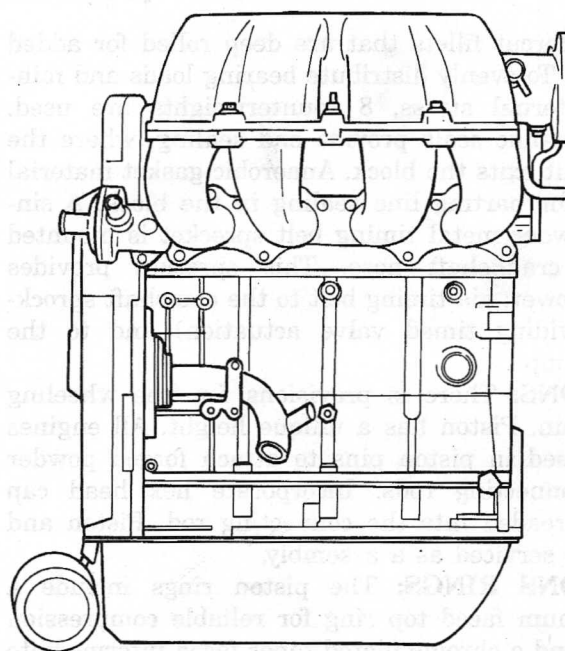
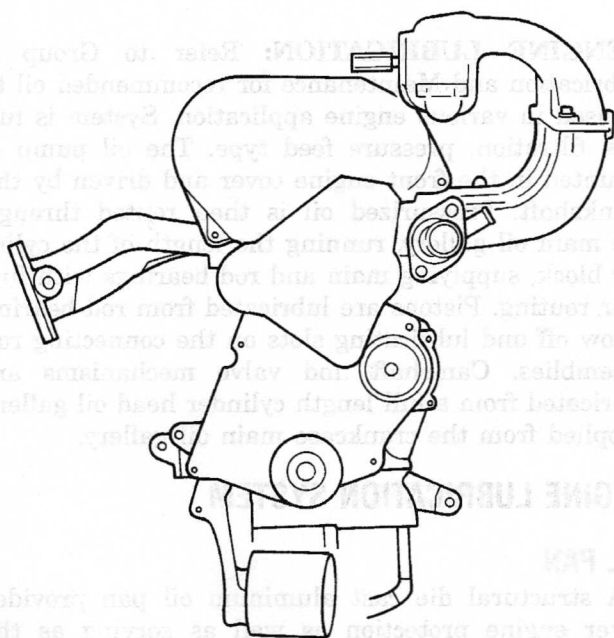


2.4L ENGINE

INDEX

	page		page
DESCRIPTION AND OPERATION		HYDRAULIC LASH ADJUSTER	85
ENGINE	67	INTAKE MANIFOLD	76
ENGINE COMPONENTS	67	OIL FILTER	97
ENGINE LUBRICATION SYSTEM	68	OIL PAN	92
GENERAL SPECIFICATIONS	67	OIL PUMP	98
DIAGNOSIS AND TESTING		PISTON AND CONNECTING ROD	99
CHECKING ENGINE OIL PRESSURE	69	TIMING BELT	89
SERVICE PROCEDURES		TIMING BELT COVER	88
CAMSHAFT END PLAY	73	TIMING BELT TENSIONER ASSEMBLY	90
CRANKSHAFT END PLAY	73	VALVE SPRINGS AND VALVE SEALS IN	
CYLINDER BORE AND SIZING PISTON	69	VEHICLE	85
FITTING CONNECTING ROD BEARINGS	70	VALVES AND VALVE SPRINGS	87
FITTING MAIN BEARINGS	71	DISASSEMBLY AND ASSEMBLY	
FITTING PISTON RINGS	69	OIL PUMP	101
REMOVAL AND INSTALLATION		CLEANING AND INSPECTION	
BALANCE SHAFTS CARRIER ASSEMBLY	82	OIL PUMP	103
CAMSHAFT	81	CAMSHAFT FOLLOWER	105
CAMSHAFT FOLLOWER	82	CRANKSHAFT	104
CAMSHAFT OIL SEAL-FRONT	93	CYLINDER BLOCK	104
CRANKSHAFT	95	CYLINDER HEAD	102
CRANKSHAFT DAMPER	88	EXHAUST MANIFOLD	101
CRANKSHAFT OIL SEAL-FRONT	94	INTAKE MANIFOLD	101
CRANKSHAFT OIL SEAL-REAR	95	VALVE AND VALVE SPRING	102
CYLINDER HEAD	86	ADJUSTMENTS	
CYLINDER HEAD COVER	80	ENGINE SUPPORT ADJUSTMENT	105
ENGINE ASSEMBLY	76	SPECIFICATIONS	
ENGINE MOUNTS-FRONT AND REAR	74	2.4L ENGINE	106
ENGINE MOUNT-LEFT	75	TORQUE CHART 2.4L	107
ENGINE MOUNT-RIGHT/ENGINE SUPPORT		SPECIAL TOOLS	
BRACKET	75	2.4L ENGINE	108
EXHAUST MANIFOLD	79		



8008a577

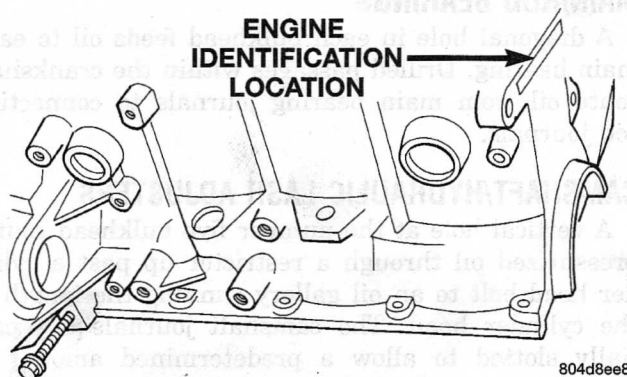
Engine-2.4L

DESCRIPTION AND OPERATION

ENGINE

ENGINE IDENTIFICATION

The engine identification number is located on the rear of the cylinder block (Fig. 1).



804d8ee8

Fig. 1 Engine Identification

GENERAL SPECIFICATIONS

2.4LENGINE _

Type	In-Line OHV, DOHC
Bore	87.5mm (3.444 in.)
Stroke	101 mm (3.976 in.)
Compression Ratio	9.4:1
Displacement	2.4 Liters (148 Cu. in.)
Firing Order	1-3-4-2
Compression Pressure.	1069 - 1172 kPa (170 - 225 psi)
Max. Variation Between Cylinders	25%
Lubrication ..	Pressure Feed-Full Flow Filtration (Direct Crankshaft. Driven Pump)

ENGINE COMPONENTS

BALANCE SHAFTS: 2.4L engines are equipped with two balance shafts installed in a carrier attached to the lower crankcase. The shafts interconnect through gears to rotate in opposite directions. These gears are driven by a short chain from the crankshaft, to rotate at two times crankshaft speed. This counterbalances certain engine reciprocating masses.

CYLINDER BLOCK AND BEDPLATE ASSEMBLY: A closed deck design is used for cooling and weight reduction with water pump molded into the block. Nominal wall thickness is 4.5 mm. The bedplate incorporates main bearing caps. Rear seal retainer is integral with the block.

CRANKSHAFT: A nodular cast iron crankshaft is used. The engine has 5 main bearings, with number 3 flanged to control thrust. The 60 mm diameter main and 50 mm diameter crank pin journals (all

DESCRIPTION AND OPERATION (Continued)

have undercut fillets that are deep rolled for added strength. To evenly distribute bearing loads and minimize internal stress, 8 counterweights are used. Hydrodynamic seals provide end sealing, where the crankshaft exits the block. Anaerobic gasket material is used for parting line sealing in the block. A sintered powder metal timing belt sprocket is mounted on the crankshaft nose. This sprocket provides motive power; via timing belt to the camshaft sprockets (providing timed valve actuation) and to the water pump.

PISTONS: There is provisions for free wheeling valve train. Piston has a unique height. All engines use pressed in piston pins to attach forged powder metal connecting rods. Incorporate hex head cap screw threaded into the connecting rod. Piston and Rods are serviced as a assembly.

PISTONS RINGS: The piston rings include a molybdenum faced top ring for reliable compression sealing and a chrome plated taper faced intermediate ring for additional cylinder pressure control. There are also standard oil control rings.

CYLINDER HEAD: Features a Dual Over Head Camshaft (DOHC) 4 valves per cylinder cross flow design. The valves are arranged in two inline banks, with the ports of the bank of two intake valves per cylinder facing toward the radiator side of engine and ports of the bank of two exhaust valves per cylinder facing toward the dash panel. Incorporates powder metal valve guides and seats. Integral oil galleries within the cylinder head supplies oil to the hydraulic lash adjusters, camshaft and valve mechanisms.

CAMSHAFTS: The nodular iron camshafts have six bearing journals and 2 cam lobes per cylinder. Flanges at the rear journals control camshaft end play. Provision for cam position sensor is located on the intake camshaft at the rear of cylinder head. A hydrodynamic oil seal is used for oil control at the front of the camshaft.

VALVES: 4 valves per cylinder are actuated by roller cam followers which pivot on stationary hydraulic lash adjusters. All valves have 6 mm diameter chrome plated valve stems. The valve sizes are 34.8 mm (1.370 inch.) diameter intake valves and 30.5 mm (1.20 inch.) diameter exhaust valves. Viton rubber valve stem seals are integral with the spring seats. Valve springs, spring retainers, and locks are conventional.

INTAKE MANIFOLD: The intake manifold is a one piece aluminum casting, attached to the cylinder head with ten screws. This long branch fan design enhances low and midspeed torque.

EXHAUST MANIFOLD: The exhaust manifold is made of cast iron for strength and high temperatures.

ENGINE LUBRICATION: Refer to Group 0 Lubrication and Maintenance for recommended oil to be used in various engine application. System is full flow filtration, pressure feed type. The oil pump is mounted in the front engine cover and driven by the crankshaft. Pressurized oil is then routed through the main oil gallery, running the length of the cylinder block, supplying main and rod bearings with further routing. Pistons are lubricated from rod bearing throw off and lubricating slots on the connecting rod assemblies. Camshaft and valve mechanisms are lubricated from a full length cylinder head oil gallery supplied from the crankcase main oil gallery.

ENGINE LUBRICATION SYSTEM**OIL PAN**

A structural die cast aluminum oil pan provides lower engine protection as well as serving as the engine oil reservoir. Oil pan is attached to block and sealed with a gasket. The oil pickup tube has a strainer and cover.

PRESSURE LUBRICATION

Oil drawn up through the pickup tube is pressurized by the pump and routed through the full flow filter to the main oil gallery running the length of the cylinder block. Oil pickup, pump and check valve provide oil flow to the main oil gallery.

MAIN/ROD BEARINGS

A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals.

CAMSHAFT/HYDRAULIC LASH ADJUSTERS

A vertical hole at the number five bulkhead routes pressurized oil through a restrictor up past a cylinder head bolt to an oil gallery running the length of the cylinder head. The camshaft journals are partially slotted to allow a predetermined amount of pressurized oil to pass into the bearing cap cavities with small holes directed to spray lubricate the camshaft lobes.

BALANCE SHAFTS

Balance shaft lubrication is provided through an oil passage from the number 1 main bearing cap through the balance shaft carrier support leg. This passage directly supplies oil to the front bearings and internal machined passages in the shafts that routes oil from front to rear shaft bearing journals.

DESCRIPTION AND OPERATION (Continued)

SPLASH LUBRICATION

Oil returning to the pan from pressurized components supplies lubrication to the valve stems. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit and install gauge assembly C-3292.

(2) Run engine until thermostat opens.

CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM

(3) Oil Pressure: Curb Idle 25 kPa (4 psi) minimum. 3000 RPM 170/550 kPa (25/80 psi).

(4) If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open or a clogged oil pickup screen.

SERVICE PROCEDURES

CYLINDER BORE AND SIZING PISTON

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin about 14 mm (9/16 inch.) from the bottom of the skirt as shown in (Fig. 3). Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line shown in (Fig. 2). Refer to for Cylinder Bore and Piston Specification Chart. Correct piston to bore clearance must be established in order to assure quiet and economical operation.

Chrysler engines use pistons designed specifically for each engine model. Clearance and sizing locations vary with respect to engine model.

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).

FITTING PISTON RINGS

(1) Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge (Fig. 4). Refer to specification in Piston Ring Specification Chart.

(2) Check piston ring to groove side clearance (Fig. 5). Refer to specification in Piston Ring Specification Chart.

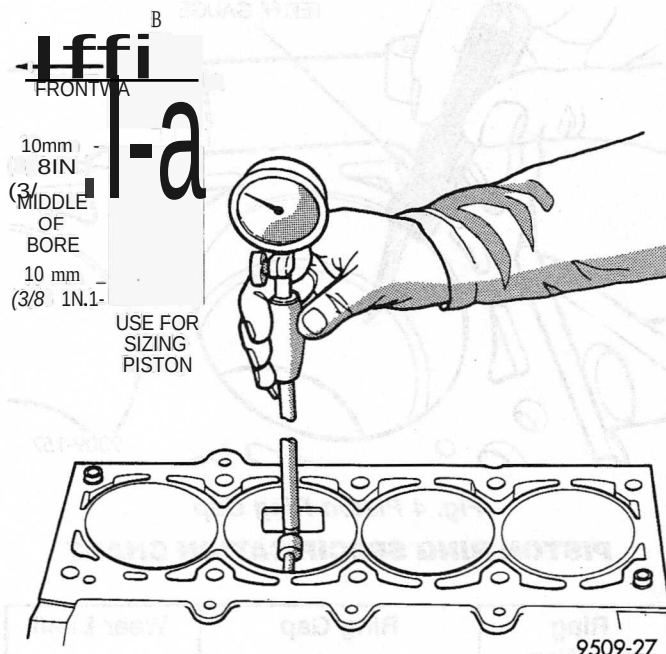


Fig. 2 Checking Cylinder Bore Size

CYLINDER BORE AND PISTON SPECIFICATION CHART

Standard Bore	Maximum Out-Of-Round	Maximum Taper
87.5 mm (3.445 in.)	0.051 mm (0.002 in.)	0.051 mm (0.002 in.)
Standard Piston Size		
87.450 - 87.468 mm (3.4434 - 3.4441 in.)		
Piston To Bore Clearance		
0.024 - 0.057 mm (0.0009 - 0.0022 in.)		
Measurements taken at Piston Size Location.		

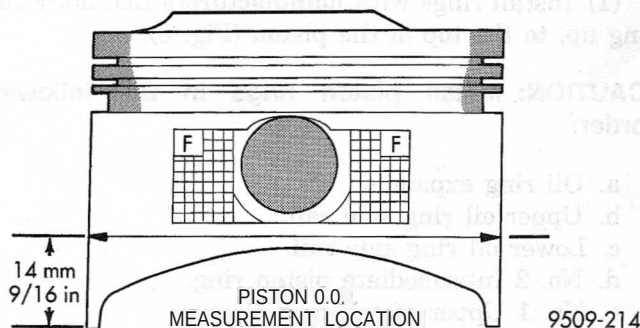


Fig. 3 Piston Measurement

SERVICE PROCEDURES (Continued)

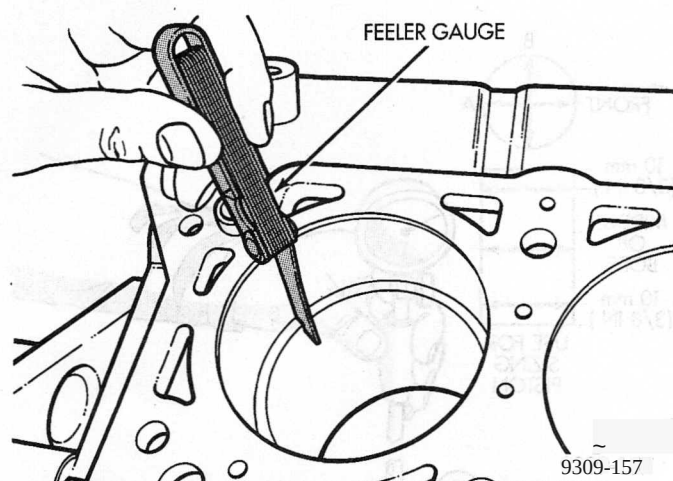


Fig. 4 Piston Ring Gap

PISTON RING SPECIFICATION CHART

Ring Position	Ring Gap	Wear Limit
Upper Ring	0.025 to 0.51 mm (0.0098 to 0.020 in.)	0.8 mm (0.031 in.)
Intermediate Ring	0.23 to 0.48 mm (0.009 to 0.018 in.)	0.8 mm (0.031 in.)
Oil Control Ring	0.25 to 0.64 mm (0.0098 to 0.025 in.)	1.0 mm (0.039 in.)
Ring Position	Groove Clearance	Max. Clearance
Upper Ring	0.030 to 0.080 mm (0.0011 to 0.0031 in.)	0.10 mm (0.004 in.)
Intermediate Ring	0.025 to 0.065 mm (0.0010 to 0.0026 in.)	0.10 mm (0.004 in.)
Oil Control Ring - Three Piece. Oil Ring Side Rails Must Be Free To Rotate After Assembly.		

PISTON RINGS-INSTALLATION

(1) Install rings with manufacturers LD. mark facing up, to the top of the piston (Fig. 6).

CAUTION: Install piston rings in the following order:

- Oil ring expander.
- Upper oil ring side rail.
- Lower oil ring side rail.
- No. 2 Intermediate piston ring.
- No. 1 Upper piston ring.

(2) Install the side rail by placing one end between the piston ring groove and the expander. Hold end firmly and press down the portion to be installed

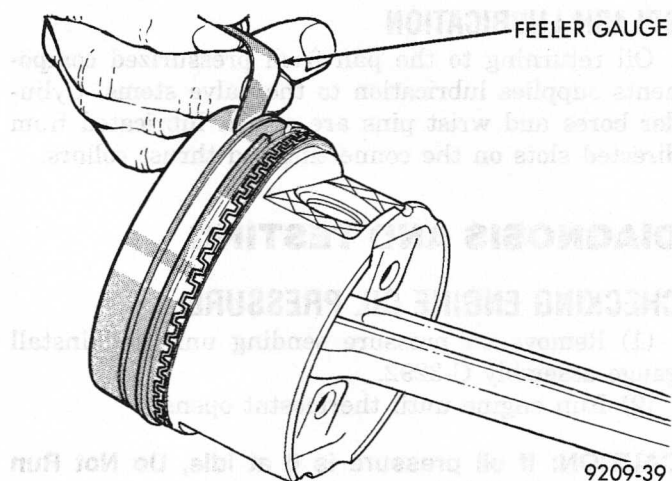


Fig. 5 Piston Ring Side Clearance

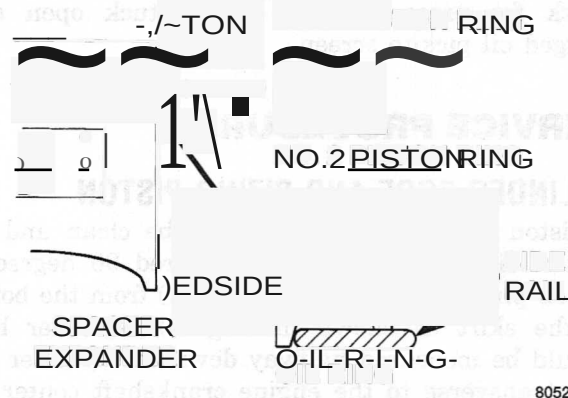


Fig. 6 Piston Ring Installation

until side rail is in position. Do not use a piston ring expander (Fig. 7).

(3) Install upper side rail first and then the lower side rail.

(4) Install No. 2 piston ring and then No. 1 piston ring.

(5) Position piston ring end gaps as shown in (Fig. 8).

(6) Position oil ring expander gap at least 45° from the side rail gaps but not on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.

FITTING CONNECTING ROD BEARINGS

Engine connecting rod bearing clearances can be determined by use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

SERVICE PROCEDURES (Continued)

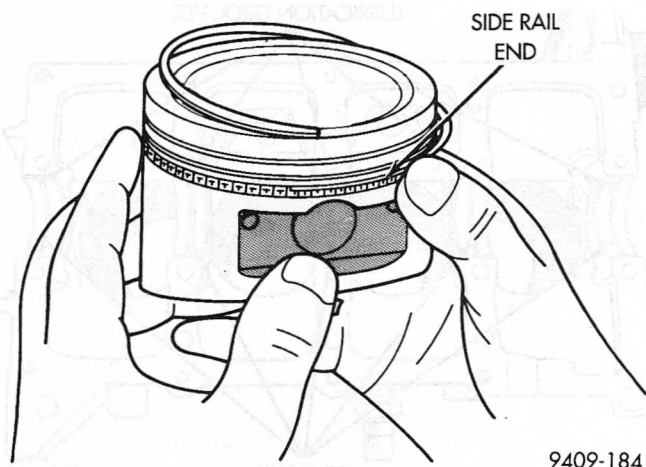


Fig. 7 Installing Side Rail

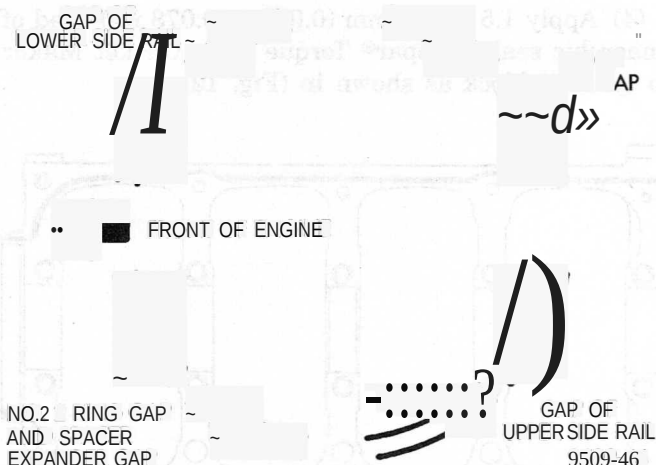


Fig. 8 Piston Ring End Gap Position

(1) Rotate the crankshaft until the connecting rod to be checked is at the bottom of its stroke.

(2) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(3) Place a piece of Plastigage across the entire width of the bearing shell in the bearing cap approximately 6.35 mm (1/4 in.) off center and away from the oil hole (Fig. 9). In addition, suspect areas can be checked by placing plastigage in the suspect area.

(4) Before assembling the rod cap with Plastigage in place, the crankshaft must be rotated until the connecting rod being checked starts moving toward the top of the engine. Only then should the cap be assembled and torqued to specifications. Do not rotate the crankshaft while assembling the cap or the Plastigage may be smeared, giving inaccurate results.

(5) Remove the bearing cap and compare the width of the flattened Plastigage (Fig. 9) with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differ-

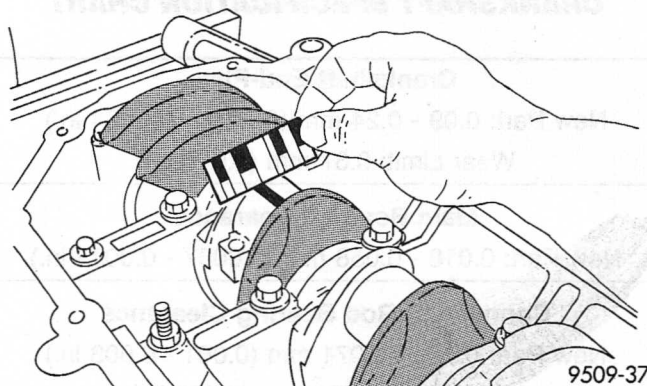


Fig. 9 Measuring Plastigage Width

ences in readings between the ends indicate the amount of taper present. Record all readings taken. Refer to Engine Specifications. Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.

(6) Plastigage is available in a variety of clearance ranges. The 0.025-0.076 mm C001-.003 in.) is usually the most appropriate for checking engine bearing proper specifications.

FITTING MAIN BEARINGS

Refer to the Engine General Information Section for Measuring Main Bearings. For Crankshaft specifications refer to Crankshaft Specification Chart.

CRANKSHAFT MAIN BEARINGS

The crankshaft is supported in five main bearings. All upper and lower bearing shells in the crankcase have oil grooves. The number three lower main thrust bearing is plain. Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal (Fig. 10).

Upper and lower Number 3 bearing halves are flanged to carry the crankshaft thrust loads and are NOT interchangeable with any other bearing halves in the engine (Fig. 10). All bearing cap bolts removed during service procedures are to be cleaned and oiled before installation. Bearing shells are available in standard and the following undersized: 0.025 mm (0.001 in.) and 0.250 mm (0.010 in.). Never install an undersize bearing that will reduce clearance below specifications.

MAIN BEARING INSTALLATION

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 11).

(2) Make certain oil holes in block line up with oil holes in bearings. Bearing tabs must seat in the block tab slots.

SERVICE PROCEDURES (Continued)

CRANKSHAFT SPECIFICATION CHART

Crankshaft End-Play	
New Part:	0.09 - 0.24 mm (0.0035 - 0.0094 in.)
Wear Limit:	0.37 mm (0.015 in.)
Main Bearing Clearance	
New Part:	0.018 - 0.058 mm (0.0007 - 0.0023 in.)
Connecting Rod Bearing Clearance	
New Part:	0.025 - 0.071 mm (0.001 - 0.003 in.)
Wear Limit:	0.075 mm (0.003 in.)
Crankshaft Journal Sizes	
Main Bearing Journal Diameter:	
Standard	60.000 $\pm$ 0.008 mm (2.3622 $\pm$ 0.0003 in.)
1st Undersize	59.975 $\pm$ 0.008 mm (2.361 $\pm$ 0.0003 in.)
Connecting Rod Journals	
Standard	49.992 $\pm$ 0.008 mm (1.968 $\pm$ 0.0003 in.)
1st Undersize	49.967 $\pm$ 0.008 mm (1.967 $\pm$ 0.0003 in.)

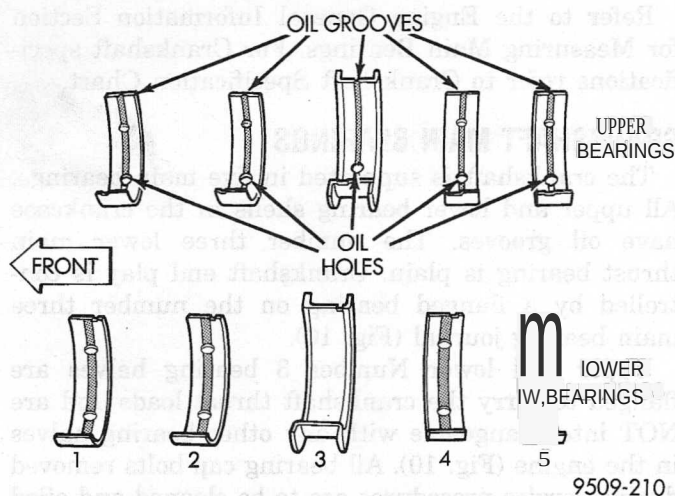


Fig. 10 Main Bearing Identification

CAUTION: Do not get oil on the bed plate mating surface. It will may effect the sealer ability to seal the bedplate to cylinder block.

(3) Oil the bearings and journals and install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bedplate or damage may occur to the engine. Ensure that both cylinder block and bedplate surfaces are clean.

