2007 ENGINE

4.0L - Service Information - Nitro

DESCRIPTION

4.0L ENGINE

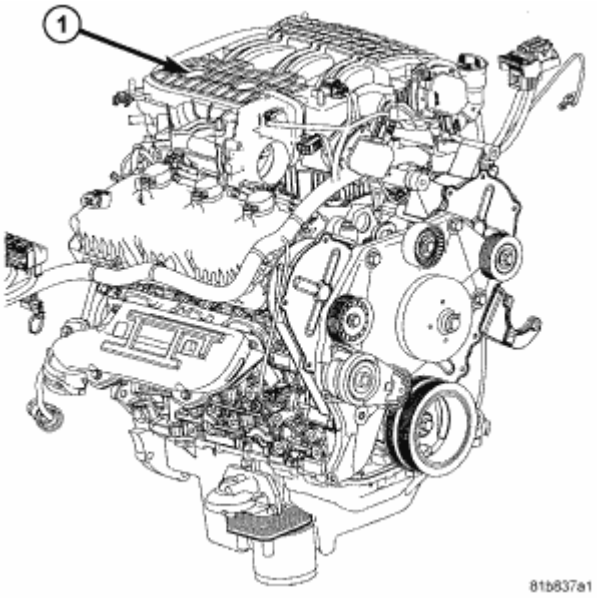

Fig. 1: 4.0L ENGINE
Courtesy of CHRYSLER LLC

The 4.0L Liter (244 Cubic Inches) 60° V-6 engine is a single overhead camshaft design with hydraulic lifters and four valves per cylinder The engine does not have provisions for a free wheeling valve train. See **Fig. 1**.

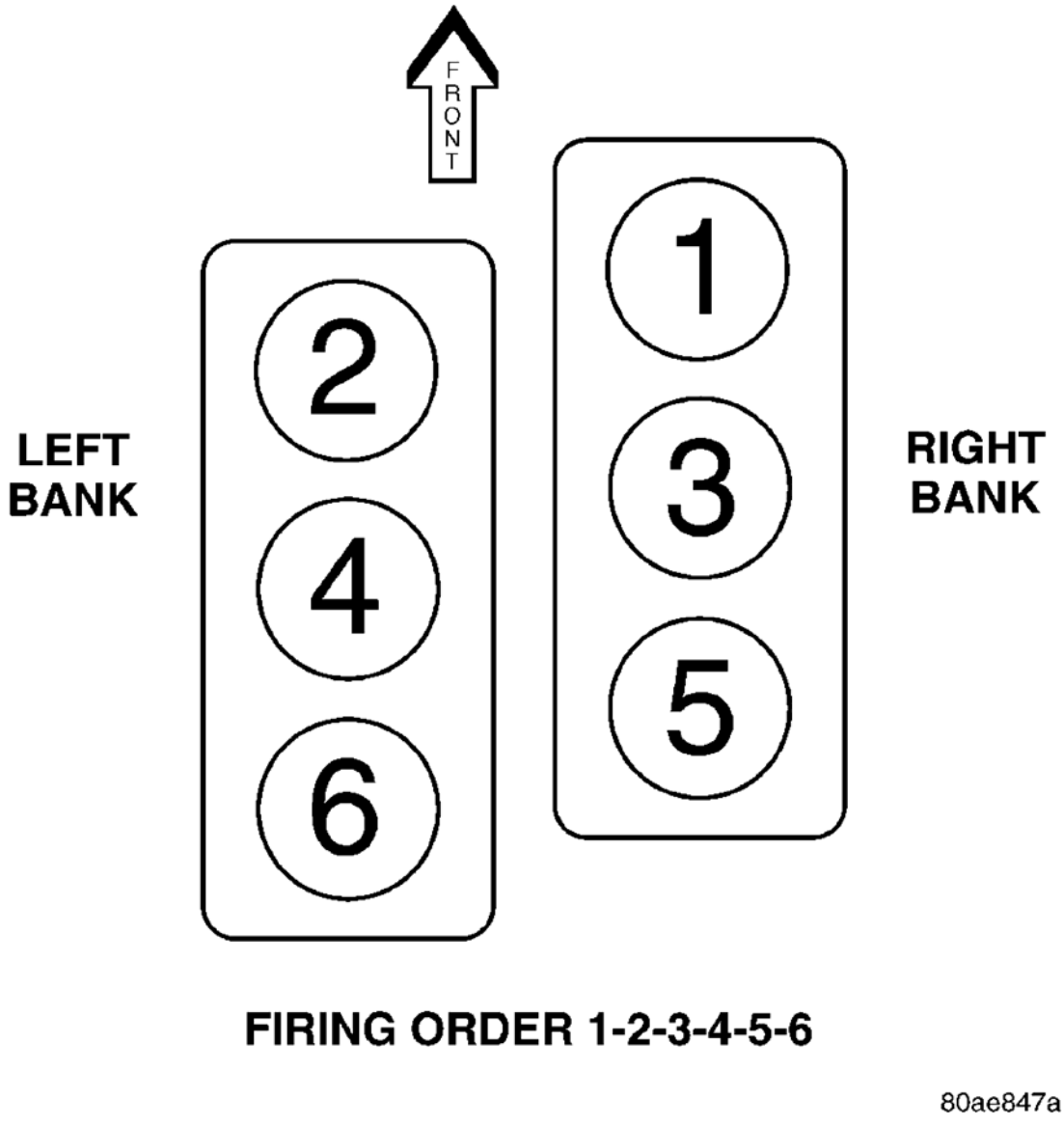

Fig. 2: Cylinder Numbering & Firing Order
Courtesy of CHRYSLER LLC

The cylinders are numbered from front to rear, with the right bank odd numbered, and the left bank even numbered The firing order is 1-2-3-4-5-6. See **Fig. 2**.

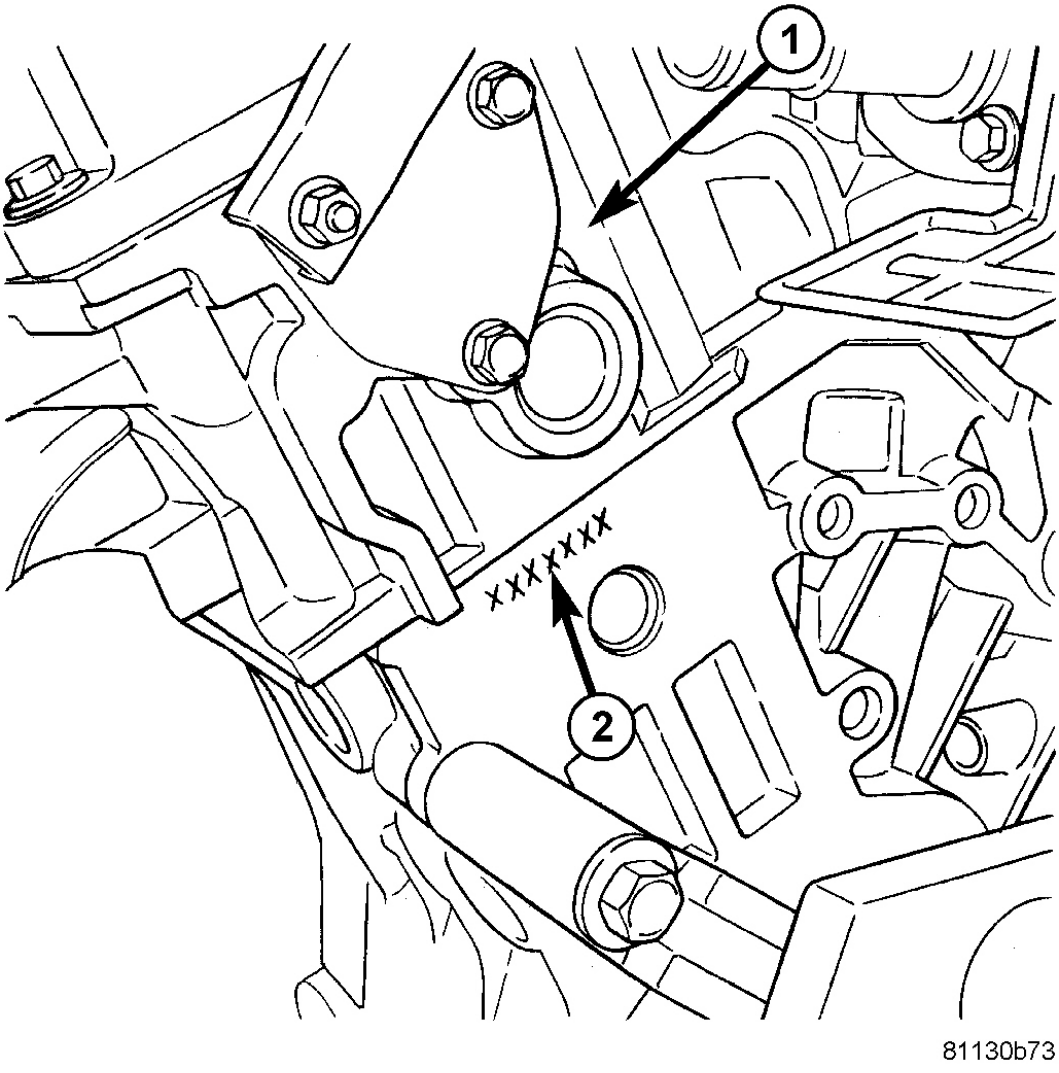

Fig. 3: Engine Identification
Courtesy of CHRYSLER LLC

1 - REAR OF LEFT CYLINDER HEAD
2 - ENGINE IDENTIFICATION NUMBER

The engine identification number (2) is located on the rear of engine block just below the left cylinder head (1). See **Fig. 3**.

DIAGNOSIS AND TESTING

INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g, a strange noise), or performance (e.g, engine idles rough and stalls).

Refer to **ENGINE MECHANICAL** and **ENGINE PERFORMANCE** for possible causes and corrections of malfunctions. Refer to **FUEL SYSTEM** for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

Cylinder Compression Pressure Test
Cylinder Combustion Pressure Leakage Test
Cylinder Head Gasket Failure Diagnosis
Intake Manifold Leakage Diagnosis
Lash Adjuster (Tappet) Noise Diagnosis
Engine Oil Leak Inspection

ENGINE MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Check and correct engine oil level.
	2. Thin or diluted oil.	2. Change oil to correct viscosity.
	3. Thick oil	3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again.
	4. Low oil pressure.	4. Check and correct engine oil level.
	5. Dirt in tappets/lash adjusters.	5. Replace rocker arm/hydraulic lash adjuster assembly.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn tappets/lash adjusters.	7. Install new rocker arm/hydraulic lash adjuster assembly.
	8. Worn valve guides.	8. Replace cylinder head(s).
	9. Excessive runout of valve seats on valve faces.	9. Grind valve seats and valves.
	10. Missing adjuster pivot.	10. Replace rocker arm/hydraulic lash adjuster assembly.

CONNECTING ROD NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thick/Thin or diluted oil. - (b.) Run engine to operating temperature. (c.) Change oil and filter again. 4. Excessive bearing clearance. 5. Connecting rod journal out-of-round. 6. Misaligned connecting rods.	1. Check engine oil level. 2. Check engine oil level. Inspect oil pump relief valve and spring. 3. Change oil to correct viscosity. 3. (a.) Change oil and filter. 4. Measure bearings for correct clearance. Repair as necessary. 5. Replace crankshaft or grind surface. 6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thick/Thin or diluted oil. - (b.) Run engine to operating temperature. (c.) Change oil and filter again. 4. Excessive bearing clearance. 5. Excessive end play. 6. Crankshaft journal out-of-round or worn. 7. Loose flywheel or torque converter.	1. Check engine oil level. 2. Check engine oil level. Inspect oil pump relief valve and spring. 3. Change oil to correct viscosity. 3. (a.) Change oil and filter. 4. Measure bearings for correct clearance. Repair as necessary. 5. Check thrust bearing for wear on flanges. 6. Replace crankshaft or grind journals. 7. Tighten to correct torque.
OIL PRESSURE DROP	1. Low oil level. 2. Faulty oil pressure sending unit. 3. Low oil pressure. 4. Clogged oil filter. 5. Worn parts in oil pump. 6. Thin or diluted oil. 7. Oil pump relief valve stuck. 8. Oil pump suction tube loose. 9. Oil pump cover warped or cracked. 10. Excessive bearing clearance.	1. Check engine oil level. 2. Install new sending unit. 3. Check sending unit and main bearing oil clearance. 4. Install new oil filter. 5. Replace worn parts or pump. 6. Change oil to correct viscosity. 7. Remove valve and inspect, clean, or replace. 8. Remove oil pan and install new tube or clean, if necessary. 9. Install new oil pump. 10. Measure bearings for correct clearance.

OIL LEAKS	1. Misaligned or deteriorated gaskets. 2. Loose fastener, broken or porous metal part. 3. Misaligned or deteriorated cup or threaded plug.	1. Replace gasket(s). 2. Tighten, repair or replace the part. 3. Replace as necessary.
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction. 2. Worn, scuffed or broken rings. 3. Carbon in oil ring slots. 4. Rings fitted too tightly in grooves. 5. Worn valve guide(s). 6. Valve stem seal(s) worn or damaged.	1. Check system and repair as necessary. (Refer to Appropriate Diagnostic Information) 2. Hone cylinder bores. Install new rings. 3. Clean pistons and install new rings. 4. Remove rings and check grooves. If groove is not proper width, replace piston. 5. Replace cylinder head(s). 6. Replace seal(s).

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

Exhaust and intake valve leaks (improper seating).
Leaks between adjacent cylinders or into water jacket.
Any causes for combustion/compression pressure loss.

WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

1. Check the coolant level and fill as required. DO NOT install the pressure cap.
2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
3. Clean spark plug recesses with compressed air.
4. Remove the spark plugs.
5. Remove the oil filler cap.
6. Remove the air cleaner.
7. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.
8. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While

testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

9. All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.
10. **FOR EXAMPLE:** At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.
3. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
4. Remove the Auto Shutdown (ASD) relay from the PDC.
5. Be sure throttle blade is fully open during the compression check.
6. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0-500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, see **SPECIAL TOOLS**.
7. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
8. Repeat the previous step for all remaining cylinders.
9. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
10. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
11. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

ENGINE PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. Refer to **DESCRIPTION** .
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. Refer to

		DIAGNOSIS AND TESTING .
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Check and adjust gap as needed.
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
8. Incorrect engine timing.	8. Check for a skipped timing belt or a loose camshaft sprocket.	
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)
	2. Incorrect fuel mixture.	2. (Refer to Appropriate Diagnostic Information)
	3. Intake manifold leakage.	3. Inspect intake manifold gasket, manifold, and vacuum hoses.
	4. Faulty coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs.	1. Set gap as needed or replace plug(s).
	2. Contamination in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Incorrect valve timing.	4. Correct valve timing as needed.
	5. Leaking cylinder head gasket.	5. Replace cylinder head gasket.
	6. Low compression.	6. Test compression of each cylinder.
	7. Burned, warped, or pitted valves.	7. Replace valves.
	8. Plugged or restricted exhaust system.	8. Check exhaust system restriction. Replace parts, as necessary.
	9. Faulty coil(s).	9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Set gap as needed or replace plug(s).
	2. Contamination in Fuel System.	2. Clean fuel system and replace fuel filter.

	3. Burned, warped, or pitted valves.	3. Replace valves.
	4. Faulty coil(s).	4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Set gap as needed or replace plug(s).
	2. Faulty coil(s).	2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	3. Dirty fuel injector(s).	3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
	4. Contamination in fuel system.	4. Clean system and replace fuel filter.

ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil level indicator to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time** , proceed with the AIR LEAK DETECTION TEST METHOD as follows:

   Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.

   Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.

   Attach an air hose with pressure gauge and regulator to the oil level indicator tube.

   CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

   Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service

information procedures.

If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

NOTE: If oil leakage is observed at the oil level indicator tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
   - Circular spray pattern generally indicates seal leakage or crankshaft damage.
   - Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as described in step 5 under ENGINE OIL LEAK INSPECTION.

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

STANDARD PROCEDURE

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results.**Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® BED PLATE SEALANT is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bedplate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

MOPAR® GASKET SEALANT is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

ENGINE CORE AND OIL GALLERY PLUGS

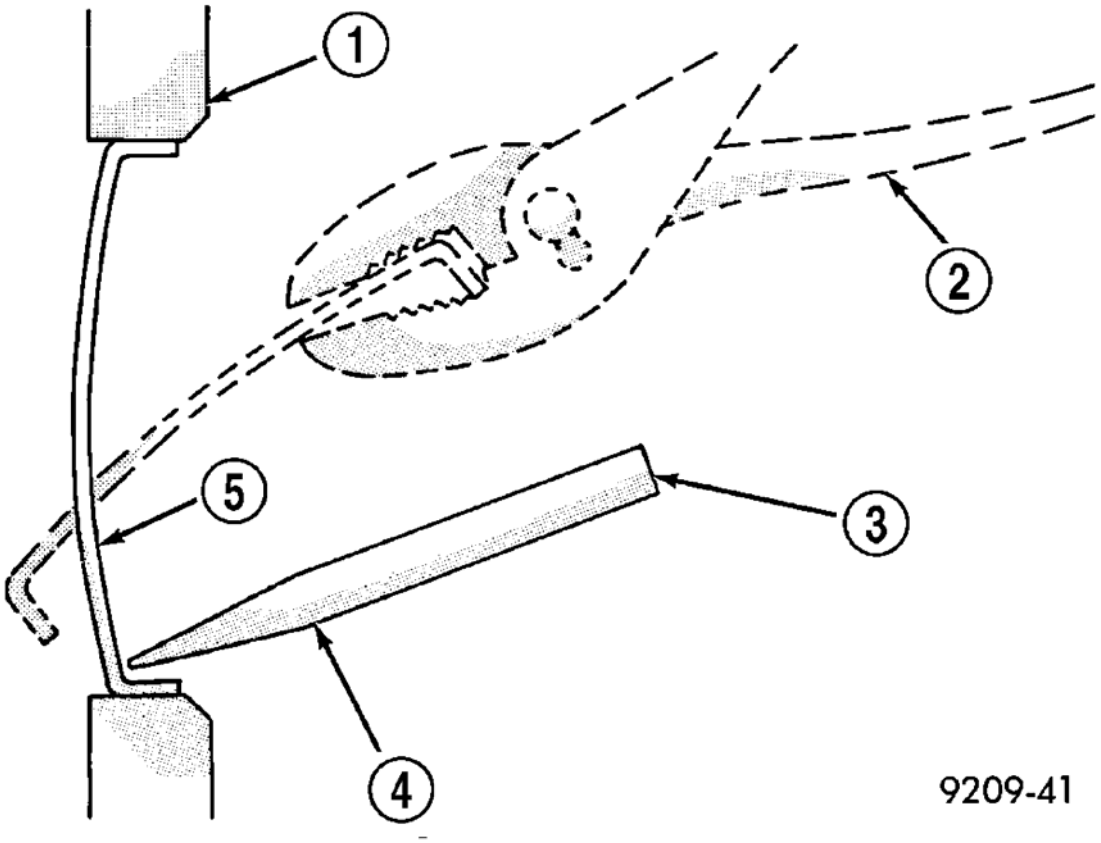

Fig. 4: Removing Core Hole Plug
Courtesy of CHRYSLER LLC

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

Using a blunt tool such as a drift (3) and a hammer, strike the bottom edge of the cup plug (5). With the cup plug rotated, grasp firmly with pliers (2) or other suitable tool and remove plug (5). See **Fig. 4**

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

ENGINE GASKET SURFACE PREPARATION

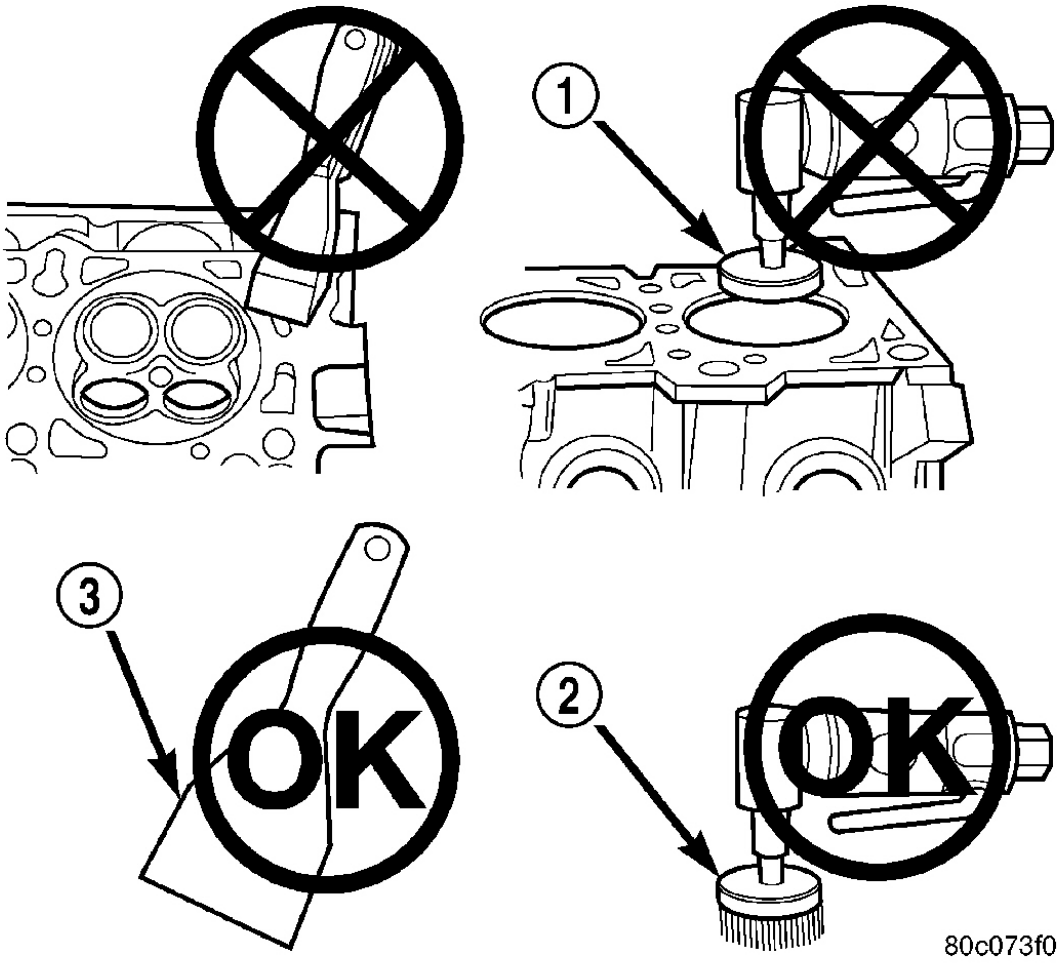

Fig. 5: Proper Tool Usage for Surface Preparation
Courtesy of CHRYSLER LLC

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

Metal scraper

Abrasive pad or paper to clean cylinder block and head

High speed power tool with an abrasive pad or a wire brush. See **Fig. 5**

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:

Solvent or a commercially available gasket remover

Plastic or wood scraper. See **Fig. 5**

Drill motor with 3M Roloc™ Bristle Disc (white or yellow). See **Fig. 5**

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e, coolant, fuel, oil or other).
6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e, connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.

10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.
13. Start engine and check for any leaks.

REMOVAL

ENGINE ASSEMBLY-REMOVAL

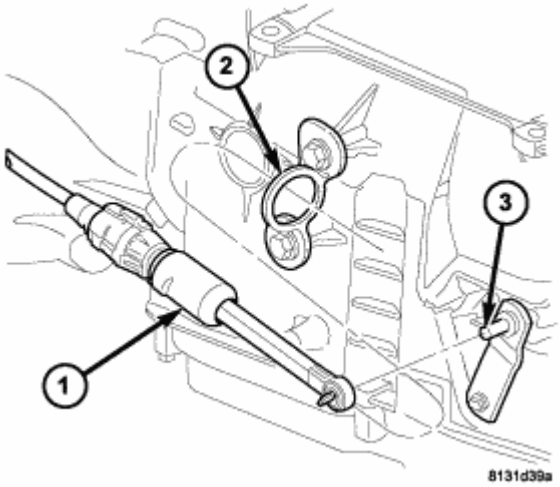

Fig. 6: Disconnecting Negative Battery Cable
Courtesy of CHRYSLER LLC

1. Perform the fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Disconnect negative battery cable (2).
3. Evacuate the air conditioning system. Refer to **STANDARD PROCEDURE** .
4. Remove the hood.

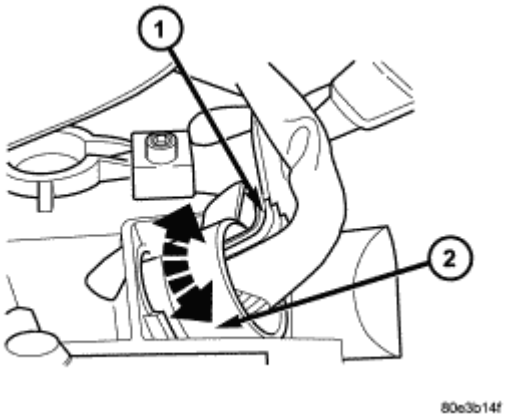

Fig. 7: Disconnecting Lower Radiator Hose

Courtesy of CHRYSLER LLC

5. Drain the cooling system (Refer to **STANDARD PROCEDURE**).
6. Disconnect the lower radiator hose.
7. Disconnect the generator electrical connectors (2) (Refer to **REMOVAL**).

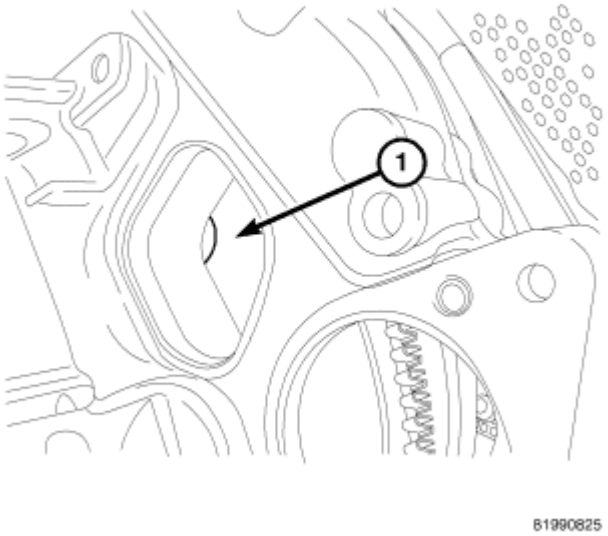

Fig. 8: Removing Starter Wiring
Courtesy of CHRYSLER LLC

8. Remove the starter wiring (2).

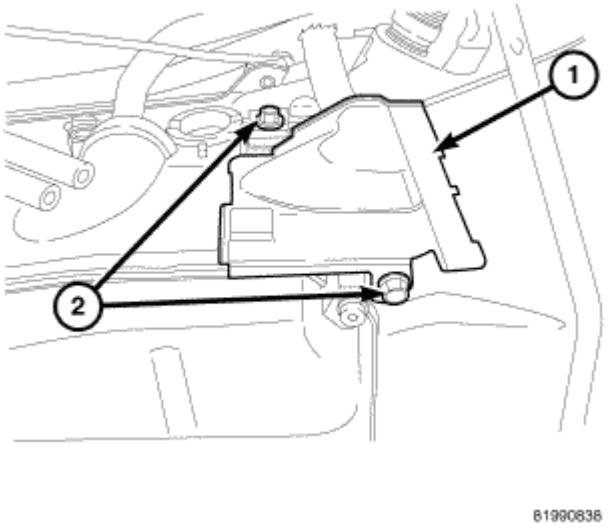

Fig. 9: Removing Starter And Spacer Plate
Courtesy of CHRYSLER LLC

9. Remove the starter (1) and spacer plate (Refer to **REMOVAL**).

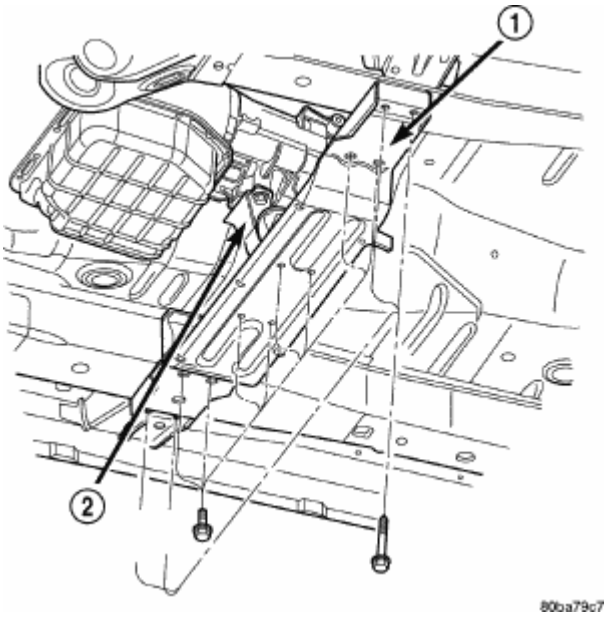

Fig. 10: Removing A/C Lines
Courtesy of CHRYSLER LLC

10. Remove the A/C lines (1,3).

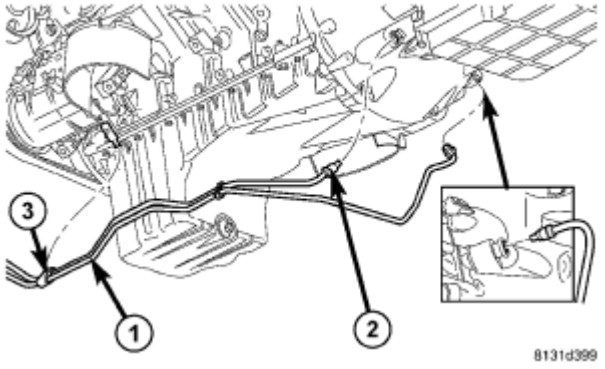

Fig. 11: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

11. Disconnect the oil cooler hose (3) at the oil cooler.

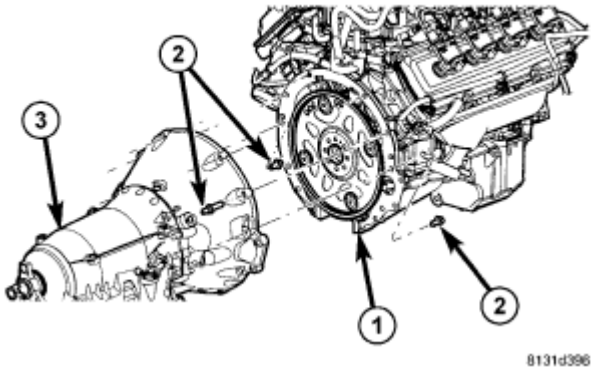

Fig. 12: Removing/Installing Oil Cooler & Coolant Hoses
Courtesy of CHRYSLER LLC

12. Disconnect the oil cooler hose (2) at the oil cooler.

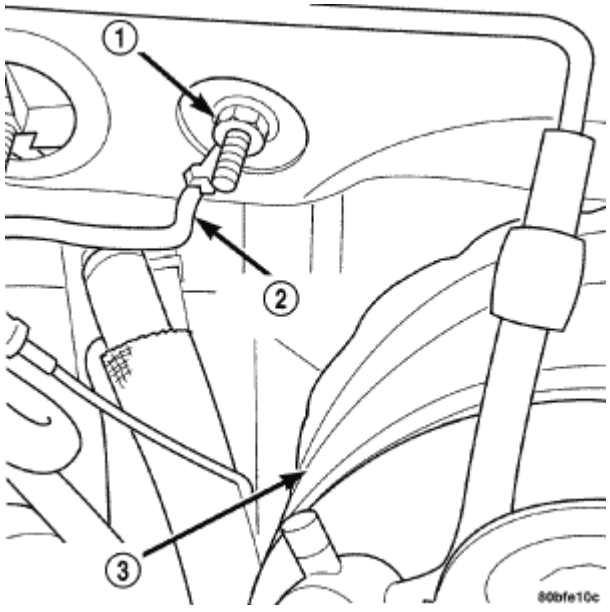

Fig. 13: Ground Strap & Transmission Housing Bolts
Courtesy of CHRYSLER LLC

13. Disconnect the ground strap (1) at the right transmission housing.
14. Disconnect the engine block heater wiring connector and set aside (if equipped).

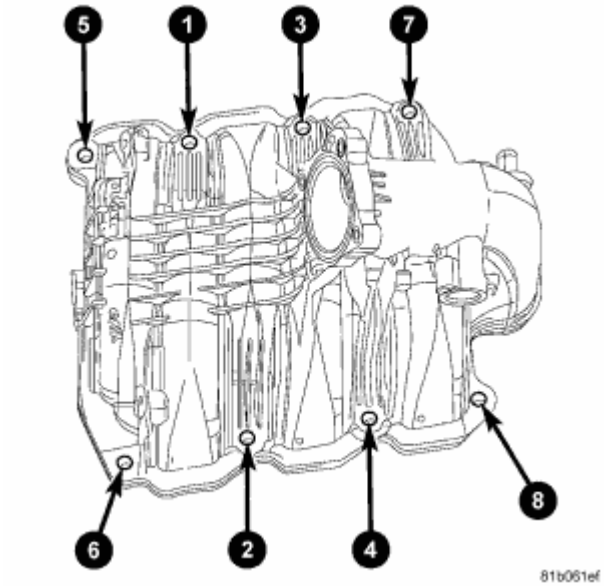

Fig. 14: CKP/Oxygen Sensors
Courtesy of CHRYSLER LLC

15. Remove the crankshaft position sensor (2) (Refer to **REMOVAL**).

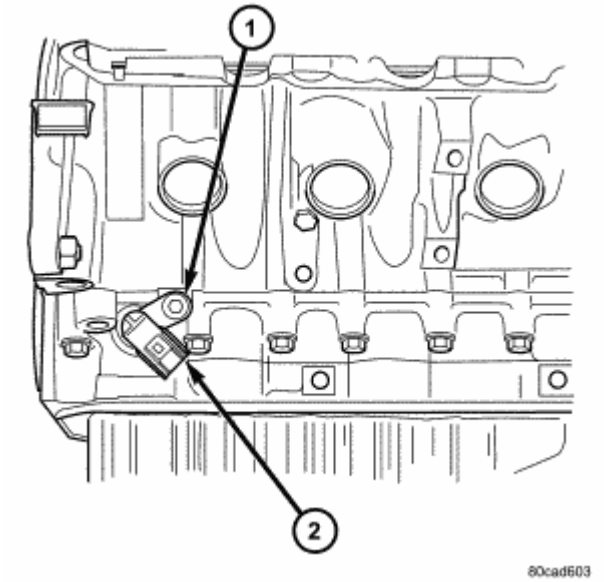

Fig. 15: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

16. Disconnect the left oxygen sensor electrical connector and separate the exhaust manifold from the left exhaust pipe (1).
17. Disconnect the right oxygen senor electrical connector and separate the exhaust manifold from the right exhaust pipe (2).

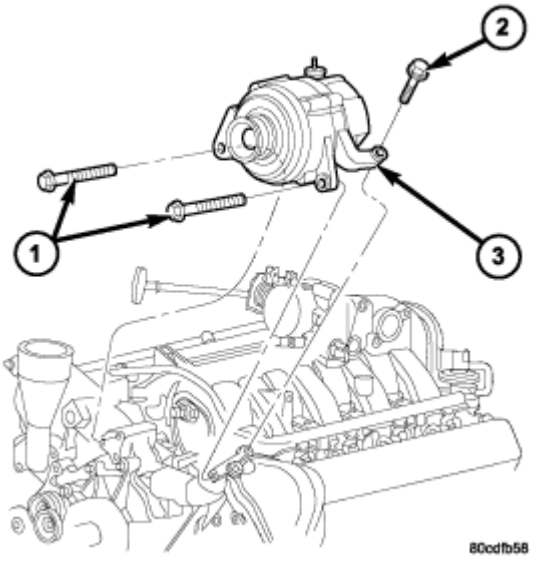

Fig. 16: Flex Plate Inspection Cover & Fastener
Courtesy of CHRYSLER LLC

18. Remove the flex plate access plate (1).

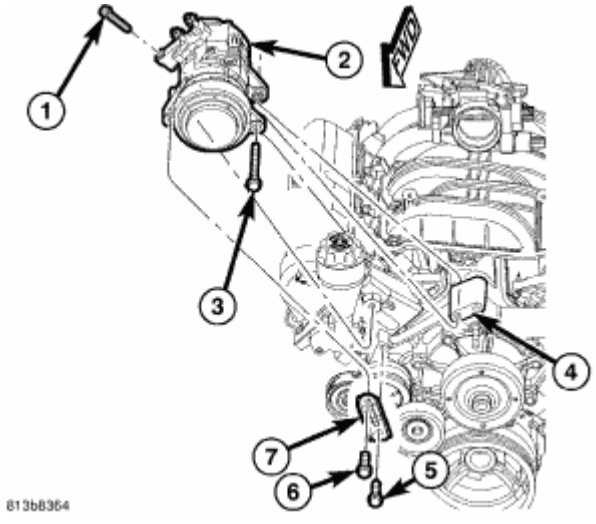

Fig. 17: Removing P/S Pump
Courtesy of CHRYSLER LLC

19. Remove the P/S pump (2).

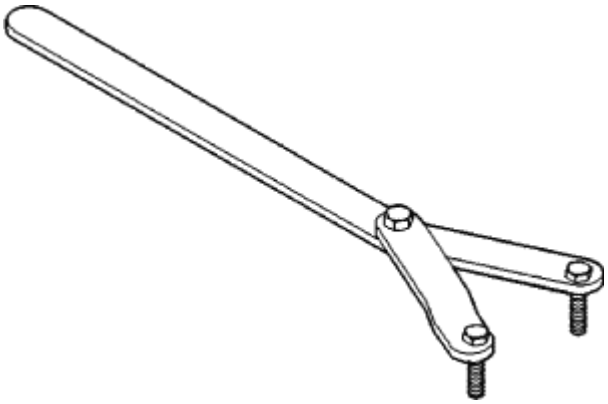

Fig. 18: Removing/Installing Torque Converter Bolts
Courtesy of CHRYSLER LLC

20. Remove the torque converter bolts (2).

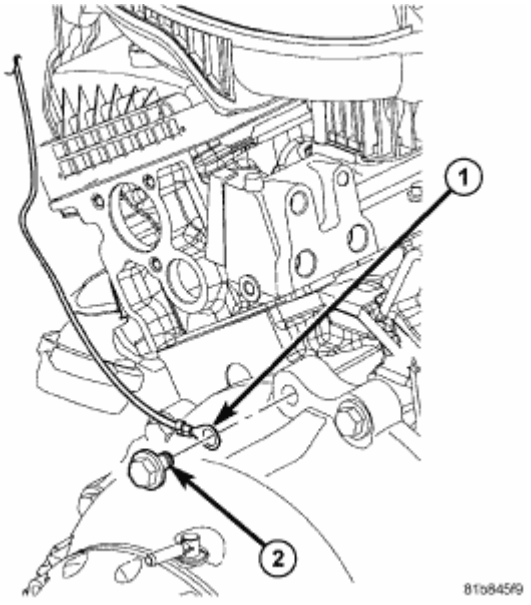

Fig. 19: Ground Strap & Transmission Housing Bolts
Courtesy of CHRYSLER LLC

21. Remove the transmission housing to engine mounting bolts (2).

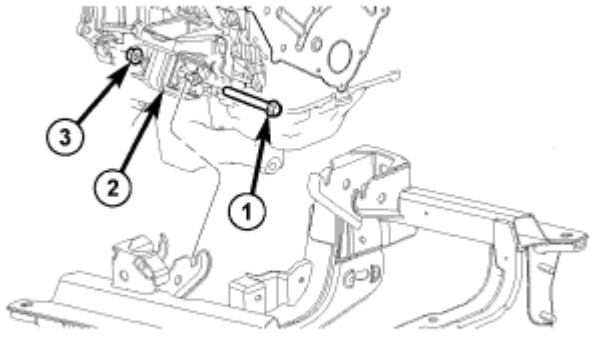

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Fig. 20: Removing/Installing Engine Mounting To Frame Fasteners
Courtesy of CHRYSLER LLC

22. Remove the engine mounting to frame fasteners (1).
23. Remove the upper intake manifold (Refer to **REMOVAL**).
24. Disconnect the heater hose.

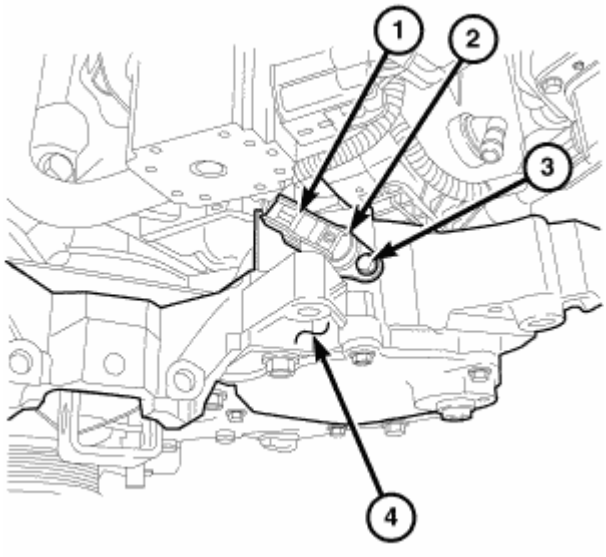

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Fig. 21: Disconnecting Coolant Temperature, Cam Position & Oil Pressure Sensor Electrical Connectors
Courtesy of CHRYSLER LLC

25. Disconnect the coolant temperature, cam position (1), oil pressure sensor electrical connectors.

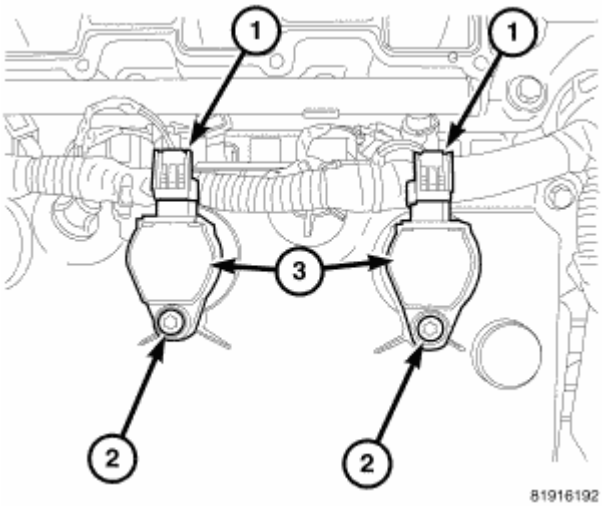

Fig. 22: Ignition Coils
Courtesy of CHRYSLER LLC

1 - Electrical Connector
2 - Mounting Bolt
3 - Coil

26. Disconnect the left ignition coil (1) and fuel injector harness connectors and position the wiring harness aside.
27. Remove the right intake manifold support braces.
28. Disconnect the capacitor and ground strap from the right cylinder head cover.

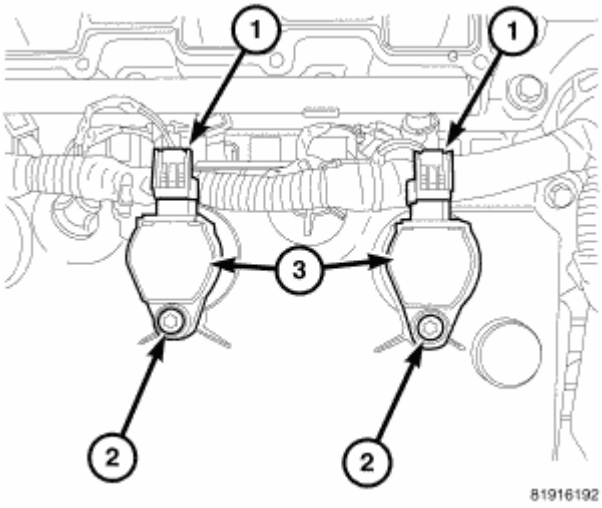

Fig. 23: Ignition Coils
Courtesy of CHRYSLER LLC

1 - Electrical Connector
2 - Mounting Bolt

3 - Coil

29. Disconnect the oxygen sensor, knock, EGR, injector and ignition coil harness connectors (1) and position the wiring harness aside.
30. Disconnect the engine wiring harness from the transmission housing and remove the remaining transmission housing bolts.

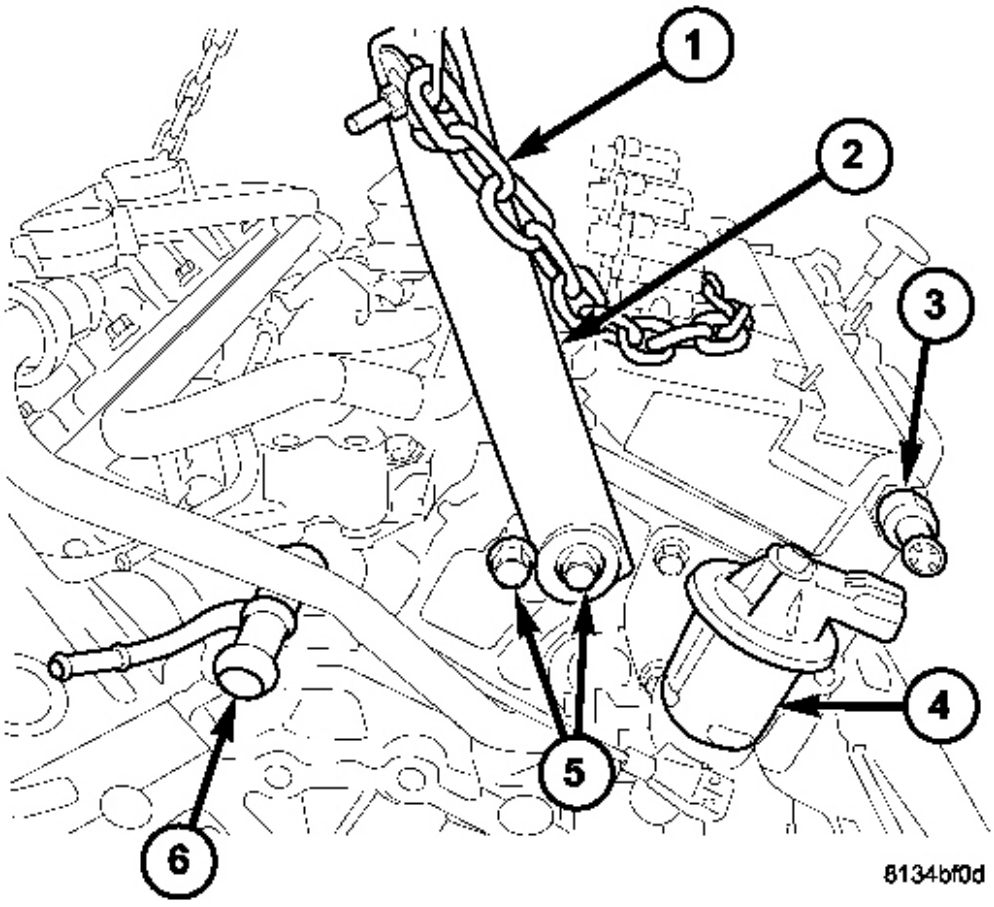

Fig. 24: Connecting Engine Lifting Bracket From Special Tool Kit 8534B To Right Rear Of Cylinder Head Outer Most Bolt Access Hole
Courtesy of CHRYSLER LLC

1 - LIFTING CHAIN
2 - ENGINE LIFTING BRACKET #8534

3 - CAM POSITION SENSOR
4 - EGR VALVE
5 - BOLTS
6 - COOLANT PIPE

31. Connect the engine lifting bracket (2) from special tool kit 8534B to the right rear of the cylinder head outer most bolt access hole (5). See **Fig. 24**.
32. Install a bolt into the inner most bolt access hole (5) next to the engine lift bracket to assure lifting bracket positioning.

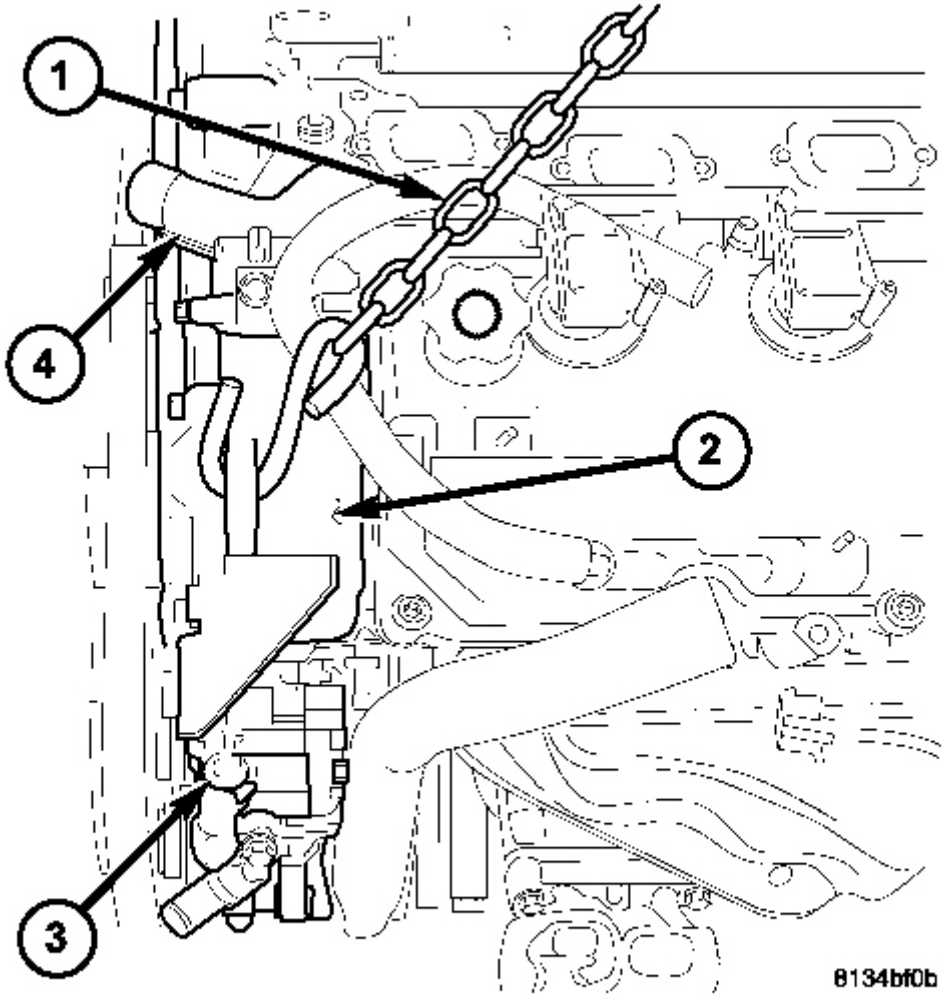

Fig. 25: Connecting Engine Hoisting Chain To Left Timing Chain Cover Engine Lifting Point And Engine Lift Bracket
Courtesy of CHRYSLER LLC

33. Connect a engine hoisting chain (1) to the left timing chain cover (2) engine lifting point and engine lift bracket. See **Fig. 25**.

CAUTION: While slowly separating the engine from the vehicle, constant checks must be made to assure proper positioning and that no damage to other components or wiring harnesses occur during separation.

34. Carefully remove the engine from the engine bay area.

INSTALLATION

ENGINE ASSEMBLY-INSTALLATION

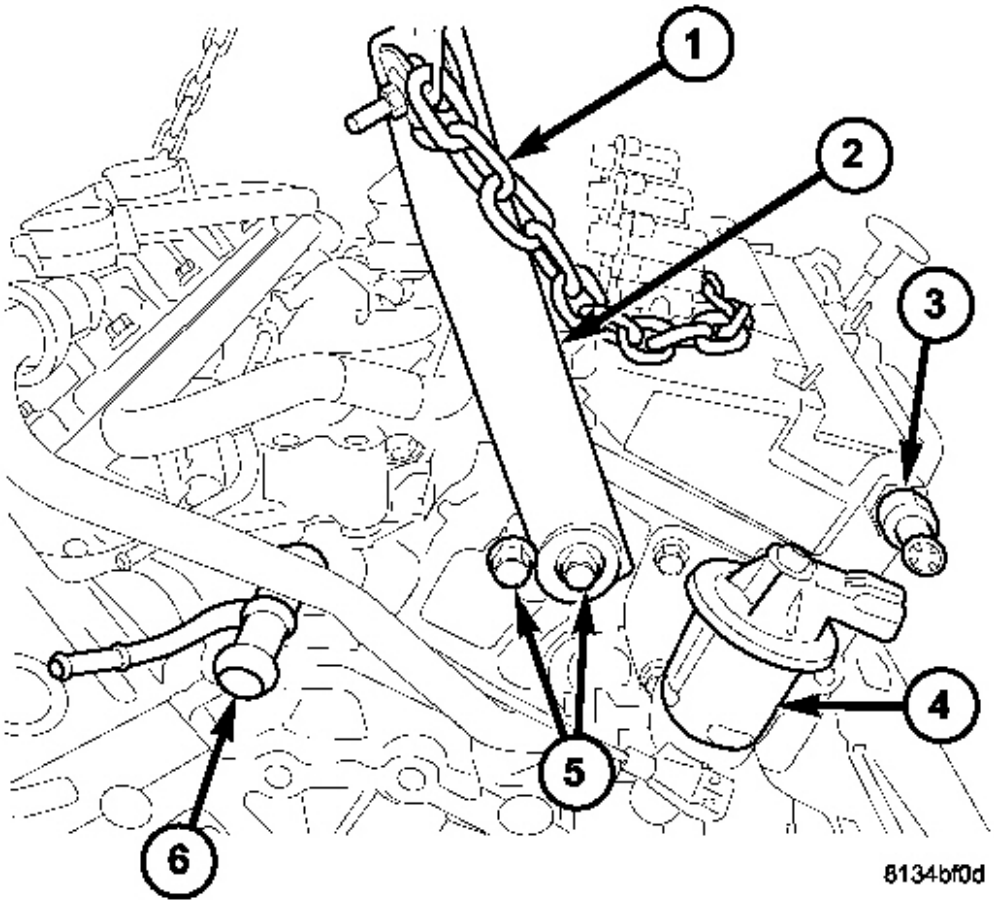

Fig. 26: Connecting Engine Lifting Bracket From Special Tool Kit 8534B To Right Rear Of Cylinder Head Outer Most Bolt Access Hole
Courtesy of CHRYSLER LLC

1 - LIFTING CHAIN
2 - ENGINE LIFTING BRACKET #8534
3 - CAM POSITION SENSOR
4 - EGR VALVE
5 - BOLTS
6 - COOLANT PIPE

1. Install special tool #8534 B, engine lifting bracket (2) to the right rear of the cylinder head and install a bolt into the inner most bolt hole (5) next to the bracket (5). See **Fig. 26**.

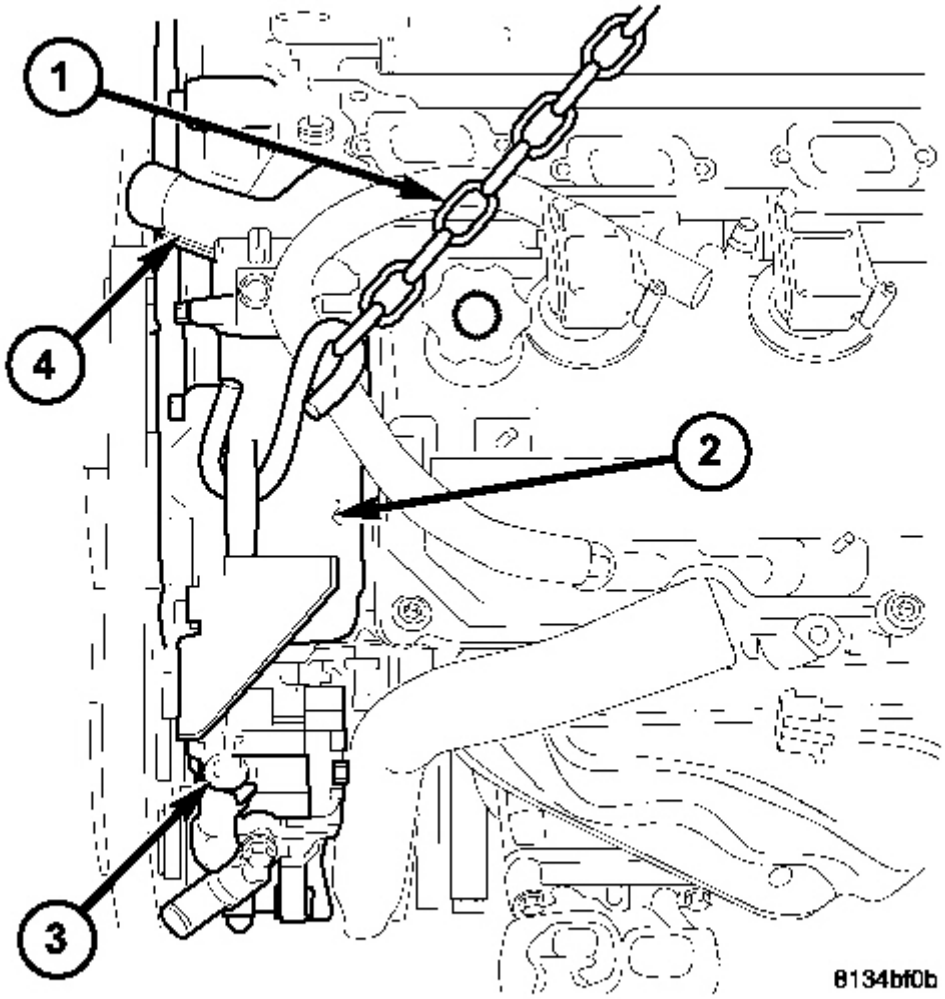

Fig. 27: Connecting Engine Hoisting Chain To Left Timing Chain Cover Engine Lifting Point And Engine Lift Bracket
Courtesy of CHRYSLER LLC

1 - LIFTING CHAIN
2 - UPPER TIMING CHAIN COVER
3 - POWER STEERING PUMP
4 - THERMOSTAT HOUSING

2. Connect a engine hoisting chain (1) to the left timing chain cover (2) lifting point and the engine lifting

bracket. See **Fig. 27**.

3. Carefully install the engine into the engine bay area and complete the union with the transmission.

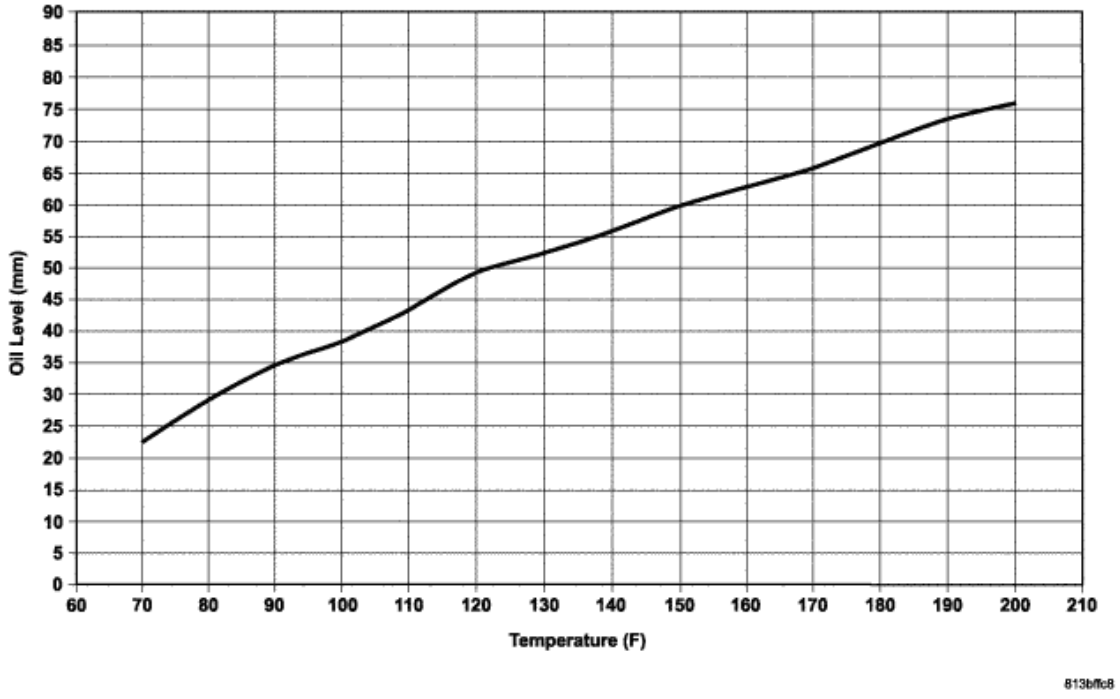

Fig. 28: Ground Strap & Transmission Housing Bolts
Courtesy of CHRYSLER LLC

4. Properly route the engine wiring harness behind the engine and tighten the accessible transmission bolts to 68 N.m (50 ft.lbs.).
5. Connect the ground strap (1) at the transmission housing.
6. Install the remaining transmission housing bolts (2) and tighten to 68 N.m (50 ft.lbs.).

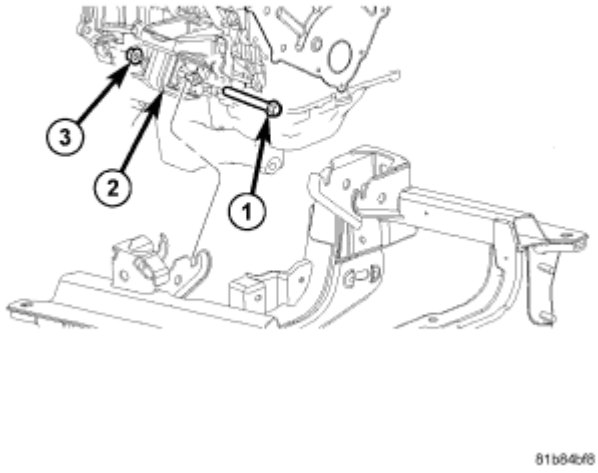

Fig. 29: Removing/Installing Engine Mounting To Frame Fasteners
Courtesy of CHRYSLER LLC

7. Install the engine mounting fasteners (1) and tighten to 101 N.m (75 lbs.ft.).

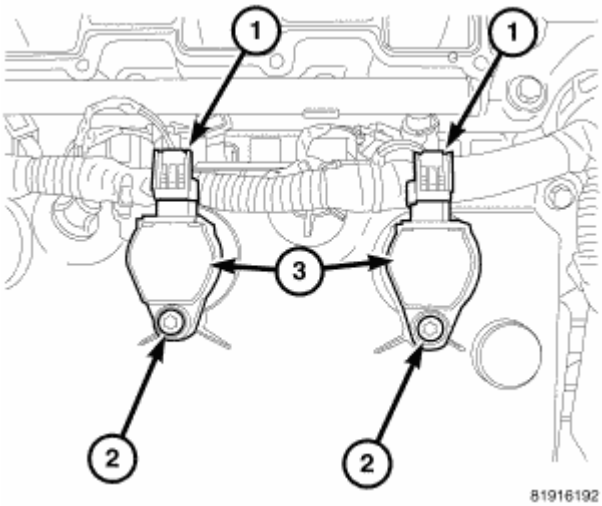

Fig. 30: Ignition Coils
Courtesy of CHRYSLER LLC

1 - Electrical Connector
2 - Mounting Bolt
3 - Coil

8. Properly position the right engine harness and connect the oxygen sensor, knock sensor, EGR, fuel injector and ignition coil harness connectors (1).
9. Connect the capacitor (3) and ground strap (3) to the right cylinder head cover.

10. Properly position the left engine harness and fuel injector harness connectors.

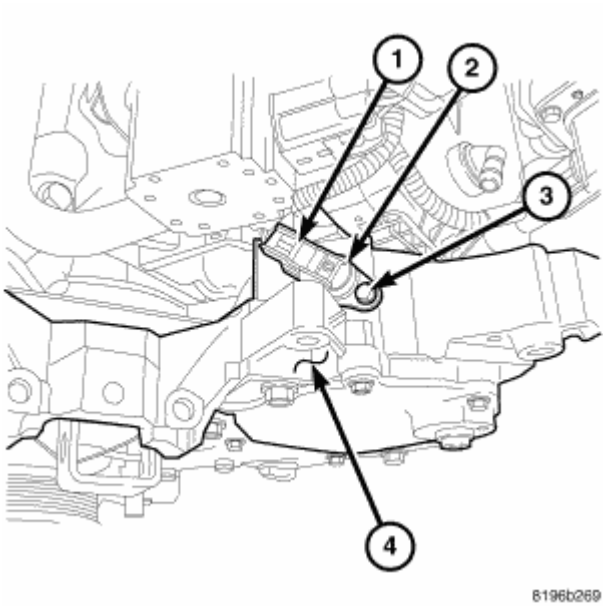

Fig. 31: Connecting Coolant Temperature, Cam Position & Oil Pressure Sensor Harness Connectors
Courtesy of CHRYSLER LLC

11. Connect the coolant temperature, cam position (1), oil pressure sensor harness connectors.
12. Connect the oxygen sensor, and the ground wire, to the cylinder head cover.

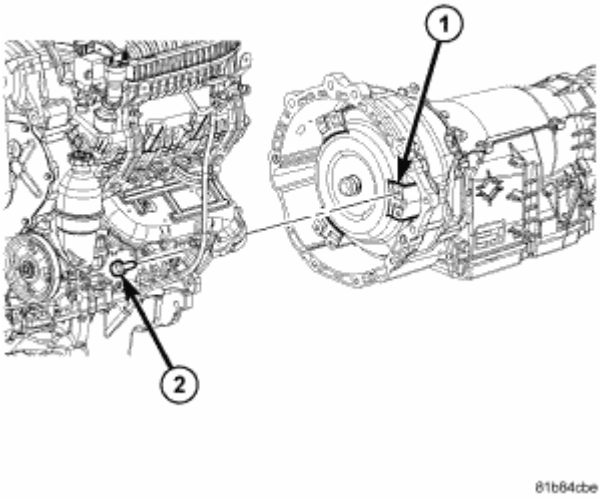

Fig. 32: Removing/Installing Torque Converter Bolts
Courtesy of CHRYSLER LLC

13. Install the torque converter bolts (2). Tighten bolts to 75 N.m (55 lbs.ft.).

14. Connect the heater hose.
15. Install the right intake manifold support braces.

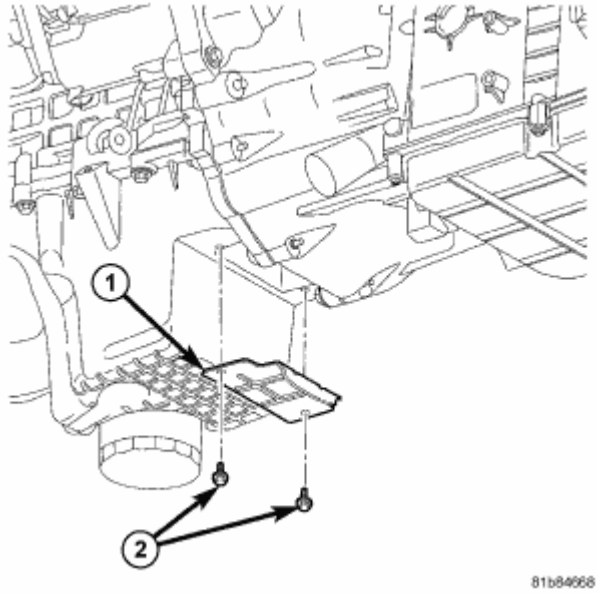

Fig. 33: Flex Plate Inspection Cover & Fastener
Courtesy of CHRYSLER LLC

16. Install the torque converter inspection plate (1). Tighten bolts to 12 N.m (105 lbs. in.)
17. Install the upper intake manifold (Refer to **INSTALLATION**).
18. Connect the upper radiator hose.

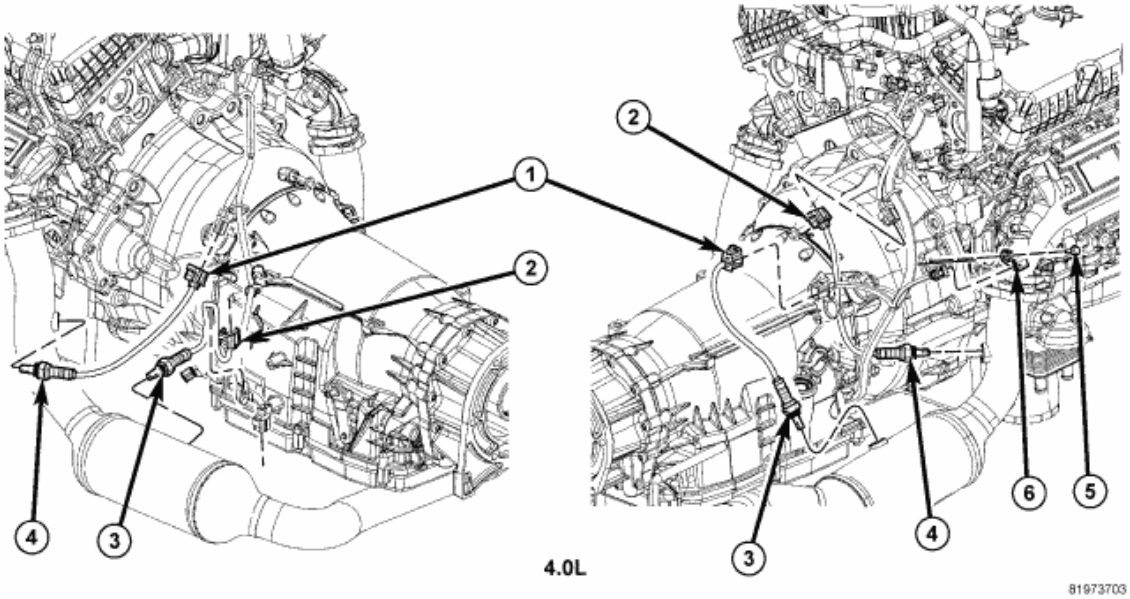

Fig. 34: CKP/Oxygen Sensors
Courtesy of CHRYSLER LLC

19. Install the crankshaft position sensor (2) (Refer to **INSTALLATION**).
20. Connect the engine block heater (if equipped).

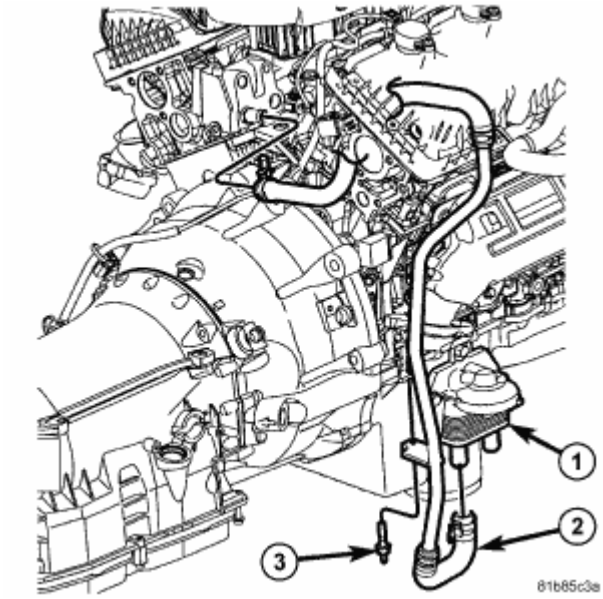

Fig. 35: Removing/Installing Oil Cooler & Coolant Hoses
Courtesy of CHRYSLER LLC

21. Connect the oil cooler hose (2) at the cooler.

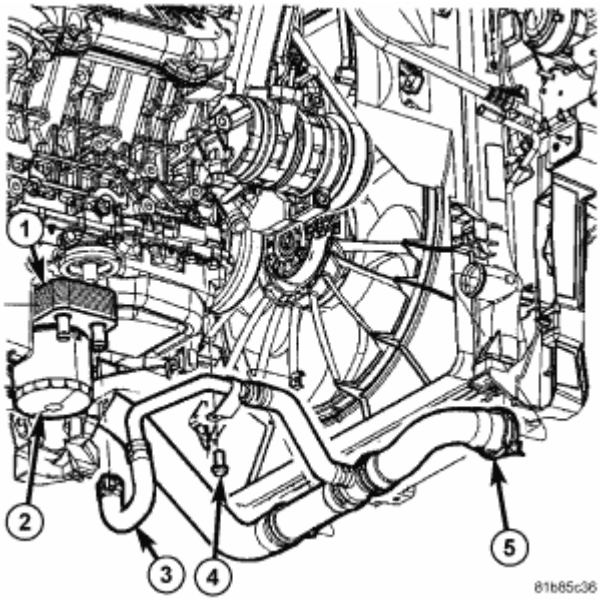

Fig. 36: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

22. Connect the oil cooler hose (3) at the cooler.
23. Connect the lower radiator hose (5).

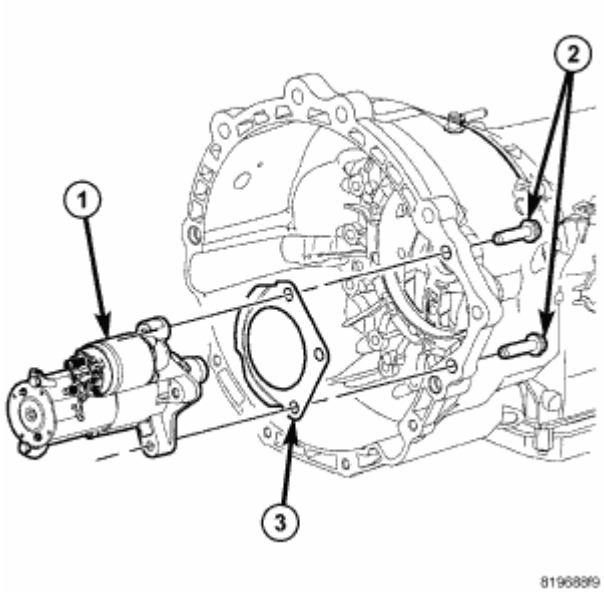

Fig. 37: Installing Starter And Spacer Plate
Courtesy of CHRYSLER LLC

24. Install new oil filter.
25. Install the starter (1) and spacer plate (Refer to **INSTALLATION**).

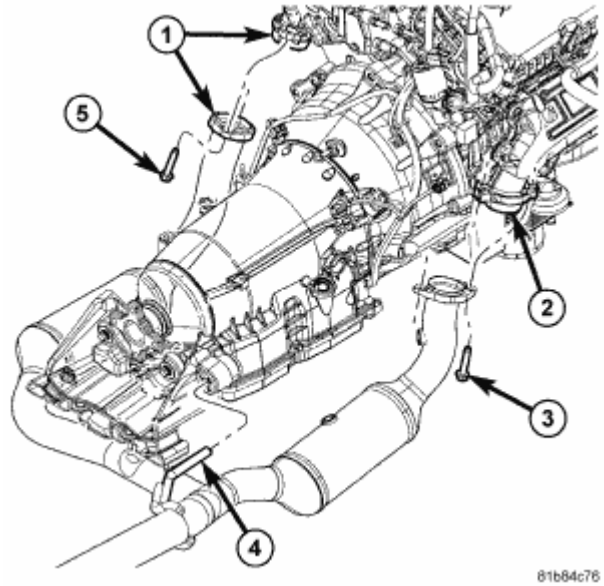

Fig. 38: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

26. Connect the left (1) and right exhaust pipe to the exhaust manifold (2).

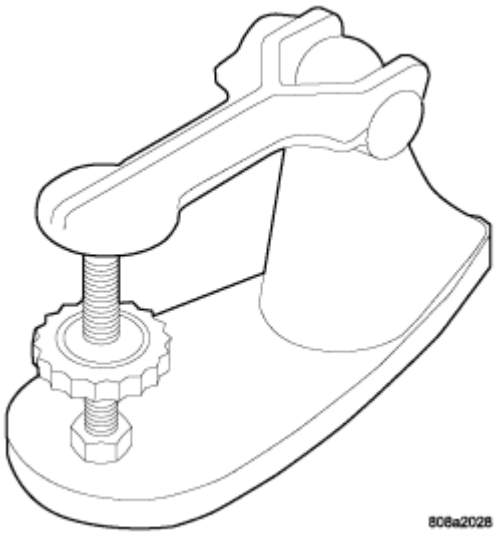

Fig. 39: CKP/Oxygen Sensors
Courtesy of CHRYSLER LLC

27. Connect the oxygen sensors (1).

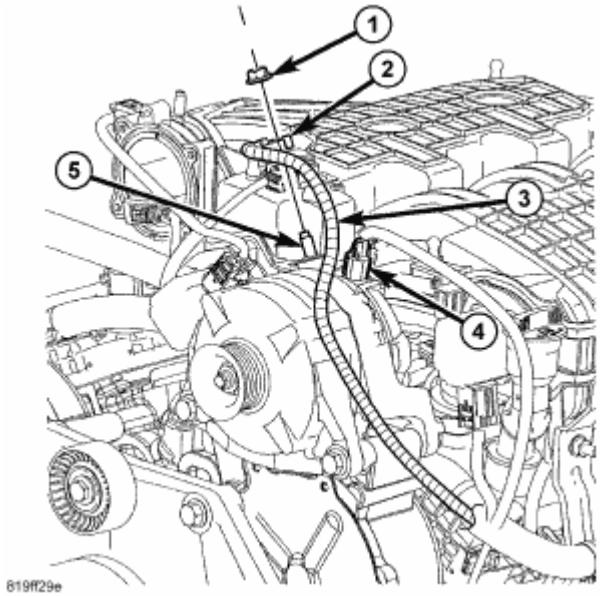

Fig. 40: Connecting Generator Electrical Connectors
Courtesy of CHRYSLER LLC

28. Connect the generator electrical connectors (2) (Refer to **INSTALLATION**).
29. Fill the cooling system to the proper level using the appropriate coolant.
30. Fill engine crankcase with proper oil to correct level (Refer to **FLUID TYPES**).

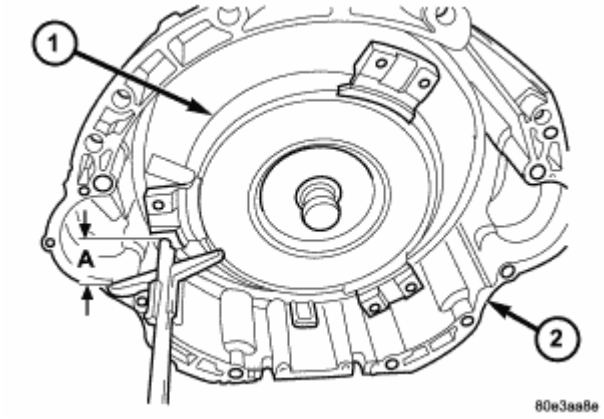

Fig. 41: Installing P/S Pump
Courtesy of CHRYSLER LLC

31. Install the P/S pump (2).

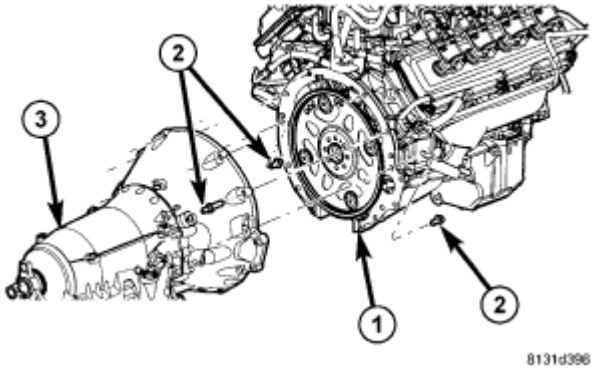

Fig. 42: Installing A/C Lines
Courtesy of CHRYSLER LLC

32. Install the A/C lines (1,3).
33. Evacuate and recharge air conditioning.
34. Install the hood.

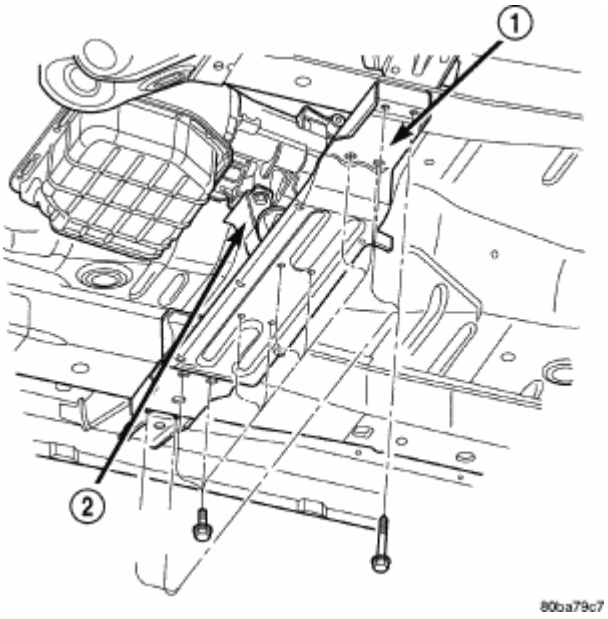

Fig. 43: Removing Battery Cable
Courtesy of CHRYSLER LLC

35. Connect the negative battery cable (2).
36. Start engine and run until operating temperature is reached.
37. Check all fluid levels and properly fill.

SPECIFICATIONS

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Camshaft Sprocket Bolt Right Side	102 +1/4 Turn	75 +1/4 Turn	-
Camshaft Sprocket Bolt Left Side	102 +1/4 Turn	75 +1/4 Turn	-
Camshaft Thrust Plate Bolts	28	-	250
Connecting Rod Cap Bolts	27 +1/4 Turn	20 +1/4 Turn	-
Crankshaft Main Bearing Cap	-	-	-
Inner Main Cap Bolts	20 +1/4 Turn	15 +1/4 Turn	-
Outer Main Cap Bolts	27 +1/4 Turn	20 +1/4 Turn	-
Tie Bolts (Horizontal)	28	-	250
Crankshaft Damper-Bolt	95	70	-
Cylinder Head Bolts*	-	-	-

Step 1	61	45	-
Step 2	88	65	-
Step 3	88	65	-
Step 4	+1/4 Turn	+1/4 Turn	-
*Refer to procedure for tightening sequence. See **INSTALLATION**.			
Cylinder Head Cover Bolts	10	-	90
Exhaust Manifold to Cylinder Head Bolts	28	-	250
Exhaust Manifold Heat Shield Bolts	12	-	105
Flex plate to Crankshaft	95	70	-
Flex plate to Torque Converter	75	55	-
Intake Manifold - Lower	28	-	250
Intake Manifold - Upper	12	-	105
Left Engine Mount to Cradle	75	55	-
Oil Cooler Connector Bolt	54	40	-
Oil Pan	-	-	-
M6 Bolts	12	-	105
M8 Bolts	28	-	250
Oil Pan Drain Plug	27	20	-
Oil Filter	16	12	-
M8 Oil Pump to Block Bolts	28	-	250
M6 Oil Pump Cover Bolts	12	-	105
Oil Pump Pick Up Tube Bolt	28	-	250
Windage Tray	28 + 90°	20 + 90°	-
Crankshaft Rear Seal Retainer	12	-	105
Right Engine Mount to Cradle	75	55	-
Rocker Shaft Pedestal Retaining Bolts	31	-	275
Spark Plugs	28	20	-
Timing Belt Tensioner Bolts	28	-	250
Timing Belt Tensioner Pulley Assembly Bolt	61	45	-
Timing Belt Cover	-	-	-
M6 Bolts	12	-	105
M8 Bolts	28	-	250
M10 Bolts	54	40	-
Upper Engine Mount to Frame Rail	68	50	-
Upper Engine Mount to timing Cover	54	40	-

4.0L ENGINE - SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Type	60° SOHC V-6 24-Valve
Displacement	4.0L

Firing Order	1-2-3-4-5-6	
Compression Ratio	10:2:1	
Lead Cylinder	#1 Right Bank	
	Metric	**Standard**
Displacement	4.0L Liters	244 cu. in.
Bore	96.0 mm	3.780 in.
Stroke	91.0 mm	3.583 in.

CYLINDER BLOCK

DESCRIPTION	**SPECIFICATIONS**	
	Metric	**Standard**
Cylinder Bore Diameter	96.0 mm ± 0.0076	3.780 in. ± 0.0003 in.
Out-of-Round (Max.)	0.006 mm	0.00023 in.
Taper (Max.)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	**SPECIFICATIONS**	
	Metric	**Standard**
Material Type	Aluminum (Full Floating Pins)	
Piston Diameter	95.98 mm ± 0.019 mm	3.7788 in. ± 0.0008 in.
Clearance at Size Location	-0.007 to +0.047 mm	-0.003 to +0.0018 in.
Piston Weight - A	374.4-379.4 grams	13.21-13.38 oz.
Piston Weight - B	379.5-384.4 grams	13.38-13.56 oz.
Piston Ring Groove Diameter #1	87.4-87.6 mm	3.441-3.449 in.
Piston Ring Groove Diameter #2	86.3-86.5 mm	3.397-3.4055 in.
Piston Ring Groove Diameter #3	86.5-86.7 mm	3.406-3.413 in.

PISTON PINS

DESCRIPTION	**SPECIFICATIONS**	
	Metric	**Standard**
Type	Full Floating	
Clearance in Piston	0.005-0.015 mm	0.002-0.0006 in.
Clearance in Rod	0.007-0.018 mm	0.0003-0.007 in.
Diameter	21.997-22.000 mm	0.8662-0.8660 in.

PISTON RINGS

DESCRIPTION	**SPECIFICATIONS**	
	Metric	**Standard**
Ring Gap-Top Compression Ring	0.20-0.36 mm	0.008-0.014 in.
Ring Gap-2nd Compression Ring (Micro-Napier	0.20-0.40 mm	0.0078-0.0157 in.

Ring Gap-Oil Control (Steel Rails)	0.25-0.76 mm	0.010-0.030 in.

PISTON RING SIDE CLEARANCE

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Top and Second Compression Ring	0.04-0.08 mm	0.0016-0.0031 in.
Oil Ring (Steel Rails	0.038-0.184 mm	0.0015-0.0073 in.

PISTON RING WIDTH

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Top Compression Ring	1.17-1.20 mm	0.0461-0.0472 in.
2nd Compression Ring (Micro-Napier	1.47-1.49 mm	0.058-0.059 in.
Oil Control (Steel Rails)	0.435-0.490 mm	0.0171-0.0193 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Bearing Clearance	0.035-0.073 mm	0.0013-0.0028 in.
Piston Pin Bore Diameter	22.005-22.012 mm	0.8663-0.8666 in.
Side Clearance (MAX)	0.39 mm	0.0153 in.
Total Weight (Less Bearing)	693 grams	24.445 oz.

CRANKSHAFT MAIN BEARING JOURNALS

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Diameter	68.987-69.013 mm	2.519-2.520 in.
Main Bearing Diametrical Clearance	0.032-0.062 mm	0.0013-0.0024 in.
Bearing Clearance (Wear Limit)	0.072 mm	0.0028 in.
Out-of-Round (MAX)	0.008 mm	0.0003 in.
Diametrical Taper (MAX)	0.010 mm	0.0004 in.
End Play	0.048-0.260 mm	0.002-0.010 in.
End Play (MAX)	0.37 mm	0.015 in.

CONNECTING ROD JOURNALS

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Diameter	57.982-58.002 mm	2.282-2.283 in.
Bearing Diametrical Clearance	0.035-0.073 mm	0.0014-0.0029 in.

Bearing Clearance (Wear Limit)	0.080 mm	0.003 in.
Out-of-Round (MAX)	0.008 mm	0.0003 in.
Diametrical Taper (MAX)	0.010 mm	0.0004 in.

CAMSHAFT

DESCRIPTION	SPECIFICATIONS	
	Metric	**Standard**
Bore Diameter	43.038-43.059 mm	1.6944-1.6953 in.
Diametrical Clearance	0.078-0.12 mm	0.003-0.0047 in.
Diametrical Clearance (MAX)	0.15 mm	0.0059 in.
Bearing Journal Diameter	42.939-42.960 mm	1.6905-1.6913 in.
End Play	0.05-0.51 mm	0.002-0.020 in.

VALVE TIMING-INTAKE VALVE

DESCRIPTION	SPECIFICATIONS (CRANKSHAFT DEGREES)
Opens	4° BTDC (A) - 1° ATDC (B)
Closes (ABDC)	60° (A) - 65° (B)
Duration	244°
Centerline	118° (A) - 123° (B)

VALVE TIMING-EXHAUST VALVE

DESCRIPTION	SPECIFICATIONS (CRANKSHAFT DEGREES)
Opens (BBDC)	61°
Closes (ATDC)	21°
Duration	262°
Centerline	110°

CYLINDER HEAD

DESCRIPTION	SPECIFICATIONS	
	Metric	**Standard**
Gasket Thickness (Compressed)	1.50 mm	0.059 in.
Valve Seat Angle (From Horizontal)	45-45.5°	
Valve Seat Runout (MAX)	0.051 mm	0.002 in.
Valve Seat Width-Intake	0.8-1.2 mm	0.031-0.067 in.
Valve Seat Width-Exhaust	1.3-1.7 mm	0.05-0.067 in.
Guide Bore Diameter (Std.)	6.975-7.00 mm	0.2746-0.2756 in.
Valve Guide Height *	9.5-10.5 mm	0.3740-0.4134 in.
* Measured from cylinder head surface		

VALVES

DESCRIPTION	SPECIFICATIONS	
	Metric	**Standard**
Face Angle (From Horizontal)	44.5°-45°	
Head Diameter-Intake	36.37-36.63 mm	1.4319-14421 in.
Head Diameter-Exhaust	28.87-29.13 mm	1.1366-1.1469 in.
Length-Intake (Overall)	114.41-114.99 mm	4.5043-4.5272 in.
Length-Exhaust (Overall)	126.17-126.75 mm	4.9673-4.9902 in.
Stem Diameter-Intake	6.935-6.953 mm	0.2730-0.2737 in.
Stem Diameter-Exhaust	6.906-6.924 mm	0.2719-0.2726 in.
Stem-to-Guide Clearance-Intake	0.022-0.065 mm	0.0009-0.0026 in.
Stem-to-Guide Clearance-Intake (MAX.) Rocking Method	0.29 mm	0.0114 in.
Stem-to-Guide Clearance-Exhaust	0.051-0.094 mm	0.002-0.0037 in.
Stem-to-Guide Clearance-Intake (MAX.) Rocking Method	0.370 mm	0.0146 in.
Valve Lift-Intake (Zero Lash)	9.00 mm	0.3543 in.
Valve Lift-Exhaust (Zero Lash)	7.00 mm	0.2756 in.
Valve Margin-Intake	0.835-1.165 mm	0.0329-0.0459 in.
Valve Margin-Exhaust	1.44-1.77 mm	0.0567-0.0697 in.
Valve Stem Tip Height-Intake	42.366-43.655 mm	1.6680-1.7187 in.
Valve Stem Tip Height-Exhaust	45.205-46.486 mm	1.780-1.8305 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATIONS	
	Metric	**Standard**
Free Length-Intake (Approx.)	43.6 mm	1.7165 in.
Free Length-Exhaust- (Approx.)	47.9 mm	1.8858 in.
Spring Force-Intake (Valve Closed)	309-358 N @ 38.0 mm	69.5-80.5 lbs. @ 1.4961 in.
Spring Force-Exhaust (Valve Closed)	355.4-400.8 N @ 38.0 mm	79.9-90.1 lbs. @ 1.496 in.
Spring Force-Exhaust (Valve Open)	646.5-714.5 N @ 31.0 mm	145.3-160.7 lbs. @ 1.2205 in.
Spring Force-Intake (Valve Open)	871.1-943.7 N @ 29.0 mm	195.8-212.2 lbs. @ 1.1417 in.
Number of Coils-Intake	6.5	
Number of Coils-Exhaust	7.5	
Color of Spring (Top of Coils)-Intake-Right Hand Coil Direction	GREY	
Color of Spring (Top of Coils)-Exhaust-Left Hand Coil Direction	BLUE	
Wire Diameter-Intake	4.29-4.35 mm	0.1547-0.1570 in.

Wire Diameter-Exhaust	3.93-3.99 mm	0.1547-0.1570 in.
Spring Installed Height *	38.0 mm	1.4961 in.
* Spring Seat to Bottom Retainer-Intake and Exhaust		

OIL PUMP

DESCRIPTION	SPECIFICATIONS	
	Metric	**Standard**
Clearance Over Rotors	0.077 mm	0.003 in.
Cover-Out-of-Flat (MAX.)	0.025 mm	0.001 in.
Inner and Outer Rotor Thickness (MIN.)	14.300 mm	0.563 in.
Inner and Outer Rotor Thickness (MAX.)	14.325 mm	0.564 in.
Clearance between Outer Rotor and Body	0.39 mm	0.015 in.
Outer Rotor Diameter (MIN.)	79.997 mm	3.149 in.
Outer Rotor Diameter (MAX.)	80.074 mm	3.153 in.
Tip Clearance Between Rotors (MAX.)	0.20 mm	0.008 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATIONS
NOTE: At Normal Operating Temperatures	
Pressure @ Curb Idle Speed *	34.47 kPa Min. (5 PSI MIN.)
Pressure @ 3000 RPM	300-724 kPa (45-105 PSI.)
*CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 RPM.	

SPECIAL TOOLS

4.0L ENGINE

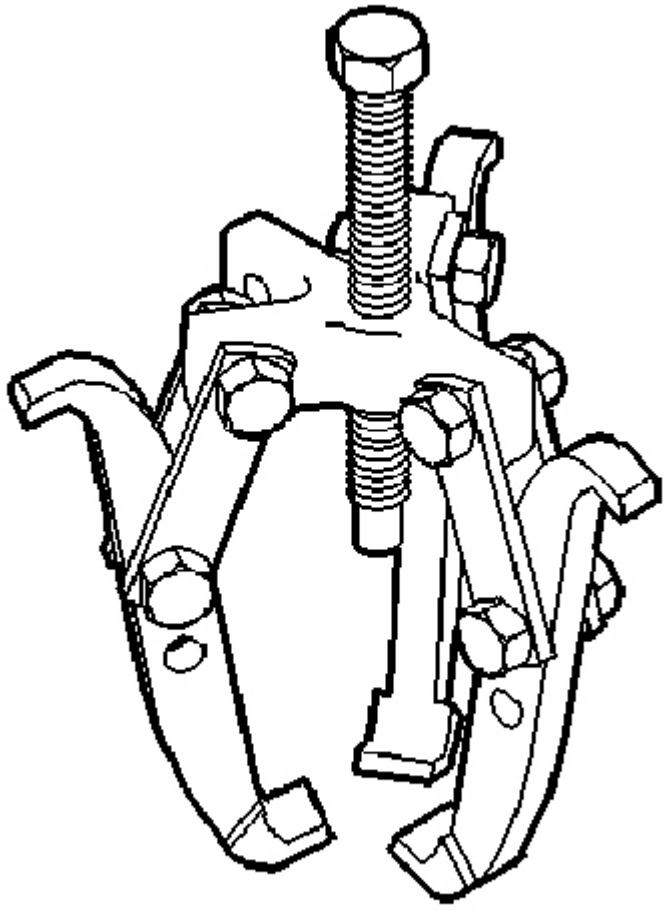

Fig. 44: Puller 1023
Courtesy of CHRYSLER LLC

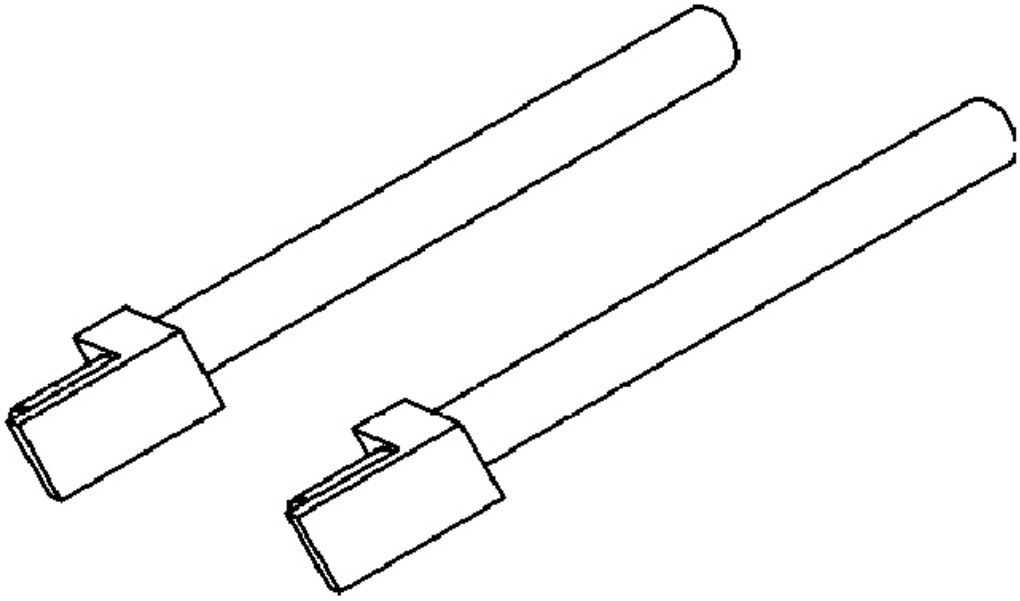

Fig. 45: Connecting Rod Installation Guides 8189
Courtesy of CHRYSLER LLC

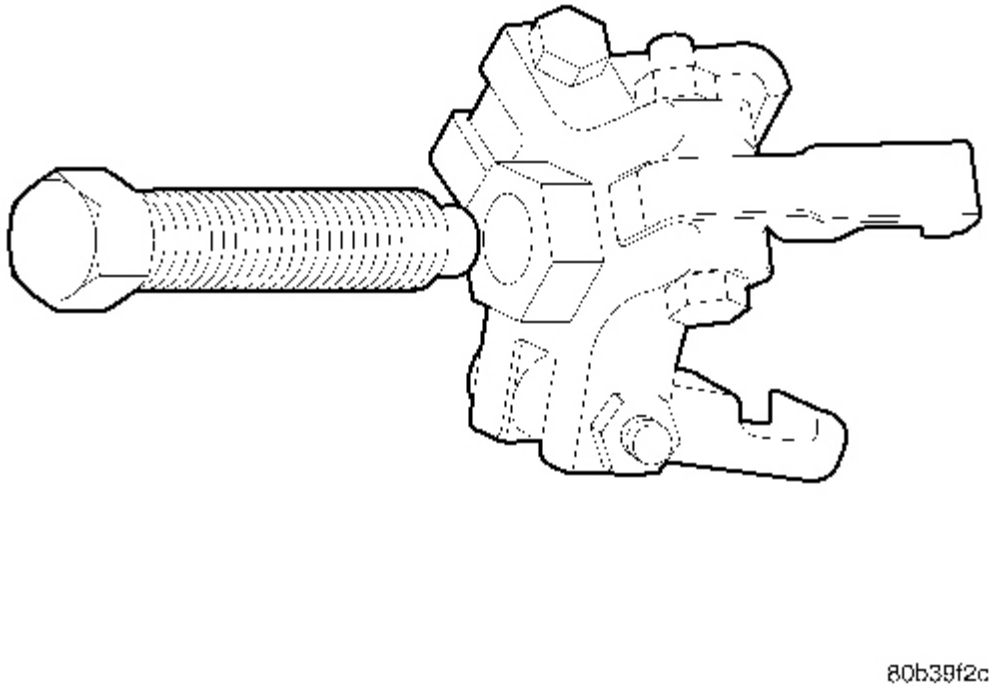

Fig. 46: Puller 8454
Courtesy of CHRYSLER LLC

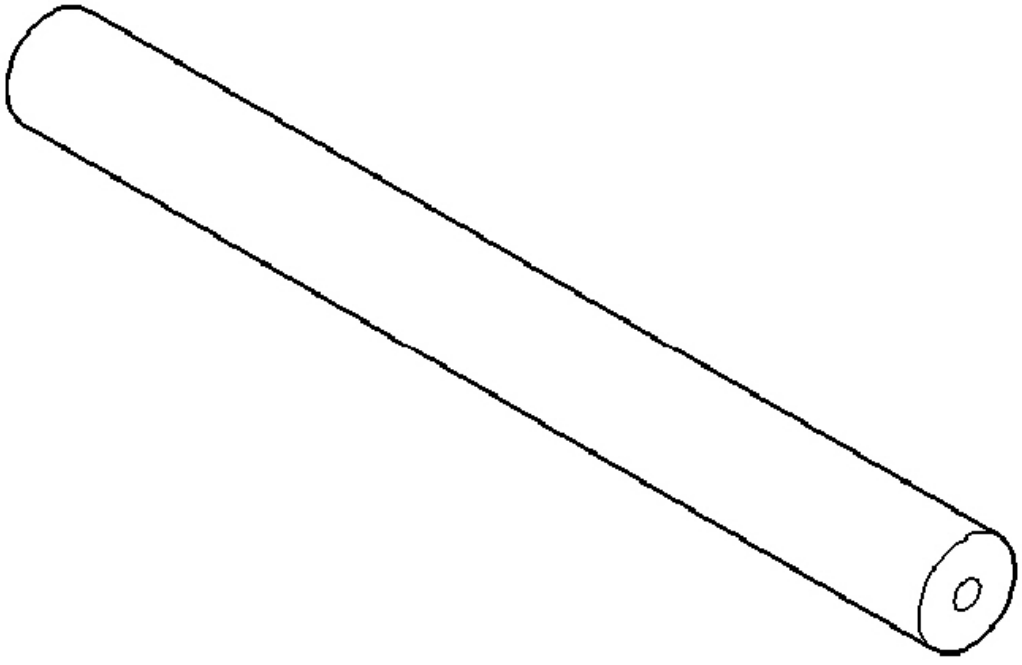

Fig. 47: Vibration Damper Remover Insert 9020 - Crank Sprocket Remover Insert C4685-C2
Courtesy of CHRYSLER LLC

