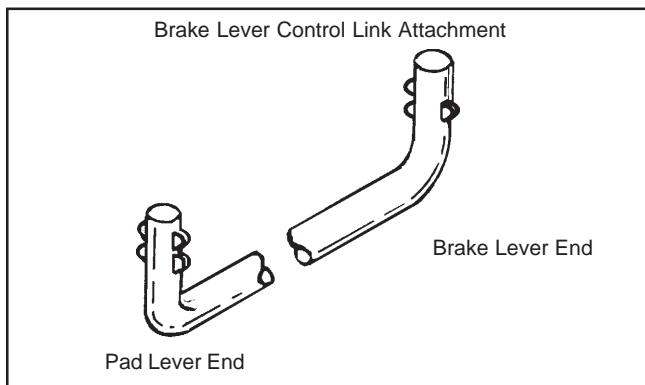


### Brake Control Lever Replacement

1. Mark hole that spring is installed into baffle.
2. Remove "E" clip from brake lever shaft.
3. Lift brake control lever and unhook link.



4. Replace with new lever and reassemble in reverse order.
5. Replacement springs must be the same size and color.
6. Be sure control lever spring is in proper hole in blower housing baffle before reassembly.



When removing the brake lever with a reverse pull brake, the pad lever must be removed to unhook the brake link from the brake lever.

### Control Switch

The brake lever must close the switch before the starter can be engaged.

Disconnect battery from circuit before making check.

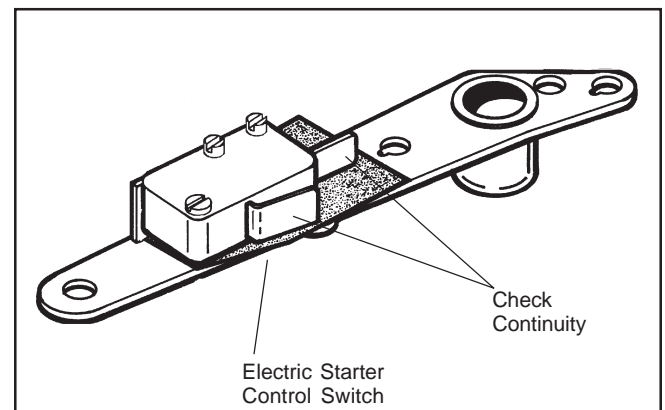
Engines equipped with an electric starter have a control switch that is attached to the brake lever. The brake lever must close the switch before the starter can be engaged.

### Checking Control Switch

1. Disconnect the battery from the circuit.
2. Use a continuity light or meter to check control switch operation.
3. Disconnect the wire harness at the engine.
4. Attach one continuity light lead to the electric starter lead. See illustration on previous page.
5. Attach the other continuity light lead to the battery ground lead.
6. With leads attached, press the control switch lever and the continuity light should turn on.

#### NOTE

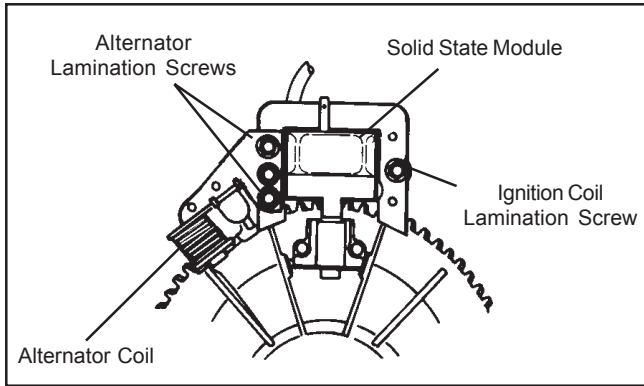
*If continuity light does not turn on replace control switch.*



## Chapter 6 Alternator

### Alternator

The 350 Milliampere charging system consists of a single alternator coil mounted to one side of the solid state module.



#### NOTE

*This charging system is designed to maintain a charged battery. Most O.E.M.'s supply a trickle charger, which should be used before and after off-season storage. This system will maintain the charge level under normal use conditions.*

**CAUTION** Do not operate engine with charging system disconnected. Doing so may result in damage to diode.

### System Checking

#### NOTE

*Set volt/ohm meter to 0-20 volt D.C. scale for test.*

*The battery MUST BE IN CIRCUIT for test to perform properly.*

1. Connect voltmeter at the battery (should read battery voltage).
2. Next, start engine -voltage should read higher than when engine is off.

#### NOTES

*If there is a change upward in voltage, the charging system is working.*

*If there is no change in voltage, the alternator should be replaced.*

### Troubleshooting Electric Start Engines

The following is a list of possible problems and causes.

#### Dead Battery

- Extended storage without charging
- Excessive cranking
- Faulty starter
- Faulty wiring
- Faulty alternator
- Faulty battery

#### Battery O.K., Engine Won't Crank

- Brake cable defective
- Faulty starter switch
- Poor electrical connections
- Faulty starter. See starter section

#### Engine Cranks Slowly

- Weak or discharged battery
- Faulty starter

### Troubleshooting for Both Mechanical and Electric Start Systems

#### If Engine Pulls or Cranks Hard

- Excessive engine drag due to obstructions under deck.
- Mower traction drive mis-adjusted
- Valve clearance too wide
- Compression release not functioning
- Flywheel brake is still applied

Maximum compression should be 90 PSI (6.2 Bar). If compression is higher, de-carbon the valve seat and head area and check valve clearances. Exhaust valve clearance may be set as low as .004" (.10 mm) if necessary to gain more compression relief. If compression is still above 90 PSI (6.2 Bar), check the camshaft compression relief mechanism.

## Chapter 7 Ignition

### Solid State Ignition

Tecumseh's solid state capacitor discharge ignition (CDI) is an all electronic ignition system and is encapsulated in epoxy for protection against dirt and moisture.

### Solid State Ignition Operation

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. This energy is transferred to a capacitor where it is stored until it is needed to fire the spark plug.

The magnet continues rotating past a trigger coil where a low voltage signal is produced and closes an electronic switch (SCR).

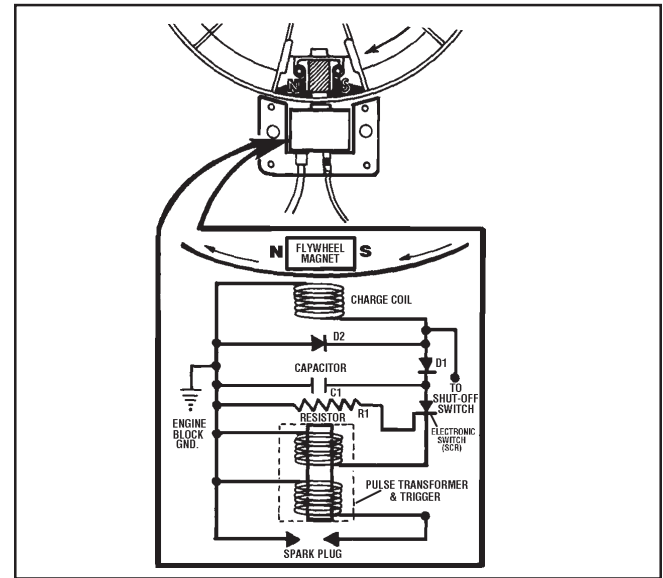
The energy which was stored in the capacitor is now transferred through the switch (SCR) to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage is transferred by means of the high tension lead to the spark plug, where it arcs across the electrode of the spark plug and ignites the fuel-air mixture.

### Spark Plug Service

Spark plugs should be replaced periodically. Check electrode gap with wire feeler gauge and adjust gap to .030" (.762 mm). Replace if electrode is pitted, burned or the porcelain is cracked. Refer to Master Parts Manual for correct replacement number. Use a spark plug tester to check for spark.

If spark plug fouls frequently, check for the following conditions:

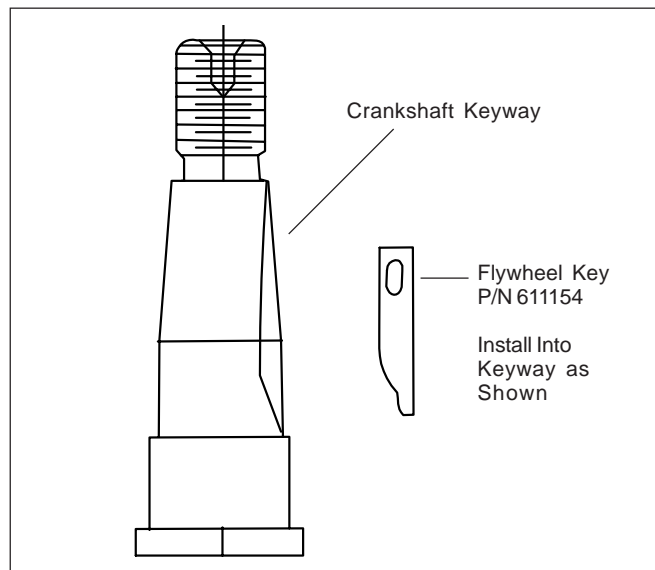
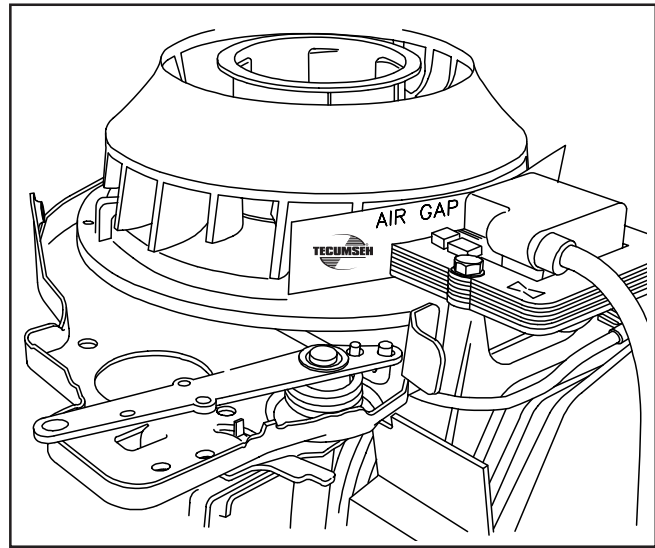
1. Incorrect spark plug
2. Poor grade gasoline
3. Breather plugged
4. Oil level too high
5. Engine using excessive oil
6. Clogged air cleaner



The proper air gap setting between magnets and the laminations on CDI systems is .0125" (.313 mm). Install gauge, Tecumseh Part No. 670297 between the magnets and laminations and tighten mounting screws to a torque of 30-40 inch pounds (3-4.5 Nm). Recheck gap setting to make certain there is proper clearance between the magnets and laminations.