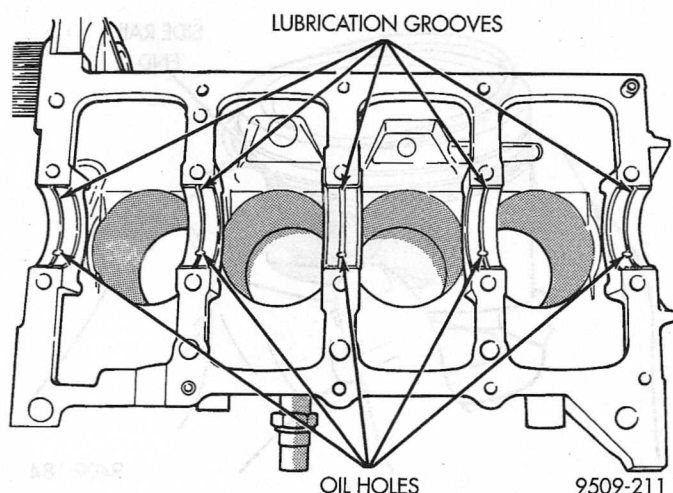


Fig. 11 Installing Main Bearing Upper Shell

(4) Apply 1.5 to 2.0 nun (0.059 to 0.078 in.) bead of anaerobic sealer Mopar® Torque Cure Gasket Maker to cylinder block as shown in (Fig. 12).

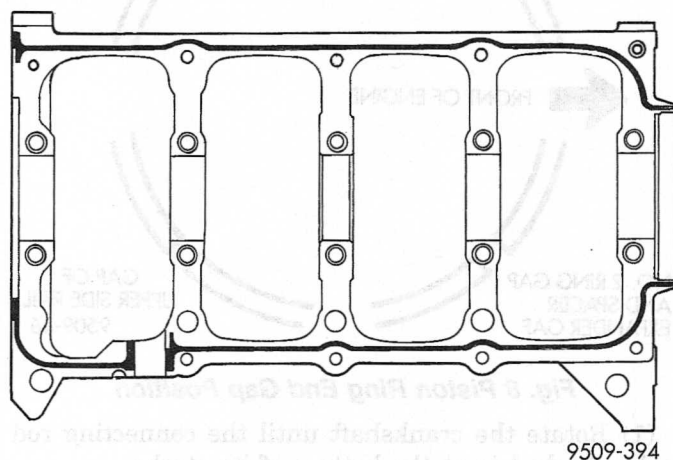


Fig. 12 Main Bearing Caps/Bedplate Sealing

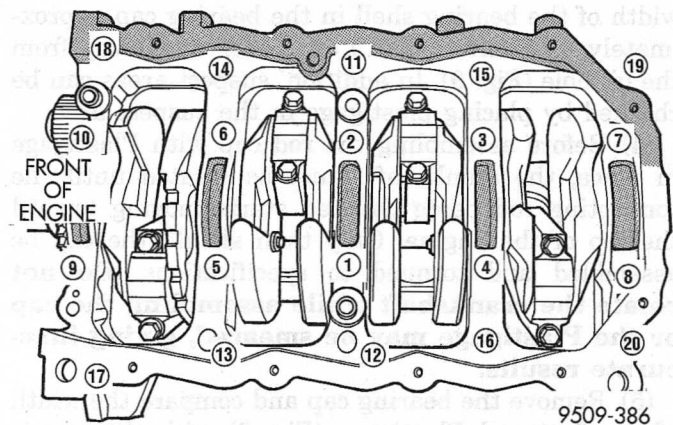


Fig. 13 Main Bearing Caps/Bedplate Torque Sequence

SERVICE PROCEDURES (Continued)

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are seated into the bedplate slots. Install the main bearing/bedplate into engine block.

(6) Before installing bolts, lubricate the threads with clean engine oil, wipe off any excess oil.

(7) Install main bearing bedplate to engine block bolts 11, 17 and 20 finger tight. Tighten these bolts down together until the bedplate contacts the cylinder block.

(8) To ensure correct thrust bearing alignment, perform the following steps:

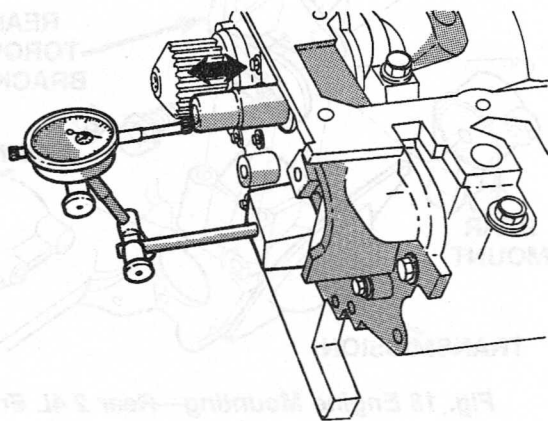
- Step 1: Rotate crankshaft until number 4 piston is at TDC.
- Step 2: Move crankshaft rearward to limits of travel.
- Step 3: Then, move crankshaft forward to limits of travel.
- Step 4: Wedge an appropriate tool between the rear of the cylinder block (**NOT BED PLATE**) and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
- Step 5: Install and tighten bolts (1 - 10) in sequence shown in (Fig. 13) to 41 N'm (30 ft. lbs.).
- Step 6: Remove wedge tool used to hold crankshaft.

(9) Tighten bolts (1 - 10) again to 41 N'm (30 ft. lbs.) + 1/4 turn in sequence shown in (Fig. 13).

(10) Install main bearing bedplate to engine block bolts (11 through 20), and torque each bolt to 28 N'm (20 ft. lbs.) in sequence shown in (Fig. 13).

(11) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N'm (50 in. lbs.).

CRANKSHAFT END PLAY



9409-189

Fig. 14 Checking Crankshaft End Play-Typical

(1) Mount a dial indicator to front of engine, locating probe on nose of crankshaft (Fig. 14).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

(4) Move crankshaft all the way to the front and read the dial indicator. Refer to Crankshaft Specification Chart for end-play specification.

CRANKSHAFT SPECIFICATION CHART

Crankshaft End-Play	
New Part:	0.09 - 0.24mm (0.0035 - 0.0094 in.)
Wear Limit:	0.37 mm (0.015 in.)

OPTIONAL CRANKSHAFT END PLAY CHECK

(1) Move crankshaft all the way to the rear of its travel using a lever inserted between a main bearing cap and a crankshaft cheek, using care not to damage any bearing surface. **DO NOT** loosen main bearing cap.

(2) Use a feeler gauge between number three thrust bearing and machined crankshaft surface to determine end play.

CAMSHAFT END PLAY

(1) Oil camshaft journals and install camshaft **WITHOUT** cam follower assemblies. Install rear cam caps and tighten screws to specified torque.

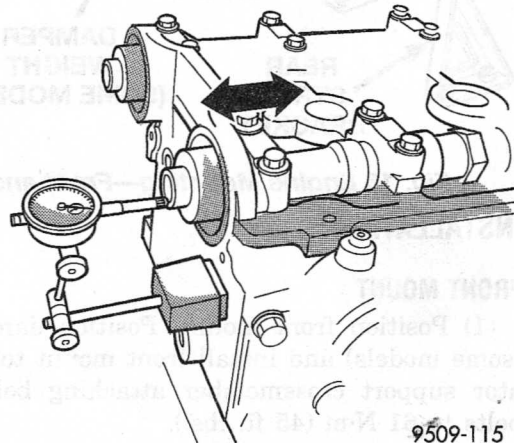
(2) Using a suitable tool, move camshaft as far rearward as it will go.

(3) Zero dial indicator (Fig. 15).

(4) Move camshaft as far forward as it will go.

(5) End play travel: 0.05 - 0.15 mm (0.002 - 0.010 in.).

(6) If end play is excessive check cylinder head and camshaft for wear; replace as necessary.



9509-115

Fig. 15 Camshaft End Play

REMOVAL AND INSTALLATION**ENGINE MOUNTS-FRONT AND REAR****REMOVAL****FRONT MOUNT**

- (1) Raise vehicle on hoist.
- (2) Remove through bolt at front mount (Fig. 17).
- (3) Remove attaching bolts from mount to lower radiator support.

NOTE: It may be necessary to tilt engine for front mount removal clearance.

- (4) Remove mount.

REAR MOUNT

- (1) Raise vehicle on hoist.
- (2) Remove through bolt (A) from rear engine mount and bracket (Fig. 18).
- (3) Remove rear strut bracket and brace (Fig. 16).
- (4) Remove bolts attaching rear mount to suspension crossmember.

NOTE: It may be necessary to tilt engine for rear mount removal clearance.

- (5) Remove rear mount.

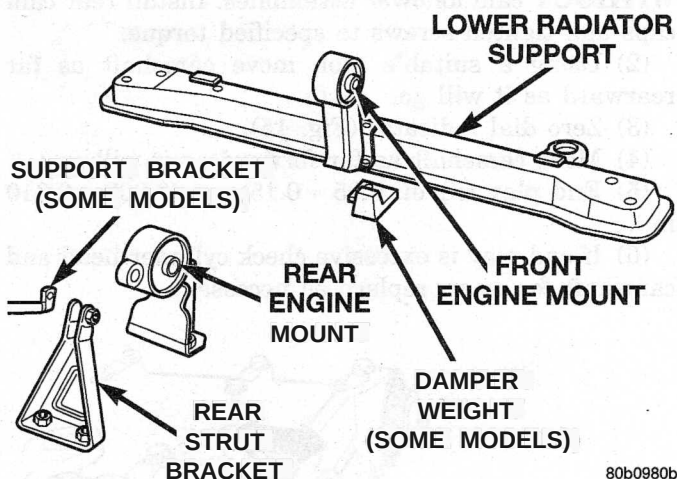
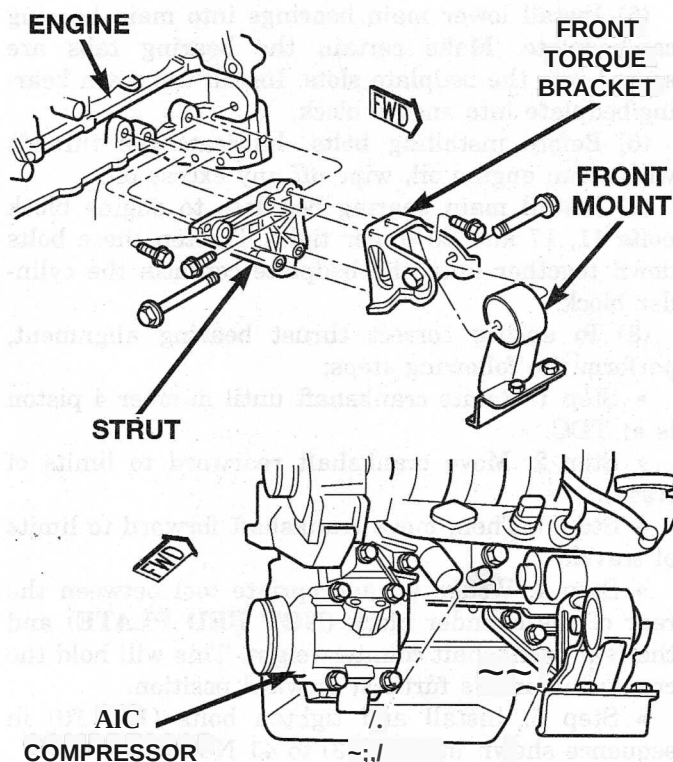


Fig. 16 Engine Mounting-Front and Rear

INSTALLATION**FRONT MOUNT**

- (1) Position front mount. Position damper weight (some models) and install front mount to lower radiator support crossmember attaching bolts. Tighten bolts to 61 N·m (45 ft. lbs.).
- (2) Install through bolt and tighten to 61 N·m (45 ft. lbs.) (Fig. 17).
- (3) Lower vehicle.



STRUT (SOME MODELS)---

80b0980c

Fig. 17 Engine Mounting—Front 2.4L Engine

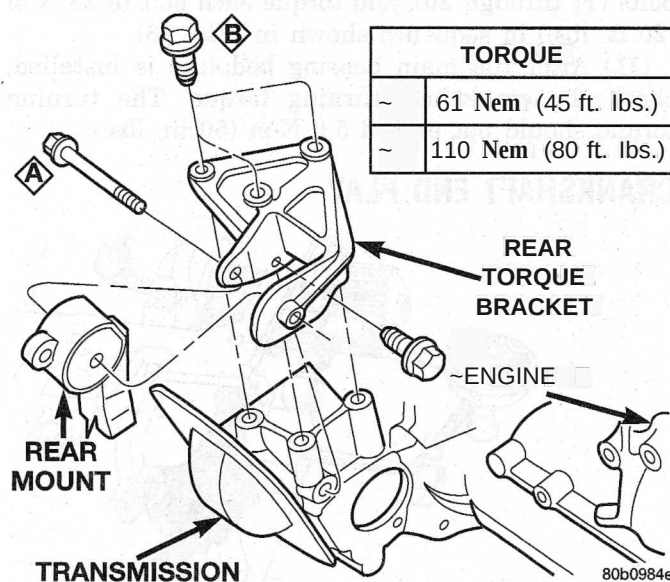


Fig. 18 Engine Mounting-Rear 2.4L Engine

REAR MOUNT

- (1) Position rear mount.
- (2) Install bolts attaching rear mount to crossmember. Tighten bolts to 61 N·m (45 ft. lbs.).
- (3) Install rear strut and support brackets (Fig. 16). Tighten bolts to the following torque values:

REMOVAL AND INSTALLATION (Continued)

- Bolts attaching strut bracket to front suspension crossmember: 61 N·m (45 ft. lbs.)
 - Nut attaching support bracket to front suspension crossmember: 108 N·m (80 ft. lbs.)
 - Bolt attaching support bracket to rear strut: 61 N·m (45 ft. lbs.)
- (4) Tighten through bolt (A) at rear mount to 61 N·m (45 ft. lbs.) (Fig. 18).
 - (5) Lower vehicle.

ENGINE MOUNT-RIGHT/ENGINE SUPPORT BRACKET

NOTE: The right side engine mount is a Hydro-Mount and may show surface cracks. This will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

- (1) Raise vehicle on a hoist and remove inner splash shield. Remove the right engine support assembly vertical fasteners from frame rail (Fig. 19).
- (2) Lower vehicle. Remove the load on the engine motor mounts by carefully supporting the engine assembly with a floor jack.
- (3) Remove the three bolts attaching the engine support assembly to the engine bracket.
- (4) Move the air conditioning dryer aside.
- (5) Remove coolant recovery system tank. Refer to Group 7, Cooling System for procedure.
- (6) Remove right engine support.
- (7) Remove the three bolts attaching the engine support bracket to the cylinder block.

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section:

- (8) Reverse removal procedure for installation. Refer to (Fig. 19) for torque specifications.

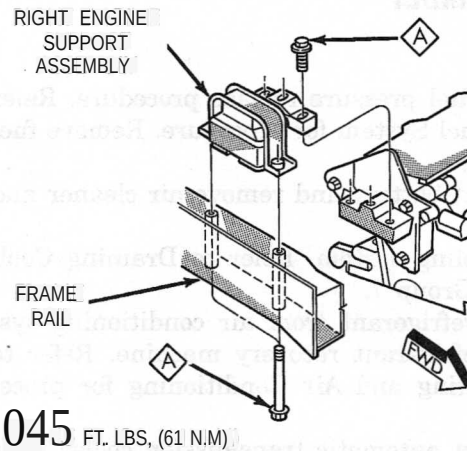
ENGINE MOUNT—LEFT

NOTE: If centering or adjusting the engine/transmission assembly is needed refer to Adjustments, in this section.

The left side engine mount is a Hydro-Mount and may show surface cracks. This will not effect it's performance and should not be replaced. Only replace the Hydro-Mount when it's leaking fluid.

REMOVAL

- (1) Support the transmission with a transmission jack.
- (2) Remove the three vertical bolts (A) from the mount to the transmission bracket (Fig. 20).



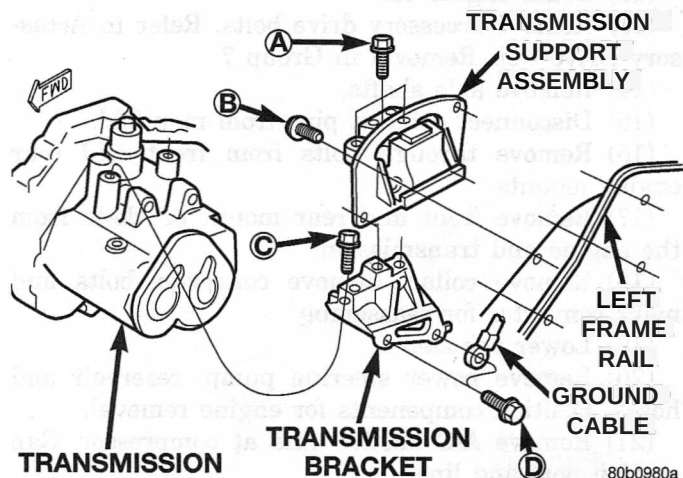
9509-276

Fig. 19 Engine Mounting-Right Side

- (3) Remove the mount to frame rail fasteners (B) and remove mount (Fig. 20).

INSTALLATION

- (1) Install mount. Tighten mount to frame rail fasteners (B) to 33 N·m (24 ft. lbs.).
- (2) Install mount to transmission bracket vertical bolts (A). Tighten to 61 N·m (45 ft. lbs.).



80b0980a

Fig. 20 Left Side Mount—Typical

ITEM	DESCRIPTION	TORQUE
A	Bolt	61 N·m (45 ft. lbs.)
B	Bolt	33 N·m (24 ft. lbs.)
C	Bolt	61 N·m (45 ft. lbs.)
D	Bolt	61 N·m (45 ft. lbs.)

REMOVAL AND INSTALLATION (Continued)**ENGINE ASSEMBLY****REMOVAL**

(1) Perform fuel pressure release procedure. Refer to Group 14, Fuel System for procedure. Remove fuel line to fuel rail.

(2) Disconnect battery and remove air cleaner and hoses.

(3) Drain cooling system. Refer to Draining Cooling System in Group 7.

(4) Remove refrigerant from air conditioning system using a refrigerant recovery machine. Refer to Group 24, Heating and Air Conditioning for procedures.

(5) Disconnect automatic transmission cooler lines and plug, if equipped.

(6) Remove cooling module assembly (radiator, fan module, and condenser).

(7) Disconnect transmission shift linkage.

(8) Disconnect throttle body linkage.

(9) Disconnect engine and transmission wiring harness.

(10) Disconnect heater hoses.

(11) Hoist vehicle and remove right inner splash shield. Remove battery splash shield.

(12) Drain engine oil.

(13) Remove accessory drive belts. Refer to Accessory Drive Belt Removal in Group 7.

(14) Remove axle shafts.

(15) Disconnect exhaust pipe from manifold.

(16) Remove through bolts from front and rear engine mounts.

(17) Remove front and rear mount brackets from the engine and transmission.

(18) Remove collar. Remove converter bolts and mark converter for reassembly.

(19) Lower vehicle.

(20) Remove power steering pump, reservoir and hoses. Position components for engine removal.

(21) Remove NC suction line at compressor. Cap suction port and line.

(22) Remove ground straps to body.

(23) Raise vehicle enough to allow engine dolly 6135 and cradle 6710 with posts 6848 to be installed under vehicle (Fig. 21).

(24) Loosen cradle engine mounts to allow movement for positioning onto engine locating holes on the engine bedplate, compressor and support bracket. Install adapters 6909 to the two post at rear of engine. Lower vehicle and position cradle mounts until the engine is resting on mounts. Tighten mounts to cradle frame. This will keep mounts from moving when removing or installing engine and transmission.

(25) Lower vehicle so weight of the engine and transmission ONLY is on the cradle.

(26) Remove engine and transmission mount bolts.

(27) Raise vehicle slowly. It may be necessary to move the engine/transmission assembly on the cradle to allow for removal around body flanges.

INSTALLATION

(1) Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine and transmission.

(2) Align engine and transmission mounts to attaching points. Install mounting bolts at the right engine and left transmission mounts. Refer to procedures outlined in this section.

(3) Slowly raise vehicle enough to remove the engine dolly and cradle Special Tools 6135 and 6710.

(4) Install axle shafts.

(5) Install torque converter bolts and collar.

(6) Install through bolts to front and rear engine mounts.

(7) Connect exhaust system to manifold.

(8) Install power steering pump, reservoir and hoses.

(9) Install NC suction line at compressor.

(10) Install accessory drive belts. Refer to Accessory Drive Belt Installation in Group 7.

(11) Install right inner splash shield and battery splash shield. Install wheels and tires.

(12) Install cooling module assembly (radiator, fan module, and condenser).

(13) Evacuate and charge air conditioning system. Refer to Group 24, Heating and Air Conditioning for procedures.

(14) Connect automatic transmission cooler lines and shift linkage.

(15) Connect fuel line and heater hoses.

(16) Install ground straps. Connect engine and throttle body connections and harnesses.

(17) Connect throttle body linkage.

(18) Fill cooling system.

(19) Connect battery.

(20) Install air cleaner and hoses.

(21) Install oil filter. Fill engine crankcase with proper oil to correct level.

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

(23) Adjust transmission linkage, if necessary.

INTAKE MANIFOLD**FUEL SYSTEM PRESSURE RELEASE PROCEDURE**

WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING SYSTEM COMPONENTS. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.

REMOVAL AND INSTALLATION (Continued)

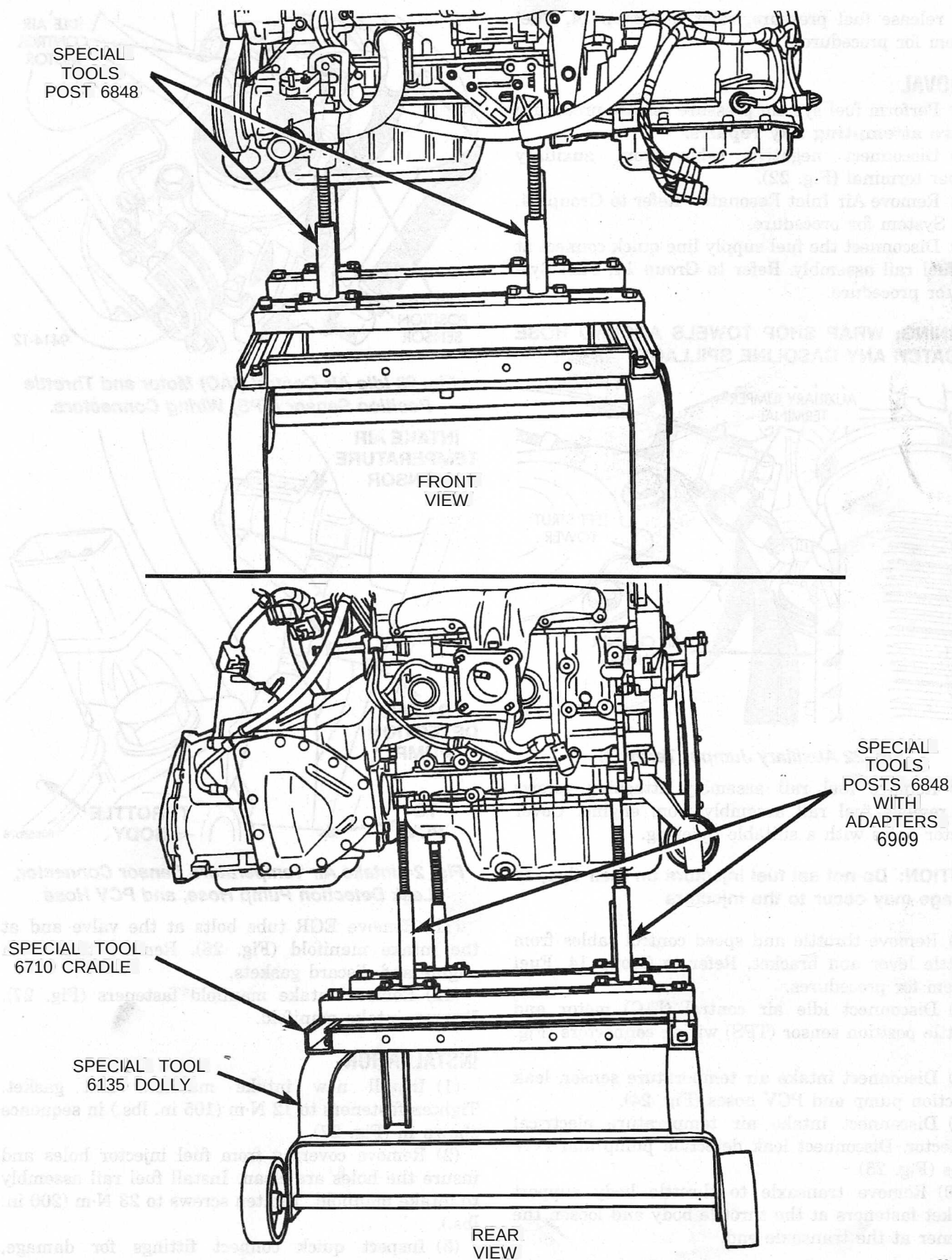


Fig. 21 Positioning Engine Cradle Support Post Mounts

REMOVAL AND INSTALLATION (Continued)

To release fuel pressure, refer to Group 14, Fuel System for procedure.

REMOVAL

(1) Perform fuel system pressure release procedure **before attempting any repairs.**

(2) Disconnect negative cable from auxiliary jumper terminal (Fig. 22).

(3) Remove Air Inlet Resonator. Refer to Group 14, Fuel System for procedure.

(4) Disconnect the fuel supply line quick connect at the fuel rail assembly. Refer to Group 14, Fuel System for procedure.

WARNING: WRAP SHOP TOWELS AROUND HOSE TO CATCH ANY GASOLINE SPILLAGE.

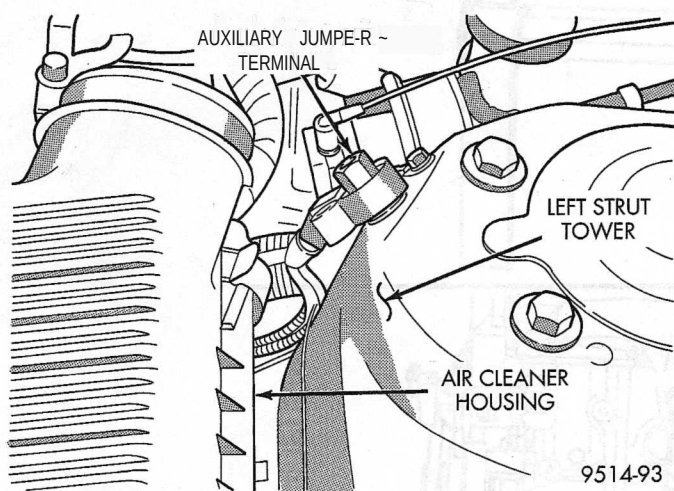


Fig. 22 Auxiliary Jumper Terminal

(5) Remove fuel rail assembly attaching screws and remove fuel rail assembly from engine. Cover injector holes with asuitable covering.

CAUTION: Do not set fuel injectors on their tips, as damage may occur to the injectors

(6) Remove throttle and speed control cables from throttle lever and bracket. Refer to Group 14, Fuel System for procedures.

(7) Disconnect idle air control (IAC) motor and throttle position sensor (TPS) wiring connectors (Fig. 23).

(8) Disconnect intake air temperature sensor, leak detection pump and PCV hoses (Fig. 24).

(9) Disconnect intake air temperature electrical connector. Disconnect leak detection pump and PCV hoses (Fig. 25).

(10) Remove trans axle to throttle body support bracket fasteners at the throttle body and loosen the fastener at the trans axle end.

