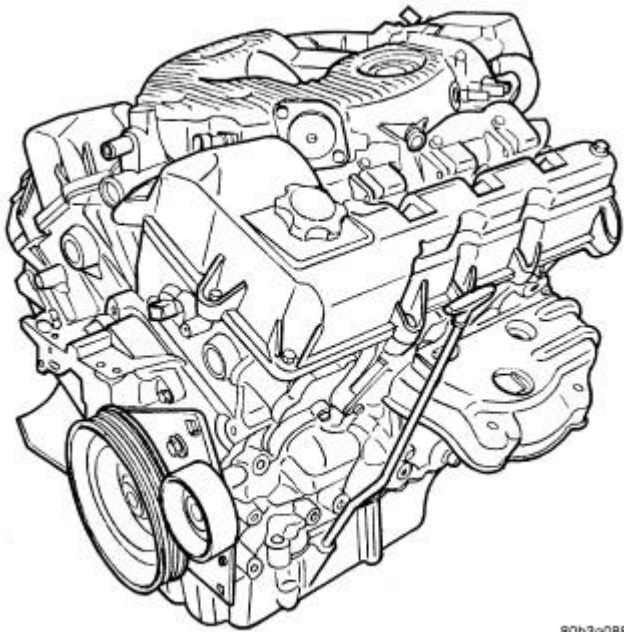


2010 ENGINE

2.7L DOHC - Service Information - Avenger, Sebring

DESCRIPTION

DESCRIPTION



80b3a088

Fig. 1: 2.7 Liter Engine

Courtesy of CHRYSLER LLC

The 2.7 Liter (167 Cubic Inches) 60 degree V-6 engine is a double overhead camshaft design with hydraulic lifters and four valves per cylinder. The engine does not have provisions for a free wheeling valve train.

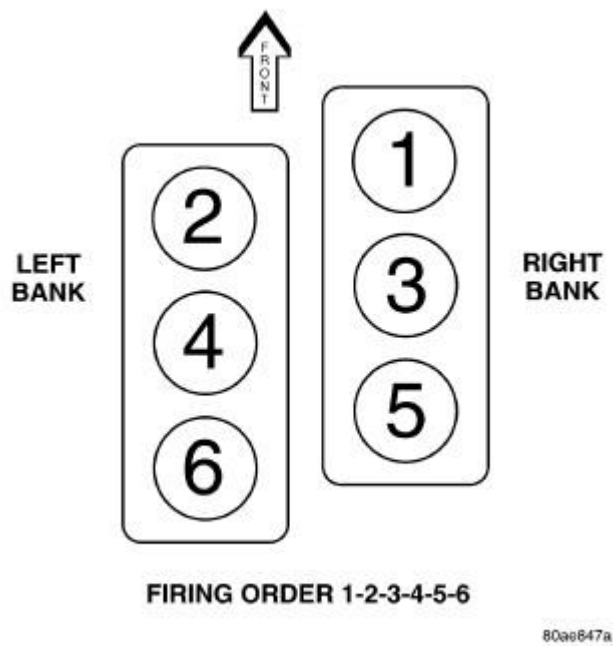


Fig. 2: Cylinder Numbering and Firing Order
Courtesy of CHRYSLER LLC

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.

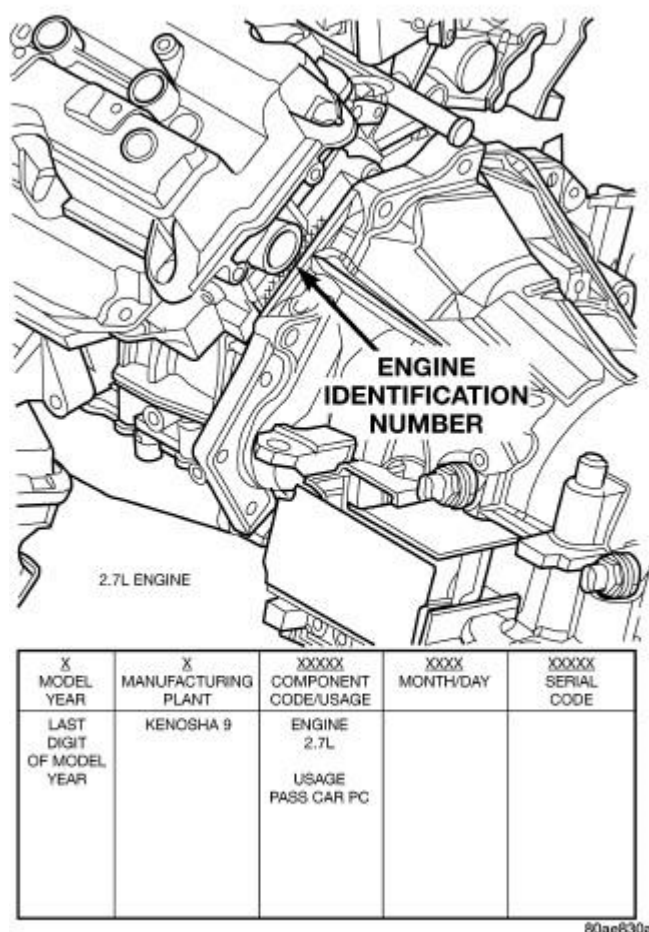


Fig. 3: Engine Identification
Courtesy of CHRYSLER LLC

The engine identification number is located on the rear of the cylinder block just below the left cylinder head.

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 **PERFORMANCE** and **MECHANICAL**.

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: Refer to **CYLINDER COMPRESSION PRESSURE TEST**.
- Cylinder Combustion Pressure Leakage Test: Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE TEST**.
- Cylinder Head Gasket Failure Diagnosis: Refer to **CYLINDER HEAD GASKET**.
- Intake Manifold Leakage Diagnosis: Refer to **INTAKE MANIFOLD LEAKS**.
- Lash Adjuster (Tappet) Noise Diagnosis: Refer to **HYDRAULIC LASH ADJUSTER NOISE DIAGNOSIS**.
- Engine Oil Leak Inspection: Refer to **ENGINE OIL LEAK INSPECTION**.

PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery. 2. Corroded or loose battery connections. 3. Faulty starter. 4. Faulty coil(s) or control unit. 5. Incorrect spark plug gap. 6. Contamination in fuel system. 7. Faulty fuel pump. 8. Incorrect engine timing.	1. Test battery. Charge or replace as necessary. Refer to <u>Electrical/Battery System/BATTERY - Description</u> 2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals. 3. Test starting system. Refer to <u>Electrical/Starting - Diagnosis and Testing</u> . 4. Test and replace as needed. (Refer to Appropriate Diagnostic Information) 5. Check and adjust gap as needed. 6. Clean system and replace fuel filter. 7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information) 8. Check for a skipped timing chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low. 2. Incorrect fuel mixture. 3. Intake manifold leakage. 4. Faulty coil(s).	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information) 2. (Refer to Appropriate Diagnostic Information) 3. Inspect intake manifold gasket, manifold, and vacuum hoses. 4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped plugs. 2. Contamination in fuel system. 3. Faulty fuel pump. 4. Incorrect valve timing. 5. Leaking cylinder head gasket. 6. Low compression. 7. Burned, warped, or pitted valves. 8. Plugged or restricted exhaust system. 9. Faulty coil(s).	1. Set gap as needed or replace plug(s). 2. Clean system and replace fuel filter. 3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information) 4. Correct valve timing as needed. 5. Replace cylinder head gasket. 6. Test compression of each cylinder. 7. Replace valves. 8. Check exhaust system restriction. Replace parts, as necessary. 9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs. 2. Contamination in Fuel System. 3. Burned, warped, or pitted valves. 4. Faulty coil(s).	1. Set gap as needed or replace plug(s). 2. Clean fuel system and replace fuel filter. 3. Replace valves. 4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap. 2. Faulty coil(s). 3. Dirty fuel injector(s). 4. Contamination in fuel system.	1. Set gap as needed or replace plug(s). 2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information) - Test and replace as necessary. (Refer to Appropriate Diagnostic Information) 4. Clean system and replace fuel filter.

MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
VALVETRAIN NOISE	1. High or low oil level in crankcase. 2. Thin or diluted oil.	1. Check and correct engine oil level. 2. Change oil to correct viscosity.

	3. Thick oil 4. Low oil pressure. 5. Dirt in tappets/lash adjusters. 6. Worn rocker arms. 7. Worn tappets/lash adjusters. 8. Worn valve guides. 9. Excessive runout of valve seats on valve faces. 10. Missing adjuster pivot.	3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again. 4. Check and correct engine oil level. 5. Replace rocker arm/hydraulic lash adjuster assembly. 6. Inspect oil supply to rocker arms. 7. Install new rocker arm/hydraulic lash adjuster assembly. 8. Ream guides and install new valves with oversize stems. 9. Grind valve seats and valves. 10. Replace rocker arm/hydraulic lash adjuster assembly.
CONNECTING ROD NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Thick oil 5. Excessive bearing clearance. 6. Connecting rod journal out-of-round. 7. 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. 4. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again. 5. Measure bearings for correct clearance. Repair as necessary. 6. Replace crankshaft or grind surface. 7. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Thick oil 4. Excessive bearing clearance. 5. Excessive end play. 6. Crankshaft journal out-of-round	1. Check engine oil level. 2. Check engine oil level. Inspect oil pump relief valve and spring. 3. Change oil to correct viscosity. 4. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again. 4. Measure bearings for correct clearance. Repair as necessary. 5. Check thrust bearing for wear on flanges. 6. Replace crankshaft or grind

	or worn. 7. Loose flywheel or torque converter.	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 Service 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 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 such as fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
4. Remove the Auto Shutdown (ASD) relay from the PDC.
5. 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 **Engine - Special Tools**.
6. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
7. Repeat the previous step for all remaining cylinders.
8. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
9. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
10. 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.**

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.

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

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.

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.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

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 dipstick 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 dipstick 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 **INSPECTION FOR REAR SEAL AREA LEAKS**.
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 dipstick tube to block location; remove the tube, clean and reseal using Mopar® Stud AND Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

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

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil 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.
 - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
 - b. 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 previously 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

especially 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

ENGINE GASKET SURFACE PREPARATION

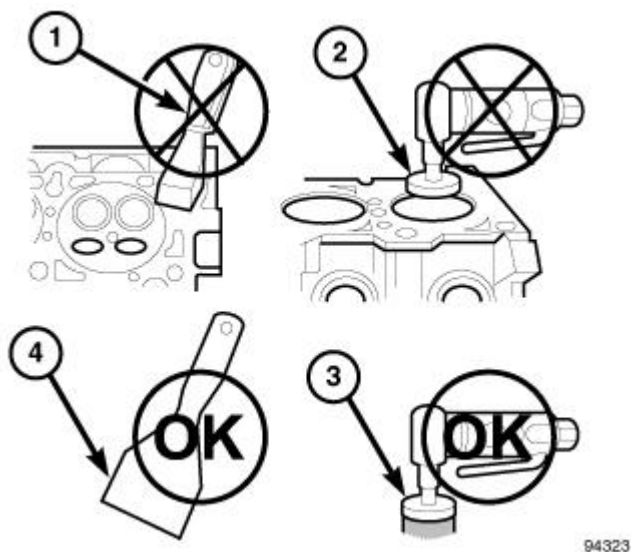


Fig. 4: PROPER TOOL USAGE FOR SURFACE PREPARATION

Courtesy of CHRYSLER LLC

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 (1).
- Abrasive pad or paper to clean cylinder block and head.
- High speed power tool with an abrasive pad or a wire brush (2,3).

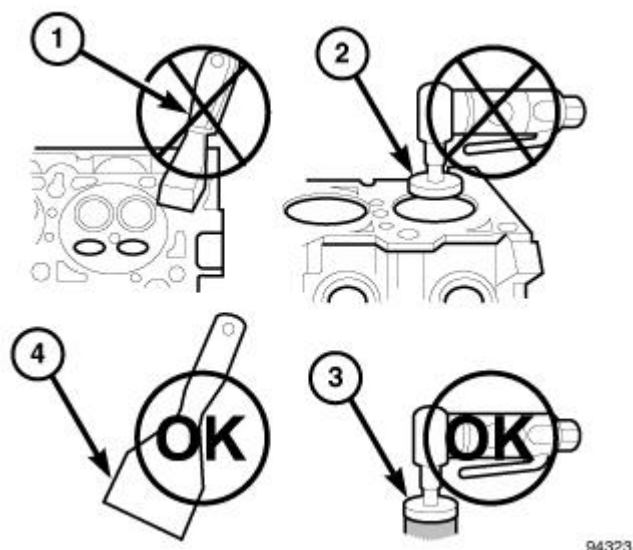


Fig. 5: PROPER TOOL USAGE FOR SURFACE PREPARATION

Courtesy of CHRYSLER LLC

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 (4).

Sealing surfaces must be free of grease or oil residue. Clean surfaces with Mopar® brake parts cleaner (or equivalent).

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.

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.

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 bed plate 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 also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

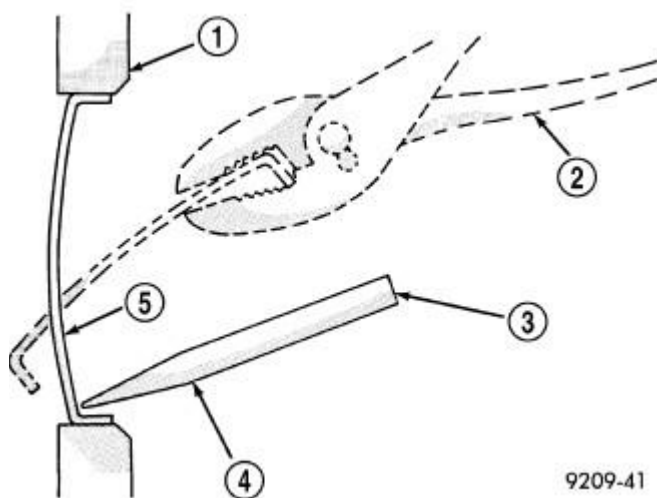
SEALER APPLICATION

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.

ENGINE CORE AND OIL GALLERY PLUGS

**Fig. 6: Core Hole Plug Removal**

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 and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug.

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.

REMOVAL

ENGINE ASSEMBLY

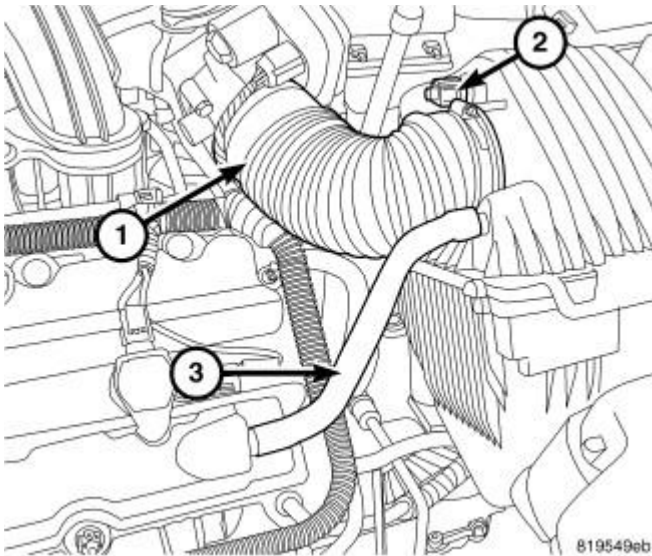


Fig. 7: AIR BOX COVER

Courtesy of CHRYSLER LLC

- 1 - Inlet Hose
- 2 - IAT sensor
- 3 - Fresh Air Hose

1. Perform the fuel pressure release procedure. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Disconnect and isolate the negative battery cable.
3. Recover the A/C system refrigerant. Refer to **Heating and Air Conditioning/Plumbing - Standard Procedure** .
4. Remove the throttle body air inlet hose and air cleaner body assembly. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.

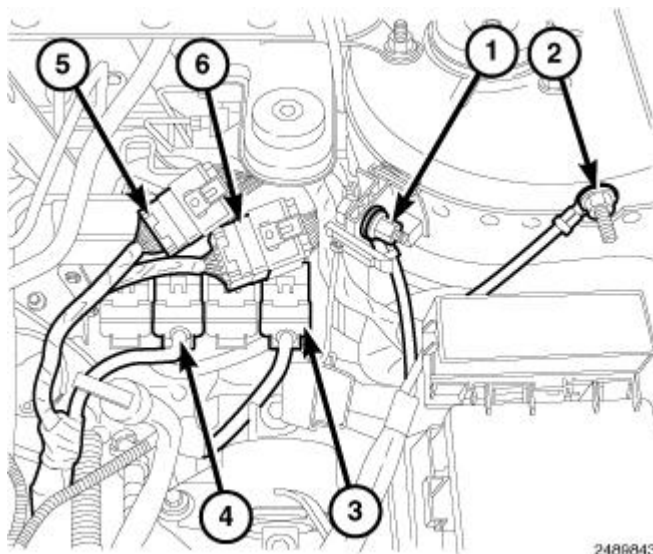


Fig. 8: Identifying Harness Connectors & Nuts
Courtesy of CHRYSLER LLC

5. Disconnect engine harness to main harness connectors (5) and (6).
6. Disconnect engine harness connector C2 (4) and transmission harness connector C4 (3) from the PCM.
7. Remove the nut (2) and black ground cable from the remote negative battery post.
8. Remove the nut (1) and the red starter cable from the remote positive battery post.

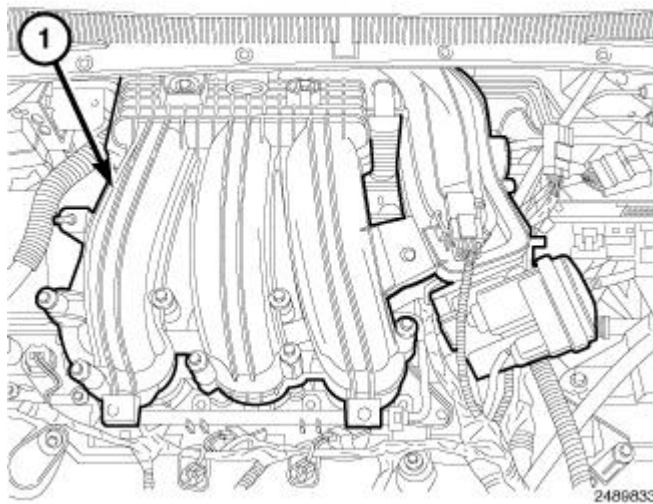


Fig. 9: Locating Upper Intake Manifold
Courtesy of CHRYSLER LLC

9. Remove the upper intake manifold (1). See [Engine/Manifolds/MANIFOLD, Intake - Installation](#).

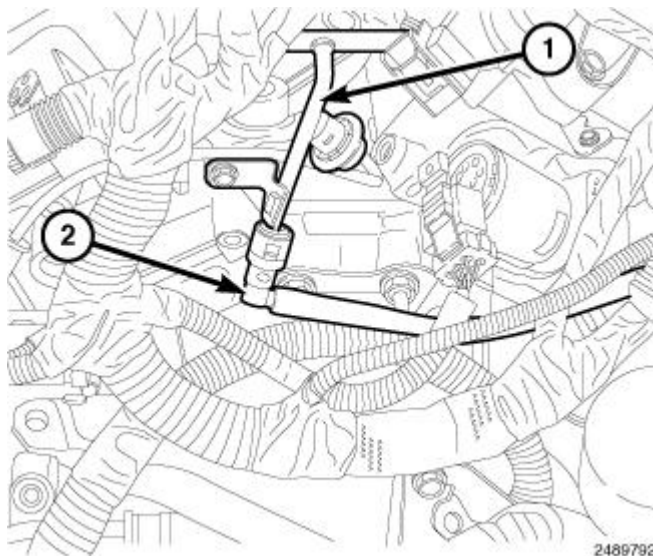


Fig. 10: Locating Fuel Supply Hose & Fuel Rail
Courtesy of CHRYSLER LLC

10. Disconnect the fuel supply hose (2) from the fuel rail (1). Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure**.

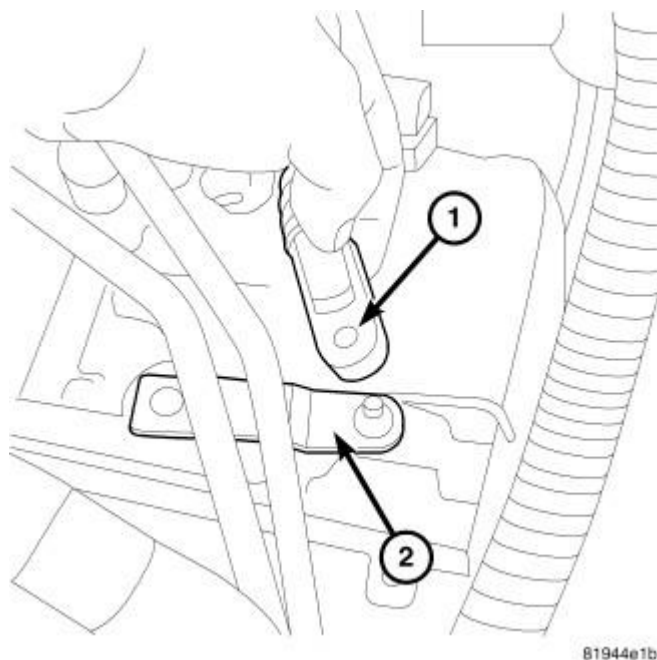


Fig. 11: SHIFT CABLE FROM MANUAL LEVER
Courtesy of CHRYSLER LLC

11. Disconnect the gearshift cable (1) from the manual valve lever (2).

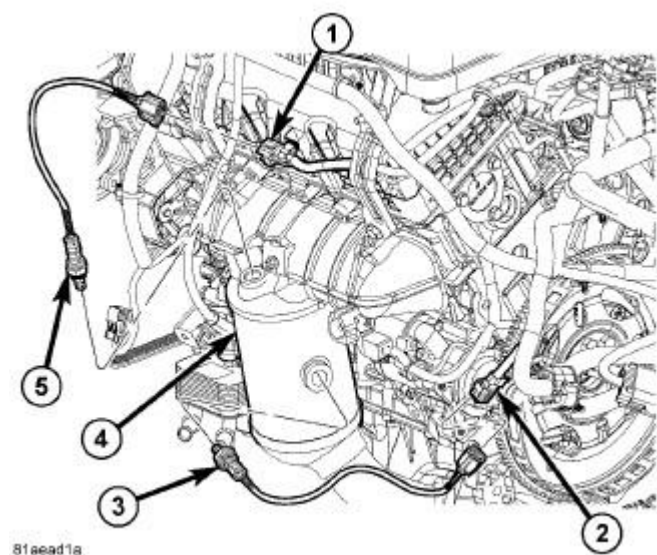


Fig. 12: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

1 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 1/1

- 2 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 1/2
- 3 - LOWER FRONT DOWNSTREAM O2 SENSOR 1/2
- 4 - LEFT ENGINE SIDE CATALYTIC CONVERTER
- 5 - UPPER FRONT UPSTREAM O2 SENSOR 1/1

12. Disconnect the front downstream oxygen sensor (3) from the engine wiring harness connector (2).
13. Disconnect the front upstream oxygen sensor (5) from the engine wiring harness connector (1).

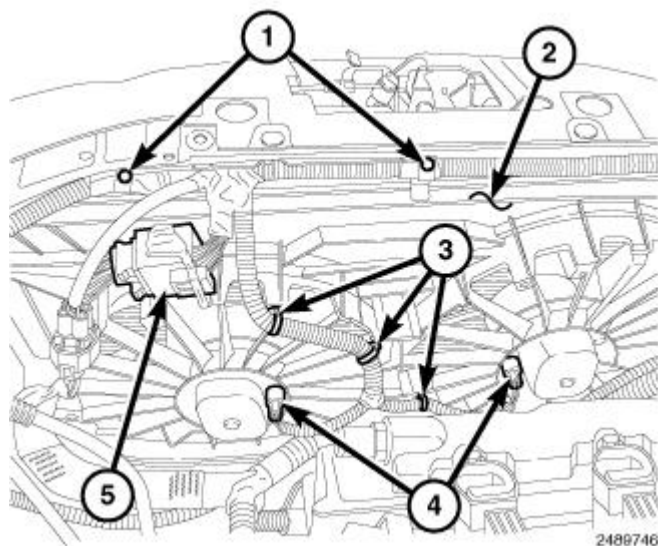


Fig. 13: Locating Cooling Fan Module, Screws, Retainers & Connectors
Courtesy of CHRYSLER LLC

14. Disconnect the fan motor electrical connectors (4).
15. Disengage three wire harness retainers (3) and the wire harness connector (5) from the cooling fan module (2).
16. Remove five screws (1) retaining the wire harness to the upper core support.
17. Disengage the two upper retainers and remove the cooling fan module (2) from the radiator.

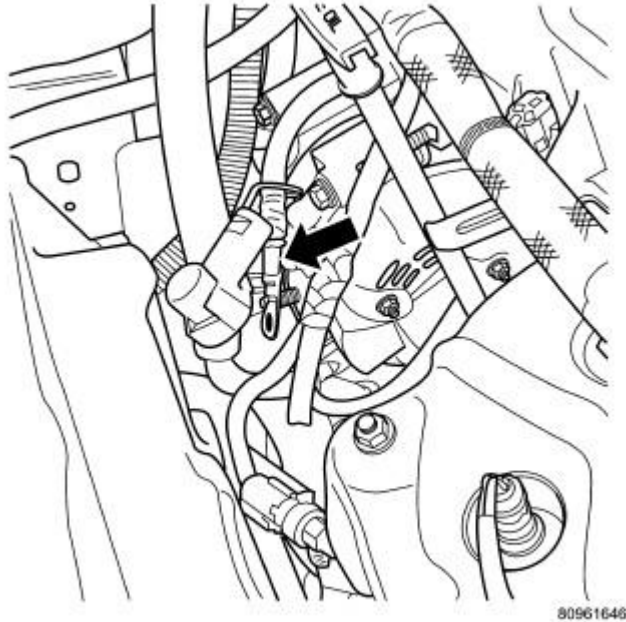


Fig. 14: GENERATOR BATTERY CABLE
Courtesy of CHRYSLER LLC

18. Remove the generator B+ terminal and field connection.

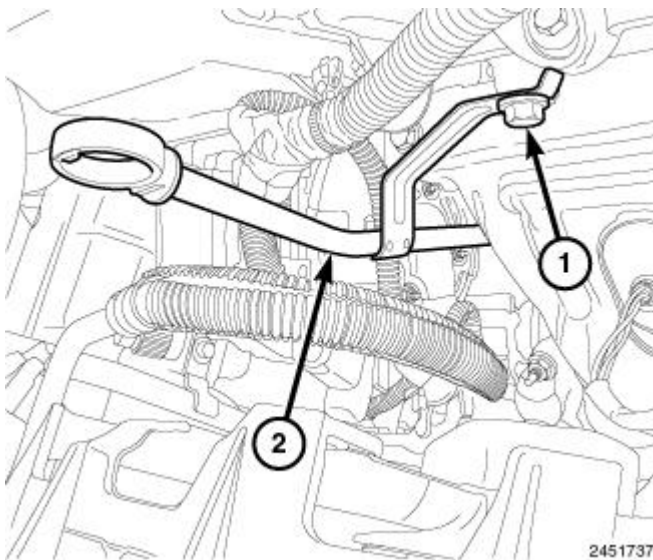


Fig. 15: Identifying Oil Dipstick Tube & Bolt
Courtesy of CHRYSLER LLC

19. Remove the bolt (1) and the engine oil dipstick and tube (2).

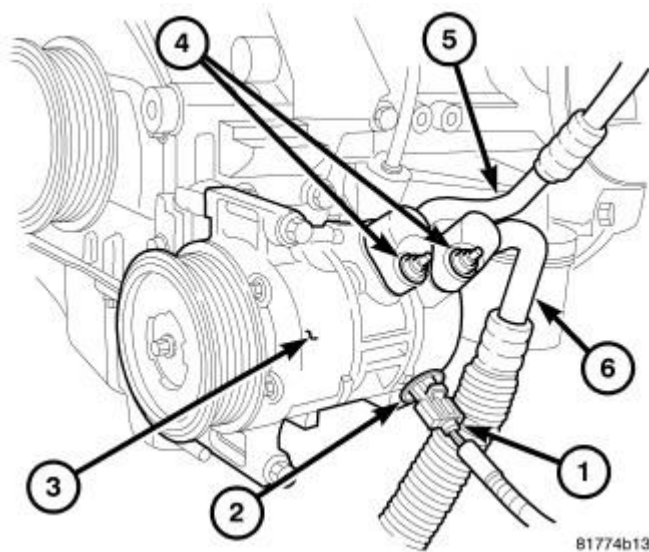


Fig. 16: A/C Compressor-Refrigerant Lines
Courtesy of CHRYSLER LLC

20. Disconnect the engine wire harness (1) from the A/C compressor connector (2).
21. Remove the nut (4) that secures the A/C suction line (6) to the A/C compressor (3).
22. Disconnect the A/C suction line from the A/C compressor and remove and discard the O-ring seals and gaskets.
23. Install plugs in, or tape over the A/C suction line and A/C compressor fittings.

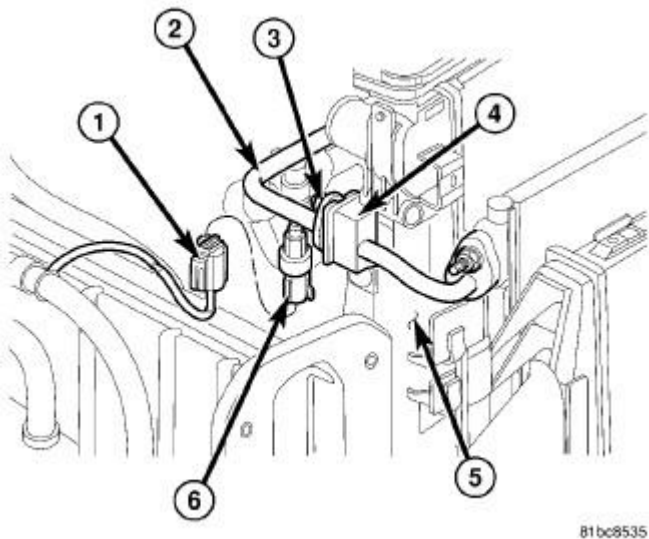
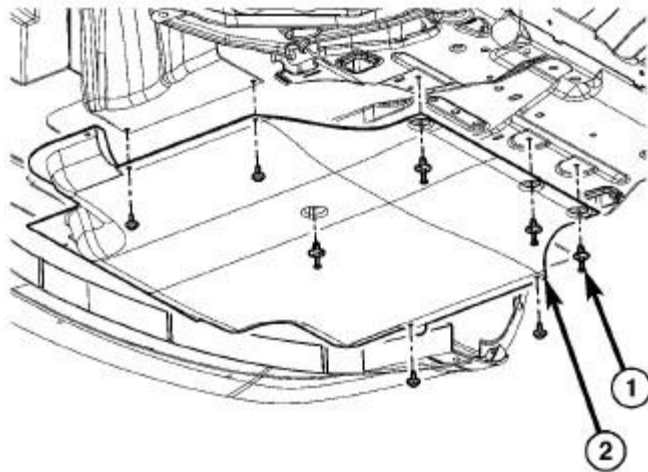


Fig. 17: Discharge Line to Jumper
Courtesy of CHRYSLER LLC

24. Disconnect the wire harness connector (1) from the A/C pressure transducer (6) located near the right side of the radiator (5).

25. Remove the nut (3) that secures the A/C discharge line to the discharge jumper line (4).
26. Disconnect the A/C discharge line from the jumper line and remove and discard the O-ring seal and gasket.
27. Install plugs in, or tape over the discharge and jumper line fittings.

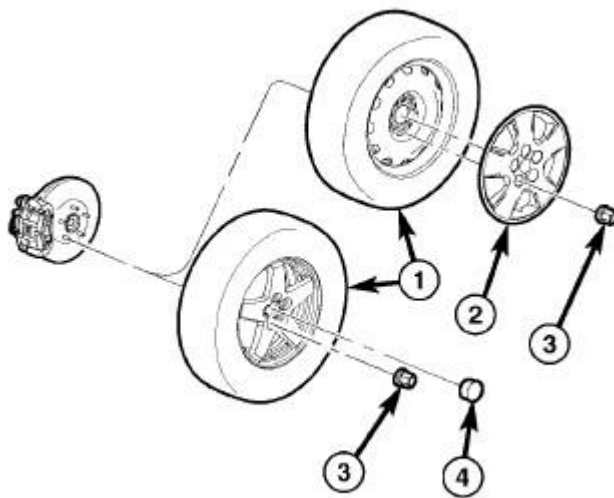


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Fig. 18: Belly Pan

Courtesy of CHRYSLER LLC

28. Raise and support the vehicle on a hoist. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure**.
29. Remove the belly pan (2), if equipped.
30. Drain the engine oil. See **Engine/Lubrication/OIL - Standard Procedure**.



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Fig. 19: TIRE AND WHEEL MOUNTING

Courtesy of CHRYSLER LLC

31. Remove the front tire and wheel assemblies. Refer to **Tires and Wheels - Removal**.

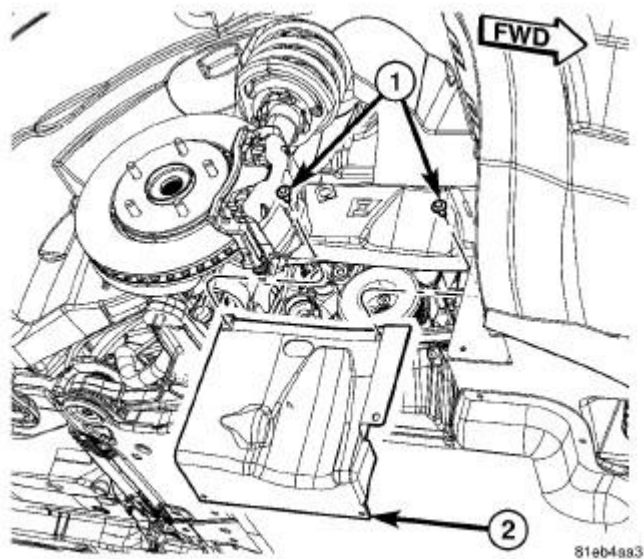


Fig. 20: LOWER SPLASH SHIELD

Courtesy of CHRYSLER LLC

32. Remove the left and right lower frame splash shields (2).

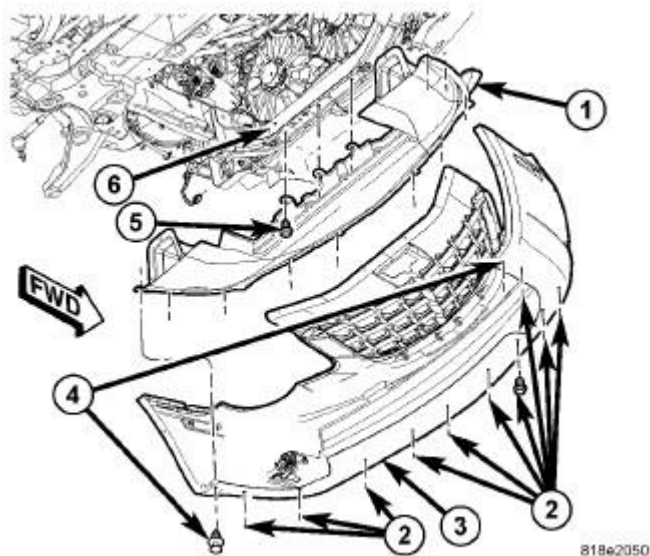


Fig. 21: LOWER FASCIA

Courtesy of CHRYSLER LLC

33. Remove the closeout panel (1) from the fascia (3). Refer to **Frame and Bumpers/Bumpers/FASCIA**,

Front Lower - Removal .

34. Drain the cooling system. Refer to **Cooling - Standard Procedure** .

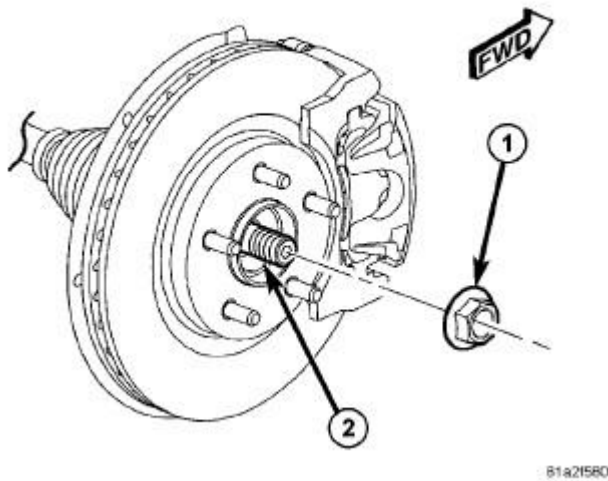


Fig. 22: HUB NUT

Courtesy of CHRYSLER LLC

35. Remove both axle shafts (2). Refer to **Differential and Driveline/Half Shaft - Removal** .

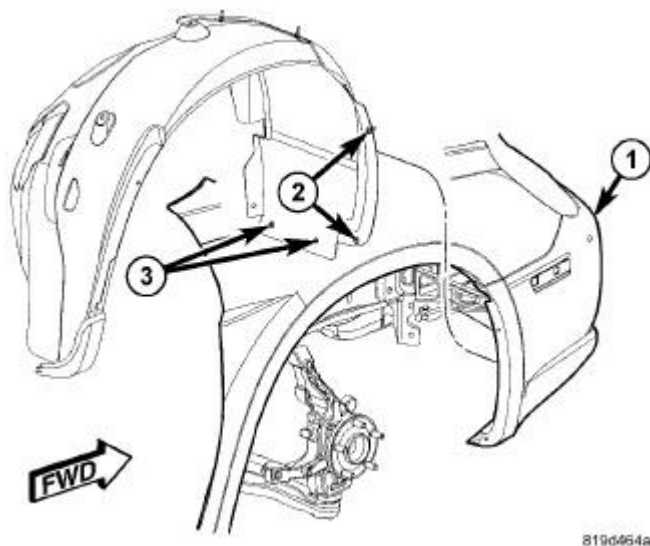


Fig. 23: FRONT SPLASH SHIELDS

Courtesy of CHRYSLER LLC

36. Remove left and right splash shields (2). Refer to **Body/Exterior/SHIELD, Splash - Removal** .

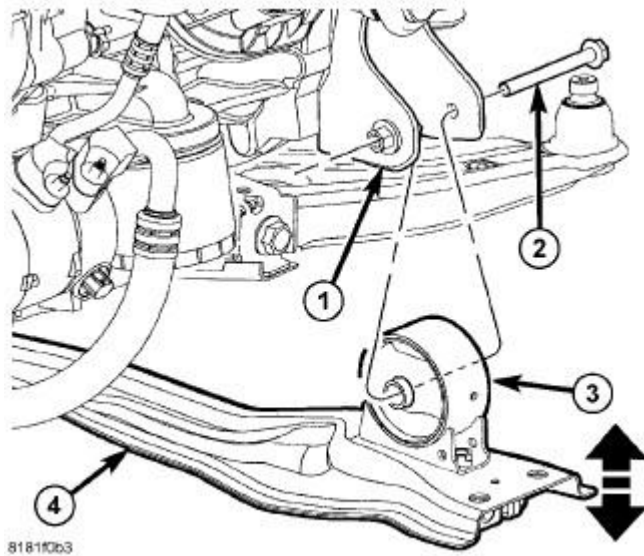


Fig. 24: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

37. Remove the fore/aft crossmember (4). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Removal**.

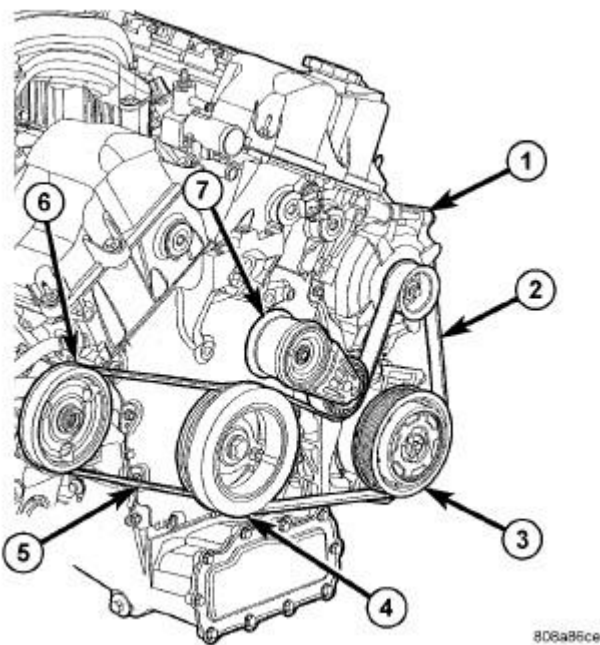


Fig. 25: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

- | |
|---------------------|
| 1 - GENERATOR |
| 2 - IDLER/TENSIONER |

38. Remove the accessory drive belt (2). Refer to Cooling/Accessory Drive/BELT, Serpentine - Removal .

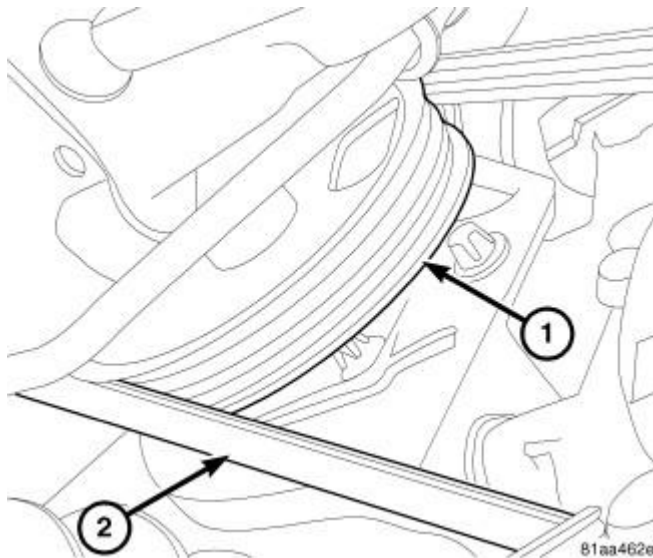


Fig. 26: STRETCH TO FIT POWER STEERING BELT REMOVAL
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - POWER STEERING PULLEY |
| 2 - STRETCH TO FIT POWER STEERING BELT |

39. Remove the power steering belt (2). Refer to Cooling/Accessory Drive/BELT, Serpentine - Removal .

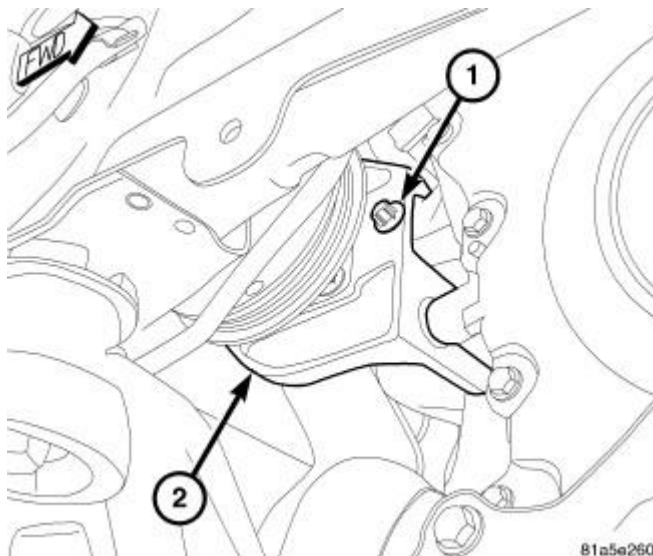


Fig. 27: FRONT PUMP MOUNTING BRACKET BOLTS - 2.7L
Courtesy of CHRYSLER LLC

40. Remove the power steering pump mounting bracket bolt (1) near the pump pulley.

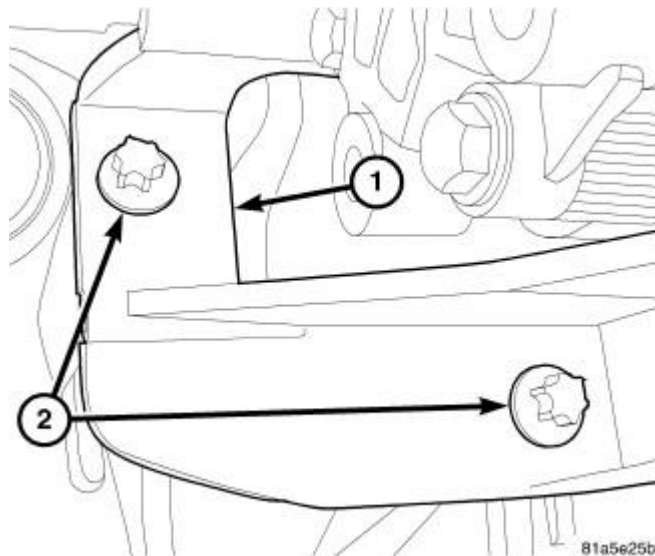


Fig. 28: REAR PUMP MOUNTING BRACKET BOLTS - 2.7L

Courtesy of CHRYSLER LLC

41. **Do not** disconnect the power steering lines from the pump. Remove the two power steering pump mounting bracket bolts (2) behind the pump on the back of the engine and reposition the power steering pump and bracket assembly (1).

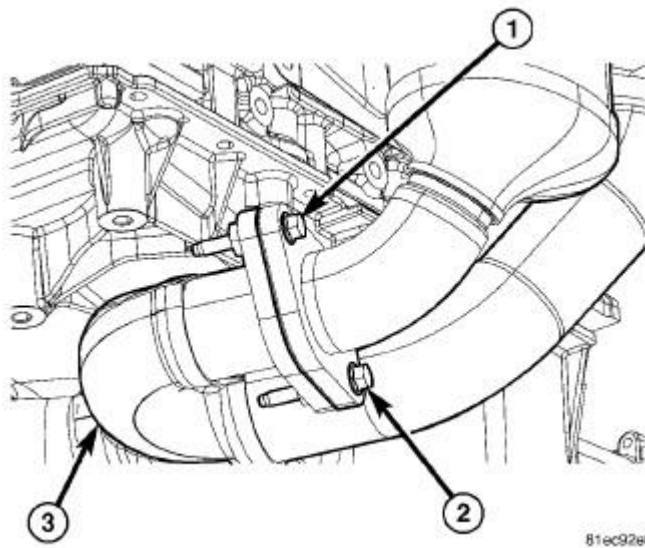


Fig. 29: Exhaust Cross-Under Pipe

Courtesy of CHRYSLER LLC

42. Remove the crossunder pipe (3). Refer to **Exhaust System/PIPE, Exhaust - Removal** .

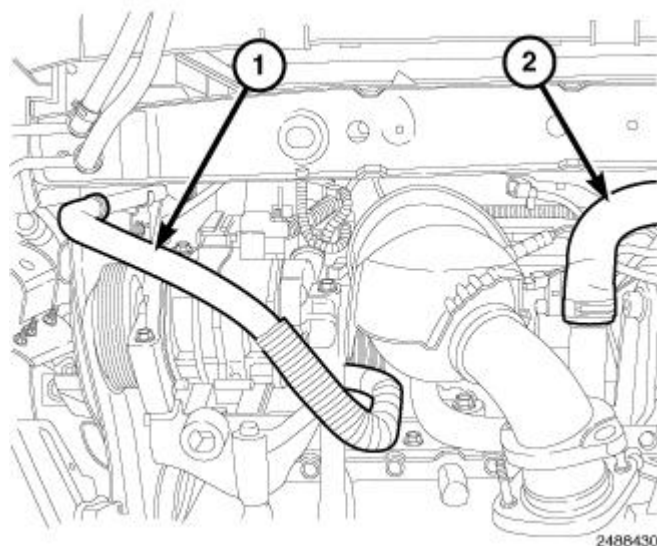


Fig. 30: Identifying Heater Return Hose & Lower Radiator Hose
Courtesy of CHRYSLER LLC

43. Disconnect the heater return hose (1) from the pipe connection at right front frame rail area.
44. Remove the lower radiator hose (2).

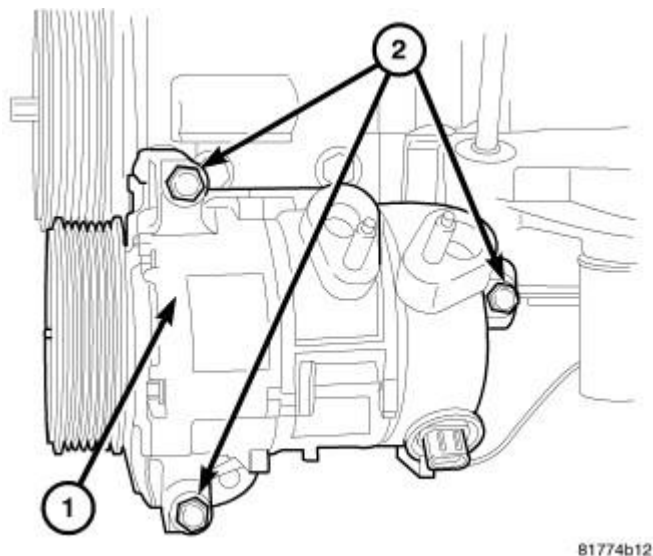
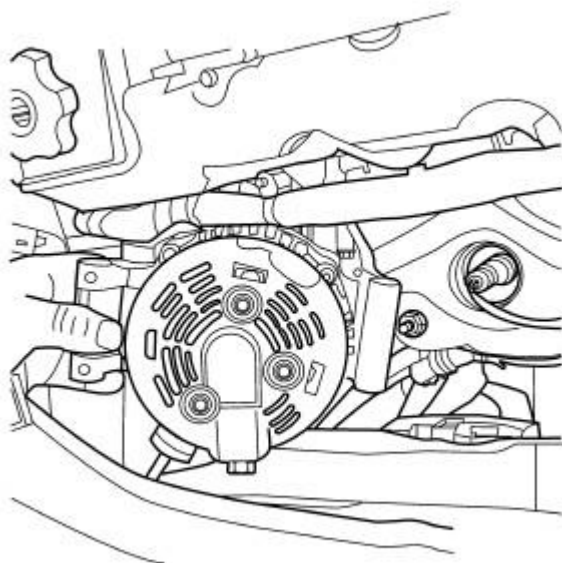


Fig. 31: Removing/Installing A/C Compressor
Courtesy of CHRYSLER LLC

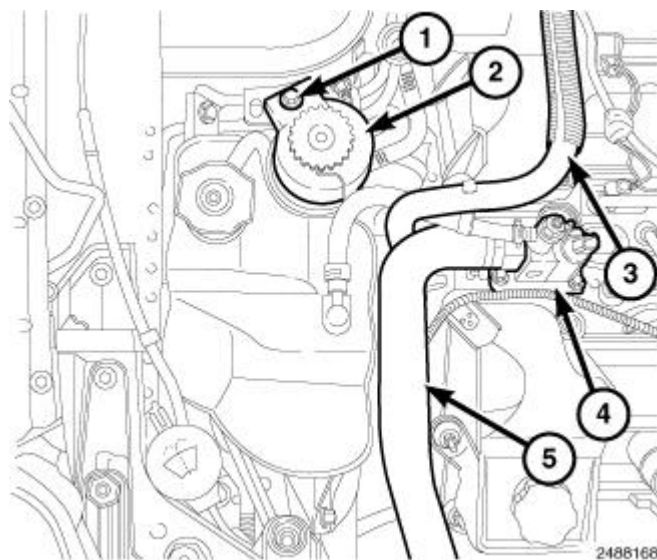
45. Support the A/C compressor (1) and remove the three bolts (2) that secure the compressor to the engine and remove the compressor with the discharge line attached.



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Fig. 32: GENERATOR
Courtesy of CHRYSLER LLC

46. Remove the three generator mounting bolts and remove the generator.



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Fig. 33: Identifying Upper Radiator Hose, Heater Hose, Power Steering Reservoir, Connectors & Screw
Courtesy of CHRYSLER LLC

47. Lower the vehicle.
48. Remove the upper radiator hose (5) from the coolant outlet connector (4).
49. Remove the heater hose (3) from the coolant outlet connector (4).

50. Remove the mounting screw (1) and reposition the power steering reservoir (2).

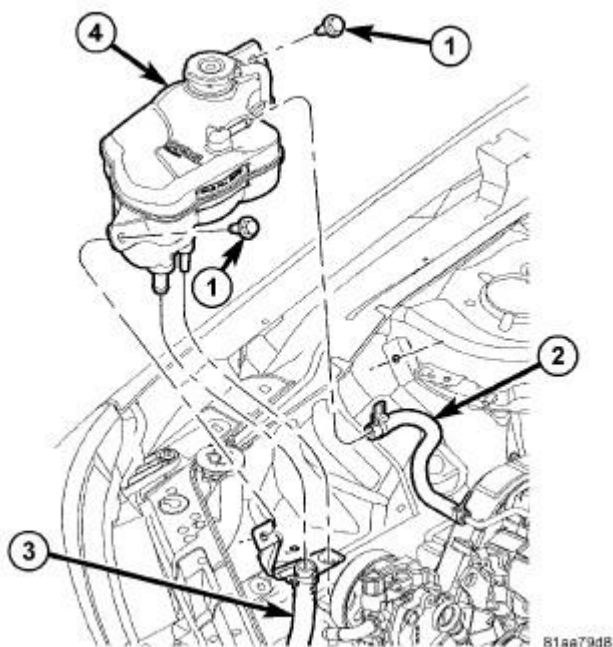


Fig. 34: COOLANT RECOVERY CONTAINER - PRESSURE SYSTEM
Courtesy of CHRYSLER LLC

51. Disconnect the return hose (2) from the coolant recovery container (4).
52. Remove two fasteners (1) and lift the coolant recovery container (4).
53. Disconnect the coolant recovery container hose (3) and remove the coolant recovery container (4).

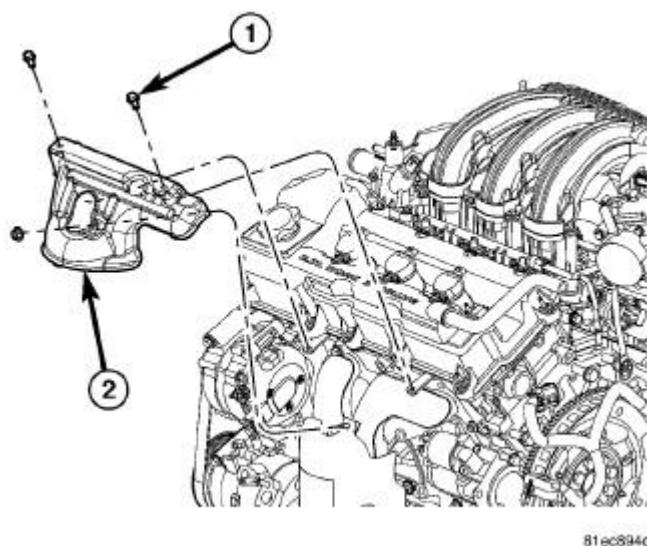


Fig. 35: FRONT MANIVERTER HEAT SHIELD

Courtesy of CHRYSLER LLC

54. Remove the front upper maniverter heat shield fasteners (1) and remove the heat shield (2).

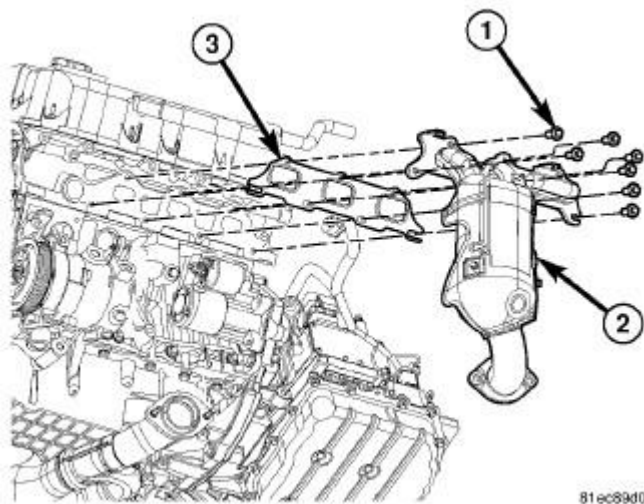


Fig. 36: Front Exhaust Maniverter & Gasket
Courtesy of CHRYSLER LLC

55. Remove the front exhaust maniverter attaching bolts (1), front maniverter (2) and gasket (3).

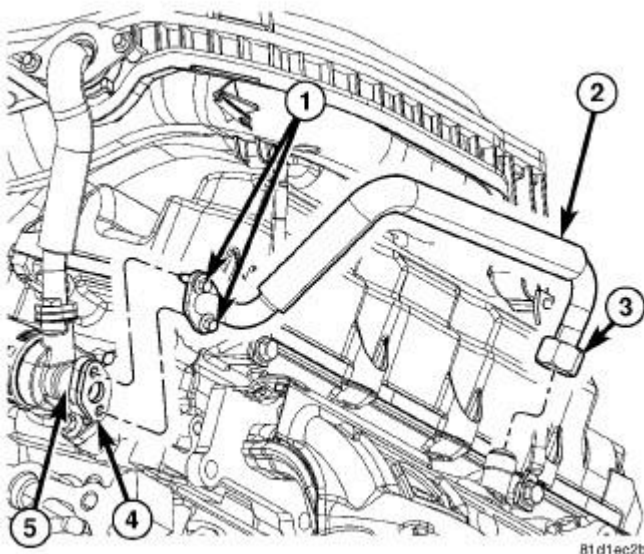
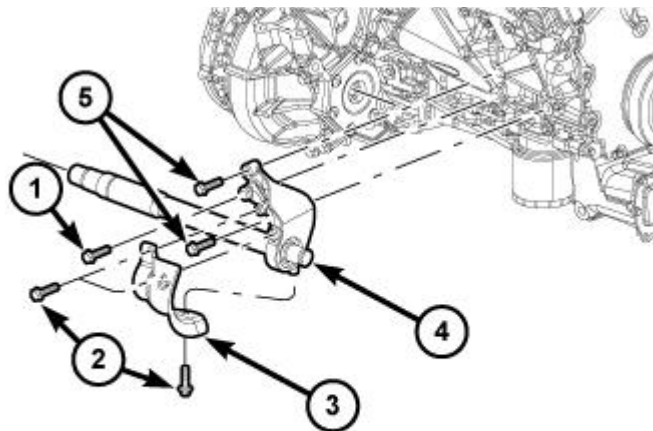


Fig. 37: 2.7L LOWER EGR TUBE
Courtesy of CHRYSLER LLC

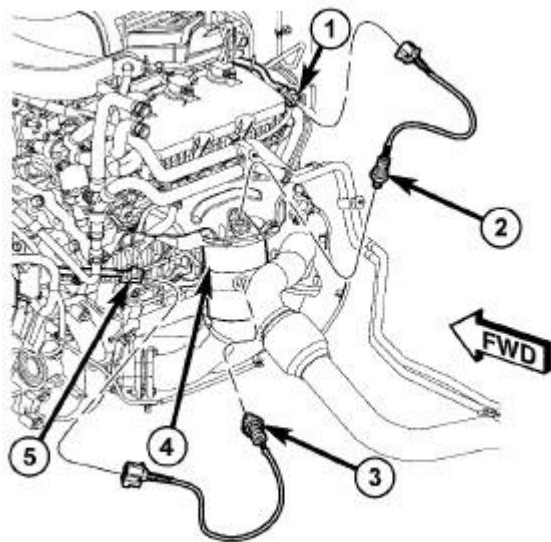
56. Remove the lower EGR tube (2). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Removal** .



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Fig. 38: Identifying Intermediate Shaft, Heat Shield & Bolts
Courtesy of CHRYSLER LLC

57. Raise and support the vehicle.
58. Remove the heat shield bolts (2) and the heat shield (3).
59. Remove the intermediate shaft bolts (1) and (5) and remove the intermediate shaft (4).



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Fig. 39: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 2/1
 2 - UPPER REAR UPSTREAM O2 SENSOR 2/1
 3 - LOWER REAR DOWNSTREAM O2 SENSOR 2/2
 4 - RIGHT ENGINE SIDE CATALYTIC CONVERTER</p> |
|--|

5 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 2/2

60. Disconnect the rear downstream oxygen sensor (3) from the engine wiring harness connector (5).
61. Disconnect the rear upstream oxygen sensor (2) from the engine wiring harness connector (1).

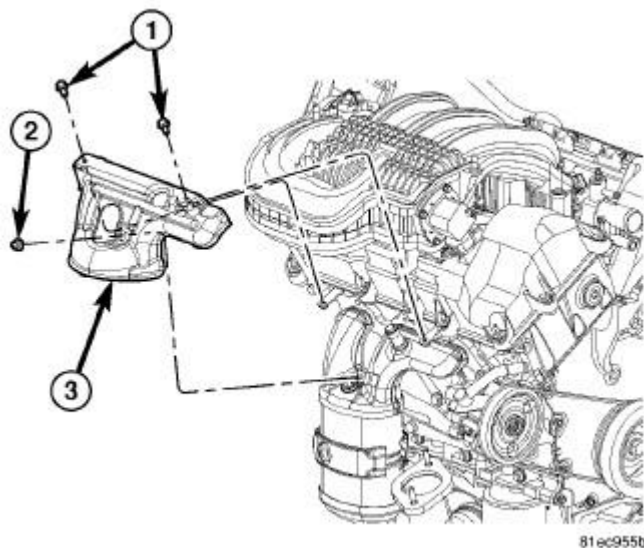


Fig. 40: Rear Maniverter Heat Shield
Courtesy of CHRYSLER LLC

62. Remove the fasteners (1 and 2) and the rear maniverter heat shield (3).

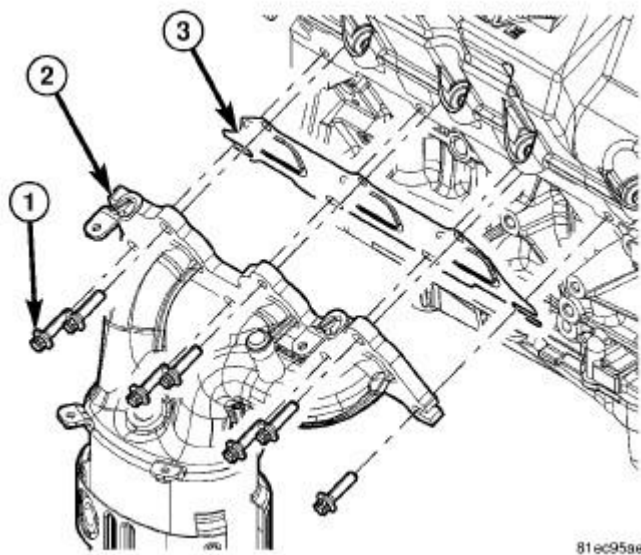


Fig. 41: Rear Maniverter, Fasteners & Gasket
Courtesy of CHRYSLER LLC

63. Remove the rear maniverter fasteners (1), rear maniverter (2) and rear maniverter gasket (3).

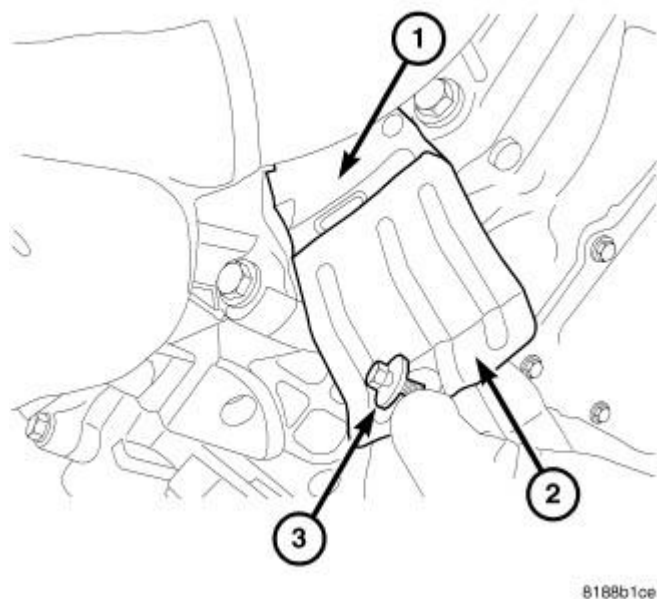


Fig. 42: DUST SHIELD
Courtesy of CHRYSLER LLC

64. If equipped with the 62TE transmission, remove the bolt (1) and torque converter dust shield (2).

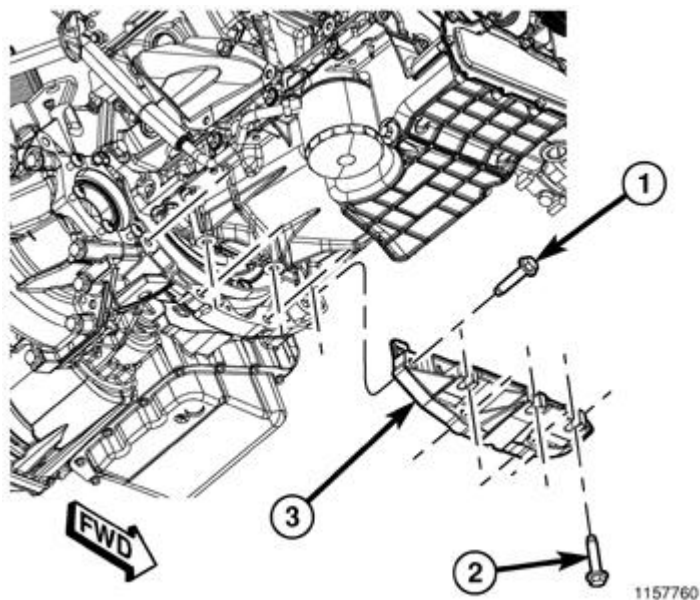


Fig. 43: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

65. If equipped with the 41TE transmission, remove the bolts (1) and (2) and the structural collar (3).

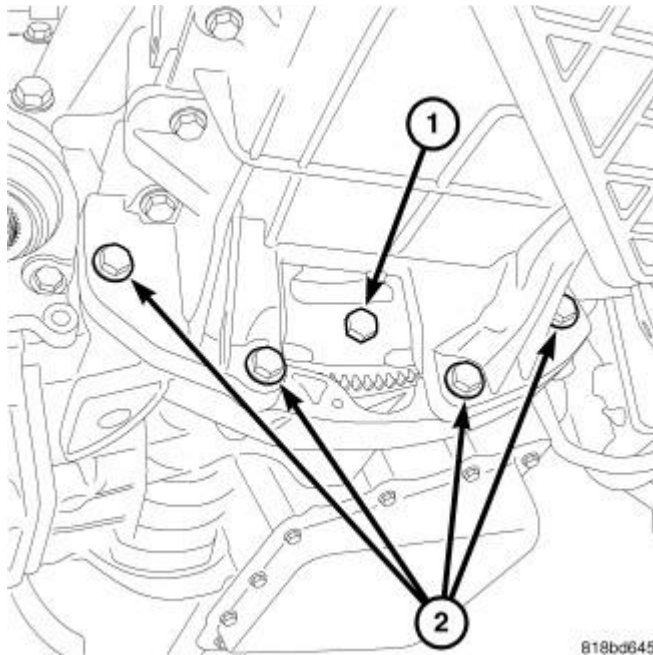


Fig. 44: TORQUE CONVERTER BOLTS

Courtesy of CHRYSLER LLC

66. Mark the driveplate to torque converter position. Remove the driveplate bolts (1).

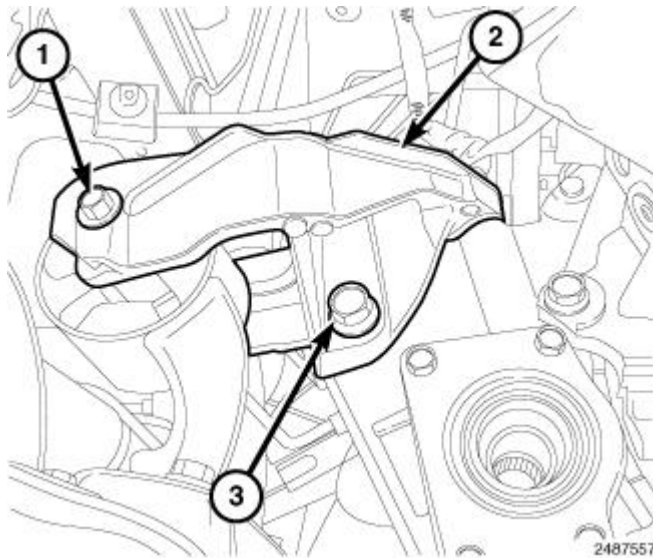


Fig. 45: Identifying Transaxle Bracket & Bolt

Courtesy of CHRYSLER LLC

67. Remove the transaxle bracket to isolator through bolt (1).
68. Remove the transaxle bracket bolt (3).

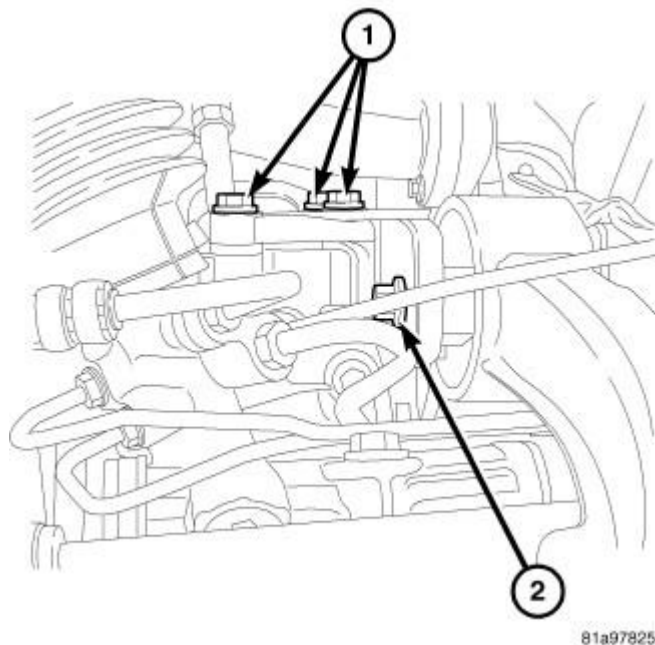


Fig. 46: Identifying Rear Mount Bracket-To-Transaxle Case Bolts
Courtesy of CHRYSLER LLC

69. Lower the vehicle.
70. Disconnect the oil cooler lines from the transaxle. Plug the lines and fittings to prevent debris from entering the transaxle or cooler circuit (Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER**).
71. Remove the remaining three transaxle bracket bolts (1) and remove the transaxle bracket.

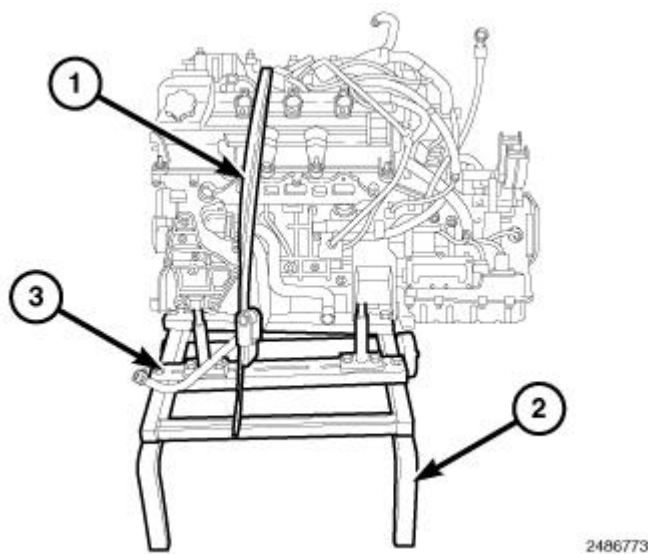


Fig. 47: Powertrain Dolly & Engine Support Cradle With Posts
Courtesy of CHRYSLER LLC

72. Adjust the vehicle height to allow the Powertrain Dolly 6135 (2) and Engine Support Cradle 6710A (3)

with Cradle Posts 6848 and Cradle Post Adapter 6848 to be installed under the vehicle.

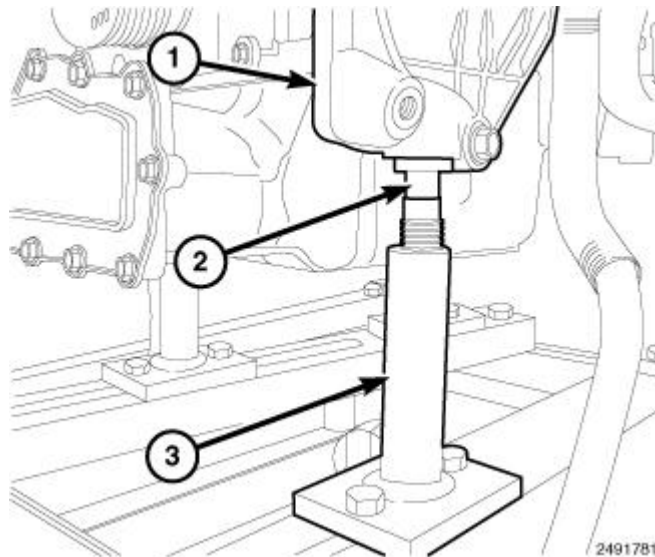


Fig. 48: A/C Compressor Mounting Bracket, Cradle Post & Adapter
Courtesy of CHRYSLER LLC

73. Place the Cradle Post Adapter 6848 (2) between the A/C compressor mounting bracket (1) and the cradle post (3).
74. Loosen the cradle post mounts to allow movement for positioning to the A/C compressor mounting bracket, the front engine mounting bracket and the oil pan rail. Lower the vehicle and position the cradle until the engine is resting on the posts. Tighten the post mounts to the cradle frame to prevent movement when removing or installing engine/transaxle assembly.

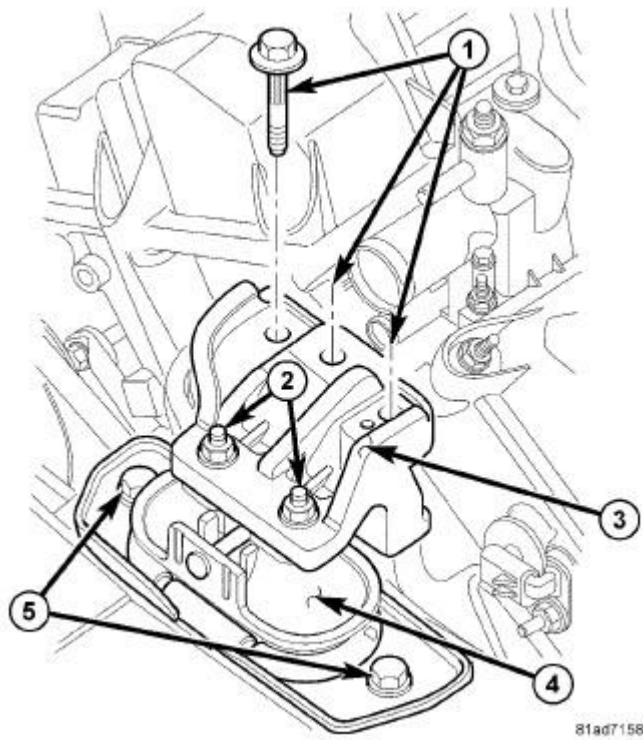


Fig. 49: Right Engine Mount
Courtesy of CHRYSLER LLC

75. Continue lowering the vehicle so that the weight of the engine and transmission ONLY is on the cradle.
76. Remove the three right side engine mount bolts (1).

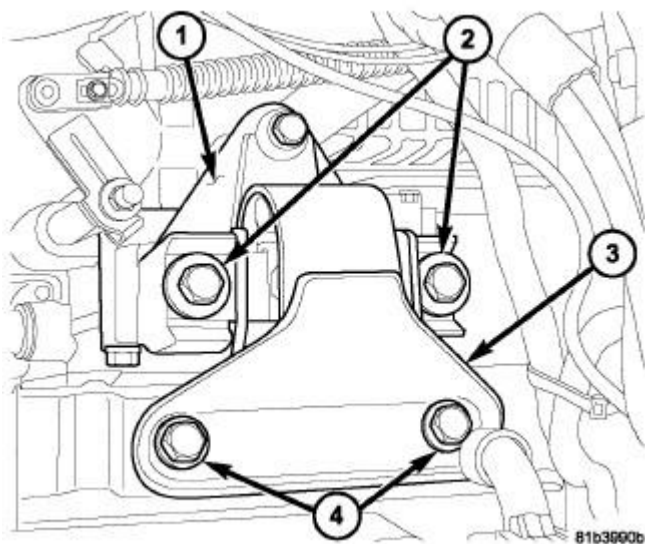


Fig. 50: LEFT MOUNT
Courtesy of CHRYSLER LLC

77. Remove the two left side transaxle mount bolts (2).

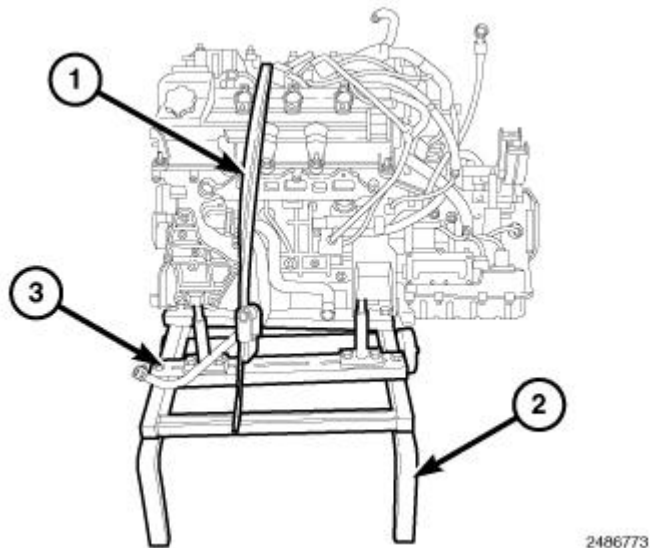


Fig. 51: Powertrain Dolly & Engine Support Cradle With Posts
Courtesy of CHRYSLER LLC

78. Secure the engine/transaxle assembly to the dolly/cradle with a safety strap (1). Slowly raise the vehicle in short length spans. Inspect at each interval for potential engine or transaxle contact to vehicle components. Move the cradle/dolly fixture as necessary to allow for removal clearance.

