ENGINE

CONTENTS

ENGINE APPLICATION

Model Application		No. Cyl.	Engine Type & Displacement	Compression Ratio	
Newport and Town and Country	(Std.)	8	"LB" 383 Cubic Inch	8.7 to 1	2 BBl. Carb., Std. Cam., Single Exhaust
	(Opt.)	8	"LB" 383 Cubic Inch	9.5 to 1	4 BBl. Carb., Std. Cam., Dual Exhaust
	(Opt.)*	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
300	(Std.)	8	"LB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust
	(Opt.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
New Yorker	(Std.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust
	(Opt.)	8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Spec. Cam., Dual Exhaust
Imperial		8	"RB" 440 Cubic Inch	9.7 to 1	4 BBl. Carb., Std. Cam., Singe Exhaust

*Town and Country—Standard Cam Only

GENERAL INFORMATION

The V8 engines for the 1970 Chrysler and Imperial Models are all the valve-in-head type with hydraulic tappets. The engines vary in compression ratio, piston displacement, camshaft, valve springs, carburetor, manifold arrangement.

The standard NEWPORT ENGINE with two bore carburetor, 8.7 to 1 compression ratio uses regular fuel.

All other engines with a 4 bore carburetor; use premium fuel.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ENGINE WILL NOT START	(a) Weak Battery.	(a) Test battery specific gravity. Recharge or replace as necessary.
	(b) Corroded or loose battery connections	(b) Clean and tighten battery connections. Apply a coat of petrolatum to terminals.
	(c) Faulty starting motor.	(c) Refer to "Starting Motor."*
	(d) Moisture on ignition wires and distributor cap.	(d) Wipe wires and cap clean and dry.
	(e) Faulty ignition cables.	(e) Replace any cracked or shorted cables.
	(f) Faulty coil or condenser.	(f) Test and replace as necessary.*
	(g) Dirty or corroded distributor contacts.	(g) Clean or replace as necesasry.
	(h) Incorrect spark plug gap.	(h) Set gap at .035".
	(i) Incorrect ignition timing.	(i) Refer to "Ignition Timing."*
	(j) Dirt or water in fuel line or carburetor.	(j) Clean lines and carburetor.**
	(k) Carburetor flooded.	(k) Adjust float level—check seats.**

Condition	Possible Cause	Correction
	(l) Incorrect carburetor float setting.	(l) Adjust float level—check seats.**
	(m) Faulty fuel pump.	(m) Install new fuel pump.**
	(n) Carburetor percolating. No fuel in the carburetor.	(n) Measure float level. Adjust bowl vent.** Inspect operation of manifold control valve.
ENGINE STALLS	(a) Idle speed set too low.	(a) Adjust carburetor.**
	(b) Incorrect choke adjustment.	(b) Adjust choke.**
	(c) Idle mixture too lean or too rich.	(c) Adjust carburetor.**
	(d) Incorrect carburetor float setting.	(d) Adjust float setting.**
	(e) Leak in intake manifold.	(e) Inspect intake manifold gasket and replace if necessary.***
	(f) Dirty, burned or incorrectly gapped distributor contacts.	(f) Replace contacts and adjust.*
	(g) Worn or burned distributor rotor.	(g) Install new rotor.
	(h) Incorrect ignition wiring.	(h) Install new wiring.
	(i) Faulty coil or condenser.	(i) Test and replace if necessary.*
ENGINE LOSS OF POWER	(a) Incorrect ignition timing.	(a) Refer to "Ignition Timing."*
	(b) Worn or burned distributor rotor.	(b) Install new rotor.
	(c) Worn distributor shaft or cam.	(c) Remove and repair distributor.*
	(d) Dirty or incorrectly gapped spark plugs.	(d) Clean plugs and set gap at .035".
	(e) Dirt or water in fuel line, carburetor or filter.	(e) Clean lines, carburetor and replace filter.**
	(f) Incorrect carburetor float setting.	(f) Adjust float level.**
	(g) Faulty fuel pump.	(g) Install a new pump.
	(h) Incorrect valve timing.	(h) Refer to "Checking Valve Timing."***
	(i) Blown cylinder head gasket.	(i) Install new head gasket.***
	(j) Low compression.	(j) Test compression of each cylinder.*
	(k) Burned, warped, pitted valves.	(k) Install new valves or regrind.***
	(l) Plugged or restricted exhaust system.	(l) Install new parts as necessary.
	(m) Faulty ignition cables.	(m) Replace any cracked or shorted cables.
	(n) Faulty coil or condenser.	(n) Test and replace as necessary.*
ENGINE MISSES ON ACCELERATION	(a) Dirty, burned, or incorrectly gapped distributor contacts.	(a) Replace contacts and adjust.*
	(b) Dirty, or gap too wide in spark plugs.	(b) Clean spark plugs and set gap at .035".
	(c) Incorrect ignition timing.	(c) Refer to "Ignition Timing."*
	(d) Dirt in carburetor.	(d) Clean carburetor.**
	(e) Acceleration pump in carburetor.	(e) Install new pump.**
	(f) Burned, warped or pitted valves.	(f) Install new valves or regrind.***
	(g) Faulty coil or condenser.	(g) Test and replace if necessary.*
ENGINE MISSES AT HIGH SPEED	(a) Dirty or incorrectly gapped distributor contacts.	(a) Clean or replace as necessary.*
	(b) Dirty or gap set too wide in spark plug.	(b) Clean spark plugs and set gap at .035".
	(c) Worn distributor shaft cam.	(c) Remove and repair distributor.*
	(d) Worn or burned distributor rotor.	(d) Install new rotor.
	(e) Faulty coil or condenser.	(e) Test and replace if necessary.*
	(f) Incorrect ignition timing.	(f) Refer to "Ignition Timing."*
	(g) Dirty jets in carburetor.	(g) Clean jets.**
	(h) Dirt or water in fuel line, carburetor or filter.	(h) Clean lines, carburetor and replace filter.**
NOISY VALVES	(a) High or low oil level in crankcase.	(a) Check for correct oil level.***
	(b) Thin or diluted oil.	(b) Change oil.***
	(c) Low oil pressure.	(c) Check engine oil level.***
	(d) Dirt in tappets.	(d) Clean tappets.***
	(e) Bent push rods.	(e) Install new push rods.***
	(f) Worn rocker arms.	(f) Inspect oil supply to rockers.***
	(g) Worn tappets.	(g) Install new tappets.***
	(h) Worn valve guides.	(h) Ream and install new valves with oversize stems.***

Condition	Possible Cause	Correction
	(i) Excessive run-out of valve seats or valve faces.	(i) Grind valve seats and valves.***
CONNECTING ROD NOISE	(a) Insufficient oil supply.	(a) Check engine oil level.***
	(b) Low oil pressure.	(b) Check engine oil level. Inspect oil pump relief valve and spring.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure bearings for correct clearance.***
	(e) Connecting rod journals out-of-round.	(e) Replace crankshaft or regrind journals.***
	(f) Misaligned connecting rods.	(f) Replace bent connecting rods.***
MAIN BEARING NOISE	(a) Insufficient oil supply.	(a) Check engine oil level.***
	(b) Low oil pressure.	(b) Check engine oil level. Inspect oil pump relief valve and spring.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.***
	(d) Excessive bearing clearance.	(d) Check bearings for correct clearances.***
	(e) Excessive end play.	(e) Check No. 3 main bearings for wear on flanges.***
	(f) Crankshaft journals out-of-round or worn.	(f) Replace crankshaft or regrind journals.***
	(g) Loose flywheel or torque converter.	(g) Tighten to correct torque.
OIL PUMPING AT RINGS	(a) Worn, scuffed, or broken rings.	(a) Hone cylinder bores if necessary and install new rings.**
	(b) Carbon in piston ring grooves and oil ring slots.	(b) Remove rings. Clean grooves. Check groove width. Install new rings.***
	(c) Rings fitted too tight in grooves.	(c) Remove rings. Check grooves. If groove is not proper width, replace pistons.***
OIL PRESSURE DROP	(a) Low oil level.	(a) Check engine oil level.
	(b) Faulty oil pressure sending unit.	(b) Install new sending unit.
	(c) Clogged oil filter.	(c) Install new oil filter.
	(d) Worn parts in oil pump.	(d) Replace worn parts or pump.
	(e) Thin or diluted oil.	(e) Change oil to correct viscosity.
	(f) Excessive bearing clearance.	(f) Measure bearings for correct clearance.***
	(g) Oil pump relief valve stuck.	(g) Remove valve and inspect, clean, and reinstall.
	(h) Oil pump suction tube loose, bent or cracked.	(h) Remove oil pan and install new tube if necessary.

* Refer to the "Electrical and Instrument" Group 8 for service procedures.
** Refer to the "Fuel System" Group 14 for service procedures.
*** Refer to the "Engine" Group 9 for service procedures.

383-440 CUBIC INCH ENGINES

INDEX

SERVICE PROCEDURES

TUNE-UP

(1) Test battery specific gravity, add water if necessary, clean and tighten battery connections.

(2) Test cranking voltage. See "Starting Motor Cranking Voltage" Electrical Section of this manual.

(3) Tighten the intake manifold bolts to 50 foot-pounds.

(4) Perform cylinder compression test. Compression should not be less than 100 pounds for 383 Cubic Inch Engine with two barrel carburetor and not vary more than 40 pounds. 110 pounds for 383, 440 Cubic Inch Engine with four barrel carburetor and should not vary more than 40 pounds. The recommended pressures are to be used only as a guide to diagnosing engine problems. An engine in good condition may exhibit higher pressures. Many conditions which are difficult to control cause variations in compression readings. An engine should not be disassembled to determine the cause of low compression unless some other malfunction is present.

(5) Clean or replace spark plugs as necessary and adjust gap to .035 inch. Tighten to 30 foot-pounds using new gaskets.

(6) Test resistance of spark plug cables. Refer to "Ignition System Secondary Circuit Inspection" Electrical Section.

(7) Inspect the breaker plate contacts, primary wire and vacuum advance operation. Test coil output voltage, primary and secondary resistance. Test Condenser. Replace parts as necessary. Refer to Ignition System and make necessary adjustments.

(8) Reset the ignition timing with the vacuum advance line disconnected. The ignition timing should be set to compensate for altitudes and/or gasoline grades.

(9) Set carburetor idle mixture adjustment. Adjust throttle stop screw to specifications. Perform a combustion analysis.

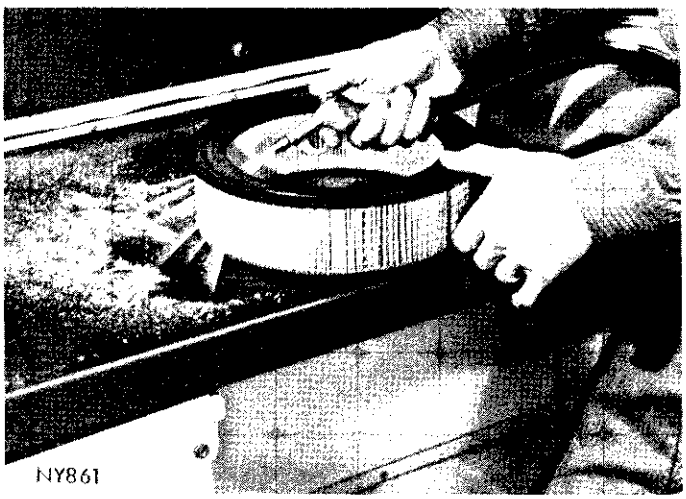


Fig. 1—Cleaning Filter Element

(10) Test the fuel pump for pressure and vacuum. Refer to "Fuel System" Group 14, Specifications.

(11) Inspect the manifold heat control valve in the right exhaust manifold for proper operation and apply Manifold Heat Control Valve Solvent Number 2525054 or equivalent to the bushing and shafts.

(12) Every 6 months, remove filter element and blow out dirt gently with air hose. Direct air from inside out, and keep nozzle 2 inches away from element to avoid damaging (Fig. 1). Clean the metal housing and replace the element. Every two years install a new factory recommended filter element. Service the unit more frequently when driving under severe conditions, such as in dusty areas.

(13) Inspect crankcase ventilation system as outlined on page 25.

(14) Inspect and adjust the accessory belt drives referring to "Cooling System" Group 7 for proper adjustments.

(15) Road test vehicle as a final check.

FRONT ENGINE MOUNTS (Fig. 2)

Removal

(1) Disconnect throttle linkage at transmission and at carburetor.

(2) Raise hood and position fan to clear radiator hose and radiator top tank.

(3) Remove torque nuts from insulator studs.

(4) Raise engine just enough to remove front engine mount assembly.

Installation

(1) Install insulator to engine bracket and tighten to specified torque.

(2) Lower the engine and install washers and prevailing torque nuts to insulator studs; tighten nuts to specified torque.

(3) Connect throttle at transmission and carburetor.

REAR ENGINE MOUNT (Fig. 3)

Removal

(1) Raise vehicle on hoist.

(2) Install transmission jack.

(3) Remove rear engine crossmember from frame and remove rear mount.

Installation

(1) Install rear engine mount to crossmember and tighten nut to specified torque.

(2) Install rear crossmember to frame and tighten bolts to specified torque.

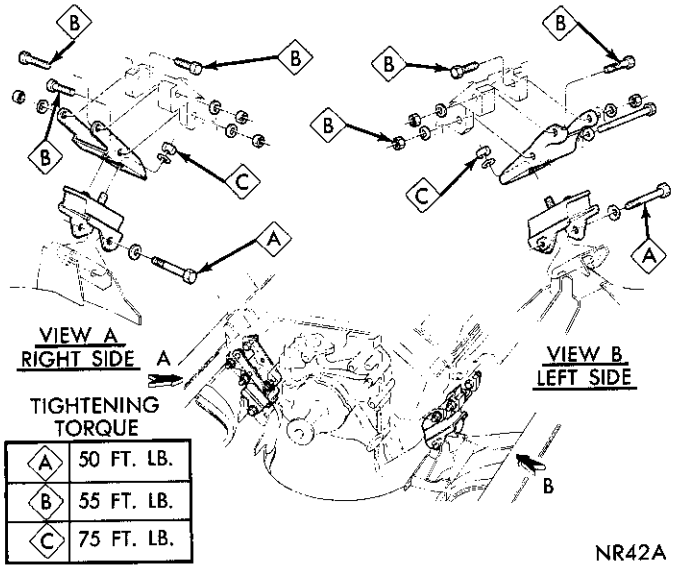


Fig. 2—Engine Front Mounts

ENGINE ASSEMBLY

Removal

(1) Scribe the outline of hinge brackets on hood to assure proper adjustments when installing.

(2) Remove hood.

(3) Drain cooling system and remove battery.

(4) Remove all hoses, fan shroud, disconnect oil cooler lines and remove radiator.

(5) Disconnect fuel lines and wires attached to engine units. Remove air cleaner and carburetor.

(6) Attach engine lifting fixture to carburetor flange studs on intake manifold.

(7) Raise vehicle on a hoist and install engine support fixture Tool C-3487-A to support rear of engine.

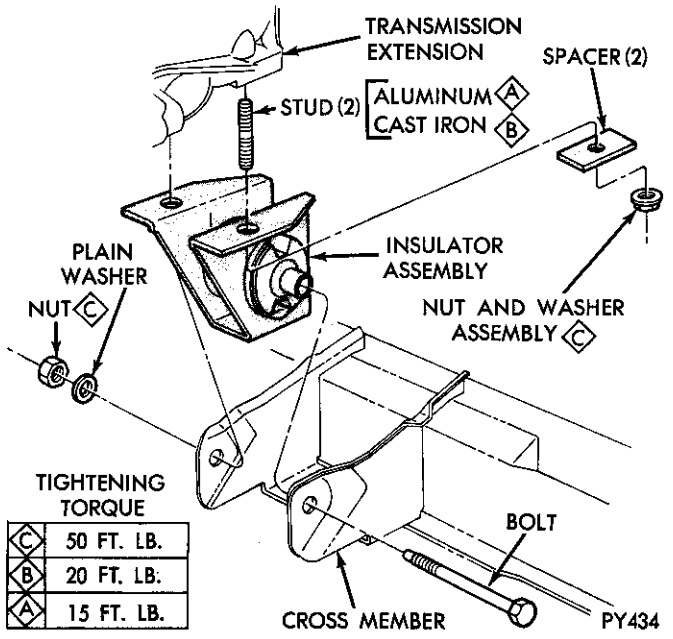


Fig. 3—Engine Rear Support

(8) Drain transmission and torque converter.

(9) Disconnect exhaust pipes at manifolds, propeller shaft, wires, linkage, cable, and oil cooler lines at the transmission.

(10) Remove engine rear support crossmember and remove transmission from vehicle.

(11) Lower vehicle and attach chain hoist to fixture eyebolt.

(12) Remove engine front mounting bolts. Raise engine with a chain hoist and work engine out of chassis.

(13) Place engine in repair stand Tool C-3167 and adapter C-3662 for disassembly, using transmission mounting bolts.

Installation

(1) Attach engine lifting fixture to carburetor flange studs on intake manifold.

(2) Attach chain hoist to fixture eyebolt.

(3) Remove engine from repair stand and lower engine carefully until engine is positioned in vehicle.

(4) Install engine support fixture Tool C-3487A and adjust to support rear of engine.

(5) Remove chain hoist from fixture eyebolt.

(6) Raise vehicle on hoist, install and tighten engine front support mounting bolts.

(7) Install transmission and engine rear support crossmember.

(8) Lower engine into position and install engine rear support crossmember bolts. Remove engine support fixture Tool C-3487A.

(9) Connect propeller shaft, wires, linkage, cable, oil cooler lines at the transmission, connect exhaust pipes to manifold using new gaskets. Install transmission filler tube.

(10) Lower vehicle and install radiator, fan shroud, hoses, oil cooler lines and connect all wires and linkage.

(11) Remove engine lifting fixture from intake manifolds and install carburetor and fuel lines. Connect throttle linkage.

(12) Install hood, using scribe marks for proper alignment.

(13) Close all drain cocks and fill cooling system.

(14) Fill engine crankcase and tranmission. Refer to "Lubrication" Group 0 for quantities and lubricants to use and check entire system for leaks and correct as necessary.

Whenever an engine has been rebuilt and/or a new camshaft and/or tappets are installed, one quart of engine supplement, Chrysler Part Number 1879406 or equivalent should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

(15) Start engine and run engine until normal operating temperature is reached.

(16) Inspect ignition timing and adjust carburetor as necessary.

(17) Adjust accelerator and transmission linkages. Road test vehicle.

ROCKER ARMS AND SHAFT ASSEMBLY

The rocker arms are of stamped steel and are arranged on one rocker arm shaft, per cylinder head. The push rod angularity tends to force the pairs of rocker arms toward each other where oilite spacers carry the side thrust at each rocker arm. The rocker shaft is held in place by bolts and stamped steel retainers attached to the five brackets on the cylinder head.

Removal

(1) Remove cylinder head cover and gasket.

(2) Remove rocker shaft bolts and retainers and remove rocker arms and shaft assembly.

(3) If rocker arm assemblies have been disassembled for cleaning, inspection, or replacement, refer to Figure 4 for proper reassembly.

Installation

(1) Install rocker arms and shaft assembly making sure to install the long stamped steel retainers in the number two and four positions.

(2) Install rocker shafts so that 3/16 inch diameter rocker arm lubrication holes point downward into the rocker arm, so that the 15° angle of these holes point outward towards the valve end of the rocker arms, (Fig. 5). This is necessary to provide proper lubrication to the rocker assemblies.

The 15° angle of the rocker arm lubrication holes is determined from the center line of the bolt holes through the shaft which are used to attach the shaft assembly to the cylinder head.

(3) Tighten rocker shaft bolts to 25 foot-pounds.

(4) Inspect cylinder cover for distortion. Straighten if necessary.

(5) Place new cylinder head cover gaskets in position and install cylinder head covers. Tighten nuts to 40 inch pounds.

