1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1972										
807-10	95.5	1565	1x2-Bbl.	102@5800	99@3000	9.25-1	3.03	77	3.31	84
807-12	95.5	1565	①	120@6250	105@5000	10.25-1	3.03	77	3.31	84
1973										
807-13	95.5	1565	①	.....	.....	9.0-1	3.03	77	3.31	84

① — Fuel Injection.

ENGINE IDENTIFICATION

Engine number and type are stamped on a plate riveted to right side of block below cylinder head. First five digits indicate engine type.

Model No.	Model Name	Engine Type
1972		
R-1302	R-15	807-10
R-1313	R-17	807-12
R-1323	R-17	807-12
1973		
R-1313	R-17	807-13

ENGINE REMOVAL

1) Disconnect battery, remove hood and drain cooling system. Disconnect all water hoses, electrical leads, vacuum lines and fuel lines. Remove radiator, starter, camshaft pulley and drive belt.

2) Remove top engine-transmission mounting bolt(s). Remove tensioner, fan belt, crankshaft pulley, fuel inlet line, and fan. Disconnect exhaust pipe from manifold and transmission crossmember. Remove clutch shield.

3) Attach suitable hoist (Mot. 477) and take up engine weight. From left and right side, remove engine side mounts and bracket.

4) Raise engine until top of transmission just meets underside of steering crossmember. Suitably support transmission and remove two bottom engine-transmission assembly bolts. Remove engine from vehicle. To install, reverse removal procedure.

INTAKE MANIFOLD

Disconnect battery and drain cooling system. Remove air filter and throttle linkage. Disconnect all necessary hoses, lines and electrical wires. Remove manifold nuts and remove manifold. To install, reverse removal procedure.

CYLINDER HEAD

Removal – 1) Disconnect battery, drain cooling system and remove air filter. Disconnect all necessary water hoses, electrical wires and cable linkage. Remove distributor, alternator (with drive belt) and valve cover.

2) Remove water pump drive belt. Disconnect exhaust pipe at manifold and place out of way. Remove rubber rings and cups from spark plug tubes.

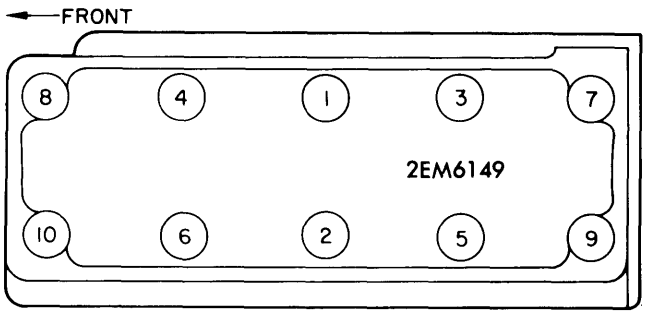
3) Loosen rocker arm adjusting screws and remove push rods. Remove cylinder head bolts and remove rocker arm assembly. Loosen cylinder head by tapping with a plastic hammer to rotate cylinder head in counterclockwise direction.

NOTE – Cylinder head gasket is stuck to cylinder head, cylinder block and liners. No attempt must be made to lift cylinder head until it has been loosened, otherwise liner seats will be loosened and liner gaskets damaged.

4) Lift cylinder head slightly and remove tappets, keeping them in order. Remove cylinder head. Install liner clamps to prevent any movement of liners.

Installation – 1) Remove liner clamp. *NOTE – All cylinder head bolt holes in cylinder block must be free of excess oil which would affect tightening.* Check liner protrusion. See *Cylinder Liners*. Install new cylinder head gasket.

2) Install locating studs and fit new rubber tappet housing gasket. *NOTE – Since distributor gear alignment is dependent on correct cylinder head installation, care must be exercised while positioning cylinder head.*



CYLINDER HEAD TIGHTENING SEQUENCE

3) Install tappets in cylinder head and place cylinder head in position. Place rocker arm assembly in position and remove locating studs. Install lubricated cylinder head bolts, tightening in steps. Adjust valves and replace remaining components in reverse of removal.