INSTALLATION

ENGINE ASSEMBLY

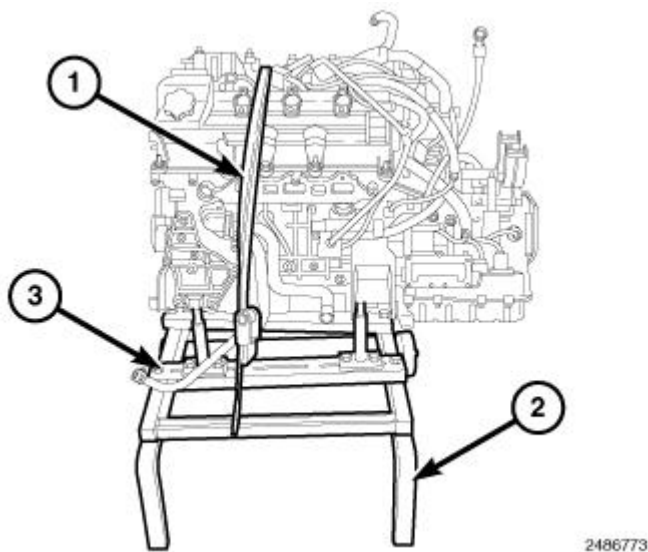


Fig. 52: Powertrain Dolly & Engine Support Cradle With Posts
Courtesy of CHRYSLER LLC

1. Position the engine/transaxle assembly under the vehicle and slowly lower the vehicle in short length spans. Inspect at each interval for potential engine or transaxle contact to vehicle components. Move the cradle/dolly fixture (2) as necessary to allow for installation clearance.

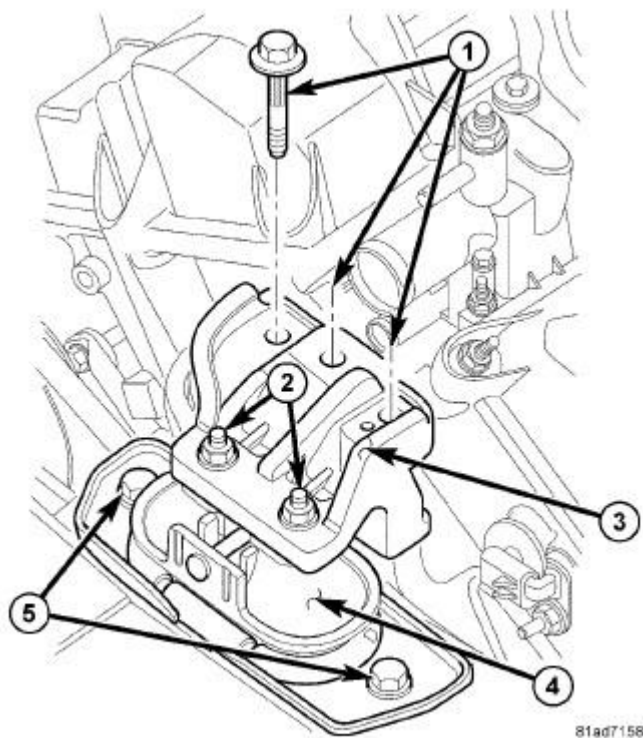


Fig. 53: Right Engine Mount
Courtesy of CHRYSLER LLC

2. Continue lowering the vehicle until the right side engine mount (3) and left side transaxle mount align to their mounting locations. Install the right side engine mount bolts (1) and tighten to 50 N.m (37 ft. lbs.).

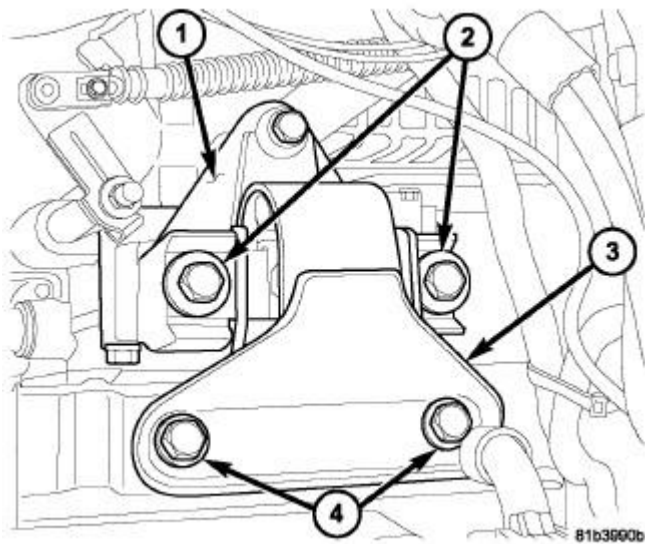


Fig. 54: LEFT MOUNT
Courtesy of CHRYSLER LLC

3. Install the left side transaxle mount bolts (2) and tighten to 98 N.m (72 ft. lbs.).

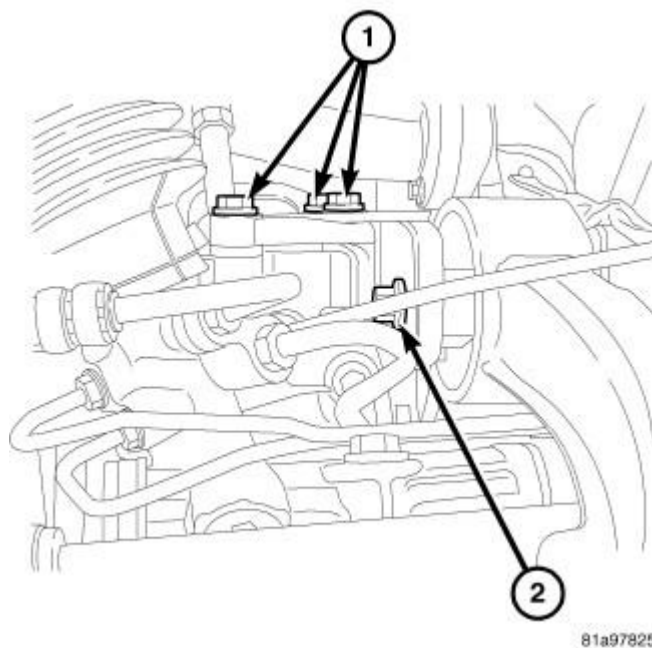


Fig. 55: Identifying Rear Mount Bracket-To-Transaxle Case Bolts
Courtesy of CHRYSLER LLC

4. Connect the oil cooler lines to the transaxle. An audible 'click' should be heard. Verify the connection by pulling outward (Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER**).
5. Position the transaxle bracket on the transaxle and install bolts (1). Finger tighten the bolts (1) at this time.

6. Remove the safety straps from the engine/transaxle assembly. Slowly raise the vehicle and remove the engine dolly and cradle.

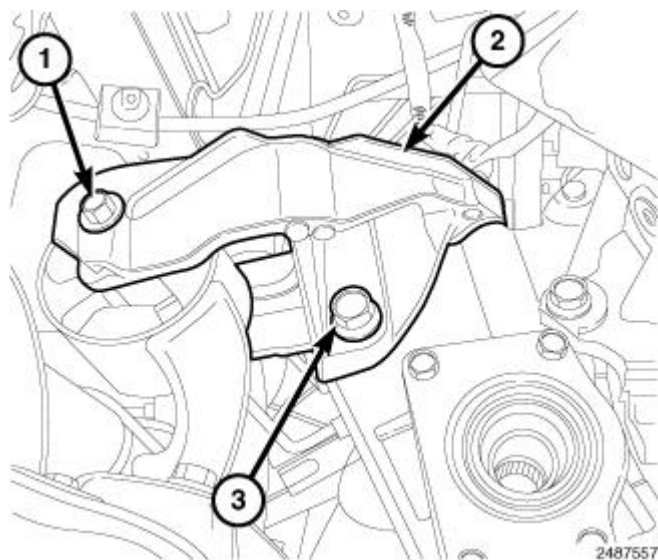


Fig. 56: Identifying Transaxle Bracket & Bolt
Courtesy of CHRYSLER LLC

7. Raise and support the vehicle.
8. Install the fourth transaxle bracket bolt (3) and tighten to 95 N.m (70 ft. lbs.).
9. Install the transaxle bracket to isolator through bolt (1) and tighten to 75 N.m (55 ft. lbs.).

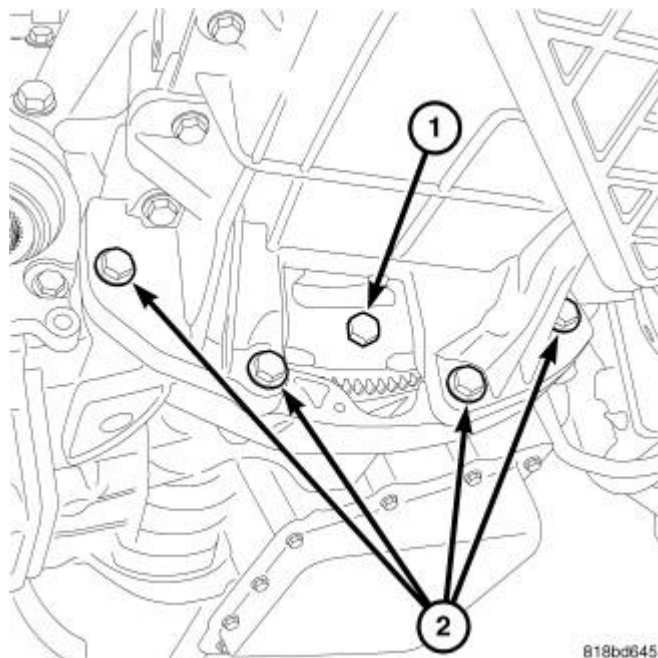


Fig. 57: TORQUE CONVERTER BOLTS
Courtesy of CHRYSLER LLC

10. Install the torque converter-to-driveplate bolts (1) and tighten to 88 N.m (65 ft. lbs.).

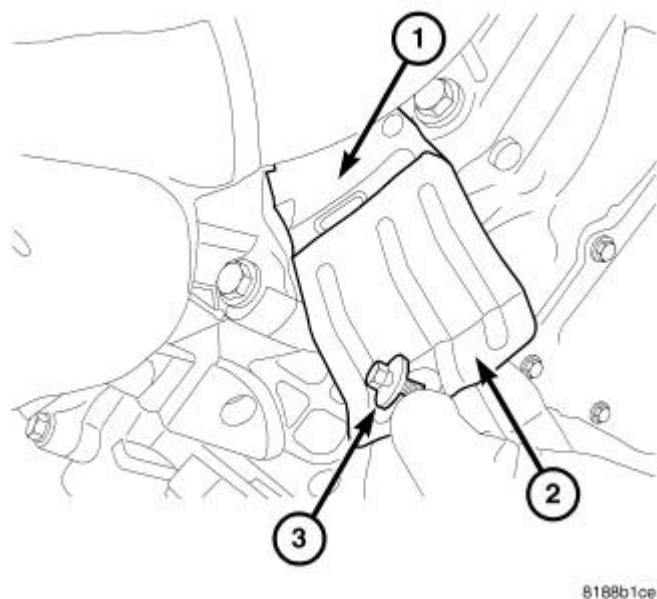


Fig. 58: DUST SHIELD
Courtesy of CHRYSLER LLC

11. If equipped with the 62TE transmission, install the torque converter dust shield (2) and bolt (1) tightened to 6 N.m (53 in. lbs.).

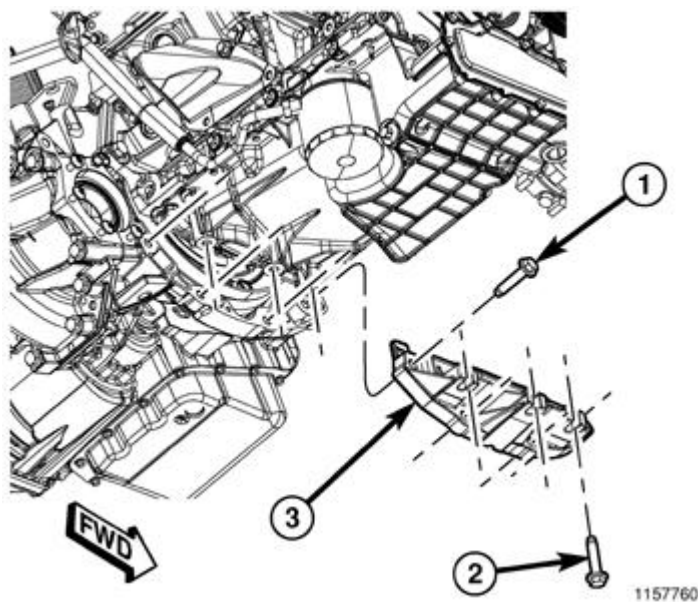


Fig. 59: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

12. If equipped with the 41TE transmission, install the structural collar (3) as follows:

CAUTION: The collar must be tightened using this service procedure, as damage to transaxle case and/or oil pan may occur.

NOTE: Make sure that structural collar (3) is flush with the oil pan and the transmission bell housing.

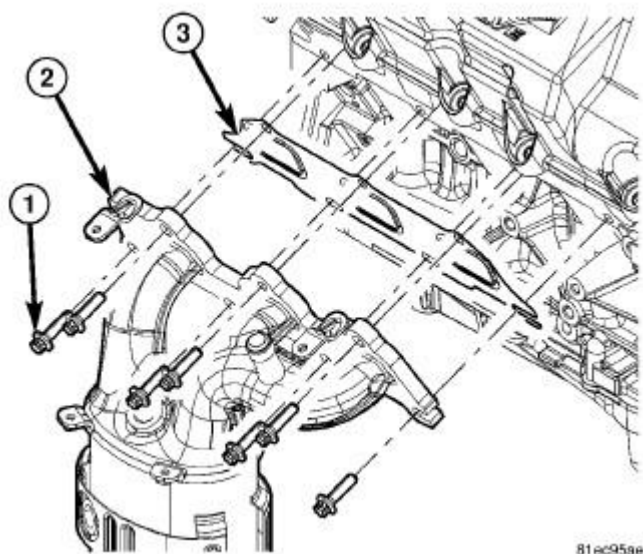


Fig. 60: Rear Maniverter, Fasteners & Gasket
Courtesy of CHRYSLER LLC

- Position the structural collar (3) on the engine and transaxle.
 - Install and finger tighten all bolts (1) and (2).
 - Pre-tighten the vertical collar bolts (2) to 1.1 N.m (10 in. lbs.).
 - Tighten the horizontal collar bolts (1) to 55 N.m (40 ft. lbs.).
 - Starting from the center and working outward, tighten the vertical collar bolts (2) to 55 N.m (40 ft. lbs.).
13. Clean the rear maniverter gasket mounting surfaces. See **Engine - Standard Procedure**.
 14. Install the rear maniverter gasket (3), rear maniverter (2) and the rear maniverter fasteners (1). Tighten the fasteners to 23 N.m (17 ft. lbs.).

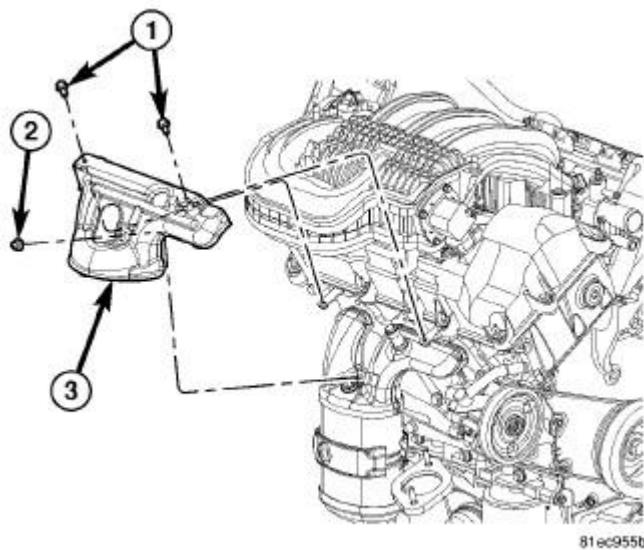


Fig. 61: Rear Manifold Heat Shield
Courtesy of CHRYSLER LLC

15. Install the rear manifold heat shield (3). Tighten fasteners (1 and 2) to 12 N.m (106 in. lbs.).

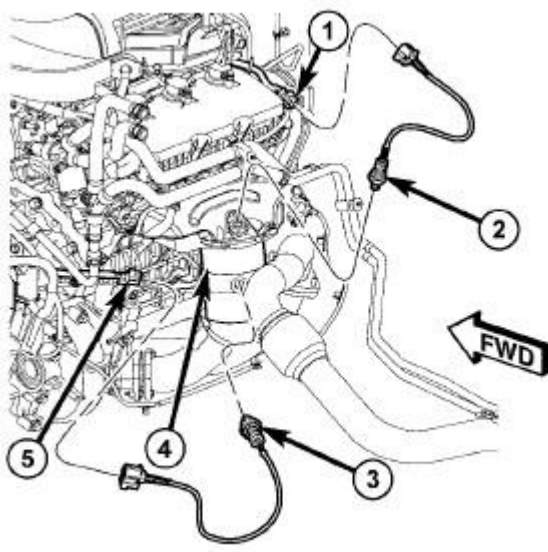
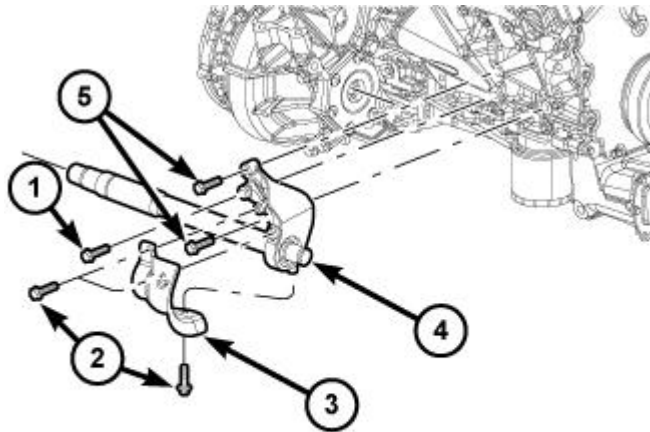


Fig. 62: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 2/1
 2 - UPPER REAR UPSTREAM O2 SENSOR 2/1
 3 - LOWER REAR DOWNSTREAM O2 SENSOR 2/2
 4 - RIGHT ENGINE SIDE CATALYTIC CONVERTER
 5 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 2/2</p> |
|--|

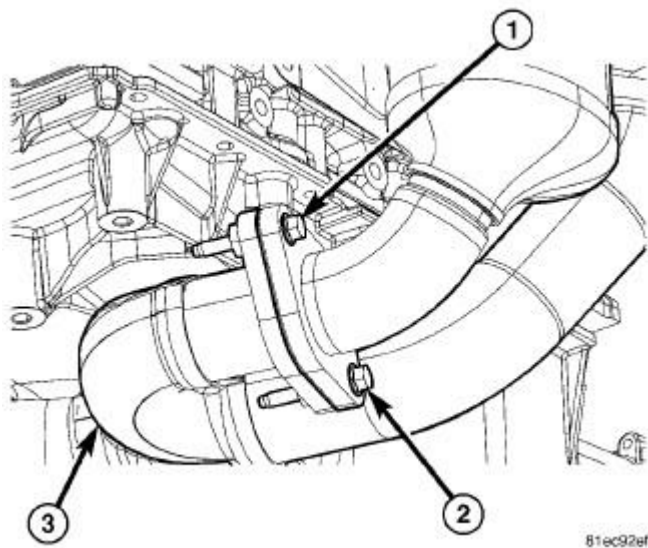
16. Connect the rear downstream oxygen sensor (3) to the engine wiring harness connector (5).
17. Connect the rear upstream oxygen sensor (2) to the engine wiring harness connector (1).



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Fig. 63: Identifying Intermediate Shaft, Heat Shield & Bolts
Courtesy of CHRYSLER LLC

18. Install the intermediate shaft (4).
19. Install the intermediate shaft bolts (1) and (5). Tighten bolt (1) to 38 N.m (28 ft. lb.) and bolts (5) to 23 N.m (17 ft. lb.).
20. Install the heat shield (3) and heat shield bolts (2).



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Fig. 64: Exhaust Cross-Under Pipe
Courtesy of CHRYSLER LLC

21. Install the crossunder pipe (3) to the rear maniverter with pipe fasteners (1) and (2). Hand tighten fasteners.

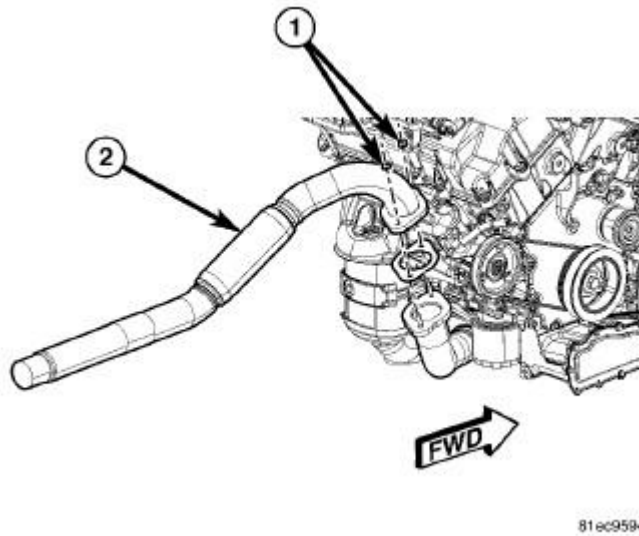


Fig. 65: 2.7L Extension Pipe
Courtesy of CHRYSLER LLC

22. Install the exhaust extension pipe (2) to the cross under pipe with pipe fasteners (1). Hand tighten fasteners.

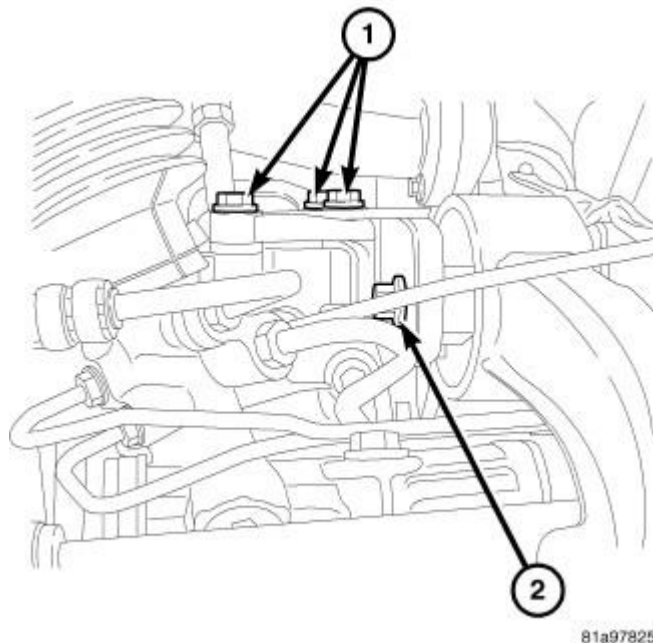


Fig. 66: Identifying Rear Mount Bracket-To-Transaxle Case Bolts
Courtesy of CHRYSLER LLC

23. Lower the vehicle.
24. Tighten the three previously installed rear engine mount bracket bolts (1) to 95 N.m (70 ft. lbs.).

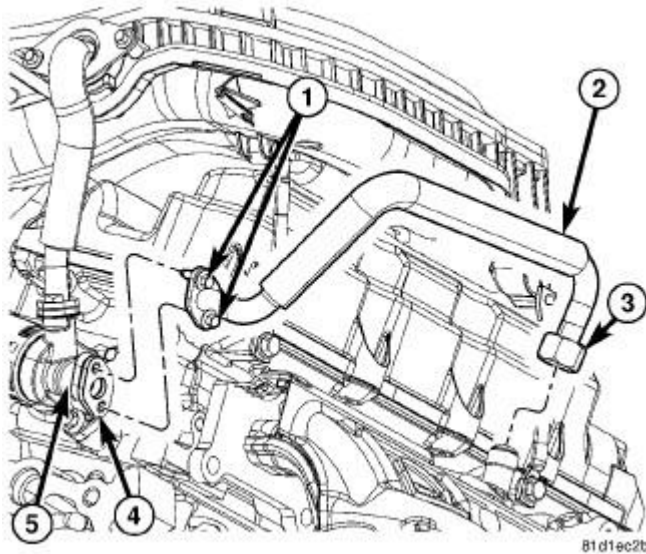


Fig. 67: 2.7L LOWER EGR TUBE
Courtesy of CHRYSLER LLC

25. Install the lower EGR tube (2). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Installation**.

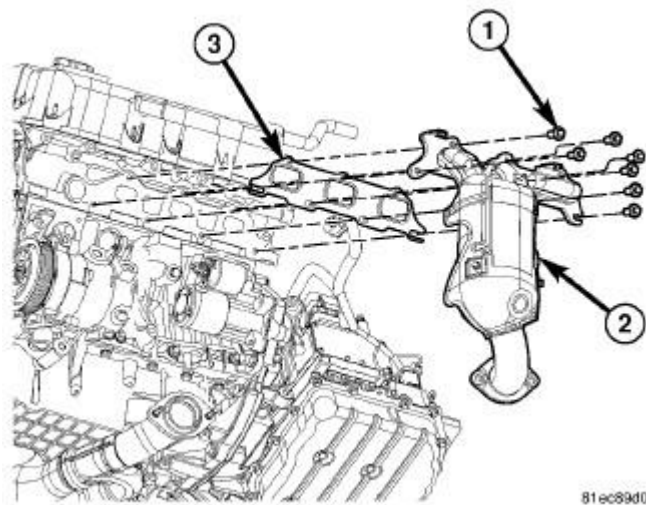


Fig. 68: Front Exhaust Maniverter & Gasket
Courtesy of CHRYSLER LLC

26. Clean the front maniverter gasket mounting surfaces. See **Engine - Standard Procedure**.

27. Install a new gasket (3), front maniverter (2) and the front exhaust maniverter attaching bolts (1). Tighten the bolts to 23 N.m (17 ft. lbs.).

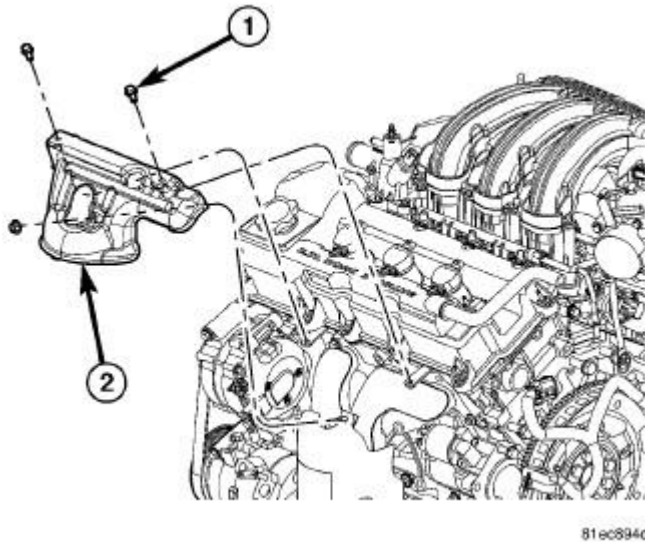


Fig. 69: FRONT MANIVERTER HEAT SHIELD
Courtesy of CHRYSLER LLC

28. Install the upper maniverter heat shield (2) and the heat shield fasteners (1). Tighten fasteners to 12 N.m (106 in. lbs.).

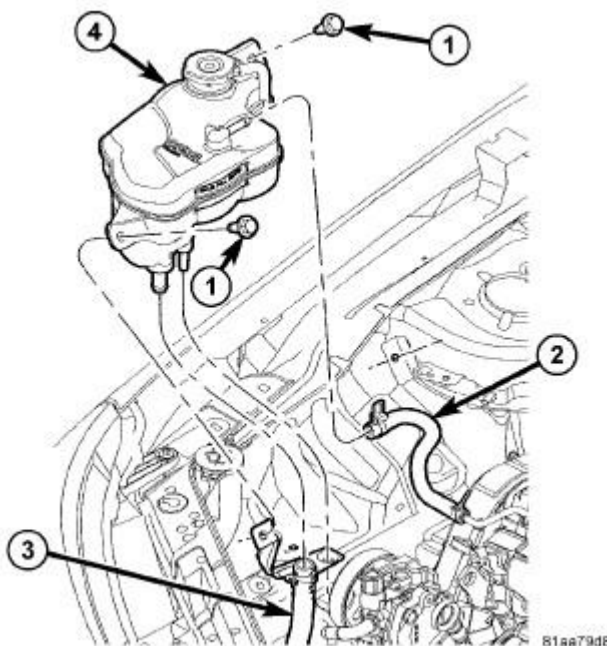


Fig. 70: COOLANT RECOVERY CONTAINER - PRESSURE SYSTEM
Courtesy of CHRYSLER LLC

29. Connect the coolant recovery container hose (3) from the radiator to the coolant recovery container (4).
30. Install the coolant recovery container (4) with two fasteners (1). Tighten fasteners to 10 N.m (89 in. lbs.).
31. Connect the return hose (2) to the coolant recovery container (4).

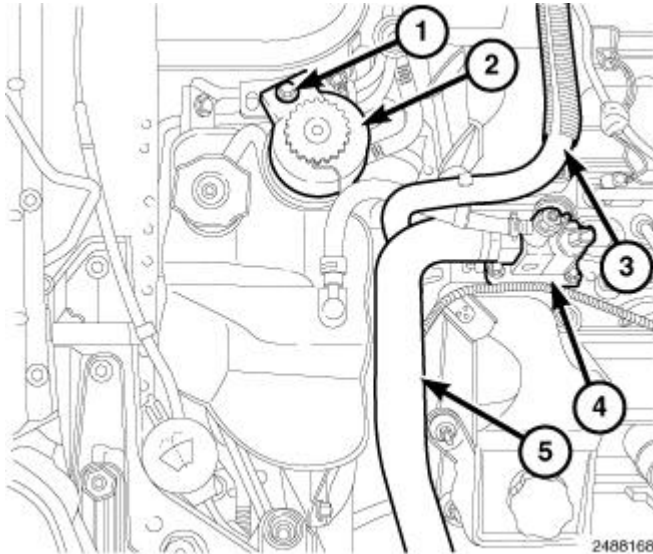
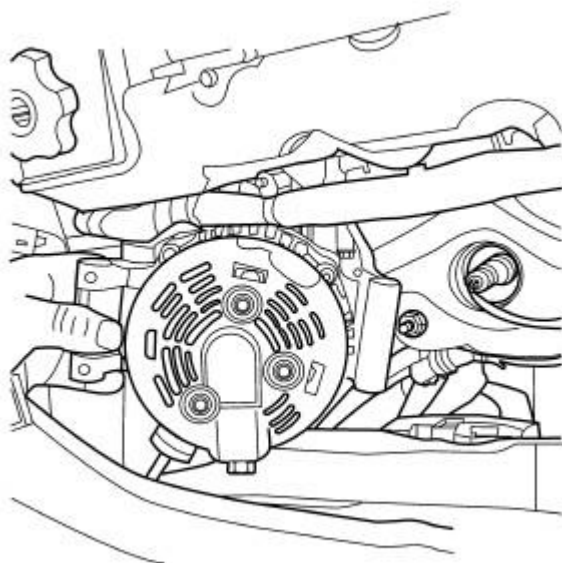


Fig. 71: Identifying Upper Radiator Hose, Heater Hose, Power Steering Reservoir, Connectors & Screw

Courtesy of CHRYSLER LLC

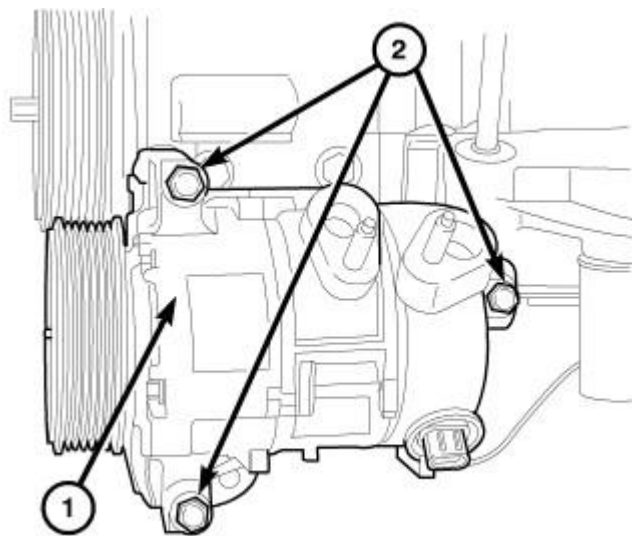
32. Install the heater hose (3) to the coolant outlet connector (4).
33. Install the upper radiator hose (5) to the coolant outlet connector (4).
34. Install the power steering reservoir (2) to the strut tower bracket with the mounting screw (1). Tighten the mounting screw to 12 N.m (106 in. lbs.).



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Fig. 72: GENERATOR
Courtesy of CHRYSLER LLC

35. Raise and support the vehicle.
36. Install the generator with two upper mounting bolts. Hand tighten bolts.
37. Install the lower generator mounting bolt and tighten to 27 N.m (20 ft. lbs.).
38. Tighten the two upper generator mounting bolts to 27 N.m (20 ft. lbs.).



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Fig. 73: Removing/Installing A/C Compressor
Courtesy of CHRYSLER LLC

39. Install the A/C compressor (1) to the engine with three bolts (2). Tighten the bolts to 25 N.m (18 ft. lbs.).

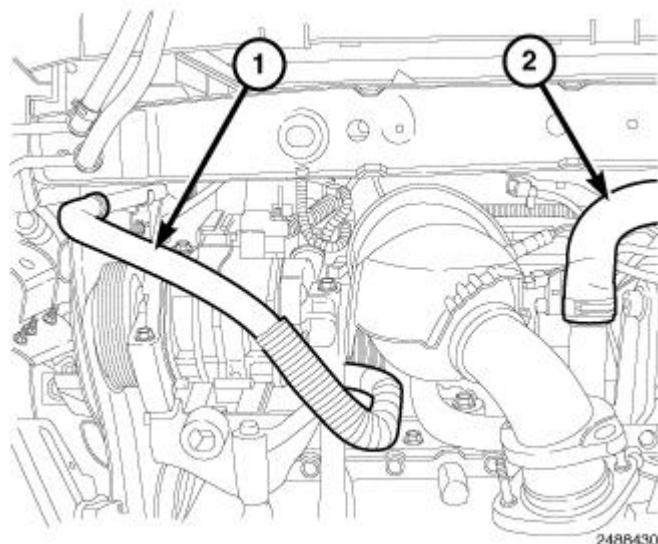


Fig. 74: Identifying Heater Return Hose & Lower Radiator Hose
Courtesy of CHRYSLER LLC

40. Connect the heater return hose (1) to the pipe connection at right front frame rail area.
41. Connect the lower radiator hose (2).

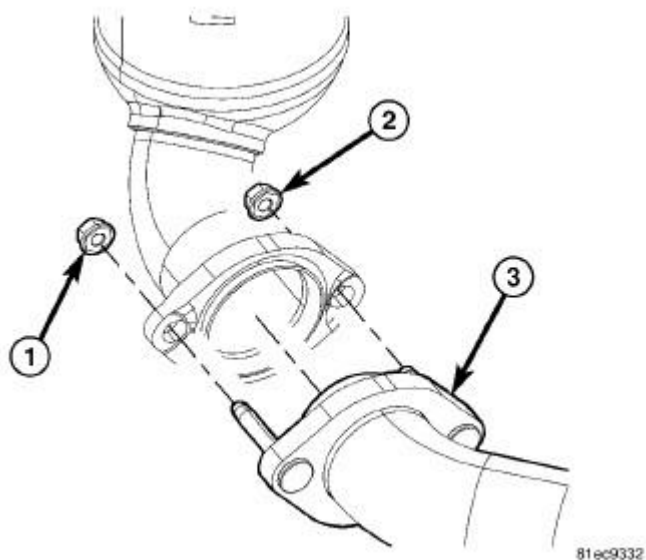


Fig. 75: Front Maniverter-To-Cross Under Fasteners
Courtesy of CHRYSLER LLC

42. Install the front maniverter-to-cross under pipe fasteners (1) and (2). Tighten to 27 N.m (20 ft. lb.).
43. Tighten the previously installed rear maniverter-to-cross under pipe fasteners to 29 N.m (21 ft. lb.).
44. Tighten the previously installed exhaust extension pipe to the cross under pipe fasteners to 27 N.m (20 ft.

lb.).

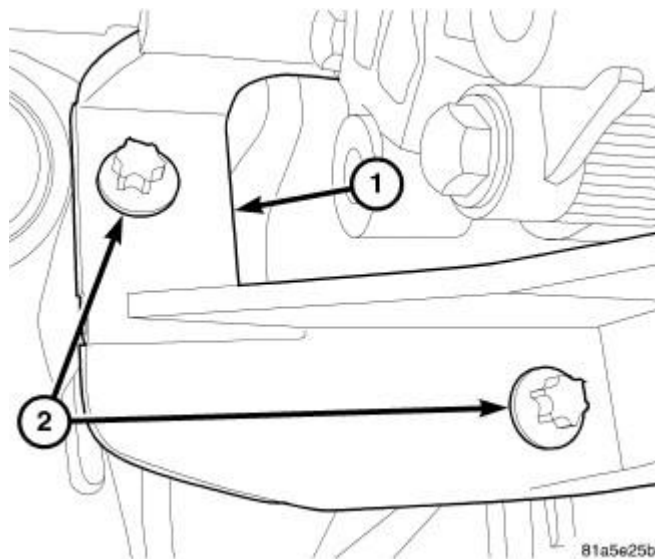


Fig. 76: REAR PUMP MOUNTING BRACKET BOLTS - 2.7L
Courtesy of CHRYSLER LLC

45. Install the power steering pump and bracket assembly (1) with two pump mounting bracket bolts (2) behind the pump on the back of the engine. Do not tighten the bolts at this time.

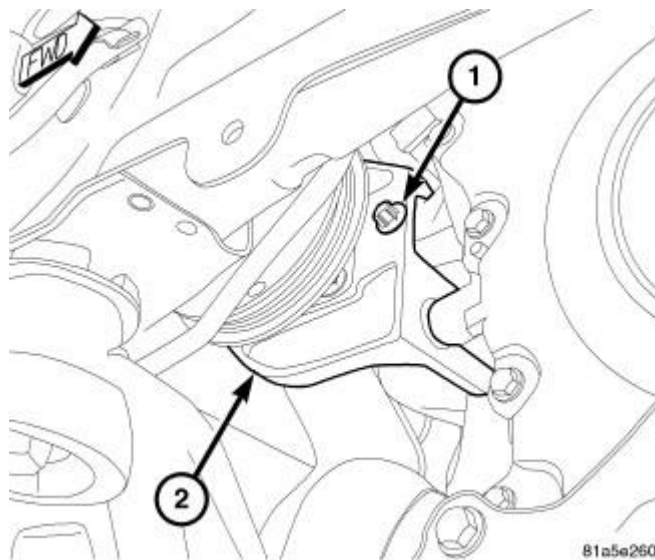


Fig. 77: FRONT PUMP MOUNTING BRACKET BOLTS - 2.7L
Courtesy of CHRYSLER LLC

46. Install the pump mounting bracket bolt (1) near the pump pulley.
47. Tighten all three pump mounting bracket bolts to 30 N.m (22 ft. lbs.).

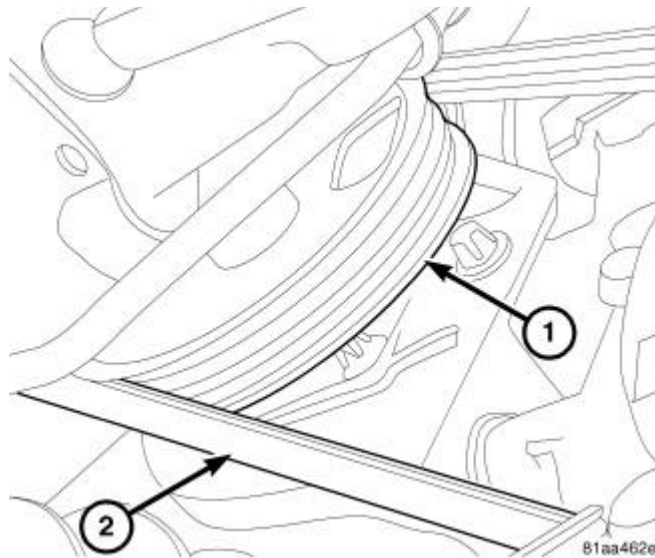


Fig. 78: STRETCH TO FIT POWER STEERING BELT REMOVAL
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - POWER STEERING PULLEY |
| 2 - STRETCH TO FIT POWER STEERING BELT |

48. Install the power steering belt (2). Refer to Cooling/Accessory Drive/BELT, Serpentine - Installation .

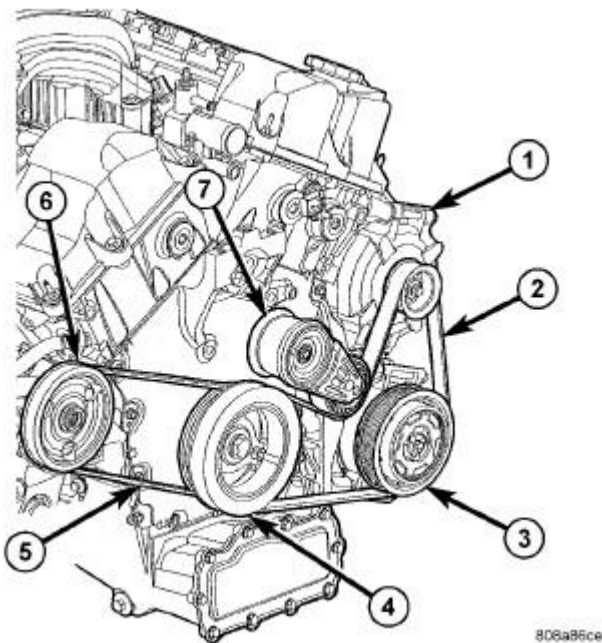


Fig. 79: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

- | |
|---------------|
| 1 - GENERATOR |
|---------------|

2 - IDLER/TENSIONER

49. Install the accessory drive belt (2). Refer to Cooling/Accessory Drive/BELT, Serpentine - Installation .

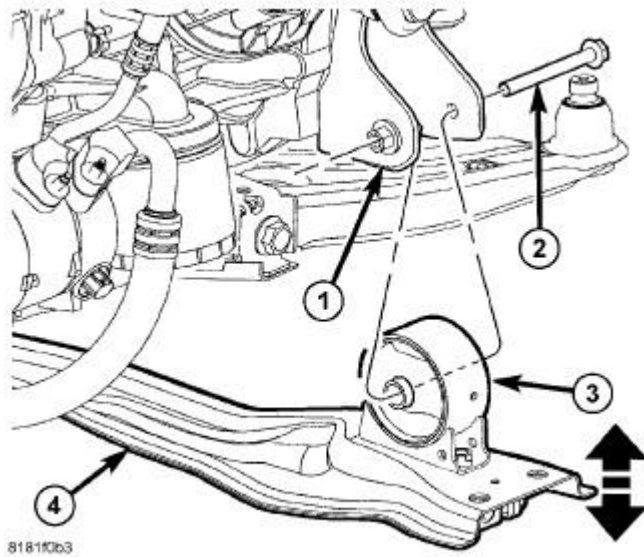


Fig. 80: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

50. Install the fore/aft cross-member (4). Refer to Frame and Bumpers/Frame/CROSSMEMBER - Installation .

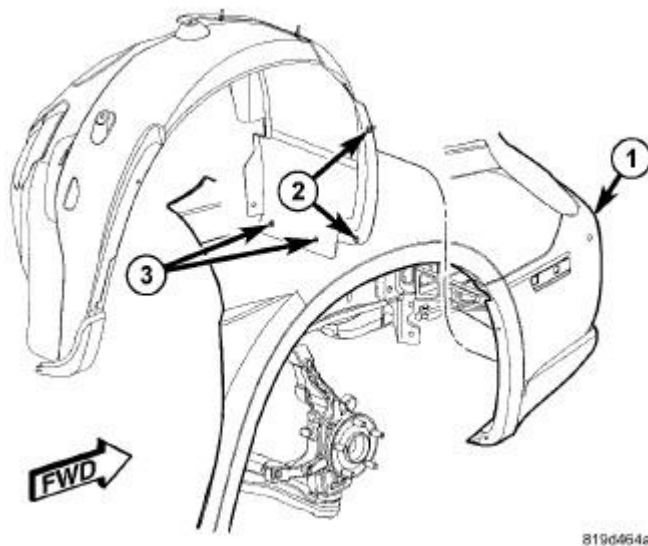


Fig. 81: FRONT SPLASH SHIELDS
Courtesy of CHRYSLER LLC

51. Install the left and right splash shields (2). Refer to **Body/Exterior/SHIELD, Splash - Installation** .

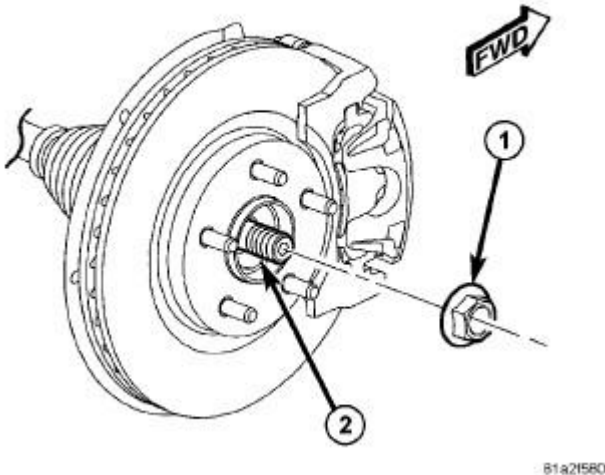


Fig. 82: HUB NUT
Courtesy of CHRYSLER LLC

52. Install both axle shafts (2). Refer to **Differential and Driveline/Half Shaft - Installation** .

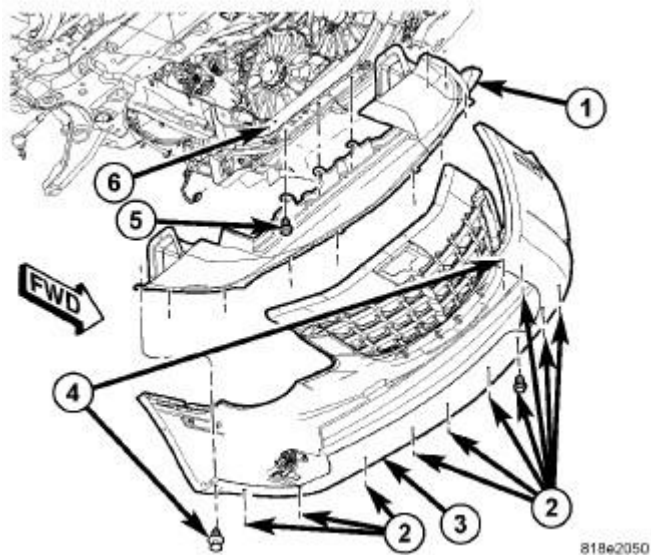


Fig. 83: LOWER FASCIA
Courtesy of CHRYSLER LLC

53. Install the closeout panel (1) onto the fascia (3). Refer to **Frame and Bumpers/Bumpers/FASCIA, Front Lower - Installation** .

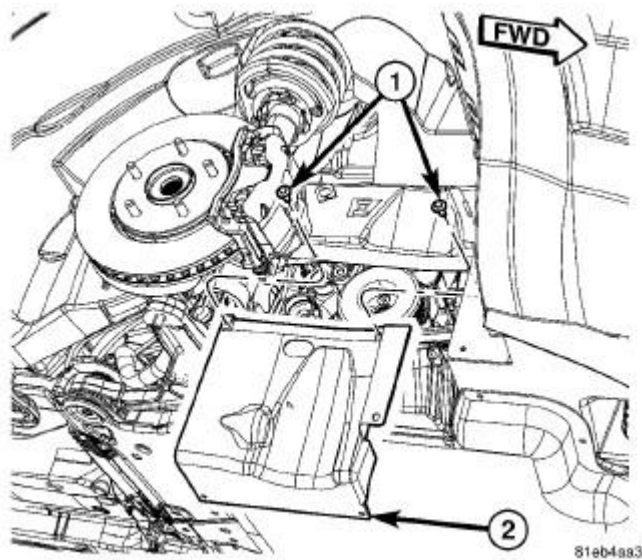


Fig. 84: LOWER SPLASH SHIELD
Courtesy of CHRYSLER LLC

54. Install the left and right lower frame splash shields (2).

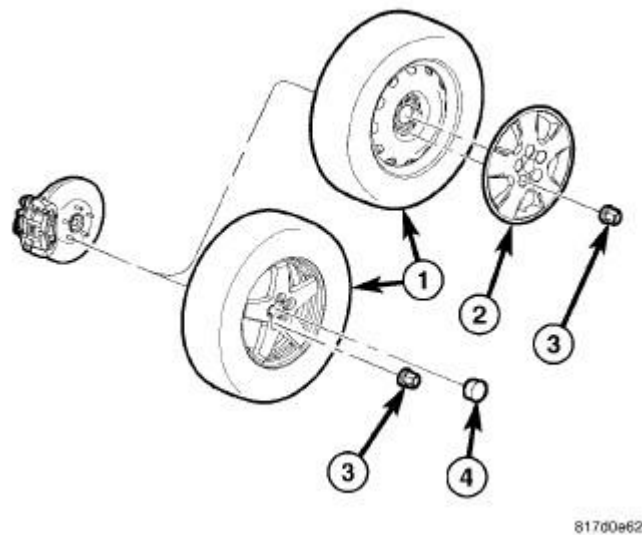


Fig. 85: TIRE AND WHEEL MOUNTING
Courtesy of CHRYSLER LLC

55. Install the front tire and wheel assemblies. Refer to **Tires and Wheels - Installation** .

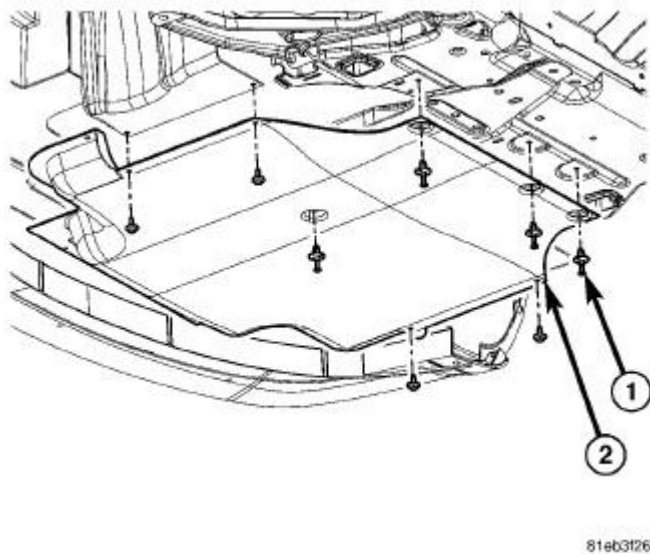


Fig. 86: Belly Pan

Courtesy of CHRYSLER LLC

56. Ensure that the oil pan drain plug is tight and install a new oil filter. See **Engine/Lubrication/FILTER, Engine Oil - Installation**.
57. Install the belly pan (2), if equipped.

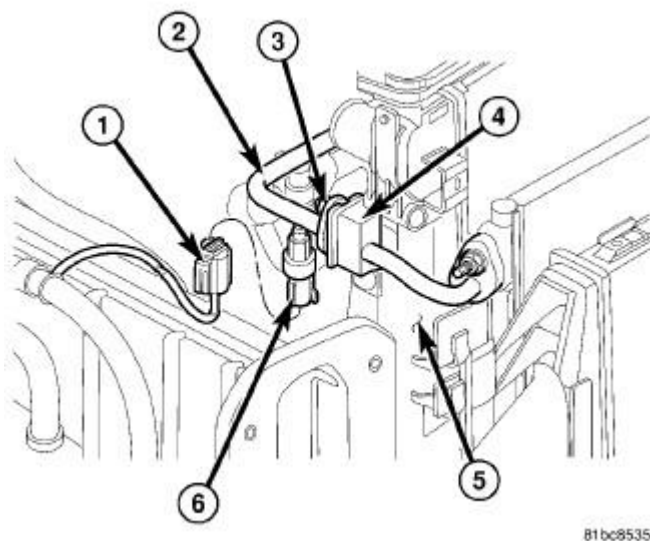


Fig. 87: Discharge Line to Jumper

Courtesy of CHRYSLER LLC

58. Lower the vehicle.
59. Remove the tape or plugs from the A/C discharge line (2) and jumper line (4) fittings.
60. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the

discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

61. Connect the A/C discharge line (2) to the jumper line (4).
62. Install the nut (3) that secures the A/C discharge line to the jumper line. Tighten the nut to 18 N.m (13 ft. lbs.).
63. Connect the wire harness connector (1) to the A/C pressure transducer (6).

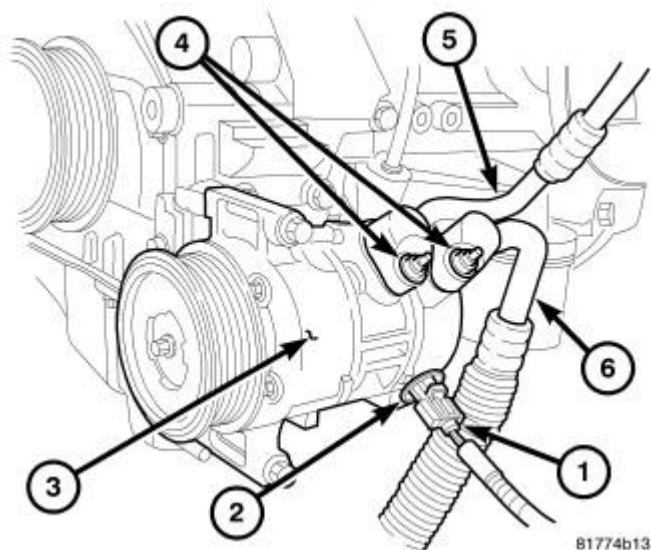


Fig. 88: A/C Compressor-Refrigerant Lines
Courtesy of CHRYSLER LLC

64. Remove the tape or plugs from the compressor port and the refrigerant line fitting.
65. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the suction line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
66. Connect the A/C suction line (6) to the A/C compressor (3).
67. Install the nut (4) that secures the A/C suction line to the A/C compressor. Tighten the nut to 20 N.m (15 ft. lbs.).
68. Connect the engine wire harness (1) to the A/C compressor connector (2).

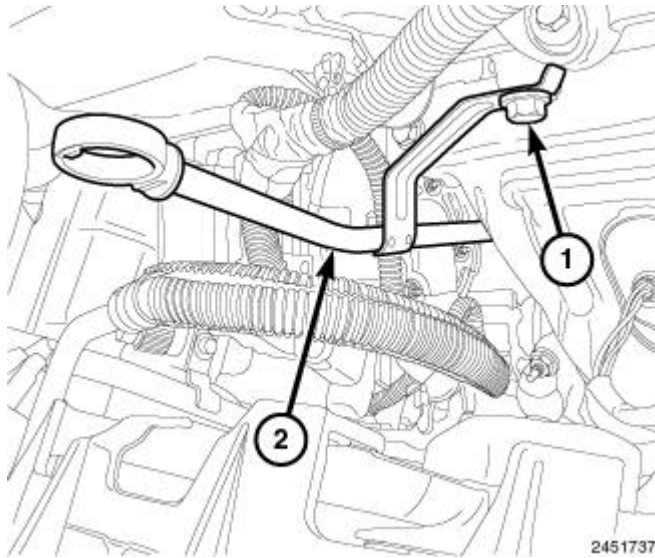


Fig. 89: Identifying Oil Dipstick Tube & Bolt
Courtesy of CHRYSLER LLC

69. Install the engine oil dipstick and tube (2). Tighten bolt to 20 N.m (15 ft. lbs.).

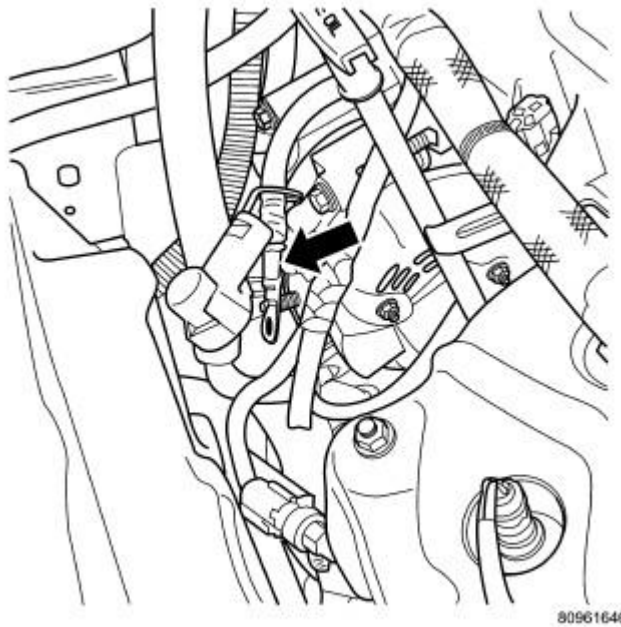


Fig. 90: GENERATOR BATTERY CABLE
Courtesy of CHRYSLER LLC

70. Connect the generator B+ terminal and field connectors.

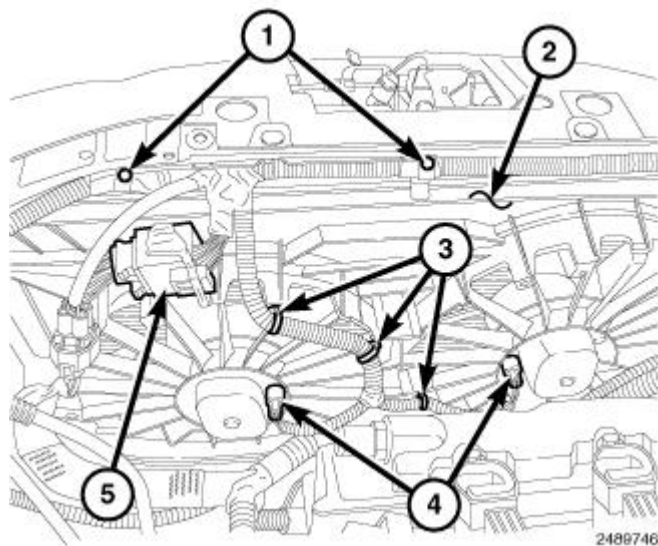


Fig. 91: Locating Cooling Fan Module, Screws, Retainers & Connectors
 Courtesy of CHRYSLER LLC

71. Install the cooling fan module (2) to the radiator and engage the two upper retainers.
72. Install five screws (1) retaining the wire harness to the upper core support.
73. Connect the fan motor electrical connectors (4).
74. Secure three wire harness retainers (3) and the wire harness connector (5) to the cooling fan module (2).

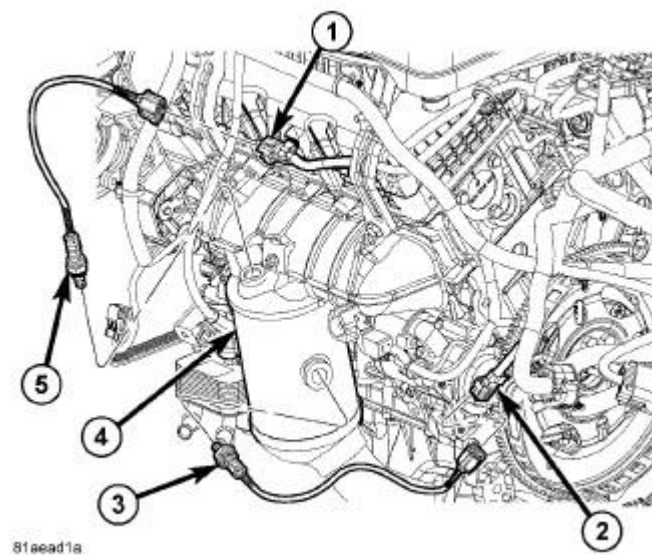
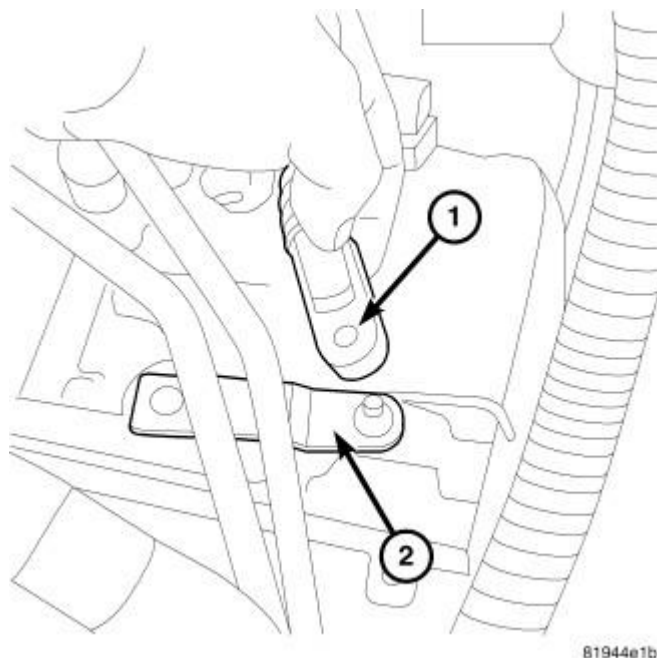


Fig. 92: Downstream & Upstream Oxygen Sensors
 Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 1/1
2 - ENGINE HARNESS CONNECTOR FOR O2 SENSOR 1/2
3 - LOWER FRONT DOWNSTREAM O2 SENSOR 1/2 |
|--|

- 4 - LEFT ENGINE SIDE CATALYTIC CONVERTER
- 5 - UPPER FRONT UPSTREAM O2 SENSOR 1/1

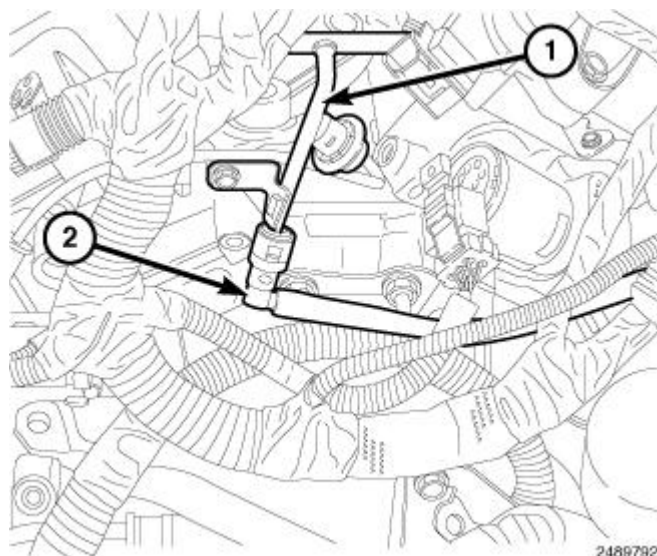
75. Connect the front downstream oxygen sensor (3) to the engine wiring harness connector (2).
76. Connect the front upstream oxygen sensor (5) to the engine wiring harness connector (1).



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Fig. 93: SHIFT CABLE FROM MANUAL LEVER
Courtesy of CHRYSLER LLC

77. Connect the gearshift cable (1) to the manual valve lever (2).



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Fig. 94: Locating Fuel Supply Hose & Fuel Rail
Courtesy of CHRYSLER LLC

78. Connect the fuel supply hose (2) to the fuel rail (1). Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure**.

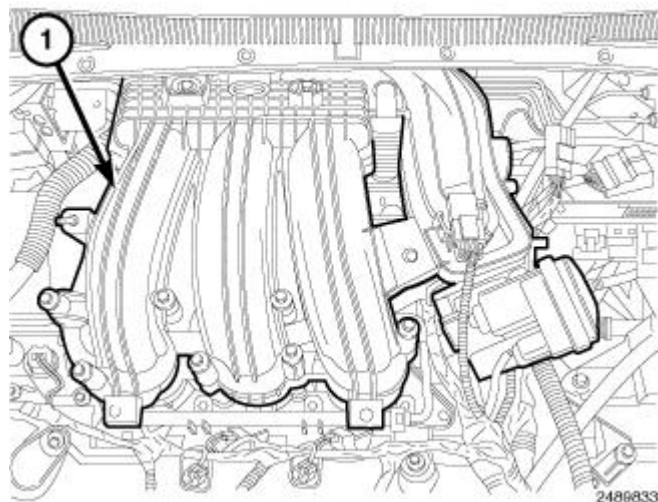


Fig. 95: Locating Upper Intake Manifold
Courtesy of CHRYSLER LLC

79. Install the upper intake manifold (1). See **Engine/Manifolds/MANIFOLD, Intake - Installation**.

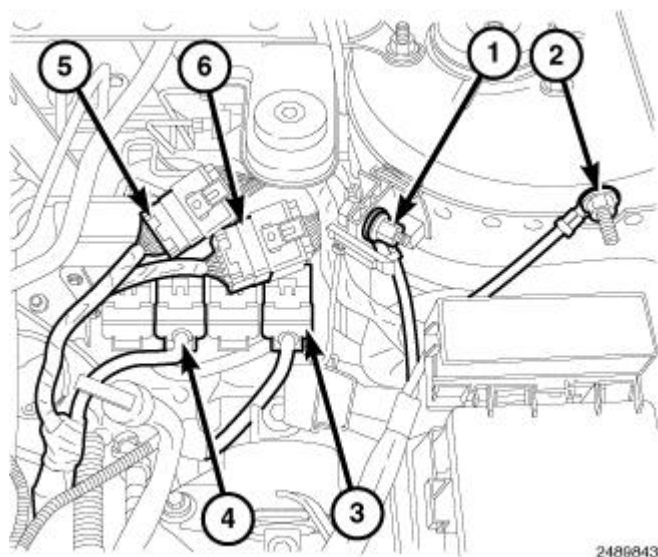


Fig. 96: Identifying Harness Connectors & Nuts
Courtesy of CHRYSLER LLC

80. Connect engine harness to main harness connectors (5) and (6).
81. Connect engine harness connector C2 (4) and transmission harness connector C4 (3) to the PCM.
82. Install the black ground cable to the remote negative battery post. Tighten the nut (2) to 16.5 N.m (145 in. lbs.).

83. Install the red starter cable to the remote positive battery post. Tighten the nut (1) to 16.5 N.m (145 in. lbs.).

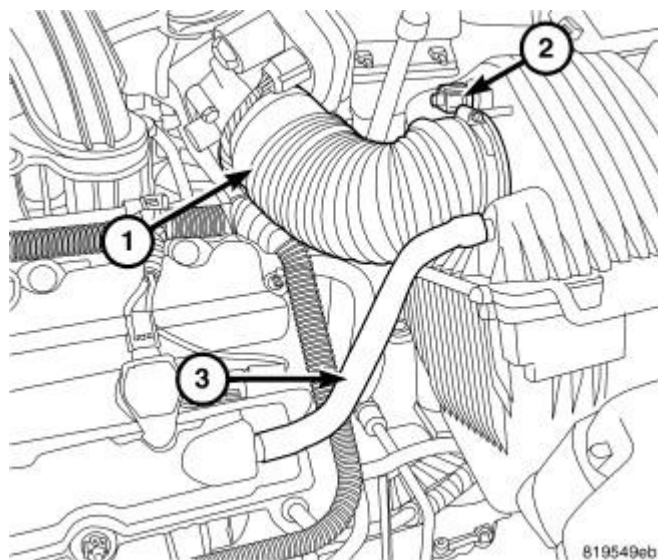


Fig. 97: AIR BOX COVER
Courtesy of CHRYSLER LLC

- | |
|--------------------|
| 1 - Inlet Hose |
| 2 - IAT sensor |
| 3 - Fresh Air Hose |

84. Install the throttle body air inlet hose and air cleaner body assembly. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
85. Evacuate and recharge the Air Conditioning system. Refer to **Heating and Air Conditioning/Plumbing - Standard Procedure**.
86. Fill the engine crankcase with the proper oil to the correct level. See **Engine/Lubrication/OIL - Standard Procedure**.
87. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lb.).
88. Fill the cooling system. Refer to **Cooling - Standard Procedure**.
89. Start the engine and run until operating temperature is reached.

NOTE: The Cam/Crank Variation Relearn procedure must be performed anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components. Refer to **DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure**.

SPECIFICATIONS

SPECIFICATIONS

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
Type	60° DOHC V-6 24-Valve	
Compression Ratio	9.67:1	
Lead Cylinder	#1 Right Bank	
Firing Order	1-2-3-4-5-6	
	Metric	Standard
Displacement	2.7 Liters	167 Cubic Inches
Bore AND Stroke	86.0 x 78.5 mm	3.386 in. x 3.091 in.

CYLINDER BLOCK

Description	Specification	
	Metric	Standard
Cylinder Bore Diameter	86.0 mm ±0.0076	3.3859 in. ±0.0003
Out of Round (Max.)	0.076 mm	0.003 in.
Taper (Max.)	0.051 mm	0.002 in.

PISTONS

Description	Specification	
	Metric	Standard
Material	Aluminum Alloy	
Piston Diameter	85.983 mm ±0.019	3.3851 in. ±0.0017
Clearance at Size Location	- 0.0096 to +0.0436 mm	- 0.0003 to +0.0016 in.
Piston Weight	316-326 grams	11.1466-11.4994 oz.
Piston Ring Groove Diameter-No. 1	77.8-78 mm	3.063-3.070 in.
Piston Ring Groove Diameter-No. 2	75.9-76.1 mm	2.988-2.996 in.
Piston Ring Groove Diameter-No. 3	76.5-76.7 mm	3.011-3.019 in.

PISTON PINS

Description	Specification	
	Metric	Standard
Type	Full Floating	
Pin Diameter	21.997-22.000 mm	0.8661-0.8662 in.
Clearance in Piston	0.005-0.013 mm	0.0002-0.0005 in.
Clearance in Rod	0.007-0.018 mm	0.0003-0.0008 in.

PISTON RINGS

Description	Specification	
	Metric	Standard

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

Ring Gap-Top Compression Ring	0.20-0.36 mm	0.008-0.014 in.
Ring Gap-2nd Compression Ring	0.37-0.63 mm	0.0146-0.0249 in.
Ring Gap-Oil Control (Steel Rails)	0.25-0.76 mm	0.010-0.030 in.

PISTON RING SIDE CLEARANCE

Description	Specification	
	Metric	Standard
Compression Ring-Top	0.035-0.083 mm	0.0013-0.0032 in.
Compression Ring-Second	0.040-0.080 mm	0.0016-0.0031 in.
Oil Ring (Steel Rails)	0.058-0.204 mm	0.0022-0.0080 in.

PISTON RING WIDTH

Description	Specification	
	Metric	Standard
Compression Rings-Top and Second	1.47-1.49 mm	0.0579-0.0587 in.
Oil Ring (Steel Rails)	0.445-0.470 mm	0.0176-0.0186 in.

CONNECTING RODS

Description	Specification	
	Metric	Standard
Bearing Clearance	0.024-0.064 mm	0.001-0.0026 in.
Side Clearance	0.13-0.38 mm	0.0052-0.015 in.
Side Clearance (Max.)	0.4318 mm	0.017 in.
Piston Pin Bore Diameter	22.007-22.015 mm	0.8665-0.8668 in.
Bearing Bore Out of Round (Max.)	0.004 mm	0.0002 in.
Total Weight (Less Bearing)	529.9 ±7 grams	18.6917 ±0.247 oz.

CRANKSHAFT MAIN BEARING JOURNALS

Description	Specification	
	Metric	Standard
Diameter	63.49-63.51 mm	2.4997-2.5004 in.
Bearing Clearance	0.035-0.053 mm	0.0014-0.0021 in.
Bearing Clearance (Max.)	0.087 mm	0.0034 in.
Out of Round (Max.)	0.015 mm	0.0006 in.
Taper (Max.)	0.015 mm	0.0006 in.
End Play	0.0475-0.2725 mm	0.0019-0.0108 in.
End Play (Max.)	0.43 mm	0.017 in.

CONNECTING ROD JOURNALS

	Specification	

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

Description	Metric	Standard
Diameter	53.51-53.49 mm	2.1067-2.106 in.
Bearing Clearance	0.024-0.064 mm	0.001-0.0026 in.
Out of Round (Max.)	0.015 mm	0.0006 in.
Taper (Max.)	0.015 mm	0.0006 in.

CAMSHAFT

Description	Specification	
	Metric	Standard
Bore Diameter	24.050-24.071 mm	0.9469-0.09476 in.
Bearing Journal Diameter	24.000-23.981	0.9449-0.9441 in.
Bearing Clearance	0.05-0.09 mm	0.0020-0.0035 in.
Bearing Clearance (Max.)	0.13 mm	0.0051 in.
End Play	0.13 mm	0.0051-0.0110 in.

VALVE TIMING-INTAKE VALVES

Description	Specification
Opens (ATDC)	2°
Closes (ABDC)	44°
Duration	222°

VALVE TIMING-EXHAUST VALVES

Description	Specification
Opens (BBDC)	36°
Closes (ATDC)	4°
Duration	220°
Valve Overlap	2°

CYLINDER HEAD

Description	Specification	
	metric	Standard
Gasket Thickness (Compressed)	1.50 mm ±0.05	0.0591 in. ±0.002 in.
Valve Seat Angle	45°-45.5°	
Valve Seat Runout (Max.)	0.05 mm	0.002 in.
Intake Valve Seat Width	1.00-1.5 mm	0.0394-0.0591 in.
Exhaust Valve Seat Width	1.25-1.75 mm	0.0492-0.0689 in.
Guide Bore Diameter (Std.)	5.975-6.00 mm	0.2353-0.2363 in.
Valve Guide Height*-Intake AND Exhaust	13.25-13.75 mm	0.5217-0.5414 in.
*Measured from cylinder head surface to top of guide		

VALVES

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

Description	Specification	
	Metric	Standard
Face Angle	44.5°-45.5°	
Head Diameter-Intake	33.67-33.93	1.3256-1.3358 in.
Head Diameter-Exhaust	27.67-27.93 mm	1.0894-1.1000 in.
Length-Intake (Overall)	107.89-108.39 mm	4.2476-4.2673 in.
Length-Exhaust (Overall)	105.88-106.38 mm	4.1685-4.1882 in.
Stem Diameter-Intake	5.934-5.952 mm	0.2337-0.2344 in.
Stem Diameter-Exhaust	5.906-5.924 mm	0.2326-0.2333 in.
Stem-to-Guide Clearance-Intake (New)	0.023-0.066 mm	0.0009-0.0026 in.
Stem-to-Guide Clearance-Exhaust (New)	0.051-0.094 mm	0.002-0.0037 in.
Stem-to-Guide Clearance-Intake (Max., Rocking Method)	0.29 mm	0.0114 in.
Stem-to-Guide Clearance-Exhaust (Max., Rocking Method)	0.370 mm	0.0146 in.
Valve Lift-Intake (Zero Lash)	9.0 mm	0.3543 in.
Valve Lift-Exhaust (Zero Lash)	8.0 mm	0.3150 in.
Valve Stem Tip Height-Intake	47.120 ±0.467 mm	1.8551 ±0.00184 in.
Valve Stem Tip Height-Exhaust	48.672 ±0.467 mm	1.9162 ±0.00184 in.

VALVE SPRING

Description	Specification	
	Metric	Standard
Free Length-Intake AND Exhaust (Approx.)	45.63 mm	1.7965 in.
Spring Force-Intake AND Exhaust (Valve Closed)	249-284 N @ 38.0 mm	56.0-64.0 lbs. @ 1.4961 in.
Spring Force-Intake (Valve Open)	658-721 N @ 29.0 mm	147.9-162.1 lbs. @ 1.1417 in.
Spring Force-Exhaust (Valve Open)	614-671 N @ 30.0 mm	138.0-150.8 lbs. @ 1.1811 in.
Number of Coils-Intake AND Exhaust	7.35	
Wire Diameter-Intake AND Exhaust	3.861 mm	0.1520 in.
Installed Height-Intake AND Exhaust (Spring seat to bottom of retainer)	38.0 mm	1.4961 in.

OIL PUMP

Description	Specification	
	Metric	Standard

2010 Chrysler Sebring Limited

2010 ENGINE 2.7L DOHC - Service Information - Avenger, Sebring

Clearance Over Rotors (Max.)	0.077 mm	0.003 in.
Cover-Out-of-Flat (Max.)	0.025 mm	0.001 in.
Inner AND Outer Rotor Thickness	9.475-9.500 mm	0.3731-0.3741 in.
Outer Rotor Clearance (Max.)	0.39 mm	0.015 in.
Outer Rotor Diameter (Min.)	89.175 mm	3.5109 in.
Tip Clearance Between Rotors (Max.)	0.20 mm	0.008 in.

OIL PRESSURE

Description	Specification	
	Metric	Standard
(NOTE: At Normal Operating Temperatures)		
Pressure @ Curb Idle Speed*	34.7 kPa Min.	5 psi Min.
Pressure @ 3000 RPM	300-724 kPa	45-105 psi
*CAUTION: If oil pressure is zero at idle, DO NOT run engine at 3000 RPM.		