### Ignition Timing

The flywheel key is what times the ignition for the engine. If this key is partially sheared from striking an object with the blade, the timing and engine performance could be affected. The key should be inspected if a performance problem exists.



## Chapter 8

# Piston, Rings and Connecting Rods

### Piston and Rings

**CAUTION** Use extreme care when handling piston. Any scratches, gouges or other marks could score the cylinder during operation and result in engine damage.

1. Before removing piston, clean any carbon from the top of the cylinder bore to prevent ring breakage when removing the piston.
2. Push the rod and piston out through the top of the cylinder.

Oversize pistons are identified by the size imprinted on the piston as shown.

3. Check the piston for wear by measuring at the bottom of the skirt 90° from the wrist pin hole.
4. Clean the carbon from the piston ring grooves, install new rings and measure side clearance.

**NOTE**

Tolerances are listed in the table of specifications.

**CAUTION** Always use new piston rings when servicing piston. When reused, old piston rings may weaken, break or dislodge resulting in engine damage.

5. Replace rings in sets and always stagger ring gaps.
6. When installing new rings, deglaze cylinder wall, using a commercially available deglazing tool.
7. Use a ring expander to remove and replace rings.

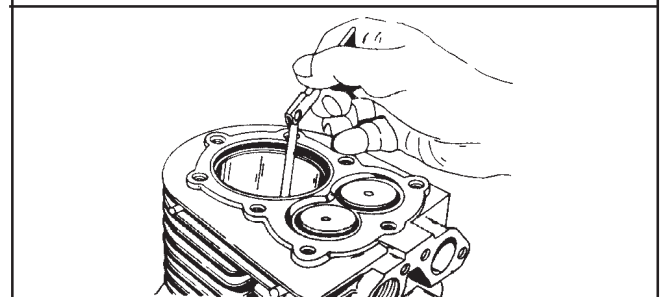
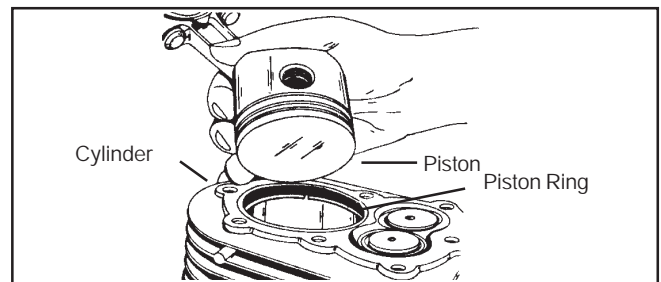
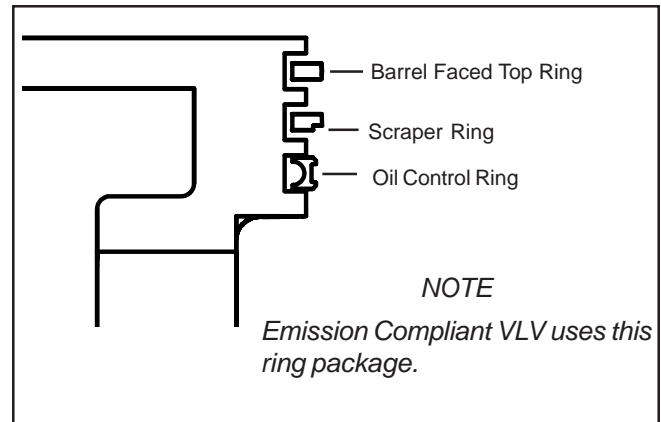
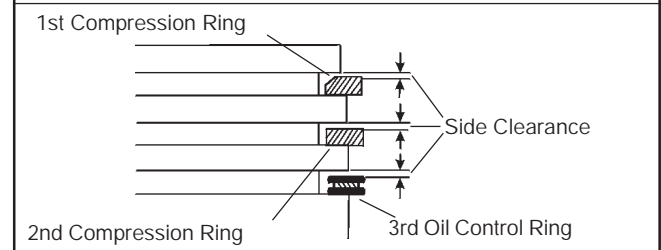
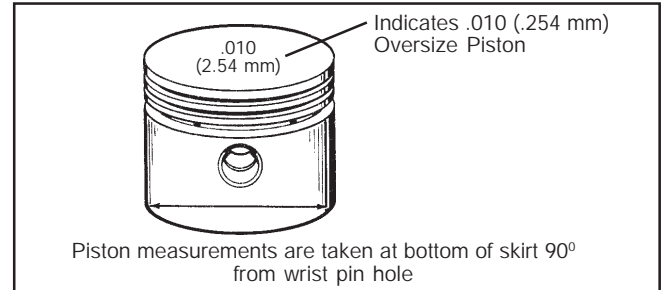
**CAUTION** Do not spread the piston rings too wide. Doing so may result in ring breakage.

The top compression ring will have a chamfer on the inside edge.

**NOTE**

The top compression ring must be installed with the chamfer side up.

8. To check ring end gap, place ring squarely in center of ring travel area.
9. Use the piston to push the ring down into the cylinder at least one inch.
10. Check ring gap on new ring to determine if cylinder should be rebored to take oversize parts.
11. See Table of Specifications.



## Connecting Rods

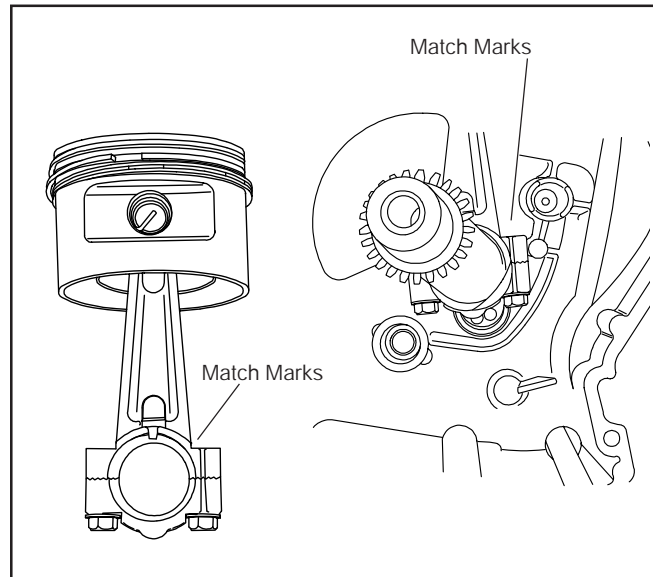
**CAUTION** Do not attempt to straighten bent connecting rods. Doing so will damage the cylinder and piston beyond repair.

Match marks on connecting rods must always align and must face outward toward the mechanic when installed in an engine.

A new piston can be installed on the connecting rod in either direction.

If the old piston is reused, install the piston to the connecting rod so that the piston will be in the same position when reinstalled in the engine.

If it is necessary to replace the connecting rod be sure to mark the valve side of the piston.



## Chapter 9

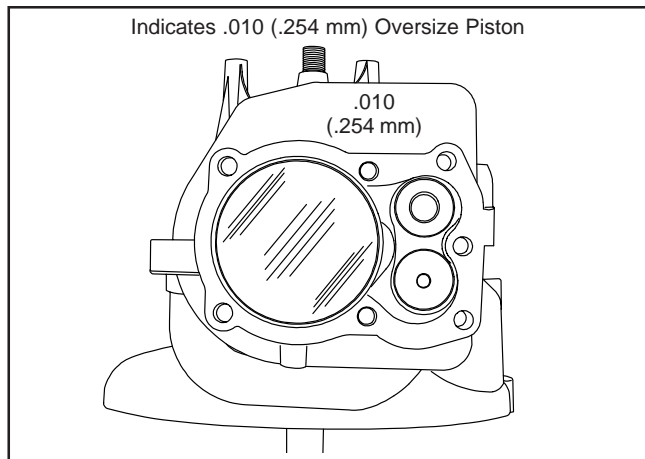
# Cylinders and Cylinder Heads

### Cylinder Service

Check cylinder for dirty, broken or cracked fins, worn or scored bearings or scored cylinder bore surface, and warped head mounting surface.

If cylinder bore is out-of round, scored or worn more than .005" (.13 mm) oversize, it should be replaced or rebored to .010 (.254 mm) or .020 (.50 mm) oversize. In some cases engines are built with an oversize cylinder; in these instances they are identified with the oversize value imprinted on the cylinder as pictured. Service pistons have the oversized valve marked on the dome.

**CAUTION** Do not use valves with undersized margins. Doing so may result in a valve that does not seat normally, burns easily, and can also lead to valve cracking.



### Reboring

#### NOTE

To re bore cylinder we recommend using a reputable machine shop or service center.

After reboring, hone the cylinder with 380 grit stone to obtain a good cross hatch pattern for proper ring seating.

Clean cylinder with soap and water, and dry thoroughly.

