2010 ENGINE

2.8L Diesel - Service Information - Grand Caravan, Town & Country

DESCRIPTION

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The 2.8L (2776cc) four-cylinder "common rail" direct injection engine is an in-line overhead valve design. The engine utilize a cast iron cylinder block. The engine has a one piece aluminum cylinder head with four valves per cylinder and dual overhead cam shafts. The 2.8L is turbocharged, intercooled and also equipped with a EGR cooler.

The identification stamp for the 2.8L is located on the right side of the engine block, below the turbocharger. The engine code label is located on the front timing cover and is the same as the engine I.D. and serial number. There is also a fuel system label on the front timing cover used for fuel system identification during ECM programming.

STANDARD PROCEDURE

ENGINE GASKET SURFACE PREPARATION

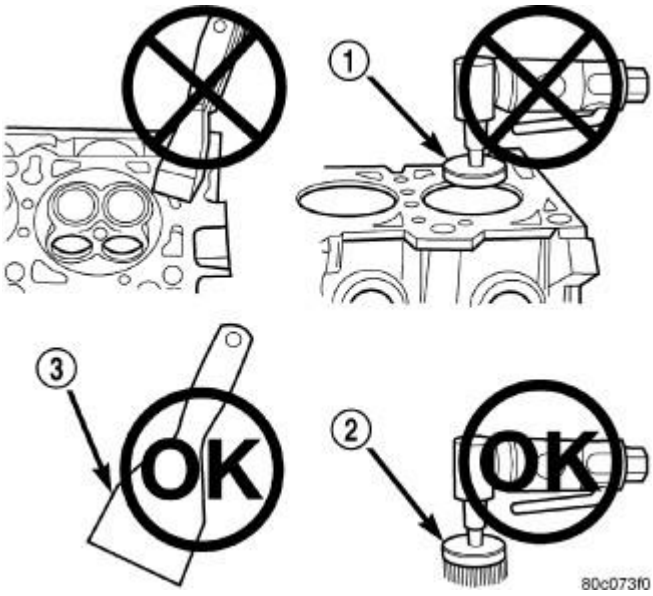

Fig. 1: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER LLC

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

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of

aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad (1), 3M Roloc™ Bristle Disc (2), or a wire brush (3)

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

COMPRESSION TEST

1. Warm up the engine to operating temperature (approximately 80 degrees C).
2. Shut off the engine.
3. Remove the engine cover.
4. Disconnect the fuel feed and return lines from the fuel filter.
5. Use a vacuum pump connected to the return line until no more fuel comes out.
6. Remove the fuel injectors. Refer to **Fuel System/Fuel Injection/INJECTOR(S), Fuel - Removal** .
7. Cranks the engine with the starter to remove combustion residue in the cylinders.
8. Install the Compression Test Adapter Tool VM.1072A into the injector hole of the cylinder to be tested. Install the fuel injector retainer bolts and securely tighten.
9. Test compression pressure by cranking the engine with the starter for at least eight revolutions.
10. Measure the pressure in all of the cylinders.
11. The maximum allowable compression difference between cylinders is 10 bar (44 psi.).
12. Remove Compression Test Adapter Tool VM.1072A.
13. Install the fuel injectors. Refer to **Fuel System/Fuel Injection/INJECTOR(S), Fuel - Installation** .
14. Install the engine cover.

REMOVAL

REMOVAL - ENGINE

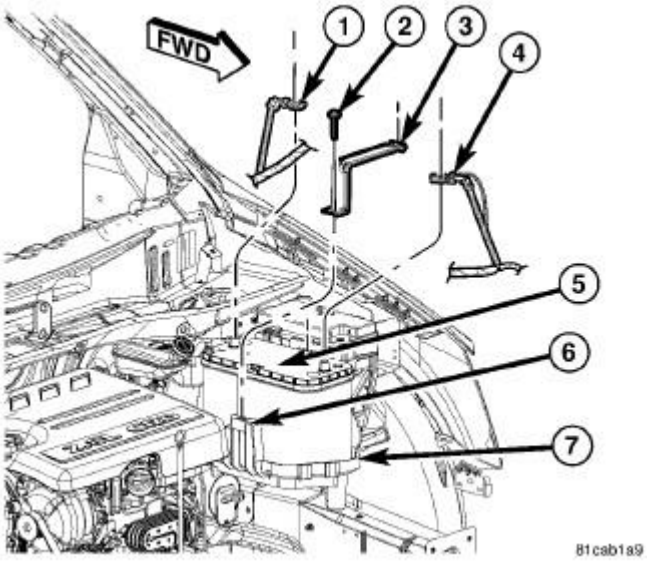

Fig. 2: Battery Cables
Courtesy of CHRYSLER LLC

1. Disconnect the battery cables (1) and (4).
2. Remove the battery (5). Refer to **Electrical/Battery System/BATTERY - Removal** .

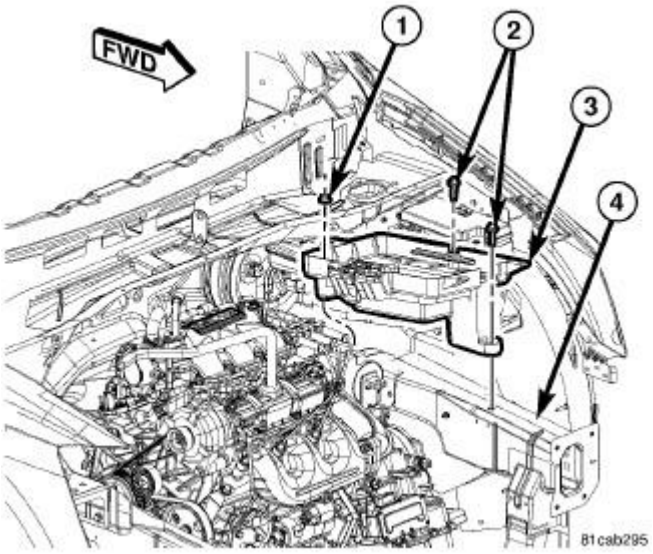

Fig. 3: Battery Tray
Courtesy of CHRYSLER LLC

3. Remove the battery tray (3). Refer to **Electrical/Battery System/TRAY, Battery - Removal** .

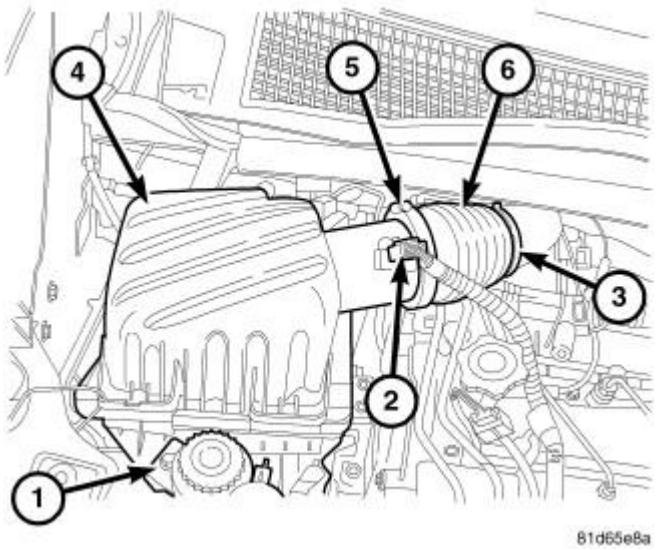

Fig. 4: Intake Air Box
Courtesy of CHRYSLER LLC

4. Remove the engine cover.
5. Evacuate the A/C system. Refer to **Heating and Air Conditioning/Plumbing - Standard Procedure** .
6. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
7. Remove the cooling fan module. Refer to **Cooling/Engine/FAN, Cooling - Removal** .

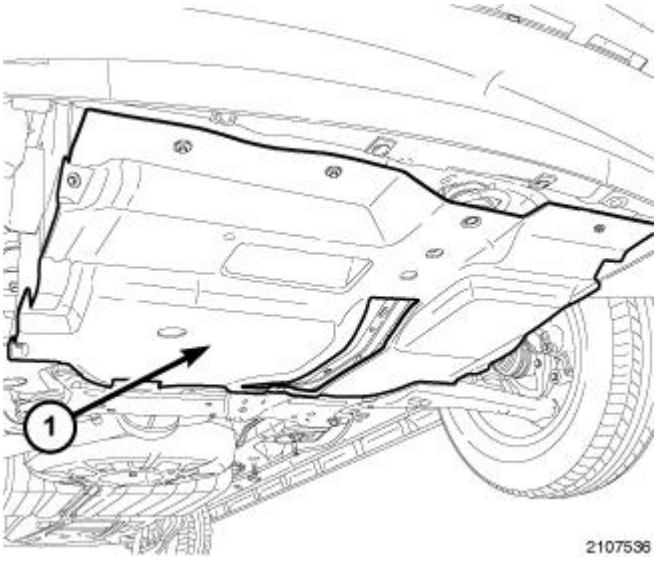

Fig. 5: Underbody Splash Shield
Courtesy of CHRYSLER LLC

8. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
9. Remove the underbody splash shield (1).

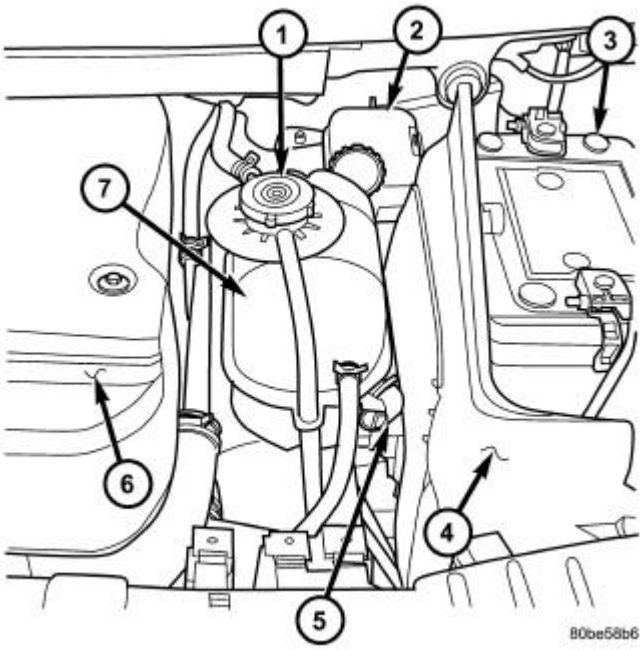

Fig. 6: Coolant Recovery Container Components
Courtesy of CHRYSLER LLC

10. Remove the coolant recovery bottle. Refer to **Cooling/Engine/BOTTLE, Coolant Recovery - Removal** .

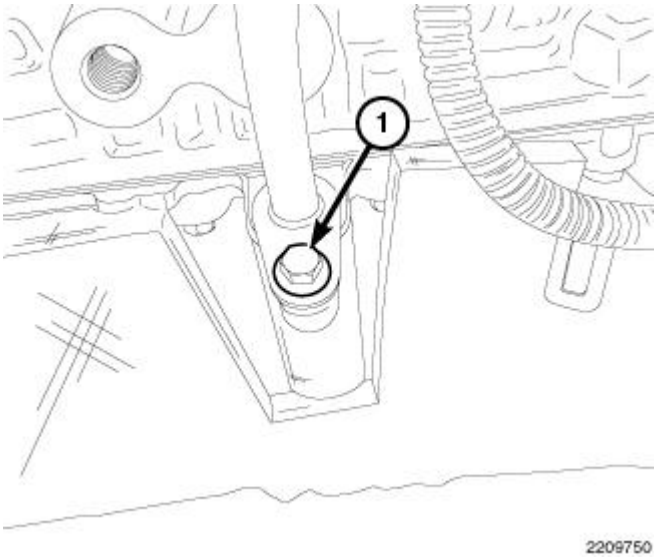

Fig. 7: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

11. Remove lower bolt (1) from the oil indicator tube.

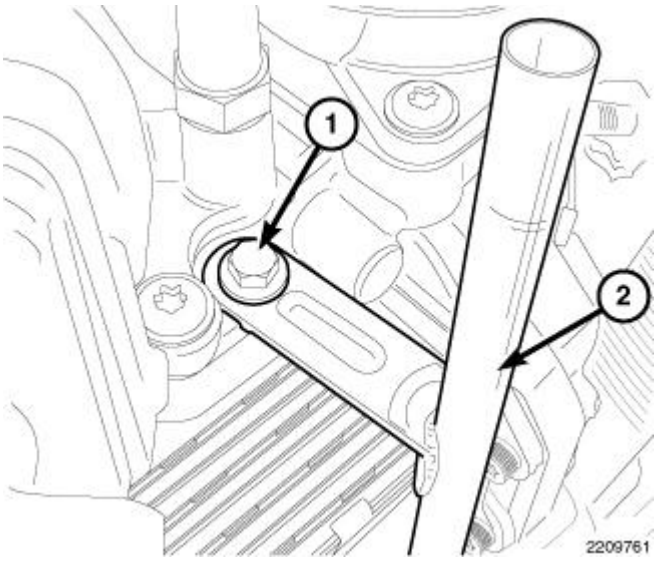

Fig. 8: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

12. Remove upper bolt (1) and the oil level indicator tube.

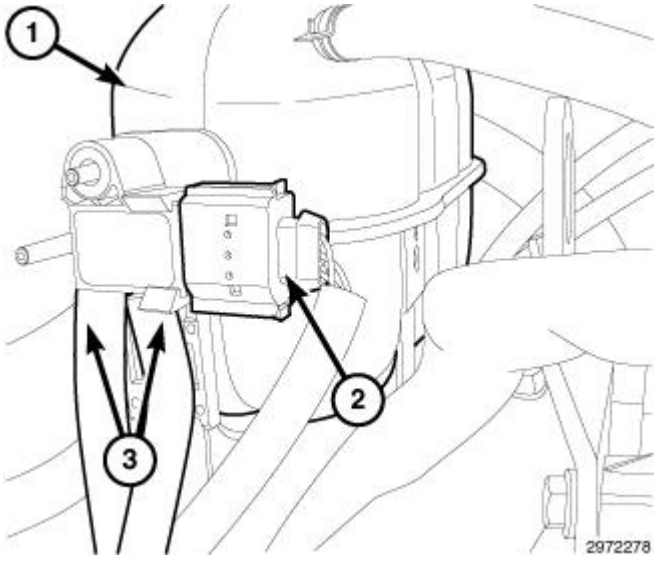

Fig. 9: Differential Pressure Sensor Hoses & Harness Connector
Courtesy of CHRYSLER LLC

13. Disconnect the brake booster vacuum hose.
14. Disconnect the two Differential Pressure Sensor (DPS) hoses (3).
15. Disconnect the DPS harness connector (2).

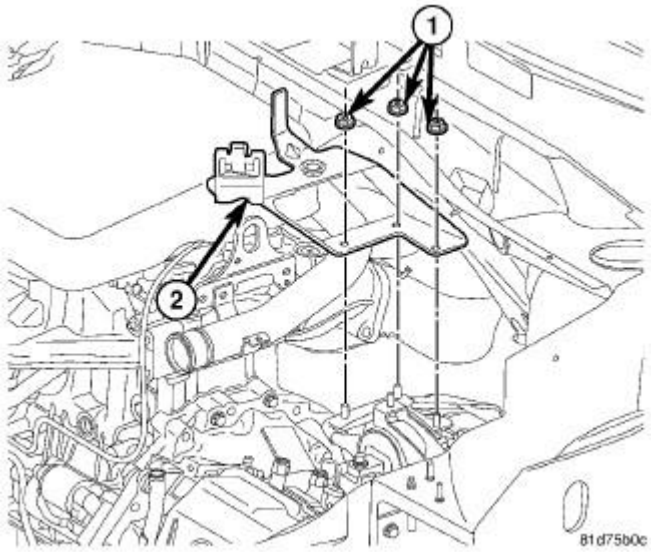

Fig. 10: Coolant Overflow Bottle Bracket & Fasteners
Courtesy of CHRYSLER LLC

16. Remove the fasteners (1), and the coolant overflow bottle bracket.

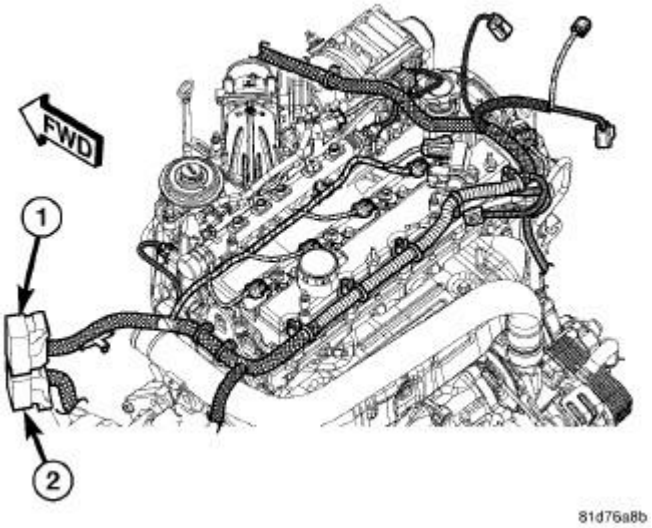

Fig. 11: Engine Harness Connectors
Courtesy of CHRYSLER LLC

17. Disconnect engine to body harness connectors.
18. Disconnect the engine harness connectors (1) and (2) from the ECM.

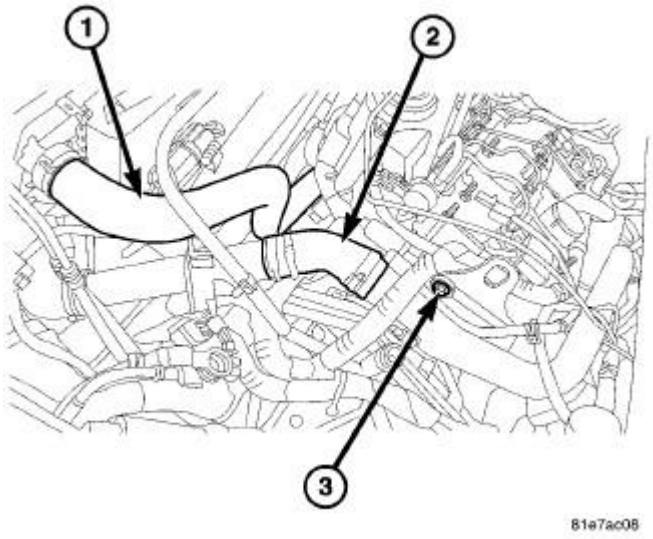

Fig. 12: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

19. Disconnect the A/C pressure transducer harness connector.
20. Disconnect the charge air cooler hoses (2).

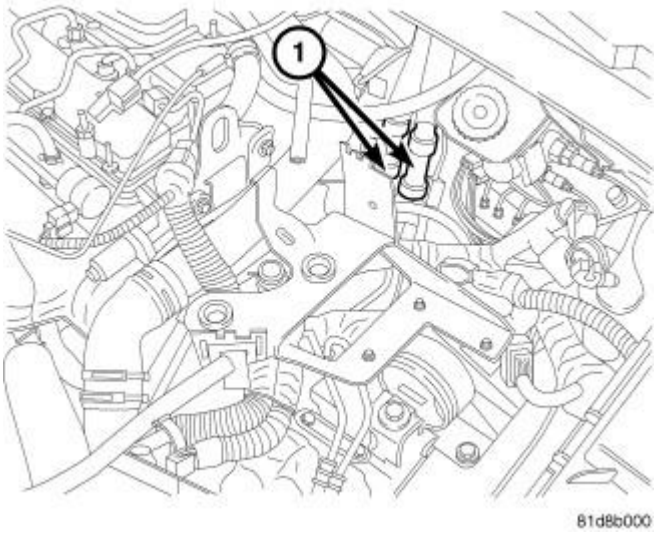

Fig. 13: Heater Core Coolant Hoses
Courtesy of CHRYSLER LLC

21. Disconnect the coolant hoses (1) from heater core.

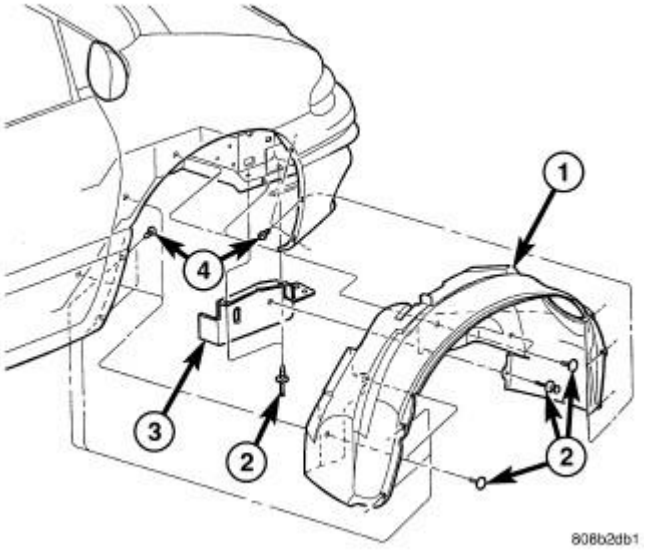

Fig. 14: Left & Right Front Inner Fender Well
Courtesy of CHRYSLER LLC

22. Remove the front tires. Refer to **Tires and Wheels - Removal** .
23. Remove the left and right front inner fender well (1). Refer to **Body/Exterior/SHIELD, Splash - Removal** .

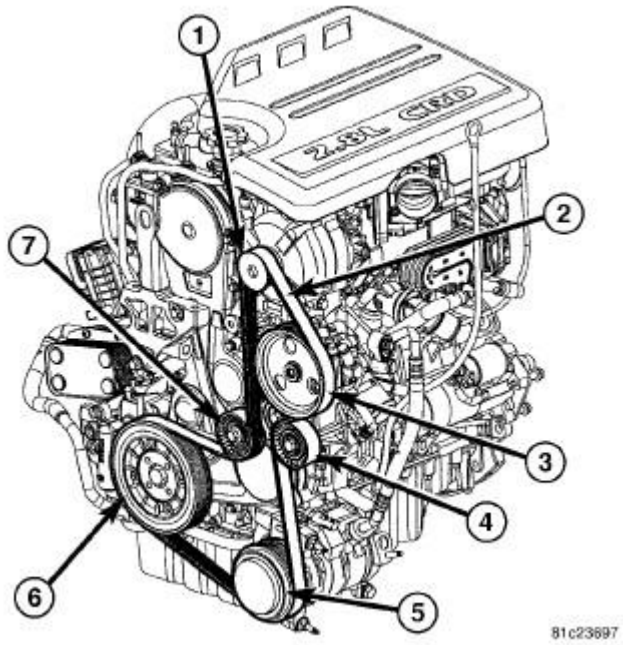

Fig. 15: Accessory Drive Belt Routing - 2.8L Diesel
Courtesy of CHRYSLER LLC

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

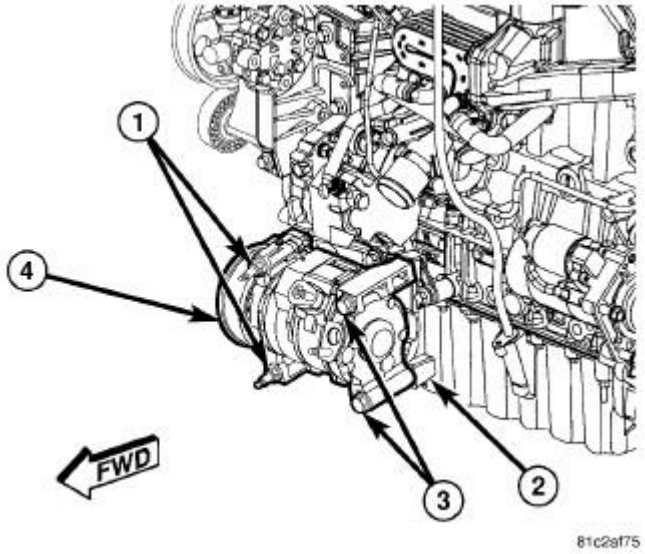

Fig. 16: A/C Compressor To Mount
Courtesy of CHRYSLER LLC

25. Remove the A/C compressor. Refer to **Heating and Air Conditioning/Plumbing/COMPRESSOR, A/C - Removal** .
26. Remove the ground cable at transmission.

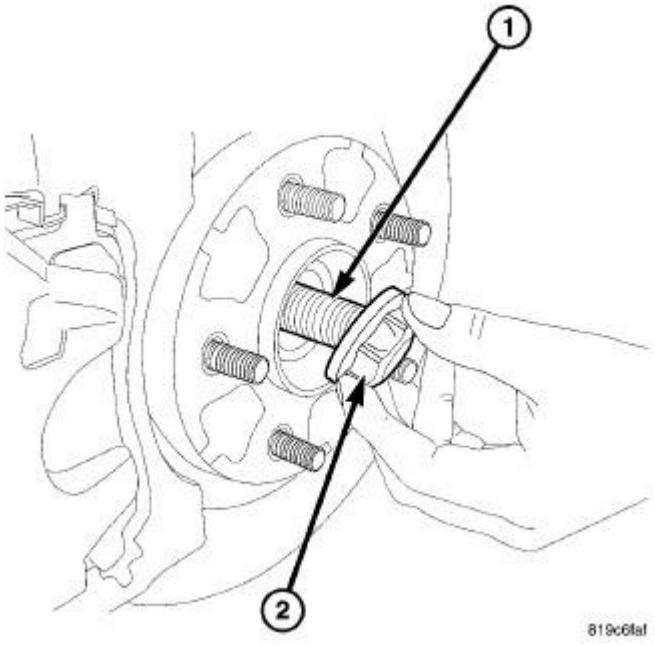

Fig. 17: Removing/Installing Halfshaft Nut
Courtesy of CHRYSLER LLC

27. Remove the right and left driveline half shafts. Refer to **Differential and Driveline/Half Shaft -**

Removal .

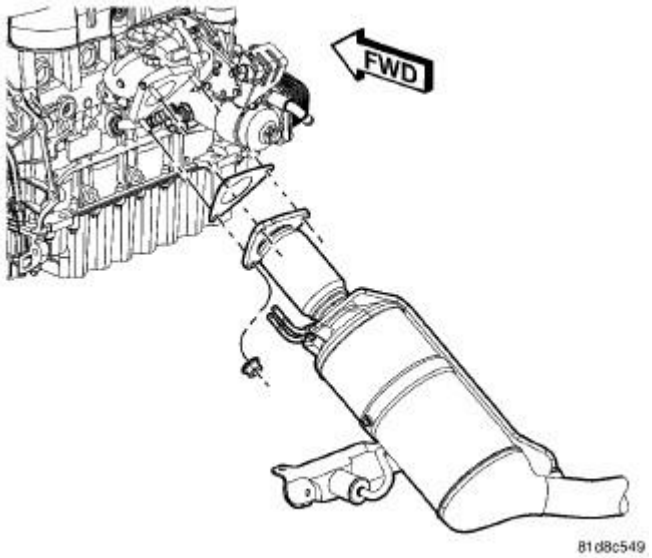

Fig. 18: Diesel Oxidation Catalyst (DOC)/Diesel Particulate Filter (DPF)
Courtesy of CHRYSLER LLC

28. Remove the Diesel Particulate Filter (DPF). Refer to **Exhaust System/FILTER, Diesel Particulate - Removal** .

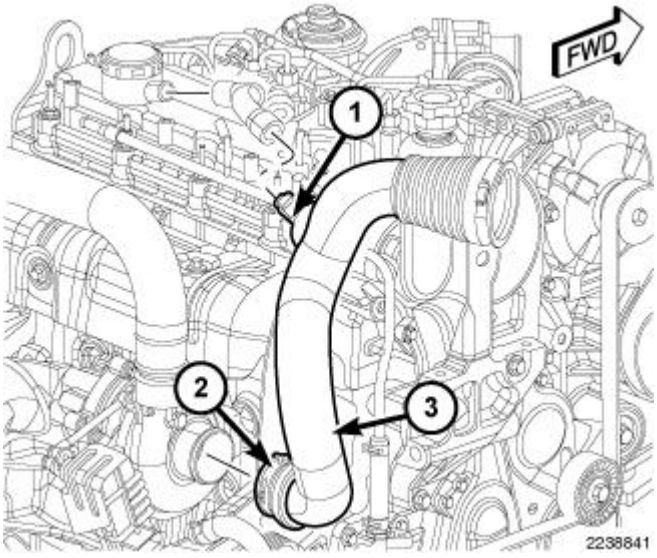

Fig. 19: Crankcase Vent Hose Heater Electrical Connector & Turbocharger Inlet Tube
Courtesy of CHRYSLER LLC

29. Disconnect the crankcase vent hose heater harness connector (1).
30. Loosen clamp (2) and remove the turbocharger inlet tube (3) from turbocharger.

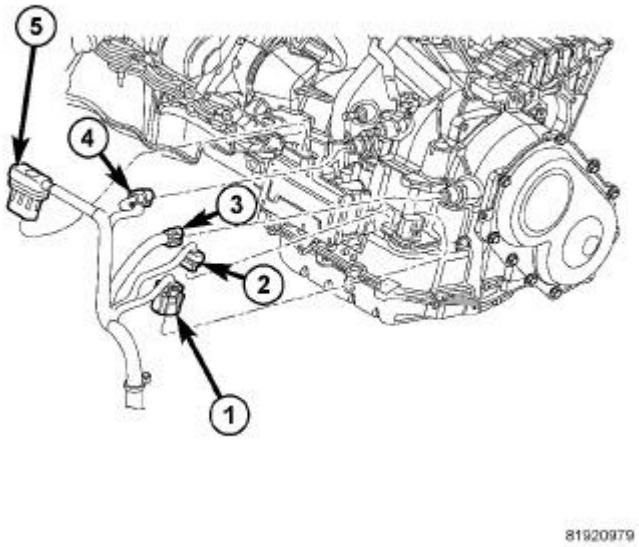

Fig. 20: Identifying Transmission Electrical Connectors
Courtesy of CHRYSLER LLC

31. Disconnect the transmission harness connectors (1 - 5).

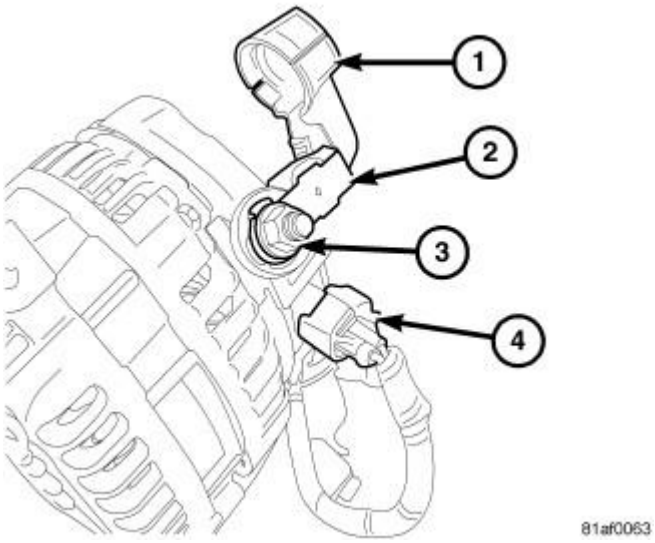

Fig. 21: Alternator Electrical Connection
Courtesy of CHRYSLER LLC

32. Remove the generator. Refer to **Electrical/Charging/GENERATOR - Removal** .

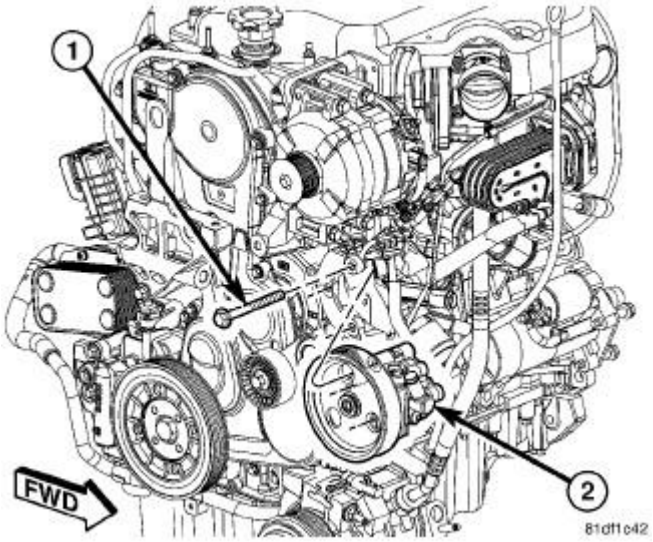

Fig. 22: Power Steering Pump & Bolts
Courtesy of CHRYSLER LLC

33. Remove the power steering pump (2). Refer to **Steering/Pump - Removal** .

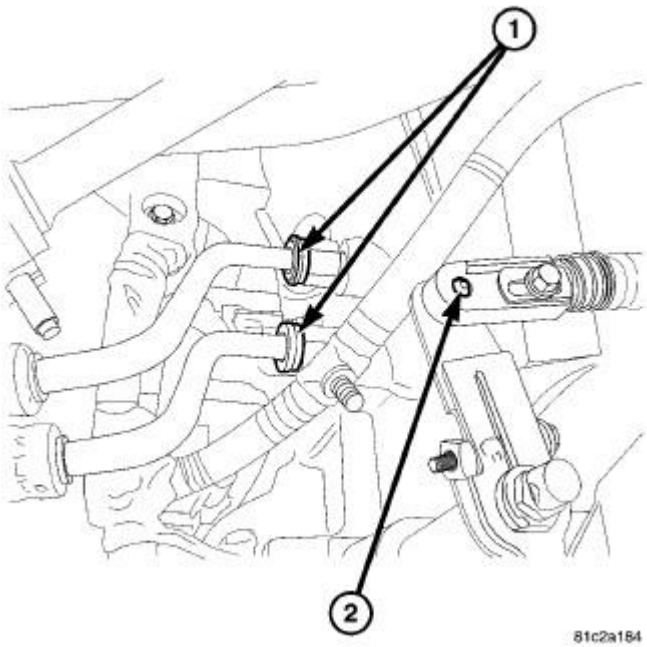

Fig. 23: Identifying Oil Cooler Lines
Courtesy of CHRYSLER LLC

34. Disconnect the transmission shift cable (2) at the transmission.
35. Disconnect the transmission cooler lines (1).

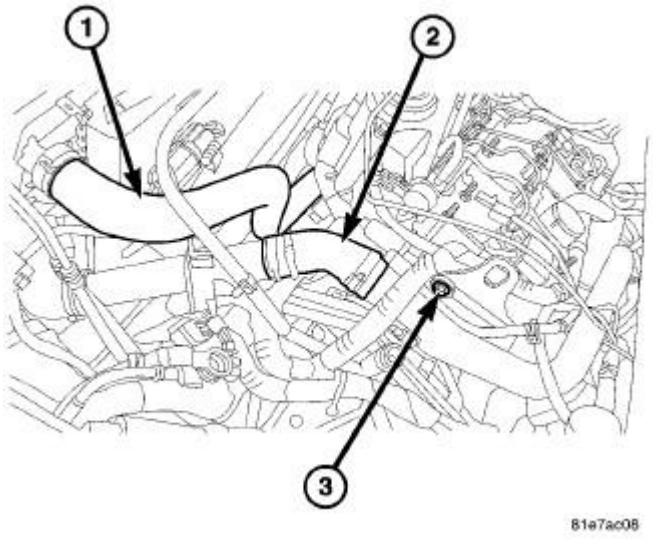

Fig. 24: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

36. Remove the upper radiator hose (1).
37. Remove the exhaust manifold and turbocharger assembly. See **Engine/Manifolds/MANIFOLD, Exhaust - Removal**.

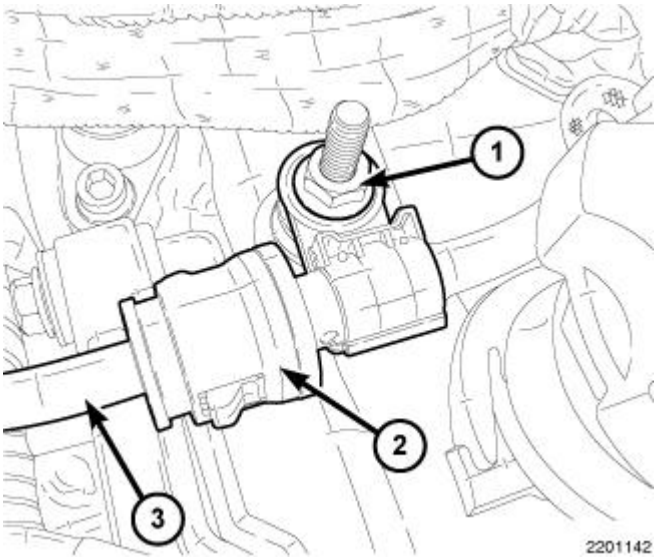

Fig. 25: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

38. Remove the retaining nut (1) and disconnect the fuel injector return line (2).

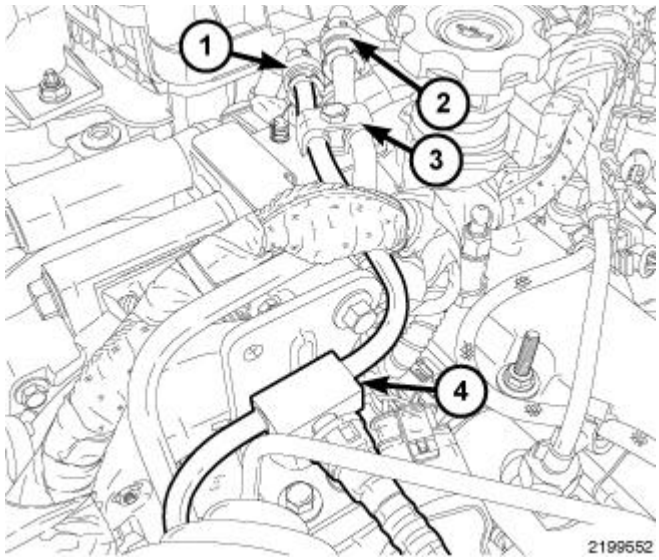

Fig. 26: Fuel Return Line Block
Courtesy of CHRYSLER LLC

39. Disconnect the fuel return line (1).
40. Disconnect the fuel feed line (2).
41. Remove the fuel line mounting bracket (3).
42. Remove the fuel return line block (4).

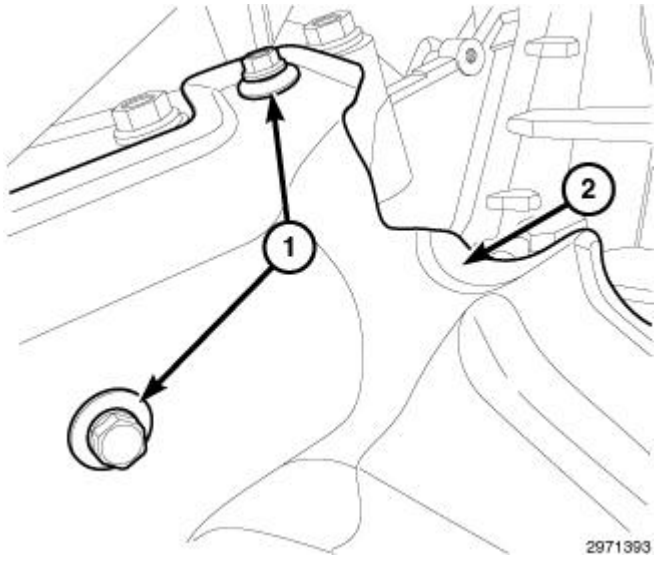

Fig. 27: Rear Mount Heat Shield & Bolt
Courtesy of CHRYSLER LLC

43. Remove bolts (1) and the rear mount heat shield (2).

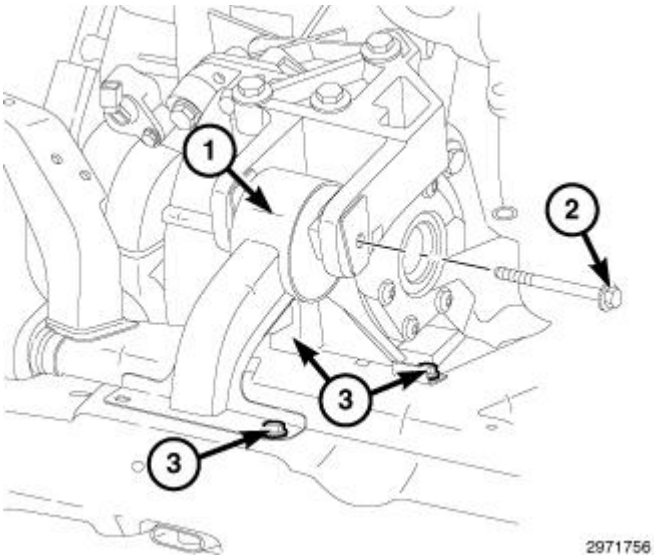

Fig. 28: Rear Mount Through Bolt
Courtesy of CHRYSLER LLC

44. Remove the rear mount through bolt (2).

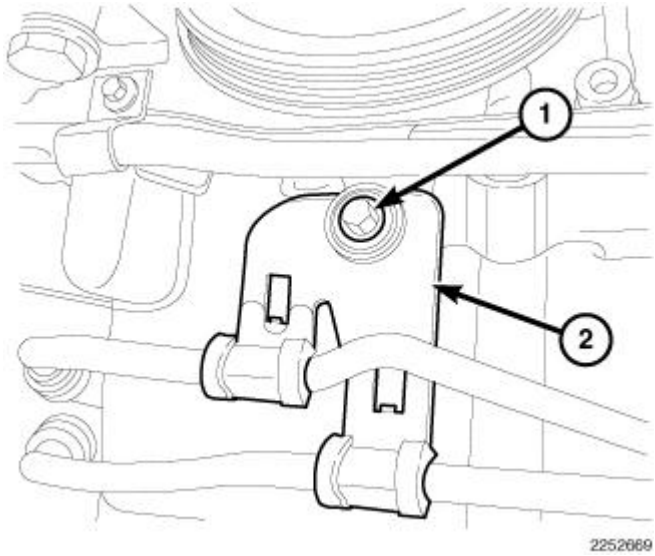

Fig. 29: Retaining Bolt Securing Power Steering Lines
Courtesy of CHRYSLER LLC

45. Remove the bolt (1) securing the power steering lines.

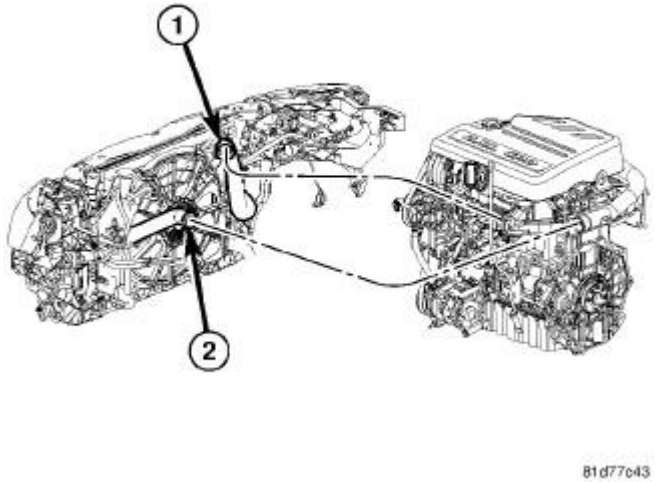

Fig. 30: Charge Air Cooler Outlet Tube
Courtesy of CHRYSLER LLC

46. Remove the lower radiator hose.
47. Remove the charge air cooler outlet tube (2).

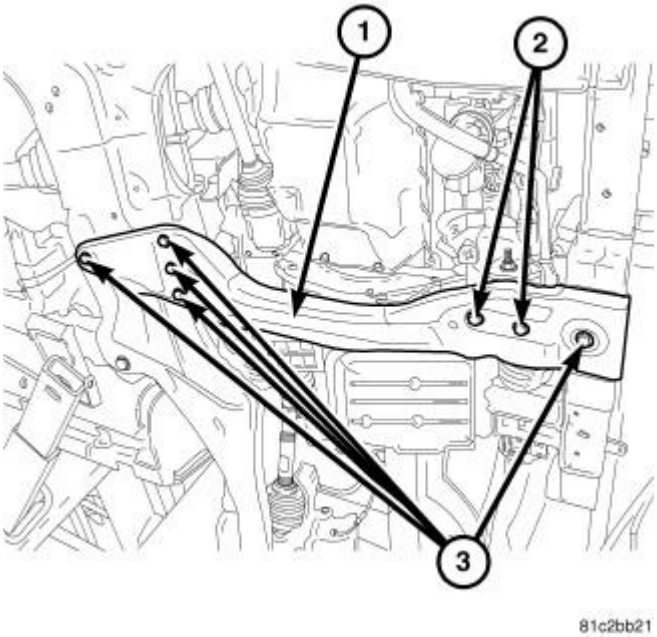

Fig. 31: Front Fore-Aft Crossmember
Courtesy of CHRYSLER LLC

48. Remove the front fore-aft crossmember (1). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Removal** .

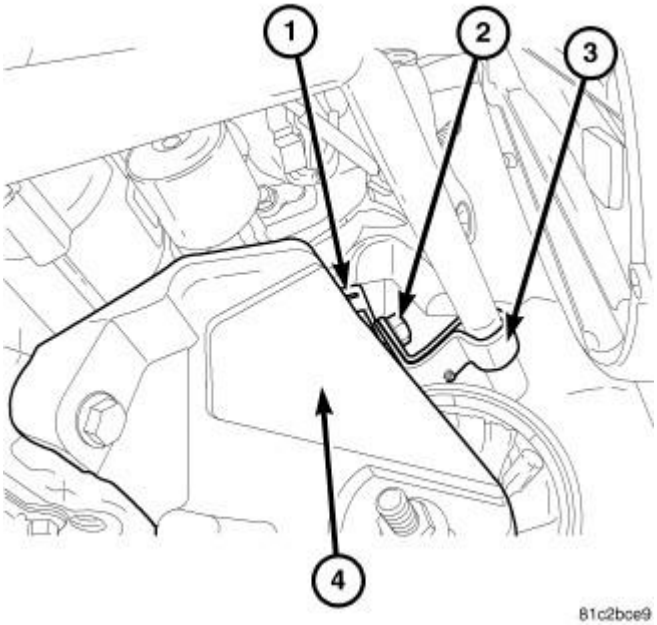

Fig. 32: Identifying Heater Tube & Ground Cable Bolt At Front Mount
Courtesy of CHRYSLER LLC

49. Remove the bolt (2) holding the ground cable (1) and the heater tube bracket (3) to the front mount (4).

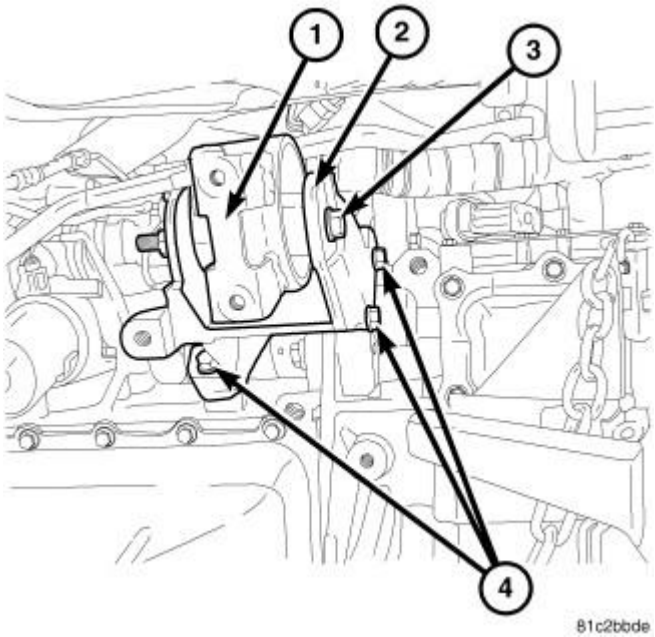

Fig. 33: Identifying Front Mount Bolts
Courtesy of CHRYSLER LLC

50. Remove the bolts (4) at the front mount bracket (2).

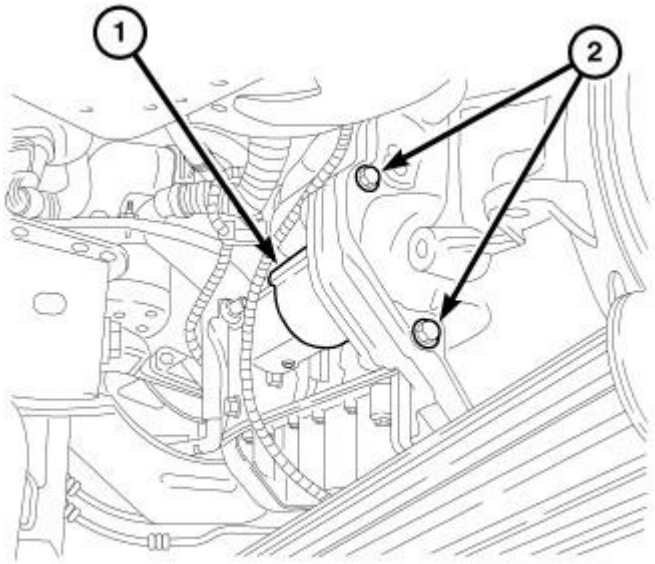

Fig. 34: STARTER MOUNTING 2.8L DIESEL
Courtesy of CHRYSLER LLC

51. Remove the starter (1). Refer to **Electrical/Starting/STARTER - Removal** .

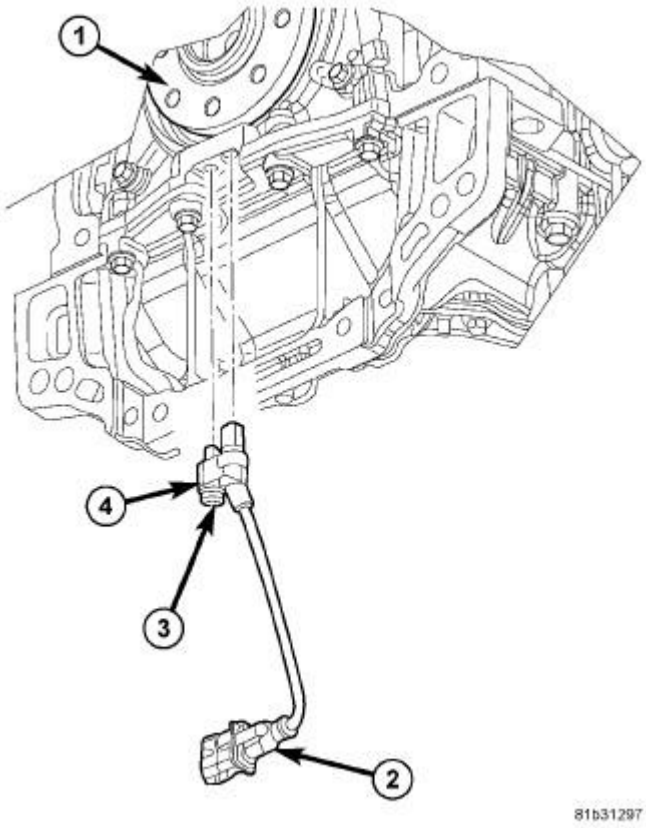

Fig. 35: Crankshaft Position Sensor
Courtesy of CHRYSLER LLC

52. Remove the Crankshaft Position Sensor (CKP). Refer to **Fuel System/Fuel Injection/SENSOR, Crankshaft Position - Removal** .

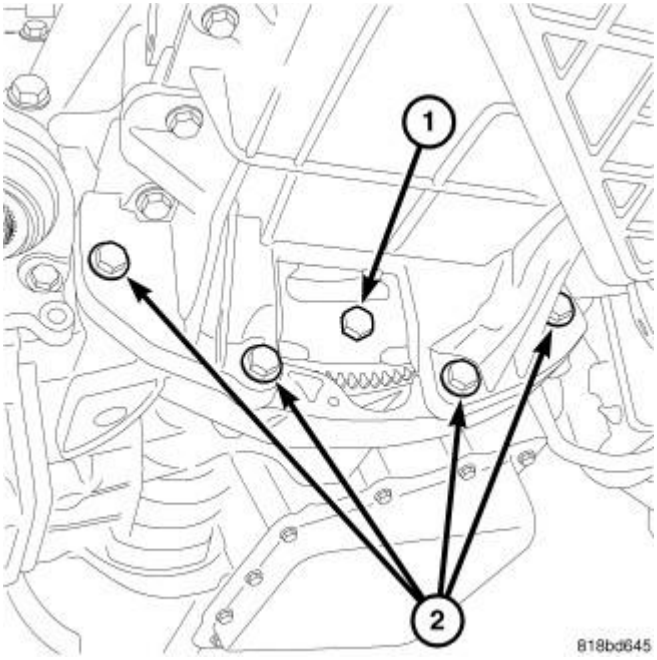

Fig. 36: Torque Converter Bolts
Courtesy of CHRYSLER LLC

53. Remove the flex plate-to-torque converter bolts (1).
54. Drain the engine oil.
55. Using a new copper sealing washer, tighten oil drain plug to 54 N.m (40 ft. lbs.).
56. Remove the four oil pan to transaxle bolts (2).
57. Position engine cradle under engine and lower vehicle over cradle.

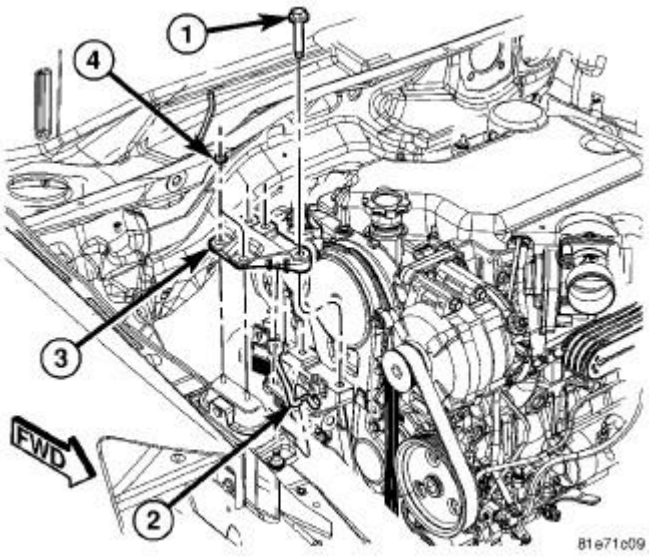

Fig. 37: Right Front Engine Mount Bracket
Courtesy of CHRYSLER LLC

58. Remove ground strap (2).
59. Remove fasteners (1) and (4) and the engine mount bracket (3).

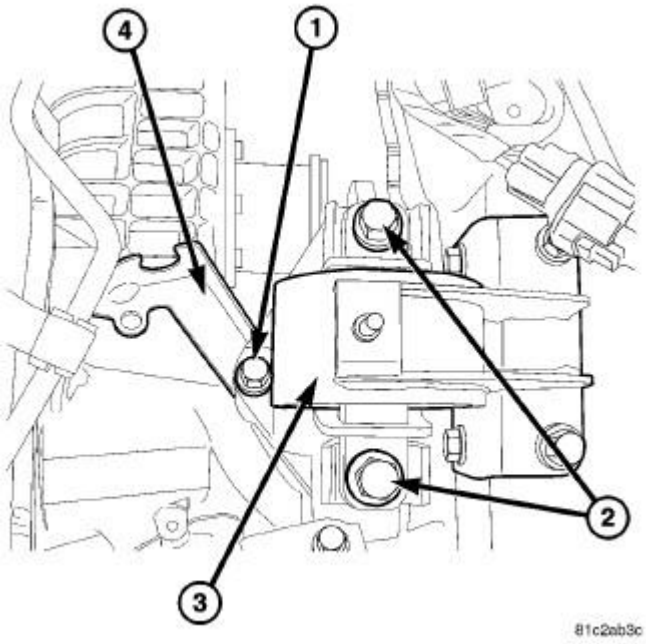

Fig. 38: Identifying Left Mount Bolts
Courtesy of CHRYSLER LLC

60. Remove the bolt from the right engine mount.
61. Carefully raise vehicle, leaving engine and transmission on engine cradle.
62. Lift engine from engine cradle and disassemble as necessary.

INSTALLATION

INSTALLATION - ENGINE

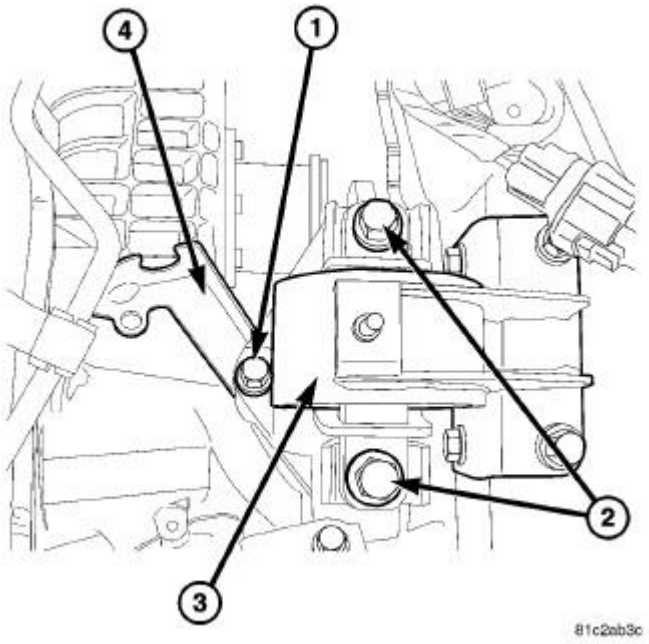

Fig. 39: Identifying Left Mount Bolts
Courtesy of CHRYSLER LLC

1. Position engine and transmission assembly under vehicle. Slowly lower the vehicle down over the engine and transmission. It is necessary to move the engine/transmission assembly with the dolly for clearance around body flanges.
2. Align engine and transmission mounts to attaching points.
3. Align the transmission mount with the left transmission mount bracket, and install the trans mount-to-trans bracket bolts (1). Tighten bolts to 95 N.m (70 ft. lbs.).

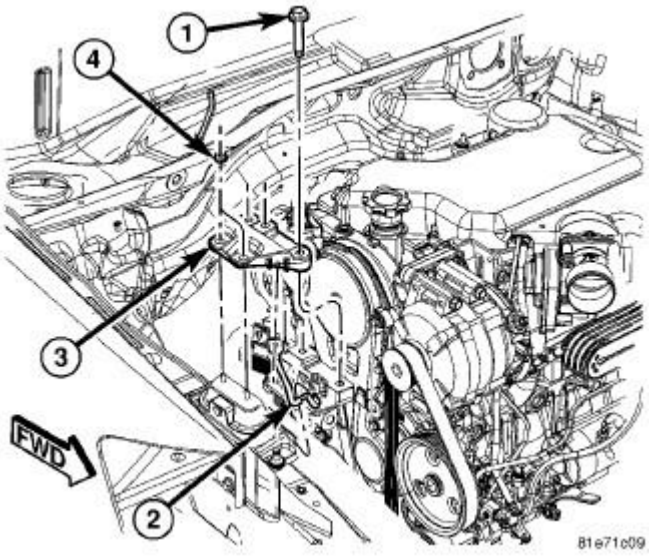

Fig. 40: Right Front Engine Mount Bracket

Courtesy of CHRYSLER LLC

4. Install the engine mount bracket (3).
    - Tighten the bolts (4) to 61 N.m (44 ft. lbs.).
    - Tighten the nuts (1) to 20 N.m (177 in. lbs.).
5. Install the ground strap (2).

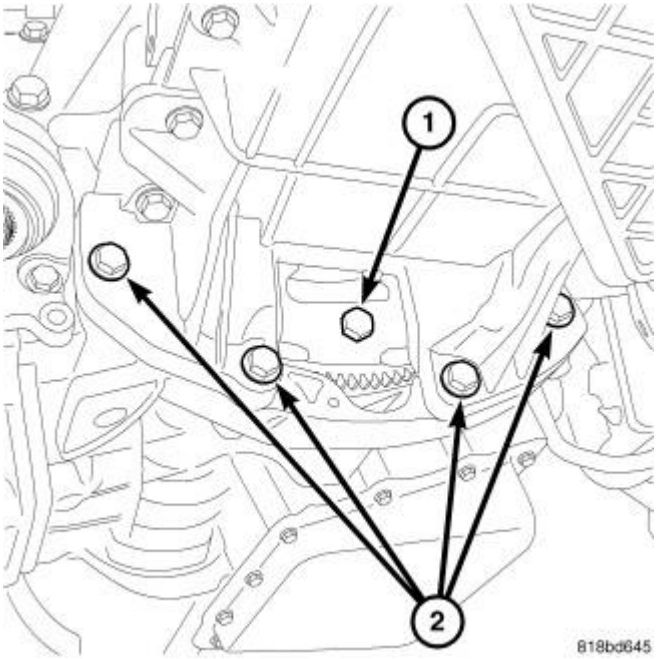

Fig. 41: Torque Converter Bolts
Courtesy of CHRYSLER LLC

6. Raise the vehicle and remove the engine cradle.
7. Install the oil pan to transaxle bolts (2) and tighten to 60 N.m (44 ft. lbs.).
8. Install flex plate- to-torque converter bolts (1) and tighten to 88 N.m (65 ft. lbs.).

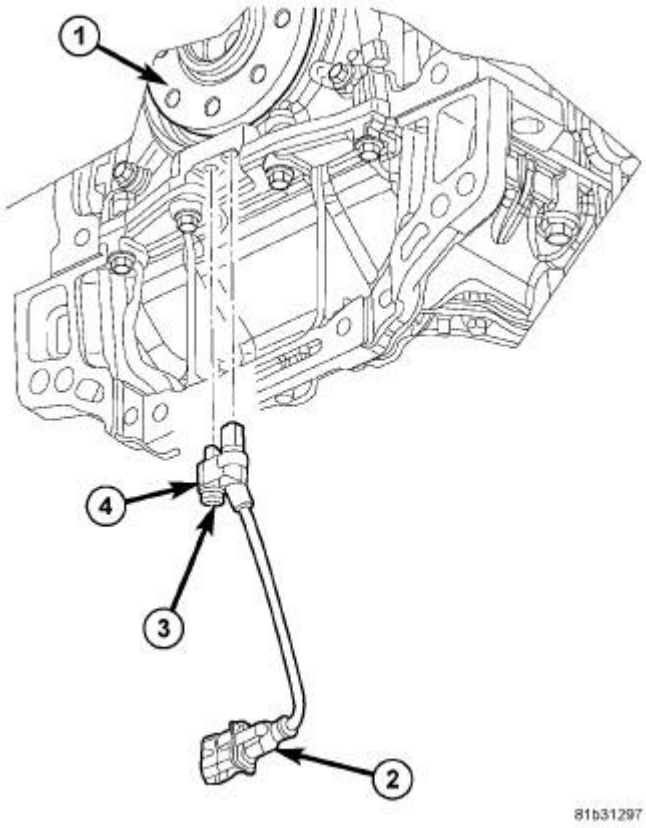

Fig. 42: Crankshaft Position Sensor
Courtesy of CHRYSLER LLC

9. Install the Crankshaft Position Sensor (CKP). Refer to **Fuel System/Fuel Injection/SENSOR, Crankshaft Position - Installation** .