TORQUE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
A/C Compressor to Engine - Bolts	28	21	-
Camshaft Sprocket - Bolts	28	-	250
Camshaft Chain Tensioner (Secondary) - Bolts	12	-	105
Camshaft Bearing Cap - Bolts	12	-	105
Connecting Rod Cap - Bolts	27 +1/4 Turn	20 +1/4 Turn	-
Crankshaft Main Bearing Cap - Tie Bolts	28	-	250
Crankshaft Main Bearing Cap - Outer Cap Bolts	27 +1/4 Turn	20 +1/4 Turn	-
Crankshaft Main Bearing Cap - Inner Cap Bolts	20 +1/4 Turn	15 +1/4 Turn	-
Crankshaft Damper - Bolt	170	125	-
Cylinder Head - Bolts	See <u>Engine/Cylinder Head - Installation.</u>		
Cylinder Head Cover - Bolts	12	-	105
Exhaust Manifold - Bolts	23	-	200
Exhaust Manifold Heat Shield - Bolts	12	-	105
Exhaust Manifold to Catalytic Converter V-Band Clamp	11	-	100
Engine Mount Bracket to Block - Bolts	61	45	-
Engine Mount Isolator - Nuts	61	45	-
Flex Plate Bolts	95	70	-
Intake Manifold (Upper and Lower) - Bolts	12	-	105
Generator Bracket-Bolts	41	30	-
Oil Pan - Bolts	28	-	250
Oil Pan - Nuts	12	-	105
Oil Pan Drain - Plug	27	20	-

Oil Filter	16	12	-
Oil Pump to Block - Bolts	28	-	250
Oil Pump Cover - Bolts	12	-	105
Oil Pump Pick Up Tube - Bolt	28	-	250
PCV Valve	7	-	60
Crankshaft Rear Seal Retainer - Bolts	12	-	105
Spark Plugs	20	15	-
Starter Mounting - Bolts	41	30	-
Structural Collar	See <u>Engine/Engine Block/COVER, Structural Dust - Installation.</u>		
Thermostat Housing/Water Inlet Connector - Bolts	12	-	105
Throttle Body - Bolts	12	-	105
Timing Chain Cover - M6 Bolts	12	-	105
Timing Chain Cover - M10 Bolts	54	40	-
Timing Chain Tensioner (Primary)	12	-	105
Timing Chain Guide Access Plug	20	15	-
Water Pump - Bolts	12	-	105
Cooling System Bleed Screw	12	-	110
Water Outlet Housing - Bolts	12	-	105

SPECIAL TOOLS

SPECIAL TOOLS

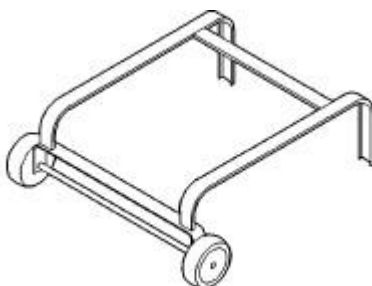


Fig. 98: DOLLY, POWER TRAIN - 6135
Courtesy of CHRYSLER LLC

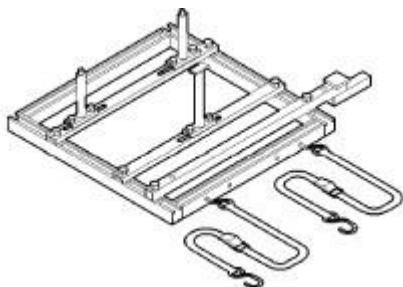


Fig. 99: CRADLE, ENGINE SUPPORT - 6710A

Courtesy of CHRYSLER LLC

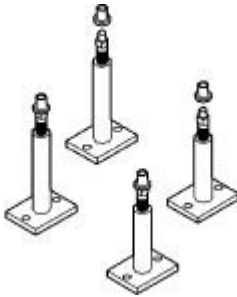


Fig. 100: POSTS, CRADLE - 6848
Courtesy of CHRYSLER LLC

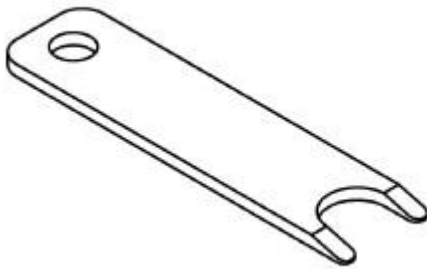


Fig. 101: TOOL, CLUTCH LINE DISCONNECT - 6638A
Courtesy of CHRYSLER LLC

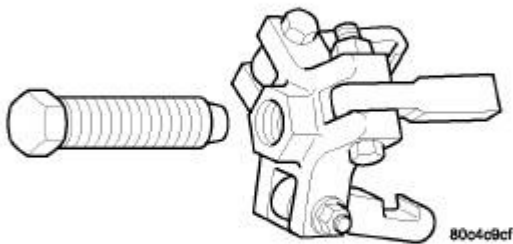


Fig. 102: 3-JAW PULLER - 8454

Courtesy of CHRYSLER LLC

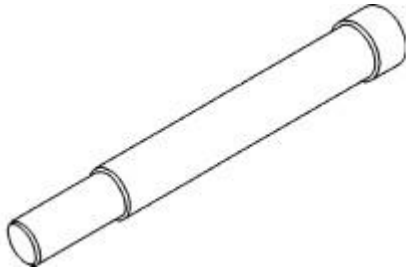


Fig. 103: INSERT, CRANKSHAFT - 8194

Courtesy of CHRYSLER LLC

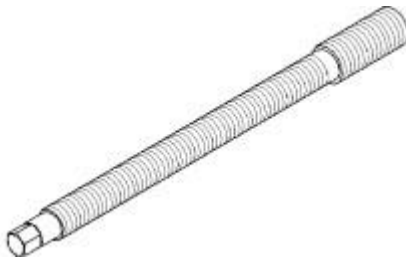


Fig. 104: SCREW, FORCING - 8179

Courtesy of CHRYSLER LLC

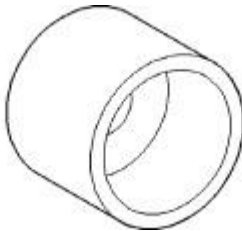
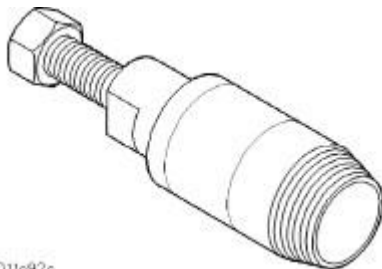


Fig. 105: INSTALLER, CRANK SPROCKET - 6792-1

Courtesy of CHRYSLER LLC



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Fig. 106: REMOVER, SEAL - 6771

Courtesy of CHRYSLER LLC

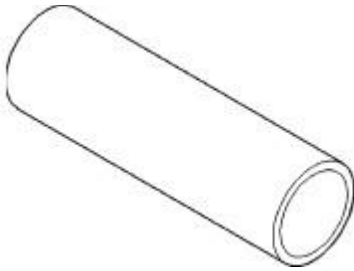


Fig. 107: Crankshaft Seal and Sprocket Installer - 6780-1
Courtesy of CHRYSLER LLC

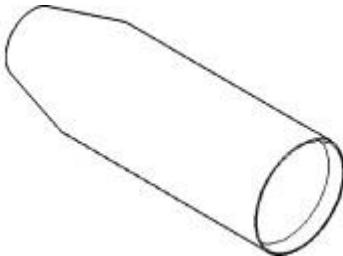


Fig. 108: INSTALLER, CRANKSHAFT SEAL - 6780-2
Courtesy of CHRYSLER LLC



Fig. 109: PULLER, BEARING - 5048
Courtesy of CHRYSLER LLC

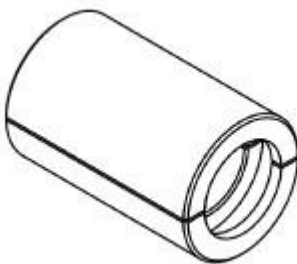


Fig. 110: REMOVER, SPROCKET - 8539
Courtesy of CHRYSLER LLC

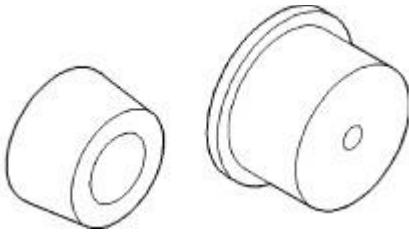


Fig. 111: INSTALLER, SEAL - 6926
Courtesy of CHRYSLER LLC

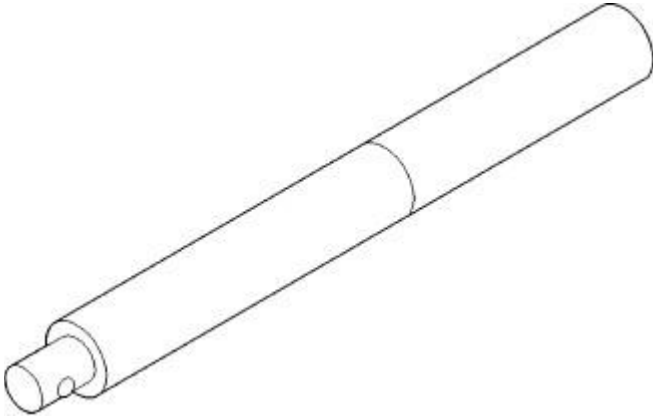


Fig. 112: DRIVER HANDLE, UNIVERSAL - C-4171
Courtesy of CHRYSLER LLC

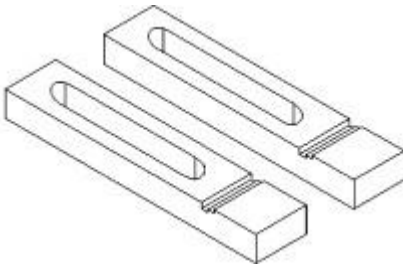


Fig. 113: ALIGNMENT FIXTURE - 8225
Courtesy of CHRYSLER LLC

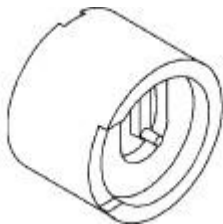


Fig. 114: GAUGE, CHAIN TENSIONER - 8186
Courtesy of CHRYSLER LLC

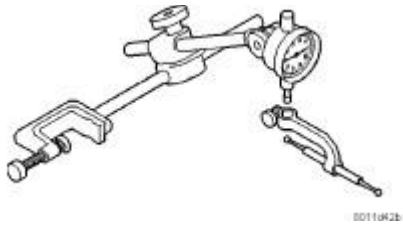


Fig. 115: SET, DIAL INDICATOR - C-3339A
Courtesy of CHRYSLER LLC

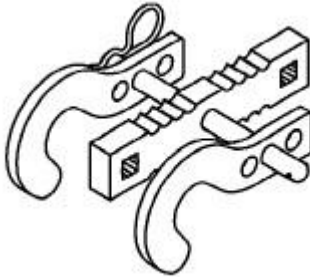


Fig. 116: COMPRESSOR, VALVE SPRING - 8215A
Courtesy of CHRYSLER LLC

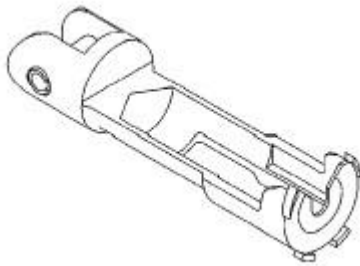


Fig. 117: VALVE SPRING ADAPTER - 8216A
Courtesy of CHRYSLER LLC



Fig. 118: COMPRESSOR, VALVE SPRING - C-3422-D
Courtesy of CHRYSLER LLC

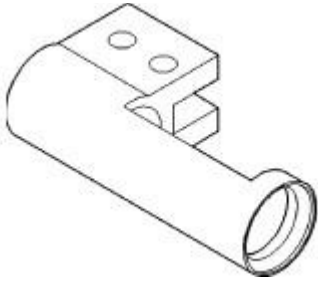


Fig. 119: Valve Spring Adapter - 6526A
Courtesy of CHRYSLER LLC

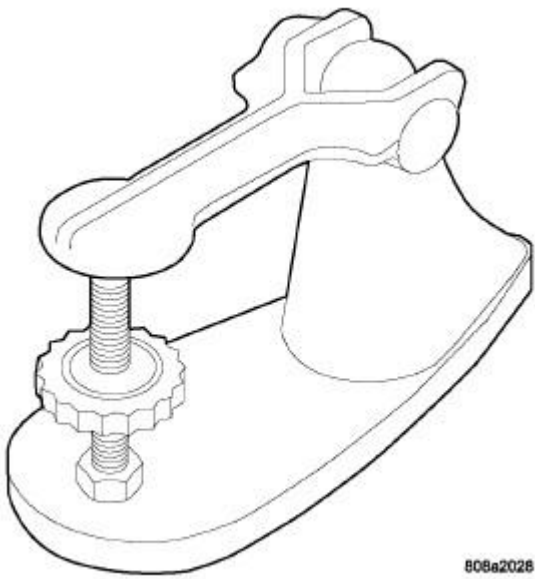


Fig. 120: Valve Spring Tester C-647
Courtesy of CHRYSLER LLC

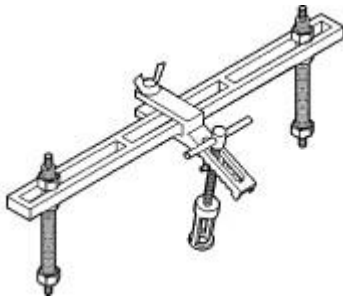


Fig. 121: COMPRESSOR, VALVE SPRING - MD998772A
Courtesy of CHRYSLER LLC

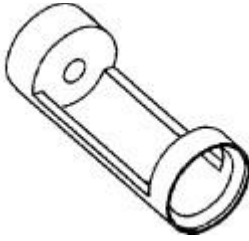
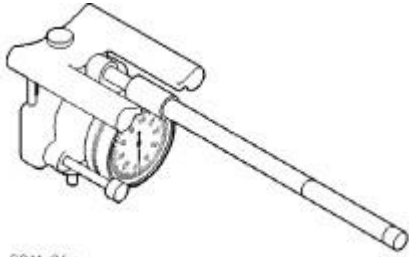


Fig. 122: ADAPTER - 6527

Courtesy of CHRYSLER LLC



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Fig. 123: CYLINDER INDICATOR - C-119

Courtesy of CHRYSLER LLC

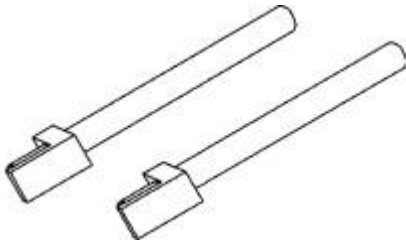


Fig. 124: GUIDE PINS - 8189

Courtesy of CHRYSLER LLC

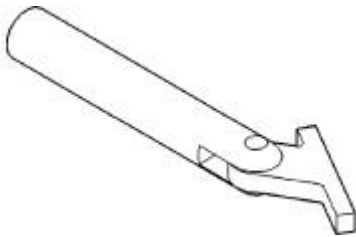


Fig. 125: REMOVER/INSTALLER - C-3059A

Courtesy of CHRYSLER LLC

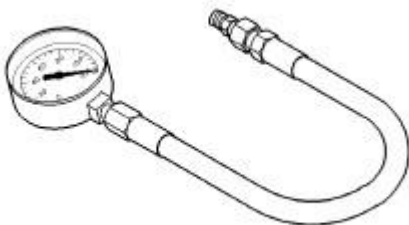


Fig. 126: GAUGE, PRESSURE - C-3292A

Courtesy of CHRYSLER LLC



Fig. 127: ADAPTER, OIL PRESSURE - 8406

Courtesy of CHRYSLER LLC



Fig. 128: DRB III ESSENTIAL KIT - CH6010A

Courtesy of CHRYSLER LLC

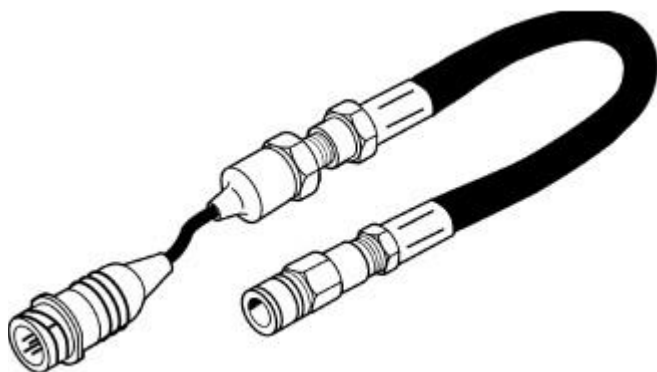


Fig. 129: PRESSURE TRANSDUCER, RPL, - CH7059

Courtesy of CHRYSLER LLC

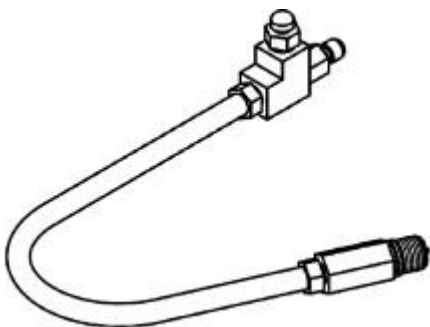


Fig. 130: ADAPTER, PRESSURE PEP - 8116

Courtesy of CHRYSLER LLC

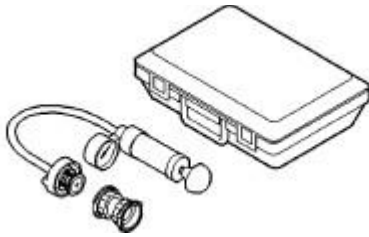


Fig. 131: Cooling System Tester - 7700-A
Courtesy of CHRYSLER LLC

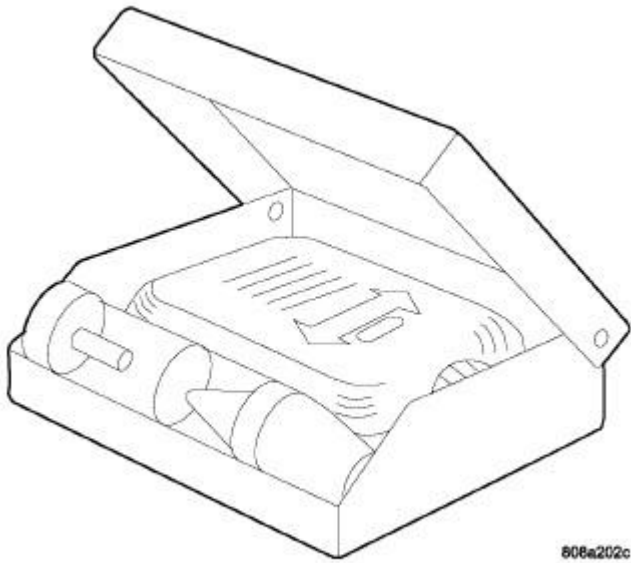


Fig. 132: BLOC-CHEK-KIT - C-3685-A
Courtesy of CHRYSLER LLC

AIR INTAKE SYSTEM

AIR CLEANER

Removal

REMOVAL

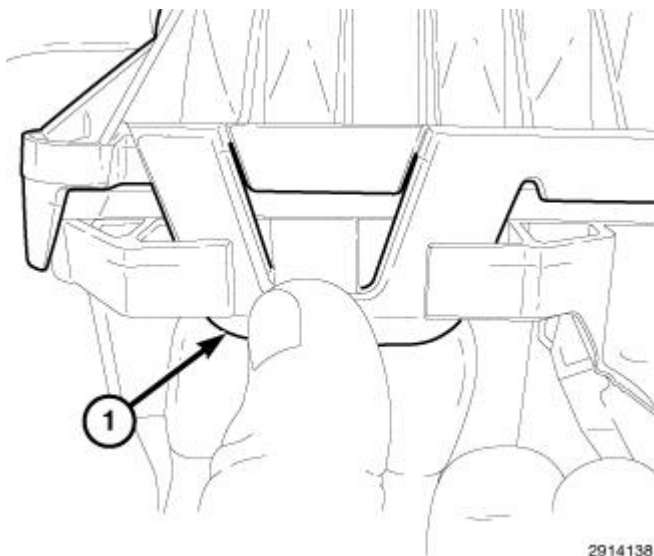


Fig. 133: Air Box Lid Tabs
Courtesy of CHRYSLER LLC

CAUTION: Do not use an assist tool or excessive force when unlocking the air box lid tabs (1). Excessive force may break the tabs off of the lid.

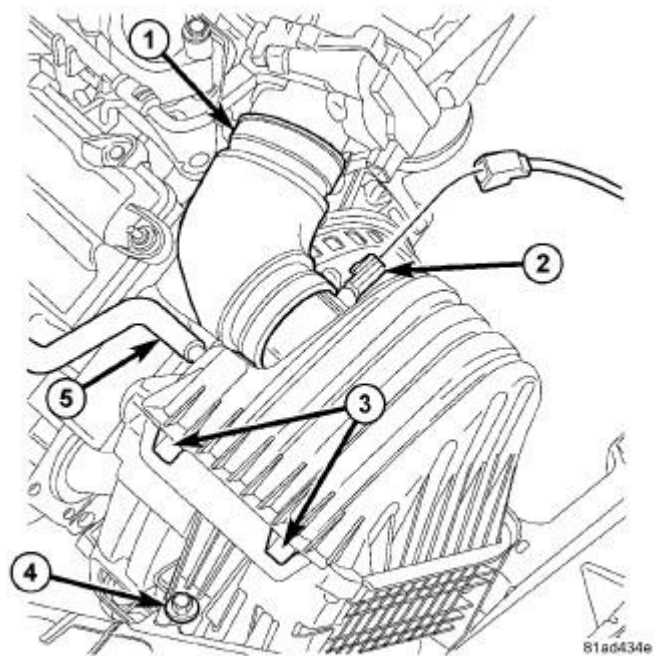


Fig. 134: Identifying Air Cleaner Housing Components
Courtesy of CHRYSLER LLC

1. Unlock the air box lid tabs (3) and lift the air cleaner housing cover.
2. Pull the cover forward to disengage the rear tabs.

3. Remove the air filter element.

Installation

INSTALLATION

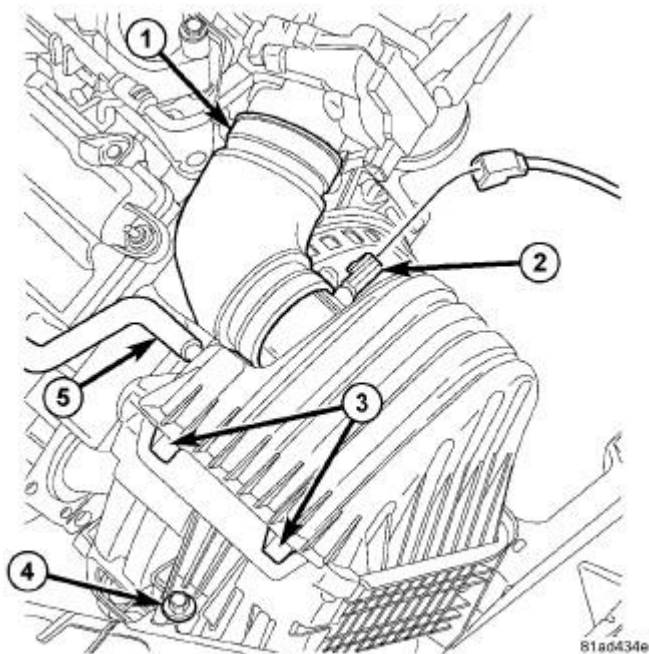


Fig. 135: Identifying Air Cleaner Housing Components
 Courtesy of CHRYSLER LLC

1. Install the air filter element into the air cleaner housing.
2. Install the cover so that the rear tabs insert into the lower air box.
3. Push down on the cover to engage the front locking tabs (3).

BODY, AIR CLEANER

Removal

REMOVAL

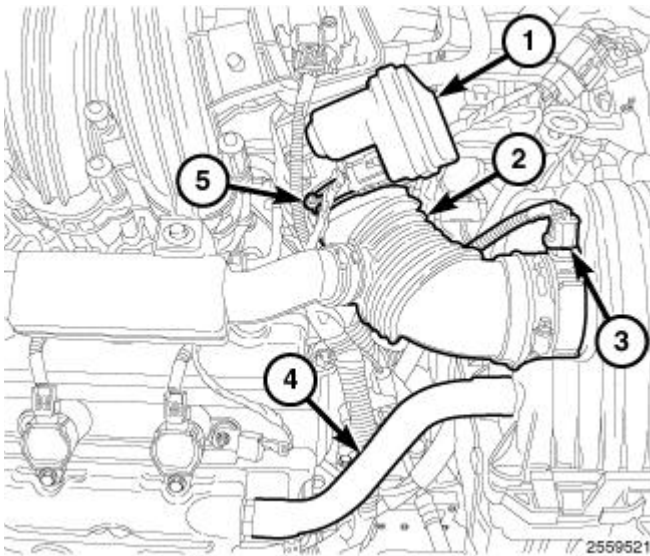


Fig. 136: Identifying Air Makeup Hose, Throttle Body & Air Inlet Hose
 Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Disconnect the inlet air temperature sensor electrical connector (3).
3. Disconnect the fresh air makeup hose (4) from the air cleaner housing.
4. Loosen the hose clamp (5) at the throttle body (1). Remove the air inlet hose (2) from throttle body.

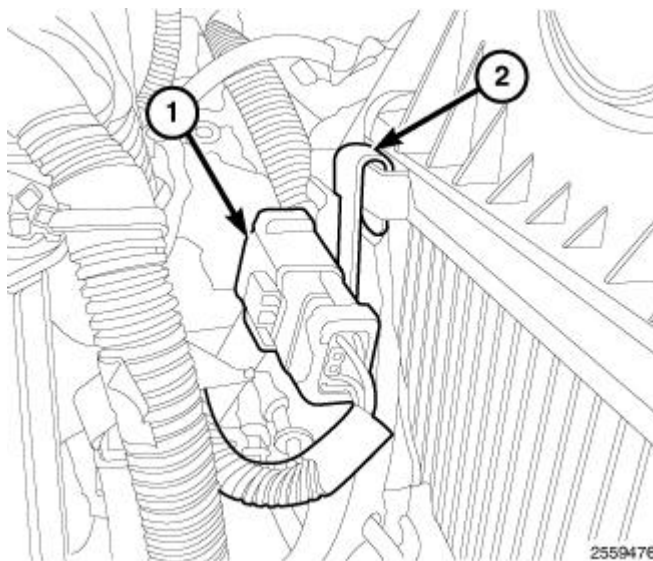


Fig. 137: Identifying Starter Cable Support Bracket & Harness Connector
 Courtesy of CHRYSLER LLC

5. Disengage the wire harness connector (1) from the starter cable support bracket (2).

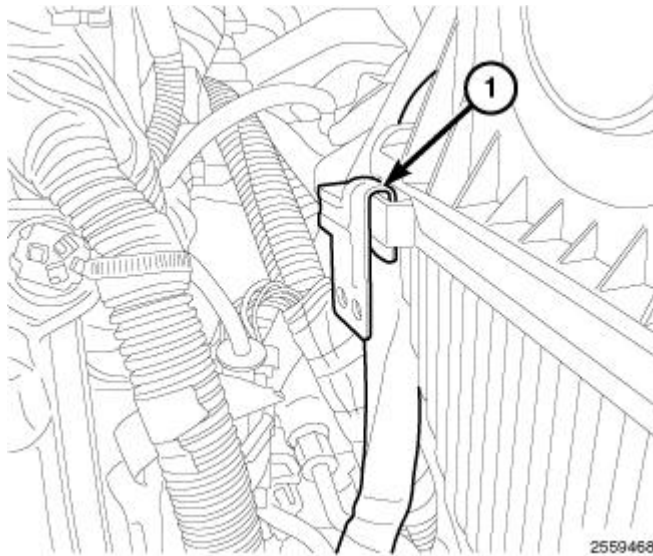


Fig. 138: Starter Cable Support Bracket
Courtesy of CHRYSLER LLC

6. Disengage the starter cable support bracket (1) from the air cleaner housing.

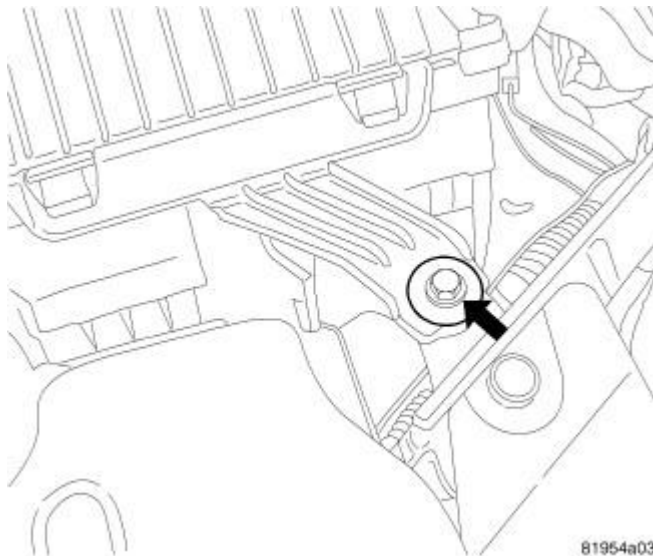


Fig. 139: MOUNTING BOLT
Courtesy of CHRYSLER LLC

7. Remove the air cleaner housing hold down fastener.
8. Pull the air cleaner housing straight up off of the locating pins.

Installation

INSTALLATION

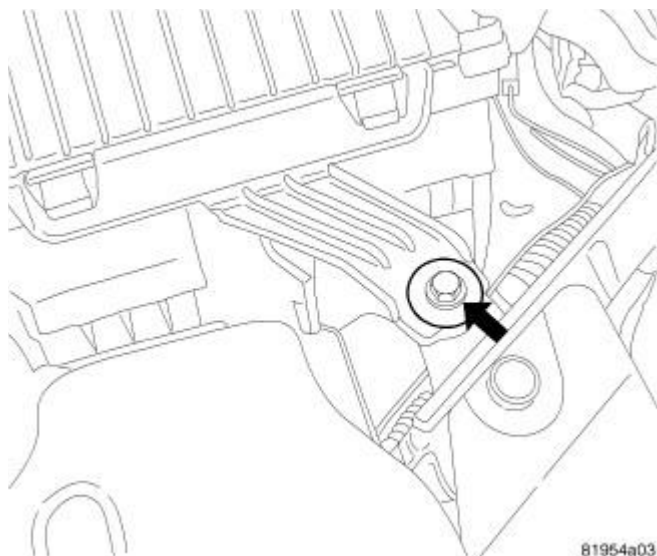


Fig. 140: MOUNTING BOLT
Courtesy of CHRYSLER LLC

1. Install the air cleaner housing straight down on the locating pins.
2. Install the air cleaner housing hold down fastener and tighten to 5 N.m (45 in. lbs.).

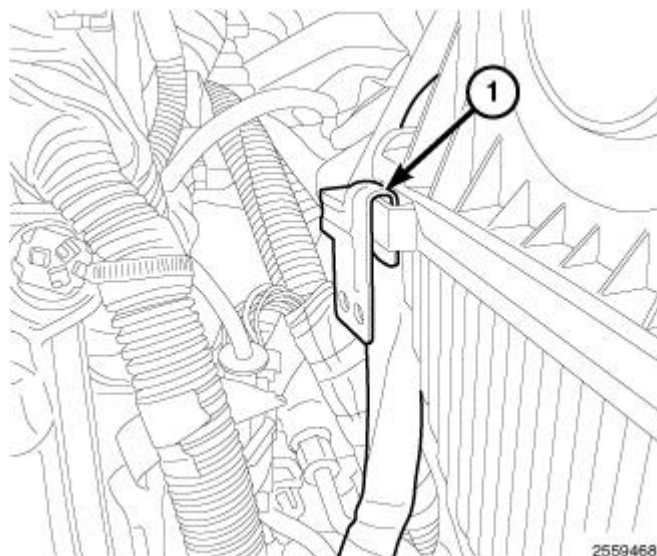


Fig. 141: Starter Cable Support Bracket
Courtesy of CHRYSLER LLC

3. Engage the starter cable support bracket (1) to the air cleaner housing.

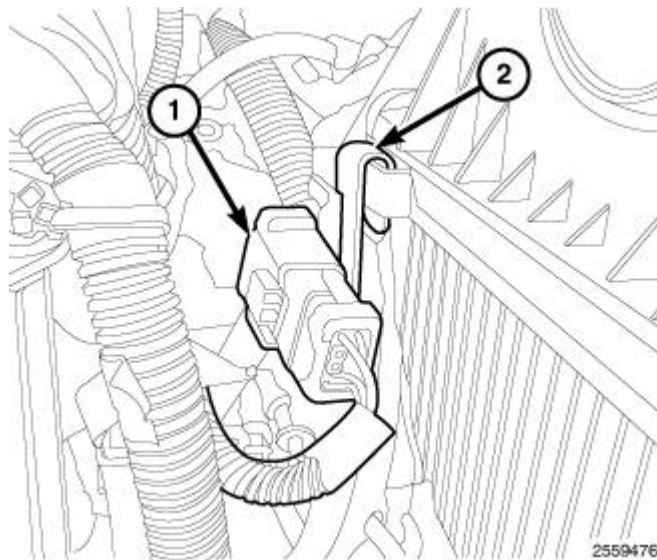


Fig. 142: Identifying Starter Cable Support Bracket & Harness Connector
Courtesy of CHRYSLER LLC

4. Engage the wire harness connector (1) to the starter cable support bracket (2).

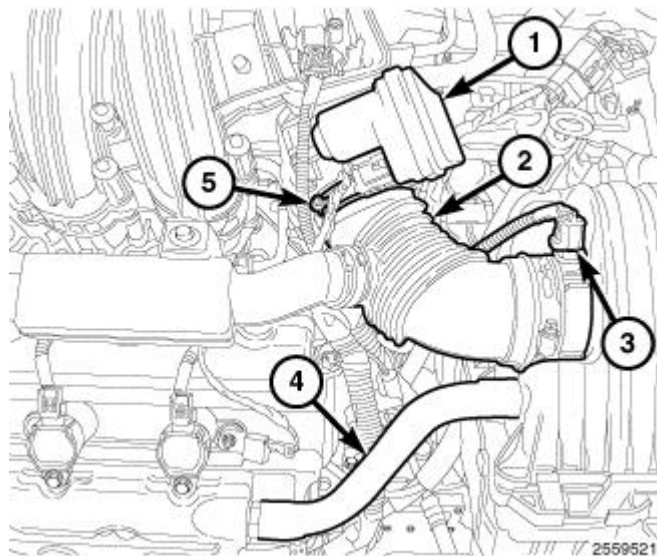


Fig. 143: Identifying Air Makeup Hose, Throttle Body & Air Inlet Hose
Courtesy of CHRYSLER LLC

5. Install the throttle body air inlet hose (2) to the throttle body (1). Tighten the hose clamp (5) to 4 N.m (35 in. lbs.).
6. Connect the fresh air makeup hose (4).
7. Connect the inlet air temperature sensor electrical connector (3).
8. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).

CYLINDER HEAD

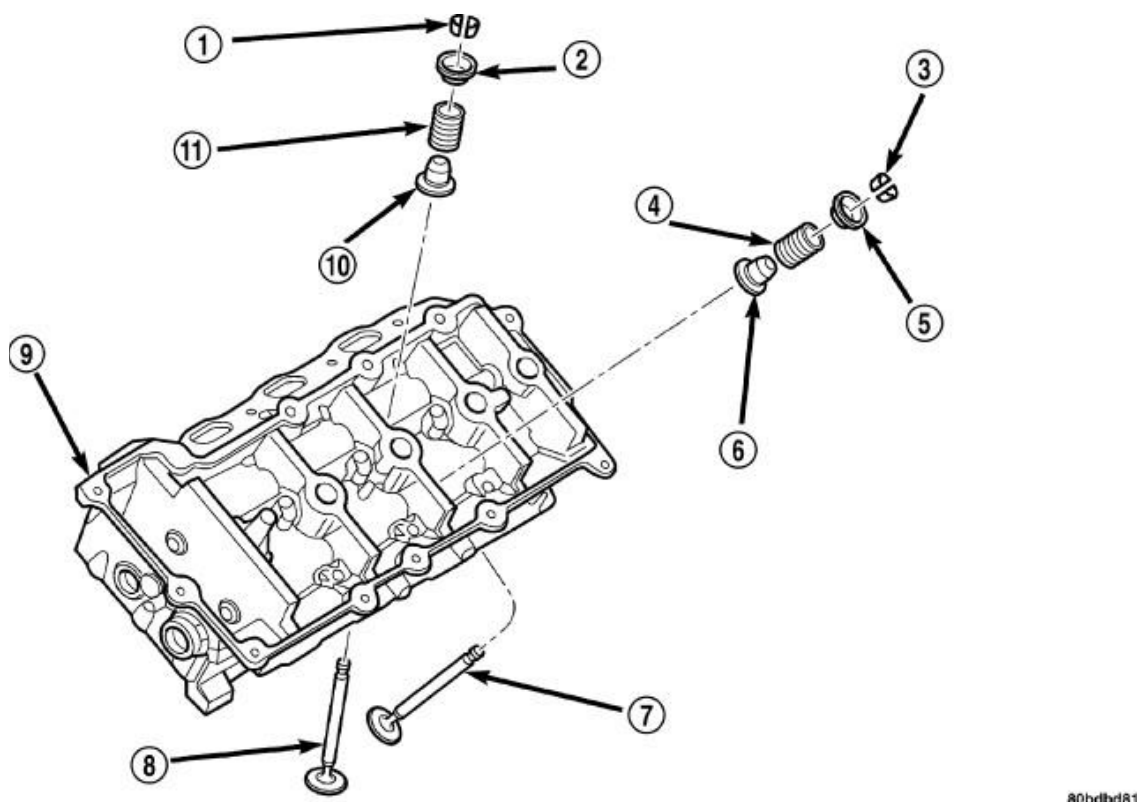
DESCRIPTION**DESCRIPTION**

Fig. 144: VALVE, SPRING SEAT/SEAL, SPRING, RETAINER AND LOCKS
 Courtesy of CHRYSLER LLC

1 - VALVE KEEPER	7 - VALVE-EXHAUST
2 - SPRING RETAINER	8 - VALVE-INTAKE
3 - VALVE KEEPER	9 - CYLINDER HEAD
4 - VALVE SPRING-EXHAUST	10 - VALVE STEM SEAL
5 - SPRING RETAINER	11 - VALVE SPRING-INTAKE
6 - VALVE STEM SEAL	-

The cylinder heads are made of an aluminum alloy. The cylinder head features four valves (8) per cylinder with pressed in powdered metal valve guides. The cylinder heads provide enclosures for the timing chain drive, necessitating a unique right and left cylinder head.

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 **CYLINDER COMPRESSION PRESSURE TEST**. 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.

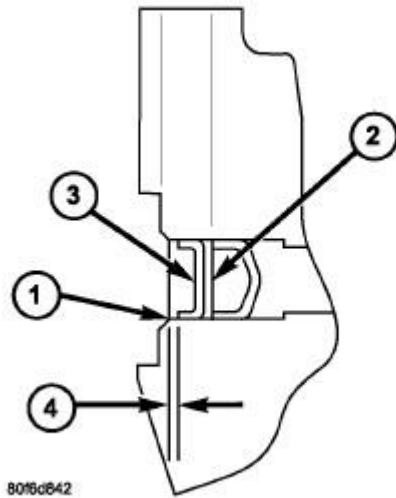
STANDARD PROCEDURE**CYLINDER HEAD OIL GALLERY CUP PLUG SERVICE**

Fig. 145: Oil Gallery Cup Plug
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CUP PLUG BORE CHAMFER
2 - ORIGINAL CUP PLUG
3 - NEW CUP PLUG
4 - 1-2 mm |
|--|

NOTE: DETERMINE WHICH CUP PLUG IS LEAKING BEFORE PERFORMING THIS PROCEDURE. IF NECESSARY, PERFORM AN ENGINE OIL LEAK DYE TEST.

Each cylinder head on a 2.7L engine has 6 external oil gallery cup plugs. It is not necessary to remove the original cup plug to install a new cup plug (3). The cup plug bore is deep enough to allow for two plugs. If it becomes necessary to service an oil gallery cup plug, perform the Repair Procedure.

NOTE: INSPECT THE CUP PLUG BORE IN QUESTION FOR THE PRESENCE OF TWO CUP PLUGS. IF THE CUP PLUG FLANGE IS JUST INSIDE (1-2 MM) THE CHAMFERED EDGE OF THE BORE TWO CUP PLUGS ARE ALREADY IN PLACE AND THE CYLINDER HEAD CANNOT BE REPAIRED.

Repair Procedure

1. Remove component(s) necessary to gain access to the oil gallery cup plug requiring service.

NOTE: SOME OF THE OIL GALLERY CUP PLUGS ARE SERVICEABLE WITH THE

HEAD INSTALLED ON THE ENGINE AND THE ENGINE IN THE VEHICLE, WHILE OTHERS REQUIRE REMOVING THE AFFECTED CYLINDER HEAD FROM THE ENGINE. IN EITHER CASE ONLY REPLACE THE CUP PLUG REQUIRING SERVICE.

2. Clean the cup plug bore with brake cleaner and compressed air. It is not necessary to remove the existing cup plug.
3. Lightly coat the new cup plug with sealer; p/n 04318083.
4. Using an appropriate installation tool drive the new cup plug into the bore until the flanged edge of the plug is just inside (1-2 mm) the chamfered edge of the bore.
5. Allow the sealant to cure for at least 20 minutes.
6. Assemble any components removed in step # 1 as necessary.

REMOVAL

REMOVAL

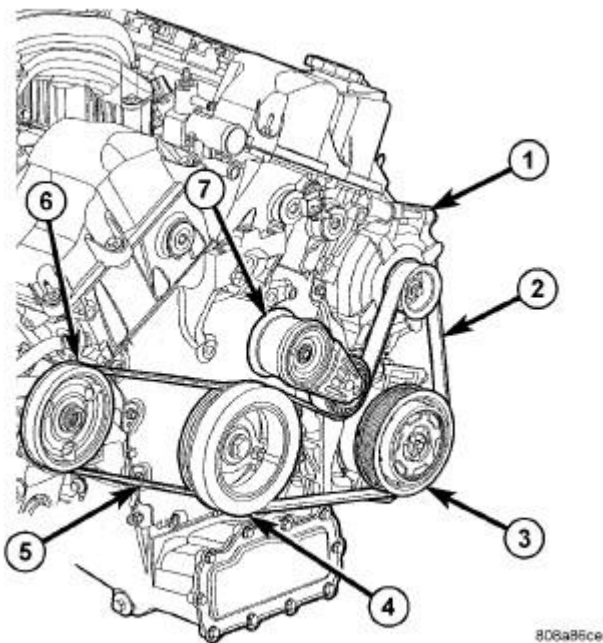
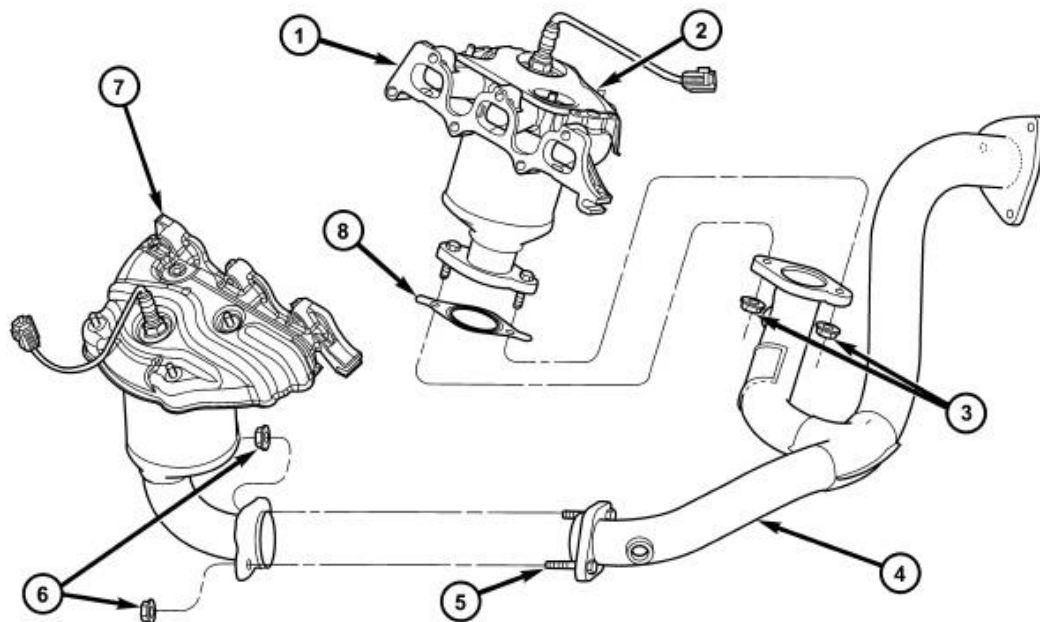


Fig. 146: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

- | |
|--------------------------------------|
| 1 - GENERATOR
2 - IDLER/TENSIONER |
|--------------------------------------|

1. Perform fuel pressure release procedure **before attempting any repairs.** . Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Disconnect negative cable from remote jumper terminal.

3. Drain cooling system.
4. Remove accessory drive belts. Refer to Cooling/Accessory Drive/BELT, Serpentine - Removal .



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Fig. 147: CROSS-UNDER PIPE
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - EXHAUST MANIFOLD - REAR
 2 - CATALYTIC CONVERTER ATTACHING STUD
 3 - NUTS - PIPE-TO-REAR CONVERTER
 4 - CROSS-UNDER PIPE
 5 - BOLT - PIPE-TO-FRONT CONVERTER
 6 - NUT - PIPE-TO-FRONT CONVERTER
 7 - EXHAUST MANIFOLD - FRONT
 8 - GASKET - PIPE-TO-CONVERTER</p> |
|--|

5. Remove the vibration damper. See Engine/Engine Block/DAMPER, Vibration - Removal.
6. Remove exhaust cross-under pipe. Refer to Exhaust System/PIPE, Exhaust Crossunder - Removal .
7. Remove the appropriate catalytic converter. Refer to Exhaust System/CONVERTER, Catalytic - Removal .

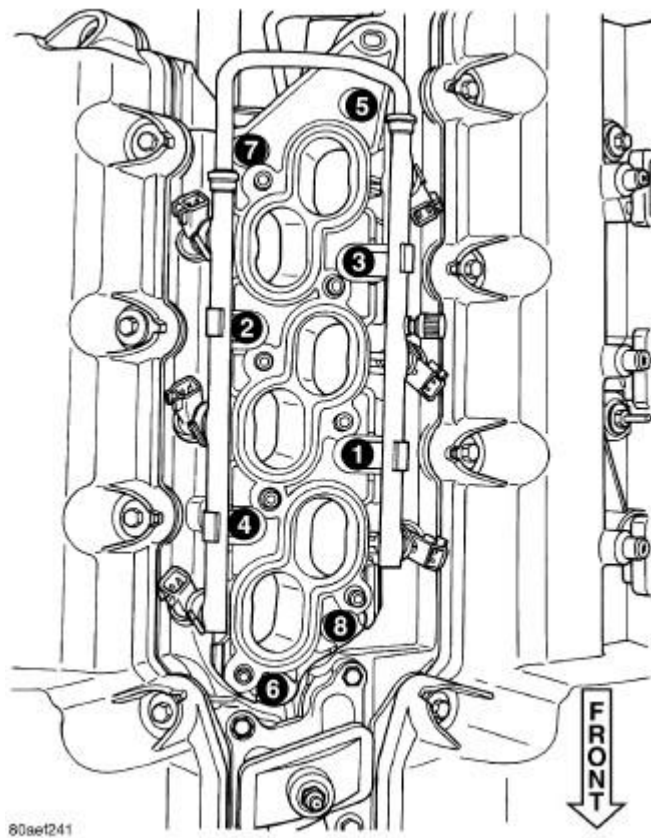


Fig. 148: Lower Intake Manifold Tightening Sequence
 Courtesy of CHRYSLER LLC

8. Remove oil pressure sensor heat shield. Disconnect oil pressure sensor connector.
9. Remove upper and lower intake manifolds. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.

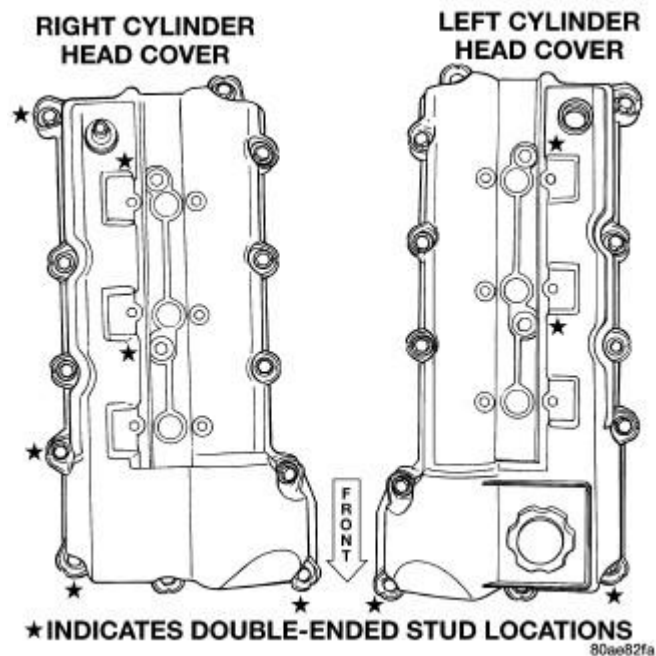


Fig. 149: Cylinder Head Covers
Courtesy of CHRYSLER LLC

10. Remove cylinder head covers. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.**
11. Disconnect camshaft position sensor and crankshaft position sensor connectors.
12. Reposition engine wiring harness to left side of vehicle.

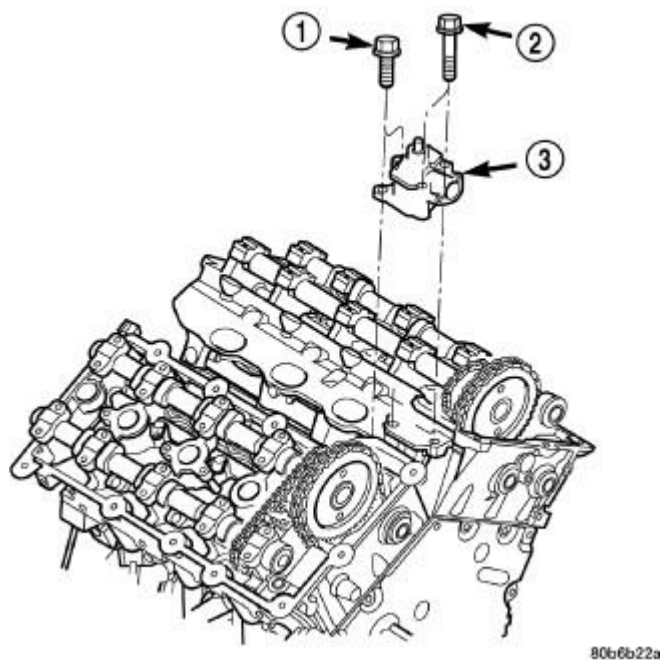


Fig. 150: Coolant Outlet Connector- 2.7L

Courtesy of CHRYSLER LLC

- | |
|------------------------------|
| 1 - BOLT (2) |
| 2 - BOLT (2) |
| 3 - COOLANT OUTLET CONNECTOR |

13. Remove coolant outlet connector (3). Refer to **Cooling/Engine/HOUSING, Coolant Outlet - Removal**.

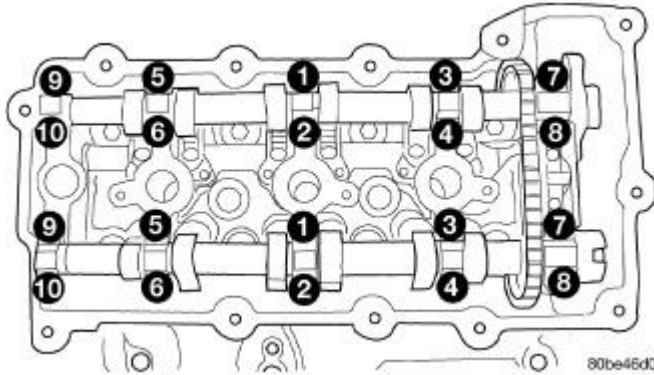


Fig. 151: Camshaft Bearing Caps
Courtesy of CHRYSLER LLC

14. Remove timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.
15. Rotate crankshaft until crankshaft sprocket timing mark aligns with timing mark on oil pump housing.
16. Remove primary timing chain. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal**.
17. Remove upper primary timing chain guides.
18. Remove camshaft bearing caps **gradually** in REVERSE sequence of installation (10-1).

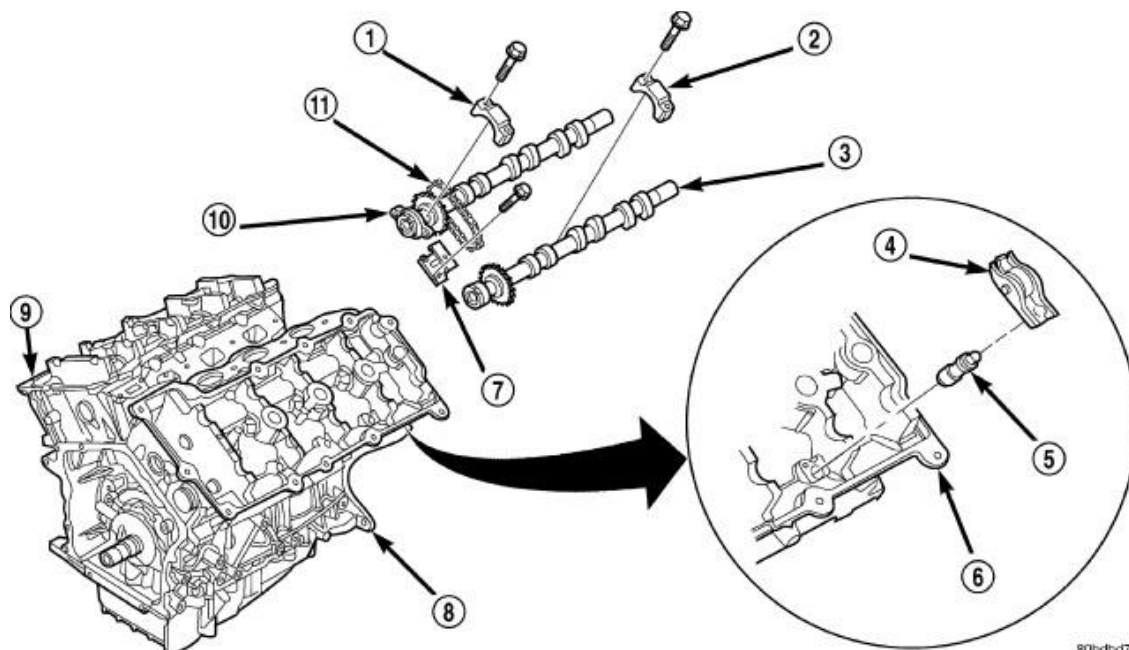


Fig. 152: Camshaft and Valvetrain Components
Courtesy of CHRYSLER LLC

1 - CAMSHAFT BEARING CAP - INTAKE	7 - CAMSHAFT (SECONDARY) CHAIN TENSIONER
2 - CAMSHAFT BEARING CAP - EXHAUST	8 - CYLINDER BLOCK
3 - CAMSHAFT - EXHAUST	9 - CYLINDER HEAD
4 - ROCKER ARM	10 - CAMSHAFT - INTAKE
5 - HYDRAULIC LIFTER	11 - CAMSHAFT (SECONDARY) TIMING CHAIN
6 - CYLINDER HEAD	

19. Remove camshafts (10) and valvetrain components from cylinder head. Note component locations for re-installation in original locations.
20. For left cylinder head removal:
 - Remove fastener securing engine oil dipstick tube to cylinder head. Remove engine oil dipstick tube.
 - Remove generator.
21. For right cylinder head removal:
 - Remove cylinder head ground strap.
 - Disconnect EGR valve electrical connector (if equipped).

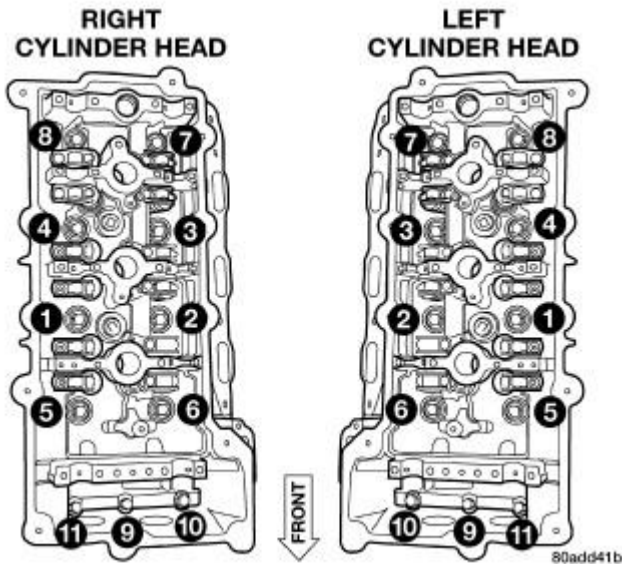


Fig. 153: CYLINDER HEAD BOLTS
Courtesy of CHRYSLER LLC

CAUTION: Ensure cylinder head bolts 11-9 are removed before attempting the removal of cylinder head, as damage to cylinder head and/or block may occur.

22. Remove cylinder head bolts in reverse sequence of installation starting with bolts 11-9, then bolts 8-1.
23. Remove cylinder head(s).
24. Remove and discard cylinder head gasket.
25. Clean cylinder head and block sealing surfaces. See Engine/Cylinder Head - Cleaning.

CLEANING

CLEANING

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 Engine - Standard Procedure. Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

INSPECTION

INSPECTION

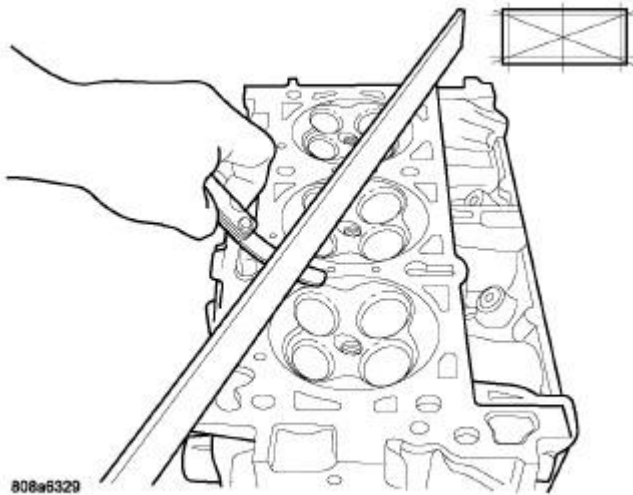


Fig. 154: Checking Cylinder Head Flatness-Typical
Courtesy of CHRYSLER LLC

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

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.

- 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.

INSTALLATION

INSTALLATION

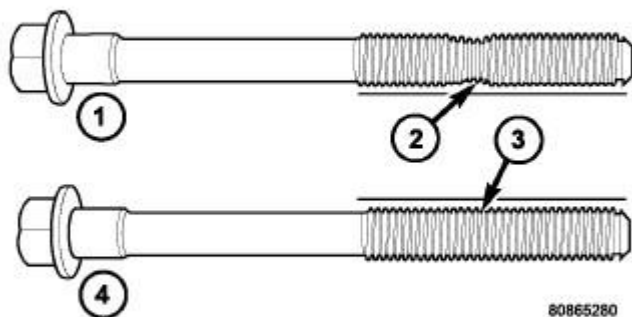


Fig. 155: Check for Stretched Bolts

Courtesy of CHRYSLER LLC

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

NOTE: The cylinder head bolts (4) 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 straight edge against the threads. If all the threads do not contact the scale, the bolt must be replaced.

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.

1. Clean sealing surfaces of cylinder head and block. See **Engine - Standard Procedure**.
2. Lubricate bolt threads with clean engine oil and install bolts.
3. Install new head gasket over locating dowels.

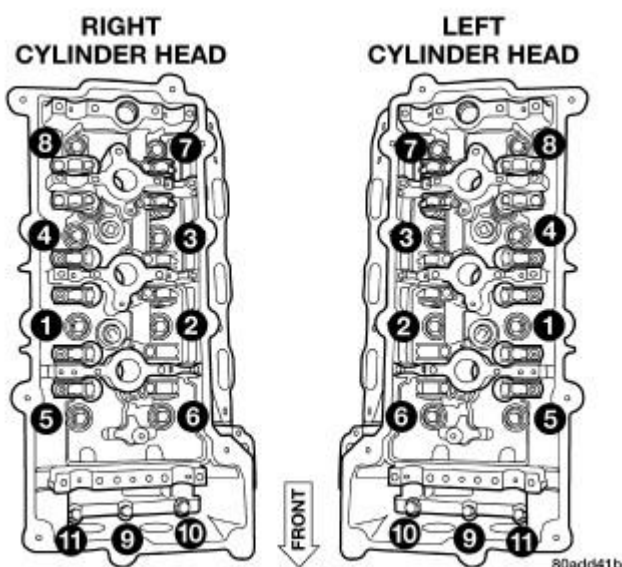


Fig. 156: Cylinder Head Tightening Sequence
Courtesy of CHRYSLER LLC

4. Install cylinder head to block, assuring head is properly positioned over locating dowels.
5. Tighten bolts in sequence shown in illustration, using the following steps and torque values:
 - Step 1: Bolts 1-8 to 48 N.m (35 ft. lbs.)
 - Step 2: Bolts 1-8 to 75 N.m (55 ft. lbs.)
 - Step 3: Bolts 1-8 to 75 N.m (55 ft. lbs.)
 - Step 4: Bolts 1-8 to +90° Turn **Do not use a torque wrench for this step.**
 - Step 5: Bolts 9-11 to 28 N.m (250 in. lbs.)
6. For left cylinder head installation:
 - Install engine oil dipstick tube.
 - Install generator.
7. For right cylinder head installation:
 - Install cylinder head ground strap.
 - Connect EGR valve electrical connector (if equipped).

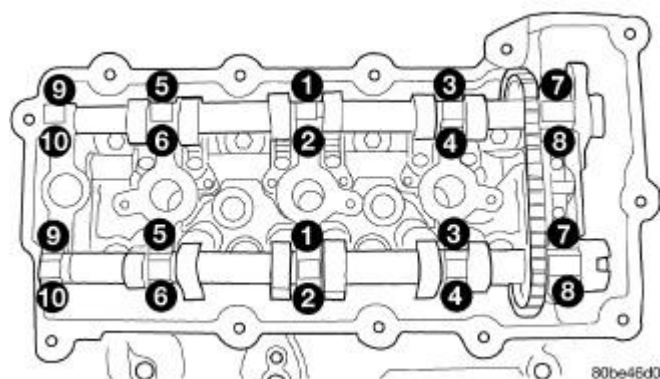
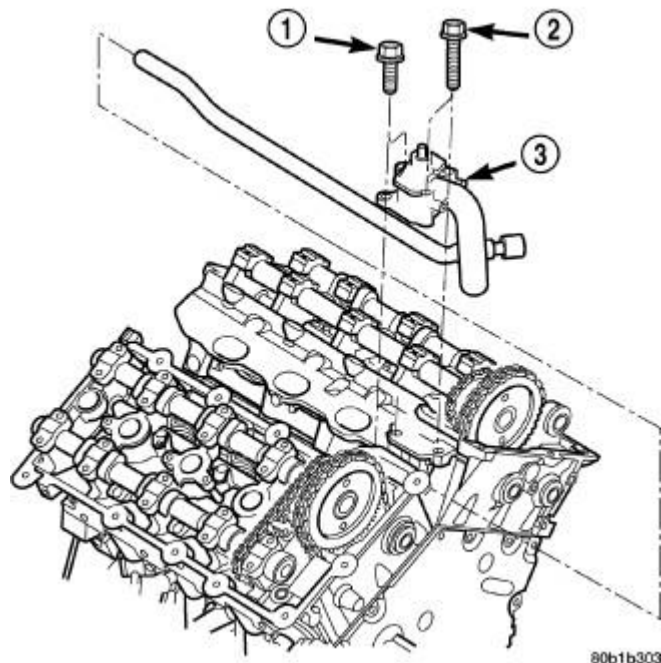


Fig. 157: Camshaft Bearing Cap Tightening Sequence

Courtesy of CHRYSLER LLC

8. Install all valvetrain components and camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation**. Tighten camshaft bearing caps in sequence shown in illustration to 12 N.m (105 in. lbs.).
9. Install primary timing chain, guides and sprockets. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation**.

**Fig. 158: WATER OUTLET CONNECTOR**

Courtesy of CHRYSLER LLC

- | |
|----------------------------|
| 1 - BOLT (2) |
| 2 - BOLT (2) |
| 3 - WATER OUTLET CONNECTOR |

10. Install coolant outlet connector (3). Refer to **Cooling/Engine/HOUSING, Coolant Outlet - Installation**.

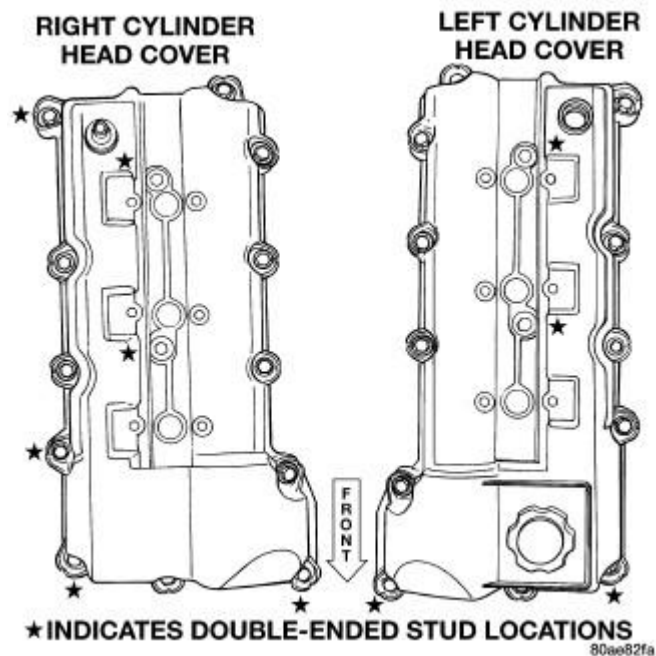


Fig. 159: Cylinder Head Covers
Courtesy of CHRYSLER LLC

11. Install cylinder head covers. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**
12. Connect camshaft position sensor and crankshaft position sensor connectors.
13. Install timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
14. Install crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation.**

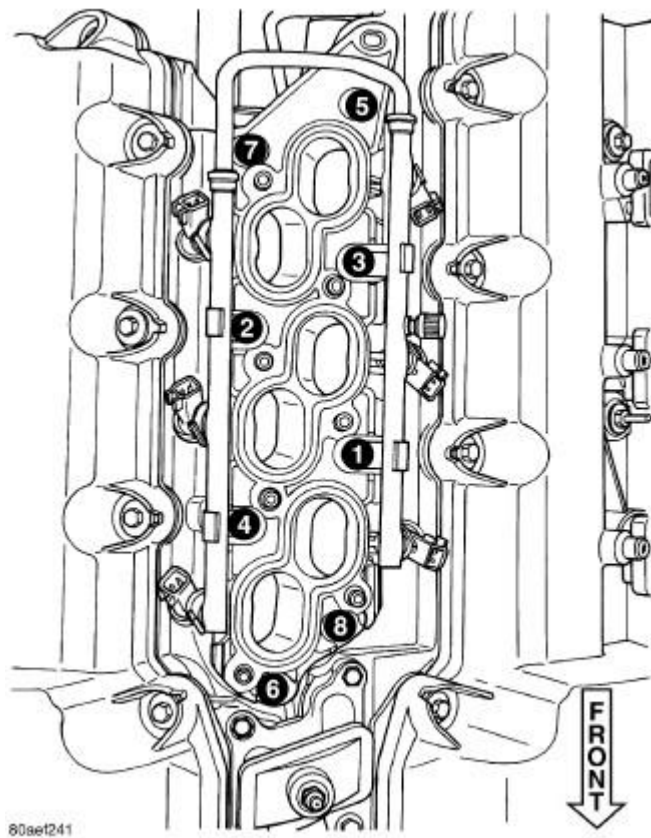
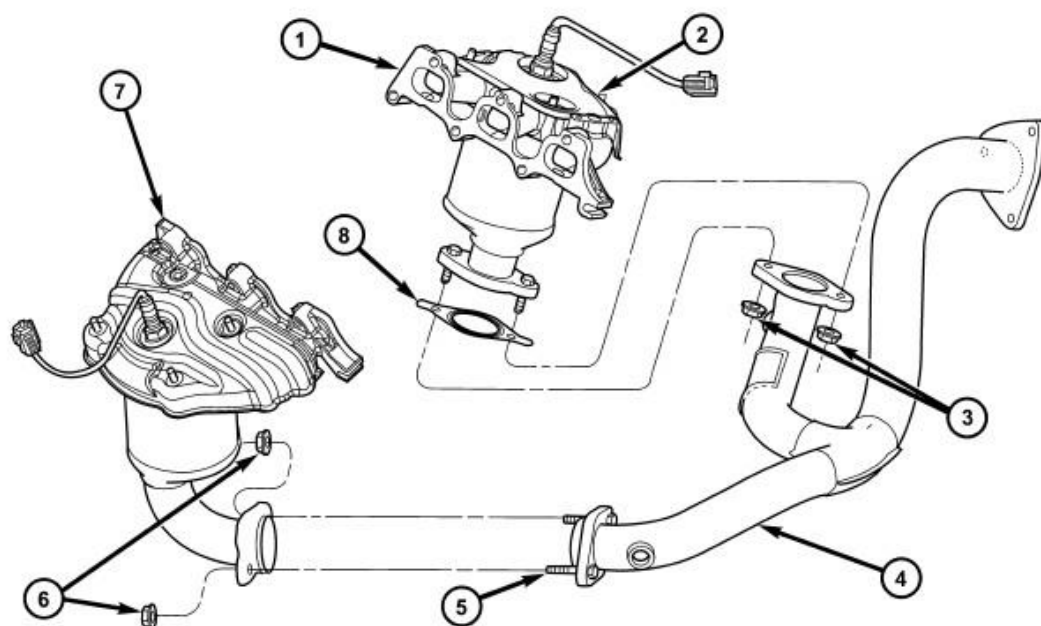


Fig. 160: Lower Intake Manifold Tightening Sequence
 Courtesy of CHRYSLER LLC

15. Install lower and upper intake manifolds. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.
16. Connect oil pressure sensor connector. Install oil pressure sensor heat shield.
17. Install catalytic converter(s). Refer to **Exhaust System/CONVERTER, Catalytic - Installation**.



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Fig. 161: CROSS-UNDER PIPE
Courtesy of CHRYSLER LLC

- 1 - EXHAUST MANIFOLD - REAR
- 2 - CATALYTIC CONVERTER ATTACHING STUD
- 3 - NUTS - PIPE-TO-REAR CONVERTER
- 4 - CROSS-UNDER PIPE
- 5 - BOLT - PIPE-TO-FRONT CONVERTER
- 6 - NUT - PIPE-TO-FRONT CONVERTER
- 7 - EXHAUST MANIFOLD - FRONT
- 8 - GASKET - PIPE-TO-CONVERTER

18. Install exhaust cross-under pipe (4). Refer to **Exhaust System/PIPE, Exhaust Crossunder - Installation** .

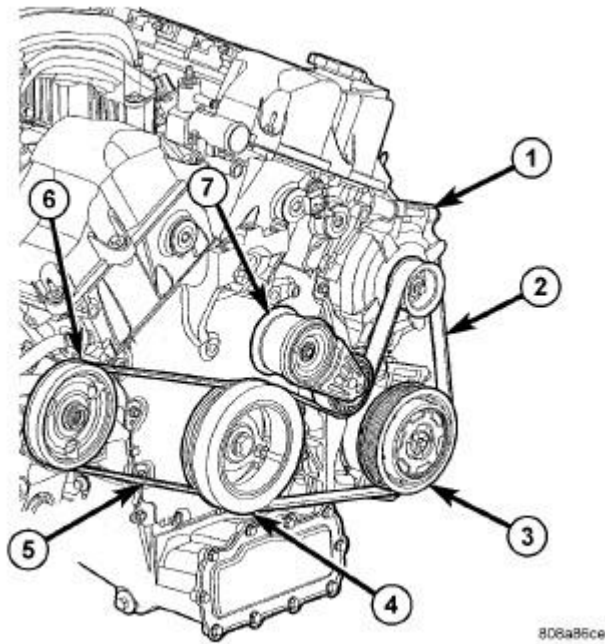


Fig. 162: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - GENERATOR
2 - IDLER/TENSIONER</p> |
|--|

19. Install accessory drive belts. Refer to Cooling/Accessory Drive/BELT, Serpentine - Installation .
20. Fill cooling system.
21. Connect negative cable to remote jumper terminal.

CAMSHAFT, ENGINE

Description

DESCRIPTION

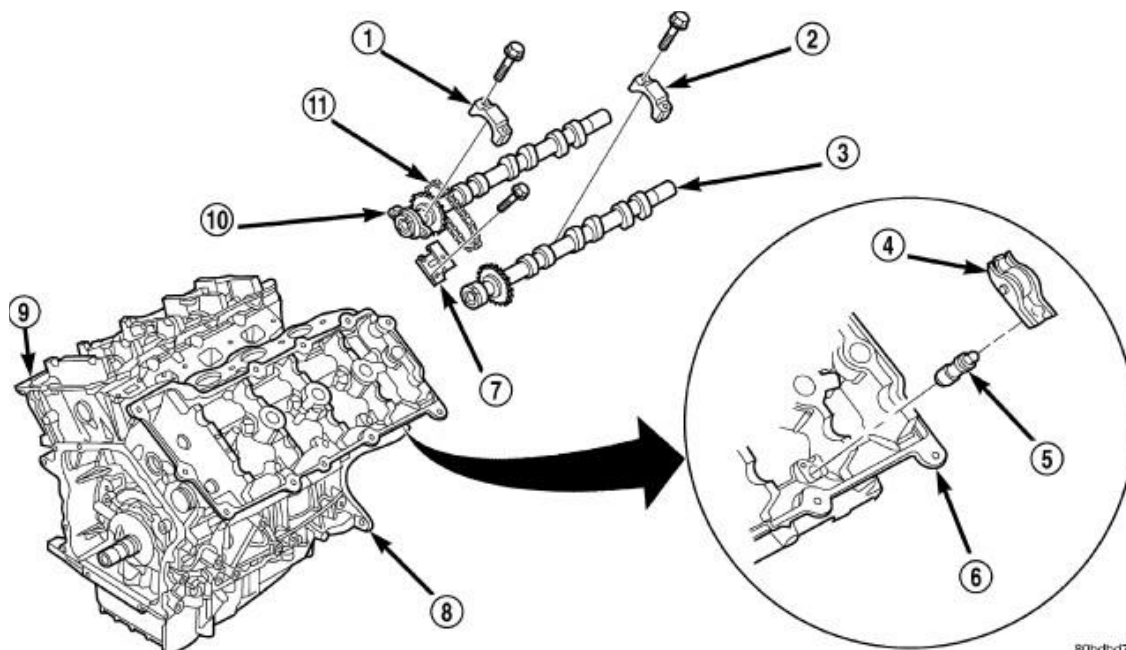


Fig. 163: Camshaft and Valvetrain Components
Courtesy of CHRYSLER LLC

1 - CAMSHAFT BEARING CAP - INTAKE	7 - CAMSHAFT (SECONDARY) CHAIN TENSIONER
2 - CAMSHAFT BEARING CAP - EXHAUST	8 - CYLINDER BLOCK
3 - CAMSHAFT - EXHAUST	9 - CYLINDER HEAD
4 - ROCKER ARM	10 - CAMSHAFT - INTAKE
5 - HYDRAULIC LIFTER	11 - CAMSHAFT (SECONDARY) TIMING CHAIN
6 - CYLINDER HEAD	

The assembled fabricated camshafts (3,10) are composed of five bearing journals machined into a hollow steel tube. Six steel lobes, a secondary timing drive sprocket, and a primary sprocket/thrust flange are pressed onto the camshaft tube using a unique assembly process. Camshaft end play is controlled by the primary camshaft sprocket attachment flange on the intake camshafts (10) and by a thrust flange on the exhaust camshafts.

Operation

OPERATION

The camshaft has precisely machined (egg shaped) lobes to provide accurate valve timing and duration. The camshaft is driven by the crankshaft via drive sprockets and chains.

Removal

REMOVAL

NOTE: The engine can be equipped with either conventional roller-type (early

production) or silent type (late production) secondary timing chains.

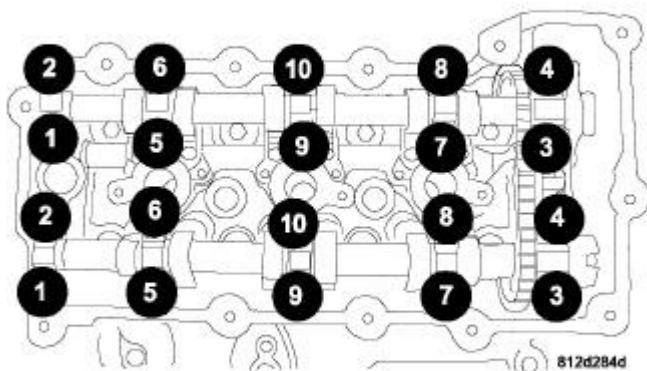


Fig. 164: CAM BEARING CAP REMOVAL

Courtesy of CHRYSLER LLC

1. Remove the primary timing chain. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.
2. Remove secondary chain tensioner mounting bolts.