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

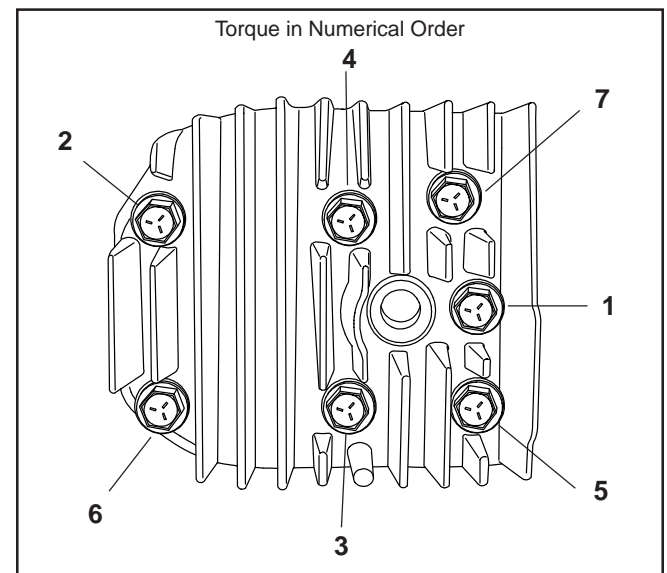
### Cylinder Heads

Check cylinder heads for warpage by placing on a flat surface. If the cylinder head gasket surface is warped in excess of .005 inches (.13 mm), replace the head.

**CAUTION** The numerical order for gradually removing and tightening head screws on the cylinder head is critical for proper distribution of pressure over gasket area. It prevents stud failure, gasket leaks including head and cylinder distortion.

Always replace head gasket and torque head bolts in 50 inch lb. (5.6 Nm) increments in the numbered sequence to a torque of 180-220 inch lbs. (20.3 - 25 Nm).

**CAUTION** Only a thin oil film is allowed to remain on cylinder head screws. Excess oil will pool in the head screw sleeve, preventing proper torque application and full thread engagement.





## Chapter 10

### Crankshafts, Camshafts and Lubrication

#### Crankshafts

**CAUTION** Do not attempt to straighten a bent crankshaft. Doing so will damage gears, and result in engine failure.

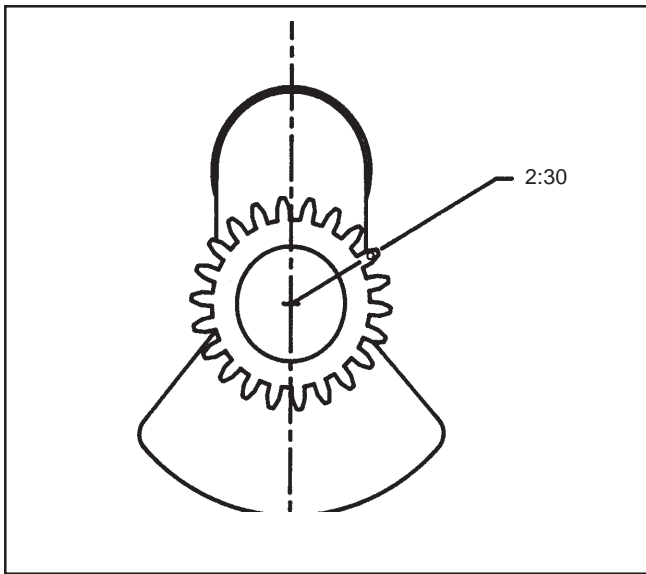
Inspect crankshaft for worn, scratched or damaged bearing surfaces, out-of-round or flat spots on the journal area, or a bent P.T.O. end.

**CAUTION** When servicing crankshaft, lubricate all bearing surfaces prior to assembly. Leaving these parts dry could accelerate wear at start-up.

When installing a crankshaft, lubricate all bearing surfaces and use oil seal protector part no. 670327.

#### Crankshaft Timing Mark

The crankshaft has a pressed-on timing gear. This gear has a small dimple punched on one of the teeth on this gear.



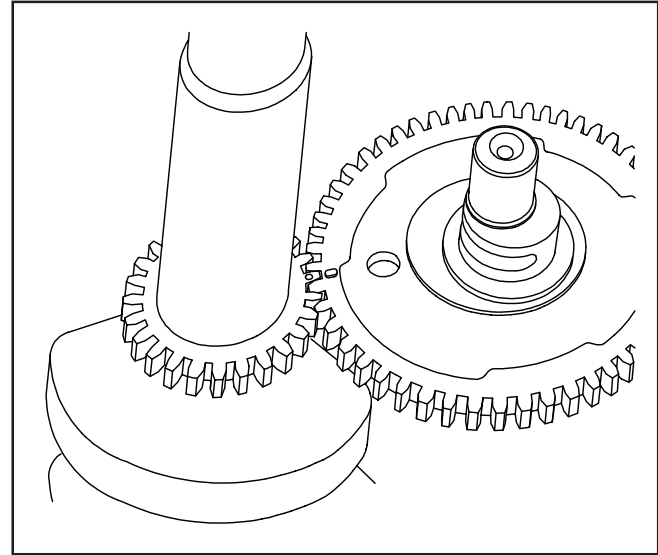
This dimple is a timing mark. With the crankpin at top dead center, the timing mark should be in the 2:30 position.

#### NOTE

Timing marks on crankshaft gear and camshaft gear must be aligned for proper valve timing.

#### Camshaft Removal

Align timing marks to relieve valve train pressure. Lift out cam.

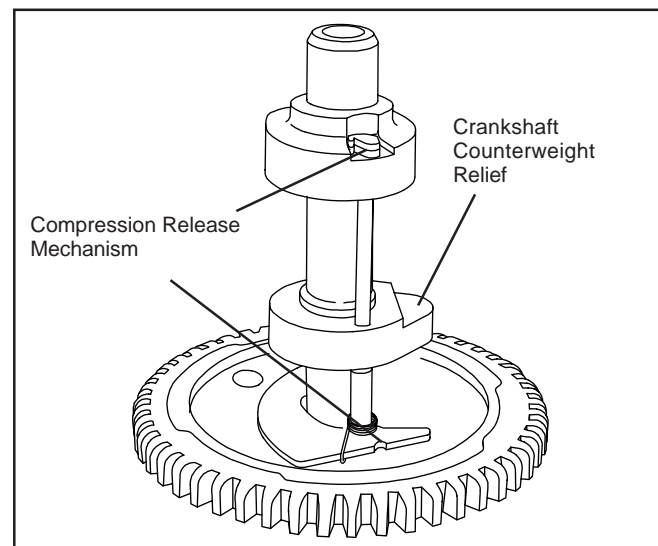


The camshaft has a mechanical compression release mechanism. A pin which runs through both cam lobes extends past the exhaust lobe and lifts the valve to relieve compression for easier starting. When the engine starts, centrifugal force moves the flyweight outward, moving the pin below the lobe, allowing full compression.

#### NOTES

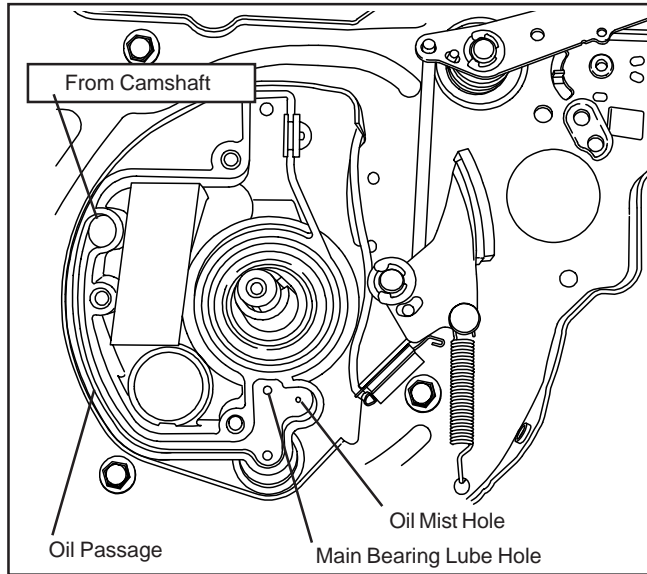
*The compression release mechanism is non-serviceable. Replace camshaft assembly if damaged or worn.*

The camshaft has been relieved in the intake lobe area. This change was made to accommodate added crankshaft counterweight material for improved engine balance.

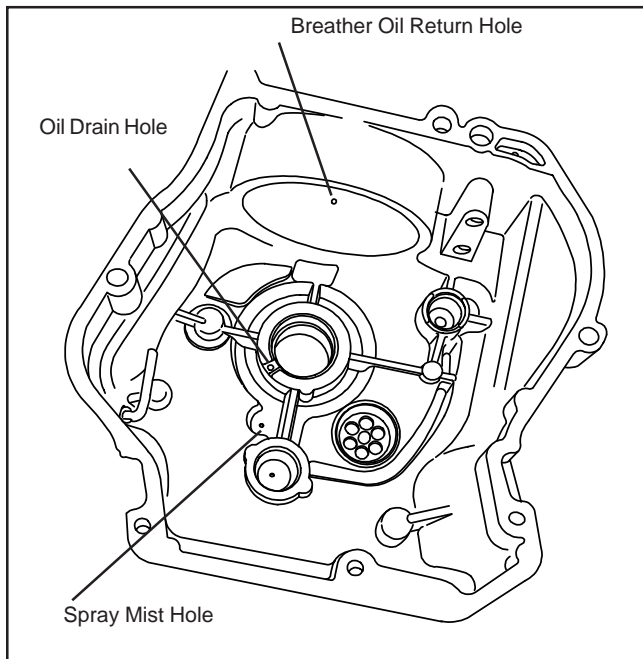


### Lubrication System

All Tecumseh Vertical shaft 4-Cycle engines use a positive displacement plunger oil pump to pump oil from the crankcase, up through the camshaft to a passage in the breather box to the top crankshaft main bearing.



Oil is pressure sprayed out of a small hole between the crankshaft and ultra-balance bearing, to lubricate the connecting rod journal area. If a heavy leakage is noted from the breather cover, check for plugged mist hole.