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)

VALVES							
Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1972							
807-10							
Int.	1.575 (40.00)	45°	45°	.059-.071 (1.5-1.8)	.315 (8.0)	.....	.....
Exh.	1.392 (35.35)	45°	45°	.067-.079 (1.7-2.0)	.315 (8.0)	.....	.....
807-12	.....	.....	.....	.....	.....	.....	.....
1973							
807-13							
Int.	1.658 (42.8)	45°	45°	.051-.063 (1.3-1.6)	.315 (8.0)	.....	.....
Exh.	1.392 (35.4)	45°	45°	.067-.079 (1.7-2.0)	.315 (8.0)	.....	.....

VALVE ARRANGEMENT

Left Side – All exhaust.

Right Side – All intake.

VALVE GUIDE SERVICING

1) Remove cylinder head and place it on a suitable support. *NOTE – Valve guide angles are: intake, 23°; exhaust , 26°.* Using a hydraulic press, remove worn guide.

2) Measure worn guide and replace it with nearest oversize. Standard valve guide diameter is .512". First oversize is .516" and identified by one index groove; second oversize is .522" and distinguished by two index grooves.

3) Turn cylinder head over and, using suitable reamer, ream bore for valve guide. Bore must accept oversize guide. Lubricate new valve guide and install it with chamfer facing outward. Using suitable tool (Mot. 357) ream valve guide bore.

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1972			
807-10			
Outer	2.14 (54.3)	.....	114@1.20 (52@30.5)
Inner	1.84 (46.8)	.....	35@1.20 (16@30.5)
807-12	.....	.....	.....
1973			
807-13			
Outer	1.81 (46.0)	.....	103@1.25 (47@31.8)
Inner	1.63 (41.5)	55@1.00 (25@25.4)	.....

VALVE SPRING REMOVAL

Cylinder Head Installed – 1) Disconnect battery and remove valve cover. Bring piston to TDC and remove push rod corresponding to spring requiring maintenance.

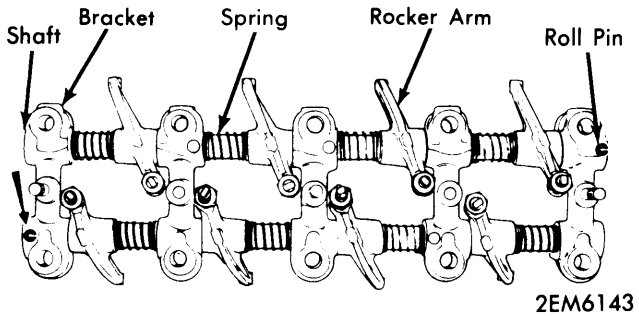
2) Using suitable tool (Mot.382), compress valve spring and remove retainer, top cup, and spring. Spring can now be further checked. To install, reverse removal procedure.

NOTE – Valve springs must be fitted with larger coil spacing toward cylinder head.

Cylinder Head Removed – Using suitable tool (U43P), compress valve spring and remove keepers, top cups, springs and base washers. To install, reverse removal procedure.

ROCKER ARM ASSEMBLY

Remove roll pins holding rocker arm shafts. Separate brackets, rocker arms and springs. End plugs must not be removed from shafts. Clean all parts and reassemble. *NOTE – Rocker arm shaft bearings 1 and 4 have same oil holes. Bearings 2, 3, and 5 do not have oil holes.*



ROCKER SHAFT ASSEMBLY

VALVE TAPPET SERVICE

1) With tappets removed, thoroughly clean tappets and tappet bores in cylinder head. Check clearance between tappets and cylinder head bores.

2) If clearance is excessive, tappet bores must be reamed for oversize tappets. Tappets are available .008" oversize. Ream tappet bores to .480" if installing new tappets.

