TECUMSEH

Model	No. Cyls.	Bore	Stroke	Displacement	Horsepower
MEDIUM FRAME MODELS					
VM70	1	2-15/16 in. (74.6 mm)	2-17/32 in. (64.3 mm)	17.16 cu. in. (281 cc)	7 (5.2 kW)
VM80	1	3-1/16 in. (77.8 mm)	2-17/32 in. (64.3 mm)	18.65 cu. in. (305 cc)	8 (5.9 kW)
VM100	1	3-3/16 in. (80.9 mm)	2-17/32 in. (64.3 mm)	20.2 cu. in. (331 cc)	10 (7.5 kW)
HM70	1	2-15/16 in. (74.6 mm)	2-17/32 in. (64.3 mm)	17.16 cu. in. (281 cc)	7 (5.2 kW)
HM80	1	3-1/16 in. (77.8 mm)	2-17/32 in. (64.3 mm)	18.65 cu. in. (305 cc)	8 (5.9 kW)
HM100	1	3-3/16 in. (80.9 mm)	2-17/32 in. (64.3 mm)	20.2 cu. in. (331 cc)	10 (7.5 kW)
HEAVY FRAME MODELS					
VH70	1	2-¾ in. (69.8 mm)	2-17/32 in. (64.3 mm)	15.0 cu. in. (246 cc)	7 (5.2 kW)
VH80	1	3-5/16 in. (84.1 mm)	2-¾ in. (69.8 mm)	23.75 cu. in. (389 cc)	8 (5.9 kW)
VH100	1	3-5/16 in. (84.1 mm)	2-¾ in. (69.8 mm)	23.75 cu. in. (389 cc)	10 (7.5 kW)
HH70	1	2-¾ in. (69.8 mm)	2-17/32 in. (64.3 mm)	15.0 cu. in. (246 cc)	7 (5.2 kW)
HH80	1	3-5/16 in. (84.1 mm)	2-¾ in. (69.8 mm)	23.75 cu. in. (389 cc)	8 (5.9 kW)
HH100	1	3-5/16 in. (84.1 mm)	2-¾ in. (69.8 mm)	23.75 cu. in. (389 cc)	10 (7.5 kW)
HH120	1	3-½ in. (88.9 mm)	2-⅞ in. (73 mm)	27.66 cu. in. (453 cc)	12 (8.9 kW)

Engines must be identified by complete model number, including specification number in order to obtain correct repair parts. Numbers on early models are located on a name plate or tag. Numbers on later models are stamped in blower housing. It is important to transfer ID tags from original engine to replacement short block so unit can be identified later.

Medium frame engines have aluminum blocks with cast iron sleeves. Heavy frame engines have cast iron cylinder and block assemblies. Early VH70 and HH70 engines were identified as V70 and H70. Models VH and VM are vertical crankshaft engines and HM and HH models have horizontal crankshafts.

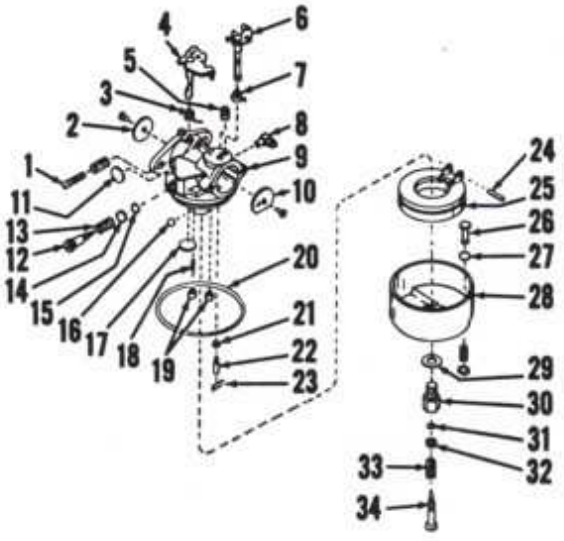


Fig. T1—Exploded view of Tecumseh carburetor.

1. Idle speed screw
2. Throttle plate
3. Return spring
4. Throttle shaft
5. Choke stop spring
6. Choke shaft
7. Return spring
8. Fuel inlet fitting
9. Carburetor body
10. Choke plate
11. Welch plug
12. Idle mixture needle
13. Spring
14. Washer
15. "O" ring
16. Ball plug
17. Welch plug
18. Pin
19. Cup plugs
20. Bowl gasket
21. Inlet needle seat
22. Inlet needle
23. Clip
24. Float shaft
25. Float
26. Drain stem
27. Gasket
28. Bowl
29. Gasket
30. Bowl retainer
31. "O" ring
32. Washer
33. Spring
34. Main fuel needle

MAINTENANCE

SPARK PLUG. Recommended spark plug is Champion J-8 or equivalent. Set electrode gap to 0.030 inch (0.762 mm). Spark plug should be removed, cleaned and adjusted periodically. Renew plug if electrodes are burned and pitted or if porcelain is cracked. If frequent plug fouling is experienced, check for following conditions:

a. Carburetor setting too rich
b. Partially closed choke
c. Clogged air filter
d. Incorrect spark plug
e. Poor grade of gasoline
f. Too much oil or crankcase breather clogged

CARBURETOR. Tecumseh or Walbro float type carburetors may be used. Adjustment and service procedures for each type carburetor is outlined in the following paragraphs.

Illustrations courtesy Tecumseh Products Co.

TECUMSEH CARBURETOR. Clockwise rotation of idle mixture needle (12 – Fig. T1) and main fuel adjusting needle (34) leans the mixture. Initial adjustment of both needles is 1 turn open. Final adjustment is made with engine running at normal operating temperature. Adjust main fuel needle for smoothest operation at high speed. Then, adjust idle mixture needle for smoothest engine idle. Adjust idle speed stop screw (1) for engine idle speed of 1800 rpm.

When overhauling, check adjusting needles for excessive wear or other damage. Inlet fuel needle (22) seats against a Viton rubber seat (21) which is pressed into carburetor body. Remove rubber seat before cleaning carburetor in a commercial cleaning solvent. The seat should be installed grooved side first. See Fig. T2.

NOTE: Some later models have a Viton tipped inlet needle (Fig. T3) and a brass seat.

Install throttle plate (2 – Fig. T1) with the two stamped lines facing out and at 12 and 3 o'clock position. The 12 o'clock line should be parallel to throttle shaft and to top of carburetor. Install choke plate (10) with flat side towards bottom of carburetor. Float setting should be 7/32-inch (5.5 mm), measured with body and float assembly in inverted position, between free end of float and rim on carburetor body. Fuel fitting (8) is pressed into body. When installing fuel inlet fitting, start fitting into bore; then, apply a light coat of Loctite 271 to shank and press fitting into position.

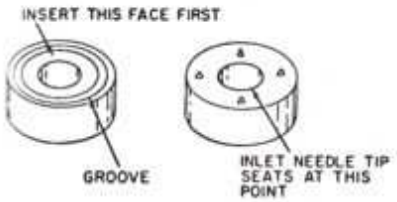


Fig. T2 – The Viton seat used on some Tecumseh carburetors must be installed correctly to operate properly. All metal needle is used with seat shown.

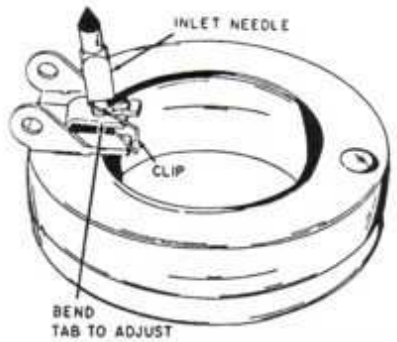


Fig. T3 – View of float and fuel inlet valve needle. The valve needle shown is equipped with resilient tip and a clip. Bend tab shown to adjust float height.

WALBRO CARBURETOR. To adjust, refer to Fig. T4 and proceed as follows: Turn both fuel adjusting needles (9 and 33) in finger tight, then back idle mixture needle (9) out 1¾ turns and main fuel needle (33) out 2 turns. Make final adjustment with engine warm and running. Adjust main fuel needle until engine runs smoothly at normal operating speed. Back out idle speed stop screw (7), hold throttle to slowest idle speed possible without stalling and adjust idle mixture needle for smoothest idle performance. Readjust idle speed screw so engine idle speed is 1800 rpm.

Float setting for Walbro carburetors is ⅛-inch (3 mm) on horizontal crankshaft engines and 3/32-inch (2.4 mm) on vertical crankshaft engines when measured with carburetor in inverted position, between free side of float and body casting rim. See H – Fig. T5. Float travel should be 9/16-inch (14 mm) as measured at free end of float. Bend lip of float tang to adjust float level.

NOTE: If carburetor has been disassembled and main nozzle (19 – Fig. T4) removed, do not reinstall nozzle; obtain and install a new service nozzle. Refer to Fig. T6.

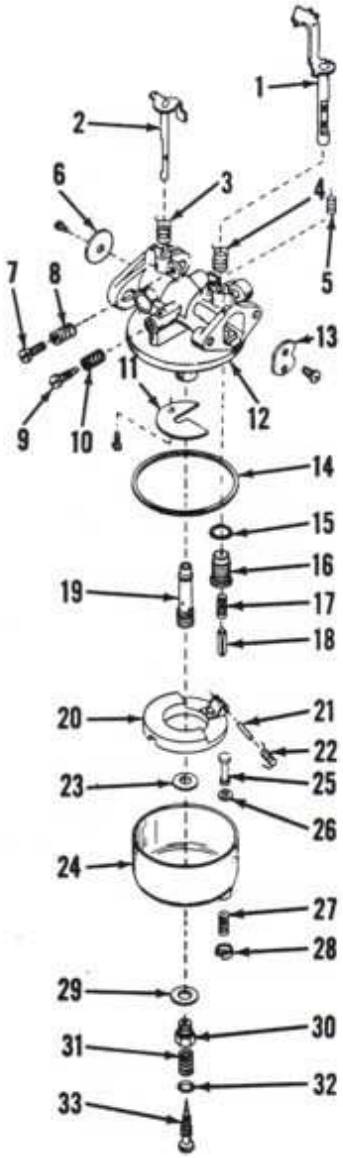


Fig. T4 – Exploded view of Walbro carburetor.