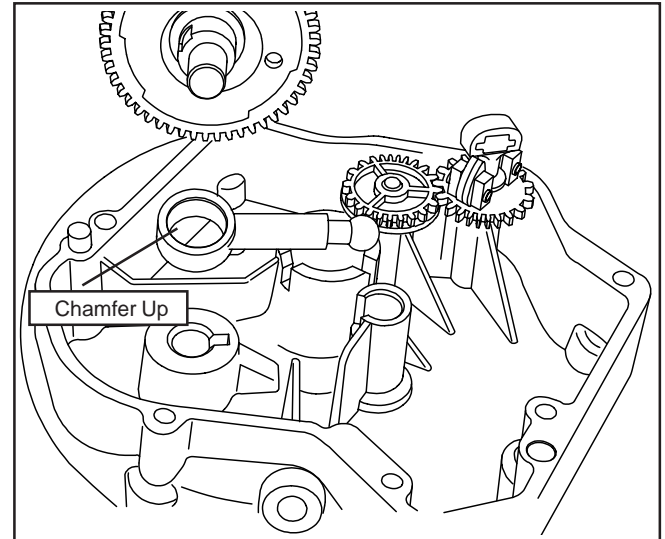


### Oil Pump

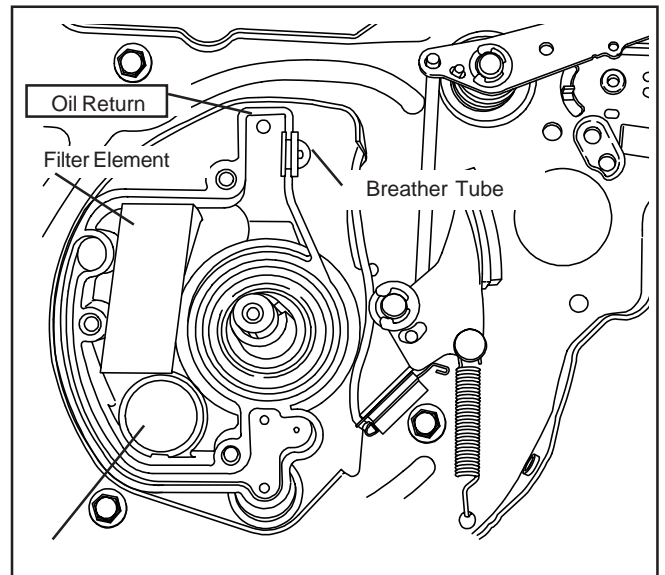
An eccentric on the camshaft works the plunger in the barrel back and forth, forcing oil up the center of the camshaft. A ball on the end of the plunger locates in a recess in the flange cover.

#### NOTE

*When installing oil pump, make certain the chamfered side of the pump barrel faces the camshaft, and the plunger ball seats in the recess of the flange cover.*



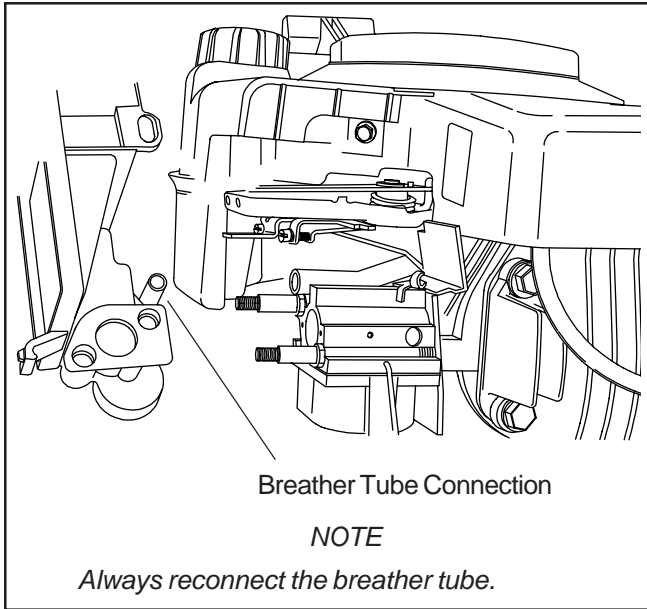
This engine has a top mounted integral breather.



The breather compartment is located under the flywheel. A check valve allows excess crankcase pressure to be vented through the element and out the breather tube. The breather tube is connected to the air cleaner body.

*NOTE*

*DO NOT pinch filter element when servicing air cleaner body. Doing so may result in leakage.*



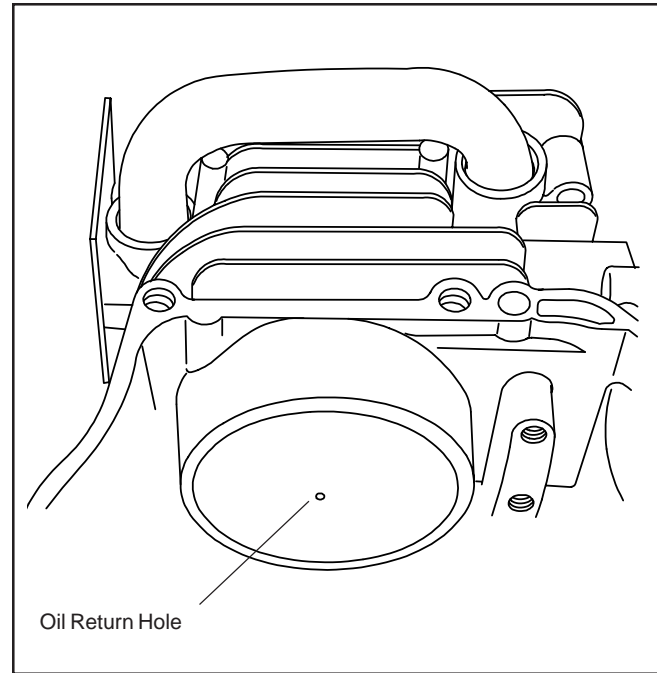
Condensed oil vapors are returned to the crankcase by means of the oil return hole. The oil return hole is opened and closed in the cylinder by the piston.

The breather filter element can be cleaned using solvent.

*NOTE*

*When reinstalling the check valve, apply oil to aid in assembly.*

A new breather valve body can be pressed into the block to replace a damaged breather valve body.



## Chapter 11

### Valves, Lifters, Spring and Valve Seats

#### General Information

Valves must be in good condition, proper sealing and proper gap must be maintained for full power, easy starting and efficient operation.

#### Valve Removal

To remove valves, use a commercially available valve spring compressor. Move the lower cap, so it will slip off the end of the valve.

Clean all parts and remove carbon from valve heads and stems. If valves are in usable condition, grind the valve faces to a 45° angle.

#### NOTES

*It is important to remove no more metal than required to clean up and true the valve face.*

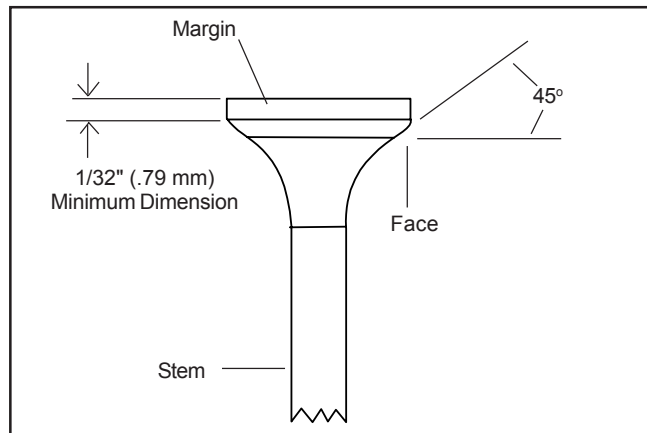
*Replace valves if they are damaged, distorted or if the margin is ground to less than 1/32" (.79 mm).*

*Replace the valve if end of valve stem shows uneven wear.*

*After valves have been ground, handle with care to prevent damage to the ground faces.*

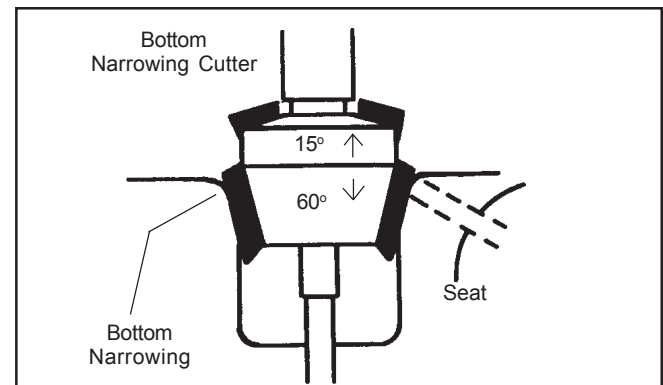
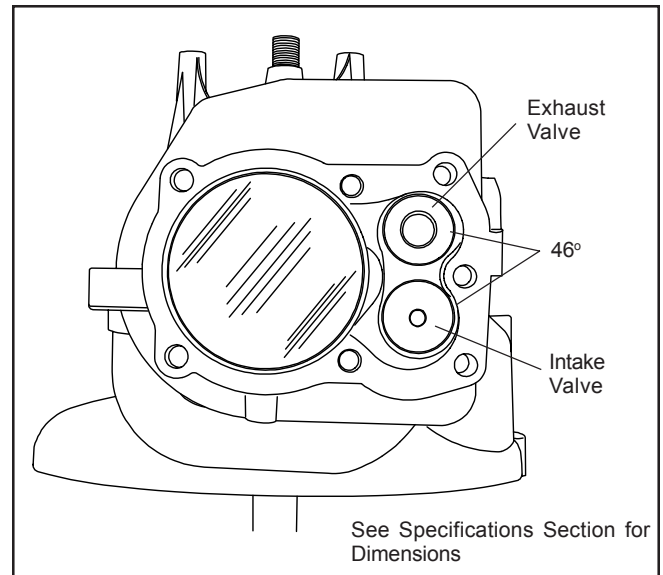
**CAUTION** Do not use valves with undersized margins. Doing so may result in a valve that does not seat normally, burns easily, and can also lead to valve cracking.