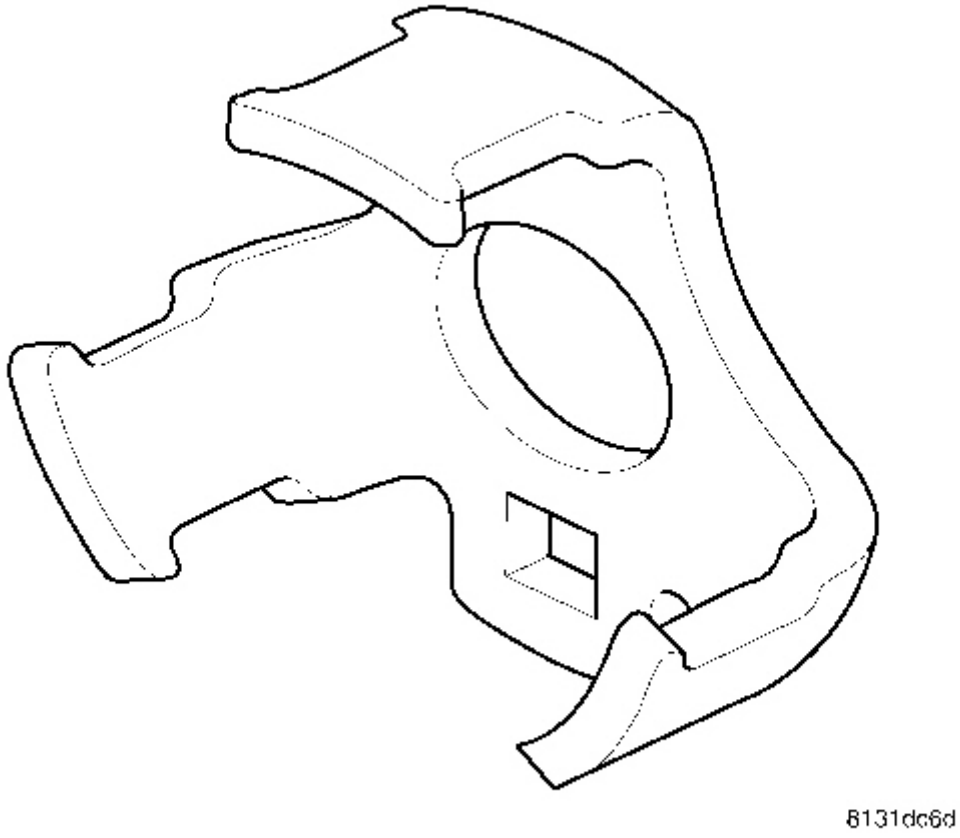

Fig. 48: Damper Holding Fixture 9365
Courtesy of CHRYSLER LLC

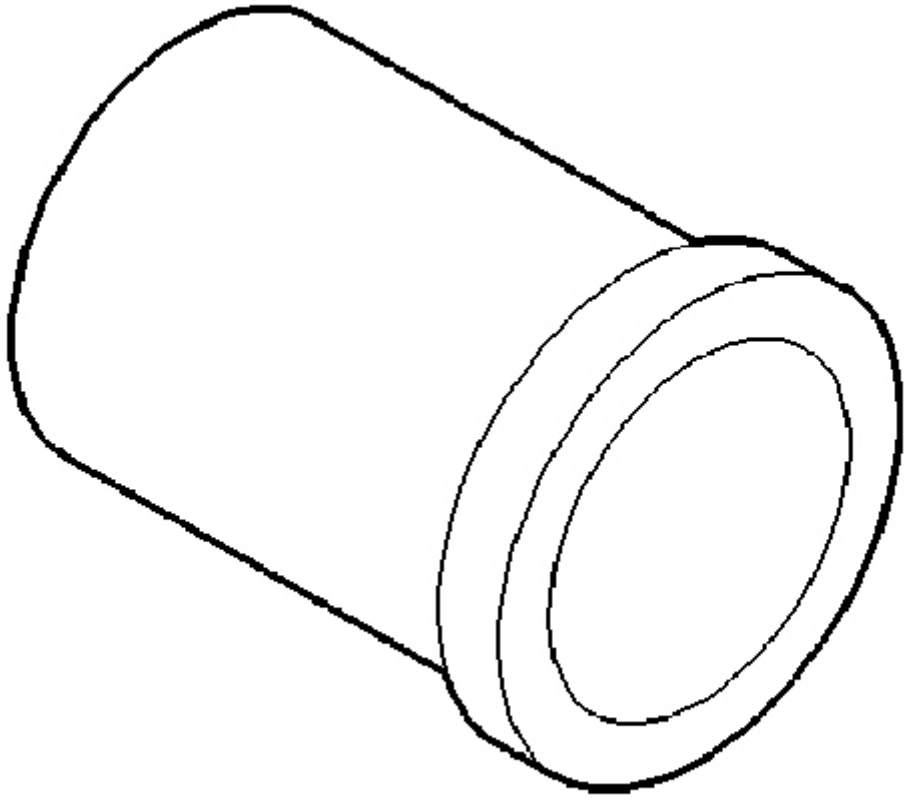

Fig. 49: Camshaft Seal Installer MD-998306
Courtesy of CHRYSLER LLC

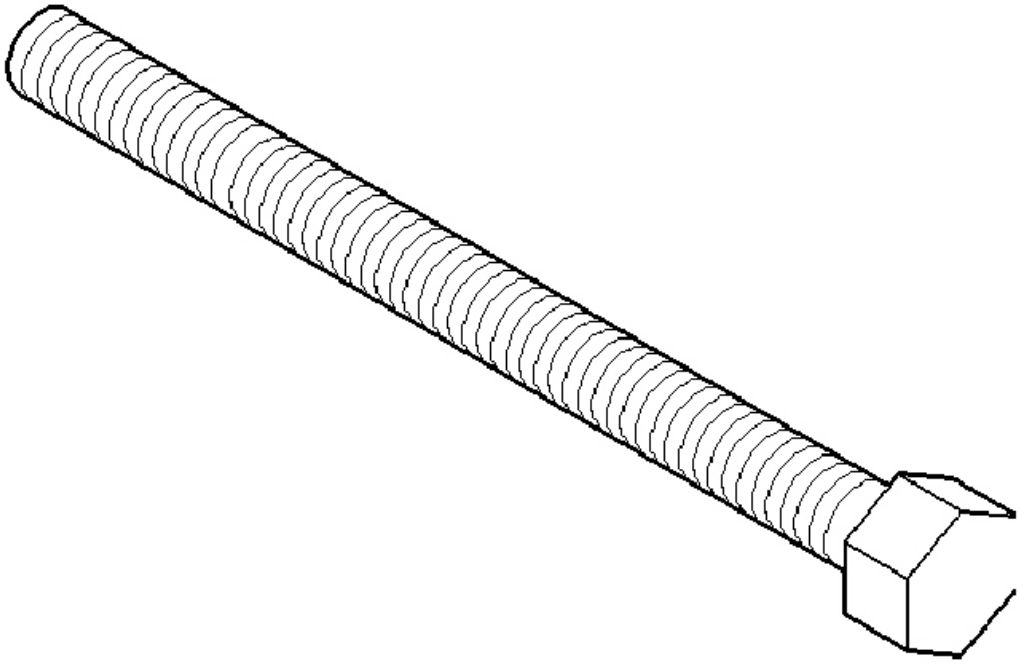

Fig. 50: Crankshaft Damper Installer Bolt C-4685-C1
Courtesy of CHRYSLER LLC

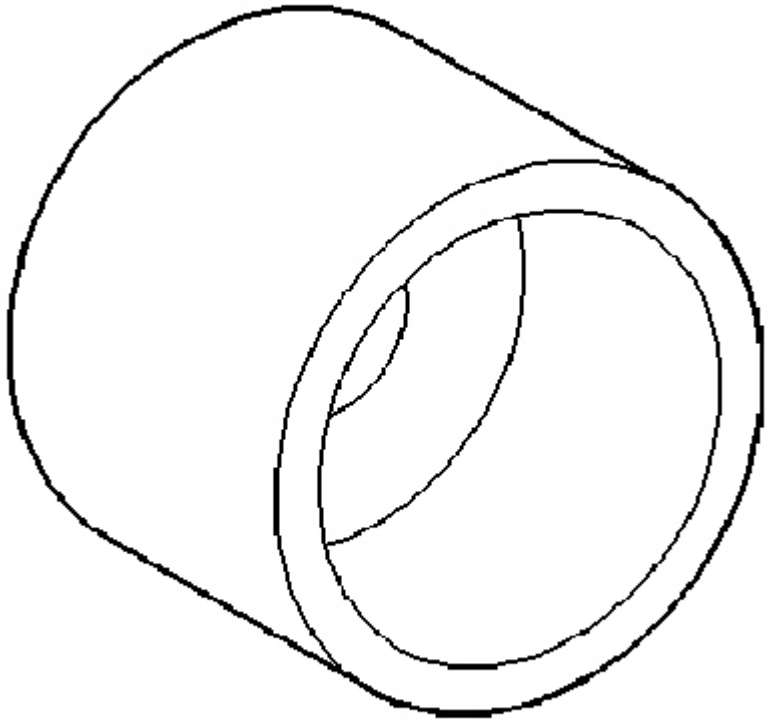

Fig. 51: Crankshaft Damper Installer 6792-1
Courtesy of CHRYSLER LLC

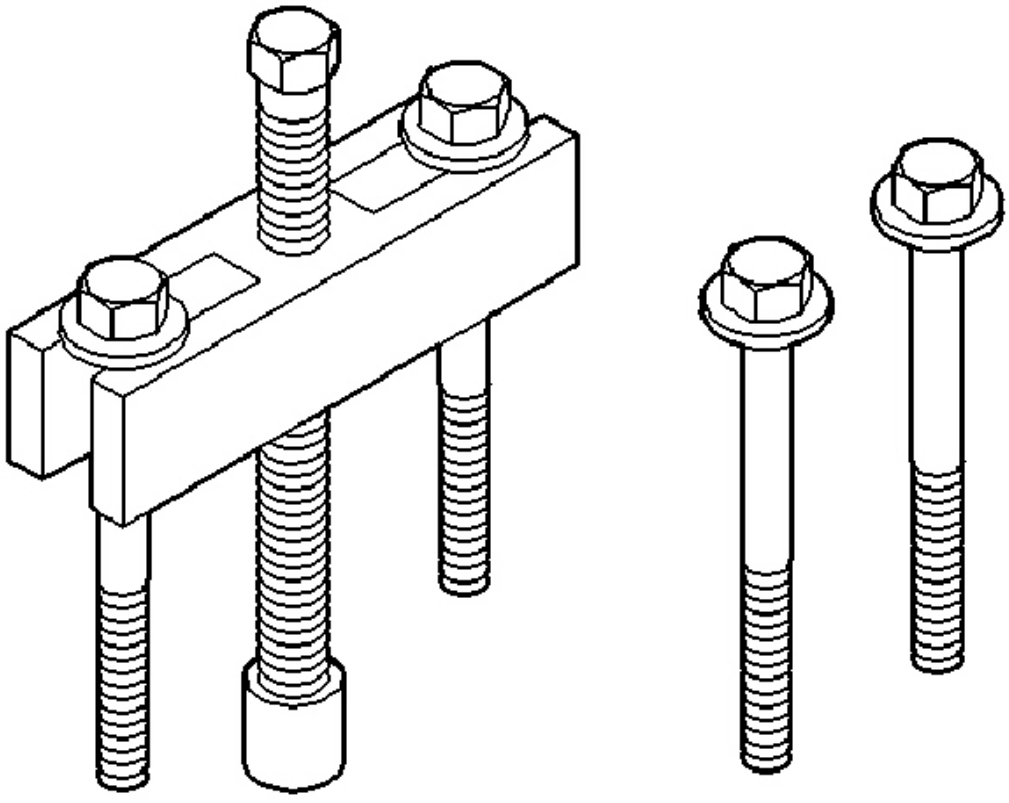

Fig. 52: Gear Puller L-4407A
Courtesy of CHRYSLER LLC

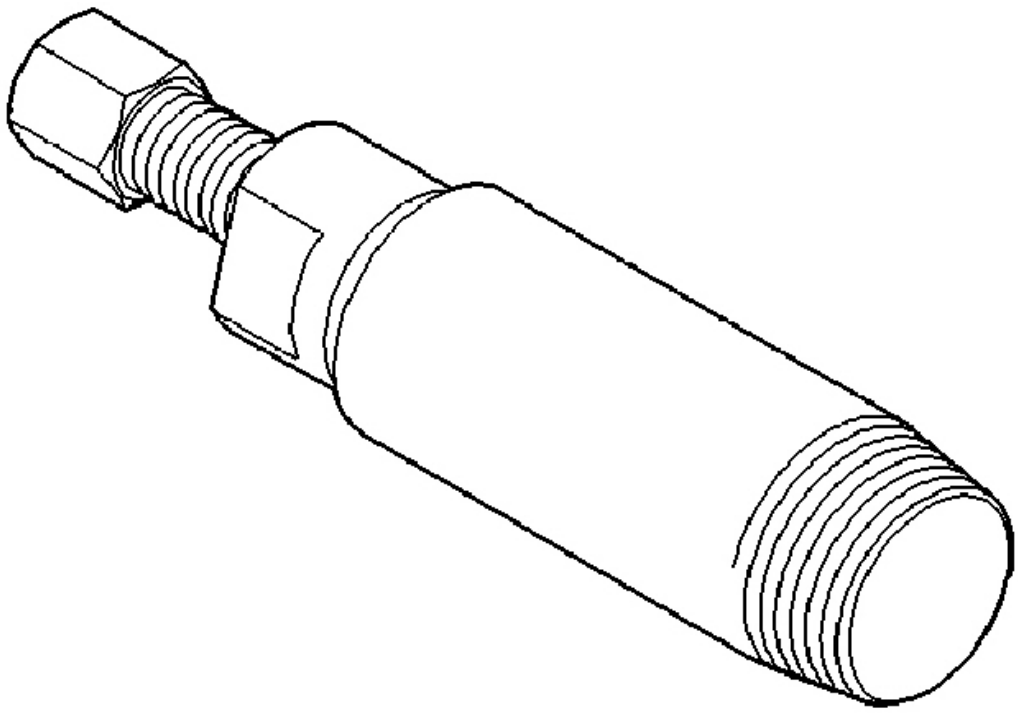

Fig. 53: Front Crankshaft Seal Remover 6341A
Courtesy of CHRYSLER LLC

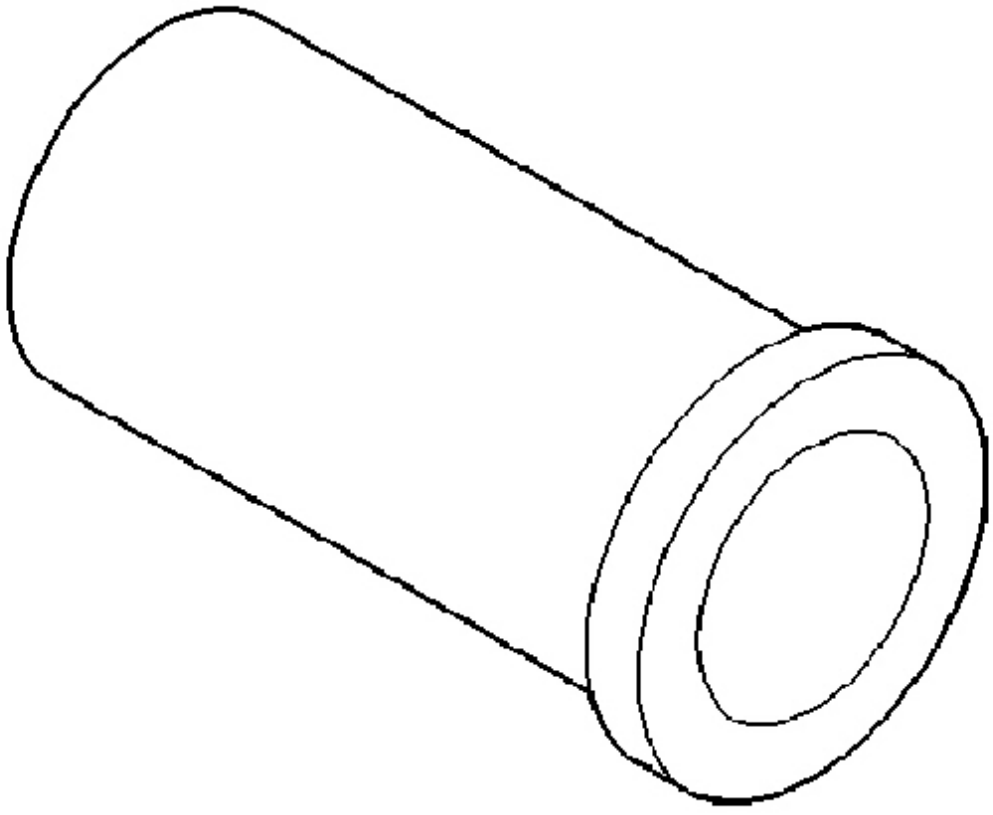

Fig. 54: Driver 6342
Courtesy of CHRYSLER LLC

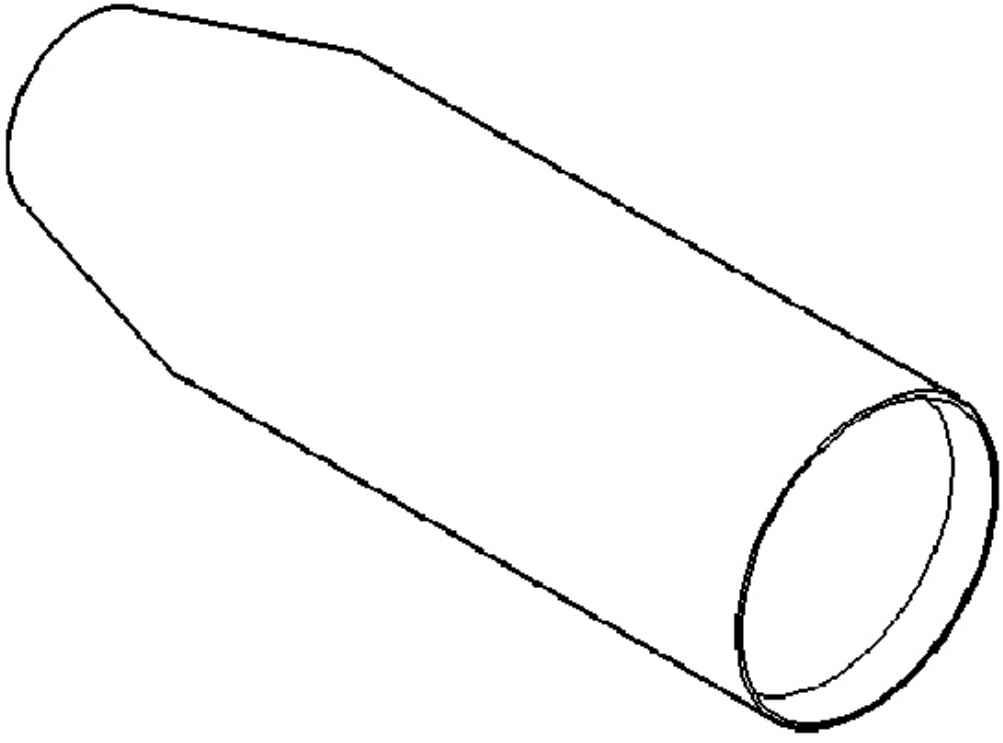

Fig. 55: Crankshaft Seal Protector 6780-2
Courtesy of CHRYSLER LLC

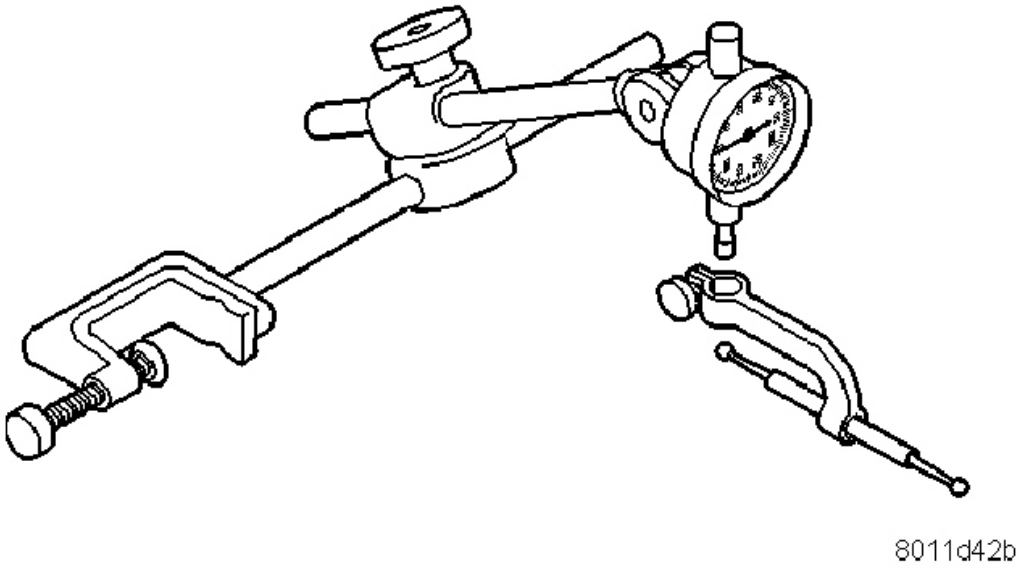

Fig. 56: Dial Indicator C-3339
Courtesy of CHRYSLER LLC

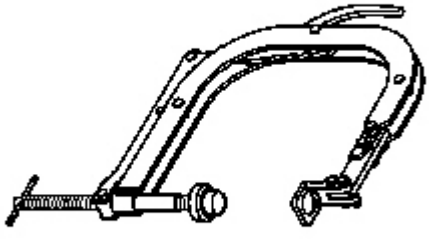

Fig. 57: Valve Spring Compressor C-3422-D
Courtesy of CHRYSLER LLC

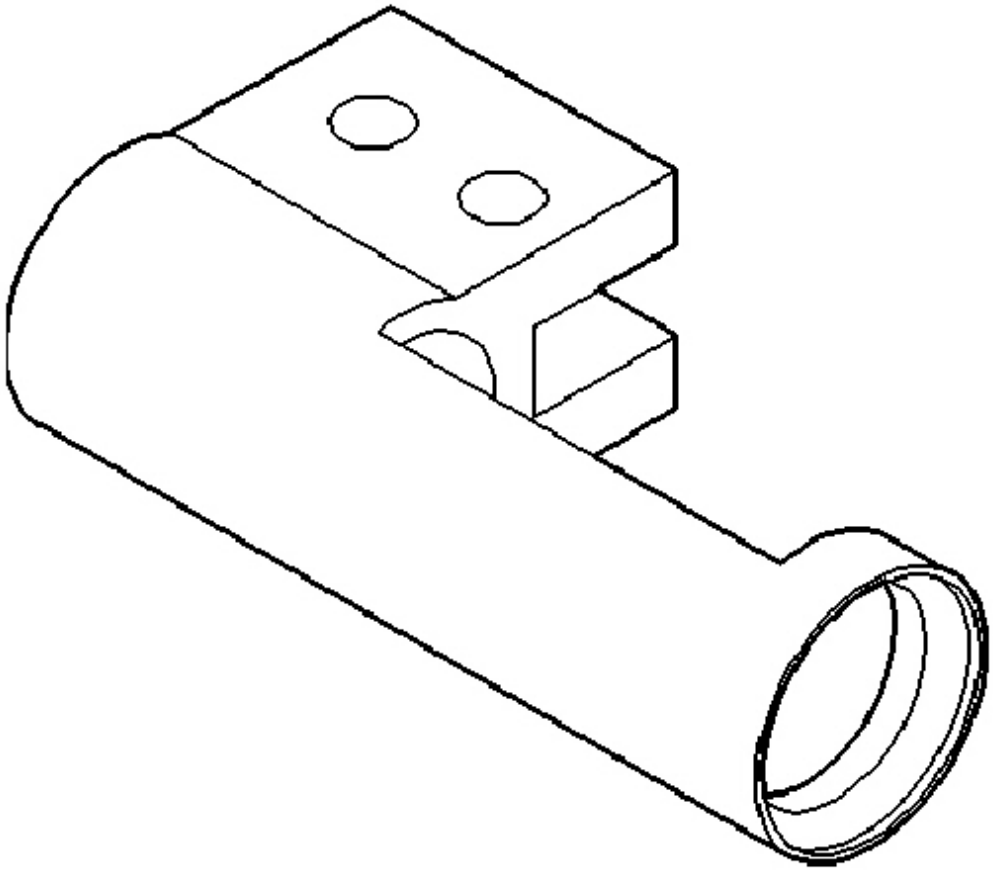

Fig. 58: Spring Compressor Adapter 6526
Courtesy of CHRYSLER LLC

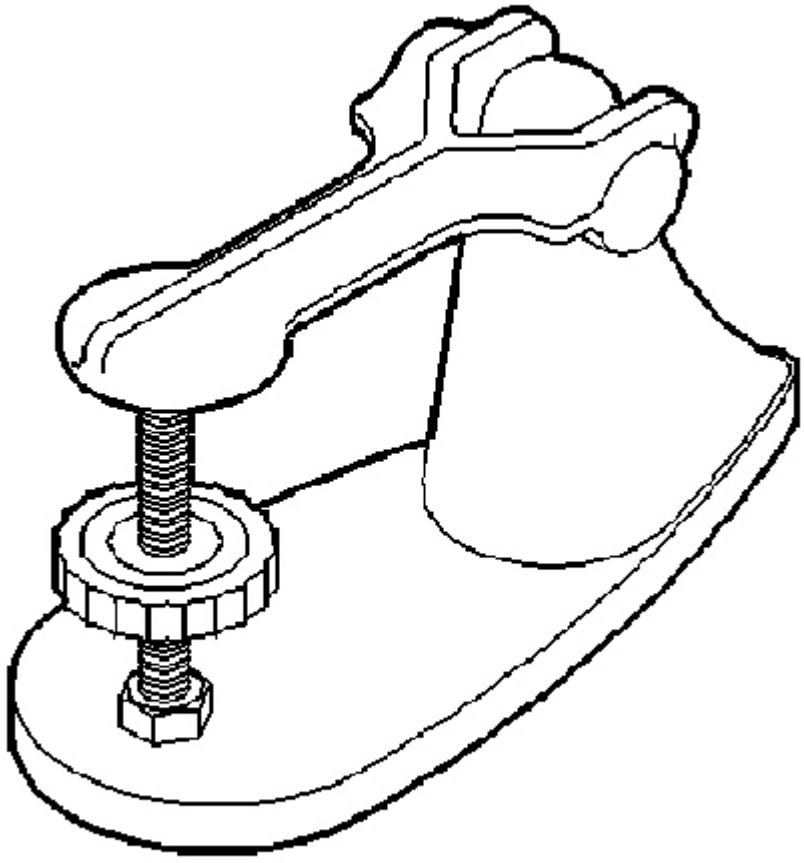

Fig. 59: Valve Spring Tester C-647
Courtesy of CHRYSLER LLC

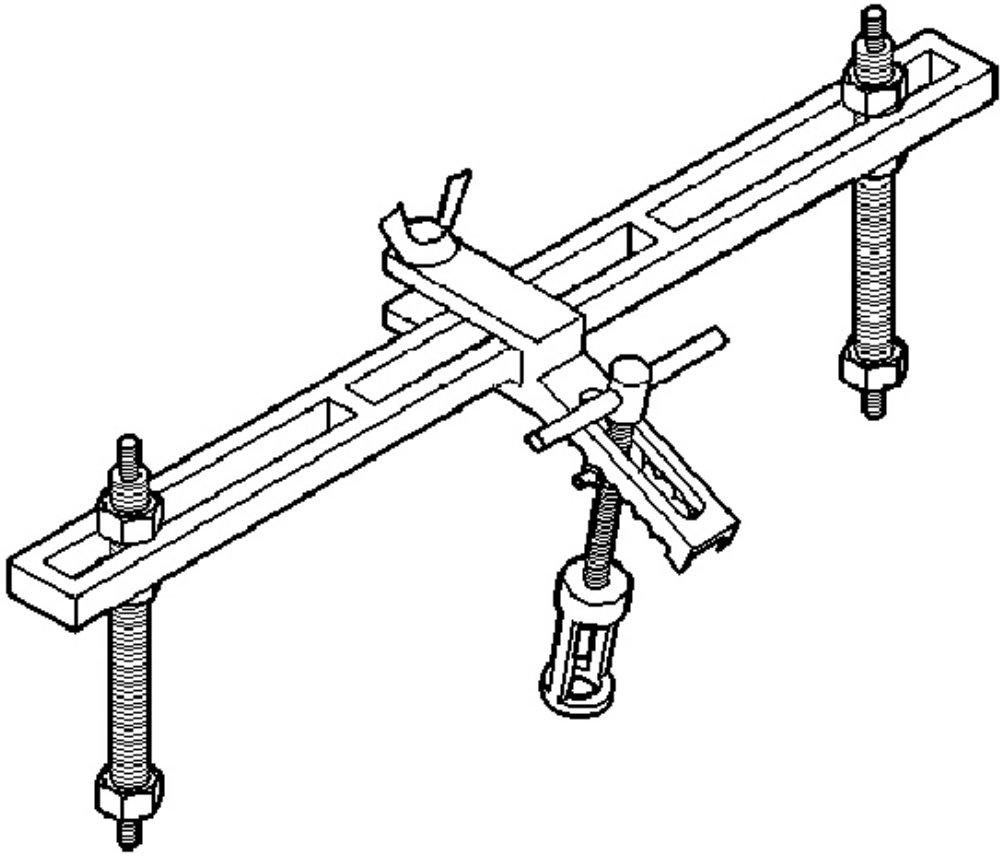

Fig. 60: Valve Spring Compressor MD998772A
Courtesy of CHRYSLER LLC

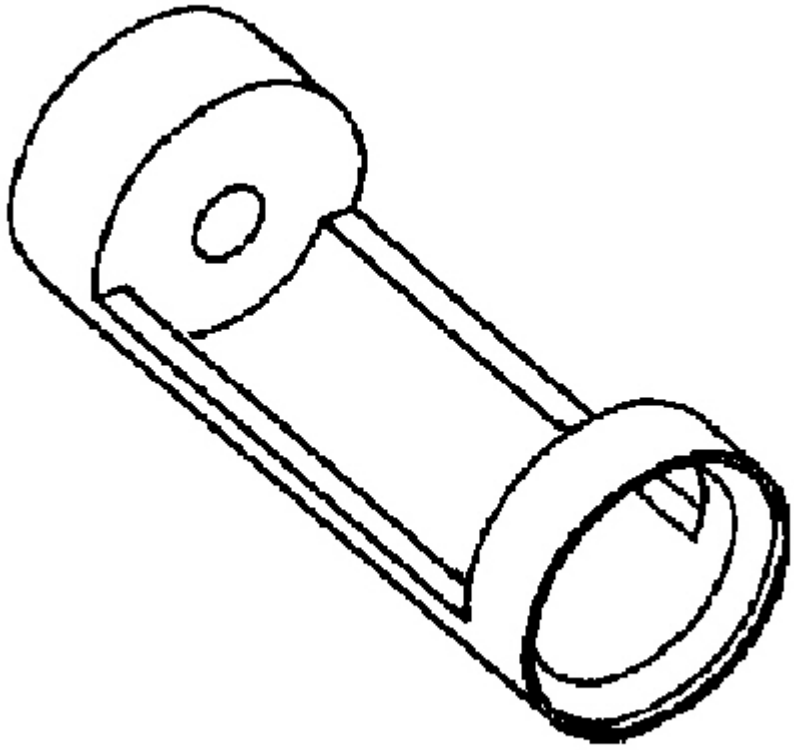

Fig. 61: Valve Spring Adapter 6527
Courtesy of CHRYSLER LLC

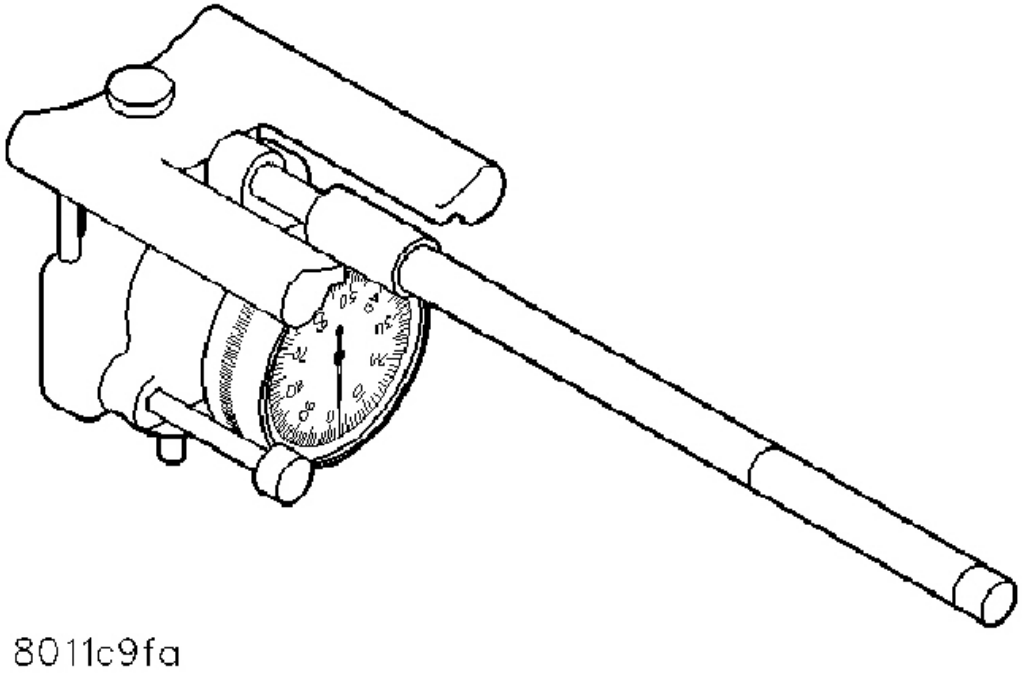

Fig. 62: Indicator, Cylinder Bore C-119
Courtesy of CHRYSLER LLC

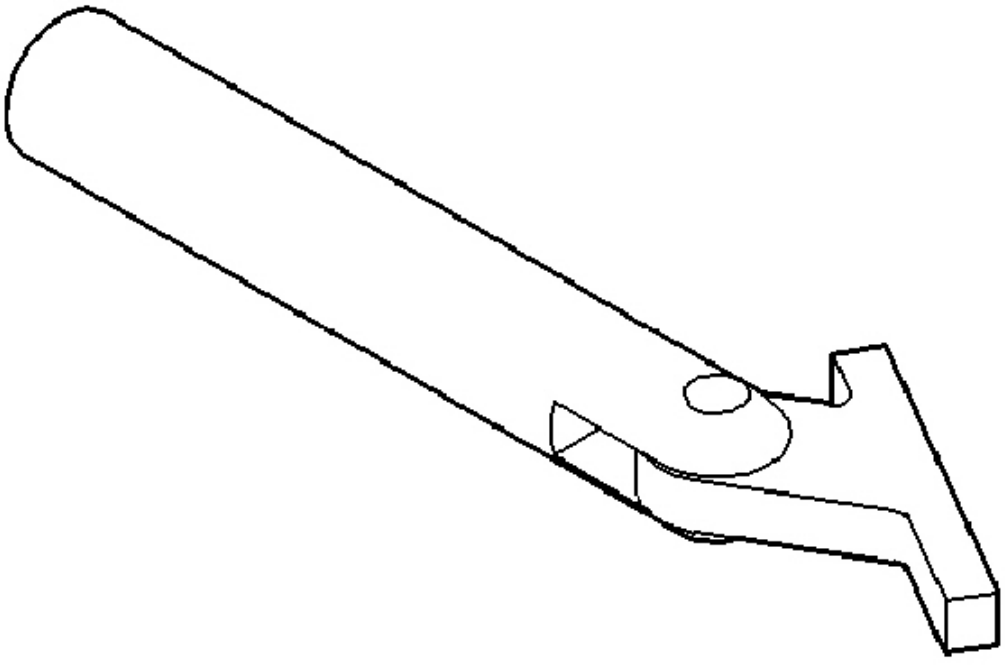

Fig. 63: Crankshaft Main Bearing Remover C-3059
Courtesy of CHRYSLER LLC

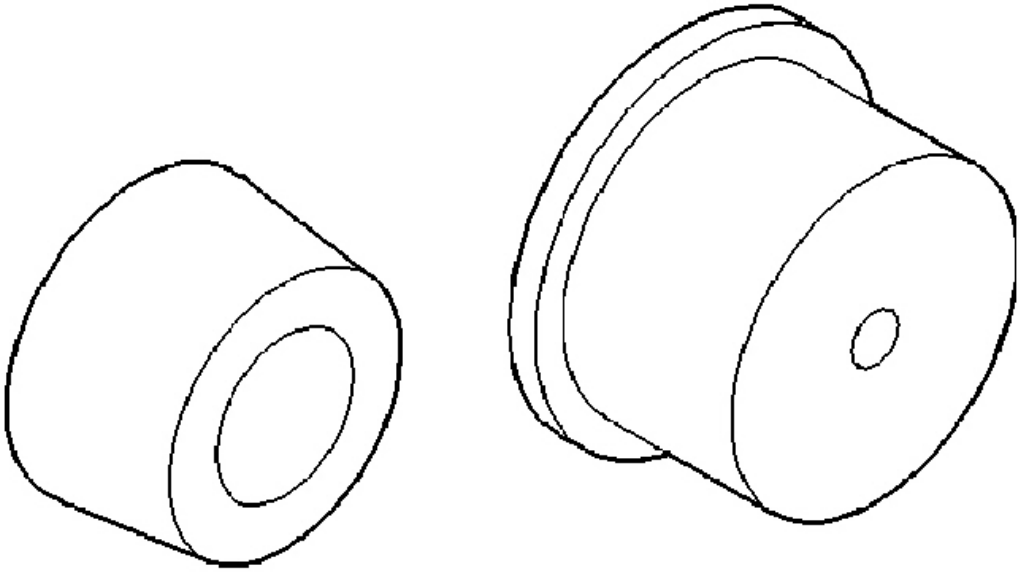

Fig. 64: Rear Crankshaft Oil Seal Installer 6926
Courtesy of CHRYSLER LLC

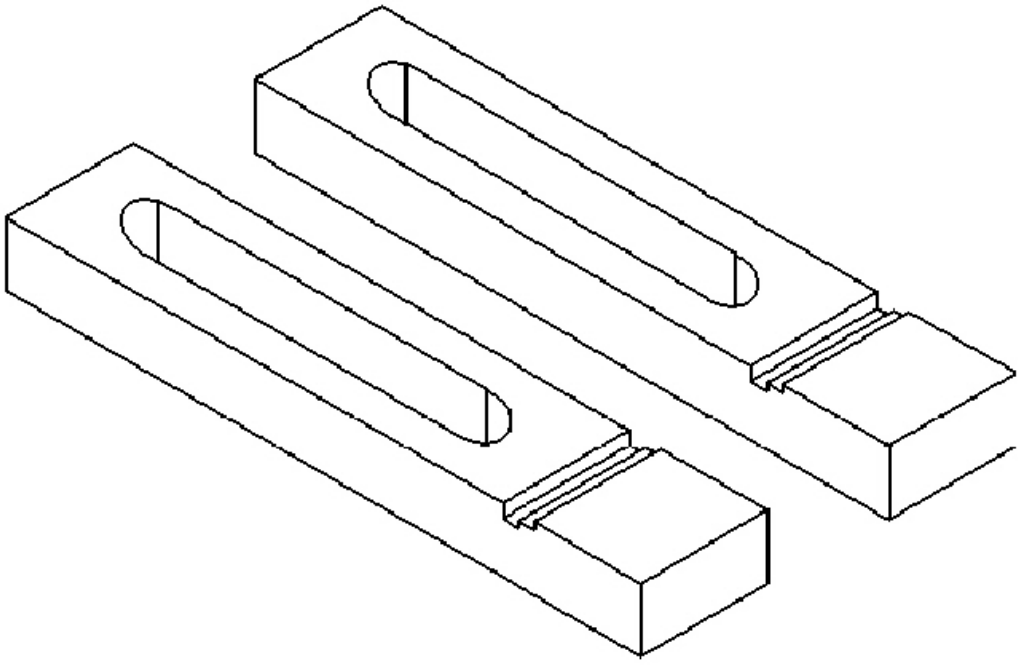

Fig. 65: Crankshaft Real Seal Retainer Alignment Fixture 8225
Courtesy of CHRYSLER LLC

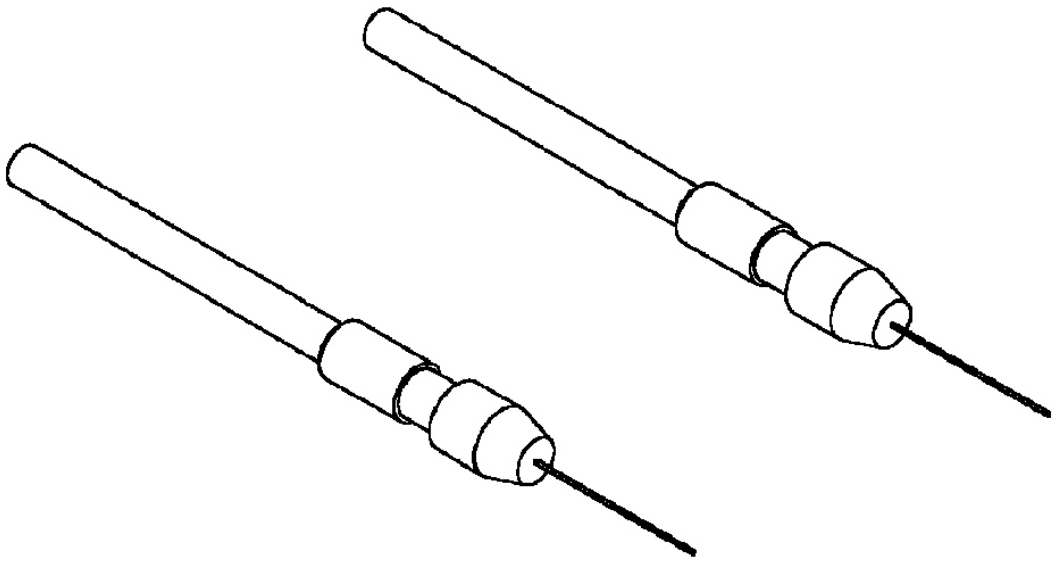

Fig. 66: Release Probe 8351
Courtesy of CHRYSLER LLC

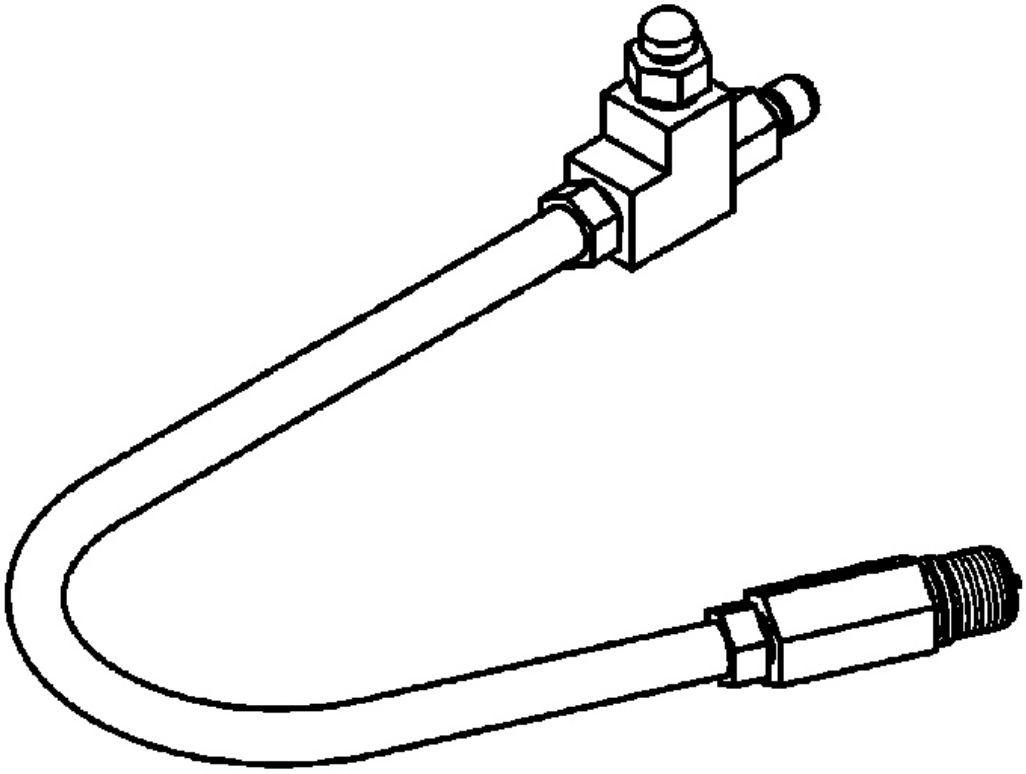

Fig. 67: Cylinder Compression Pressure Adaptor 8116
Courtesy of CHRYSLER LLC

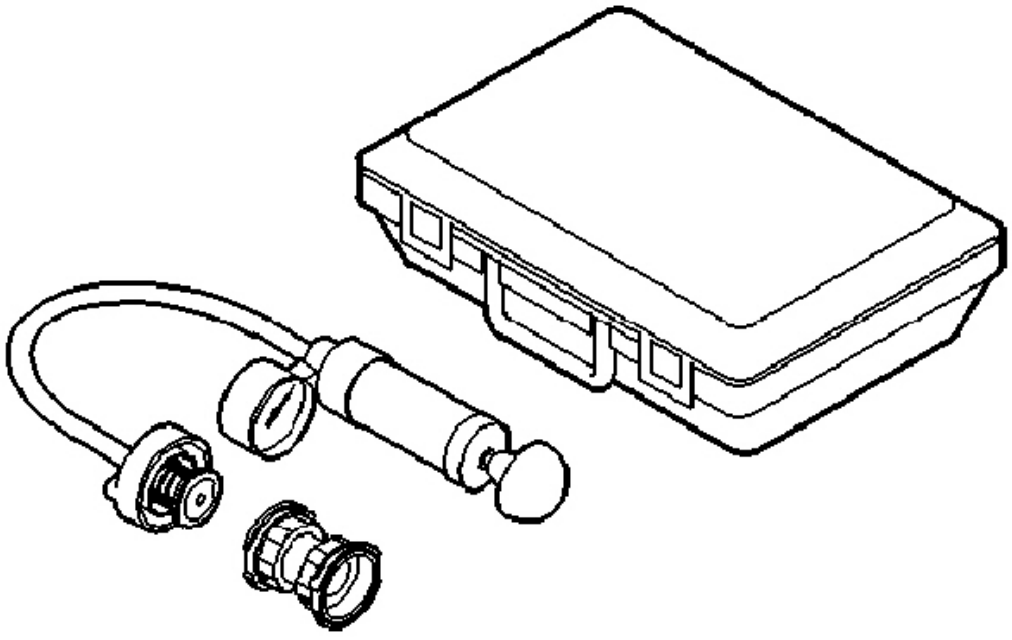

Fig. 68: Pressure Tester Kit 7700
Courtesy of CHRYSLER LLC

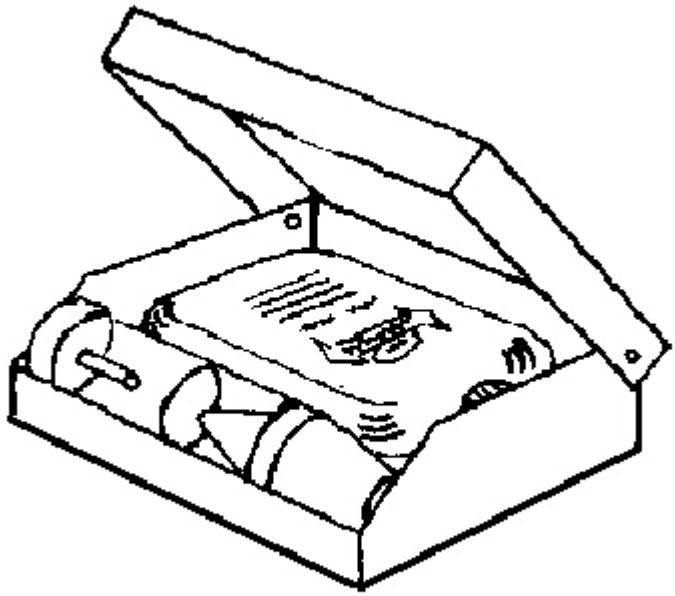

Fig. 69: Bloc-Chek-Kit C-3685-A
Courtesy of CHRYSLER LLC

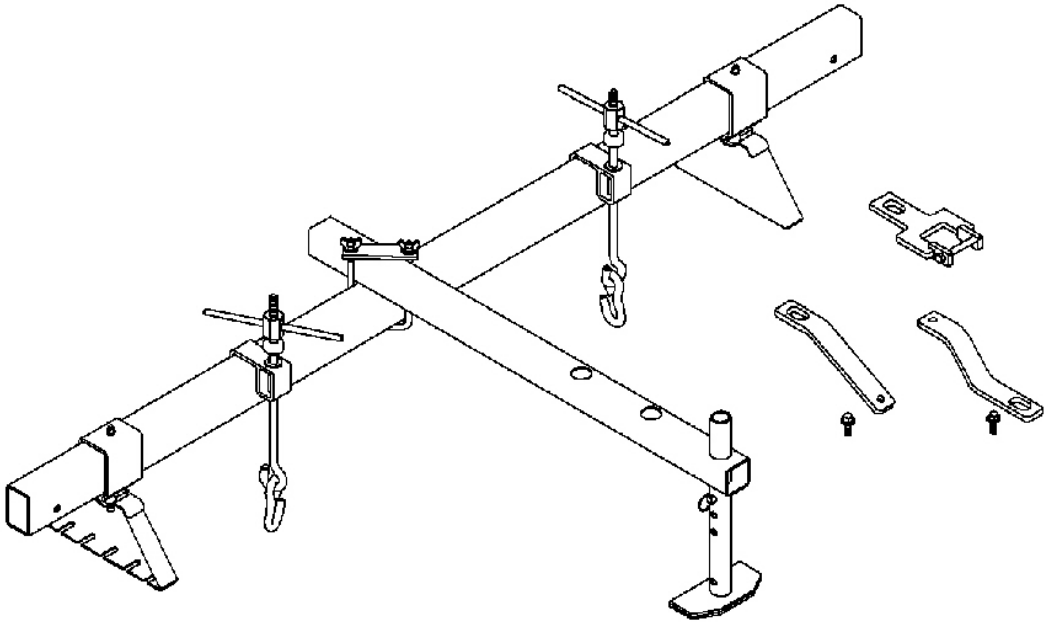

Fig. 70: Driveline Support Fixture 8534B
Courtesy of CHRYSLER LLC

AIR INTAKE SYSTEM

ELEMENT-AIR CLEANER

REMOVAL

REMOVAL

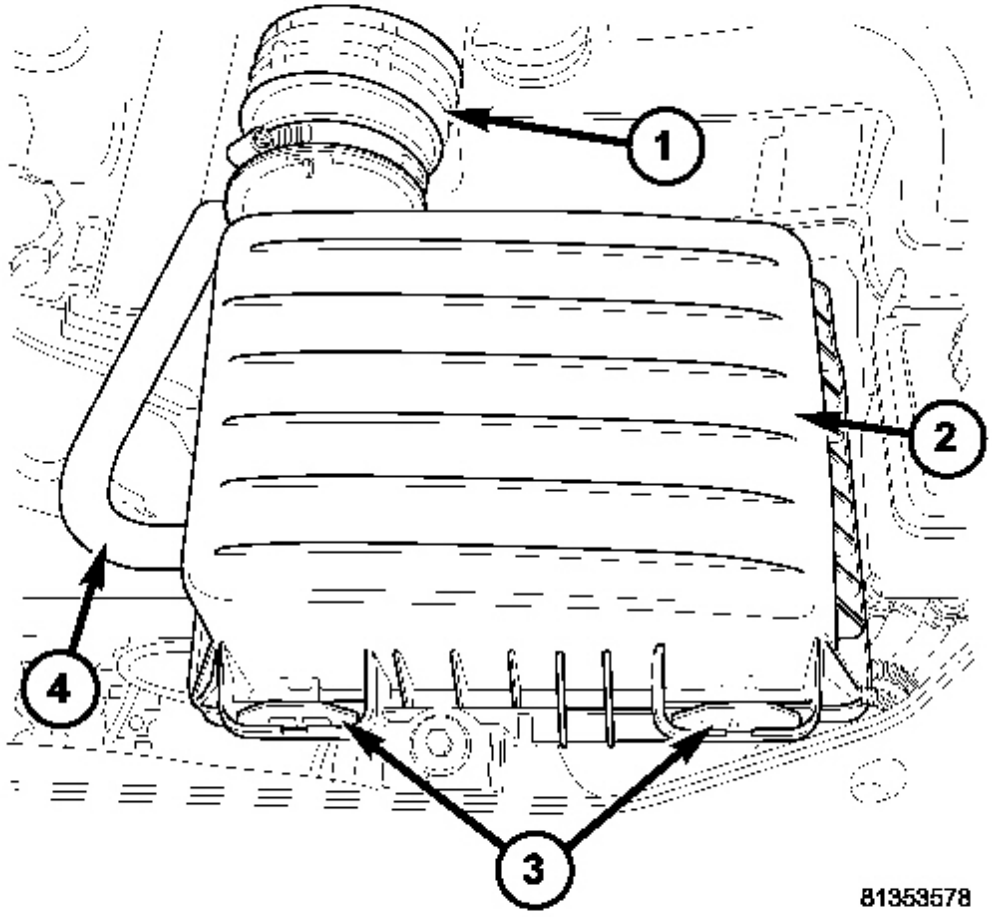

Fig. 71: Air Cleaner Housing Cover, CCV Hose, Locking Tab & Air Inlet Duct To Throttle Body
Courtesy of CHRYSLER LLC

1 - AIR INLET DUCT TO THROTTLE BODY
2 - AIR CLEANER HOUSING COVER
3 - LOCKING TABS
4 - CCV HOSE

1. Disconnect the CCV hose (4) at the housing cover (2). See **Fig. 71**.
2. Release the housing cover tabs (3). See **Fig. 71**

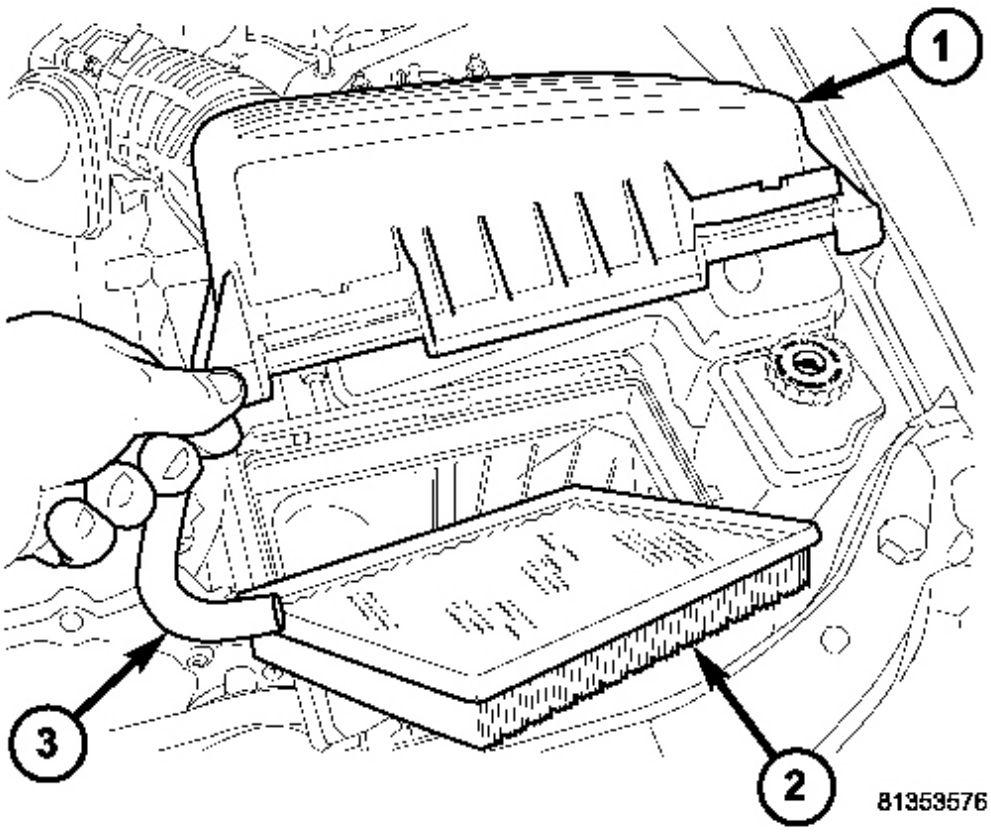

Fig. 72: Air Cleaner Cover, Element & CCV Hose
Courtesy of CHRYSLER LLC

1 - AIR CLEANER COVER
2 - ELEMENT
3 - CCV HOSE

3. Lift the cover (1) and pull toward the front of the vehicle to release the rear cover to housing alignment tabs. See **Fig. 72**.
4. Remove the element (2).

INSTALLATION

INSTALLATION

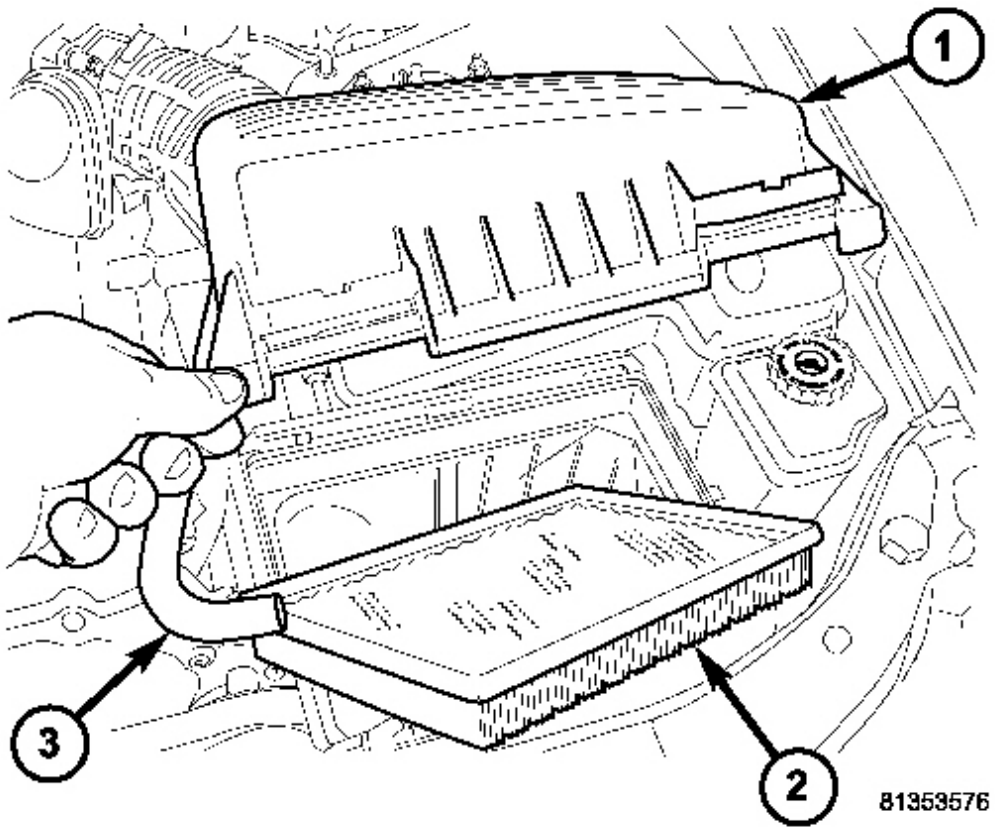

Fig. 73: Air Cleaner Cover, Element & CCV Hose
Courtesy of CHRYSLER LLC

1 - AIR CLEANER COVER
2 - ELEMENT
3 - CCV HOSE

1. Install the air filter element (2) into air box. See **Fig. 73**.
2. Position the cover (1) so that the rear locking tabs insert into the lower housing.
3. Seat cover (1) onto element housing and assure that the front locking tabs engage.
4. Reconnect the CCV hose (3).

HOUSING-AIR CLEANER

REMOVAL

REMOVAL

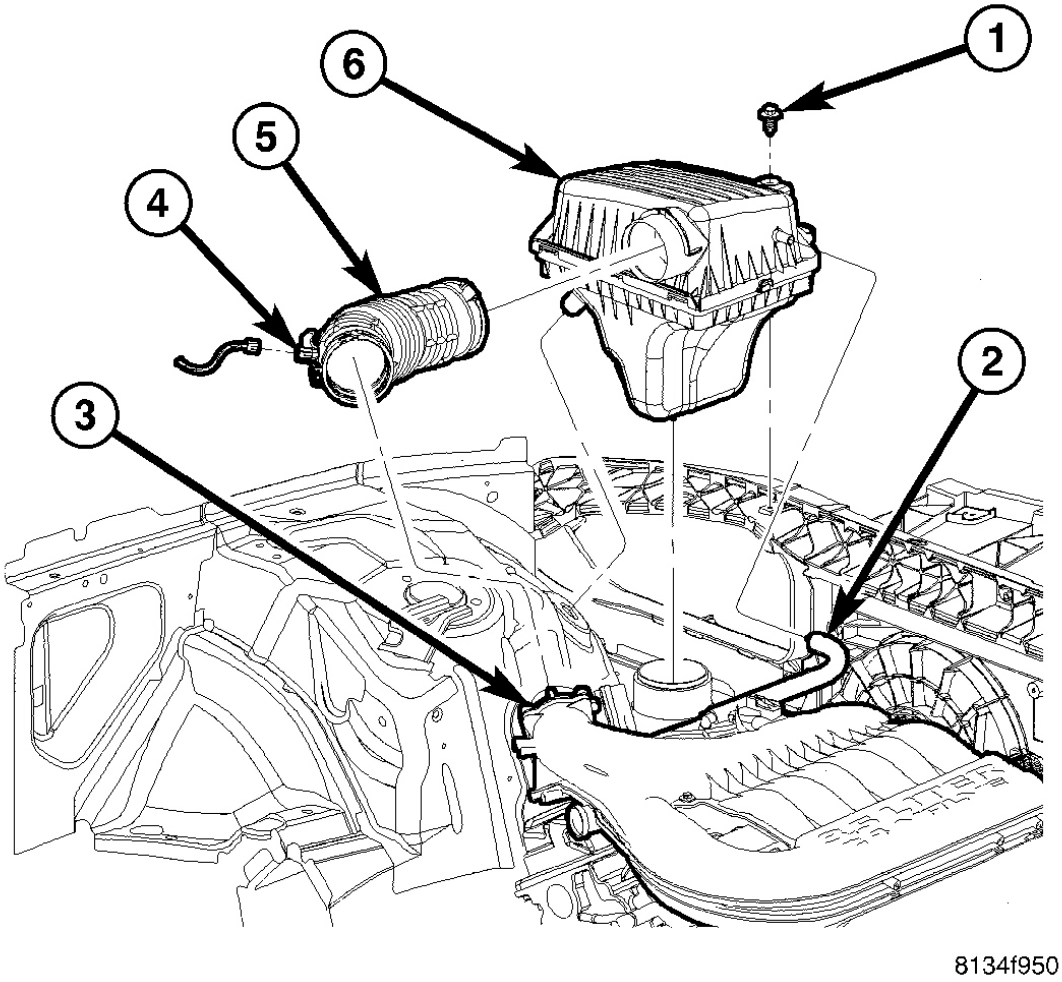

Fig. 74: Air Cleaner Housing Assembly
Courtesy of CHRYSLER LLC

1 - BOLT
2 - CCV HOSE
3 - THROTTLE
4 - IAT SENSOR
5 - INLET AIR DUCT
6 - AIR CLEANER ELEMENT HOUSING

1. Separate the air inlet duct (5) at the element housing (6).
2. Disconnect the CCV hose (2) at the element housing (6).

3. Remove the housing retaining bolt (1).
4. Pull housing up and off of the locating pin.
5. Remove element housing (6) from vehicle. See **Fig. 74**

INSTALLATION

INSTALLATION

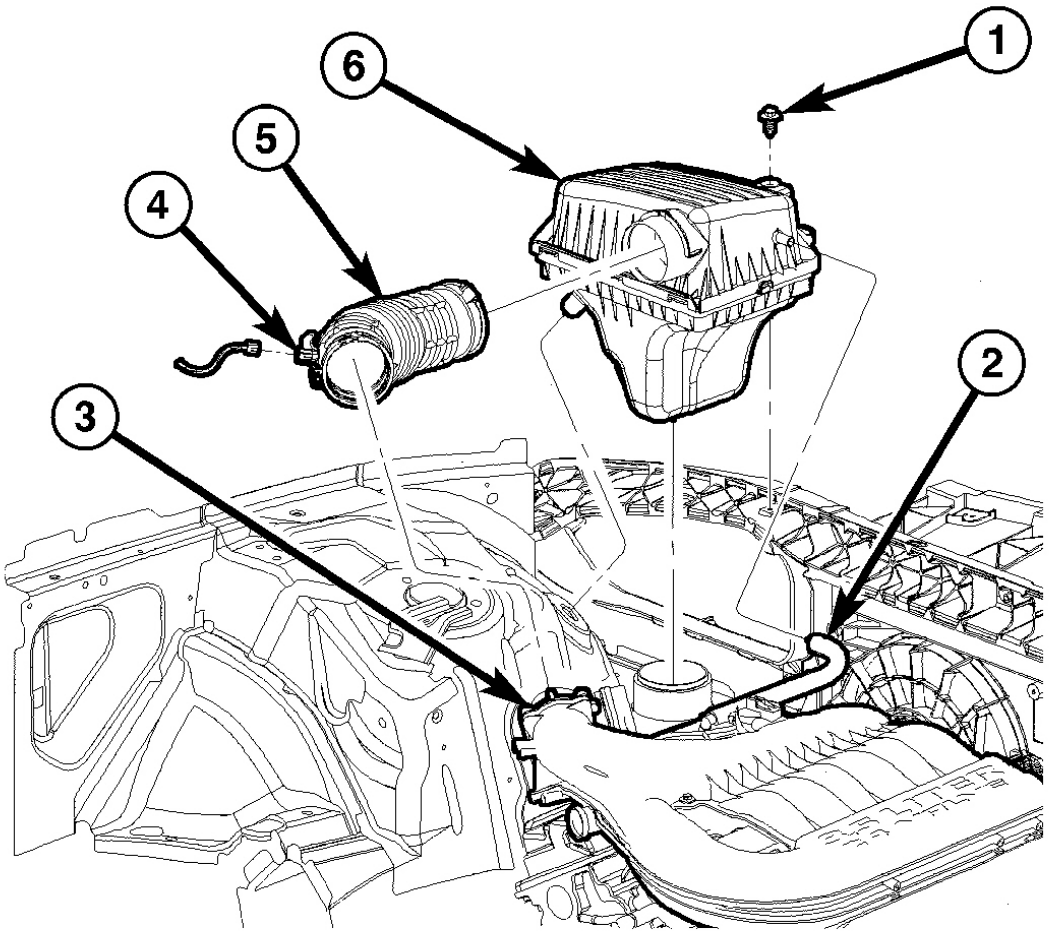

Fig. 75: Air Cleaner Housing Assembly
Courtesy of CHRYSLER LLC

1 - BOLT 2 - CCV HOSE 3 - THROTTLE

4 - IAT SENSOR
5 - INLET AIR DUCT
6 - AIR CLEANER ELEMENT HOUSING

1. Align the housing (6) with the lower air inlet duct and alignment grommet in the wheel housing.
2. Properly fit the housing (6) and install housing retaining bolt (1). See **Fig. 75**.
3. Connect the inlet air duct (5) to the housing (6) and tighten clamp.
4. Connect the CCV hose (2) to housing.

CYLINDER HEAD(S)

DESCRIPTION

CYLINDER HEAD

The aluminum alloy cylinder heads feature cross- flow type intake and exhaust ports. Valve guides and seat inserts are powdered metal. Valves are arranged in a "V", with each camshaft on center. To improve combustion speed the chambers are a compact spherical design with a squish area of approximately 30 percent of the piston top area. The cylinder heads are common to either cylinder bank by reversing the direction of installation.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in

Cylinder Compression Pressure Test. See **DIAGNOSIS AND TESTING**. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50-70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

CYLINDER HEAD - REMOVAL

RIGHT CYLINDER HEAD

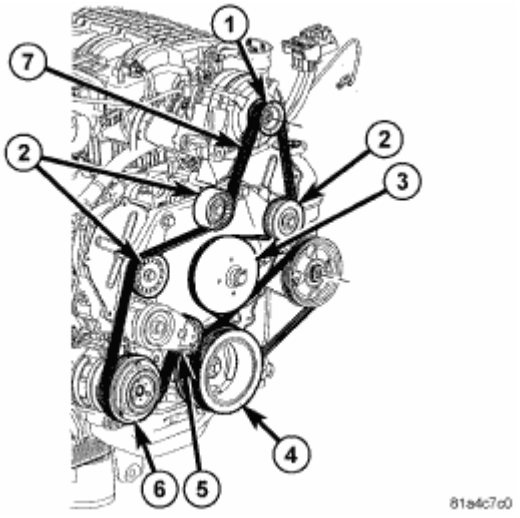

Fig. 76: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

1. Perform the fuel relief procedure.
2. Disconnect the negative battery cable.
3. Drain cooling system. Refer to **STANDARD PROCEDURE** .
4. Remove the upper intake manifold. See **REMOVAL**.
5. Remove the lower intake manifold. See **REMOVAL**.
6. Remove accessory drive belt (7).
7. Remove accessory drive belt idler pulley.

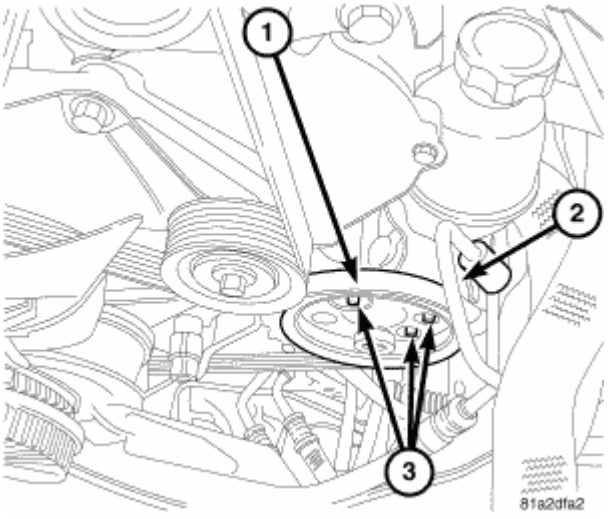

Fig. 77: Removing Power Steering Mounting Bolts, Pump & Crankshaft Damper
Courtesy of CHRYSLER LLC

8. Remove the power steering mounting bolts (3) and set the pump aside (Refer to **REMOVAL**).
9. Remove crankshaft damper (4) (Refer to **REMOVAL**).

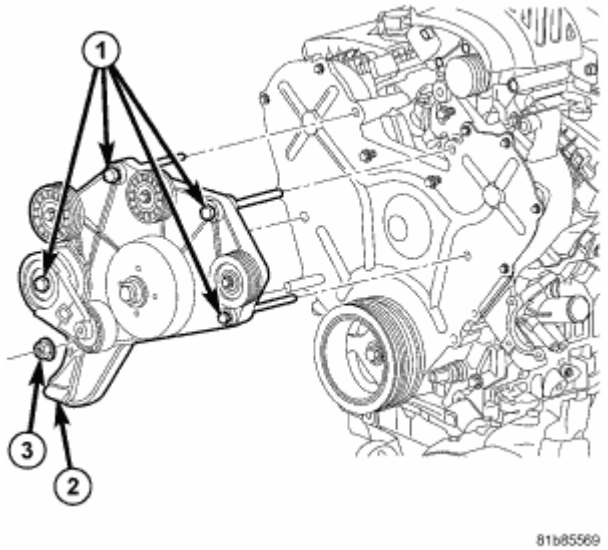

Fig. 78: Removing/Installing Accessory Drive Bracket
Courtesy of CHRYSLER LLC

10. Remove the accessory drive bracket (2).
11. Remove the outer timing belt cover bolts and cover.

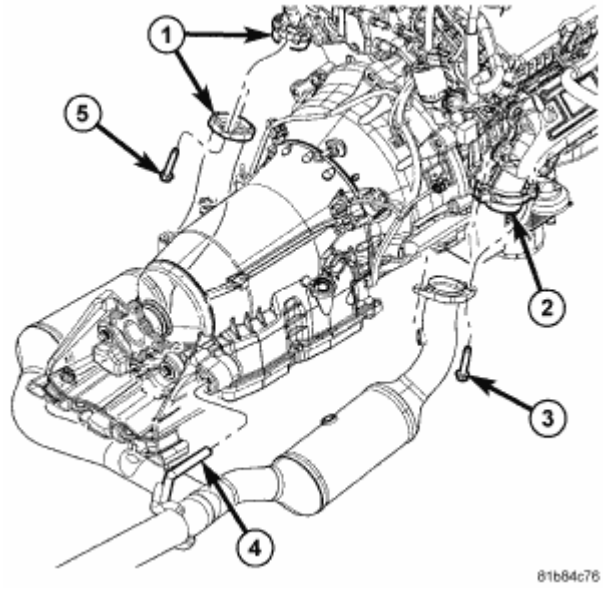

Fig. 79: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

12. Remove front exhaust pipe to exhaust manifold mounting bolts (3,5).
13. Disconnect both oxygen sensor harness connectors on each side.

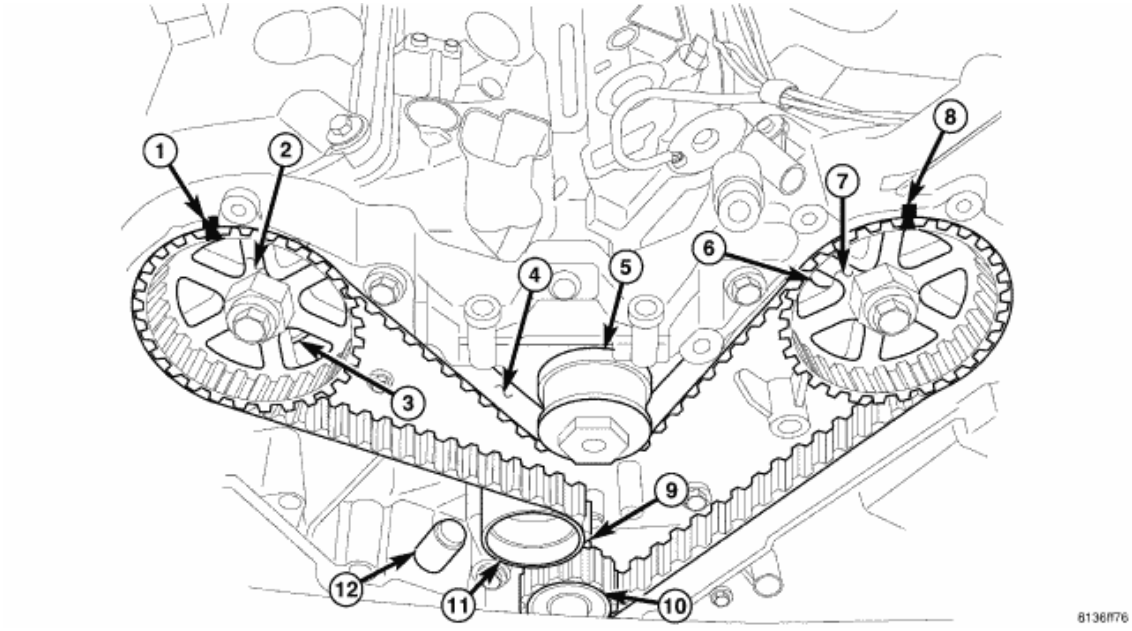

Fig. 80: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT	8 - LEFT CAMSHAFT

GEAR	GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

14. Rotate the engine to TDC and align timing belt marks (1, 8, 9). See **Fig. 80**.
15. Remove the timing belt tensioner (1, 2) and reset the tensioner. See **REMOVAL**.
16. Remove the timing belt (4). See **REMOVAL**.
17. Remove the right cylinder head cover to cylinder head ground strap and capacitor.
18. Remove the EGR valve and tube assembly.
19. Remove the right cylinder head cover.

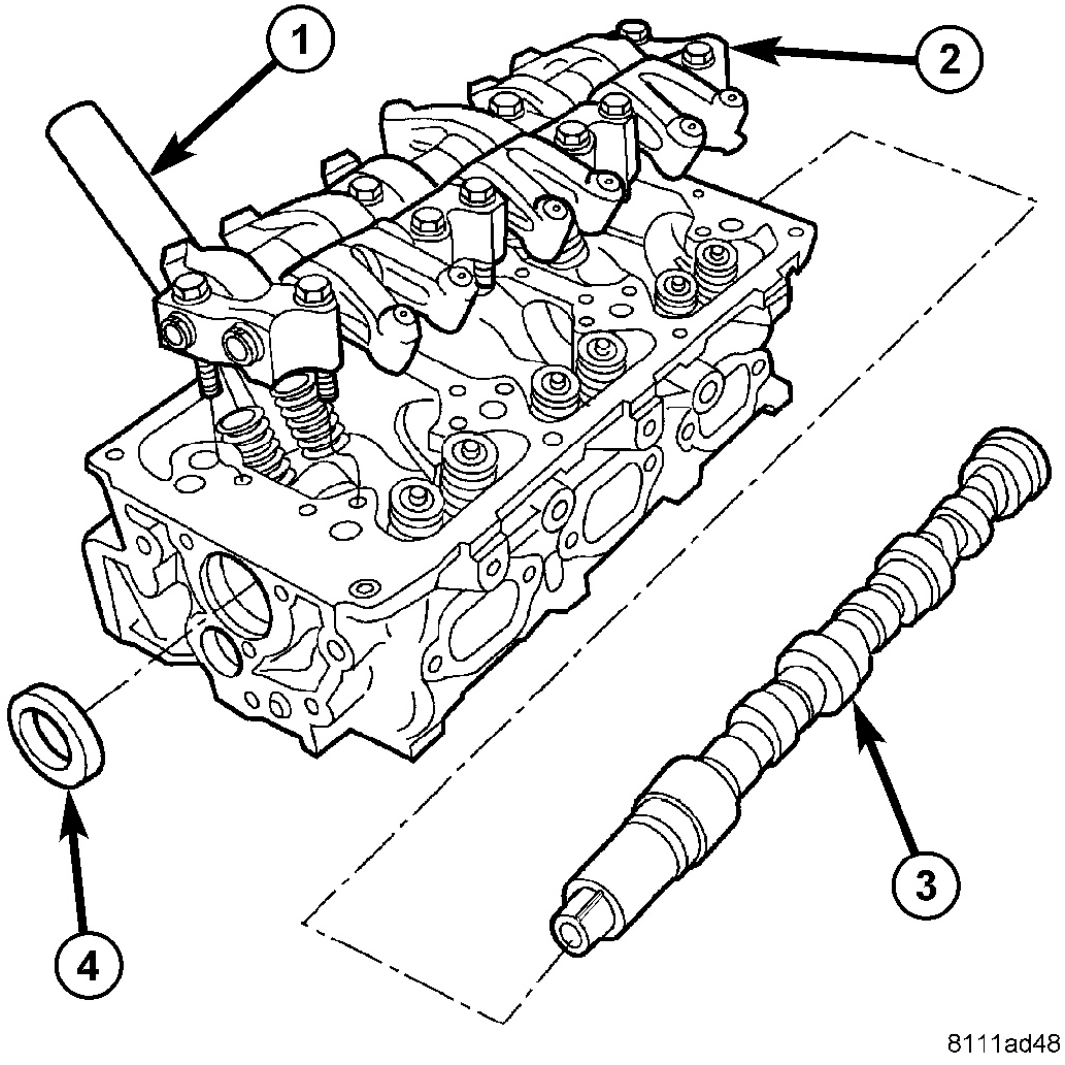

Fig. 81: Camshaft, Rocker Arm Assembly & Cylinder Head
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE
2 - ROCKER ARM ASSEMBLY
3 - CAMSHAFT
4 - CAMSHAFT SEAL

20. Remove the right rocker arm assembly (2).

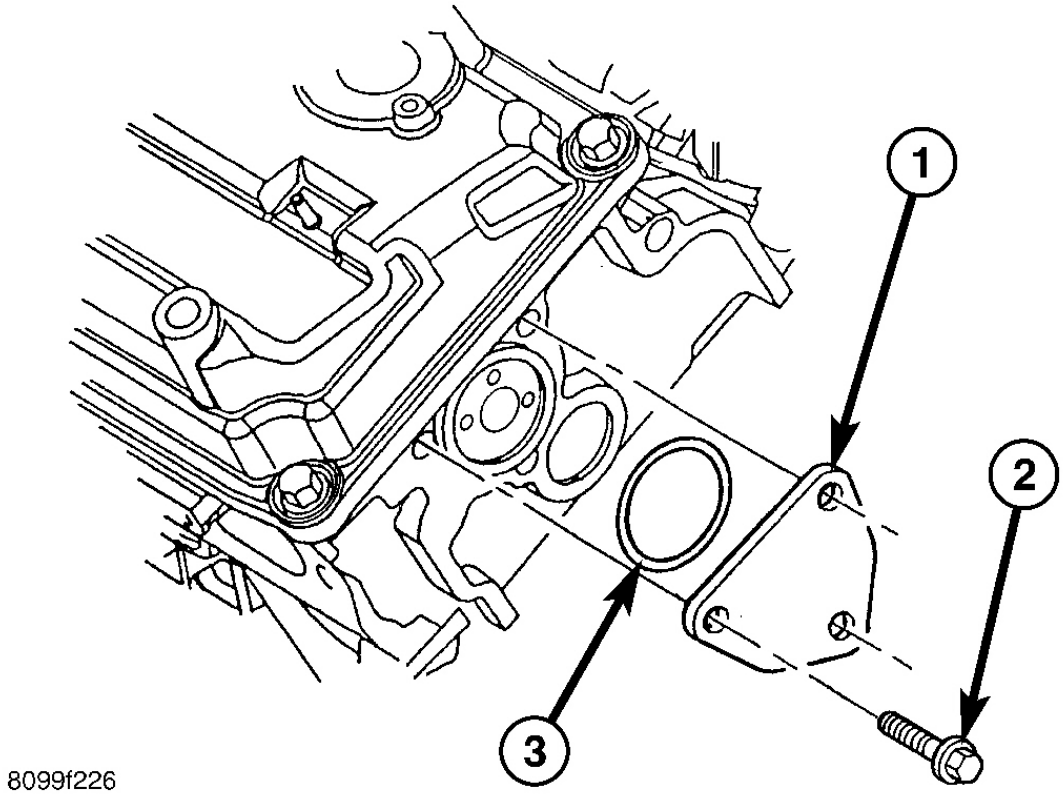

Fig. 82: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

21. Remove the right rear camshaft thrust plate (1). See **Fig. 82**.

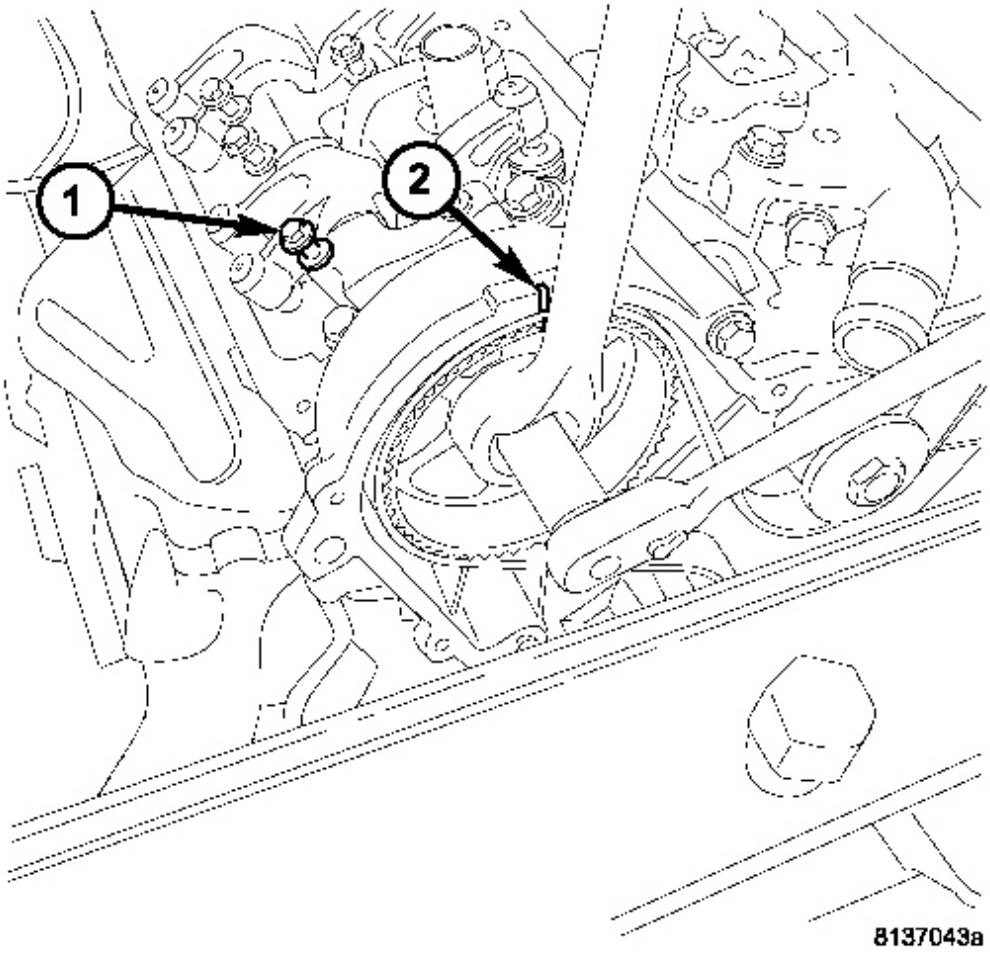

Fig. 83: Removing/Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

1 - LOOSENED ROCKER ASSEMBLY
2 - RIGHT CAMSHAFT TDC

22. Counterhold the cam gear and remove the right cam gear retaining bolt. See **Fig. 83**.

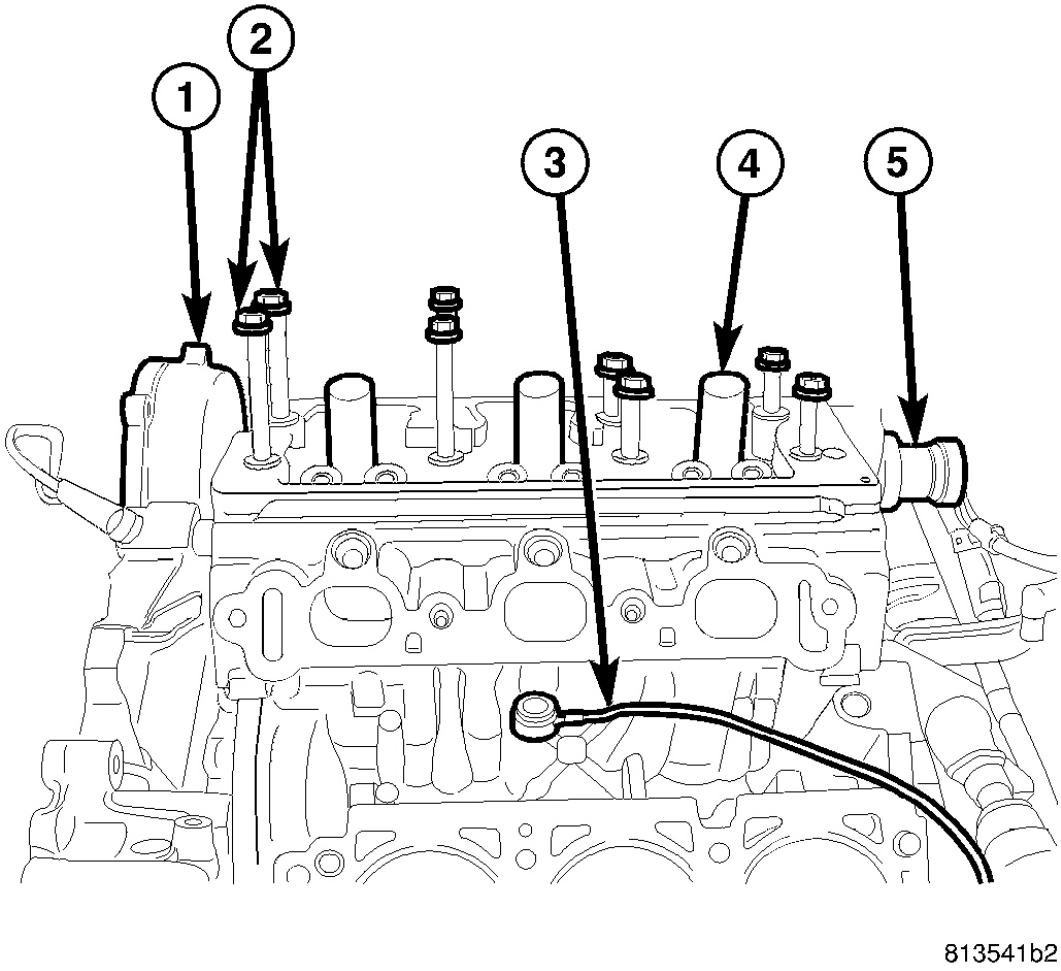

Fig. 84: Timing Chain Cover, Cylinder Head Bolts, Knock Sensor, Spark Plug Tube & Camshaft
Courtesy of CHRYSLER LLC

1 - TIMING CHAIN COVER
2 - CYLINDER HEAD BOLTS
3 - KNOCK SENSOR
4 - SPARK PLUG TUBE
5 - CAMSHAFT

23. Push the camshaft (5) out of the back of the cylinder head approximately 3.5 inches and remove the right cam gear. See **Fig. 84**.

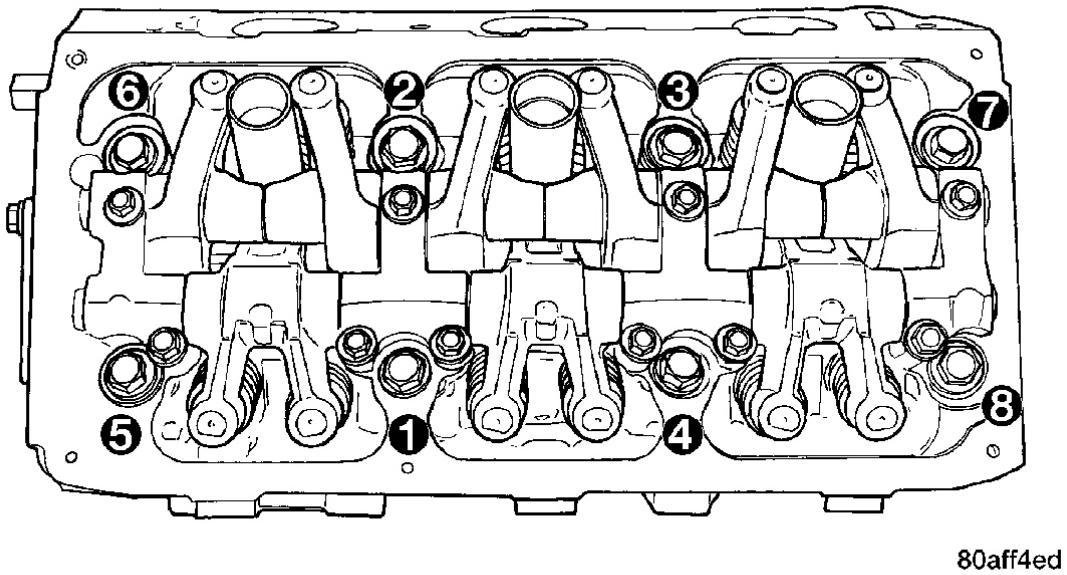

Fig. 85: Cylinder Head Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

24. Remove the inner timing cover to cylinder head retaining bolts.
25. Remove the cylinder head bolts in REVERSE of tightening sequence. See **Fig. 85**.
26. Remove the cylinder head.
27. Clean and inspect all mating surfaces.

LEFT CYLINDER HEAD

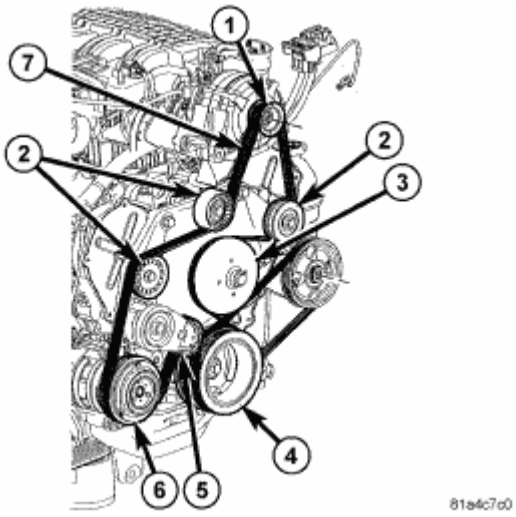

Fig. 86: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

1. Perform the fuel relief procedure.
2. Disconnect the negative battery cable.
3. Drain cooling system (Refer to **STANDARD PROCEDURE**).
4. Remove the upper intake manifold.
5. Remove the lower intake manifold (Refer to **REMOVAL**).
6. Remove the accessory drive belt (7).
7. Remove the belt tensioner.
8. Remove the accessory drive idler pulley.

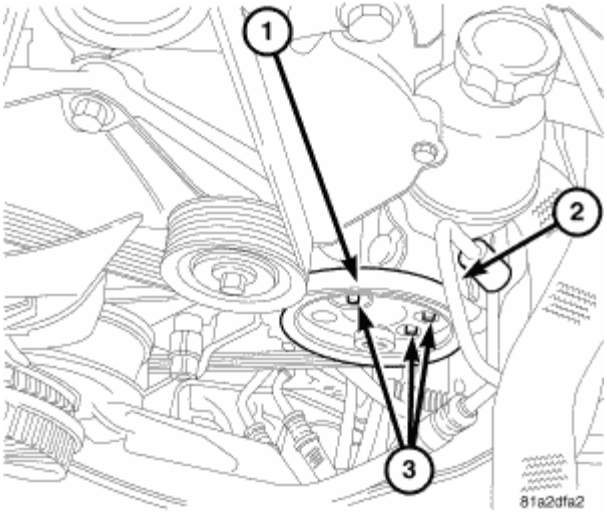

Fig. 87: Removing Power Steering Mounting Bolts, Pump & Crankshaft Damper
Courtesy of CHRYSLER LLC

9. Remove the power steering mounting bolts (3) and set pump (2) aside.
10. Remove the crankshaft damper (Refer to **REMOVAL** .

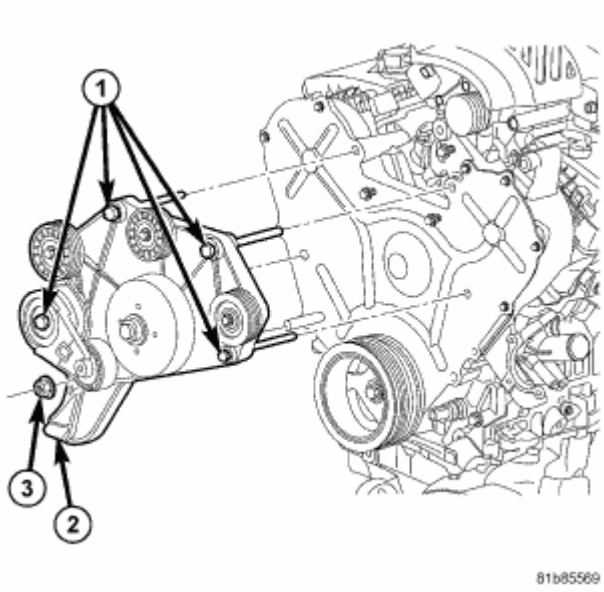

Fig. 88: Removing/Installing Accessory Drive Bracket
Courtesy of CHRYSLER LLC

11. Remove the accessory drive bracket (2).
12. Remove the outer timing belt cover bolts and cover.

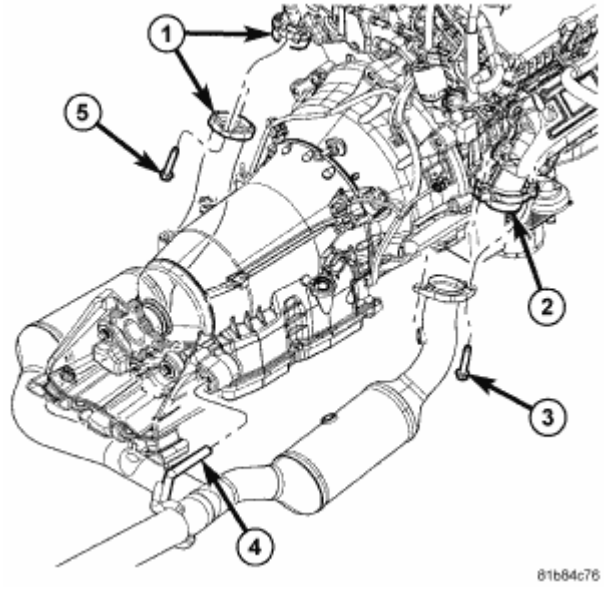

Fig. 89: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

13. Remove the front exhaust pipe to exhaust manifold mounting bolts (3,5).
14. Disconnect both oxygen sensor harness connectors.

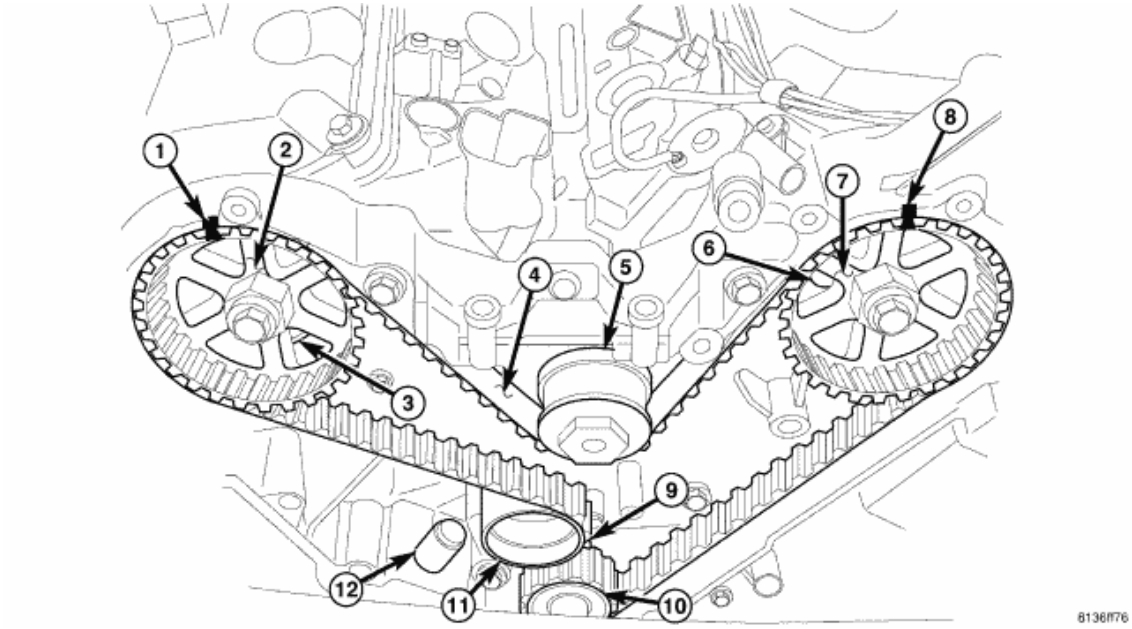

Fig. 90: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

15. Remove the outer timing belt cover. See **REMOVAL**).
16. Remove the timing belt tensioner (12), timing belt (4), then reset tensioner. See **REMOVAL**.
17. Rotate the engine to TDC and align the timing marks (1,8,9). See **Fig. 90**.
18. Remove the left cylinder head cover to cylinder head ground strap.
19. Remove the left cylinder head cover.

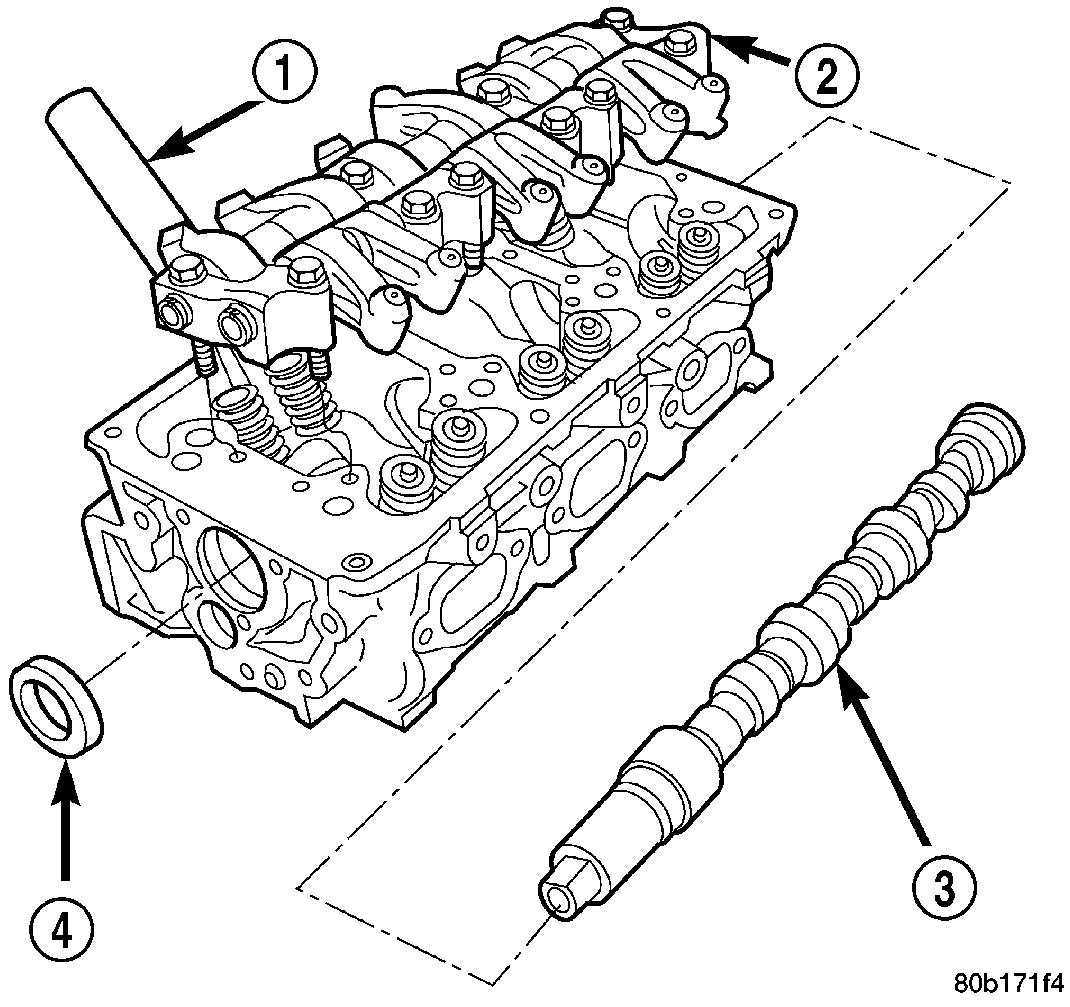

Fig. 91: Cylinder Head, Camshaft, & Rocker Arms
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE
2 - ROCKER ARM ASSEMBLY
3 - CAMSHAFT
4 - SEAL

20. Remove the left rocker arm assembly (2). See **Fig. 91**.

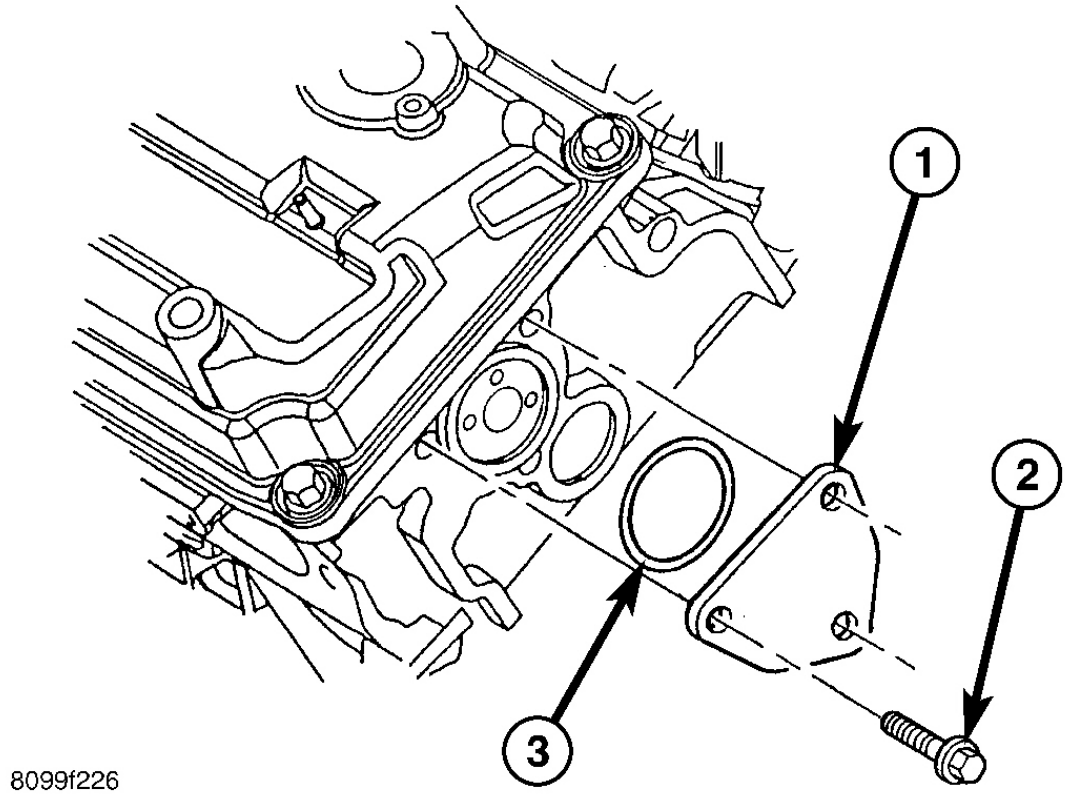

Fig. 92: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

21. Remove the left camshaft thrust plate (1).

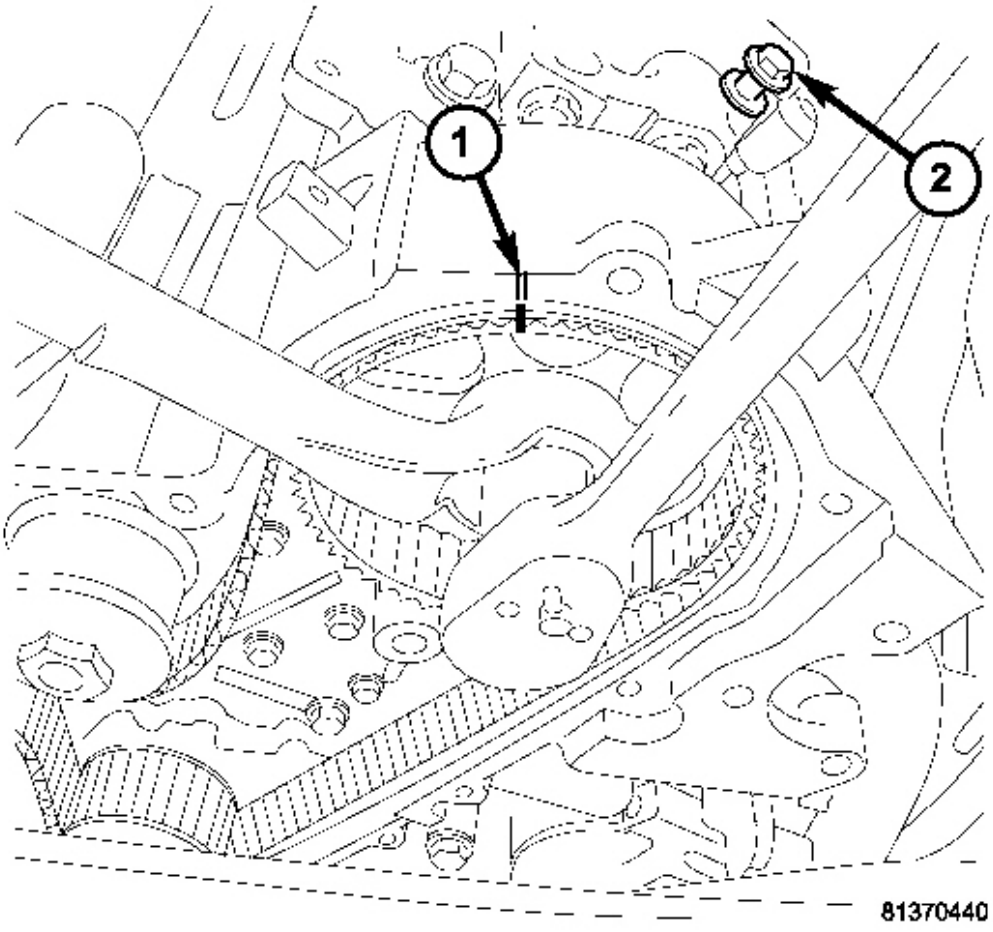

Fig. 93: Left Camshaft Sprocket
Courtesy of CHRYSLER LLC

1 - LEFT CAMSHAFT TDC 2 - LOOSENED ROCKER ASSEMBLY

22. Counterhold the left cam gear and remove the cam gear retaining bolt. See **Fig. 93**. See **REMOVAL**.
23. Push the camshaft out of the back of the cylinder head approximately 3.5 inches and remove the cam gear.

Remove the front timing belt housing to cylinder head bolts.

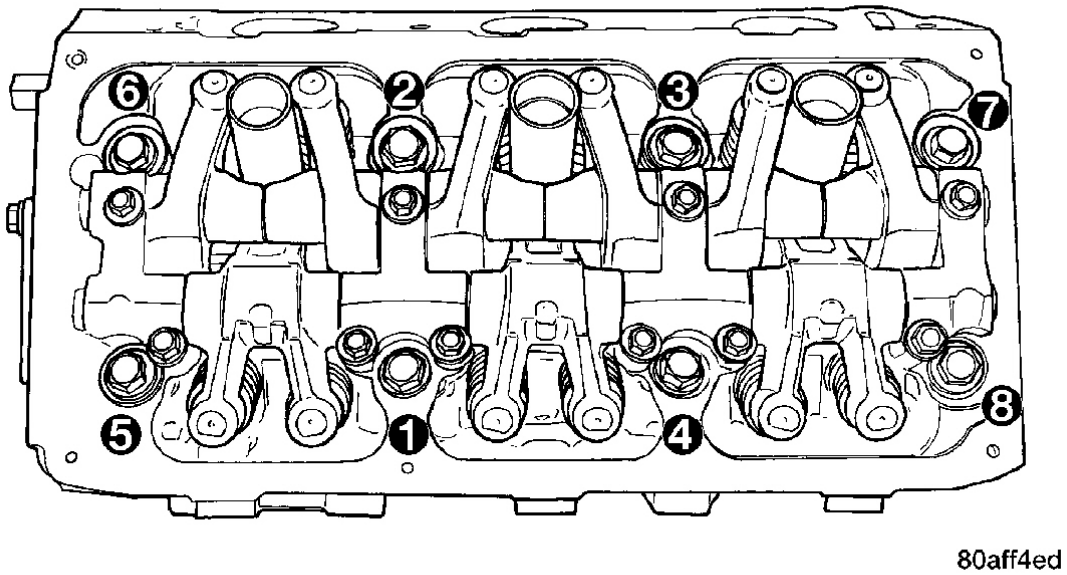

Fig. 94: Cylinder Head Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

24. Remove the cylinder head bolts in REVERSE of tightening sequence.
25. Remove the cylinder head.
26. Clean and inspect all mating surfaces.

CLEANING

CYLINDER HEAD

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

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

Clean all engine oil passages.

INSPECTION

CYLINDER HEAD

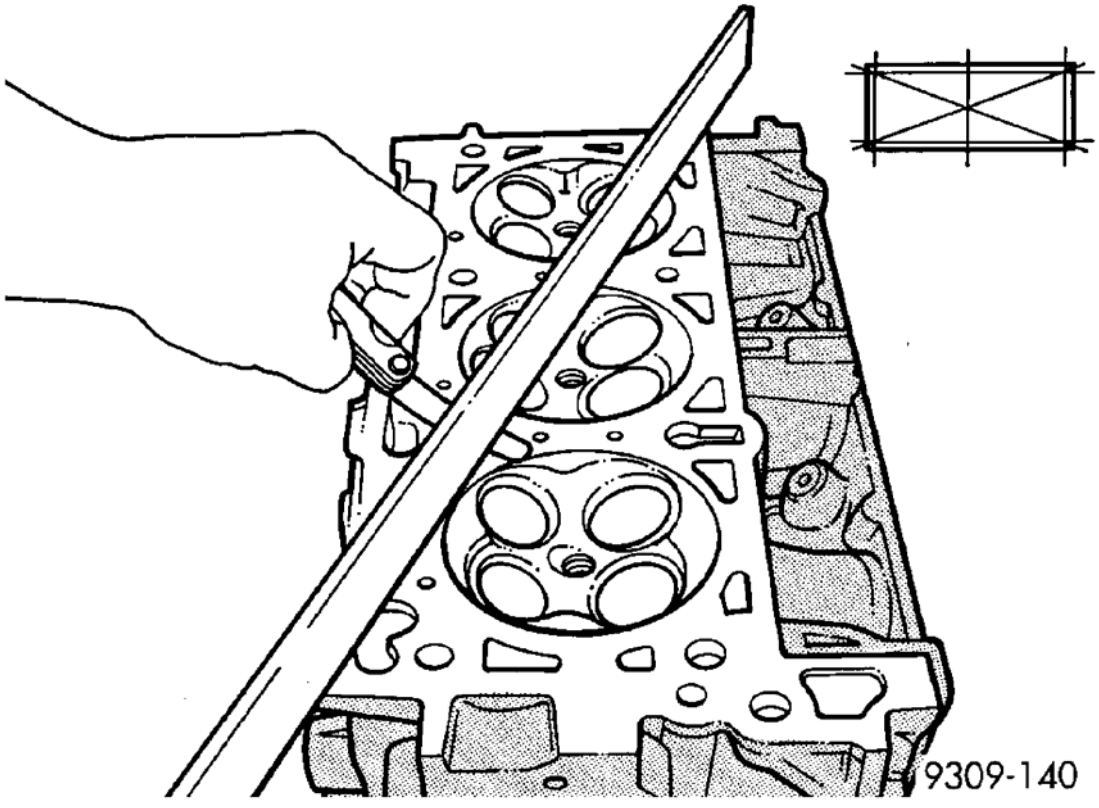

Fig. 95: Checking Cylinder Head Flatness
Courtesy of CHRYSLER LLC

1. Before cleaning, check for leaks, damage and cracks.
2. Clean cylinder head and oil passages.
3. Check cylinder head for flatness. See **Fig. 95**.
4. Cylinder head must be flat within:

   Standard dimension = less than 0.05 mm (0.002 inch.)
   Service Limit = 0.2 mm (0.008 inch.)
   Grinding Limit = Maximum of 0.2 mm (0.008 inch.) is permitted.

CAUTION: 0.20 mm (0.008 in.) MAX is a combined total dimension of the stock removal limit from cylinder head and block top surface (Deck) together.

INSTALLATION

CYLINDER HEAD - INSTALLATION

RIGHT CYLINDER HEAD

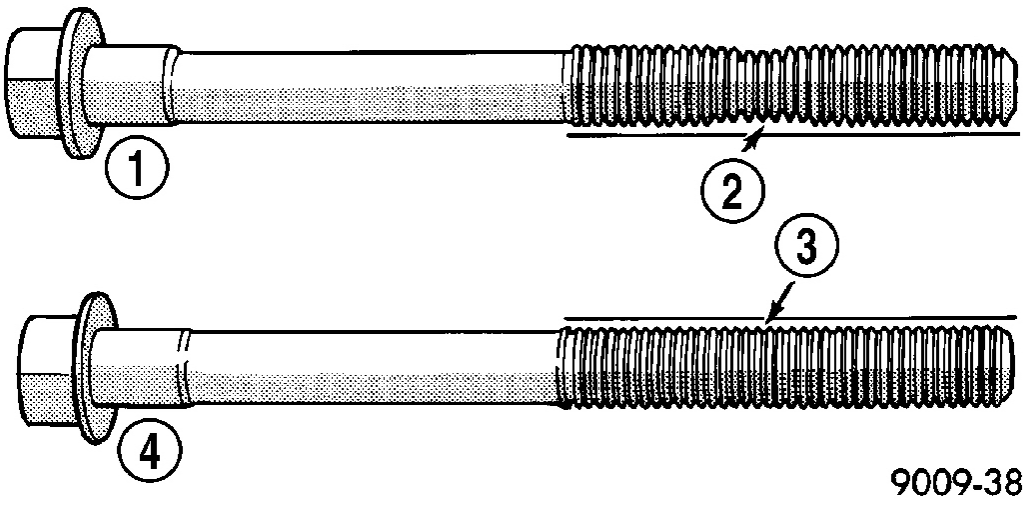

Fig. 96: Checking For Stretched Bolts
Courtesy of CHRYSLER LLC

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

CAUTION: THE CYLINDER HEAD GASKETS ARE NOT INTERCHANGEABLE BETWEEN CYLINDER HEADS AND ARE CLEARLY MARKED RIGHT OR LEFT.

The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts must be replaced. .

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 must be replaced.

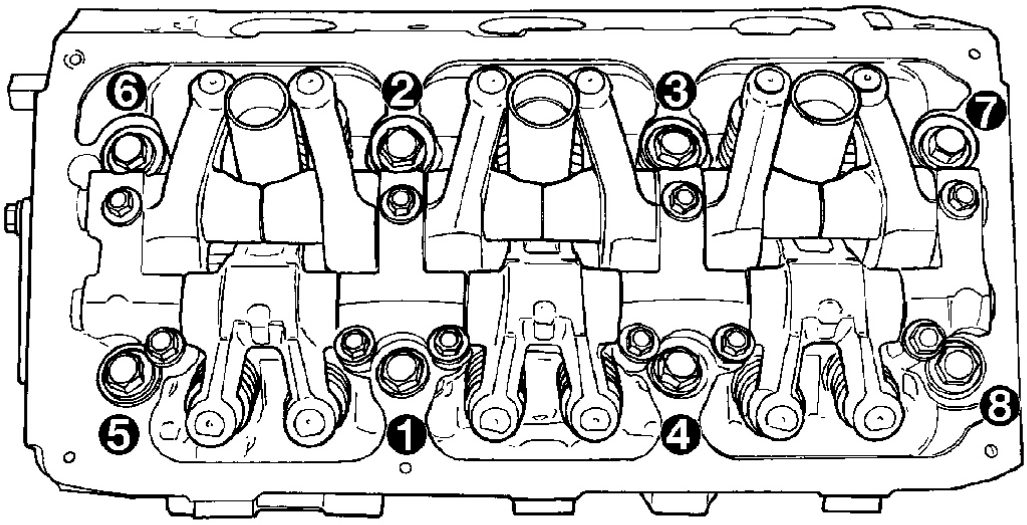

Fig. 97: Cylinder Head Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use ONLY a wooden or plastic scraper. See ENGINE GASKET SURFACE PREPARATION.

1. Clean sealing surfaces of cylinder head and block.

CAUTION: Ensure that the correct head gaskets are used and are oriented correctly on cylinder block.

NOTE: Before installing the cylinder head bolts, lubricate the threads with clean engine oil.

2. Install the cylinder head over locating dowels and finger tighten the head bolts.
3. Tighten the cylinder head bolts in the following sequence, using the 4 step torque-turn method. Tighten according to the following torque values:
   - Step 1: All to 61 N.m (45 ft. lbs.)
   - Step 2: All to 88 N.m (65 ft. lbs.)
   - Step 3: All (again) to 88 N.m (65 ft. lbs.)
   - Step 4: + 90° Turn **Do not use a torque wrench for this step.**
4. Bolt torque after 90° turn should be over 122 N.m (90 ft. lbs.) in the tightening direction. If not, replace

the bolt.