1. Choke shaft
2. Throttle shaft
3. Throttle return spring
4. Choke return spring
5. Choke stop spring
6. Throttle plate
7. Idle speed stop screw
8. Spring
9. Idle mixture needle
10. Spring
11. Baffle
12. Carburetor body
13. Choke plate
14. Bowl gasket
15. Gasket
16. Inlet valve seat
17. Spring
18. Inlet valve
19. Main nozzle
20. Float
21. Float shaft
22. Spring
23. Gasket
24. Bowl
25. Drain stem
26. Gasket
27. Spring
28. Retainer
29. Gasket
30. Bowl retainer
31. Spring
32. "O" ring
33. Main fuel adjusting needle

GOVERNOR. A mechanical flyweight type governor is used on all models. Governor weight and gear assembly is

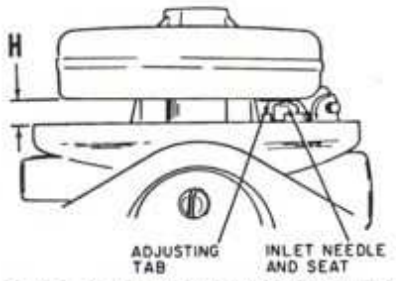


Fig. T5 – Float height (H) should be measured as shown on Walbro float carburetors. Bend adjusting tab to adjust height.

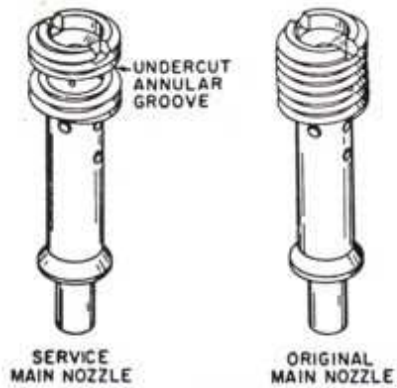


Fig. T6 – The main nozzle originally installed is drilled after installation through hole in body. Service main nozzles are grooved so alignment is not necessary.

Illustrations courtesy Tecumseh Products Co.

driven by camshaft gear and rides on a renewable shaft which is pressed into engine crankcase or crankcase cover. Press governor shaft in until shaft end is located as shown in Fig. T7, T8, T9 or T10.

To adjust governor lever position on vertical crankshaft models, refer to Fig. T11. Loosen clamp screw on governor lever. Rotate governor lever shaft counter-clockwise as far as possible. Move governor lever to the left until throttle is fully open, then tighten clamp screw.

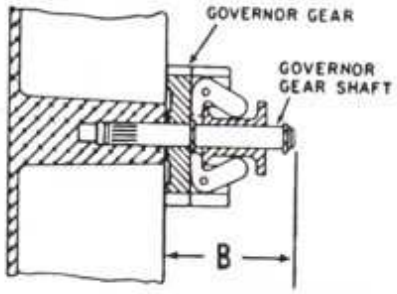


Fig. T7—View showing installation of governor shaft and governor gear and weight assembly on Models HH80, HH100 and HH120. Dimension (B) is 1 inch (25.4 mm).

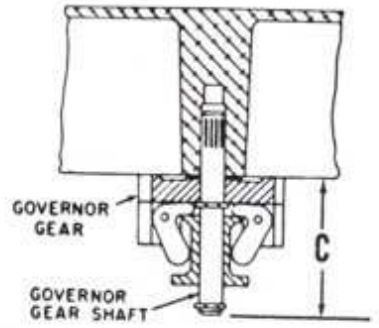


Fig. T8—Governor gear and shaft installation on Models VH80 and VH100. Dimension (C) is 1 inch (25.4 mm).

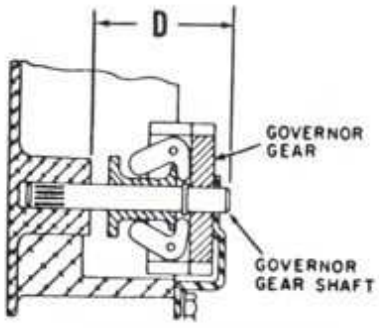


Fig. T9—Correct installation of governor shaft and gear and weight assembly on Models HH70, HM70, HM80 and HM100. Dimension (D) is 1-⅜ inches (34.9 mm) on Models HM70, HM80 and HM100 or 1-17/64 inches (32.1 mm) on Models HH70.

On horizontal crankshaft models, loosen clamp screw on lever, rotate governor lever shaft clockwise as far as possible. See Fig. T12. Move governor lever clockwise until throttle is wide open, tighten clamp screw.

For external linkage adjustments, refer to Figs. T13 and T14. Loosen screw (A), turn plate (B) counter-clockwise as far as possible and move lever (C) to the left until throttle is fully open. Tighten screw (A). Governor spring must be hooked in hole (D) as shown. Adjusting screws on bracket shown in Figs. T13 and T14 are used to adjust fixed or variable speed settings.

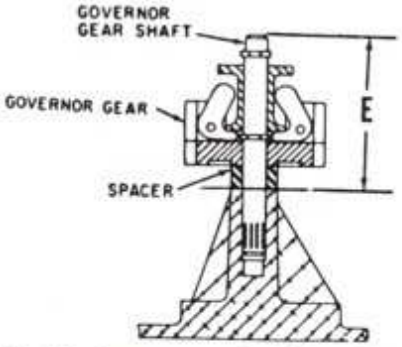


Fig. T10—Governor gear and shaft installation on Models VH70, VM70, VM80 and VM100. Dimension (E) is 1-19/32 inches (40.5 mm).

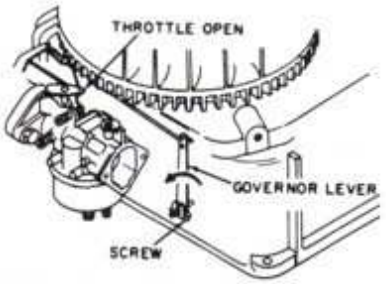


Fig. T11—When adjusting governor linkage on Models VH70, VM70, VM80 or VM100, loosen clamp screw and rotate governor lever shaft and lever counter-clockwise as far as possible.

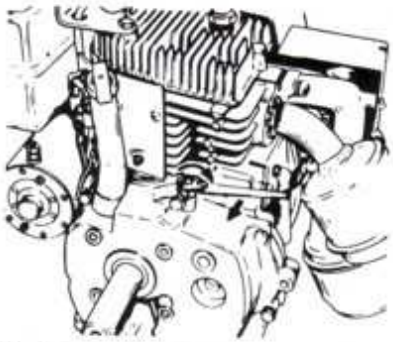


Fig. T12—On Models HH70, HM70, HM80 and HM100, rotate governor lever shaft and lever clockwise when adjusting linkage.

MAGNETO IGNITION. Tecumseh flywheel type magnetos are used on some models. On Models VM70, HM70, VM80, HM80, VM100, HM100, HH70 and VH70, breaker points are enclosed

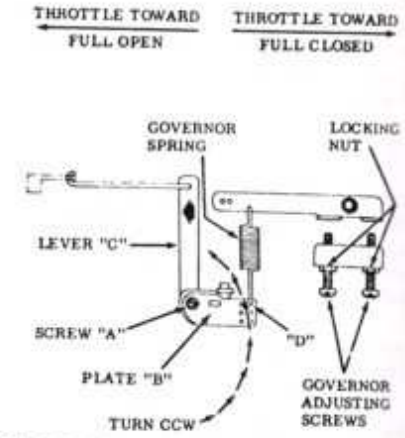


Fig. T13—External governor linkage on Models VH80 and VH100. Refer to text for adjustment procedure.

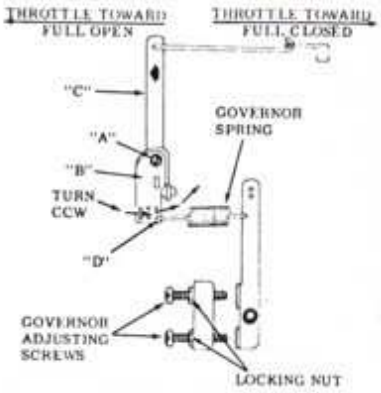


Fig. T14—External governor linkage on Models HH80, HH100 and HH120. Refer to text for adjustment procedure.

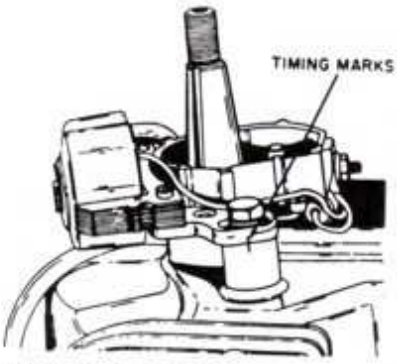


Fig. T15—On Models VM70, VH70, HM70, HH70, VM80, HM80, VM100 and HM100 equipped with magneto ignition, adjust breaker point gap to 0.020 inch (0.508 mm) and align timing marks as shown.