NOTE: Camshaft bearing caps should have been marked during engine manufacturing. For example, number one exhaust camshaft bearing is marked "1E & gt;"

3. Slowly loosen camshaft bearing cap bolts in the sequence shown in illustration.

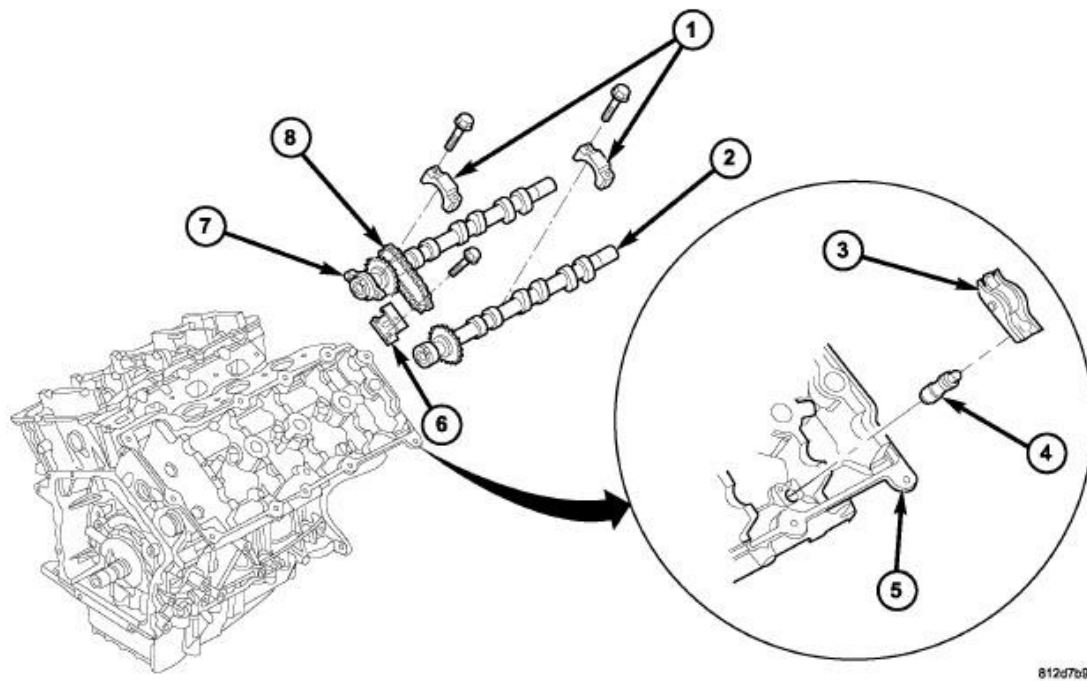


Fig. 165: VALVETRAIN
Courtesy of CHRYSLER LLC

4. Remove camshaft bearing caps (1).
5. Remove intake camshaft (7), exhaust camshaft (2), secondary timing chain (8), and secondary timing chain tensioner (6) together as an assembly.
6. Remove secondary timing chain tensioner (6) and secondary timing chain (8) from camshafts (2) and (7).
7. Inspect camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Inspection.**

Inspection

INSPECTION

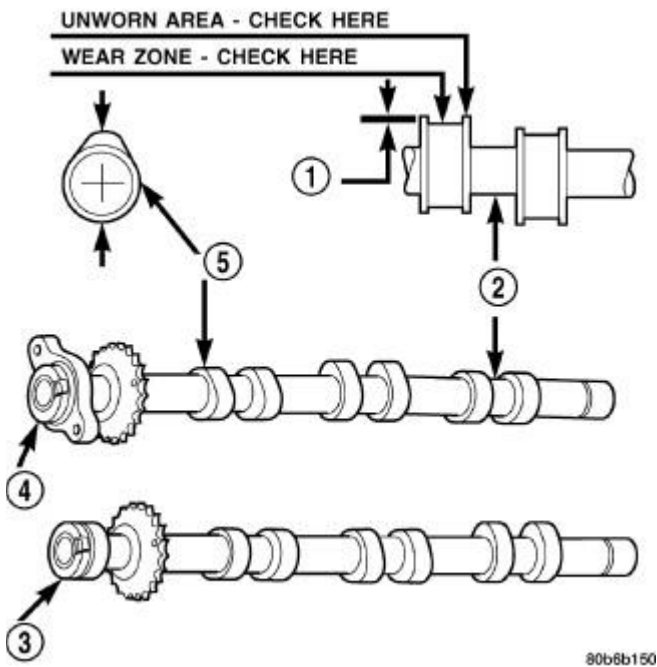


Fig. 166: Camshaft Inspection
Courtesy of CHRYSLER LLC

- 1 - ACTUAL WEAR
- 2 - BEARING JOURNAL
- 3 - EXHAUST CAMSHAFT
- 4 - INTAKE CAMSHAFT
- 5 - LOBE

1. Inspect camshaft bearing journals (2) for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Inspect camshaft sprockets for excessive wear. Replace camshafts if necessary.
3. Check the cam lobe surfaces for abnormal wear and damage. Replace camshaft if defective. Measure the actual wear and replace, if out of limits-standard value is 0.0254 mm (0.001 in.); wear **limit** is 0.254 mm (0.010 in.).

Installation

INSTALLATION

CAUTION: When the timing chain is removed and the cylinder heads are installed, **DO NOT** rotate the camshafts or crankshaft without first locating the proper crankshaft position. Failure to do so will result in valve and/or piston damage.

NOTE: The engine can be equipped with either conventional roller-type (early

production) or silent type (late production) secondary timing chains.

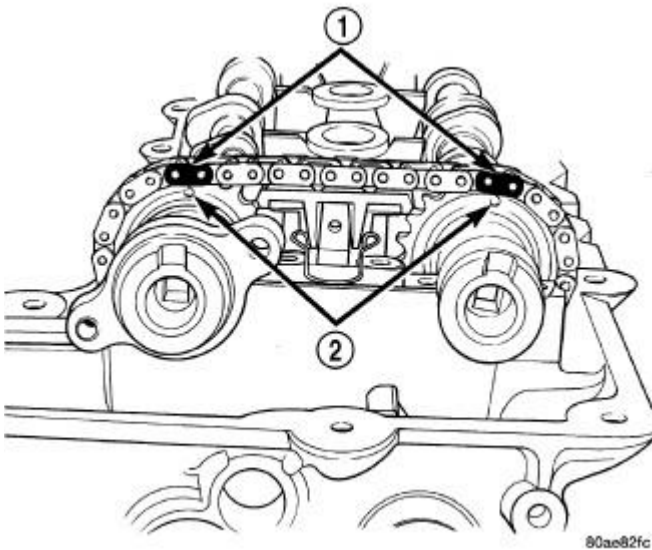


Fig. 167: Camshaft Chain Timing
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - PLATED CHAIN LINKS
2 - CAMSHAFT TIMING MARKS (DOTS) |
|--|

1. For engines equipped with roller chains (early production), assemble camshaft chain on the cams ensuring that the plated links (1) are aligned with the timing dot (2) on the camshaft sprockets.

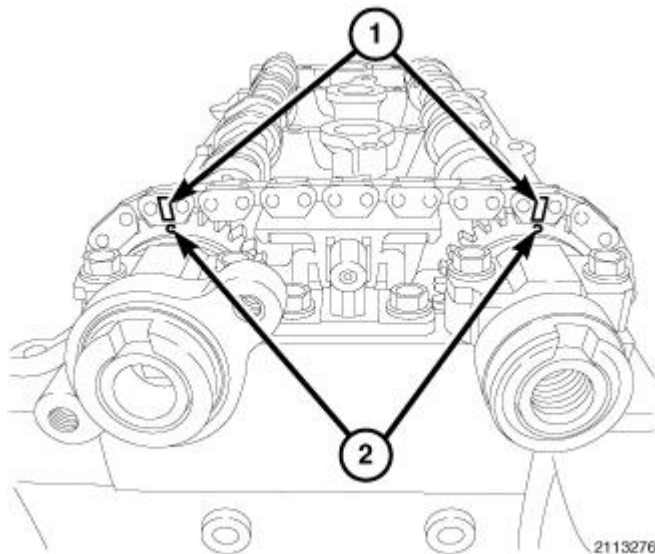


Fig. 168: Identifying Marked Links & Timing Dot On Camshaft Sprockets
Courtesy of CHRYSLER LLC

2. For engines equipped with silent chains (late production) assemble camshaft chain on the cams ensuring

that the marked links (1) are aligned with the timing dot (2) on the camshaft sprockets.

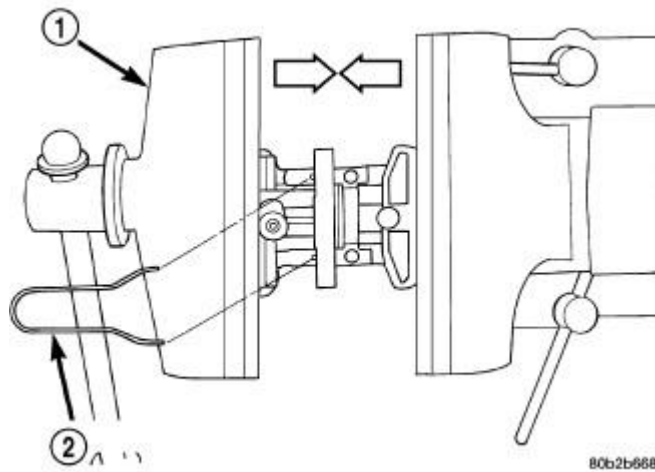


Fig. 169: Locking Camshaft (Secondary) Chain Tensioner
Courtesy of CHRYSLER LLC

1 - VISE
2 - LOCK PIN

3. If camshaft chain tensioner is already in the compressed and locked position, proceed to step 4.
4. When the camshaft chain tensioner is removed, it is necessary to compress and lock the tensioner using the following procedures:
 - a. Place tensioner (1) into a soft jaw vise.
 - b. SLOWLY compress tensioner until fabricated lock pin (2) or the equivalent can be inserted into the locking holes.
 - c. Remove compressed and locked tensioner from the vise.
5. Insert the compressed and locked camshaft chain tensioner in-between the camshafts and chain.

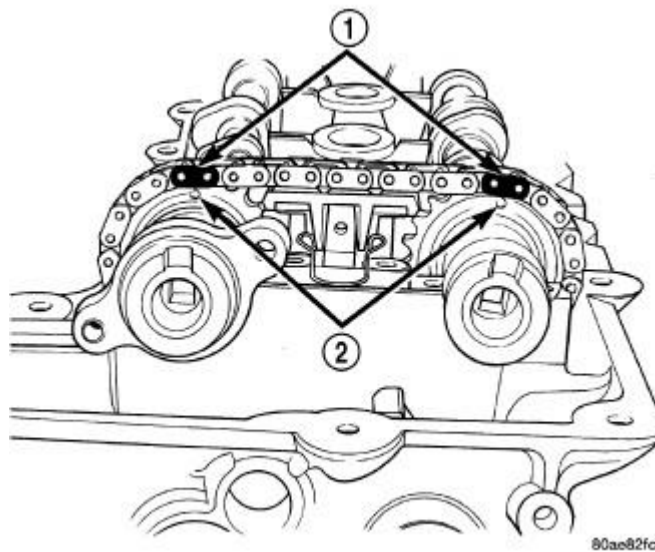


Fig. 170: Camshaft Chain Timing
Courtesy of CHRYSLER LLC

1 - PLATED CHAIN LINKS
2 - CAMSHAFT TIMING MARKS (DOTS)

6. For engines equipped with roller chains (early production), rotate the cams so that the plated links (1) and dots (2) are facing the 12:00 O'clock position.

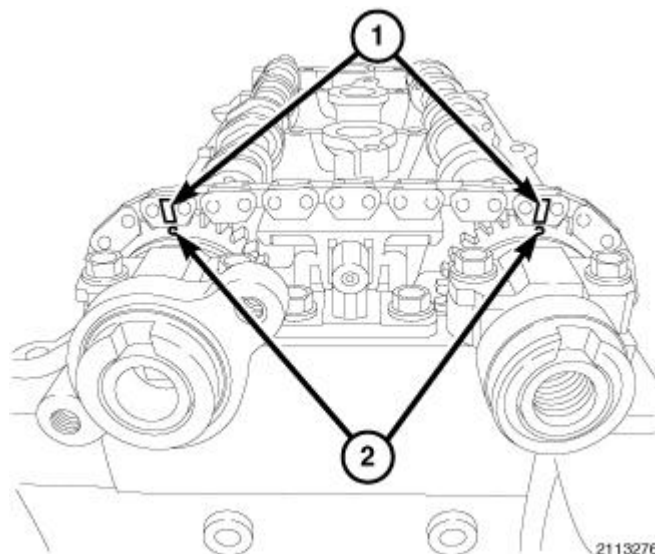


Fig. 171: Identifying Marked Links & Timing Dot On Camshaft Sprockets
Courtesy of CHRYSLER LLC

7. For engines equipped with silent chains (late production), rotate the cams so that the marked links (1) and dots (2) are facing the 12:00 O'clock position.

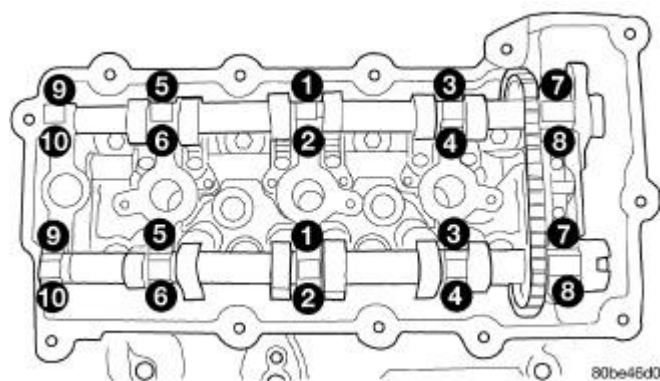


Fig. 172: Camshaft Bearing Cap Tightening Sequence
Courtesy of CHRYSLER LLC

8. Install cams to cylinder head. Verify that rocker arms are correctly seated and in proper positions.
9. Install camshaft bearing caps. Verify that bearing caps are installed in same position as removed.
10. Tighten cam bearing cap bolts gradually in sequence shown in illustration to 12 N.m (105 in. lbs.).
11. Install secondary chain tensioner bolts and tighten to 12 N.m (105 in. lbs.).
12. Remove locking pin from secondary tensioners.
13. Verify end play of camshafts are within specification. See Engine - Specifications.
14. Install the primary timing chain. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.

COVER(S), CYLINDER HEAD, LEFT

Removal

REMOVAL

1. Disconnect negative battery cable.
2. Disconnect electrical connectors from ignition coils and capacitor. Reposition electrical harness.
3. Remove ground strap from cylinder head cover stud.

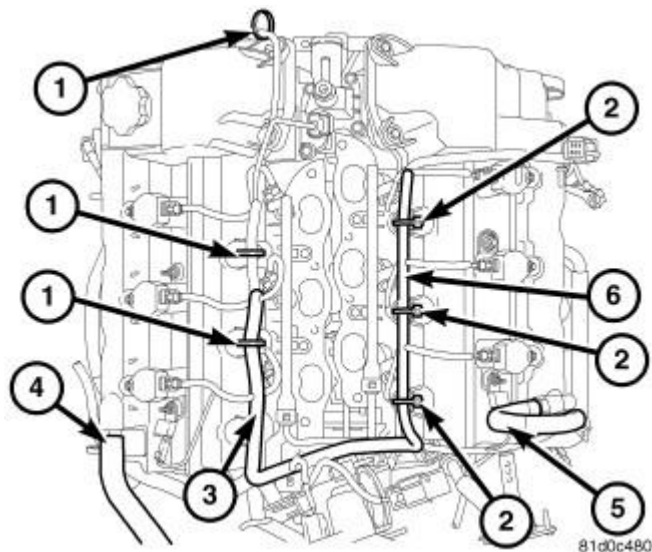


Fig. 173: 2.7L ENGINE WIRING HARNESS

Courtesy of CHRYSLER LLC

1 - Left cylinder head cover engine harness retainers
2 - Right cylinder head cover engine harness retainers
3 - Left engine harness
4 - Makeup air hose
5 - PCV Hose
6 - Right engine harness

4. Disconnect engine harness retaining clips (1) from cylinder head cover studs. Position the engine harness (3) aside.
5. Remove fastener attaching ignition coil capacitor.
6. Remove ignition coils. Refer to **Electrical/Ignition Control/COIL, Ignition - Removal**.

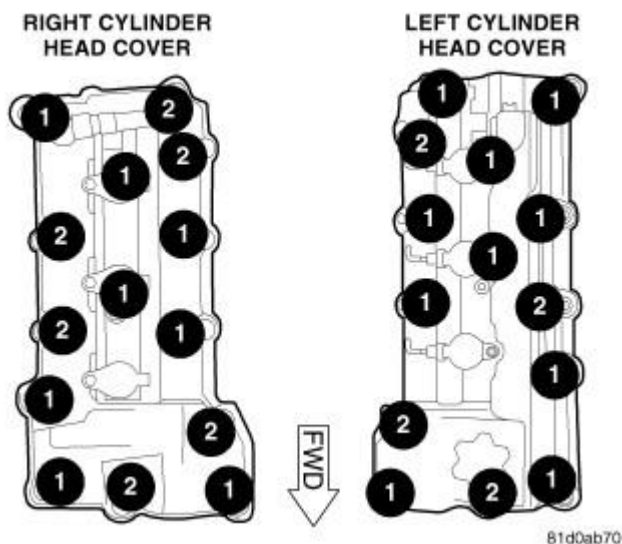


Fig. 174: Cylinder Head Cover Fasteners

Courtesy of CHRYSLER LLC

- | |
|------------------------|
| 1 - DOUBLE ENDED STUDS |
| 2 - BOLTS |

7. Loosen all left cylinder head cover fasteners.

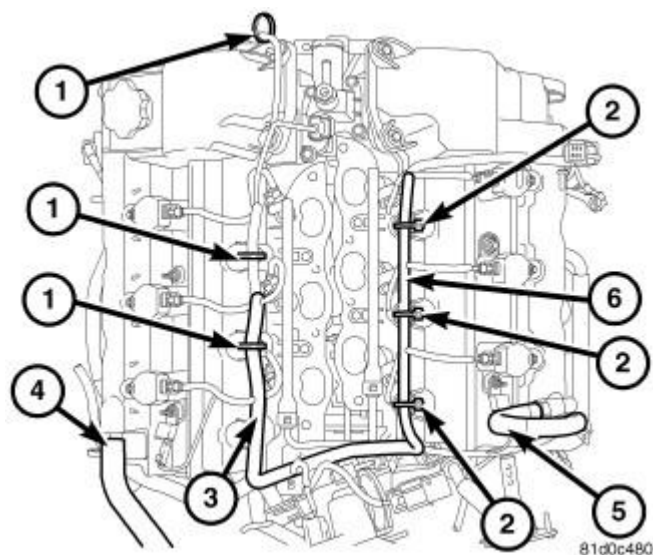


Fig. 175: 2.7L ENGINE WIRING HARNESS

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - Left cylinder head cover engine harness retainers |
| 2 - Right cylinder head cover engine harness retainers |
| 3 - Left engine harness |
| 4 - Makeup air hose |
| 5 - PCV Hose |
| 6 - Right engine harness |

8. Disconnect the makeup air hose (4).

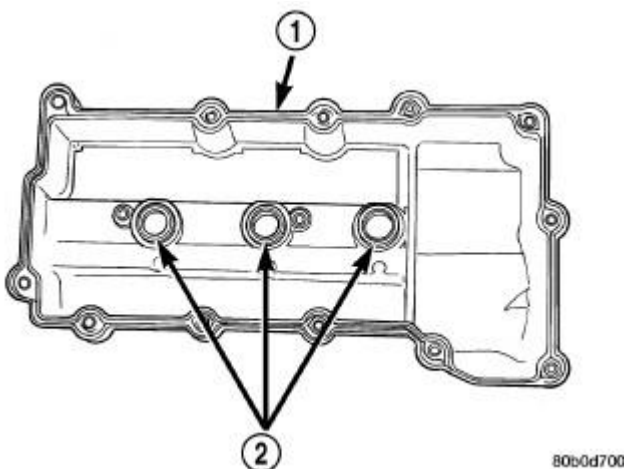


Fig. 176: Cylinder Head Cover Gasket and Spark Plug Seals
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - ONE PIECE GASKET</p> <p>2 - SPARK PLUG WELL SEALS</p> |
|--|

NOTE: Cylinder head cover attaching bolts are captured to the cover.

CAUTION: Make certain the double ended studs in the center of the cylinder head cover are loose before attempting to remove cover.

- Remove the left cylinder head cover (1).

Installation

INSTALLATION

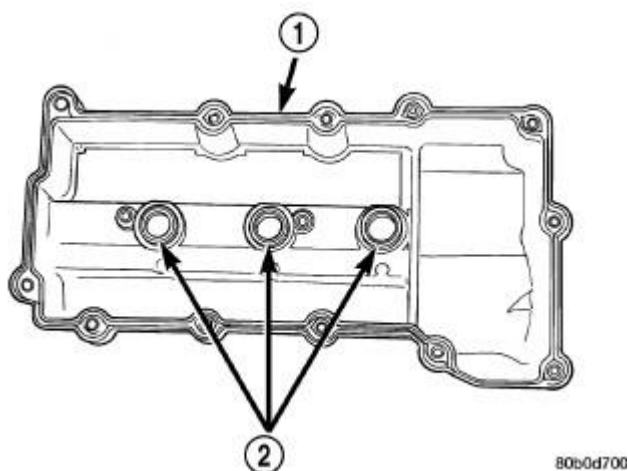


Fig. 177: Cylinder Head Cover Gasket and Spark Plug Seals
Courtesy of CHRYSLER LLC

- 1 - ONE PIECE GASKET
2 - SPARK PLUG WELL SEALS

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gaskets (1) as necessary.

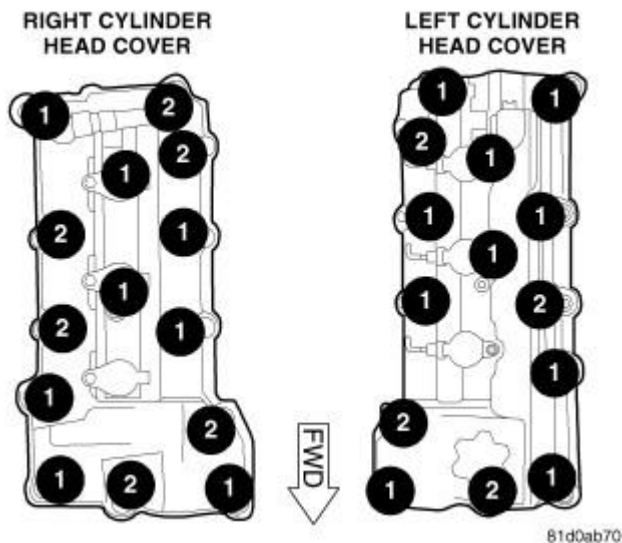


Fig. 178: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

- 1 - DOUBLE ENDED STUDS
2 - BOLTS

2. Install cylinder head cover and hand start all fasteners. Verify that all double-ended studs are in the correct locations (1).
3. Tighten cylinder head cover attaching bolts and double-ended studs to 12 N.m (105 in. lbs.).

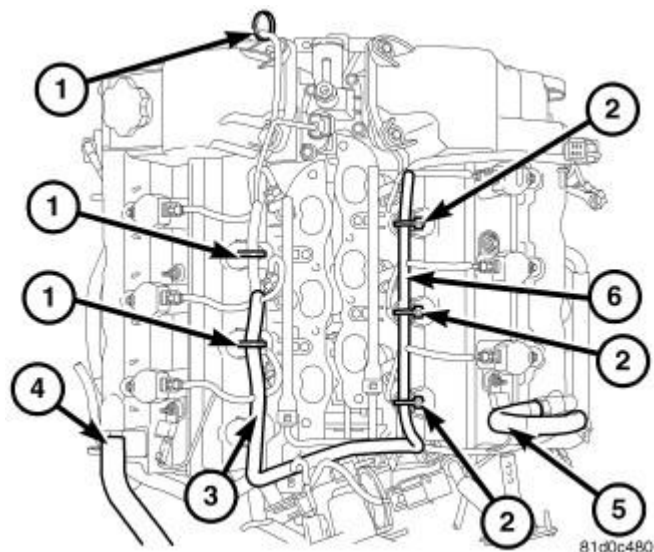
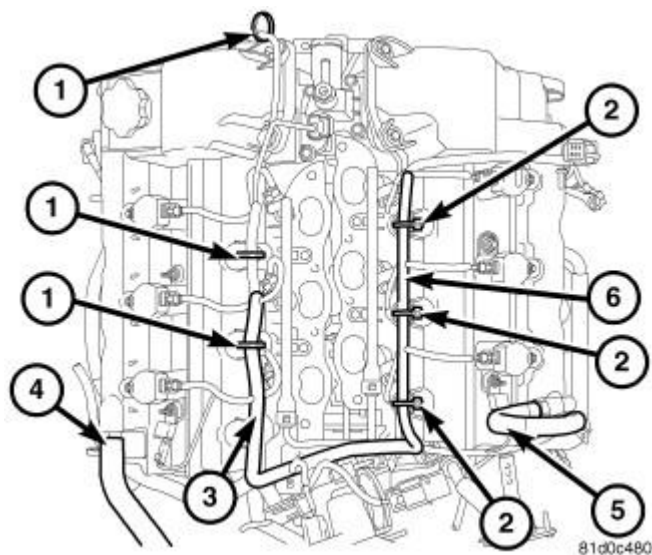


Fig. 179: 2.7L ENGINE WIRING HARNESS

Courtesy of CHRYSLER LLC

1 - Left cylinder head cover engine harness retainers
2 - Right cylinder head cover engine harness retainers
3 - Left engine harness
4 - Makeup air hose
5 - PCV Hose
6 - Right engine harness

4. Reposition the left engine harness (3), and install the left engine harness retainers (1) to the double-ended studs.
5. Install the ignition coils. Refer to **Electrical/Ignition Control/COIL, Ignition - Installation**.
6. Install ignition coil capacitor and fastener.
7. Reconnect all electrical connectors.
8. Install ground strap to cylinder head cover stud.

**Fig. 180: 2.7L ENGINE WIRING HARNESS**

Courtesy of CHRYSLER LLC

1 - Left cylinder head cover engine harness retainers
2 - Right cylinder head cover engine harness retainers
3 - Left engine harness
4 - Makeup air hose
5 - PCV Hose
6 - Right engine harness

9. Install the makeup air hose.
10. Connect negative battery cable.

COVER(S), CYLINDER HEAD, RIGHT**Removal****REMOVAL**

1. Disconnect negative battery cable.

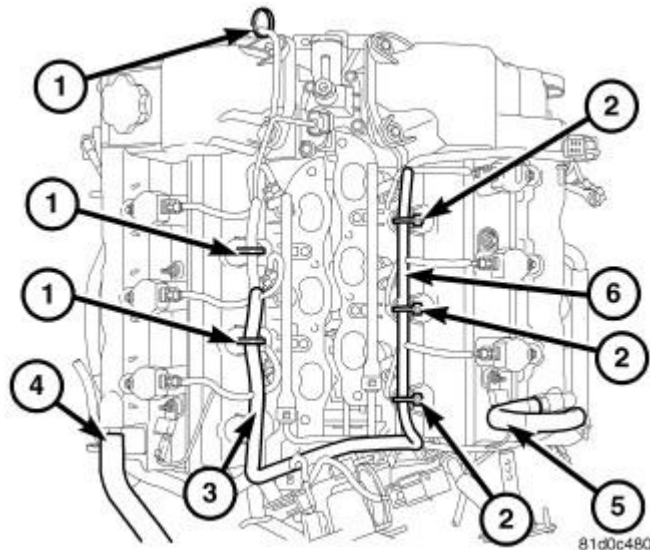


Fig. 181: 2.7L ENGINE WIRING HARNESS
Courtesy of CHRYSLER LLC

1 - Left cylinder head cover engine harness retainers
2 - Right cylinder head cover engine harness retainers
3 - Left engine harness
4 - Makeup air hose
5 - PCV Hose
6 - Right engine harness

2. Disconnect electrical connectors from ignition coils and capacitor.
3. Disconnect right engine harness retaining clips (2) from cylinder head cover studs. Position the engine harness (6) aside.
4. Disconnect the PCV hose (5) from the upper intake manifold.
5. Remove upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.

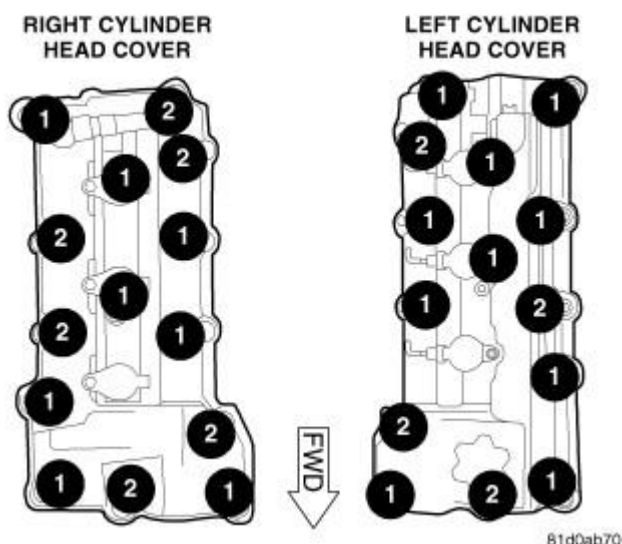


Fig. 182: Cylinder Head Cover Fasteners
 Courtesy of CHRYSLER LLC

1 - DOUBLE ENDED STUDS 2 - BOLTS

6. Remove ground strap from cylinder head cover stud.
7. Disconnect electrical harness retaining clips from cylinder head cover studs. Reposition electrical harness.
8. Remove fastener attaching ignition coil capacitor.
9. Remove ignition coils. Refer to **Electrical/Ignition Control/COIL, Ignition - Removal**.
10. Loosen all cylinder head cover fasteners.

NOTE: Cylinder head cover attaching bolts are captured to the cover.

CAUTION: Make certain the double ended studs in the center of the cylinder head cover are loose before attempting to remove cover.

11. Remove cylinder head cover.

Installation

INSTALLATION

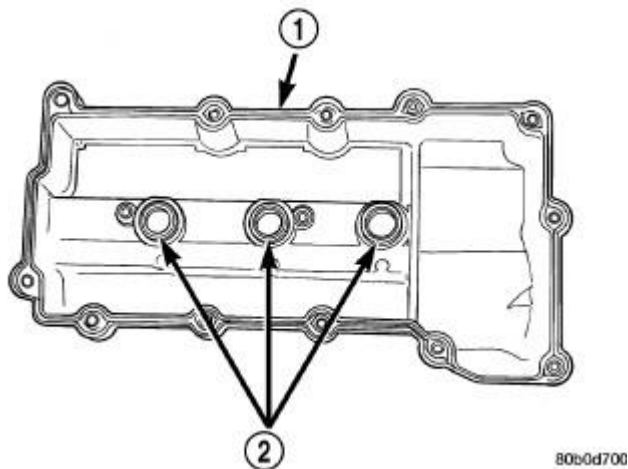


Fig. 183: Cylinder Head Cover Gasket and Spark Plug Seals
Courtesy of CHRYSLER LLC

- 1 - ONE PIECE GASKET
2 - SPARK PLUG WELL SEALS

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gaskets (1) as necessary.

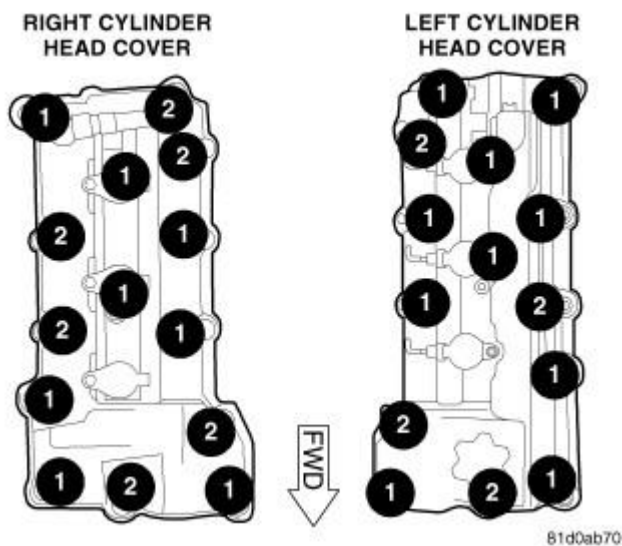


Fig. 184: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

- 1 - DOUBLE ENDED STUDS
2 - BOLTS

2. Install cylinder head cover and hand start all fasteners. Verify that all double-ended studs are in the correct locations.
3. Tighten cylinder head cover attaching bolts and double-ended studs (1) to 12 N.m (105 in. lbs.).

4. Install ignition coils. Refer to **Electrical/Ignition Control/COIL, Ignition - Installation** .
5. Install ignition coil capacitor and fastener.
6. Connect ground strap to cylinder head cover stud.

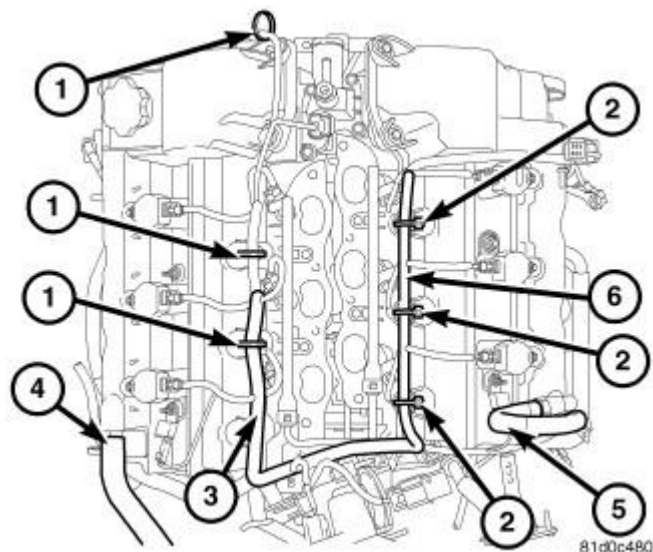


Fig. 185: 2.7L ENGINE WIRING HARNESS
 Courtesy of CHRYSLER LLC

1 - Left cylinder head cover engine harness retainers
2 - Right cylinder head cover engine harness retainers
3 - Left engine harness
4 - Makeup air hose
5 - PCV Hose
6 - Right engine harness

7. Reposition the right engine harness (6), and install the right engine harness retainers (2) to the double-ended studs.
8. Install upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.
9. Reconnect the PCV to the upper intake manifold.

LIFTER(S), HYDRAULIC

Diagnosis and Testing

HYDRAULIC LASH ADJUSTER 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 **LASH ADJUSTER (TAPPET) NOISE 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.

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) 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(s).

Removal

REMOVAL

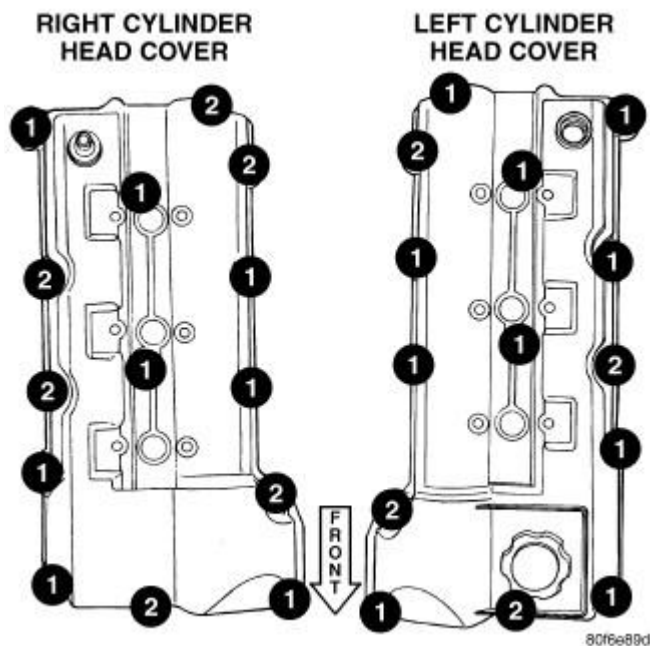


Fig. 187: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

1 - DOUBLE ENDED STUDS
2 - BOLTS

1. Install hydraulic lash adjuster making sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.
2. Install the rocker arm(s). See [Engine/Cylinder Head/ROCKER ARM, Valve - Installation](#).
3. Install the cylinder head covers. See [Engine/Cylinder Head/COVER\(S\), Cylinder Head - Installation](#).

ROCKER ARM, VALVE

Description

DESCRIPTION

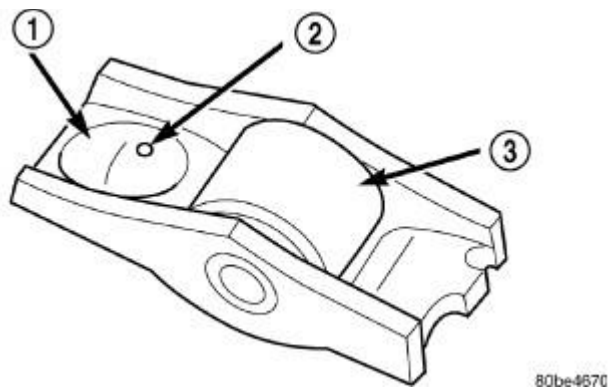


Fig. 188: Rocker Arm

Courtesy of CHRYSLER LLC

- 1 - LASH ADJUSTER POCKET
- 2 - OIL SQUIRT HOLE
- 3 - ROLLER

The rocker arms are composed of steel stampings with an integral roller bearing. The rocker arms incorporate a 0.5 mm (0.0197 in.) oil hole in the lash adjuster socket for roller/camshaft lobe lubrication.

Removal

REMOVAL

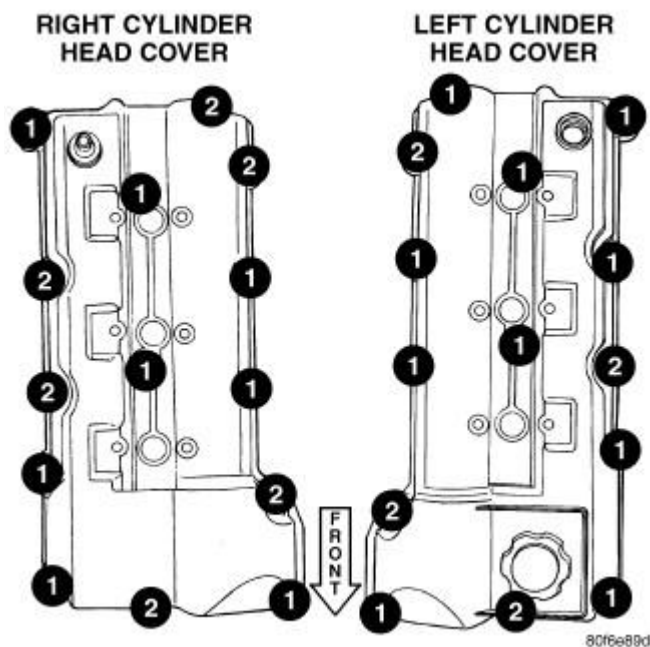


Fig. 189: Cylinder Head Cover Fasteners

Courtesy of CHRYSLER LLC

1 - DOUBLE ENDED STUDS

2 - BOLTS

1. Remove the cylinder head cover(s). See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.

CAUTION: Always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

2. Rotate engine until the cam lobe is on its base circle (heel), on the rocker arm being removed.

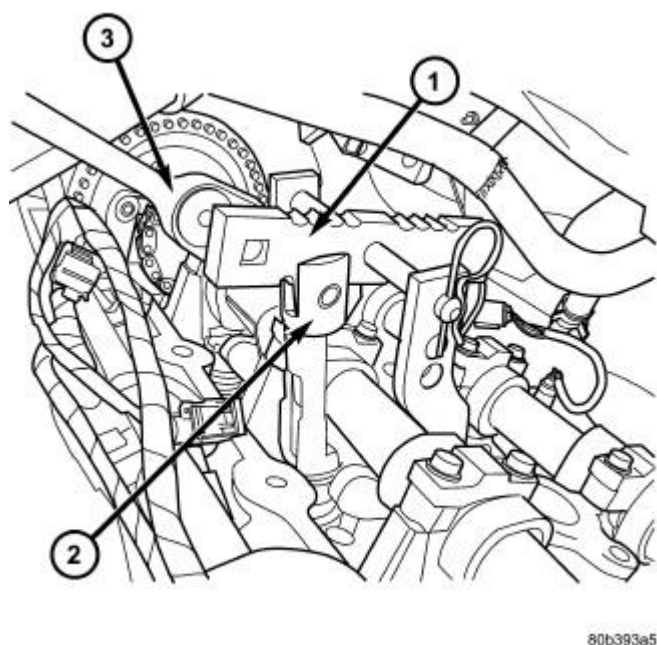


Fig. 190: Rocker Arm - Removal/Installation - 2.7L
Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR 8215-A
2 - VALVE SPRING ADAPTER 8216-A
3 - 3/8" DRIVE RATCHET

CAUTION: Depress valve spring only enough to remove rocker arm.

3. Using Valve Spring Compressor 8215A (1) and Valve Spring Adapter 8216A (2), depress valve spring only enough to release tension on rocker arm.
4. Remove rocker arm from cylinder head.

CAUTION: If rocker arms are to be reused, identify position of rocker arms for reassembly in their original positions.

5. Repeat procedure for each rocker arm removed.
6. Inspect the rocker arm for wear or damage. See Engine/Cylinder Head/ROCKER ARM, Valve - Inspection.

Inspection

INSPECTION

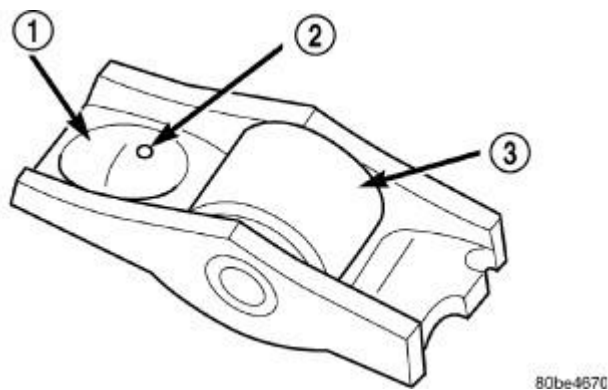


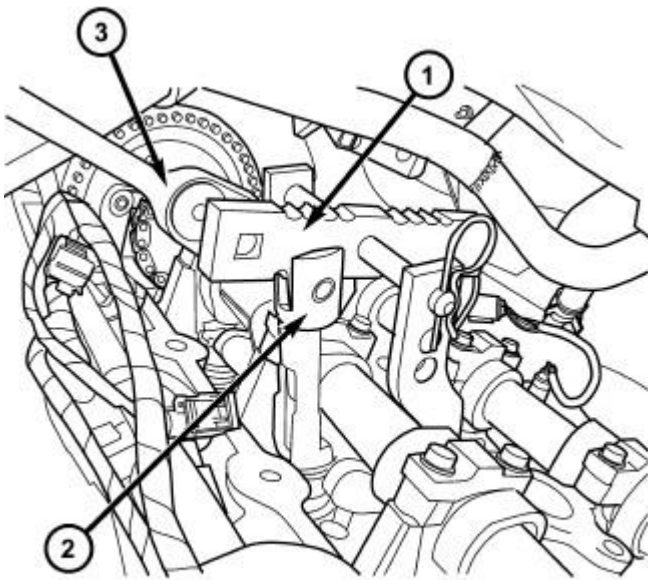
Fig. 191: Rocker Arm
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - LASH ADJUSTER POCKET
2 - OIL SQUIRT HOLE
3 - ROLLER |
|---|

Inspect the cam follower assembly for wear or damage. Replace as necessary.

Installation

INSTALLATION



80b393a5

Fig. 192: Rocker Arm - Removal/Installation - 2.7L
Courtesy of CHRYSLER LLC

- 1 - SPECIAL TOOL 8215A
- 2 - SPECIAL TOOL 8216A
- 3 - 3/8" DRIVE RATCHET

1. Lubricate rocker arms with clean engine oil before installation.
2. Rotate engine until cam lobe is on its base circle (heel) of rocker arm being installed.
3. Using Special Tools 8215A (1) and 8216A Adaptor, depress valve spring only enough to install rocker arm.
4. Install rocker arm in original position (if reused) over valve and lash adjuster. Release tension on valve spring.

NOTE: Inspect rocker arm for proper engagement into lash adjuster and valve tip.

5. Repeat procedure for each rocker arm being installed.

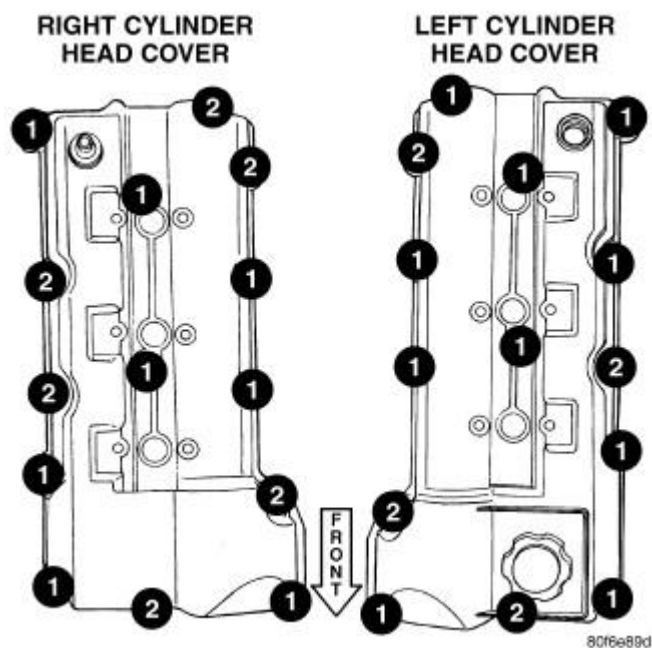


Fig. 193: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

1 - DOUBLE ENDED STUDS
2 - BOLTS

6. Install cylinder head cover(s). Refer to procedure in this service information.

SEAL(S), VALVE GUIDE

Removal

REMOVAL

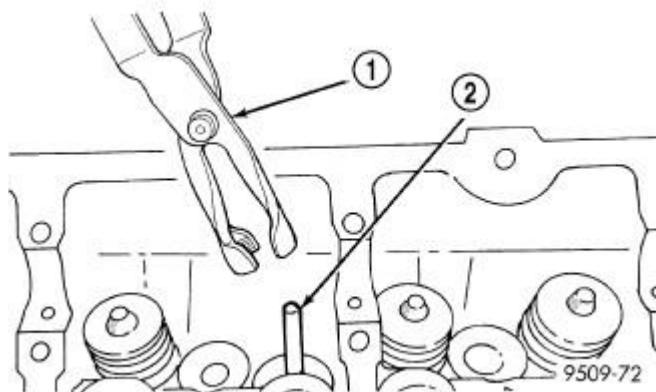


Fig. 194: Valve Stem Seal-Removal/Installation
Courtesy of CHRYSLER LLC

1 - VALVE SEAL TOOL

2 - VALVE STEM

1. Remove valve spring. See Engine/Cylinder Head/SPRING(S), Valve - Removal.
2. Remove valve stem seal by using a valve seal tool.

Installation

INSTALLATION

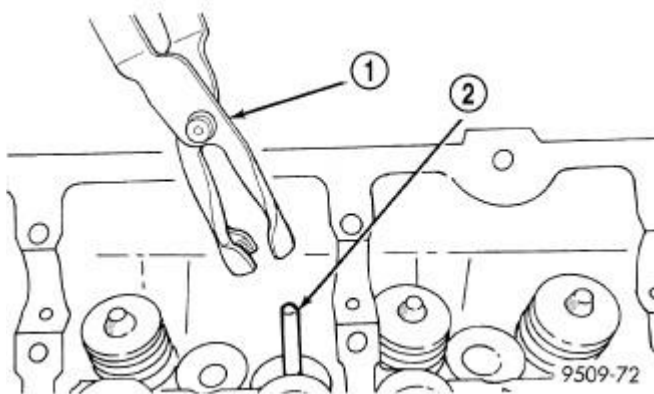


Fig. 195: Valve Stem Seal-Removal/Installation
Courtesy of CHRYSLER LLC

1 - VALVE SEAL TOOL

2 - VALVE STEM

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.
2. Install valve spring. See Engine/Cylinder Head/SPRING(S), Valve - Installation.

SPRING(S), VALVE

Description

DESCRIPTION

The valve springs are made from high strength, chrome-silicon steel. The springs are common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which incorporates a garter spring to maintain consistent lubrication control to the valve stem.

Removal

IN VEHICLE

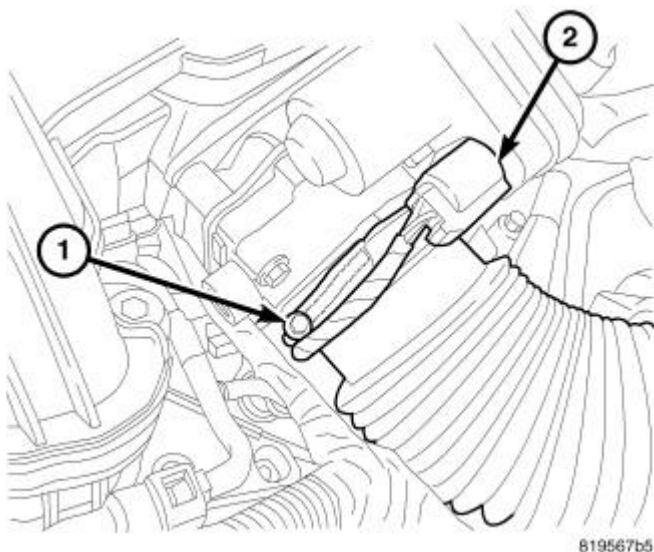


Fig. 196: Air Cleaner Housing & Inlet Hose

Courtesy of CHRYSLER LLC

1. Perform fuel system pressure release procedure **before attempting any repairs.** . Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Disconnect negative cable from remote jumper terminal.
3. Remove air cleaner housing and inlet hose (1).

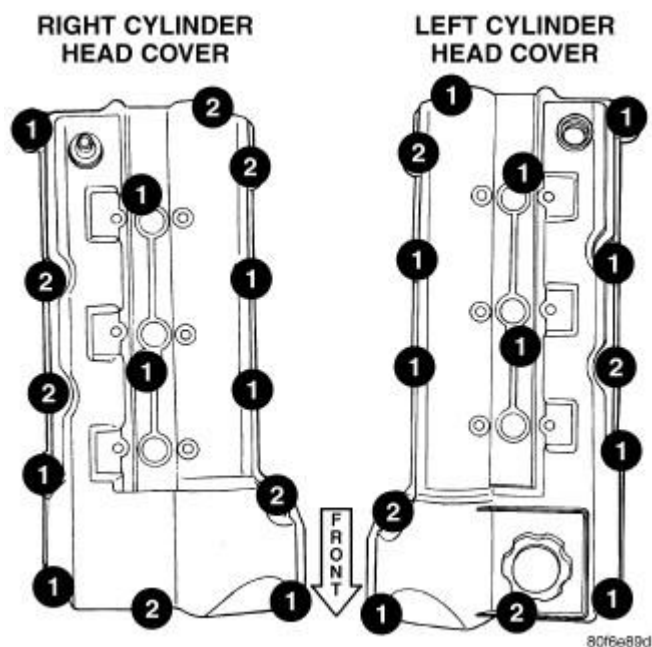


Fig. 197: Cylinder Head Cover Fasteners

Courtesy of CHRYSLER LLC

- 1 - DOUBLE ENDED STUDS
- 2 - BOLTS

4. Remove upper intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Removal.
5. Remove cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
6. Remove crankshaft vibration damper, timing chain cover, and timing chain. See Engine/Engine Block/DAMPER, Vibration - Removal. See Engine/Valve Timing/COVER(S), Engine Timing - Removal. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.

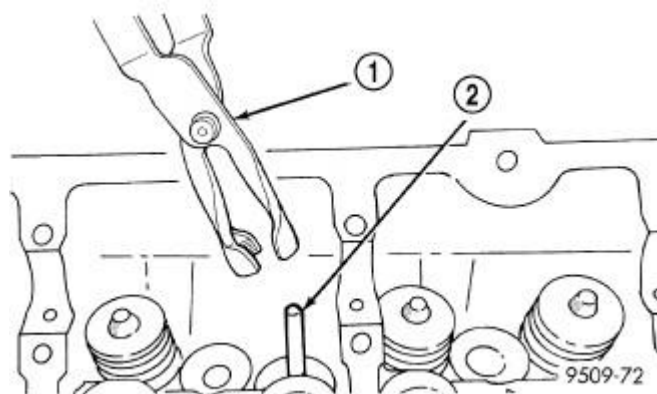


Fig. 198: Valve Stem Seal-Removal/Installation
Courtesy of CHRYSLER LLC

- 1 - VALVE SEAL TOOL
- 2 - VALVE STEM

7. Remove camshafts and rocker arms. See Engine/Cylinder Head/CAMSHAFT, Engine - Removal.
8. With air hose attached to spark plug adapter installed in the cylinder being serviced, apply 620.5-689 kPa (90-100 psi) air pressure. This is to hold valves in place while servicing components.
9. Using Special Tool MD 998772A with adapter 6779, compress valve spring and remove valve locks, retainer, and valve spring.
10. Remove valve stem seal. See Engine/Cylinder Head/SEAL(S), Valve Guide - Removal.

OFF VEHICLE

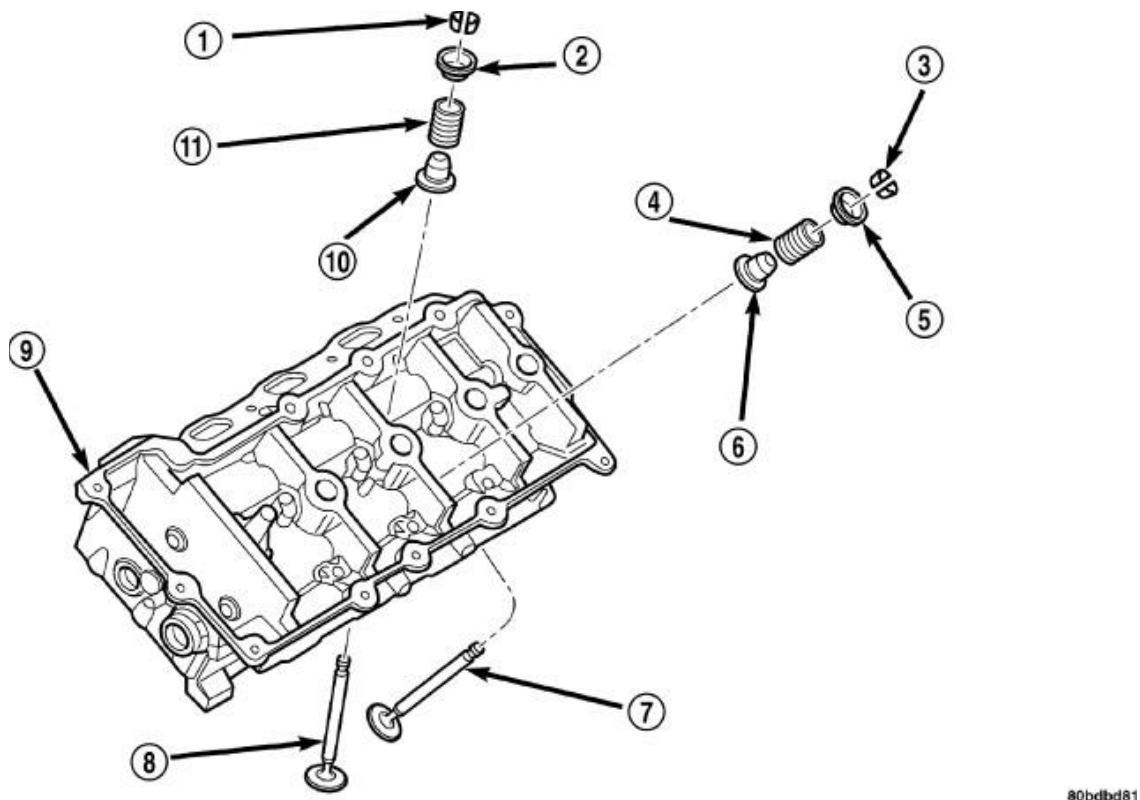


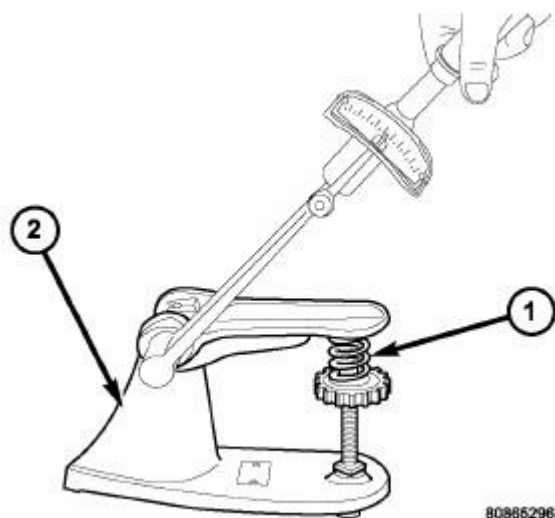
Fig. 199: VALVE, SPRING SEAT/SEAL, SPRING, RETAINER AND LOCKS
 Courtesy of CHRYSLER LLC

1 - VALVE KEEPER	7 - VALVE-EXHAUST
2 - SPRING RETAINER	8 - VALVE-INTAKE
3 - VALVE KEEPER	9 - CYLINDER HEAD
4 - VALVE SPRING-EXHAUST	10 - VALVE STEM SEAL
5 - SPRING RETAINER	11 - VALVE SPRING-INTAKE
6 - VALVE STEM SEAL	-

1. With cylinder head removed, compress valve springs using a Special Tool C-3422-D, Valve Spring Compressor.
2. Remove valve retaining locks, valve spring retainers, valve springs and valve spring seat/stem seal assembly.

Inspection

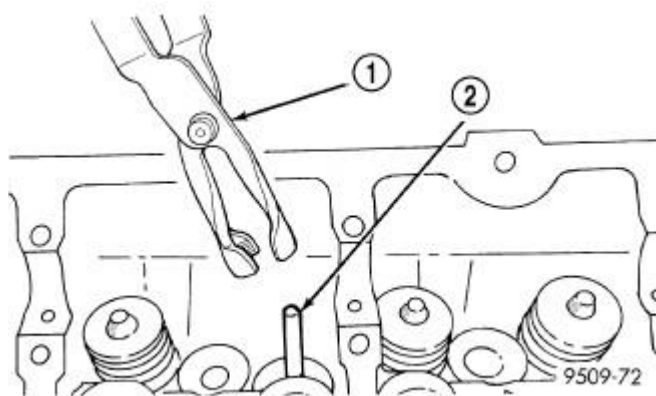
INSPECTION

**Fig. 200: TESTING VALVE SPRING**

Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL C-647

Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested. **As an example;** the compression length of a spring to be tested is 38.00 mm (1.496 in.). Turn the table of Tool C-647 until surface is in line with the 38.00 mm (1.496 in.) 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 **Engine - Specifications**. Replace any springs that do not meet specifications.

Installation**IN VEHICLE****Fig. 201: Valve Stem Seal-Removal**

Courtesy of CHRYSLER LLC

- 1 - VALVE SEAL TOOL
2 - VALVE STEM

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 locks
2. Follow the same procedure on the remaining cylinders using the firing sequence 1-2-3-4-5-6. **Make sure piston is at TDC on the cylinder that the valve spring is to be removed.**
3. Remove spark plug adapter tool and Special Tool MD 998772A.
4. Install rocker arm(s).

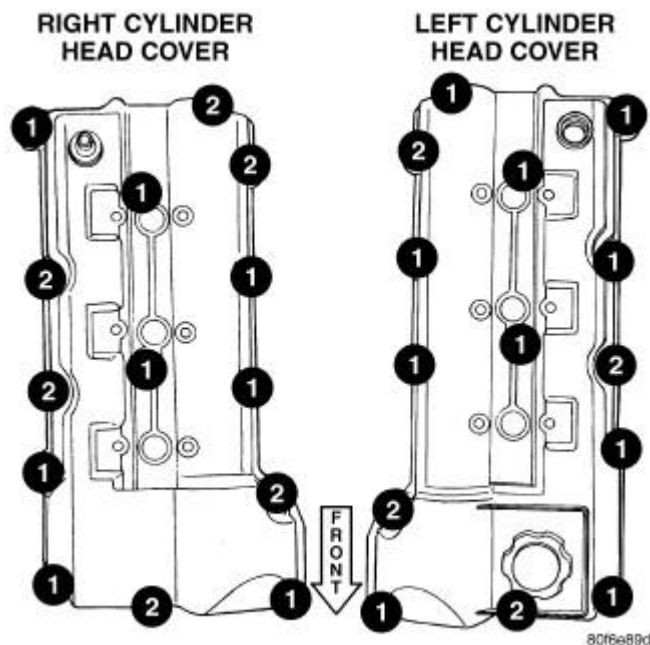


Fig. 202: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

- 1 - DOUBLE ENDED STUDS
2 - BOLTS

5. Install camshafts, timing chain, and timing chain cover. See Engine/Cylinder Head/CAMSHAFT, Engine - Installation. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation. See Engine/Valve Timing/COVER(S), Engine Timing - Installation.
6. Install cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.
7. Install upper intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Installation.

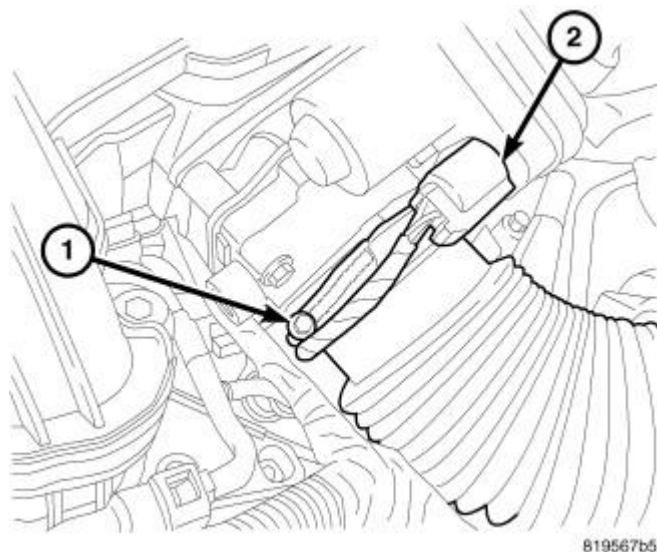


Fig. 203: Air Cleaner Housing & Inlet Hose
Courtesy of CHRYSLER LLC

8. Install air cleaner housing and inlet hose (1).
9. Connect negative cable.

OFF VEHICLE

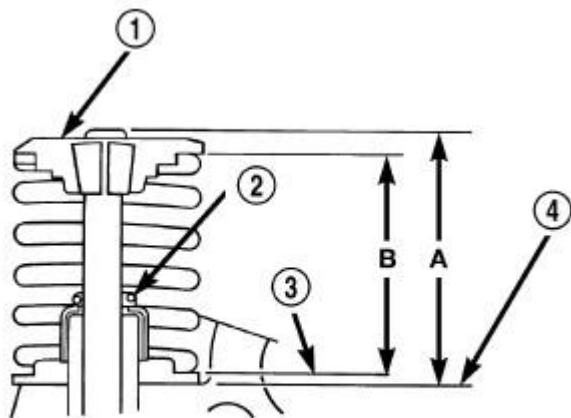


Fig. 204: Valve Tip Height and Valve Spring Installed Height
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - SPRING RETAINER
2 - GARTER SPRING
3 - VALVE SPRING SEAT TOP
4 - CYLINDER HEAD SURFACE</p> |
|--|

1. If removed, install the valve(s). See **Engine/Cylinder Head/VALVES, Intake and Exhaust -**

Installation.

2. If valves or seats have been reground, check valve tip height (A). If valve tip height for intake valve is greater than 47.59 mm (1.8737 in.) or 49.14 mm (1.9347 in.) for exhaust valve, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.

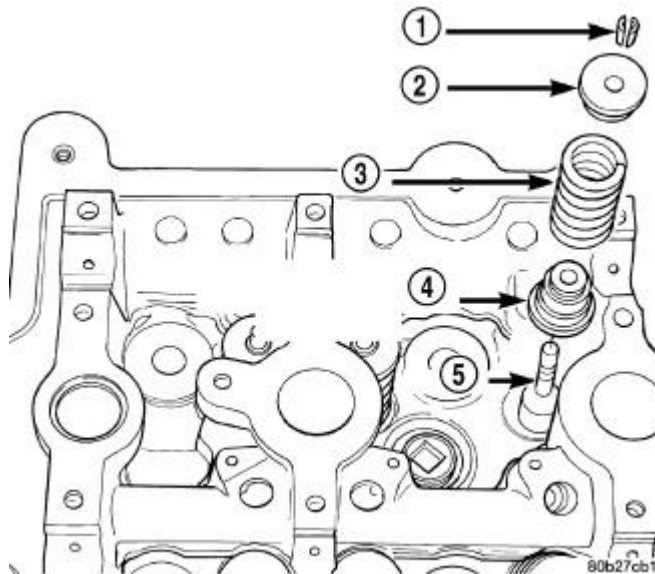


Fig. 205: Valve Seal and Spring
Courtesy of CHRYSLER LLC

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

3. Install valve seal/spring seat assembly over valve guides on all valve stems. Ensure that the garter spring is intact around the top of the rubber seal. Install valve springs, valve retainers.

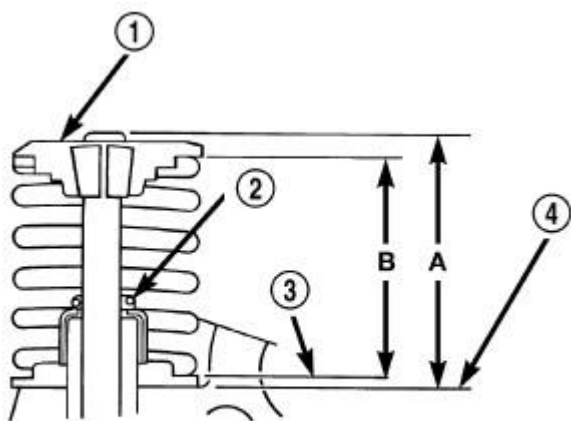


Fig. 206: Valve Tip Height and Valve Spring Installed Height
Courtesy of CHRYSLER LLC

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

4. Compress valve springs with a valve spring compressor install locks and release tool. **If valves and/or seats 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.

VALVES, INTAKE AND EXHAUST

Description

DESCRIPTION

The valves are made of heat resistant steel, and have chrome plated stems to prevent scuffing. The four valves per cylinder (two intake and two exhaust) are actuated by roller rocker arms, which pivot on stationary lash adjusters. All valves use three bead lock keepers to retain springs and to promote valve rotation.

Standard Procedure

VALVE AND VALVE SEAT REFACING

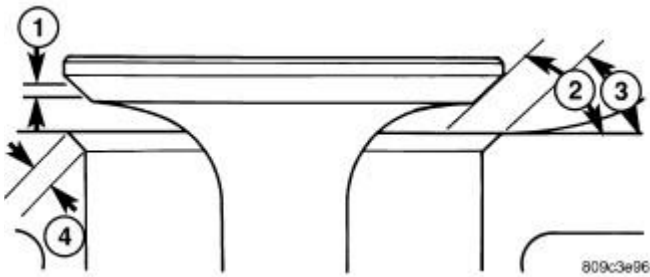


Fig. 207: Valve Face and Seat
Courtesy of CHRYSLER LLC

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

The intake and exhaust valves have a 44.5 to 45 degree face angle (2). The valve seats have a 45 to 45.5 degree face angle (3).

VALVES

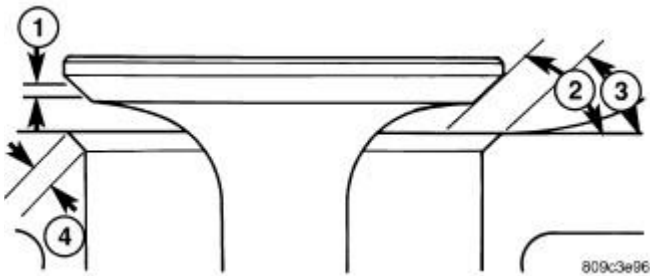


Fig. 208: Valve Face and Seat
Courtesy of CHRYSLER LLC

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

Inspect the remaining margin after the valves are refaced. See **Engine - Specifications**.

VALVE SEATS

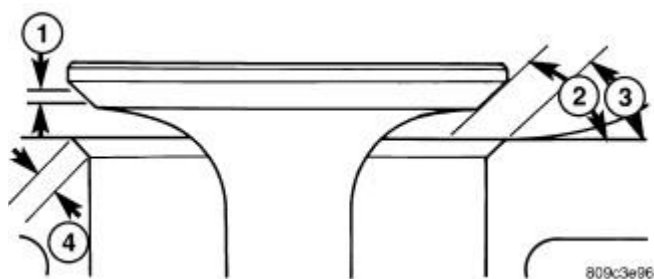


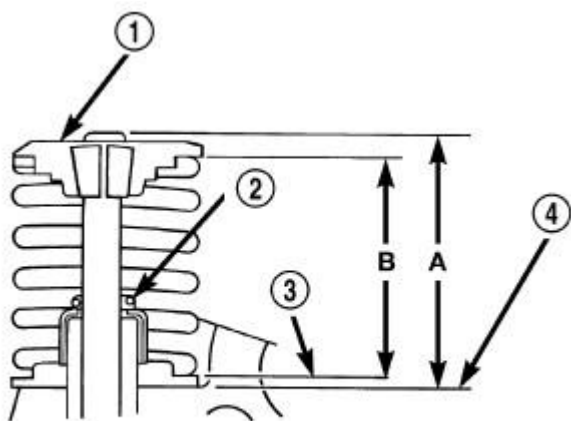
Fig. 209: Valve Face and Seat
Courtesy of CHRYSLER LLC

- | |
|---|
| 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 with Prussian blue to determine where the valve contacts the seat. To do this, coat valve seat **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, contact is satisfactory. If the blue is transferred to top edge of valve face, then lower valve seat with a 15 degree stone. If the blue is transferred to the bottom edge of valve face, then raise valve seat with a 65 degree stone.

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

4. When seat is properly positioned the width of the intake 1.00 to 1.50 mm (0.0394 to 0.0591 in.) and exhaust seats should be 1.25 to 1.75 mm (0.049 to 0.069 in.).



80570e02

Fig. 210: Valve Tip Height and Valve Spring Installed Height
Courtesy of CHRYSLER LLC

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

5. Check the valve spring installed height after refacing the valve and seat.

VALVE AND SPRING INSTALLED HEIGHT

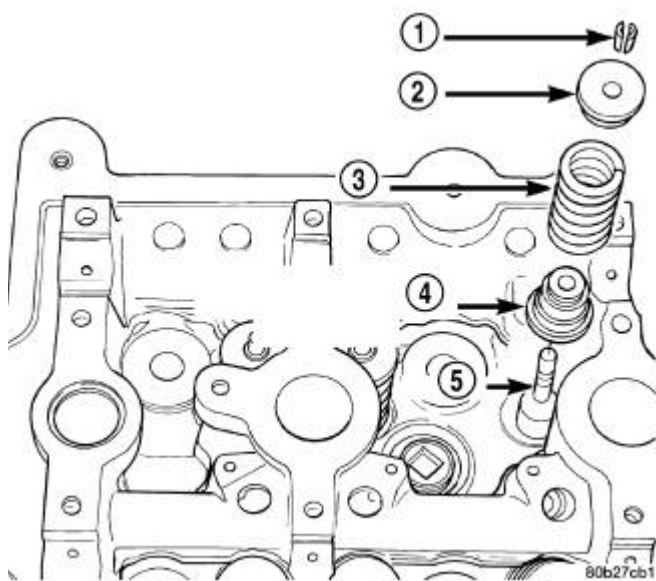


Fig. 211: Valve Seal and Spring
Courtesy of CHRYSLER LLC

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

1. Coat valve stems with clean engine oil and insert them in cylinder head.
2. If valves (5) or seats have been refaced, check valve tip height (A). If valve tip height for intake valve is greater than 47.59 (1.8737 in.) or 49.14 (1.9347 in.) for exhaust valve, 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 stems. Ensure that the garter spring is intact around the top of the rubber seal.

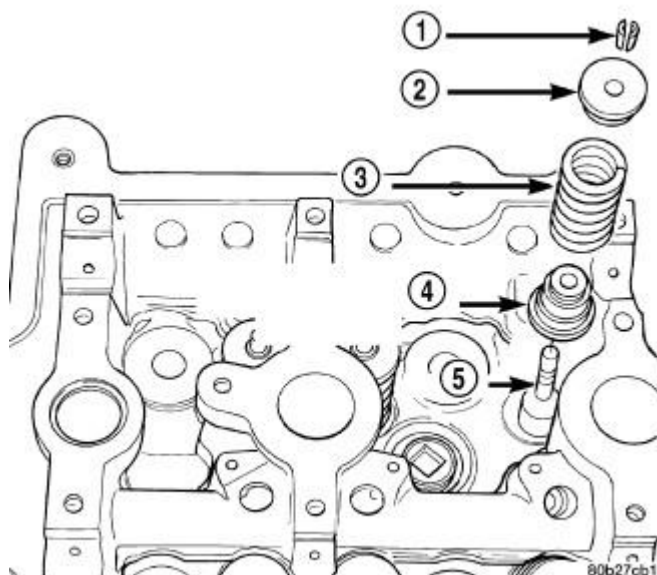


Fig. 212: Valve Seal and Spring
Courtesy of CHRYSLER LLC

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

4. Position valve springs (3) and retainer on spring seat.
5. Compress valve spring with a valve spring compressor.
6. Install retainer locks and release tool.
7. If valves and/or seats are refaced, measure the installed height of springs (B). Measurement is 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.

Removal

REMOVAL

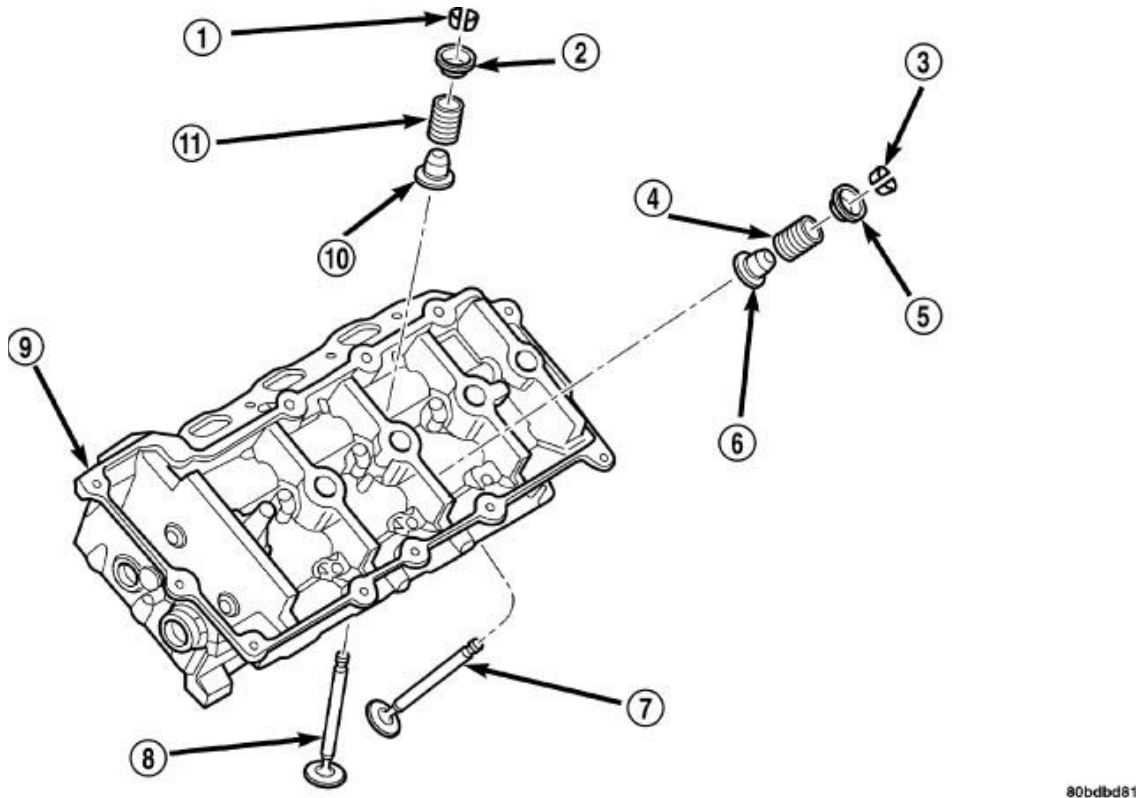


Fig. 213: VALVE, SPRING SEAT/SEAL, SPRING, RETAINER AND LOCKS
Courtesy of CHRYSLER LLC

1 - VALVE KEEPER	7 - VALVE-EXHAUST
2 - SPRING RETAINER	8 - VALVE-INTAKE
3 - VALVE KEEPER	9 - CYLINDER HEAD
4 - VALVE SPRING-EXHAUST	10 - VALVE STEM SEAL
5 - SPRING RETAINER	11 - VALVE SPRING-INTAKE
6 - VALVE STEM SEAL	-

1. Remove cylinder head(s). See **Engine/Cylinder Head - Removal**.
2. Remove valve spring. See **Engine/Cylinder Head/SPRING(S), Valve - Removal**.
3. Before removing valves, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.**
4. Remove valve (7). Identify each valve to ensure installation in original location.

Inspection

INSPECTION

VALVES

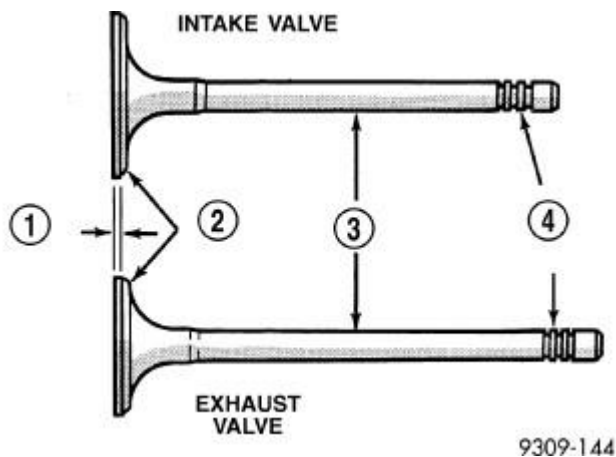


Fig. 214: Intake and Exhaust Valves
Courtesy of CHRYSLER LLC

- 1 - MARGIN
- 2 - FACE
- 3 - STEM
- 4 - VALVE SPRING RETAINER LOCK GROOVES

1. Clean and inspect valves thoroughly. Replace burned, warped and cracked valves.
2. Measure valve stems for wear (3). For valve specifications, see [Engine - Specifications](#).

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

VALVE GUIDES

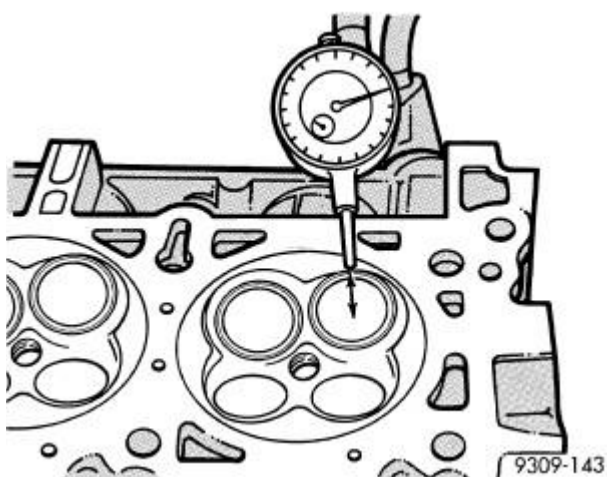
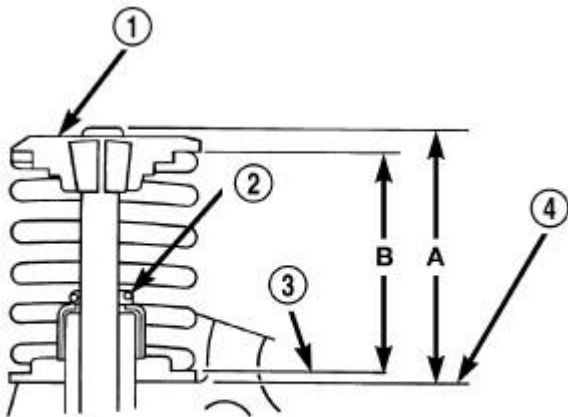


Fig. 215: Measuring Valve Guide Wear - Typical

Courtesy of CHRYSLER LLC

1. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
2. Measure valve stem-to-guide clearance as follows:
3. 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.
4. Attach dial indicator Tool C-3339A to cylinder head and set it at right angle of valve stem being measured.
5. Move valve to and from the indicator. For clearance specifications, see Engine - Specifications.