#### Valve Seats

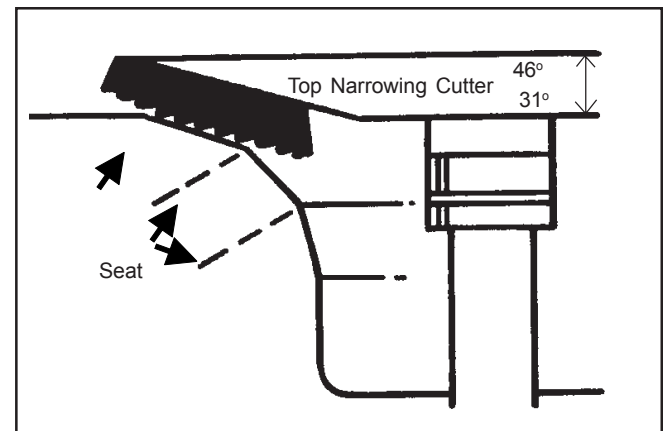


Valve seats are not replaceable. If they are burned or pitted, they can be reground using a grinding stone or valve seat cutter.

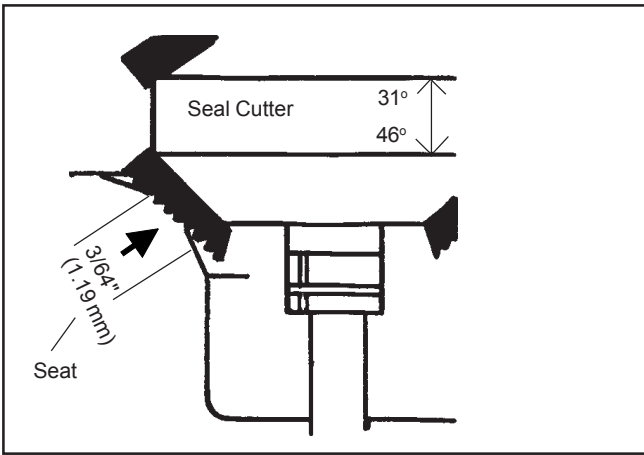
The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of three different degree cutters. First, use the 60° cutter to clean and narrow the seat from the bottom toward the center.



Second, use the 31° cutter to clean and narrow the seat from the top toward the center.



Seats are ground at an angle of 46°, to a width of 3/64" (1.19 mm).



Valves are not identical. Make sure the valve marked "EX" or "X" is installed in the exhaust valve location, and the valve marked "I" is installed in the intake valve location. If the valves are unmarked, the nonmagnetic valve is installed in the exhaust valve location.

### Valve Adjustment

Clearance between the valve stem and lifter must be set to the recommended specifications when the engine is cold (see page 40). Check these clearances with the piston T.D.C. on the compression stroke. Grind end of valve stem with a valve grinder, or use a "V" block to hold the valve square on grinding wheel, grinding to the proper .004" to .008" (.101 - .203 mm) clearance.

#### NOTE

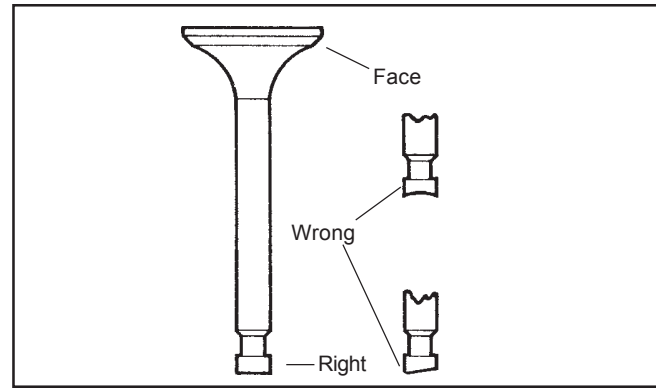
*Some emissionized engines use intake valve stem seals to maintain proper oil control and emission compliance. They must be replaced if the valve has been removed.*

### Valve Installation

1. To reinstall valves, position valve caps and spring in the valve compartment.
2. Install valves in guides with valve marked "I" in the intake port. The valve stem must pass through the spring. The valve spring cap should sit around the valve lifter exposed end.

**⚠ WARNING** Use extreme care when servicing any springs. Wear the appropriate safety equipment. These springs may be highly compressed and could fly out with considerable force. Failure to do so may result in death or serious injury.

3. Use a valve spring compressor to compress the valve spring.
4. Position the valve spring cap onto the valve stem and release valve spring tension to lock cap in place.



### Valve Lifters

It is a good practice not to interchange lifters, even though they are identical, once a wear pattern has been established.

### Upsize Valve Guides

Valve guides are permanently installed in the cylinder. If they become worn excessively, they can be reamed oversized to accommodate a 1/32" (.79 mm) over size valve stem.

1. Ream guides with a straight shanked hand reamer or low speed drill press.
2. Refer to Table of Specifications to determine correct oversize dimension.

Reamers are available through your Tecumseh parts suppliers.

3. See Tool Section for correct part numbers.
4. After oversizing valve guides the seats must be recut to align with the valve guides.

## Chapter 12

### Oil Seal Service and Mounting Flange

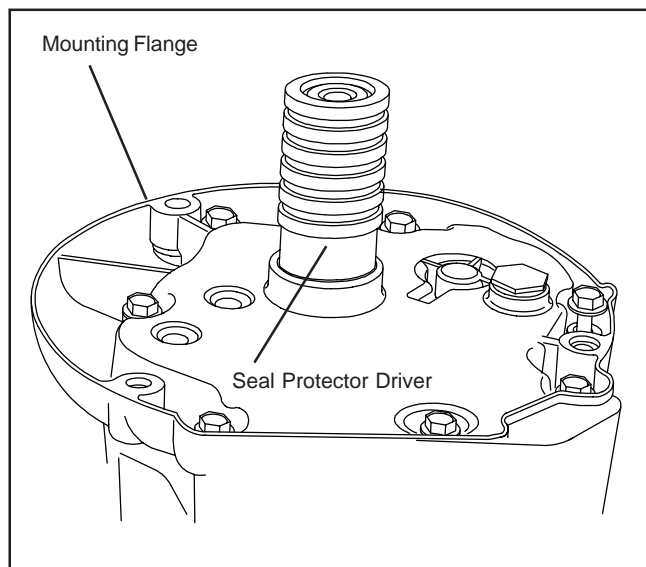
#### Oil Seal Service

1. Drain oil from crankcase.
2. If the crankshaft end is rusty or pitted, polish the crankshaft with emery cloth so it will not damage the bearings when the cover is removed.
3. Remove mounting bolts and slide seal protector-driver tool (Part No. 670327A) into the oil seal.

#### NOTE

If necessary, tap edge of flange or cover **lightly** with a rubber mallet to remove cover.

4. Clean and inspect the cover for wear and scoring of bearings.
5. Inspect crankshaft bearings.
6. Replace any worn or damaged parts.



#### NOTES

If crankshaft is out of engine, remove old oil seals by tapping them out with a screwdriver or punch from the inside.

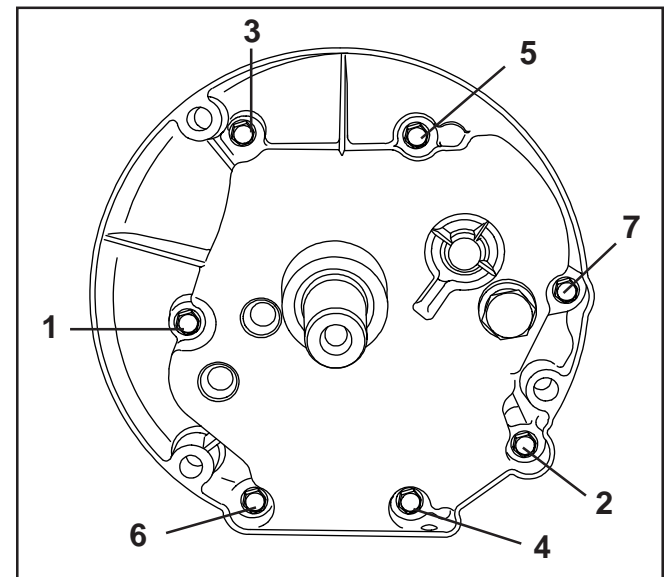
To remove a seal with the crankshaft in the engine, insert a screwdriver between the seal and the crankshaft and pry the seal out.

#### Seal Replacement

1. Lubricate the outside of the new oil seal with oil prior to installation.
2. Use seal driver-protector tool (Part No. 670327A).
3. Place oil seal over the driver-protector and place over crankshaft, driving it into position using universal driver (Part No. 670272). The seal will automatically be driven into the proper depth.

**CAUTION** The numerical order for gradually removing and tightening screws on the mounting flange is critical for proper distribution of pressure. Failure to do so may result in oil leaks and accelerated engine wear.

4. Torque flange bolts in numerical order as shown in illustration.
5. See Torque Specifications Section.





## Chapter 13 Troubleshooting

The following charts can be helpful in locating the most common troubles associated with gasoline engines; Possible causes and remedies are listed below. Refer to the appropriate sections in this Technician's Handbook for further detail of procedures.

<b>Table 1. 4-Cycle Engine Troubleshooting Chart</b>	
<b>Engine Fails to Start or Starts with Difficulty</b>	
<b>Cause</b>	<b>Remedy and Reference</b>
No fuel in tank.	Fill tank with clean, fresh fuel.
Shut-off valve closed.	Open valve.
Tank cap vent obstructed.	Clean the vent or replace the cap.
Obstructed fuel line.	Clean fuel screen and line. If necessary, remove and clean carburetor.
Engine flooded.	Close fuel shut-off, if so equipped, and pull starter until engine starts. Reopen fuel shut-off for normal fuel flow.
Water in fuel.	Drain tank. Clean carburetor and fuel lines. Dry spark plug points. Fill tank with clean, fresh fuel.
Spark plug fouled.	Replace spark plug.
No spark at plug.	Check ignition air gap. If air gap is correct and there is no spark at plug replace ignition.
Spark plug porcelain cracked.	Replace spark plug.
Electric starter does not crank engine.	See 12 volt starter troubleshooting chart.
Loose or defective ignition wiring.	Check ignition wiring for shorts or grounds; repair if necessary
Incorrect timing.	Flywheel key has sheared or partially sheared. Replace key.
Poor compression.	Overhaul engine.
<b>Engine Knocks</b>	
Loose flywheel.	Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to proper torque.
Improper ignition timing.	Flywheel key has sheared or partially sheared. Replace key.
Carbon in combustion chamber.	Remove cylinder head and clean carbon from head and piston.
Loose or worn connecting rod.	Replace connecting rod.
Worn cylinder.	Replace cylinder.