Illustrations courtesy Tecumseh Products Co.

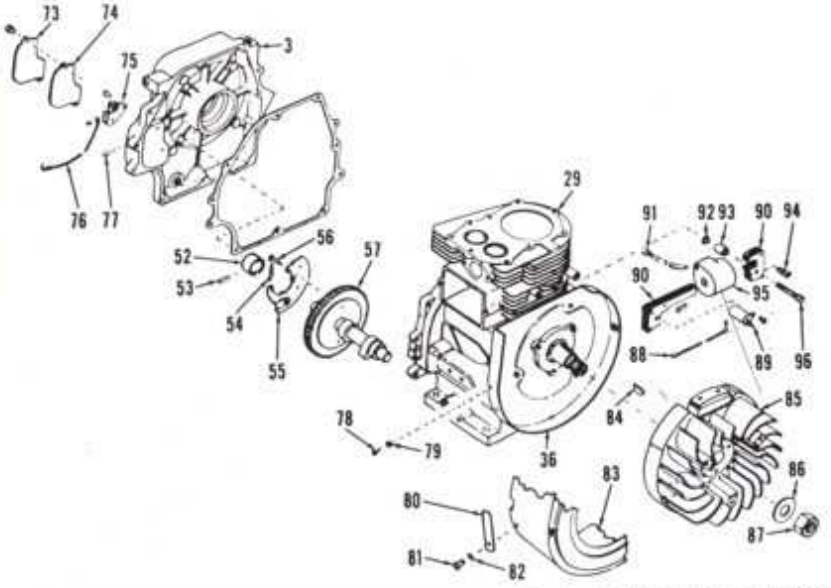


Fig. T16 — Exploded view of magneto ignition components used on Models HH80, HH100 and HH120. Timing advance and breaker points used on engines equipped with battery ignition are identical.

3. Crankcase cover
29. Cylinder block
36. Blower air baffle
52. Breaker cam
53. Push rod
54. Spring
55. Timing advance weight
56. Rivet
57. Camshaft assy.
73. Breaker box cover
74. Gasket
75. Breaker points
76. Ignition wire
77. Pin
78. Screw
79. Clip
80. Ground switch
81. Screw
82. Washer
83. Blower housing
84. Flywheel key
85. Flywheel
86. Washer
87. Nut
88. Condenser wire
89. Condenser
90. Armature core
91. High tension lead
92. Washer
93. Spacer
94. Screw
95. Coil
96. Screw

by the flywheel. Breaker point gap must be adjusted to 0.020 inch (0.508 mm). Timing is correct when timing mark on stator plate is in line with mark on bearing plate as shown in Fig. T15. If timing marks are defaced, points should start to open when piston is 0.085-0.095 inch (2.159-2.413 mm) BTDC.

Breaker points on Models HH80, VH80, HH100, VH100 and HH120 are located in crankcase cover as shown in Fig. T16. Timing should be correct when points are adjusted to 0.020 inch (0.508 mm) gap. To check timing with a continuity light, refer to Fig. T17. Remove "pop" rivets securing identification plates to blower housing. Remove plate to expose timing port hole. Connect continuity light to terminal screw (78 – Fig. T16) and suitable engine ground. Rotate engine clockwise until piston is on compression stroke and timing mark is just below stator laminations as shown in Fig. T17. At this time, points should be ready to open and continuity light should be on. Rotate flywheel until mark just passes under edge of laminations. Points should open and light should be out. If not, adjust points slightly until light goes out. The points are actuated by push rod (53 – Fig. T16) which rides against breaker cam (52). Breaker cam is driven by a tang on advance weight (55). When cranking, spring (54) holds advance weight in retarded position (TDC). At operating speeds, centrifugal force overcomes spring pressure and weight moves cam to advance ignition so spark occurs when piston is at 0.095 inch (2.413 mm) BTDC.

An air gap of 0.006-0.010 inch (0.152-0.254 mm) should be between flywheel and stator laminations. To adjust gap, turn flywheel magnet into position under coil core. Loosen holding screws and place shim stock or feeler gage between coil and magnet. Press coil against gage and tighten screws.

BATTERY IGNITION. Models HH80, HH100 and HH120 may be equipped with a battery ignition. Delco-Remy 1115222 coil and 1965489 condenser are externally mounted while points are located in crankcase cover. See Fig. T18. Points should be adjusted to 0.020 inch (0.508 mm) gap. To check timing, disconnect primary wire between coil and points and follow same procedure as described in MAGNETO IGNITION section.

SOLID STATE IGNITION (WITHOUT ALTERNATOR). The Tecumseh solid state ignition system shown in Fig. T19 may be used on some models not equipped with flywheel alternator. This system does not use ignition breaker points. The only moving part of the system is the rotating flywheel with charging magnets. As flywheel magnet passes

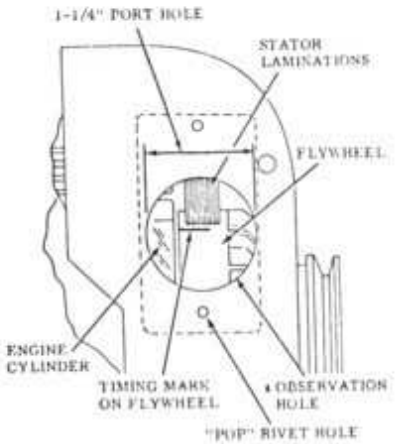


Fig. T17 — On Models HH80, HH100 and HH120, remove identification plate to observe timing mark on flywheel through port hole in blower housing.

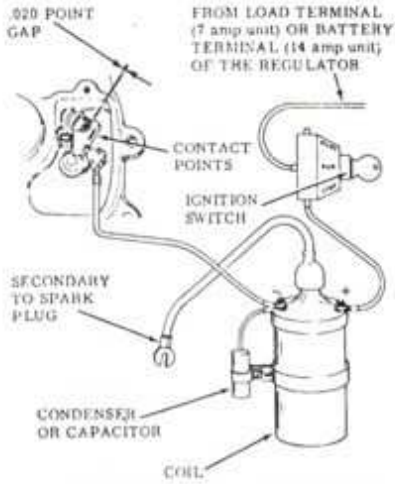


Fig. T18 — Typical battery ignition wiring diagram used on some HH80, HH100 and HH120 engines.

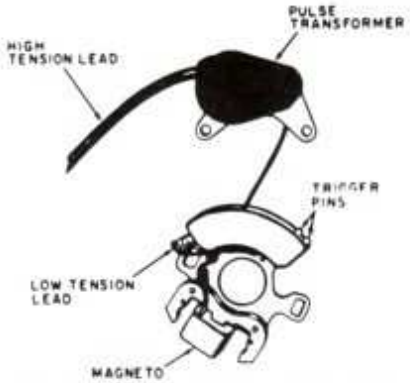


Fig. T19 — View of solid state ignition system used on some models not equipped with flywheel alternator.

Illustrations courtesy Tecumseh Products Co.

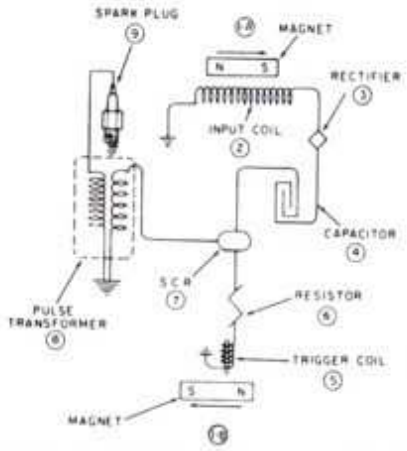


Fig. T20 – Diagram of solid state ignition system used on some models.

position (1A – Fig. T20), a low voltage AC current is induced into input coil (2). Current passes through rectifier (3) converting this current to DC. It then travels to capacitor (4) where it is stored. The flywheel rotates approximately 180 degrees to position (1B). As it passes trigger coil (5), it induces a very small electric charge into the coil. This charge passes through resistor (6) and turns on the SCR (silicon controlled rectifier) switch (7). With SCR switch closed, low voltage current stored in capacitor (4) travels to pulse transformer (8). Voltage is stepped up instantaneously and current is discharged across electrodes of spark plug (9), producing a spark before top dead center.

Some units are equipped with a second trigger coil and resistor set to turn SCR switch on at a lower rpm. This second trigger pin is closer to the flywheel and produces a spark at TDC for easier starting. As engine rpm increases, the first (shorter) trigger pin picks up the small electric charge and turns SCR switch on, firing spark plug BTDC.

If system fails to produce a spark to spark plug, first check high tension lead Fig. T19. If condition of high tension lead is questionable, renew pulse transformer and high tension lead assembly. Check low tension lead and renew if insulation is faulty. The magneto charging coil, electronic triggering system and mounting plate are available only as an assembly. If necessary to renew this assembly, place unit in position on engine. Start retaining screws, turn mounting plate counter-clockwise as far as possible, then tighten retaining screw to a torque of 5-7 ft.-lbs. (7-9.5 N·m).

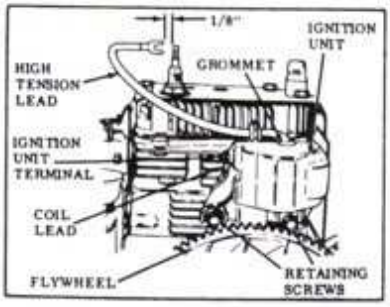


Fig. T21 – View of solid state ignition unit used on some models equipped with flywheel alternator. System should produce a good blue spark 1/8-inch (3 mm) long at cranking speed.