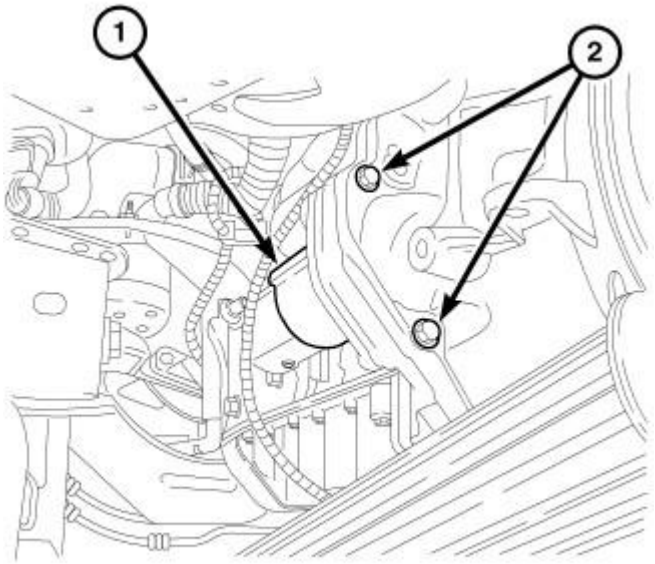

Fig. 43: STARTER MOUNTING 2.8L DIESEL
Courtesy of CHRYSLER LLC

10. Install the starter (1). Refer to **Electrical/Starting/STARTER - Installation** .

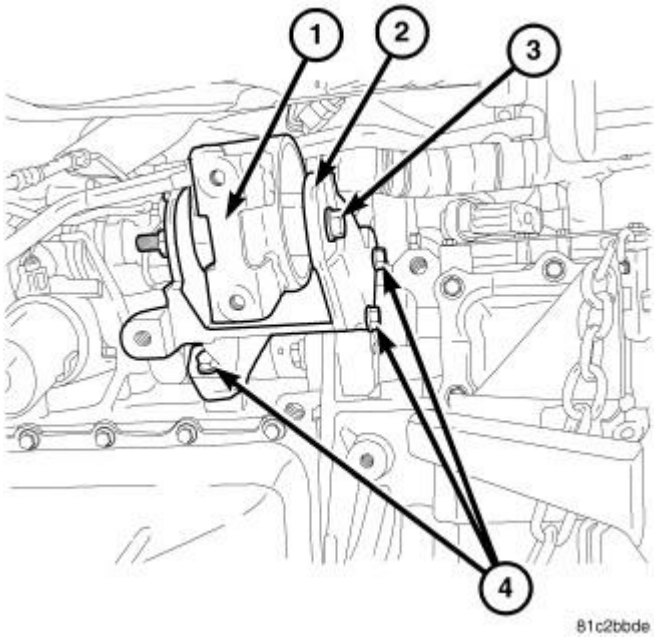

Fig. 44: Identifying Front Mount Bolts
Courtesy of CHRYSLER LLC

11. Install the front mount bracket (2). Tighten bolts to 95 N.m (70 ft. lbs.).

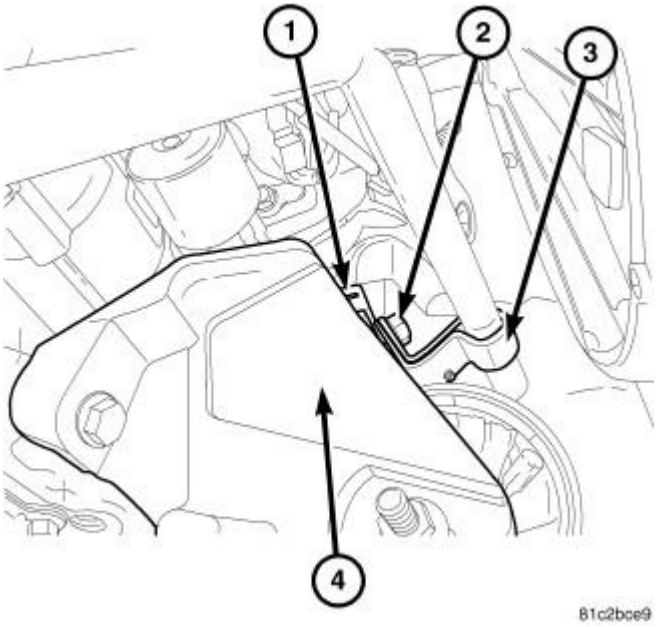

Fig. 45: Identifying Heater Tube & Ground Cable Bolt At Front Mount
Courtesy of CHRYSLER LLC

12. Install the bolt (2) holding the ground cable (1) and the heater tube bracket (3) to the front mount (4).

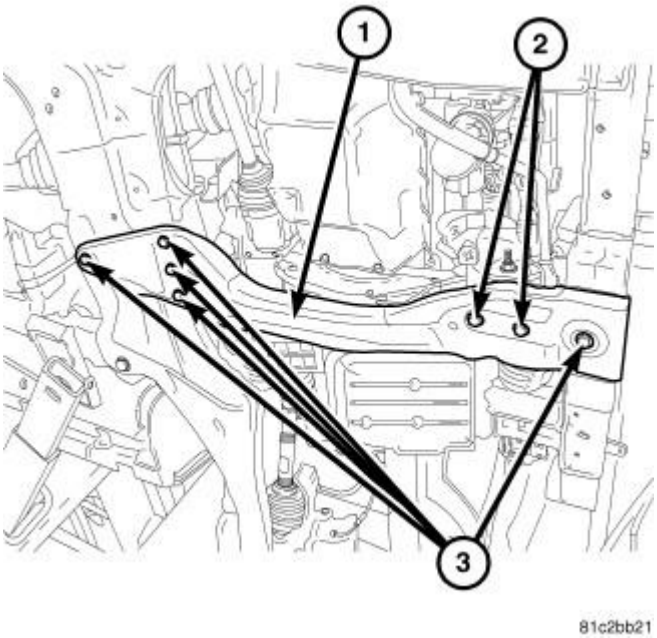

Fig. 46: Front Fore-Aft Crossmember
Courtesy of CHRYSLER LLC

13. Install the front fore-aft crossmember (1). Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Installation** .

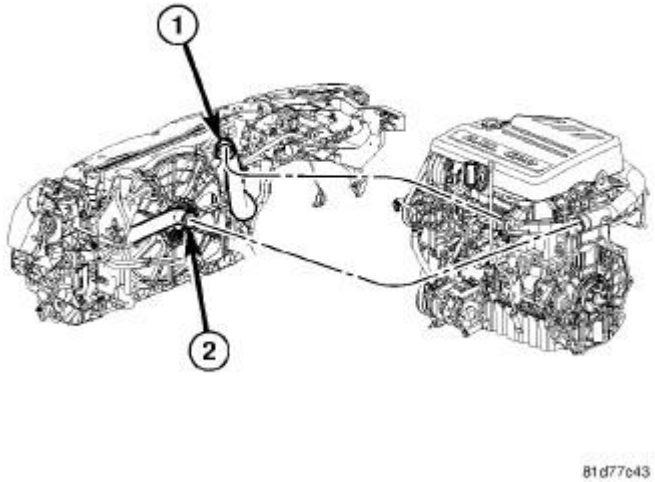

Fig. 47: Charge Air Cooler Outlet Tube
Courtesy of CHRYSLER LLC

14. Install the charge air cooler outlet tube (2).
15. Install the lower radiator hose.

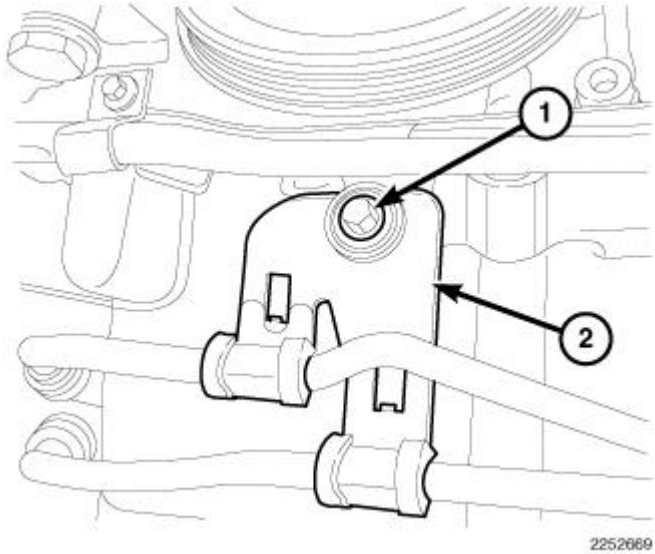

Fig. 48: Retaining Bolt Securing Power Steering Lines
Courtesy of CHRYSLER LLC

16. Install the retaining bolt (1) securing the power steering lines. Tighten to 15 N.m (133 in. lbs.).

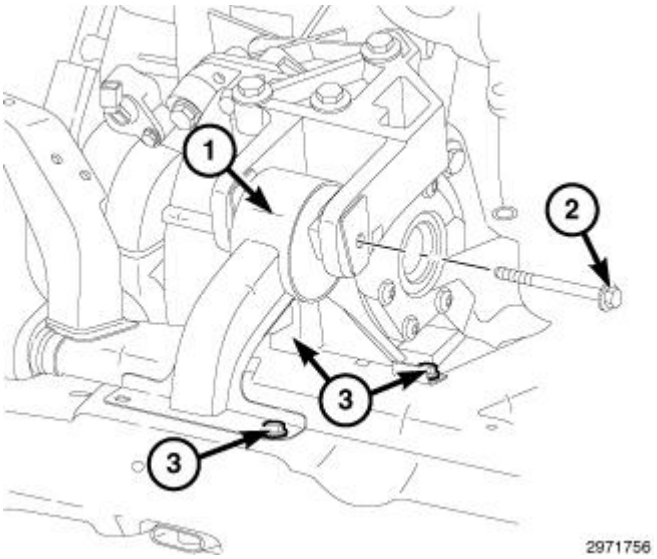

Fig. 49: Rear Mount Through Bolt
Courtesy of CHRYSLER LLC

17. Install the rear mount through bolt and tighten to 61 N.m (45 ft. lbs.).

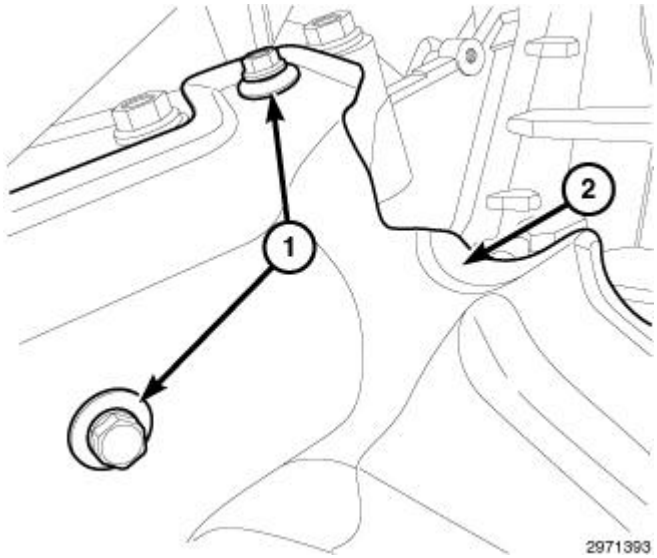

Fig. 50: Rear Mount Heat Shield & Bolt
Courtesy of CHRYSLER LLC

18. Install the rear mount heat shield (2). Tighten bolts (1) to 14 N.m (124 in. lbs.).

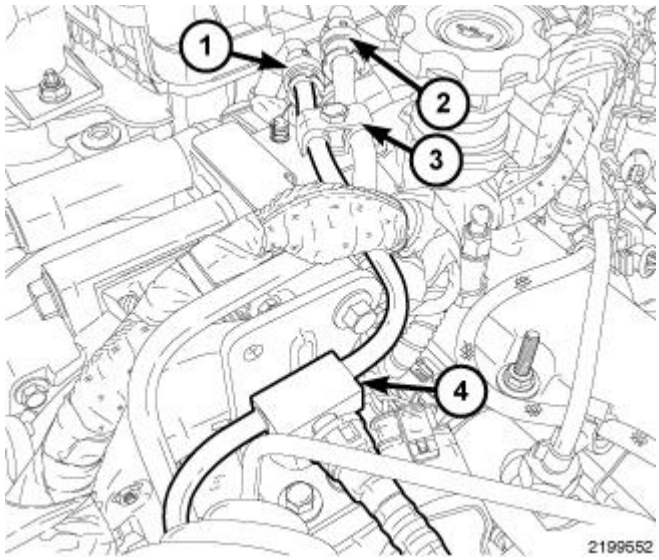

Fig. 51: Fuel Return Line Block
Courtesy of CHRYSLER LLC

19. Install the fuel return line block (4).
20. Install the fuel line mounting bracket (3).
21. Connect the fuel feed line (2).
22. Connect the fuel return line (1).

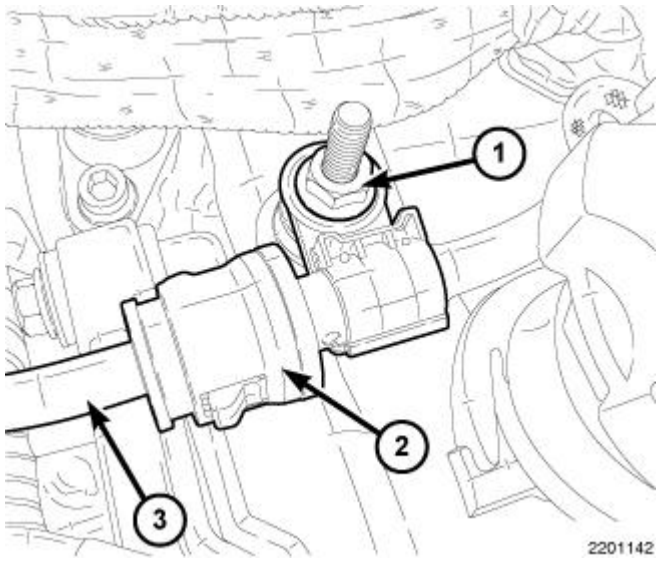

Fig. 52: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

23. Connect the fuel injector return line (2) and securely tighten the retaining nut (1).

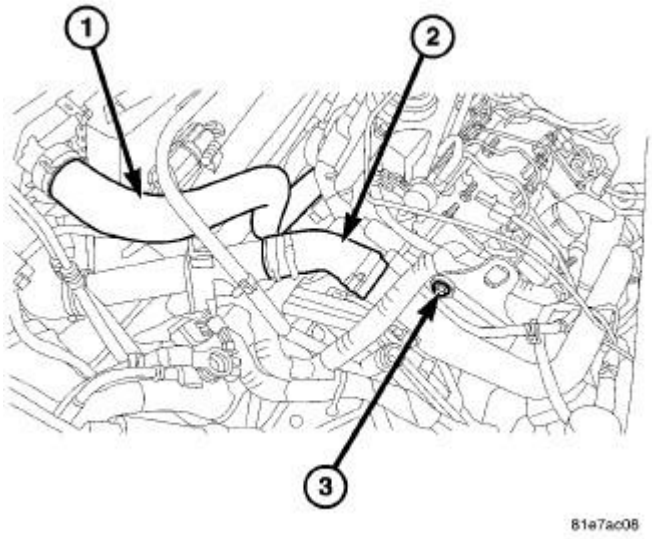

Fig. 53: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

24. Install the exhaust manifold and turbocharger assembly. See **Engine/Manifolds/MANIFOLD, Exhaust - Installation**.
25. Install the upper radiator hose (1).

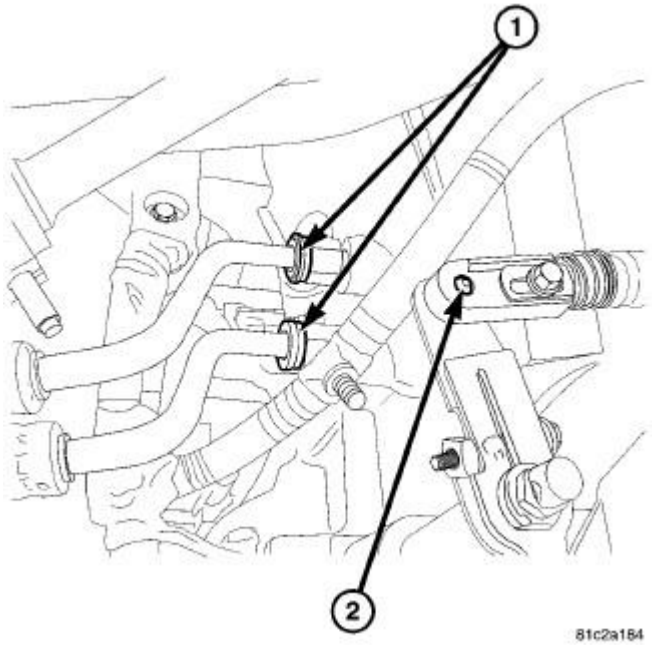

Fig. 54: Identifying Oil Cooler Lines
Courtesy of CHRYSLER LLC

26. Connect the transmission shift cable (2) at the transmission.

27. Connect the transmission lines (1).

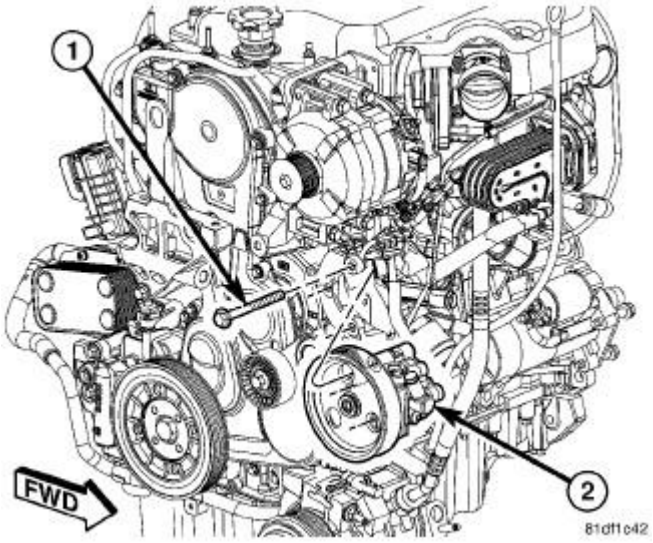

Fig. 55: Power Steering Pump & Bolts
Courtesy of CHRYSLER LLC

28. Install the power steering pump (2). Refer to **Steering/Pump - Installation** .

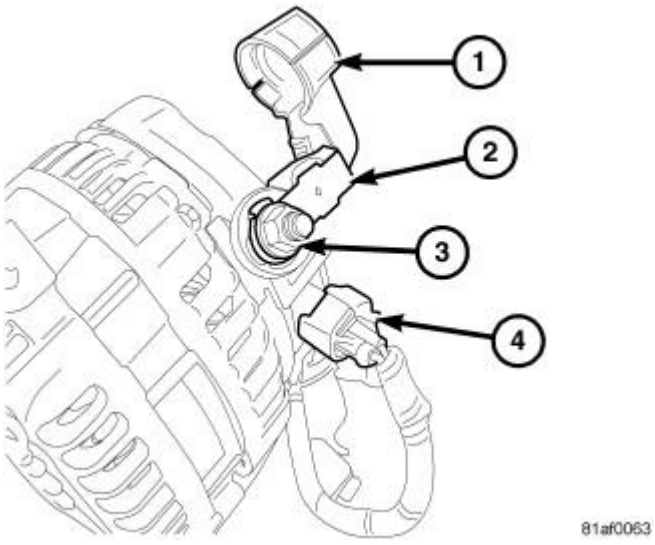

Fig. 56: Alternator Electrical Connection
Courtesy of CHRYSLER LLC

29. Install the generator. Refer to **Electrical/Charging/GENERATOR - Installation** .

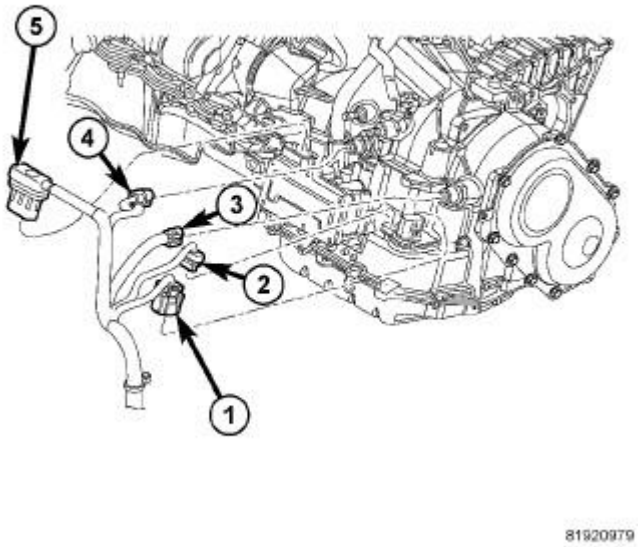

Fig. 57: Identifying Transmission Electrical Connectors
Courtesy of CHRYSLER LLC

30. Connect the transmission harness connectors (1 - 5).

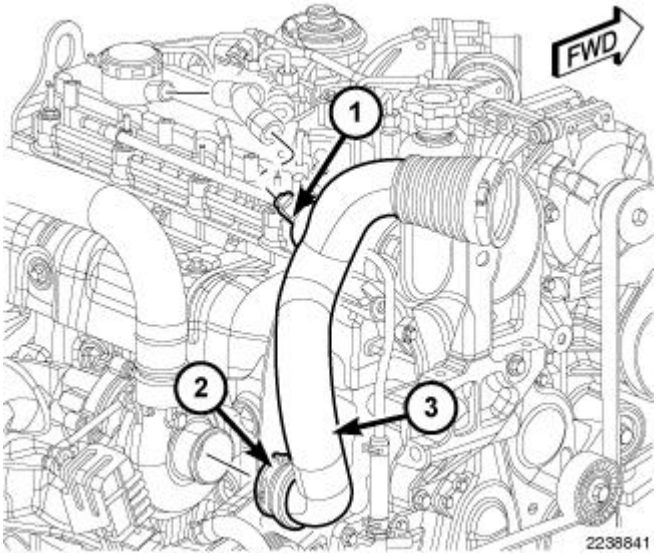

Fig. 58: Crankcase Vent Hose Heater Electrical Connector & Turbocharger Inlet Tube
Courtesy of CHRYSLER LLC

31. Install the turbocharger inlet tube (3) to turbocharger and securely tighten clamp (2).
32. Connect the crankcase vent hose heater harness connector (1).

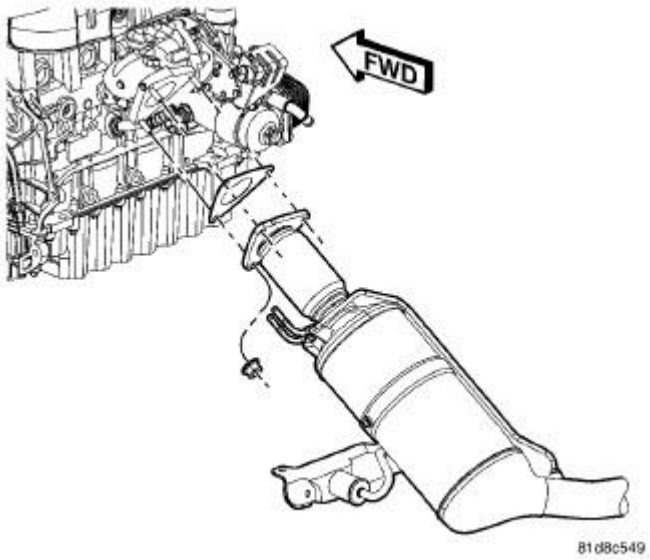

Fig. 59: Diesel Oxidation Catalyst (DOC)/Diesel Particulate Filter (DPF)
Courtesy of CHRYSLER LLC

33. Install the Diesel Particulate Filter (DPF). Refer to **Exhaust System/FILTER, Diesel Particulate - Installation** .

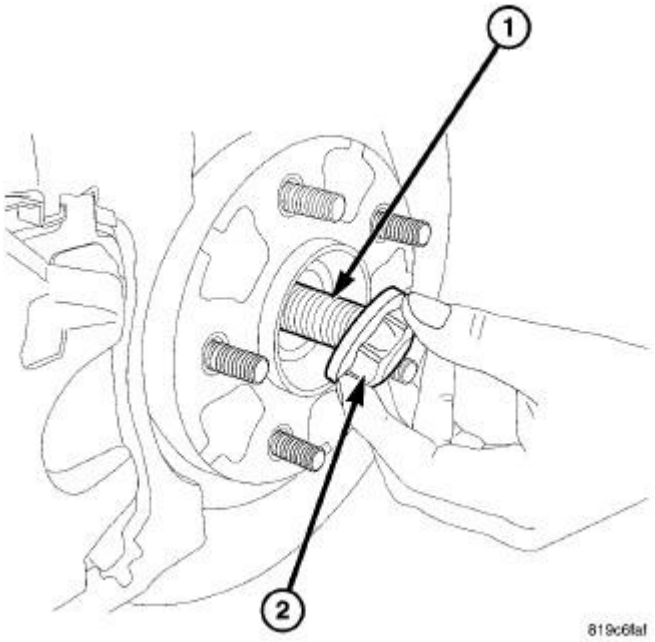

Fig. 60: Removing/Installing Halfshaft Nut
Courtesy of CHRYSLER LLC

34. Install the right and left driveline half shafts. Refer to **Differential and Driveline/Half Shaft - Installation** .

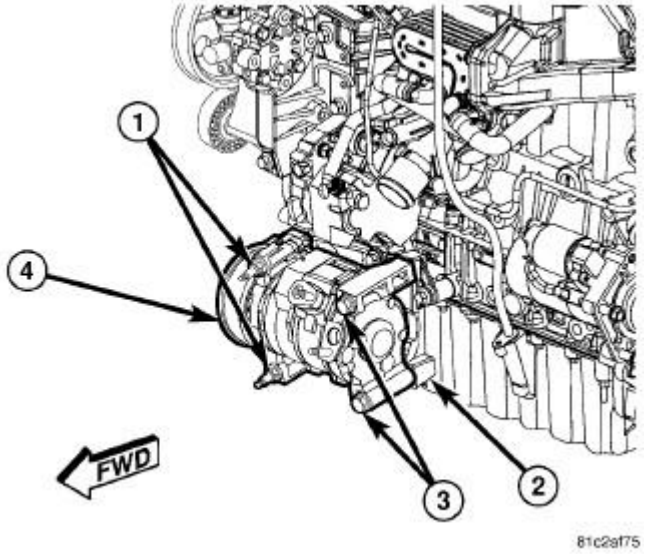

Fig. 61: A/C Compressor To Mount
Courtesy of CHRYSLER LLC

35. Install the ground cable at transmission. Tighten bolt to 54 N.m (40 ft. lbs.).
36. Install the A/C compressor. Refer to **Heating and Air Conditioning/Plumbing/COMPRESSOR, A/C - Installation** .

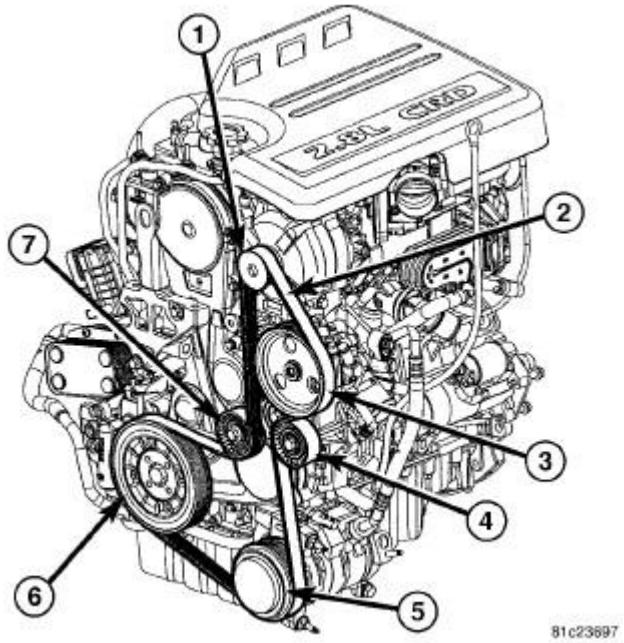

Fig. 62: Accessory Drive Belt Routing - 2.8L Diesel
Courtesy of CHRYSLER LLC

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

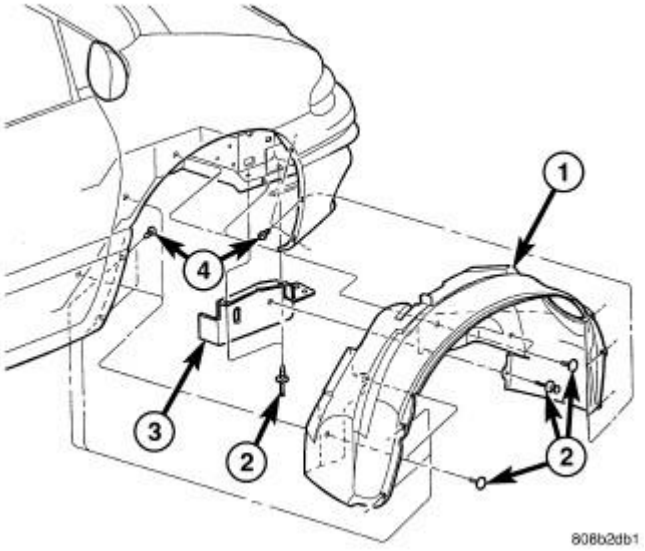

Fig. 63: Left & Right Front Inner Fender Well
Courtesy of CHRYSLER LLC

38. Install the right and left front inner fender well (1). Refer to **Body/Exterior/SHIELD, Splash - Installation** .
39. Install the front tires. Refer to **Tires and Wheels - Installation** .

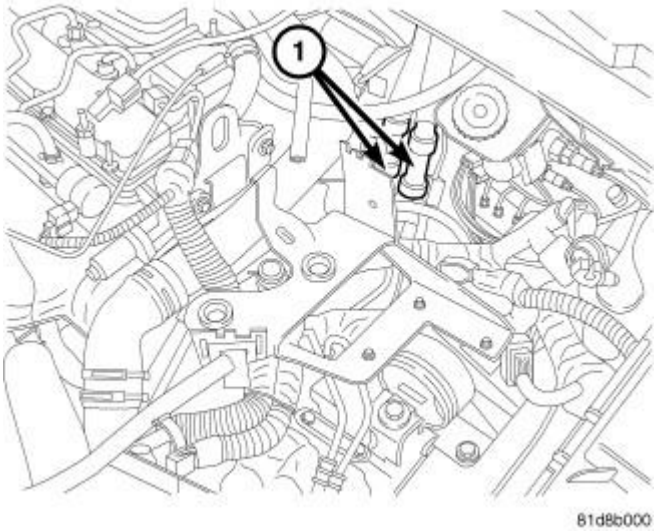

Fig. 64: Heater Core Coolant Hoses
Courtesy of CHRYSLER LLC

40. Connect the coolant hoses (1) to the heater core.

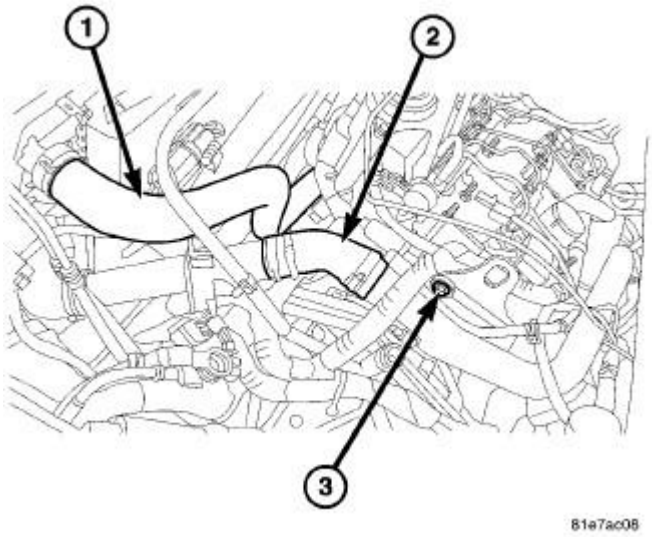

Fig. 65: Charge Air Cooler Hoses
Courtesy of CHRYSLER LLC

41. Connect the charge air cooler hoses (2).
42. Connect the A/C pressure transducer harness connector.

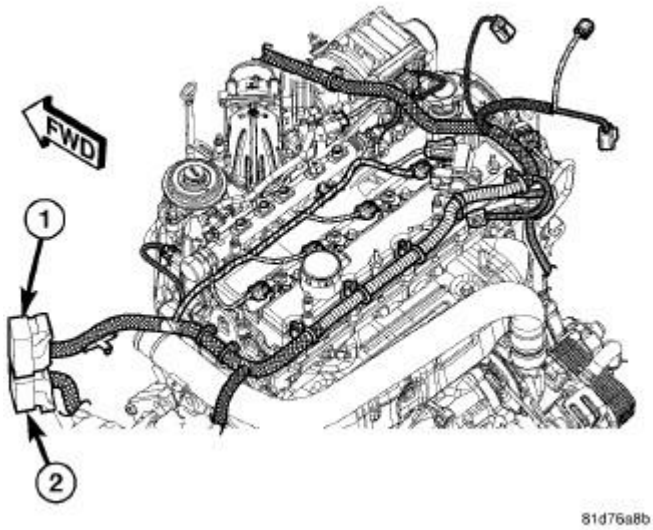

Fig. 66: Engine Harness Connectors
Courtesy of CHRYSLER LLC

43. Connect the engine harness connectors (1 and 2) to the ECM.
44. Connect engine to body harness connectors.

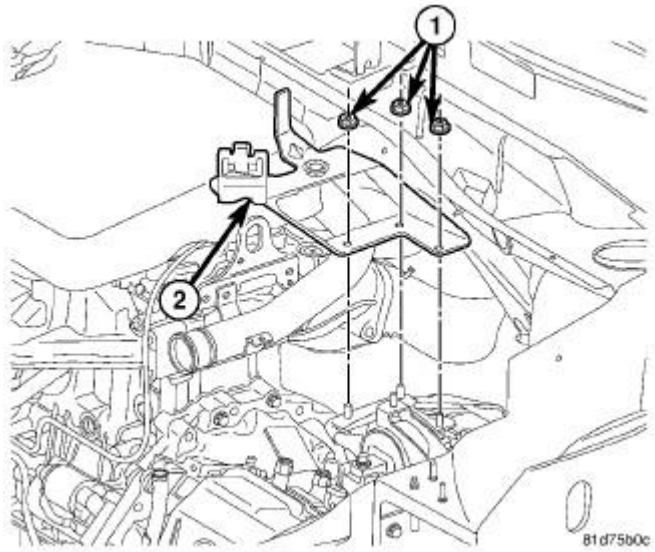

Fig. 67: Coolant Overflow Bottle Bracket & Fasteners
Courtesy of CHRYSLER LLC

45. Install the fasteners (1), and the coolant overflow bottle bracket.

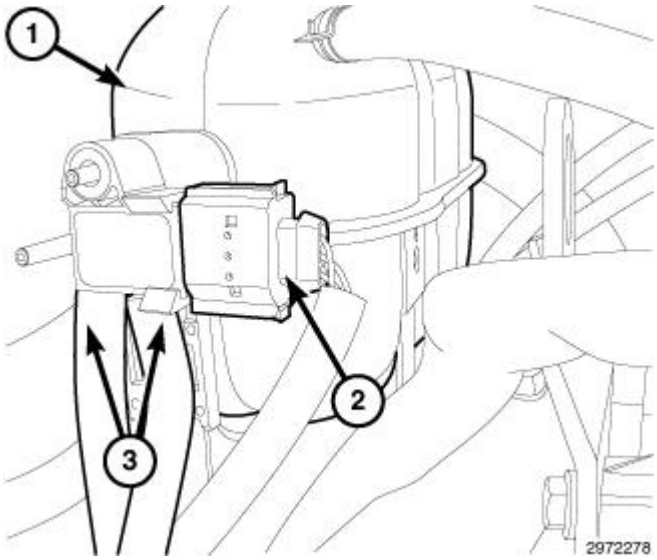

Fig. 68: Differential Pressure Sensor Hoses & Harness Connector
Courtesy of CHRYSLER LLC

46. Connect the Differential Pressure Sensor (DPS) harness connector (2).
47. Connect the two DPS hoses (3).
48. Connect the brake booster vacuum hose.

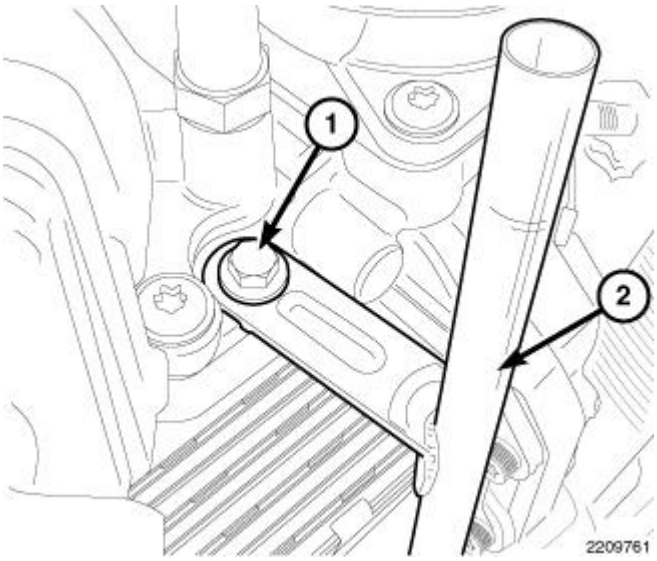

Fig. 69: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

49. Install the oil level indicator tube (2). Tighten upper bolt (1) to 11 N.m (97 in. lbs.).

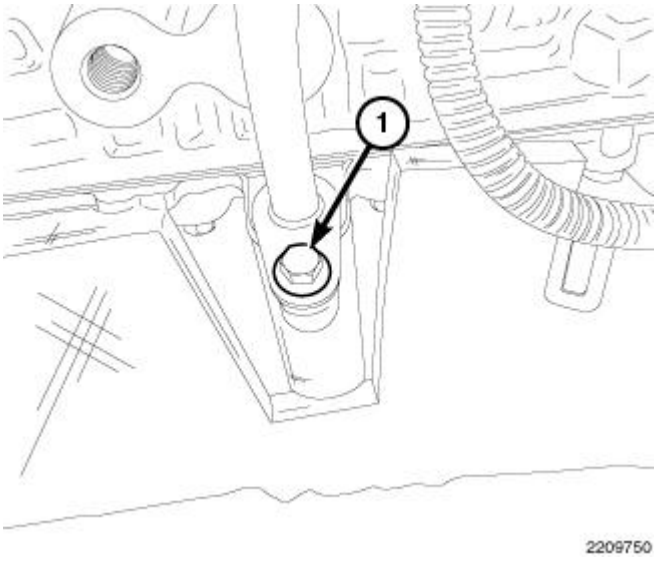

Fig. 70: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

50. Install the oil indicator lower bolt (1). Tighten lower bolt to 11 N.m (97 in. lbs.).

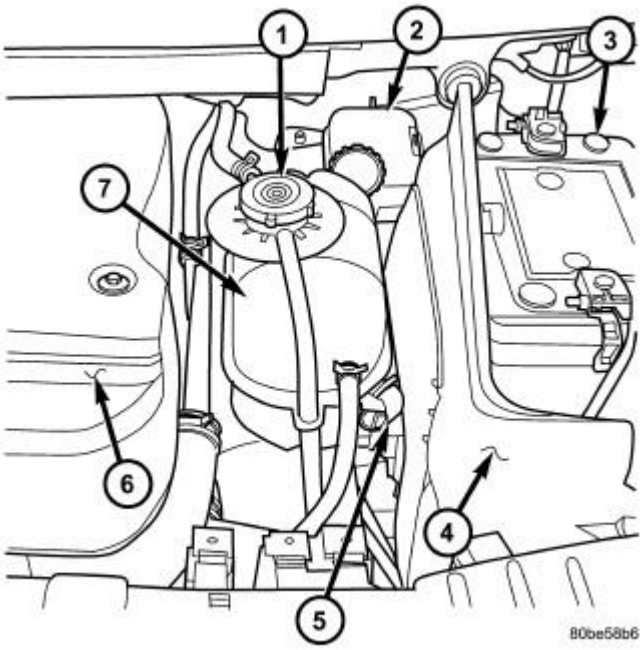

Fig. 71: Coolant Recovery Container Components
Courtesy of CHRYSLER LLC

51. Install the coolant recovery bottle. Refer to **Cooling/Engine/BOTTLE, Coolant Recovery - Installation** .

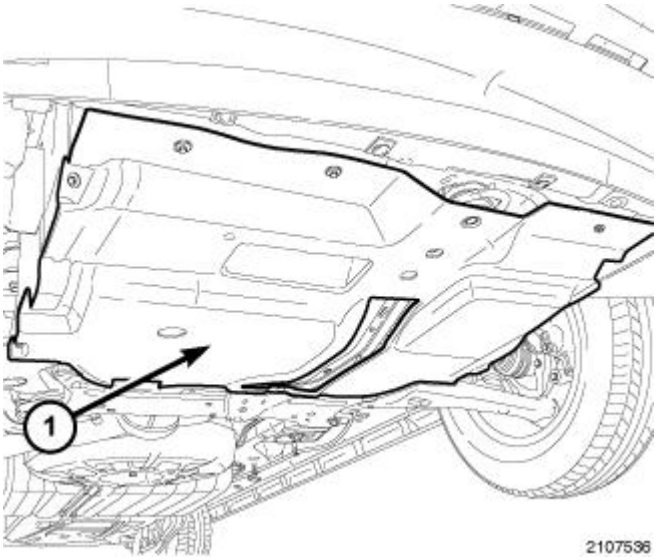

Fig. 72: Underbody Splash Shield
Courtesy of CHRYSLER LLC

52. Install the underbody splash shield (1).
53. Lower the vehicle.

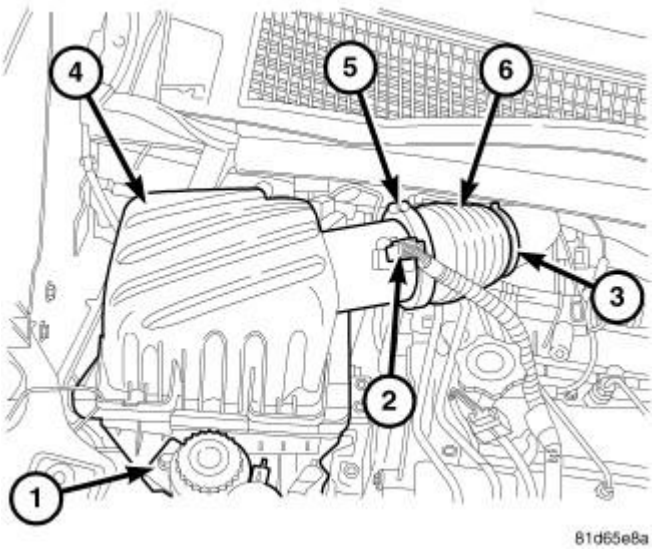

Fig. 73: Intake Air Box
Courtesy of CHRYSLER LLC

54. Install the cooling fan module. Refer to **Cooling/Engine/FAN, Cooling - Installation** .
55. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
56. Charge the refrigerant system. Refer to **Heating and Air Conditioning/Plumbing - Standard Procedure** .
57. Install the engine cover.

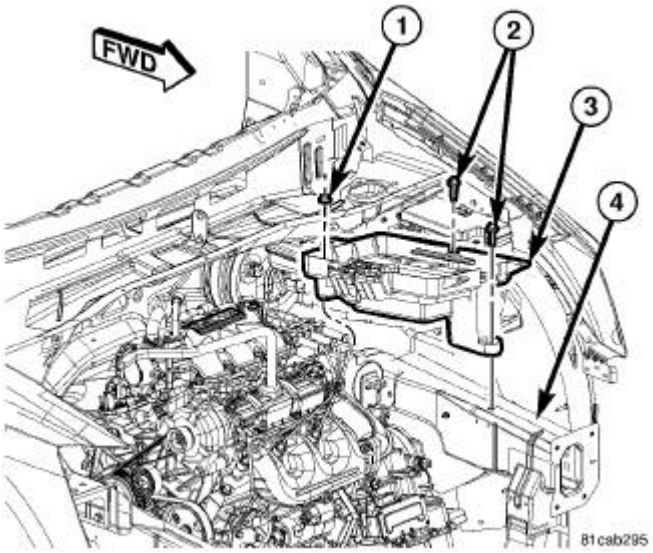

Fig. 74: Battery Tray
Courtesy of CHRYSLER LLC

58. Install the battery tray (3). Refer to **Electrical/Battery System/TRAY, Battery - Installation** .

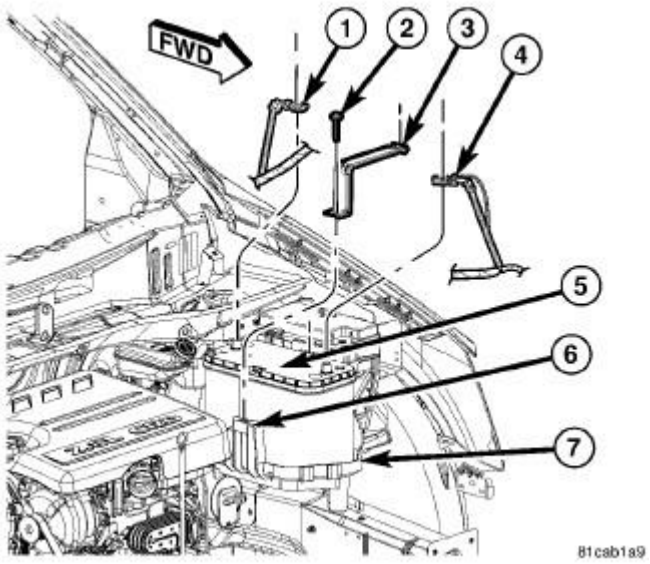

Fig. 75: Battery Cables
Courtesy of CHRYSLER LLC

59. Install the battery (5). Refer to **Electrical/Battery System/BATTERY - Installation** .
60. Connect the battery cables (1 and 4).
61. Install a new oil filter. Fill the engine crankcase with the proper oil to the correct level. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .
62. Refill the coolant system. Refer to **Cooling - Standard Procedure** .
63. Start the engine and run until operating temperature is reached.
64. Adjust transmission linkage, if necessary.

SPECIFICATIONS

ENGINE INFORMATION

ENGINE INFORMATION (1 OF 2)

2.8L Engine Specifications	
Engine	2.8L RT
Engine Type	2.8L - 16 Valves
Displacement	2777 cc
Bore	94.00
Stroke	100.05
Power (VGT)	120 kW (177CV) @ 3800 RPM
Torque (ATX)	460 N.m @ 1800 RPM
Cylinders	4 In line
Injection Order	1-3-4-2
Compression Ratio	17.0:1

Vacuum at idle	680 mm/HG (27.5 In/HG)
Idle Speed (ATX)	765 +/- 50 RPM
Maximum RPM in Gear	4500 RPM
Maximum RPM in neutral	ATX 2800
Belt tension	Automatic Belt Tensioner
Thermostat opening	80°C +/- 2°C
Generator Rating	Denso 12V-220A
Glow Plug	4.4V
Emissions Level	EU4
Block configuration/Material	Open/Cast Iron
Cylinder Head	Dual Overhead Cam
Timing System	Belt
Fuel System	CP3.2+ 1,600 bar Fuel Pump, Piezo Injectors
Fuel Supply	Electric Fuel Pump In the Fuel Tank
Electronic Control Unit	EDC 16
Timing System	Belt Driven DOHC Overhead Camshaft
Air Intake	Dry Filter With turbocharger and Charge Air Cooler
Fuel System	Direct Fuel Injection Common Rail System
Emission devices	Cooled EGR (pneumatic) Electric Intake Throttle Fast Metallic Glow plugs
Combustion Cycle	4 Stroke
Cylinder Compression Difference Between Cylinders	10 bar (145 psi)
Cooling System	Water Cooling
Pressure Cap Setting	14 psi
Turbocharger	Single VGT with REA
Intake Ports	Aluminum heads with traditional dual side intake and exhaust ports. One intake port is helical and the other has a directed entry.
Crankshaft	8 Counterweights with an incorporated balance shaft gear.
Camshafts	2 overhead camshafts with axial front bearings and identical camshaft caps, finger followers, and hydraulic lifters.
Intake AND Exhaust Valves	Flat with fire deck face.
Intake Manifold	Aluminum, with Cast-in EGR passages, intake mixer, vacuum actuated EGR valve, electric intake throttle and a U-type EGR cooler
Lubrication	Pressure Lubricated By Rotary Pump
Minimum Oil Pressure (warm)	0.7 BAR (10 psi) at idle/2.5 BAR (36 psi) at 3800 RPM
Engine Rotation	Clockwise Viewed From Front Cover

ENGINE INFORMATION (2 OF 2)

2.8L Engine Specifications	
Cylinder Head	
Cylinder head height	135.5 mm (5.334 in.)
Cylinder head flatness deformation tolerance	0.075 mm (0.003 in.)
Cylinder Head Gasket Thickness	
0 Hole	1.10 mm (0.043 in)
1 Hole	1.20 mm (0.047 in)
2 Holes	1.30 mm (0.051 in)
Intake Manifold	
Intake manifold flatness deformation tolerance	0.15 mm (0.006 in.)
Exhaust Manifold	
Exhaust manifold flatness deformation tolerance	0.1 mm (0.004 in.)
Tappets	
Hydraulic tappet outside diameters	11.994 mm +/- 0.06 mm (0.472 in +/- 0.002)
Valves	
Intake valve face angle	45°30'
Exhaust valve face angle	45°30'
Intake Valve Head Diameter	32 mm (1.25 in.)
Exhaust Valve Head Diameter	29.4 mm (1.15 in.)
Intake Valve Stem Diameter	5.97 mm (0.235 in.)
Exhaust Valve Stem Diameter	5.96 mm (0.235 in.)
Intake Valve Guide Stem Clearance	
Min	0.030 mm (0.0012 in.)
Max	0.060 mm (0.0024 in.)
Exhaust Valve Guide Stem Clearance	
Min	0.040 mm (0.0016 in.)
Max	0.070 mm (0.0028 in.)
Valve Springs	
Free Length	50.8 mm (2 in.)
Closed Valve	38 mm (1.49 in.)
Opened Valve	29 mm (1.14 in.)
Camshafts	
Camshaft End Play	
Min	0.150 mm (0.006 in.)
Max	0.350 mm (0.013 in.)
Outer Journal Diameter (at crankshaft)	25.95 mm +/- 0.01 mm (1.021 mm +/-.0004 in)
Inner Journal Diameter (at cylinder head)	26.00 mm + 0.015 mm (1.027 mm .0006 in)
Crankshaft Journal Clearance	
Max	0.075 mm (0.003 in.)
Min	0.030 mm (0.0012 in)

Connecting Rods	
Connecting Rod Diameter (Small End)	32 mm (1.26 in.)
Connecting Rod Diameter (Large End)	57.563 mm (2.266 in.)
Piston Pin	
Diameter	32 mm (1.26 in.)
Length: Mahle Mondial	70.7 mm - 71.00 mm (2.78 in - 2.79 in.)
Length: Federal Mogul	74 mm (2.9 in.)
Crankshaft	
End Play	0.1 mm - 0.34 mm (0.004 in. - 0.013 in.)
Bearing Selection. Refer to **Standard Procedure**.	
Engine Block	
Cylinder Bore Internal Diameter	94 mm (3.700 in.)
Cylinder Bore Out-Of-Round (Roundness)	0.009 mm (0.0003 in.)
Oversized Piston	+0.40 mm (+0.015 in.)
Fuel System	
Injection Pressure	CRS 3.0 - 1600 Bar (23.206 psi)
High Pressure Pump	CP3.2+
ECU	EDC16CP31
Injectors	Piezo CRI 3.0
Glow Plugs	
Make/Type	Bosch/GLP2
Voltage	4.4V
Lubrication System	
Oil Pump Outer Rotor End Play	
Min	0.01 (0.0004 in.)
Max	0.09 (0.0036 in.)
Oil Pump Inner Rotor End Play	
Max	0.01 mm (0.0004 in.)
Min	0.09 mm (0.0036 in.)
Oil Pump Outer Rotor to Body Diameter Clearance	
Max	0.130 mm (0.052 in.)
Min	0.230 mm (0.0091 in)
Oil Pressure Relief Valve	
Opening Pressure	5 Bar (73 psi)
Oil Pressure Valve Spring Free Length	46.8 mm (1.84 in)
Minimum Oil Pressure (Warm)	-
at Idle	0.7 Bar (10 psi)
at 3800 RPM	2.5 Bar (36 psi)
Cooling System	
Thermostat Opening Temperature	80°C (176°F)
Pressure Cap Setting	1.2 Bar (17 psi)
Engine Oil	

Specification Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Description** .
Coolant
Specification. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Description** .

CYLINDER HEAD GASKET SELECTION

Cylinder Head Gasket Selection		
-	Millimeters	Inches
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.300 - 0.399	0.0119 - 0.0158
CYLINDER HEAD GASKET THICKNESS	1.10	0.0434
PISTON CLEARANCE	0.700-0.800	0.0276 -0.0315
-		
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.400 - 0.499	0.0158 - 0.0197
CYLINDER HEAD GASKET THICKNESS	1.20	0.0473
PISTON CLEARANCE	0.700-0.800	0.0276 -0.0315
-		
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.500 - 0.600	0.0197 - 0.0237
CYLINDER HEAD GASKET THICKNESS	1.30	0.0512
PISTON CLEARANCE	0.700-0.800	0.0276 -0.0315

TORQUE

ENGINE BLOCK

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Air Temp/Pressure sensor	12	-	106
Balance Shaft	33	24	-
Connecting Rod Caps	See **Engine/Engine Block/ROD, Piston and Connecting - Installation**.		
Dipstick Tube (block)	11	-	97
Dipstick Tube (sump)	11	-	97
Front Mount	See **Engine/Engine Mounting/INSULATOR, Engine Mount - Installation**.		
Left Transmission Mount	Refer to appropriate Transmission SERVICE INFORMATION article.		
Fuel Quantity Solenoid	11	-	97
Main Bearing Caps	See **Engine/Engine Block/CRANKSHAFT - Installation**.		
Oil Cooler	12	-	106
Oil Cooler coolant Adapter	11	-	97

Tube at Oil Filter Housing Bolt			
Oil Cooler Coolant Tube Bolt	15	-	133
Oil Drain Plug	54	40	-
Oil Filter Cap	25	18	-
Oil Filter Housing Bolts	33	24	-
Oil Jet	11	-	97
Oil Pan	See **Engine/Lubrication/PAN, Oil - Installation**.		
Oil Pan to Transaxle Bolts	60	44	-
Oil Pickup Tube	15	-	133
Oil Pressure Sensor	14	-	124
Rear Mount	Refer to **ENGINE MOUNTING**.		
Rear Mount Bracket	Refer to **ENGINE MOUNTING**.		
Right Engine Mount	Refer to **ENGINE MOUNTING**.		

CYLINDER HEAD

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Camshaft Cap	11	-	97
Camshaft Position Sensor	11	-	97
Camshaft Sprocket	80	59	-
Charge Air Cooler Clamp - Intercooler Side	25	18	-
Charge Air Cooler Clamp - Turbocharger Side	5	-	44
Cylinder Head Bolt	See **Engine/Cylinder Head - Installation**.		
Cylinder Head Cover	11	-	97
EGR Air Flow Control Valve Bolts	11	-	97
Exhaust Elbow	33	24	-
Exhaust Elbow Bracket	33	24	-
Exhaust Manifold	36	27	-
Exhaust Manifold Heat Shield	33	24	-
Front Camshaft Journal	11	-	97
Fuel injector	33	24	-
Fuel Injector Tubes at Fuel Injector	28	21	-
Fuel Injector Tubes at Fuel Rail	5 + 75°	-	44 + 75°
Fuel Rail	24	18	-
Glow Plugs	14	-	124

High Pressure Fuel Feed Line at Fuel Rail	5 + 75°	-	44 + 75°
High Pressure Fuel Feed Tube at High Pressure Pump	28	21	-
High Pressure Fuel Tube Bracket Bolt	15	-	133
Intake Manifold Nuts	25	18	-
Turbocharger	32	24	-
Turbocharger Brace Bolts	32	24	-
Turbocharger Oil Feed Line at the Engine Block	32	24	-
Turbocharger Adapter (oil feed line to engine block connection)	54	40	-
Turbocharger Oil Feed Line Banjo Bolt at Turbocharger	24	18	-
Turbocharger Oil Return Line	15	-	133
Vacuum Tube	11	-	97

FRONT ENGINE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Crankshaft Damper	32	24	-
Crankshaft Sprocket	100 + 120°	74 + 120°	-
Front Engine Cover	33	24	-
Front Engine Lifting Bracket	45	33	-
High Pressure Fuel Pump	24	18	-
High Pressure Fuel Pump Sprocket Nut.	88	65	-
Timing Belt Cover (upper)	8	-	71
Timing Belt Cover (inner)	11	-	97
Timing Belt Cover (lower)	8	-	71
Timing Belt Tensioner	28	21	-
Water Pump	32	24	-

REAR ENGINE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Crankshaft Position Sensor Cover Plate	15	-	133
Crankshaft Position Sensor	11	-	97
Flex Plate (ATX) Bolt	See **Engine/Engine Block/FLEXPLATE - Installation**.		

Transmission Adapter Plate (Allen bolts)	79	58	-
Transmission Adapter Plate (hex bolts)	45	33	-

ACCESSORY DRIVE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
A/C Compressor Bolts	28	21	-
A/C Compressor Nut	32	24	-
A/C Compressor/Generator Bracket Bolts	45	33	-
Accessory Drive Belt Tensioner Bolt	45	33	-
Accessory Drive Idler Pulley Bolt	45	33	-
Generator Bolts	33	24	-
Power Steering Pump Bolts	33	24	-
Power Steering Pump Pulley Bolts	33	24	-

SPECIAL TOOLS

SPECIAL TOOLS

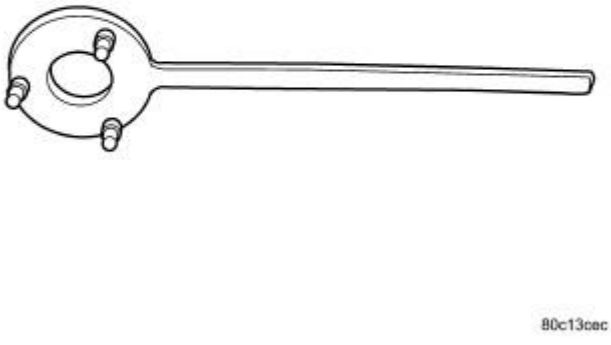

Fig. 76: LOCKING TOOL - VM.1055
Courtesy of CHRYSLER LLC

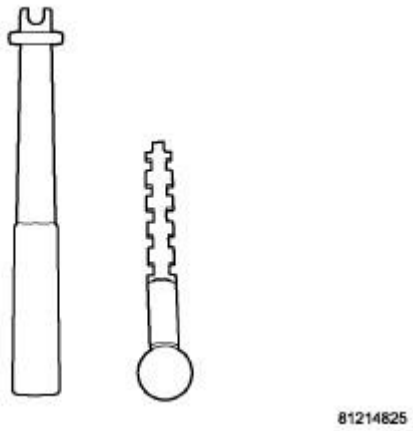

Fig. 77: CAMSHAFT OIL SEAL REMOVER - VM.1058
Courtesy of CHRYSLER LLC

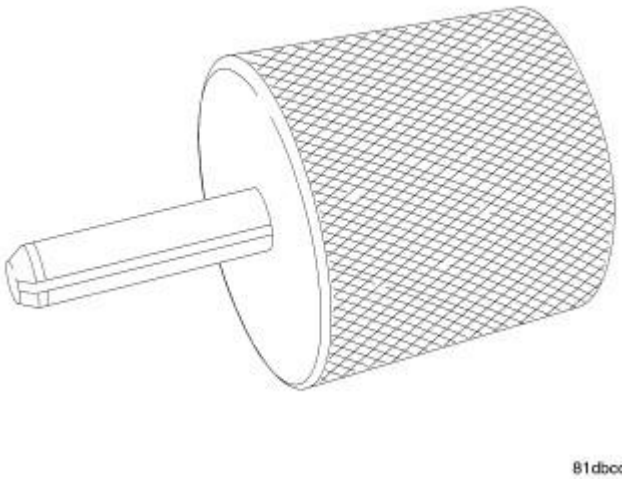

Fig. 78: BALANCE SHAFT LOCK PIN - VM.10012
Courtesy of CHRYSLER LLC

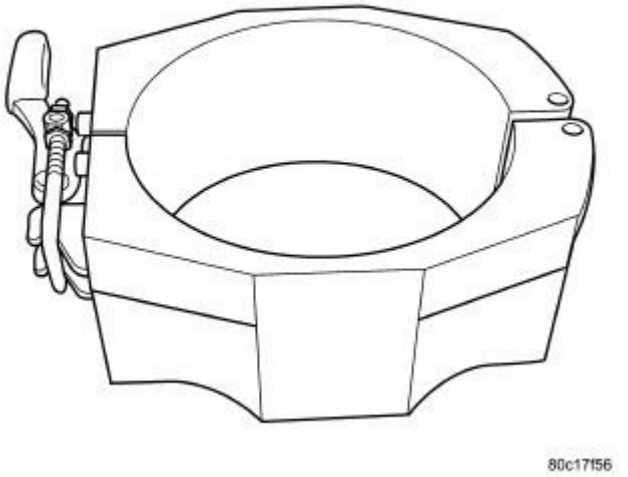

Fig. 79: 2.8L PISTON INSTALLER - VM.1082
Courtesy of CHRYSLER LLC

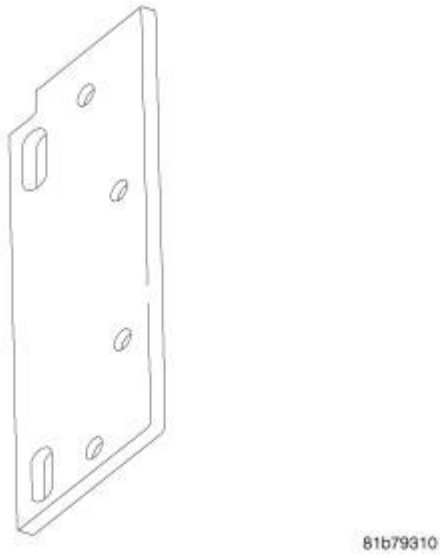

Fig. 80: FRONT AND REAR SEAL TOOL - VM.9990
Courtesy of CHRYSLER LLC

Fig. 81: COMPRESSION TEST ADAPTER - VM.1072A
Courtesy of CHRYSLER LLC

Fig. 82: SEAL INSTALLER/SEAL GUIDE- 9937
Courtesy of CHRYSLER LLC

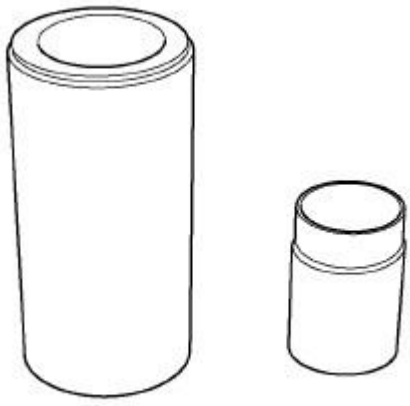

Fig. 83: SEAL INSTALLER - VM.1057
Courtesy of CHRYSLER LLC

Fig. 84: CAMSHAFT LOCKING TOOL - VM.9991
Courtesy of CHRYSLER LLC

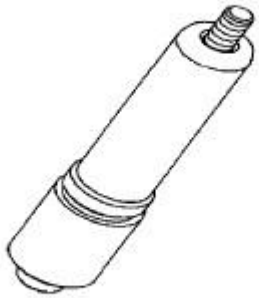

Fig. 85: CRANKSHAFT LOCKING TOOL - VM.9992
Courtesy of CHRYSLER LLC

Fig. 86: CRANKSHAFT SEAL INSTALLER - VM.9993
Courtesy of CHRYSLER LLC

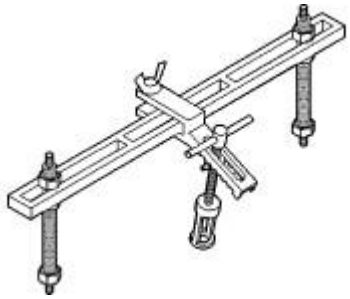

Fig. 87: Valve Spring Compressor MD998772A
Courtesy of CHRYSLER LLC

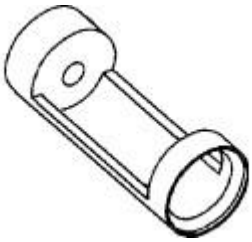

Fig. 88: Valve Spring Adapter MD998772A-15
Courtesy of CHRYSLER LLC

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

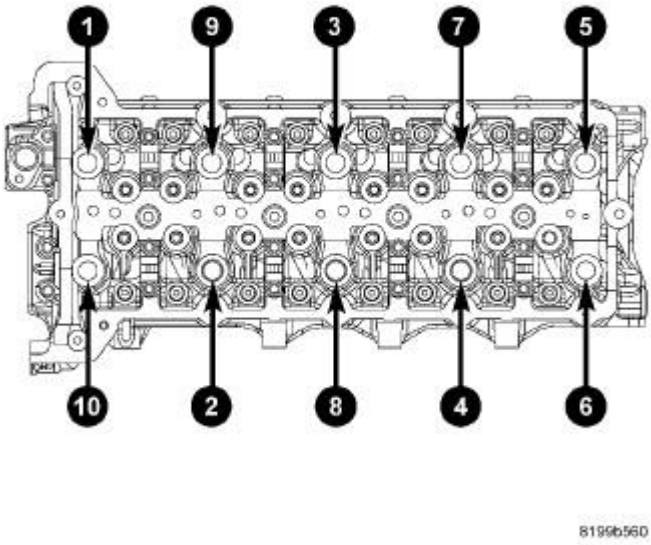

Fig. 89: Cylinder Head Bolt Torque Sequence
Courtesy of CHRYSLER LLC

The 2.8L aluminum, overhead valve cylinder head is torqued in a cross pattern. The cylinder head itself is not resurfaceable.