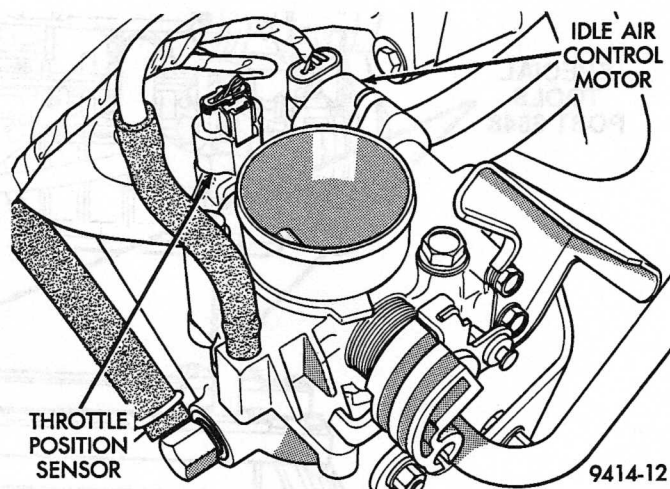


Fig. 23 Idle Air Control (IAC) Motor and Throttle Position Sensor (TPS) Wiring Connectors.

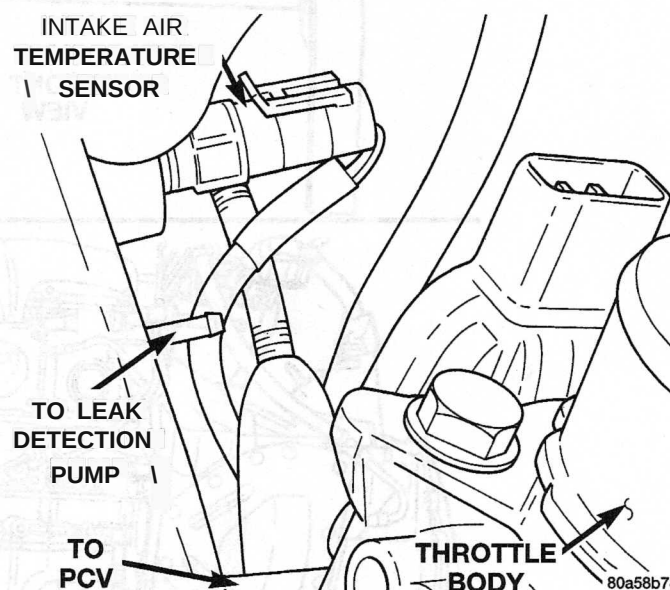


Fig. 24 Intake Air Temperature Sensor Connector, Leak Detection Pump Hose, and PCV Hose

(11) Remove EGR tube bolts at the valve and at the intake manifold (Fig. 26). Remove tube from engine and discard gaskets.

(12) Remove intake manifold fasteners (Fig. 27). Remove intake manifold.

INSTALLATION

(1) Install new intake manifold and gasket. Tighten fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 27).

(2) Remove covering from fuel injector holes and insure the holes are clean. Install fuel rail assembly to intake manifold. Tighten screws to 23 N·m (200 in. lbs.).

(3) Inspect quick connect fittings for damage, replace if necessary. Refer to Group 14, Fuel System for procedure. Lubricate tube with clean engine oil.

REMOVAL AND INSTALLATION (Continued)

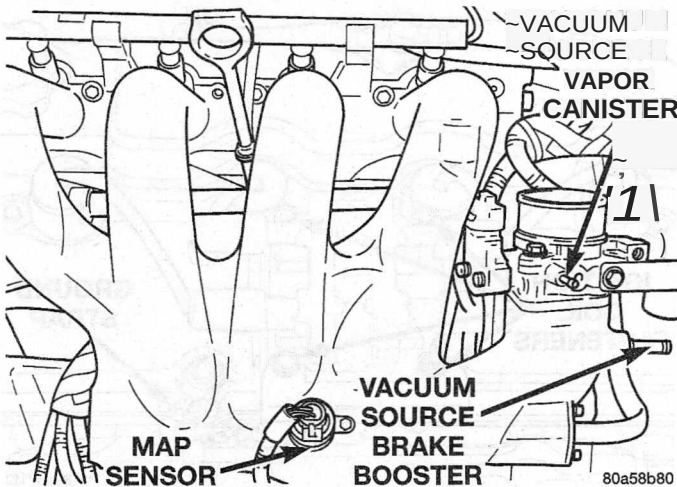


Fig. 25 Manifold Absolute Pressure (MAP), Vapor Canister Hose, and Brake Booster Hose

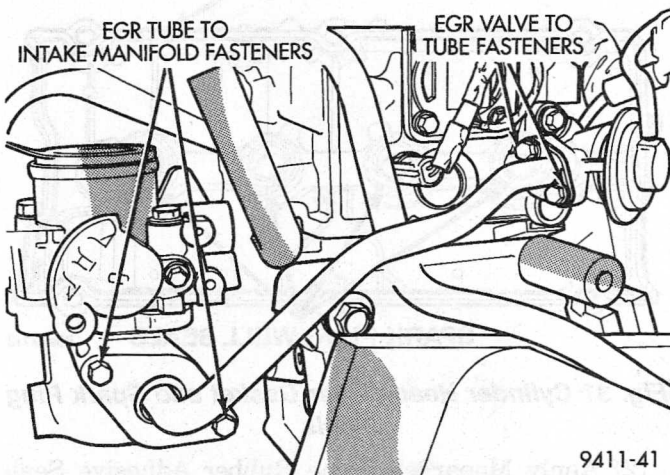


Fig. 26 Tube Assembly—Typical

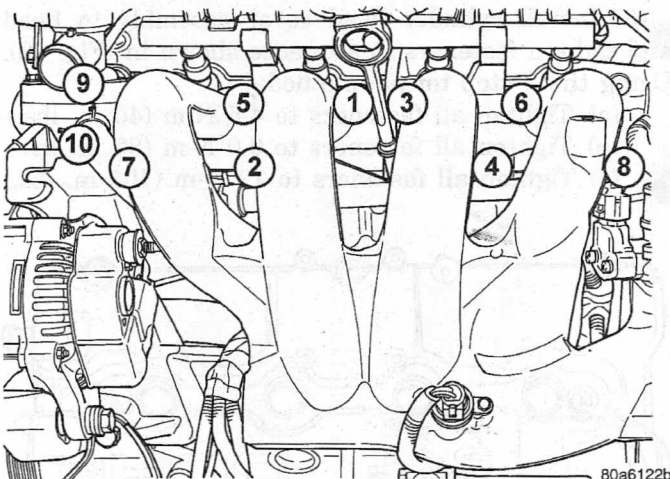


Fig. 27 Intake Manifold Tightening Sequence-2.4L Engine

Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.

(4) Install throttle body. Tighten fastener to 22 N·m (200 in. lbs.). Install transaxle to throttle body support bracket and tighten to 12 N·m (105 in. lbs.) at the throttle body first. Next tighten the bracket at the transaxle.

(5) Connect PCV; leak detection pump hoses, and intake air temperature sensor wiring connectors (Fig. 24).

(6) Connect Manifold Absolute Pressure (MAP) electrical connector, vapor canister hose, and brake booster hose (Fig. 25).

(7) Connect knock sensor electrical and starter relay connectors. Connect wiring harness to intake manifold tab.

(8) Connect Idle Air Control (IAC) motor and Throttle Position Sensor (TPS) wiring connectors (Fig. 23).

(9) Install throttle and speed control cables to bracket. Connect cables to the throttle lever. Refer to Group 14, Fuel System Throttle Body Installation procedure.

(10) Position new EGR tube gaskets and loosely assemble the EGR tube onto valve and intake manifold (Fig. 26). First tighten tube fasteners at the EGR valve to 11 N·m (95 in. lbs.). Then, tighten the intake manifold side fasteners to 11 N·m (95 in. lbs.).

(11) Connect negative cable to auxiliary jumper terminal (Fig. 22).

(12) With the DRB scan tool use ASD Fuel System Test to pressurize system to check for leaks.

CAUTION: When using the ASD Fuel System Test, the Auto Shutdown (ASO) relay will remain energized for 7 minutes or until the ignition switch is turned to the OFF position, or Stop All Test is selected.

EXHAUST MANIFOLD

REMOVAL

(1) Remove exhaust pipe from manifold. It may be necessary to remove the entire exhaust system. Refer to Group 11, Exhaust System for procedure.

(2) Remove exhaust manifold heat shield (Fig. 28).

(3) Remove 8 exhaust manifold retaining fasteners and remove exhaust manifold (Fig. 29).

INSTALLATION

(1) Install new manifold gasket. **DO NOT APPLY SEALER.**

(2) Position exhaust manifold in place. Tighten fasteners, starting at center and progressing outward in

REMOVAL AND INSTALLATION (Continued)

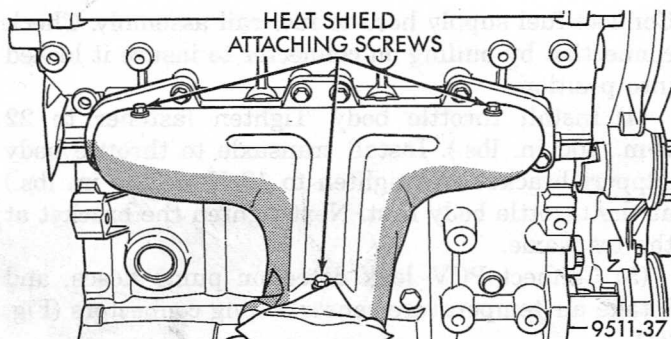


Fig. 28 Exhaust Manifold Heat Shield

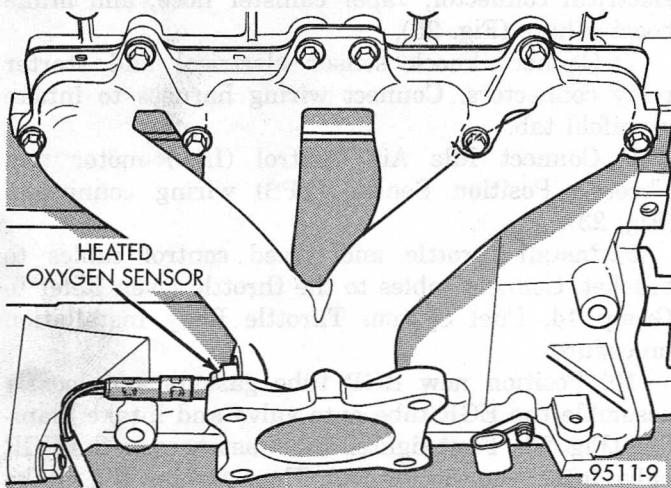


Fig. 29 Exhaust Manifold

both directions to 23 N·m (200 in. lbs.). Repeat this procedure until all fasteners are at specified torque.

(3) Install exhaust manifold heat shield.

(4) Attach exhaust pipe and tighten fasteners to 28 N·m (250 in. lbs.)

CYLINDER HEAD COVER

REMOVAL

(1) Remove ignition coil pack and plug wires (Fig. 30). Remove ground strap.

(2) Remove the cylinder head cover fasteners.

(3) Remove cylinder head cover from cylinder head.

INSTALLATION

NOTE: Replace spark plug well seals when installing a new cylinder head cover gasket.

(1) Install new cylinder head cover gaskets and spark plug seals (Fig. 31).

Do not allow oil or solvents to contact the timing belt as they can deteriorate the rubber and cause tooth skipping.

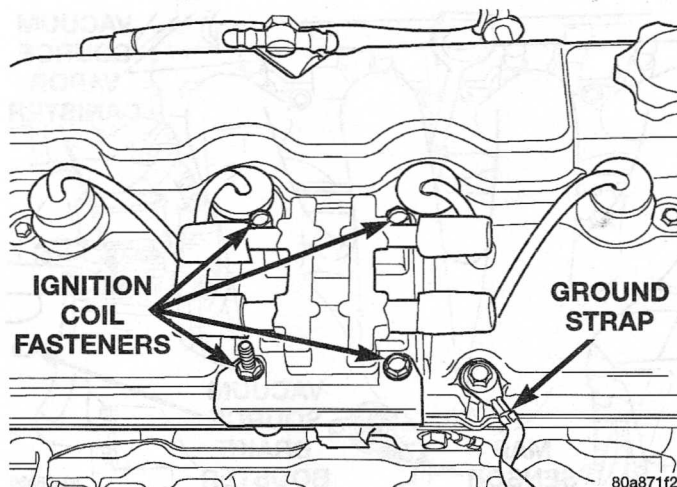


Fig. 30 Ignition Coil Pack and Ground Strap

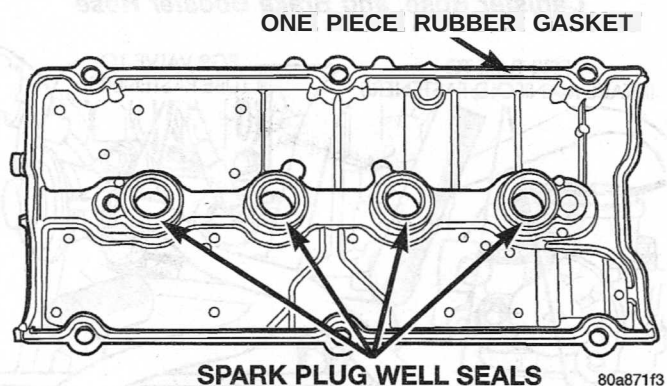


Fig. 31 Cylinder Head Cover Gasket and Spark Plug Seals

(2) Apply Mopar® Silicone Rubber Adhesive Sealant at the camshaft cap corners and at the top edge of the 1/2 round seal.

(3) Install cylinder head cover assembly to head and tighten fasteners in sequence shown in (Fig. 32). Using the 3 step torque method:

- Tighten all fasteners to 4.5 N·m (40 in. lbs.)
- Tighten all fasteners to 9.0 N·m (80 in. lbs.)
- Tighten all fasteners to 12 N·m (105 in. lbs.)

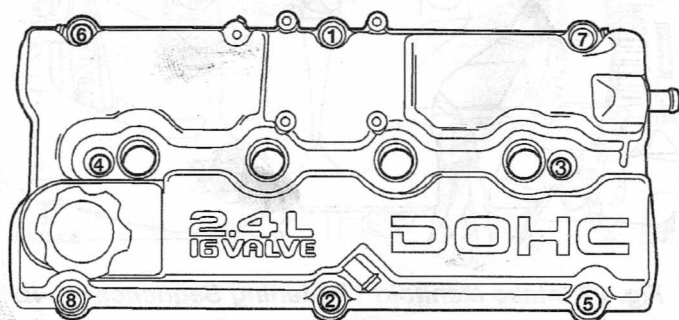


Fig. 32 Cylinder Head Cover Tightening Sequence

REMOVAL AND INSTALLATION (Continued)

- (4) Install ignition coil pack and plug wires. Tighten fasteners to 12 N·m (105 in. lbs.).
- (5) Install ground strap.

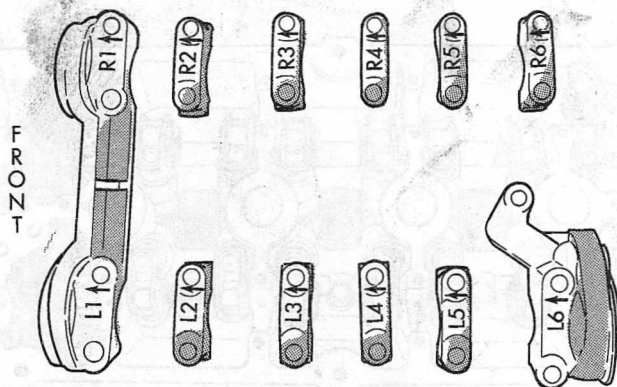
CAMSHAFT

REMOVAL

- (1) Remove cylinder head cover using procedure in this section.
- (2) Remove timing belt, sprockets and covers. Refer to Timing Belt Service in this section.
- (3) Bearing caps are identified for location. Remove the outside bearing caps first (Fig. 33).
- (4) Loosen the camshaft bearing cap attaching fasteners in sequence shown (Fig. 34) one camshaft at a time.

CAUTION: Camshafts are not interchangeable. The intake cam number 6 thrust bearing face spacing is wider.

- (5) Identify the camshafts before removing from the head. The camshafts are not interchangeable.

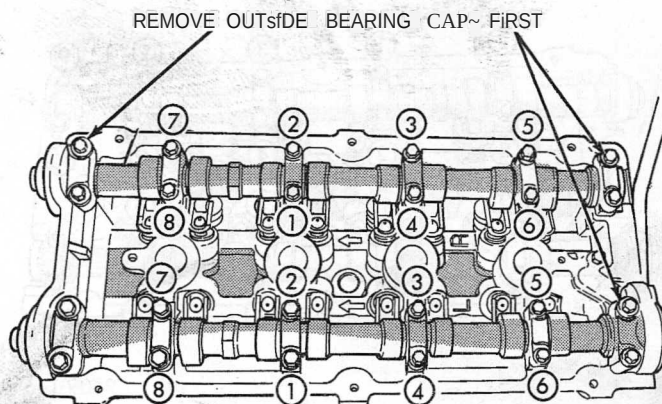


9509-112

Fig. 33 Camshaft Bearing Cap Identification

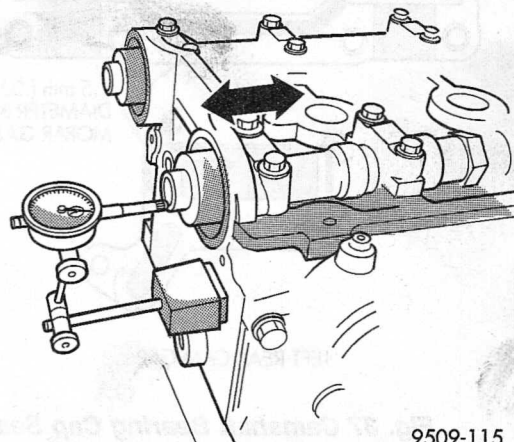
CAMSHAFT END PLAY

- (1) Oil camshaft journals and install camshaft **WITHOUT** cam follower assemblies. Install rear cam caps and tighten screws to specified torque.
- (2) Using a suitable tool, move camshaft as far rearward as it will go.
- (3) Zero dial indicator (Fig. 35).
- (4) Move camshaft as far forward as it will go.
- (5) End play travel: 0.05-0.15 mm (0.002-0.010 in.).
- (5) If end play is excessive check cylinder head and camshaft for wear; replace as necessary.



9509-113

Fig. 34 Camshaft Bearing Cap—Removal



9509-115

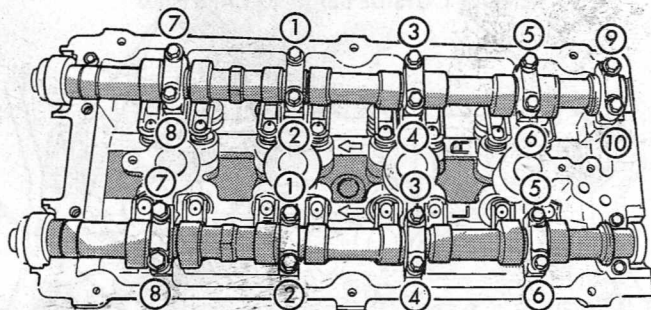
Fig. 35 Camshaft End Play

INSTALLATION

CAUTION: Ensure that **NONE** of the pistons are at top dead center when installing the camshafts.

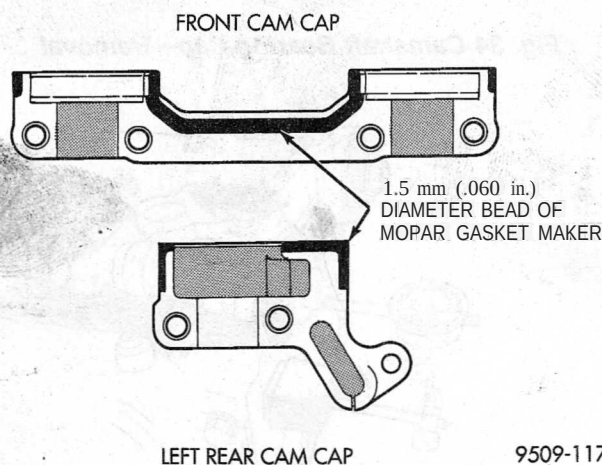
- (1) Remove camshaft retaining caps and lubricate bearing journals. Install cam followers and camshafts with clean oil. Install right and left camshaft bearing caps #2 thru #5 and ~~ng~~ #6. Tighten M6 fasteners to 12 N·m (105 in. lbs.) in sequence shown in (Fig. 36).
- (2) Apply Mopar® Gasket Maker to No. 1 and No. 6 bearing caps (Fig. 37). Install bearing caps and tighten M8 fasteners to 28 N·m (250 in. lbs.).
- (3) Bearing end caps must be installed before seals can be installed.
- (4) Install timing belt, sprockets and covers. Refer to timing belt service in this section.
- (5) Install cylinder head cover using procedure in this section.

REMOVAL AND INSTALLATION (Continued)



9509-116

Fig. 36 Camshaft Bearing Cap Tightening Sequence



9509-117

Fig. 37 Camshaft Bearing Cap Sealing

CAMSHAFT FOLLOWER

REMOVAL

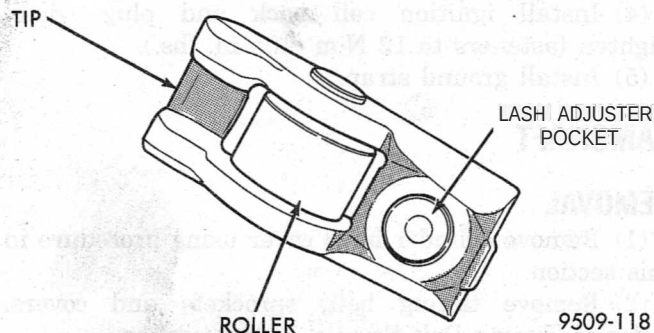
- (1) Remove cylinder head cover using procedure in this section.
- (2) Remove timing belt, sprockets and covers using procedure in this section.
- (3) Remove camshaft. Refer to procedure in this section.

CAUTION: If cam follower assemblies are to be reused, always mark position for reassembly in their original positions.

- (4) Remove cam follower assemblies from cylinder head.

INSPECTION

Inspect the cam follower assembly for wear or damage (Fig. 38). Replace as necessary.

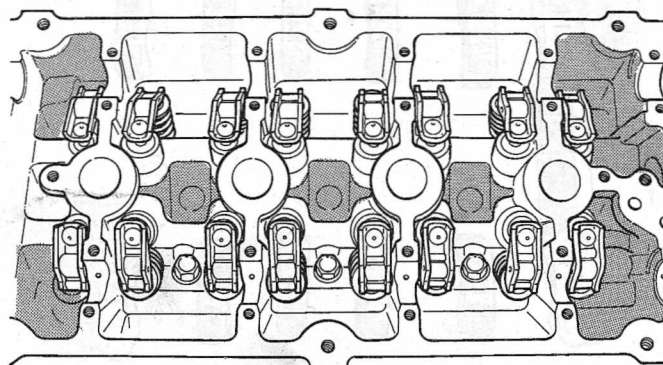


9509-118

Fig. 38 Cam Follower Assembly

INSTALLATION

- (1) Lubricate with clean oil and install cam follower assemblies in their original position on the hydraulic adjuster and valve stem (Fig. 39).
- (2) Install the camshafts. Refer to procedure in this section.
- (3) Install timing belt, sprockets and covers using procedures in this section.
- (4) Install cylinder head cover using procedure in this section.



9509-119

Fig. 39 Cam Follower Assemblies-Installation

BALANCE SHAFTS CARRIER ASSEMBLY

BALANCE SHAFTS

REMOVAL

- (1) Drain engine oil and remove oil pan. Refer to procedures in this section.
- (2) Remove chain cover, guide and tensioner (Fig. 40). Also see Carrier Assembly Removal for service procedures requiring only temporary relocation of assembly.
- (3) Remove gear cover retaining stud (double ended to also retain chain guide). Remove cover and balance shaft gears (Fig. 40).

REMOVAL AND INSTALLATION (Continued)

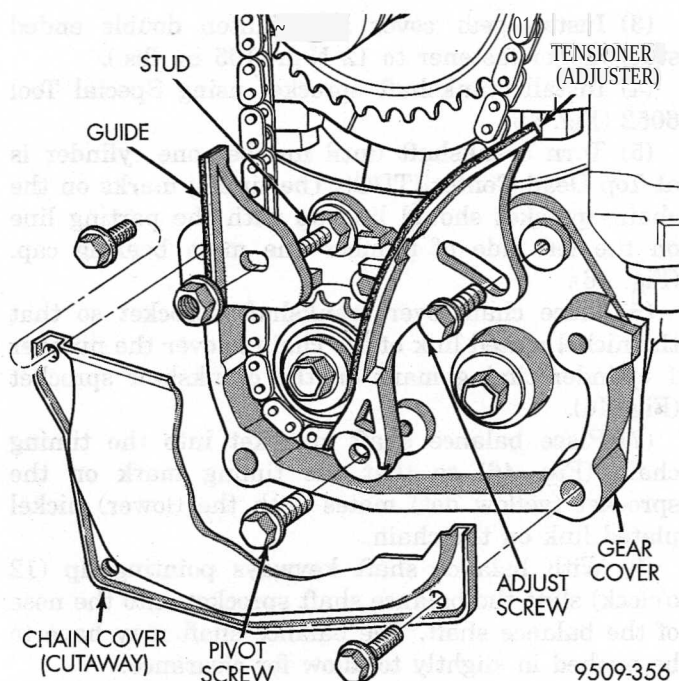


Fig. 40 Chain Cover, Guide and Tensioner

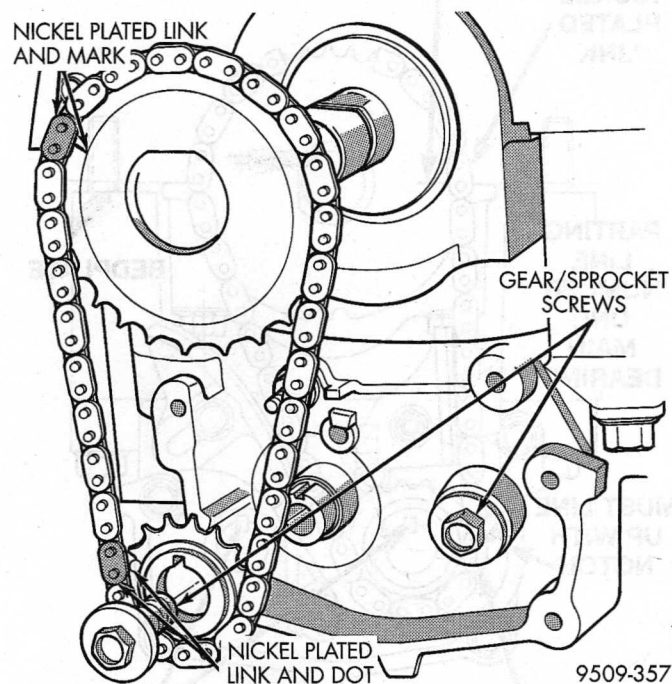


Fig. 41 Drive Chain and Sprockets

(4) Remove balance shaft gear and chain sprocket retaining screws and crankshaft chain sprocket. Remove chain and sprocket assembly (Fig. 41). Using two wide pry bars, work the sprocket back and forth until it is off the shaft.

(5) Remove carrier gear cover and balance shafts (Fig. 42).

(6) Remove four carrier to crankcase attaching bolts to separate carrier from engine bedplate.

