

1966-74 383", 400", 413" & 440" V8 ENGINES

| GENERAL SPECIFICATIONS | | | | | | | |
|------------------------|-----------------|------------|-----------|--------------------------|--------------|---------|--------|
| Year | Displ. Cu. Ins. | Carburetor | HP at RPM | Torque (Ft. Lbs. at RPM) | Compr. Ratio | Bore | Stroke |
| 1966-71 | 383" | 2-Bbl. | ..... | ..... | 9.2-1 | 4.25" | 3.375" |
| | 413" | 2 & 4-Bbl. | ..... | ..... | 7.5-1 | 4.188" | 3.370" |
| 1972-74 | 400" | 2-Bbl. | ..... | ..... | 8.2-1 | 4.342" | 3.375" |
| | 413" | 2 & 4-Bbl. | ..... | ..... | 7.5-1 | 4.188" | 3.370" |
| | 440"-1 | 4-Bbl. | ..... | ..... | 8.2-1 | 4.320" | 3.750" |
| | 440"-3 | 4-Bbl. | ..... | ..... | 8.12-1 | 4.3215" | 3.750" |

ENGINE IDENTIFICATION

The Engine Identification Number is located as follows:

383" & 400" — Right side of cylinder block, forward of No. 2 cylinder and adjacent to distributor mounting pad.

413" (1970-72) & 440" (1974) — Left side of block, adjacent to front tappet rail.

413" (1973) & 440" (1973) — Top front of cylinder block, forward of No. 2 cylinder.

First three numerals designate engine cubic inch displacement on 1966-73 models. First five digits contain engine cubic inch displacement on 1974 models.

| Application | Digits |
|-------------|--------|
| 383"..... | 383 |
| 400"..... | 400 |
| 413"..... | 413 |
| 440"..... | 440 |

SPECIAL ENGINE MARKS

Information identifying special engine marks is stamped on cylinder block after serial number and is decoded as follows:

- "LC" — Low compression.
- "HC" — High compression.
- "HP" — High performance.

Maltese Cross (⌘) — .001" undersize crankshaft journals. "M" or "R", representing "main" or "rod" followed by the cylinder number of journals concerned, will be found stamped on a crank shaft counterweight.

Maltese Cross (⌘) & "X" — .010" undersize crankshaft journals. "M" or "R" will be found stamped on a crankshaft counterweight.

- "A" — Indicates all cylinder bores .020" oversize.
- "◆" — Indicates .008" oversize tappets.
- "O/S" — Indicates .005" oversize valve stems.

ENGINE REMOVAL

See *Engine Removal at end of Engine Section.*

INTAKE MANIFOLD

Removal — 1) Drain cooling system and remove air cleaner. Remove alternator, fuel line and accelerator linkage. Remove vacuum control tube at carburetor and distributor. Disconnect

distributor cap, coil wires, and heater hose. Remove closed ventilation system and evaporation control system (if equipped).

2) Disconnect diverter valve vacuum line from intake manifold (if equipped). Disconnect air pump line at exhaust manifolds (1972-73) and at cross-over tube check valve (1974) if equipped. Disconnect diverter valve on the high mount air pump (1972-73). Remove air pump on 1974 models.

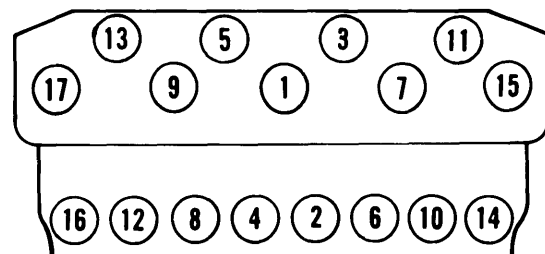
3) Disconnect heat indicator sending unit wire and remove spark plugs. Remove intake manifold, ignition coil and carburetor as an assembly.

Installation — Install intake manifold, carburetor and coil as an assembly. Tighten manifold bolts in two steps.

CYLINDER HEAD

Removal — Remove intake manifold, carburetor and coil as an assembly. Remove tappet chamber cover, rocker arm covers and gaskets. Remove air pump cross-over tube and check valve assembly on 1974 models (if equipped). Remove exhaust manifold(s). Remove rocker arm and shaft assemblies and push rods. **NOTE** — Identify push rods to insure installation in original location. Remove cylinder head bolts, cylinder heads and gaskets. **NOTE** — On 413" engines, tag center bolts for replacement in original holes and inspect all bolts for burned-out or failed Ny-Loc. Replace bolts as necessary.

Installation — Clean all gasket surfaces of cylinder block and head. Coat new gasket with suitable sealer. Install gasket and cylinder head on cylinder block. Install cylinder head bolts and tighten to specifications in two steps. Use tightening sequence shown in illustration. **NOTE** — Do not retighten cylinder head bolts after engine has been operated when embossed steel head gaskets are used.



← FRONT
CYLINDER HEAD TIGHTENING SEQUENCE

2D001

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

| VALVES | | | | | | | |
|---|------------|------------|------------|-----------------------------------|----------------|----------------|------------|
| Engine & Valve | Head Diam. | Face Angle | Seat Angle | Seat Width | Stem Diameter | Stem Clearance | Valve Lift |
| 1966-67 383" Int. Exh. | 2.08" | 45° | 45° | $\frac{1}{16}$ - $\frac{3}{32}$ " | .372-.373" | .001-.003" | ② .392" |
| | 1.60" | 45° | 45° | $\frac{3}{64}$ - $\frac{1}{16}$ " | .371-.372" | .002-.004" | ② .390" |
| 1968-72 383" Int. Exh. 400" Int. Exh. 413" Int. Exh. | 2.08" | 45° | 45° | $\frac{1}{16}$ - $\frac{3}{32}$ " | .372-.373" | .001-.003" | .425" |
| | 1.74" | 45° | 45° | $\frac{3}{64}$ - $\frac{1}{16}$ " | .371-.372" | .002-.004" | .435" |
| | 2.08" | 45° | 45° | $\frac{1}{16}$ - $\frac{3}{32}$ " | .372-.373" | .001-.0027" | .425" |
| | 1.74" | 45° | 45° | $\frac{3}{64}$ - $\frac{1}{16}$ " | ③ | ④ | .435" |
| 1973-74 400" Int. Exh. 413" Int. Exh. 440"-1 Int. Exh. 440"-3 Int. Exh. | 2.08" | 45° | 45° | $\frac{1}{16}$ - $\frac{3}{32}$ " | .372-.373" | .001-.0027" | .430" |
| | 1.74" | 45° | 45° | $\frac{3}{64}$ - $\frac{1}{16}$ " | .3723-.373" | .001-.0027" | .430" |
| | 1.88" | 45° | 45° | .06-.08" | .3718-.3725" | ① | .360" |
| | 1.50" | 45° | 45° | .09-.11" | .433-.434" | ① | .360" |
| | 2.08" | 45° | 45° | $\frac{1}{16}$ - $\frac{3}{32}$ " | ⑤ .3718-.3725" | .0015-.0032" | ⑥ .464" |
| | 1.74" | 45° | 45° | $\frac{3}{64}$ - $\frac{1}{16}$ " | .3718-.3725" | .0015-.0032" | ④ .464" |
| | 2.08" | 45° | 45° | .06-.08" | .3718-.3725" | ① | .434" |
| | 1.74" | 45° | 45° | .09-.11" | .371-.372" | ① | .434" |

- ① — Clearance using wobble checking method is .017".
 ② — Valve lift in 1967 is same as 383" for 1968-72.
 ③ — Hot end is .3713-.3720". Cold end is .3723-.3730".
 ④ — Hot end is .002-.0037". Cold end is .001-.0027".
 ⑤ — "AW" & "PW" models are .3723-.373".
 ⑥ — "AW" & "PW" models valve lift is .2894" (Intake) and .2869" (Exhaust).