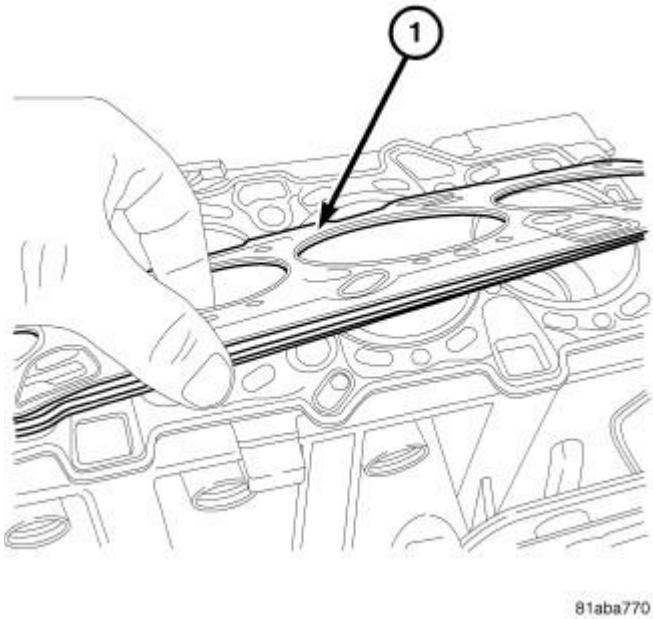

Fig. 90: MLS GASKET
Courtesy of CHRYSLER LLC

1. The cylinder head uses a selectable Multi-layered Steel gasket that is available in three sizes.

STANDARD PROCEDURE

VALVE SEALS - IN VEHICLE

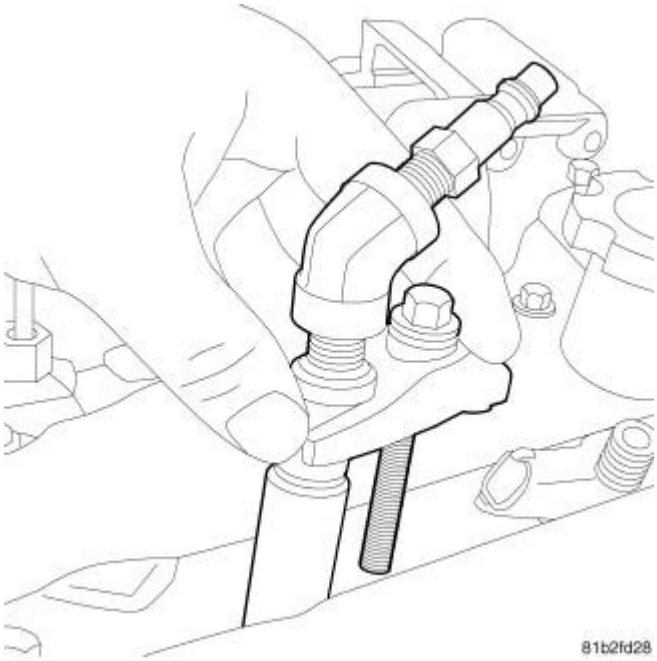

Fig. 91: COMPRESSION TESTER
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal**.

NOTE: Rocker arms and lifters must be kept in order of removal and stored in the up right position.

3. Position the rocker arms aside. See **Engine/Cylinder Head/ROCKER ARM, Valve - Removal**.
4. Install the Compression Tester Adaptor Tool VM.1072A, into the injector hole and retain with an injector hold down (2) bolt.
5. Prepare Valve Spring Compressor Tool MD998772A for usage by inverting the tool to cylinder head holding screws so that the thread size matches the cylinder head.
6. Install Valve Spring Compressor Tool MD998772A onto cylinder head and using Valve Spring Adaptor MD998772A-15, place the adaptor over the valve spring.
7. Connect a regulated air supply (3) to Compression Test Adapter Tool VM.1072A and pressurize the cylinder.
8. Place shop towels around the working area of the cylinder head to prevent valve locks from accidently entering the engine.

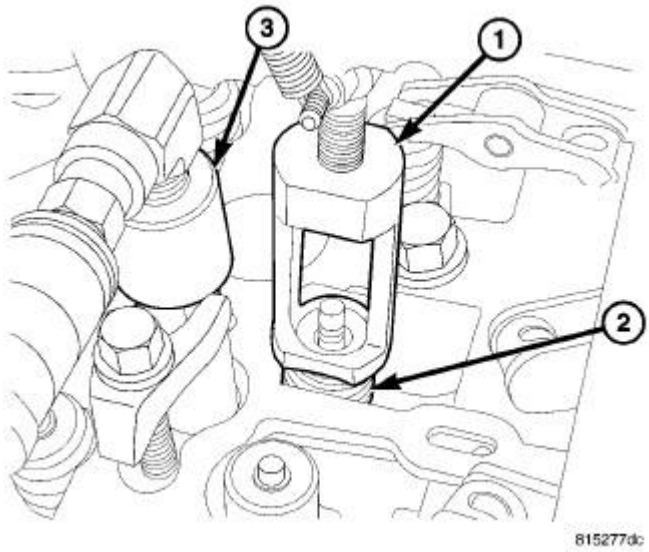

Fig. 92: MD998772A-15 ADAPTOR
Courtesy of CHRYSLER LLC

1 - MD998772A-15 ADAPTOR 2 - VALVE SPRING 3 - VM.1072A COMPRESSION TESTER ADAPTOR

9. Using Valve Spring Adaptor MD998772A-15 (1), collapse the valve spring (2) and remove the locks.
10. Remove the valve spring (2) assembly.

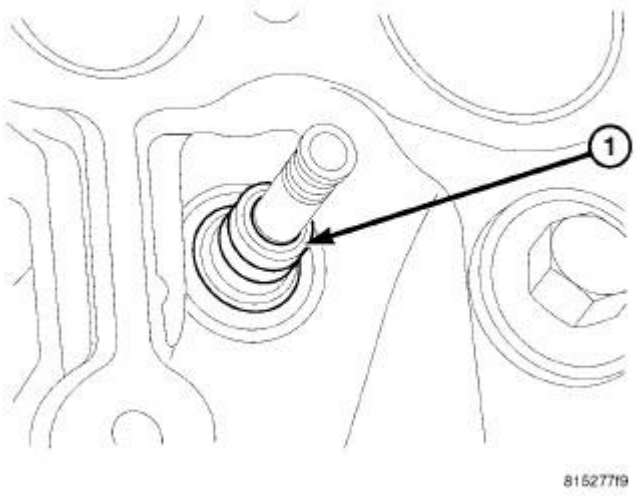

Fig. 93: VALVE SEAL
Courtesy of CHRYSLER LLC

1 - VALVE SEAL

11. Remove the valve seal (1).
12. Repeat this procedure for all cylinders.

VALVE SERVICE

This procedure is done with the cylinder head removed.

DISASSEMBLY

1. Remove the cylinder head. See **Engine/Cylinder Head - Removal**.
2. Use Valve Spring Compressor Tool MD 998772A and Valve Spring Adapter Tool MD 998772A -15 and compress each valve spring.
3. Remove the valve locks, retainers, and springs.
4. Use a smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.
5. Remove the valves, and place them in a rack in the same order as removed.

VALVE CLEANING

1. Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.
2. Clean all residue and gasket material from the engine cylinder head machined gasket surface.

INSPECTION

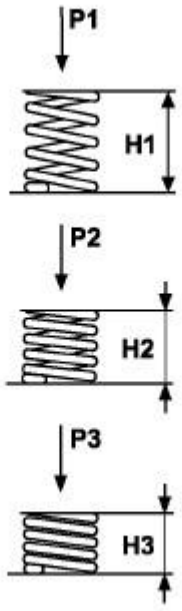

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Fig. 94: VALVE SPRING CHART
Courtesy of CHRYSLER LLC

LOAD Kg		HEIGHT mm		STATE
P1	0.00	H1	50.8	FREE LENGTH
P2	182-5 +10%	H2	38.0	VALVE CLOSED
P3	395±5%	H3	29.0	VALVE OPEN

1. Inspect for cracks in the combustion chambers and valve ports.
2. Inspect for cracks on the exhaust seat.
3. Inspect for cracks in the gasket surface at each coolant passage.
4. Inspect valves for burned, cracked or warped heads.
5. Inspect for scuffed or bent valve stems.
6. Replace valves displaying any damage.
7. Check valve spring height.

VALVE SEAT REFACING

1. Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.
2. Use tapered stones to obtain the specified seat width when required.

VALVE GUIDES

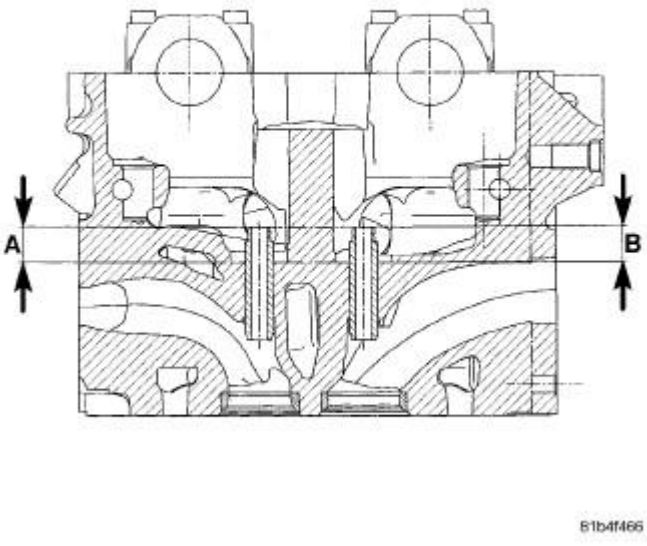

Fig. 95: VALVE HEIGHT
Courtesy of CHRYSLER LLC

1. Valve Guides height requirement.
2. Measurement A and B: 13.50 mm - 14.00 mm (0.570 in - 0.590 in).

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

1. Measure and record internal diameter of valve guides. Valve guide internal diameter is 6.0 to 6.012 mm (0.2362 to 0.2366 in).
2. Measure valve stems and record diameters. Intake valve stem diameter 5.952 to 5.97 mm (0.2343 to 0.2350 in). Exhaust valve stem diameter 5.942 to 5.96 mm (0.2339 to 0.2346 in).
3. Subtract diameter of valve stem from internal diameter of its respective valve guide to obtain valve stem clearance in valve guide. Clearance of inlet valve stem in valve guide is 0.03 to 0.06 mm (.0011 to .0023 in). Clearance of exhaust valve stem in valve guide is 0.04 to 0.07 mm (.0015 to .0027 in).
4. If valve stem clearance in valve guide exceeds tolerances, new valve guides must be installed.

REMOVAL

REMOVAL - CYLINDER HEAD

1. Disconnect the battery cables.
2. Drain the cooling system. Refer to **Cooling - Standard Procedure** .
3. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.

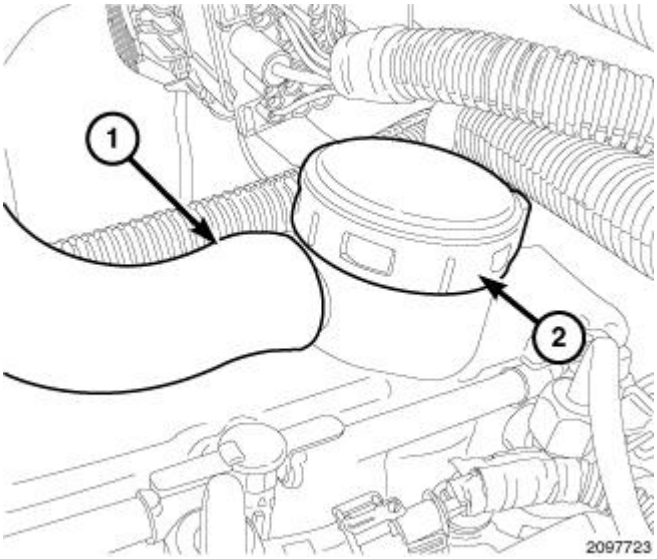

Fig. 96: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

4. Disconnect the crankcase vent hose (1) from the oil separator (2).

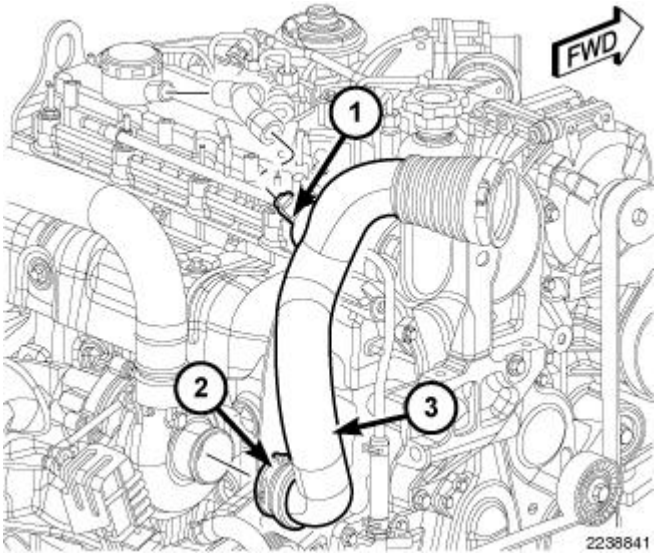

Fig. 97: Crankcase Vent Hose Heater Electrical Connector & Turbocharger Inlet Tube
Courtesy of CHRYSLER LLC

5. Disconnect the crankcase vent hose heater harness connector (1).
6. Loosen clamp (2) and remove the turbocharger inlet tube (3) from turbocharger.

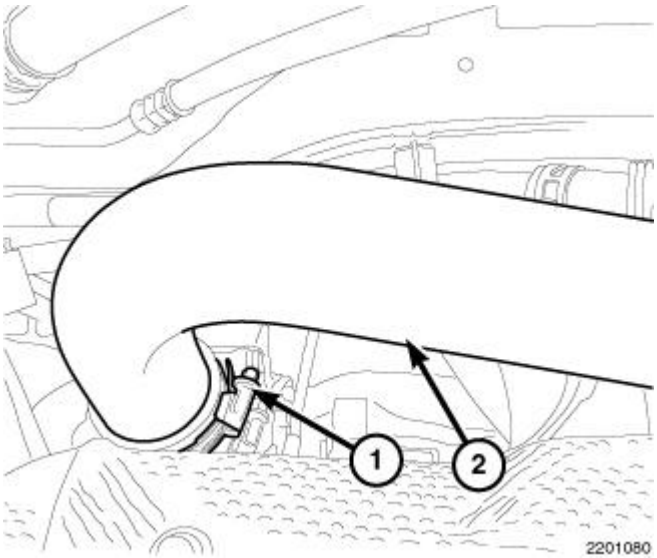

Fig. 98: Charge Air Cooler Inlet Hose
Courtesy of CHRYSLER LLC

7. Loosen clamp (1) and disconnect the charge air cooler inlet hose (2) from turbocharger.

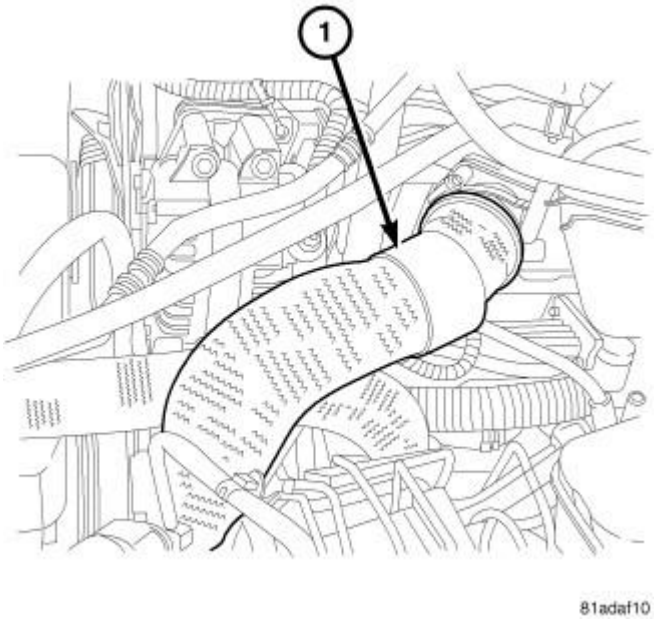

Fig. 99: Charge Air Cooler Outlet Hose
Courtesy of CHRYSLER LLC

8. Remove the Charge Air Cooler (CAC) outlet hose (1) from the EGR air flow control valve.
9. Remove the intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.
10. Remove the exhaust manifold. See **Engine/Manifolds/MANIFOLD, Exhaust - Removal**.
11. Remove the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Removal**.

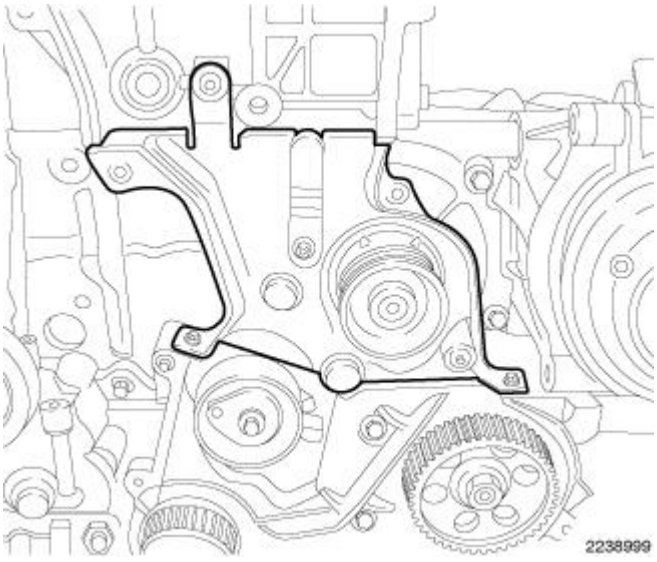

Fig. 100: Inner Timing Belt Cover
Courtesy of CHRYSLER LLC

12. Remove the inner timing belt cover.

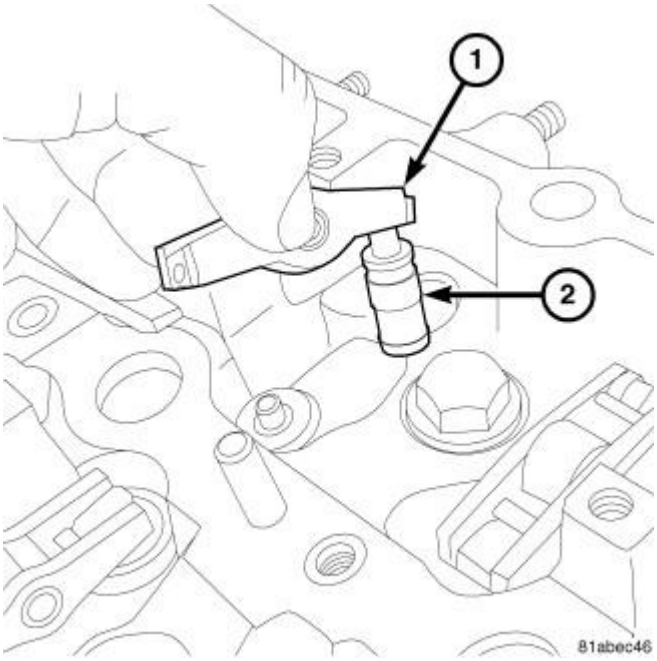

Fig. 101: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

NOTE: Observe the position of the rocker arms and lifters. Always return the rocker arms and lifters to their original location.

13. Remove the rocker arms (1) and hydraulic lifters (2).
14. Remove the cylinder head bolts.
15. Remove the cylinder head.

CLEANING

CLEANING

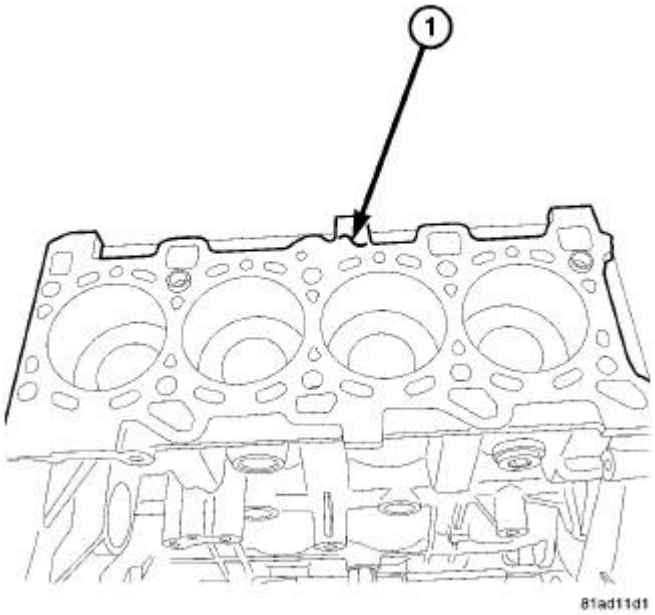

Fig. 102: ENGINE BLOCK
Courtesy of CHRYSLER LLC

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon. See **Engine - Standard Procedure**.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

INSPECTION

INSPECTION

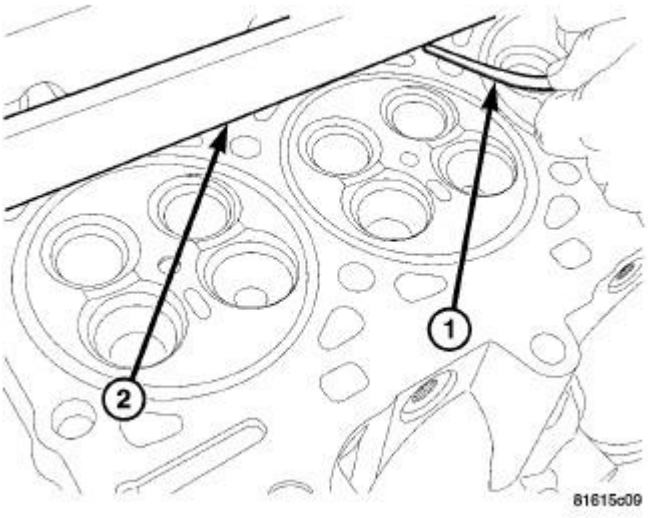

Fig. 103: Cylinder Head Flatness (1 Of 2)
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE 2 - STEEL STRAIGHT EDGE

CAUTION: The cylinder head surface and straight edge must be absolutely clean before the flatness measurement is taken. DO NOT check flatness across the combustion chamber area or on the marks left by the gasket stopper.

Use a cleaned straight edge (2) and feeler (1) gauge to check the flatness. Lie the straight edge (2) parallel across the cooling ports. Measure before each combustion chamber toward the outer edge of the cylinder head, above and below each combustion chamber, between each combustion chamber, top and bottom, on the cylinder head and block mating surfaces. The **maximum** allowed warpage is 0.075 mm (0.003 in.).

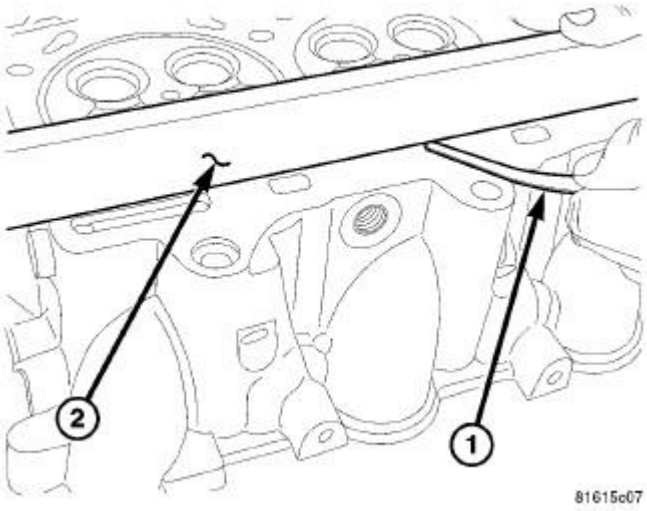

Fig. 104: Cylinder Head Flatness (2 Of 2)
Courtesy of CHRYSLER LLC

1 - Feeler Gauge 2 - Straightedge

The minimum cylinder head thickness is 135.5 mm (5.33 in.).

INSTALLATION

INSTALLATION - CYLINDER HEAD

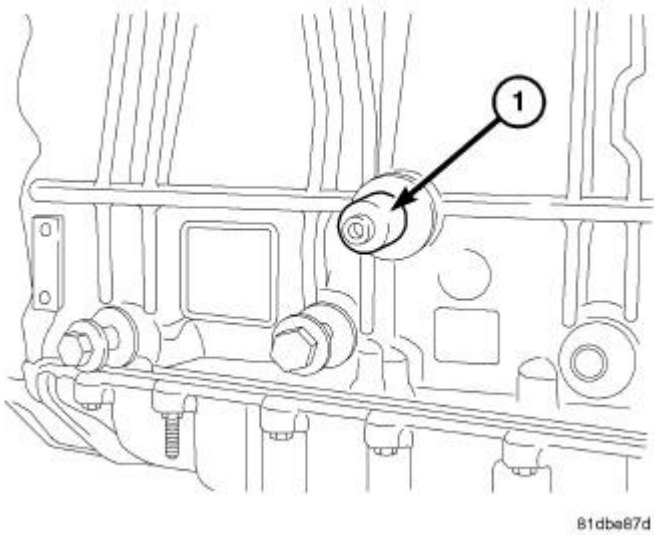

Fig. 105: Crankshaft Locking Tool
Courtesy of CHRYSLER LLC

1. Remove the Crankshaft Locking Tool VM.9992 (1).

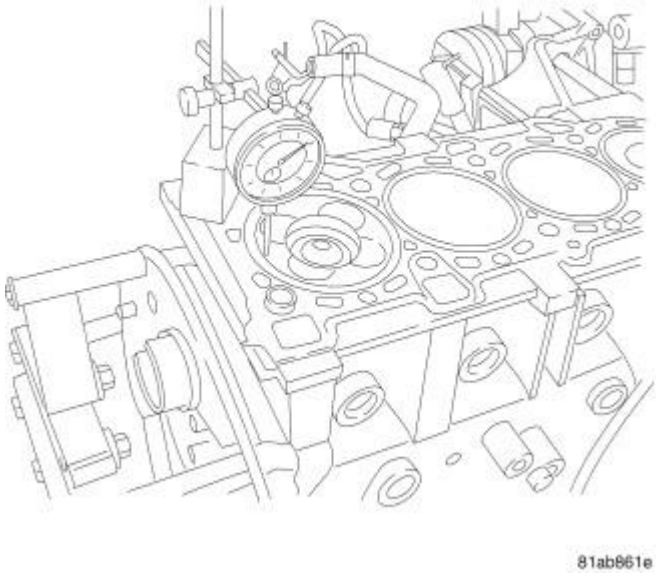

Fig. 106: Deck Height
Courtesy of CHRYSLER LLC

2. Set the number one piston to top dead center (TDC).

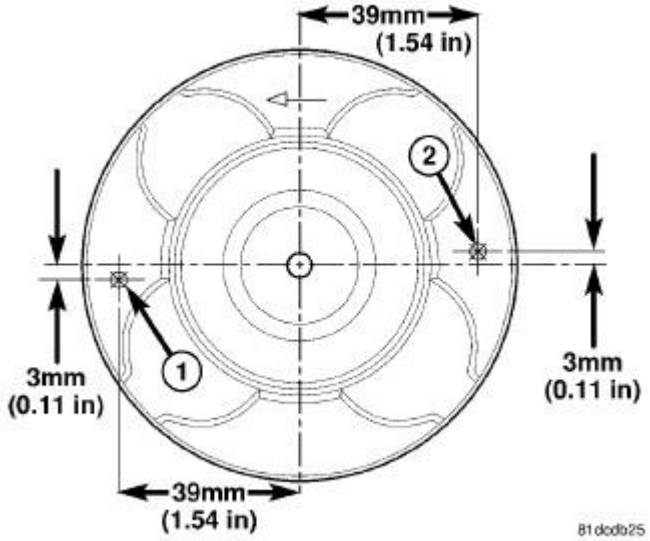

Fig. 107: Piston Protrusion Measurement
Courtesy of CHRYSLER LLC

3. Zero the dial indicator on the top of the piston at location shown (1) in illustration.
4. Use the dial indicator to measure the height of the piston at top dead center.

5. Zero the dial indicator on the top of the piston at location shown (2) in illustration.
6. Use the dial indicator to measure the height of the piston at top dead center.
7. Repeat the procedure for each cylinder.
8. Average the 4 piston protrusion readings to determine the required gasket thickness.
9. Select the appropriate cylinder head gasket from the cylinder head gasket chart.

CYLINDER HEAD GASKET SELECTION CHART

Cylinder Head Gasket Selection		
-	Millimeters	Inches
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.300 - 0.399	0.0119 - 0.0158
CYLINDER HEAD GASKET THICKNESS (No Hole)	1.10	0.0434
PISTON CLEARANCE	0.700 - 0.800	0.0276 - 0.0315
-		
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.400 - 0.499	0.0158 - 0.0197
CYLINDER HEAD GASKET THICKNESS (One Hole)	1.20	0.0473
PISTON CLEARANCE	0.700 - 0.800	0.0276 - 0.0315
-		
DISTANCE FROM PISTON AT TDC TO CYLINDER BLOCK	0.500 - 0.600	0.0197 - 0.0237
CYLINDER HEAD GASKET THICKNESS (Two Holes)	1.30	0.0512
PISTON CLEARANCE	0.700 - 0.800	0.0276 - 0.0315

10. Return piston No. 1 to 90 degrees ATDC, and align the crankshaft timing marks.

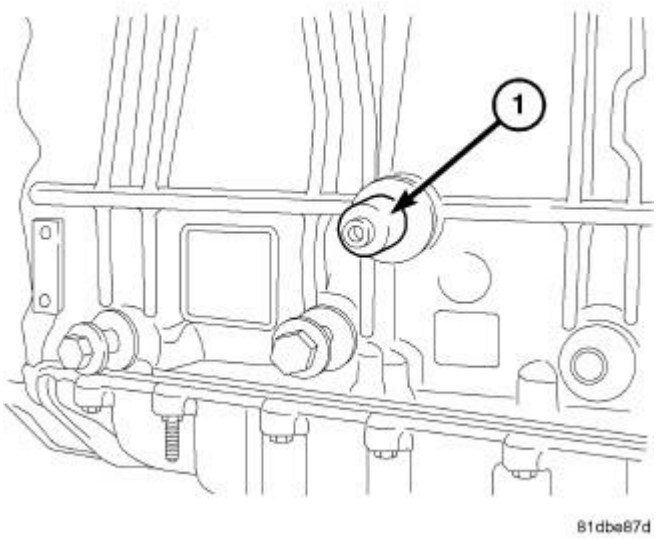

Fig. 108: Crankshaft Locking Tool
Courtesy of CHRYSLER LLC

11. Reinstall the Crankshaft Locking Tool VM.9992 (1).

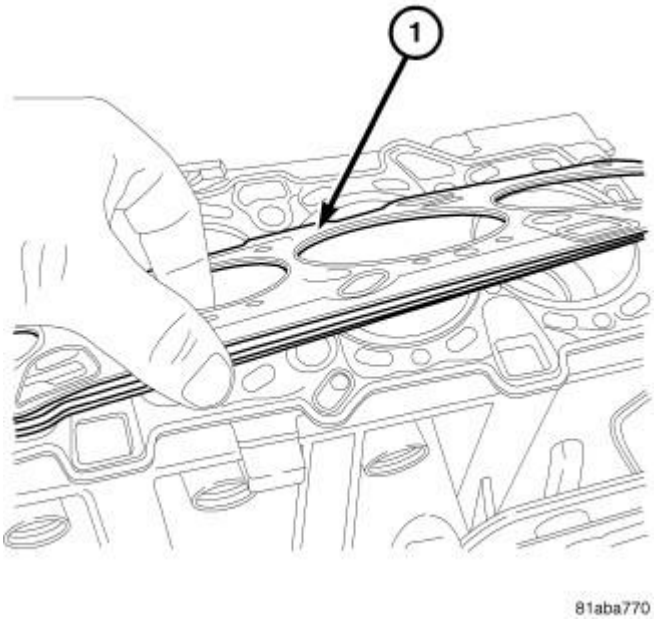

Fig. 109: MLS GASKET
Courtesy of CHRYSLER LLC

12. Install the head gasket (1).
13. Install the cylinder head.

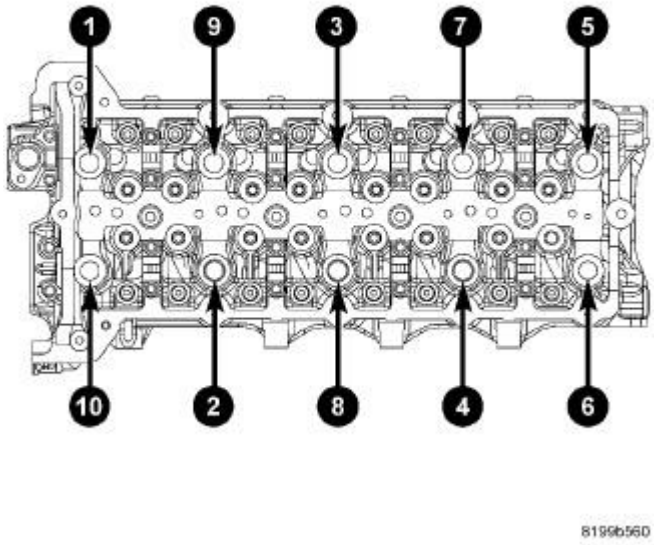

Fig. 110: Cylinder Head Bolt Torque Sequence
Courtesy of CHRYSLER LLC

NOTE: Always use new cylinder head bolts whenever the existing bolts have been removed.

14. Install the cylinder head bolts in the illustrated pattern. Tighten the bolts to 30 N.m (22 ft. lbs.).
15. Repeat the pattern, turning the bolts an additional 85 degrees. Repeat the pattern twice more, turning an additional 85 degrees each time for a total of 255 degrees.

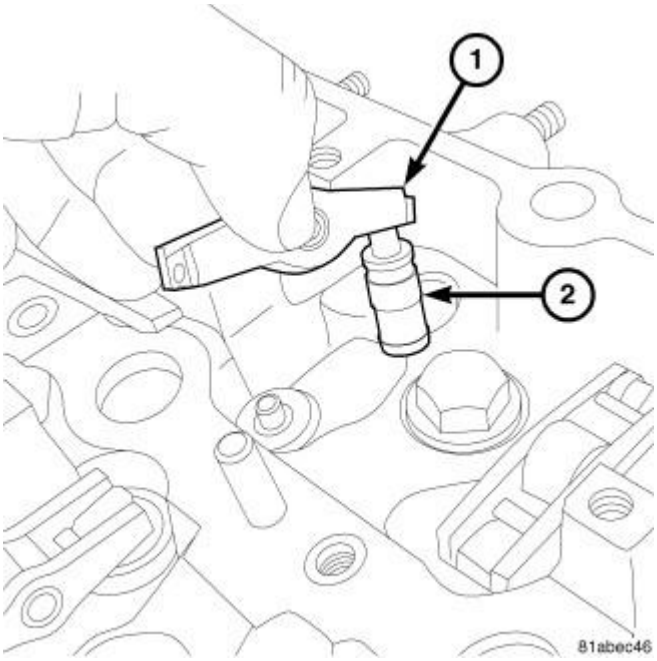

Fig. 111: Hydraulic Lifters & Rocker Arms
Courtesy of CHRYSLER LLC

NOTE: Make sure to return the lifters and arms to their original position.

16. Install the hydraulic lifters (2) and rocker arms (1).

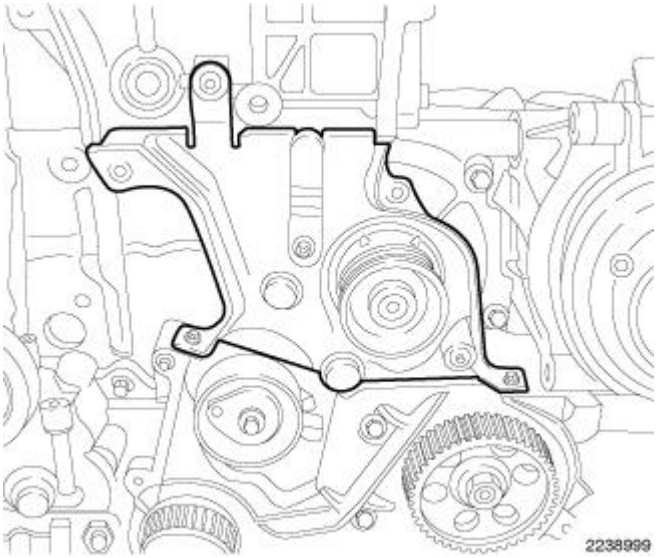

Fig. 112: Inner Timing Belt Cover
Courtesy of CHRYSLER LLC

17. Install the inner front cover. Torque the bolts to 11 N.m (97 in. lbs.).
18. Install the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation**.
19. Install the exhaust manifold. See **Engine/Manifolds/MANIFOLD, Exhaust - Installation**.

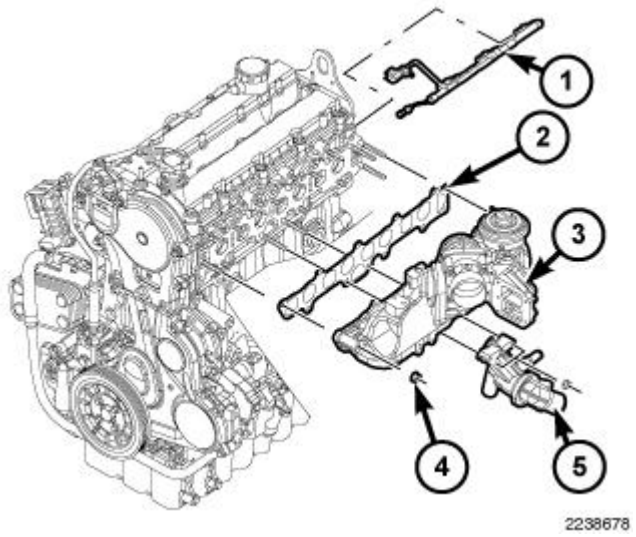

Fig. 113: Intake Manifold & Thermostat Housing
Courtesy of CHRYSLER LLC

20. Install the intake manifold (3). See **Engine/Manifolds/MANIFOLD, Intake - Installation**.

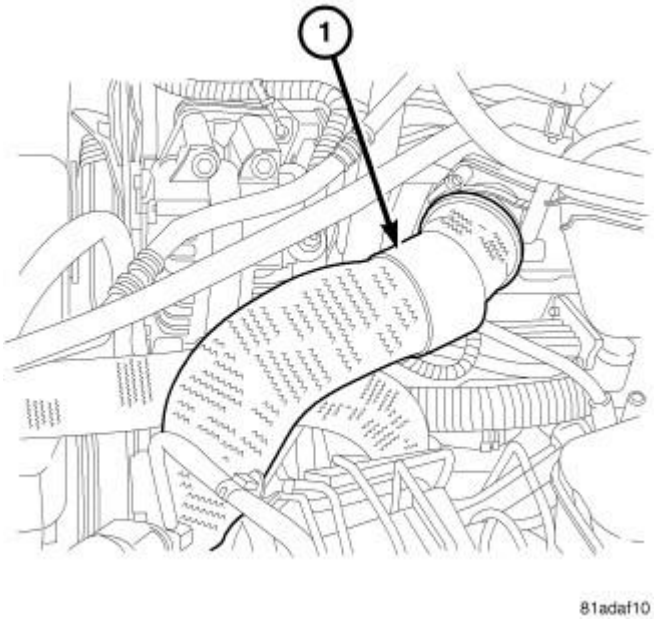

Fig. 114: Charge Air Cooler Outlet Hose
Courtesy of CHRYSLER LLC

21. Install the charge air cooler outlet hose (1) top the EGR air flow control valve.

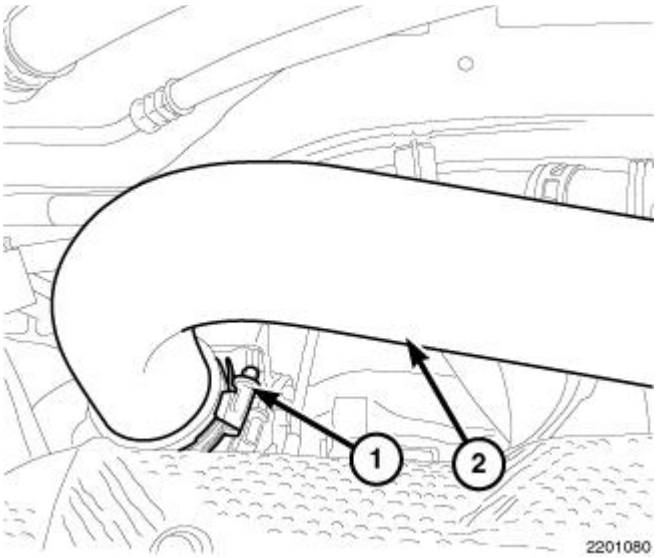

Fig. 115: Charge Air Cooler Inlet Hose
Courtesy of CHRYSLER LLC

22. Install the charge air cooler inlet hose (2) to the turbocharger and tighten clamp (1).

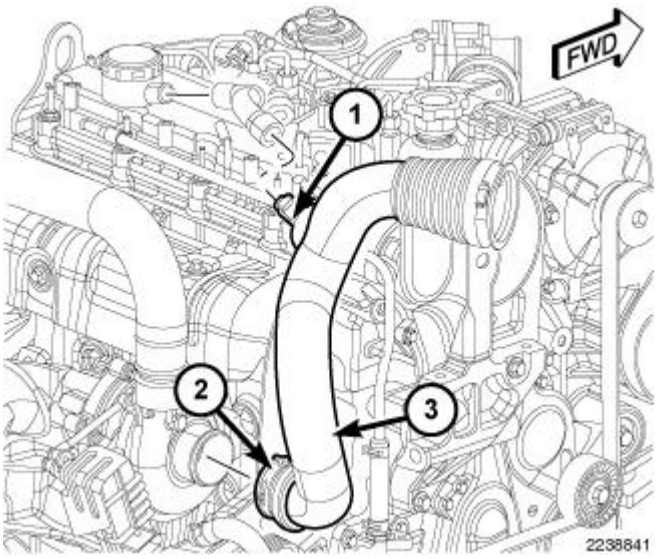

Fig. 116: Crankcase Vent Hose Heater Electrical Connector & Turbocharger Inlet Tube
Courtesy of CHRYSLER LLC

23. Install the turbocharger inlet tube (3) and securely tighten clamp (2).
24. Connect the crankcase vent hose heater harness connector (1).

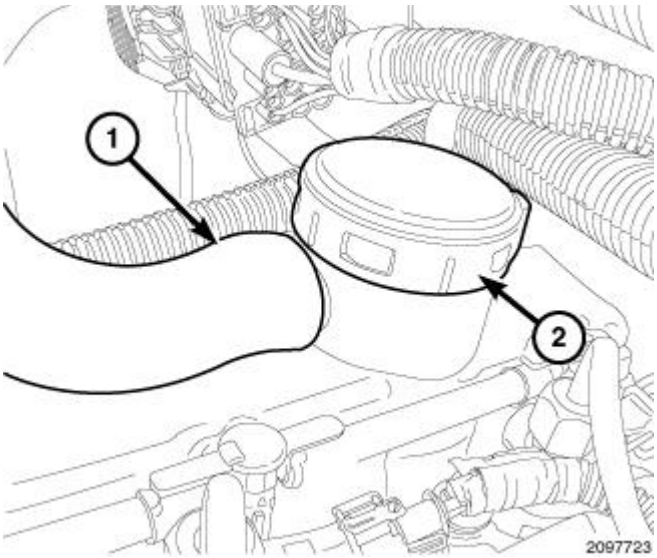

Fig. 117: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

25. Connect the crankcase vent hose (1) to the oil separator (2).
26. Install the intake air body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
27. Fill the cooling system. Refer to **Cooling - Standard Procedure** .
28. Connect the battery cables.
29. Start the engine, and inspect for leaks.

CAMSHAFT, ENGINE

Description

DESCRIPTION

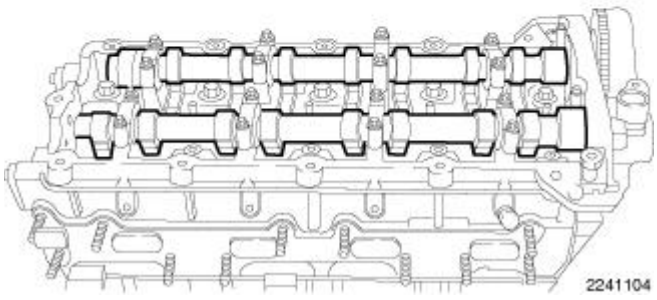

Fig. 118: Camshafts

Courtesy of CHRYSLER LLC

The camshafts are made of cast iron with eight machined lobes and four bearing journals.

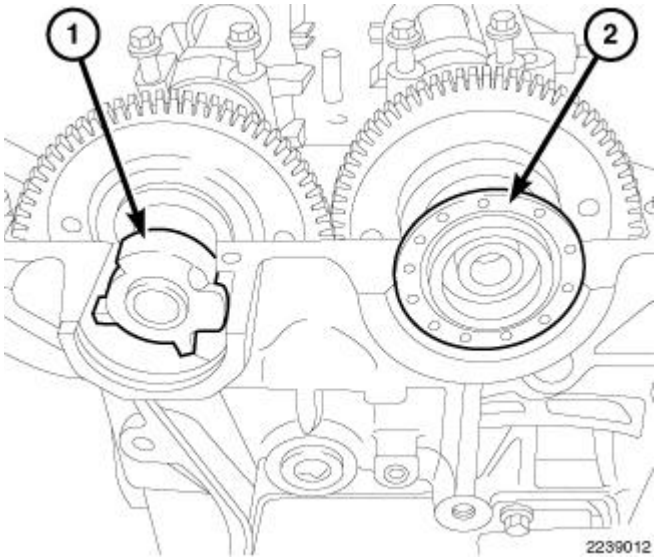

Fig. 119: Intake Camshaft Oil Seal
Courtesy of CHRYSLER LLC

1. The exhaust camshaft (1) incorporates the Camshaft Position (CMP) sensor reluctor wheel. The intake camshaft uses a camshaft seal (2).

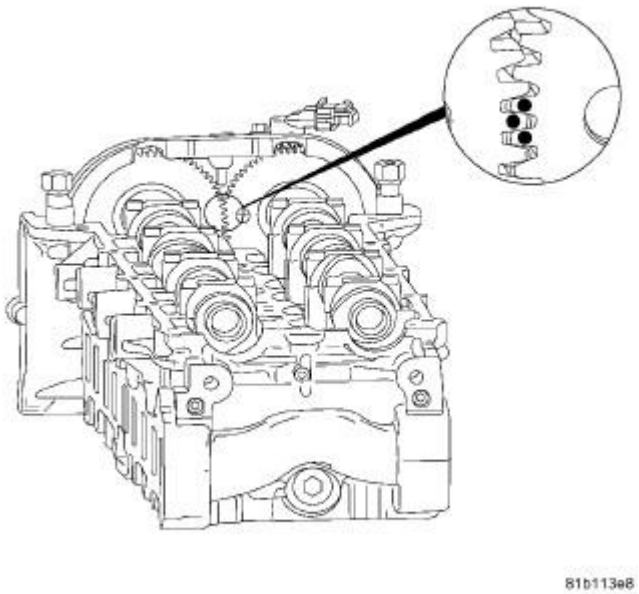

Fig. 120: Camshaft Timing Dots
Courtesy of CHRYSLER LLC

2. The dots on the back of the camshaft gears are for initial timing only. These dots are for timing the camshafts to each other.

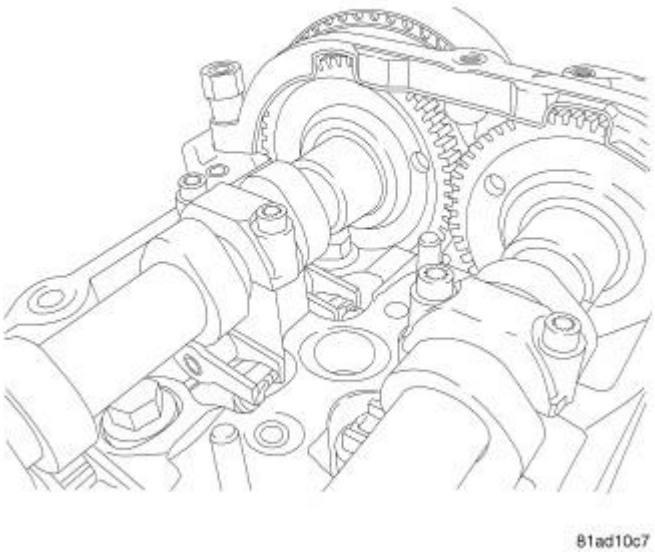

Fig. 121: Camshafts Set To 90 Degrees ATDC
Courtesy of CHRYSLER LLC

3. To correctly set engine timing, the camshafts must be set to 90° ATDC. The Camshaft Locking Tool VM.9991 is used to correctly set the camshafts to their proper location. The illustration above shows camshafts set at 90° ATDC.

Removal

REMOVAL - CAMSHAFT

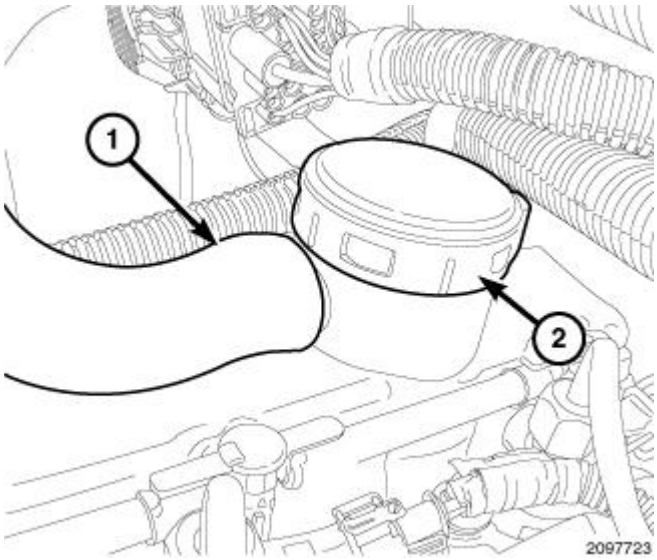

Fig. 122: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove engine cover.
3. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
4. Disconnect the crankcase vent hose (1) from the oil separator (2).

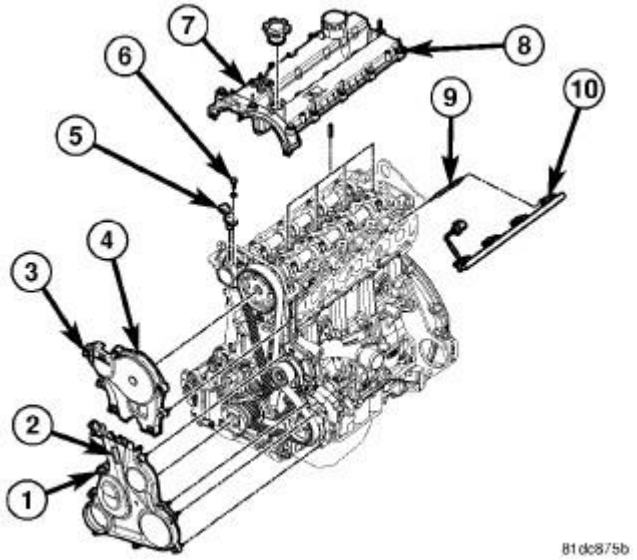

Fig. 123: Upper And Lower Front Covers
Courtesy of CHRYSLER LLC

5. Remove the cylinder head cover (7). See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal**.

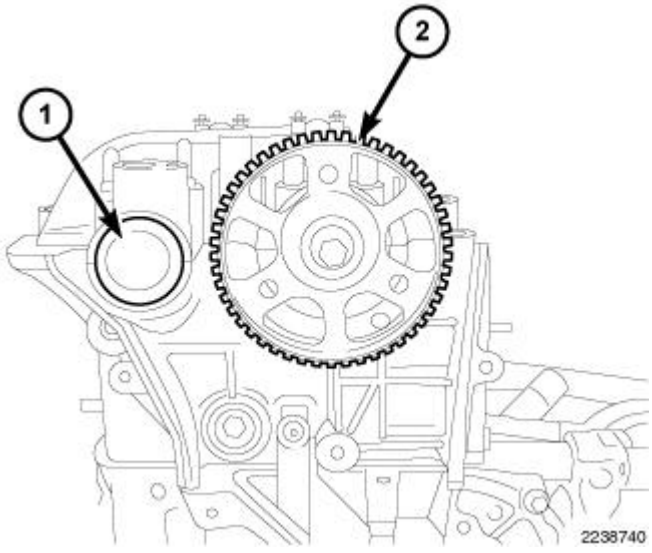

Fig. 124: Camshaft Sprocket
Courtesy of CHRYSLER LLC

6. Remove the camshaft sprocket (2). See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Removal**.

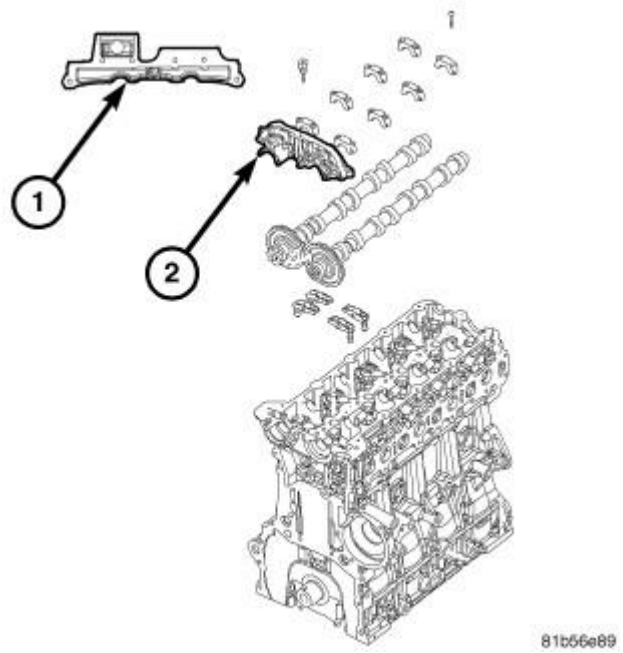

Fig. 125: Front Camshaft Bearing Journal
Courtesy of CHRYSLER LLC

7. Remove bolts, and the front camshaft bearing journal (2).

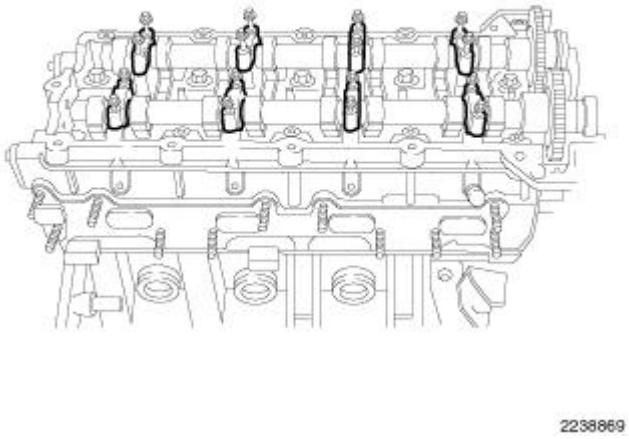

Fig. 126: Camshaft Cap Bolts
Courtesy of CHRYSLER LLC

8. Using a circular pattern, loosen the camshaft bearing cap bolts.

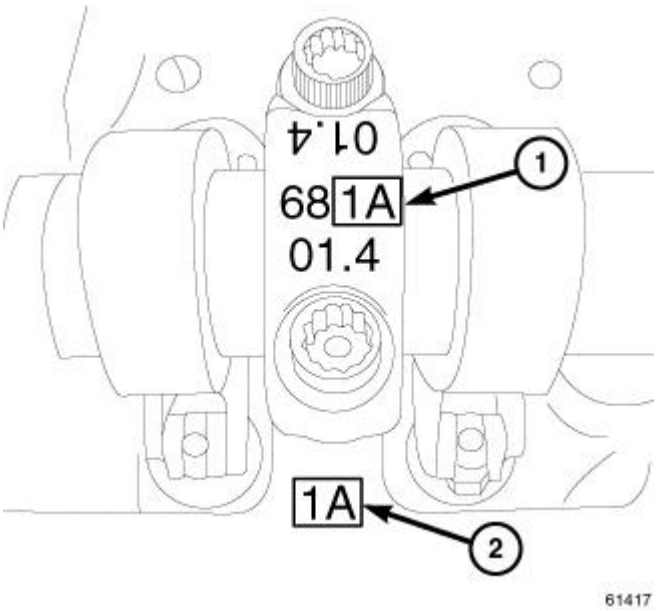

Fig. 127: Identifying Camshaft Cap & Cylinder Head (Intake Side) Markings
Courtesy of CHRYSLER LLC

NOTE: The camshaft bearing caps must be installed in the same location and direction as they were removed. Match the marks on the camshaft cap to the marks on the cylinder head (1). The illustration is an example of a camshaft cap mark.

9. Remove the camshaft bearing caps.

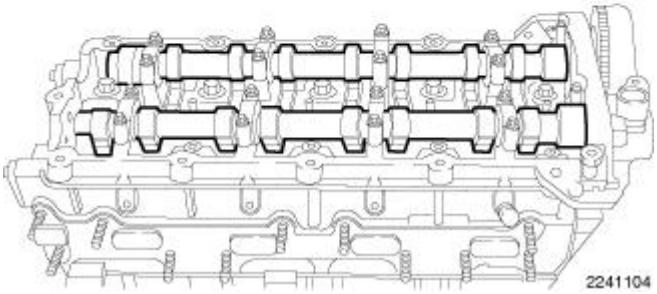

Fig. 128: Camshafts
Courtesy of CHRYSLER LLC

10. Remove the camshafts.

Installation

INSTALLATION - CAMSHAFT

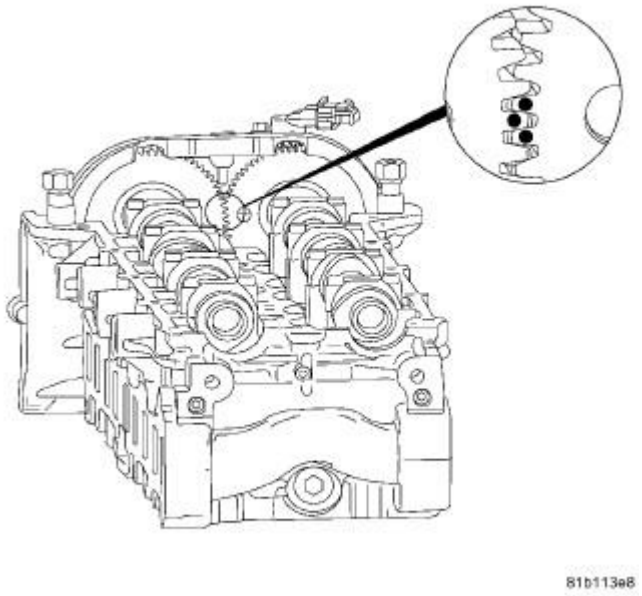

Fig. 129: Camshaft Timing Dots
Courtesy of CHRYSLER LLC

1. Lubricate the camshaft journals with Mopar® Engine Oil Supplement, or equivalent.

NOTE: The dots on the back of the camshaft gears are for initial timing only. These dots are for timing the camshafts to each other. To correctly set engine timing, the camshafts must be set to 90° ATDC. The camshaft locking tool is used to correctly set the camshafts to their proper location.

2. Make sure that the three small orientation dots marks on the back side of the camshaft gears are horizontal and facing each other.
3. Carefully install camshafts onto the camshaft journals and align the dots.

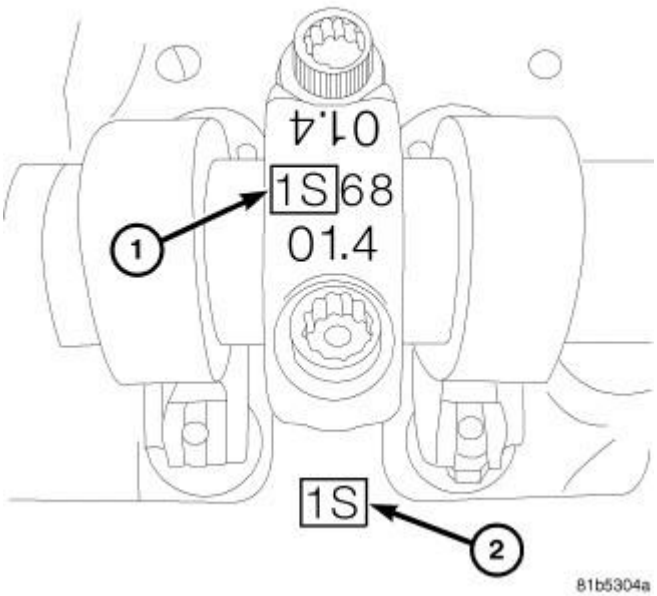

Fig. 130: Identifying Camshaft Cap & Cylinder Head (Exhaust Side) Markings
Courtesy of CHRYSLER LLC

4. The camshaft cap must be aligned with the mark (1) aligned in the same direction as the cylinder head mark (2). In the illustration, the camshaft cap is the first cylinder (indicated by the 1S); the exhaust side of the cylinder head (indicated by the 1S). Each camshaft cap location is marked in this manner on both the camshaft cap and cylinder head. It is critical that all of the camshaft caps are returned to their correct.

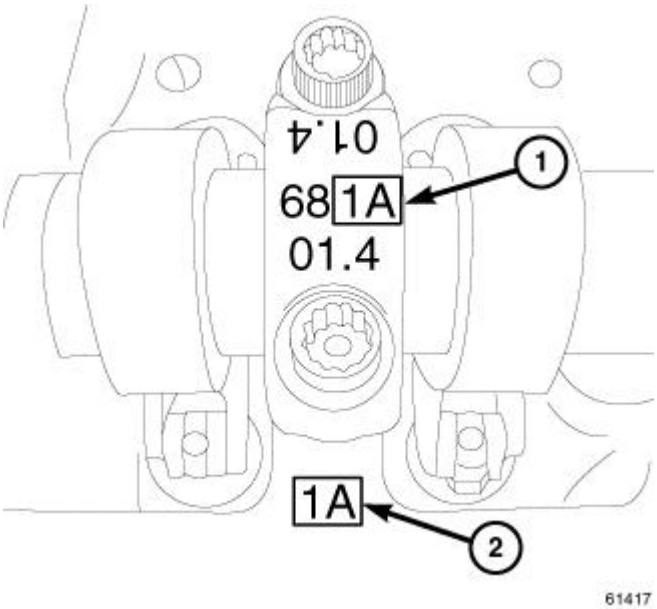

Fig. 131: Identifying Camshaft Cap & Cylinder Head (Intake Side) Markings
Courtesy of CHRYSLER LLC

5. The camshaft cap must be aligned with the mark (1) aligned in the same direction as the cylinder head

mark (1). In the illustration, the camshaft cap is the first cylinder (indicated by the 1A); the intake side of the cylinder head is (indicated by the 1A). Each camshaft cap location is marked in this manner on both the camshaft cap and cylinder head. It is critical that all of the camshaft caps are returned to their correct locations.

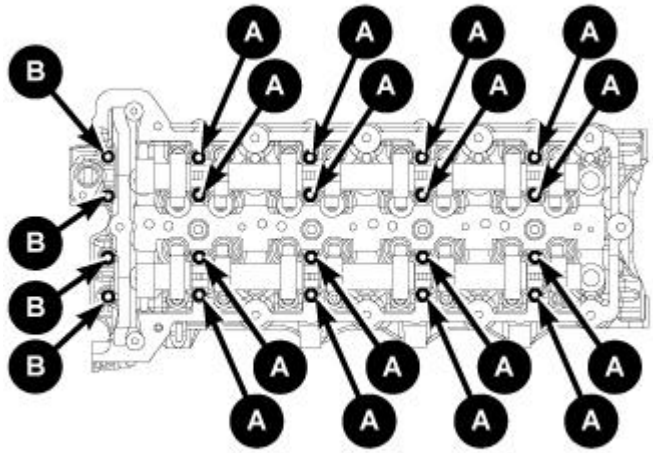

Fig. 132: Identifying Camshaft Bolts
Courtesy of CHRYSLER LLC

NOTE: When the camshaft caps are removed, always replace the camshaft cap bolts.

