

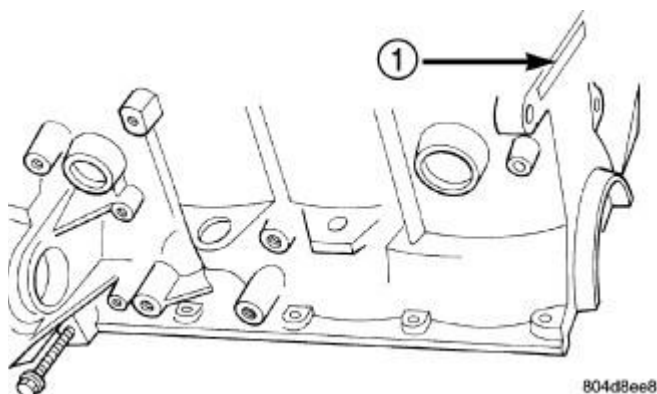
2010 ENGINE**2.4L DOHC - Service Information - PT Cruiser****DESCRIPTION****DESCRIPTION**

Fig. 1: Engine Identification
Courtesy of CHRYSLER LLC

1 - ENGINE IDENTIFICATION LOCATION

The 2.4 Liter (148 cu. in.) in-line four cylinder engine is a double over head camshaft with hydraulic lash adjusters and four valve per cylinder design. The engine is free-wheeling; meaning it has provisions for piston-to-valve clearance. However valve-to-valve interference can occur, if camshafts are rotated independently.

The cylinders are numbered from front of the engine to the rear. The firing order is 1-3-4-2.

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

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 the Engine Mechanical and the Engine Performance diagnostic charts, for possible causes and corrections of malfunctions. See **MECHANICAL** and **PERFORMANCE**.

For fuel system diagnosis, see **FUEL SYSTEM** .

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**.
- Engine Cylinder Head Gasket Failure Diagnosis: Refer to **CYLINDER HEAD GASKET**.
- Intake Manifold Leakage Diagnosis: Refer to **INTAKE MANIFOLD LEAKS**.
- Hydraulic Lash Adjuster 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 - Diagnosis and Testing</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. Set gap. Refer to <u>Electrical/Ignition Control - Specifications</u> . 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 belt/chain.
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low. 2. Incorrect fuel mixture. 3. Intake manifold leakage.	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information) 2. (Refer to Appropriate Diagnostic Information) 3. Inspect intake manifold,

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	4. Faulty ignition coil(s).	manifold gasket, and vacuum hoses. 4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)
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 ignition coil(s).	1. Clean plugs and set gap. 2. Clean system and replace fuel filter. 3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information) 4. Correct valve timing. 5. Replace cylinder head gasket. 6. Test compression of each cylinder. 7. Replace valves. 8. Perform exhaust restriction test. Refer to <u>Exhaust System - Diagnosis and Testing</u> . Install new 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 ignition coil(s).	1. Clean spark plugs and set gap. 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 ignition coil(s). 3. Dirty fuel injector(s). 4. Contamination in fuel system.	1. Clean spark plugs and set gap. 2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information) 3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information) 4. Clean system and replace fuel filter.

MECHANICAL

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CONDITION	POSSIBLE CAUSES	CORRECTION
VALVETRAIN NOISE	1. High or low oil level in crankcase. 2. Thin or diluted oil. 3. Thick oil - - 4. Low oil pressure. 5. Dirt in lash adjusters. 6. Worn rocker arms. 7. Worn lash adjusters. 8. Worn valve guides. 9. Excessive runout of valve seats on valve faces. 10. Missing adjuster pivot.	1. Check and correct engine oil level. 2. Change oil to correct viscosity. 3. (a) Change engine oil and filter. (b) Run engine to operating temperature. (c) Change engine 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 engine oil and filter. (b) Run engine to operating temperature. (c) Change engine 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 - -	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 engine oil and filter. (b) Run engine to operating temperature. (c) Change engine oil and filter again.

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	5. Excessive bearing clearance. 6. Excessive end play. 7. Crankshaft journal out-of-round or worn. 8. Loose flywheel or torque converter.	5. Measure bearings for correct clearance. Repair as necessary. 6. Check thrust bearing for wear on flanges. 7. Replace crankshaft or grind journals. 8. 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).	1. Check system and repair as necessary. Refer to <u>Emissions Control/Evaporative Emissions/VALVE, Positive Crankcase Ventilation (PCV) - Diagnosis and Testing</u> . 2. Hone cylinder bores. Install new rings. 3. Install new rings. 4. Remove rings and check grooves. If groove is not proper width, replace piston. 5. Ream guide(s) and replace valve(s) with oversize valve(s) and seal(s).

6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).
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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.

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 Totally Integrated Power Module (TIPM).
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.**

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

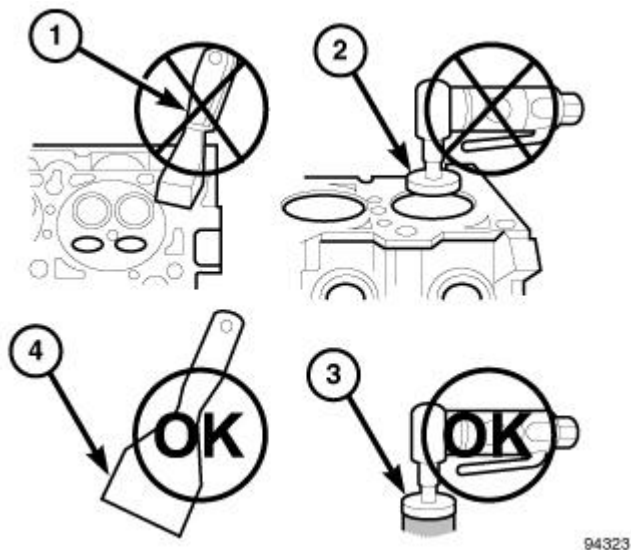


Fig. 2: PROPER TOOL USAGE FOR SURFACE PREPARATION
Courtesy of CHRYSLER LLC

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).

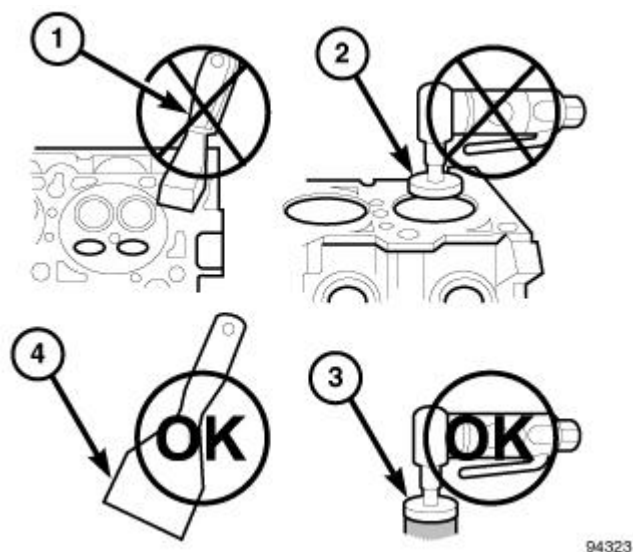


Fig. 3: PROPER TOOL USAGE FOR SURFACE PREPARATION

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

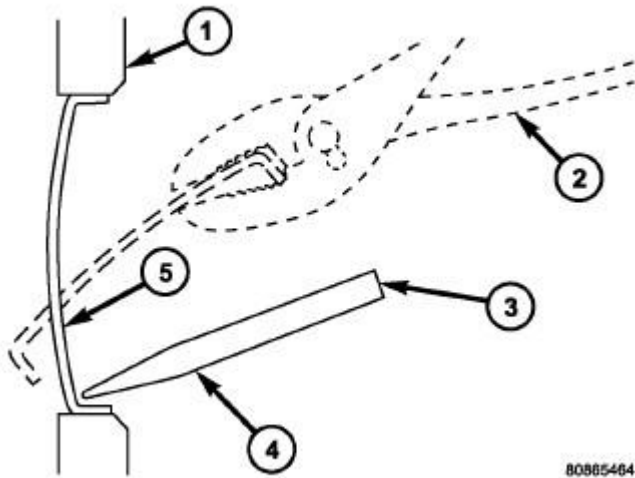


Fig. 4: Core Hole Plug Removal
Courtesy of CHRYSLER LLC

- 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 (4) and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers (2) or other suitable tool and remove plug (5) .

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 (1) 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.

MEASURING BEARING CLEARANCE USING PLASTIGAGE

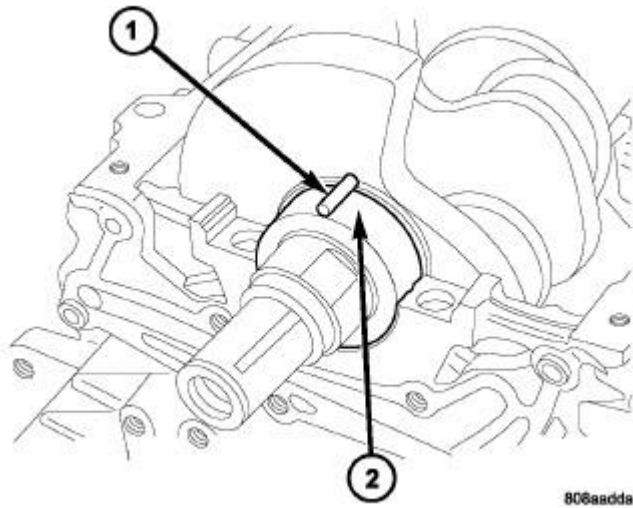


Fig. 5: Plastigage Placed in Lower Shell-Typical
Courtesy of CHRYSLER LLC

1 - PLASTIGAGE

Engine crankshaft bearing clearances can be determined by use of Plastigage (1) or equivalent. The following is the recommended procedure for the use of Plastigage:

1. Remove oil film from surface to be checked. Plastigage is soluble in oil.
2. Place a piece of Plastigage (1) across the entire width of the bearing shell in the cap approximately 6.35 mm (1/4 in.) off center and away from the oil holes . (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Torque the bearing cap/bed plate bolts of the bearing being checked to the proper specifications.

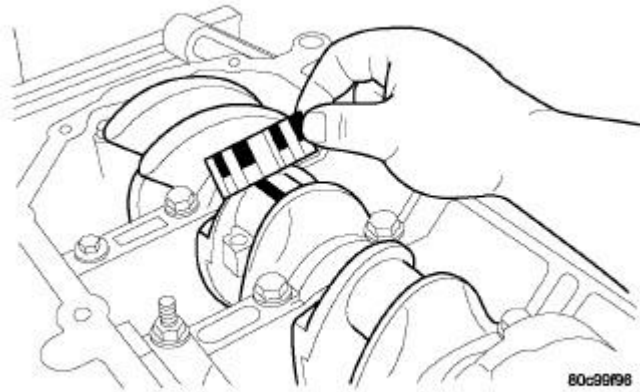


Fig. 6: Connecting Rod Bearing Clearance - Typical
Courtesy of CHRYSLER LLC

3. Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package. Locate the band closest to the same width. This band shows the amount of clearance in thousandths of a millimeter. Differences in readings between the ends indicate the amount of taper present. Record all readings taken. Compare clearance measurements to specs found in engine specifications. See Engine **SPECIFICATIONS**. Plastigage generally is accompanied by two scales. One scale is in inches, the other is a metric scale.

NOTE: Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking.

4. Install the proper crankshaft bearings to achieve the specified bearing clearances.

REMOVAL

REMOVAL

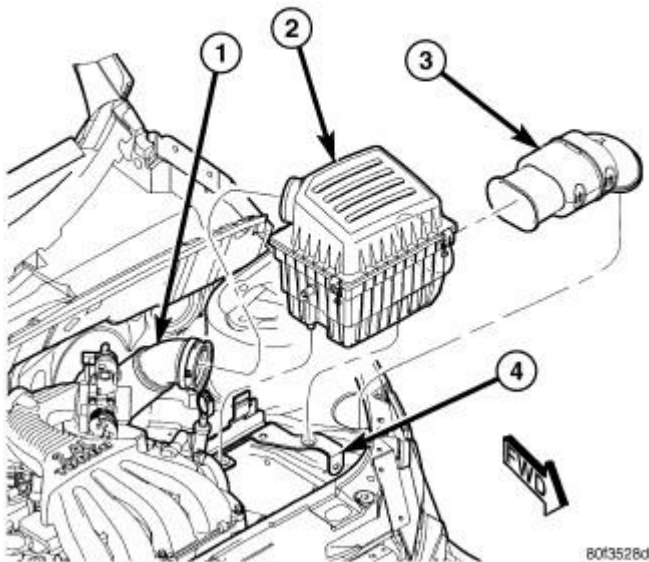


Fig. 7: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

1. Perform fuel pressure release procedure, then disconnect and remove fuel line. Refer to **FUEL SYSTEM PRESSURE RELEASE PROCEDURE** .
2. Remove air cleaner housing assembly (2) and clean air hose (1). See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.

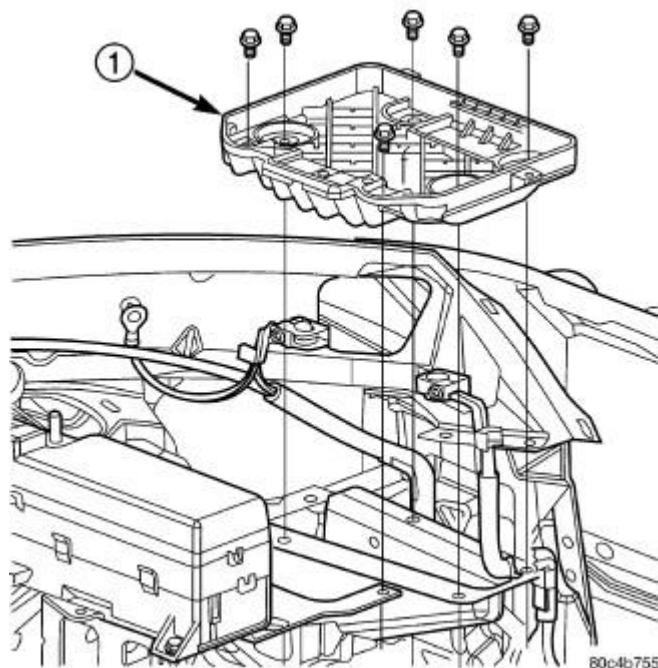
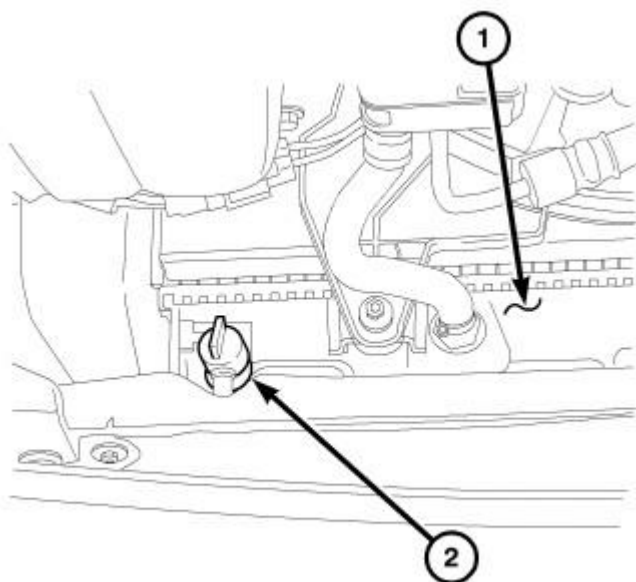


Fig. 8: Battery Tray-Removal/Installation

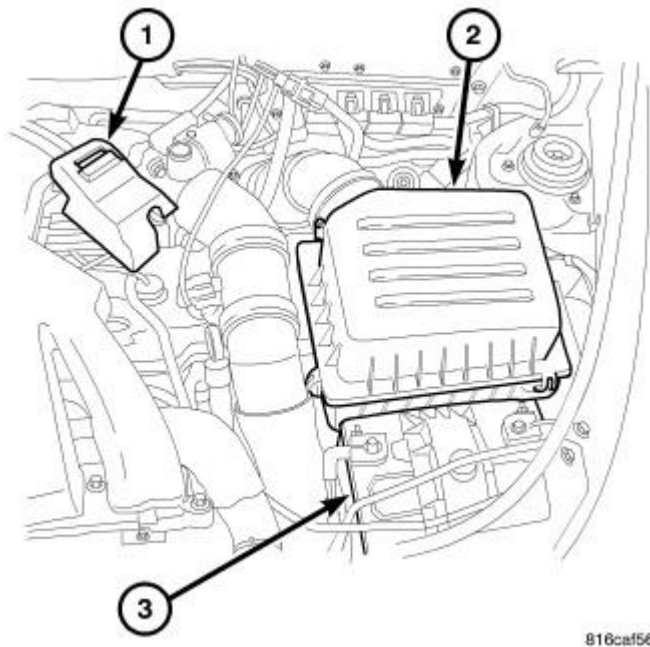
Courtesy of CHRYSLER LLC

3. Disconnect both cables from battery.
4. Remove battery and battery tray (1). Refer to **Electrical/Battery System/BATTERY - Removal** .
5. Disconnect battery temperature sensor.

**Fig. 9: DRAIN COCK**

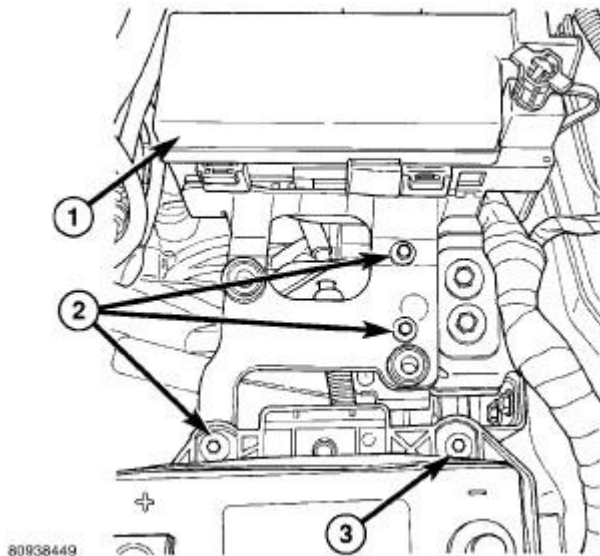
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6. Drain cooling system. Refer to **SYSTEM DRAINING** .
7. Discharge air conditioning system, if equipped. Refer to **STANDARD PROCEDURE** .

**Fig. 10: AIR CLEANER**

Courtesy of CHRYSLER LLC

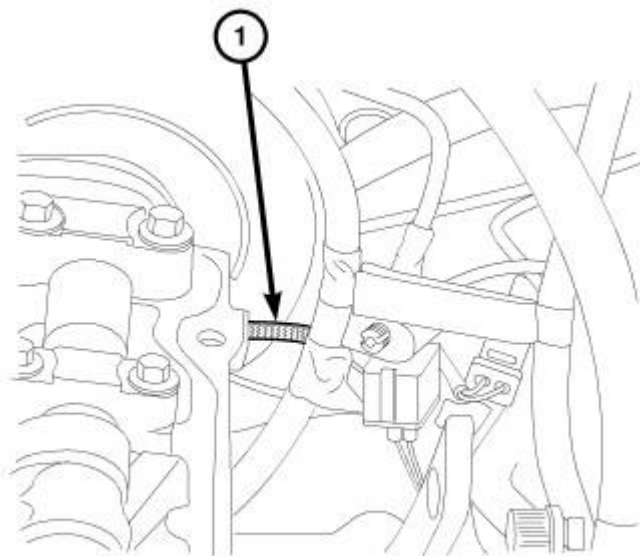
8. Remove throttle cable cover.
9. Disconnect throttle and speed control cables from throttle body.
10. Disconnect engine wiring harness at Powertrain Control Module (PCM).

**Fig. 11: TIPM Bracket Attaching Bolts**

Courtesy of CHRYSLER LLC

11. Disconnect positive cable from Totally Integrated Power Module (TIPM) (1) and ground wire from vehicle body. Remove bolts attaching PDC (2) and set aside .

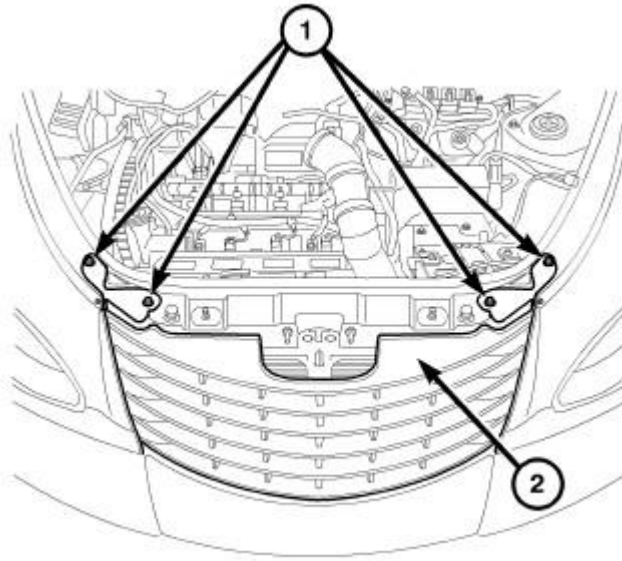
12. Disconnect wiring connectors at lower battery tray support.



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Fig. 12: HEAD GROUND
Courtesy of CHRYSLER LLC

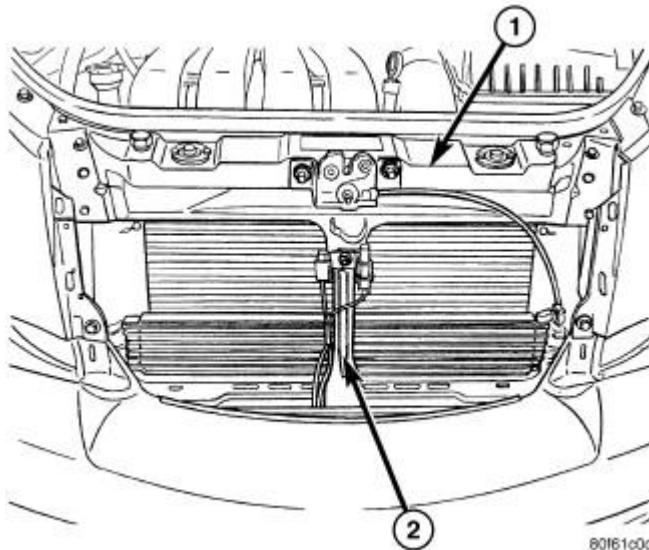
13. Disconnect ground wire (1) from the vehicle body-to-engine at the right side strut tower.
14. Disconnect brake booster vacuum hose from intake manifold.
15. Disconnect the proportional purge hose from throttle body.
16. Disconnect coolant reserve/recovery hose from coolant outlet connector.
17. Disconnect heater hoses.



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Fig. 13: GRILL REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

18. Remove grill (2). Refer to **Body/Exterior/GRILLE - Removal** .



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Fig. 14: Upper Radiator Closure Panel and Center Brace
Courtesy of CHRYSLER LLC

19. Remove upper radiator closure (1) and center brace (2). Refer to **Body/Exterior/CROSSMEMBER, Radiator - Removal** .
20. Remove upper radiator hose.
21. Remove lower radiator hose.

22. Remove thermostat housing.

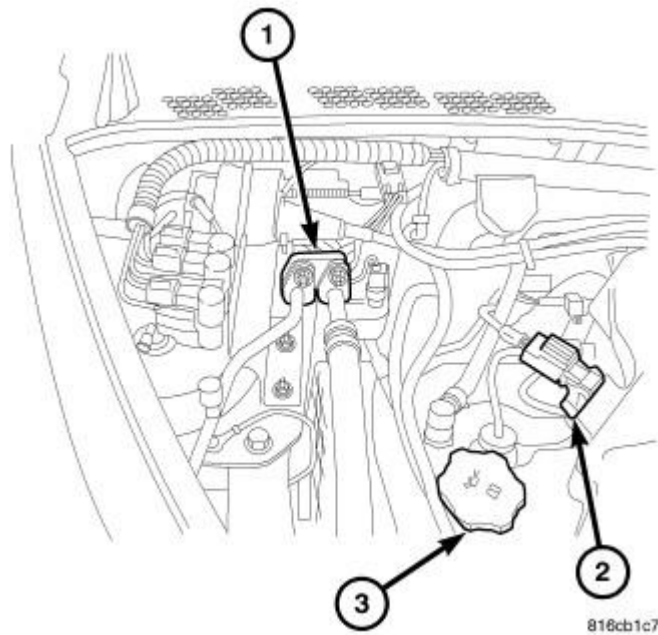


Fig. 15: A/C LINES

Courtesy of CHRYSLER LLC

23. Disconnect upper A/C line from A/C condenser.
24. Disconnect A/C lines at junction near upper torque strut.
25. **Automatic Transmission equipped vehicles:**
 - a. Using a blade or suitable hose cutter, cut transaxle oil cooler lines off flush with transmission fittings. Plug lines and fittings to prevent debris from entering transaxle or cooler circuit. A service splice kit will be installed upon reassembly.
 - b. Disconnect transmission electrical connectors.
 - c. Disconnect transmission shift linkage.

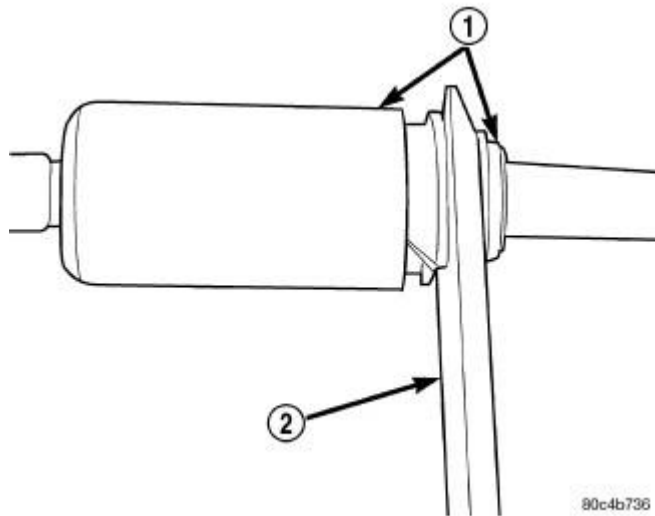


Fig. 16: Disconnecting Clutch Hydraulic Line
Courtesy of CHRYSLER LLC

1 - QUICK CONNECT FITTING 2 - DISCONNECT TOOL 6638 A

26. Manual Transmission equipped vehicles:

- a. Using Special Tool 6638A (2), disconnect clutch hydraulic line .
- b. Disconnect transmission shift linkage.
- c. Disconnect transmission electrical connectors.

27. Turbocharger equipped vehicles: Disconnect power steering hoses from radiator.

28. Disconnect radiator fan electrical connector and remove cooling module assembly (fan, radiator, A/C condenser, transmission oil cooler).
29. Hoist vehicle and remove front wheels.
30. Remove right and left inner splash shields.
31. Remove both axle shafts. Refer to **Differential and Driveline/Half Shaft - Removal** .
32. Remove accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
33. Remove generator and support brackets.

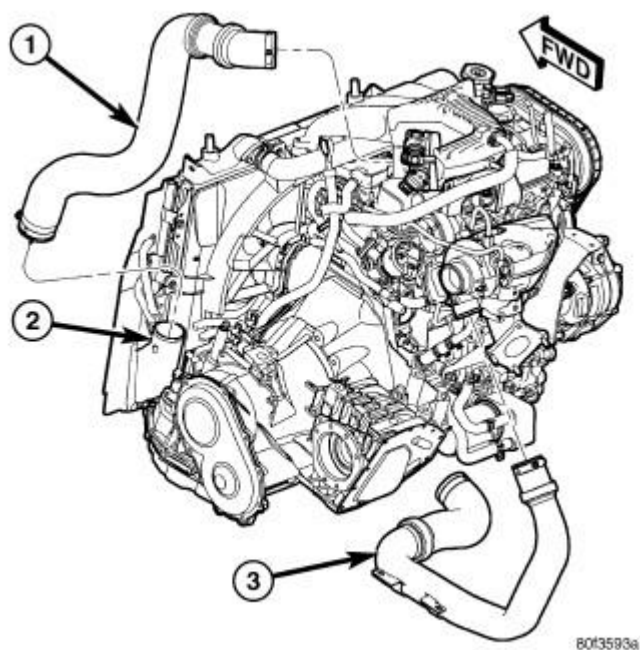


Fig. 17: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

34. **Turbocharger equipped vehicles:** Remove charge air cooler hoses (1 AND 3) .
35. Drain engine oil.

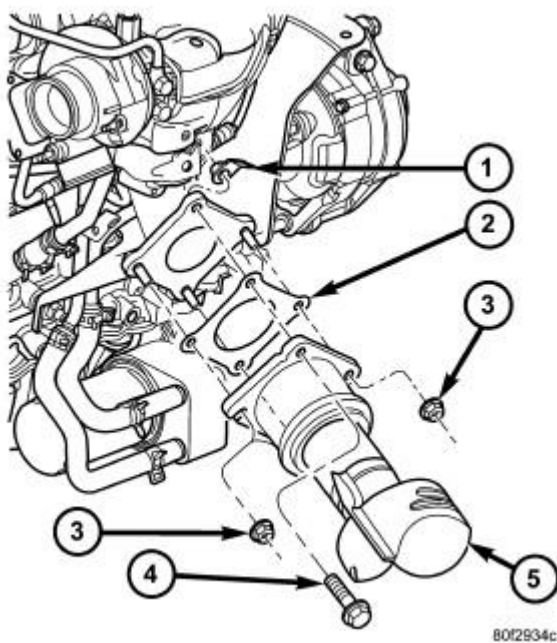
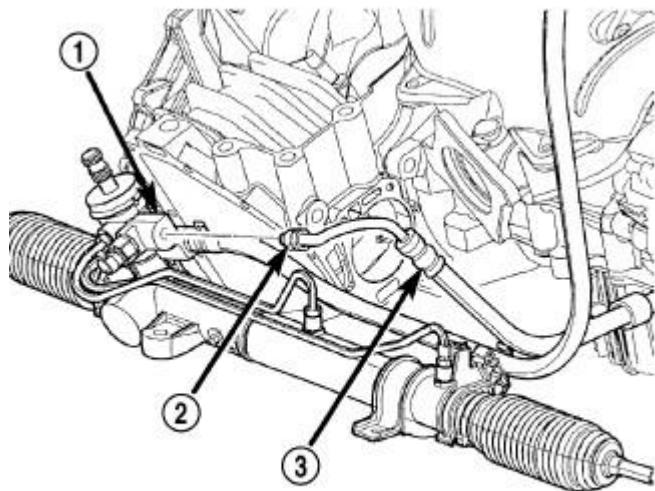


Fig. 18: Converter to Exhaust Manifold Connection - 2.4L Turbo
Courtesy of CHRYSLER LLC

- 1 - FLAG NUT
- 2 - GASKET
- 3 - NUT
- 4 - BOLT
- 5 - CATALYTIC CONVERTER

- 36. Disconnect the downstream oxygen sensor connector.
- 37. Disconnect exhaust system from manifold (1) .



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Fig. 19: Power Steering Fluid Pressure Hose
Courtesy of CHRYSLER LLC

- 38. **Non-Turbo equipped vehicles:** Disconnect power steering pressure hose (3) from steering gear (1) .

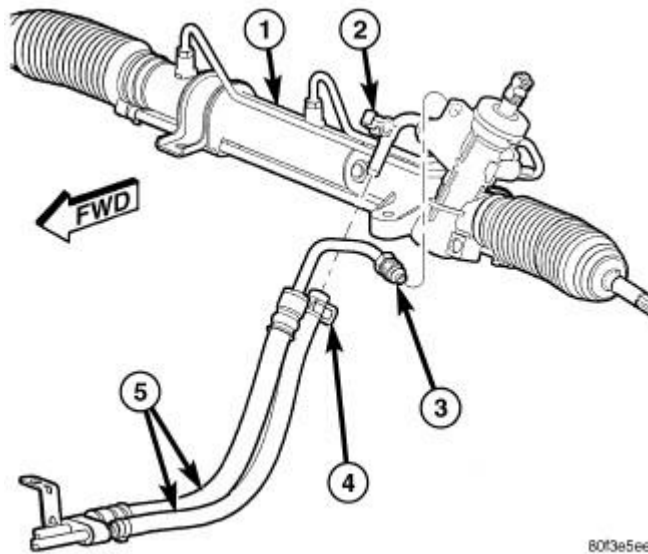


Fig. 20: Hoses At Power Steering Gear - 2.4L Turbo
Courtesy of CHRYSLER LLC

39. **Turbocharger equipped vehicles:** Disconnect both power steering hoses (3 AND 5) from steering gear (1) .

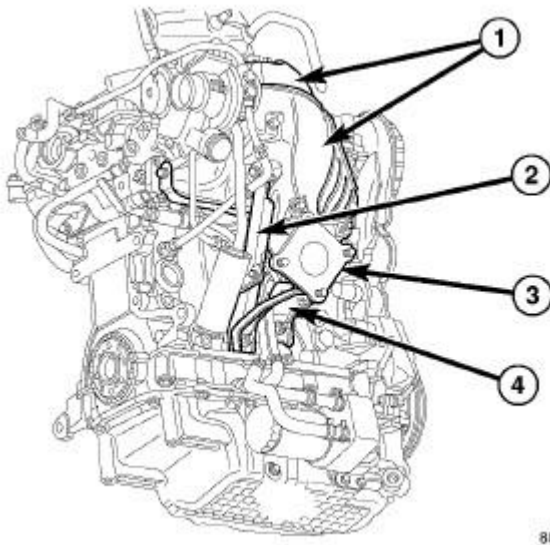


Fig. 21: Turbocharger Brackets and Heat Shields
Courtesy of CHRYSLER LLC

40. **Turbocharger equipped vehicles:** Remove upper and lower heat shields (1), elbow support bracket (4), turbocharger support bracket (2), and elbow (3) .
41. Remove structural collar. See **Engine/Engine Block/COVER, Structural Dust - Removal**.
42. **Automatic Transmission equipped vehicles:**

- a. Remove torque converter bolts and mark converter to flex plate orientation for reassembly.

43. **Manual Transmission equipped vehicles:**

- a. Remove drive plate to clutch module bolts and mark plate orientation for reassembly.

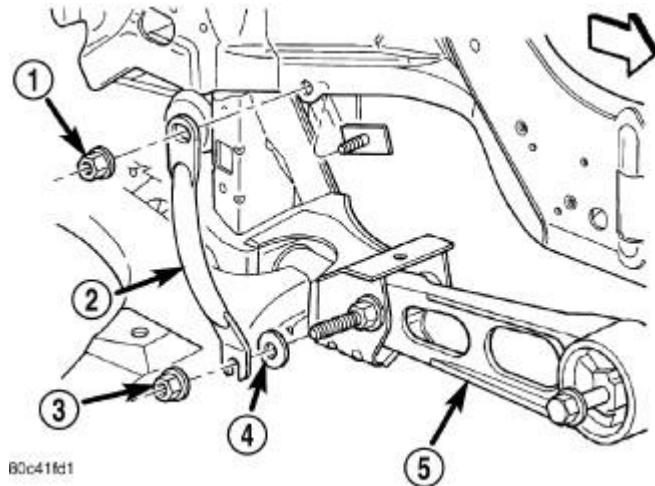


Fig. 22: Pencil Strut
Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT
- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

- 44. Remove lower engine torque strut (5). See **Engine/Engine Mounting/STRUT, Torque - Removal**.
- 45. Lower vehicle and remove A/C compressor.
- 46. Disconnect power steering lines from power steering pump.
- 47. Remove power steering pump.

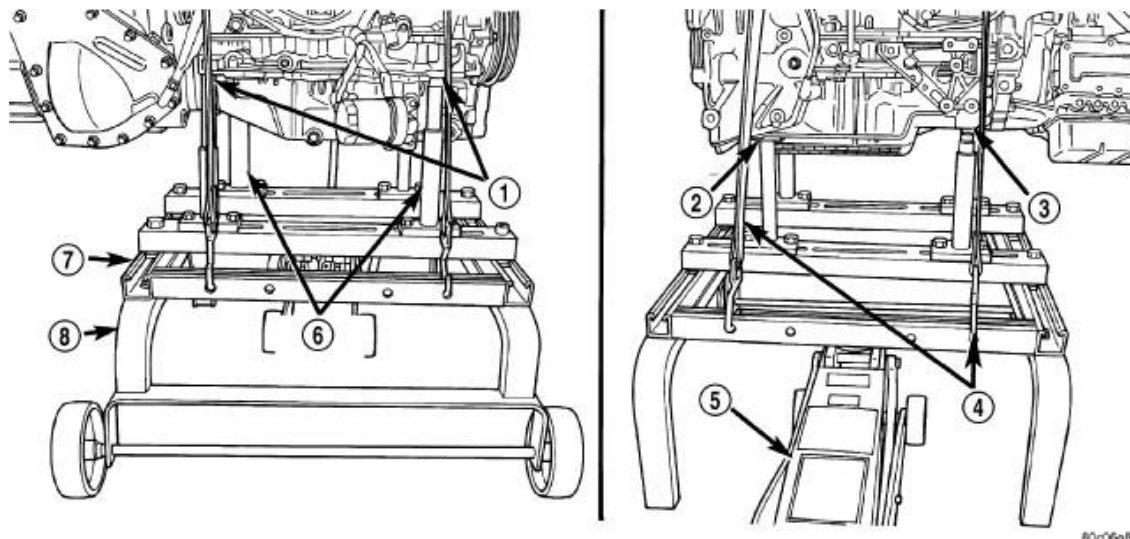


Fig. 23: Positioning Engine Cradle Support Post
Courtesy of CHRYSLER LLC

48. Raise vehicle enough to allow engine dolly (7), cradle (8), and posts (6), to be installed under vehicle. For Special Tool identification, see **Engine - Special Tools**.
49. Loosen engine support posts (6) to allow movement for positioning onto engine locating holes and flange on the engine bedplate. Lower vehicle and position cradle (8) until the engine is resting on support posts (6) . Tighten mounts to cradle (8) frame. This will keep support posts (6) from moving when removing or installing engine and transmission.
50. Install safety straps (4) around the engine to cradle (8) . Tighten safety straps (4) and lock them into position.

WARNING: Safety straps MUST be used.

51. Raise vehicle enough to determine if safety straps (4) are secure enough to hold cradle (8) assembly to engine.
52. Lower vehicle so weight of the engine and transmission ONLY is on the cradle (8) assembly.

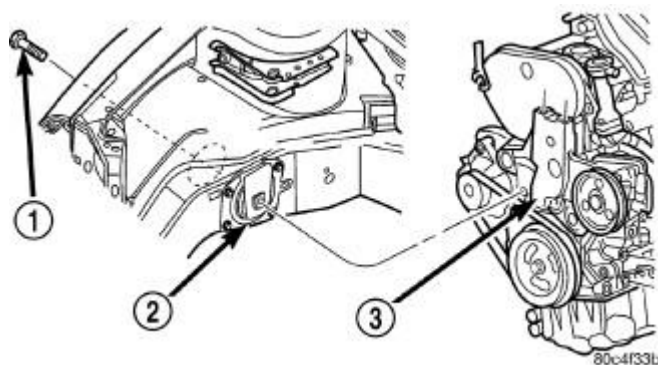


Fig. 24: Right Mount Through Bolt
Courtesy of CHRYSLER LLC

53. Remove the upper engine torque strut.
54. Remove right mount through bolt (1) .

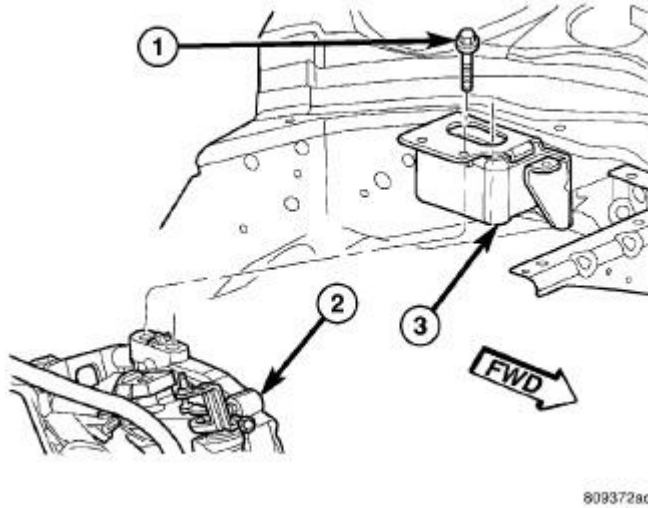


Fig. 25: Left Mount Bolts
Courtesy of CHRYSLER LLC

55. Remove left mount (3) attaching bolts .
56. Raise vehicle slowly until engine/transaxle assembly clears engine compartment. It may be necessary to move the engine/transmission assembly with the cradle to allow for removal around body flanges.

INSTALLATION

INSTALLATION

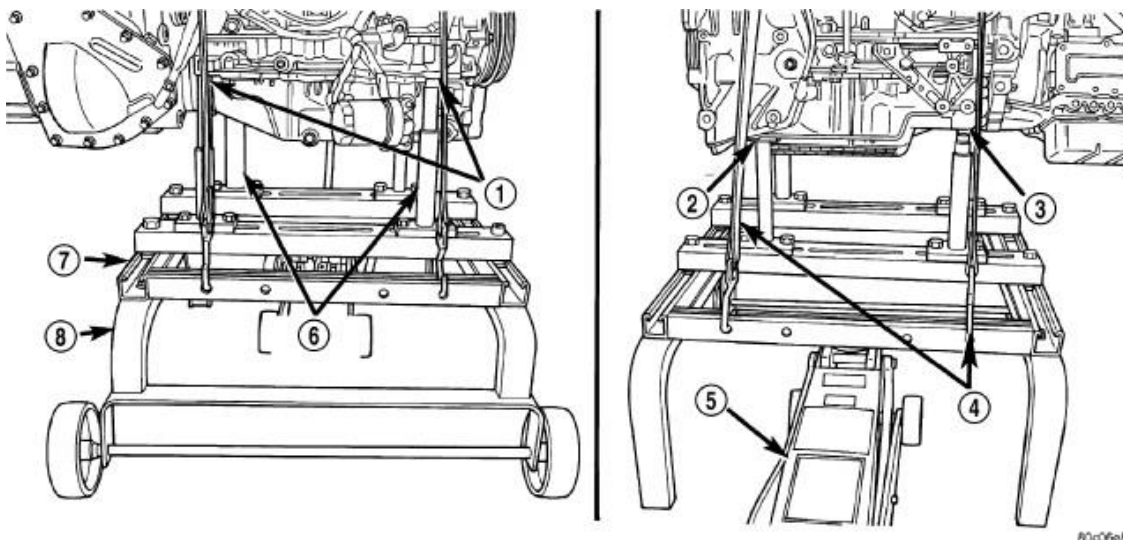


Fig. 26: Positioning Engine Cradle Support Post

Courtesy of CHRYSLER LLC

1. Position engine and transmission assembly under vehicle and slowly lower the vehicle over the engine/transaxle assembly.

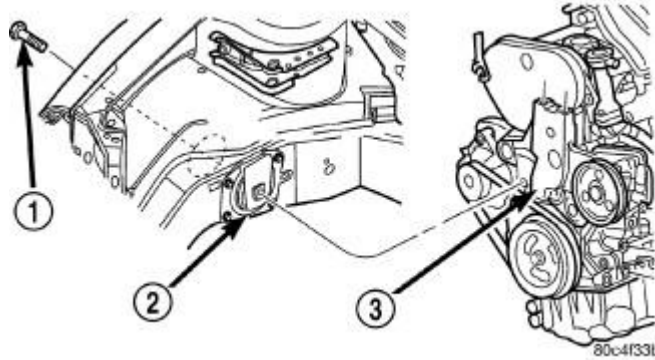


Fig. 27: Right Mount Through Bolt

Courtesy of CHRYSLER LLC

NOTE: To prevent possible damage to engine mount bracket (3) or mount (2), the through bolt (1) must be started by hand to prevent cross threading.

2. Continue lowering vehicle until engine/transaxle aligns to mounting locations. Install mounting bolts at the right engine mount. Tighten bolts (1) to 118 N.m (87 ft. lbs.).

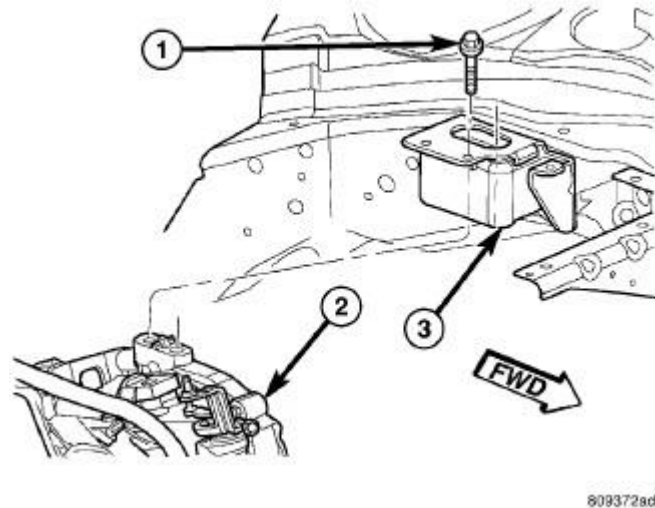


Fig. 28: Left Mount Bolts

Courtesy of CHRYSLER LLC

3. Install left transaxle mount (3). Tighten bolts (1) to 118 N.m (87 ft. lbs.).
4. Install upper engine torque strut.

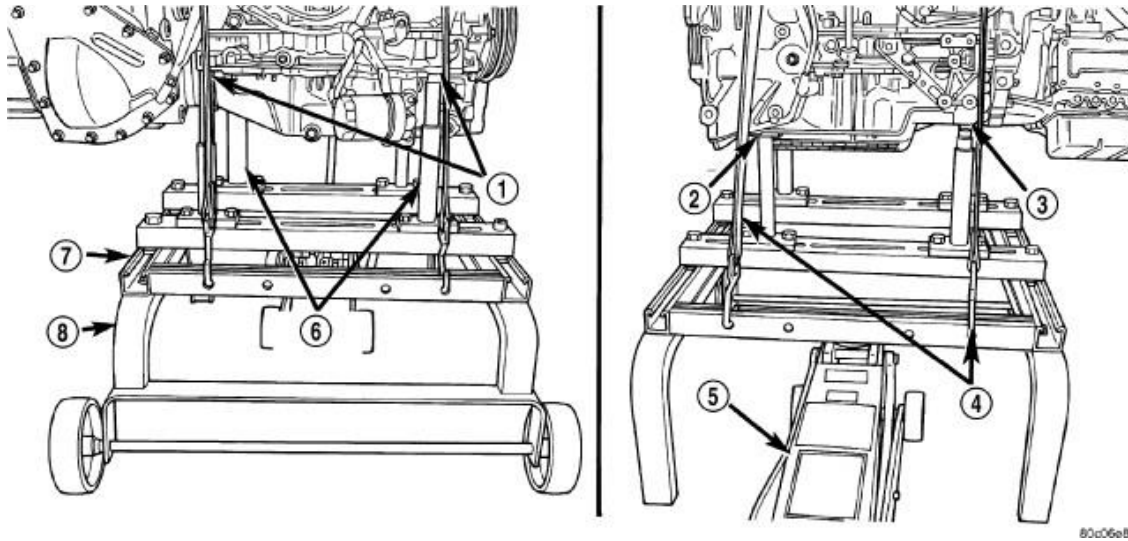


Fig. 29: Positioning Engine Cradle Support Post
Courtesy of CHRYSLER LLC

5. Remove safety straps (4) from engine/transaxle assembly. Slowly raise vehicle enough to remove the engine dolly 6135 (7) and cradle 6710A (8).

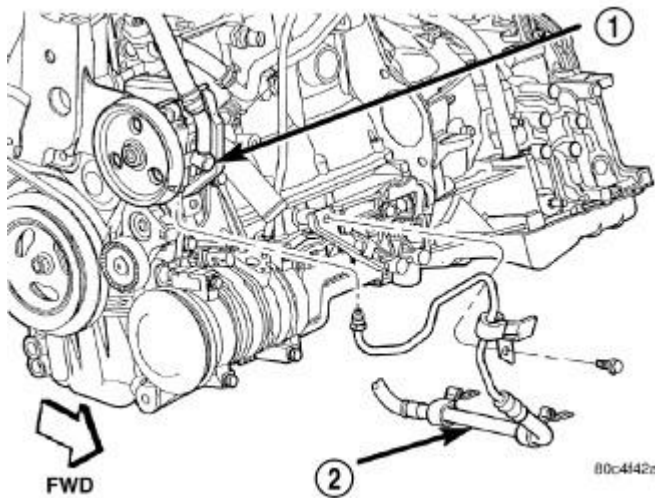


Fig. 30: Pressure Hose Connection To Pump
Courtesy of CHRYSLER LLC

6. Install power steering pump (1).
7. Connect power steering lines (2) to power steering pump (1).
8. Install A/C compressor.

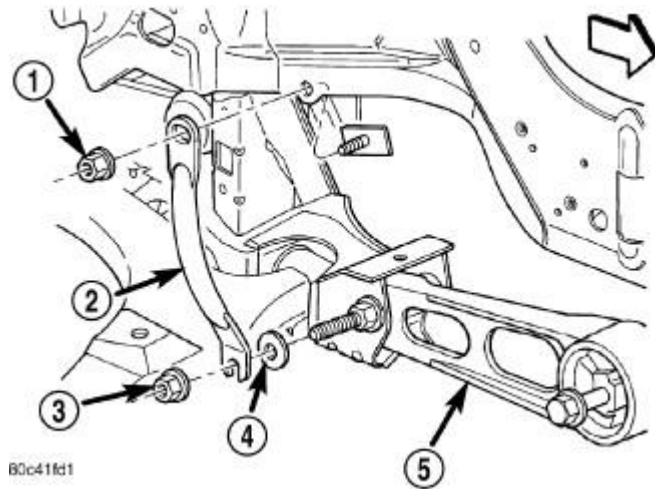


Fig. 31: Pencil Strut

Courtesy of CHRYSLER LLC

9. Install lower engine torque strut (5). See Engine/Engine Mounting/STRUT, Torque - Installation.
10. **Automatic Transmission equipped vehicles:**
 - a. Install torque converter bolts.
11. **Manual Transmission equipped vehicles:**
 - a. Install drive plate to clutch module bolts.

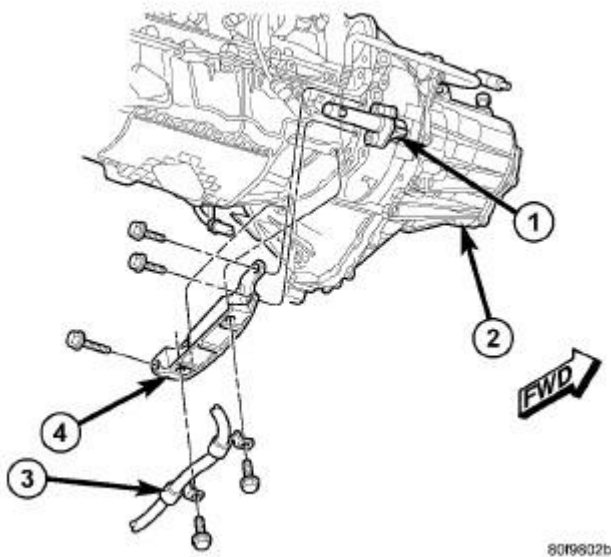


Fig. 32: Structural Collar and Bending Strut - (Manual Transaxle Equipped)

Courtesy of CHRYSLER LLC

12. Install structural collar (4). See Engine/Engine Block/COVER, Structural Dust - Installation.

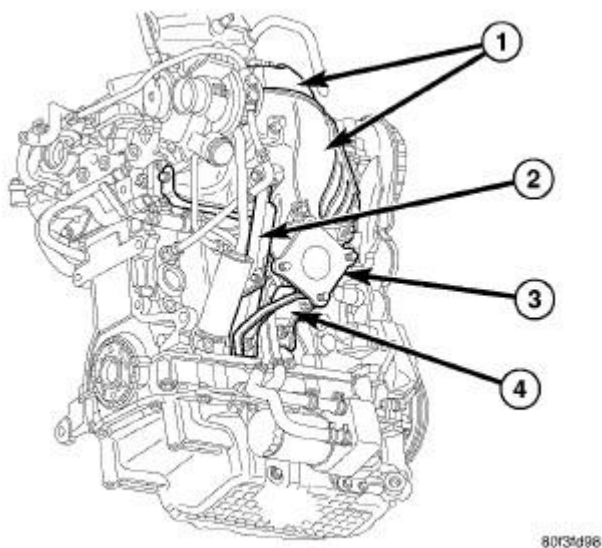


Fig. 33: Turbocharger Brackets and Heat Shields
Courtesy of CHRYSLER LLC

13. **Turbocharger equipped vehicles:** Install elbow (3), turbocharger support bracket (2), elbow support bracket (4), and upper and lower heat shields (1) .

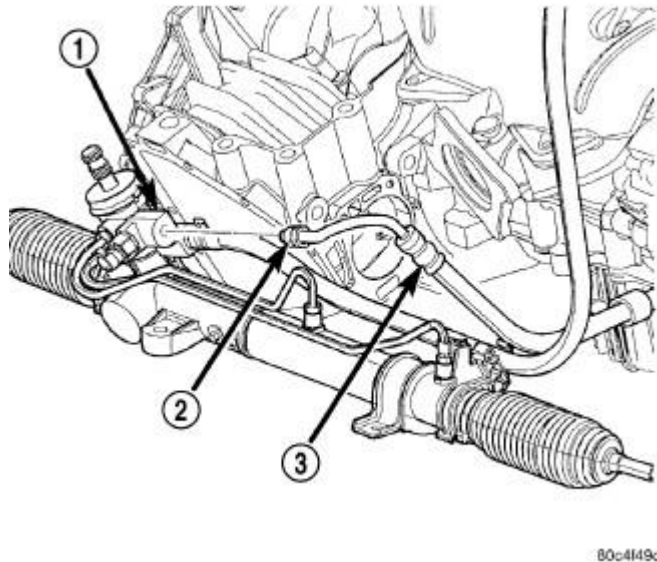


Fig. 34: Power Steering Fluid Pressure Hose
Courtesy of CHRYSLER LLC

14. **Non-Turbo equipped vehicles:** Connect power steering pressure hose (3) to steering gear (1) .

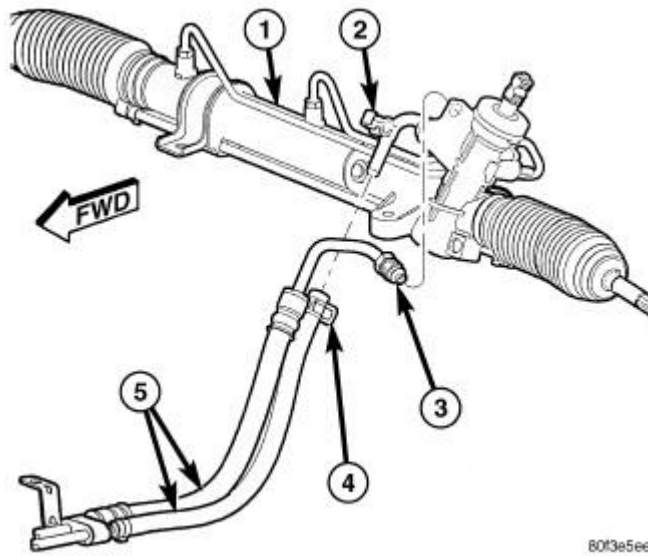


Fig. 35: Hoses At Power Steering Gear - 2.4L Turbo
Courtesy of CHRYSLER LLC

15. **Turbocharger equipped vehicles:** Connect both power steering hoses (5) to steering gear (1) .

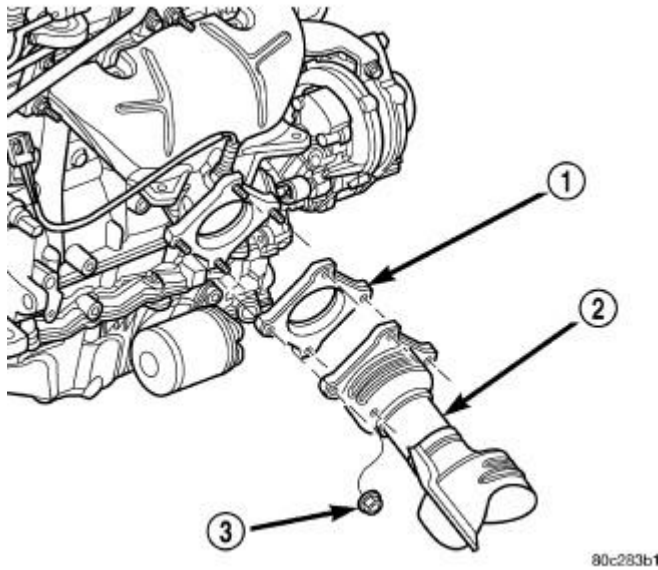


Fig. 36: Exhaust System To Manifold Connection
Courtesy of CHRYSLER LLC

16. Connect exhaust system (2) to manifold.
17. Connect the downstream oxygen sensor.

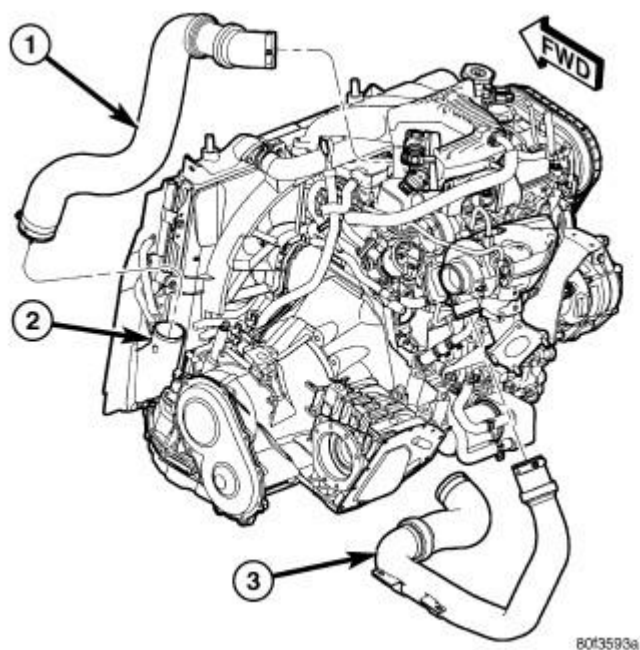
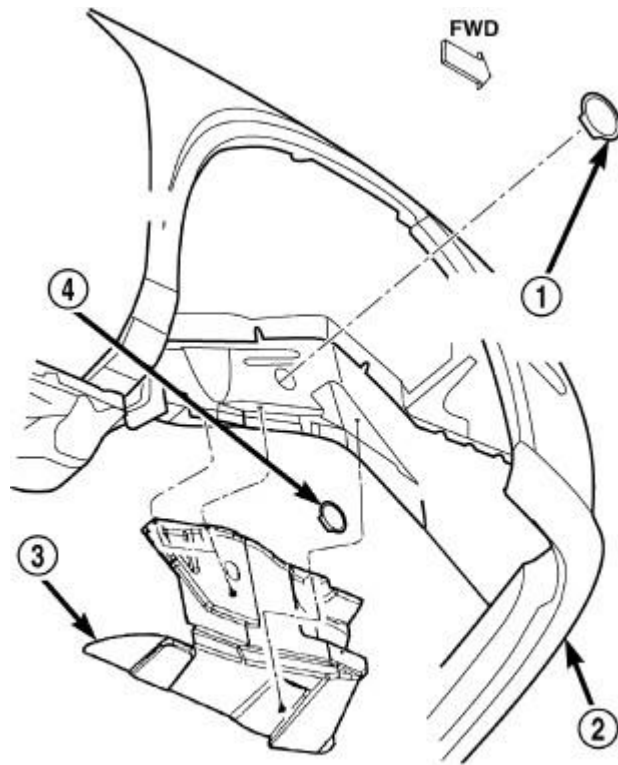


Fig. 37: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

18. **Turbocharger equipped vehicles:** Install charge air cooler to throttle body hose (1) .
19. Install charge air cooler to turbocharger hose (3) .
20. Install generator and mounting brackets.
21. Install accessory drive belts. Refer to **BELT, SERPENTINE** .



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Fig. 38: Splash Shield

Courtesy of CHRYSLER LLC

22. Install axle shafts. Refer to **Differential and Driveline/Half Shaft - Installation** .
23. Install right inner splash shield (3).
24. Install wheels and lower vehicle.
25. Install cooling module assembly (fan, radiator, A/C condenser, transmission oil cooler). Connect radiator fan electrical connector.
26. **Turbocharger equipped vehicles:** Connect power steering hoses to radiator.

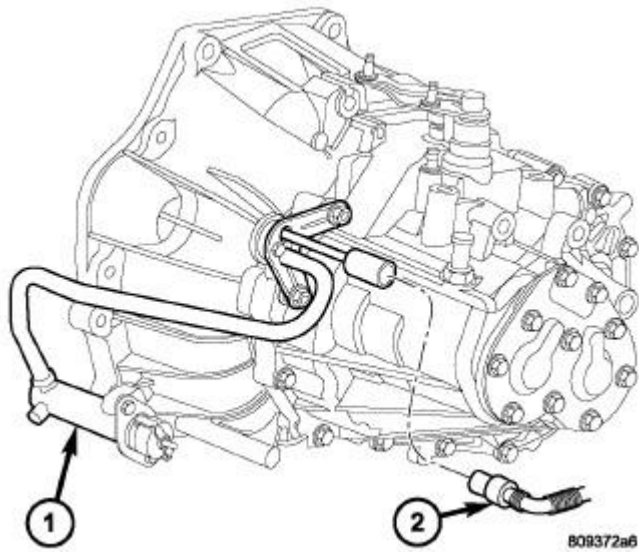


Fig. 39: Clutch Hydraulic Line to Slave Cylinder
Courtesy of CHRYSLER LLC

27. Manual Transmission equipped vehicles:

- a. Connect clutch hydraulic line (2) .
- b. Connect transmission shift linkage.
- c. Connect transmission electrical connectors.

NOTE: **It is not necessary to bleed the clutch hydraulic system. The quick-connect fittings close immediately after disconnection; allowing no fluid to escape.**

28. Automatic Transmission equipped vehicles:

- a. Connect transmission oil cooler lines using service splice kit. Refer to instructions provided with kit.
- b. Connect transmission electrical connectors.
- c. Connect transmission shift linkage.

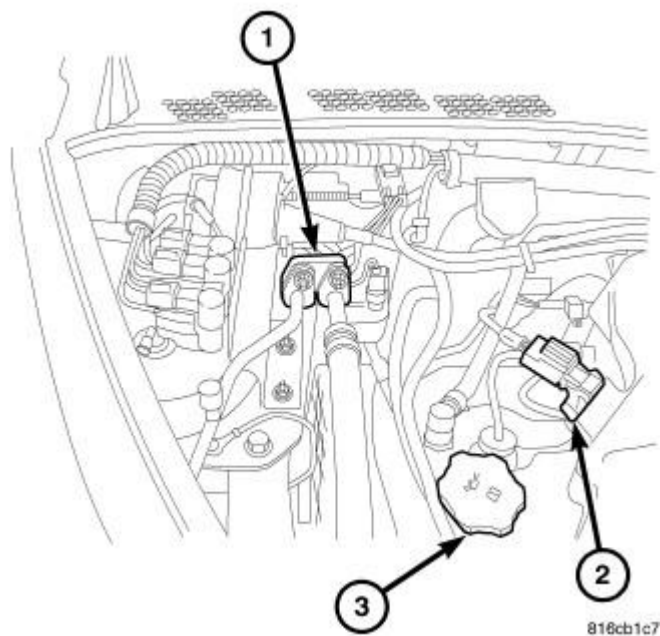


Fig. 40: A/C LINES

Courtesy of CHRYSLER LLC

29. Connect A/C lines (1) at junction near upper torque strut.
30. Connect upper A/C line to A/C condenser.
31. Install upper and lower radiator hoses.

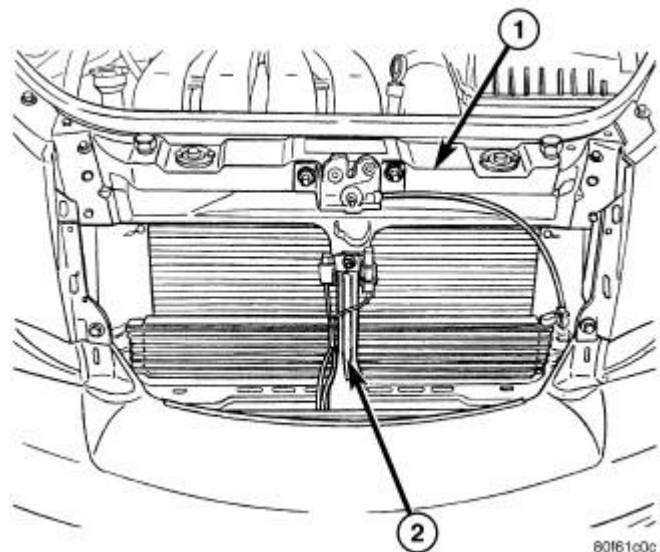
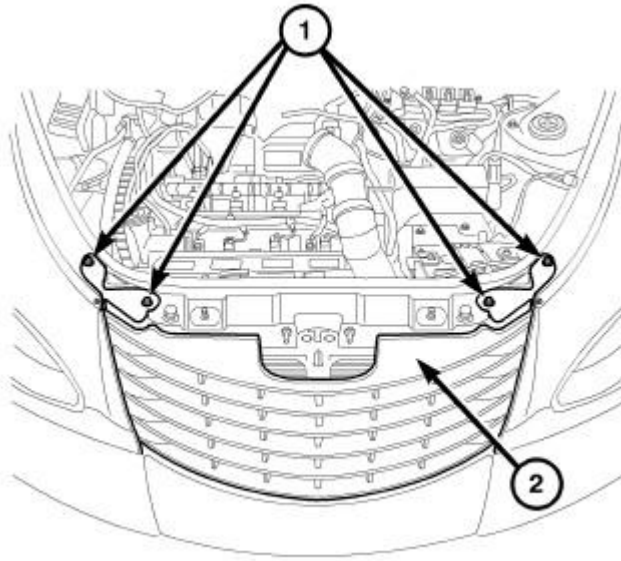


Fig. 41: Upper Radiator Closure Panel and Center Brace

Courtesy of CHRYSLER LLC

32. Install upper radiator closure panel (1) and center brace (2). Refer to **Body/Exterior/CROSSMEMBER, Radiator - Installation**.



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Fig. 42: GRILL REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

33. Install grille (2) and tighten grill retaining fasteners (1). Refer to **Body/Exterior/GRILLE - Installation** .
34. Connect fuel line and heater hoses.
35. Connect coolant reserve/recovery hose to coolant outlet connector.
36. Connect brake booster vacuum hose to intake manifold.
37. Connect the proportional purge hose to throttle body.

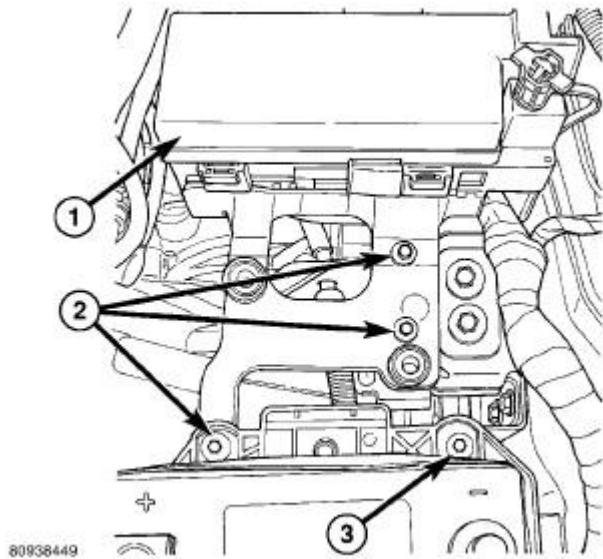


Fig. 43: TIPM Bracket Attaching Bolts
Courtesy of CHRYSLER LLC

38. Install all ground straps and connect engine wiring harness.
39. Position Totally Integrated Power Module (TIPM) (1) and install bolts. Connect positive battery cable to PDC (1) and ground wire to vehicle body.
40. Connect engine wiring harness at Powertrain Control Module (PCM).
41. Connect throttle and speed control cables.
42. Install battery tray and battery. Refer to **Electrical/Battery System/BATTERY - Installation**.
43. Connect cables to battery.

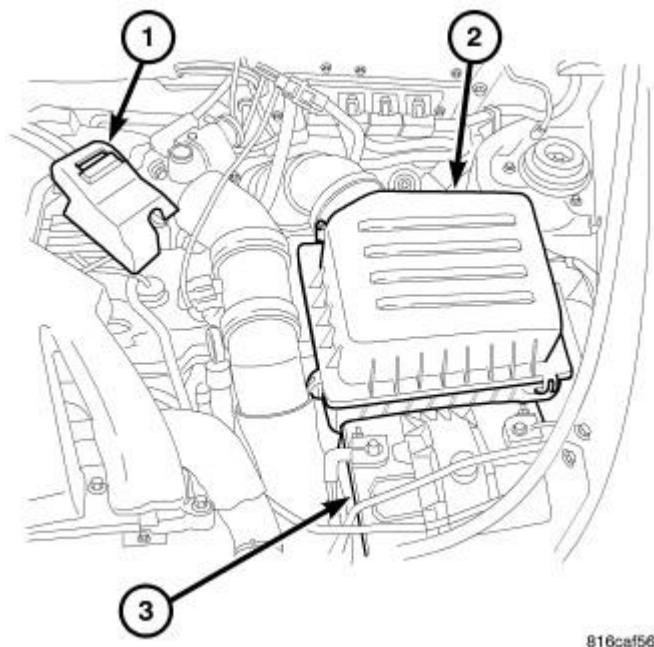


Fig. 44: AIR CLEANER
Courtesy of CHRYSLER LLC

44. Install air cleaner housing assembly and connect clean air hose. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
45. Install oil filter. Fill engine crankcase with proper oil to correct level.
46. Fill power steering system.
47. Fill cooling system. Refer to **STANDARD PROCEDURE**.
48. Evacuate and recharge A/C system. Refer to **STANDARD PROCEDURE**.
49. Start engine and run until operating temperature is reached. Check for leaks.
50. Perform torque strut adjustment procedure. See **Engine/Engine Mounting/STRUT, Torque - Adjustments**.
51. Adjust transmission linkage, if necessary.

SPECIFICATIONS

SPECIFICATIONS

2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, DOHC	
Number of Cylinders	4	
Firing Order	1-3-4-2	
Compression Ratio	-	
Non-Turbo	9.5:1	
Turbo	8.1:1	
Max. Variation Between Cylinders	25%	
Displacement	2.4 Liters	148 cu. in.
Bore	87.5 mm	3.445 in.
Stroke	101.0 mm	3.976 in.
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	87.4924-87.5076 mm	3.4446-3.4452 in.
Out-of-Round (Max.)	0.051 mm	0.002 in.
Taper (Max.)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter	-	-
Non-Turbo	87.456-87.474 mm	3.4431-3.4439 in.
Turbo	87.436-87.454 mm	3.4424-3.4431 in.
Clearance @ 24.6 mm (0.551 in.) from bottom of skirt (Non-Turbo)	0.018-0.0516 mm	0.0007-0.0020 in.
Clearance @ 22 mm (0.866 in.) from bottom of skirt (Turbo)	0.046-0.064 mm	0.0018-0.0025 in.
Weight		
Non-Turbo	345-355 grams	12.17-12.52 oz.
Turbo	331-339 grams	11.67-11.95 oz.
Land Clearance (Diametrical)	-	-
Non-Turbo	0.563-0.621 mm	0.022-0.024 in.
Turbo	0.556-0.674 mm	0.021-0.027 in.
Piston Length	-	-
Non-Turbo	66.25 mm	2.608 in.
Turbo	61.43 mm	2.419 in.
Piston Ring Groove Depth No. 1	-	-

2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

	Non-Turbo	3.946-4.045 mm	0.155-0.159 in.
	Turbo	3.713-3.882 mm	0.146-0.153 in.
Piston Ring Groove Depth No. 2		-	-
	Non-Turbo	4.555-4.680 mm	0.179-0.184 in.
	Turbo	4.118-4.297 mm	0.162-0.169 in.
Piston Ring Groove Depth No. 3		-	-
	Non-Turbo	4.108-4.220 mm	0.162-0.166 in.
	Turbo	2.818-2.967 mm	0.110-0.116 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap-Top Compression Ring	-	-
Non-Turbo	0.25-0.51 mm	0.0098-0.020 in.
Turbo	0.20-0.40 mm	0.0078-0.0157 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-2nd Compression Ring	-	-
Non-Turbo	0.23-0.48 mm	0.009-0.018 in.
Turbo	0.20-0.40 mm	0.007-0.015 in.
Wear Limit	0.8 mm	0.031 in.
Ring Gap-Oil Control Steel Rails	-	-
Non-Turbo	0.25-0.64 mm	0.009-0.025 in.
Turbo	0.15-0.66 mm	0.005-0.025 in.
Wear Limit	1.0 mm	0.039 in.
Ring Side Clearance-Compression Rings	-	-
Non-Turbo	0.030-0.080 mm	0.0011-0.0031 in.
Turbo	0.035-0.085 mm	0.001-0.003 in.
Wear Limit	0.10 mm	0.004 in.
Ring Side Clearance-Oil Ring Pack	-	-
Non-Turbo	0.012-0.178 mm	0.0004-0.0070 in.
Turbo	0.027-0.176 mm	0.001-0.006 in.
Ring Width-Compression Rings		
Non-Turbo	1.47-1.50 mm	0.057-0.059 in.
Turbo Top Ring	1.17-1.19 mm	0.0460-0.0468 in.
Turbo 2nd Ring	1.472-1.49 mm	0.057-0.058 in.
Ring Width-Oil Ring Pack	-	-
Non-Turbo	2.72-2.88 mm	0.107-0.1133 in.
Turbo	2.64-2.89 mm	0.103-0.113 in.

CONNECTING ROD

DESCRIPTION	SPECIFICATION
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2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

	Metric	Standard
Bearing Clearance	0.025-0.071 mm	0.0009-0.0027 in.
Wear Limit	0.075 mm	0.003 in.
Bore Diameter-Piston Pin	-	-
Non-Turbo	20.96-20.98 mm	0.8252-0.8260 in.
Turbo	22.007-22.015 mm	0.8664-0.8667 in.
Bore Diameter-Crankshaft End	-	-
Non-Turbo	52.993-53.007 mm	2.0863-2.0868 in.
Turbo	52.992-53.008 mm	2.0862-2.0869 in.
Side Clearance	0.13-0.38 mm	0.005-0.015 in.
Wear Limit	0.40 mm	0.016 in.
Weight-Total (Less Bearing)	-	-
Non-Turbo	565.8 grams	19.96 oz.
Turbo	663.5 grams	23.4 oz.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	49.984 - 50.000 mm	1.968 - 1.9685 in.
Main Bearing Journal Diameter	59.992 - 60.008 mm	2.362 - 2.3625 in.
Journal Out-of-Round (Max.)	0.0035 mm	0.0003 in.
Journal Taper (Max.)	0.007 mm	0.0001 in.
End Play	0.09 - 0.24 mm	0.0035 - 0.0094 in.
Wear Limit	0.38 mm	0.015 in.
Main Bearing Diametrical Clearance	0.018 - 0.062 mm	0.0007 - 0.0024 in.

HYDRAULIC LASH ADJUSTER

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	15.901 - 15.913 mm	0.626 - 0.6264 in.
Plunger Travel Minimum (Dry)	3.0 mm	0.118 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journals No. 1 - 6	26.020 - 26.041 mm	1.024 - 1.025 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	

2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

	Metric	Standard
Journal Diameter No. 1-6	25.976 - 25.995 mm	1.022 - 1.023 in.
Bearing Clearance - Diametrical	0.025 - 0.065 mm	0.0009 - 0.0025 in.
End Play	0.05 - 0.17 mm	0.0019 - 0.0066 in.
Lift (Zero Lash)	-	
Intake	8.25 mm	(0.324 in.)
Exhaust	6.60 mm	(0.259 mm)
Intake Valve Timing*	-	
Closes (ABDC)		44.3°
Opens (ATDC)		6.2°
Duration		218°
Exhaust Valve Timing*	-	
Closes (ATDC)		0.8°
Opens (BBDC)		39.9°
Duration		220.7°
Valve Overlap		5.4°
* All reading in crankshaft degrees at 0.5 mm (0.019 in.) valve lift.		

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Gasket Thickness (Compressed)	0.71 mm	0.028 in.

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Angle	44.5 - 45°	
Seat Diameter - Intake	34.37 - 34.63 mm	1.353 - 1.363 in.
Seat Diameter - Exhaust	27.06 - 27.32 mm	1.065 - 1.075 in.
Runout (Max.)	0.05 mm	0.002 in.
Valve Seat Width - Intake and Exhaust	0.9 - 1.3 mm	0.035 - 0.051 in.
Service Limit - Intake	2.0 mm	0.079 in.
Service Limit - Exhaust	2.5 mm	0.098 in.

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter I.D.	5.975 - 6.000 mm	0.235 - 0.236 in.
Guide Bore Diameter	11.0 - 11.02 mm	0.4330 - 0.4338 in.

2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

Guide Height (spring seat to guide tip)	13.25 - 13.75 mm	0.521 - 0.541 in.
---	------------------	-------------------

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle - Intake and Exhaust	44.5 - 45°	
Head Diameter - Intake	34.67 - 34.93 mm	1.364 - 1.375 in.)
Head Diameter - Exhaust	28.32 - 28.52 mm	1.114 - 1.122 in.
Valve Length (Overall)	-	-
Intake	112.76 - 113.32 mm	4.439 - 4.461 in.
Exhaust	110.89 - 111.69 mm	4.365 - 4.397 in.
Valve Stem Diameter	-	-
Intake	5.934 - 5.952 mm	0.2337 - 0.2344 in.
Exhaust	5.906 - 5.924 mm	0.2326 - 0.2333 in.

VALVE MARGIN

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	1.2 - 1.7 mm	0.047 - 0.066 in.
Service Limit	0.95 mm	(.0037 in.)
Exhaust	0.985 - 1.315 mm	0.038 - 0.051 in.
Service Limit	1.05 mm	.039 in.

VALVE STEM TIP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	48.04 mm	1.891 in.
Exhaust	47.99 mm	1.889 in.

VALVE STEM TO GUIDE CLEARANCE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Intake	0.048 - 0.066 mm	0.0018 - 0.0025 in.
Max. Allowable	0.076 mm	0.003 in.
Service Limit	0.25 mm	0.010 in.
Exhaust	0.0736 - 0.094 mm	0.0029 - 0.0037 in.
Max. Allowable	0.101 mm	0.004 in.
Service Limit	0.25 mm	0.010 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	

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-	Metric	Standard
Free Length (Approx.)	49.34 mm	1.943 in.
Nominal Force (Valve Closed)	311 N ±16.6 @ 38.0 mm	70 lbs. @ 1.496 in.
Nominal Force (Valve Open)	596 N ± 30.7 N@ 29.25 mm	134 lbs. @ 1.152 in.
Installed Height	38.00 mm	1.496 in.
Number of Coils	7.8	
Wire Diameter	3.61 mm	0.142 in

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Over Rotors (Max.)	0.10 mm	0.004 in.
Cover Out-of-Flat (Max.)	0.025 mm	0.001 in.
Inner Rotor Thickness (Min.)	10.699 mm	0.421 in.
Outer Rotor Thickness (Min.)	10.699 mm	0.421 in.
Outer Rotor Clearance (Max.)	0.039 mm	0.015 in.
Outer Rotor Diameter (Min.)	85.924 mm	3.383 in.
Tip Clearance Between Rotors (Max.)	0.20 mm	0.008 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed*	25 kPa	4 psi
At 3000 RPM	170 - 550 kPa	25 - 80 psi
CAUTION: *If pressure is ZERO at curb idle, DO NOT run engine at 3000 RPM.		