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)

VALVE CLEARANCE ADJUSTMENT

Due to peculiarties of camshaft design, valve clearances must be set one at a time to avoid error. Rotate engine until intake valve of first column is open then adjust intake valve shown in second column. Adjust all intake valves, then use same procedure for exhaust valves. Adjust intake valves to .010" (.025 mm) and exhaust valves to .012" (.030 mm).

Valve Open	Adjust Valve
#1	#4
#2	#3
#3	#2
#4	#1

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
1972						
807-10	.....	Free Fit	Press Fit	.....	①	.....
807-12	.....	Free Fit	Free Fit	.....	①	.....
1973						
807-13	.....	Free Fit	Free Fit	.....	①	.....

① – Pre-set gap, do not alter.

OIL PAN REMOVAL

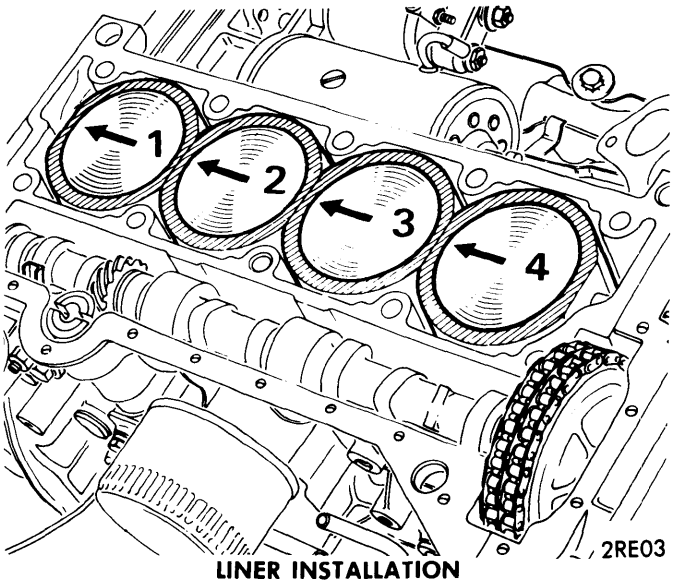
Raise vehicle and drain crankcase. Extract oil pan bolts and ease pan from its position. It may be necessary to remove clutch shield. To install, reverse removal procedure. *NOTE – Ensure oil pan contact surface is scraped clean before installing new gasket.*

CYLINDER LINERS

Removal – 1) Disconnect battery and drain cooling system and oil pan. Remove cylinder head and install liner clamps. *See Cylinder Head.* Remove oil pan and oil pump.

2) Mark connecting rods on cam side, number one at clutch end. Remove connecting rod caps and bearings. Remove liner clamp and remove liner-piston-rod assembly.

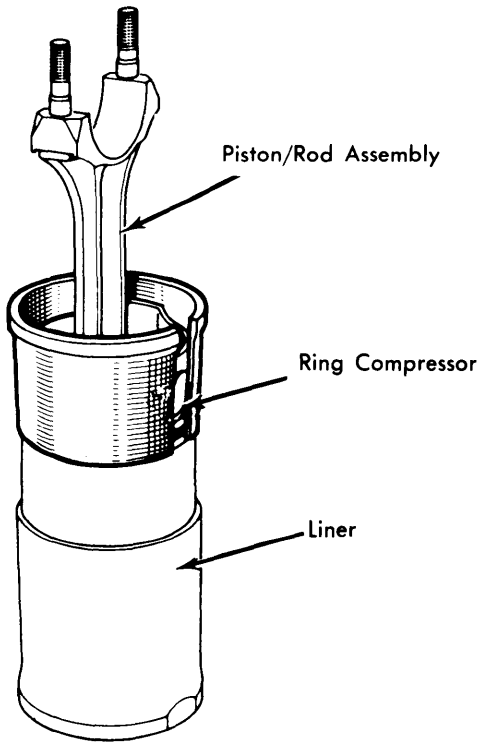
Installation – 1) Before installing pistons in liners protrusion of liner above cylinder block gasket face must be checked. Correct protrusion is .006-.008" checked with liner bottom seals installed. Seals are available .003" (blue spot), .004" (red spot) and .005" (green spot). Select correct seal to provide correct protrusion.