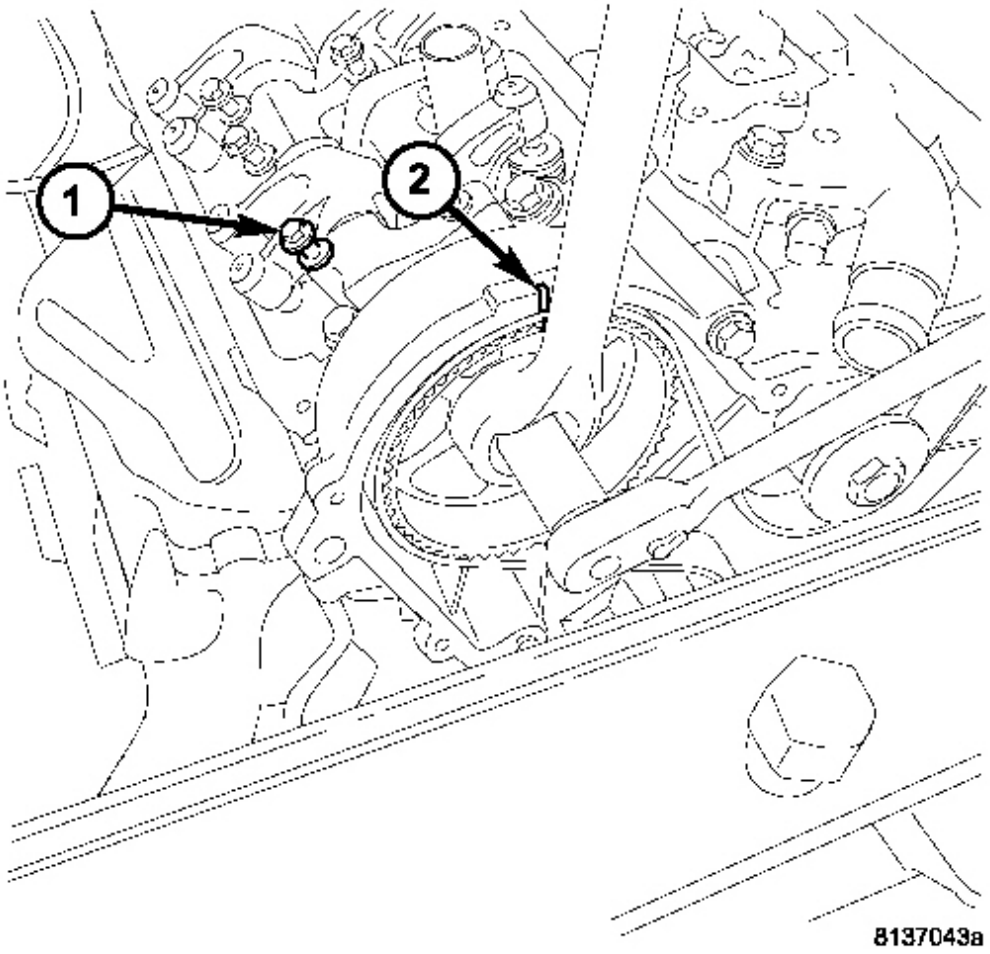

Fig. 98: Removing/Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

1 - LOOSENED ROCKER ASSEMBLY 2 - RIGHT CAMSHAFT TDC

5. Install the inner timing cover to cylinder head bolts. Tighten bolts to 54 N.m (40 lbs.ft.).
6. Install camshaft sprocket (2) Counterhold the camshaft sprocket gear (2) and tighten the camshaft sprocket bolt to 102 N.m plus a 1/4 turn (75 lbs. ft. plus a 1/4 turn). See **INSTALLATION**.

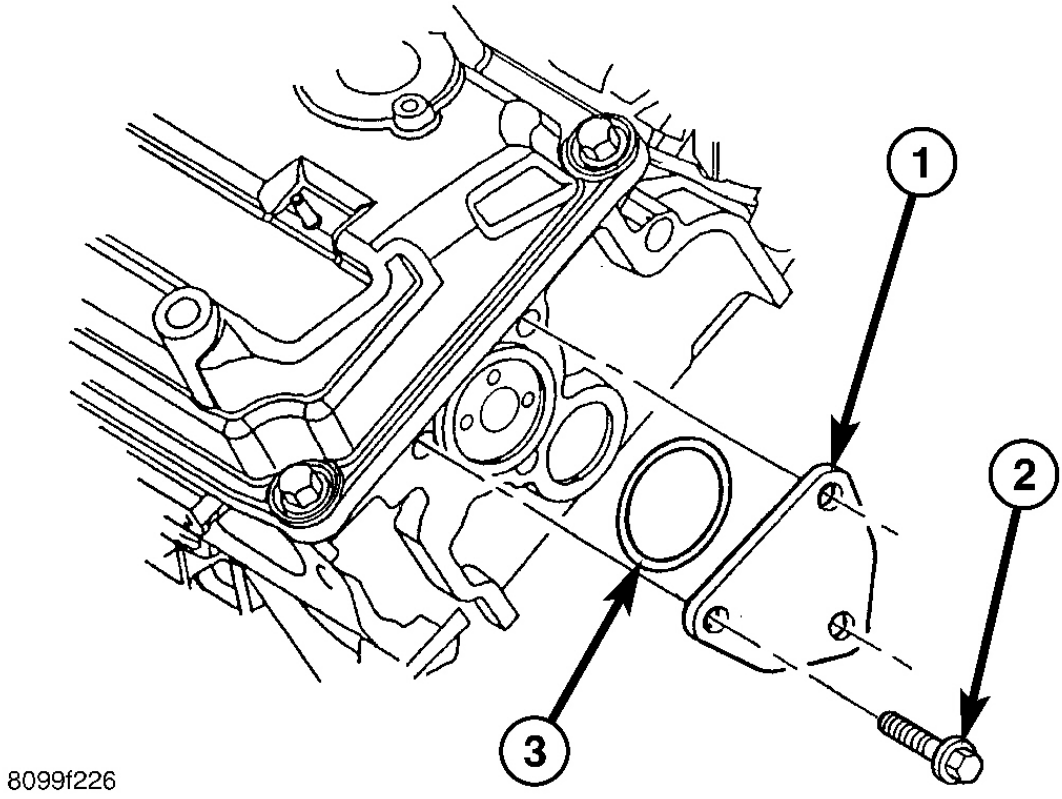

Fig. 99: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

7. Install the rear camshaft thrust plate (1) and seal (3) and the EGR valve.

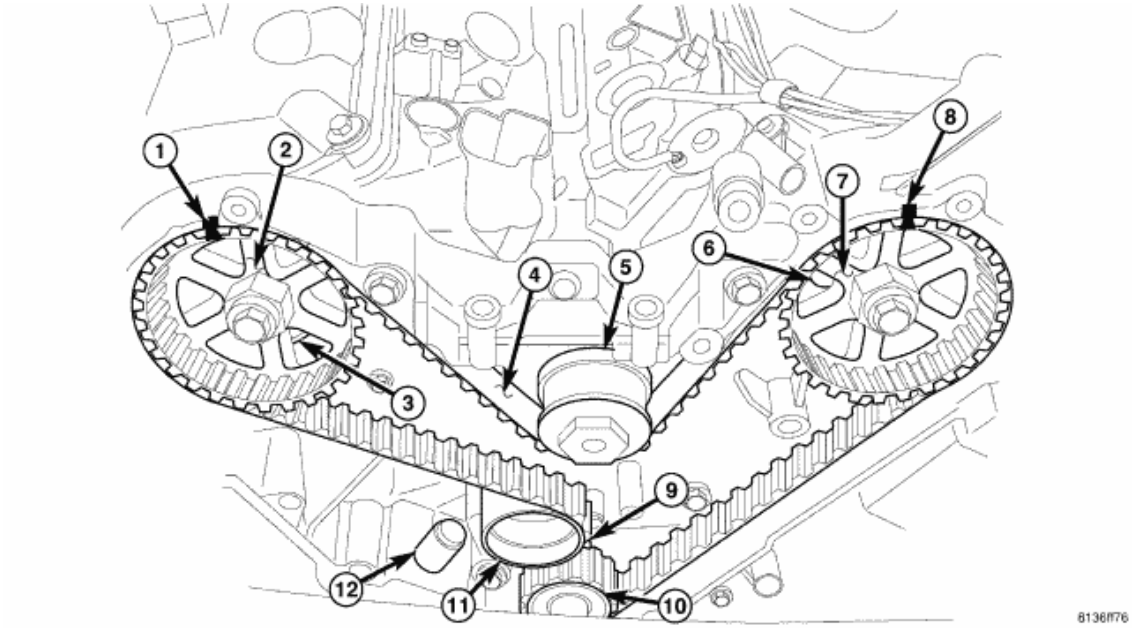

Fig. 100: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

8. Rotate the camshaft gear to it's alignment mark (1) and check the left camshaft gear (7) and crankshaft gear timing alignment marks (9).
9. Install the timing belt (4) and tensioner (12). See **INSTALLATION**.

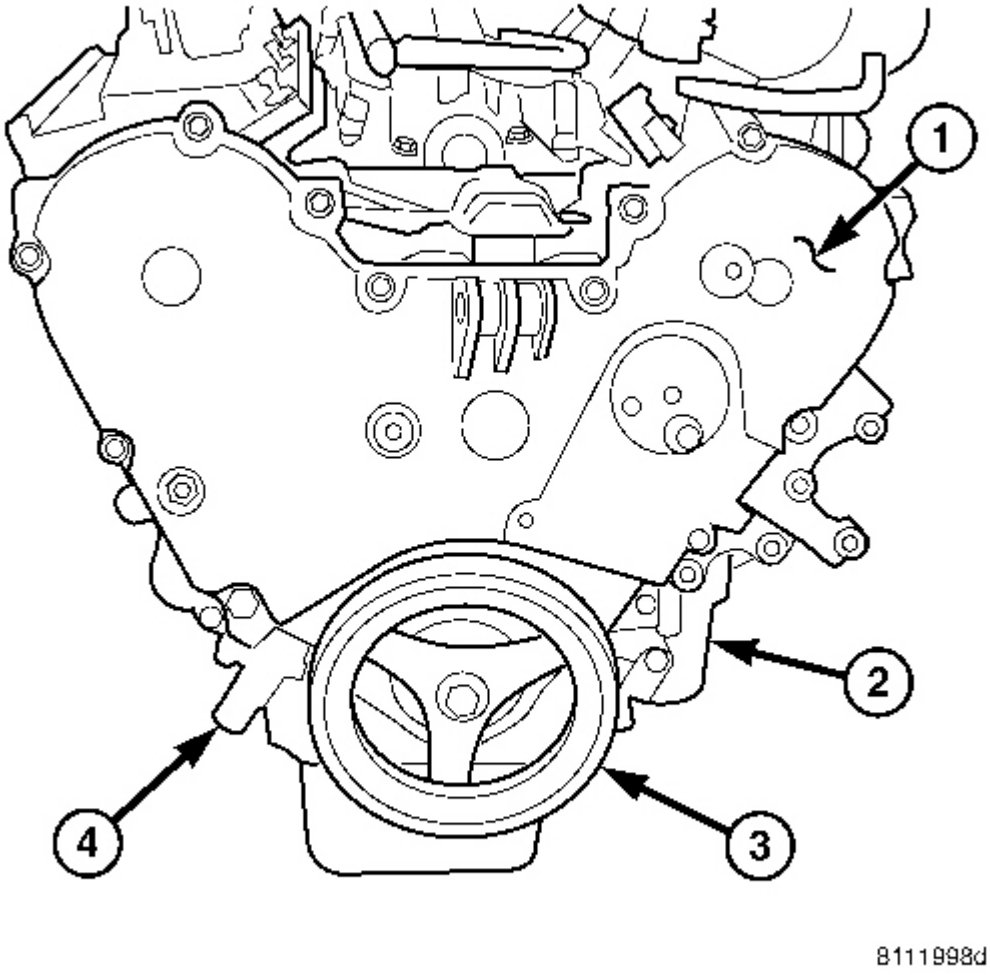

Fig. 101: Front Timing Belt Cover, Engine Oil Filter, Vibration Damper & Timing Belt Tensioner
Courtesy of CHRYSLER LLC

1 - FRONT TIMING BELT COVER
2 - ENGINE OIL FILTER
3 - VIBRATION DAMPER
4 - TIMING BELT TENSIONER

10. Install the timing belt outer cover (1) (Refer to **INSTALLATION**).

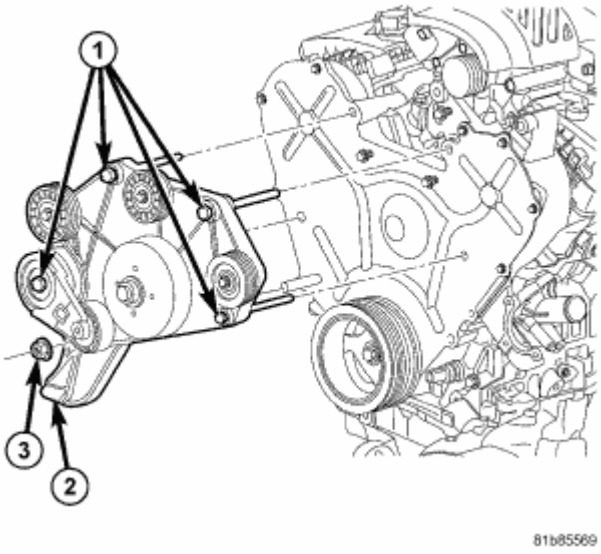

Fig. 102: Removing/Installing Accessory Drive Bracket
Courtesy of CHRYSLER LLC

11. Install the accessory drive bracket (2).

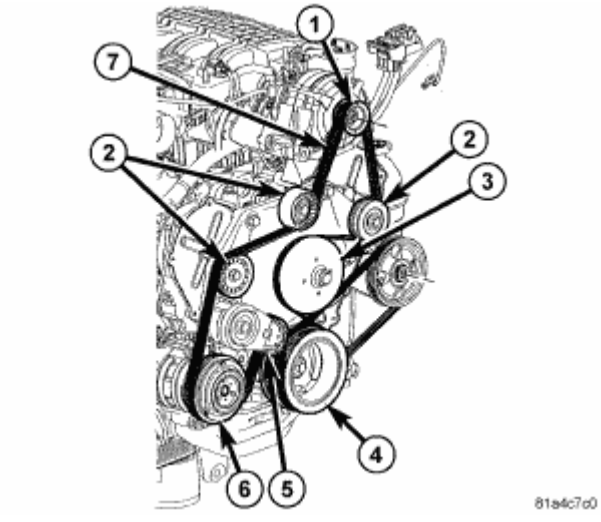

Fig. 103: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

12. Install the vibration damper (Refer to **INSTALLATION**).
13. Install the accessory drive belt tensioner.
14. Install the accessory drive belt idler pulley.
15. Install the accessory drive belt (7).

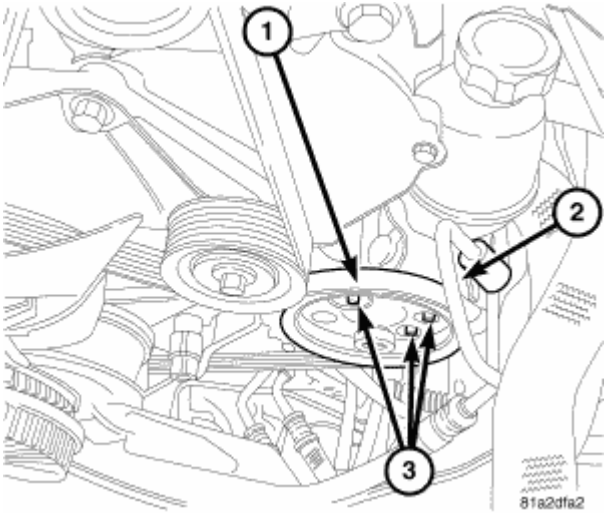

Fig. 104: Removing/Installing Power Steering Pump
Courtesy of CHRYSLER LLC

16. Install the power steering pump (2).
17. Install the right rocker arm assembly.
18. Install the right cylinder head cover, ground strap and insulator.
19. Install lower intake manifold (Refer to **INSTALLATION**).
20. Install the fuel rail.
21. Install the upper intake manifold (Refer to **INSTALLATION**).

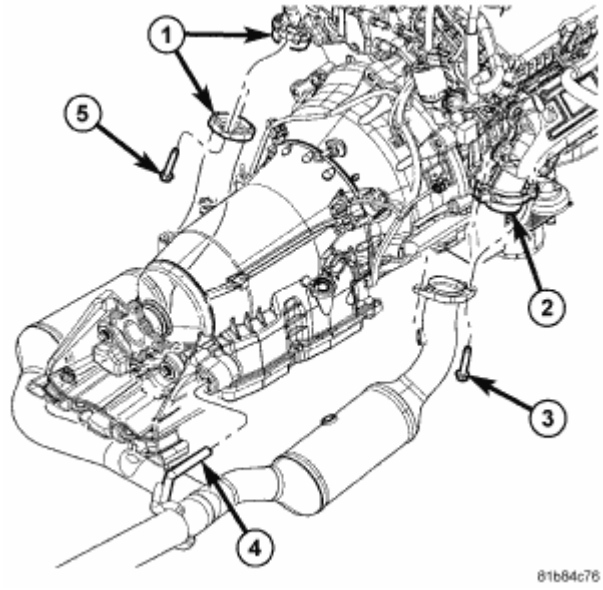

Fig. 105: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

22. Install the right exhaust manifold (Refer to **INSTALLATION**).
23. Install the exhaust pipe (1) and connect the oxygen sensors.
24. Connect the air cleaner element housing (Refer to **INSTALLATION**).
25. Fill the coolant system.
26. Connect the negative battery cable.

LEFT CYLINDER HEAD

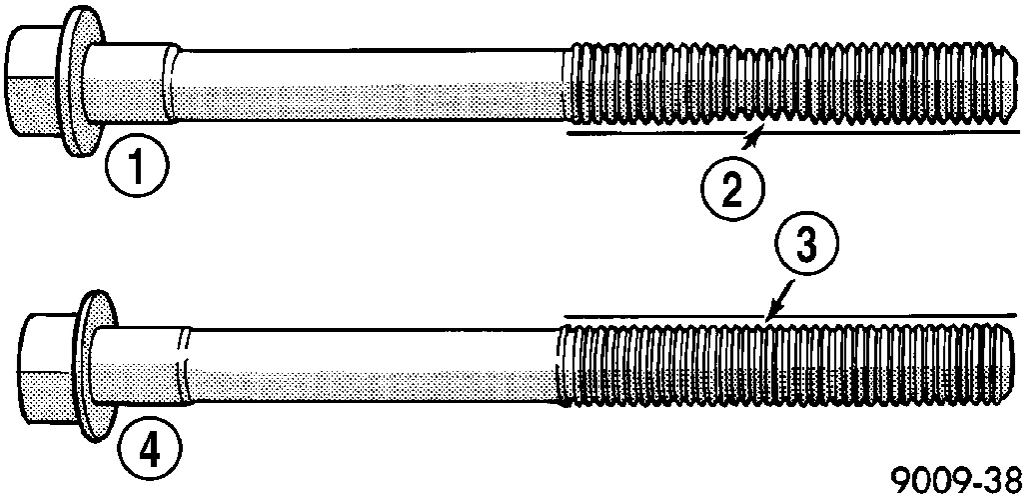

Fig. 106: Checking For Stretched Bolts
Courtesy of CHRYSLER LLC

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

CAUTION: THE CYLINDER HEAD GASKETS ARE NOT INTERCHANGEABLE BETWEEN CYLINDER HEADS AND ARE CLEARLY MARKED RIGHT OR LEFT.

The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts must be replaced.

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 must be replaced.

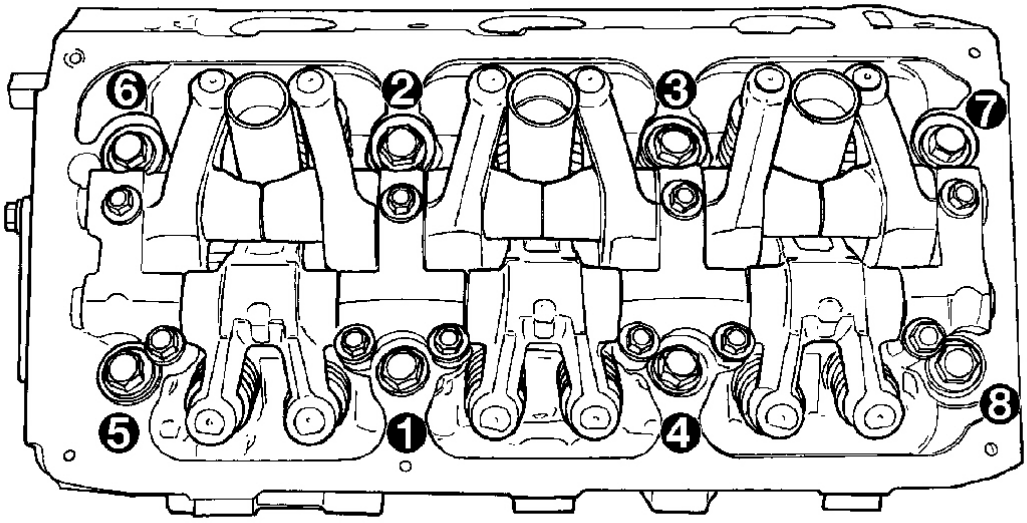

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Fig. 107: Cylinder Head Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use ONLY a wooden or plastic scraper. See ENGINE GASKET SURFACE PREPARATION.

1. Clean sealing surfaces of cylinder head and block.

CAUTION: Ensure that the correct head gaskets are used and are oriented correctly on cylinder block.

2. Install head gasket over locating dowels. Ensure the gasket is installed on the correct side of engine.

NOTE: Before installing the cylinder head bolts, lubricate the threads with engine oil.

3. Install the cylinder head over locating dowels, insert and finger tighten the head bolts.
4. Tighten the cylinder head bolts in the sequence shown. Using the 4 step torque-turn method, tighten according to the following torque values:
   - Step 1: All to 61 N.m (45 ft. lbs.)
   - Step 2: All to 88 N.m (65 ft. lbs.)
   - Step 3: All (again) to 88 N.m (65 ft. lbs.)
   - Step 4: + 90° Turn **Do not use a torque wrench for this step.**
5. Bolt torque after 90° turn should be over 122 N.m (90 ft. lbs.) in the tightening direction. If not, replace the bolt.
6. Install the inner timing cover to cylinder head bolts. Tighten bolts to 54 N.m (40 lbs.ft.).

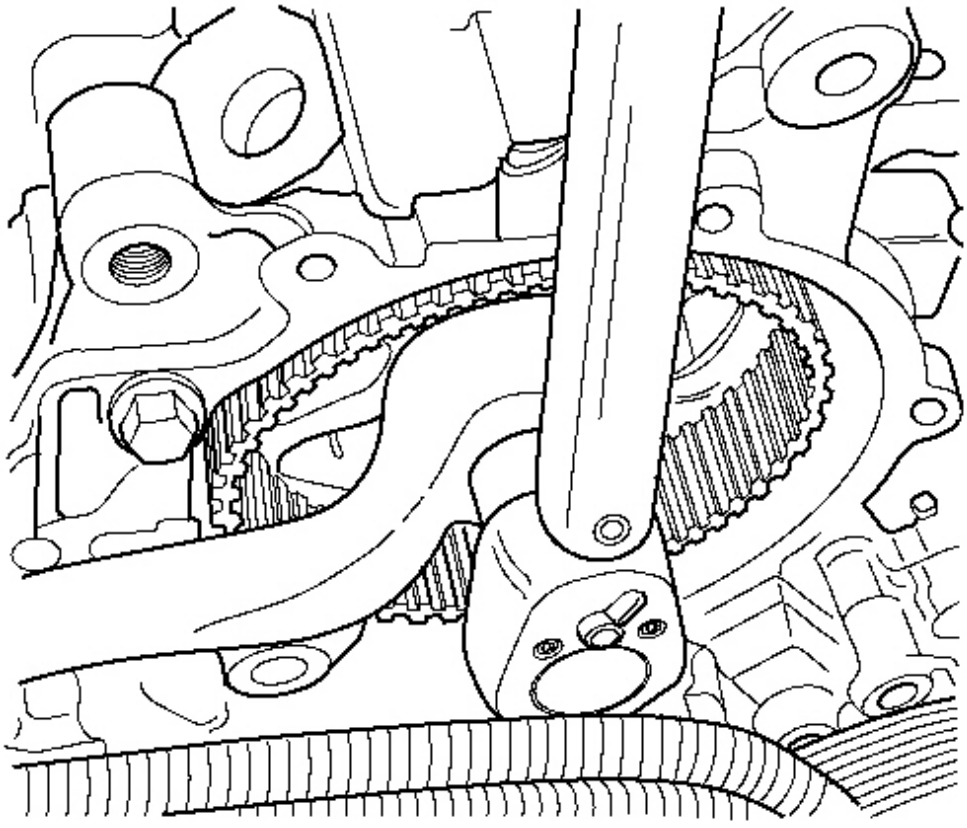

Fig. 108: Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

7. Install camshaft sprocket. Counterhold the camshaft sprocket gear and tighten the camshaft sprocket bolt to 102 N.m plus a 1/4 turn (75 lbs. ft. plus a 1/4 turn)

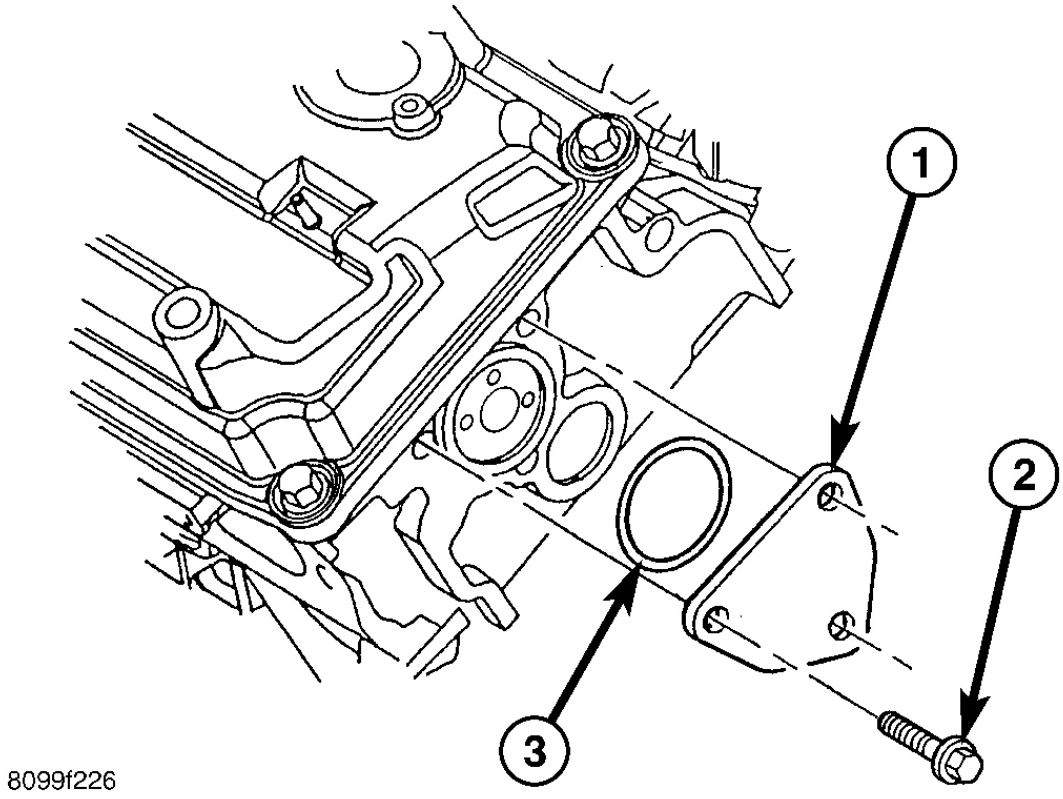

Fig. 109: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

8. Install the rear camshaft thrust plate (1) and seal (3).

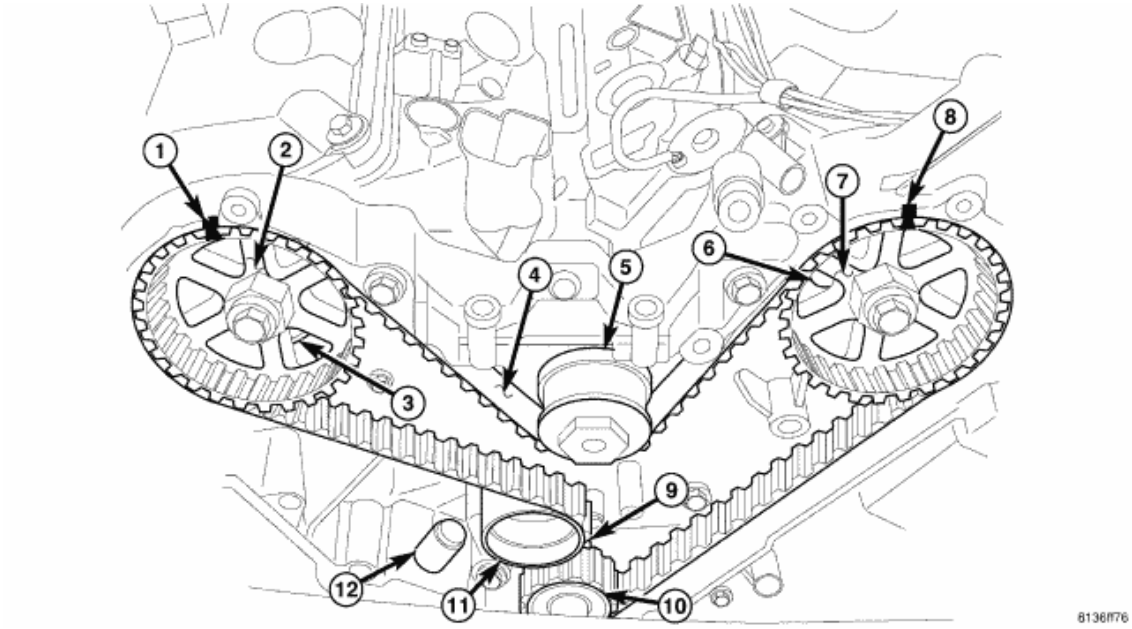

Fig. 110: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

9. Rotate the camshaft gear (7) to it's alignment mark (8) and check the right camshaft gear (1) and crankshaft gear timing (9) alignment marks.
10. Install the timing belt (4) and tensioner (11). See **INSTALLATION**.

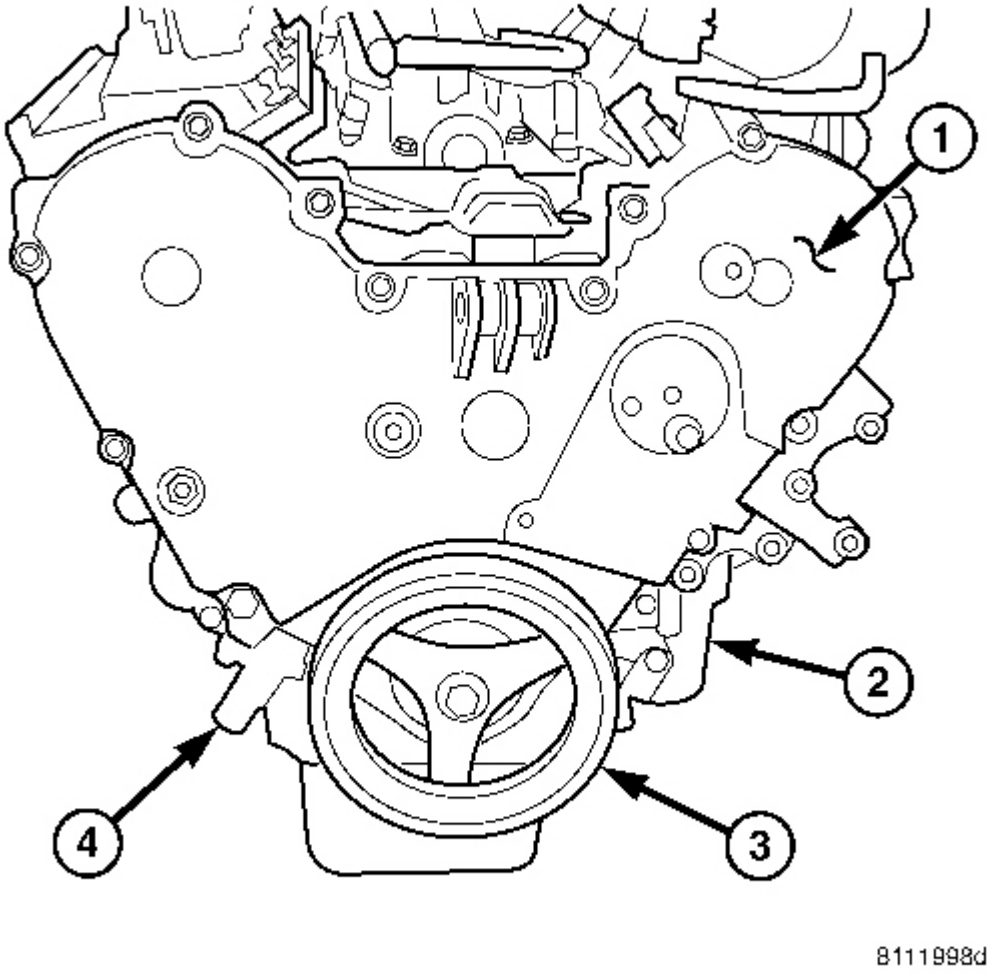

Fig. 111: Front Timing Belt Cover, Engine Oil Filter, Vibration Damper & Timing Belt Tensioner
Courtesy of CHRYSLER LLC

1 - FRONT TIMING BELT COVER
2 - ENGINE OIL FILTER
3 - VIBRATION DAMPER
4 - TIMING BELT TENSIONER

11. Install the timing belt front cover (1). See **INSTALLATION**).

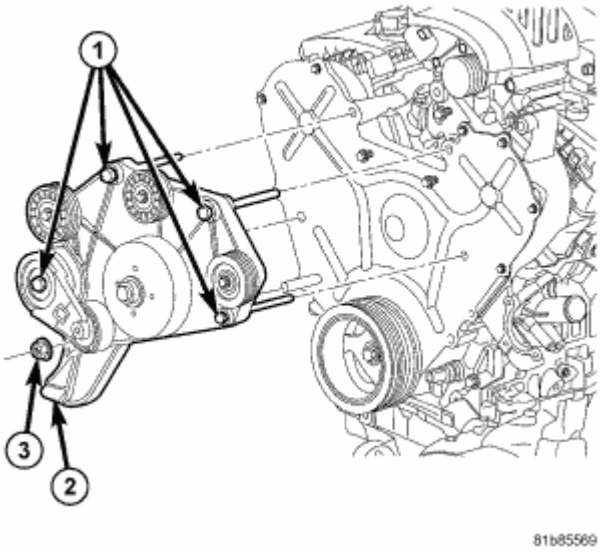

Fig. 112: Removing/Installing Accessory Drive Bracket
Courtesy of CHRYSLER LLC

12. Install the accessory drive bracket (2).

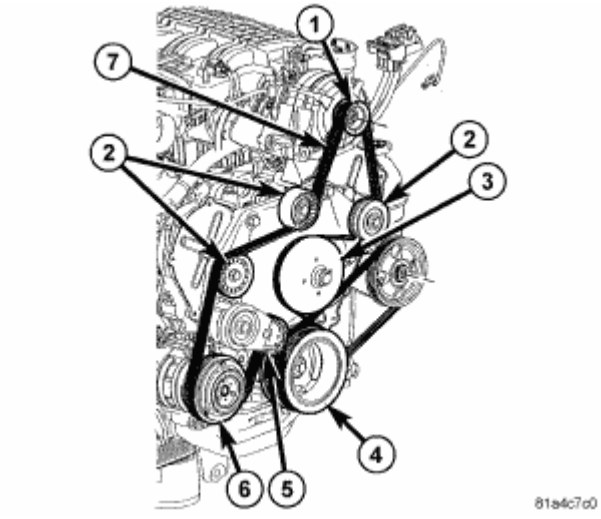

Fig. 113: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

13. Install the accessory drive belt tensioner (5).
14. Install the accessory drive belt idler pulley.
15. Install the accessory drive belt (7).
16. Install the vibration damper (4) (Refer to **INSTALLATION**).

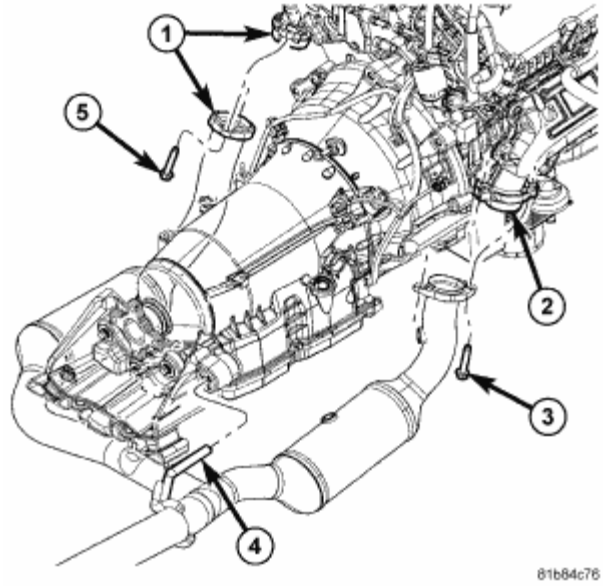

Fig. 114: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

17. Install the left exhaust manifold. (Refer to **INSTALLATION**).
18. Connect the exhaust pipe (1) and connect the oxygen sensor.
19. Install the left rocker arm assembly.
20. Install the left cylinder head cover and ground strap.

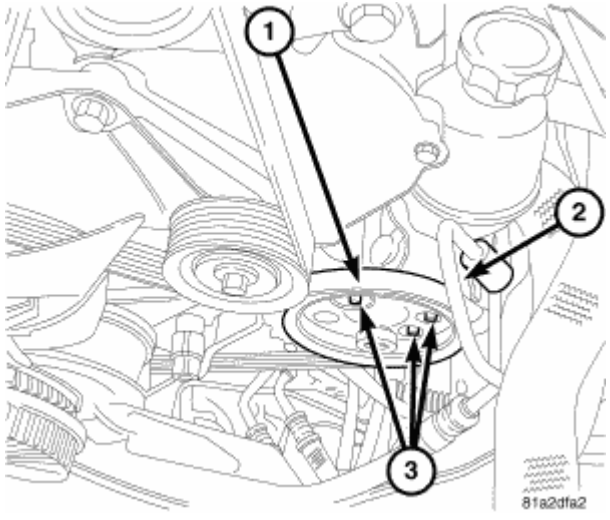

Fig. 115: Removing/Installing Power Steering Pump

Courtesy of CHRYSLER LLC

21. Install the power steering pump (2).
22. Install lower intake manifold (Refer to **INSTALLATION**).
23. Install the fuel rail.
24. Install the upper intake manifold (Refer to **INSTALLATION**).
25. Connect the air cleaner element housing (Refer to **INSTALLATION**).
26. Fill the coolant system.
27. Connect the negative battery cable.

SEAL -CAMSHAFT OIL

REMOVAL

REMOVAL

RIGHT CYLINDER HEAD

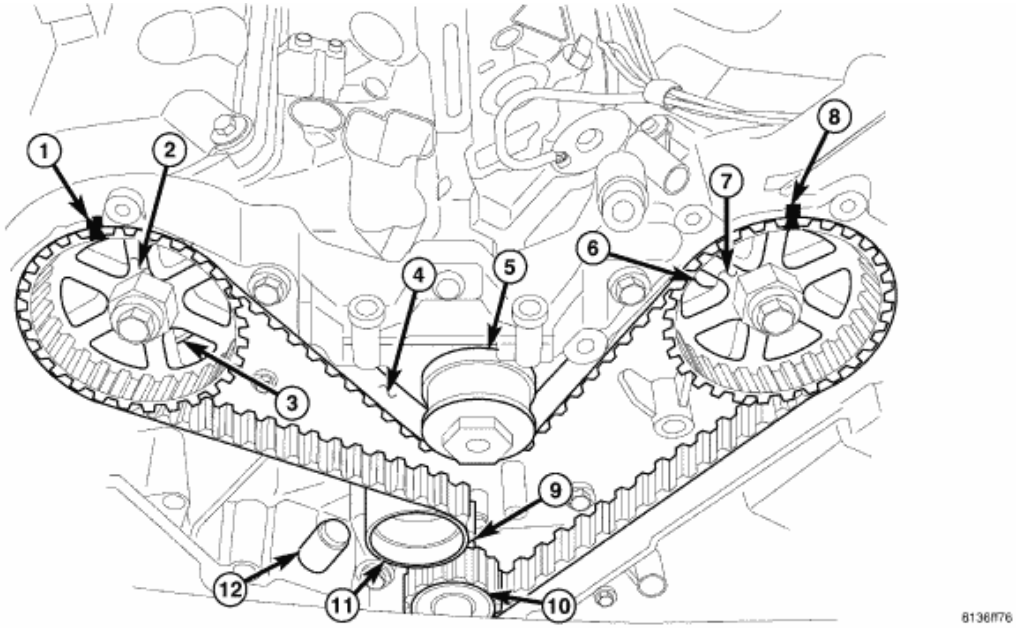

Fig. 116: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove front timing cover and align the camshaft gear (1,8) and crankshaft gear timing mark (9) to TDC. See **REMOVAL**).
3. Remove timing belt (4).

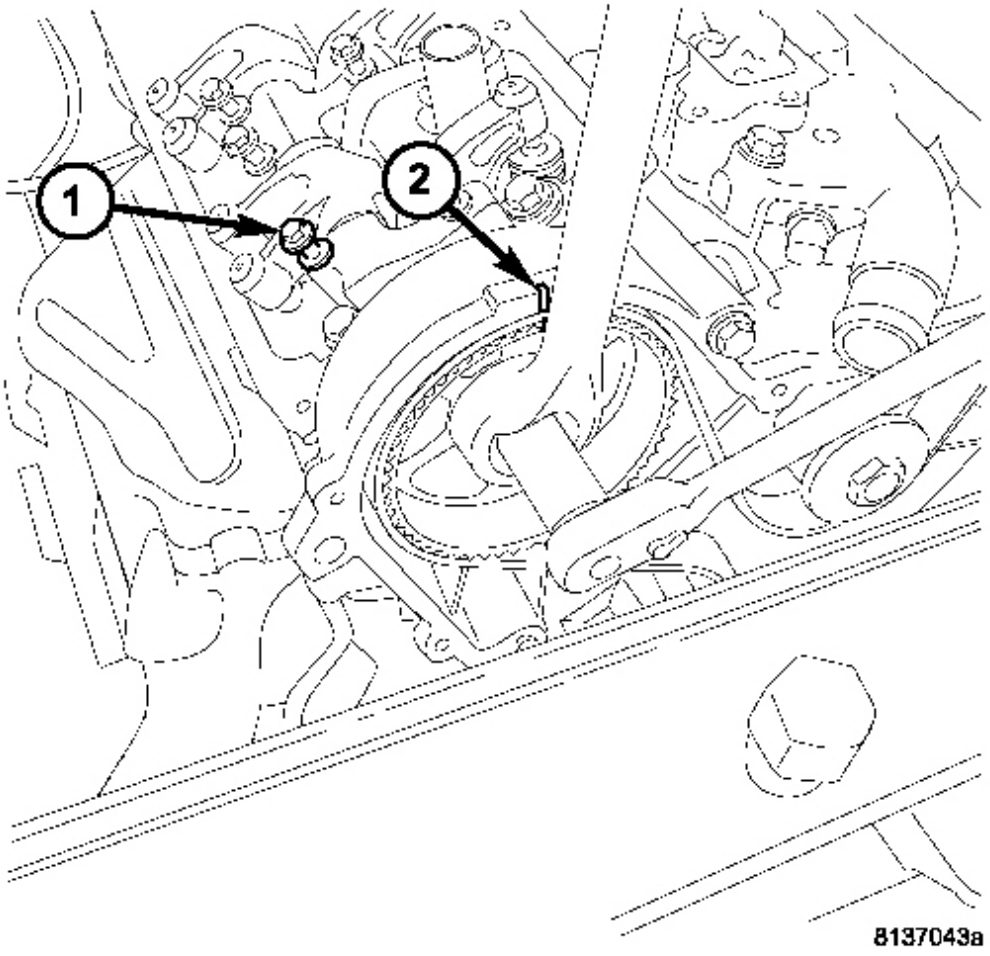

Fig. 117: Removing/Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

4. Remove the right camshaft sprocket. See **Fig. 117**. See **REMOVAL**.

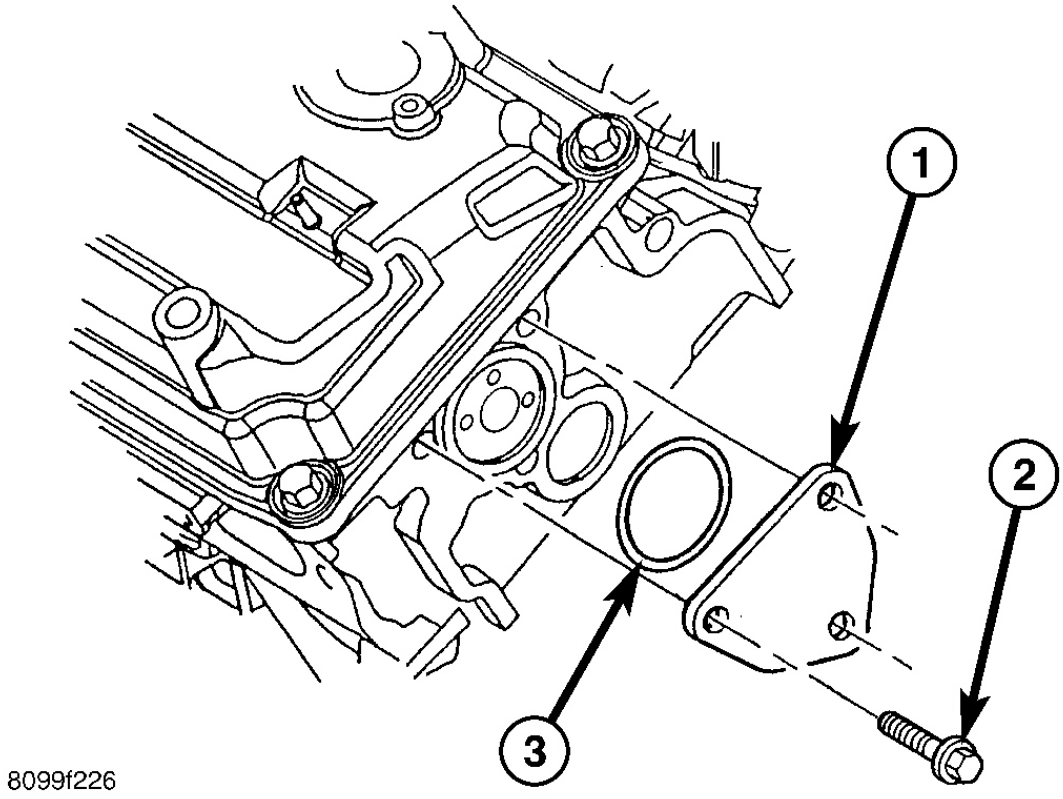

Fig. 118: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

5. Remove the EGR valve and camshaft thrust plate (1) from the rear of the cylinder head.
6. Remove the cylinder head cover. See **REMOVAL**).
7. Remove the rocker arm assembly. See **REMOVAL**.
8. Maneuver the camshaft rearward and out of the cylinder head approximately 3.5 inches.

NOTE: Care must be taken not to damage the cylinder head to seal or camshaft journal surfaces when removing the camshaft seal.

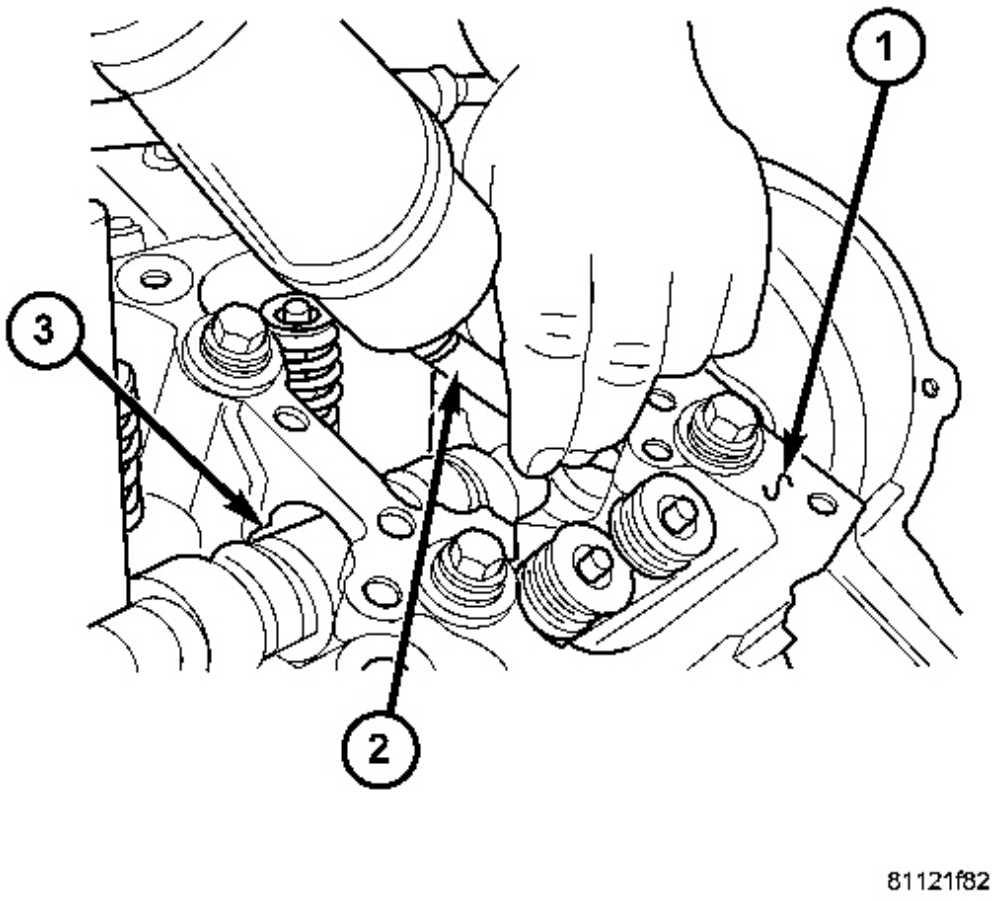

Fig. 119: Removing Camshaft Oil Seal
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD
2 - DRIFT
3 - CAMSHAFT

9. Using an appropriate driver carefully remove camshaft oil seal. See **Fig. 119**

LEFT CYLINDER HEAD

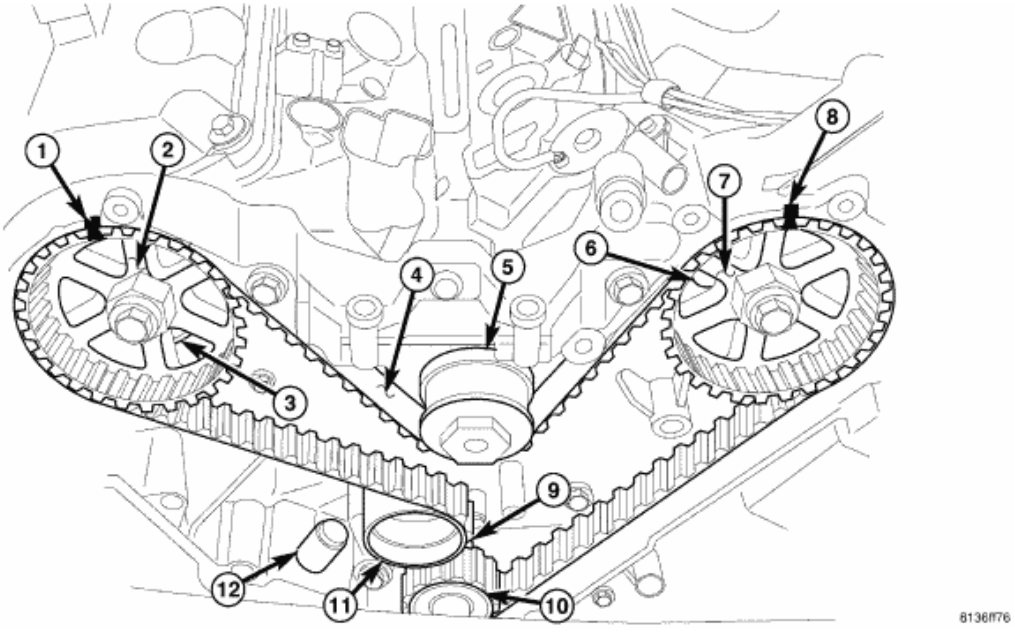

Fig. 120: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Drain cooling system.
3. Remove front timing cover and align the camshaft gear and crankshaft gear timing marks to TDC. See **REMOVAL**).
4. Remove the rear timing cover. See **REMOVAL**).
5. Remove the cylinder head cover. See **REMOVAL**).
6. Remove the rocker arm assembly. See **REMOVAL**.

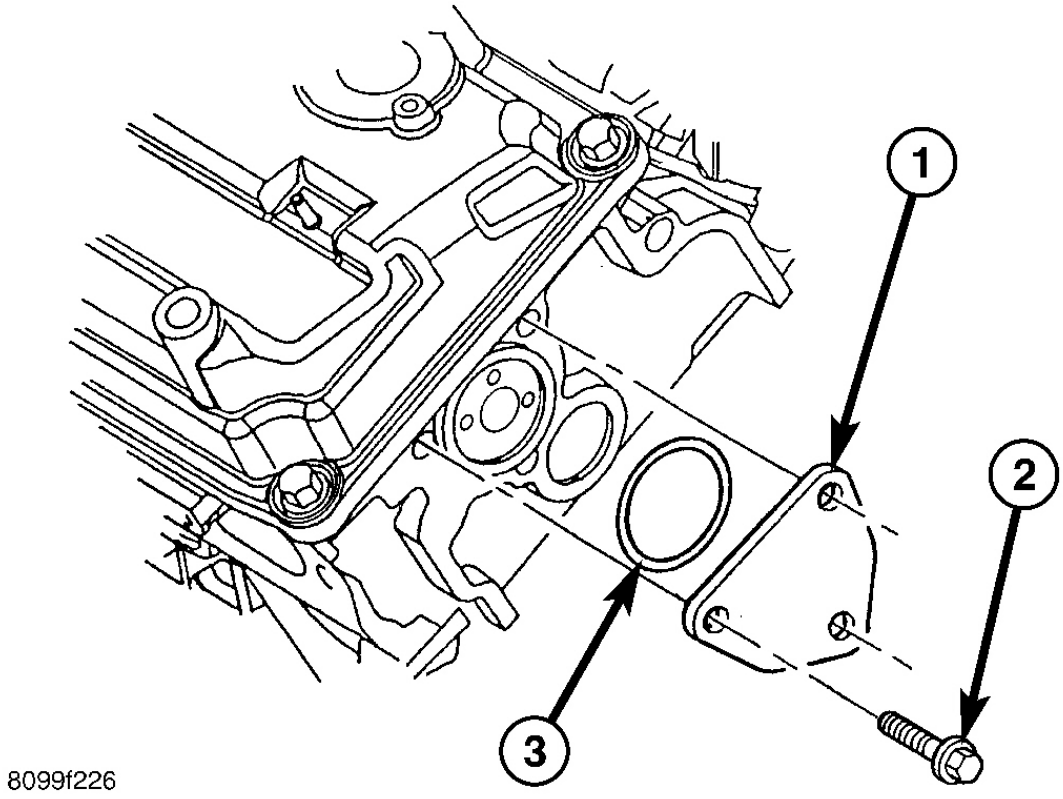

Fig. 121: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

7. Remove the camshaft thrust plate (1) from the rear of the cylinder head.
8. Maneuver the camshaft rearward and out of the cylinder head approximately 3.5 inches.

NOTE: Care must be taken not to damage the cylinder head to seal or camshaft journal surfaces when removing the camshaft seal.

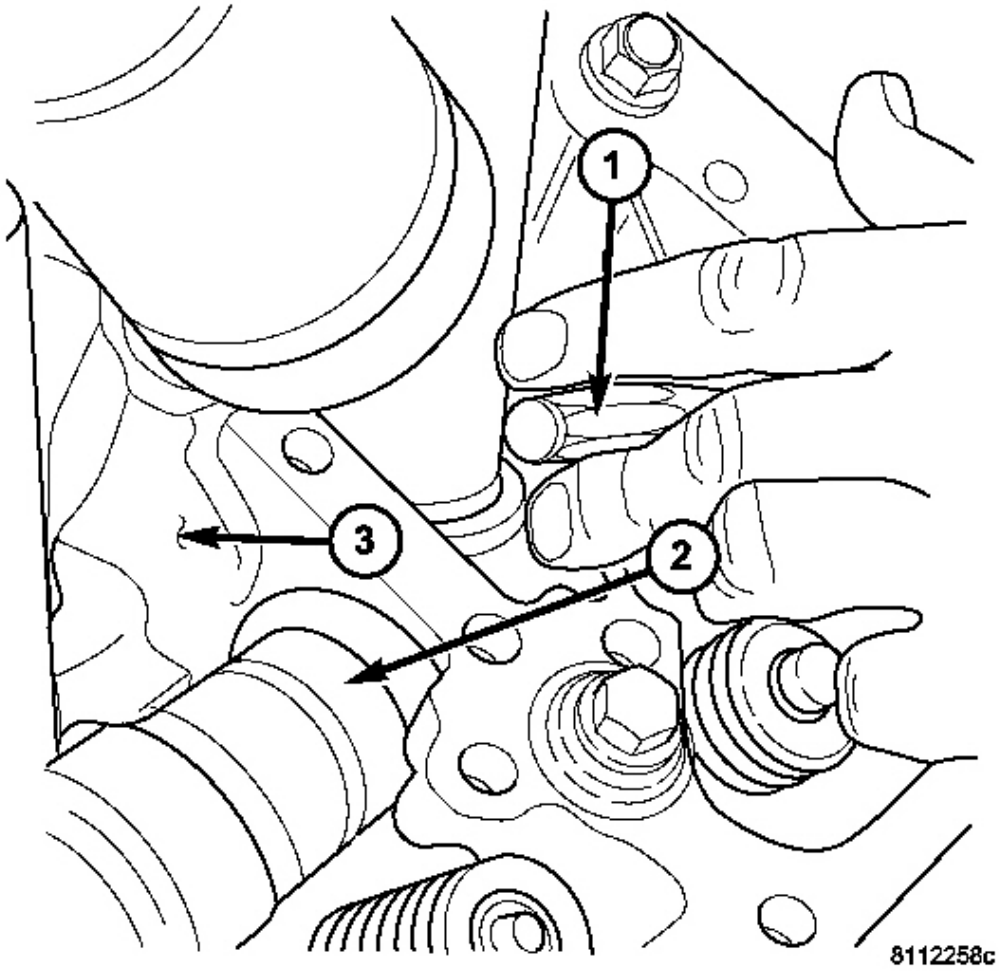

Fig. 122: Removing Camshaft Oil Seal
Courtesy of CHRYSLER LLC

1 - DRIFT
2 - CAMSHAFT
3 - CYLINDER HEAD

9. Using an appropriate driver (1) carefully remove camshaft oil seal.

INSTALLATION

INSTALLATION

RIGHT CYLINDER HEAD

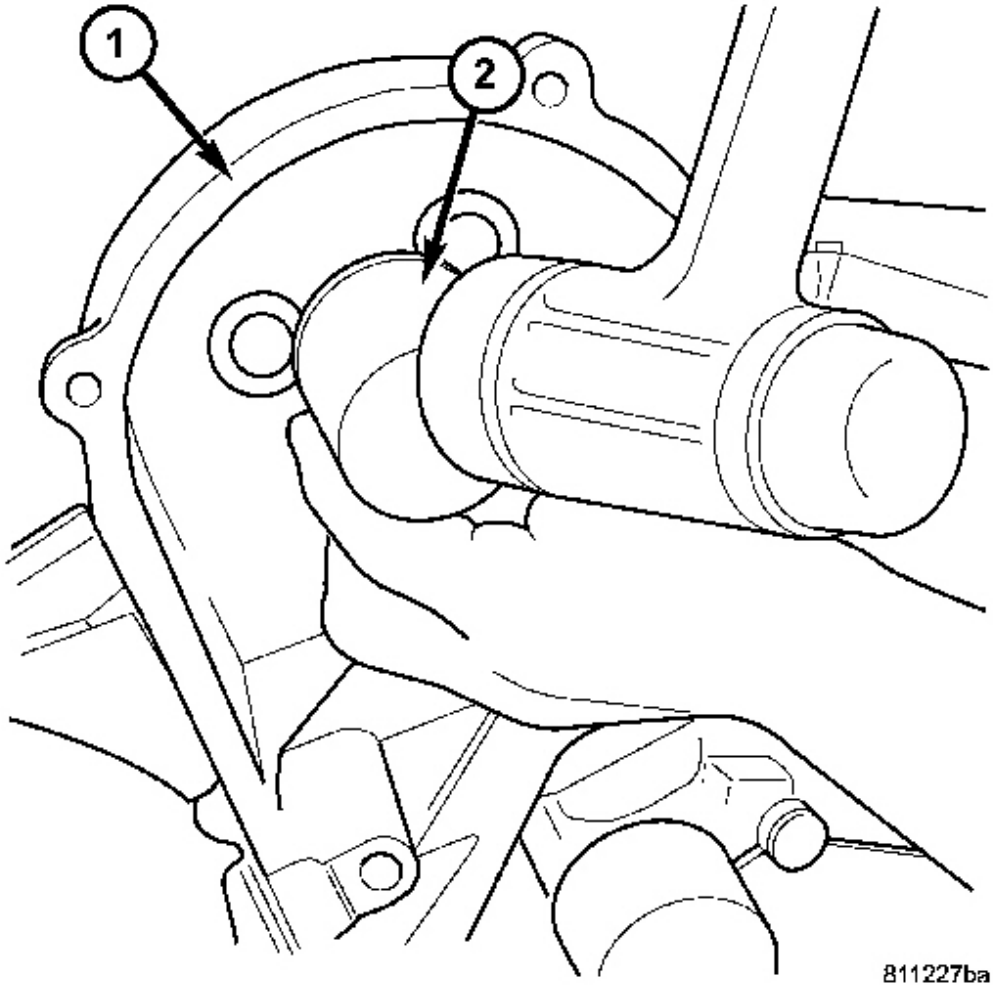

Fig. 123: Using MD-998306 To Tap Seal Into Place
Courtesy of CHRYSLER LLC

1 - REAR TIMING COVER
2 - SPECIAL TOOL MD-998306

1. Position the camshaft seal into the cylinder head. See **Fig. 123**.
2. Using MD-998306 (2) tap the seal into place. See **Fig. 123**.

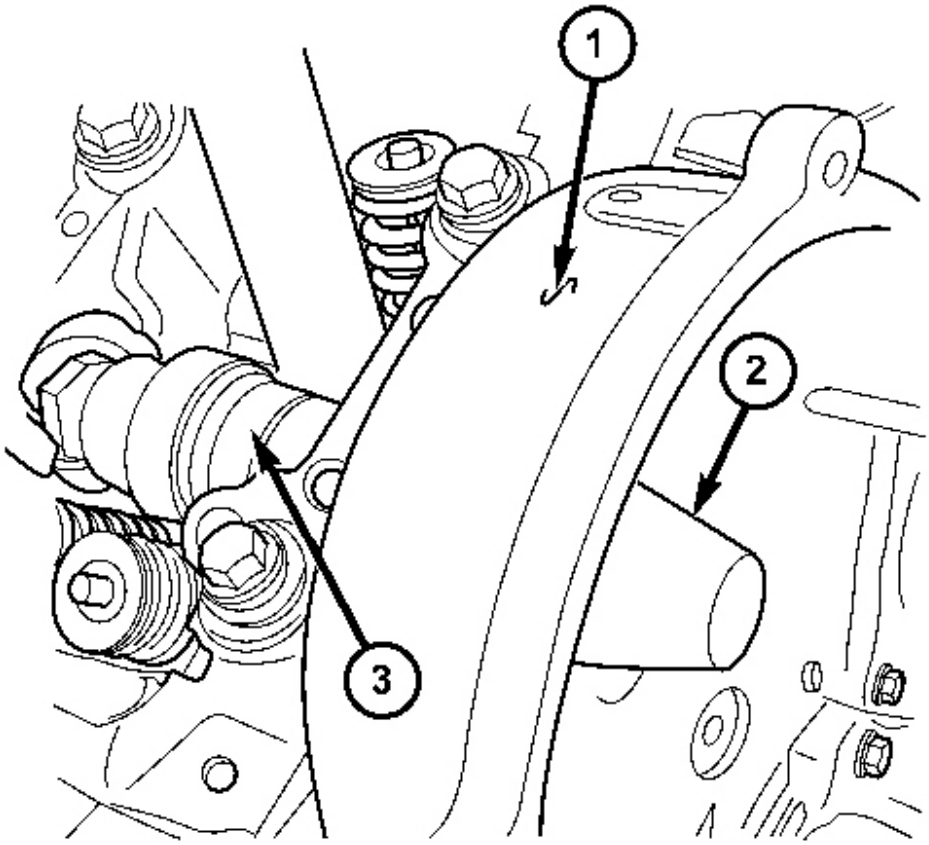

Fig. 124: Rear Timing Cover, Special Tool 6788 & Camshaft
Courtesy of CHRYSLER LLC

1 - REAR TIMING COVER
2 - SPECIAL TOOL 6788
3 - CAMSHAFT

3. Apply light coat of clean engine oil to the camshaft oil seal lip and 6788 Seal Protector Sleeve (2).
4. Install oil seal 6788 Seal Protector Sleeve (2) onto the camshaft. See **Fig. 124**.
5. Slide the camshaft (3) forward, inserting the seal protector (2) through the camshaft seal until the camshaft (3) seats. See **Fig. 124**.

6. Remove Special Tool (2) from the camshaft.

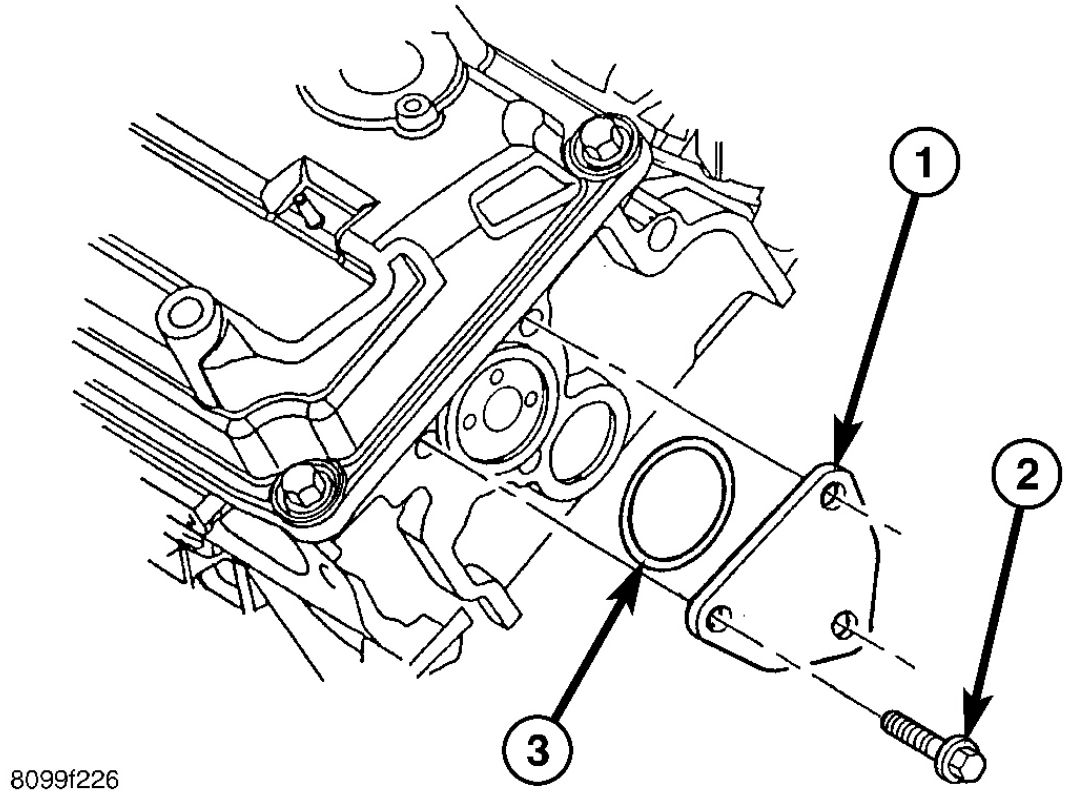

Fig. 125: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

7. Install the camshaft thrust plate (1), and new seal (3) to the rear of the cylinder head. See **Fig. 125**.

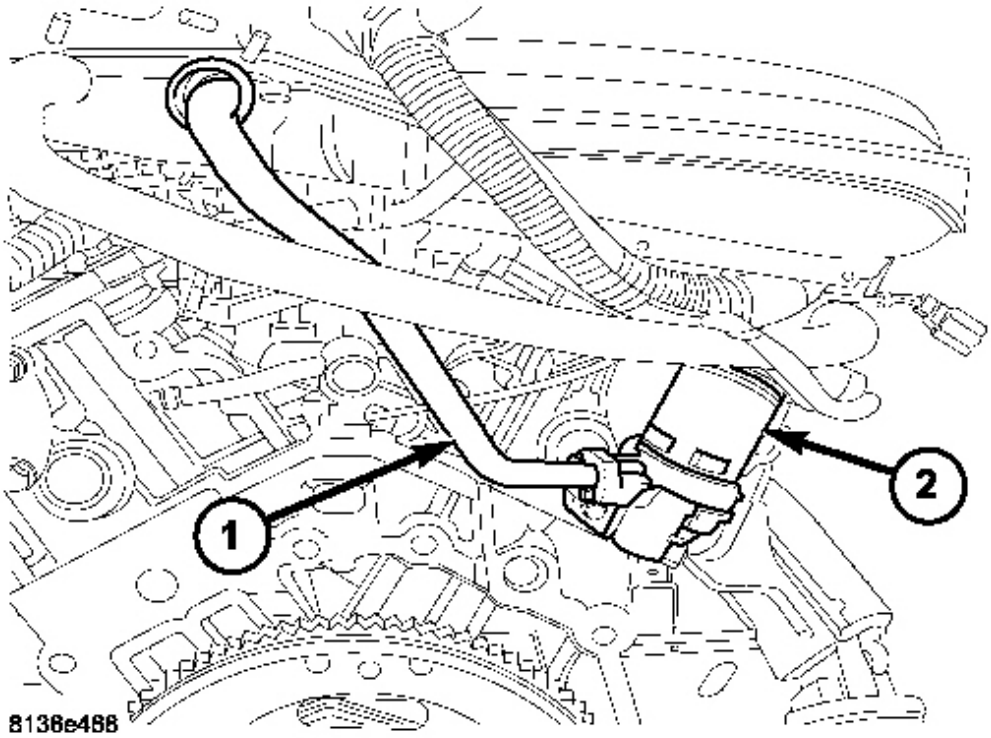

Fig. 126: Installing EGR valve
Courtesy of CHRYSLER LLC

1 - TUBE 2 - EGR VALVE

8. Install the EGR valve (2). See **Fig. 126**.

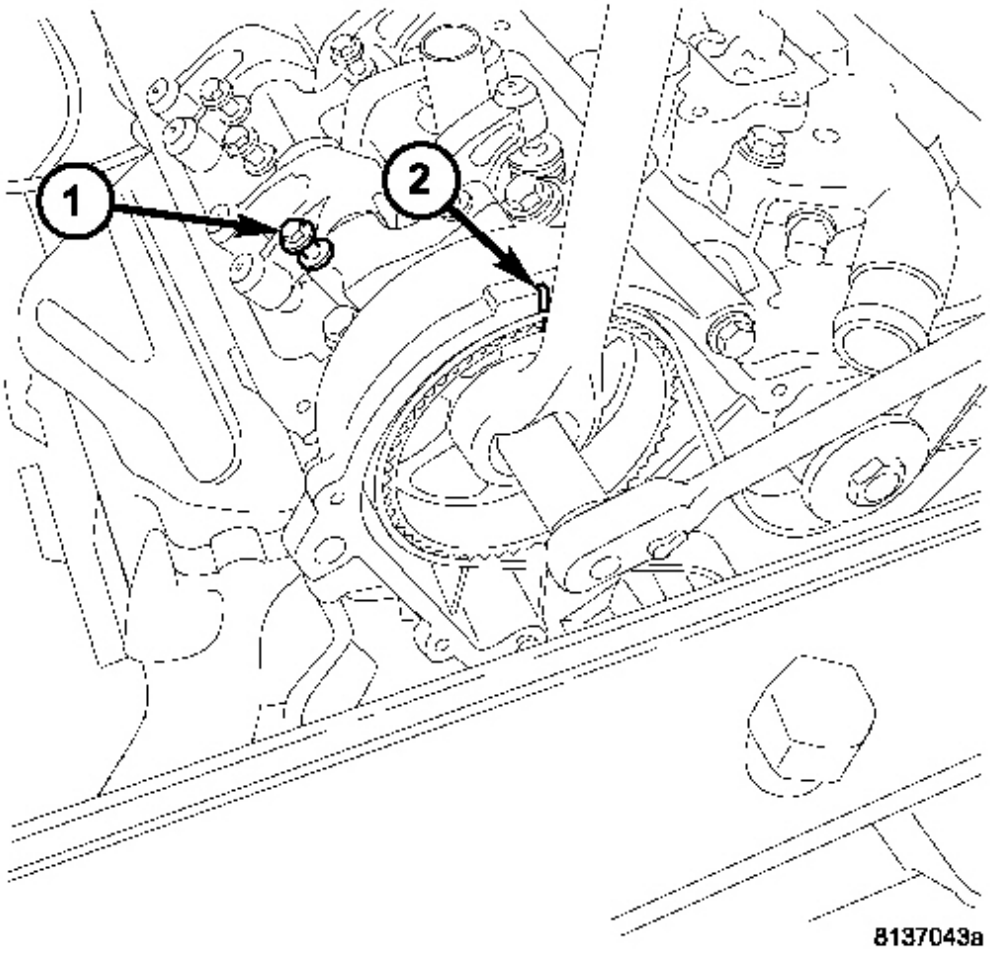

Fig. 127: Removing/Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

9. Install camshaft sprocket (2) and tighten the camshaft sprocket bolt to 102 N.m (75 ft.lbs.).

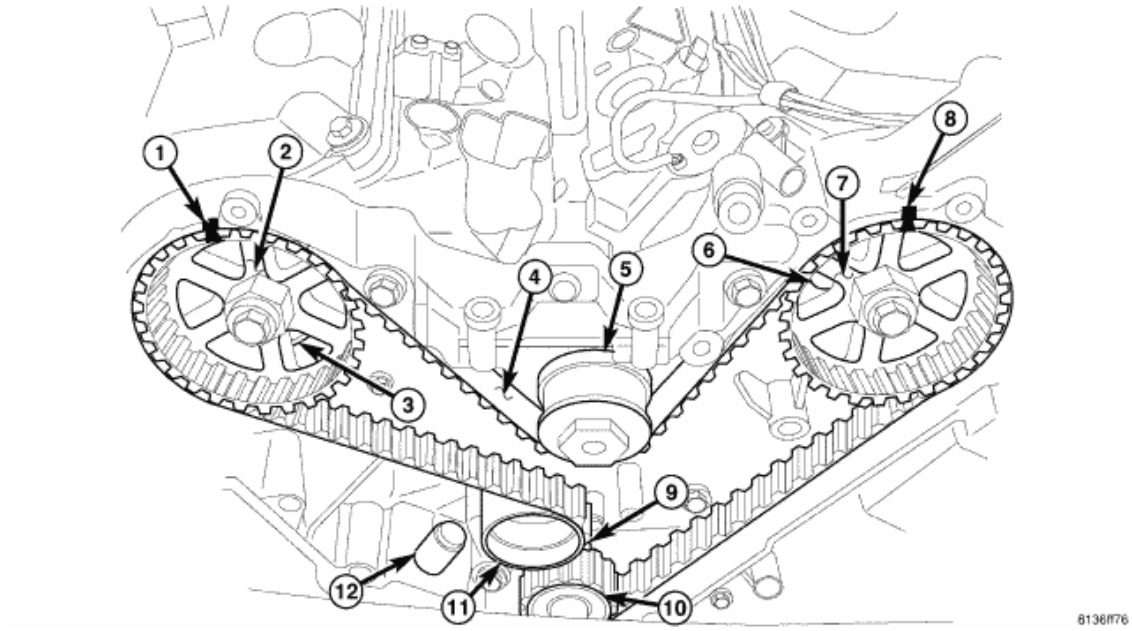

Fig. 128: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

10. Install the timing belt (4). See **Fig. 128**. See **INSTALLATION**.
11. Install rocker assembly (1). See **INSTALLATION**.

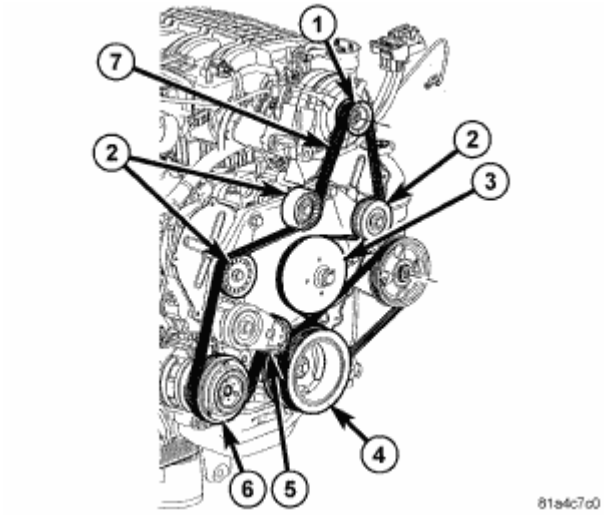

Fig. 129: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

12. Install cylinder head cover. See **INSTALLATION**
13. Install the front timing belt cover. See **INSTALLATION**.
14. Install the vibration damper (4). See **INSTALLATION**.
15. Fill cooling system. Refer to **STANDARD PROCEDURE** .
16. Connect the negative battery cable.

LEFT CYLINDER HEAD

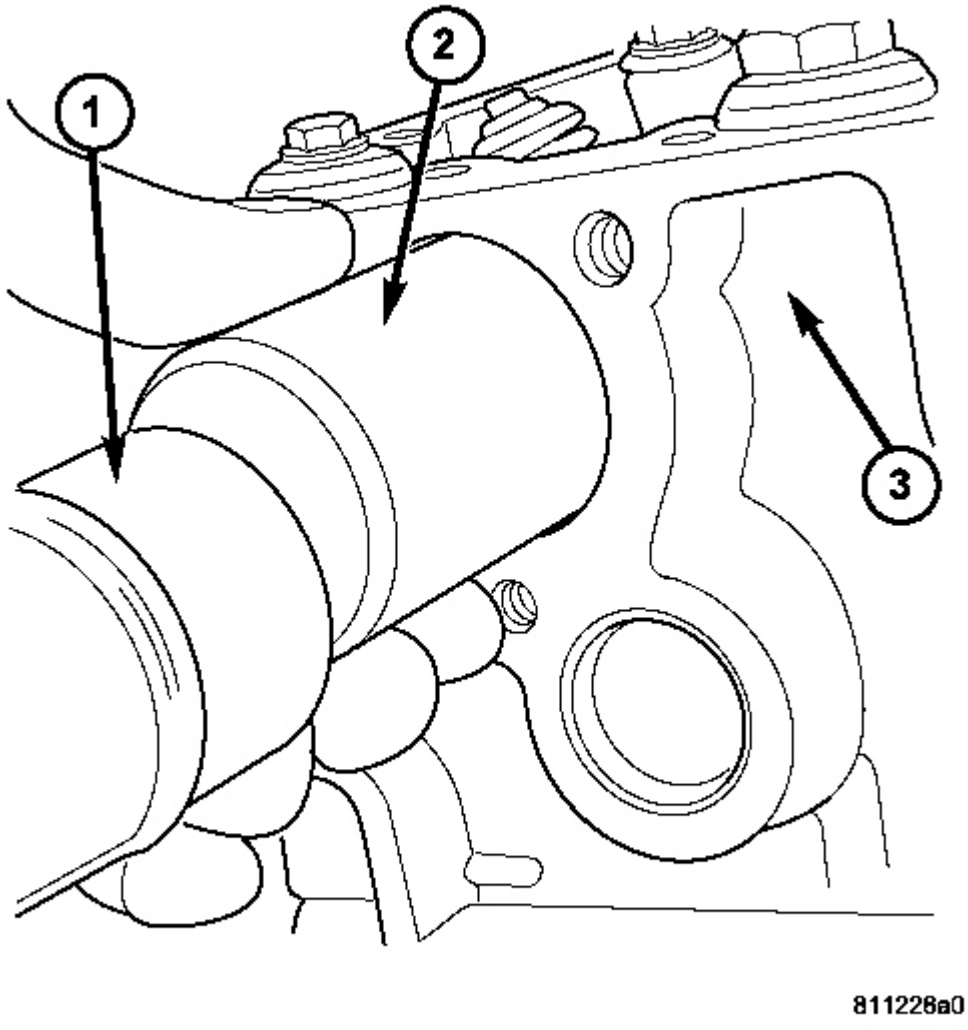

Fig. 130: Using MD-998306 To Tap Seal Into Place
Courtesy of CHRYSLER LLC

1 - MALLET
2 - SPECIAL TOOL MD-998306
3 - CYLINDER HEAD

1. Position the camshaft seal into the cylinder head (3)

2. Using MD-998306 (2) tap the seal into place. See **Fig. 130**.

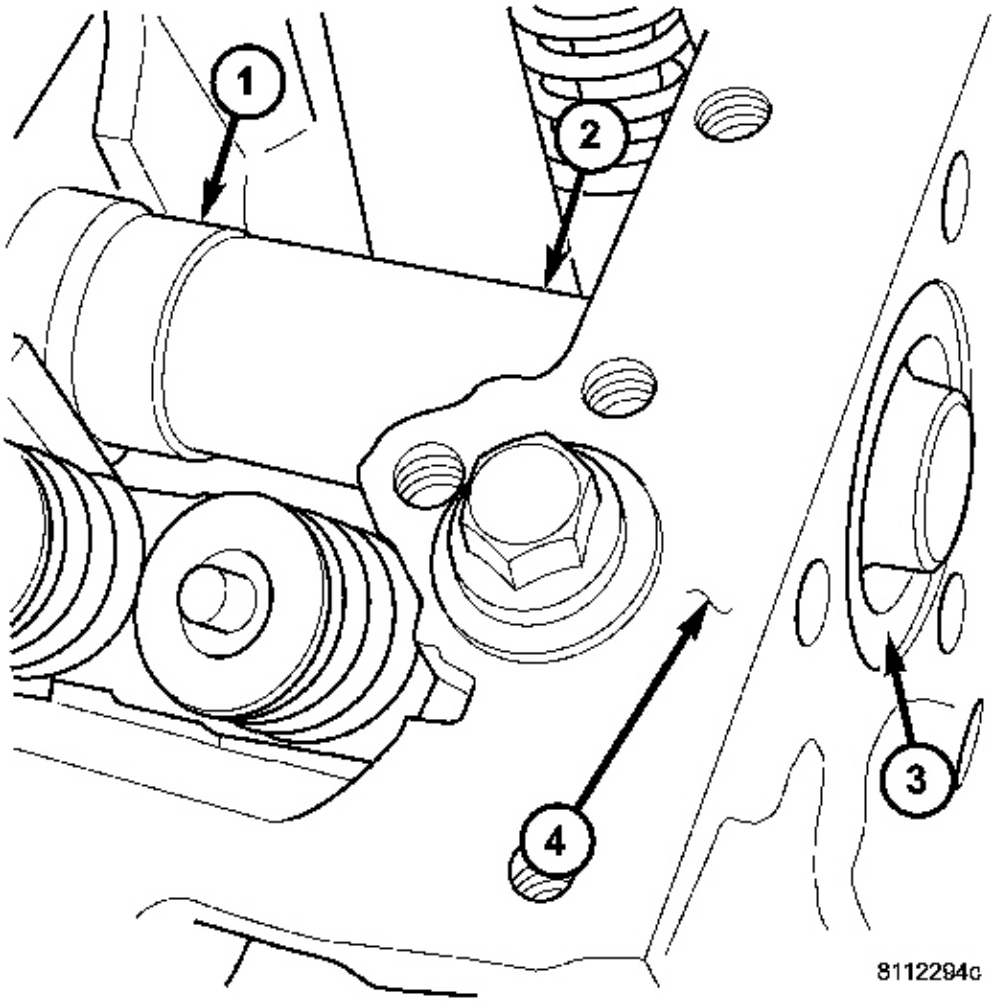

Fig. 131: Camshaft, Special Tool 6788, Camshaft Seal & Cylinder Head
Courtesy of CHRYSLER LLC

1 - CAMSHAFT
2 - SPECIAL TOOL 6788
3 - CAMSHAFT SEAL
4 - CYLINDER HEAD

3. Apply light coat of engine oil to the camshaft oil seal lip (3) and 6788 (2) Seal Protector Sleeve.
4. Install oil seal (3) 6788 Seal Protector Sleeve (2) onto the camshaft (1). See **Fig. 131**
5. Slide the camshaft (1) forward, inserting the seal protector (2) through the camshaft seal (3) until the camshaft seats. See **Fig. 131**.
6. Remove 6788 (2) from the camshaft (1).

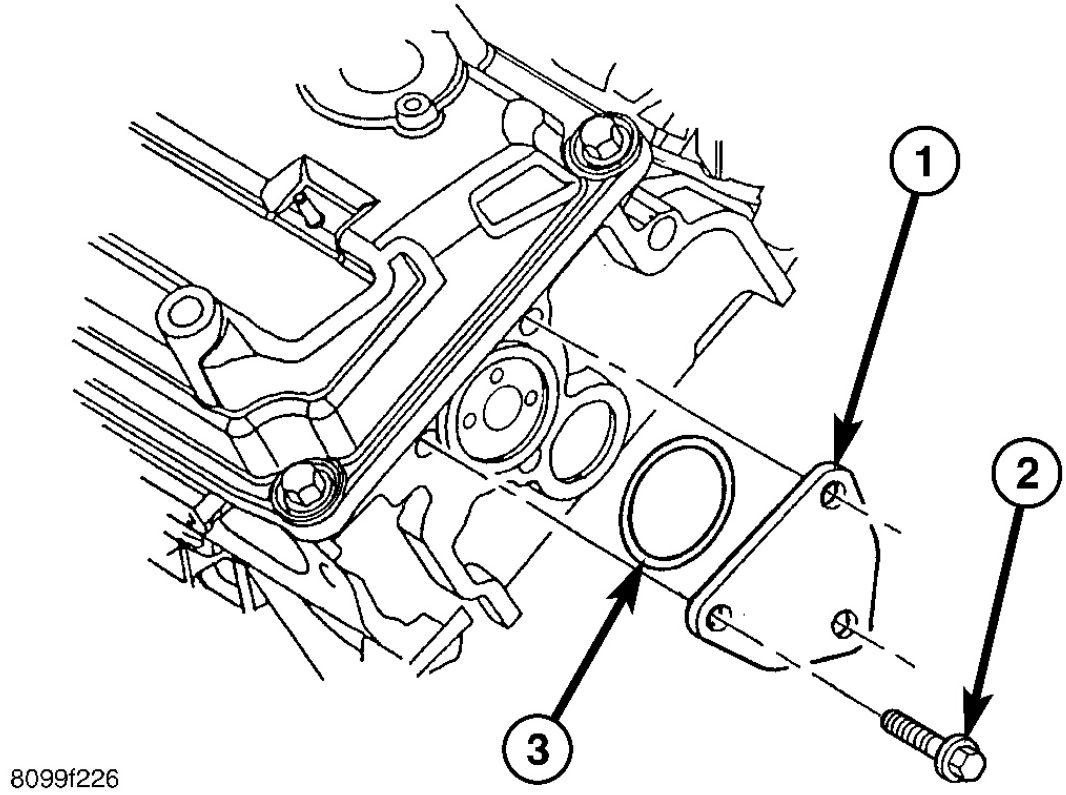

Fig. 132: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

7. Install the camshaft thrust plate (1) and new seal (3) to the rear of the cylinder head. See **Fig. 132**.
8. Install rear timing belt cover. See **INSTALLATION**).

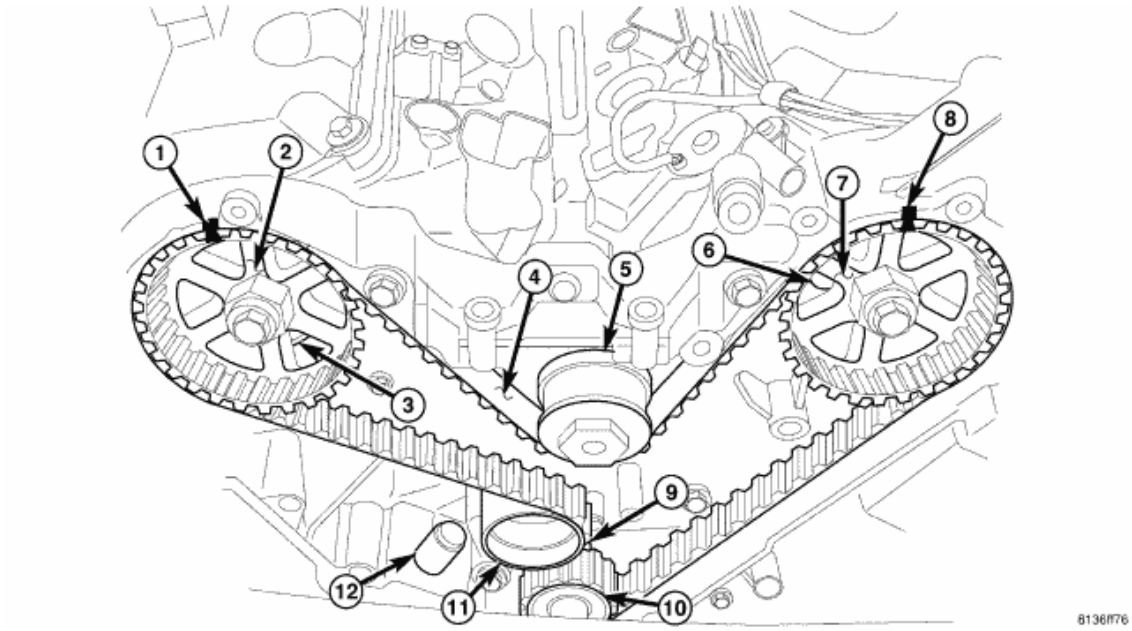

Fig. 133: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

9. Install the camshaft gear (7) and align the timing marks (1,8,9). See **Fig. 133**. See **INSTALLATION**.
10. Install the timing belt (4). See **INSTALLATION**.
11. Install the rocker arm assembly. See **INSTALLATION**.
12. Install the cylinder head cover.

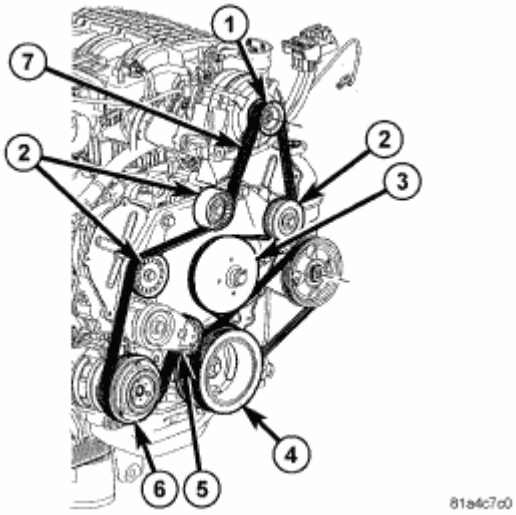

Fig. 134: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

13. Install the front timing belt cover. See **INSTALLATION**.
14. Install the vibration damper (4). See **INSTALLATION**.
15. Fill cooling system. Refer to **STANDARD PROCEDURE** .

16. Connect the negative battery cable.

CAMSHAFT(S)

DESCRIPTION

CAMSHAFT

A single overhead camshaft per cylinder head provides valve actuation. The left camshaft accommodates a cam sensor pick-up wheel and is therefore longer. Each camshaft is supported by four bearing journals. A thrust plate attached to the rear of each cylinder head controls camshaft end play. Right and left camshaft driving sprockets support a timing mark, are keyed, and not interchangeable because of the cam sensor pick-up wheel on the left sprocket. Camshaft bearing lubrication is provided via a oil supply passage through each rocker shaft pedestal dowel.

OPERATION

CAMSHAFT

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

REMOVAL

CAMSHAFT

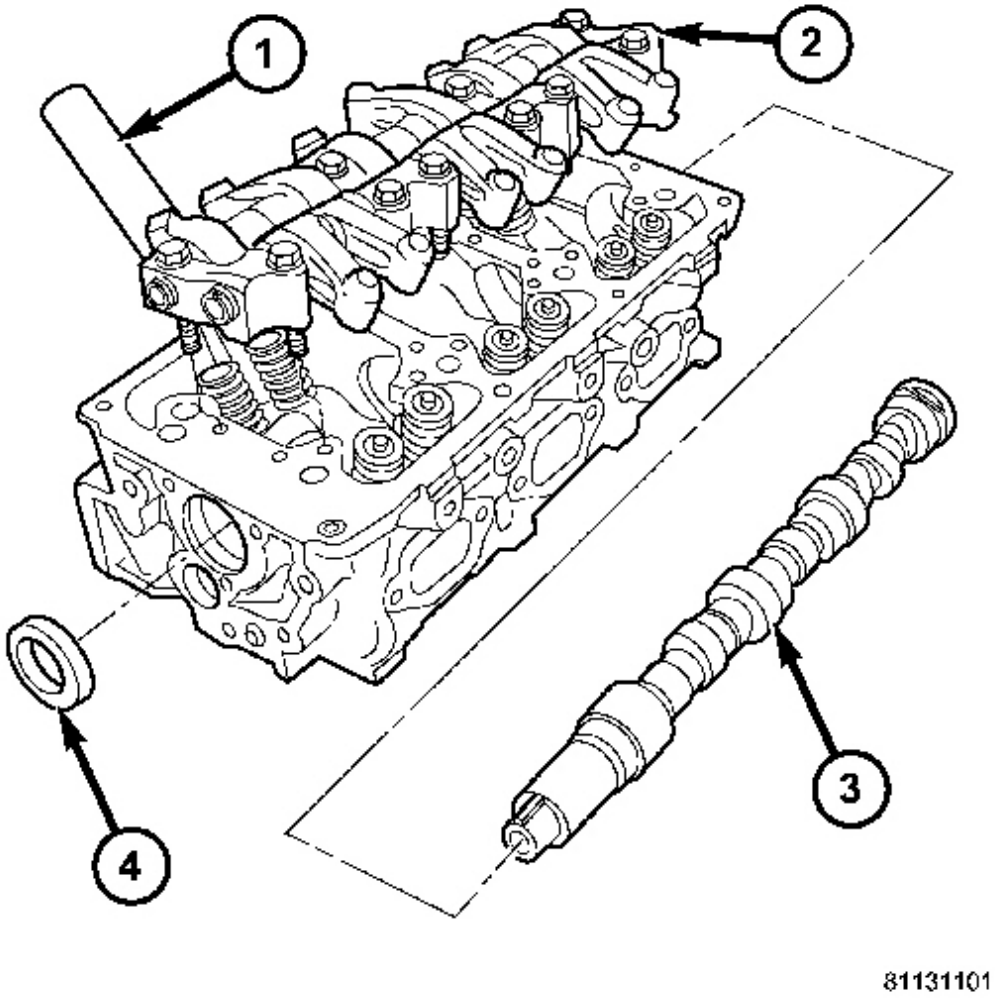

Fig. 135: Spark Plug Tube, Rocker Arm Assembly, Camshaft & Seal
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE
2 - ROCKER ARM ASSEMBLY
3 - CAMSHAFT
4 - SEAL

NOTE: Camshafts are removed from the rear of each cylinder head.

1. Remove the cylinder head. See **REMOVAL**.

CAUTION: Care must be taken not to nick or scratch the journals when removing the camshaft.

2. Carefully remove the camshaft (3) from the rear of the cylinder head. See **Fig. 135**

INSPECTION

CAMSHAFT

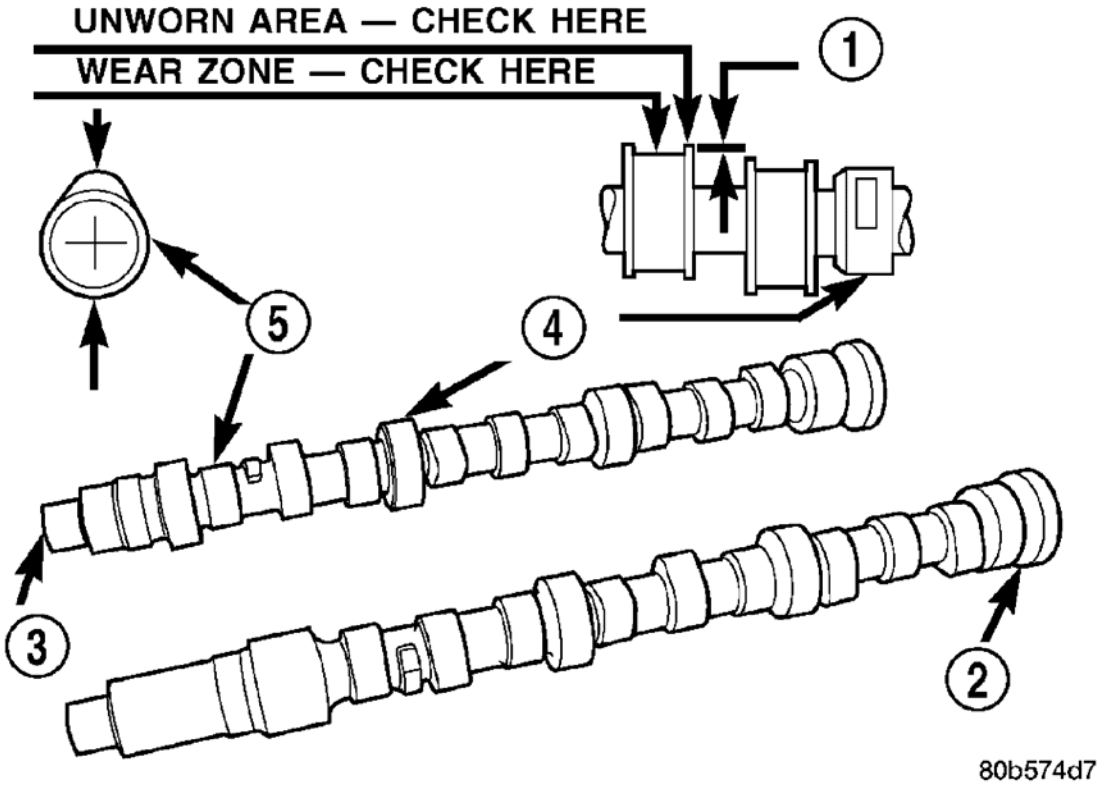

Fig. 136: Camshaft Inspection
Courtesy of CHRYSLER LLC

1 - ACTUAL WEAR
2 - LEFT CAMSHAFT
3 - RIGHT CAMSHAFT
4 - BEARING JOURNAL
5 - LOBE

1. Inspect camshaft bearing journals (4) for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.

2. Check the cam lobe (5) and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

NOTE: If camshaft is replaced due to lobe wear or damage, always replace the rocker arms.

3. Measure the lobe (5) actual wear and replace camshaft if out of limit. Standard value is 0.0254 mm (0.001 in.), wear. See **Fig. 136**. **Limit** is 0.254 mm (0.010 in.).

INSTALLATION

CAMSHAFT

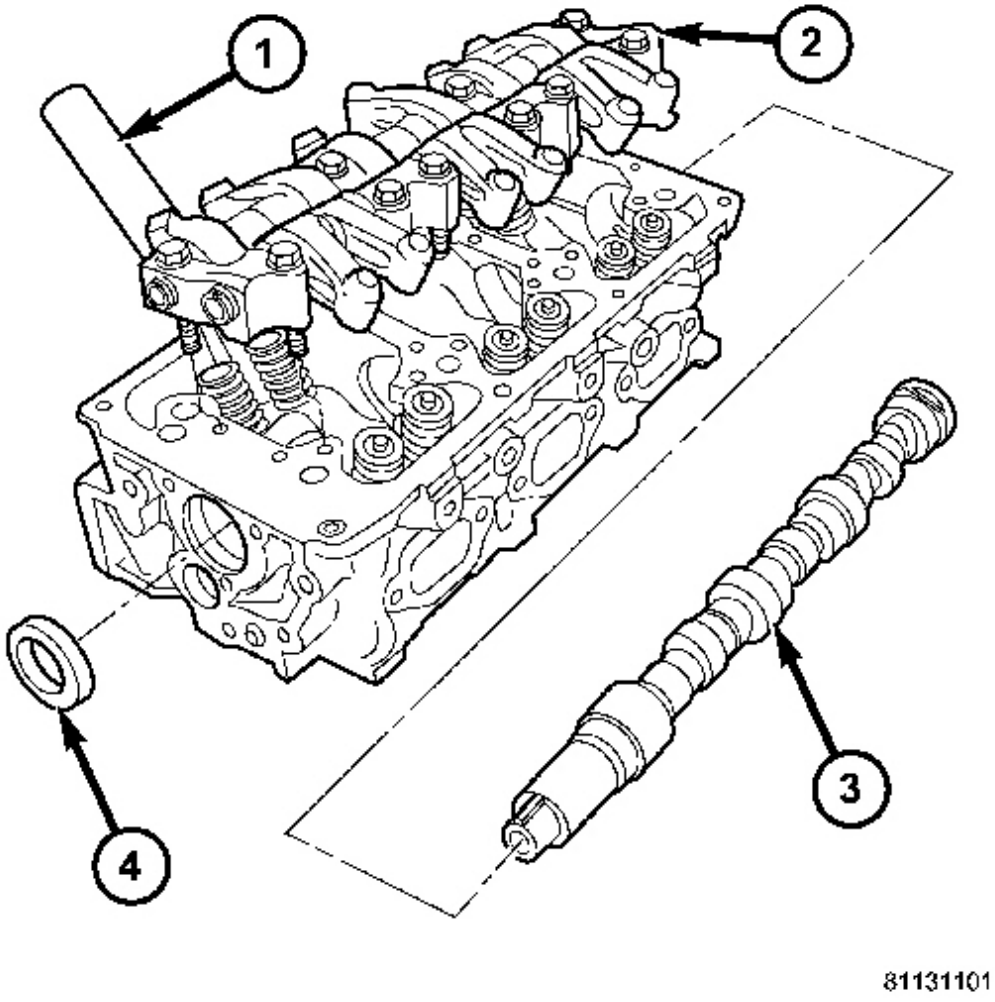

Fig. 137: Spark Plug Tube, Rocker Arm Assembly, Camshaft & Seal
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE
2 - ROCKER ARM ASSEMBLY
3 - CAMSHAFT
4 - SEAL

NOTE: **Care must be taken not to scrape or nick the camshaft journals when installing the camshaft into position.**

1. Lubricate camshaft (3) bearing journals, camshaft lobes and camshaft seal (4) with clean engine oil and install camshaft (3) into cylinder head. See **Fig. 137**.
2. Install the cylinder head. See **INSTALLATION**.

COVER CYLINDER HEAD - LEFT

REMOVAL

CYLINDER HEAD COVER - LEFT

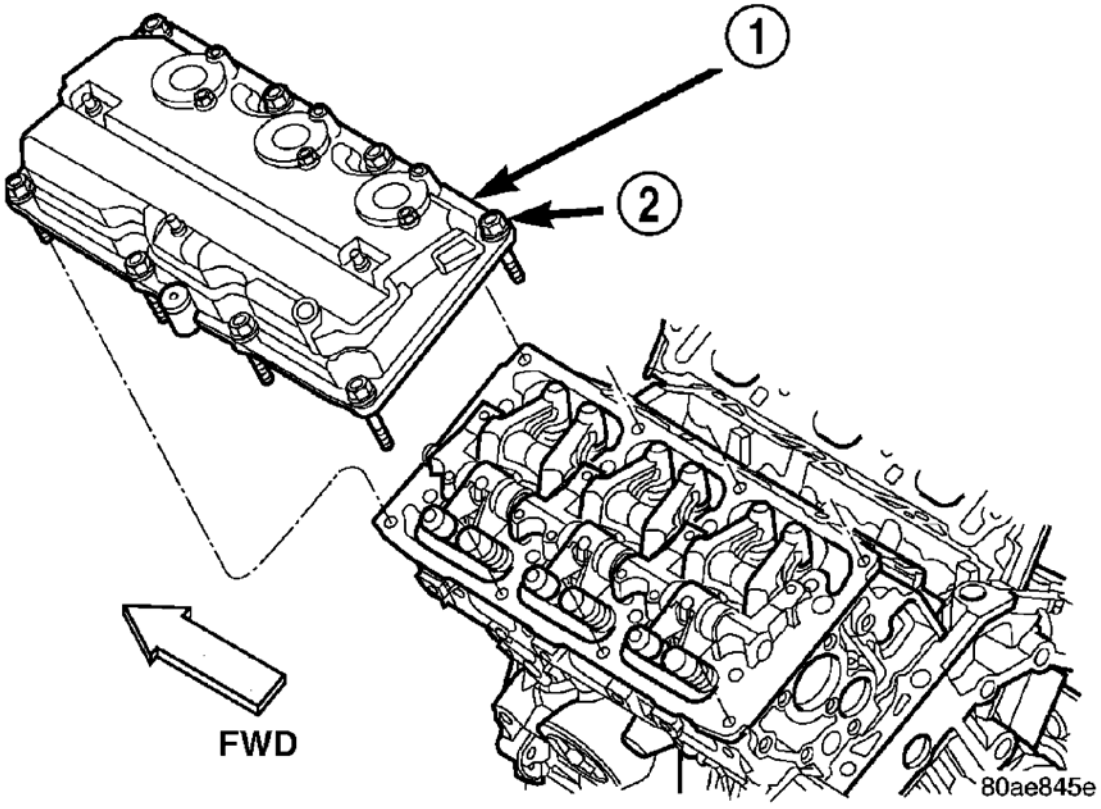

Fig. 138: Removing/Installing Cylinder Head Cover
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER-LEFT SIDE
2 - BOLTS (8)

WARNING: DO NOT START OR RUN ENGINE WITH CYLINDER HEAD COVER REMOVED FROM THE ENGINE. DAMAGE OR PERSONAL INJURY MAY OCCUR.

1. Disconnect and isolate the negative battery cable.

2. Remove the upper intake manifold from the engine. See **REMOVAL**.
3. Cover lower intake manifold with a suitable cover during service.
4. Disconnect and remove the three ignition coils.
5. Remove the ground strap/resistor retaining bolt from the cylinder head cover.
6. Lift up on the wire harness track retaining tabs.
7. Completely loosen the cylinder head cover retaining bolts and remove the cylinder head cover. See **Fig. 138**.

INSTALLATION

CYLINDER HEAD COVER - LEFT

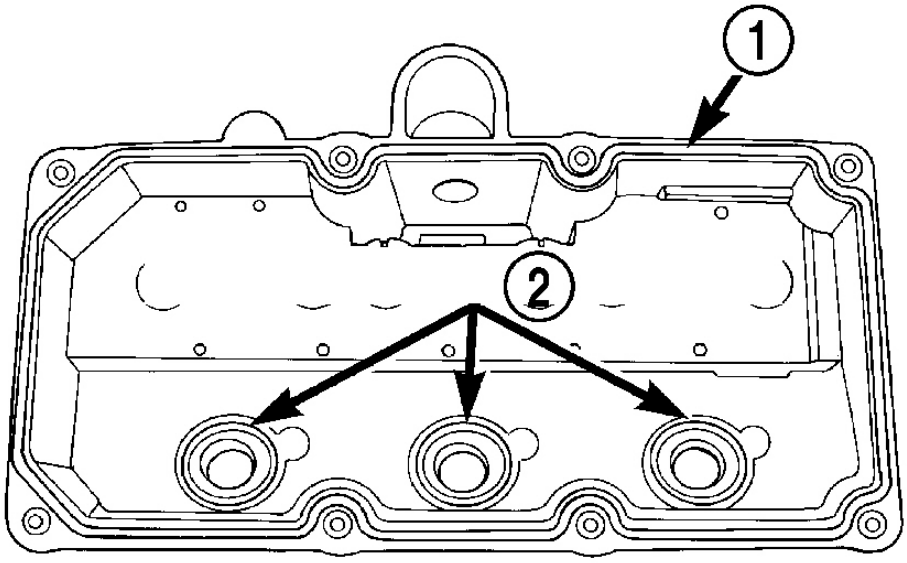

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Fig. 139: Inspecting/Replacing Gasket And Seals
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER GASKET
2 - SPARK PLUG TUBE SEALS

1. Clean cylinder head and cover mating surfaces. Inspect and replace gasket (1) and seals (2) as necessary. See **Fig. 139**.

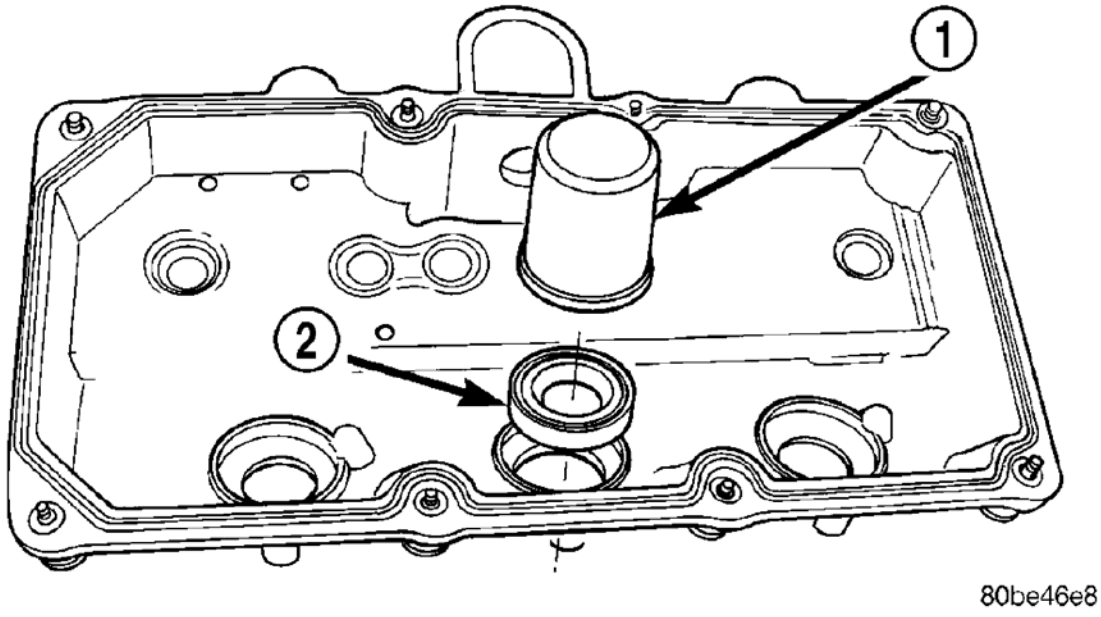

Fig. 140: Installing Seals Using MD-998306
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL MD-998306
2 - SPARK PLUG TUBE SEAL

2. To replace spark plug tube seals (2):
   - Using a suitable pry tool, carefully remove tube seals (2).
   - Position new seal (2) with the part number on seal facing cylinder head cover.
   - Install seals using MD-998306 (1). See **Fig. 140**.