<b>Table 1. 4-Cycle Engine Troubleshooting Chart (Continued)</b>	
<b>Engine Misses Under Load</b>	
<b>Cause</b>	<b>Remedy and Reference</b>
Spark plug fouled.	Replace spark plug.
Improper spark plug gap.	Regap spark plug.
Spark plug porcelain cracked.	Replace spark plug.
Improper valve clearance.	Adjust valve clearance to recommended specifications.
Weak valve spring.	Replace valve spring.
<b>Engine Lacks Power</b>	
Air cleaner fouled.	Service air cleaner.
Lack of lubrication.	Fill crankcase to the proper level.
Ignition improperly timed.	Replace flywheel key.
Valves leaking.	Grind valves and set to recommended specifications.
Worn rings.	Replace rings.
<b>Engine Overheats</b>	
Cooling fins clogged.	Clean cooling fins.
Air flow obstructed.	Remove any obstructions from air passages in shrouds.
Fuel tank cap vent hole clogged.	Open vent hole.
Lack of lubrication.	Fill crankcase to proper level.
Excessive load on engine.	Check operation of associated equipment. Reduce excessive load.
Carbon in combustion chamber.	Remove cylinder head and clean carbon from head and piston.
Engine improperly timed.	Replace flywheel key if sheared.
<b>Engine Surges or Runs Unevenly</b>	
Governor parts sticking or binding.	Clean, and if necessary repair governor parts.
Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking.	Clean, lubricate, or adjust linkage and deburr throttle shaft or butterfly. Carburetor throttle linkage or throttle
Intermittent spark at spark plug.	Disconnect ignition cut-off wire at the engine. Crank engine. If spark, check ignition switch, safety switch and interlock switch. If no spark, check ignition air gap. Check wires for poor connections, cuts or breaks.
Governor not set properly.	Perform static governor setting.
Dirty carburetor.	Clean carburetor.
Valves not seated.	Clean carbon from valve, recut seats, check valve clearance.
<b>Engine Vibrates Excessively</b>	
Engine not securely mounted.	Tighten loose mounting bolts.
Bent crankshaft.	Replace crankshaft.
Associated equipment out of balance.	Check associated equipment.

**Table 1. 4-Cycle Engine Troubleshooting Chart (Continued)**

<b>Engine Uses Excessive Amount of Oil</b>	
<b>Cause</b>	<b>Remedy and Reference</b>
Oil level too high.	To check level turn dipstick cap tightly into receptacle for accurate level reading.
Oil filler cap loose or gasket damaged causing spillage.	Replace ring gasket under cap and tighten tube securely.
Engine speed too fast.	Using tachometer adjust engine RPM to spec.
Gaskets damaged or gasket surfaces nicked causing oil to leak out.	Clean and smooth gasket surfaces. Always use new gaskets.
Breather tube not connected to air cleaner.	Reconnect tube.
Using 10W30 oil under high load/high temperature conditions.	Replace with SAE 30 oil.
Breather mechanism damaged or dirty causing leakage.	Replace breather assembly.
Drain hole in breather box clogged causing oil to spill out of breather.	Clean hole with wire to allow oil to return to crankcase.
Oil passages obstructed.	Clean out all oil passages.
Piston oil control ring return holes clogged.	Remove oil control ring and clean return holes.
Piston rings and grooves worn excessively.	Reinstall new rings and check land clearance and correct as necessary.
Cylinder wall worn or glazed, allowing oil to bypass rings into combustion chamber.	Bore cylinder for oversized piston & rings.
Piston fit undersized.	Measure and replace as necessary.
Valve guides worn excessively thus passing oil into combustion chamber.	Ream valve guide oversize and install 1/32" oversize valve and new valve seal if equipped.
<b>Oil Seal Leaks</b>	
Crankcase breather plugged.	Clean or replace breather.
Seal outside seat in cylinder or side cover is damaged, allowing oil to seep around outer edge of seal.	Visually check seal receptacle for nicks and damage. Replace P.T.O. cylinder cover, or small cylinder cover on the magneto end if necessary.
Old seal hardened and worn. Crankshaft seal contact surface is worn undersize causing seal to leak.	Replace seal. Check crankshaft size and replace if worn excessively.
Crankshaft bearing under seal is worn excessively, causing crankshaft to wobble in oil seal.	Check crankshaft bearings for wear and replace if necessary.

<b>Table 1. 4-Cycle Engine Troubleshooting Chart (Continued)</b>	
<b>Oil Seal Leaks (Continued)</b>	
<b>Cause</b>	<b>Remedy and Reference</b>
Bent crankshaft causing seal to leak.	Check crankshaft for straightness and replace if necessary.
New seal damaged upon installation.	Use proper seal protector tools and methods for installing another new seal.
New seal installed without correct seal driver and not seating squarely in cavity.	Replace with new seal, using proper tools and methods.
Oil seal driven too far into cavity.	Remove seal and replace with new seal, using the correct driver tool and procedures.
<b>Breather Passing Oil</b>	
Oil level too high.	Check oil level Turn dipstick cap tightly into receptacle for accurate level reading. DO NOT fill above full mark.
Loose oil fill cap or gasket damaged or missing.	Install new ring gasket under cap and tighten securely.
Engine speed too fast.	Use tachometer to adjust correct RPM.
Cylinder cover gasket leaking.	Replace cover gasket.
Damaged or worn oil seals on end of crankshaft.	Replace seals.
Breather mechanism loose or gaskets leaking.	Install new gaskets and tighten securely.
Breather mechanism installed upside down.	Small oil drain holes must be down to drain oil from mechanism.
Drain hole in breather box clogged.	Clean hole with wire to allow oil to return to crankcase.
Breather mechanism dirty.	Clean thoroughly in solvent. Use new gaskets when reinstalling unit.
Breather mechanism damaged.	Replace umbrella valve/seat in Vector engine and TVS engines.
Breather assembly not assembled correctly.	See section on Breather Assembly.
Rings not properly seated.	Check for worn, or out of round cylinder. Replace rings. Break in new rings with engine working under a varying load. Rings must be seated under high compression, or in other words, under varied load conditions.

**Table 2. Carburetor Malfunction Check Points**

Trouble	Corrections
Engine will not start	1, 2, 3, 4, 5, 6, 8, 14, 15, 17, 18, 19
Engine will not accelerate	2, 3, 17
Engine hunts (at idle or high speed)	3, 4, 8, 9, 14, 20, 21, 22
Engine will not idle	4, 8, 9, 14, 20, 21, 22
Engine lacks power at high speed	2, 3, 6, 8, 17
Carburetor floods	4, 7, 16, 18
Carburetor leaks	6, 7, 18
Engine overspeeds	8, 9, 14, 15
Idle speed is excessive	8, 9, 14, 15
Engine starves for fuel at high speed (leans out)	1, 3, 4, 6, 15, 16, 17
Carburetor runs rich	7, 16, 18
Performance unsatisfactory after being serviced.	1, 2, 3, 4, 5, 6, 7, 8, 9, 15, 16, 17

1. Open fuel-shut off valve at fuel tank—Fill tank with fuel.
2. Check ignition, spark plug.
3. Clean air cleaner—Service as required.
4. Dirt or restriction in fuel system—Clean tank and fuel strainers, check for kinks or sharp bends.
5. Check for stale fuel or water in fuel - - Fill with fresh fuel.
6. Examine fuel line and pick-up for sealing at fittings.
7. Check and clean atmospheric vent holes in carburetor and air cleaner body.
8. Examine throttle for binding or excessive play- - Remove all dirt or paint, replace shaft.
9. Examine throttle return spring for operation.
10. Check for bent throttle plate.
11. Adjust control cable or linkage, to assure carburetor control.
12. Clean carburetor after removing all nonmetallic parts that are serviceable. Trace all passages.
13. Check inlet needle and seat for condition and proper installation.
14. Check sealing of welch plugs, and gaskets.
15. Adjust governor linkage.
16. Check float shaft for wear and float for leaks or dents.
17. Check flywheel key for damage.
18. Shrunken primer bulb causing siphon affect.
19. Check for warp air filter box causing prime charge loss.
20. Air leak at idle welch plug, reseal with nail polish.
21. Air leak at intake cross over pipe, check using spray carburetor cleaner.
22. Air leak between the carburetor body and bowl. Replace bowl assembly.

Table 3. Troubleshooting 12 Volt Starters		
Problem	Probable Cause	Remedy and Reference
Does not function	Weak or dead battery.	Check charge and/or replace battery.
	Loose or faulty electrical connections.	Correct.
	Corroded battery terminals and/or electrical connections.	Clean terminals and/or connections.
	Load on engine.	Disengage brake.
	Electric starter cranks, but no spark at spark plug.	Disconnect ignition cut-off wire at the engine. Crank engine. If spark at spark plug, ignition switch, safety switch is in operative. If no spark, check air gap. Check wires for poor connections, cuts or breaks.
	Electric starter does not crank engine.	Remove starter wire. Use a jumper battery and cables and attach directly to starter wire. If starter cranks engine the starter is okay, check solenoid, starter switches, safety switches and interlock switch. Check wires for poor connections, cuts or breaks.
	Electric starter cranks, but engine does not turn over.	Check flywheel ring gear for broken teeth. Replace flywheel if necessary.
	Brushes sticking.	Free brushes. Replace worn brushes and those which have come in contact with grease and oil.
	Open or shorted armature.	Replace armature.
	Shorted, open or grounded field coil.	Repair or replace housing.
	Armature binding or bent.	Free armature and adjust end play, replace armature, or replace starter.
	Low RPM	Dirty or oily commutator.
Incorrect engine oil.		Ensure the correct weight of oil is being used.
Unit controls engaged.		Insure all unit controls are in neutral or disengaged.
Weak or annealed brush springs.		Replace springs.
Loose or faulty electrical connections in motor.		Correct.
Brushes not seated properly.		Correct.
Worn bearings in cap assemblies.		Clean bearings or replace cap assemblies.
Bent armature.		Replace armature.
Binding armature.		Free up armature. Adjust armature end play. Binding armature. Free up armature. Adjust armature end play.
Dirty armature commutator.		Clean commutator.
Shorted or open armature.		Replace armature.