VALVE ARRANGEMENT

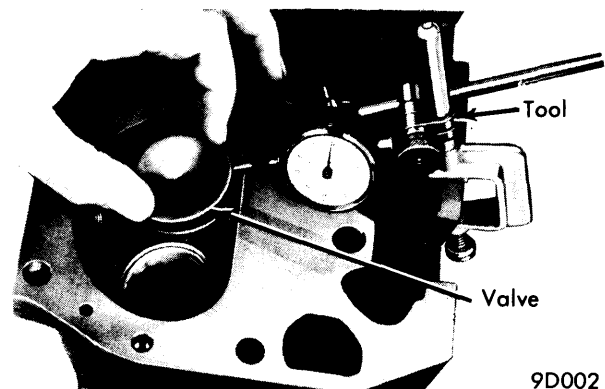
E-I-E-E-I-I-E (Both banks, front to rear).

VALVE GUIDE SERVICING

Wear Check — Remove valve springs and install suitable sleeve over valve stem and install valve in cylinder head. Attach suitable dial indicator to cylinder head and position indicator at a right angle to valve stem being measured. Total sideplay should be within specifications. If dial reading is excessive or stems are scuffed or scored, valve guides require servicing.

Servicing (413") — Both intake and exhaust guides are replaceable type. Valve guides and valves are serviced in standard sizes only. To replace guides, use suitable tool (C-3159) for removal and installation of intake guides and suitable tool (DD-915) for removal and installation of exhaust guides.

Servicing (All Other Engines) — Ream guides to next oversized valve stem if necessary. Oversize valve stems are available in .005", .015" and .030" oversize. **NOTE** — Do not attempt to ream guides from standard diameter to .030" oversize in one step. Use step procedure to obtain the .030".



MEASURING VALVE STEM TO GUIDE CLEARANCE

VALVE STEM OIL SEALS

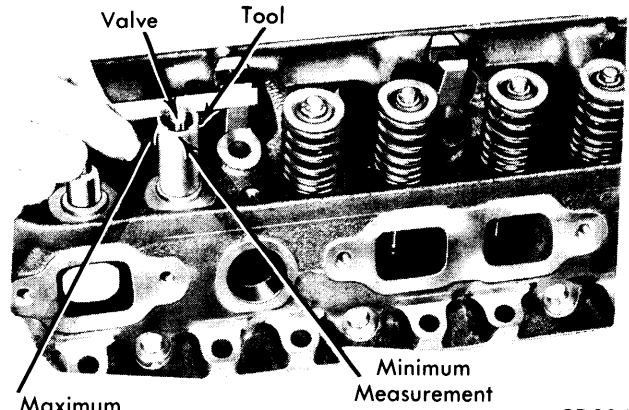
Cup type oil seals are used on all valves with the following exceptions: 413" exhaust valves do not use oil seals and 440"-3 (used in Motor Home) intake valves use umbrella type oil seals. Coat valve stems with oil and insert in cylinder head. Press new seals squarely over valve guide using valve stem as a guide. Do not force seal against top of guide as the sealing lip pressure of the seal will be greatly reduced.

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

| VALVE SPRINGS | | | |
|-----------------|-------------|-----------------|-------------------|
| Engine | Free Length | PRESSURE (LBS.) | |
| | | Valve Closed | Valve Open |
| 1966 383" | 2 1/32" | 95-105@1 5/64" | 187-203@1 1/32" |
| 1967 383" | | | |
| Int. | 2 1/32" | 121-129@1 5/64" | 192-208@1 1/32" |
| Exh. | 2 1/32" | 95-105@1 5/64" | 187-203@1 1/32" |
| 1968-74 383" | 2 5/8" | 121-129@1 5/64" | 192-208@1 1/32" |
| 400" | 2 5/8" | 121-129@1 5/64" | 192-208@1 1/32" |
| 413" | | | |
| Int. | 2 5/16" | 75-85@1 5/64" | 173-187@1 1/32" |
| Exh. | 2 1/8" | ② 80-90@1 4/64" | ② 168-182@1 2/64" |
| 440"-1 ① | 2 1/4" | 100-110@1 5/64" | 236-256@1 2 3/64" |
| 440"-3 | | | |
| Int. | 2 3/64" | 121-129@1 5/64" | 192-208@1 1/16" |
| Exh. | 2 2 3/64" | 118-128@1 4/64" | 200-210@1 1/16" |

- ① — "AW" & "PW" model specifications are same as 400".
- ② — 1971-73 Specifications are 78-88@1 3/4" (valve closed) and 168-182@1 2/64" (valve open).

Installation — Coat valve stems with engine oil and insert valves in cylinder head. If valves or seats are reground, check valve stem height using suitable tool (C-3648). If valve is too long, grind off tip until length is within limits. Install new seals over valve guides. Install valve springs, retainers or rotators. Compress valve springs using suitable tool (C-3422A), install valve retaining locks and release tool.



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MEASURING VALVE STEM LENGTH

VALVE SPRING INSTALLED HEIGHT

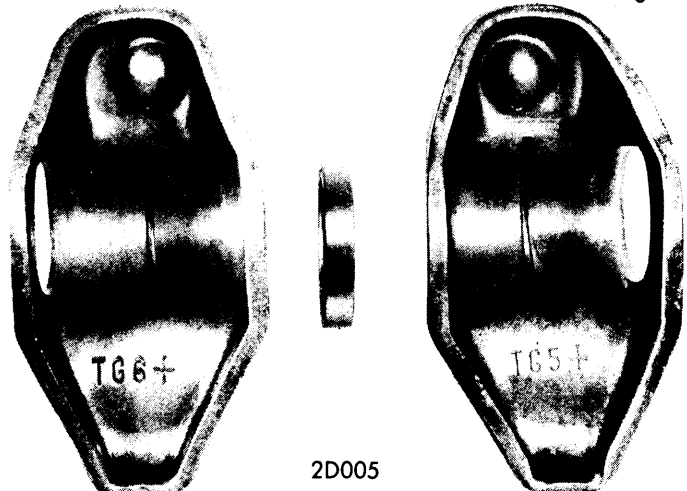
If valves and/or seats are reground, measure installed height of springs. Measurement is taken from bottom of spring seat in cylinder head to bottom surface of spring retainer. **NOTE** — If spacers are installed, measure from top of spacer. On 413" and 440"-3, which are used in Motor Homes, installed height should be 1 5/64"-1 5 7/64" for intake valves and 1 4 5/64"-1 4 9/64" on exhaust valves. On all other engines, installed height should be 1 5 3/64"-1 5 7/64" on both exhaust and intake valves. If not within specifications, install a 1/16" spacer at head counterbore to correct spring height. **CAUTION** — Do not shim to a height less than specifications.

ROCKER ARM ASSEMBLY

Rocker arms are stamped steel and are arranged on a rocker arm shaft. Rocker arm shaft is held in place by bolts and stamped steel retainers attached to five brackets on the cylinder head. Rocker arms may be identified as "right" and "left" as shown in illustration.