TORQUE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Balance Shaft Carrier to Block-Bolts	54	40	-
Balance Shaft Gear Cover-Double Ended Fastener	12	-	105
Balance Shaft Sprocket-Bolt	28	-	250
Balance Shaft Chain Tensioner-Bolts	12	-	105
Balance Shaft Carrier Cover-Bolts	12	-	105
Camshaft Bearing Caps	12	-	105
Camshaft Sprocket-Bolt	115	85	-
Connecting Rod Cap-Bolts	27 +1/4 turn	20 +1/4 turn	-
	Crankshaft Main Bearing	-	-

2010 Chrysler PT Cruiser

2010 ENGINE 2.4L DOHC - Service Information - PT Cruiser

	Cap/Bedplate		
-M8 Bolts	28	-	250
-M11 Bolts	75	55	-
Crankshaft Damper-Bolt	136	100	-
Cylinder Head-Bolts	Refer to Procedure. See <u>Engine/Cylinder Head - Installation</u>		
Cylinder Head Cover-Bolts	12	-	105
Flex Plate to Crankshaft-Bolts	95	70	-
Engine Mount Through bolt-Right	118	87	-
Engine Support Bracket-Bolts	61	45	-
Exhaust Manifold-Bolts	23	-	200
Exhaust Manifold Heat Shield-Bolts	12	-	105
Exhaust Pipe to Manifold-Bolts	28	20	248
Intake Manifold Upper-Bolts	12	-	105
Intake Manifold Lower-Bolts	12	-	105
Intake Manifold Upper-Bolts (Turbo)	Refer to <u>UPPER INTAKE MANIFOLD.</u>		
Intake Manifold Lower-Bolts (Turbo)	Refer to <u>LOWER INTAKE MANIFOLD.</u>		
Oil Cooler Connector Bolt (Turbo)	55	41	-
Oil Filter	14	10	-
Oil Filter Adapter-Bolts	12	-	105
Oil Jet Fastener (Turbo)	12	-	105
Oil Pan-Bolts	12	-	105
Oil Pan Drain-Plug	28	20	-
Oil Pump to Block-Bolts	28	20	-
Oil Pump Cover Plate-Screws	13	-	118
Oil Pump Pick-up Tube-Bolt	23	-	200
PCV Valve	8	-	70
Spark Plugs	18	13	-
Timing Belt Cover-Front Upper and Lower-Bolts	6	-	50
Timing Belt Cover-Rear	-	-	-
-M6 Bolts	12	-	105
-M8 Bolts	28	-	250
Timing Belt Idler Pulley	61	45	-
Timing Belt Tensioner Lock Bolt	25	-	220
Timing Belt Tensioner Assembly-Bolts	61	45	-

SPECIAL TOOLS

SPECIAL TOOLS

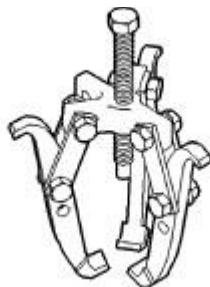


Fig. 45: Puller 1026

Courtesy of CHRYSLER LLC

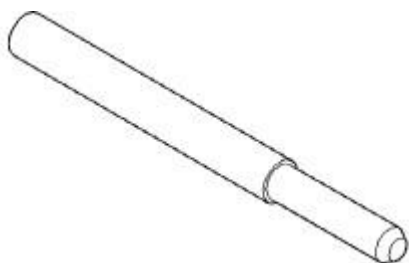


Fig. 46: Crankshaft Damper Removal Insert 6827A

Courtesy of CHRYSLER LLC

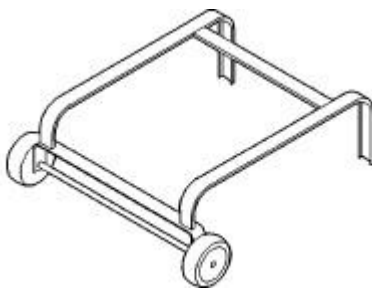


Fig. 47: Dolly 6135

Courtesy of CHRYSLER LLC

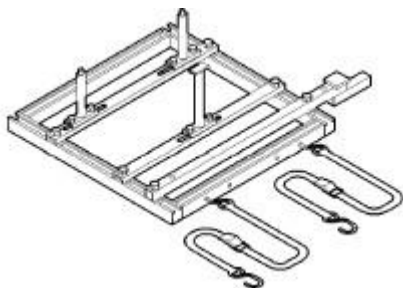


Fig. 48: Cradle 6710

Courtesy of CHRYSLER LLC

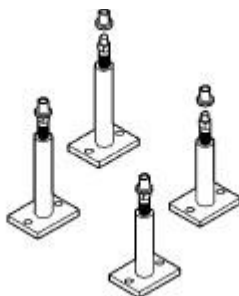


Fig. 49: Post Kit Engine Cradle 6848
Courtesy of CHRYSLER LLC

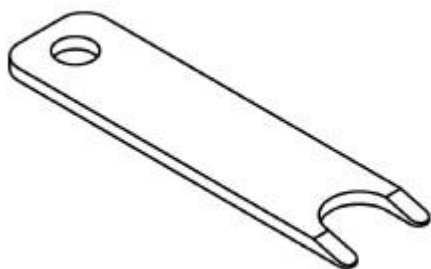


Fig. 50: Clutch Line Disconnect 6638A
Courtesy of CHRYSLER LLC

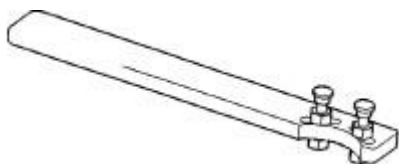


Fig. 51: Camshaft Sprocket Holder 6847
Courtesy of CHRYSLER LLC

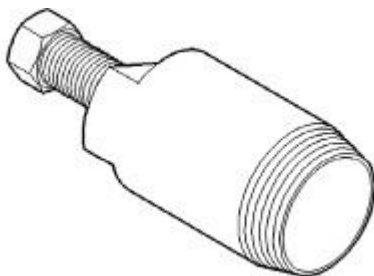


Fig. 52: Camshaft Seal Remover C-4679-A
Courtesy of CHRYSLER LLC

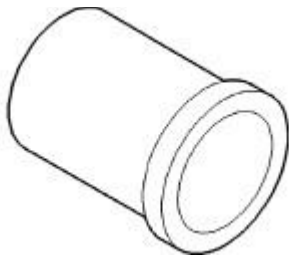


Fig. 53: Camshaft Seal Installer MD-998306
Courtesy of CHRYSLER LLC

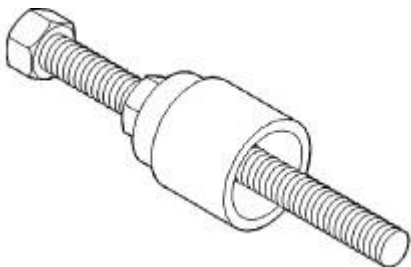


Fig. 54: Crankshaft Damper/Sprocket Installer 6792
Courtesy of CHRYSLER LLC

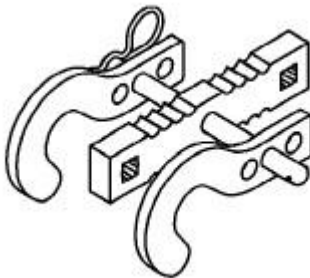


Fig. 55: Valve Spring Compressor 8215-A
Courtesy of CHRYSLER LLC

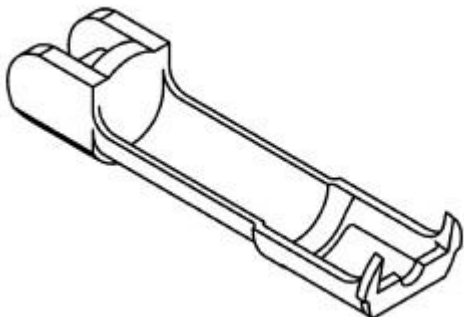


Fig. 56: Adaptor 8436
Courtesy of CHRYSLER LLC

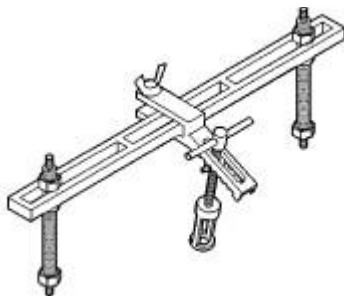


Fig. 57: Valve Spring Compressor MD-998772-A
Courtesy of CHRYSLER LLC

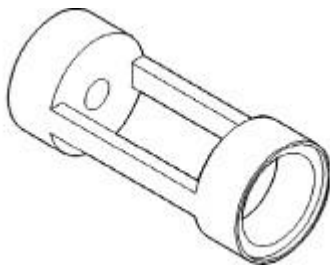


Fig. 58: Valve Spring Compressor Adapter 6779
Courtesy of CHRYSLER LLC

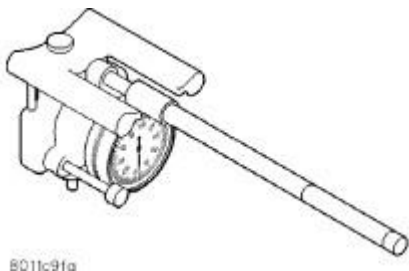


Fig. 59: Cylinder Bore Gage C-119
Courtesy of CHRYSLER LLC

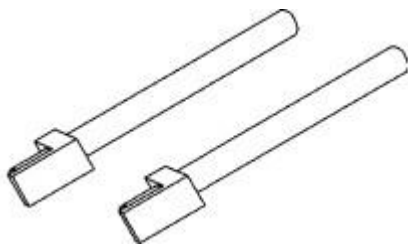


Fig. 60: Connecting Rod Guides 8189
Courtesy of CHRYSLER LLC

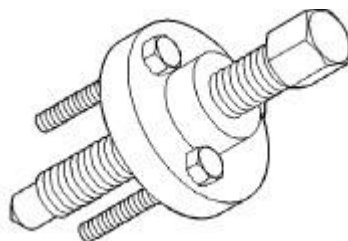


Fig. 61: Crankshaft Sprocket Remover 6793
Courtesy of CHRYSLER LLC

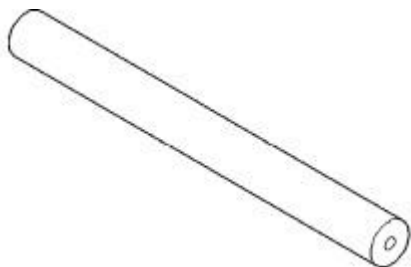
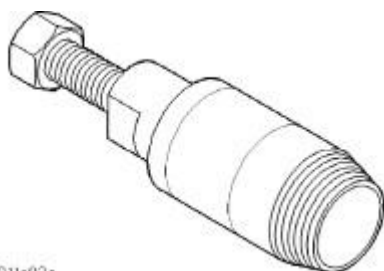


Fig. 62: Crankshaft Sprocket Remover Insert C-4685-C2
Courtesy of CHRYSLER LLC



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Fig. 63: Crankshaft Front Seal Remover 6771
Courtesy of CHRYSLER LLC

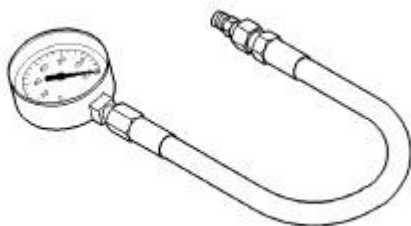


Fig. 64: Oil Pressure Gage C-3292
Courtesy of CHRYSLER LLC



Fig. 65: Adaptor 8406
Courtesy of CHRYSLER LLC

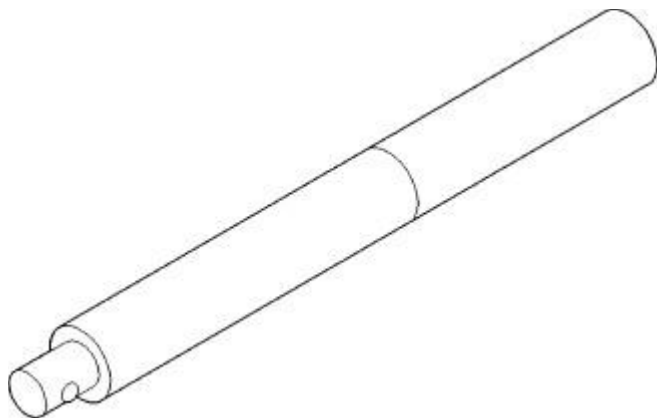


Fig. 66: Driver Handle C-4171
Courtesy of CHRYSLER LLC

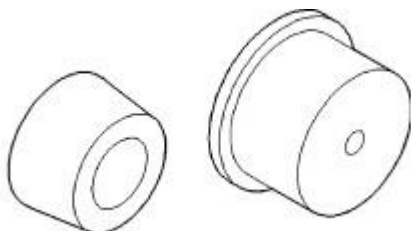


Fig. 67: Rear Crankshaft Seal Guide and Installer 6926-1 and 6926-2
Courtesy of CHRYSLER LLC

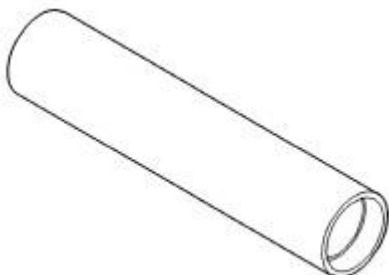


Fig. 68: Balance Shaft Sprocket Installer 6052
Courtesy of CHRYSLER LLC

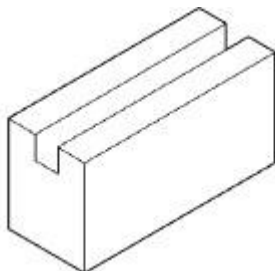


Fig. 69: Post Adapter 8130
Courtesy of CHRYSLER LLC

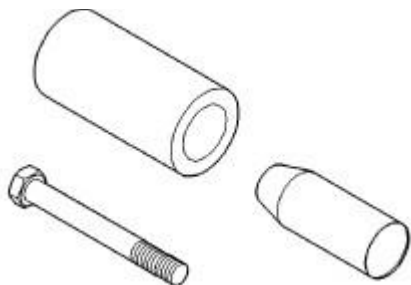


Fig. 70: Front Crankshaft Oil Seal Installer 6780
Courtesy of CHRYSLER LLC

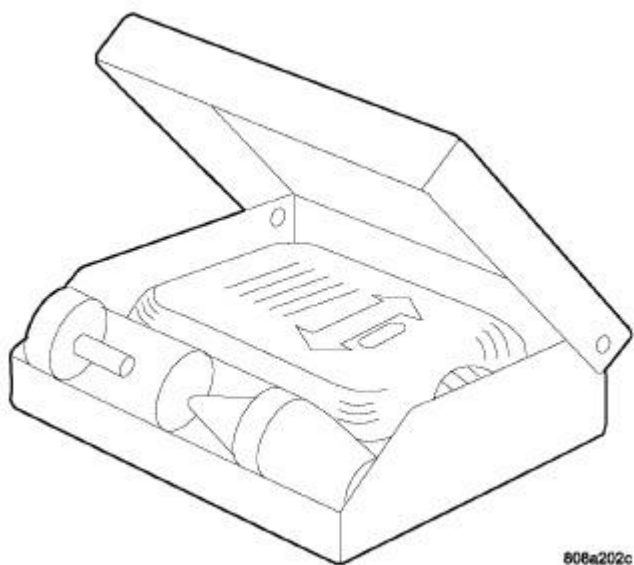


Fig. 71: Combustion Leak Tester C-3685-A
Courtesy of CHRYSLER LLC

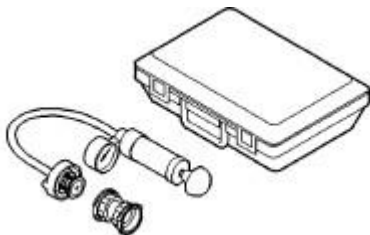


Fig. 72: Cooling System Tester 7700
Courtesy of CHRYSLER LLC

AIR INTAKE SYSTEM

AIR CLEANER

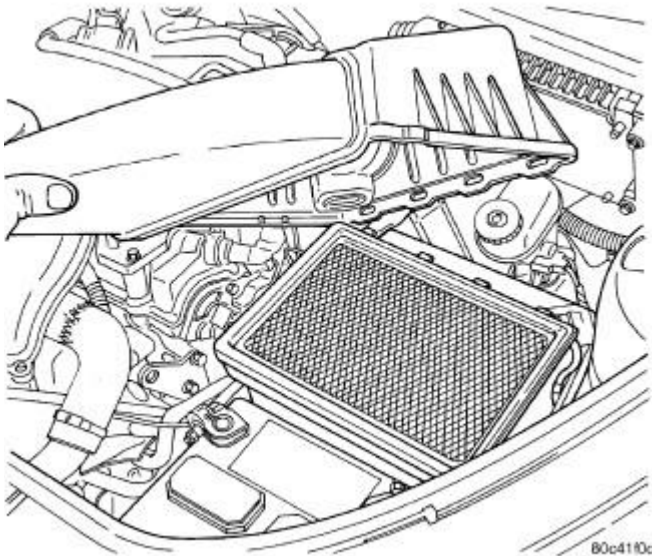
Removal**REMOVAL**

Fig. 73: Air Cleaner Cover
Courtesy of CHRYSLER LLC

NOTE: It is normal for turbo charger equipped vehicles to have a small amount of oil accumulation in the air cleaner housing. The amount depends on driving style.

1. Unfasten clasps on sides of air cleaner housing cover. Lift cover off air cleaner housing .
2. Remove filter element.

NOTE: On vehicles equipped with a turbo charger, the make-up-air filter should be replaced when replacing air filter element.

3. On turbo charger equipped vehicles remove the make-up-air filter element.
4. If necessary, clean the inside of the air cleaner housing.

Installation**INSTALLATION**

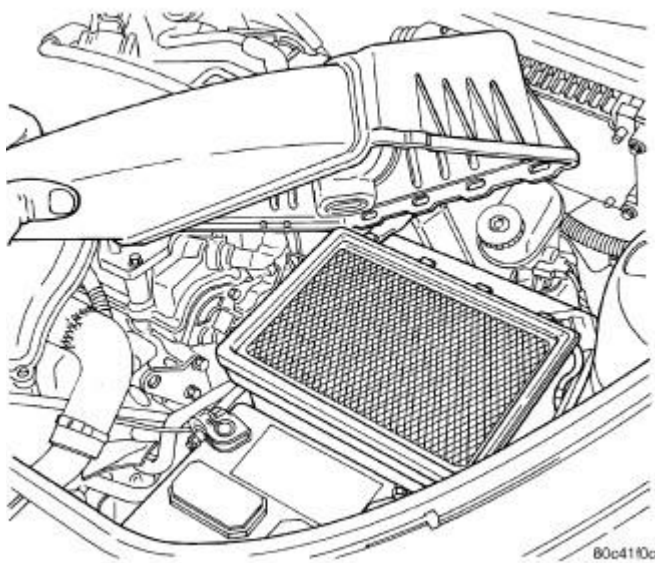


Fig. 74: Air Cleaner Cover
Courtesy of CHRYSLER LLC

1. Install new filter element.

NOTE: On vehicles equipped with a turbo charger, the make-up-air filter should be replaced when replacing air filter element.

2. Install new make-up-air filter.
3. Place cover over air cleaner housing. Snap clasps in place.

BODY, AIR CLEANER

Removal

REMOVAL

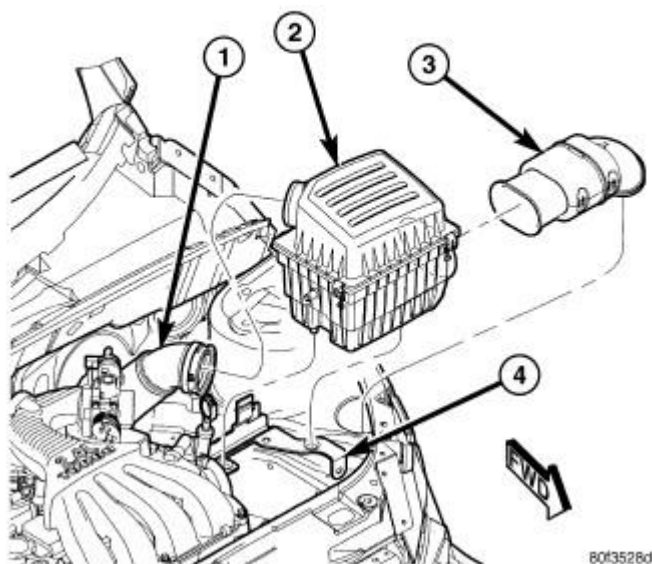


Fig. 75: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - CLEAN AIR HOSE
2 - AIR CLEANER HOUSING
3 - FRESH AIR INLET DUCT
4 - PDC MOUNTING BRACKET |
|---|

1. Disconnect the throttle body air inlet hose/clean air hose (1) from the air cleaner housing (2) .
2. Pull air cleaner housing (2) straight up to remove.
3. Remove the inlet duct (3) from the air cleaner housing (2) .

Installation

INSTALLATION

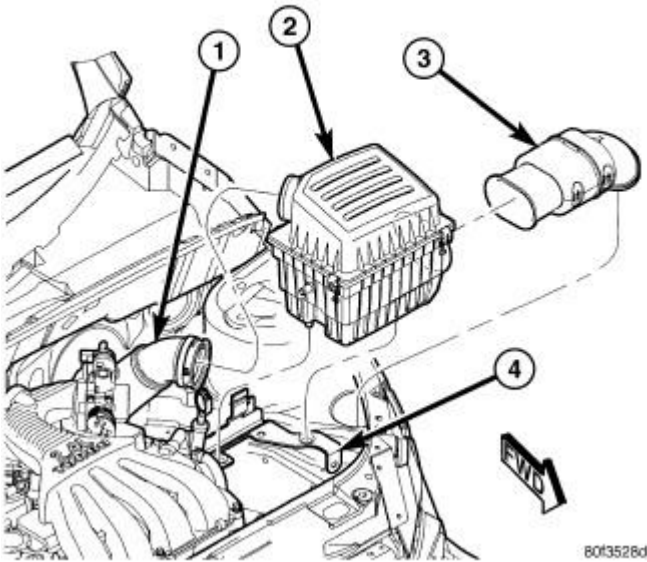


Fig. 76: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CLEAN AIR HOSE
2 - AIR CLEANER HOUSING
3 - FRESH AIR INLET DUCT
4 - TIPM MOUNTING BRACKET |
|--|

1. Install inlet duct (3) to the air cleaner housing (2).
2. Make sure the rubber grommets, for the air cleaner housing lower pins, are in place when reinstalling the air cleaner housing (2). The rubber grommets mount to the Totally Integrated Power Module (TIPM) bracket (4).
3. Push air cleaner housing (2) down while aligning pins into the grommets.
4. Connect the throttle body air inlet hose/clean (1) air hose to the air cleaner housing (2).

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

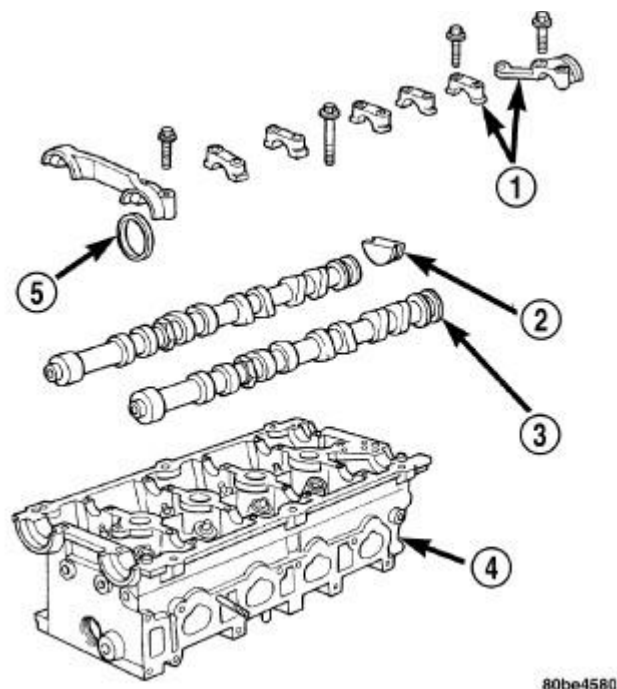


Fig. 77: Cylinder Head and Camshafts
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT BEARING CAPS
- 2 - PLUG
- 3 - CAMSHAFT
- 4 - CYLINDER HEAD
- 5 - CAMSHAFT OIL SEAL

The cross flow designed, aluminum cylinder head contains dual overhead camshafts with four valves per cylinder . The valves are arranged in two in-line banks. The intake valves face toward the front of the vehicle. The exhaust valves face the dash panel. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Integral oil galleries provide lubrication passages to the hydraulic lash adjusters, camshafts, and valve mechanisms.

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.

REMOVAL

REMOVAL

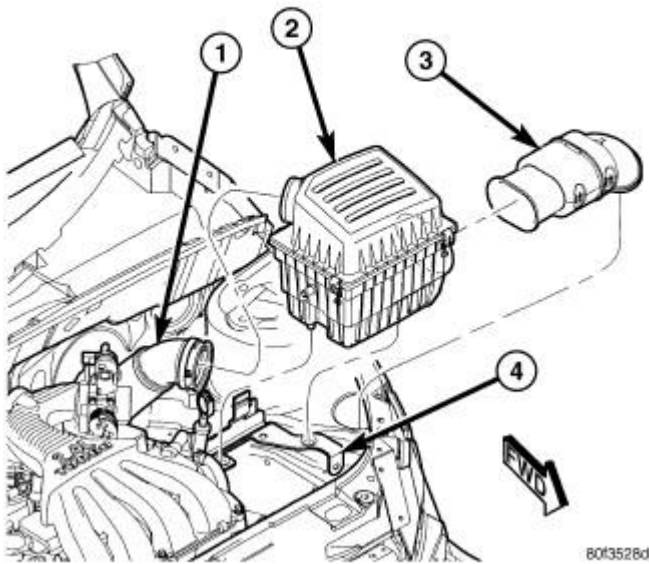
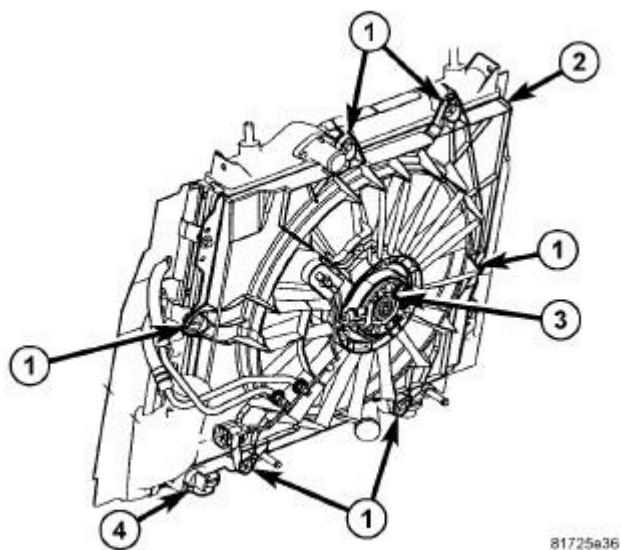


Fig. 78: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|---|
| <ul style="list-style-type: none">1 - CLEAN AIR HOSE2 - AIR CLEANER HOUSING3 - FRESH AIR INLET DUCT4 - TIPM MOUNTING BRACKET |
|---|

1. Perform fuel system pressure release procedure **before attempting any repairs**. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Remove clean air hose (1) and air cleaner housing (2). See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
3. Disconnect negative cable from battery.



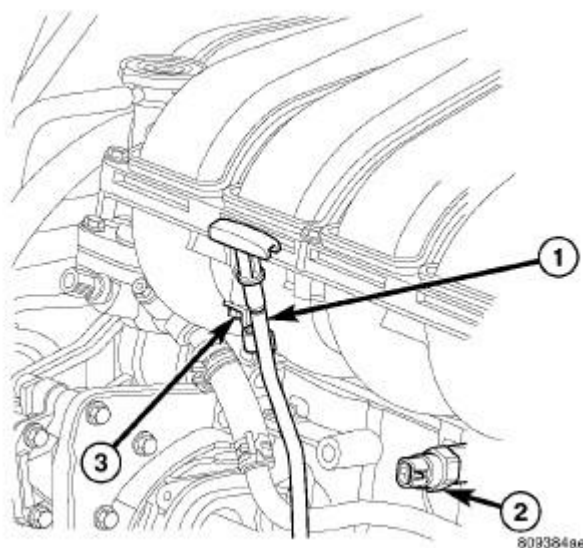
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Fig. 79: FAN - RADIATOR MOUNTING

Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - MOUNTING FASTENERS
 2 - COOLING FAN ASSEMBLY
 3 - COOLING FAN MOTOR
 4 - DRAIN COCK</p> |
|--|

4. Open drain cock (4) to drain cooling system into a clean container.
5. Remove upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.



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Fig. 80: Dipstick Tube

Courtesy of CHRYSLER LLC

6. Remove fastener (3) attaching dipstick tube (1) to lower intake manifold .

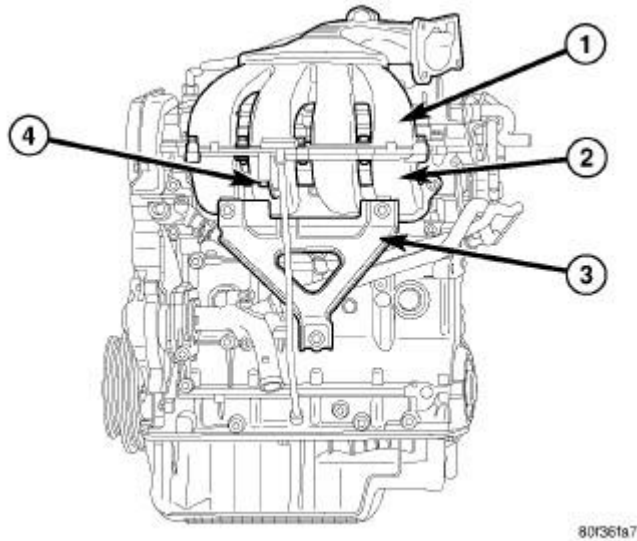


Fig. 81: Lower Intake Manifold Support Bracket - 2.4L Turbo
 Courtesy of CHRYSLER LLC

7. **Turbocharger equipped vehicles:** Remove lower intake manifold support bracket (3) .
8. Disconnect the fuel supply line quick-connect at the fuel rail assembly. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure** .
9. Remove heater tube support bracket from cylinder head.
10. Remove upper radiator hose. Disconnect heater hoses from thermostat housing.
11. Disconnect engine coolant temperature sensor connector.
12. Remove accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .

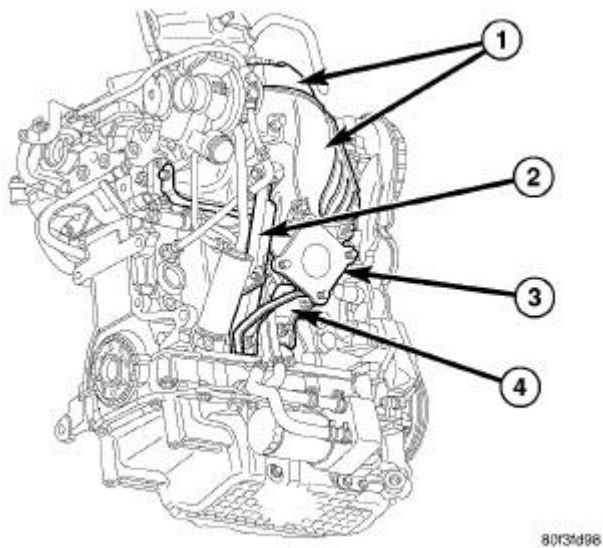


Fig. 82: Turbocharger Brackets and Heat Shields
Courtesy of CHRYSLER LLC

13. Raise vehicle on a suitable hoist.
14. Disconnect exhaust pipe from manifold.
15. **Turbocharger equipped vehicles:**
 - Remove turbocharger heat shields (1)
 - Remove elbow support bracket (4)
 - Remove turbocharger support bracket (2)
 - Remove elbow (3)

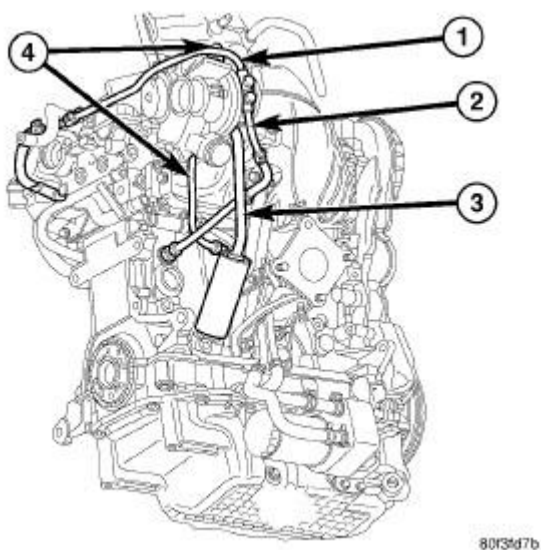


Fig. 83: Turbocharger Lines and Hoses

Courtesy of CHRYSLER LLC

16. **Turbocharger equipped vehicles:** . See Engine/Turbocharger System/LINES and HOSES, Turbocharger - Removal .
- Remove oil return tube (4)
 - Remove oil supply line (1)
 - Remove coolant supply line (3)
 - Remove coolant return line (2)
17. Disconnect ignition coil wiring connector. Remove ignition coil and plug wires from engine.
18. Disconnect camshaft position sensor wiring connector.
19. Remove timing belt and camshaft sprockets. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal.
20. Remove timing belt idler pulley and rear timing belt cover. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.

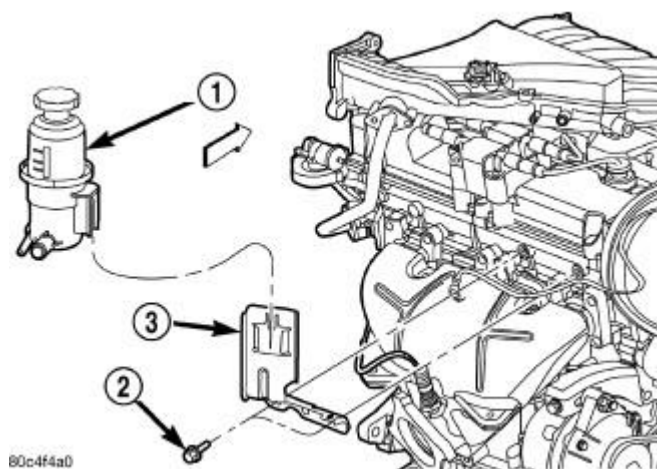


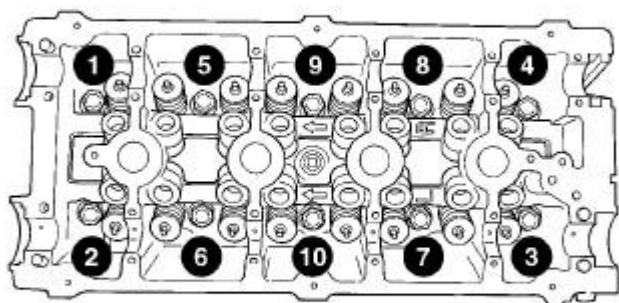
Fig. 84: Power Steering Fluid Reservoir and Bracket
Courtesy of CHRYSLER LLC

1 - POWER STEERING RESERVOIR 2 - BOLT 3 - BRACKET
--

21. **Non-Turbo equipped vehicles:** Remove fasteners (2) securing power steering pump fluid reservoir (1) and bracket (3) to cylinder head.
22. Remove cylinder head cover. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
23. Remove camshafts. See Engine/Cylinder Head/CAMSHAFT, Engine - Removal.

NOTE: Identify rocker arm location for reassembly prior to removal.

24. Remove rocker arms.



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Fig. 85: Cylinder Head Bolt Removal

Courtesy of CHRYSLER LLC

25. Remove cylinder head bolts in the reverse sequence of tightening .
26. Remove cylinder head from engine block.
27. Inspect and clean cylinder head and block sealing surfaces. Refer to CLEANING and INSPECTION for procedures.

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

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.

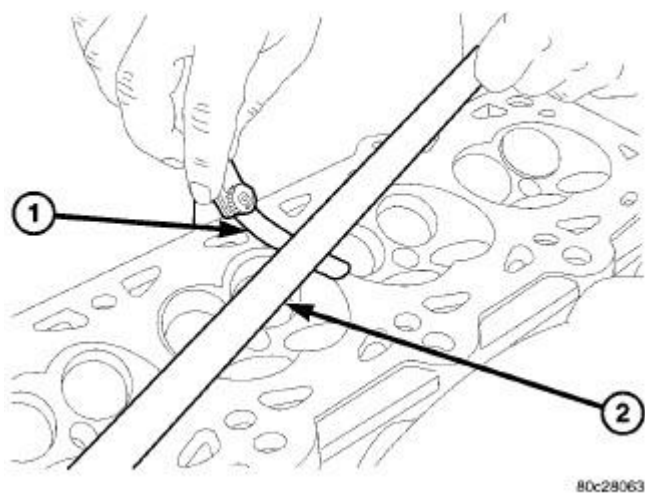
INSPECTION**INSPECTION**

Fig. 86: Checking Cylinder Head Flatness
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE
2 - STRAIGHT EDGE

1. Cylinder head must be flat within 0.1 mm (0.004 in.) .
2. Inspect camshaft bearing journals for scoring.

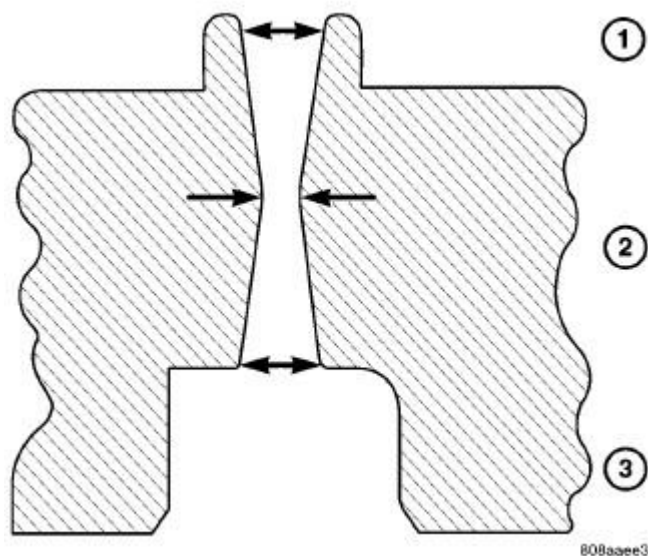
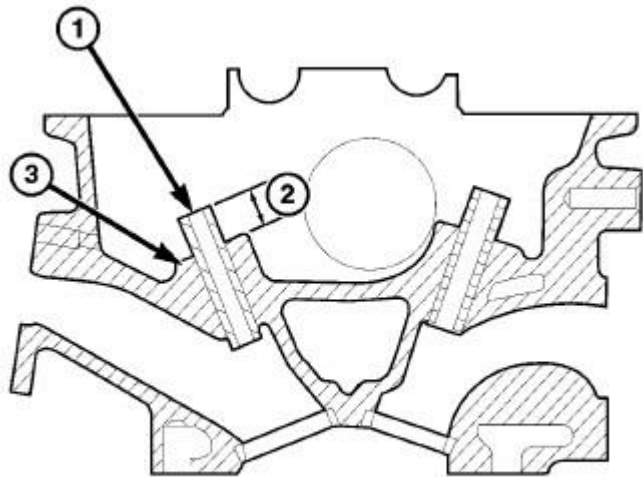


Fig. 87: Checking Wear on Valve Guide-Typical
Courtesy of CHRYSLER LLC

1 - TOP
2 - MIDDLE
3 - BOTTOM
4 - CUT AWAY VIEW OF VALVE GUIDE
MEASUREMENT LOCATIONS

3. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
4. Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom (1, 2, 3) . See Engine **SPECIFICATIONS**. Replace guides if they are not within specification.



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Fig. 88: Valve Guide Height
Courtesy of CHRYSLER LLC

1 - VALVE GUIDE
2 - 13.25 - 13.75 MM (0.521 - 0.541 IN.)
3 - SPRING SEAT

5. Check valve guide height (2) .

INSTALLATION

INSTALLATION

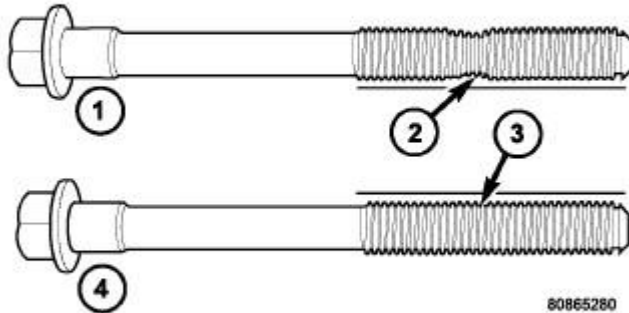


Fig. 89: Checking Bolts for Stretching (Necking)
Courtesy of CHRYSLER LLC

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

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

Necking (1) can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2) , the bolt should be replaced.

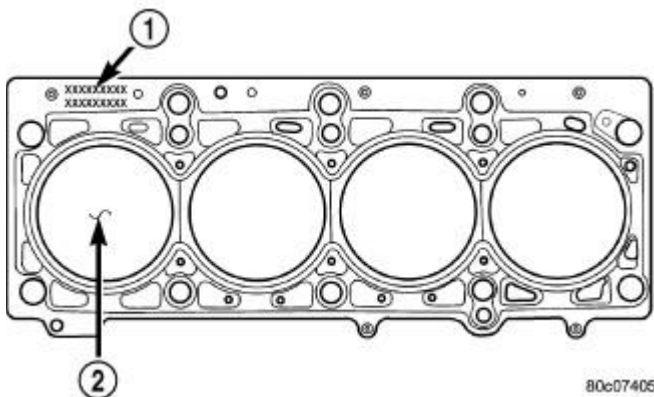


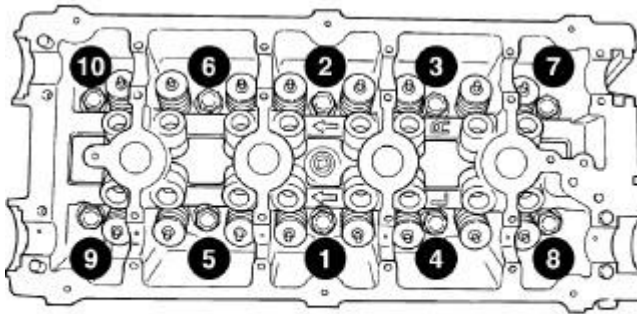
Fig. 90: Cylinder Head Gasket Positioning
Courtesy of CHRYSLER LLC

- 1 - PART NUMBER FACES UP

2 - NO. 1 CYLINDER

NOTE: **Cylinder head should be cleaned and inspected prior to replacement.**

1. Position the new cylinder head gasket on engine block with the part number (1) facing up . Ensure gasket is seated over the locating dowels in block.
2. Position cylinder head onto engine block.
3. Before installing the bolts, the threads should be lightly coated with engine oil.



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Fig. 91: Cylinder Head Tightening Sequence
Courtesy of CHRYSLER LLC

4. Tighten the cylinder head bolts in the sequence shown in illustration . Using the 4 step torque-turn method, tighten according to the following values:
 - First: All to 34 N.m (25 ft. lbs.)
 - Second: All to 82 N.m (60 ft. lbs.)
 - Third: All to 82 N.m (60 ft. lbs.)

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

- **Fourth: Turn all bolts an additional 1/4 Turn**

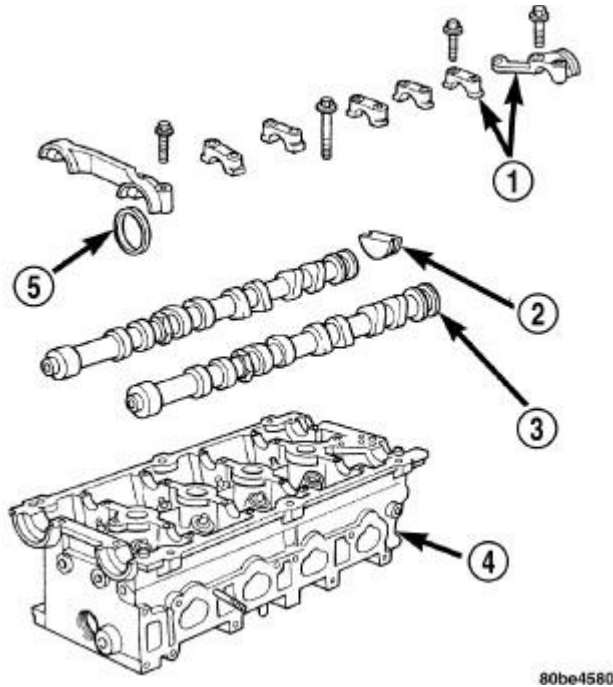


Fig. 92: Cylinder Head & Camshafts
Courtesy of CHRYSLER LLC

5. Install rocker arms
6. Install camshafts (3). See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation.**

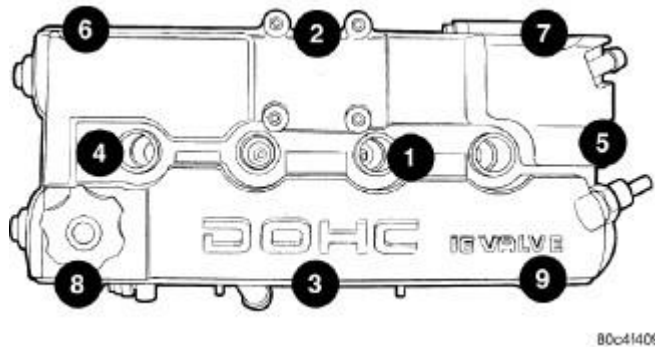


Fig. 93: Cylinder Head Cover Tightening Sequence (Typical Cover Shown)
Courtesy of CHRYSLER LLC

7. Install cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**

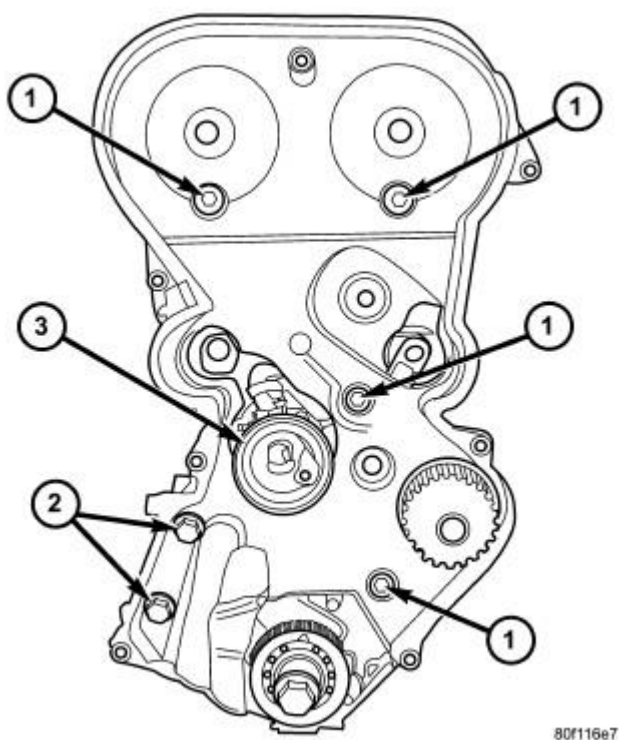


Fig. 94: Rear Timing Belt Cover Fasteners
Courtesy of CHRYSLER LLC

8. Install rear timing belt cover and tighten fasteners (1, 2). See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.
9. Install timing belt tensioner.
10. Install camshaft sprockets and timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation**.

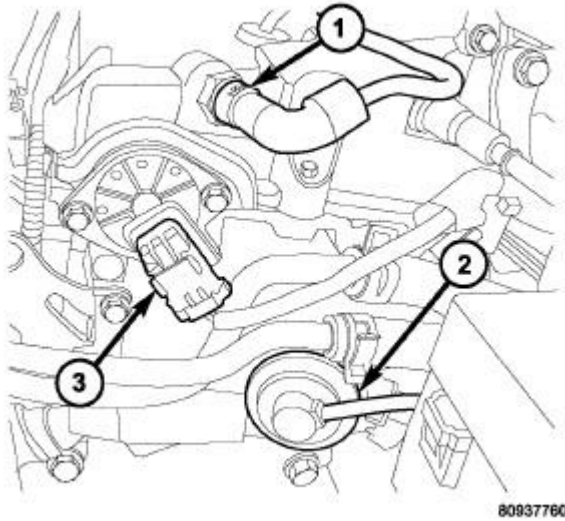


Fig. 95: Camshaft Position Sensor
Courtesy of CHRYSLER LLC

11. Connect cam sensor wiring connector (3).
12. Install ignition coil and plug wires. Connect ignition coil wiring connector.

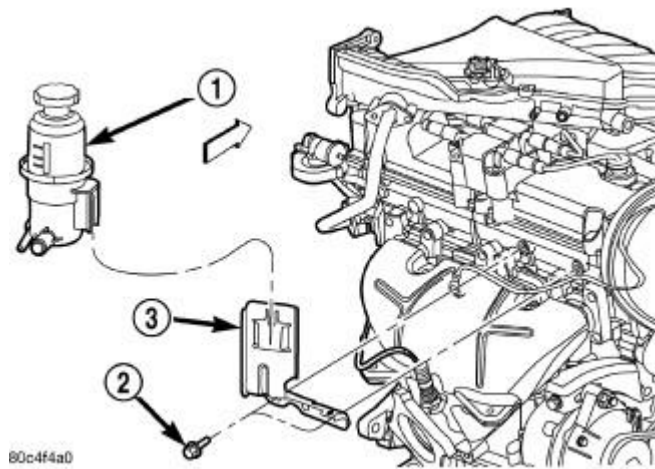


Fig. 96: Power Steering Fluid Reservoir and Bracket
Courtesy of CHRYSLER LLC

13. **Non-Turbo equipped vehicles:** Install power steering pump bracket (3) and reservoir (1) to cylinder head.

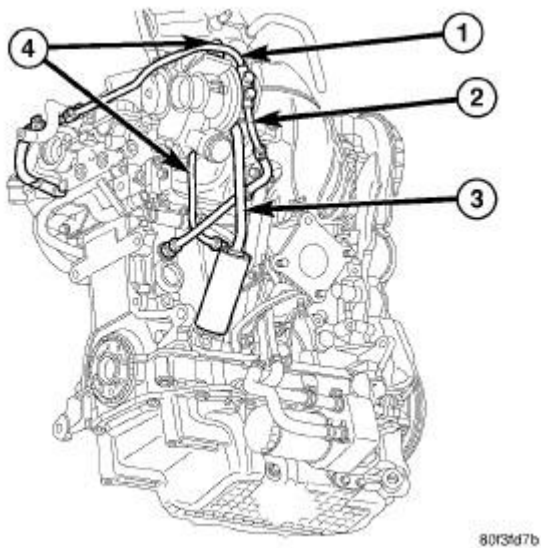


Fig. 97: Turbocharger Lines and Hoses
Courtesy of CHRYSLER LLC

14. **Turbocharger equipped vehicles:** . See **Engine/Turbocharger System/LINES and HOSES, Turbocharger - Installation** .

- Install coolant return line (2).
- Install coolant supply line (3).
- Install oil supply line (1).
- Install oil return tube (4).

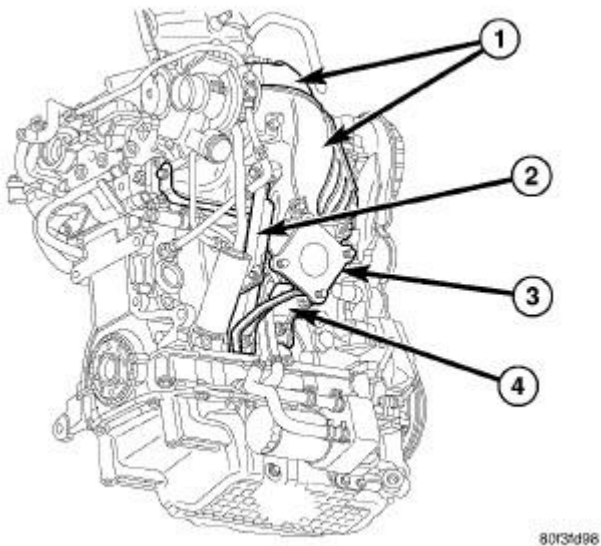


Fig. 98: Turbocharger Brackets and Heat Shields
Courtesy of CHRYSLER LLC

15. Turbocharger equipped vehicles:

- Install elbow (3)
- Install turbocharger support bracket (2).
- Install elbow support bracket (4).
- Install turbocharger heat shields (1).

16. Install exhaust pipe to manifold. Tighten fasteners to 28 N.m (20 ft. lbs.).

17. Install accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .

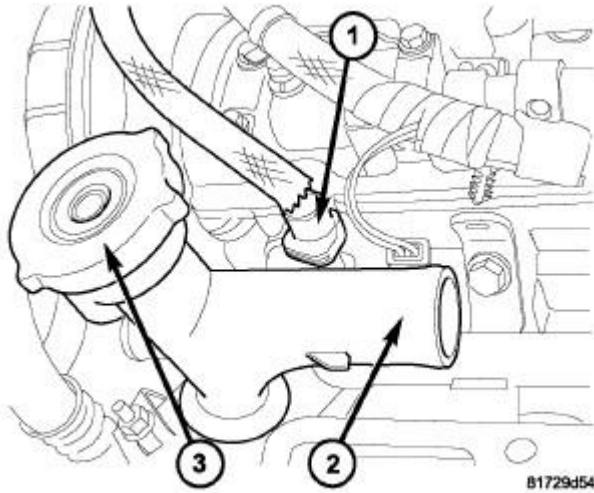


Fig. 99: Upper Radiator Hose To Coolant Outlet, Radiator Cap & ECT Sensor Connector
Courtesy of CHRYSLER LLC

18. Connect engine coolant temperature sensor connector.
19. Connect upper radiator hose to coolant outlet (2). Connect heater hoses to thermostat housing.
20. Install heater tube support bracket to cylinder head.

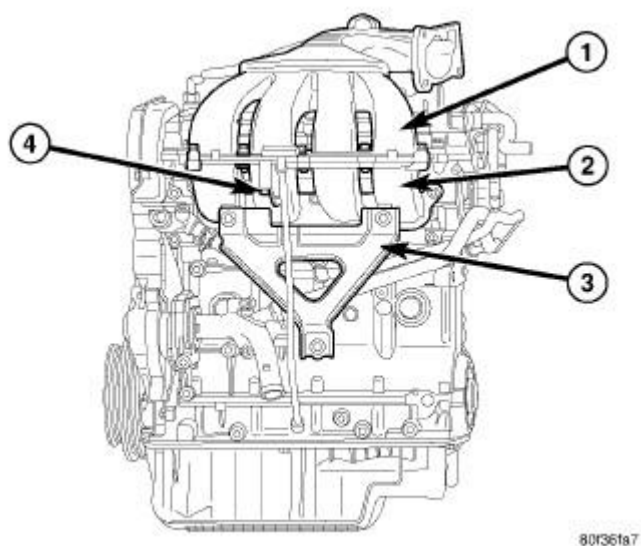


Fig. 100: Lower Intake Manifold Support Bracket - 2.4L Turbo
Courtesy of CHRYSLER LLC

21. **Turbocharger equipped vehicles:** Install lower intake manifold support bracket (3) .

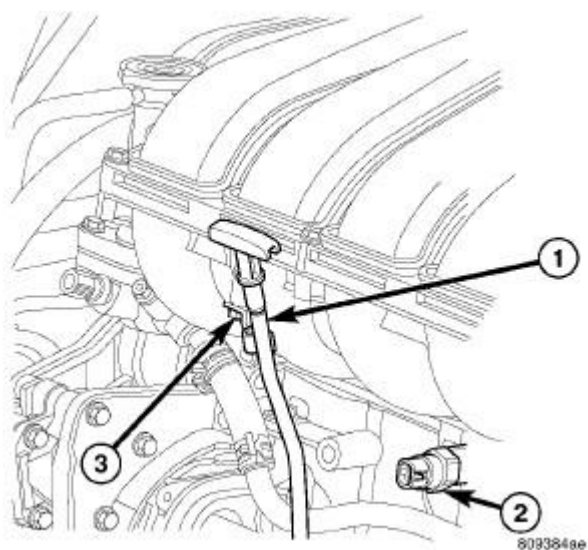


Fig. 101: Dipstick Tube
Courtesy of CHRYSLER LLC

22. Install fastener (3) attaching dipstick tube (1) to lower intake manifold .

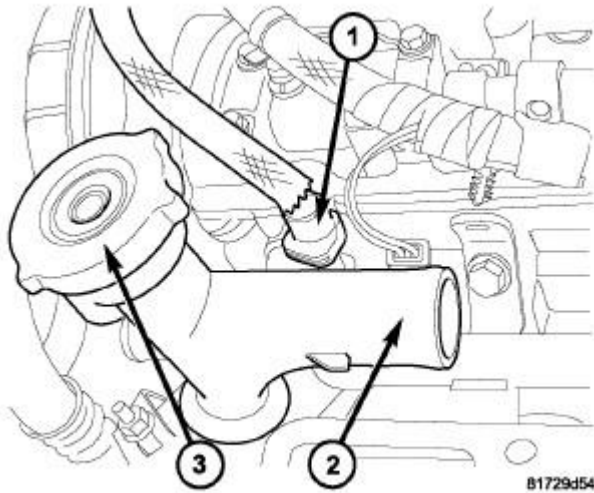


Fig. 102: Upper Radiator Hose To Coolant Outlet, Radiator Cap & ECT Sensor Connector
Courtesy of CHRYSLER LLC

23. Connect fuel supply line (1) quick-connect at the fuel rail assembly. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure**.
24. Install upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.
25. Remove radiator pressure cap (3) and fill the cooling system. Refer to **STANDARD PROCEDURE**.
26. Connect negative cable to battery.

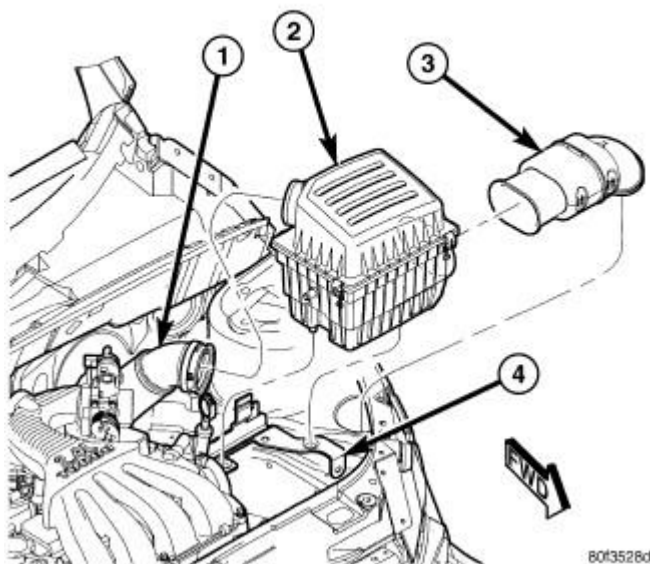


Fig. 103: Air Inlet System - 2.4L Turbo

Courtesy of CHRYSLER LLC

27. Install clean air hose (1) and air cleaner housing (2).

CAMSHAFT, ENGINE

Description

DESCRIPTION

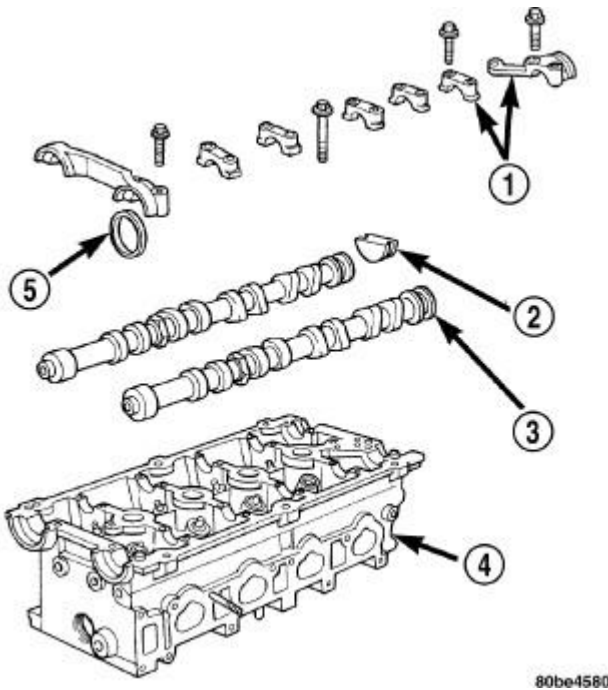


Fig. 104: Cylinder Head and Camshafts
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT BEARING CAPS
- 2 - PLUG
- 3 - CAMSHAFT
- 4 - CYLINDER HEAD
- 5 - CAMSHAFT OIL SEAL

Both camshafts have six bearing journal surfaces and two cam lobes per cylinder . Flanges at the rear journals control camshaft end play. Provision for a cam position sensor is located on the intake camshaft on the rear of the cylinder head. A hydrodynamic oil seal (5) is used for oil control at the front of the camshaft.

Operation

OPERATION

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined

lobes to provide accurate valve timing and duration.

Standard Procedure

MEASURING CAMSHAFT END PLAY

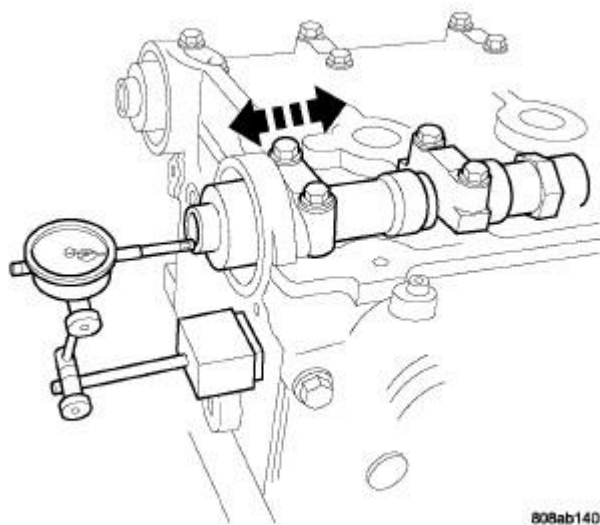


Fig. 105: Camshaft End Play - Typical
Courtesy of CHRYSLER LLC

1. Oil camshaft journals and install camshaft **WITHOUT** rocker arms. Install rear cam caps and tighten screws to 12 N.m (105 in. lbs.).
2. Using a suitable tool, move camshaft as far rearward as it will go.
3. Zero dial indicator .
4. Move camshaft as far forward as it will go.
5. Record reading on dial indicator. For end play specification, see Engine **SPECIFICATIONS**.
6. If end play is excessive, check cylinder head and camshaft for wear; replace as necessary.

Removal

REMOVAL

1. Remove cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal**.
2. Remove camshaft position sensor and camshaft target magnet. Refer to **Electrical/Ignition Control/SENSOR, Camshaft Position - Removal** .
3. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal**.
4. Remove camshaft sprockets and timing belt rear cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.

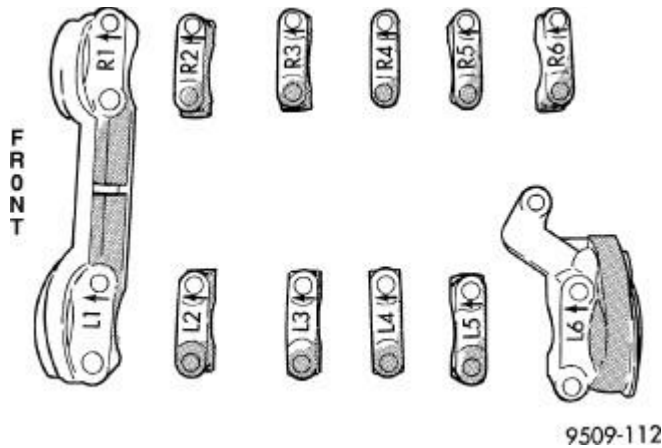


Fig. 106: Camshaft Bearing Cap Identification
Courtesy of CHRYSLER LLC

5. Bearing caps are identified for location. Remove the outside bearing caps first .

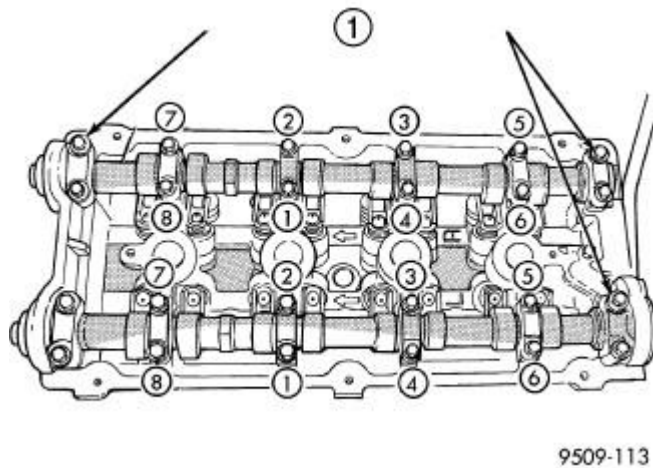


Fig. 107: Camshaft Bearing Cap - Removal
Courtesy of CHRYSLER LLC

1 -
REMOVE
OUTSIDE
BEARING
CAPS
FIRST

6. Loosen the camshaft bearing cap attaching fasteners in sequence shown in illustration one camshaft at a time.

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

7. Identify the camshafts before removing from the head. The camshafts are not interchangeable.
8. Remove camshafts from cylinder head.

NOTE: If removing rocker arms, identify for reinstallation in the original position.

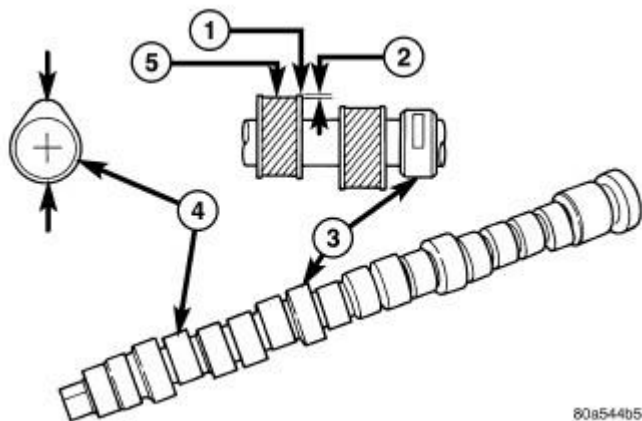
Cleaning

CLEANING

Clean camshaft with a suitable solvent.

Inspection

INSPECTION



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Fig. 108: Checking Camshaft(s) for Wear
Courtesy of CHRYSLER LLC

- 1 - UNWORN AREA
- 2 - ACTUAL WEAR
- 3 - BEARING JOURNAL
- 4 - LOBE
- 5 - WEAR ZONE

1. Inspect camshaft bearing journals (3) for damage and binding . If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Check the cam lobe (4) and bearing surfaces (3) for abnormal wear and damage. Replace camshaft if defective.

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

3. Measure the lobe actual wear (unworn area (1) - wear zone (5) = actual wear) and replace camshaft if out

of limit. Standard value is 0.0254 mm (0.001 in.), wear **limit** is 0.254 mm (0.010 in.).

Installation

INSTALLATION

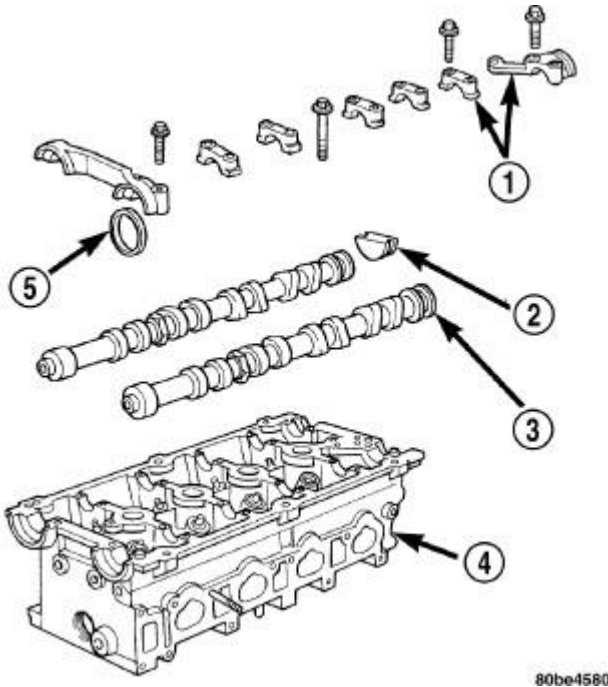


Fig. 109: Cylinder Head & Camshafts
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT BEARING CAPS
- 2 - PLUG
- 3 - CAMSHAFT
- 4 - CYLINDER HEAD
- 5 - CAMSHAFT OIL SEAL

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

1. Lubricate all camshaft bearing journals, rocker arms and camshaft lobes.
2. Install all rocker arms in original positions, if reused.

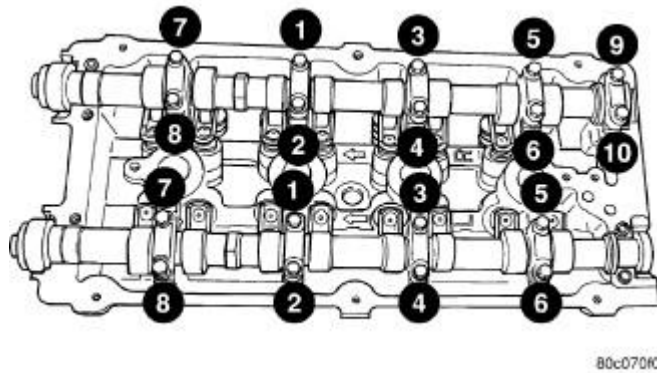


Fig. 110: Camshaft Bearing Cap Tightening Sequence
Courtesy of CHRYSLER LLC

3. Position camshafts on cylinder head bearing journals. Install right and left camshaft bearing caps No. 2 - 5 and right No. 6. Tighten M6 fasteners to 12 N.m (105 in. lbs.) in the sequence shown in illustration .

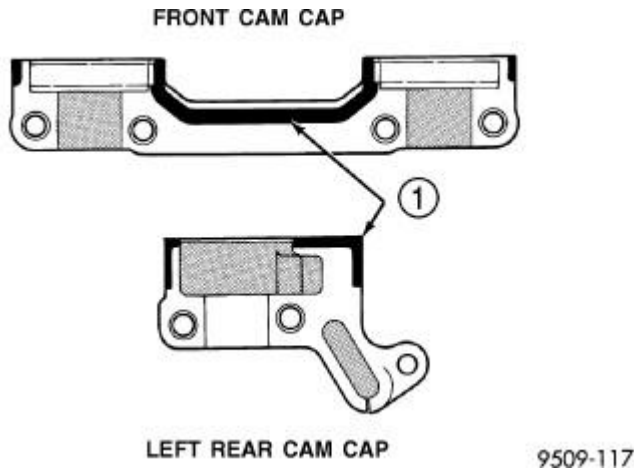


Fig. 111: Camshaft Bearing Cap Sealing
Courtesy of CHRYSLER LLC

1 - 1.5 mm (.060 in.) DIAMETER BEAD OF MOPAR GASKET MAKER

4. Apply Mopar® Gasket Maker to No. 1 and No. 6 bearing caps . Install bearing caps and tighten M8 fasteners to 28 N.m (250 in. lbs.).

NOTE: Bearing end caps must be installed before seals can be installed.

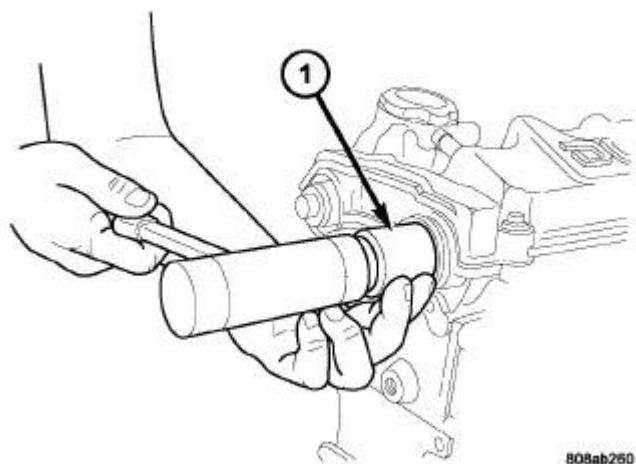


Fig. 112: Camshaft Seal - Installation
Courtesy of CHRYSLER LLC

1 - CAMSHAFT SEAL INSTALLER MD-998306

5. Install camshaft oil seals using Camshaft Seal Installer MD-998306. See **Engine/Cylinder Head/SEAL (S), Camshaft - Installation.**

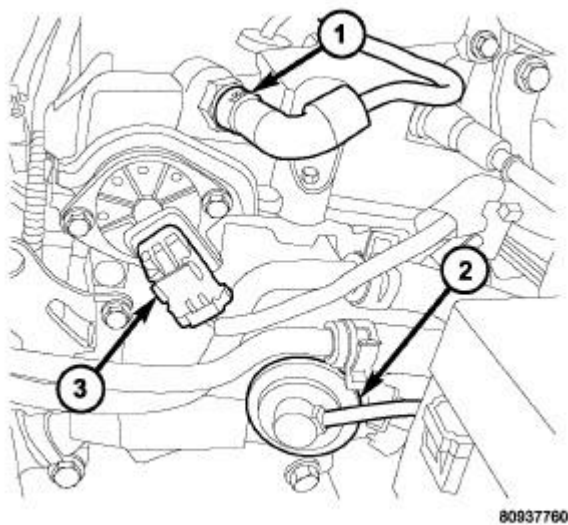


Fig. 113: Camshaft Position Sensor
Courtesy of CHRYSLER LLC

1 - PCV VALVE
2 - EGR VALVE

3 - CAMSHAFT POSITION SENSOR

6. Install camshaft target magnet and camshaft position sensor (3).
7. Install cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**

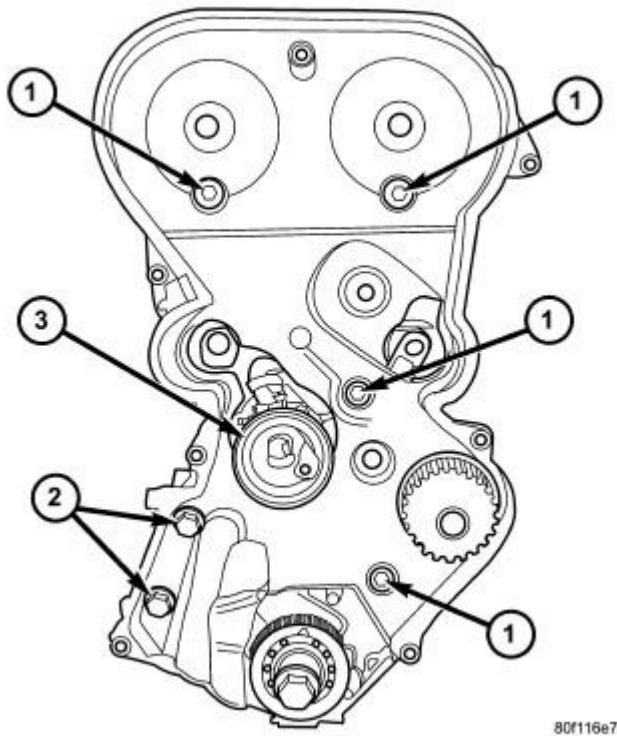


Fig. 114: Rear Timing Belt Cover Fasteners
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - M6 BOLTS - 12 N.m (105 in. lbs.)
2 - M8 BOLTS - 28 N.m (250 in. lbs.)
3 - TIMING BELT TENSIONER |
|---|

8. Install timing belt rear cover and tighten fasteners (1,2) and install timing belt tensioner (3).

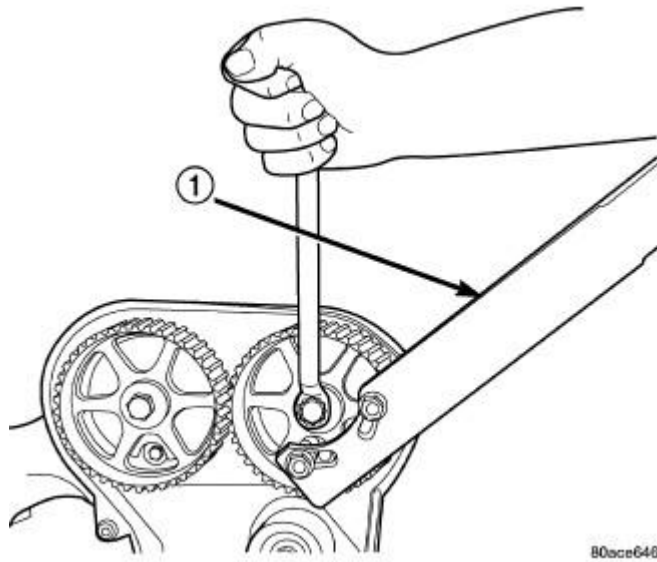


Fig. 115: Camshaft Sprocket-Removal/Installation
Courtesy of CHRYSLER LLC

1 - CAMSHAFT SPROCKET HOLDER 6847

9. Install camshaft sprockets using Camshaft Sprocket Holder 6847 (1). See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
10. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation.**

COVER(S), CYLINDER HEAD

Removal

REMOVAL

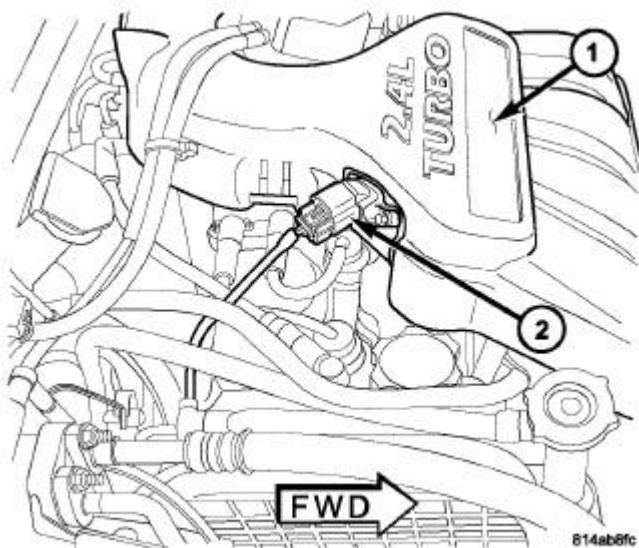


Fig. 116: INTAKE COVER

Courtesy of CHRYSLER LLC

- 1 - INTAKE MANIFOLD COVER
- 2 - MAP SENSOR

1. Remove intake manifold cover (1).
2. Remove upper intake manifold. See [Engine/Manifolds/MANIFOLD, Intake - Removal](#).
3. Remove ignition coil and spark plug wires.

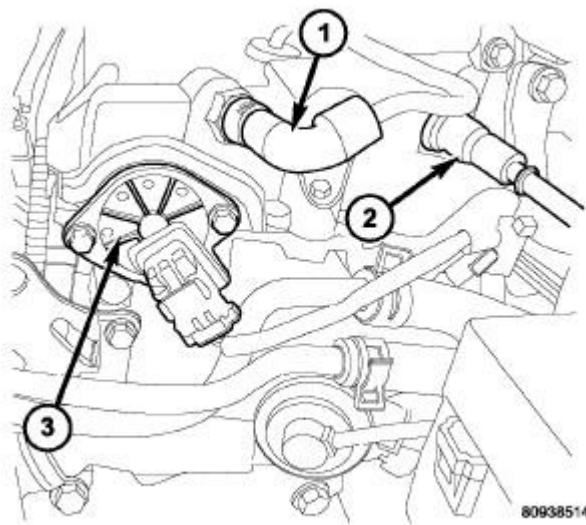


Fig. 117: PCV & Make-Up Air Hose

Courtesy of CHRYSLER LLC

- 1 - PCV HOSE
- 2 - MAKE-UP AIR HOSE

4. Disconnect PCV (1) and make-up air (2) hoses from cylinder head cover .

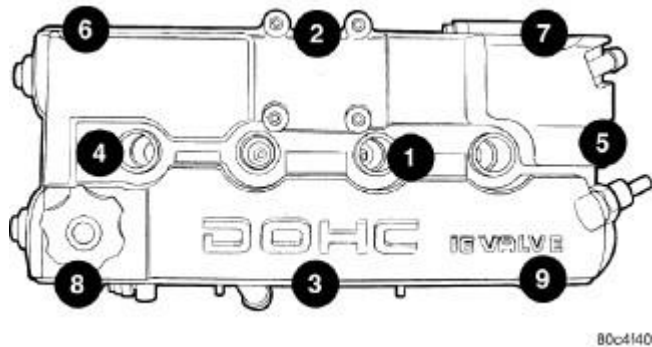


Fig. 118: Cylinder Head Cover Tightening Sequence (Typical Cover Shown)
Courtesy of CHRYSLER LLC

5. Remove cylinder head cover bolts by reversing the order shown in illustration.

CAUTION: When removing cylinder head cover bolts, be careful not to interchange the two (2) center bolts with the seven (7) perimeter bolts. The two (2) center bolts contain an aluminum washer between the bolt head and torque limiter for sealing purposes.

6. Remove cylinder head cover from cylinder head.

Installation

INSTALLATION

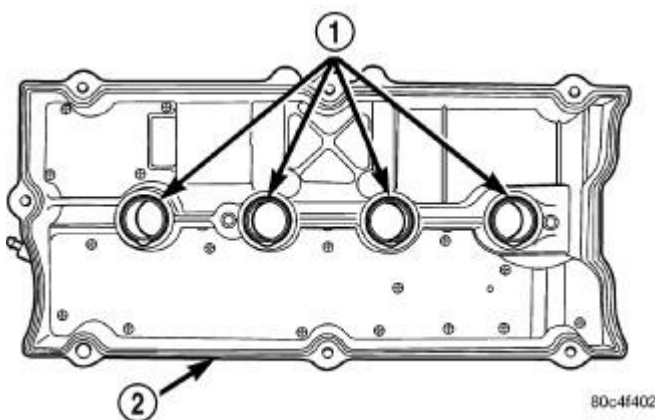


Fig. 119: Cylinder Head Cover Gasket and Spark Plug Well Seals
Courtesy of CHRYSLER LLC

1 - SPARK PLUG WELL SEALS

2 - GASKET

NOTE: Replace spark plug well seals (1) and bolt seals when installing a new cylinder head cover gasket (2).

1. Install new cylinder head cover gaskets (2) and spark plug well seals (1).

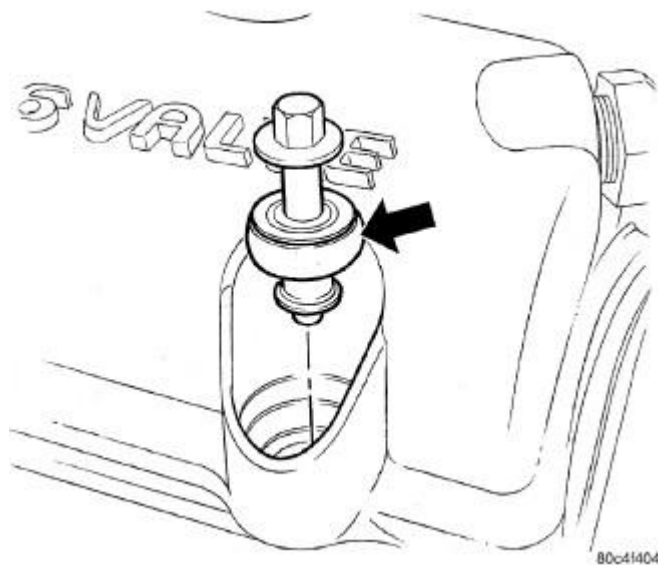


Fig. 120: Cylinder Head Cover Bolt Assembly
Courtesy of CHRYSLER LLC

2. Replace cylinder head cover bolt seals .

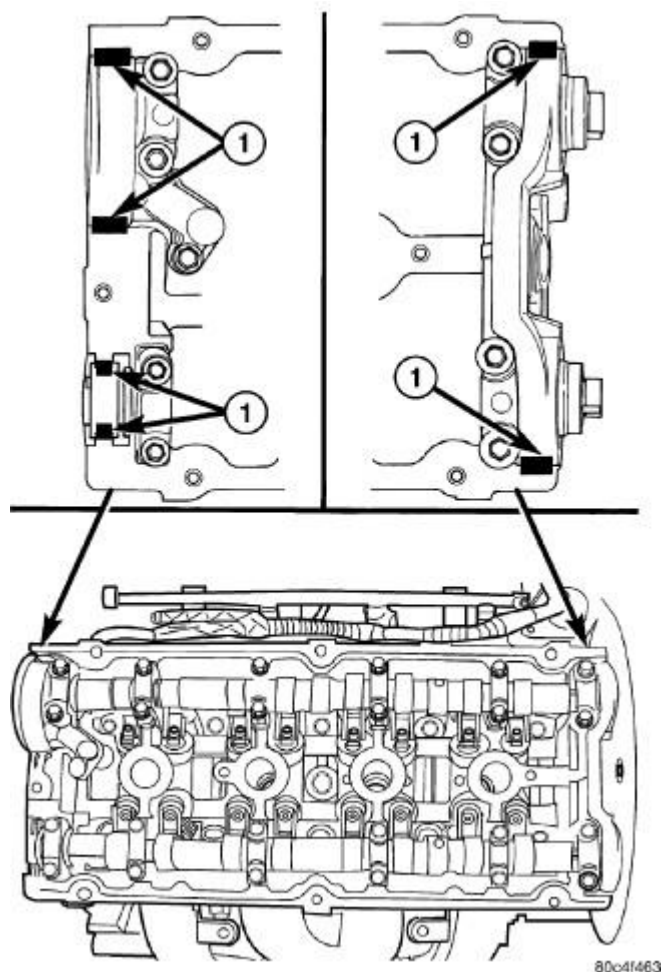
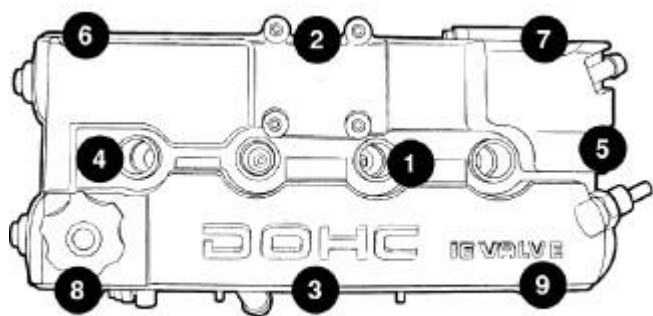


Fig. 121: Sealer Locations
Courtesy of CHRYSLER LLC

1 - SEALER LOCATION

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

3. Apply Mopar® Engine RTV GEN II at the camshaft cap corners and at the top edges of the 1/2 round seal (1) .



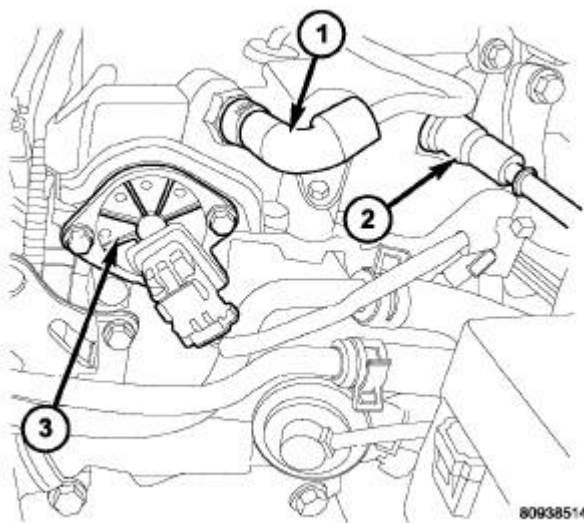
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Fig. 122: Cylinder Head Cover Tightening Sequence (Typical Cover Shown)

Courtesy of CHRYSLER LLC

CAUTION: When installing cylinder head cover bolts, be careful not to interchange the two (2) center bolts with the seven (7) perimeter bolts. The two (2) center bolts contain an aluminum washer between the bolt head and torque limiter for sealing purposes.

4. Install cylinder head cover assembly to cylinder head. Install all bolts, ensuring the two (2) bolts containing the sealing washer are located in the center locations of cover. Tighten bolts in sequence shown in illustration . Using a 3 step torque method as follows:
 - a. Tighten all bolts to 4.5 N.m (40 in. lbs.).
 - b. Tighten all bolts to 9.0 N.m (80 in. lbs.).
 - c. Tighten all bolts to 12 N.m (105 in. lbs.).
5. Install ignition coil and spark plug wires. Tighten fasteners to 12 N.m (105 in. lbs.).



80938514

Fig. 123: PCV & Make-Up Air Hose

Courtesy of CHRYSLER LLC

- 1 - PCV HOSE
2 - MAKE-UP AIR HOSE

6. If the PCV valve was removed, apply Mopar® Thread Sealant with Teflon to threads and install valve to cylinder head cover. Tighten PCV valve to 8 N.m (70 in. lbs.).
7. Connect PCV (1) and make-up air (2) hoses to cylinder head cover .

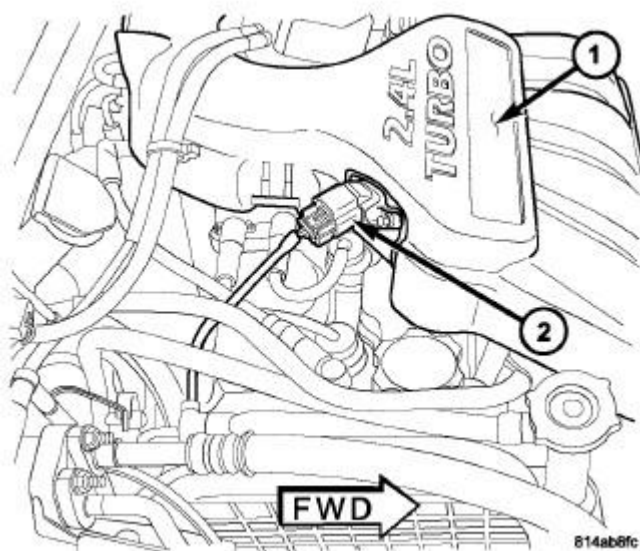


Fig. 124: INTAKE COVER
Courtesy of CHRYSLER LLC

- 1 - INTAKE MANIFOLD COVER
2 - MAP SENSOR

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

LIFTER(S), HYDRAULIC

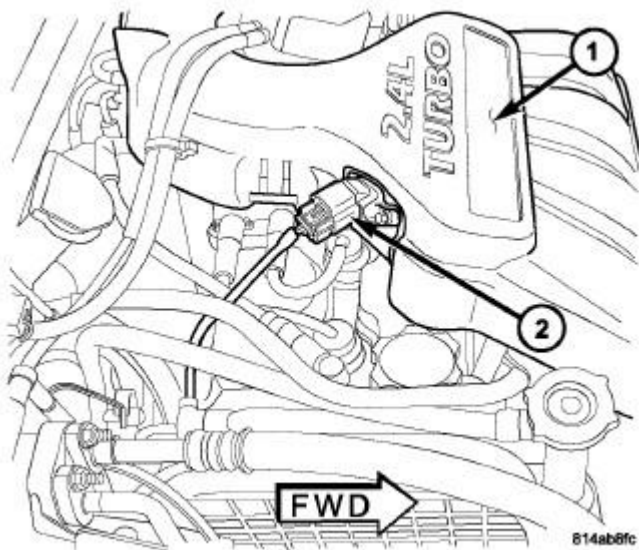
Diagnosis and Testing

HYDRAULIC LASH ADJUSTER NOISE DIAGNOSIS

A tappet-like noise may be produced from several items. Check the following items.

1. Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.
2. Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.
3. 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.

4. Low oil pressure.
 5. The oil restrictor (integral to the cylinder head gasket) in the vertical oil passage to the cylinder head is plugged with debris.
 6. Air ingested into oil due to broken or cracked oil pump pick up.
 7. Worn valve guides.
 8. Rocker arm ears contacting valve spring retainer.
 9. Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.
 10. Faulty lash adjuster.
- Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.
 - Remove suspected lash adjusters, and replace as necessary.

Removal**REMOVAL****Fig. 125: INTAKE COVER**

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - INTAKE MANIFOLD COVER
2 - MAP SENSOR |
|---|

1. Remove intake manifold cover (1).
2. Remove upper intake manifold.

NOTE: This procedure is for in-vehicle service with camshafts installed.

3. Remove cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.**

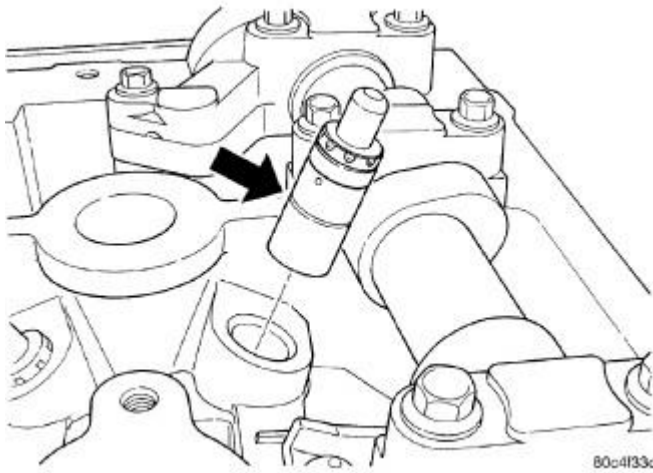


Fig. 126: Hydraulic Lash Adjuster
Courtesy of CHRYSLER LLC

NOTE: If reusing, mark each rocker arm and each hydraulic lash adjuster for reassembly in original position. Lash adjusters are serviced as an assembly.

4. Remove rocker arm. See **Engine/Cylinder Head/ROCKER ARM, Valve - Removal.**
5. Remove hydraulic lash adjuster .
6. Repeat removal procedure for each hydraulic lash adjuster.

Installation

INSTALLATION

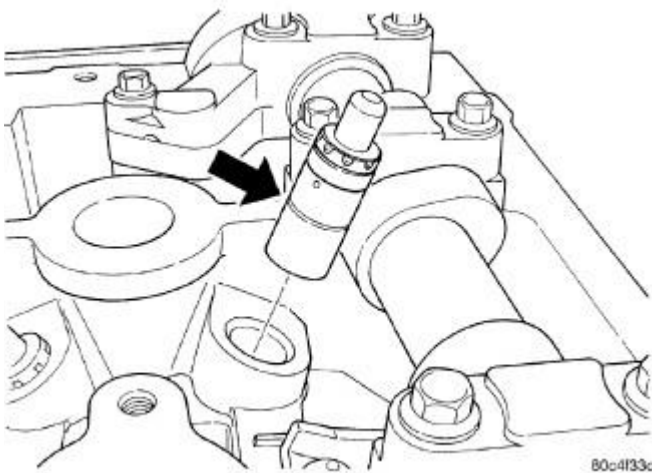


Fig. 127: Hydraulic Lash Adjuster
Courtesy of CHRYSLER LLC

1. Install hydraulic lash adjuster . Ensure the lash adjusters are at least partially full of engine oil. This is indicated by little or no plunger travel when the lifter is depressed.
2. Install rocker arm. See **Engine/Cylinder Head/ROCKER ARM, Valve - Installation.**
3. Repeat installation procedure for each hydraulic lash adjuster.