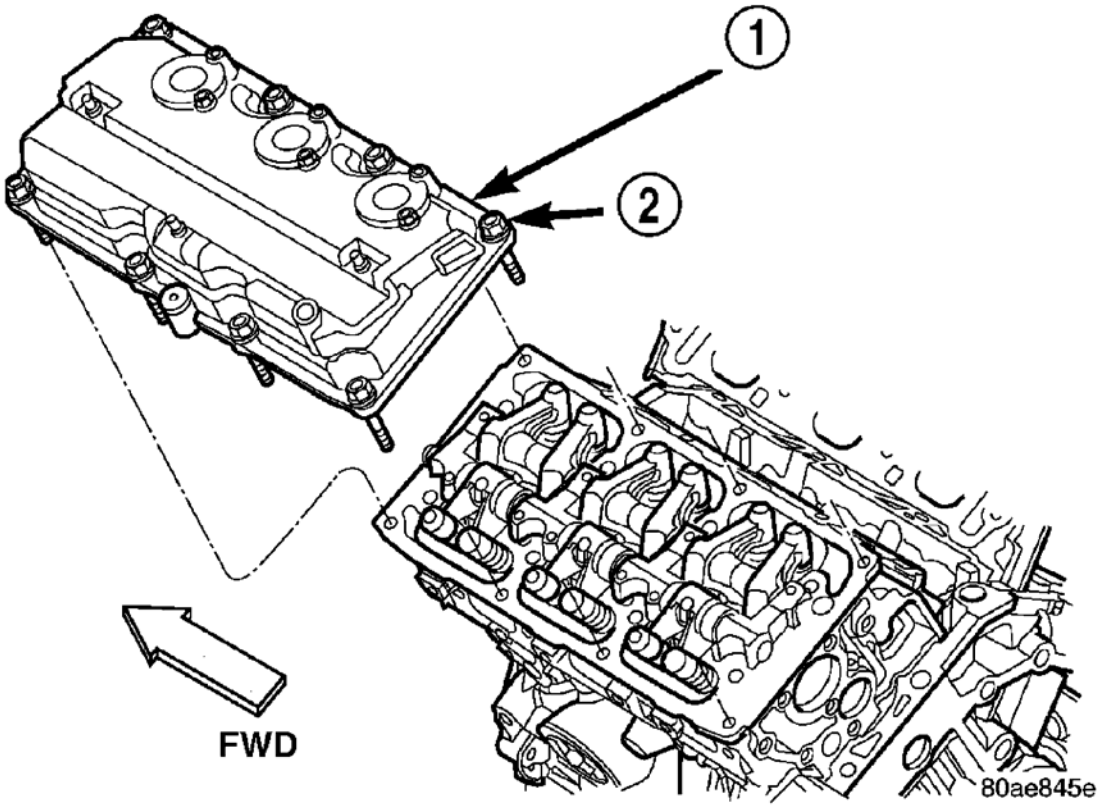

Fig. 141: Removing/Installing Cylinder Head Cover
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER-LEFT SIDE 2 - BOLTS (8)

3. Install cylinder head cover (1) and bolts (2). Tighten to 12 N.m (105 in. lbs.).
4. Position the wiring harness (3) on the cylinder head cover.
5. Reclip the wire harness track retaining tabs into the cover.
6. Install the ground strap/resistor retaining bolt onto the cylinder head cover.
7. Install the ignition coils (2). Tighten mounting screws to 6.7 N.m (60 in. lbs.)
8. Connect the ignition coil electrical connectors (2).
9. Install upper intake manifold. See **INSTALLATION**.
10. Connect negative battery cable.

COVER CYLINDER HEAD - RIGHT

REMOVAL

CYLINDER HEAD COVER - RIGHT

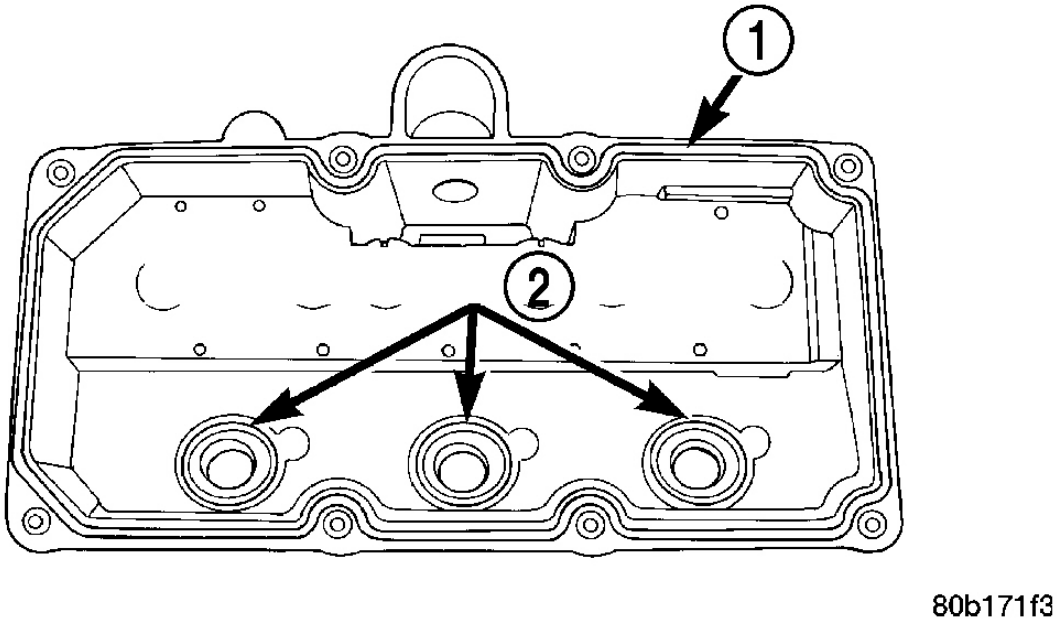

Fig. 142: Cylinder Head Cover Gasket & Spark Plug Tube Seals
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER GASKET
2 - SPARK PLUG TUBE SEALS

WARNING: DO NOT START OR RUN ENGINE WITH CYLINDER HEAD COVER REMOVED FROM THE ENGINE. DAMAGE OR PERSONAL INJURY MAY OCCUR.

1. Disconnect the negative battery cable.
2. Remove the upper intake manifold. See **REMOVAL**.
3. Cover lower intake manifold openings during service.
4. Disconnect and remove the three ignition coils.
5. Lift up on the wire harness track retaining tabs.
6. Remove the ground strap retaining bolt from the cylinder head cover.
7. Completely loosen the cylinder head cover retaining bolts and remove the cylinder head cover (1).

INSTALLATION

CYLINDER HEAD COVER - RIGHT

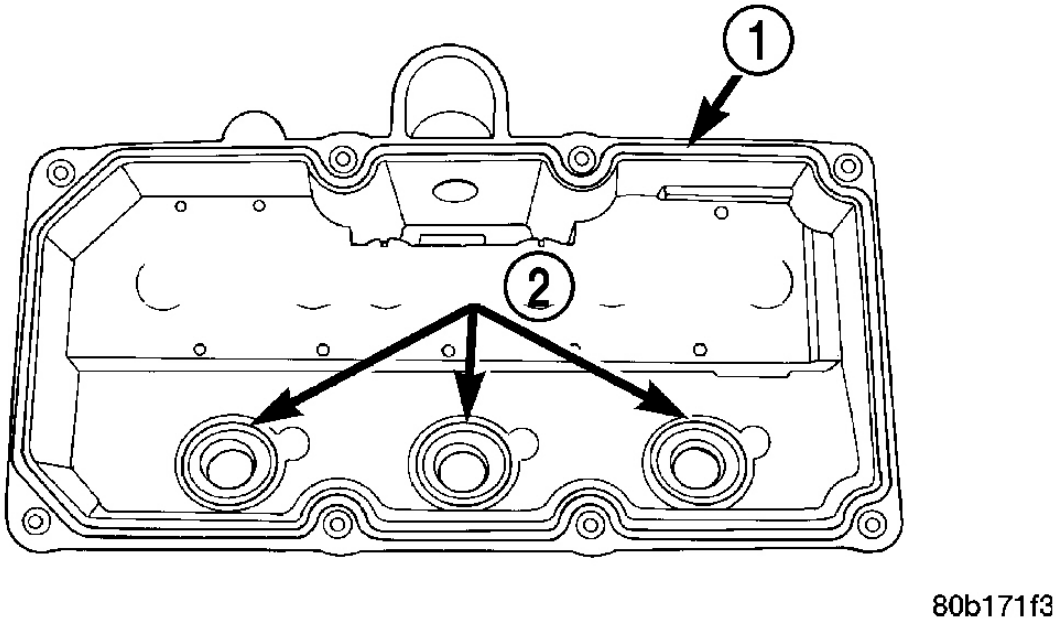

Fig. 143: Cylinder Head Cover Gasket & Spark Plug Tube Seals
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER GASKET
2 - SPARK PLUG TUBE SEALS

1. Clean cylinder head and cover mating surfaces. Inspect and replace gasket (1) and seals (2) as necessary. See **Fig. 143**.

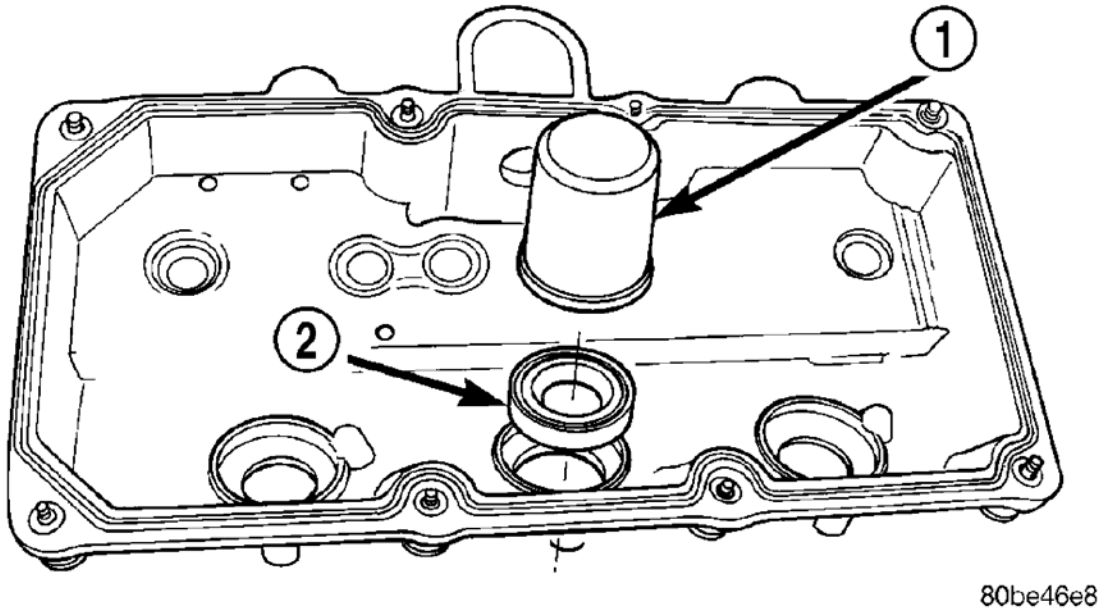

Fig. 144: Installing Spark Plug Tube Seal
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL MD-998306 2 - SPARK PLUG TUBE SEAL

2. To replace spark plug tube seals (2):
   - Using a suitable pry tool, carefully remove tube seals (2).
   - Position new seal (2) with the part number on seal facing cylinder head cover.
   - Install seals using MD-99830 (1).
3. Install cylinder head cover bolts and tighten to 12 N.m (105 in. lbs.).
4. Install the ground strap retaining bolt to the cylinder head cover.
5. Install the wire harness track.
6. Install the ignition coils. Tighten mounting screws to 6.7 N.m (60 in. lbs.).
7. Connect the ignition coil electrical connectors (2).
8. Install upper intake manifold. See **INSTALLATION**.
9. Connect negative battery cable

VALVES & SEATS -INTAKE/EXHAUST

DESCRIPTION

VALVES

Valves are made of highly heat-resistant steel and are chrome plated to prevent stem scuffing. The intake valve

is a one-piece forging, while the exhaust valve has a forged head with a welded stem for lock groove hardness. The four valves (two intake and two exhaust) employ a three-groove lock design to help facilitate valve rotation.

OPERATION

VALVES

The intake valve allows the air/fuel mixture to enter the combustion chamber. The exhaust valve allows the burned air/fuel mixture to exit the combustion chamber. Also, the intake and exhaust valves seal the combustion chamber during the compression and power strokes.

STANDARD PROCEDURE

VALVE AND VALVE SEAT REFACING

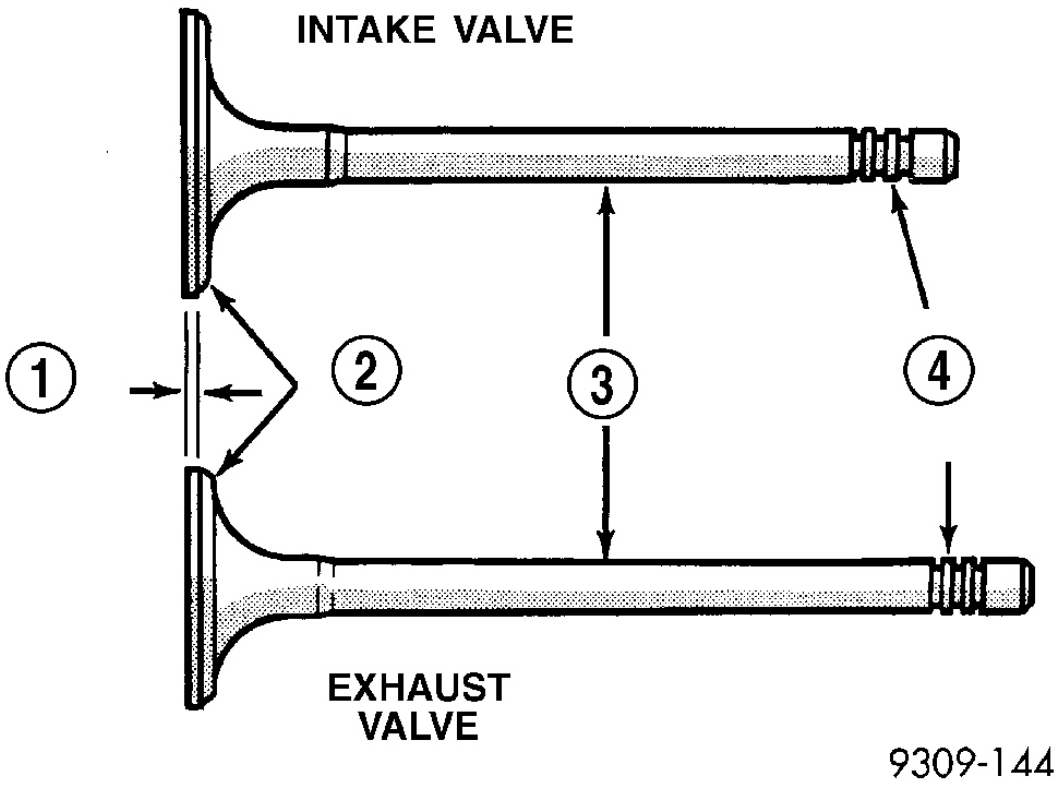

Fig. 145: Intake & Exhaust Valves
Courtesy of CHRYSLER LLC

1 - MARGIN
2 - FACE

3 - STEM
4 - VALVE SPRING RETAINER LOCK GROOVES

VALVES

1. Inspect the remaining margin (1) after the valves are refaced. See **SPECIFICATIONS**.

VALVE SEATS

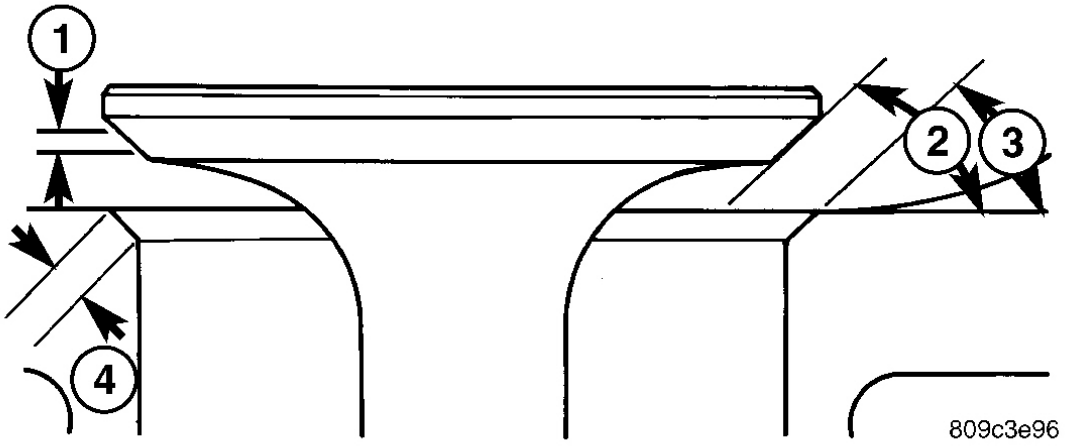

Fig. 146: Valve Face & Seat
Courtesy of CHRYSLER LLC

1 - SEAT WIDTH
2 - FACE ANGLE
3 - SEAT ANGLE
4 - SEAT CONTACT AREA

1. When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.
2. Measure the concentricity of valve seat using dial indicator. Total runout should not exceed 0.051 mm (0.002 inch.) Total indicator reading.
3. Inspect the valve seat (3) with Prussian blue to determine where the valve (1) contacts the seat. To do this, coat valve seat (1) **LIGHTLY** with Prussian blue then set valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of valve face (2), contact is satisfactory. If the blue is transferred to top edge of valve face (2), then lower valve seat (3) with a 15° stone. If the blue is transferred to the bottom edge of valve face (2), then raise valve seat (3) with a 65° stone.

NOTE: Valve seats (1) which are worn or burned can be reworked, provided that correct angle and seat width (1) are maintained. Otherwise cylinder head

must be replaced.

4. When seat is properly positioned the width of the intake seats should be 0.75 to 1.25 mm (0.0296 to 0.0493 in.) and exhaust seats should be 1.25 to 1.75 mm (0.049 to 0.069 in.). See **Fig. 146**.

VALVE AND SPRING INSTALLED HEIGHT

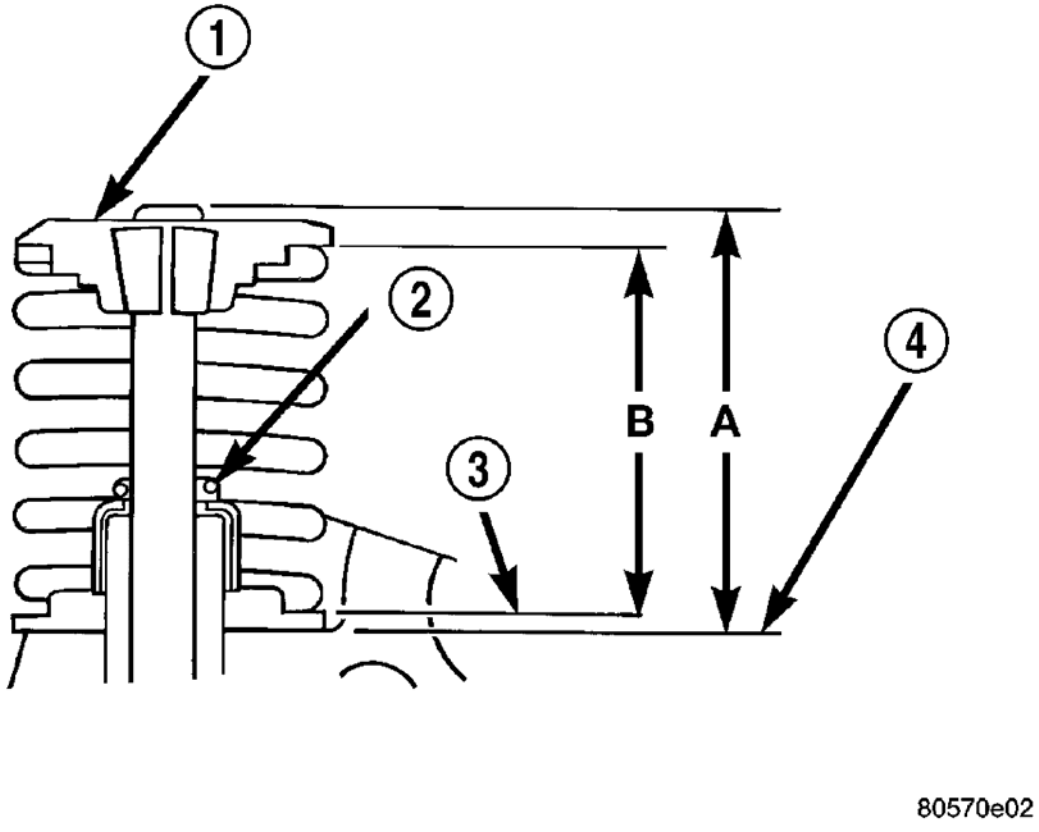

Fig. 147: Checking Valve Tip Height & Valve Spring Installed Height
Courtesy of CHRYSLER LLC

1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE

1. Coat valve stems with clean engine oil and insert them in cylinder head.
2. If valves or seats have been refaced, check valve tip height (A). See **Fig. 147**. If valve tip height is greater than 43.65 mm (1.7185 in.) intake or 46.48 mm (1.8299 in.) exhaust, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.
3. Install valve seal/spring seat assembly over valve guides on all valve stem. See **Fig. 149**. Ensure that the garter spring is intact around the top of the rubber seal.

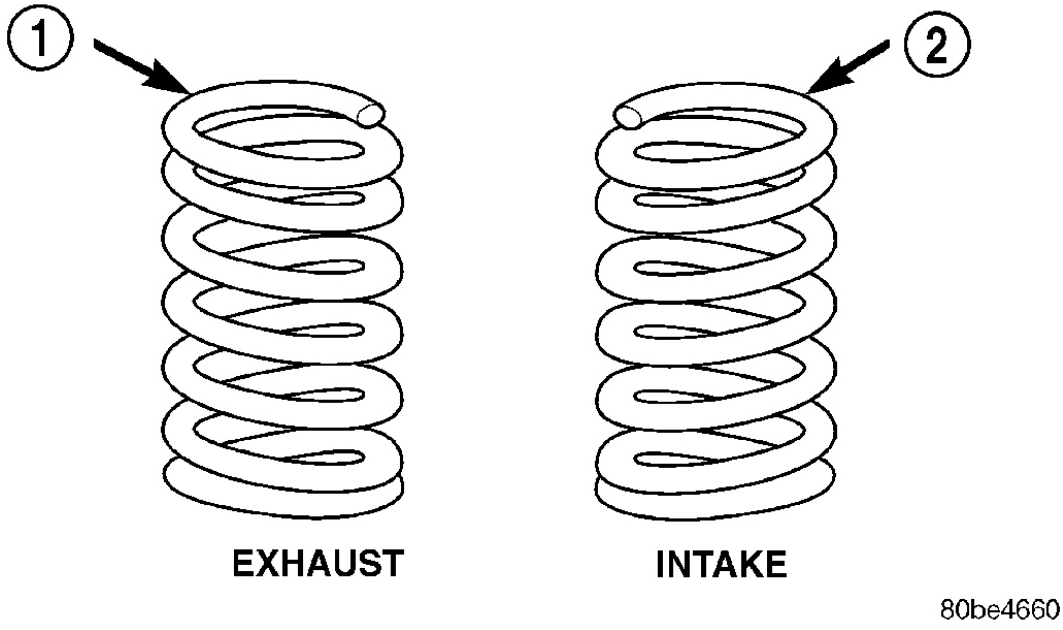

Fig. 148: Valve Spring Identification
Courtesy of CHRYSLER LLC

1 - YELLOW OR WHITE DYE
2 - ORANGE DYE

4. Place valve spring (color-coded end facing up). See **Fig. 148** and valve retainer into position on spring seat. See **Fig. 147**.

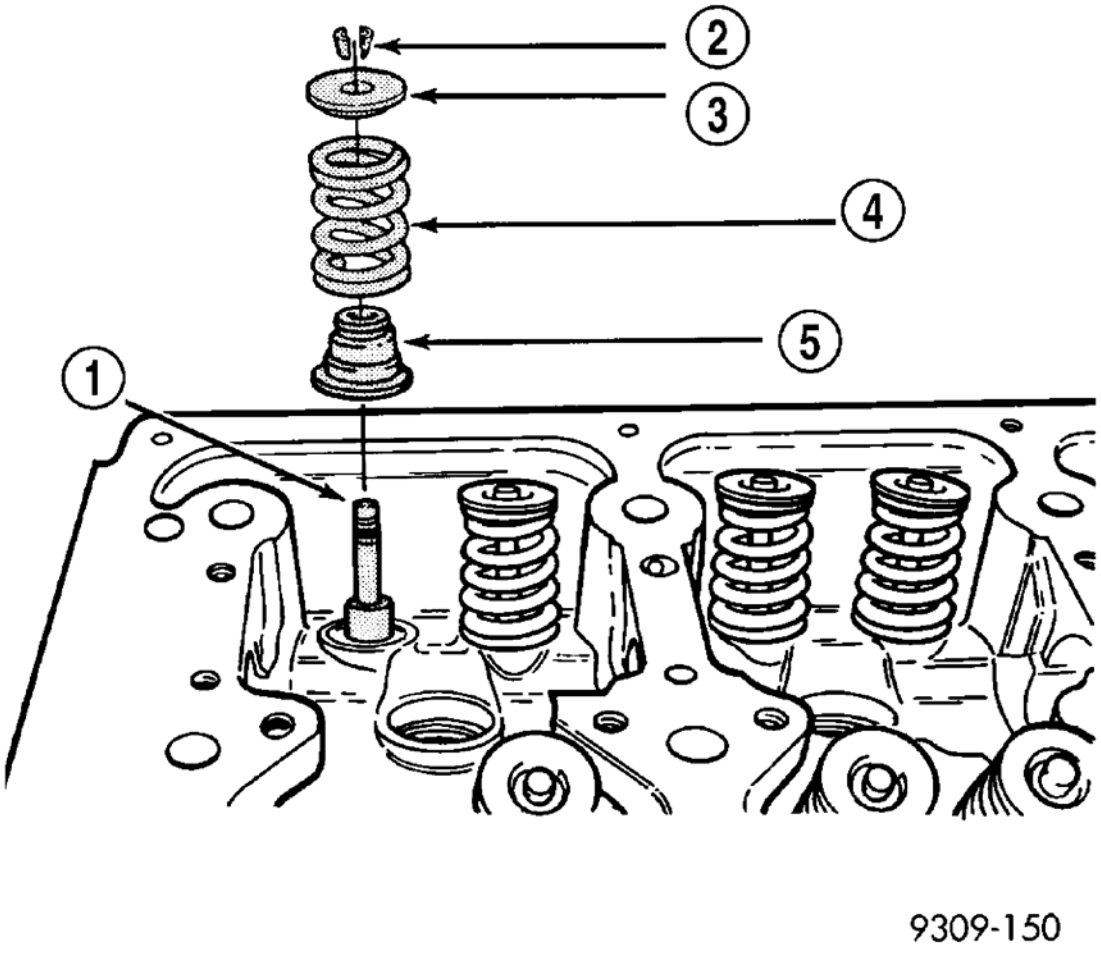

Fig. 149: Valve Seal & Spring-Installation
Courtesy of CHRYSLER LLC

1 - VALVE
2 - VALVE RETAINING LOCKS
3 - VALVE SPRING RETAINER
4 - VALVE SPRING
5 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY

5. Compress valve springs (4) with valve spring compressor C-3422-D and adapter 6526. See **SPECIAL TOOLS**, install locks (2) and release tool.
6. If valves (1) and/or seats are refaced, measure the installed height of springs. See **Fig. 147**. Measurements are taken from top of spring (4) seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve spring seat to bring spring height back within specification.

REMOVAL

VALVES

1. Remove cylinder head(s). See **REMOVAL**.
2. Remove rocker arm assembly. See **REMOVAL**.
3. Remove valve spring(s). See **REMOVAL**.
4. Before removing valve, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves to insure installation in original location.
5. Remove valve(s) from cylinder head.

CLEANING

VALVE AND VALVE SPRING

1. Clean all valves thoroughly and discard burned, warped and cracked valves.

INSPECTION

VALVE GUIDES

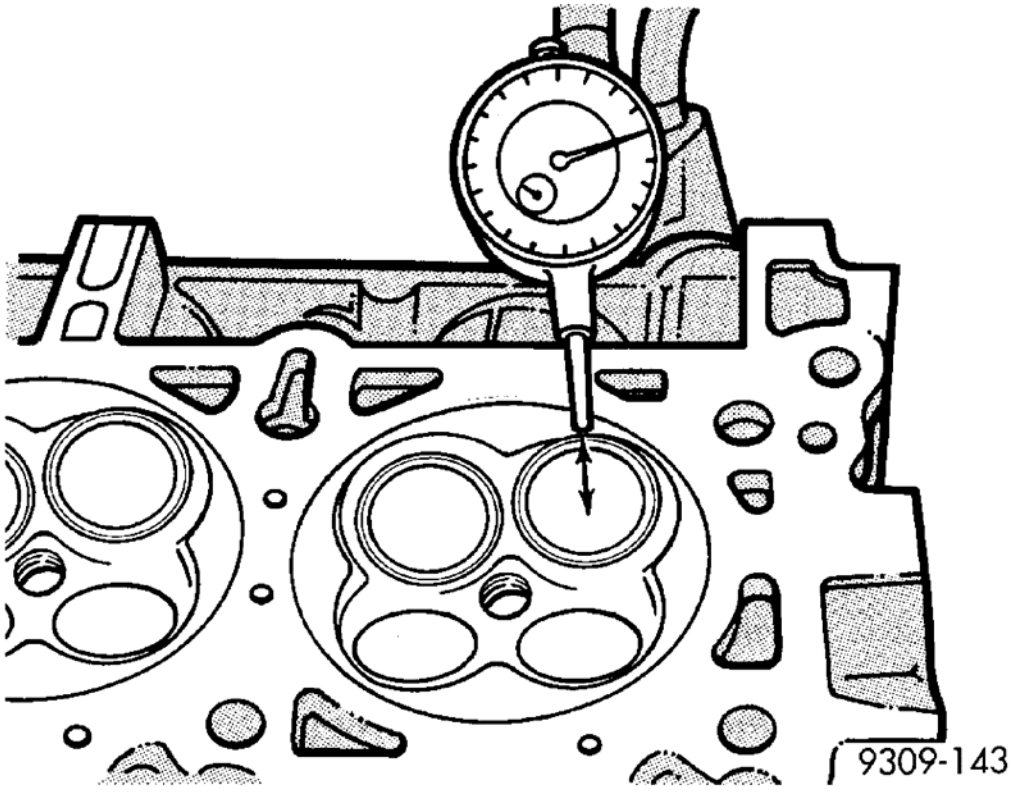

Fig. 150: Measuring Valve Guide Wear
Courtesy of CHRYSLER LLC

1. Measure valve stem-to-guide clearance as follows:
2. Install valve into cylinder head so it is 15 mm (0.590 inch.) off the valve seat. A small piece of hose may be used to hold valve in place.
3. Attach dial indicator Tool C-3339 to cylinder head and set it at right angle of valve stem being measured. See **Fig. 150**.
4. Move valve to and from the indicator.
5. Note dial indicator reading and compare to engine specifications. See **SPECIFICATIONS**.

NOTE: Replace cylinder head if stem-to-guide clearance exceeds specifications, or if guide is loose in cylinder head.

VALVES

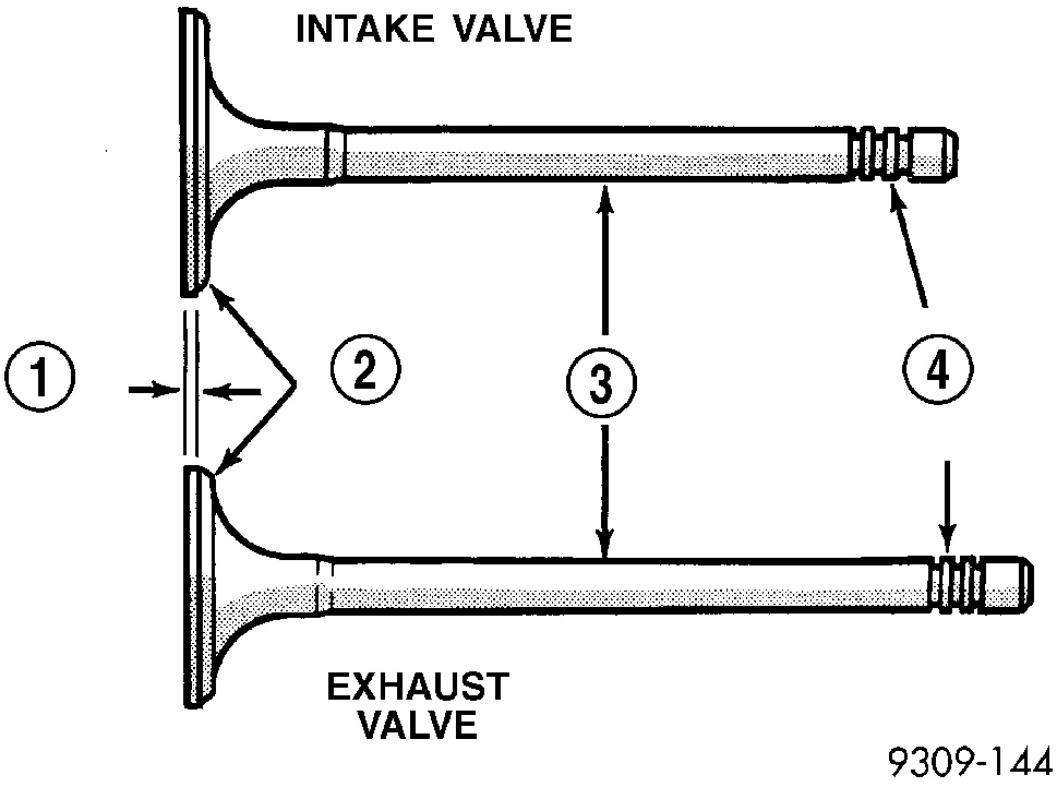

Fig. 151: Intake & Exhaust Valves
Courtesy of CHRYSLER LLC

1 - MARGIN
2 - FACE
3 - STEM

4 - VALVE SPRING RETAINER LOCK GROOVES

1. Measure valve stems for wear approximately 60 mm (2.36 in.) below the valve lock grooves. See **Fig. 151**.
2. Compare measurement to specifications, see **SPECIFICATIONS**.

NOTE: Valve stems are chrome plated and should not be polished. See Fig. 151.

INSTALLATION

VALVES

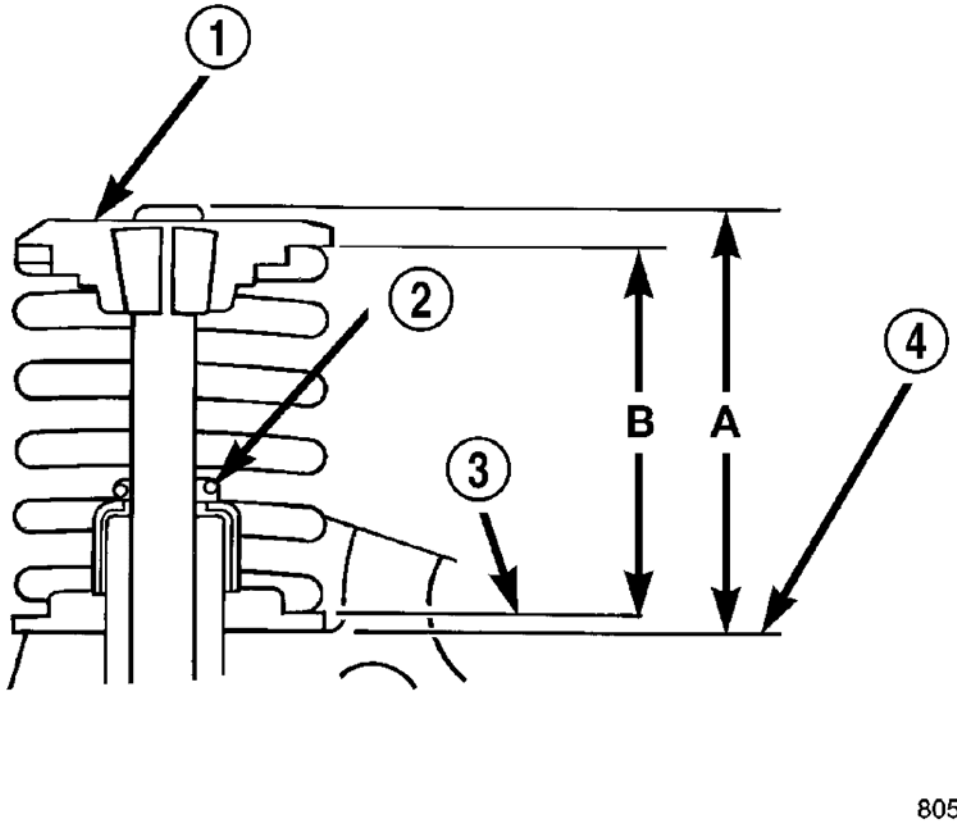

Fig. 152: Checking Valve Tip Height & Valve Spring Installed Height
Courtesy of CHRYSLER LLC

1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE

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

2. If valves or seats have been reground, check valve tip height (A). See **Fig. 152**. If valve tip height is greater than 43.65 mm (1.7185 in.) intake or 46.48 mm (1.8299 in.) exhaust, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.
3. Install new valve stem seals.
4. Install valve springs. See **INSTALLATION**.
5. Install cylinder head(s). See **INSTALLATION**.

ROCKER ARM SHAFT/ROCKER ARM/LASH ADJUSTER

DESCRIPTION

ROCKER ARMS

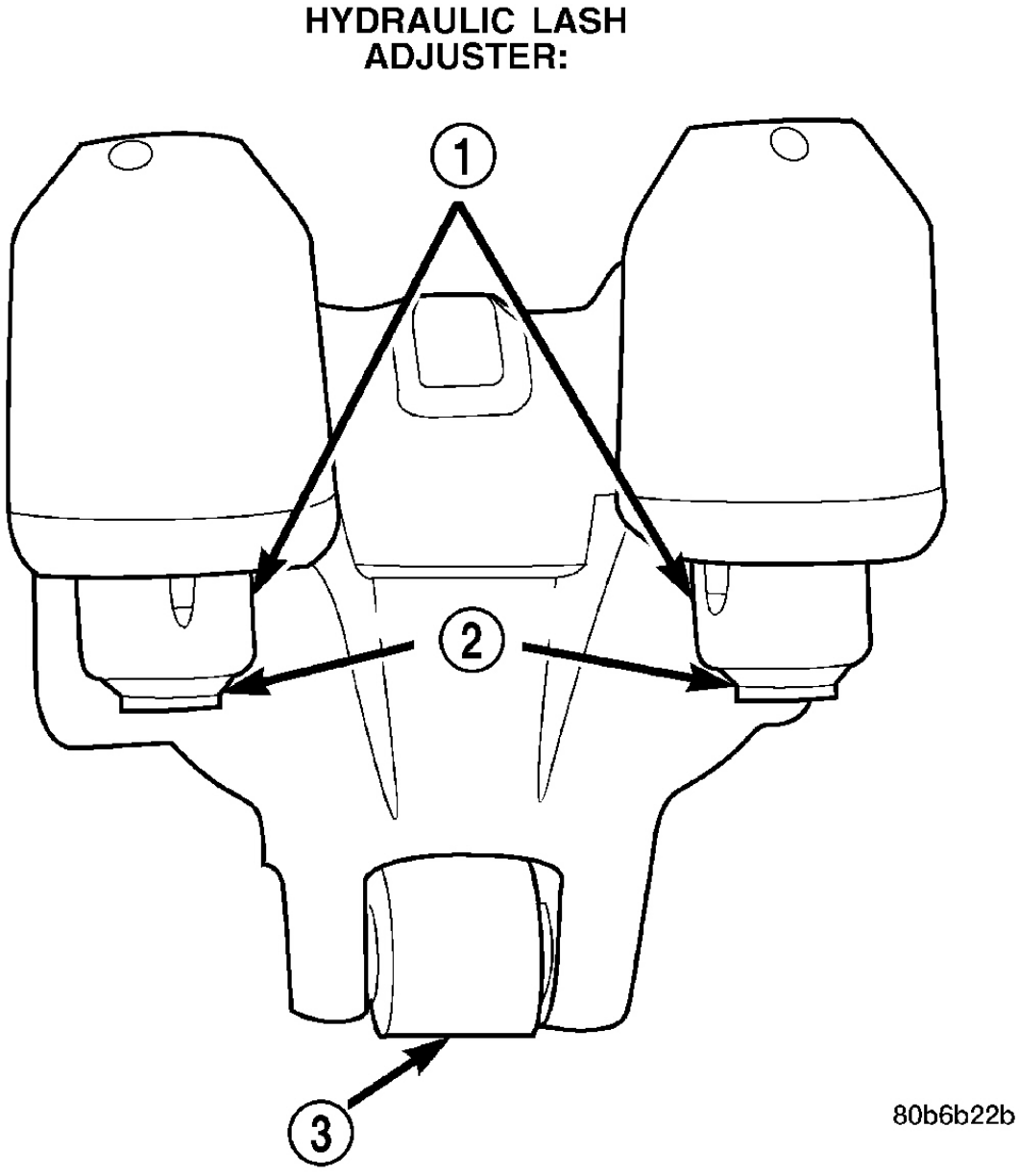

Fig. 153: Rocker Arm Assembly
Courtesy of CHRYSLER LLC

1 - RETAINER
2 - SWIVEL PAD
3 - ROLLER

Rocker arms are made of light weight permanent mold aluminum alloy with a roller (3) type follower operating

against the camshaft. See **Fig. 153**. The valve actuating end of the rocker arms are machined to retain hydraulic lash adjusters, eliminating the need for manual valve lash adjustment.

ROCKER ARM SHAFTS

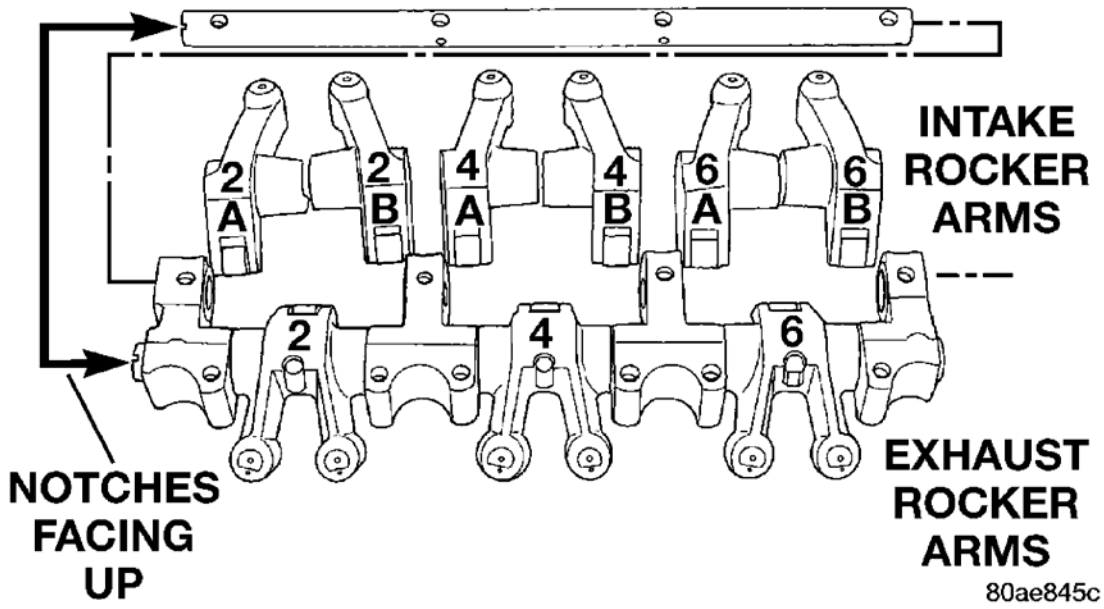

Fig. 154: Rocker Arms & Shafts
Courtesy of CHRYSLER LLC

The rocker arm shafts are tubular steel and are supported by several forged aluminum alloy pedestals, which are fastened to the cylinder head. Four shafts are used, one for each intake and exhaust rocker arm bank on each cylinder head. The shafts are hollow to provide a duct for lubricating oil flow from the cylinder head to the valve mechanisms. One hollow dowel per pedestal is used to locate the pedestal to the cylinder head, orient the exhaust rocker shaft, and serve as a cam bearing oil feed passage. See **Fig. 154**.

OPERATION

ROCKER ARMS

The rocker arm is the pivot point between the camshaft lobe and the valve.

DIAGNOSIS AND TESTING

LASH ADJUSTER (TAPPET) NOISE DIAGNOSIS

Proper noise diagnosis is essential in locating the source of a NVH complaint. Locating a lash adjuster (tappet) type noise can sometimes be difficult. As a result, an initial misdiagnosis may occur.

Refer to the following chart indicating possible lash adjuster (tappet) noise sources and possible sources that could lead to a misdiagnosis.

Refer to Lash Adjuster (Tappet) Noise Chart for Possible Causes and Correction of a lash adjuster (tappet) type noise.

POSSIBLE NOISE SOURCES	POSSIBLE NOISE MISDIAGNOSIS SOURCES
Spongy/soft/aerated lash adjusters.	Exhaust leak.
Missing lash adjuster swivel contact pads.	Exhaust rocker arm-to-cylinder head cover contact.
Intake rocker-to-camshaft bearing journal contact.	Piston pin bore fit.
Rocker arm bind-up.	Timing drive hydraulic tensioner tick.
Intake rocker arm-to-spark plug tube contact.	Accessory drive belt deterioration.
Excessive cam end play.	Piston-to-bore clearance knock.
Broken valve spring.	Crankshaft bearing noise.
Broken/loose camshaft sprocket bolt.	
Incomplete cam lobe machining.	
Cracked lash adjuster cartridge body.	

LASH ADJUSTER (TAPPET) NOISE CHART

POSSIBLE CAUSES	CORRECTION
1. Engine oil level-too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.	1. Check and correct engine oil level.
2. Insufficient running time after rebuilding cylinder head.	2. Low speed running of up to 1 hour may be required to fully evacuate trapped air from the valve train system. During this time, turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
3. Air trapped in lash adjuster (after 1 hour run time).	3. See below: (a) Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Very spongy adjusters can be bottomed out easily. (b) Before proceeding, perform Lash Adjuster Bleeding procedure. (c) If lash adjuster(s) are still spongy, replace with new adjuster/rocker arm assembly*.
4. Low oil pressure	4. See below: (a) Check and correct engine oil level. (b) Check engine oil pressure. (c) Check for excessive bearing clearance and correct. (d) Check for worn oil pump.
5. Oil passage to cylinder head(s) plugged with debris.	5. Check cylinder head oil passages and cylinder head gasket restrictor for blockage. Clean or replace

	as necessary.
6. Worn valve guide(s).	6. Ream guide(s) and replace valve(s) with oversize valves and seal(s).
7. Air injected into oil due to broken or cracked oil pump pickup tube.	7. Inspect pickup tube and replace as necessary.
8. Collapsed lash adjuster due to debris injection.	8. Clean debris from engine and replace lash adjuster/rocker assembly*.
9. Intake rocker arm roller clevis ear(s) contacting camshaft bearing journal(s) on side.	9. Inspect camshaft end play and all valve train components for wear. Replace as necessary.
***Lash adjusters are serviced with the rocker arms-do not disassemble.**	

STANDARD PROCEDURE

HYDRAULIC LASH ADJUSTER BLEEDING

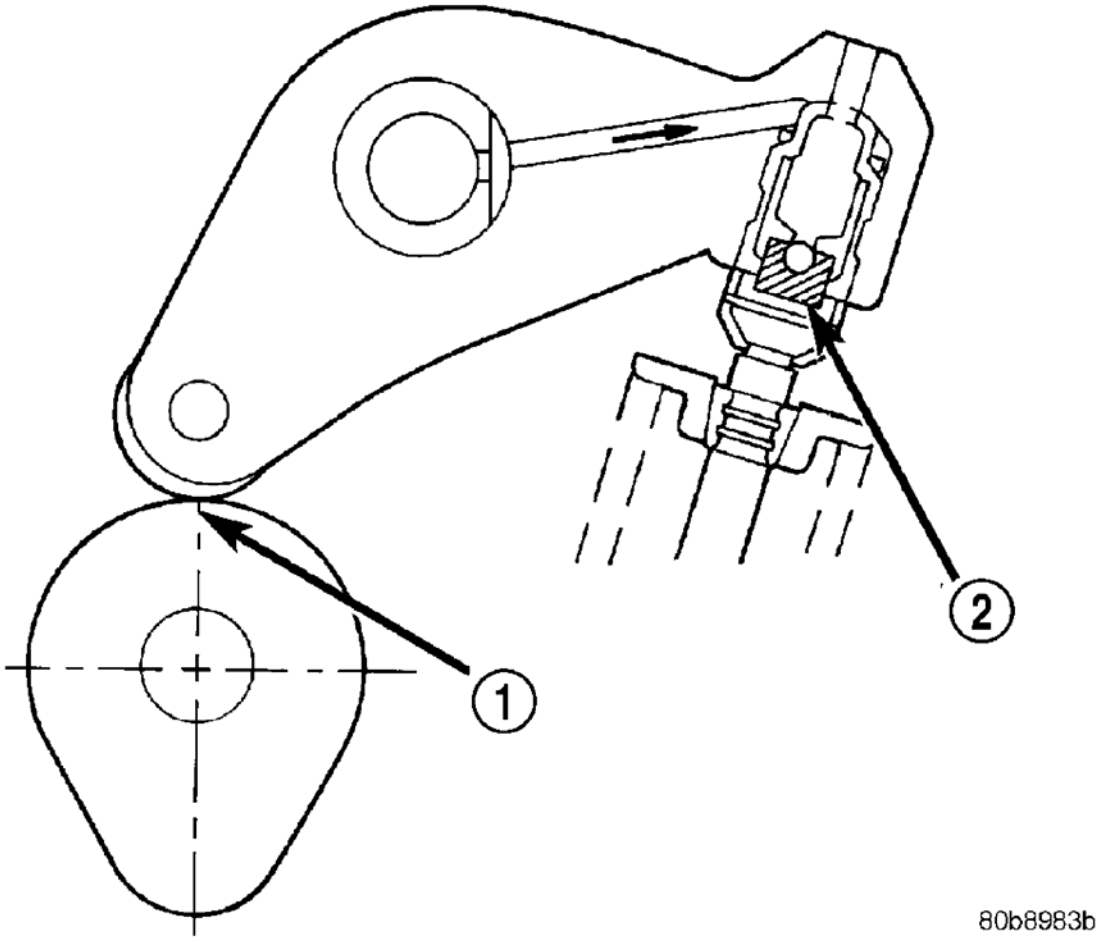

Fig. 155: Rocker Arm Positioned On Base Circle Of Camshaft
Courtesy of CHRYSLER LLC

1 - CAMSHAFT BASE CIRCLE
2 - HIGH-PRESSURE CHAMBER

Use this procedure to manually bleed aerated oil from the lash adjuster and remove sponginess.

1. Run the engine, bringing it to operating temperature in order to freshly pressurize and warm the valvetrain system oil supply.
2. Remove cylinder head cover(s).
3. Ensure the rocker arm is positioned on the base circle (1) of the cam. See **Fig. 155**. Rotate engine as necessary.

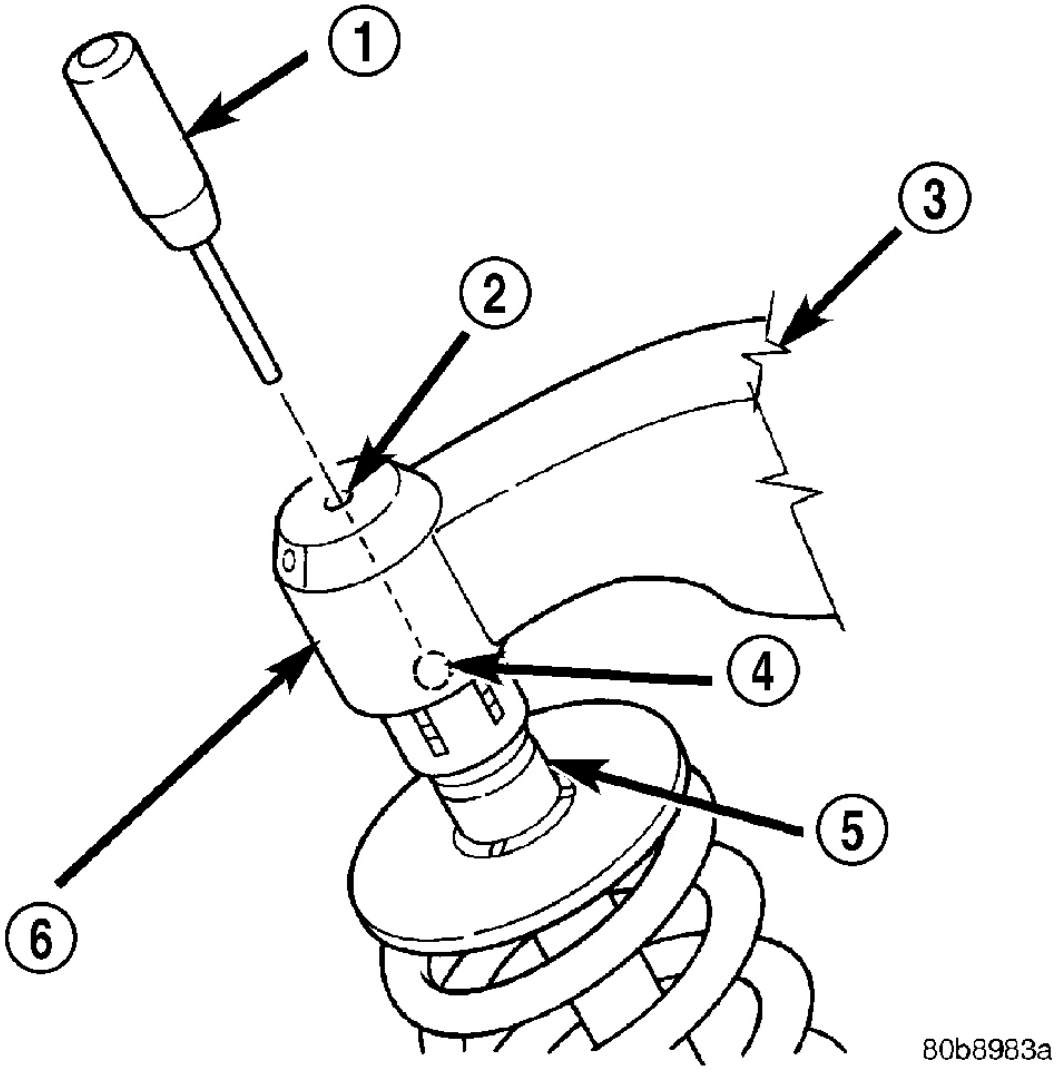

Fig. 156: Special Tool 8351, Service Access Hole, Rocker Arm, Check Ball, Valve Tip & Lash

Adjuster
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 8351 2 - OIL AIR RELIEF SERVICE ACCESS HOLE 3 - ROCKER ARM ASSEMBLY 4 - INTERNAL CHECK BALL 5 - VALVE TIP 6 - HYDRAULIC LASH ADJUSTER WITHIN ROCKER ARM

4. For intake rocker arm positions:
   - Adjust Special Tool 8351 (1) Release Probe's gauge pin to extend approximately 20 mm (0.787 in.). Then, carefully insert the release probe gauge pin into the lash adjuster (6) service access hole (2). See **Fig. 156**.

     CAUTION: If probe tip (1) breaks off within the lash adjuster (6), replace the affected rocker arm (3).

   - Gently unseat lash adjuster's internal check ball (4).
   - While the internal check ball (4) is held unseated, press the rocker arm (3) into the valve tip (5), allowing the lash adjuster (6) to fully collapse. Hold this fully collapsed position for about one second, or longer.
   - Slowly release the rocker arm (3), thereby allowing the (6) to extend, which in turn refills the high pressure chamber with non-aerated oil.
   - Remove probe to allow check ball (4) to seat.
   - Recheck for sponginess. If the lash adjuster (6) sponginess is not completely or nearly eliminated, then repeat procedure.
   - If the spongy condition cannot be removed, replace effected rocker arm(s) (3).
5. For exhaust rocker arm (3) positions:
   - Adjust Special Tool 8351 (1) Release Probe gauge pin to extend approximately 20 mm (0.787 in.). Then, using two release probes, carefully insert gauge pins into the lash adjuster service access holes. See **Fig. 156**.

     CAUTION: If probe tip (1) breaks off within the lash adjuster (6), replace the affected rocker arm (3).

   - Gently unseat BOTH lash adjuster's internal check ball (4) at the same time.
   - While the internal check ball (4) is held unseated, press the rocker arm (6) into the valve tip, allowing the lash adjuster to fully collapse. Hold this fully collapsed position for about one second, or longer.
   - Slowly release the rocker arm (3), thereby allowing the lash adjuster (6) to extend, which in turn

refills the high pressure chamber with non-aerated oil.

- Remove probes (1) to allow check balls (4) to seat.
- Recheck for sponginess. If the lash adjuster (6) sponginess is not completely or nearly eliminated, then repeat procedure.
- If the spongy condition cannot be removed, replace effected rocker arm(s) (3).

6. Install cylinder head cover(s).

REMOVAL

SHAFT -ROCKER ARMS

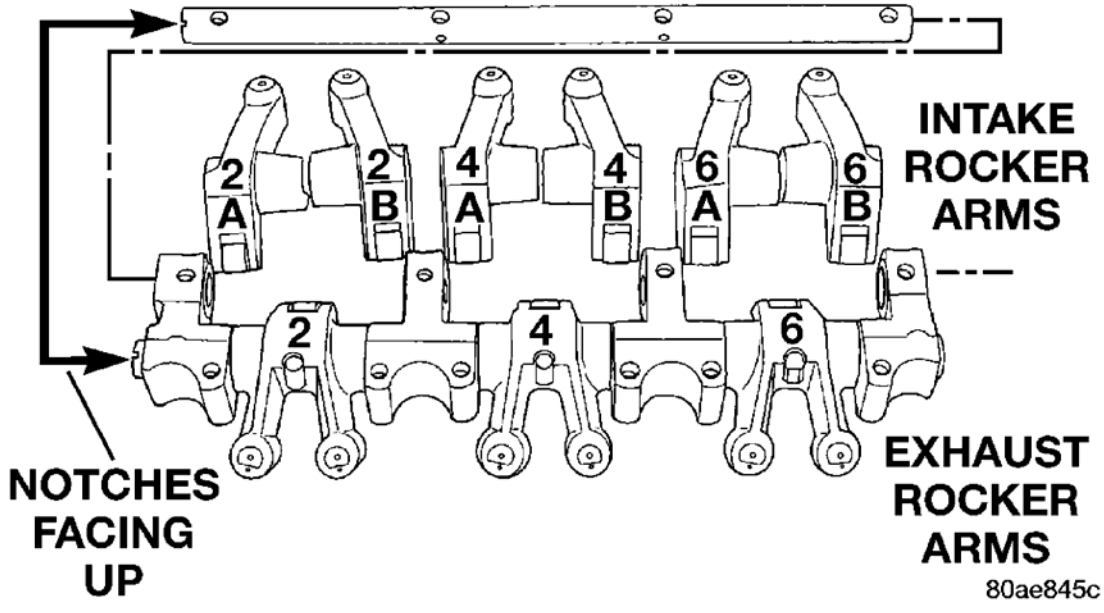

Fig. 157: Rocker Arms & Shafts
Courtesy of CHRYSLER LLC

CAUTION: The rocker arm shafts are hollow and are used as lubrication oil passages. The rocker arm and shaft assembly on the RIGHT side of the engine has an oil passage hole from the cylinder head to the third rocker shaft support. The rocker arm shaft assembly on the LEFT side of the engine has an oil passage hole from the cylinder head to the second rocker shaft support.

1. Remove cylinder head covers. See **REMOVAL**)
2. Identify the rocker arm assembly and rocker arms before disassembly. See **Fig. 157**.
3. Remove rocker arm assembly bolts.
4. Remove rocker arm assembly.

NOTE: To prevent air ingestion into lash adjusters, avoid turning rocker arm assembly upside down.

CAUTION: Do not allow rocker arm assembly to rest on lash adjusters, as damage may occur to lash adjusters and/or plastic retainers.

DISASSEMBLY

SHAFT -ROCKER ARMS

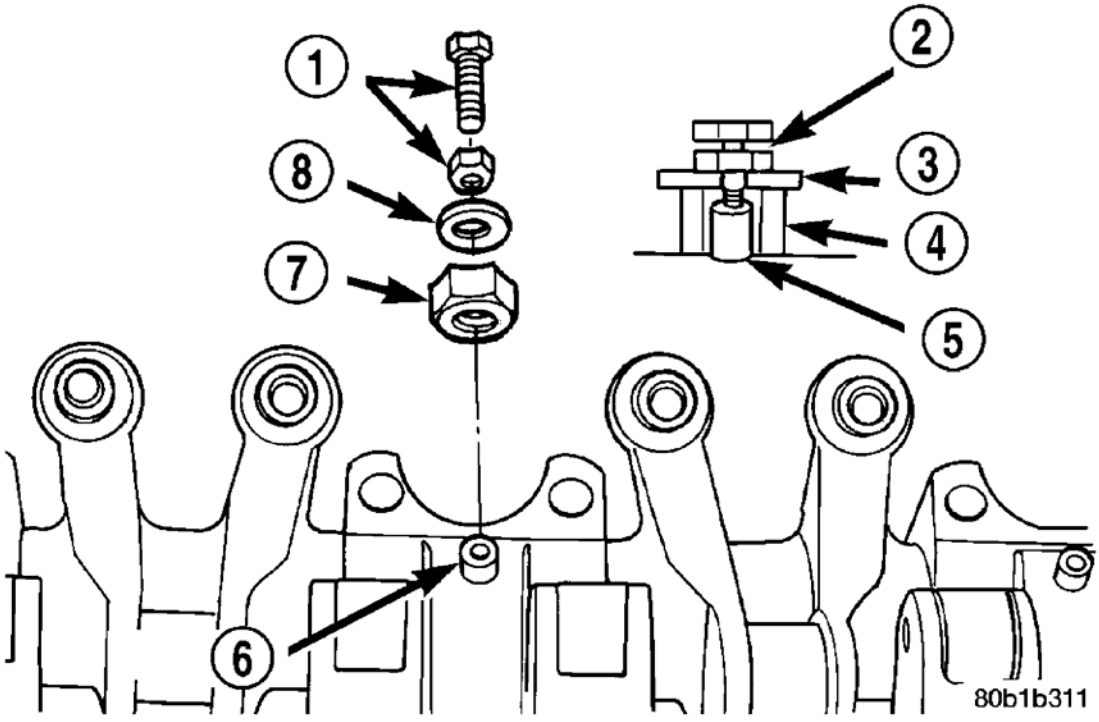

Fig. 158: Rocker Arms & Shaft - Disassembly
Courtesy of CHRYSLER LLC

1 - 4mm SCREW AND NUT
2 - 4mm SCREW AND NUT
3 - WASHER
4 - SPACER
5 - DOWEL
6 - DOWEL
7 - SPACER
8 - WASHER

1. Remove rocker arm and shafts. See **REMOVAL**.

2. Remove dowel pin using a 4 mm screw, nut, spacer, and washer installed into the pin. See **Fig. 158**. Thread the screw into the pin, then loosen the nut on the screw. This will pull the dowel out of the shaft support. Do not reuse dowel pins. Remove the rocker arms and pedestals in order.
3. Check the rocker arm mounting portion of the shafts for wear or damage. Replace if damaged or heavily worn.
4. Check shaft oil holes for clogging with small wire, clean as required.

INSPECTION

SHAFT -ROCKER ARMS

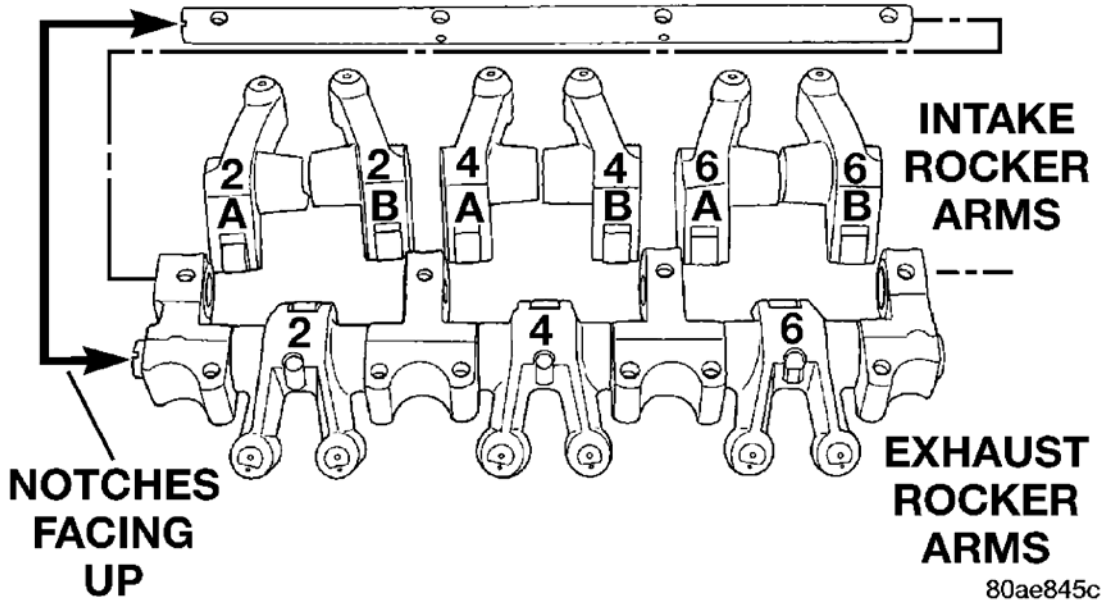

Fig. 159: Rocker Arms & Shafts
Courtesy of CHRYSLER LLC

The rocker arm shafts are hollow and are used as lubrication oil ducts. The rocker arm and shaft assembly on the **right** side of the engine has an oil passage hole from the cylinder head located at the third rocker shaft support pedestal. The rocker arm and shaft assembly on the **left** side of the engine has an oil passage hole from the cylinder head located at the second rocker shaft support pedestal.

NOTE: To prevent air ingestion into lash adjusters, avoid turning rocker arm assembly upside down.

CAUTION: Do not allow rocker arm assembly to rest on lash adjusters, as damage may occur to lash adjuster and plastic retainer.

The intake and exhaust rocker arms are different. They should be identified before disassembling the assembly.

See **Fig. 159**.

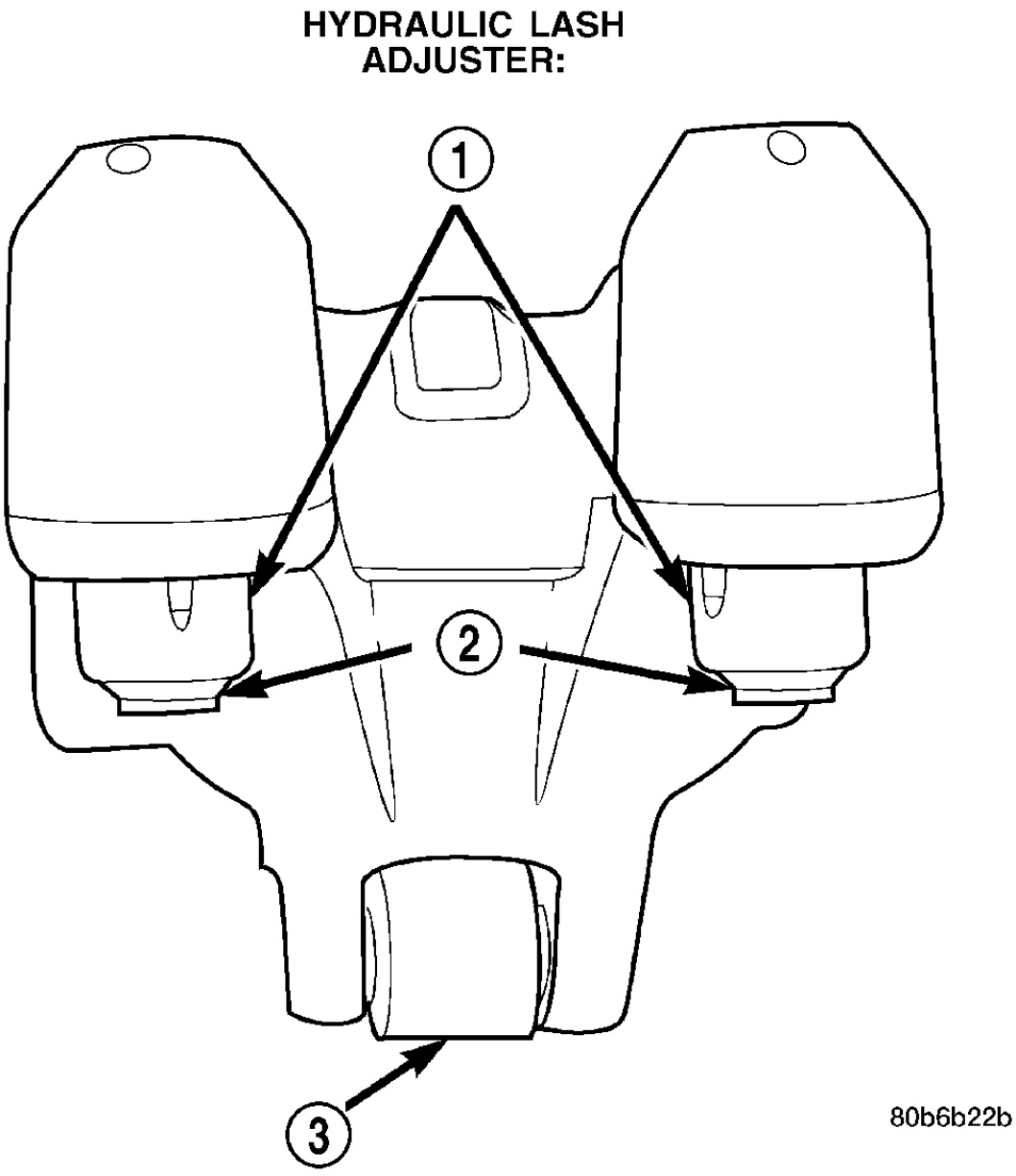

Fig. 160: Rocker Arm Assembly
Courtesy of CHRYSLER LLC

1 - RETAINER
2 - SWIVEL PAD
3 - ROLLER

Check rocker arms for wear or damage. See **Fig. 160**:

Roller scuffing or wear
Shaft bore scuffing or wear
Swivel pad on lash adjuster missing or broken
Rocker arm showing signs of fatigue or cracking
Roller axle protruding from arm

Replace assembly as necessary if any rocker arms shows signs of wear.

CAUTION: Do Not remove lash adjuster from rocker arm assembly. Damage to the adjuster and rocker arm will result.

ASSEMBLY

SHAFT -ROCKER ARMS

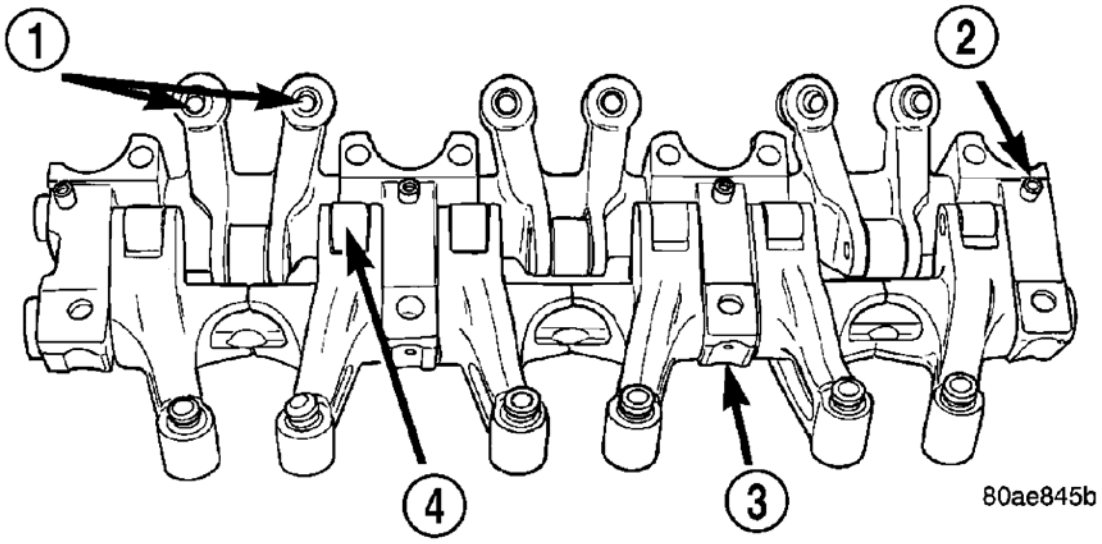

Fig. 161: Hydraulic Lash Adjusters, Dowel Pin, Pedestal & Roller
Courtesy of CHRYSLER LLC

1 - HYDRAULIC LASH ADJUSTERS
2 - DOWEL PIN
3 - PEDESTAL
4 - ROLLER

CAUTION: New dowel pins must be installed when reassembling.

1. Install the rocker arms, and pedestals (3) onto the shaft.
2. Install dowel pins (2). See **Fig. 161**. Dowel pins (2) pass through the pedestal (3) into the exhaust rocker shafts. Dowel pins (2) should be pressed in until they bottom-out against the rocker shaft in the pedestal (3).
3. Install rocker arm and shafts. See **INSTALLATION**.

INSTALLATION

SHAFT -ROCKER ARM

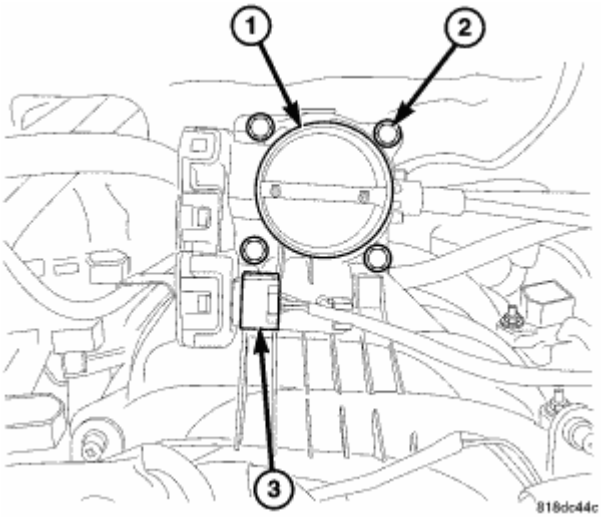

Fig. 162: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

NOTE: Rocker arm and shaft assembly can be installed either prior to or after (preferred) cylinder head installation.

1. Rotate camshaft gears to the position shown in (1,8,9). See **Fig. 162**. With the camshaft gears in these positions the lobes are in a neutral position (no load to the valve). This will allow the rocker arm shaft assembly to be tightened into position with little or no valve spring load on it.

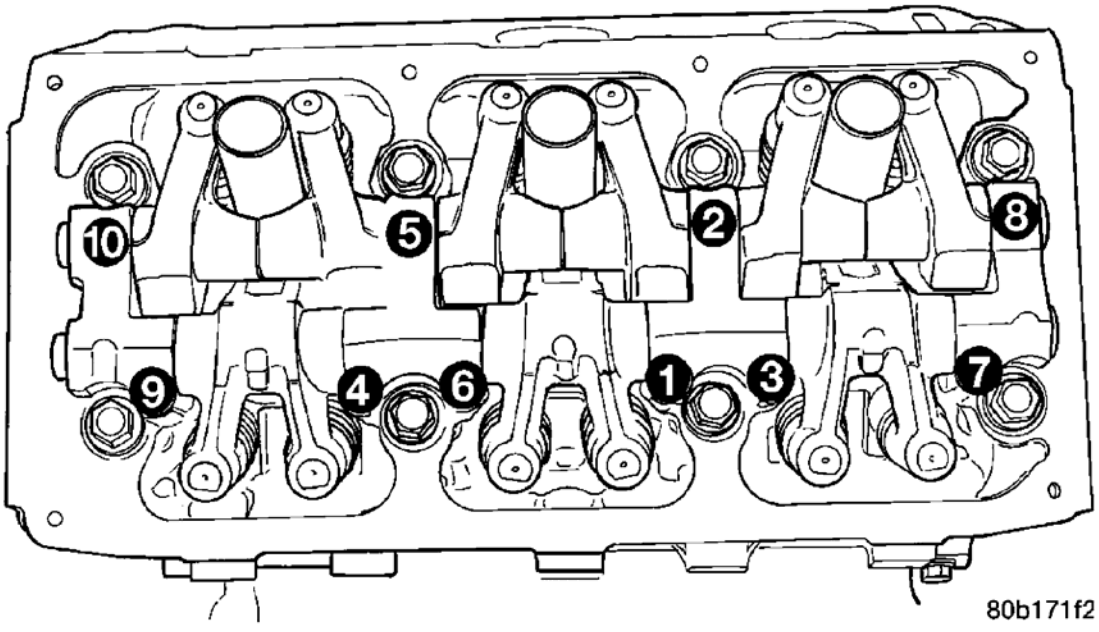

Fig. 163: Rocker Arm/Shaft Assembly Bolts Tightening Sequence
Courtesy of CHRYSLER LLC

2. Install the rocker arm and shaft assembly making sure that the identification marks face toward the front of engine for left head and toward the rear of the engine for right head.
3. Tighten rocker arm/shaft assembly bolts in sequence to 31 N.m (275 in. lbs.). See **Fig. 163**.
4. Install cylinder head covers. See **INSTALLATION**).

TUBE -SPARK PLUG

REMOVAL

TUBE -SPARK PLUG

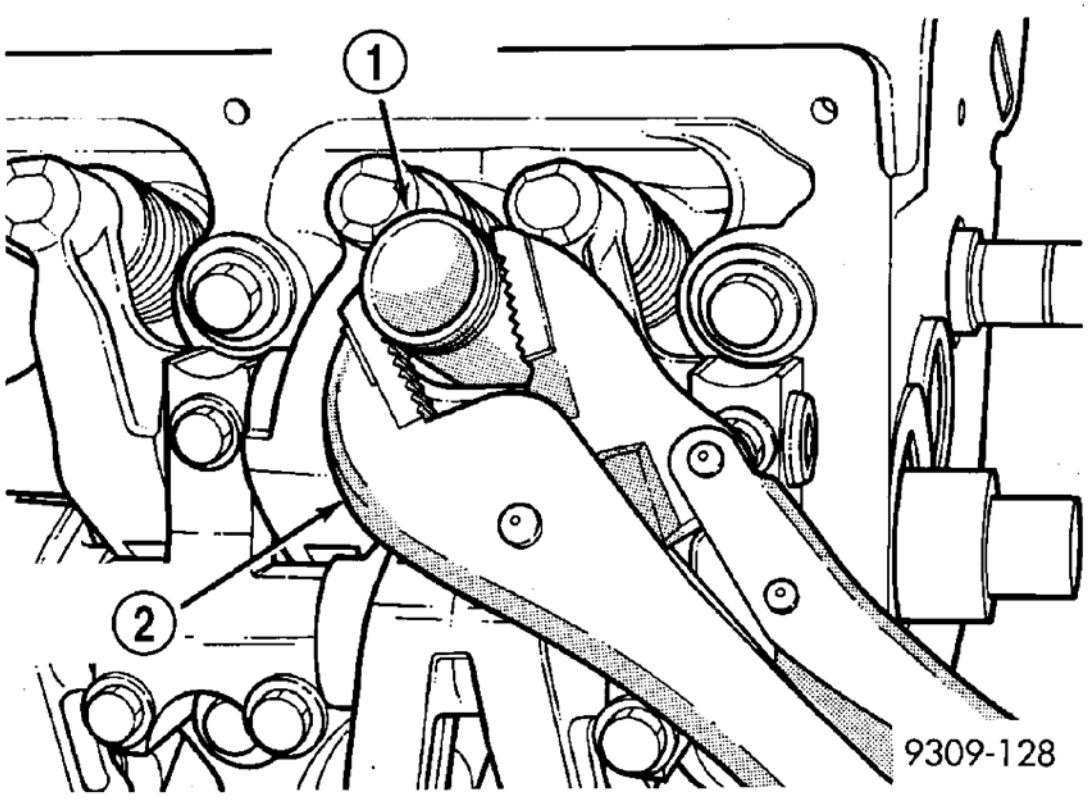

Fig. 164: Using Suitable Locking Pliers To Remove Tube From Cylinder Head
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE 2 - LOCKING PLIERS

1. Remove cylinder head cover(s). See **REMOVAL**.
2. Using suitable locking pliers, remove the tube from the cylinder head and discard tube. See **Fig. 164**.
3. Clean area around spark plug with Mopar® Parts Cleaner or equivalent.

INSTALLATION

TUBE -SPARK PLUG

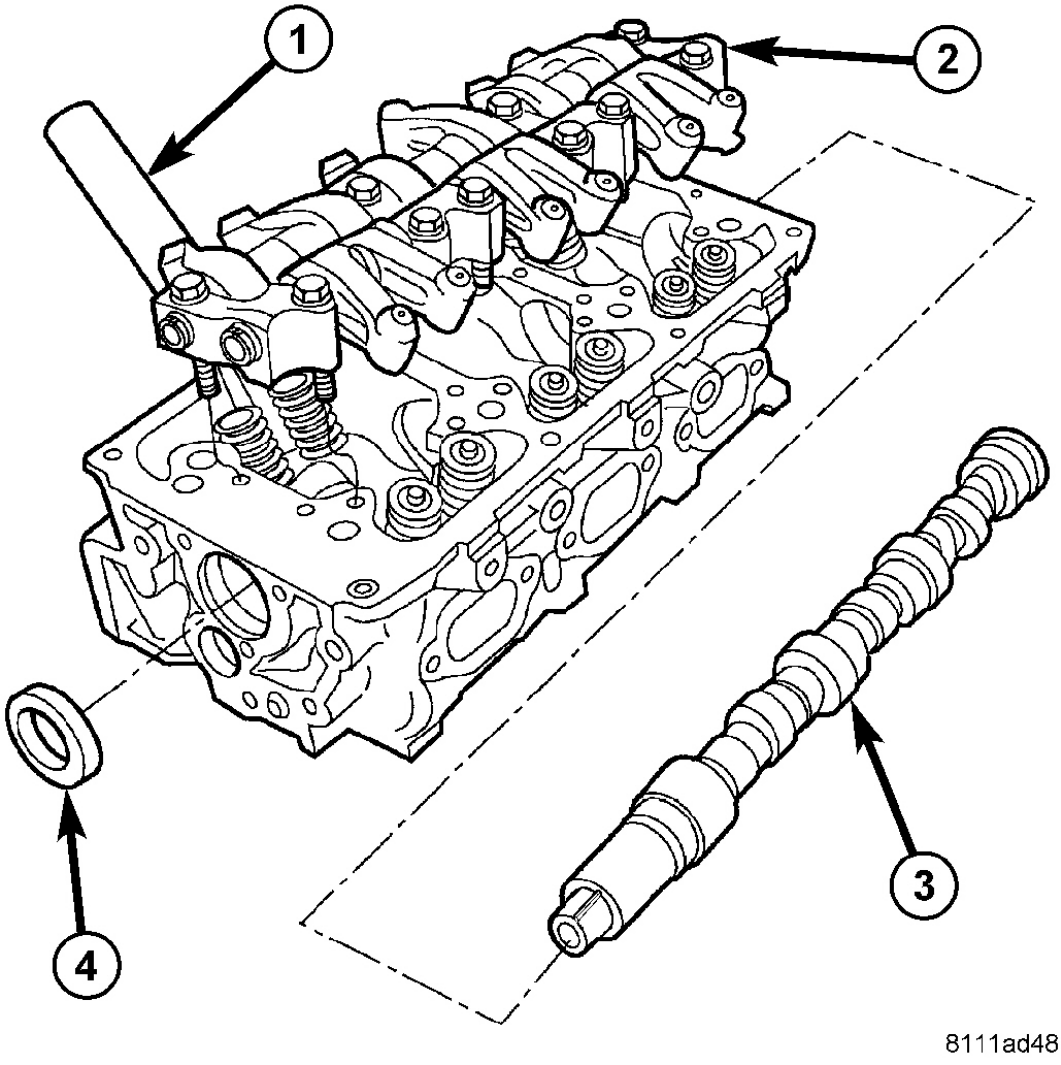

Fig. 165: Camshaft, Rocker Arm Assembly & Cylinder Head
Courtesy of CHRYSLER LLC

1 - SPARK PLUG TUBE
2 - ROCKER ARM ASSEMBLY
3 - CAMSHAFT
4 - CAMSHAFT SEAL

1. Apply Mopar® Stud and Bearing Mount to a new tube (1) approximately 1 mm (0.039 in.) from the end of tube, in a 3 mm (0.118 in.) wide area. See **Fig. 165**.
2. Install sealer end of tube (1) into the cylinder head. Then carefully install the tube (1) using a hardwood block and mallet. Install the tube (1) until it is seated into the bottom of the bore.

3. For spark plug tube (1) seal replacement, see **REMOVAL**).
4. Install cylinder head cover(s). See **INSTALLATION**

SEAL -VALVE STEM

REMOVAL

SEAL -VALVE STEM

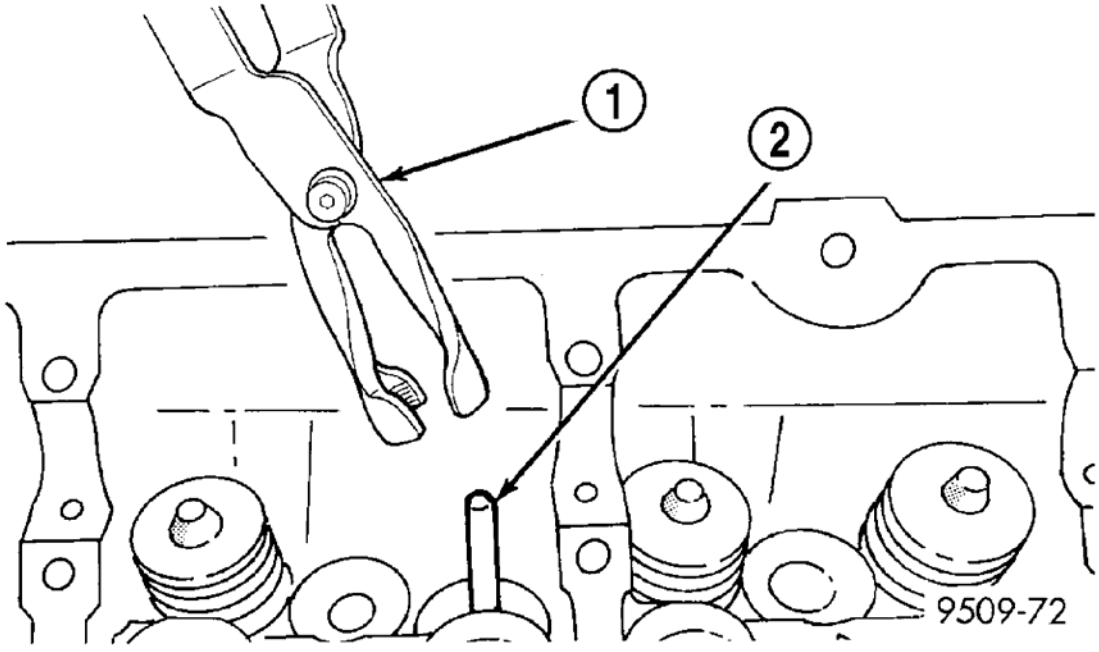

Fig. 166: Removing Valve Stem Seals By Using Valve Stem Seal Tool
Courtesy of CHRYSLER LLC

1 - VALVE SEAL TOOL 2 - VALVE STEM

1. Remove valve spring. See **REMOVAL**.
2. Remove valve stem seals by using a valve stem seal tool. See **Fig. 166**.

INSTALLATION

SEAL -VALVE STEM

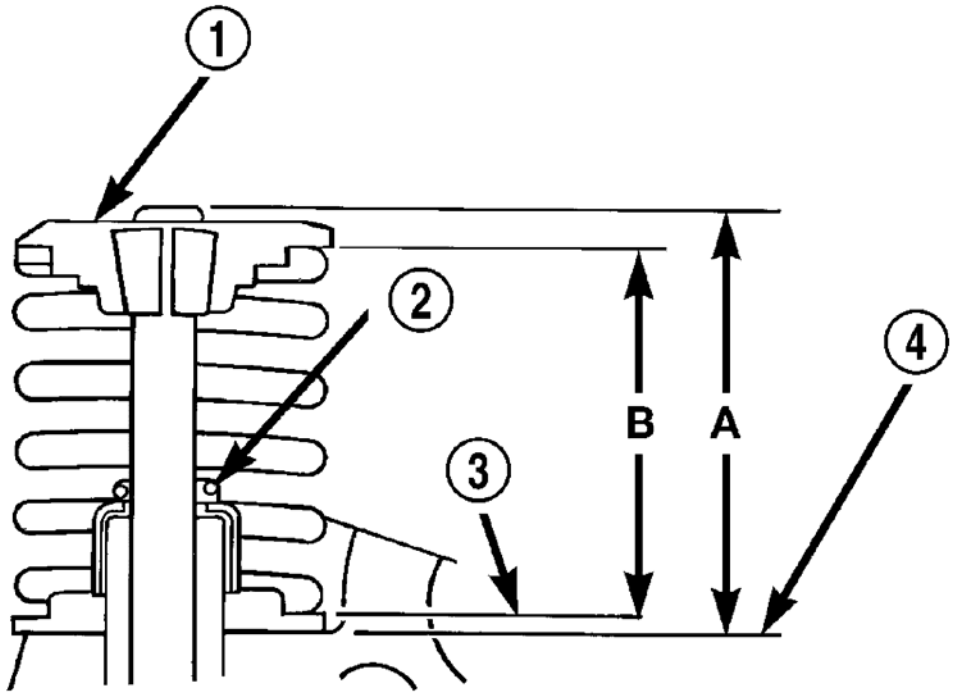

Fig. 167: Checking Valve Tip Height & Valve Spring Installed Height
Courtesy of CHRYSLER LLC

1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE

1. The valve stem seal/valve spring seat should be pushed firmly and squarely over the valve guide using the valve stem as guide. **Do Not Force** seal against top of guide. When installing the valve retainer locks, compress the spring **only enough** to install the locks.

CAUTION: Do not remove garter spring (2) around the seal at the top of the valve stem seal. See Fig. 167.

2. Install valve spring. See **INSTALLATION**.

SPRING -VALVE

DESCRIPTION

VALVE SPRING

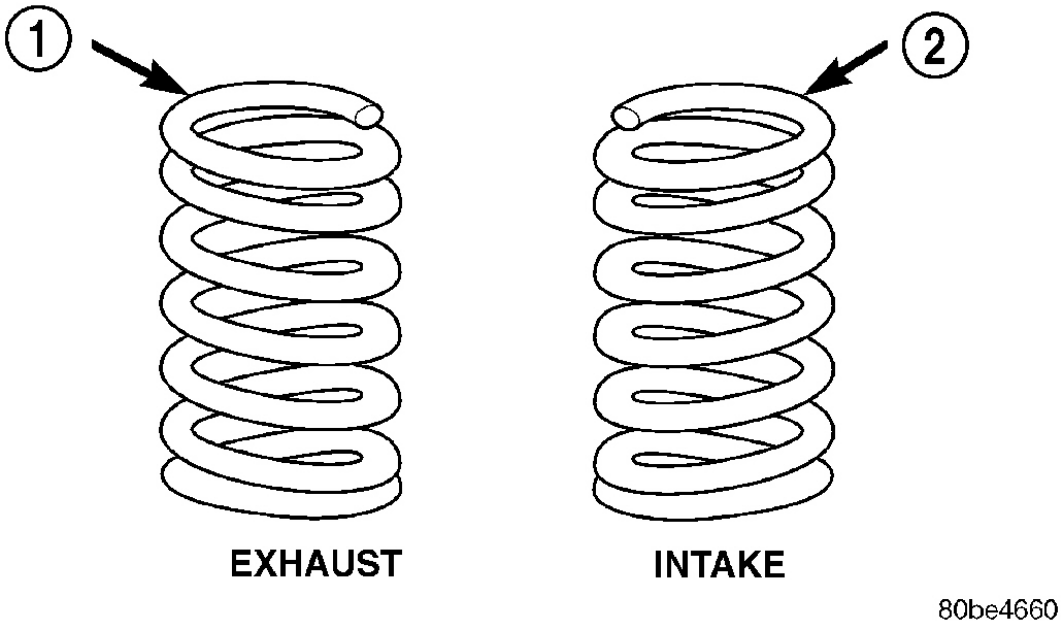

Fig. 168: Valve Spring Identification
Courtesy of CHRYSLER LLC

1 - YELLOW OR WHITE DYE 2 - ORANGE DYE

The valve springs are made from chrome silicon alloy wire and incorporate a "bee-hive" design. Valve spring retainers and locks are common from valve-to-valve. The valve spring seat is integral with the valve stem oil seal, which incorporates a garter spring to maintain consistent lubrication control to the valve stem.

The valve springs are unique for intake compared to exhaust. Both have different lengths and are wound in opposite directions. The valve springs are color coded, intake spring is right hand coil direction with orange dye on the top coils, and the exhaust spring is left hand coil direction with a yellow or white dye on the top coils. See **Fig. 168**.

The exhaust spring with the white dye on the top of the coils has an increased open and closed load when compared to the exhaust spring with the yellow dye. A yellow and a white exhaust valve spring **should never** be used on a single forked rocker arm. Color coated exhaust springs should always be used in pairs for a forked exhaust rocker springs.

OPERATION

VALVE SPRING

The valve spring returns the valve against its seat for a positive seal of the combustion chamber.

REMOVAL

VALVE SPRING - CYLINDER HEAD ON

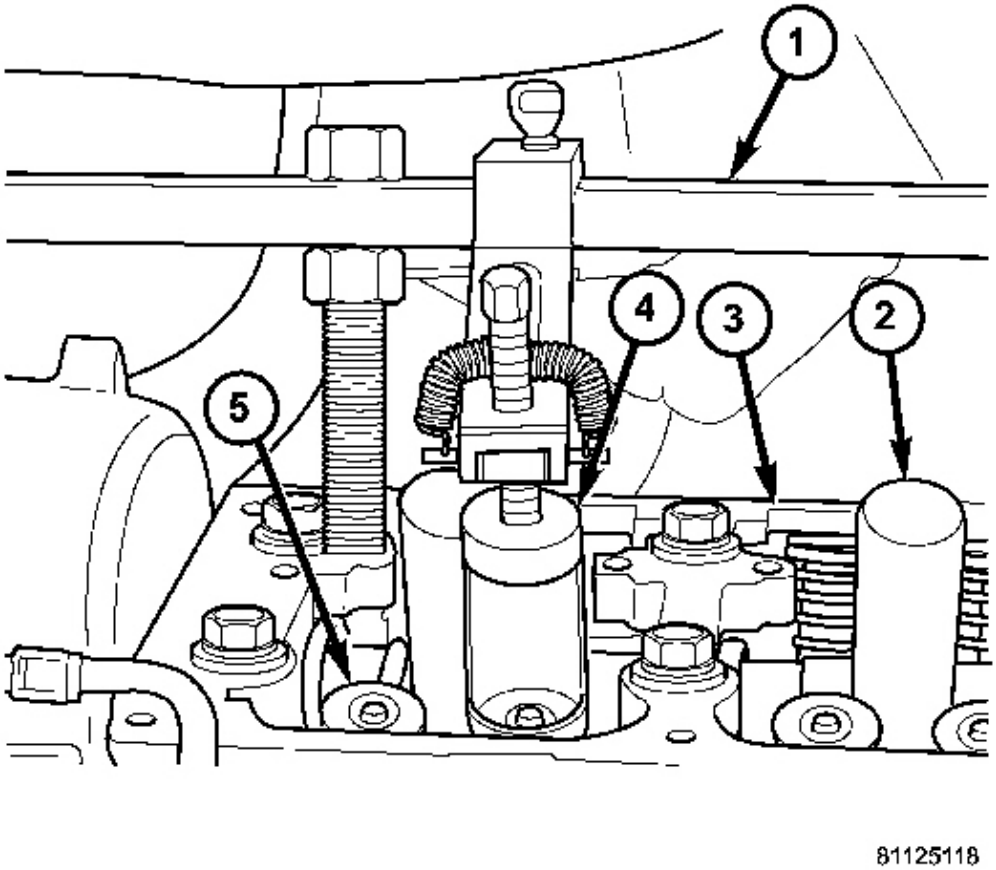

Fig. 169: MD 998772A, Spark Plug Tubes, Cylinder Head, 6527 - Adaptor & Valve Spring Retainer
Courtesy of CHRYSLER LLC

1 - MD 998772A
2 - SPARK PLUG TUBES
3 - CYLINDER HEAD
4 - 6527 - ADAPTOR
5 - VALVE SPRING RETAINER

1. Disconnect negative battery cable.
2. Remove upper intake manifold. See **REMOVAL**.
3. Remove cylinder head cover(s). See **REMOVAL**.
4. Remove rocker arm and shaft assembly. See **REMOVAL**.
5. Remove spark plugs.
6. Rotate the crankshaft clockwise, until the number 1 piston is at Top Dead Center (TDC) on the compression stroke.
7. With air hose attached to spark plug adapter installed in number 1 spark plug hole, apply 620.5 to 689 kPa (90 to 100 psi) air pressure. This is to hold valves into place while servicing components.
8. Using Tool MD 998772A (1) with adapter 6527 (4) or equivalent, compress valve spring and remove valve locks (5). Release tension on valve spring, remove retainer (5) and valve spring. See **SPECIAL TOOLS**. . See **Fig. 169**.
9. Remove valve stem seal, if required. See **REMOVAL**.
10. Follow the same procedure on the remaining 5 cylinders using the firing sequence 1-2-3-4-5-6. **Make sure piston is at TDC in each cylinder of the valve spring that is being removed.**
11. Remove spark plug adapter tool.

VALVE SPRING - CYLINDER HEAD OFF

1. Compress valve spring with valve spring compressor C-3422-D and adapter 6526. See **SPECIAL TOOLS**.
2. Remove valve retaining locks. Release valve spring compressor. Remove valve spring retainer and valve spring.
3. Remove valve stem seal assembly. See **REMOVAL**.

INSPECTION

VALVE SPRING - INSPECTION

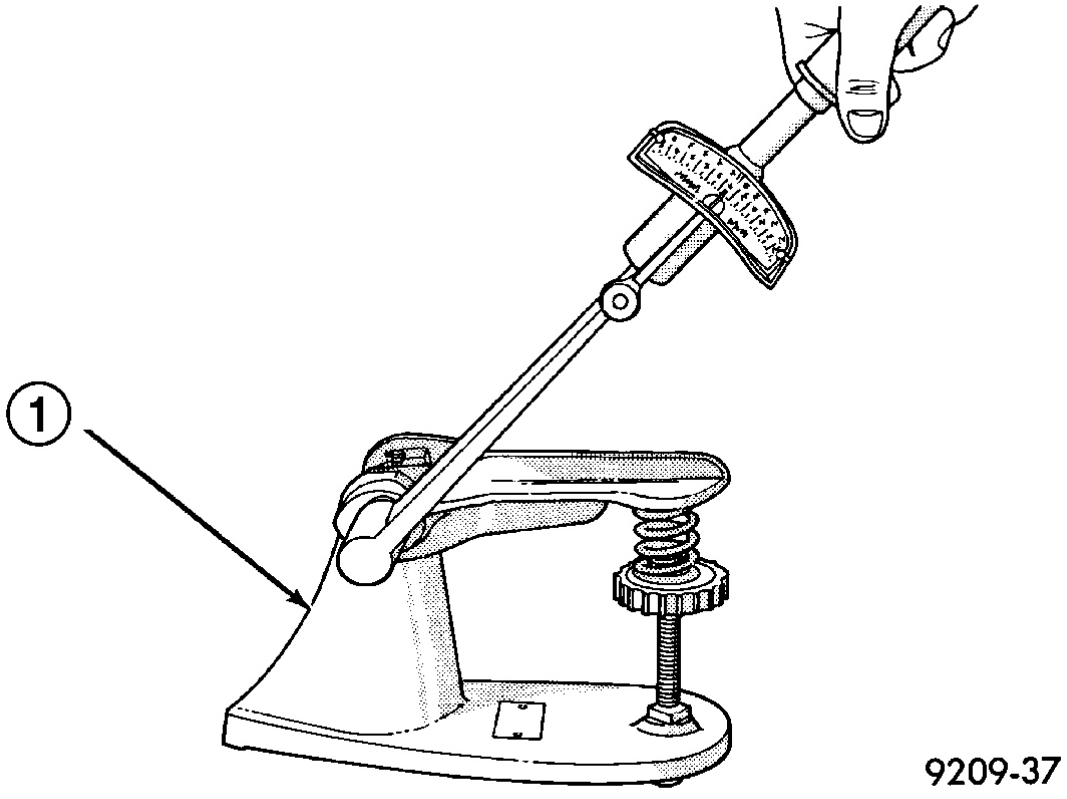

Fig. 170: Testing Valve Spring
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL C-647

When valves have been removed for inspection, reconditioning or replacement, valve springs should be tested. See **Fig. 170**. **As an example;** the compression length of the spring to be tested is 38.00 mm (1.496 in.). Turn table of Tool C-647 until surface is in line with the 38.00 mm (1.496 inches.) mark on the threaded stud and the zero mark on the front. Place spring over stud on the table and lift compressing lever to set tone device. Pull on torque wrench until ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Engine Specifications to obtain specified height and allowable tensions. See **SPECIFICATIONS**. Replace springs that do not meet specifications.

INSTALLATION

VALVE SPRING - CYLINDER HEAD OFF

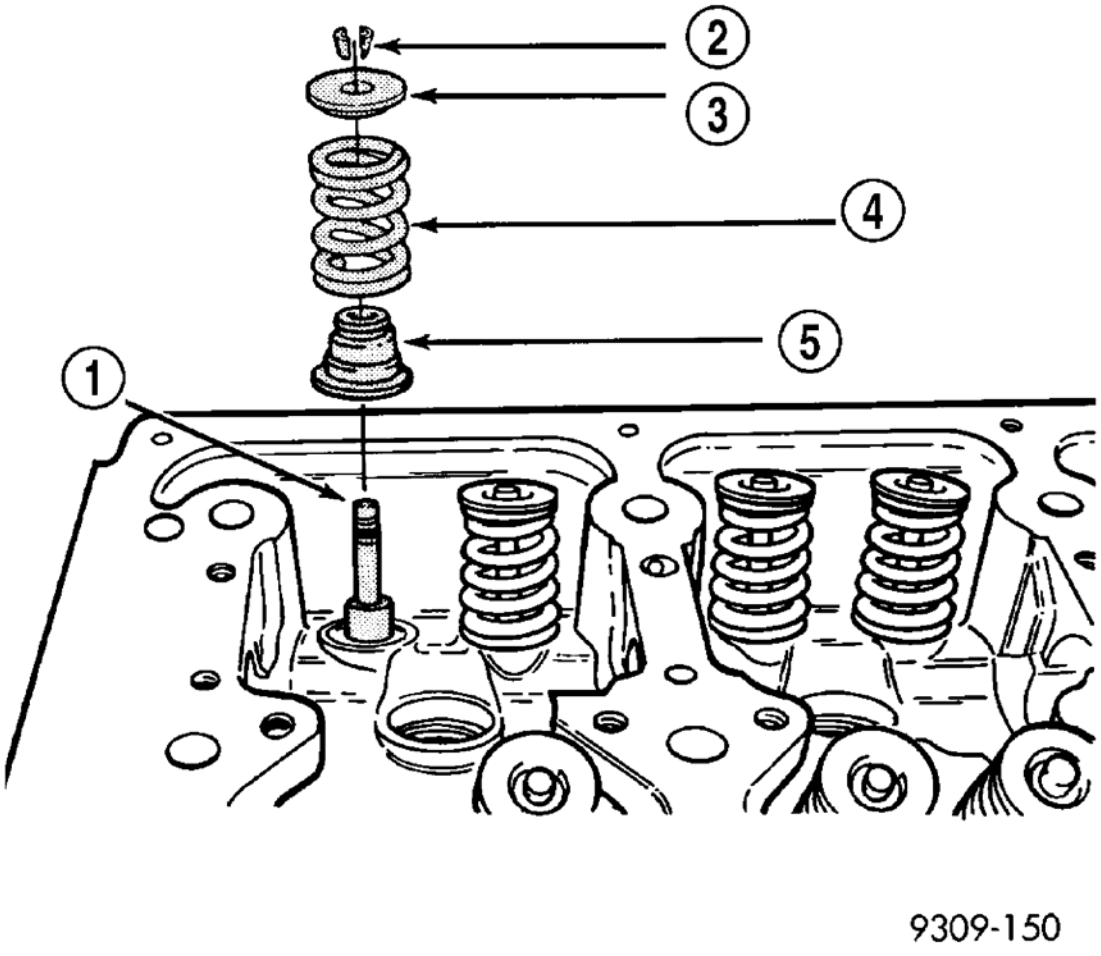

Fig. 171: Valve, Valve Retaining Locks, Valve Spring Retainer, Valve Spring & Valve Seal/Valve Spring Seat Assembly
Courtesy of CHRYSLER LLC

1 - VALVE
2 - VALVE RETAINING LOCKS
3 - VALVE SPRING RETAINER
4 - VALVE SPRING
5 - VALVE SEAL AND VALVE SPRING SEAT ASSEMBLY

1. Install valves if removed.
2. Install valve stem seal/spring seat assembly (5) over valve guides on all valve stems. See **Fig. 171**. Ensure that the garter spring is intact around the top of the rubber seal.
3. Place valve spring (color-coded end facing up) (4) and valve retainer into position.

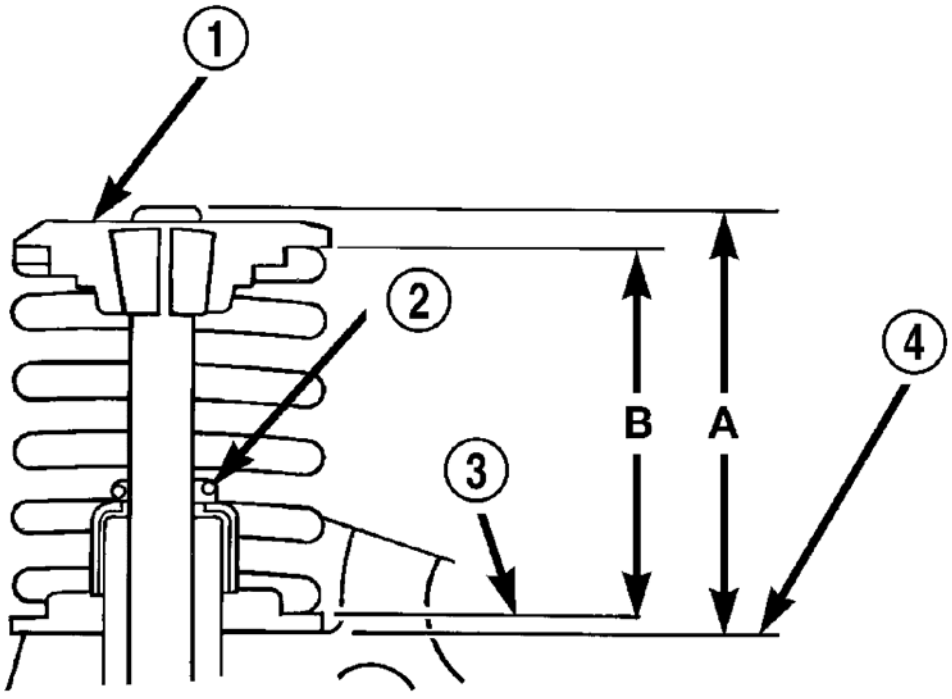

Fig. 172: Spring Retainer, Garter Spring, Valve Spring Seat Top & Cylinder Head Surface
Courtesy of CHRYSLER LLC

1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE

4. Compress valve spring with valve spring compressor. Install locks and release tool. **If valve and/or seat are reground, measure the installed height of springs (B), 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 (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve spring seat to bring spring height back within specification. See **Fig. 172**.

SPRING -VALVE - CYLINDER HEAD ON

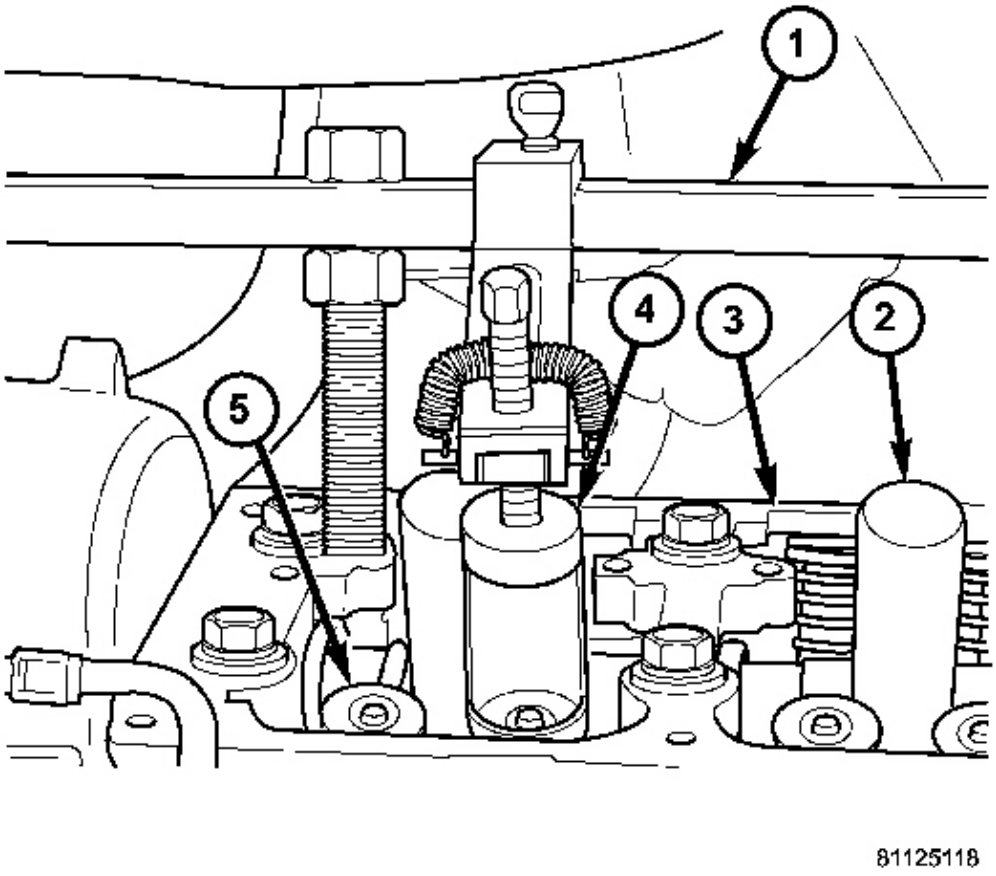

Fig. 173: MD 998772A, Spark Plug Tubes, Cylinder Head, 6527 - Adaptor & Valve Spring Retainer
Courtesy of CHRYSLER LLC

1 - MD 998772A
2 - SPARK PLUG TUBES
3 - CYLINDER HEAD
4 - 6527 - ADAPTOR
5 - VALVE SPRING RETAINER

1. Install new valve seal(s) if required. See **INSTALLATION**.
2. Place valve spring (color-coded end facing up) and valve retainer into position.
3. Compress valve spring using Special Tool MD 998772A (1) with Adaptor 6527 (4) only enough to install locks (5). See **Fig. 173**.

4. After installing locks, release tension on valve spring and verify proper installation.
5. Remove Special Tool MD 998772A (1) and spark plug adapter tool.
6. Install rocker arm and shaft assembly. See **INSTALLATION**.
7. Install cylinder head cover(s). See **INSTALLATION**).
8. Install spark plugs.
9. Install upper intake manifold. See **INSTALLATION**.
10. Connect negative battery cable.