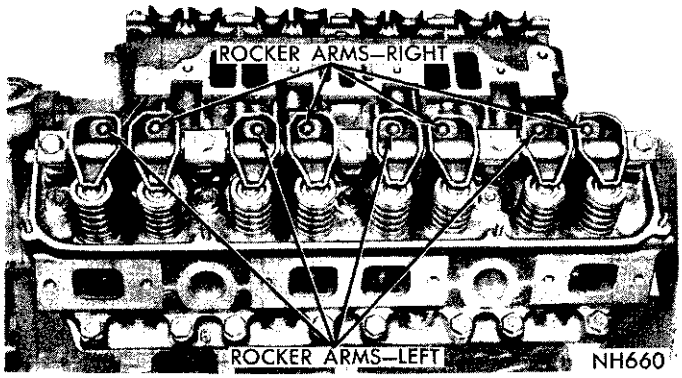


Fig. 4—Rocker Arm Assemblies Installed

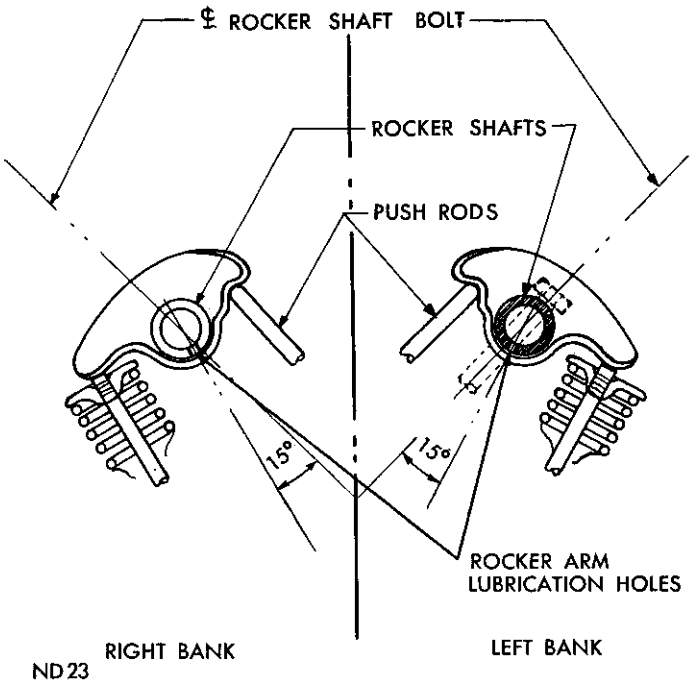


Fig. 5—Rocker Arm Lubrication Holes

(6) Install crankcase ventilation system and evaporative control system (if so equipped).

CYLINDER HEADS

The chrome alloy cast iron cylinder heads are held in place by 17 bolts. The spark plugs enter the cylinder head horizontally and are located at the wedge of the combustion chambers.

Removal

(1) Drain cooling system.

(2) Remove alternator, carburetor, air cleaner and fuel line.

(3) Disconnect accelerator linkage.

(4) Remove closed ventilation system and evaporative control system (if so equipped).

(5) Remove vacuum control tube at carburetor and distributor.

(6) Disconnect distributor cap, coil wires and heater hose.

(7) Disconnect heat indicator sending unit wire.

(8) Remove spark plugs.

(9) Remove intake manifold, ignition coil and carburetor as an assembly.

(10) Remove tappet chamber cover.

(11) Remove cylinder head covers and gaskets.

(12) Remove exhaust manifolds.

(13) Remove rocker arm and shaft assemblies. Remove push rods and **identify to insure installation in original location.**

(14) Remove the 17 head bolts from each cylinder head and remove cylinder heads.

(15) Place cylinder head in holding fixture tool C-3626.

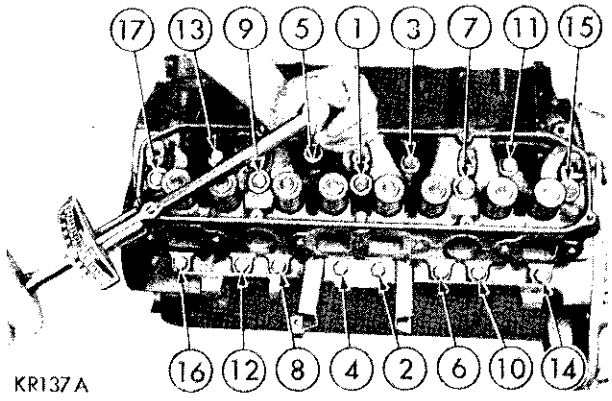


Fig. 6—Cylinder Head Tightening Sequence

Installation

(1) Clean gasket surfaces of the cylinder block and cylinder head. Remove all burrs from edges of cylinder heads.

(2) Inspect all surfaces with a straightedge if there is any reason to suspect leakage. If out of flatness exceeds .00075 times the span length in any direction; either replace head or lightly machine the head gasket surface. As an example, if a 12 inch span is .004″ out of flat, allowable is 12 x .00075 = .009″. Head is OK.

The cylinder head surface finish should be 70-180 micro-inches.

(3) Coat new gaskets lightly with a suitable sealer, Chrysler Number 1057794 or equivalent. Install gaskets and cylinder heads.

(4) Install cylinder head bolts. Starting at top center, tighten all cylinder head bolts to 40 foot-pounds in sequence (Fig. 6). Repeat the procedure, tightening all head bolts to 70 foot-pounds.

(5) Inspect push rods and replace any worn or bent rods.

(6) Install push rods in the tappets maintaining alignment, using rod (Fig. 7).

(7) Install rocker arm and shaft assembly starting each push rod into its respective rocker arm socket (Fig. 4) making sure to install the long stamped steel retainers in the number two and four positions. **Tighten bolts to 25 foot-pounds.**

(8) Place new cylinder head gasket in position and install cylinder head covers. Tighten nuts to 40 inch pounds.

(9) Install exhaust manifolds and tighten nuts to 30 foot-pounds.

(10) Adjust spark plugs to .035 inch gap and install plugs, tighten plugs to 30 foot-pounds.

(11) Install a new tappet chamber cover and tighten end bolts to 9 foot-pounds.

(12) Install intake manifold, carburetor and ignition coil as an assembly and tighten manifold bolts to 40 foot-pounds.

(13) Install distributor cap. Connect the coil wire, heat indicator sending unit wire, accelerator linkage, spark plug cables and insulators.

(14) Install vacuum hose at carburetor and distributor.

(15) Install closed ventilation system and evaporative control system (if so equipped).

(16) Install alternator and drive belts. Tighten alternator adjusting strap bolt to 200 inch-pounds, and alternator mounting bolt to 30 foot-pounds.

(17) Install fuel line and carburetor air cleaner.

(18) Fill cooling system. Adjust belt tensions as outlined in "Cooling System" Group 7.

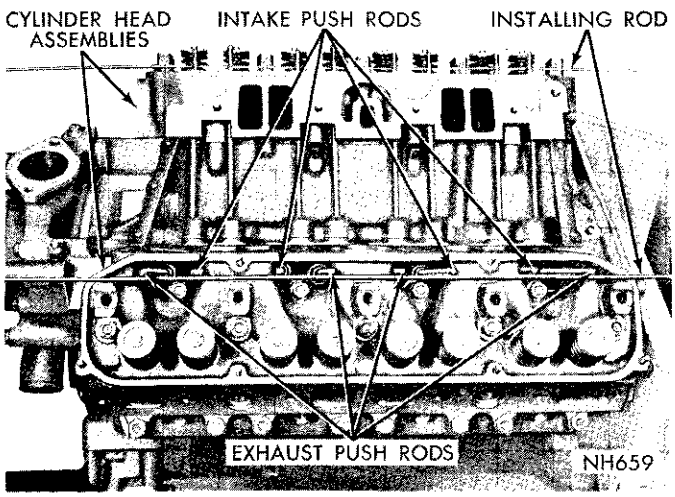


Fig. 7—Push Rods Installed

VALVES AND VALVE SPRINGS

Valves are arranged in-line in the cylinder heads and inclined 30 degrees outward from vertical. The intake and exhaust valves operate in guides that are cast integral with the heads.

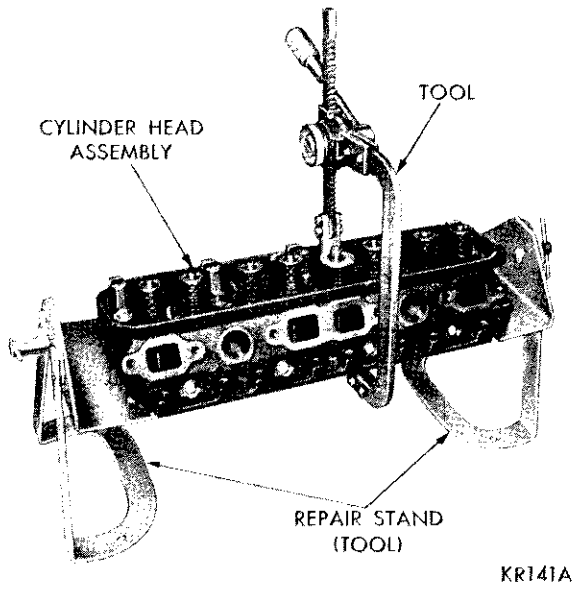


Fig. 8—Compressing Valve Spring

Removal

(1) With cylinder head removed, compress valve springs, using Tool C-3422A, (Fig. 8).

(2) Remove valve retaining locks, valve spring retainers, valve stem cup seals and valve springs.

(3) Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guide. **Identify valves to insure installation in original location.**

Valve Inspection

(1) Clean valves thoroughly, and discard any burned, warped or cracked valves.

(2) Measure valve stems for wear. Refer to specifications for proper size. If wear exceeds .002 inch, replace the valve.

(3) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

(4) Measure valve stem guide clearance as follows: Install sleeve Tool C-3973 over valve stem (Fig. 9) and install valve.

(5) The special sleeve places the valve at the correct height for measuring with a dial indicator. Attach dial indicator Tool C-3339 to the cylinder head and set it at a right angle to the valve stem being measured (Fig. 10).

(6) Move valve to and from the indicator. Total dial indicator reading should not exceed .017 inch. If the dial indicator reading is excessive or if the stems are scored or worn excessively, ream the guides for new valves with oversize stems.

(7) Service valves with oversize stems are available in .005, .015 and .030 inch oversizes. Reamers to accommodate the oversize valve stem are as follows:

Reamer Tool Number	Reamer Oversize	Valve Guide Size
C-3433	.005 in.	.379-.380 in.
C-3430	.015 in.	.389-.390 in.
C-3427	.030 in.	.404-.405 in.

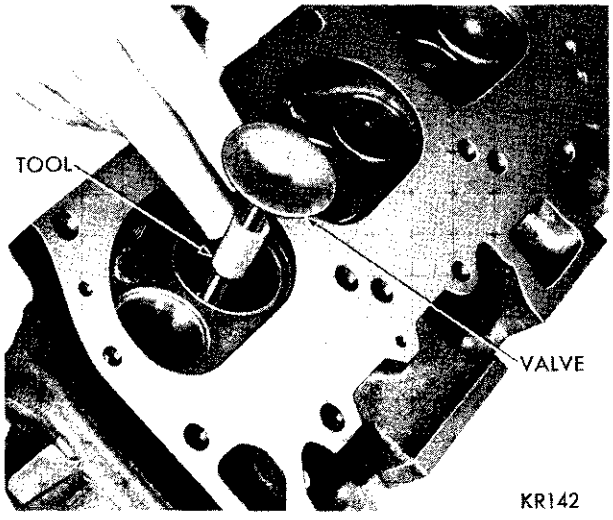


Fig. 9—Installing Valve and Tool C-3973

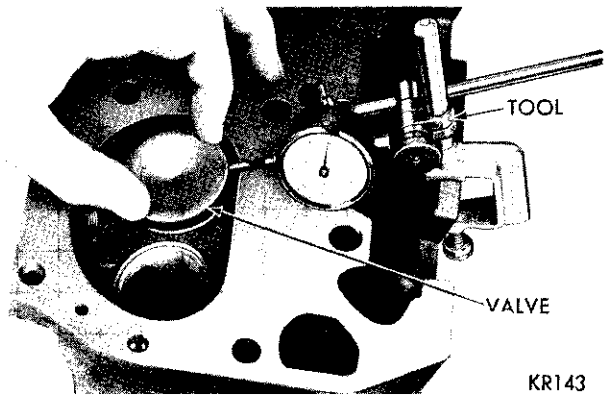


Fig. 10—Measuring Valve Guide Wear

(8) Slowly turn reamer by hand and clean guide thoroughly before installing new valve. **Do not attempt to ream the valve guides from standard directly to .030 inch. Use step procedure of .005, .015 and .030 inch so the valve guides may be reamed true in relation to the valve seat.**

Refacing Valves and Valve Seats

The intake and exhaust valve faces have a 45 degree angle. Always inspect the remaining valve margin after the valves are refaced (Fig. 11). Valves with less than 3/64 inch margin should be discarded.

(1) The angle of both the valve and seat should be identical. When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete valve seat surface must be obtained.

(2) Inspect valve seat with Prussian blue to determine where valve contacts seat. To do this, coat valve seat lightly with Prussian blue, then set valve in place. Rotate valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 30°

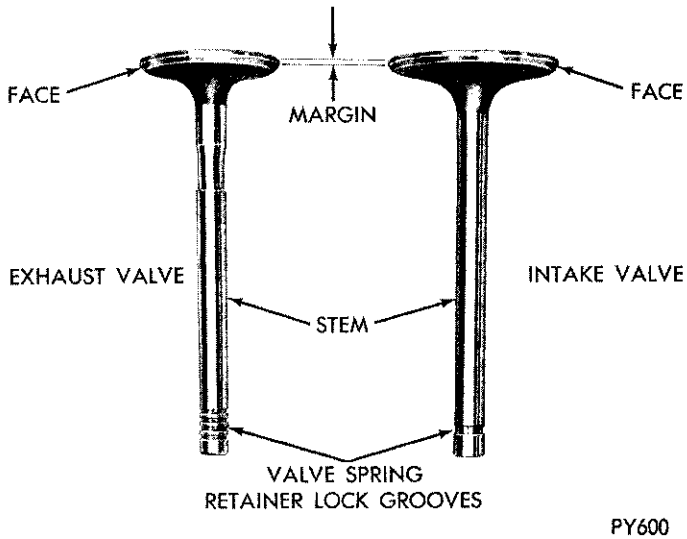


Fig. 11—Intake and Exhaust Valves

stone. If the blue is transferred to the bottom edge of the valve face raise the valve seat with a 60° stone.

(3) When the seat is properly positioned the width of the intake seats should be 1/16 to 3/32 inch. The width of the exhaust seats should be 3/64 to 1/16 inch.

(4) Measure the concentricity of the valve seat using dial indicator No. 13725. The total runout should not exceed .003 inch (total indicator reading).

(5) When valves and seats are reground, the position of the valve in the cylinder head is changed, shortening the operating length of the hydraulic tappet. This means that the plunger is operating closer to its "bottomed" position, and less clearance is available for thermal expansion of the valve mechanism during high speed driving.

(6) The design of the valve mechanism includes a safety factor to allow for a limited amount of wear, and the refacing of the valves and seats.

(7) To insure that limits have not been exceeded, the dimension from valve spring seat in the head to the valve tip should be measured with gauge, Tool C-3648 (Fig. 12).

(8) The end of the cylindrical gauge and the bottom of slotted area represent the maximum and minimum allowable extension of the valve stem tip beyond the spring seat.

(9) If the tip exceeds the maximum, grind stem tip to within gauge limits. Clean tappets if tip grinding is required.

Testing the Valve Springs (Fig. 13)

(1) Whenever valves are removed for inspection, reconditioning or replacement, the valve springs should be tested. As an example, the compressed length of the spring to be tested is 1-15/32 inches. Turn the table of Tool C-647 until the surface is in line with the 1-15/32 inch mark on the threaded stud and the zero mark to the front. Place the spring over the stud on the table and lift the compressing lever to set the tone device. Pull on the torque wrench until a ping is heard. Take the reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at the test length. Fractional measurements are indicated on the table for finer adjustments. Refer to specifications to obtain specified height and allowable tension. Discard the springs that do not meet specifications.

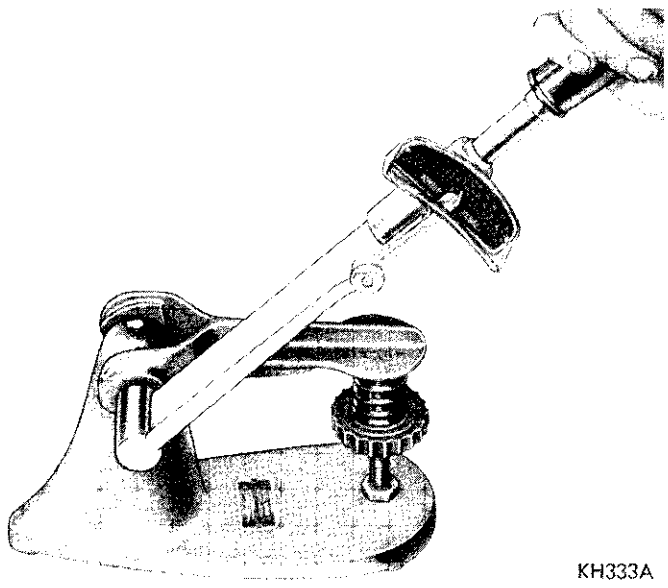

KH333A

Fig. 13—Testing Valve Springs

(2) Inspect each valve spring for squareness at both ends with a steel square and surface plate (Fig. 14).

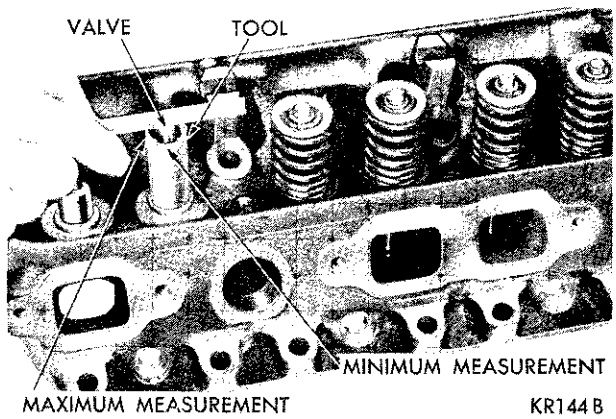
(3) If the spring is more than 1/16 inch out of square, install a new spring.

Installation

(1) Coat valve stems with lubricating oil and insert them in position in cylinder head.

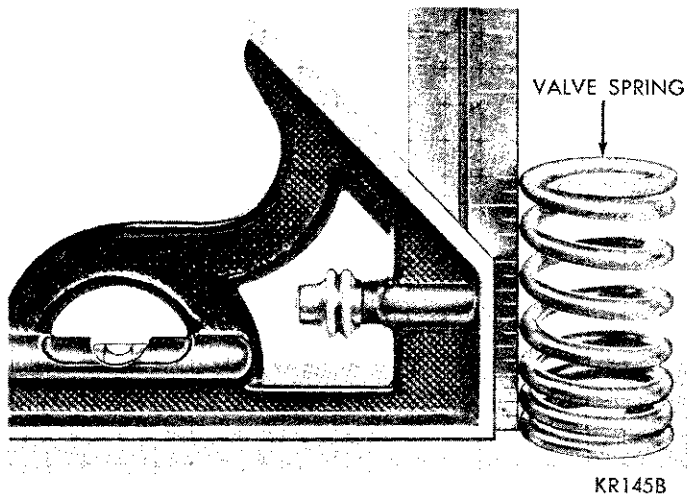
(2) Install new cup seals on the intake and exhaust valve stems and over valve guides (Fig. 15 and 16) and install valve springs and retainers.

(3) Compress valve springs with Tool C-3422A. Install locks and release tool. **If valves and/or seats are reground, measure installed height of the springs.**



KR144B

Fig. 12—Measuring Valve Stem Length



KR145B

Fig. 14—Inspecting Valve Spring Squareness

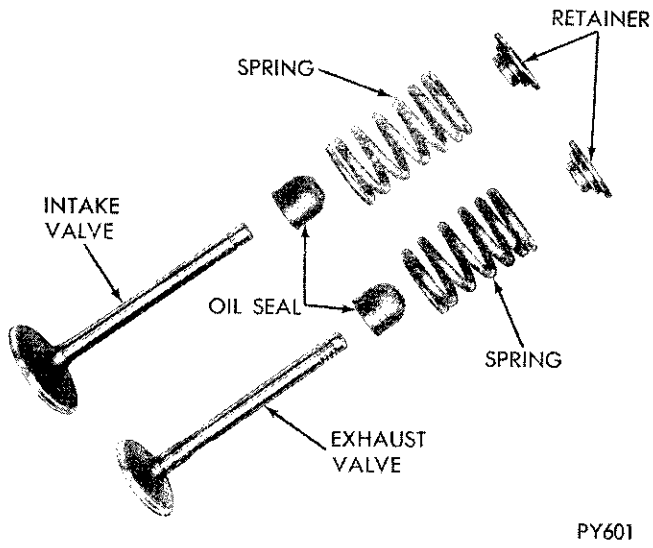


Fig. 15—Valve Assembly (Disassembled View)

Make sure measurement is taken from the bottom of spring seat in cylinder head to bottom surface of spring retainer. If the height is greater than 1-57/64 inches, install a 1/16 inch spacer in the head counterbore to bring the spring height back to normal 1-53/64 to 1-57/64 inch. (If spacers are installed, measure from the top of the spacer.)