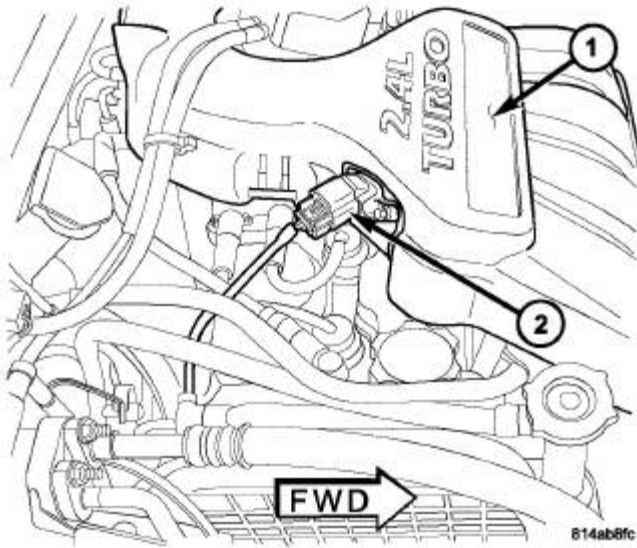


Fig. 128: INTAKE COVER
Courtesy of CHRYSLER LLC

1 - INTAKE MANIFOLD COVER 2 - MAP SENSOR

4. Install cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**
5. Install upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation.**
6. Install intake manifold cover (1).

ROCKER ARM, VALVE

Removal

REMOVAL

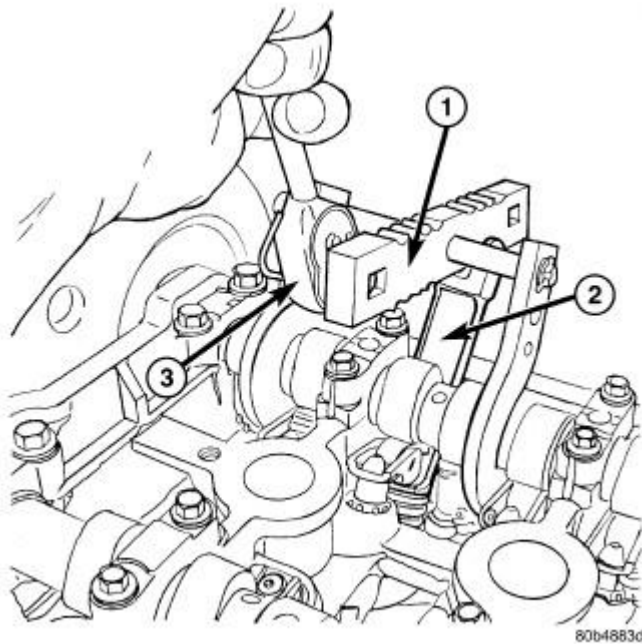


Fig. 129: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - VALVE SPRING COMPRESSOR 8215A
2 - ADAPTER 8436
3 - 3/8" DRIVE RATCHET |
|---|

NOTE: This procedure is for in-vehicle service with camshafts installed.

1. Remove cylinder head cover. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
2. Remove spark plugs.
3. Rotate engine until the camshaft lobe, on the follower being removed, is positioned on its base circle (heel). Also, the piston should be a minimum of 6.3 mm (0.25 in) below TDC position.

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

4. Using Valve Spring Compressor 8215A (1) and Adapter 8436 (2) slowly depress valve assembly until rocker arm can be removed .
5. Repeat removal procedure for each rocker arm.

Inspection

INSPECTION

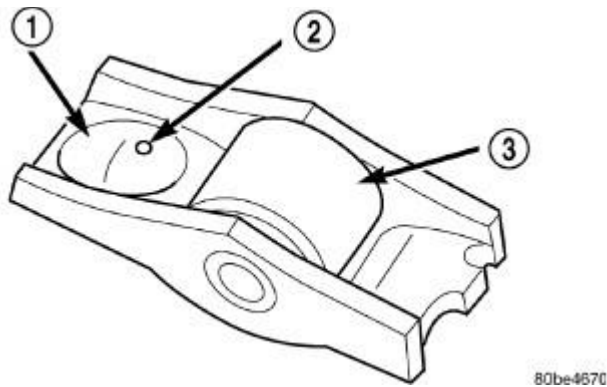


Fig. 130: Rocker Arm

Courtesy of CHRYSLER LLC

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

Inspect the rocker arm lash adjuster pocket (1) and roller (3) for wear or damage. Make sure the oil squirt hole (2) is not plugged. Replace as necessary.

Installation

INSTALLATION

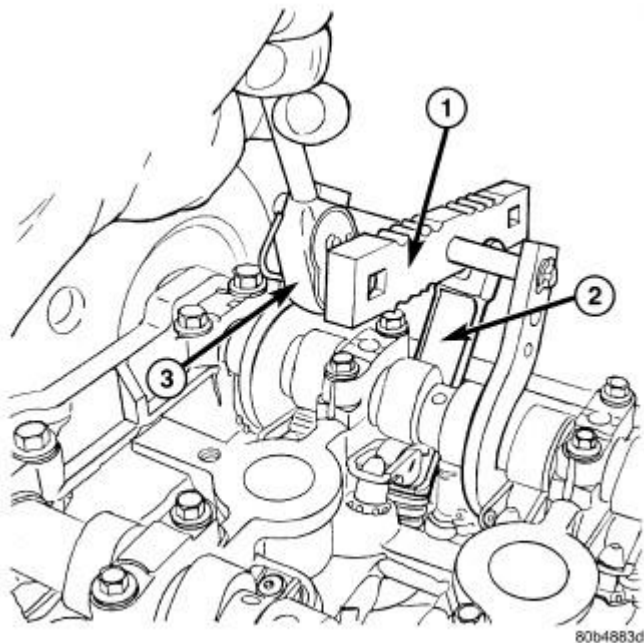


Fig. 131: Rocker Arm - Removal/Installation

Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR 8215A

2 - ADAPTER 8436

3 - 3/8" DRIVE RATCHET

1. Lubricate rocker arm with clean engine oil.
2. Using Valve Spring Compressor 8215A (1) and Adapter 8436 (2) slowly depress valve assembly until rocker arm can be installed on the hydraulic lifter and valve stem .
3. Repeat installation procedure for each rocker arm.
4. Install spark plugs.
5. Install cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**

SEAL(S), CAMSHAFT

Removal

REMOVAL



Fig. 132: Camshaft Sprocket - Removal/Installation

Courtesy of CHRYSLER LLC

1. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal.**
2. Hold each camshaft sprocket with Camshaft Sprocket Holder 6847 (1) while removing center bolt .
3. Remove camshaft sprockets.
4. Remove rear timing belt cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal.**

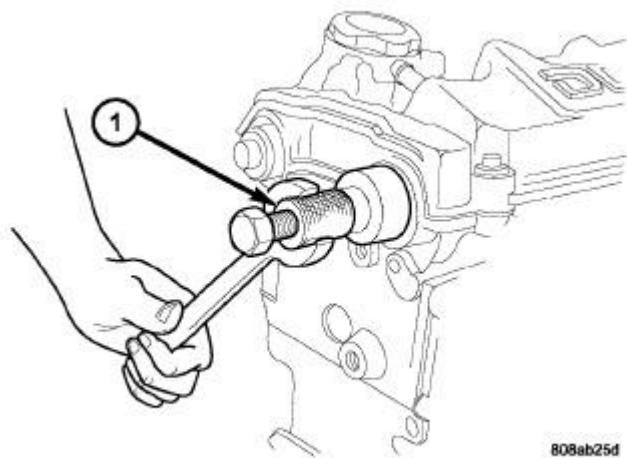


Fig. 133: Camshaft Oil Seal - Removal With C-4679A
Courtesy of CHRYSLER LLC

1 -
SPECIAL
TOOL C-
4679A

5. Remove camshaft seal using Camshaft Seal Remover C-4679A (1) .

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

Installation

INSTALLATION

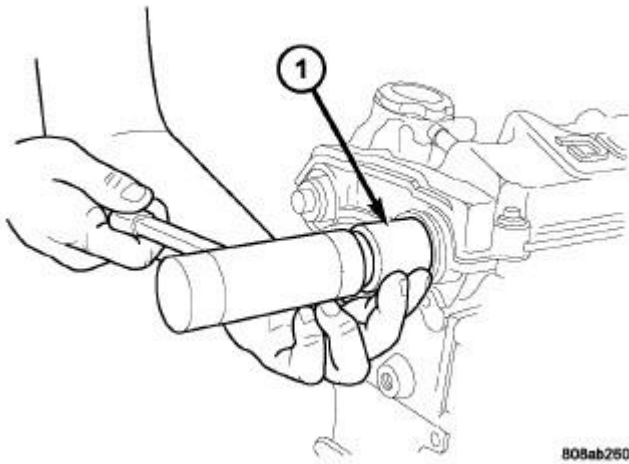


Fig. 134: Camshaft Seal - Installation
Courtesy of CHRYSLER LLC

1 - CAMSHAFT SEAL INSTALLER MD-998306

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



Fig. 135: Camshaft Sprocket - Removal/Installation
Courtesy of CHRYSLER LLC

3. Install timing belt rear cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.

4. Install camshaft sprockets. Hold each sprocket with Camshaft Sprocket Holder 6847 (1) and tighten center bolt to 115 N.m (85 ft. lbs.) .
5. Install timing belt and front covers. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation. See Engine/Valve Timing/COVER(S), Engine Timing - Installation.

SPRING(S), VALVE

Removal

CYLINDER HEAD ON

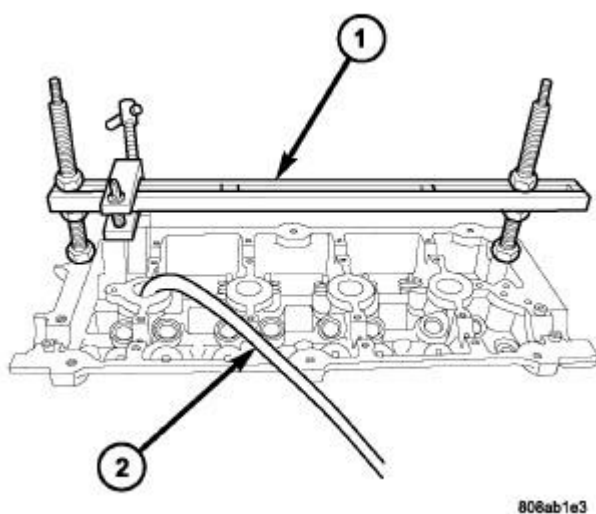


Fig. 136: Valve Spring - Removal/Installation
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - VALVE SPRING COMPRESSOR MD 998772A
2 - AIR HOSE |
|--|

1. Remove cylinder head cover. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
2. Remove camshafts. See Engine/Cylinder Head/CAMSHAFT, Engine - Removal.
3. Rotate crankshaft until piston is at TDC on compression.
4. With air hose attached to Cylinder Compression Pressure Adapter 8116 installed in spark plug hole (2), apply 90-120 psi air pressure.
5. Using Valve Spring Compressor MD-998772-A (1) with Valve Spring Compressor Adapter 6779 , compress valve springs and remove valve locks.

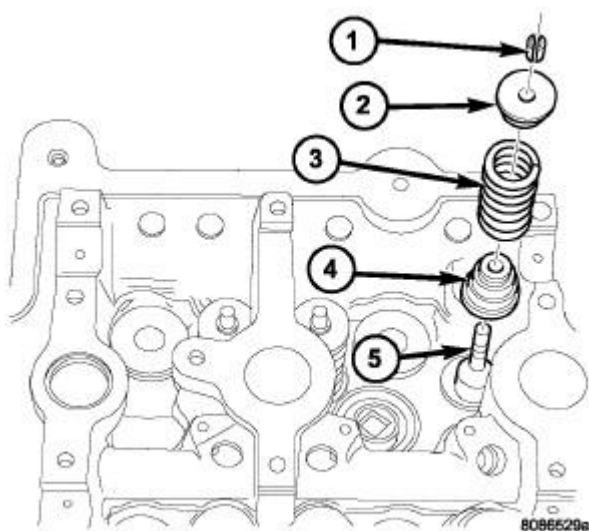


Fig. 137: Valve Seal and Spring
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - VALVE LOCKS
2 - VALVE RETAINER
3 - VALVE SPRING
4 - VALVE STEM SEAL
5 - VALVE STEM |
|--|

6. Remove Valve Spring Compressor Adapter 6779 and remove valve retainer (2).
7. Remove valve spring(s) (3).
8. Remove valve stem seal(s) (4) .

CYLINDER HEAD OFF

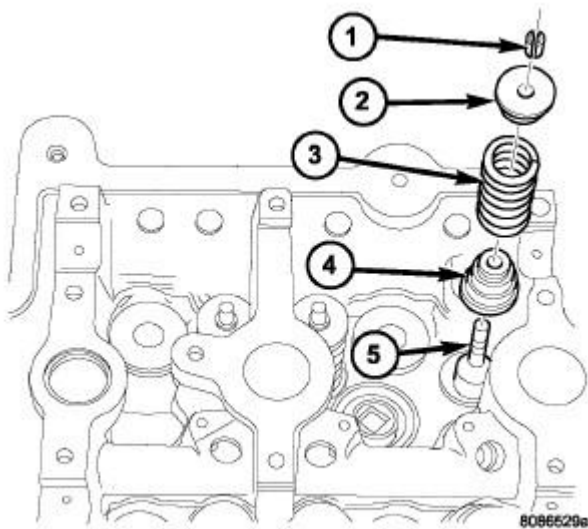


Fig. 138: Valve Seal and Spring
Courtesy of CHRYSLER LLC

- 1 - VALVE LOCKS
- 2 - VALVE RETAINER
- 3 - VALVE SPRING
- 4 - VALVE STEM SEAL
- 5 - VALVE STEM

1. With cylinder head removed from cylinder block, compress valve springs (3) using a universal valve spring compressor.
2. Remove valve retaining locks (1), valve spring retainers (2), valve springs (3), and valve stem seals (4).
3. Before removing valves (5), **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves, locks and retainers to insure installation in original location.
4. Inspect the valves. See **Engine/Cylinder Head/SPRING(S), Valve - Inspection.**

Inspection

INSPECTION

1. Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct tension. Discard the springs that do not meet specifications. The following specifications apply to both intake and exhaust valves springs:
 - Valve Closed Nominal Tension-75 lbs. @ 38.0 mm (1.50 in.)
 - Valve Open Nominal Tension-134 lbs. @ 29.75 mm (1.17 in.)
2. Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends. If the spring is more than 1.5 mm (1/16 inch) out of square, install a new spring.

Installation

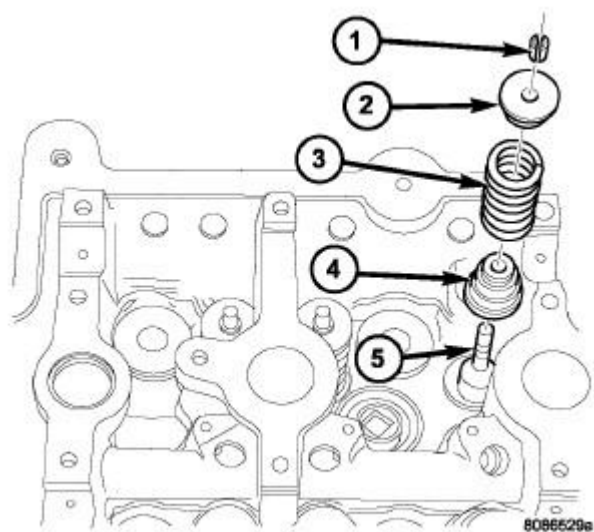
CYLINDER HEAD ON

Fig. 139: Valve Seal and Spring
Courtesy of CHRYSLER LLC

- 1 - VALVE LOCKS
- 2 - VALVE RETAINER
- 3 - VALVE SPRING
- 4 - VALVE STEM SEAL
- 5 - VALVE STEM

1. Install valve seal/valve seat assembly (4). Push the assembly down to seat it onto the valve guide.
2. Install valve spring (3) and retainer (2).

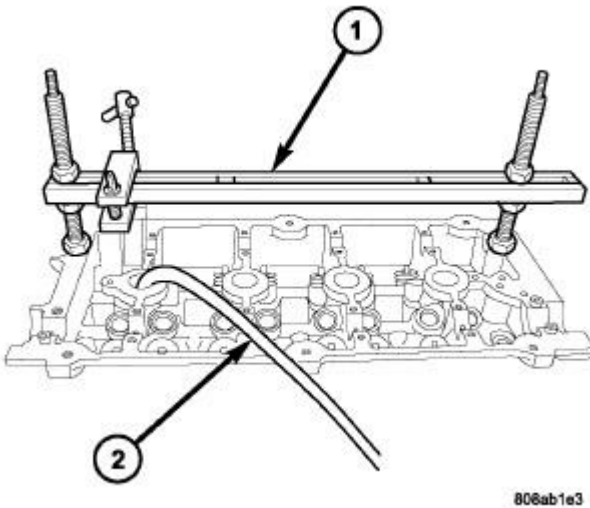


Fig. 140: Valve Spring - Removal/Installation
Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR MD 998772A 2 - AIR HOSE
--

3. Use Valve Spring Compressor MD-998772-A (1) with Valve Spring Compressor Adapter 6779 to compress valve springs only enough to install locks. Correct alignment of tool is necessary to avoid nicking valve stems .
4. Remove air hose (2) and install spark plugs.
5. Install camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation.**
6. Install cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**

CYLINDER HEAD OFF

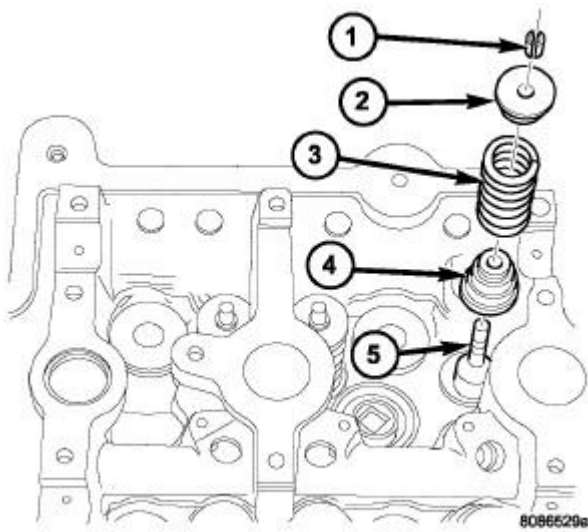


Fig. 141: Valve Seal and Spring
Courtesy of CHRYSLER LLC

- 1 - VALVE LOCKS
- 2 - VALVE RETAINER
- 3 - VALVE SPRING
- 4 - VALVE STEM SEAL
- 5 - VALVE STEM

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

1. Coat valve stems (5) with clean engine oil and insert in cylinder head.
2. Install new valve stem seals (4) on all valves. The valve stem seals should be pushed firmly and squarely over valve guide.
3. Install valve springs (3) and retainers (2).
4. Compress valve springs only enough to install locks, taking care not to misalign the direction of compression. Nicked valve stems may result from misalignment of the valve spring compressor.

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

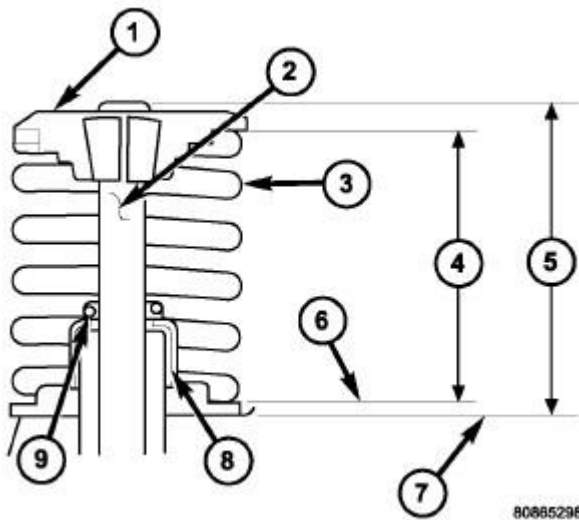


Fig. 142: Valve Tip Height and Valve Spring Installed Height
 Courtesy of CHRYSLER LLC

- | |
|----------------------|
| 1 - SPRING RETAINER |
| 2 - VALVE STEM |
| 3 - VALVE SPRING |
| 4 - INSTALLED HEIGHT |
| 5 - |
| 6 - |
| 7 - |
| 8 - VALVE SEAL/SEAT |
| 9 - GARTER SPRING |

- Check the valve spring installed height (4) after refacing the valve and seat. Make sure measurements are taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.525 in.), install a 0.762 mm (0.030 in.) spacer 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. They have chrome plated stems to prevent scuffing. Viton rubber valve stem seals are integral with the spring seats. The valves have three-bead lock keepers to retain springs and to promote valve rotation.

Operation

OPERATION

The four valves per cylinder (two intake and two exhaust) are opened by using roller rocker arms which pivot on hydraulic lash adjusters.

Cleaning

CLEANING

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

ENGINE BLOCK

DESCRIPTION

DESCRIPTION

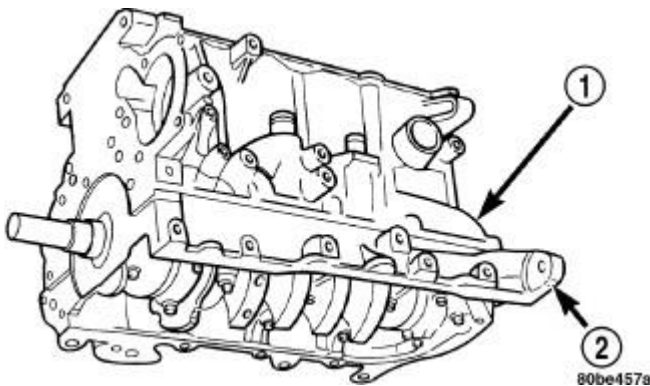


Fig. 143: Cylinder Block and Bed plate

Courtesy of CHRYSLER LLC

1 - CYLINDER BLOCK

2 - BED PLATE

The cast iron cylinder block is a two-piece assembly, consisting of the cylinder block (1) and bed plate (2). The bed plate (2) incorporates the main bearing caps and bolts to the cylinder block (1). This design offers a much stronger lower end and increased cylinder block rigidity. The rear oil seal retainer is integral with the block. The bed plate and block are serviced as an assembly.

STANDARD PROCEDURE

CYLINDER BORE HONING

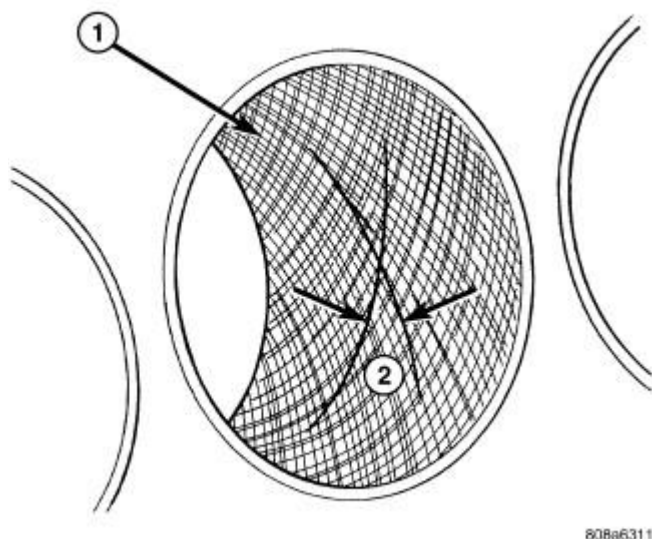


Fig. 144: Cylinder Bore Cross-Hatch Pattern
Courtesy of CHRYSLER LLC

1 - CROSS-HATCH PATTERN
2 - 40°-60°

1. Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, 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 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 (1). When hone marks **intersect** at 40-60 degrees (2), 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 (2). 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.

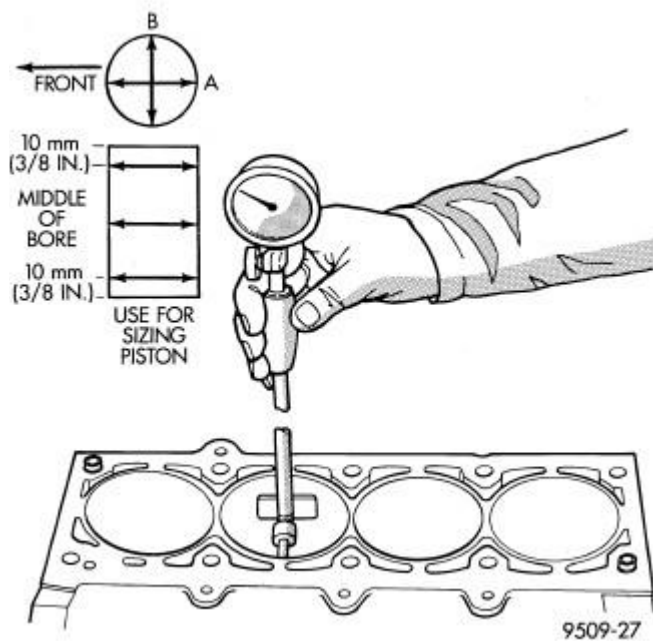
INSPECTION**INSPECTION****ENGINE BLOCK**

Fig. 145: 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

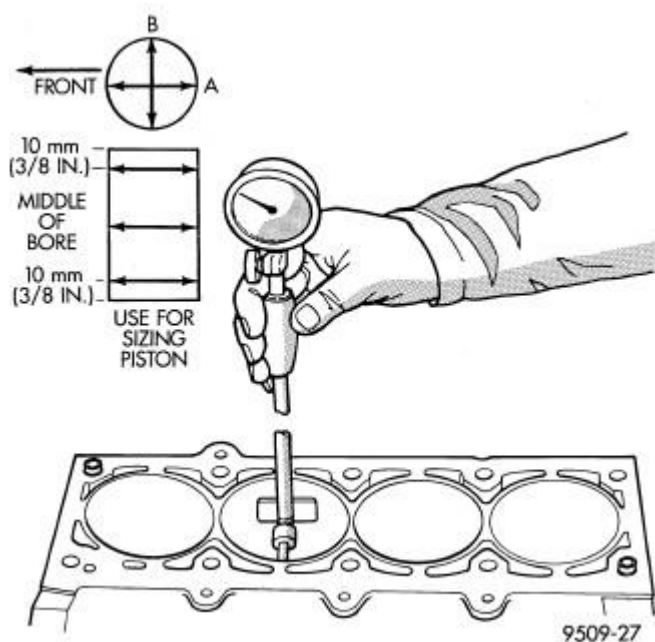


Fig. 146: Checking Cylinder Bore Size

Courtesy of CHRYSLER LLC

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

The cylinder walls should be checked for out-of-round and taper with Tool C119 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 - FITTING

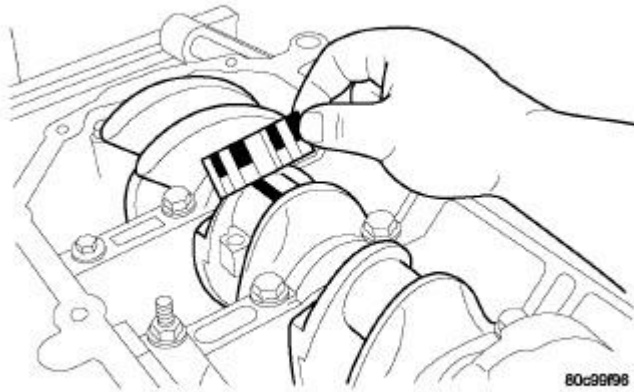


Fig. 147: Connecting Rod Bearing Clearance - Typical
Courtesy of CHRYSLER LLC

1. For measuring connecting rod bearing clearance procedure and use of Plastigage. See **Engine - Standard Procedure**. For bearing clearance, refer to Engine Specifications. See Engine **SPECIFICATIONS**.

NOTE: **The rod bearing bolts should not be reused.**

2. Before installing the **NEW** bolts the threads should be oiled with clean engine oil.
3. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

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

1. Tighten the bolts to 27 N.m (20 ft. lbs.).
2. Tighten the connecting rod bolts an additional **1/4 TURN**.

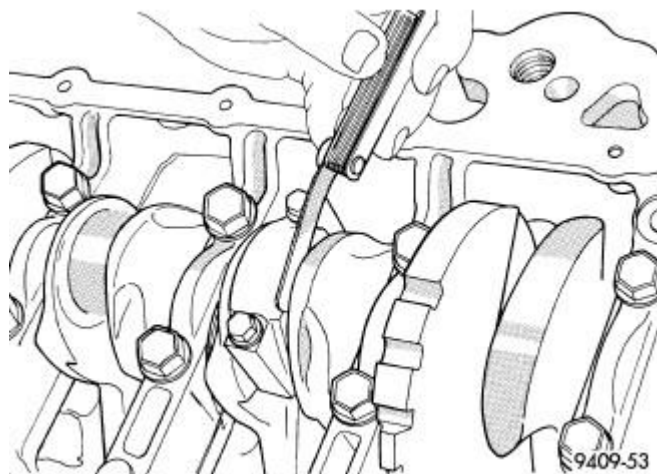


Fig. 148: Connecting Rod Side Clearance - Typical
Courtesy of CHRYSLER LLC

5. Using a feeler gauge, check connecting rod side clearance . Refer to clearance specifications. See Engine **SPECIFICATIONS**.

COVER, STRUCTURAL DUST

Removal

REMOVAL

STRUCTURAL COLLAR - AUTOMATIC TRANSAXLE EQUIPPED

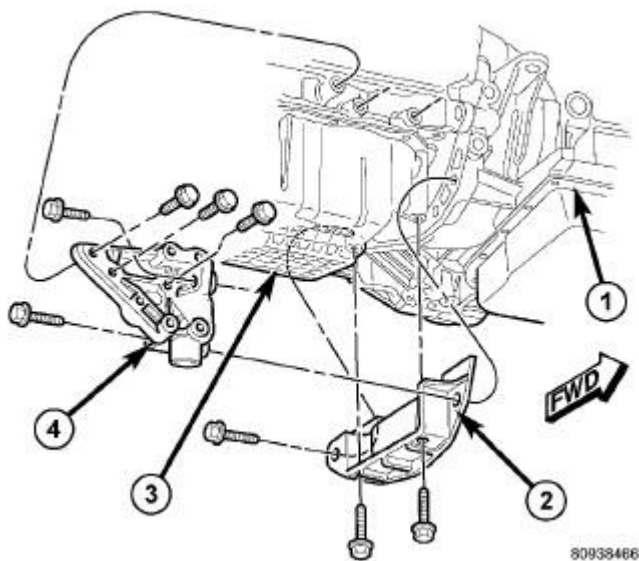
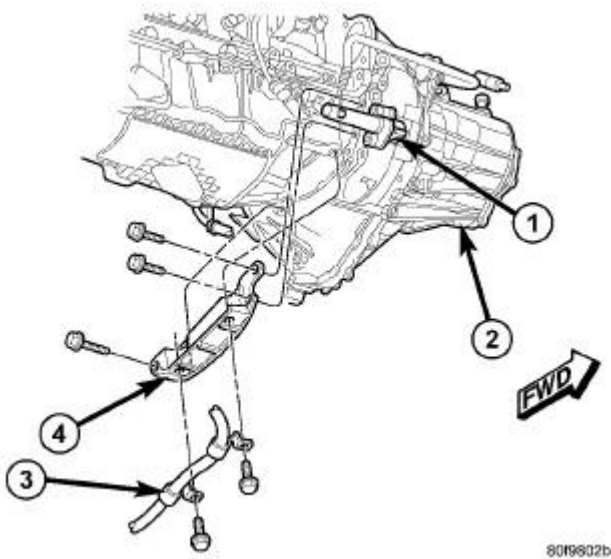


Fig. 149: Structural Collar and Bending Strut - (Automatic Transaxle Equipped)
Courtesy of CHRYSLER LLC

- 1 - TRANSAXLE
- 2 - STRUCTURAL COLLAR
- 3 - OIL PAN
- 4 - BENDING STRUT

1. Raise vehicle on hoist.
2. Remove bolts attaching bending strut (4) to engine and transaxle (1) .
3. Remove bolts attaching structural collar (2) to engine, oil pan, and transaxle . Remove strut and collar.

STRUCTURAL COLLAR - MANUAL TRANSAXLE EQUIPPED

8019802b

Fig. 150: Structural Collar and Bending Strut - (Manual Transaxle Equipped)

Courtesy of CHRYSLER LLC

- 1 - HYDRAULIC CLUTCH SLAVE CYLINDER
- 2 - TRANSAXLE
- 3 - POWER STEERING HOSE
- 4 - STRUCTURAL COLLAR

1. Raise vehicle on hoist.
2. Remove bolts attaching collar and clutch slave cylinder (1) to transaxle (2) .
3. Remove remaining bolts attaching structural collar (4) to oil pan and transaxle . Remove structural collar (4).

Installation**INSTALLATION****STRUCTURAL COLLAR - AUTOMATIC TRANSAXLE EQUIPPED**

CAUTION: Torque procedure for the structural collar and bending strut must be followed or damage could occur to oil pan, collar, and/or bending strut.

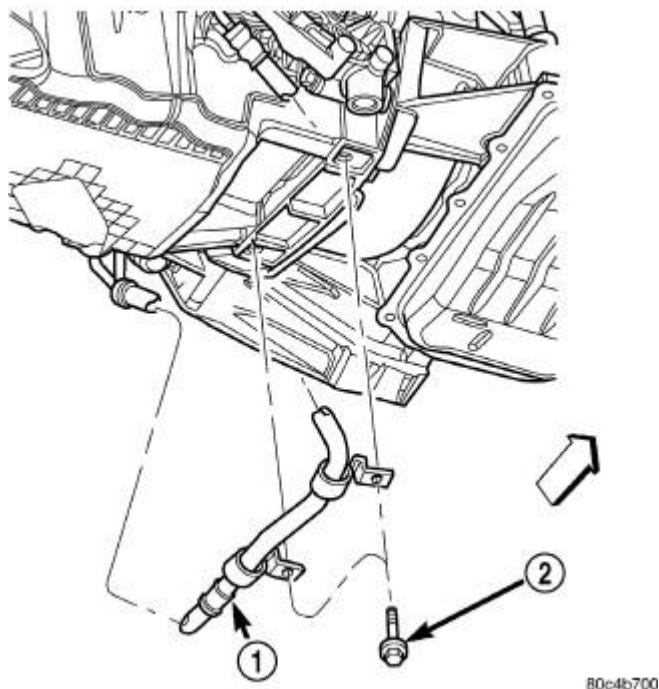


Fig. 151: Power Steering Hose To Structural Collar
Courtesy of CHRYSLER LLC

- | |
|-------------------------------------|
| 1 - POWER STEERING HOSE
2 - BOLT |
|-------------------------------------|

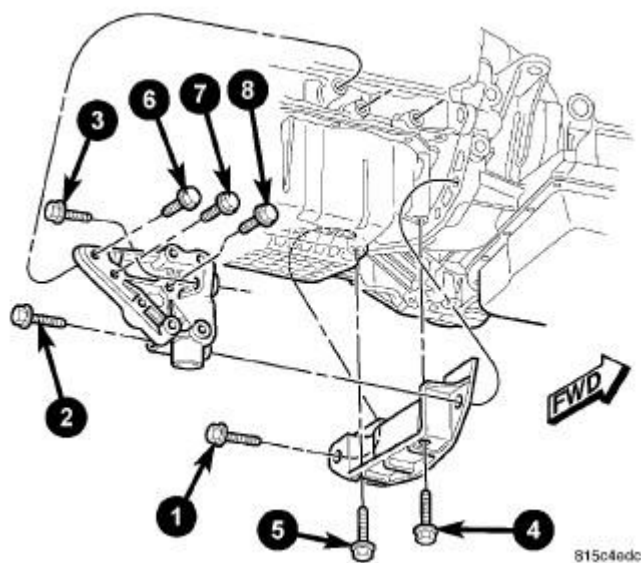


Fig. 152: Structural Collar And Bending Strut Torque Sequence - A/T

Courtesy of CHRYSLER LLC

1. Perform the following steps for installing structural collar and bending strut. Refer to **Fig. 149** .
2. Place collar into position between transaxle and oil pan. Install collar to transaxle bolt (1), **hand start only** .

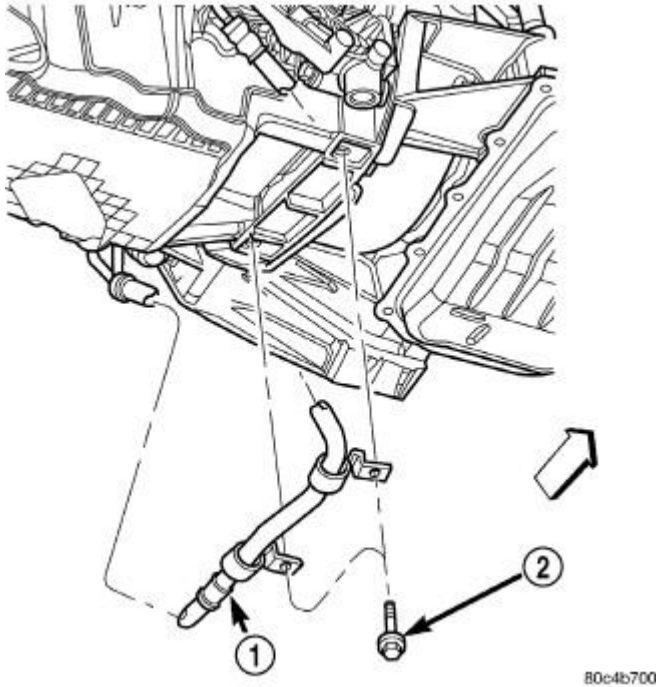


Fig. 153: Power Steering Hose To Structural Collar
Courtesy of CHRYSLER LLC

1 - POWER STEERING HOSE 2 - BOLT

3. Position power steering hose (1) support bracket and install collar to oil pan bolt (2), **hand tight only**.

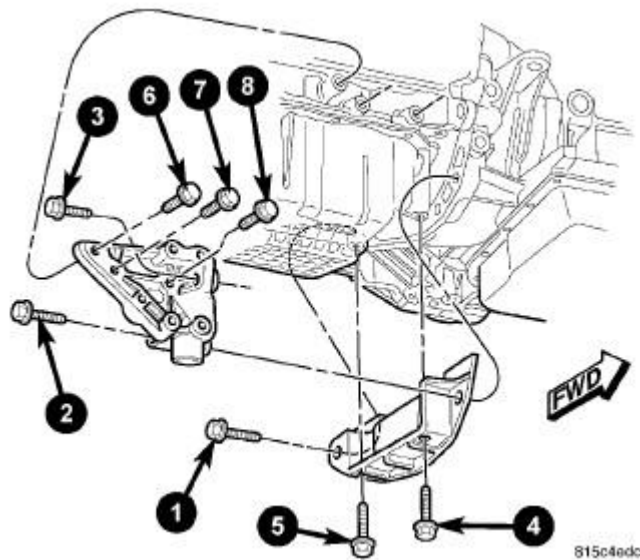


Fig. 154: Structural Collar And Bending Strut Torque Sequence - A/T
 Courtesy of CHRYSLER LLC

4. Position bending strut in place and **hand start only** bolt (3) into the upper transaxle hole.
5. Install bolt (2), through strut and collar, **hand start only**.
6. Install bolt (6), strut to cylinder block, **hand tight only**.
7. Position power steering hose support bracket and install the remaining collar to oil pan bolt (5), **hand tight only**.
8. Final torque collar to transaxle bolts (1 - 3), to 101 N.m (75 ft. lbs.)
9. Install bolts (7) and (8), through strut and into cylinder block.
10. Final torque bolts (4 - 8) to 61 N.m (45 ft. lbs.).
11. Lower vehicle.

STRUCTURAL COLLAR - MANUAL TRANSAXLE EQUIPPED

CAUTION: Torque procedure for the structural collar and bending strut must be followed or damage could occur to oil pan, collar, and/or bending strut.

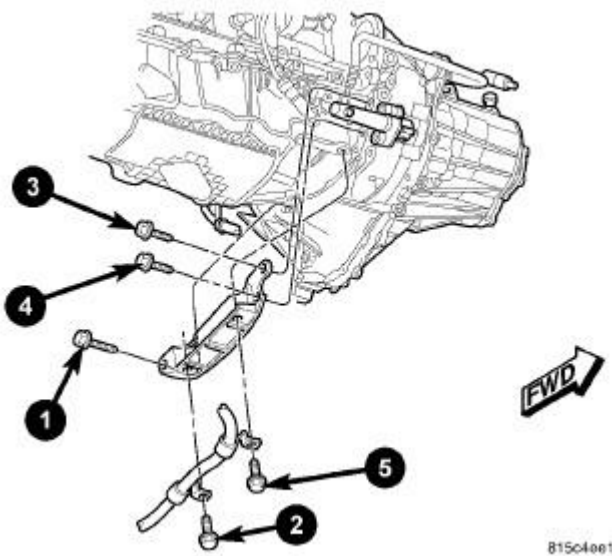


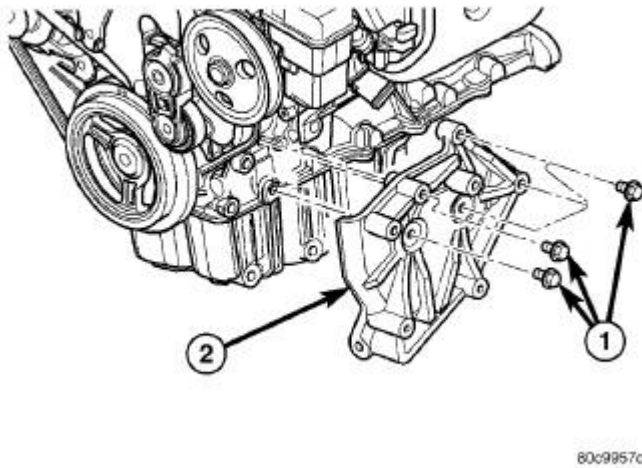
Fig. 155: Structural Collar And Bending Strut - M/T
 Courtesy of CHRYSLER LLC

1. Perform the following steps for installing structural collar and bending strut. Refer to :
2. Place collar into position between transaxle and oil pan. Install collar to transaxle bolt (1), **hand start only** .
3. Position power steering hose support bracket and install collar to oil pan bolt (2), **hand tight only** .
4. Position clutch slave cylinder into mounting position and install bolts (3) and (4) **hand tight only** .
5. Position power steering hose support bracket and install the remaining collar to oil pan bolt (5) **hand tight only** .
6. Final torque all bolts in sequence shown in illustration to the following torque values:
7. Torque bolt (1) to 101 N.m (75 ft. lbs.)
8. Torque bolts (2) and (5) to 61 N.m (45 ft. lbs.)
9. Torque bolts (3) and (4) to 28 N.m (20 ft. lbs.)
10. Torque bolt
11. Lower vehicle.

CRANKSHAFT

Standard Procedure

MEASURING CRANKSHAFT END PLAY



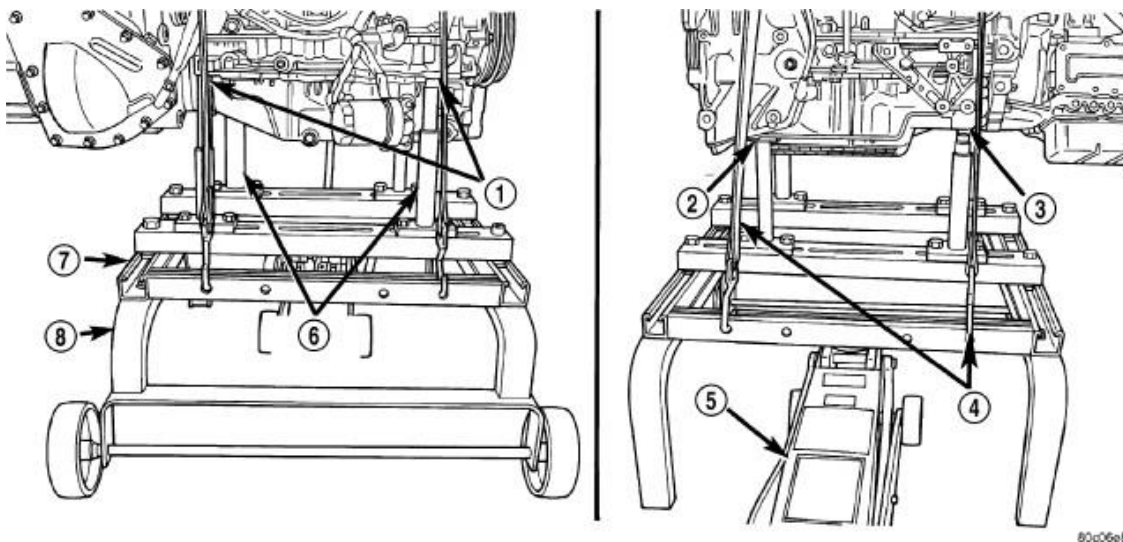
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Fig. 156: Checking Crankshaft End Play - Typical
Courtesy of CHRYSLER LLC

1. Mount a dial indicator to front of engine with the locating probe on 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. See Engine **SPECIFICATIONS** for end play specification.

Removal

REMOVAL



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Fig. 157: Positioning Engine Cradle Support Post
Courtesy of CHRYSLER LLC

- 1 - POST LOCATING HOLES IN BLOCK
- 2 - POST POSITIONED UNDER BRACKET
- 3 - POST LOCATING HOLE IN STRUT
- 4 - SAFETY STRAPS
- 5 - FLOOR JACK
- 6 - POST KIT ENGINE CRADLE 6848
- 7 - DOLLY 6135
- 8 - CRADLE 6710

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

1. Remove engine assembly from vehicle. See Engine - Removal.
2. Separate transaxle from engine.
3. Remove drive plate/flex plate.

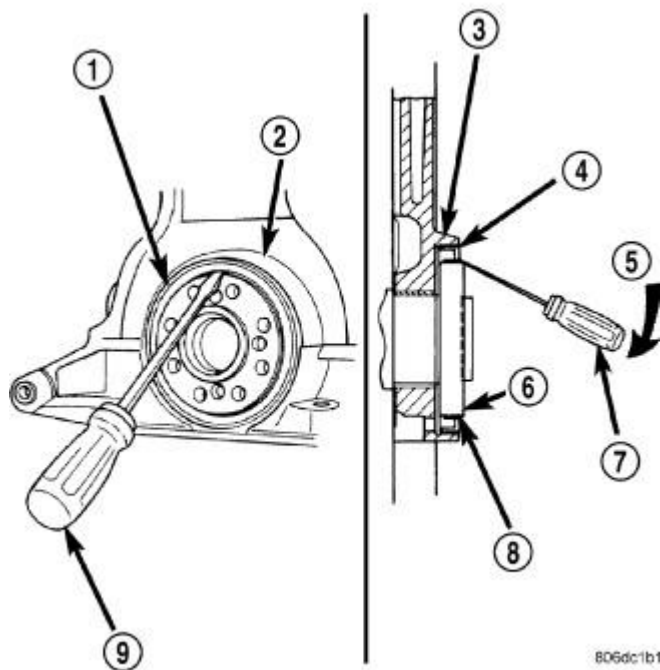


Fig. 158: Rear Crankshaft Oil Seal - Removal
Courtesy of CHRYSLER LLC

- 1 - REAR CRANKSHAFT SEAL
- 2 - ENGINE BLOCK
- 3 - ENGINE BLOCK
- 4 - REAR CRANKSHAFT SEAL METAL CASE
- 5 - PRY IN THIS DIRECTION
- 6 - CRANKSHAFT
- 7 - SCREWDRIVER

8 - REAR CRANKSHAFT SEAL DUST LIP

9 - SCREWDRIVER

4. Remove crankshaft rear oil seal (1). See Engine/Engine Block/SEAL, Crankshaft Oil - Removal.
5. Mount engine on a suitable repair stand.
6. Drain engine oil and remove oil filter.
7. Remove crankshaft vibration damper. See Engine/Engine Block/DAMPER, Vibration - Removal.
8. Remove engine mount support bracket.
9. Remove front timing belt covers. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
10. Remove the timing belt. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal.
11. Remove the rear timing belt cover. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.

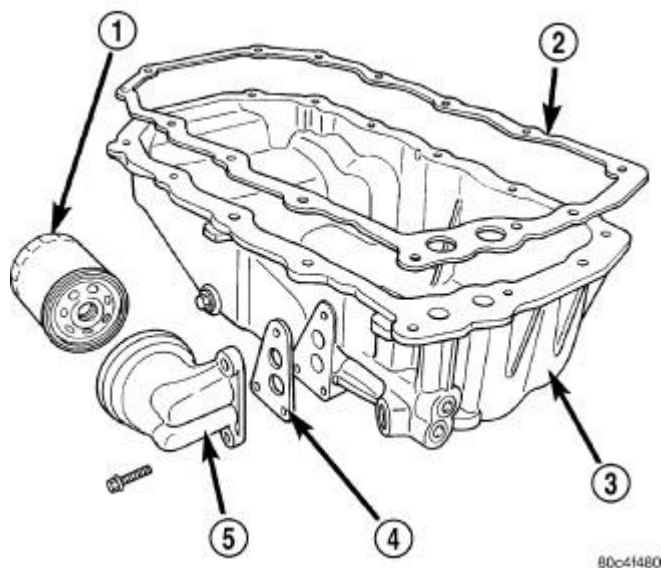


Fig. 159: Oil Pan

Courtesy of CHRYSLER LLC

1 - OIL FILTER

2 - OIL PAN GASKET

3 - OIL PAN

4 - ADAPTER GASKET

5 - OIL FILTER ADAPTER

12. Remove the oil pan (3). See Engine/Lubrication/PAN, Oil - Removal.
13. Remove oil pump pick-up tube.
14. Remove the crankshaft sprocket and oil pump. See Engine/Lubrication/PUMP, Engine Oil - Removal.
15. Remove balance shafts and housing assembly. See Engine/Engine Block/MODULE, Balance Shaft - Removal.
16. Remove crankshaft position sensor.

NOTE: If piston/connecting rod replacement is necessary, remove cylinder head. See Engine/Cylinder Head - Removal.

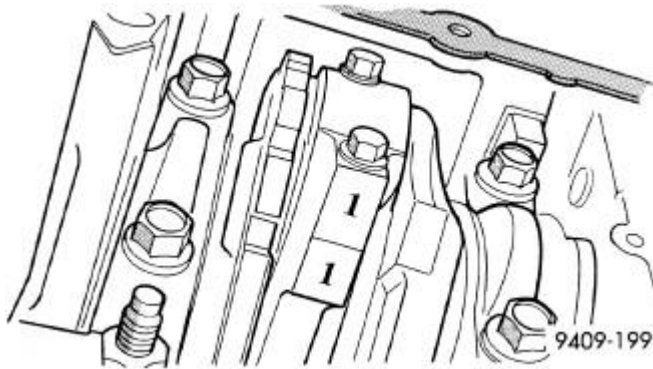


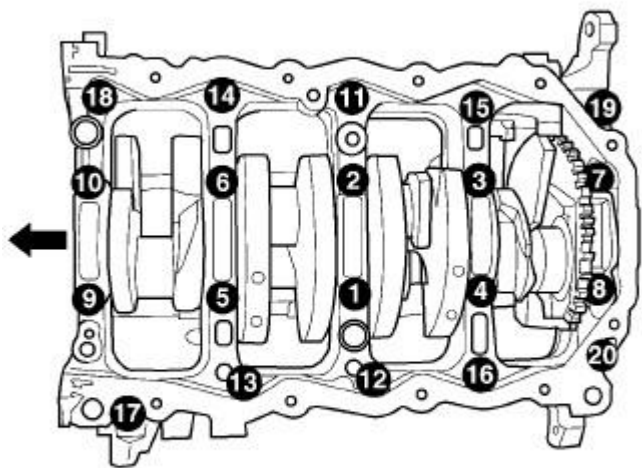
Fig. 160: Identify Connecting Rod to Cylinder-Typical
Courtesy of CHRYSLER LLC

17. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap .

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

18. Remove all connecting rod bolts and caps. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.



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Fig. 161: Bed Plate Bolt Removal Sequence
Courtesy of CHRYSLER LLC

19. Remove all bed plate bolts from the engine block .
20. Using a mallet gently tap the bedplate loose from the engine block dowel pins.

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

21. Bed plate should be removed evenly from the cylinder block dowel pins to prevent damage to the dowel pins and thrust bearing.
22. Lift out crankshaft from cylinder block. Do not damage the main bearings or journals when removing the crankshaft.
23. Remove the target ring mounting screws and discard.
24. Remove the target ring from the crankshaft.

Inspection

INSPECTION

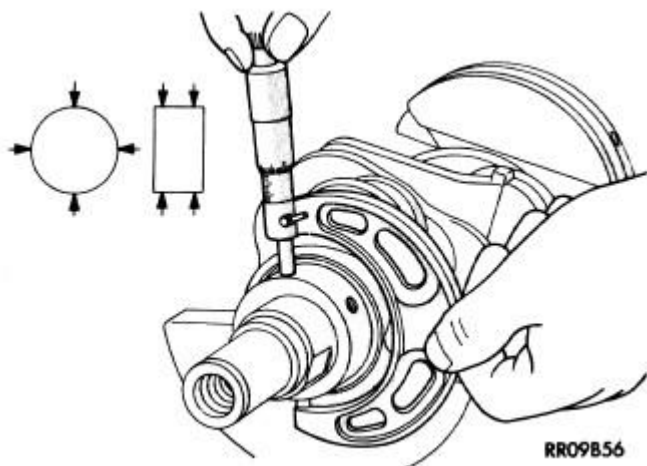


Fig. 162: Crankshaft Journal Measurements - Typical
Courtesy of CHRYSLER LLC

The crankshaft journals should be checked for excessive wear, taper and scoring . Limits of taper or out of round on any crankshaft journals should be held to 0.025 mm (0.001 in.). Journal grinding should not exceed 0.305 mm (0.012 in.) under the standard journal diameter. DO NOT grind thrust faces of No. 3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

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

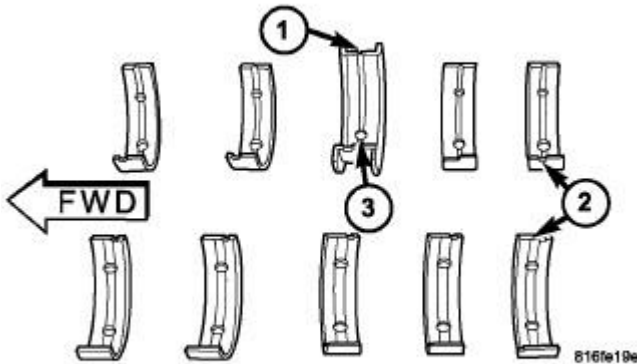
Installation**INSTALLATION****CRANKSHAFT MAIN BEARING LOCATION**

Fig. 163: MAIN BEARING ID
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Oil Groove
2 - Main Bearings
3 - Oil Hole |
|---|

CAUTION: The upper and lower thrust bearing halves are NOT interchangeable. Make certain the bearing half with the oil groove and hole is installed in the engine block.

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

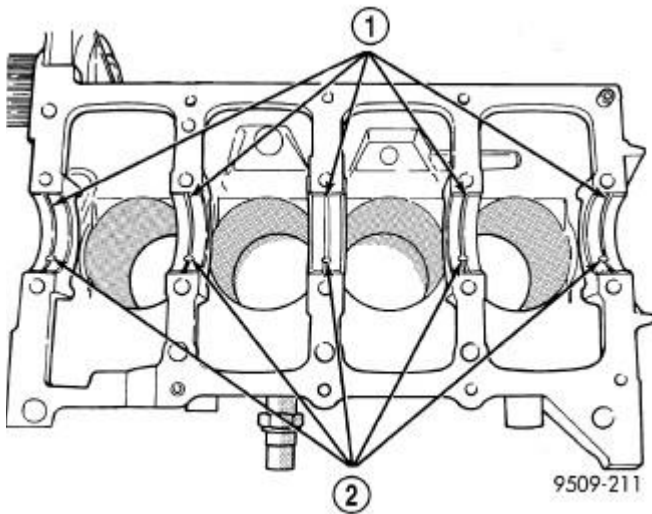


Fig. 164: Installing Main Bearing Upper Shell
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - LUBRICATION GROOVES
2 - OIL HOLES |
|--|

1. Install the main bearing upper shells with the lubrication groove and oil hole in the engine block .
2. Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.

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

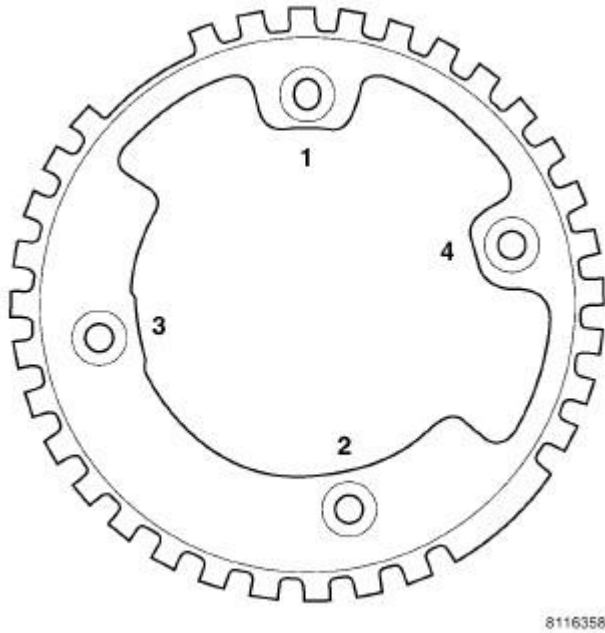


Fig. 165: Target Ring
Courtesy of CHRYSLER LLC

1 - TARGET RING

NOTE: If the crankshaft is sent out for machine work, it must be balanced as an assembly with the target ring installed.

3. Clean crankshaft and target ring with MOPAR® Brake Parts cleaner and dry with compressed air to ensure that the crankshaft mating surface and target ring mounting holes are free from oil and lock patch debris.

NOTE: Always use NEW mounting screws whether installing original or new target ring.

4. Install **NEW** mounting screws finger tight starting with the #1 location. Make sure engagement occurs with the shoulder of the screws and mounting hole before starting all other screws.
5. Torque all mounting screws with T30 torx bit to 13 N.m (110 in-lbs) following the torque sequence .

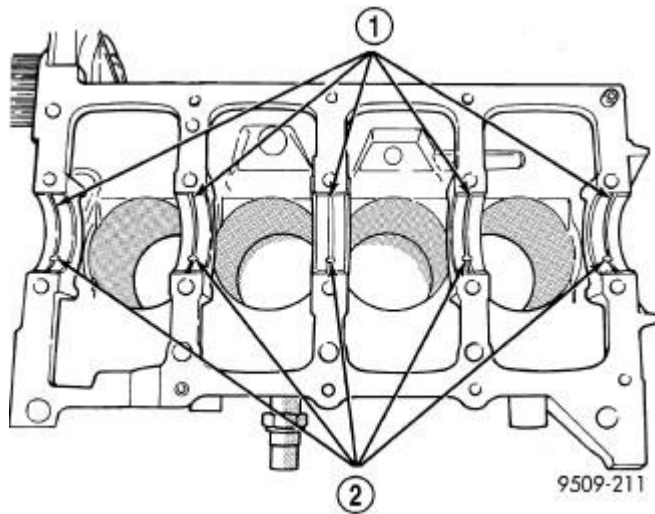


Fig. 166: Installing Main Bearing Upper Shell
Courtesy of CHRYSLER LLC

1 - LUBRICATION GROOVES
2 - OIL HOLES

6. Oil the bearings and journals. Install crankshaft in engine block.

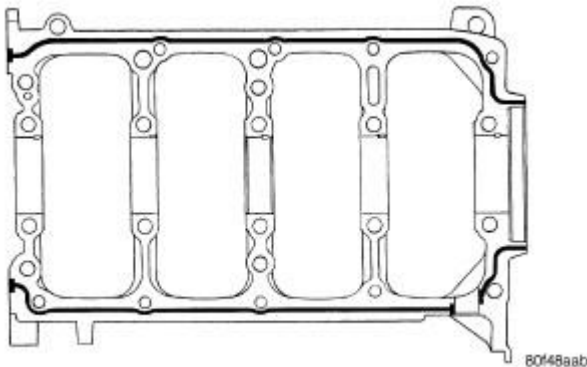
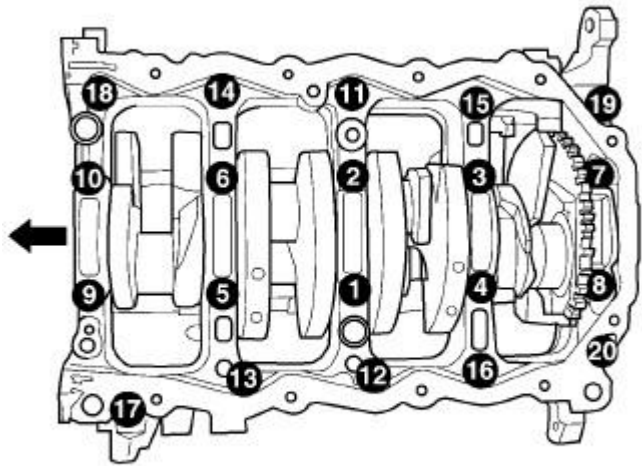


Fig. 167: Bed Plate Sealing
Courtesy of CHRYSLER LLC

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

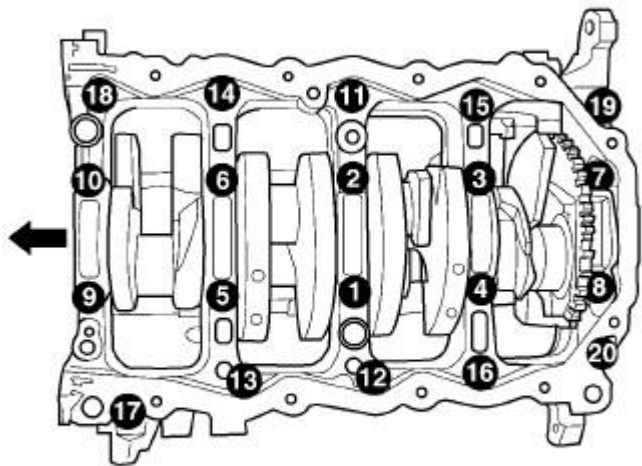
7. Apply a 1.5 to 2.0 mm (0.059 to 0.078 in.) bead of Mopar® Bed Plate Sealant to bed plate as shown in illustration .
8. Install lower main bearings into main bearing cap/bed plate. Make certain the bearing tabs are seated into the bed plate slots. Install the main bearing/bed plate into engine block.



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Fig. 168: Main Bearing Caps/Bed Plate Bolt Torque Sequence
Courtesy of CHRYSLER LLC

9. Before installing the bolts the threads should be oiled with clean engine oil, wipe off any excess oil.
10. Install main bearing cap/bed plate to engine block bolts 11, 17, and 20 finger tight. Tighten these bolts down together until the bed plate contacts the cylinder block .
11. To ensure correct thrust bearing alignment, perform the following steps:



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Fig. 169: Main Bearing Caps/Bed Plate Bolt Torque Sequence
Courtesy of CHRYSLER LLC

- Step 1: Rotate crankshaft until number 4 piston is at TDC.
 - Step 2: Move crankshaft rearward to limits of travel.
 - Step 3: Then, move crankshaft forward to limits of travel.
 - Step 4: Wedge an appropriate tool between the rear of the cylinder block (**NOT BED PLATE**) and the rear crankshaft counterweight. This will hold the crankshaft in it's furthest forward position.
 - Step 5: Install and tighten bolts (1-10) in sequence shown in illustration to 41 N.m (30 ft. lbs.).
 - Step 6: Remove wedge tool used to hold crankshaft.
12. Tighten bolts (1-10) again to 41 N.m (30 ft. lbs.) in sequence shown in illustration .
 13. Install main bearing bed plate to engine block bolts (11-20), and torque each bolt to 28 N.m (250 in. lbs.) in sequence shown in illustration .
 14. Tighten bolts (1-10) to 75 N.m (55 ft. lbs.) in sequence shown in illustration .
 15. Tighten bolts (11-20) again to 28 N.m (250 in. lbs.) in sequence shown in illustration .
 16. After the main bearing bed plate is installed, check the crankshaft turning torque. The turning torque should not exceed 5.6 N.m (50 in. lbs.).
 17. Check crankshaft end play. See Engine/Engine Block/CRANKSHAFT - Standard Procedure.
 18. Install connecting rod bearings and caps. **Do Not Reuse Connecting Rod Bolts.** Torque connecting rod bolts to 27 N.m (20 ft. lbs.) plus 1/4 turn.
 19. Install balance shafts and housing assembly. See Engine/Engine Block/MODULE, Balance Shaft - Installation.

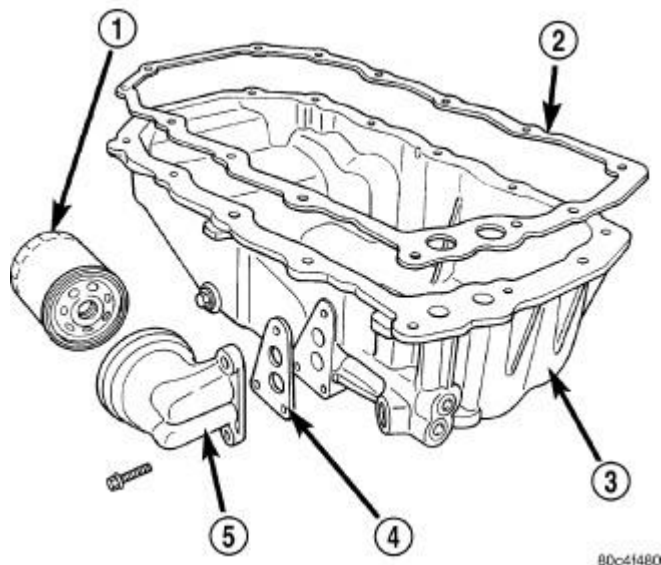


Fig. 170: Oil Pan
Courtesy of CHRYSLER LLC

1 - OIL FILTER

- 2 - OIL PAN GASKET
- 3 - OIL PAN
- 4 - ADAPTER GASKET
- 5 - OIL FILTER ADAPTER

20. Install the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Installation**.
21. Install oil pump pick-up tube. Torque fastener to 23 N.m (200 in. lbs.).
22. Install the oil pan (3). See **Engine/Lubrication/PAN, Oil - Installation**.
23. Install crankshaft position sensor.
24. Install cylinder head if it was removed. See **Engine/Cylinder Head - Installation**.

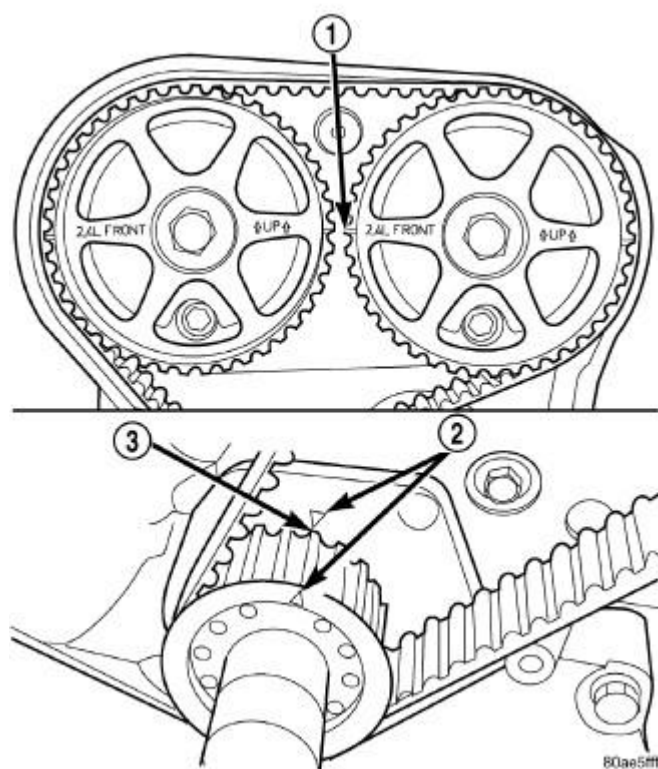
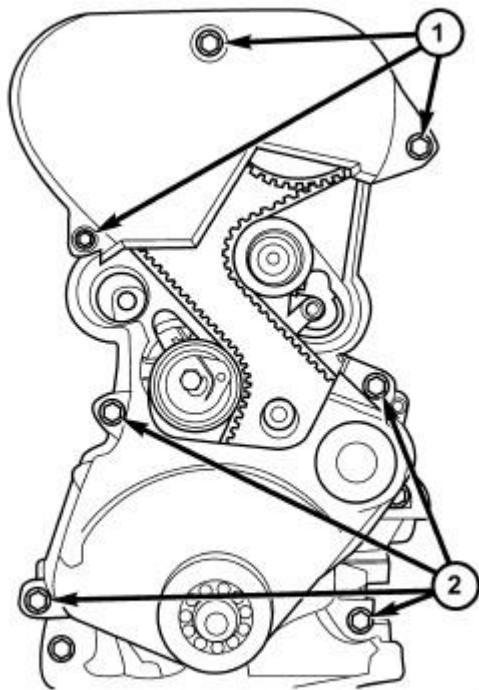


Fig. 171: Crankshaft and Camshaft Timing
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT TIMING MARKS
- 2 - CRANKSHAFT TDC MARKS
- 3 - TRAILING EDGE OF SPROCKET TOOTH

25. Install the timing belt rear cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.
26. Install front crankshaft oil seal and crankshaft sprocket. See **Engine/Engine Block/SEAL, Crankshaft Oil - Installation**.
27. Install the timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation**.



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Fig. 172: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

1 - UPPER COVER FASTENERS 2 - LOWER COVER FASTENERS
--

28. Install the timing belt front covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
29. Install engine mount support bracket.
30. Install crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation.**
31. Install **NEW** oil filter.

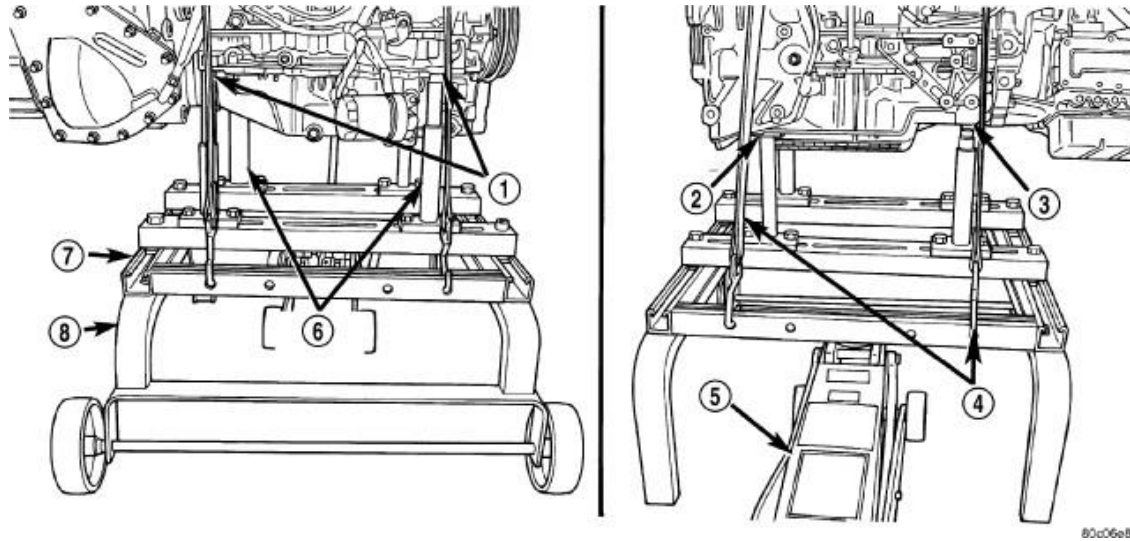


Fig. 173: Positioning Engine Cradle Support Post
Courtesy of CHRYSLER LLC

- 1 - POST LOCATING HOLES IN BLOCK
- 2 - POST POSITIONED UNDER BRACKET
- 3 - POST LOCATING HOLE IN STRUT
- 4 - SAFETY STRAPS
- 5 - FLOOR JACK
- 6 - POST KIT ENGINE CRADLE 6848
- 7 - DOLLY 6135
- 8 - CRADLE 6710

32. Remove engine from repair stand and position on Dolly 6135 (7) and Cradle 6710A (8). Install safety straps (4) around the engine to cradle and tighten and lock them into position.
33. Install crankshaft rear oil seal. See **Engine/Engine Block/SEAL, Crankshaft Oil - Installation.**
34. Install drive plate/flex plate. Apply Mopar® Lock AND Seal Adhesive to bolt threads and tighten to 95 N.m (70 ft. lbs.).
35. Attach transaxle to engine. Tighten attaching bolts to 101 N.m (75 ft. lbs.).
36. Install the engine assembly. See **Engine - Installation.**

DAMPER, VIBRATION

Removal

REMOVAL

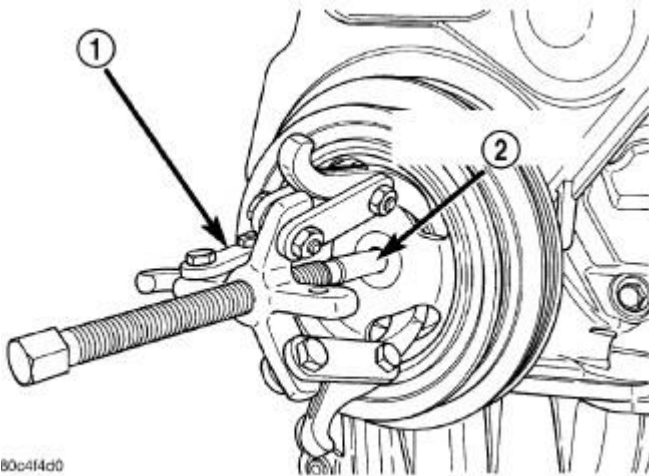


Fig. 174: Crankshaft Damper-Removal
Courtesy of CHRYSLER LLC

1 - PULLER 1026

2 - CRANKSHAFT DAMPER REMOVAL INSERT 6827A

1. Remove accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
2. Remove lower splash shield.
3. Remove crankshaft damper bolt.
4. Remove damper by using Puller 1026 (1) and Crankshaft Damper Removal Insert 6827A (2) .

Installation

INSTALLATION

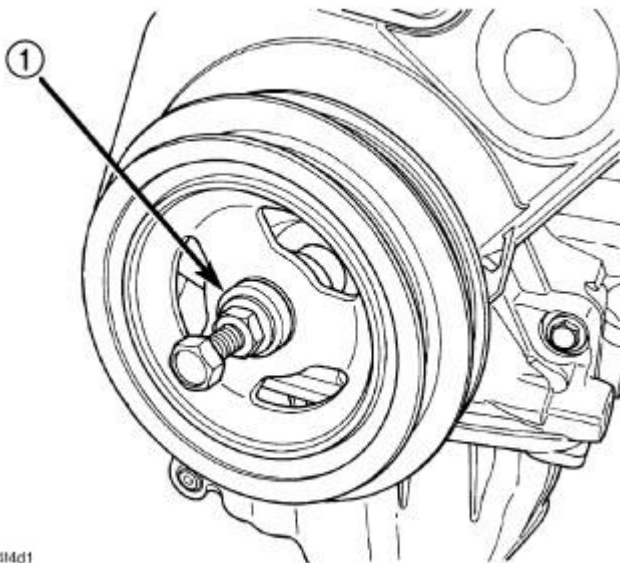


Fig. 175: Crankshaft Damper-Installation

Courtesy of CHRYSLER LLC

1 - CRANKSHAFT DAMPER/SPROCKET INSTALLER 6792

1. Install crankshaft damper using Crankshaft Damper/Sprocket Installer 6792 (1) (M12 1.75 x 150 mm bolt, washer, thrust bearing and nut).

NOTE: Lubricate the threads of the M12 1.75 x 150 mm bolt using Mopar® Nickel Anti-seize Compound or equivalent, before beginning to press the damper on.

2. Remove Crankshaft Damper/Sprocket Installer 6792 (1).
3. Apply Mopar® Lock AND Seal Adhesive (Medium Strength Threadlocker) to crankshaft damper bolt and tighten to 136 N.m (100 ft. lbs.) .
4. Install accessory drive belts. Refer to Cooling/Accessory Drive/BELT, Serpentine - Installation .

FLEXPLATE

Removal

REMOVAL

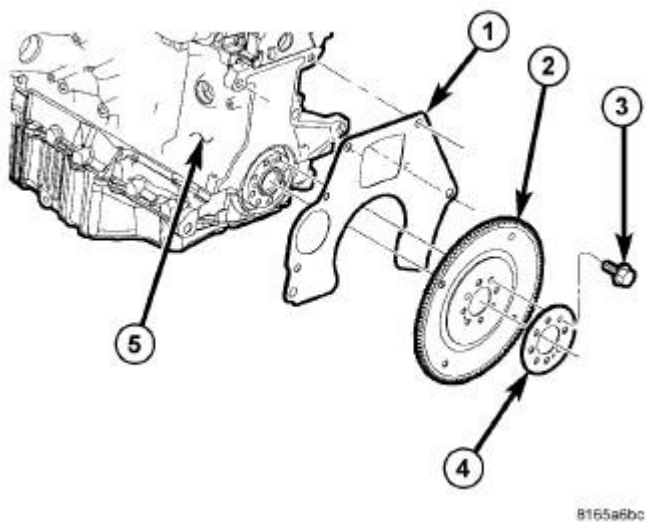
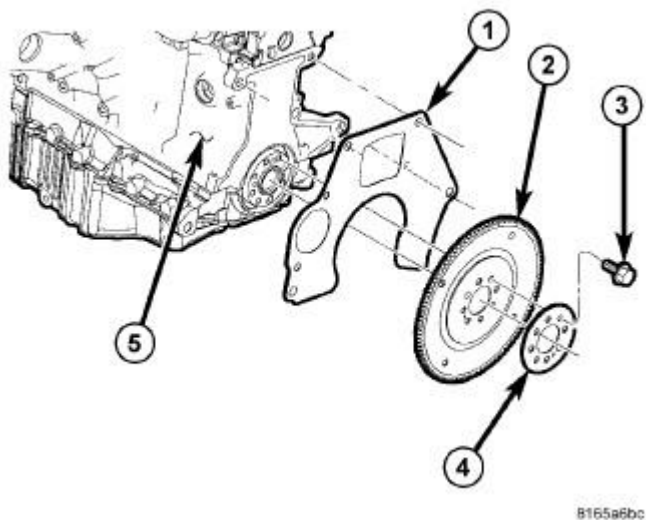


Fig. 176: FLEX PLATE

Courtesy of CHRYSLER LLC

1. Remove transaxle
2. Remove flex plate retaining bolts (3).
3. Remove shim (4) and flex plate (2).

Installation**INSTALLATION****Fig. 177: FLEX PLATE****Courtesy of CHRYSLER LLC**

1. Install flex plate (2) and shim (4).
2. Install bolts (3) and torque bolts to 95 N.m (70 ft. lbs.).
3. Install transaxle.

MODULE, BALANCE SHAFT**Description****DESCRIPTION**

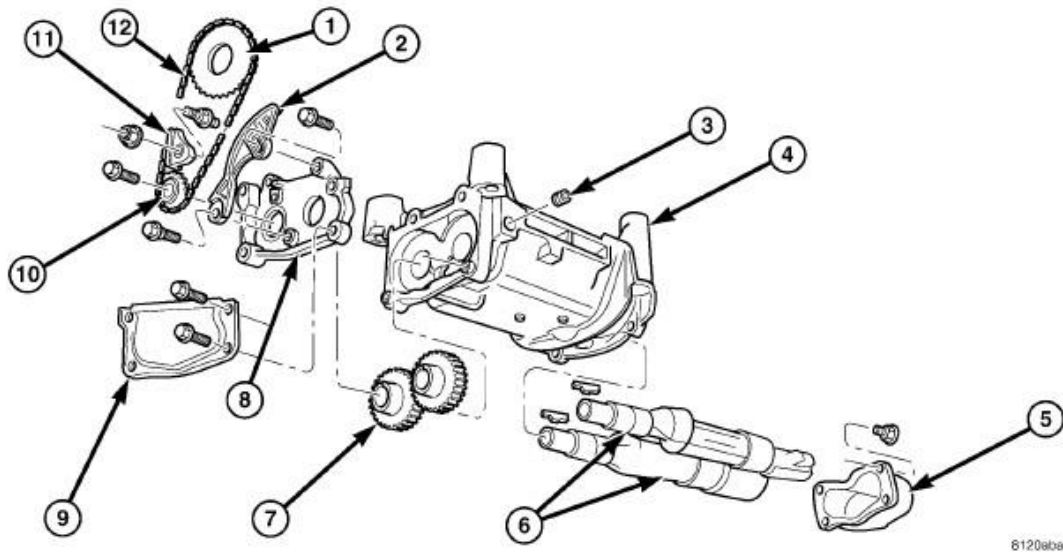


Fig. 178: Balance Shafts and Carrier Assembly
Courtesy of CHRYSLER LLC

1 - SPROCKET	7 - GEARS
2 - TENSIONER	8 - GEAR COVER
3 - PLUG	9 - CHAIN COVER
4 - CARRIER	10 - SPROCKET
5 - REAR COVER	11 - GUIDE
6 - BALANCE SHAFTS	12 - CHAIN

The 2.4L engine is equipped with two nodular cast iron balance shafts (6) installed in a cast aluminum carrier (4) attached to the lower cylinder block .

Operation

OPERATION

The balance shafts are driven by the crankshaft via a roller chain and sprockets. The balance shafts are connected by helical gears. The dual counter rotating shafts decrease second order vertical shaking forces caused by component movement.

Removal

REMOVAL

BALANCE SHAFTS/CHAIN/SPROCKETS

NOTE: For service procedures requiring only temporary relocation of carrier assembly, refer to BALANCE SHAFT CARRIER procedure.

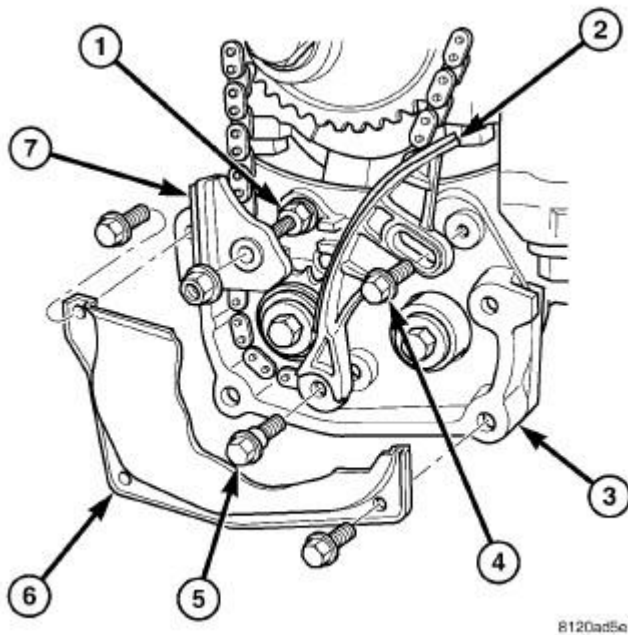


Fig. 179: Chain Cover, Guide and Tensioner
Courtesy of CHRYSLER LLC

- 1 - STUD
- 2 - TENSIONER (ADJUSTER)
- 3 - GEAR COVER
- 4 - ADJUSTER SCREW
- 5 - SHOULDERED PIVOT SCREW
- 6 - CHAIN COVER (CUTAWAY)
- 7 - GUIDE

1. Drain engine oil.
2. Remove the oil pan and pick-up tube. See **Engine/Lubrication/PAN, Oil - Removal**.
3. If replacing crankshaft sprocket, remove oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Removal**.
4. Remove chain cover (6) , guide (7) and tensioner (2). Discard pivot screw (5) and adjuster screw (4) .

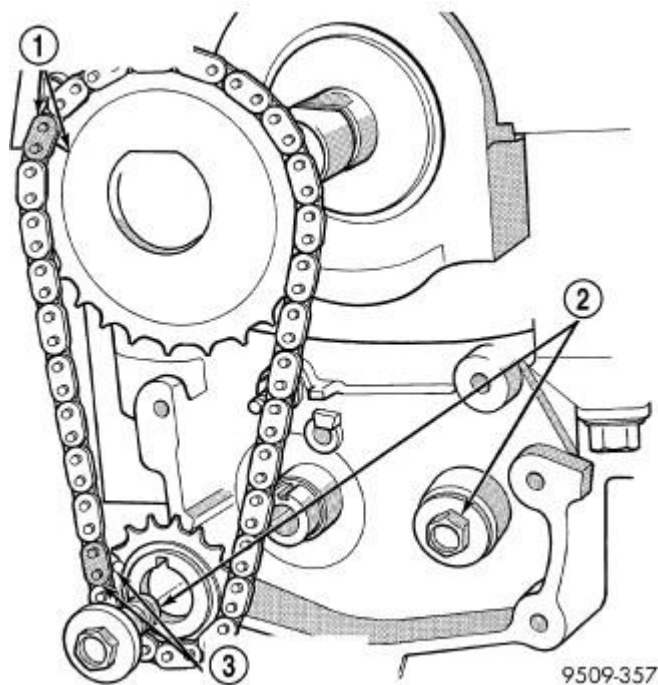


Fig. 180: Drive Chain and Sprockets
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - NICKEL PLATED LINK AND MARK
2 - GEAR/SPROCKET SCREWS
3 - NICKEL PLATED LINK AND DOT</p> |
|--|

5. Remove screw retaining balance shaft drive sprocket (2) . Remove chain and sprocket.
6. Using two wide pry bars, work the crankshaft sprocket back and forth until it is off the crankshaft shaft.

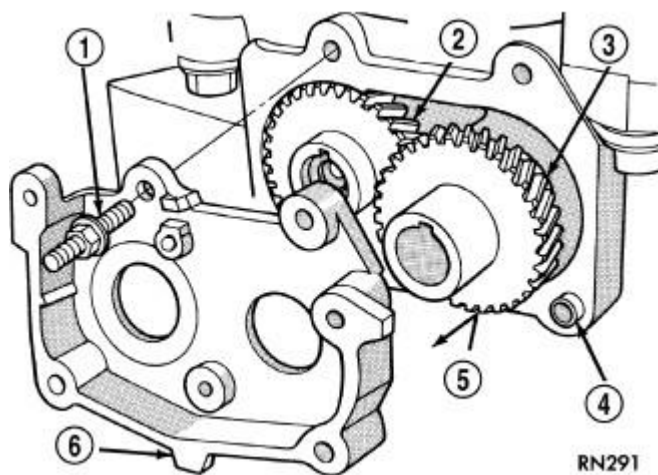


Fig. 181: Gear Cover and Gears
Courtesy of CHRYSLER LLC

- 1 - STUD (DOUBLE ENDED)
- 2 - DRIVE GEAR
- 3 - DRIVEN GEAR
- 4 - CARRIER DOWEL
- 5 - GEAR(S)
- 6 - GEAR COVER

7. Remove gear cover retaining stud (1) (double ended to also retain chain guide). Remove cover (6) and balance shaft gears (5) .