CYLINDER BLOCK

DESCRIPTION

BLOCK-CYLINDER

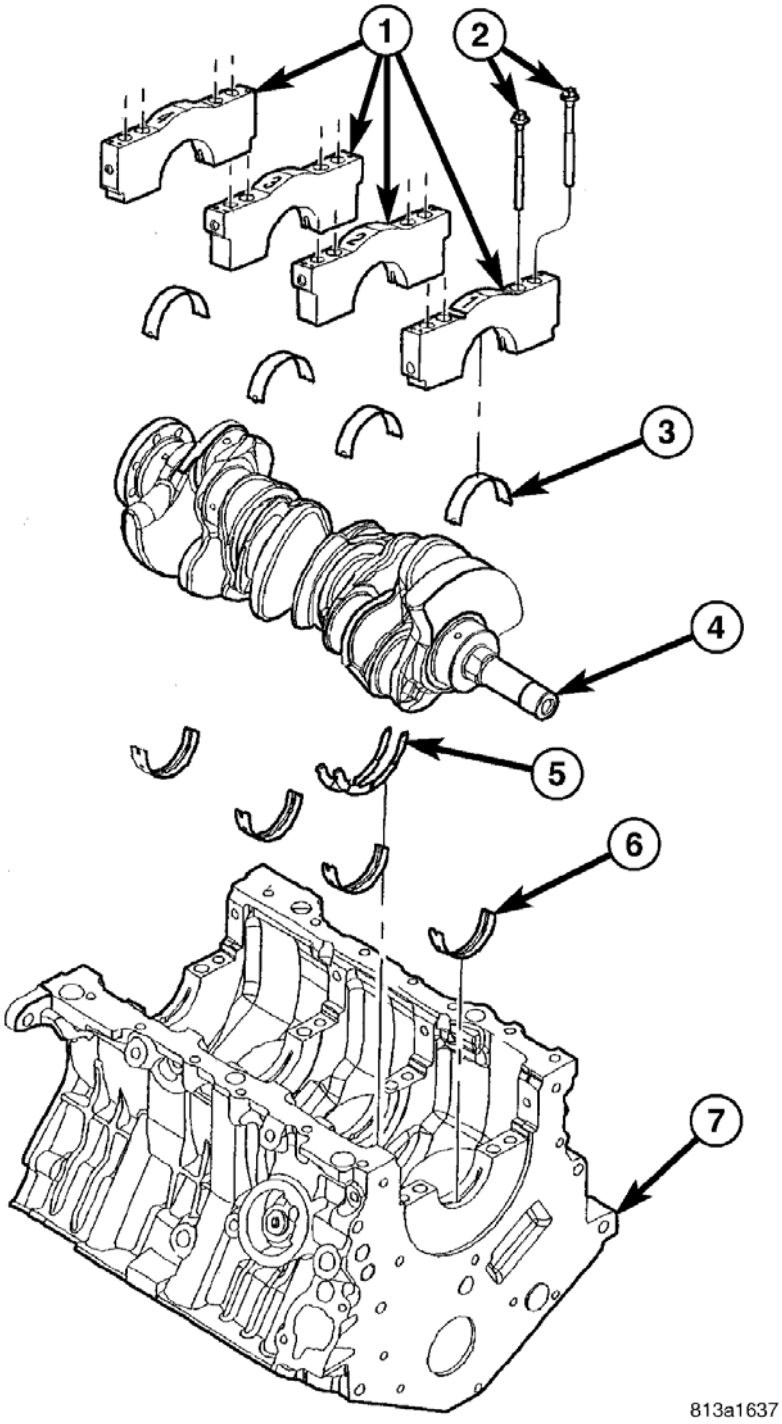

Fig. 174: Main Caps, Bolts, Main Bearing-Lower, Crankshaft, Thrust Washers, Main Bearing-Upper & Engine Block
Courtesy of CHRYSLER LLC

1 - MAIN CAPS
2 - BOLTS
3 - MAIN BEARING-LOWER
4 - CRANKSHAFT
5 - THRUST WASHERS
6 - MAIN BEARING-UPPER
7 - ENGINE BLOCK

The cylinder block is made of heat treated aluminum with cast-in-place iron liners. The block is a closed deck design with the right bank forward. To provide high rigidity and improved noise, vibration and harshness (NVH), the block has cast-in contours and ribs, along with powdered metal 6 bolt main caps (4 vertical, 2 horizontal), with a die cast aluminum structural beam windage tray mounted to the main caps. See **Fig. 174**.

CLEANING

BLOCK-CYLINDER

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

BLOCK-CYLINDER

ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, see **ENGINE CORE AND OIL GALLERY PLUGS**.
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

CYLINDER BORE

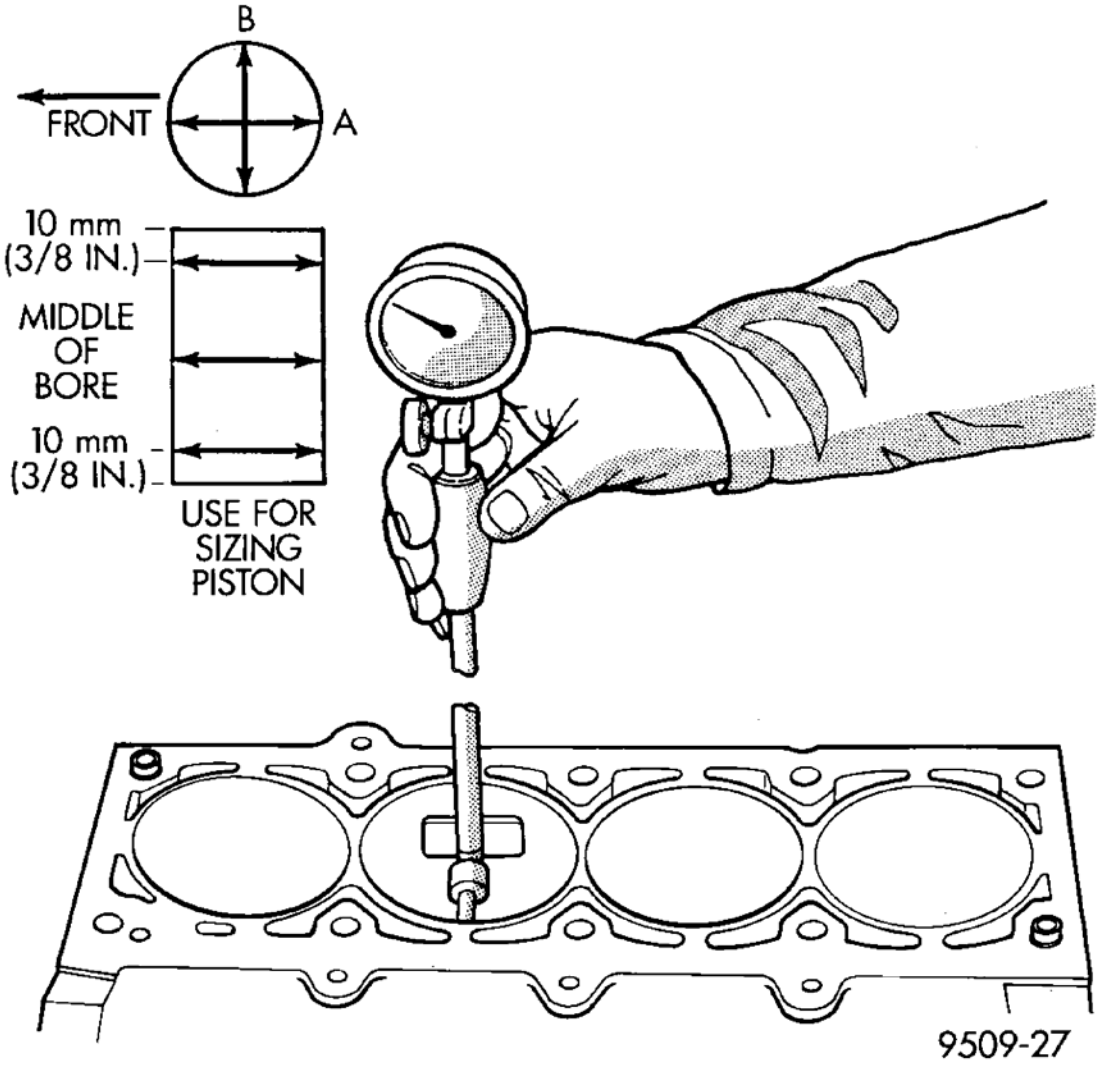

Fig. 175: Cylinder Bore Measurement
Courtesy of CHRYSLER LLC

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

The cylinder walls should be checked for out-of-round and taper with Tool C119 cylinder bore gauge, or equivalent. See **Fig. 175**. See **SPECIFICATIONS**. If the cylinder walls are badly scuffed 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. See **Fig. 175**. 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. See **SPECIFICATIONS**.

BEARING -CONNECTING ROD

STANDARD PROCEDURE

CONNECTING RODS AND BEARINGS

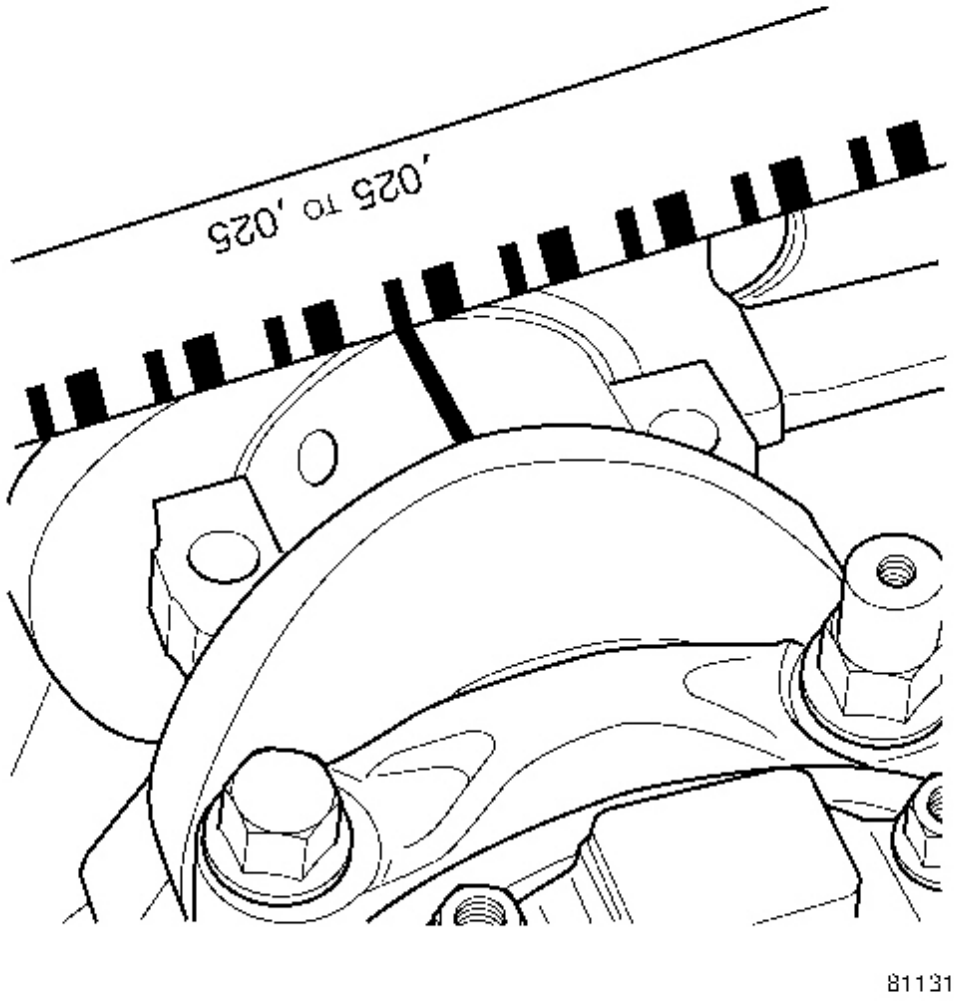

Fig. 176: Connecting Rod Bearing Clearance
Courtesy of CHRYSLER LLC

CAUTION: The bearing caps are not interchangeable and should be paint marked or scribed at removal to insure correct assembly. DO NOT use a metal stamp.

The bearing shells must be installed with the tangs inserted into the machined grooves in the rods and caps.

Install cap with the tangs on the same side as the rod.

Fit all rods on one bank until complete.

Limits of out-of-round on any crankshaft journals should be held to 0.008 mm (0.0003 in.). Bearings are available in standard, 0.025 mm (0.001 in.), and 0.254 mm (0.010 in.) undersizes. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

1. For measuring main bearing clearance and connecting rod bearing clearance use plastigage. See **Fig. 176**. For more information on using plastigage. See **STANDARD PROCEDURE**. Refer to Engine Specifications for bearing clearance specifications . See **SPECIFICATIONS**.

NOTE: The rod bearing bolts should be examined before reuse. If the threads are necked down the bolts must be replaced. See Fig. 177.

CONNECTING ROD BOLTS

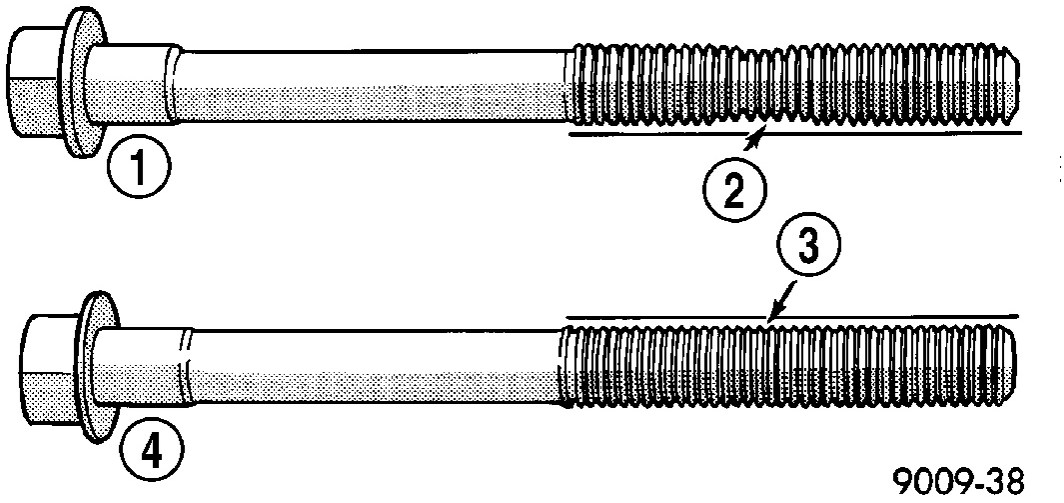

Fig. 177: Examining Connecting Rod Bolts For Stretching
Courtesy of CHRYSLER LLC

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

1. Examine connecting rod bolts for stretching (1). Stretching (1) can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt must be replaced.
2. Before installing the bolts the threads should be cleaned and inspected.

3. Install clean bolts finger tight. Then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod cap bolts to specification. See **SPECIFICATIONS**.

CONNECTING ROD SIDE CLEARANCE

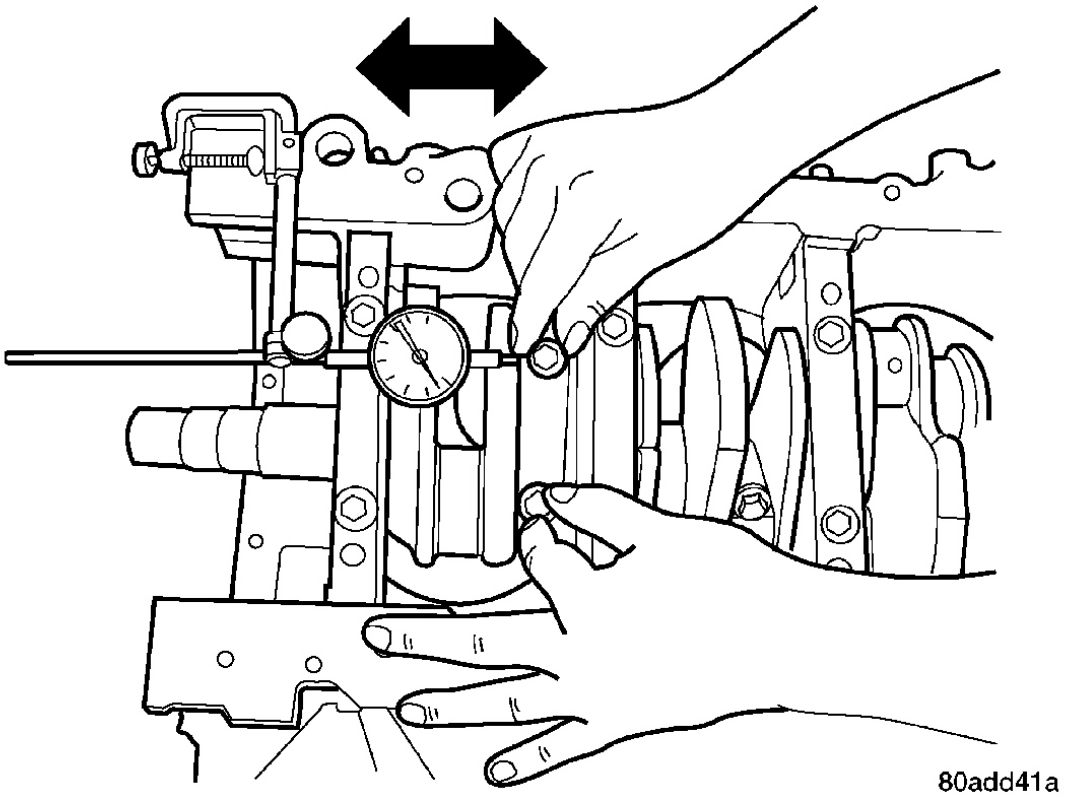

Fig. 178: Connecting Rod Side Clearance Measuring
Courtesy of CHRYSLER LLC

1. Mount a dial indicator to a stationary point on engine. Locate probe perpendicular to and resting against the connecting rod cap being checked. Move connecting rod all the way to rear of its travel. Zero the dial indicator. Move connecting rod forward to limit of travel and read the dial indicator. See **Fig. 178**. Compare measurement to specification listed in engine specifications. See **SPECIFICATIONS**. Repeat procedure for each connecting rod. Turn crankshaft for connecting rod accessibility.

CRANKSHAFT

DESCRIPTION

CRANKSHAFT

The crankshaft is constructed of a forged micro alloy steel. A six throw, nine counterweight crankshaft is

supported by four select fit main bearings with number two serving as the thrust washer location. The six separate connecting rod throws are an even-firing design which reduces torque fluctuations while a torsional vibration damper is used to control torsion caused vibration of the crankshaft. Rubber lipped seals are used at front and rear. The front seal is retained in the oil pump case and the rear seal is retained in a block-mounted housing.

OPERATION

CRANKSHAFT

The crankshaft transfers force generated by combustion within the cylinder to the flywheel or flexplate.

REMOVAL

CRANKSHAFT - REMOVAL

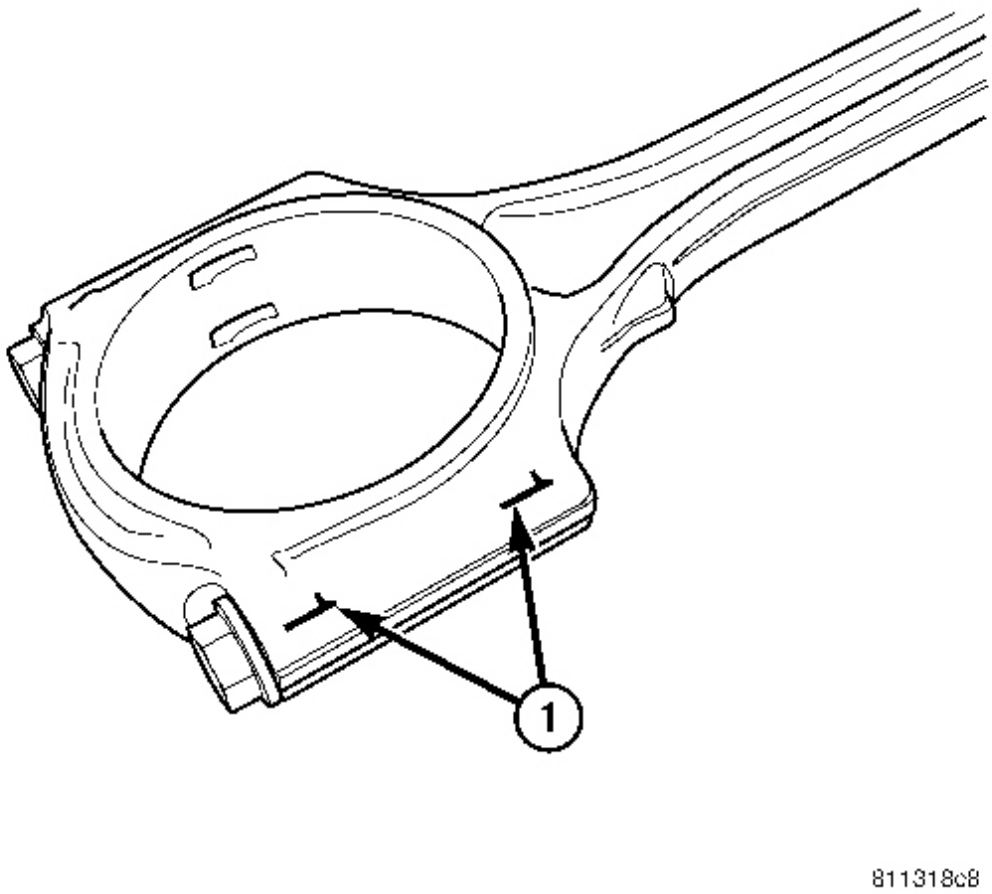

Fig. 179: Connecting Rod to Cylinder Identification
Courtesy of CHRYSLER LLC

1 - PAINT MARK OR SCRIBE

1. Remove engine from vehicle. See **REMOVAL**.
2. Remove oil pan. See **REMOVAL**.
3. Remove oil pickup tube.
4. Remove front timing belt cover. See **REMOVAL**.
5. Remove timing belt and tensioner. See **REMOVAL**.
6. Remove crankshaft sprocket. See **REMOVAL**.
7. Tap dowel pin out of crankshaft.

8. Remove oil pump assembly. See **REMOVAL**.
9. Remove crankshaft rear oil seal retainer (Refer to **REMOVAL**).

CAUTION: Connecting rod bearing caps are not interchangeable and should be paint marked or scribed before removal to insure correct assembly. DO NOT use a metal stamp to mark the bearing caps.

10. Remove connecting rod bearing caps. See **Fig. 179**. See **Fig. 179**

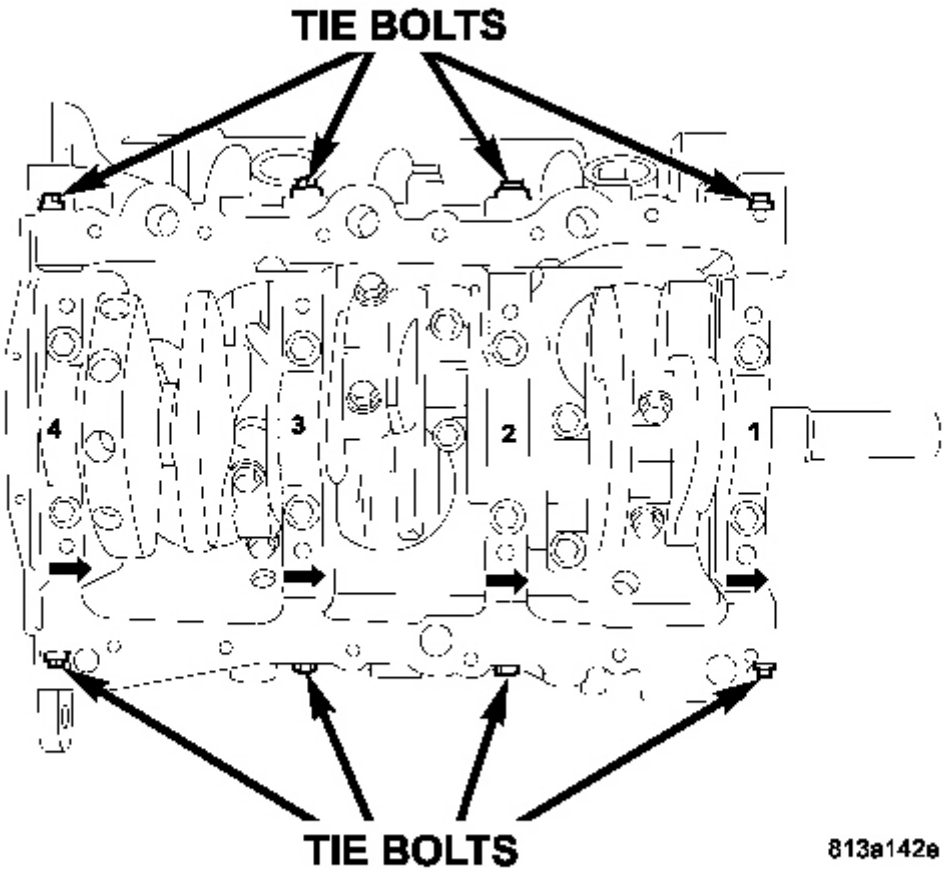

Fig. 180: Main Bearing Cap Identification
Courtesy of CHRYSLER LLC

WARNING: Main bearing caps are not interchangeable and should be paint

marked or scribed before removal to insure correct assembly. DO NOT use a metal stamp to mark the bearing caps.

11. Remove main bearing caps (1). Main bearing caps (1) are not interchangeable and are marked to insure correct assembly. See **Fig. 180**. See **Fig. 181**

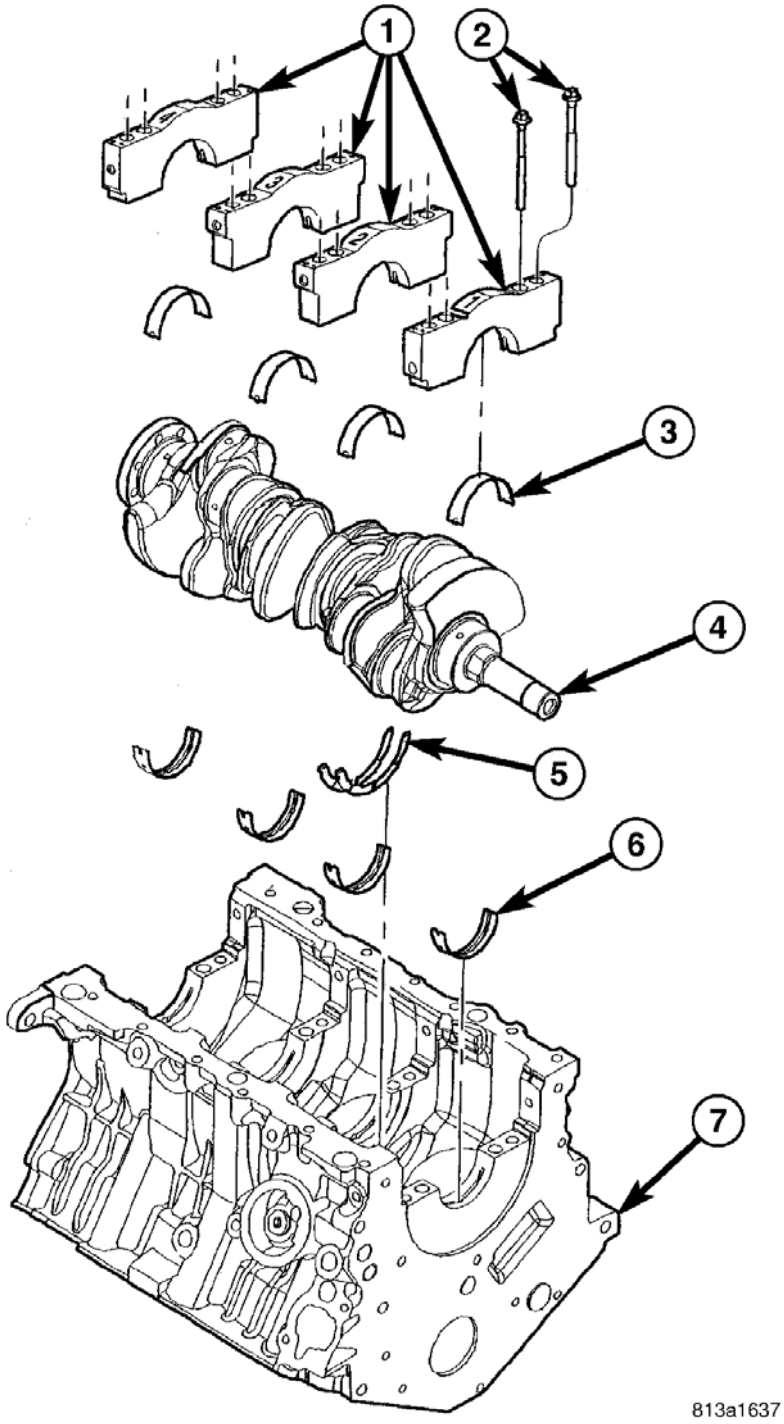

Fig. 181: Main Caps, Bolts, Main Bearing-Lower, Crankshaft, Thrust Washers, Main Bearing-Upper & Engine Block
Courtesy of CHRYSLER LLC

1 - MAIN CAPS
2 - BOLTS
3 - MAIN BEARING-LOWER
4 - CRANKSHAFT
5 - THRUST WASHERS
6 - MAIN BEARING-UPPER
7 - ENGINE BLOCK

12. Remove crankshaft (4) from cylinder block (7). See **Fig. 181**.

NOTE: Before installing crankshaft, refer to Fitting Main Bearings and Installation of Connecting Rod Bearings. See STANDARD PROCEDURE for Main Bearings. . See STANDARD PROCEDURE for Connecting Rod Bearings.

INSPECTION

CRANKSHAFT

The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper on any crankshaft journals should be held to 0.010 mm (0.0004 in.). Limits for journal roundness should be 0.008 mm (0.0003 in.). Journal grinding should not exceed 0.254 mm (0.010 in.) under the standard journal diameter. DO NOT grind thrust faces of Number 2 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages. Crank journals must be polished smooth 0.10 micronra.

CAUTION: With a forged steel crankshaft 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.

INSTALLATION

CRANKSHAFT - INSTALLATION

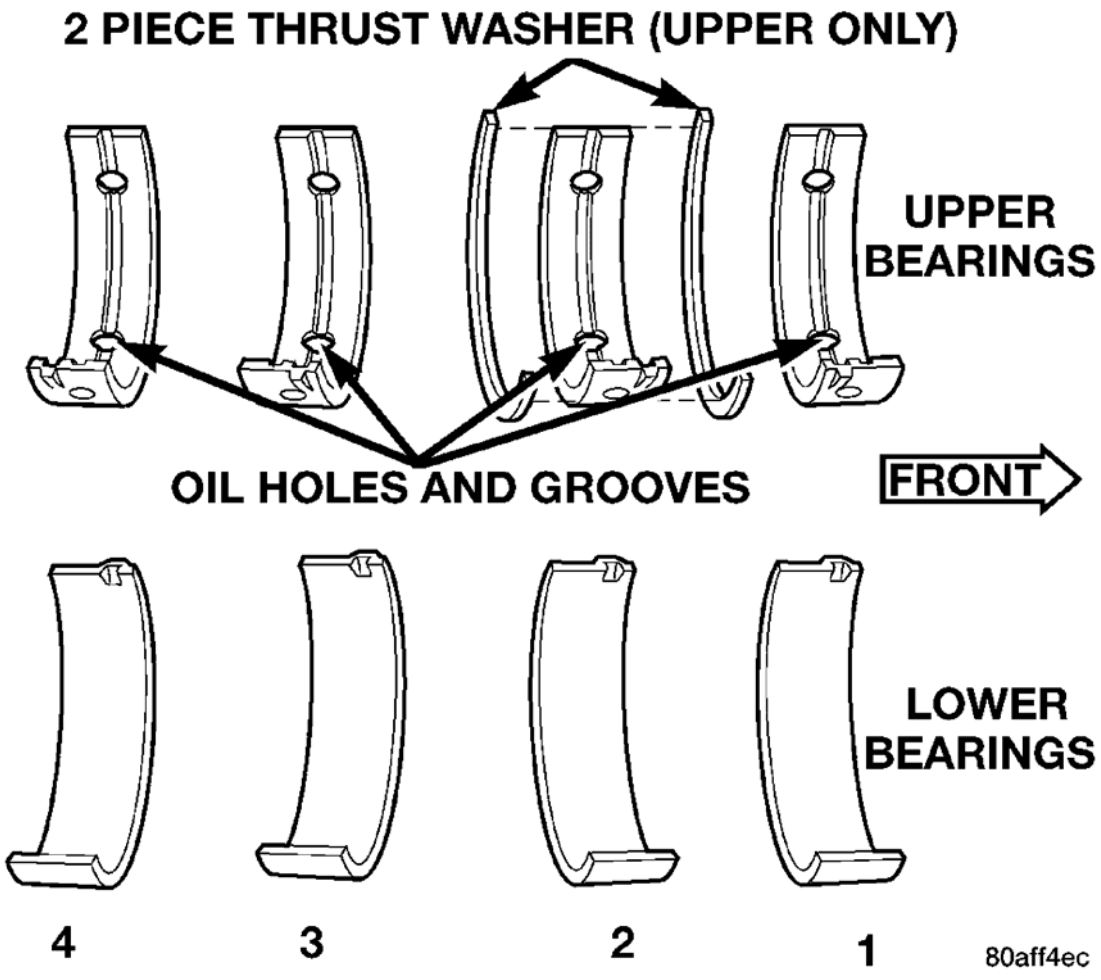

Fig. 182: Main Bearing Identification
Courtesy of CHRYSLER LLC

CAUTION: Main bearings are select fit. See STANDARD PROCEDURE for proper bearing size selection.

1. Install crankshaft upper main bearings in cylinder block. Ensure oil holes in bearings line up with oil holes in cylinder block. See **Fig. 182**. See **STANDARD PROCEDURE**.

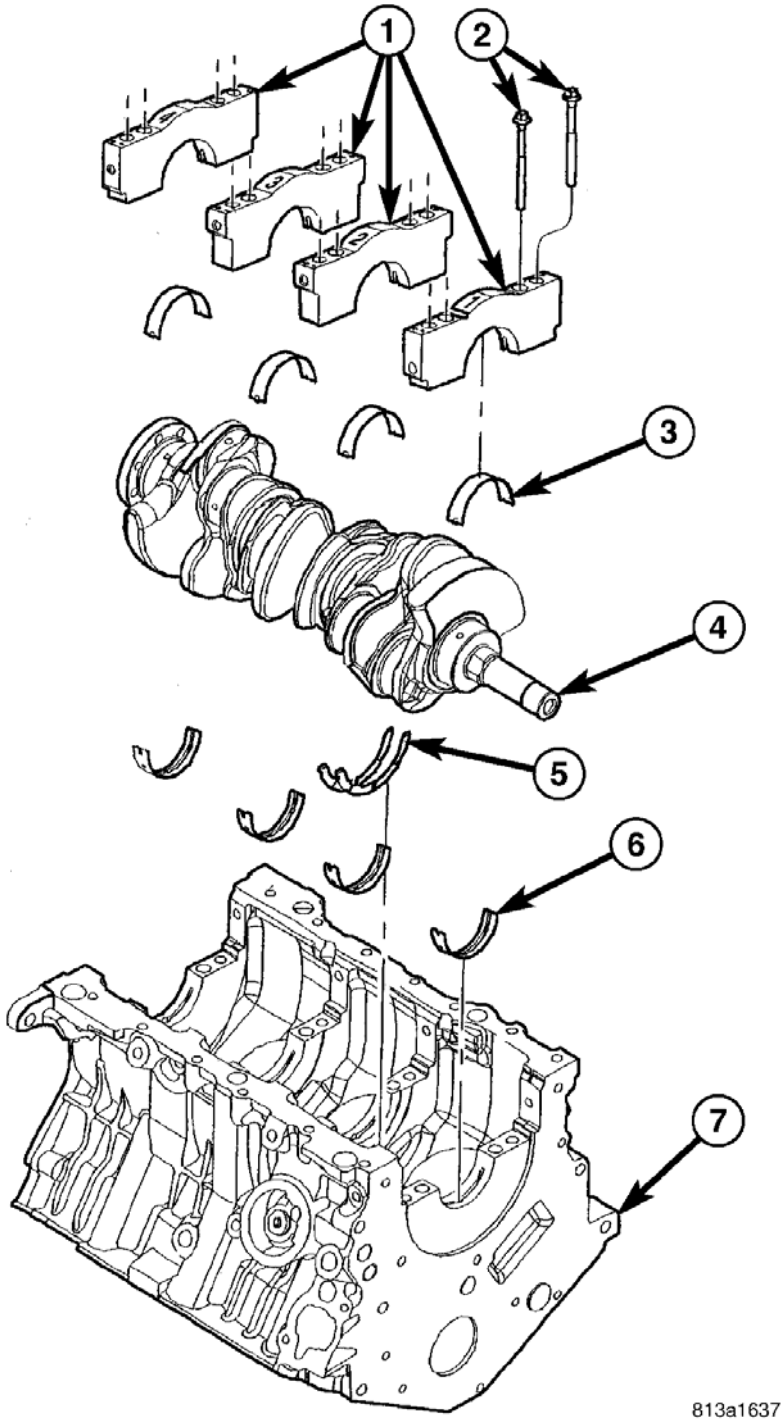

Fig. 183: Main Caps, Bolts, Main Bearing-Lower, Crankshaft, Thrust Washers, Main Bearing-Upper & Engine Block
Courtesy of CHRYSLER LLC

1 - MAIN CAPS
2 - BOLTS
3 - MAIN BEARING-LOWER
4 - CRANKSHAFT
5 - THRUST WASHERS
6 - MAIN BEARING-UPPER
7 - ENGINE BLOCK

NOTE: Care must be taken not to damage the journals or bearings during crankshaft installation.

2. Install the crankshaft (4) to cylinder block (7). See **Fig. 183**

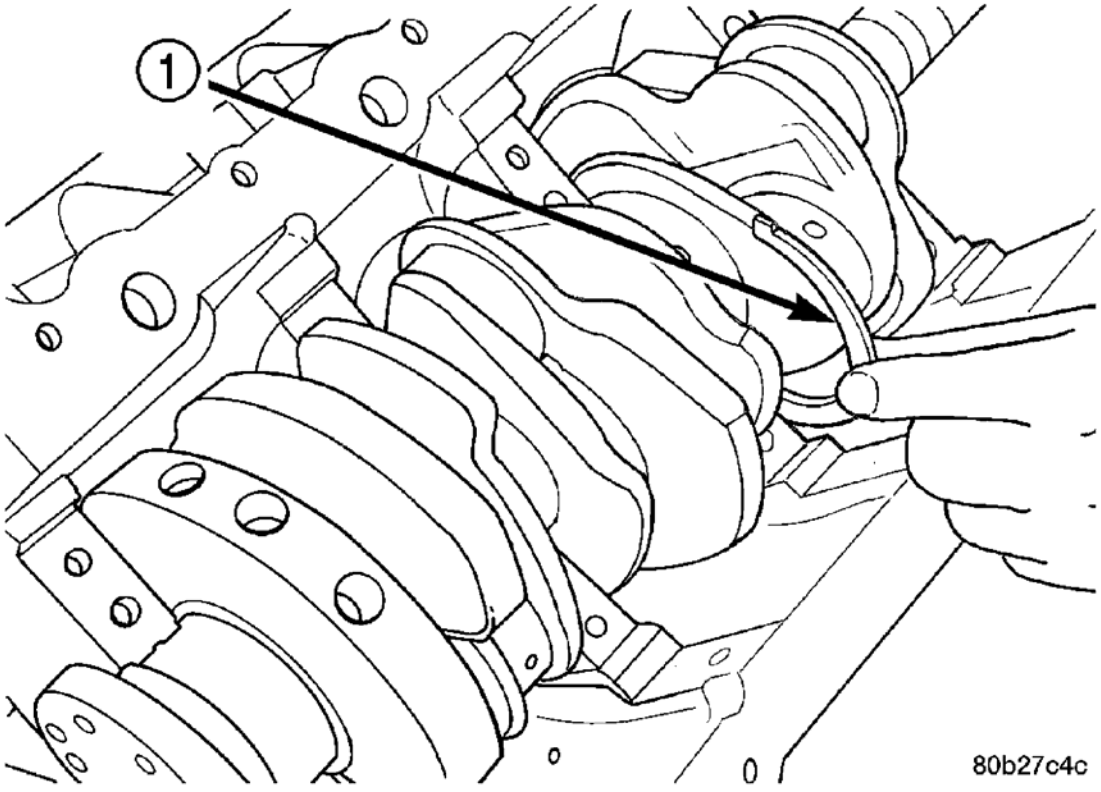

Fig. 184: Installing Thrust Washer
Courtesy of CHRYSLER LLC

1 - FRONT THRUST WASHER

3. Move crankshaft forward to limit of travel. Lubricate and install the front thrust washer (1) by rolling the washer (1) onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface. See **Fig. 184**.
4. Move crankshaft rearward to limit of travel. Lubricate and install the rear thrust washer by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface. See **Fig. 184**.

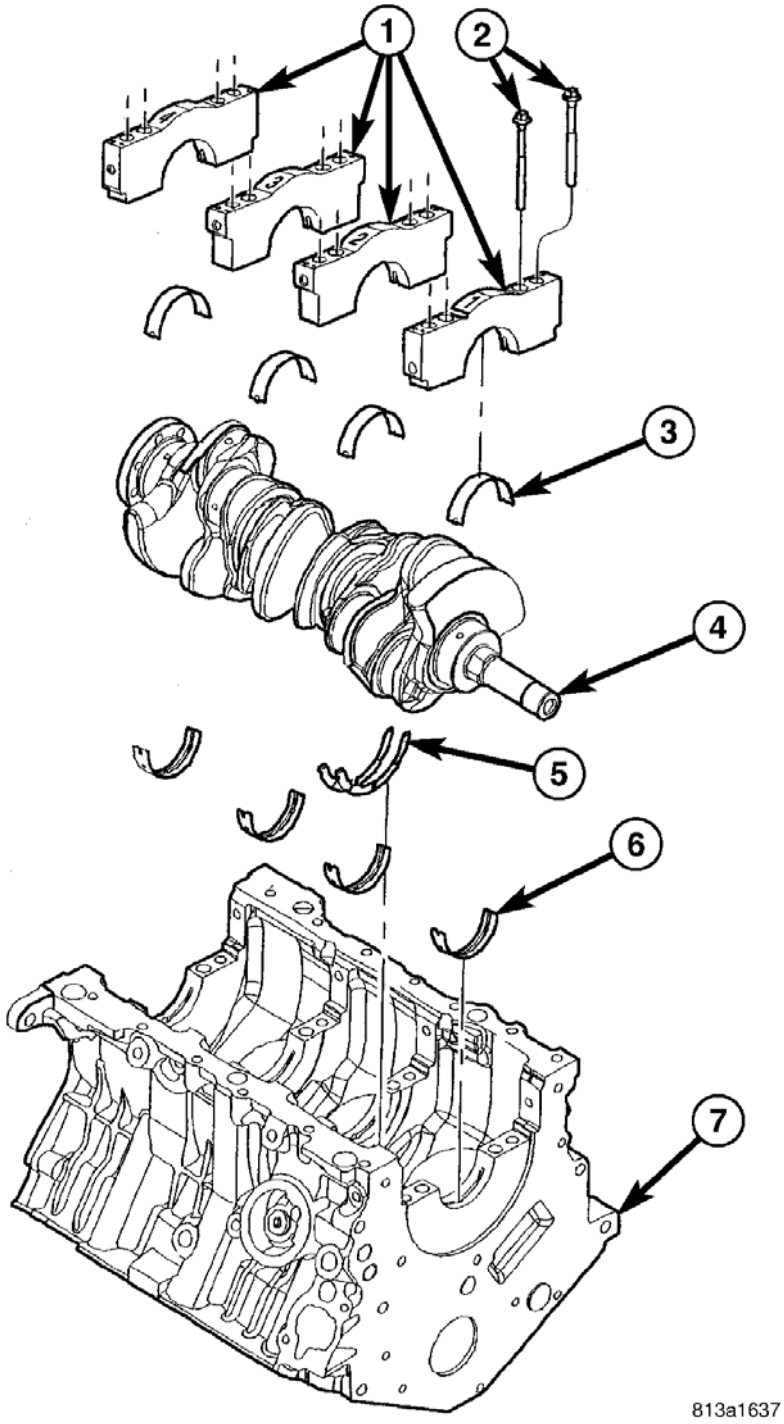

Fig. 185: Main Caps, Bolts, Main Bearing-Lower, Crankshaft, Thrust Washers, Main Bearing-Upper & Engine Block
Courtesy of CHRYSLER LLC

1 - MAIN CAPS
2 - BOLTS
3 - MAIN BEARING-LOWER
4 - CRANKSHAFT
5 - THRUST WASHERS
6 - MAIN BEARING-UPPER
7 - ENGINE BLOCK

5. Install lower main bearings (3) into main bearing caps (1). See **Fig. 185**.
6. Lubricate lower main bearings (3) with clean engine oil.

NOTE: Lubricate main bearing cap bolts (2) with engine oil before installation.

7. Install each main cap (1) and tighten bolts finger tight.

   The main bearing cap bolts (2) must be tightened in the proper sequence. First the inner main cap bolts (2), secondly the windage tray bolts, lastly the main cap tie (horizontal) bolts (6).

8. Install the inside main bearing cap bolts (2) and tighten to 20 N.m + 1/4 turn (15 ft. lbs. + 1/4 turn).
9. Measure crankshaft end play. Refer to **CRANKSHAFT MAIN BEARING JOURNALS**.
10. Install connecting rods and measure side clearance. See **STANDARD PROCEDURE**.
11. Install windage tray. Lubricate bolts with engine oil and tighten to 27 N.m + 1/4 turn (20 ft. lbs. + 1/4 turn).

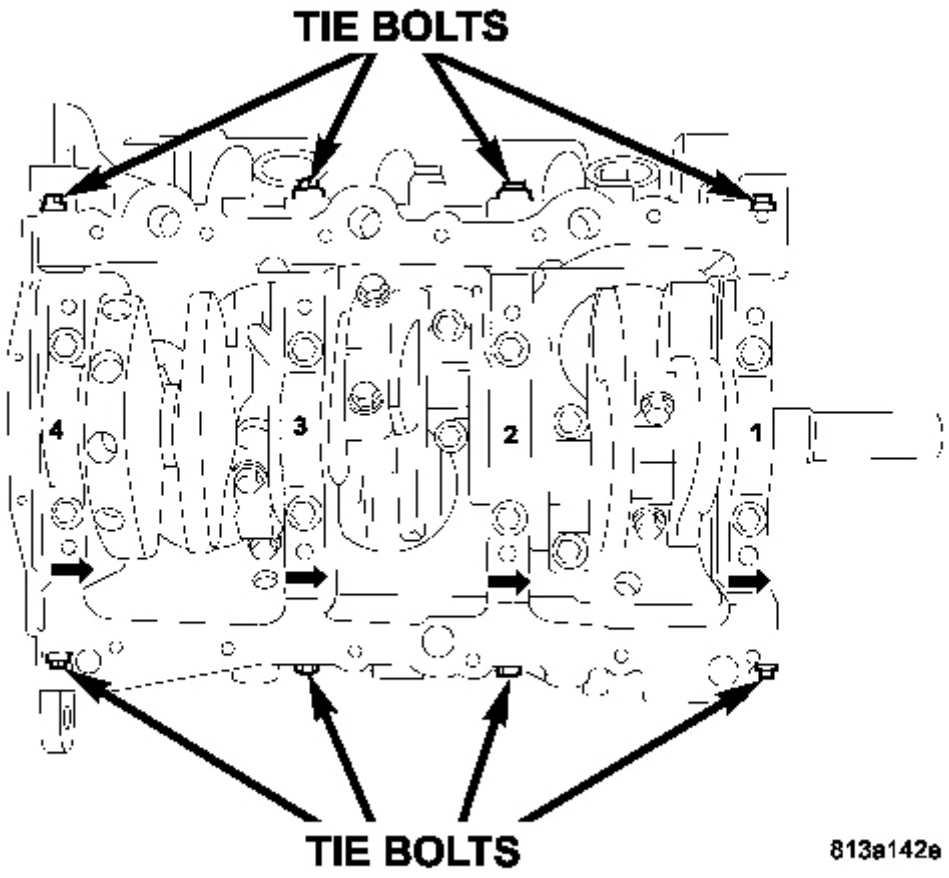

Fig. 186: Main Bearing Cap Identification
Courtesy of CHRYSLER LLC

12. Install the main cap tie (horizontal) bolts and tighten to 28 N.m (250 in. lbs.). See **Fig. 186**.
13. Install rear crankshaft oil seal retainer and oil seal (Refer to **INSTALLATION**)
14. Install oil pump assembly. See **INSTALLATION**.
15. Install dowel pin in crankshaft. See **INSTALLATION**.
16. Install crankshaft sprocket. See **INSTALLATION**.
17. Install timing belt and tensioner. See **INSTALLATION**.
18. Install front timing belt cover. See **INSTALLATION**.
19. Install oil pickup tube and tighten bolt to 28 N.m (250 in. lbs.).
20. Install oil pan. See **INSTALLATION**.

21. Install engine assembly. See **INSTALLATION**.
22. Fill engine crankcase with proper amount of oil.

BEARING -CRANKSHAFT MAIN

STANDARD PROCEDURE

BEARING -CRANKSHAFT MAIN FITTING

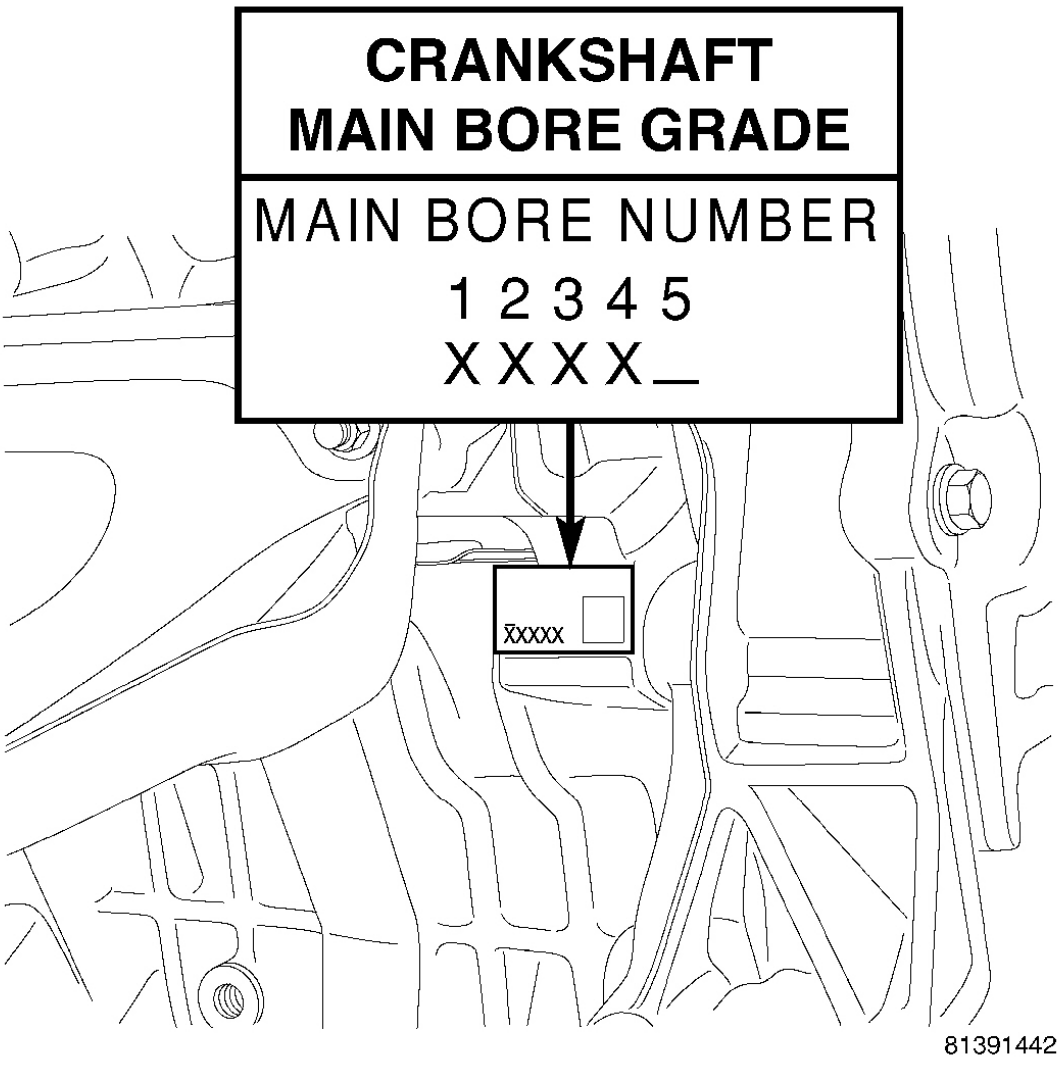

Fig. 187: Engine Block Main Bore Grade
Courtesy of CHRYSLER LLC

The main bearings are a "select fit" to achieve proper oil clearances. For main bearing selection, the block and

crankshaft have grade identification marks.

The marks for the cylinder block main bore grade are located on the right front side of the engine block. See **Fig. 187**. These grade marks (1, 2, or 3) are read left to right, corresponding to main bore 1, 2, 3, 4. The 5th digit is a check some digit for plant validation during manufacturing.

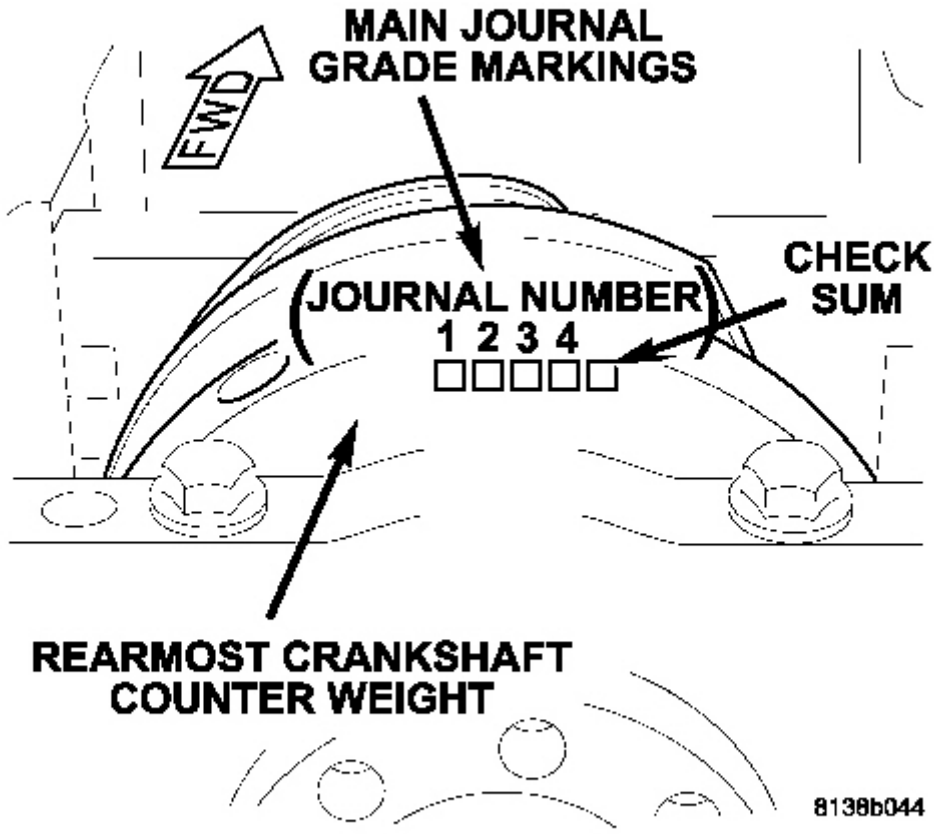

Fig. 188: Crankshaft Main Journal Grade Marking Location - Rear of Block
Courtesy of CHRYSLER LLC

The grade marks for the crankshaft are located on the rearmost crankshaft counter weight as shown in **Fig. 188**. The crankshaft journal grade marks (A, B, or C) are read left to right, corresponding with journal number 1, 2, 3, 4.

Refer to **. Refer to** to properly select the main bearings. For an example, if the main bore grade is 3 and the journal grade is B, the proper select fit bearing would be a (2) +0.003 mm (+0.0002 in.).

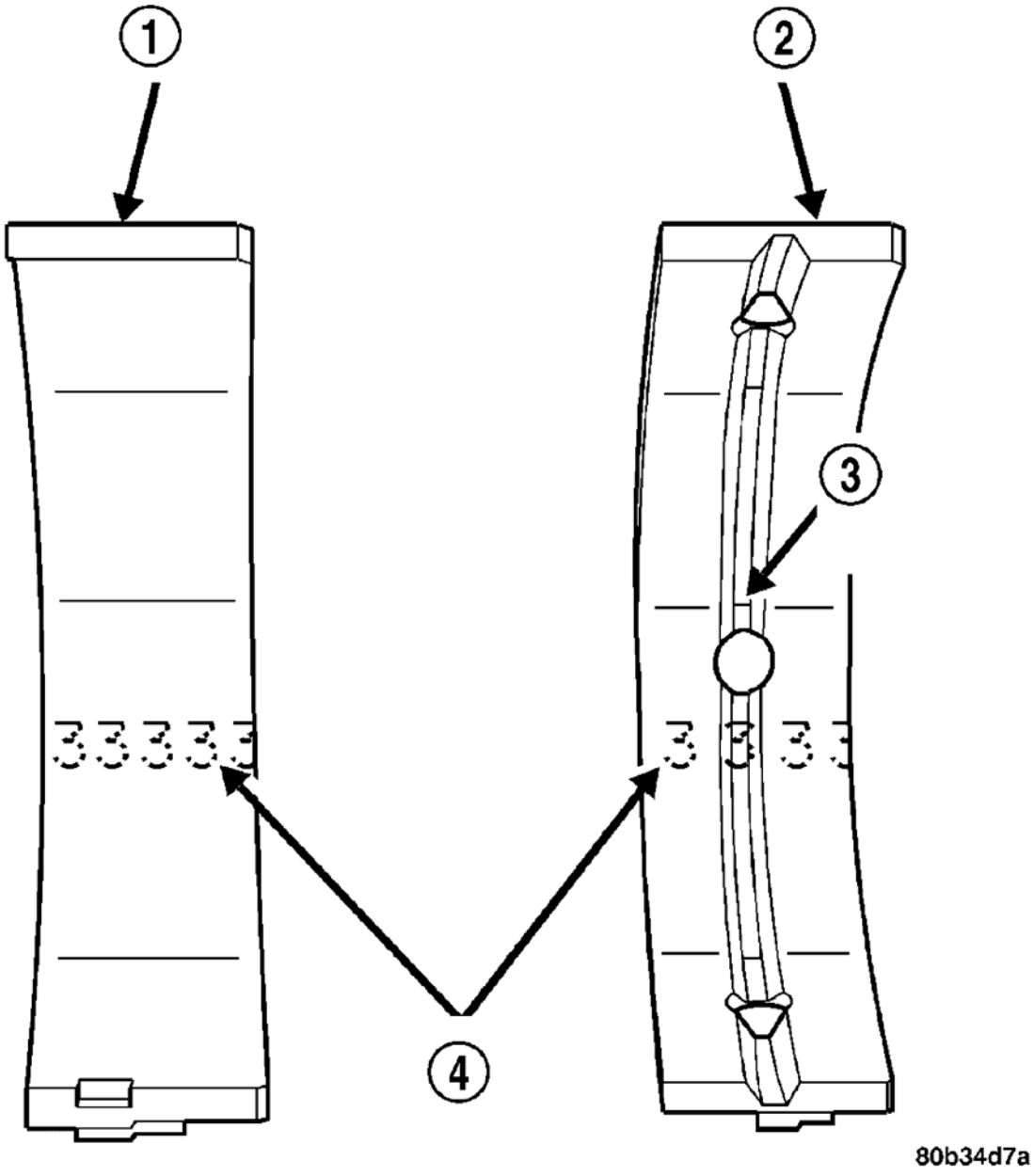

Fig. 189: Main Bearing Grade Marks
Courtesy of CHRYSLER LLC

1 - LOWER MAIN BEARING
2 - UPPER MAIN BEARING
3 - OIL FEED HOLE AND GROOVE
4 - GRADE SELECTION INK MARKS

NOTE: Service main bearings have a number from (1-5) marked in ink on the bearing

surface. See Fig. 189. For verification, refer to for number to size identification.

The upper main bearing (2) has a oil feed hole and a center groove to allow lubrication of the main journal and must be properly positioned in the block.

MAIN BEARING SELECTION CHART

Crankshaft Main Journal Grade Marks Each bearing grade increment of 0.003 mm is for wall thickness so diametrical clearances are adjusted 0.006 mm per select fit class	**Main Bearing Bore Grade Marks**			
		1	**2**	**3**
	A	(3) Standard	(2) +003 mm (+0.0001 in.)	(1) +0.006 mm (+0.0002 in.)
	B	(4) -0.003 mm (-0.0001 in.)	(3) Standard	(2) +003 mm (+0.0001 in.)
	C	(5) -0.006 mm (-0.0002 in.)	(4) -0.003 mm (-0.0001 in.)	(3) Standard

CRANKSHAFT DIAMETER

Crankshaft Diameter (mm)		
Min	Max	Grade
63.9870 mm	63.9956 mm	A
63.9957 mm	64.0042 mm	B
64.0043 mm	64.0130 mm	C

BLOCK MAIN BORE DIAMETER

Block Main Bore Diameter (mm)		
Min	Max	Grade
68.9895 mm	68.9964 mm	1
68.9965 mm	69.0034 mm	2
69.0035 mm	69.0105 mm	3

BLOCK MAIN BORE GRADE

Crankshaft Journal Grade	**Block Main Bore Grade**			
		1	**2**	**3**
	A	Class 3	Class 2	Class 1
	B	Class 4	Class 3	Class 2
	C	Class 5	Class 4	Class 3

REMOVAL

BEARING -CRANKSHAFT MAIN

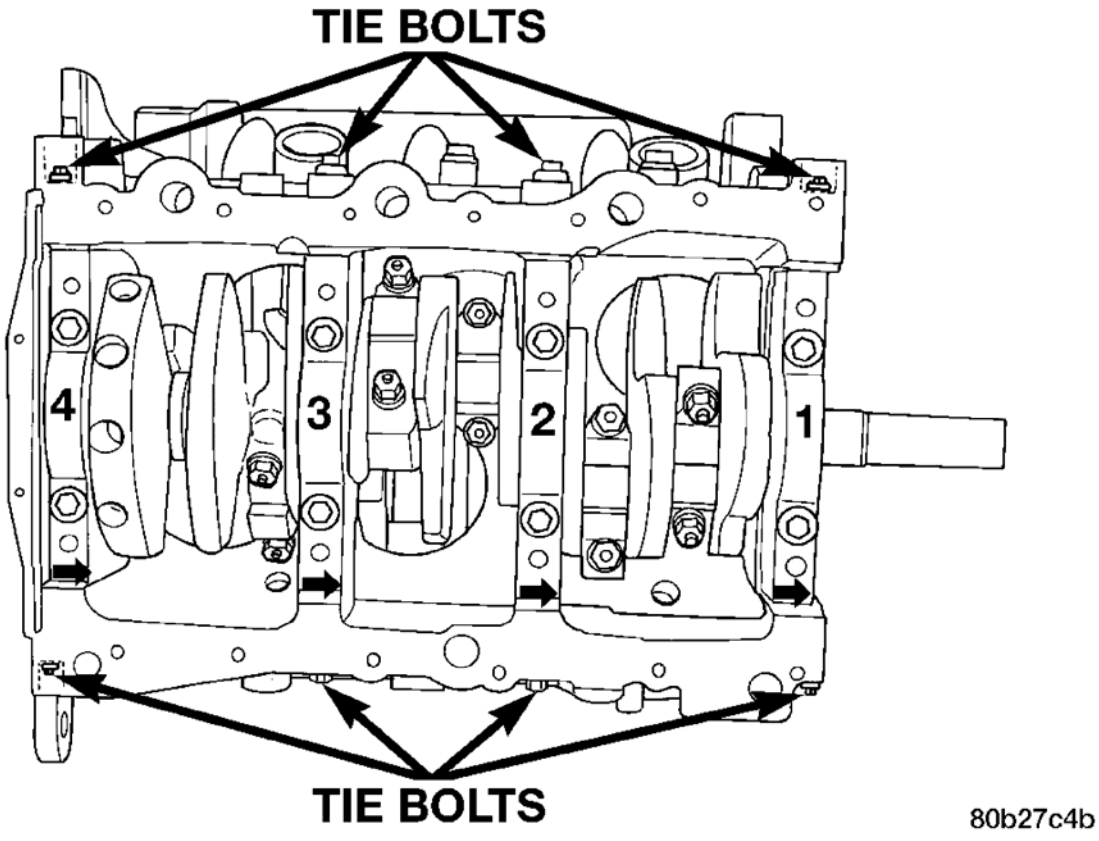

Fig. 190: Main Bearing Cap Identification
Courtesy of CHRYSLER LLC

Bearing caps are not interchangeable and are marked to insure correct assembly. See **Fig. 190**. Upper and lower bearing halves are NOT interchangeable.

1. Remove oil pan. See **REMOVAL**.
2. Remove oil pick-up tube and windage tray.
3. Identify bearing caps before removal. See **Fig. 190**.

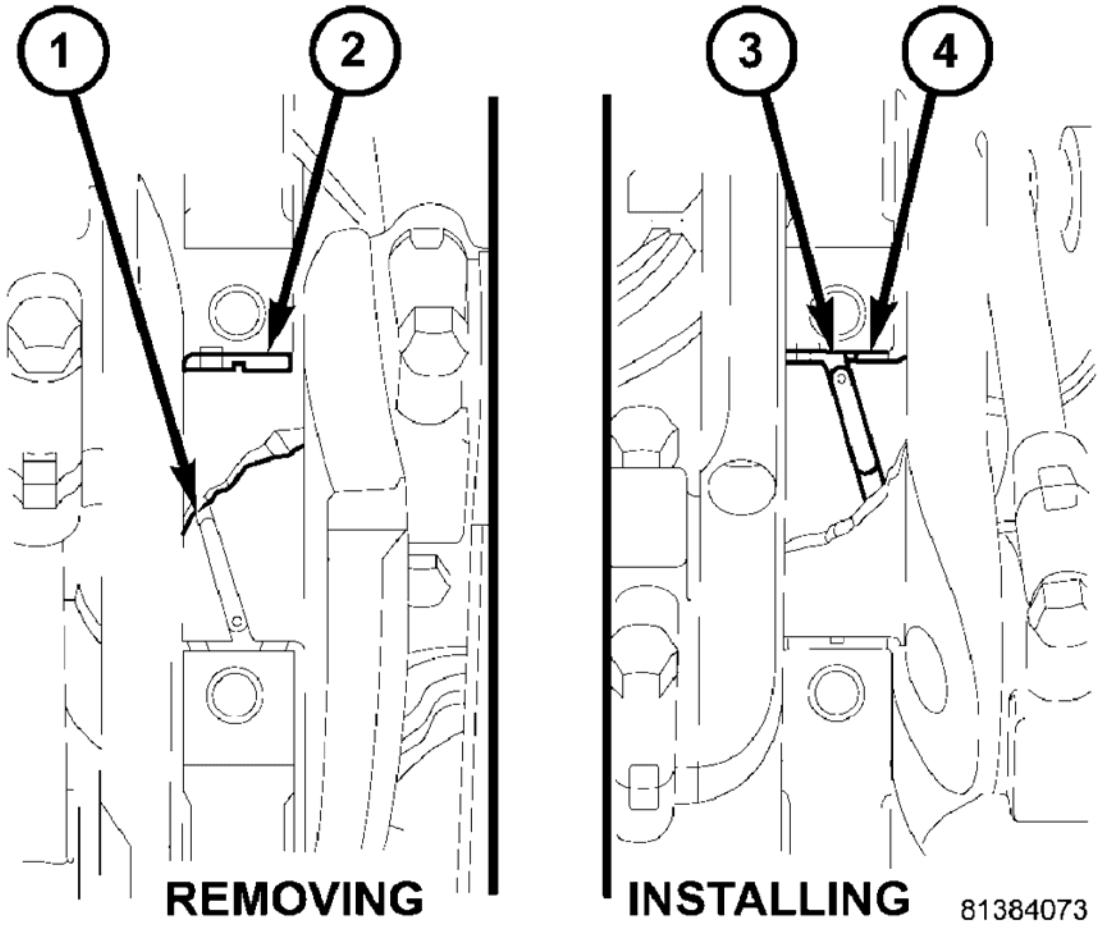

Fig. 191: Removing/Installing Upper Main Bearing With Special Tool C- 3059
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL C-3059
2 - BEARING
3 - SPECIAL TOOL C-3059
4 - BEARING

4. Remove bearing caps one at a time. Remove upper half of bearing by inserting Main Bearing Tool C-3059 into the oil hole of crankshaft. See **Fig. 191**.
5. Slowly rotate crankshaft clockwise, forcing out upper half of bearing shell.

INSTALLATION

BEARING -CRANKSHAFT MAIN

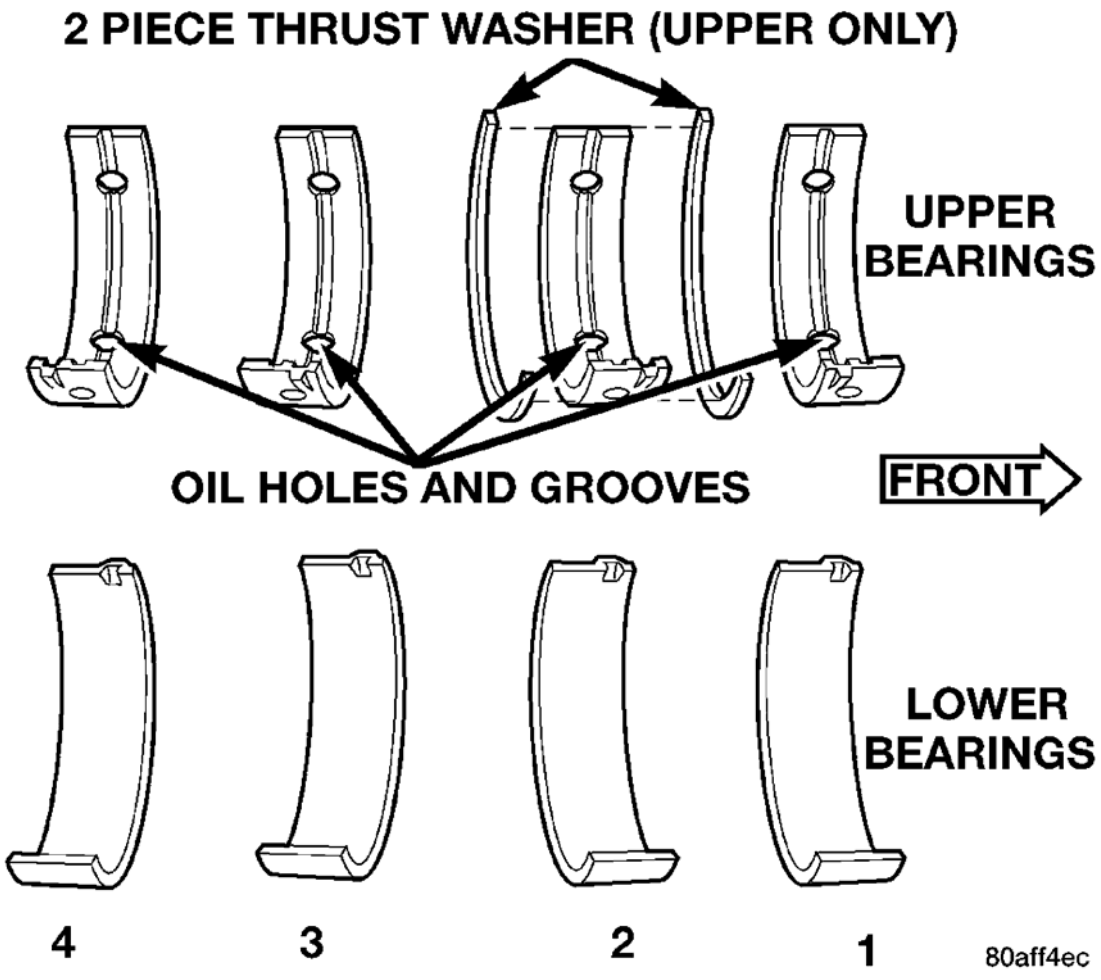

Fig. 192: Main Bearing Identification
Courtesy of CHRYSLER LLC

Bearing caps are not interchangeable and are marked to insure correct assembly. Upper and lower bearing halves are NOT interchangeable. See **Fig. 192**.

CAUTION: Main bearings are select fit. See STANDARD PROCEDURE.

NOTE: Only one main bearing should be selectively fitted while all other main bearing caps are properly tightened.

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

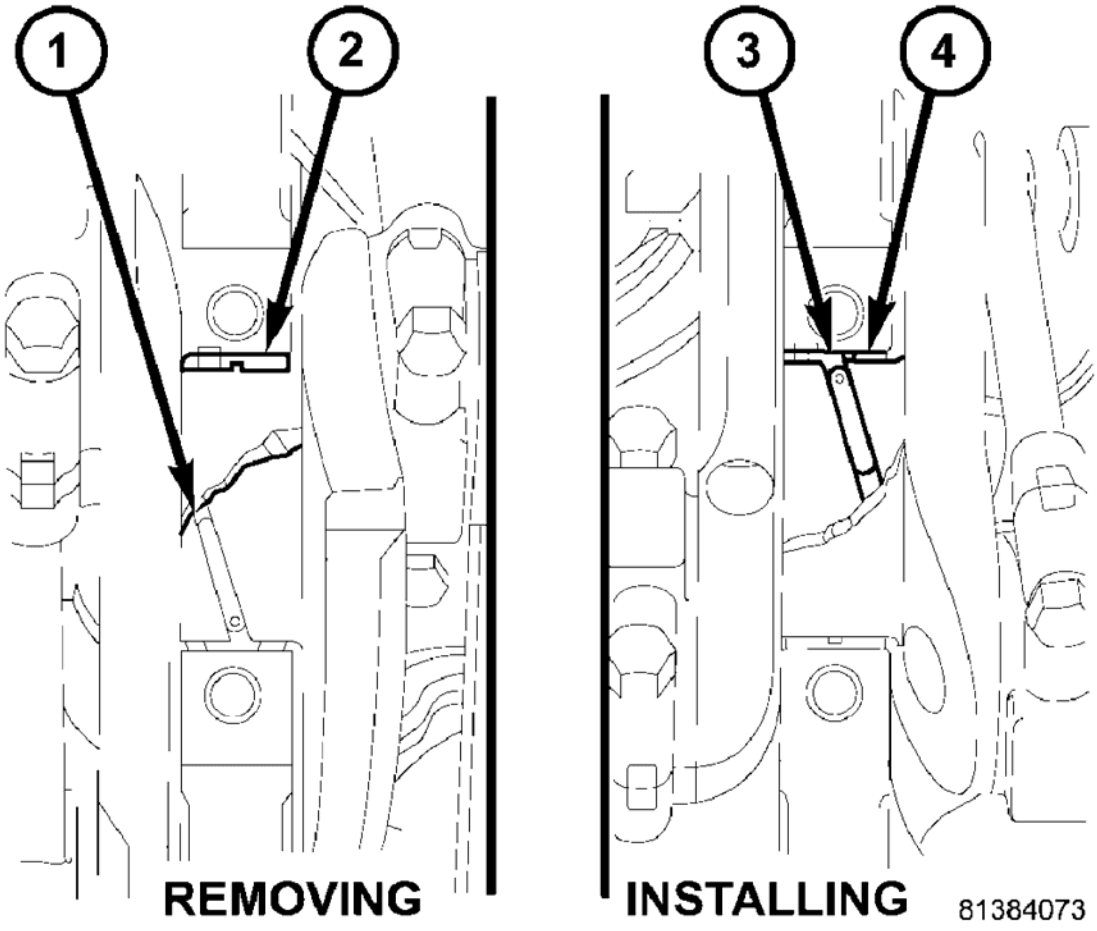

Fig. 193: Removing/Installing Upper Main Bearing With Special Tool C- 3059
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL C-3059
2 - BEARING
3 - SPECIAL TOOL C-3059
4 - BEARING

1. Lubricate main bearing (4) with clean engine oil.
2. Start bearing (4) in place, and insert Main Bearing Tool C-3059 (3) into oil hole of crankshaft. See **Fig. 193**.
3. Slowly rotate crankshaft counterclockwise sliding the bearing into position. Remove Main Bearing Tool C-3059.

NOTE: Lubricate main bearing cap bolts with engine oil before installation.

4. Lubricate and install lower bearing half and main cap Tighten bolts finger tight.

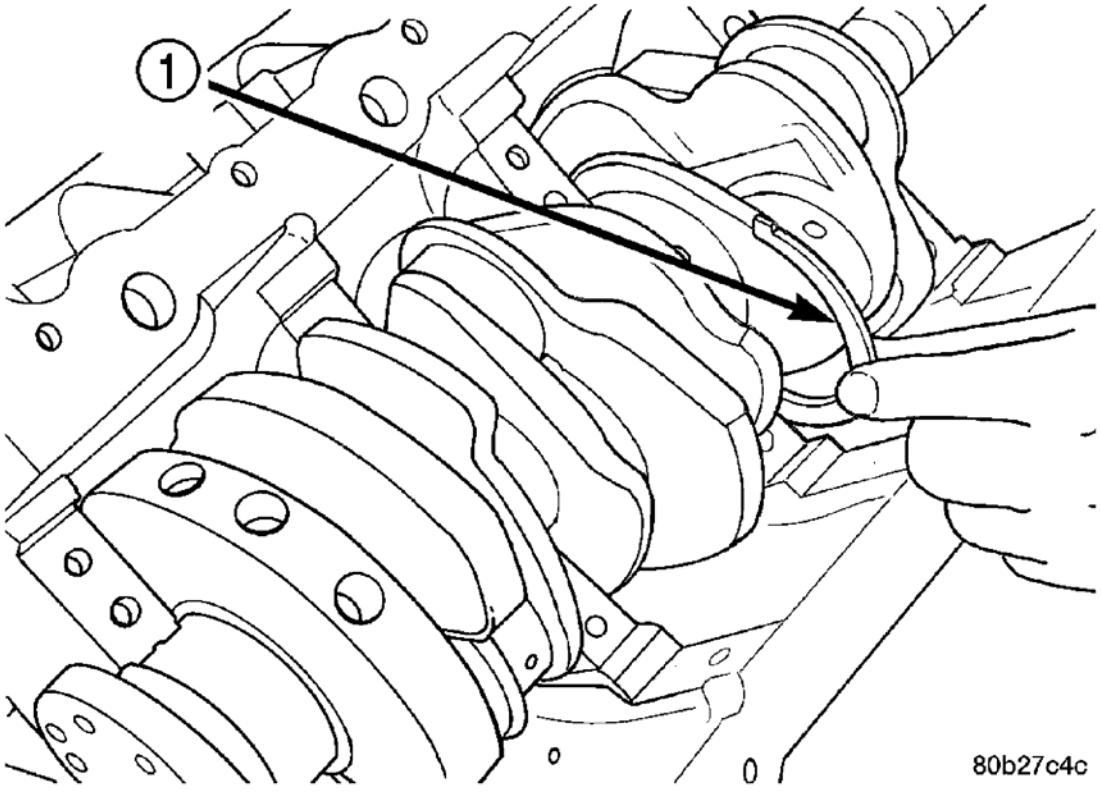

Fig. 194: Installing Thrust Washer
Courtesy of CHRYSLER LLC

1 - FRONT THRUST WASHER

5. For installing thrust washers (1) at the No. 2 main bearing location, use the following procedure:
   - Move crankshaft forward to limit of travel. Lubricate and install the front thrust washer (1) by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface. See **Fig. 194**.
   - Move crankshaft rearward to limit of travel. Lubricate and install the rear thrust washer by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface.

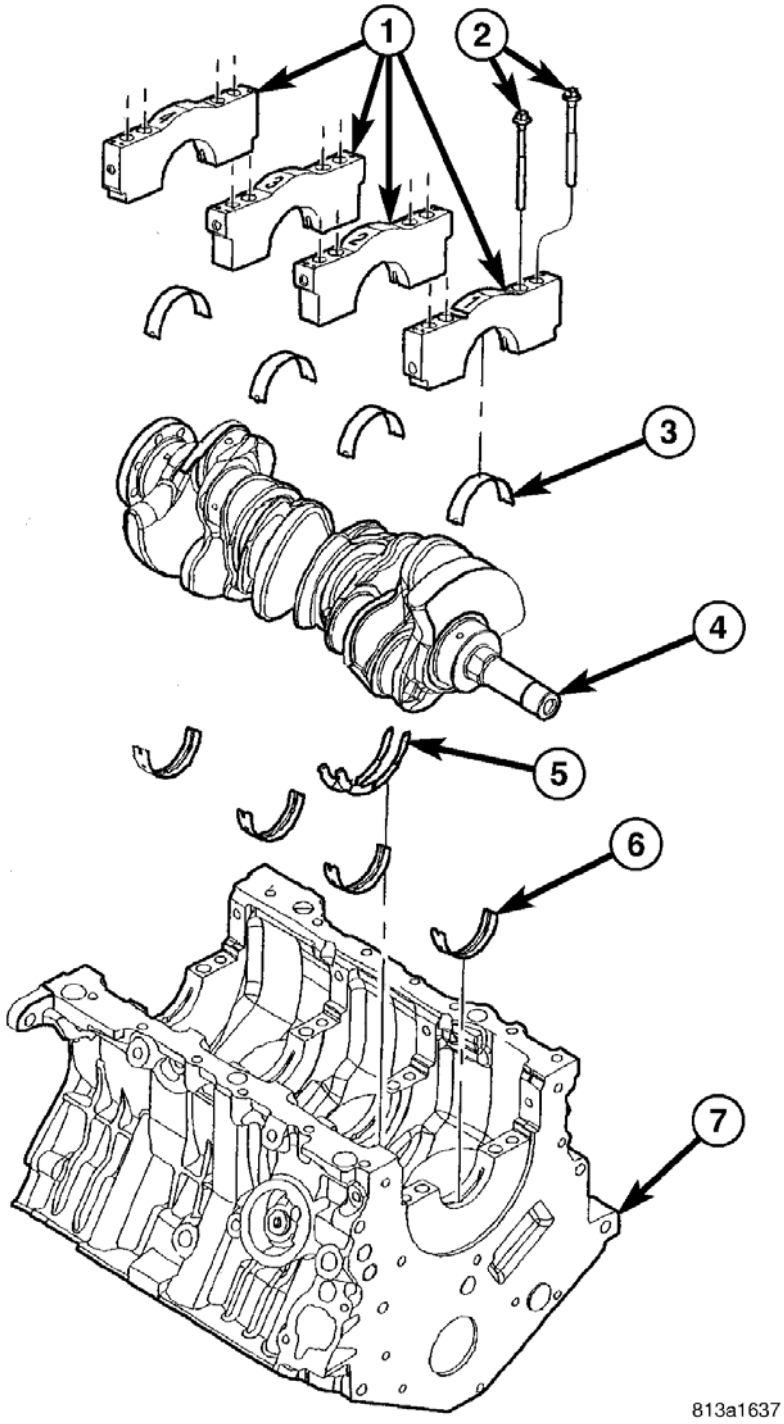

Fig. 195: Main Caps, Bolts, Main Bearing-Lower, Crankshaft, Thrust Washers, Main Bearing-Upper & Engine Block
Courtesy of CHRYSLER LLC

1 - MAIN CAPS
2 - BOLTS
3 - MAIN BEARING-LOWER
4 - CRANKSHAFT
5 - THRUST WASHERS
6 - MAIN BEARING-UPPER
7 - ENGINE BLOCK

The main bearing cap bolts (2) must be tightened in the proper sequence. First the inner main cap bolts, secondly the windage tray bolts, lastly the main cap tie (horizontal) bolts.

6. Install each main bearing cap (1) and tighten inner bolts finger tight.
7. Tighten inner main bearing cap bolts (2) to 20 N.m + 1/4 turn (15 ft. lbs. + 1/4 turn).
8. Measure crankshaft end play. Refer to **CRANKSHAFT MAIN BEARING JOURNALS**.
9. Install windage tray. Lubricate bolts with engine oil and tighten to 27 N.m + 1/4 turn (20 ft. lbs. + 1/4 turn).

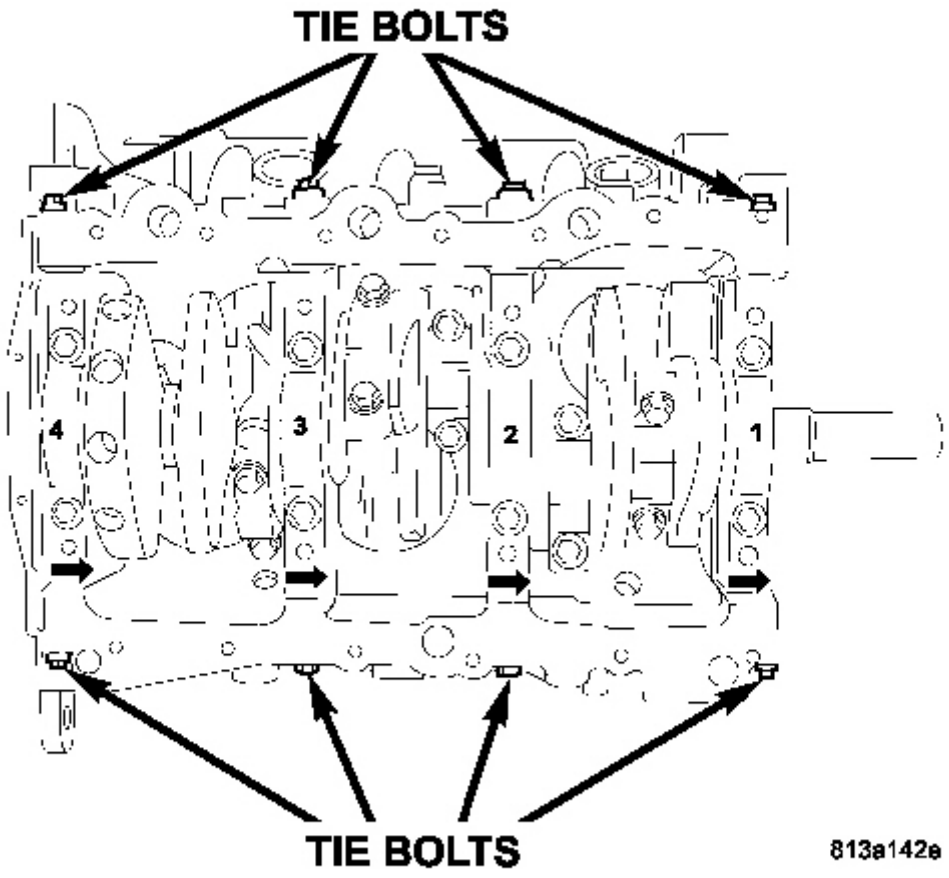

Fig. 196: Main Bearing Cap Identification
Courtesy of CHRYSLER LLC

10. Install the main cap tie (horizontal) bolts and tighten to 28 N.m (250 in. lbs.). See **Fig. 196**. See **Fig. 195**
11. Install oil pick-up tube.
12. Install oil pan. See **INSTALLATION**.
13. Fill engine crankcase with proper oil to correct level.

SEAL -CRANKSHAFT OIL FRONT

REMOVAL

SEAL-CRANKSHAFT OIL FRONT

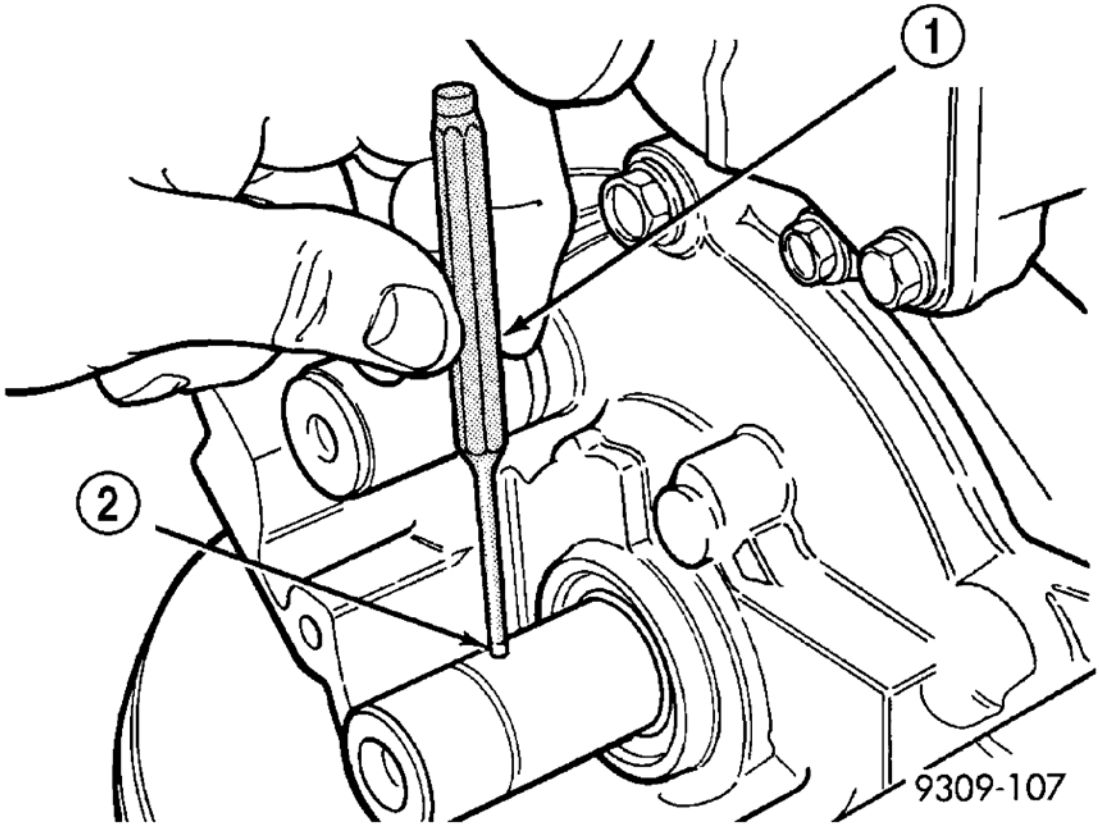

Fig. 197: Removing/Installing Crankshaft Sprocket Dowel Pin
Courtesy of CHRYSLER LLC

1 - PIN PUNCH 2 - DOWEL

1. Remove the crankshaft sprocket. See **REMOVAL**.
2. Tap the dowel pin (2) out of the crankshaft. See **Fig. 197**.

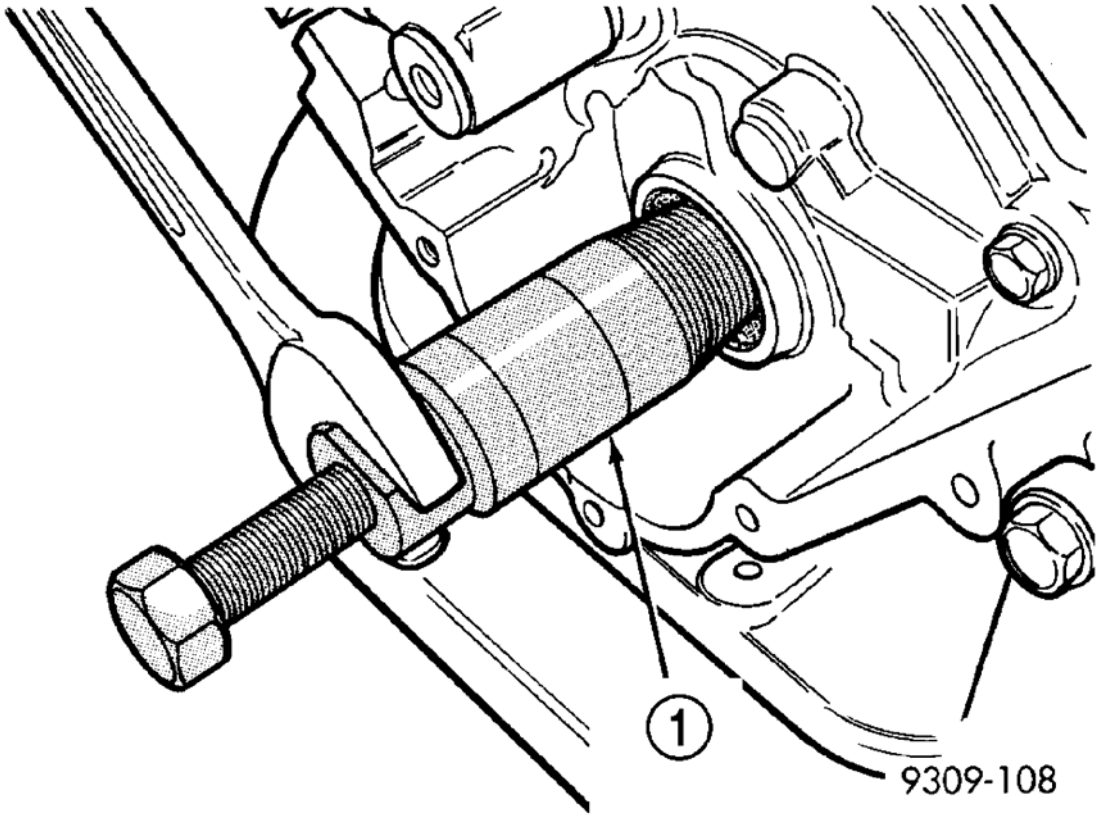

Fig. 198: Removing Crankshaft Oil Seal With Special Tool 6341A
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6341A

3. Remove crankshaft seal using Tool 6341A (1). See **Fig. 198**.

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

4. Shaft seal lip surface must be free of varnish, dirt or nicks. Polish with 400 grit paper if necessary.

INSTALLATION

SEAL-CRANKSHAFT OIL FRONT

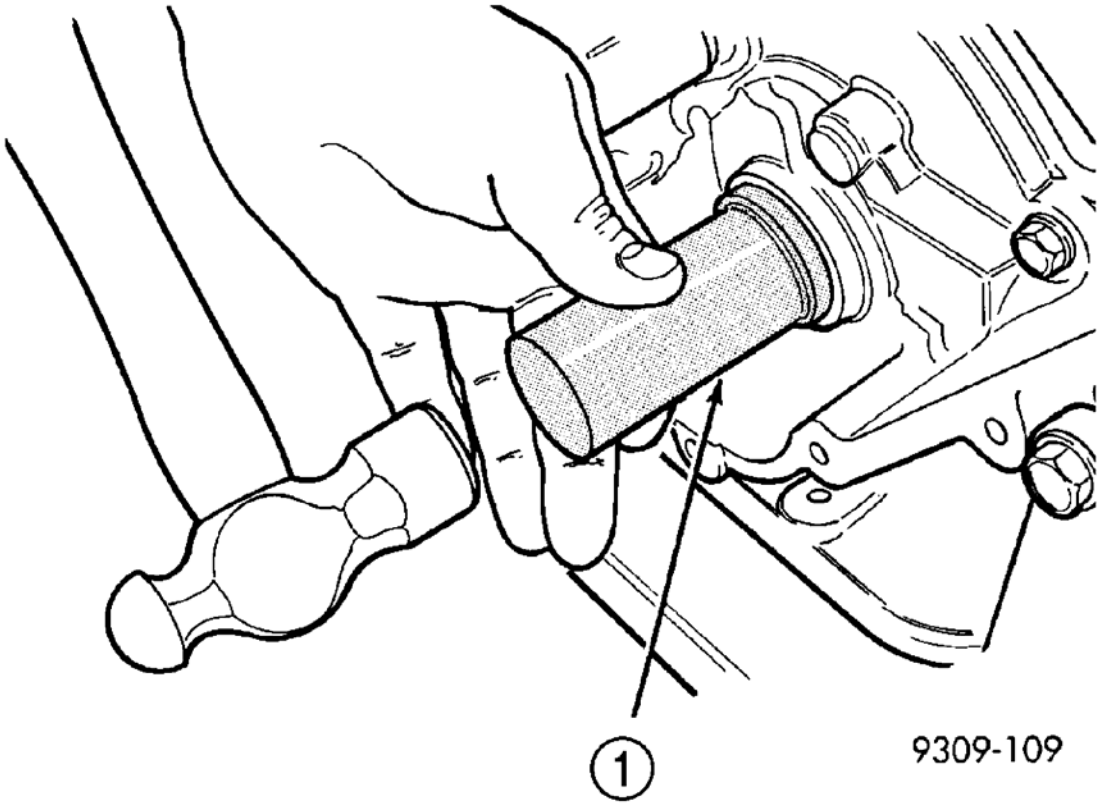

Fig. 199: Installing Crankshaft Oil Seal With Special Tool 6342
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6342

1. Install crankshaft seal using Special Tool 6342 (1). See **Fig. 199**.
2. Install the dowel pin into the crankshaft to 1.2 mm (0.047 in.) protrusion.
3. Install the crankshaft sprocket. See **INSTALLATION**.

SEAL - CRANKSHAFT OIL REAR

DESCRIPTION

SEAL-CRANKSHAFT OIL REAR

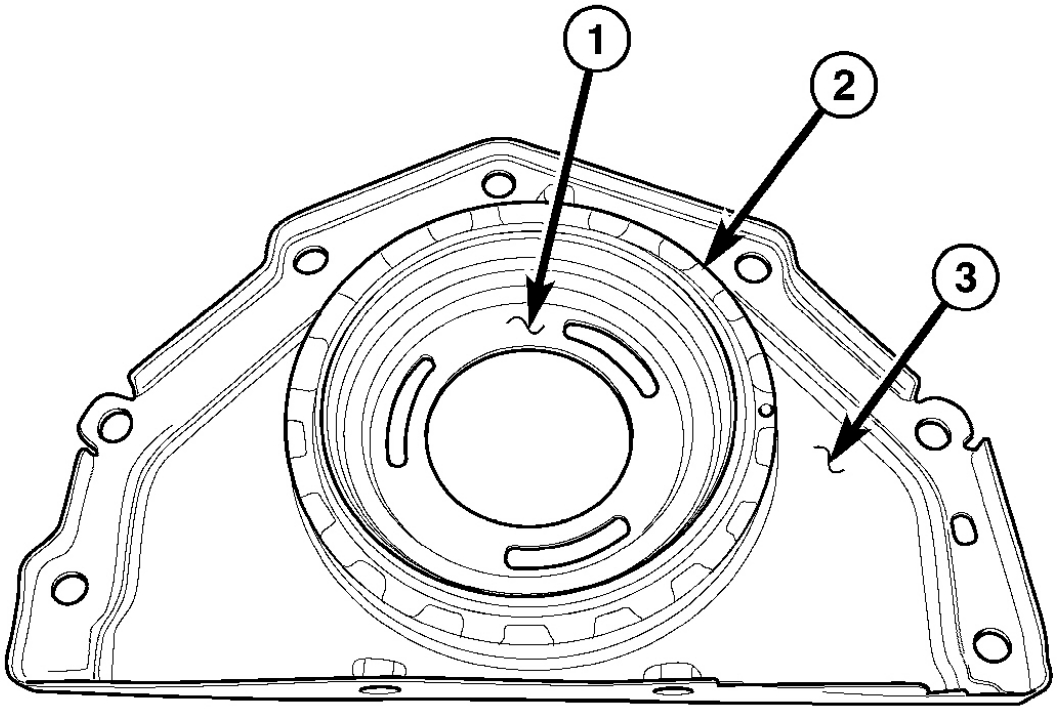

Fig. 200: Seal Protector, Seal & Retainer
Courtesy of CHRYSLER LLC

1 - SEAL PROTECTOR
2 - SEAL
3 - RETAINER

The rear crankshaft oil seal (2) and retainer (3) are molded and serviced as an assembly. This assembly also includes a separate rear crankshaft seal protector (1) that should not be removed before the seal is installed on the engine block. Once the seal protector (1) is separated from the assembly it can not be re-installed on the assembly or reused.

REMOVAL

SEAL-CRANKSHAFT OIL REAR

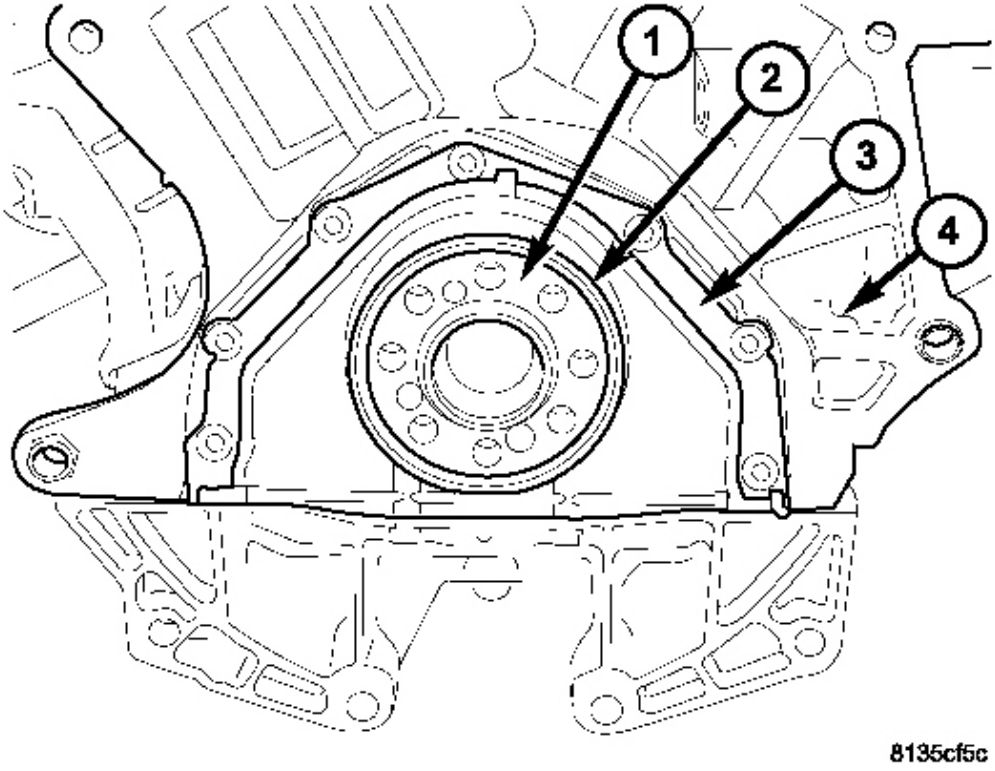

Fig. 201: Crankshaft, Rear Crankshaft Oil Seal, Rear Crankshaft Oil Seal Retainer & Engine Block
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT
2 - REAR CRANKSHAFT OIL SEAL
3 - REAR CRANKSHAFT OIL SEAL RETAINER
4 - ENGINE BLOCK

1. Remove the engine oil pan. See **REMOVAL**.
2. Lower the weight of the engine back onto the engine mounts.
3. Remove transmission from vehicle.
4. Remove the flex plate.
5. Remove the rear crankshaft oil seal retainer bolts.
6. Remove the crankshaft oil seal and clean all mating surfaces.

INSTALLATION

SEAL-CRANKSHAFT OIL REAR

CAUTION: If a burr or scratch is present on the crankshaft edge (chamfer), clean surface using 400 grit sand paper to prevent seal damage during installation. Make sure the rear crankshaft oil seal surface is clean and free of any abrasive materials.

NOTE: The rear crankshaft oil seal and retainer are an assembly. DO NOT separate the seal protector from the rear crankshaft oil seal before installation on engine. Damage to the seal lip will occur if the seal protector is removed and installed prior to installation on engine.

1. Apply engine oil to crankshaft seal surface.

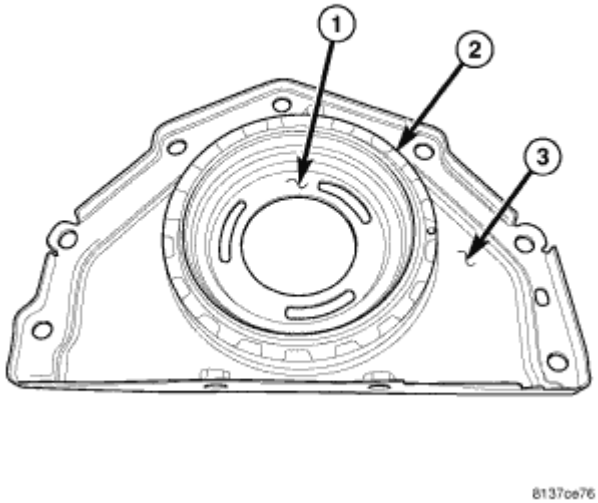

Fig. 202: Seal Protector, Seal & Retainer
Courtesy of CHRYSLER LLC

1 - SEAL PROTECTOR
2 - SEAL
3 - RETAINER

2. If the seal protector (1) is missing or was accidentally dislodged, go to step 3. Otherwise, carefully position the oil seal retainer assembly (3), and seal protector (1) on crankshaft and push firmly into place on engine block (during this step, the seal protector will be pushed from the rear oil seal assembly as a result of installing the rear oil seal). Hand tighten the rear oil seal fasteners, and go to step 4.

NOTE: The seal lip (2) must always uniformly curl inward toward the engine on the crankshaft (1).

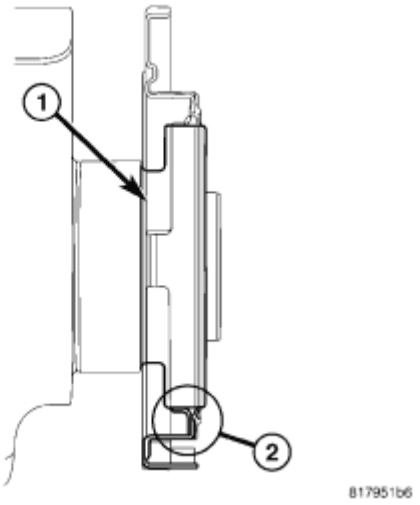

Fig. 203: Rear Seal Installed
Courtesy of CHRYSLER LLC

CAUTION: If for any reason the installation sleeve is missing or dislodged from rear crankshaft oil seal prior to installation, the following procedure must be performed.

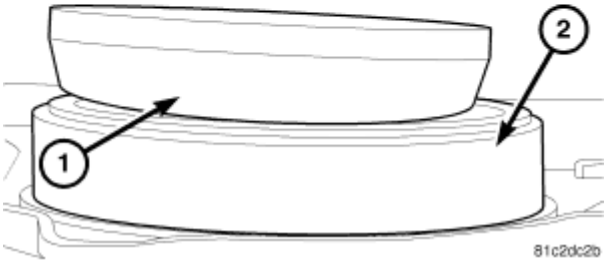

Fig. 204: Tapered End & Rear Crankshaft Oil Seal Assembly
Courtesy of CHRYSLER LLC

3. Using the chamfered seal guide from Special Tool 6926, insert the tapered end (1) into the transmission side of the rear crankshaft oil seal assembly (2), and push the seal guide through the seal assembly. This will ensure the seal lip is positioned toward the engine when the seal assembly is installed. When the seal lip is correctly positioned, go to step 2.

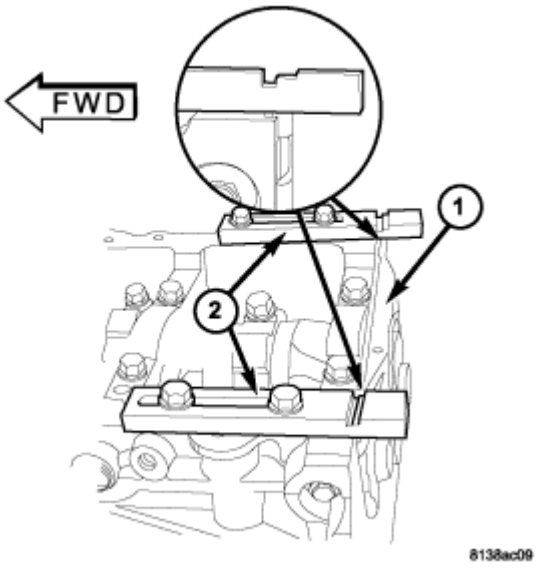

Fig. 205: Rear Crankshaft Seal Retainer Alignment
Courtesy of CHRYSLER LLC

1 - SEAL RETAINER 2 - SPECIAL TOOLS 8225

NOTE: The following steps must be performed to prevent oil leaks at sealing joints.

4. Attach Special Tools 8225 (1) to pan rail using the oil pan fasteners.

NOTE: Special Tools 8225 (1), are use to assist with the fit of the flush mount rear main seal retainer. The notch on tool should be located away the seal retainer.

5. While applying firm pressure to the seal retainer against Special Tools 8225 (1), tighten seal retainer screws to 12 N.m (105 in. lbs.).
6. Remove special tool #8225 (1).

NOTE: Make sure that the seal flange is flush with the block oil pan sealing surface.

7. Install oil pan. Tighten the 6mm fasteners to 12N.m (105 in.lbs.) and the 8mm fasteners to 28N.m (250 in.lbs.).
8. Install the flex plate and transmission.