LINER INSTALLATION

2) Install piston and rod assembly in liner. *See Piston & Rod Assembly.* Install piston-rod-liner assembly into cylinder block. *NOTE – Number one is at clutch end, arrow points to flywheel and number on connecting rod is on cam side.*

3) Lubricate bearings and replace connecting rod caps. Replace remaining components in reverse of removal taking care not to disturb liner bottom seals.



PISTON INSTALLATION

PISTON & ROD ASSEMBLY

Removal – Piston and connecting rods are removed from cylinder block with cylinder liners. *See Cylinder Liners.* Remove piston through bottom of liner and remove rings, piston pin and connecting rod. *See Piston Pins.*

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)

Installation – 1) Replace connecting rod and piston pin. *NOTE – Piston must be assembled with arrow on piston pointing downward. Number stamped on connecting rod journal must face right with top of piston toward installer.*

2) Replace piston rings spacing gaps 120° apart. See *Fitting Pistons*. Using suitable ring compressor (Mot.442) push piston through bottom of cylinder liner with flat on side of liner parallel with sides of connecting rod.

FITTING PISTONS

Pistons, rings and liners are matched sets and must never be interchanged. All piston ring clearances and gaps are preset and must not be altered. See *Piston and Rod Assembly*.

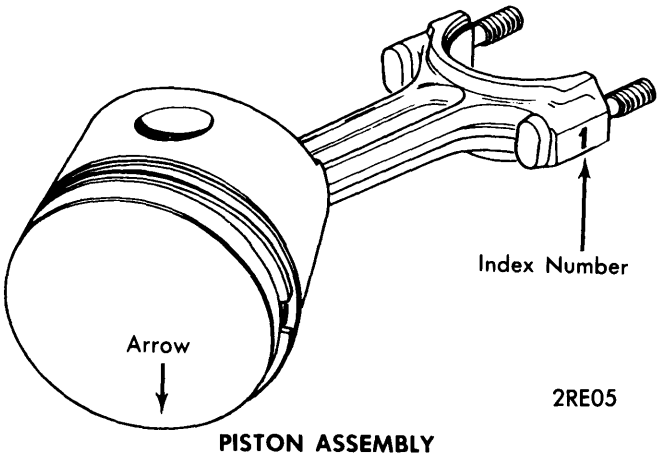
PISTON PINS

807-10 Engines – 1) Using suitable tool assembly (Mot.255) and hydraulic press, extract piston pin. Check piston rod alignment and correct any distortion. Check pin fit in new piston. Heat connecting rod to 482°F (250°C) before installing pin.

2) Lubricate piston with Molykote M55. Place connecting rod-piston assembly on support. With mandrel, hand push pin through piston, until resistance is met. Seat pin using hydraulic press. Install rings (note index marks for correct installation).

807-12/13 Engines, Removal – Remove one circlip, push out piston pin and separate piston from connecting rod. Piston pin is free floating in both piston and rod. If excess clearance exists in connecting rod, bushing must be replaced and reamed for free fit.

Installation – Install one circlip in piston and insert piston pin into piston and connecting rod. **Piston must be assembled** with arrow on piston pointing downward and number on rod facing right side when top of piston is toward installer. Install second circlip and check for binding.



PISTON ASSEMBLY

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1972-73 807	2.157 (54.80)	.....	No. 3	.002-.009 (.05-.23)	1.890 (48.00)	.....	.012-.022 (.30-.56)

MAIN BEARING SERVICE

1) With cylinder head and oil pan removed, invert engine so crankshaft is exposed. Remove connecting rod bearing caps. Mark position of main bearing caps to cylinder block. Remove all except front main bearing cap.