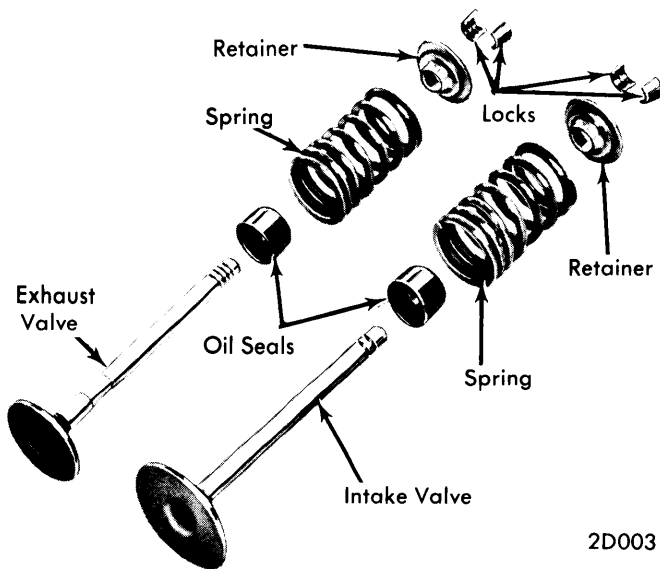
Rocker Arm — Left

Rocker Arm — Right



2D005

ROCKER ARM IDENTIFICATION



2D003

VALVE ASSEMBLIES (TYPICAL)

VALVE SPRINGS

Removal — With cylinder head removed, compress valve springs using a suitable tool (C-3422A). Remove valve retaining locks, retainers or rotators, cup seals and valve springs. Remove any burrs from valve stem lock grooves to prevent damage to valve guide and identify valves to insure installation in original location.

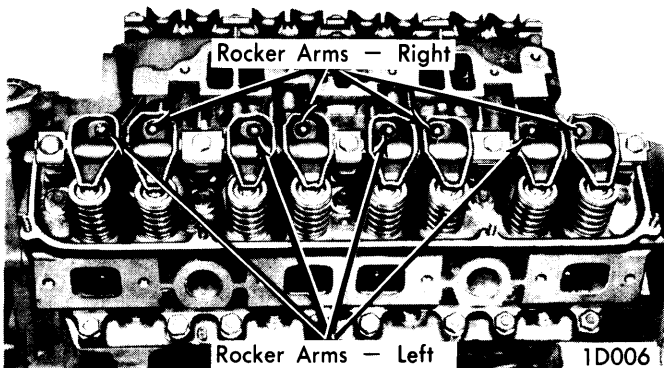
Inspection — Whenever valve springs have been removed, they must be tested. Using a suitable tester, valve springs must be within specifications. Replace springs which do not meet specifications. Inspect each valve spring for squariness using a steel square and surface plate. If spring is more than 1/16" out-of-square, a new spring must be installed.

Chrysler Corp. V8 Engines

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

Removal — Remove cylinder head cover and gasket. Remove rocker arm shaft bolts and retainers. Remove rocker arm and shaft assembly.

Installation — If rocker arm assemblies are disassembled, reassemble with rocker arms in correct position on shaft (see illustration). Long stamped steel retainers must be in the number two and four positions on shaft. Install rocker arm shafts with $\frac{3}{16}$ " lubrication holes pointing downward into the rocker arms so that the 15° angle of these holes point outward towards valve end of rocker arms (see illustration). **CAUTION** — 1966-67 models require push rod to be installed with small diameter end or ball end seated in lifter. On 1968-74 models, push rod ends are identical and may be installed with either end seated in lifter. 1966-67 lifters and push rods are NOT interchangeable with 1968-74 lifters and push rods.



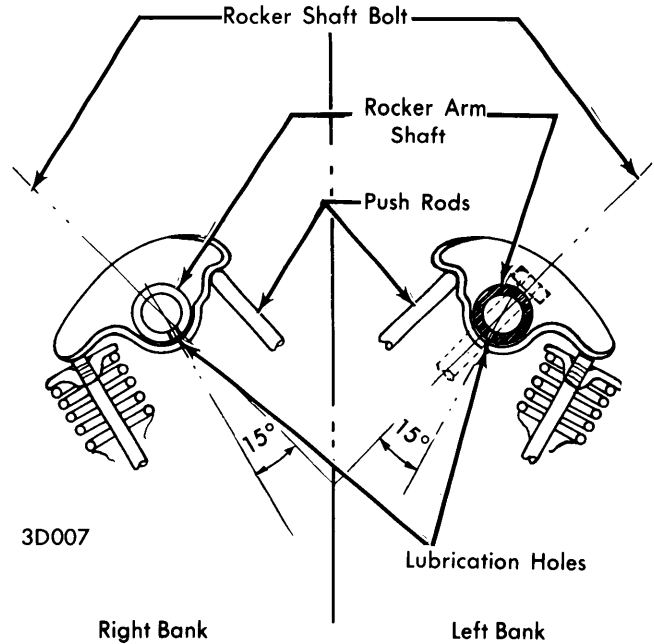
ROCKER ARM LOCATION ON SHAFT

HYDRAULIC VALVE LIFTER ASSEMBLY

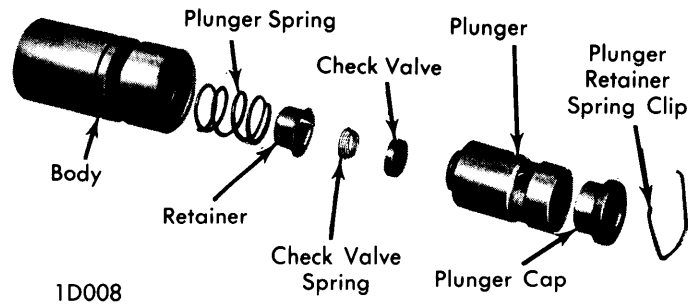
NOTE — Lifters are serviced as complete assemblies only. Parts are not interchangeable between lifters. If any component of lifter is worn or damaged, complete lifter must be replaced.

To test, remove cap from plunger (see illustration) and plunger from tappet body. Fill tappet body with clean kerosene and install plunger and cap. Place lifter upright in Lifter Testing Pliers and check leak down. If lifter collapses immediately, disassemble, clean and retest. If rapid leak down still occurs, replace

lifter. Use a straightedge to check all tappets for a negative crown. If a negative crown (dish) is observed, tappet must be replaced.



ROCKER ARM SHAFT LUBRICATING HOLES ALIGNMENT



HYDRAULIC LIFTER ASSEMBLY (TYPICAL)

| PISTONS, PINS, RINGS | | | | | | | |
|----------------------|-------------------|----------------|----------------|--------------|------------|----------------|-------------|
| Engine | PISTONS Clearance | PINS | | RINGS | | | |
| | | Piston Fit | Rod Fit ① | Rings | End Gap | Side Clearance | |
| 1966-72 383" | .0005-.0015" | .00045-.00075" | .0007-.0012" | 1 & 2 | .013-.025" | .0015-.003" | |
| | | | | 3 | .013-.025" | .0002-.005" | |
| | 400" | .00025-.00125" | .00045-.00075" | .0007-.0012" | 1 & 2 | .013-.025" | .0015-.003" |
| | | | | 3 | .013-.025" | .0002-.005" | |
| 413" | .0005-.0015" | .00045-.00075" | .0007-.0012" | 1 & 2 | .013-.023" | .0025-.004" | |
| | | | | 3 | .015-.055" | .001-.003" | |
| 1973-74 | 400" | .00025-.00125" | .00045-.00075" | .0007-.0014" | 1 & 2 | .013-.052" | .0015-.003" |
| | | | | | 3 | .015-.062" | .0002-.005" |
| | 413" | .0005-.0015" | .00045-.00075" | .0007-.0012" | 1 & 2 | .013-.023" | .0025-.004" |
| | | | | | 3 | .015-.055" | .001-.003" |
| | 440"-1 | .0003-.0013" | .00045-.00075" | .0007-.0014" | 1 & 2 | .013-.052" | .0015-.004" |
| | | | | | 3 | .015-.055" | .000-.005" |
| 440"-3 | .0003-.0013" | .00045-.00075" | .0007-.0012" | 1 & 2 | .013-.023" | .0015-.003" | |
| | | | | 3 | .015-.055" | .000-.005" | |

① — Interference fit.