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

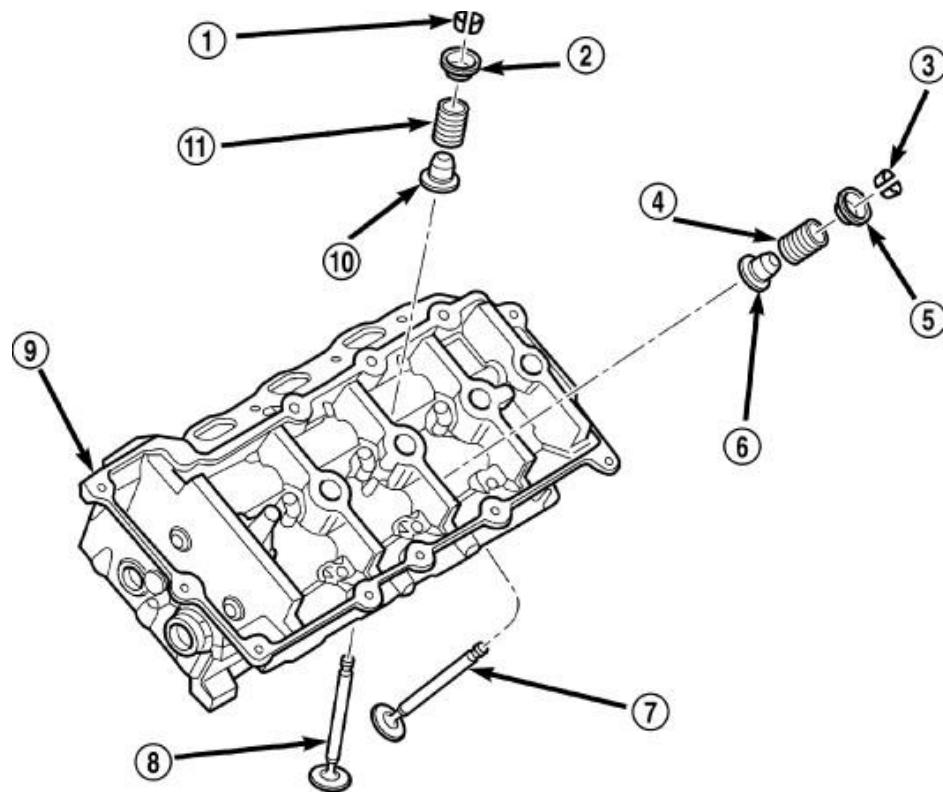
Installation**INSTALLATION**

80570e02

Fig. 216: Valve Tip Height and 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). If valve tip height for intake valve is greater than 47.59 mm (1.8737 in.) or 49.14 mm (1.9347 in.) for exhaust valve, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.



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Fig. 217: VALVE, SPRING SEAT/SEAL, SPRING, RETAINER AND LOCKS
Courtesy of CHRYSLER LLC

1 - VALVE KEEPER	7 - VALVE-EXHAUST
2 - SPRING RETAINER	8 - VALVE-INTAKE
3 - VALVE KEEPER	9 - CYLINDER HEAD
4 - VALVE SPRING-EXHAUST	10 - VALVE STEM SEAL
5 - SPRING RETAINER	11 - VALVE SPRING-INTAKE
6 - VALVE STEM SEAL	-

3. Install valve spring (4). See Engine/Cylinder Head/SPRING(S), Valve - Installation.

ENGINE BLOCK

DESCRIPTION

DESCRIPTION

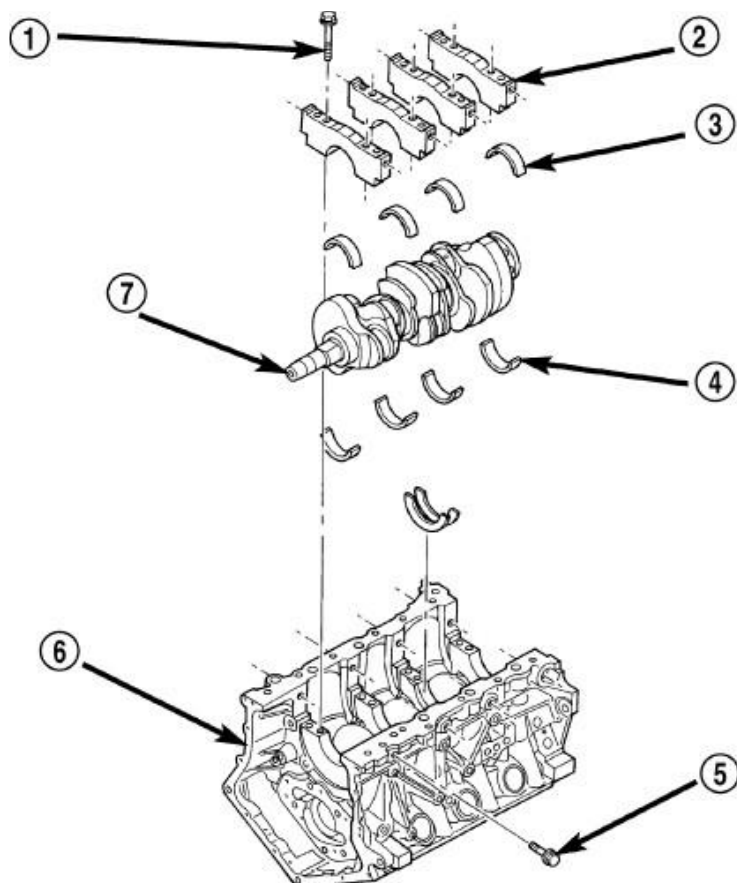


Fig. 218: ENGINE BLOCK AND CRANKSHAFT
 Courtesy of CHRYSLER LLC

- 1 - MAIN CAP BOLT-VERTICAL
- 2 - MAIN CAP
- 3 - MAIN BEARING-LOWER
- 4 - MAIN BEARING-UPPER
- 5 - MAIN CAP BOLT - HORIZONTAL
- 6 - CYLINDER BLOCK
- 7 - CRANKSHAFT

The cylinder block (6) 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 NVH, the block has cast-in contours and ribs, along with powdered metal main caps (2) each with 6 bolts, 4 vertical (1) and 2 horizontal (5). The engine is equipped with a windage tray mounted to the main caps.

The block design allows coolant flow between the cylinder bores and an internal coolant by-pass to the thermostat.

STANDARD PROCEDURE

CYLINDER BORE HONING

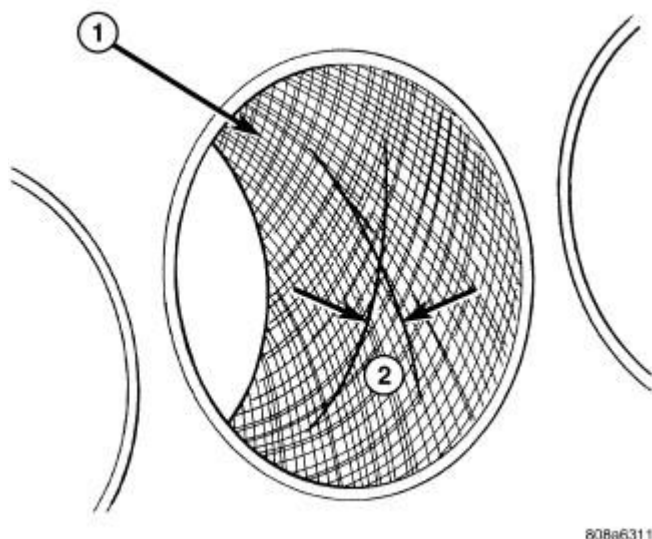


Fig. 219: Cylinder Bore Cross-Hatch Pattern
Courtesy of CHRYSLER LLC

1 - CROSS-HATCH PATTERN
2 - 40°-60°

1. Used carefully, a quality commercially available cylinder bore resizing hone equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.
2. Deglazing of the cylinder walls may be done using a quality commercially available cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20-60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.
3. Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks **intersect** at 40-60 degrees, the cross hatch angle is most satisfactory for proper seating of rings.
4. A controlled hone motor speed between 200-300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40-60 degree angle. Faster up and down strokes increase the cross-hatch angle.
5. After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.

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

CLEANING

CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

INSPECTION

INSPECTION

ENGINE BLOCK

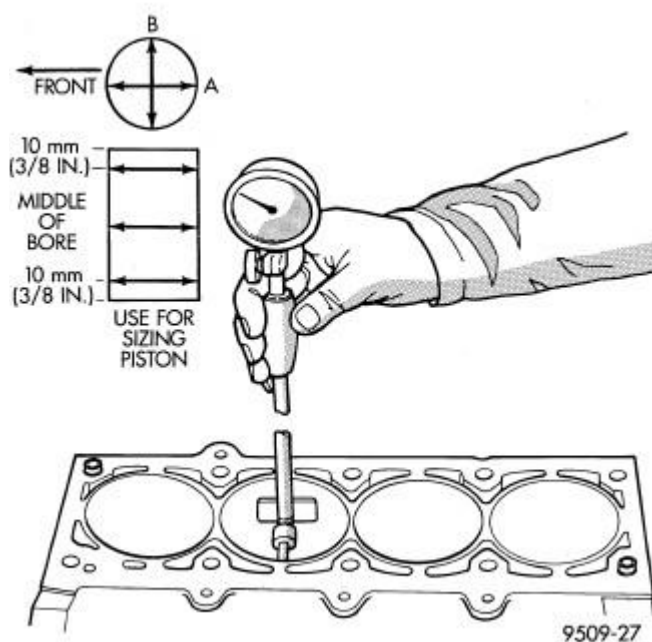


Fig. 220: Checking Cylinder Bore Size

Courtesy of CHRYSLER LLC

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 - Standard Procedure**.
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

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 or equivalent. See **Engine - 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. 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 **Engine - Specifications**.

BEARING(S), CONNECTING ROD

Standard Procedure

CONNECTING ROD AND BEARING FITTING

CONNECTING ROD BEARING

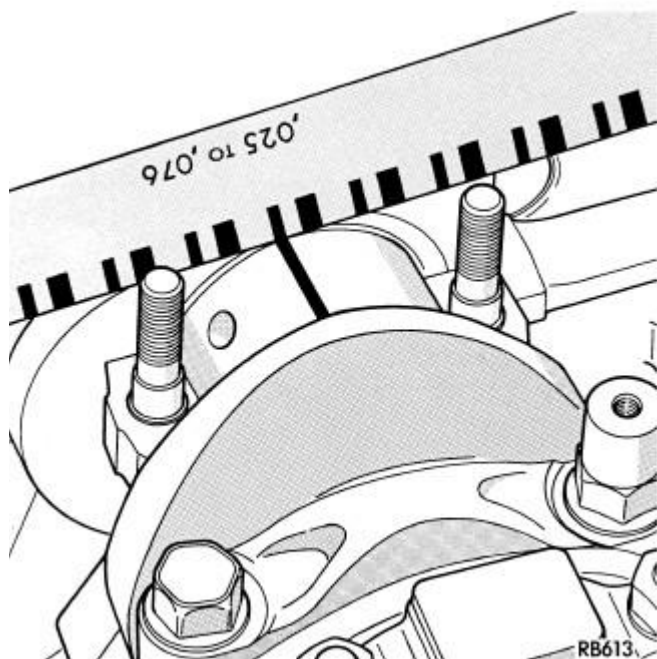


Fig. 221: Checking Connecting Rod Bearing Clearance-Typical
Courtesy of CHRYSLER LLC

Fit all connecting rods on one bank until complete.

The bearing caps are not interchangeable and should be marked at removal to ensure correct assembly.

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces as engine damage may occur.

The bearing shells must be installed with the tangs inserted into the machined grooves in the rods and caps. Also, assure that the hole in upper bearing half aligns with oil squirt hole in rod. Install cap with the tangs on the same side as the rod.

CAUTION: Assure that hole in upper bearing half aligns with hole in connecting rod as engine damage may occur.

Limits of taper or out-of-round on any crankshaft journals should be held to 0.015 mm (0.0006 in.). Bearings are available 0.025 mm (0.001 in.) and 0.250 mm (0.010 in.) undersize. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

1. For measuring Main Bearing Clearance and Connecting Rod Bearing Clearance use plastigage. For more information on using plastigage, see Engine - Standard Procedure. Refer to Engine Specifications for bearing clearance specifications. See Engine - Specifications.

CONNECTING ROD BOLTS

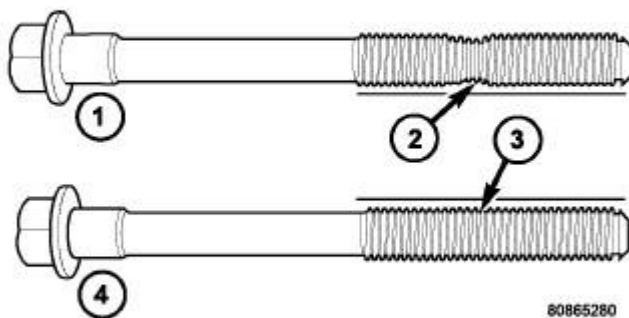


Fig. 222: Check for Stretched Bolts
Courtesy of CHRYSLER LLC

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

NOTE: The connecting rod bearing cap bolts must be examined before reuse. If the threads are necked down (2) due to stretching, the bolt(s) must be replaced.

NOTE: Connecting rod bolts are retained in the rod cap with a light press fit. If bolts are to be removed, use a hammer and punch to drive bolts from connecting rod cap using care not to damage fractured cap surface.

1. Examine connecting rod bolt for stretching. Stretching can be checked by holding a scale or straight edge

against the threads. If all the threads do not contact the scale the bolt should be replaced.

2. Before installing the bolts, lubricate the threads with engine oil.
3. Install bolts finger tight. Then alternately torque each nut to assemble the cap properly.
4. Tighten the nuts to specification. See **Engine - Specifications**.

CONNECTING ROD SIDE CLEARANCE

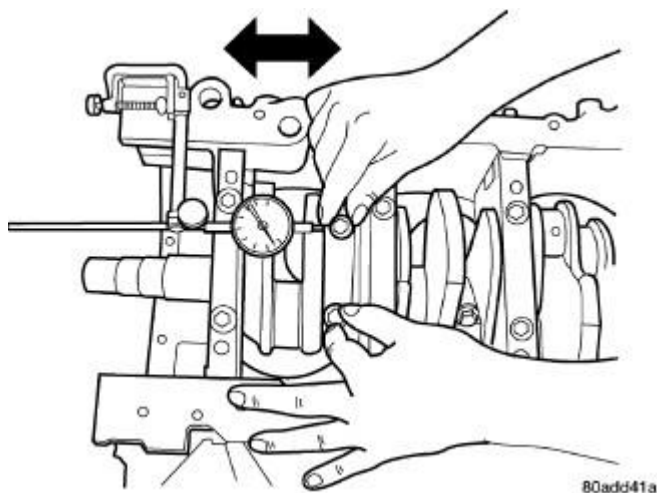


Fig. 223: Connecting Rod Side Clearance Measuring
Courtesy of CHRYSLER LLC

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. Compare measurement to specification listed in engine specifications. See **Engine - Specifications**. Repeat procedure for each connecting rod. Turn crankshaft for connecting rod accessibility.

BEARING(S), CRANKSHAFT, MAIN

Standard Procedure

CRANKSHAFT MAIN BEARING FITTING

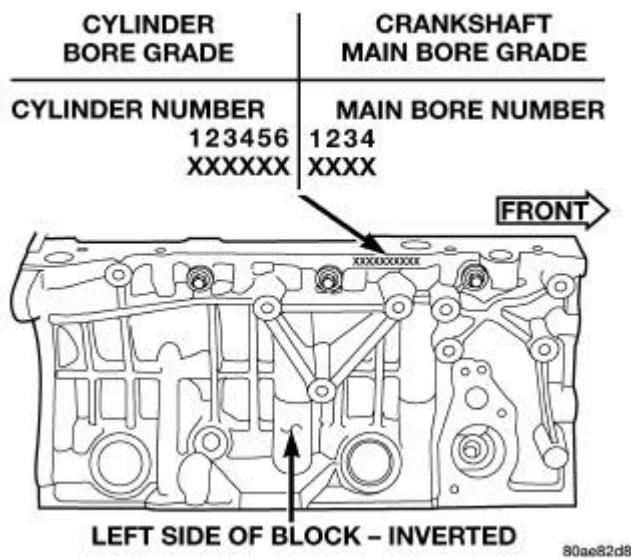


Fig. 224: Cylinder Block Main Bore Grade Marking
Courtesy of CHRYSLER LLC

The grade marks for the cylinder block main bearing bore grade is located on the pan rail just below the left side engine mount bracket. These marks are read left to right, corresponding to main bore 1, 2, 3, 4.

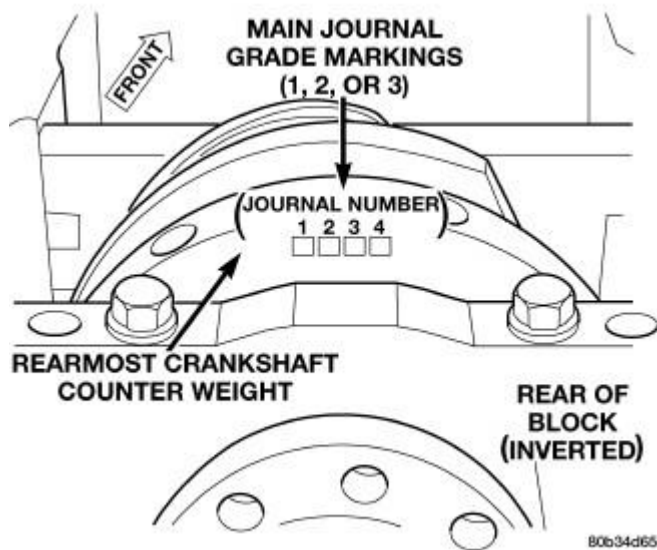


Fig. 225: Crankshaft Main Journal Grade Marking Location
Courtesy of CHRYSLER LLC

The main bearings are "select fit" to achieve proper oil clearances. For main bearing selection, the block and crankshaft have grade identification marks.

The grade marks for the crankshaft are located on the rearmost crankshaft counter weight as shown in illustration. The crankshaft journal grade marks are read left to right, corresponding with journal number 1, 2, 3,

4.

MAIN BEARING SELECTION CHART-2.7L

	Main Bearing Bore Grade Mark		
	1	2	3
Crankshaft Main Journal Grade Mark	1 (3) standard	(2) +0.003 mm (+0.0002 in.)	(1) +0.006 mm (+0.0003 in.)
	2 (4) -0.003 mm (-0.0002)	(3) standard	(2) +0.003 mm (+0.0002 in.)
	3 (5) -0.006 mm (-0.0003 in.)	(4) -0.003 mm (-0.0002 in.)	(3) standard

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

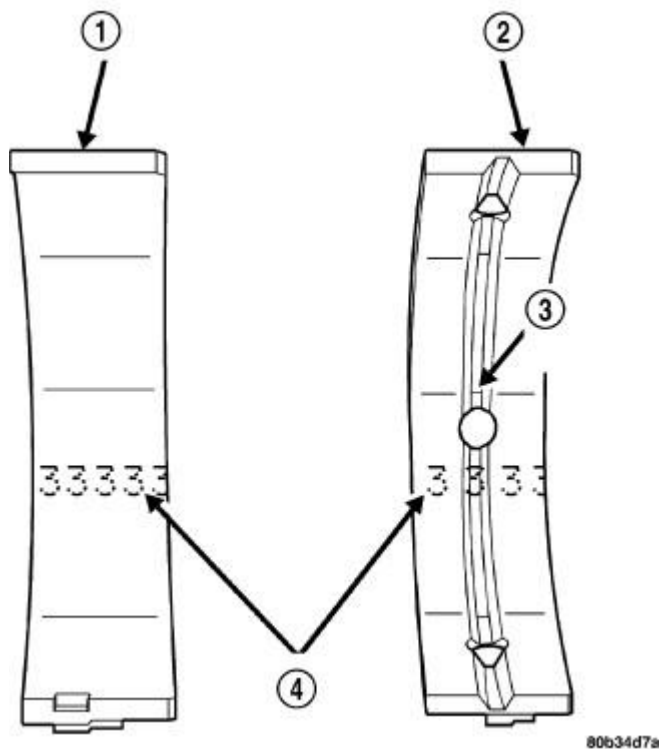


Fig. 226: Main Bearing Grade Marks

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. For verification, use the Main Bearing Selection Chart for number to size identification.

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

NOTE: Although cylinder bores are graded for size, there is only one piston size.

COVER, STRUCTURAL DUST

Removal

REMOVAL

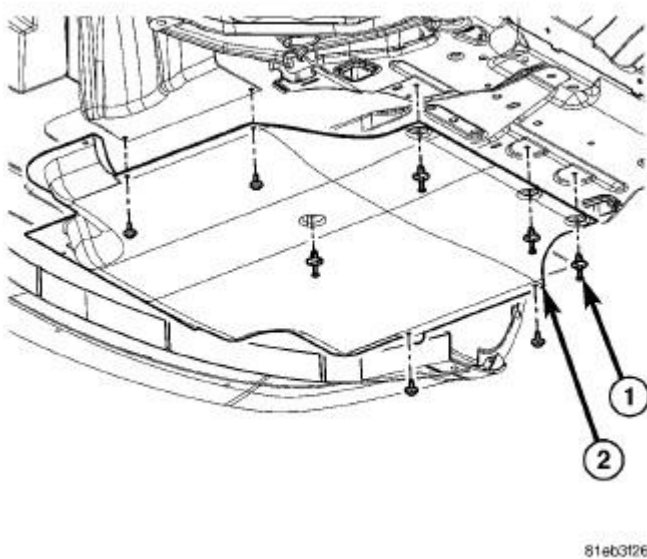


Fig. 227: Belly Pan

Courtesy of CHRYSLER LLC

1. Raise and secure the vehicle on a hoist. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
2. Remove the belly pan (2), if equipped.

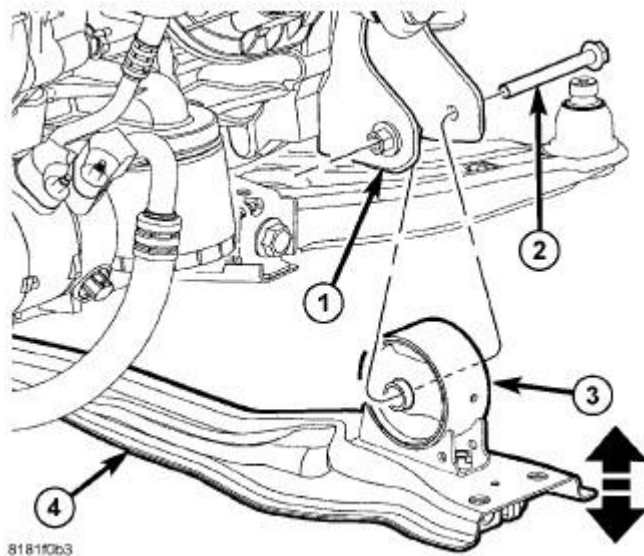


Fig. 228: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

3. Remove the fore/aft cross-member (4). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Removal**.

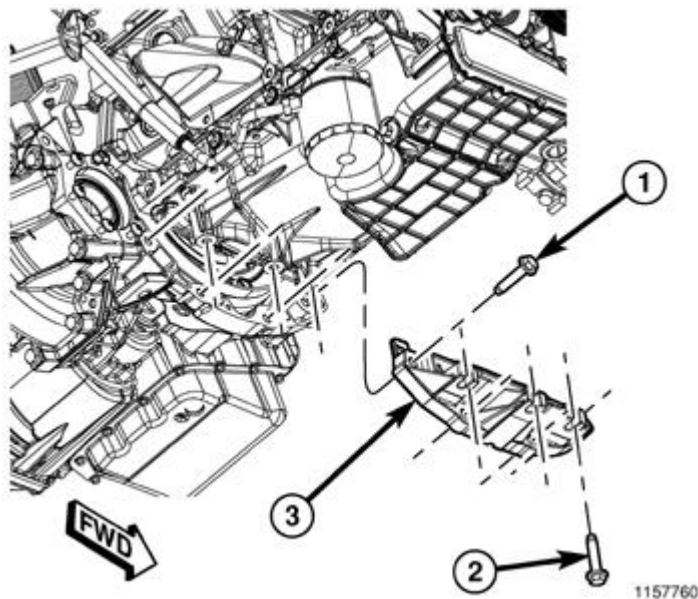


Fig. 229: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

4. Remove three bolts (2) attaching the structural collar (3) to the oil pan.
5. Remove four bolts (1) and the structural collar (3) from the transmission.

Installation

INSTALLATION

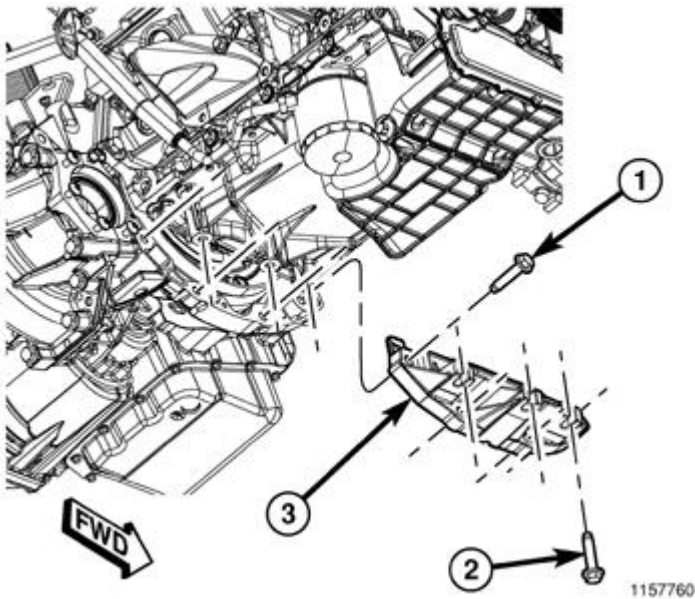


Fig. 230: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

CAUTION: The collar must be tightened using this service procedure, as damage to transaxle case and/or oil pan may occur.

1. Position the structural collar (3) on the engine and transaxle.
2. Finger tighten all bolts (1) and (2).

NOTE: Make sure that structural collar (3) is flush with the oil pan and the transmission bell housing.

3. Install the vertical collar bolts (2) to the oil pan, pre-torque bolts to 1.1 N.m (10 in. lbs.).
4. Install the horizontal collar bolts (1) to the transmission and tighten to 55 N.m (40 ft. lbs.).
5. Starting with the center vertical bolts and working outward, final torque all bolts to 55 N.m (40 ft. lbs.).

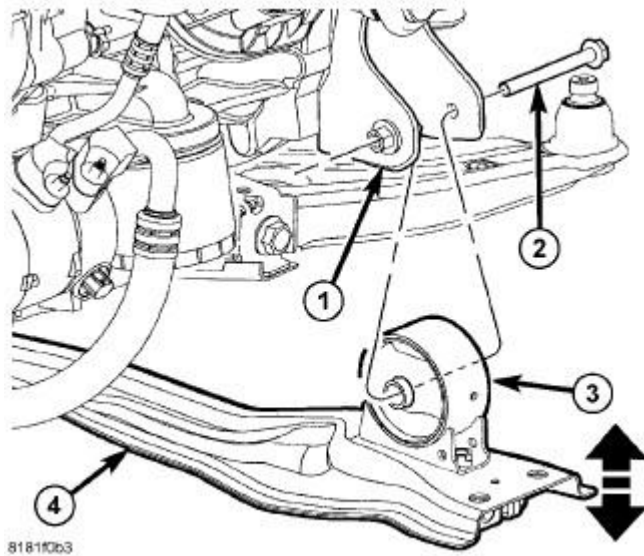


Fig. 231: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

6. Install the fore/aft crossmember (4). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Installation** .

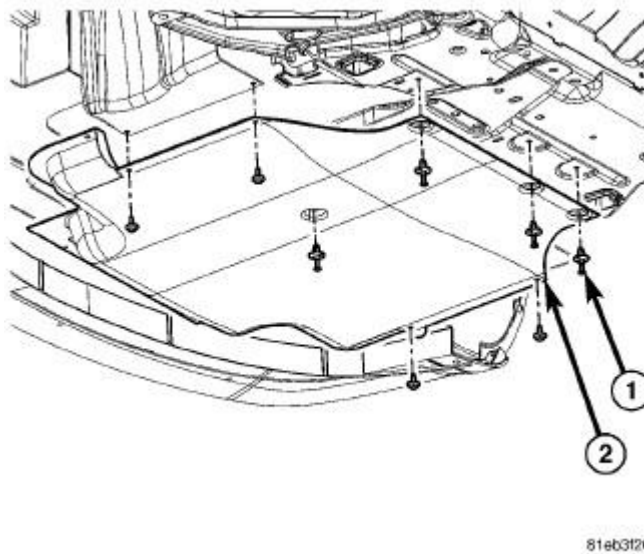


Fig. 232: Belly Pan
Courtesy of CHRYSLER LLC

7. Install the belly pan (2), if equipped.
8. Lower the vehicle.

CRANKSHAFT

Description**DESCRIPTION**

The crankshaft is constructed of a forged micro alloy steel. The six throw, nine counterweight crankshaft is supported by four select fit main bearings with the number three serving as the thrust washer location. The select fit identification markings will be on the rear side of the number nine (rearmost) counterweight. The six separate connecting rod throws are an even-firing design which reduces torque fluctuations while a vibration damper is used to control torsional vibration.

The crankshaft oil seals are a one piece design. The front seal is retained by the timing chain cover, and the rear seal in a housing that attaches to the cylinder block.

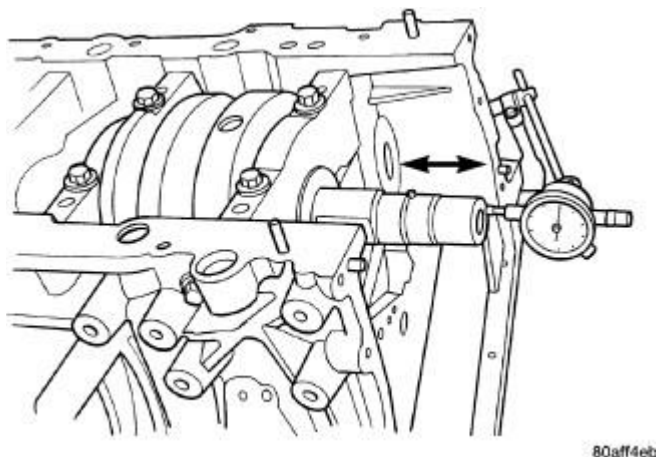
Standard Procedure**CRANKSHAFT END PLAY**

Fig. 233: CHECKING CRANKSHAFT END PLAY
Courtesy of CHRYSLER LLC

1. Mount a dial indicator to a stationary point at front of engine. Locate the probe perpendicular against nose of crankshaft.
2. Move crankshaft all the way to the rear of its travel.
3. Zero the dial indicator.
4. Move crankshaft all the way to the front and read the dial indicator. For crankshaft end play clearances, see **Engine - Specifications.**

Removal**REMOVAL**

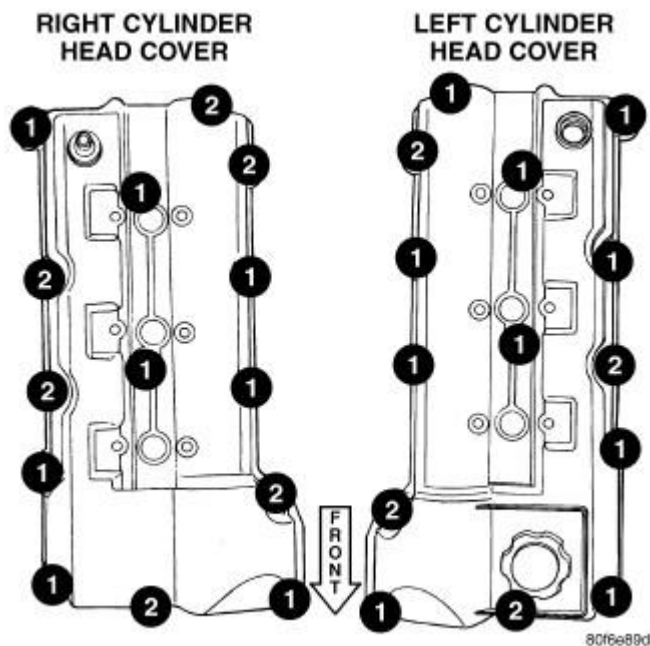


Fig. 234: Cylinder Head Cover Fasteners

Courtesy of CHRYSLER LLC

1. Drain engine oil and remove oil filter. See Engine/Lubrication/OIL - Standard Procedure.
2. Remove engine from vehicle. See Engine - Removal.
3. Mount engine on an engine stand.
4. Remove oil pan and oil pick-up tube. See Engine/Lubrication/PAN, Oil - Removal.
5. Remove idler pulley bracket for accessory drive belt.
6. Remove upper intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Removal.
7. Remove cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.

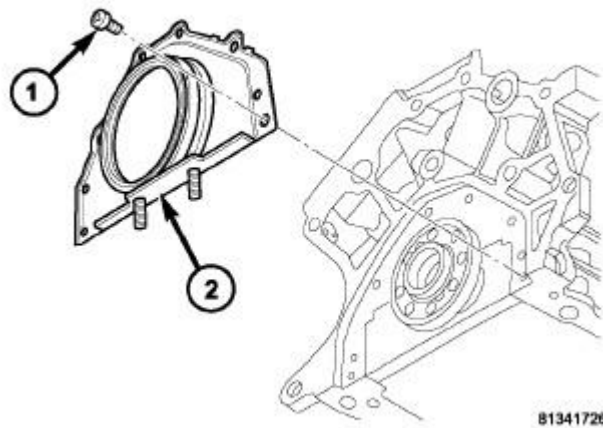


Fig. 235: Oil Seal Retainer

Courtesy of CHRYSLER LLC

8. Remove timing chain cover. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
9. Remove primary timing chain. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.
10. Remove crankshaft sprocket. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.
11. Remove oil pump. See Engine/Lubrication/PUMP, Engine Oil - Removal.
12. Remove crankshaft rear oil seal retainer (2). See Engine/Engine Block/SEAL, Crankshaft Oil - Removal.

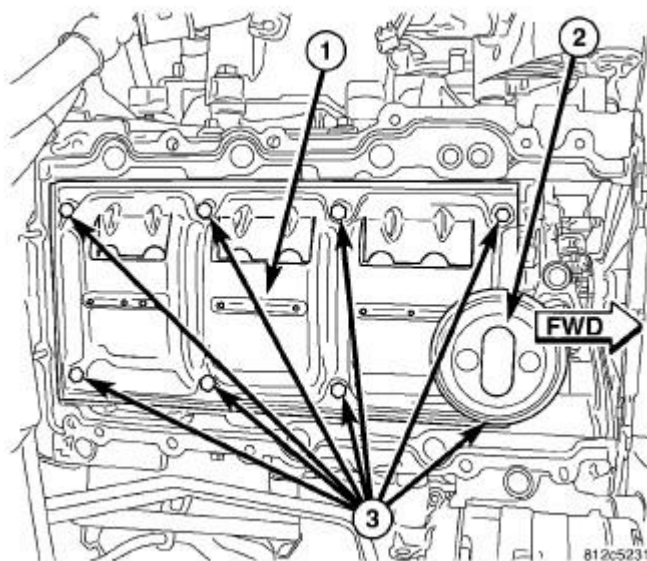


Fig. 236: Windage Tray

Courtesy of CHRYSLER LLC

13. Remove windage tray (1).

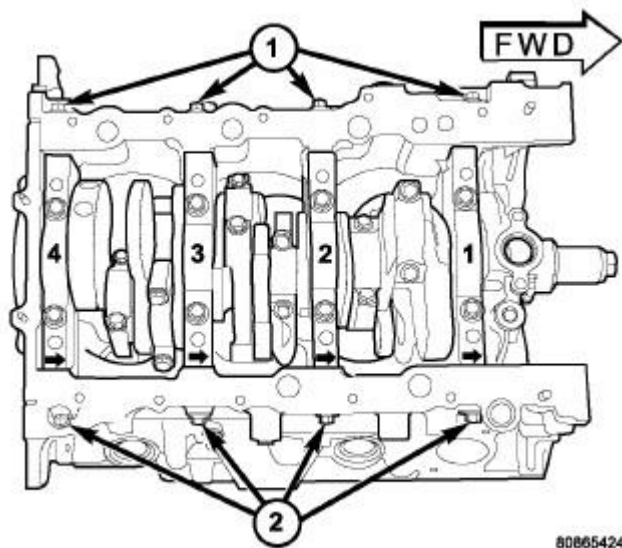


Fig. 237: Main Bearing Cap Identification

Courtesy of CHRYSLER LLC

14. Turn crankshaft until connecting rod cap to be removed is accessible.

NOTE: Connecting rod bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

15. Mark connecting rod bearing cap positions using a permanent ink marker or scribe tool. Also scribe a location reference mark from the #3 main bearing cap to the engine block to use as a guide during reassembly.
16. Remove connecting rod bearing caps. Use care to prevent damage to the crankshaft bearing surfaces.

CAUTION: Care should be taken not to damage the fractured rod and cap joint face surfaces or damage to the engine may occur.

17. Remove main bearing tie bolts (1) and (2).

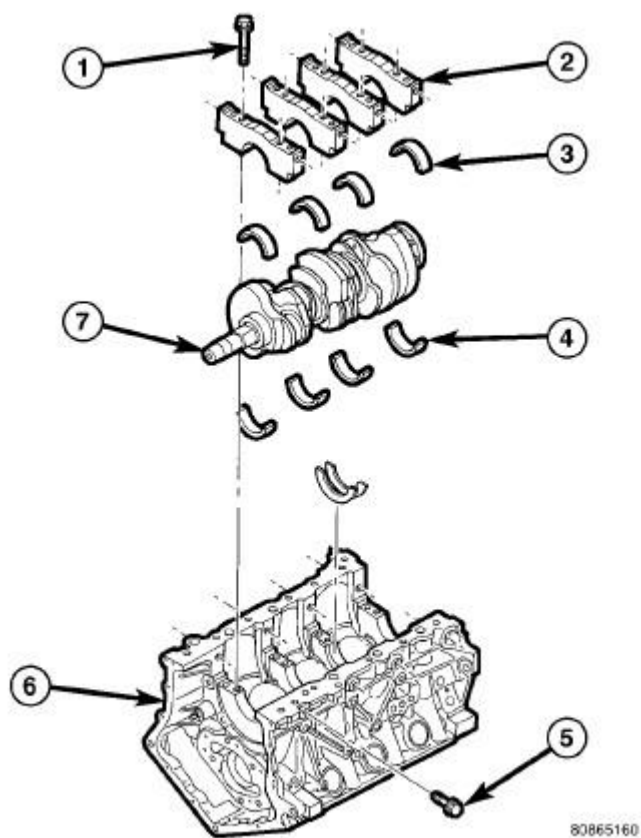


Fig. 238: CYLINDER BLOCK AND CRANKSHAFT

Courtesy of CHRYSLER LLC

18. Remove main bearing cap bolts (1) and main bearing caps (2).

CAUTION: When removing crankshaft, use care not to damage bearing surfaces on the crankshaft.

19. Remove crankshaft (7) from cylinder block (6).

Installation

INSTALLATION

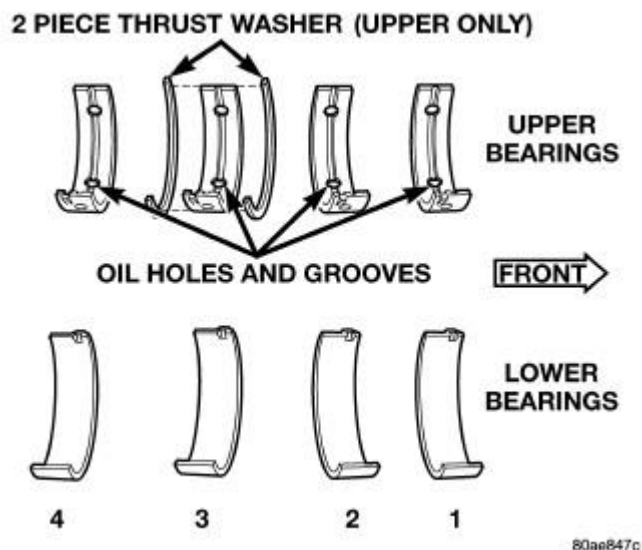


Fig. 239: Main Bearing Identification
Courtesy of CHRYSLER LLC

NOTE: Upper and lower bearing halves are NOT interchangeable.

CAUTION: Main bearings are select fit. See Engine/Engine Block/BEARING(S), Crankshaft - Standard Procedure.

1. Install crankshaft upper main bearings in cylinder block. Ensure the tangs engage the slots in the block and oil holes in bearings line up with oil holes in cylinder block. See Engine/Engine Block/BEARING(S), Crankshaft - Standard Procedure.
2. Lubricate upper main bearing halves with engine oil.

CAUTION: When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

3. Install crankshaft.

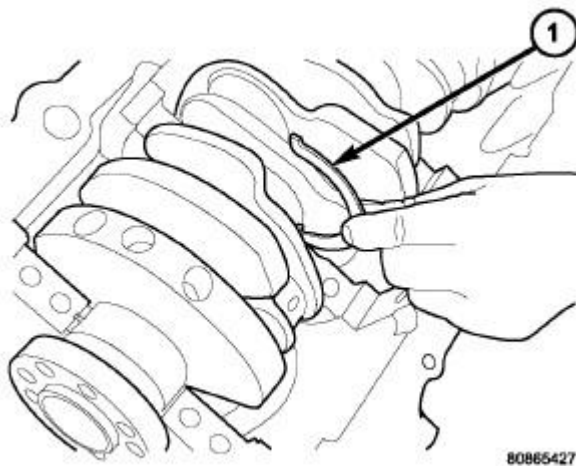


Fig. 240: Thrust Washer - Installation
Courtesy of CHRYSLER LLC

NOTE: **Make sure that the coated and oil groove side of crankshaft thrust washer faces the crankshaft thrust surface.**

4. Push crankshaft forward. Lubricate and install the front thrust washer (1) by rolling the thrust washer onto the machined shelf between the No. 3 upper main bulk head and crankshaft thrust surface.
5. Move crankshaft rearward. Lubricate and install the rear thrust washer by rolling the thrust washer onto the machined shelf between the No. 3 upper main bulk head and crankshaft thrust surface.

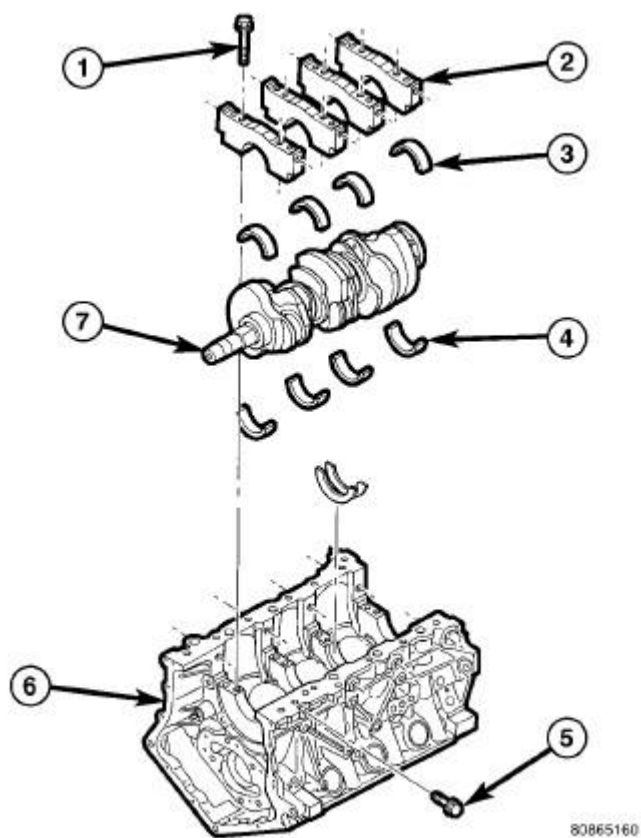


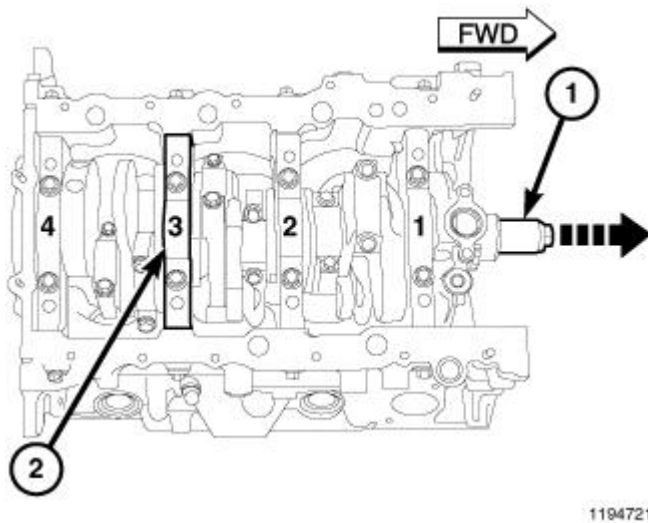
Fig. 241: CYLINDER BLOCK AND CRANKSHAFT

Courtesy of CHRYSLER LLC

6. Install lower main bearings (3) into main bearing caps (2).
7. Lubricate lower main bearings (3) with clean engine oil.

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

8. Install each main cap (2) and tighten inner bolts (1) finger tight. Align the location reference mark scribed on the #3 main bearing cap during disassembly.

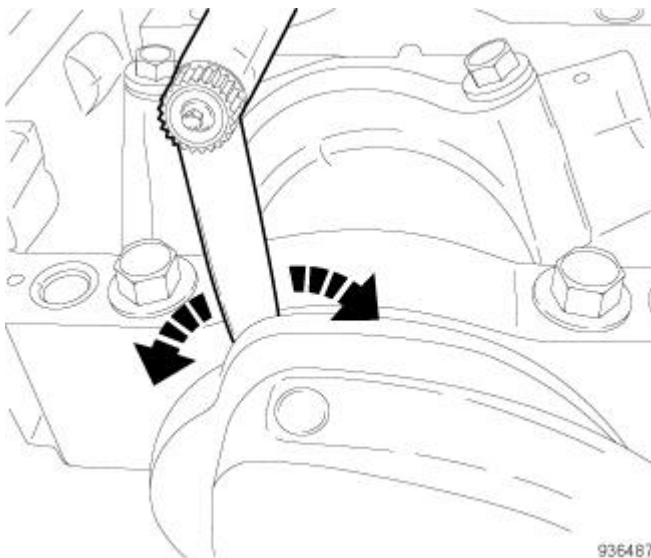


1194721

Fig. 242: Moving Crankshaft Forward So Crankshaft Face Is Tight Against Thrust Bearing
Courtesy of CHRYSLER LLC

CAUTION: The #3 main bearing cap must be centered over the inner bolt holes located on the block. Failure to center the bearing cap can result in contact with the crankshaft counterweights and thrust bearing failure.

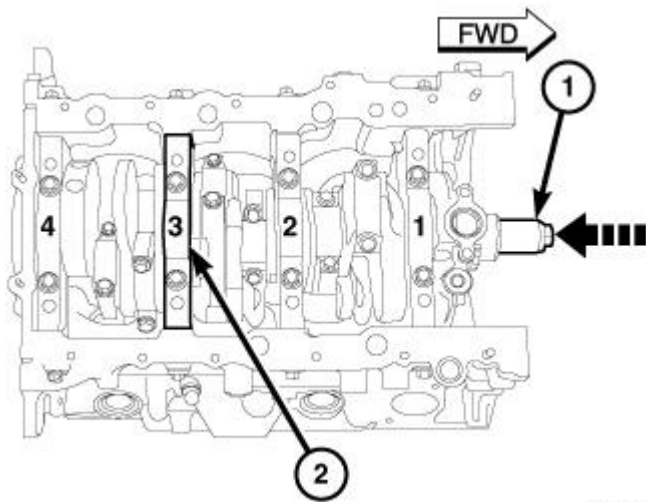
9. Verify that the #3 main bearing cap is properly centered over the inner bolt holes located in the block:
 - a. Tighten main bearing cap inner bolts to 20 N.m (15 ft. lbs.).
 - b. Move crankshaft (1) forward to limit of travel so that crankshaft thrust face (2) is tight against thrust bearing.



936487

Fig. 243: Sliding Feeler Gauge Side-To-Side Across Bearing Cap
Courtesy of CHRYSLER LLC

- c. Verify that a 0.25 mm (0.010 inch) shim or feeler gage will fit between the #3 main cap (rear face) and the crankshaft thrust face. Slide the gage side-to-side all of the way across the cap making sure that the clearance at all areas exceeds 0.25 mm (0.010 inch). The feeler gage should slide all the way down to the #3 main journal.



1194711

Fig. 244: Moving Crankshaft Rearward So Crankshaft Face Is Tight Against Thrust Bearing
Courtesy of CHRYSLER LLC

- d. Move crankshaft (1) rearward to limit of travel so that crankshaft thrust face (2) is tight against thrust bearing.
- e. Verify that a 0.25 mm (0.010 inch) shim or feeler gage will fit between the #3 main cap (front face) and the crankshaft thrust face. Slide the gage side-to-side all of the way across the cap making sure that the clearance at all areas exceeds 0.25 mm (0.010 inch). The feeler gage should slide all the way down to the #3 main journal.
- f. A properly centered #3 main bearing cap has a minimum of 0.25 mm (0.010 inch) clearance in both the forward and rearward crankshaft positions. If measured clearance is less than 0.25 mm (0.010 inch), loosen and reposition #3 main bearing cap until this minimum clearance can be verified by repeating this procedure.

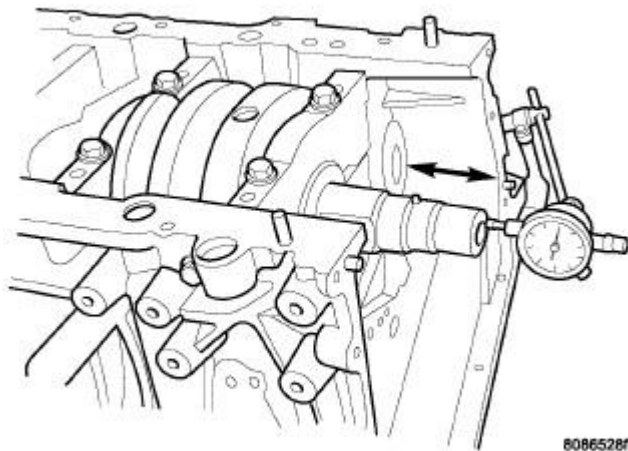


Fig. 245: CHECKING CRANKSHAFT END PLAY

Courtesy of CHRYSLER LLC

10. Following verification of proper #3 bearing cap centering, finish tightening the main bearing cap inner bolts an additional 90° turn.
11. Measure crankshaft end play. See **Engine/Engine Block/CRANKSHAFT - Standard Procedure.**

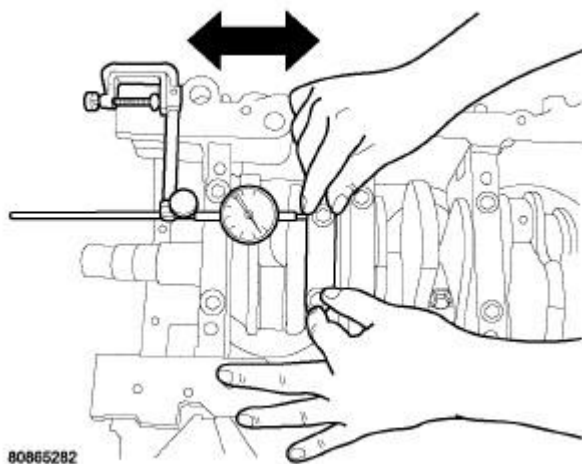


Fig. 246: Connecting Rod Side Clearance Measuring

Courtesy of CHRYSLER LLC

12. Install connecting rods and measure side clearance. See **Engine/Engine Block/BEARING(S), Connecting Rod - Standard Procedure.**

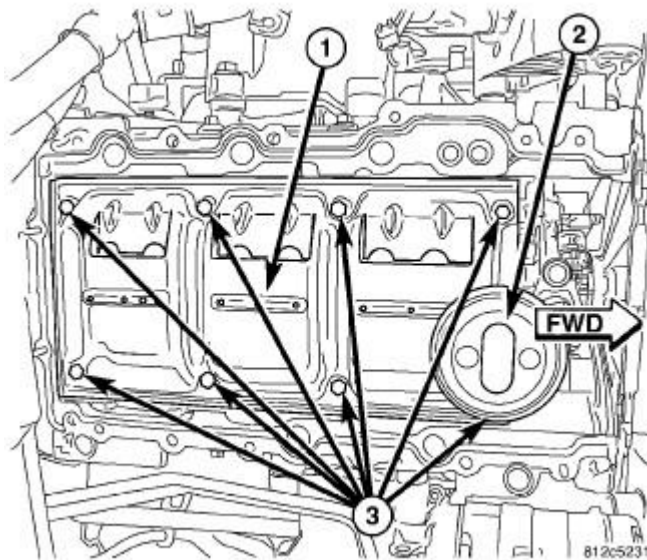


Fig. 247: Windage Tray
Courtesy of CHRYSLER LLC

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

13. Install windage tray (1) with the slots to right side of engine. Lubricate bolts (3) with engine oil and tighten to 27 N.m + 90° Turn (20 ft. lbs. + 90° turn).

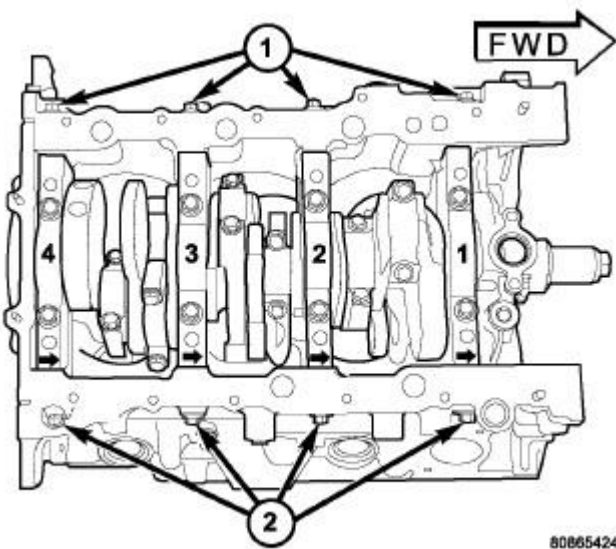


Fig. 248: Main Bearing Cap Identification
Courtesy of CHRYSLER LLC

14. Install the main cap tie (horizontal) bolts (1) and (2) and tighten to 28 N.m (250 in. lbs.).
15. Install rear crankshaft oil seal retainer and oil seal assembly. Refer to **SEAL, Crankshaft Oil, Rear.**

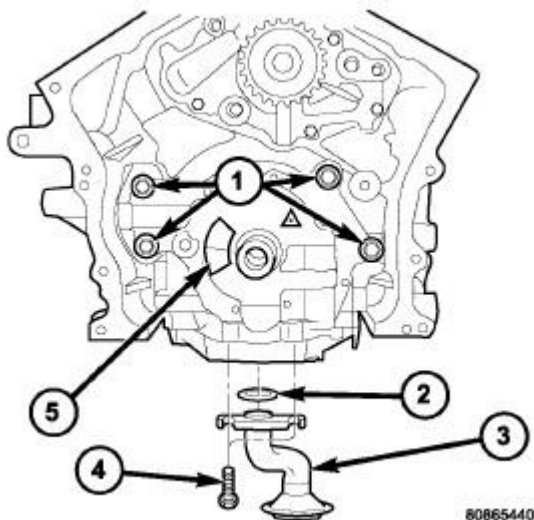


Fig. 249: Oil Pump and Pick-up Tube
Courtesy of CHRYSLER LLC

16. Install oil pump assembly (5). See **Engine/Lubrication/PUMP, Engine Oil - Installation.**
17. Install oil pick-up tube (3) and O-ring (2). Tighten bolts (4) to 28 N.m (250 in. lbs.).
18. Install oil pan gasket, oil pan, and oil filter. See **Engine/Lubrication/PAN, Oil - Installation.**
19. Install crankshaft sprocket. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.**
20. Install timing chain. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.**
21. Install timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**

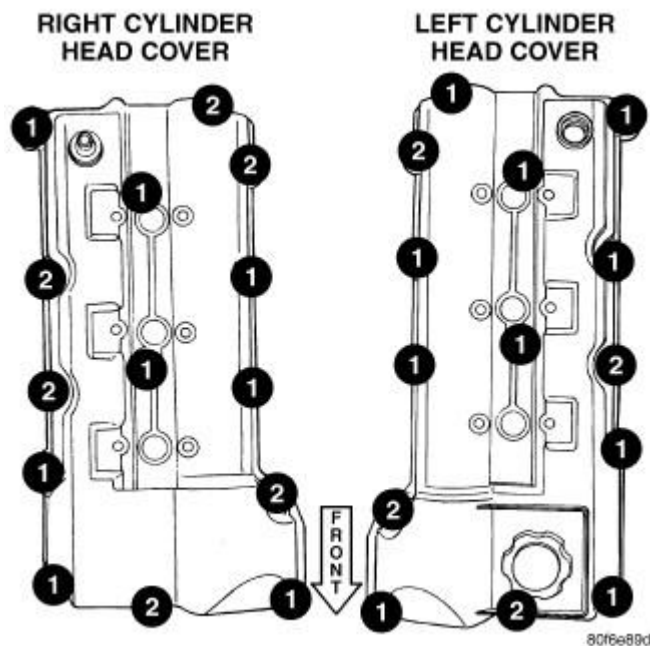


Fig. 250: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

22. Install cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.
23. Install oil dipstick tube.
24. Install engine assembly. See Engine - Installation.
25. Fill engine crankcase with proper oil to correct level. See Engine/Lubrication/OIL - Standard Procedure.
26. Fill with coolant. Refer to Cooling - Standard Procedure.
27. Start engine and check for leaks.

DAMPER, VIBRATION

Removal

REMOVAL

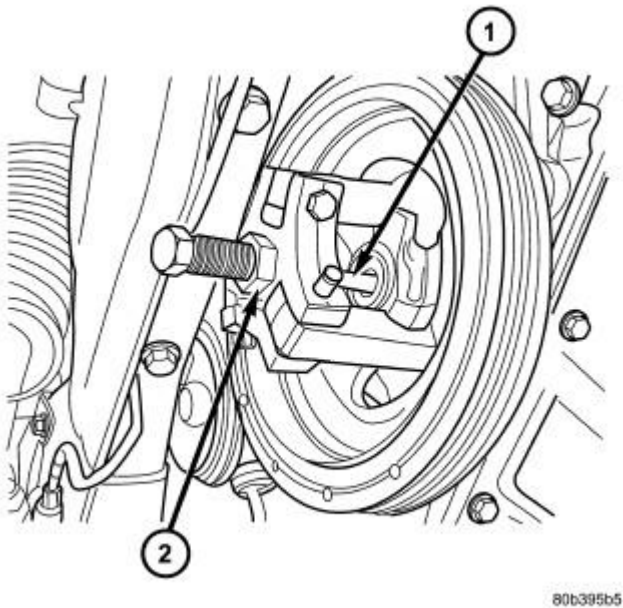


Fig. 251: Vibration Damper- Removal
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - SPECIAL TOOL 8454 PULLER
2 - SPECIAL TOOL 8194 INSERT |
|--|

1. Disconnect negative battery cable.
2. Remove right front wheel and belt splash shield.
3. Remove accessory drive belts. Refer to Cooling/Accessory Drive/BELT, Serpentine - Removal .
4. Remove damper bolt.
5. Remove damper by using Special Tools 8194 Insert and 8454 Puller (1).

Installation

INSTALLATION

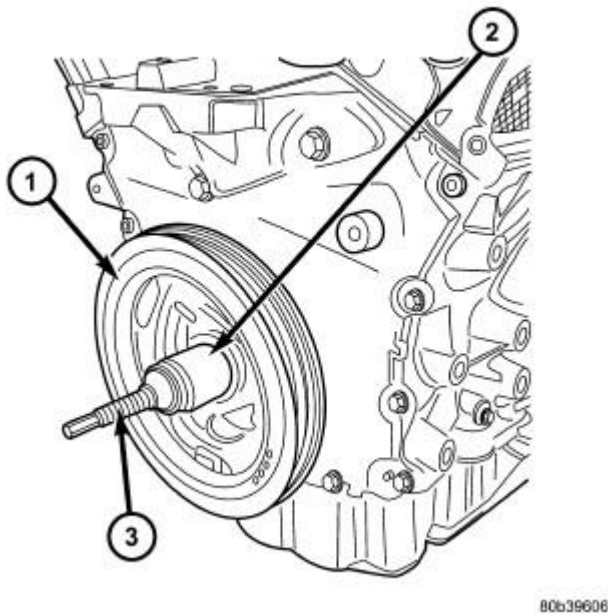


Fig. 252: Vibration Damper- Installation
 Courtesy of CHRYSLER LLC

- 1 - VIBRATION DAMPER
- 2 - SPECIAL TOOL 6792-1
- 3 - SPECIAL TOOL 8179

1. Install damper using Special Tools 8179 (3) Screw, with Nut and Thrust Bearing from 6792, and 6792-1 Installer (2).
2. Install damper center bolt. Tighten center bolt to 170 N.m (125 ft. lbs.).
3. Install accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
4. Install belt splash shield and right front wheel.
5. Lower vehicle.
6. Connect negative battery cable.

FLEXPLATE

Removal

REMOVAL

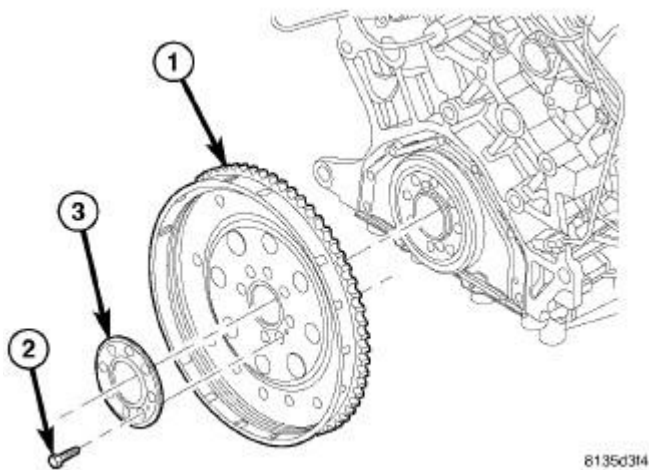


Fig. 253: FLEX PLATE

Courtesy of CHRYSLER LLC

1. Remove transmission.
2. Remove flex plate attaching bolts (2).
3. Remove backing plate (3) and flex plate (1).

Installation

INSTALLATION

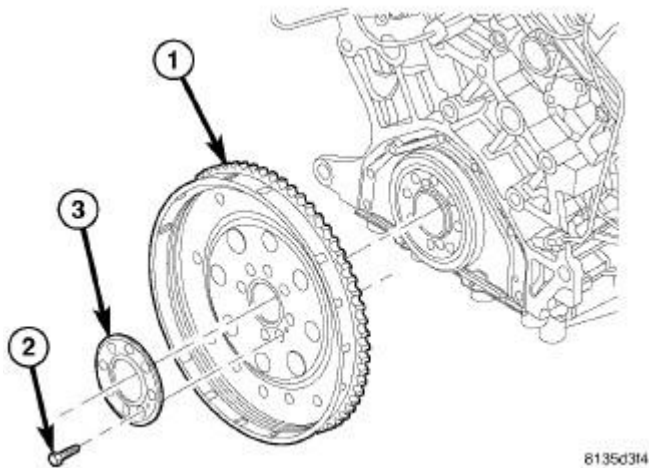


Fig. 254: FLEX PLATE

Courtesy of CHRYSLER LLC

1. Position the flex plate (1) with backing plate (3) on the crankshaft.
2. Apply Mopar® Lock AND Seal Adhesive to the eight flex plate bolts (2).
3. Install the flex plate bolts (2). Tighten the bolts to 95 N.m (70 ft. lbs.).
4. Install the transaxle. Refer to **Transmission and Transfer Case/Automatic - 41TE - Installation**.

NOTE: The Cam/Crank Variation Relearn procedure must be performed anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components. Refer to DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure

RING(S), PISTON

Standard Procedure

PISTON RING FITTING

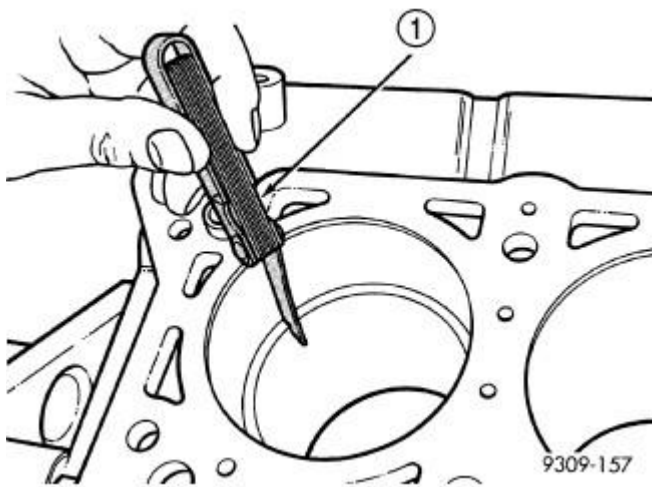


Fig. 255: CHECK GAP ON PISTON RINGS

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 inch.) from bottom of cylinder bore. Check gap with feeler gauge (1). Refer to Engine - Specifications for clearance measurements.

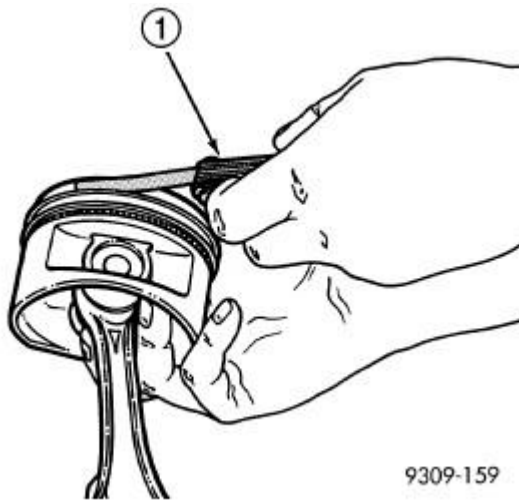


Fig. 256: Measuring Piston Ring Side Clearance
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

2. Check piston ring to groove clearance (1). For clearance specifications, see Engine - Specifications.

Removal

REMOVAL

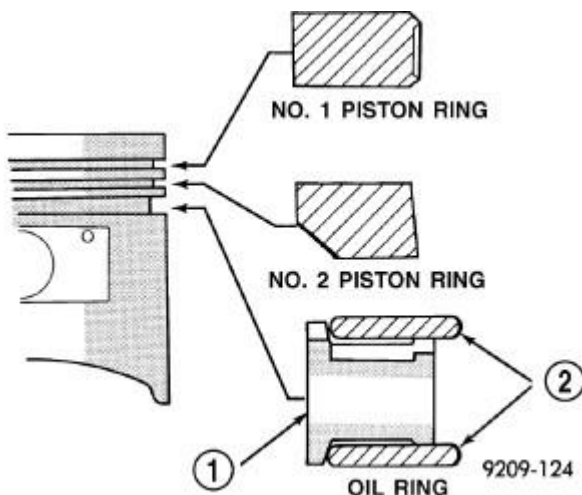


Fig. 257: PISTON RING - INSTALLATION
Courtesy of CHRYSLER LLC

1 - SPACER EXPANDER
2 - SIDE RAIL

1. Remove piston and connecting rod. See Engine/Engine Block/ROD, Piston and Connecting - Removal.

2. Remove No. 1 and No. 2 piston rings from piston using a ring expander tool.
3. Remove upper oil ring side rail.
4. Remove lower oil ring side rail.
5. Remove oil ring expander.

Installation

INSTALLATION

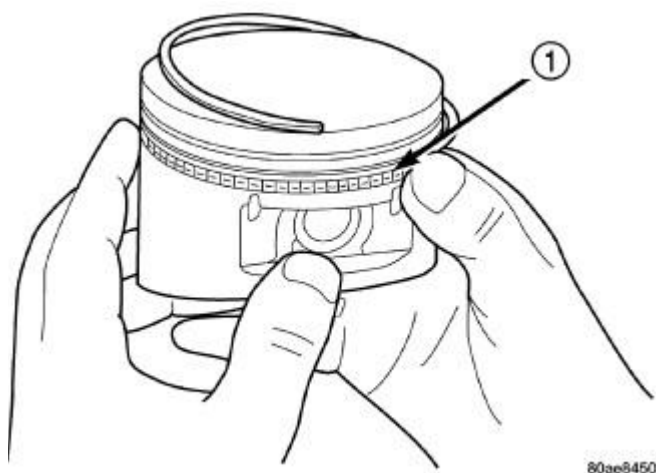


Fig. 258: SIDE RAIL - INSTALLATION

Courtesy of CHRYSLER LLC

1 - SIDE RAIL END

1. Measure clearance of piston rings to the cylinder bore and piston. See **Engine/Engine Block/RING(S), Piston - Standard Procedure**.

CAUTION: Install piston rings in the following order:

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

Install the side rail (1) by placing one end between the piston ring groove and the oil ring expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander during this step.**

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

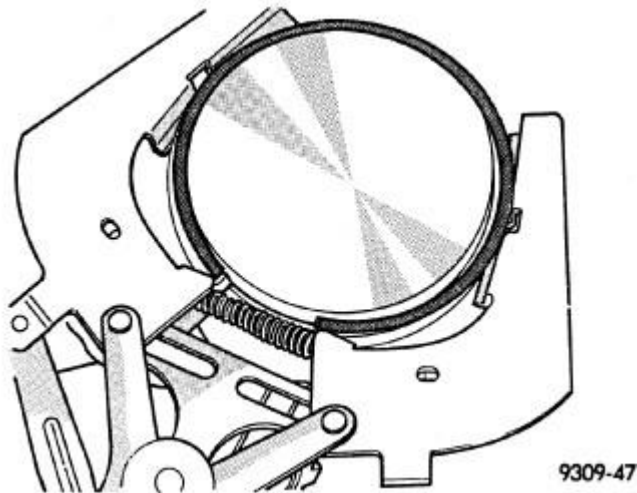


Fig. 259: UPPER AND INTERMEDIATE RINGS
Courtesy of CHRYSLER LLC

NOTE: The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston.

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

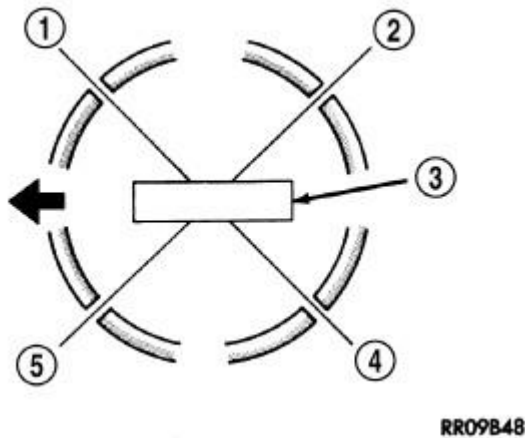


Fig. 260: PISTON RING END GAP POSITION
Courtesy of CHRYSLER LLC

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

ROD, PISTON AND CONNECTING

Description

DESCRIPTION

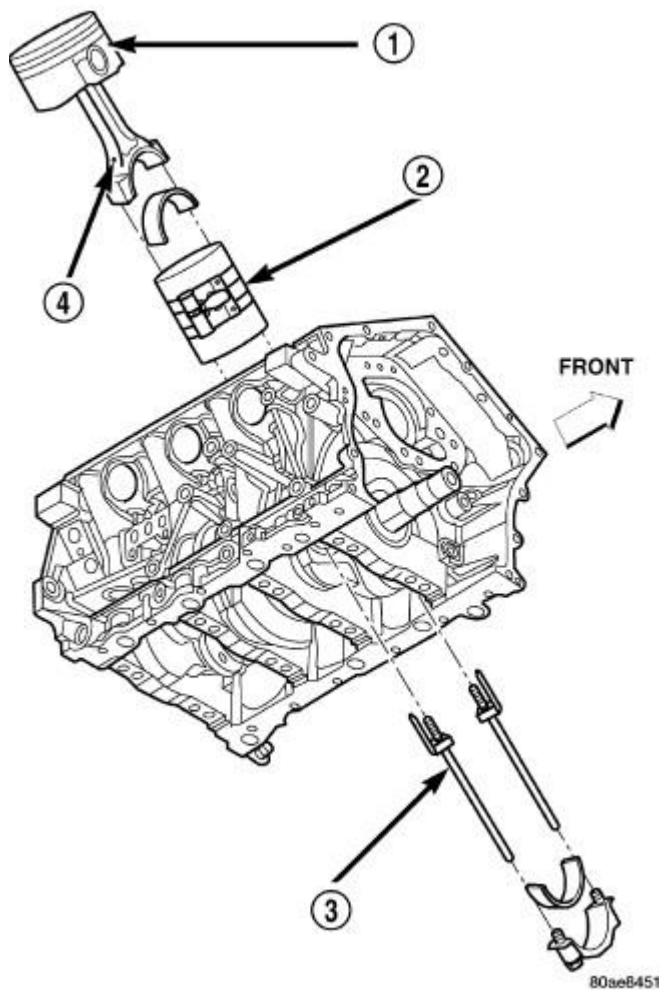


Fig. 261: Piston and Connecting Rod
Courtesy of CHRYSLER LLC

The pistons (1) are made of a high strength aluminum alloy with an anodized top ring groove. Piston skirts are coated with a solid lubricant for scuff resistance. The connecting rods are made of powdered metal with a "fractured cap" design. The connecting rod attaches to the piston with a full floating pin retained by lock rings. The piston and connecting rod are serviced as an assembly.

Standard Procedure

FITTING PISTONS

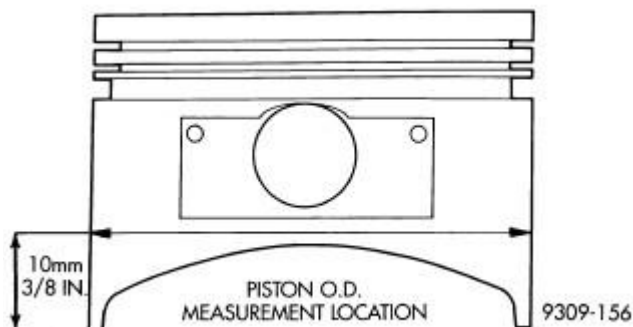


Fig. 262: Piston Measurements
Courtesy of CHRYSLER LLC

The pistons have been cast and machined to one size and weight. The piston and rod assemblies are matched to weigh the same for engine balance.

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line. Refer to Engine Specifications. See **Engine - Specifications**. **Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).**

PISTON PINS

The pistons have been cast and machined to one size and weight. The piston and rod assemblies are matched to weigh the same for engine balance.

The piston pin is full floating and is held in place by lock rings. **Do Not switch pistons with other rods .** Pistons and connecting rods are serviced as an assembly for balance.

Removal

REMOVAL

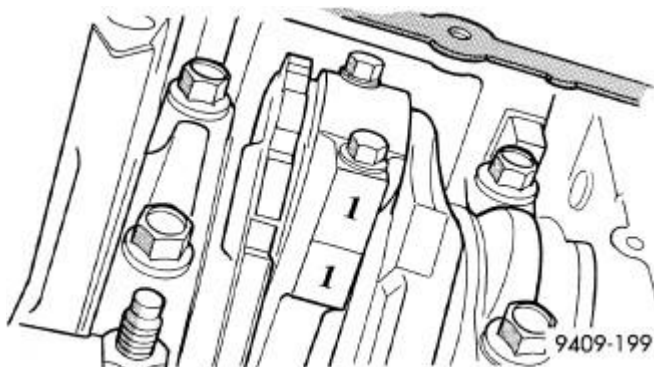


Fig. 263: Identify Connecting Rod to Cylinder

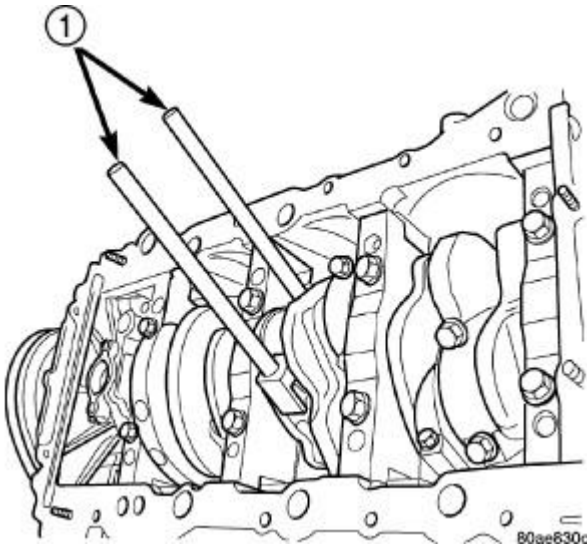
Courtesy of CHRYSLER LLC

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

NOTE: Connecting rod bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

2. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

**Fig. 264: Connecting Rod Guides**

Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 8189 CONNECTING ROD GUIDES
--

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

3. Remove connecting rod cap. Install Special Tool 8189 Connecting Rod Guides into the connecting rod being removed. Remove each piston and rod assembly out of cylinder bore.

NOTE: Be careful not to nick crankshaft journals.