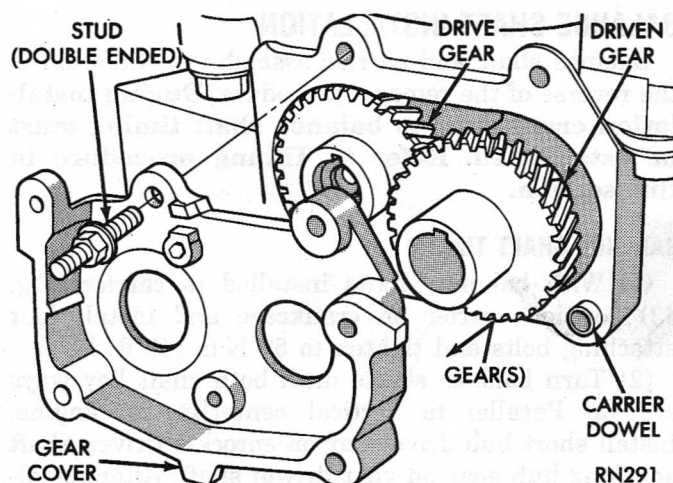


Fig. 42 Gear Cover and Gears

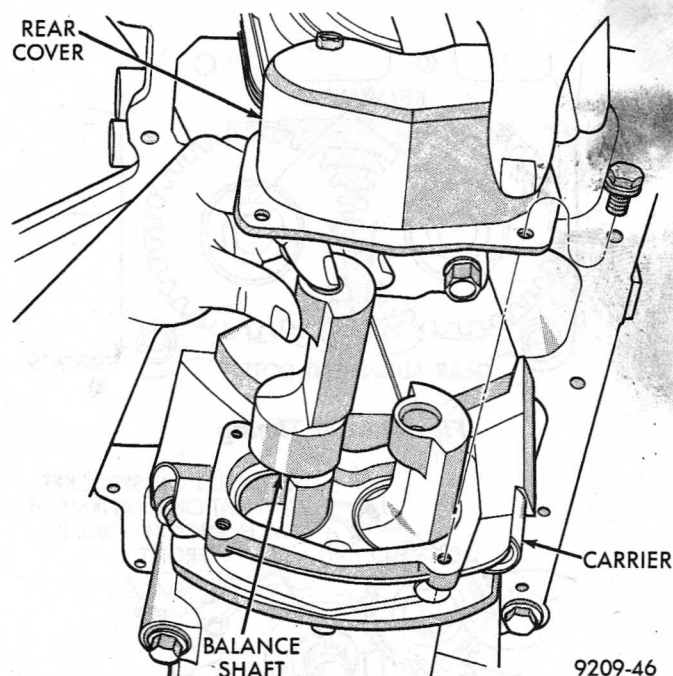


Fig. 43 Balance Shaft(s)-Removal/Installation

BALANCE SHAFT CARRIER

REMOVAL

The following components will remain intact during carrier removal. Gear cover, gears, balance shafts and the rear cover (Fig. 43).

(1) Remove chain cover and driven balance shaft chain sprocket screw.

(2) Loosen tensioner pivot and adjusting screws, move driven balance shaft inboard through driven chain sprocket. Sprocket will hang in lower chain loop.

(3) Remove carrier to crankcase attaching bolts to remove carrier.

REMOVAL AND INSTALLATION (Continued)

BALANCE SHAFT INSTALLATION

Balance shaft and carrier assembly installation is the reverse of the removal procedure. **During installation crankshaft to balance shaft timing must be established. Refer to Timing procedure in this section.**

BALANCE SHAFT TIMING

(1) With balance shafts installed in carrier (Fig. 43) position carrier on crankcase and install four attaching bolts and tighten to 54 N·m (40 ft. lbs.).

(2) Turn balance shafts until both shaft key ways are up Parallel to vertical centerline of engine. Install short hub drive gear on sprocket driven shaft and long hub gear on gear driven shaft. After installation gear and balance shaft keyways must be up with gear timing marks meshed as shown in (Fig. 44).

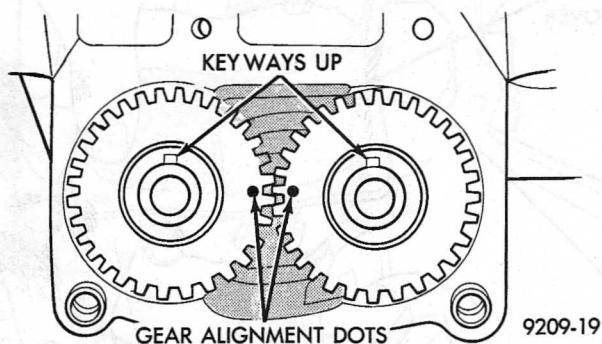


Fig. 44 Gear Timing

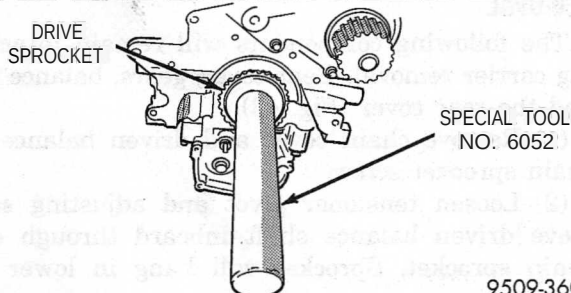
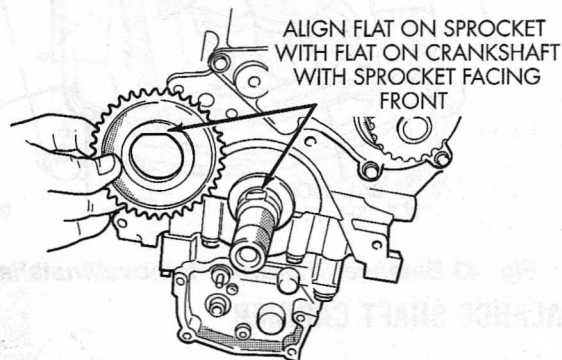


Fig. 45 Crankshaft Sprocket—Installation

(3) Install gear cover and tighten double ended stud/washer fastener to 12 N·m (105 in. lbs.).

(4) Install crankshaft sprocket using Special Tool 6052 (Fig. 45).

(5) Turn crankshaft until number one cylinder is at Top Dead Center (TDC). The timing marks on the chain sprocket should line up with the parting line on the left side of number one main bearing cap. (Fig. 46).

(6) Place chain over crankshaft sprocket so that the nickel plated link of the chain is over the number 1 cylinder timing mark on the crankshaft sprocket (Fig. 46).

(7) Place balance shaft sprocket into the timing chain (Fig. 46) so that the timing mark on the sprocket (yellow dot) mates with the (lower) nickel plated link on the chain.

(8) With balance shaft keyways pointing up (12 o'clock) slide the balance shaft sprocket onto the nose of the balance shaft. The balance shaft may have to be pushed in slightly to allow for clearance.

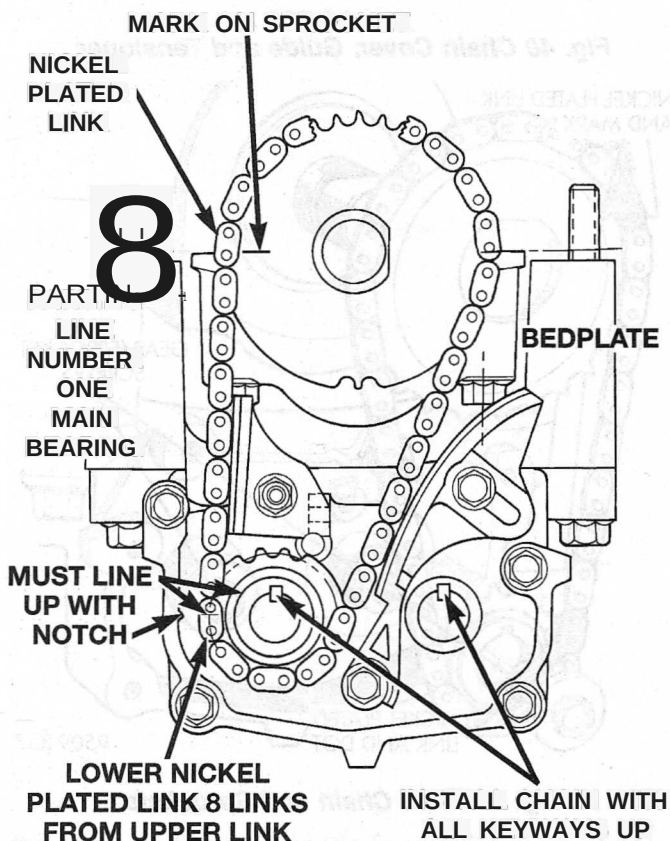


Fig. 46 Balance Shaft Timing

NOTE: THE TIMING MARK ON THE SPROCKET, THE (LOWER) NICKEL PLATED LINK, AND THE ARROW ON THE SIDE OF THE GEAR COVER SHOULD LINE UP WHEN THE BALANCE SHAFTS ARE TIMED CORRECTLY.

REMOVAL AND INSTALLATION (Continued)

(9) If the sprockets are timed correctly install the balance shaft bolts and tighten to 28 N·m (250 in. lbs.). A wood block placed between crankcase and crankshaft counterbalance will prevent crankshaft and gear rotation.

CHAIN TENSIONING

- (1) Install chain tensioner loosely assembled.
- (2) Position guide on double ended stud making sure tab on the guide fits into slot on the gear cover. Install and tighten nut/washer assembly to 12 N·m (105 in. lbs.).
- (3) Place a shim 1 mm (0.039 in.) thick x 70 mm (2.75 in.) long or between tensioner and chain. Push tensioner and shim up against the chain. **Apply firm pressure (5.5 to 6.6 lbs.) directly behind the adjustment slot to take up all slack.** Chain must have shoe radius contact as shown in (Fig. 47).
- (4) With the load applied, tighten top tensioner bolt first, then bottom pivot bolt. Tighten bolts to 12 N·m (105 in. lbs.). Remove shim.
- (5) Install carrier covers and tighten screws to 12 N·m (105 in. lbs.).
- (6) Install oil pan and fill engine crankcase with proper oil to correct level.

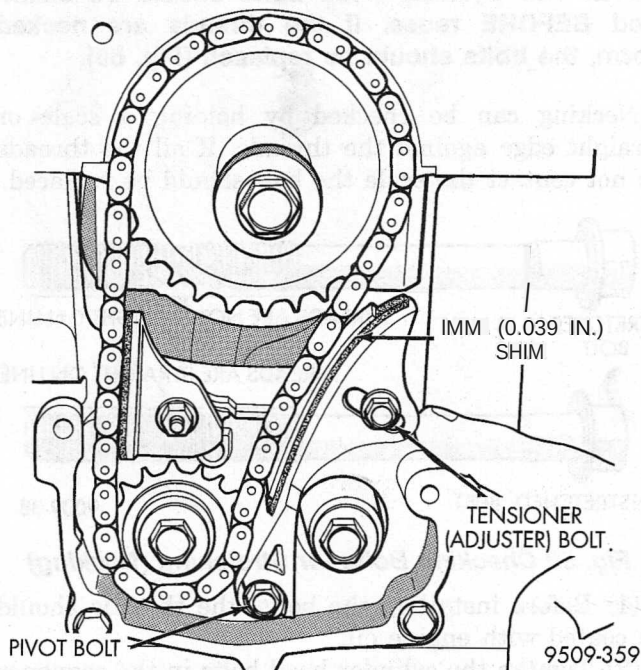


Fig. 47 Chain Tension Adjustment

HYDRAULIC LASH ADJUSTER

REMOVAL

- (1) Remove cylinder head cover. Refer to procedure in this section.
- (2) Remove camshafts and cam follower assemblies. Refer to camshaft removal procedure in this

section to gain access to cam followers and lash adjusters.

(3) Mark hydraulic lash adjusters for reassembly in their original position. Lash adjusters are serviced as an assembly.

INSTALLATION

(1) Install hydraulic lash adjuster assembly making sure adjusters are at least partially full of oil. This is indicated by little or no plunger travel when the lash adjuster is depressed.

(2) Install following components following procedures in this section:

- cam follower assemblies
- camshafts
- cylinder head cover.

VALVE SPRINGS AND VALVE SEALS IN VEHICLE

REMOVAL

- (1) Remove camshafts as previously outlined in this section.
- (2) Rotate crankshaft until piston is at TDC on compression.
- (3) With air hose attached to adapter tool installed in spark plug hole, apply 90-120 psi air pressure.
- (4) Using Special Tool MD-998772-A with adapter 6779 (Fig. 48) compress valve springs and remove valve locks.
- (5) Remove valve spring.
- (6) Remove valve stem seal by using valve stem seal tool.

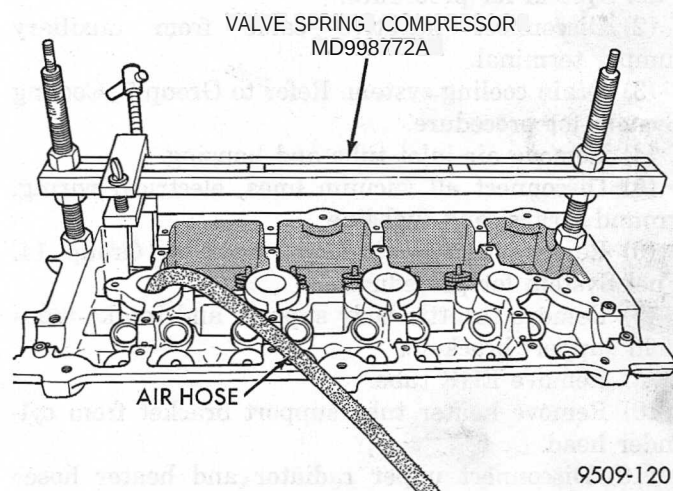


Fig. 48 Valve Spring-Removal/Installation

INSTALLATION

(1) Install valve seal/valve spring seat assembly (Fig. 49). Push the assembly down to seat it onto the valve guide.

REMOVAL AND INSTALLATION (Continued)

(2) Install valve spring and retainer, use Special Tool MD-998772-A with adapter 6779 to compress valve springs only enough to install locks (Fig. 48). Correct alignment of tool is necessary to avoid nicking valve stems.

(3) Remove air hose and install spark plugs.

(4) Install camshafts as previously outlined in this section.

(5) Install cylinder head cover as previously outlined in this section.

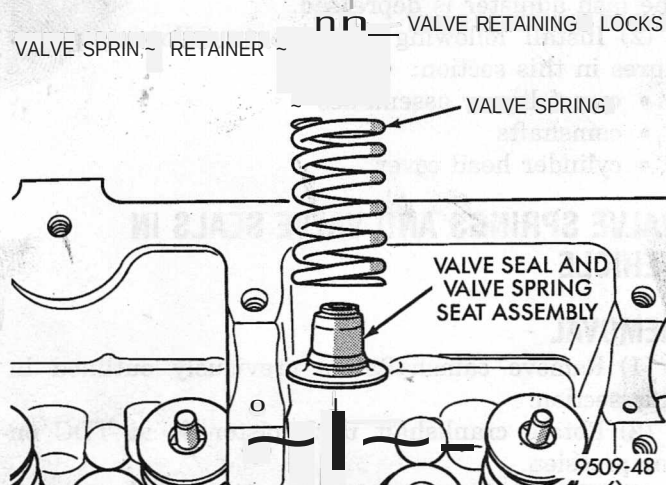


fig. 49 Valve Stem Seal/Valve Spring Seat

CYLINDER HEAD**REMOVAL**

(1) Perform fuel system pressure release procedure before attempting any repairs. Refer to Group 14, Fuel System for procedure.

(2) Disconnect negative cable from auxiliary jumper terminal..

(3) Drain cooling system. Refer to Group 7, Cooling System for procedure.

(4) Remove air inlet tube and housing.

(5) Disconnect all vacuum lines, electrical wiring, ground straps, and fuel pipe.

(6) Remove throttle linkage. Refer to Group 14, Fuel System for procedures

(7) Remove throttle body support and intake manifold support brackets.

(8) Remove EGR tube.

(9) Remove heater tube support bracket from cylinder head.

(10) Disconnect upper radiator and heater hoses from intake manifold water outlet connections.

(11) Remove fastener attaching dipstick tube to cylinder head.

(12) Remove accessory drive belts. Refer to Group 7, Cooling System for procedure.

(13) Remove power brake vacuum hose from intake manifold.

(14) Raise vehicle and remove exhaust pipe from manifold.

(15) Remove power steering pump reservoir and line support bracket from cylinder head and set aside.

(16) Disconnect coil pack wiring connector and remove coil pack and plug wires from engine.

(17) Remove cam sensor and fuel injectors wiring connectors.

(18) Remove timing belt and camshaft sprockets. Refer to procedures in this section.

(19) Remove timing belt idler pulley and rear timing belt cover.

(20) Remove cylinder head cover using procedure in this section.

(21) Remove camshafts and cam followers. Refer to procedures in this section.

(22) Remove cylinder head bolts and remove cylinder head from engine block.

(23) Inspect and clean cylinder head. Refer to Cleaning and Inspection in this section for procedures.

INSTALLATION

NOTE: The Cylinder head bolts should be examined BEFORE reuse. If the threads are necked down, the bolts should be replaced (Fig. 50).

Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt should be replaced.

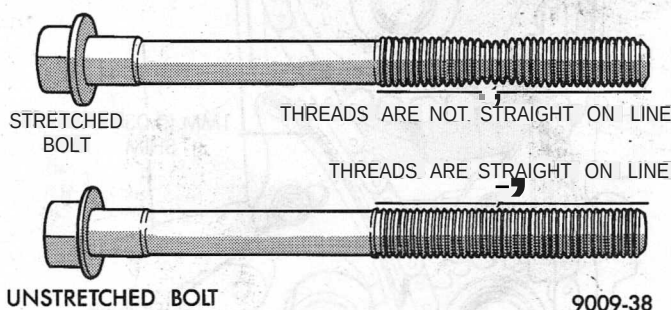


Fig. 50 Checking Bolts for Stretching (Necking)

(1) Before installing the bolts, the threads should be coated with engine oil.

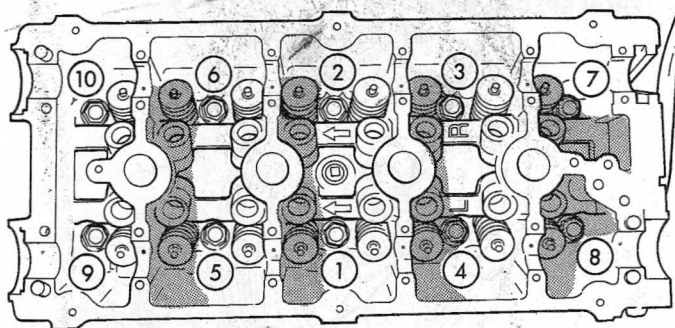
(2) Tighten the cylinder head bolts in the sequence shown in (Fig. 51). Using the 4 step torque turn method, tighten according to the following values:

- First All to 34 N'm (25 ft. lbs.)
- Second All to 68 N'm (50 ft. lbs.)
- Third All to 68 N'm (50 ft. lbs.)

CAUTION: Do not use a torque wrench for the following step.

- Fourth Turn an additional 1/4 Turn,

REMOVAL AND INSTALLATION (Continued)



9509-122

fig. 51 Cylinder Head Tightening Sequence

(3) Install camshafts and cam followers. Refer to procedures in this section.

(4) Install cylinder head cover using procedure in this section.

(5) Install rear timing belt cover and timing belt idler pulley.

(6) Install timing belt and camshaft sprockets. Refer to procedures in this section.

(7) Install cam sensor and fuel injectors wiring connector.

(8) Install coil pack and plug wires onto the engine. Connect coil pack wiring connector.

(9) Install power steering pump reservoir and line support bracket to cylinder head.

(10) Raise vehicle and install the exhaust pipe to the manifold.

(11) Install power brake vacuum hose to the intake manifold.

(12) Install accessory drive belts. Refer to Group P7, Cooling System for procedure.

(13) Install throttle body support and intake manifold support brackets.

(14) Install heater tube support bracket to cylinder head.

(15) Connect upper radiator and heater hoses to intake manifold water outlet connections.

(16) Install EGR tube and tighten fasteners to 11 N·m (95 in. lbs.).

(17) Install fastener attaching dipstick tube to cylinder head.

(18) Install throttle linkage. Refer to Group 14, Fuel System for procedures.

(19) Install air inlet tube and housing.

(20) Connect all vacuum lines, electrical wiring, ground straps and fuel line.

(21) Fill cooling system. Refer to Group 7, Cooling System for procedure.

(22) Connect negative cable to auxiliary jumper terminal.

VALVES AND VALVE SPRINGS

REMOVAL

(1) With cylinder head removed, compress valve springs using a universal valve spring compressor.

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

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

(4) Inspect and clean the valves. Refer to Cleaning and Inspection outlined in this section for procedure.

INSTALLATION

(1) Coat valve stems with clean engine oil and insert in cylinder head.

(2) Install new valve stem seals on all valves using a valve stem seal tool (Fig. 52). The valve stem seals should be pushed firmly and squarely over valve guide.

CAUTION: When oversize valves are used, the corresponding oversize valve seal must also be used. Excessive guide wear may result if oversize seals are not used with oversize valves.

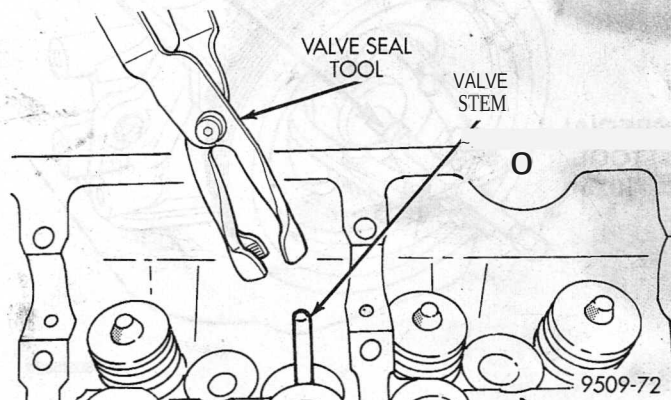


Fig. 52 Valve Stem Oil Seal Tool

(3) Install valve springs and retainers. Compress valve springs only enough to install locks, taking care not to misalign the direction of compression. Nicked valve stems may result from misalignment of the valve spring compressor.

CAUTION: When depressing the valve spring retainers with valve spring compressor the locks can become dislocated. Ensure both locks are in the correct location after removing tool.

(4) Check the valve spring installed height B after refacing the valve and seat (Fig. 53). Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a .762 mm (0.030

REMOVAL AND INSTALLATION (Continued)

in.) spacer under the valve spring seat to bring spring height back within specification.

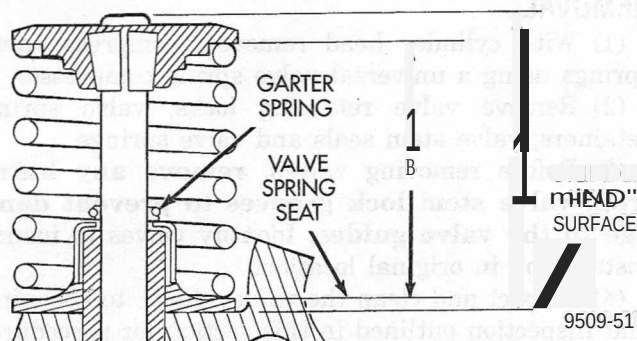


Fig. 53 Checking Spring Installed Height and Valve Tip Height Dimensions

CRANKSHAFT DAMPER**REMOVAL**

Remove crankshaft damper bolt. Remove damper by using Special Tool 1026 and Insert 6827-A (Fig. 54).

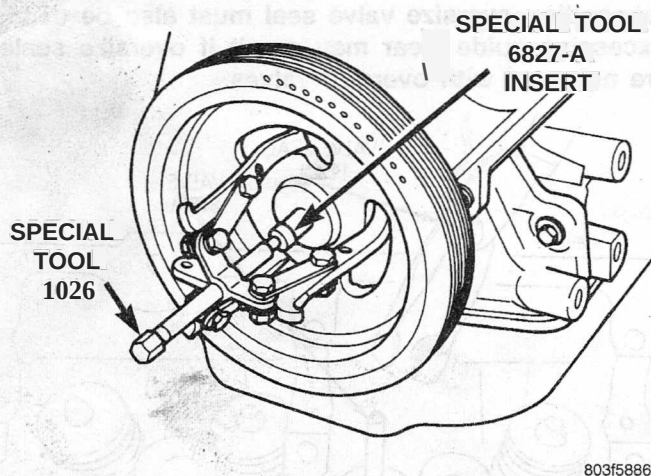


Fig. 54 Crankshaft Damper-Removal

INSTALLATION

Install crankshaft damper using M12 1.75 X 150 mm bolt, washer, thrust bearing and nut from Special Tool 6792. Install crankshaft vibration damper bolt and tighten to 142 N·m (105 ft. lbs.) (Fig. 55).

TIMING BELT COVER**FRONT COVER****REMOVAL**

(1) Remove crankshaft damper. Refer to procedure in this section.

(2) Remove generator belt idler pulley.

(3) Remove front timing belt cover fasteners (Fig. 56) and remove covers.

M12-1.75 x 150 MM BOLT,
WASHER AND THRUST BEARING
FROM SPECIAL TOOL 6792

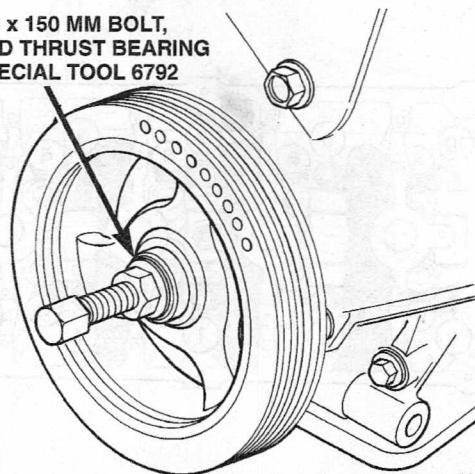


Fig. 55 Crankshaft Damper-Installation

(4) Remove engine mount bracket (Fig. 56).

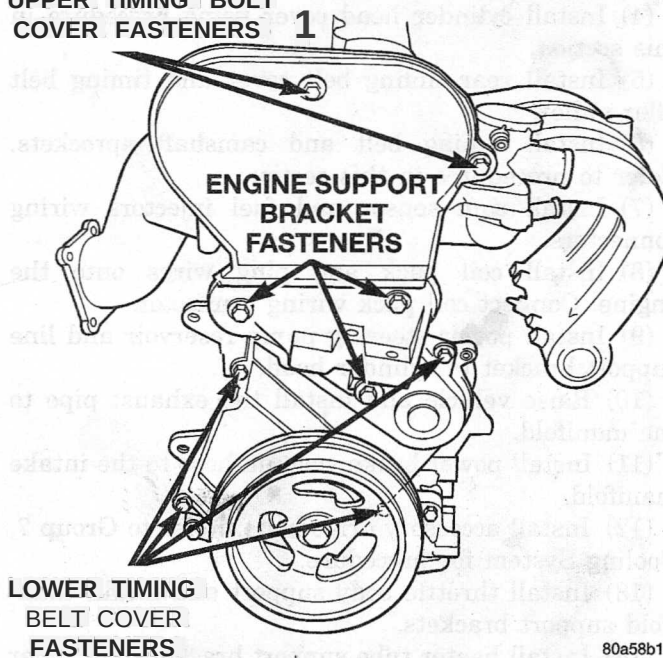
UPPER TIMING BOLT COVER FASTENERS 1

Fig. 56 Front Timing Belt Covers

INSTALLATION

(1) Install the engine mount bracket and front timing belt covers (Fig. 56).

(2) Install generator belt idler pulley and tighten bolt to 54 N·m (40 ft. lbs.).

(3) Install crankshaft damper. Refer to crankshaft damper installation for procedure.