PLATE - FLEX

REMOVAL

PLATE - FLEX

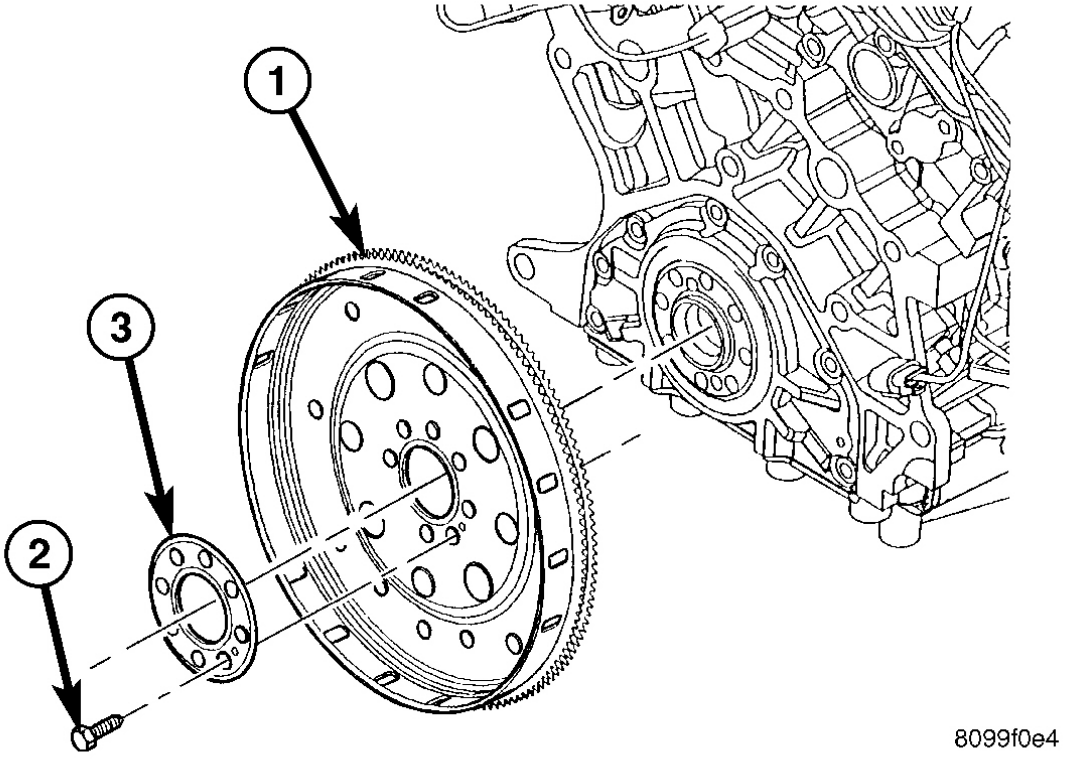

Fig. 206: Removing/Installing Flex Plate
Courtesy of CHRYSLER LLC

1 - FLEX PLATE 2 - BOLT (QTY. 8) 3 - BACKING PLATE

1. Remove the transmission.
2. Remove flex plate attaching bolts (2).
3. Remove the flex plate (1). See **Fig. 206**.

INSTALLATION

PLATE-FLEX

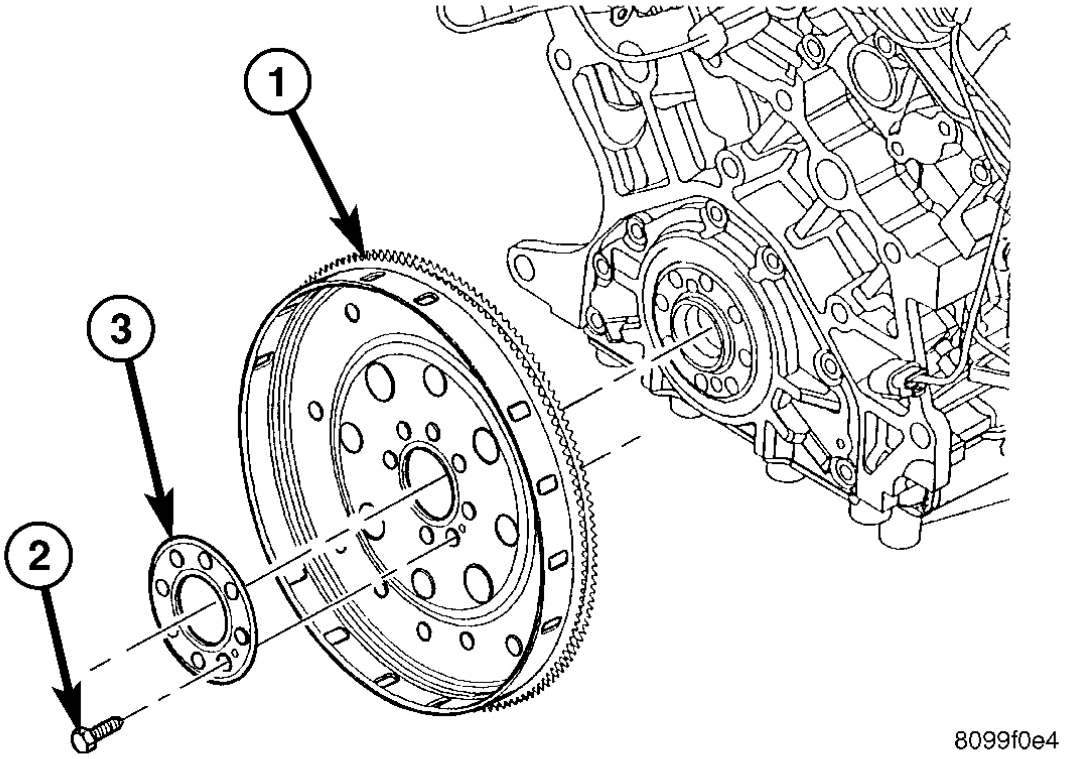

Fig. 207: Removing/Installing Flex Plate
Courtesy of CHRYSLER LLC

1 - FLEX PLATE 2 - BOLT (QTY. 8) 3 - BACKING PLATE

1. Position flex plate (1) with backing plate (3) on the crankshaft. See **Fig. 207**.
2. Apply Mopar® Lock & Seal Adhesive to the flex plate bolts (2).
3. Install flex plate bolts (2). See **Fig. 207**. Tighten bolts to 95 N.m (70 ft. lbs.).
4. Install the transmission.

ROD - PISTON & CONNECTING

DESCRIPTION

ROD-PISTON & CONNECTING

The pistons are made of a high strength aluminum alloy. Top land height has been decreased to reduce emissions. Piston skirts are coated with a solid lubricant for scuff resistance. Connecting rod is forged steel with a fractured connecting rod cap design. The connecting rod is also equipped with a squirt hole and attaches to the

piston with a full floating pin retained by lock rings.

OPERATION

ROD-PISTON & CONNECTING

The piston and connecting rod assembly is the link between the combustion force and the crankshaft.

STANDARD PROCEDURE

FITTING PISTONS

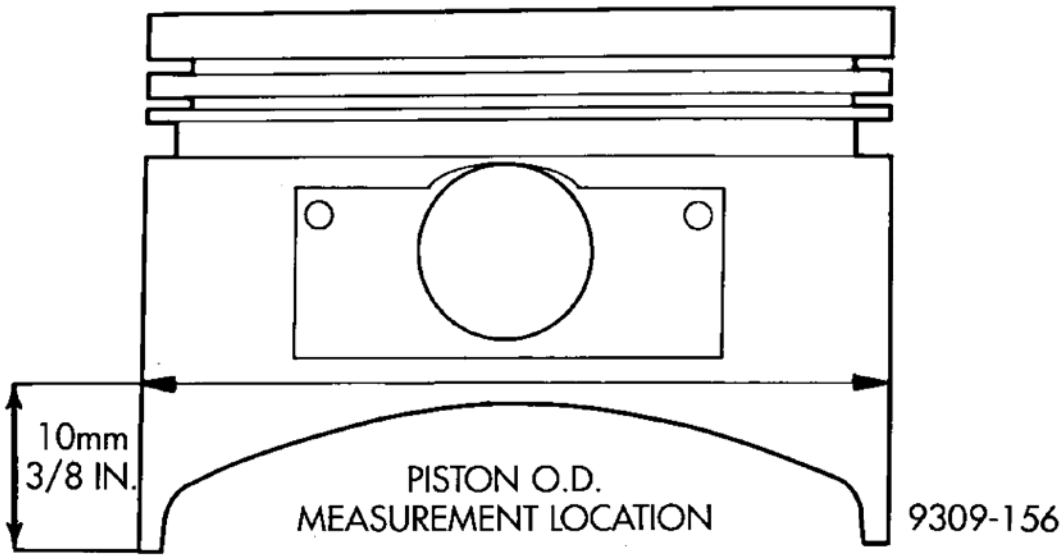

Fig. 208: Piston Measurements
Courtesy of CHRYSLER LLC

The pistons are machined to two different weight specifications and matched to rods based on weight. All piston and rod assemblies weigh the same to maintain engine balance.

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90° to piston pin at size location shown in **Fig. 208**. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line. See **SPECIFICATIONS**. **Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).**

REMOVAL

ROD-PISTON & CONNECTING

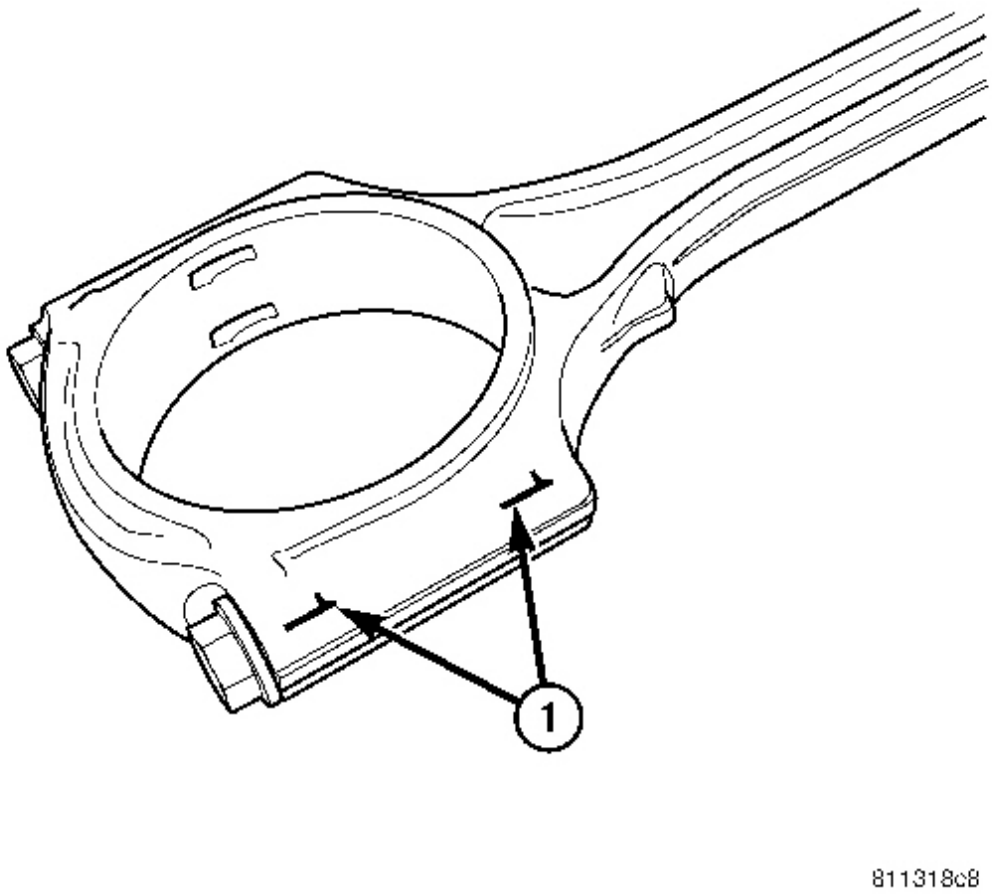

Fig. 209: Connecting Rod to Cylinder Identification
Courtesy of CHRYSLER LLC

1 - PAINT MARK OR SCRIBE

1. Remove the cylinder heads. See **REMOVAL**.
2. Remove the oil pan. See **REMOVAL**.
3. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation. Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so that each connecting rod is centered in cylinder bore.**

CAUTION: DO NOT stamp the connecting rods for cylinder identification

4. Inspect connecting rods and connecting rod caps for cylinder identification. Identify them with a paint mark or scribe, if necessary. See **Fig. 209**.

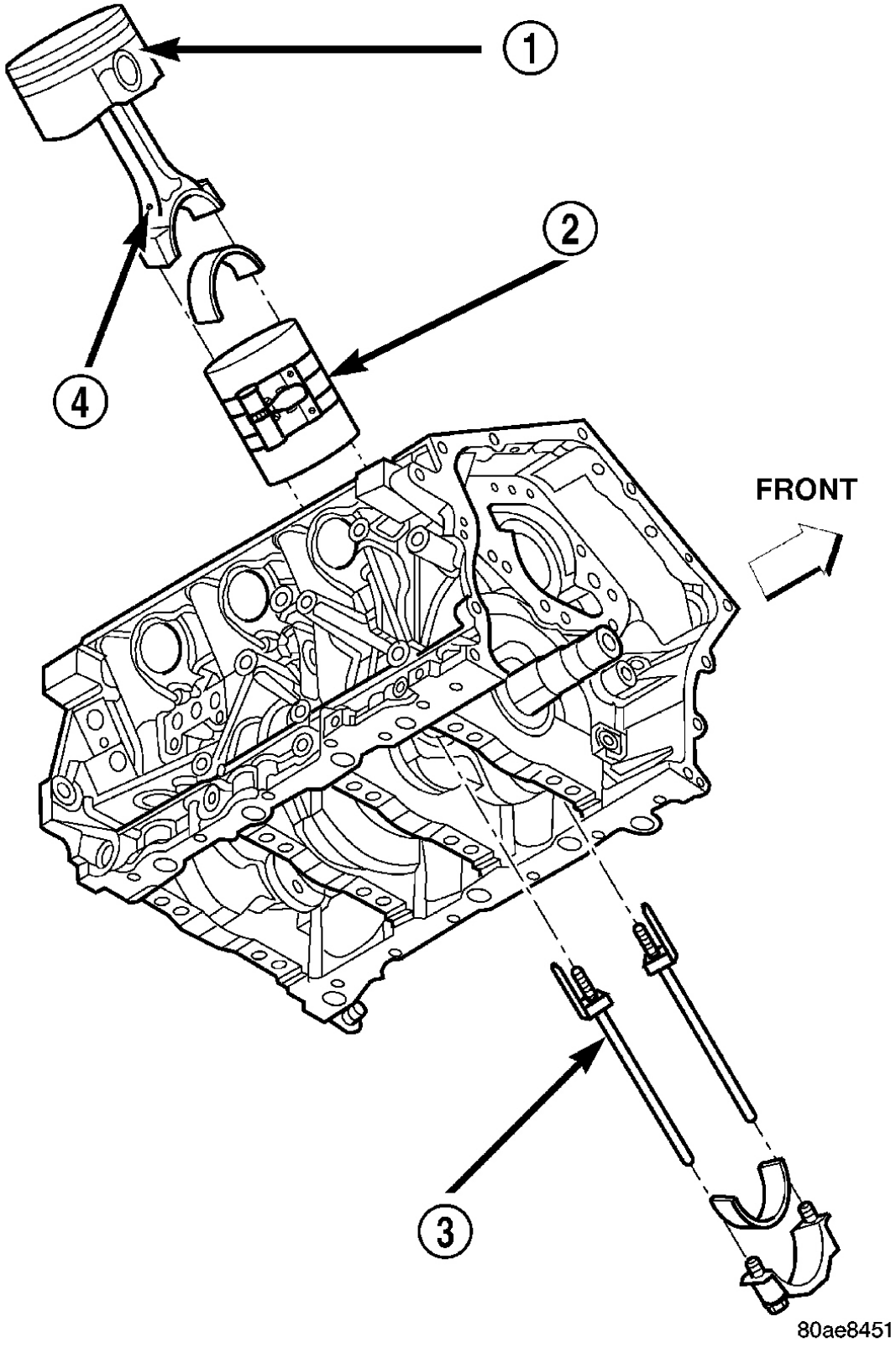
1
2
4
FRONT
3
80ae8451

Fig. 210: Installing Piston & Connecting Rod
Courtesy of CHRYSLER LLC

5. Remove connecting rod cap. Install protectors, tool 8189, on connecting rod. See **Fig. 210**. Guide each piston and rod assembly out of cylinder bore.

NOTE: Be careful not to nick crankshaft journals.

6. After removal, install bearing cap on the mating rod.

INSTALLATION

ROD-PISTON & CONNECTING

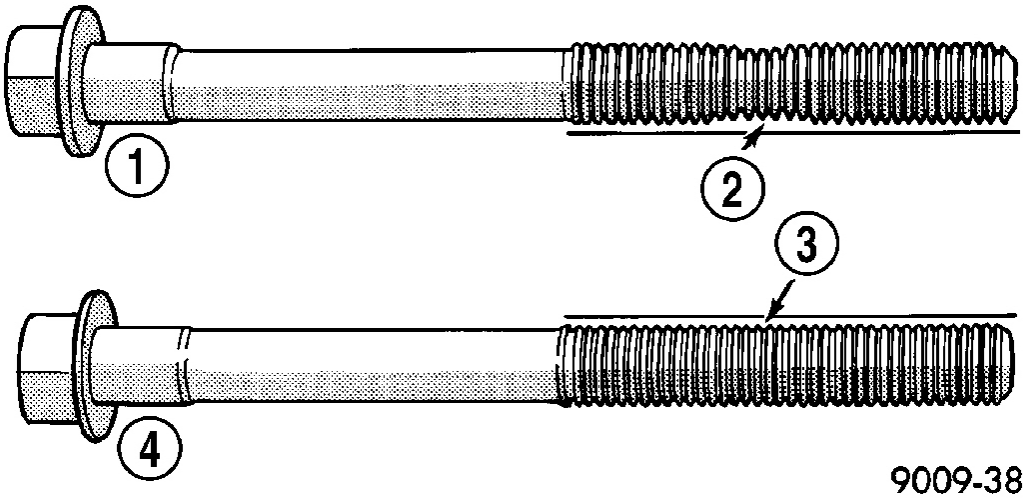

Fig. 211: Checking Connecting Rod Bolts For Necking
Courtesy of CHRYSLER LLC

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

1. Install the piston rings. See **INSTALLATION**.

NOTE: The connecting rod bearing cap bolts must be examined before reuse. If the threads are necked down, the bolts must be replaced.

2. Check connecting rod bolts for necking by holding a scale or straight edge against the threads. If all

threads do not contact the scale, the bolt must be replaced. See **Fig. 211**.

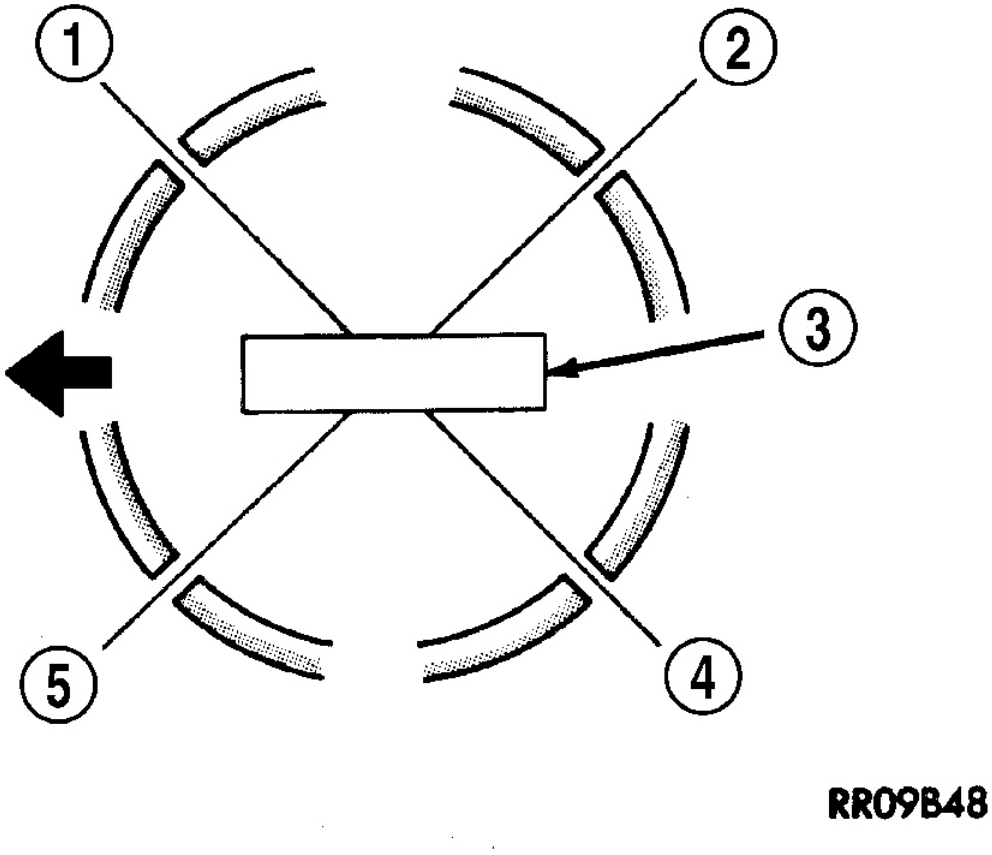

Fig. 212: Ensuring Compression Ring Gaps Are Staggered
Courtesy of CHRYSLER LLC

1 - SIDE RAIL UPPER
2 - NO. 1 RING GAP
3 - PISTON PIN
4 - SIDE RAIL LOWER
5 - NO. 2 RING GAP AND SPACER EXPANDER GAP

3. Before installing pistons and connecting rod assemblies into the bore, ensure that compression ring gaps are staggered so that neither is in line with oil ring rail gap. See **Fig. 212**.

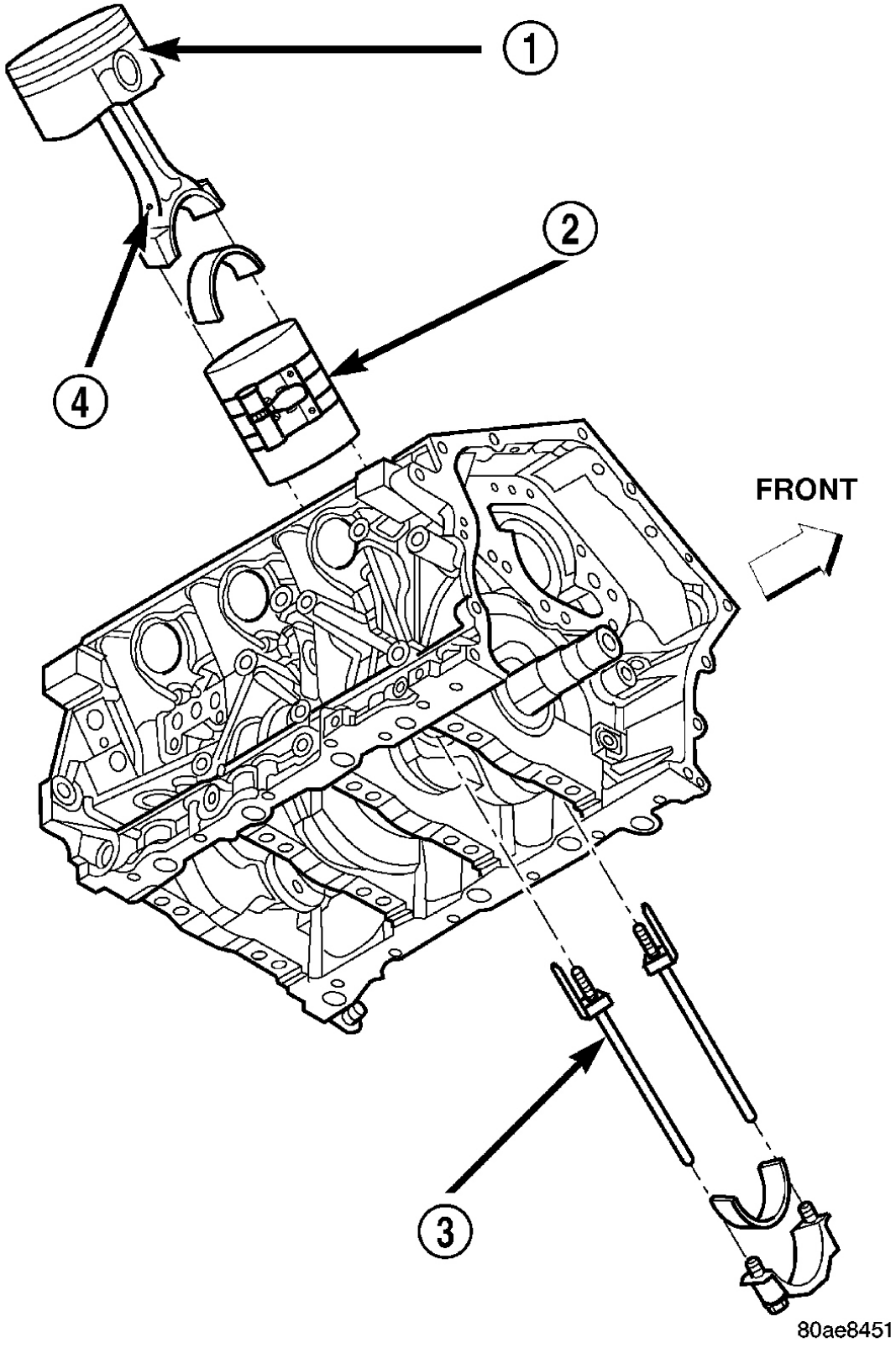
1
2
4
FRONT
3
80ae8451

Fig. 213: Identifying Piston & Connecting Rod
Courtesy of CHRYSLER LLC

4. Immerse the piston head and rings in clean engine oil, slide the ring compressor over the piston and tighten with the special wrench. See **Fig. 213**. **Ensure position of rings does not change during this operation.**
5. Install connecting rod bolt protectors, special tool # 8189. See **Fig. 213**.
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert the rod and piston into cylinder bore and guide the rod over the crankshaft journal.

CAUTION: Do Not interchange piston assemblies cylinder-to-cylinder or bank-to-bank.

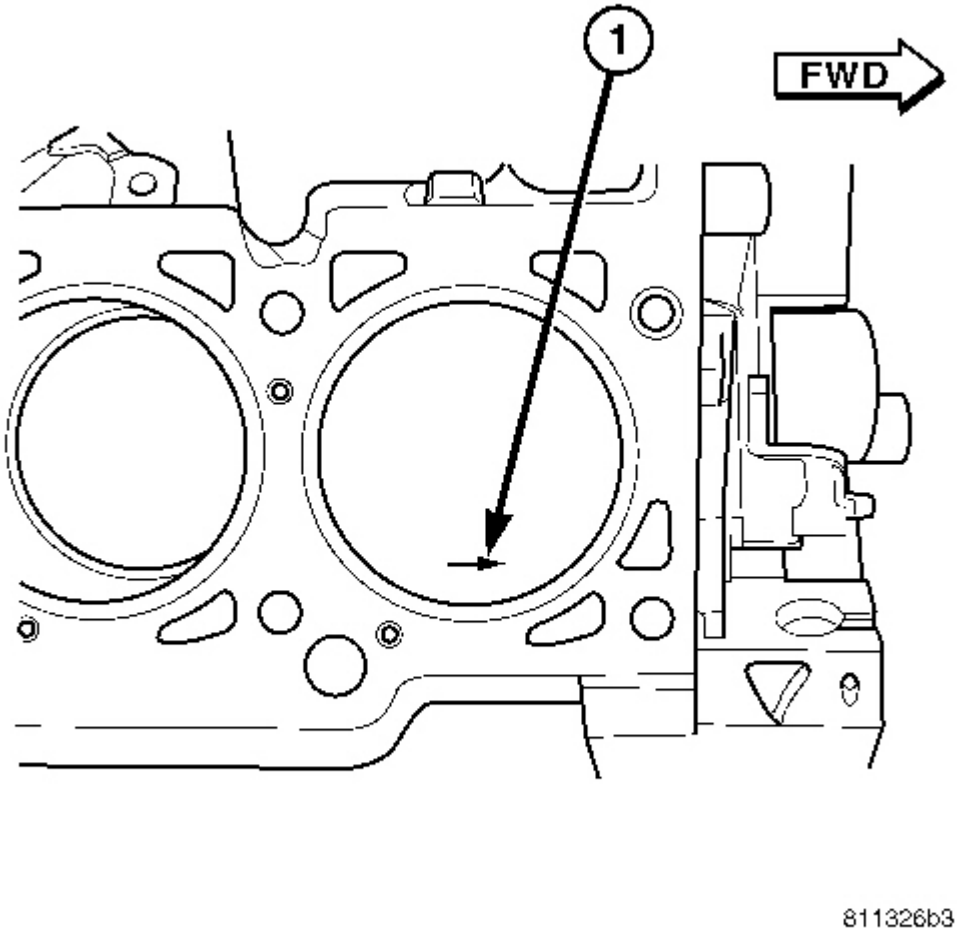

Fig. 214: Piston Orientation
Courtesy of CHRYSLER LLC

1 - ARROW FACES FRONT OF ENGINE

7. The arrow on top of piston must be pointing toward front of engine. See **Fig. 214**

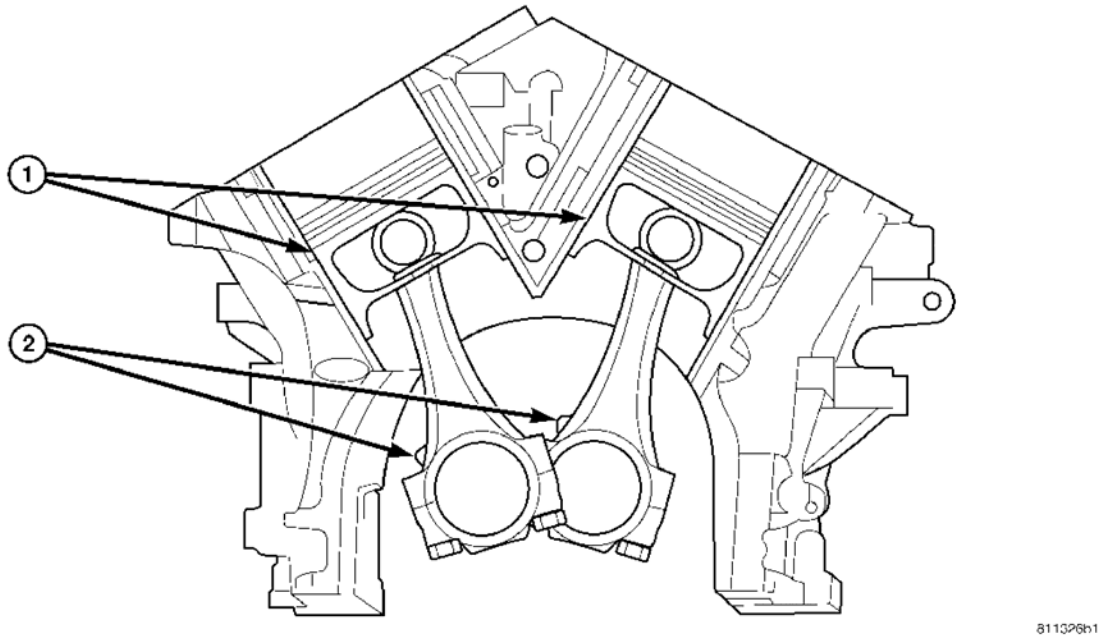

Fig. 215: Piston & Connecting Rod Positioning
Courtesy of CHRYSLER LLC

1 - MAJOR THRUST SIDE OF PISTON 2 - OIL SQUIRT HOLE

CAUTION: View of connecting rod oil squirt hole is from the front of the engine.

8. The oil squirt hole on connecting rod faces the major thrust side of the cylinder bore. See **Fig. 215**.

NOTE: Make sure the rod bearings are seated with the oil squirt hole aligned.

9. 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: Connecting rod bolts must be lubricated with clean engine oil.

10. Install the rod caps. Install cleaned and inspected connecting rod bolts and tighten to 27 N.m (20 ft. lbs.) Plus 1/4 turn.
11. Install the cylinder head(s). See **INSTALLATION**.
12. Install the oil pan. See **INSTALLATION**.

RING - PISTON

DESCRIPTION

RING - PISTON

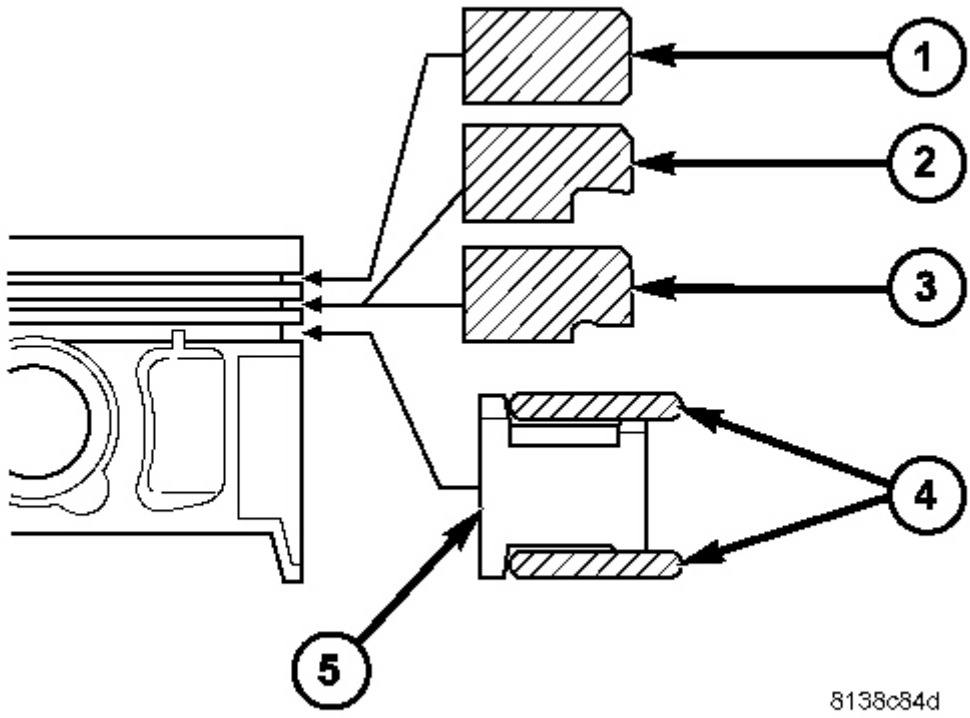

Fig. 216: Piston Rings
Courtesy of CHRYSLER LLC

1 - TOP PISTON RING
2 - CHROME INTERMEDIATE PISTON RING
3 - MICRO-NAPIER INTERMEDIATE PISTON RING
4 - OIL CONTROL RINGS
5 - SPACER

The piston rings include a moly-filled top ring with a symmetric barrel face. The intermediate piston ring is of the standard chrome design OR Micro-Napier design. The Micro-Napier design has a reduced "hook" on the running face, removes the need for chroming and improves oil economy. The oil control package consists of two steel rails and an expander spacer. See **Fig. 216**.

STANDARD PROCEDURE

PISTON RING FITTING

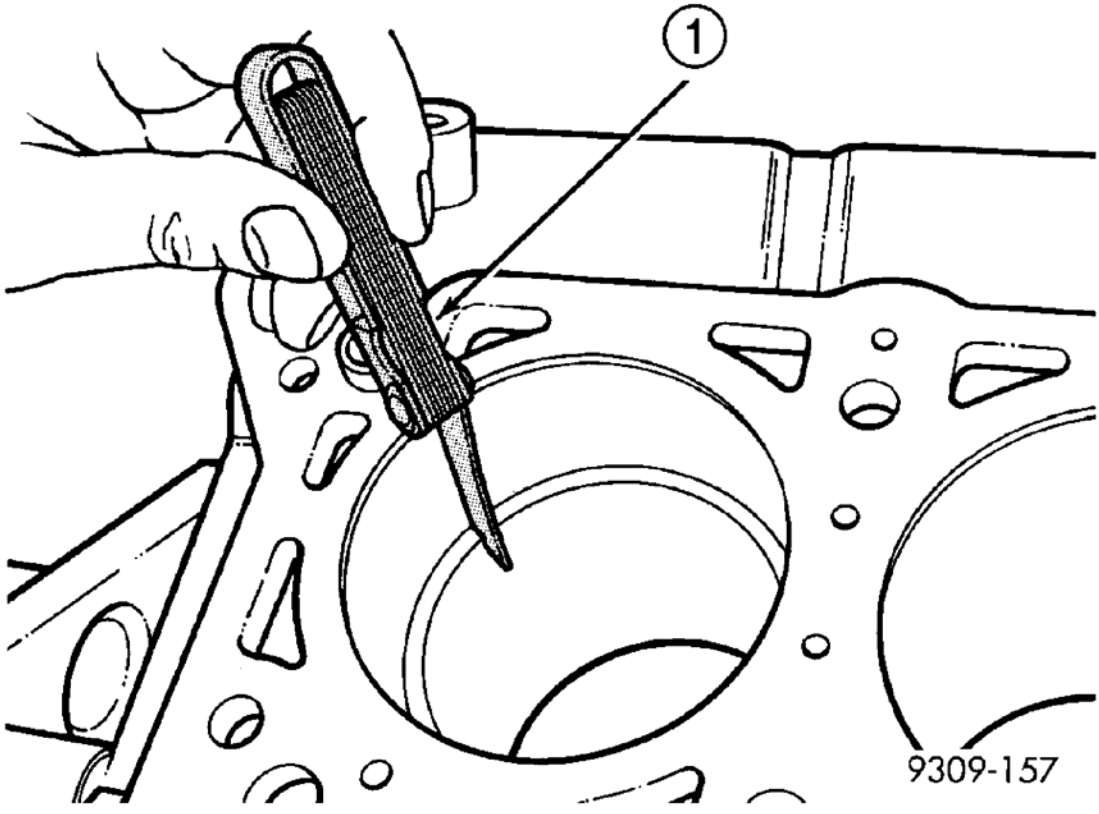

Fig. 217: Checking Piston Rings Gap
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

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 in.) from bottom of cylinder bore. Check gap with feeler gauge. See **Fig. 217**. For clearance specifications, see **SPECIFICATIONS**.

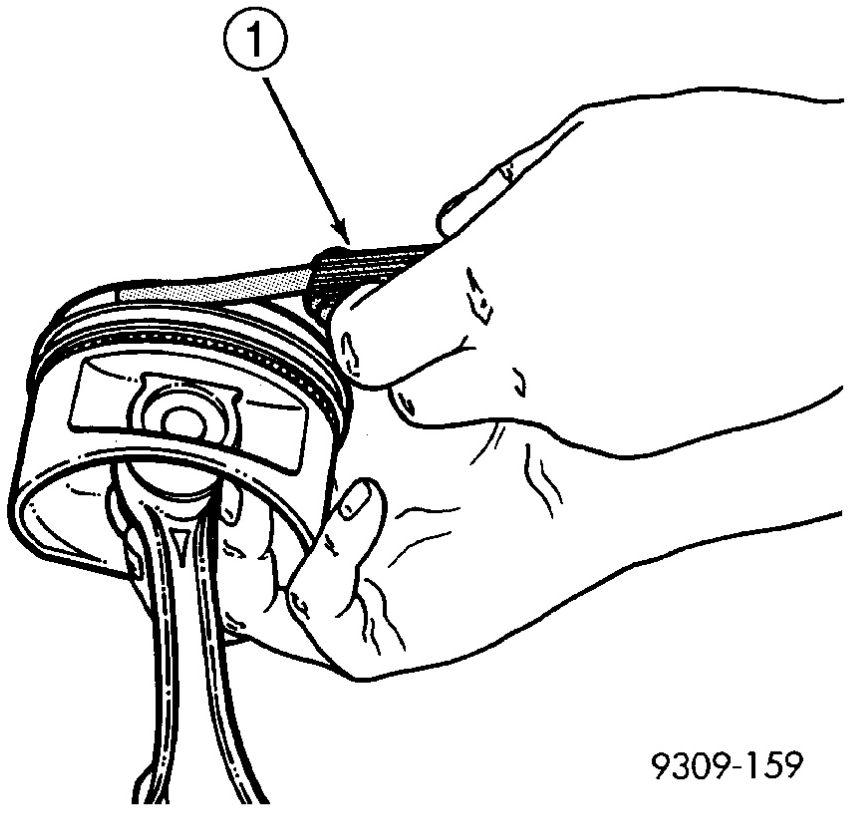

Fig. 218: Checking Piston Ring To Groove Clearance
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

2. Check piston ring to groove clearance: See **Fig. 218**. For clearance specifications, see **SPECIFICATIONS**.

REMOVAL

RING - PISTON

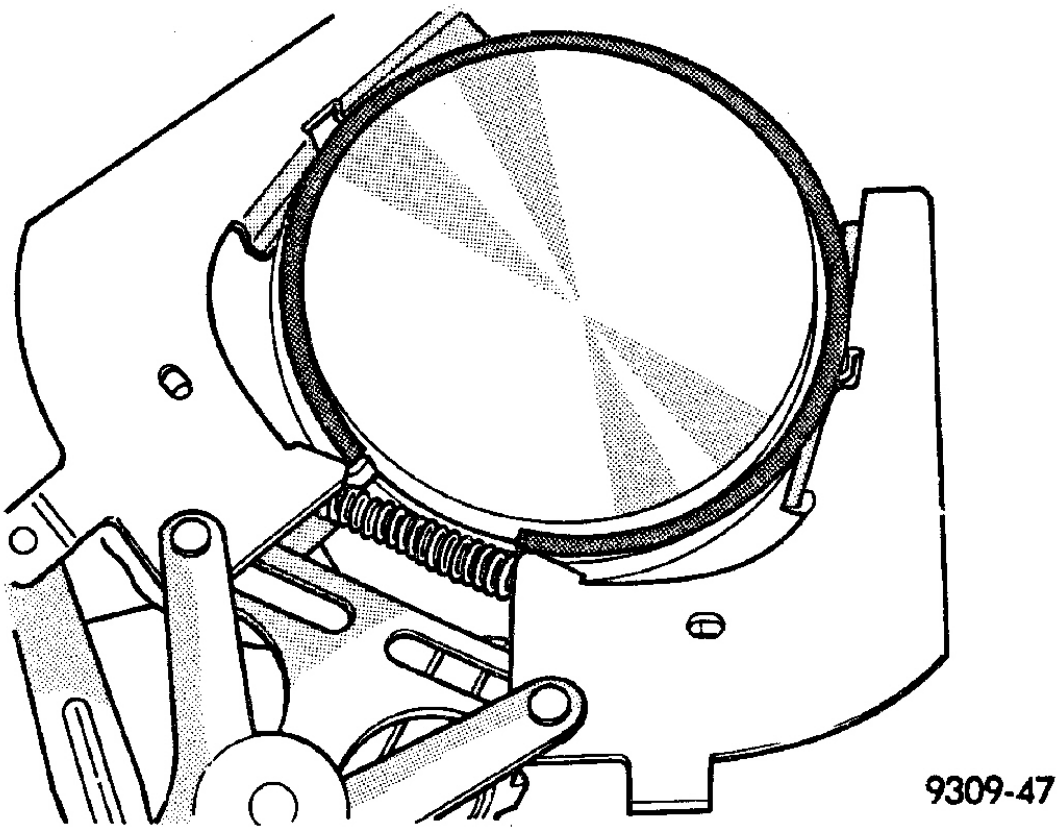

Fig. 219: Removing/Installing No. 1 And No.2 Piston Rings From Piston Using Ring Expander Tool
Courtesy of CHRYSLER LLC

1. Remove piston and connecting rod. See **REMOVAL**.
2. Remove No. 1 and No.2 piston rings from piston using a ring expander tool. See **Fig. 219**.

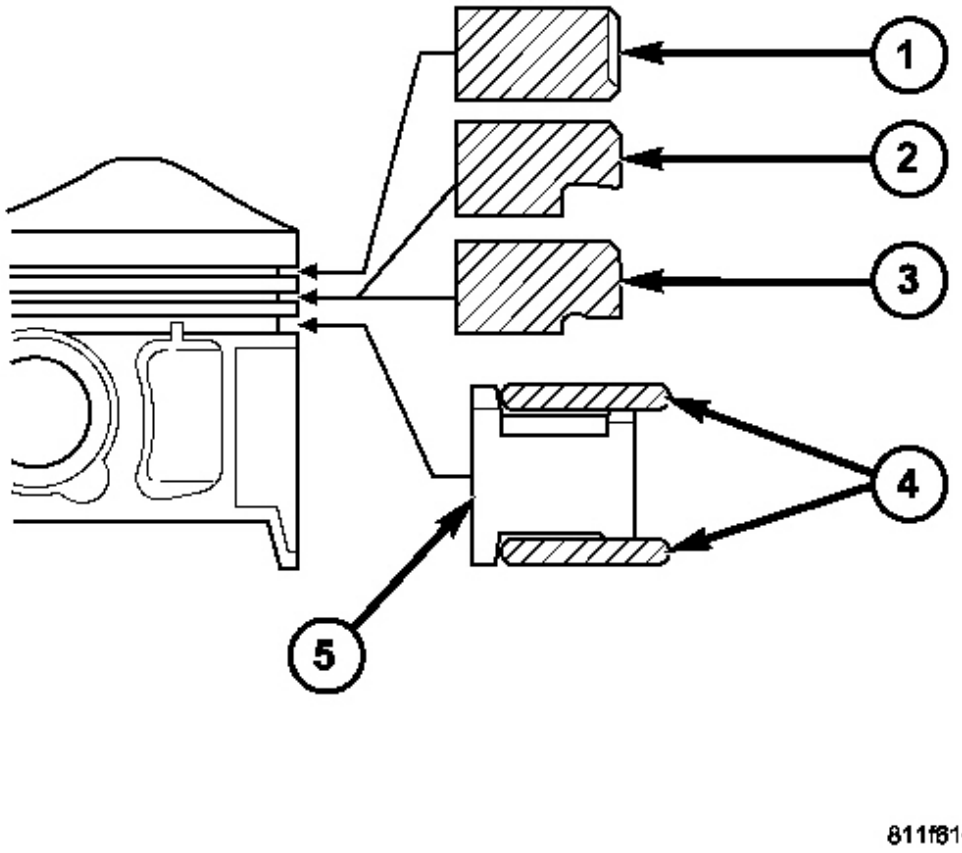

Fig. 220: Removing Upper Oil Control Ring Side Rail, Lower Oil Control Ring Side Rail & Oil Control Ring Expander
Courtesy of CHRYSLER LLC

1 - TOP PISTON RING
2 - CHROME INTERMEDIATE PISTON RING
3 - MICRO-NAPIER INTERMEDIATE PISTON RING
4 - OIL CONTROL RINGS
5 - SPACER

3. Remove upper oil control ring side rail. See **Fig. 220**.
4. Remove lower oil control ring side rail. See **Fig. 220**.
5. Remove oil control ring expander. See **Fig. 220**

INSTALLATION

RING - PISTON

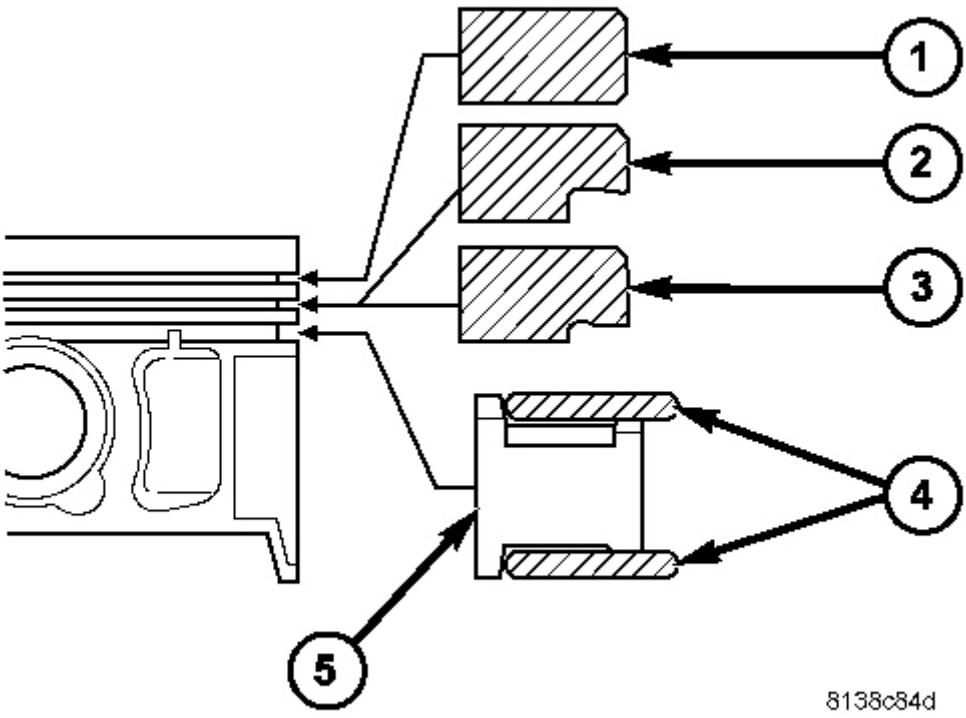

Fig. 221: Piston Rings
Courtesy of CHRYSLER LLC

1 - TOP PISTON RING
2 - CHROME INTERMEDIATE PISTON RING
3 - MICRO-NAPIER INTERMEDIATE PISTON RING
4 - OIL CONTROL RINGS
5 - SPACER

1. Measure clearance of piston rings to the cylinder bore and piston. See **STANDARD PROCEDURE**.

   The No. 1 and No. 2 piston rings have a different cross section. See Fig. 221. Insure that which ever design No. 2 ring is installed, it is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston. See **DESCRIPTION**. . See **Fig. 221**.

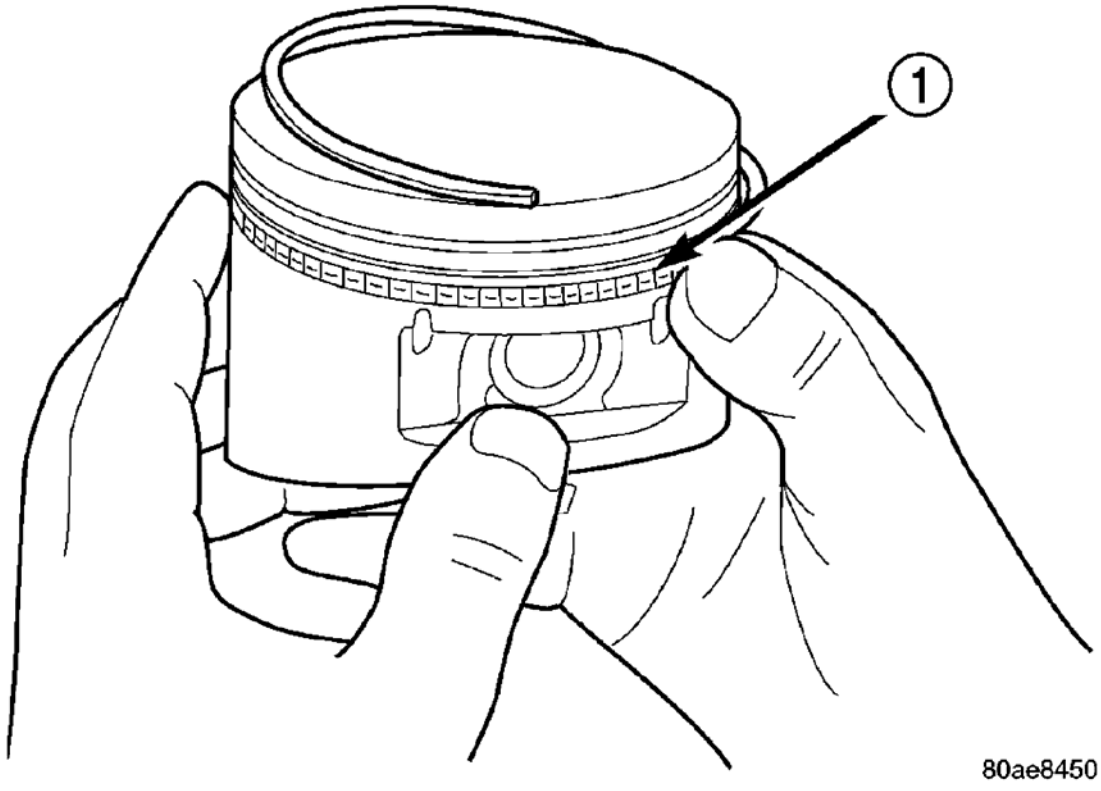

Fig. 222: Installing Side Rail
Courtesy of CHRYSLER LLC

1 - SIDE RAIL END

CAUTION: Install piston rings in the following order:

Oil ring expander.
Lower oil control ring side rail.
Upper oil control 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 spacer. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander tool during this step. See Fig. 222.**

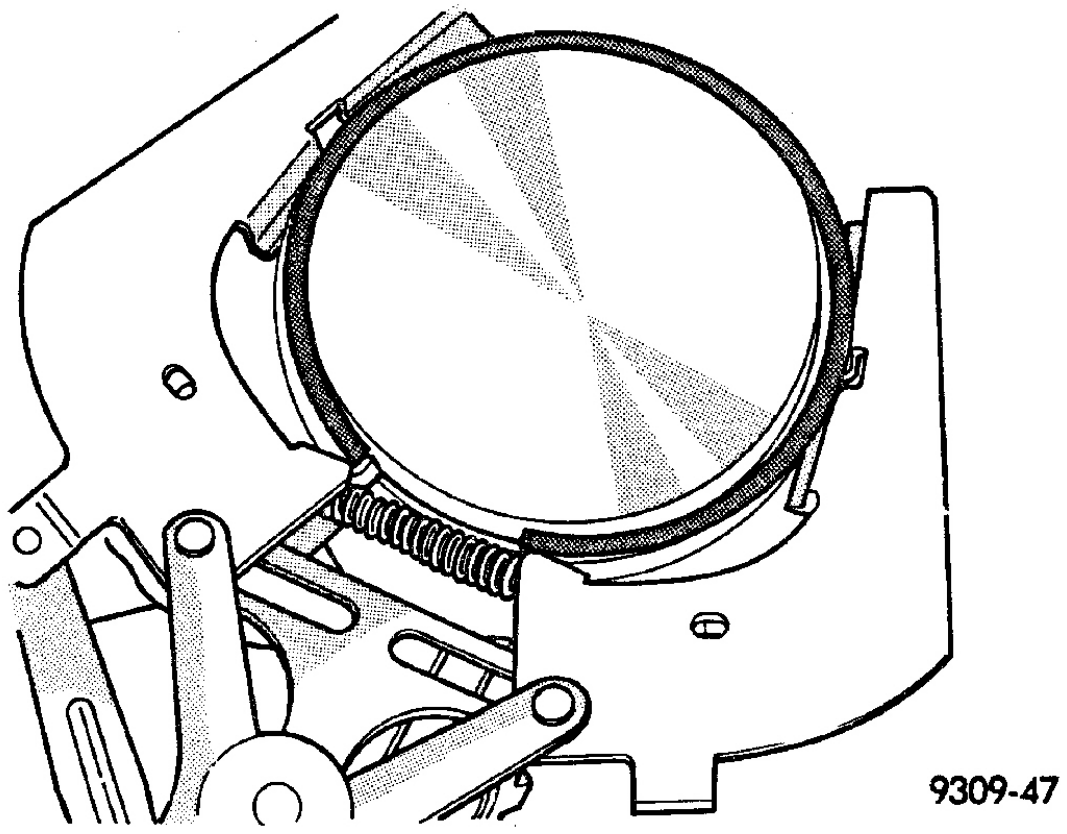

Fig. 223: Removing/Installing No. 1 And No.2 Piston Rings From Piston Using Ring Expander Tool
Courtesy of CHRYSLER LLC

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

   The No. 1 and No. 2 piston rings have a different cross section. See **Fig. 223**. Insure that which ever design No. 2 ring is installed, it is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston. See **DESCRIPTION**.

4. Install No. 2 piston ring and then No. 1 piston ring. See **Fig. 223**.

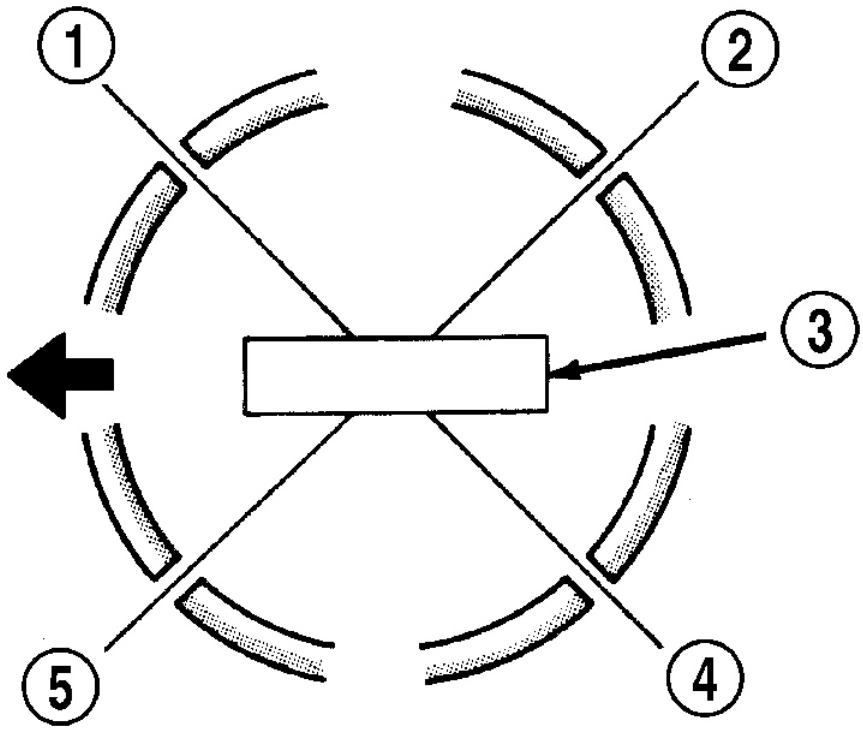

Fig. 224: Piston Ring End Gap Position
Courtesy of CHRYSLER LLC

1 - SIDE RAIL UPPER
2 - NO. 1 RING GAP
3 - PISTON PIN
4 - SIDE RAIL LOWER
5 - NO. 2 RING GAP AND SPACER EXPANDER GAP

5. Position piston ring end gaps as shown in **Fig. 224**.
6. Position oil control 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.

DAMPER - CRANKSHAFT

REMOVAL

DAMPER-CRANKSHAFT

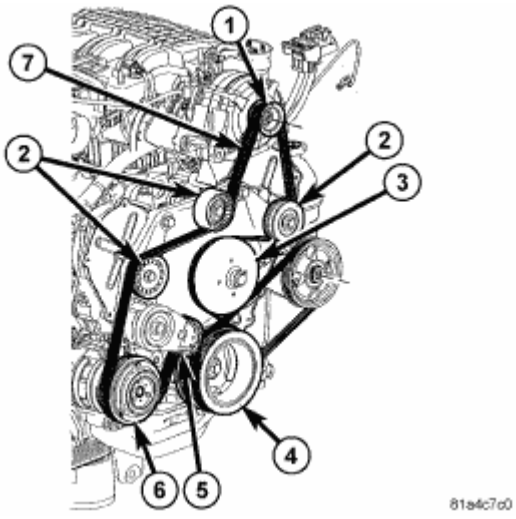

Fig. 225: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

1. Disconnect negative battery cable.
2. Remove the accessory drive belt (7) (Refer to **REMOVAL**).
3. Raise vehicle on hoist.

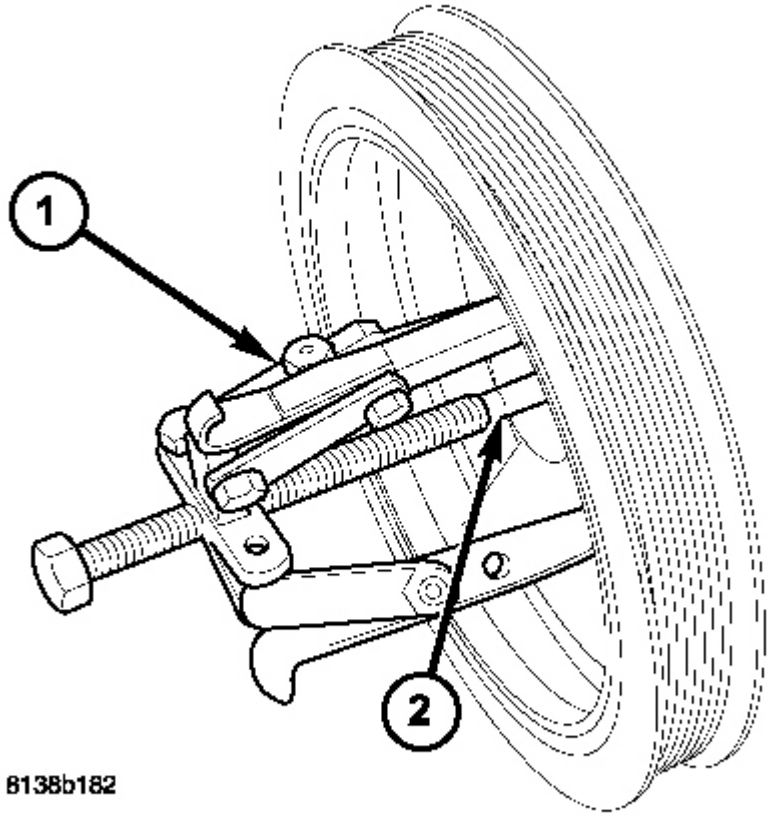

Fig. 226: Using 1023 Puller And 9020-R To Remove Crankshaft Damper
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 1023 PULLER 2 - SPECIAL TOOL 9020-R INSERT

4. Remove crankshaft damper bolt.
5. Use 1023 puller, and insert 9020-R, remove crankshaft damper.

INSTALLATION

DAMPER-CRANKSHAFT

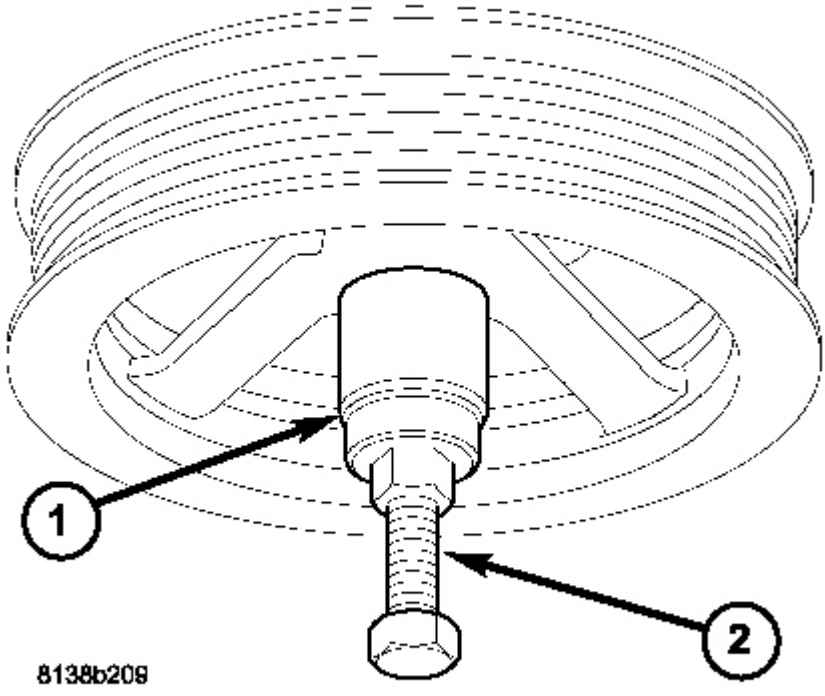

Fig. 227: Installing Crankshaft Damper Using Special Tools C-4685-C1 Bolt With Nut And Thrust Bearing From 6792, And 6792-1 Installer
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6792-1
2 - SPECIAL TOOL C-4685-C1

1. Install crankshaft damper using Special Tools C-4685-C1 (5.9 in.) Bolt, with Nut and Thrust Bearing from 6792, and 6792-1 Installer.

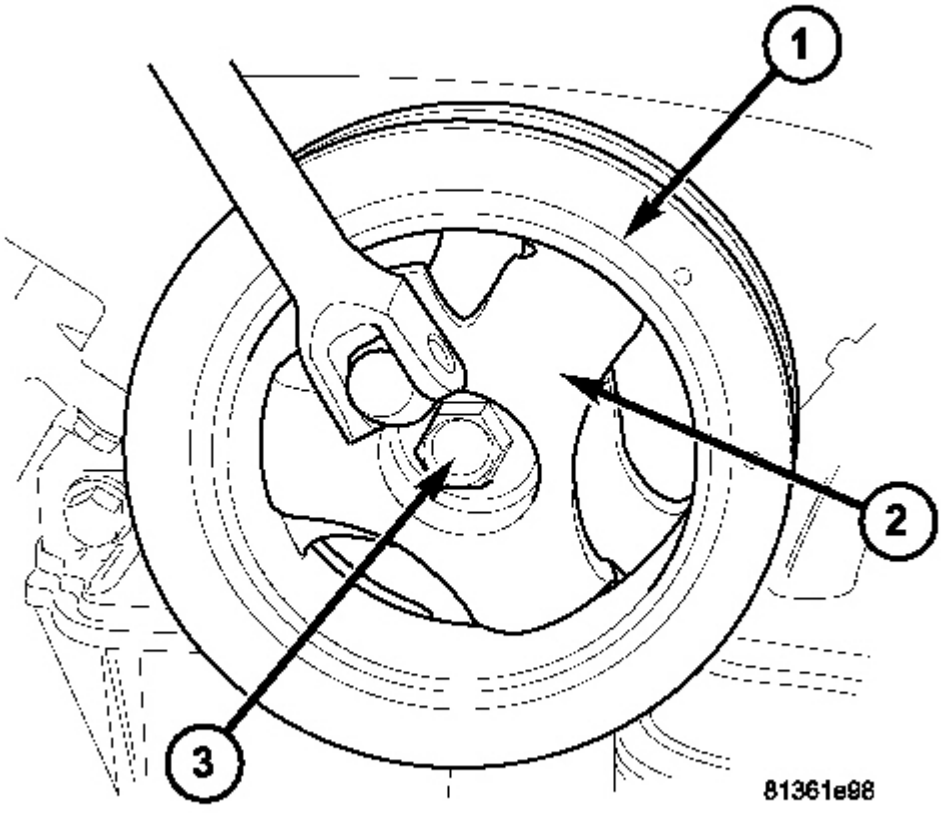

Fig. 228: Installing Crankshaft Damper Bolt
Courtesy of CHRYSLER LLC

2. Install crankshaft damper bolt. Torque bolt to 95 N.m (70 ft. lbs.) while holding damper with Special Tool 9365.
3. Lower vehicle.

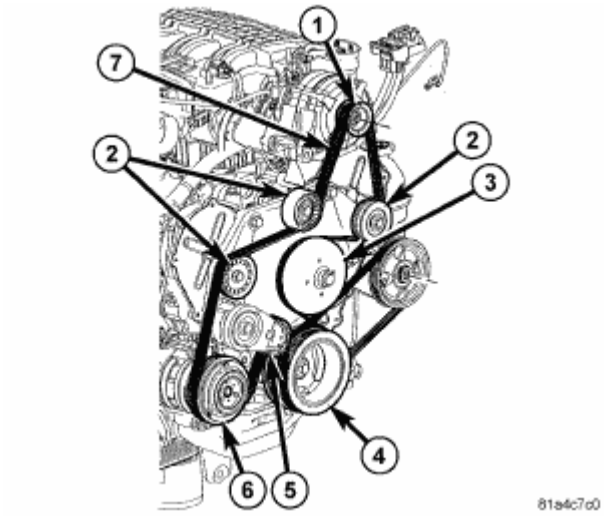

Fig. 229: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

4. Install accessory drive belt (7).
5. Connect negative battery cable.

ENGINE MOUNTING

DESCRIPTION

ENGINE MOUNTS

The engine mounting system are of molded rubber material and consist of two mounts; right and a left side support the powertrain, and control powertrain torque.

MOUNT -LEFT

REMOVAL

MOUNT-LEFT

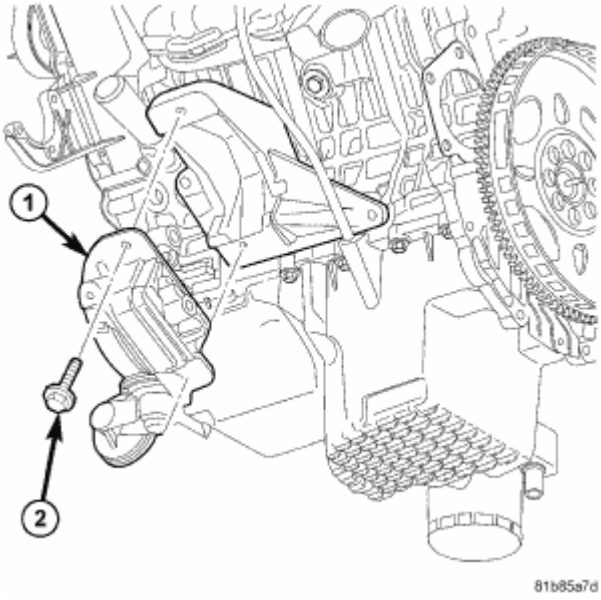

Fig. 230: Left Engine Mount
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove both engine mount to frame nuts and remove the left engine mount bolts (2).
4. Using a suitable jack and a block of wood under the oil pan, raise the engine until the weight is off of the mounts (approximately 5mm).
5. Remove the engine mount bolts and remove the mount.

INSTALLATION

MOUNT-LEFT

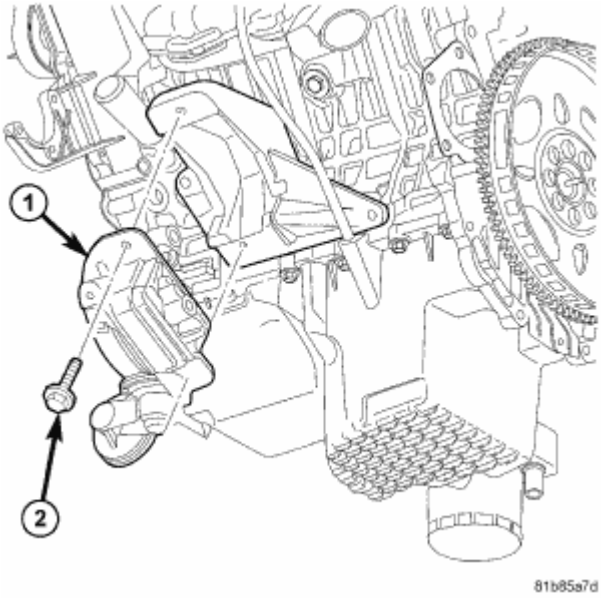

Fig. 231: Left Engine Mount
Courtesy of CHRYSLER LLC

1. Install the left mount (1) to the engine mounting bracket. Hand tighten fasteners.
2. Tighten the engine mount to mounting bracket fasteners (2) to 75 N.m (55 ft.lbs.).
3. Lower the engine and remove lifting device.
4. Install the left engine mount to frame fasteners and tighten both to 75 N.m (55 ft. lbs.).
5. Connect the negative battery cable.

MOUNT - RIGHT

REMOVAL

ENGINE MOUNT - RIGHT

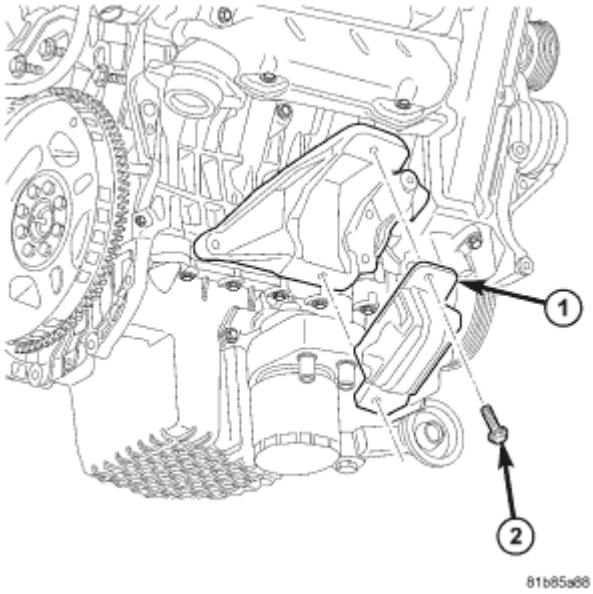

Fig. 232: Right Engine Mount
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove both of the engine mount to frame fasteners.
4. Using a suitable jack stand and a block of wood positioned under the oil pan, raise the engine until the weight is off of the mounts (approximately 5 mm.).
5. Remove both of the engine mount to bracket bolts (2).
6. Remove the engine mount (1).

INSTALLATION

ENGINE MOUNT - RIGHT

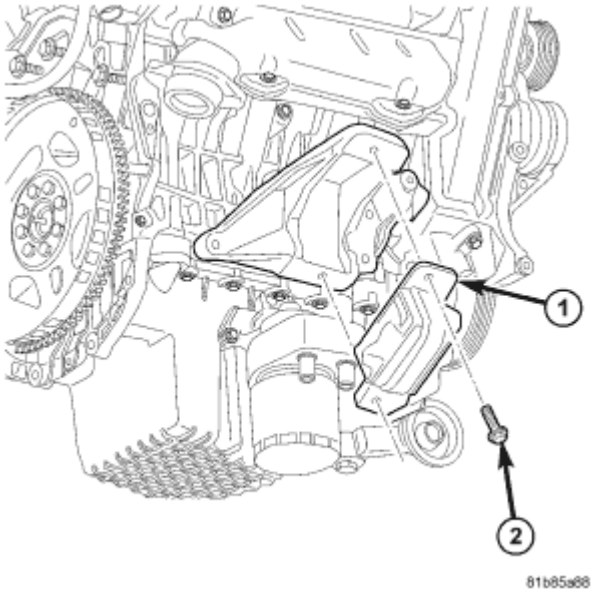

Fig. 233: Right Engine Mount
Courtesy of CHRYSLER LLC

1. Install the engine mount (1) to the engine bracket. Tighten bolts (2) to 54 N.m (40 lbs. ft.).
2. Lower the engine and remove the lifting devise.
3. Install the right engine mount to frame fasteners and tighten both to 75 N.m (55 lbs. ft.).
4. Connect the negative battery cable.

MOUNT - REAR

REMOVAL

ENGINE MOUNT - REAR

NOTE: A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

1. Disconnect negative cable from battery.
2. Raise the vehicle and support the transmission.
3. Remove the nuts holding the support cushion to the crossmember. Remove the crossmember.

MANUAL TRANSMISSION

Remove the support cushion nuts and remove the cushion.
Remove the transmission support bracket bolts and remove the bracket from the transmission.

AUTOMATIC TRANSMISSION

Remove the support cushion bolts and remove the cushion and the support bracket from the transmission (4WD) or from the adaptor bracket (2WD).

On 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission. Remove the adaptor bracket.

INSTALLATION

ENGINE MOUNT - REAR

MANUAL TRANSMISSION:

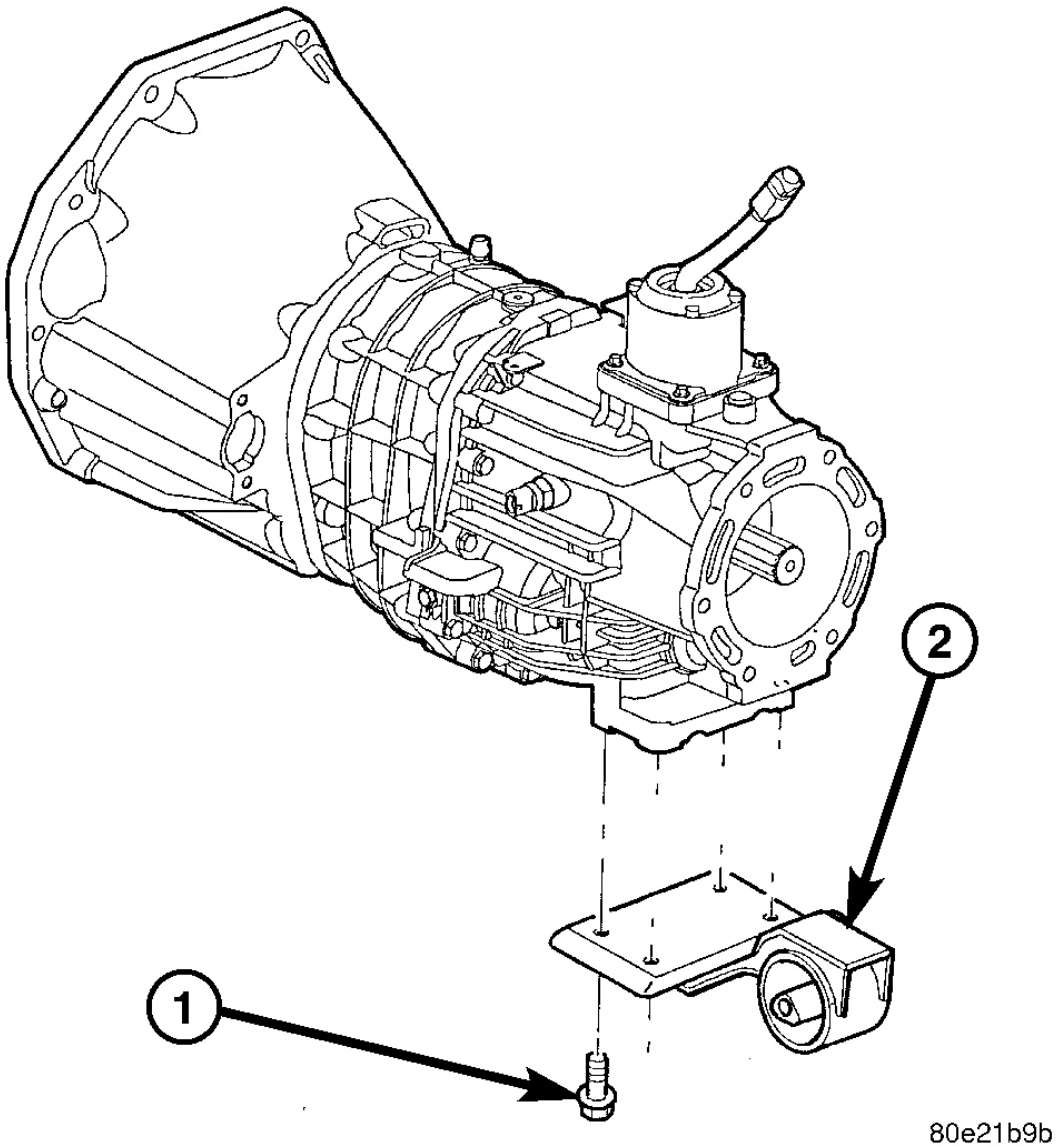

Fig. 234: Transmission Mount - 2.4L Manual Trans
Courtesy of CHRYSLER LLC

1 - TRANSMISSION MOUNT 2 - MOUNTING BOLT

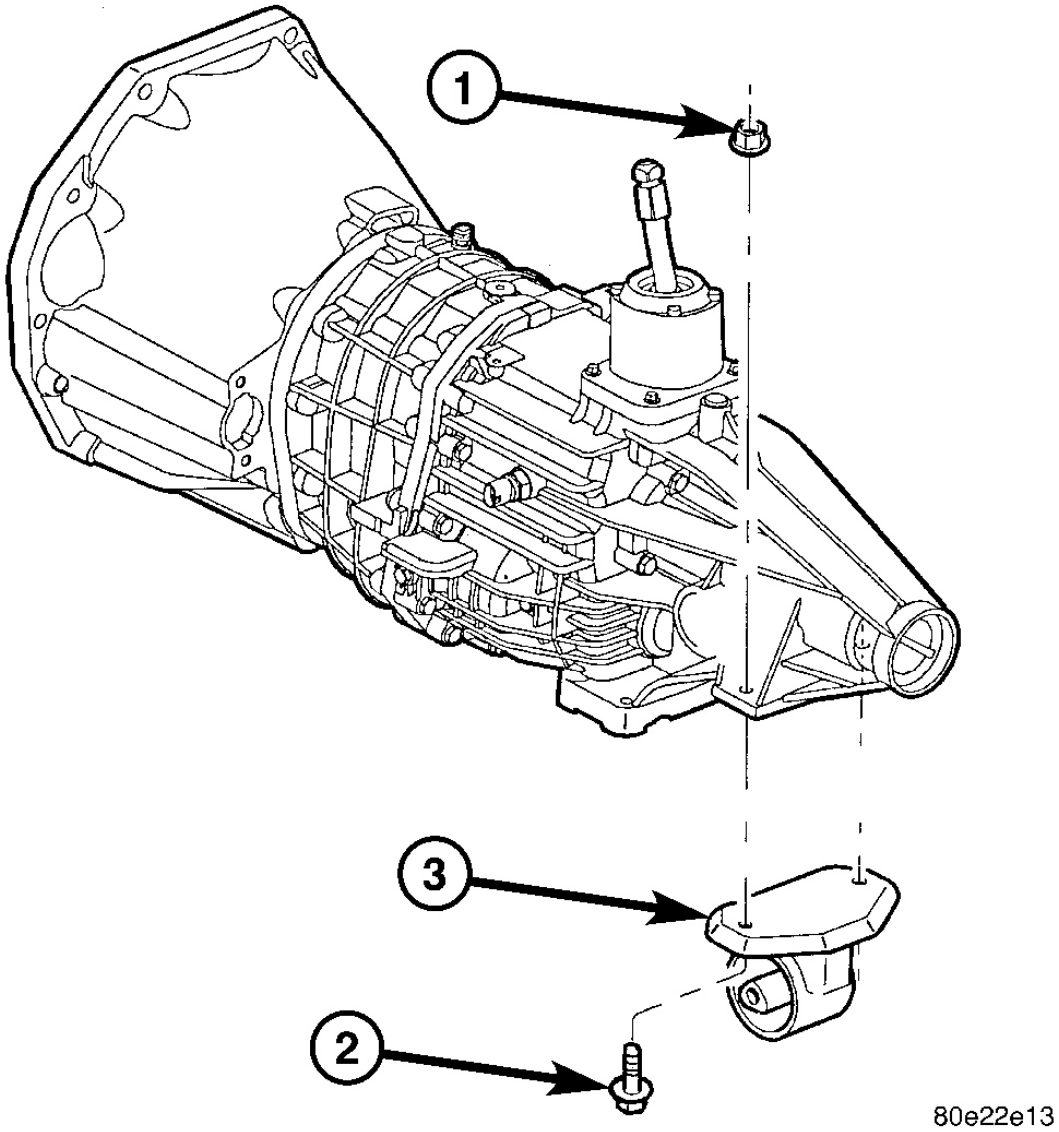

Fig. 235: Transmission Mount - 3.7L Manual Trans 2WD
Courtesy of CHRYSLER LLC

1 - NUT

2 - BOLT
3 - TRANS MOUNT

1. Install the transmission mount (1) to the transmission. Install the bolts (2) and tighten.
2. Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
3. Install crossmember-to-sill bolts and tighten to 41 N.m (30 ft. lbs.)
4. Remove the transmission support.
5. Lower the vehicle.
6. Connect negative cable to battery.

AUTOMATIC TRANSMISSION:

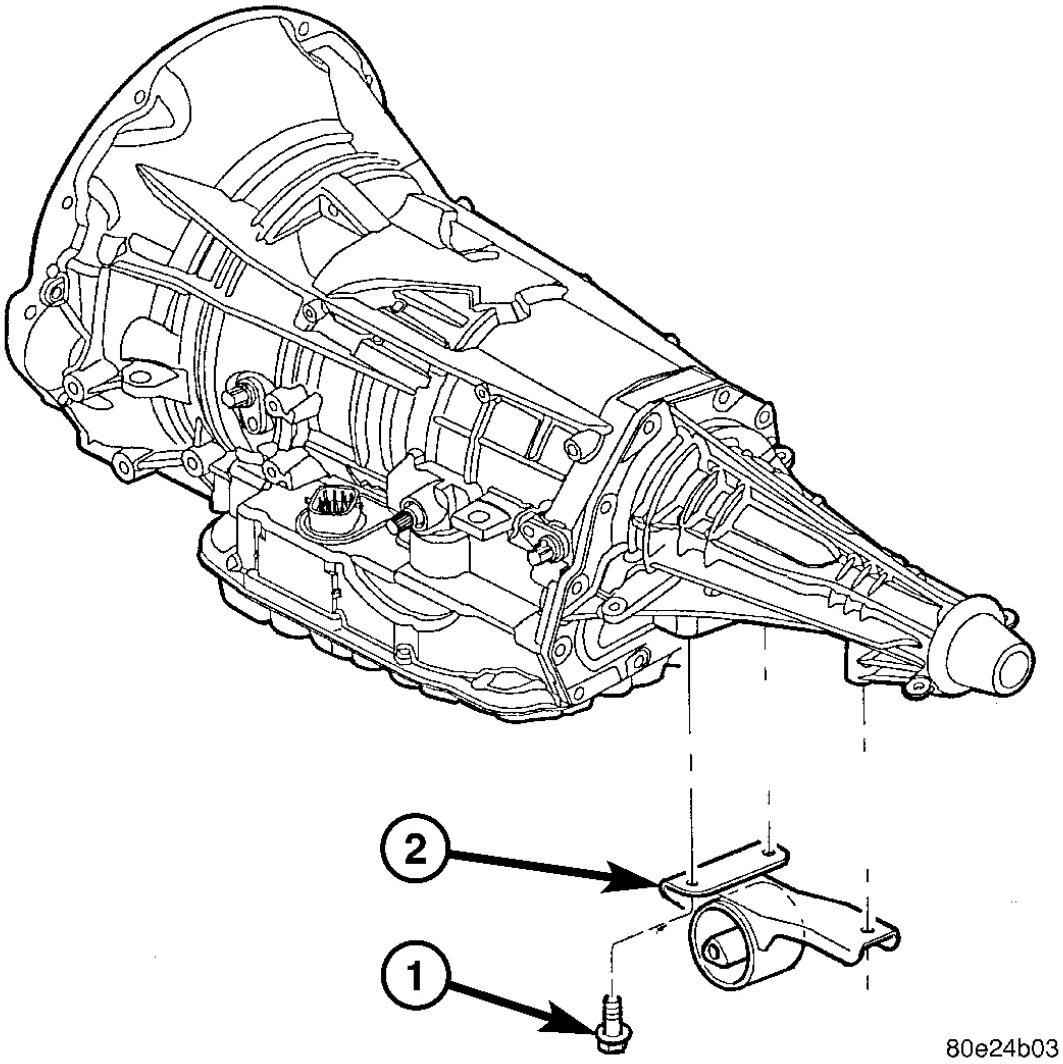

Fig. 236: Transmission Mount - 3.7L 2WD Auto Trans
Courtesy of CHRYSLER LLC

1 - BOLT 2 - MOUNT

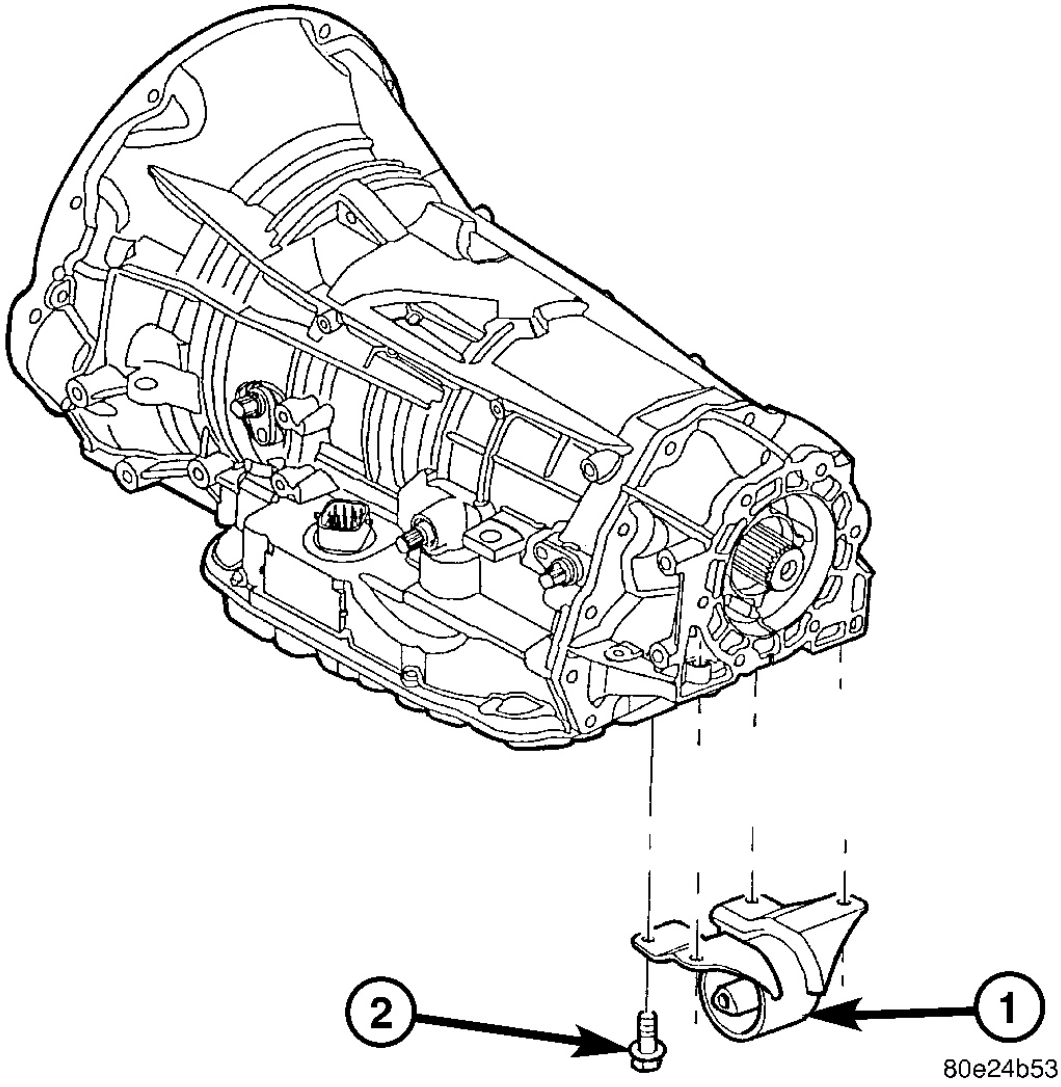

Fig. 237: Transmission Mount - 3.7L 4WD Auto Trans
Courtesy of CHRYSLER LLC

1 - MOUNT 2 - BOLT

1. Install the transmission mount to transmission and See **Fig. 236** and **Fig. 237**. Install the bolts.
2. Position the crossmember in the vehicle. Install the crossmember to mount through bolt and nut.
3. Remove the transmission support.
4. Lower the vehicle.
5. Connect negative cable to battery.

LUBRICATION

DESCRIPTION

ENGINE LUBRICATION SYSTEM

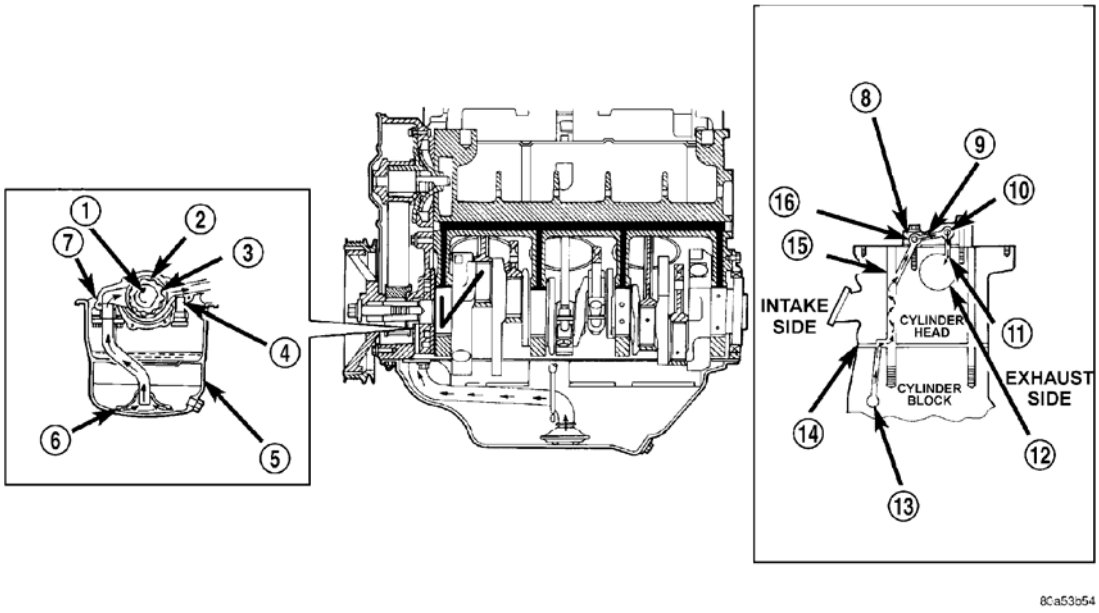

Fig. 238: Oil Lubrication System
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT	9 - PEDESTAL DRILLED PASSAGE
2 - OUTER ROTOR	10 - EXHAUST ROCKER SHAFT
3 - INNER ROTOR	11 - SHAFT/PEDESTAL DOWEL PASSAGE
4 - RELIEF VALVE	12 - CAMSHAFT BEARING BORE
5 - OIL PAN	13 - CYLINDER BLOCK OIL GALLERY
6 - OIL SCREEN	14 - CYLINDER HEAD GASKET
7 - OIL PUMP CASE	15 - HEAD BOLT HOLE
8 - OIL FLOWS TO ONLY ONE PEDESTAL ON EACH HEAD - SECOND FROM REAR ON RIGHT HEAD - SECOND FROM FRONT ON	16 - INTAKE ROCKER SHAFT

LEFT HEAD

The oil lubrication system is a full-flow filtration, pressure feed type. The oil pump body is mounted to the engine block. The pump inner rotor is driven by the crankshaft. A windage tray, increases power by minimizing oil windage at high engine RPM. For increased oil cooling, an oil pan mounted, oil-to-coolant oil cooler is used. See **Fig. 238**.

OPERATION

ENGINE LUBRICATION SYSTEM

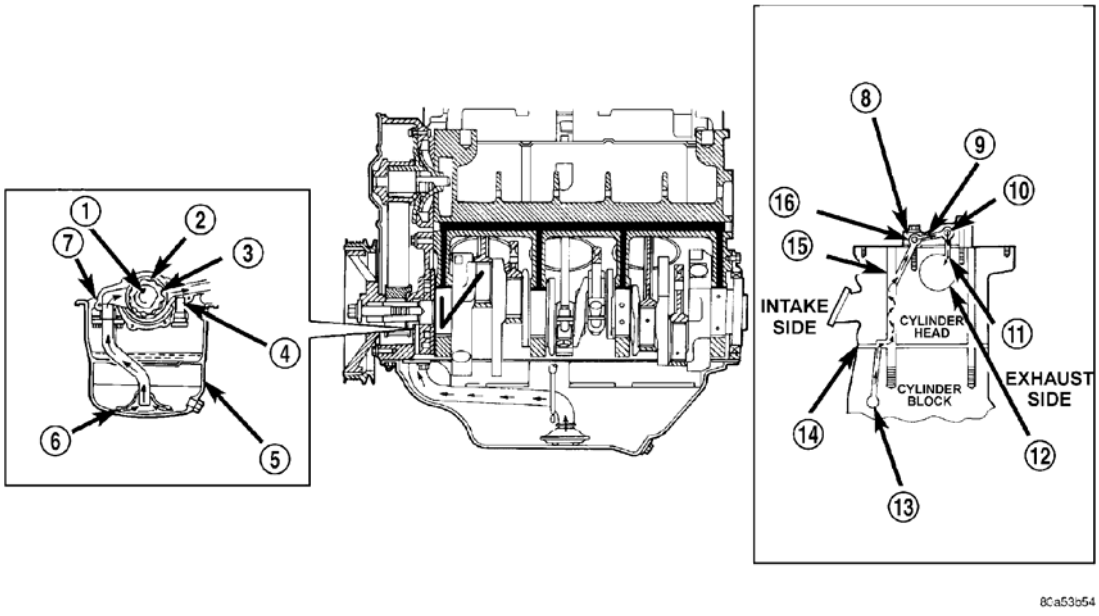

Fig. 239: Oil Lubrication System
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT	9 - PEDESTAL DRILLED PASSAGE
2 - OUTER ROTOR	10 - EXHAUST ROCKER SHAFT
3 - INNER ROTOR	11 - SHAFT/PEDESTAL DOWEL PASSAGE
4 - RELIEF VALVE	12 - CAMSHAFT BEARING BORE
5 - OIL PAN	13 - CYLINDER BLOCK OIL GALLERY
6 - OIL SCREEN	14 - CYLINDER HEAD GASKET
7 - OIL PUMP CASE	15 - HEAD BOLT HOLE
8 - OIL FLOWS TO ONLY ONE PEDESTAL ON EACH HEAD - SECOND FROM REAR ON RIGHT HEAD - SECOND FROM FRONT ON LEFT HEAD	16 - INTAKE ROCKER SHAFT

Engine oil stored in the oil pan (5) is drawn in and discharged by a gear rotor type oil pump (2, 3). The oil pump

is directly coupled to the crankshaft (1). Oil pressure is regulated by a relief valve (4). The oil is fed through an oil filter and to the crankshaft journals from the oil gallery (8) in the cylinder block. This gallery also feeds oil under pressure to the cylinder heads. Oil flows through each cylinder heads oil passage to the rocker shafts (10, 16). Oil then feeds the camshaft journals (12), rocker arms, and hydraulic lash adjusters. See **Fig. 239**.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

Check oil pressure using a gauge at oil pressure switch location.

1. Remove the oil pressure switch (1) (Refer to **REMOVAL**).
2. Install oil pressure test gauge, C-3292 with Adapter 8406. For Special Tool identification, (Refer to **SPECIAL TOOLS**).

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

3. Warm engine to normal operating temperature.
4. Monitor gauge readings at idle and 3000 RPM. For specifications (Refer to **SPECIFICATIONS**).

OIL

DESCRIPTION

ENGINE OIL

For engine oil type and capacity. Refer to **DESCRIPTION** .

STANDARD PROCEDURE

OIL LEVEL CHECK

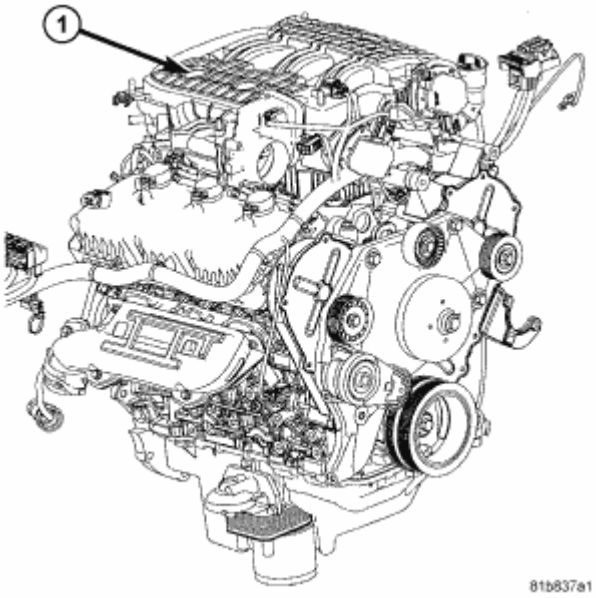

Fig. 240: 4.0L ENGINE
Courtesy of CHRYSLER LLC

The best time to check engine oil level is after the engine has sat overnight, or if the engine has been running, allow the engine to be shut off for at least 5 minutes before checking oil level.

Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at, or below, the ADD mark on the indicator.

ENGINE OIL AND FILTER CHANGE

Change engine oil at mileage and time intervals described in the Maintenance Schedule. Refer to **DESCRIPTION** .

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

TO CHANGE ENGINE OIL

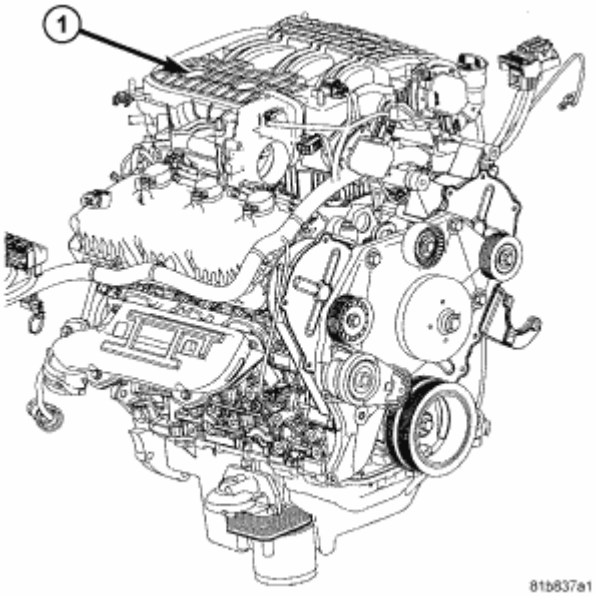

Fig. 241: 4.0L ENGINE
Courtesy of CHRYSLER LLC

1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Open hood, remove engine oil fill cap. See **Fig. 241**.

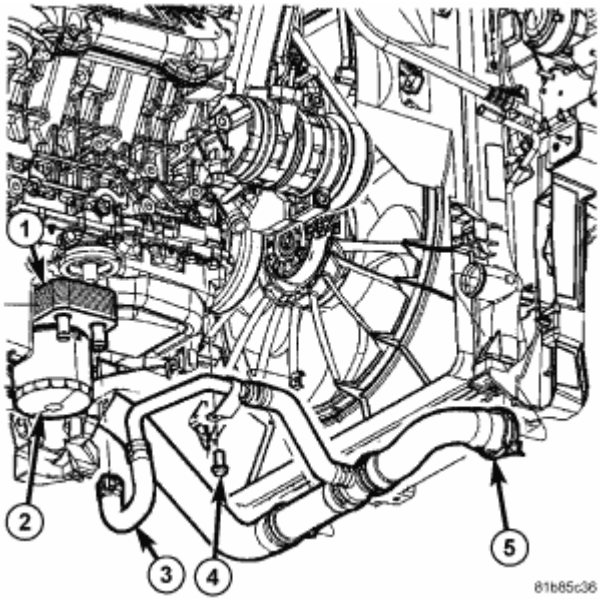

Fig. 242: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

4. Raise vehicle on hoist.
5. Place a suitable drain pan under crankcase drain.

6. Remove oil pan drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.
7. Remove oil filter (2). See **Fig. 242**.
8. Install drain plug in crankcase. Torque oil pan drain plug to 27 N.m (20 ft. lbs.).
9. Install new oil filter (2). See **Fig. 242**.

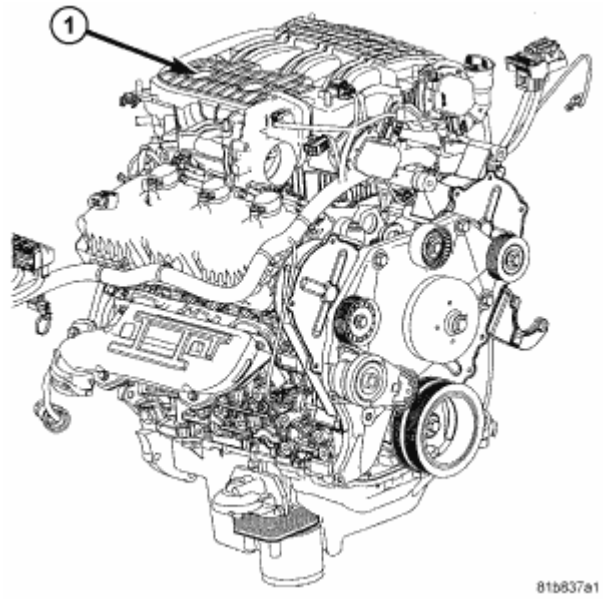

Fig. 243: 4.0L ENGINE
Courtesy of CHRYSLER LLC

10. Lower vehicle.
11. Fill crankcase with specified amount and type of engine oil. (Refer to **ENGINE OIL**)
12. Install oil fill cap. See **Fig. 243**.
13. Start engine and inspect for leaks.
14. Stop engine and inspect oil level.

OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. When replacing oil filter, use a Mopar® filter or equivalent.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING above.

COOLER-ENGINE OIL

DESCRIPTION

COOLER-ENGINE OIL

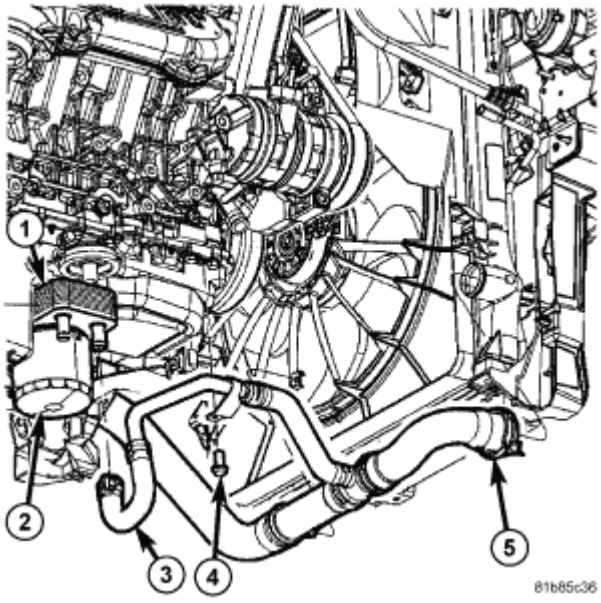

Fig. 244: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

The engine oil cooler (1) is a oil-to-coolant type and is mounted between the oil filter and the oil pan.

OPERATION

COOLER-ENGINE OIL

Engine oil travels from the oil cooler and into the oil filter. Engine oil then exits the filter into the main gallery. Engine coolant flows into the cooler from the heater return tube and exits into the water inlet tube.

REMOVAL

REMOVAL

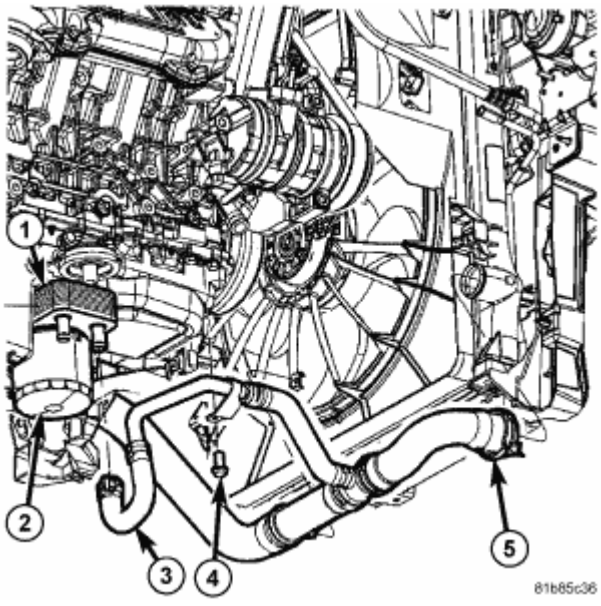

Fig. 245: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

1. Drain cooling system.
2. Raise vehicle on hoist.
3. Disconnect coolant hose (3) from oil cooler (1).

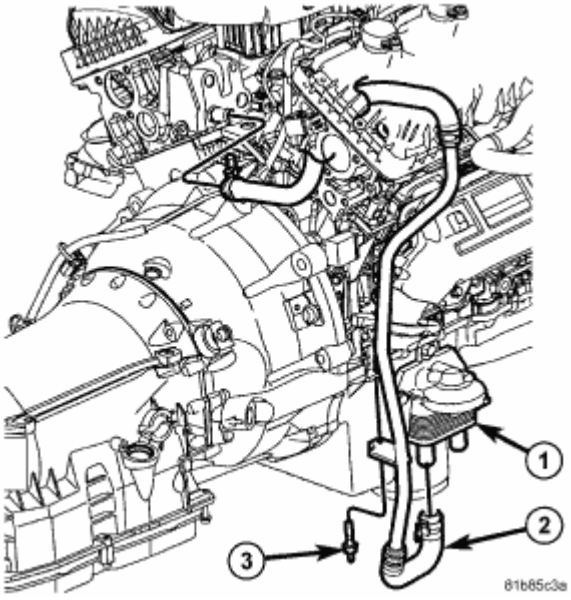

Fig. 246: Removing/Installing Oil Cooler & Coolant Hoses
Courtesy of CHRYSLER LLC

4. Disconnect coolant hoses (2) from oil cooler (1).
5. Remove oil filter.

6. Remove oil cooler attaching fastener from center of oil cooler.
7. Remove oil cooler (1).

INSTALLATION

INSTALLATION

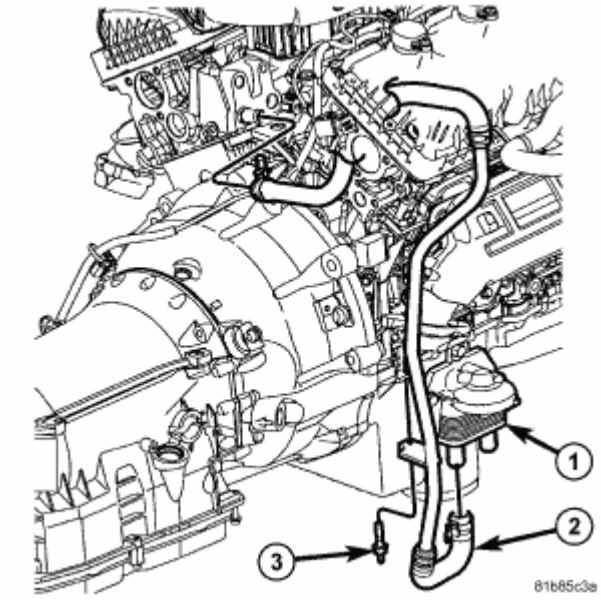

Fig. 247: Removing/Installing Oil Cooler & Coolant Hoses
Courtesy of CHRYSLER LLC

1. Position oil cooler to fitting on oil pan.

NOTE: Remove all oil and debris from the seal retainer surface. The cut out section of the oil cooler seal retainer flange (top), must be aligned with the tab on the oil pan. The oil cooler must be prevented from turning during the tightening sequence.

2. Install oil cooler (1) attaching fastener and tighten to 61 N.m (45 ft. lbs.).
3. Install oil filter and tighten to 12 N.m (106 in. lbs.).
4. Connect coolant hose (2) to oil cooler (1).

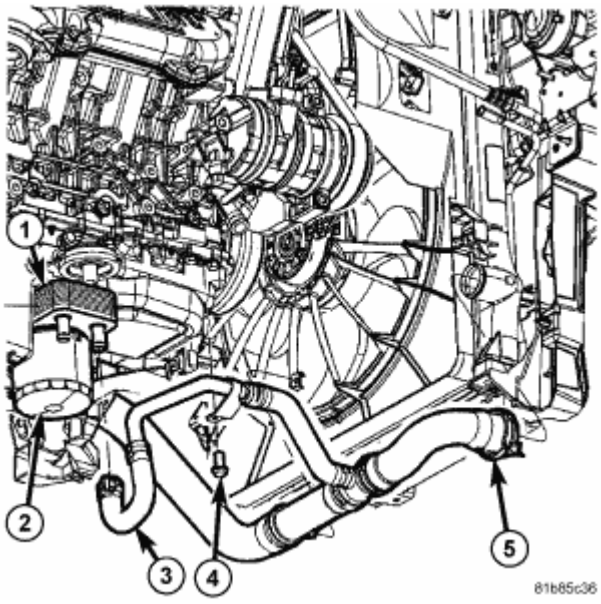

Fig. 248: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

5. Connect coolant hose (3) to oil cooler (1).
6. Fill cooling system.

FILTER-OIL

REMOVAL

FILTER-OIL

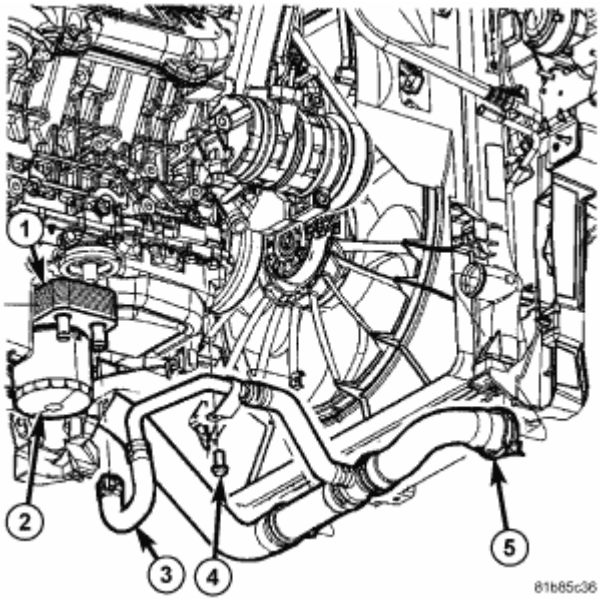

Fig. 249: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose

Courtesy of CHRYSLER LLC

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

1. Using a suitable oil filter wrench, unscrew filter (2) from base and discard.

INSTALLATION

FILTER-OIL

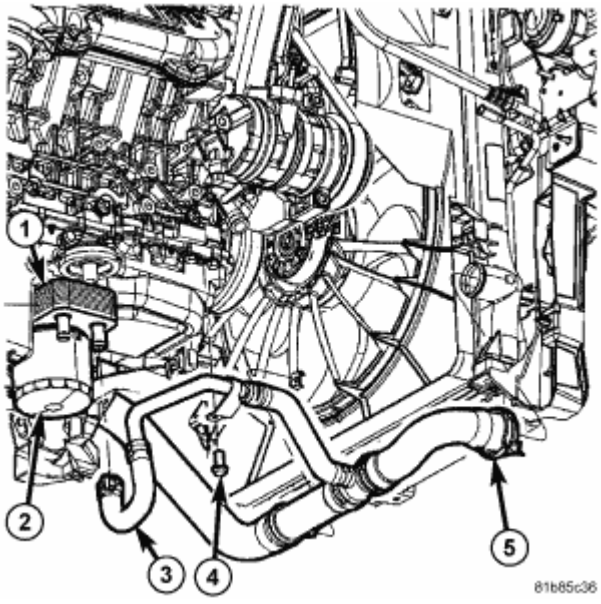

Fig. 250: Engine Oil Cooler, Coolant Hose, Filter & Lower Radiator Hose
Courtesy of CHRYSLER LLC

1. Wipe base clean, then inspect gasket contact surface.
2. Lubricate gasket of new filter (2) with clean engine oil.
3. Install and tighten filter to 12 N.m (106 in. lbs.) of torque after gasket contacts base. Use filter wrench if necessary.
4. Start engine and check for leaks.