HYDRAULIC TAPPETS

Preliminary to Checking the Hydraulic Tappets

(1) Before disassembling any part of the engine to correct tappet noise, read the oil pressure at the gauge (Install a reliable gauge at pressure sending unit if vehicle has no oil pressure gauge.) and check the oil level in the oil pan. The pressure should be between 45 and 65 pounds at 1000 R.P.M.

(2) The oil level in the pan should never be above the "full" mark on dipstick, or below the "add oil" mark. Either of these two conditions could be responsible for noisy tappets.

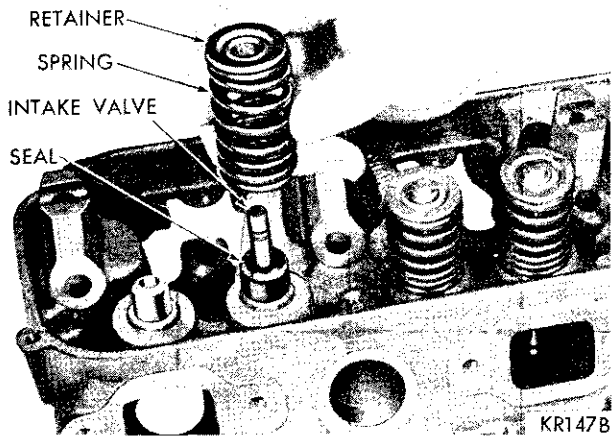


Fig. 16—Installing Valve, Spring, Cup Seal and Retainer

Oil Level Too High

(3) If oil level is above the "full" mark on dipstick, it is possible for the connecting rods to dip into the oil while engine is running and create foam. Foam in oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

Oil Level Too Low

(4) Low oil level may allow oil pump to take in air which, when fed to the tappets, causes them to lose length and allows valves to seat noisily. Any leaks on intake side of pump through which air can be drawn will create the same tappet action. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, engine should be operated at fast idle for sufficient time to allow all of the air inside of the tappets to be bled out.

Tappet Noise Diagnosis

(1) To determine source of tappet noise, operate engine at idle with cylinder head covers removed.

(2) Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation. **Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.**

(3) Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leakdown around the unit plunger which will necessitate replacing the tappet, or by the plunger partially sticking in the tappet body cylinder. A heavy click is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between the plunger and the tappet body, causing the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.

Tappet Removal

(1) The tappet can be removed without removing intake manifold or cylinder heads by following this recommended procedure: Remove cylinder head covers.

(2) Remove rocker arms and shaft assembly.

(3) Remove push rods and **identify to insure installation in original location.**

(4) Slide a magnetic pickup tool through push rod opening in cylinder head and seat tool firmly in the head of tappet.

(5) Pull tappet out of bore with a twisting motion. If all tappets are to be removed, **identify tappets to insure installation in original location.**

A diamond shaped marking stamped on the engine numbering pad indicates that some tappet bodies are .008 inch oversize.

CAUTION: The plunger and tappet bodies are not interchangeable. The plunger and valve must always be fitted to the original body. It is advisable to work on one tappet at a time to avoid mixing of parts. Mixed parts are not compatible. Do not disassemble a tappet on a dirty work bench.

Disassembly (Fig. 17)

(1) Pry out plunger retainer spring clip.

(2) Clean varnish deposits from inside of tappet body above plunger cap.

(3) Invert tappet body and remove plunger cap, plunger, flat check valve, check valve spring, check valve retainer and plunger spring.

Cleaning and Assembly

(1) Clean all tappet parts in a solvent that will remove all varnish and carbon.

(2) Replace tappets that are unfit for further service with new assemblies.

(3) If plunger shows signs of scoring or wear and valve is pitted, or if valve seat on end of plunger indicates any condition that would prevent valve from seating, install a new tappet assembly.

(4) Assemble tappets (Fig. 17).

Testing

(1) Fill a pan with clean kerosene.

(2) Remove cap from plunger and plunger from tappet body.

(3) Fill tappet body with kerosene and install plunger.

(4) Unseat check valve with a brass rod to permit complete installation of plunger. Replace cap.

(5) Hold tappet in an upright position and insert lower jaw of pliers, Tool C-3160, in the groove of tappet body (Fig. 18).

(6) Engage jaw of pliers with top of tappet plunger. Test leakdown by compressing the pliers. If plunger

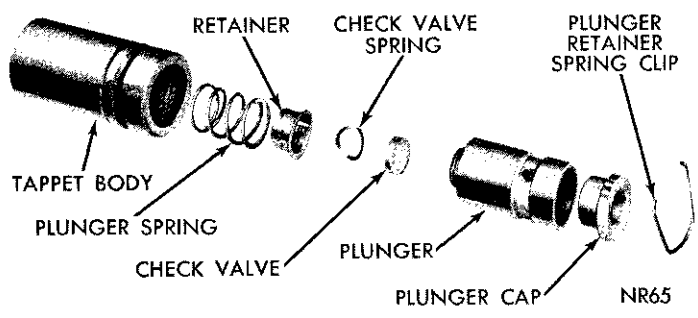


Fig. 17—Hydraulic Tappet Assembly (Disassembled View)

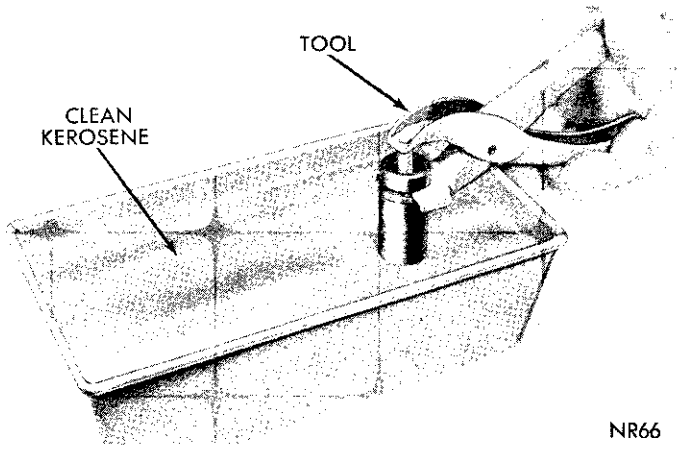


Fig. 18—Testing Tappet Using Tool C-3160

collapses almost instantly as pressure is applied, disassemble tappet, clean and test again (Fig. 18).

(7) If tappet still does not operate satisfactorily after cleaning, install a new tappet assembly. **If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to next oversize.**

Installation

(1) Lubricate tappets.

(2) Install tappets and push rods in their original positions.

(3) Install rocker arm and shaft assembly.

(4) Start and operate engine. Warm up to normal operating temperature.

CAUTION: To prevent damage to valve mechanism, engine must not be run above fast idle until all hydraulic tappets have filled with oil and have become quiet.

VALVE TIMING

(All Models)

(1) Turn crankshaft until NO. 6 exhaust valve is closing and NO. 6 intake valve is opening.

(2) Insert a 1/4 inch spacer between rocker arm pad and stem tip of No. 1 intake valve (second valve on the left bank).

(3) Install a dial indicator so plunger contacts valve spring retainer as nearly perpendicular as possible.

(4) Allow spring load to bleed tappet down giving in effect a solid tappet. Zero the indicator.

(5) Turn the crankshaft clockwise (normal running direction) until intake valve has lifted .025 inch with 256-260° camshaft and .033 inch with 268-284° camshaft. See specifications for engine application. The timing on the timing indicator, located on the chain case cover, should read from 10 degrees BTDC to 2 degrees ATDC. If the reading is not within specified limits: Inspect timing sprocket index marks, inspect timing chain for wear, and determine accuracy of

the DC mark on timing indicator. Turn crankshaft counterclockwise until valve is closed and remove the indicator and spacer.

CAUTION: Do not turn crankshaft any further clockwise, as the valve spring might bottom and result in serious damage.

TIMING CHAIN COVER, OIL SEAL AND CHAIN

Cover Removal

(1) Drain cooling system and remove radiator and water pump assembly.

(2) Remove crankshaft vibration damper attaching bolt.

(3) Remove two of the pulley bolts, install Tool C-3688, and pull damper assembly off end of crankshaft (Fig. 19).

(4) Remove chain cover and gasket. **It is normal to find particles of neoprene collected between seal retainer and crankshaft oil slinger after seal has been in operation.**

(5) Slide crankshaft oil slinger off end of crankshaft.

Measuring Timing Chain for Stretch

(1) Place a scale next to the timing chain so any movement of the chain may be measured.

(2) Place a torque wrench and socket over camshaft sprocket attaching bolt and apply torque in the direction of crankshaft rotation to take up slack; 30 foot-pound (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed). **With torque applied to the camshaft sprocket bolt, crankshaft should not be permitted to move. It may be necessary to block crankshaft to prevent rotation.**

(3) Holding a scale with dimensional reading even with edge of a chain link, apply torque in the reverse direction 30 foot-pounds (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed), and note amount of chain movement (Fig. 20).

(4) Install a new timing chain, if its movement exceeds 3/16 inch.

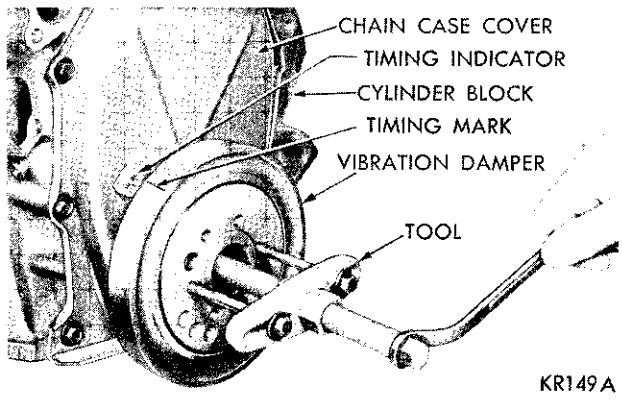


Fig. 19—Removing Vibration Damper Assembly

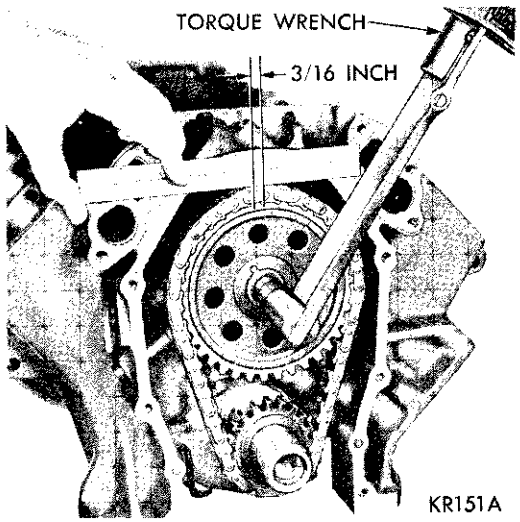


Fig. 20—Measuring Timing Chain Stretch

(5) If chain is satisfactory, slide crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).

(6) If chain is not satisfactory, remove camshaft sprocket attaching bolt and remove timing chain with crankshaft and camshaft sprockets. **When installing timing chain, use Tool C-3509 to prevent camshaft from contacting the welch plug in the rear of engine block. Remove distributor and oil pump-distributor drive gear. Locate tool against rear side of cam gear and attach tool with distributor retainer plate bolt (Fig. 21).**

(7) Place camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft sprocket bores.

(8) Place timing chain around both sprockets.

(9) Turn crankshaft and camshaft to line up with keyway location on crankshaft sprocket and dowel hole in camshaft sprocket.

(10) Lift sprockets and chain (keep sprockets tight against chain in position as described).

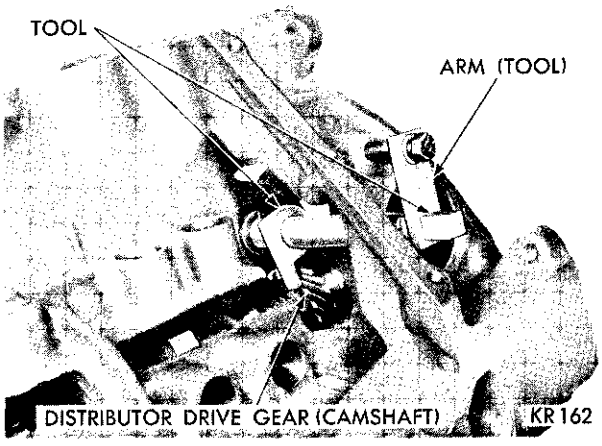


Fig. 21—Camshaft Holding Tool C-3509

Fig. 22—Alignment of Timing Marks

(11) Slide both sprockets evenly over their respective shafts.

(12) Use a straight edge to measure alignment of timing marks (Fig. 22).

(13) Install washer and camshaft sprocket bolt, tighten to 35 foot-pounds. Check to be sure that rear face of aluminum camshaft sprocket is **flush** with end of camshaft. Slide the crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).

Oil Seal Replacement (Cover Removed)

(1) Position remover screw of Tool C-3506 through case cover, inside of case cover up. Position remover blocks directly opposite each other, and force the angular lip between the neoprene and flange of seal retainer.

(2) Place washer and nut on remover screw. Tighten nut, forcing the blocks into the gap to a point

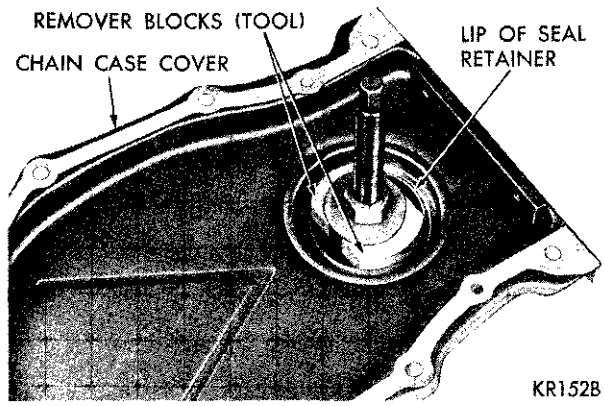


Fig. 23—Remover Blocks Expanded to Puller Position

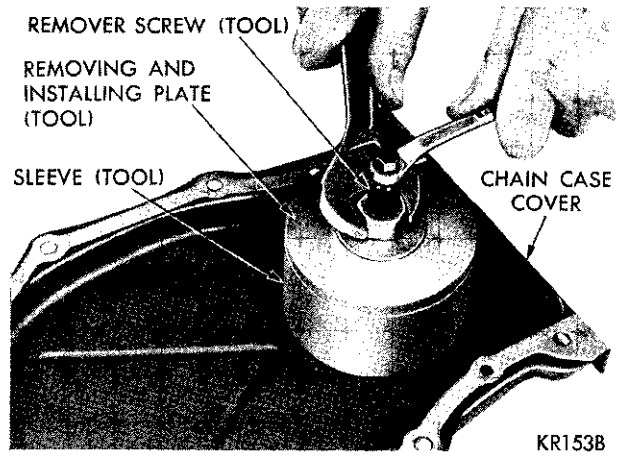


Fig. 24—Removing Oil Seal

of distorting the seal retainer lip (Fig. 23). This is important, **remover is only positioned at this point.**

(3) Place sleeve over retainer and place removing and installing plate into the sleeve.

(4) Place flat washer and nut on the remover screw. Hold center screw and tighten remover nut to remove the seal (Fig. 24).

(5) Insert remover screw through the removing and installing plate so thin shoulder will be facing up.

(6) Insert remover screw with the plate through seal opening (inside of chain case cover facing up).

(7) Place seal in cover opening, with neoprene down. Place seal installing plate into the new seal, with protective recess toward lip of seal retainer (Fig. 25). **The lip of the neoprene seal must be toward source of oil.**

(8) Install flat washer and nut on remover screw, hold screw and tighten nut (Fig. 26).

(9) The seal is properly installed when the neoprene is tight against face of cover. Try to insert a .0015 inch feeler gauge between the neoprene and the cover (Fig. 27). If the seal is installed properly, feeler gauge cannot be inserted. **Do not over compress neoprene.**

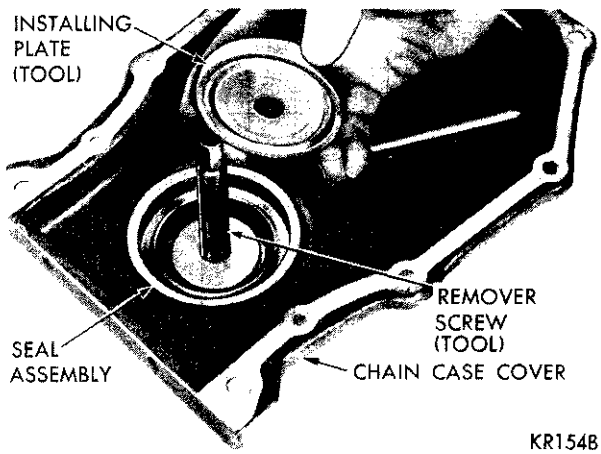


Fig. 25—Positioning Installer Plate

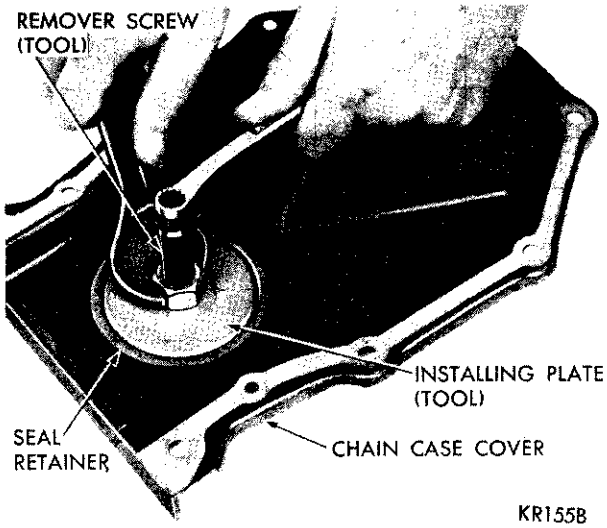


Fig. 26—Installing New Seal

Cover Installation

(1) Be sure mating surfaces of chain case cover and cylinder block are clean and free from burrs.

(2) Using a new gasket slide chain case cover over locating dowels. Install and tighten bolts 15 foot-pounds.

(3) Lubricate seal lip with Lubriplate, place damper hub slot on key in crankshaft, and slide vibration damper on crankshaft.

(4) Place installing tool, part of Tool C-3688 in position and press damper on the crankshaft (Fig. 28).

(5) Install damper retainer washer and bolt. Tighten to 135 foot-pounds.

(6) Slide belt pulley over shaft and attach with bolts and lockwashers. Tighten bolts to 200 inch-pounds.

CAMSHAFT

The camshaft has an integral oil pump and distributor drive gear and fuel pump eccentric (Fig. 29).

The rearward camshaft thrust is taken by the rear face of the aluminum camshaft sprocket hub, bearing directly on the front of cylinder block, eliminating need for a thrust plate. The helix of the oil pump and distributor drive gear and camshaft lobe taper both tend to provide a rearward thrust.