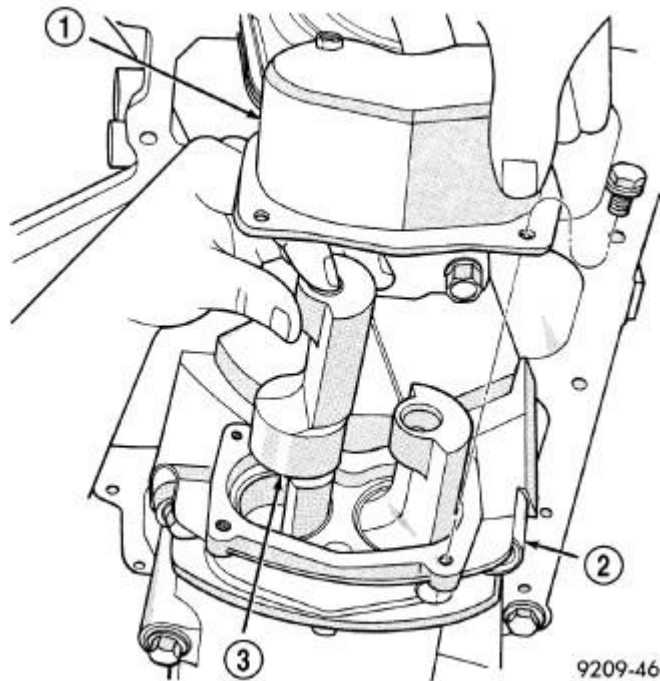


Fig. 182: Balance Shaft - Removal/Installation
Courtesy of CHRYSLER LLC

- 1 - REAR COVER
- 2 - CARRIER
- 3 - BALANCE SHAFT

8. Remove rear cover (1) and balance shafts (3) .
9. Remove four carrier to crankcase attaching bolts to separate carrier from engine bedplate.

BALANCE SHAFT CARRIER

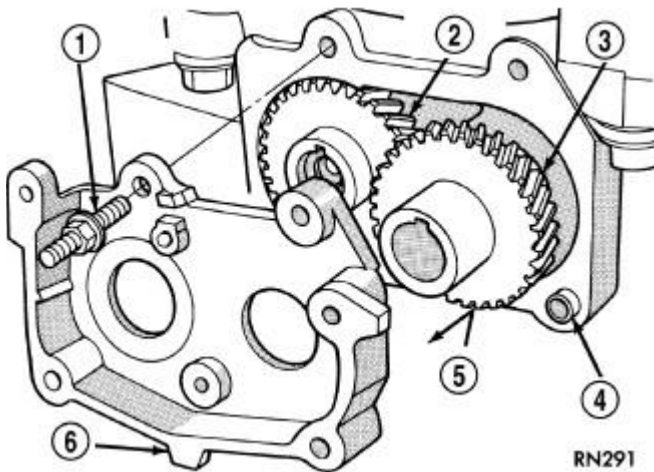


Fig. 183: Gear Cover and Gears
Courtesy of CHRYSLER LLC

- 1 - STUD (DOUBLE ENDED)
- 2 - DRIVE GEAR
- 3 - DRIVEN GEAR
- 4 - CARRIER DOWEL
- 5 - GEAR(S)
- 6 - GEAR COVER

The following components will remain intact during carrier removal: Gear cover (6), gears (5), balance shafts and the rear cover .

1. Drain engine oil.
2. Remove the oil pan and pick-up tube. See **Engine/Lubrication/PAN, Oil - Removal**.

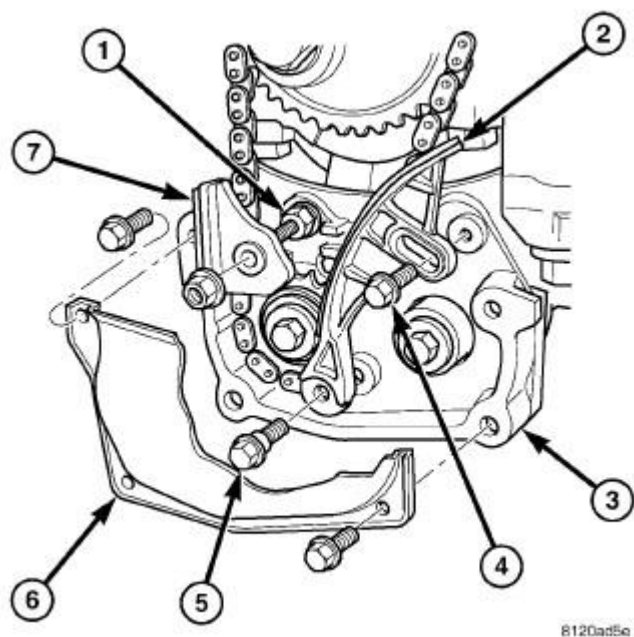


Fig. 184: Chain Cover, Guide and Tensioner
Courtesy of CHRYSLER LLC

- 1 - STUD
- 2 - TENSIONER (ADJUSTER)
- 3 - GEAR COVER
- 4 - ADJUSTER SCREW
- 5 - SHOULDERED PIVOT SCREW
- 6 - CHAIN COVER (CUTAWAY)
- 7 - GUIDE

3. Remove chain cover (6), guide (7), and tensioner (2) .

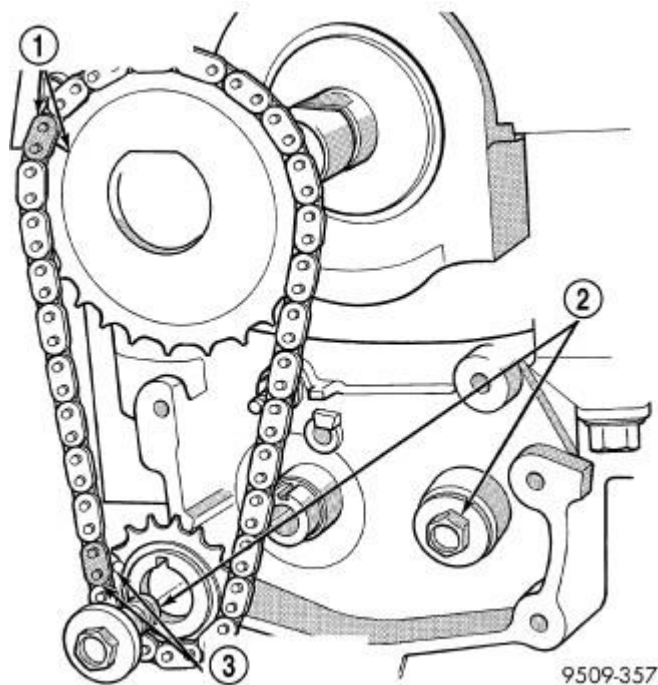


Fig. 185: Drive Chain and Sprockets
Courtesy of CHRYSLER LLC

1 - NICKEL PLATED LINK AND MARK 2 - GEAR/SPROCKET SCREWS 3 - NICKEL PLATED LINK AND DOT

4. Remove screw retaining balance shaft drive sprocket (2) .
5. Move balance shaft inboard through drive chain sprocket. Sprocket will hang in lower chain loop.
6. Remove carrier to crankcase attaching bolts to remove carrier.

Installation

INSTALLATION

BALANCE SHAFT INSTALLATION/TIMING

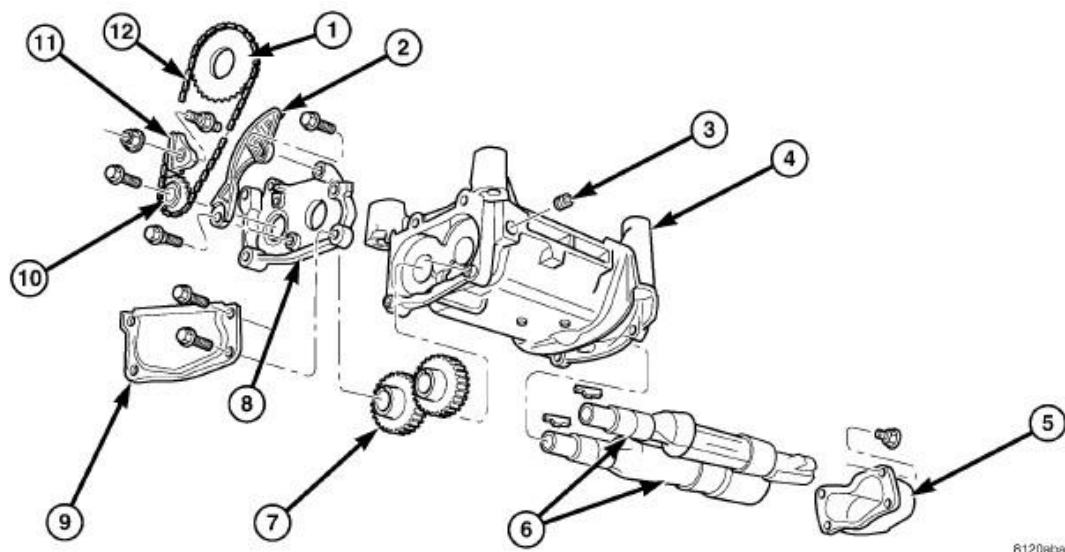


Fig. 186: Balance Shafts and Carrier Assembly
Courtesy of CHRYSLER LLC

Balance shaft (6) and carrier (4) assembly installation is the reverse of the removal procedure. **During installation crankshaft-to-balance shaft timing must be established. Refer to VALVE TIMING.**

1. With balance shafts (6) installed in carrier (4) position carrier on crankcase and install four attaching bolts and tighten to 54 N.m (40 ft. lbs.).

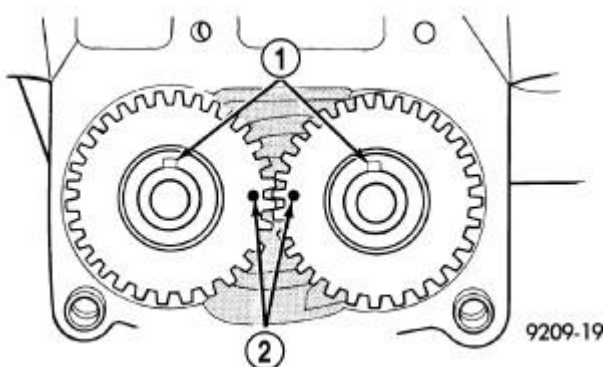


Fig. 187: Gear Timing
Courtesy of CHRYSLER LLC

2. Turn balance shafts until both shaft key ways are up (1), parallel to vertical centerline of engine. Install short hub drive gear on sprocket driven shaft and long hub gear on gear driven shaft. After installation gear and balance shaft keyways must be up (1) with gear timing marks meshed (2) as shown in illustration.
3. Install gear cover and tighten double ended stud/washer fastener to 12 N.m (105 in. lbs.).

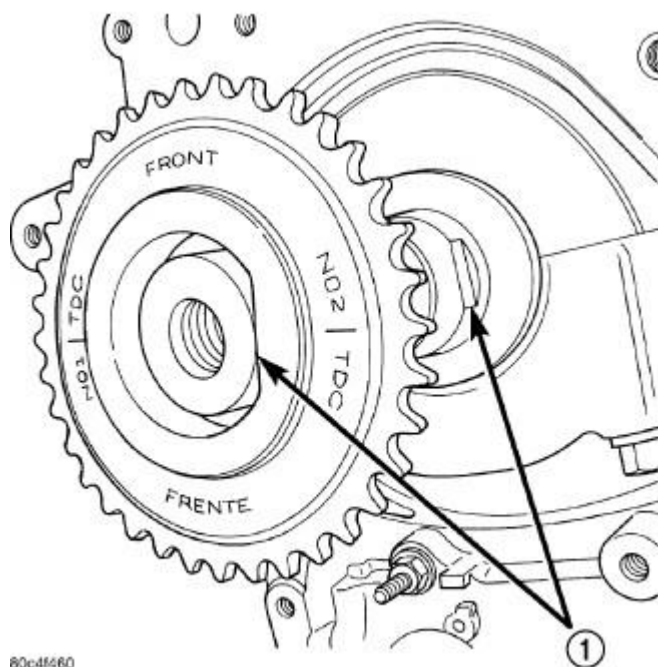


Fig. 188: Balance Shaft Sprocket Alignment to Crankshaft
Courtesy of CHRYSLER LLC

4. Align flat on balance shaft drive sprocket to the flat on crankshaft (1).

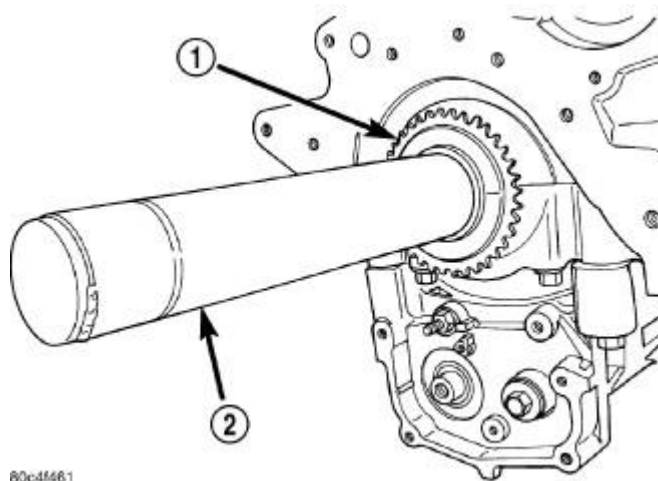
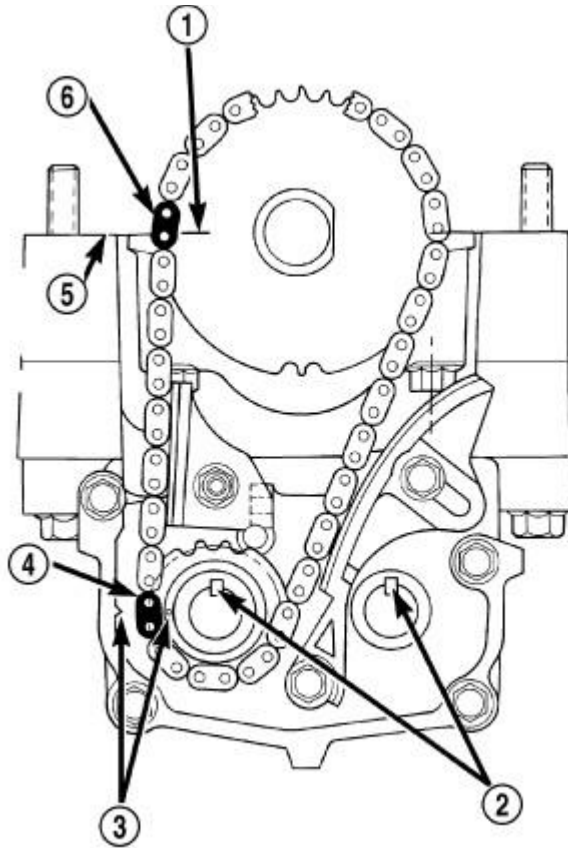


Fig. 189: Balance Shaft Drive
Courtesy of CHRYSLER LLC

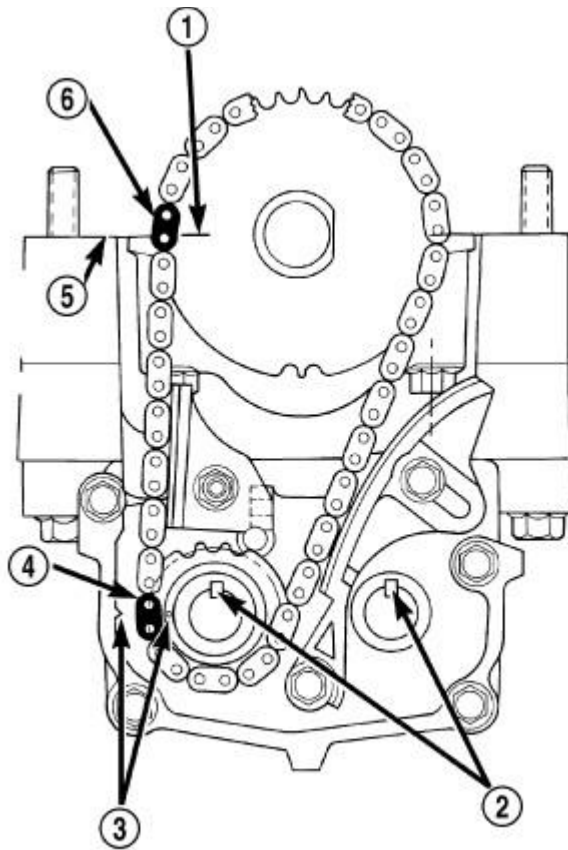
5. Install balance shaft drive sprocket on crankshaft using Balance Shaft Sprocket Installer 6052 (2).



80c070e0

Fig. 190: Balance Shaft Timing
Courtesy of CHRYSLER LLC

6. Turn crankshaft until number 1 cylinder is at top dead center (TDC). The timing marks on the chain sprocket (1) should line up with the parting line (5) on the left side of number one main bearing cap.
7. Place chain over crankshaft sprocket so that the plated link of the chain is over the number 1 cylinder timing mark on the balance shaft crankshaft sprocket.
8. Place balance shaft sprocket into the timing chain and align the timing mark on the sprocket (dot) with the (lower) plated link on the chain.



80c070e0

Fig. 191: Balance Shaft Timing
Courtesy of CHRYSLER LLC

NOTE: The lower plated link (4) is 8 links from the upper link (6).

9. With balance shaft keyways pointing up (2) (12 o'clock) slide the balance shaft sprocket onto the nose of the balance shaft. The balance shaft may have to be pushed in slightly to allow for clearance.

NOTE: The timing mark on the sprocket, the (lower) nickel plated link, and the arrow on the side of the gear cover should line up when the balance shafts are timed correctly.

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

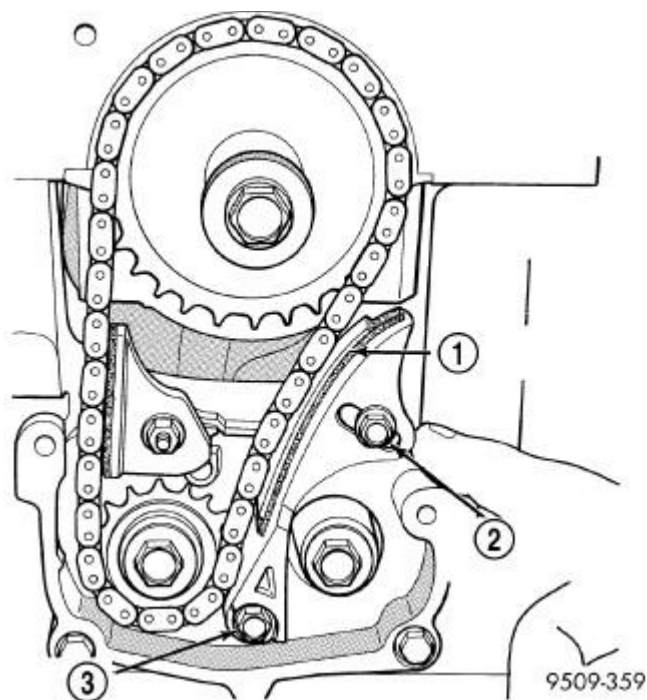


Fig. 192: Chain Tension Adjustment
Courtesy of CHRYSLER LLC

11. CHAIN TENSIONING:

- a. Install chain tensioner (2) loosely assembled with **new** adjuster screw and shouldered pivot screw.
 - b. Position guide on double ended stud making sure tab on the guide fits into slot on the gear cover. Install and tighten nut/washer assembly to 12 N.m (105 in. lbs.).
 - c. Place a shim (1) 1 mm (0.039 in.) thick x 70 mm (2.75 in.) long between tensioner and chain. Push tensioner and shim up against the chain. **Apply firm pressure 2.5-3 Kg (5.5-6.6 lbs.) directly behind the adjustment slot to take up all slack.** Chain must have shoe radius contact as shown in illustration.
 - d. With the load applied, tighten top tensioner adjuster bolt (2) first, then bottom shouldered pivot bolt (3). Tighten bolts to 12 N.m (105 in. lbs.). Remove shim (1).
 - e. Install carrier covers and tighten screws to 12 N.m (105 in. lbs.).
12. If removed, install oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Installation.**
 13. Install pick-up tube and oil pan. See **Engine/Lubrication/PAN, Oil - Installation.**
 14. Fill engine crankcase with proper oil to correct level.

RING(S), PISTON

Standard Procedure

PISTON RING - FITTING

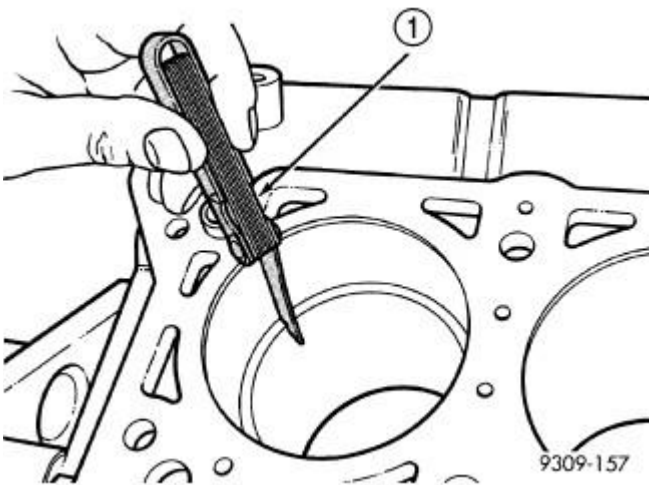


Fig. 193: Piston Ring Gap
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch) from bottom of cylinder bore. Check gap with feeler gauge (1) . Refer to Engine Specifications. See Engine **SPECIFICATIONS**.

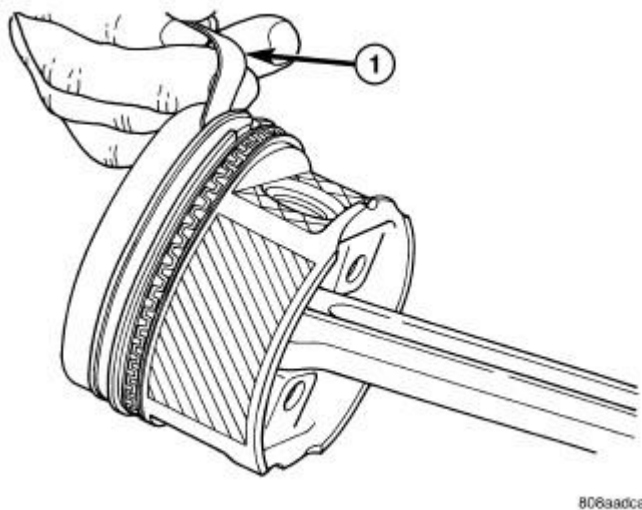


Fig. 194: Piston Ring Side Clearance
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

2. Check piston ring to groove side clearance with a feeler gauge (1) . Refer to Engine Specifications. See Engine **SPECIFICATIONS**.

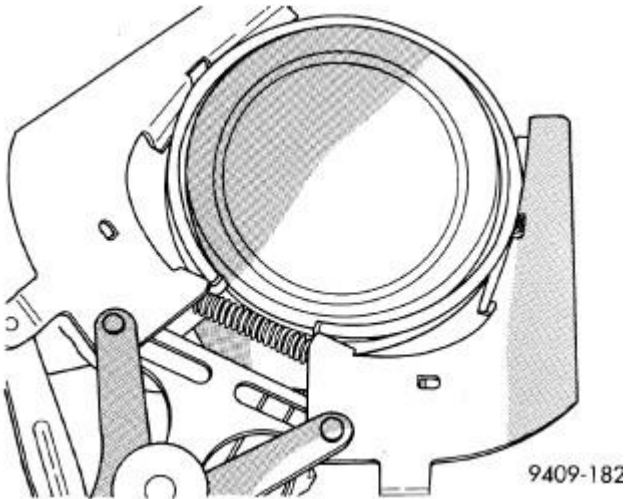
Removal**REMOVAL**

Fig. 195: Piston Rings-Removing and Installing
Courtesy of CHRYSLER LLC

1. Using a suitable ring expander, remove upper and intermediate piston rings .
2. Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.
3. Clean ring grooves of any carbon deposits.

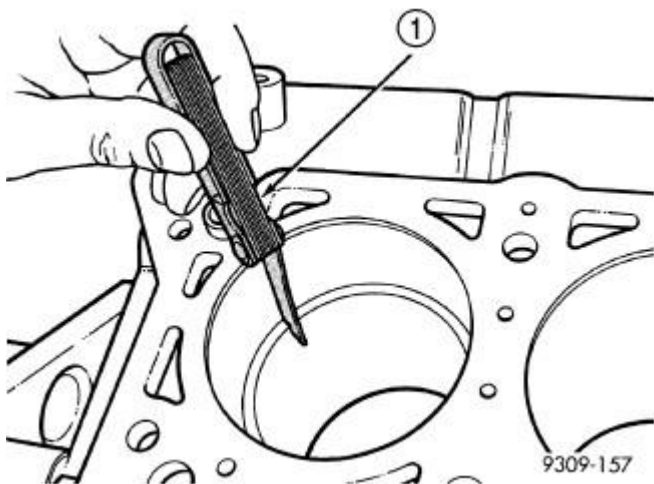
Installation**INSTALLATION**

Fig. 196: Piston Ring Gap
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

NOTE: Piston ring end gap must be checked prior to installing piston rings on the piston.

1. Check piston ring end gap with a feeler gauge (1). See Engine/Engine Block/RING(S), Piston - Standard Procedure.

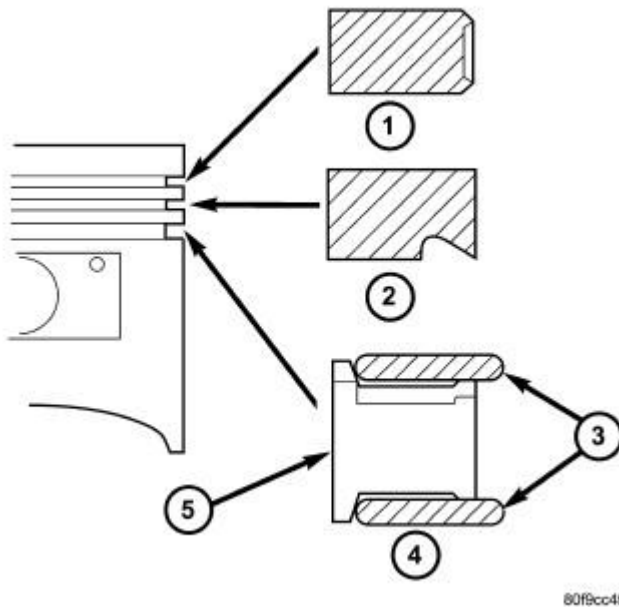


Fig. 197: Piston Ring Installation
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - NO. 1 PISTON RING
2 - NO. 2 PISTON RING
3 - SIDE RAIL
4 - OIL RING
5 - SPACER EXPANDER |
|--|

NOTE: The identification mark on face of upper and intermediate piston rings must point toward top of piston.

CAUTION: Install piston rings in the following order:

2. Install rings with manufacturers identification mark facing up, to the top of the piston.
 - Oil ring expander.
 - Upper oil ring side rail.
 - Lower oil ring side rail.

- No. 2 Intermediate piston ring.
 - No. 1 Upper piston ring.
3. Install oil ring expander.

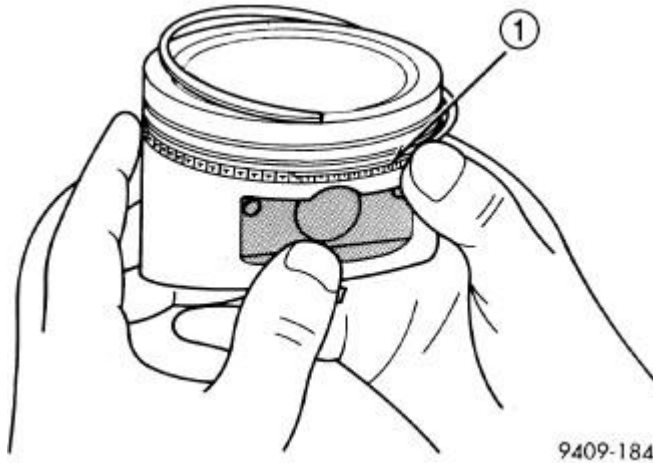


Fig. 198: Installing Side Rail
Courtesy of CHRYSLER LLC

1 - SIDE RAIL END

4. Install upper side rail first and then the lower side rail. Install the side rails 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.**

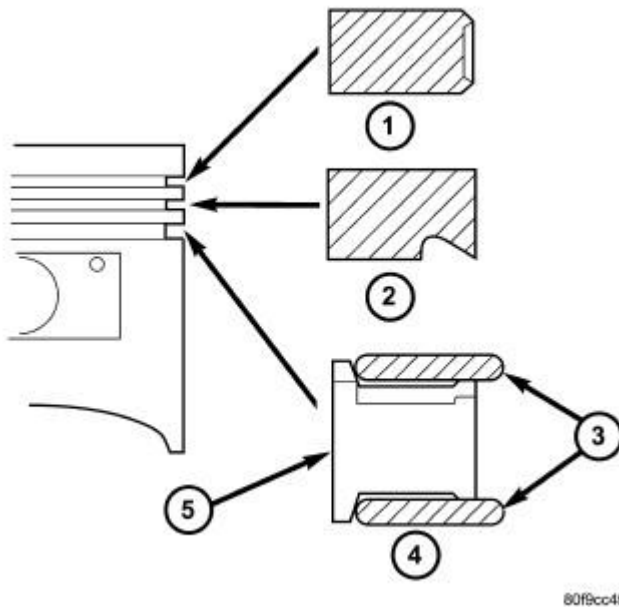


Fig. 199: Installing Piston Ring

Courtesy of CHRYSLER LLC

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

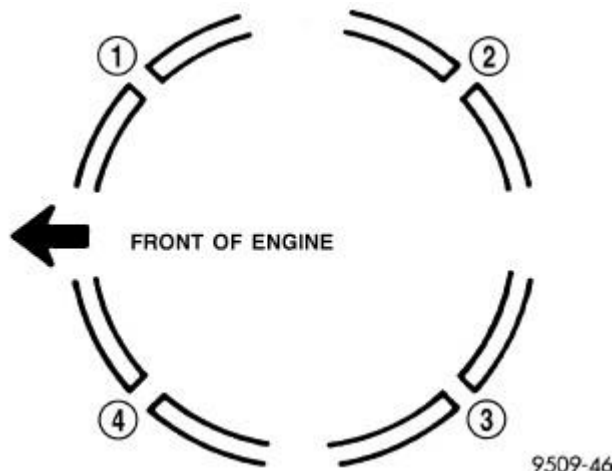


Fig. 200: Piston Ring End Gap Position
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - GAP OF LOWER SIDE RAIL |
| 2 - NO. 1 RING GAP |
| 3 - GAP OF UPPER SIDE RAIL |
| 4 - NO. 2 RING GAP AND SPACER EXPANDER GAP |

6. Position piston ring end gaps as shown in illustration.
7. 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

Non-Turbo

The pistons are made of a cast aluminum alloy. The pistons have pressed-in pins attached to forged powdered metal connecting rods. The pistons pin is offset 1 mm (0.0394 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. Hex head cap screws are used to provide alignment and durability in the assembly. The pistons and connecting rods are serviced as an assembly.

Turbo

The pistons are made of a cast aluminum alloy. The pistons have full floating pins attached to forged steel connecting rods. The pistons pin is offset 1 mm (0.0394 in.) towards the thrust side of the piston. The connecting rods are a cracked cap design and are not repairable. Hex head cap screws are used to provide

alignment and durability in the assembly. The connecting rod has an oil squirt hole to provide extra cylinder wall lubrication. The pistons and connecting rods are serviced as an assembly.

Standard Procedure

PISTON TO CYLINDER BORE FITTING

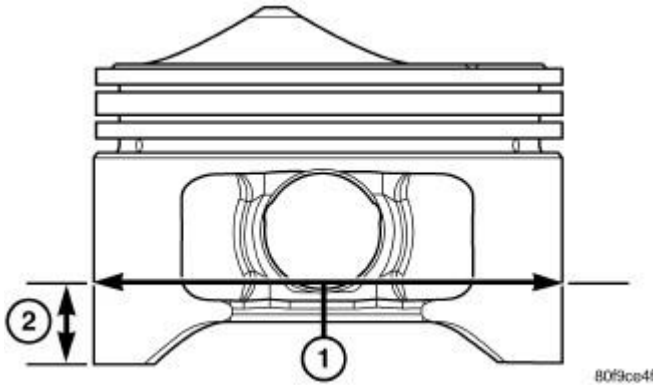


Fig. 201: Piston Measurement - Non-Turbo
Courtesy of CHRYSLER LLC

1 - PISTON DIAMETER
2 - 14 mm (0.551 in.)

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

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin.

Non-Turbo:

- Measurement should be taken approximately 14 mm (0.551 in.) from the bottom of the skirt (2) as shown in illustration .

Turbo:

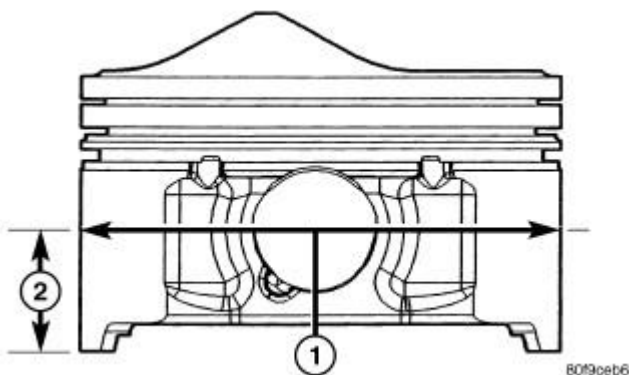


Fig. 202: Piston Measurement - Turbo
Courtesy of CHRYSLER LLC

1 - PISTON DIAMETER

2 - 22 mm (0.866 in.)

- Measurement should be taken approximately 22 mm (0.866 in.) from the bottom of the skirt (2) as shown in illustration .

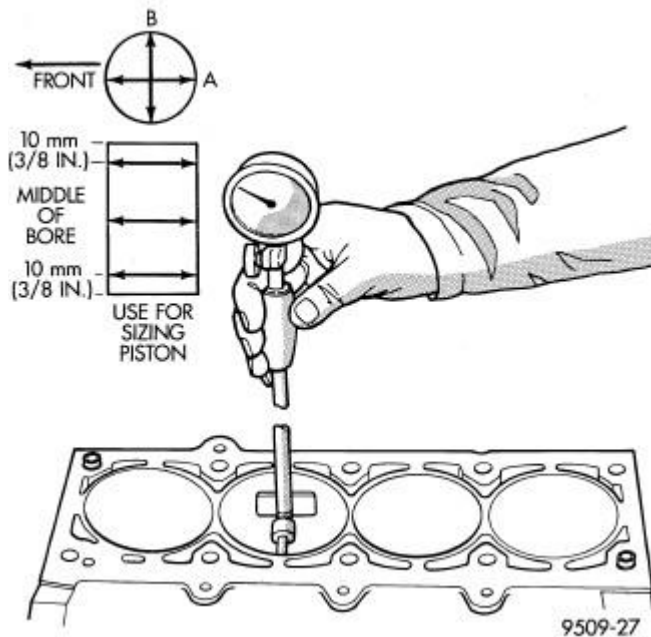


Fig. 203: Checking Cylinder Bore
Courtesy of CHRYSLER LLC

Cylinder bores should be measured halfway down the cylinder bore and transverse (measurement location B) to the engine crankshaft center line shown in illustration . Refer to for Engine Specifications. See Engine **SPECIFICATIONS**. Correct piston to bore clearance must be established in order to assure quiet and economical operation.

Removal

REMOVAL

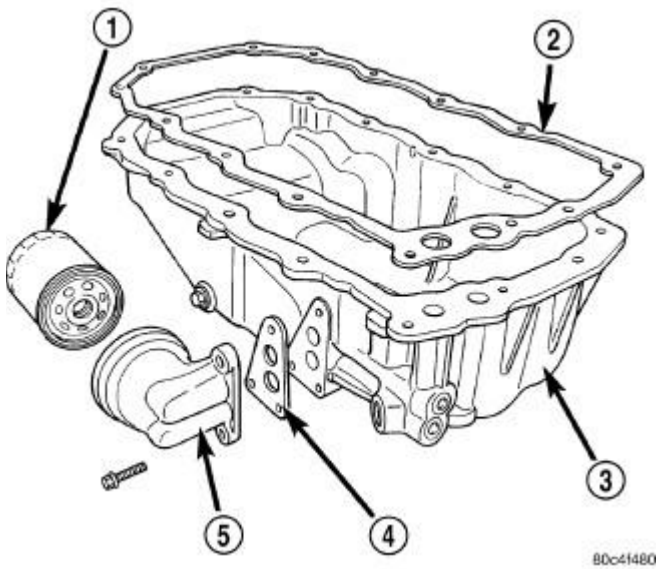


Fig. 204: Oil Pan
Courtesy of CHRYSLER LLC

1. Remove cylinder head. See **Engine/Cylinder Head - Removal.**
2. Remove oil pan (3). See **Engine/Lubrication/PAN, Oil - Removal.**

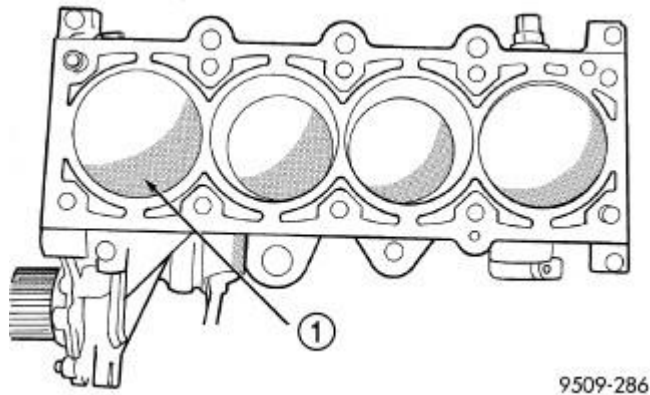


Fig. 205: Piston Markings
Courtesy of CHRYSLER LLC

3. Remove Balance Shaft Carrier Assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Removal.**
4. 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 .**
5. Pistons have a directional stamping in the front half of the piston facing towards the **front** of engine .
6. Pistons and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each piston is centered in the bore.

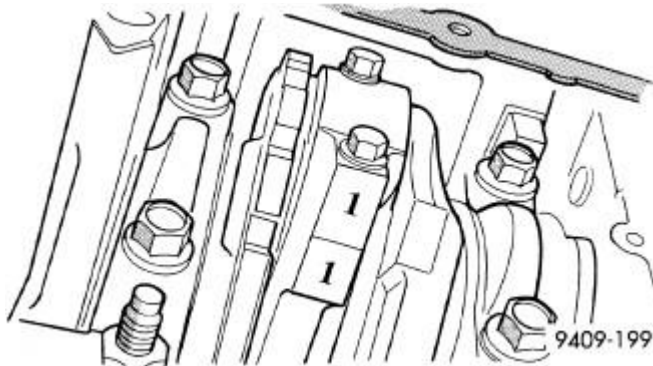


Fig. 206: Identify Connecting Rod to Cylinder - Typical
 Courtesy of CHRYSLER LLC

7. Using a permanent ink or paint marker, identify cylinder number on each connecting rod cap.

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

8. Remove connecting rod bolts and cap. Care should be taken not to damage the fracture rod and cap surfaces.

NOTE: Do not reuse connecting rod bolts.

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

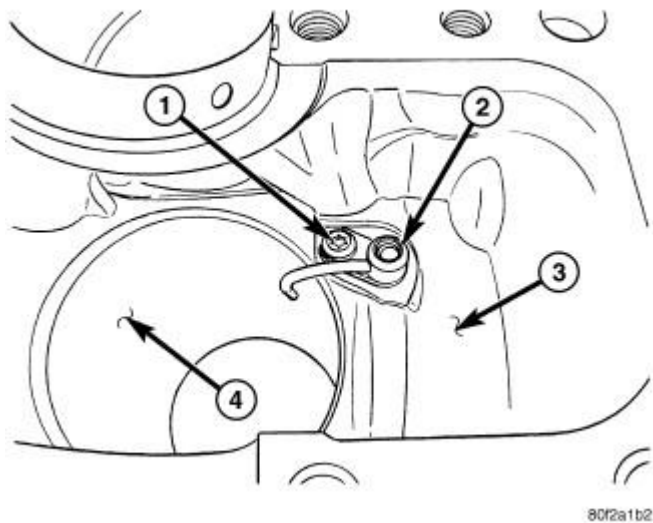


Fig. 207: Oil Jet Fastener - 2.4L Turbo
 Courtesy of CHRYSLER LLC

NOTE: On Turbocharger equipped engines, be careful not to damage the oil jet (2) when removing piston/connecting rod .

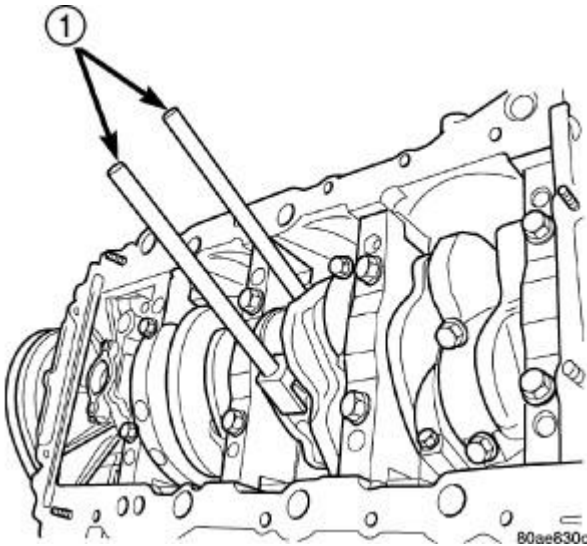


Fig. 208: Connecting Rod Guides - Typical
Courtesy of CHRYSLER LLC

9. To protect crankshaft journal and fractured rod surfaces, install Connecting Rod Guides 8189 onto connecting rod. Carefully push each piston and rod assembly out of cylinder bore.
10. Remove Connecting Rod Guides 8189, connecting rod guides and reinstall bearing cap on the mating rod.

NOTE: Piston and rods are serviced as an assembly.

11. Repeat procedure for each piston and connecting rod assembly.
12. Remove piston rings. See Engine/Engine Block/RING(S), Piston - Removal.

Installation

INSTALLATION

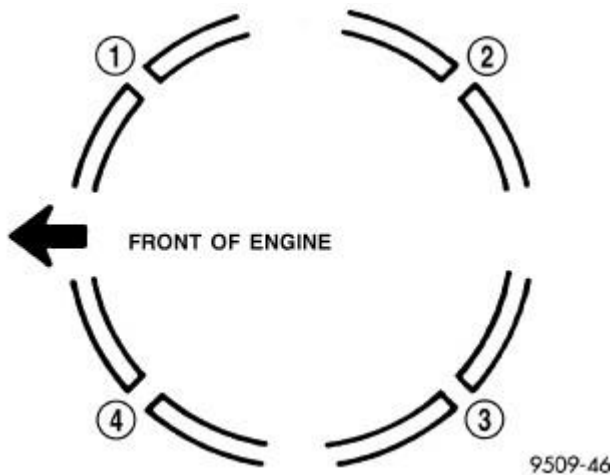


Fig. 209: Piston Ring End Gap Position

Courtesy of CHRYSLER LLC

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

1. Install piston rings on piston. See **Engine/Engine Block/RING(S), Piston - Installation**
2. Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring gap .
3. Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in illustration . As viewed from top.

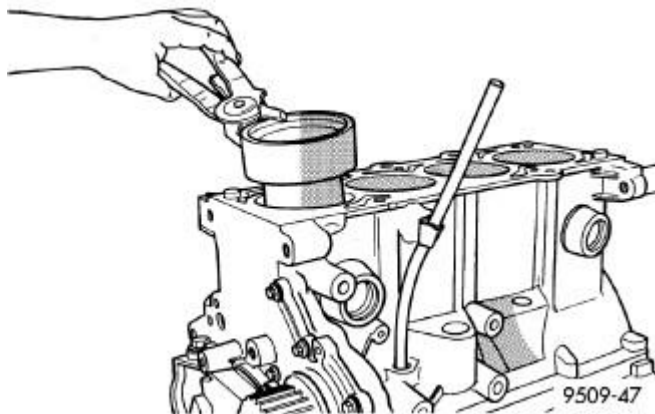


Fig. 210: Piston-Installation

Courtesy of CHRYSLER LLC

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

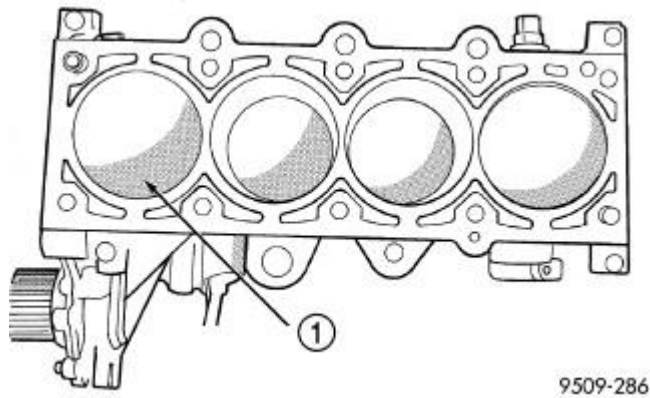


Fig. 211: Piston Markings
Courtesy of CHRYSLER LLC

1 -
DIRECTIONAL
ARROW WILL
BE
IMPRINTED
IN THIS AREA

NOTE: If installing used piston/rod assembly, they must be installed in their original position.

5. The directional stamp (1) on the piston should face toward the front of the engine .
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Lubricate connecting rod journal with clean engine oil.

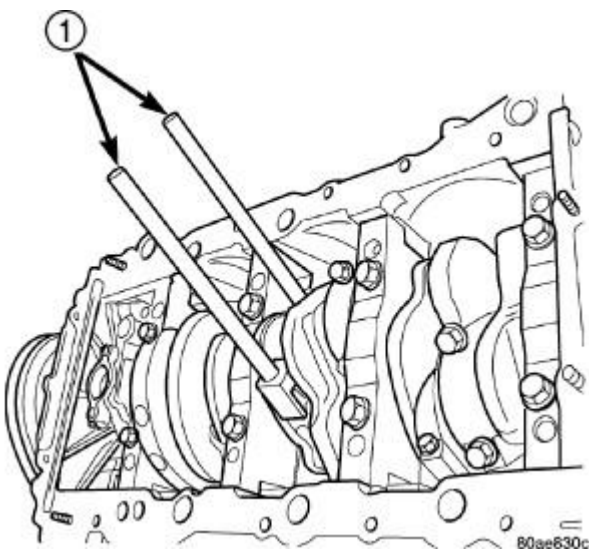


Fig. 212: Connecting Rod Guides - Typical
Courtesy of CHRYSLER LLC

7. Install connecting rod upper bearing half into connecting rod. Install Connecting Rods Guides 8189 (1) onto connecting rod .
8. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.
9. Remove Connecting Rod Guides 8189.

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

10. Before installing the **NEW** bolts, the threads should be coated with clean engine oil.
11. Install connecting rod lower bearing half into connecting rod cap. Install connecting rod cap.
12. Install each bolt finger tight then alternately torque each bolt to assemble the cap properly.
13. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

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

- Tighten the bolts to 27 N.m (20 ft. lbs.).
- Tighten the connecting rod bolts an additional **1/4 TURN**.

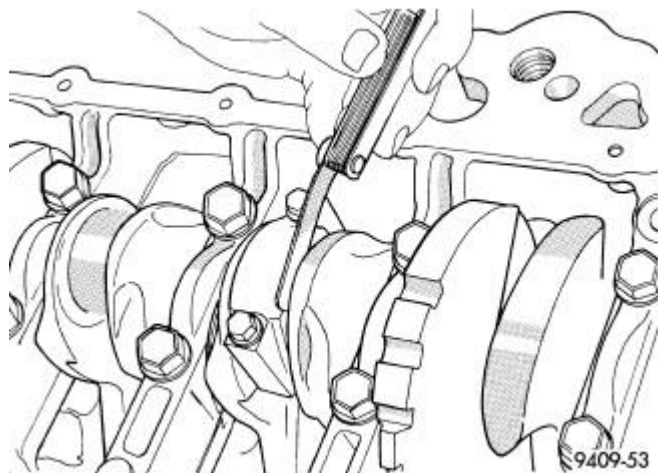


Fig. 213: Checking Connecting Rod Side Clearance - Typical
Courtesy of CHRYSLER LLC

14. Using a feeler gauge, check connecting rod side clearance . See Engine **SPECIFICATIONS** for connecting rod side clearance.
15. Install Balance Shaft Carrier Assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Installation**

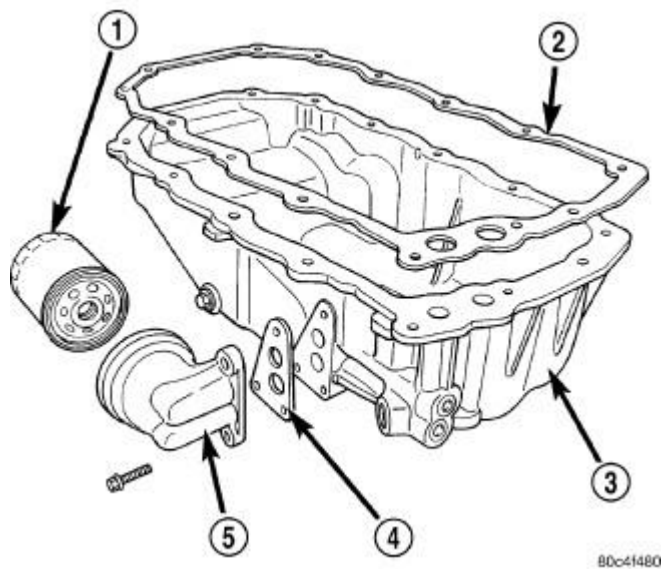


Fig. 214: Oil Pan

Courtesy of CHRYSLER LLC

- 1 - OIL FILTER
- 2 - OIL PAN GASKET
- 3 - OIL PAN
- 4 - ADAPTER GASKET
- 5 - OIL FILTER ADAPTER

16. Install oil pan (3). See [Engine/Lubrication/PAN, Oil - Installation](#).
17. Install cylinder head. See [Engine/Cylinder Head - Installation](#).
18. Start engine and check for leaks.

SEAL, CRANKSHAFT OIL, FRONT

Removal

REMOVAL

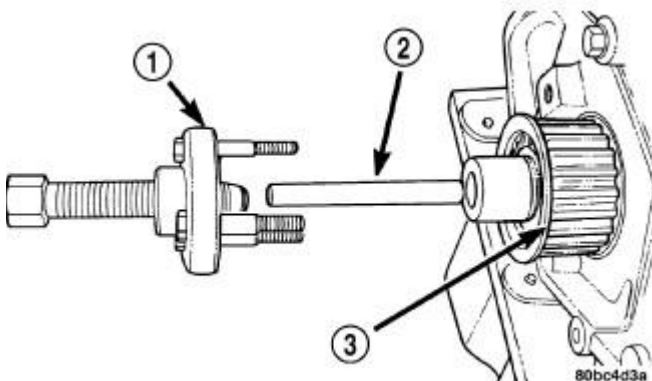
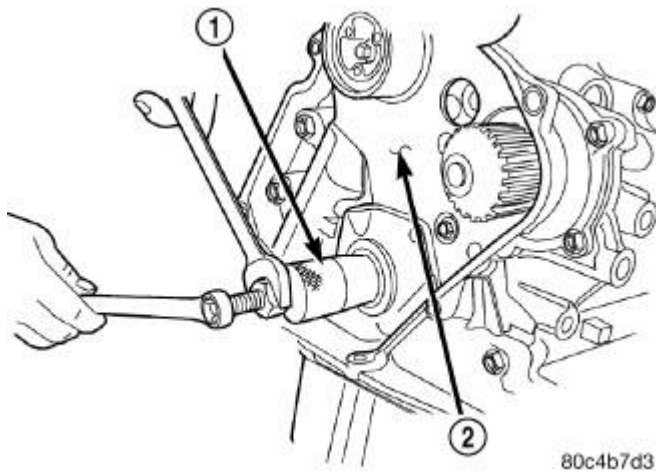


Fig. 215: Crankshaft Sprocket - Removal

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - CRANKSHAFT SPROCKET REMOVER 6793
2 - CRANKSHAFT SPROCKET REMOVER INSERT C-4685-C2
3 - CRANKSHAFT SPROCKET |
|---|

1. Remove the crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Removal**.
2. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal**.
3. Remove crankshaft sprocket (3) using Crankshaft Sprocket Remover 6793 (1) and Crankshaft Sprocket Remover Insert C-4685-C2 (2) .

**Fig. 216: Front Crankshaft Oil Seal - Removal**

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CRANKSHAFT FRONT SEAL REMOVER 6771
2 - REAR TIMING BELT COVER |
|--|

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

4. Use Crankshaft Front Seal Remover 6771 (1) to remove front crankshaft oil seal . Be careful not to damage the seal surface of cover.

Installation**INSTALLATION**

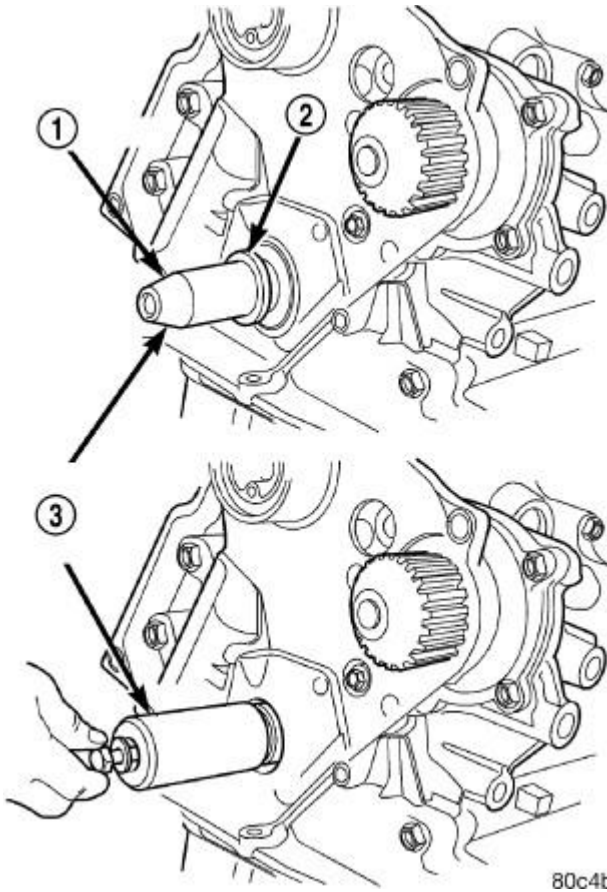
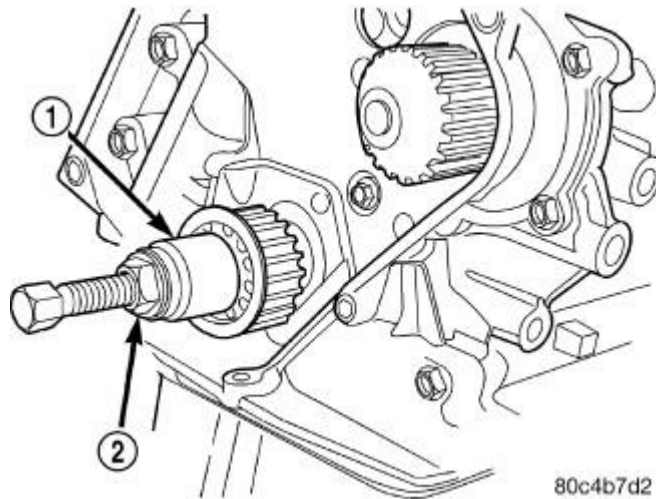


Fig. 217: Crankshaft Front Oil Seal - Installation
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - SEAL PROTECTOR 6780 - 2
2 - SEAL
3 - FRONT CRANKSHAFT SEAL INSTALLER 6780 - 1 |
|---|

1. Install new seal by using Front Crankshaft Seal Installer 6780 (3) .
2. Place seal (2) into opening with seal spring towards the inside of engine. Install seal until flush with cover.

**Fig. 218: Crankshaft Sprocket - Installation**

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CRANKSHAFT DAMPER/SPROCKET INSTALLER
6792
2 - TIGHTEN NUT TO INSTALL |
|--|

3. Install crankshaft sprocket using Crankshaft Damper/Sprocket Installer 6792 (1) .
4. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation.**
5. Install crankshaft vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation.**

SEAL, CRANKSHAFT OIL, REAR**Removal****REMOVAL**

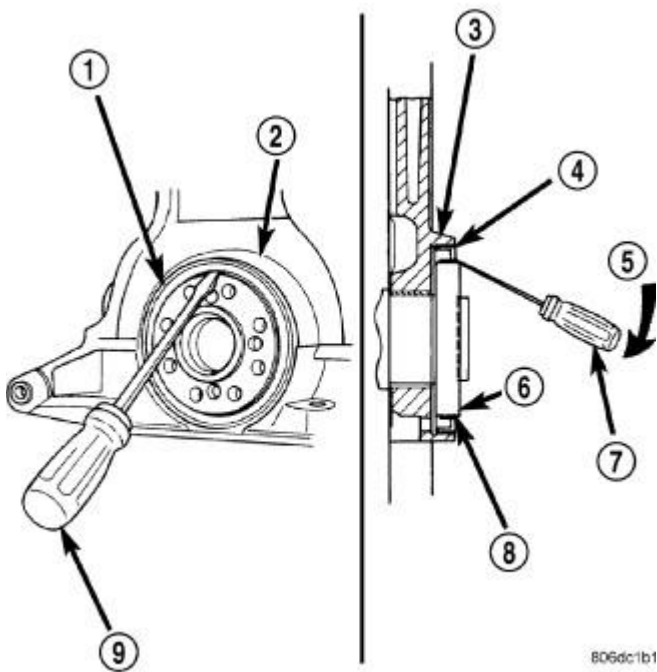


Fig. 219: Rear Crankshaft Oil Seal - Removal
Courtesy of CHRYSLER LLC

- 1 - REAR CRANKSHAFT SEAL
- 2 - ENGINE BLOCK
- 3 - ENGINE BLOCK
- 4 - REAR CRANKSHAFT SEAL METAL CASE
- 5 - PRY IN THIS DIRECTION
- 6 - CRANKSHAFT
- 7 - SCREWDRIVER
- 8 - REAR CRANKSHAFT SEAL DUST LIP
- 9 - SCREWDRIVER

1. Remove transaxle. Refer to appropriate Transmission SERVICE INFORMATION for procedure.
2. Remove flex plate.
3. Insert a 3/16 flat bladed screwdriver (7,9) between the dust lip (8) and the metal case (4) of the crankshaft seal. Angle the screwdriver through the dust lip against metal case of the seal. Pry out seal.

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

Installation

INSTALLATION

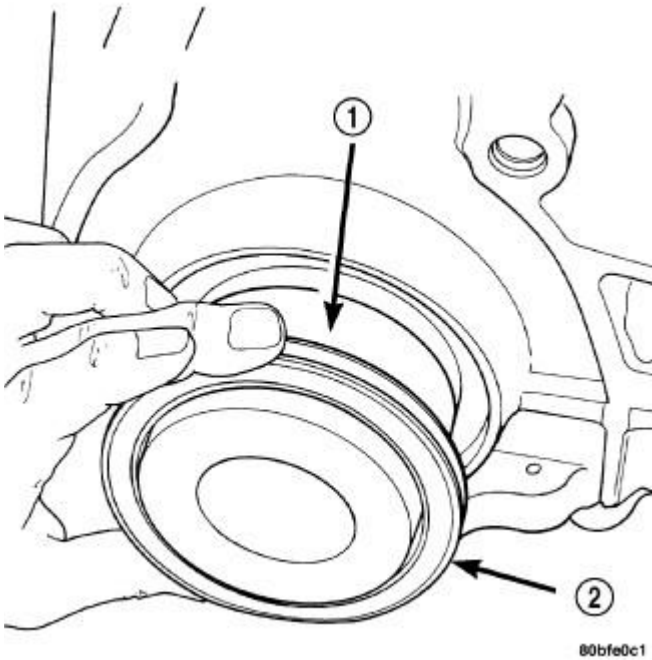


Fig. 220: Rear Crankshaft Seal and Special Tool 6926-1
Courtesy of CHRYSLER LLC

1 - REAR CRANKSHAFT SEAL GUIDE 6926 2 - SEAL

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

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

1. Place Rear Crankshaft Seal Guide 6926-1 (1) on crankshaft .
2. Position seal (2) over guide tool . Rear Crankshaft Seal Guide 6926-1 should remain on crankshaft during installation of seal. Ensure that the lip of the seal is facing towards the crankcase during installation.

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

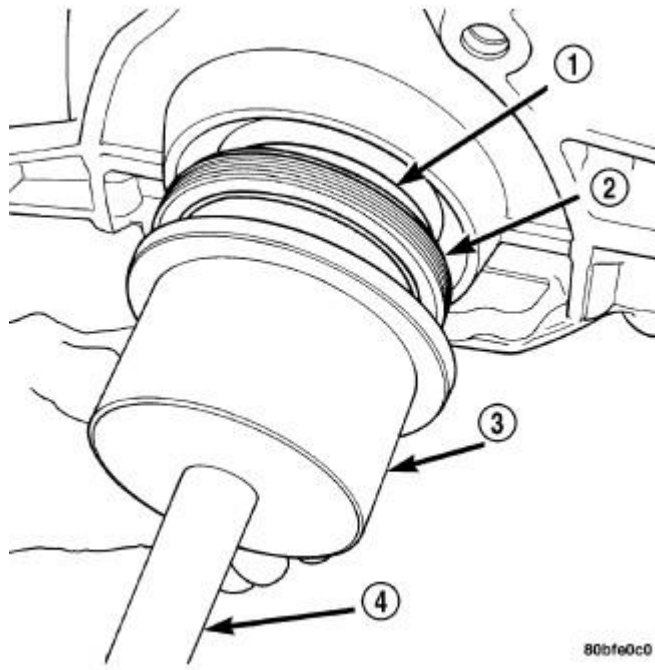


Fig. 221: Crankshaft Seal and Special Tools 6926-2 AND C-4171
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - REAR CRANKSHAFT SEAL GUIDE 6926</p> <p>2 - SEAL</p> <p>3 - REAR CRANKSHAFT SEAL INSTALLER 6926</p> <p>4 - DRIVER HANDLE C-4171</p> |
|---|

3. Drive the seal into the block using Rear Crankshaft Seal Installer 6926-2 and Driver Handle C-4171 until the tool bottoms out against the block .
4. Install flex plate. Apply Mopar® Lock AND Seal Adhesive to bolt threads and tighten bolts to 95 N.m (70 ft. lbs.).
5. Install transaxle. Refer to appropriate Transmission SERVICE INFORMATION for procedure.

ENGINE MOUNTING

DESCRIPTION

DESCRIPTION

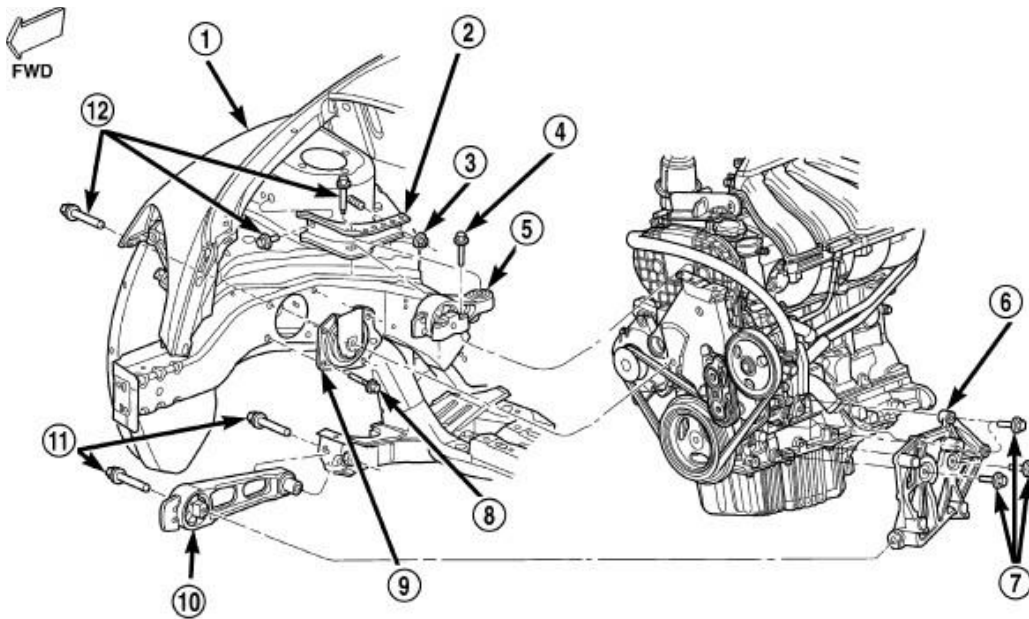


Fig. 222: Engine Mounting-Right Side
Courtesy of CHRYSLER LLC

- 1 - RIGHT FENDER
- 2 - UPPER TORQUE STRUT BRACKET
- 3 - NUT
- 4 - BOLT
- 5 - UPPER TORQUE STRUT
- 6 - LOWER TORQUE STRUT BRACKET
- 7 - BOLTS
- 8 - BOLTS
- 9 - RIGHT ENGINE MOUNT
- 10 - LOWER TORQUE STRUT
- 11 - BOLTS
- 12 - BOLTS
- 13 - FWD

The engine mounting system consists of a four-point system utilizing two load-carrying mounts and two torque struts. The load-carrying mounts are located on each frame rail. The right mount is a hydro-elastic mount (9).

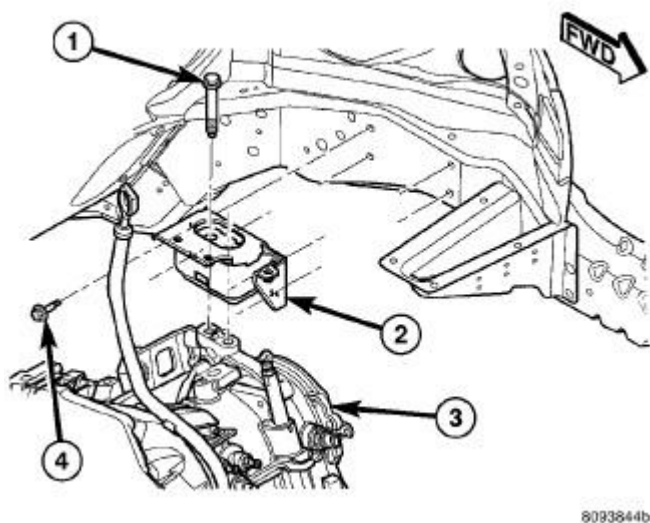


Fig. 223: Left Mount
Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - LEFT MOUNT
- 3 - TRANSAXLE
- 4 - BOLT

The left mount is a conventional elastomeric isolator (2).

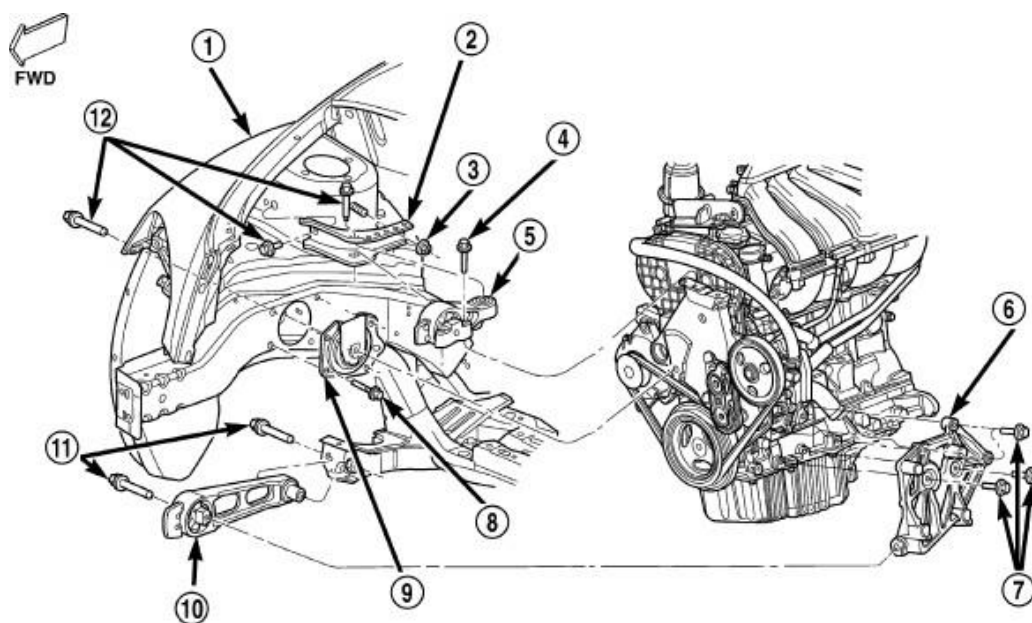


Fig. 224: Engine Mounting-Right Side

Courtesy of CHRYSLER LLC

1 - RIGHT FENDER
2 - UPPER TORQUE STRUT BRACKET
3 - NUT
4 - BOLT
5 - UPPER TORQUE STRUT
6 - LOWER TORQUE STRUT BRACKET
7 - BOLTS
8 - BOLTS
9 - RIGHT ENGINE MOUNT
10 - LOWER TORQUE STRUT
11 - BOLTS
12 - BOLTS
13 - FWD

The upper torque strut (5) and the lower torque strut (10) are attached at the front of the engine, straddling the right side load-carrying mount. The upper strut (10) connects to the suspension strut tower and the lower to the suspension crossmember.

OPERATION

OPERATION

The four-point engine mounting system minimizes the transmission of structure-borne engine noise to the passenger compartment. The load-carrying right and left mounts dampen and isolate vertical motion and vibration. The two struts absorb torque reaction forces and torsional vibrations.

INSULATOR, ENGINE MOUNT, LEFT

Removal

REMOVAL

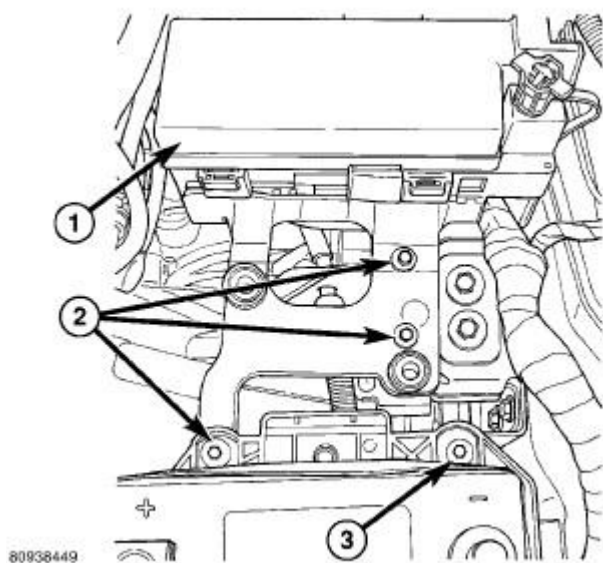


Fig. 225: PDC Bracket Attaching Bolts
Courtesy of CHRYSLER LLC

1. Remove air cleaner assembly.
2. Disconnect negative cable from battery.
3. Remove bolts attaching the power distribution center (PDC) bracket (2) to left mount and battery tray (3) .

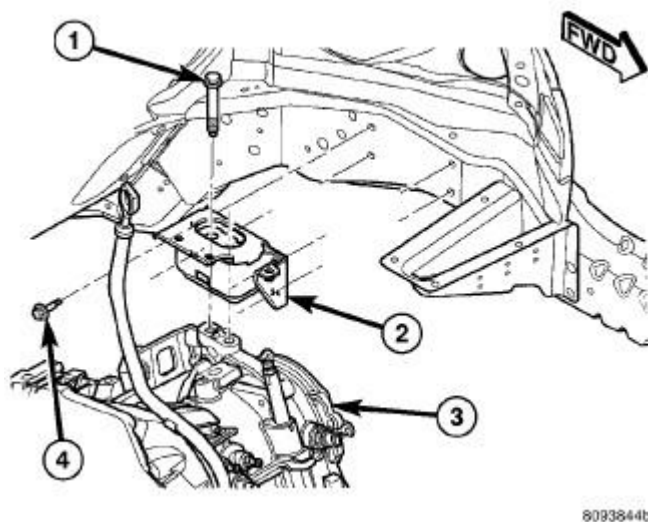
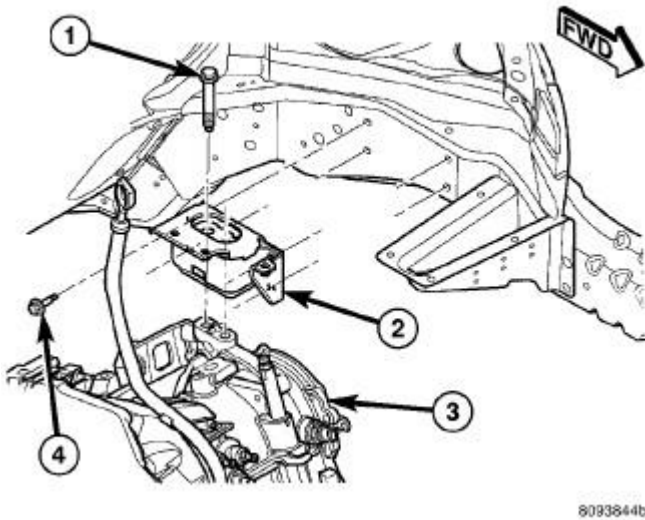


Fig. 226: Left Mount
Courtesy of CHRYSLER LLC

- | |
|------------------------------------|
| <p>1 - BOLT
2 - LEFT MOUNT</p> |
|------------------------------------|

3 - TRANSAXLE**4 - BOLT**

4. Support transaxle (3) with a suitable jack.
5. Remove mount to transaxle bolts (1) .
6. Remove left mount (2) bracket to body frame rail fasteners .
7. Remove mount (2).

Installation**INSTALLATION****Fig. 227: Left Mount**

Courtesy of CHRYSLER LLC

1 - BOLT**2 - LEFT MOUNT****3 - TRANSAXLE****4 - BOLT**

1. Install engine mount (2) bracket to body frame rail and tighten fasteners to 28 N.m (250 in. lbs.) .
2. Position engine/transaxle for installation of mount to transaxle bolts (1). Install and tighten bolts to 68 N.m (50 ft. lbs.) .
3. Remove jack from under transaxle (3).

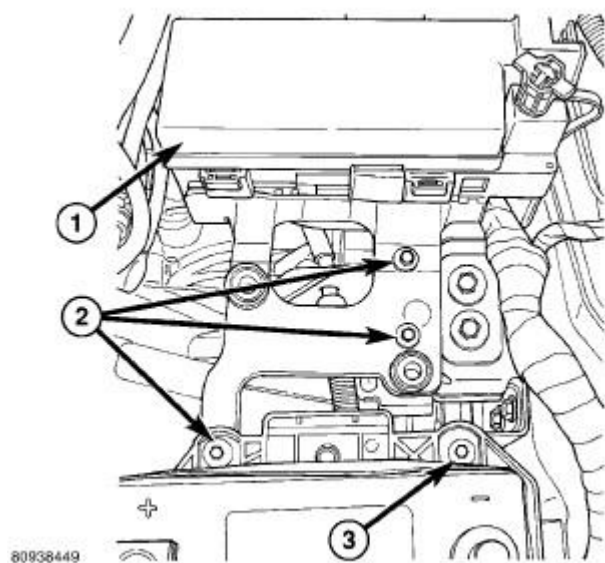


Fig. 228: TIPM Bracket Attaching Bolts
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Totally Integrated Power Module (TIPM)
2 - TIPM BRACKET BOLTS
3 - BATTERY TRAY BOLT |
|---|

4. Install bolts (2) attaching the power distribution center (PDC) bracket to left mount and battery tray .
5. Connect negative cable to battery.
6. Install air cleaner assembly.

INSULATOR, ENGINE MOUNT, RIGHT

Removal

REMOVAL

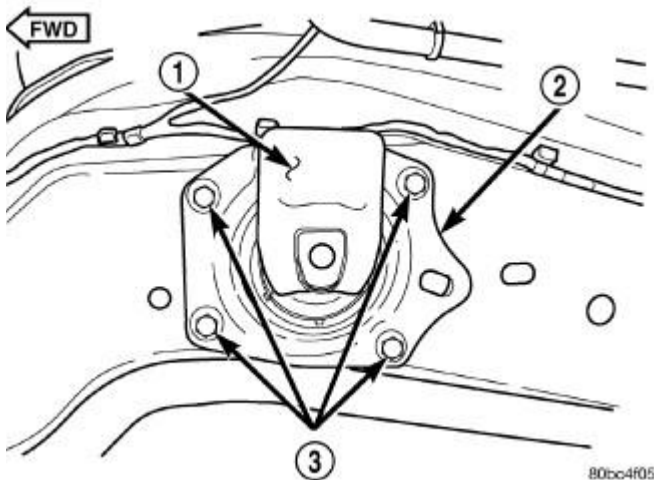


Fig. 229: Engine Mount-Right
Courtesy of CHRYSLER LLC

- 1 - SNUBBER PAD
- 2 - RIGHT ENGINE MOUNT
- 3 - BOLTS

1. Remove the engine assembly for the required clearance to access the engine mount. See **Engine - Removal**.

NOTE: The right engine mount attaching holes are slightly oversize to compensate for manufacturing tolerances. The mount has been set at the manufacturing plant for proper powertrain alignment. Therefore, it is necessary to mark the position of the mount before the attaching bolts (3) are loosened.

2. Using a permanent ink marker or equivalent, mark the position of engine mount (2) to the body frame rail.
3. Remove bolts (3) attaching mount to body .
4. Remove mount (2).

Installation

INSTALLATION

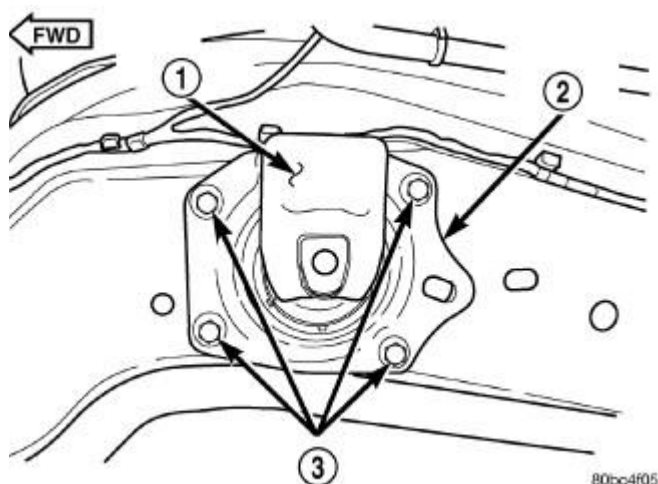


Fig. 230: Engine Mount-Right
Courtesy of CHRYSLER LLC

- 1 - SNUBBER PAD
- 2 - RIGHT ENGINE MOUNT
- 3 - BOLTS

1. Position mount (2) into the original position on body frame rail .

NOTE: Engine mount (2) must be installed in the original position on body frame rail. If mount was not marked or frame rail was replaced, perform the following procedure.

NOTE: Start all bolts (3) by hand to avoid possible cross threading.

2. Perform the following procedure if the mount position was not previously marked, or the frame rail was replaced:
 - a. Insert new mount loosely in frame rail.
 - b. Align the four holes in the mount with the mating holes in the rail such that the holes are concentric (frame rail holes centered in the mount holes).
 - c. Using a permanent ink marker or equivalent, mark the position of engine mount to the body frame rail while maintaining mounting hole concentricity.
3. Ensure the mount maintains originally marked position and install mount bolts. Tighten bolts to 28 N.m (250 in. lbs.) .
4. Install the engine assembly. See [Engine - Installation](#).

STRUT, TORQUE

Removal

UPPER

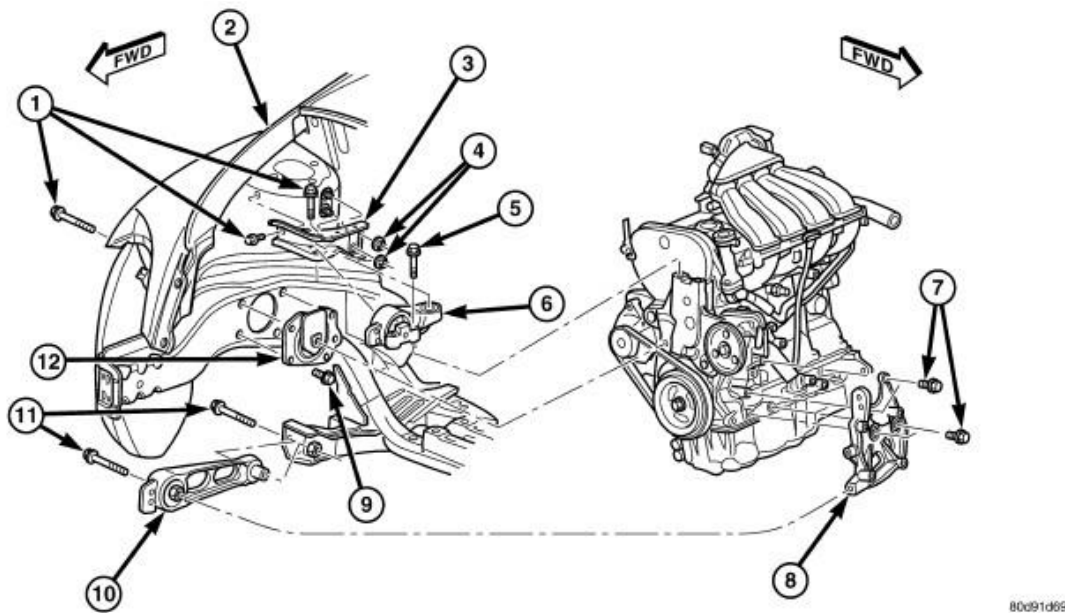
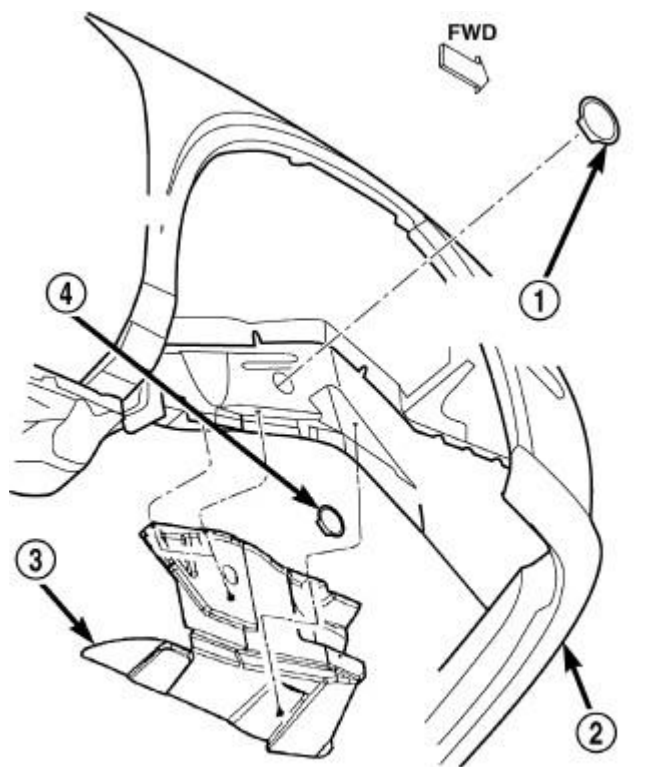


Fig. 231: Engine Mounting - Right Side
Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - RIGHT FENDER
- 3 - UPPER TORQUE STRUT BRACKET
- 4 - NUTS
- 5 - BOLT
- 6 - UPPER TORQUE STRUT
- 7 - BOLT
- 8 - LOWER TORQUE STRUT BRACKET
- 9 - BOLT
- 10 - LOWER TORQUE STRUT
- 11 - BOLT
- 12 - RIGHT ENGINE MOUNT

1. Remove bolts attaching upper torque strut (6) to shock tower bracket and engine mount bracket .
2. Remove timing belt front upper cover (if A/C equipped).
3. Remove the upper torque strut (6).

LOWER



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Fig. 232: Splash Shield

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - RIGHT MOUNT BOLT ACCESS PLUG
2 - FASCIA
3 - SPLASH SHIELD
4 - CRANKSHAFT BOLT ACCESS PLUG |
|--|

1. Raise vehicle on hoist.
2. Remove accessory drive belt splash shield (3) .

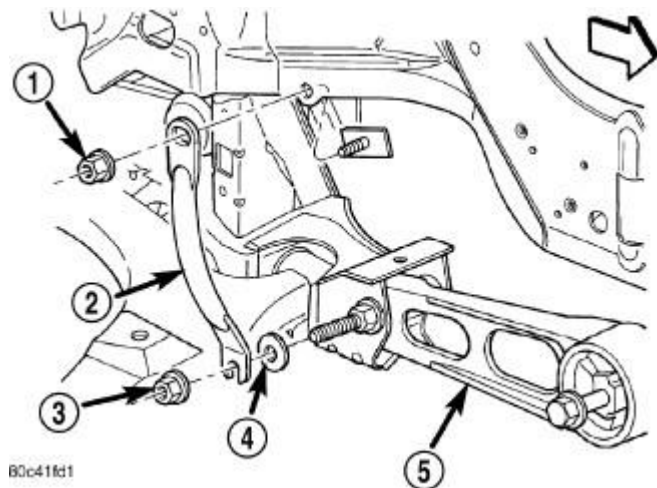


Fig. 233: Pencil Strut
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - NUT
2 - PENCIL STRUT
3 - NUT
4 - FLAT WASHER
5 - LOWER TORQUE STRUT</p> |
|--|

3. Remove pencil strut (2) .
4. Remove bolts attaching lower torque strut to crossmember and strut bracket .
5. Remove lower torque strut (5).