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

OIL PAN

See Oil Pan Removal at end of Engine Section.

PISTON & ROD ASSEMBLY

NOTE — Following procedures are with cylinder head and oil pan removed.

Removal — Remove ridge at top of cylinder bores using suitable tool before removing pistons from block.

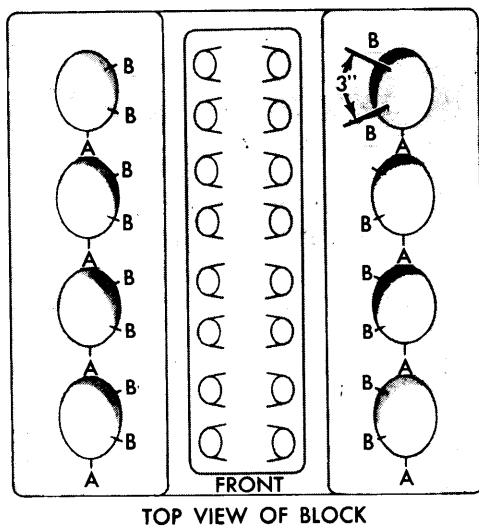
NOTE — Keep tops of pistons covered during this procedure. Rotate crankshaft and inspect connecting rods and rod caps for cylinder identification. Identify them if necessary. Remove rod cap and push each piston and rod assembly out top of cylinder bore being careful not to nick crankshaft journals. Install rod caps on mating rods.

Installation — 1) Before installing piston and connecting rod assemblies into cylinder block, compression ring gaps must be staggered so neither is in line with oil ring rail gaps and "TOP" must be facing top of piston. On all engines except 413", oil ring expander ends should be positioned under the notch on piston and oil ring rail gaps should be facing middle of engine upon installation and spread 3" apart (see illustration). On 413" engines, cast iron oil ring and expander gaps must be positioned 180° apart, over the piston pin bosses.

2) Immerse piston head and rings in clean engine oil and slide suitable ring compressor over piston and tighten. **NOTE** — Do not allow position of rings to change during ring compressor installation and tightening.

3) Rotate crankshaft so connecting rod journal is on center of cylinder bore. Insert rod and piston assembly into cylinder bore and guide rod over the crankshaft journal, taking care not to nick the journal. **NOTE** — Notch on top of piston must face front of engine and larger chamfer of connecting rod bore must be installed toward crankshaft journal fillet.

4) Tap piston into cylinder bore using wooden handle of a hammer and guide connecting rod into place on crankshaft journal. Install rod cap and tighten. Repeat procedure for each piston assembly.



A — Expander Gaps

B — Rail Gaps

OIL RING POSITIONING

2D009

FITTING PISTONS

Pistons should be measured 90° to piston pin axis at top of skirt. Measure cylinder bore halfway down the bore 90° to crankshaft center line. Pistons and cylinder bores should be measured at normal room temperature, 70°F.

PISTON PINS

Removal — Use suitable tool for piston pin removal as follows:

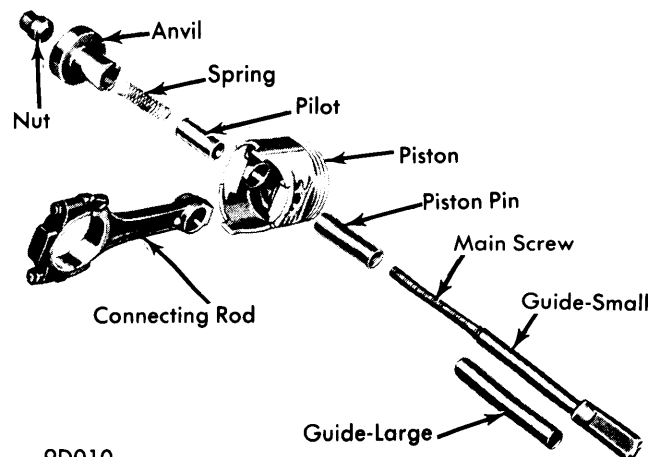
Install pilot on main screw (see illustration) and install screw through piston pin. Install anvil (with spring removed) over threaded end of main screw with small end of anvil against piston boss. Install nut loosely on main screw and place assembly on a press. Press piston pin out of connecting rod. Remove tool from piston.

Installation — 1) Lubricate piston pin holes in piston and connecting rod and use suitable tool to install pin. Install spring inside pilot and install spring and pilot in the anvil. Install piston pin over main screw.

2) Place piston (with notch up) and connecting rod over pilot so pilot extends through piston pin holes. Assemble rods to pistons of the right cylinder bank (2, 4, 6 and 8) with indent on piston head opposite to larger chamfer on 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 large bore end of connecting rod.

3) Install main screw and piston pin in piston and install nut on main screw to hold assembly together. Place assembly in a vise. Press piston pin in until piston pin bottoms on the pilot.

Checking Pin Fit — Assemble suitable tool in same manner as for piston pin removal and place assembly in a vise. Attach a torque wrench to nut and test torque to 15 ft. lbs. If connecting rod moves downward on piston pin, reject connecting rod and piston pin combination. Install a new connecting rod and recheck. If connecting rod does not move under 15 ft. lbs. torque, piston pin fit is satisfactory.



9D010

PISTON PIN REMOVAL & INSTALLATION

Chrysler Corp. V8 Engines

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

| CRANKSHAFT MAIN & CONNECTING ROD BEARINGS | | | | | | | |
|---|----------------|--------------|----------------|--------------------|-------------------------|--------------|------------|
| Engine | MAIN BEARINGS | | | | CONNECTING ROD BEARINGS | | |
| | Journal Diam. | Clearance ② | Thrust Bearing | Crankshaft Endplay | Journal Diam. | Clearance | Sideplay ① |
| 1966-72 | | | | | | | |
| 383" | 2.6245-2.6255" | .0005-.0015" | 3 | .002-.007" | 2.374-2.375" | .0005-.0015" | .009-.017" |
| 400" | 2.6245-2.6255" | .0005-.0015" | 3 | .002-.007" | 2.374-2.375" | .0005-.002" | .009-.017" |
| 413" | 2.7495-2.7505" | .0015-.0025" | 3 | .002-.007" | 2.374-2.375" | .001-.0025" | .009-.017" |
| 1973-74 | | | | | | | |
| 400" | 2.6245-2.6255" | .0005-.002" | 3 | .002-.007" | 2.374-2.375" | .001-.0025" | .009-.017" |
| 413" | 2.7495-2.7505" | .0015-.0025" | 3 | .002-.007" | 2.374-2.375" | .0005-.002" | .009-.017" |
| 440" | 2.7495-2.7505" | .0005-.002" | 3 | .002-.007" | 2.374-2.375" | .001-.0025" | .009-.017" |

① — Total of two rods.