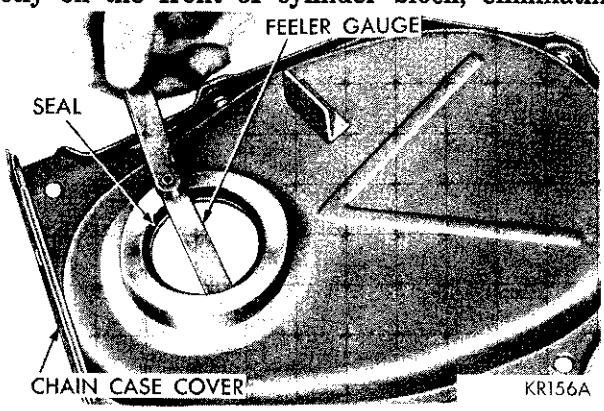


Fig. 27—Inspecting Seal for Proper Seating

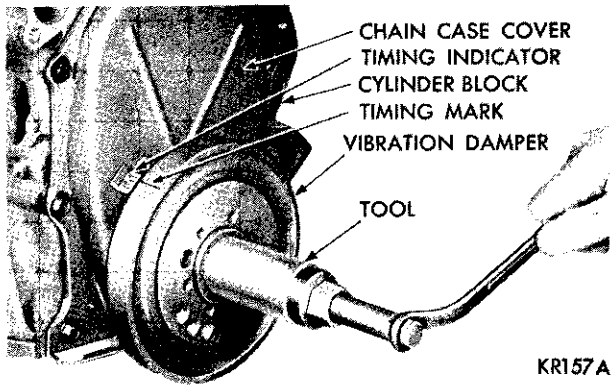


Fig. 28—Installing Vibration Damper Assembly

Removal

(1) With tappets and the timing chain and sprockets removed, remove distributor and lift out oil pump and distributor drive shaft.

(2) Remove fuel pump to allow fuel pump push rod to drop away from cam eccentric.

(3) Remove camshaft, being careful not to damage camshaft bearings with the cam lobes.

Installation

(1) Lubricate camshaft lobes and camshaft bearing journals and insert camshaft to within 2 inches of its final position in cylinder block.

(2) Modify Tool C-3509 by grinding off index lug holding the upper arm on the tool and rotate arm 180 degrees.

(3) Install Tool C-3509 in place of distributor drive gear and shaft, as shown in Figure 21.

(4) Hold tool in position with distributor lock plate screw. This tool will restrict camshaft from being pushed in too far and prevent knocking out the welch plug in the rear of cylinder block. **The tool should remain installed until camshaft and crankshaft sprockets and timing chain have been installed.**

Whenever an engine has been rebuilt and/or a new camshaft and/or tappets are installed, one quart of engine supplement, Chrysler Part Number 1879406 or

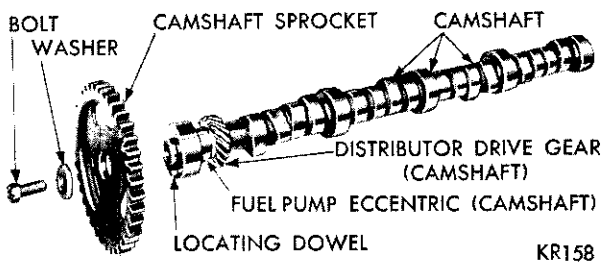


Fig. 29—Camshaft and Sprocket Assembly (Disassembled View)

equivalent should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

Whenever camshaft is replaced, all tappet faces must be inspected for crown with a straight edge. If any contact surface is dished or worn, tappet must be replaced.

CAMSHAFT BEARINGS
(Engine Removed from Vehicle)

Removal

(1) With engine completely disassembled drive out camshaft rear bearing welch plug.

(2) Install proper size adapters and horse shoe washers (part of Tool C-3132A) at the back of each bearing to be removed and drive out bearings (Fig. 30).

Installation

(1) Install new camshaft bearings with Tool C-3132A. Place new camshaft bearing over proper adapter.

(2) Position bearing in the tool. Install the horse shoe lock and by reversing removal procedure, carefully drive bearing into place.

(3) Install remaining bearings in like manner. **Install the NO. 1 camshaft bearing 1/32 inward from the front face of cylinder block.**

The oil holes in camshaft bearings and the cylinder block must be in exact register to insure proper lubrication (Fig. 30).

The camshaft bearing index can be inspected after installation by inserting a pencil flashlight in the bearing. The camshaft bearing oil hole should be perfectly aligned with the drilled oil passage from the main bearing. Other oil holes in the camshaft bearings should be visible by looking down on the left bank oil hole above and between NO. 6 and NO. 8 cylinders to NO. 4 camshaft bearing and on the right bank above and between NO. 5 and 7 cylinders to NO. 4 camshaft bearings. If camshaft bearing oil holes are not in exact register, remove and reinstall them correctly. Install a new welch plug at rear of camshaft. **Be sure this plug does not leak.**

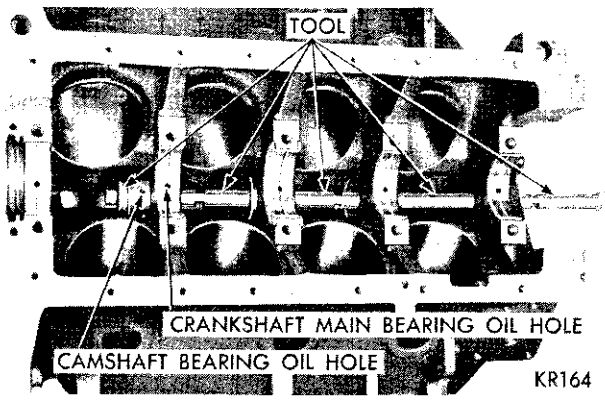


Fig. 30—Removing Camshaft Bearing

DISTRIBUTOR DRIVE SHAFT BUSHING

Removal

(1) Insert Tool C-3052 into the old bushing and thread down until a tight fit is obtained.

(2) Hold remover screw and tighten nut until bushing is removed, (Fig. 31).

Installation

(1) Slide a new bushing over burnishing end of Tool C-3053 and insert tool bushing into the bore.

(2) Drive bushing and tool into position, using a soft hammer, (Fig. 32).

(3) As the burnisher is pulled through the bushing by tightening remover nut, the bushing is expanded tight in the block and burnished to correct size (Fig. 33). **DO NOT REAM THIS BUSHING.**

Distributor Timing

Before installing distributor and oil pump drive shaft, time the engine as follows:

(1) Rotate crankshaft until NO. 1 cylinder is at top dead center on the firing stroke.

(2) When in this position, the straight line on the vibration damper should be under "0" on timing indicator.

(3) Coat shaft and drive gear with engine oil. Install the shaft so that after gear spirals into place, it will index with the oil pump shaft, so slot in top of drive gear will be parallel with center line of crankshaft (Fig. 34).

Installation of Distributor

(1) Hold distributor over mounting pad on cylinder block with vacuum chamber pointing toward center of engine.

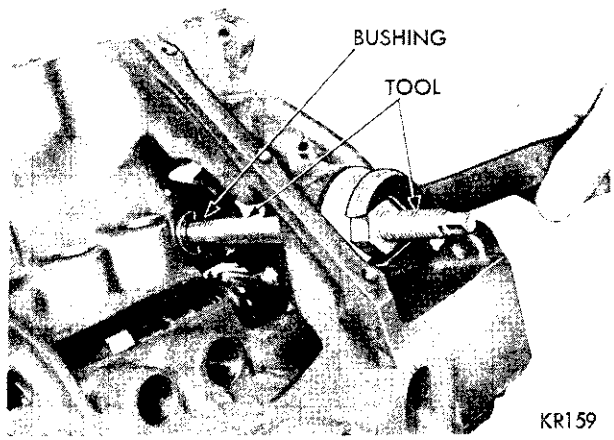


Fig. 31—Removing Distributor Drive Shaft Bushing

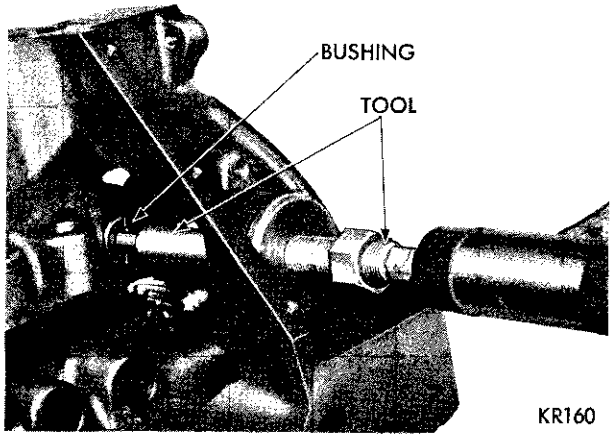


Fig. 32—Installing Distributor Drive Shaft Bushing

(2) Turn rotor until it points forward and to approximate location of No. 1 tower terminal in the distributor cap.

(3) Place distributor gastet in position.

(4) Lower the distributor and engage the shaft in the slot of distributor drive shaft gear.

(5) Turn distributor clockwise until breaker contacts are just separating, install and tighten hold down clamp.

CYLINDER BLOCK

The cylinder block is of the deep block design which eliminates the need for a torque converter housing adapter plate. Its sides extend three inches below the crankshaft center line.

Piston Removal

(1) Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.**

The pistons and connecting rods must be removed from the top of the cylinder block. When removing piston and connecting rod assemblies from the engine, rotate the crankshaft so each connecting rod is centered in cylinder bore.

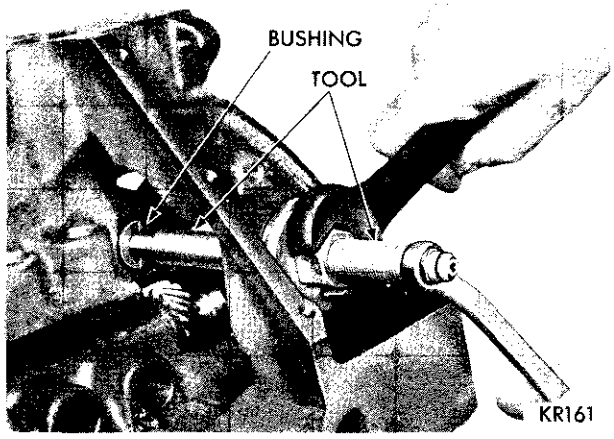


Fig. 33—Burnishing Distributor Drive Shaft Bushing

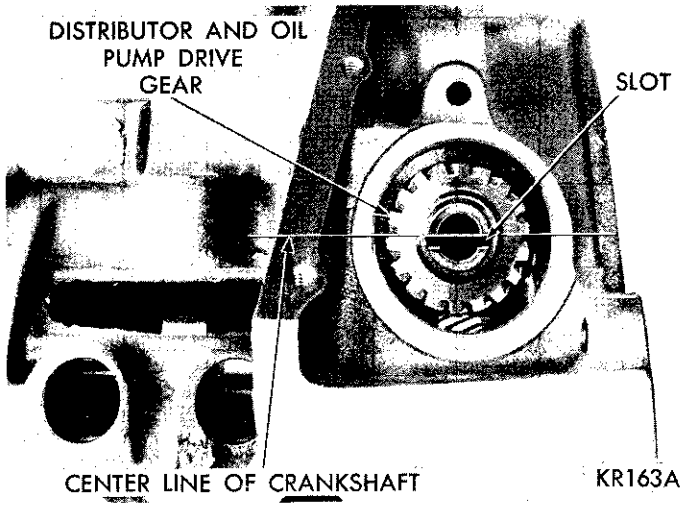


Fig. 34—Distributor Drive Gear Installed

(2) Inspect connecting rods and connecting rod caps for cylinder identification. Identify them if necessary.

(3) Remove connecting rod cap. Install connecting rod bolt guide set on connecting rod bolts. Push each piston and rod assembly out of cylinder bore. **Be careful not to nick crankshaft journals.**

(4) Install bearing caps on mating rods.

Cleaning and Inspection

(1) Clean cylinder block thoroughly and inspect all core hole plugs for evidence of leaking.

(2) If new core plugs are installed, coat edges of plug and core hole with Number 1057794 Sealer or equivalent. Drive the core plug in so that the rim lies at least 1/64″ below the lead-in chamfer.

(3) Examine block for cracks or fractures.

Cylinder Bore Inspection

The cylinder walls should be measured for out-of-round and taper with Tool C-119. If the cylinder bores show more than .005″ out-of-round, or a taper of more than .010″ or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operation should be closely coordinated with the fitting of pistons and rings in order that specified clearance may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep the abrasive materials from entering the crankcase area.

(1) Used carefully, the cylinder bore resizing hone C-823 equipped with 220 grit stones and 390 extensions necessary with 383 and 440 cubic inch engines

is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones (3501-3810) if the cylinder bore is straight and round. 20 to 60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Using honing oil C-3501-3880 or a light honing oil available from major oil distributors. **Do not use engine or transmission oil, mineral oil or kerosene.**

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 60°, cross hatch angle is most satisfactory for proper seating of rings (See Fig. 35).

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives. Wash cylinder block and crankshaft thoroughly.

CAUTION: Be sure all abrasives are removed from the engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and the cloth remains clean. Oil bores after cleaning to prevent rusting.

PISTONS, PINS and RINGS

Pistons

The pistons are cam ground so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. Under operating temperatures, expansion forces the pin bosses away from each other, thus causing the piston to assume a more nearly round shape. It is important that old or new pistons be measured for taper and elliptical shape before they are fitted into the cylinder bore (See Fig. 36).

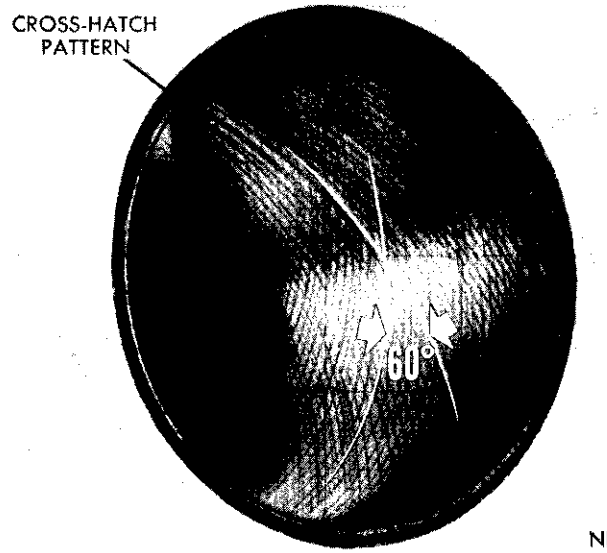


Fig. 35—Cross Hatch Pattern

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize so piston balance can be maintained. For cylinder bores which have been honed or rebored, pistons are available in standard and the following oversizes: .005, .020, and .040 inch.

Fitting Pistons

Piston and cylinder wall must be clean and dry. Specified clearance between the piston and the cylinder wall is .0003 to .0013 inch.

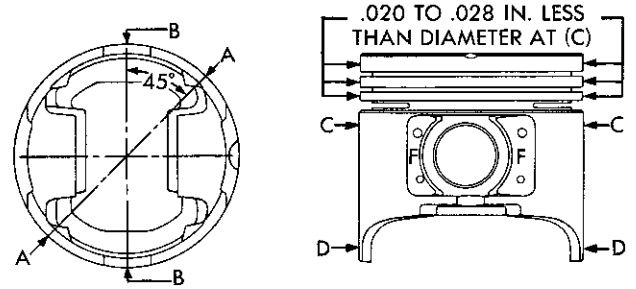
Piston diameter should be measured at the top of skirt 90 degrees to piston pin axis. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line. **Pistons and cylinder bores should be measured at normal room temperature, 70 degrees F.**

All service pistons include pins, and are available in standard and the following oversizes: .005, .020 and .040 inch.

Fitting Rings

(1) Measure piston ring gap about two inches from bottom of cylinder bore in which it is to be fitted. (An inverted piston can be used to push rings down to insure positioning rings squarely in cylinder wall before measuring.)

(2) Insert feeler stock in the gap. Ring gap should be between .013 to .052 inch for the compression rings and .015 to .062 inch for the oil ring steel rails in standard size bores. Maximum gap on .005 inch O/S bores should be .060 inch for compression rings and .070 inch for the oil ring steel rails.



THE ELLIPTICAL SHAPE OF THE PISTON SKIRT SHOULD BE .010 TO .012 IN. LESS AT DIAMETER (A) THAN ACROSS THE THRUST FACES AT DIAMETER (B). MEASUREMENT IS MADE ⅛ IN. BELOW LOWER RING GROOVE

DIAMETERS AT (C) AND (D) CAN BE EQUAL OR DIAMETER AT (D) CAN BE .0015 IN. GREATER THAN (C)

Fig. 36—Piston Measurements

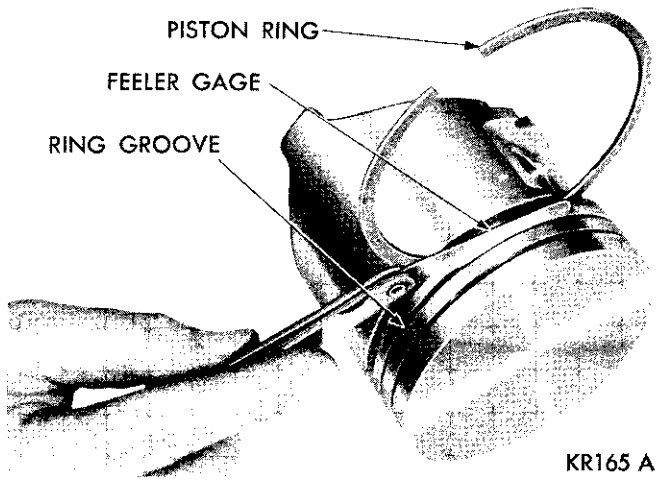


Fig. 37—Measuring Piston Ring Clearance

(3) Measure side clearance between piston ring and ring groove (Fig. 37). Clearance should be .0015 to .003 inches for the top compression ring and intermediate ring. Steel rail service oil ring should be free in groove, but should not exceed .005 inch side clearance.

(4) Install the three piece oil ring in lower ring groove using instructions in ring package.

(5) Install compression rings in middle and top groove as shown on instruction sheet. Be sure the mark "top" on each compression ring faces top of piston.

(6) For the two top rings use ring installer Tool C-3673 for 383 cubic inch engines and Tool C-4001 for the 440 cubic inch engines.

Piston Pin Removal

(1) Arrange Tool C-3684 parts for removal of piston pin, (Fig. 38).

(2) Install pilot on main screw.

(3) Install main screw through piston pin.

(4) Install anvil over threaded end of main screw with small end of anvil against piston boss. **Be sure spring is removed from anvil.**

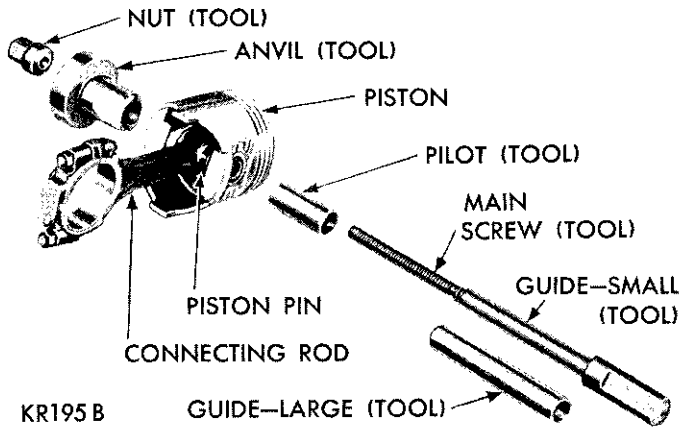


Fig. 38—Tool Arrangement for Removing Piston Pin

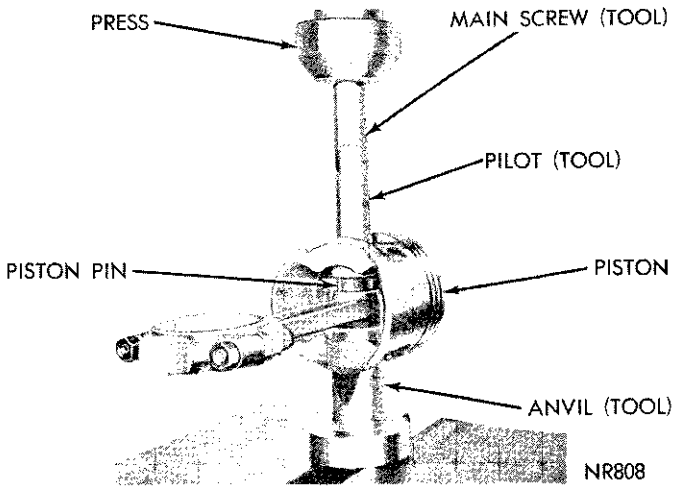


Fig. 39—Removing Piston Pin

(5) Install nut loosely on main screw and place assembly on a press, (Fig. 39).

(6) Press piston pin out of connecting rod. **When pin falls free from connecting rod, stop press to prevent damage to bottom of anvil.**

(7) Remove tool from piston.