Installation

UPPER

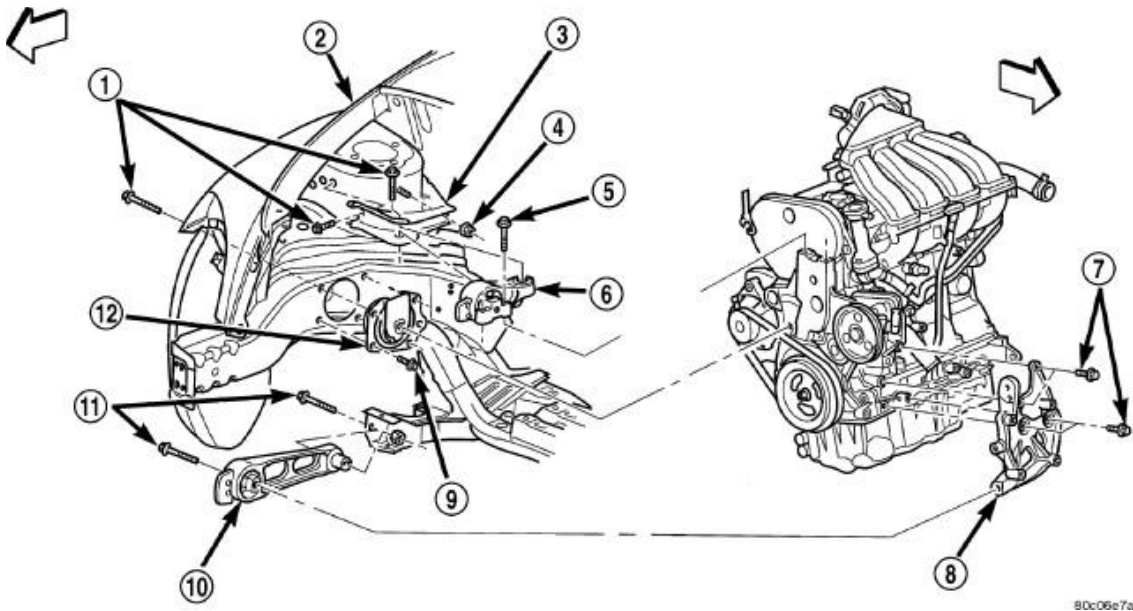


Fig. 234: Engine Mounting - Right Side
Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - RIGHT FENDER
- 3 - UPPER TORQUE STRUT BRACKET
- 4 - NUT
- 5 - BOLT
- 6 - UPPER TORQUE STRUT
- 7 - BOLT
- 8 - LOWER TORQUE STRUT BRACKET
- 9 - BOLT
- 10 - LOWER TORQUE STRUT
- 11 - BOLT
- 12 - RIGHT ENGINE MOUNT

1. Position the upper torque strut (6) into mounting location .
2. Move torque strut aside (towards right fender) and install timing belt front upper cover (if A/C equipped).
3. Install the torque strut mounting bolts and perform the torque strut adjustment procedure. See **Engine/Engine Mounting/STRUT, Torque - Adjustments.**

LOWER

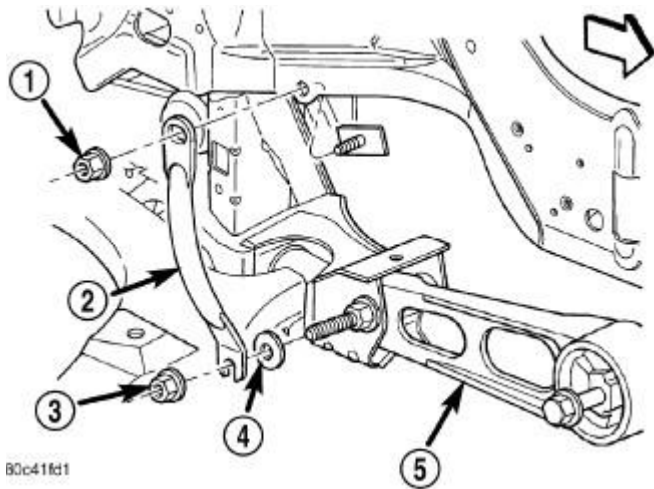
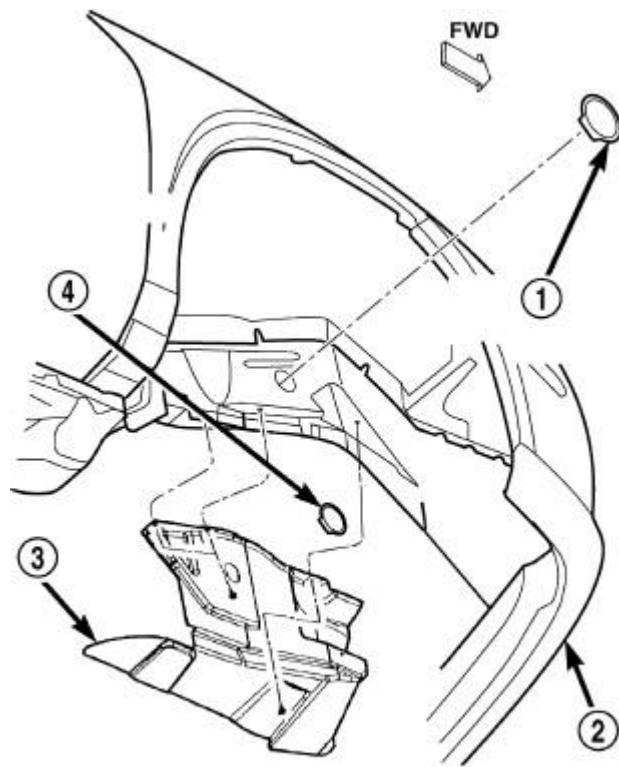


Fig. 235: Pencil Strut

Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT
- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

1. Position lower torque strut (5) into mounting locations.
2. Install mounting bolts and perform torque strut adjustment procedure. See **Engine/Engine Mounting/STRUT, Torque - Adjustments.**
3. Install pencil strut and tighten nuts to 58 N.m (43 ft. lbs.) .



80c4f47b

Fig. 236: Splash Shield
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - RIGHT MOUNT BOLT ACCESS PLUG
2 - FASCIA
3 - SPLASH SHIELD
4 - CRANKSHAFT BOLT ACCESS PLUG</p> |
|--|

4. Install accessory belt splash shield (3) and lower vehicle.

Adjustments

ENGINE TORQUE STRUT ADJUSTMENT

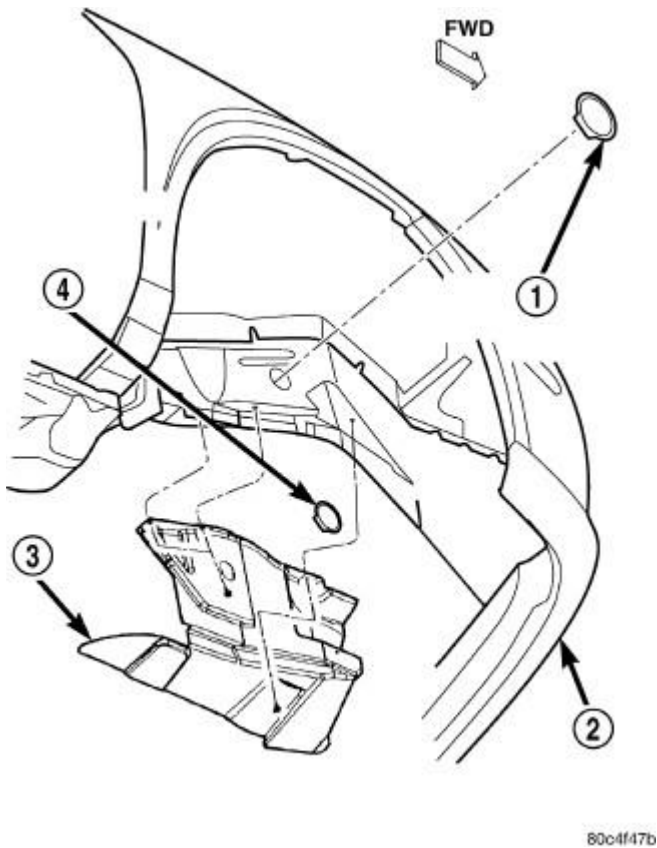


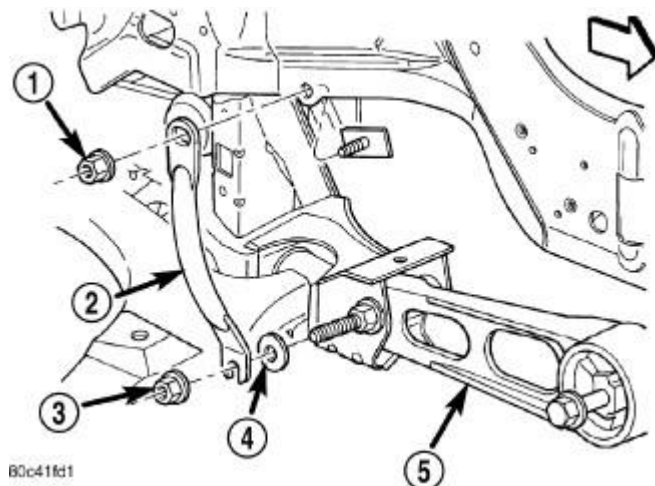
Fig. 237: Splash Shield

Courtesy of CHRYSLER LLC

- 1 - RIGHT MOUNT BOLT ACCESS PLUG
- 2 - FASCIA
- 3 - SPLASH SHIELD
- 4 - CRANKSHAFT BOLT ACCESS PLUG

The upper and lower torque struts need to be adjusted together to assure proper engine positioning and engine mount loading. Whenever a torque strut bolt(s) is loosened, this procedure must be performed.

1. Remove accessory drive belt splash shield (3) .

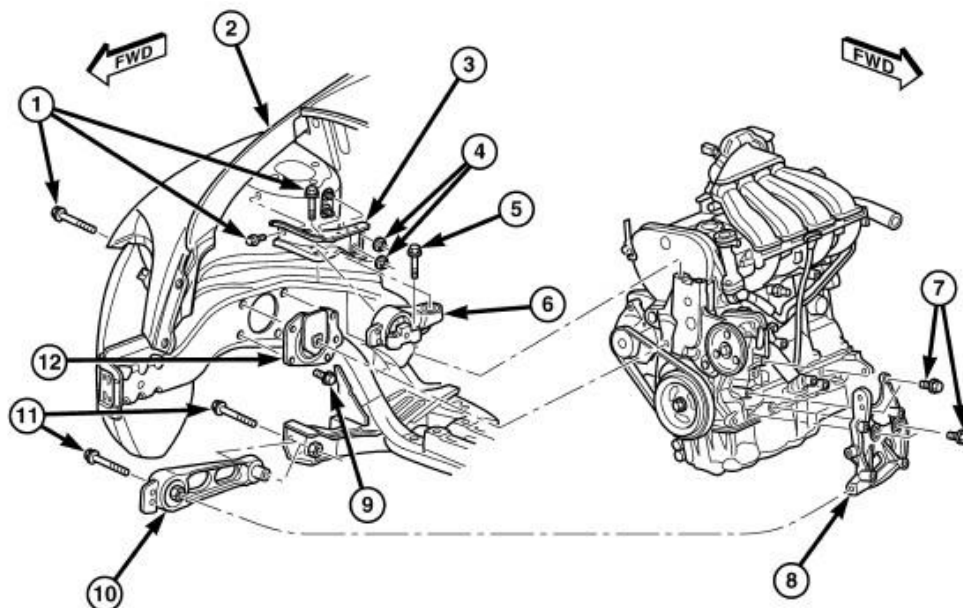


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Fig. 238: Pencil Strut
Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT
- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

2. Remove pencil strut (2) .



80c91d69

Fig. 239: Engine Mounting - Right Side
Courtesy of CHRYSLER LLC

- 1 - BOLT

- 2 - RIGHT FENDER
- 3 - UPPER TORQUE STRUT BRACKET
- 4 - NUTS
- 5 - BOLT
- 6 - UPPER TORQUE STRUT
- 7 - BOLT
- 8 - LOWER TORQUE STRUT BRACKET
- 9 - BOLT
- 10 - LOWER TORQUE STRUT
- 11 - BOLT
- 12 - RIGHT ENGINE MOUNT

3. Loosen the upper (6) and lower torque strut (10) attaching bolt at the suspension crossmember and shock tower bracket .

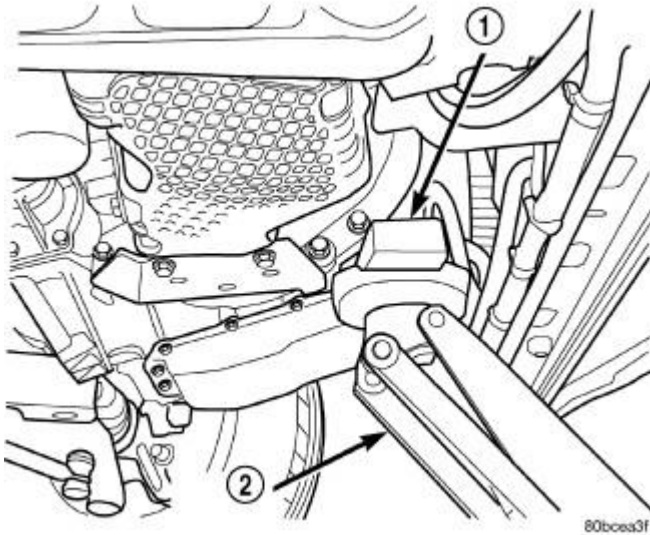


Fig. 240: Floor Jack Positioning
Courtesy of CHRYSLER LLC

- 1 - WOOD BLOCK
- 2 - FLOOR JACK

4. The engine position may now be adjusted by positioning a suitable floor jack on the forward edge of the transmission bell housing .

NOTE: **The floor jack must be positioned as shown in illustration to prevent minimal upward lifting of the engine.**

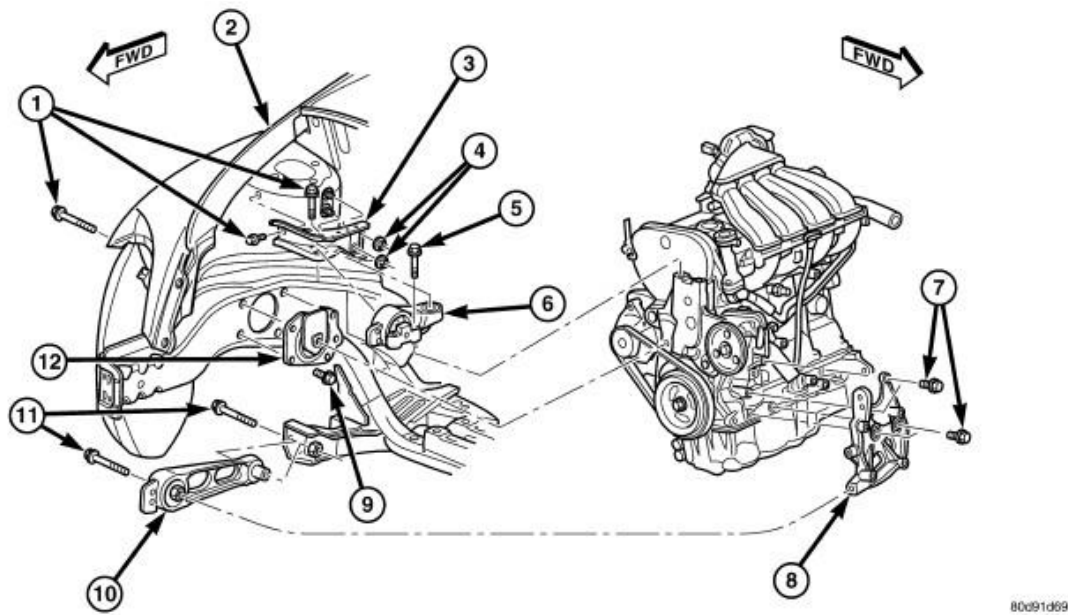


Fig. 241: Engine Mounting - Right Side
Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - RIGHT FENDER
- 3 - UPPER TORQUE STRUT BRACKET
- 4 - NUTS
- 5 - BOLT
- 6 - UPPER TORQUE STRUT
- 7 - BOLT
- 8 - LOWER TORQUE STRUT BRACKET
- 9 - BOLT
- 10 - LOWER TORQUE STRUT
- 11 - BOLT
- 12 - RIGHT ENGINE MOUNT

5. With the engine supported, remove the upper (6) and lower torque strut (10) attachment bolt(s) at shock tower bracket and suspension crossmember . Verify that the torque struts are free to move within the shock tower bracket and crossmember. Reinstall the torque strut bolt(s), but do not tighten.

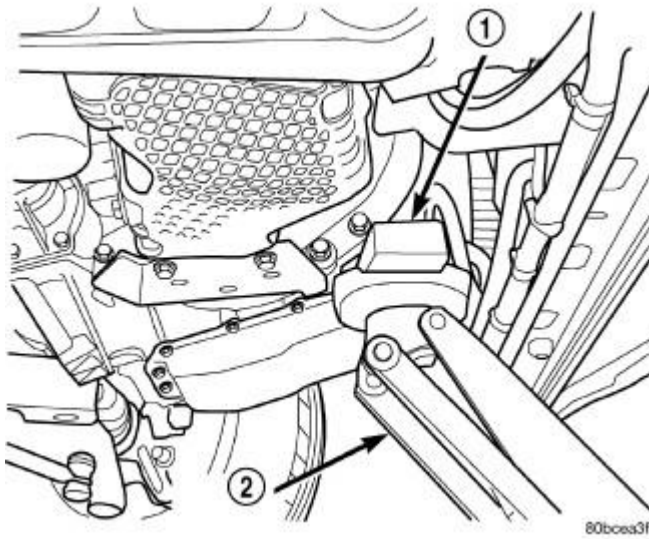


Fig. 242: Floor Jack Positioning
Courtesy of CHRYSLER LLC

- | |
|----------------|
| 1 - WOOD BLOCK |
| 2 - FLOOR JACK |

- Carefully apply upward force, allowing the upper engine to rotate rearward.

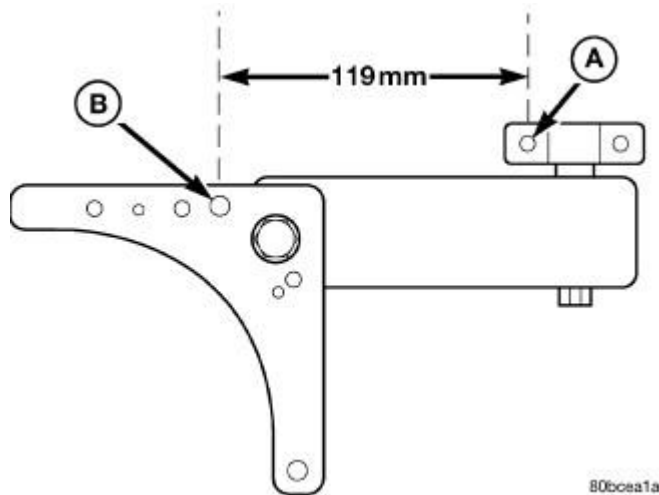


Fig. 243: Engine Position Measurement
Courtesy of CHRYSLER LLC

- When the distance between the center of the rearmost attaching bolt on the engine mount bracket (point "A") and the center of the hole on the shock tower bracket (point "B") is 119 mm (4.70 in.) .

CAUTION: The engine must be held in position with jack until both the upper and lower torque strut bolts are tightened.

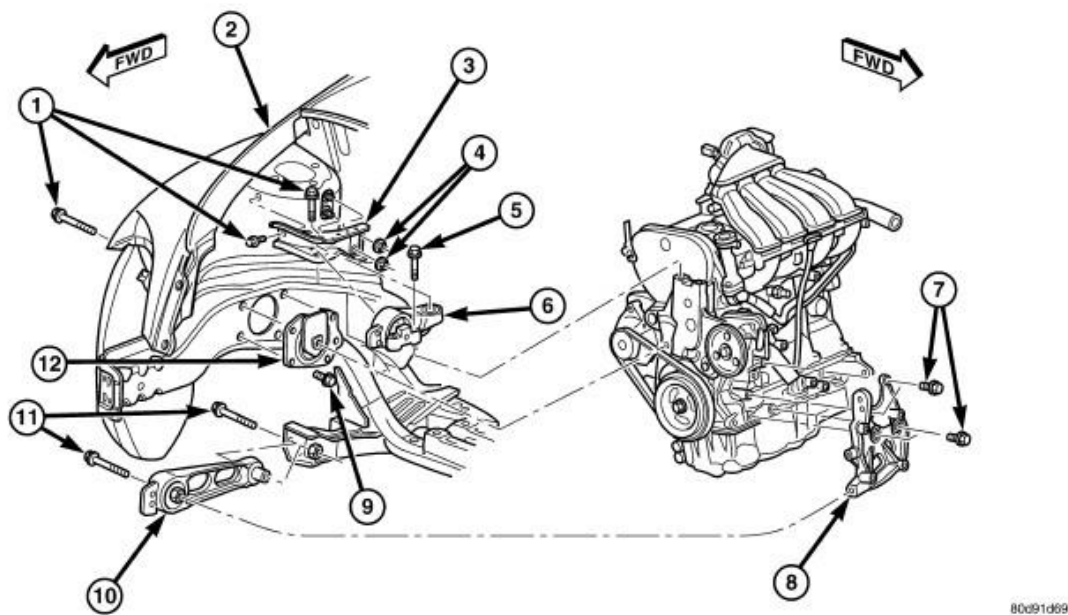


Fig. 244: Engine Mounting - Right Side
Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - RIGHT FENDER
- 3 - UPPER TORQUE STRUT BRACKET
- 4 - NUTS
- 5 - BOLT
- 6 - UPPER TORQUE STRUT
- 7 - BOLT
- 8 - LOWER TORQUE STRUT BRACKET
- 9 - BOLT
- 10 - LOWER TORQUE STRUT
- 11 - BOLT
- 12 - RIGHT ENGINE MOUNT

8. With the engine held at the proper position, tighten both the upper strut (6) and lower torque strut (10) bolts to 115 N.m (85 ft. lbs.) .
9. Remove the floor jack.

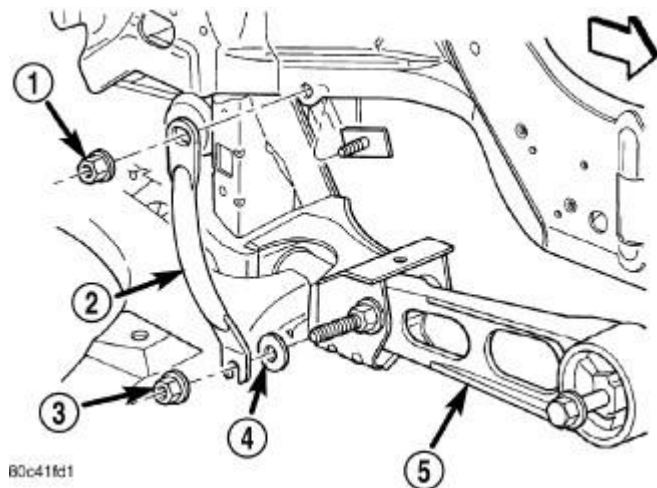
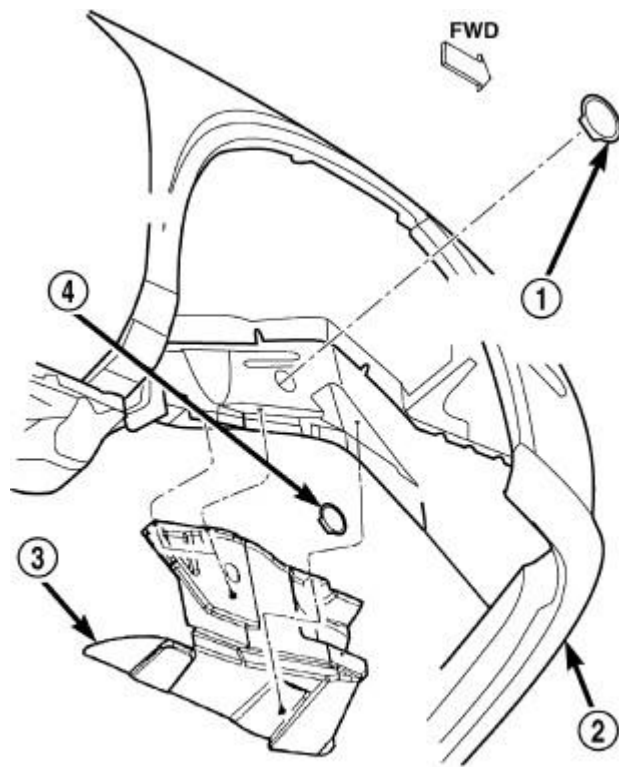


Fig. 245: Pencil Strut
Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT
- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

10. Install pencil strut (2) and tighten nuts (1,3) to 58 N.m (43 ft. lbs.) .



80c4f47b

Fig. 246: Splash Shield
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - RIGHT MOUNT BOLT ACCESS PLUG
2 - FASCIA
3 - SPLASH SHIELD
4 - CRANKSHAFT BOLT ACCESS PLUG |
|--|

11. Install accessory drive belt splash shield (3) .

LUBRICATION

DESCRIPTION

DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump is mounted in the front engine cover and driven by the crankshaft.

OPERATION

OPERATION

Engine oil drawn up through the pickup tube and is pressurized by the oil pump and routed through the full-flow filter to the main oil gallery running the length of the cylinder block. A diagonal hole in each bulkhead feeds oil to each main bearing. Drilled passages within the crankshaft route oil from main bearing journals to connecting rod journals. Balance shaft lubrication is provided through an oil passage from the number one main bearing cap through the balance shaft carrier support leg. This passage directly supplies oil to the front bearings and internal machined passages in the shafts that routes oil from front to the rear shaft bearing journals. A vertical hole at the number five bulkhead routes pressurized oil through a restrictor (integral to the cylinder head gasket) up past a cylinder head bolt to an oil gallery running the length of the cylinder head. The camshaft journals are partially slotted to allow a predetermined amount of pressurized oil to pass into the bearing cap cavities. Lubrication of the camshaft lobes are provided by small holes in the camshaft bearing caps that are directed towards each lobe. Oil returning to the pan from pressurized components supplies lubrication to the valve stems. Cylinder bores and wrist pins are splash lubricated from directed slots on the connecting rod thrust collars.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

1. Disconnect and remove oil pressure switch. See **Engine/Lubrication/SWITCH, Oil Pressure - Removal.**
2. Install Gauge C-3292A with Adaptor fitting 8406.
3. Start engine and record oil pressure. Refer to Specifications for correct oil pressure requirements. See Engine **SPECIFICATIONS.**

CAUTION: If oil pressure is 0 at idle, do not perform the 3000 RPM test

4. If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open, a clogged oil pick-up screen or a damaged oil pick-up tube O-ring.
5. After test is complete, remove test gauge and fitting.
6. Install oil pressure switch and connector. See **Engine/Lubrication/SWITCH, Oil Pressure - Installation.**

ADAPTER, OIL FILTER

Removal

REMOVAL

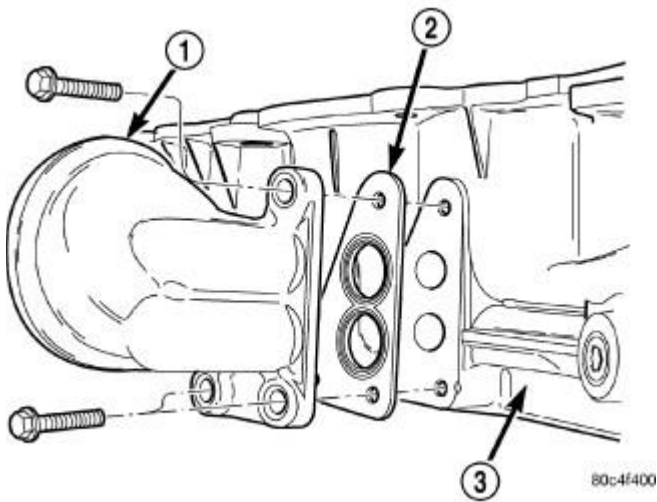


Fig. 247: Oil Filter Adaptor
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - OIL FILTER ADAPTER
2 - GASKET
3 - OIL PAN |
|---|

1. Raise vehicle on hoist.
2. Place a suitable oil collecting container under oil filter.
3. Remove oil filter. See **Engine/Lubrication/FILTER, Engine Oil - Removal**.
4. **Turbocharger Equipped Vehicles:** Remove oil cooler connector bolt. **DO NOT** disconnect coolant lines from oil cooler. Reposition oil cooler.
5. Remove filter adapter (1) attaching bolts .
6. Remove filter adapter (1) and gasket (2) .

Installation

INSTALLATION

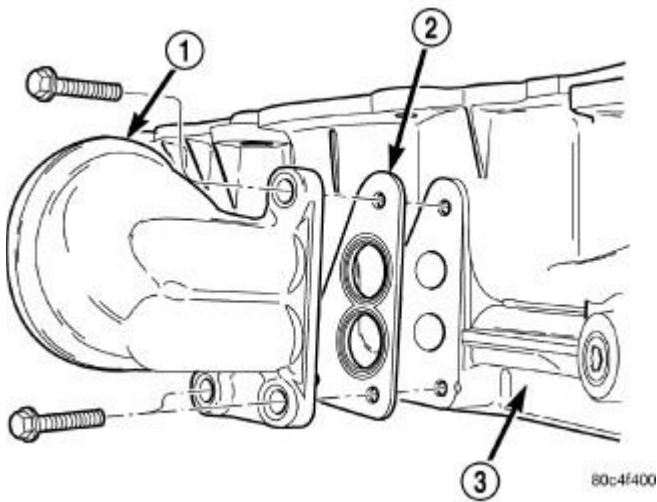


Fig. 248: Oil Filter Adaptor
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - OIL FILTER ADAPTER
2 - GASKET
3 - OIL PAN</p> |
|--|

1. Clean all gasket sealing surfaces
2. Install gasket (2) and filter adaptor (1) to oil pan . Tighten bolts to 12 N.m (105 in. lbs.).
3. **Turbocharger Equipped Vehicles:**
 - Replace oil cooler seal
 - Lubricate seal and position oil cooler to oil filter adapter (1), aligning notch to tab
 - Install oil cooler connector bolt. Torque connector bolt to 55 N.m (41 ft. lbs.)
4. Install oil filter. See **Engine/Lubrication/FILTER, Engine Oil - Installation**.
5. Lower vehicle and check engine oil level. Adjust level as necessary.

COOLER AND LINES, OIL

Description

DESCRIPTION

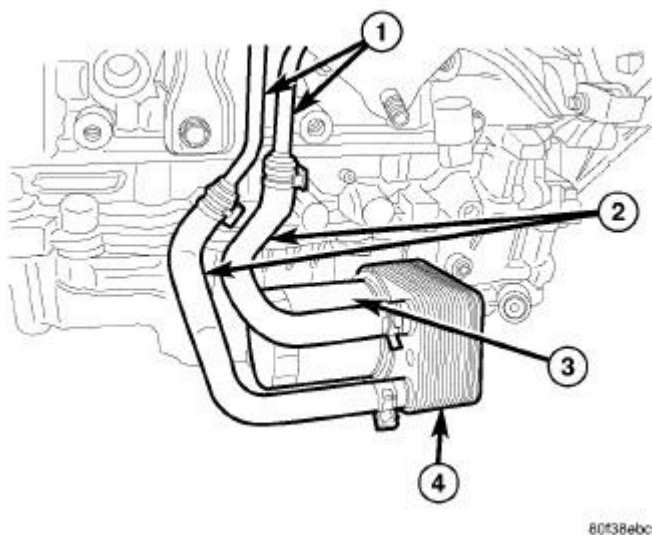


Fig. 249: Oil Cooler and Lines
Courtesy of CHRYSLER LLC

- 1 - COOLANT TUBES
- 2 - COOLANT HOSES
- 3 - OIL FILTER
- 4 - OIL COOLER

An engine oil cooler (4) is used on the 2.4L Turbocharged engine. The cooler is a coolant-to-oil type and mounted between the oil filter and oil filter adapter .

Removal

REMOVAL

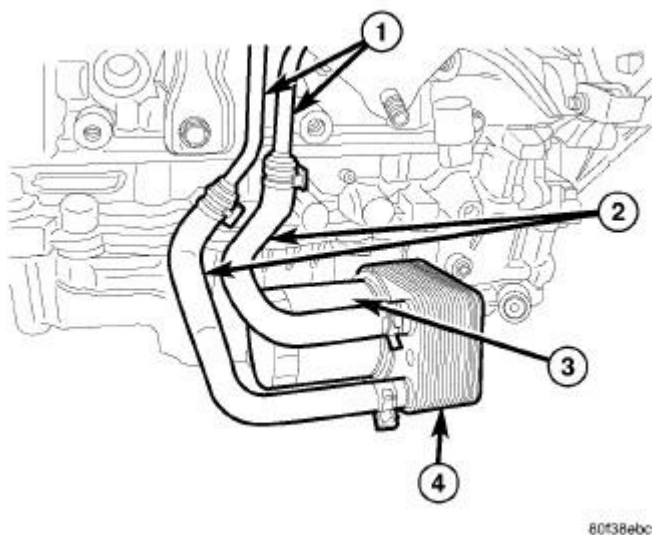


Fig. 250: Oil Cooler and Lines
Courtesy of CHRYSLER LLC

1. Raise vehicle on hoist.
2. Drain cooling system. Refer to **SYSTEM DRAINING** .
3. Disconnect oil cooler coolant hoses (1,2) .
4. Remove oil filter (3).

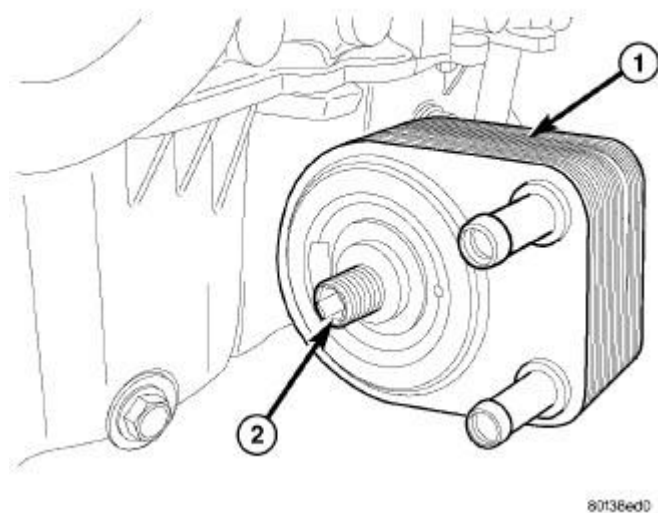


Fig. 251: Oil Cooler Connector Bolt
Courtesy of CHRYSLER LLC

5. Remove oil cooler connector bolt (2) .
6. Remove oil cooler (1).

Installation

INSTALLATION

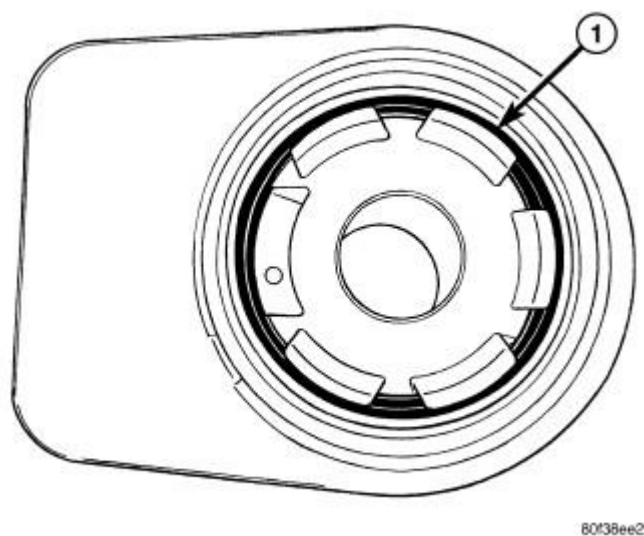


Fig. 252: Oil Cooler Seal
Courtesy of CHRYSLER LLC

1. Replace oil cooler seal (1) .

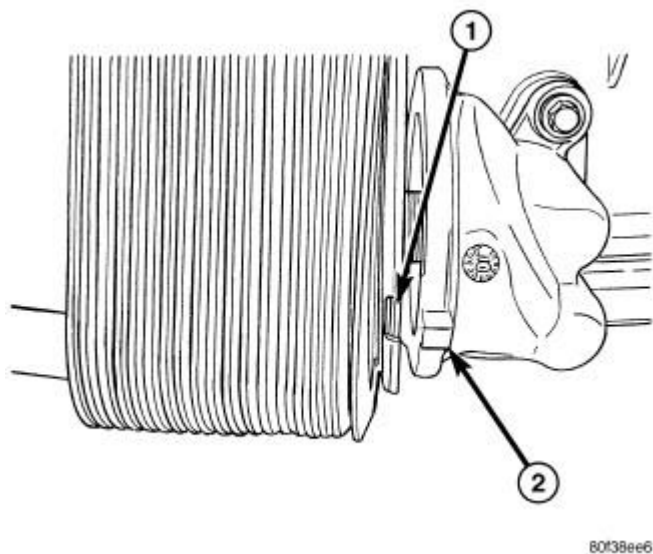


Fig. 253: Oil Cooler Alignment
Courtesy of CHRYSLER LLC

2. Lubricate seal and position oil cooler to oil filter adapter, aligning notch (1) to tab (2) .

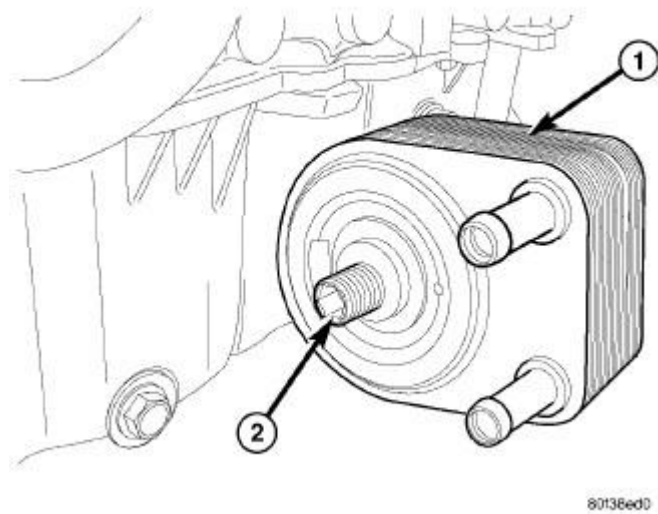


Fig. 254: Oil Cooler Connector Bolt
Courtesy of CHRYSLER LLC

3. Install oil cooler connector bolt (2). Torque connector bolt to 55 N.m (41 ft. lbs.) .
4. Install oil filter.

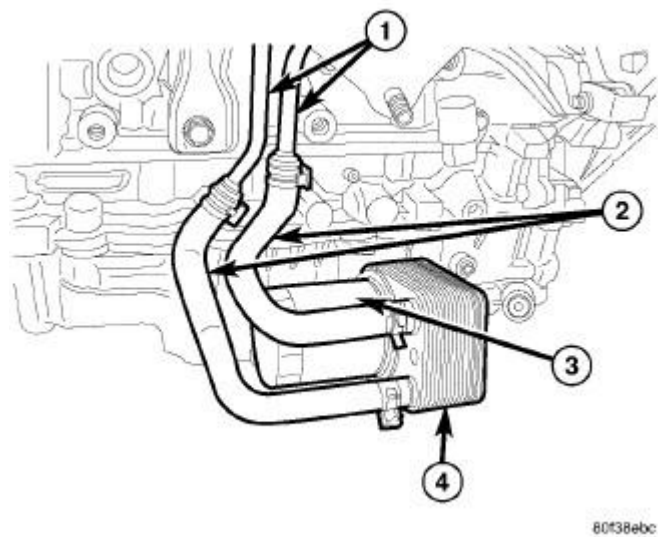
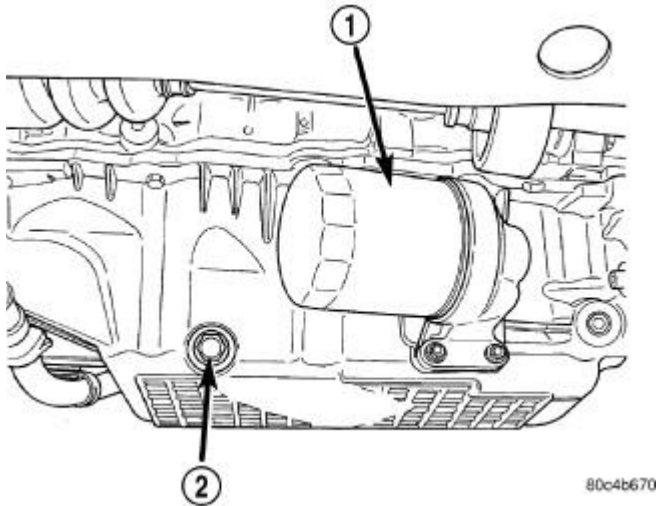


Fig. 255: Oil Cooler and Lines
Courtesy of CHRYSLER LLC

5. Connect oil cooler coolant hoses (1,2) .
6. Lower vehicle.
7. Fill cooling system. Refer to **STANDARD PROCEDURE** .

FILTER, ENGINE OIL**Removal****REMOVAL****Fig. 256: Oil Filter**

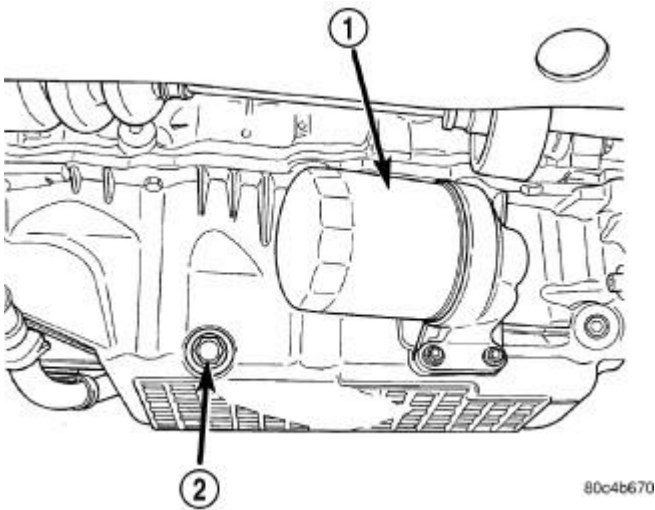
Courtesy of CHRYSLER LLC

- | |
|----------------------------------|
| 1 - OIL FILTER
2 - DRAIN PLUG |
|----------------------------------|

CAUTION: When servicing the oil filter (1) avoid deforming the filter can by installing the remove/install tool band strap against the can to base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

1. Using a suitable filter wrench, turn oil filter (1) counterclockwise to remove.

Installation**INSTALLATION**

**Fig. 257: Oil Filter****Courtesy of CHRYSLER LLC**

- | |
|----------------------------------|
| 1 - OIL FILTER
2 - DRAIN PLUG |
|----------------------------------|

1. Clean and check filter mounting surface. The surface must be smooth, flat and free of debris or pieces of gasket.
2. Lubricate new oil filter (1) gasket.
3. Screw oil filter (1) on until the gasket contacts base. Tighten to 14 N.m (10 ft. lbs.).

JET, PISTON OIL COOLER, 2.4L TURBO**Description****DESCRIPTION**

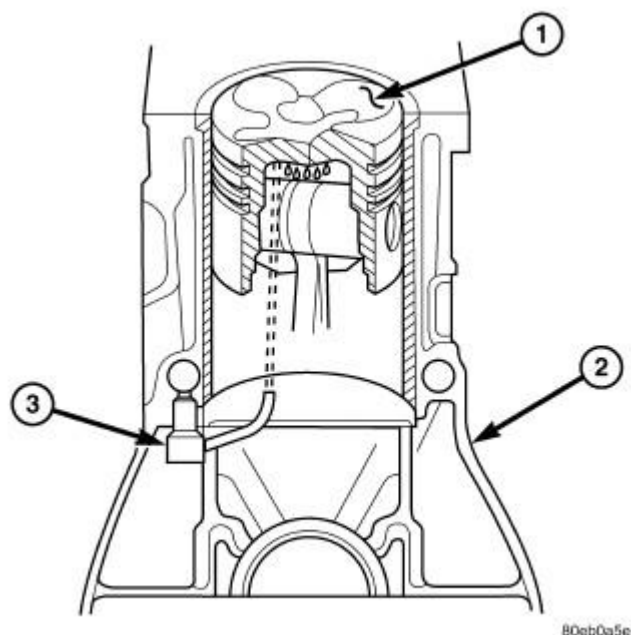


Fig. 258: Oil Jet - 2.4L Turbo
Courtesy of CHRYSLER LLC

- 1 - PISTON ASSEMBLY
- 2 - ENGINE BLOCK
- 3 - OIL JET

The 2.4L Turbocharged engines are equipped with four oil jets (3) installed in the engine block (2). The oil jets are provided engine oil pressure from the main oil gallery. The oil jets (3) are used to cool the pistons. An integral check ball controls the flow of oil through the oil jet (3) .

Removal

REMOVAL

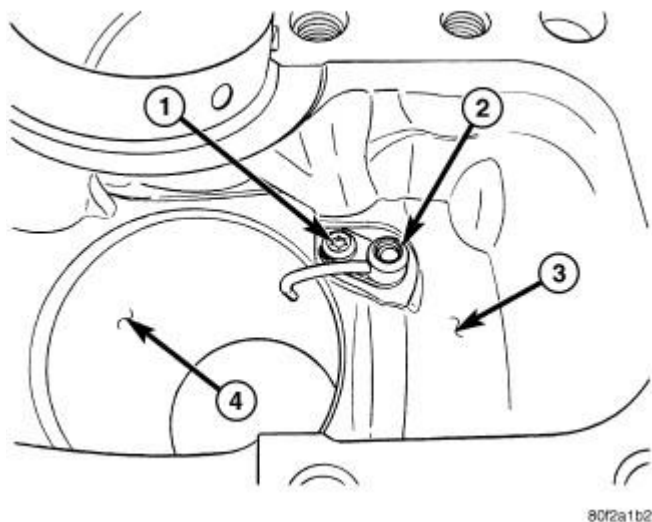


Fig. 259: Oil Jet Fastener - 2.4L Turbo

Courtesy of CHRYSLER LLC

1. Remove crankshaft. See **Engine/Engine Block/CRANKSHAFT - Removal**.
2. Remove oil jet fastener (1) .

CAUTION: Do Not Pull on Oil Jet Tube

3. Using pliers or other similar tool, pull oil jet (2) from engine block (3).

Installation

INSTALLATION

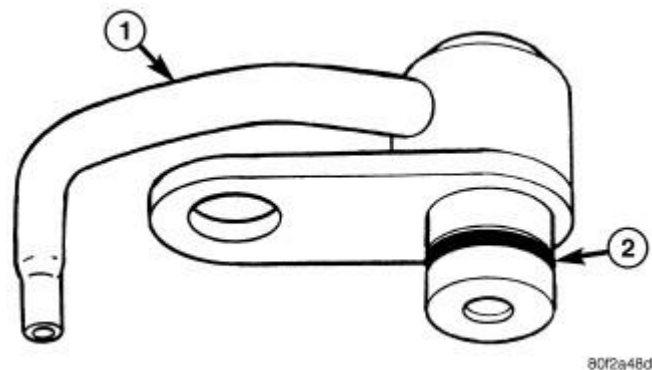


Fig. 260: Oil Jet O-ring

Courtesy of CHRYSLER LLC

- 1 - OIL JET
- 2 - O-RING

1. Inspect oil jet o-ring (2) .
2. Lightly coat o-ring (2) with clean engine oil.
3. Push oil jet (1) into engine block until it is fully seated.

CAUTION: Ensure oil jet is fully seated in engine block before installing fastener. Do Not use the oil jet fastener to draw the oil jet into the engine block. Damage to oil jet may occur.

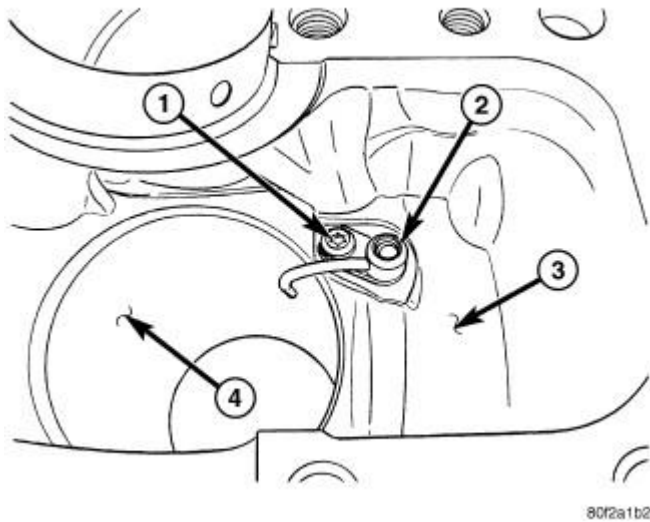


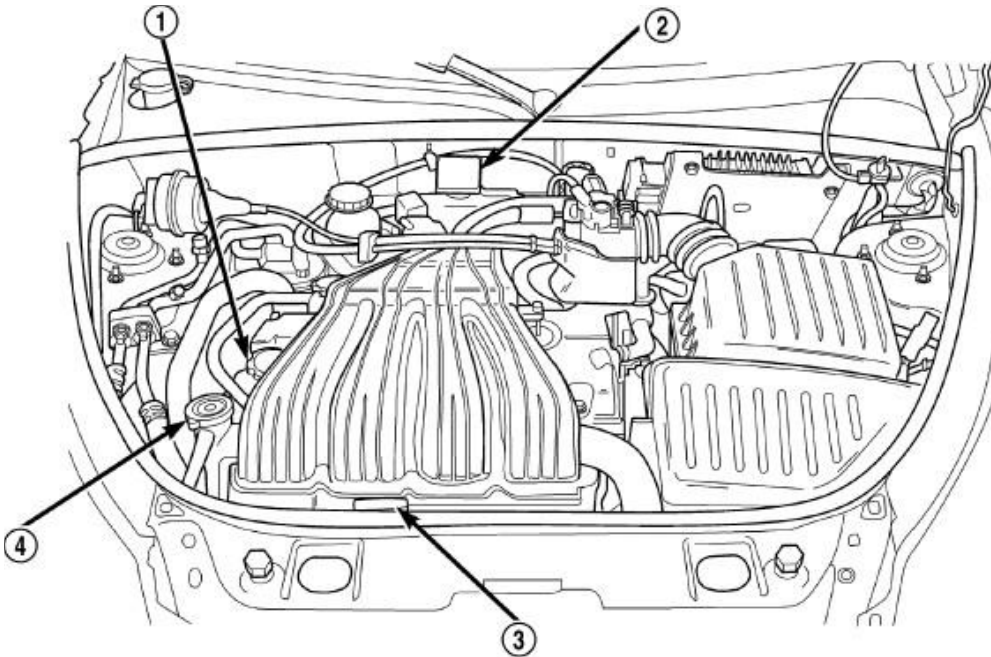
Fig. 261: Oil Jet Fastener - 2.4L Turbo
Courtesy of CHRYSLER LLC

4. Install oil jet fastener (1). Torque fastener to 12 N.m (105 in. lbs.) .
5. Install crankshaft. See **Engine/Engine Block/CRANKSHAFT - Installation.**

OIL

Standard Procedure

ENGINE OIL LEVEL CHECK



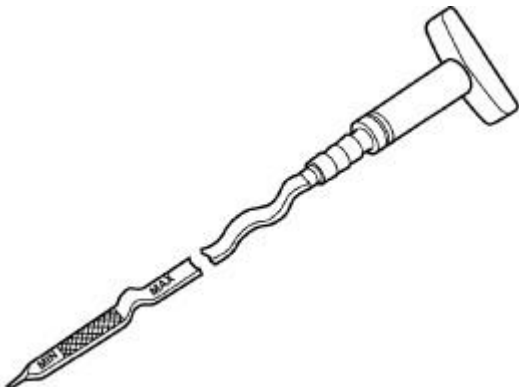
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Fig. 262: Engine Oil Dipstick and Fill Locations
Courtesy of CHRYSLER LLC

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

The best time to check engine oil level is after the vehicle 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. Remove dipstick (3) and observe oil level.



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Fig. 263: Engine Oil Dipstick
Courtesy of CHRYSLER LLC

Add oil only when the level is at or below the MIN mark .

CAUTION: Do not operate engine if the oil level is above the MAX mark on the dipstick. Excessive oil volume can cause oil aeration which can lead to engine failure due to loss of oil pressure or increase in oil temperature.

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

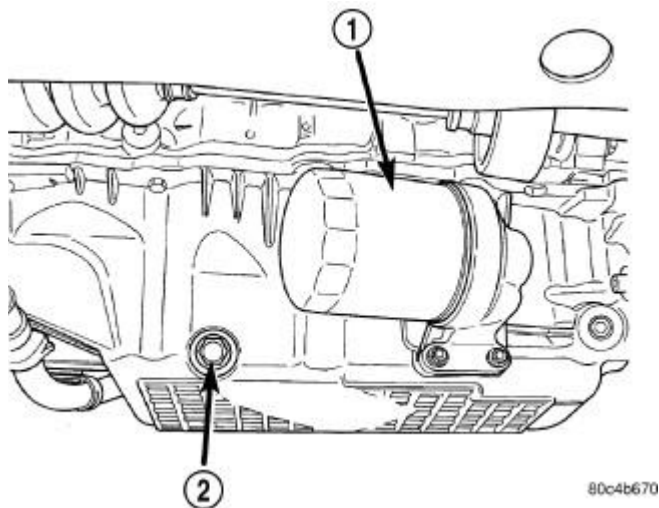


Fig. 264: Oil Filter and Drain Plug
Courtesy of CHRYSLER LLC

- | |
|----------------------------------|
| 1 - OIL FILTER
2 - DRAIN PLUG |
|----------------------------------|

1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Remove oil fill cap.
4. Raise vehicle on hoist.
5. Place a suitable oil collecting container under oil pan drain plug (2).
6. Remove oil pan drain plug (2) and allow oil to drain into collecting container. Inspect drain plug threads

for stretching or other damage. Replace drain plug and gasket if damaged.

7. Remove oil filter (1) . See **Engine/Lubrication/FILTER, Engine Oil - Removal.**

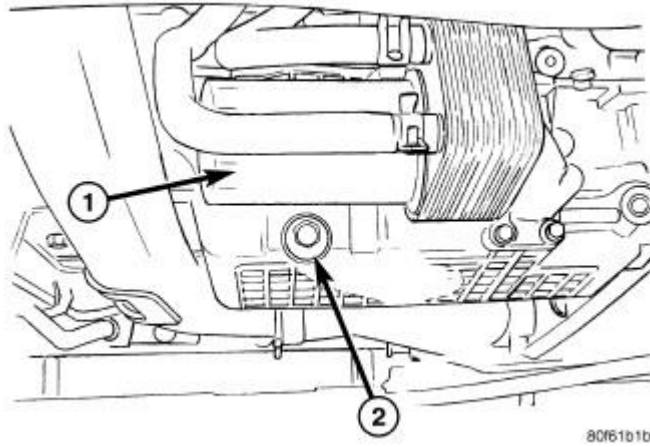


Fig. 265: Oil Filter and Drain Plug - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - OIL FILTER 2 - DRAIN PLUG

8. Install oil pan drain plug (2). Torque drain plug to 28 N.m (20 ft. lbs.).
9. Install new oil filter (1). See **Engine/Lubrication/FILTER, Engine Oil - Installation.**

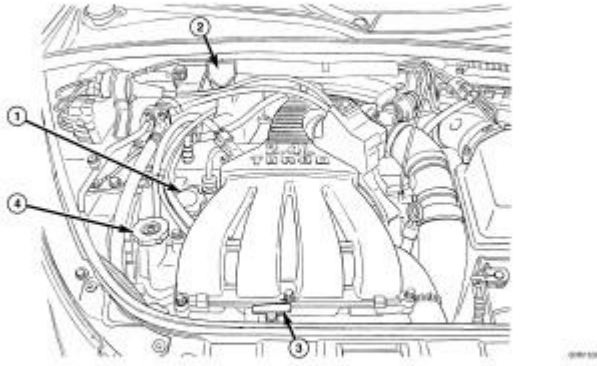


Fig. 266: Engine Oil Dipstick and Fill Locations - 2.4L Turbo
Courtesy of CHRYSLER LLC

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

10. Lower vehicle and fill crankcase (1) with specified type and amount of engine oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** and **Vehicle Quick Reference/Capacities and Recommended Fluids - Description** .
11. Install oil fill cap (1) .
12. Start engine and inspect for leaks.
13. Stop engine and inspect oil level (3).

OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. Replace oil filter with a Mopar® or the 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.

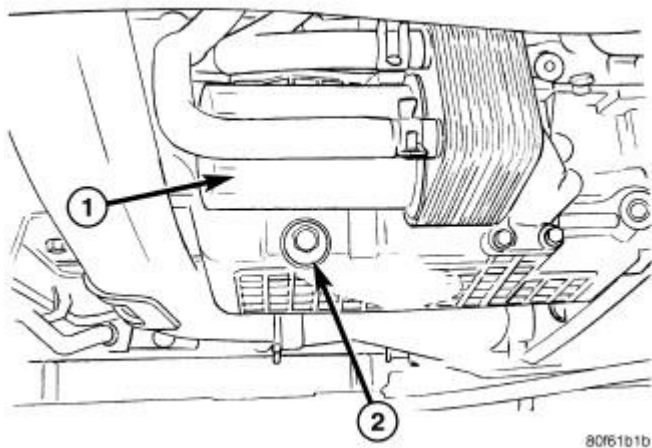
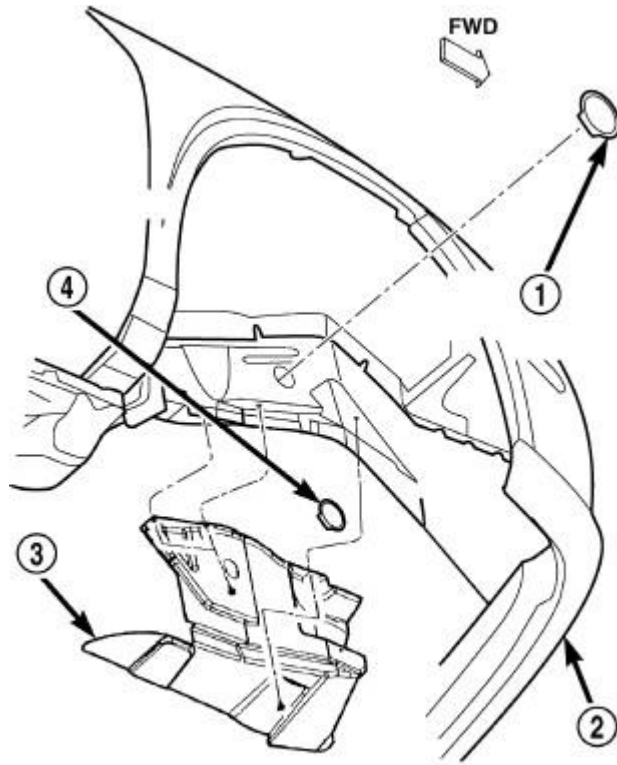
PAN, OIL**Removal****REMOVAL**

Fig. 267: Oil Filter and Drain Plug - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|----------------------------------|
| 1 - OIL FILTER
2 - DRAIN PLUG |
|----------------------------------|

1. Raise vehicle on hoist.
2. Drain engine oil (2) and remove oil filter (1).



80c4f47b

Fig. 268: Splash Shield
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - RIGHT MOUNT BOLT ACCESS PLUG
2 - FASCIA
3 - SPLASH SHIELD
4 - CRANKSHAFT BOLT ACCESS PLUG</p> |
|--|

3. Remove accessory drive belt splash shield (3).
4. **Turbocharger Equipped Vehicles:** Remove turbocharger to charge air cooler hose assembly. See **Engine/Turbocharger System/COOLER and HOSES, Charge Air - Removal**.
5. **Turbocharger Equipped Vehicles:** Remove oil cooler connector bolt. **DO NOT** disconnect coolant lines from oil cooler. Reposition oil cooler.

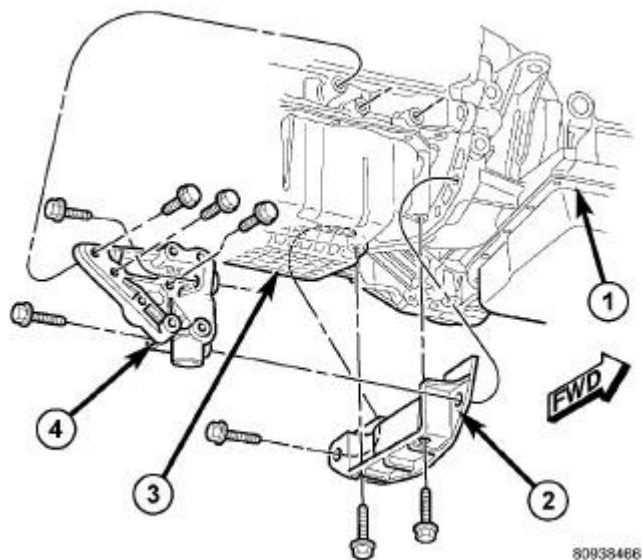


Fig. 269: Structural Collar and Bending Strut - (Automatic Transaxle Equipped)
Courtesy of CHRYSLER LLC

- 1 - TRANSAXLE
- 2 - STRUCTURAL COLLAR
- 3 - OIL PAN
- 4 - BENDING STRUT

6. Remove structural collar (2). See **Engine/Engine Block/COVER, Structural Dust - Removal.**

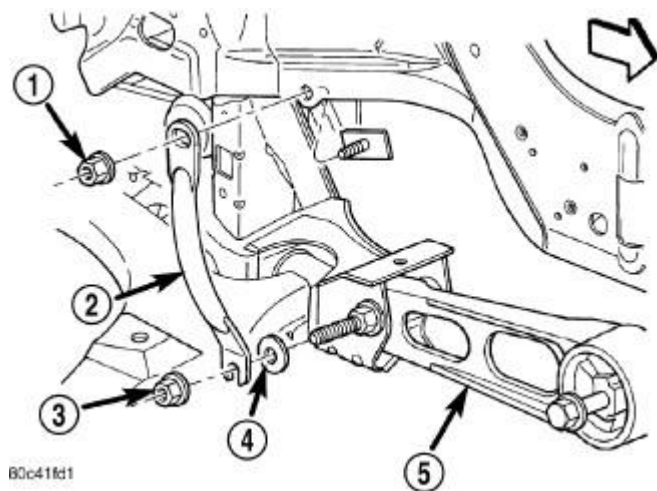


Fig. 270: Pencil Strut
Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT

- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

7. Remove lower torque strut (5). See **Engine/Engine Mounting/STRUT, Torque - Removal**.

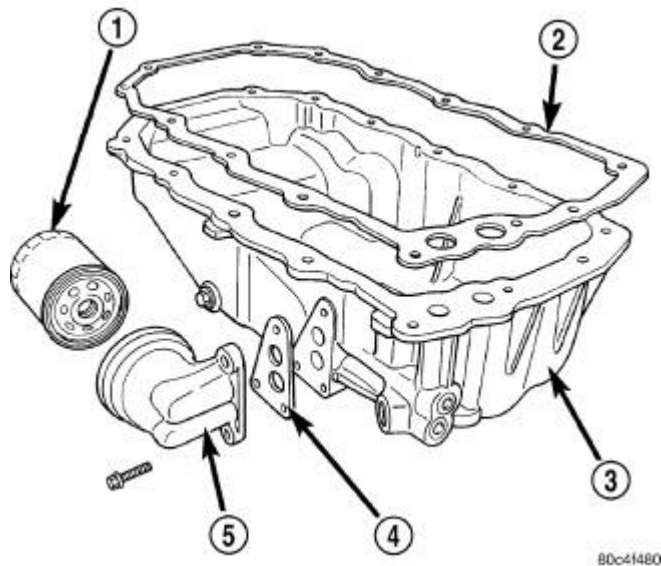


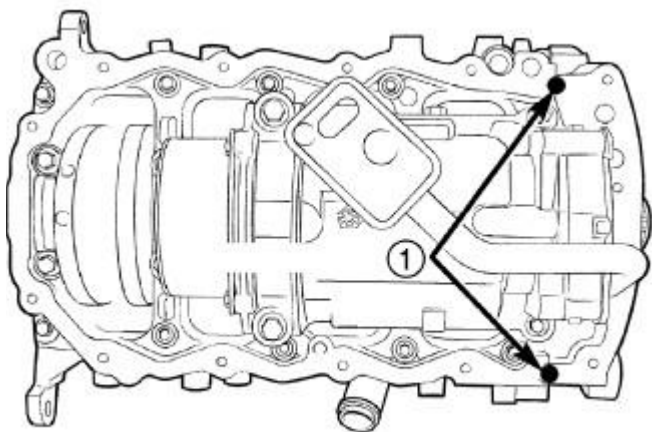
Fig. 271: Oil Pan
Courtesy of CHRYSLER LLC

- 1 - OIL FILTER
- 2 - OIL PAN GASKET
- 3 - OIL PAN
- 4 - ADAPTER GASKET
- 5 - OIL FILTER ADAPTER

8. Remove oil filter adapter (5) and gasket (4) .
9. Remove oil pan (3) and gasket (2) .
10. Clean oil pan and all gasket surfaces.

Installation

INSTALLATION

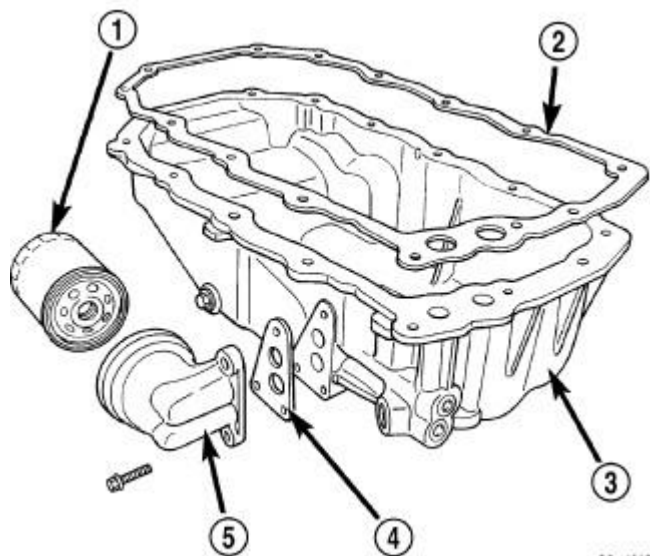


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Fig. 272: Oil Pan Sealing
Courtesy of CHRYSLER LLC

1 - SEALER LOCATIONS

1. Apply Mopar® Engine RTV GEN II at the oil pump to engine block parting lines (1) .



80c41480

Fig. 273: Oil Pan
Courtesy of CHRYSLER LLC

- 1 - OIL FILTER
- 2 - OIL PAN GASKET
- 3 - OIL PAN
- 4 - ADAPTER GASKET
- 5 - OIL FILTER ADAPTER

2. Install oil pan gasket (2) to the block.
3. Install oil pan (3). Tighten screws to 12 N.m (105 in. lbs.).
4. Install oil filter adapter (5) and gasket (4) . Tighten screws to 12 N.m (105 in. lbs.).
5. **Turbocharger Equipped Vehicles:**
 - Replace oil cooler seal
 - Lubricate seal and position oil cooler to oil filter adapter, aligning notch to tab
 - Install oil cooler connector bolt. Torque connector bolt to 55 N.m (41 ft. lbs.).

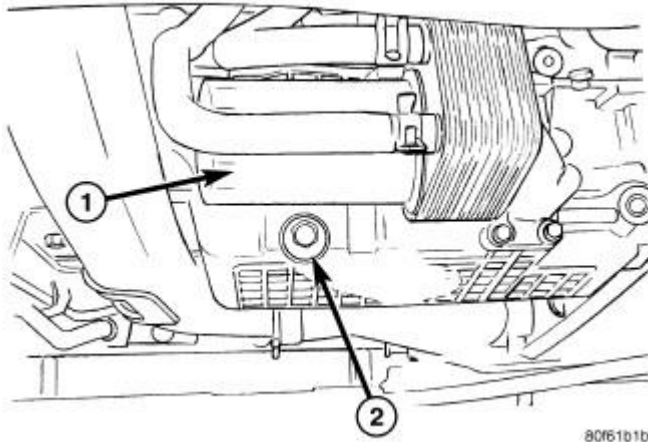


Fig. 274: Oil Filter and Drain Plug - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - OIL FILTER 2 - DRAIN PLUG

6. Install oil drain plug (2) and oil filter (1).

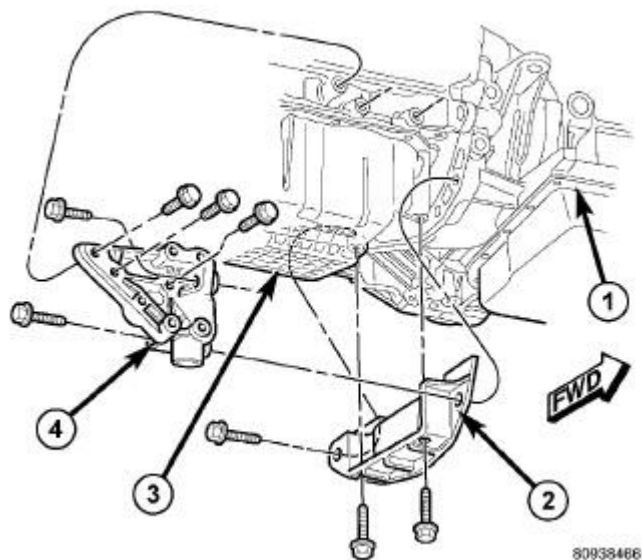


Fig. 275: Structural Collar and Bending Strut - (Automatic Transaxle Equipped)
Courtesy of CHRYSLER LLC

- 1 - TRANSAXLE
- 2 - STRUCTURAL COLLAR
- 3 - OIL PAN
- 4 - BENDING STRUT

7. Install structural collar (2). See Engine/Engine Block/COVER, Structural Dust - Installation.

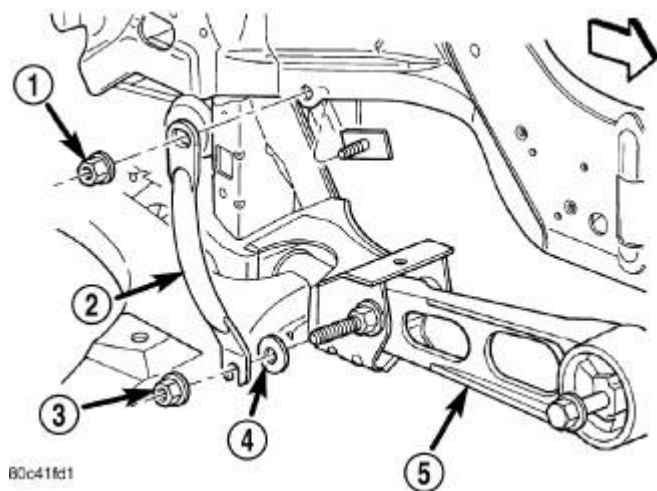
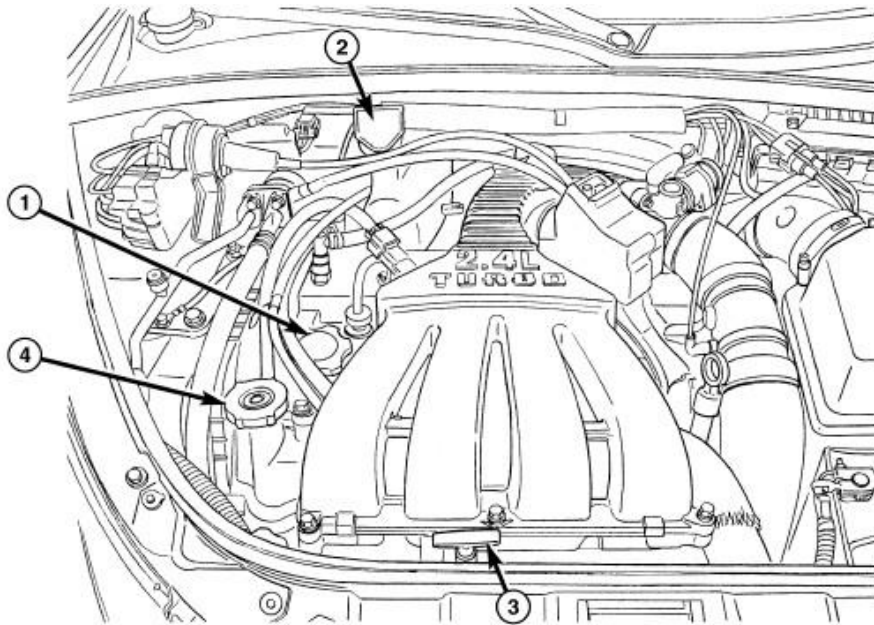


Fig. 276: Pencil Strut
Courtesy of CHRYSLER LLC

- 1 - NUT
- 2 - PENCIL STRUT
- 3 - NUT

- 4 - FLAT WASHER
- 5 - LOWER TORQUE STRUT

8. Install lower torque strut (5). See **Engine/Engine Mounting/STRUT, Torque - Installation**.
9. **Turbocharger Equipped Vehicles:** Install turbocharger to charge air cooler hose assembly. See **Engine/Turbocharger System/COOLER and HOSES, Charge Air - Installation**.



80F61b39

Fig. 277: Engine Oil Dipstick and Fill Locations - 2.4L Turbo
 Courtesy of CHRYSLER LLC

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

10. Lower vehicle and fill engine crankcase (1) with proper oil to correct level (3).
11. Start engine and check for leaks.

PUMP, ENGINE OIL

Removal

REMOVAL

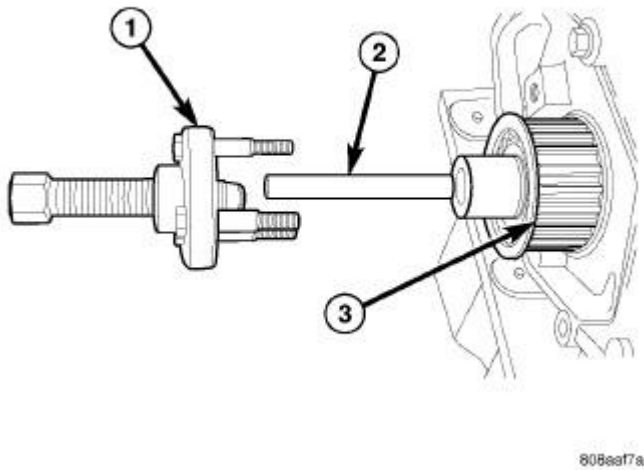


Fig. 278: Crankshaft Sprocket - Removal
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - CRANKSHAFT SPROCKET REMOVER 6793
2 - CRANKSHAFT SPROCKET REMOVER INSERT C-4685-C2
3 - CRANKSHAFT SPROCKET |
|---|

1. Disconnect negative cable from battery.
2. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal**.
3. Remove timing belt rear cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.
4. Remove oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.
5. Remove crankshaft sprocket (3) using Crankshaft Sprocket Remover 6793 (1) and Crankshaft Sprocket Remover Insert C-4685-C2 (2) .

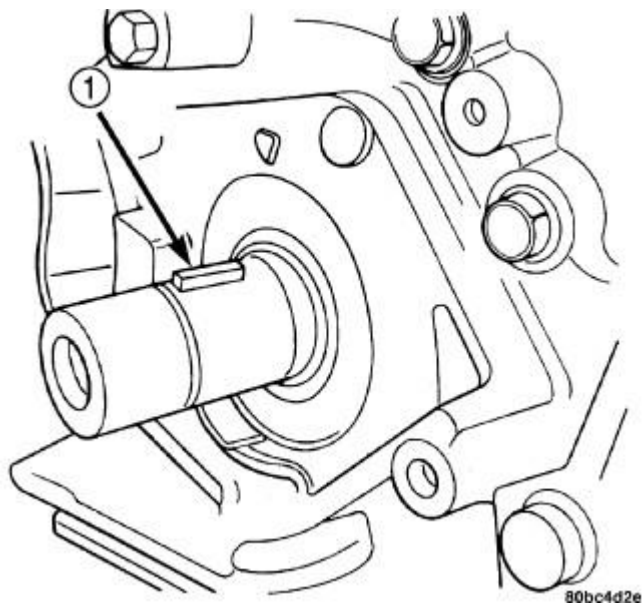


Fig. 279: Crankshaft Key
Courtesy of CHRYSLER LLC

1 -
CRANKSHAFT
KEY

6. Remove crankshaft key (1) .

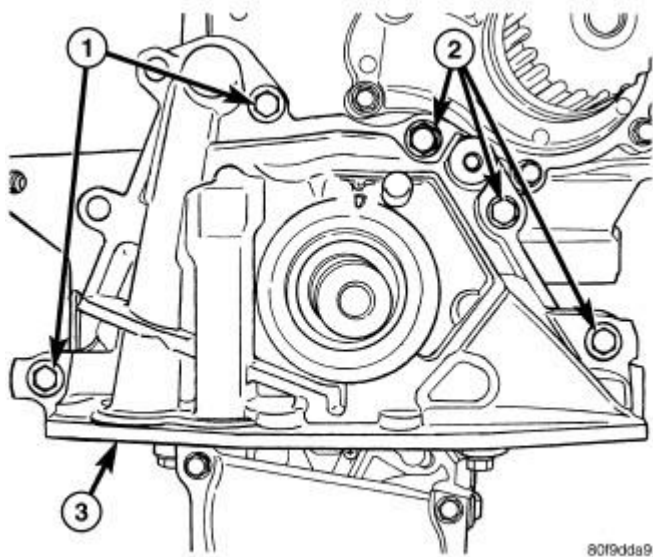


Fig. 280: Oil Pump
Courtesy of CHRYSLER LLC

1 - BOLTS

- 2 - BOLTS
- 3 - OIL PUMP

7. Remove oil pick-up tube.
8. Remove oil pump (3) and front crankshaft seal.

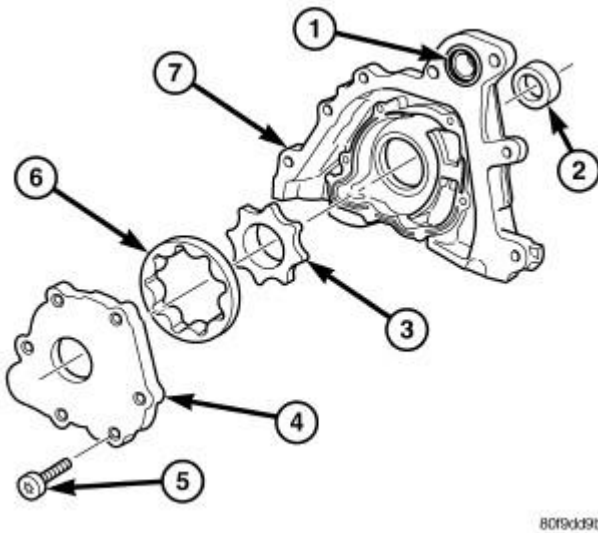
Disassembly**DISASSEMBLY**

Fig. 281: Oil Pump Components
Courtesy of CHRYSLER LLC

- 1 - O-RING
- 2 - FRONT CRANKSHAFT SEAL
- 3 - INNER ROTOR
- 4 - OIL PUMP COVER
- 5 - FASTENER
- 6 - OUTER ROTOR
- 7 - OIL PUMP BODY

1. Remove oil pump cover fasteners (5), and lift off cover (4) .
2. Remove pump rotors (3, 6) .
3. Wash all parts in a suitable solvent and inspect carefully for damage or wear.

Cleaning**CLEANING**

Clean all parts thoroughly.

Inspection

INSPECTION

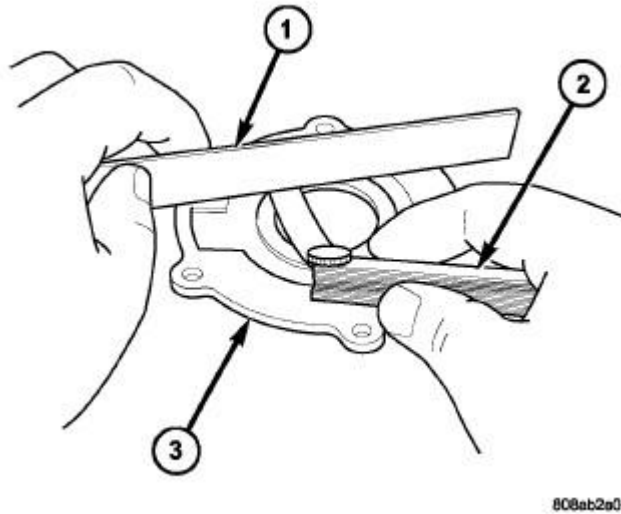


Fig. 282: Checking Oil Pump Cover Flatness
Courtesy of CHRYSLER LLC

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

1. Inspect the mating surface of the oil pump. Surface should be smooth. Replace pump cover if scratched or grooved.
2. Lay a straightedge (1) across the pump cover (3) surface . If a 0.025 mm (0.001 in.) feeler gauge (2) can be inserted between cover and straight edge, cover should be replaced.

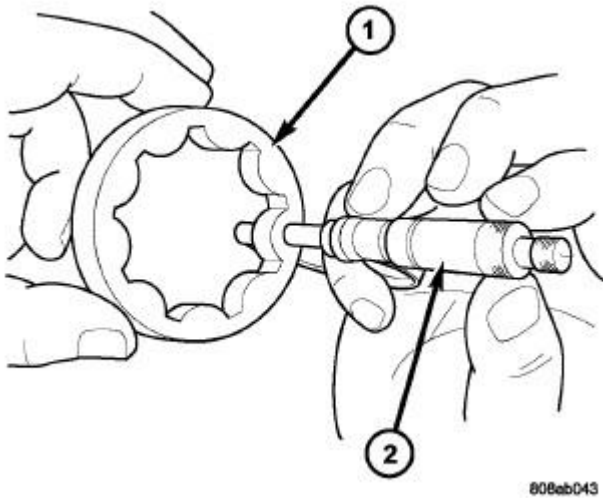


Fig. 283: Measuring Outer Rotor Thickness
Courtesy of CHRYSLER LLC

3. Measure thickness and diameter of outer rotor (1). If outer rotor thickness measures 10.699 mm (0.421 in.) or less , or if the diameter is 85.924 mm (3.383 in.) or less, replace outer rotor (1).

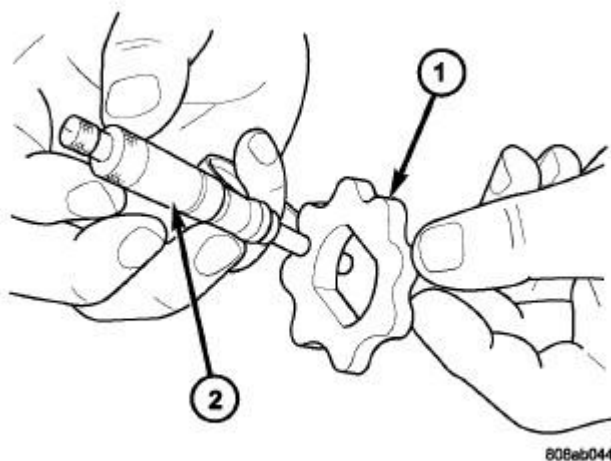


Fig. 284: Measuring Inner Rotor Thickness
Courtesy of CHRYSLER LLC

4. If inner rotor (1) measures 10.699 mm (0.421 in.) or less replace inner rotor (1) .

Assembly

ASSEMBLY

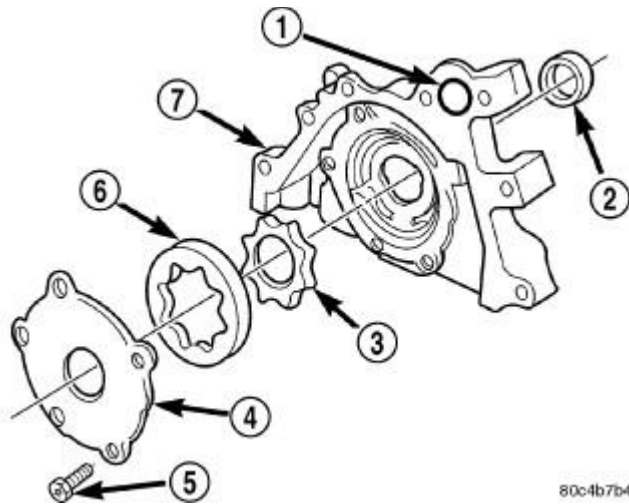


Fig. 285: Oil Pump Components
Courtesy of CHRYSLER LLC

- 1 - O-RING
- 2 - SEAL
- 3 - INNER ROTOR
- 4 - OIL PUMP COVER
- 5 - FASTENER
- 6 - OUTER ROTOR
- 7 - OIL PUMP BODY

1. Assemble pump, using new parts as required. **Install the inner rotor (3) with chamfer facing the cast iron oil pump cover (4).**
2. Prime oil pump before installation by filling rotor cavity with engine oil.
3. Install cover and tighten fasteners (5) to 13 N.m (118 in. lbs.) .

Installation

INSTALLATION

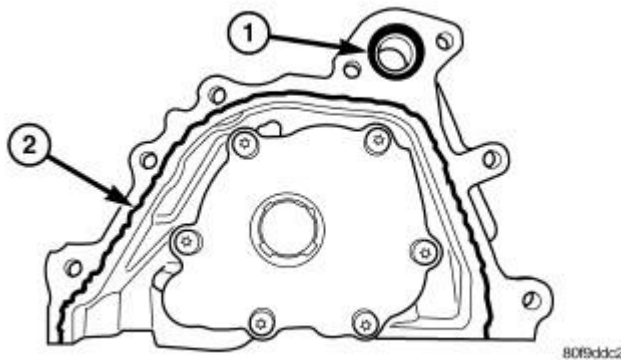


Fig. 286: Oil Pump Sealing

Courtesy of CHRYSLER LLC

1 - O-RING

2 - SEALER LOCATION

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

CAUTION: To align, the front crankshaft seal MUST be out of pump, or damage may result.

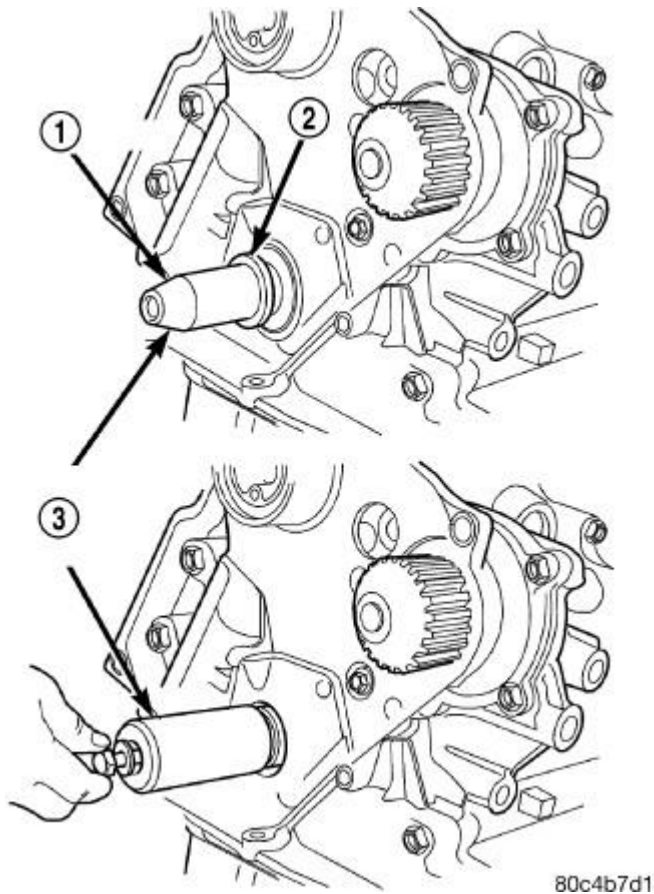


Fig. 287: Front Crankshaft Seal - Installation

Courtesy of CHRYSLER LLC

1 - SEAL PROTECTOR 6780 - 2

2 - SEAL

3 - FRONT CRANKSHAFT SEAL INSTALLER 6780 - 1

5. Install new front crankshaft seal (2) using Front Crankshaft Oil Seal Installer 6780 (3) .

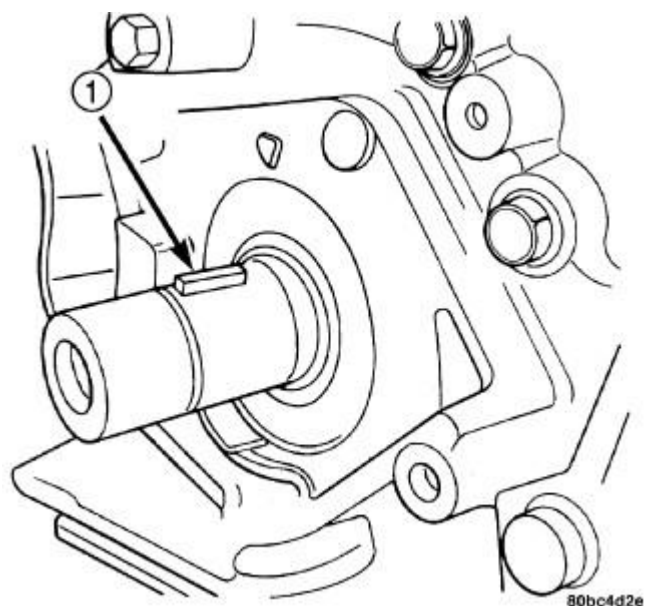


Fig. 288: Crankshaft Key
Courtesy of CHRYSLER LLC

1 -
CRANKSHAFT
KEY

6. Install crankshaft key (1) .

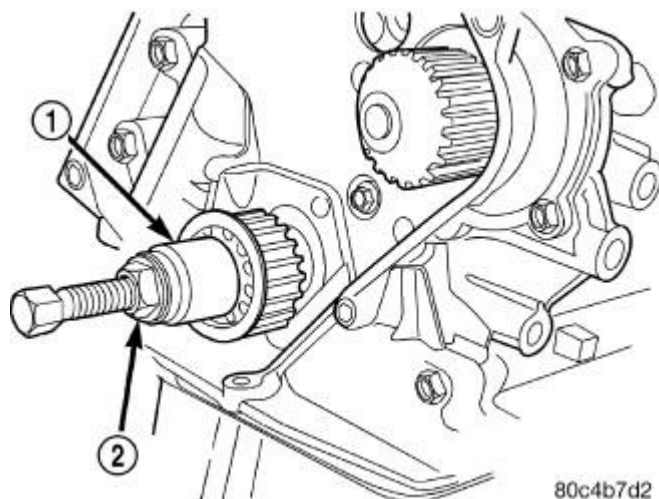


Fig. 289: Crankshaft Sprocket - Installation
Courtesy of CHRYSLER LLC

1 - CRANKSHAFT DAMPER/SPROCKET INSTALLER
6792

2 - TIGHTEN NUT TO INSTALL

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Special Tool 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

7. Install crankshaft sprocket using Crankshaft Damper/Sprocket Installer 6792 (1) .

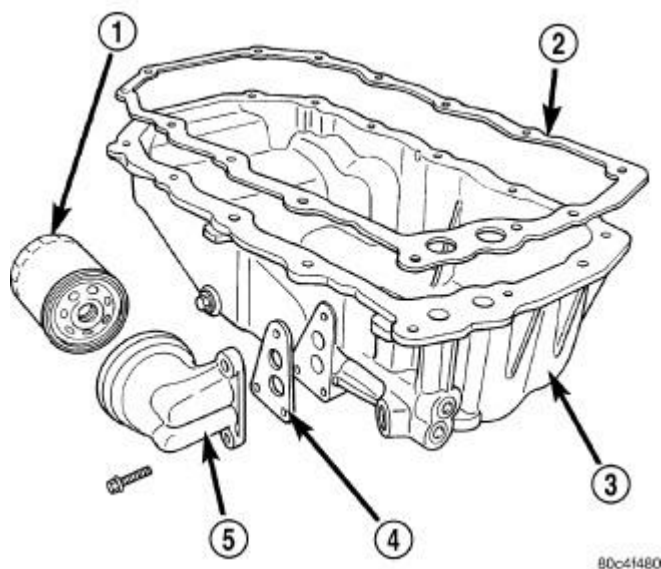


Fig. 290: Oil Pan
Courtesy of CHRYSLER LLC

- | |
|------------------------|
| 1 - OIL FILTER |
| 2 - OIL PAN GASKET |
| 3 - OIL PAN |
| 4 - ADAPTER GASKET |
| 5 - OIL FILTER ADAPTER |

8. Install oil pump pick-up tube.
9. Install oil pan (3). See **Engine/Lubrication/PAN, Oil - Installation**.
10. Install timing belt rear cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.
11. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation**.