6. The camshaft bolts have 3 different bolt sizes:
   - Bolts A are M6 35 mm
   - Bolts B are M6 45 mm

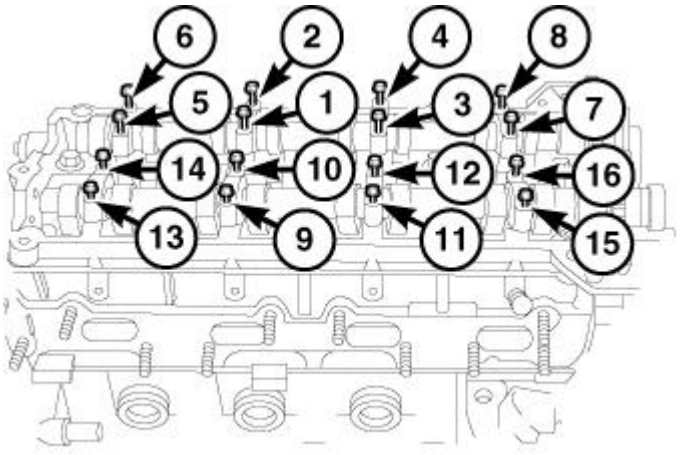

Fig. 133: Identifying Camshaft Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

7. Using new bolts and the tightening sequence shown in illustration, install the camshaft bolts and tighten bolts in one turn increments until finger tight.

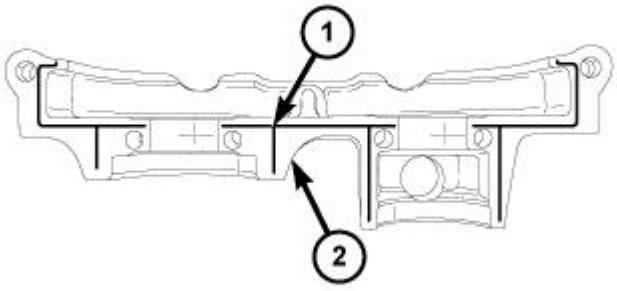

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Fig. 134: Applying Sealant To Front Camshaft Bearing Journal
Courtesy of CHRYSLER LLC

8. Apply a thin bead of Loctite® 510 to the front camshaft bearing journal (1) in the location illustrated (1).
9. Install the front camshaft bearing journal and tighten the new bolts finger tight.

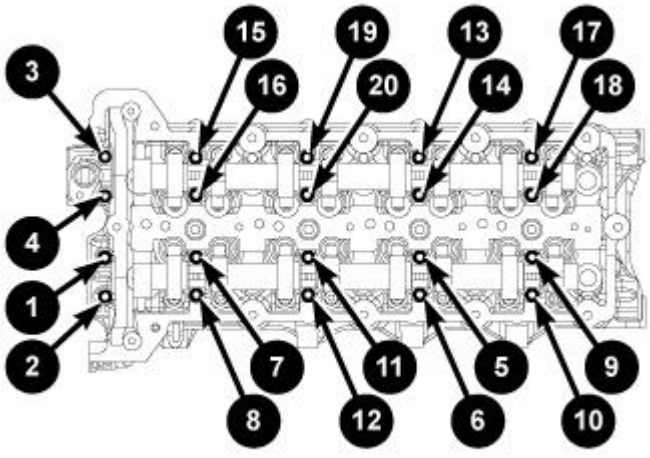

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Fig. 135: Camshaft Cap Bolt Torque Sequence

Courtesy of CHRYSLER LLC

10. Using the tightening sequence shown in illustration, tighten the camshaft cap bolts to 11 N.m (97 in. lbs.).

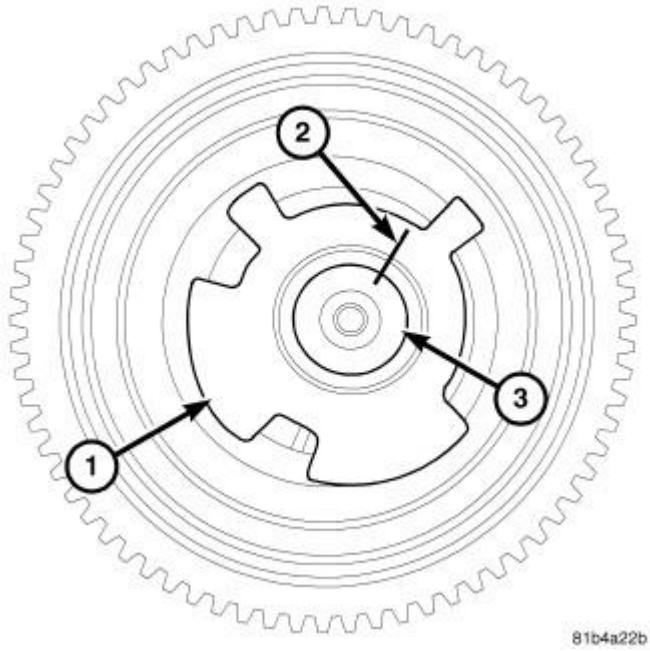


Fig. 136: Marking CMP Sensor Reluctor Wheel & Exhaust Camshaft
Courtesy of CHRYSLER LLC

11. Use a paint marker to mark the location of the camshaft tone wheel on the camshaft. It is critical that the tone wheel is not rotated on the camshaft.

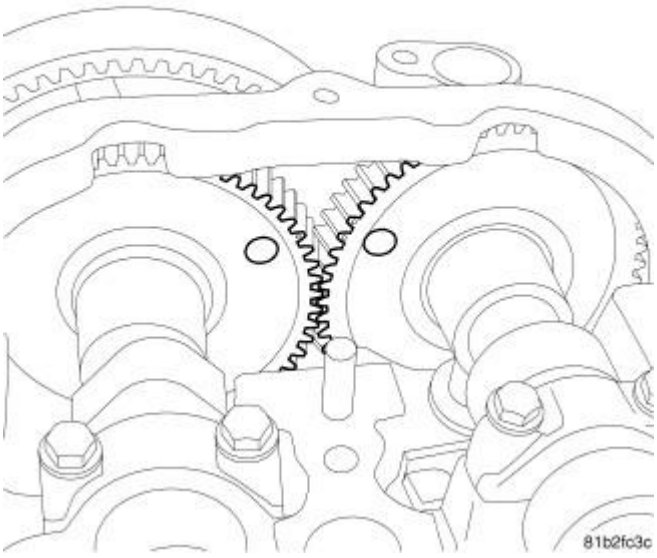


Fig. 137: Camshaft Marks At 90 Degrees ATDC

Courtesy of CHRYSLER LLC

WARNING: DO NOT USE CAMSHAFT LOCKING TOOL VM.9991 TO ROTATE THE ENGINE. THE TOOL MAY ROTATE THE TONE WHEEL ON THE CAMSHAFT. IF THE TONE WHEEL IS ROTATED ON THE CAMSHAFT, THE CAMSHAFT MUST BE REPLACED.

12. Rotate the camshafts so that the Camshaft Locking Tool VM.9991 fits into place.

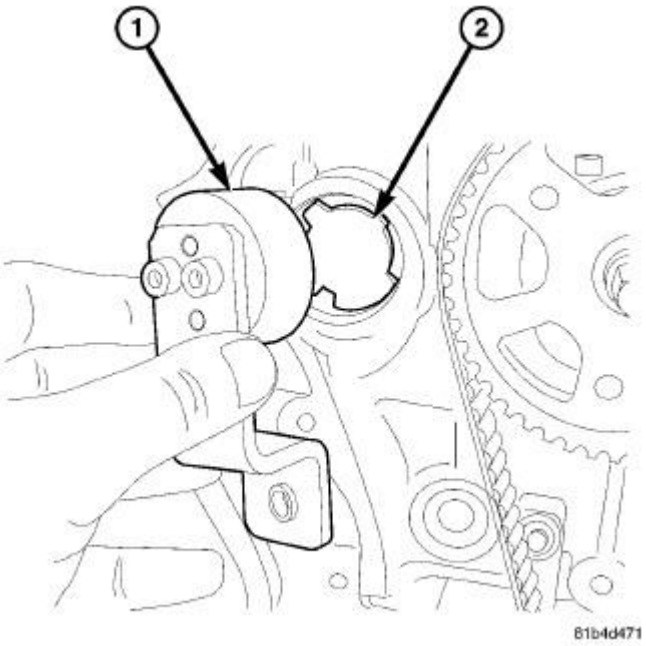


Fig. 138: INSTALLING CAMSHAFT LOCK TOOL
Courtesy of CHRYSLER LLC

13. Install the Camshaft Locking Tool VM.9991 (1).

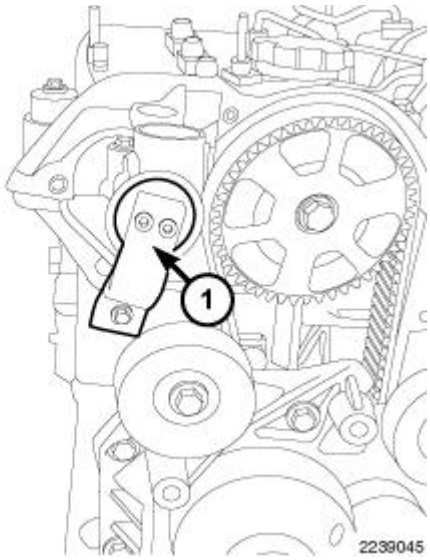


Fig. 139: Camshaft Locking Tool
Courtesy of CHRYSLER LLC

14. When the Camshaft Locking Tool VM.9991 (1) is bolted in place, the camshafts are locked at 90 degrees ATDC.

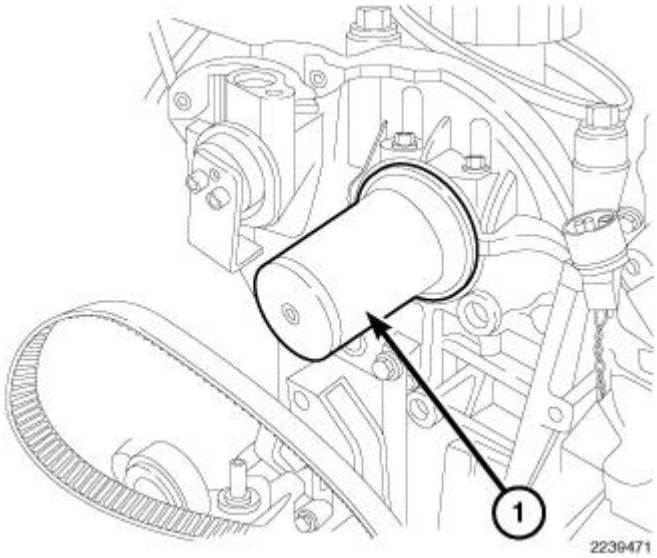


Fig. 140: Seal Installer
Courtesy of CHRYSLER LLC

15. Using the Seal Guide 9937-2 and Seal Installer (1) 9937-1 (1), install the intake camshaft oil seal.

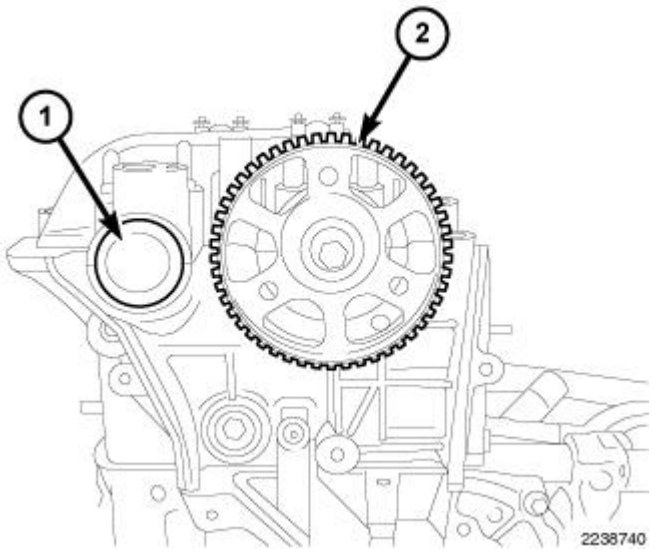


Fig. 141: Camshaft Sprocket
Courtesy of CHRYSLER LLC

16. Install the camshaft sprocket (2). See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Installation**.

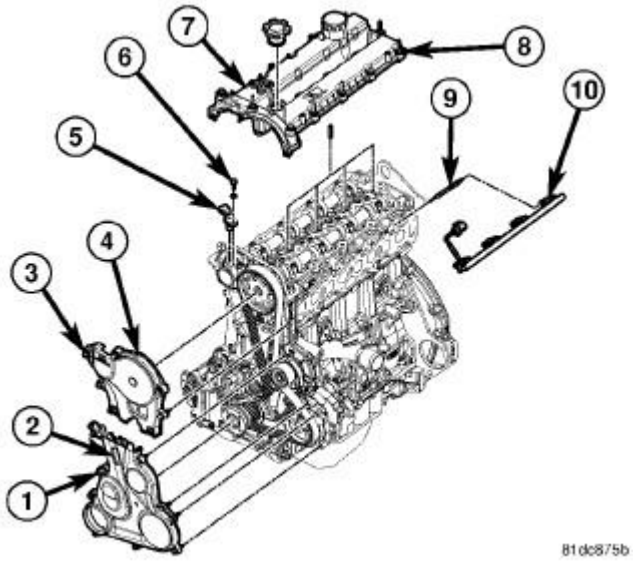


Fig. 142: Upper And Lower Front Covers
Courtesy of CHRYSLER LLC

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

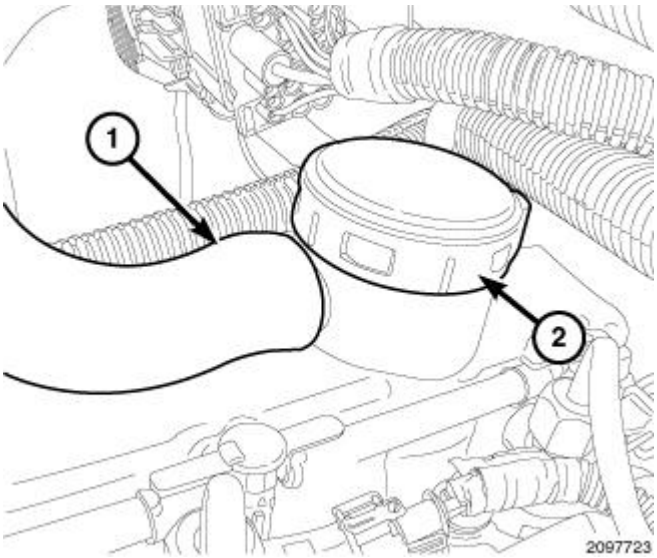


Fig. 143: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

18. Connect the crankcase vent hose (1) from the oil separator (2).
19. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
20. Install the engine cover.
21. Connect negative battery cable.

CHECKING CAMSHAFT ENDPLAY

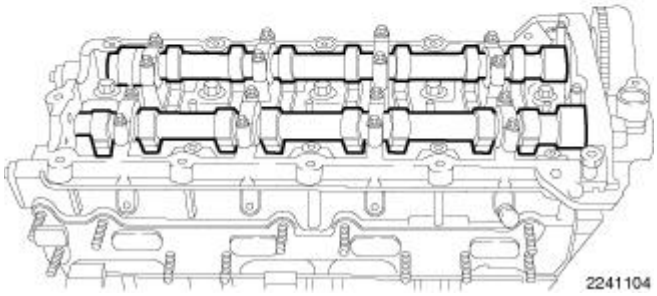


Fig. 144: Camshafts
Courtesy of CHRYSLER LLC

1. After camshafts are properly installed in cylinder head cover check end play of camshafts with a dial indicator.

NOTE: If the camshaft endplay is not within specification, replace the cylinder head.

2. Measure the camshaft end play with a dial indicator. The end play should be between 0.15 mm 0.35 mm (0.006 in - 0.014 in.).

COVER(S), CYLINDER HEAD

Description

DESCRIPTION

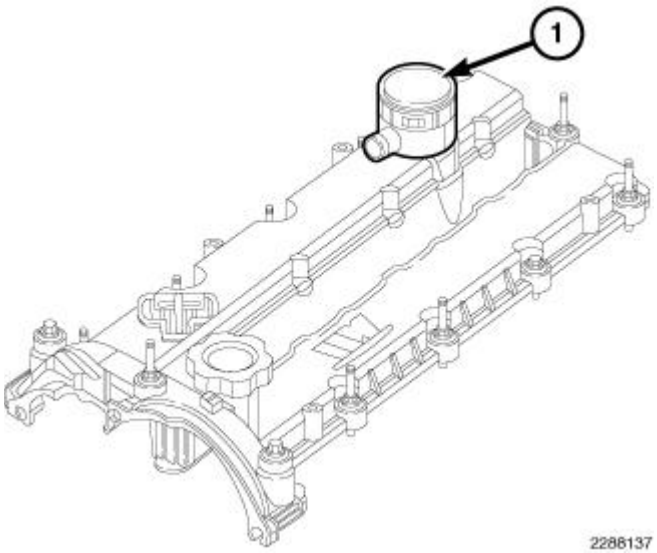


Fig. 145: Crankcase Ventilation (CCV) System
Courtesy of CHRYSLER LLC

The cylinder head cover is made of an injection molded composite and incorporates crankcase ventilation (CCV) system (1).

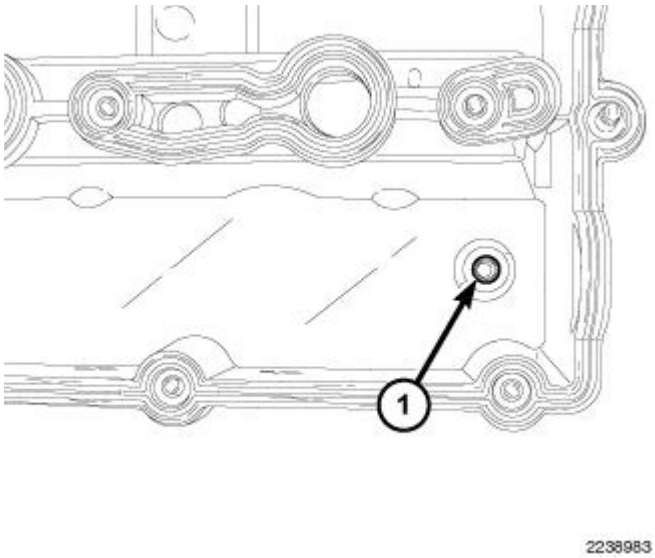


Fig. 146: Oil Drain Back Access Hole
Courtesy of CHRYSLER LLC

The cylinder head cover also incorporates a oil drain back hole (1) for the crankcase ventilation (CCV) system.

Removal

REMOVAL - CYLINDER HEAD COVER

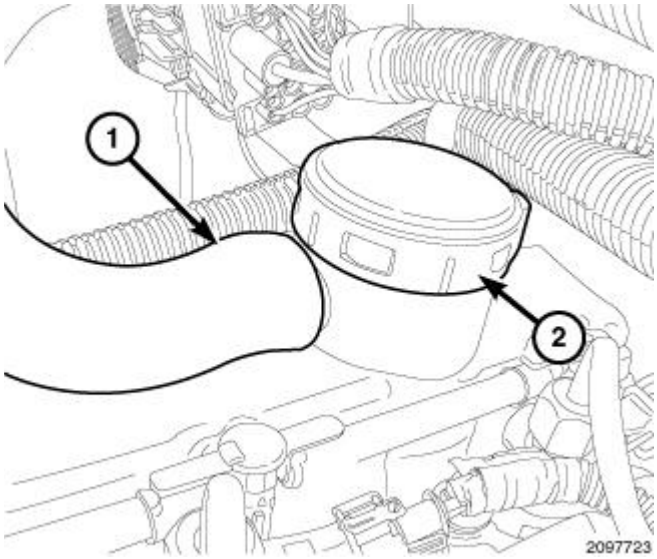


Fig. 147: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
4. Disconnect the crankcase vent hose (1) from the oil separator (2).

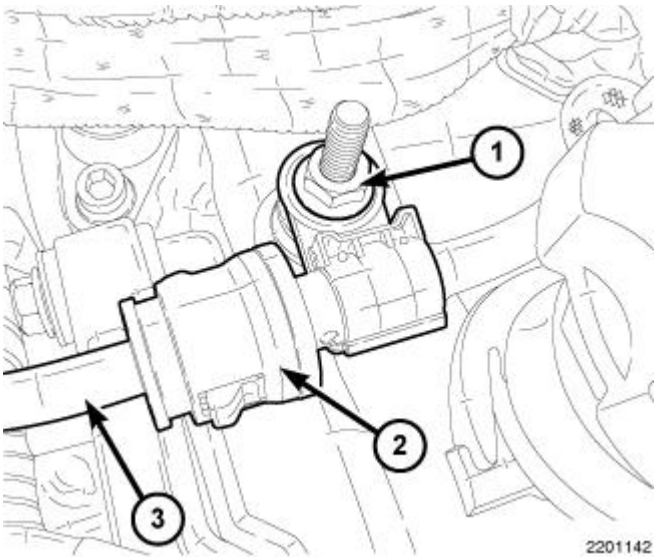


Fig. 148: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

5. Remove the retaining nut (1) and disconnect the fuel injector return line (2).

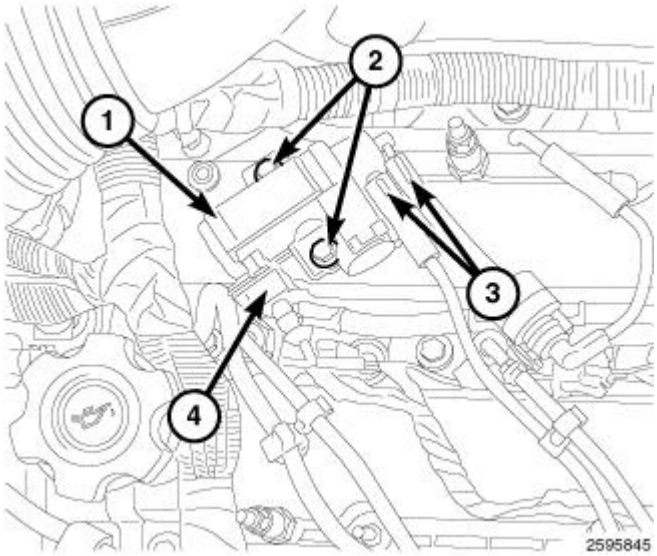


Fig. 149: EGR Vacuum Solenoid Vacuum Lines & Harness Connector
Courtesy of CHRYSLER LLC

6. Disconnect the EGR vacuum solenoid vacuum lines (3).
7. Disconnect the EGR vacuum solenoid harness connector (4).
8. Remove bolts (2) and the vacuum solenoid (1).

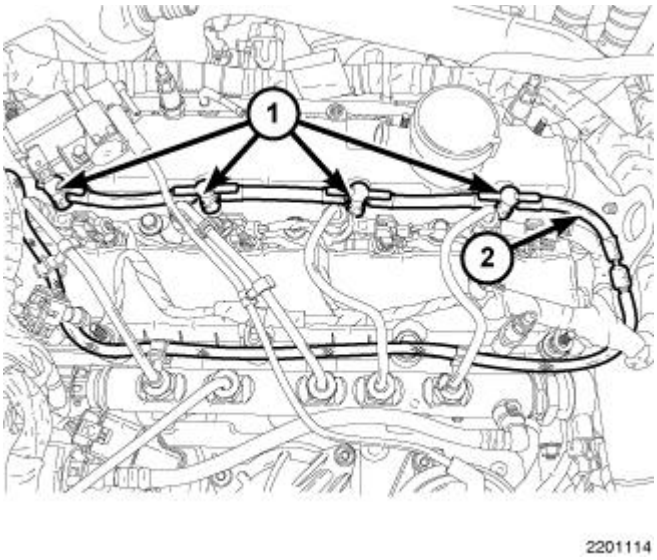


Fig. 150: Common Fuel Return Line
Courtesy of CHRYSLER LLC

9. A lock button (1) is used to secure the common fuel return line to each fuel injector. Use your fingers to lift up all four lock buttons (1) to unlock them. After unlocking all four buttons, lift fuel return line assembly and remove the fuel injector return line (2).

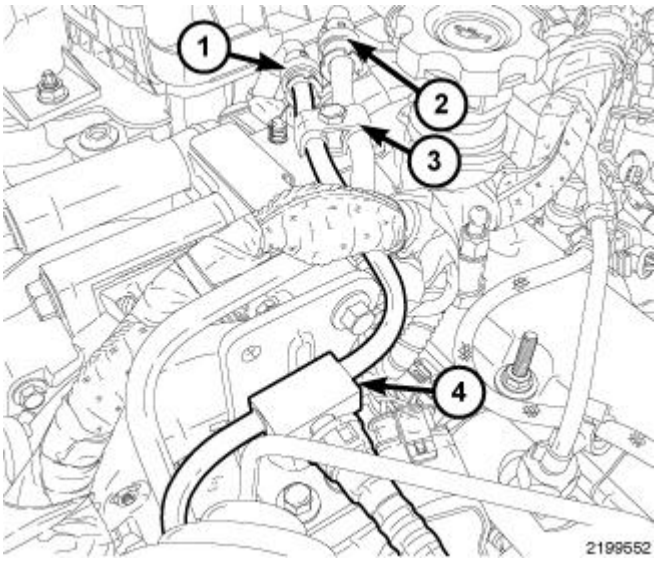


Fig. 151: Fuel Return Line Block
Courtesy of CHRYSLER LLC

10. Disconnect the fuel return line (1).
11. Disconnect the fuel feed line (2).
12. Remove the fuel line mounting bracket (3).
13. Remove the fuel return line block (4).

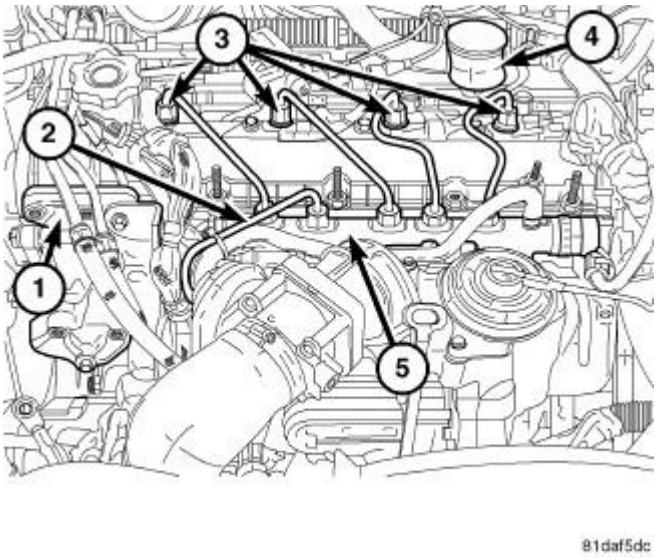


Fig. 152: FUEL RAIL
Courtesy of CHRYSLER LLC

14. Remove the fuel tubes (3). Refer to **Fuel System/Fuel Delivery/TUBE(S), Fuel - Removal** .

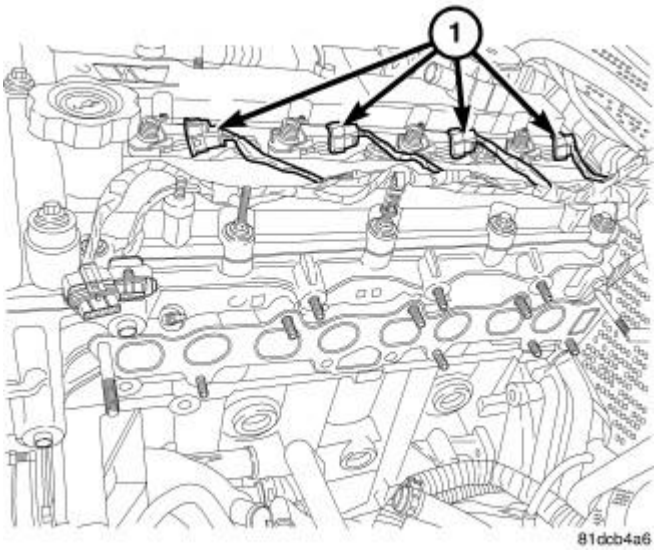


Fig. 153: Fuel Injectors
Courtesy of CHRYSLER LLC

15. Disconnect the fuel injector harness connectors from the fuel injectors (1).

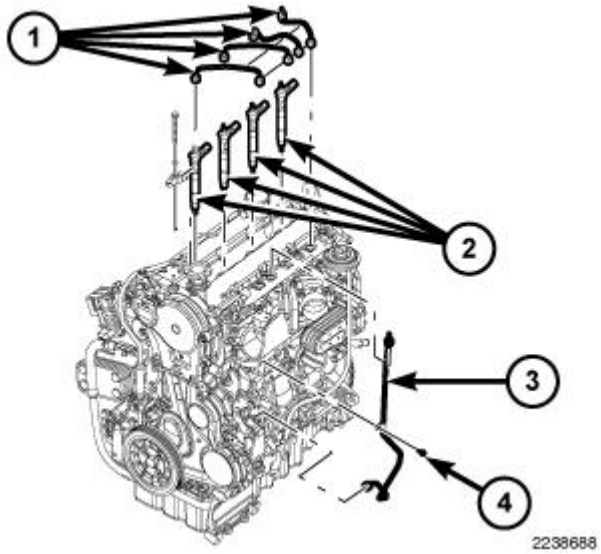


Fig. 154: Fuel Injectors
Courtesy of CHRYSLER LLC

16. Remove bolts and the fuel injectors (2).

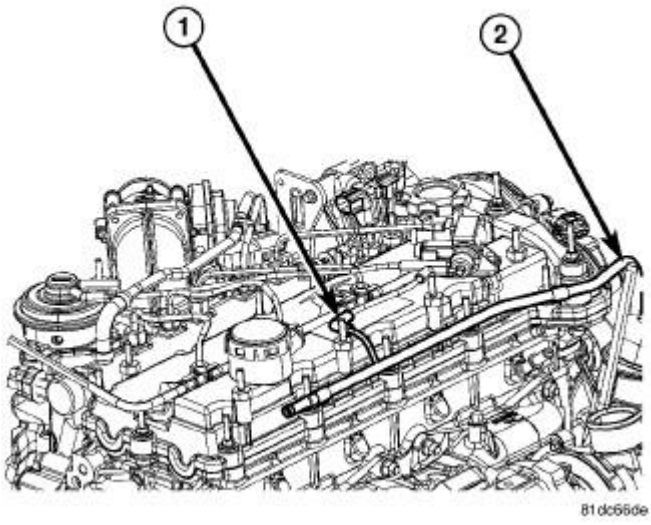


Fig. 155: Vacuum Supply Tube
Courtesy of CHRYSLER LLC

17. Remove the engine wire harness retaining clips from the cylinder head cover stud bolts.
18. Disconnect the vacuum line (1).
19. Disconnect the vacuum line (2) from the vacuum pump.
20. Remove retaining nuts and remove the vacuum line (2).

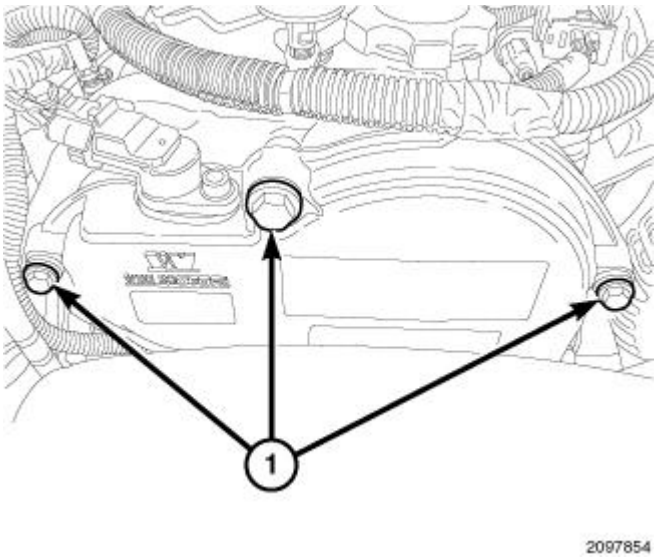


Fig. 156: Upper Cover Bolts
Courtesy of CHRYSLER LLC

NOTE: The upper cover bolts are encased in a collar which does not permit them to be removed.

21. Loosen the upper front timing cover bolts (1).

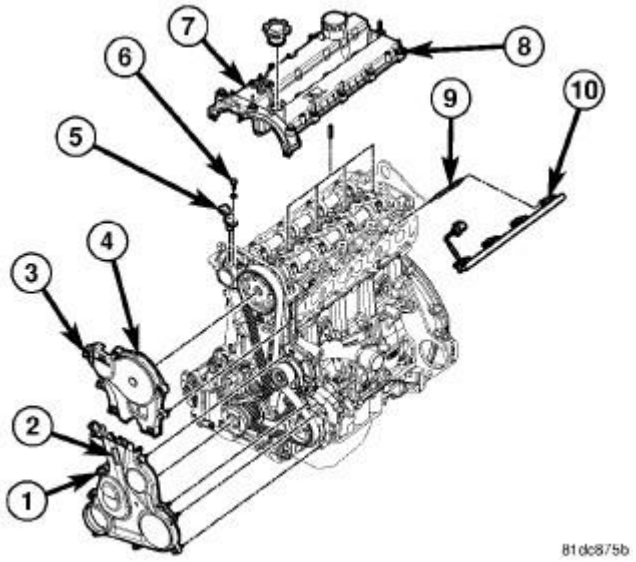


Fig. 157: Upper And Lower Front Covers
Courtesy of CHRYSLER LLC

22. Remove the 12 fasteners (8) and the cylinder head cover (7).

Installation

INSTALLATION - CYLINDER HEAD COVER

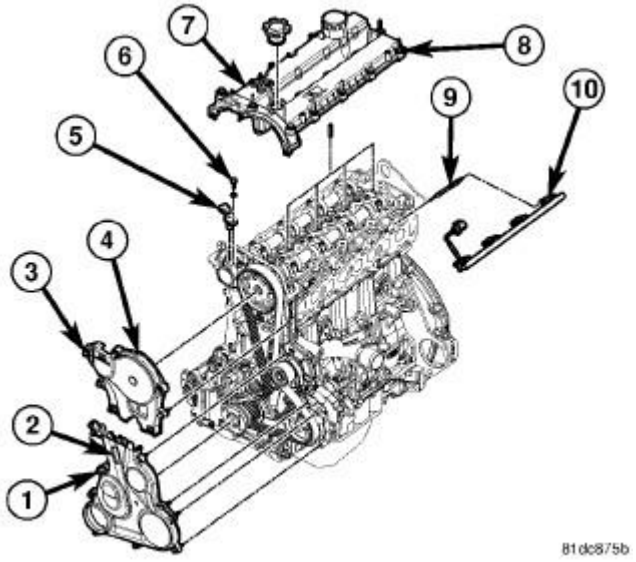


Fig. 158: Upper And Lower Front Covers
Courtesy of CHRYSLER LLC

1. Clean the sealing surfaces and inspect the gasket or replace if necessary.
2. Install the cylinder head cover (7). Tighten fasteners to 11 N.m (97 in. lbs.).

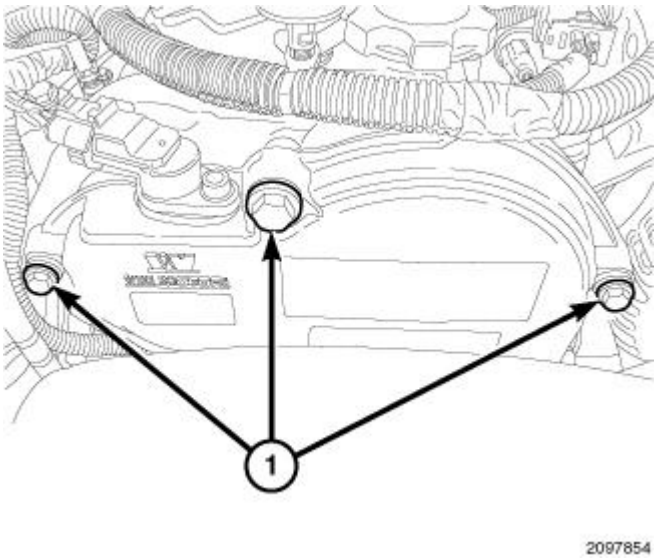


Fig. 159: Upper Cover Bolts
Courtesy of CHRYSLER LLC

3. Tighten the upper front timing cover bolts (1) to 8 N.m (71 in. lbs.).

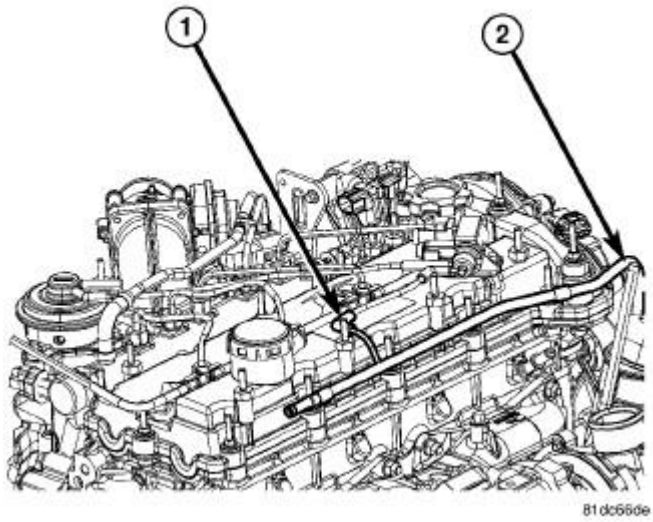


Fig. 160: Vacuum Supply Tube
Courtesy of CHRYSLER LLC

4. Install the vacuum line (2) and securely tighten the retaining nuts.
5. Connect the vacuum line (2) to the vacuum pump.
6. Connect the vacuum line (1) to the fitting.
7. Install the engine wire harness retaining clips from the cylinder head cover stud bolts.

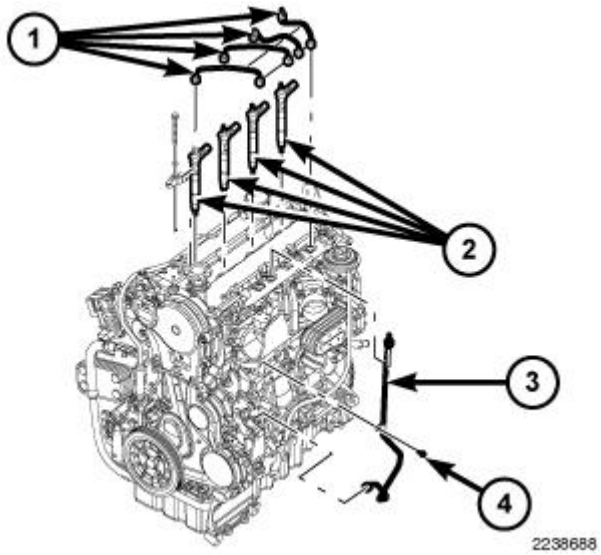


Fig. 161: Fuel Injectors
Courtesy of CHRYSLER LLC

8. Using new washers, install injectors (2) and injector retainer claw.
9. Install the injector clamp bolts. Tighten bolts to 33 N.m (24 ft. lbs.).

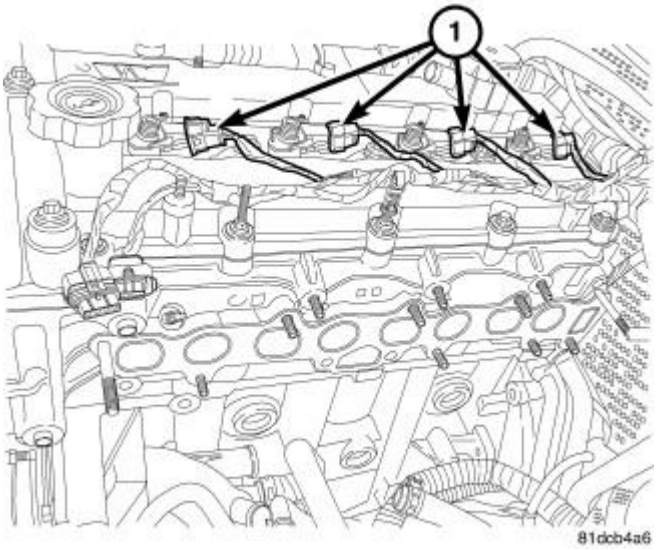


Fig. 162: Fuel Injectors
Courtesy of CHRYSLER LLC

10. Connect the fuel injector harness connectors (1).

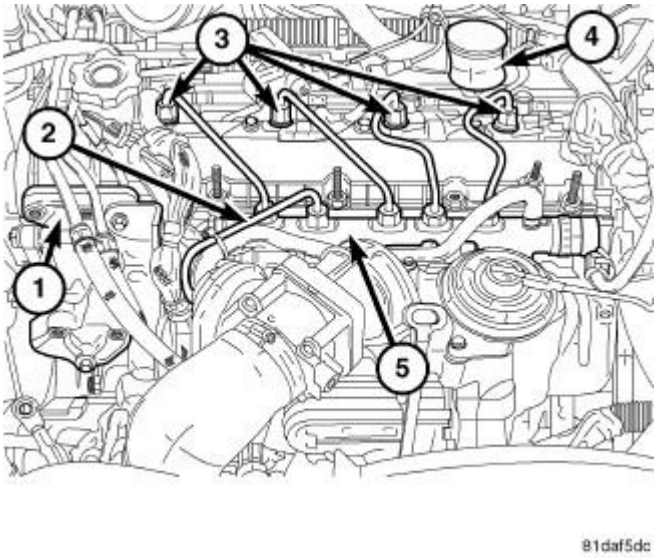


Fig. 163: FUEL RAIL
Courtesy of CHRYSLER LLC

11. Install the fuel tubes (3). Refer to **Fuel System/Fuel Delivery/TUBE(S), Fuel - Installation** .

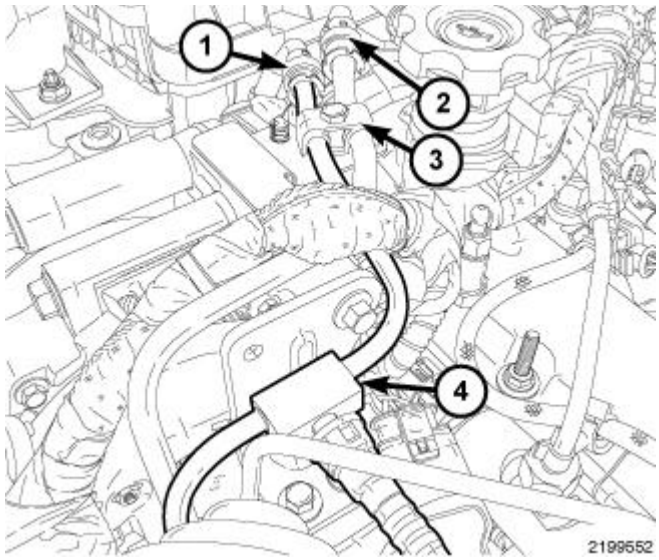


Fig. 164: Fuel Return Line Block
Courtesy of CHRYSLER LLC

12. Install the fuel return line block (4).
13. Install the fuel line mounting bracket (3).
14. Connect the fuel feed line (2).
15. Connect the fuel return line (1).

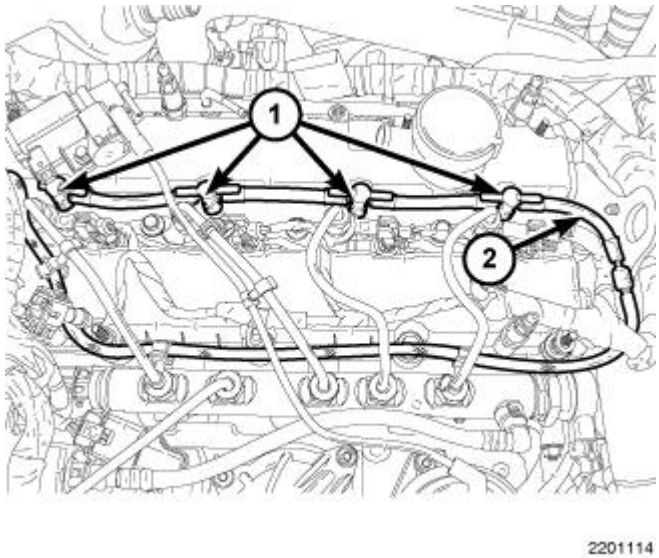


Fig. 165: Common Fuel Return Line
Courtesy of CHRYSLER LLC

16. Install the fuel injector fuel return line (2) onto the fuel injector and push down on the lock tab (1) to lock in place.

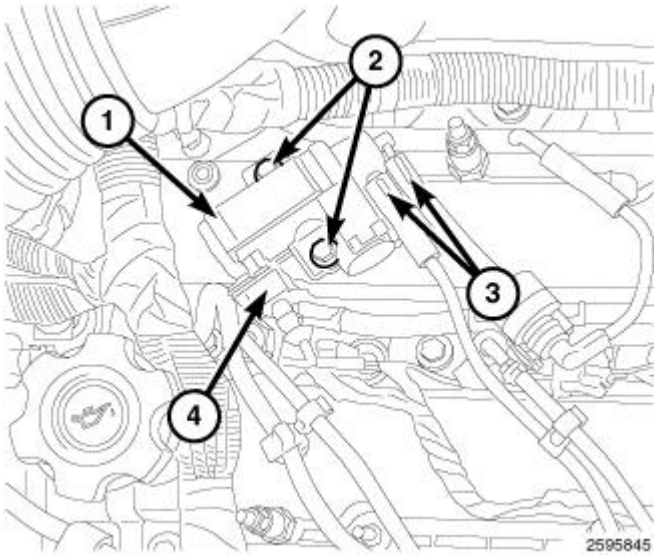


Fig. 166: EGR Vacuum Solenoid Vacuum Lines & Harness Connector
Courtesy of CHRYSLER LLC

17. Install the EGR vacuum solenoid (1). Tighten bolts to 12 N.m (106 in. lbs).
18. Connect the EGR vacuum solenoid harness connector (4).
19. Connect the EGR vacuum solenoid vacuum lines (3).

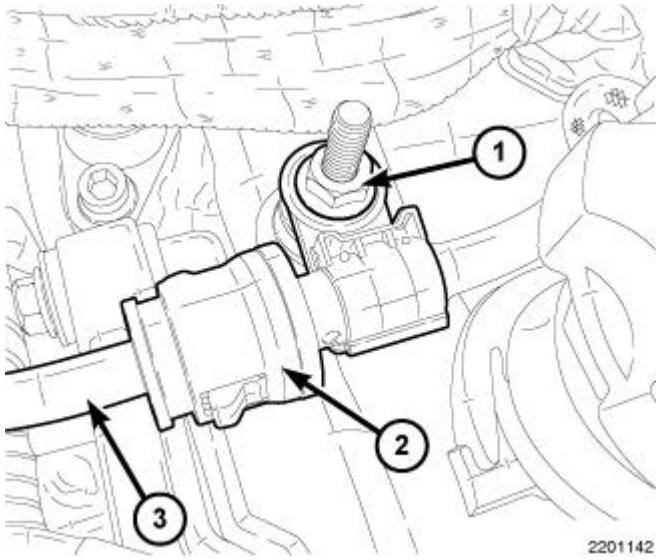


Fig. 167: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

20. Connect the fuel injector return line (2) and securely tighten the retaining nut (1).

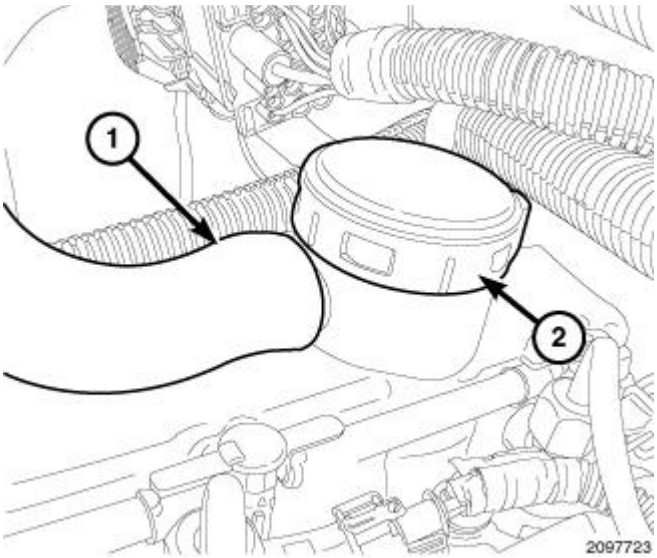


Fig. 168: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

21. Connect the crankcase vent hose (1) to the oil separator (2).
22. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
23. Install the engine cover.
24. Connect the negative battery cable.

LIFTER(S), HYDRAULIC

Description

DESCRIPTION

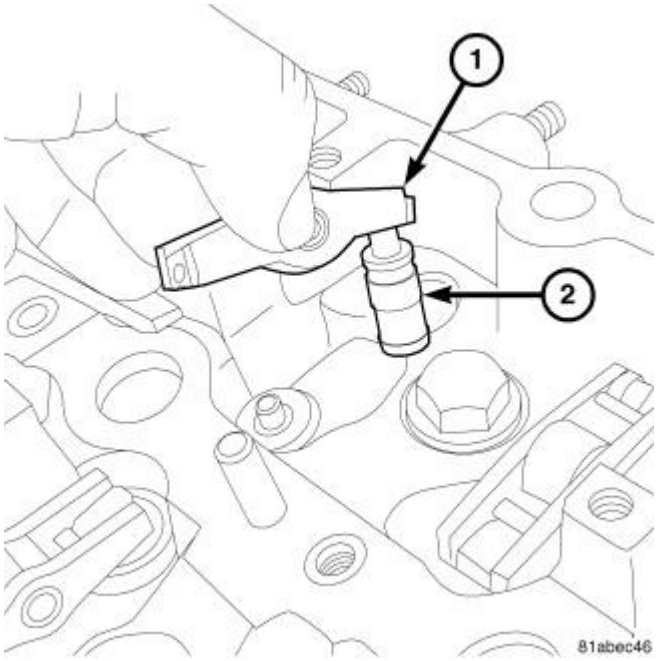


Fig. 169: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

Valve lash is controlled by hydraulic tappets (2) located inside the cylinder head, in tappet bores below the camshafts.

Removal

REMOVAL

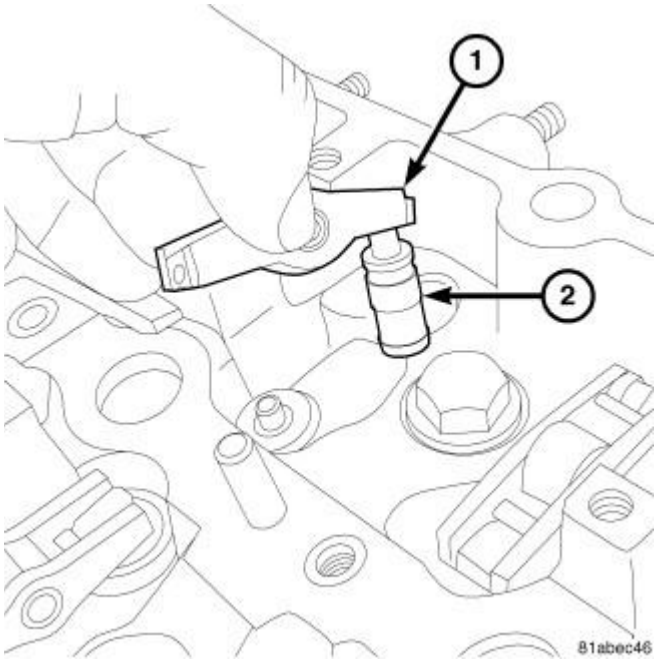


Fig. 170: Rocker Arms & Hydraulic Lifters

Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Removal**.

NOTE: Always return the hydraulic lifters to their original location in the cylinder head.

3. Remove the rocker arms (1) and hydraulic lifters (2).

Inspection

INSPECTION

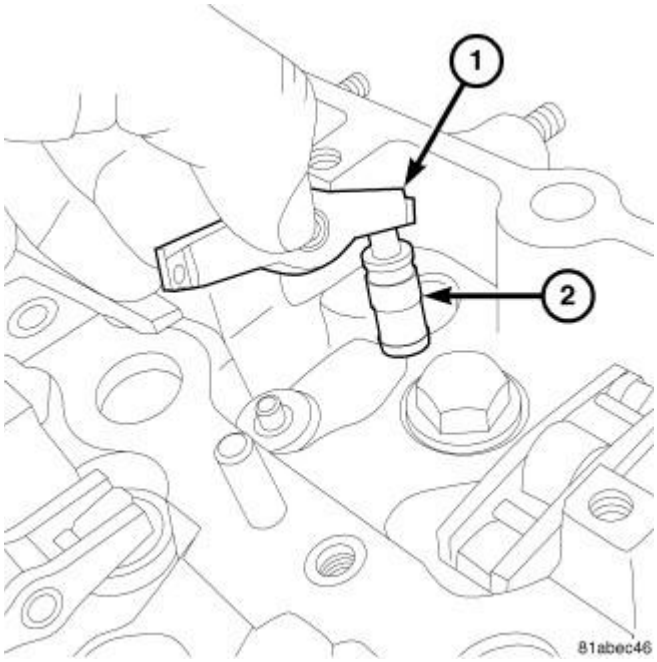


Fig. 171: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

Clean each lifter assembly (1) in cleaning solvent to remove all varnish and sludge deposits. Inspect for indications of scuffing on the side and base of each lifter body.

Installation

INSTALLATION

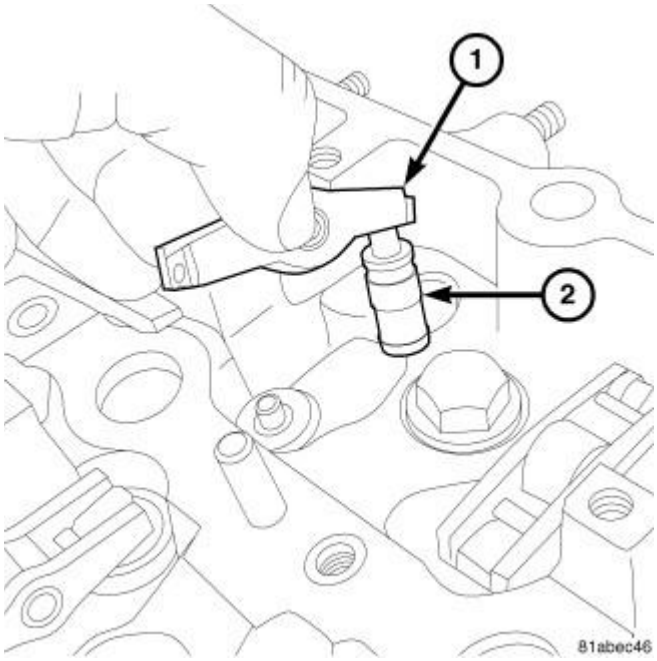


Fig. 172: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

1. Install the rocker arms (1) and hydraulic lifters (2) into their original locations.
2. Install the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation**.
3. Connect the negative battery cable.

ROCKER ARM, VALVE

Description

DESCRIPTION

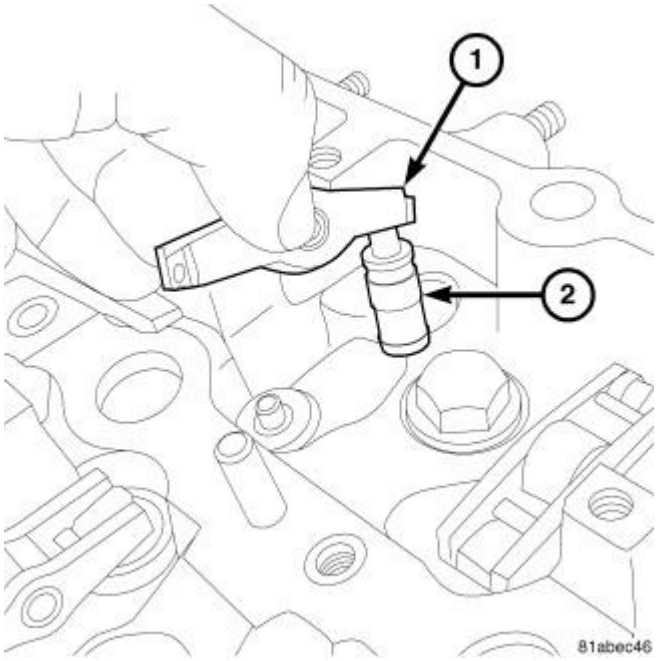


Fig. 173: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

The rocker arms (1) are made of stamped steel and serviced as an assembly along with the lifter.

The rocker arms (1) are used as a link between the camshaft and valves. As the camshaft rotates, the lobes of the camshafts apply downward pressure on the rocker arms (1). This pressure is then applied to the hydraulic lifter (2) which opens the valve.

Removal

REMOVAL - ROCKER ARM

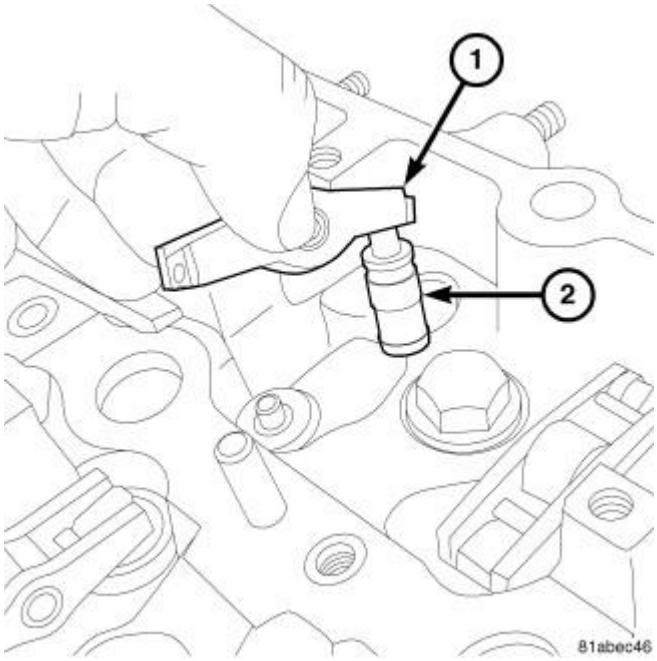


Fig. 174: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

CAUTION: Before removing the cylinder head cover/intake manifold (2) the engine must rotated to 90° after TDC to assure proper alignment of the engine timing components. Failure to do so could result in valve and/or piston damage during reassembly. See Engine/Valve Timing - Standard Procedure.

1. Disconnect negative battery cable.
2. Remove the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Removal**.
3. Remove rocker arms (1) and lifters (2).

Installation

INSTALLATION - ROCKER ARM

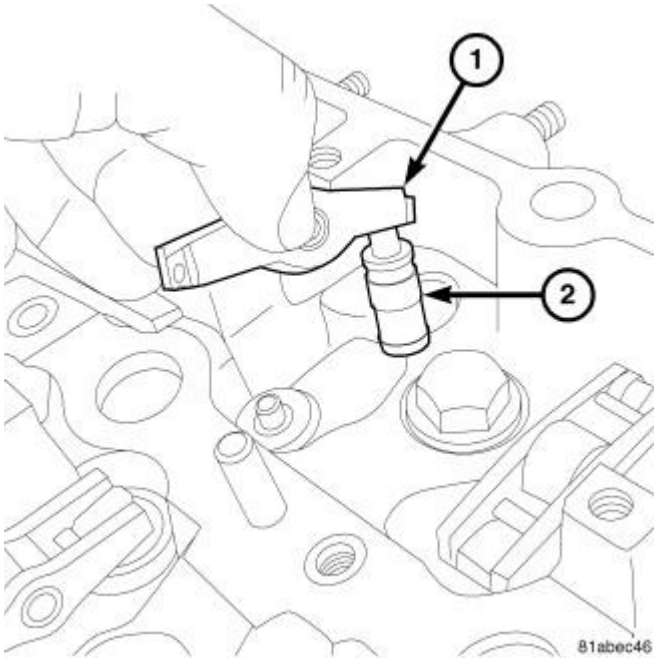


Fig. 175: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER LLC

1. Clean and inspect gasket sealing surfaces.
2. Lubricate lifter ball end of lifter(s), valve(s), and rocker arm roller(s) with Mopar® Engine Oil Supplement or equivalent.
3. Connect rocker arm(s) to lifter and position on valve(s).
4. Install the camshafts. See **Engine/Cylinder Head/CAMSHAFT, Engine - Installation**.
5. Connect negative battery cable.

SEAL(S), CAMSHAFT

Removal

REMOVAL - CAMSHAFT OIL SEAL

CAUTION: Before removing the timing belt, the engine must be placed at 90° after TDC. Failure to do so may result in valve and/or piston damage during assembly.

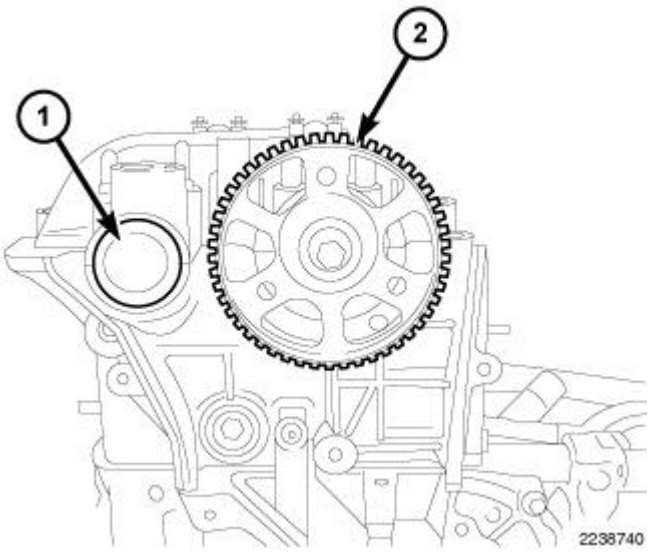


Fig. 176: Camshaft Sprocket
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the intake camshaft sprocket (2). See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Removal**.

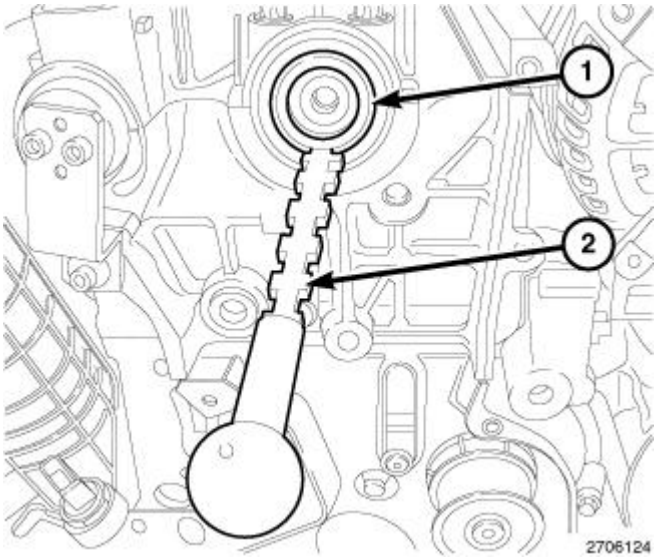


Fig. 177: SEAL REMOVER & SEAL
Courtesy of CHRYSLER LLC

3. Install the Seal Remover VM.1058 (2) into seal (1) as illustrated.

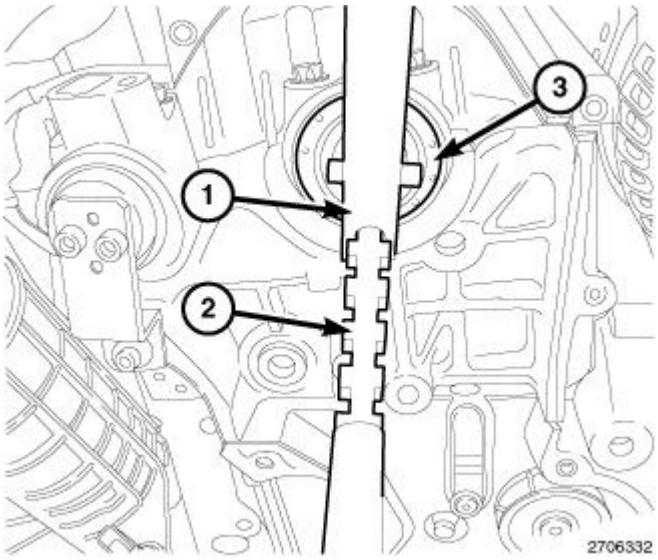


Fig. 178: Identifying Seal Remover Handle, Seal Remover & Intake Camshaft Oil Seal
Courtesy of CHRYSLER LLC

4. Position the Seal Remover Handle VM.1058 (1) onto Seal Remover VM.1058 (2) and remove the intake camshaft oil seal (3).