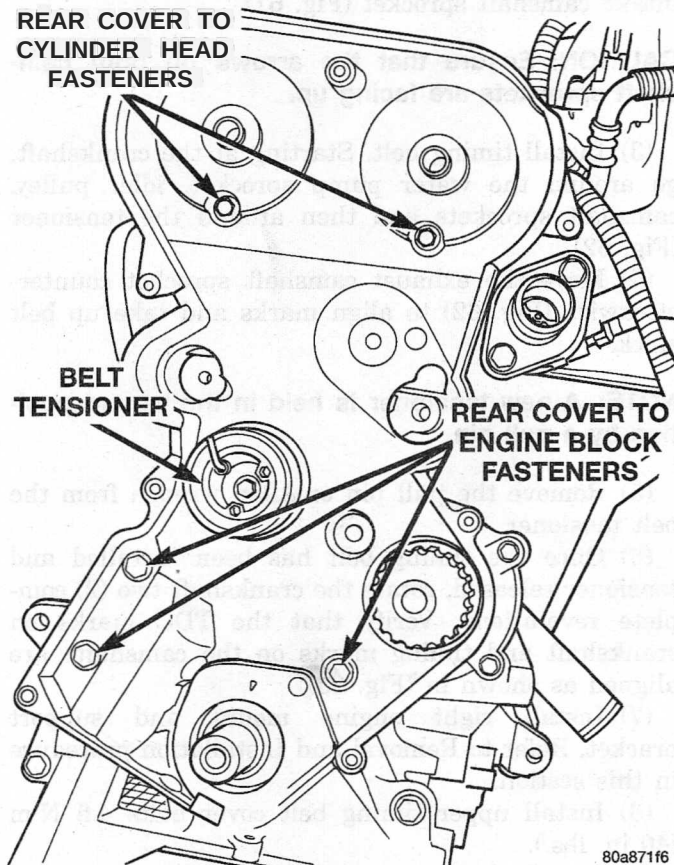
REAR COVER**REMOVAL**

(1) Remove front timing belt covers.

(2) Remove Timing Belt. Refer to procedure in this section.

REMOVAL AND INSTALLATION (Continued)

- (3) Remove timing belt idler pulley.
- (4) Remove both camshaft sprockets. Refer to procedure in the section.
- (5) Remove rear timing belt fasteners and remove cover from engine (Fig. 57).

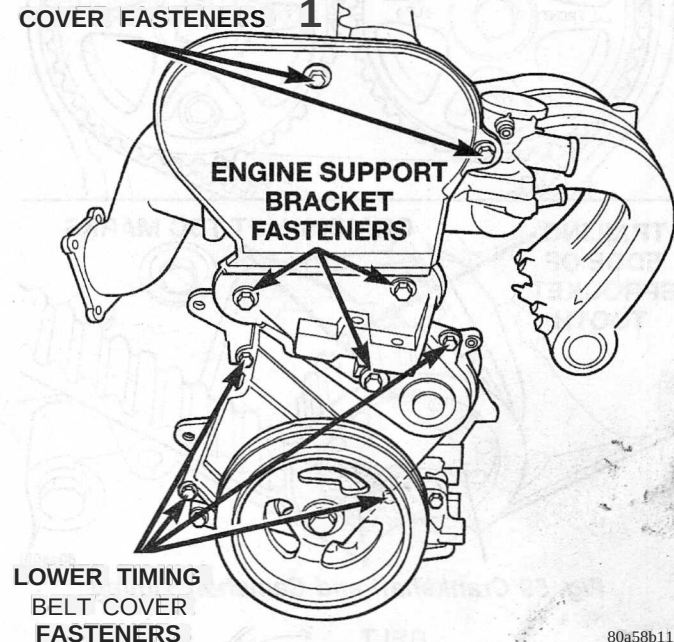
**Fig. 57 Rear Timing Belt Cover Fasteners****INSTALLATION**

- (1) Install rear timing belt cover and fasteners (Fig. 57).
- (2) Install timing belt idler.
- (3) Install camshaft sprocket and timing belt. Refer to procedures in this section.
- (4) Install engine mount bracket.
- (5) Install front covers. Refer to Front Cover installation procedure in this section.

TIMING BELT**REMOVAL**

- (1) Raise vehicle on hoist. Remove right front wheel.
- (2) Remove right inner splash shield.
- (3) Remove accessory drive belts. Refer to Group 7, Cooling System.
- (4) Remove crankshaft damper bolt, and remove damper. Refer to Removal and Installation procedure in this section.

- (5) Remove generator belt idler pulley.
- (6) Remove lower timing belt cover fasteners and remove cover (Fig. 58).
- (7) Lower vehicle and remove upper timing belt cover fasteners and remove cover.

UPPER TIMING BOLT COVER FASTENERS 1

80a58b11

Fig. 58 Timing Belt Covers

- (8) Remove right engine mount and support bracket. Refer to Removal and Installation procedure in this section.

CAUTION: When aligning crankshaft and camshaft timing marks always rotate engine from crankshaft. Camshaft should not be rotated after timing belt is removed. Damage to valve components may occur. Always align timing marks before removing timing belt.

- (9) Before the removal of the timing belt, rotate crankshaft until the TDC mark on oil pump housing aligns with the TDC mark on crankshaft sprocket (trailing edge of sprocket tooth) (Fig. 59).

NOTE: The crankshaft sprocket TDC mark is located on the trailing edge of the sprocket tooth. Failure to align trailing edge of sprocket tooth to TDC mark on oil pump housing will cause the camshaft timing marks to be misaligned.

- (10) Install 6 mm Allen wrench into belt tensioner. Before rotating the tensioner, insert the long end of a 1/8" or 3 mm Allen wrench into the pin hole on the front of the tensioner (Fig. 60). While rotating the tensioner counterclockwise, push in lightly on the 1/8" or 3 mm Allen wrench, until it slides into the locking hole.

REMOVAL AND INSTALLATION (Continued)

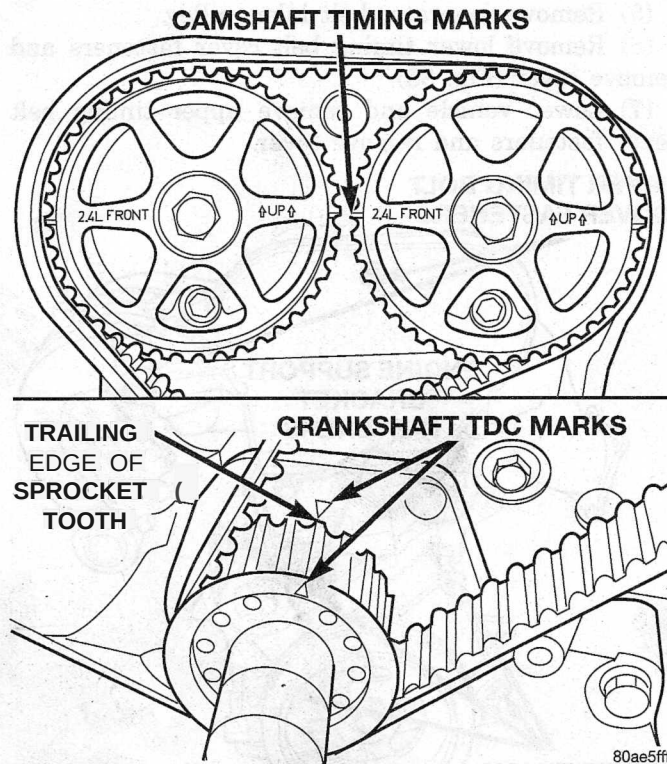


Fig. 59 Crankshaft and Camshaft Timing

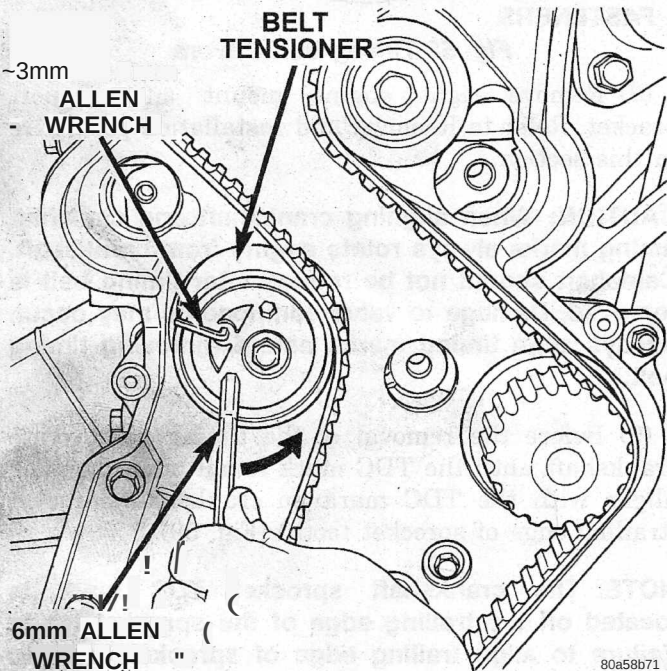


Fig. 60 Locking Timing Belt Tensioner

(11) Remove timing belt.

CAUTION: If timing belt was damaged due to incorrect tracking (alignment), the belt tensioner assembly must be replaced. Refer to Timing Belt Tensioner Assembly Removal and Installation procedure in this section.

INSTALLATION

(1) Set crankshaft sprocket to TDC by aligning the sprocket with the arrow on the oil pump housing.

(2) Set camshafts timing marks so that the exhaust camshaft sprocket is a 1/2 notch below the intake camshaft sprocket (Fig. 61).

CAUTION: Ensure that the arrows on both camshaft sprockets are facing up.

(3) Install timing belt. Starting at the crankshaft, go around the water pump sprocket, idler pulley, camshaft sprockets and then around the tensioner (Fig. 62).

(4) Move the exhaust camshaft sprocket counter-clockwise (Fig. 62) to align marks and take up belt slack.

NOTE: A new tensioner is held in the wound position by a pull pin.

(5) Remove the pull pin or Allen wrench from the belt tensioner.

(6) Once the timing belt has been installed and tensioner released, rotate the crankshaft two (2) complete revolutions. Verify that the TDC marks on crankshaft and timing marks on the camshafts are aligned as shown in (Fig. 63).

(7) Install right engine mount and support bracket. Refer to Removal and Installation procedure in this section.

(8) Install upper timing belt cover bolts 4.5 N·m (40 in. lbs.).

(9) Install the lower timing belt cover bolts 4.5 N·m (40 in. lbs.).

(10) Install generator belt idler pulley and tighten bolt to 54 N·m (40 ft. lbs.).

(11) Install crankshaft damper. Refer to procedure in this section.

(12) Install accessory drive belts. Refer to Group 7, Cooling System.

(13) Install right inner splash shield.

(14) Install right front wheel.

TIMING BELT TENSIONER ASSEMBLY

REMOVAL

(1) Remove timing belt. Refer to Removal and Installation procedure in this section.

(2) Remove timing belt idler pulley.

(3) Hold camshaft sprocket with Special Tool 6847 while removing bolt (Fig. 64). Remove both cam sprockets.

(4) Remove rear timing belt cover fasteners and remove cover from engine (Fig. 65).

REMOVAL AND INSTALLATION (Continued)

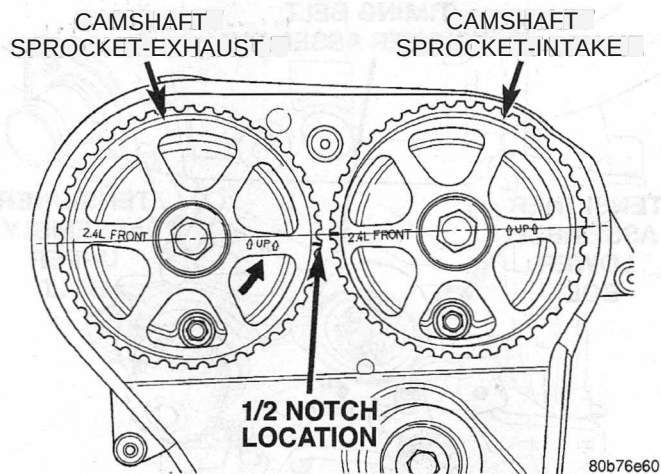


Fig. 61 Camshaft Sprocket Alignment For Timing Belt Installation

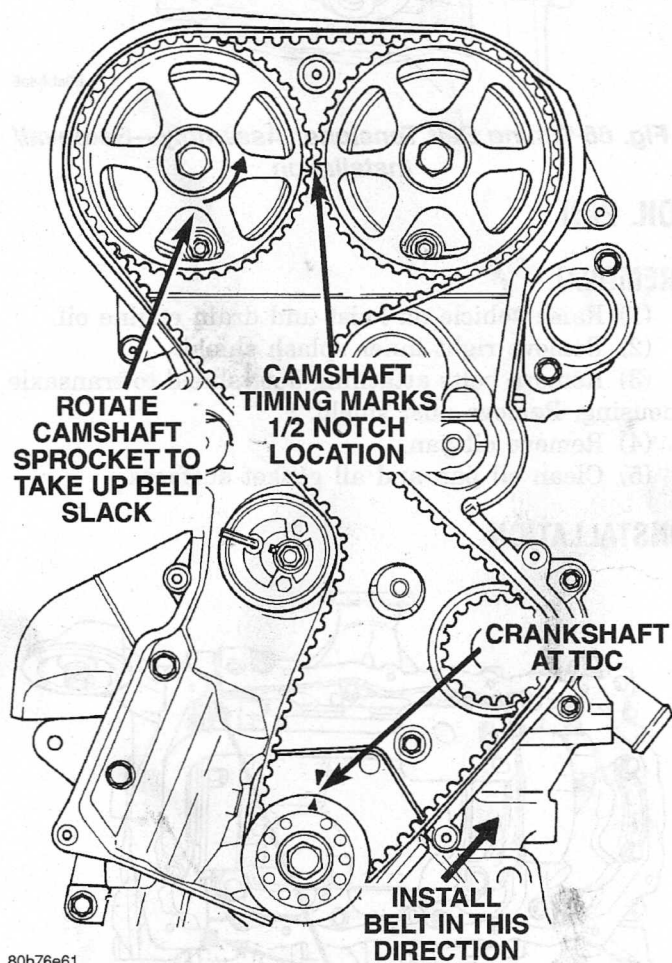


Fig. 62 Timing Belt—Installation

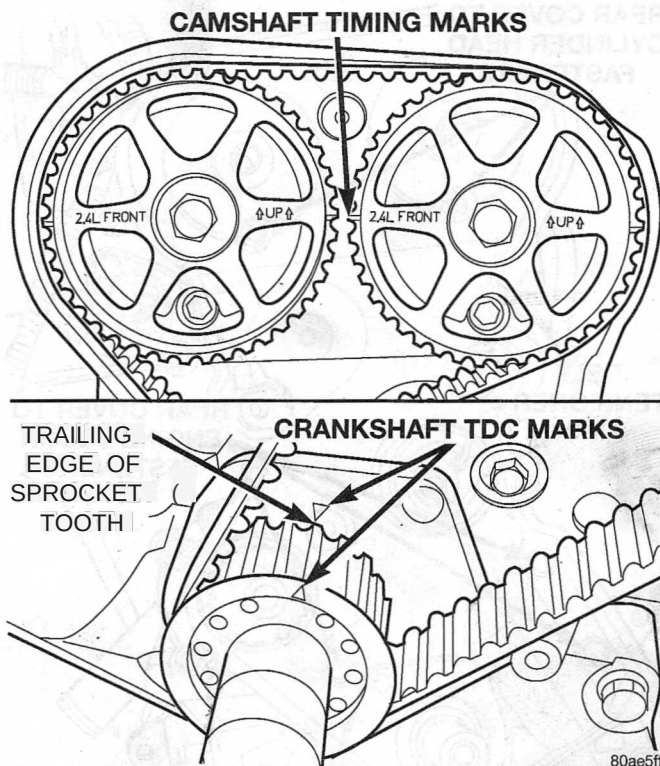


Fig. 63 Crankshaft and Camshaft Timing

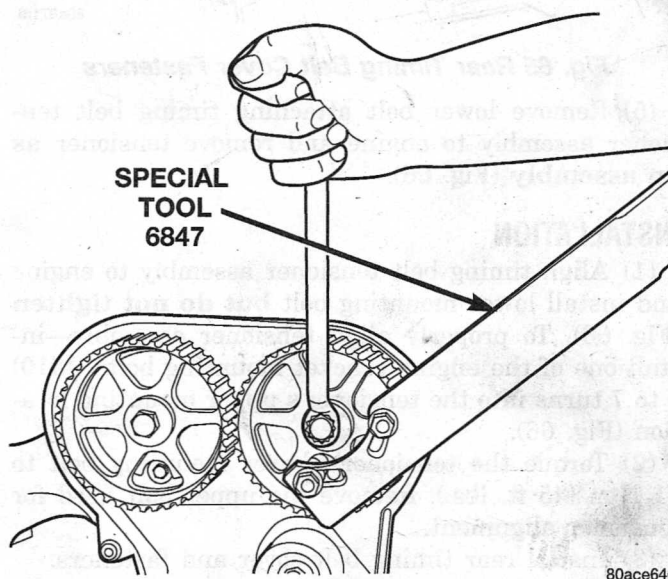


Fig. 64 Camshaft Sprockets—Removal/Installation

REMOVAL AND INSTALLATION (Continued)

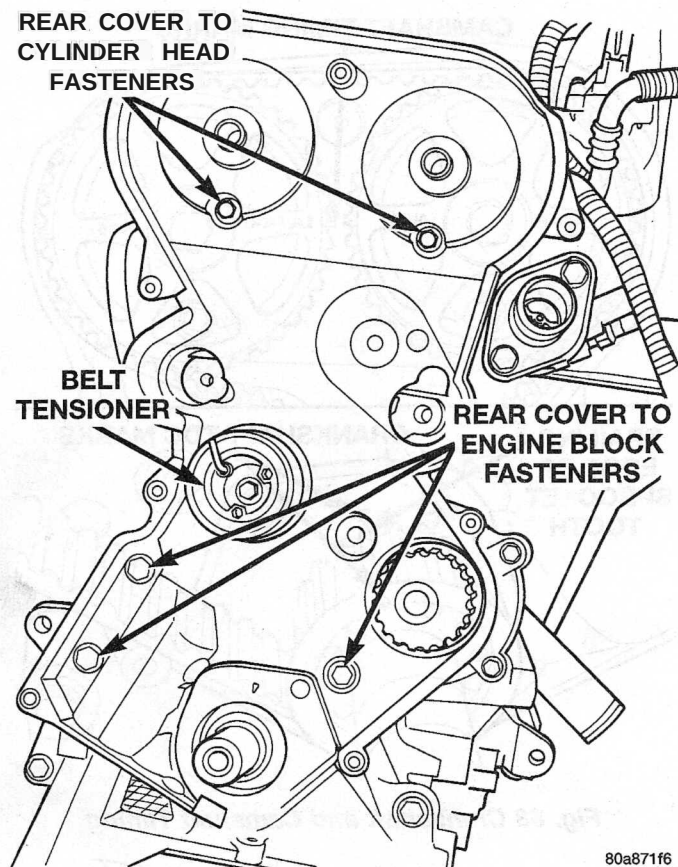


Fig. 65 Rear Timing Belt Cover Fasteners

(5) Remove lower bolt attaching timing belt tensioner assembly to engine and remove tensioner as an assembly (Fig. 66).

INSTALLATION

(1) Align timing belt tensioner assembly to engine and install lower mounting bolt **but do not tighten** (Fig. 66). To properly align tensioner assembly—install one of the engine bracket mounting bolts (MIO) 5 to 7 turns into the tensioner's upper mounting location (Fig. 66).

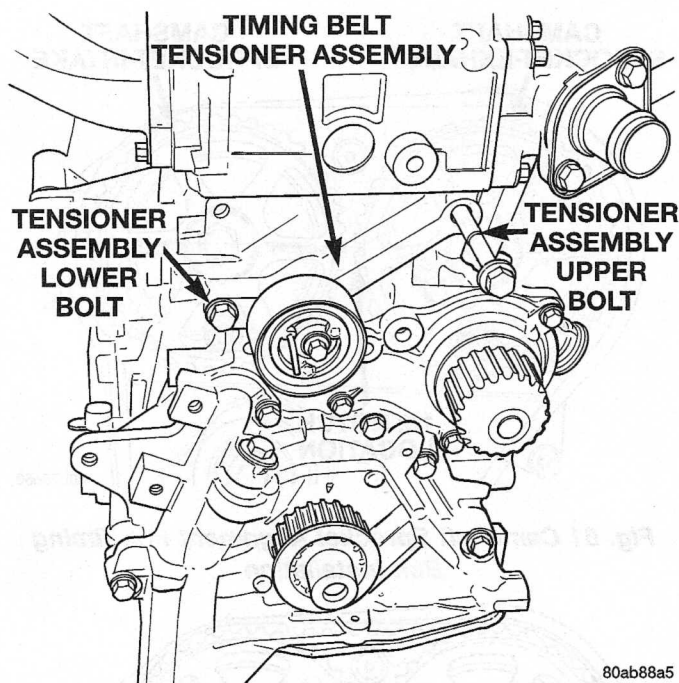
(2) Torque the tensioner's lower mounting bolt to 61 N·m (45 ft. lbs.). Remove the upper bolt used for tensioner alignment.

(3) Install rear timing belt cover and fasteners.

(4) Install timing belt idler pulley and torque mounting bolt to 61 N·m (45 ft. lbs.).

(5) Install camshaft sprockets. Use Special Tool 6847 to hold sprockets (Fig. 64), torque bolts to 101 N·m (75 ft. lbs.).

(6) Install timing belt. Refer to procedure in this section.



80ab88a5

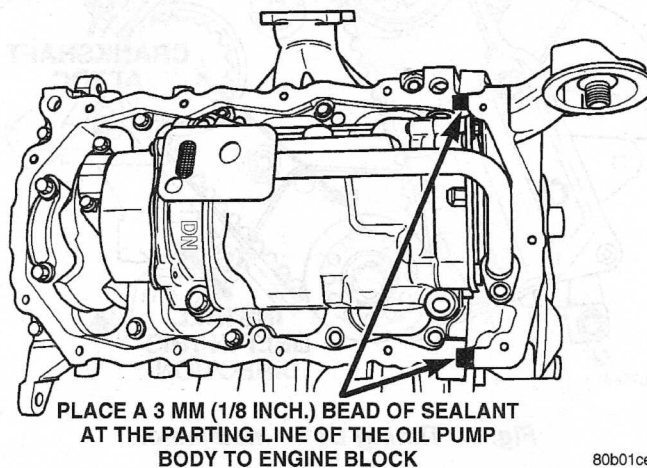
Fig. 66 Timing Belt Tensioner Assembly-Removal/Installation

OIL PAN

REMOVAL

- (1) Raise vehicle on hoist and drain engine oil.
- (2) Remove right inner splash shield.
- (3) Remove bolts attaching dust shield to trans axle housing. Remove dust shield.
- (4) Remove oil pan.
- (5) Clean oil pan and all gasket surfaces.

INSTALLATION



80b01cef

Fig. 67 Oil Pan Sealing

(1) Apply Mopar® Silicone Rubber Adhesive Sealant or equivalent at the oil pump to engine block parting line (Fig. 67).

REMOVAL AND INSTALLATION (Continued)

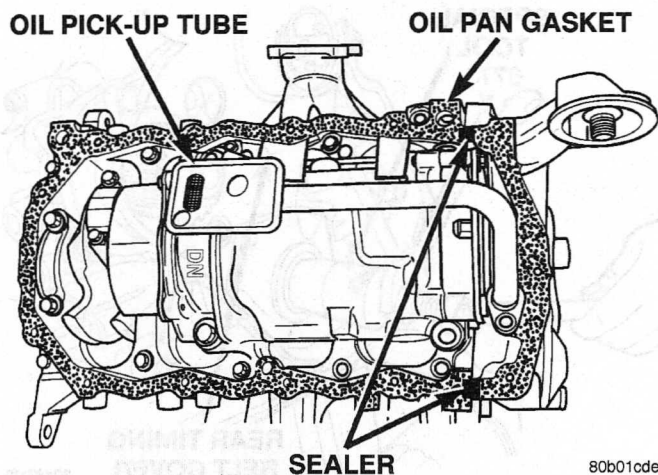


Fig. 68 Oil Pan Gasket Installation

- (2) Install the oil pan gasket to the block (Fig. 68).
- (3) Install pan and tighten the screws to 12 N·m (105 in. lbs.).
- (4) Install dust shield.
- (5) Lower vehicle and fill engine crankcase with proper oil to correct level.

CAMSHAFT OIL SEAL-FRONT

REMOVAL

- (1) Remove front timing belt cover and timing belt. Refer to procedures in this section.
- (2) Hold camshaft sprocket with Special Tool 6847 while removing center bolt (Fig. 69).
- (3) Remove rear timing belt cover. Refer to procedure in this section.
- (4) Remove camshaft seal using Special Tool C-4679-A (Fig. 70).

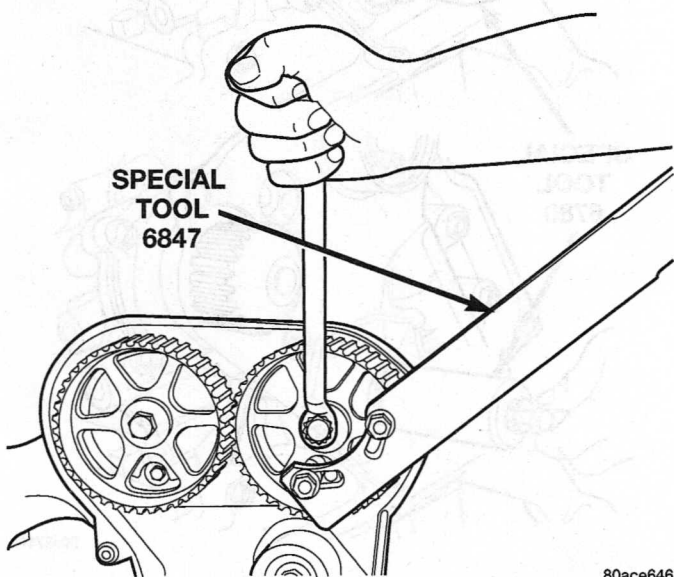


Fig. 69 Camshaft Sprocket—Removal/Installation

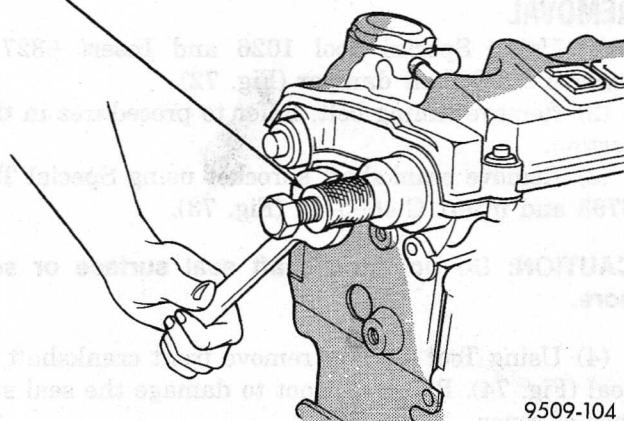
SPECIAL TOOL
C-4679

Fig. 70 Camshaft Oil Seal-Removal With C-4679-A

CAUTION: Do not nick shaft seal surface or seal bore

INSTALLATION

- (1) Shaft seal surface must be free of varnish, dirt or nicks. Polish with 400 grit paper if necessary.
- (2) Install camshaft seal into cylinder head using Special Tool MD-998306 until flush with head (Fig. 71).