**Table 3. Troubleshooting 12 Volt Starters (Continued)**

<b>Problem</b>	<b>Probable Cause</b>	<b>Remedy and Reference</b>
Motor stalls under load.	Shorted field coil.	Correct, or replace housing assembly.
	Shorted or open armature.	Replace armature.
Intermittent operation.	Break in electrical circuit.	Disconnect ignition cut-off wire at the engine. Crank engine, if spark, check ignition switch, safety switch and interlock switch. Check wires for poor connections, cuts or breaks.
	Loose or faulty electrical connections.	Correct.
	Dirty or oily commutator.	Clean and dress commutator.
	Brushes binding in holders.	Free up brushes. Replace worn brushes and those which have come in contact with grease and oil.
	Open armature.	Replace armature and interlock switch.
Sluggish disengagement of the drive assembly pinion gear.	Dirt and oil on assembly and armature shaft.	Clean drive assembly and armature shaft and relubricate shaft splines.
	Bent armature.	Replace armature.

<b>Chapter 14</b>				
<b>Engine Specifications</b>				
Displacement	11.19	183.4 cc	12.6	207 cc
Stroke	2.047	51.993 mm	2.047	51.993 mm
Bore	<u>2.6390</u> 2.6380	67.031 mm	<u>2.796</u> 2.795	<u>71.018 mm</u> 70.993 mm
Air Gap Dimension Ignition	.0125	.30 mm	.0125	.30 mm
Spark plug gap	.030	.70 mm	.030	.70 mm
Valve Clearance Intake and Exhaust	<u>.004</u> .008	<u>.101 mm</u> .203 mm	<u>.004</u> .008	<u>.101 mm</u> .203 mm
Valve Seat Angle	46°	46°	46°	46°
Valve Seat Width	.047	1.2 mm	.047	1.2mm
Valve Guide Oversize Dia.	<u>.2807</u> .2817	<u>7.129 mm</u> 7.155 mm	<u>.2807</u> .2817	<u>7.129 mm</u> 7.155 mm
Crankshaft End Play	<u>.005</u> .027	<u>.127 mm</u> .685 mm	<u>.005</u> .027	<u>.127 mm</u> .685 mm
Crankpin Journal Dia.	<u>1.0235</u> 1.0230	<u>25.996 mm</u> 25.984 mm	<u>1.0235</u> 1.0230	<u>25.996 mm</u> 25.984 mm
Crankshaft Magneto Main Brg. Dia	<u>1.0242</u> 1.0237	<u>26.014 mm</u> 26.001 mm	<u>1.0242</u> 1.0237	<u>26.014 mm</u> 26.001 mm
Crankshaft P.T.O. Main Brg. Dia	<u>1.0242</u> 1.0237	<u>26.014 mm</u> 26.001 mm	<u>1.0242</u> 1.0237	<u>26.014 mm</u> 26.001 mm
Camshaft Bearing Dia.	<u>.4980</u> .4975	<u>12.649 mm</u> 12.636 mm	<u>.4980</u> .4975	<u>12.649 mm</u> 12.636 mm
Conn. Rod Dia. Crank Brg.	<u>1.0246</u> 1.0240	<u>26.024 mm</u> 26.009 mm	<u>1.0246</u> 1.0240	<u>26.024 mm</u> 26.009 mm
Piston Diameter	<u>2.6340</u> 2.6330	<u>66.903 mm</u> 66.878 mm	<u>2.6340</u> 2.6330	<u>66.903 mm</u> 66.878 mm
Ring Groove Side Clearance 1st & 2nd Comp.	<u>.002</u> .005	<u>.050 mm</u> .127 mm	<u>.002</u> .005	<u>.050 mm</u> .127 mm
Side Clearance (Bot.) Oil	<u>.0005</u> .0035	<u>.012 mm</u> .088 mm	<u>.0005</u> .0035	<u>.012 mm</u> .088 mm
Piston Skirt Clearance measured 90° from pin at the bottom of the skirt	<u>.004</u> .006	<u>.101 mm</u> .152 mm	<u>.004</u> .006	<u>.101 mm</u> .152 mm



<b>Torque Specifications</b>		
	Inch-Lbs.	Nm
Governor Rod Clamp to Lever	7-12	1.4 - 1.4
Breather Cover	40-50	4.5 - 5.7
Valve Box Cover	25-35	3.1 - 4.0
Connecting Rod	95-110	10.7 - 12.4
Cylinder Head	180-220	20.3 - 25
Mounting Flange or Cylinder Cover	100-130	11.3 - 14.7
Housing Baffle to Cylinder	80-120	9.0 - 13.6
Solid State Ignition to Cylinder	30-50	3.4 - 5.7
Alternating Coil Assembly to Lamination	25-35	2.8 - 4.0
Flywheel Nut (Aluminum)	<u>400-440</u>	<u>45.2 - 49.7</u>
Flywheel Nut (Cast Iron)	500-600	56.5 - 67.8
Housing to Baffle	35-45	4.0 - 5.1
Carburetor Stud to Cylinder	50-75	5.7 - 8.5
A/C Hex Nut to Stud	35-45	4.0 - 5.1
Control Face Plate to Baffle	20-35	2.3-3.9
Starter Top Mounting	20-30	2.3 - 3.4
Electric Starter to Baffle	25-35	2.8 - 3.9
5/8-18 Plug (Hex Flange) Drain plug	90-150	10.2 - 17.0
Plastic Tank to Housing	12-20	1.4 - 2.3
Threaded Fill Tube (Plastic)	45-65	4.0 - 7.3
Large Diameter Oil Fill Plug	Hand Tight	
Muffler Mounting (Shoulder Screw)	100-165	11.3 - 18.7
A/C Body & Housing to Baffle	35-45	4.0 - 5.1
Conduit Clip Screw (Throttle Cable)	5-15	.6 - 1.7
Muffler Deflector	10-15	1.1 - 1.7

## Chapter 15

### Education Materials and Tools

#### Available Technician's Handbooks

**692508**

Covers the diagnosis and repair of Tecumseh 2-cycle engines. Except the TC Engine and TVS840.

**692509**

Covers the diagnosis and repair of the Tecumseh 4-cycle light/medium frame engines.

**691462A**

Covers the diagnosis and repair of Tecumseh 4-cycle large frame engines.

**691218**

Covers the diagnosis and repair of Peerless® power train components.

**694782**

Contains technical information for the repair of the TC series, 2-cycle engines.

**694988**

Contains diagnosis and technical information for the repair of TVS840, HSK/HXL845/850, 2-cycle engines.

**695244A**

Covers the diagnosis and repair of the OVRM/OVM/OHH/OHM/OHV 4-cycle overhead valve engines.

**695578**

Covers the diagnosis and repair of the Vector Series, 4-cycle engines.

#### Video Programs

**695015**

Carburetor Troubleshooting. Covers identification of carburetors used on Tecumseh engines and how to troubleshoot and repair them. 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.

**695285**

An in-depth look at the 800 series transaxles. Detailing the teardown and reassembly procedures for the 800, 801 and 820 transaxles.

#### Specialty/Troubleshooting Booklets Instructional Guide

**692738**

Assists in the use and understanding of the Tecumseh Master Parts Manual. Illustrates time saving features incorporated into the manual. Explains new carburetor parts breakdown format.

#### 4-Cycle Engine Failure Analysis

**695590**

This booklet is designed as a tool for the average technician to correctly assess the cause of failure.

#### Carburetor Troubleshooting Booklet

**695907**

This booklet is designed as a quick reference to carburetion problems and related repair procedures.

#### Ignition Systems Troubleshooting Booklet

**694903**

This booklet contains information on the identification, possible problems and related repair procedures of Tecumseh Ignition Systems.

#### 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 designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

#### Tester Booklets

**694529**

Test procedures for Tecumseh electrical components using Graham-Lee Tester 31-SM or 31-SMX-H.