4. After removal, install bearing cap on the mating rod to prevent damage to the fractured cap to rod surfaces.

Installation

INSTALLATION

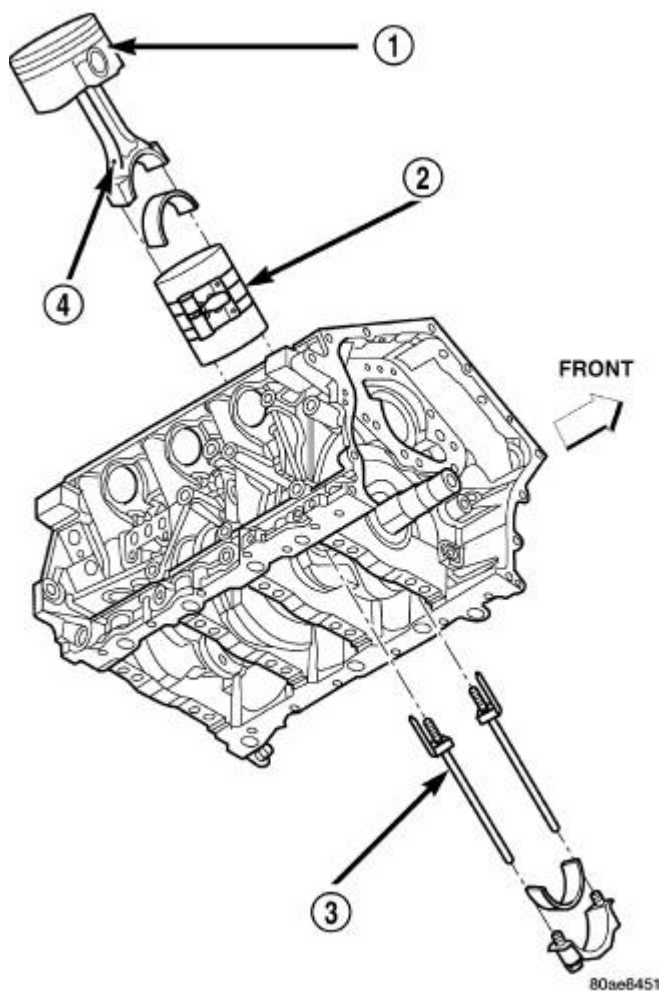


Fig. 265: Piston and Connecting Rod
Courtesy of CHRYSLER LLC

1. Install the piston rings. See **Engine/Engine Block/RING(S), Piston - Installation**.
2. Before installing piston 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.
3. Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps are located properly.
4. Immerse the piston head and rings in clean engine oil, slide the ring compressor over the piston and tighten with the special wrench. **Ensure position of rings does not change during this operation.**

CAUTION: Ensure the hole in bearing half aligns with hole in connecting rod, as damage to engine may occur.

5. Position bearing onto connecting rod. Ensure that hole in bearing half is aligned to hole in connecting rod. Lubricate bearing surface with clean engine oil.
6. Install Special Tools 8189 Connecting Rod Guides into connecting rod.

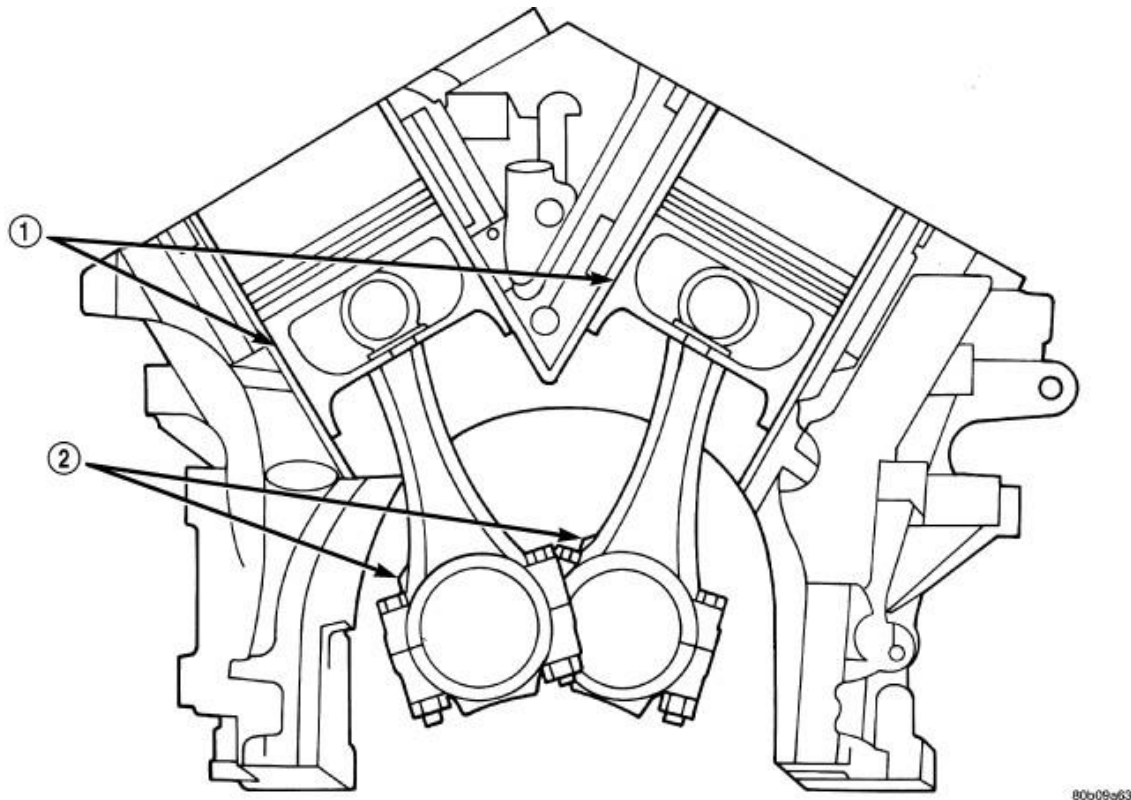


Fig. 266: Piston and Connecting Rod Positioning (Front View of Engine)
Courtesy of CHRYSLER LLC

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

7. The pistons are marked on top with an arrow and with an "F" (Front) above the pin boss. These marks must be pointing toward the front of engine on both cylinder banks. The connecting rod oil squirt hole (2) faces the major thrust (right) side of the block.
8. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal.

CAUTION: Do Not interchange piston assemblies bank to bank, as engine damage may occur.

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.

10. Lubricate rod bolts and bearing surface with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N.m (20 ft. lbs.) Plus 1/4 turn.

SEAL, CRANKSHAFT OIL, FRONT

Removal

REMOVAL

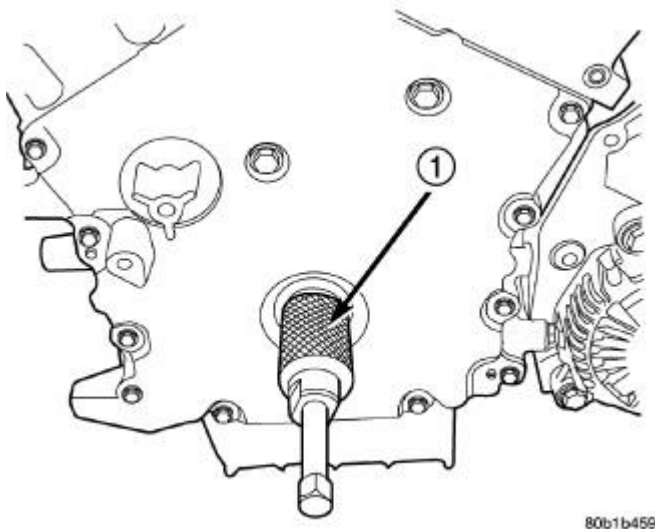


Fig. 267: Crankshaft Front Oil Seal - Removal

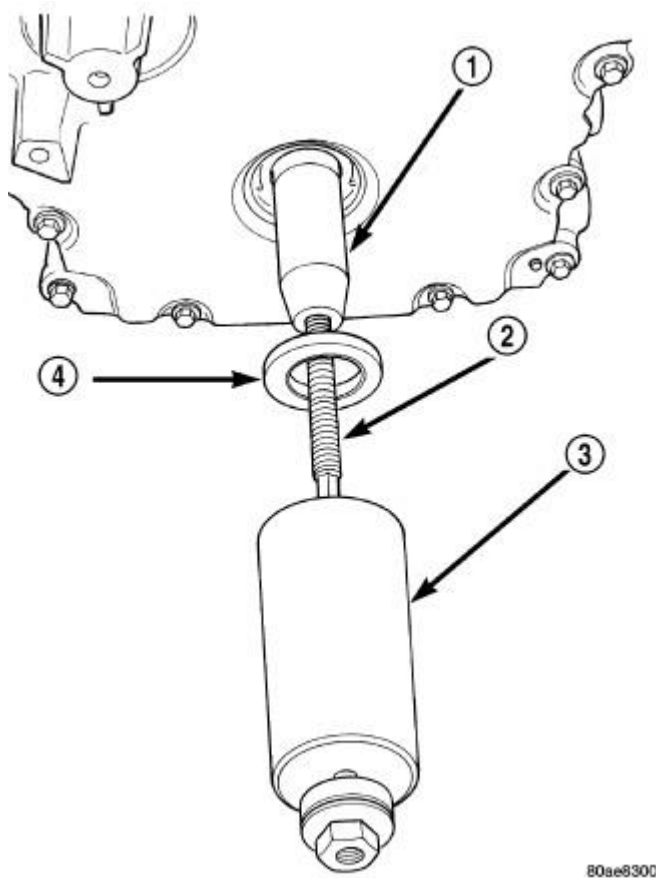
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6771

1. Remove crankshaft vibration damper. See Engine/Engine Block/DAMPER, Vibration - Removal.
2. Install Special Tool 8194, Insert into crankshaft nose. Remove seal using Special Tool 6771, Remover (1).

Installation

INSTALLATION



80se6300

Fig. 268: Crankshaft Front Oil Seal - Installation
Courtesy of CHRYSLER LLC

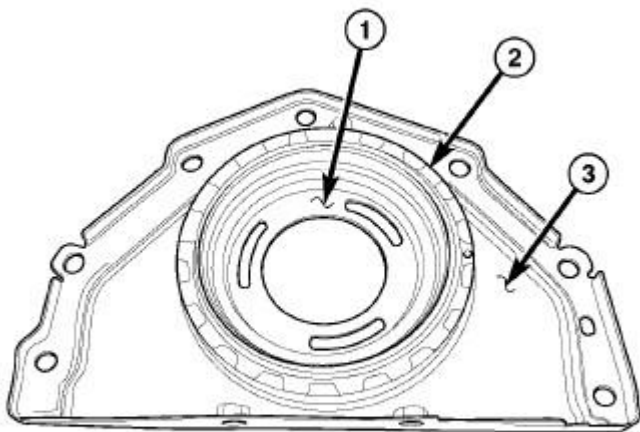
- 1 - SPECIAL TOOL 6780-2
- 2 - SPECIAL TOOL 8179
- 3 - SPECIAL TOOL 6780-1
- 4 - SEAL

1. Install new seal using Special Tools 6780-2 Sleeve, 6780-1 Installer, and 8179 Stud (2).
2. Install crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation.**

SEAL, CRANKSHAFT OIL, REAR

Description

DESCRIPTION



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Fig. 269: CRANKSHAFT OIL SEAL - REAR
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

REMOVAL

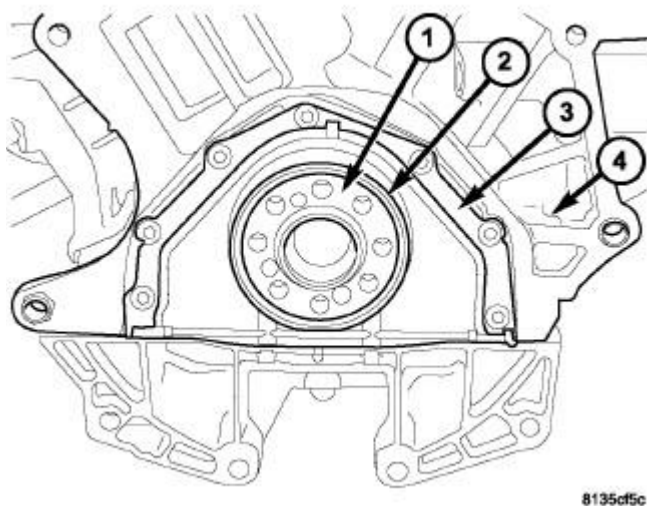


Fig. 270: REAR MAIN SEAL AND RETAINER
Courtesy of CHRYSLER LLC

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

1. Remove the engine oil pan. See **Engine/Lubrication/PAN, Oil - 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

INSTALLATION

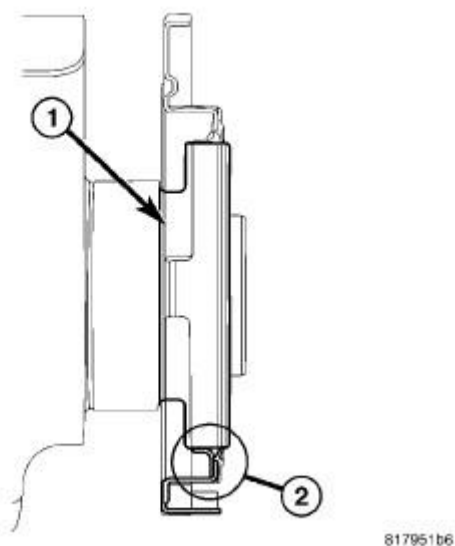


Fig. 271: REAR SEAL INSTALLED

Courtesy of CHRYSLER LLC

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

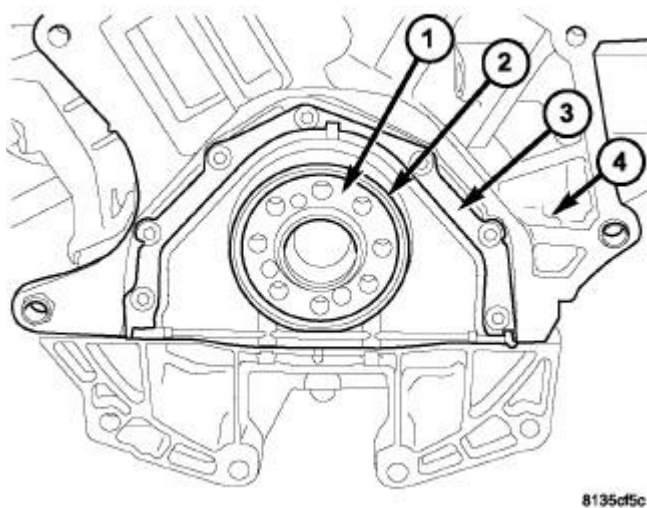


Fig. 272: REAR MAIN SEAL AND RETAINER

Courtesy of CHRYSLER LLC

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

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.

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.
2. Carefully position the oil seal, retainer and seal protector on crankshaft and push firmly into place on engine block (the seal protector will be removed from the rear oil seal assembly as a result of installing the rear oil seal). Hand tighten the rear oil seal fasteners.

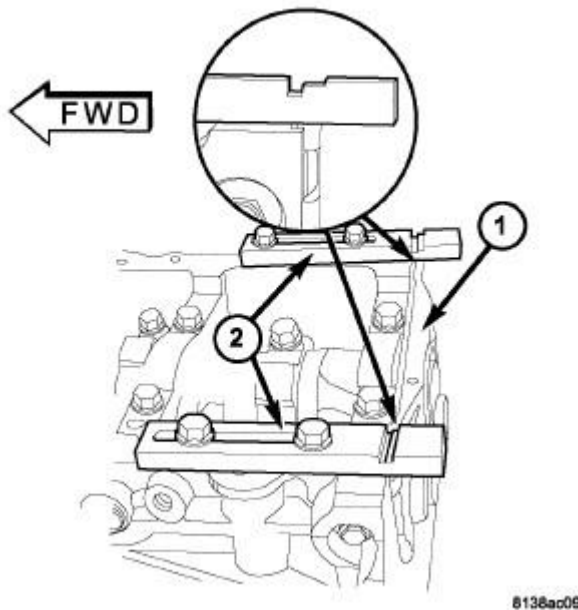


Fig. 273: REAR CRANKSHAFT SEAL RETAINER ALIGNMENT
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - SEAL RETAINER
2 - SPECIAL TOOLS 8225 |
|---|

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

3. 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.

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

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

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

ENGINE MOUNTING

ADJUSTMENTS

ADJUSTMENT

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

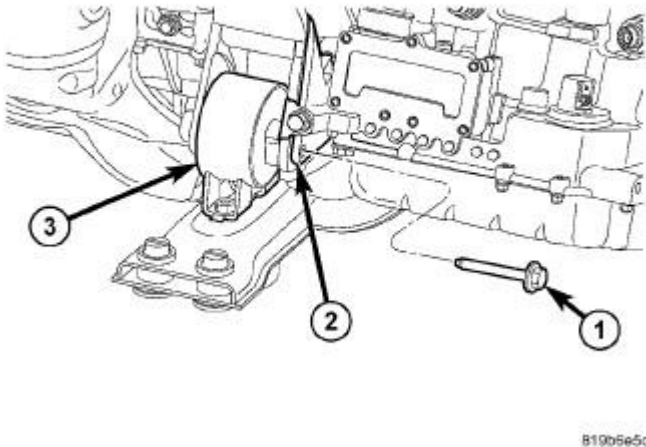
Check and reposition right and left engine support assemblies as required. Adjust drive train position, if required, for the following conditions:

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

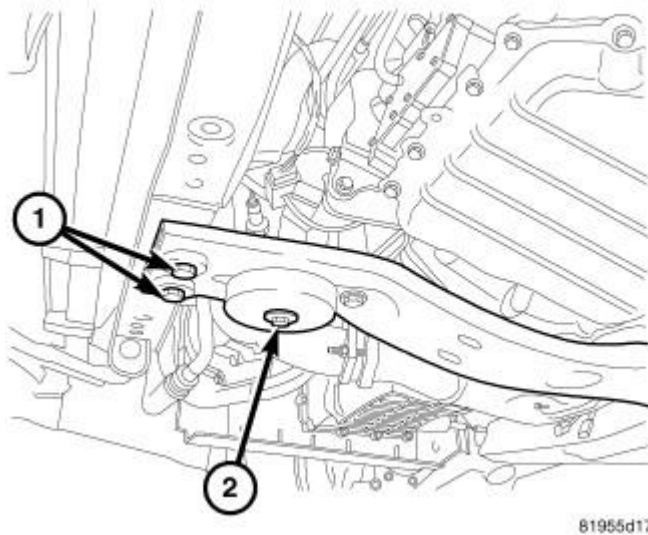
ENGINE SUPPORT ADJUSTMENT

1. Remove the load on the engine motor mounts by carefully supporting the engine and transmission assembly with a floor jack.
2. Loosen the right engine support assembly vertical fasteners.
3. Loosen the left engine support assembly vertical bolts.
4. Pry the engine right or left as required to achieve the proper drive shaft assembly length. Refer to appropriate Suspension and Driveshaft articles for driveshaft identification and related assembly length measuring.
5. Tighten right engine support assembly vertical bolts to 61 N.m (45 ft. lbs.). and tighten left engine support assembly bolts to 61 N.m (45 ft. lbs.).
6. Recheck drive shaft length.

INSULATOR, ENGINE MOUNT, FRONT

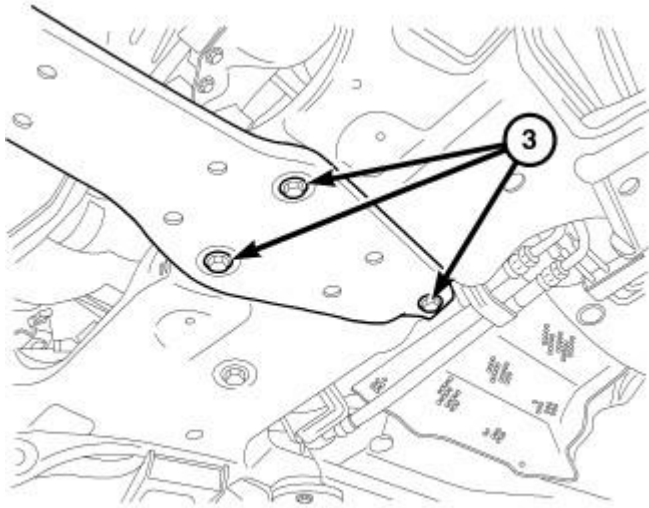
Removal**REMOVAL****Fig. 274: HORIZONTAL BOLT****Courtesy of CHRYSLER LLC**

1. Disconnect the negative battery cable.
2. Raise vehicle and support.
3. Remove the front mount through bolt (1).

**Fig. 275: ENGINE MOUNT/CROSSMEMBER****Courtesy of CHRYSLER LLC**

4. Remove front engine mount bolt (2).

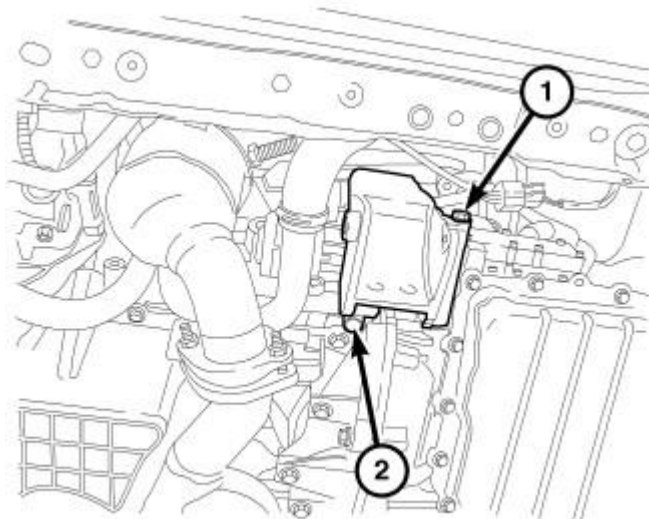
5. Remove crossmember front mounting bolts (1).



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Fig. 276: CROSSMEMBER REAR
Courtesy of CHRYSLER LLC

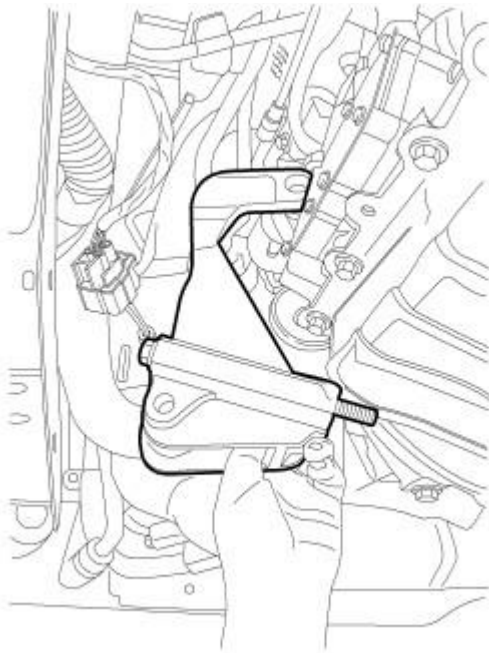
6. Remove crossmember mounting bolts (3).
7. Remove crossmember from vehicle.



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Fig. 277: BRACKET IN PLACE
Courtesy of CHRYSLER LLC

8. Remove front engine mounting bolts (2).
9. Loosen front engine mounting thru bolts (1).



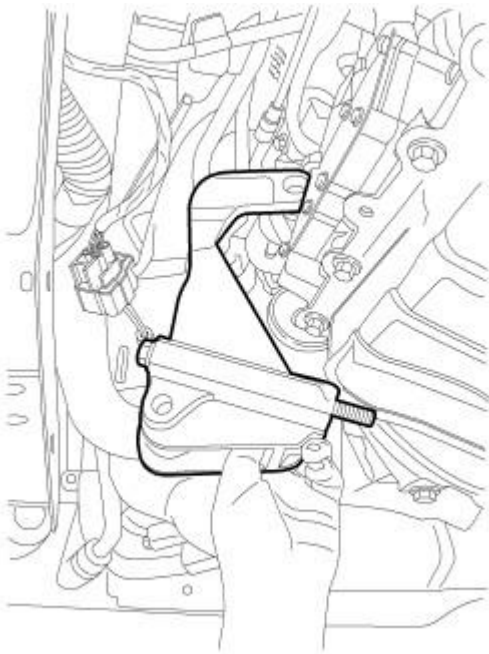
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Fig. 278: BRACKET FOR MOUNT
Courtesy of CHRYSLER LLC

10. Remove the front engine mount bracket from engine block.

Installation

INSTALLATION



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Fig. 279: BRACKET FOR MOUNT
Courtesy of CHRYSLER LLC

1. Install front anti-roll mount bracket and start bolts.

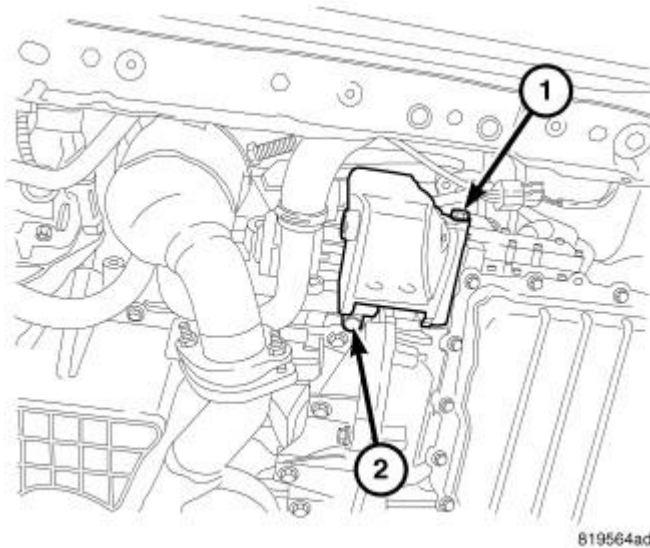


Fig. 280: BRACKET IN PLACE
Courtesy of CHRYSLER LLC

2. Install the engine anti-roll mount and bolts (1) and (2). Tighten to 50 N.m (37 ft. lbs.)

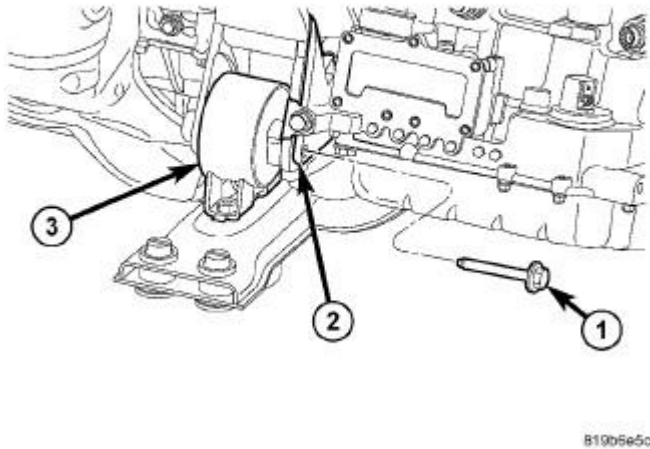
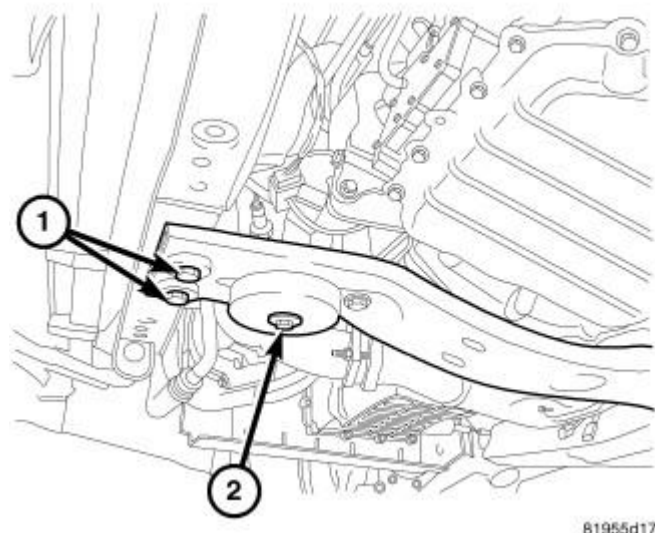


Fig. 281: HORIZONTAL BOLT
Courtesy of CHRYSLER LLC

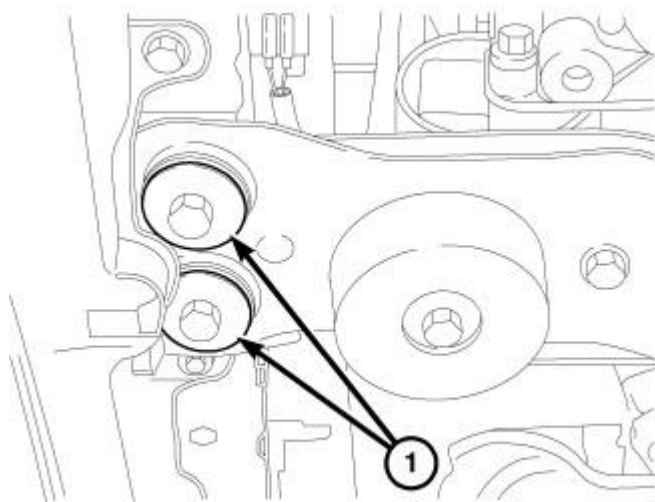
3. Install mount through bolt (1) and tighten to 47 N.m (35 ft. lbs.).



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Fig. 282: ENGINE MOUNT/CROSSMEMBER
Courtesy of CHRYSLER LLC

4. Install lower engine anti-roll mount bolt (2) and tighten bolts to 47 N.m (35 ft. lbs.).
5. Install bolts (1) and tighten to 55 N.m (40.5 ft. lbs.).



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Fig. 283: FRONT FORE CROSS MEMBER BOLTS
Courtesy of CHRYSLER LLC

6. Install bolts (1) and tighten to 55 N.m (40.5 ft. lbs.).

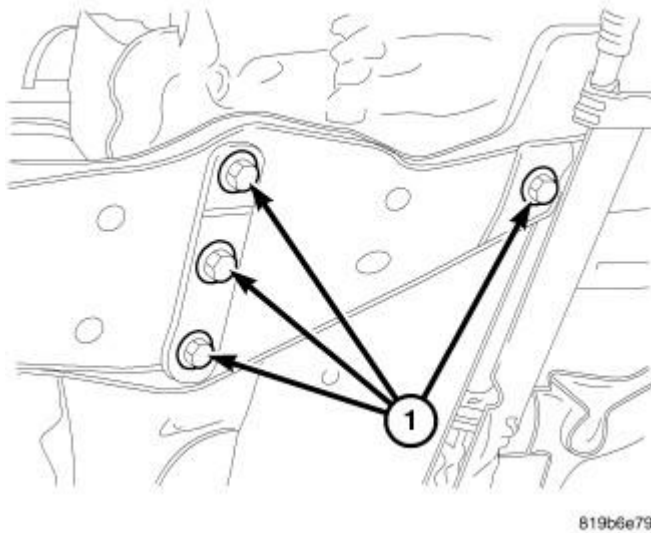


Fig. 284: FRONT AFT CROSSMEMBER BOLTS
Courtesy of CHRYSLER LLC

7. Tighten bolts (1) to 50 N.m (37 ft. lbs.).
8. If equipped, install the belly pan.
9. Lower vehicle.
10. Connect the negative battery cable.

INSULATOR, ENGINE MOUNT, LEFT

Removal

REMOVAL

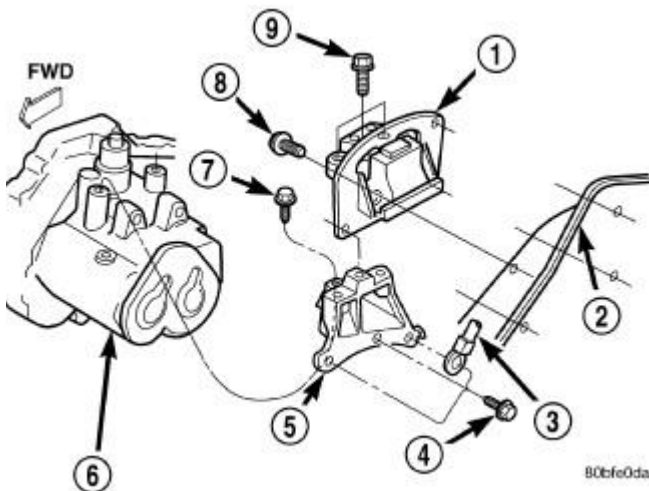


Fig. 285: Left Side Mount - Typical
Courtesy of CHRYSLER LLC

- 1 - TRANSMISSION SUPPORT ASSEMBLY
- 2 - LEFT FRAME RAIL
- 3 - GROUND CABLE
- 4 - BOLT (D)
- 5 - TRANSMISSION BRACKET
- 6 - TRANSMISSION
- 7 - BOLT (C)
- 8 - BOLT (B)
- 9 - BOLT (A)

1. Disconnect negative battery cable.
2. Remove throttle body air inlet hose and air cleaner housing assembly.
3. Support transmission with floor jack and wooden block.
4. Remove the three vertical bolts from mount to transmission bracket (5).
5. Slightly lower transmission with floor jack.
6. Remove mount to frame rail fasteners (8) and remove mount.

Installation

INSTALLATION

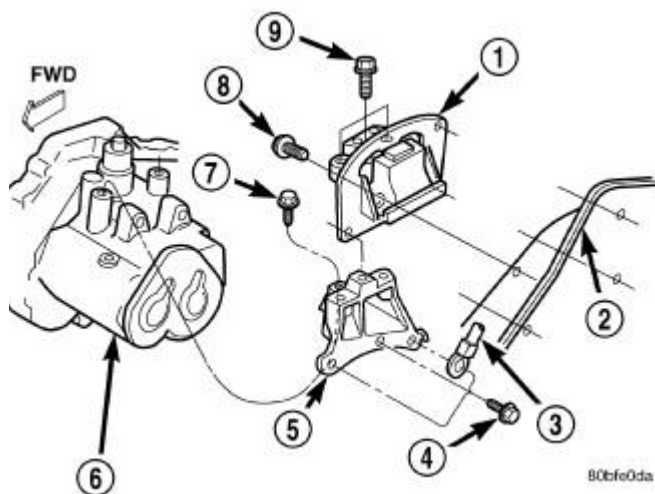


Fig. 286: Left Side Mount - Typical
Courtesy of CHRYSLER LLC

- 1 - TRANSMISSION SUPPORT ASSEMBLY
- 2 - LEFT FRAME RAIL
- 3 - GROUND CABLE
- 4 - BOLT (D)
- 5 - TRANSMISSION BRACKET
- 6 - TRANSMISSION

7 - BOLT (C)

8 - BOLT (B)

9 - BOLT (A)

1. Position mount to frame rail. Install mount to frame rail fasteners (8). Torque fasteners to 33 N.m (24 ft. lbs.).
2. Raise transmission into position with floor jack.
3. Install three vertical bolts from mount to transmission bracket (9). Torque fasteners to 61 N.m (45 ft. lbs.).
4. Remove floor jack and wooden block.
5. Install throttle body air inlet hose and air cleaner housing assembly.
6. Connect negative battery cable.

INSULATOR, ENGINE MOUNT, REAR

Removal

REMOVAL

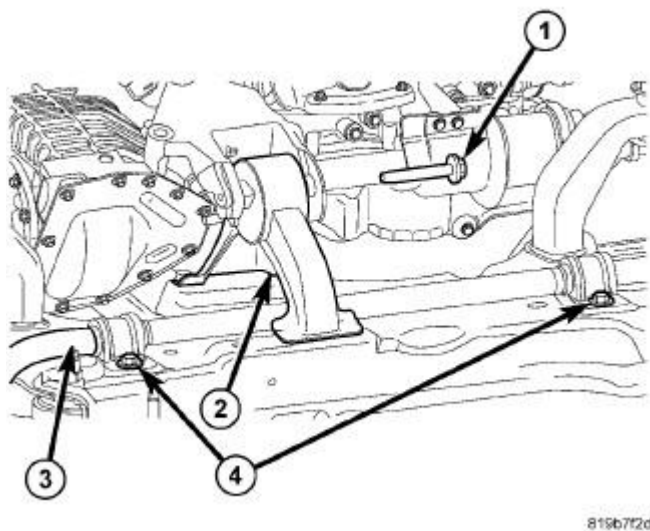


Fig. 287: REAR TORQUE MOUNT
Courtesy of CHRYSLER LLC

1. Remove throttle body air inlet hose and air cleaner housing assembly.
2. Remove three vertical bolts attaching rear mount bracket to transaxle case.
3. Remove rear mount bracket through bolt (1).
4. Loosen the front mount through bolt.
5. Remove horizontal bolt attaching rear mount bracket to transaxle case.
6. Remove mount bracket (2).

7. Remove rear mount to suspension crossmember attaching bolts.
8. Remove rear mount.

Installation

INSTALLATION

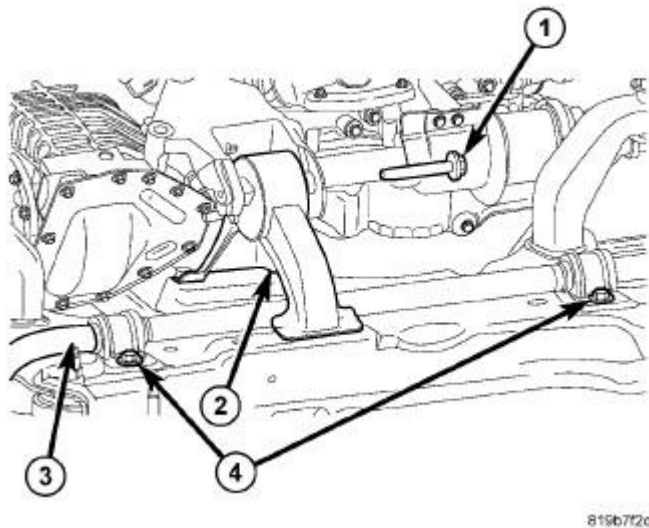


Fig. 288: REAR TORQUE MOUNT

Courtesy of CHRYSLER LLC

1. Position rear mount on suspension crossmember and loosely install bolts.
2. Position mount bracket (2) on transaxle and install bolts. Tighten to 95 N.m (70 ft. lbs.).
3. Tighten rear mount to crossmember bolts to 61 N.m (45 ft. lbs.)

NOTE: Be sure the weight of the engine is static and in rest position.

4. Install rear mount to bracket through bolt (1) and tighten to 75 N.m (55 ft. lbs.).
5. Tighten front mount through bolt to 75 N.m (55 ft. lbs.)
6. Install throttle body air inlet hose and air cleaner housing assembly.

INSULATOR, ENGINE MOUNT, RIGHT

Removal

REMOVAL

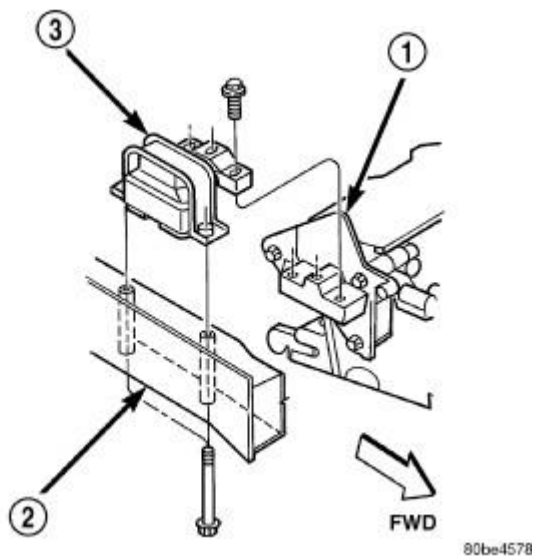


Fig. 289: ENGINE MOUNTING RIGHT SIDE
Courtesy of CHRYSLER LLC

- 1 - ENGINE SUPPORT BRACKET
- 2 - FRAME RAIL
- 3 - RIGHT ENGINE MOUNT

1. Remove coolant pressure container.
2. Remove heater tube front attaching screw.
3. Raise vehicle on a hoist and remove inner splash shield.
4. Remove heater tube rear attaching screw.
5. Remove the right engine support assembly vertical fasteners from frame rail.
6. Lower vehicle. Remove the load on the engine motor mounts by carefully supporting the engine assembly with floor jack and wooden block on oil pan.
7. Remove the bolts attaching the engine support assembly to the engine bracket (1).
8. Remove right engine mount.

Installation

INSTALLATION

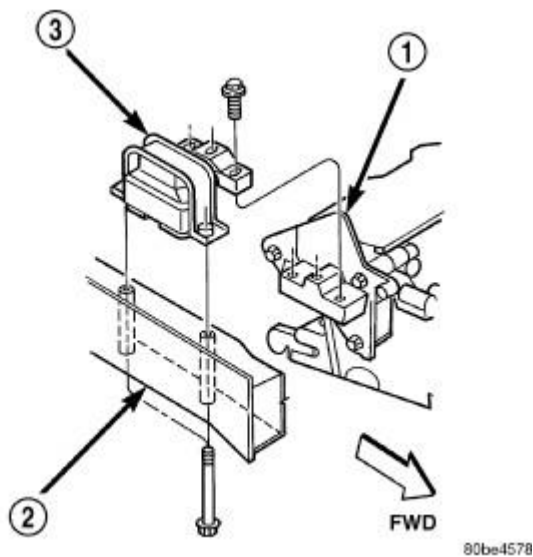


Fig. 290: ENGINE MOUNTING RIGHT SIDE
Courtesy of CHRYSLER LLC

- 1 - ENGINE SUPPORT BRACKET
- 2 - FRAME RAIL
- 3 - RIGHT ENGINE MOUNT

1. Position right engine mount and install frame rail (2) to mount bolts. Tighten bolts to 61 N.m (45 ft. lbs.).
2. Install the mount to engine support bracket bolts and tighten to 61 N.m (45 ft. lbs.).
3. Raise vehicle on a hoist.
4. Install heater tube rear attaching screw.
5. Install inner splash shield and lower vehicle.
6. Install heater tube front attaching screw.
7. Install coolant bottle.

LUBRICATION

DESCRIPTION

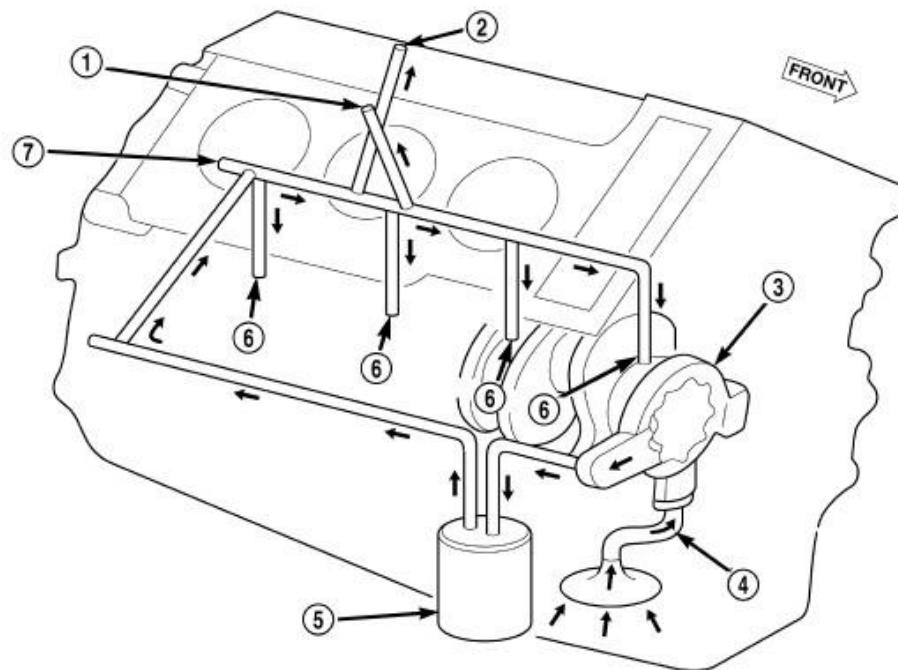
DESCRIPTION

The 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 structural windage tray is used to increase power by minimizing oil windage at high engine RPM. An engine oil cooler is used on some models.

OPERATION

OPERATION

Oil from the oil pan is pumped by a gerotor type oil pump (3) directly coupled to the crankshaft. Oil pressure is controlled by a relief valve mounted inside the oil pump housing.

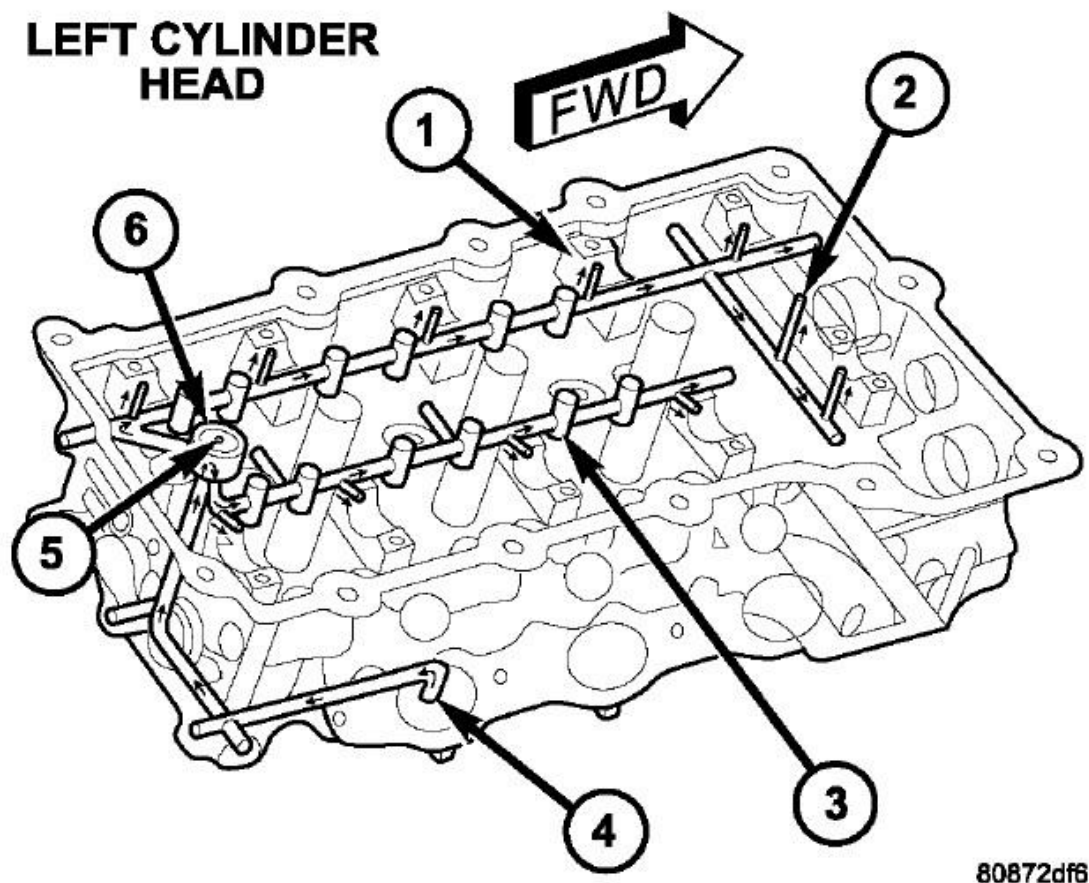


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Fig. 291: Cylinder Block Oil Lubrication System
Courtesy of CHRYSLER LLC

1 - TO RIGHT CYLINDER HEAD	5 - OIL FILTER
2 - TO LEFT CYLINDER HEAD	6 - TO CRANKSHAFT MAIN JOURNALS
3 - OIL PUMP	7 - MAIN OIL GALLERY
4 - OIL PICKUP TUBE	-

FROM:	TO:	FROM:	TO:
Oil Pump	Oil Filter Mounting (inlet)	Main Oil Gallery - Center of Block	1. Crankshaft Main Bearings
Oil Filter Mounting (inlet)	Oil Filter		2. Left Cylinder Head*
Oil Filter	Oil Filter Mounting (outlet)		3. Right Cylinder Head*
Oil Filter Mounting (outlet)	Oil Gallery - Right side of Block	Crankshaft Main Bearings	Connecting Rod Bearings
Oil Gallery - Right side of Block	Oil Gallery - Rear of Block and to Oil Cooler (some models)	Left Cylinder Head	Accumulator
Oil Gallery - Rear of Block	Main Oil Gallery - Center of Block	Right Cylinder Head	Accumulator
*The cylinder head gaskets have an oil restrictor to control oil flow to the cylinder heads.			

**Fig. 292: Cylinder Head Oil Lubrication System - Left Side**

Courtesy of CHRYSLER LLC

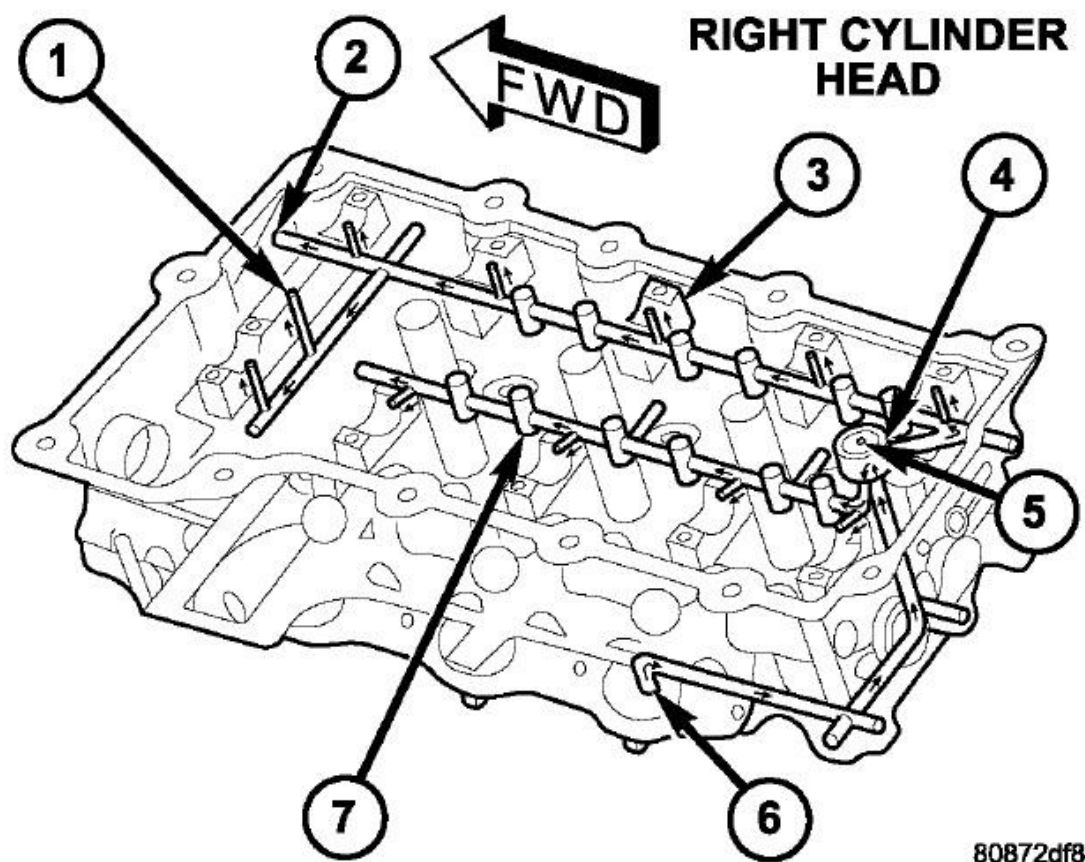
1 - CAM JOURNALS	4 - OIL FEED FROM BLOCK
2 - OIL FEED TO CAMSHAFT (SECONDARY) CHAIN TENSIONER	5 - VENT HOLE
3 - LASH ADJUSTER BORES	6 - ACCUMULATOR

FROM:	TO:
Left Cylinder Head Oil Inlet Gallery (intake side of head)	Oil Gallery and Accumulator - Rear of Head*
Oil Gallery and Accumulator - Rear of Head*	1. Exhaust Camshaft Oil Passage 2. Intake Camshaft Oil Passage
Left Exhaust Camshaft Oil Passage	1. Left Exhaust Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms 3. Left Camshaft (Secondary) Chain Tensioner**
Left Intake Camshaft Oil Passage	1. Left Intake Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker

Arms

* When oil reaches the back of the cylinder head, the oil gallery feeds oil into an accumulator chamber that is located towards center of the head. The accumulator chamber is closed off with a pressed in core plug that has a small orifice to act as a vent. Oil then travels down at a 45 degree angle from the accumulator into two passages, one for the intake and one for the exhaust side of the cylinder head.

** The secondary camshaft chain tensioner is the last component to receive oil on the left cylinder head.



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Fig. 293: Cylinder Head Oil Lubrication System - Right Side

Courtesy of CHRYSLER LLC

1 - OIL FEED TO CAMSHAFT (SECONDARY) CHAIN TENSIONER	5 - VENT HOLE
2 - OIL FEED TO TIMING CHAIN (PRIMARY) TENSIONER	6 - OIL FEED FROM BLOCK
3 - CAM JOURNALS	7 - LASH ADJUSTOR BORES
4 - ACCUMULATOR	-

FROM:	TO:
Right Cylinder Head Oil Inlet Gallery (intake side)	Oil Gallery and Accumulator - Rear of Head*

of head)	
Oil Gallery and Accumulator - Rear of Head*	1. Exhaust Camshaft Oil Passage 2. Intake Camshaft Oil Passage
Right Exhaust Camshaft Oil Passage	1. Right Exhaust Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms 3. Right Camshaft (Secondary) Chain Tensioner 4. Primary Timing Chain Tensioner - Right Head**
Right Intake Camshaft Oil Passage	1. Right Intake Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms
* When oil reaches the back of the cylinder head, the oil gallery feeds oil into an accumulator chamber that is located towards center of the head. The accumulator chamber is closed off with a pressed in core plug that has a small orifice to act as a vent. Oil then travels down at a 45 degree angle from the accumulator into two passages, one for the intake and one for the exhaust side of the cylinder head.	
** The timing (primary) chain tensioner is the last component to receive oil on the right cylinder head.	

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

1. Remove the oil pressure switch. Refer to **SWITCH, Oil Pressure**.
2. Install oil pressure test gauge assembly, Special Tools C-3292A with 8406 adaptor.
3. Start engine and monitor gauge readings.

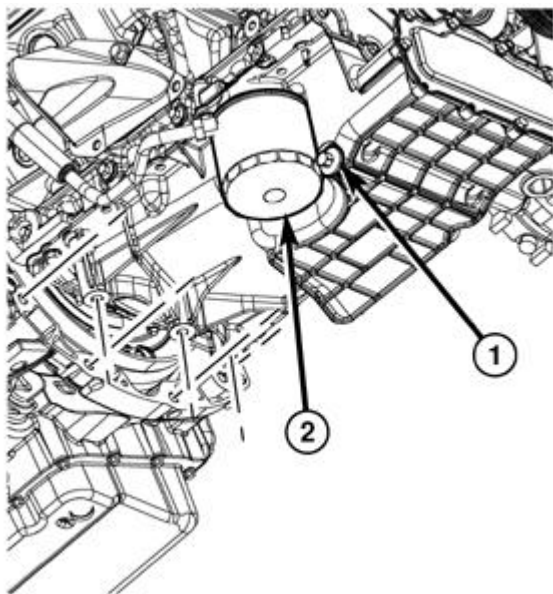
CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM

4. Oil Pressure (engine at operating temperature): **Curb Idle** 34.5 kPa (5 psi) minimum **3000 RPM** 300-724 kPa (45-105 psi).
5. If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open or a clogged oil pickup screen.
6. Install oil pressure switch after testing is completed. Refer to **SWITCH, Oil Pressure**.

FILTER, ENGINE OIL

Removal

REMOVAL



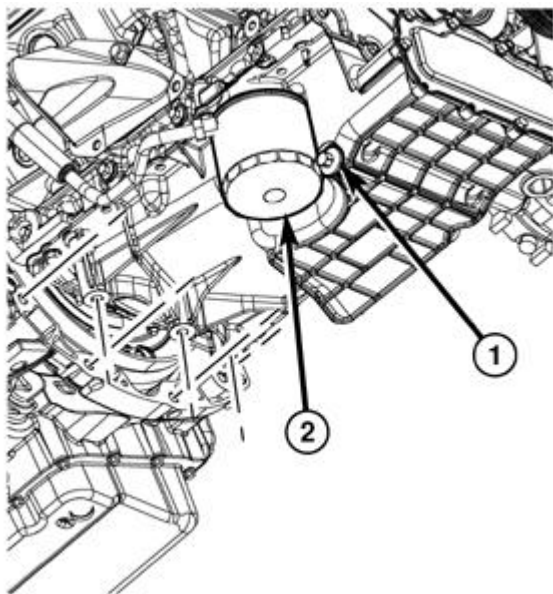
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Fig. 294: Oil Filter & Drain Plug
Courtesy of CHRYSLER LLC

1. Raise vehicle on hoist.
2. Position a suitable collecting container under oil filter location.
3. Remove oil filter (2) using a suitable oil filter wrench. Dispose of oil filter following environmental guidelines.

Installation

INSTALLATION



1168335

Fig. 295: Oil Filter & Drain Plug

Courtesy of CHRYSLER LLC

1. Wipe filter base clean, then inspect gasket sealing surface.
2. Lubricate gasket of new filter with clean engine oil.
3. Install oil filter (2) and tighten to 16 N.m (12 ft. lbs.) after gasket contacts base. Use filter wrench if necessary.
4. Fill crankcase with proper engine oil to correct level if drained. Start engine and check for leaks.

OIL**Description****DESCRIPTION**

For engine oil type and capacity, refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Description** .

Standard Procedure**ENGINE OIL AND FILTER CHANGE**

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.

Change engine oil and filter at mileage and time intervals described in the Maintenance Schedule. Refer to **Vehicle Quick Reference/Maintenance Schedules - Description** .

TO CHANGE ENGINE OIL

1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Hoist and support vehicle on safety stands. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
4. Remove oil fill cap.
5. Place a suitable drain pan under crankcase drain.
6. Remove 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. See **Engine/Lubrication/FILTER, Engine Oil - Removal**.

8. Install drain plug in crankcase.
9. Install new oil filter. Refer to **Engine/Lubrication/FILTER, Engine Oil - Installation.**
10. Lower vehicle and fill crankcase with specified type and amount of engine oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Description** .
11. Install oil fill cap.
12. Start engine and inspect for leaks.
13. Stop engine and inspect oil level.

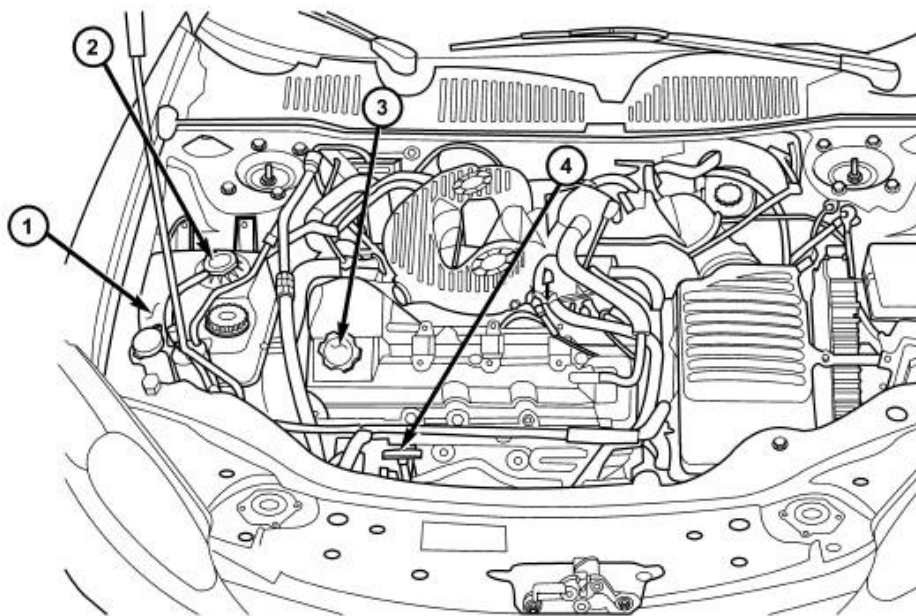
OIL FILTER SPECIFICATION

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 listed above.

ENGINE OIL LEVEL CHECK



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Fig. 296: Fluid Level Check - 2.7L
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - COOLANT PRESSURE CONTAINER
2 - COOLANT PRESSURE CAP
3 - ENGINE OIL FILL
4 - ENGINE OIL DIPSTICK |
|--|

The best time to check engine oil level is after it 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 (4). Add only when the level is at or below the ADD mark.

PAN, OIL

Removal

REMOVAL

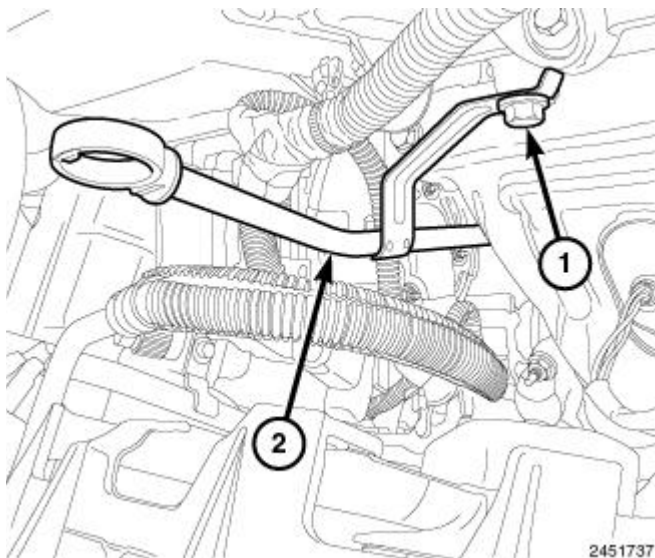


Fig. 297: Identifying Oil Dipstick Tube & Bolt
Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the bolt (1) and the engine oil dipstick tube (2).

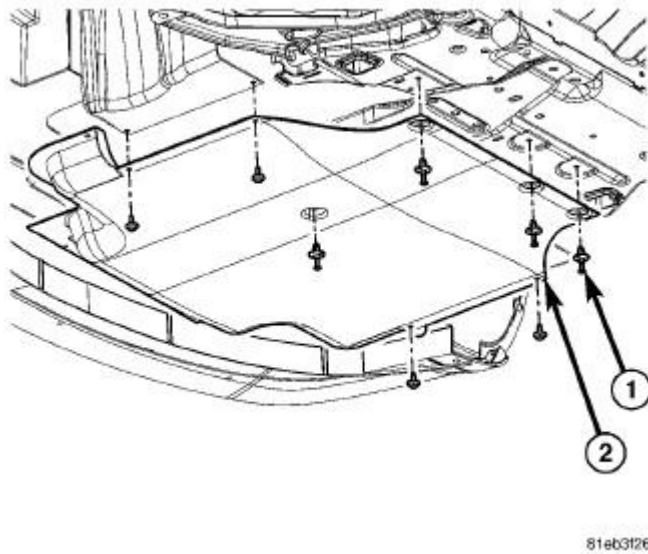


Fig. 298: Belly Pan

Courtesy of CHRYSLER LLC

3. Raise and secure the vehicle on a hoist. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure**.
4. Remove the belly pan (2), if equipped.

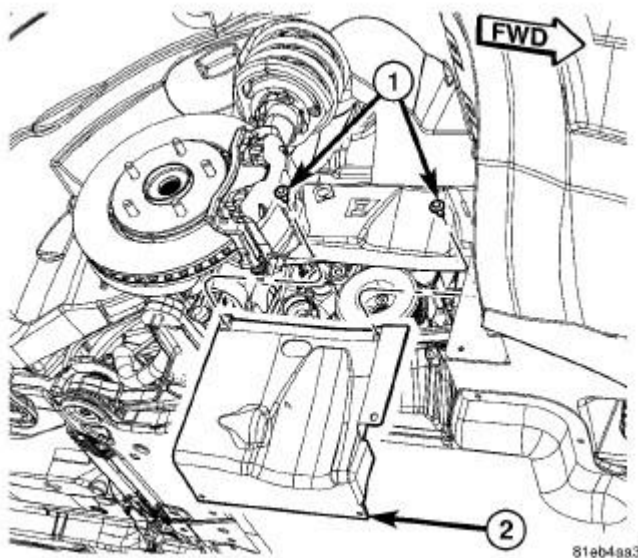


Fig. 299: LOWER SPLASH SHIELD

Courtesy of CHRYSLER LLC

5. Remove the right lower splash shield (2).

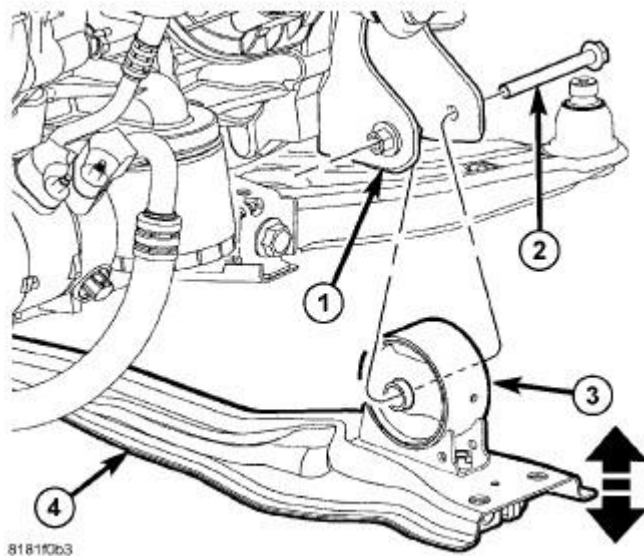


Fig. 300: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

6. Drain the engine oil and remove the oil filter. See [Engine/Lubrication/FILTER, Engine Oil - Removal](#).
7. Remove the fore/aft crossmember (4). Refer to [Frame and Bumpers/Frame/CROSSMEMBER - Removal](#).

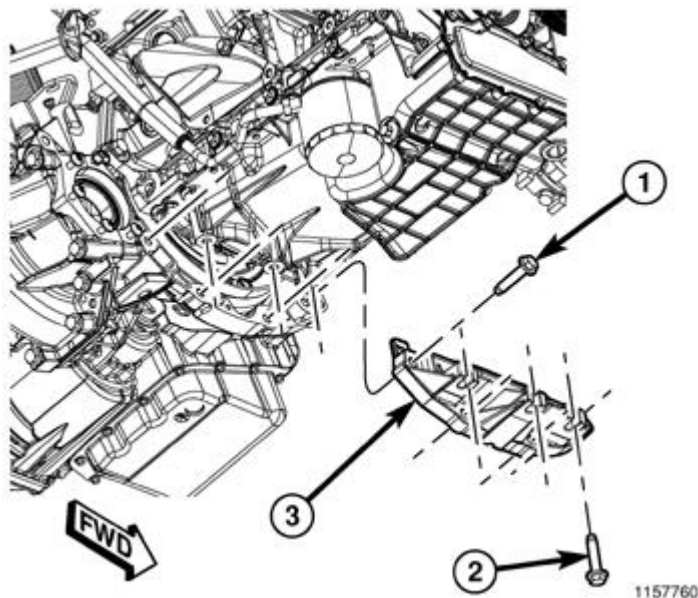


Fig. 301: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

8. Remove the structural collar (3). See [Engine/Engine Block/COVER, Structural Dust - Removal](#).

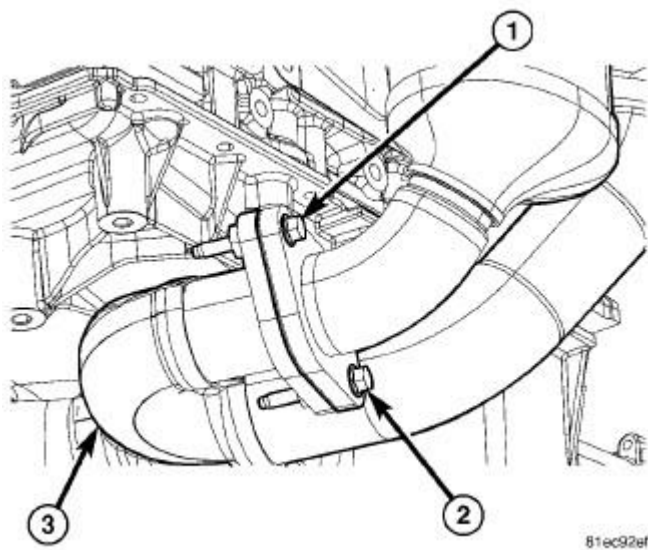


Fig. 302: Exhaust Cross-Under Pipe
Courtesy of CHRYSLER LLC

9. Remove the exhaust cross-under pipe (3). Refer to **Exhaust System/PIPE, Exhaust Crossunder - Removal**.

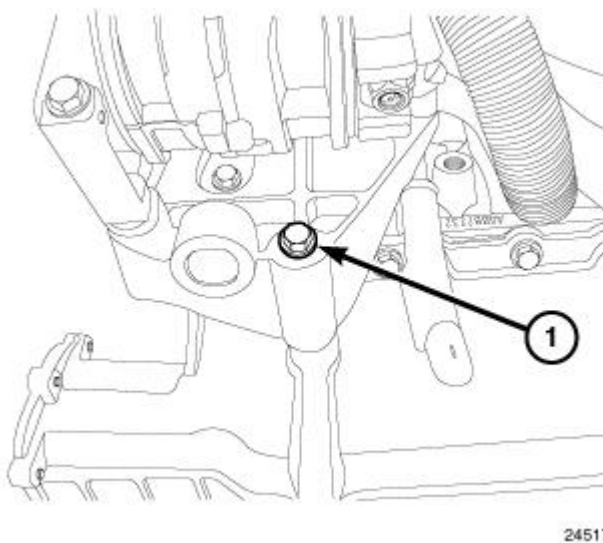


Fig. 303: A/C Compressor Mounting Bracket Lower Bolt
Courtesy of CHRYSLER LLC

10. Remove the lower bolt (1) attaching the A/C compressor mounting bracket to the oil pan.

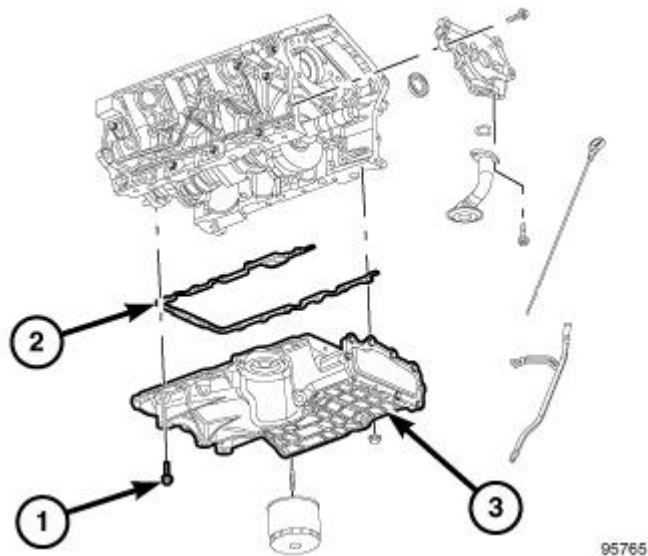


Fig. 304: Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER LLC

CAUTION: Assure removal of the two bolts attaching the timing cover to the oil pan, as damage to the timing cover and/or oil pan may occur.

11. Remove the oil pan attaching fasteners (1). Remove the oil pan (3) and gasket (2).

Installation

INSTALLATION

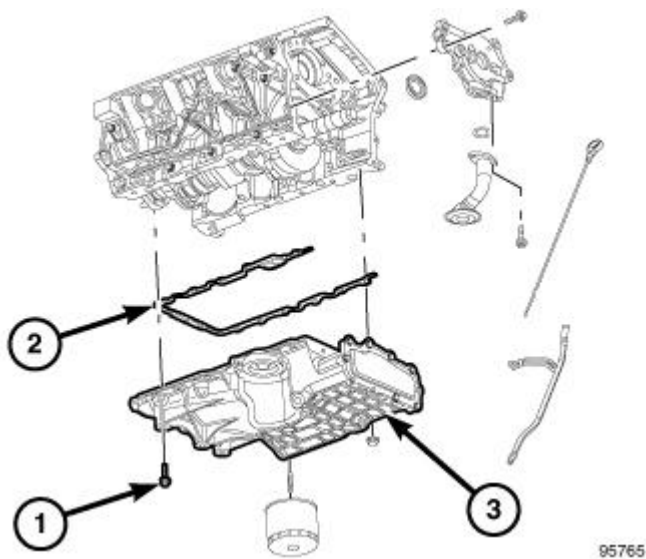


Fig. 305: Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER LLC

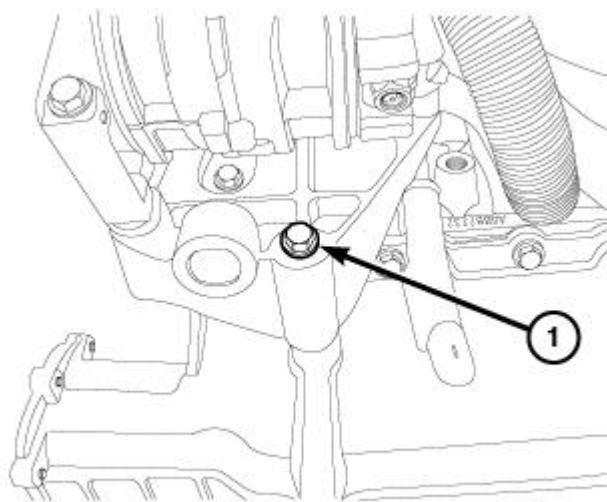
1. Clean the oil pan and oil pan sealing surfaces. Inspect the oil pan and timing chain cover gaskets. Replace

as necessary.

2. Apply an 1/8 inch bead of Mopar® Engine RTV GEN II to the front T-joints (oil pan gasket to timing cover gasket interface) and the rear T-joints (oil pan gasket to crankshaft rear oil seal retainer gasket interface).
3. Install the oil pan gasket (2) to the engine block.

NOTE: To prevent oil leaks at oil pan to timing chain cover, the following tightening sequence procedure must be performed.

4. Install the oil pan (3) and fasteners (1) using the following tightening sequence:
 - a. Install the oil pan bolts and nuts **finger tight only-just tight enough to compress the gasket's rubber seal**.
 - b. Install the timing chain cover to oil pan bolts and tighten to 12 N.m (105 in. lbs.).
 - c. Tighten the oil pan bolts to 28 N.m (250 in. lbs.).
 - d. Tighten the oil pan nuts to 12 N.m (105 in. lbs.).



2451799

Fig. 306: A/C Compressor Mounting Bracket Lower Bolt
Courtesy of CHRYSLER LLC

5. Install the lower bolt (1) attaching the A/C compressor mounting bracket to the oil pan. Tighten bolt to 28 N.m (21 ft. lbs.).

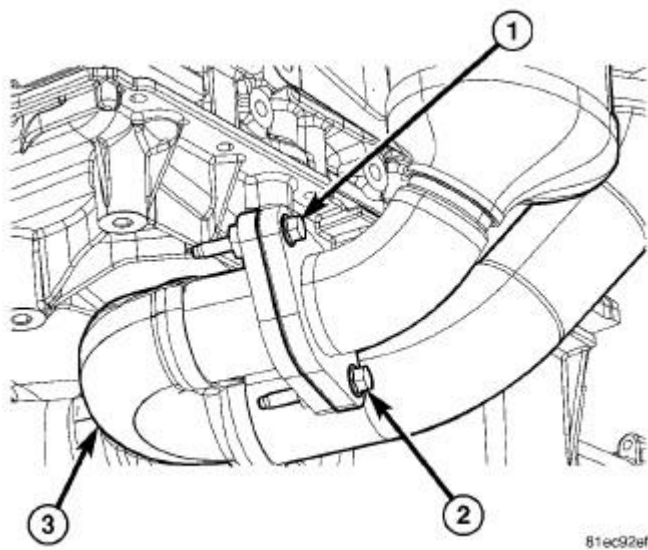


Fig. 307: Exhaust Cross-Under Pipe
Courtesy of CHRYSLER LLC

6. Install the oil filter and drain plug. See Engine/Lubrication/FILTER, Engine Oil - Installation.
7. Install exhaust cross-under pipe. Refer to Exhaust System/PIPE, Exhaust Crossunder - Installation.