Installation

(1) Test piston pin fit in the piston. It should be a sliding fit in the piston at 70 degrees F. Piston pins are supplied in standard sizes only.

(2) Lubricate piston pin holes in the piston and connecting rod.

(3) Arrange Tool C-3684 parts for installation of piston pin (Fig. 40).

(4) Install spring inside the pilot and install spring and pilot in the anvil. Install piston pin over main screw.

(5) Place piston, with "front" up, over the pilot so pilot extends through piston pin hole.

(6) Position connecting rod over the pilot which extends through piston pin hole. **Assemble rods to pistons of the right cylinder bank (2, 4, 6, and 8) with indent on piston head opposite to the larger chamfer**

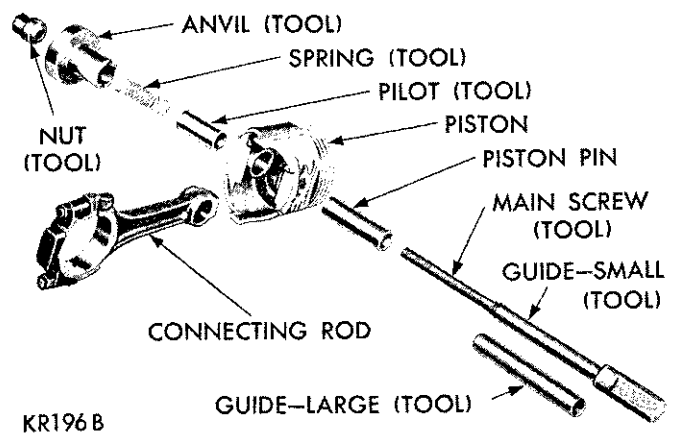


Fig. 40—Tool Arrangement for Installing Piston Pin

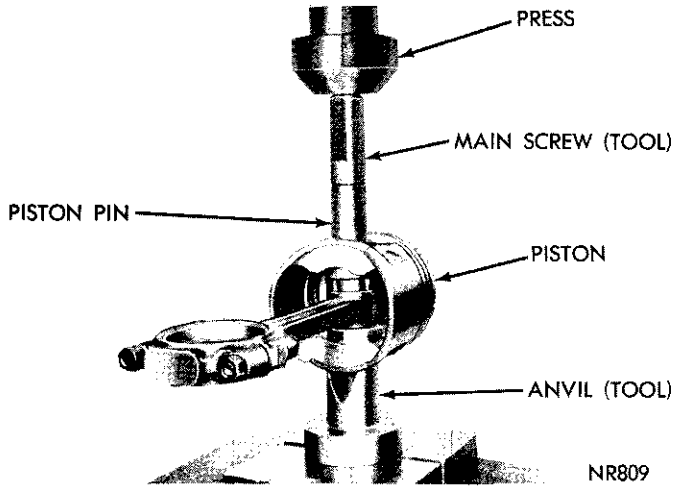


Fig. 41—Installing Piston Pin

on the large bore end of connecting rod. Assemble rods to pistons of the left cylinder bank (1, 3, 5, and 7) with indent on piston head on the same side as the large chamfer on the large bore end of the connecting rod.

(7) Install main screw and piston pin in piston, (Fig. 40).

(8) Install nut on puller screw to hold assembly together. Place assembly on a press (Fig. 41).

(9) Press piston pin in until piston pin "bottoms" on the pilot. This will position pin in connecting rod.

(10) Remove tool and arrange tool parts and piston assembly in same manner (Fig. 38).

(11) Place assembly in a vise (Fig. 42).

(12) Attach torque wrench to nut and tighten up to 15 foot-pounds. If the connecting rod moves downward on piston pin, reject this connecting rod and piston pin combination. Obtain a connecting rod with

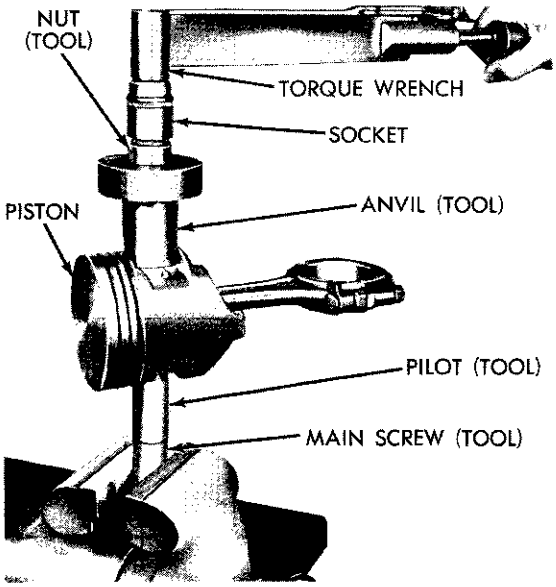


Fig. 42—Testing Fit of Piston Pin in Connecting Rod

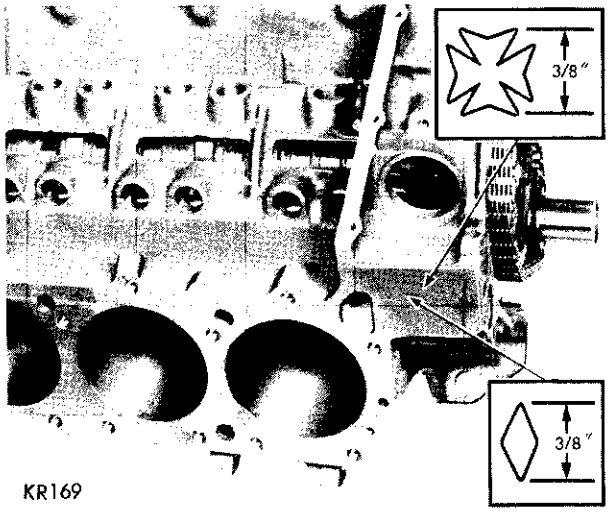


Fig. 43—Showing Location of External Engine Numbering Pad

proper small end bore diameter and repeat the installation and tightening procedure.

(13) If connecting rod does not move under 15 foot-pounds, piston pin and connecting rod interference is satisfactory, remove tool.

CRANKSHAFT IDENTIFICATION

IMPORTANT: A Maltese Cross stamped on the engine numbering pad (Fig. 43) indicates that engine is equipped with a crankshaft which has one or more connecting rods and/or main bearing journals finished .001 inch undersize. The position of the undersize journal or journals is stamped on a machine surface of the NO. 3 counterweight (Fig. 44). A Maltese Cross with an X indicates .010 inch undersize journals.

The connecting rod journals are identified by the letter "R" and main bearing journals by the letter "M." For example "M-1" indicates that NO. 1 main bearing is .001 inch undersize.

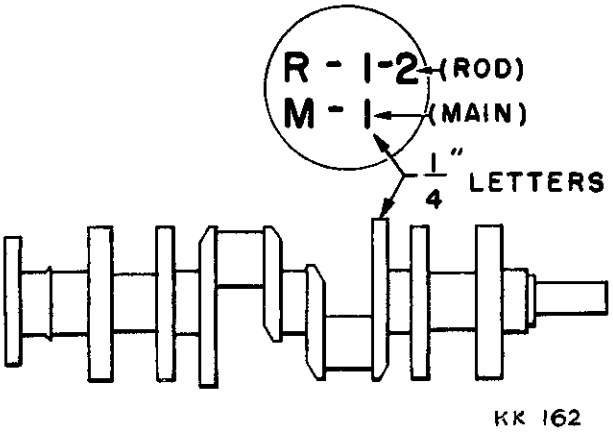


Fig. 44—Showing Location of Internal Marking of Counterweight

CONNECTING RODS

Installation of Connecting Rod Bearings

Fit all rods on one bank until complete. Do not alternate from one bank to another, because when rods are assembled to the piston correctly, they are not interchangeable from one bank to another.

Each bearing cap has a small "V" groove across parting face. When installing the lower bearing shell, make certain "V" groove in shell is in line with "V" groove in cap. This allows lubrication of the cylinder wall. The bearings should always be installed so that the small formed tang fits into the machined grooves of the rods. The end clearance should be from .009 to .017 inch (two rods).

Limits of taper or out-of-round on any crankshaft journals should be held to a maximum of .001 inch. Bearings are available in .001, .002, .003, .010 and .012 inch undersize. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

MEASURING CONNECTING ROD BEARING CLEARANCE

Shim Stock Method

(1) (a) 383 engine with 2-barrel carburetor, place an oiled .001 inch brass shim stock (1/2 inch wide and 3/4 inch long) between the bearing and connecting rod journal.

(b) 383 engine with 4-barrel carburetor and 440 with tri-metal bearings, use an oiled .002 inch brass shim stock (1/2 inch wide and 3/4 inch long) between the bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 foot-pounds.

(3) Turn crankshaft 1/4 turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. 383 engine with 2-barrel carburetor, correct clearance is from .0005 to .0015 inch; 383 with 4-barrel carburetor and 440 with tri-metal bearings, correct clearance is from .001 to .002 inch.

(4) Side play should be from .009 to .017 inch (two rods).

INSTALLING PISTON AND CONNECTING ROD ASSEMBLY IN CYLINDER BLOCK

(1) Before installing pistons, rods, and rod assemblies in the bore, be sure that the compression ring gaps are staggered so that neither are in line with oil ring rail gaps.

(2) The oil ring expander ends should be positioned toward the outside of the "V" of the engine. The oil ring rail gaps should be positioned opposite each other and above the piston pin holes.

(3) Immerse piston head and rings in clean engine oil, slide ring compressor, Tool C-385, over the piston and tighten with special wrench (part of Tool C-385). **Be sure position of rings does not change during this operation.**

(4) Install connecting rod bolt protectors on rod bolts, the long protector should be installed on the numbered side of the connecting rod.

(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal (Fig. 45).

(6) Tap piston down in cylinder bore, using handle of a hammer. At the same time, guide connecting rod into position on crankpin journal.

(7) The notch or groove on top of piston must be pointing toward front of engine and larger chamfer of connecting rod bore must be installed toward crank pin journal fillet.

(8) Install rod caps, tighten nuts to 45 foot-pounds.

CRANKSHAFT MAIN JOURNALS

Crankshaft main bearing journals should be inspected for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. DO NOT grind the thrust faces of the NO. 3 main bearing. Do not nick crankpin or main bearing fillets. After regrinding, remove rough edges from crankshaft oil holes and clean out all oil passages.

CRANKSHAFT MAIN BEARINGS

New lower main bearings halves Numbers 1, 2, 4 5 are interchangeable (Fig. 46). New upper main bearing halves Number 2, 4 and 5 are also interchangeable. Upper and lower bearing halves are not interchangeable because upper bearing is grooved and lower bearing is not.

The NO. 1 upper main bearing IS NOT INTER-

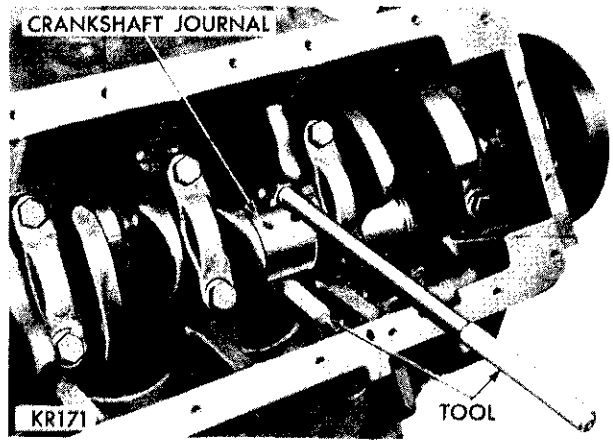


Fig. 45—Installing Connecting Rod

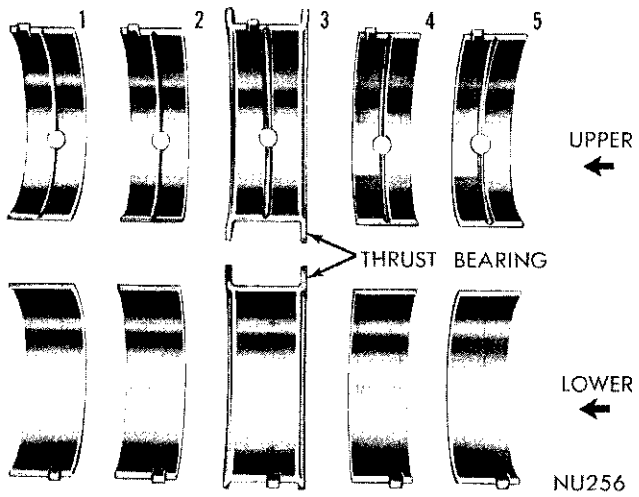


Fig. 46—Main Bearing Identification

CHANGEABLE AND IS CHAMFERED on the tab side for timing chain oiling and can be identified by a red marking on edge of bearing.

Upper and lower NO. 3 bearings are flanged to carry the crankshaft thrust loads and are **not interchangeable** with any other bearings in the engine. **Bearings that are not badly worn or pitted must be reinstalled in the same position.**

Bearing caps are not interchangeable and should be marked at removal to insure correct assembly. Bearings are available in standard and the following undersizes: .001, .002, .003, .010, .011 and .012 inch. Do not install an undersize bearing that will reduce clearance below specifications.

Removal

(1) Remove oil pan and identify bearing caps before removal.

(2) Remove bearing caps one at a time. Remove upper half of bearing by inserting Tool C-3059 (Fig. 47) into oil hole of crankshaft.

(3) Slowly rotate crankshaft clockwise, forcing out upper half of bearing.

Installation

Only one main bearing should be selectively fitted while all other main bearing caps are properly torqued.

When installing a new upper bearing shell, slightly chamfer the sharp edges from the plain side.

(1) Start bearing in place, and insert Tool C-3059 into oil hole of crankshaft (Fig. 47).

(2) Slowly rotate crankshaft counter-clockwise sliding the bearing into position. Remove Tool C-3059.

MEASURING MAIN BEARING CLEARANCE

Shim Stock Method

(1) Smooth edges of a 1/2 x 3/4 inch piece of brass shim stock, .001 inch thickness.

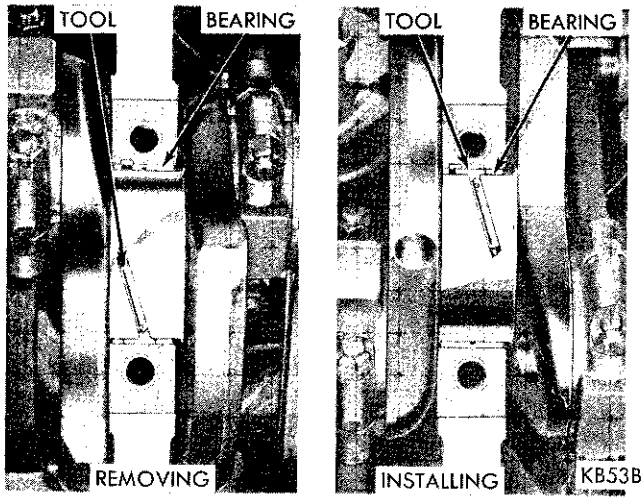


Fig. 47—Removing or Installing Upper Main Bearing

(2) Install bearing in center main bearing cap, bearing tang in groove in cap, lubricate bearing and position shim stock across the bearing, install cap, tighten bolts to 85 foot-pounds.

(3) If a slight drag is felt as crankshaft is turned (moved no more than 1/4 turn in either direction), clearance is .001 inch or less and is considered satisfactory.

If, however, no drag is felt, the bearing is too large or crankshaft cannot be rotated, bearing is too small and should be replaced with the correct size.

(4) Measure crankshaft end play .002 to .007 inch. If end play is less than .002 inch or more than .007 inch, install a new number 3 main bearing.

(5) Fit remaining bearings in same manner.

It is permissable to use one .001 inch undersize bearing shell with one standard bearing shell or one .002 inch undersize bearing shell with one .001 inch undersize shell. **Always use the smaller diameter bearing half as the upper. Never use an upper bearing half more than .001 inch smaller than the lower**

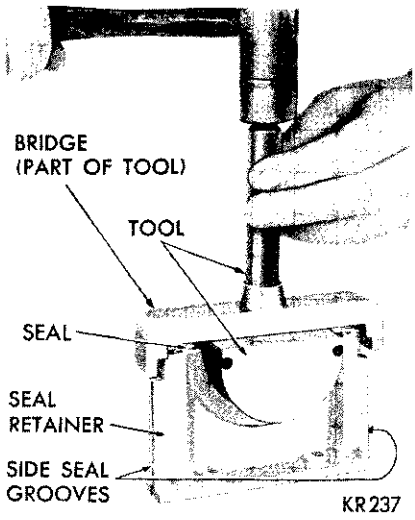


Fig. 48—Installing Rear Main Bearing Lower Oil Seal

bearing half and never use a new bearing half with a used bearing half.

REAR MAIN BEARING OIL SEAL *(Crankshaft Removed)*

Upper Rear Main Seal Installation

(1) Install a new rear main bearing oil seal in cylinder block so that both ends protrude.

(2) Tap seal down into position, using Tool C-3625 for 383 Cubic Inch Engines or Tool C-3743 for 440 Cubic Inch Engines, with bridge removed until tool is seated in bearing bore.

(3) Hold the tool in this position and cut off portion of seal that extends above the block on both sides.

Lower Rear Main Seal Installation

(1) Install a new seal in seal retainer so ends protrude (Fig. 48).

(2) Install bridge on tool and tap the seal down into position with Tool C-3625 for 383 Cubic Inch Engines or Tool C-3743 for 440 Cubic Inch Engines until tool is seated.

(3) Trim off that portion of the seal that protrudes above the cap (Fig. 49).

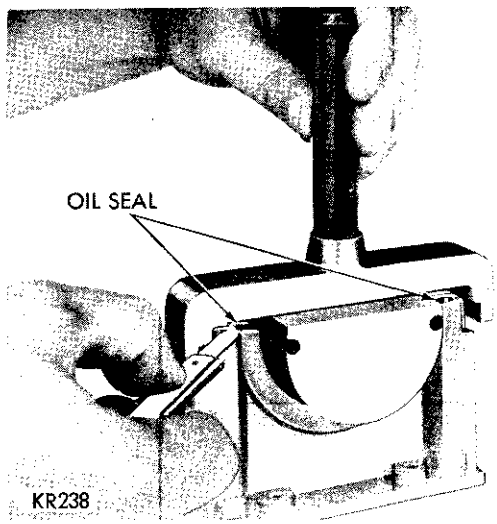


Fig. 49—Trimming Rear Main Bearing Lower Oil Seal

Side Seals Installation

Perform the following operations as rapidly as possible. These side seals are made from a material that expands quickly when oiled.

(1) Apply mineral spirits or diesel fuel to the side seals.

(2) Install seals immediately in the seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds.

Failure to pre-oil the seals will result in an oil leak.

ENGINE OILING SYSTEM (Fig. 50)

OIL PAN

Removal

(1) Disconnect battery cable and remove dipstick.

(2) Raise vehicle on a hoist and disconnect steering linkage from idler arm and steering arm.

(3) Disconnect exhaust pipe branches from right and left manifolds.

(4) Remove clamp attaching exhaust pipe to extension and remove exhaust pipe.

(5) Drain crankcase oil.

(6) Remove converter dust shield.

(7) Remove oil pan bolts. Turn flywheel until counterweight and connecting rods at front end of crankshaft are at their highest position to provide clearance, and lower the pan. Turn pan counterclockwise to clear oil screen and suction pipe as it is lowered.

Installation

(1) Inspect alignment of oil strainer. The bottom of the strainer must be on a horizontal plane with machined surface of cylinder block. The bottom of the strainer must touch the bottom of oil pan.

(2) Install oil pan.

(3) Install converter dust shield.

(4) Connect exhaust pipe branches to the manifolds and to the exhaust extension.

(5) Connect steering linkage at idler arm and at pitman arm.

(6) Connect battery cable, install dipstick.

(7) Install drain plug and refill crankcase with the proper grade and quantity of oil.

OIL PUMP

Removal

Remove oil pump attaching bolts and remove pump and filter assembly from bottom side of engine.

Disassembly

(1) Remove filter base and oil seal ring.

(2) Remove pump rotor and shaft and lift out outer pump rotor.

(3) Remove the oil pressure relief valve plug and lift out the spring and relief valve plunger (Fig. 51).