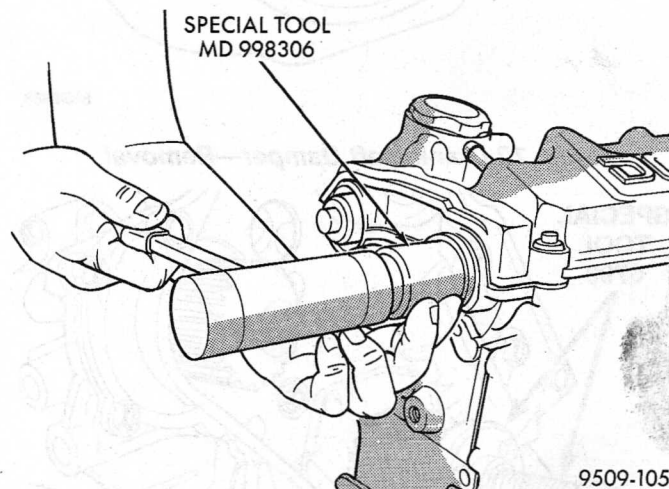


Fig. 71 Camshaft Seal-Installation

- (3) Install rear timing belt cover. Refer to procedure in this section.
- (4) Install camshaft sprocket. While holding sprocket with Special Tool 6847, tighten center bolt to 101 N·m (75 ft. lbs.) (Fig. 69).
- (5) Install timing belt and front covers. Refer to procedures in this section.

REMOVAL AND INSTALLATION (Continued)**CRANKSHAFT OIL SEAL-FRONT****REMOVAL**

- (1) Using Special Tool 1026 and Insert 6827-A, remove crankshaft damper (Fig. 72).
- (2) Remove timing belt. Refer to procedures in this section.
- (3) Remove crankshaft sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 73).

CAUTION: Do not nick shaft seal surface or seal bore.

- (4) Using Tool 6771 to remove front crankshaft oil seal (Fig. 74). Be careful not to damage the seal surface of cover.

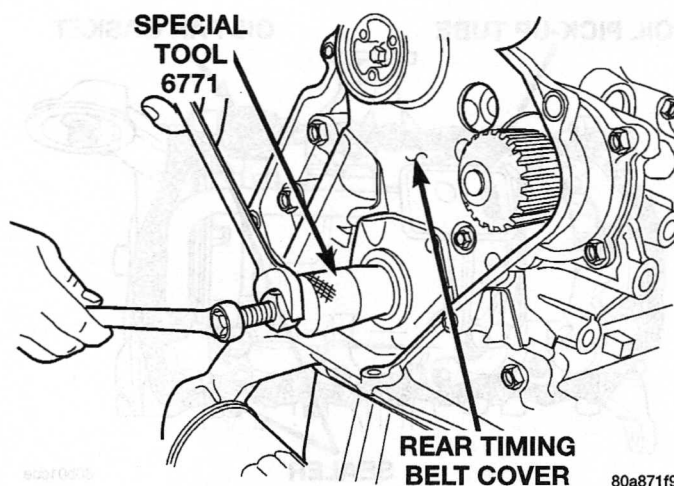
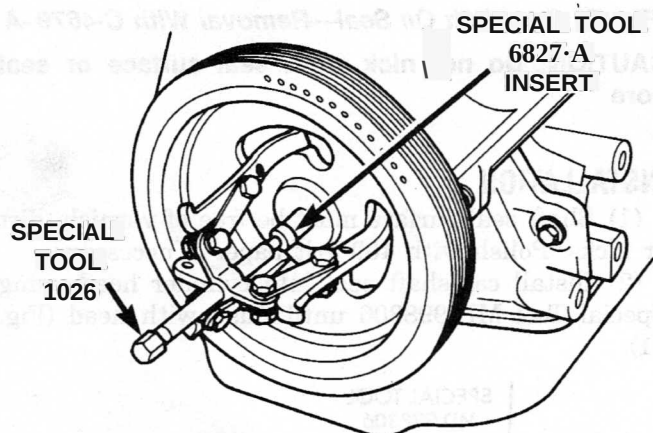


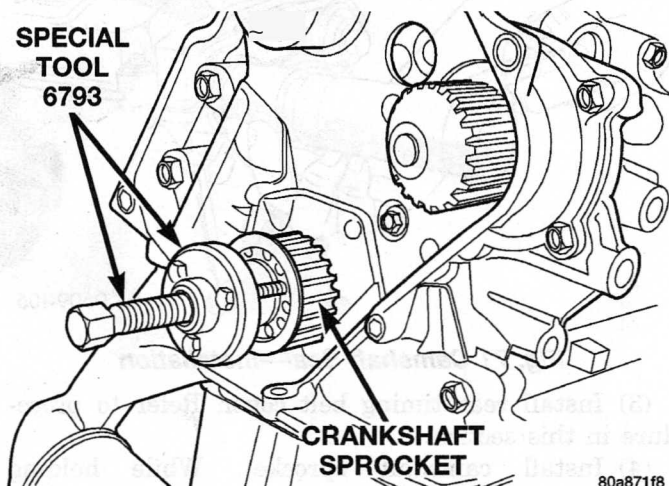
Fig. 74 Front Crankshaft Oil Seal-Removal

- (3) Install crankshaft sprocket using Special Tool 6792 (Fig. 76).
- (4) Install timing belt and timing belt covers. Refer to procedures in this section.
- (5) Install crankshaft damper (Fig. 77). Use thrust bearing/washer and 12M 1.75 x 150 mm bolt from Special Tool 6792. Install crankshaft damper bolt and tighten to 142 N·m (105 ft. lbs.).



803f5886

Fig. 72 Crankshaft Damper-Removal

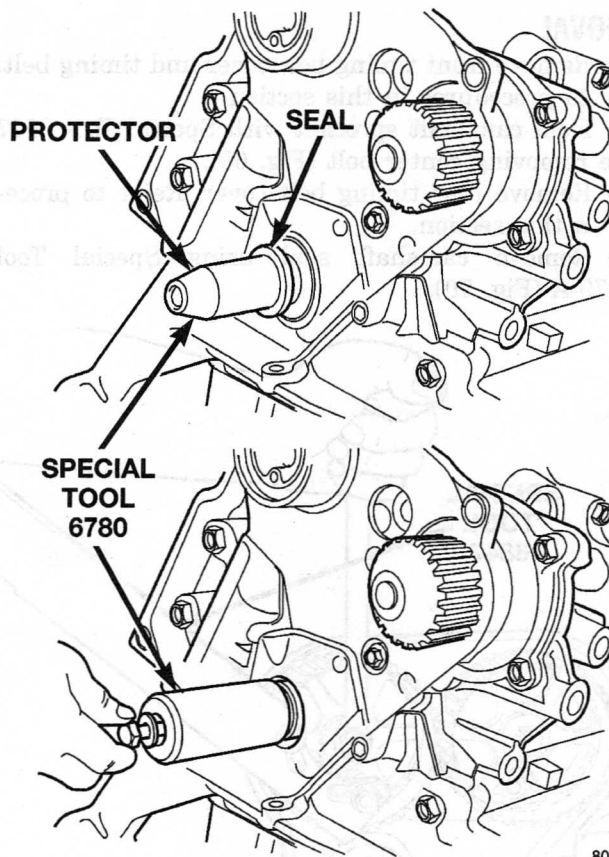


80a871f8

Fig. 73 Crankshaft Sprocket-Removal

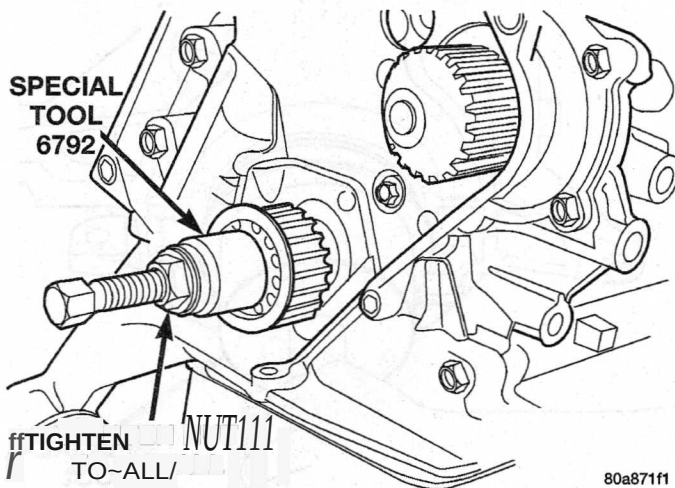
INSTALLATION

- (1) Install new seal by using Tool 6780 (Fig. 75).
- (2) Place seal into opening with seal spring towards the inside of engine. Install seal until flush with cover.

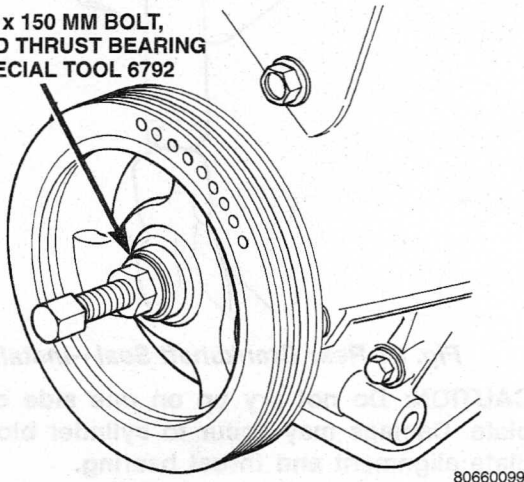


80a871f7

Fig. 75 Front Crankshaft Oil Seal-Installation

REMOVAL AND INSTALLATION (Continued)**Fig. 76 Crankshaft Sprocket—Installation**

M12-1.75 x 150 MM BOLT,
WASHER AND THRUST BEARING
FROM SPECIAL TOOL 6792

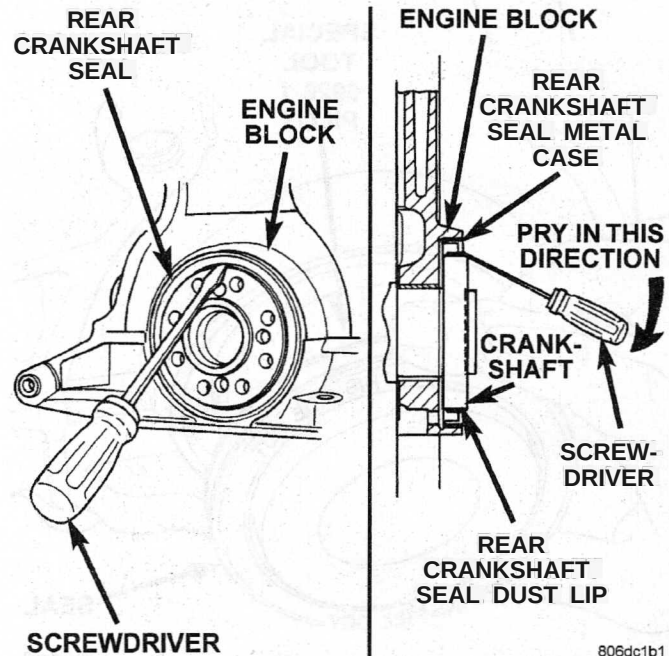
**Fig. 77 Crankshaft Damper-Installation****CRANKSHAFT OIL SEAL-REAR****REMOVAL**

(1) Insert a 3/16 flat bladed screwdriver between the dust lip and the metal case of the crankshaft seal. Angle the screwdriver (Fig. 78) through the dust lip against metal case of the seal. Pry out seal.

CAUTION: Do not permit the screwdriver blade to contact crankshaft seal surface. Contact of the screwdriver blade against crankshaft edge (chamfer) is permitted.

INSTALLATION

CAUTION: If burr or scratch is present on the crankshaft edge (chamfer), cleanup with 400 grit sand paper to prevent seal damage during installation of new seal.

**Fig. 78 Rear Crankshaft Oil Seal-Removal**

NOTE: When installing seal, no lube on seal is needed.

(1) Place Special Tool 6926-1 on crankshaft. This is a pilot tool with a magnetic base (Fig. 79).

(2) Position seal over pilot tool. Make sure you can read the words **THIS SIDE OUT** on seal (Fig. 79). Pilot tool should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.

CAUTION: If the seal is driven into the block past flush, this may cause an oil leak.

(3) Drive the seal into the block using Special Tool 6926-2 and handle C-4171 (Fig. 80) until the tool bottoms out against the block (Fig. 81).

CRANKSHAFT**REMOVAL**

NOTE: Crankshaft can not be removed when engine is in vehicle.

(1) Remove engine assembly from vehicle. Refer to procedure in this section.

(2) Separate engine from transaxle.

(3) Remove drive plate and crankshaft rear oil seal.

(4) Mount engine on a repair stand.

(5) Remove oil filter and oil pan. Refer to procedure in this section.

REMOVAL AND INSTALLATION (Continued)

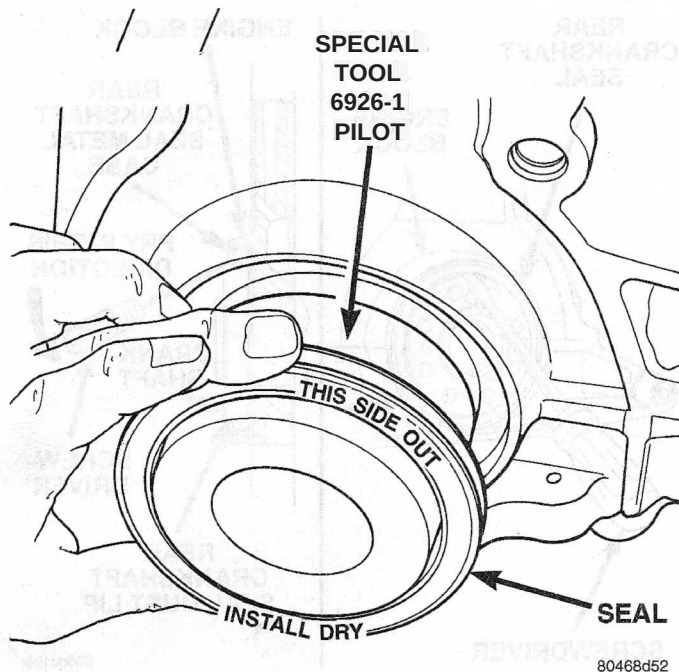


Fig. 79 Rear Crankshaft Seal and Special Tool 6926-1

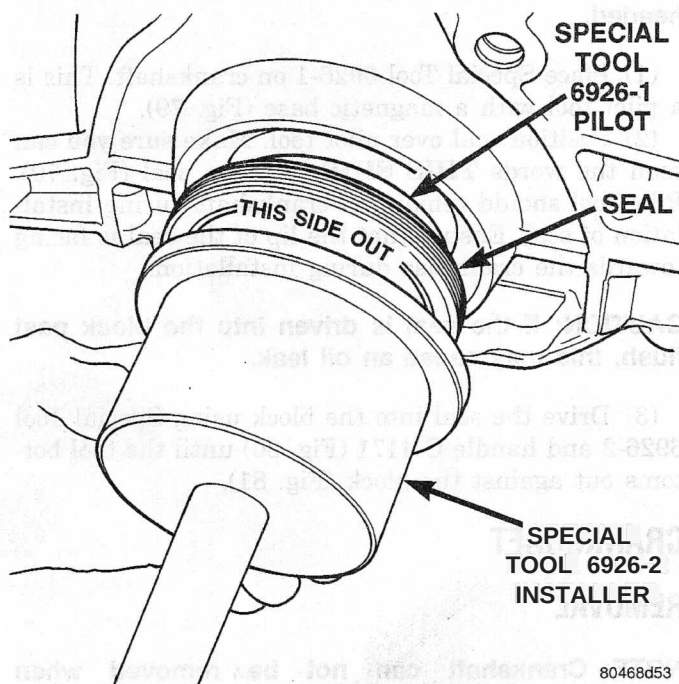


Fig. 80 Crankshaft Seal Special Tool 6926-2

(6) Remove Timing Belt Cover, Timing Belt and Oil Pump. Refer to procedure in this section.

(7) Remove Balance Shafts Assembly. Refer to procedure in this section.

(8) Remove all main bearing cap bedplate bolts from the engine block. Refer to procedure in this section.

(9) Using a mallet gently tap the bedplate loose from the engine block dowel pins.

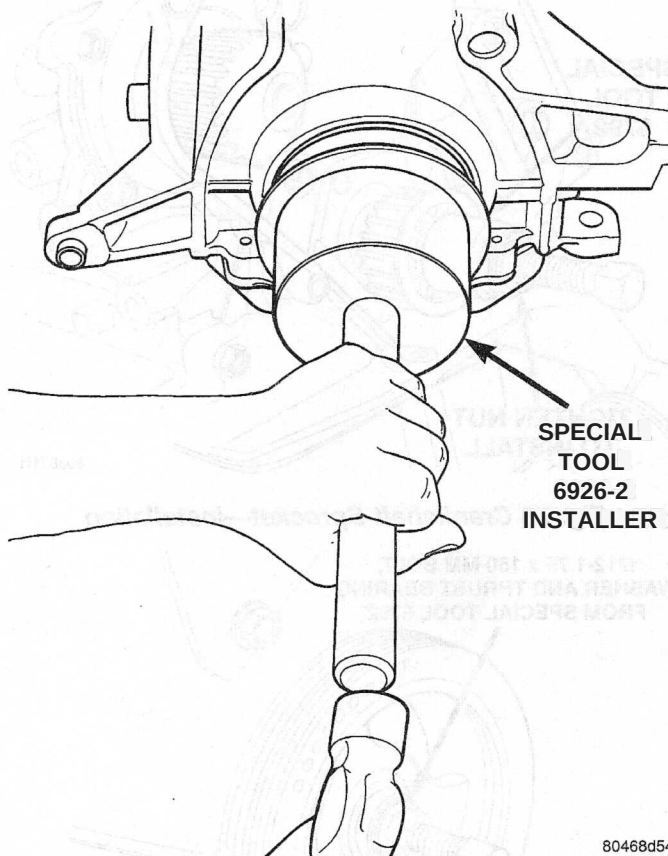


Fig. 81 Rear Crankshaft Seal-Installation

CAUTION: Do not pry up on one side of the bedplate. Damage may occur to cylinder block to bedplate alignment and thrust bearing.

(10) Bedplate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.

(11) Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.

INSTALLATION

(1) Install the main bearing shells with the lubrication groove in the cylinder block (Fig. 82).

(2) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

CAUTION: Do not get oil on the bedplate mating surface. It will may effect the sealer ability to seal the bed plate to cylinder block.

(3) Oil the bearings and journals. Install crankshaft.

CAUTION: Use only the specified anaerobic sealer on the bed plate or damage may occur to the engine.

REMOVAL AND INSTALLATION (Continued)

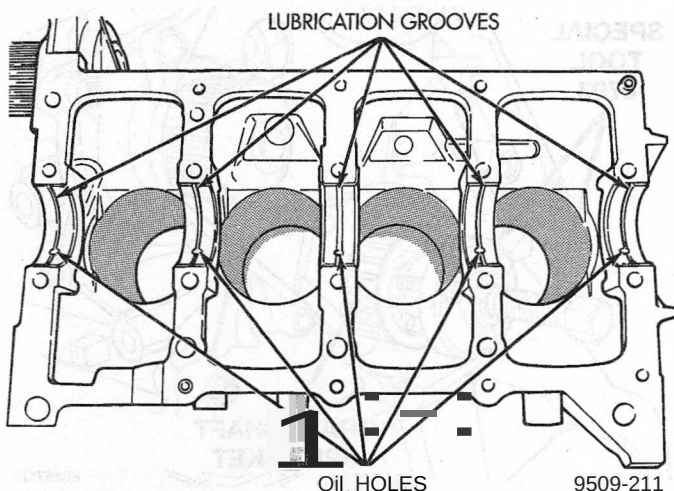


Fig. 82 Installing Main Bearing Upper Shell

(4) Apply 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar®Torque Cure Gasket Maker to cylinder block as shown in (Fig. 83).

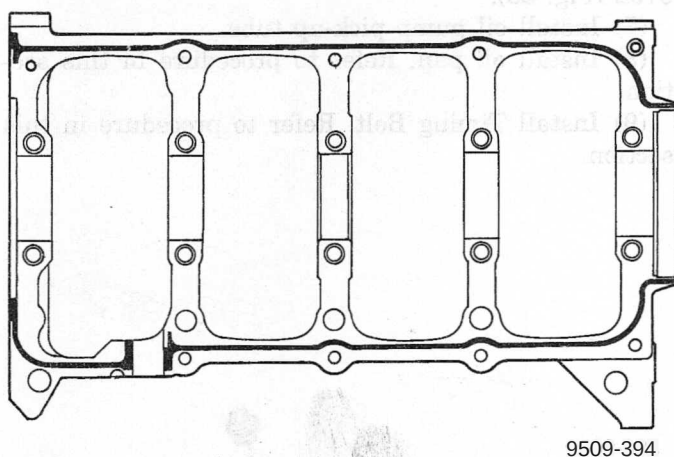


Fig. 83 Main Bearing Caps/Bedplate Sealing

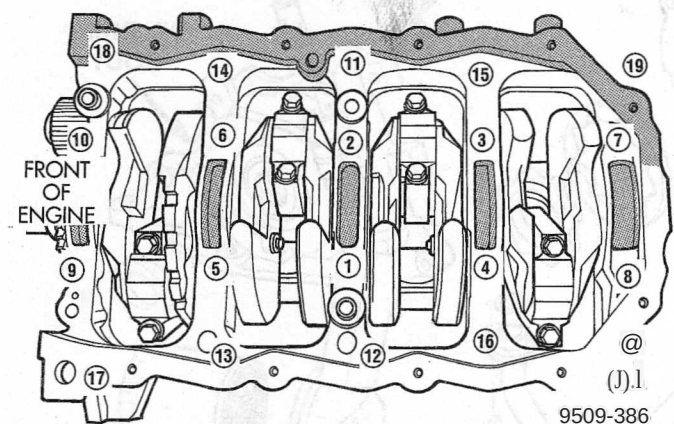


Fig. 84 Main Bearing Caps/Bedplate Torque Sequence

(5) Install lower main bearings into main bearing cap/bedplate. Make certain the bearing tabs are

seated into the bedplate slots. Install the main bearing/bedplate into engine block.

(6) Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.

(7) Install main bearing bedplate to engine block bolts 11, 17 and 20 finger tight. Tighten these bolts down together until the bedplate contacts the cylinder block.

(8) To ensure correct thrust bearing alignment, perform the following steps:

- Step 1: Rotate crankshaft until number 4 piston is at TDC.

- Step 2: Move crankshaft rearward to limits of travel.

- Step 3: Then, move crankshaft forward to limits of travel.

- Step 4: Wedge an appropriate tool between the rear of the cylinder block (**NOT BED PLATE**) and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.

- Step 5: Install and tighten bolts (1 - 10) in sequence shown in (Fig. 84) to 41 N'm (30 ft. lbs.).

- Step 6: Remove wedge tool used to hold crankshaft.

(9) Tighten bolts (1 - 10) again to 41 N'm (30 ft. lbs.) +1/4 turn in sequence shown in (Fig. 84).

(10) Install main bearing bedplate to engine block bolts (11 through 20), and torque each bolt to 28 N'm (20 ft. lbs.) in sequence shown in (Fig. 84).

(11) After the main bearing bedplate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N'm (50 in. lbs.).

(12) Install balance shaft assembly.

(13) Install oil pump, timing belt and covers.

(14) Install oil pan and oil filter.

(15) Install crankshaft rear oil seal. Refer to procedure in this section.

(16) Install drive plate. Apply Mopar®Lock & Seal Adhesive to bolt threads and tighten to 95 N'm (70 ft. lbs.).

(17) Attach transaxle to engine. Tighten attaching bolts to 101 N'm (75 ft. lbs.).

(18) Install engine assembly.

OIL FILTER

CAUTION: When servicing the oil filter avoid deforming the filter can by installing the remove/install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

(1) Turn counterclockwise to remove.

(2) To install, lubricate new filter gasket. Check filter mounting surface. The surface must be smooth, flat and free of debris or old pieces of rubber. Screw filter on until the gasket contacts base. Tighten to 21 N'm (15 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)**OIL PUMP****REMOVAL**

- (1) Disconnect negative cable from battery.
- (2) Remove Timing Belt. Refer to procedure in this section.
- (3) Remove Oil Pan. Refer to procedure in this section.
- (4) Remove Crankshaft Sprocket using Special Tool 6793 and insert C-4685-C2 (Fig. 85).
- (5) Remove oil pick-up tube.
- (6) Remove oil pump, (Fig. 86) and front crankshaft seal.

INSTALLATION

- (1) Make sure all surfaces are clean and free of oil and dirt.
- (2) Apply Mopar® Gasket Maker to oil pump as shown in (Fig. 87). Install oil ring into oil pump body discharge passage.
- (3) Prime oil pump before installation.
- (4) Align oil pump rotor flats with flats on crankshaft as you install the oil pump to the block.

NOTE: Front crankshaft seal **MUST** be out of pump to align, or damage may result.

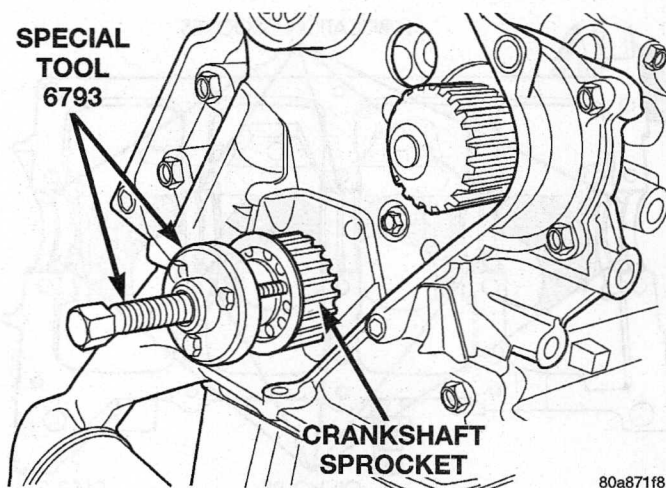


Fig. 85 Crankshaft Sprocket-Removal

- (5) Install new front crankshaft seal using Special Tool 6780 (Fig. 88).
- (6) Install crankshaft sprocket using Special Tool 6792 (Fig. 89).
- (7) Install oil pump pick-up tube.
- (8) Install oil pan. Refer to procedure in this section.
- (9) Install Timing Belt. Refer to procedure in this section.