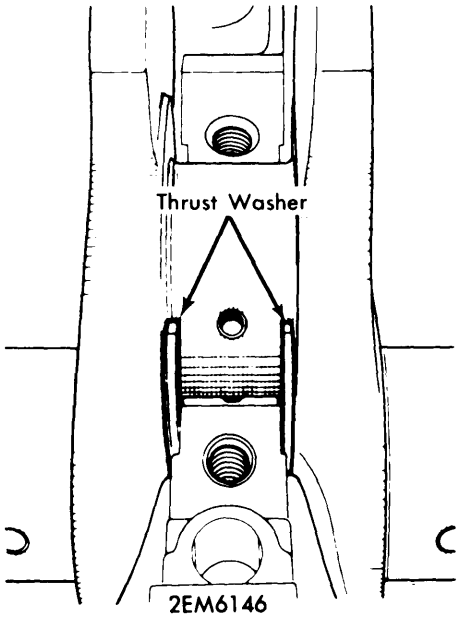
2) Push up front main bearing by lightly tapping on lower corners. Remove seal and bearing.

3) Remove crankshaft, bearings, and thrust washers. With crankshaft removed, pilot bearing can be replaced.

4) Check crankshaft, connecting rod bearings, and main bearings for wear. If crankshaft diameter is found out of tolerance, it may be ground to fit .010" undersize main and connecting rod bearings.

NOTE – Crankshaft and connecting rod journals are roll hardened.

5) Fit upper main bearings (those with oil holes). Lubricate main bearing journals and fit crankshaft into positon. Fit thrust washers, white metal toward crankshaft. Fit bearings to main bearing caps. Numbers 2, 3, 4, and 5 do not have oil holes. Fit main bearings caps into position aligned with previously made reference marks. Carefully install No. 1 main bearing cap and seals. *NOTE – Correct fit is imperative.*



THRUST WASHER INSTALLATION

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)

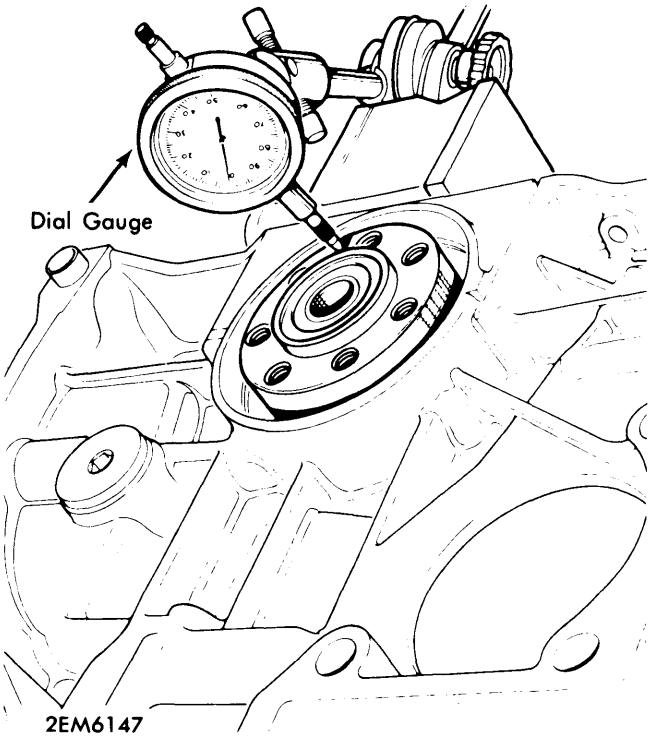
6) Fit upper connecting rod bearings and rod over crankshaft. Install rod caps and tighten to specification.

7) Using a dial gauge, check crankshaft end play. Play must not exceed .009". If correct end play is not obtained, replace thrust washers. Thrust washers are available in standard (.110"), and two oversizes (.114 and .116").

REAR MAIN BEARING OIL SEAL

NOTE – Because lip of seal is extremely delicate, exercise caution.

Fit seal on suitable tool (Mot.259-01) and lubricate outside. Install seal by lightly tapping shaft of installer tool. Seal is fully seated when tool just touches crankshaft.



MEASURING CRANKSHAFT END PLAY

TIMING CHAIN COVER OIL SEAL

Engine Installed – 1) Loosen fan belt, unlock and unscrew pulley mounting bolt. Remove pulley and extract oil seal.