Installation

INSTALLATION - CAMSHAFT OIL SEAL

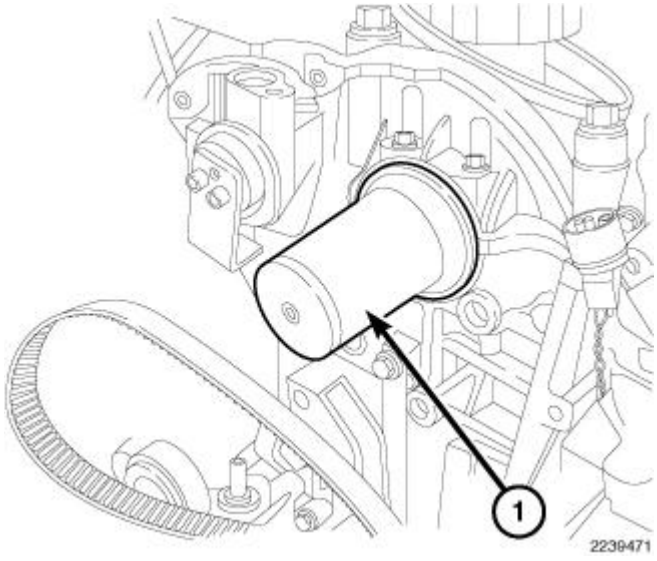


Fig. 179: Seal Installer
Courtesy of CHRYSLER LLC

1. Using the Seal Guide 9937-2 and Seal Installer (1) 9937-1 (1), install the intake camshaft oil seal.

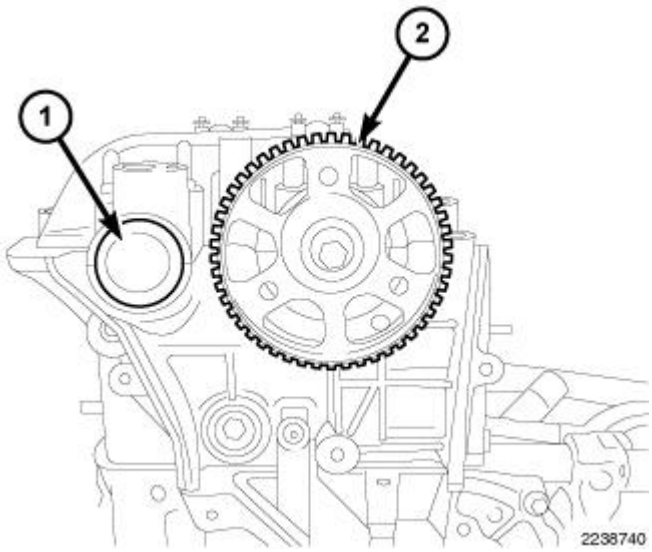


Fig. 180: Camshaft Sprocket
Courtesy of CHRYSLER LLC

2. Install the intake camshaft sprocket (2). See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Installation**.
3. Connect the negative battery cable.

ENGINE BLOCK

DESCRIPTION

DESCRIPTION

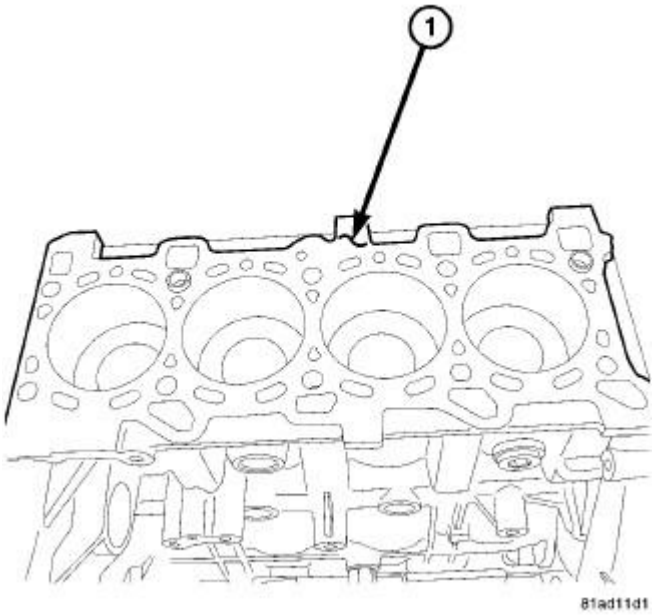


Fig. 181: ENGINE BLOCK
Courtesy of CHRYSLER LLC

The 2.8L CRD Diesel engine uses a cast iron engine block. The cylinder block has increased stiffness that reduces structural flexing and a fractured connecting rod cap design that can not distort connecting rod cap fit.

STANDARD PROCEDURE

BEARING SELECTION CHARTS

CONNECTING ROD BEARINGS - LARGE END

Connecting Rod Journal Diameter - Connecting Rod Large End	Bearing Half	Connecting Rod Journal Diameter - Crankshaft			
-	-	D	C	B	A
		53.929 - 53.936	53.936 - 53.942	53.942 - 53.948	53.948 - 53.955
A 57.563 - 57.568	Upper Bearing Shell	Blue	Blue	Red	Red
	Lower Bearing Shell	Yellow	Blue	Blue	Red
-					
B 57.568 - 57.573	Upper Bearing Shell	Yellow	Blue	Blue	Red
	Lower Bearing Shell	Yellow	Yellow	Blue	Blue
-					

C 57.573 - 57.578	Upper Bearing Shell	Yellow	Yellow	Blue	Blue
	Lower Bearing Shell	Green	Yellow	Yellow	Blue
-					
D 57.578 - 57.583	Upper Bearing Shell	Green	Yellow	Yellow	Blue
	Lower Bearing Shell	Green	Green	Yellow	Yellow

CRANKSHAFT BEARINGS

Cylinder Block Seat Diameter	**Bearing Half**	**Crankshaft Main Journal Diameter**			
-	-	**D**	**C**	**B**	**A**
		64.974 - 64.981	**64.981 - 64.987**	**64.987 - 64.993**	**64.993 - 65.000**
A 69.000 - 69.005	Upper Bearing Shell	Blue	Blue	Red	Red
	Lower Bearing Shell	Yellow	Blue	Blue	Red
-					
B 69.005 - 69.010	Upper Bearing Shell	Yellow	Blue	Blue	Red
	Lower Bearing Shell	Yellow	Yellow	Blue	Blue
-					
C 69.010 - 69.015	Upper Bearing Shell	Yellow	Yellow	Blue	Blue
	Lower Bearing Shell	Green	Yellow	Yellow	Blue
-					
D 69.015 - 69.020	Upper Bearing Shell	Green	Yellow	Yellow	Blue
	Lower Bearing Shell	Green	Green	Yellow	Yellow

BEARING(S), CRANKSHAFT, MAIN

Removal

REMOVAL

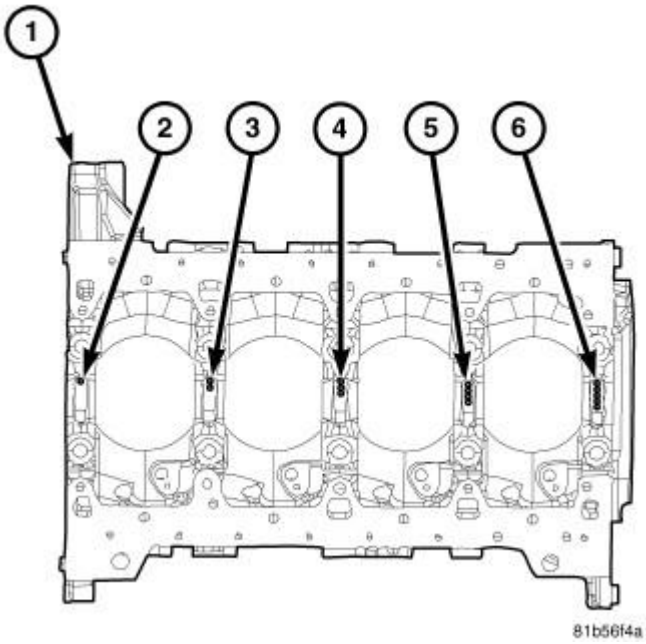


Fig. 182: CRANKSHAFT CAP LOCATION MARKS
Courtesy of CHRYSLER LLC

NOTE: Bearing caps (2-6) are not interchangeable and are marked to ensure according to their locations (2-6) in the block (1). Upper and lower bearing halves are NOT interchangeable, and must be installed facing in the correct direction.

1. Remove the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Removal**.
2. Identify bearing cap locations (2-6) before removal.

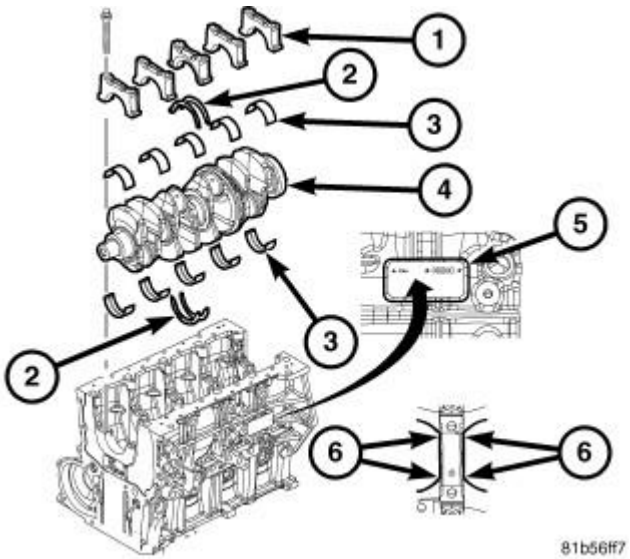
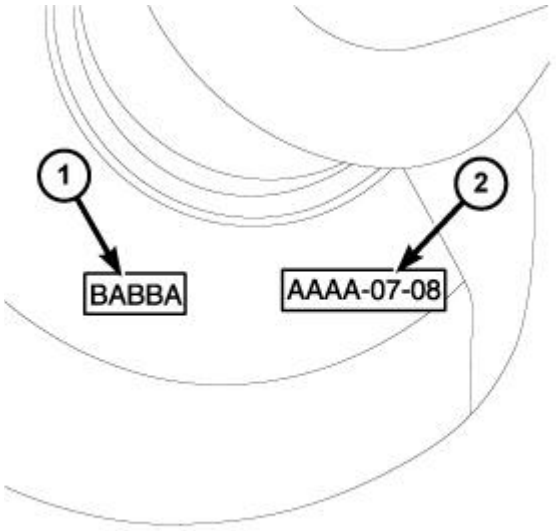


Fig. 183: CRANKSHAFT BEARING SIZE MARK
Courtesy of CHRYSLER LLC

3. Remove the bearing caps (1) one at a time, and if possible, replace the crankshaft bearings (3) one at a time. Carefully rotate upper half of bearing from between the carrier and the crankshaft (4). If the upper half of the bearing does not easily slide out of position, the crankshaft must be removed for further inspection. See **Engine/Engine Block/CRANKSHAFT - Removal**.

Installation

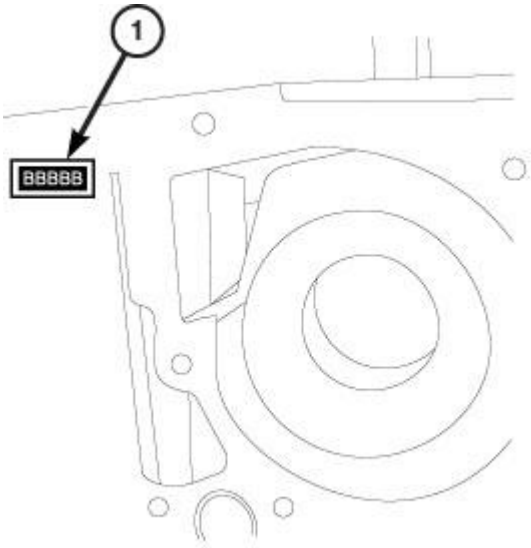
INSTALLATION



61703

Fig. 184: MAIN BEARING SIZE MARK ON CRANK
Courtesy of CHRYSLER LLC

1. Locate the crankshaft journal size (1) stamp on the crankshaft weight.



61705

Fig. 185: MAIN BEARING SIZE MARK ON BLOCK
Courtesy of CHRYSLER LLC

2. Locate the engine block crankshaft journal size stamp on the engine block (1).

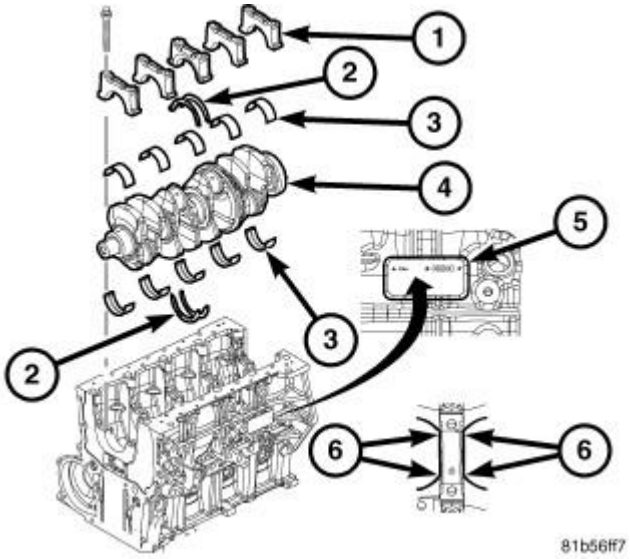


Fig. 186: CRANKSHAFT BEARING SIZE MARK
Courtesy of CHRYSLER LLC

3. Use the crankshaft stamp and engine block stamp to select the correct crankshaft bearing sizes from the bearing chart. The letters stamped into the block are in the same order as the cylinders (5). The first letter corresponds to the first cylinder, the second to the second, etc. See **Engine/Engine Block - Standard Procedure**.
4. If the crankshaft was removed to install the bearings, install the crankshaft. See **Engine/Engine Block/CRANKSHAFT - Installation**.
5. Install the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Installation**.

COVER, ENGINE, FRONT

Description

DESCRIPTION

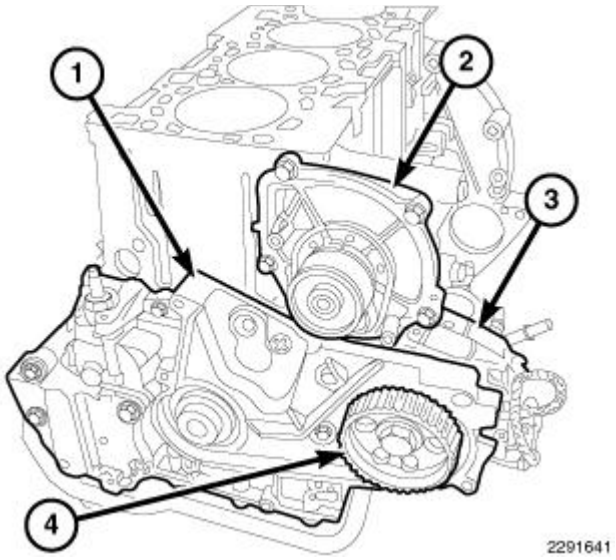


Fig. 187: Oil Pump Cover Assembly
Courtesy of CHRYSLER LLC

The front engine cover assembly on this engine is an aluminum cover that incorporates the oil pump and vacuum pump.

Removal

REMOVAL - FRONT ENGINE COVER

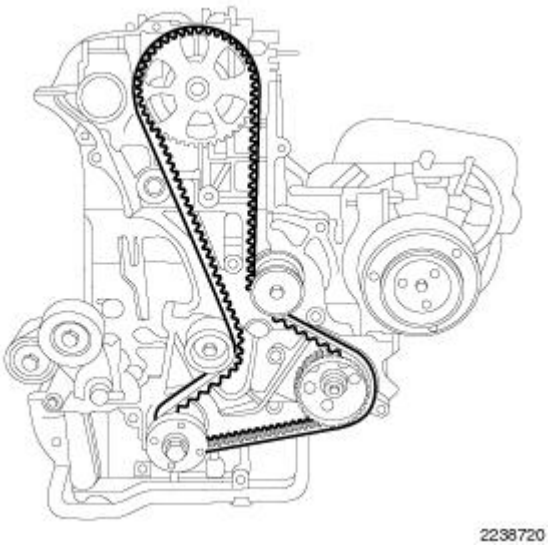


Fig. 188: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the timing belt. See **Engine/Valve Timing/BELT, Timing - Removal**.

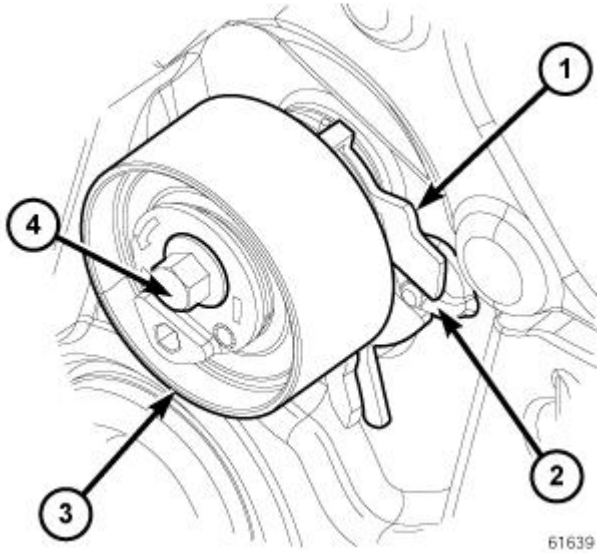


Fig. 189: Timing Belt Tensioner
Courtesy of CHRYSLER LLC

3. If necessary, remove bolt (4) and the timing belt tensioner (3).

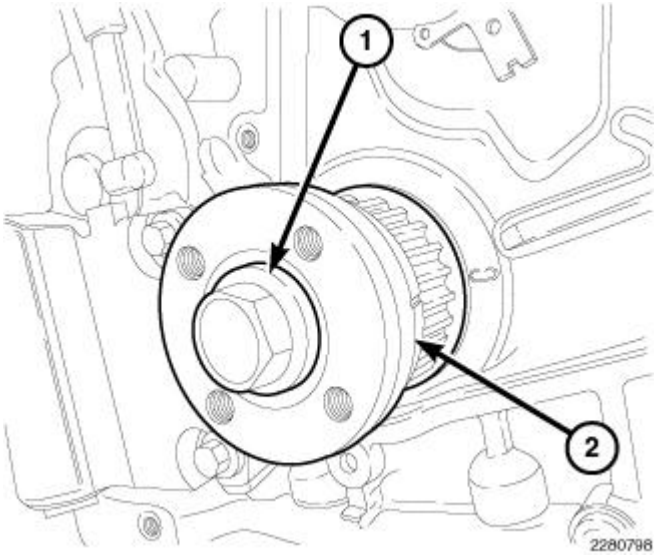


Fig. 190: Crankshaft Sprocket And Bolt
Courtesy of CHRYSLER LLC

NOTE: The crankshaft sprocket bolt is a left handed thread.

4. Remove the bolt (1) and the crankshaft sprocket (2).

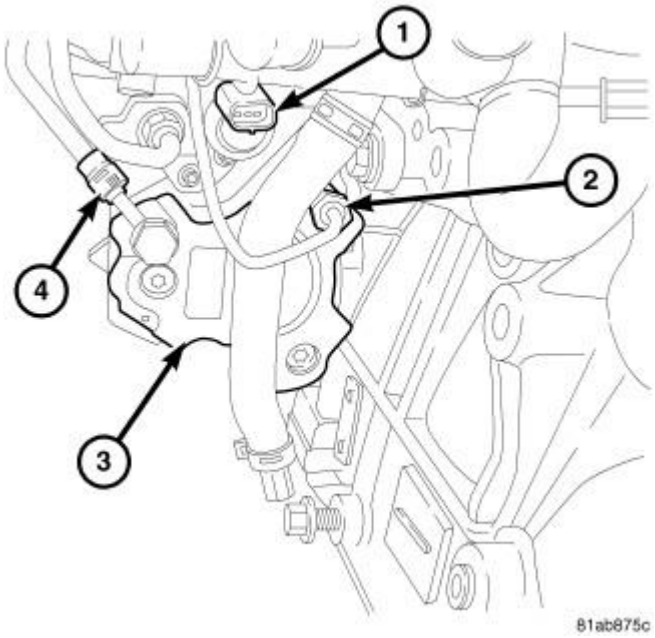


Fig. 191: High Pressure Fuel Line At Pump
Courtesy of CHRYSLER LLC

5. Disconnect high-pressure fuel line (4) at rear of pump by removing banjo bolt.
6. Disconnect high-pressure fuel line (2) at rear of pump by removing fitting at end of line.
7. Disconnect the fuel quantity solenoid harness connector (1).

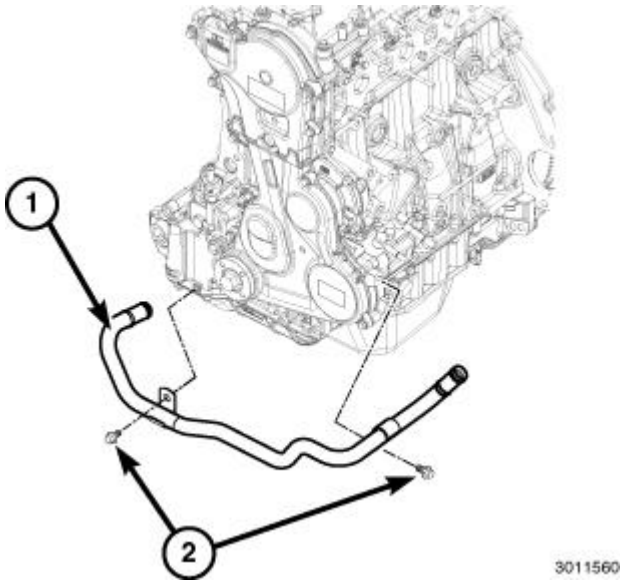


Fig. 192: Coolant Tube & Bolts
Courtesy of CHRYSLER LLC

8. Disconnect the coolant tube hose at oil cooler and by fuel injection pump.
9. Remove bolts (2), and the coolant tube (1).

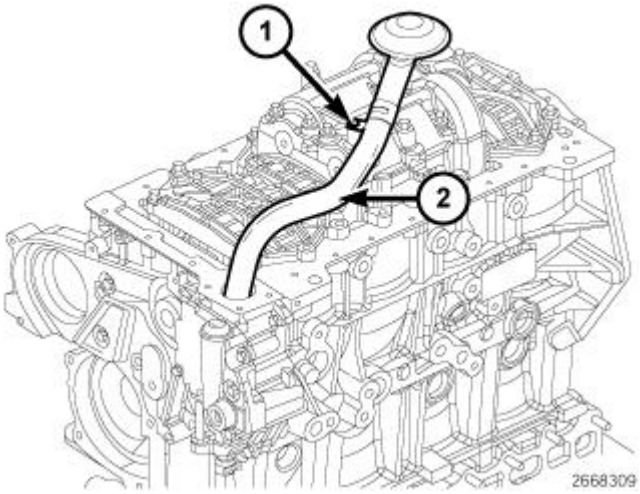


Fig. 193: Oil Pump Pickup Tube & Bolt
Courtesy of CHRYSLER LLC

10. Remove the oil pickup tube. See **Engine/Lubrication/PICK-UP, Oil Pump - Removal**.

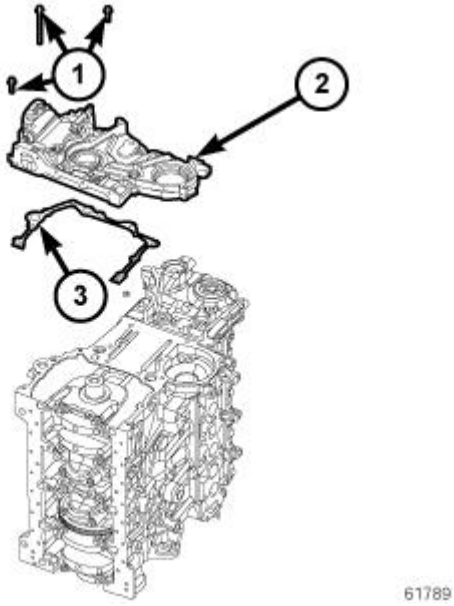


Fig. 194: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

11. Disconnect the vacuum hose at vacuum pump.
12. Remove the eight bolts (1), and the front cover assembly (2).

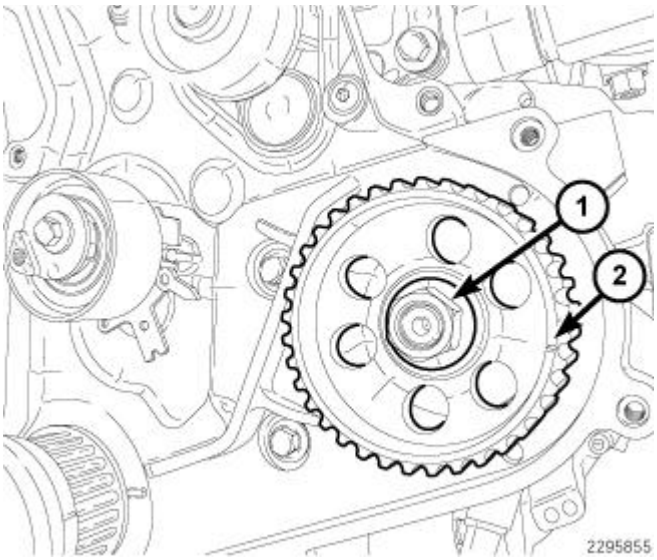


Fig. 195: Injection Pump Gear & Mounting Nut
Courtesy of CHRYSLER LLC

13. If necessary, using Locking Tool VM.1055, remove the nut (1).
14. If necessary, attach a typical 3-jaw Gear/Sprocket Puller 1023 and remove sprocket from pump.
15. If necessary, remove nuts and the injection fuel pump.

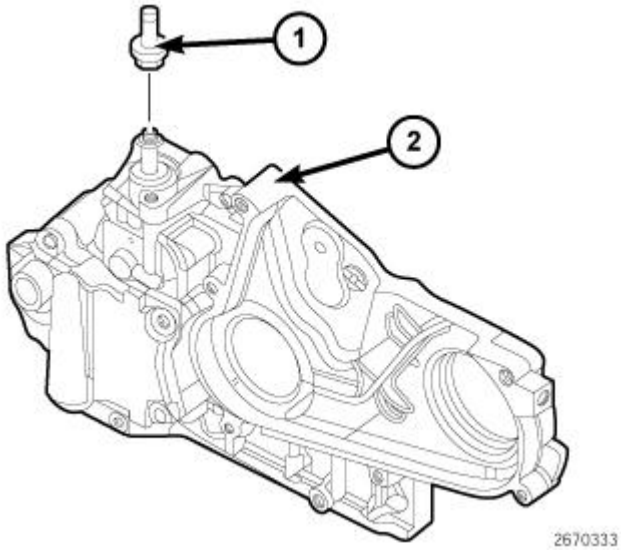


Fig. 196: Front Cover & Vacuum Pump Check Valve
Courtesy of CHRYSLER LLC

16. If necessary, remove the vacuum pump check valve.

Installation

INSTALLATION - FRONT ENGINE COVER

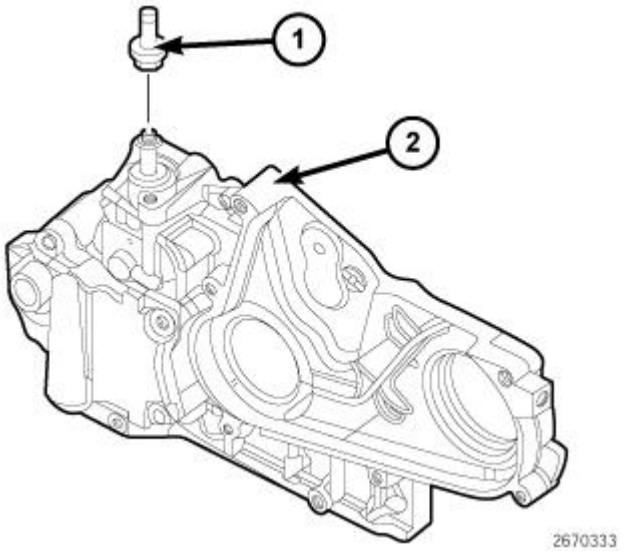


Fig. 197: Front Cover & Vacuum Pump Check Valve
Courtesy of CHRYSLER LLC

1. Clean and inspect the gasket mating services.
2. If necessary, install the front crankshaft oil seal. See **Engine/Engine Block/SEAL, Crankshaft Oil - Installation**.
3. If necessary, transfer the vacuum pump check valve (1) and securely tighten.

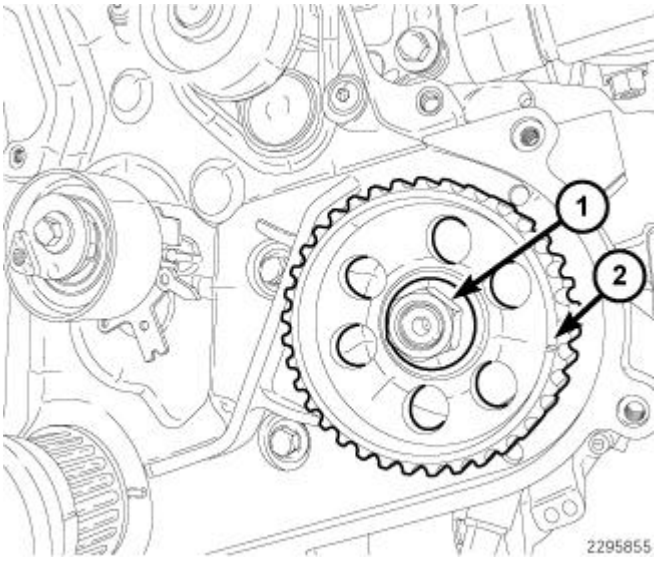


Fig. 198: Injection Pump Gear & Mounting Nut
Courtesy of CHRYSLER LLC

4. If necessary, install the high pressure fuel pump (3). Tighten nuts to 24 N.m (18 ft. lbs.).
5. Install the high pressure fuel pump (4) sprocket.
6. Using the Locking Tool VM.1055. Tighten nut (1) to 88 N.m (65 ft. lbs.).

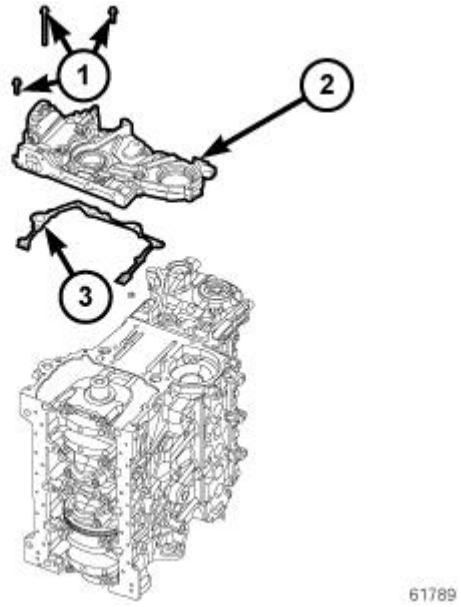


Fig. 199: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

7. Install the front cover gasket (3).
8. Install the front cover assembly (2) and tighten the eight bolts (1) finger tight.

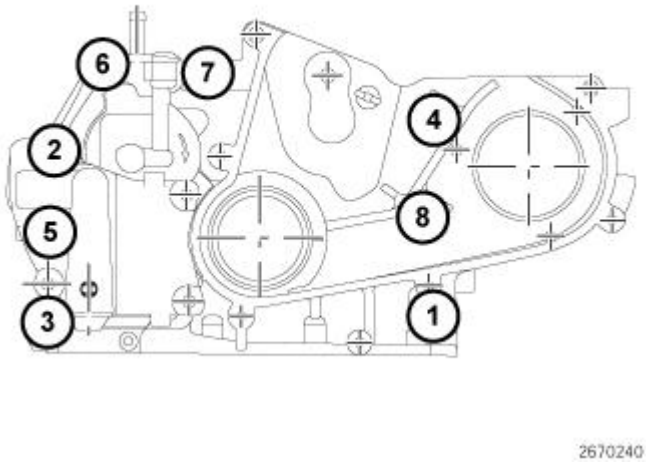


Fig. 200: Front Cover Assembly Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

9. Using the tightening sequence shown in illustration, tighten bolts to 33 N.m (24 ft. lbs.).
10. Connect the vacuum hose at vacuum pump.

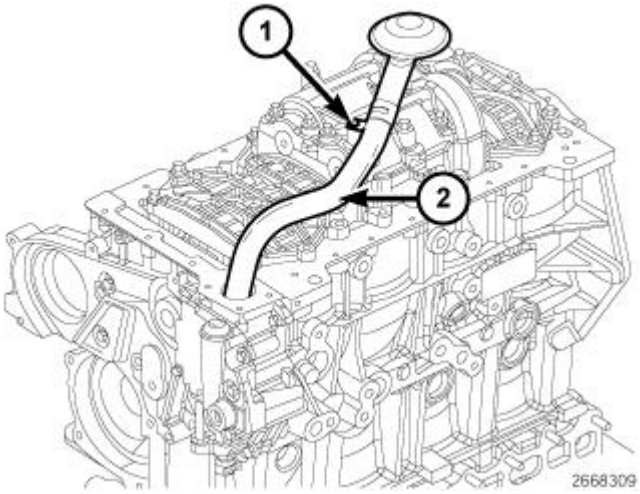


Fig. 201: Oil Pump Pickup Tube & Bolt
Courtesy of CHRYSLER LLC

11. Install the oil pump pickup tube. See **Engine/Lubrication/PICK-UP, Oil Pump - Installation**.

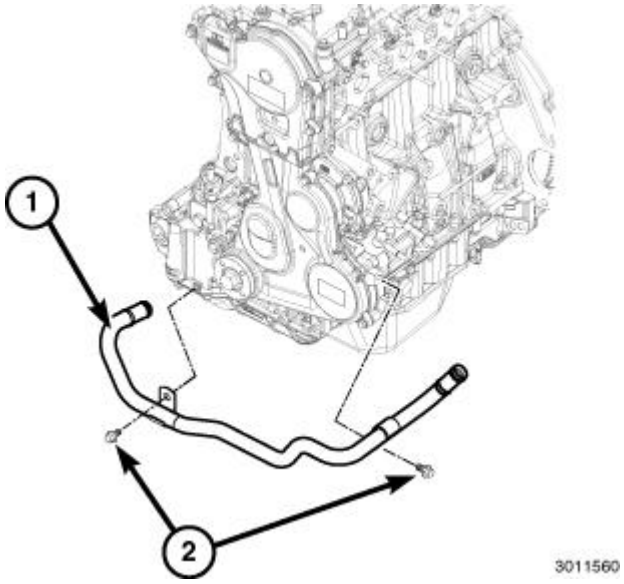


Fig. 202: Coolant Tube & Bolts
Courtesy of CHRYSLER LLC

12. Install the coolant tube (1). Tighten bolts (2) to 15 N.m (133 in. lbs.).
13. Connect the coolant tube hose at oil cooler and by fuel injection pump.

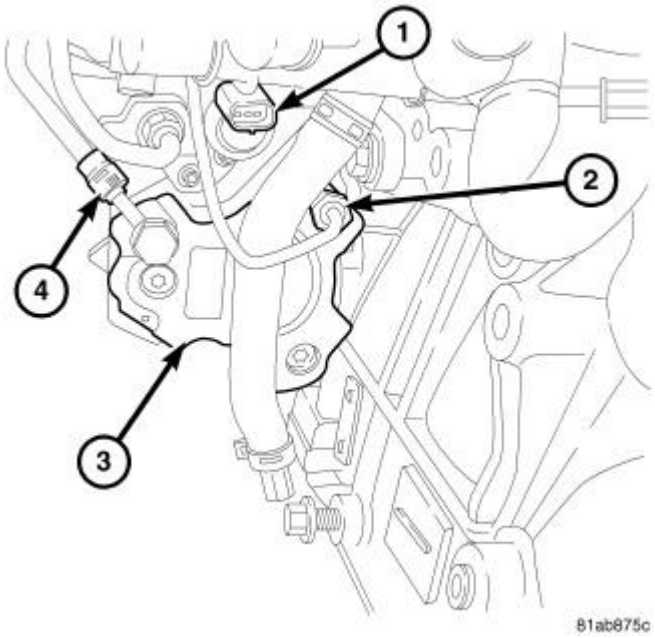


Fig. 203: High Pressure Fuel Line At Pump
Courtesy of CHRYSLER LLC

14. Connect fuel quantity solenoid (1) harness connector.
15. Install high-pressure fuel line (2) at rear of pump. Tighten line nut to 28 N.m (21 ft. lbs.).
16. Using new sealing washers, install high-pressure fuel line (4) at rear of pump. Tighten banjo bolt to 28 N.m (21 ft. lbs.).

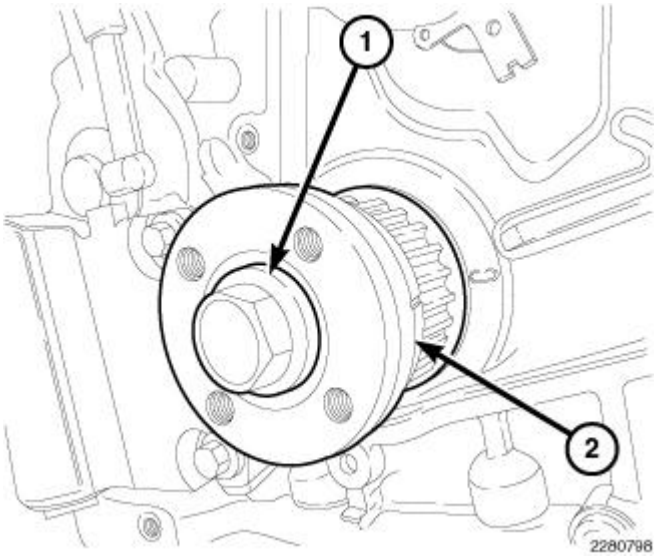


Fig. 204: Crankshaft Sprocket And Bolt
Courtesy of CHRYSLER LLC

NOTE: The crankshaft sprocket bolt is a left handed thread.

17. Install the crankshaft sprocket (2). Tighten bolt (1) to 100 N.m (74 ft. lbs.) plus an additional 120 degrees turn.

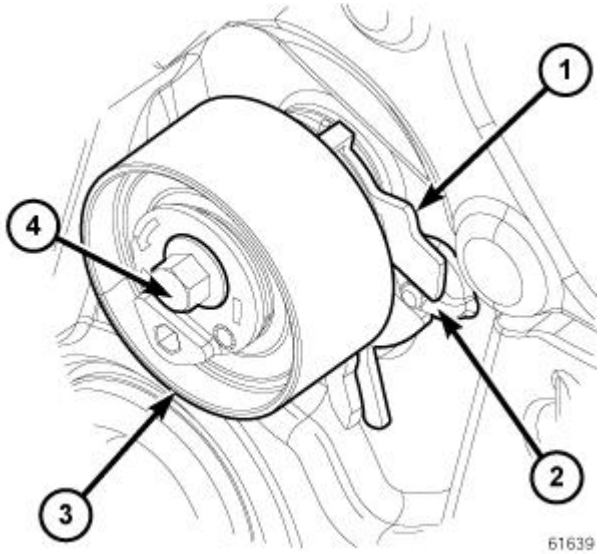


Fig. 205: Timing Belt Tensioner
Courtesy of CHRYSLER LLC

18. If necessary, install the timing belt tensioner (3) and tighten bolt finger tight.

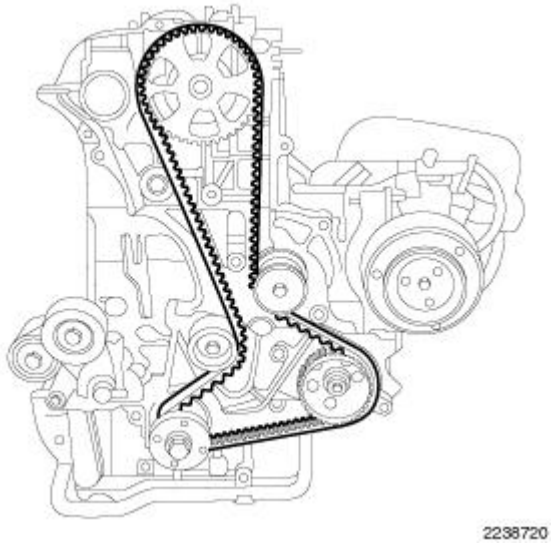


Fig. 206: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

19. Install the timing belt. See **Engine/Valve Timing/BELT, Timing - Installation**.
20. Connect the negative battery cable.

CRANKSHAFT

Description

DESCRIPTION

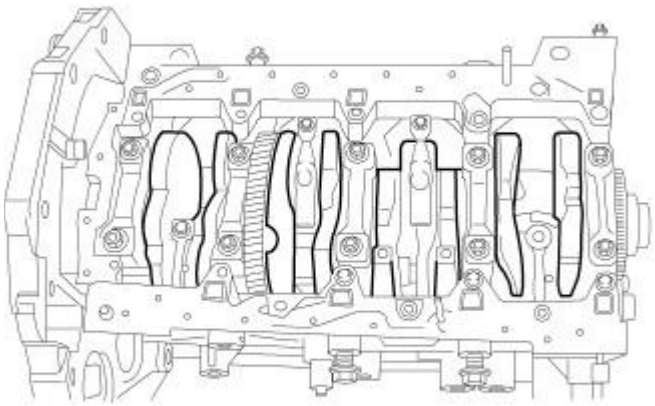


Fig. 207: CRANKSHAFT
Courtesy of CHRYSLER LLC

The crankshaft for the 2.8L is a forged steel type design with five main bearing journals. The crankshaft is located at the bottom of the engine block.

Standard Procedure

CHECKING CRANKSHAFT END PLAY

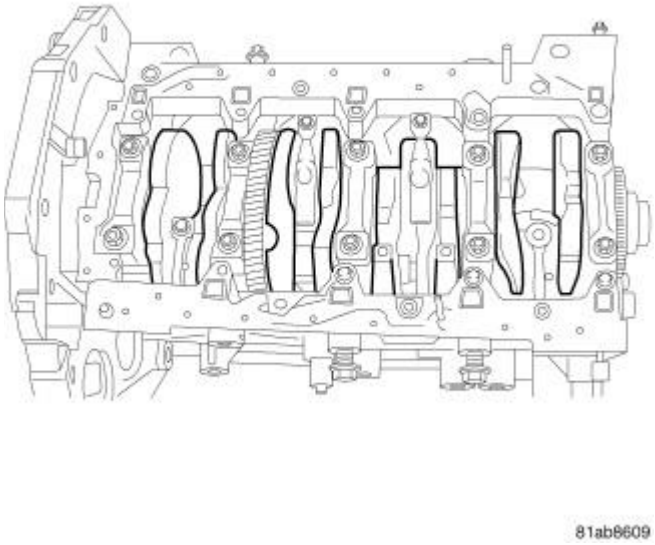


Fig. 208: CRANKSHAFT
Courtesy of CHRYSLER LLC

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

Removal

REMOVAL - CRANKSHAFT

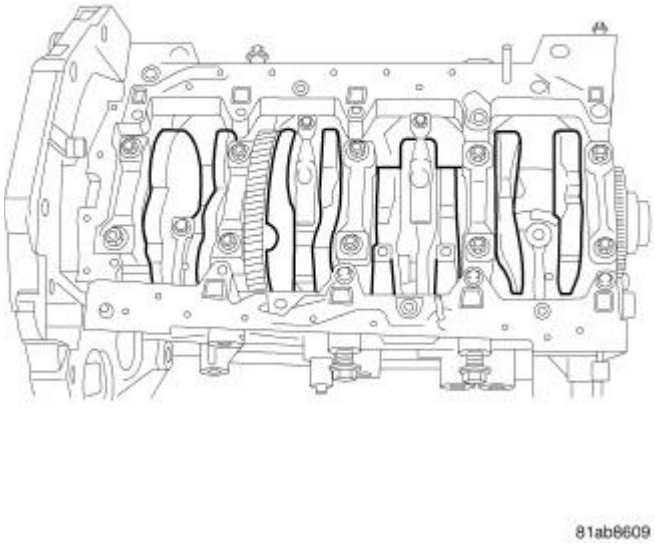


Fig. 209: CRANKSHAFT
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Removal**.
3. Remove the rear crankshaft oil seal carrier. See **Engine/Engine Block/SEAL, Crankshaft Oil - Removal**.
4. Remove the front cover. See **Engine/Engine Block/COVER, Engine - Removal**.
5. Remove the bearing caps from the connecting rods.
6. Remove the bearing caps from the crankshaft journals.
7. Remove the crankshaft.

Installation

INSTALLATION - CRANKSHAFT

1. Use the crankshaft bearing selection chart for main bearing selection. Refer to **STANDARD PROCEDURE**.
2. Lubricate and install the crankshaft bearings. Make sure the thrust washer is not touching the engine block.
3. Install the crankshaft.

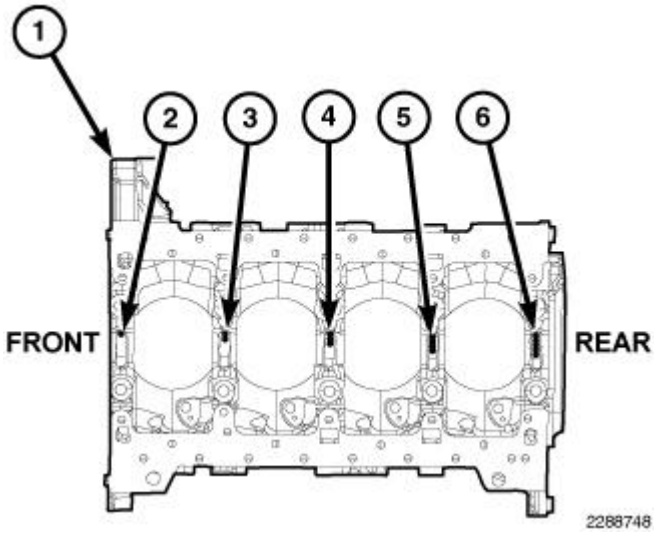


Fig. 210: Main Bearing Caps
Courtesy of CHRYSLER LLC

4. Using new bolts, install the main bearing caps in the same location as they were removed. The notches on the top of the bearing caps indicate their proper position. The front cap has one notch, the next cap two, etc.

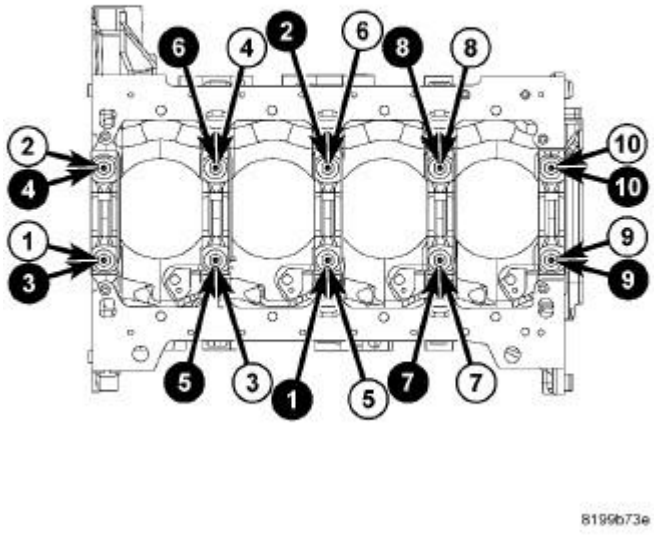


Fig. 211: Crankshaft Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

5. Using the black number bubbles in the tightening pattern, tighten the crankshaft bolts to 50 N.m (36 ft. lbs.).

6. Using the white number bubbles in the tightening pattern, tighten the bolts an additional 90 degrees turn.
7. Measure the crankshaft end play. Crankshaft end play must be between 0.1 mm and 0.33 mm (0.004 in - 0.13 in).
8. Using the bearing chart, select the correct bearings and install the connecting rod bearings. Using new bolts, install the connecting rod bearing caps. See **Engine/Engine Block/ROD, Piston and Connecting - Installation**.
9. Install the front cover. See **Engine/Engine Block/COVER, Engine - Installation**.
10. Install the rear crankshaft seal carrier. See **Engine/Engine Block/SEAL, Crankshaft Oil - Installation**.
11. Install the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Installation**.
12. connect the negative battery cable.

DAMPER, VIBRATION

Removal

VIBRATION DAMPER

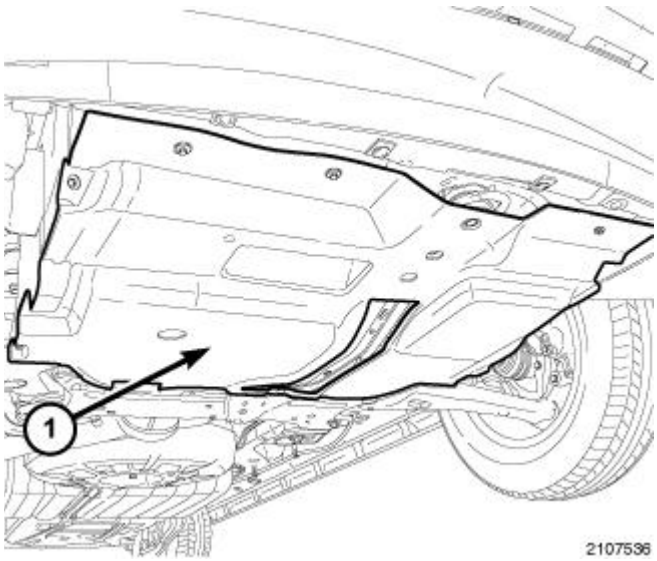


Fig. 212: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the underbody splash shield (1).
4. Remove the right front inner splash shield.
5. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .

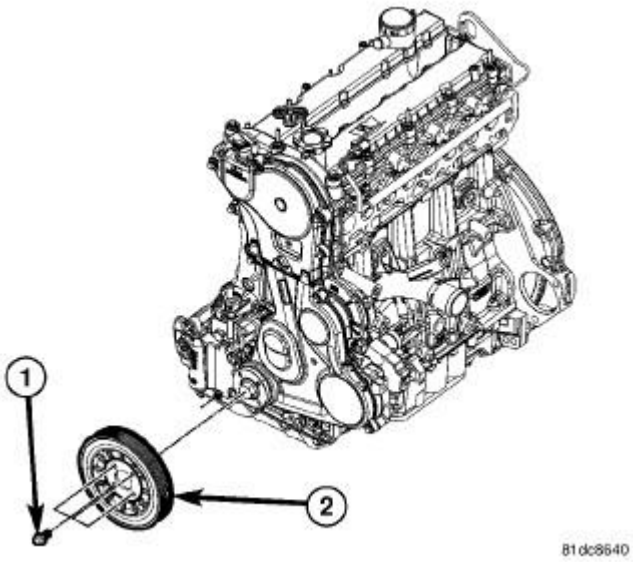


Fig. 213: CRANKSHAFT DAMPER
Courtesy of CHRYSLER LLC

6. Remove the bolts (1) and the vibration damper (2).

Installation

VIBRATION DAMPER

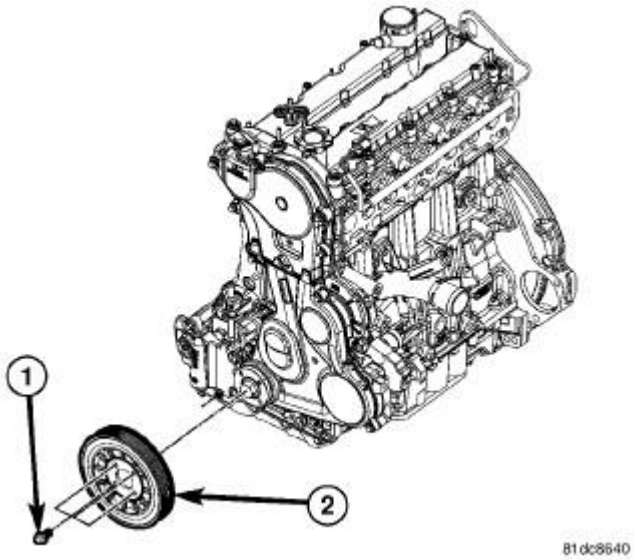


Fig. 214: CRANKSHAFT DAMPER
Courtesy of CHRYSLER LLC

1. Install the vibration damper (2). Tighten bolts (1) to 32 N.m (24 ft. lbs.).

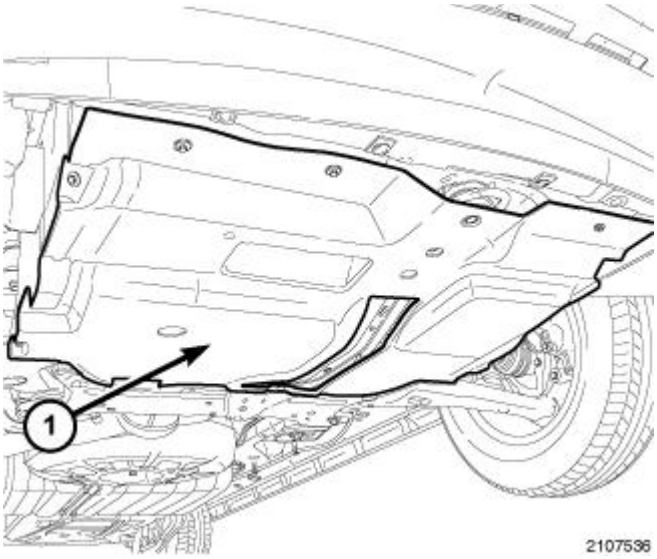


Fig. 215: Underbody Splash Shield
Courtesy of CHRYSLER LLC

2. Install accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
3. Install the right front inner splash shield.
4. Install the underbody splash shield (1).
5. Lower the vehicle.
6. Connect the negative battery cable.

FLEXPLATE

Removal

REMOVAL - FLEXPLATE

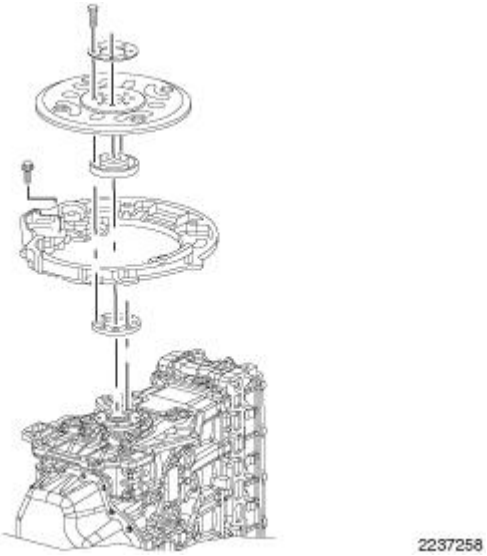


Fig. 216: FLEX PLATE

Courtesy of CHRYSLER LLC

1. Remove the transmission. Refer to **Transmission and Transfer Case/Automatic - 62TE - Removal** .
2. Paint mark the flexplate hub to flex plate relation.
3. Remove the 40 mm bolts and flexplate.

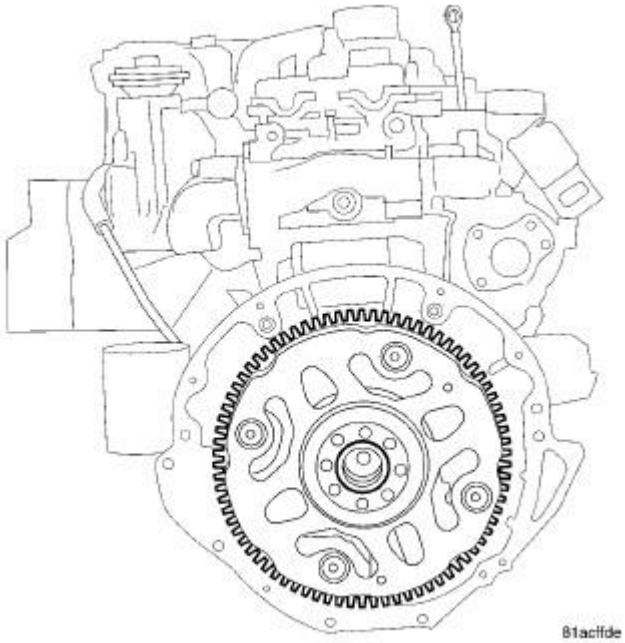


Fig. 217: FLEX PLATE - INSTALLED
Courtesy of CHRYSLER LLC

4. Inspect flexplate (2) for damage.

Installation

INSTALLATION - FLEXPLATE

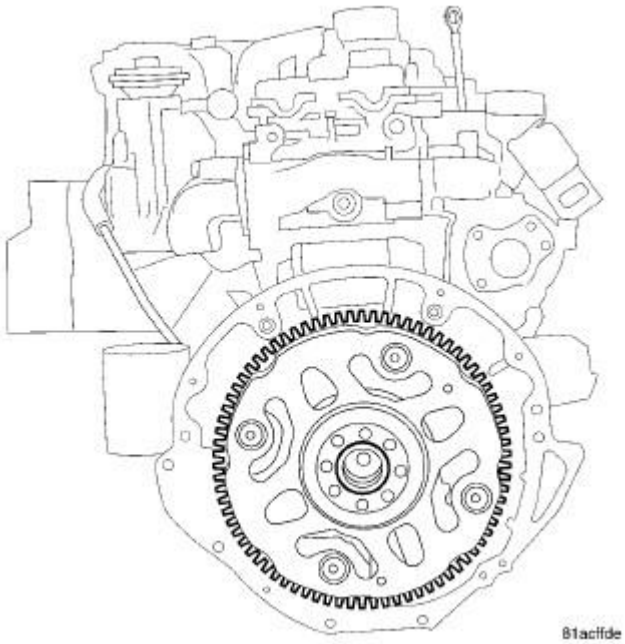


Fig. 218: FLEX PLATE - INSTALLED
Courtesy of CHRYSLER LLC

1. Install the flexplate and align with the paint marks on the hub.

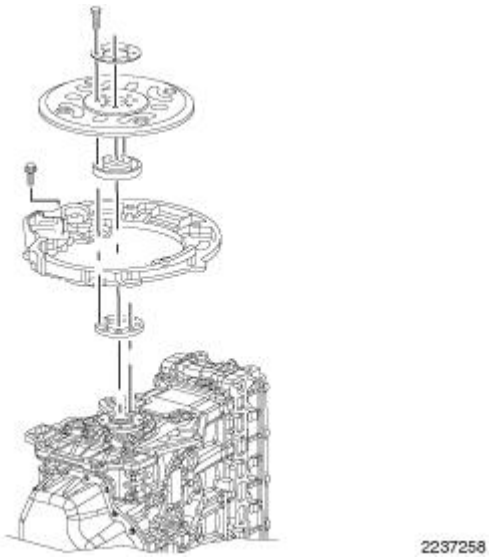


Fig. 219: FLEX PLATE
Courtesy of CHRYSLER LLC

NOTE: Always use new flexplate bolts.

NOTE: Do not lubricate new bolts as they are already coated with an anti-scuff treatment.

FLEXPLATE BOLT LENGTH

Bolt Length	Torque Angle
40 mm	60°
50 mm	75°
60 mm	90°

2. Install the flexplate bolts. Using a cross pattern, tighten bolts to 50 N.m (37 ft. lbs.).
3. Using a torque wrench fitted with a Torque Angle Gauge, (Goniometer), loosen one flexplate bolt at a time and tighten to 25 N.m (18 ft. lbs.) plus angle in relation to bolt length.
4. Install the transmission. Refer to **Transmission and Transfer Case/Automatic - 62TE - Installation** .

MODULE, BALANCE SHAFT

Description

DESCRIPTION

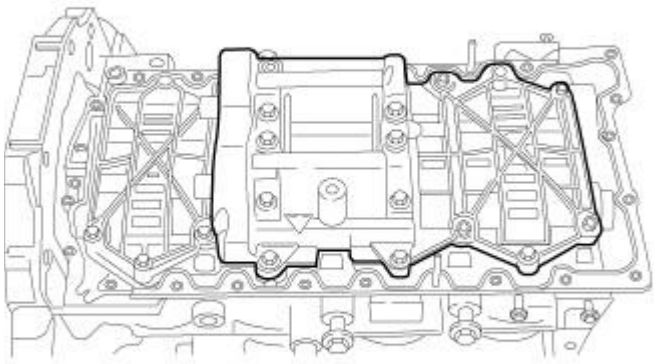


Fig. 220: Balance Shaft Module
Courtesy of CHRYSLER LLC

The balance shaft is gear-driven and is used to counteract engine vibration and roughness. The balance shaft assembly includes balancers on two shafts. It is only serviced as an assembly. Balance shafts must be timed to the crankshaft.

Removal

REMOVAL - BALANCE SHAFT

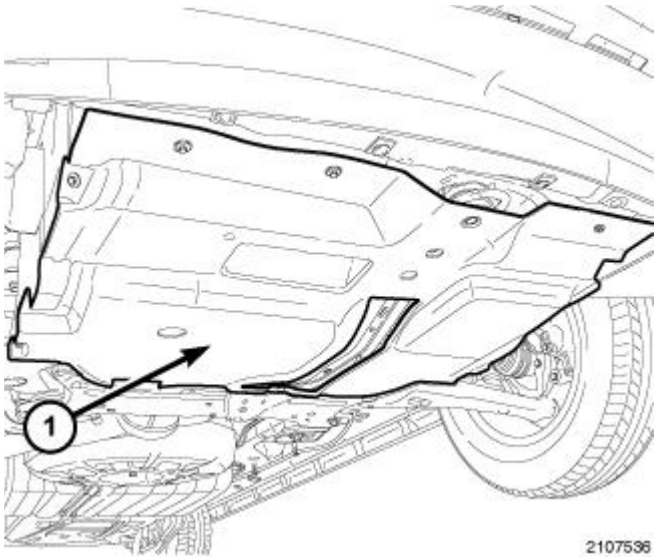


Fig. 221: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
3. Remove the underbody splash shield (1).

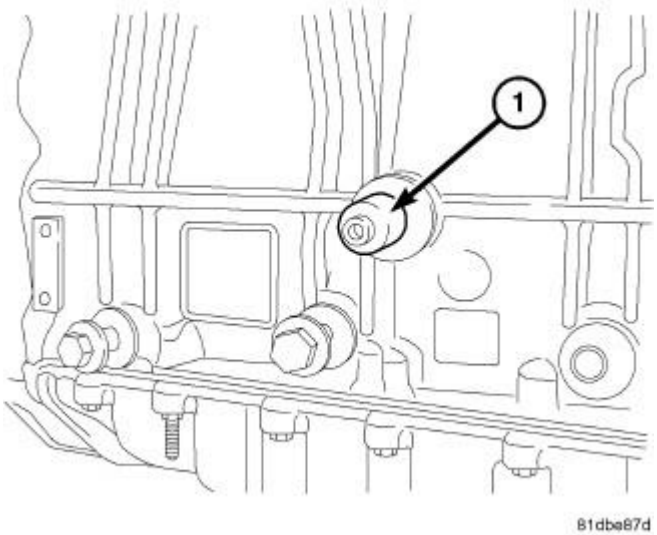


Fig. 222: CRANKSHAFT LOCKING TOOL
Courtesy of CHRYSLER LLC

4. Lock the engine 90 degrees ATDC. See **Engine/Valve Timing - Standard Procedure**.

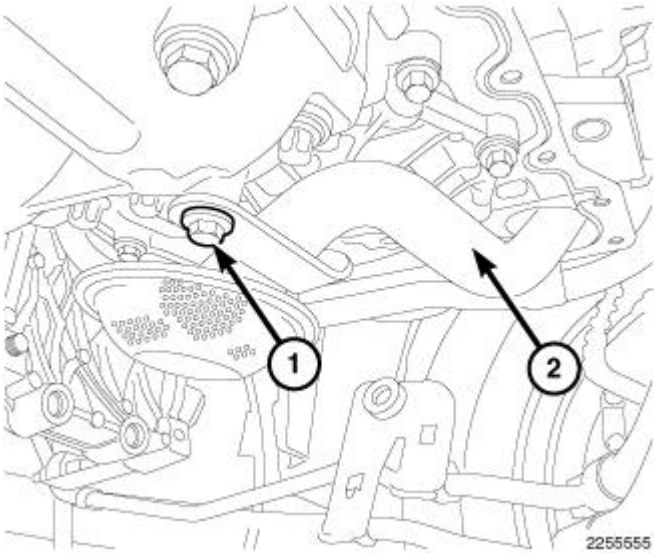


Fig. 223: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

5. Remove the oil pickup tube (2). See **Engine/Lubrication/PICK-UP, Oil Pump - Removal**.

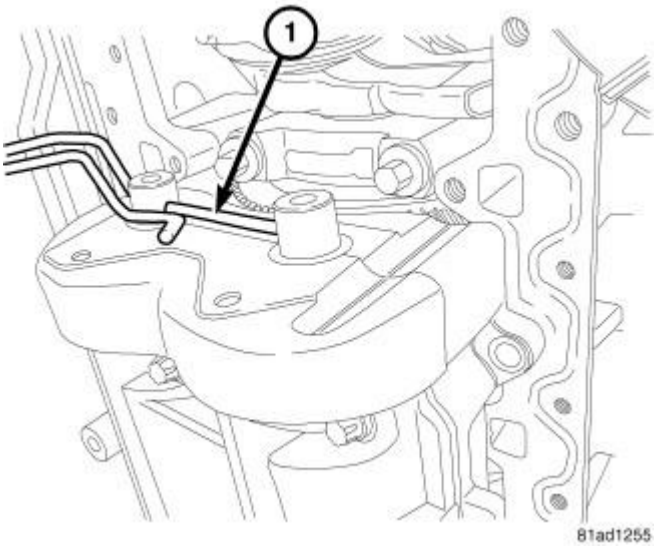
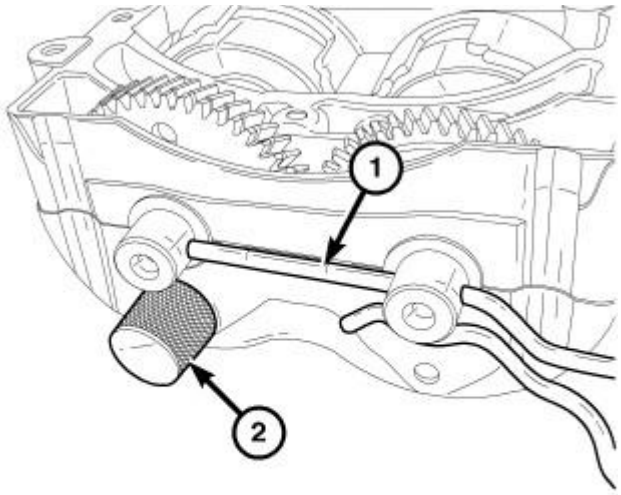


Fig. 224: BALANCE SHAFT TIMING TOOL
Courtesy of CHRYSLER LLC

6. Place a dowel rod through the holes in the balance shaft axles to keep the balance shafts in the correct position for reassembly.