Inspection and Assembly

(1) Clean all parts thoroughly. The mating face of filter base (oil pump cover) should be smooth. Replace filter base if it is scratched or grooved.

(2) Lay a straightedge across oil pump filter base surface (Fig. 52). If a .0015 inch feeler gauge can be

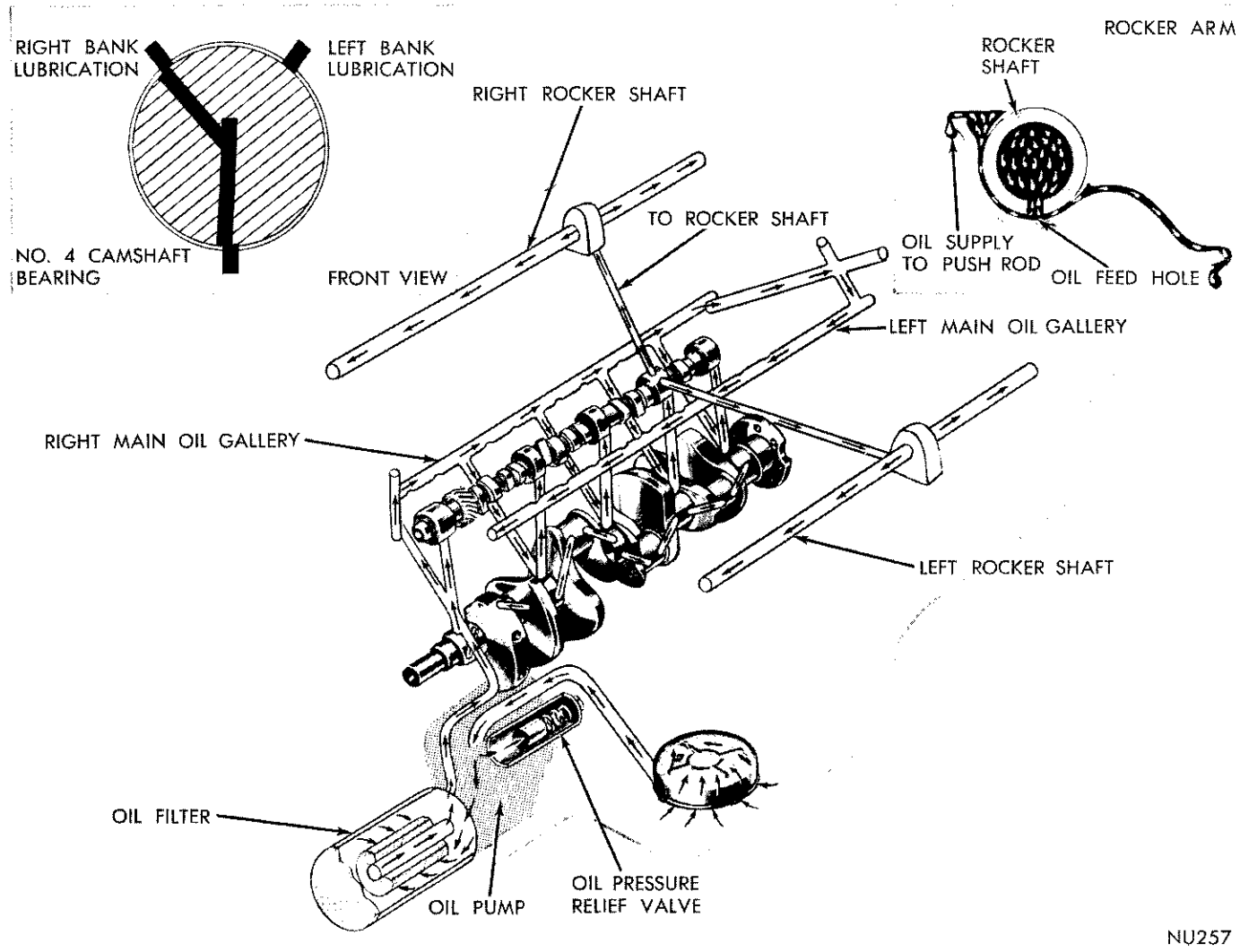


Fig. 50—Engine Oiling System

inserted between the base and straightedge, filter base should be replaced.

(3) If outer rotor length measures less than .943 inch (Fig. 53) and diameter less than 2.469 inches, replace outer rotor.

(4) If inner rotor length measures less than .942 inch (Fig. 54), a new inner rotor should be installed.

(5) Install outer rotor into pump body, pressing to one side with fingers and measure clearance between outer rotor and pump body (Fig. 55). If measurement

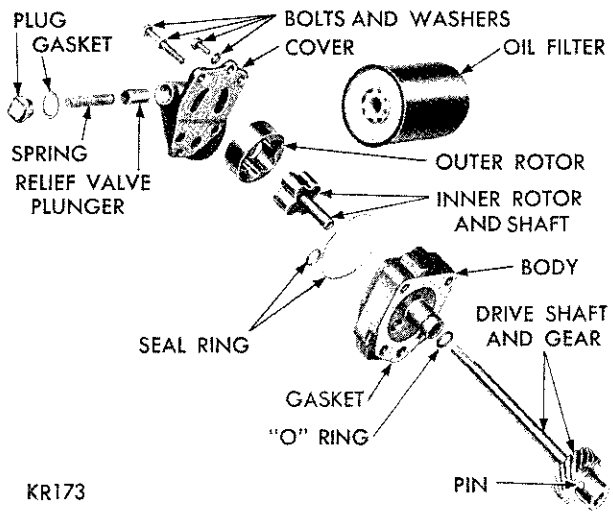


Fig. 51—Oil Pump and Filter Assembly (Disassembled View)

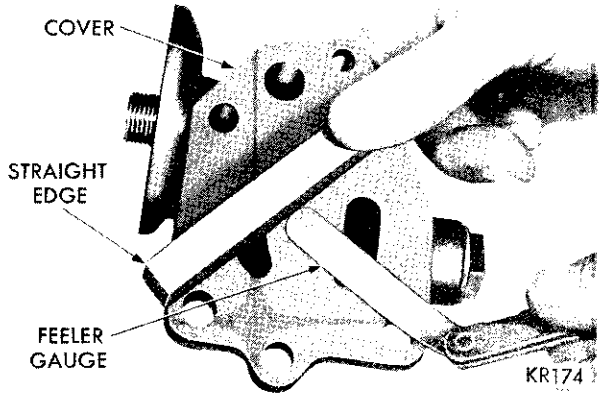


Fig. 52—Measuring Oil Pump Cover Flatness

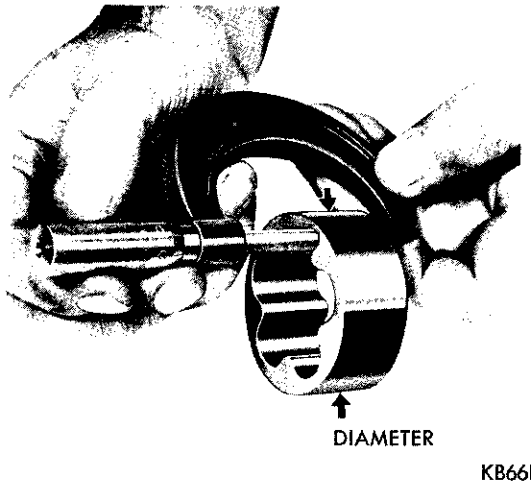


Fig. 53—Measuring Outer Rotor Thickness

is more than .014 inch, replace oil pump body.

(6) Install inner rotor into pump body and place a straightedge across the face between bolt holes (Fig. 56). If a feeler gauge of more than .004 inch can be inserted between the rotors and straightedge, replace pump body.

(7) If the tip clearance between inner and outer rotors (Fig. 57) is more than .010 inch, replace inner and outer rotor.

Servicing Oil Pressure Relief Valve

Inspect oil pump relief valve plunger for scoring and free operation in its bore. Small scores may be removed with 400 grit wet or dry paper providing extreme care is used not to round off the sharp edge portion of the valve.

The relief valve spring has a free length of 2-9/32 to 2-19/64 inch and should test 14.85 to 15.85 lbs. when compressed to 1-19/32 inch. Discard spring that fails to meet specifications.

If the oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure. **When assembling the oil pump, be sure to use new oil seal rings between filter base and pump body.**

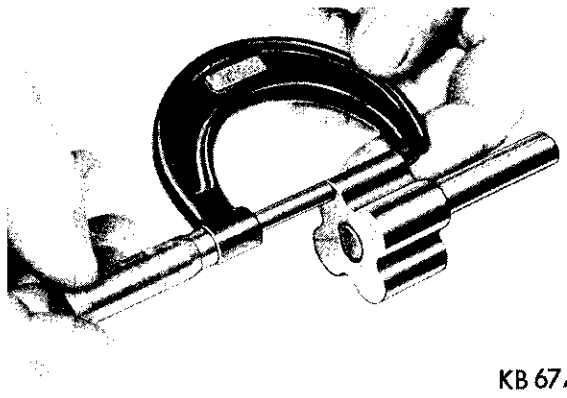


Fig. 54—Measuring Inner Rotor Thickness

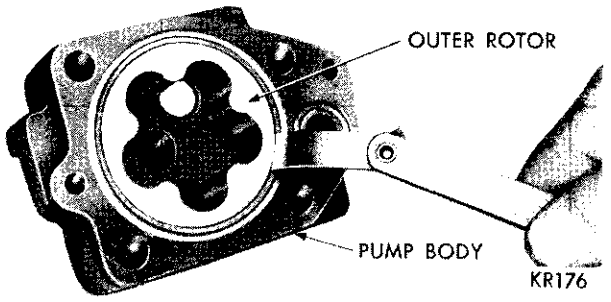


Fig. 55—Measuring Outer Rotor Clearance

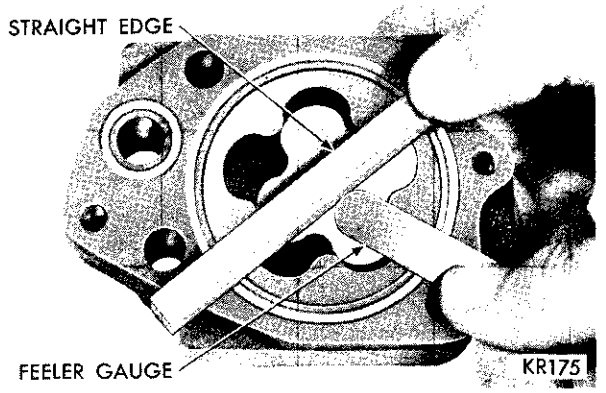


Fig. 56—Measuring Clearance Over Rotors

Installation

(1) Install a new "O" ring seal on the pilot of oil pump before attaching oil pump to cylinder block.

(2) Install oil pump on engine, using a new gasket on engine and tighten attaching bolts to 30 foot-pounds. Install oil filter element.

OIL FILTER REPLACEMENT

The "spin on" oil filter should be replaced preferably to coincide with every second oil change.

Removal

Use care so as not to damage transmission oil cooler lines.

(1) Using Tool C-4065 unscrew the filter from the base on bottom side of engine and discard (Fig. 58).

(2) Wipe base clean.

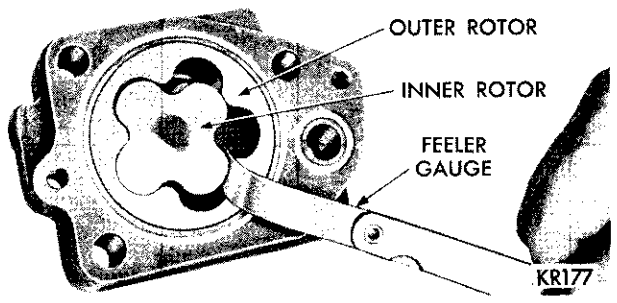


Fig. 57—Measuring Clearance Between Rotors

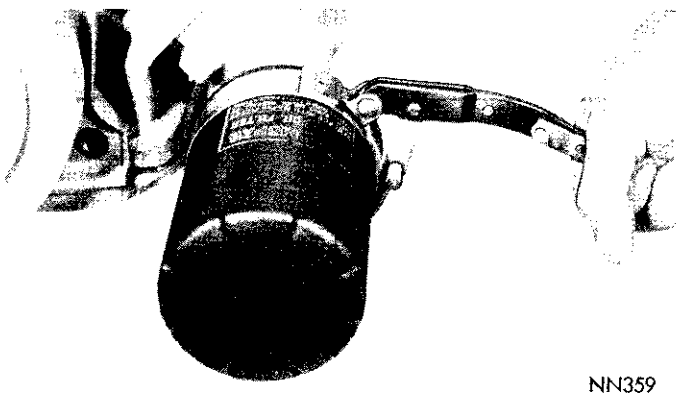


Fig. 58—Removing Oil Filter

Installation

(1) Install the "spin" oil filter by hand, finger tight. Do not use tool.

(2) To obtain an effective seal, tighten filters by hand the additional number of turns indicated on the replacement filter. Start engine and inspect for leaks.

CRANKCASE VENTILATION SYSTEM

(1) A fully closed crankcase ventilation system is installed on all vehicles. The fully closed ventilation system operates by air drawn into the crankcase from the air cleaner and through the crankcase inlet air cleaner by means of a hose (Fig. 1).

Air is circulated through the engine and drawn out of the cylinder head cover by manifold vacuum into the combustion chambers and dispelled with the exhaust gases.

The system consists of a ventilation valve installed in the outlet vent of the cylinder head cover, and a hose. The hose is connected between the outlet vent and the lower part of the carburetor body. The function of the valve is to regulate the flow of crankcase ventilation at various throttle positions and will operate effectively as long as normal maintenance is applied.

The valve and hose are subject to fouling with sludge and carbon formation due to the nature of the material carried by the ventilation system.

A plugged vent system may in turn cause excessive engine crankcase sludge formation and may also cause rough and erratic engine idle or excessive oil

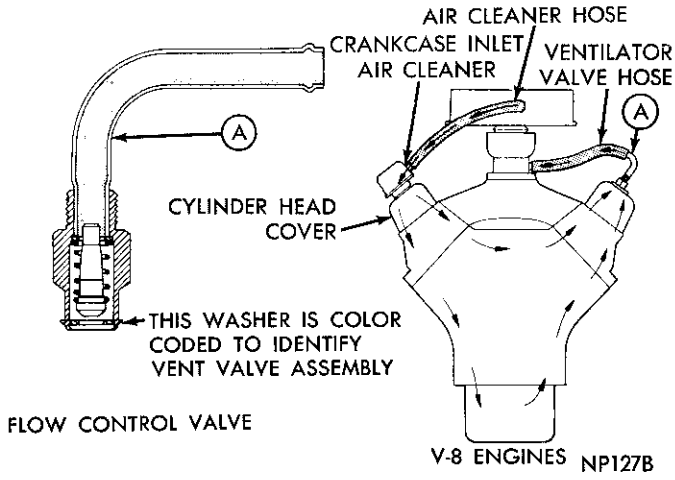


Fig. 1—Fully Closed Ventilation System

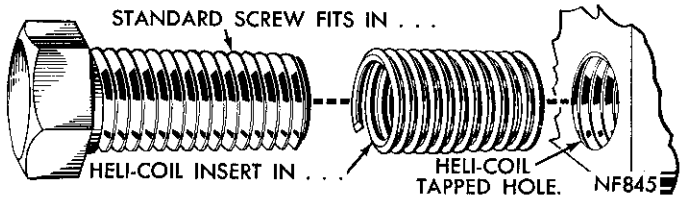


Fig. 2—Heli-Coil Installation

leakage. The ventilation system should be cleaned every six months and valve replaced every year in average service and more frequently if the vehicle is used extensively for short trips—driving less than 10 miles—with frequent idling, such as city traffic.

See the "Lubrication and Maintenance" section, Group 0 of this manual for proper service procedures.

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tape, and installing a Heli-Coil Insert into the tapped holes. This brings the hole back to its original thread size (See Fig. 2).

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for the repair of damaged or worn thread. Heli-Coil tools and inserts are readily available from automotive parts jobbers.

Heli-Coil Insert			Drill	Tap	Inserting Tool	Extracting Tool
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
1/2-20	1185-4	3/8″	17/64(.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32″	Q(.332)	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16″	X(.397)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32″	29/64(.453)	7 CPB	528-7N	1227-16
1/2-13	1185-8	3/4″	33/64(.516)	8 CPB	528-8N	1227-16

SPECIFICATIONS

ENGINE	
Type	90°V
Number of Cylinders	8
Bore	
383 Cubic Inch	4.25 inch
440 Cubic Inch	4.320 inch
Stroke	
383 Cubic Inch	3.375 inch
440 Cubic Inch	3.750 inch
Minimum Compression with Engine Warm, Spark Plugs Removed, Wide-Open Throttle	100 psi* 110 psi**
Maximum Variation Between Cylinders (any one engine)	40 psi
Firing Order	1-8-4-3-6-5-7-2
Basic Timing.....Manual	TDC±2-1/2°
Automatic 383 and 440 Hi. Perf.	2.5°BTC±2-1/2°
440 Std. Automatic	5°BTC±2-1/2°
CYLINDER NUMBERING (FRONT TO REAR)	
Left Bank	1-3-5-7
Right Bank	2-4-6-8
CYLINDER BLOCK	
Cylinder Bore (Standard)	
383 Cubic Inch	4.2495-4.2515"
440 Cubic Inch	4.320-4.322"
Cylinder Bore out-of-round (Maximum allowable)	.005"
Cylinder Bore Taper (Maximum allowable)	.010"
Reconditioning Working Limits (for taper and out-of-round)	.001"
Maximum Allowable Oversize (cylinder bores)	.040"
Tappet Bore Diameter	.9050-.9058"
Distributor Lower Drive Shaft Bushing (press fit in cylinder block)	.0005-.0040"
Ream to	.4865-.4880"
Shaft to Bushing Clearance	.0007-.0027"
CRANKSHAFT	
Type	Fully Counter-Balanced
Bearings	Steel Backed Babbitt△
Journal Diameter 383 Cubic Inch	2.6245 to 2.6255"
440 Cubic Inch	2.7495 to 2.7505"
Crank Pin Diameter	2.374 to 2.375"
Maximum Out-of-Round Permissible	.001"
Number of Main Bearings	5
Clearance Desired (Bearings Installed I.D. Minus Journal O.D.)	.0005 to .0015"
Maximum Clearance Allowable	.0025"
End Play	.002 to .007"
Thrust Taken by	No. 3 Main Bearing
Finish at Rear Seal Surface	Diagonal Knurling
Interchangeability of Bearings	Upper Nos. 2, 4, 5 Lower Nos. 1, 2, 4, 5
MAIN BEARINGS (Service)	
All available in standard and the following undersizes	.001, .002, .003, .010, .011, .012"
CONNECTING RODS AND BEARINGS	
Type	Drop Forged "I" Beam
Length (Center to Center) 383 Cubic Inch	6.356 to 6.360"
440 Cubic Inch	6.766 to 6.770"
Weight (Less Bearing Shells) 383 Cubic Inch	812 ± 4 GMS.
440 Cubic Inch	846 ± 4 GMS.
Bearings 383 2-BBL.	Steel Backed Babbitt
383 4-BBL., 440 4-BBL.	Tri-Metal Steel Backed
Diameter and Length	2.376 x .927"
Clearance Desired (Bearings Installed I.D. Minus Journal O.D.)	
383 2-BBL.	.0005 to .0015"
383 4-BBL., 440 4-BBL.	.001 to .002"
Maximum Allowable	.0025"

* 383-2BBL. Carb.
**383-440-4BBL. Carb.