SWITCH, OIL PRESSURE**Description****DESCRIPTION**

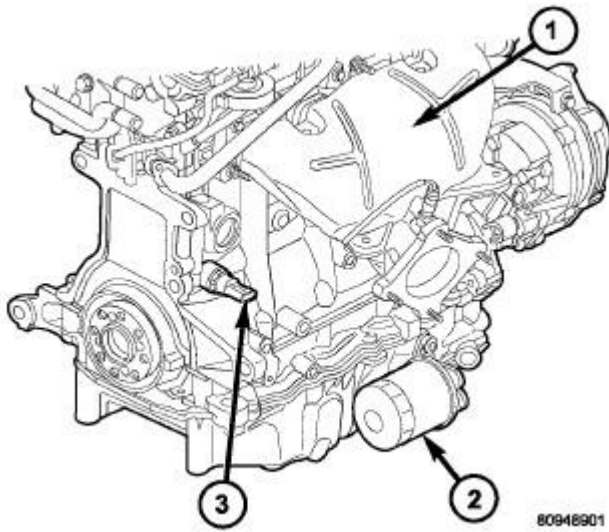


Fig. 291: Engine Oil Pressure Switch
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - EXHAUST MANIFOLD HEAT SHEILD
2 -OIL FILTER
3 - OIL PRESSURE SWITCH |
|--|

The oil pressure switch (3) is located on the right rear side of the engine block . The oil pressure switch (3) is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

Operation

OPERATION

The oil pressure switch is normally "Closed." The switch changes from a "Closed" circuit to an "Open" circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an "Open" circuit to a "Closed" circuit, on decreasing pressure, between 2 psig and 4 psig.

Removal

REMOVAL

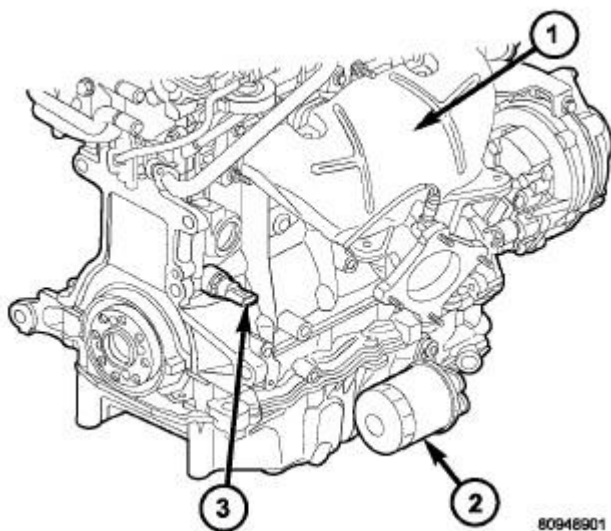


Fig. 292: Engine Oil Pressure Switch
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - EXHAUST MANIFOLD HEAT SHEILD
2 -OIL FILTER
3 - OIL PRESSURE SWITCH |
|--|

1. Raise vehicle.
2. Position oil collecting container under pressure switch (3) location.
3. Disconnect oil pressure switch electrical connector and remove switch (3) .

Installation

INSTALLATION

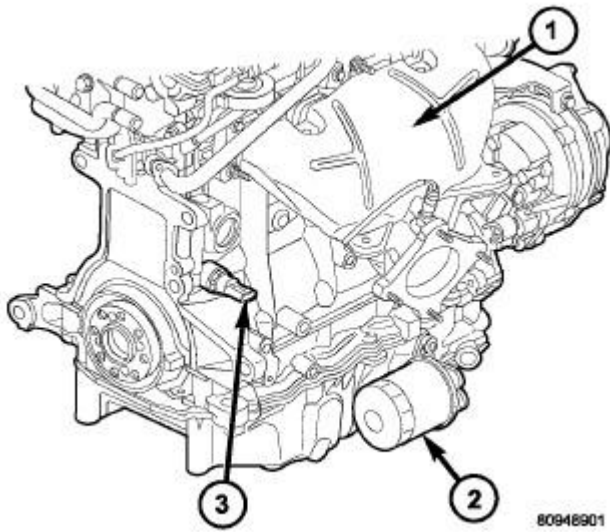


Fig. 293: Engine Oil Pressure Switch
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - EXHAUST MANIFOLD HEAT SHEILD</p> <p>2 - OIL FILTER</p> <p>3 - OIL PRESSURE SWITCH</p> |
|--|

1. Install oil pressure switch (3) and connect electrical connector .
2. Lower vehicle.
3. Start engine and allow to run a minimum of 2 minutes.
4. Shut engine off and check engine oil level. Adjust level as necessary.

MANIFOLDS

MANIFOLD, EXHAUST

Removal

REMOVAL

NOTE: The exhaust manifold on Turbocharged equipped vehicles is serviced as an assembly with the Turbocharger. See Engine/Turbocharger System/TURBOCHARGER - Removal.

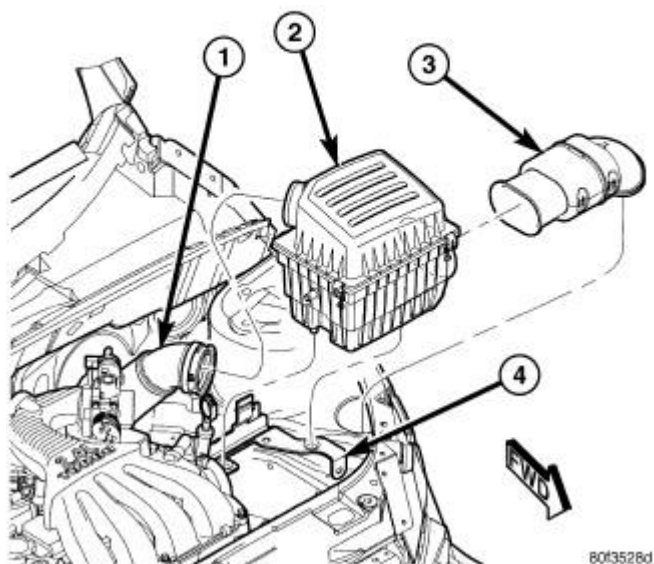


Fig. 294: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CLEAN AIR HOSE
2 - AIR CLEANER HOUSING
3 - FRESH AIR INLET DUCT
4 - TIPM MOUNTING BRACKET |
|--|

1. Remove clean air hose (1) and air cleaner housing (2).
2. Disconnect negative cable from battery.

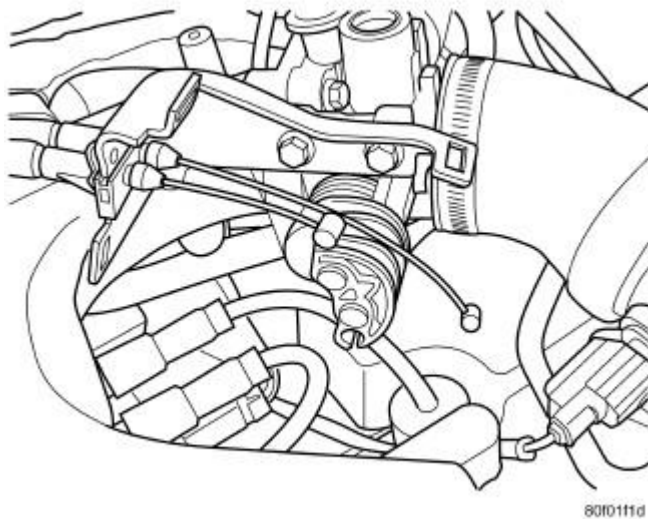


Fig. 295: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

3. Disconnect throttle and speed control cables from the throttle lever and bracket.

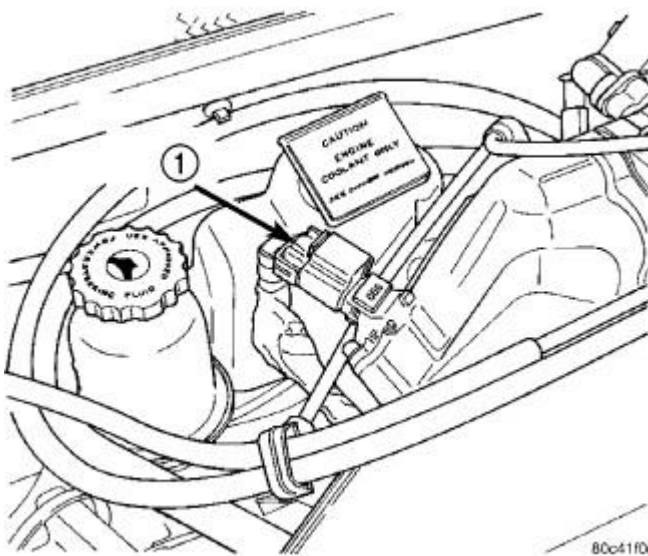


Fig. 296: MAP Sensor
Courtesy of CHRYSLER LLC

1 - MAP SENSOR

4. Disconnect MAP sensor (1) electrical connector.

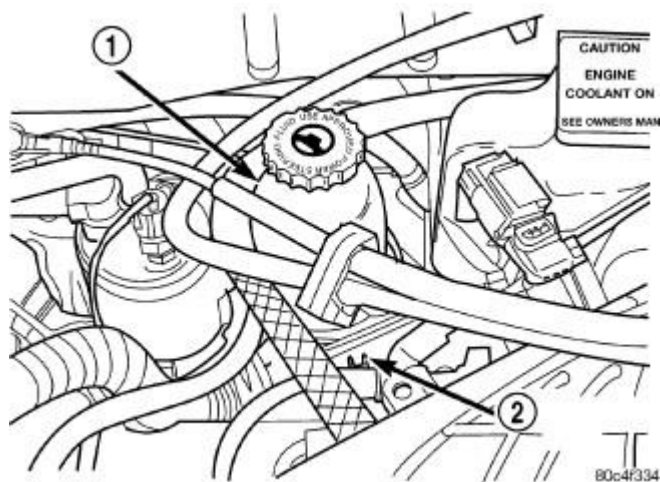


Fig. 297: Power Steering Fluid Reservoir
Courtesy of CHRYSLER LLC

1 - POWER
STEERING
FLUID
RESERVOIR
2 -
RETAINING
TAB

5. Remove fasteners securing power steering fluid reservoir (1) to cylinder head.
6. Remove coolant recovery container. Refer to **Cooling/Engine/BOTTLE, Coolant Recovery - Removal**.

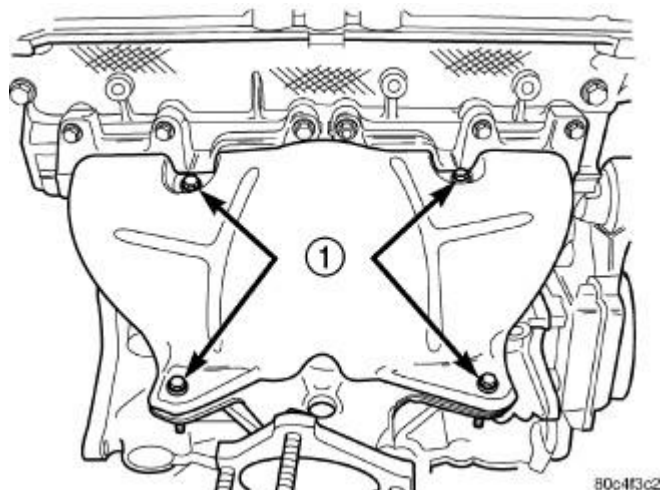


Fig. 298: Exhaust Manifold Heat Shield Bolts
Courtesy of CHRYSLER LLC

1 - BOLTS

7. Remove bolts (1) attaching upper heat shield .
8. Remove upper heat shield.
9. Raise vehicle.

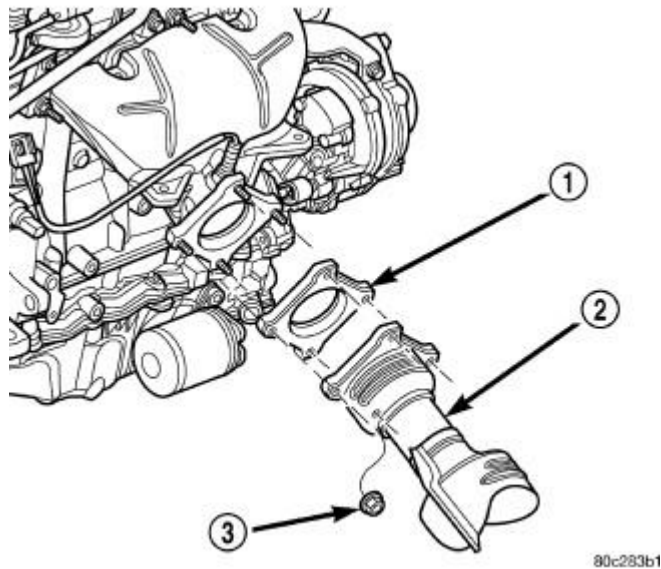


Fig. 299: Exhaust Manifold To Pipe Connection
Courtesy of CHRYSLER LLC

10. Disconnect exhaust pipe from manifold .

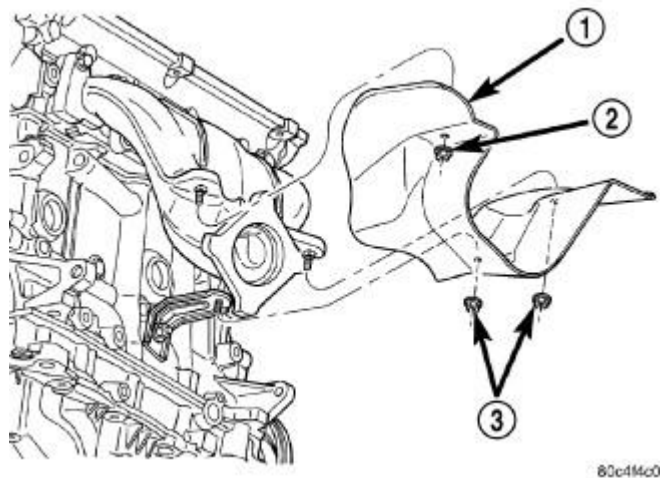


Fig. 300: Heat Shield - Engine Wiring
Courtesy of CHRYSLER LLC

- | |
|---------------------------------------|
| 1 - HEAT SHIELD
2 - NUT
3 - NUT |
|---------------------------------------|

11. Remove engine wiring heat shield (1) .

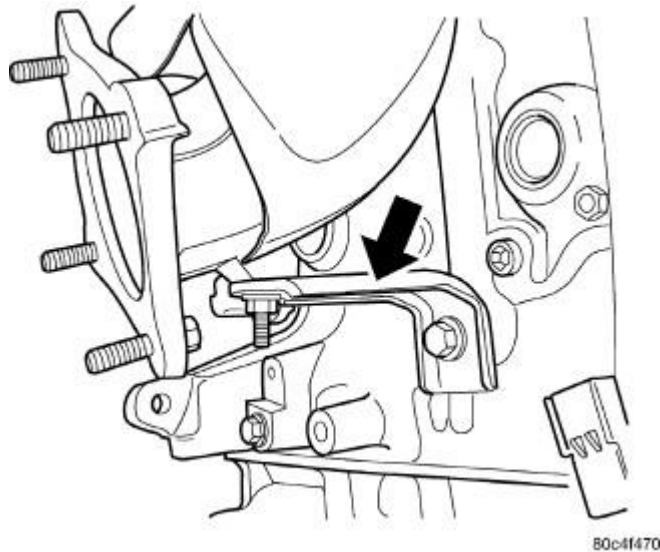


Fig. 301: Exhaust Manifold Support Bracket
Courtesy of CHRYSLER LLC

12. Remove manifold support bracket .

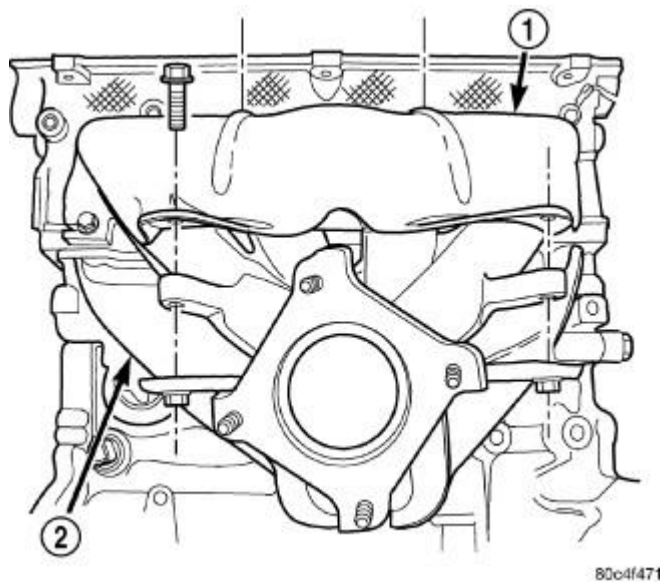


Fig. 302: Exhaust Manifold Heat Shields
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - UPPER HEAT SHIELD
2 - LOWER HEAT SHIELD |
|--|

13. Remove lower exhaust manifold heat shield (2) .
14. Disconnect oxygen sensor electrical connector.

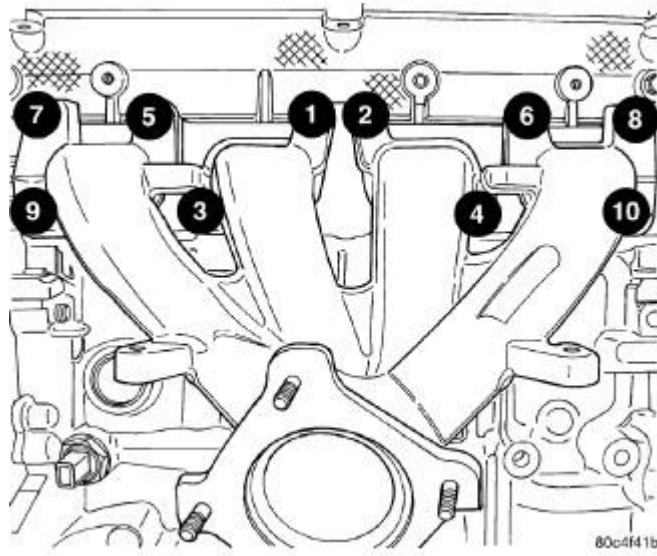


Fig. 303: Exhaust Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

15. Remove exhaust manifold lower retaining fasteners .
16. Lower vehicle and remove the upper exhaust manifold retaining fasteners.
17. Remove exhaust manifold from above/between the engine and cowl panel.
18. Remove and discard manifold gasket.

Cleaning

CLEANING

1. Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

Inspection

INSPECTION

1. Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.
2. Inspect manifolds for cracks or distortion. Replace manifold as necessary.

Installation

INSTALLATION

NOTE: The exhaust manifold on Turbocharged equipped vehicles is serviced as an assembly with the Turbocharger. See **Engine/Turbocharger System/TURBOCHARGER - Installation.**

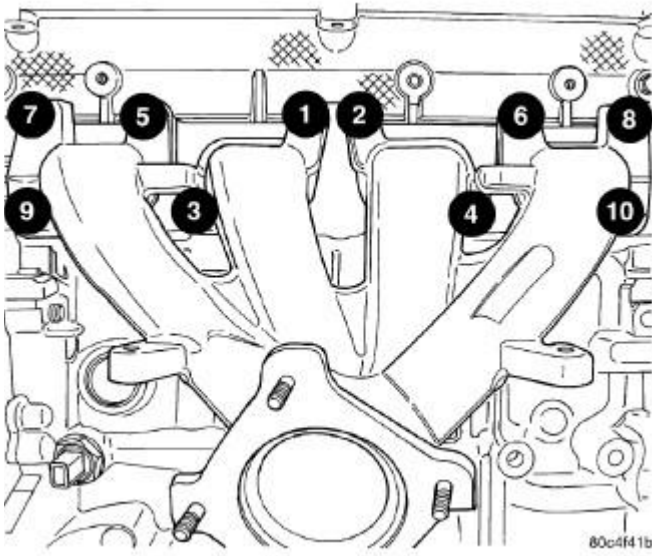


Fig. 304: Exhaust Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

1. Install a new exhaust manifold gasket. **DO NOT APPLY SEALER** .
2. Position exhaust manifold in place. Tighten fasteners in the sequence shown in illustration above to 23 N.m (200 in. lbs.) . Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.

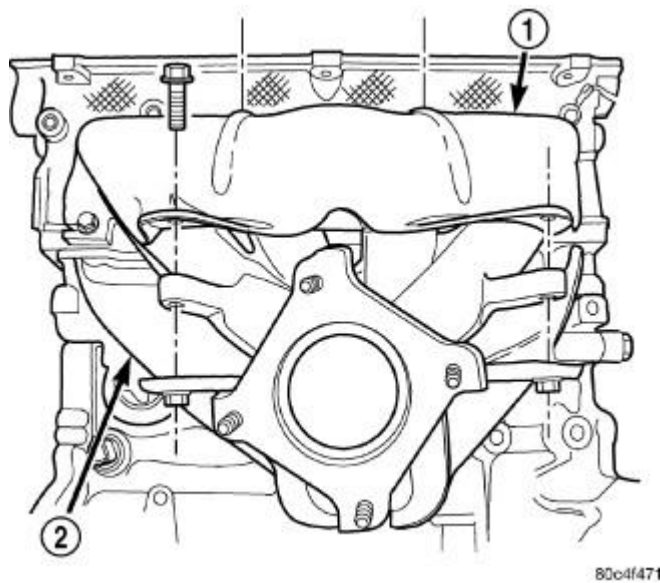


Fig. 305: Exhaust Manifold Heat Shields
Courtesy of CHRYSLER LLC

1 - UPPER HEAT SHIELD 2 - LOWER HEAT SHIELD
--

3. Install exhaust manifold heat shields . Tighten bolts to 12 N.m (105 in. lbs.).

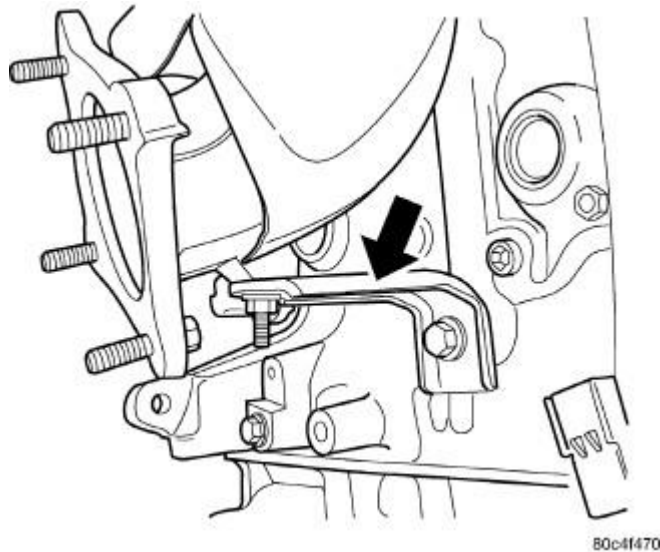


Fig. 306: Exhaust Manifold Support Bracket
Courtesy of CHRYSLER LLC

4. Install exhaust manifold support bracket .
5. Install engine wiring heat shield .
6. Connect oxygen sensor electrical connector.

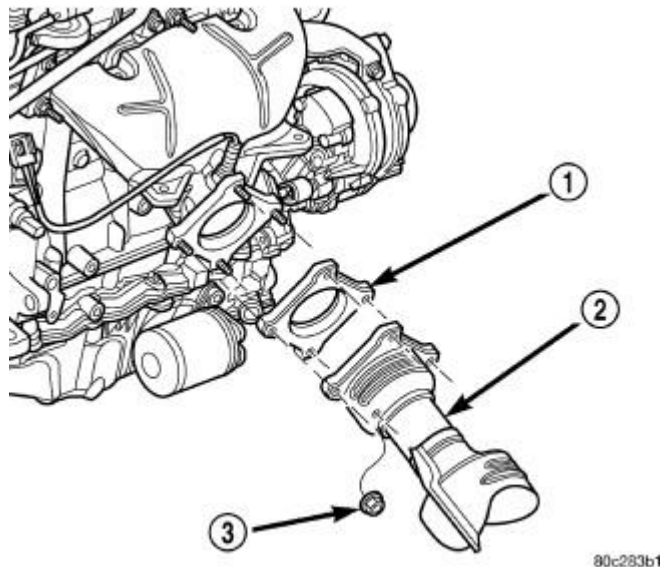


Fig. 307: Exhaust Manifold To Pipe Connection
Courtesy of CHRYSLER LLC

- | |
|---------------------------------------|
| 1 - GASKET
2 - CATALYTIC CONVERTER |
|---------------------------------------|

3 - NUT

7. Install exhaust pipe (2) to manifold with a new gasket (1) . Tighten fasteners to 28 N.m (250 in. lbs.).
8. Install coolant recovery container. Refer to **Cooling/Engine/BOTTLE, Coolant Recovery - Installation** .

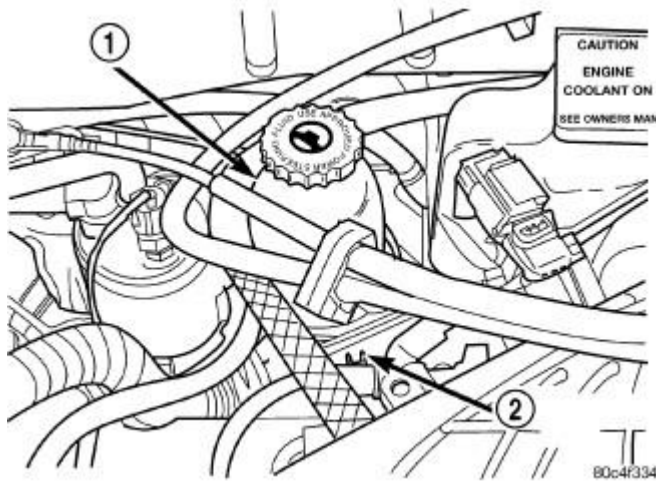


Fig. 308: Power Steering Fluid Reservoir
Courtesy of CHRYSLER LLC

1 - POWER
STEERING
FLUID
RESERVOIR
2 -
RETAINING
TAB

9. Install fasteners securing power steering fluid reservoir (1) to cylinder head.

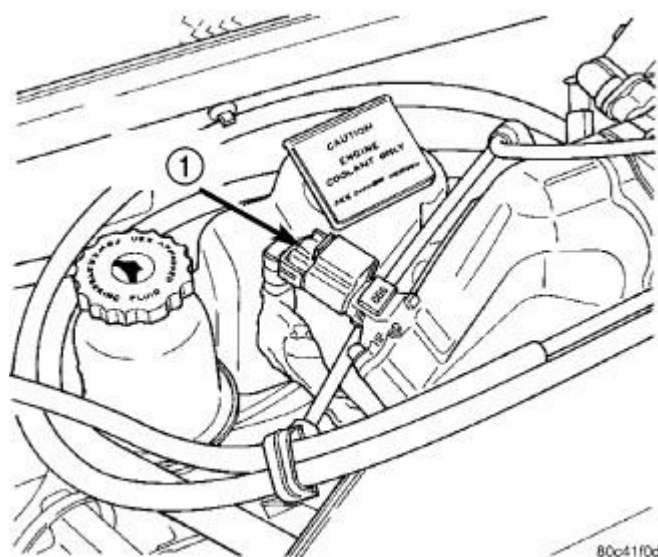


Fig. 309: MAP Sensor
Courtesy of CHRYSLER LLC

1 - MAP SENSOR

10. Connect MAP sensor (1) electrical connector.

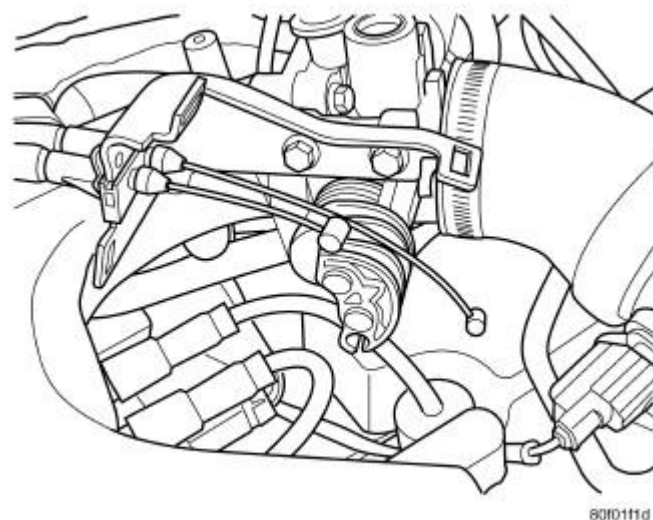


Fig. 310: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

11. Connect throttle and speed control cables to the throttle lever and bracket.

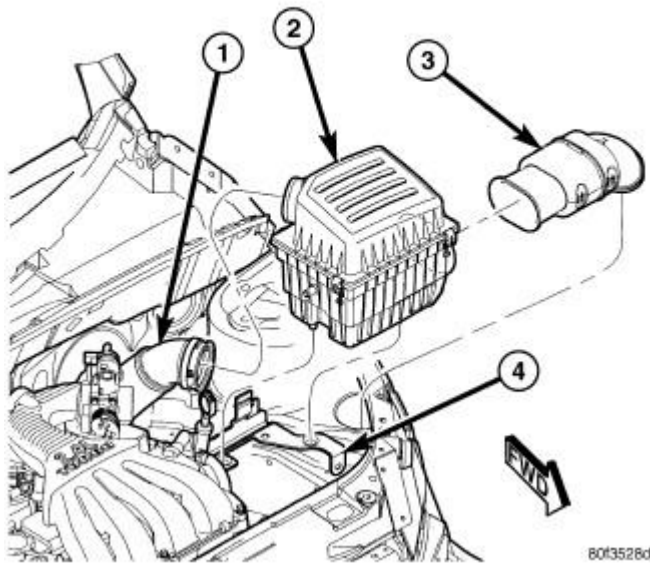


Fig. 311: Air Inlet System - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|--|
| <ul style="list-style-type: none"> 1 - CLEAN AIR HOSE 2 - AIR CLEANER HOUSING 3 - FRESH AIR INLET DUCT 4 - TIPM MOUNTING BRACKET |
|--|

- 12. Connect negative cable to battery.
- 13. Install clean air hose (1) and air cleaner housing (2).

MANIFOLD, INTAKE

Diagnosis and Testing

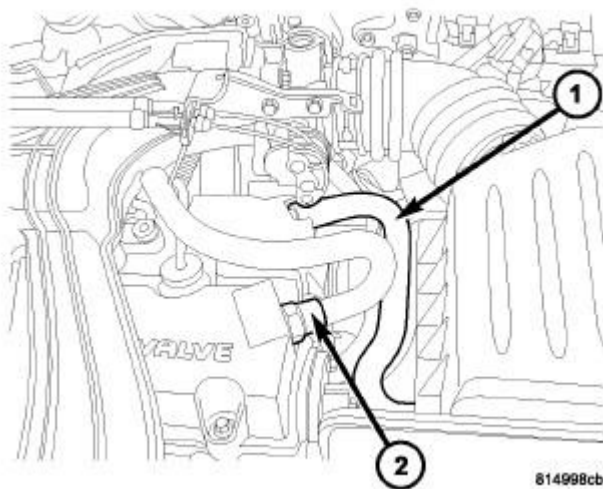
INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

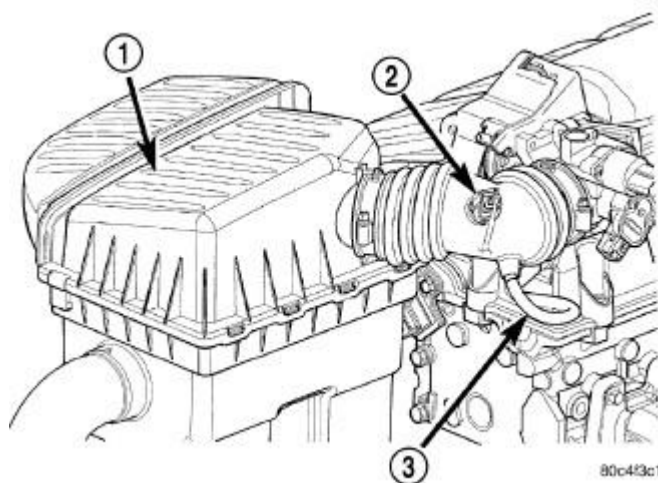
WARNING: Use extreme caution when the engine is operating. Do not stand in a direct line with the fan. Do not put your hands near the pulleys, belts or the fan. Do not wear loose clothing.

- 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.

Removal**UPPER INTAKE MANIFOLD****Non-Turbo****Fig. 312: PCV****Courtesy of CHRYSLER LLC**

1. Disconnect inlet air temperature sensor and make-up air hose (1) from clean air hose.

**Fig. 313: Clean Air Hose****Courtesy of CHRYSLER LLC**

2. Remove air cleaner housing (1) and clean air hose assembly.
3. Disconnect negative cable from battery.

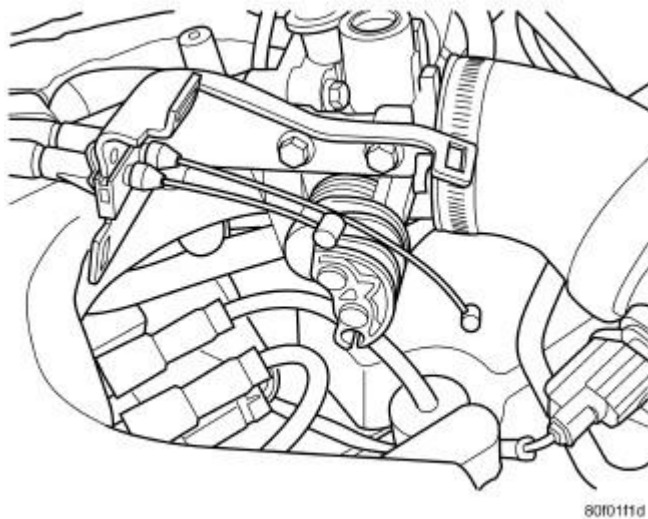


Fig. 314: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

4. Remove throttle and speed control cables from throttle lever and bracket.

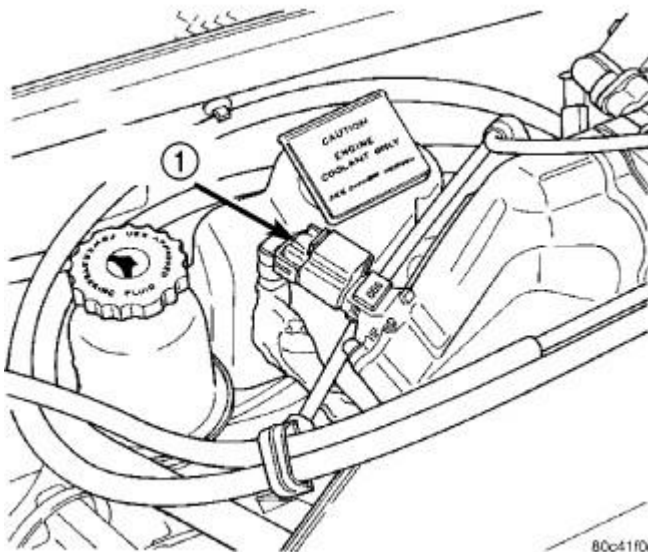


Fig. 315: MAP Sensor
Courtesy of CHRYSLER LLC

5. Disconnect manifold absolute pressure (MAP) sensor (1).

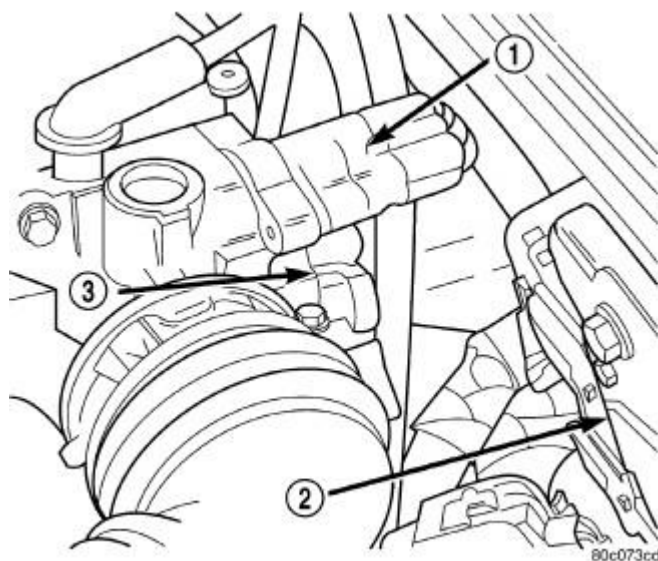


Fig. 316: Idle Air Control (IAC) Motor and Throttle Position Sensor (TPS) Wiring Connectors
Courtesy of CHRYSLER LLC

6. Disconnect idle air control (IAC) motor (1) and throttle position sensor (TPS) (3) wiring connectors.

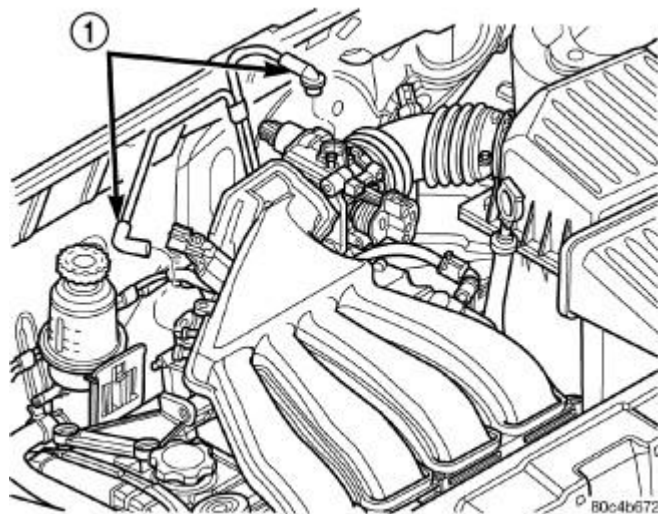


Fig. 317: Proportional Purge Hoses
Courtesy of CHRYSLER LLC

7. Disconnect proportional purge hoses (1).

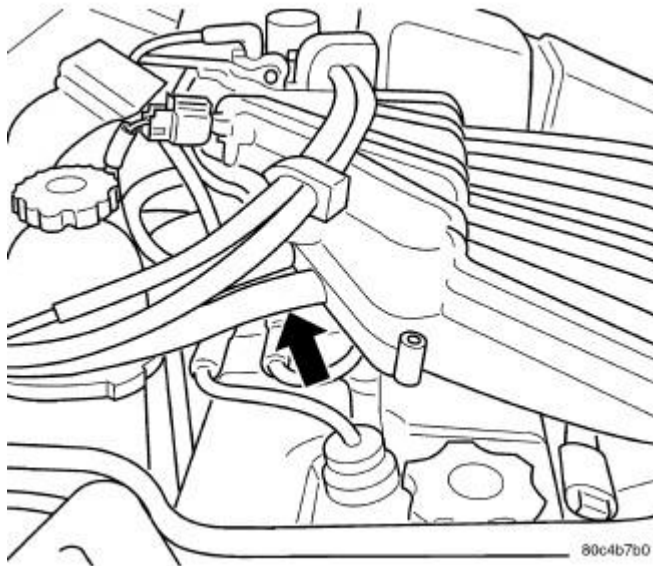


Fig. 318: Brake Booster Hose
Courtesy of CHRYSLER LLC

8. Disconnect brake booster hose.
9. Disconnect PCV hose from intake manifold.

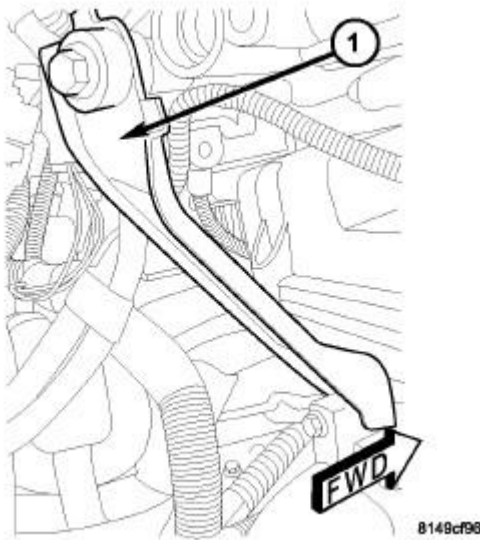


Fig. 319: INTAKE MANIFOLD SUPPORT
Courtesy of CHRYSLER LLC

10. Remove rear intake manifold support bracket (1).
11. Remove upper intake manifold fasteners.
12. Remove upper intake manifold.

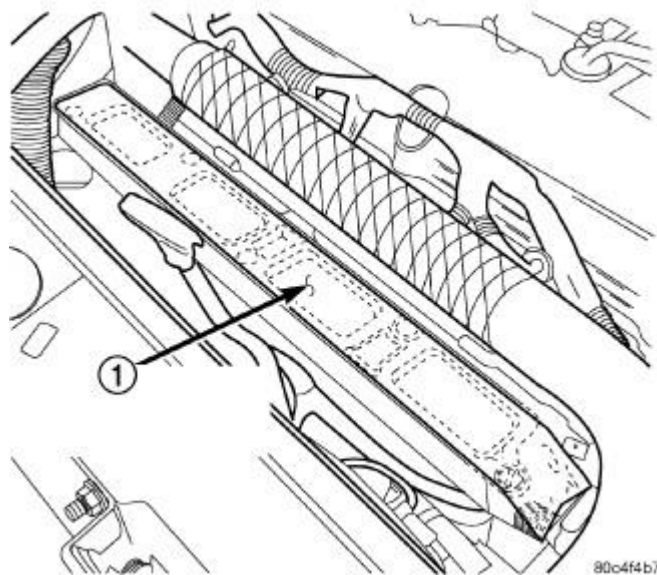


Fig. 320: Cover Lower Intake Manifold Openings
Courtesy of CHRYSLER LLC

13. If further service is required, cover the lower intake manifold openings to prevent foreign materials from entering the engine.

Turbo

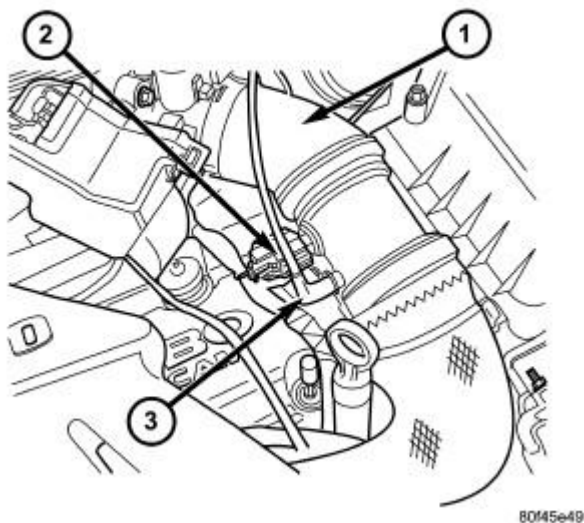


Fig. 321: IAT Sensor - 2.4L Turbo
Courtesy of CHRYSLER LLC

NOTE: This engine could be equipped with an aluminum Intake manifold or a plastic intake manifold.

1. Disconnect negative battery cable.
2. Disconnect the inlet air temperature (IAT) sensor (2) connector.
3. Disconnect the throttle inlet pressure (TIP) hose (3).

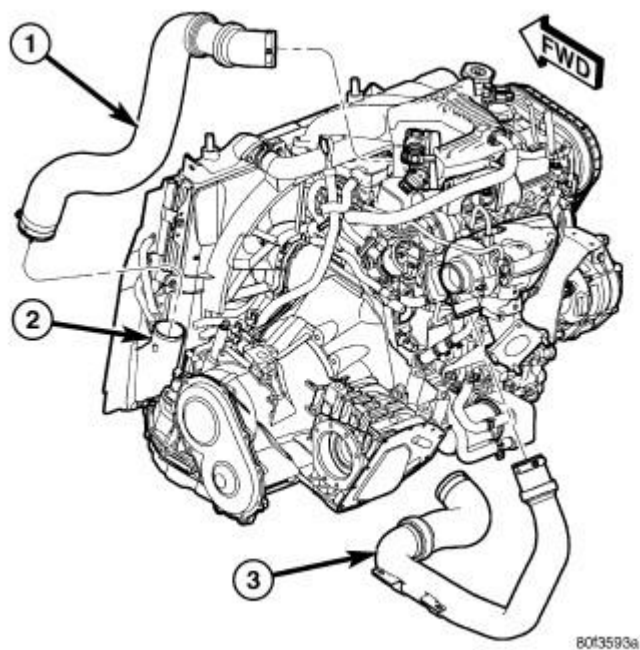


Fig. 322: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

4. Disconnect charge air cooler hose at throttle body (1).
5. Disconnect idle air control (IAC) motor and throttle position sensor connectors.

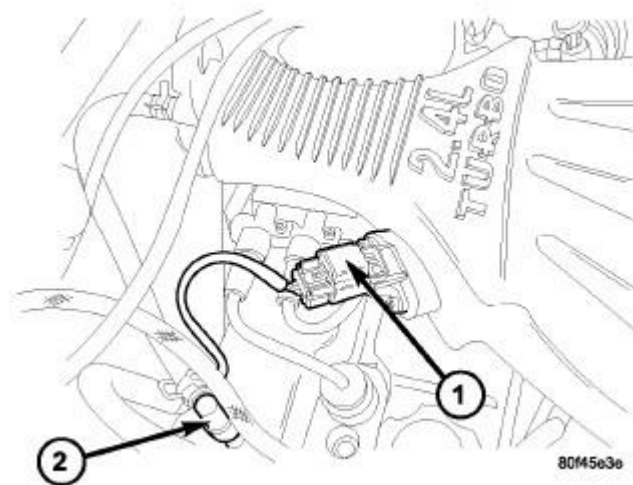


Fig. 323: MAP Sensor - 2.4L Turbo
Courtesy of CHRYSLER LLC

6. Disconnect the MAP sensor connector (1).

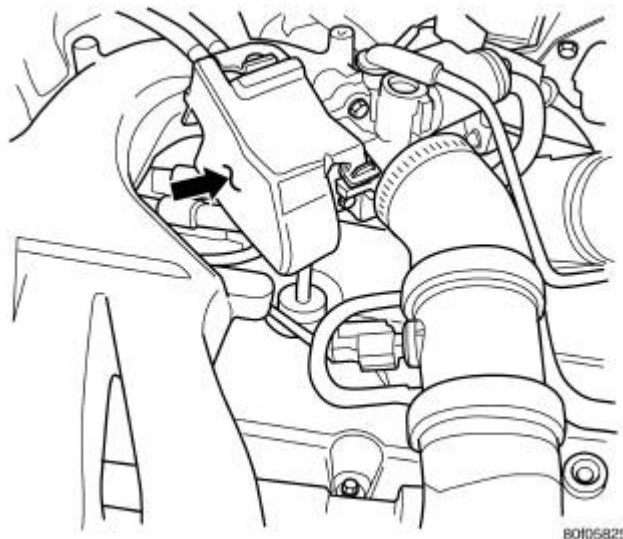


Fig. 324: Throttle Control Shield 2.4L Turbo
Courtesy of CHRYSLER LLC

7. Remove the throttle control shield.

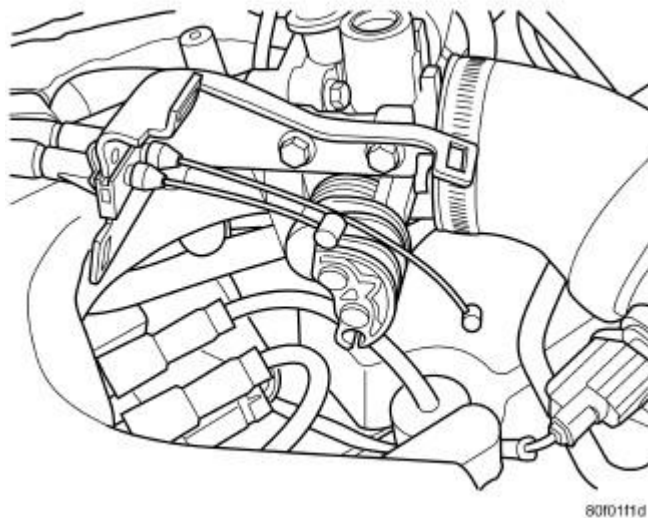


Fig. 325: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

8. Remove the throttle cable from the throttle body lever.

9. If equipped with speed control, remove speed control cable from the throttle lever by sliding clasp out hole used for throttle cable.

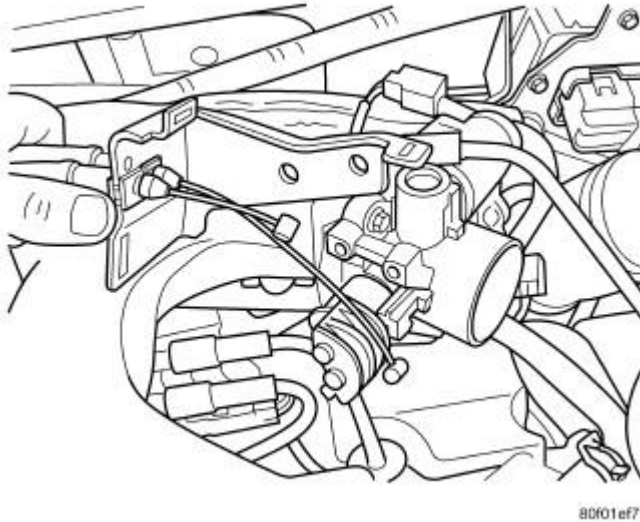


Fig. 326: Throttle Cable Bracket - 2.4L Turbo
Courtesy of CHRYSLER LLC

10. Remove the 2 screws for the throttle cable bracket.
11. Reposition throttle cable bracket .
12. Remove intake manifold cover.

NOTE: To remove intake manifold cover, start with clips near throttle body.

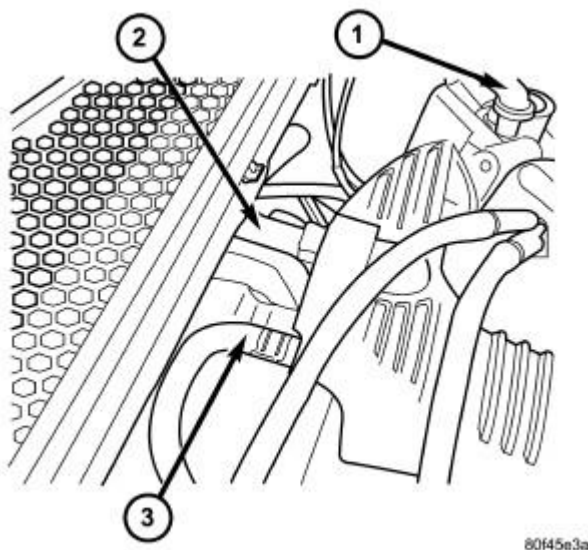


Fig. 327: Vacuum Hoses - 2.4L Turbo

Courtesy of CHRYSLER LLC

13. Disconnect brake booster hose (3) and PCV hose (3) from intake manifold.
14. Disconnect purge solenoid hose (1) from throttle body.

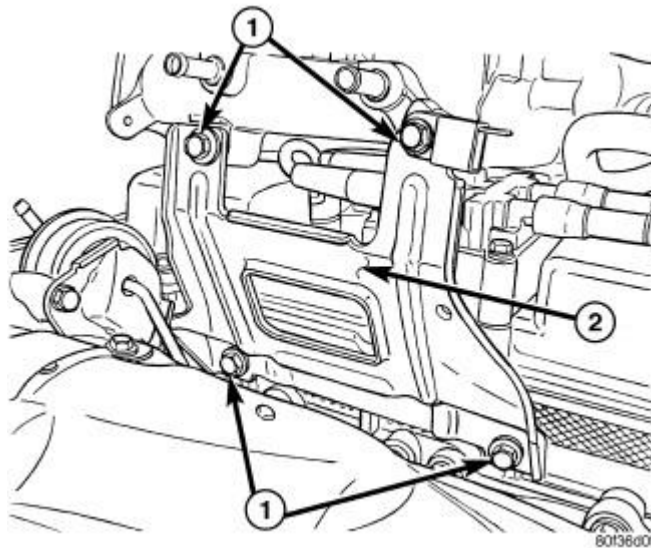


Fig. 328: Support Bracket
Courtesy of CHRYSLER LLC

15. Remove upper intake manifold support bracket (2).
16. Remove upper intake manifold fasteners (1).
17. Remove upper intake manifold.

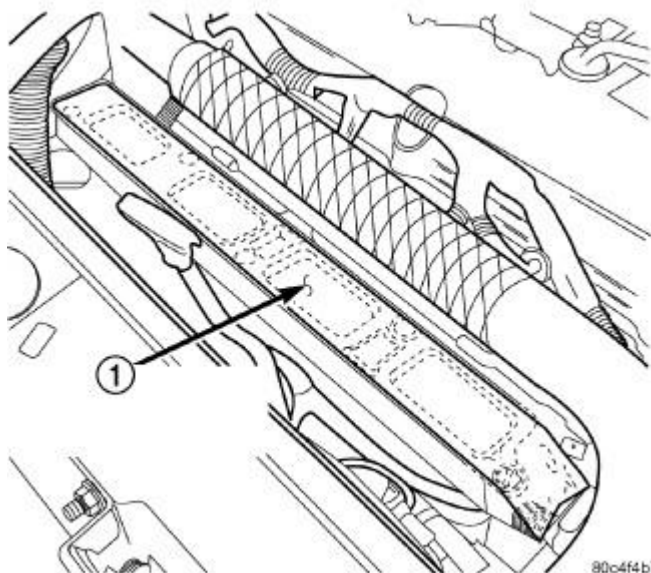
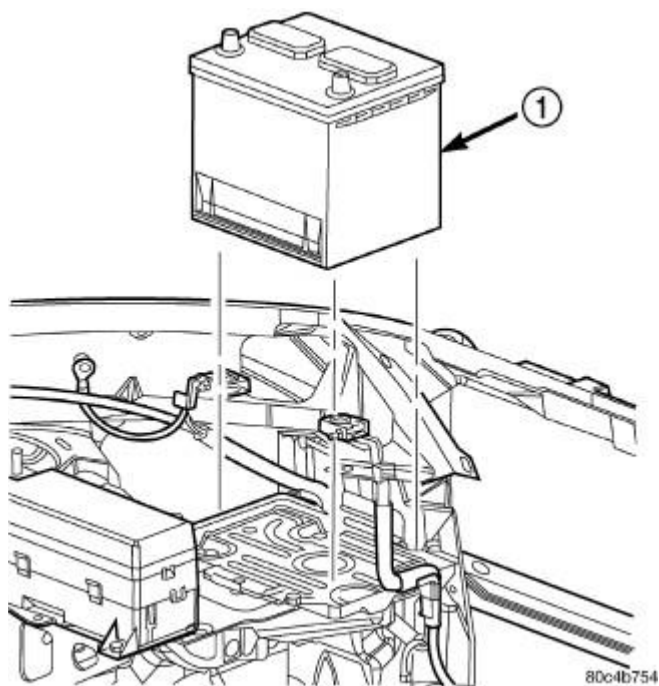


Fig. 329: Cover Lower Intake Manifold Openings

Courtesy of CHRYSLER LLC

18. If further service is required, cover the lower intake manifold openings (1) to prevent foreign materials from entering the engine.

LOWER INTAKE MANIFOLD

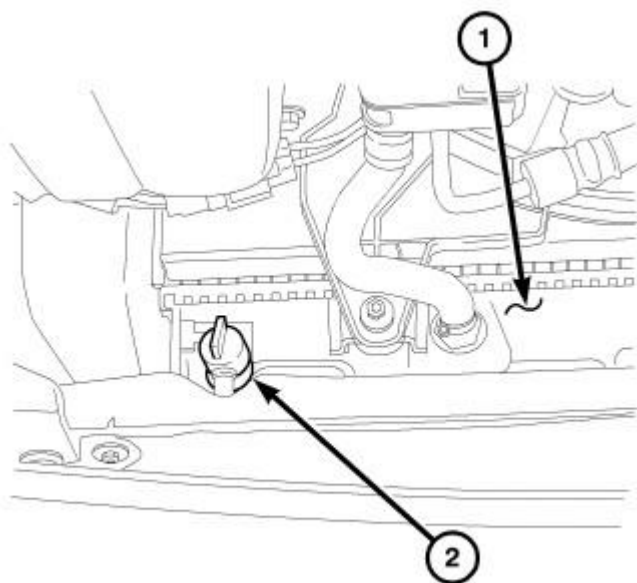
**Fig. 330: Battery-Removal/Installation**

Courtesy of CHRYSLER LLC

WARNING: Release fuel system pressure before servicing system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle.

NOTE: Turbo charged engines could be equipped with either an aluminum or a plastic intake manifold.

1. Perform fuel system pressure release procedure **before attempting any repairs**. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Disconnect negative battery cable (1).
3. Remove upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.

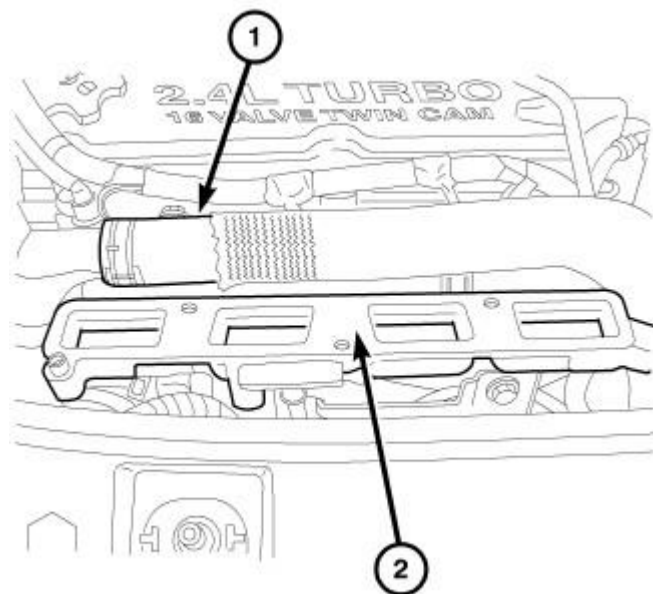


816ca14c

Fig. 331: DRAINCOCK

Courtesy of CHRYSLER LLC

4. Partially drain (2) cooling system below thermostat level. Refer to **SYSTEM DRAINING**.



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Fig. 332: RADIATOR HOSE

Courtesy of CHRYSLER LLC

5. Remove upper radiator hose (1).

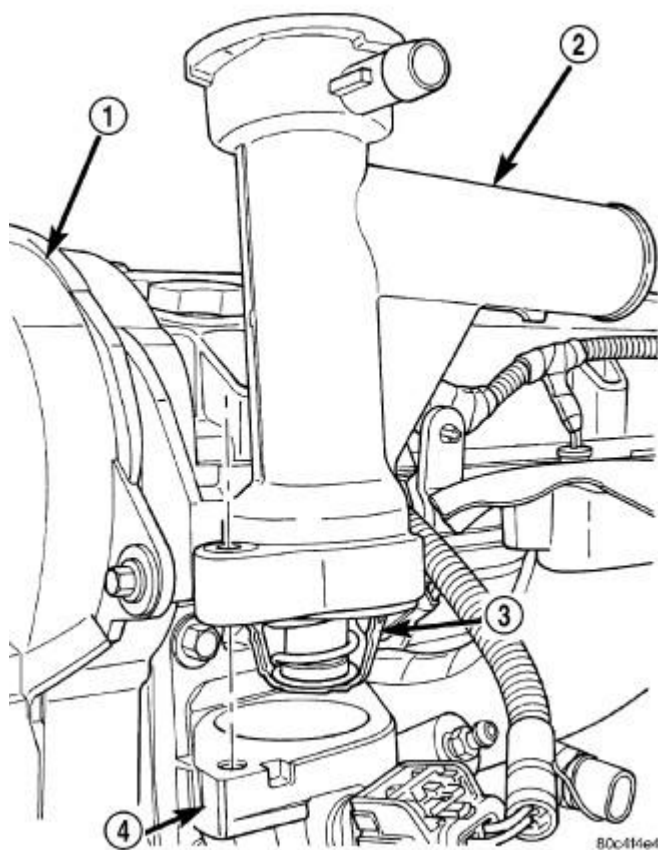


Fig. 333: Thermostat and Coolant Outlet Connector
Courtesy of CHRYSLER LLC

6. Remove coolant outlet connector (2) and thermostat (3). Refer to **THERMOSTAT** .

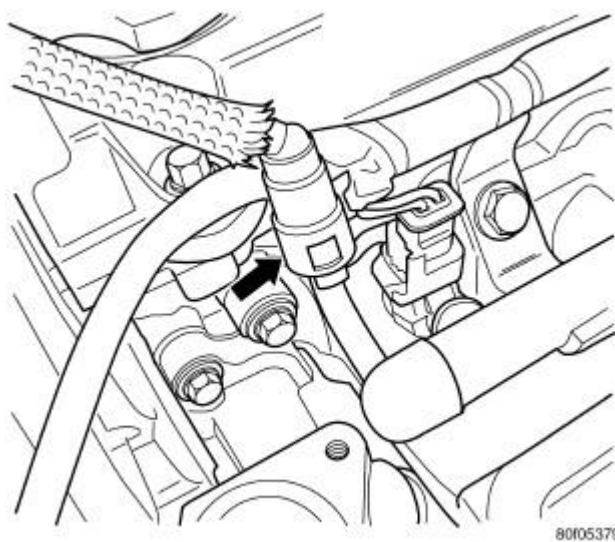


Fig. 334: FUEL LINE CONNECTION - 2.4L TURBO

Courtesy of CHRYSLER LLC

7. Disconnect the fuel supply line quick connect at the fuel rail assembly. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure**.

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

8. Disconnect fuel injector wiring harness.

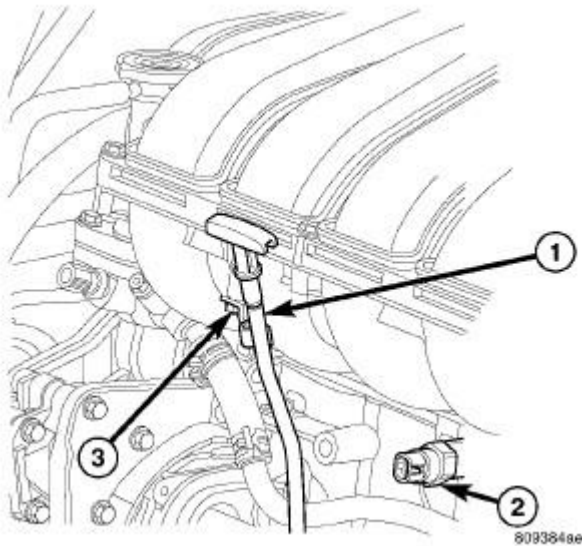


Fig. 335: Dipstick Tube
Courtesy of CHRYSLER LLC

9. Remove screw (3) attaching the oil dipstick tube (1) to lower intake manifold.

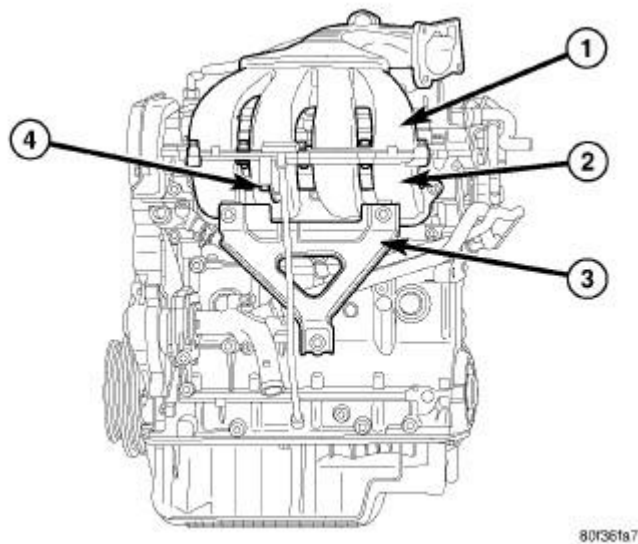


Fig. 336: Lower Intake Manifold Support Bracket - 2.4L Turbo
Courtesy of CHRYSLER LLC

10. **Turbocharger Equipped Engine:** Remove fasteners for lower intake manifold support bracket (3).

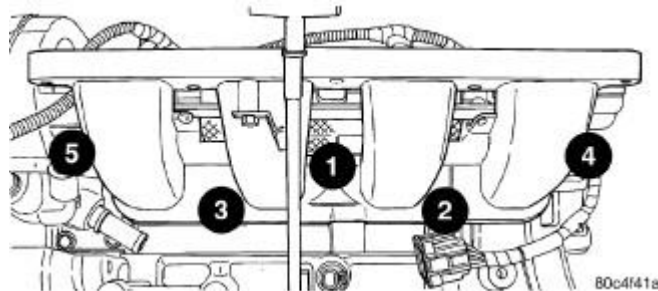


Fig. 337: Lower Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

11. Remove lower intake manifold fasteners .
12. Remove lower intake manifold.

Cleaning

CLEANING

1. Discard gasket(s).
2. Clean all sealing surfaces.

Inspection

INSPECTION

1. Inspect manifold for cracks, distortion, or mounting surface warpage. Replace manifold if necessary.
2. Inspect manifold gasket for surface damage or excessive swelling. Replace gaskets as necessary.

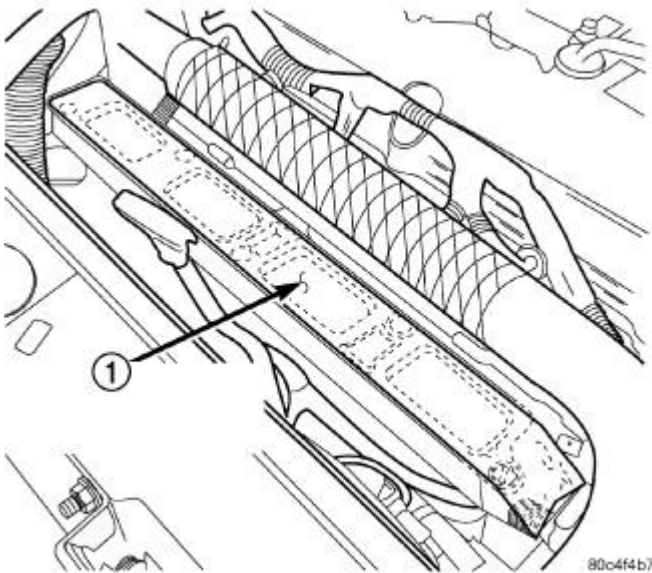
Installation**UPPER INTAKE MANIFOLD****Non-Turbo**

Fig. 338: Cover Lower Intake Manifold Openings
Courtesy of CHRYSLER LLC

1 - INTAKE MANIFOLD MUST BE COVERED DURING SERVICE

1. If lower intake manifold was covered during service, remove cover (1).
2. Clean all sealing surfaces. Replace seals as necessary.
3. Position new seals on manifold.

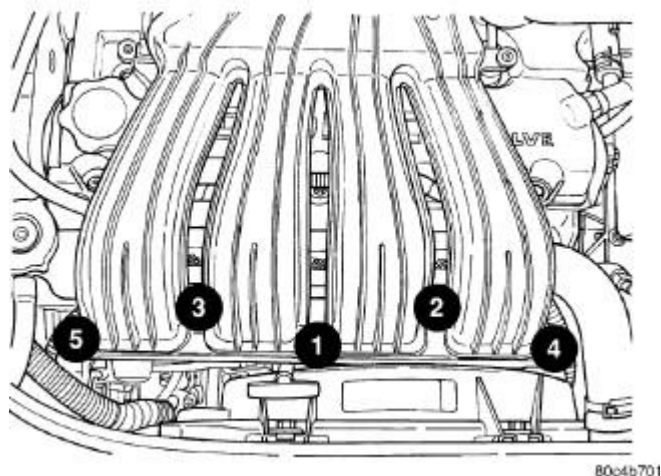


Fig. 339: Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

4. Position upper intake manifold on lower intake manifold. Tighten upper intake manifold fasteners to 12 N.m (105 in. lbs.) in sequence shown in illustration .

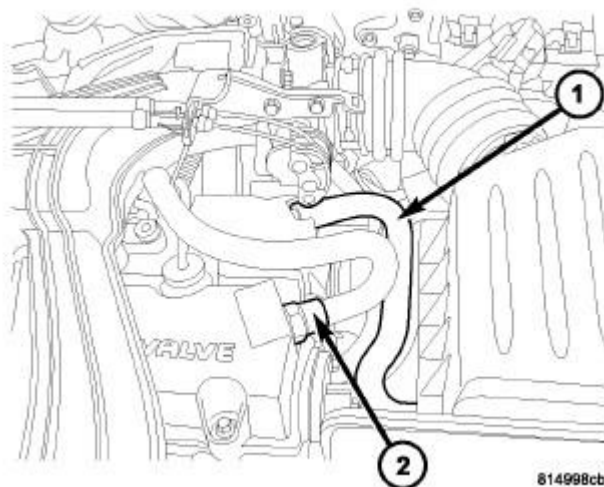


Fig. 340: PCV
Courtesy of CHRYSLER LLC

5. Connect PCV hose (2) to intake manifold .

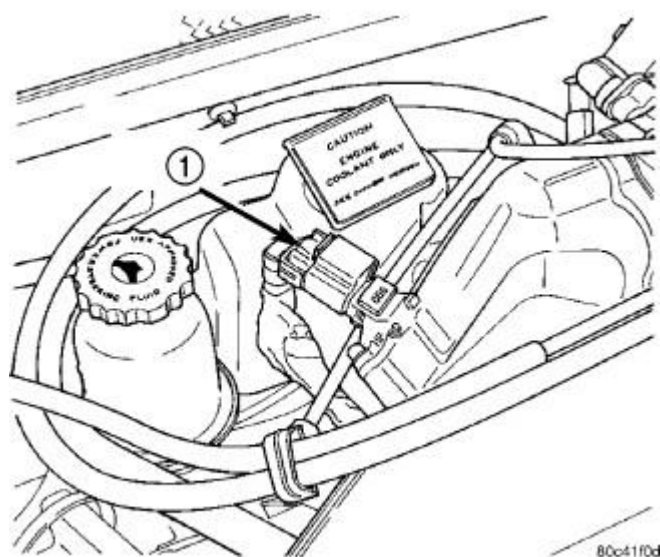


Fig. 341: MAP Sensor
Courtesy of CHRYSLER LLC

1 - MAP SENSOR

6. Connect manifold absolute pressure (MAP) (1) electrical connector .

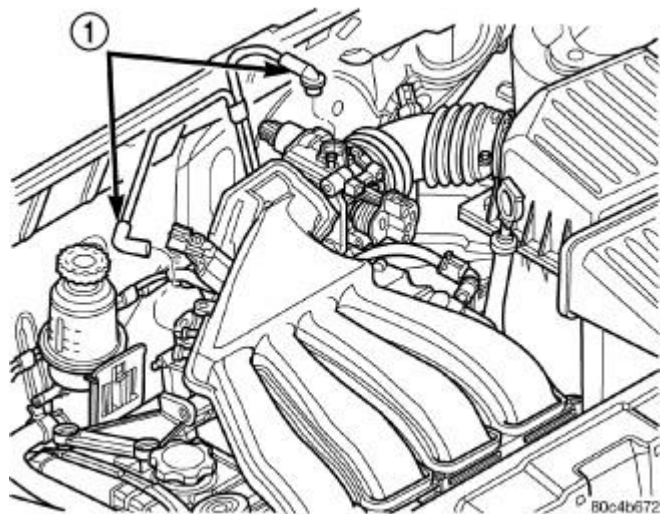


Fig. 342: Proportional Purge Hoses
Courtesy of CHRYSLER LLC

1 - PROPORTIONAL PURGE HOSES

7. Connect proportional purge hoses (1) .

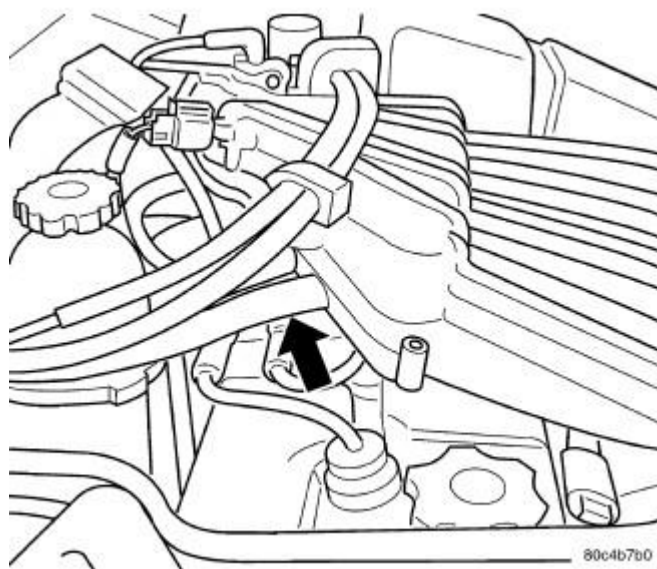


Fig. 343: Brake Booster Hose
Courtesy of CHRYSLER LLC

8. Connect brake booster hose .
9. Connect Idle Air Control (IAC) motor and Throttle Position Sensor (TPS) wiring connectors.

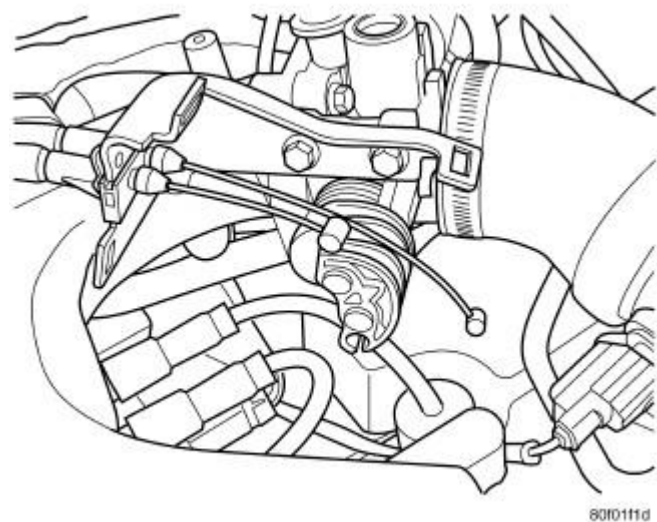


Fig. 344: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

10. Install throttle and speed control cables to bracket. Connect cables to the throttle lever.
11. Connect negative cable to battery.

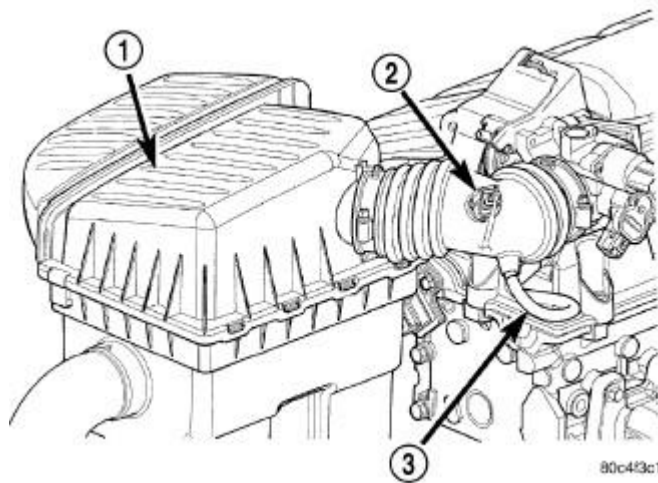


Fig. 345: Clean Air Hose
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - AIR CLEANER HOUSING
2 - INLET AIR TEMPERATURE SENSOR
3 - MAKE-UP AIR HOSE |
|---|

12. Install air cleaner housing (1) and clean air hose. Tighten clean air hose clamp to 1.7 N.m (15 in. lbs.).
13. Connect make-up (3) air hose and inlet air temperature sensor (2) .

Turbo

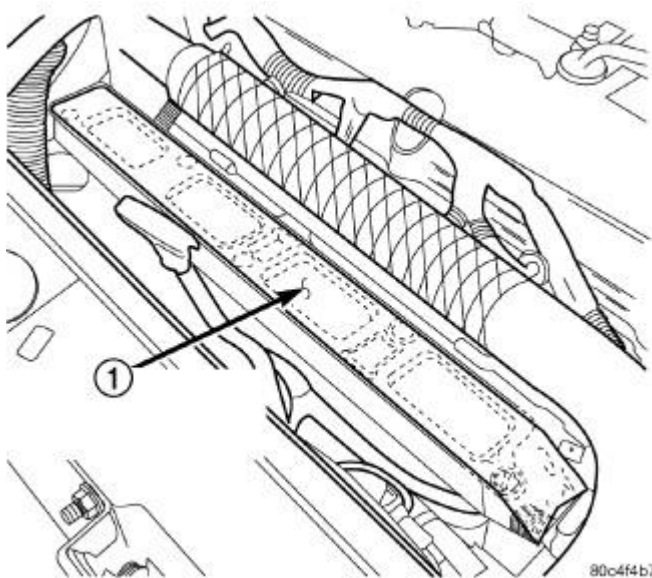


Fig. 346: Cover Lower Intake Manifold Openings
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - INTAKE MANIFOLD MUST BE COVERED DURING SERVICE |
|--|

1. If lower intake manifold was covered during service, remove cover (1) .
2. Clean all sealing surfaces. Replace upper intake manifold gasket.

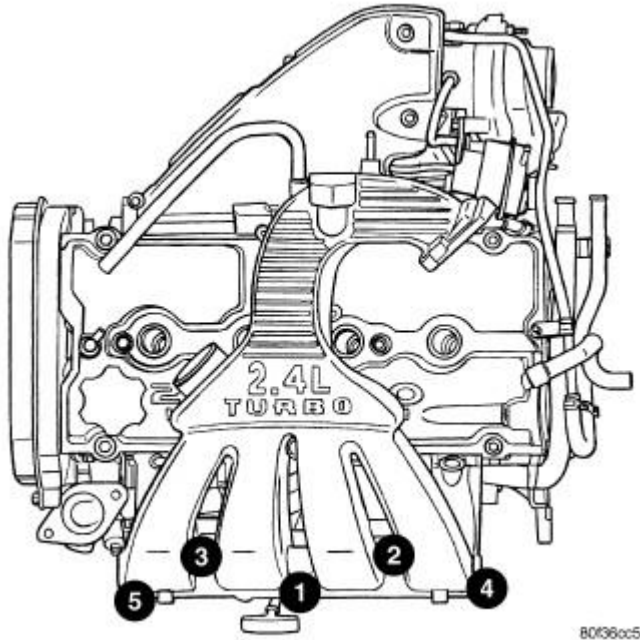
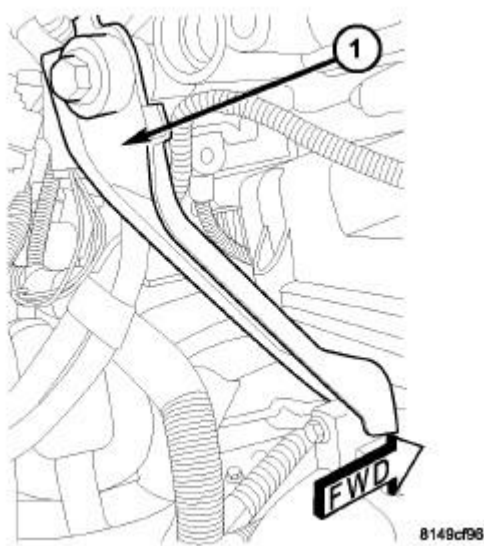


Fig. 347: Intake Manifold Tightening Sequence - 2.4L Turbo
Courtesy of CHRYSLER LLC

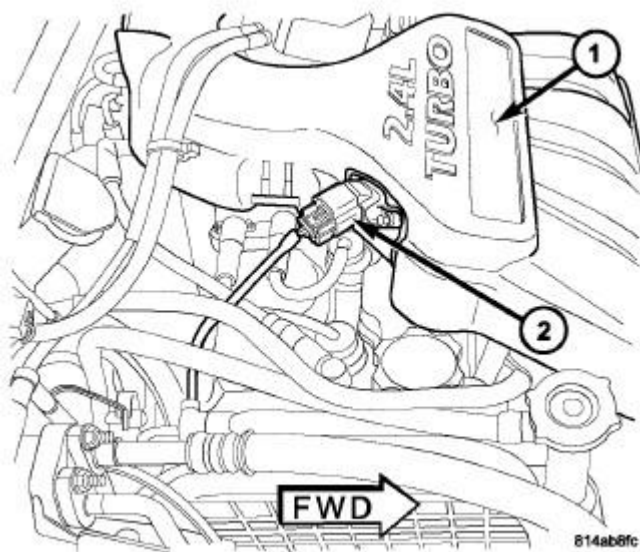
NOTE: This engine could be equipped with either a plastic intake manifold or an aluminum intake manifold.

3. Position upper intake manifold on lower intake manifold. On engines equipped with an aluminum intake manifold, tighten manifold fasteners to 28 N.m (250 in. lbs.) in sequence shown in illustration . On engines equipped with a plastic intake manifold, tighten manifold fasteners to 12 N.m (105 in. lbs.) in sequence shown in illustration .

**Fig. 348: INTAKE MANIFOLD SUPPORT**

Courtesy of CHRYSLER LLC

4. Install upper intake manifold to cylinder head support bracket (1) . Torque cylinder head fasteners to 28 N.m (250 in. lbs.) and manifold fasteners to 6 N.m (55 in. lbs.).

**Fig. 349: INTAKE COVER**

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - Intake Manifold Cover
2 - Harness Connector |
|--|

5. Install the intake manifold cover (1).

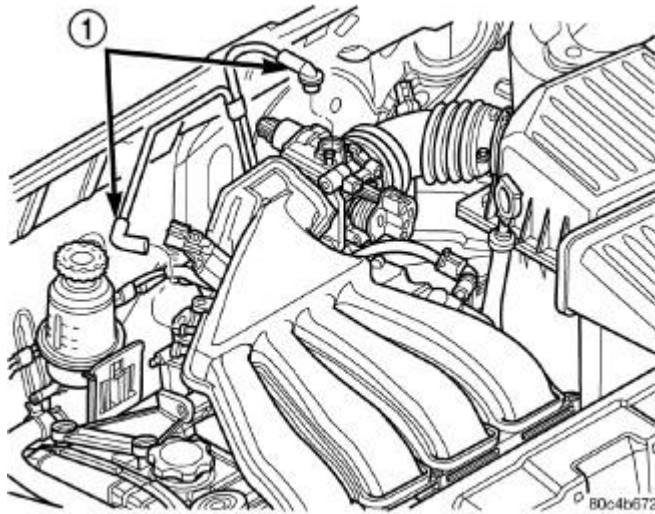


Fig. 350: Proportional Purge Hoses
Courtesy of CHRYSLER LLC

1 - PROPORTIONAL PURGE HOSES

6. Connect purge solenoid hose to throttle body (1) .

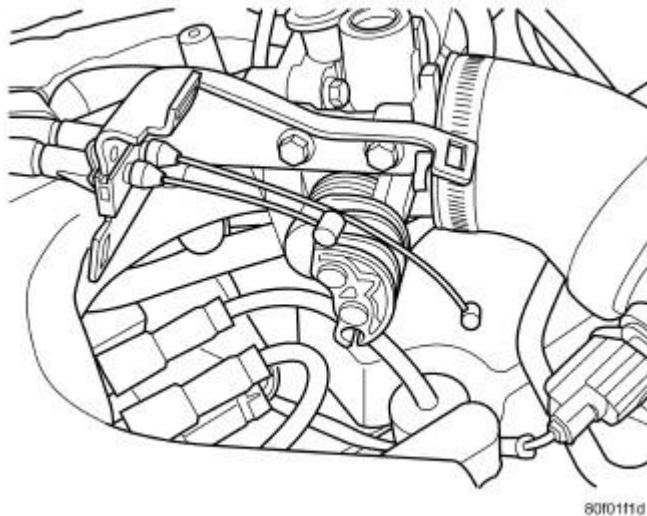


Fig. 351: Throttle Cables - 2.4L Turbo
Courtesy of CHRYSLER LLC

7. Connect brake booster vacuum hose and PCV hose to intake manifold.
8. Install the 2 screws for the throttle cable bracket and tighten to 12 N.m (105 in. lbs.) on aluminum intake manifolds and 6 N.m (55 in. lbs.) on plastic intake manifolds.