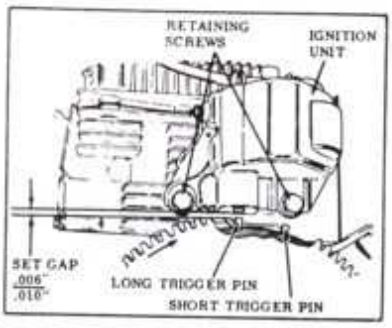


Fig. T22 – Adjust air gap between long trigger pin and ignition unit to 0.006-0.010 inch (0.152-0.254 mm).

SOLID STATE IGNITION (WITH ALTERNATOR). The Tecumseh solid state ignition system used on some models equipped with flywheel alternator does not use ignition breaker points. The only moving part of the system is the rotating flywheel with charging magnets and trigger pins. Other components of system are ignition generator coil and stator assembly, spark plug and ignition unit.

The long trigger pin induces a small charge of current to close the SCR (silicon controlled rectifier) switch at engine cranking speed and produces a spark at TDC for starting. As engine rpm increases, the first (shorter) trigger pin induces the current which produces a spark when piston is 0.095 inch (2.413 mm) BTDC.

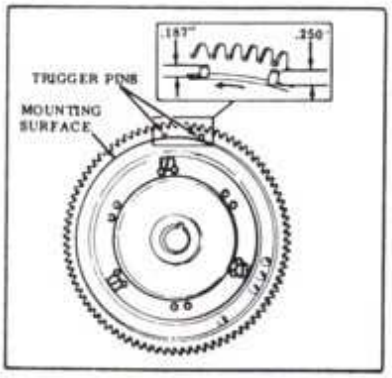


Fig. T23 – Remove flywheel and drive trigger pins in or out as necessary until long pin is extended 0.250 inch (6.35 mm) and short pin is extended 0.187 inch (4.75 mm) above mounting surface.

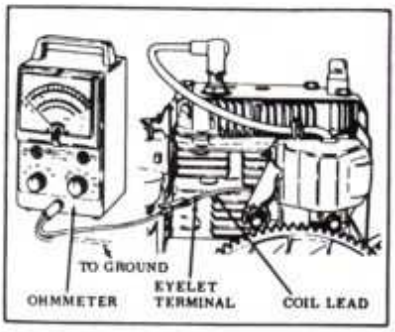


Fig. T24 – View showing an ohmmeter connected for resistance test of ignition generator coil.

Test ignition system as follows: Hold high tension lead 1/8-inch (3 mm) from spark plug (Fig. T21), crank engine and check for a good blue spark. If no spark is present, check high tension lead and coil lead for loose connections or faulty insulation. Check air gap between long trigger pin and ignition unit as shown in Fig. T22. Air gap should be 0.006-0.010 inch (0.152-0.254 mm). To adjust air gap, loosen the two retaining screws and move ignition unit as necessary, then tighten retaining screws.

NOTE: The long trigger pin should extend 0.250 inch (6.35 mm) and the short trigger pin should extend 0.187 inch (4.75 mm), measured as shown in Fig. T23. If not, remove flywheel and drive pins in or out as required.

Remove coil lead from ignition terminal and connect an ohmmeter as shown in Fig. T24. If series resistance test of ignition generator coil is below 400 ohms, renew stator and coil assembly (Fig. T25). If resistance is above 400 ohms, renew ignition unit.

LUBRICATION. On Models VH70, VM70, VM80 and VM100, a barrel and plunger type oil pump (Fig. T26 or T27) driven by an eccentric on camshaft, pressure lubricates upper main bearing and connecting rod journal. When installing early type pump (Fig. T26), chamfered side of drive collar must be

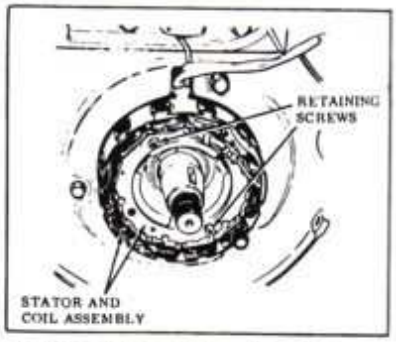


Fig. T25 – Ignition generator coil and stator serviced only as an assembly.

Illustrations courtesy Tecumseh Products Co.

against thrust bearing surface on camshaft gear. When installing late type pump, place side of drive collar with large flat surface shown in Fig. T27 away from camshaft gear.

An oil slinger (59 – Fig. T28), installed on crankshaft between gear and lower bearing is used to direct oil upward for complete engine lubrication on Models VH80 and VH100. A tang on slinger hub, when inserted in slot in crankshaft gear, correctly positions slinger on crankshaft as shown in Fig. T28.

Splash lubrication system on all other models is provided by use of an oil dipper on connecting rod. See Figs. T30 and T31.

Use only high quality, detergent motor oil having API classification SE, SF or SG. SAE 30 oil is recommended for operating in temperatures above 32°F (0°C) and SAE 10W for operating in temperatures below 32°F (0°C).

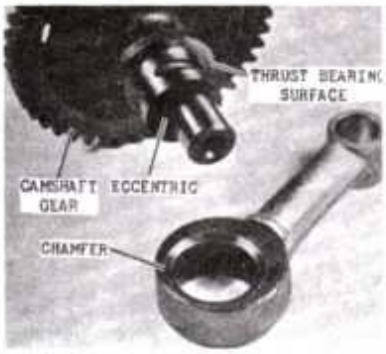


Fig. T26 – View of early type oil pump used on Models VH70, VM70 and VM80. Chamfered face of drive collar should be towards camshaft gear.

Fig. T27 – Install late type oil pump so large flat surface on drive collar is away from camshaft gear.

Fig. T28 – Oil slinger (59) on Models VH80 and VH100 must be installed on crankshaft as shown.

Fig. T29 – Connecting rods used on Models VH80 and VH100 have two oil holes.

REPAIRS

TIGHTENING TORQUE. Recommended tightening torques are as follows:

Models VM70, HM70, VM80, HM80, VM100, HM100, HH70, VH70

Cylinder Head	180 in.-lbs. (20.3 N·m)
Connecting Rod	120 in.-lbs. (13.5 N·m)
Crankcase Cover	110 in.-lbs. (12.4 N·m)
Ball Bearing Retainer Nut	20 in.-lbs. (2.3 N·m)

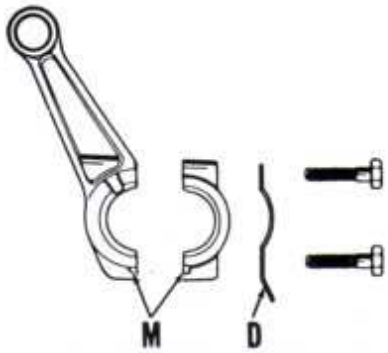


Fig. T30 – Connecting rod assembly used on Models VH70, VM70, VM80, VM100, HH70, HM70, HM80 and HM100. Note position of oil dipper (D) and match marks (M).

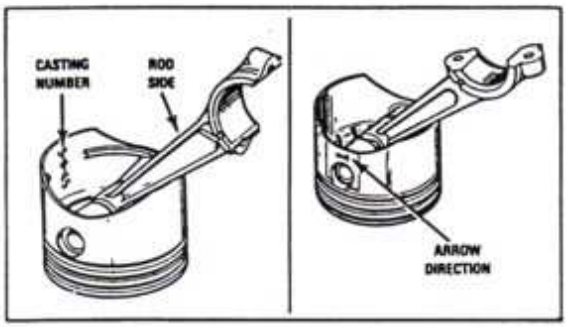


Fig. T30A – On Models VM70, HM70, HM80, HM100 and VM100, install piston on rod with arrow or casting number positioned as shown.

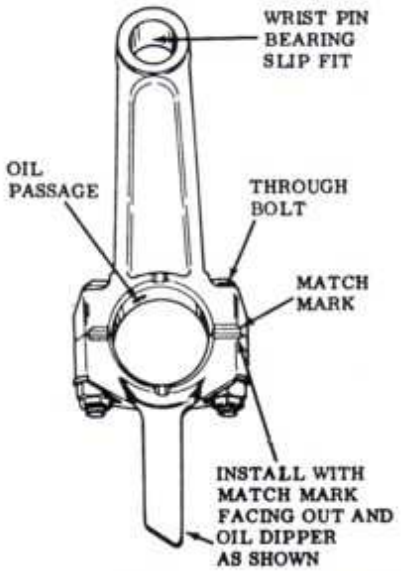


Fig. T31 – Connecting rod assembly used on Models HH80, HH100 and HH120.

Flywheel Nut	440 in.-lbs. (49.7 N·m)
Spark Plug	250 in.-lbs. (28.2 N·m)
Magneto Stator Mounting	75 in.-lbs. (8.5 N·m)
Carburetor Mounting	60 in.-lbs. (6.8 N·m)

Models HH80, VH80, HH100, VH100, HH120

Cylinder Head	200 in.-lbs. (22.6 N·m)
Connecting Rod	110 in.-lbs. (12.4 N·m)
Crankcase Cover	110 in.-lbs. (12.4 N·m)
Bearing Retainer	110 in.-lbs. (12.4 N·m)
Flywheel Nut	650 in.-lbs. (73.5 N·m)
Spark Plug	250 in.-lbs. (28.3 N·m)
Magneto Stator Mounting	85 in.-lbs. (9.6 N·m)
Carburetor Mounting	85 in.-lbs. (9.6 N·m)

Illustrations courtesy Tecumseh Products Co.