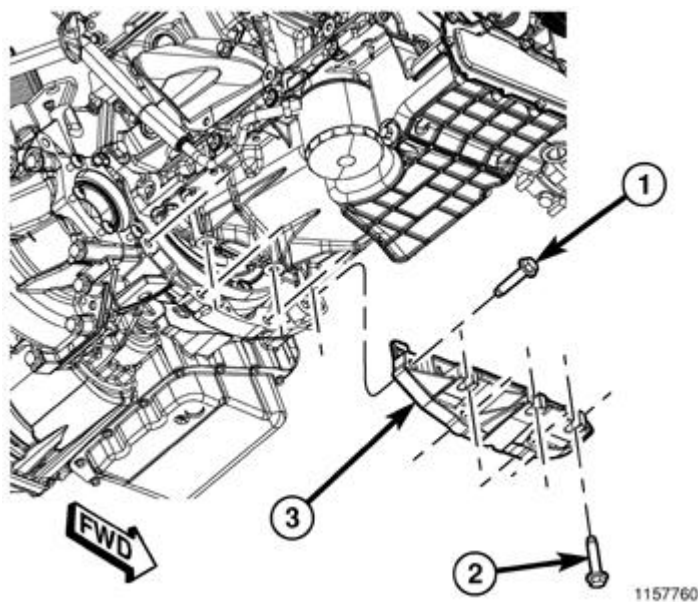


Fig. 308: Structural Collar & Bolts
Courtesy of CHRYSLER LLC

8. Install structural collar (3). See Engine/Engine Block/COVER, Structural Dust - Installation.

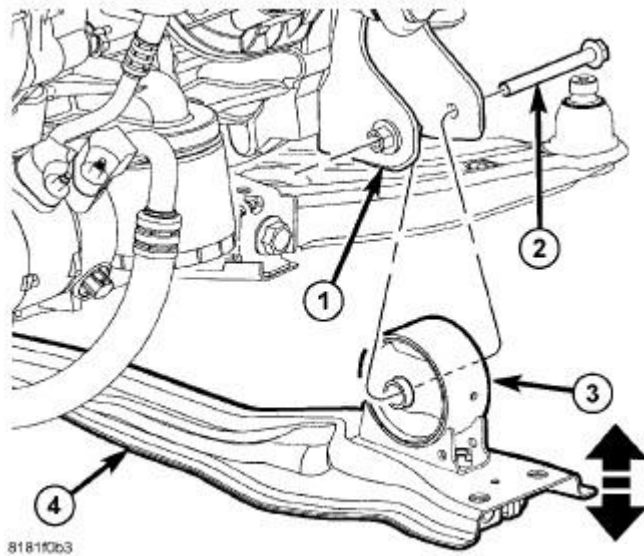


Fig. 309: Front Engine Mount Through Bolt
Courtesy of CHRYSLER LLC

9. Install the fore/aft crossmember (4). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Installation** .

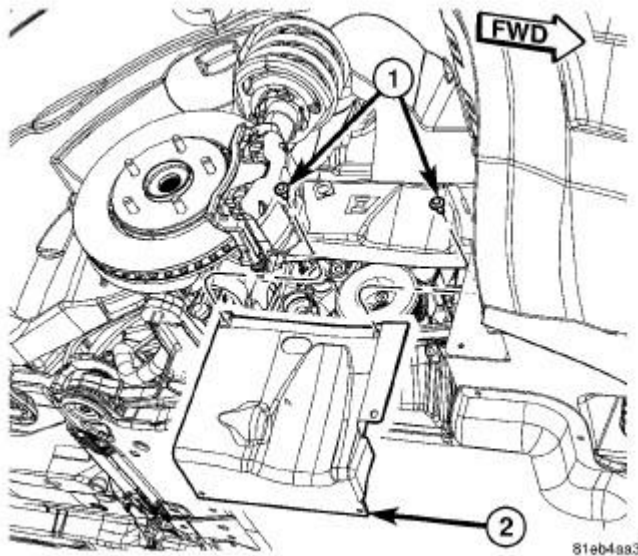


Fig. 310: LOWER SPLASH SHIELD
Courtesy of CHRYSLER LLC

10. Install the right lower splash shield (2).

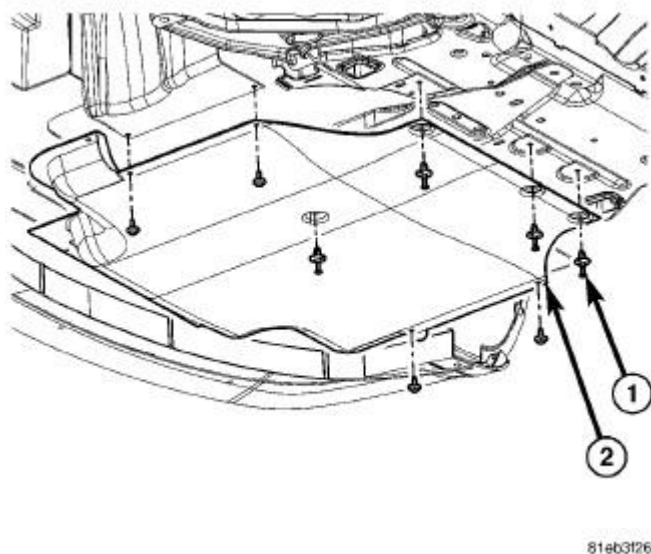


Fig. 311: Belly Pan
Courtesy of CHRYSLER LLC

11. Install the belly pan (2), if equipped.

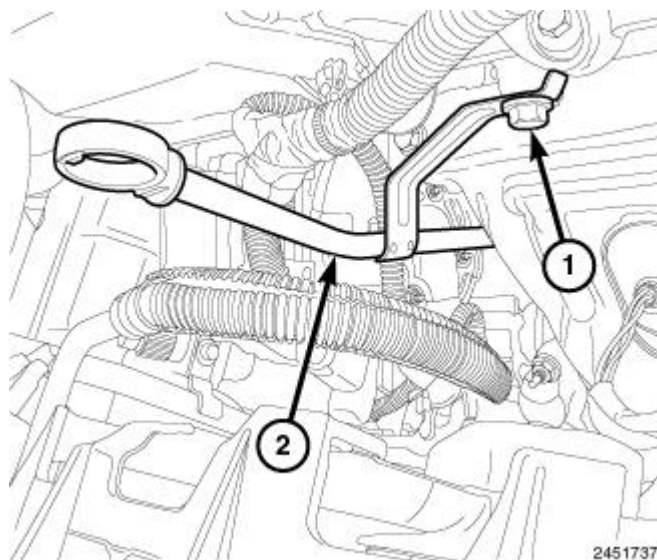


Fig. 312: Identifying Oil Dipstick Tube & Bolt
Courtesy of CHRYSLER LLC

12. Install the engine oil dipstick and tube (2). Tighten bolt to 20 N.m (15 ft. lbs.).
13. Fill the engine crankcase with the proper oil to the correct level. See **Engine/Lubrication/OIL - Standard Procedure**.
14. Connect the negative battery cable.

PUMP, ENGINE OIL

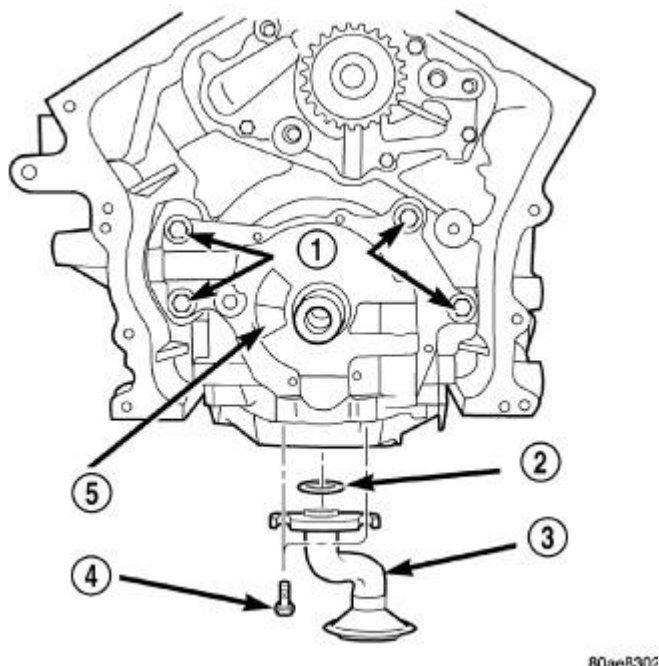
Removal**REMOVAL**

Fig. 313: Oil Pump and Pick-up Tube
Courtesy of CHRYSLER LLC

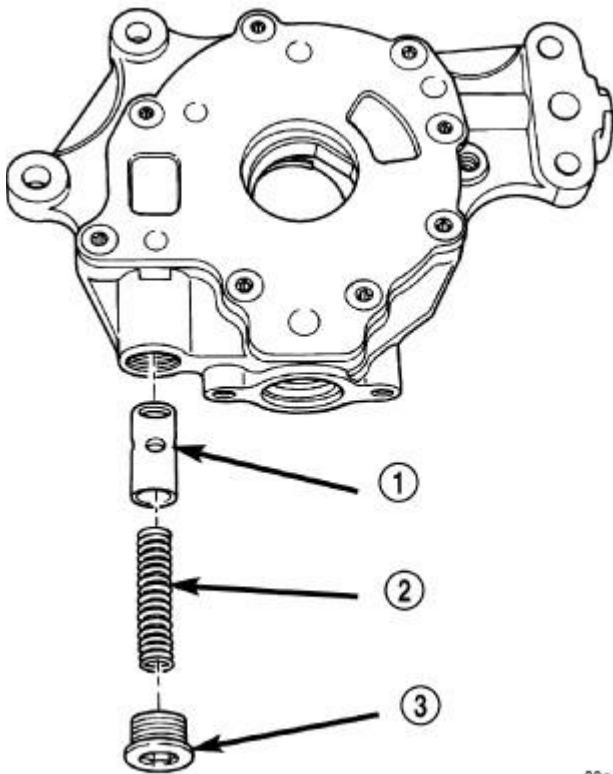
- 1 - BOLTS
- 2 - O-RING
- 3 - PICK-UP TUBE
- 4 - BOLT
- 5 - OIL PUMP

NOTE: The oil pump pressure relief valve can be serviced by removing the oil pan.

1. Remove crankshaft vibration damper. See [Engine/Engine Block/DAMPER, Vibration - Removal](#).
2. Remove timing chain cover. See [Engine/Valve Timing/COVER\(S\), Engine Timing - Removal](#).
3. Remove timing chain and sprockets. See [Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal](#).
4. Remove oil pan. See [Engine/Lubrication/PAN, Oil - Removal](#).
5. Remove oil pick-up tube (3) and O-ring (2).
6. Ensure that crankshaft is positioned so that the oil pump drive flats are parallel to the oil pan mounting surface. This position will properly locate oil pump upon installation.
7. Remove oil pump attaching bolts (1).
8. Remove oil pump (5).

Disassembly

DISASSEMBLY



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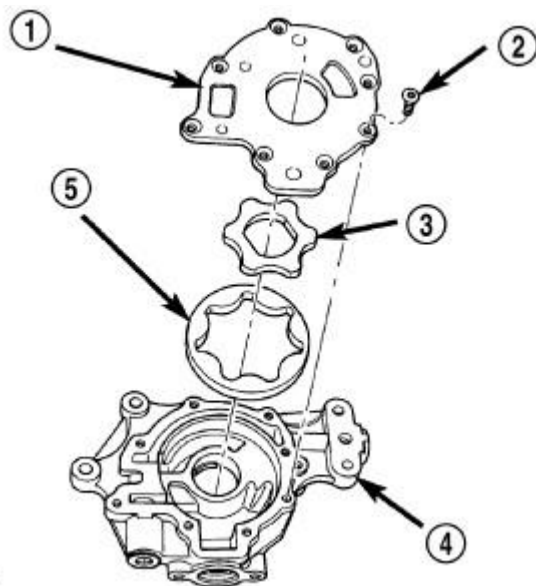
Fig. 314: Oil Pressure Relief Valve
Courtesy of CHRYSLER LLC

- 1 - RELIEF VALVE
- 2 - SPRING
- 3 - RETAINER CAP

1. Remove the pressure relief valve (1) by remove the threaded retaining cap from the oil pump housing.

CAUTION: Oil pump pressure relief valve must be installed as shown in illustration or engine damage may occur.

2. Remove spring and relief valve.



80ae8455

Fig. 315: Oil Pump

Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - OIL PUMP COVER
 2 - SCREWS (8)
 3 - OIL PUMP INNER ROTOR
 4 - OIL PUMP HOUSING
 5 - OIL PUMP OUTER ROTOR</p> |
|---|

3. Remove oil pump cover screws (2) and lift off cover plate.
4. Remove pump rotors.
5. Wash all parts in a suitable solvent.
6. Inspect components carefully for damage or wear. See **Engine/Lubrication/PUMP, Engine Oil - Inspection.**

Cleaning

CLEANING

1. Clean all parts thoroughly in a suitable solvent.

Inspection

INSPECTION

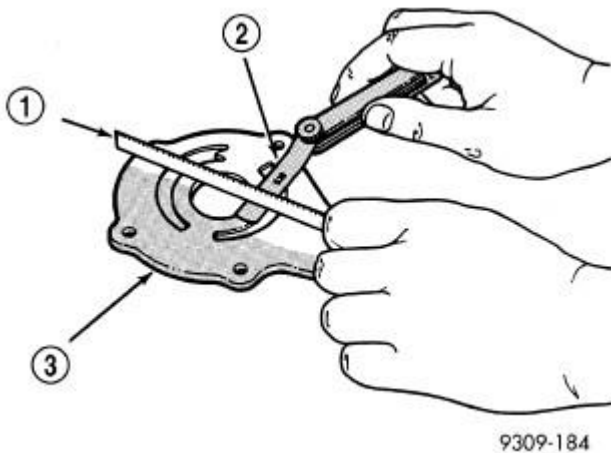


Fig. 316: CHECKING OIL PUMP COVER FLATNESS - TYPICAL
Courtesy of CHRYSLER LLC

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

1. Disassemble the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Disassembly.**
2. Clean all oil pump components. See **Engine/Lubrication/PUMP, Engine Oil - Cleaning.**
3. Inspect mating surface of the oil pump housing and cover. Replace oil pump if deeply scratched or grooved (minor surface scratches and polishing is normal).
4. Lay a straightedge across the pump cover surface (3). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced.

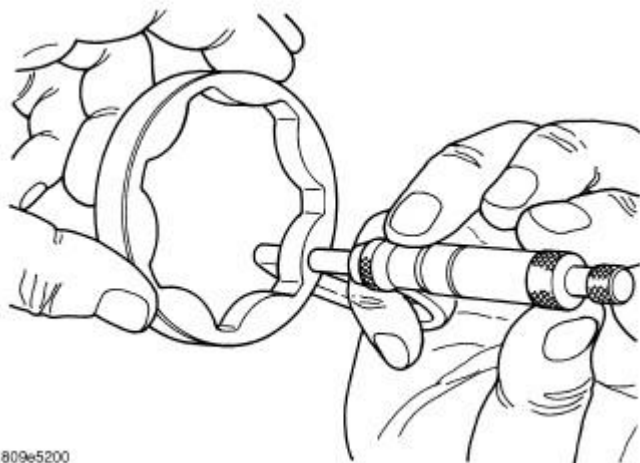
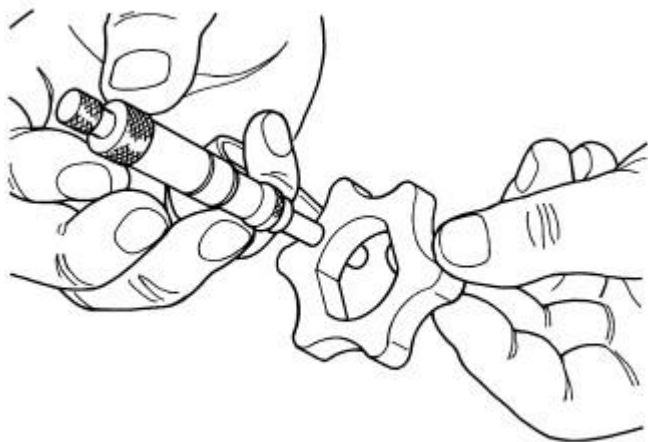


Fig. 317: MEASURING OUTER ROTOR THICKNESS
Courtesy of CHRYSLER LLC

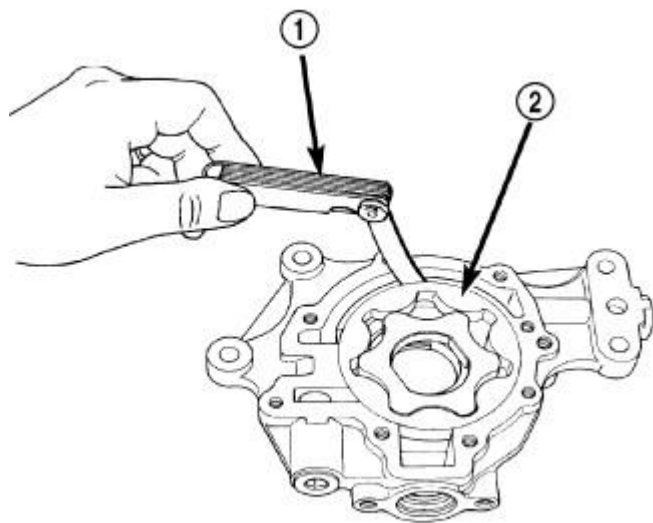
5. Measure thickness and diameter of outer rotor. If outer rotor thickness measures 9.474 mm (0.373 in.) or less, or if the diameter is 89.174 mm (3.5108 in.) or less, replace outer rotor.



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Fig. 318: MEASURING INNER ROTOR THICKNESS
 Courtesy of CHRYSLER LLC

6. If inner rotor measures 9.474 mm (0.373 in.) or less replace inner rotor.

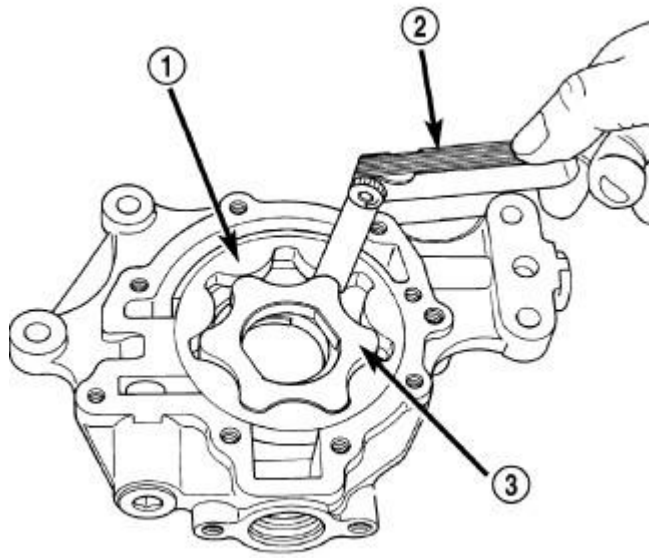


80ae8443

Fig. 319: MEASURING OUTER ROTOR CLEARANCE IN HOUSING
 Courtesy of CHRYSLER LLC

- | |
|-------------------------------------|
| 1 - FEELER GAUGE
2 - OUTER ROTOR |
|-------------------------------------|

7. Slide outer rotor into body, press to one side with fingers and measure clearance between rotor and body. If measurement is 0.39 mm (0.015 in.) or more, replace body only if outer rotor is in specifications.



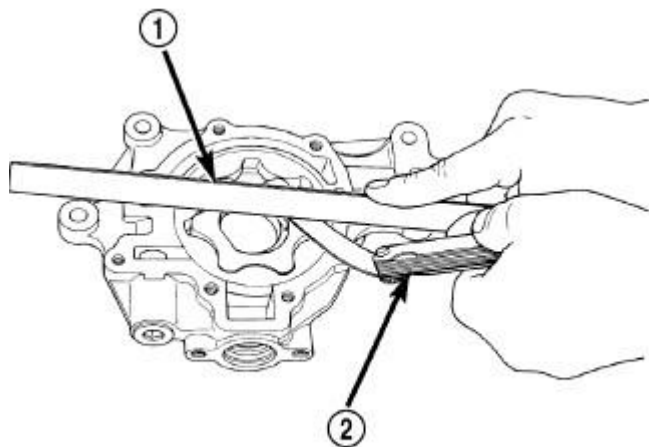
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Fig. 320: MEASURING CLEARANCE BETWEEN ROTORS

Courtesy of CHRYSLER LLC

- 1 - OUTER ROTOR
- 2 - FEELER GAUGE
- 3 - INNER ROTOR

8. Install inner rotor into body. If clearance between inner and outer rotors is 0.20 mm (0.008 in.) or more, replace both rotors.



80ae6445

Fig. 321: MEASURING CLEARANCE OVER ROTORS

Courtesy of CHRYSLER LLC

- 1 - STRAIGHT EDGE
- 2 - FEELER GAUGE

9. Place a straightedge 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 **ONLY** if rotors are in specification.
10. Inspect oil pressure relief valve plunger for scoring and free operation in its bore. Small marks may be removed with 400-grit wet or dry sandpaper.
11. The relief valve spring has a free length of approximately 49.5 mm (1.95 in.) it should test between 23 - 25 pounds when compressed to 34 mm (1.34 in.). Replace spring that fails to meet specifications.
12. Assemble oil pump.

Assembly

ASSEMBLY

1. Assemble pump using new parts as required.
2. Tighten cover screws to 12 N.m (105 in. lbs.).
3. Tighten oil pressure relief valve retaining cap to 12 N.m (105 in. lbs.).
4. Prime oil pump before installation by filling rotor cavity with engine oil.

Installation

INSTALLATION

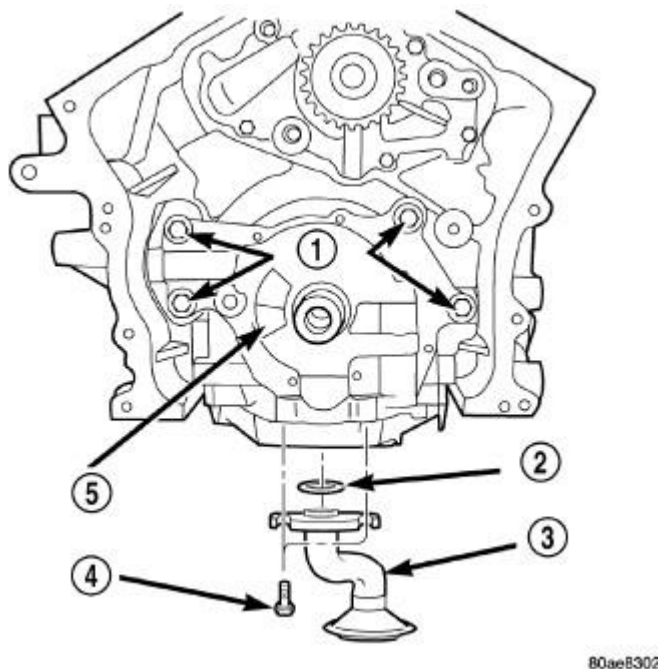


Fig. 322: Oil Pump and Pick-up Tube
Courtesy of CHRYSLER LLC

1 - BOLTS
2 - O-RING

3 - PICK-UP TUBE

4 - BOLT

5 - OIL PUMP

CAUTION: The crankshaft oil pump drive flats must be parallel to the oil pan mounting surface before installing the oil pump. This position will properly locate the oil pump. If not properly located, severe damage to the oil pump can occur.

1. Prime the oil pump before installation by filling rotor cavity with engine oil.
2. If the crankshaft has been rotated, it must be repositioned so that the oil pump drive flats are parallel to the oil pan mounting surface prior to oil pump installation.
3. Install oil pump (5) carefully over crankshaft and into position.
4. Install oil pump attaching bolts (1). Tighten bolts to 28 N.m (250 in. lbs.).
5. Install oil pick-up tube (3) with new O-ring (2). Lubricate O-ring (2) with clean engine oil before installation. Tighten attaching bolts to 28 N.m (250 in. lbs.).
6. Install oil pan. See Engine/Lubrication/PAN, Oil - Installation.
7. Install timing chain and sprockets. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.
8. Install timing chain cover. See Engine/Valve Timing/COVER(S), Engine Timing - Installation.
9. Install crankshaft vibration damper. See Engine/Engine Block/DAMPER, Vibration - Installation.
10. Fill crankcase with engine oil to correct level.

SWITCH, OIL PRESSURE

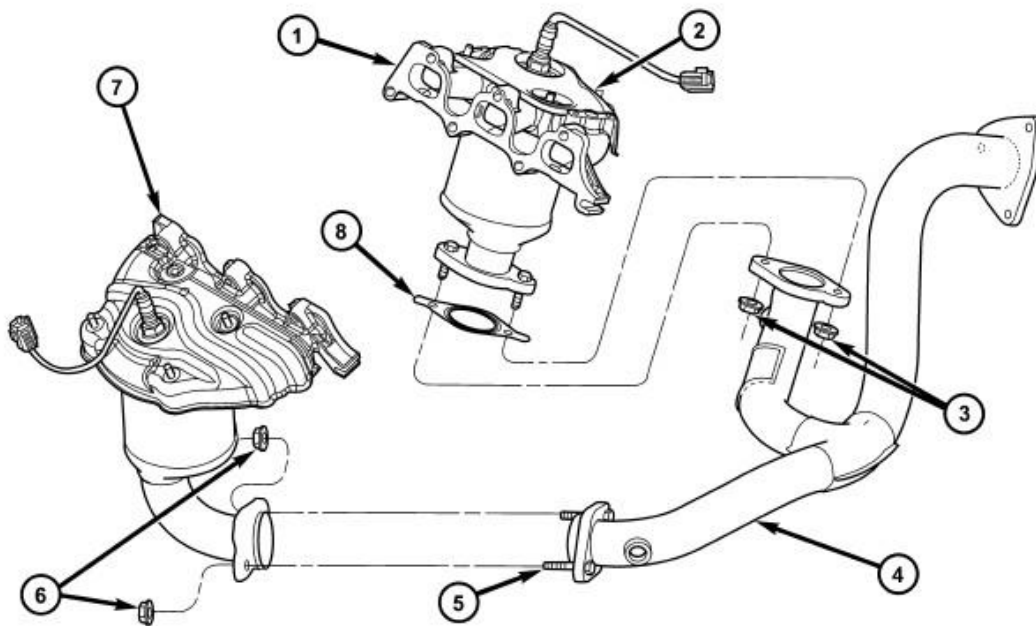
Description

DESCRIPTION

The engine oil pressure switch is located on the right side of the engine block. The switch screws into the engine main oil gallery. The normally closed switch provides an input through a single wire to the low pressure indicator light on the instrument cluster.

Removal

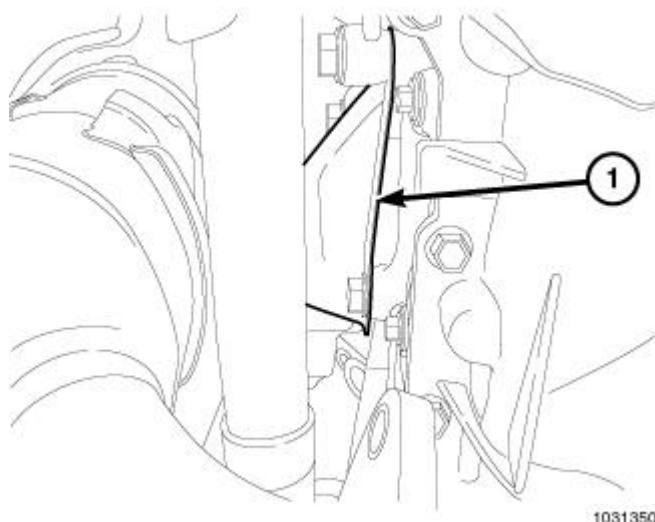
REMOVAL



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Fig. 323: Identifying Cross-Under Pipe
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise vehicle on hoist.
3. Remove the exhaust system. Refer to **Exhaust System - Removal** .
4. Remove the cross-under pipe (4). Refer to **Exhaust System/PIPE, Exhaust Crossunder - Removal** .



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Fig. 324: Locating Heat Shield Covering Oil Pressure Switch
Courtesy of CHRYSLER LLC

5. Remove heat shield (1) that covers oil pressure switch.

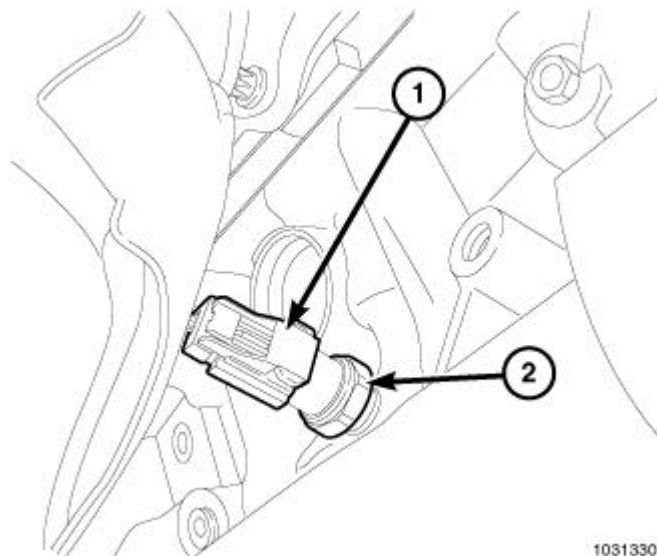


Fig. 325: Oil Pressure Switch & Electrical Connector
Courtesy of CHRYSLER LLC

6. Disconnect oil pressure switch electrical connector (1).
7. Position an oil collecting container under switch location.
8. Remove switch (2) by unscrewing from the engine block.

Installation

INSTALLATION

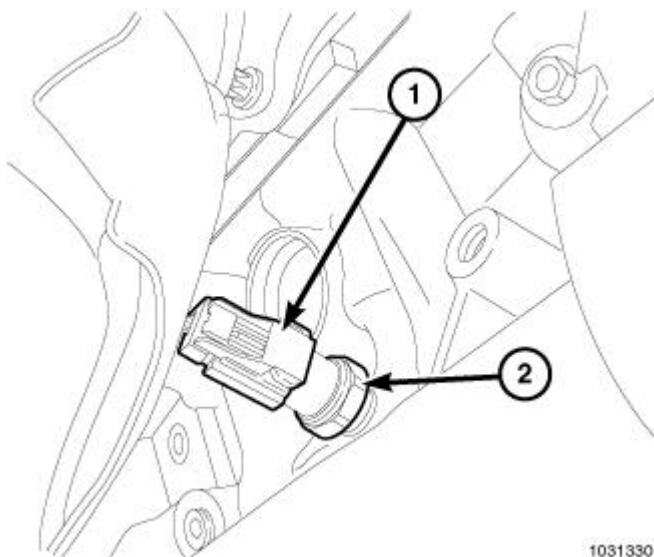


Fig. 326: Oil Pressure Switch & Electrical Connector
Courtesy of CHRYSLER LLC

1. Apply Mopar® Thread Sealant to the oil pressure switch threads.
2. Install oil pressure switch (2).
3. Connect electrical connector (1).

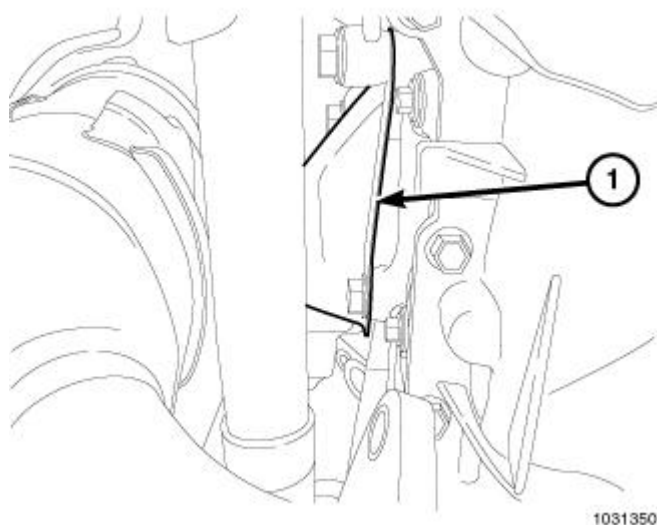


Fig. 327: Locating Heat Shield Covering Oil Pressure Switch
Courtesy of CHRYSLER LLC

4. Install oil pressure switch heat shield (1).

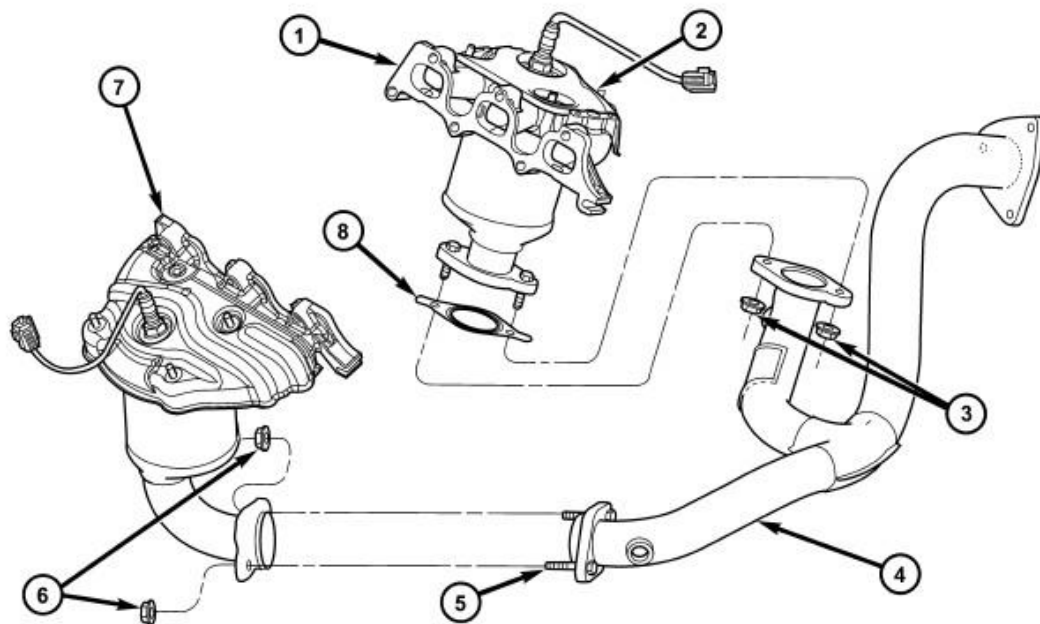


Fig. 328: Identifying Cross-Under Pipe
Courtesy of CHRYSLER LLC

5. Install the cross-under pipe (4). Refer to **Exhaust System/PIPE, Exhaust Crossunder - Installation** .
6. Install the exhaust system. Refer to **Exhaust System - Installation** .
7. Lower vehicle.
8. Connect the negative battery cable. Tighten nut to 4.5 N.m (40 in. lbs.).
9. Start engine and check for leaks.
10. Check engine oil level and adjust as necessary.

VALVE, OIL PRESSURE RELIEF

Removal

REMOVAL

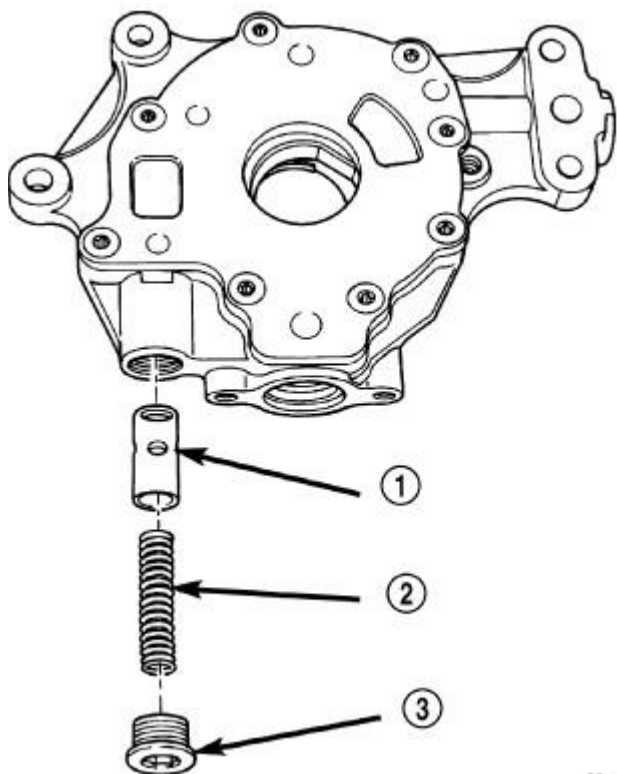


Fig. 329: Oil Pressure Relief Valve
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - RELIEF VALVE</p> <p>2 - SPRING</p> <p>3 - RETAINER CAP</p> |
|---|

1. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.
2. Remove the pressure relief valve (1) by remove the threaded retaining cap from the oil pump housing.

CAUTION: Oil pump pressure relief valve must be installed as shown in illustration or engine damage may occur.

3. Remove spring and relief valve.

Installation

INSTALLATION

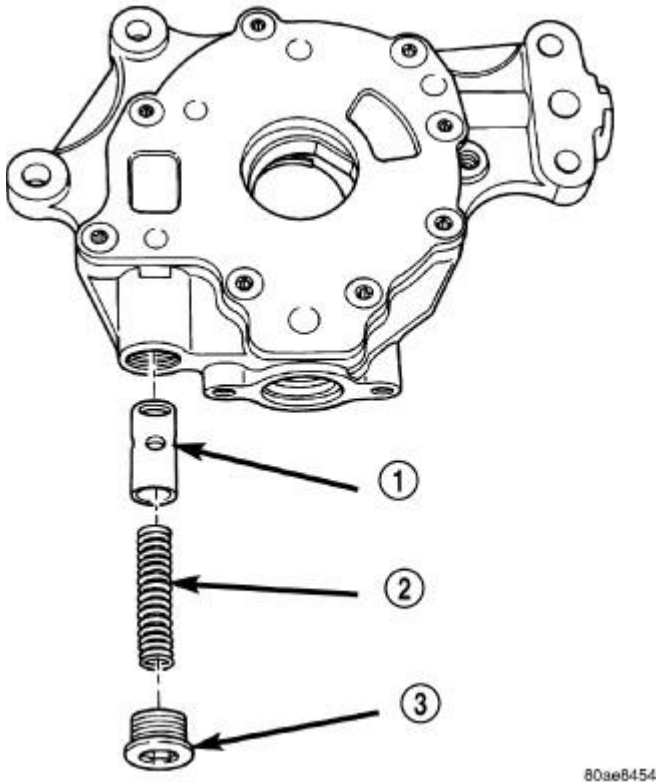


Fig. 330: Oil Pressure Relief Valve
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - RELIEF VALVE
2 - SPRING
3 - RETAINER CAP |
|--|

1. Lubricate relief valve with oil.

CAUTION: The pressure relief valve must be installed as shown in illustration or engine damage may occur.

2. Install relief valve (1), spring and retainer cap. Tighten cap to 12 N.m (105 in. lbs.).
3. Install the oil pan. See Engine/Lubrication/PAN, Oil - Installation.

MANIFOLDS

MANIFOLD, EXHAUST

Removal

REMOVAL

FRONT

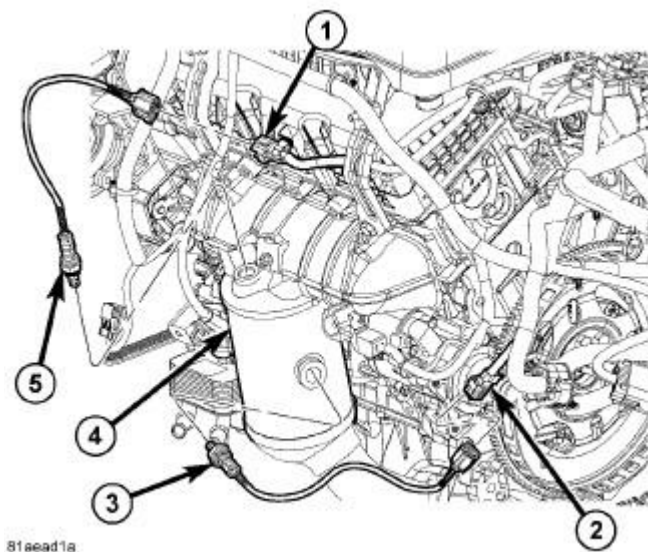


Fig. 331: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the engine cover.
3. Disconnect the front upstream oxygen sensor (5) from the engine wiring harness connector (1).
4. Disconnect the front downstream oxygen sensor (3) from the engine wiring harness connector (2).

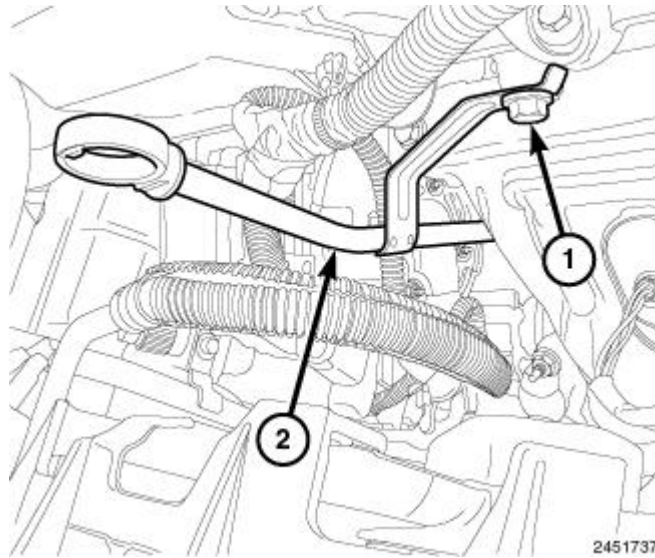


Fig. 332: Identifying Oil Dipstick Tube & Bolt
Courtesy of CHRYSLER LLC

5. Remove the bolt (1) and the engine oil level indicator tube (2).

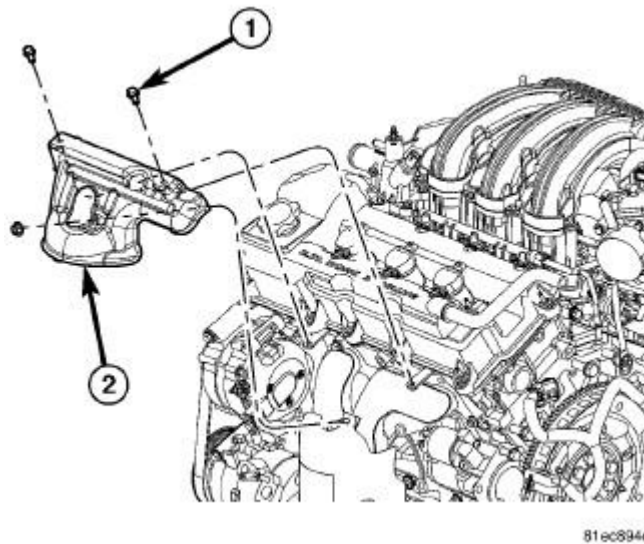


Fig. 333: FRONT MANIVERTER HEAT SHIELD
Courtesy of CHRYSLER LLC

6. Remove the front upper maniverter heat shield fasteners (1) and remove the heat shield (2).

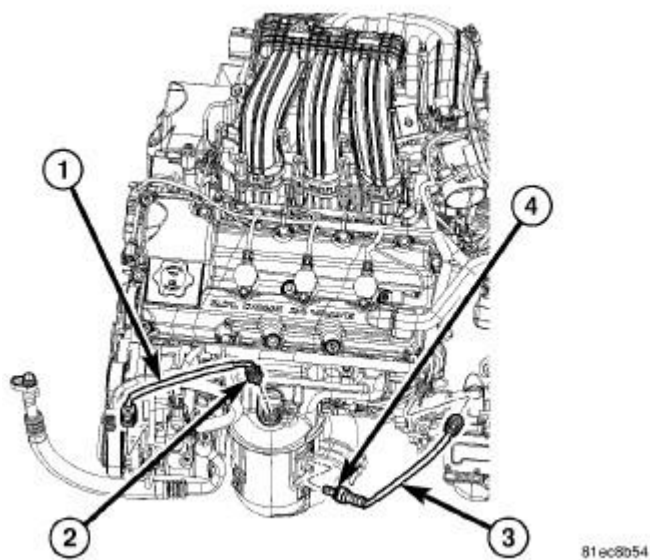


Fig. 334: Oxygen Sensors

Courtesy of CHRYSLER LLC

7. Remove upstream (2) and downstream (4) oxygen sensors. Refer to **Fuel System/Fuel Injection/SENSOR, Oxygen - Removal**.

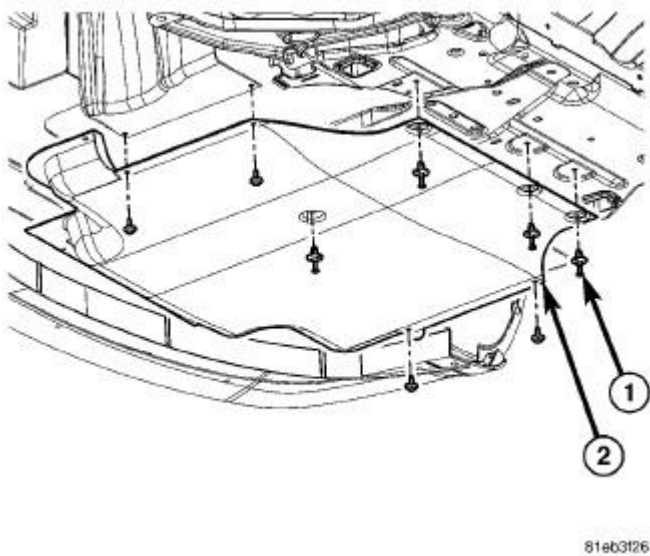


Fig. 335: Belly Pan

Courtesy of CHRYSLER LLC

8. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure**.
9. Remove the belly pan (2), if equipped.

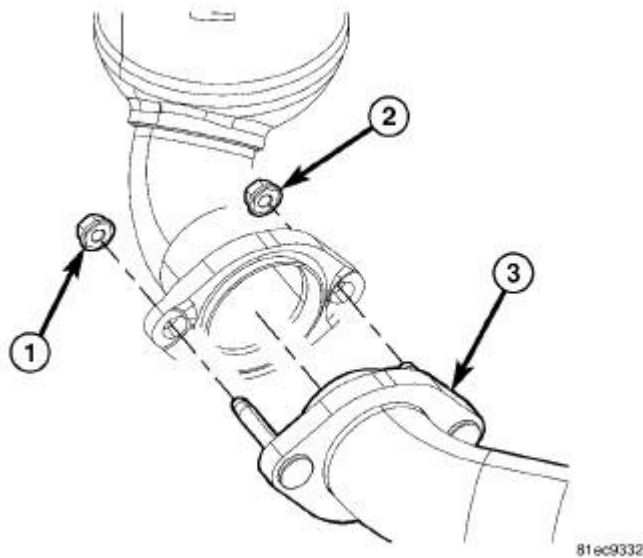


Fig. 336: Front Maniverter-To-Cross Under Fasteners
Courtesy of CHRYSLER LLC

10. Remove the front maniverter-to-crossunder fasteners (1) and (2).

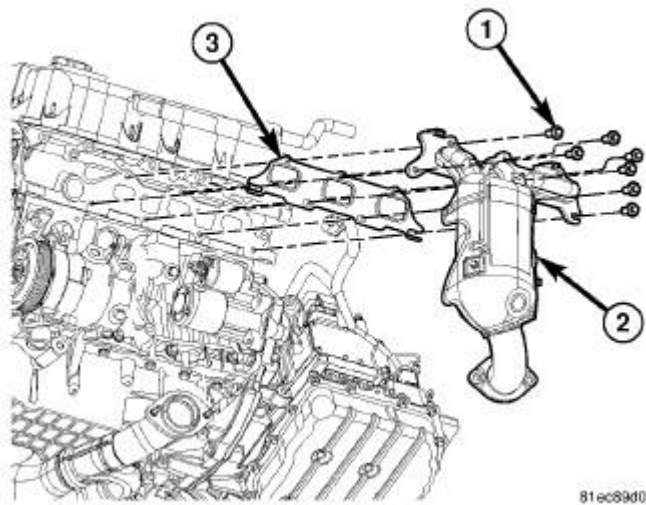


Fig. 337: Front Exhaust Maniverter & Gasket
Courtesy of CHRYSLER LLC

11. Lower the vehicle.
12. Remove the front exhaust maniverter attaching bolts (1), front maniverter (2) and gasket (3).

REAR

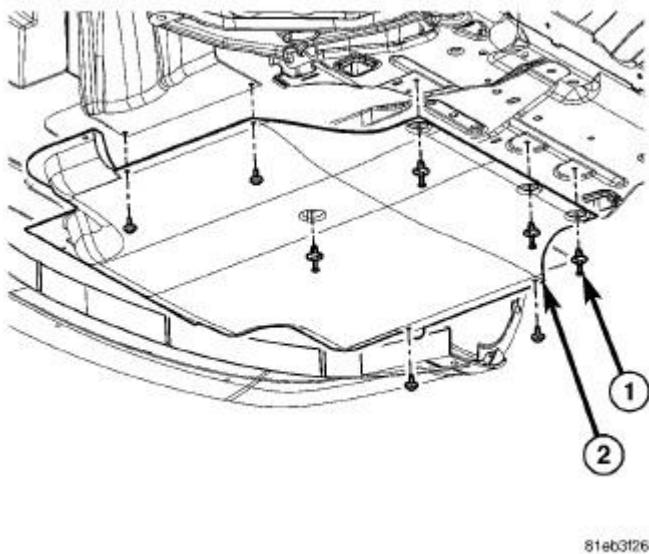


Fig. 338: Belly Pan

Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the engine cover.
3. Raise and support the vehicle. Refer to Vehicle Quick Reference/Hoisting - Standard Procedure .
4. Remove the belly pan (2), if equipped.

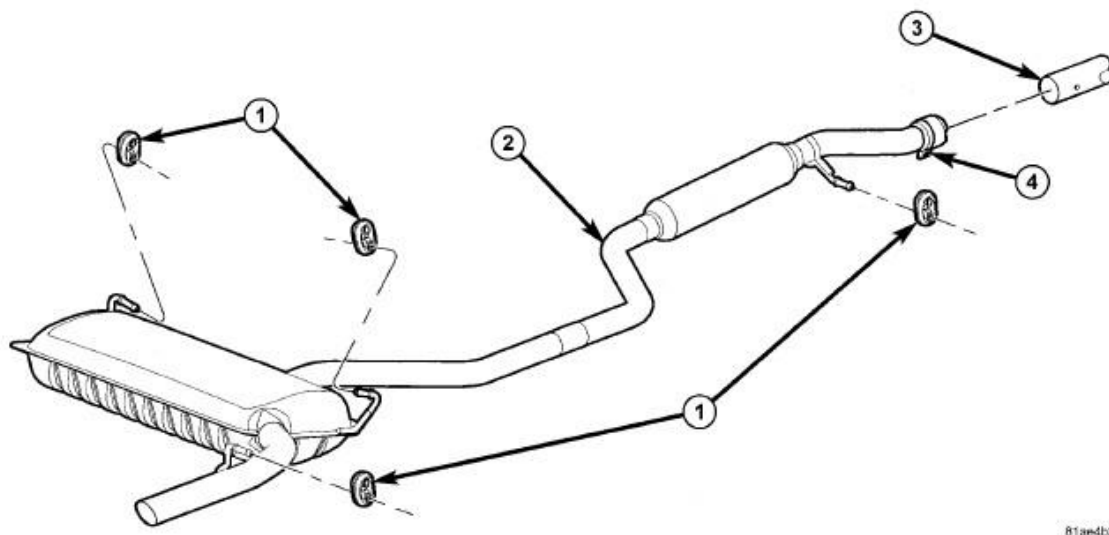


Fig. 339: Identifying Muffler & Resonator Assembly

Courtesy of CHRYSLER LLC

5. Remove the exhaust system (2). Refer to Exhaust System - Removal .

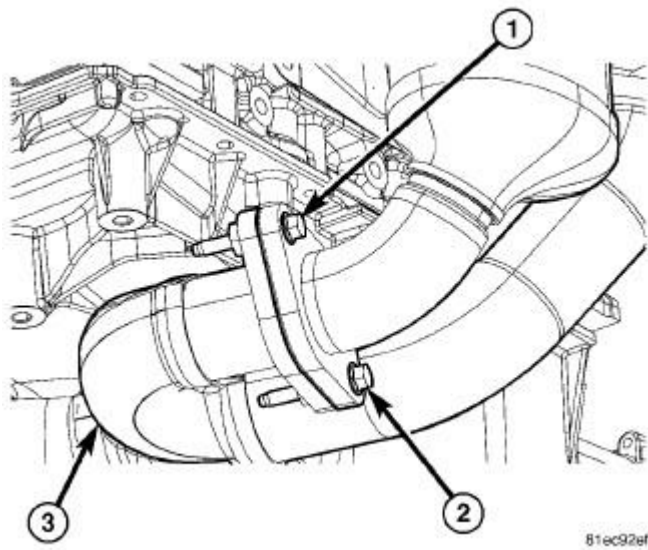


Fig. 340: Exhaust Cross-Under Pipe
Courtesy of CHRYSLER LLC

6. Remove the crossunder pipe (3). Refer to **Exhaust System/PIPE, Exhaust - Removal** .

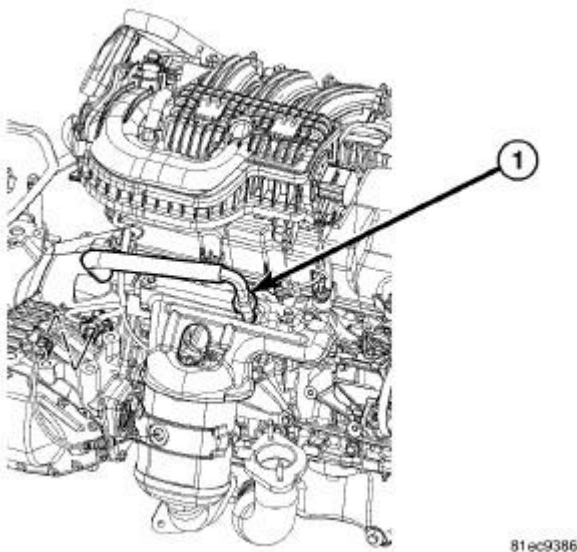


Fig. 341: Lower EGR Tube
Courtesy of CHRYSLER LLC

7. Loosen the lower EGR tube flange nut (1).

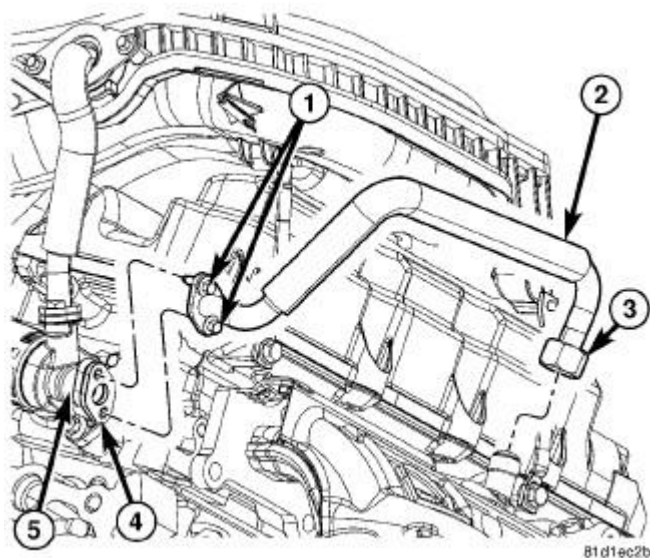


Fig. 342: Identifying Lower EGR Tube - 2.7L
Courtesy of CHRYSLER LLC

8. Lower the vehicle.
9. Remove the lower EGR tube (2). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Removal**.

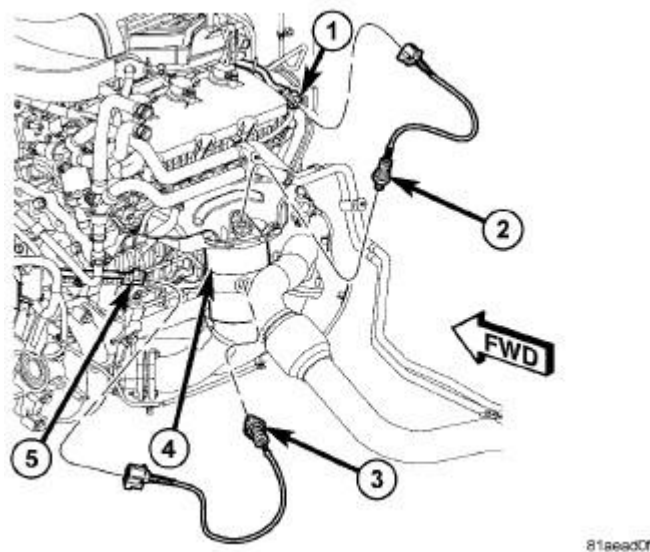


Fig. 343: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

10. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure**.
11. Disconnect the rear upstream oxygen sensor (2) from the engine wiring harness connector (1).
12. Disconnect the rear downstream oxygen sensor (3) from the engine wiring harness connector (5).

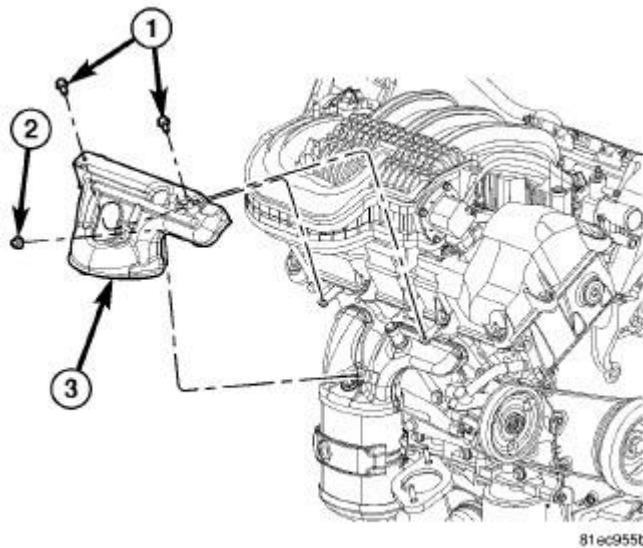


Fig. 344: Rear Maniverter Heat Shield
Courtesy of CHRYSLER LLC

13. Remove the fasteners (1 and 2) and the rear maniverter heat shield (3).

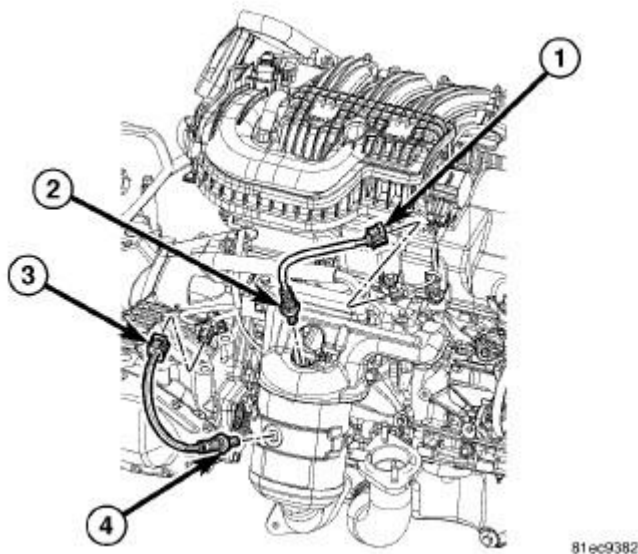


Fig. 345: Oxygen Sensors
Courtesy of CHRYSLER LLC

14. Remove upstream (2) and downstream (4) oxygen sensors. Refer to **Fuel System/Fuel Injection/SENSOR, Oxygen - Removal**.

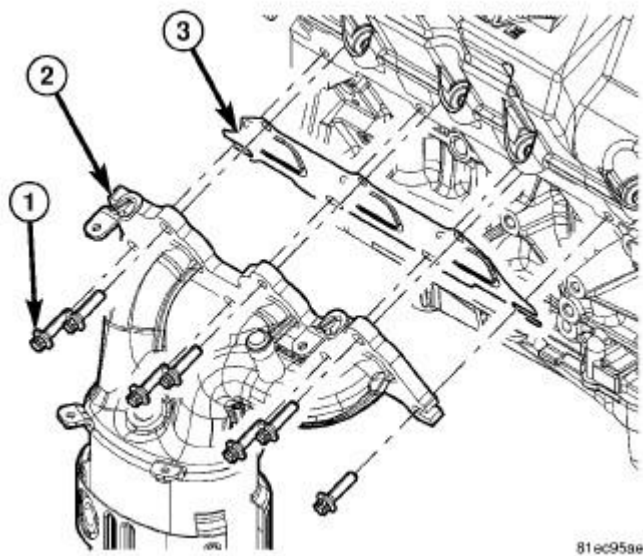


Fig. 346: Rear Maniverter, Fasteners & Gasket
Courtesy of CHRYSLER LLC

15. Remove the rear maniverter fasteners (1), rear maniverter (2) and rear maniverter gasket (3).

Inspection

INSPECTION

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

INSTALLATION

FRONT

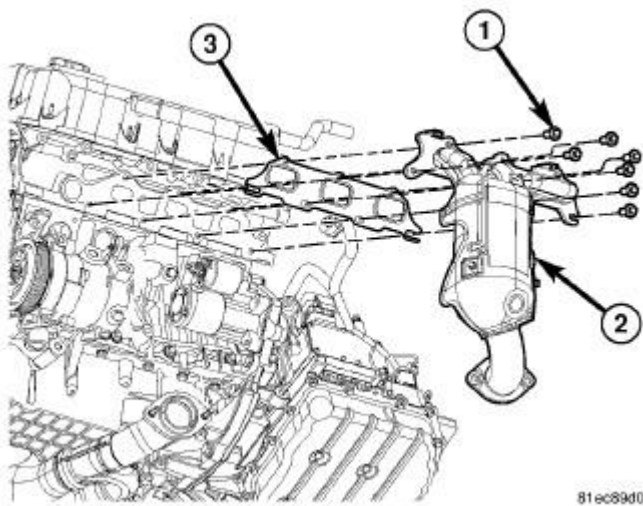


Fig. 347: Front Exhaust Maniverter & Gasket
Courtesy of CHRYSLER LLC

1. Clean the front maniverter gasket mounting surfaces. See **Engine - Standard Procedure**.
2. Install a new gasket (3), front maniverter (2) and the front exhaust maniverter attaching bolts (1). Tighten the bolts to 23 N.m (17 ft. lbs.).

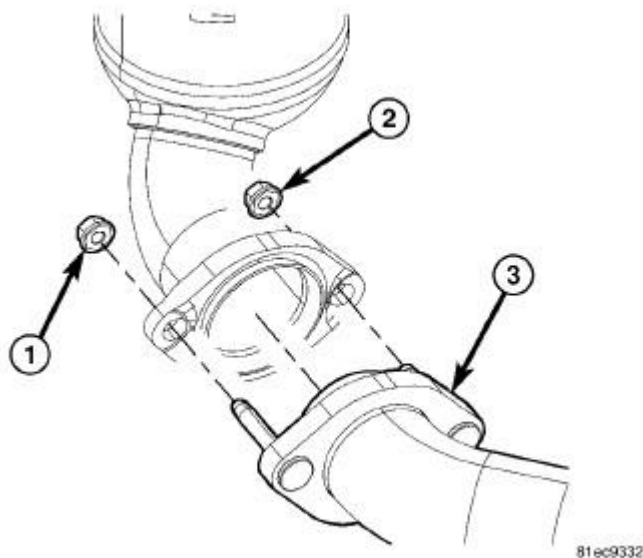


Fig. 348: Front Maniverter-To-Cross Under Fasteners
Courtesy of CHRYSLER LLC

3. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure**.
4. Install the front maniverter-to-crossunder fasteners (1 and 2). Tighten fasteners to 27 N.m (20 ft. lbs.).

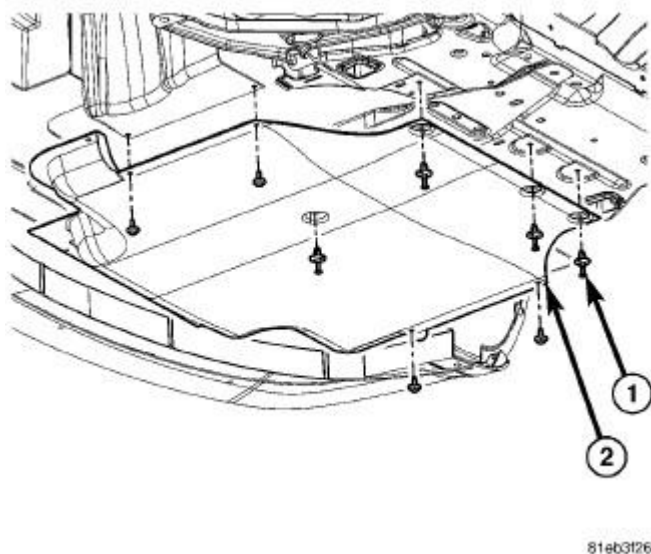


Fig. 349: Belly Pan
Courtesy of CHRYSLER LLC

5. Install the belly pan (2), if equipped.

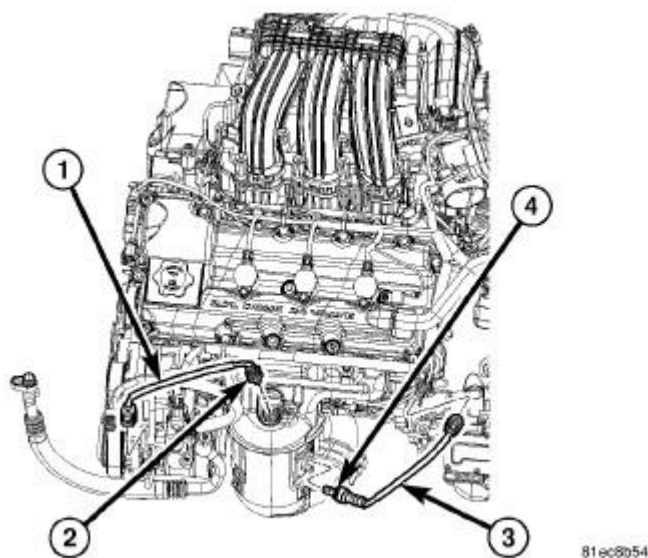
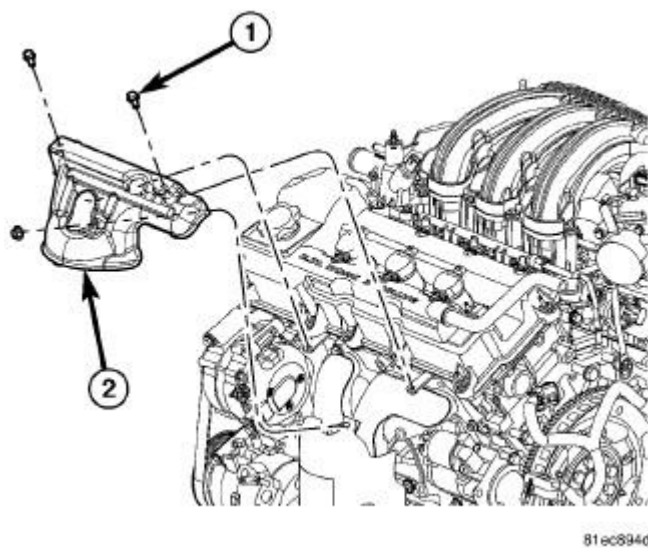


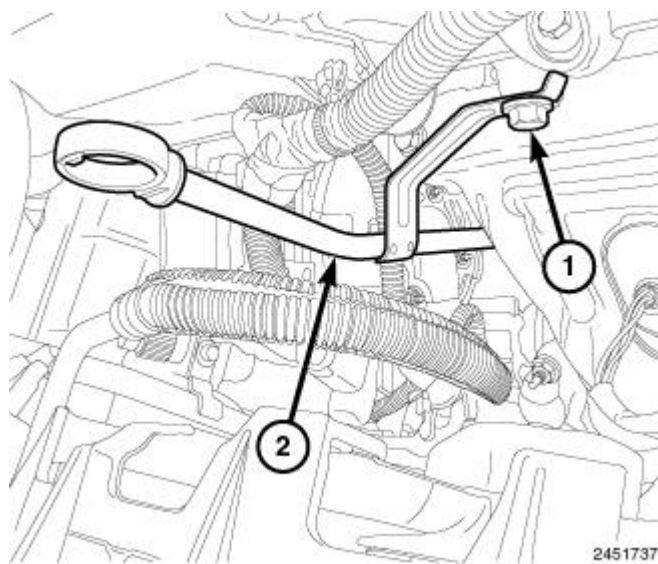
Fig. 350: Oxygen Sensors
Courtesy of CHRYSLER LLC

6. Lower the vehicle.
7. Install the upstream (2) and downstream (4) oxygen sensors. Tighten the sensors to 41 N.m (30 ft. lbs.). Refer to **Fuel System/Fuel Injection/SENSOR, Oxygen - Installation** .

**Fig. 351: FRONT MANIVERTER HEAT SHIELD**

Courtesy of CHRYSLER LLC

8. Install the upper manifold heat shield (2) and the heat shield fasteners (1). Tighten fasteners to 12 N.m (106 in. lbs.).

**Fig. 352: Identifying Oil Dipstick Tube & Bolt**

Courtesy of CHRYSLER LLC

9. Install the engine oil level indicator tube (2). Tighten the bolt (1) to 20 N.m (15 ft. lbs.).

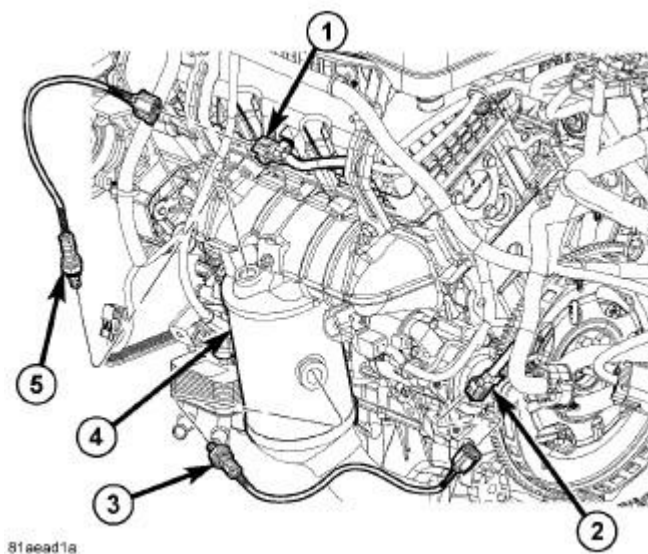


Fig. 353: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

10. Connect the front downstream oxygen sensor (3) to the engine wiring harness connector (2).
11. Connect the front upstream oxygen sensor (5) to the engine wiring harness connector (1).
12. Connect the negative battery cable and tighten the nut to 5 N.m (45 in. lbs.).
13. Install the engine cover.

REAR

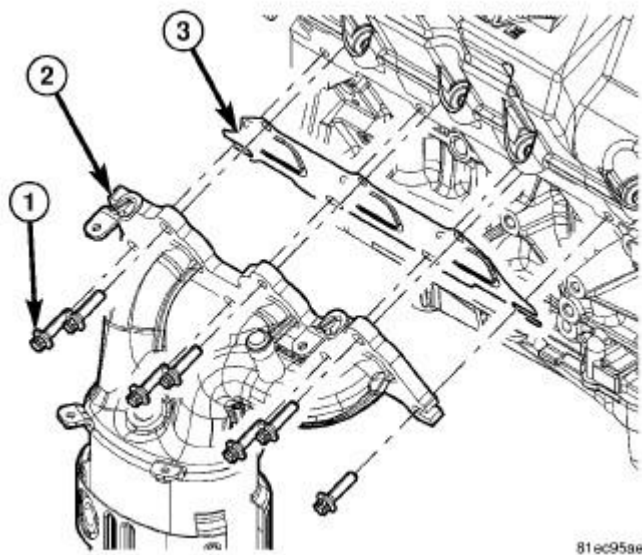


Fig. 354: Rear Maniverter, Fasteners & Gasket
Courtesy of CHRYSLER LLC

1. Clean the rear maniverter gasket mounting surfaces. See **Engine - Standard Procedure**.
2. Install the rear maniverter gasket (3), rear maniverter (2) and the rear maniverter fasteners (1). Tighten the fasteners to 23 N.m (17 ft. lbs.).

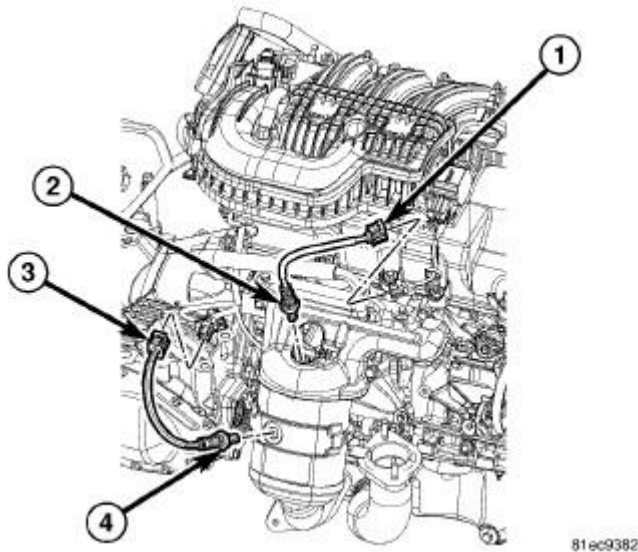


Fig. 355: Oxygen Sensors
Courtesy of CHRYSLER LLC

3. Install the upstream (2) and downstream (4) oxygen sensors. Tighten the sensors to 41 N.m (30 ft. lbs.). Refer to **Fuel System/Fuel Injection/SENSOR, Oxygen - Installation**.

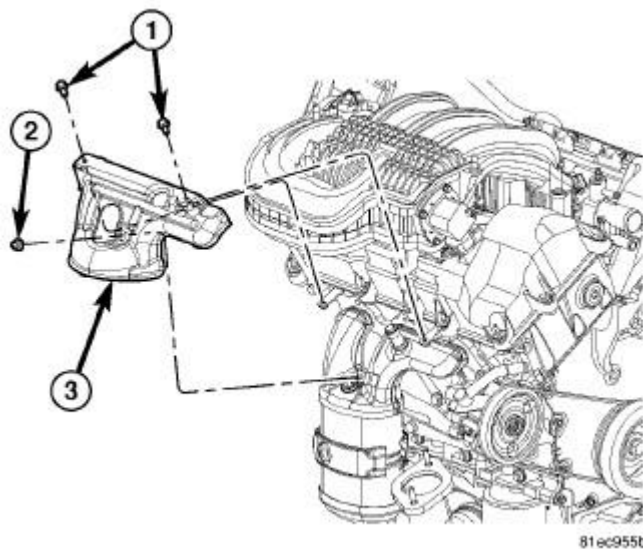


Fig. 356: Rear Maniverter Heat Shield
Courtesy of CHRYSLER LLC

4. Install the rear manifold heat shield (3). Tighten fasteners (1 and 2) to 12 N.m (106 in. lbs.).

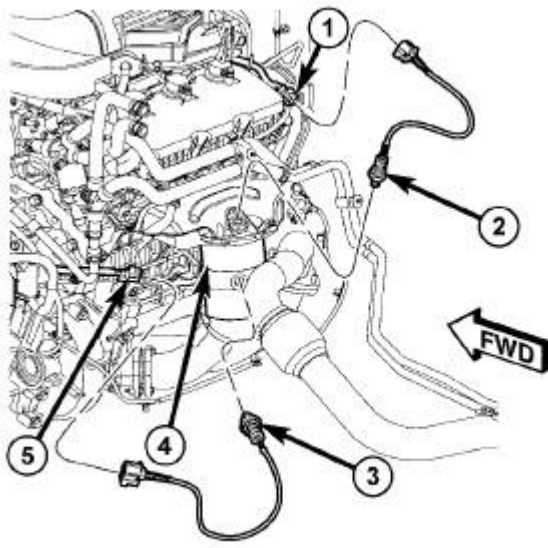


Fig. 357: Downstream & Upstream Oxygen Sensors
Courtesy of CHRYSLER LLC

5. Connect the rear downstream oxygen sensor (3) to the engine wiring harness connector (5).
6. Connect the rear upstream oxygen sensor (2) to the engine wiring harness connector (1).

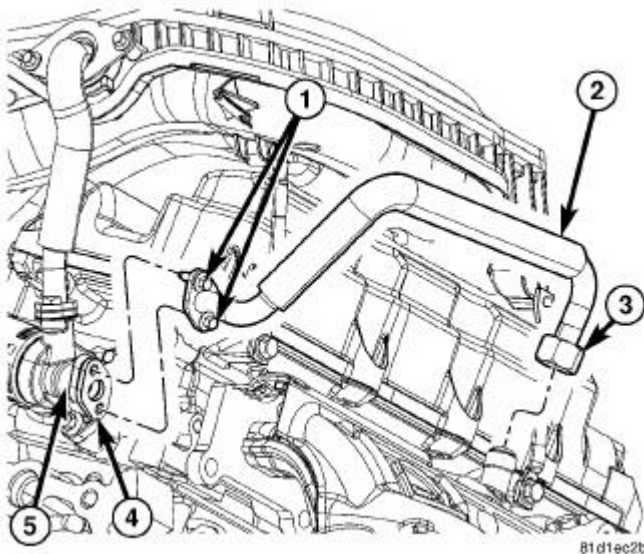


Fig. 358: Identifying Lower EGR Tube - 2.7L
Courtesy of CHRYSLER LLC

7. Install the lower EGR tube (2). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Installation**.

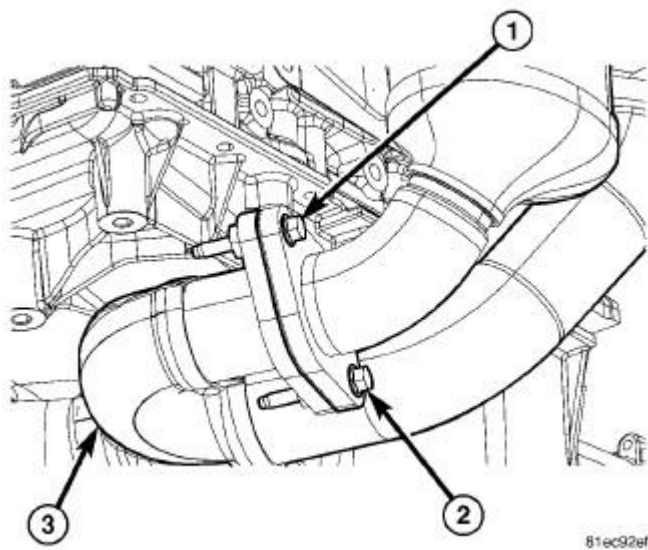


Fig. 359: Exhaust Cross-Under Pipe
Courtesy of CHRYSLER LLC

8. Install the crossunder pipe (3) to the rear maniverter with pipe fasteners (1) and (2). Hand tighten fasteners.

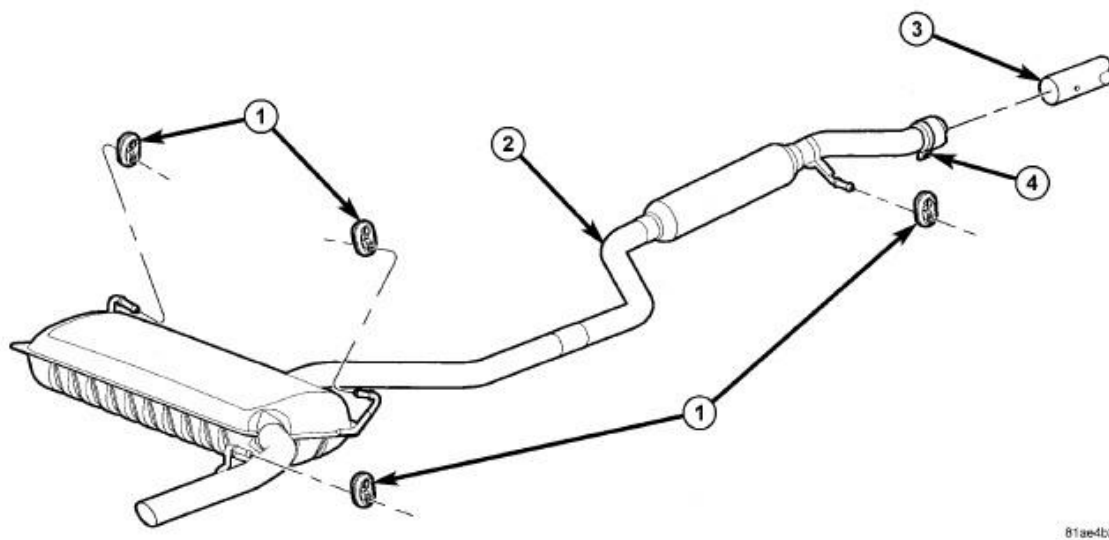
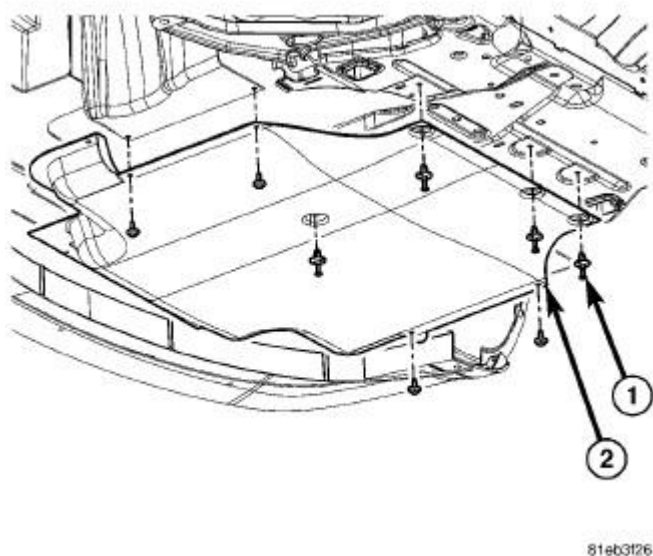


Fig. 360: Identifying Muffler & Resonator Assembly
Courtesy of CHRYSLER LLC

9. Install the exhaust system. Refer to **Exhaust System - Installation** .
10. Tighten the previously installed rear maniverter-to-cross under pipe fasteners to 29 N.m (21 ft. lb.).