② — Wear limit is .0025"

MAIN & CONNECTING ROD BEARINGS

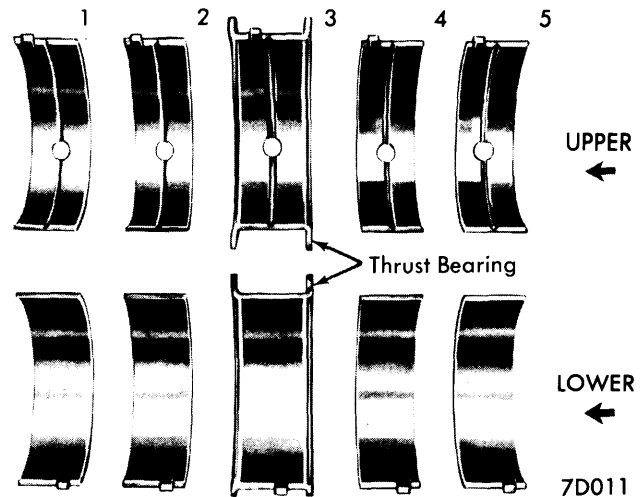
Connecting Rod Bearings — 1) After ensuring rod caps are marked for cylinder identification, remove rod caps. Smooth edges of a ½" by ¾" piece of brass shim stock .001" thick. Oil and place shim stock between bearing and connecting rod journal. Install bearing cap and tighten. Rotate crankshaft ¼ turn in each direction (Shim Stock Method for checking clearances). If a slight drag is felt, clearance is within limits. If no drag is felt, clearance is excessive. If crankshaft cannot be rotated, clearance is not enough.

2) New bearings are available in standard, .001", .002", .003", .010" and .012" undersize. Always install bearings in pairs. Do not use a new bearing with an old bearing. Install connecting rod bearings so formed tang fits into machined groove in connecting rod. Install rod caps, with "V" groove of bearing matching "V" groove of cap, and tighten nuts.

Main Bearings — 1) Use Shim Stock Method (thickness of shim .001") and check main bearing clearances, one at a time while all other main bearing caps are tight. New bearings are available in standard, .001", .002", .003", .010" and .012" undersize. A new .001" bearing may be used in combination with a new standard bearing or a .002" with a .001". **NOTE** — Always use smaller diameter bearing as upper bearing on journal and do NOT use a new bearing in combination with an old bearing. Bearings must be replaced in pairs.

2) New lower main bearings, numbers 1, 2, 4 and 5, are interchangeable. New upper main bearings, numbers 2, 4 and 5, are also interchangeable. **NOTE** — Upper and lower bearings are NOT interchangeable with each other. Number 1 upper main bearing is NOT interchangeable and is chamfered on tab side for timing chain oiling and can be identified by a red marking on edge of bearing. Number 3 upper and lower main bearings are the thrust bearings and are not interchangeable with any other bearings (see illustration).

3) If bearing clearances are not within limits, remove bearing cap, insert suitable tool (C-3059) in oil hole of crankshaft journal and rotate crankshaft clockwise to remove upper bearing. To install new bearing, slightly chamfer sharp edges from plain side and start bearing in place. Install tool and slowly rotate crankshaft counterclockwise, sliding bearing in place. Install main bearing cap with new bearing installed and tighten. Check crankshaft end play and if not within specifications, replace number 3 upper and lower main bearings.



MAIN BEARING IDENTIFICATION

REAR MAIN BEARING OIL SEAL

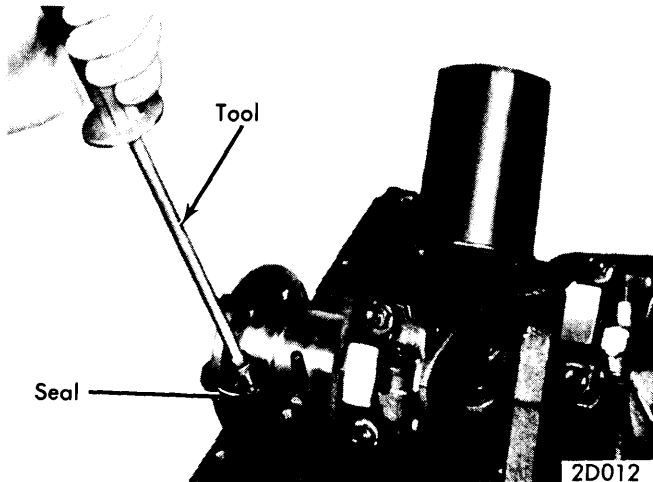
New split rubber type seals may be used for replacement without removing crankshaft. New type must be installed as paired upper and lower seals and cannot be used in combination with rope type seals. A rope type seal is supplied with engine gasket package to be used when engine is rebuilt or crankshaft is removed.

Removal W/Crankshaft Installed — With oil pan removed, remove rear seal retainer and rear main bearing cap. Remove lower rope seal from cap by prying from the side using a small screwdriver. Remove upper rope seal by turning suitable tool (C-4148) into end of seal and pulling seal out with tool while turning crankshaft. **CAUTION** — Do not damage crankshaft with tool during removal procedure.

Installation — Wipe crankshaft surface clean and oil lightly before installing a new seal. Oil seal lip lightly with engine oil. Hold seal (with paint stripe to rear) tightly against crankshaft with thumb and rotate crankshaft, if necessary, while sliding seal into groove. **CAUTION** — Care must be exercised so sharp edge of groove does not shave or nick the back of seal. Install other half of seal into lower seal retainer with paint stripe to rear. Install rear main bearing cap and tighten bolts. **NOTE** — Do not use sealer or cement on seal ends or lips.

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

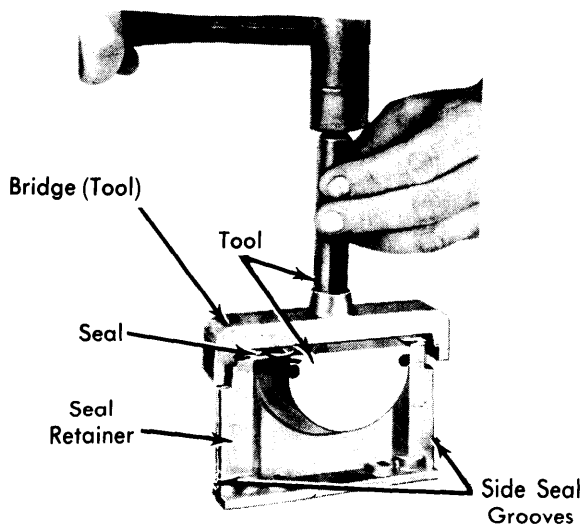
Side Seals Installation — *NOTE* — Following operations must be performed as rapidly as possible since seals are made from material which expands quickly when oiled. Apply mineral spirits or diesel fuel to side seals and install seals in seal retainer grooves. Install seal retainer and tighten screws. Seals must be pre-oiled to prevent oil leaks.



REMOVING UPPER OIL SEAL

Installation W/Crankshaft Removed — Install a new oil seal (rope type) in cylinder block and in seal retainer so that both ends protrude. Tap seal into position on cylinder block using suitable tool (C-3635 or C-3743) with bridge removed until tool is seated in bearing bore. Install bridge on tool and tap seal into position in rear main bearing cap until tool is seated. Holding tool in position, trim off portion of seal which protrudes above the cylinder block and bearing cap.

Side Seals Installation — *NOTE* — Following operations must be performed as rapidly as possible since seals are made from material which expands quickly when oiled. Apply mineral spirits or diesel fuel to side seals and install seals in seal retainer grooves. Install seal retainer and tighten screws. Seals must be pre-oiled to prevent oil leaks.