△440—#3 Tin Aluminum Alloy Steel Backed

Side Clearance	.009 to .017"
Bearings for Service	Standard .001, .002, .003, .010, .012" Undersize
Piston Pin Bore Diameter	1.0923 to 1.0928"
CAMSHAFT	
Drive	Chain
Bearings	Steel Backed Babbitt
Number	5
Thrust Taken By	Cylinder Block
Clearance Desired (Bearing Installed I.D. Minus Journal O.D.)	.001 to .003"
Maximum Allowable	.005"
CAMSHAFT BEARING JOURNALS	
Diameter	
No. 1	1.998 to 1.999"
No. 2	1.982 to 1.983"
No. 3	1.967 to 1.968"
No. 4	1.951 to 1.952"
No. 5	1.748 to 1.749"
CAMSHAFT BEARINGS	
Diameter (after reaming)	
No. 1	2.000 to 2.001"
No. 2	1.984 to 1.985"
No. 3	1.969 to 1.970"
No. 4	1.953 to 1.954"
No. 5	1.750 to 1.751"

	383 and 440 Cubic Inch	440 Cubic Inch Hi. Perf.
VALVE TIMING		
Intake Opens (BTC)	18°	21°
Intake Closes (ABC)	58°	67°
Exhaust Opens (BBC)	66°	79°
Exhaust Closes (ATC)	14°	25°
Valve Overlap	32°	46°
Intake Valve Duration	256°	268°
Exhaust Valve Duration	260°	284°

TIMING CHAIN	
Adjustment	None
Number of Links	50
Pitch	.50"
Width	.75"
TAPPETS	
Type	Hydraulic
Body Diameter	.9040 to .9045
Clearance in Cylinder Block	.0005 to .0018 inch
Oversize Available for Service	.001, .008, .030 inch
Clearance Between Valve Stem and Rocker Arm Pad (Dry Lash)	.060-.210 inch
PISTONS	
Type	Autothermic w/Steel Struts
Land Clearance (diametrical)	
440 Cubic Inch	.021" to .029"
383 Cubic Inch	.023" to .030"
Clearance at Top of Skirt	.0003" to .0013"
Weight (Standard Through .040" Oversize)	
383 Cubic Inch	770 grms.
440 Cubic Inch	857.5 grms.
Piston Length (Overall)	
383 Cubic Inch	3.874 in.
440 Cubic Inch	3.650 in.
Ring Groove Depth	
No. 1—	
383 Cubic Inch	.220 in.
440 Cubic Inch	.220 in.
No. 2—	
383 Cubic Inch	.220 in.
440 Cubic Inch	.220 in.

No. 3—		
383 Cubic Inch		.208 in.
440 Cubic Inch		.208 in.
Pistons for Service		Standard, .005", .020", .040", Oversize
PISTON PINS		
Type		Press Fit in Rod
Diameter		1.0935 to 1.0937"
Length		3.555 to 3.575"
Clearance in Piston		.00045 to .00075"
Interference in Rod		.0007 to .0012"
Piston Pins for Service		Standard Only
Direction Offset in Piston		Toward Right Side of Engine
PISTON RINGS		
Number of Rings Per Piston		3
Compression		2
Oil		1
Oil Ring Type		3-Piece Chrome-Plated Rails with Stainless Steel Expander-Spacer
Ring Width		
Compression		.0775"-.0780"
Oil—Steel Rails		.025"
Ring Gap		
Compression		.013"-.023"
Oil—Steel Rails		.015"-.055"
Ring Side Clearance		
Compression		.0015"-.0030"
Oil—Steel Rails		.0000"-.005"
Service Rings		
Ring Gap		
Compression		.013"-.023"
Oil—Steel Rails		.015"-.062"
Ring Side Clearance		
Compression		.0015"-.004"
Oil—Steel Rails		.0000"-.005"
Valves—Intake	383-440	440 High Performance
Head Diameter	2.008"	2.008"
Length to (center of valve face)	4.87"	4.87"
Stem Diameter	.3723"-.3730"	.3718"-.3725"
Stem to Guide Clearance	.0010"-.0027"	.0015"-.0032"
Maximum Allowable	.017"*	.017"*
Face Angle	45°	45°
Valve for Service (Oversize Stems Diameter)	Std., .005", .015", .030"	Std., .005", .015", .030"
Lift (Zero Lash)	.425"	.450"
Valves—Exhaust		
Head Diameter	1.75"	1.75"
Length to (center of valve face)	4.87"	4.87"
Stem Diameter		
Hot End	.3713"-.3720"	.3708"-.3715"
Cold End	.3723"-.3730"	.3718"-.3725"
Stem to Guide Clearance		
Hot End	.0020"-.0037"	.0025"-.0042"
Cold End	.0010"-.0027"	.0015"-.0032"
Maximum Allowable	.017"*	.017"*
Face Angle	45°	45°
Valve for Service (Oversize Stem Diameter)	Std., .005", .015", .030"	Std., .005", .015", .030"
Lift (Zero Lash)	.435"	.458"
Valve Springs		
Number	16	16
Free Length	2.58"	2.23"
Load When Compressed to Valve Closed	121-129 @ 1-55/64"	100-110 @ 1-55/64"

*With Tools C-3973 and C-3339 using wobble method.

Valve Open	192-208 @ 1-7/16"	236-256 @ 1-23/64"
Valve Spring I.D.	1.01"-1.03"	1.07"-1.09"
Maximum Allowable Out of Plumb	.060"	.080"
Valve Spring Installed Height (spring seat to retainer)	1-53/64-1-57/64"	1-53/64"-1-57/64"
Use 1/16" spacer to reduce spring height when over specifications		
VALVE GUIDES		
Type		Cast in Head
Guide Bore Diameter		.374-.375" std.
CYLINDER HEAD		
Number Used		2
Combustion Chamber		Wedge Type
Valve Seat Runout (maximum)		.002"
Intake Valve Seat Angle		45°
Intake Seat Width		.060 to .085"
Exhaust Valve Seat Angle		45°
Exhaust Seat Width		.040 to .060"
Cylinder Head Gasket Compressed (thickness)		.021"
ENGINE LUBRICATION		
Pump Type		Rotor Full Pressure
Capacity (qts.)		4 U.S. or 3-1/4 Imperial Quarts*
Pump Drive		Camshaft
Operating Pressure at 1000 R.P.M.		45 to 65 lbs.
Oil Filter Type		Full Flow
Pressure Drop Resulting from Clogged Filter		7 to 9 lbs.
OIL PUMP INSPECTION LIMITS FOR REPLACEMENT		
Oil Pump Cover (filter base)		.0015 inch or more
Outer Rotor Length		.943 inch or less
Outer Rotor Diameter		2.469 inch or less
Inner Rotor Length		.942 inch or less
Clearance Over Rotor—Outer		.004 inch or more
Inner		.004 inch or more
Outer Rotor Clearance		.014 inch or more
Tip Clearance Between Rotors		.010 inch or more

*When filter is replaced, add 1 U.S. Quart or 3/4 of an Imperial Quart.

OVERSIZE AND UNDERSIZE ENGINE COMPONENT MARKINGS

Engine Displacement	Condition	Identification	Location of Identification
383 cu. in. 440 cu. in.	.001" U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating #2 & 3 main bearing journal) and/or R-1-4 etc. (indicating #1 & 4 connecting rod journals)	Top Pad—Front of Engine Crankshaft Counterweight
	.010" U/S Crankshaft	Maltese Cross and X M-10 (indicate .010" U/S all main journals) and/or R-10 (indicates .010" U/S all rod journals)	Top Pad—Front of Engine Crankshaft Counterweight
	.020" O/S Cylinder Bores	A	Top Pad—Front of Engine
	.008" O/S Tappets	Diamond	Top Pad—Front of Engine
	.005" O/S Valve Stems	O.S.	Single Bolt Boss on End of the Head

TIGHTENING REFERENCE

ENGINE

	Foot-Inch Pounds
A/C Compressor to Engine Bolt	30
Alternator Adjusting Strap Mounting Bolt	30
Alternator Adjusting Strap Bolt	200
Alternator Mounting Bolt	30
Camshaft Lock Bolt	35
Carburetor to Manifold Nut	200
Connecting Rod Nut	45
Cylinder Head Bolt	70
Chain Case Cover Bolt	200
Clutch Housing Bolt	30
Crankshaft Rear Bearing Seal Retainer	25
Crankshaft Vibration Damper Bolt	135
Cylinder Head Cover Stud and Nut	40
Distributor Clamp Bolt	200
Exhaust Manifold Nut	30
Exhaust Pipe Flange Nut	50
Exhaust Pipe Clamp Nut	20
Exhaust Pipe Support Clamp Bolt	20
Fan Attaching Bolt	15-18
Fan Belt Idler Pulley Nut	45
Fan Belt Idler Pulley Bracket Bolt	30
Flex Plate to Crankshaft	55
Flex Plate to Converter	270
Flywheel to Crankshaft	55
Fuel Pump Attaching Bolt	30
Intake Manifold Bolt	50
Main Bearing Cap Bolt	85
Oil Pan Drain Plug	20
Oil Pan Screws	200
Oil Pump Cover Bolt	10
Oil Pump Attaching Bolt	30
Rocker Shaft Bracket Bolt	25
Spark Plug	30
Starter Mounting Bolt	50
Transmission Case to Block	30
Vibration Damper Belt Pulley Bolts	200
Valve Tappet Cover End Bolt	9
Water Pump to Housing Bolt	30
Water Pump Housing to Cylinder Block Bolt	30

CLEANER AIR SYSTEM

CONTENTS

CLEANER AIR SYSTEM (CAS)

The Federal government has imposed more stringent exhaust emissions requirements on all U.S. and most imported cars. These new standards require that exhaust emissions from all cars not exceed 2.2 grams of hydrocarbons and 23 grams of carbon monoxide per vehicle mile as measured during a prescribed test. This constitutes about a 33% decrease in exhaust emission levels. The new grams per mile standards take into consideration that total emission levels are a function of vehicle weight.

Several changes have been made to our engines to meet these new standards and maintain or improve vehicle driveability (Fig. 1).

HEATED AIR SYSTEM

All engines have a heated air intake system. This system provides a faster more efficient engine warm up with improved fuel economy and reduced exhaust emissions (Fig. 2).

The HEATED AIR SYSTEM is basically a two air flow circuit system.

(1) When the under hood air temperature is 10° F or lower, the air flow will be through the stove, into a flexible connector, into the adaptor on the bottom of the snorkel and into the air cleaner.

(2) When the under hood air temperature is above 100° F, the air flow will be through the snorkel into the air cleaner.

When the under hood air temperature is between approximately 10° F and 100° F, there will be air flow through both circuits after the engine has been started and the exhaust manifold starts to give off heat. The colder the under hood air the greater the

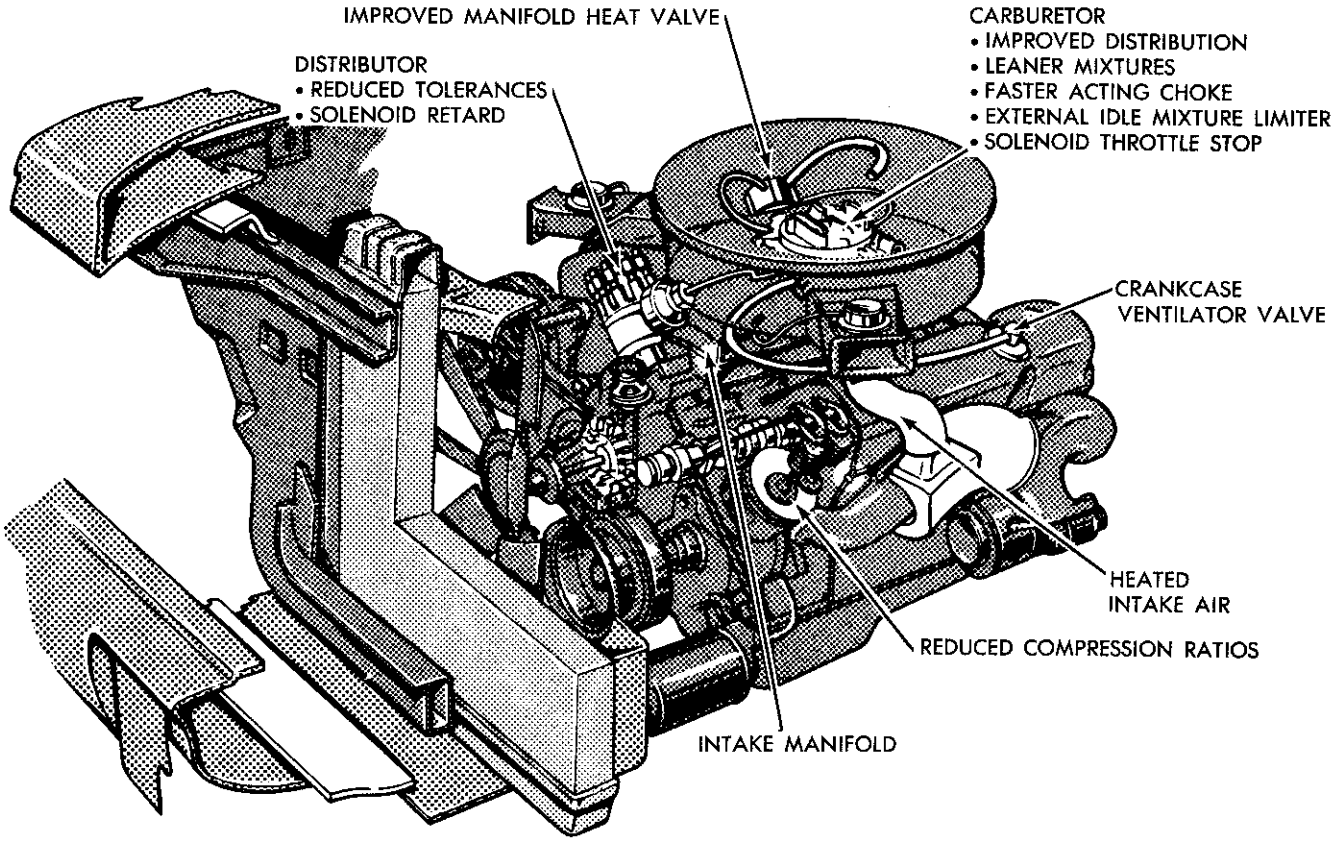


Fig. 1—1970 Cleaner Air System

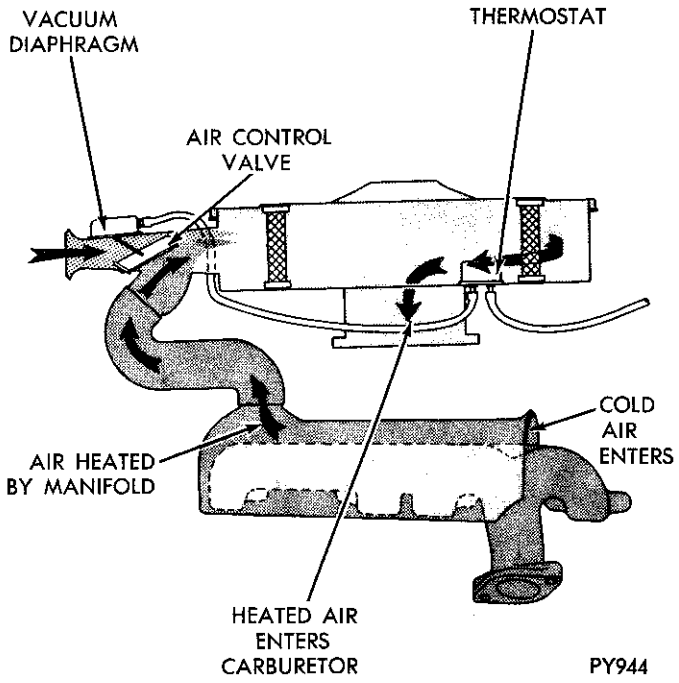


Fig. 2— Heated Inlet Air System

flow of air through the stove, and the warmer the air the greater the flow through the snorkel. The quantity of air through each circuit is controlled by a heat control door in the snorkel so as to maintain a temperature of 95° to 105° F at the temperature sensor mounted inside the air cleaner housing.

The modulation of the induction air temperature is performed by intake manifold vacuum, a temperature sensor and a vacuum diaphragm which operates the heat control door in the snorkel.

A vacuum hose connects to a hose nipple on the base of the carburetor and leads to one side (either side) of the sensor and another hose connected to the opposite side of the sensor and leads to the vacuum diaphragm on the snorkel.

The sensor is simply a bimetalic strip attached rigidly at one end and controls a small air valve at the other end. This valve is connected into the same vacuum chamber on the bottom of the sensor that the 2 hoses connect into. When the temperature at the sensor is less than 95° F the valve is closed and the intake manifold vacuum is communicated to the vacuum diaphragm which in turn lifts the heat control door and allows heated air from the exhaust manifold stove to enter the air cleaner. When the temperature at the sensor is above 105° F, the valve in the sensor opens and decreases the vacuum at the vacuum diaphragm and the spring in the diaphragm housing pushes the heat control door downward decreasing the heated air flow from the stove and increases the air flow through the snorkel.

The vacuum diaphragm is simply a bellows type diaphragm mounted in a housing with a spring between the diaphragm and the top of the housing and a hose nipple in the side of the housing to connect to the vacuum hose from the sensor. Permanently connected to the piston of the vacuum diaphragm is a link which hooks into the heat control door. Since the diaphragm is opposed by a spring, it requires not less than 5″ Hg to lift the heat control door off the floor of the snorkel and not greater than 9″ Hg to raise the door to the top of the snorkel.

With the vacuum diaphragm opposed by a spring it is obvious that temperature modulation will occur only at road load throttle positions or when the intake manifold vacuum is above the operating vacuum of the vacuum diaphragm. But should a burst of power be required, and the throttle is opened wide, the intake manifold vacuum drops and the heat control door drops to the floor of the snorkel closing off the hot air and opens the snorkel to eliminate any undue resistance to free breathing of the engine.

SERVICE PROCEDURES

HEATED AIR SYSTEM

Improper functioning of this system will affect driveability as well as affecting the vehicle exhaust emission control system and may result in failure of the vehicle to meet Federal Emission regulations.

To determine whether the system is functioning properly, the following procedure should be used:

(1) Make sure all vacuum hoses (Figs. 3 and 4), and the stove to air cleaner flexible connector are properly attached and are in good condition.

(2) With a cold engine and ambient temperature in the engine compartment of less than 100 degrees F., the heat control door (valve plate) in the snorkel should be in the **up position** or **heat on position.**

(3) With the engine warmed up and running, check the air temperature entering the snorkel or at the sensor. When the air temperature entering the outer end of snorkel is 105 degrees F. or higher the door should be in the **down** position (**heat off**).

(4) Remove the air cleaner from the engine and allow it to cool down to 90 to 95 degrees F. With 20″ Hg vacuum applied to the sensor the door should be in the **up** position (**heat on** position). Should the door not rise to the heat on position, check the vacuum diaphragm for proper operation.

(5) Check the vacuum diaphragm by applying vacuum directly to the vacuum diaphragm (with Tool C-3707 and vacuum pump C-4081) with a vacuum gauge in the line and a bleed valve to control the vacuum

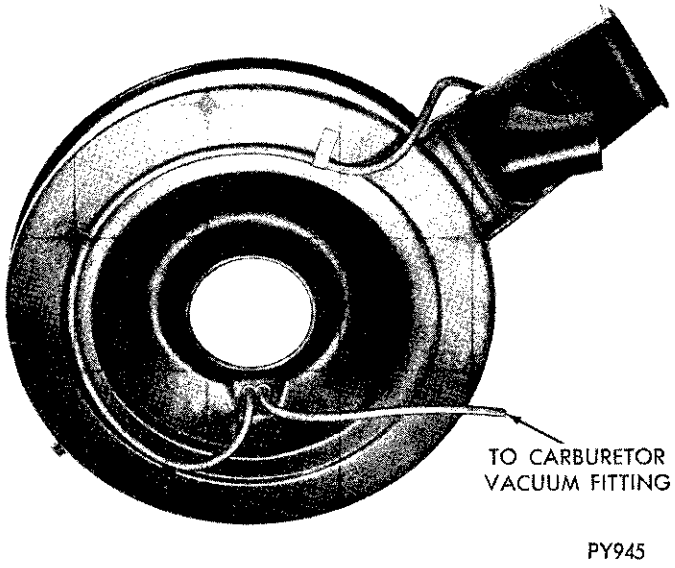


Fig. 3—Routing of Vacuum Hoses Single Snorkel Air Cleaner

inserted in the line between the gauge and the vacuum source. Apply 20 inches Hg to the vacuum diaphragm and stop off the line and check for diaphragm leaks (Fig. 5). The diaphragm should hold 20" Hg for five minutes. Next release the vacuum on the vacuum diaphragm. Then with the use of the bleed valve build the vacuum slowly and observe the door operation. The door should lift off the bottom of the snorkel at not less than 5 inches Hg and be in the full up position with no more than 9 inches Hg.

(6) Should the vacuum diaphragm not perform adequately, replace it and repeat the checks in steps 2 and 3.