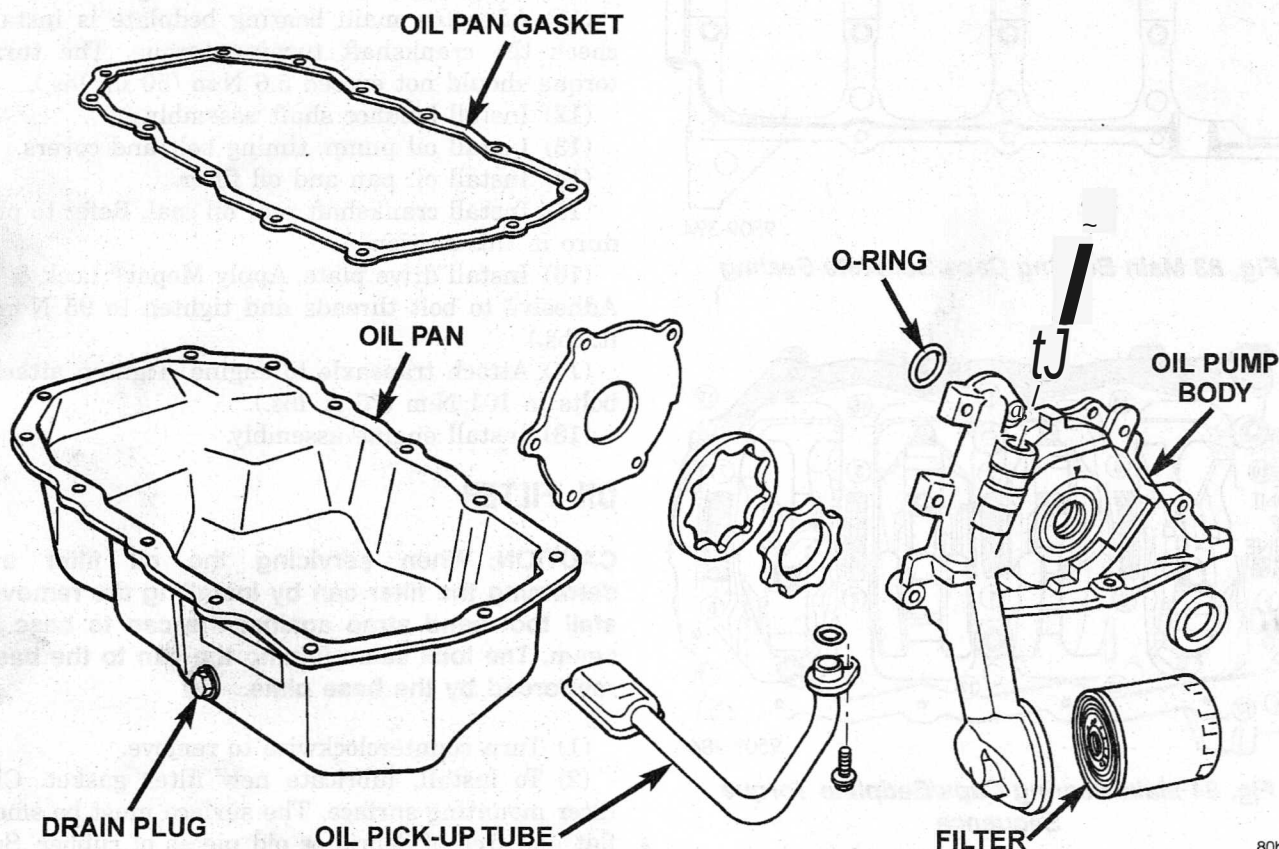


Fig. 86 Oil Pump and Pick-up Tube

REMOVAL AND INSTALLATION (Continued)

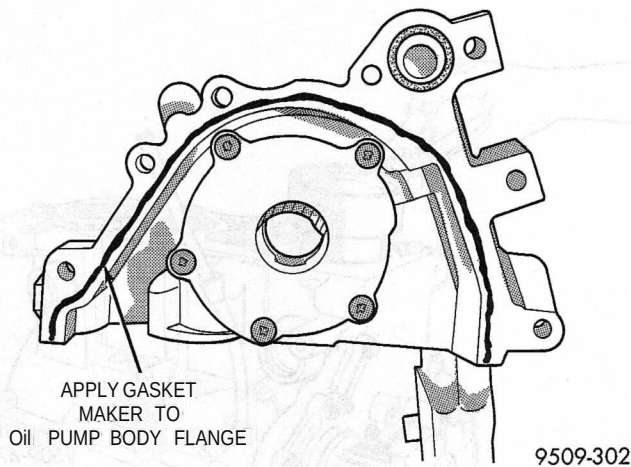


Fig. 87 Oil Pump Sealing

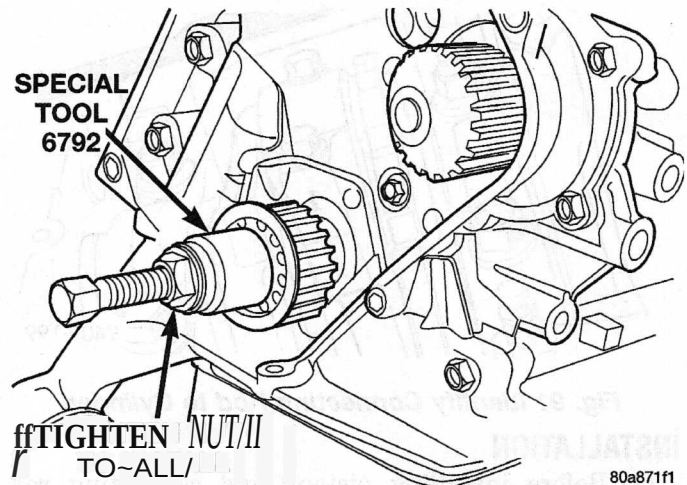


Fig. 89 Crankshaft Sprocket—Installation

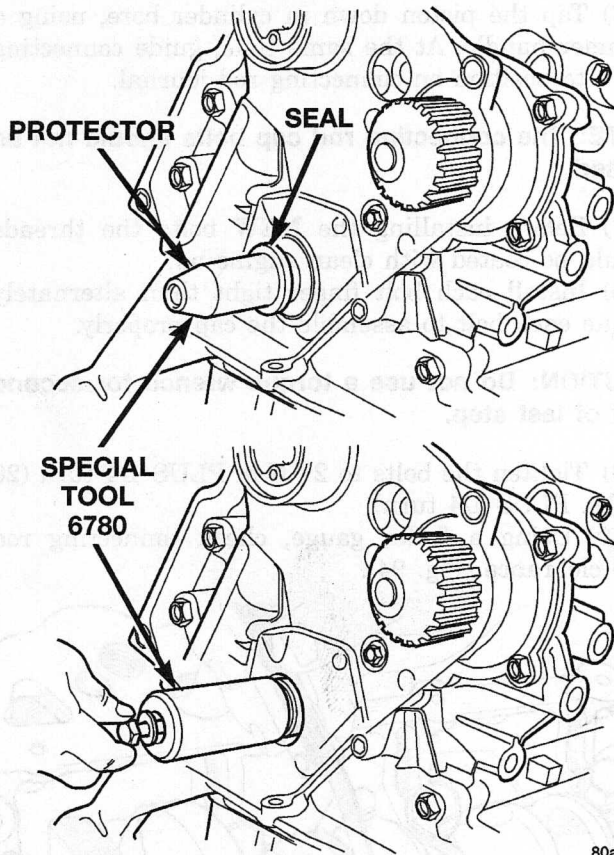


Fig. 88 Front Crankshaft Seal-Installation

PISTON AND CONNECTING ROD

REMOVAL

NOTE: Cylinder Head must be removed before Pistons and Rods. Refer to Cylinder Head Removal in this section.

(1) Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cyl-

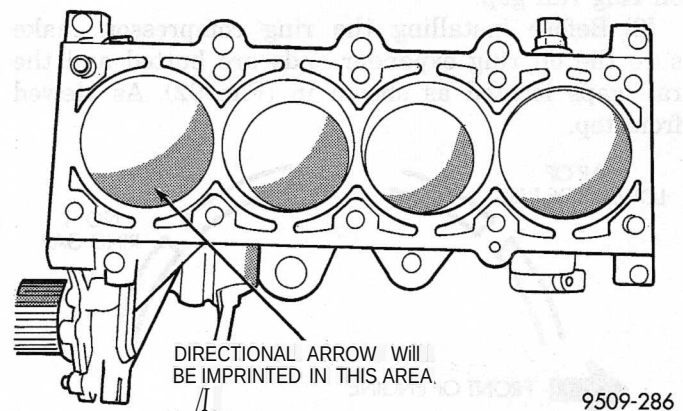


Fig. 90 Piston Markings

inder block. **Be sure to keep tops of pistons covered during this operation.** Mark piston with matching cylinder number (Fig. 90).

(2) Remove oil pan. Scribe the cylinder number on the side of the rod and cap (Fig. 91) for identification.

(3) Pistons have a directional stamping in the front half of the piston facing towards the **front** of engine.

(4) Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft, so that each connecting rod is centered in cylinder bore.

(5) Remove Balance Shaft Assembly. Refer to Balance Shaft Removal in this section.

(6) Remove connecting rod cap bolts. Push each piston and rod assembly out of cylinder bore.

NOTE: Be careful not to nick crankshaft journals.

(7) After removal, install bearing cap on the mating rod.

(8) Piston and Rods are serviced as an assembly.

REMOVAL AND INSTALLATION (Continued)

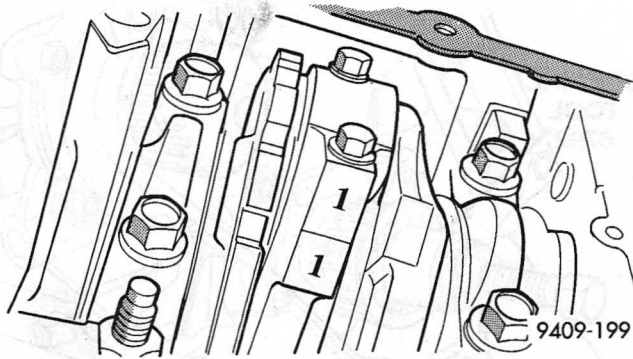


Fig. 91 Identify Connecting Rod to Cylinder

INSTALLATION

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

(2) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in (Fig. 92). As viewed from top.

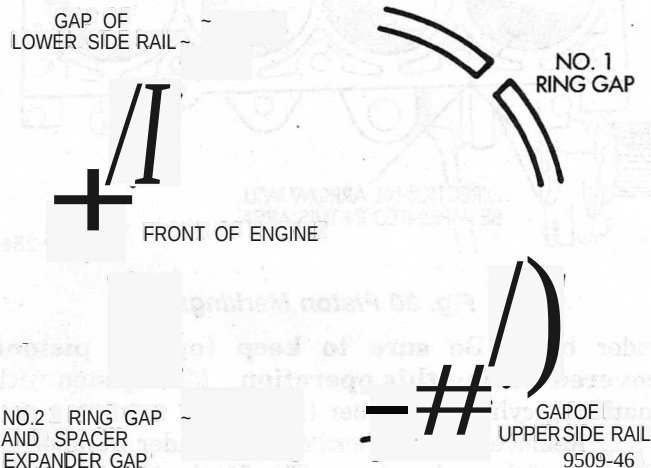


Fig. 92 Piston Ring End Gap Position

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston (Fig. 93). **Be sure position of rings does not change during this operation.**

(4) The directional stamp on the piston should face toward the front of the engine (Fig. 90).

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

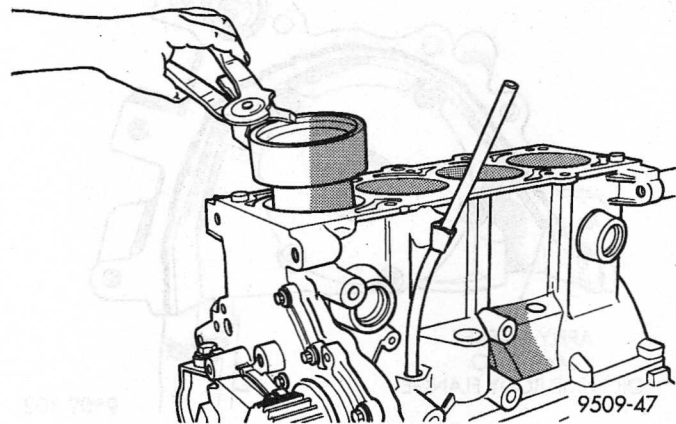


Fig. 93 Piston-Installation

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

NOTE: The connecting rod cap bolts should not be reused.

(7) Before installing the **NEW** bolts the threads should be coated with clean engine oil.

(8) Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.

CAUTION: Do not use a torque wrench for second part of last step.

(9) Tighten the bolts to 27 N'm PLUS 1/4 turn (20 ft. lbs. PLUS 1/4 turn).

(10) Using a feeler gauge, check connecting rod side clearance (Fig. 94).

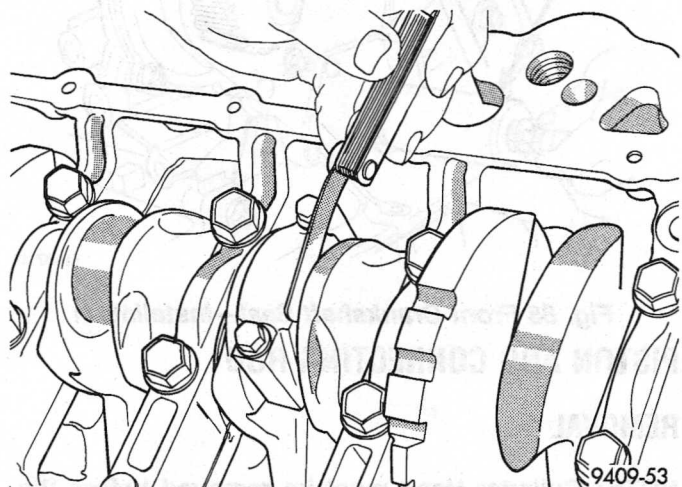


Fig. 94 Checking Connecting Rod Side Clearance

DISASSEMBLY AND ASSEMBLY

OIL PUMP

DISASSEMBLY

- (1) To remove the relief valve, proceed as follows:
 - (a) Remove the threaded plug and gasket from the oil pump (Fig. 95).
 - (b) Remove spring and relief valve (Fig. 95)
- (2) Remove oil pump cover screws, and lift off cover.
- (3) Remove pump rotors.
- (4) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

ASSEMBLY

- (1) Assemble pump, using new parts as required.
Install the inner rotor with chamfer facing the cast iron oil pump cover.
- (2) Prime oil pump before installation by filling rotor cavity with engine oil.
- (3) Install cover and tighten screws to 12 N·m (105 in. lbs.).

CAUTION: Oil pump pressure relief valve must be installed as shown in (Fig. 95) or serious damage may occur.

- (4) Install relief valve, spring, gasket and cap as shown in (Fig. 95). Tighten cap to 41 N·m (30 ft. lbs.).

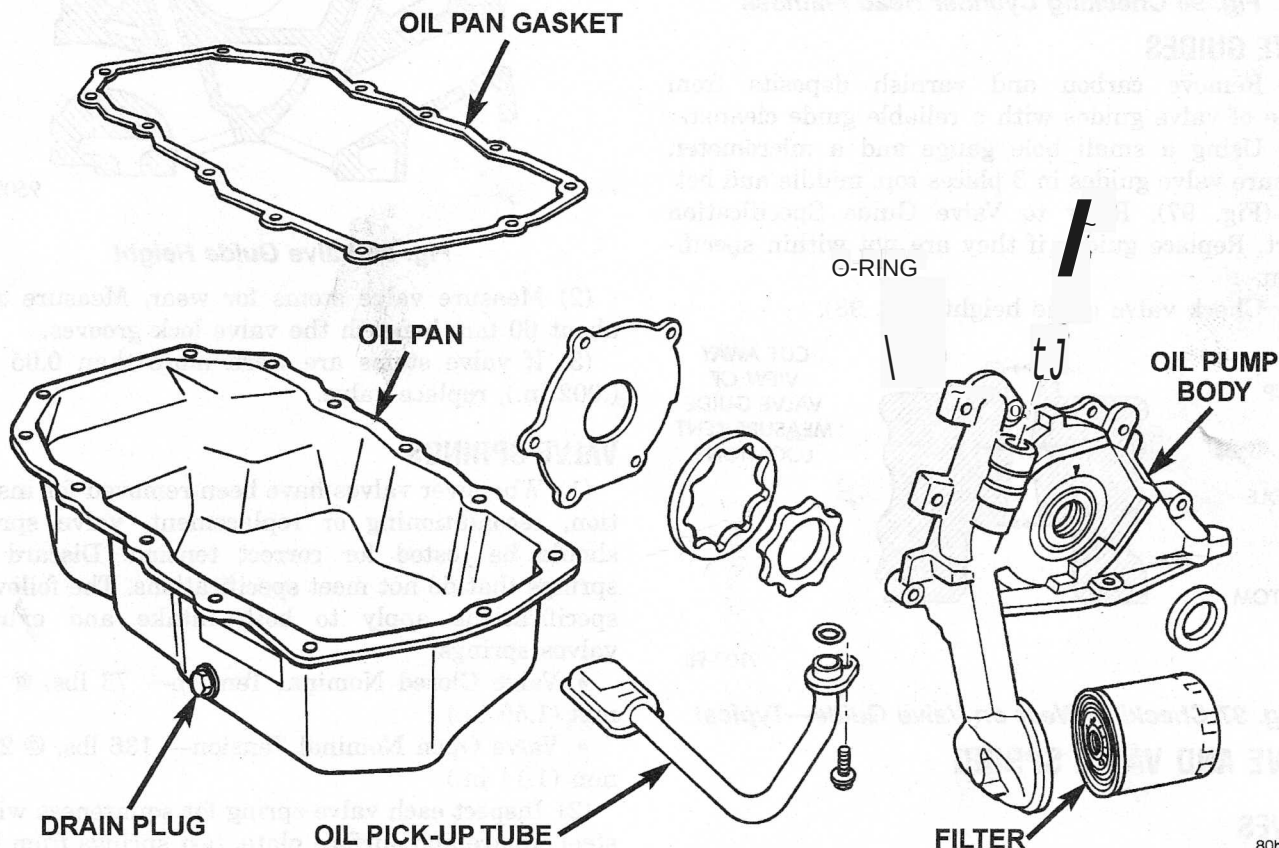
CLEANING AND INSPECTION

INTAKE MANIFOLD

- (1) Discard gasket and clean all surfaces of manifold to cylinder head surfaces.
- (2) Check manifold surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
- (3) Inspect manifold for cracks or distortion. Replace manifold if necessary.

EXHAUST MANIFOLD

- (1) Discard gasket and clean all surfaces of manifolds and cylinder head.
- (2) Test manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
- (3) Inspect manifolds for cracks or distortion. Replace manifold as necessary.



80b3c702

Fig. 95 Oil Pressure Relief Valve

CLEANING AND INSPECTION (Continued)**CYLINDER HEAD****CLEANING**

Remove all gasket material from cylinder head and block. Be careful not to gouge or scratch the aluminum head sealing surface.

INSPECTION

(1) Cylinder head must be flat within 0.1 mm (0.004 inch) (Fig. 96).

(2) Inspect camshaft bearing journals for scoring.

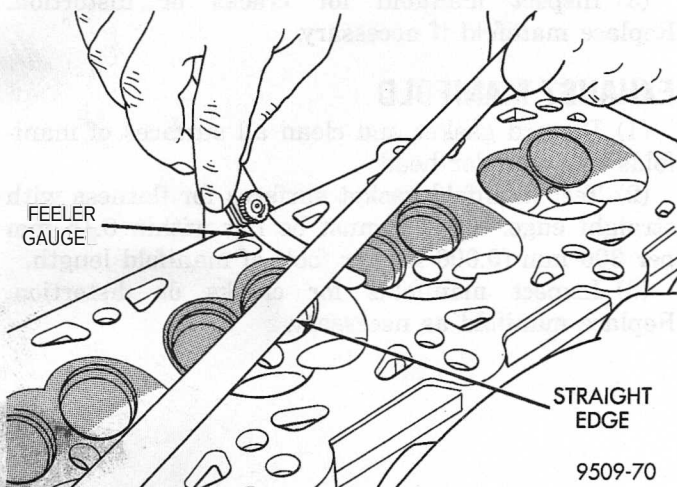


Fig. 96 Checking Cylinder Head Flatness

VALVE GUIDES

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

(2) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (Fig. 97). Refer to Valve Guide Specification Chart. Replace guides if they are not within specification.

(3) Check valve guide height (Fig. 98).

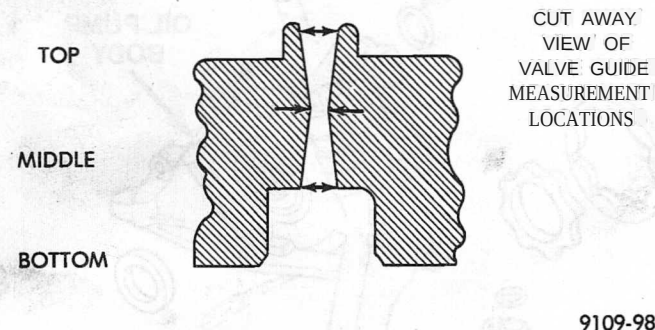


Fig. 97 Checking Wear on Valve Guide—Typical

VALVE AND VALVE SPRING**VALVES**

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

VALVE GUIDE SPECIFICATION CHART

Valve Guide Diameter		
Intake and Exhaust Valve:	5.975 - 6.000 mm (0.2352 - 0.2362 in.)	

Valve Guide Clearance		
	New	Service Limit
Intake Valve:	0.048 - 0.066 mm (0.0018 - 0.0025 in.)	0.25 mm (0.010 in.)
Exhaust Valve:	0.0736 - 0.094 mm (0.0029 - 0.0037 in.)	

0.013.25 - 0.13.75 MM
(.521 - .541 IN.)

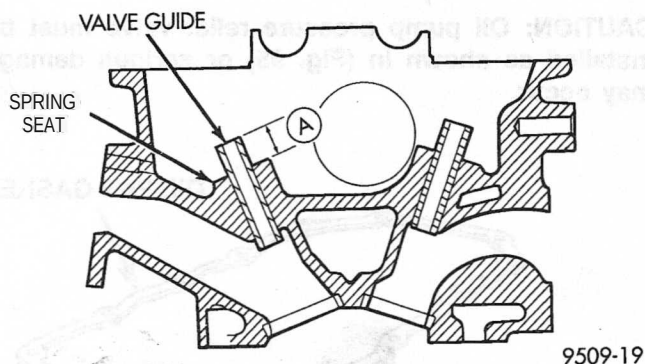


Fig. 98 Valve Guide Height

(2) Measure valve stems for wear. Measure stem about 60 mm beneath the valve lock grooves.

(3) If valve stems are worn more than 0.05 mm (.002 in.), replace valve.

VALVE SPRINGS

(1) Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:

- Valve Closed Nominal Tension— 76 lbs. @ 38.0 mm (1.50 in.)
- Valve Open Nominal Tension— 136 lbs. @ 29.75 mm (1.17 in.)

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

CLEANING AND INSPECTION (Continued)**OIL PUMP**

(1) Clean all parts thoroughly. Mating surface of the oil pump should be smooth (Fig. 99). Replace pump cover if scratched or grooved.

(2) Lay a straightedge across the pump cover surface (Fig. 100). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced.

(3) Measure thickness and diameter of outer rotor. If outer rotor thickness measures 9.40 mm (0.370 in.) or less (Fig. 101), or if the diameter is 79.95 mm (3.148 in.) or less, replace outer rotor.

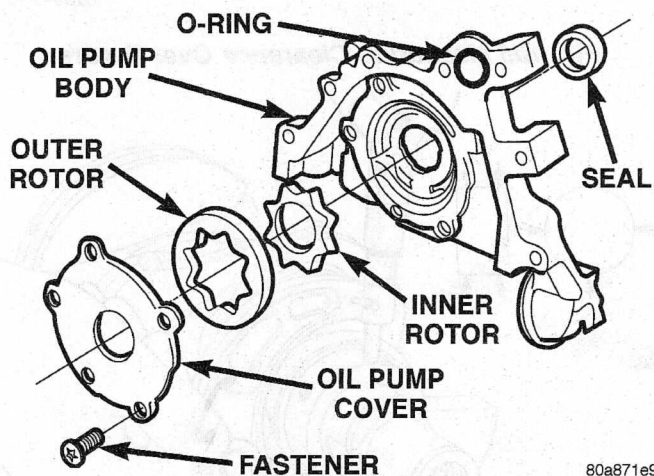
(4) If inner rotor measures 9.40 mm (0.370 in.) or less replace inner rotor (Fig. 102).

(6) Install inner rotor into pump housing. If clearance between inner and outer rotors (Fig. 104) is 0.203 mm (0.008 in.) or more, replace both rotors.

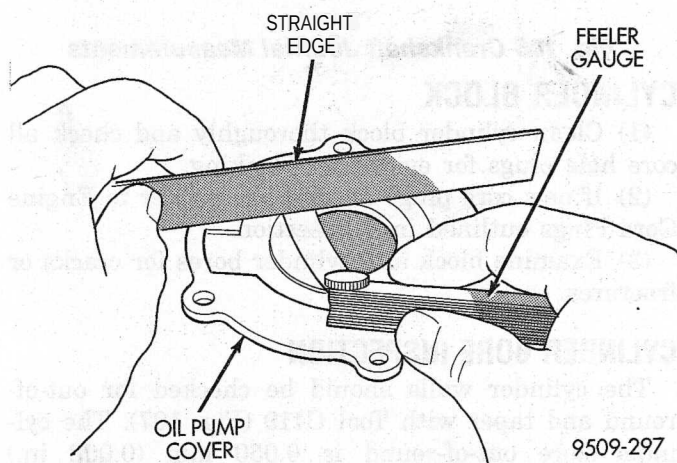
(7) Place a straightedge across the face of the pump housing, between bolt holes. If a feeler gauge of 0.102 mm (0.004 in.), or more can be inserted between rotors and the straightedge, replace pump assembly (Fig. 105), **ONLY** if rotors are in specs.

(8) Inspect oil pressure relief valve plunger for scoring and free operation in its bore. Small marks may be removed with 400 grit wet or dry sandpaper.

(9) The relief valve spring has a free length of approximately 60.7 mm (2.39 inches) it should test between 18 and 19 pounds when compressed to 40.5 mm (1.60 inches). Replace spring that fails to meet specifications.



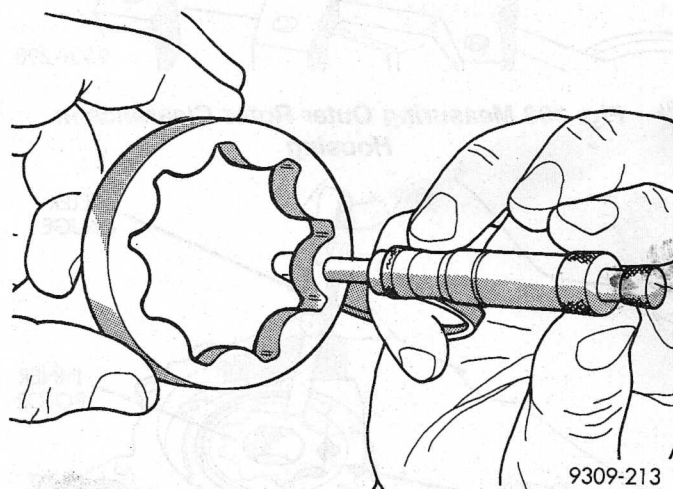
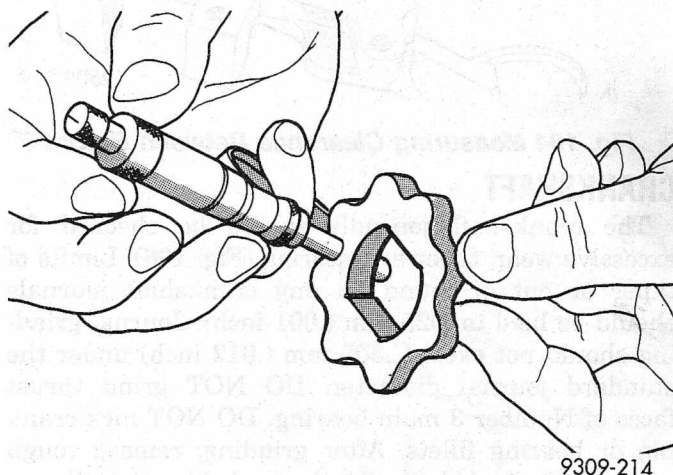
80a871e9

Fig. 99 Oil Pump

9509-297

Fig. 100 Checking Oil Pump Cover Flatness

(5) Slide outer rotor into pump housing, press to one side with fingers and measure clearance between rotor and housing (Fig. 103). If measurement is 0.39 mm (0.015 in.) or more, replace housing only if outer rotor is in specification.

**Fig. 101 Measuring Outer Rotor Thickness****Fig. 102 Measuring Inner Rotor Thickness**

CLEANING AND INSPECTION (Continued)

(10) If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other reasons for oil pressure loss.