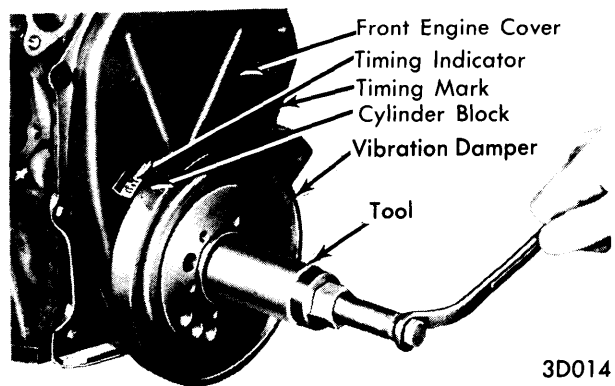


INSTALLING LOWER OIL SEAL

ENGINE FRONT COVER

Removal — Drain cooling system, disconnect radiator hoses and remove radiator. Remove water pump assembly. Remove crankshaft vibration damper attaching bolt. Remove two of the pulley bolts, install suitable tool (C-3688) and remove damper assembly from end of crankshaft. Remove front cover attaching bolts, front cover and gasket.

Installation — Check that mating surfaces of front cover and cylinder block are clean and free from burrs. Install new gasket and engine front cover over locating dowels. Install and tighten front cover attaching bolts. Lubricate front cover seal lip with Lubriplate, position vibration damper hub slot on key in crankshaft and slide hub onto crankshaft. Position suitable installing tool (part of C-3688) and press vibration damper assembly on crankshaft. Install damper retaining washer and bolt. Install drive belt pulley, water pump assembly and radiator. Adjust drive belt tension and fill cooling system.

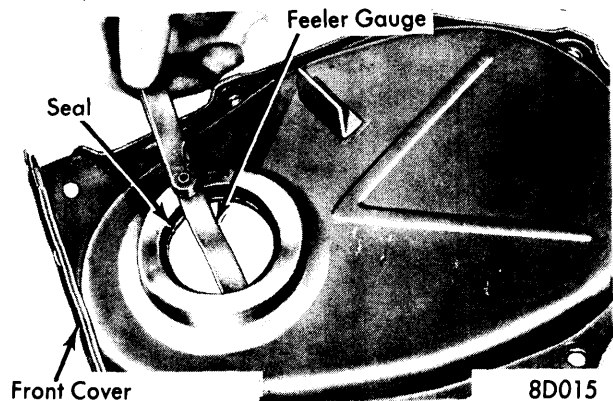


INSTALLING VIBRATION DAMPER

FRONT COVER OIL SEAL

Removal — With front cover removed, use a drift and hammer to lightly tap at several positions around seal case to deform seal inward. *CAUTION* — Support front cover at seal area to prevent deforming front cover. Using vise grips, twist and pull seal at several positions to remove seal from cover.

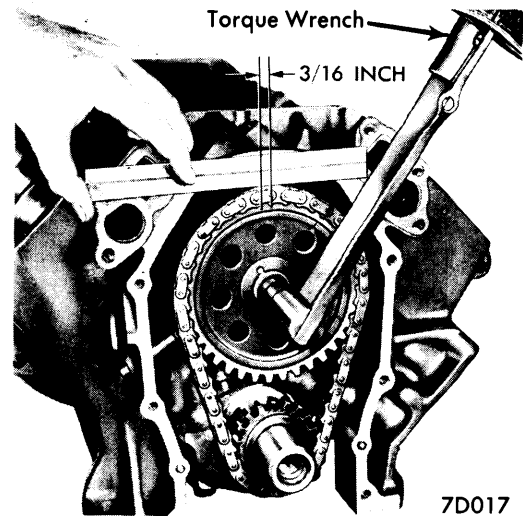
Installation — Use a suitable tool (C-3506) to press seal into front cover. *NOTE* — Lip of the seal must be toward rear of engine. Seal is properly installed when neoprene is tight against face of cover. A .0015" feeler gauge should not be able to enter between neoprene face and cover (see illustration).



CHECKING FRONT COVER SEAL INSTALLATION

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

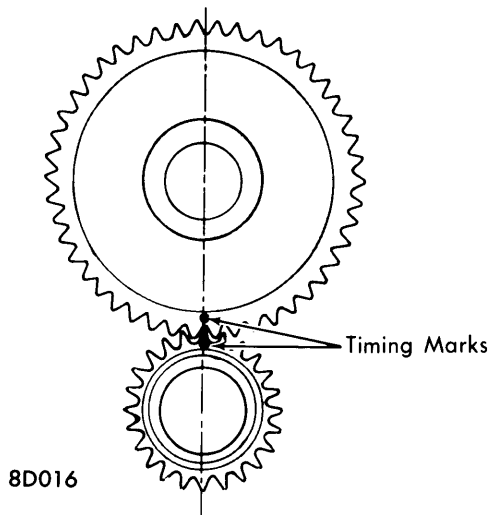
| CAMSHAFT | | | |
|-----------------------------------|---------------|------------|-----------|
| Engine | Journal Diam. | Clearance | Lobe Lift |
| 1966-74 383", 400" & 440"-1 | No. 1-2.000" | .001-.003" | |
| | No. 2-1.984" | | |
| | No. 3-1.969" | | |
| | No. 4-1.953" | | |
| | No. 5-1.750" | | |
| 413" & 440"-3 | No. 1-1.998" | .001-.005" | |
| | No. 2-1.982" | | |
| | No. 3-1.967" | | |
| | No. 4-1.951" | | |
| | No. 5-1.748" | | |



MEASURING TIMING CHAIN STRETCH

TIMING GEARS

Removal & Installation (Early 413" Only) — Remove engine front cover. Slide crankshaft oil slinger off end of crankshaft and remove camshaft gear attaching bolts. Remove camshaft gear and crankshaft gear using suitable pullers. Install camshaft and crankshaft gears with timing marks in alignment (see illustration). Install and tighten camshaft gear attaching bolts.



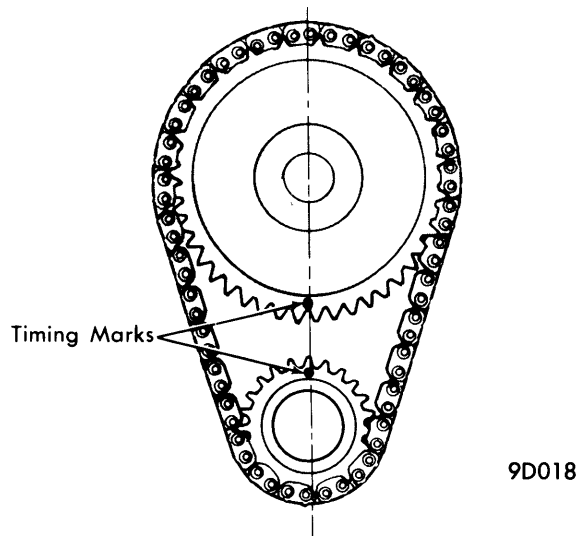
TIMING GEAR ALIGNMENT

Removal — With front cover removed, remove camshaft sprocket attaching bolt and washer. Remove timing chain with crankshaft and camshaft sprockets.

Installation — When installing timing chain, use a suitable tool (C-3509) to prevent camshaft from contacting welch plug in 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. Then proceed as follows:

1) Place camshaft and crankshaft sprockets on bench with timing marks on an imaginary centerline through bore of both sprockets. Place timing chain around both sprockets. Turn crankshaft and camshaft to line up with keyway location in sprockets.