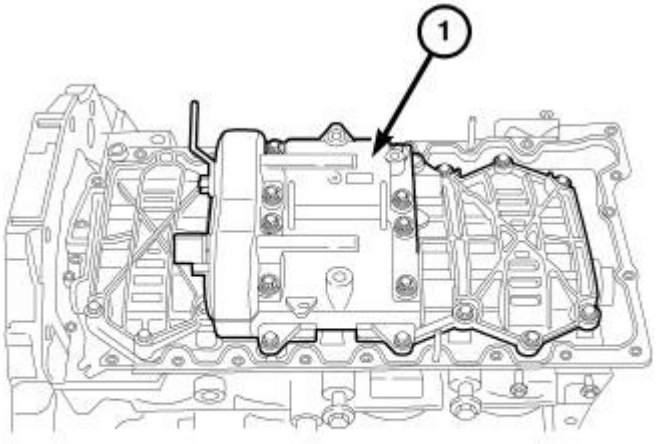


81ce8d7c

Fig. 225: BALANCE SHAFT TOOL INSTALLED
Courtesy of CHRYSLER LLC

WARNING: The balance shaft pin must be installed before the balance shaft assembly is remove from the engine. The balance shaft pin must always remain in the balance shaft assembly while the assembly is removed from the engine. Do not remove the balance shaft pin until the balance shaft assembly is completely installed on the engine, and the TDC crank locking tool is correctly installed.

7. Insert the Balance Shaft Locking Pin Tool VM.10012 (2) into the balance shaft assembly to lock the split gears together.



81de47f4

Fig. 226: Balance Shaft Housing
Courtesy of CHRYSLER LLC

8. Remove bolts and the balance shaft housing (1).

Installation

INSTALLATION - BALANCE SHAFT

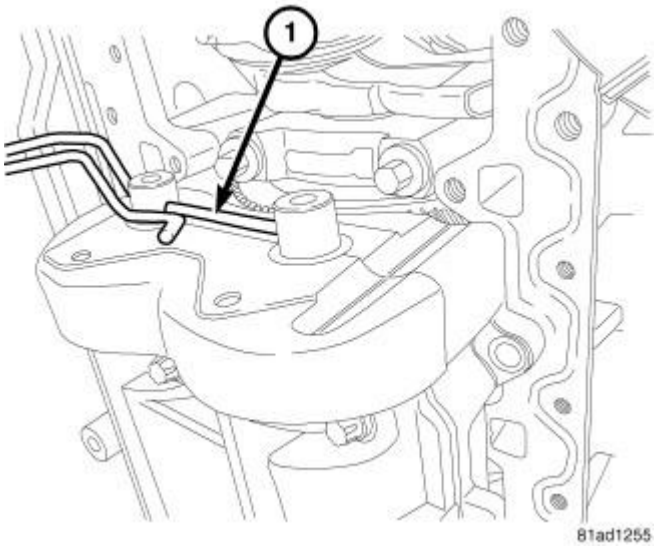


Fig. 227: BALANCE SHAFT TIMING TOOL
Courtesy of CHRYSLER LLC

1. The balance shafts must remain aligned by the alignment dowel and the balance shaft pin must remain in the balance shaft assembly until the assembly is completely installed to the engine.

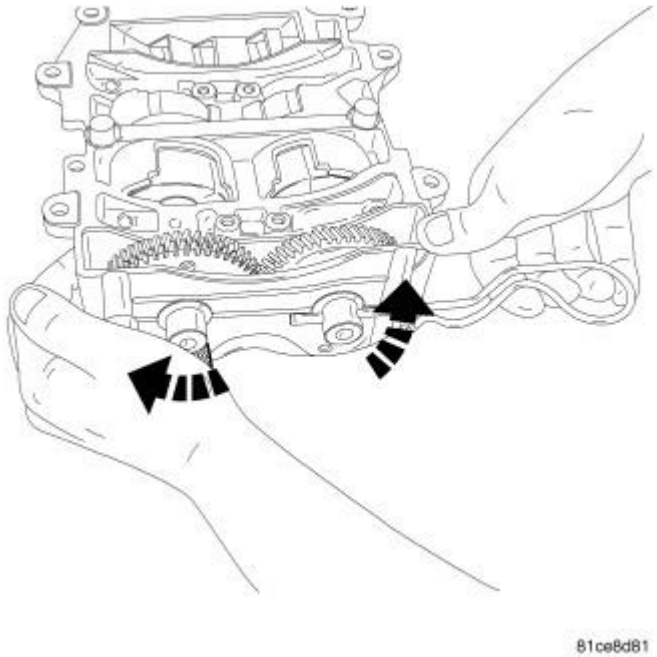


Fig. 228: BALANCE SHAFT TOOL INSTALLATION
Courtesy of CHRYSLER LLC

2. The balance shaft pin should never be removed from the balance shaft assembly when the balance shaft assembly is not installed in the engine. If the balance shaft was removed from the vehicle without the pin, or the pin was removed, use the dowel to load the spring while pressing the tool into place as shown in illustration.

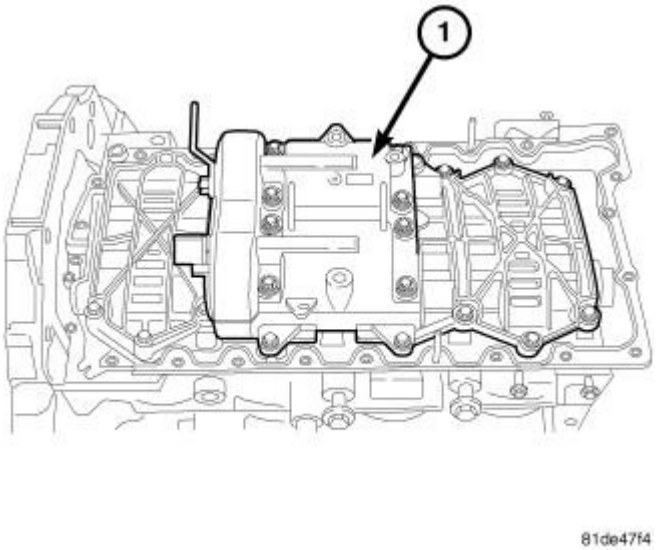


Fig. 229: Balance Shaft Housing
Courtesy of CHRYSLER LLC

3. Install the balance shaft housing (1).

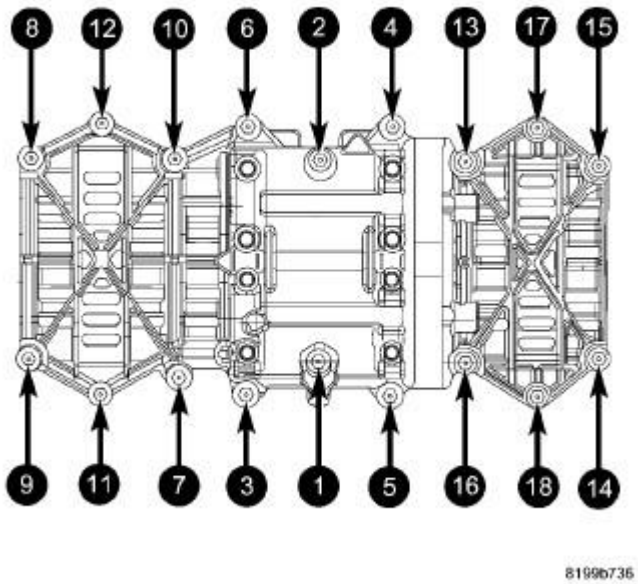


Fig. 230: BALANCE SHAFT HOUSING TORQUE SEQUENCE
Courtesy of CHRYSLER LLC

4. Use the tightening sequence shown in illustration, tighten bolts to 33 N.m (24 ft. lbs.).

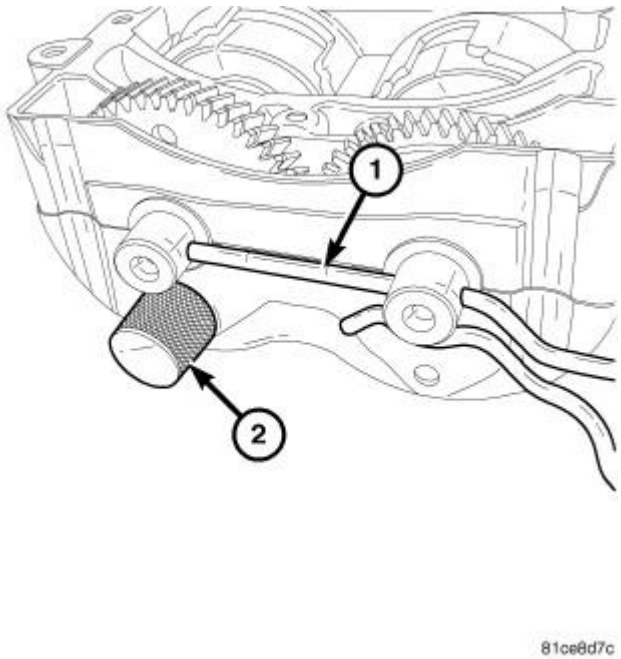


Fig. 231: BALANCE SHAFT TOOL INSTALLED
Courtesy of CHRYSLER LLC

5. Remove the balance shaft dowel assembly and the Balance Shaft Locking Pin Tool VM.10012 (2).

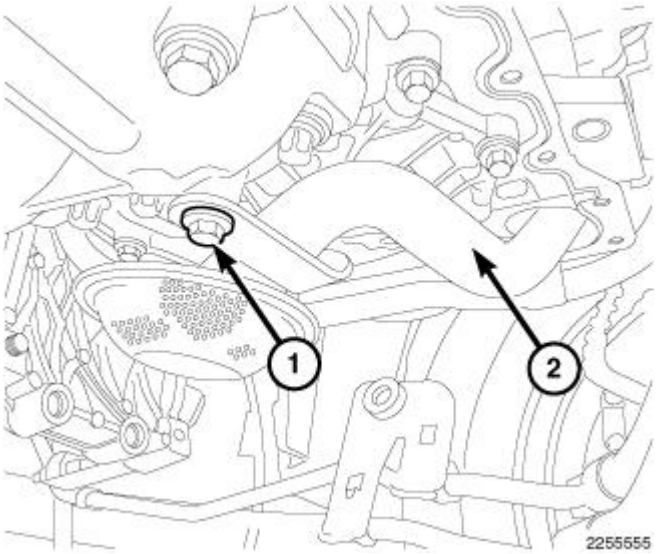


Fig. 232: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

6. Install the oil pickup tube. See **Engine/Lubrication/PICK-UP, Oil Pump - Installation**.

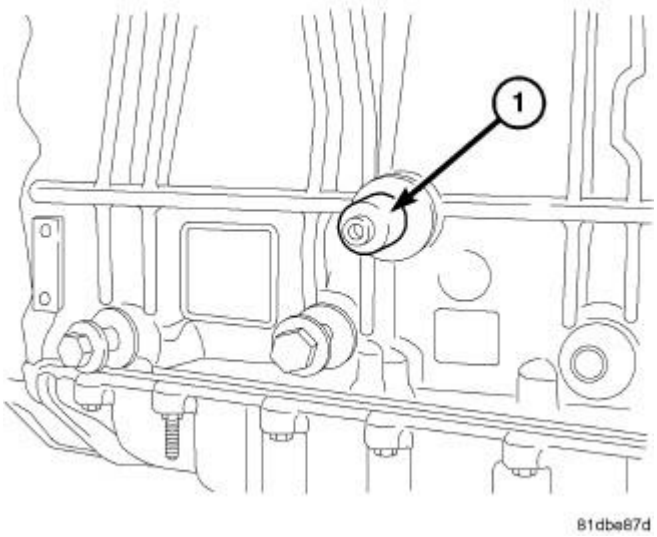


Fig. 233: CRANKSHAFT LOCKING TOOL
Courtesy of CHRYSLER LLC

7. Remove the Crank Locking Tool VM.9992 (1).

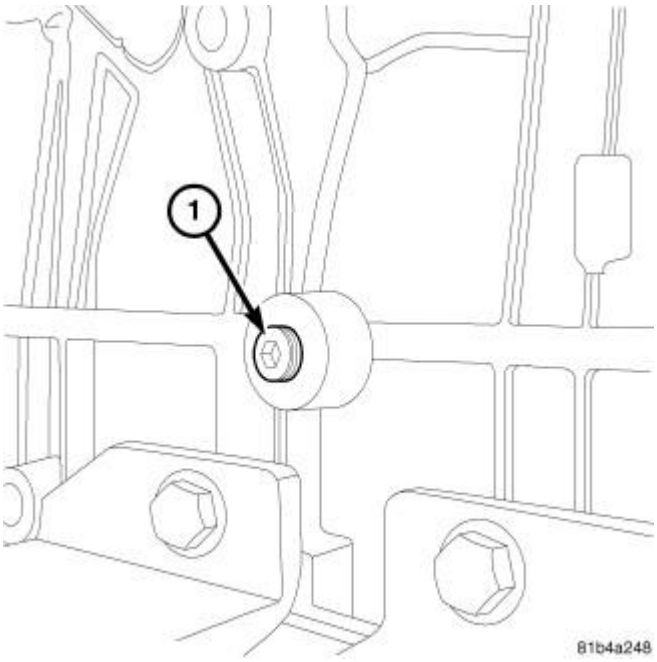


Fig. 234: Engine Block Plug
Courtesy of CHRYSLER LLC

8. Install the engine block plug (1). Tighten the engine block plug to 30 N.m (22 ft. lbs.).

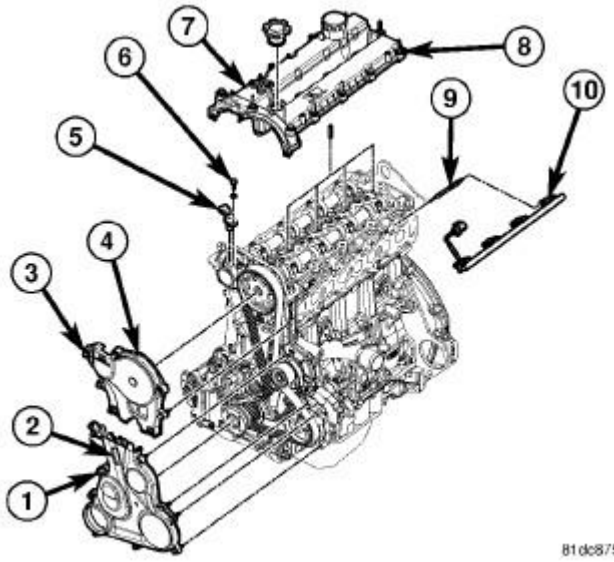


Fig. 235: Upper & Lower Front Covers
Courtesy of CHRYSLER LLC

9. Install the upper (4) and lower (2) front covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.
10. Fill the engine with recommended engine oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .

11. Connect the negative battery cable.
12. Start the engine and check for leaks.

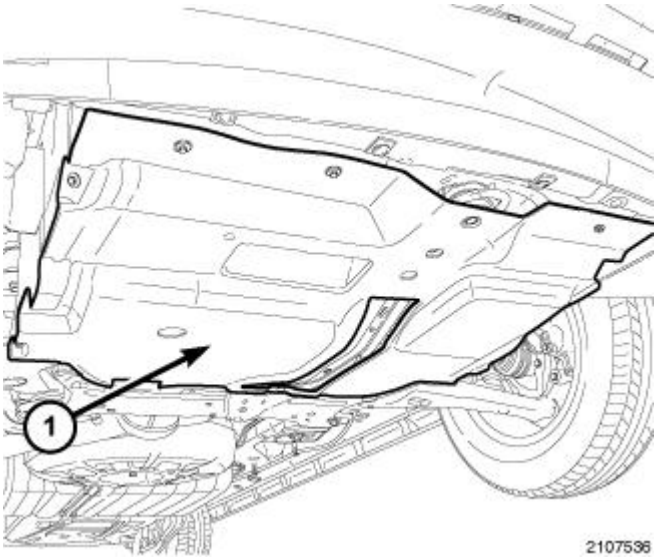


Fig. 236: Underbody Splash Shield
Courtesy of CHRYSLER LLC

13. Install the underbody splash shield (1) and securely tighten fasteners.
14. Lower the vehicle.

PLATE, TRANSMISSION ADAPTER

Description

DESCRIPTION

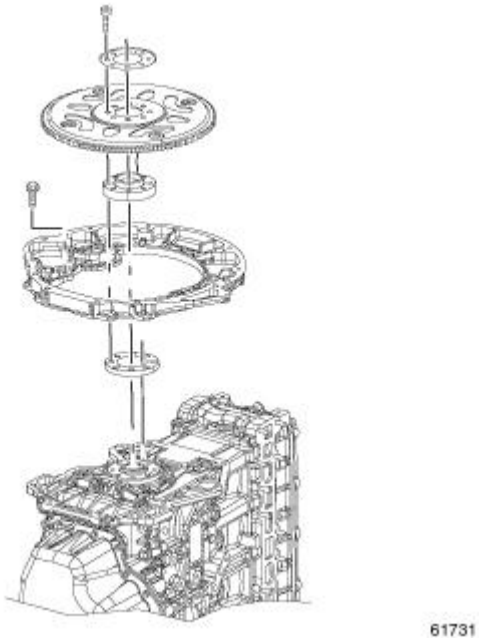


Fig. 237: FLYWHEEL AND FLEX PLATE
Courtesy of CHRYSLER LLC

The transmission plate adapter is the component that allows the transmission to be bolted to the engine.

Removal

REMOVAL

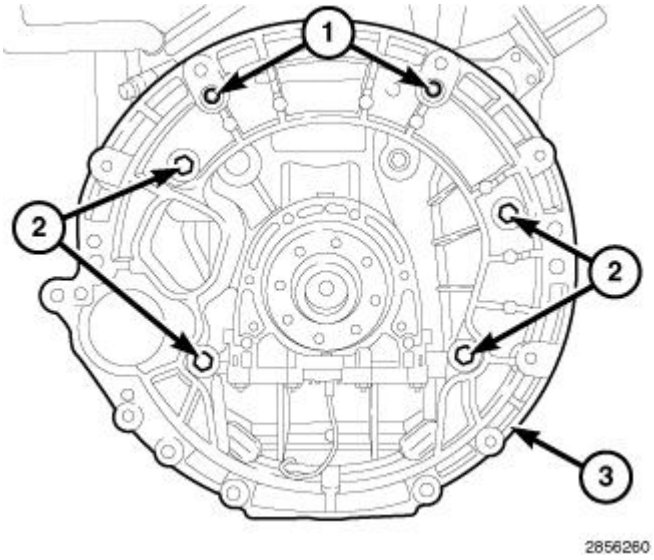


Fig. 238: Transmission Adapter Plate & Bolts
Courtesy of CHRYSLER LLC

1. Remove the flex plate. See **Engine/Engine Block/FLEXPLATE - Removal**.
2. On manual transmission models, remove the flywheel.

NOTE: Do not use any magnetic tools near the crankshaft sensor tone ring.

3. Remove bolts (1 and 2) and the transmission adapter plate (3).

Installation

INSTALLATION

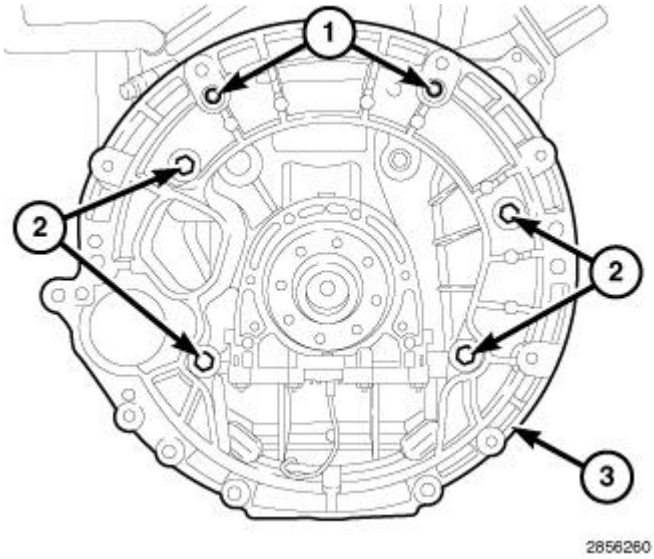


Fig. 239: Transmission Adapter Plate & Bolts
Courtesy of CHRYSLER LLC

NOTE: Do not use any magnetic tools near the crankshaft tone ring.

1. Install the transmission adapter plate (3). Tighten bolts (1 and 2) finger tight.
   - Tighten bolts (2) to 69 N.m (51 ft. lbs.).
   - Tighten bolts (1) to 79 N.m (58 ft. lbs.).
2. On manual transmission models, install the flywheel .
3. Install the flex plate. See **Engine/Engine Block/FLEXPLATE - Installation**.

PUMP, INTERNAL VACUUM

Description

DESCRIPTION

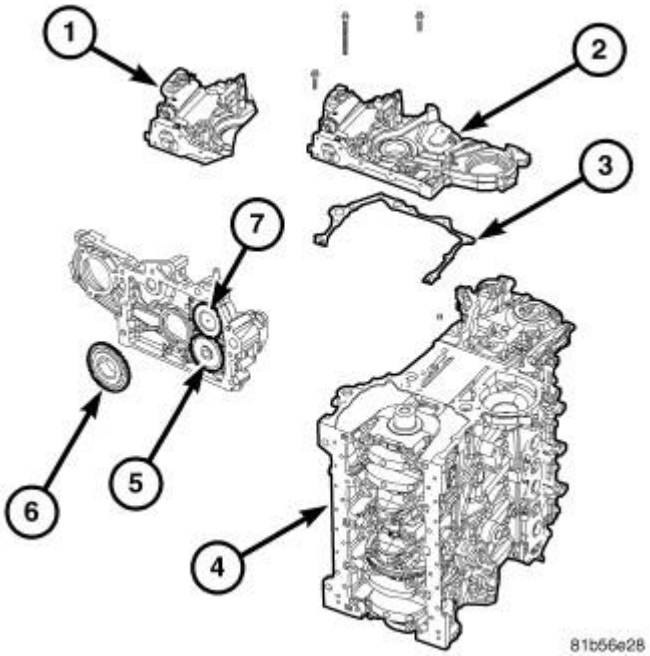


Fig. 240: Vacuum Pump And Oil Pump
Courtesy of CHRYSLER LLC

The diesel engine uses a internal vacuum pump (7). This vacuum pump (7) is mounted in the front engine cover (2). The vacuum pump is driven by a sprocket (6) on the crankshaft.

Diagnosis and Testing

VACUUM PUMP

1. Connect a vacuum gauge to the booster check valve with a short length of hose and T-fitting.
2. Start the engine allowing the engine to run for 30 seconds. Vacuum should be 18 inches HG (609 millibars). Verify the vacuum line is not leaking. If no leak is present, replace vacuum pump. See **Engine/Engine Block/PUMP, Internal Vacuum - Removal**.

Removal

REMOVAL - VACUUM PUMP

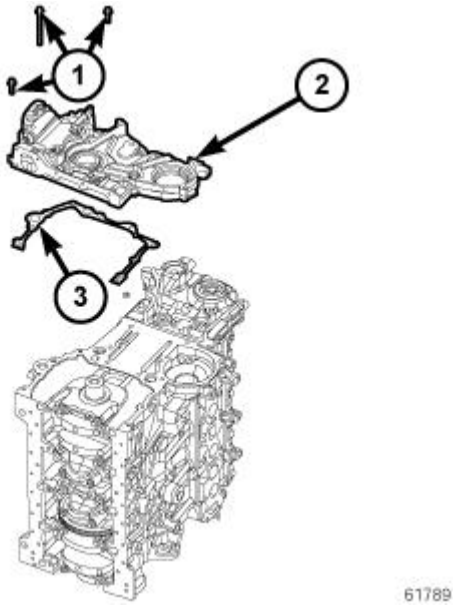


Fig. 241: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

NOTE: The vacuum pump is not a serviceable item, it is part of the front cover. If diagnosis has directed you to replace the vacuum pump, then the front cover needs to be replaced.

1. Disconnect the negative battery cable.
2. Remove the front cover (1). See **Engine/Engine Block/COVER, Engine - Removal**.

Installation

INSTALLATION - VACUUM PUMP

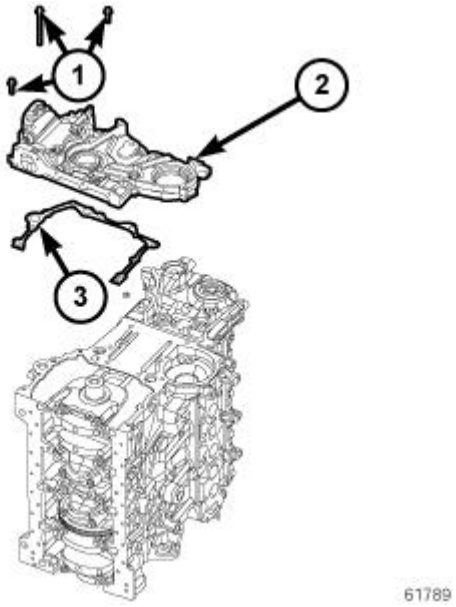


Fig. 242: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

1. Install the front cover (1). See **Engine/Engine Block/COVER, Engine - Installation**.
2. Connect the negative battery cable.

ROD, PISTON AND CONNECTING

Description

DESCRIPTION

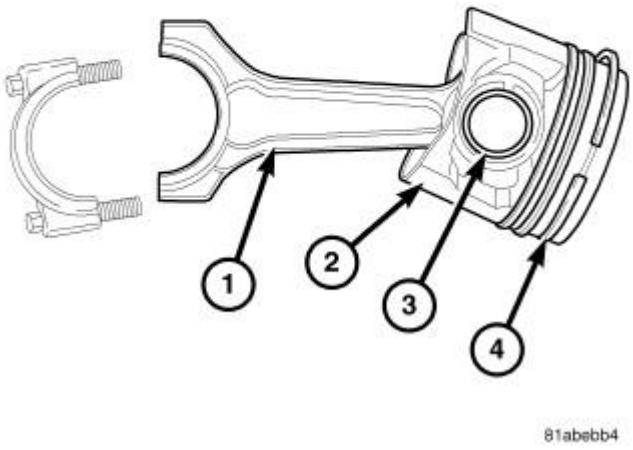


Fig. 243: PISTON AND CONNECTING ROD
Courtesy of CHRYSLER LLC

The pistons (2) are of a free floating design. Oil jets in the engine block lubricate and cool the piston and piston pin (3) assembly. The connecting rods (1) have a pressed in place wrist pin bushing which is lubricated by the oil jets. Connecting rod (7) and bearing caps have cracked mating surfaces and are not interchangeable.

Standard Procedure

STANDARD PROCEDURE

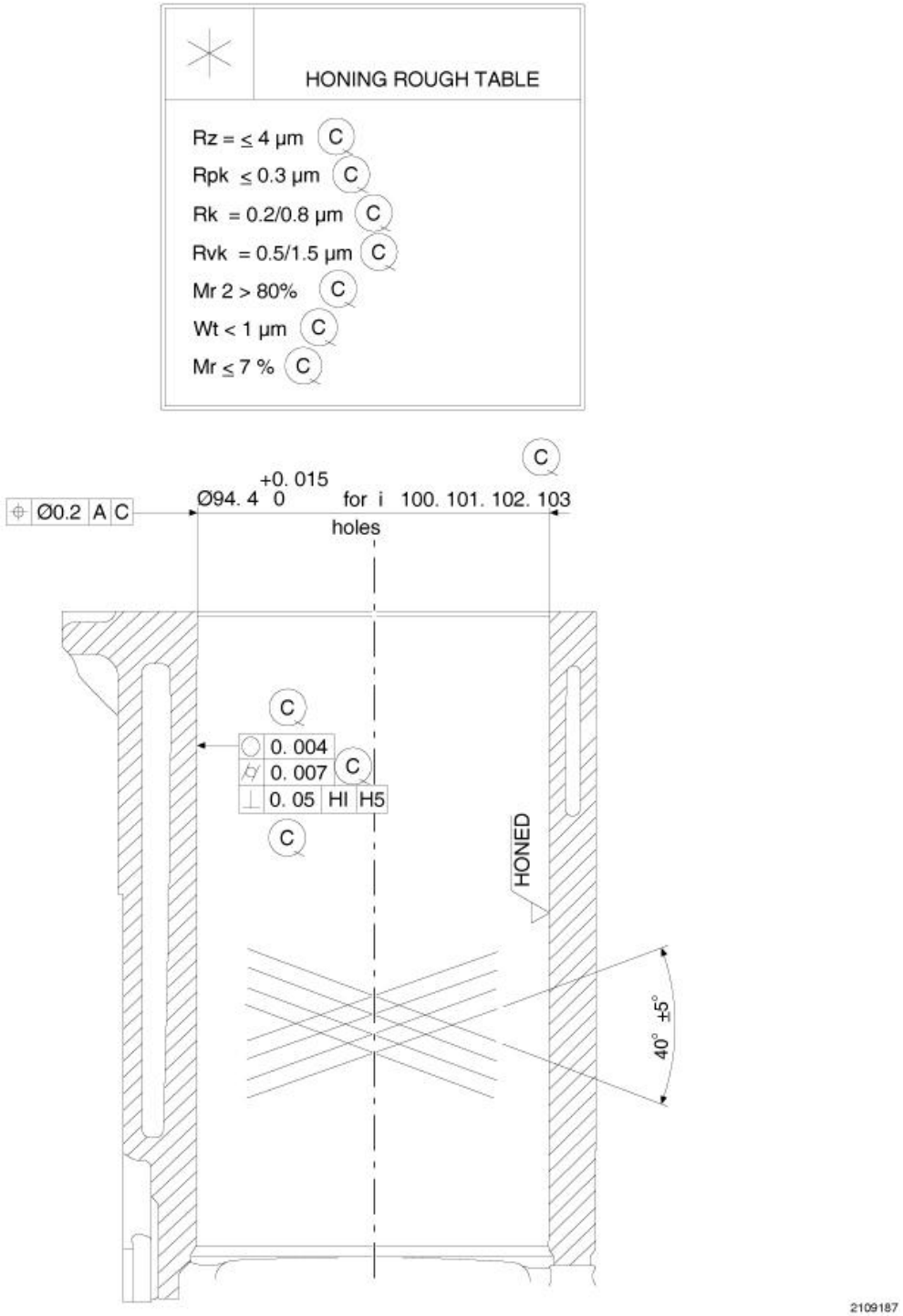


Fig. 244: Honing Rough Table
Courtesy of CHRYSLER LLC

PISTON RING FITTING

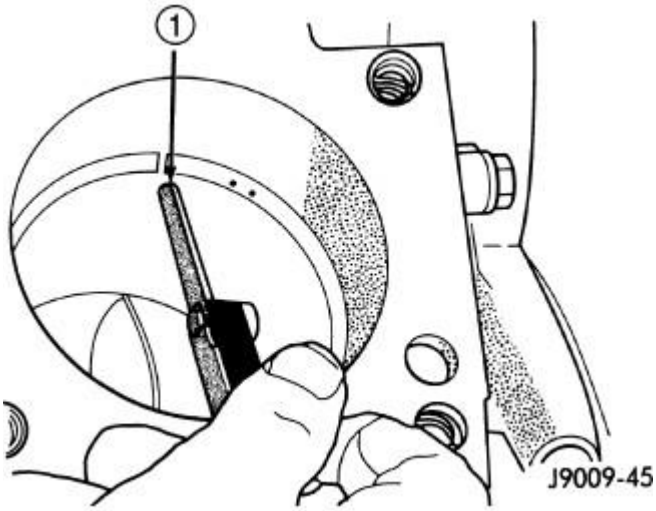


Fig. 245: RING END GAP MEASUREMENT
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 in.) from bottom of cylinder bore . Check gap with feeler gauge. Top compression ring gap .30 to .45 mm (.0118 to .0177 in.). Second compression ring gap .30 to .45 mm (.0118 to .0177 in.). Oil control ring gap .25 to .50 mm (.0098 to .0196 in.).
2. If ring gaps exceed dimension given, new rings or cylinder liners must be fitted. Keep piston rings in piston sets.

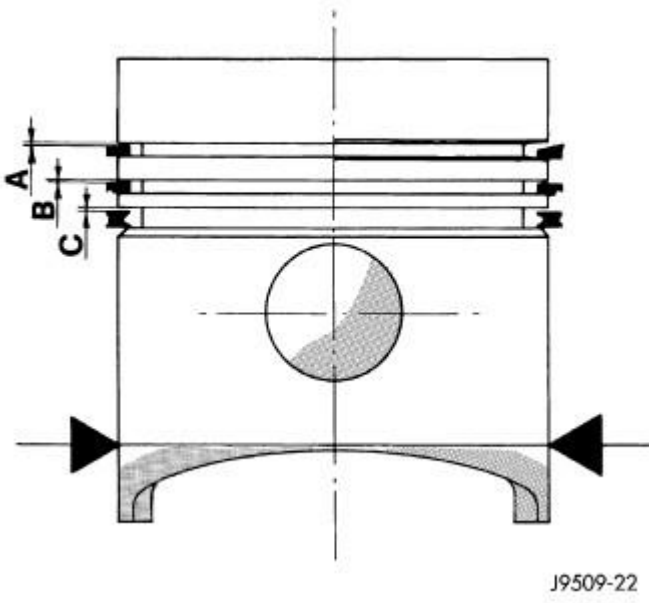


Fig. 246: PISTON RING TO GROOVE CLEARANCE
Courtesy of CHRYSLER LLC

3. Check piston ring to groove clearance . Top compression ring gap .080 to .130 mm (.0031 to .0051 in.). Second compression ring gap .070 to .110 mm (.0027 to .0043 in.). Oil control ring gap .040 to .080 mm (.0015 to .0031 in.).

Removal

INSTALLATION

INSTALLATION - PISTON PIN

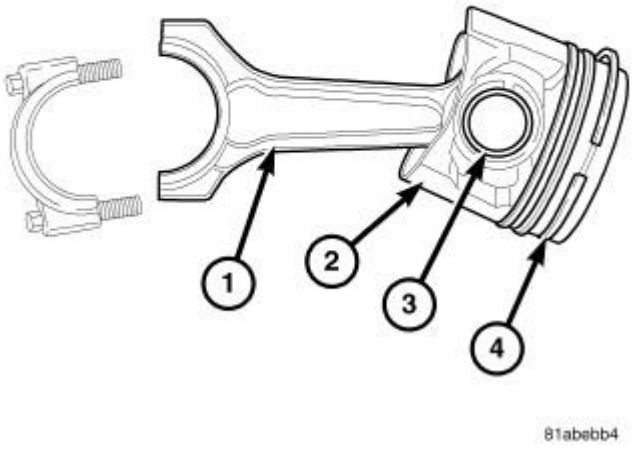


Fig. 247: PISTON AND CONNECTING ROD
Courtesy of CHRYSLER LLC

1. Secure connecting rod (1) in soft jawed vice.
2. Lubricate piston pin (3) and piston (2) with clean engine oil.
3. Position piston (2) on connecting rod (1).

CAUTION: Ensure arrow on piston crown and the bearing cap numbers on the connecting rod are on the opposite side.

4. Install piston pin (1).
5. Install snap ring in piston (2) to retain piston pin (3).
6. Remove connecting rod (1) from vice.

INSTALLATION - PISTON RINGS

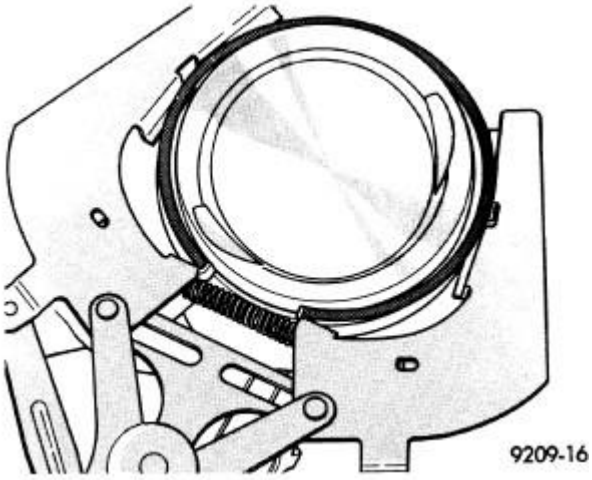


Fig. 248: PISTON RINGS - REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

1. Install rings on the pistons using a suitable ring expander.

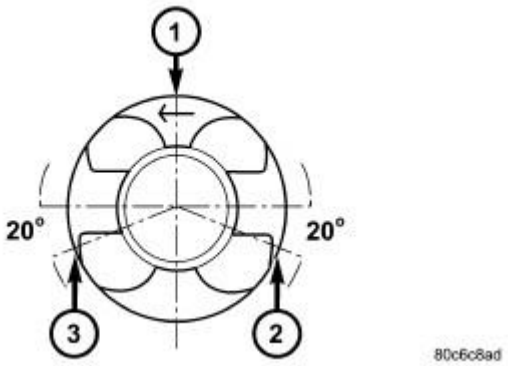


Fig. 249: PISTON RING GAP LOCATION
Courtesy of CHRYSLER LLC

1 - SECOND COMPRESSION RING GAP POSITION
2 - OIL CONTROL RING GAP POSITION
3 - TOP COMPRESSION RING GAP POSITION

2. Top compression ring is tapered and chromium plated. The second ring is of the scraper type and must be installed with scraping edge facing bottom of the piston. The third is an oil control ring. Ring gaps must be positioned, before inserting piston into the liners, as follows.
3. Top ring gap must be positioned at the No. 3 position (looking at the piston crown from above).
4. Second piston ring gap should be positioned at the No. 1 position.
5. Oil control ring gap should be positioned at the No. 2 position.

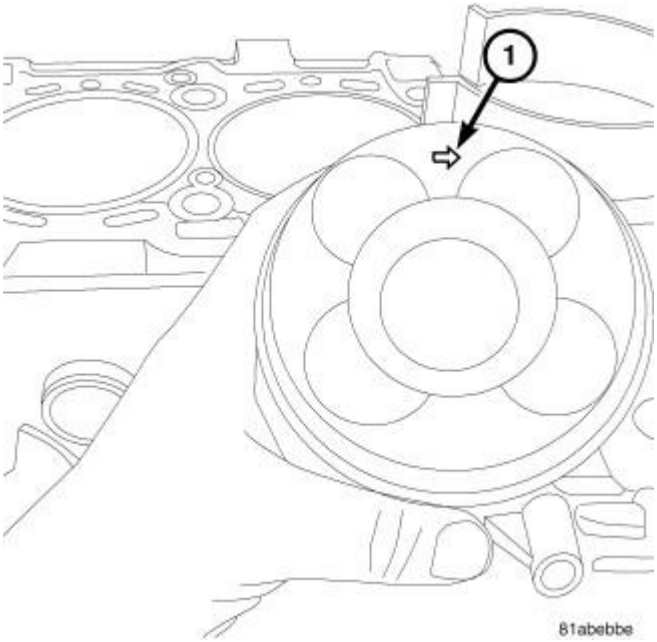


Fig. 250: PISTON DIRECTION
Courtesy of CHRYSLER LLC

6. When assembling pistons check that components are installed in the same position as before disassembly, determined by the numbers stamped on the crown of individual pistons. Engine cylinders are numbered starting from gear train end of the engine. **Face arrow on top of piston toward front of engine** . Therefore, the numbers stamped on connecting rod big end should face toward the injection pump side of engine. To insert piston into cylinder use a ring compressor as shown in illustration.

INSTALLATION - PISTON

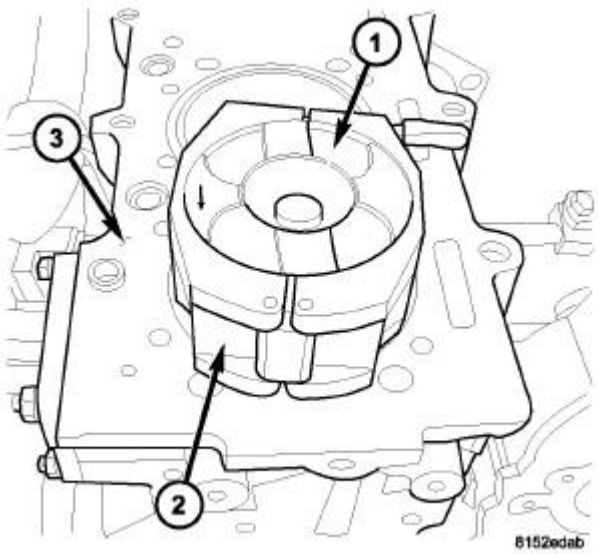


Fig. 251: PISTON INSTALLATION
Courtesy of CHRYSLER LLC

1 - PISTON 2 - PISTON RING COMPRESSOR 3 - ENGINE BLOCK

1. Before installing pistons, and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.
2. Before installing the ring compressor, make sure the oil ring expander ends are butted together.
3. Immerse the piston head and rings in clean engine oil, slide the piston ring compressor, over the piston and tighten. **Ensure position of rings does not change during this operation** .
4. Face arrow on piston towards front of engine.

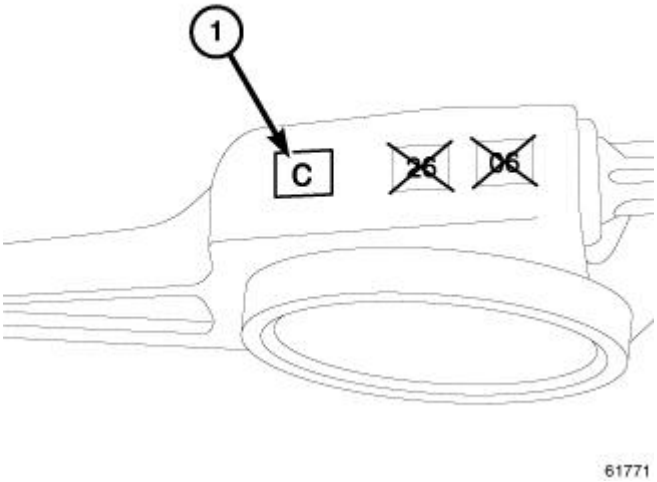


Fig. 252: CONNECTING ROD SIZE
Courtesy of CHRYSLER LLC

5. The letter "C" (1) is used for connecting rod bearing selection on the bearing chart and is to be matched with the letter found on the crankshaft in order to determine the correct size bearings to be used.

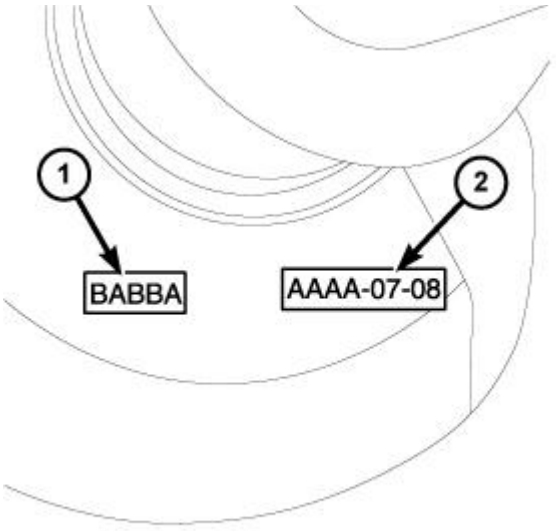


Fig. 253: MAIN BEARING SIZE MARK ON CRANK
Courtesy of CHRYSLER LLC

6. Compare the crankshaft connecting rod journal diameter (2) with the bearing selection chart to determine the correct bearing size for each cylinder. The letters stamped into the crankshaft (2) are in the same order as the cylinders. The first letter corresponds to the first cylinder, the second to the second, etc. See **Engine/Engine Block - Standard Procedure**.

NOTE: The connecting rod bolts must be replaced every time they are loosened or removed.

CAUTION: Care must be taken not to nick crankshaft journal when installing pistons.

7. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal.
8. Guide the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.
9. Install connecting rod caps. Using new rod bolts, tighten to 10 N.m (88 in. lbs.). Then, tighten bolts to 30 N.m (22 ft. lbs.) plus an additional 40 degrees turn. Then with a torque wrench set to 88 N.m (65 ft. lbs.) make the final tighten check on bolts.
10. Install the oil jets. See **Engine/Lubrication/JET, Piston Oil Cooler - Installation**.
11. Install cylinder head. See **Engine/Cylinder Head - Installation**.
12. Install balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Installation**.
13. Connect the negative battery cable.

Inspection

INSPECTION

PISTONS

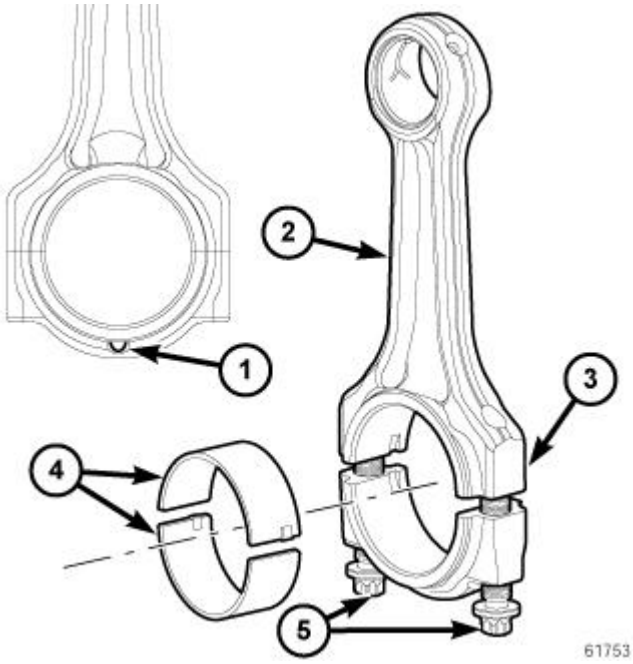


Fig. 254: CONNECTING ROD IDENTIFICATION
Courtesy of CHRYSLER LLC

1 - CONNECTING ROD PAWL
2 - CONNECTING ROD
3 - PAINTED CYLINDER IDENTIFIER
4 - CONNECTING ROD BEARINGS
-

1. Piston Diameter: Size: 91.912 - 91.928 mm (3.6185 - 3.6192 in.) Maximum wear limit .05 mm (.0019 in.).
2. Check piston pin bores in piston for roundness. Make 3 checks at 120° intervals. Maximum out of roundness .05 mm (.0019 in.).
3. The piston diameter should be measured approximately 15 mm (.590 in.) up from the base.
4. Skirt wear should not exceed 0.1 mm (.00039 in.).
5. The clearance between the cylinder liner and piston should not exceed 0.065-0.083 mm (.0025-.0032 in.).

CONNECTING RODS

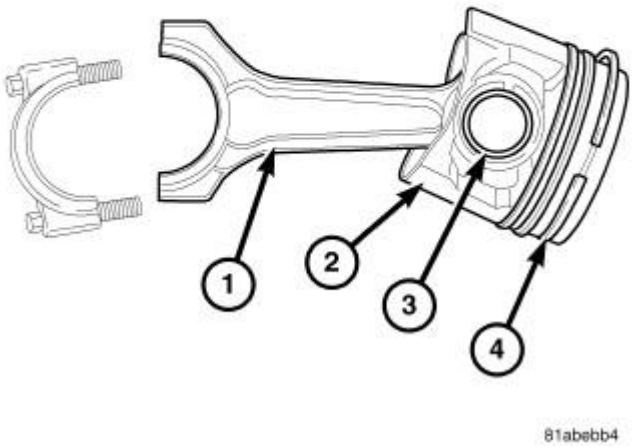


Fig. 255: PISTON AND CONNECTING ROD
Courtesy of CHRYSLER LLC

CAUTION: Connecting rod bolts must be replaced when disassembled. When assembling the connecting rod (2), be sure that the connecting rod pawl (1) on each of the connecting rod caps is facing the rear (fly wheel) side of the engine.

NOTE: Do Not lubricate the new connecting rod bolts. They are already coated with a anti scuff treatment.

1. Assemble connecting rod bearings (4) and bearing caps to their respective connecting rods (2) ensuring that the serrations on the cap and reference marks are aligned.
2. Tighten connecting cap bolts to 10 N.m (88 in. lbs.).
3. Without loosening connecting rod bolts, tighten all bolts to 30 N.m (22 ft. lbs.).
4. Using a torque angle gauge, tighten each bolt an additional 40°.
5. Recheck all bolt tightening with a torque wrench set to 88 N.m (65 ft. lbs.).
6. Check and record internal diameter of crank end of connecting rod (2).

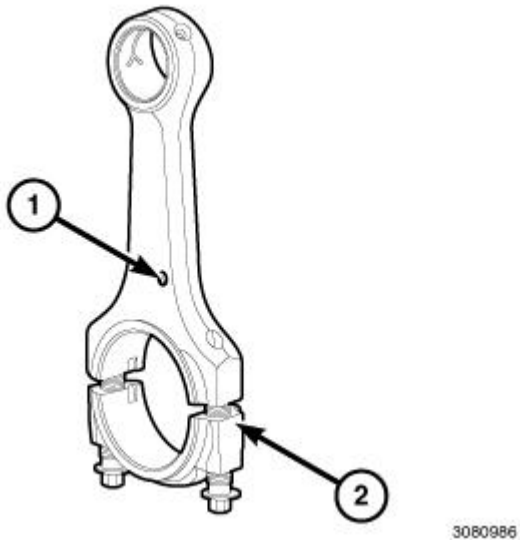


Fig. 256: Connecting Rod & Cap
Courtesy of CHRYSLER LLC

CAUTION: When changing connecting rods (2), DO NOT use a stamp to mark the cylinder location. Identify the connecting rods (2) and caps location using a paint marker. All four must have the same weight. Replacement connecting rods (2) will only be supplied in sets of four.

Connecting rods (2) are supplied in sets of four since they all must be of the same weight category. The weight of the connecting rod is identified by a paint mark (1) on the connecting rod.

PISTON PINS

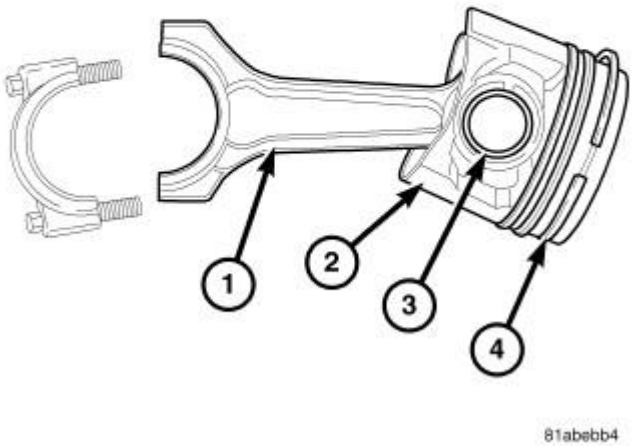


Fig. 257: PISTON AND CONNECTING ROD
Courtesy of CHRYSLER LLC

1. Measure the diameter of piston pin in the center and both ends. For specification, see **Engine - Specifications**.

Installation

REMOVAL

NOTE: Both the connecting rod and the connecting rod cap are paint marked to aid during assembly. Paint marks disappear after time. If the rod and the cap are not marked with paint, paint mark or scribe them before disassembly.

1. Disconnect the negative battery cable.
2. Remove cylinder head. See **Engine/Cylinder Head - Removal**.
3. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
4. Remove balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Removal**.
5. Remove the oil jets. See **Engine/Lubrication/JET, Piston Oil Cooler - Removal**.
6. Remove top ridge of cylinder bores with a ridge reamer before removing pistons from cylinder block. **Be sure to keep top of pistons covered during this operation.**
7. Piston and connecting rods must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centered in cylinder bore.

NOTE: Be careful not to nick or scratch crankshaft journals

8. After removal, install bearing cap on the mating rod and mark pistons with matching cylinder number when removed from engine block.

REMOVAL - PISTON PIN

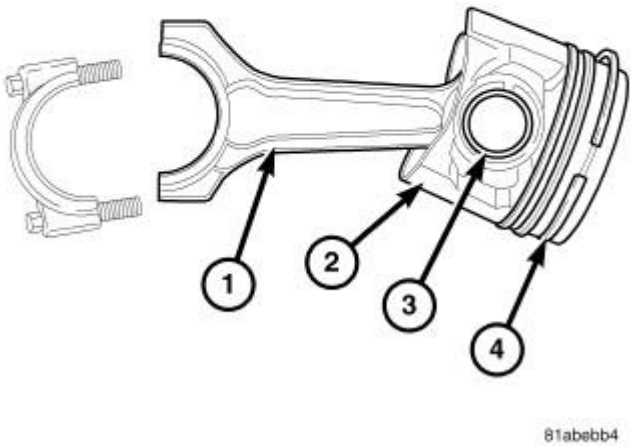


Fig. 258: PISTON AND CONNECTING ROD
Courtesy of CHRYSLER LLC

1. Secure connecting rods (1) in a soft jawed vice.
2. Remove 2 snap rings securing piston pin (3).
3. Push piston pin (3) out of piston (2) and connecting rod (1).

REMOVAL - PISTON RING

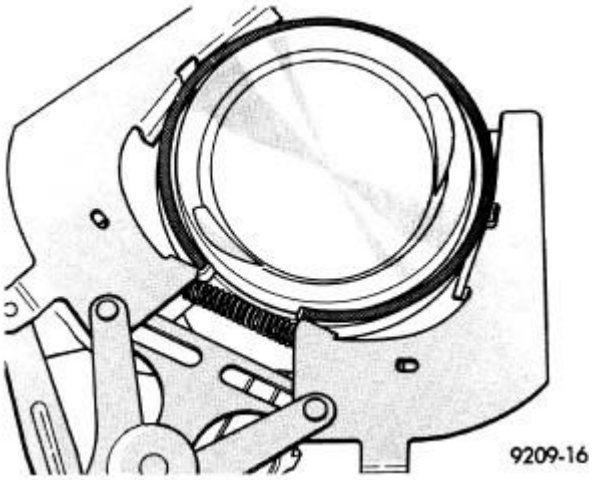


Fig. 259: PISTON RINGS - REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

1. ID mark on face of top and second piston rings must point toward piston crown.
2. Using a suitable ring expander, remove top and second piston rings.

3. Remove upper oil ring side rail, lower oil ring side rail and then the oil expander from piston.
4. Carefully clean carbon from piston crowns, skirts and ring grooves ensuring the 4 oil holes in the oil control ring groove are clear.

SEAL, CRANKSHAFT OIL, FRONT

Removal

REMOVAL - FRONT CRANKSHAFT OIL SEAL

1. Remove the timing belt. See **Engine/Valve Timing/BELT, Timing - Removal**.
2. Remove the crankshaft sprocket. See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Removal**.

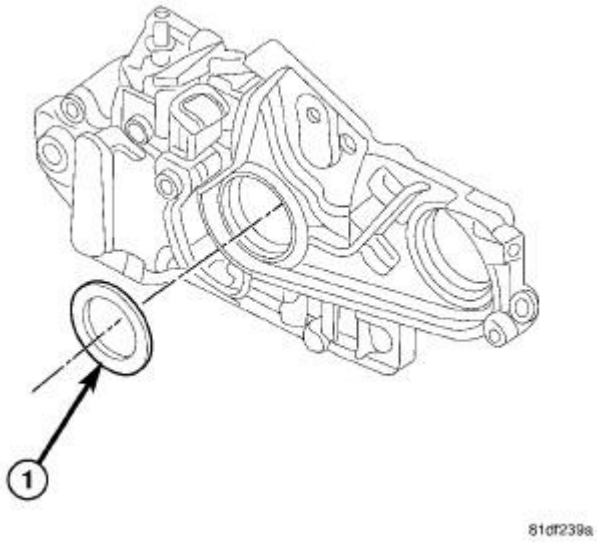


Fig. 260: Front Crankshaft Oil Seal
Courtesy of CHRYSLER LLC

NOTE: Do not gouge or scratch the surface of the crankshaft when removing the front crankshaft oil seal.

3. Remove the front crankshaft oil seal (1).

Installation

INSTALLATION - FRONT CRANKSHAFT OIL SEAL

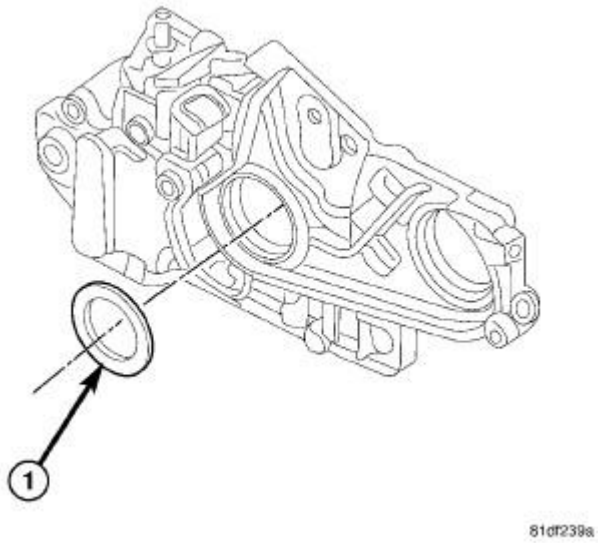


Fig. 261: Front Crankshaft Oil Seal
Courtesy of CHRYSLER LLC

1. Using Front Seal Installer VM.10335, install the front crankshaft oil seal (1) into the front engine cover.
2. Install the crankshaft sprocket. See **Engine/Valve Timing/SPROCKET(S), Timing Belt and Chain - Installation**.
3. Install the timing belt. See **Engine/Valve Timing/BELT, Timing - Installation**.

SEAL, CRANKSHAFT OIL, REAR

Description

DESCRIPTION

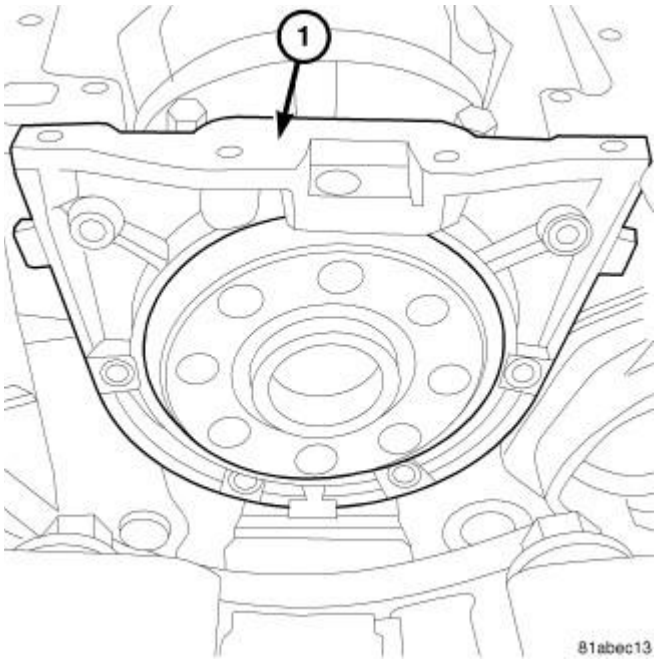


Fig. 262: Rear Crankshaft Seal & Rear Main Oil Seal Carrier
Courtesy of CHRYSLER LLC

The rear crankshaft seal consists of a seal and a seal carrier (1). The rear seal is inserted into the carrier. Once assembled the rear main seal assembly should not be separated to reduce the possibility of damage to the internal rear seal lip.

Removal

REMOVAL

1. Remove the transaxle. Refer to **Transmission and Transfer Case/Automatic - 62TE - Removal** .
2. Remove flywheel assembly.
3. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.

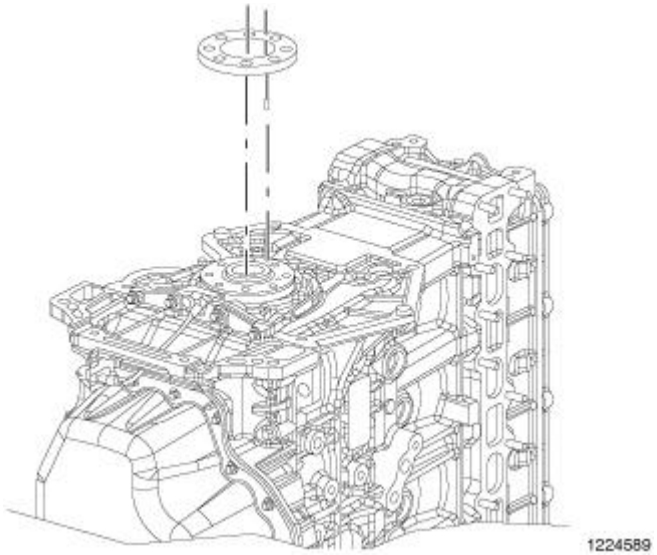


Fig. 263: Crankshaft Sensor Tone Wheel
Courtesy of CHRYSLER LLC

4. Remove the crankshaft sensor tone wheel before removing the rear main oil seal.

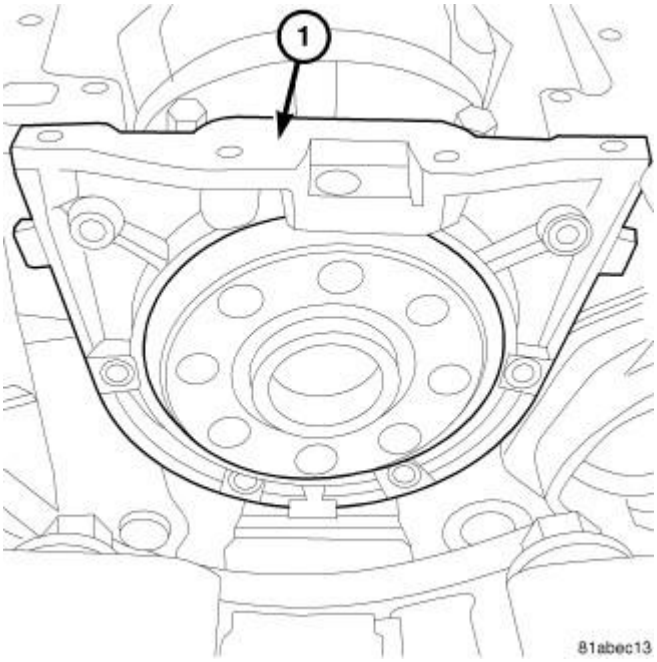


Fig. 264: Rear Crankshaft Seal & Rear Main Oil Seal Carrier
Courtesy of CHRYSLER LLC

5. Remove the rear crankshaft seal and the rear main oil seal carrier.

Installation

INSTALLATION - REAR CRANKSHAFT OIL SEAL

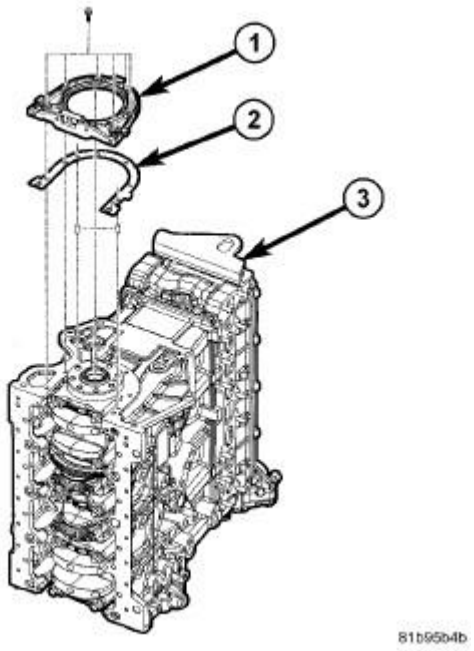


Fig. 265: REAR MAIN SEAL GASKET
Courtesy of CHRYSLER LLC

1. Make sure the rear main seal sealing surfaces are free of oil and debris.
2. Position the rear main seal carrier gasket (2) onto the rear of the engine block (3).
3. Using Crankshaft Seal Installer Tool VM.9993, install rear crankshaft oil seal into the rear main seal carrier (1).
4. Using Crankshaft Seal Installer Tool VM.9993 install the rear main seal carrier onto the engine block (3).