2) To install seal, fit oil seal over suitable tool (Mot. 525), align seal, and screw bolt in until tool just meets timing chain cover. Reverse removal procedure for remaining components.

CAMSHAFT

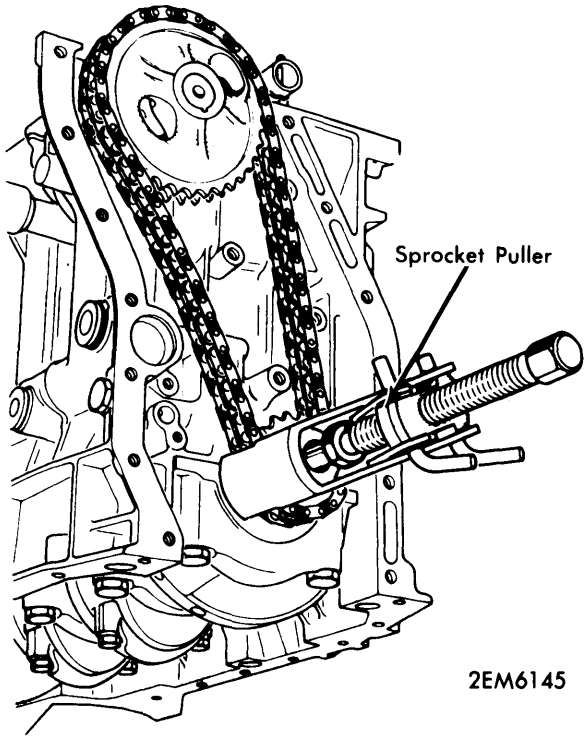
NOTE – Camshaft specifications not available at time of publication.

TIMING CHAIN

Removal – 1) With engine removed and suitably supported, remove timing cover and timing chain tensioner. Remove camshaft sprocket retaining bolts, washer and thrust ring.

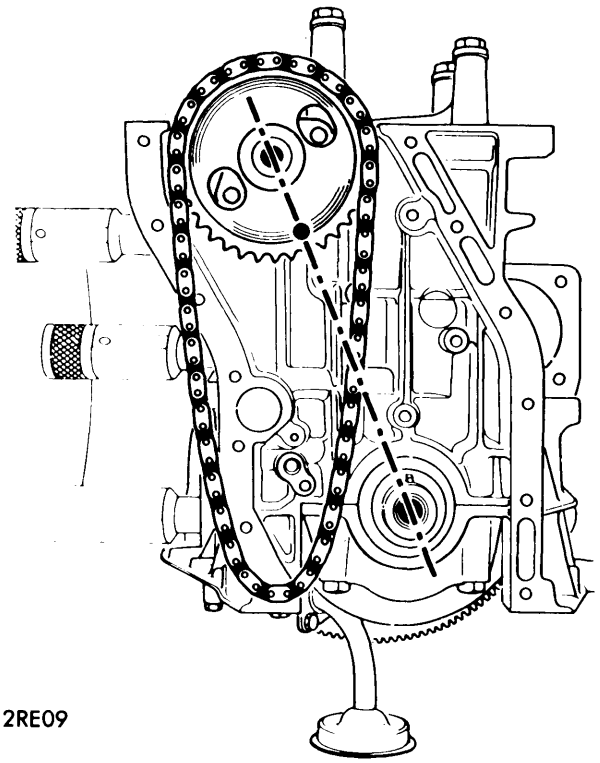
2) Remove chain damper and camshaft securing bolts. Withdraw crankshaft sprocket and chain, using suitable puller (Mot.49), while easing camshaft forward. *NOTE – It is not necessary to completely remove camshaft to remove chain.*

Installation – 1) Position chain on camshaft sprocket. Align camshaft sprocket timing mark with centers of crankshaft and camshaft. Turn crankshaft, bringing key upward.