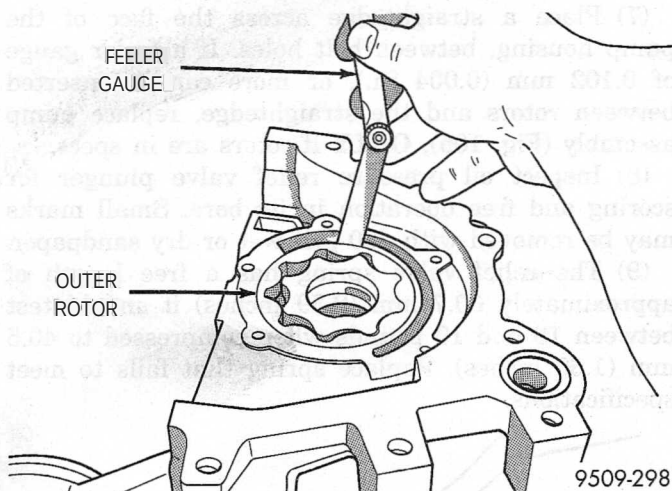


Fig. 103 Measuring Outer Rotor Clearance in Housing

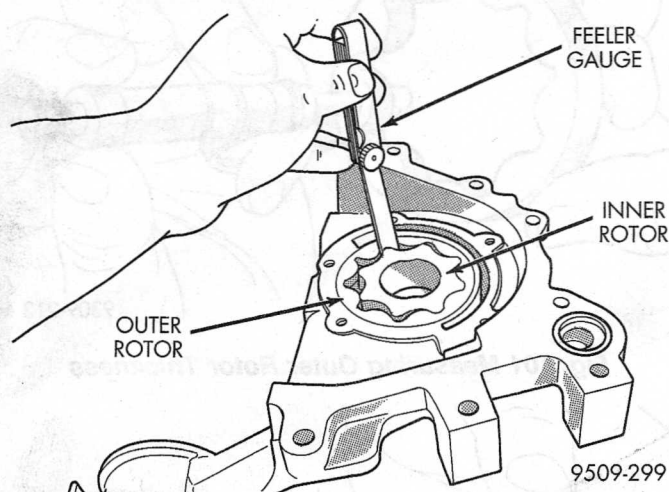


Fig. 104 Measuring Clearance Between Rotors

CRANKSHAFT

The crankshaft journals should be checked for abrasiveness, wear, taper and scoring (Fig. 106). Limits of taper or out of round on any crankshaft journals should be held to .025 mm (.001 inch). Journal grinding should not exceed .305 mm (.012 inch) under the standard journal diameter. **DO NOT** grind thrust faces of Number 3 main bearing. **DO NOT** nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

CAUTION: With the nodular cast iron crankshafts used it is important that the final paper or cloth polish after any journal regrind be in the same direction as normal rotation in the engine.

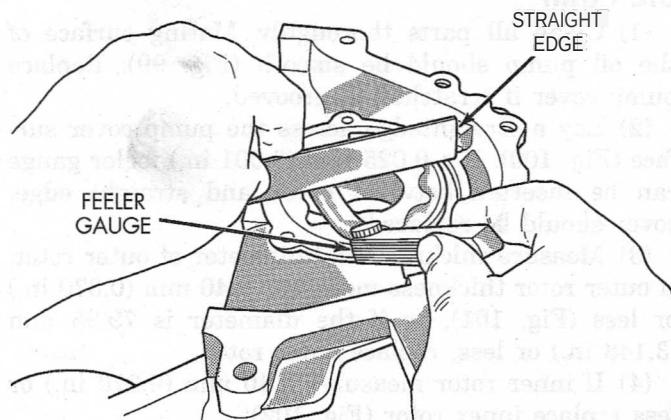


Fig. 105 Measuring Clearance Over Rotors

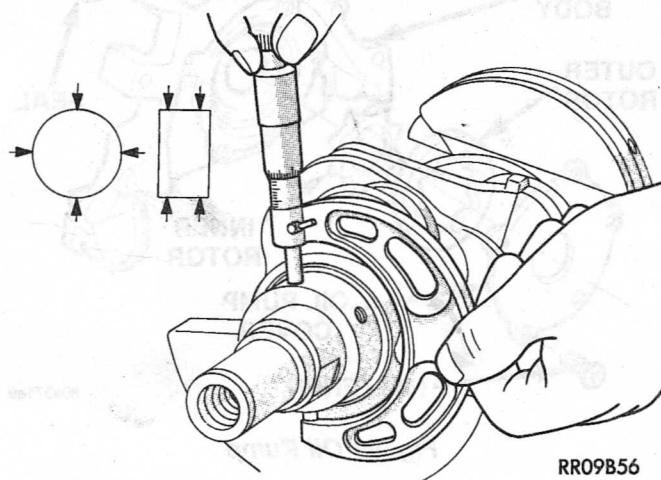


Fig. 106 Crankshaft Journal Measurements

CYLINDER BLOCK

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

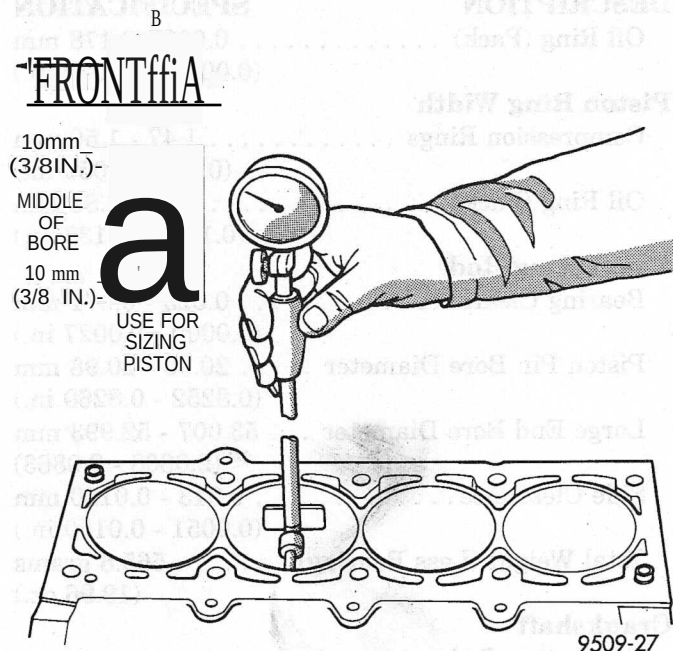
(2) If new core plugs are installed, refer to Engine Core Plugs outlined in this section.

(3) Examine block and cylinder bores for cracks or fractures.

CYLINDER BORE INSPECTION

The cylinder walls should be checked for out-of-round and taper with Tool C119 (Fig. 107). The cylinder bore out-of-round is 0.050 mm (0.002 in.) maximum and cylinder bore taper is 0.051 mm (0.002 in.) maximum. If the cylinder walls are badly cuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

Measure the cylinder bore at three levels in directions A and B (Fig. 107). Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore.

CLEANING AND INSPECTION (Continued)**Fig. 107 Checking Cylinder Bore Size**

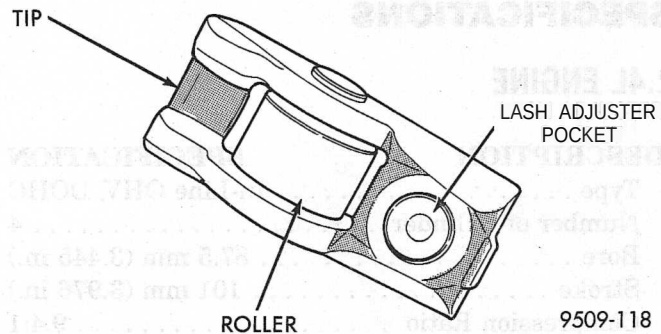
Refer to Cylinder Bore and piston Specification Chart.

**CYLINDER BORE AND PISTON
SPECIFICATION CHART**

Standard Bore	Maximum Out-Of-Round	Maximum Taper
87.5 mm (3.445 in.)	0.051 mm (0.002 in.)	0.051 mm (0.002 in.)
Standard Piston Size		
87.450 - 87.468 mm (3.4434 - 3.4441 in.)		
Piston To Bore Clearance		
0.024 - 0.057 mm (0.0009 - 0.0022 in.)		
Measurements taken at Piston Size Location.		

CAMSHAFT FOLLOWER

Inspect the cam follower assembly for wear or damage (Fig. 108). Replace as necessary.

**Fig. 108 Cam Follower Assembly****ADJUSTMENTS****ENGINE SUPPORT ADJUSTMENT'**

The right and left support assemblies are slotted to allow for right/left drive train adjustment in relation to drive shaft assembly length.

Check and reposition right and left engine support assemblies as required. Adjust drive train position, if required, for the following conditions:

- Drive shaft distress: See Group 2, Suspension and Driveshaft.
- Any front end structural damage (after repair).
- Support Assembly replacement.

ENGINE SUPPORT ADJUSTMENT

(1) Remove the load on the engine motor mounts by carefully supporting the engine and transmission assembly with a floor jack.

(2) Loosen the right engine support assembly vertical fasteners.

(3) Loosen the left engine support assembly vertical bolts.

(4) Pry the engine right or left as required to achieve the proper drive shaft assembly length. Refer to Group 2, Suspension and Driveshaft for driveshaft identification and related assembly length measuring.

(5) Tighten right engine support assembly vertical bolts to 61 N'm (45 ft. lbs.), and tighten left engine support assembly bolts to 61 N'm (45 ft. lbs.).

(6) Recheck drive shaft length.

SPECIFICATIONS

2.4L ENGINE

DESCRIPTION	SPECIFICATION
Type	In-Line OHV, DOHC
Number of Cylinder	4
Bore	87.5 mm (3.445 in.)
Stroke	101 mm (3.976 in.)
Compression Ratio	9.4:1
Displacement	2.4 Liters (148 Cubic Inches)
Firing Order	1, 3, 4, 2
Compression Pressure	1172-1551 kPa (170-225 psi)
Maximum Variation Between Cylinder	25 %
Lubrication ..	Pressure Feed-Full Flow Filtration (Direct Crankshaft Driven Pump)
Cylinder Block	
Cylinder Bore Diameter ...	87.4924 - 87.5076 mm (3.4446 - 3.4452 in.)
Out-of-Round (Max.)	0.051 mm (0.002 in.)
Taper (Max.)	0.051 mm (0.002 in.)
Pistons	
Clearance at 14 mm (9/16 in.)	
From Bottom of Skirt	0.024 - 0.057 mm (0.0009 - 0.0022 in.)
Weight	332 - 346 grams (11.85 - 12.20 oz.)
Top Land Clearance	
(Diametrical)	0.614 - 0.664 mm (0.024 - 0.026 in.)
Piston Length	60.30 mm (2.374 in.)
Piston Ring Groove Depth	
No.1	4.640 - 4.784 mm (0.182 - 0.188 in.)
No.2	4.575 - 4.719 mm (0.180 - 0.185 in.)
No.3	4.097 - 4.236 mm (0.161 - 0.166 in.)
Piston Pins	
Clearance in Piston	0.005 - 0.018 mm
In Rod (Interference)	0.018 - 0.043 mm (0.0007 - 0.0017 in.)
Diameter	21.998 - 22.003 mm (0.8660 - 0.8662 in.)
End Play	None
Length	72.75 - 73.25 mm (2.864 - 2.883 in.)
Piston Ring Gap	
Top Compression Ring	0.25 - 0.51 mm (0.0098 - 0.020 in.)
2nd Compression Ring	0.23 - 0.48 mm (0.009 - 0.018 in.)
Oil Control (Steel Rails)	0.25 - 0.64 mm (0.0098 - 0.025 in.)
Piston Ring Side Clearance	
Top and Second	
Compression Rings	0.030 - 0.080 mm (0.0011 - 0.0031 in.)

DESCRIPTION	SPECIFICATION
Oil Ring (Pack)	0.012 - 0.178 mm (0.0004 - 0.0070 in.)
Piston Ring Width	
Compression Rings	1.47 - 1.50 mm (0.057 - 0.059 in.)
Oil Ring (Pack)	2.72 - 2.88 mm (0.107 - 0.1133 in.)
Connecting Rod	
Bearing Clearance	0.025 - 0.071 mm (0.0009 - 0.0027 in.)
Piston Pin Bore Diameter	20.96 - 20.98 mm (0.8252 - 0.8260 in.)
Large End Bore Diameter ...	53.007 - 52.993 mm (2.0868 - 2.0863)
Side Clearance	0.013 - 0.0150 mm (0.0051 - 0.0150 in.)
Total Weight (Less Bearing)	565.8 grams (19.96 oz.)
Crankshaft	
Connecting Rod	
Journal Diameter	49.984 - 50.000 mm (1.967 - 1.9685 in.)
Out-of-Round (Max.)	0.0035 mm (0.0001 in.)
Taper (Max.)	0.0038 mm (0.0001 in.)
Main Bearing Diametrical	
Clearance No.1 - 5	0.018 - 0.058 mm (0.0007 - 0.0023 in.)
End Play	0.09 - 0.24 mm (0.0035 - 0.0094 in.)
Main Bearing Journals	
Diameter	59.992 - 60.008 mm (2.361 - 2.3625 in.)
Out-of-Round (Max.)	0.0035 mm (0.0001 in.)
Taper (Max.)	0.0038 (0.0001 in.)
Hydraulic Lash Adjusters	
Body Diameter	15.901 - 15.913 mm (0.626 - 0.6264 in.)
Plunger Travel Minimum (Dry)	3.0 mm (0.118 in.)
Camshaft	
Bearing Bore	
Diameters No. 1-6	26.020 - 26.041 mm (1.024 - 1.025 in.)
Diametrical Bearing Clearance ..	0.069 - 0.071 mm (0.0027 - 0.003 in.)
End Play ..	0.050 - 0.170 mm (0.0019 - 0.0066 in.)
Bearing Journal	
Diameter No. 1-6	25.951 - 25.970 mm (1.021 - 1.022 in.)
Lift (Zero Lash) Intake	8.25 mm (0.324 in.)
Lift (Zero Lash) Exhaust	6.52 mm (0.256 in.)
Valve Timing - Intake Valve	
Closes (ABDC)	5P
Opens (BTDC)	1°
Duration	232°

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Valve Timing - Exhaust Valve	
Closes (ATDC)	8°
Opens (BBDC)	52°
Duration	240°
Valve Timing	
Valve Overlap	9°
Cylinder Head	
Material	Cast Aluminum
Gasket Thickness (Compressed)	1.15 mm (0.045 in.)
Cylinder Head Valve Seat	
Angle	45°
Runout (Max.)	0.050 mm (0.002 in.)
Width (Finish) Intake and Exhaust	0.9 - 1.3 mm (0.035 - 0.051 in.)
Guide Bore Diameter (Std)	11.0 - 11.02 mm (0.4330 - 0.4338 in.)
Finish Guide Bore ID	5.975 - 6.000 mm (0.235 - 0.236 in.)
Valves	
Face Angle	44-1/2° - 45°
Head Diameter Intake	34.67 - 34.93 mm (1.364 - 1.375 in.)
Head Diameter Exhaust	30.37 - 30.63 mm (1.195 - 1.205 in.)
Length-Intake (Overall)	112.76 - 113.32 mm (4.439 - 4.461 in.)
Length-Exhaust (Overall)	109.59 - 110.09 mm (4.314 - 4.334 in.)
Valve Margin-Intake	1.285 - 1.615 mm (0.050 - 0.063 in.)
Valve Margin-Exhaust	0.985 - 1.315 mm (0.038 - 0.051 in.)
Valve Stem Tip Height-Intake	48.04 mm (1.891 in.)
Valve Stem Tip Height-Exhaust	47.99 mm (1.889 in.)
Stem Diameter-Intake	5.934 - 5.952 mm (0.234 - 0.234 in.)
Stem Diameter-Exhaust	5.906 - 5.924 mm (0.233 - 0.233 in.)
Stem-to-Guide Clearance—	
Intake	0.048 - 0.066 mm (0.0018 - 0.0025 in.)
Stem-to-Guide Clearance—	
Exhaust	0.0736 - 0.094 mm (0.0029 - 0.0037 in.)
Max. Allowable Stem-to-Guide	
Clearance-Intake and Exhaust	0.025 mm (0.010 in.)

DESCRIPTION	SPECIFICATION
Valve Springs	
Free Length (Approx.)	48.4 mm (1.905 in.)
Spring Tension	
(Valve Closed)	338 N ±20 N 38.0 mm (75.98 lbs. ±4.5 lbs. @ 1.496 in.)
Spring Tension	
(Valve Open)	607 N ±30 N @ 29.75 mm (136 lbs. ±7 @ 1.172 in.)
Number of Coils	7.82
Wire Diameter	3.86 mm (0.151 in.)
Installed Spring Height	38.00 mm (1.496 in.)
Oil Pump	
Clearance Over Rotors (Max.)	0.10 mm (0.004 in.)
Cover Out-of-Flat (Max.) ...	0.025 mm (0.001 in.)
Inner Rotor Thickness (Min.) .	9.40 mm (0.370 in.)
Outer Rotor (Oil Pump)	
Clearance (Max.)	0.39 mm (0.015 in.)
Diameter (Min.)	79.95 mm (3.148 in.)
Thickness (Min.)	9.40 mm (0.370 in.)
Tip Clearance Between Rotors (Max.) ...	0.20 mm (0.008 in.)
Oil Pressure	
At Curb Idle Speed *	25 kPa (4 psi)
At 3000 rpm	170 - 550 kPa (25 - 80 psi)

CAUTION: * If pressure is ZERO at curb Idle, DO NOT run engine at 3,000 rpm.

TORQUE CHART 2.4L

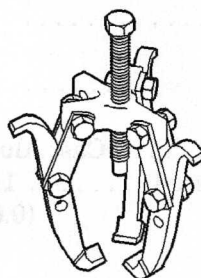
DESCRIPTION	TORQUE
Balance Shaft Carrier to Block	
Bolts	54 N'm (40 ft. lbs.)
Balance Shaft Gear Cover	
Double Ended Fastener	12 N'm (105 in. lbs.)
Balance Shaft Sprockets	
Bolts	28 N'm (250 in. lbs.)
Balance Shaft Chain Tensioner	
Bolts	12 N'm (105 in. lbs.)
Balance Shaft Carrier Cover	
Fasteners	12 N'm (105 in. lbs.)
Camshaft Sensor Pick Up	
Bolts	27 N'm (20 ft. lbs.)
Camshaft Sprocket	
Bolt	101 N'm (75 ft. lbs.)
Connecting Rod Cap	
Bolts	27 N'm (20 ft. lbs.) Plus 1/4 Turn
Crankshaft Main Bearing Cap/Bedplate	
M8 Bedplate Bolts	34 N'm (250 in. lbs.)
Main Cap Bolts M11	41 N'm (30 ft. lbs.)
	Plus 1/4 Turn

SPECIFICATIONS (Continued)

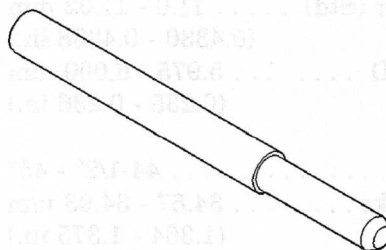
DESCRIPTION	TORQUE
Crankshaft Damper	
Bolt	135 N'm (100 ft. lbs.)
Cylinder Head	
Bolts	Refer To Cylinder- Head Installation
Cylinder Head Cover	
Bolts	12 N'm (105 in. lbs.)
Drive Plate to Crankshaft	
Bolts	95 N'm (70 ft. lbs.)
Engine Mount Bracket-Right	
Bolts	61 N'm (45 ft. lbs.)
Engine Mount-Front & Rear	
Through Bolt	61 N'm (45 ft. lbs.)
Exhaust Manifold to Cylinder Head	
Bolts	23 N'm (200 in. lbs.)
Exhaust Manifold Heat Shield	
Bolts	12 N'm (105 in. lbs.)
Front Torque Bracket-2.4L Engine	
Bolts	33 N'm (24 ft. lbs.)
Front Powertrain Bending Strut-2.4L Engine	
Long Bolts	101 N'm (75 ft. lbs.)
Short Bolt	61 N'm (45 ft. lbs.)
Intake Manifold	
Bolts	23 N'm (200 in. lbs.)
Oil Filter	
Filter	20 N'm (15 ft. lbs.)
Oil Pan	
Bolts	12 N'm (105 in. lbs.)
Drain Plug	27 N'm (20 ft. lbs.)
Oil Pump Attaching	
Bolts	28 N'm (250 in. lbs.)
Oil Pump Cover Fastener ...	12 N'm (105 in. lbs.)
Oil Pump Pick-up Tube Bolt	28 N'm (250 in. lbs.)
Oil Pump Relief Valve Cap ...	41 N'm (30 ft. lbs.)
Rear Torque Bracket-2.4L Engine	
Bolts	110 N'm (80 ft. lbs.)
Spark Plugs	
Plugs	28 N'm (20 ft. lbs.)
Timing Belt Cover	
Outer to Inner Attaching Bolts M6	4.5 N'm (40 in. lbs.)
Inner Cover to Head/Oil Pump Bolts M6 ..	12 N'm (105 in. lbs.)
Timing Belt Tensioner Assembly	
Bolts	61 N'm (45 ft. lbs.)
Thermostat Housing	
Bolts	23 N'm (200 in. lbs.)
Water Pump Mounting	
Bolts	12 N'm (105 in. lbs.)

SPECIAL TOOLS

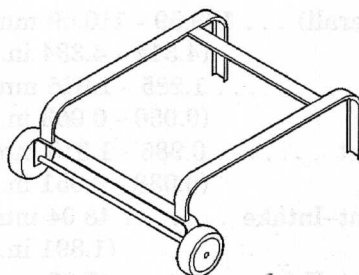
2.4L ENGINE



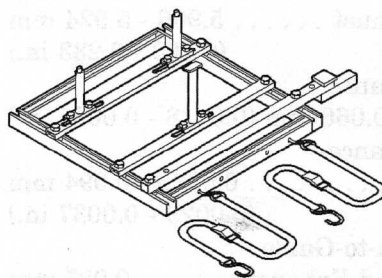
Puller 1026



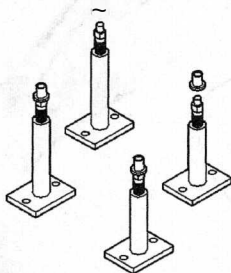
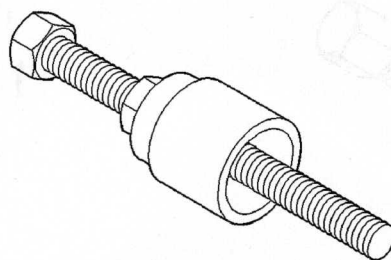
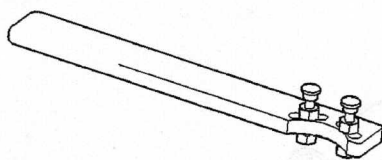
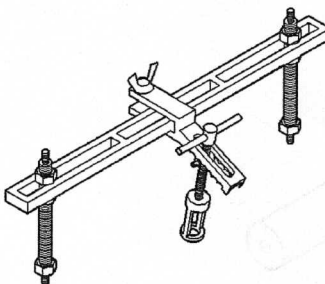
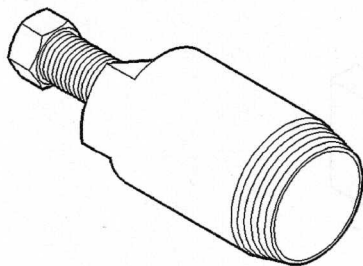
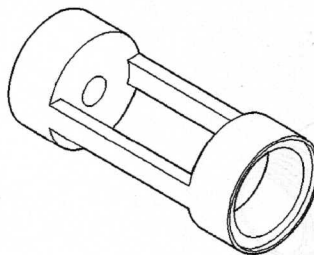
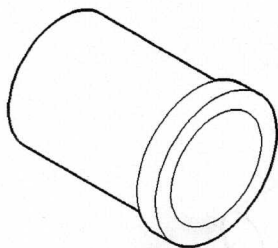
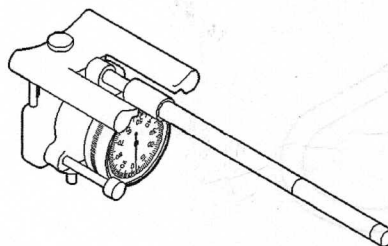
Crankshaft Damper Removal Insert 6827-A



Dolly 6135



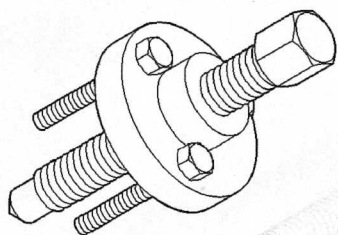
Cradle 6710

SPECIAL TOOLS (Continued)**Post Kit Engine Cradle 6848****Crankshaft Damper Installer 6792****Camshaft Sprocket Holder 6847****Valve Spring Compressor MD-998772-A****Camshaft Seal Remover C-4679-A****Valve Spring Compressor Adapter 6779****Camshaft Seal Installer MD-998306**

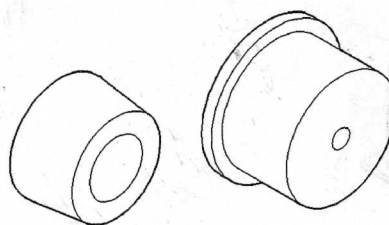
8011c9fa

Cylinder Bore Gage C-119

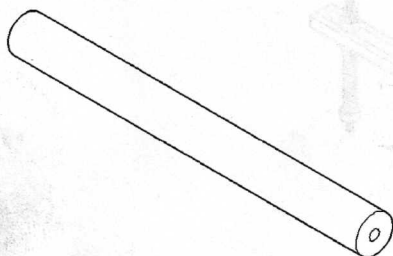
SPECIAL TOOLS (Continued)



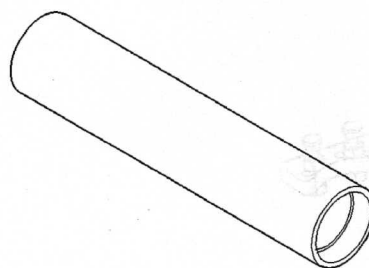
Crankshaft Sprocket Remover 6793



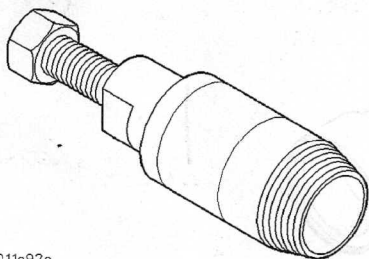
Rear Crankshaft Seal Guide and Installer 6926-1 and 6926-2



Crankshaft Sprocket Remover Insert C-4685-C2

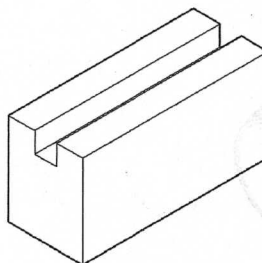


Balance Shaft Sprocket Installer 6052

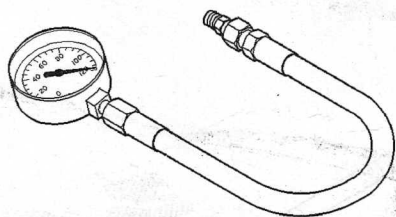


8011c92c

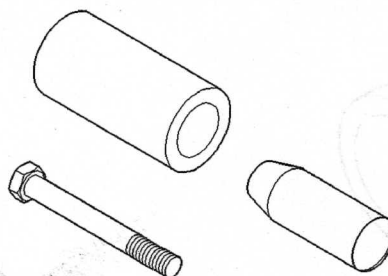
Crankshaft Seal Remover 6771



Post Adapter 8130



Oil Pressure Gage C-3292



Front Crankshaft Oil Seal Installer 6780