2) Slide both sprockets evenly over their respective shafts (with new chain installed on sprockets). Use a straightedge to measure alignment of timing marks. Install camshaft attaching bolt and washer. Tighten bolt and slide crankshaft oil slinger over shaft and up against sprocket (flange away from sprocket).



TIMING CHAIN SPROCKET ALIGNMENT

TIMING CHAIN

Checking For Stretch — Position scale next to timing chain (see illustration) to measure any movement of the chain. Place torque wrench with socket over camshaft sprocket lock bolt and apply torque in direction of crankshaft rotation to remove slack. Torque should be 30 ft. lbs. with cylinder heads installed or 15 ft. lbs. with cylinder heads removed. **NOTE** — Do not permit the crankshaft to move. Apply same torque in reverse direction and measure amount of chain movement. If movement exceeds 1/8" on 413" or 440"-3, install a new timing chain. If movement exceeds 3/16" on all other engines, install a new timing chain.

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

CAMSHAFT

NOTE — Whenever a new camshaft is installed inspect and check, with a straightedge, all tappet faces for "dishing". Replace any tappet with a negative crown.

Removal — Remove intake manifold and rocker arm covers. Remove rocker arm and shaft assemblies. Remove push rods and tappets. **NOTE** — Identify push rods and tappets for reinstallation in original location. Remove distributor and lift out oil pump-distributor drive shaft. Remove fuel pump and allow fuel pump push rod to drop away from cam eccentric. Remove timing chain and sprockets. Remove camshaft taking care not to damage camshaft bearings with camshaft lobes.

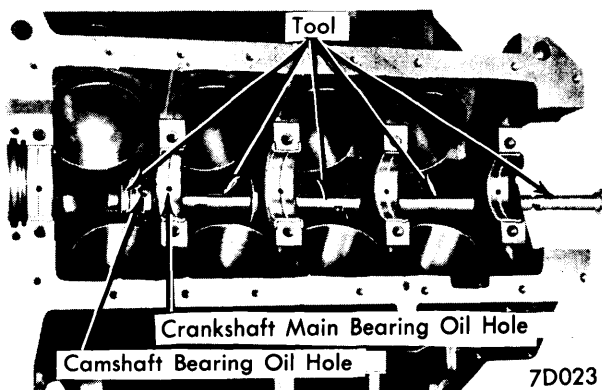
Installation — Lubricate camshaft lobes and bearing journals. Insert camshaft to within 2" of its final position in block. Install suitable tool (C-3509) in distributor drive hole and hold in position using distributor retainer plate bolt. **NOTE** — Tool must be modified by grinding off index lug holding upper arm on tool and then rotate arm 180°. Install camshaft to final position. Install timing chain and sprockets, fuel pump and rod. Install oil pump-distributor drive shaft and distributor (see Distributor Timing & Installation). Reverse removal procedure for remaining components.

CAMSHAFT BEARINGS

Removal — With engine completely disassembled, drive out rear cam bearing welch plug. Install proper size adapters and horse shoe washers (C-3132A) at rear of each bearing to be removed and drive out bearings.

Installation — 1) Place new camshaft bearing over proper adapter and position bearing in tool. Install horse shoe lock and by reversing removal procedure, drive bearing into place. Install remaining bearings in same manner. **NOTE** — Install No. 1 bearing $\frac{1}{32}$ " inward from front face of cylinder block.

2) Bearing index must be inspected after installation by inserting a pencil flashlight in bearing. Bearing oil hole must be aligned with drilled oil passage from main bearing. Other oil holes in bearing should be visible by looking down on left bank oil hole above and between No. 6 and No. 8 cylinders to No. 4 camshaft bearing. On right bank, look down on oil hole between and above No. 5 and No. 7 cylinders to No. 4 camshaft bearing. If bearing oil holes are not in exact alignment, remove and reinstall correctly. Install new welch plug squarely in hole at rear of camshaft.

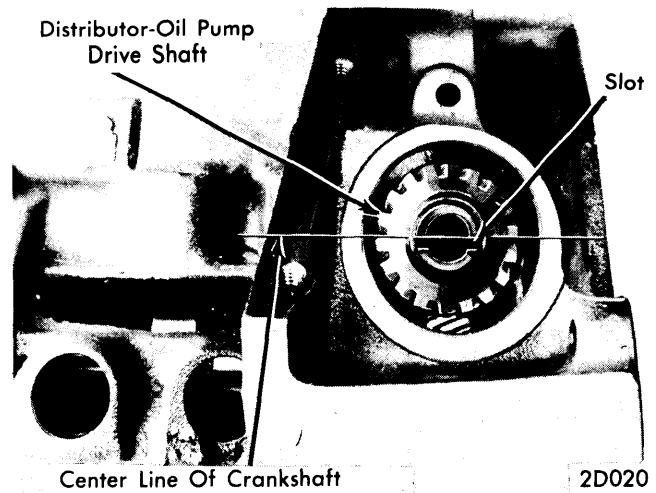


CAMSHAFT BEARING REMOVAL

DISTRIBUTOR TIMING & INSTALLATION

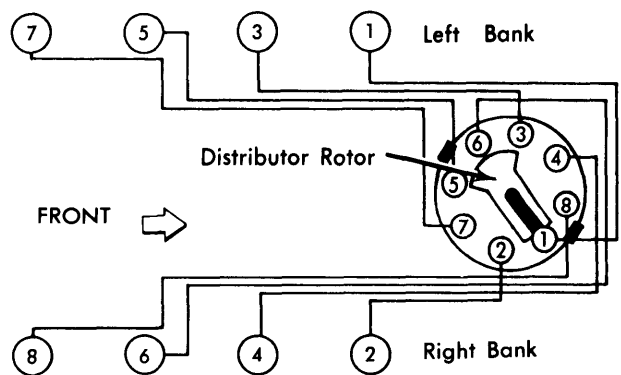
NOTE — On gear driven camshafts, the distributor shaft rotates clockwise. On chain driven camshafts, the distributor shaft rotates counterclockwise.

Distributor Timing — Before installing distributor-oil pump drive shaft, time engine as follows: Rotate crankshaft so number one cylinder is at top dead center on the firing stroke (both valves closed). Straight line on vibration damper should be under "O" on timing indicator. Coat shaft and drive gear with engine oil. Install shaft so that when gear spirals into place, it will index with oil pump shaft so slot in top of drive gear will be parallel with center line of crankshaft (see illustration).



DISTRIBUTOR DRIVE GEAR SLOT ALIGNMENT

Distributor Installation — Hold distributor over mounting pad of cylinder block with vacuum chamber pointing toward center of engine. Turn rotor to point forward and approximately toward location of number one terminal in distributor cap. Place distributor gasket in position, lower distributor and engage shaft in slot of distributor drive shaft gear. Turn distributor in direction of distributor shaft rotation until breaker points are just separating and install hold down clamp.



DISTRIBUTOR INSTALLATION

Chrysler Corp. V8 Engines

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

ENGINE OILING

Crankcase Capacity — Capacity on 383" (1966) is 4 qts. while 400" (1972-74) and 440"-1 (1973-74) require 5 qts. All other engines require 6 qts. On all engines, add 1 qt. with oil filter change.

Oil Filter — Change at first oil change and every second oil change after that.

Pressure Regulator Valve — In oil pump. Not adjustable.

Normal Oil Pressure (Hot) — Pressure should be 45-65 psi at 1500 RPM on 383" (1966) and 45-65 psi at 1000 RPM on 383" (1967-71). On all other engines, pressure should be 30-80 psi at 2000 RPM.