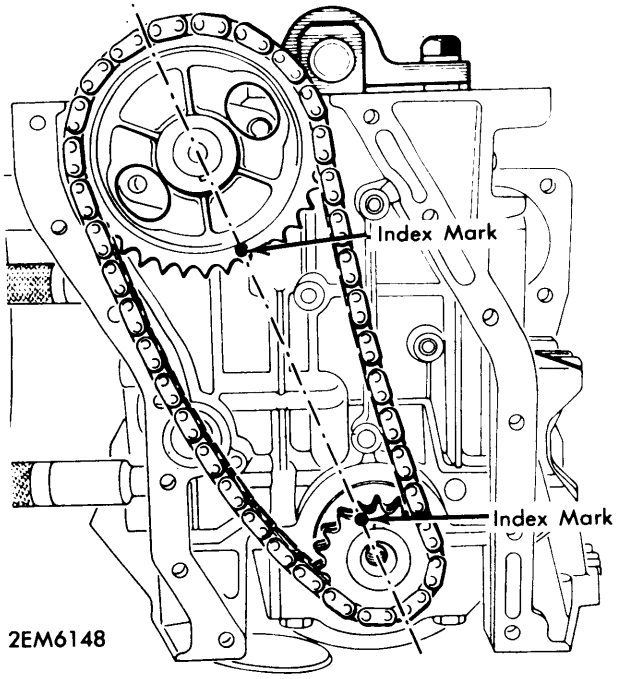
CRANKSHAFT SPROCKET REMOVAL

2) Fit crankshaft sprocket on chain (timing mark facing outward), keeping timing marks in line. Using suitable tool, install crankshaft sprocket while sliding camshaft into place.



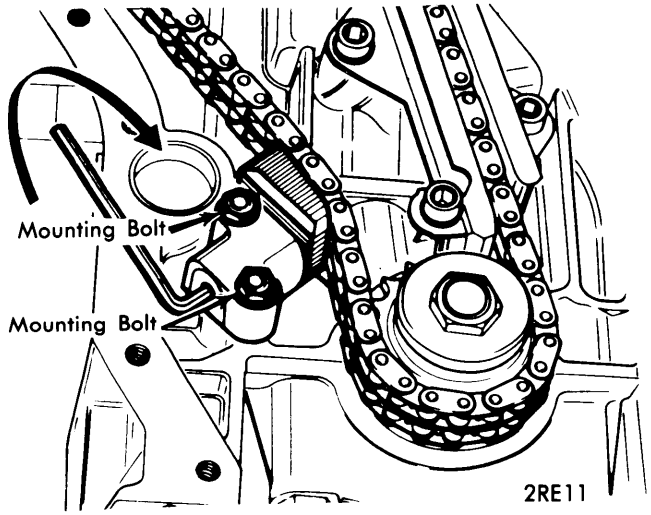
CAMSHAFT SPROCKET ALIGNMENT

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)



TIMING MARKS – CORRECT ALIGNMENT

3) Replace chain damper and camshaft securing bolts. Adjust chain tensioner, as shown in illustration. *See Valve Timing.*



TIMING CHAIN – CORRECT ADJUSTMENT

CAMSHAFT REMOVAL

1) Remove and suitably support engine. Remove (in order) cylinder head, distributor drive gear, oil pan, timing chain cover, camshaft rear bearing, timing chain and camshaft. Camshaft is secured by two bolts accessible through pulley.

NOTE – Camshaft and distributor drive gear are replaced as a set. Camshaft sprocket must be replaced at each disassembly.

2) To install, position a new flange key. Using suitable press, fit sprocket, taking load behind first camshaft bearing. Reverse removal procedure for remaining components.