CONNECTING ROD. Piston and connecting rod assembly is removed from cylinder head end of engine. The aluminum alloy rod rides directly on the crankshaft. Running clearance is not adjustable. Crankpin diameter is 1.1865-1.1870 inches (30.137-30.150 mm) on Models VM70, HM70, VM80, HM80, VM100, HM100, HH70 and VH70 and 1.3750-1.3755 inches (34.925-34.938 mm) on all other models.

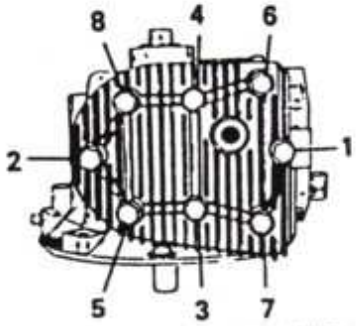


Fig. T32—On Models VM70, HM70, VH70 and HH70, tighten cylinder head cap screws evenly to a torque of 180 in.-lbs. (20 N·m) using tightening sequence shown.

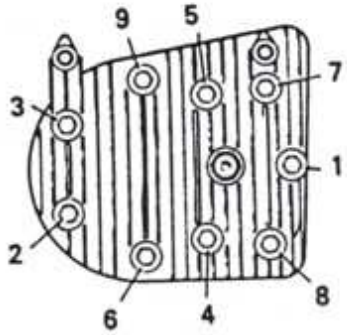


Fig. T33—Tighten cylinder head cap screws on Models HM80, VM80, HM100 and VM100 in sequence shown to a torque of 180 in.-lbs. (20 N·m).

Fig. T34—View showing cylinder head cap screw tightening sequence used on early HH80, HH100 and HH120 engines. Tighten cap screws to a torque of 200 in.-lbs. (22.6 N·m). Note type and length of cap screws.

Connecting rods are equipped with match marks and on some models pistons are marked for correct assembly. See Figs. T29, T30, T30A and T31. Install rod on all models so marks are toward pto end of crankshaft. Use new self-locking nuts or rod bolt lock each time rod is installed.

CYLINDER HEAD. When removing cylinder head, be sure to note location of different length cap screws for aid in correct assembly. Always install new head gasket and tighten cap screws evenly in sequence shown in Figs. T32, T33, T34 or T35. Refer to TIGHTENING TORQUE section for correct torque values.

PISTON, PIN AND RINGS. Aluminum alloy piston is fitted with two compression rings and one oil control ring. Ring end gap on all models should be 0.010-0.020 inch (0.254-0.508 mm). Side clearance of new rings in ring grooves of a new piston should be 0.002-0.0035 inch (0.051-0.0889 mm) on Models HH80, HH100, HH120; 0.0025-0.003 inch (0.0635-0.076 mm) on Models VH80 and VH100; 0.002-0.003 inch (0.051-0.076 mm) on Models VM70, HM70, HM80, VM80, HH70, VH70; 0.002-0.005 inch (0.051-0.127 mm) on Models VM100 and HM100. Piston rings and pistons are available in standard size and oversizes of 0.010 and 0.020 inch for Models VM70, HM70, VM80, HM80, VM100, HM100, HH70 and VH70 or in standard size and oversizes of 0.010, 0.020, 0.030 and 0.040 inch for all other models.

The top compression ring must be installed with inside chamfer to top of piston. If second compression ring has a notch on outside of ring, install ring with notch towards bottom of piston skirt. Oil ring can be installed either side up. Stagger ring gaps about 90 degrees around piston.

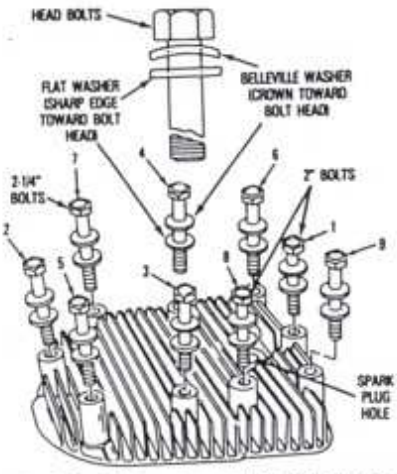


Fig. T35—Flat washers and Belleville washers are used on cylinder head cap screws on late HH80, HH100 and HH120 and all VH80 and VH100 engines. Tighten cap screws in sequence shown to a torque of 200 in.-lbs. (22.6 N·m).

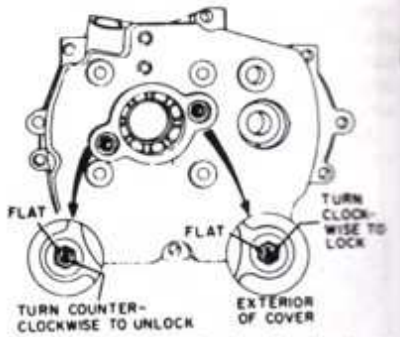


Fig. T36—View showing bearing locks on Models HM70, HH70, HM80 and HM100 equipped with ball bearing main. Locks must be released before removing crankcase cover. Refer to Fig. T37 for interior view of cover and locks.

Piston skirt clearance in cylinder, measured at thrust side of piston just below oil ring, should be 0.010-0.012 inch (0.254-0.305 mm) on Model HH120; 0.006-0.008 inch (0.152-0.203 mm) on HH80 and HH100; 0.003-0.004 inch (0.076-0.203 mm) on VH80 and VH100; 0.0045-0.006 inch (0.1143-0.152 mm) on all other models.

Piston pin diameter is 0.6248-0.6250 inch (15.870-15.875 mm) on Models VM70, HM70, VM80, HM80, VM100, HM100, HH70 and VH70 or 0.6873-0.6875 inch (17.457-17.462) on all other models. Piston pin clearance should be 0.0001-0.0008 inch (0.0025-0.0203 mm) in rod and 0.0002-0.0005 inch (0.0051-0.0127 mm) in piston. If excessive clearance exists, both piston and pin must be renewed as pin is not available separately.

CYLINDER. If cylinder is scored or if taper or out-of-round exceeds 0.005 inch (0.127 mm), cylinder should be rebored to next suitable oversize. Standard cylinder bore is 2.9375-2.9385 inches (74.6125-74.6379 mm) on Models VM70 and HM70; 3.062-3.063 inches (77.775-77.800 mm) on early Models VM80 and HM80; 3.125-3.126 inches (79.375-

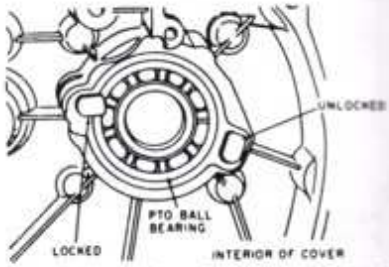


Fig. T37—Interior view of crankcase cover and ball bearing locks used on Models HM70, HH70, HM80 and HM100.

Illustrations courtesy Tecumseh Products Co.

79.400 mm) on late Models VM80 and HM80; 3.187-3.188 inches (80.950-80.975 mm) on Models VM100 and HM100; 2.750-2.751 inches (69.850-69.875 mm) on Models HH70 and VH70; 3.312-3.313 inches (84.125-84.150 mm) on Models HH80, VH80, HH100 and VH100; 3.500-3.501 inches (88.900-88.925 mm) on Model HH120.

CRANKSHAFT. Crankshaft main journals ride directly in aluminum alloy bearings in crankcase and mounting flange (engine base) on vertical crankshaft engines or in two renewable steel backed bronze bushings. On some horizontal crankshaft engines, crankshaft rides in a renewable sleeve bushing at flywheel end and a ball bearing or bushing at pto end. Models HH80, VH80, HH100, VH100 and HH120 are equipped with taper roller bearings at both ends of crankshaft.

Normal running clearance of crankshaft journals in aluminum bearings or bronze bushings is 0.0015-0.0025 inch (0.0381-0.0635 mm). Renew crankshaft if main journals are more than 0.001 inch (0.025 mm) out-of-round or if crankpin is more than 0.0005 inch (0.0127 mm) out-of-round.

Check crankshaft gear for wear, broken tooth or loose fit on crankshaft. If gear is damaged, remove from crankshaft with an arbor press. Renew gear pin and press new gear on shaft making certain timing mark is facing pto end of shaft.

On models equipped with ball bearing at pto end of shaft, refer to Figs. T36 and T37 before attempting to remove crankcase cover. Loosen locknuts and rotate protruding ends of lock pins counter-clockwise to release bearing and remove cover. Ball bearing will remain on crankshaft. When reassembling, turn lock pins clockwise until flats on pins face each other, then tighten locknuts to 20 in.-lbs. (2.3 N·m).

Crankshaft end play on Models VM70, HM70, VM80, HM80, VM100, HM100, HH70 and VH70 should be 0.0005-0.027 inch (0.127-0.686 mm), and is controlled by washers (25 and 27 – Fig. T40) or (35 and 37 – Fig. T41).

To remove tapered roller bearings (30 and 51 – Fig. T42 or T43) from crankshaft on Models HH80, VH80, HH100, VH100 and HH120, use a suitable puller. Bearings will be damaged during removal and new bearings must be installed. Heat bearings in oil to approxi-

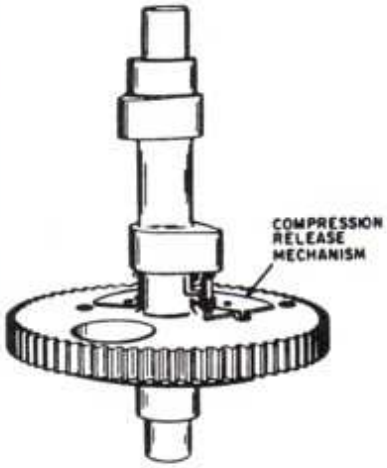


Fig. T38 – View of Insta-matic Ezee-Start compression release camshaft assembly used on all models except HH80, HH100 and HH120.