(7) Should the vacuum diaphragm perform adequately but proper temperature is not maintained, replace the sensor and repeat the temperature checks in steps 2 and 3.

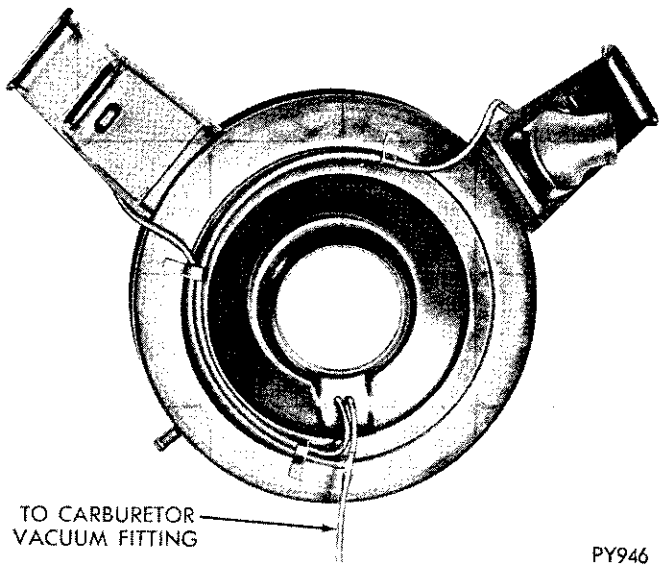


Fig. 4—Routing of Vacuum Hoses Dual Snorkel Air Cleaner

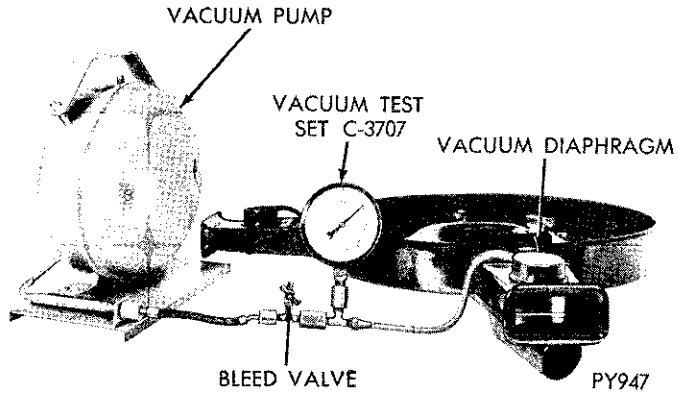


Fig. 5—Inspecting Vacuum Diaphragm

DUAL SNORKEL

The dual snorkel air cleaner performs at low temperatures and above 105 degrees F. basically like a single snorkel air cleaner with one exception:

(1) On deep throttle accelerations, both snorkels are open (when intake manifold vacuum drops below the 5 inches Hg).

(2) The non-heat air snorkel is conencted to manifold vacuum through a **"TEE"** in the vacuum hose between the carburetor and the sensor (Fig. 4).

Check second snorkel vacuum diaphragm as one with heat connector.

VACUUM DIAPHRAGM

With air cleaner housing removed from vehicle.

(1) Bend down lock tab (Fig. 6) and carefully lift forward edge to clear lock tab, then slide forward to disengage rear lock tab, then slide to right to unhook operating rod from heat control door (Fig. 7).

(2) With the vacuum diaphragm removed, check the door for freedom of travel. When the door is

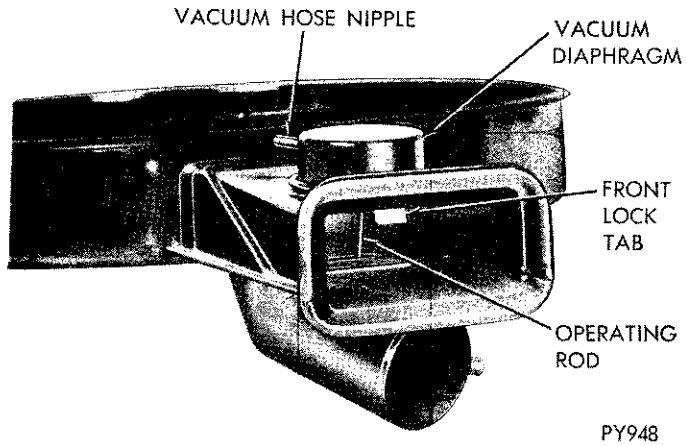


Fig. 6—Opening Front Lock Tab

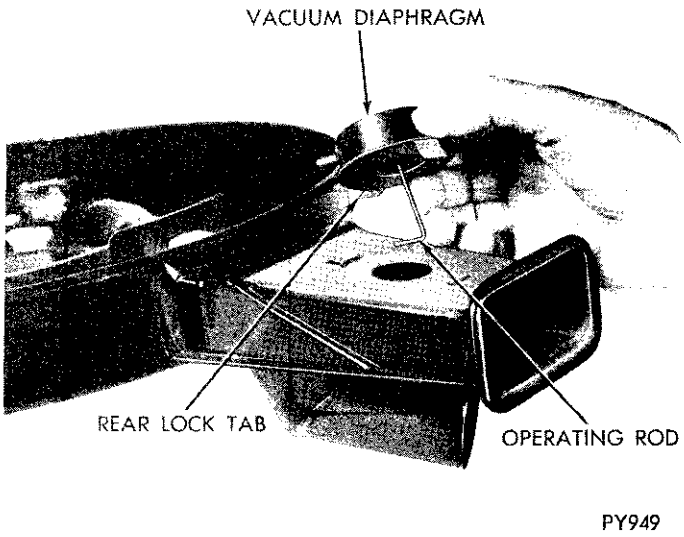


Fig. 7—Removing or Installing Vacuum Diaphragm

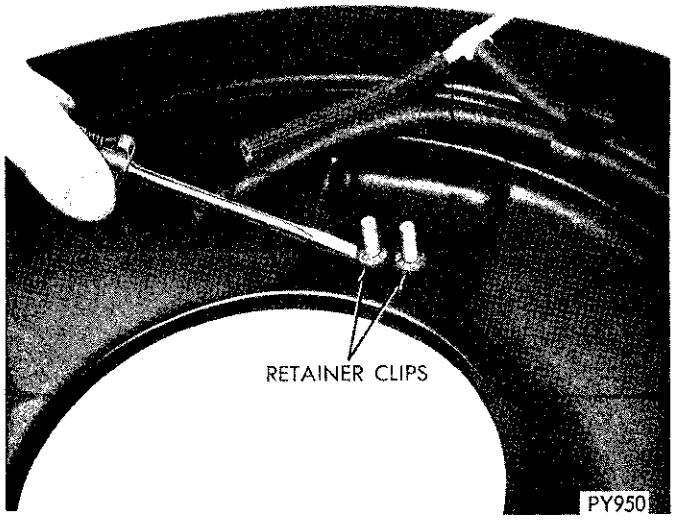


Fig. 8—Removing Retainer Clips

raised to the up position, it should fall freely when released. If it does not, observe door to snorkel side walls for interference or foreign matter. Also check hinge pin for foreign matter. Try to release by blowing with compressed air or by releasing the interference.

Installation

(1) Insert operating rod into heat control door, then slide rearward engaging the rear lock tab, when front lock is in position press forward edge down.

(2) While holding vacuum diaphragm down, apply 9 inches of vacuum to diaphragm hose nipple, door should operate freely. If door operates freely, bend lock tab forward. While supporting snorkel and the lock tab with a piece of flat steel held securely under lock tab, flatten flush with snorkel. **Manually operating heater door could cock rod and diaphragm which would restrict operation of the heater door.**

(3) Assembly air cleaner, install on vehicle and test operation.

SENSOR

Removal

With air cleaner housing removed from vehicle.

(1) Disconnect vacuum hoses from sensor, remove retainer clips (Fig. 8), and discard (new clips are supplied with a new sensor).

(2) Remove sensor with gasket and discard.

Installation

(1) Position gasket on air cleaner housing and install sensor (Fig. 9).

(2) Supporting sensor on outer diameter, install new retainer clips securely being sure gasket is compressed to form an air seal. **Supporting sensor on plastic guard could damage bi-metal strip. No attempt should be made to adjust sensor.**

(3) Install vacuum hoses (Figs. 3 and 4).

(4) Install air cleaner and test operation. Refer to Exhaust System, Group 11, for service procedures on Air Heaters.

CARBURETORS AND CHOKES

All carburetors have leaner mixtures and mixture distribution has been improved on all engines. All two and four barrel carburetors will have dual idle mixture screws with an external adjustment limiting device for better control of idle mixtures. Other carburetor changes include: idle fuel discharged into a bypass air slot for better atomization (383 CID 2V).

Used in conjunction with heater intake air is a new fast acting automatic choke control. This unit reacts quickly to hot exhaust gases to provide a shortened period of mixture enrichment, and hence improved

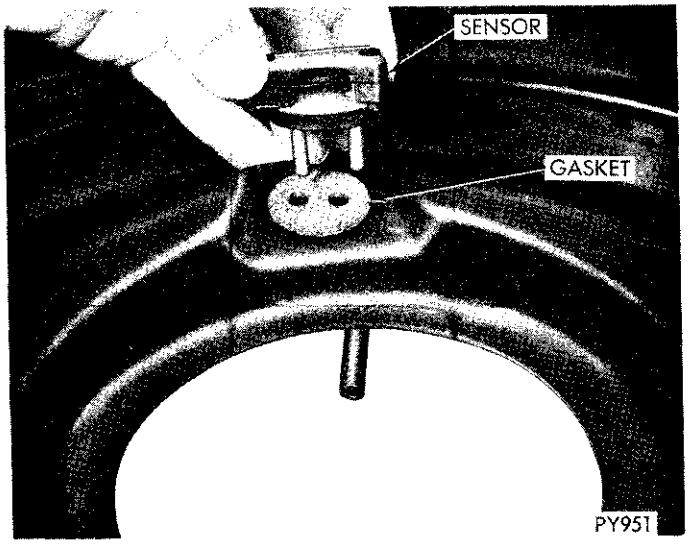


Fig. 9—Installing Gasket and Sensor

fuel economy and reduced emissions. This is achieved by using a removable, thin stamped, stainless-steel cup between the thermostatic choke control unit and the exhaust passage gases in place of the thicker cast-in manifold pocket used previously. A gasket is installed between the steel cup and manifold to ensure that no exhaust leak occurs. Also a part of the heated air system is a heat insulating spacer between the intake manifold and carburetor. This is used in place of a gasket and is essential for correct operation.

IDLE SPEED SOLENOID

The 440 high performance engines employ idle speeds between 800 and 1000 rpm to obtain acceptable lower emissions during idle and deceleration. In order to prevent "after running" with such high idle speeds, these engines have an electrical solenoid throttle stop which holds the throttle at the correct idle position when energized but de-energizes when the ignition is turned off, allowing the throttle blades to close more completely. Refer to "Fuel System" Group 14 for service procedures.

LOWER COMPRESSION RATIOS

The 383 and 440 CID engines have new pistons to reduce compressions by about 0.5. The lower compression ratio reduce hydrocarbon emissions by producing a better combustion chamber shape and by leaving more heat in the exhaust to assist the after combustion reaction.

DISTRIBUTOR SOLENOID

All 383 and 440 engines have a solenoid incorporated in the distributor vacuum advance mechanism to retard the ignition timing when the throttle is closed. At closed throttle, electrical contacts on the carburetor throttle stop and with idle adjusting screw in the closed position, causes the distributor solenoid to energize. This retards the ignition timing to provide reduced exhaust emissions under hot idle conditions. Cold or part throttle starting is not penalized because the distributor solenoid is not energized unless the hot idle adjusting screw is against the throttle stop contact. **Timing must be set at closed throttle to give ignition full retard.**

SERVICE PROCEDURES

IGNITION TIMING (383 Cu. In. 440 Cu. In.)

(Solenoid Distributor)

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give proper ignition timing. The ignition timing test will indicate the timing of the spark at No. 1 cylinder at curb idle (Hot only).

Test procedure as follows:

(1) Disconnect vacuum hose at distributor, and plug hose.

(2) Connect the secondary lead of a power timing light to No. 1 spark plug, red primary lead to positive terminal of the battery and the black primary lead to the negative battery terminal. **Do not puncture cables, boots or nipples with test probes. Always use proper adapters. Puncturing the spark plug cables with a probe will damage the cables. The probe can separate the conductor and cause high resistance. In addition breaking the rubber insulation may permit secondary current to arc to ground.**

(3) Loosen the distributor hold-down mounting screw just enough so distributor housing can be rotated in its mounting.

(4) Start the engine and set the curb idle as shown in "Specifications." (Transmission in Neutral and Engine Hot).

(5) Aim the power timing light at the timing marks on the chain case cover. If the timing light flash occurs when the timing mark on the vibration damper is located ahead of specified degree mark on the timing plate. The timing is advanced. To adjust turn distributor housing **(Not Vacuum Chamber)** Counter clockwise. **Do not use vacuum chamber as a turning handle.** If the timing light flash occurs when the timing mark on the vibration damper is located past the specified degree mark on the timing plate. The timing is retarded. **To adjust turn distributor housing clockwise.** Timing may vary from the specified specifications a plus or minus 2-1/2° and still fall within range, but if the timing is checked it should be adjusted to the specification shown on the distributor charts.

(6) To check the distributor solenoid for proper operation, disconnect the wire at the carburetor. Aim the power timing light at the timing marks on the chain case. The timing should advance above 5-1/2° and the engine speed should increase.

(7) Stop the engine and tighten the distributor hold-down screw.

(8) Reconnect the wire at the carburetor throttle stop.

(9) Reconnect the vacuum hose to the distributor.

(10) Remove the timing light.

EVAPORATION CONTROL SYSTEM

Chrysler Corporation cars sold in California have an Evaporation Control System (ECS) to reduce the loss of fuel from the fuel system to the atmosphere by evaporation. This is a closed system which controls fuel expansion and feeds fuel evaporation emissions from the carburetor or fuel tank. The vapors pass through vent lines to the crankcase by way of the crankcase inlet air cleaner. Since fuel vapors are two

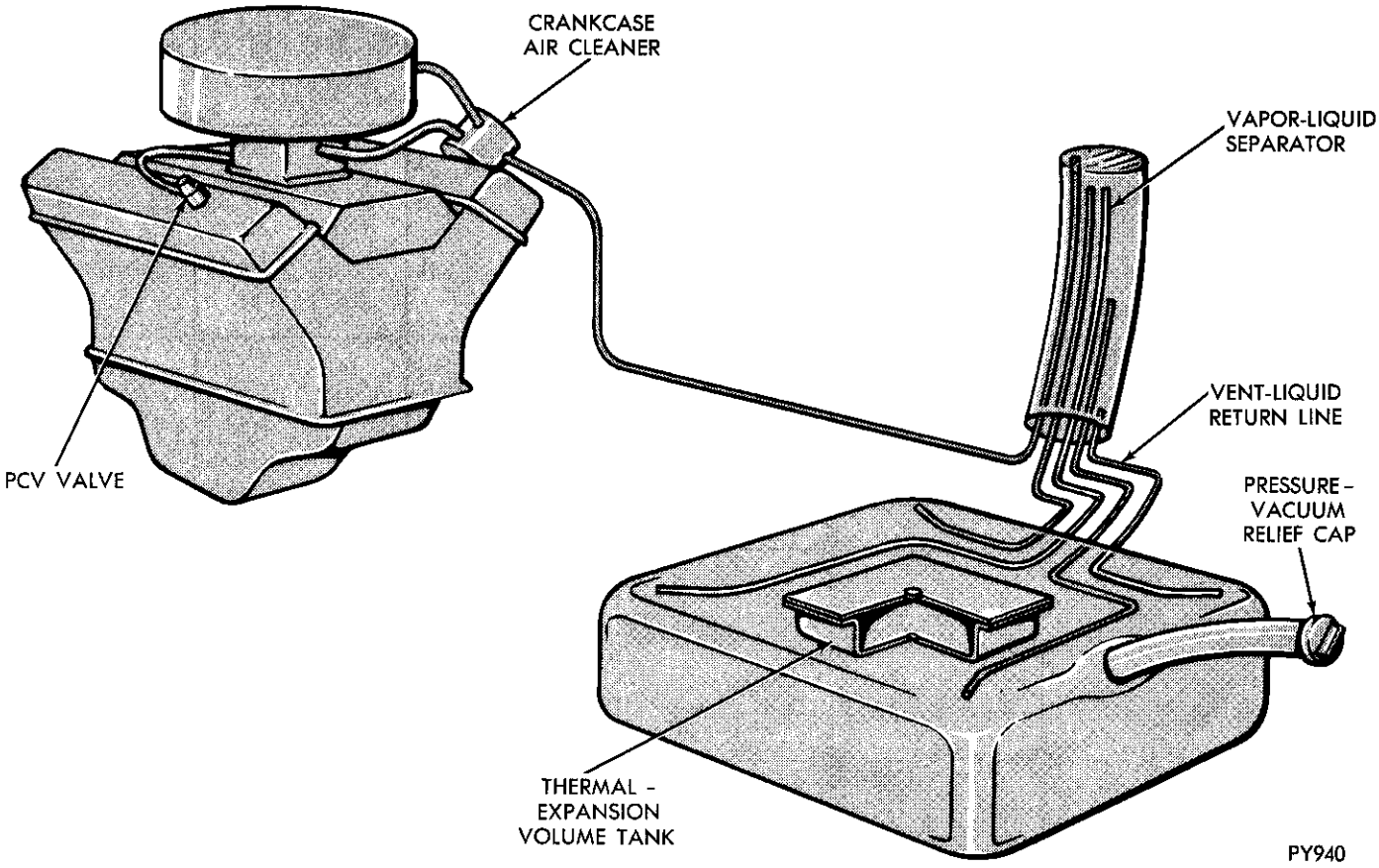


Fig. 10—Evaporation Control System

to four times heavier than air, they settle to the bottom of the crankcase. With the engine running the fuel vapors are purged from the crankcase and together with the normal crankcase vapor are drawn via the crankcase ventilation system, which is an existing part of the Cleaner Air System (CAS) into the base of the carburetor to be burnt by engine combustion.

The possible expansion of fuel in a full fuel tank, due to a rise in temperature, is allowed for by a 1.4 gallon over-fill limiter tank inside the main fuel tank which fills much slower than the main tank. When the main tank is filled, it remains essentially empty to allow for thermal expansion ((Fig. 10).

The loss of any fuel or vapor out of the filler neck is prevented by the use of a filler cap which will release only under significant pressure (1/2 to 1 psi) or vacuum (1/4 to 1/2 psi). This cap is identified by the words **pressure-vacuum** and must be replaced by a similar unit if replacement is necessary, in order for the system to remain effective.

Because the fuel tank is flat on top, four vents are used, one in each corner of the tank and are connected to a vapor-liquid separator by rubber hoses. The vapor-liquid separator is a piece of two inch steel tubing mounted at an angle inside the trunk of the vehicle (quarter panel) which internally holds four vent lines from the tank and a vent line which leads to the crankcase inlet air cleaner. These lines are of different heights so the tank will always be vented regardless of vehicle attitude, and fuel vapor will be transferred to the crankcase. One vent line from the tank is short to provide a drain back to the tank for any liquid fuel which may get into the separator during maneuvers or incline parking. The vent to the crankcase is at the highest point in the separator and has a small orifice to minimize liquid fuel transfer to the crankcase.

The ECS system also includes closed ventilation of fuel vapor from the carburetor bowl. On eight cylinder engines this is accomplished via a hose connection from the carburetor bowl to the crankcase inlet air cleaner.

SERVICE DIAGNOSIS

The ECS sysem should not require any maintenance in normal service. Any loss of fuel or vapor from the fuel filler cap would indicate one or more of the following:

(1) An unsatisfactory seal between cap and filler neck.

(2) A malfunction of ECS cap release valve. A quick check of the ECS fuel cap may be made by placing against the mouth and blowing into the hole in the release valve housing. An immediate leak with light blowing or lack of release with hard blowing indicates a defective or incorrect unit.

(3) All ECS lines plugged between fuel tank and vapor separator.

(4) Plugged ECS line between the vapor separator and the crankcase air inlet filter.

(5) Plugged fuel tank expansion chamber inlet hole in main tank. A removable plug is provided in the top surface of ECS fuel tanks, for access to expansion chamber in event of plugging of its fill/drain hole. If purging of the fuel tank is required, the expansion chamber must be purged separately through the top access plug hole.