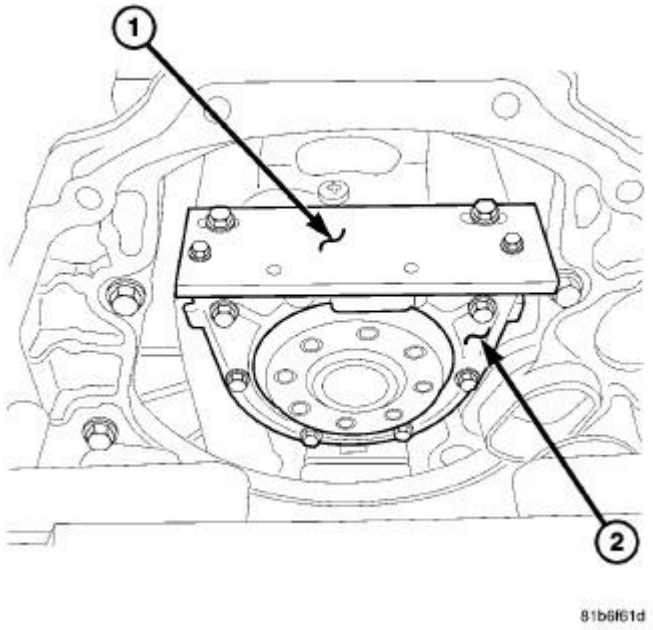


Fig. 266: REAR SEAL TOOL INSTALLED
Courtesy of CHRYSLER LLC

5. Loosely install the bolts that secure the rear oil seal carrier (2) to the engine block.
6. Use Front and Rear Seal Tool VM.9990 (1) to set the depth of the rear main seal (2).

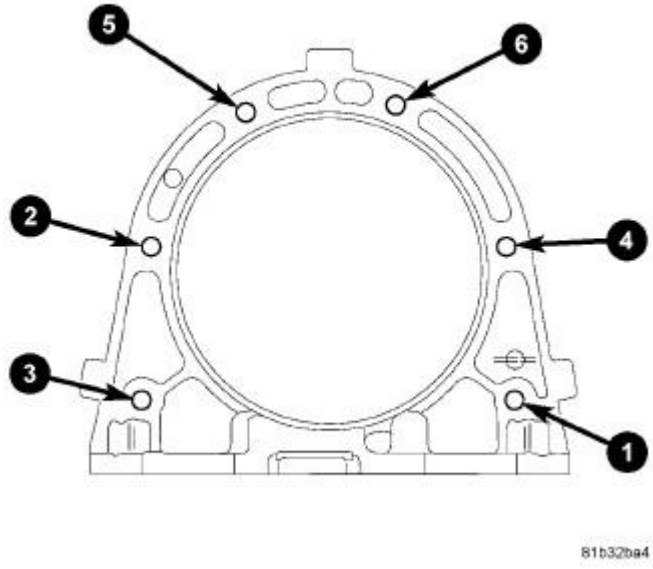


Fig. 267: REAR COVER TORQUE
Courtesy of CHRYSLER LLC

7. Use the illustrated pattern, tighten the rear seal cover bolts to 15 N.m (133 in. lbs.).
8. Make sure the crankshaft sensor tone wheel is positioned correctly on the crankshaft.
9. Install the crankshaft sensor tone wheel to the rear of the crankshaft.
10. Install the oil pan. See **Engine/Lubrication/PAN, Oil - Installation**.
11. Install the flexplate. See **Engine/Engine Block/FLEXPLATE - Installation**.
12. Install the transaxle. Refer to **Transmission and Transfer Case/Automatic - 62TE - Installation** .

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, LEFT

Removal

REMOVAL - LEFT ENGINE MOUNT

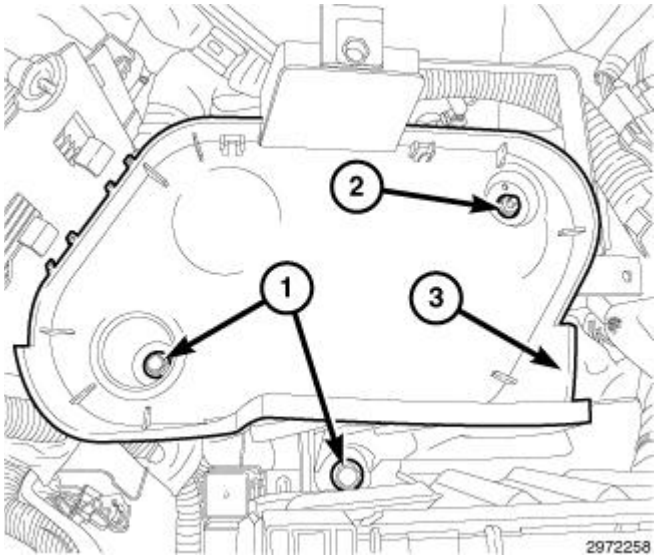


Fig. 268: Battery Tray Bolts & Nut
Courtesy of CHRYSLER LLC

1. Remove the battery. Refer to **Electrical/Battery System/BATTERY - Removal** .
2. Detach the wire harness loom from battery tray.
3. Remove two bolts (1), one nut (2), and the battery tray.

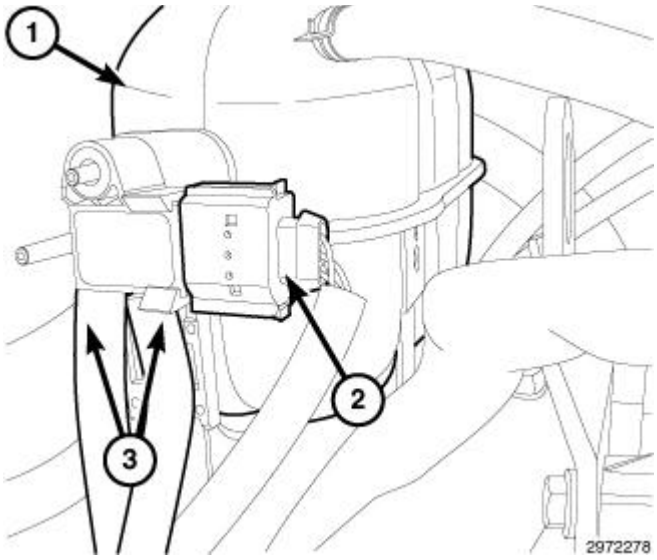


Fig. 269: Differential Pressure Sensor Hoses & Harness Connector
Courtesy of CHRYSLER LLC

4. Remove the coolant bottle (1) from bracket and position aside.
5. Disconnect the Differential Pressure Sensor (DPS) harness connector (2).
6. Disconnect the two DPS sensor hoses (3).

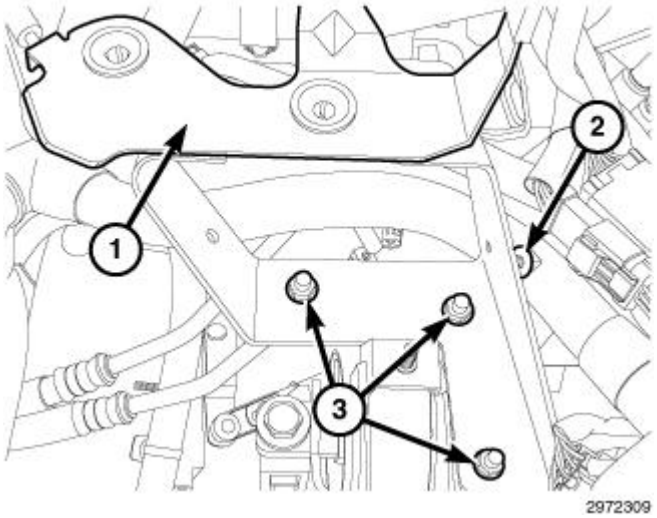


Fig. 270: Wire Harness Loom Clips, Coolant Bottle Bracket & Nuts
Courtesy of CHRYSLER LLC

7. Remove the wire harness loom clips (2) from coolant bottle bracket (1).
8. Remove the three nuts (3) and the coolant bottle bracket (1).

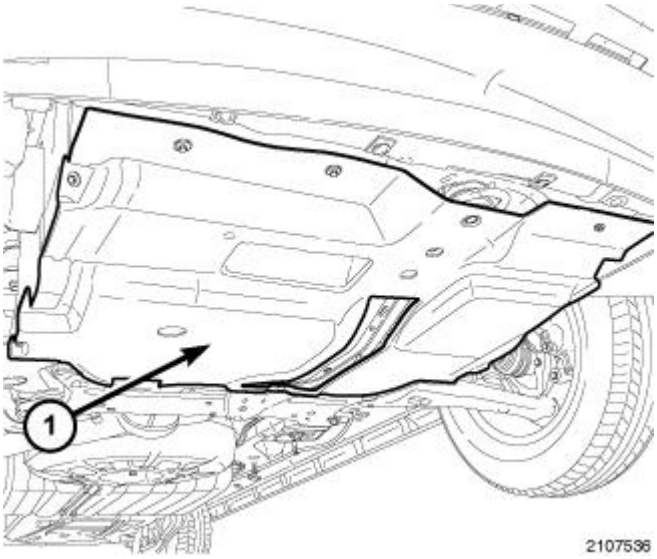


Fig. 271: Underbody Splash Shield
Courtesy of CHRYSLER LLC

9. Remove the underbody splash shield (1).
10. Remove the left side front wheel house splash shield.
11. Support the transmission and engine from below.

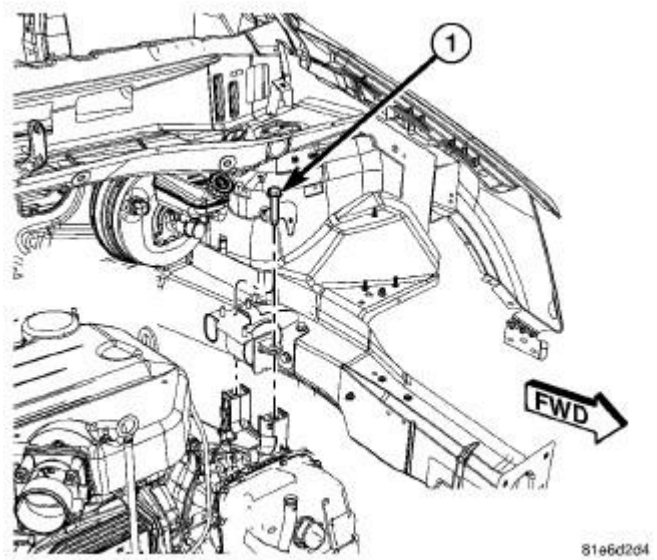


Fig. 272: Engine Mount-To-Transmission Bracket Bolts
Courtesy of CHRYSLER LLC

12. Remove the engine mount-to-transmission bracket bolts (1).

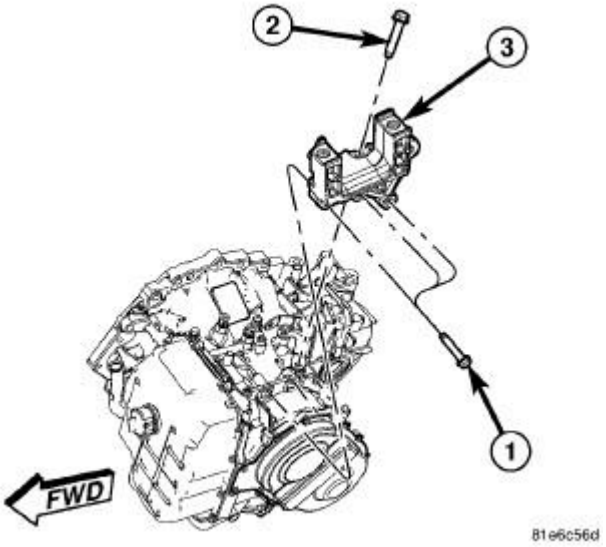


Fig. 273: Transmission Mount Bolts
Courtesy of CHRYSLER LLC

13. Remove the upper transaxle bracket-to-case bolt (2).
14. Raise and support the vehicle.
15. Position transmission jack.
16. Remove the fore/aft crossmember. Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Removal** .
17. Lower transmission jack.
18. Remove the three bolts (1), and the transmission mount bracket (3).

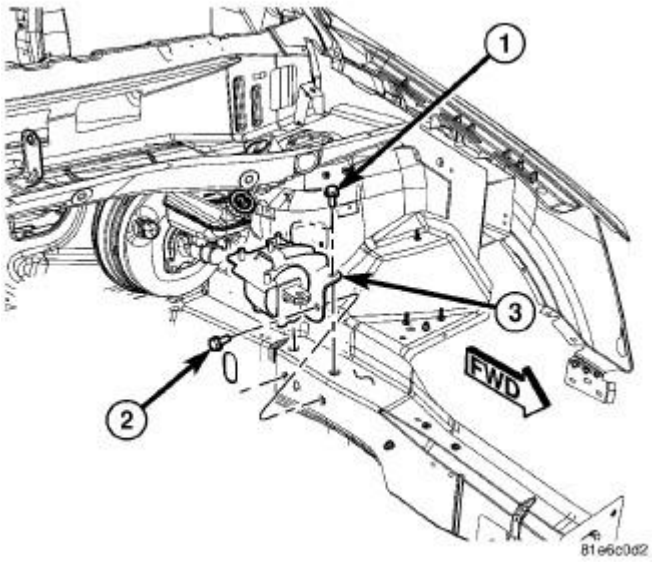


Fig. 274: Left Engine Mount
Courtesy of CHRYSLER LLC

19. Reinstall the fore/aft crossmember loosely.
20. Lower the vehicle.
21. Remove the engine mount-to-rail bolts (1) and (2), and the left engine mount (3) from the rail.

Installation

INSTALLATION - LEFT ENGINE MOUNT

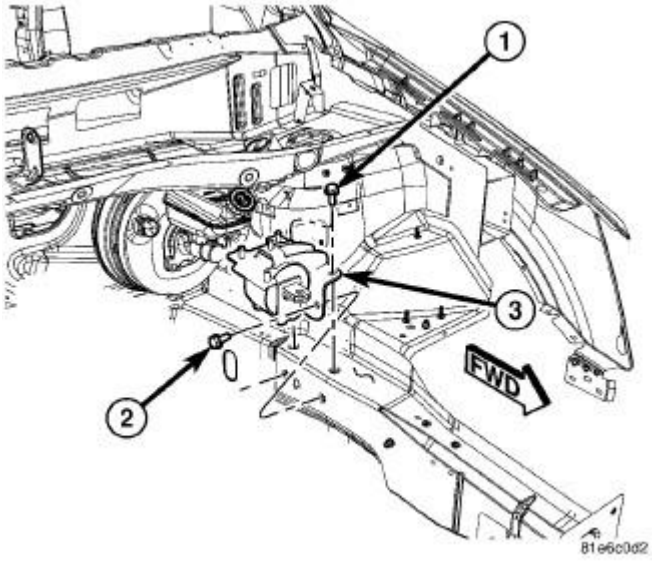


Fig. 275: Left Engine Mount
Courtesy of CHRYSLER LLC

1. Install the left engine mount (3) onto the rail. Tighten the bolts (1) and (2) to 54 N.m (40 lbs. ft.).
2. Raise and support the vehicle.
3. Remove the fore/aft crossmember.

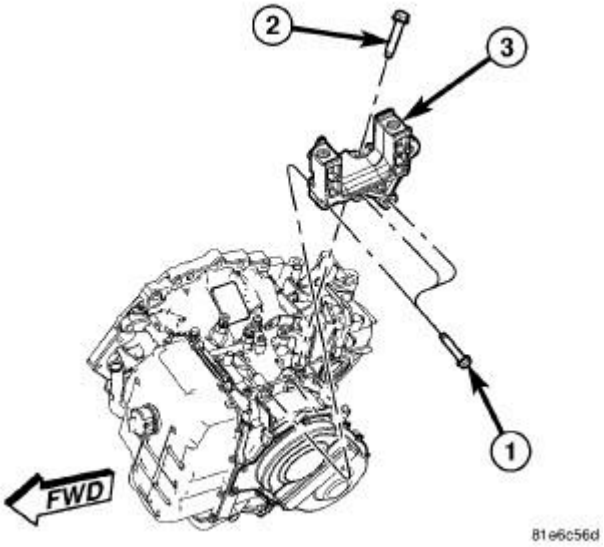


Fig. 276: Transmission Mount Bolts
Courtesy of CHRYSLER LLC

4. Install the transmission mount bracket (3). Tighten the bolts (3) to 45 N.m (33 ft. lbs.).
5. Raise transmission jack.
6. Install the fore/aft crossmember. Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Installation** .
7. Remove transmission jack.
8. Lower the vehicle.
9. Install the upper transaxle bracket-to-case bolt (2). Tighten bolt (2) to 40 N.m (30 ft. lbs.).

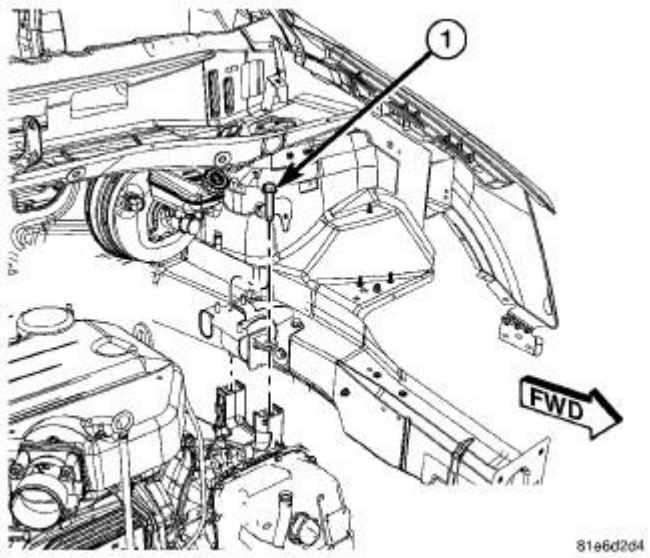


Fig. 277: Engine Mount-To-Transmission Bracket Bolts
Courtesy of CHRYSLER LLC

10. Align the transmission mount with the left transmission mount bracket, and install the trans mount-to-trans bracket bolts (1). Tighten bolts to 95 N.m (70 ft. lbs.).

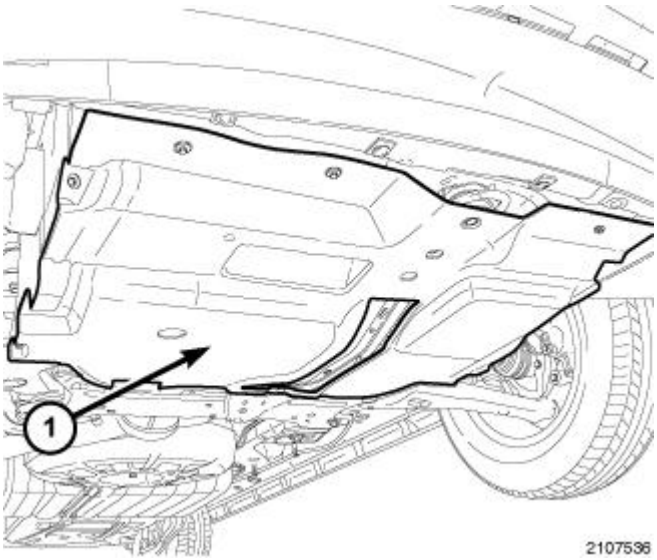


Fig. 278: Underbody Splash Shield
Courtesy of CHRYSLER LLC

11. Remove transmission jack.
12. Install the left side front wheel house splash shield.
13. Remove the underbody splash shield (1).

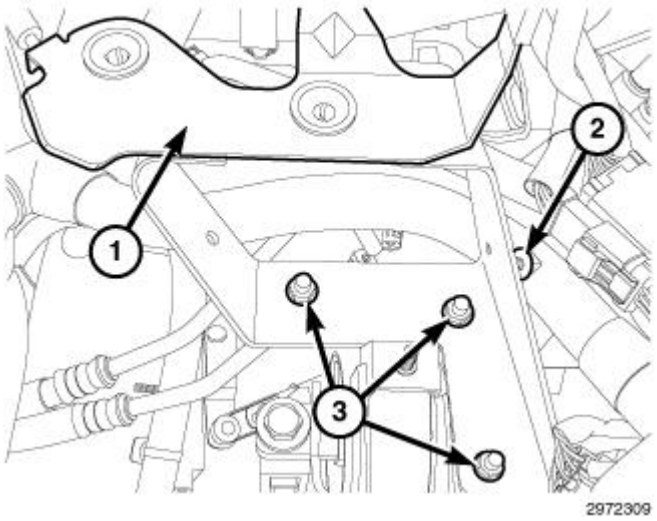


Fig. 279: Wire Harness Loom Clips, Coolant Bottle Bracket & Nuts
Courtesy of CHRYSLER LLC

14. Install the coolant bottle bracket (1). Tighten nuts (3) to 12 N.m (106 in. lbs.).
15. Install the wire harness loom clips (2) to the coolant bottle bracket (1).

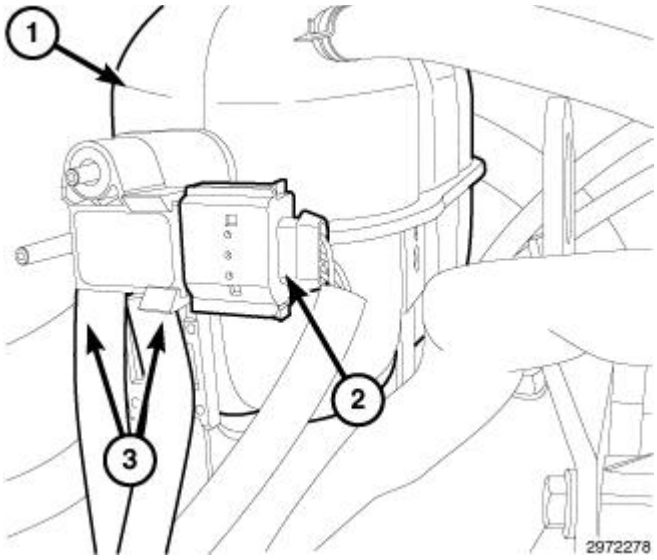


Fig. 280: Differential Pressure Sensor Hoses & Harness Connector
Courtesy of CHRYSLER LLC

16. Connect the two DPS sensor hoses (3).
17. Connect the DPS sensor harness connector (2).
18. Install the coolant bottle (1) onto the bracket.

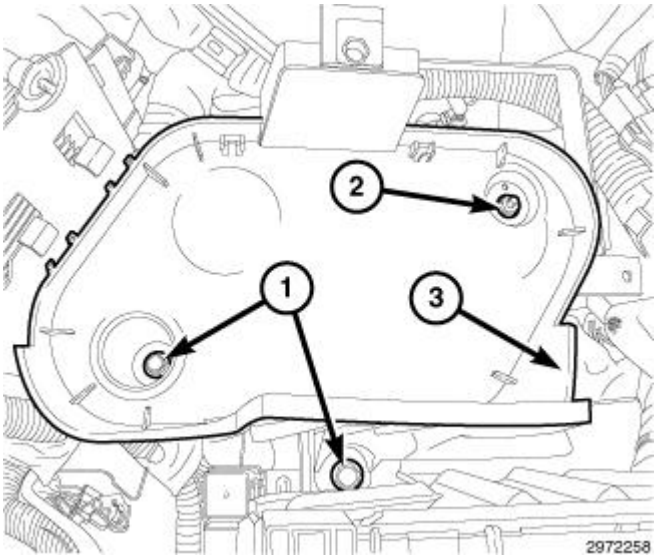


Fig. 281: Battery Tray Bolts & Nut
Courtesy of CHRYSLER LLC

19. Install the battery tray.
    - Tighten nut (2) to 12 N.m (106 in. lbs.).
    - Tighten the two bolts (1) to 12 N.m (106 in. lbs.).
20. Attach the wire harness loom from battery tray.
21. Install the battery. Refer to **Electrical/Battery System/BATTERY - Installation** .

INSULATOR, ENGINE MOUNT, RIGHT

Removal

REMOVAL - RIGHT ENGINE MOUNT

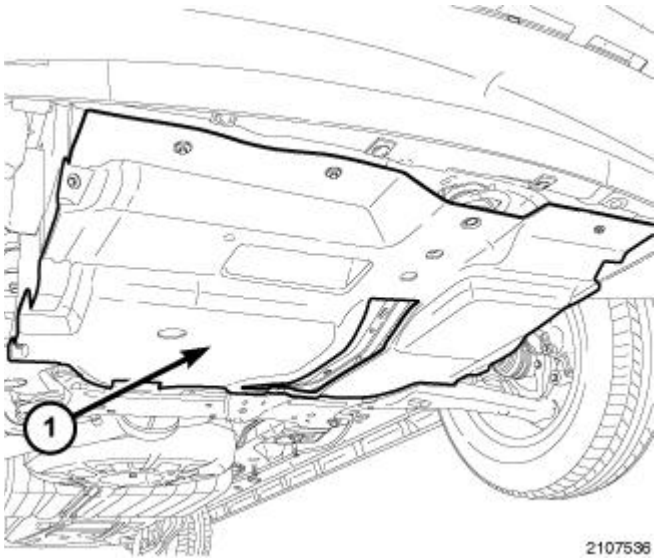


Fig. 282: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
3. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
4. Remove the underbody splash shield (1).

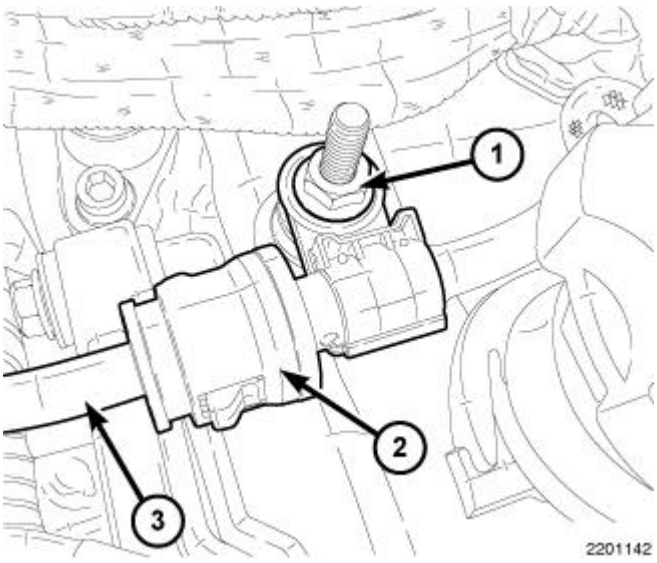


Fig. 283: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

5. Remove the retaining nut (1) and disconnect the fuel injector return line (2).

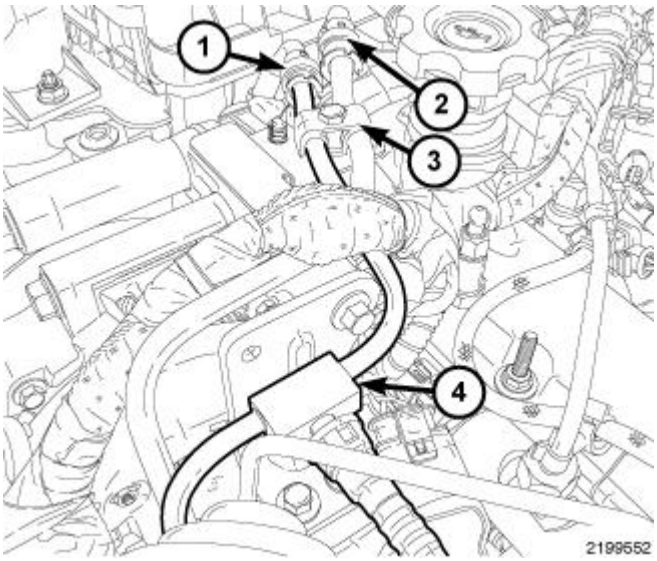


Fig. 284: Fuel Return Line Block
Courtesy of CHRYSLER LLC

6. Disconnect the fuel return line (1).
7. Disconnect the fuel feed line (2).

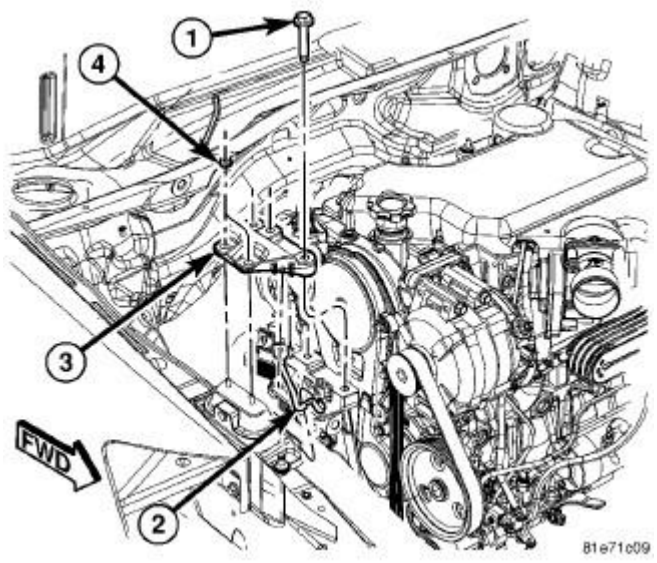


Fig. 285: Right Front Engine Mount Bracket
Courtesy of CHRYSLER LLC

8. Support the engine from below.
9. Remove the ground strap (2).
10. Remove the fasteners (1 and 4) and the engine mount bracket (3).

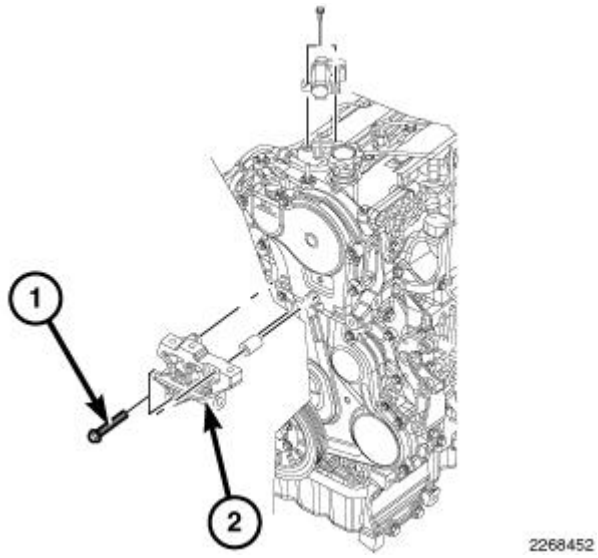


Fig. 286: Inner Engine Mount Bracket
Courtesy of CHRYSLER LLC

11. Remove fasteners (1) and the inner engine mount bracket (2).

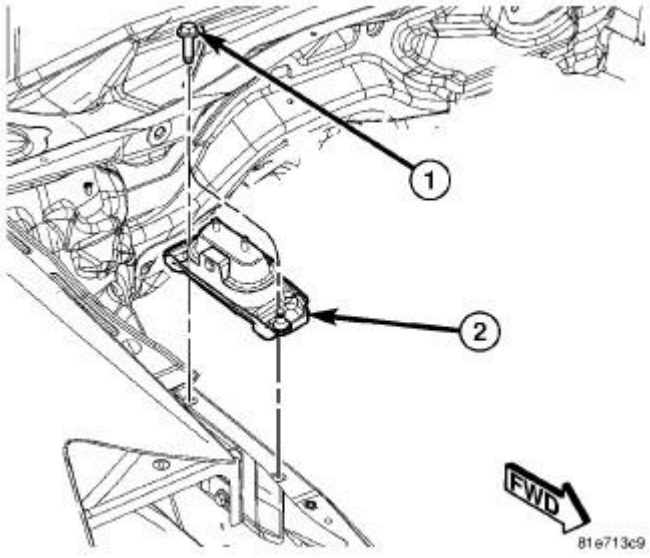


Fig. 287: Lower Engine Mount
Courtesy of CHRYSLER LLC

12. Remove the bolts (1) and the engine mount (2).

Installation

INSTALLATION - RIGHT ENGINE MOUNT

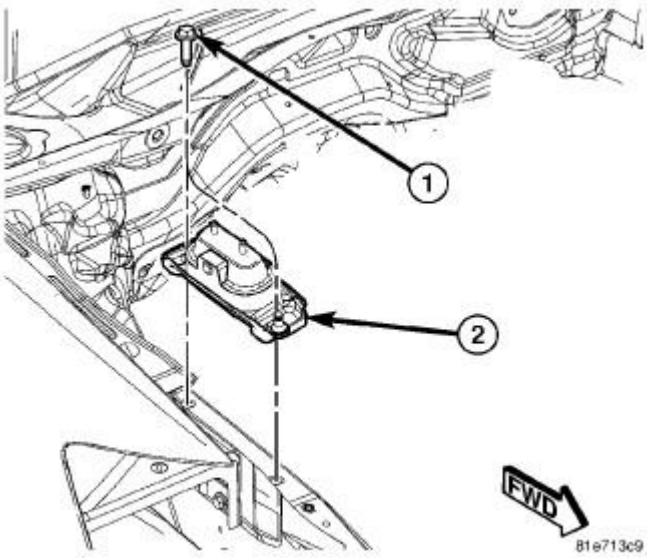


Fig. 288: Lower Engine Mount
Courtesy of CHRYSLER LLC

1. Install the engine mount (2). Tighten the fasteners (1) to 54 N.m (40 ft. lbs.).

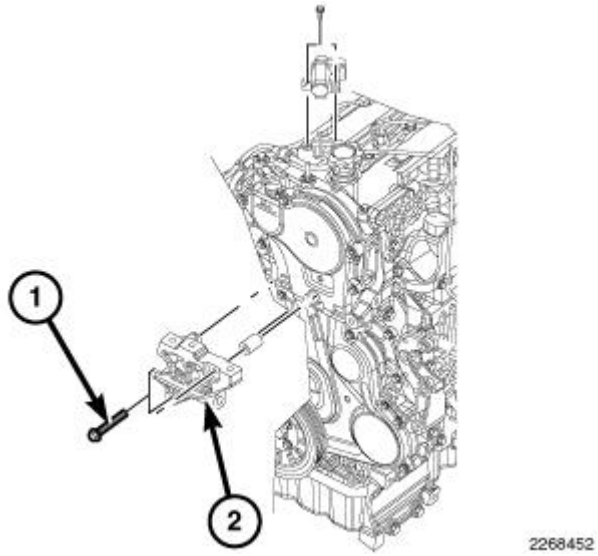


Fig. 289: Inner Engine Mount Bracket
Courtesy of CHRYSLER LLC

2. Install the inner engine mount bracket (2). Tighten fasteners (1) to 45 N.m (33 ft. lbs.).

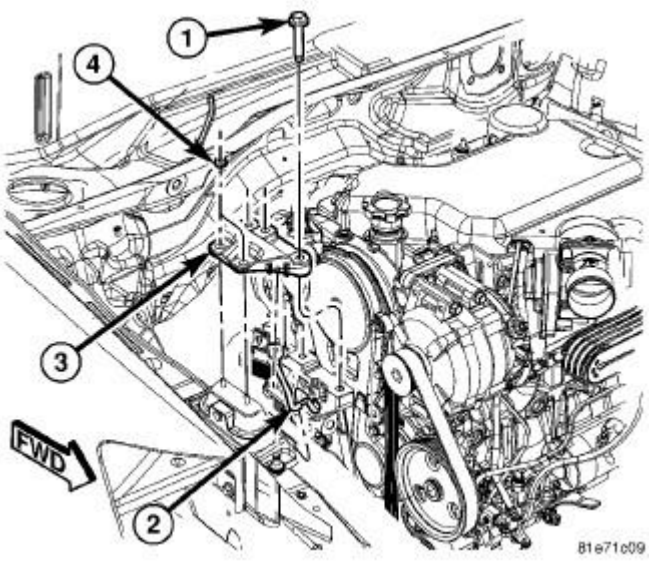


Fig. 290: Right Front Engine Mount Bracket
Courtesy of CHRYSLER LLC

3. Install the engine mount bracket (3).
    - Tighten the bolts (4) to 61 N.m (44 ft. lbs.).
    - Tighten the nuts (1) to 20 N.m (177 in. lbs.).
4. Install the ground strap (2).
5. Remove the support from under engine.

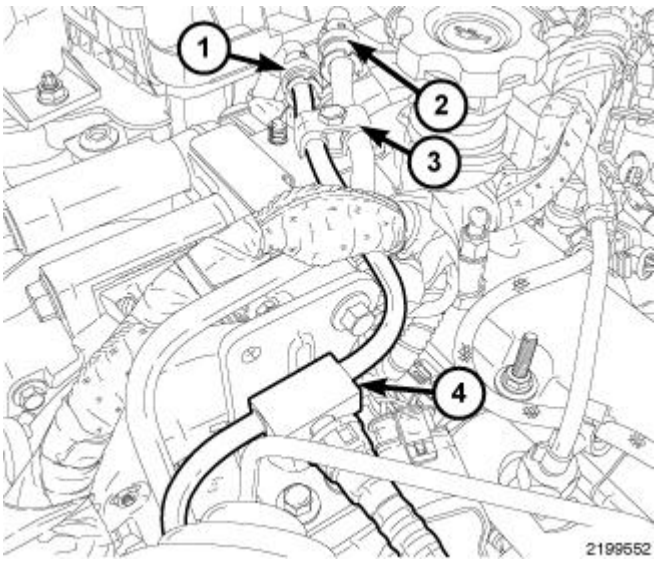


Fig. 291: Fuel Return Line Block
Courtesy of CHRYSLER LLC

6. Connect the fuel feed line (2).
7. Connect the fuel return line (1).

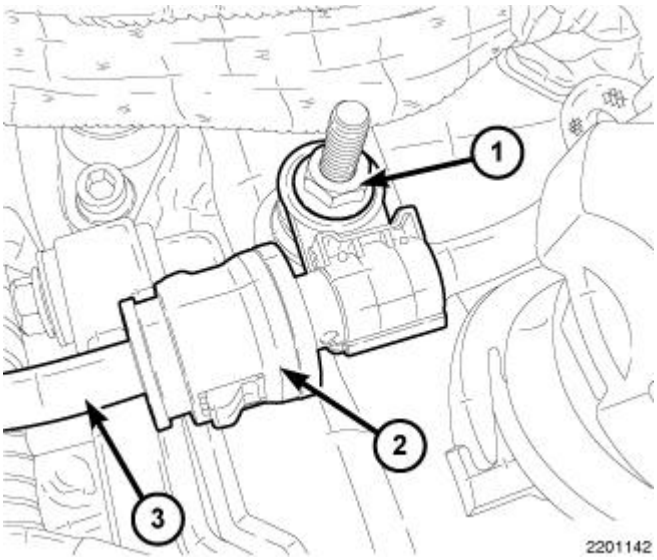


Fig. 292: Fuel Injector Return Line & Retaining Nut
Courtesy of CHRYSLER LLC

8. Connect the fuel injector return line (2) and install the retaining nut (1).

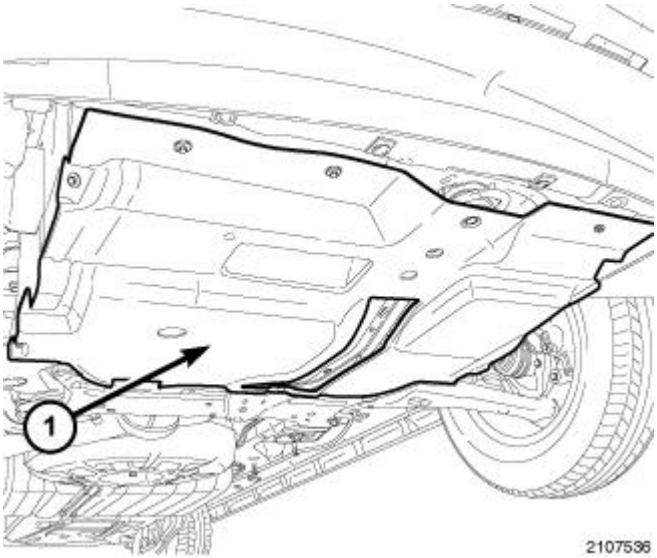


Fig. 293: Underbody Splash Shield
Courtesy of CHRYSLER LLC

9. Install the underbody splash shield (1).
10. Lower the vehicle.
11. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
12. Connect the negative battery cable.

LUBRICATION

COOLER, OIL

Description

DESCRIPTION

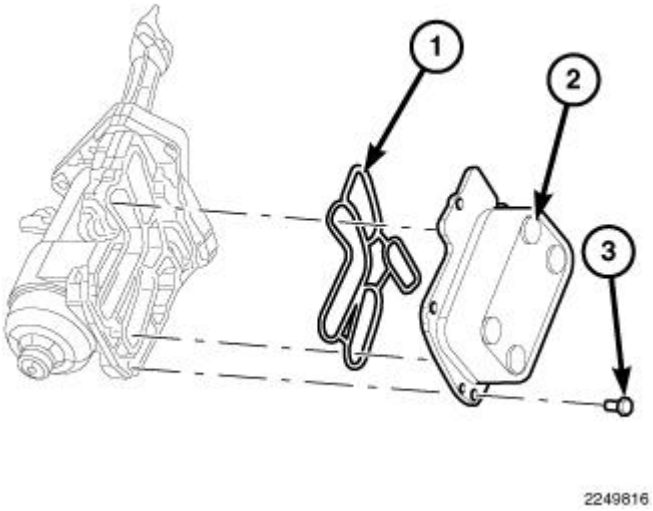


Fig. 294: Oil Cooler Components
Courtesy of CHRYSLER LLC

1. Engine coolant is used to cool the engine oil. A plate-style external heat exchanger (2) is located on the oil filter housing (3) which is on the right side of the engine. A gasket (1) seals the oil cooler to the oil filter housing. Replace the gasket (1) whenever the oil cooler is removed or replaced. The oil is fed to the oil cooler through the oil filter housing.

Removal

REMOVAL - OIL COOLER

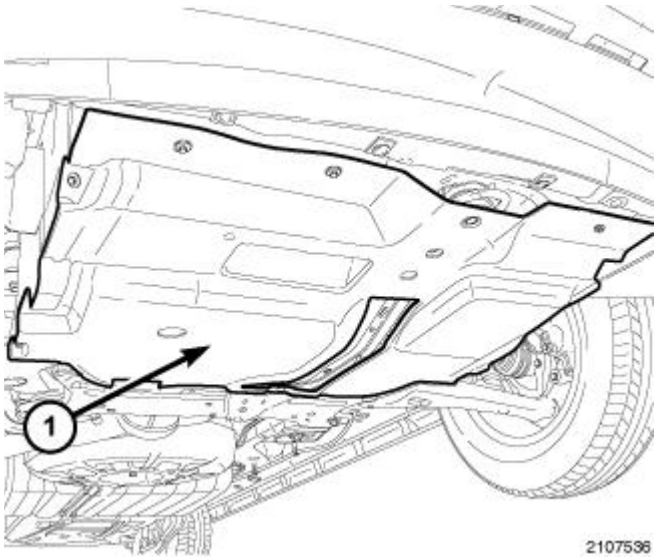


Fig. 295: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the underbody splash shield (1).
4. Drain the cooling system. Refer to **Cooling - Standard Procedure** .
5. Drain the engine oil.
6. Using a new copper sealing washer, tighten oil drain plug to 54 N.m (40 ft. lbs.).
7. Remove the right front inner splash shield.

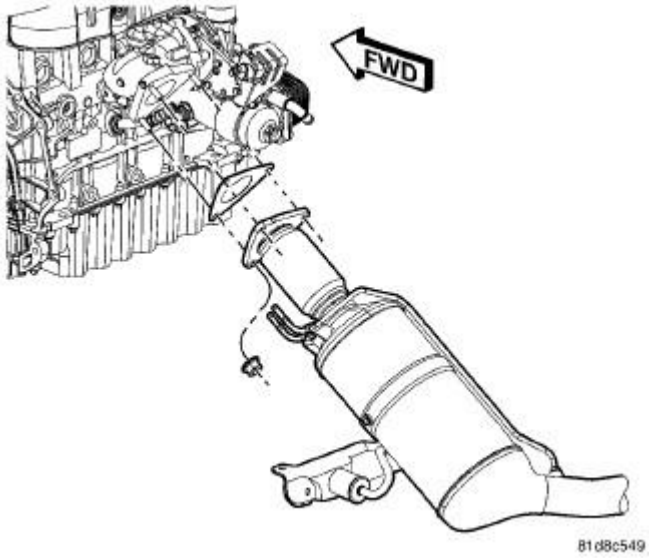


Fig. 296: Diesel Oxidation Catalyst (DOC)/Diesel Particulate Filter (DPF)
Courtesy of CHRYSLER LLC

8. Remove the Diesel Particulate Filter (DEF). Refer to **Exhaust System/FILTER, Diesel Particulate - Removal** .

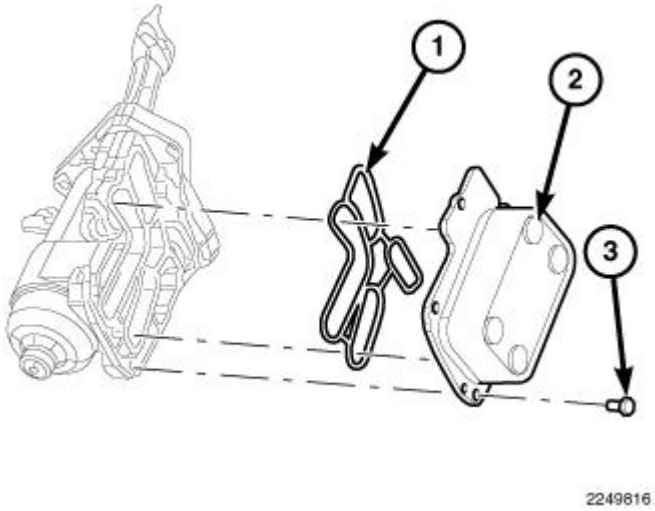


Fig. 297: Oil Cooler Components
Courtesy of CHRYSLER LLC

9. Remove the oil filter housing. See **Engine/Lubrication/HOUSING, Oil Filter - Removal**.
10. Remove the five bolts (3) and the oil cooler (2).

Installation

OIL COOLER

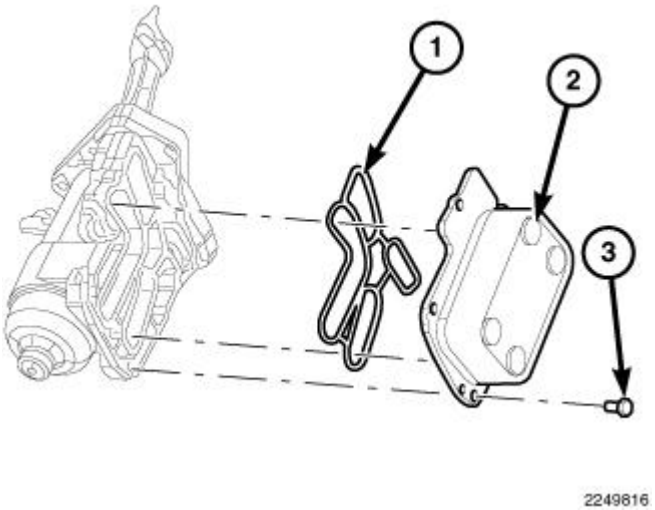


Fig. 298: Oil Cooler Components
Courtesy of CHRYSLER LLC

1. Using a new gasket (1), install the oil cooler (2). Tighten bolts (3) to 12 N.m (106 in. lbs.).
2. Install the oil filter housing. See **Engine/Lubrication/HOUSING, Oil Filter - Installation**.

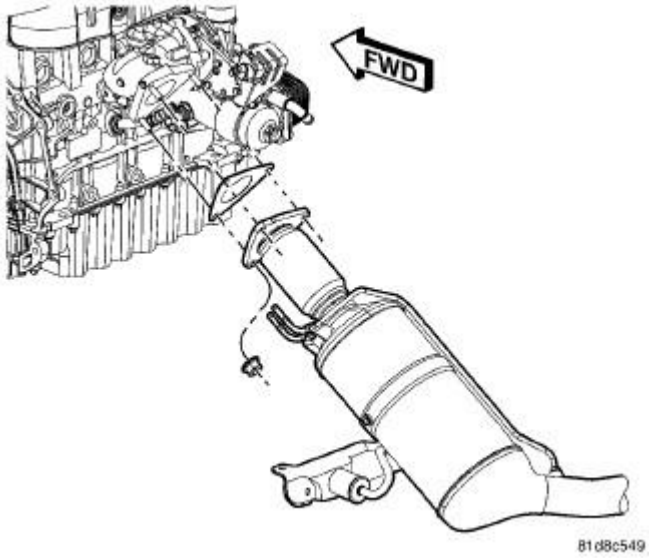


Fig. 299: Diesel Oxidation Catalyst (DOC)/Diesel Particulate Filter (DPF)
Courtesy of CHRYSLER LLC

3. Install the Diesel Particulate Filter (DEF). Refer to **Exhaust System/FILTER, Diesel Particulate - Installation** .
4. Install the right front inner splash shield. Refer to **Body/Exterior/SHIELD, Splash - Installation** .
5. Fill the engine with the recommended engine oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .
6. Fill the cooling system. Refer to **Cooling - Standard Procedure** .
7. Connect the negative battery cable.
8. Start engine and check for leaks.

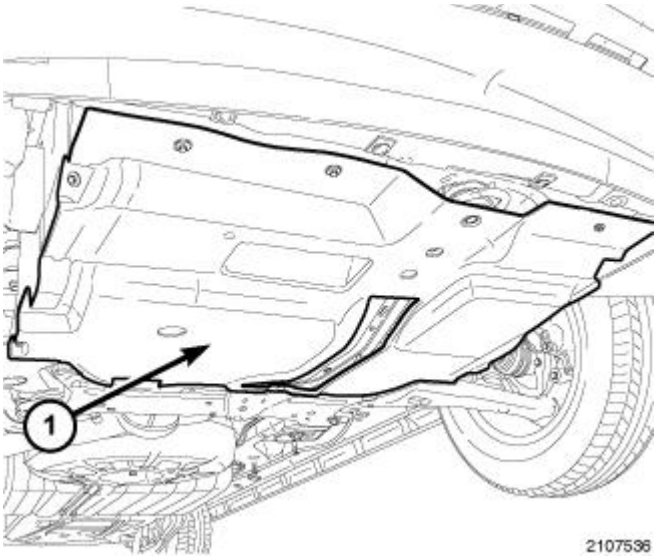


Fig. 300: Underbody Splash Shield
Courtesy of CHRYSLER LLC

9. Install the underbody splash shield (1) and securely tighten the fasteners.
10. Lower the vehicle.

FILTER, ENGINE OIL

Removal

REMOVAL - OIL FILTER

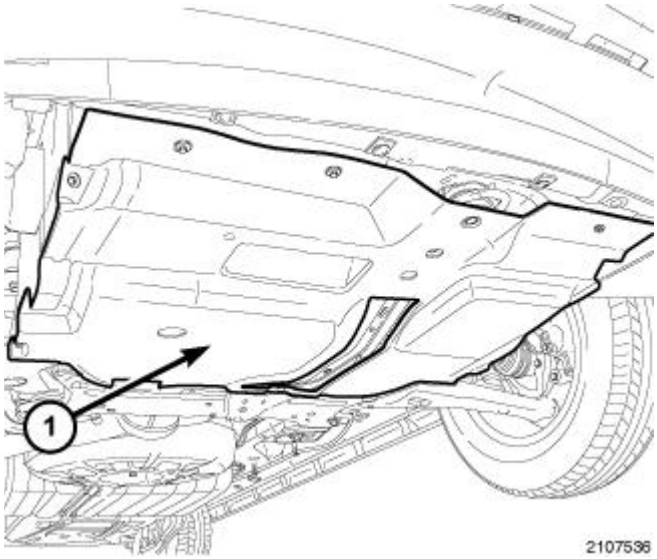


Fig. 301: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.

2. Raise and support the vehicle.
3. Remove the underbody splash shield (1).
4. Drain the engine oil.
5. Using a new copper sealing washer, tighten oil drain plug to 54 N.m (40 ft. lbs.).

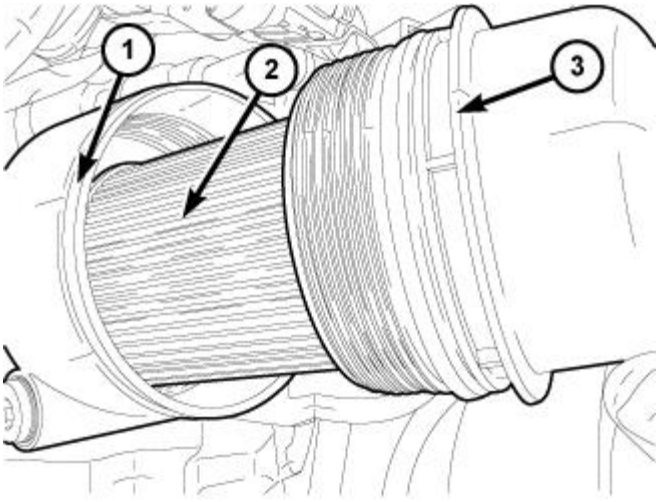


Fig. 302: Oil Filter & Housing Adapter Cap
Courtesy of CHRYSLER LLC

6. Remove oil filter housing adapter cap (3) and the oil filter (2).

Installation

INSTALLATION - OIL FILTER

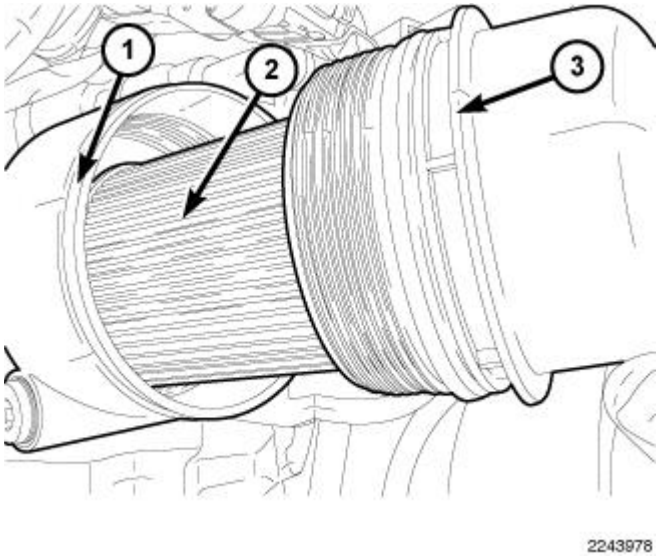


Fig. 303: Oil Filter & Housing Adapter Cap
Courtesy of CHRYSLER LLC

1. Install the oil filter (2) and oil filter housing adapter cap (3). Tighten cap to 25 N.m (18 ft. lbs.).

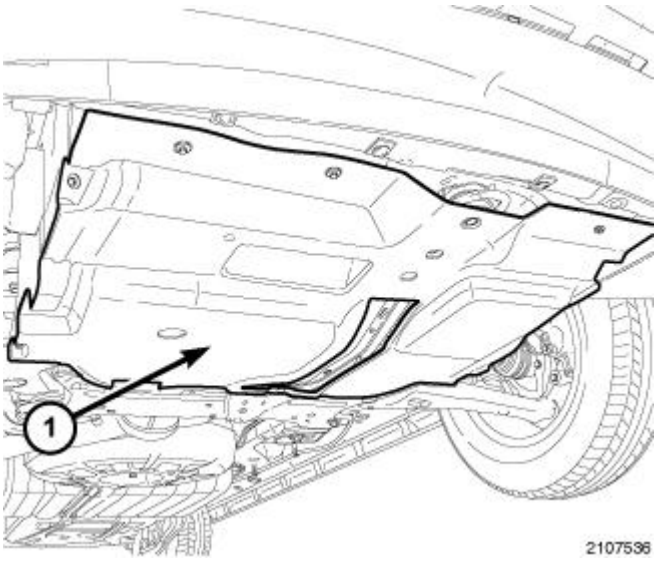


Fig. 304: Underbody Splash Shield
Courtesy of CHRYSLER LLC

2. Install the under body splash shield.
3. Lower the vehicle.
4. Fill the engine with recommended engine oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .
5. Connect the negative battery cable.

HOUSING, OIL FILTER

Description

DESCRIPTION

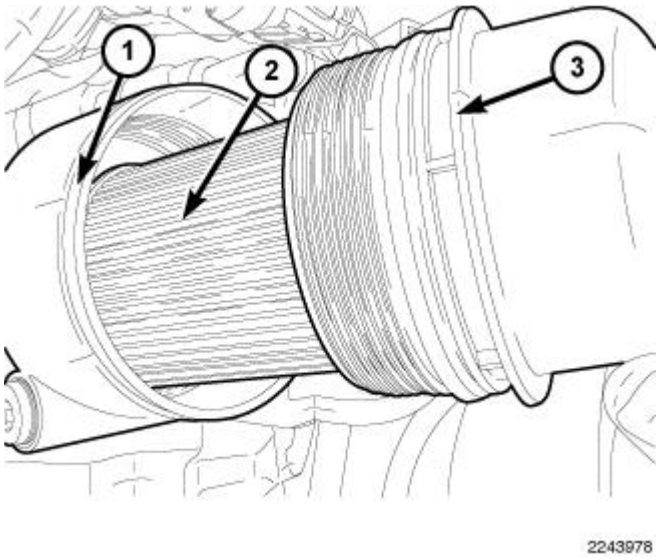


Fig. 305: Oil Filter & Housing Adapter Cap
Courtesy of CHRYSLER LLC

An oil filter adapter is used on this vehicle to relocate the oil filter for easier access when servicing.

Removal

REMOVAL - OIL FILTER HOUSING

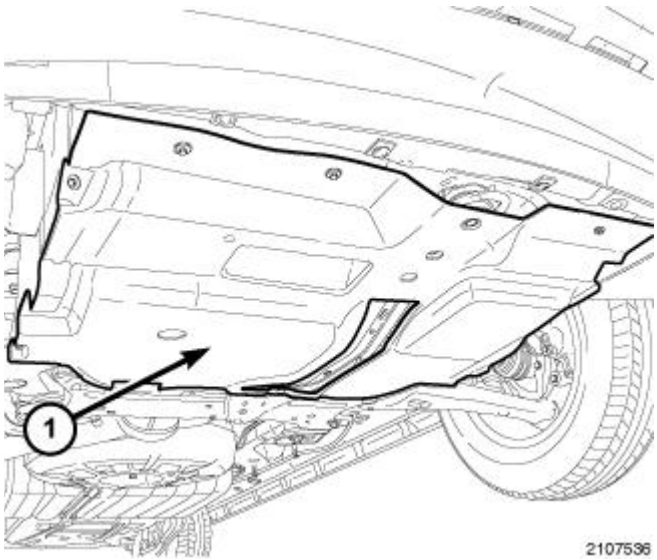


Fig. 306: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the underbody splash shield (1).
4. Drain the cooling system. Refer to **Cooling - Standard Procedure** .

5. Drain the engine oil.
6. Using a new copper sealing washer, tighten oil drain plug to 54 N.m (40 ft. lbs.).
7. Remove the right front inner splash shield.
8. Remove the Diesel Particulate Filter (DEF). Refer to **Exhaust System/FILTER, Diesel Particulate - Removal** .

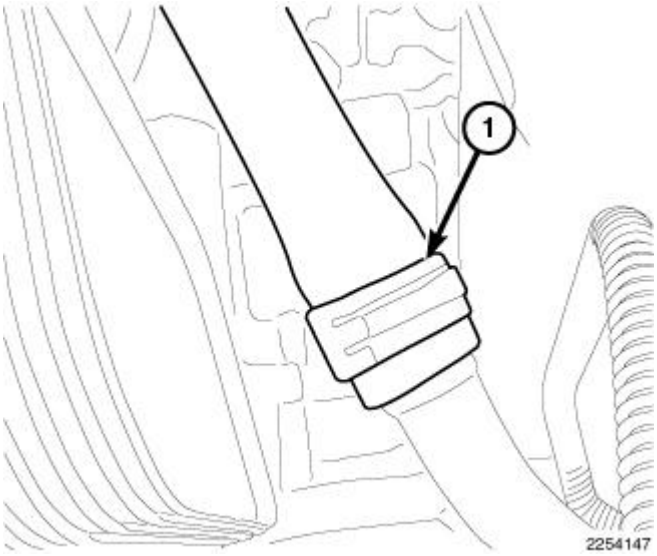


Fig. 307: Engine Oil Coolant Hose
Courtesy of CHRYSLER LLC

9. Disconnect the engine oil coolant hose (1).

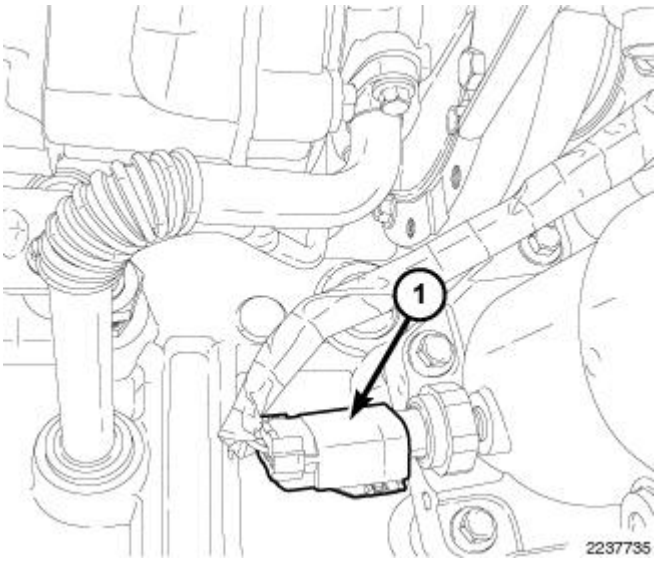


Fig. 308: Oil Pressure Switch Harness Connector
Courtesy of CHRYSLER LLC

10. Disconnect the oil pressure switch harness connector (1).

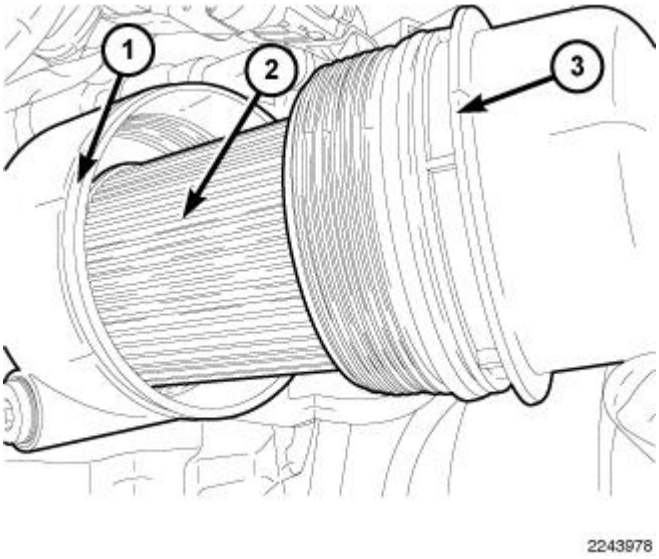


Fig. 309: Oil Filter & Housing Adapter Cap
Courtesy of CHRYSLER LLC

11. Remove oil filter housing adapter cap (3) and the oil filter (2).

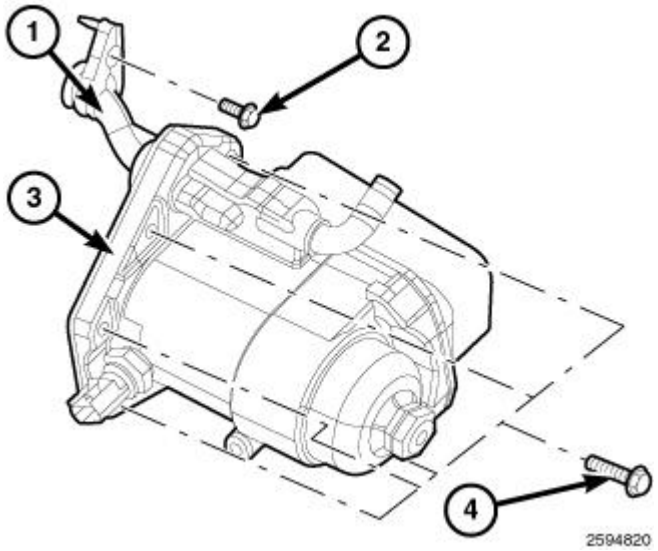


Fig. 310: Engine Oil Filter Housing
Courtesy of CHRYSLER LLC

12. Remove bolts (2 and 4) along with the oil filter housing (3) and oil filter tube (1) from engine block.

Installation

INSTALLATION - OIL FILTER HOUSING

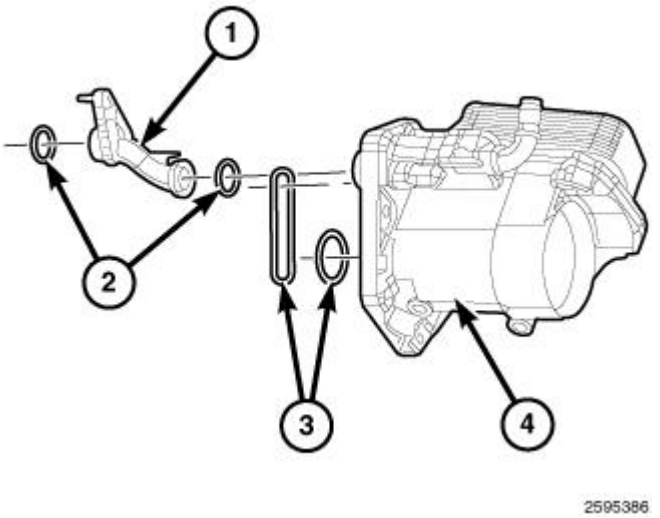


Fig. 311: Oil Filter Tube & Housing With O-Ring Gaskets
Courtesy of CHRYSLER LLC

1. Install new O-ring gaskets (2) onto the oil filter tube (1).
2. Install new O-ring gaskets (3) onto the oil filter housing (4).