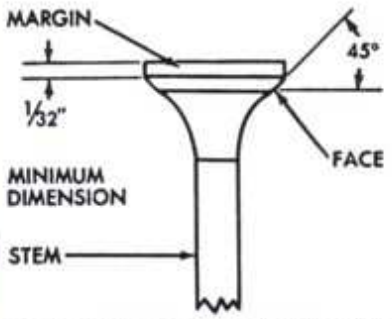


Fig. T39 – Valve face angle should be 45 degrees. Minimum valve head margin is 1/32-inch (0.8 mm).

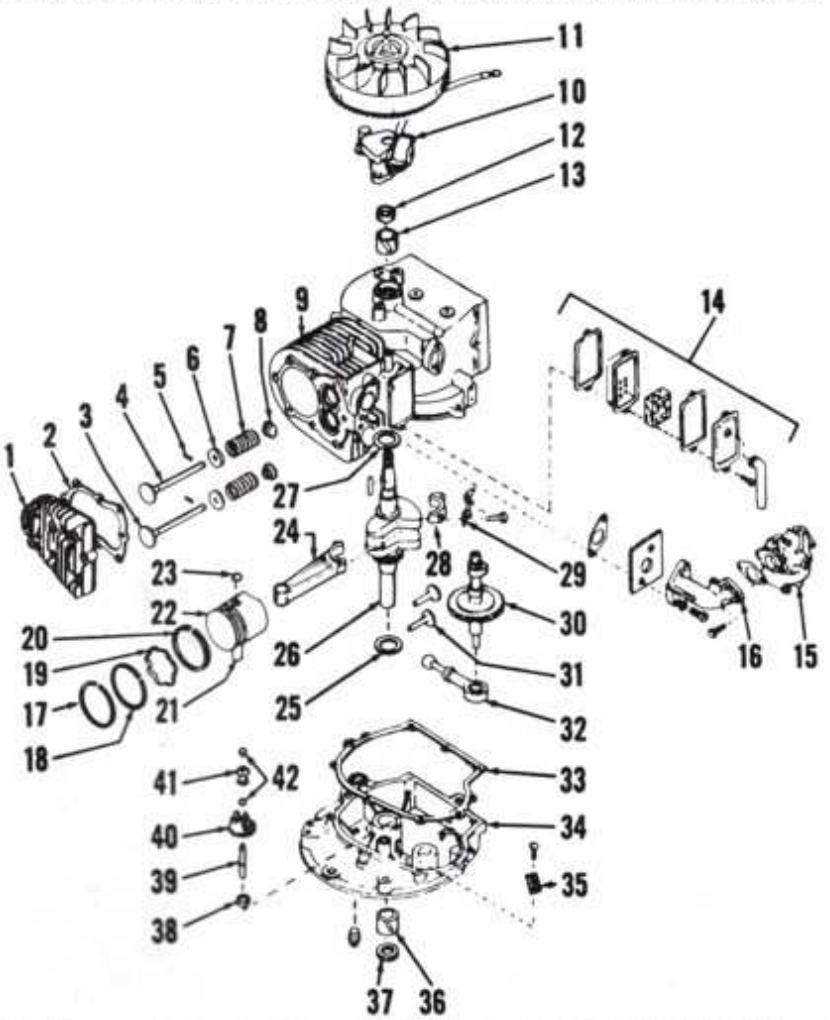


Fig. T40 – Exploded view of vertical crankshaft engine typical of Models VH70, VM70, VM80 and VM100. Renewable bushings (13 and 36) are not used on Models VM70, VM80 and VM100.

1. Cylinder head
2. Head gasket
3. Exhaust valve
4. Intake valve
5. Pin
6. Spring cap
7. Valve spring
8. Spring cap
9. Cylinder block
10. Magneto
11. Flywheel
12. Oil seal
13. Crankshaft bushing
14. Breather assy.
15. Carburetor
16. Intake pipe
17. Top compression ring
18. Second compression ring
19. Oil ring expander
20. Oil control ring
21. Piston pin
22. Piston
23. Retaining ring
24. Connecting rod
25. Thrust washer
26. Crankshaft
27. Thrust washer
28. Rod cap
29. Rod bolt lock
30. Camshaft assy.
31. Valve lifters
32. Oil pump
33. Gasket
34. Mounting flange (engine base)
35. Oil screen
36. Crankshaft bushing
37. Oil seal
38. Spacer
39. Governor shaft
40. Governor gear assy.
41. Spool
42. Retaining rings

Illustrations courtesy Tecumseh Products Co.

mately 300°F (150°C), then quickly slide bearings into position. Bearing cup (12) is a press fit in crankcase cover or engine base. Bearing cup (31) is a slip fit in block (29). To adjust crankshaft bearings, first assemble crankshaft assembly, piston and rod and crankcase cover or engine base. Tighten all bolts to correct torque value. Install bearing retaining cap (35) without shim gaskets (32), steel washers (33) or "O" ring (58). Tighten screws finger tight. Use a feeler gage to measure gap between bearing retainer flange and block. If no measurable clearance exists, install 0.010 inch steel washer between bearing retainer and cup until such clearance is obtained. If clearance does not exceed 0.007 inch (0.178 mm), no shim gasket (32) will be required and when retainer cap screws are tightened to correct torque, bearing preload will be 0.001-0.007 inch (0.025-0.178 mm). If clearance measures more than 0.007 inch (0.178 mm), subtract 0.001 inch (0.025 mm) from measurement to allow for preload; this will give actual distance to be shimmed. Since shim gaskets compress approximately ⅓ their thickness, shim pack should be 1½ times actual distance. Shim gaskets are available in thicknesses of 0.003-0.004, 0.004-0.005 and 0.005-0.007 inch. Remove bearing retainer, install "O" ring (58) and desired shim gaskets and reinstall retainer. Tighten cap screws to 110 in.-lbs. (12 N·m). Crankshaft seal should be installed to 0.025 inch (0.635 mm) below surface.

Crankshaft dimensions are as follows:

Main Journal Diameter

VH70, HH70
Flywheel and pto ends . . . . . 0.9985-0.9990 in. (25.362-25.375 mm)

VM70, HM70, VM80, HM80, VM100, HM100
Flywheel end . . . . . 0.9985-0.9990 in. (25.362-25.375 mm)
Pto end . . . . . 1.1870-1.1875 in. (30.150-30.162 mm)

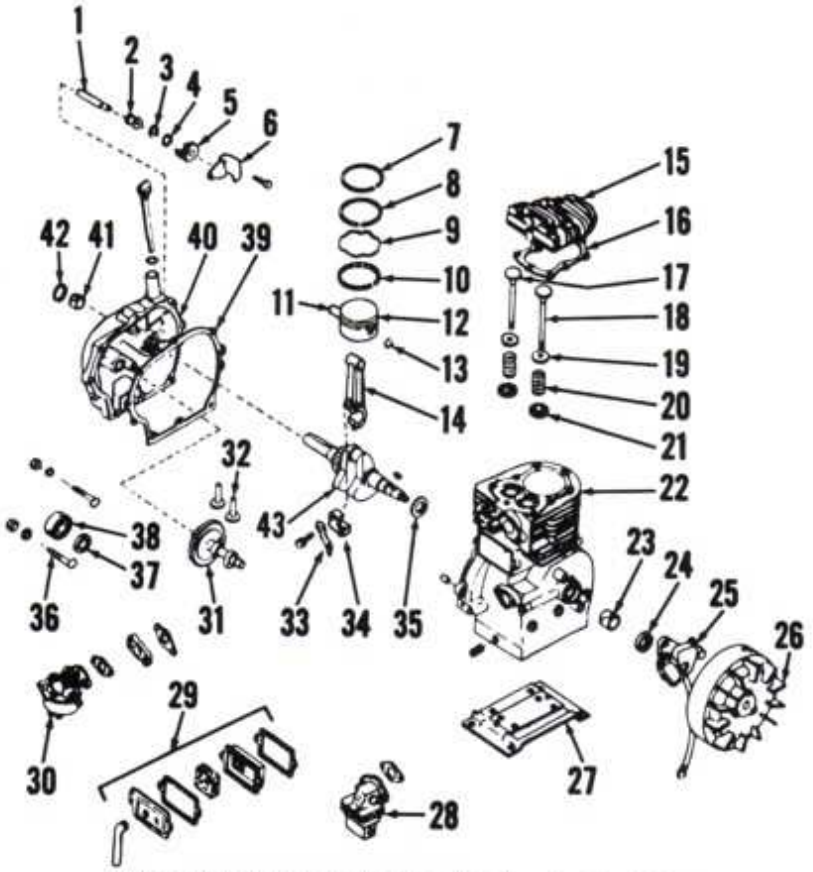
HH80, VH80, HH100, VH100, HH120
Flywheel and pto ends . . . . . 1.1865-1.870 in. (30.137-30.150 mm)

Crankpin Journal Diameter

HH80, VH80, HH100, VH100, HH120 . . . . . 1.3750-1.3755 in. (34.925-34.938 mm)
All other models . . . . . 1.1860-1.1865 in. (30.124-30.137 mm)

CAMSHAFT. The camshaft and camshaft gear are an integral part which rides on journals at each end of shaft. Renew camshaft if gear teeth are worn or if bearing surfaces are worn or scored. Cam lobe nose to heel diameter should be 1.3045-1.3085 inches (33.134-33.236 mm) on Models HH80, VH80, HH100 and HH120 or 1.263-1.267 inches (32.080-32.182 mm) on all other models. Camshaft journal diameter is 0.6235-0.6240 inch (15.837-15.850 mm). Maximum allowable clearance between camshaft journal and bearing is 0.003 inch (0.076 mm).