PAN - OIL

REMOVAL

OIL PAN-REMOVAL

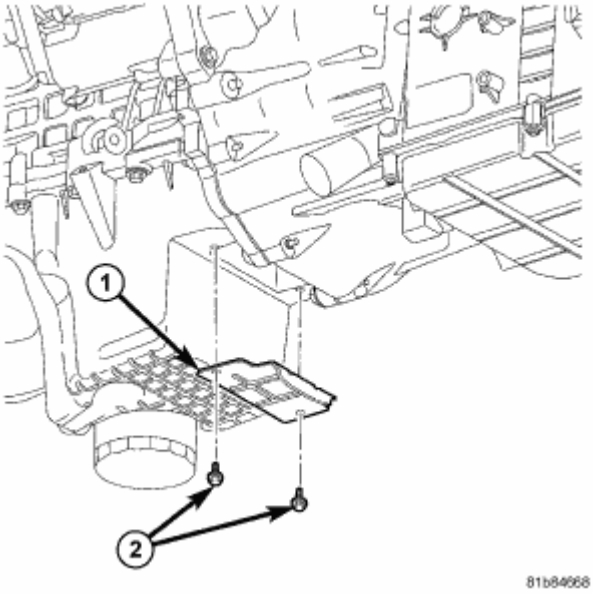

Fig. 251: Flex Plate Inspection Cover & Fastener
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove engine oil indicator.
3. Raise and support the vehicle.
4. Drain engine oil and remove the oil filter (Refer to **STANDARD PROCEDURE**).
5. Remove the oil filter, oil cooler mounting stud and set oil cooler aside (Refer to **REMOVAL**).
6. Remove the flex plate access cover (1).

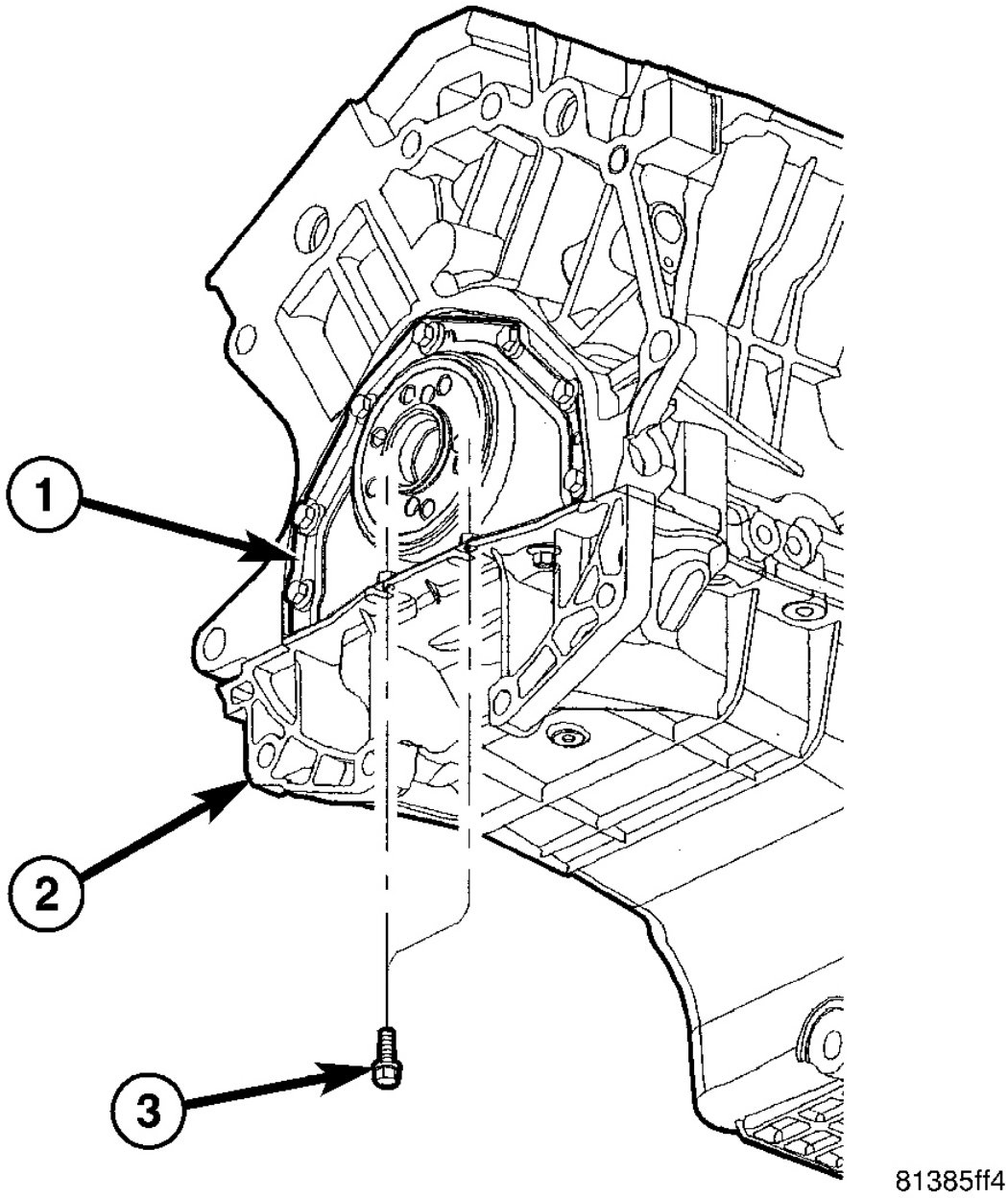

Fig. 252: Removing Two Rear Oil Pan Bolts
Courtesy of CHRYSLER LLC

1 - REAR MAIN SEAL RETAINER
2 - OIL PAN
3 - BOLT

7. Remove the two rear oil pan bolts (3).

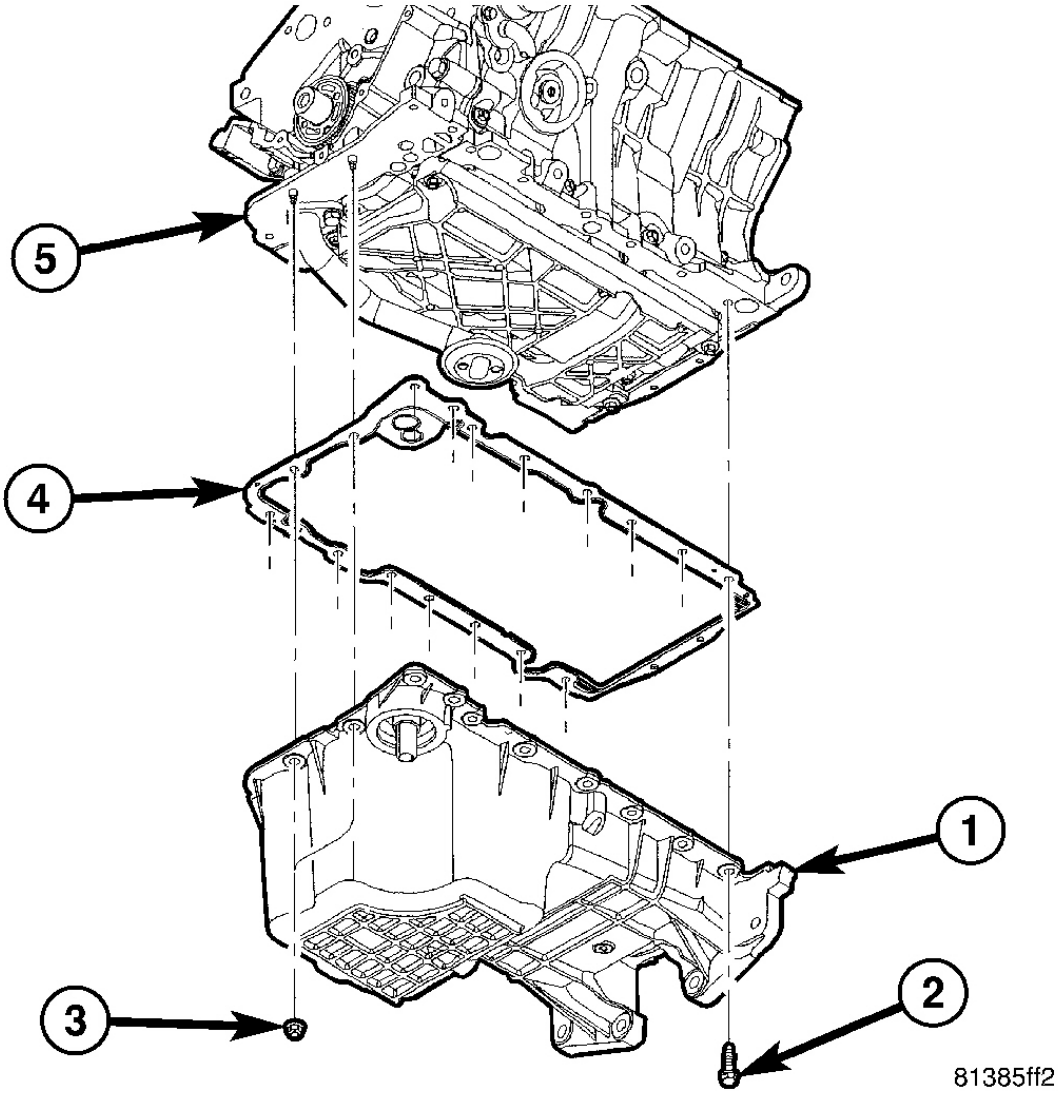

Fig. 253: Oil Pan, Bolt, Fastener, Gasket & Engine Block
Courtesy of CHRYSLER LLC

1 - OIL PAN
2 - BOLT
3 - FASTENER
4 - GASKET
5 - ENGINE BLOCK

8. Remove the remaining oil pan bolts and nuts.
9. Loosen the engine mount bolts at the cradle.
10. Raise and support the engine using a suitable floor jack with a block of wood at the transmission housing.
11. Remove the oil pan (1).

NOTE: A small amount of oil will remain in the oil pan. Use care when removing the oil pan from the engine.

12. Clean all mating surfaces.

INSTALLATION

OIL PAN-INSTALLATION

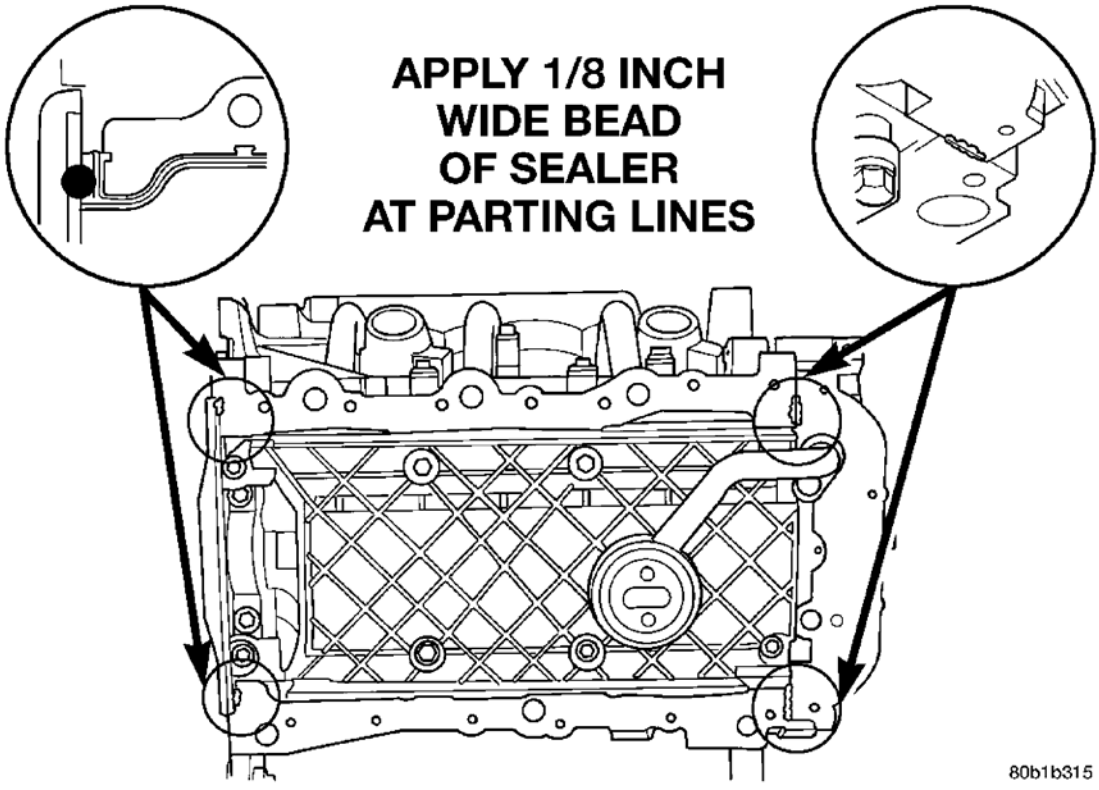

Fig. 254: Applying 1/8 Inch Bead Of Mopar® Engine RTV GEN II At Parting Line Of Oil Pump Housing And Rear Seal Retainer
Courtesy of CHRYSLER LLC

1. Clean oil pan and all gasket surfaces.
2. Apply a 1/8 inch bead of Mopar® Engine RTV GEN II at the parting line of the oil pump housing and the rear seal retainer. See **Fig. 254**

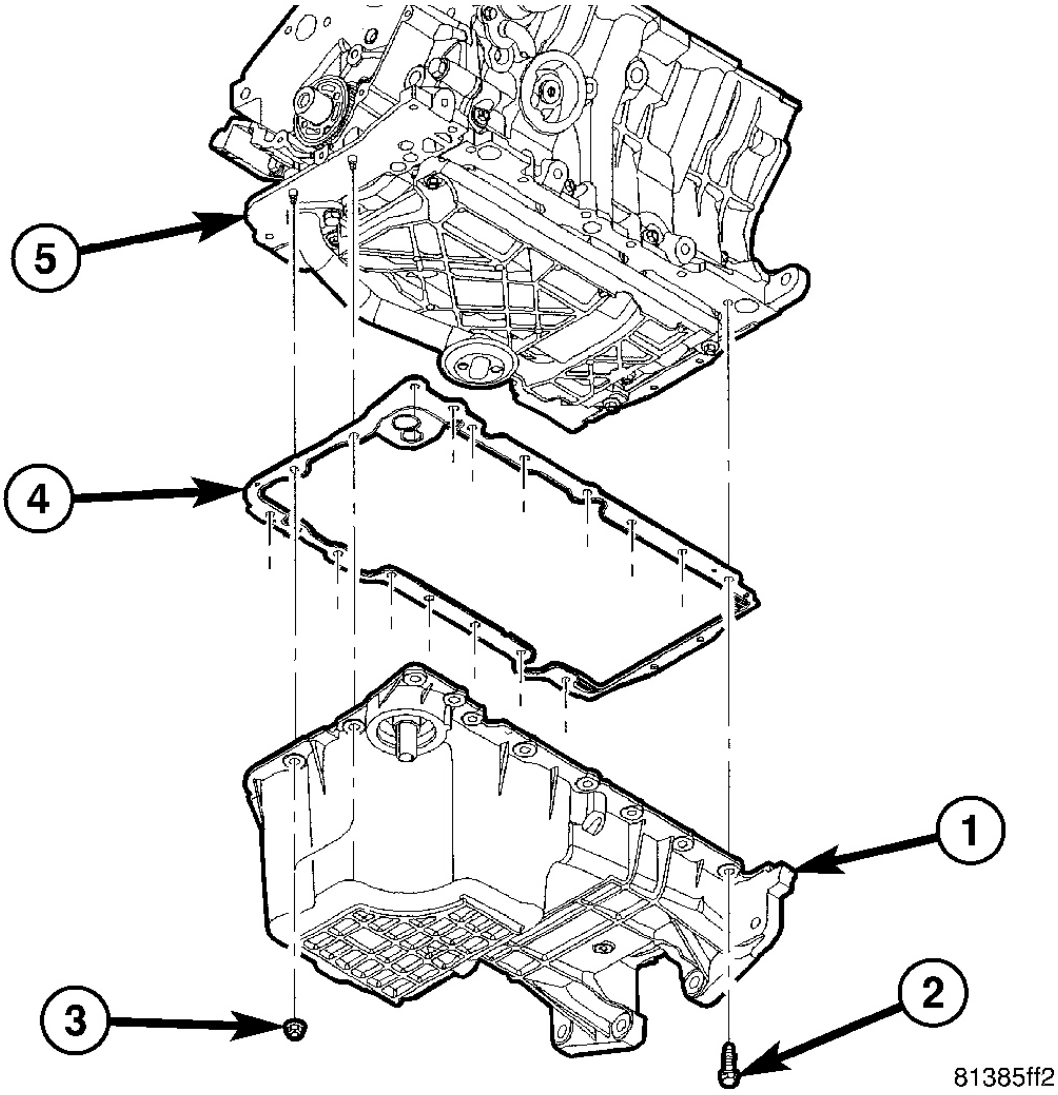

Fig. 255: Oil Pan, Bolt, Fastener, Gasket & Engine Block
Courtesy of CHRYSLER LLC

1 - OIL PAN
2 - BOLT
3 - FASTENER
4 - GASKET
5 - ENGINE BLOCK

3. Install oil pan gasket to the engine block. See **Fig. 255**.
4. Install the oil pan while aligning the oil level indicator tube and attach fasteners finger tight.

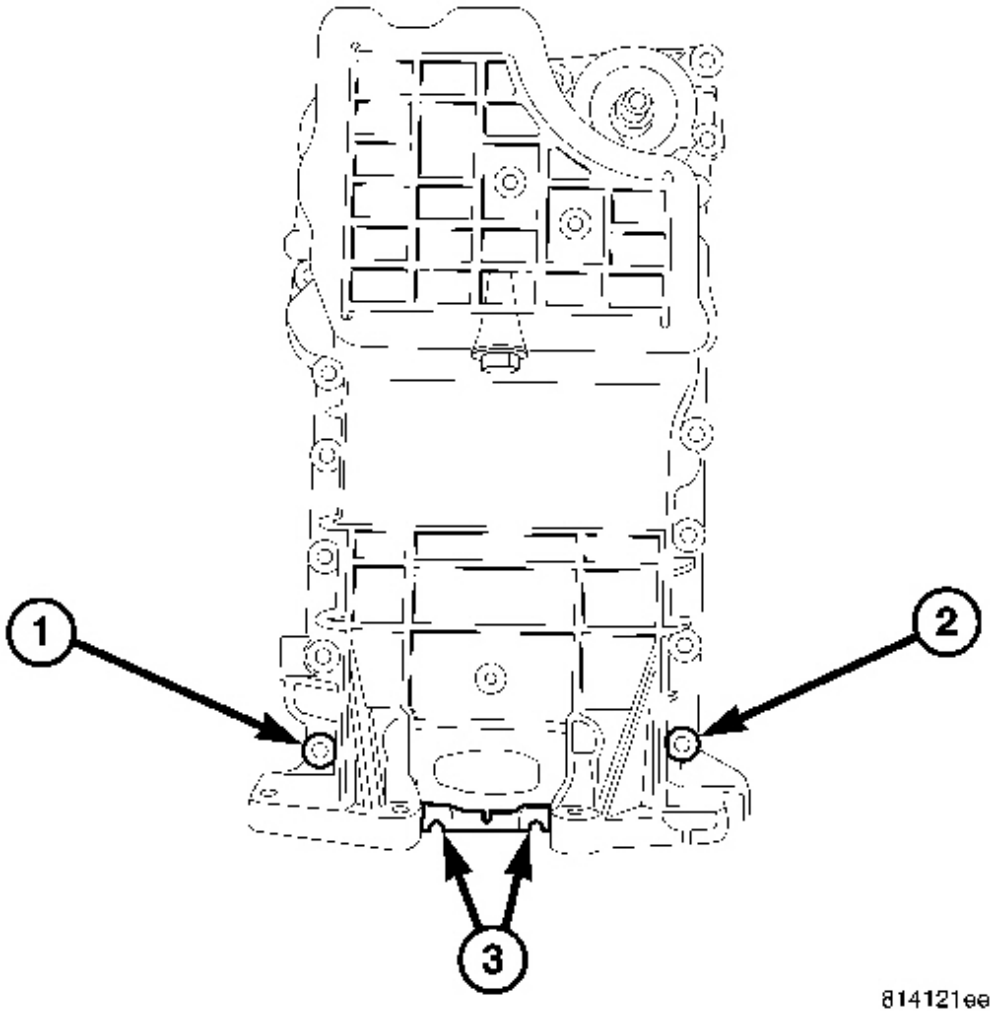

Fig. 256: Oil Pan Alignment
Courtesy of CHRYSLER LLC

1 - TIGHTEN FIRST
2 - TIGHTEN SECOND
3 - TIGHTEN LAST

NOTE: Assure that the rear face of the oil pan is flush to the transmission bell housing when installing the oil pan.

5. Pre-torque the horizontal rear oil pan to transmission bolts to 1.4 N.m (12 in. lbs.).
6. First tighten the M8 (1) oil pan alignment bolt to 28N.m (250 lbs. in.), then tighten bolt (2) to 28N.m (250 lbs. in.). See **Fig. 256**.
7. Tighten the remaining M8 bolts and M8 nuts to 28 N.m (250 in. lbs.), and the M6 bolts to 12 N.m (105 in. lbs.). See **Fig. 256**.
8. Tighten the four M10 oil pan to transmission bolts to 55 N.m (40 ft.lbs.).
9. Lower the engine and remove the lifting fixture. Tighten the engine mount to cradle fasteners to 75 N.m (55 lbs. ft.).

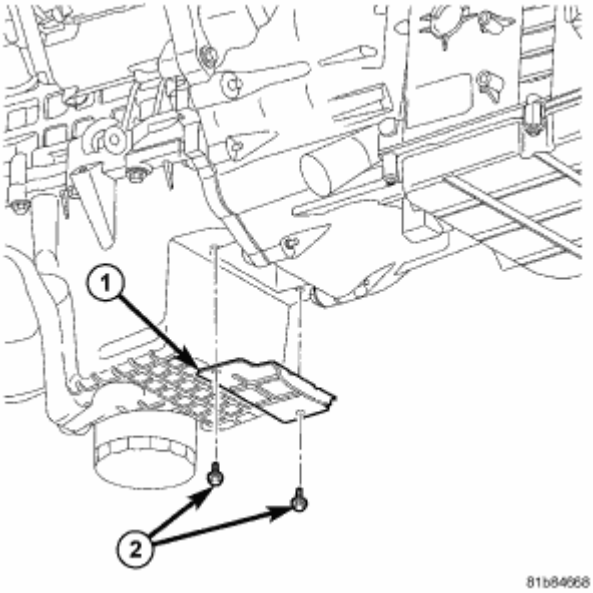

Fig. 257: Flex Plate Inspection Cover & Fastener
Courtesy of CHRYSLER LLC

10. Install the flex plate inspection cover (1) and tighten the fastener (2) to 11 N.m (97 in. lbs.). See **Fig. 257**.
11. Install the oil cooler (align the oil cooler notch to oil pan tab (Refer to **INSTALLATION**).
12. Install the engine oil filter. Tighten filter to 12 N.m (106 in. lbs.).
13. Fill engine crankcase with proper oil to correct level.
14. Connect negative battery cable.

SWITCH-OIL PRESSURE SENSOR

REMOVAL

SWITCH-OIL PRESSURE SENSOR

1. Raise vehicle on hoist.
2. Position an oil collecting container under switch location.
3. Disconnect electrical connector.

4. Unscrew oil pressure switch.

INSTALLATION

SWITCH-OIL PRESSURE SENSOR

1. Apply Mopar® Thread Sealant to the switch threads.
2. Install oil pressure switch to fitting.
3. Connect electrical connector.
4. Lower vehicle.
5. Start engine and check for leaks.
6. Check engine oil level and adjust as necessary.

PUMP - OIL

REMOVAL

PUMP-OIL

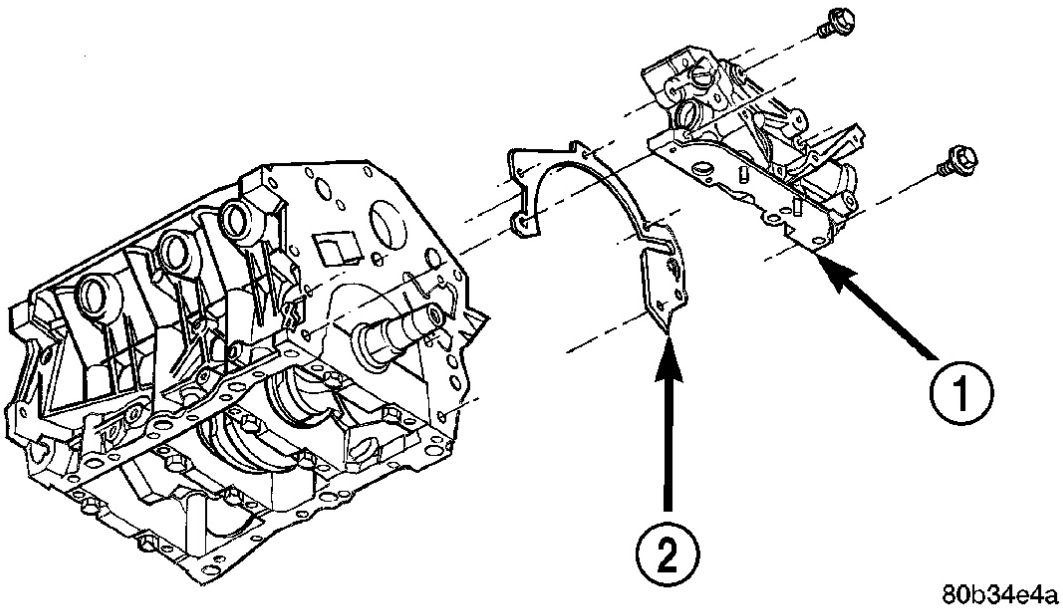

Fig. 258: Oil Pump & Gasket
Courtesy of CHRYSLER LLC

1 - OIL PUMP
2 - GASKET

1. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
2. Remove the timing belt. See **REMOVAL**.
3. Remove the crankshaft sprocket. See **REMOVAL**.
4. Remove the oil pan. See **REMOVAL**.

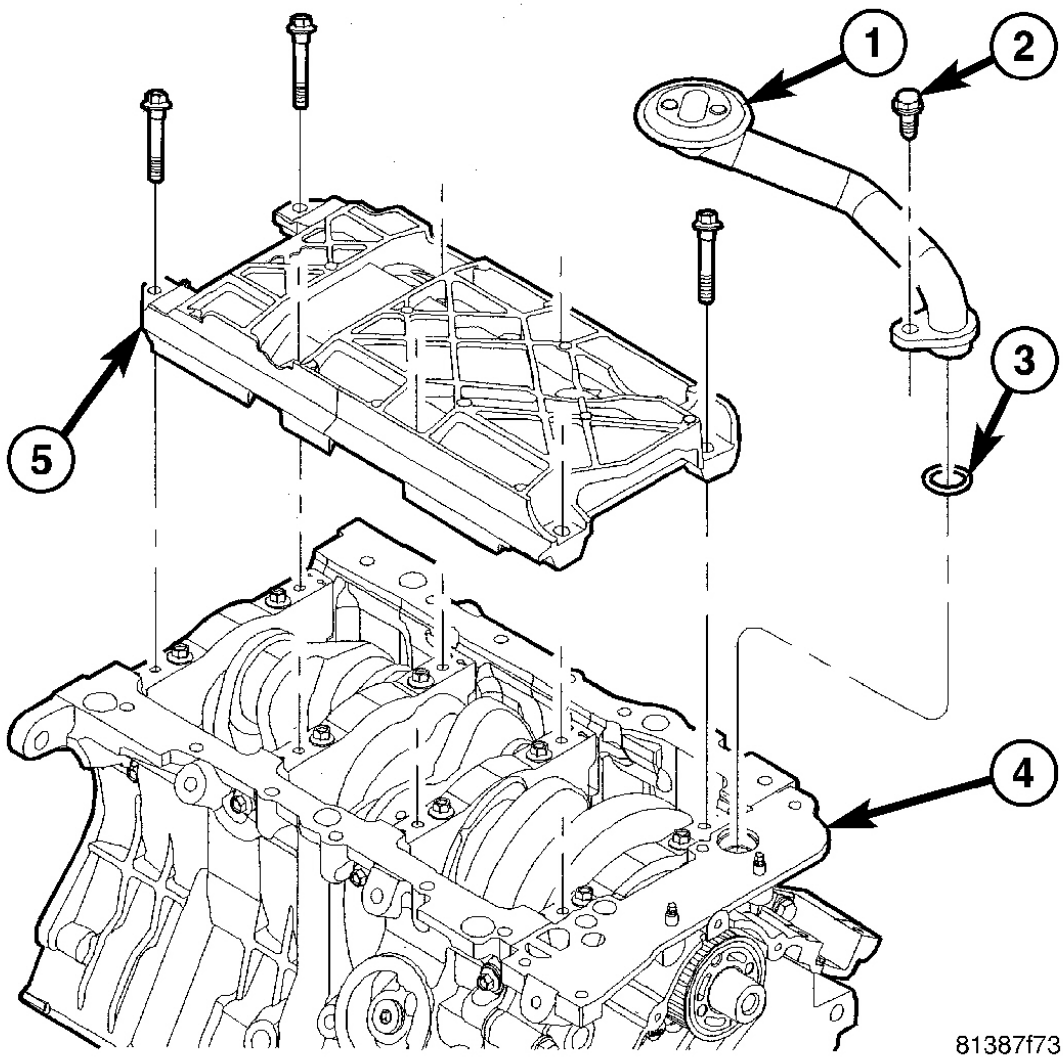

Fig. 259: Oil Pick Up Tube With Strainer, Bolt, O-Ring, Oil Pump & Windage Tray
Courtesy of CHRYSLER LLC

1 - OIL PICK UP TUBE WITH STRAINER
2 - BOLT
3 - O-RING
4 - OIL PUMP

5 - WINDAGE TRAY

5. Remove the oil pickup tube. See **Fig. 259**.

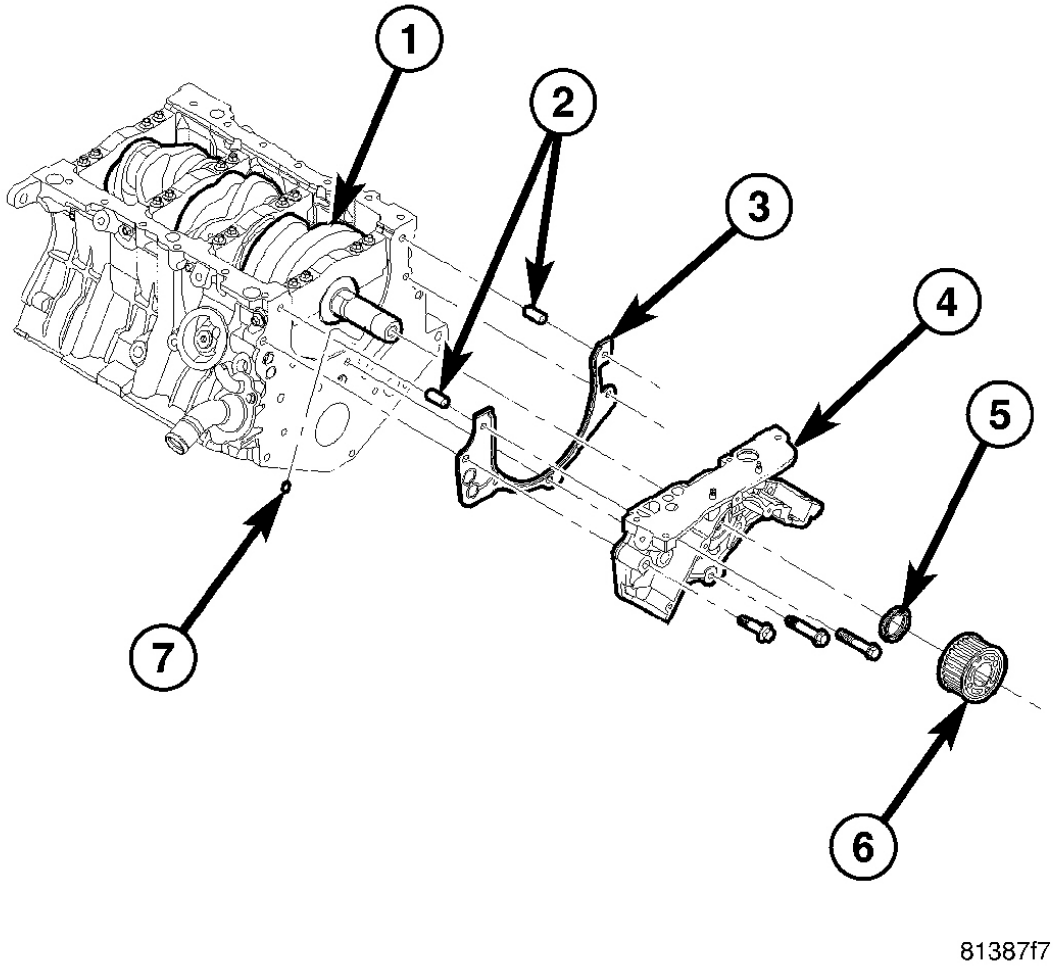

Fig. 260: Crankshaft, Dowel, Gasket, Oil Pump, Front Crankshaft Seal, Crankshaft Gear & Pin
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT
2 - DOWEL
3 - GASKET
4 - OIL PUMP
5 - FRONT CRANKSHAFT SEAL
6 - CRANKSHAFT GEAR
7 - PIN

6. Remove the oil pump fasteners. Remove the oil pump and gasket from engine. See **Fig. 260**.

DISASSEMBLY

PUMP-OIL

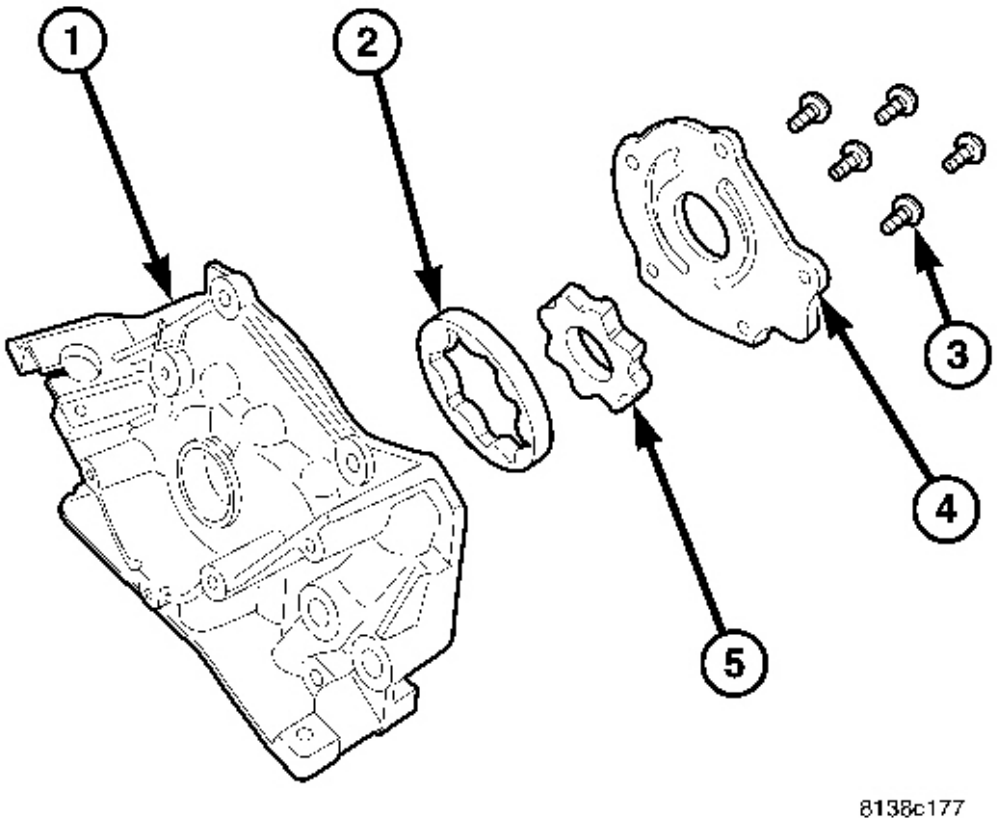

Fig. 261: Oil Pump Body, Oil Pump Outer Rotor, Screws, Oil Pump Cover & Oil Pump Inner Rotor
Courtesy of CHRYSLER LLC

1 - OIL PUMP BODY
2 - OIL PUMP OUTER ROTOR
3 - SCREWS
4 - OIL PUMP COVER
5 - OIL PUMP INNER ROTOR

1. Remove oil pump cover screws (3) and lift off cover (4). See **Fig. 261**.
2. Remove pump rotors (2, 5).
3. Wash all parts in a suitable solvent and inspect carefully for damage or wear.

CLEANING

PUMP-OIL

1. Clean all parts thoroughly in a suitable solvent.

INSPECTION

PUMP-OIL

NOTE: DO NOT inspect the oil relief valve assembly. If the oil relief valve is suspect, replace the oil pump.

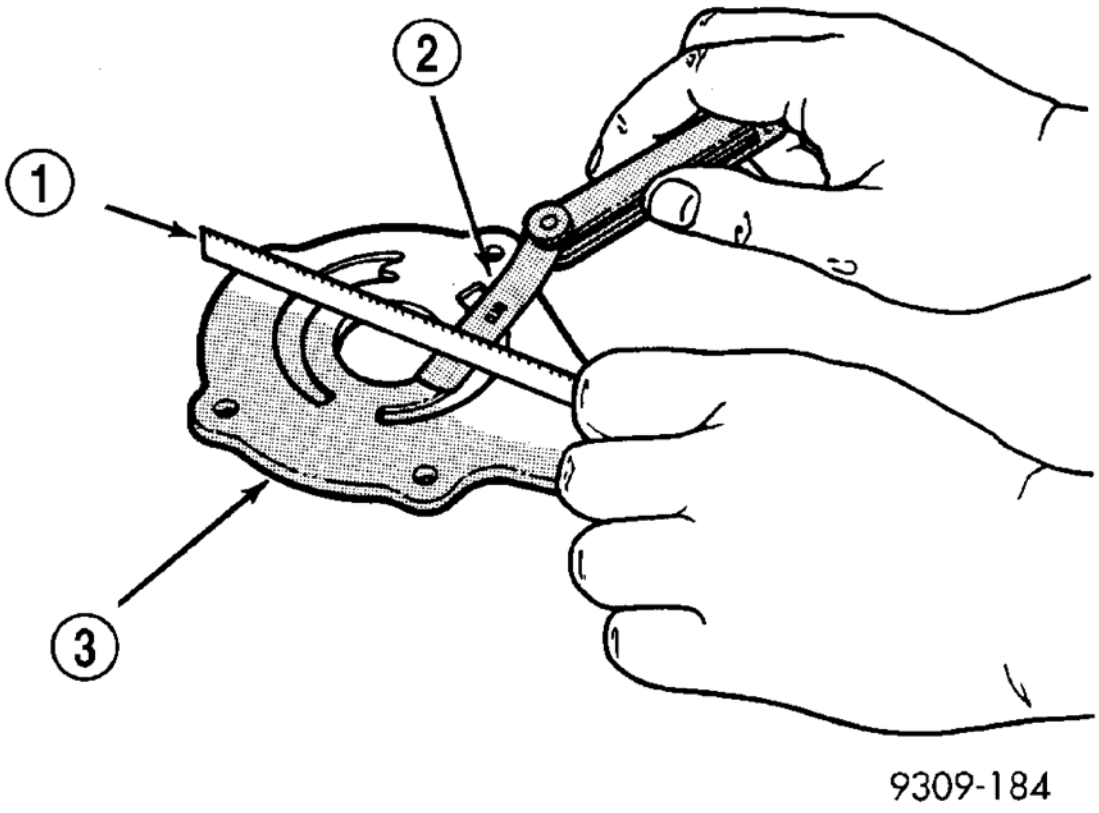

Fig. 262: Checking Oil Pump Cover Flatness
Courtesy of CHRYSLER LLC

1 - STRAIGHT EDGE

2 - FEELER GAUGE
3 - OIL PUMP COVER

1. Disassemble oil pump. See **DISASSEMBLY**.
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. Replace pump cover if scratched or grooved.
3. Lay a straightedge (1) across the pump cover (3) surface. If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced. See **Fig. 262**.

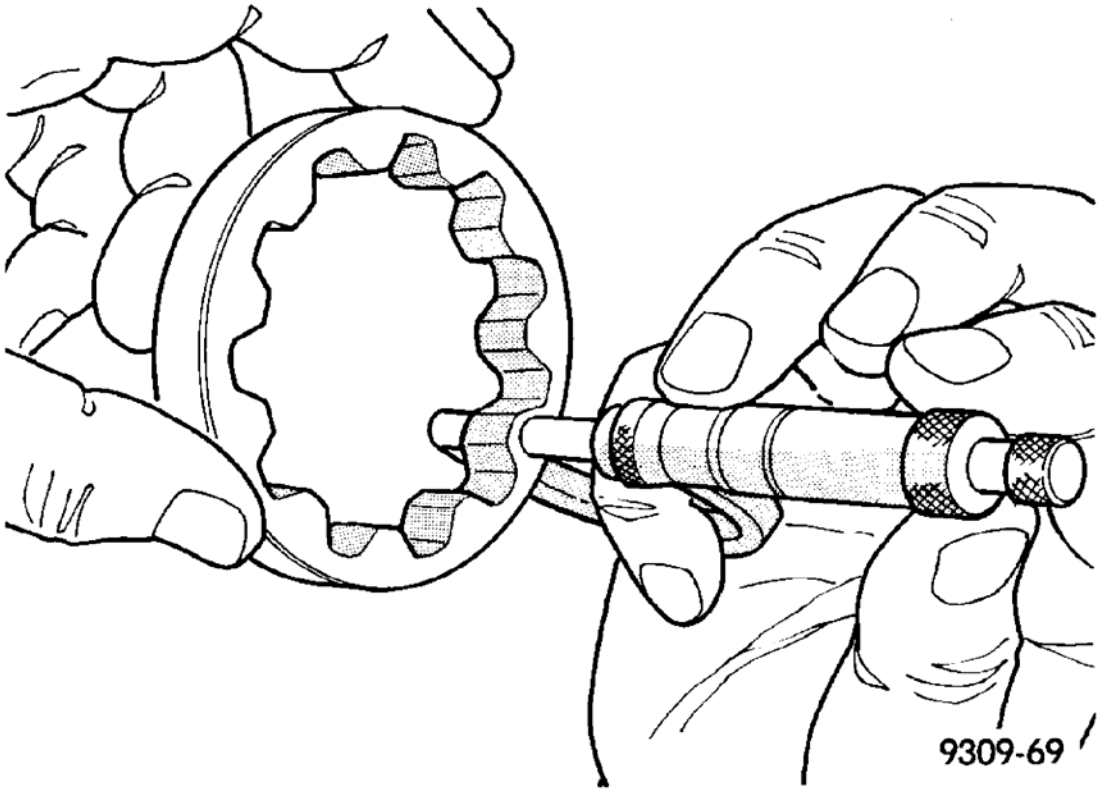

Fig. 263: Measuring Thickness And Diameter Of Outer Rotor
Courtesy of CHRYSLER LLC

4. Measure thickness and diameter of outer rotor. If outer rotor thickness measures 14.299 mm (0.563 in.) or less , or if the diameter is 79.78 mm (3.141 inches.) or less, replace outer rotor. See **Fig. 263**.

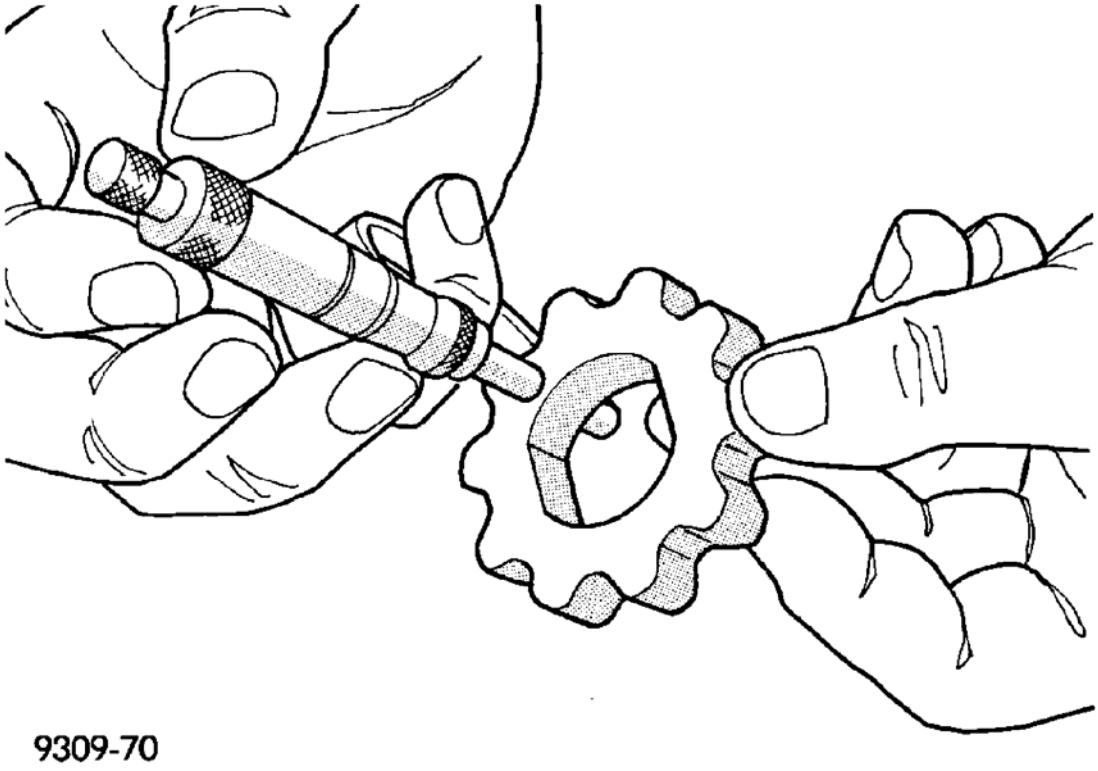

Fig. 264: Measuring Inner Rotor Thickness
Courtesy of CHRYSLER LLC

5. If inner rotor measures 14.299 mm (0.563 in.) or less replace inner rotor. See **Fig. 264**.

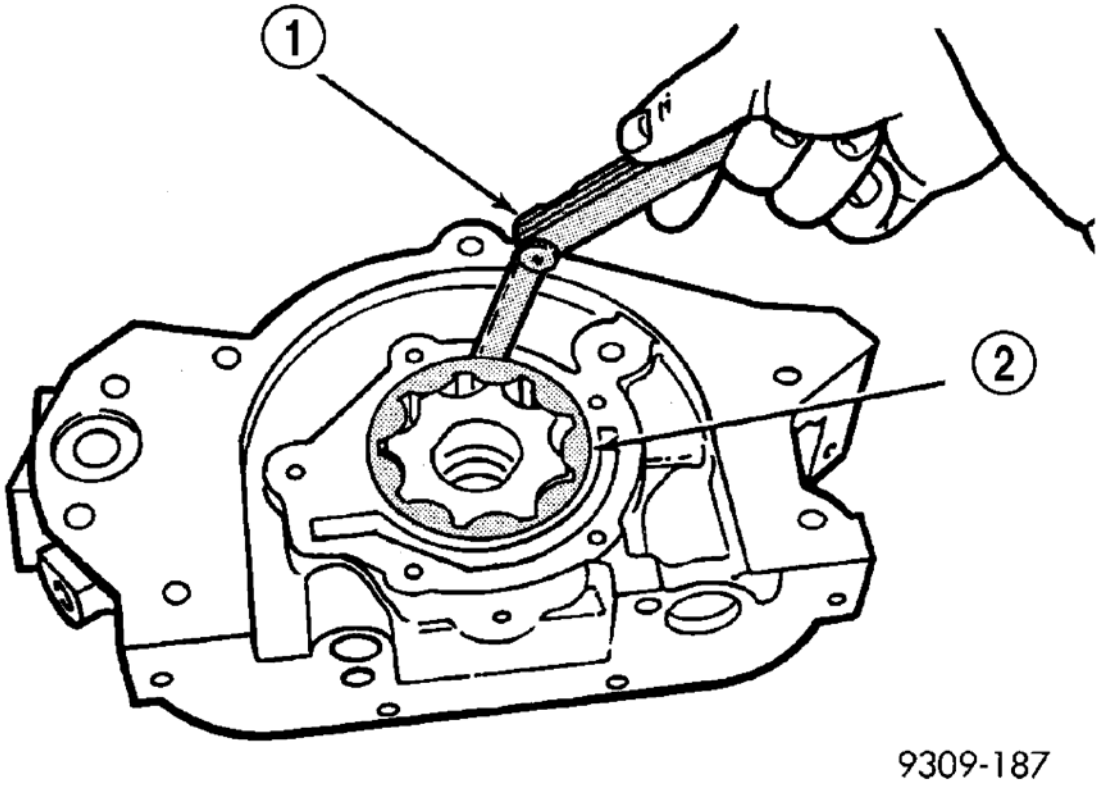

Fig. 265: Measuring Outer Rotor Clearance In Housing
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE
2 - OUTER ROTOR

6. Slide outer rotor (2) into body, press to one side with fingers and measure clearance between rotor and body. If measurement is 0.39 mm (0.015 inch.) or more, replace body only if outer rotor is in specifications. See **Fig. 265**.

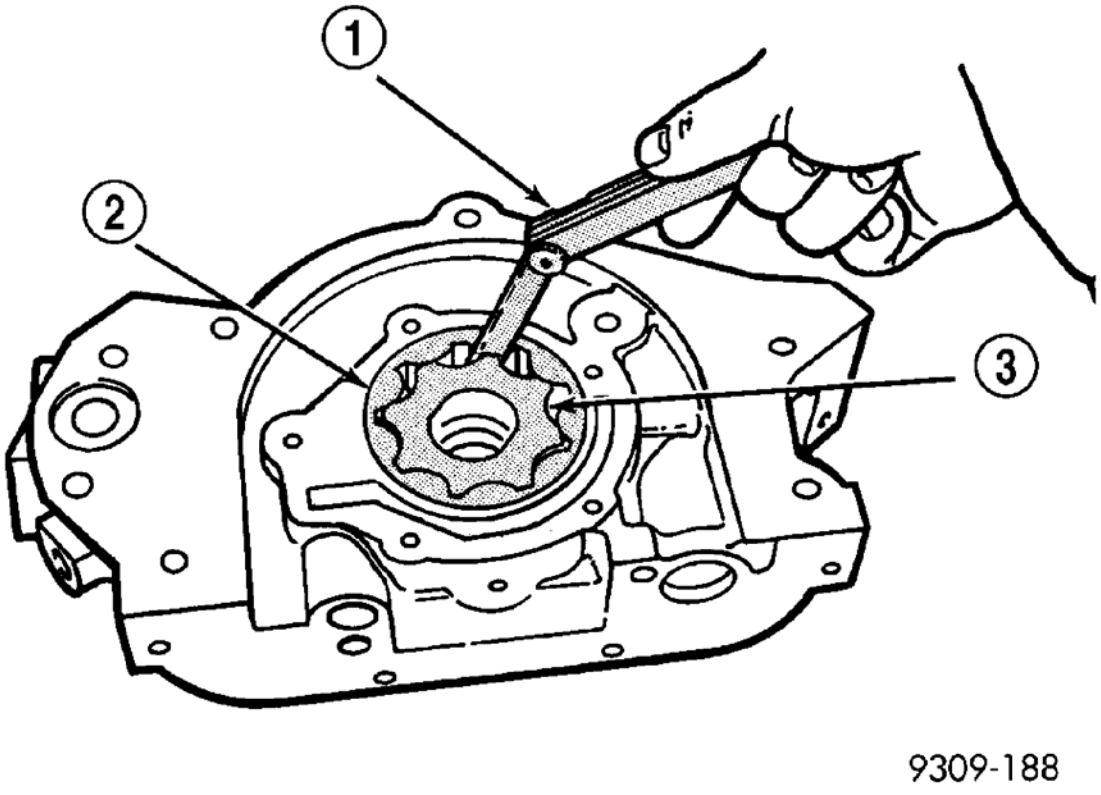

Fig. 266: Measuring Clearance Between Rotors
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE
2 - OUTER ROTOR
3 - INNER ROTOR

7. Install inner rotor into body. If clearance between inner (3) and outer rotors (2) is 0.20 mm (0.008 inch.) or more, replace both rotors. See **Fig. 266**.

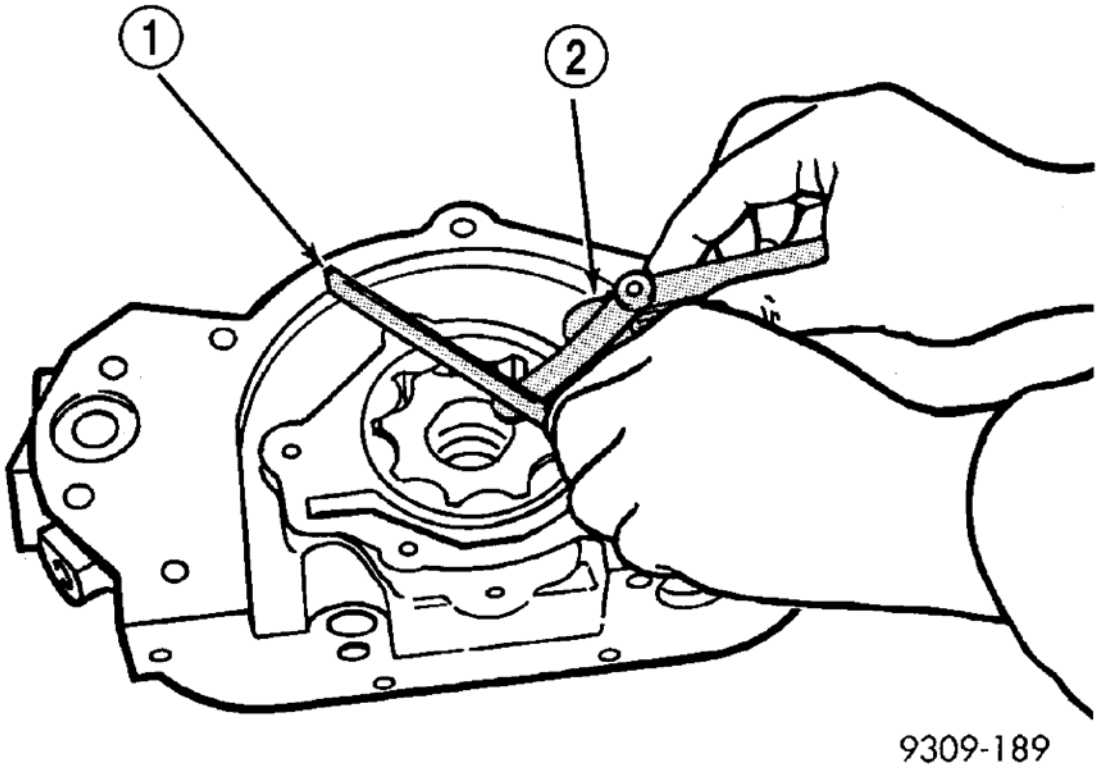

Fig. 267: Measuring Clearance Over Rotors
Courtesy of CHRYSLER LLC

1 - STRAIGHT EDGE
2 - FEELER GAUGES

8. Place a straightedge (1) across the face of the body, between bolt holes. If a feeler gauge of 0.077 mm (0.003 in.) or more can be inserted between rotors and the straightedge, replace pump assembly. See **Fig. 267**. **ONLY** if rotors are in specs.
9. Assemble oil pump. See **ASSEMBLY**.

ASSEMBLY

PUMP-OIL

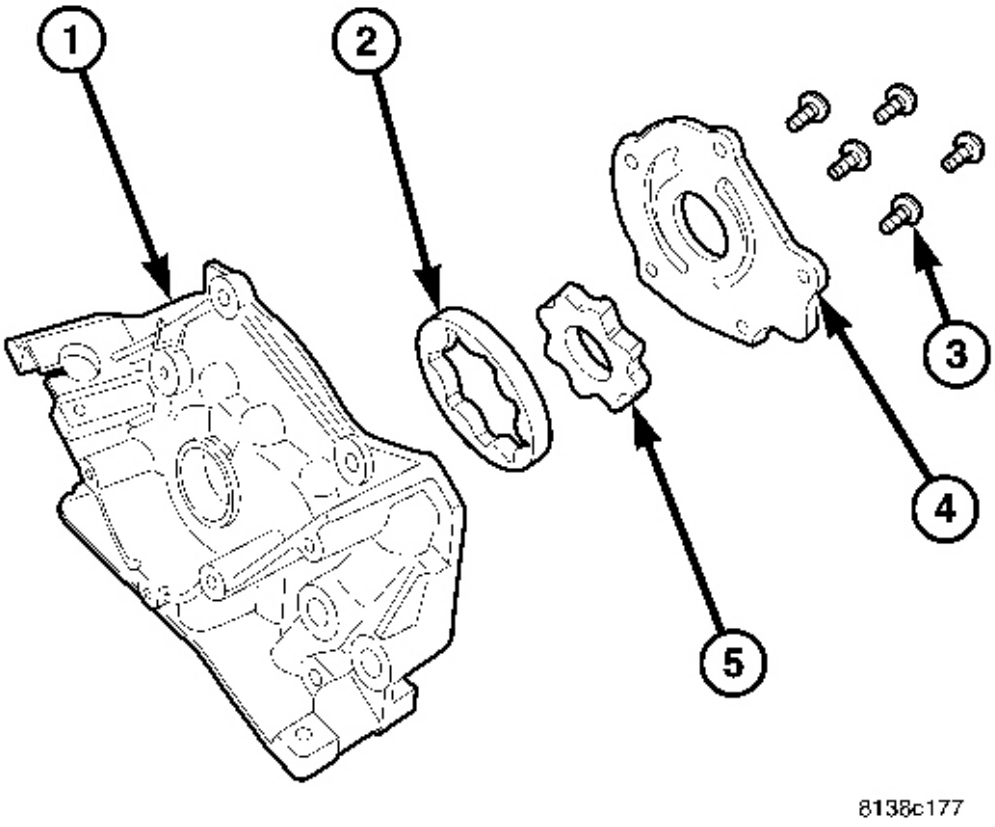

Fig. 268: Oil Pump Body, Oil Pump Outer Rotor, Screws, Oil Pump Cover & Oil Pump Inner Rotor
Courtesy of CHRYSLER LLC

1 - OIL PUMP BODY
2 - OIL PUMP OUTER ROTOR
3 - SCREWS
4 - OIL PUMP COVER
5 - OIL PUMP INNER ROTOR

1. Assemble oil pump using new parts as required.
2. Tighten cover screws (3) to 12 N.m (105 in. lbs.). See **Fig. 268**.
3. Prime oil pump before installation by filling rotor cavity with engine oil.
4. If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other reasons for oil pressure loss.

INSTALLATION

PUMP-OIL

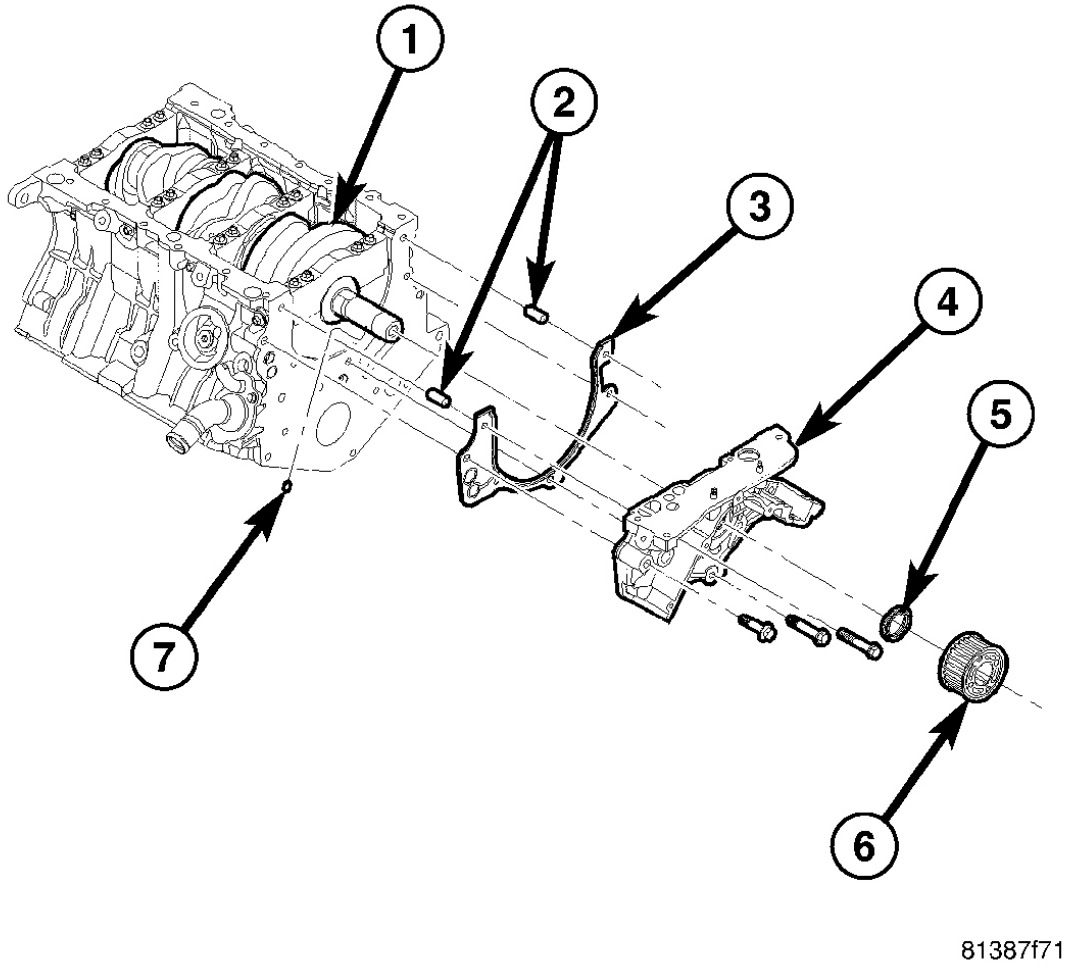

Fig. 269: Crankshaft, Dowel, Gasket, Oil Pump, Front Crankshaft Seal, Crankshaft Gear & Pin
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT
2 - DOWEL
3 - GASKET
4 - OIL PUMP
5 - FRONT CRANKSHAFT SEAL
6 - CRANKSHAFT GEAR
7 - PIN

1. Prime oil pump (4) before installation by filling rotor cavity with clean engine oil.
2. Install oil pump (4) and gasket (3) carefully over the crankshaft. Position pump onto block and tighten bolts to 28 N.m (250 in. lbs.).

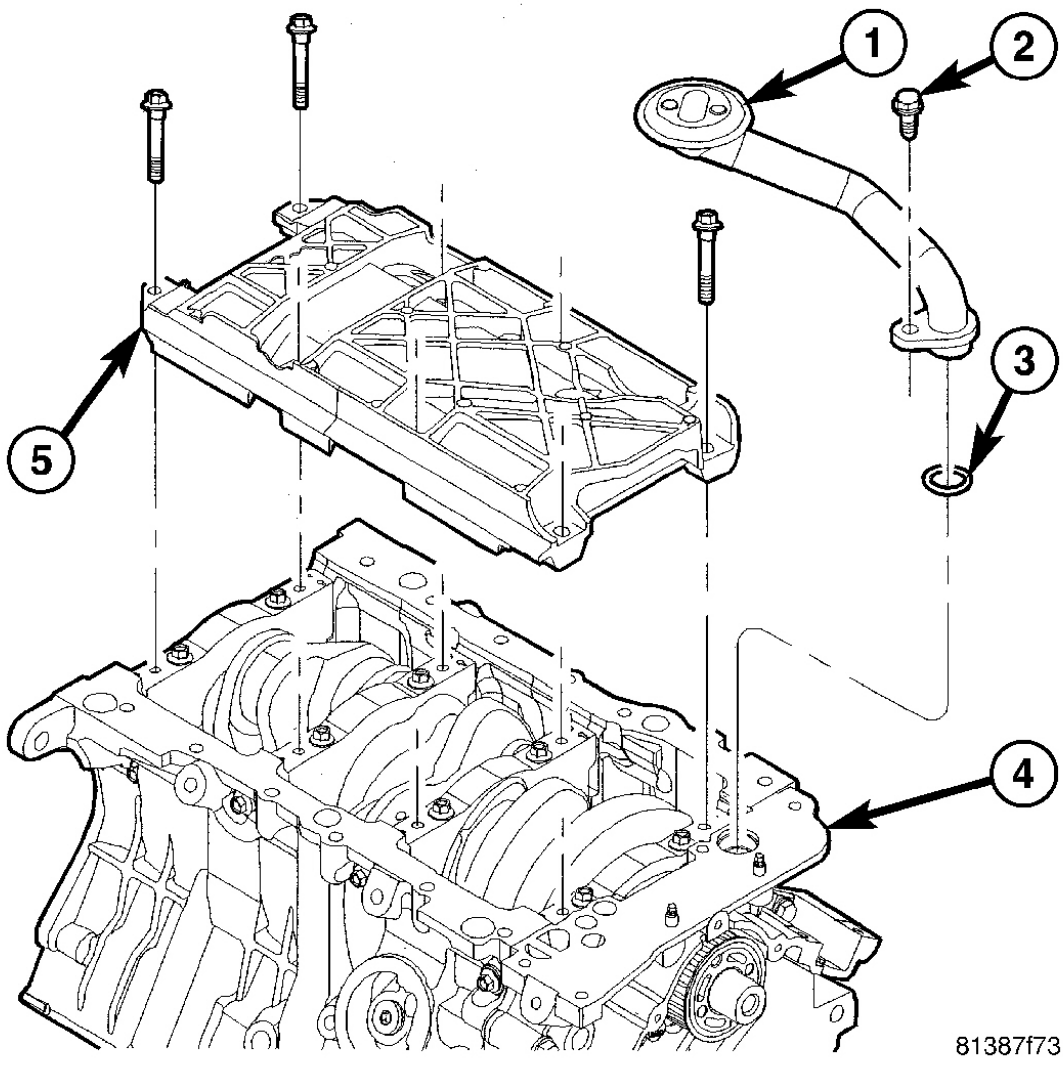

Fig. 270: Oil Pick Up Tube With Strainer, Bolt, O-Ring, Oil Pump & Windage Tray
Courtesy of CHRYSLER LLC

1 - OIL PICK UP TUBE WITH STRAINER
2 - BOLT
3 - O-RING
4 - OIL PUMP
5 - WINDAGE TRAY

3. Install new O-ring (3) on oil pickup tube (1).
4. Install oil pickup tube (1).
5. Install oil pan. (Refer to **INSTALLATION**)
6. Install crankshaft sprocket. (Refer to **INSTALLATION**)
7. Install timing belt. (Refer to **INSTALLATION**)
8. Install the timing belt covers. (Refer to **INSTALLATION** for Front and **INSTALLATION** for Rear)

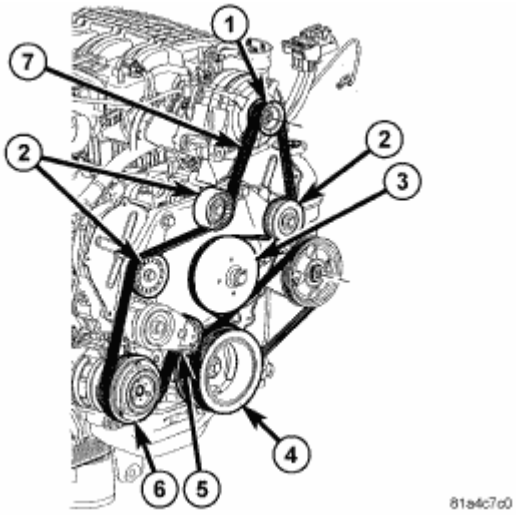

Fig. 271: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

9. Install the crankshaft vibration damper (4). (Refer to **INSTALLATION**)
10. Install the accessory drive belt (7). (Refer to **INSTALLATION**)
11. Fill the cooling system. (Refer to **STANDARD PROCEDURE**)
12. Fill engine crankcase with proper oil to the correct level.

MANIFOLDS

MANIFOLD - INTAKE

REMOVAL

INTAKE MANIFOLD-LOWER

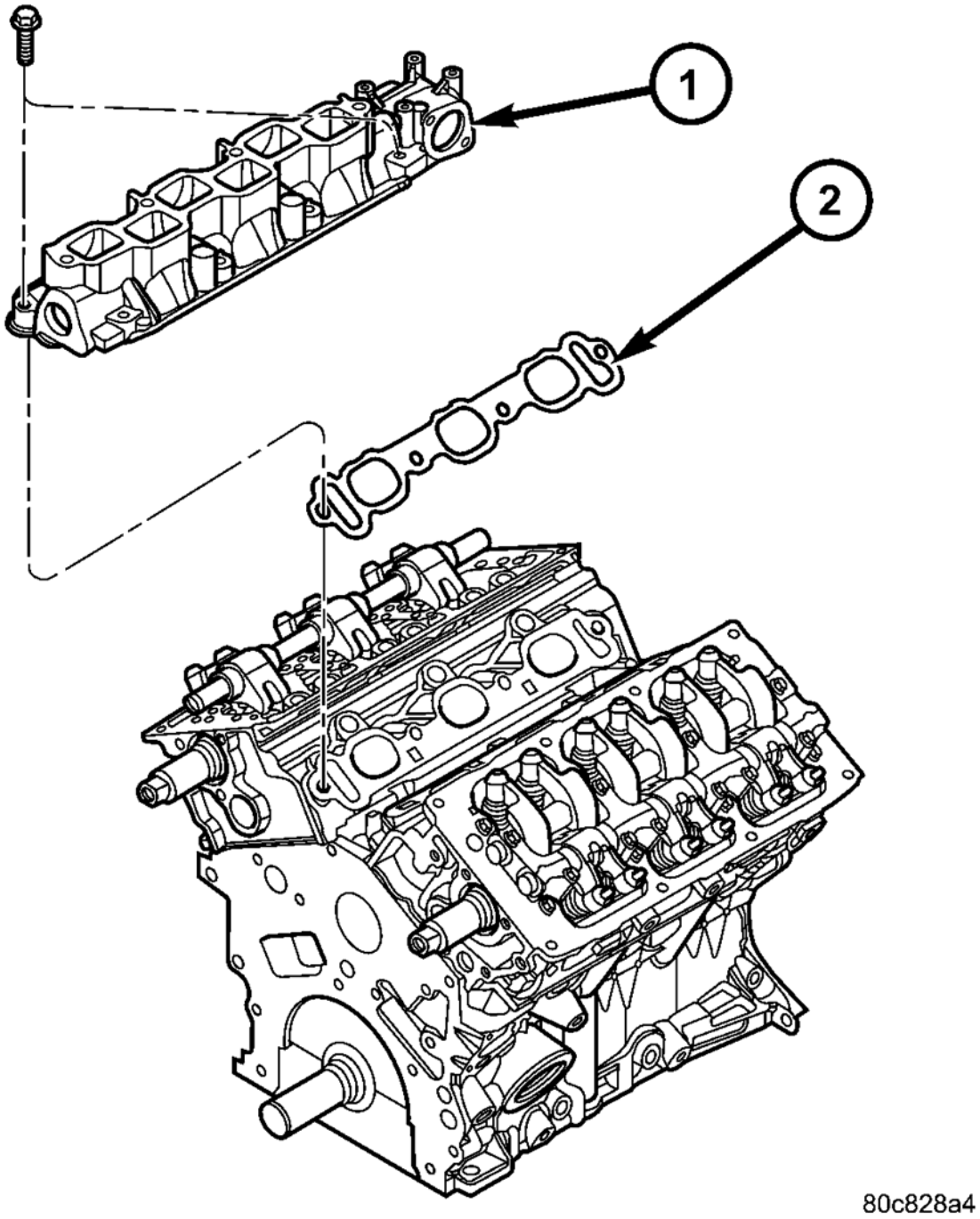

Fig. 272: Lower Intake Manifold
Courtesy of CHRYSLER LLC

1 - LOWER INTAKE MANIFOLD
2 - GASKET

1. Perform fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Drain the cooling system.
3. Disconnect the upper radiator hose from the thermostat housing.
4. Remove the upper intake manifold. See **REMOVAL**.
5. Reposition power steering fluid reservoir and bracket.
6. Disconnect the electrical connectors to fuel injectors and coolant temperature sensor.

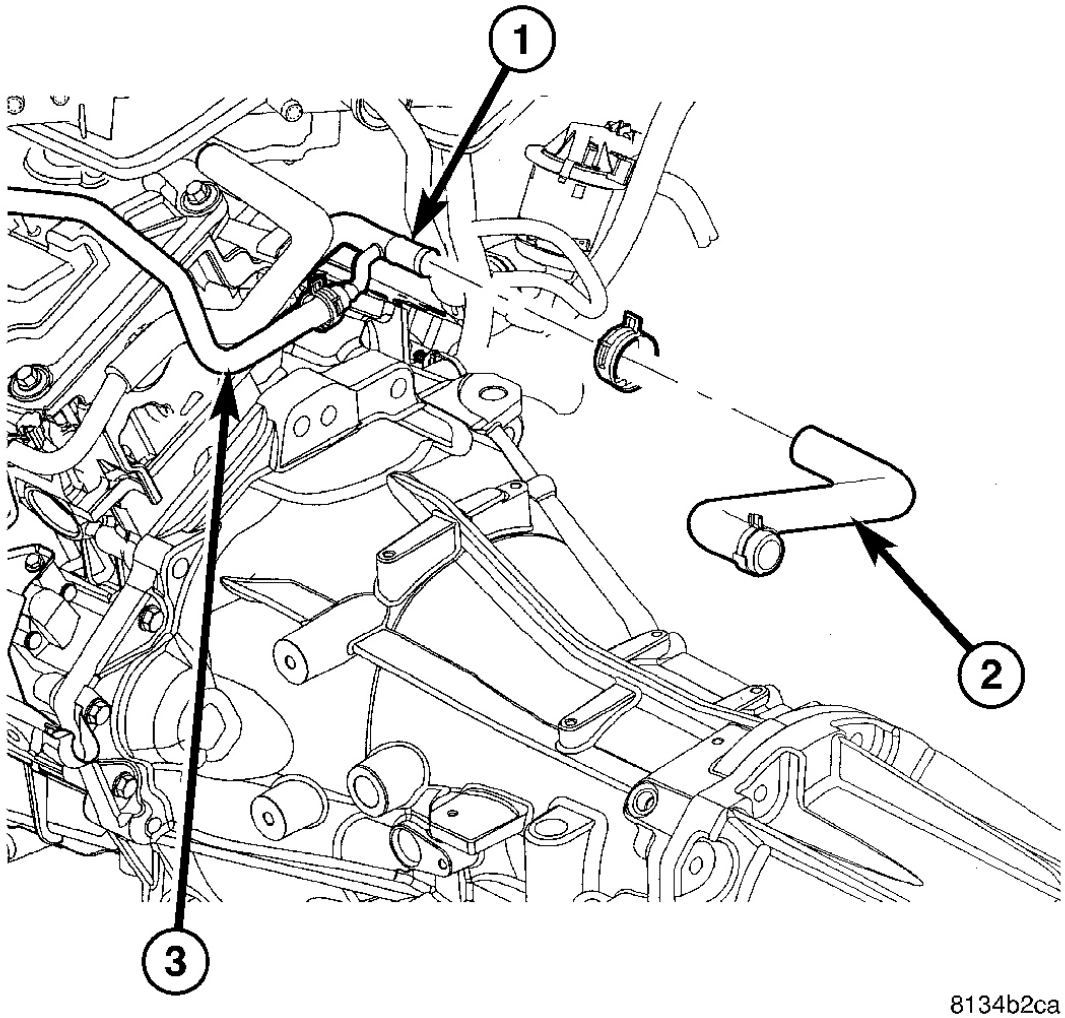

Fig. 273: Coolant Pipe, Heater Hose & Coolant Reservoir Hose
Courtesy of CHRYSLER LLC

1 - COOLANT PIPE 2 - HEATER HOSE

3 - COOLANT RESERVOIR HOSE

7. Disconnect heater hose from the rear intake manifold. See **Fig. 273**.
8. Disconnect the coolant container hose at the rear intake manifold. See **Fig. 273**.

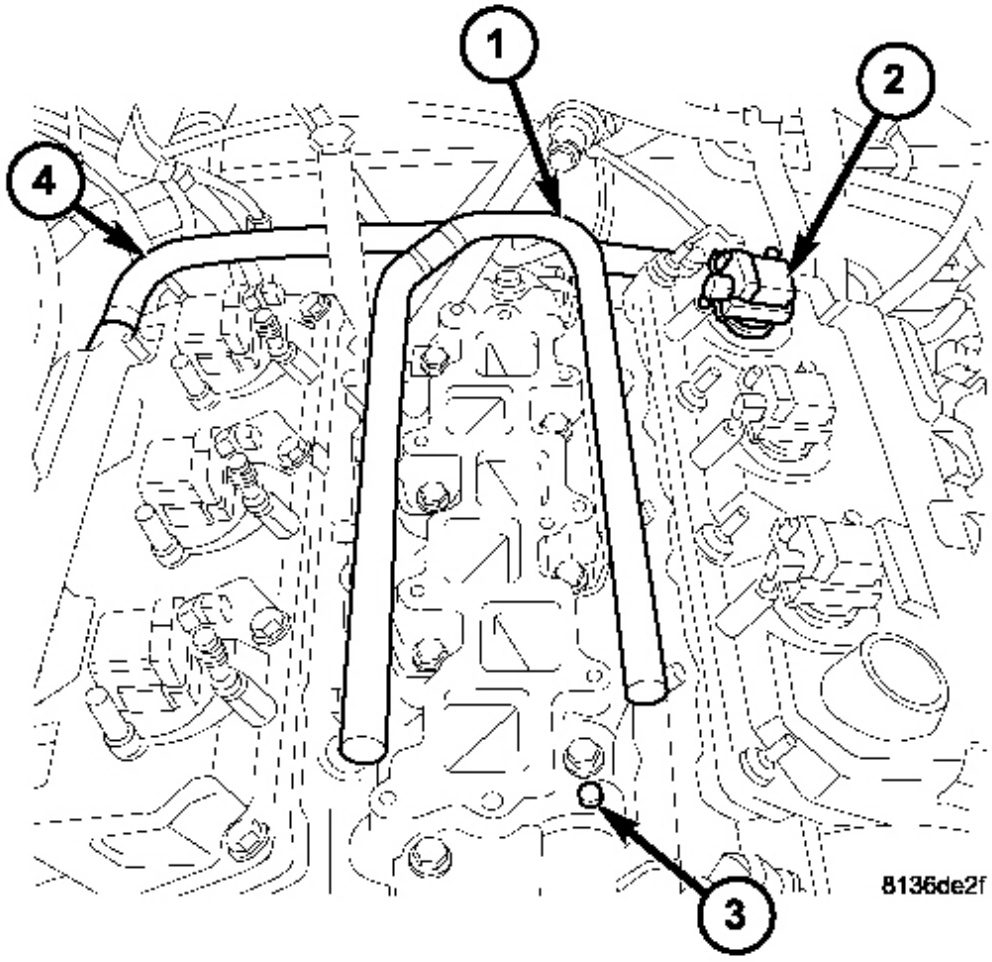

Fig. 274: Fuel Rail, Ignition Coil, Lower Intake Manifold & PCV Valve
Courtesy of CHRYSLER LLC

1 - FUEL RAIL
2 - IGNITION COIL
3 - LOWER INTAKE MANIFOLD

4 - PCV VALVE

9. Disconnect the fuel supply hose from fuel rail (Refer to **FUEL LINES**). See **Fig. 274**.
10. Remove the bolts attaching fuel rail.
11. Remove fuel rail and injectors as an assembly.
12. Remove bolts attaching lower intake and remove intake manifold. See **Fig. 272**.

MANIFOLD-INTAKE-UPPER

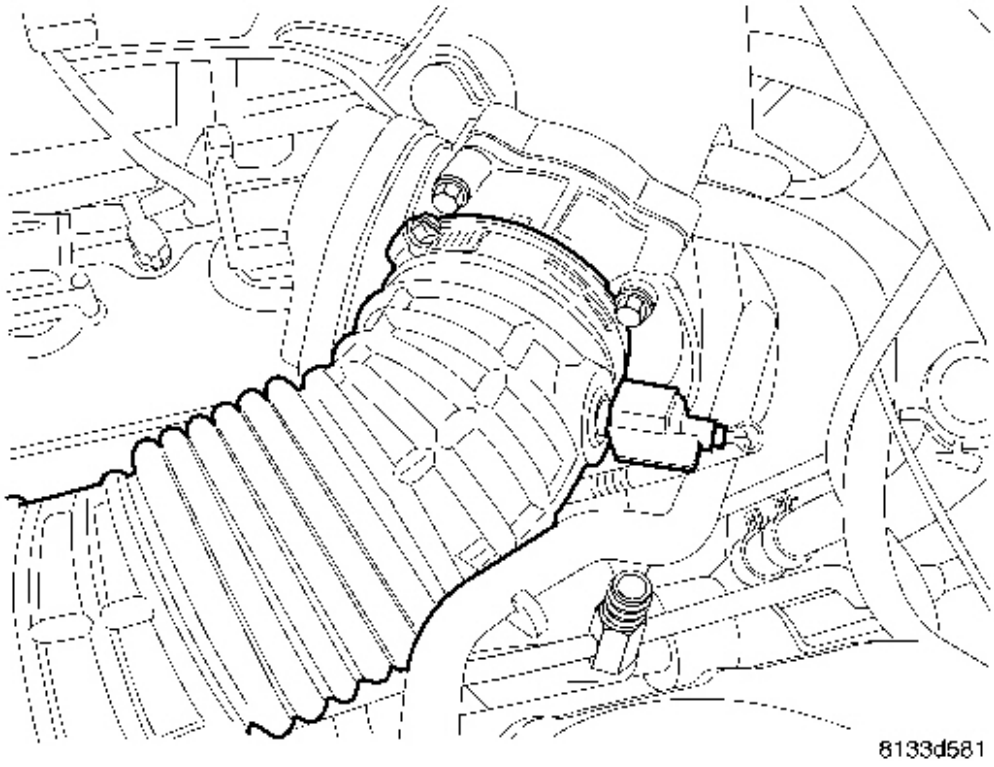

Fig. 275: Removing/Installing Inlet Hose And IAT Sensor Harness Connector
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Disconnect the IAT sensor electrical connector.
3. Remove air inlet hose from the throttle body. See **Fig. 275**.

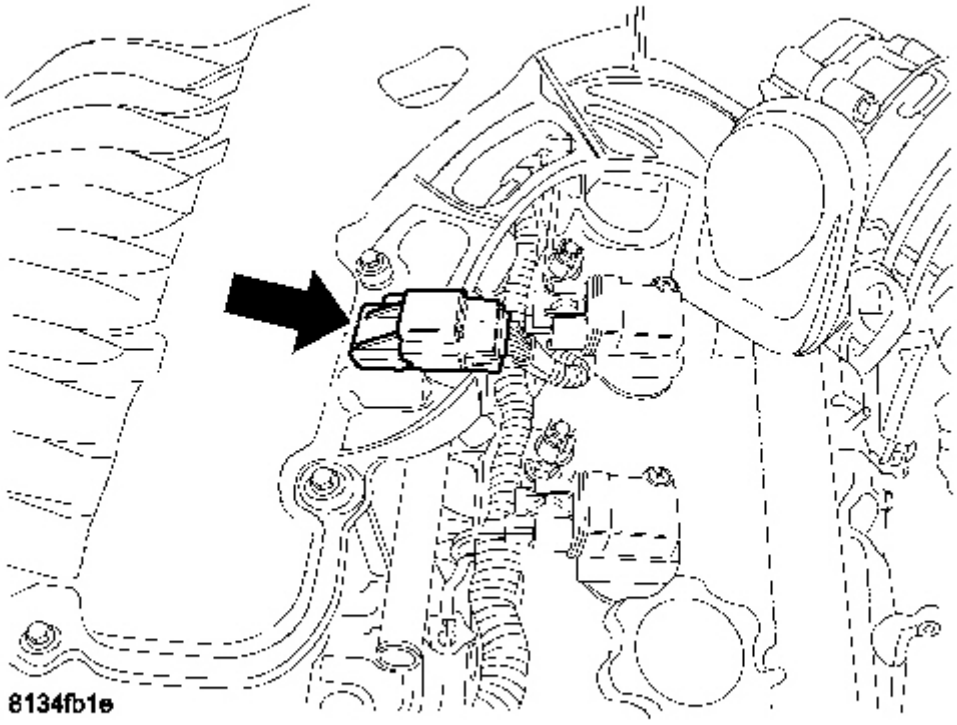

Fig. 276: Locating Manifold Absolute Pressure Sensor
Courtesy of CHRYSLER LLC

4. Disconnect the MAP sensor electrical connector.

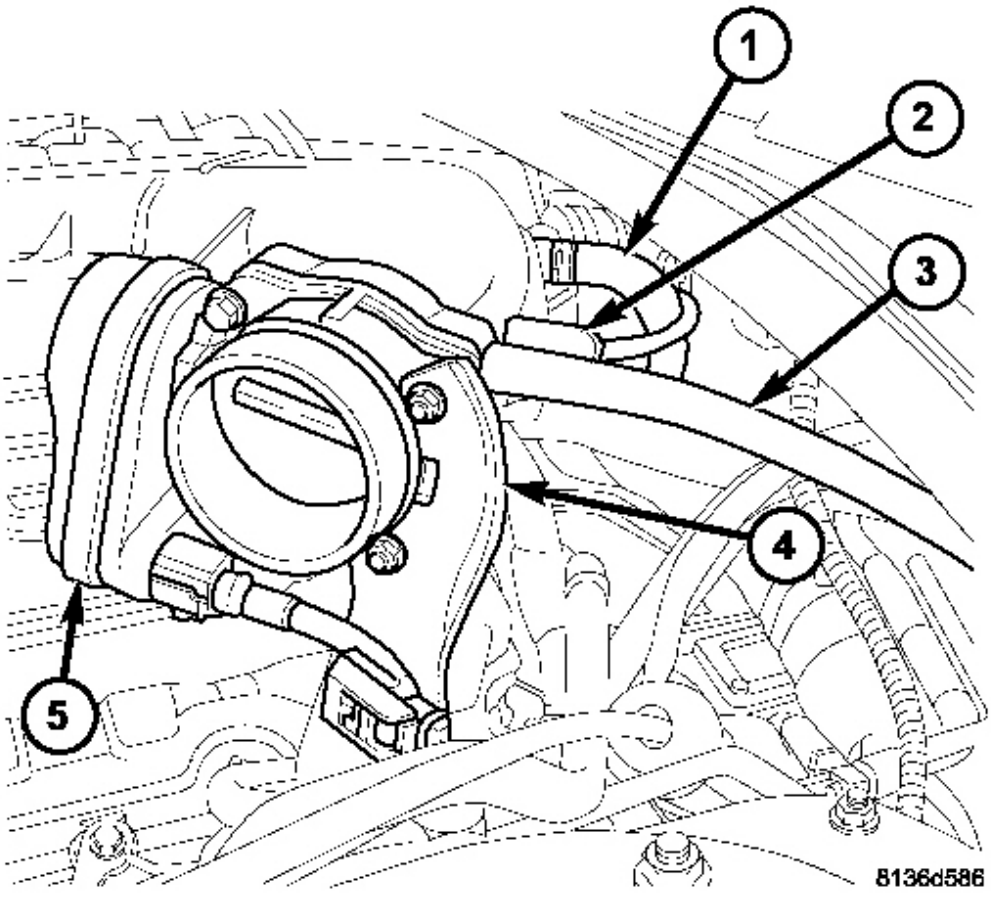

Fig. 277: PCV Hose, Purge Hose, Brake Booster Hose, Throttle Bracket & Electronic Throttle Control
Courtesy of CHRYSLER LLC

1 - PCV HOSE
2 - PURGE HOSE
3 - BRAKE BOOSTER HOSE
4 - THROTTLE BRACKET
5 - ELECTRONIC THROTTLE CONTROL

5. Separate the engine electrical harness connectors from the intake manifold.
6. Disconnect the EGR tube, PCV, Purge and power brake booster vacuum hoses from the upper intake manifold.

7. Disconnect the electronic throttle control electrical connector.
8. Remove the throttle bracket (4) fasteners from the throttle body and cylinder head.

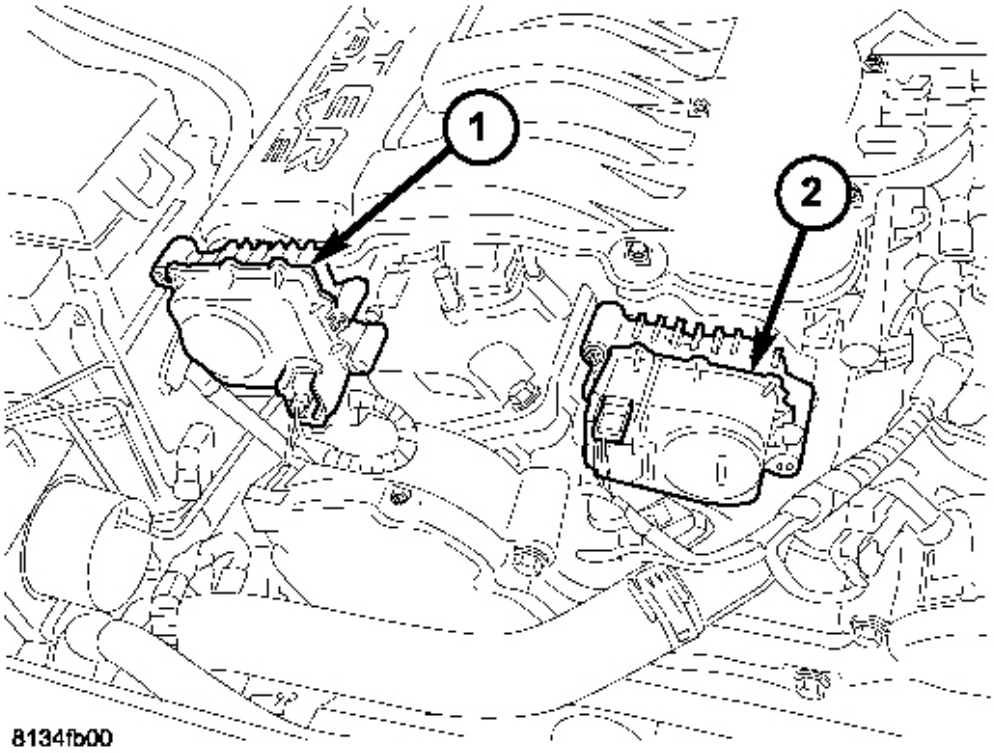

Fig. 278: Identifying Manifold Tuning Valve & Short Runner Valve
Courtesy of CHRYSLER LLC

1 - Manifold Tuning Valve 2 - Short Runner Valve

9. Disconnect electrical connectors from the Manifold Tuning Valve (MTV) and Short Runner Valve.
10. Remove the right intake manifold support brackets.
11. Remove the upper intake manifold retaining bolts, insulation foam pad and manifold. Clean all gasket sealing surfaces.

INSTALLATION

INTAKE MANIFOLD-LOWER

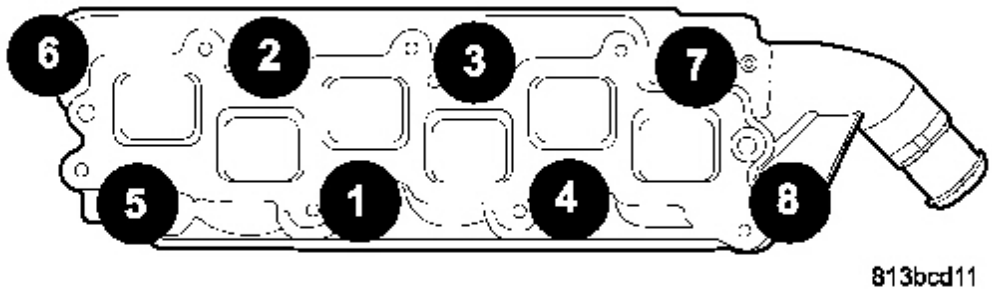

Fig. 279: Lower Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

1. Clean all sealing surfaces.
2. Position new gaskets and intake manifold on cylinder head surfaces.
3. Install intake manifold bolts and gradually tighten in sequence shown until a torque of 28 N.m (250 in. lbs.) is obtained. See **Fig. 279**.

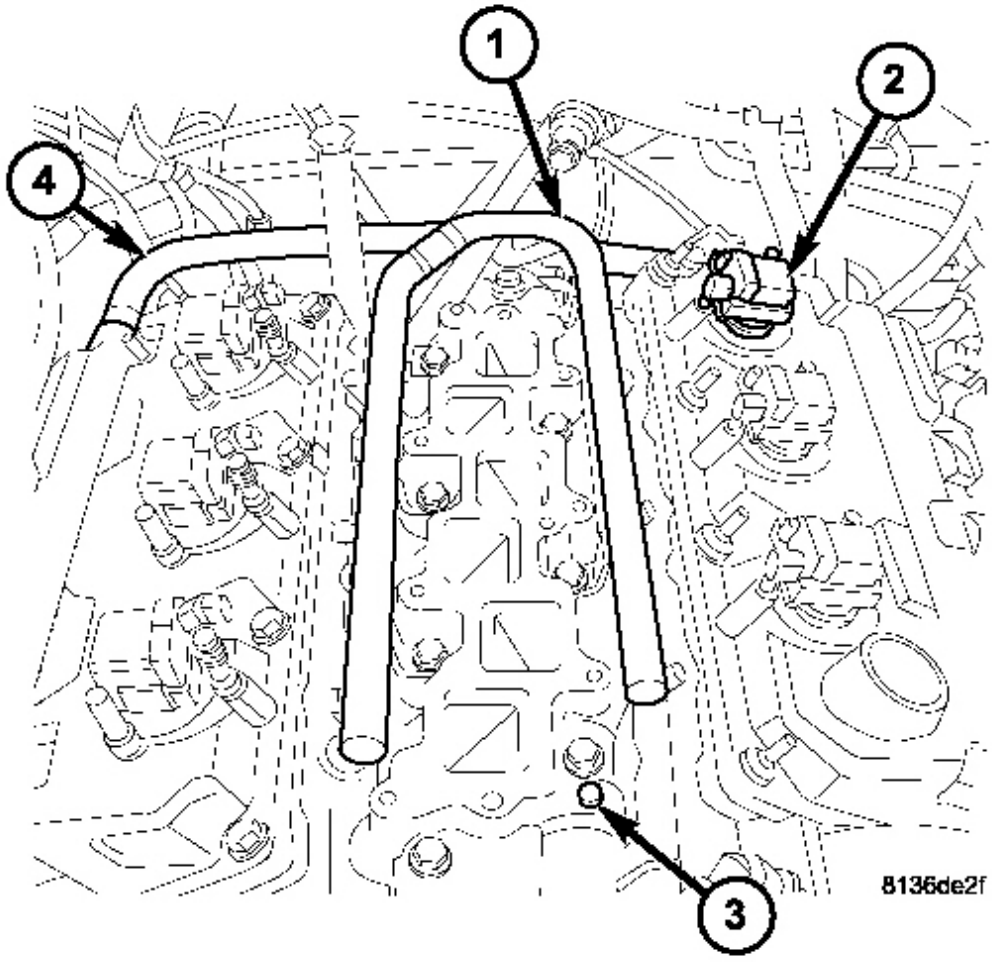

Fig. 280: Fuel Rail, Ignition Coil, Lower Intake Manifold & PCV Valve
Courtesy of CHRYSLER LLC

1 - FUEL RAIL
2 - IGNITION COIL
3 - LOWER INTAKE MANIFOLD
4 - PCV VALVE

4. Install fuel rail and injectors as an assembly. See **Fig. 280**, refer to **INSTALLATION** .
5. Connect fuel supply hose to fuel rail. (Refer to **FUEL SYSTEM**)

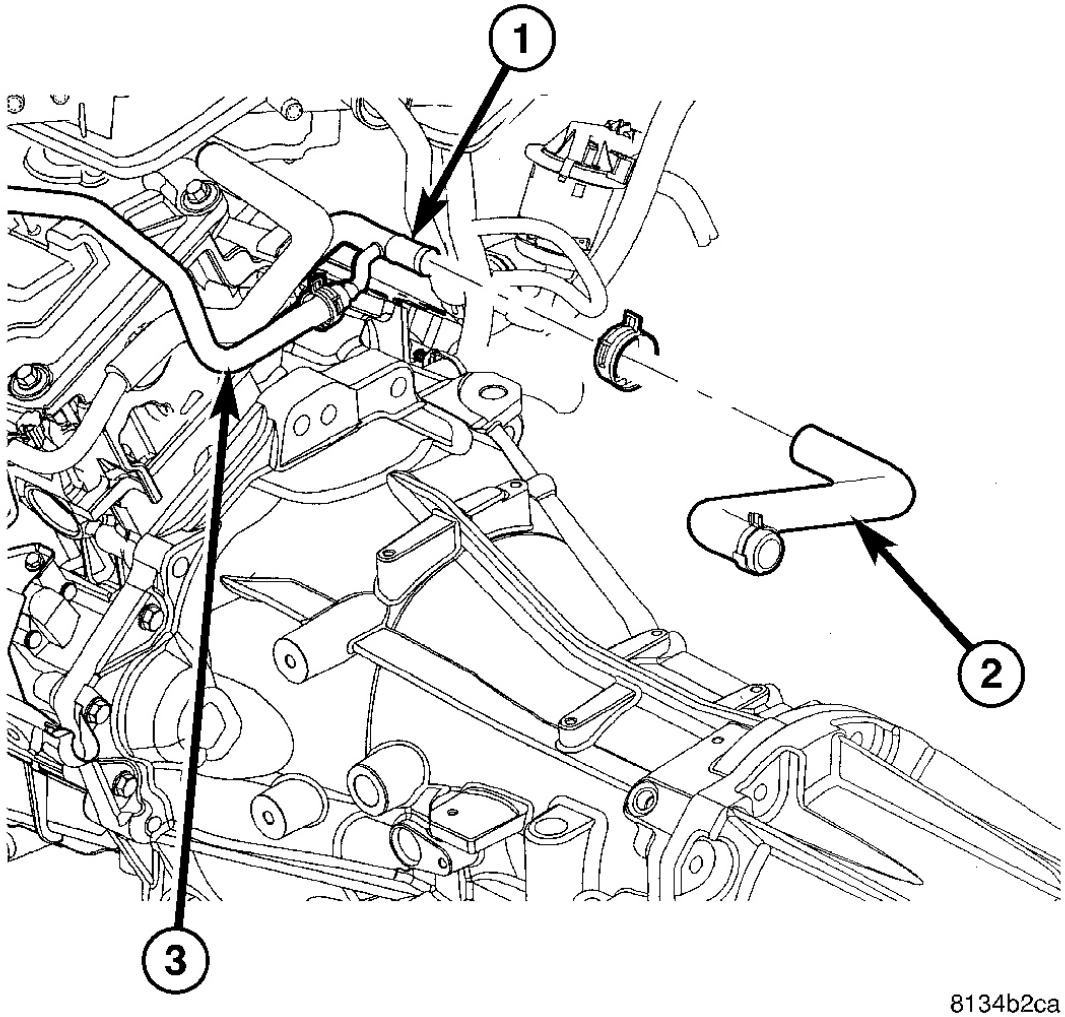

Fig. 281: Coolant Pipe, Heater Hose & Coolant Reservoir Hose
Courtesy of CHRYSLER LLC

1 - COOLANT PIPE
2 - HEATER HOSE
3 - COOLANT RESERVOIR HOSE

6. Connect heater hose to rear lower intake manifold. See **Fig. 281**.
7. Connect coolant container hose to the rear lower intake manifold. See **Fig. 281**.
8. Connect electrical connectors to fuel injectors and coolant temperature sensor.
9. Install power steering fluid reservoir and bracket.
10. Install upper intake manifold. See **INSTALLATION**.
11. Connect the upper radiator hose to the thermostat housing.

12. Fill the cooling system.

MANIFOLD-INTAKE-UPPER

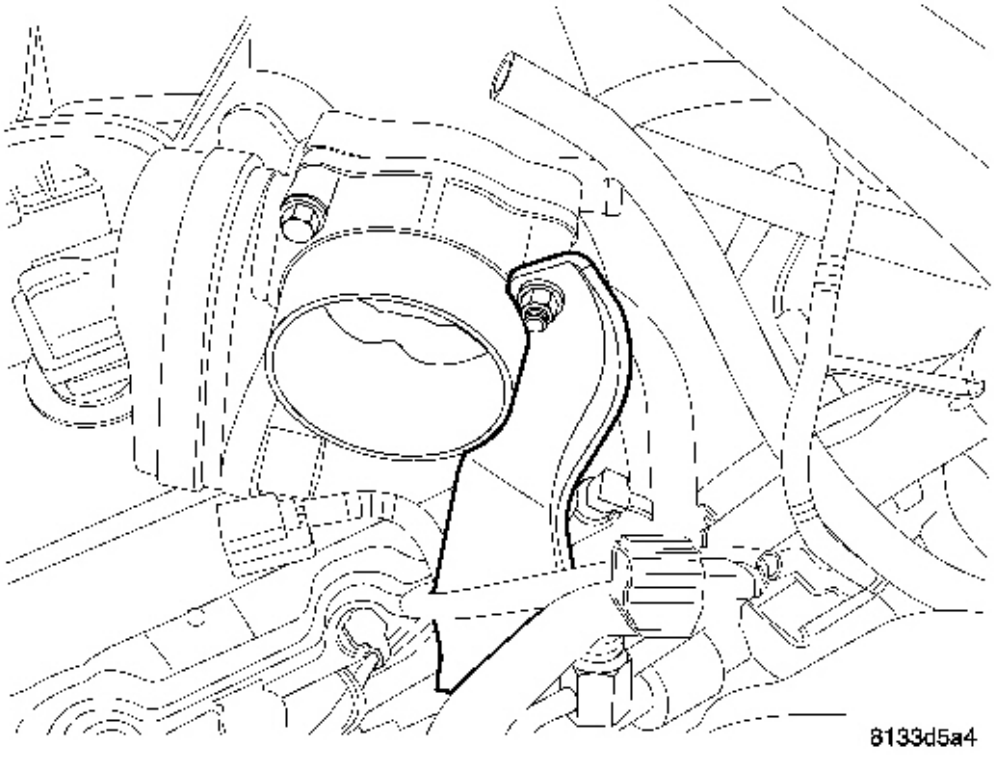

Fig. 282: Throttle Body Bracket
Courtesy of CHRYSLER LLC

1. Clean and inspect gasket sealing surfaces.
2. Position new gasket.
3. Install the upper intake manifold insulator foam.
4. Install the upper intake manifold. Tighten bolts to 12 N.m (105 in.lbs.) starting in the center working outward in a cross sequence pattern.
5. Install the right manifold support brackets. Tighten fasteners to 12 N.m (105 in.lbs.).
6. Install the throttle bracket. See **Fig. 282**. Tighten fasteners to 12 N.m (105 in.lbs.) at the throttle body and 28N.m (259 in.lbs.) at the cylinder head.

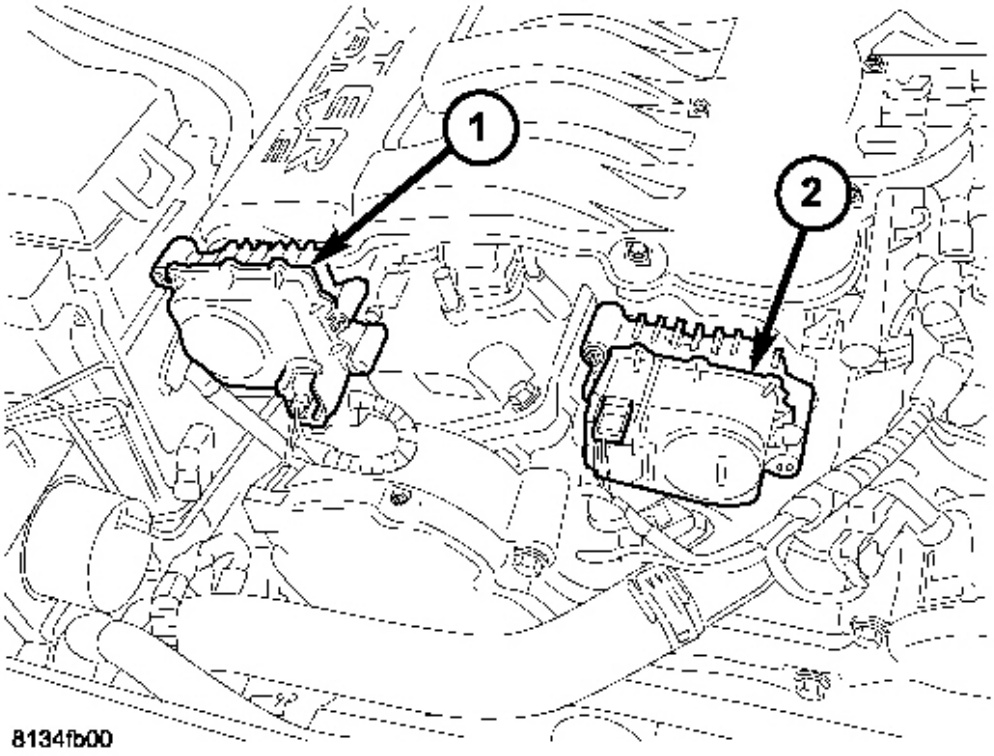

Fig. 283: Identifying Manifold Tuning Valve & Short Runner Valve
Courtesy of CHRYSLER LLC

1 - Manifold Tuning Valve
2 - Short Runner Valve

7. Connect the manifold tuning valve and short runner valve electrical connectors.

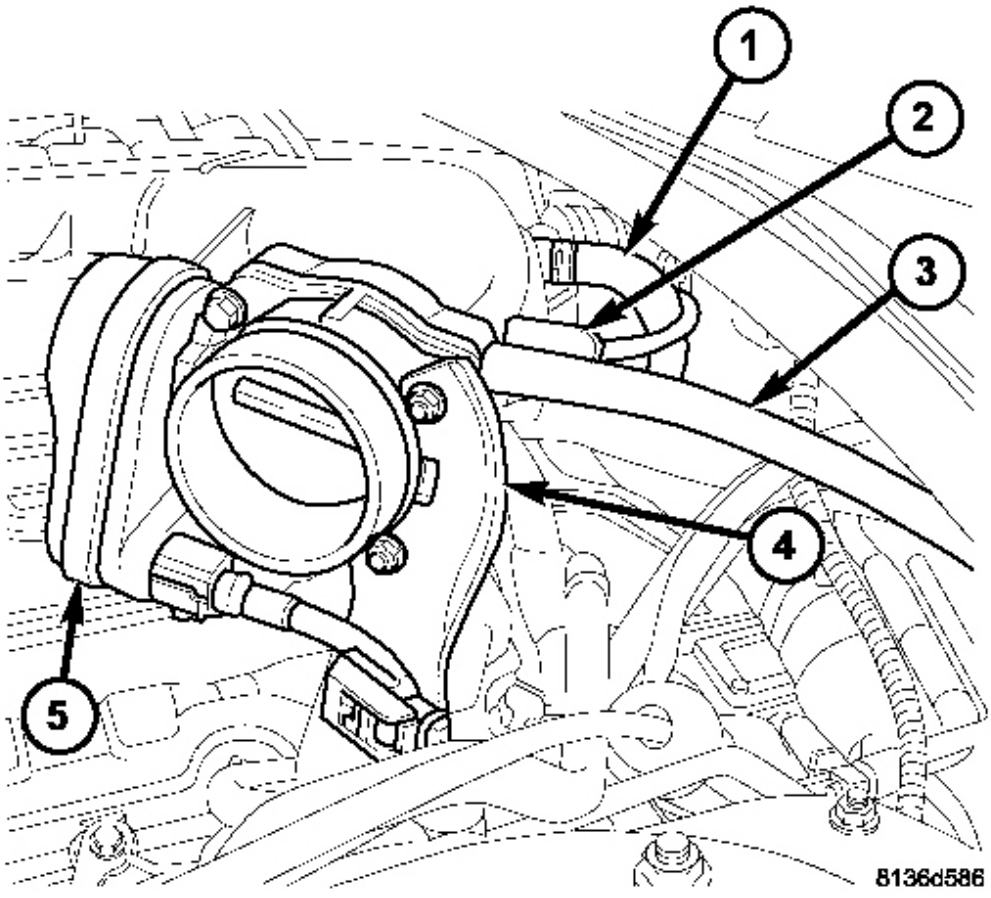

Fig. 284: PCV Hose, Purge Hose, Brake Booster Hose, Throttle Bracket & Electronic Throttle Control
Courtesy of CHRYSLER LLC

1 - PCV HOSE
2 - PURGE HOSE
3 - BRAKE BOOSTER HOSE
4 - THROTTLE BRACKET
5 - ELECTRONIC THROTTLE CONTROL

8. Connect the electronic throttle control harness connector.
9. Connect the engine electrical connectors to the intake manifold.
10. Connect the EGR tube, PCV, Purge and power brake booster vacuum hoses to the intake manifold.