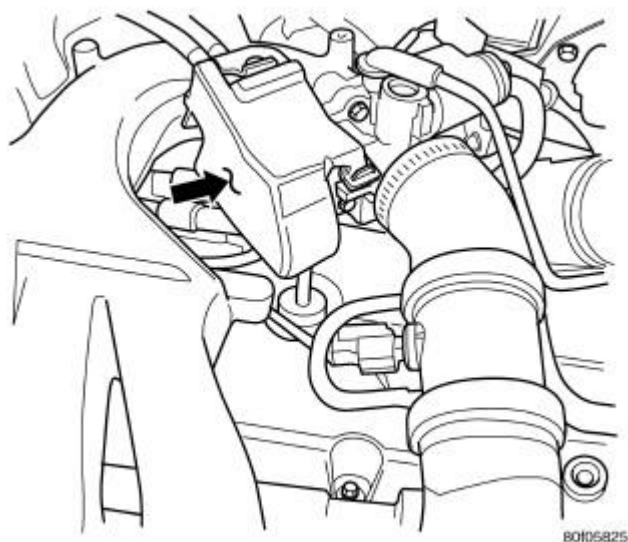


Fig. 352: Throttle Control Shield 2.4L Turbo
Courtesy of CHRYSLER LLC

9. Install the throttle control shield .
10. Connect idle air control (IAC) motor and throttle position sensor connectors.

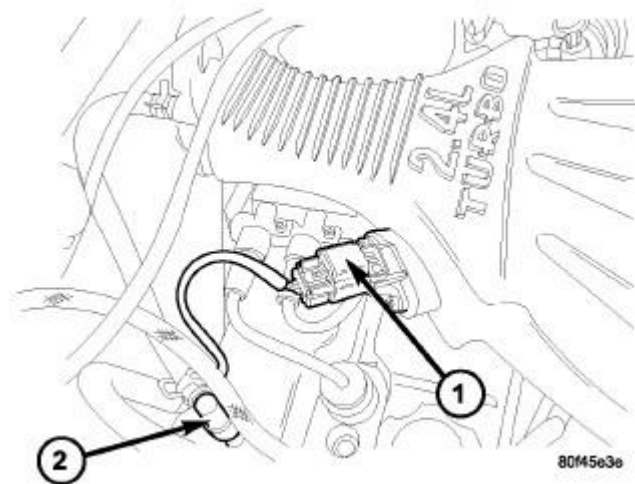


Fig. 353: MAP Sensor - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - MAP SENSOR

11. Connect the MAP sensor (1) connector .

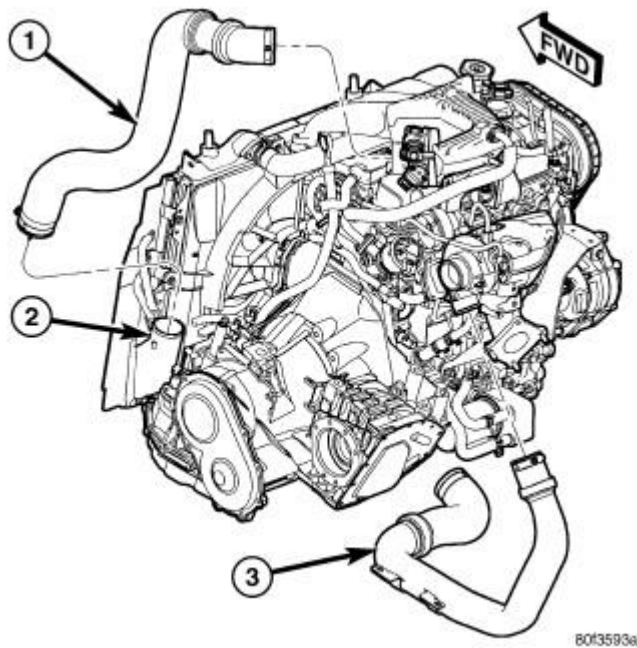


Fig. 354: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
2 - CHARGE AIR COOLER
3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER

12. Connect charge air cooler hose to throttle body (1) . Tighten hose clamp to 1.7 N.m (15 in. lbs.).
13. Connect negative battery cable.

LOWER INTAKE MANIFOLD

NOTE: Turbo charged engines could be equipped with either an aluminum or a plastic manifold.

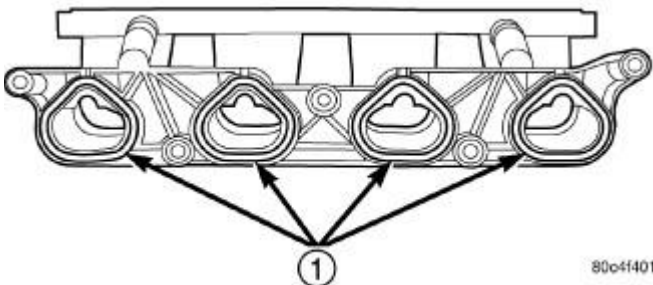


Fig. 355: Lower Intake Manifold Seals - Naturally Aspirated Engine

Courtesy of CHRYSLER LLC

1. Clean all gasket surfaces.
2. **Naturally Aspirated Engine:** Position new seals on lower intake manifold.
3. **Turbocharged Engine:** Replace lower intake manifold gasket.

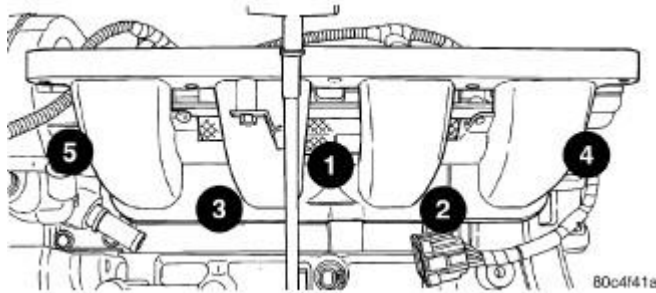


Fig. 356: Lower Intake Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

4. **Naturally Aspirated Engine:** Install lower intake manifold. Tighten fasteners to 12 N.m (105 in. lbs.) in sequence shown in illustration.
5. **Turbocharged Engine:** Install lower intake manifold. If equipped with an aluminum manifold, tighten fasteners to 28 N.m (250 in. lbs.) in sequence shown in illustration. If equipped with a plastic manifold, tighten fasteners to 12 N.m (105 in. lbs.) in sequence shown in illustration.

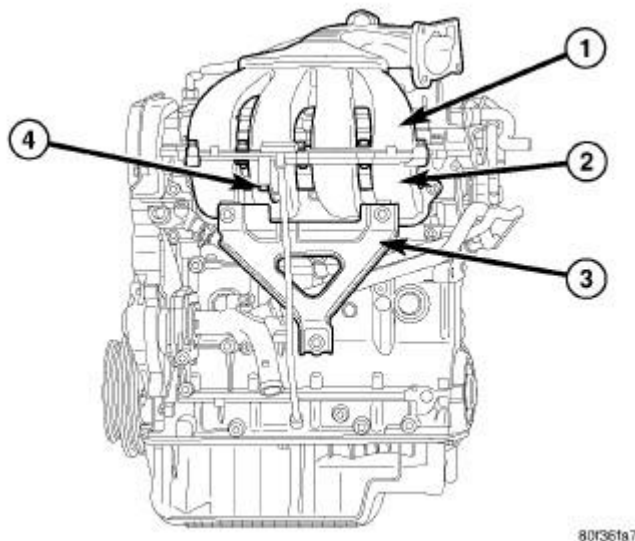


Fig. 357: Lower Intake Manifold Support Bracket - 2.4L Turbo
Courtesy of CHRYSLER LLC

6. **Turbocharger Equipped Engine:** Install fasteners for lower intake manifold support bracket (3). If equipped with an aluminum manifold, torque fasteners to 54 N.m (40 ft. lbs.). If equipped with a plastic manifold, torque manifold fasteners to 6 N.m (55 in. lbs.).

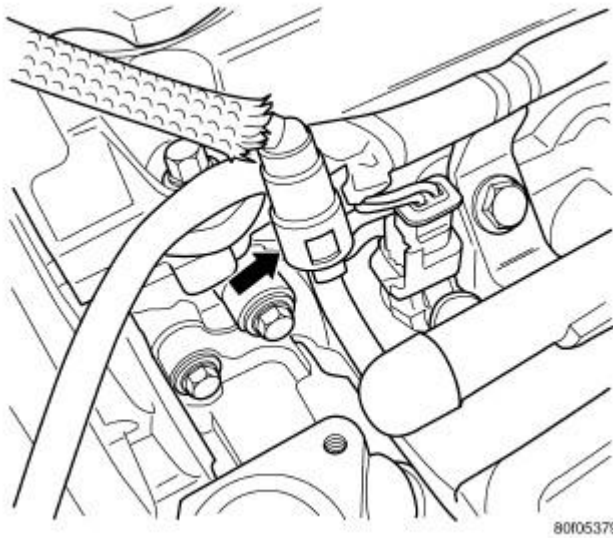


Fig. 358: FUEL LINE CONNECTION - 2.4L TURBO
Courtesy of CHRYSLER LLC

7. If removed, install the fuel rail assembly to intake manifold. Tighten screws to 23 N.m (200 in. lbs.).
8. Connect fuel injector wiring harness.
9. Inspect quick connect fittings for damage, replace if necessary. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure**. Lubricate tube with clean engine oil. Connect fuel supply hose to fuel rail assembly. Check connection by pulling on connector to insure it locked into position.

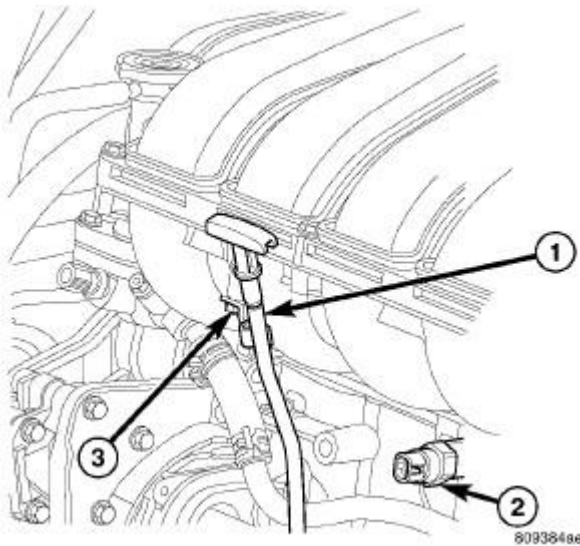


Fig. 359: Dipstick Tube
Courtesy of CHRYSLER LLC

10. Install the screw attaching the oil dipstick tube to lower intake manifold.

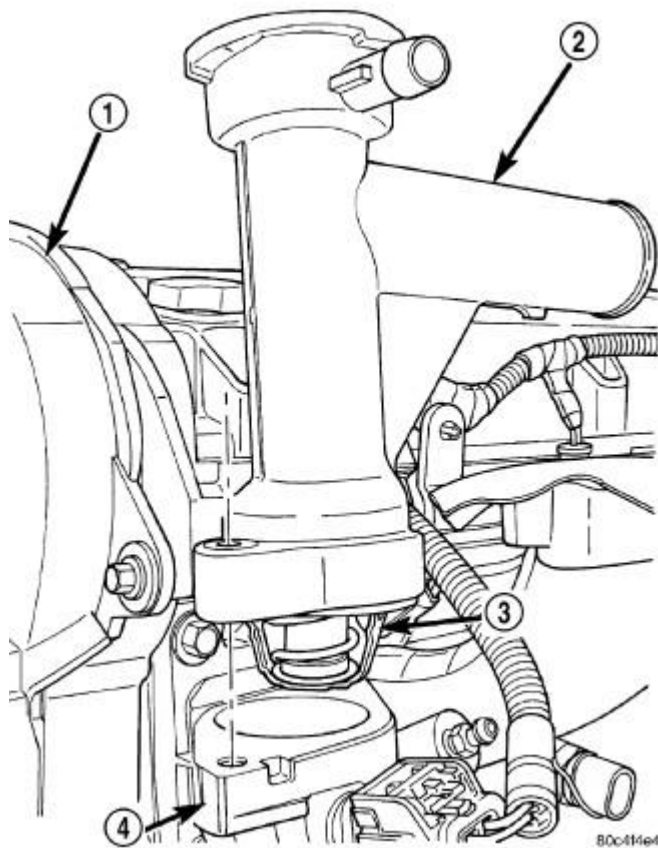
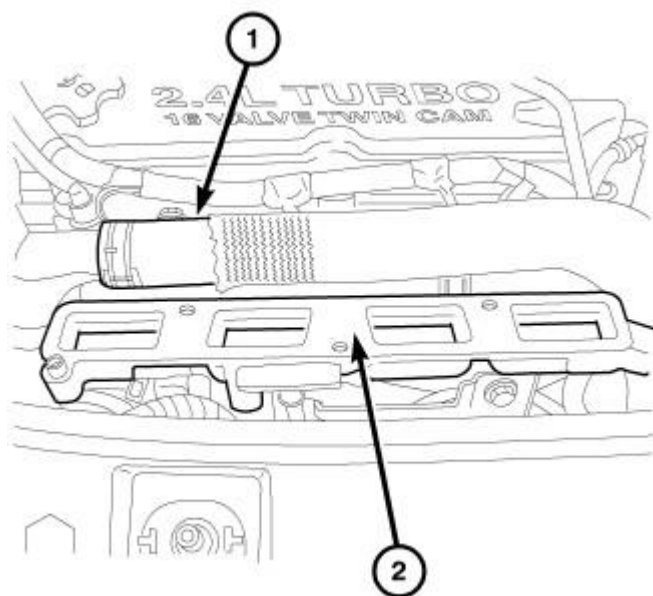


Fig. 360: Thermostat and Coolant Outlet Connector
Courtesy of CHRYSLER LLC

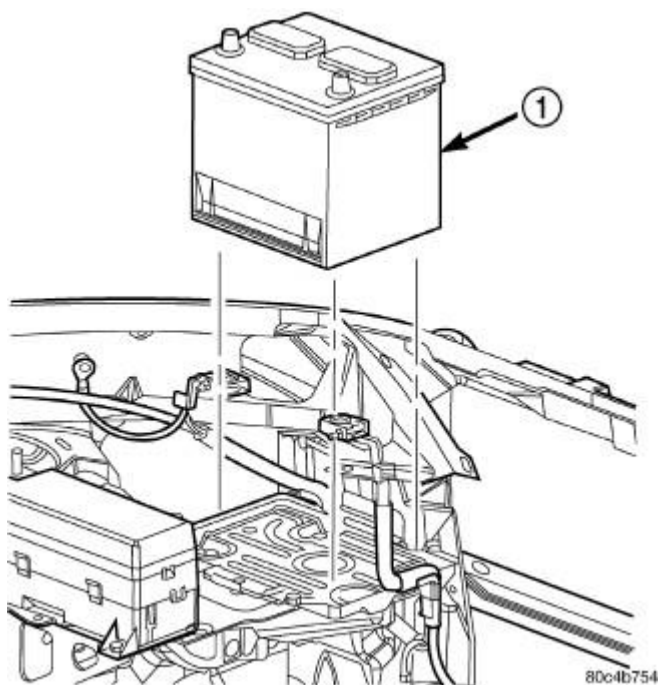
11. Install thermostat (3) and coolant outlet connector (2). Refer to **THERMOSTAT** .



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Fig. 361: RADIATOR HOSE
Courtesy of CHRYSLER LLC

12. Install radiator upper hose (1).
13. Install upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.



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Fig. 362: Battery-Removal/Installation
Courtesy of CHRYSLER LLC

14. Connect negative cable to battery (1).

15. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
16. With the DRBIII® scan tool use ASD Fuel System Test to pressurize system to check for leaks.

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

17. Start engine and check for leaks.

TURBOCHARGER SYSTEM

DIAGNOSIS AND TESTING

TURBOCHARGER

Check for Diagnostic Trouble Codes (DTCs) stored in PCM memory. If any DTCs are present, refer to the appropriate Engine Performance Diagnostic testing information.

TURBOCHARGER DIAGNOSIS

CONDITION	POSSIBLE CAUSES
Low boost pressure, lack of power	Clogged air filter Leaks between engine and turbocharger Exhaust restriction Restriction in charge air cooler hose(s) Wastegate stuck open Wastegate actuator malfunction Seized turbocharger shaft
Overboost	Wastegate stuck shut Wastegate actuator malfunction
Noisy operation or vibration	Leak(s) in charge air cooler hose(s) Intake or exhaust leaks Oil starvation Worn turbocharger bearings Damaged turbine/compressor fins
Blue smoke from exhaust	Oil return line blocked Engine breather clogged Turbocharger shaft seals damaged

COOLER AND HOSES, CHARGE AIR

Removal

CHARGE AIR COOLER

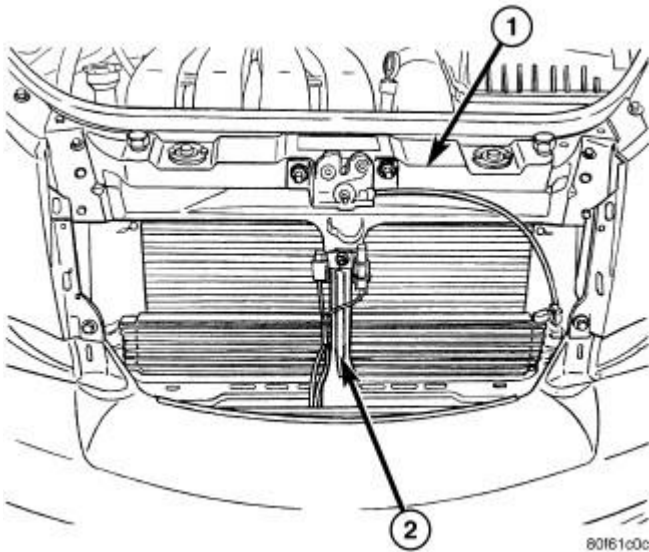


Fig. 363: Upper Radiator Closure Panel and Center Brace
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - UPPER RADIATOR CLOSURE PANEL
2 - CENTER BRACE |
|--|

1. Drain cooling system. Refer to Cooling - Standard Procedure .
2. Remove air cleaner housing. See Engine/Air Intake System/BODY, Air Cleaner - Removal.
3. Disconnect negative battery cable.
4. Disconnect positive battery cable.
5. Remove battery and battery tray. Refer to Electrical/Battery System/BATTERY - Removal .
6. Remove grille. Refer to Body/Exterior/GRILLE - Removal .
7. Remove upper radiator closure panel (1) and center brace (2). Refer to Body/Exterior/CROSSMEMBER, Radiator - Removal .

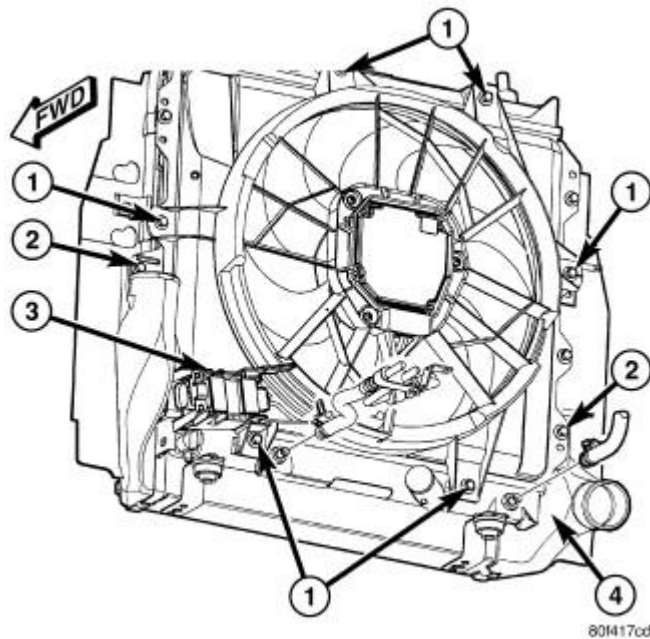


Fig. 364: Cooling Module - 2.4L Turbo
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - RADIATOR FAN FASTENERS
2 - CHARGE AIR COOLER FASTENERS
3 - RADIATOR FAN CONNECTOR
4 - CHARGE AIR COOLER</p> |
|--|

8. Remove front bumper fascia. Refer to **Frame and Bumpers/Bumpers/FASCIA, Front - Removal** .
9. Remove front bumper. Refer to **Frame and Bumpers/Bumpers/REINFORCEMENT, Bumper - Removal** .
10. Loosen charge air cooler hose clamps. Disconnect charge air cooler hoses.
11. Remove radiator fan. Refer to **Cooling/Engine/FAN, Cooling - Removal** .
12. Remove charge air cooler fasteners (2).
13. Remove radiator. Refer to **Cooling/Engine/RADIATOR, Engine Cooling - Removal** .
14. Remove charge air cooler.

CHARGE AIR COOLER HOSES

HOSE - CHARGE AIR COOLER TO THROTTLE BODY

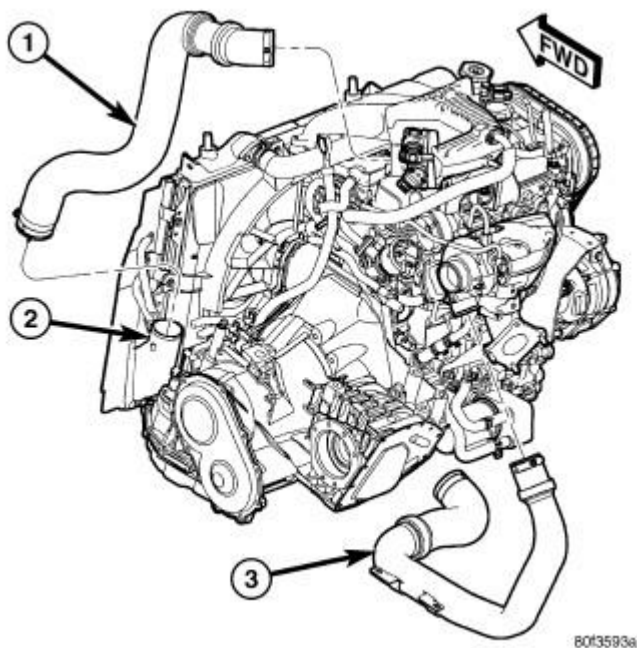


Fig. 365: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
2 - CHARGE AIR COOLER
3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER |
|--|

NOTE: Fascia shown in illustration removed for clarification.

1. Remove air cleaner housing. See [Engine/Air Intake System/BODY, Air Cleaner - Removal](#)
2. Remove battery and battery tray. Refer to [Electrical/Battery System/TRAY, Battery - Removal](#).
3. Remove hose (1) from charge air cooler (2).

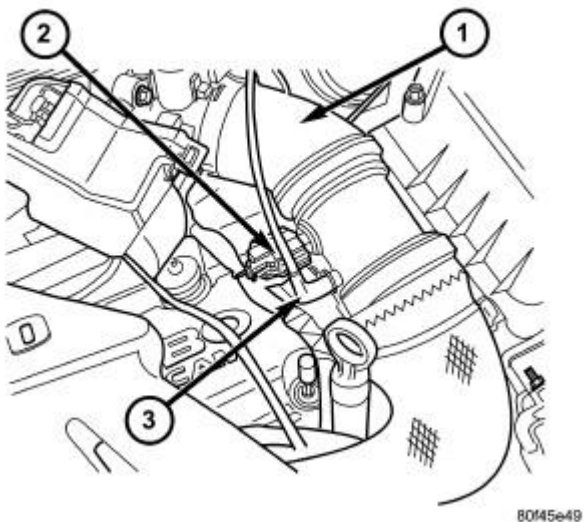


Fig. 366: IAT Sensor - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY 2 - IAT SENSOR 3 - TIP HOSE
--

4. Disconnect inlet air temperature (IAT) sensor (2).
5. Disconnect throttle inlet pressure (TIP) hose (3) from charge air cooler hose (1).
6. Remove hose (1) from charge air cooler.

HOSE - TURBOCHARGER TO CHARGE AIR COOLER

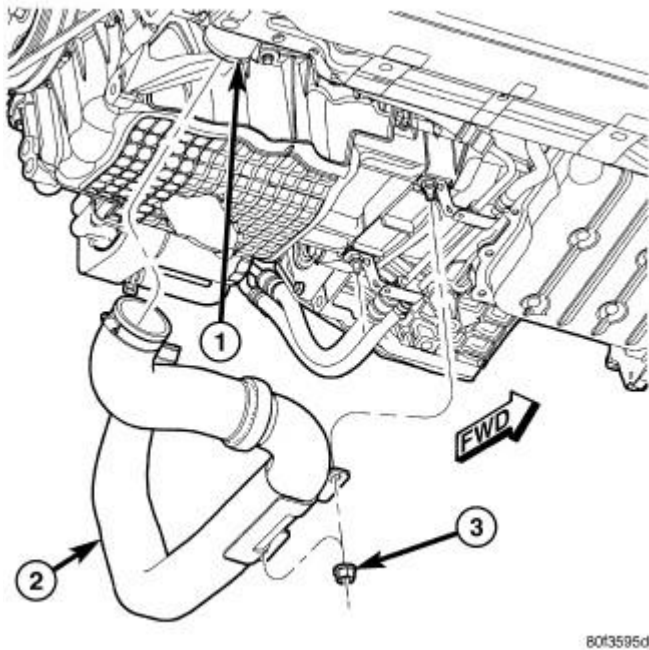


Fig. 367: Charge Air Cooler Hose
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CHARGE AIR COOLER
2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
3 - NUT |
|--|

1. Raise vehicle on hoist.
2. Remove hose (2) at the charge air cooler.
3. Remove nuts (3) securing charge air cooler hose to structural collar.
4. Remove hose (2) at turbocharger.

Installation

CHARGE AIR COOLER

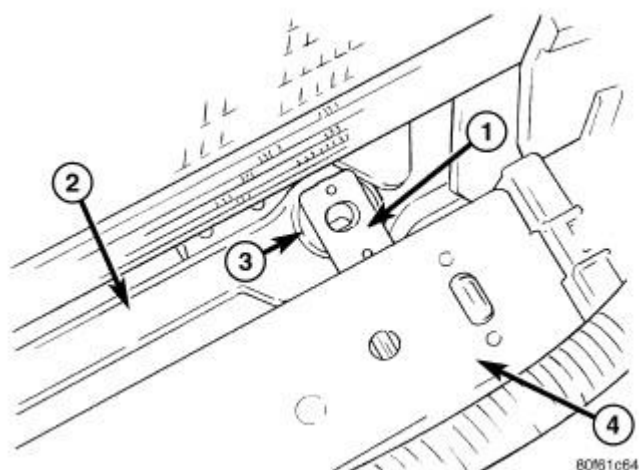


Fig. 368: Charge Air Cooler Locating Tab

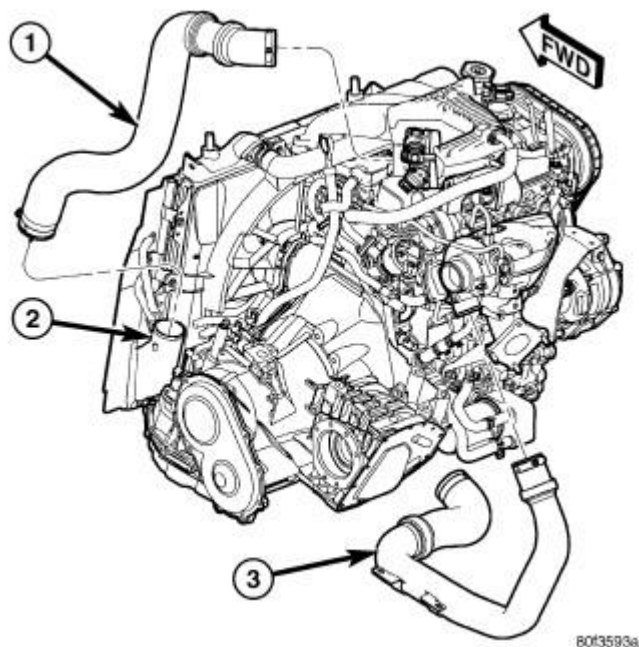
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - LOCATING TAB
2 - LOWER RADIATOR SUPPORT CROSSMEMBER
3 - RADIATOR MOUNT BUSHING
4 - CHARGE AIR COOLER |
|---|

1. Position charge air cooler to mounting location.

NOTE: When lowering radiator, make sure lower radiator pins engage properly through charge air cooler tabs .

2. Install radiator. Refer to Cooling/Engine/RADIATOR, Engine Cooling - Installation .
3. Install fasteners attaching charge air cooler to radiator. Tighten fasteners to 8 N.m (70 in. lbs.).
4. Install radiator fan. Refer to Cooling/Engine/FAN, Cooling - Installation .
5. Connect charge air cooler hoses. Tighten hose clamps to 1.7 N.m (15 in. lbs.).
6. Install front bumper. Refer to Frame and Bumpers/Bumpers/REINFORCEMENT, Bumper - Installation .
7. Install front bumper fascia. Refer to Frame and Bumpers/Bumpers/FASCIA, Front - Installation .
8. Install upper radiator closure panel and center brace. Refer to Body/Exterior/CROSSMEMBER, Radiator - Installation .
9. Install grille. Refer to Body/Exterior/GRILLE - Installation .
10. Install battery tray and battery. Refer to Electrical/Battery System/BATTERY - Installation .
11. Connect positive battery cable.
12. Connect negative battery cable.
13. Install air cleaner housing. See Engine/Air Intake System/BODY, Air Cleaner - Installation.
14. Fill cooling system. Refer to Cooling - Standard Procedure .

CHARGE AIR COOLER HOSES**HOSE - CHARGE AIR COOLER TO THROTTLE BODY****Fig. 369: Charge Air Cooler Hoses****Courtesy of CHRYSLER LLC**

- | |
|--|
| 1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY
2 - CHARGE AIR COOLER
3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER |
|--|

1. Position hose (1) to mounting location.
2. Connect hose (1) to throttle body.
3. Connect hose (1) to charge air cooler (2).
4. Tighten hose clamps to 1.7 N.m (15 in. lbs.).

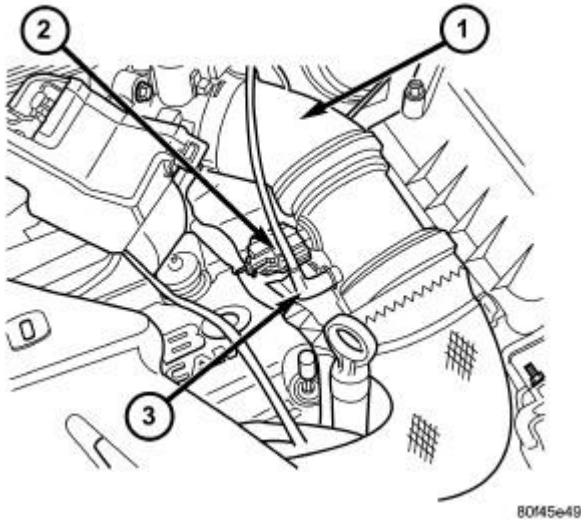


Fig. 370: IAT Sensor - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY 2 - IAT SENSOR 3 - TIP HOSE

5. Connect Throttle Inlet Pressure (TIP) hose (3) to charge air cooler hose.
6. Connect Inlet Air Temperature (IAT) sensor connector (2).
7. Install battery tray support bracket.
8. Install battery tray and battery. Refer to **Electrical/Battery System/BATTERY - Installation**.
9. Connect positive battery cable.
10. Connect negative battery cable.
11. Install air cleaner housing. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.

HOSE - TURBOCHARGER TO CHARGE AIR COOLER

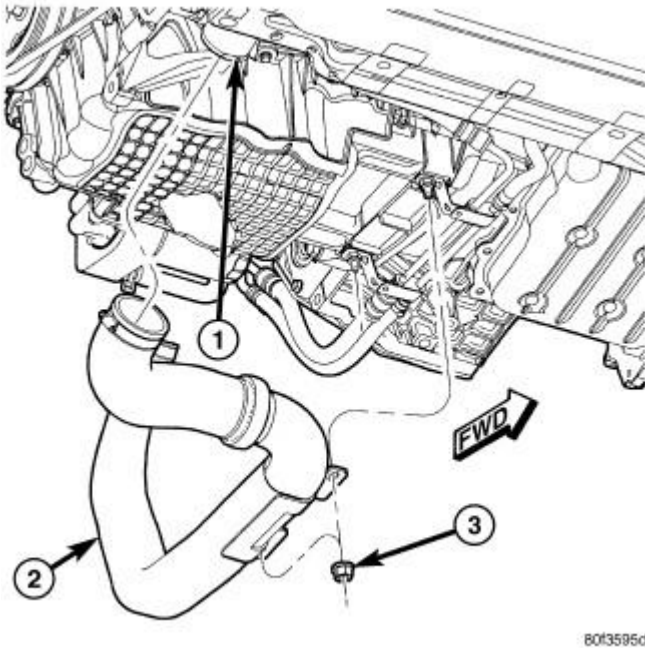


Fig. 371: Charge Air Cooler Hose
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CHARGE AIR COOLER
2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
3 - NUT |
|--|

1. Position hose (2) to mounting location.
2. Temporarily install nuts (3) securing charge air cooler hose (2) to structural collar.
3. Connect hose (2) to turbocharger.
4. Connect hose (2) to charge air cooler.
5. Tighten hose clamps to 1.7 N.m (15 in. lbs.).
6. Tighten nuts (3) securing charge air cooler hose to structural collar.
7. Lower vehicle.

LINES AND HOSES, TURBOCHARGER, OIL AND COOLANT

Removal

TURBOCHARGER LINES

COOLANT SUPPLY LINE

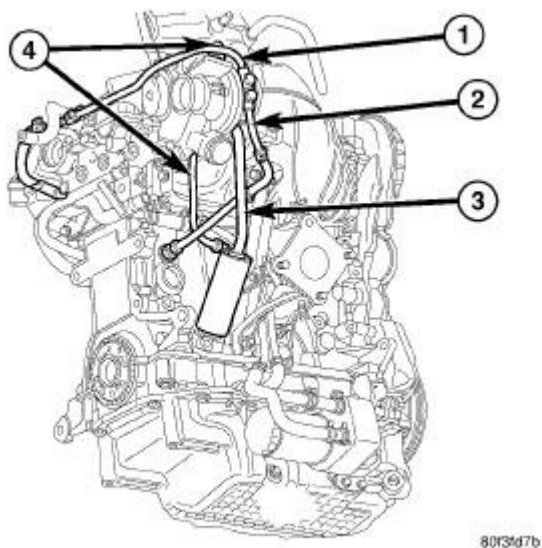


Fig. 372: Turbocharger Lines and Hoses
Courtesy of CHRYSLER LLC

1. Raise vehicle on hoist.

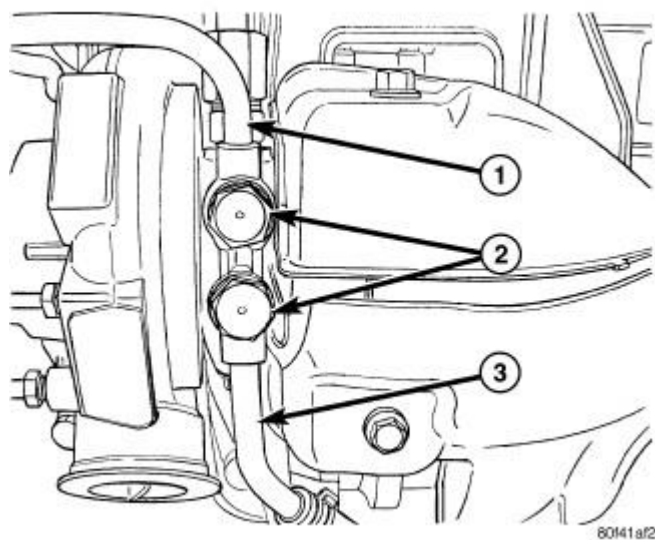


Fig. 373: Coolant Lines - Banjo Fittings
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - COOLANT RETURN LINE
2 - BANJO BOLTS - 30 N.m (22 ft. lbs.)
3 - COOLANT SUPPLY LINE</p> |
|---|

2. Drain cooling system. Refer to **Cooling - Standard Procedure** .

3. Remove banjo bolt (2) from coolant supply line (3) at turbocharger.

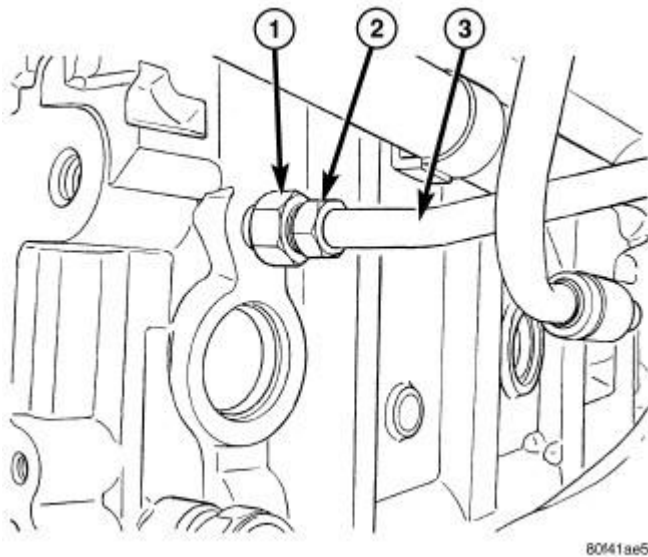


Fig. 374: Coolant Supply Line - Engine Block Fitting
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - BRASS FITTING - 41 N.m (30 ft. lbs.)
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - COOLANT SUPPLY LINE |
|--|

4. Disconnect coolant supply line (3) flared fitting (2) from brass fitting (1) at engine block.
5. Remove coolant supply line.

COOLANT RETURN LINE

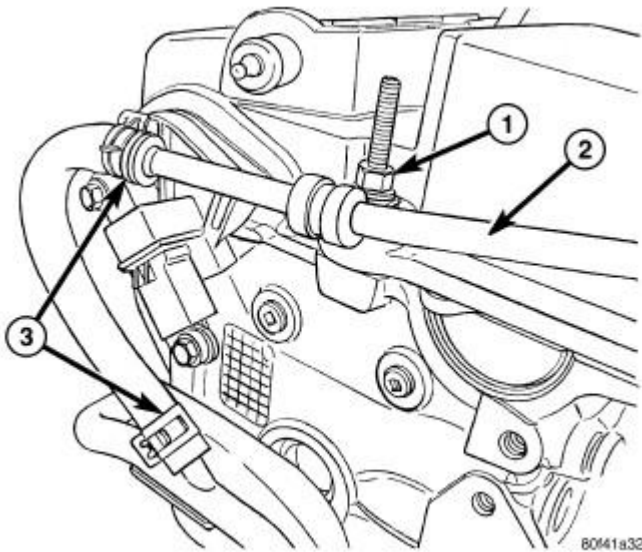


Fig. 375: Coolant Return Line Bracket
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - NUT
2 - COOLANT RETURN LINE
3 - HOSE CLAMPS |
|---|

1. Drain cooling system. Refer to **Cooling - Standard Procedure** .
2. Remove air cleaner housing. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
3. Disconnect Inlet Air Temperature (IAT) sensor connector.
4. Disconnect Throttle Inlet Pressure (TIP) hose from charge air cooler hose.
5. Loosen hose clamp at throttle body.
6. Disconnect charge air cooler hose from throttle body. Reposition charge air cooler hose.
7. Remove fastener securing coolant return line bracket to cylinder head cover stud.
8. Remove hose clamp from coolant return line (2) at heater tube. Disconnect hose from heater tube.
9. Remove banjo bolt from coolant return line at turbocharger.
10. Remove coolant return line.

OIL SUPPLY LINE

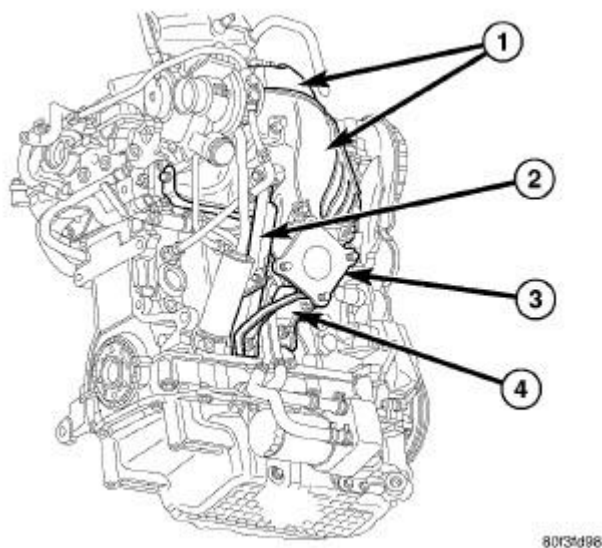


Fig. 376: Turbocharger Brackets and Heat Shields
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET</p> |
|--|

1. Raise vehicle on hoist.
2. Remove elbow support bracket (4).

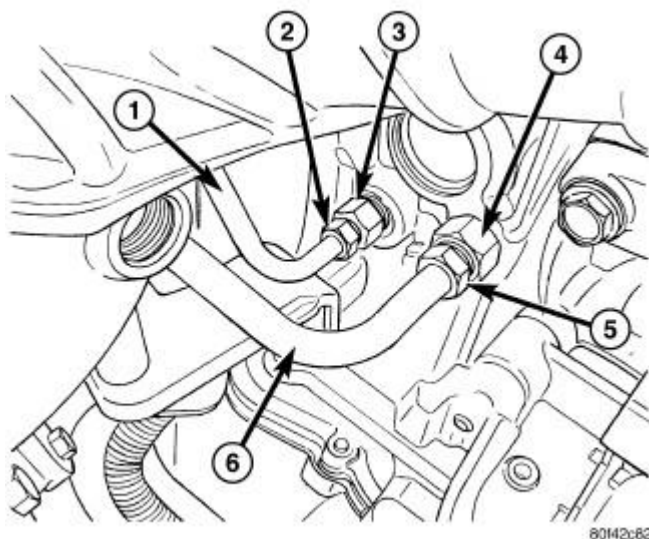


Fig. 377: Oil Supply Line - Engine Block Fitting
Courtesy of CHRYSLER LLC

- 1 - OIL SUPPLY LINE
- 2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
- 3 - BRASS FITTING - 41 N.m (30 ft. lbs.)
- 4 - BRASS FITTING - 41 N.m (30 ft. lbs.)
- 5 - FLARED FITTING - 31 N.m (23 ft. lbs.)
- 6 - OIL COOLER COOLANT LINE

3. Disconnect oil supply line flared fitting (2) from brass fitting (3) at engine block.
4. Lower vehicle.
5. Disconnect oil supply line flared fitting (2) from brass fitting (3) at turbocharger.

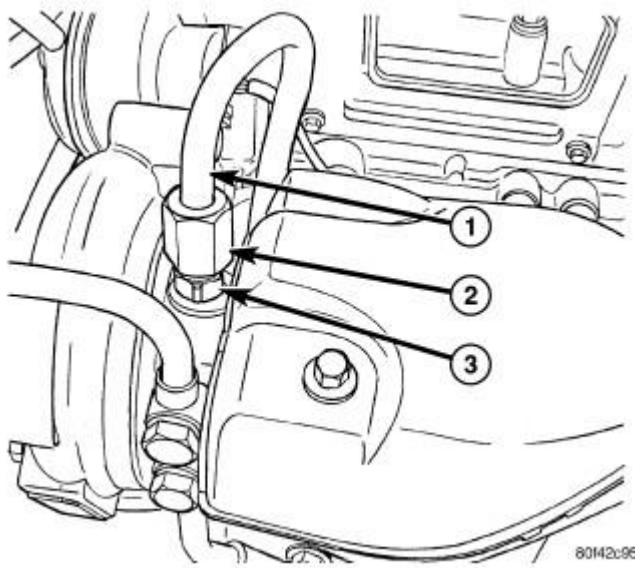


Fig. 378: Oil Supply Line - Turbocharger Fitting
Courtesy of CHRYSLER LLC

- 1 - OIL SUPPLY LINE
- 2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
- 3 - BRASS FITTING - 41 N.m (30 ft. lbs.)

6. Remove oil supply line (1).

OIL RETURN LINE

1. Raise vehicle on hoist.
2. Remove the two fasteners securing the oil return line to the turbocharger.
3. Remove hose clamp from oil return line.
4. Remove oil return line from crankcase nipple.

Installation

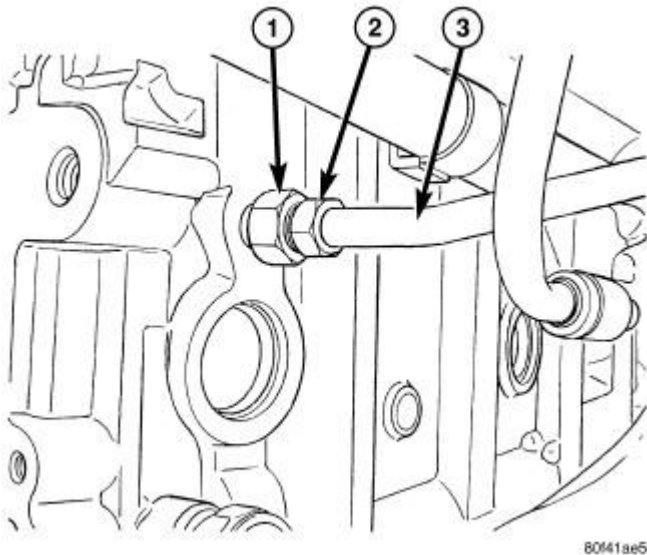
TURBOCHARGER LINES**COOLANT SUPPLY LINE**

Fig. 379: Coolant Supply Line - Engine Block Fitting
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - BRASS FITTING - 41 N.m (30 ft. lbs.)
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - COOLANT SUPPLY LINE |
|--|

1. If the brass fitting (1) was removed from the engine block, apply thread sealer to the threads and install into the engine block. Tighten the brass fitting (1) to 41 N.m (30 ft. lbs.).
2. Position the coolant supply line tube (3) onto the brass fitting (1) at the engine block.
3. Install the after run pump hoses to the after run pump.
4. Install **NEW** washers on the banjo fitting of coolant supply line. Hand start the banjo bolt.
5. Tighten the flared fitting (2) to 31 N.m (23 ft. lbs.).

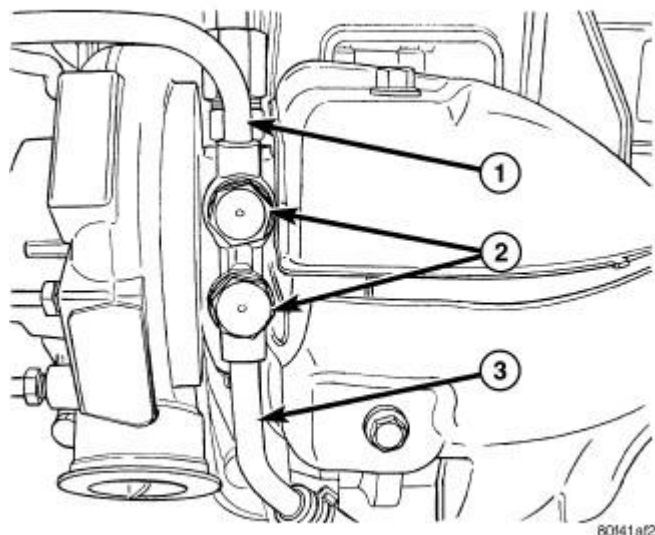


Fig. 380: Coolant Lines - Banjo Fittings
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - COOLANT RETURN LINE
2 - BANJO BOLTS - 30 N.m (22 ft. lbs.)
3 - COOLANT SUPPLY LINE |
|--|

6. Tighten the banjo fitting bolts (2) to 30 N.m (22 ft. lbs.).
7. Lower the vehicle.
8. Fill the cooling system. Refer to **Cooling - Standard Procedure** .

COOLANT RETURN LINE

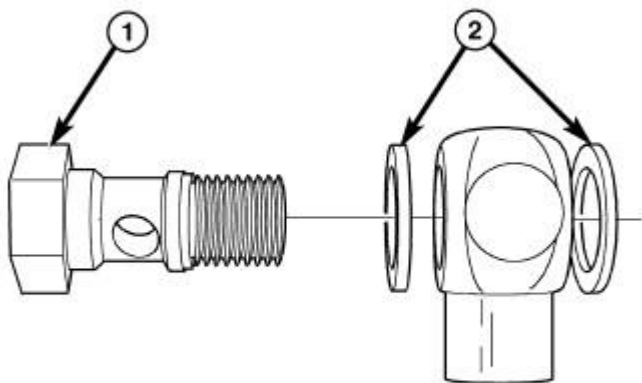


Fig. 381: Banjo Bolt and Washers

Courtesy of CHRYSLER LLC

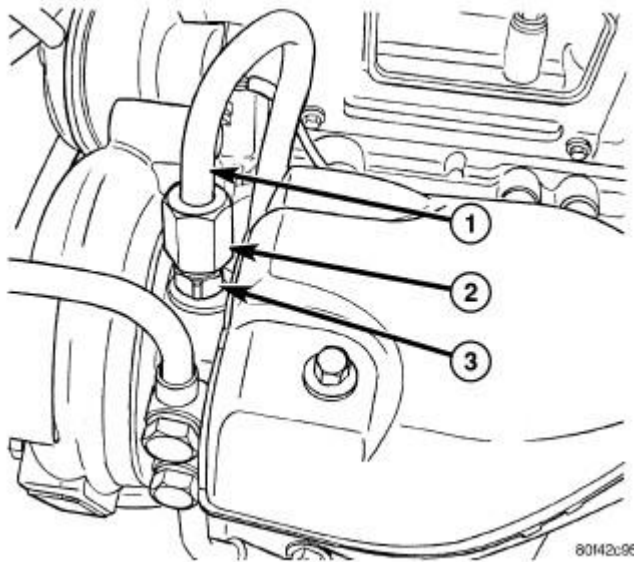
1 - BANJO BOLT

2 - WASHERS

1. Position the coolant return line on the turbocharger.
2. Install **NEW** washers (2) onto the banjo fitting of the coolant return line. Hand start the banjo bolt.
3. Install the hose onto the thermostat housing.
4. Tighten the banjo bolt to 40 N.m (29.5 ft. lbs.).
5. Secure the coolant return line bracket to the turbocharger housing tighten to 12 N.m (9 ft. lbs.).
6. Fill the cooling system. Refer to **Cooling - Standard Procedure** .

OIL SUPPLY LINE

1. If the engine block brass fitting (3) or turbocharger brass fitting was removed, apply thread sealer to threads and install. Tighten the brass fittings (3) to 41 N.m (30 ft. lbs.).
2. Position the oil supply line (1) to the mounting location.

**Fig. 382: Oil Supply Line - Turbocharger Fitting**

Courtesy of CHRYSLER LLC

1 - OIL SUPPLY LINE

2 - FLARED FITTING - 31 N.m (23 ft. lbs.)

3 - BRASS FITTING - 41 N.m (30 ft. lbs.)

3. Hand start the flared fitting (2) at turbocharger.
4. Raise the vehicle on hoist.

5. Hand start the flared fitting (2) on the line to the engine block brass fitting (3).

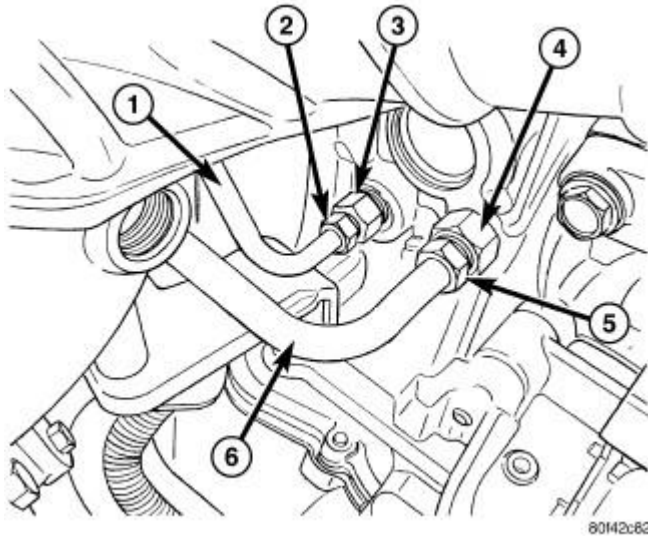


Fig. 383: Oil Supply Line - Engine Block Fitting
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - OIL SUPPLY LINE
 2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
 3 - BRASS FITTING - 41 N.m (30 ft. lbs.)
 4 - BRASS FITTING - 41 N.m (30 ft. lbs.)
 5 - FLARED FITTING - 31 N.m (23 ft. lbs.)
 6 - OIL COOLER COOLANT LINE</p> |
|---|

6. Tighten the flared fittings to 31 N.m (23 ft. lbs.).
7. Lower the vehicle.

OIL RETURN LINE

NOTE: If drain back nipple is not damaged or showing signs of leakage, steps 2, 3, 4, and 9 can be skipped.

1. Clean gasket surfaces.
2. Using a paint pen, mark the new drain back nipple to a depth of 17 mm (0.669 in.) from the end to be installed in block.
3. Apply MOPAR® Stud'n Bearing mount and adhesive to the drain back nipple.
4. Using Bearing Installer 9723, install the drainback nipple.
5. Install the oil return line hose over the drain back nipple.
6. Install a new gasket.

7. Install the two fasteners securing the oil return tube to the turbocharger. Tighten the fasteners to 12 N.m (105 in. lbs.).
8. Perform oil change. See **Engine/Lubrication/OIL - Standard Procedure**.
9. Lower the vehicle.

SOLENOID, WASTEGATE

Description

SOLENOIDS AND VACUUM HARNESS

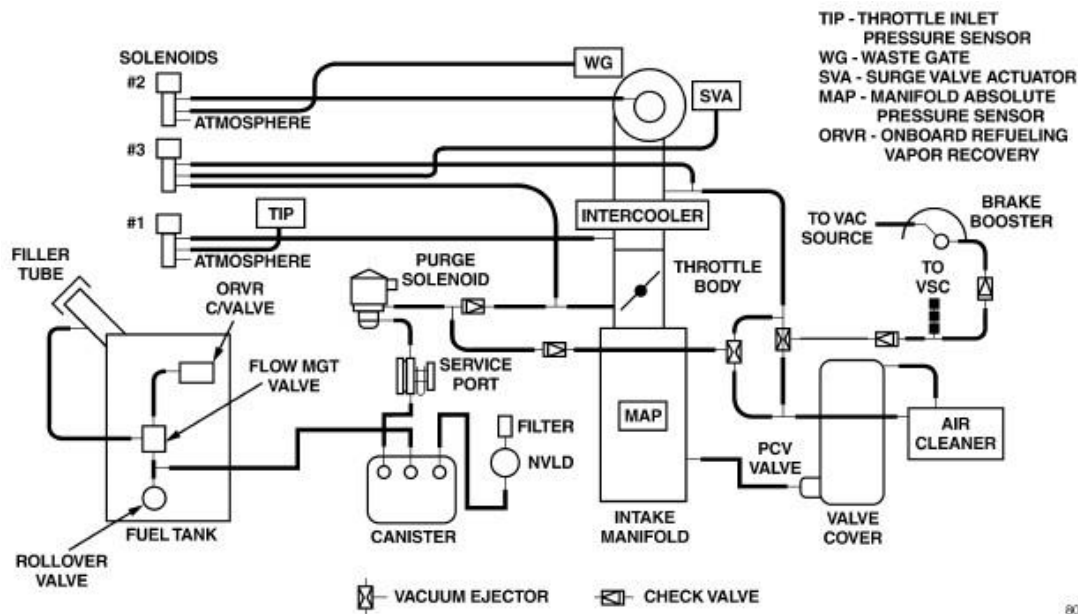


Fig. 384: Vacuum Harness Schematic
Courtesy of CHRYSLER LLC

Turbocharged vehicles are equipped with three solenoids that are PCM controlled. They are mounted to the right shock tower. A vacuum harness connects the solenoids to their respective component.

- Wastegate Actuator Solenoid
- Surge Valve Actuator Solenoid
- Throttle Inlet Pressure (TIP) Solenoid

Removal

WASTEGATE SOLENOID

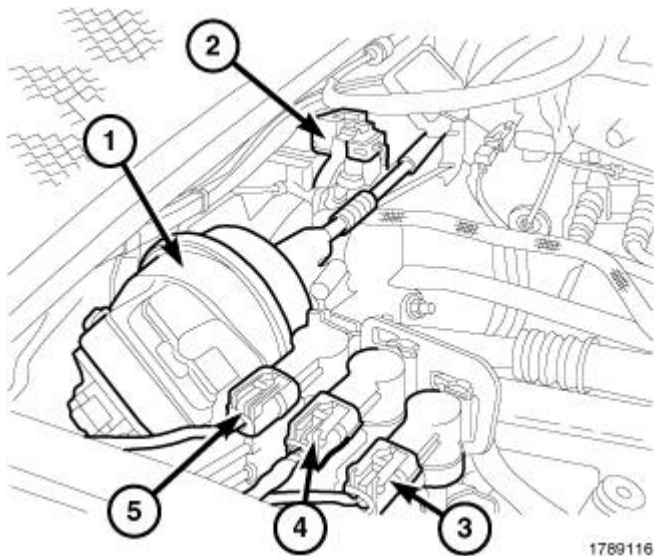


Fig. 385: Wastegate Solenoid & Electrical Connectors
 Courtesy of CHRYSLER LLC

1. Disconnect the electrical connectors (3, 4 and 5).
2. Remove the nuts (1) the securing the solenoid mounting bracket to the shock tower.

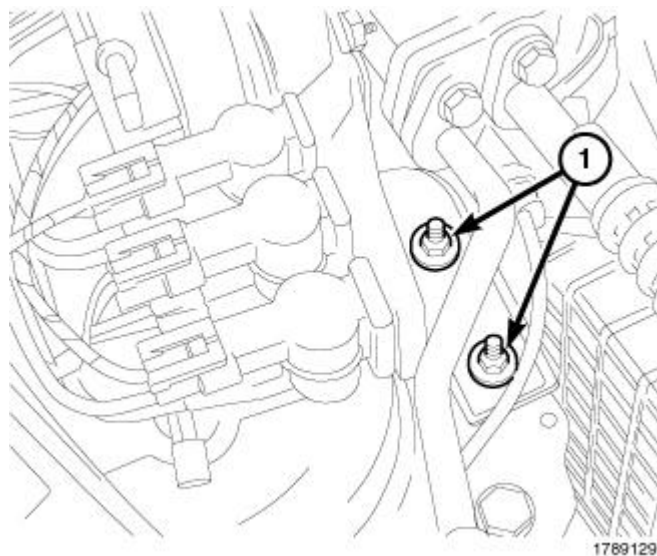


Fig. 386: Nuts Securing Solenoid Mounting Bracket
 Courtesy of CHRYSLER LLC

3. Disconnect vacuum harness connector from solenoid.
4. Push on the solenoid lock tab and slide solenoid off the bracket.

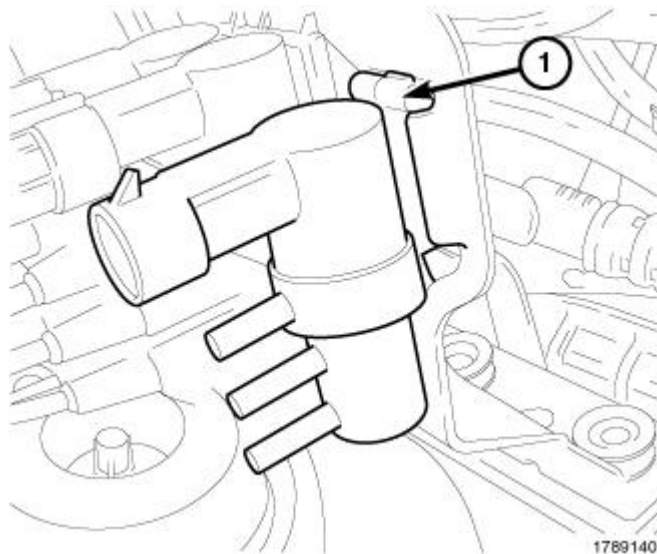


Fig. 387: Solenoid Mounting Bracket
Courtesy of CHRYSLER LLC

5. If necessary, remove the solenoid mounting bracket.

Installation

WASTEGATE SOLENOID

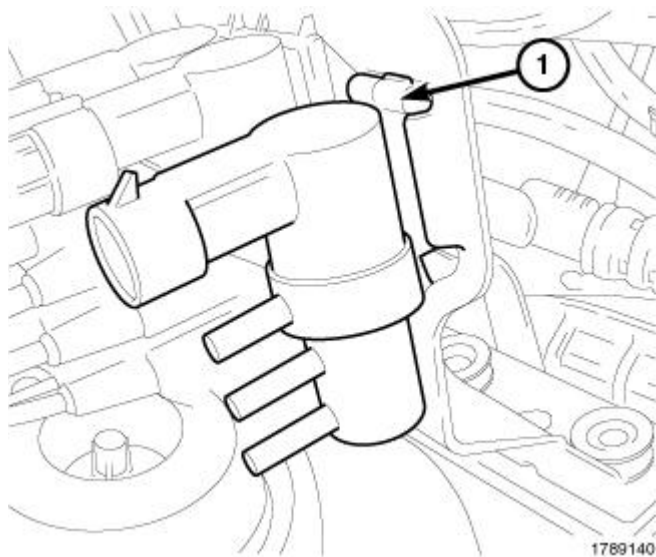


Fig. 388: Solenoid Mounting Bracket
Courtesy of CHRYSLER LLC

1. If removed, install the solenoid mounting bracket.
2. Slide the solenoids onto the mounting tab until the lock tab (1) engages.
3. Connect vacuum harness connector to solenoid.

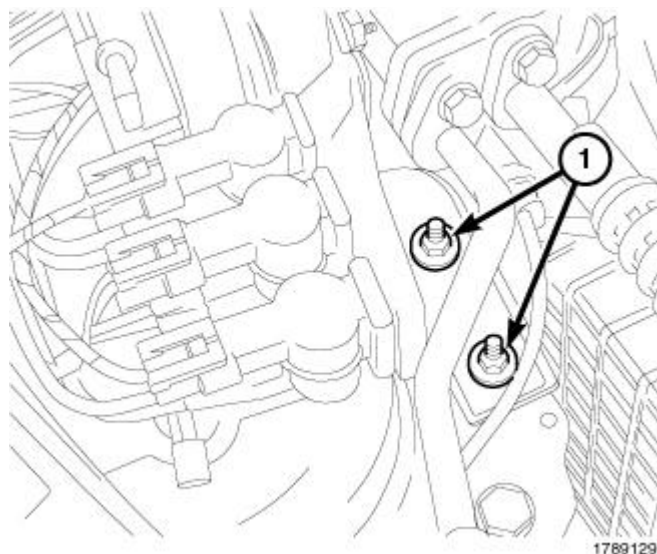


Fig. 389: Nuts Securing Solenoid Mounting Bracket
Courtesy of CHRYSLER LLC

4. Install the nuts securing the solenoid mounting bracket to the shock tower (1).

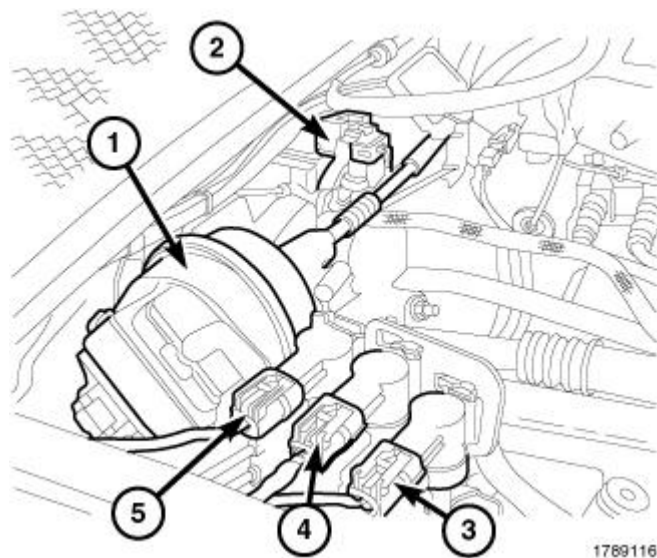


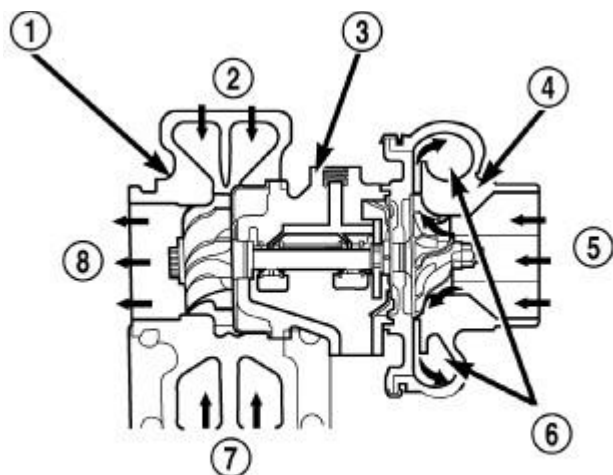
Fig. 390: Wastegate Solenoid & Electrical Connectors
Courtesy of CHRYSLER LLC

5. Connect solenoid electrical connectors (3, 4 and 5).

TURBOCHARGER

Description

TURBOCHARGER



80b5ec50

Fig. 391: Turbocharger - Typical
Courtesy of CHRYSLER LLC

- | |
|---------------------------------|
| 1 - TURBINE SECTION |
| 2 - EXHAUST GAS |
| 3 - BEARING HOUSING |
| 4 - COMPRESSOR SECTION |
| 5 - INLET AIR |
| 6 - COMPRESSED AIR TO ENGINE |
| 7 - EXHAUST GAS |
| 8 - EXHAUST GAS TO EXHAUST PIPE |

CAUTION: The turbocharger is a performance part and must not be tampered with. Tampering with the wastegate components can reduce durability by increasing cylinder pressure and thermal loading due to incorrect inlet and exhaust manifold pressure. Poor fuel economy and failure to meet regulatory emissions laws may result. Increasing the turbocharger boost **WILL NOT** increase engine power.

The turbocharger is an exhaust-driven supercharger which increases the pressure and density of the air entering the engine. With the increase of air entering the engine, more fuel can be injected into the cylinders, which creates more power during combustion.

The turbocharger assembly consists of four (4) major component systems:

- Turbine section (1)
- Compressor section (4)
- Bearing housing (3)
- Wastegate

Operation

OPERATION

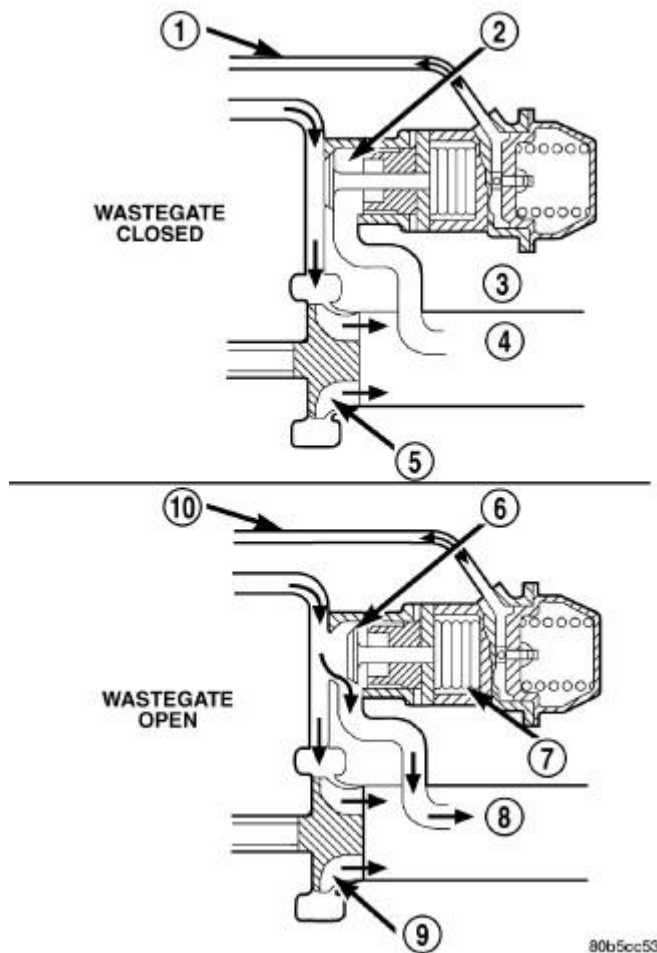


Fig. 392: Wastegate Operation
 Courtesy of CHRYSLER LLC

- 1 - SIGNAL LINE
- 2 - EXHAUST BYPASS VALVE
- 3 - WASTEGATE
- 4 - EXHAUST
- 5 - TURBINE
- 6 - EXHAUST BYPASS VALVE
- 7 - WASTEGATE
- 8 - EXHAUST
- 9 - TURBINE
- 10 - SIGNAL LINE

Exhaust gas pressure and energy drive the turbine, which in turn drives a centrifugal compressor that

compresses the inlet air, and forces the air into the engine through the charge air cooler and plumbing. Since heat is a by-product of this compression, the air must pass through a charge air cooler to cool the incoming air and maintain power and efficiency.

Increasing air flow to the engine provides:

- Improved engine performance
- Improved operating economy
- Altitude compensation

The turbocharger also uses a wastegate (3), which regulates intake manifold air pressure and prevents over boosting at high engine speeds. When the wastegate valve is closed, all of the exhaust gases flow through the turbine wheel. As the intake manifold pressure increases, the wastegate actuator opens the valve, diverting some of the exhaust gases away from the turbine wheel. This limits turbine shaft speed and air output from the impeller.

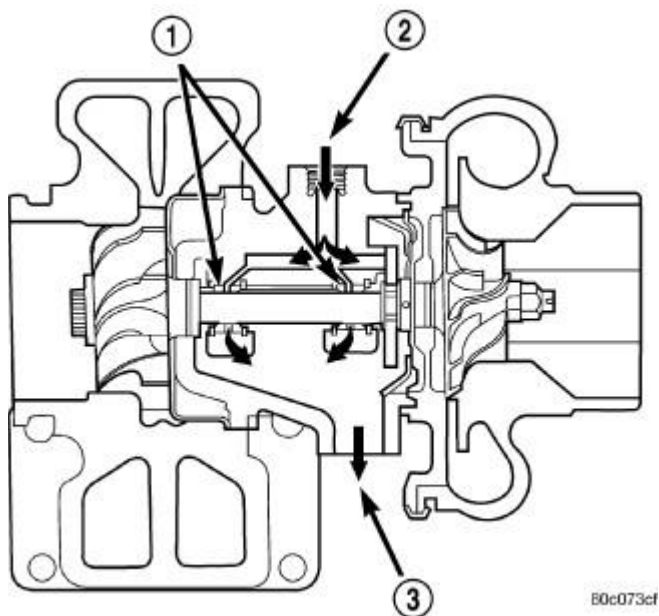


Fig. 393: Turbocharger Oil Supply and Drain
Courtesy of CHRYSLER LLC

- | |
|------------------------------------|
| 1 - BEARINGS |
| 2 - OIL SUPPLY (FROM ENGINE BLOCK) |
| 3 - OIL RETURN (TO OIL PAN) |

The turbocharger is cooled by engine coolant. The coolant is delivered to the turbocharger by a supply line that connects from engine block to the turbocharger. A coolant return line connects the turbocharger to heater tubes.

The turbocharger is lubricated by engine oil that is pressurized, cooled, and filtered. The oil is delivered to the turbocharger by a supply line that is tapped into the cylinder block. The oil travels into the bearing housing, where it lubricates the shaft and bearings (1). A return pipe at the bottom of the bearing housing, routes the

engine oil back to the crankcase.

The most common turbocharger failure is bearing failure related to repeated hot shutdowns with inadequate "cool-down" periods. A sudden engine shut down after prolonged operation will result in the transfer of heat from the turbine section of the turbocharger to the bearing housing. This causes the oil to overheat and break down, which causes bearing and shaft damage the next time the vehicle is started.

Letting the engine idle after extended operation allows the turbine housing to cool to normal operating temperature. The following chart should be used as a guide in determining the amount of engine idle time required to sufficiently cool down the turbocharger before shut down, depending upon the type of driving and the amount of cargo.

TURBOCHARGER "COOL DOWN" CHART	
Driving Conditions	Idle Time (in minutes) Before Shut Down
Normal Driving	Not required
Aggressive Driving or Heavily Loaded	3
Trailer Tow	5

Removal

GAS ENGINES

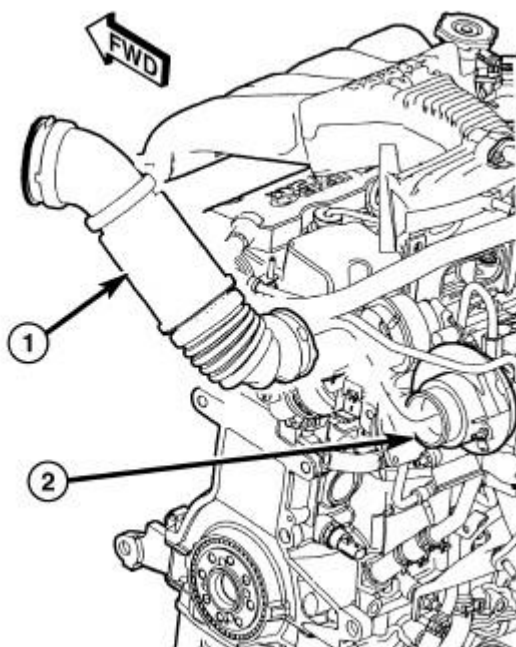


Fig. 394: Clean Air Hose - 2.4L Turbo
Courtesy of CHRYSLER LLC

1 - CLEAN AIR HOSE

2 - TURBOCHARGER

CAUTION: If turbocharger is replaced due to a bearing failure, replacement of the oil pressure feed line is required. Oil return tube should be cleaned also.

NOTE: The turbocharger and exhaust manifold are serviced as an assembly. Do Not attempt to remove the turbocharger from the exhaust manifold. Exhaust leaks will result. It is recommended that the turbocharger elbow be replaced along with the turbocharger/exhaust manifold assembly.

1. Disconnect negative battery cable.
2. Drain cooling system. Refer to Cooling - Standard Procedure .
3. Remove air cleaner housing and lid. See Engine/Air Intake System/BODY, Air Cleaner - Removal.
4. Disconnect clean air hose (1) from turbocharger (2).

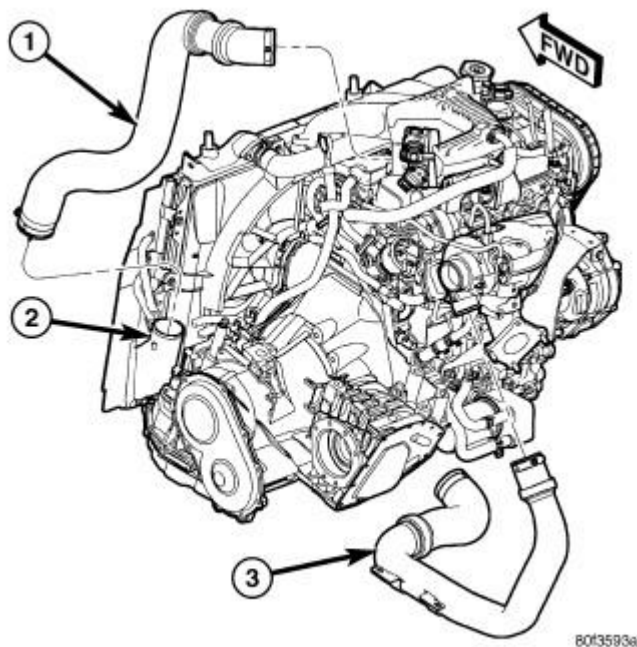


Fig. 395: Charge Air Cooler Hoses

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - HOSE - CHARGE AIR COOLER TO THROTTLE BODY |
| 2 - CHARGE AIR COOLER |
| 3 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER |

5. Disconnect throttle and speed control cables at throttle body.

6. Disconnect electrical connectors from the following components:

- Inlet Air Temperature (IAT) Sensor
- MAP Sensor
- IAC Motor
- Throttle Position Sensor
- Ignition Coil Capacitor
- Upstream Oxygen Sensor

7. Disconnect air inlet hose at throttle body (1).

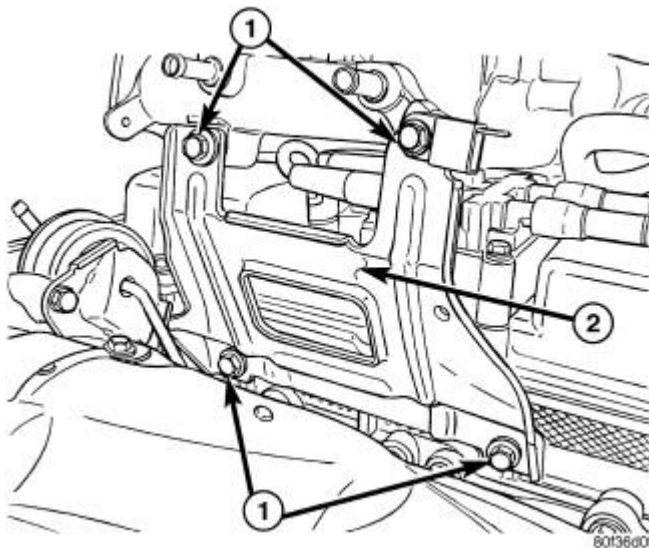


Fig. 396: Support Bracket
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - FASTENERS |
| 2 - UPPER INTAKE MANIFOLD SUPPORT BRACKET |

8. Disconnect vacuum hoses at throttle body and upper intake manifold.
9. Remove upper intake manifold support bracket (2).

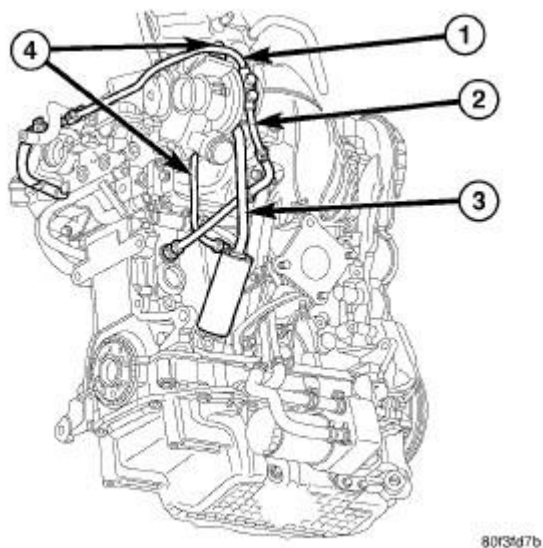


Fig. 397: Turbocharger Lines and Hoses
Courtesy of CHRYSLER LLC

10. Remove upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.

CAUTION: Cover lower intake manifold opening with suitable cover to prevent any foreign objects from entering.

11. Disconnect oil supply line (1) at turbocharger.
12. Remove coolant return line (2).

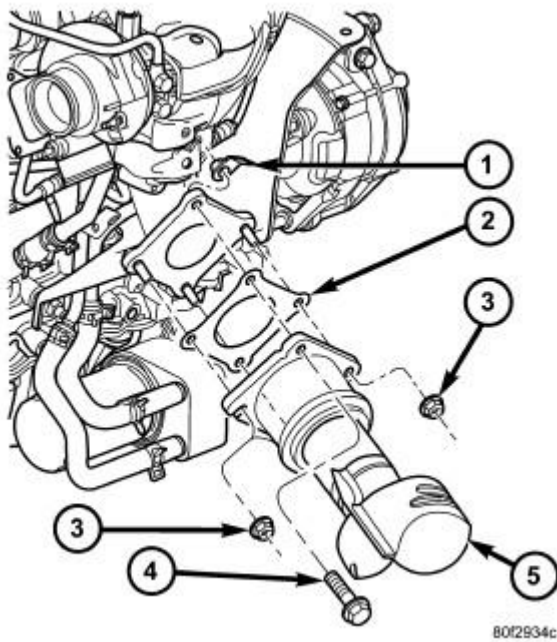


Fig. 398: Converter to Exhaust Manifold Connection - 2.4L Turbo
 Courtesy of CHRYSLER LLC

- 1 - FLAG NUT
- 2 - GASKET
- 3 - NUT
- 4 - BOLT
- 5 - CATALYTIC CONVERTER

13. Disconnect vacuum hoses from turbocharger.
14. Raise vehicle on hoist.
15. Disconnect muffler ground strap. Remove muffler. Refer to **Exhaust System/MUFFLER, Exhaust - Removal**.
16. Disconnect downstream oxygen sensor.
17. Remove fasteners (3 and 4) securing catalytic converter (5) to exhaust manifold.
18. Remove catalytic converter and intermediate pipe as an assembly.

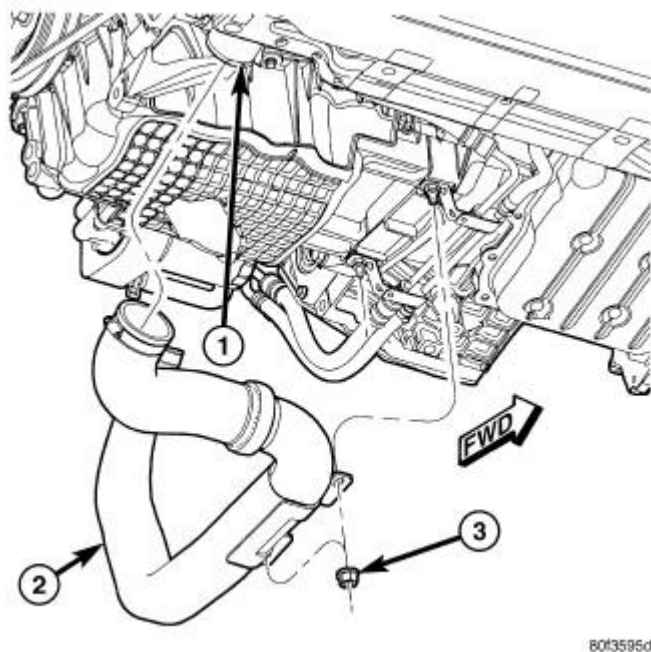


Fig. 399: Charge Air Cooler Hose
Courtesy of CHRYSLER LLC

- 1 - CHARGE AIR COOLER
- 2 - HOSE - TURBOCHARGER TO CHARGE AIR COOLER
- 3 - NUT

19. Remove turbocharger to charge air cooler hose assembly (2).

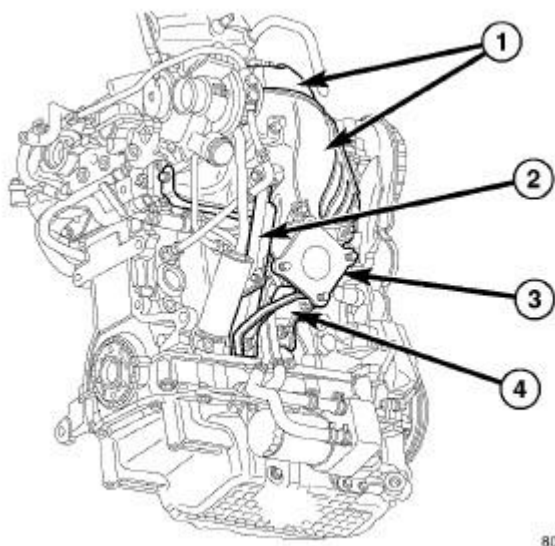
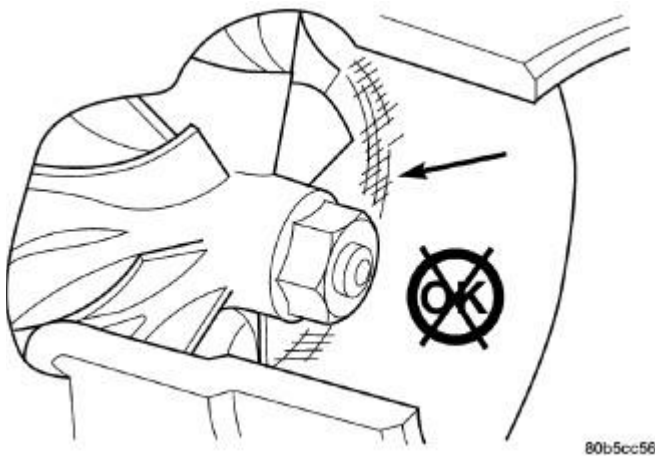


Fig. 400: Turbocharger Brackets and Heat Shields

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET |
|--|

20. Remove turbocharger lower heat shield (1).
21. Remove turbocharger elbow support bracket (4).
22. Remove turbocharger support bracket (2).
23. Remove turbocharger elbow (3).
24. Remove lower exhaust manifold fasteners that are accessible while vehicle is on hoist.
25. Lower vehicle.
26. Remove upper exhaust manifold fasteners.
27. Remove turbocharger/exhaust manifold assembly from above/between the engine and cowl panel.
28. Remove and discard exhaust manifold gasket.

Inspection**INSPECTION****Fig. 401: Inspect Compressor Housing for Impeller Rubbing Condition**

Courtesy of CHRYSLER LLC

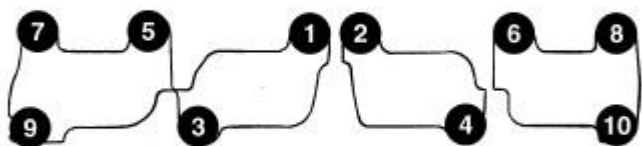
Visually inspect the turbocharger and exhaust manifold gasket surfaces. Replace stripped or eroded mounting studs.

1. Visually inspect the turbocharger for cracks. The following cracks are NOT acceptable:
 - Cracks in the turbine and compressor housing that go completely through.
 - Cracks in the mounting flange that are longer than 15 mm (0.6 in.).

- Cracks in the mounting flange that intersect bolt through-holes.
 - Two (2) Cracks in the mounting flange that are closer than 6.4 mm (0.25 in.) together.
2. Visually inspect the impeller and compressor wheel fins for nicks, cracks, or chips.
 3. Visually inspect the turbocharger compressor housing for an impeller rubbing condition. Replace the turbocharger if the condition exists.

Installation

GAS ENGINES



80138bb9

Fig. 402: Exhaust Manifold Tightening Sequence
Courtesy of CHRYSLER LLC

CAUTION: If turbocharger is replaced due to a bearing failure, replacement of the oil pressure feed line is required. Oil return tube should be cleaned also.

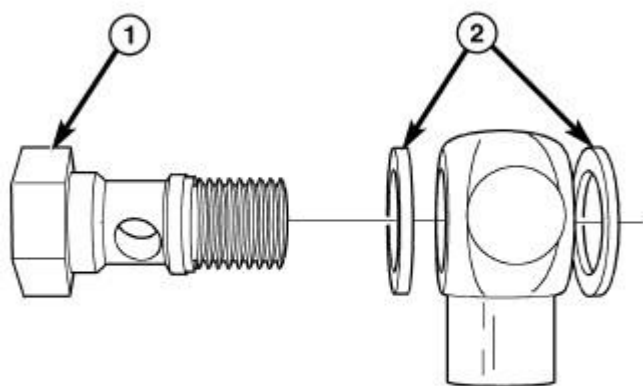
NOTE: The turbocharger and exhaust manifold are serviced as an assembly. Do Not attempt to remove the turbocharger from the exhaust manifold. Exhaust leaks will result. It is recommended that the turbocharger elbow be replaced along with the turbocharger/exhaust manifold assembly.

1. Clean gasket sealing surfaces. Replace exhaust manifold gasket. **DO NOT APPLY SEALER TO GASKET.**

NOTE: Stainless steel layer of exhaust manifold gasket goes against cylinder head, graphite layer of gasket goes against manifold surface.

2. Turbocharger/exhaust manifold assembly is installed from above/between the engine and cowl panel.
3. Position turbocharger/exhaust manifold assembly in place. Gradually tighten fasteners, starting at center and progressing outward in both directions to 28 N.m (250 in. lbs.). Raise and lower vehicle for fastener access as necessary. Repeat tightening procedure until all fasteners are at specified torque.
4. Install turbocharger elbow. Torque fasteners to 28 N.m (250 in. lbs.).
5. Install turbocharger upper heat shield. Torque fasteners to 28 N.m (250 in. lbs.).