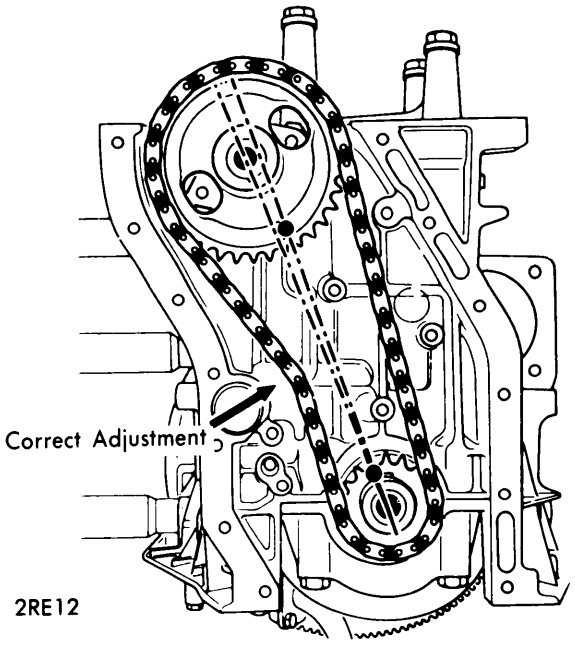
VALVE TIMING

Engine	INTAKE Open (BTDC)	INTAKE Close (ABDC)	EXHAUST Open (BBDC)	EXHAUST Close (ATDC)
1972				
807-10	24°	68°	68°	24°
807-12	40°	72°	72°	40°
1973				
807-13	40°	72°	72°	40°

VALVE TIMING

Ensure crankshaft and camshaft timing marks are aligned. Check timing chain adjustment (see illustration).

NOTE – When chain is in normal position, a line passing through timing marks will not quite bisect camshaft.



CAMSHAFT & CRANKSHAFT ALIGNMENT

1972 R-15 & 1972-73 R-17 (807) 4 CYLINDER (Cont.)

ENGINE OILING

Crankcase Capacity – Approximately 4¼ qts. With filter change add ¼ qt. With oil cooler add ½ qt.

Oil Filter – Disposable canister type.

Normal Oil Pressure – 22 psi at idle and 53 psi at 4000 RPM.

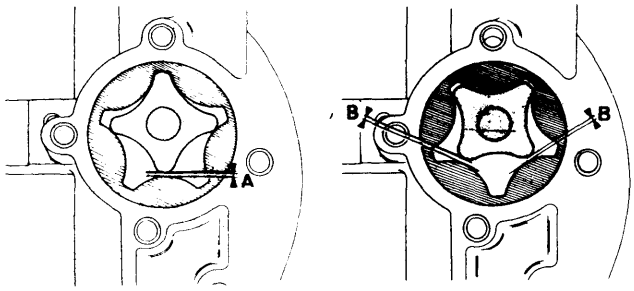
Pressure Regulator Valve – Located in oil pump.

OIL PUMP

1) With engine and oil pan removed, oil pump can be disassembled. Remove cotter pin retaining relief valve, and lift out cup, spring, spring guide, and piston.

2) Clean all parts and inspect relief valve assembly. Check inner and outer rotors for damage.

3) Measure tip clearance in both positions, as shown in illustration. Clearance in "POSITION 1" must be .002-.012" and .001-.006" in "POSITION 2". If either tolerance is exceeded, rotors must be changed.



Position 1 **Position 2**

TIP CLEARANCE

4) To reassemble, fit piston, spring guide, spring, and cup in position. Install retaining cotter pin, strainer flange seal, strainer and lock tab. Tighten all bolts.

NOTE – It is possible to remove oil pump cover and rotor without removing engine.

ENGINE COOLING

Cooling System Capacity – Approximately 7 1/4 quarts.

WATER PUMP

Disconnect battery and drain cooling system. Remove water pump and alternator drive belts. Remove all necessary water hoses. Remove both water pump and camshaft pulleys. Remove water pump. To install, reverse removal procedure.

NOTE – If water pump is hard to free, tap it with a plastic hammer.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	
Step 1	55-60 (7.6-8.3)
Step 2①	60-65 (8.3-9.0)
Intake & Exhaust Manifolds	25 (3.5)
Main Bearings	45 (6.2)
Connecting Rods	35 (4.8)
Camshaft Sprocket Bolt	15 (2.1)

① – After engine has run 10 min. and been allowed to cool exactly 50 min.