Medium frame engines and Models VH70 and VH80 are equipped with Insta-matic Ezee-Start compression release camshaft (Fig. T38). Check compression release parts for binding, or excessive wear or other damage. If any parts are damaged or worn, renew com-



1. Governor shaft
2. Spool
3. Washer
4. Retaining ring
5. Gear & flyweight assy.
6. Bracket
7. Top compression ring
8. Second compression ring
9. Oil ring expander
10. Oil control ring
11. Piston pin
12. Piston
13. Retaining ring
14. Connecting rod
15. Cylinder head
16. Head gasket
17. Exhaust valve
18. Intake valve
19. Spring cap
20. Valve spring
21. Spring retainer
22. Cylinder block
23. Crankshaft bushing
24. Oil seal
25. Magneto
26. Flywheel
27. Mounting plate
28. Fuel pump
29. Breather assy.
30. Carburetor
31. Camshaft assy.
32. Valve lifter
33. Rod bolt lock
34. Rod cap
35. Thrust washer
36. Bearing lock pin
37. Thrust washer
38. Ball bearing
39. Gasket
40. Crankcase cover
41. Bushing
42. Oil seal
43. Crankshaft

Fig. T41—Exploded view of horizontal crankshaft engine typical of Models HH70, HM70, HM80 and HM100. Engines may be equipped with crankshaft bushing (41) or ball bearing (38) at pto end of shaft.

Illustrations courtesy Tecumseh Products Co.

plete camshaft assembly. Compression release parts are not serviced separately.

On Models HH80, HH100 and HH120, timing advance unit should be inspected and any worn or damaged parts renewed. Refer to Fig. T43 for exploded view of timing advance (52 through 56).

On all models, when installing camshaft, align timing mark on cam gear with mark on crankshaft gear. Timing mark on crankshaft gear is a chamfered tooth.

VALVE SYSTEM. On Models HH80, VH80, HH100, VH100 and HH120, valve tappet gap with engine cold is 0.010 inch (0.254 mm) for intake and 0.020 inch (0.508 mm) for exhaust. Valve tappet gap on all other models with engine cold is 0.010 inch (0.254 mm) for both valves. To obtain correct gap, grind valve stem end off squarely. Valve seat angle width is 3/64-inch (1.2 mm) on all models. When valve head margin is less than 1/32-inch (0.8 mm), renew valve. See Fig. T39.

Valve guides are non-renewable on all models. If excessive clearance exists, valve guide should be reamed and a new valve with oversize stem installed. Ream guide to 0.344-0.345 inch (8.738-8.763 mm) on Models HH80, VH80, HH100, VH100 and HH120 and to 0.3432-0.3442 inch (8.717-8.743 mm) on all other models.

Valve spring free length should be 1.885 inches (47.88 mm) on Models HH80, VH80, HH100, VH100 and HH120. Valve spring free length should be 1.562 inches (39.67 mm) on all other models.

DYNA-STATIC BALANCER. The Dyna-Static engine balancer operates by means of a pair of counterweighted gears driven by crankshaft to counteract the unbalance caused by counterweights on crankshaft. The balancer used on medium frame engine is similar to those used on heavy frame models. On medium frame models, balancer gears are held in position on the shafts by a bracket bolted to crankcase or engine base (Fig. T44). Snap rings are used on heavy frame models to retain balancer gears on shafts.

The renewable balancer gear shafts are pressed into crankcase cover or engine base. On medium frame models,

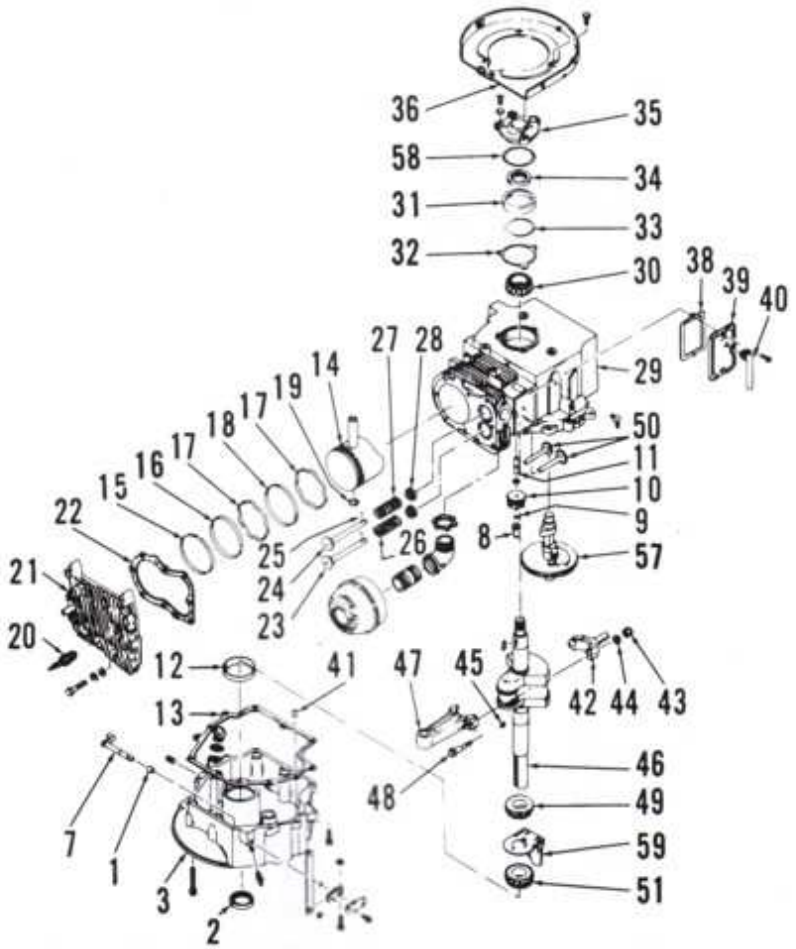


Fig. T42—Exploded view of Model VH80 or VH100 vertical crankshaft engine.

1. Governor arm bushing
2. Oil seal
3. Mounting flange (engine base)
7. Governor arm
8. Thrust spool
9. Snap ring
10. Governor gear & weight assy.
11. Governor shaft
12. Bearing cup
13. Gasket
14. Piston & pin assy.
15. Top compression ring
16. Second compression ring
17. Ring expanders
18. Oil control ring
19. Retaining ring
20. Spark plug
21. Cylinder head
22. Head gasket
23. Exhaust valve
24. Intake valve
25. Pin
26. Exhaust valve spring
27. Intake valve spring
28. Spring cap
29. Cylinder block
30. Bearing cone
31. Bearing cup
32. Shim gasket
33. Steel washer (0.010 in.)
34. Oil seal
35. Bearing retainer cap
36. Blower air baffle
38. Gasket
39. Breather
40. Breather tube
42. Rod cap
43. Self-locking nut
44. Washer
45. Crankshaft gear pin
46. Crankshaft
47. Connecting rod
48. Rod bolt
49. Crankshaft gear
50. Valve lifters
51. Bearing cone
57. Camshaft assy.
58. "O" ring
59. Oil slinger

Illustrations courtesy Tecumseh Products Co.

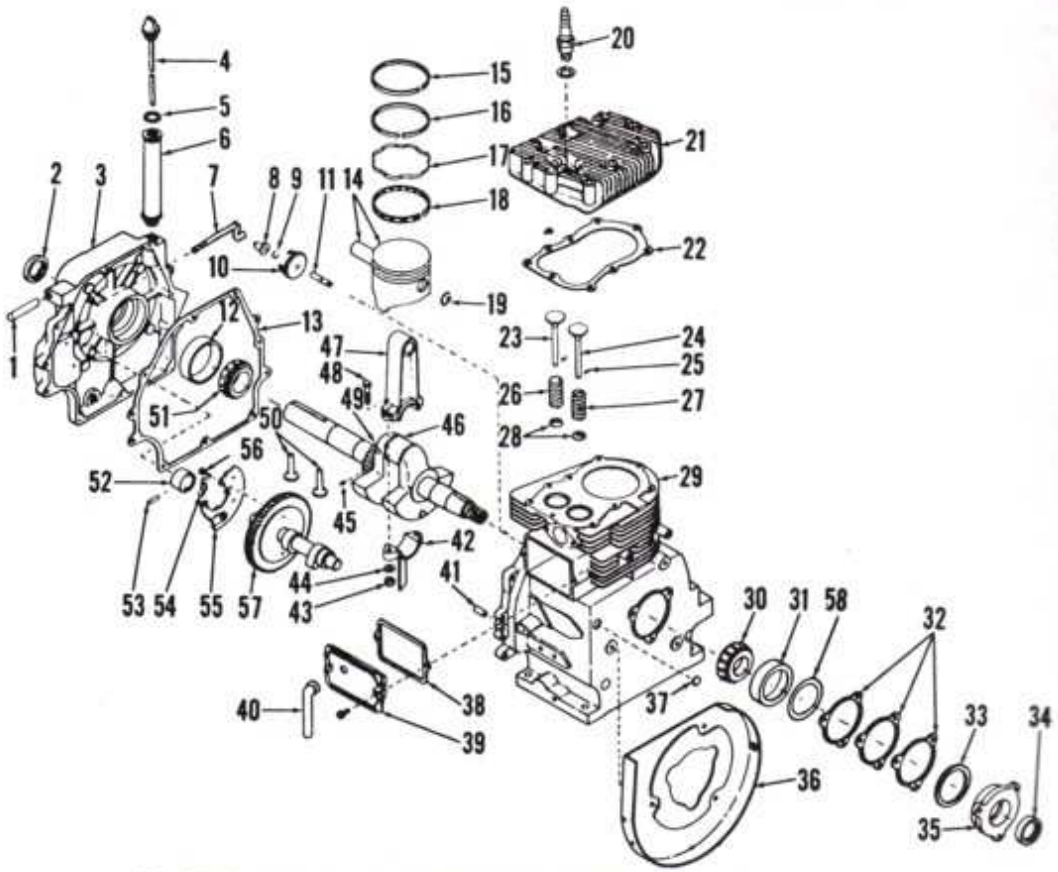


Fig. T43 – Exploded view of Model HH80, HH100 or HH120 horizontal crankshaft engine.