6. Install turbocharger coolant supply line. Install **NEW** washers. Torque banjo fitting bolt to 37 N.m (27 ft. lbs.). Torque flared fitting to 31 N.m (23 ft. lbs.).
7. Replace oil return tube gasket. Install oil return tube. Torque fasteners to 12 N.m (105 in. lbs.). Make sure heat shield for oil return line is properly installed.
8. Install turbocharger support bracket. Torque M8 fasteners to 28 N.m (250 in. lbs.) and M10 fasteners to 54 N.m (40 ft. lbs.).
9. Install turbocharger elbow support bracket.
10. Install turbocharger to charge air cooler hose assembly.
11. Install catalytic converter and intermediate pipe as an assembly.
12. Install fasteners securing catalytic converter to exhaust manifold. Torque fasteners to 28 N.m (250 in. lbs.).



BOM40149

Fig. 403: Banjo Bolt and Washers
Courtesy of CHRYSLER LLC

1 - BANJO BOLT 2 - WASHERS

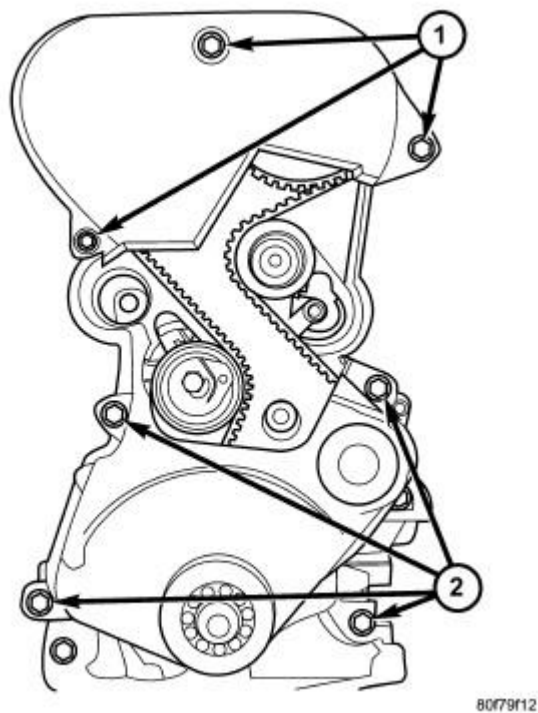
13. Install muffler. Connect muffler ground strap. Refer to **Exhaust System/MUFFLER, Exhaust - Installation**.
14. Connect downstream oxygen sensor.
15. Lower vehicle.
16. Connect vacuum hoses to turbocharger.
17. Install coolant return line. Install **NEW** washers (2). Torque banjo fitting bolt to 37 N.m (27 ft. lbs.).
18. Connect oil supply line at turbocharger. Torque flared fitting to 31 N.m (23 ft. lbs.).

NOTE: The lower heat shield tabs must overlap the upper heat shield to prevent

fatiguing and premature failure of the union.

19. Install turbocharger lower heat shield. Torque fasteners to 28 N.m (250 in. lbs.).
20. Install upper intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation.**
21. Install upper intake manifold support bracket.
22. Connect vacuum hoses at throttle body and upper intake manifold.
23. Connect air inlet hose at throttle body.
24. Connect electrical connectors to the following components:
 - Inlet Air Temperature (IAT) Sensor
 - MAP Sensor
 - IAC Motor
 - Throttle Position Sensor
 - Ignition Coil Capacitor
 - Upstream Oxygen Sensor
25. Connect throttle and speed control cables at throttle body.
26. Connect clean air hose to turbocharger.
27. Install air cleaner housing and lid. See **Engine/Air Intake System/BODY, Air Cleaner - Installation.**
28. Fill cooling system. Refer to **Cooling - Standard Procedure** .
29. Change oil and filter.
30. Connect negative battery cable.
31. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.
32. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if needed.

VALVE TIMING**BELT AND SPROCKETS, TIMING****Removal****TIMING BELT**

**Fig. 404: Front Timing Belt Covers**

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - UPPER COVER FASTENERS
2 - LOWER COVER FASTENERS |
|--|

1. Disconnect negative battery cable.
2. Remove upper and lower front timing belt covers . See **Engine/Valve Timing/COVER(S), Engine Timing - Removal.**

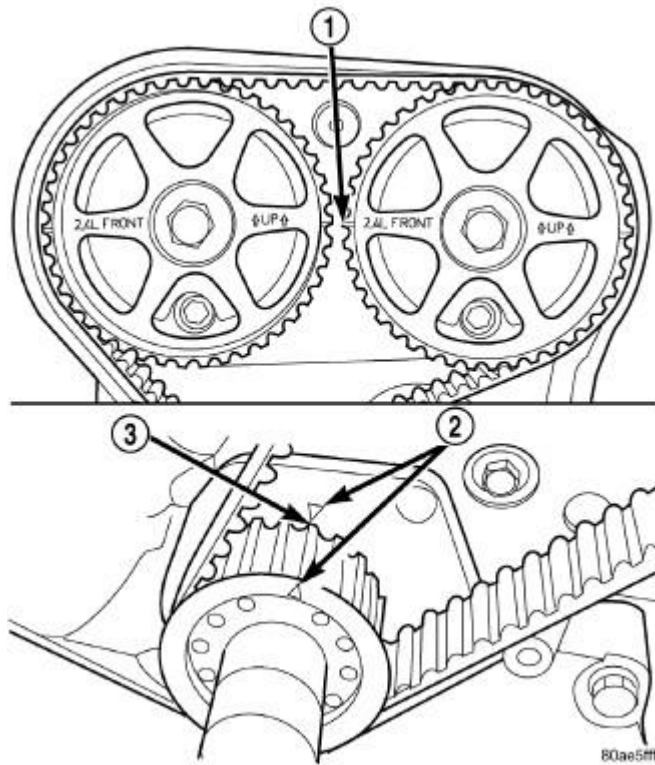


Fig. 405: Crankshaft and Camshaft Timing
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH |
|--|

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

- Before the removal of the timing belt, rotate crankshaft until the TDC mark on oil pump housing aligns with the TDC mark on crankshaft sprocket (2) (trailing edge of sprocket tooth) .

NOTE: The crankshaft sprocket TDC mark (2) is located on the trailing edge of the sprocket tooth. Failure to align trailing edge of sprocket tooth to TDC mark on oil pump housing will cause the camshaft timing marks to be misaligned.

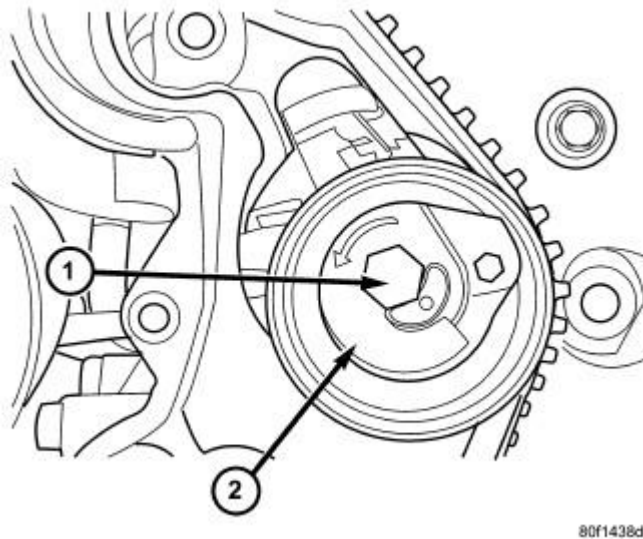


Fig. 406: Timing Belt Tensioner
Courtesy of CHRYSLER LLC

1 - LOCK BOLT 2 - TOP PLATE

4. Loosen timing belt tensioner lock bolt (1) .
5. Insert Allen wrench into the hexagon opening located on the top plate (2) of the belt tensioner pulley . Rotate the top plate (2)**CLOCKWISE** until there is enough slack in timing belt to allow for removal.
6. Remove timing belt.

CAUTION: If timing belt was damaged due to incorrect tracking (alignment), the belt tensioner pulley and bracket must be replaced as an assembly. See Engine/Valve Timing/TENSIONER, Engine Timing - Removal.

CAMSHAFT SPROCKET(S)

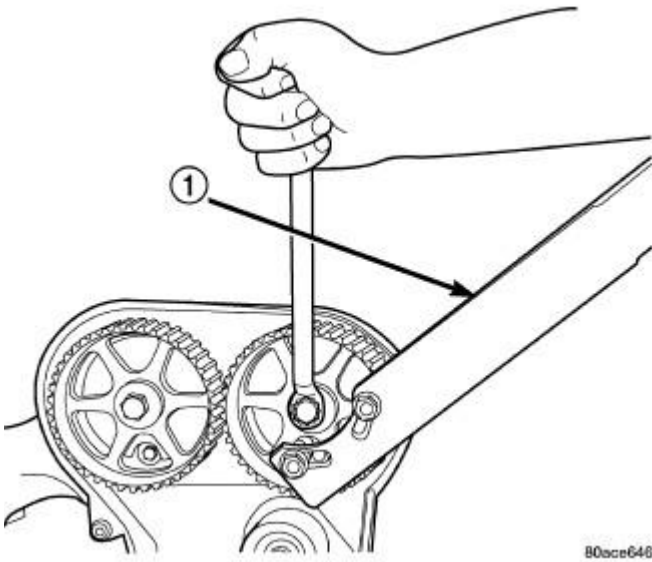


Fig. 407: Camshaft Sprocket-Removal/Installation
Courtesy of CHRYSLER LLC

1. Remove upper and lower front timing belt covers. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
2. Remove timing belt. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal.
3. Use Camshaft Sprocket Holder 6847 (1) to hold camshaft sprockets while removing the sprocket bolt(s) . Remove camshaft sprocket(s).

CRANKSHAFT SPROCKET

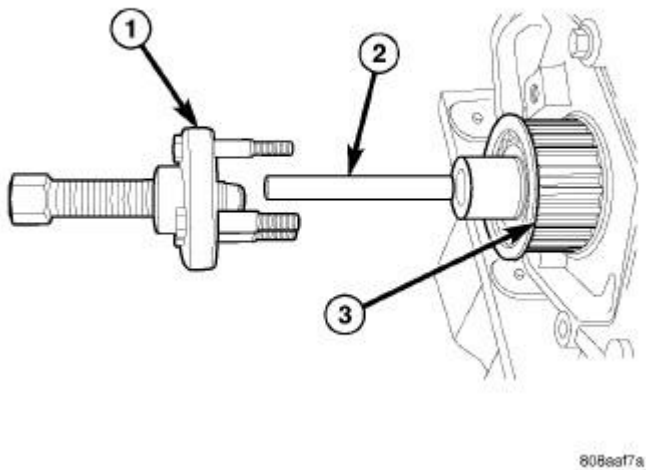


Fig. 408: Crankshaft Sprocket - Removal
Courtesy of CHRYSLER LLC

- 1 - CRANKSHAFT SPROCKET REMOVER 6793
- 2 - CRANKSHAFT SPROCKET REMOVER INSERT C-4685-C2
- 3 - CRANKSHAFT SPROCKET

1. Remove upper and lower front timing belt covers. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
2. Remove timing belt. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal.
3. Remove crankshaft sprocket (3) using Crankshaft Sprocket Remover 6793 (1) and Crankshaft Sprocket Remover Insert C-4685-C2 (2) .

Installation

CRANKSHAFT SPROCKET

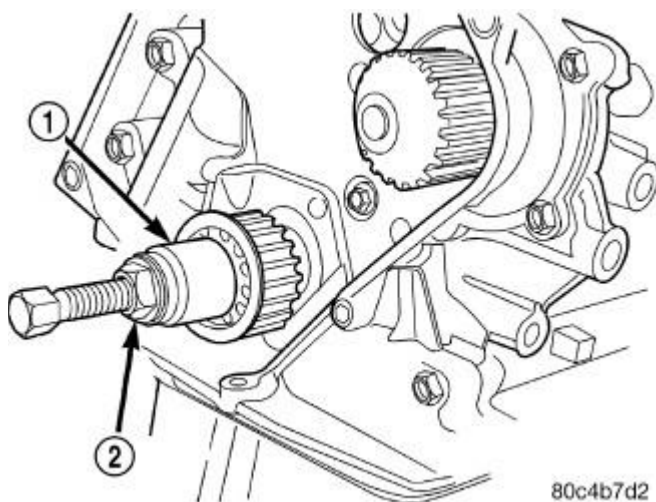


Fig. 409: Crankshaft Sprocket - Installation

Courtesy of CHRYSLER LLC

- 1 - CRANKSHAFT DAMPER/SPROCKET INSTALLER 6792
- 2 - TIGHTEN NUT TO INSTALL

CAUTION: The crankshaft sprocket is set to a predetermined depth from the factory for correct timing belt tracking. If removed, use of Crankshaft Damper/Sprocket Installer 6792 is required to set the sprocket to original installation depth. An incorrectly installed sprocket will result in timing belt and engine damage.

1. Install crankshaft sprocket using Crankshaft Damper/Sprocket Installer 6792 (1) .
2. Install timing belt. See Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation.
3. Install upper and lower front timing belt covers. See Engine/Valve Timing/COVER(S), Engine Timing - Installation.

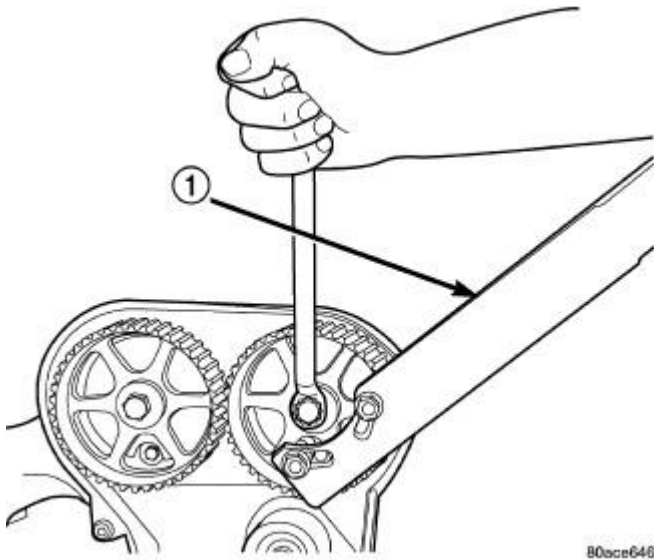
CAMSHAFT SPROCKET(S)

Fig. 410: Camshaft Sprocket-Removal/Installation
Courtesy of CHRYSLER LLC

1 - CAMSHAFT SPROCKET HOLDER 6847

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts. Damage to the camshaft-to-sprocket locating dowel pin may occur.

1. Install camshaft sprockets. Hold sprockets with Camshaft Sprocket Holder 6847 (1) while tightening center bolt to 115 N.m (85 ft. lbs.) .
2. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation**.
3. Install upper and lower front timing belt covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.

TIMING BELT

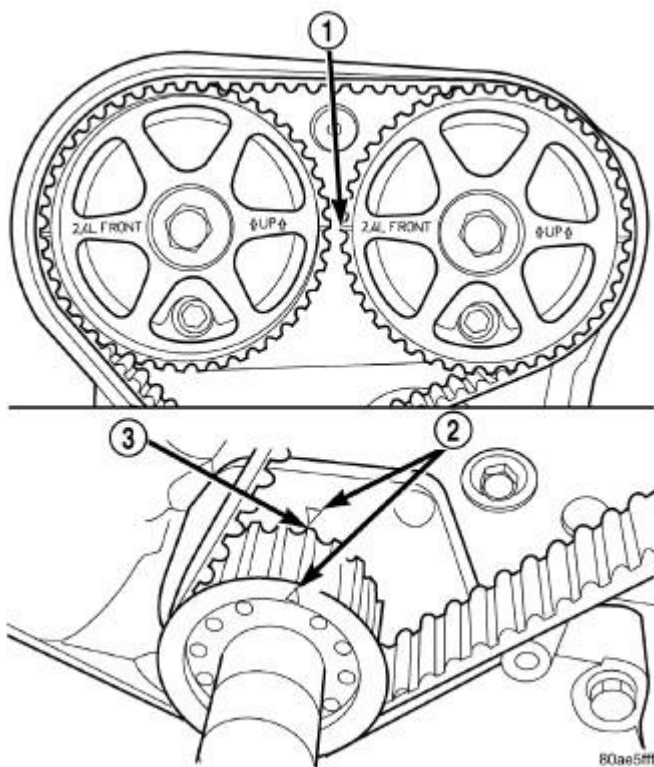


Fig. 411: Crankshaft and Camshaft Timing
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT TIMING MARKS
- 2 - CRANKSHAFT TDC MARKS
- 3 - TRAILING EDGE OF SPROCKET TOOTH

1. Set crankshaft sprocket to TDC by aligning the sprocket with the arrow on the oil pump housing (2).

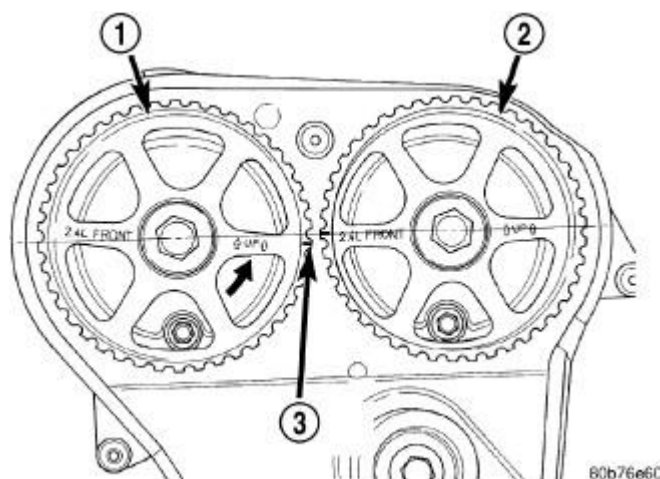


Fig. 412: Camshaft Sprocket Alignment For Timing Belt Installation
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT SPROCKET-EXHAUST
- 2 - CAMSHAFT SPROCKET-INTAKE
- 3 - 1/2 NOTCH LOCATION

2. Set camshafts timing marks so that the exhaust camshaft sprocket (1) is a 1/2 notch (3) below the intake camshaft sprocket (2) .

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

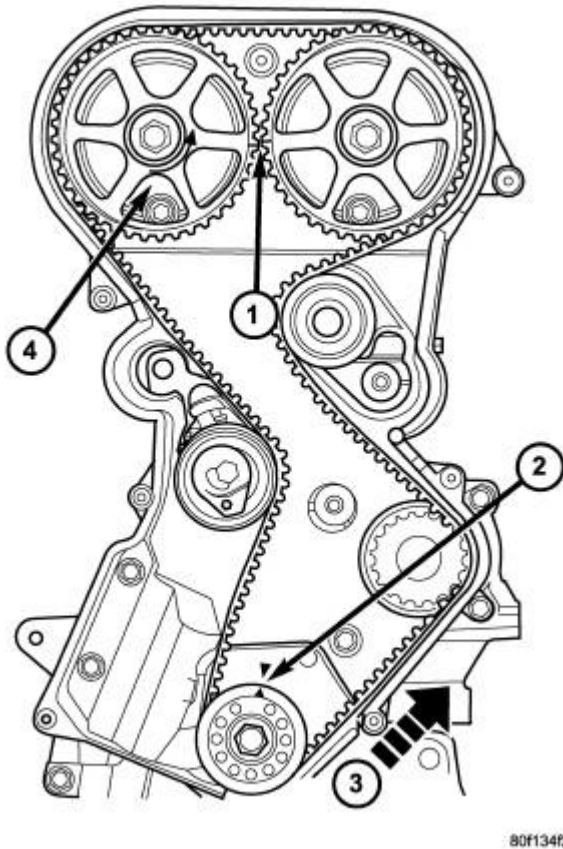
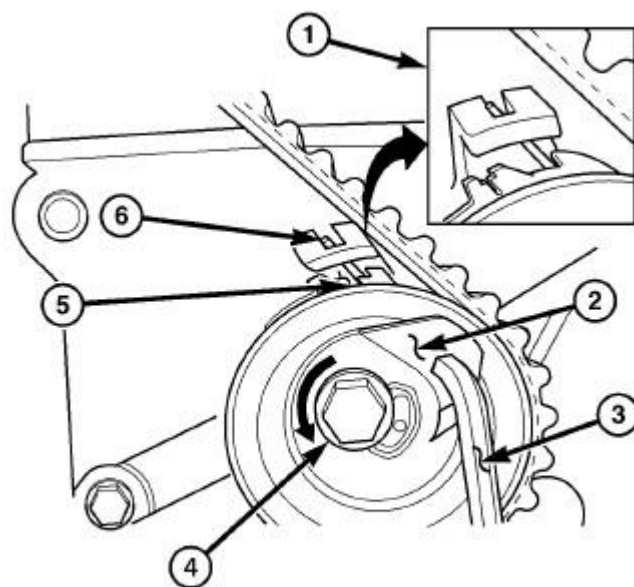


Fig. 413: Timing Belt Installation
Courtesy of CHRYSLER LLC

- 1 - CAMSHAFT TIMING MARKS 1/2 NOTCH LOCATION
- 2 - CRANKSHAFT AT TDC
- 3 - INSTALL BELT IN THIS DIRECTION
- 4 - ROTATE CAMSHAFT SPROCKET TO TAKE UP

BELT SLACK

3. Install timing belt. Starting at the crankshaft, go around the water pump sprocket, idler pulley, camshaft sprockets and then around the tensioner .
4. Move the exhaust camshaft sprocket (4) counterclockwise to align marks and take up belt slack.



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Fig. 414: Timing Belt Tension Adjustment
 Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - ALIGN SETTING NOTCH WITH SPRING TANG
2 - TOP PLATE
3 - ALLEN WRENCH
4 - LOCK BOLT
5 - SETTING NOTCH
6 - SPRING TANG |
|--|

5. Insert Allen wrench (3) into the hexagon opening located on the top plate (2) of the belt tensioner pulley. Rotate the top plate (2) **COUNTERCLOCKWISE** . The tensioner pulley will move against the belt and the tensioner setting notch (1) will eventually start to move clockwise. Watching the movement of the setting notch (1), continue rotating the top plate (2) counterclockwise until the setting notch is aligned with the spring tang (6) . Using the Allen wrench (3) to prevent the top plate (2) from moving, torque the tensioner lock bolt (4) to 25 N.m (220 in. lbs.). Setting notch (5) and spring tang (6) should remain aligned after lock bolt (4) is torqued.
6. Remove Allen wrench (3) and torque wrench.

NOTE: **Repositioning the crankshaft to the TDC position must be done only**

during the **CLOCKWISE** rotation movement. If TDC is missed, rotate a further two revolutions until TDC is achieved. **DO NOT** rotate crankshaft counterclockwise as this will make verification of proper tensioner setting impossible.

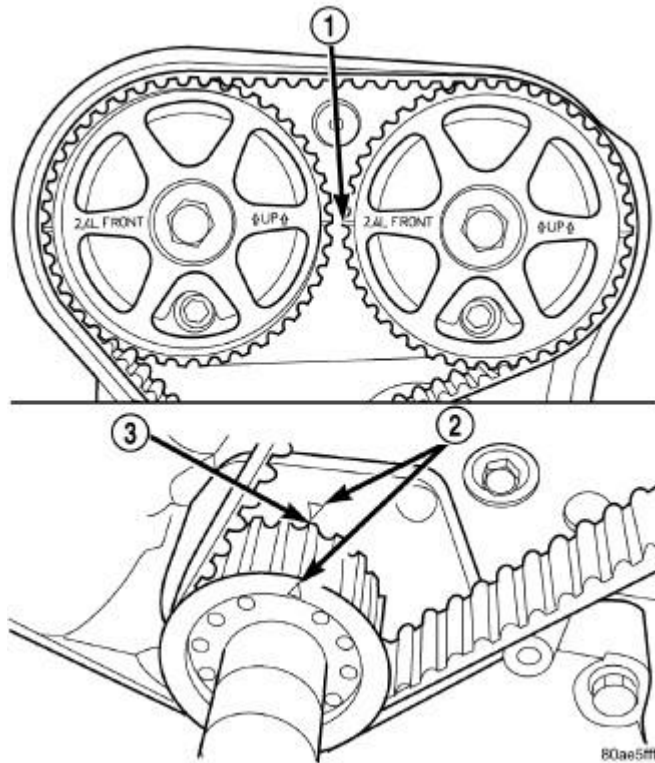
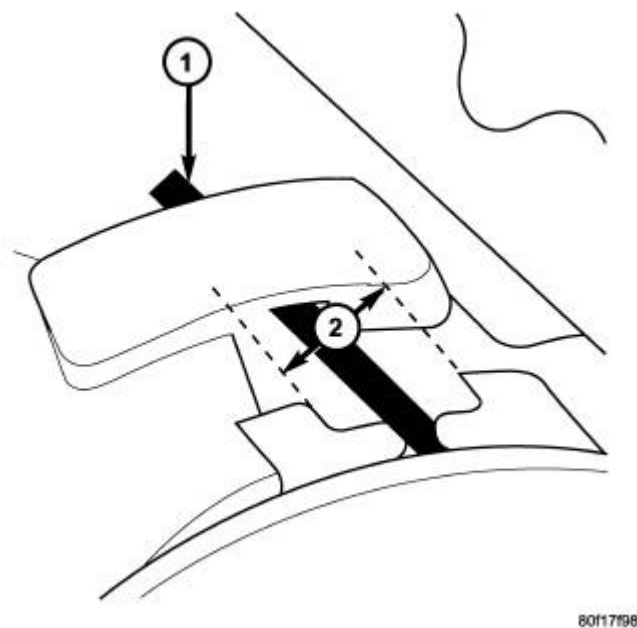


Fig. 415: Crankshaft and Camshaft Timing
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - CAMSHAFT TIMING MARKS
2 - CRANKSHAFT TDC MARKS
3 - TRAILING EDGE OF SPROCKET TOOTH |
|--|

7. Rotate the crankshaft **CLOCKWISE** two complete revolutions manually for seating of the belt, until the crankshaft is repositioned at the TDC position. Verify that the camshaft (1) and crankshaft (2) timing marks are in proper position .

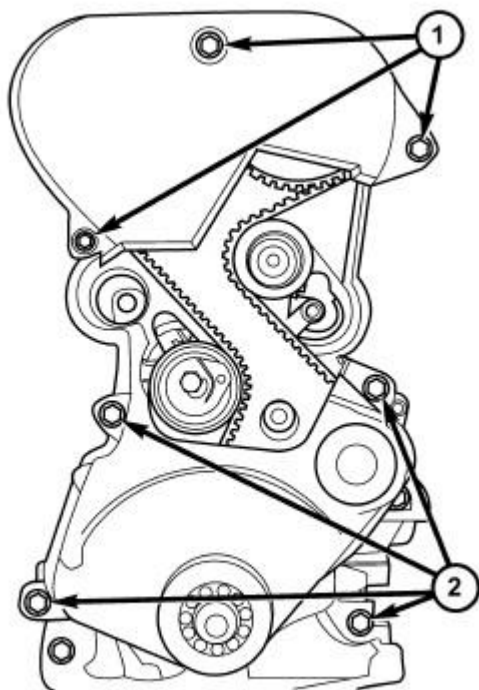


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Fig. 416: Timing Belt Tension Verification
Courtesy of CHRYSLER LLC

1 - SPRING TANG 2 - TOLERANCE WINDOW

8. Check if the spring tang (1) is within the tolerance window (2) . If the spring tang (1) is within the tolerance window (2), the installation process is complete and nothing further is required. If the spring tang (1) is not within the tolerance window (2), repeat Steps 5 through 7.



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Fig. 417: Front Timing Belt Covers

Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - UPPER COVER FASTENERS
2 - LOWER COVER FASTENERS</p> |
|--|

9. Install upper and lower front timing belt covers . See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
10. Connect negative cable to battery.

COVER(S), ENGINE TIMING

Removal

REMOVAL

FRONT COVER-UPPER

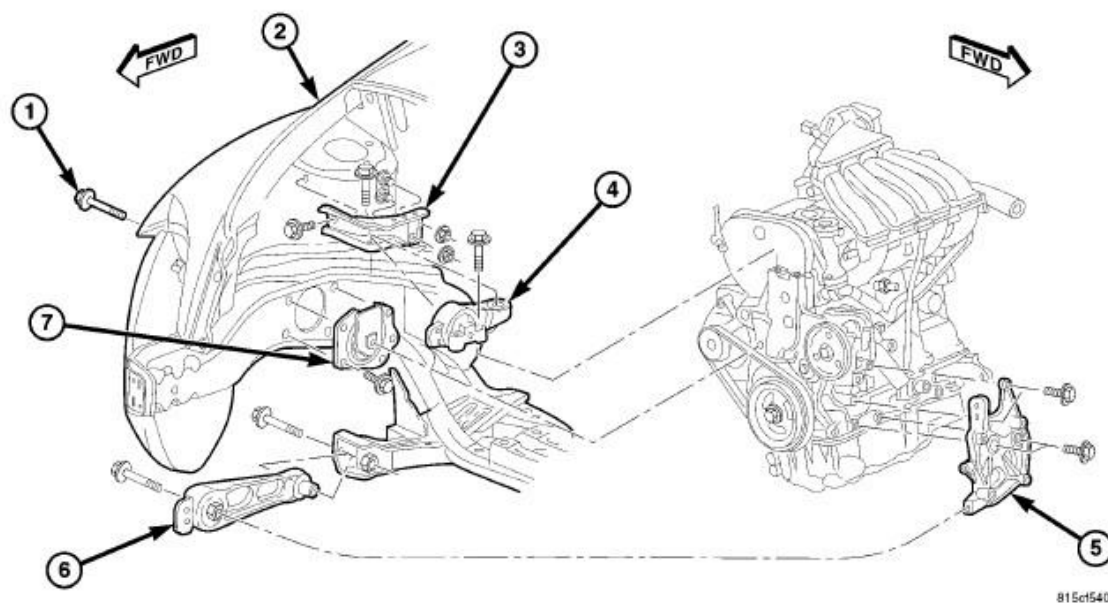


Fig. 418: RIGHT MOUNT
Courtesy of CHRYSLER LLC

1. Remove upper torque strut (4) attaching bolts and set strut aside. See **Engine/Engine Mounting/STRUT, Torque - Removal**.

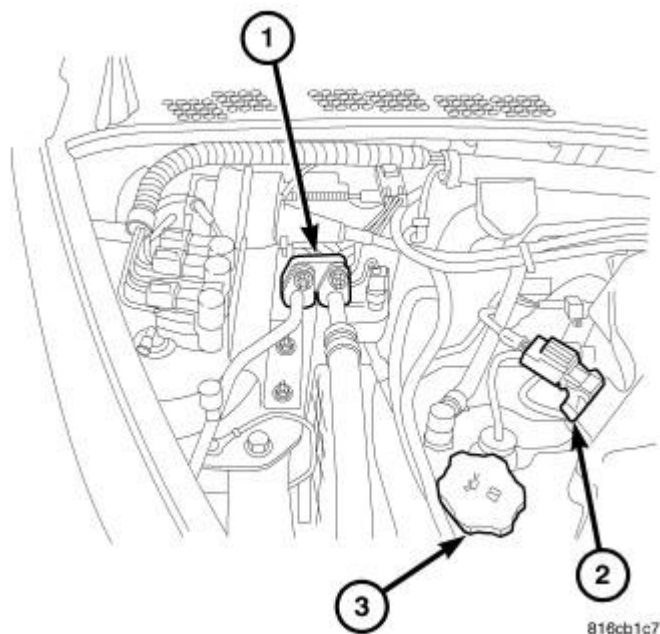


Fig. 419: A/C LINES
Courtesy of CHRYSLER LLC

2. Turbocharger equipped vehicles:
 - Discharge and evacuate air conditioning system. Refer to **STANDARD PROCEDURE**.

- Disconnect air conditioning lines at junction block (1) near upper timing belt cover.

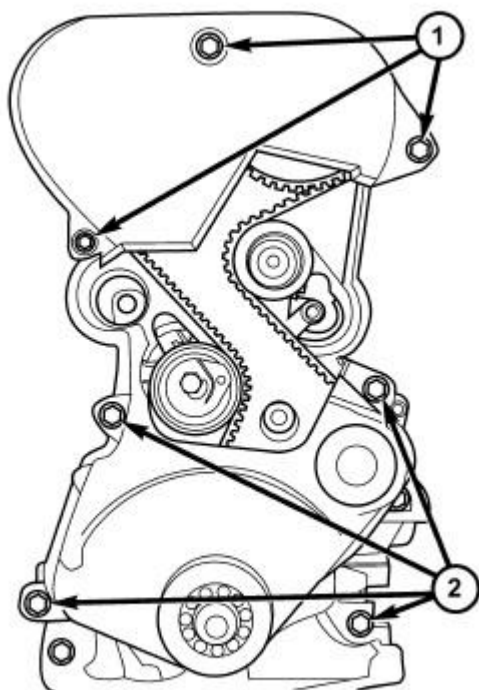
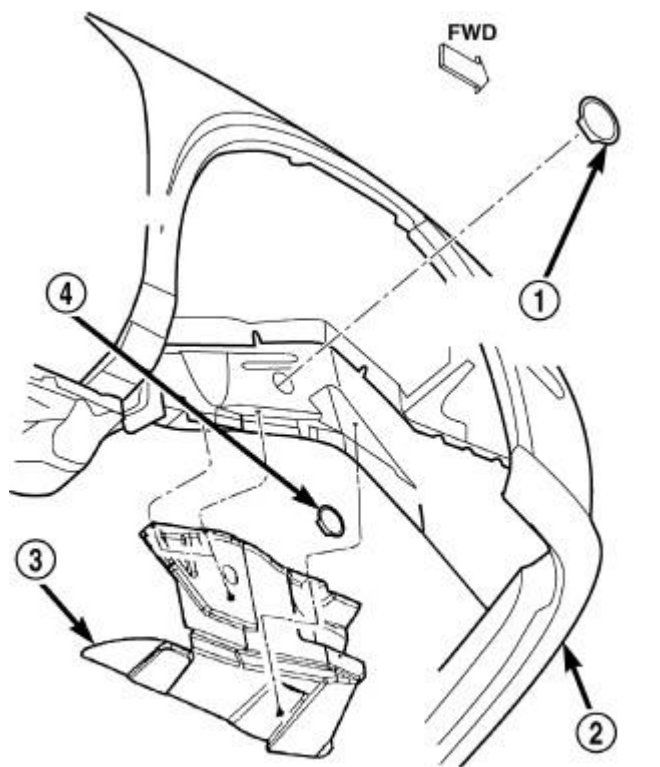


Fig. 420: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

3. Remove upper timing belt cover fasteners (1) and remove cover.

FRONT COVER-LOWER



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Fig. 421: Splash Shield

Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Raise vehicle on hoist. Remove right front wheel.
3. Remove the right splash shield (3).

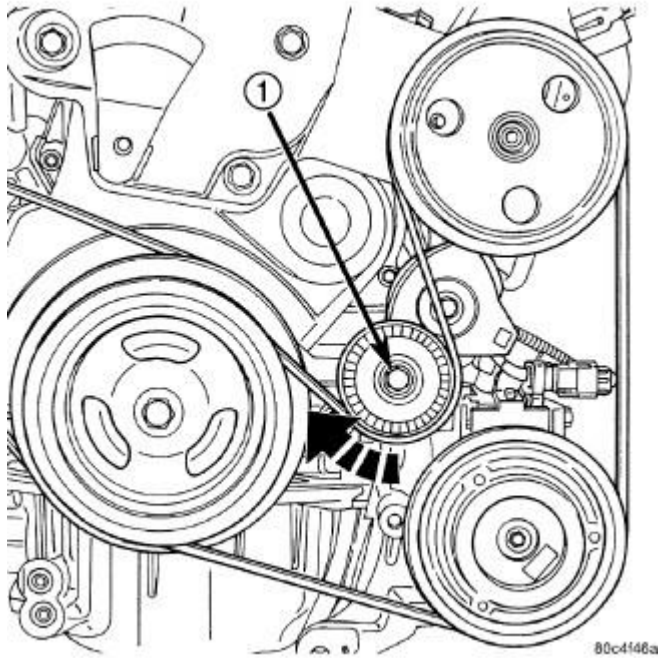


Fig. 422: Accessory Belt-Removing
Courtesy of CHRYSLER LLC

4. Remove accessory drive belts. Refer to Cooling/Accessory Drive/BELT, Serpentine - Removal .
5. Remove crankshaft damper. See Engine/Engine Block/DAMPER, Vibration - Removal.

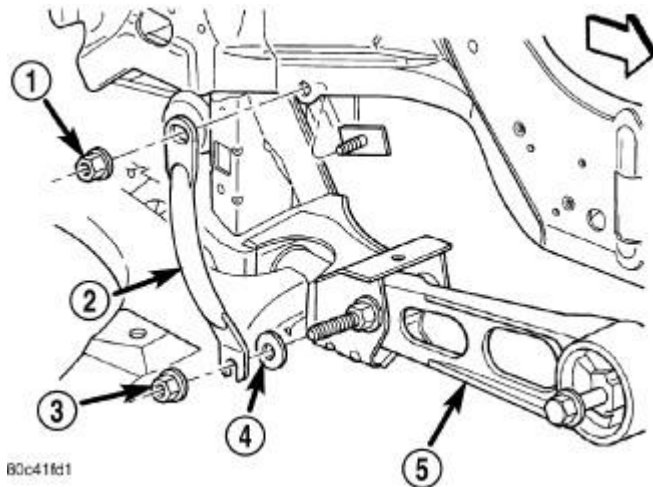


Fig. 423: Pencil Strut
Courtesy of CHRYSLER LLC

6. Remove the lower torque strut (5). See Engine/Engine Mounting/STRUT, Torque - Removal.

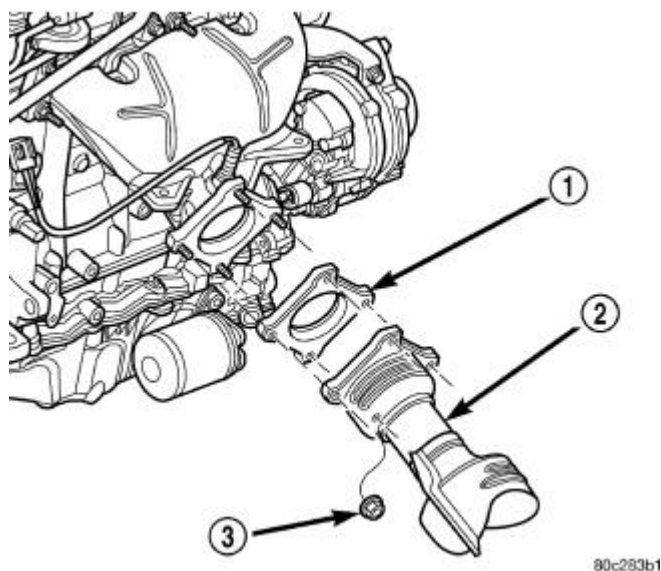


Fig. 424: Exhaust Manifold To Pipe Connection
Courtesy of CHRYSLER LLC

7. Disconnect catalytic converter (2) from manifold.
8. Disconnect A/C pressure switch at rear of compressor housing.
9. Lower vehicle and support engine with a jack.

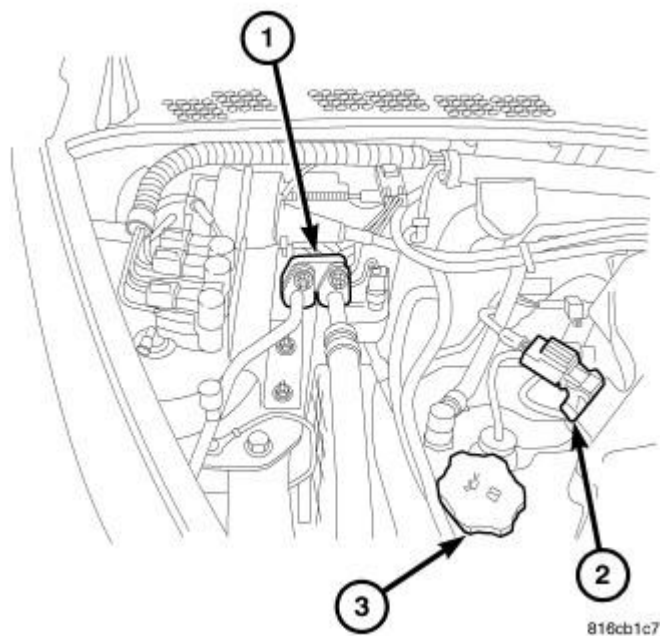


Fig. 425: A/C LINES
Courtesy of CHRYSLER LLC

10. Discharge A/C system and disconnect A/C lines at coupling block (1). Refer to **STANDARD PROCEDURE**.

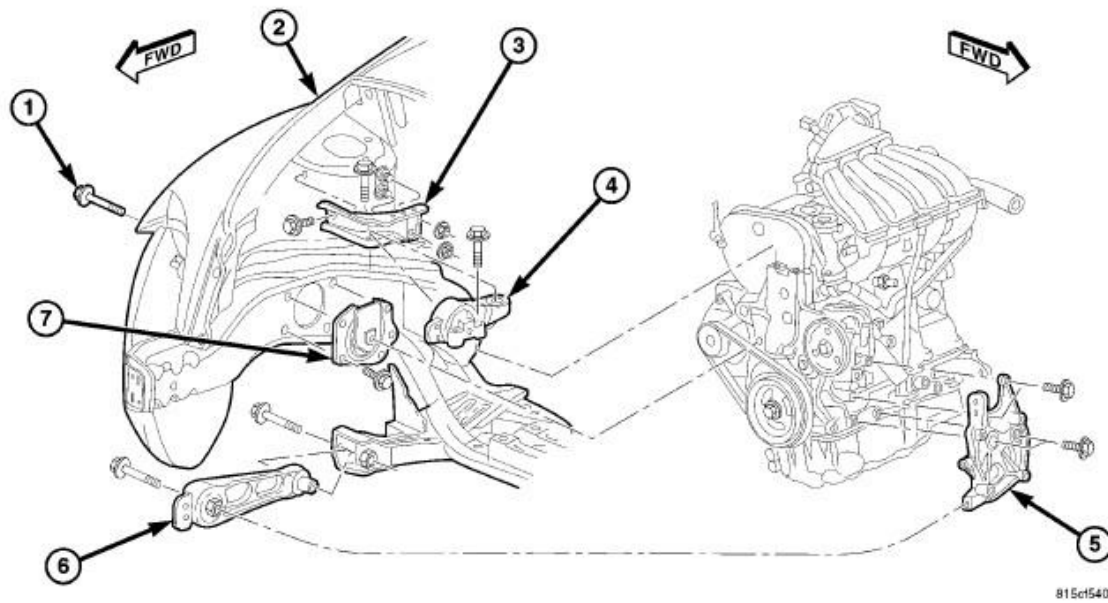


Fig. 426: RIGHT MOUNT
Courtesy of CHRYSLER LLC

11. Remove upper torque strut (4). See **Engine/Engine Mounting/STRUT, Torque - Removal.**
12. Remove screw attaching ground strap to strut bracket.
13. Remove upper torque strut bracket (3) from strut tower.
14. Remove upper radiator closure panel. Refer to **Body/Exterior/CROSSMEMBER, Radiator - Removal.**

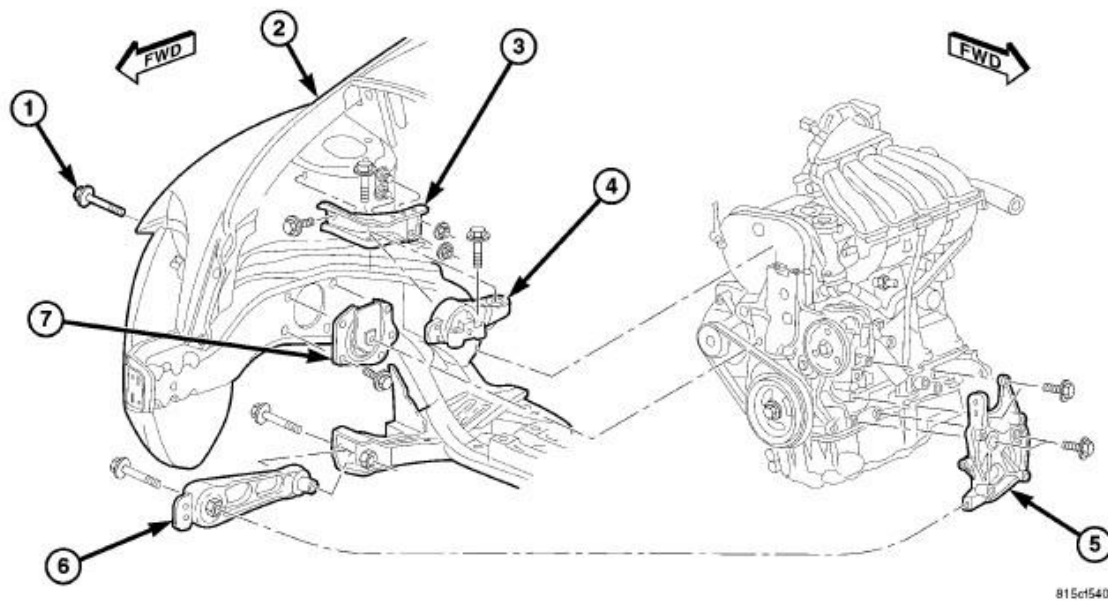


Fig. 427: RIGHT MOUNT
Courtesy of CHRYSLER LLC

15. Remove power steering pump and bracket. Set pump aside. **Do not disconnect lines from pump.**
16. With engine properly supported, remove right engine mount through bolt (1).

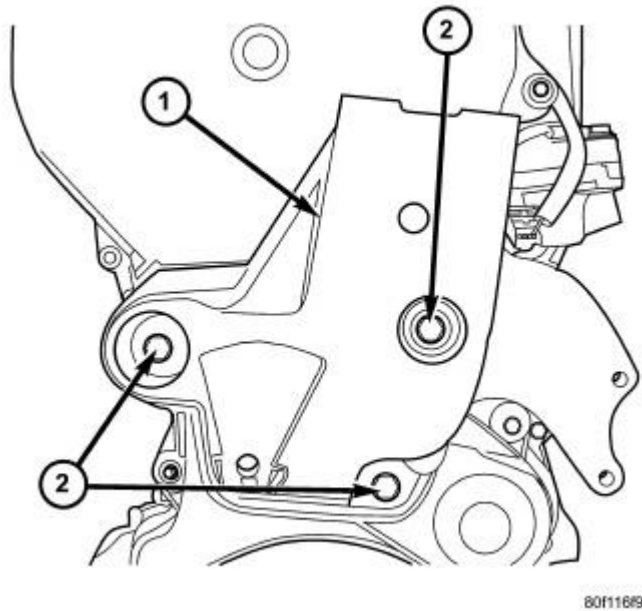


Fig. 428: Engine Support Bracket
Courtesy of CHRYSLER LLC

17. Raise engine with jack until engine support bracket bolts (2) are accessible .
18. Remove engine support bracket (1).

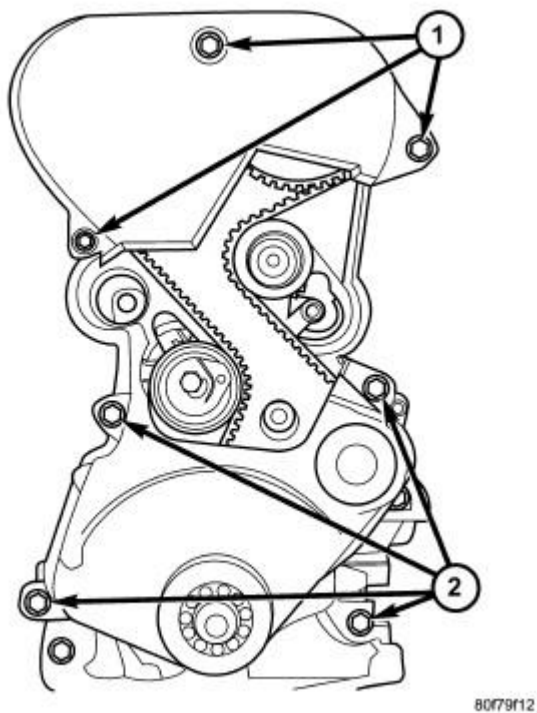
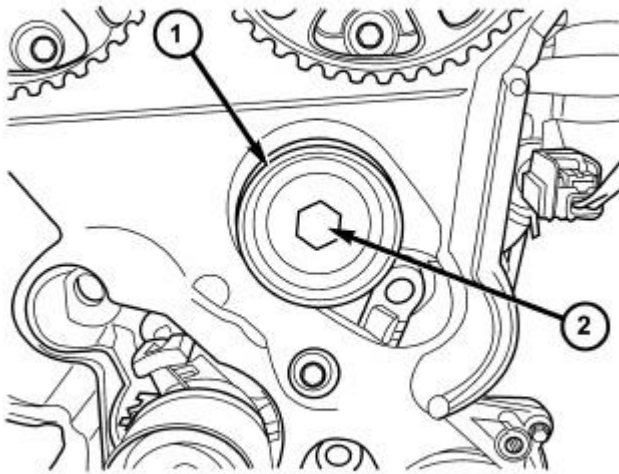


Fig. 429: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

19. Remove timing belt cover fasteners (1,2) and remove cover.

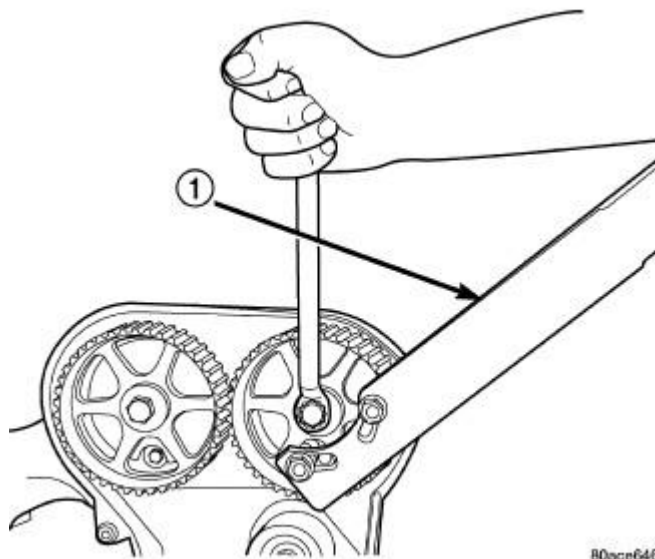
REAR COVER



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Fig. 430: Timing Belt Idler Pulley
Courtesy of CHRYSLER LLC

1. Remove front timing belt covers. Refer to above procedures.
2. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal**.
3. Remove timing belt idler pulley (1).



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Fig. 431: Camshaft Sprocket-Removal/Installation
Courtesy of CHRYSLER LLC

4. Remove camshaft sprockets. Use Camshaft Sprocket Holder 6847 (1) to hold camshaft sprockets while

removing the sprocket bolts.

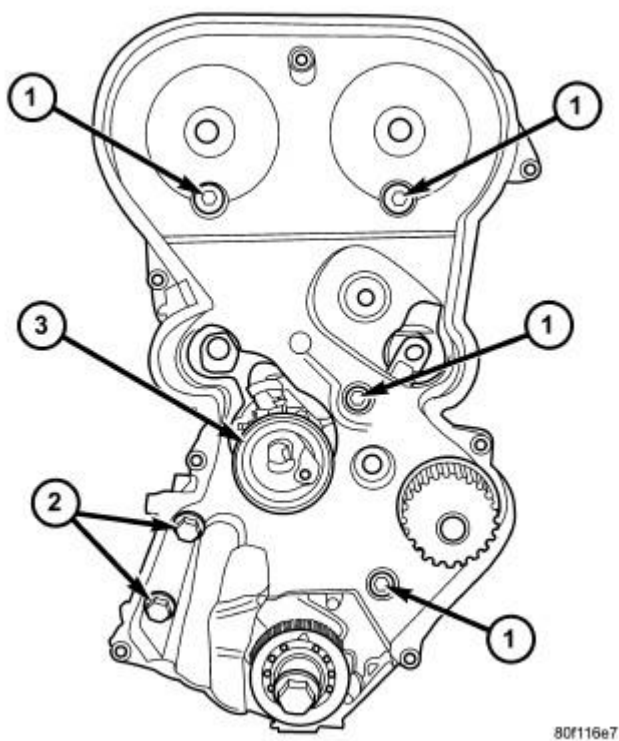


Fig. 432: Rear Timing Belt Cover Fasteners
Courtesy of CHRYSLER LLC

5. Remove rear timing belt cover fasteners (1,2) and remove cover from engine.

Installation

INSTALLATION

FRONT COVER - UPPER

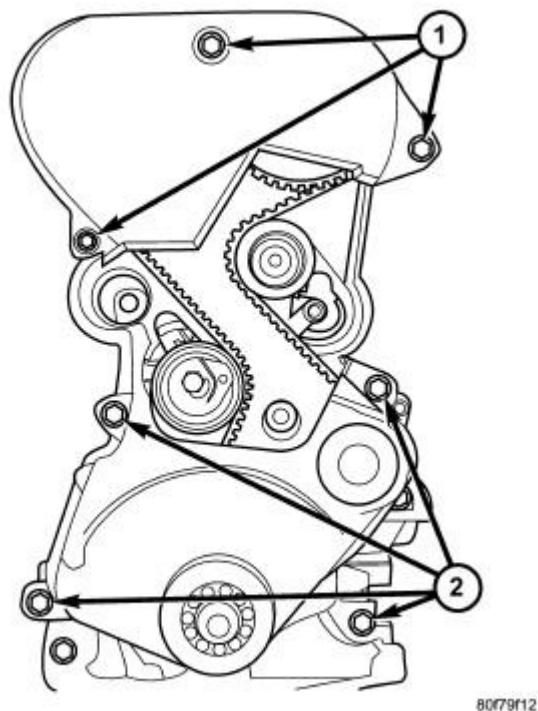


Fig. 433: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

1. Install timing belt cover and tighten fasteners (1) to 6 N.m (50 in. lbs.).

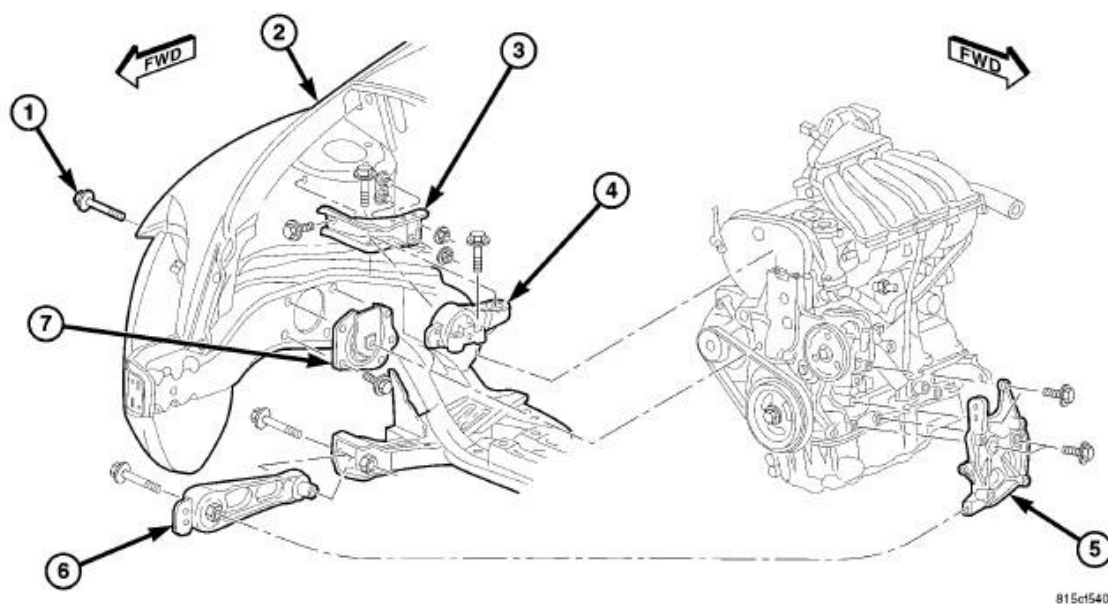


Fig. 434: RIGHT MOUNT
Courtesy of CHRYSLER LLC

2. Install upper torque strut (4). See **Engine/Engine Mounting/STRUT, Torque - Installation**.

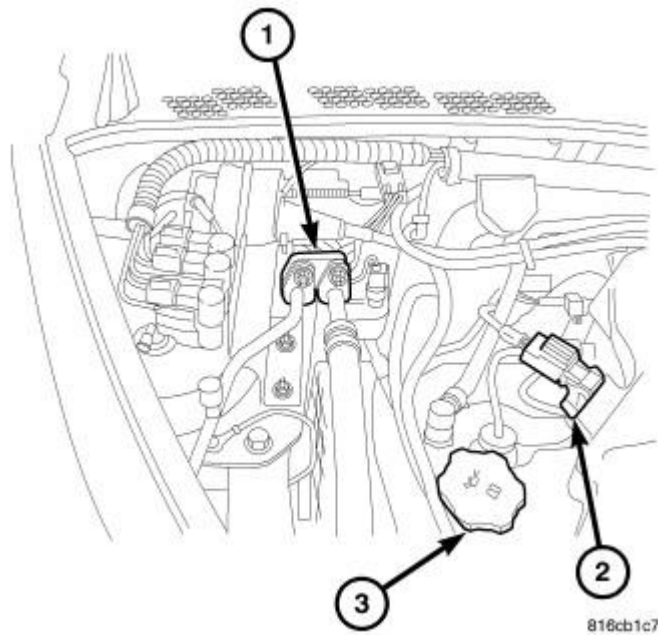


Fig. 435: A/C LINES

Courtesy of CHRYSLER LLC

3. **Turbocharger equipped vehicles:**
 - Connect air conditioning lines at junction block (1) near upper timing belt cover.
 - Recharge air conditioning system. Refer to **STANDARD PROCEDURE** .
4. Perform torque strut adjustment procedure. See **Engine/Engine Mounting/STRUT, Torque - Adjustments**.

FRONT COVER - LOWER

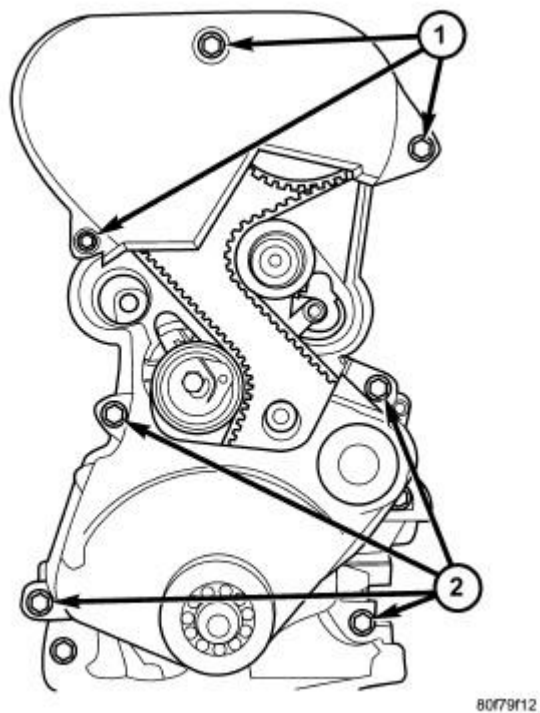


Fig. 436: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

1. Install lower timing belt cover and tighten fasteners (2) to 6 N.m (50 in. lbs.).

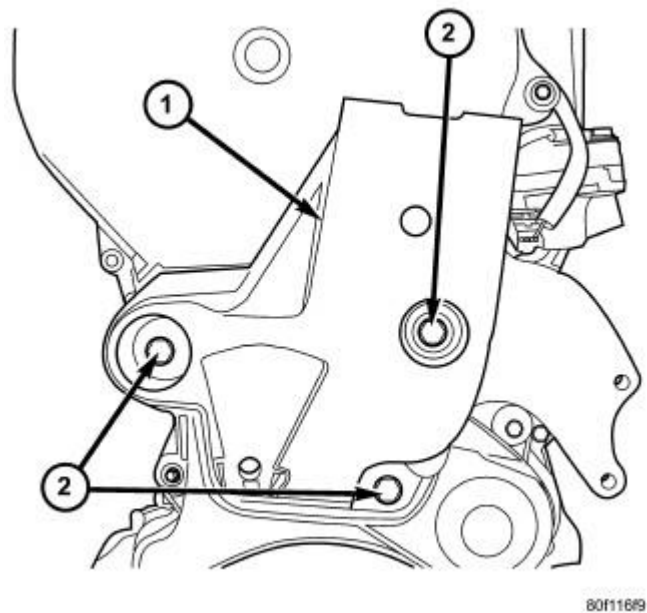


Fig. 437: Engine Support Bracket

Courtesy of CHRYSLER LLC

2. Install right engine support bracket (1). Ensure the power steering pump is properly located in mounting location on bracket. Tighten mount bracket bolts (2) to 61 N.m (45 ft. lbs.).

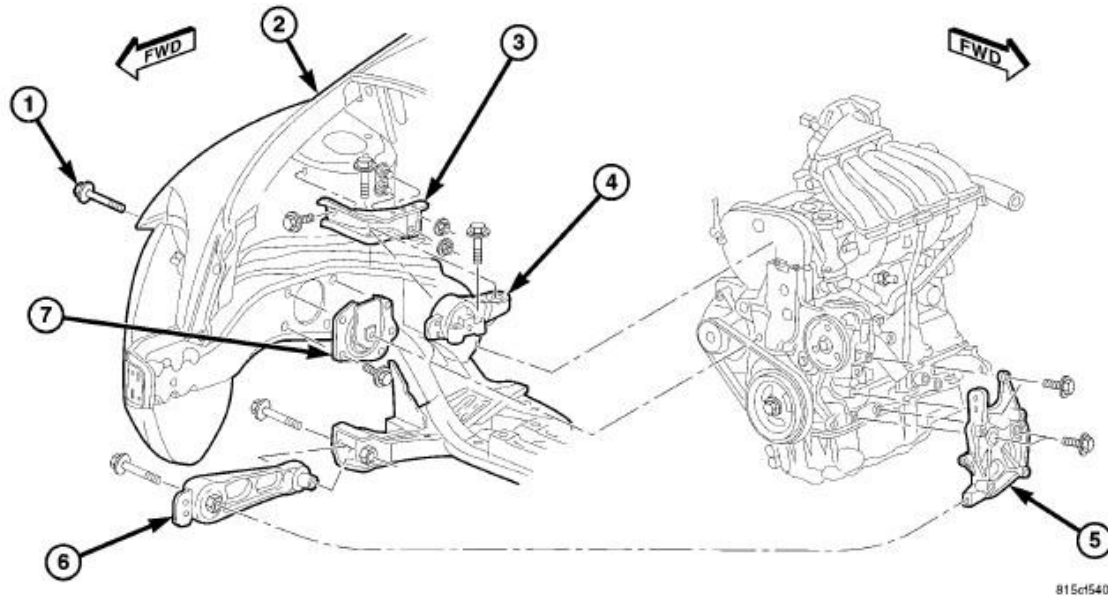


Fig. 438: RIGHT MOUNT

Courtesy of CHRYSLER LLC

3. Lower engine into mounting position and install right engine mount through bolt (1). Tighten bolt to 118 N.m (87 ft. lbs.).
4. Install power steering pump and bracket.
5. Install upper radiator closure panel. Refer to **Body/Exterior/CROSSMEMBER, Radiator - Installation**.
6. Install torque strut bracket (3) to strut tower.
7. Connect ground strap to bracket.
8. Install upper torque strut (4).

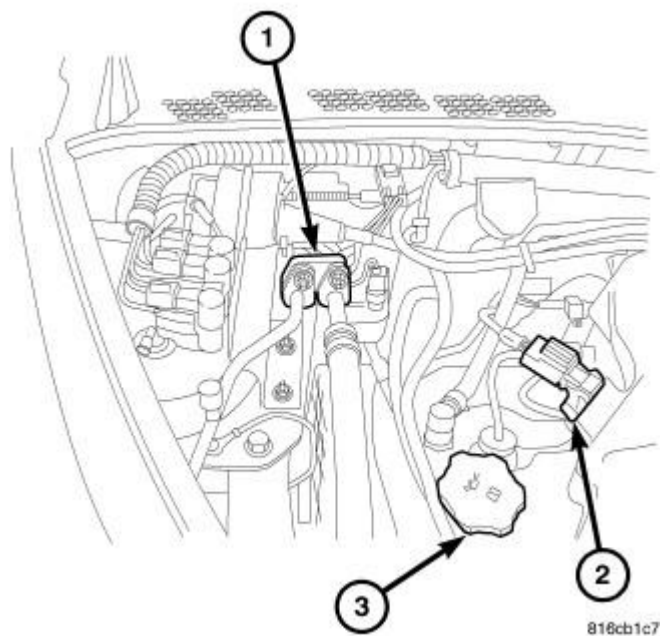


Fig. 439: A/C LINES

Courtesy of CHRYSLER LLC

9. Connect A/C lines (1) and charge A/C system. Refer to **STANDARD PROCEDURE** .
10. Raise vehicle.

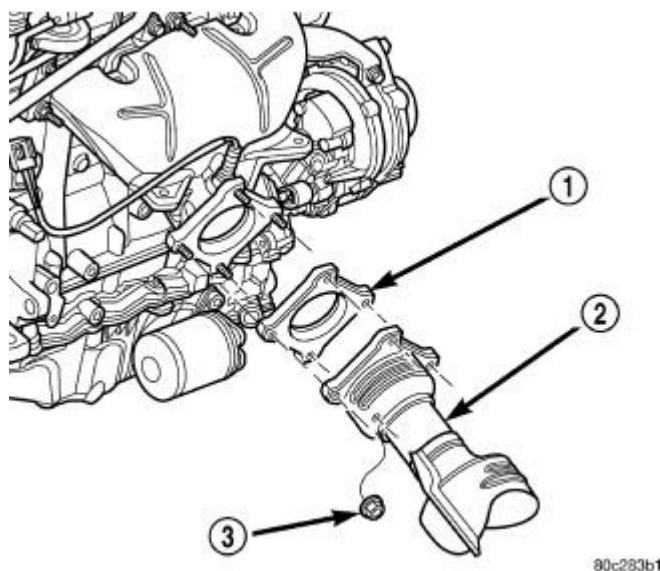


Fig. 440: Exhaust Manifold To Pipe Connection

Courtesy of CHRYSLER LLC

11. Connect catalytic converter (2) to manifold.
12. Connect A/C pressure switch connector.

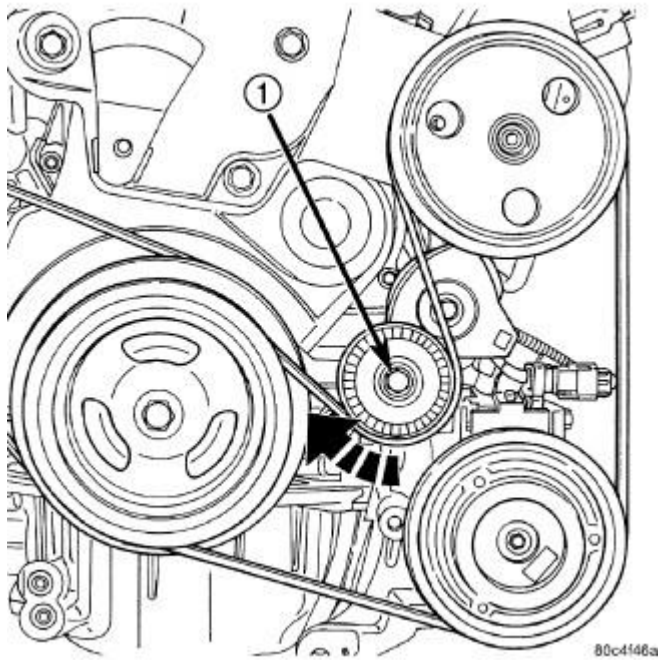


Fig. 441: Accessory Belt-Removing
Courtesy of CHRYSLER LLC

13. Install crankshaft damper. See **Engine/Engine Block/DAMPER, Vibration - Installation**.
14. Install accessory drive belts. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation**.

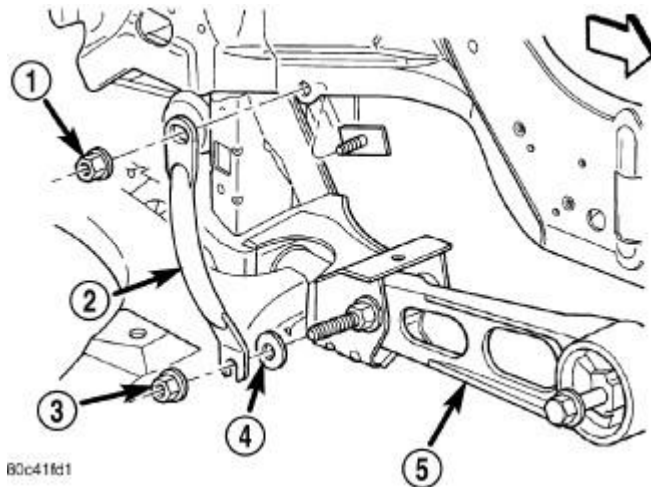
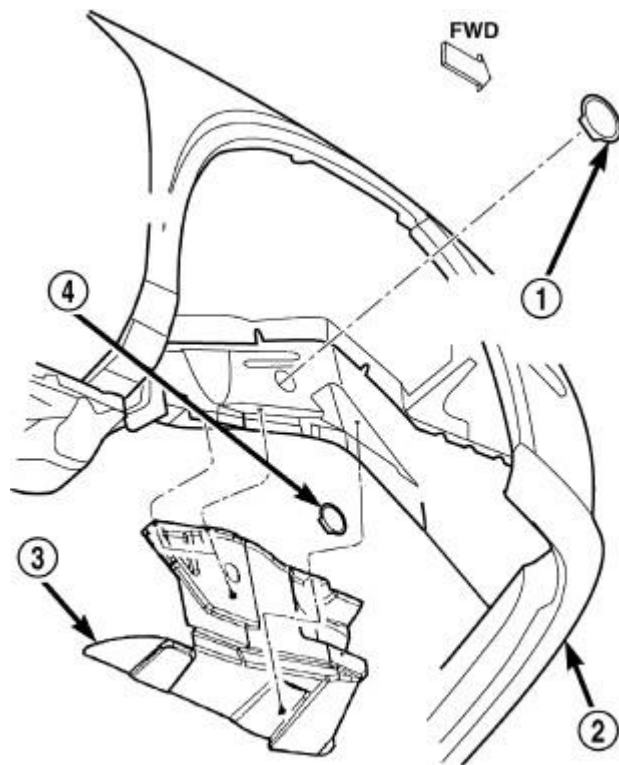


Fig. 442: Pencil Strut
Courtesy of CHRYSLER LLC

15. Install lower torque strut (5). See **Engine/Engine Mounting/STRUT, Torque - Installation**.
16. Perform torque strut adjustment procedure. See **Engine/Engine Mounting/STRUT, Torque - Adjustments**.

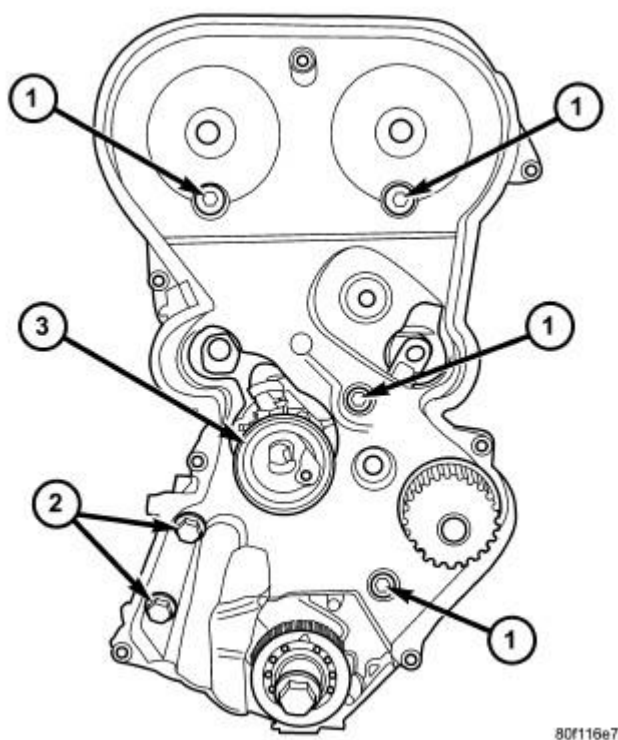


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Fig. 443: Splash Shield
Courtesy of CHRYSLER LLC

17. Install right splash shield (3).
18. Install right front wheel.
19. Connect negative cable to battery.

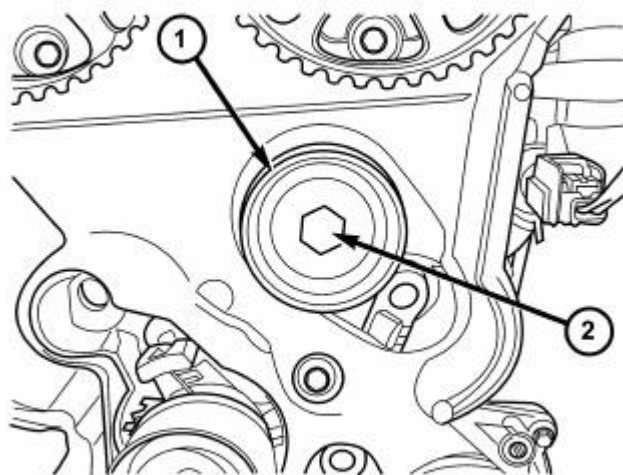
REAR COVER



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Fig. 444: Rear Timing Belt Cover Fasteners
Courtesy of CHRYSLER LLC

1. Install rear timing belt cover and fasteners (1,2). Torque fasteners to values specified in



80f116eb

Fig. 445: Timing Belt Idler Pulley

Courtesy of CHRYSLER LLC

2. Install timing belt idler pulley (1). Tighten timing belt idler pulley fastener (2) to 61 N.m (45 ft. lbs.).



Fig. 446: Camshaft Sprocket-Removal/Installation

Courtesy of CHRYSLER LLC

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts.
Damage to the camshaft-to-sprocket locating dowel pin may occur.

3. Install camshaft sprockets. Hold sprockets with camshaft sprocket holder 6847 while tightening center bolt to 115 N.m (85 ft. lbs.).
4. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation**.

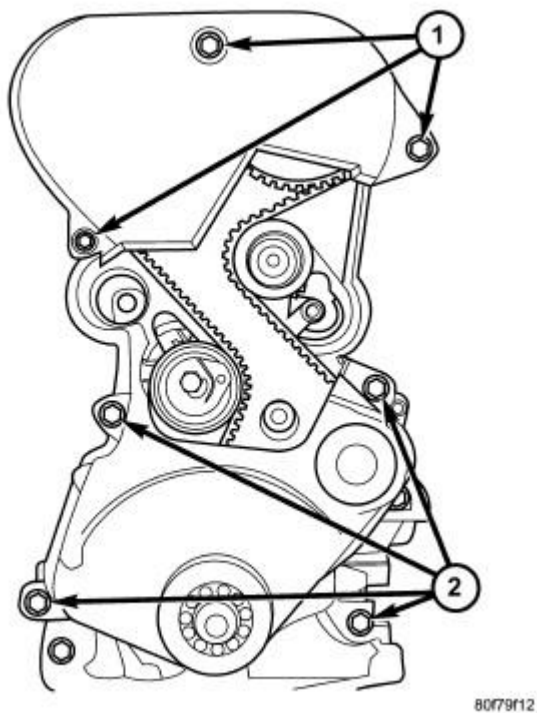


Fig. 447: Front Timing Belt Covers
Courtesy of CHRYSLER LLC

5. Install front timing belt covers. Refer to above procedures.

TENSIONER, ENGINE TIMING

Removal

REMOVAL

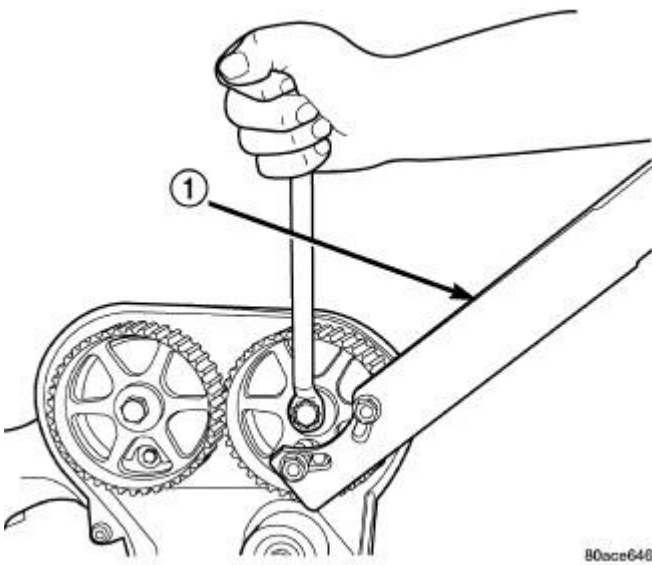


Fig. 448: Camshaft Sprockets
Courtesy of CHRYSLER LLC

1. Remove timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Removal**.
2. Remove timing belt idler pulley.
3. Hold camshaft sprocket with Camshaft Sprocket Holder 6847 (1) while removing bolt . Remove both camshaft sprockets.

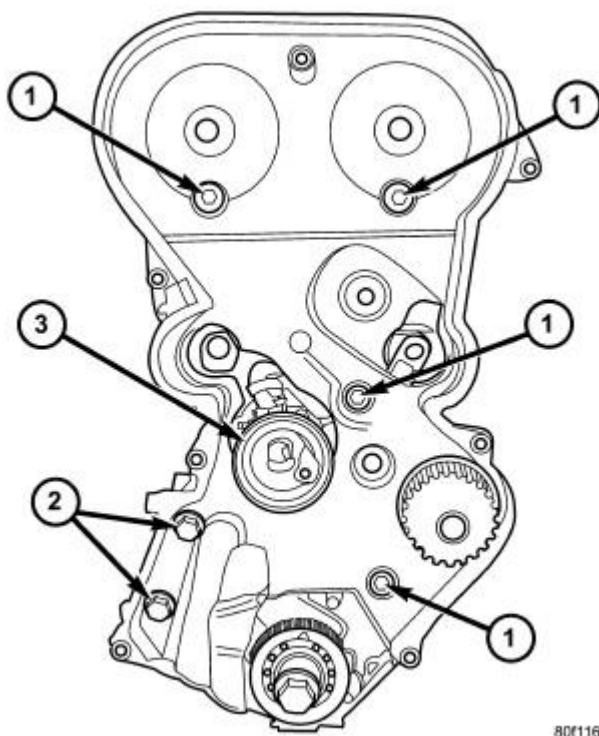
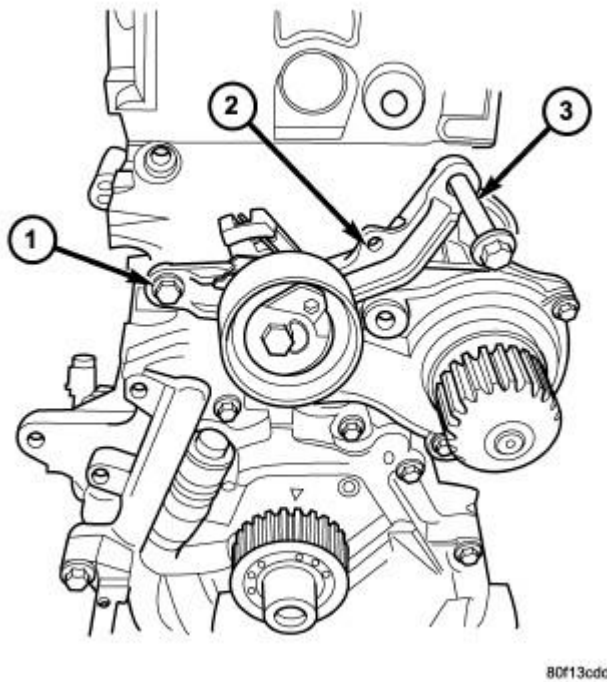


Fig. 449: Rear Timing Belt Cover Fasteners

Courtesy of CHRYSLER LLC

4. Remove rear timing belt cover fasteners (1,2) and remove cover from engine .

**Fig. 450: Timing Belt Tensioner/Bracket Assembly**

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - BOLT
2 - TENSIONER ASSEMBLY
3 - BOLT-INSTALL FOR PROPER ALIGNMENT |
|---|

5. Remove lower bolt (1) attaching timing belt tensioner assembly to engine and remove tensioner (2) **as an assembly** .

Installation**INSTALLATION**

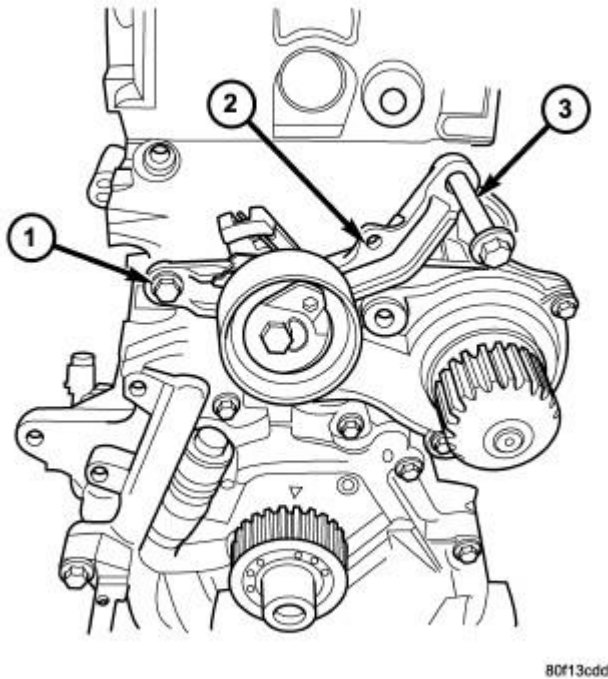


Fig. 451: Timing Belt Tensioner/Bracket Assembly
 Courtesy of CHRYSLER LLC

- 1 - BOLT
- 2 - TENSIONER ASSEMBLY
- 3 - BOLT-INSTALL FOR PROPER ALIGNMENT

1. Align timing belt tensioner assembly (2) to engine and install lower mounting bolt (1) **but do not tighten** . To properly align tensioner assembly to engine; temporarily install one of the engine bracket mounting bolts (M10) 5-7 turns into the tensioner assembly upper mounting location (3) .
2. Torque the tensioner's lower mounting bolt (1) to 61 N.m (45 ft. lbs.). Remove the upper bolt used for tensioner alignment (3).

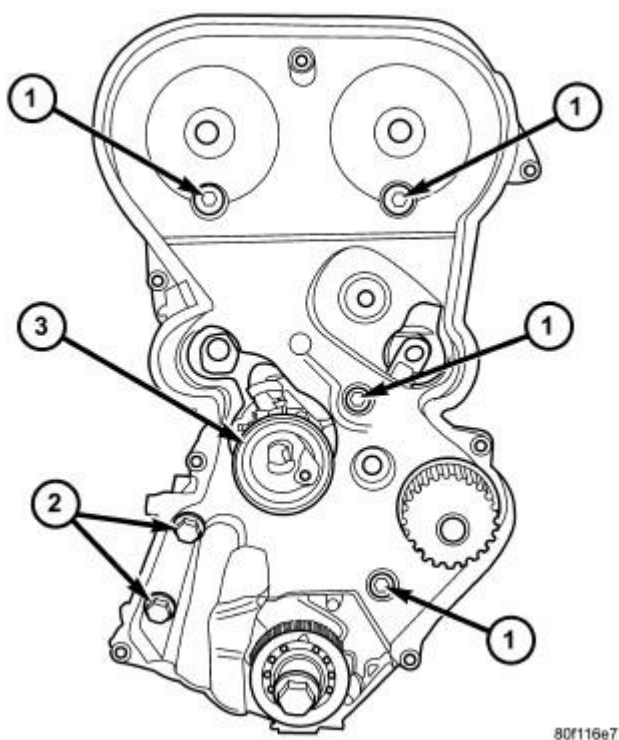


Fig. 452: Rear Timing Belt Cover Fasteners
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - M6 BOLTS - 12 N.m (105 in. lbs.)
2 - M8 BOLTS - 28 N.m (250 in. lbs.)
3 - TIMING BELT TENSIONER |
|---|

3. Install rear timing belt cover and fasteners (1,2) .

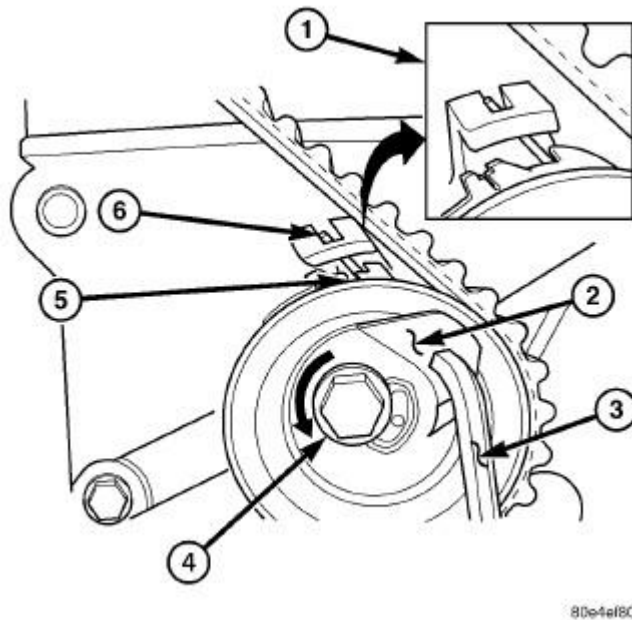


Fig. 453: Timing Belt Tension Adjustment
 Courtesy of CHRYSLER LLC

- 1 - ALIGN SETTING NOTCH WITH SPRING TANG
- 2 - TOP PLATE
- 3 - 6 mm ALLEN WRENCH
- 4 - LOCK BOLT
- 5 - SETTING NOTCH
- 6 - SPRING TANG

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

CAUTION: Do not use an impact wrench to tighten camshaft sprocket bolts.
 Damage to the camshaft-to-sprocket locating dowel pin may occur.

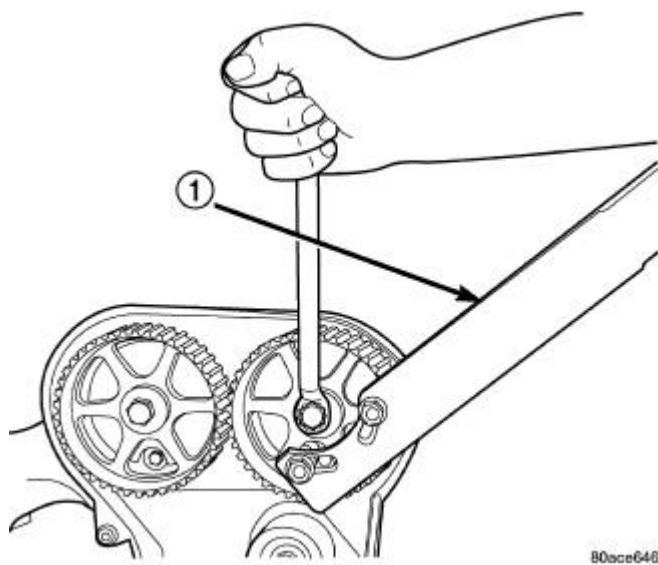


Fig. 454: Camshaft Sprockets
Courtesy of CHRYSLER LLC

1 - CAMSHAFT SPROCKET HOLDER 6847

5. Install camshaft sprockets. Use Camshaft Sprocket Holder 6847 to hold sprockets and tighten bolts to 115 N.m (85 ft. lbs.).
6. Install timing belt. See **Engine/Valve Timing/BELT and SPROCKETS, Timing - Installation.**