**Fig. 361: Belly Pan**

Courtesy of CHRYSLER LLC

11. Install the belly pan (2), if equipped.
12. Connect the negative battery cable and tighten the nut to 5 N.m (45 in. lbs.).
13. Install the engine cover.

MANIFOLD, INTAKE

Diagnosis and Testing

INTAKE MANIFOLD LEAKS

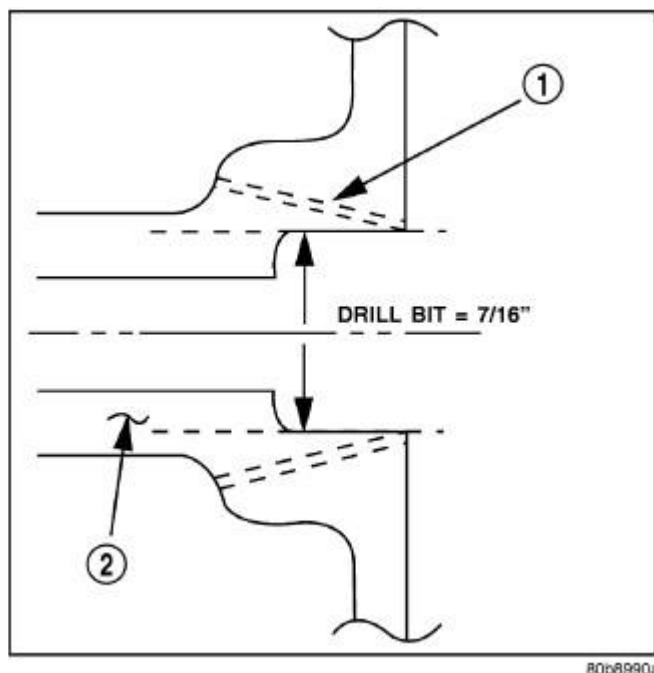
An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: Use extreme caution when the engine is operating. Do not stand in a direct line with the fan. Do not put your hands near the pulleys, belts or the fan. Do not wear loose clothing.

1. Start the engine.
2. Spray a small stream of water (Spray Bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

Standard Procedure

INTAKE MANIFOLD VACUUM PORT REPAIR

**Fig. 362: MANIFOLD PORT (NIPPLE) REPAIR**

Courtesy of CHRYSLER LLC

1 - 1/4" - 18 NPT PIPE TAP

2 - NIPPLE (PORT)

The composite intake manifold vacuum ports can be repaired. Although, if the manifold plenum chamber is damaged or cracked, the manifold must be replaced.

To repair a broken or damaged vacuum nipple (port) on the composite intake manifold, perform the following procedure:

PARTS REQUIRED	TOOLS REQUIRED
Brass Nipple - 3/8" O.D. x 1/4" pipe thread (Speed Control Port)	Pipe Tap - 1/4" - 18 NPT
Brass Nibble - 1/2" O.D. x 1/4" pipe thread (Brake Booster Port)	Drill Bit - 7/16"
	File/Sand Paper

NOTE: While performing this procedure, avoid getting the manifold material residue into the plenum chamber.

1. File or sand the remaining port back until a flat surface is obtained (plane normal to nipple (port) axis).
2. Drill out the nipple (port) base using a 7/16" drill bit.
3. Using a 1/4"-18 NPT pipe tap, cut internal threads. Use caution to start tap in a axis same as original nipple.
4. Apply Mopar® Thread Sealant to threads of repair nipple(s).

5. Install repair nipple(s). Do not over torque repair nipple(s).

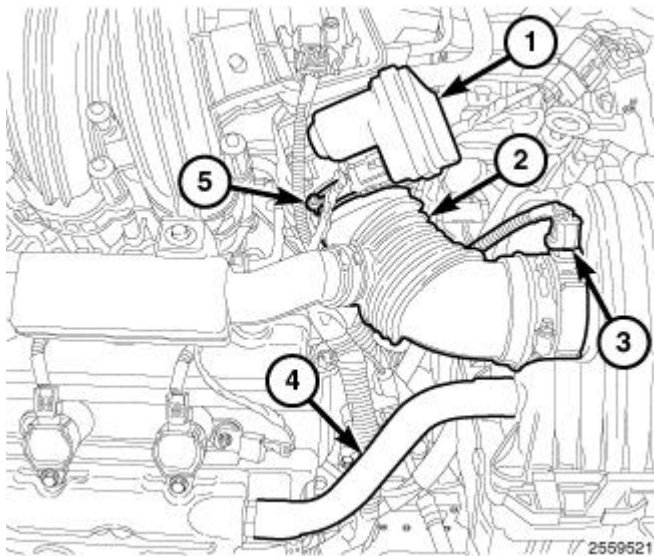
Removal**UPPER**

Fig. 363: Identifying Air Makeup Hose, Throttle Body & Air Inlet Hose
Courtesy of CHRYSLER LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the throttle body air inlet hose (2) and air cleaner housing assembly. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.

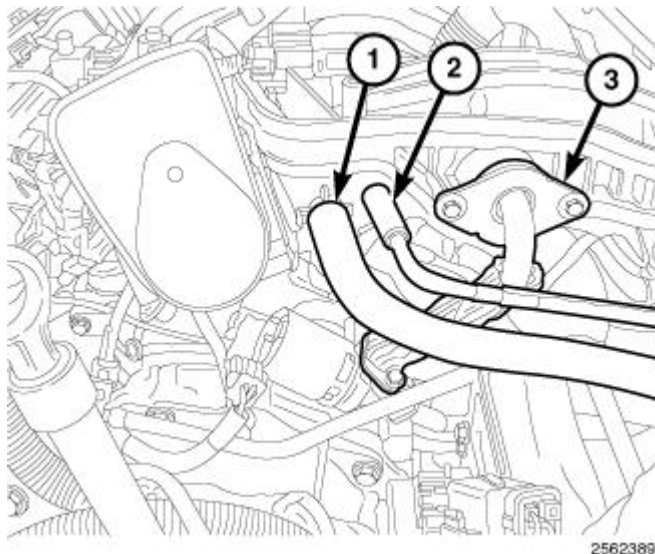


Fig. 364: Locating Upper EGR Tube, Brake Booster Hose & Vapor Purge Hose
Courtesy of CHRYSLER LLC

3. Remove the upper EGR tube (3). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Removal**.
4. Disconnect the brake booster hose (1) and the vapor purge hose (2) from the upper intake manifold.

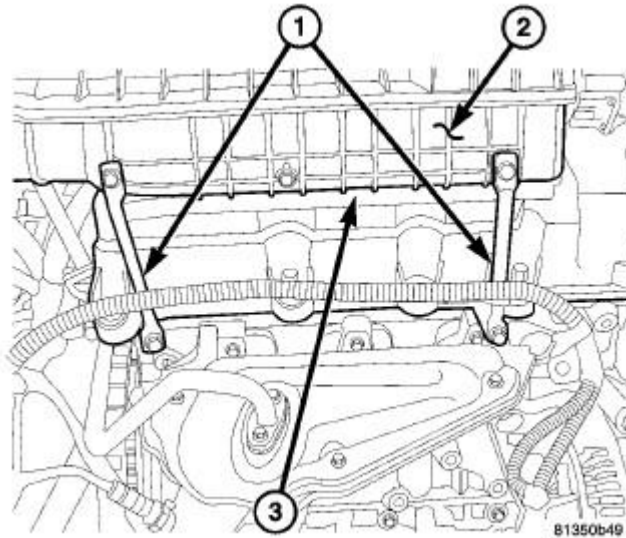


Fig. 365: Intake Brackets
Courtesy of CHRYSLER LLC

5. Remove the two intake manifold support brackets (1).

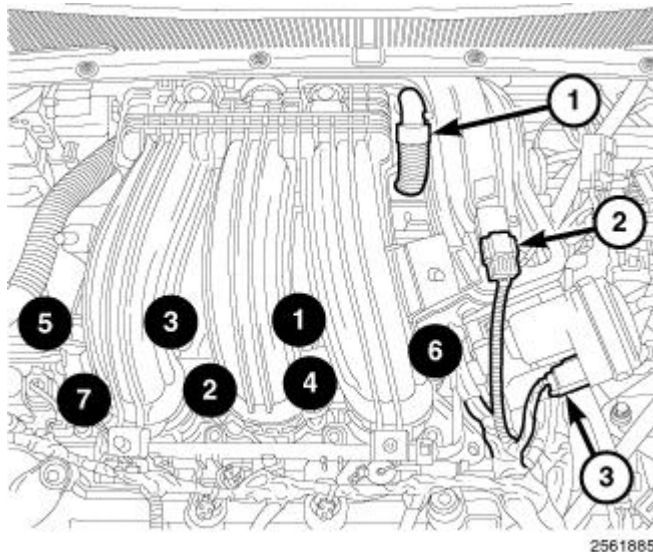
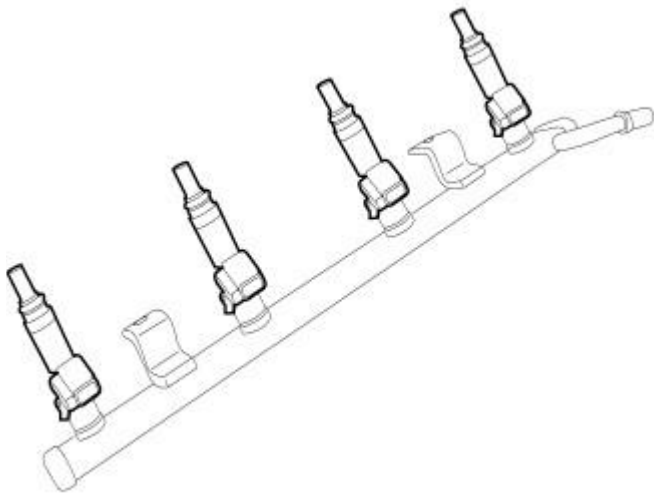


Fig. 366: Locating Manifold Bolts, MAP Sensor & ETC Electrical Connectors
Courtesy of CHRYSLER LLC

6. Disconnect the electrical connectors from the Manifold Absolute Pressure (MAP) sensor (2) and the Electronic Throttle Control (ETC) (3).

7. Disconnect the Positive Crankcase Ventilation (PCV) hose (1).
8. Remove the seven manifold attaching bolts in reverse of the tightening sequence shown in illustration.
9. Remove the upper intake manifold.

LOWER

818384c6

Fig. 367: Fuel Injector Location - Typical
Courtesy of CHRYSLER LLC

1. Release fuel system pressure.
2. Remove upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.
3. Disconnect electrical connectors from the fuel injectors.
4. Remove fuel supply hose from fuel rail
5. Remove screw attaching fuel rail support bracket to the throttle body support bracket.
6. Remove bolts attaching fuel rail.

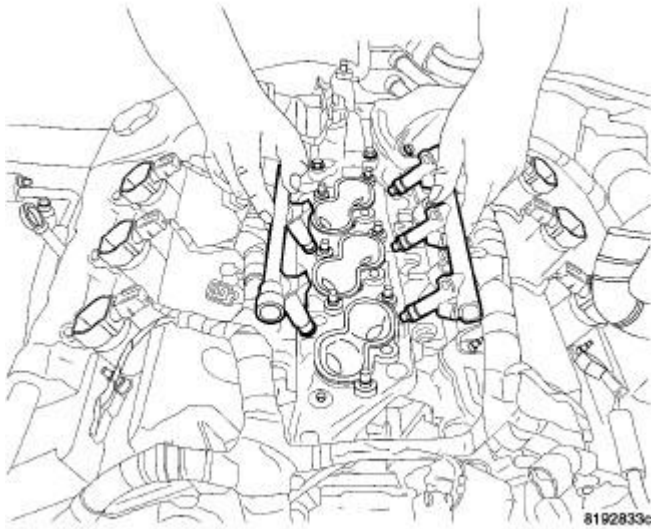


Fig. 368: FUEL RAIL REMOVE/INSTALL
Courtesy of CHRYSLER LLC

7. Remove fuel rail and injectors as an assembly.

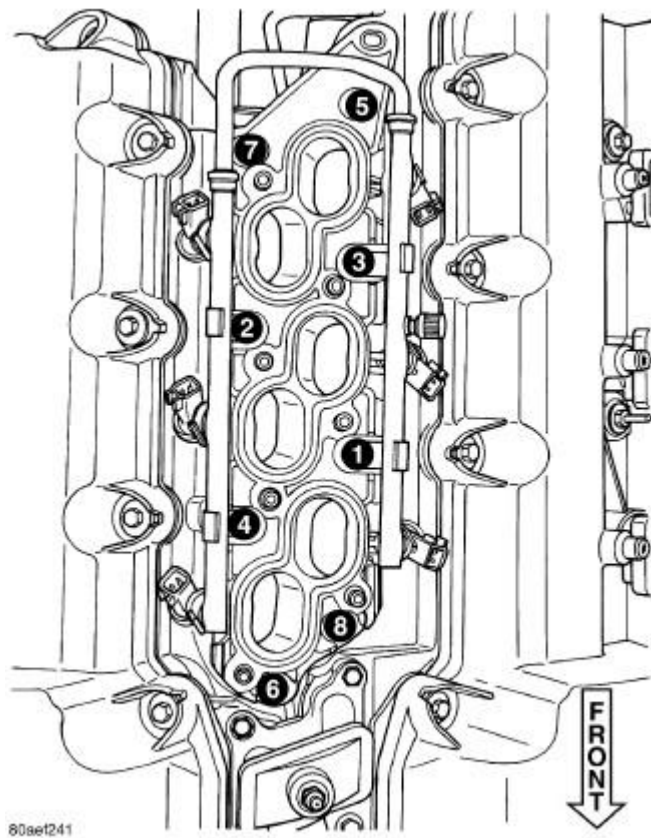


Fig. 369: Lower Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

8. Remove manifold attaching bolts.
9. Remove lower manifold.
10. Inspect manifold. See **Engine/Manifolds/MANIFOLD, Intake - Inspection.**

Inspection**INTAKE MANIFOLD UPPER**

Check manifold for:

- Damage and cracks
- Gasket surface damage or warpage
- Damaged or clogged EGR ports

If the manifold exhibits any damaged or warped conditions, replace the manifold. Clean EGR ports as necessary.

If a vacuum port is damaged, a repair procedure can be performed. See **Engine/Manifolds/MANIFOLD, Intake - Standard Procedure.**

INTAKE MANIFOLD LOWER

Check manifold for:

- Damage and cracks
- Gasket surface damage or warpage
- Damaged fuel injector ports

If the manifold exhibits any of these conditions, replace the manifold.

Installation**UPPER**

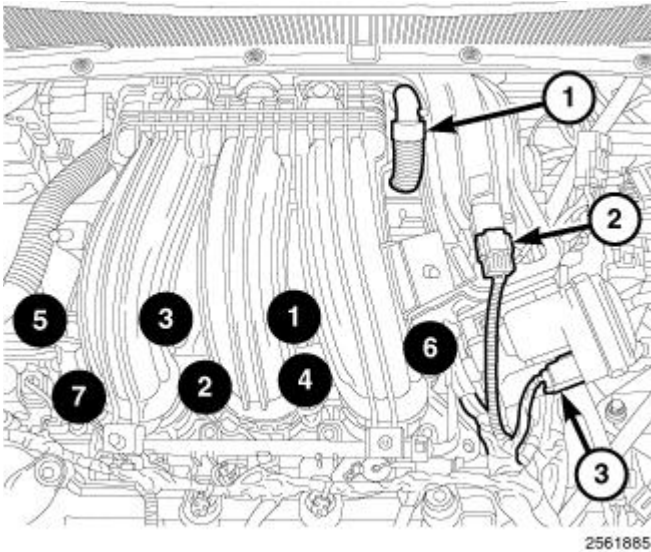


Fig. 370: Locating Manifold Bolts, MAP Sensor & ETC Electrical Connectors
 Courtesy of CHRYSLER LLC

1. Clean and inspect the gasket sealing surfaces. Gaskets can be reused if free of cuts or tears.

NOTE: Make sure the fuel injectors and wiring harnesses are positioned to not interfere with upper manifold installation.

2. Position the upper intake manifold onto the lower intake manifold.
3. Install the manifold attaching bolts and tighten in the sequence shown in illustration to 12 N.m (105 in. lbs.).
4. Connect the Positive Crankcase Ventilation (PCV) hose (1).
5. Connect the electrical connectors to the Manifold Absolute Pressure (MAP) sensor (2) and the Electronic Throttle Control (ETC) (3).

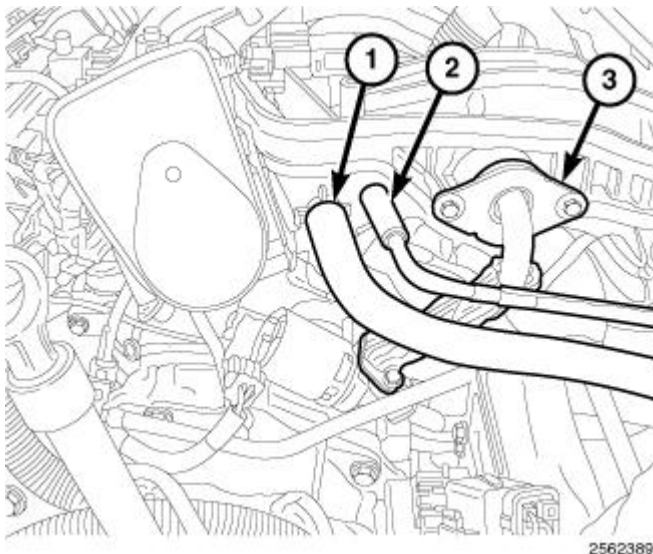


Fig. 371: Locating Upper EGR Tube, Brake Booster Hose & Vapor Purge Hose
Courtesy of CHRYSLER LLC

6. Connect the brake booster hose (1) and the vapor purge hose (2) to the upper intake manifold.
7. Install the upper EGR tube (3). Refer to **Emissions Control/Exhaust Gas Recirculation/TUBE, Exhaust Gas Recirculation (EGR) - Installation** .

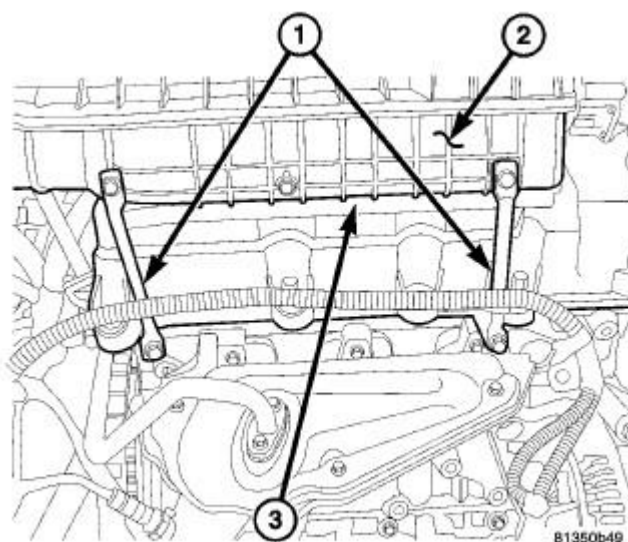


Fig. 372: Intake Brackets
Courtesy of CHRYSLER LLC

8. Install the two intake manifold support brackets (1). Tighten the fasteners to 12 N.m (105 in. lbs.).

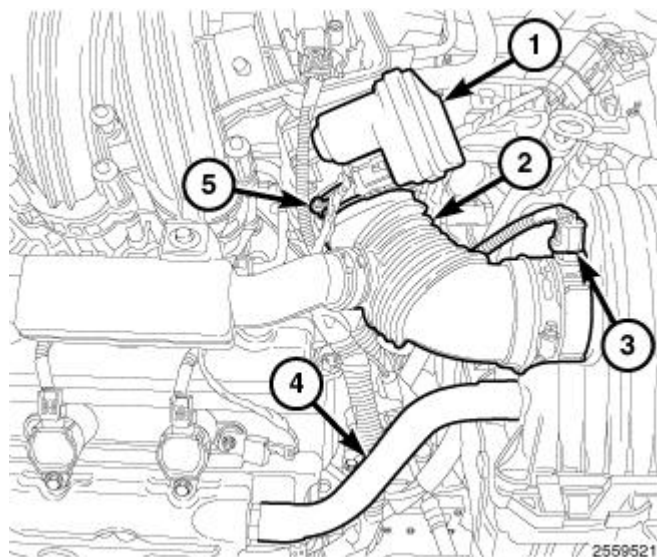


Fig. 373: Identifying Air Makeup Hose, Throttle Body & Air Inlet Hose
Courtesy of CHRYSLER LLC

9. Install the air cleaner housing assembly and connect the throttle body air inlet hose (2). See Engine/Air Intake System/BODY, Air Cleaner - Installation.
10. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).

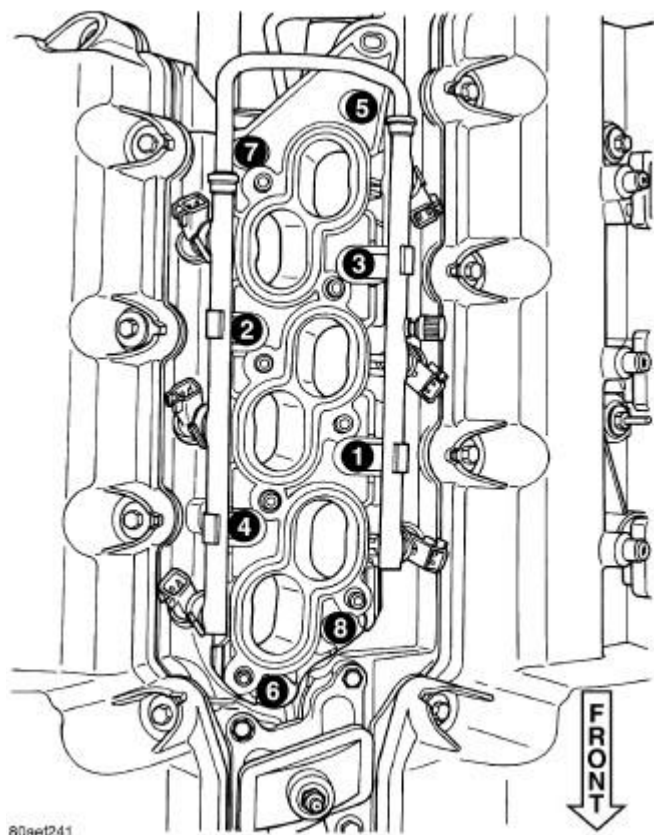
LOWER

Fig. 374: Lower Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

1. Clean and inspect sealing surfaces of cylinder head and manifold. Gaskets can be reused provided they are free of cuts or tears.
2. Position manifold on cylinder head surfaces.

NOTE: For ease of installing upper intake manifold, install a bolt 2 - 3 turns to the rearmost attaching hole of intake. This will properly position lower manifold.

3. Install manifold attaching bolts and tighten in sequence shown in illustration, to 12 N.m (105 in. lbs.). Remove bolt used for aligning manifold.

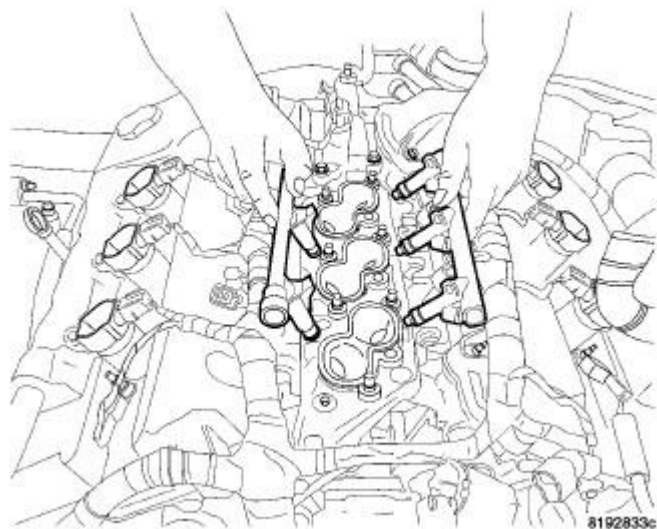


Fig. 375: FUEL RAIL REMOVE/INSTALL
Courtesy of CHRYSLER LLC

4. Install fuel rail with injectors.
5. Connect the fuel injector electrical connectors.

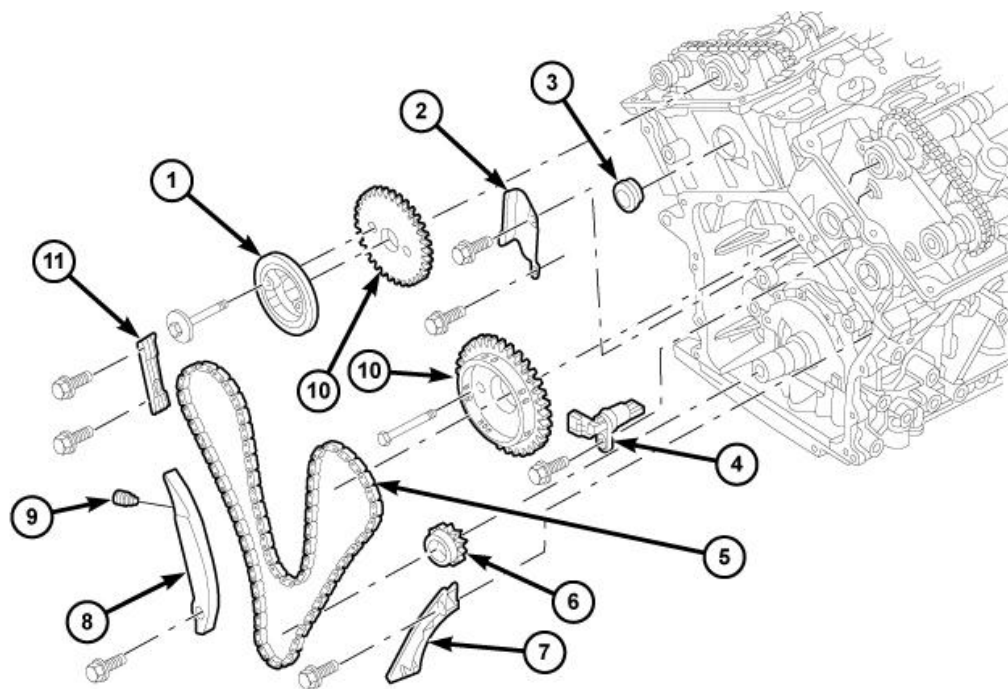
NOTE: Make sure fuel injectors are located in the correct location and position, as upper intake manifold interference could occur.

6. Install screw attaching fuel rail support bracket to the throttle body support bracket.
7. Connect fuel supply hose to fuel rail.
8. Install upper intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Installation.

VALVE TIMING

DESCRIPTION

DESCRIPTION



43519

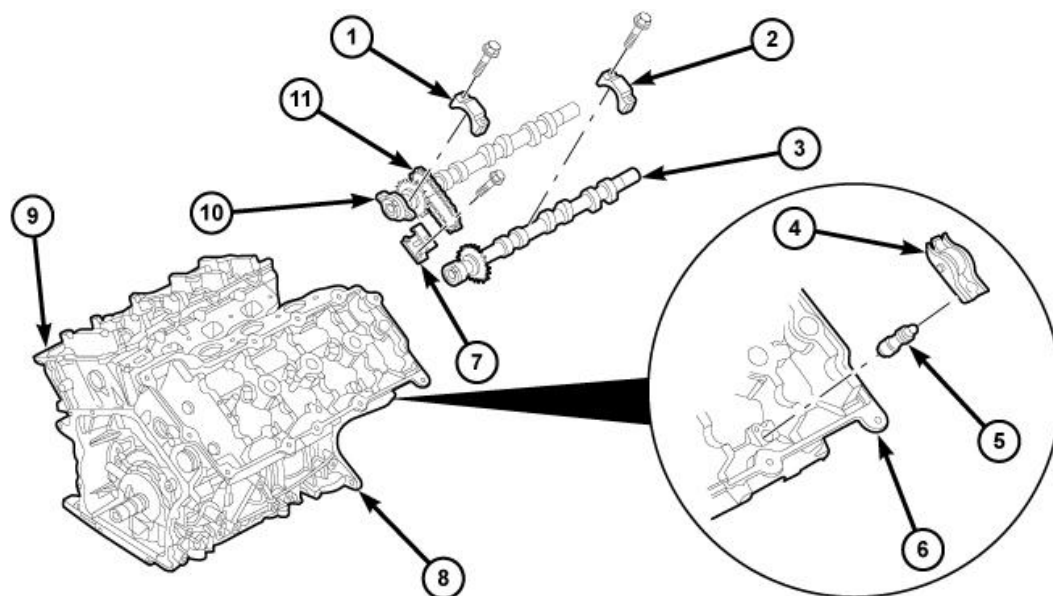
Fig. 376: Identifying Timing Drive System Components
 Courtesy of CHRYSLER LLC

The timing drive system has been designed to provide quiet performance and reliability to support a **NON** free-wheeling engine. The system consists of a primary (5) drive chain and a secondary chain drive.

The **primary** timing chain (5) is a double-flexure, inverted tooth type chain. The primary chain drives both of the intake camshafts directly from a sprocket mounted on the crankshaft. In addition, the water pump is driven by the "back side" of the primary chain, necessitating the double-flexure type chain.

The chain is controlled by three fixed chain guides (2), (7), (11) and a pivoting tensioner arm (8). These guides utilize low-friction and long wearing nylon plastic wear faces. To tension the primary chain, a fully automatic spring-loaded, engine oil-fed, hydraulic tensioner (9) is used. The tensioner (9) is mounted in the right cylinder head with the plunger contacting the pivoting tensioner arm (8). A mechanical ratchet mechanism inside the tensioner prevents excessive chain slack upon engine start-up as the chain wears. The tensioner is designed with an internal oil reservoir to assure noise-free performance, even during engine start-up before oil pressure reaches the tensioner.

For lubrication the primary chain utilizes oil leakage from the front of the oil pump. This oil spills on the crankshaft sprocket, which is then carried by the chain throughout the primary drive.



43077

Fig. 377: Camshaft & Valvetrain Components
 Courtesy of CHRYSLER LLC

The **secondary** timing chain (11) drive system uses either two conventional roller-type chains (early production) or two silent type chains (late production), one at each cylinder bank. The purpose of the secondary chain (11) is to provide a mechanical driven connection between the intake and exhaust camshafts. The intake camshafts drive the exhaust camshafts. The sprockets for both intake and exhaust camshafts are a press-fit and are only serviced as an assembly with the camshafts.

To tension the secondary chain, spring-loaded, hydraulic tensioners (7) are used at each bank and attach to each cylinder head between the intake and exhaust camshafts. The tensioner (7) incorporates upper and lower chain guide faces. The lower guide face is attached directly to the tensioner's hydraulic plunger. Also, the tensioner uses an internal oil reservoir design to prevent engine start-up noise. The secondary chains are lubricated via an oil passage through the upper guide face on each tensioner.

STANDARD PROCEDURE

ENGINE TIMING - VERIFICATION

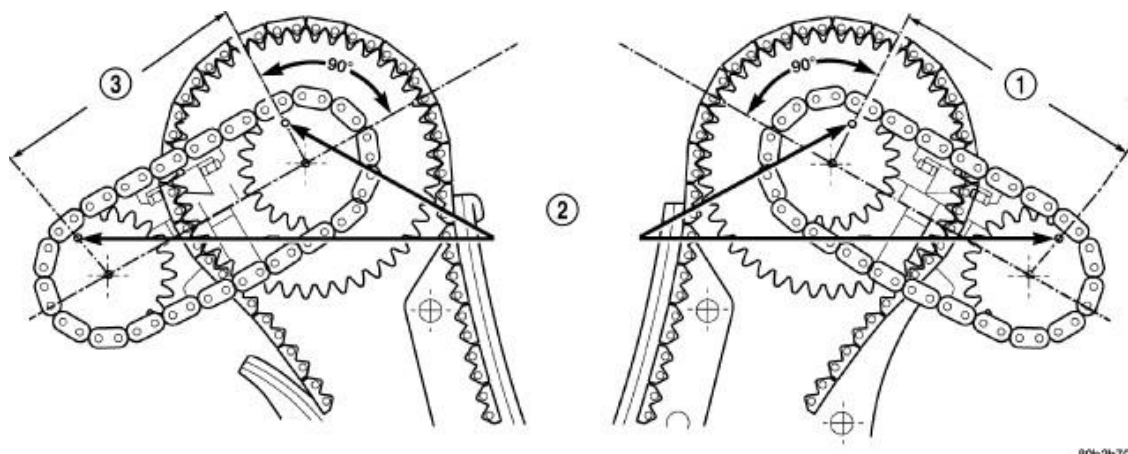


Fig. 378: ENGINE TIMING
Courtesy of CHRYSLER LLC

1 - 12 PINS	3 - 12 PINS
2 - CAMSHAFT TIMING MARKS	

NOTE: Note: The engine timing verification procedure is the same for both conventional roller-type (early production) or silent type (late production) secondary timing chains.

Correct timing is critical for the NON free-wheeling designed, 2.7L engine. Engine timing can be verified by using the following procedures:

1. Remove cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
2. Rotate engine until number one cylinder is at TDC on the EXHAUST stroke.
3. View the intake camshaft sprocket timing mark. The mark should be 90° from the cylinder head cover sealing surface on both right and left cylinder banks.
4. Count the chain pins between the timing marks (2) on the intake camshaft and the exhaust camshaft. Engine is timed correctly when there are 12 chain pins between the timing marks (2) on the intake camshaft and exhaust camshaft.
5. If marks are not correctly aligned, proceed to Timing Chain and Sprockets for service procedures. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.

CHAIN AND SPROCKETS, TIMING

Removal

TIMING CHAIN AND CAM SPROCKETS

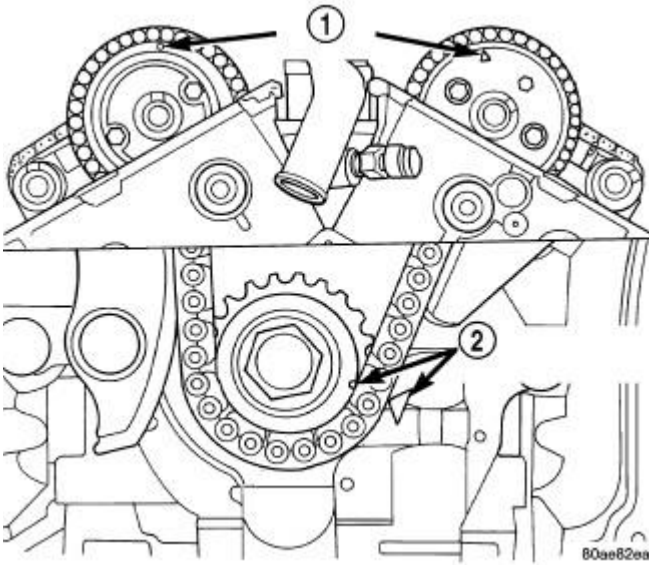


Fig. 379: TIMING MARK ALIGNMENT
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TIMING MARKS</p> |
|--|

1. Disconnect negative battery cable.
2. Drain cooling system.
3. Remove upper intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Removal.
4. Remove cylinder head covers, crankshaft vibration damper, and timing chain cover. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal. See Engine/Engine Block/DAMPER, Vibration - Removal. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.

CAUTION: When aligning timing marks, always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

5. Align crankshaft sprocket timing mark to mark on oil pump housing (2). The mark on oil pump housing is 60° ATDC of #1 cylinder.

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT rotate the camshafts or crankshaft without first locating the proper crankshaft position. Failure to do so will result in valve and/or piston damage.

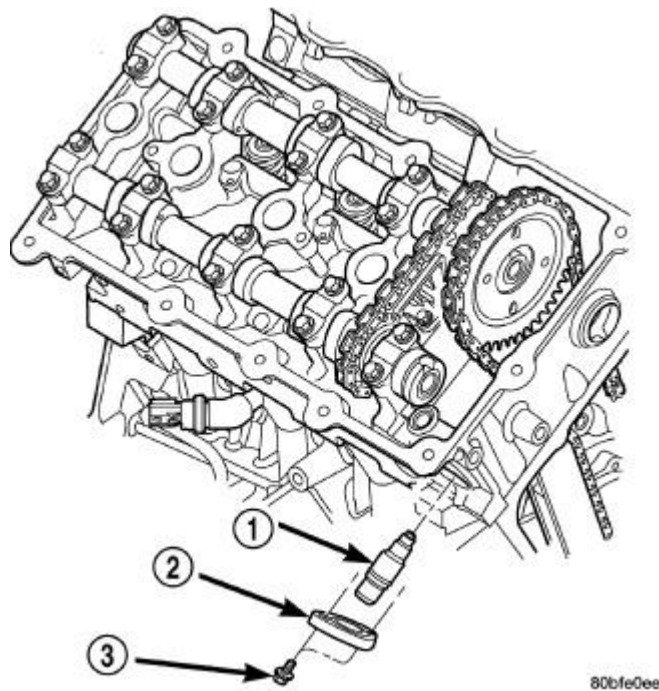


Fig. 380: PRIMARY TIMING CHAIN TENSIONER
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - TENSIONER
2 - RETAINER CAP
3 - BOLT</p> |
|--|

6. Remove power steering pump and bracket as an assembly. **Do not** disconnect power steering lines from pump. Reposition pump and support with suitable retaining strap.
7. Remove primary timing chain tensioner retainer cap (2) and tensioner (1) from right cylinder head.
8. Disconnect and remove camshaft position sensor from left cylinder head.
9. Remove timing chain guide access plugs from cylinder heads.

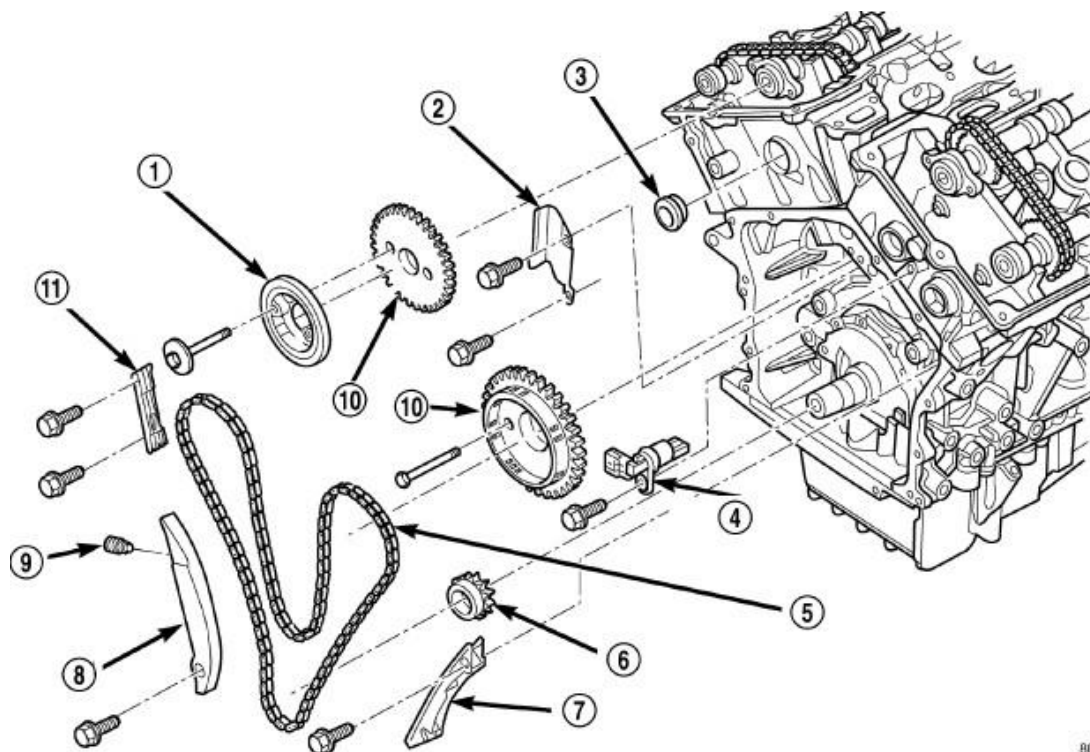


Fig. 381: TIMING DRIVE SYSTEM - PRIMARY
Courtesy of CHRYSLER LLC

1 - CAMSHAFT DAMPER (IF EQUIPPED)	7 - CHAIN GUIDE
2 - CHAIN GUIDE	8 - CHAIN TENSIONER ARM
3 - ACCESS PLUG	9 - CHAIN TENSIONER
4 - CAMSHAFT POSITION SENSOR	10 - CAMSHAFT SPROCKETS
5 - PRIMARY TIMING CHAIN	11 - CHAIN GUIDE
6 - CRANKSHAFT SPROCKET	

NOTE: When camshaft sprocket bolts are removed, the camshafts will rotate in a clockwise direction.

- Starting with the right camshaft sprocket, remove the sprocket attaching bolts. Remove camshaft damper (if equipped) and sprocket.
- Remove left side camshaft sprocket attaching bolts and remove sprocket.
- Remove lower chain guide (7) and tensioner arm (8).
- Remove the primary timing chain.
- For removal of crankshaft sprocket. See **Engine/Engine Block/CRANKSHAFT - Removal**.

CRANKSHAFT SPROCKET

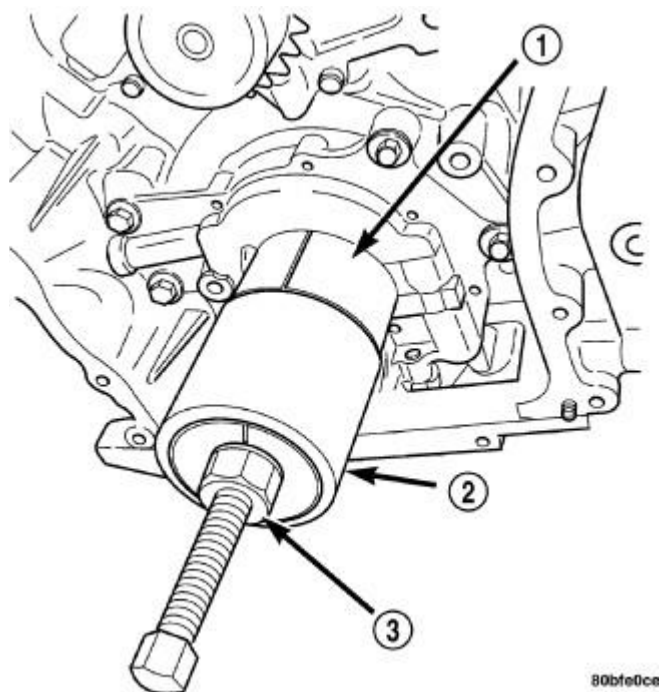


Fig. 382: Crankshaft Sprocket - Removal
Courtesy of CHRYSLER LLC

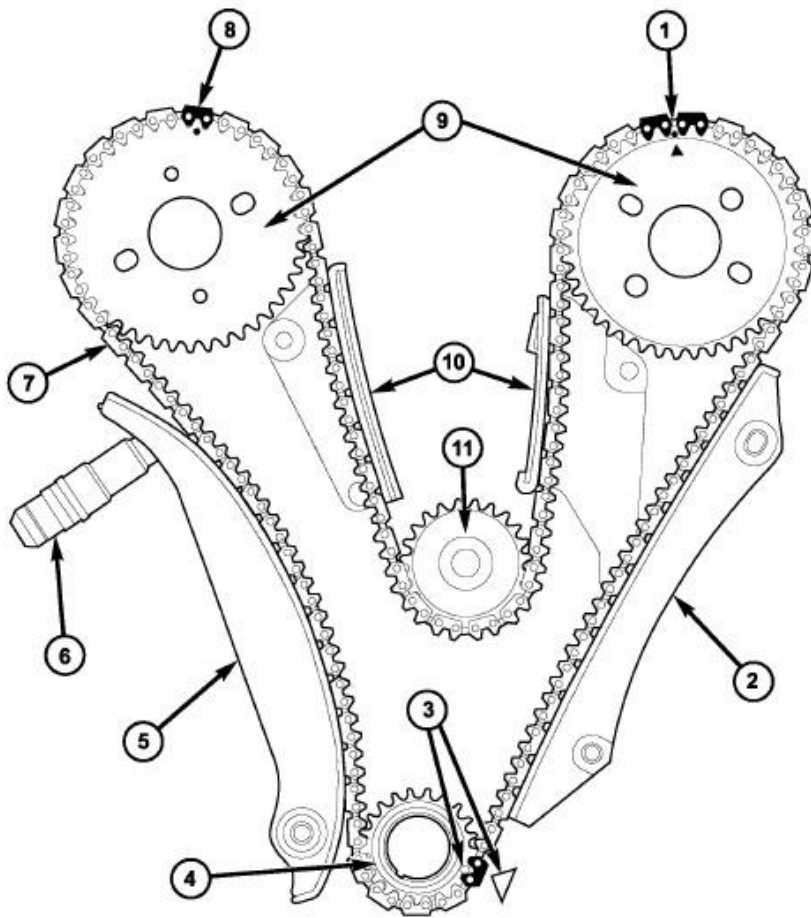
- | |
|---|
| 1 - SPECIAL TOOL 8539
2 - SPECIAL TOOL 5048-6
3 - SPECIAL TOOL 5048-1 |
|---|

1. Remove primary timing chain. See Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal.

CAUTION: Use care not to turn crankshaft while removing crankshaft sprocket, as damage to valves and or pistons could occur.

2. Remove crankshaft sprocket by first installing the crankshaft damper bolt. Apply grease or equivalent to damper bolt head and position Special Tools 5048-1, 5048-6, and 8539 (1) on sprocket and crankshaft nose. Remove sprocket using care not to rotate the crankshaft.

Installation**TIMING CHAIN AND CAM SPROCKETS**



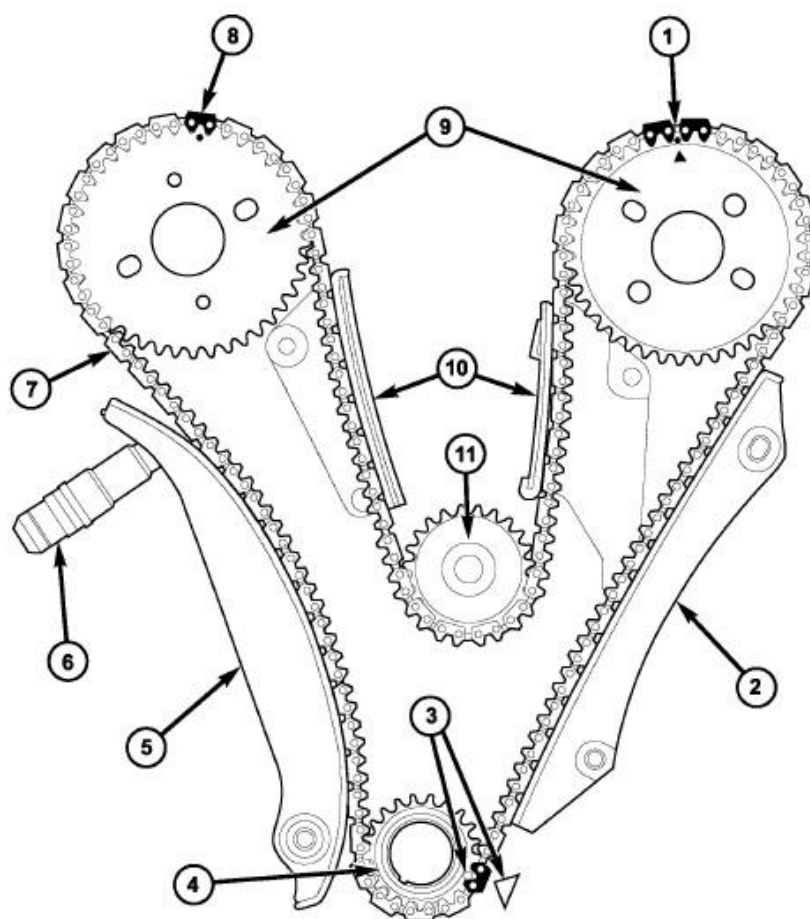
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Fig. 383: TIMING CHAIN ALIGNMENT MARKS - PRIMARY
Courtesy of CHRYSLER LLC

1. Inspect all sprockets (4),(9),(11) and chain guides (2),(5),(10). Replace if worn.
2. For crankshaft sprocket installation procedures, see **Engine/Engine Block/CRANKSHAFT - Installation**.
3. If removed, install the right and left side short chain guides (10). Tighten attaching bolts to 28 N.m (250 in. lbs.).
4. Align the crankshaft sprocket timing mark to the mark on the oil pump housing (3).

NOTE: Lubricate timing chain and guides with engine oil before installation.

5. Place the left side primary chain sprocket onto the chain so that the timing mark is located in between the two (plated) timing links (1).



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Fig. 384: TIMING CHAIN ALIGNMENT MARKS - PRIMARY
Courtesy of CHRYSLER LLC

6. Lower the primary chain with the left side sprocket through the left cylinder head opening.

NOTE: The camshaft sprockets can be allowed to float on the camshaft hub during installation.

7. Loosely position the left side camshaft sprocket over the camshaft hub.
8. Align the timing (plated) link to the crankshaft sprocket timing mark (3).
9. Position the primary chain onto the water pump drive sprocket (11).
10. Align the right camshaft sprocket timing mark to the timing (plated) link on the timing chain (8) and loosely position over the camshaft hub.
11. Verify that all chain timing (plated) links are properly aligned to the timing marks on all sprockets.
12. Install the left side lower chain guide (2) and tensioner arm (5). Tighten attaching bolts to 28 N.m (250 in. lbs.).

NOTE: Inspect the O-ring on the chain guide access plugs before installing. Replace the O-ring as necessary.

13. Install the chain guide access plugs to the cylinder heads. Tighten plugs to 20 N.m (15 ft. lbs.).

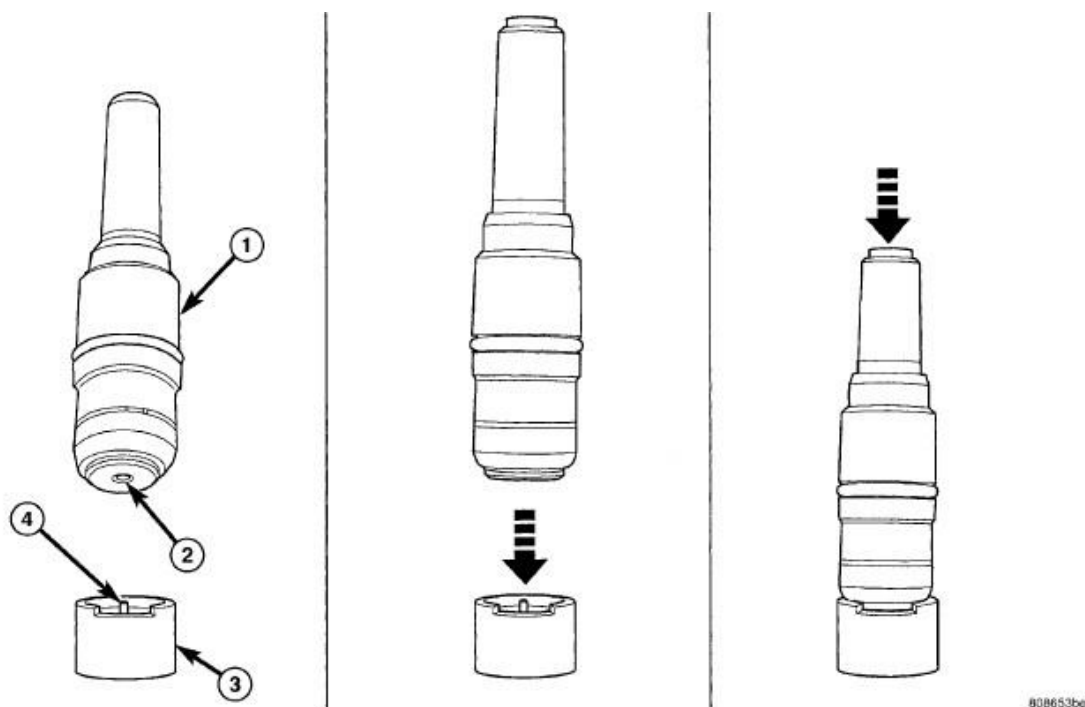


Fig. 385: TIMING CHAIN TENSIONER - OIL PURGING
Courtesy of CHRYSLER LLC

NOTE: To reset the primary timing chain tensioner, engine oil will first need to be purged from the tensioner.

14. Purge oil from the timing chain tensioner using the following procedure:
 - a. Place the check ball (2) end of the tensioner into the shallow end of Chain Tensioner Gauge 8186 (3).
 - b. Using hand pressure, slowly depress the tensioner until oil is purged from the tensioner.
15. Reset the timing chain tensioner using the following procedure:
 - a. Position the cylinder plunger (4) into the deeper end of Chain Tensioner Gauge 8186 (3).
 - b. Apply a downward force until tensioner is reset.

NOTE: If oil was not first purged from the tensioner, use slight finger pressure to assist the center arm pin of Chain Tensioner Gauge 8186 to unseat the tensioner's check ball.

CAUTION: Ensure the tensioner is properly reset. The tensioner body (4) must bottom against the top edge of Chain Tensioner Gauge 8186 (3). Failure to properly perform the resetting procedure may cause tensioner jamming.

NOTE: Inspect the tensioner O-ring (2) for nicks or cuts and make sure the snap ring (1) is correctly installed, replace as necessary.

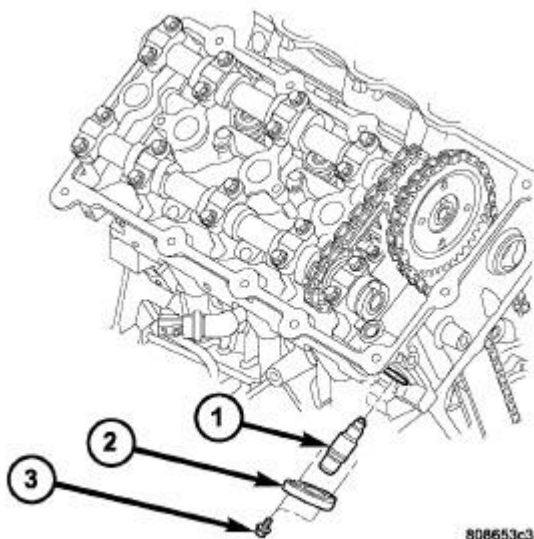


Fig. 386: PRIMARY TIMING CHAIN TENSIONER

Courtesy of CHRYSLER LLC

16. Install the reset chain tensioner (1) into the right cylinder head.
17. Position tensioner retaining plate (2) and tighten bolts (3) to 12 N.m (105 in. lbs.).

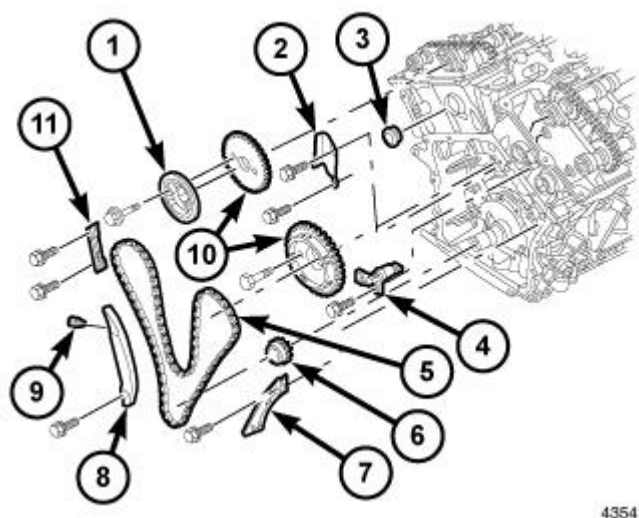


Fig. 387: TIMING DRIVE SYSTEM - PRIMARY

Courtesy of CHRYSLER LLC

18. Starting at the right cylinder bank, first position the camshaft damper (1) (if equipped) on the camshaft hub, then insert a 3/8" square drive extension with a breaker bar into the intake camshaft drive hub. Rotate the camshaft until the camshaft hub aligns to the camshaft sprocket and damper attaching holes.

Install the sprocket attaching bolts and tighten to 28 N.m (250 in. lbs.).

19. Insert a 3/8" square drive extension with a breaker bar into the intake camshaft drive hub and rotate the camshaft until the sprocket attaching bolts can be installed. Tighten the sprocket bolts to 28 N.m (250 in. lbs.).
20. Rotate the crankshaft slightly clockwise to remove timing chain slack, if necessary.

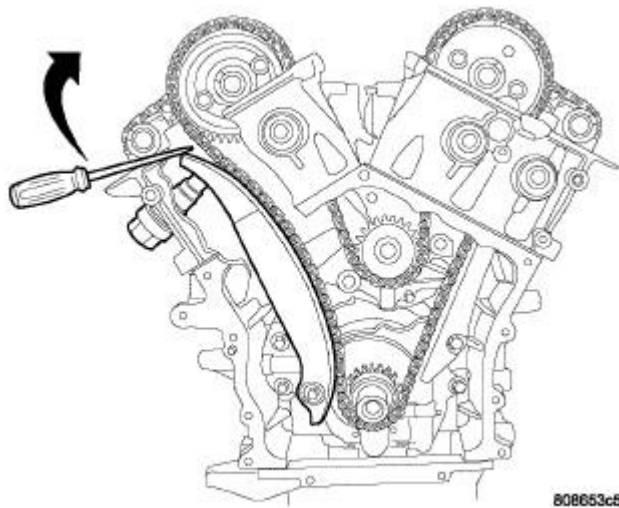


Fig. 388: TIMING CHAIN TENSIONER ACTIVATING
Courtesy of CHRYSLER LLC

21. Activate the timing chain tensioner by using a flat bladed pry tool to gently pry tensioner arm towards the tensioner slightly. Then release the tensioner arm. Verify the tensioner is activated (extends).

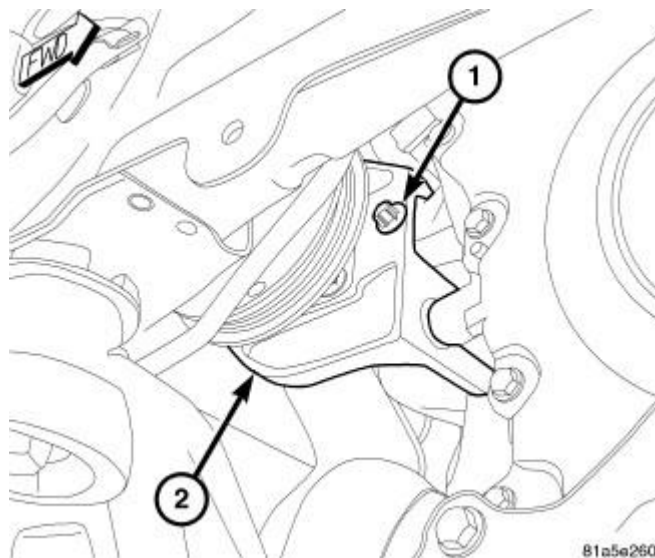


Fig. 389: FRONT PUMP MOUNTING BRACKET BOLTS - 2.7L
Courtesy of CHRYSLER LLC

22. Install the power steering pump and bracket assembly. Refer to [Steering/Pump - Installation](#) .

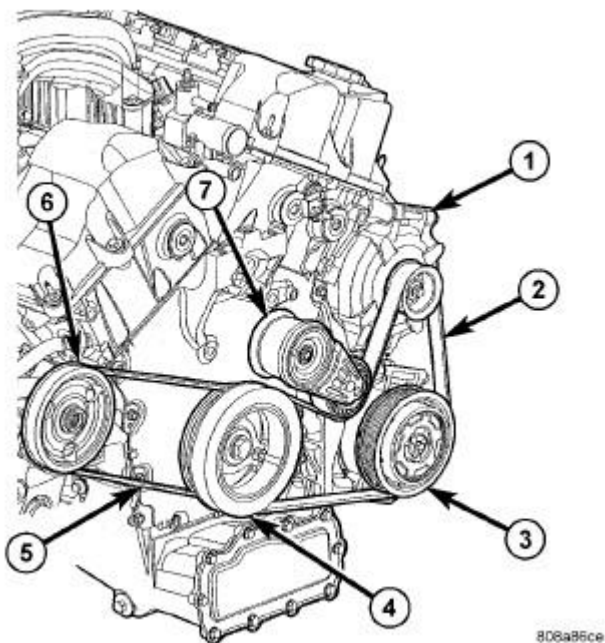


Fig. 390: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

23. Install the camshaft position sensor and connect the electrical connector.
24. Install the timing chain cover, crankshaft vibration damper, and accessory drive belts. See [Engine/Valve Timing/COVER\(S\), Engine Timing - Installation](#).

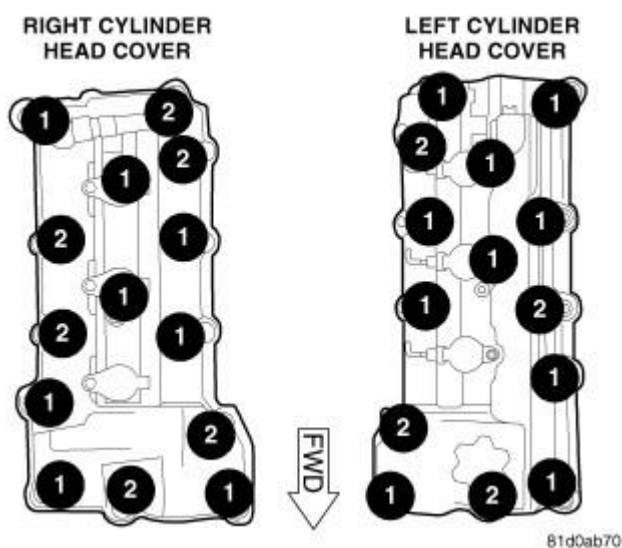


Fig. 391: Cylinder Head Cover Fasteners
Courtesy of CHRYSLER LLC

- 1 - DOUBLE ENDED STUDS
- 2 - BOLTS

25. Install the cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Installation. See Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.
26. Install the upper intake manifold and air cleaner housing assembly. See Engine/Manifolds/MANIFOLD, Intake - Installation.
27. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).
28. Fill the cooling system. Refer to Cooling - Standard Procedure.

NOTE: After installation of a reset tensioner, engine noise will occur after initial start-up. This noise will normally disappear within 5-10 seconds.

29. Operate the engine until it reaches normal operating temperature. Check cooling system for correct fluid level. Refer to Cooling - Standard Procedure

NOTE: The Cam/Crank Variation Relearn procedure must be performed anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components. Refer to DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure.

CRANKSHAFT SPROCKET

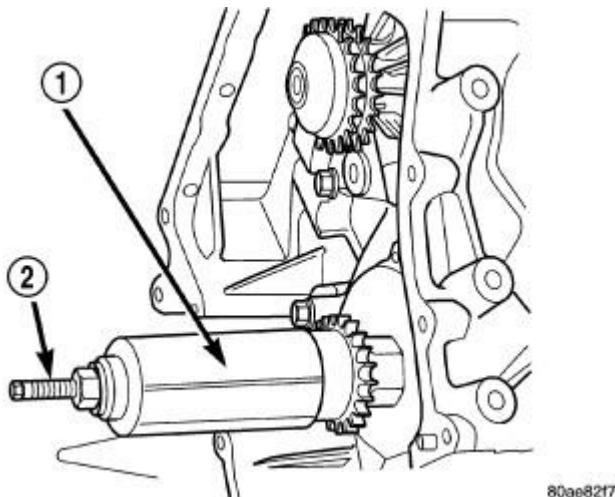


Fig. 392: Crankshaft Sprocket - Installation
Courtesy of CHRYSLER LLC

- 1 - SPECIAL TOOL 6780-1
- 2 - SPECIAL TOOL 8179

1. Install crankshaft sprocket using Special Tools 6780-1 and 8179 (2) until sprocket bottoms against

crankshaft step flange. Use care not to rotate crankshaft.

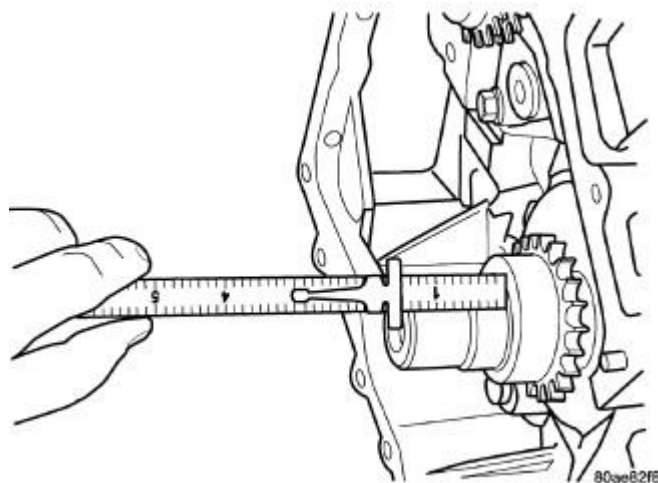


Fig. 393: Crankshaft Sprocket Depth Measurement
Courtesy of CHRYSLER LLC

2. Verify that crankshaft sprocket is installed to proper depth by measuring from sprocket outer face to end of crankshaft. Measurement should read: 39.05 ± 0.50 mm (1.5374 ± 0.020 in.).
3. Install primary timing chain. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation**.

COVER(S), ENGINE TIMING

Removal

REMOVAL

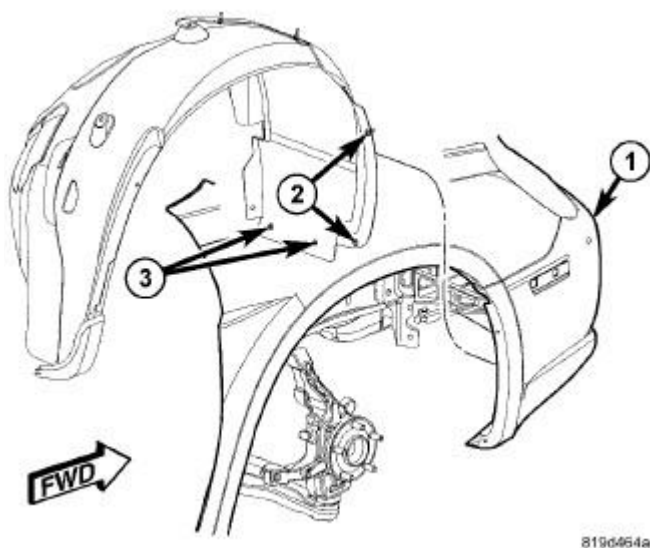


Fig. 394: FRONT SPLASH SHIELDS

Courtesy of CHRYSLER LLC

1. Disconnect and isolate negative battery cable.
2. Drain cooling system.
3. Remove coolant pressure container.
4. Remove right front wheel and belt splash shield (2).

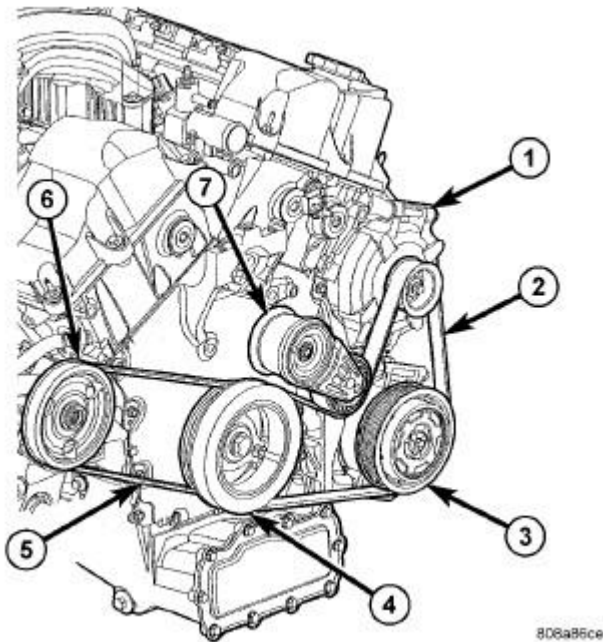
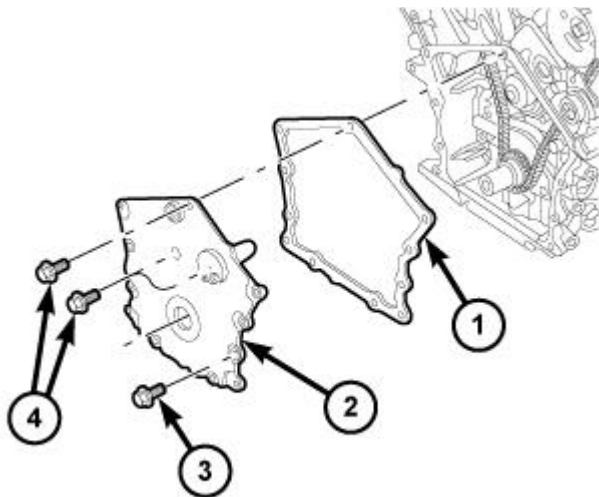


Fig. 395: Accessory Drive Belt System - 2.7L
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - GENERATOR</p> <p>2 - IDLER/TENSIONER</p> |
|---|

5. Remove accessory drive belts (2). Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal**.
6. Remove crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Removal**.
7. Remove AC/Generator belt tensioner/bracket assembly.
8. Disconnect heater hose from tube at right front frame rail area.
9. Remove screws securing heater supply tube to right frame rail. Reposition heater supply tube.



43527

Fig. 396: TIMING CHAIN COVER**Courtesy of CHRYSLER LLC**

10. Place a floor jack with wooden block under oil pan to support engine.
11. Remove right engine mount.
12. Remove upper timing chain cover bolts.
13. Remove remaining bolts securing timing chain cover to engine.
14. Remove timing chain cover (2).
15. Discard timing chain cover gasket (1). Remove front crankshaft oil seal from cover.

Installation**INSTALLATION**

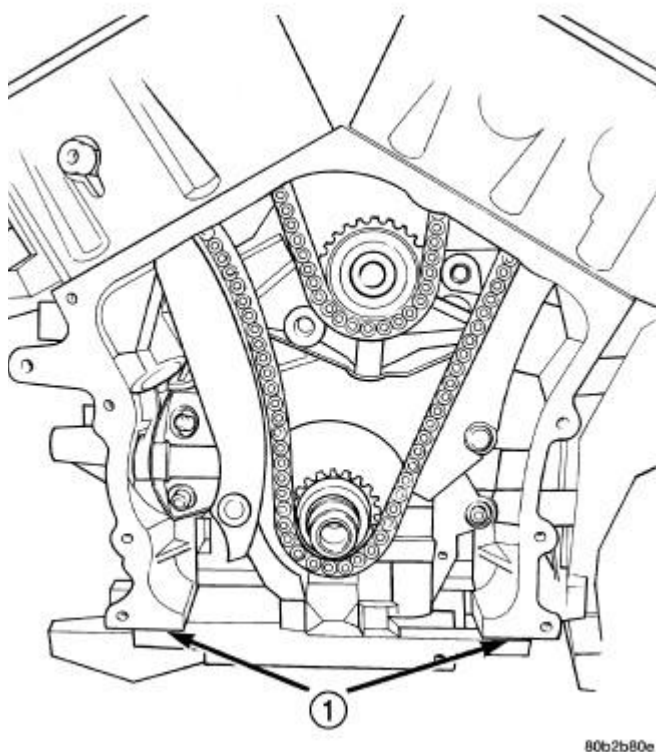


Fig. 397: TIMING CHAIN COVER SEALING
Courtesy of CHRYSLER LLC

1 - PLACE A 1/8 INCH BEAD OF SEALER AT PARTING LINE

1. Inspect and clean timing chain cover sealing surfaces.
2. Before installing timing cover gasket apply a 1/8 inch bead of Mopar® Engine RTV GEN II to the parting lines (1) between the oil pan and cylinder block.

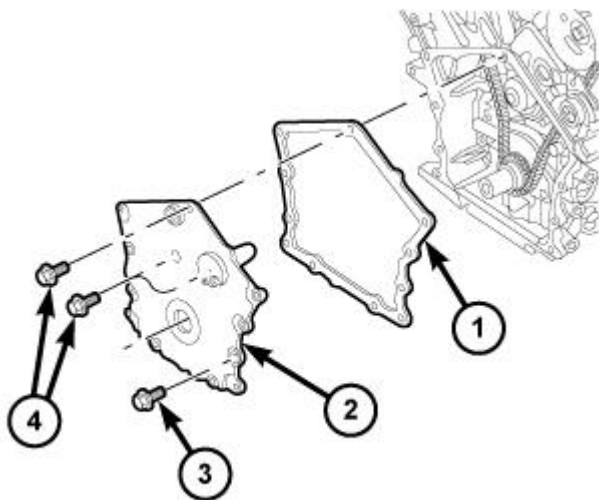
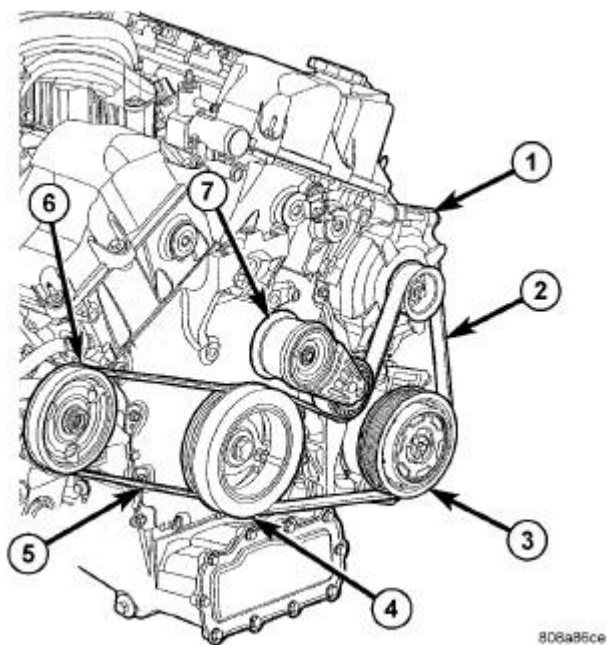


Fig. 398: TIMING CHAIN COVER

Courtesy of CHRYSLER LLC

3. Install timing cover (2) and gasket (1). Tighten M10 cover bolts to 54 N.m (40 ft. lbs.) and M6 bolts to 12 N.m (105 in. lbs.).
4. Install front crankshaft oil seal using Special Tool 6780-2 sleeve and 6780-1 installer.
5. Install right engine mount. See **Engine/Engine Mounting/INSULATOR, Engine Mount - Installation**.
6. Install screws attaching heater supply tube to right front frame rail area.

**Fig. 399: Accessory Drive Belt System - 2.7L**

Courtesy of CHRYSLER LLC

- | |
|---------------|
| 1 - GENERATOR |
| 2 - BELT |

7. Connect heater hose to supply tube at right front frame rail area.
8. Install AC/Generator belt tensioner/bracket assembly.
9. Install crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation**.
10. Install accessory drive belts (2). Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation**.

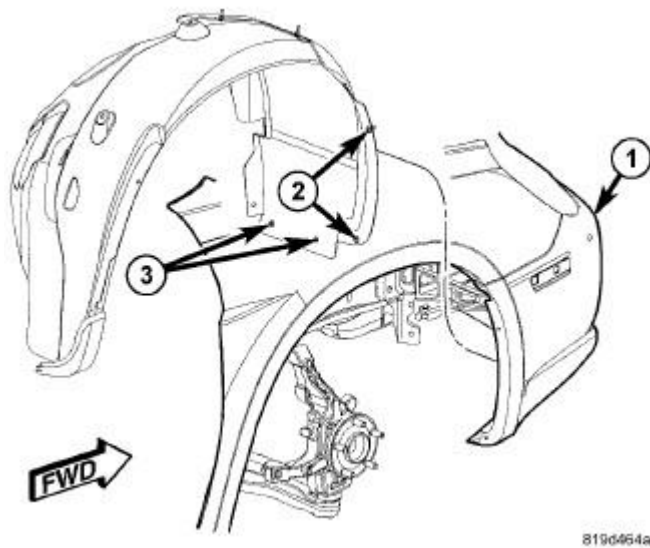


Fig. 400: FRONT SPLASH SHIELDS
Courtesy of CHRYSLER LLC

11. Install belt splash shield and right front wheel.
12. Install coolant pressure container.
13. Fill cooling system.
14. Connect negative battery cable.