Oil Pump Specifications

| | |
|-----------------------------------|-------------|
| Pump Cover Wear..... | .0015" Max. |
| Inner Rotor Thickness..... | .942" Min. |
| Outer Rotor Thickness..... | .943" Min. |
| Outer Rotor Diameter..... | 2.469" Min. |
| Clearance Over Rotors..... | .004" Max. |
| Outer Rotor-to-Pump Body..... | .014" Max. |
| Tip Clearance Between Rotors..... | .010" Max. |

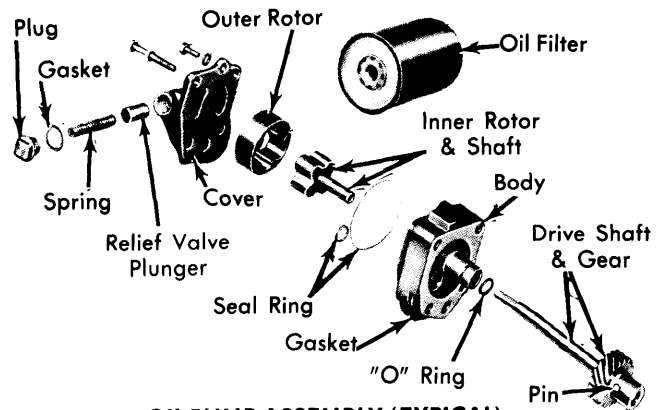
Pressure Relief Valve Spring — Spring on 383" engine has a free length of 2 $\frac{7}{32}$ " and should test 14.85-15.85 lbs. when compressed to 1 $\frac{1}{32}$ ". Spring on all other engines has a free length of 2 $\frac{1}{4}$ " and should test 22.3-23.3 lbs. when compressed to 1 $\frac{1}{32}$ ".

ENGINE OILING SYSTEM

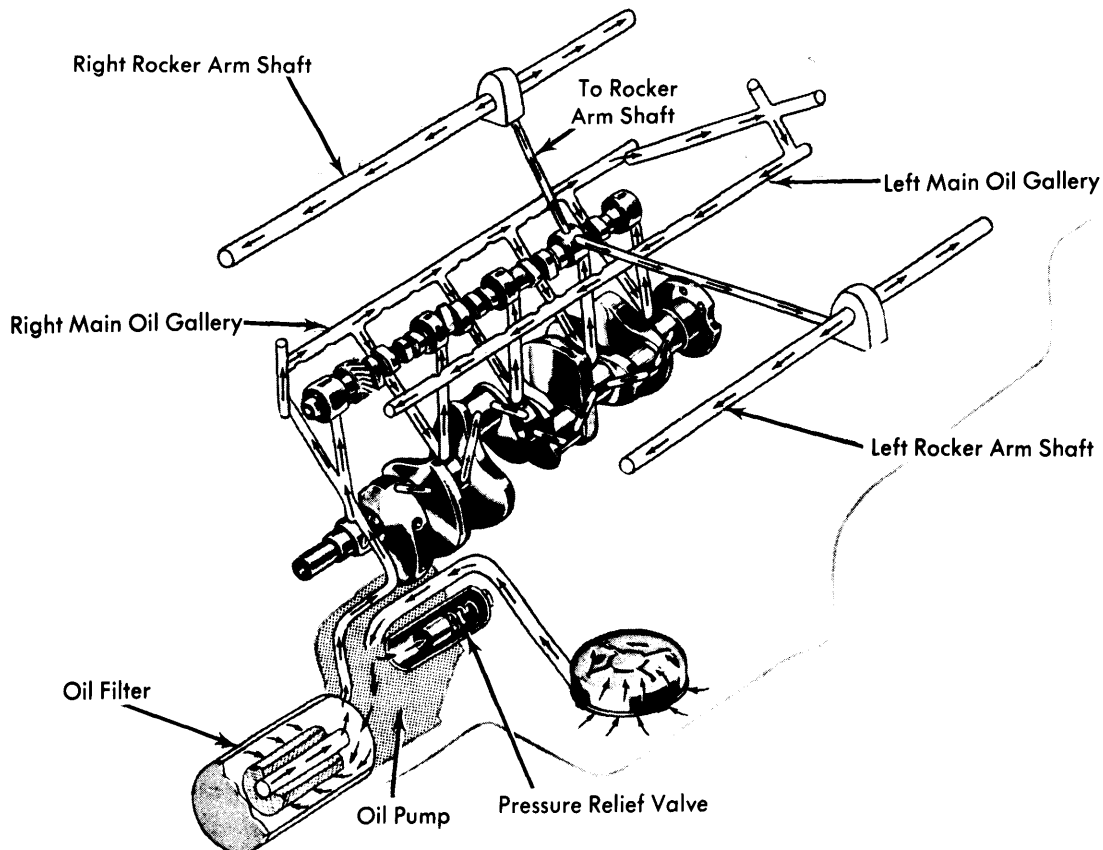
See illustration. Force feed type using rotor type pump and full flow oil filter. Oil is supplied to hollow rocker arm shaft through indexed holes in No. 4 camshaft bearing. Drilled holes in rocker shaft supply oil to rocker arms which supply lubrication to push rods and valve assemblies. Holes in main oil galleries supply oil to valve lifters.

OIL PUMP

Disassemble (see illustration), clean and inspect all parts for proper clearances (see specifications). **NOTE** — Inner rotor and shaft assembly can only be replaced if outer rotor is replaced as units are a matched assembly.



OIL PUMP ASSEMBLY (TYPICAL)



ENGINE OILING SYSTEM

1966-74 383", 400", 413" & 440" V8 ENGINES (Cont.)

TIGHTENING SPECIFICATIONS

| Application | Ft. Lbs. |
|-------------------------------|----------|
| Camshaft Lock Bolt | |
| 383" & 413" | 35 |
| 400" & 440" | 50 |
| Connecting Rod Cap | 45 |
| Crankshaft Bolt | 135 |
| Cylinder Head | ① 70 |
| Distributor Clamp Bolt | 15 |
| Exhaust Manifold | |
| 413" | 40 |
| All Other Engines | 30 |
| Front Cover | |
| 400" & 440"-1 | ② |
| All Other Engines | 15 |
| Fuel Pump | 30 |
| Intake Manifold | |
| 383" | 50 |
| 400" & 440"-1 | 40 |
| 413" & 440"-3 | 45 |
| Main Bearing Cap | 85 |
| Oil Pump | |
| 383" | 35 |
| 400" | |
| 1972 | 30 |
| 1973-74 | 10 |
| 413" | 35 |
| 440"-1 | ③ 10 |
| 440"-3 | 30 |
| Rear Main Seal Retainer | |
| 413" & 440"-3 | 25 |
| All Other Engines | ④ 30 |
| Rocker Arm Bracket Bolt | 30 |
| Rocker Arm Cover | 3.5 |
| Tappet Cover (End Bolt) | |
| 383" | 4 |
| 400" & 440"-1 | 15 |
| 413" & 440"-3 | 10 |
| Vibration Damper Pulley | |
| 413" & 440"-3 | 30 |
| All Other Engines | 15 |

- ① — Initial torque is to 50 ft. lbs. in sequence.
 ② — $\frac{5}{16}$ "-18 bolts tighten to 200 INCH lbs. and $\frac{3}{8}$ "-16 bolts tighten to 40 ft. lbs.
 ③ — "AW" and "PW" models tighten to 30 ft. lbs.
 ④ — "AW" and "PW" models tighten to 25 ft. lbs.