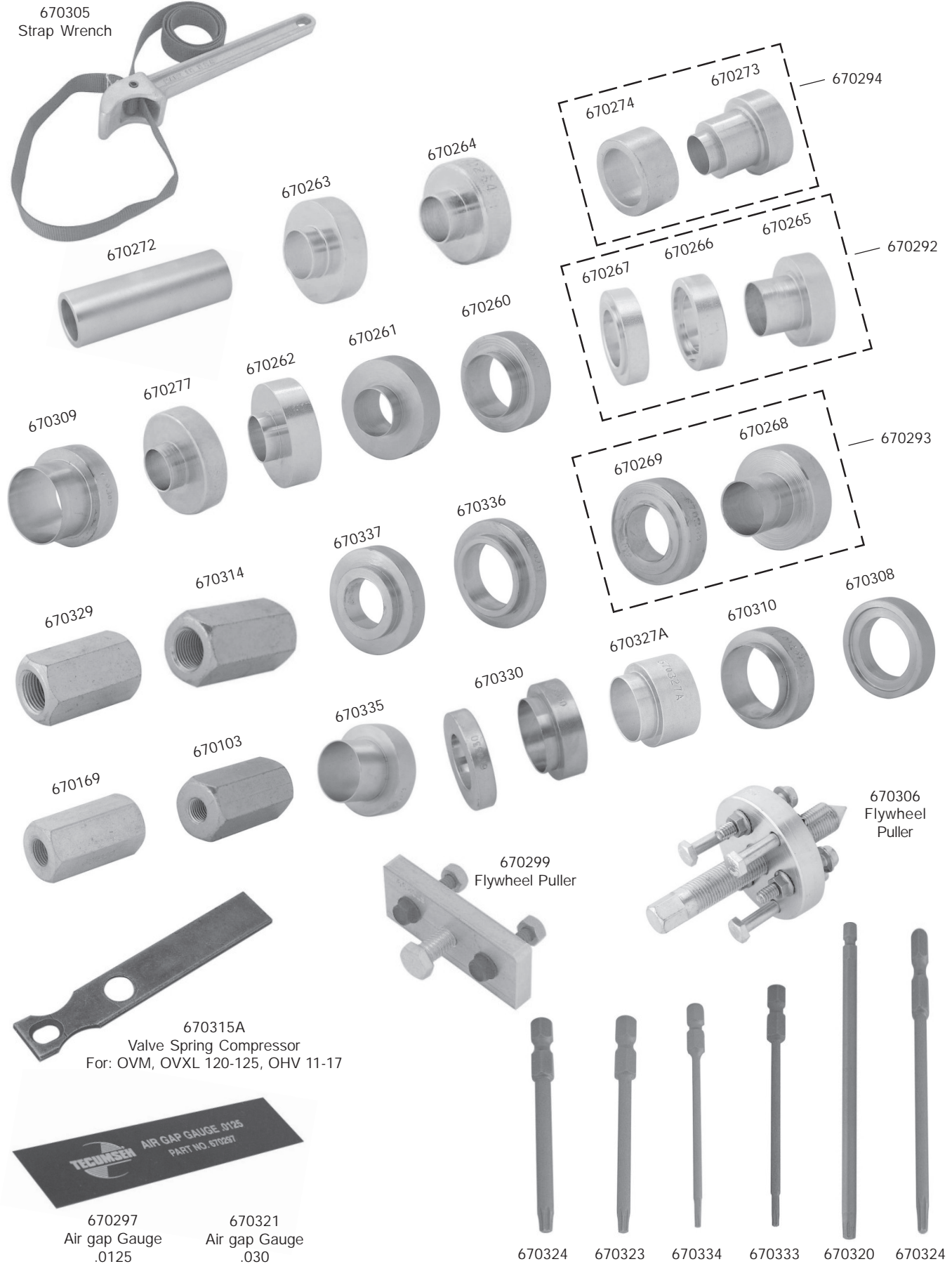
**694530**

Test procedures for Tecumseh electrical components using Merco-O-Tronic Tester 9800. (Tests are similar for 98, 98A and 79.)

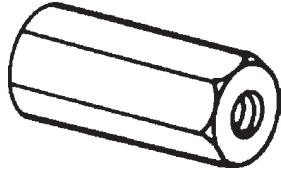
### Tool Kit 670195E

Kit contains tools for 2- and 4-cycle engines.

Includes all items on this page but items may be purchased separately.

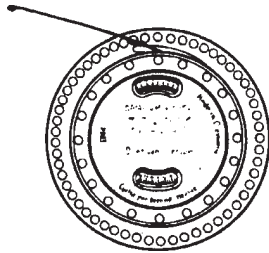


**FLYWHEEL KNOCK-OFF TOOL**



**No. 670169**

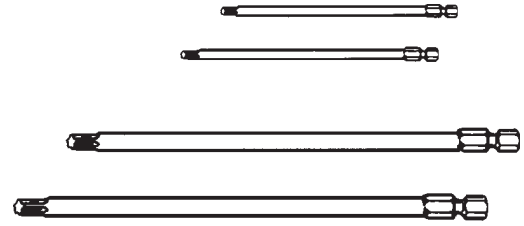
**VIBRATION TACHOMETER**



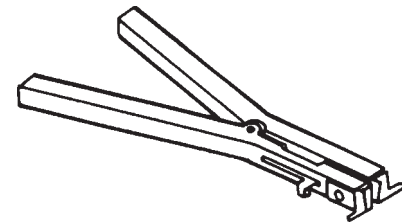
**No. 670156 - Vibration tachometer.**

**TORX DRIVERS**

Torx 8	670334
Torx 10	670333
Torx 15	670323
Torx 20	670324
Torx 25	670319
Torx 30	670320



**No. 670339 - E-5 Socket**



**No. 670117 - Ring Expander**



**No. 670283 - Valve Guide Reamer**

**Chapter 16**  
**Sears Craftsman Cross Reference Chart**

143.434112	VLV55-501004
143.434252	VLV55-501008
143.945500	VLV55-501004A
143.956000	VLV60-502003A
143.956002	VLV60-502004A
143.956006	VLV60-502012A
143.966000	VLV60-502015B
143.966006	VLV60-502023B
143.966008	VLV60-502024B
143.966500	VLV65-502501A
143.966502	VLV65-502502A
143.966504	VLV65-502503A
143.966506	VLV65-502504A
143.966508	VLV65-502505A
143.975512	VLV55-501068C
143.975514	VLV55-501069C
143.976000	VLV60-502015C
143.976006	VLV60-502047C
143.976008	VLV60-502055C
143.976500	VLV65-502506B
143.976502	VLV65-502510B
143.976600	VLV66-502507B
143.976602	VLV66-502508B
143.976604	VLV66-502505B
143.976604	VLV66-502509B

143.976608	VLV66-502511B
143.976610	VLV66-502512B
143.976612	VLV66-502513D
143.986008	VLV60-502055D
143.986516	VLV65-502521C
143.986600	VLV66-502505C
143.986700	VLV66-502514C
143.986706	VLV66-502515C
143.986708	VLV66-502516C
143.986710	VLV66-502517C
143.986712	VLV66-502518C
143.986720	VLV66-502523C
143.996500	VLV126-502522D
143.996700	VLV126-502524D
143.996704	VLV126-502525D
143.996706	VLV126-502523D
143.996708	VLV126-502526D
143.996710	VLV126-502527D
143.996712	VLV126-502528D
143.006500	VLV126-502522E
143.006704	VLV126-502527E
143.006706	VLV126-502533E
143.006710	VLV126-502523E
143.016500	VLV126-502534E

## Decimal/Fraction Conversions

<b>.016</b>	<b>=</b>	<b>1/64</b>	<b>.516</b>	<b>=</b>	<b>33/64</b>
<b>.031</b>	<b>=</b>	<b>1/32</b>	<b>.531</b>	<b>=</b>	<b>17/32</b>
<b>.047</b>	<b>=</b>	<b>3/64</b>	<b>.547</b>	<b>=</b>	<b>35/64</b>
<b>.063</b>	<b>=</b>	<b>1/16</b>	<b>.563</b>	<b>=</b>	<b>9/16</b>
<b>.078</b>	<b>=</b>	<b>5/64</b>	<b>.578</b>	<b>=</b>	<b>37/64</b>
<b>.094</b>	<b>=</b>	<b>3/32</b>	<b>.594</b>	<b>=</b>	<b>19/32</b>
<b>.109</b>	<b>=</b>	<b>7/64</b>	<b>.609</b>	<b>=</b>	<b>39/64</b>
<b>.125</b>	<b>=</b>	<b>1/8</b>	<b>.625</b>	<b>=</b>	<b>5/8</b>
<b>.141</b>	<b>=</b>	<b>9/64</b>	<b>.641</b>	<b>=</b>	<b>41/64</b>
<b>.156</b>	<b>=</b>	<b>5/32</b>	<b>.656</b>	<b>=</b>	<b>21/32</b>
<b>.172</b>	<b>=</b>	<b>11/64</b>	<b>.672</b>	<b>=</b>	<b>43/64</b>
<b>.188</b>	<b>=</b>	<b>3/16</b>	<b>.688</b>	<b>=</b>	<b>11/16</b>
<b>.203</b>	<b>=</b>	<b>13/64</b>	<b>.703</b>	<b>=</b>	<b>45/64</b>
<b>.219</b>	<b>=</b>	<b>7/32</b>	<b>.719</b>	<b>=</b>	<b>23/32</b>
<b>.234</b>	<b>=</b>	<b>15/64</b>	<b>.734</b>	<b>=</b>	<b>47/64</b>
<b>.25</b>	<b>=</b>	<b>1/4</b>	<b>.75</b>	<b>=</b>	<b>3/4</b>
<b>.266</b>	<b>=</b>	<b>17/64</b>	<b>.766</b>	<b>=</b>	<b>49/64</b>
<b>.281</b>	<b>=</b>	<b>9/32</b>	<b>.781</b>	<b>=</b>	<b>25/32</b>
<b>.297</b>	<b>=</b>	<b>19/64</b>	<b>.797</b>	<b>=</b>	<b>51/64</b>
<b>.312</b>	<b>=</b>	<b>5/16</b>	<b>.813</b>	<b>=</b>	<b>13/16</b>
<b>.328</b>	<b>=</b>	<b>21/64</b>	<b>.828</b>	<b>=</b>	<b>53/64</b>
<b>.344</b>	<b>=</b>	<b>11/32</b>	<b>.844</b>	<b>=</b>	<b>27/32</b>
<b>.359</b>	<b>=</b>	<b>23/64</b>	<b>.859</b>	<b>=</b>	<b>55/64</b>
<b>.375</b>	<b>=</b>	<b>3/8</b>	<b>.875</b>	<b>=</b>	<b>7/8</b>
<b>.391</b>	<b>=</b>	<b>25/64</b>	<b>.891</b>	<b>=</b>	<b>57/64</b>
<b>.406</b>	<b>=</b>	<b>13/32</b>	<b>.906</b>	<b>=</b>	<b>29/32</b>
<b>.422</b>	<b>=</b>	<b>27/64</b>	<b>.922</b>	<b>=</b>	<b>59/64</b>
<b>.438</b>	<b>=</b>	<b>7/16</b>	<b>.938</b>	<b>=</b>	<b>15/16</b>
<b>.453</b>	<b>=</b>	<b>29/64</b>	<b>.953</b>	<b>=</b>	<b>61/64</b>
<b>.469</b>	<b>=</b>	<b>15/32</b>	<b>.969</b>	<b>=</b>	<b>31/32</b>
<b>.484</b>	<b>=</b>	<b>31/64</b>	<b>.984</b>	<b>=</b>	<b>63/64</b>
<b>.50</b>	<b>=</b>	<b>1/2</b>			

**NOTES**