1. Governor arm bushing
2. Oil seal
3. Crankcase cover
4. Dipstick
5. Gasket
6. Oil filler tube
7. Governor arm
8. Thrust spool
9. Snap ring
10. Governor gear & weight assy.
11. Governor shaft
12. Bearing cup
13. Gasket
14. Piston & pin assy.
15. Top compression ring
16. Second compression ring
17. Oil ring expander
18. Oil control ring
19. Retaining ring
20. Spark plug
21. Cylinder head
22. Head gasket
23. Exhaust valve
24. Intake valve
25. Pin
26. Exhaust valve spring
27. Intake valve spring
28. Spring cap
29. Cylinder block
30. Bearing cone
31. Bearing cup
32. Shim gaskets
33. Steel washer (0.010 in.)
34. Oil seal
35. Bearing retainer cap
36. Blower air baffle
37. Plug
38. Gasket
39. Breather assy.
40. Breather tube
41. Dowel pin
42. Rod cap
43. Self-locking nut
44. Washer
45. Crankshaft gear pin
46. Crankshaft
47. Connecting rod
48. Rod bolt
49. Crankshaft gear
50. Valve lifters
51. Bearing cone
52. Breaker cam
53. Push rod
54. Spring
55. Timing advance weight
56. Rivet
57. Camshaft assy.
58. "O" ring

press shaft into cover or engine base until a distance of 1.757-1.763 inches (44.628-44.780 mm) exists between shaft bore boss and edge of step cut on shafts as shown in Fig. T46. Heavy frame model shafts should be pressed until a distance of 1.7135-1.7185 inches (43.523-43.650 mm) exists between cover boss and the outer edge of snap ring groove as shown in Fig. T47.

All balancer gears are equipped with renewable cage needle bearings. See Figs. T48 and T49. Using tool #670230, press new bearings into gears until cage is flush to 0.015 inch (0.381 mm) below edge of bore.

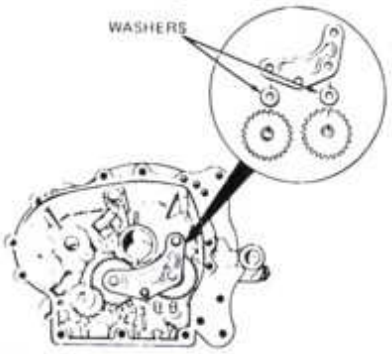


Fig. T44 – View showing Dyna-Static balancer gears installed in Model VM80 or VM100 engine base. Balancer gears are identically located in Model HM80 or HM100 crankcase cover. Note location of washers between gears retaining bracket.

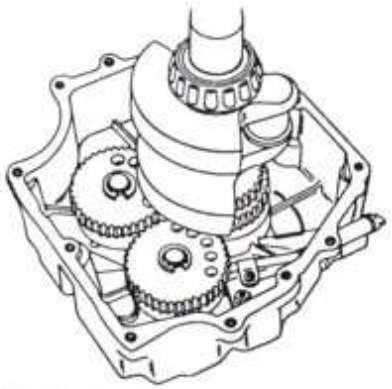


Fig. T45 – View showing Dyna-Static balancer gears installed in Model HH80, HH100 or HH120 crankcase cover. Note gear retaining snap rings.

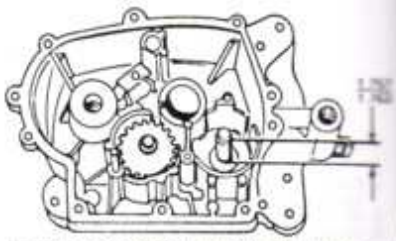


Fig. T46 – On Models HM80, VM80, HM100 and VM100, balancer gear shafts must be pressed into cover or engine base so a distance of 1.757-1.763 inches (44.628-44.780 mm) exists between shaft bore boss and edge of step cut as shown.

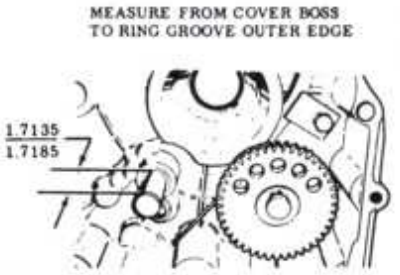


Fig. T47—On Models HH80, HH100 and HH120, press balancer gear shafts into cover to dimension shown.

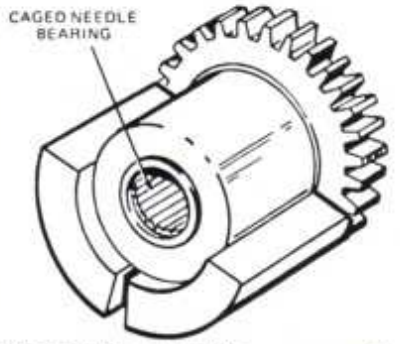
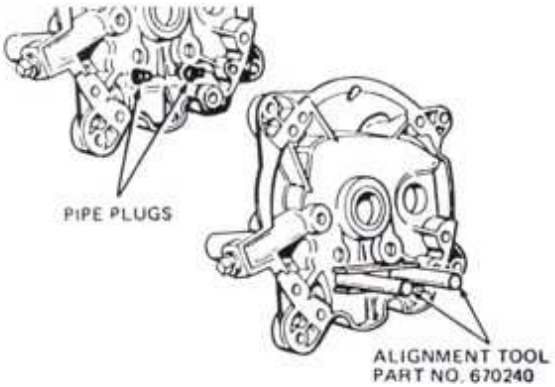


Fig. T48—Using tool #670210, press new needle bearings into Model HM80, VM80, HM100 or VM100 balancer gears until bearing cage is flush to 0.015 inch (0.381 mm) below edge of bore.

Fig. T49—On Models HH80, HH100 and HH120, needle bearings are installed flush to 0.015 inch (0.381 mm) below edge of bore. Note tool alignment notch at lower side of balancer.

When reassembling engine, balancer gears must be timed with crankshaft for correct operation. Refer to Figs. T50 and T51 and remove pipe plugs. Insert alignment tool #670240 through crankcase cover of Models HM80 and HM100 or engine base of Models VM80 and VM100 and into timing slots in balancer gears. On Models HH80, HH100 and HH120, insert timing tool #670239 through cover and into balancer gears. Then, on all models, turn crankshaft to place piston at TDC and carefully install engine base or cover with balancer gears. When correctly assembled, piston should be on TDC and weights on balancer gears should be in directly opposite position. See Figs. T52 and T53.

Fig. T50—To time engine balancer gears, remove pipe plugs and insert alignment tool #670240 through crankcase cover (HM80 and HM100) or engine base (VM80 and VM100) and into slots in balancer gears. Refer also to Fig. T52.



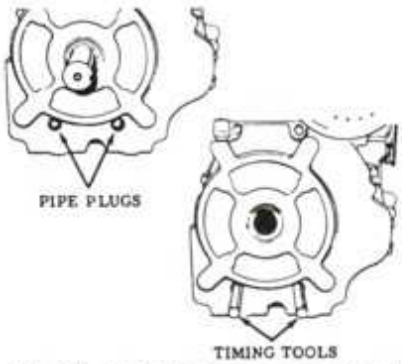


Fig. T51—To time balancer gears on Models HH80, HH100 and HH120, remove pipe plugs and insert timing tools #670239 through crankcase cover and into timing slots in balancer gears. Refer also to Fig. T53.

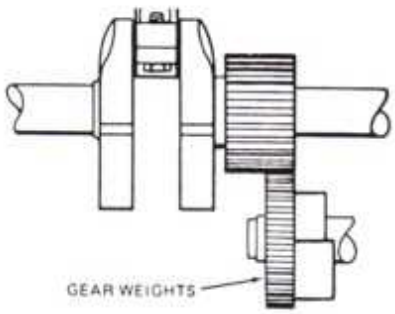


Fig. T52—View showing correct balancer gear timing to crankshaft gear on Models HM80, VM80, HM100 and VM100. With piston at TDC, weights should be directly opposite.

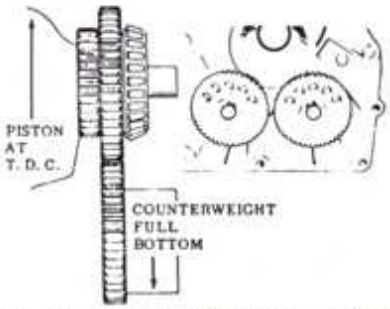


Fig. T53—On Models HH80, HH100 and HH120, balancer gears are correctly timed to crankshaft when piston is at TDC and weights are at full bottom position.

Illustrations courtesy Tecumseh Products Co.