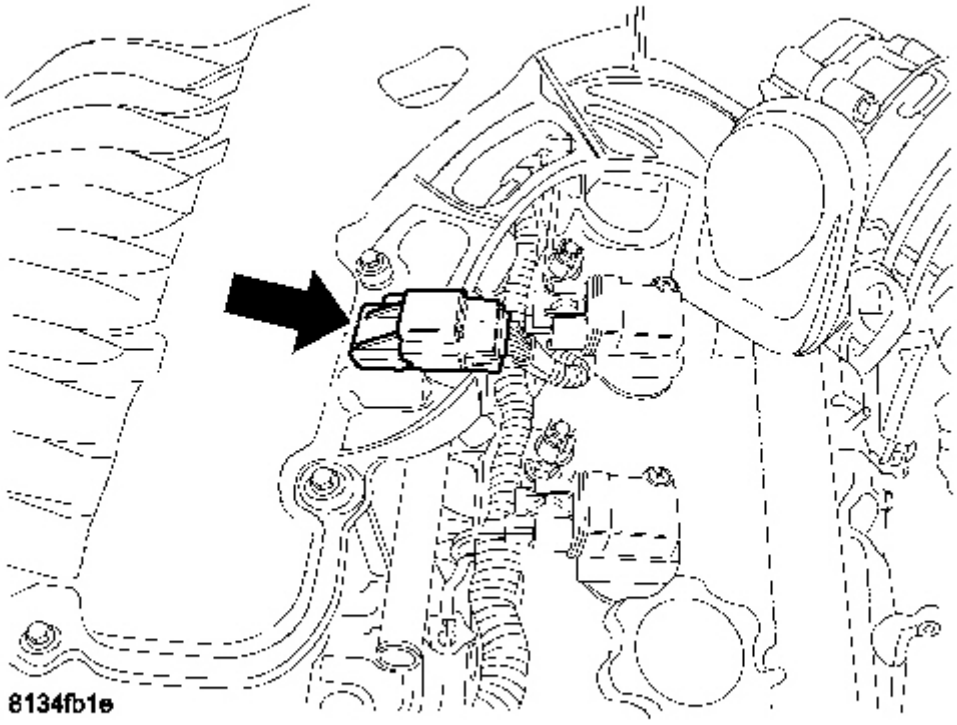

Fig. 285: Locating Manifold Absolute Pressure Sensor
Courtesy of CHRYSLER LLC

11. Connect the MAP sensor harness connector.

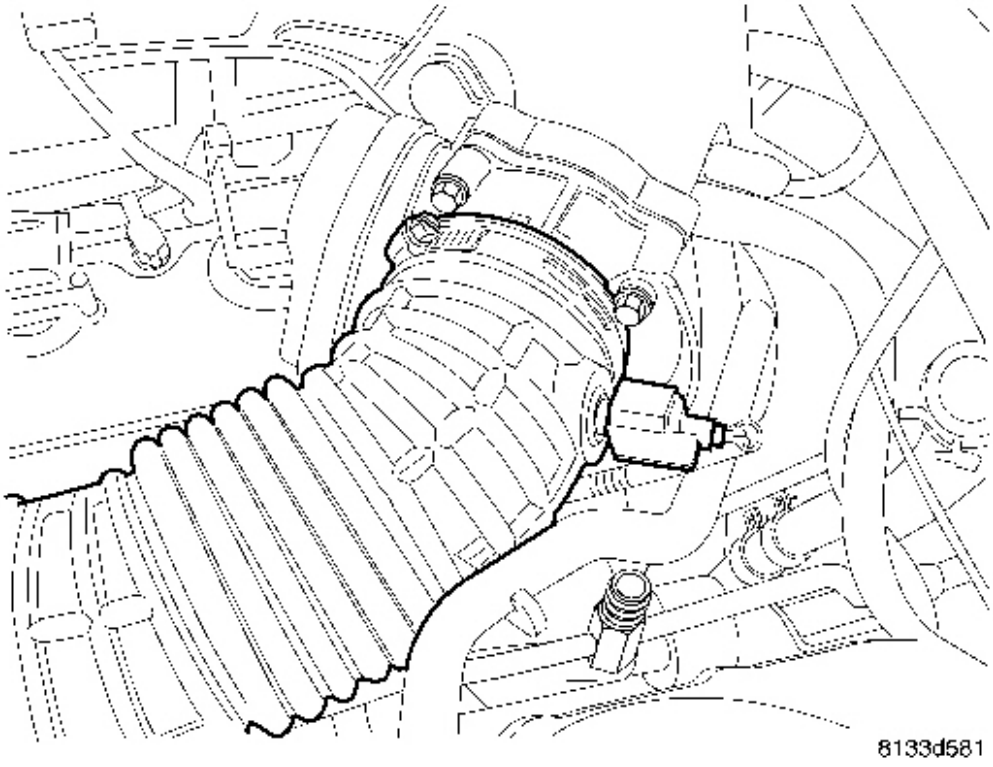

Fig. 286: Removing/Installing Inlet Hose And IAT Sensor Harness Connector
Courtesy of CHRYSLER LLC

12. Install the inlet hose and connect the IAT sensor harness connector.
13. Connect negative battery cable.

MANIFOLD-EXHAUST LEFT

REMOVAL

MANIFOLD-EXHAUST LEFT

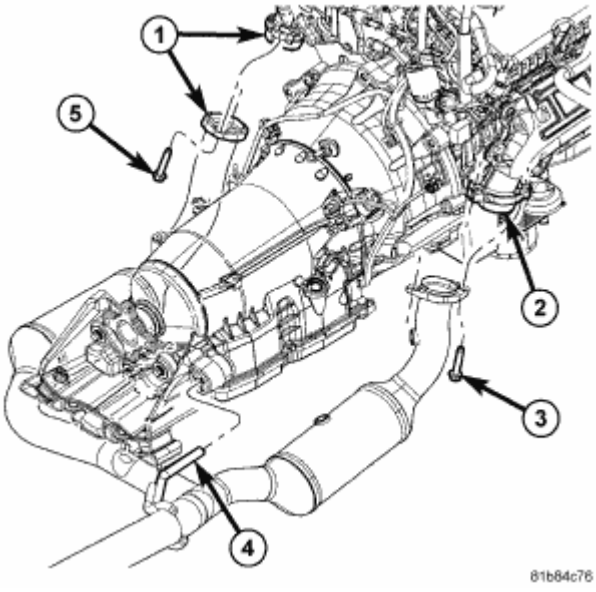

Fig. 287: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Raise and support the vehicle.
3. Separate the front exhaust pipe to manifold union (2).

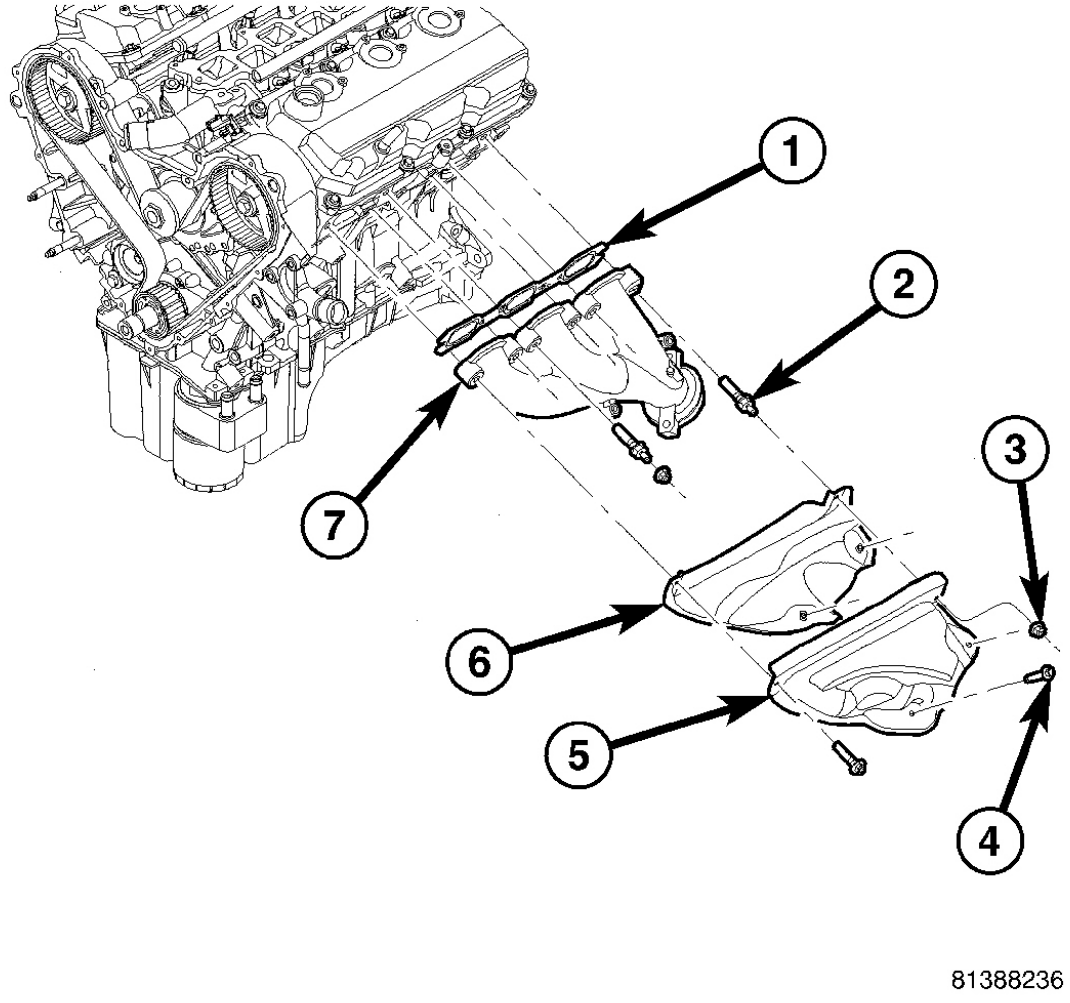

Fig. 288: Left Exhaust Manifold
Courtesy of CHRYSLER LLC

1 - GASKET
2 - STUD
3 - NUT
4 - BOLT
5 - UPPER HEAT SHIELD
6 - LOWER HEAT SHIELD
7 - EXHAUST MANIFOLD

4. Lower the vehicle.
5. Disconnect and remove the oxygen sensor from the exhaust manifold (7)
6. Remove the exhaust manifold shield (5) retaining bolts, exhaust manifold (7) , and discard gasket (1).

INSPECTION

EXHAUST MANIFOLD

1. Inspect exhaust manifolds for damage or cracks.
2. Check manifold flatness.
3. Inspect the exhaust manifold gasket for obvious discoloration or distortion.
4. Check distortion of the cylinder head mounting surface with a straightedge and thickness gauge.

INSTALLATION

MANIFOLD-EXHAUST LEFT

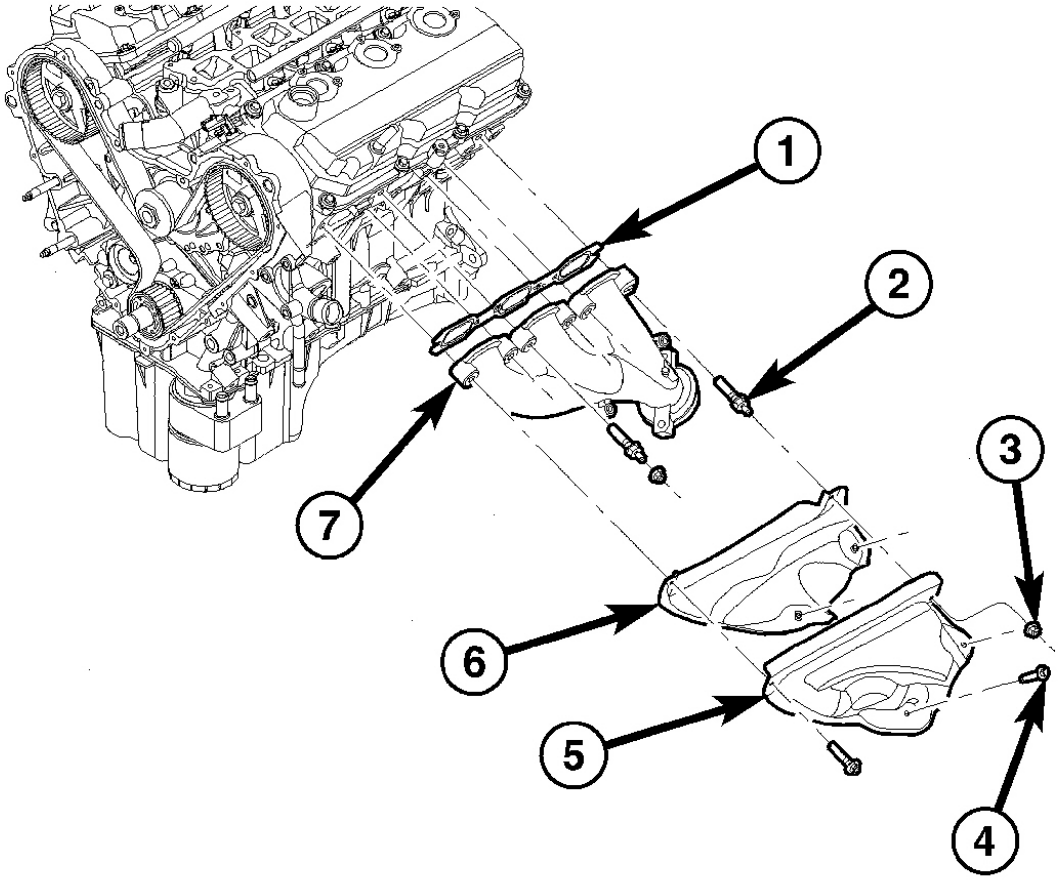

Fig. 289: Left Exhaust Manifold
Courtesy of CHRYSLER LLC

1 - GASKET
2 - STUD
3 - NUT
4 - BOLT
5 - UPPER HEAT SHIELD
6 - LOWER HEAT SHIELD
7 - EXHAUST MANIFOLD

NOTE: If replacing the exhaust manifold, tighten the exhaust outlet studs to manifold to 40N.m (350 in.lbs.).

1. Position the exhaust manifold (7) and gasket (1). Install the retaining bolts (2). Tighten 4 bolts starting at the center working outward to 23 N.m (200 in. lbs.).
2. Install the exhaust manifold heat shields (5,6). Tighten the bolts to 12N.m (105 in. lbs.).
3. Tighten the out most stud nuts to 8N.m (73 in.lbs.).
4. Connect the oxygen sensor.

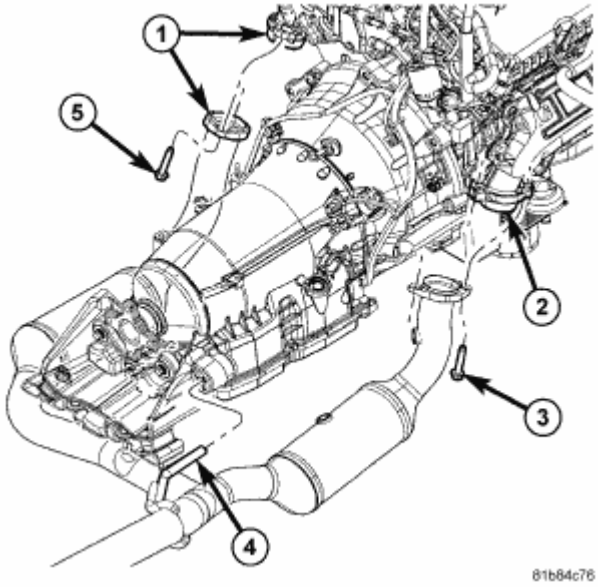

Fig. 290: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

5. Raise and support the vehicle.
6. Connect the exhaust pipe to manifold union (2). Tighten the exhaust stud nuts to 34N.m (300 in.lbs.).
7. Connect the negative battery cable.

MANIFOLD-EXHAUST RIGHT

REMOVAL

MANIFOLD-EXHAUST RIGHT

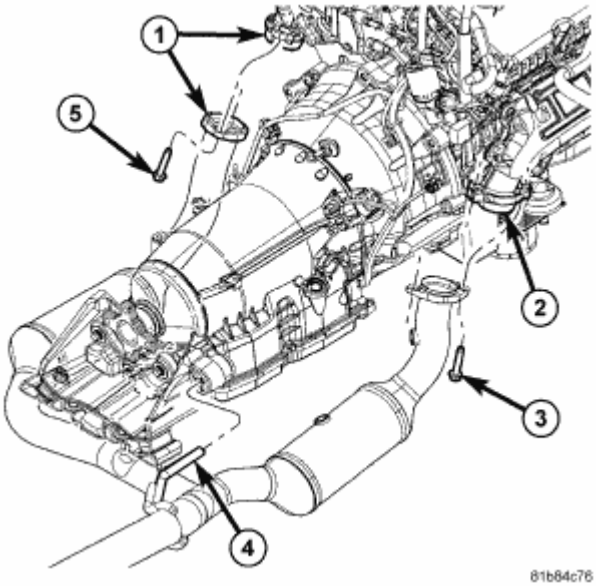

Fig. 291: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Disconnect the upstream oxygen sensor electrical connector.
3. Raise and support the vehicle.
4. Remove the exhaust manifold to exhaust pipe flange retaining bolts (2).

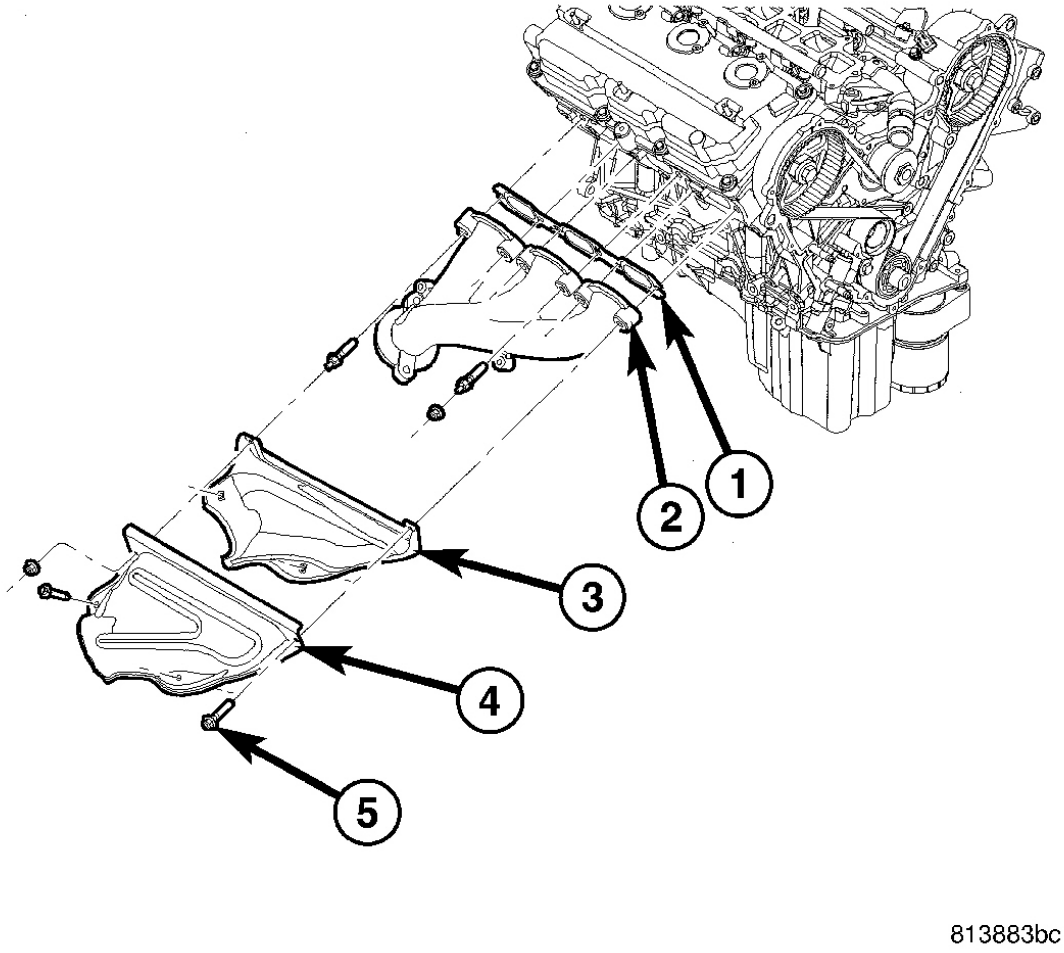

Fig. 292: Right Exhaust Manifold
Courtesy of CHRYSLER LLC

1 - GASKET
2 - MANIFOLD
3 - LOWER SHIELD
4 - UPPER SHIELD
5 - BOLT

5. Lower the vehicle.
6. Remove the exhaust manifold heat shield and manifold.
7. Remove the oxygen sensor from the exhaust manifold.

INSTALLATION

MANIFOLD-EXHAUST RIGHT

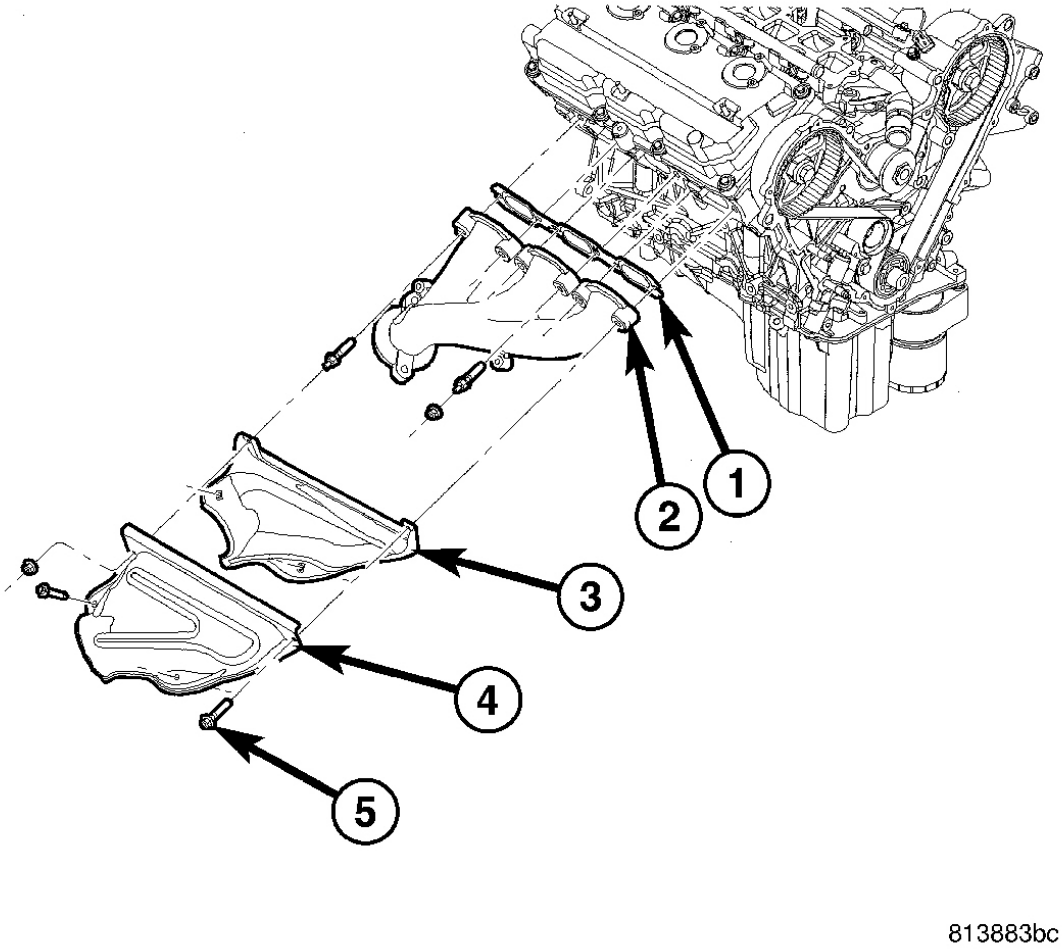

Fig. 293: Right Exhaust Manifold
Courtesy of CHRYSLER LLC

1 - GASKET
2 - MANIFOLD
3 - LOWER SHIELD
4 - UPPER SHIELD
5 - BOLT

1. Clean gasket surfaces.

NOTE: If replacing the exhaust manifold, tighten the exhaust outlet studs to 39N.m (350 in.lbs.).

2. Position the exhaust manifold and gasket. Install the retaining bolts. Tighten 4 bolts starting at the center working outward to 23 N.m (200 in. lbs.). See **Fig. 293**.
3. Install the heat shields. Tighten the heat shield fasteners to 12 N.m (105 in.lbs.).
4. Tighten the 2 out most nuts to 8 N.m (73 in.lbs.).
5. Connect the oxygen sensor.
6. Raise and support the vehicle.

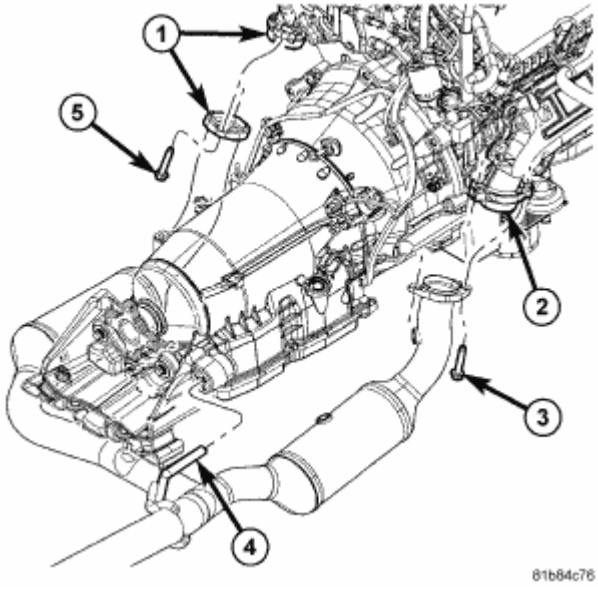

Fig. 294: Removing/Installing Exhaust Pipe
Courtesy of CHRYSLER LLC

7. Connect the front exhaust pipe to exhaust manifold (2). Tighten the fasteners to 34 N.m (300 in. lbs.).
8. Connect the negative battery cable.

VALVE TIMING

DESCRIPTION

TIMING DRIVE SYSTEM

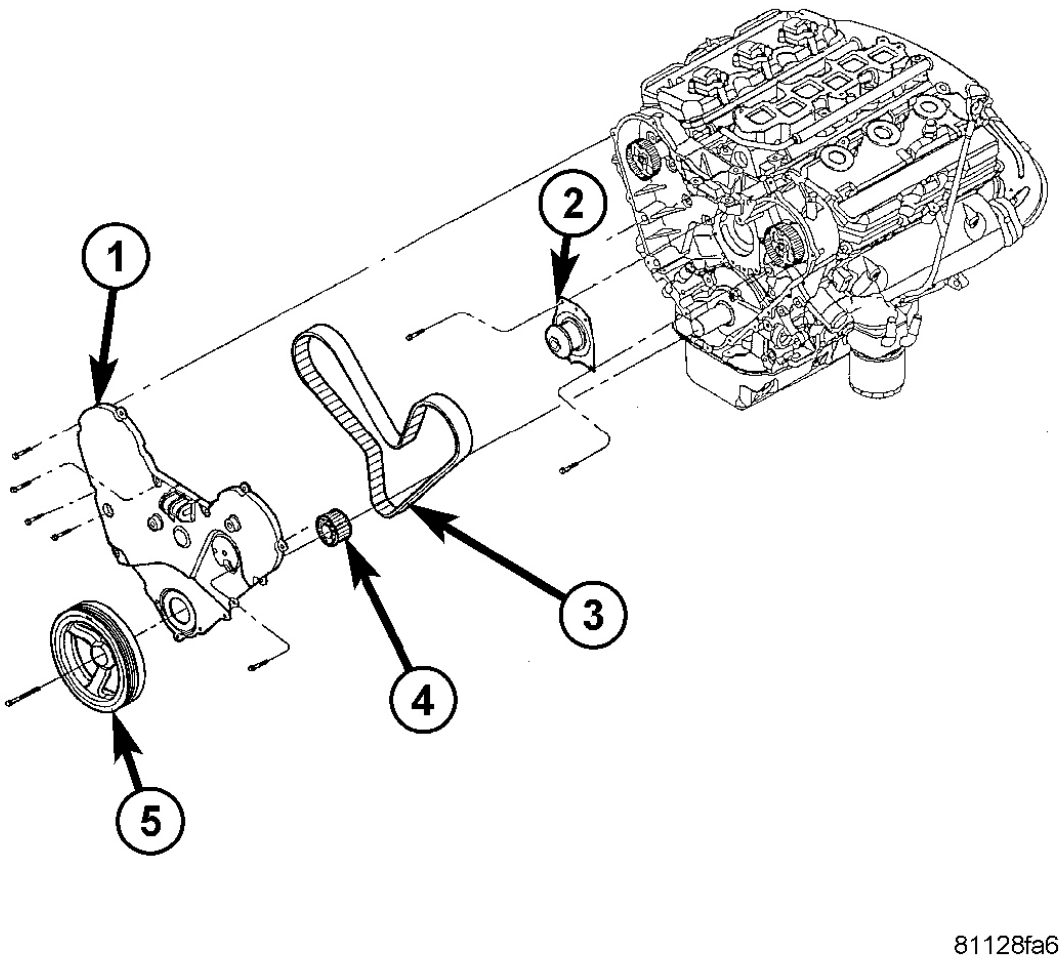

Fig. 295: Timing Drive System
Courtesy of CHRYSLER LLC

1 - FRONT TIMING COVER
2 - WATER PUMP
3 - TIMING BELT
4 - CRANKSHAFT SPROCKET
5 - CRANKSHAFT DAMPER

The timing drive system has been designed to provide quiet performance and reliability to support a **NON** free-wheeling engine.

The timing drive components include a crankshaft sprocket (4), camshaft sprockets, tensioner pulley, hydraulic tensioner and a timing belt (3). The water pump (2) is driven by the back side of the timing belt (3). The right and left camshaft sprockets are keyed and not interchangeable because of the cam sensor pick-up wheel on the left sprocket. See **Fig. 295**.

COVER-FRONT TIMING BELT

REMOVAL

COVER-FRONT TIMING BELT

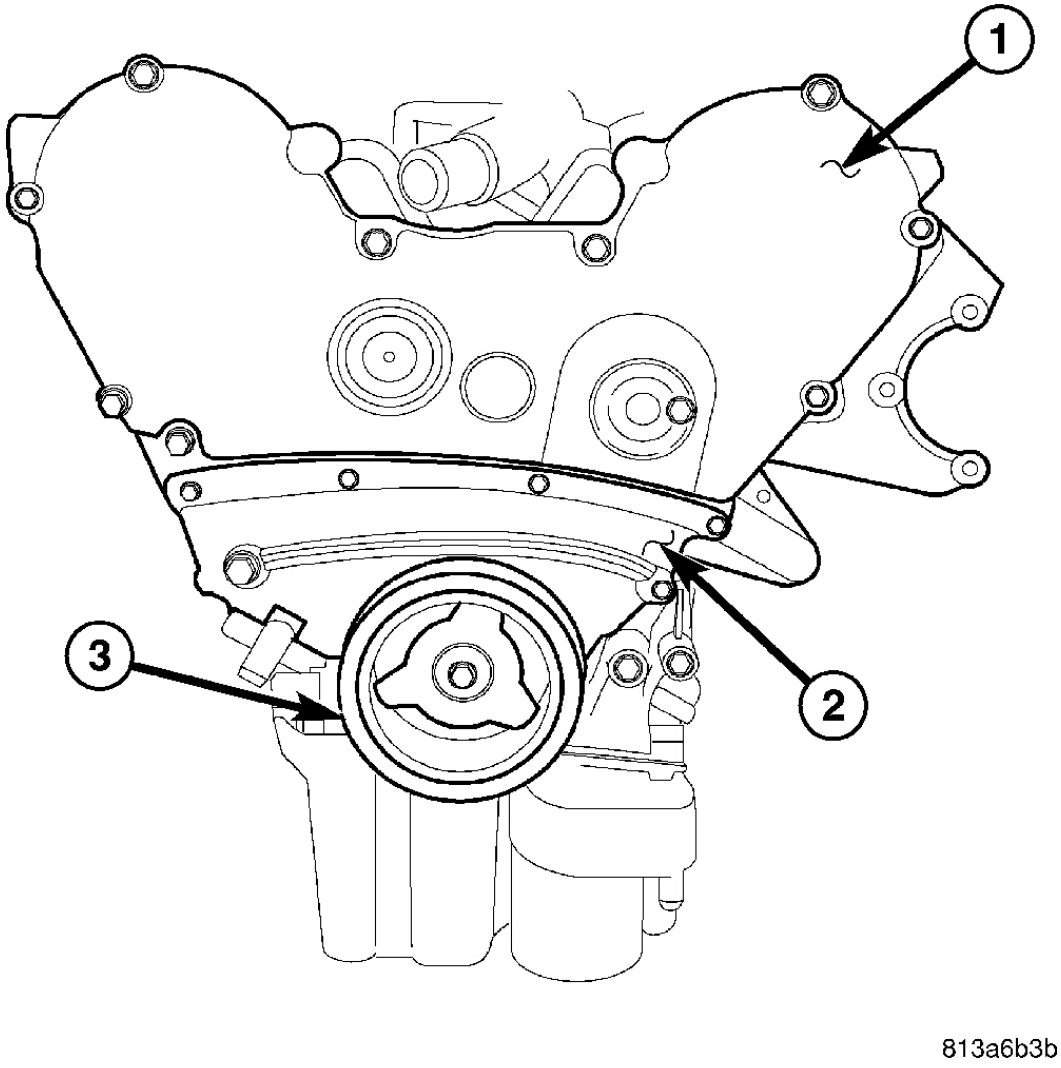

Fig. 296: Front Timing Covers
Courtesy of CHRYSLER LLC

1 - UPPER FRONT TIMING COVER
2 - LOWER FRONT TIMING COVER
3 - VIBRATION DAMPER

1. Perform fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Disconnect negative battery cable.
3. Remove accessory drive belt. Refer to **REMOVAL** .
4. Remove accessory drive belt tensioner.
5. Remove bolts for power steering pump. Reposition power steering pump aside.
6. Raise vehicle on hoist.

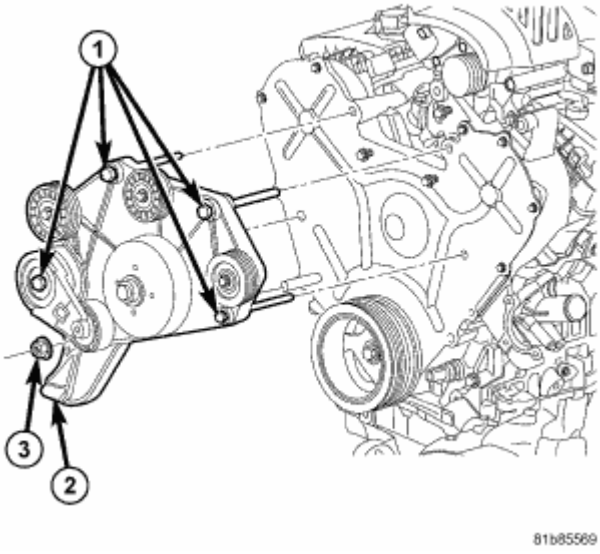

Fig. 297: Removing/Installing Accessory Drive Bracket
Courtesy of CHRYSLER LLC

7. Remove crankshaft damper. See **REMOVAL**.
8. Remove the lower front timing belt cover fasteners. See **Fig. 296**.

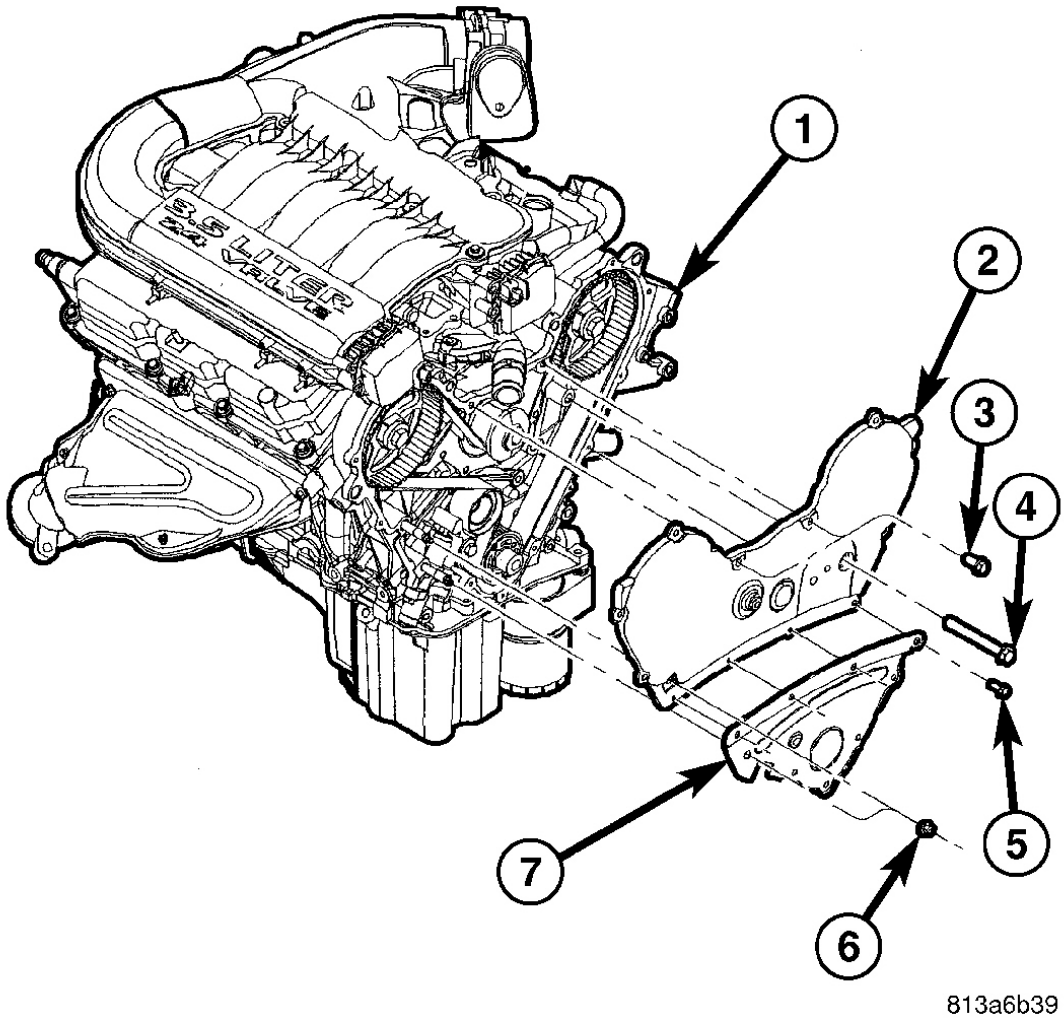

Fig. 298: Upper & Lower Timing Covers
Courtesy of CHRYSLER LLC

1 - INNER TIMING COVER
2 - UPPER TIMING COVER
3 - 8 mm BOLT(S)
4 - 10mm BOLT(S)
5 - 6 mm BOLT(S)
6 - NUT(S)
7 - LOWER TIMING COVER

9. Lower the vehicle.
10. Remove the upper timing belt cover bolts and remove front timing belt cover. See **Fig. 298**.

INSTALLATION

COVER-FRONT TIMING BELT

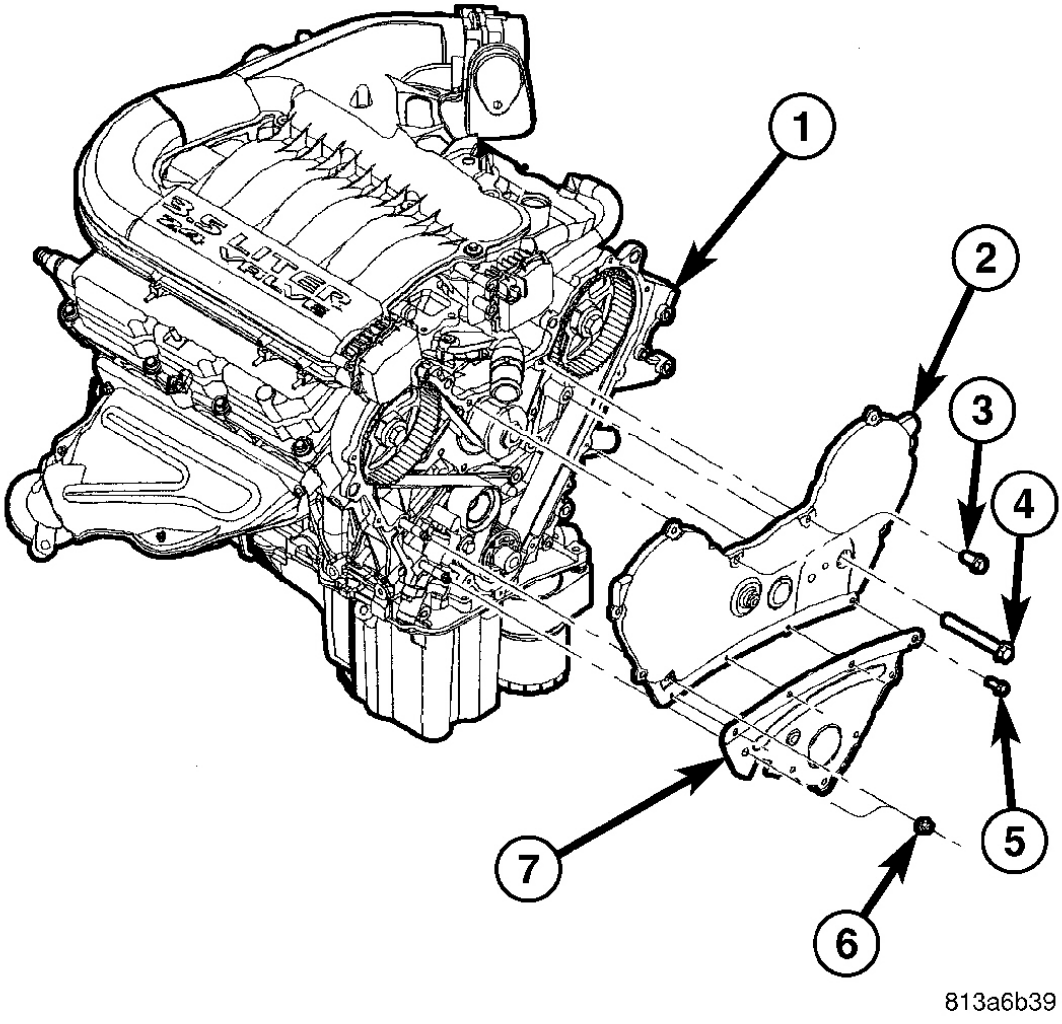

Fig. 299: Upper & Lower Timing Covers
Courtesy of CHRYSLER LLC

1 - INNER TIMING COVER
2 - UPPER TIMING COVER
3 - 8 mm BOLT(S)
4 - 10mm BOLT(S)
5 - 6 mm BOLT(S)
6 - NUT(S)
7 - LOWER TIMING COVER

1. Exchange the accessory drive belt pulley if necessary. Tighten bolt to 61 N.m (45 ft.lbs.).
2. Install upper front timing belt cover. See **Fig. 299**.
3. Install lower timing belt front cover. See **Fig. 299**.
4. Tighten the timing cover bolts as follows:
   M6 bolts - 12N.m (105 in.lbs.)
   M8 bolts - 28N.m (250 in.lbs.)
   M10 bolts - 54N.m (40 lbs.ft.)
5. Install power steering pump fasteners. Tighten bolts to 23 N.m (200 lbs. in.).
6. Install crankshaft damper. See **INSTALLATION**.
7. Install accessory drive belt tensioner. Refer to **INSTALLATION** . Torque fastener to 28 N.m (250 in. lbs.).
8. Install accessory drive belt. Refer to **INSTALLATION** .
9. Lower vehicle.
10. Connect negative battery cable.

COVER-REAR TIMING BELT

REMOVAL

COVER-REAR TIMING BELT

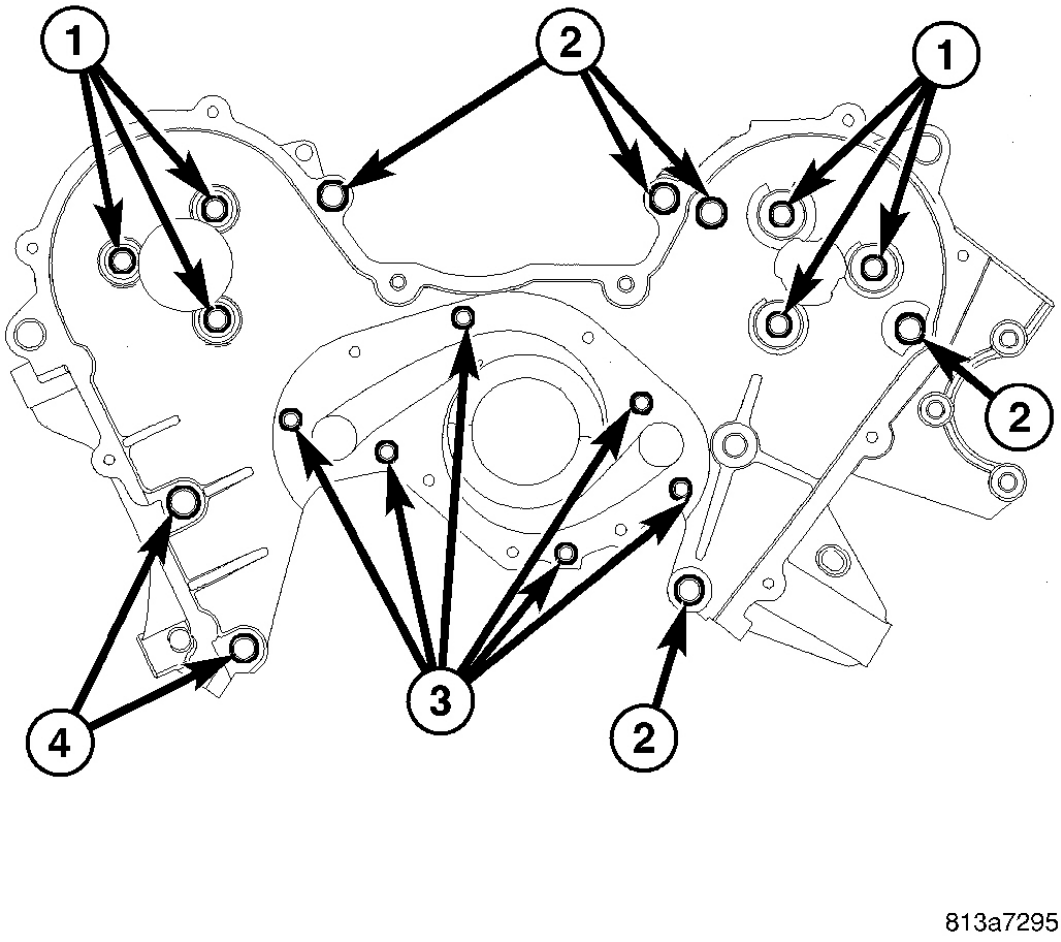

Fig. 300: Timing Belt Rear Cover Fasteners
Courtesy of CHRYSLER LLC

1 - M8 FASTENERS (APPLY THREAD SEALANT)
2 - M10 FASTENERS
3 - M6 FASTENERS
4 - M10 FASTENERS (STUD/NUT)

NOTE: The rear timing belt cover has O-rings to seal the water pump passages to cylinder block. Do not reuse the O-rings.

1. Perform fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Disconnect the negative battery cable.
3. Remove timing belt. See **REMOVAL**.
4. Remove camshaft sprockets. See **REMOVAL**.

5. Remove rear timing belt cover bolts (1, 2, 3). See **Fig. 300**.
6. Remove the rear cover.

INSTALLATION

COVER-REAR TIMING BELT

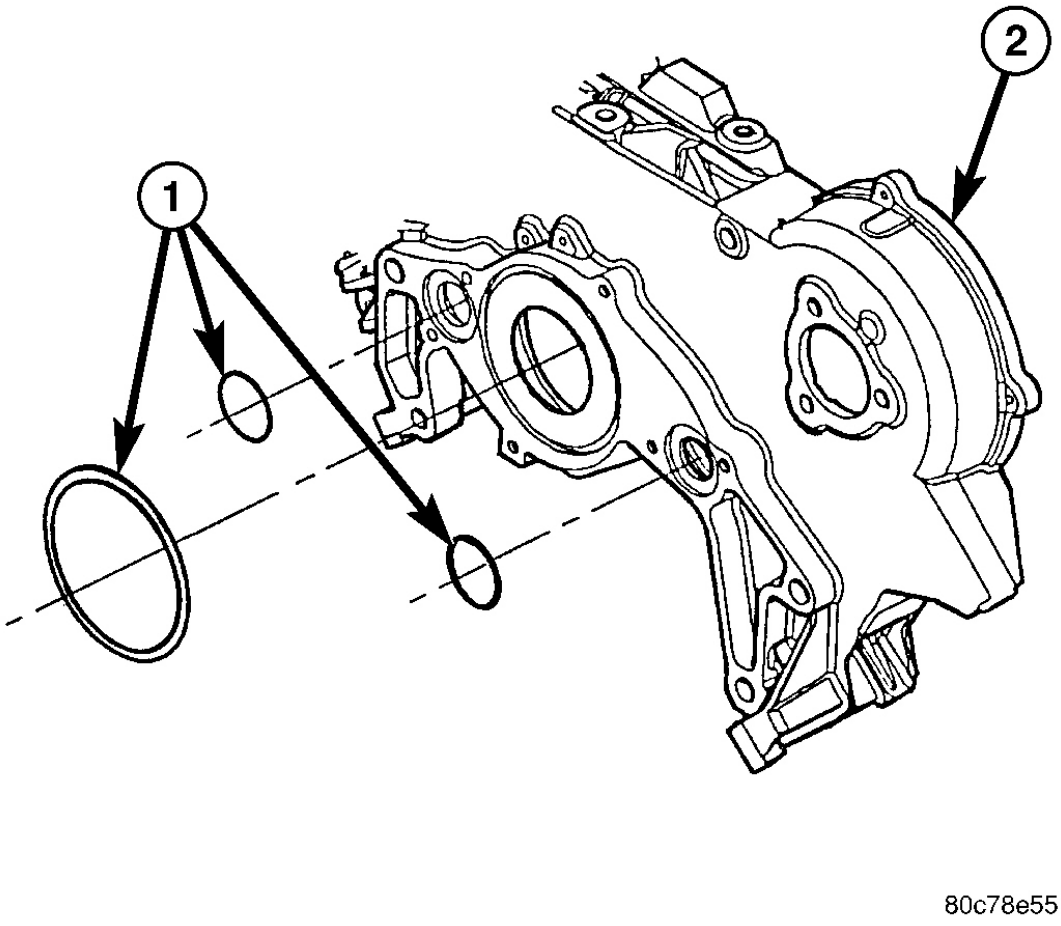

Fig. 301: Rear Timing Belt Cover Seals & Rear Timing Belt Cover
Courtesy of CHRYSLER LLC

1 - REAR TIMING BELT COVER SEALS
2 - REAR TIMING BELT COVER

1. Clean rear timing belt cover O-ring (1) sealing surfaces and grooves. Lubricate new O-rings with Mopar® Dielectric Grease or equivalent to facilitate assembly. See **Fig. 301**.
2. Position **NEW** O-rings on cover (2).

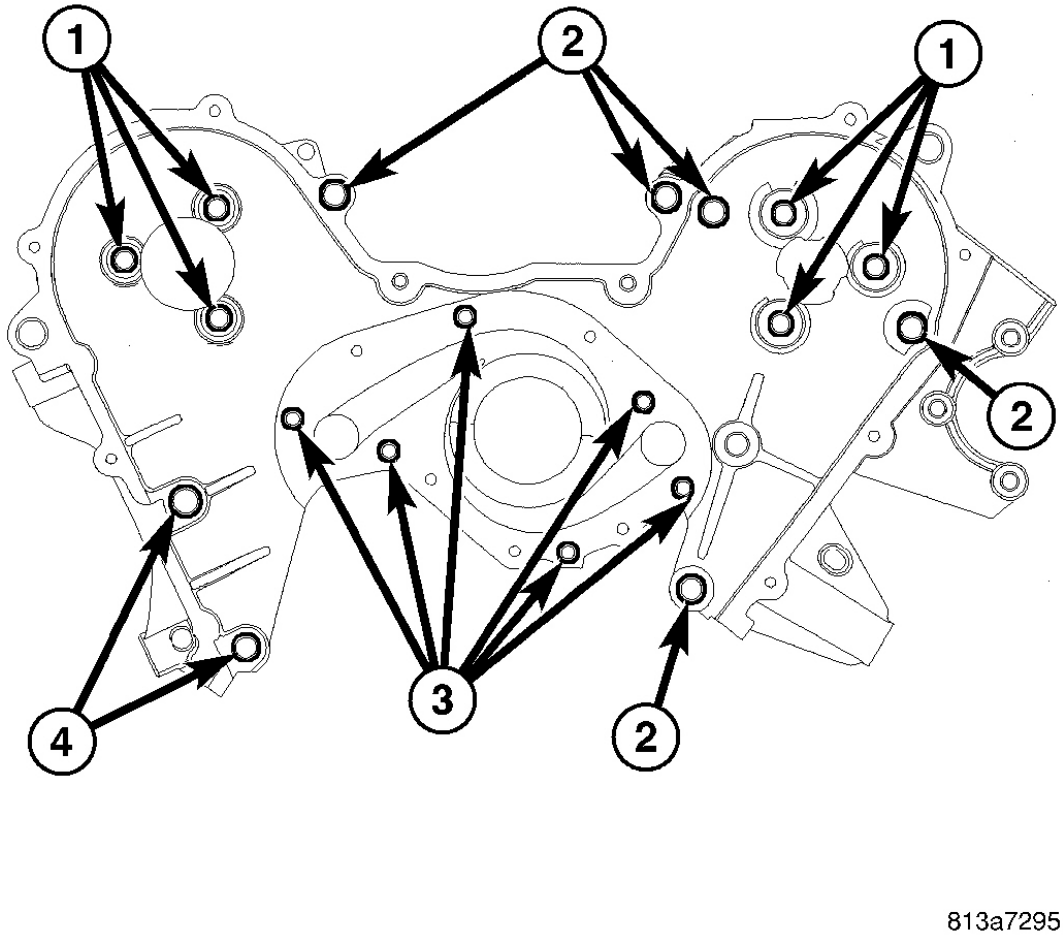

Fig. 302: Timing Belt Rear Cover Fasteners
Courtesy of CHRYSLER LLC

1 - M8 FASTENERS (APPLY THREAD SEALANT)
2 - M10 FASTENERS
3 - M6 FASTENERS
4 - M10 FASTENERS (STUD/NUT)

3. Install rear timing belt cover (4). See **Fig. 302**. Tighten bolts to the following specified torque:
   M10 (2, 5) - 54 N.m (40 ft. lbs.)
   M8 (1) - 28 N.m (20 ft. lbs.)
   M6 (3) - 12 N.m (105 in. lbs.)
4. Install camshaft sprockets. See **INSTALLATION**.
5. Install timing belt. See **INSTALLATION**.

BELT-TIMING AND SPROCKETS

REMOVAL

CRANKSHAFT SPROCKET

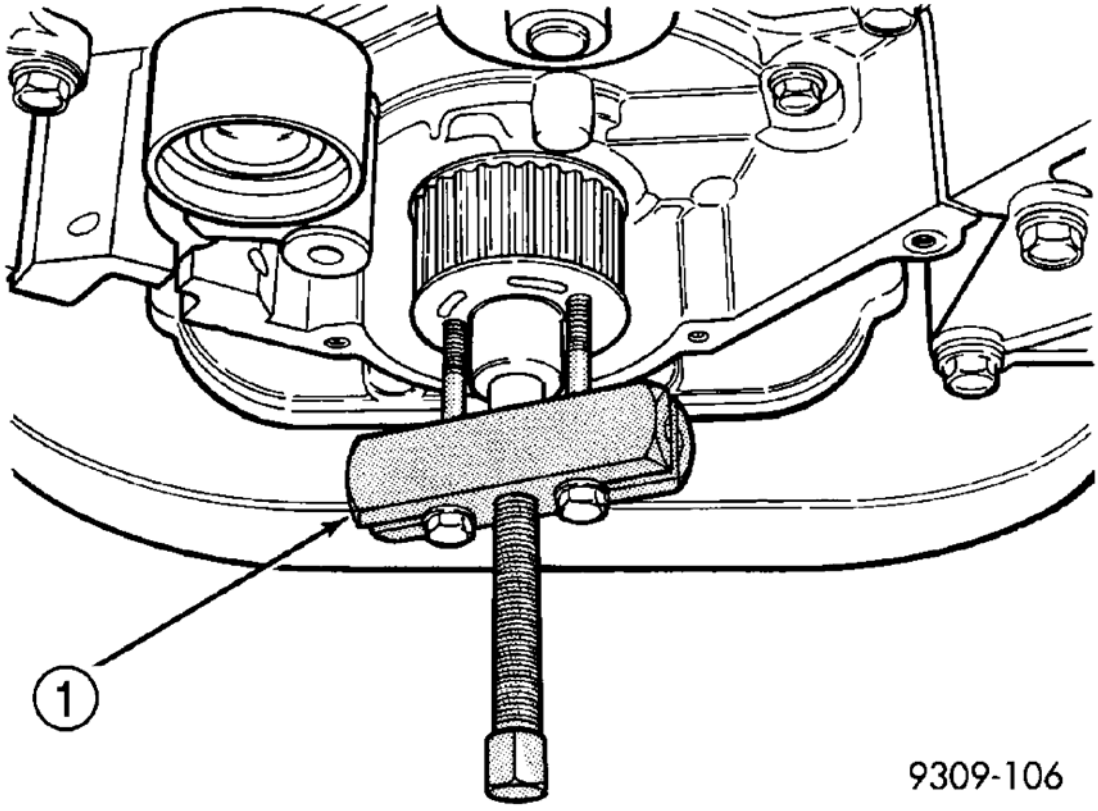

Fig. 303: Removing Crankshaft Sprocket Using Special Tool L-4407-A
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL L-4407-A

1. Remove the timing belt. See **REMOVAL**.
2. Remove crankshaft sprocket using Special Tool L-4407-A (1). See **Fig. 303**.

TIMING BELT

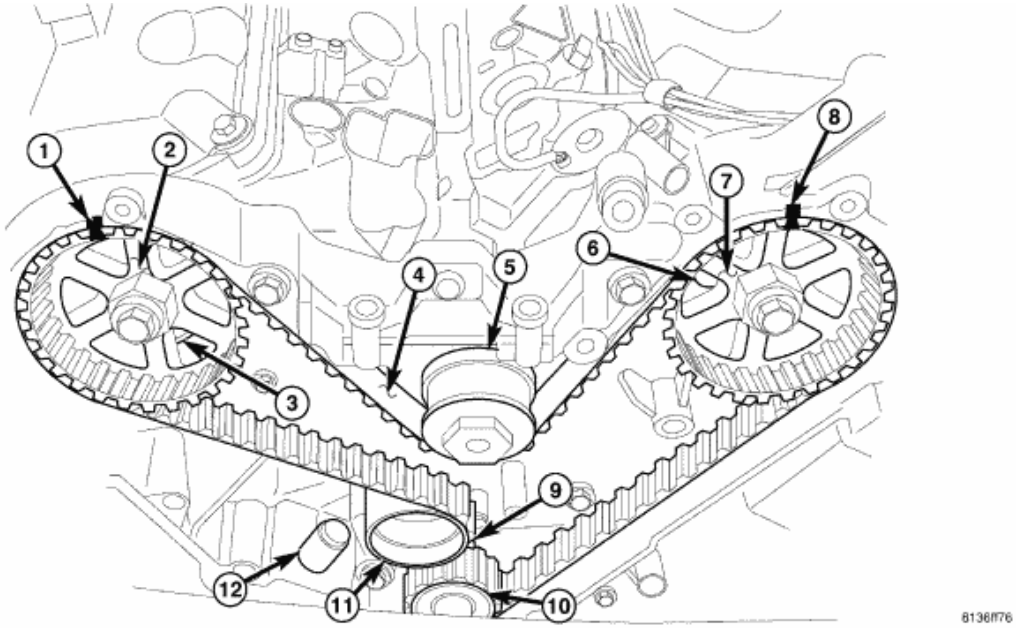

Fig. 304: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

CAUTION: The 4.0L is NOT a freewheeling engine. Therefore, loosen the valve train rocker assemblies before servicing the timing drive.

1. Perform fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Disconnect negative battery cable.
3. Remove both cylinder head covers and loosen the rocker arm assemblies. See **REMOVAL**.
4. Remove the front timing belt cover. See **REMOVAL**).
5. Mark belt running direction, if timing belt is to be reused.

CAUTION: When aligning timing marks, always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

6. Rotate engine clockwise until crankshaft (10) mark aligns with the TDC mark on oil pump housing (9) and the camshaft sprocket (2, 7) timing marks (1, 8) are aligned with the marks on the rear cover. See **Fig. 304**.
7. Remove the timing belt tensioner (12) and remove timing belt.
8. Inspect the tensioner for fluid leakage.
9. Inspect the pivot and bolt for free movement, bearing grease leakage, and smooth rotation. If not rotating freely, replace the arm and pulley assembly.

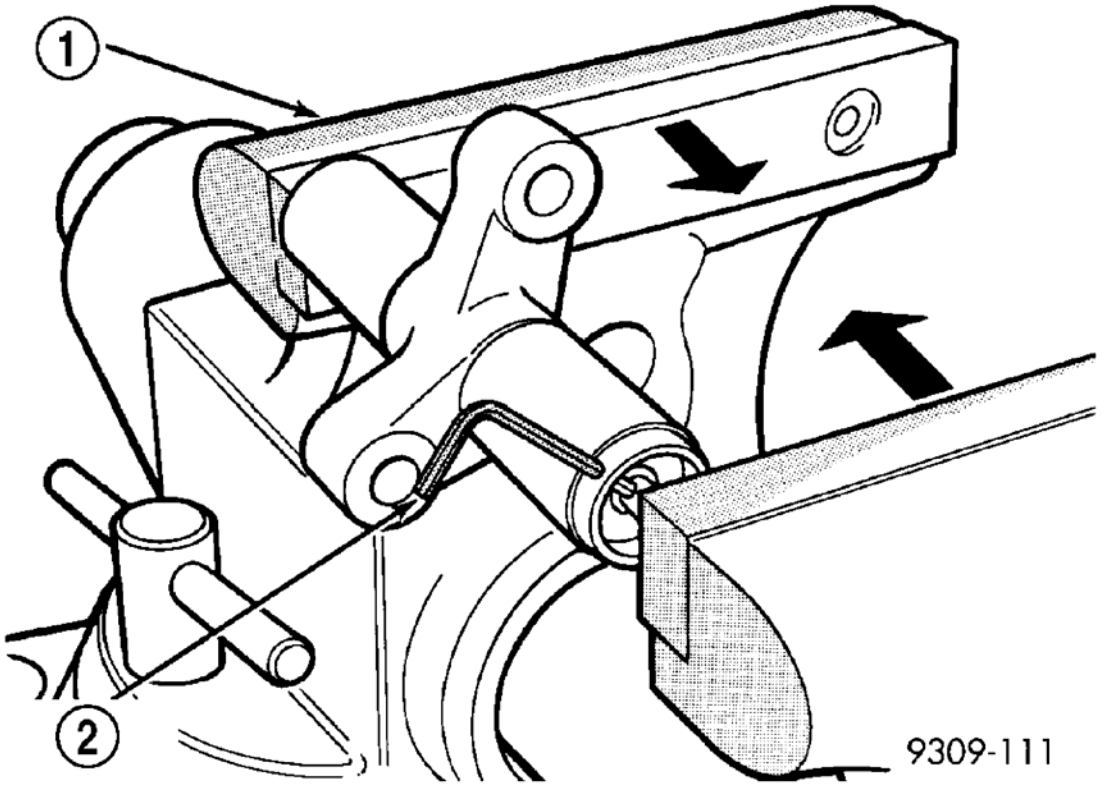

Fig. 305: Compressing Timing Belt Tensioner
Courtesy of CHRYSLER LLC

1 - VISE
2 - LOCKING PIN

10. When tensioner is removed from the engine it is necessary to compress the plunger into the tensioner body.

CAUTION: Index the tensioner in the vise the same way it is installed on the engine. This ensures proper pin orientation when tensioner is installed on the engine.

- Place the tensioner into a vise (1) and SLOWLY compress the plunger. Total bleed down of tensioner should take about 5 minutes. See **Fig. 305**.
- When plunger is compressed into the tensioner body install a pin (2) through the body and plunger to retain plunger in place until tensioner is installed.

CAMSHAFT SPROCKETS

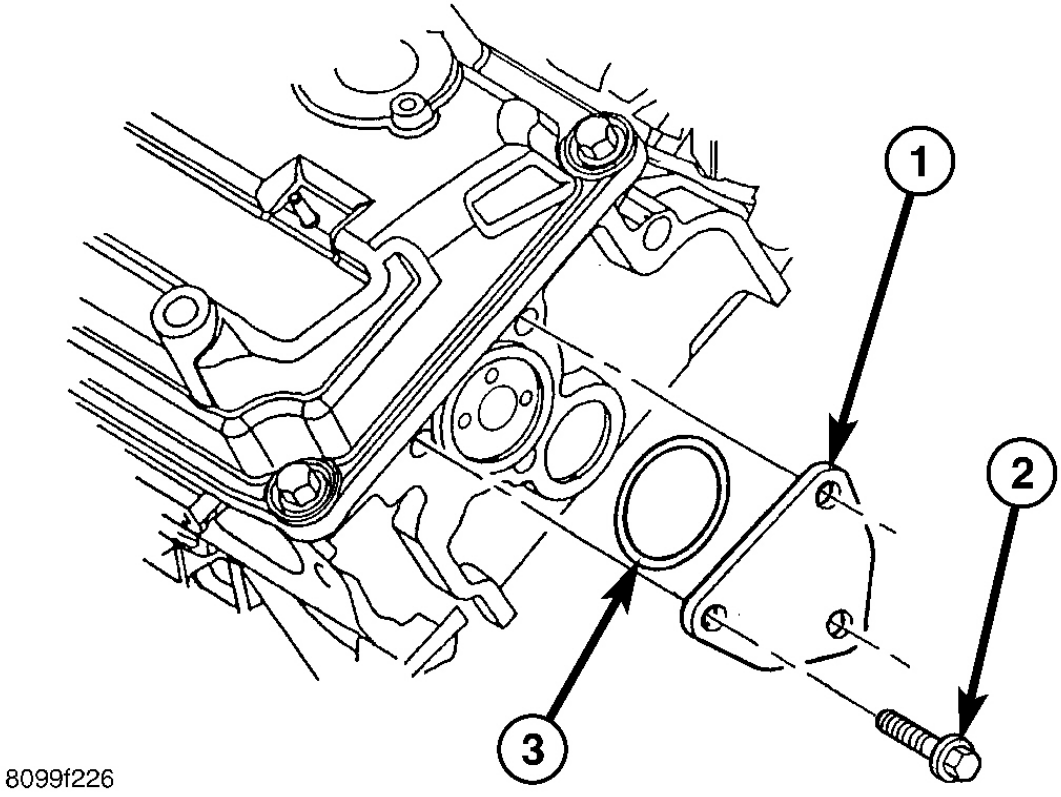

Fig. 306: Camshaft Thrust Plate, Bolt & O-Ring
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

CAUTION: The 4.0L engine is NOT a free-wheeling design. Therefore, care should be taken not to rotate the camshafts or crankshaft with the timing belt removed.

NOTE: The camshaft timing gears are keyed to the camshaft.

1. Perform fuel pressure release procedure. Refer to **STANDARD PROCEDURE** .
2. Remove front timing belt cover. See **REMOVAL**).
3. Position crankshaft sprocket to the TDC mark on the oil pump housing by turning crankshaft in the clockwise direction.
4. Install a dial indicator in number 1 cylinder to check TDC of the piston. Rotate the crankshaft until the piston is at exactly TDC.
5. Remove camshaft retainer/thrust plate (1) from rear of right cylinder head. See **Fig. 306**.
6. Remove the right cylinder head cover.
7. Remove the right rocker arm assembly.
8. Remove the timing belt tensioner and timing belt.

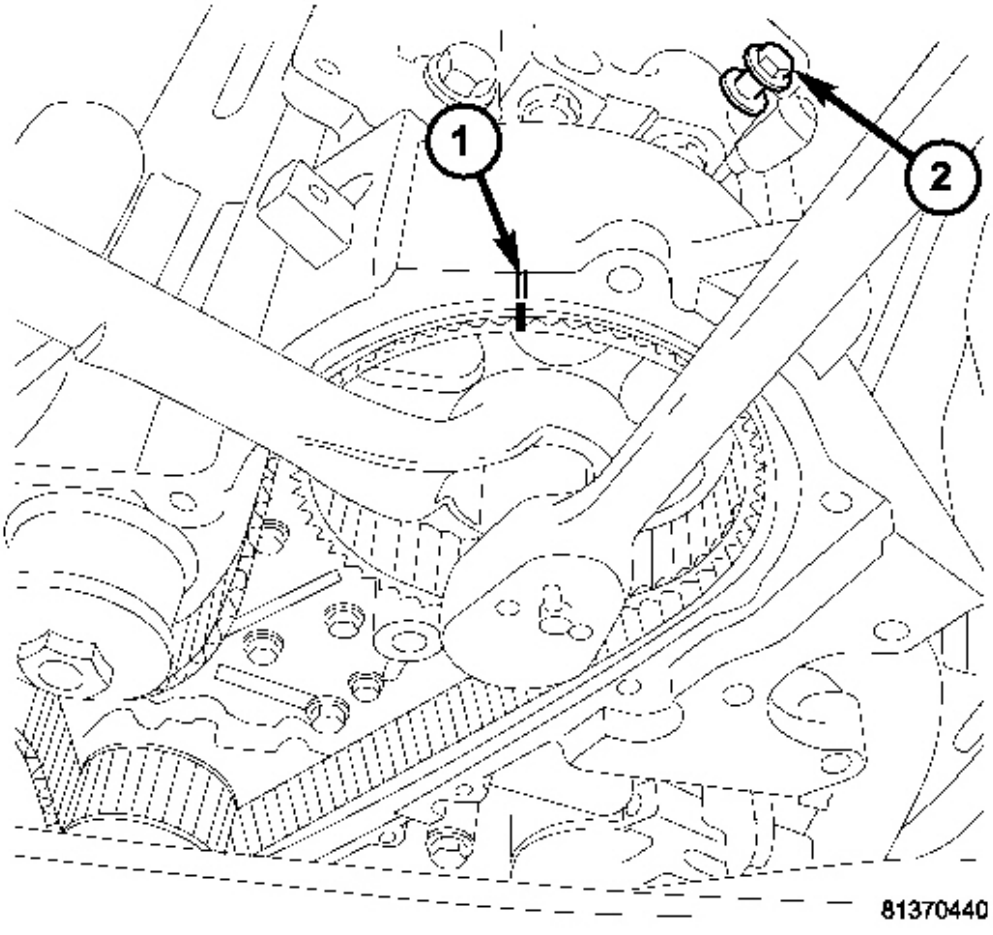

Fig. 307: Left Camshaft Sprocket
Courtesy of CHRYSLER LLC

1 - LEFT CAMSHAFT TDC
2 - LOOSENED ROCKER ASSEMBLY

9. Hold left camshaft sprocket with a 36 mm (1 7/16 in.) box end wrench.
10. Loosen and remove the camshaft gear retaining bolt and washer. The left bolt is 255 mm (10.0 in.) long.

NOTE: The camshaft timing gears are keyed to the camshaft.

11. Remove the camshaft sprocket. See **Fig. 307**

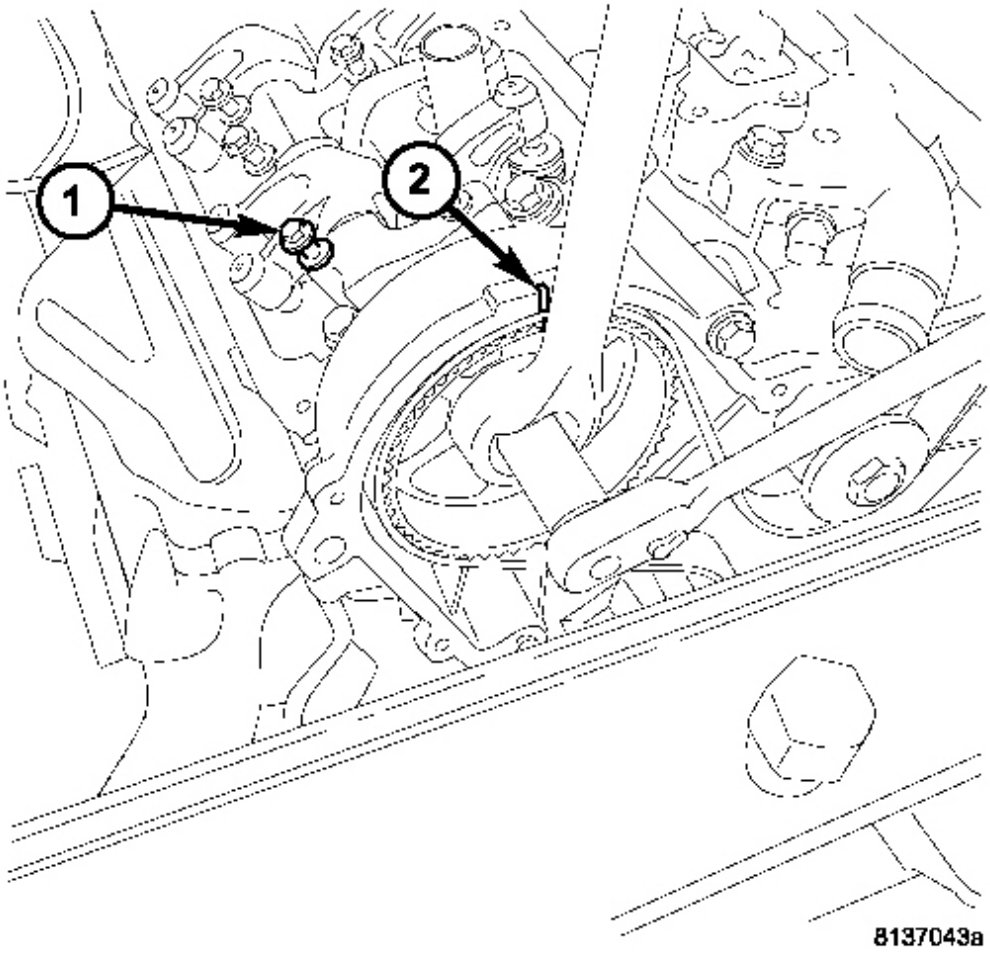

Fig. 308: Removing/Installing Camshaft Sprocket
Courtesy of CHRYSLER LLC

1 - LOOSENED ROCKER ASSEMBLY
2 - RIGHT CAMSHAFT TDC

CAUTION: The right camshaft must be pushed rearward approximately 3 1/2 inches to remove the camshaft gear retaining bolt and gear. Care must be taken not to scratch or nick the camshaft or cylinder head journals when moving camshaft.

12. Hold right camshaft sprocket with a 36 mm (1 7/16 in.) box end wrench.

13. Loosen and remove the camshaft gear retaining bolt and washer. The right bolt is 213 mm (8 3/8 in.) long.

NOTE: The camshaft timing gears are keyed to the camshaft.

14. Remove the camshaft sprocket. See **Fig. 308**.

INSPECTION

TIMING BELT AND SPROCKETS

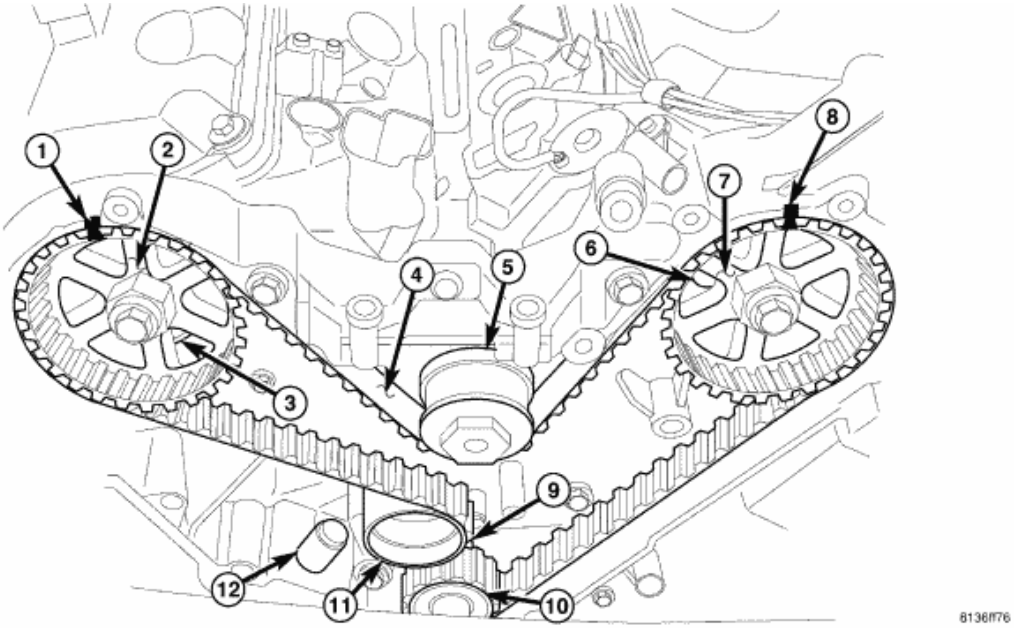

Fig. 309: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

Remove the outer timing covers. Rotate the crankshaft until the pointer on the crankshaft sprocket (10) aligns the TDC mark on the oil pump (9). Check to determine if the camshaft sprocket (2, 7) timing marks (1, 8) are aligned with the marks on the inner timing cover. It may take an additional full revolution of the crankshaft before the camshaft sprocket marks are aligned. See **Fig. 309**.

TIMING BELT

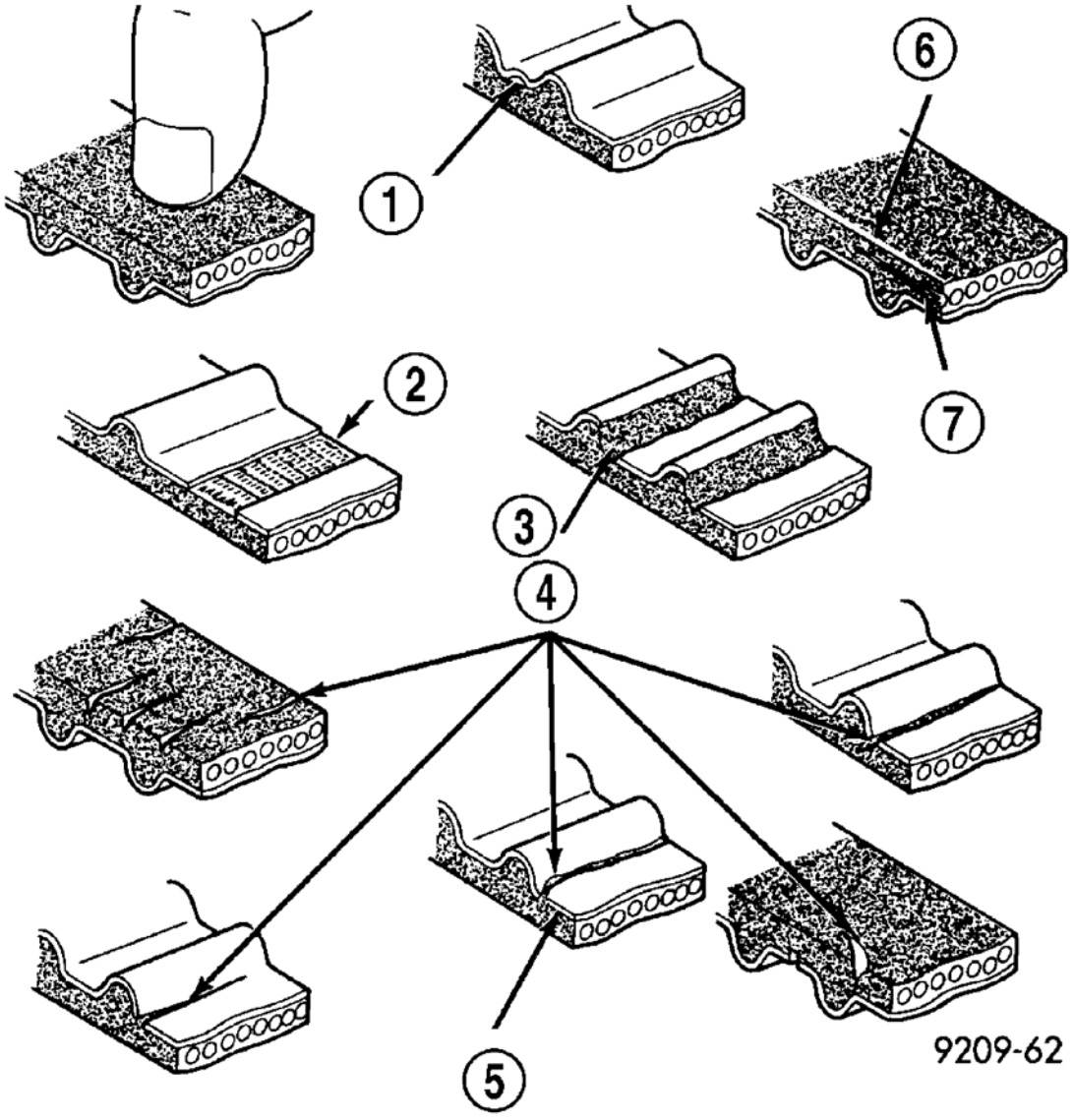

Fig. 310: Timing Belt Inspection
Courtesy of CHRYSLER LLC

1 - PEELING
2 - TOOTH MISSING AND CANVAS FIBER EXPOSED
3 - RUBBER EXPOSED
4 - CRACKS
5 - PEELING
6 - ROUNDED EDGE
7 - ABNORMAL WEAR (FLUFFY STRAND)

1. Remove front timing belt cover. See **REMOVAL**).

2. Inspect both sides of the timing belt. Replace belt if any of the following conditions exist. See **Fig. 310**:
   - Hardening of back rubber back side is glossy without resilience and leaves no indent when pressed with fingernail.
   - Cracks (4) on rubber back.
   - Cracks or peeling (1) of canvas.
   - Cracks on rib root.
   - Cracks on belt sides.
   - Missing teeth (2).
   - Abnormal wear (7) of belt sides. The sides are normal if they are sharp as if cut by a knife.
   - Vehicle mileage or time at component maintenance requirement. Refer to **DESCRIPTION** .
3. If none of the above conditions are seen on the belt, the front timing belt cover can be installed. See **INSTALLATION**.

INSTALLATION

CRANKSHAFT SPROCKET

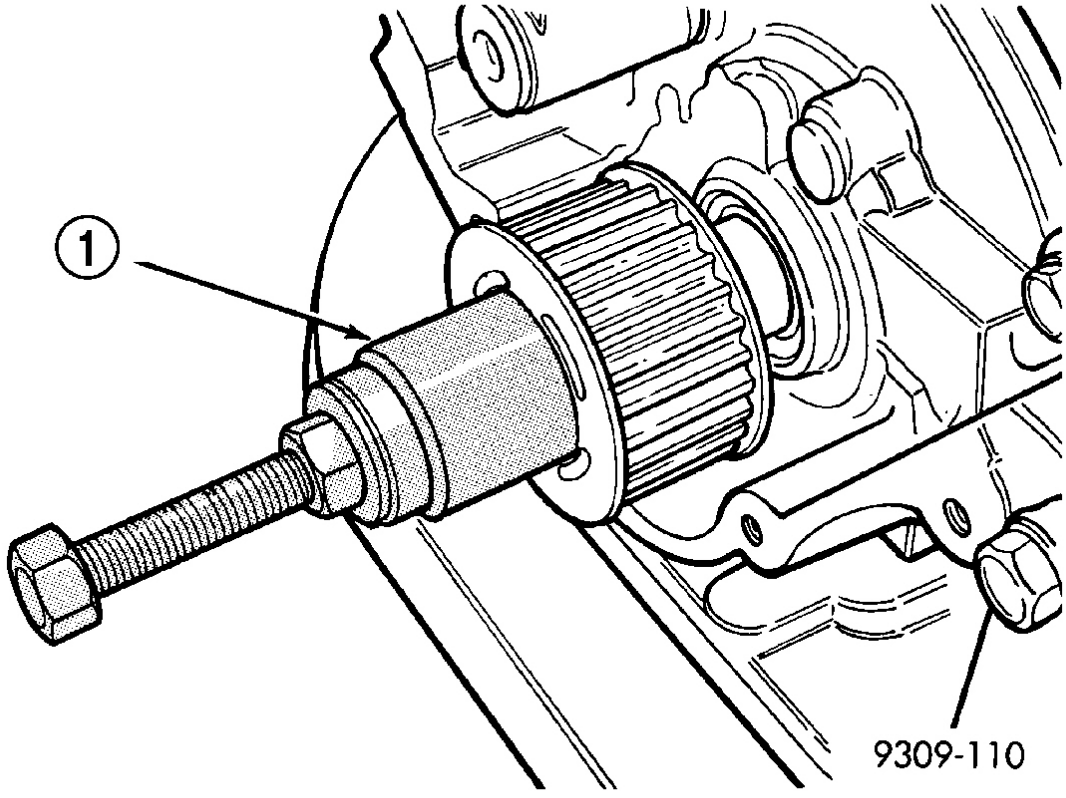

Fig. 311: Installing Crankshaft Sprocket

Courtesy of CHRYSLER LLC

1 - INSTALL WITH SPECIAL TOOL 6641 WITH 12mm SCREW C-4685-C1 AND THRUST BEARING AND WASHER

CAUTION: To ensure proper installation depth of crankshaft sprocket, Special Tool 6641 must be used.

1. Install crankshaft sprocket using Special Tools 6641 (1) and C-4685-C1. See **Fig. 311**.
2. Install timing belt. See **INSTALLATION**.

CAMSHAFT SPROCKETS

CAUTION: The camshaft sprockets are keyed and not interchangeable from side to side because of the camshaft position sensor pick-up.

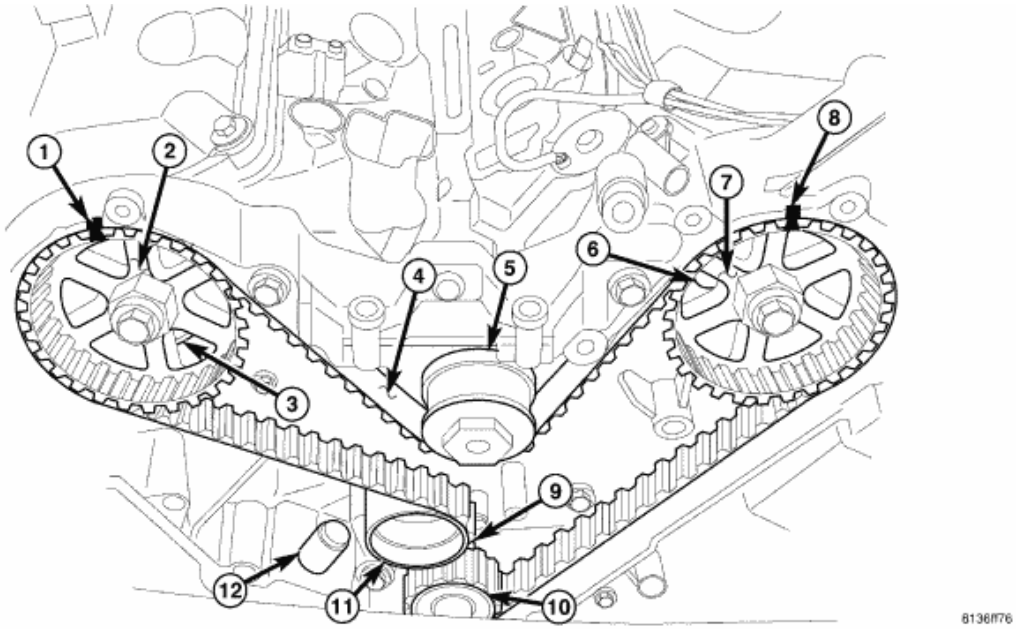

Fig. 312: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY

6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

1. Install camshaft sprockets onto the camshafts. Install **NEW** sprocket attaching bolts into place. The 255 mm (10 in.) bolt is to be installed in the left camshaft and the 213 mm (8 3/8 in.) bolt is to be installed into the right camshaft. **Do not tighten the bolts; tightened at later step.** Camshaft sprocket (2, 7) marks (1, 8) should be aligned with the marks on the cover at both sprockets. See **Fig. 312**.

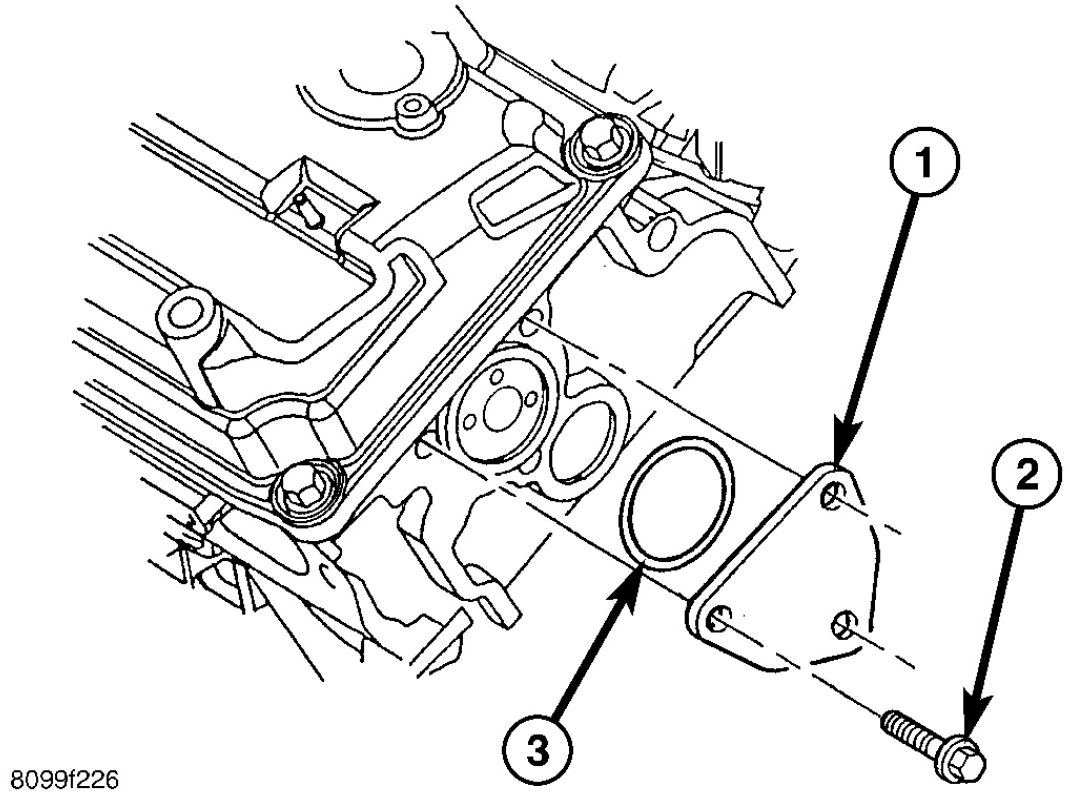

Fig. 313: Camshaft Thrust Plate
Courtesy of CHRYSLER LLC

1 - CAMSHAFT THRUST PLATE
2 - BOLT
3 - O-RING

2. Install the camshaft thrust plates (1) and o-ring (3). Tighten bolts (2) to 28 N.m (250 in. lbs.). See **Fig. 313**.
3. Install the timing belt starting first at the crankshaft sprocket (10), then to remaining components in a counterclockwise direction.

4. Install the belt around the last sprocket. Maintain tension on the belt as it is positioned around the tensioner pulley (11). Each camshaft sprockets mark should still be aligned with the rear cover marks. See **Fig. 312**.

NOTE: For timing belt tensioner reset procedure, see REMOVAL.

5. Hold the tensioner pulley against the belt and install the reset (pinned) timing belt tensioner into the housing. Tighten attaching bolts to 28 N.m (250 in. lbs.).
6. Remove tensioner retaining pin to allow the tensioner to extend to the pulley bracket.
7. Using a dial indicator, position the number 1 piston at TDC.
8. Hold the camshaft sprocket hex with a 36 mm (1 7/16 in.) wrench and tighten the camshaft bolts to the following:

   Right side = 102 N.m (75 ft. lbs.) +90° turn

   Left side = 102 N.m (75 ft. lbs.) +90° turn
9. Remove dial indicator and install spark plug.
10. Remove Special Tools 6642.
11. Install front timing belt cover. See **INSTALLATION**.

TIMING BELT

CAUTION: If camshafts have moved from the timing marks, always rotate camshaft towards the direction nearest to the timing marks (DO NOT TURN CAMSHAFTS A FULL REVOLUTION OR DAMAGE to valves and/or pistons could result).

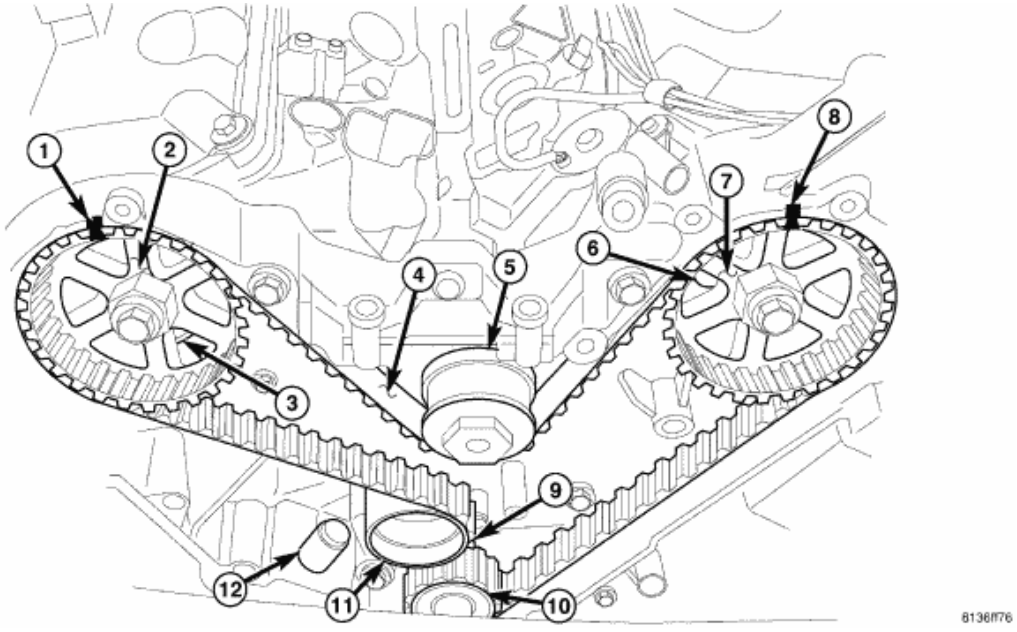

Fig. 314: Identifying Timing Gear Components
Courtesy of CHRYSLER LLC

1 - RIGHT CAMSHAFT GEAR ALIGNMENT MARK	7 - LEFT CAMSHAFT GEAR
2 - RIGHT CAMSHAFT GEAR	8 - LEFT CAMSHAFT GEAR ALIGNMENT MARK
3 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - RIGHT	9 - CRANKSHAFT GEAR ALIGNMENT MARK
4 - TIMING BELT	10 - CRANKSHAFT GEAR
5 - WATER PUMP PULLEY	11 - TIMING BELT TENSIONER PULLEY
6 - CYLINDER HEAD TO INNER TIMING BELT COVER BOLTS - LEFT	12 - TIMING BELT TENSIONER

1. Align the crankshaft sprocket (10) with the TDC mark (9) on oil pump cover. See **Fig. 314**.
2. Align the camshaft sprockets (2, 7) timing reference marks (1, 8) with the marks on the rear cover.
3. Install the timing belt starting at the crankshaft sprocket (10) going in a counterclockwise direction. Install the belt around the last sprocket. Maintain tension on the belt as it is positioned around the tensioner pulley (11).

NOTE: If the camshaft gears have been removed it is only necessary to have the camshaft gear retaining bolts installed to a snug torque at this time.

4. Holding the tensioner pulley (11) against the belt, install the tensioner into the housing and tighten to 28 N.m (250 in. lbs.). Each camshaft sprocket mark should remain aligned the cover marks.
5. When tensioner is in place pull retaining pin to allow the tensioner to extend to the pulley bracket.
6. Rotate crankshaft sprocket 2 revolutions and check the timing marks on the camshafts and crankshaft. The marks should line up within their respective locations. If marks do not line up, repeat procedure.

NOTE: If camshaft gears have been removed and timing is correct, counterhold and tighten the camshaft gears to final torque specification. See INSTALLATION.

7. Install the front timing belt cover. See **INSTALLATION**.
8. Tighten the rocker arm assemblies and install the cylinder head covers. See **INSTALLATION**.
9. Connect negative battery cable.

TENSIONER - TIMING BELT & PULLEY

REMOVAL

TIMING BELT TENSIONER PULLEY ASSEMBLY

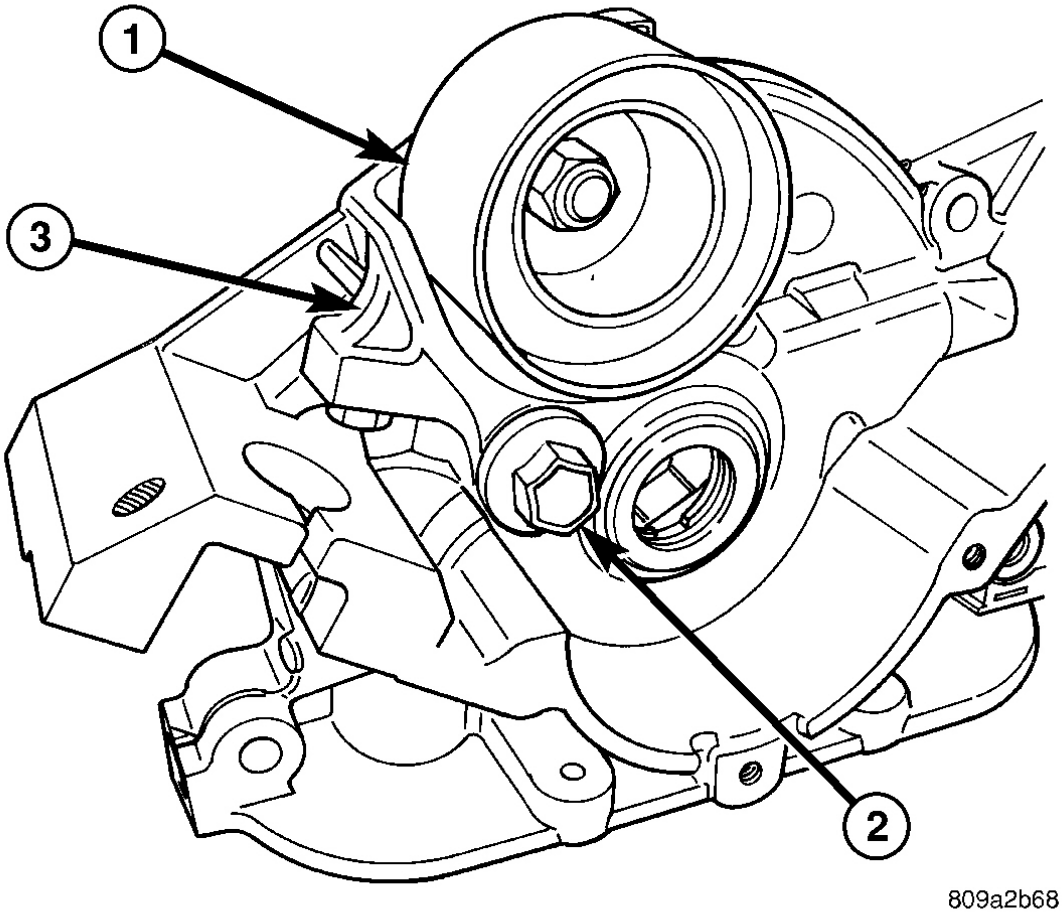

Fig. 315: Removing/Installing Tensioner Pulley, Pivot Bolt & Tensioner Bracket
Courtesy of CHRYSLER LLC

1 - TENSIONER PULLEY
2 - PIVOT BOLT
3 - TENSIONER BRACKET

1. Remove the timing belt. See **TIMING BELT**.
2. Remove the timing belt tensioner pulley (1) and bracket (3) assembly by unscrewing the pivot bolt (2) from the oil pump housing. See **Fig. 315**.

TIMING BELT TENSIONER

1. For timing belt tensioner removal procedure. See **TIMING BELT**.

INSPECTION

TIMING BELT TENSIONER PULLEY ASSEMBLY

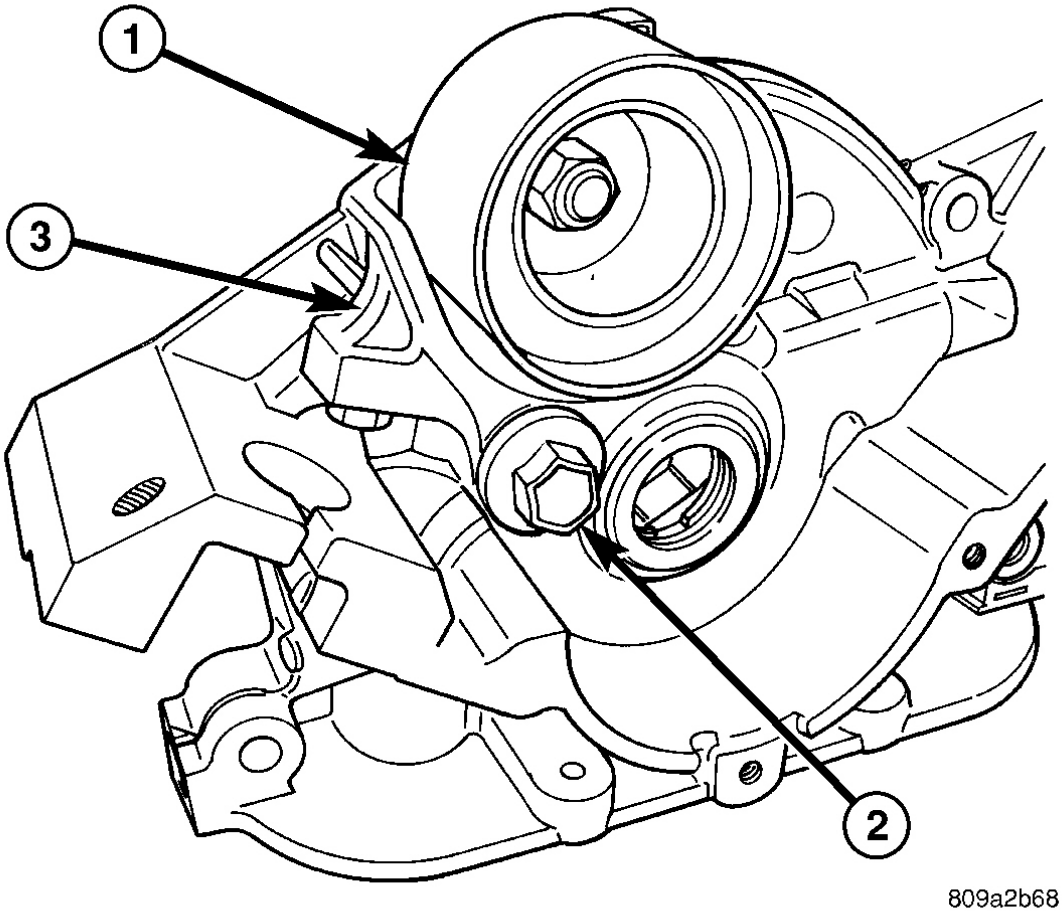

Fig. 316: Removing/Installing Tensioner Pulley, Pivot Bolt & Tensioner Bracket
Courtesy of CHRYSLER LLC

1 - TENSIONER PULLEY
2 - PIVOT BOLT
3 - TENSIONER BRACKET

NOTE: The tensioner pulley (1), bracket (3), and pivot bolt (2) is serviced as an assembly.

1. Inspect pulley (1) for free movement. Replace if pulley is loose, seized, or rough turning. See **Fig. 316**.
2. Inspect pulley bearing and seal. Replace if damaged.
3. Inspect pivot bolt (2) for free movement in assembly housing. Replace assembly if seized or excessive looseness.

TIMING BELT TENSIONER

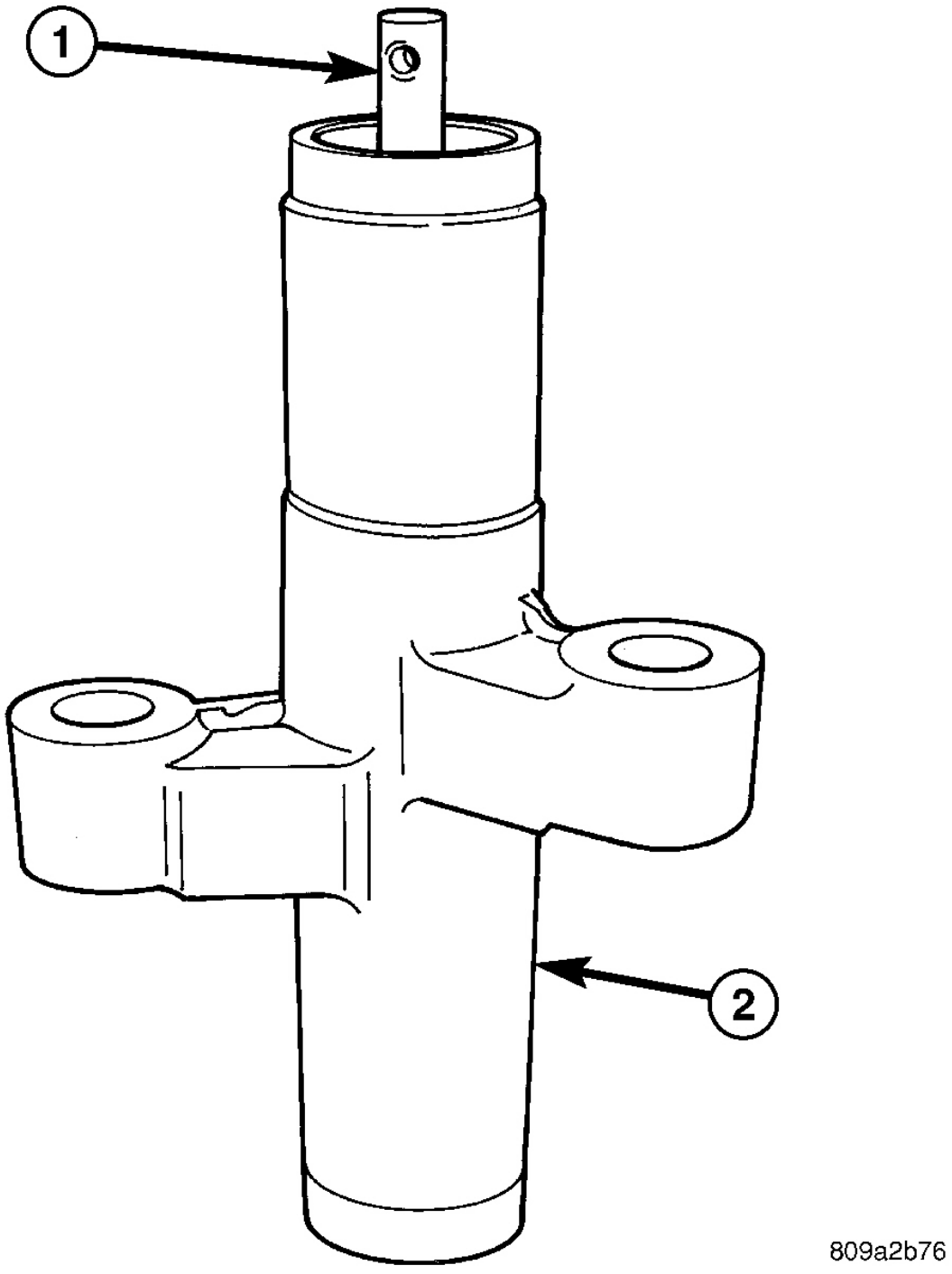

Fig. 317: Timing Housing & Plunger (Extended Position)

Courtesy of CHRYSLER LLC

1 - PLUNGER (EXTENDED POSITION) 2 - TENSIONER HOUSING

1. Inspect hydraulic tensioner (2) for fluid loss around the plunger (1) seal. Replace tensioner if leaking. See **Fig. 317**.

INSTALLATION

TIMING BELT TENSIONER PULLEY ASSEMBLY

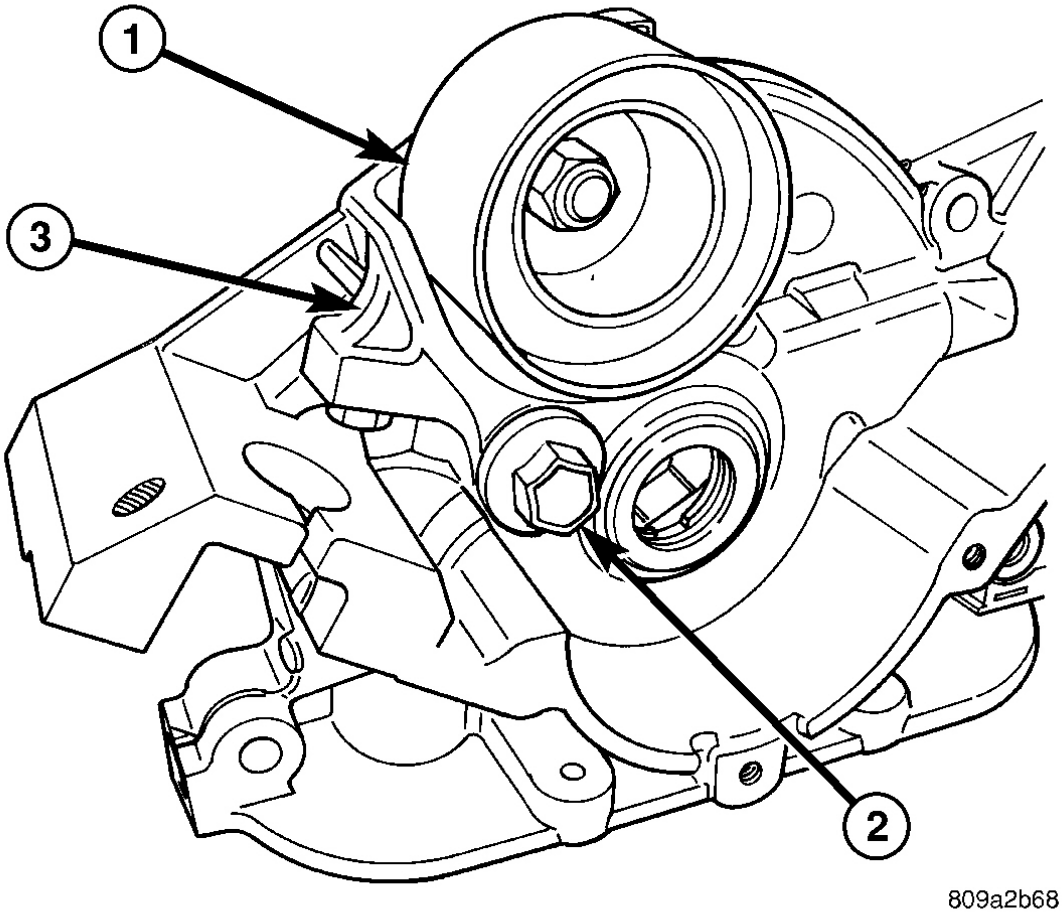

Fig. 318: Removing/Installing Tensioner Pulley, Pivot Bolt & Tensioner Bracket
Courtesy of CHRYSLER LLC

1 - TENSIONER PULLEY 2 - PIVOT BOLT

3 - TENSIONER BRACKET

1. Install the timing belt tensioner pulley (1) assembly. Tighten the pivot bolt (2) to 61 N.m (45 ft. lbs.). See **Fig. 318**.
2. Install the timing belt. See **TIMING BELT**.

TIMING BELT TENSIONER

1. For timing belt tensioner installation procedure. See **TIMING BELT**.