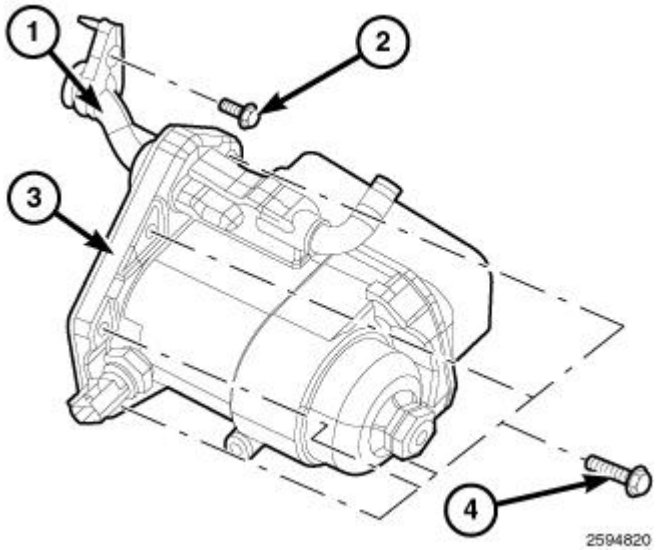


Fig. 312: Engine Oil Filter Housing
Courtesy of CHRYSLER LLC

3. Install the oil filter tube (1) to the engine block. Tighten bolt (2) to 11 N.m (97 in. lbs.).
4. Install the oil filter housing (3). Tighten bolts (4) to 32 N.m (24 ft. lbs.).

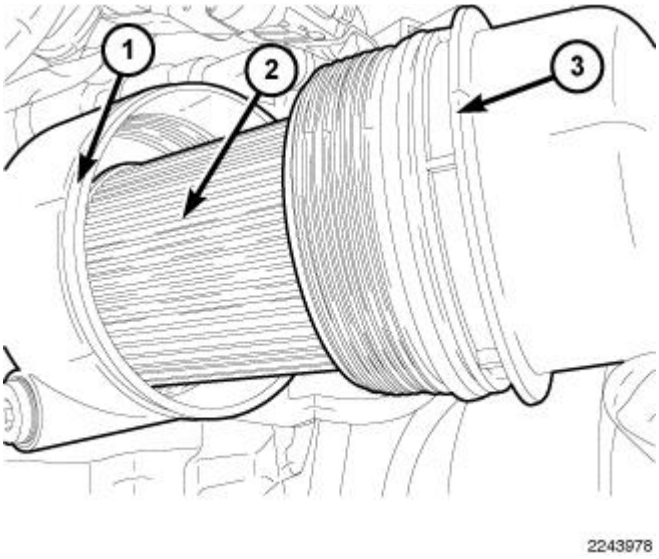


Fig. 313: Oil Filter & Housing Adapter Cap
Courtesy of CHRYSLER LLC

5. Install the oil filter (2).
6. Install the oil filter housing adapter cap (3). Tighten to 25 N.m (18 ft. lbs.).

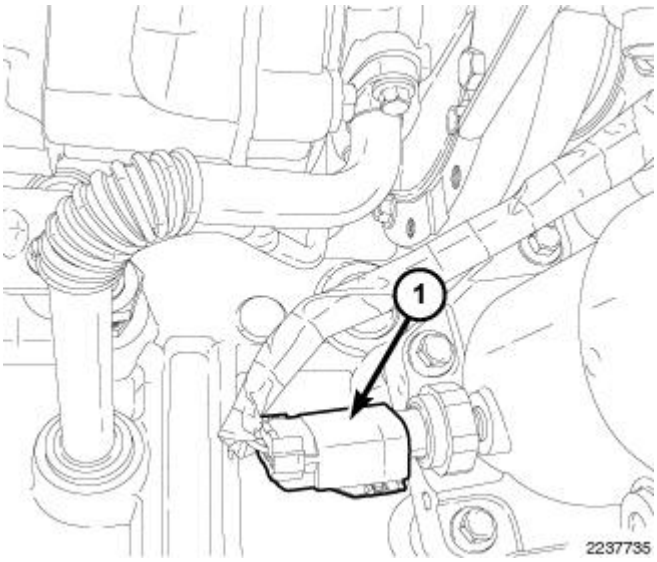


Fig. 314: Oil Pressure Switch Harness Connector
Courtesy of CHRYSLER LLC

7. Connect the oil pressure switch harness connector (1).

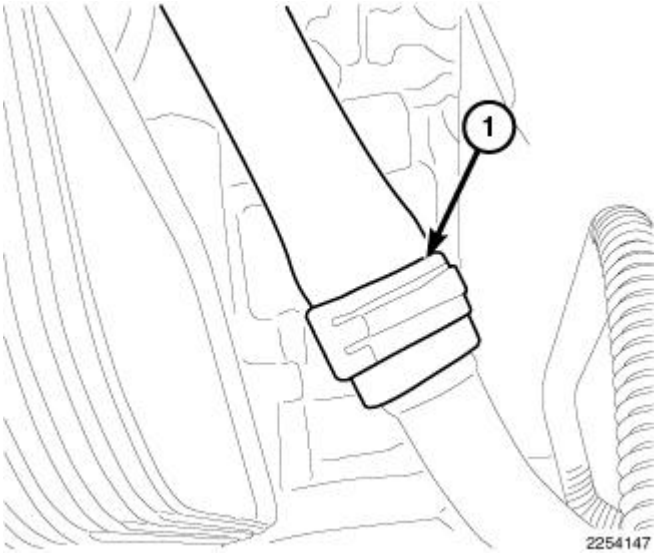


Fig. 315: Engine Oil Coolant Hose
Courtesy of CHRYSLER LLC

8. Connect the engine oil coolant hose (1).
9. Install the Diesel Particulate Filter (DEF). Refer to **Exhaust System/FILTER, Diesel Particulate - Installation** .
10. Install the right front inner splash shield.
11. Fill the engine with recommended oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .
12. Fill the cooling system. Refer to **Cooling - Standard Procedure** .

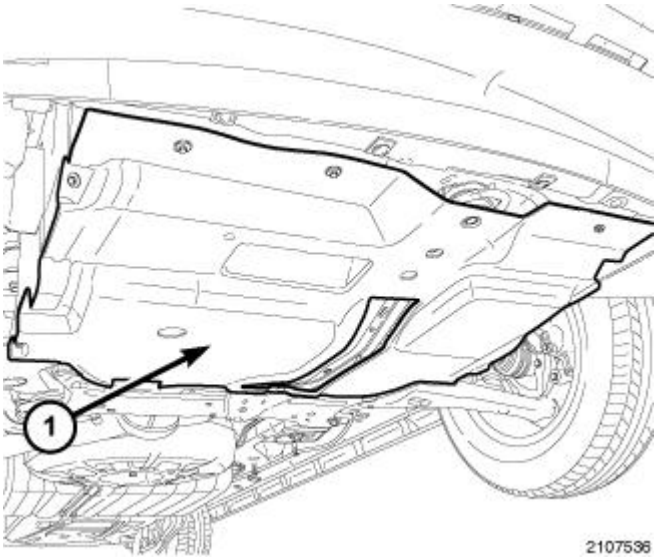


Fig. 316: Underbody Splash Shield
Courtesy of CHRYSLER LLC

13. Connect the negative battery cable.

14. Start the engine and check for leaks.
15. Install the underbody splash shield (1) and securely tighten fasteners.

JET, PISTON OIL COOLER

Description

DESCRIPTION

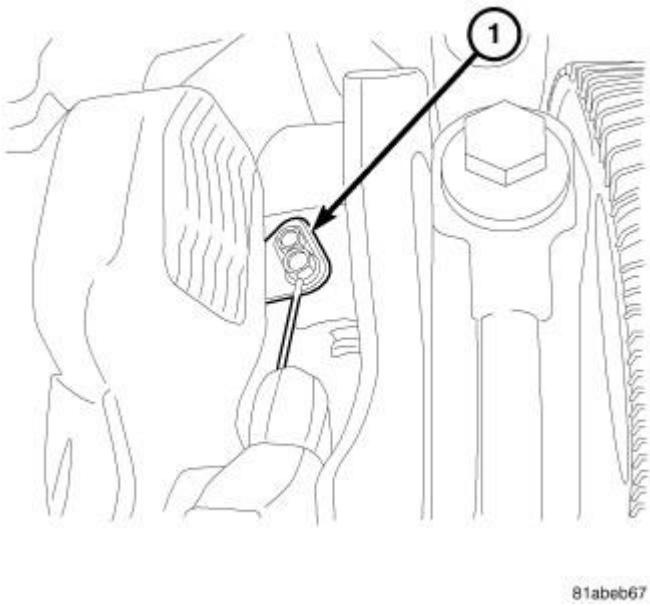


Fig. 317: OIL JET
Courtesy of CHRYSLER LLC

There are four oil jets installed in the engine block. These oil jets are used to cool and lubricate the piston assemblies.

Removal

REMOVAL

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage. Care must be taken not to damage the crankshaft tone ring when removing cylinder number four oil jet.

NOTE: To prevent damage to the oil jets, remove the oil jets before removing the pistons.

1. Disconnect negative battery cable.

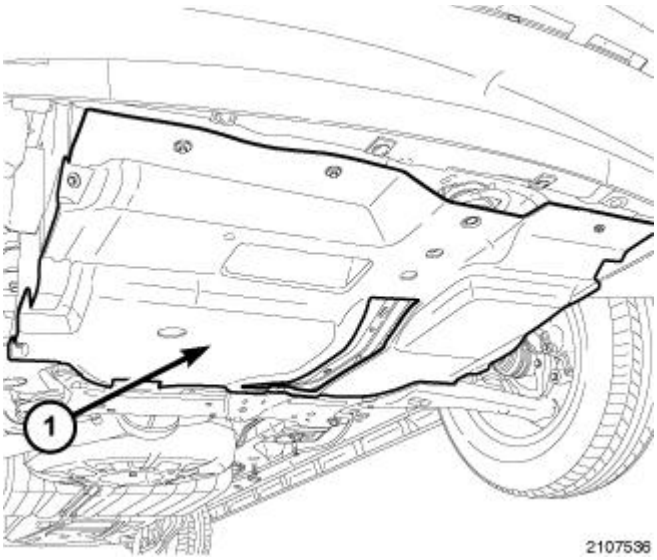


Fig. 318: Underbody Splash Shield
Courtesy of CHRYSLER LLC

2. Remove the underbody splash shield (1).
3. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.

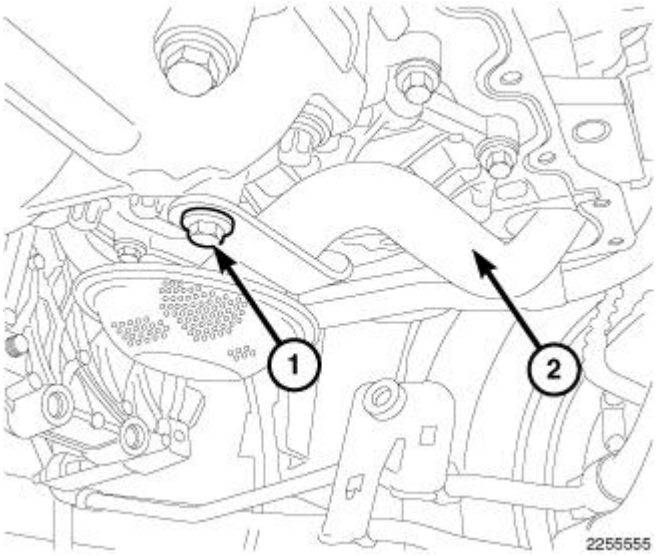


Fig. 319: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

4. Remove retaining bolt (1) and the oil pickup tube (2) from engine. Discard the O-rings.

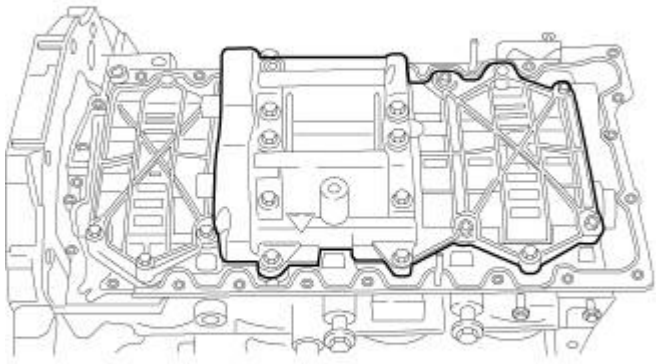


Fig. 320: Balance Shaft Module
Courtesy of CHRYSLER LLC

5. Remove the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Removal**.

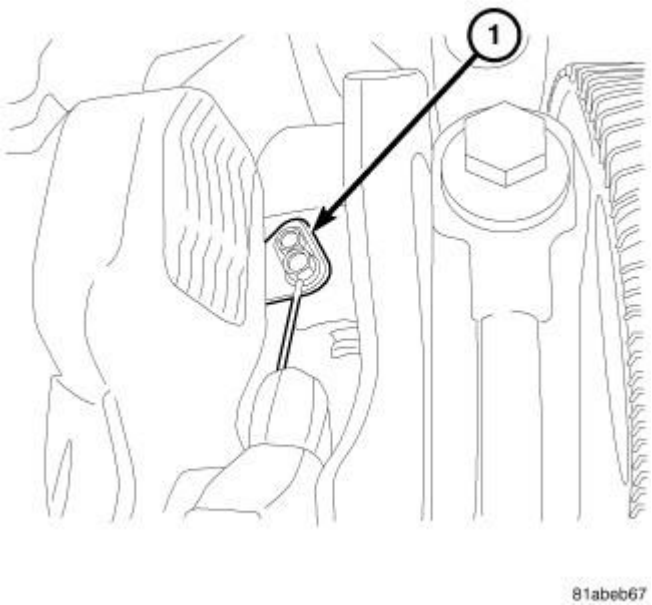


Fig. 321: OIL JET
Courtesy of CHRYSLER LLC

6. Remove the oil jet (1) and discard the O-rings.

Installation

INSTALLATION

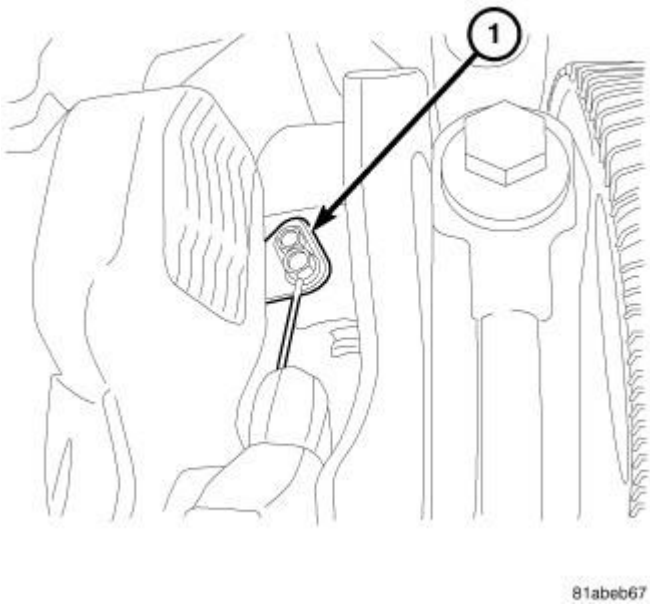


Fig. 322: OIL JET
Courtesy of CHRYSLER LLC

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage. Care must be taken not to damage the crankshaft tone ring when removing cylinder number four oil jet.

1. Using a new O-ring, lubricate and install the O-ring on oil jet.
2. Install oil jet (1). Tighten bolt to 11 N.m (97 in. lbs.).

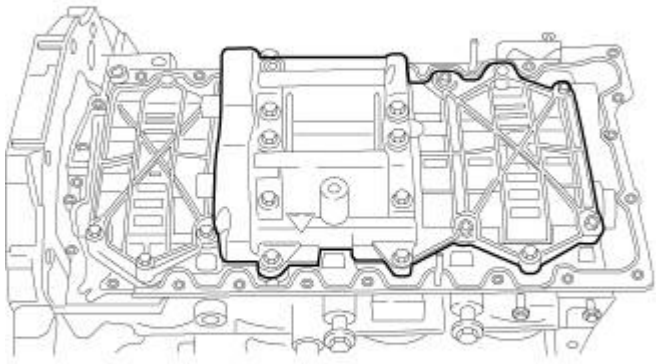


Fig. 323: Balance Shaft Module
Courtesy of CHRYSLER LLC

3. Install the balance shaft assembly. See **Engine/Engine Block/MODULE, Balance Shaft - Installation**.

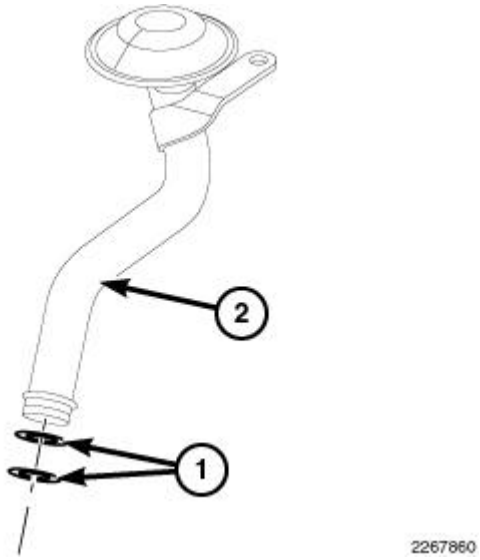


Fig. 324: Oil Pickup Tube & O-Rings
Courtesy of CHRYSLER LLC

4. Using new O-rings, lubricate and install the 2 O-rings (1) on oil pickup tube (2).

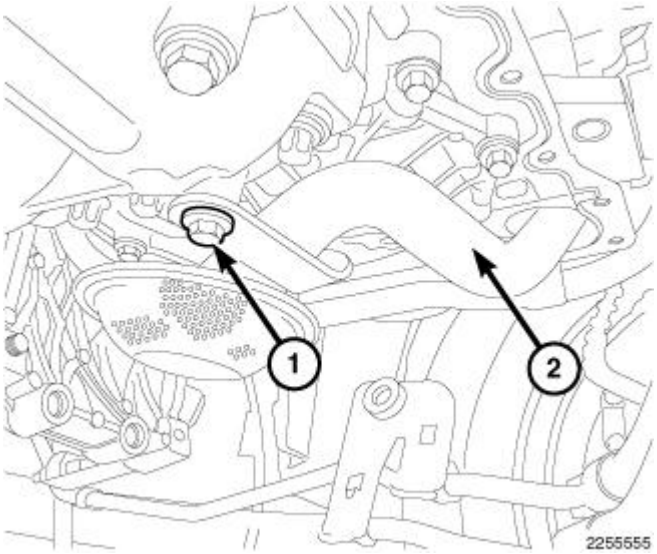


Fig. 325: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

5. Install the oil pickup tube. Tighten the bolt to 15 N.m (133 in. lbs.).
6. Install the oil pan. See **Engine/Lubrication/PAN, Oil - Installation**.
7. Fill engine with oil.
8. Connect negative battery cable.
9. Start engine and check for leaks.

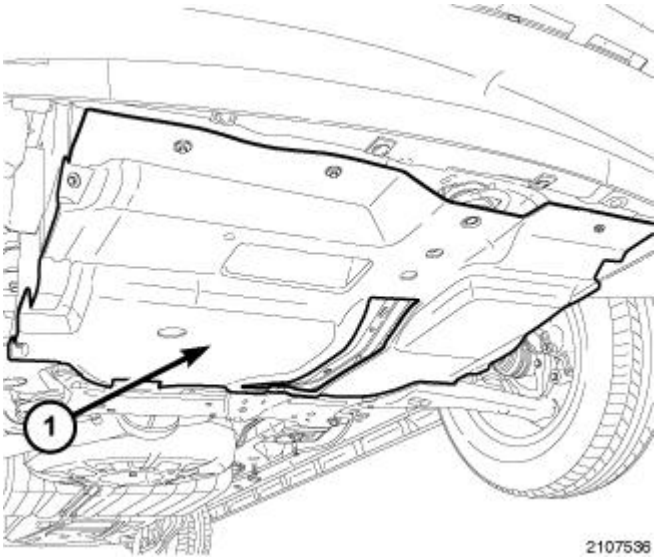


Fig. 326: Underbody Splash Shield
Courtesy of CHRYSLER LLC

10. Install the underbody splash shield (1) and securely tighten fasteners.

OIL

Description

DESCRIPTION

Refer to the LUBRICATION AND MAINTENANCE for oil specifications. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .

PAN, OIL

Removal

REMOVAL - OIL PAN

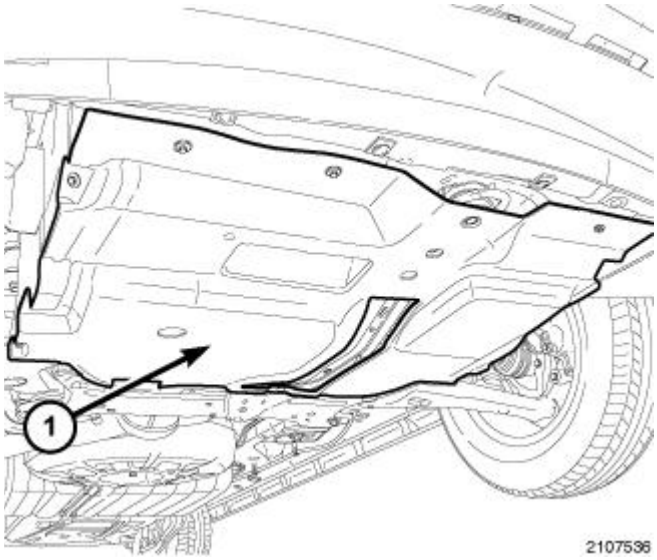


Fig. 327: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle. Refer to **Vehicle Quick Reference/Hoisting - Standard Procedure** .
3. Remove the underbody splash shield (1).
4. Drain the engine oil.
5. Using a new copper sealing washer, tighten oil drain plug to 54 N.m (40 ft. lbs.).
6. Remove accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
7. If equipped, remove the insulation around the oil pan.
8. Remove the front fore and aft crossmember. Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Removal** .

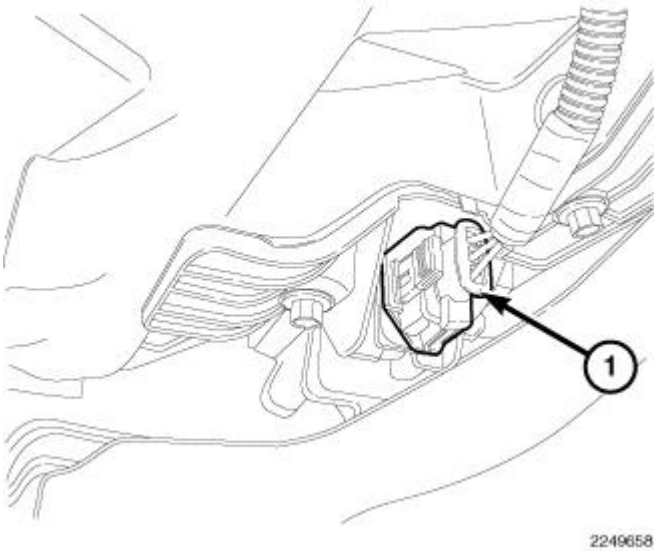


Fig. 328: Crankshaft Position Sensor (CKP) Harness Connector
Courtesy of CHRYSLER LLC

9. Disconnect the Crankshaft Position Sensor (CKP) connector (1).

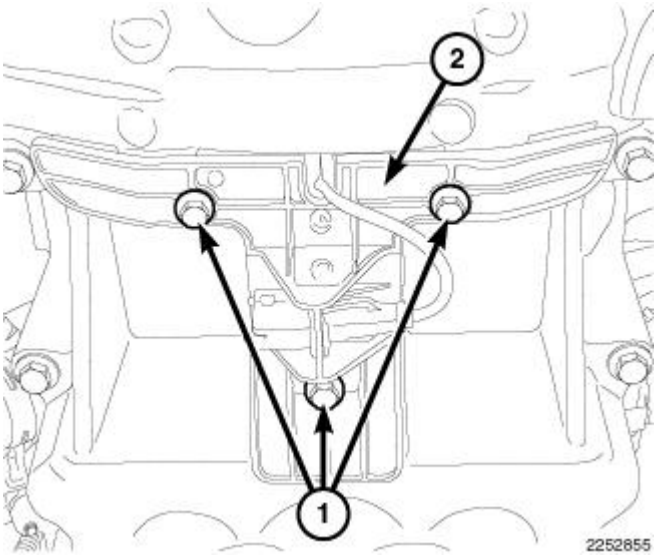


Fig. 329: Crankshaft Position Sensor (CKP) Access Cover
Courtesy of CHRYSLER LLC

10. Remove bolts (1) and the Crankshaft Position Sensor (CKP) access cover (2).

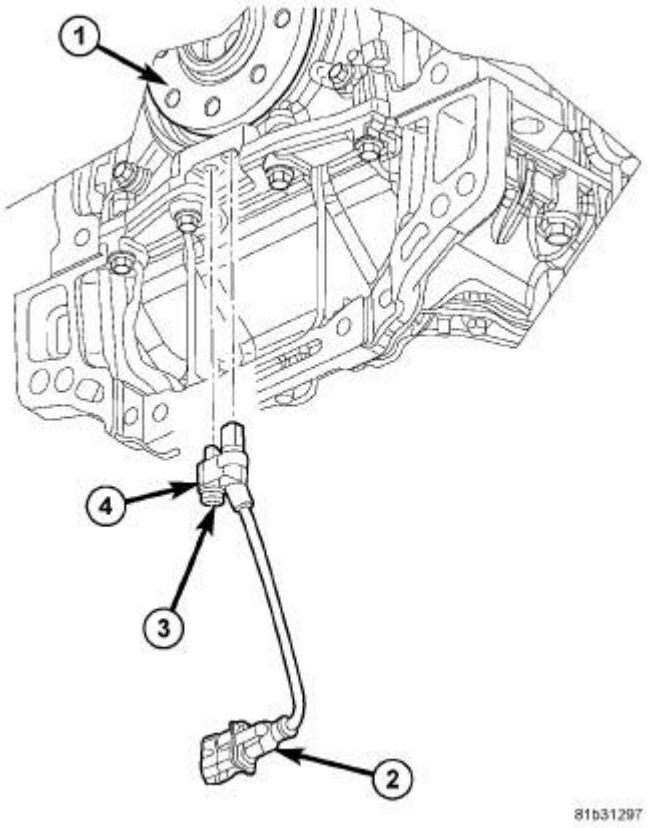


Fig. 330: Crankshaft Position Sensor
Courtesy of CHRYSLER LLC

11. Remove bolt (3) and the Crankshaft Position (CKP) Sensor (4).

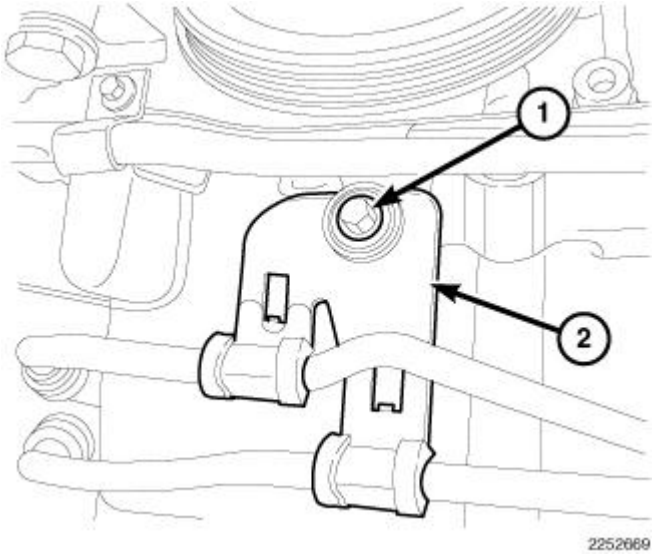


Fig. 331: Retaining Bolt Securing Power Steering Lines
Courtesy of CHRYSLER LLC

12. Remove the bolt (1) securing the power steering lines.

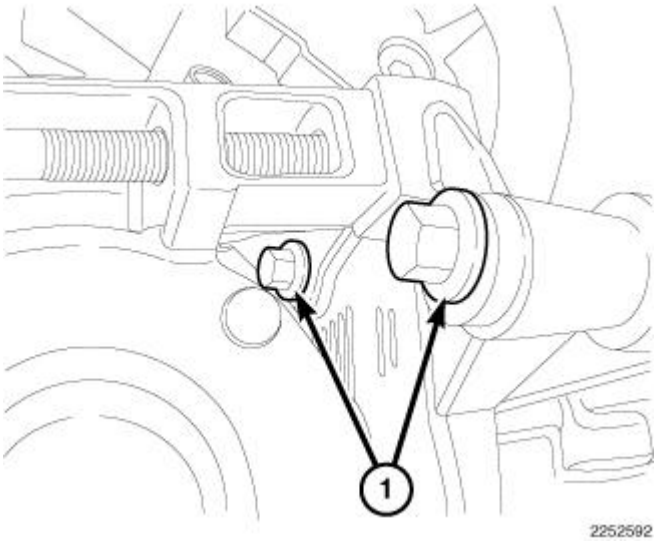


Fig. 332: Upper A/C Mounting Bracket Bolts
Courtesy of CHRYSLER LLC

13. Loosen the upper A/C mounting bracket bolts (1).

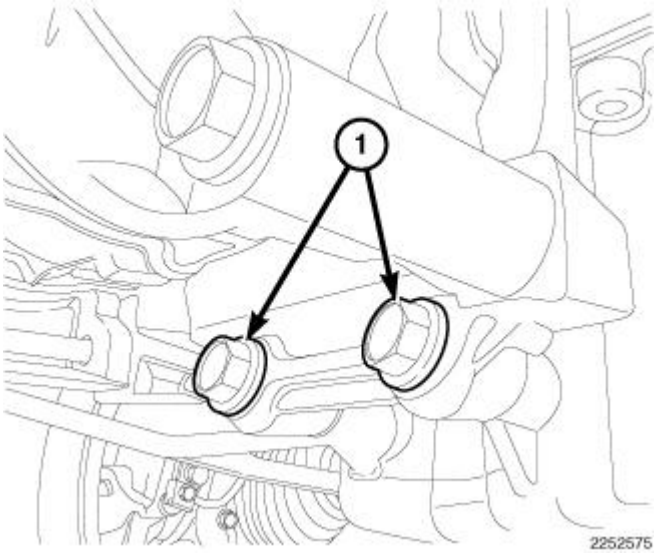


Fig. 333: A/C Mounting Bracket Bolts
Courtesy of CHRYSLER LLC

14. Loosen the lower A/C mounting bracket bolts and position the A/C mounting bracket forward to clear oil pan bosses.

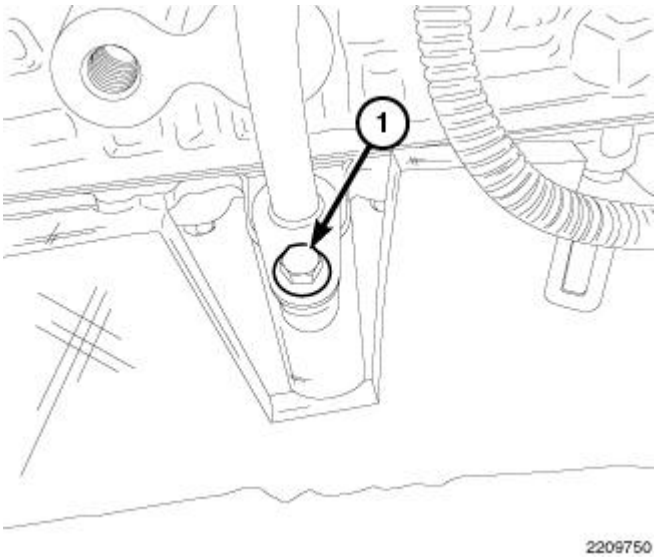


Fig. 334: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

15. Remove lower bolt (1) from the oil indicator tube.

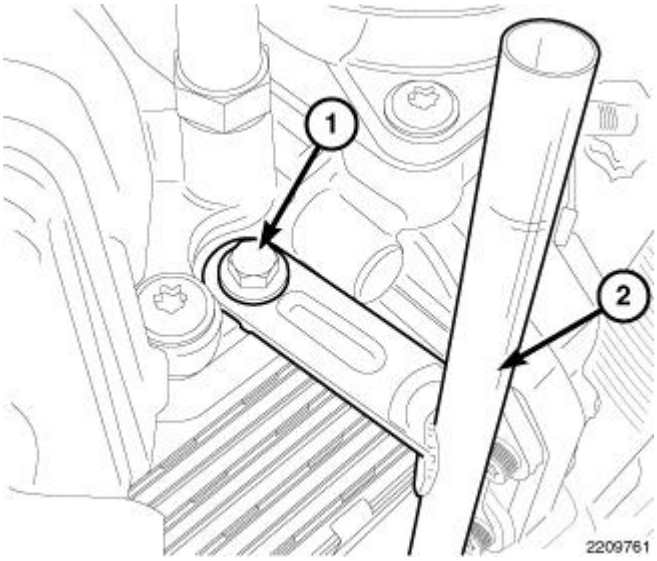


Fig. 335: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

16. Remove upper bolt (1) and the oil level indicator tube.

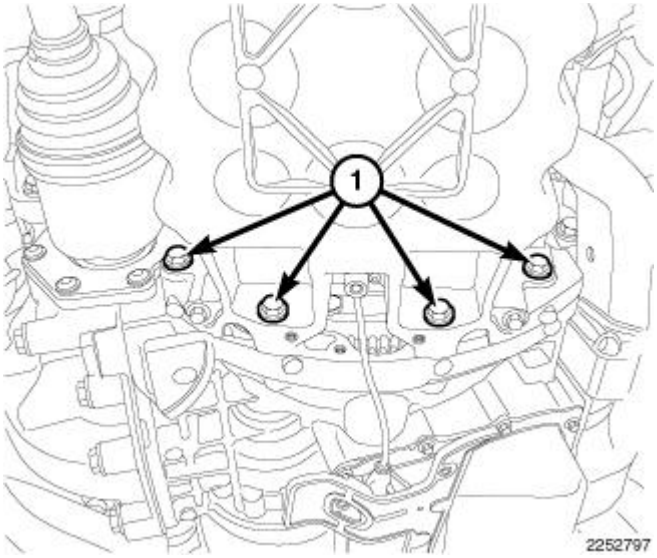


Fig. 336: Oil Pan To Transaxle Bolts
Courtesy of CHRYSLER LLC

17. Remove oil pan-to-transaxle bolts (1).

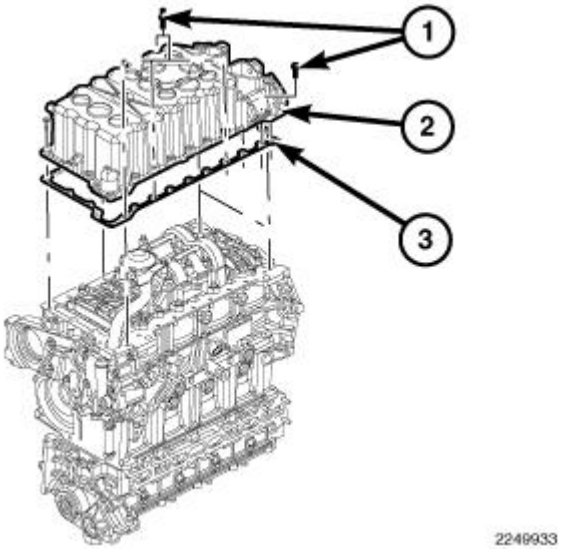


Fig. 337: Oil Pan Gasket With Oil Pan & Fasteners
Courtesy of CHRYSLER LLC

18. Remove fasteners (1) and the oil pan (2).
19. Remove the oil pan gasket (3).

Installation

INSTALLATION - OIL PAN

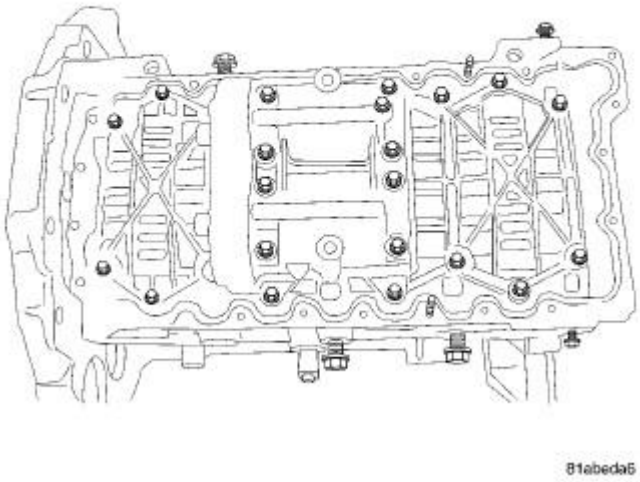


Fig. 338: Bolt Locations
Courtesy of CHRYSLER LLC

1. Clean oil pan and engine block gasket surfaces.

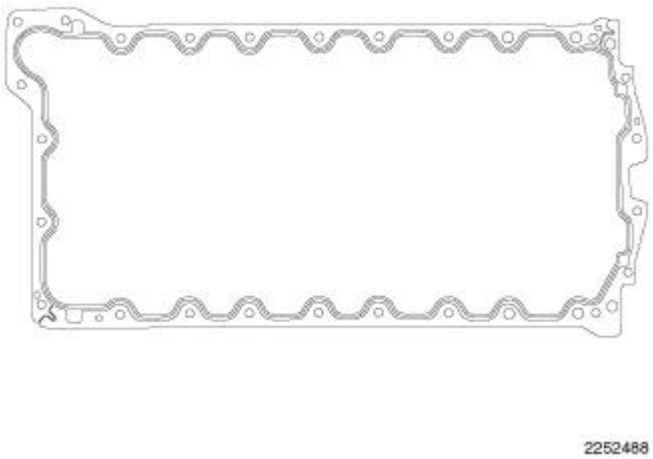


Fig. 339: Oil Pan Gasket Surface
Courtesy of CHRYSLER LLC

2. Install the upper oil pan gasket.

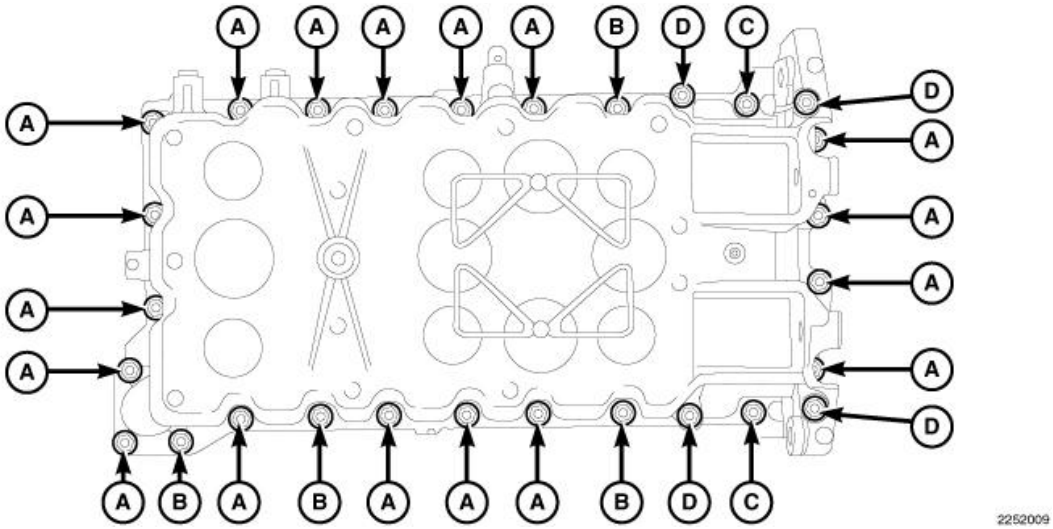


Fig. 340: Oil Pan Bolts
Courtesy of CHRYSLER LLC

3. The oil pan bolts have 2 different bolt sizes:

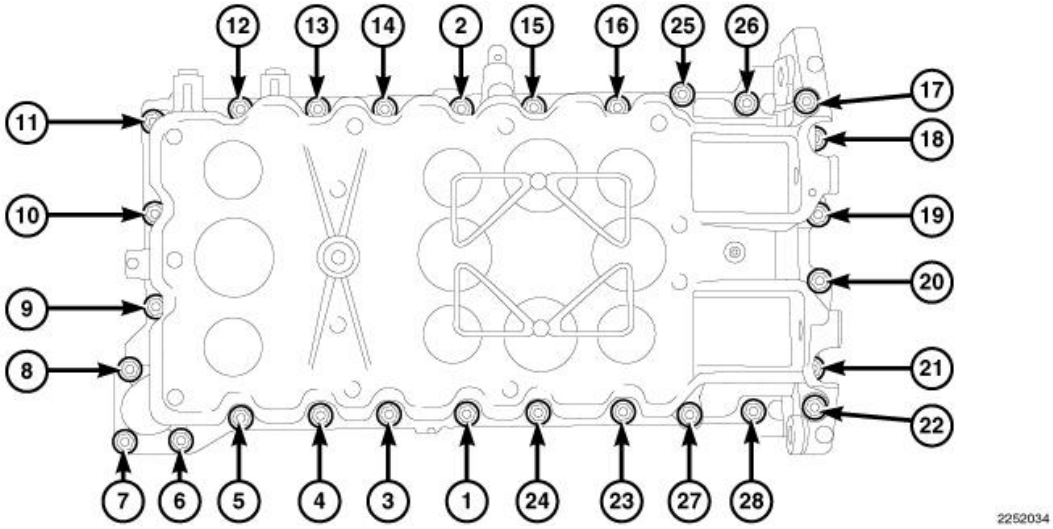


Fig. 341: Oil Pan Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

- Bolts A are M6
- Bolts B are M6 stud bolts
- Bolts C are M8 short
- Bolts D are M8 long

4. Install oil pan.
5. Tighten oil pan bolts to:
   - M6 bolts to 15 N.m (133 in. lbs.)
   - M8 bolts to 32 N.m (24 ft. lbs.)

6. Loosen all of the oil pan and stud bolts 90 degrees and retighten to.

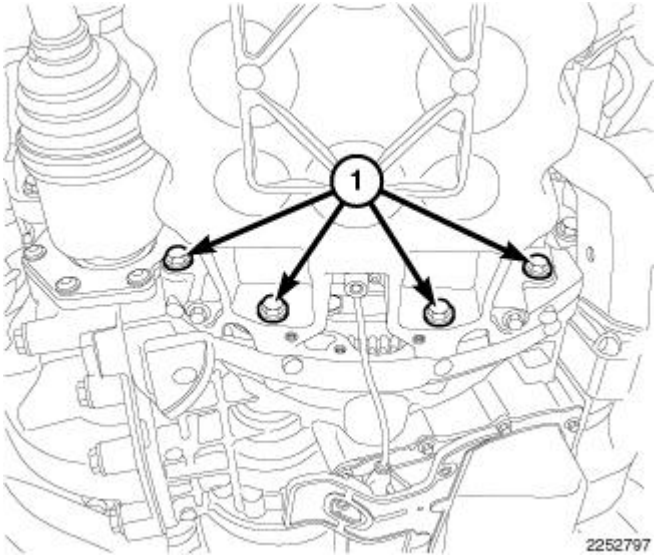


Fig. 342: Oil Pan To Transaxle Bolts
Courtesy of CHRYSLER LLC

- M6 bolts to 15 N.m (133 in. lbs.)
- M8 bolts to 32 N.m (24 ft. lbs.)

7. Install the oil pan to transaxle bolts. Tighten bolts to 60 N.m (44 ft. lbs.).

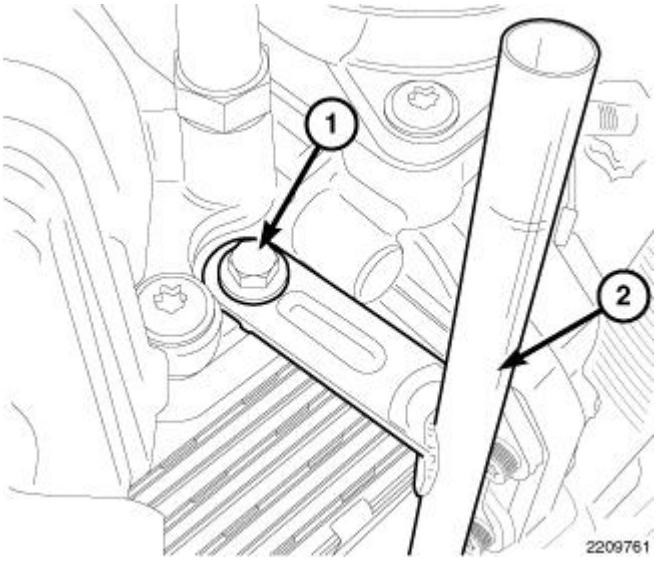


Fig. 343: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

8. Install the oil level indicator tube (2). Tighten upper bolt (1) to 11 N.m (97 in. lbs.).

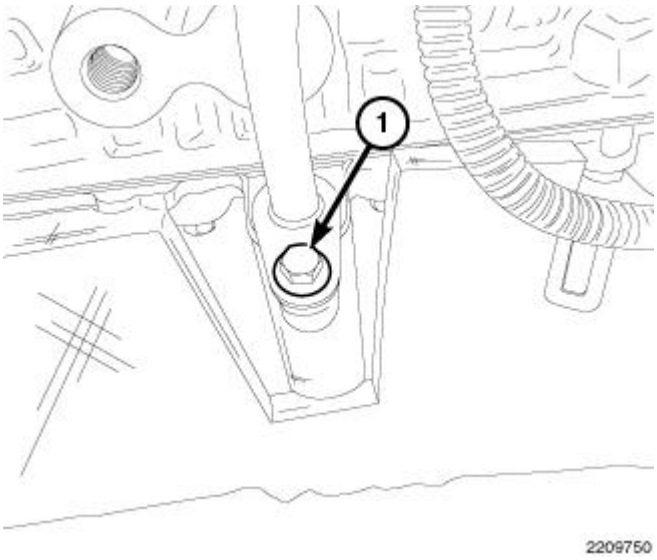


Fig. 344: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

9. Install the oil indicator lower bolt (1). Tighten lower bolt to 11 N.m (97 in. lbs.).

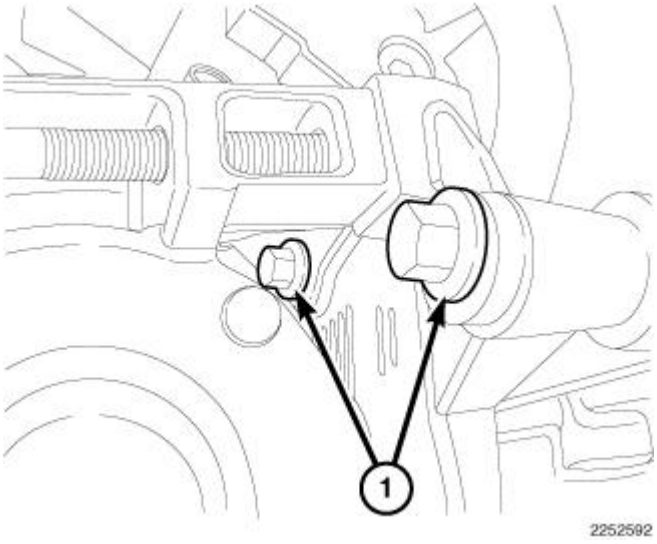


Fig. 345: Upper A/C Mounting Bracket Bolts
Courtesy of CHRYSLER LLC

10. Position the A/C bracket onto oil pan bosses. Tighten the upper A/C mounting bracket bolts (1) to 23 N.m (17 ft. lbs.).

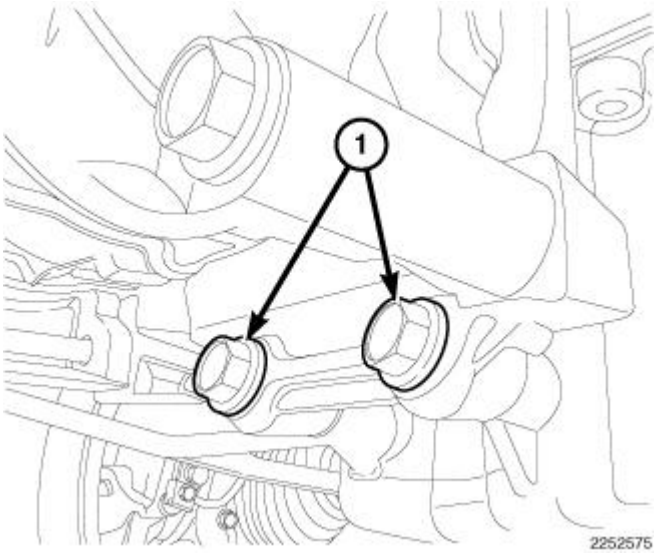


Fig. 346: A/C Mounting Bracket Bolts
Courtesy of CHRYSLER LLC

11. Tighten the lower A/C mounting bracket bolts (1) to 23 N.m (17 ft. lbs.).

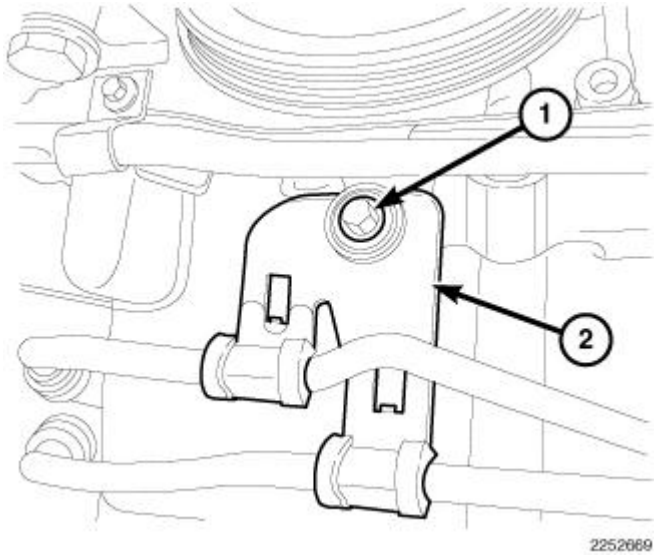


Fig. 347: Retaining Bolt Securing Power Steering Lines
Courtesy of CHRYSLER LLC

12. Install the retaining bolt (1) securing the power steering lines. Tighten to 15 N.m (133 in. lbs.).

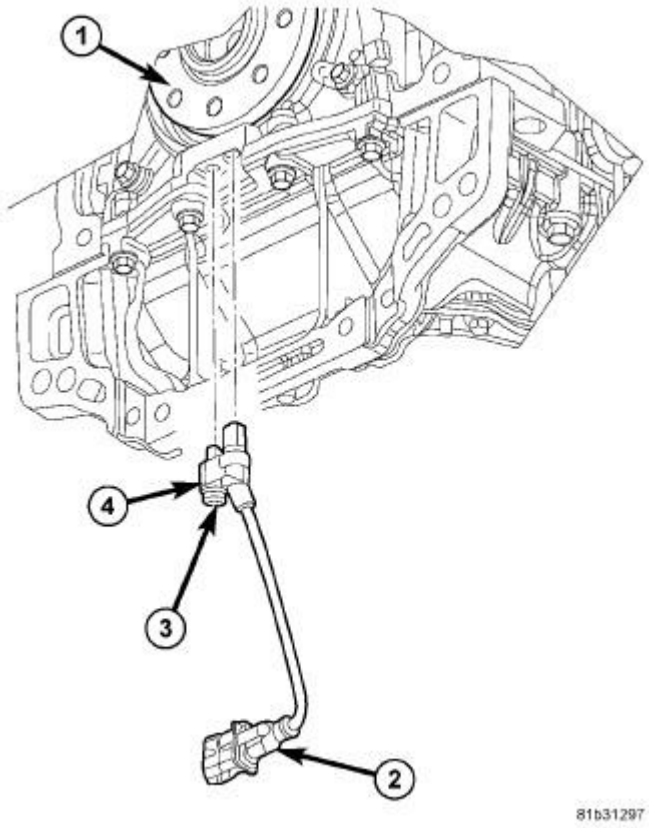


Fig. 348: Crankshaft Position Sensor
Courtesy of CHRYSLER LLC

13. Install the Crankshaft Position Sensor (CKP) (4). Tighten bolts to 11 N.m (97 in. lbs.).

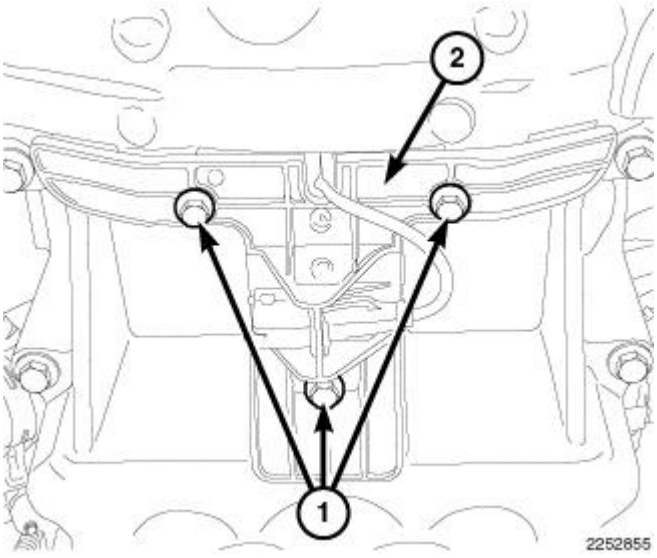


Fig. 349: Crankshaft Position Sensor (CKP) Access Cover
Courtesy of CHRYSLER LLC

14. Install Crankshaft Position Sensor (CKP) access cover (2). Tighten bolts to 15 N.m (133 in. lbs.).

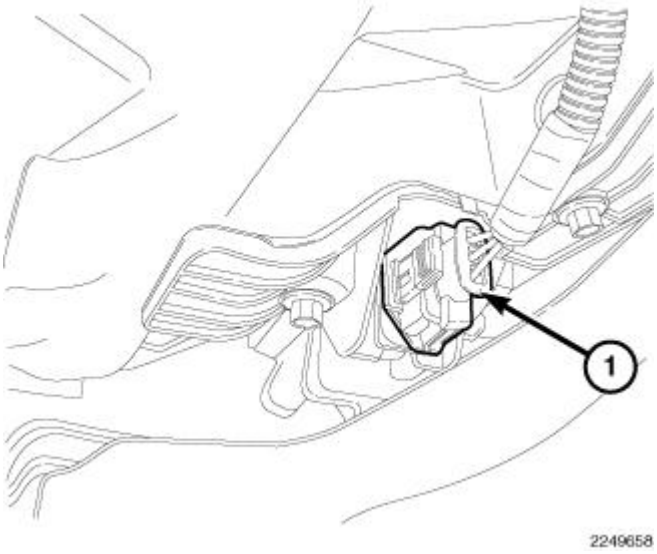


Fig. 350: Crankshaft Position Sensor (CKP) Harness Connector
Courtesy of CHRYSLER LLC

15. Connect the Crankshaft Position Sensor (CKP) harness connector (1).

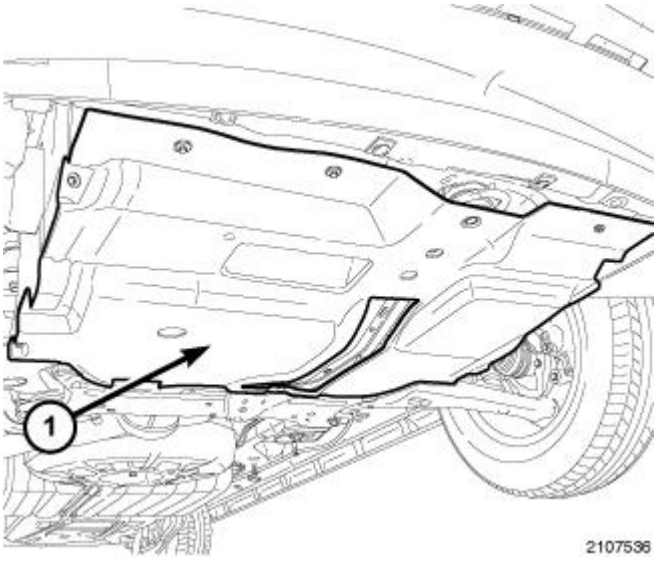


Fig. 351: Underbody Splash Shield
Courtesy of CHRYSLER LLC

16. Install the front fore and aft crossmember. Refer to **Frame and Bumpers/Frame/CROSSMEMBER - Installation** .
17. If equipped, install the insulation around the oil pan.
18. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
19. Fill engine with recommended oil. Refer to **Vehicle Quick Reference/Capacities and Recommended**

Fluids - Specifications .

20. Connect the negative battery cable.
21. Start engine and check for leaks.
22. Install the underbody splash shield (1) and securely tighten fasteners.
23. Lower the vehicle.

PICK-UP, OIL PUMP

Removal

REMOVAL - OIL PICKUP TUBE

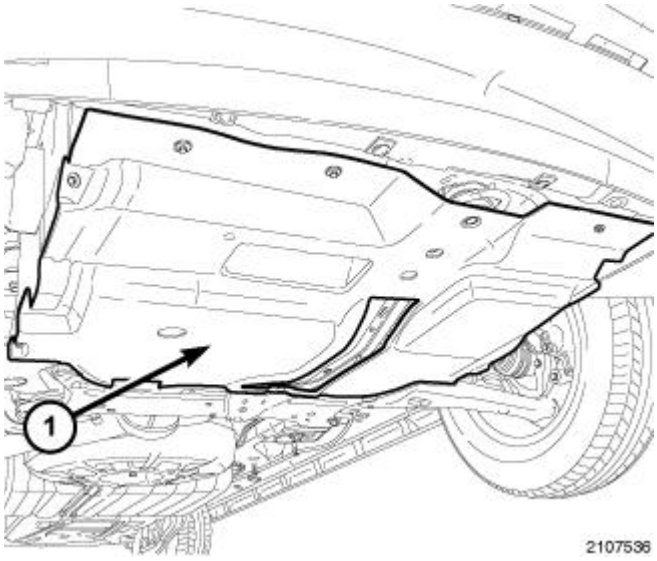


Fig. 352: Underbody Splash Shield
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove the underbody splash shield (1).
3. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.

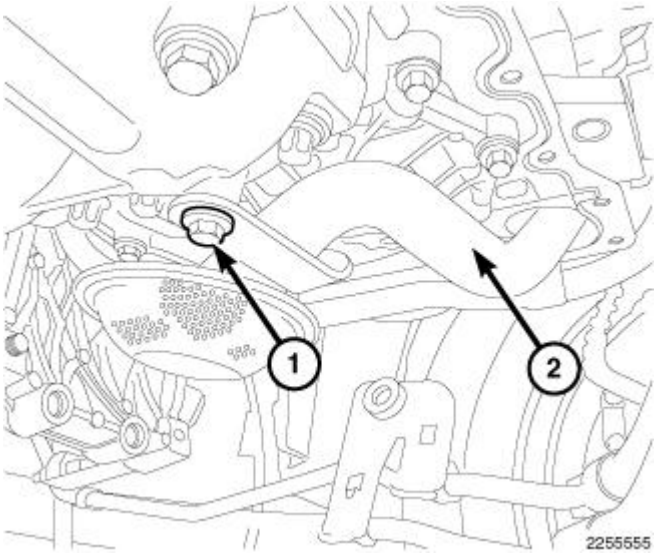


Fig. 353: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

4. Remove bolt (1), and the oil pickup tube (2) from engine. Discard O-rings.

Installation

INSTALLATION - OIL PICKUP TUBE

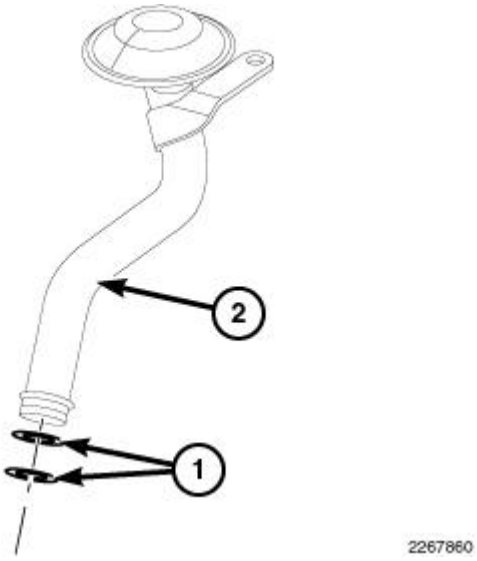


Fig. 354: Oil Pickup Tube & O-Rings
Courtesy of CHRYSLER LLC

1. Using new O-rings, lubricate and install the 2 O-rings (1) on oil pickup tube (2).

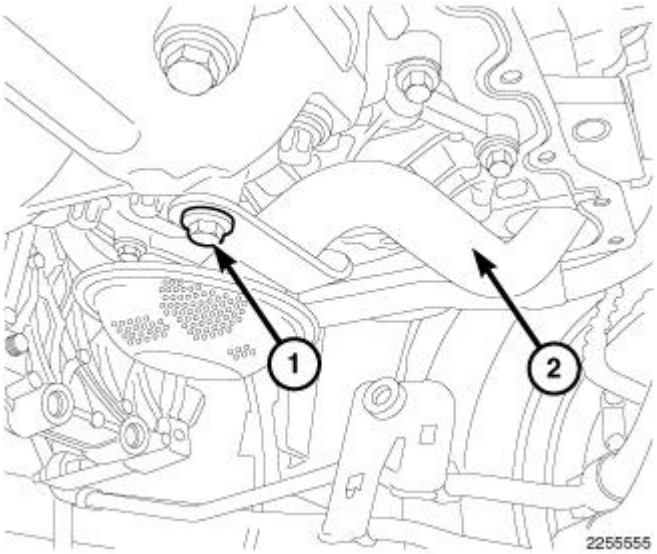


Fig. 355: Oil Pickup Tube With Bolt
Courtesy of CHRYSLER LLC

2. Install the oil pickup tube. Tighten bolt to 15 N.m (133 in. lbs.).
3. Install the oil pan. See **Engine/Lubrication/PAN, Oil - Installation**
4. Fill engine with oil.
5. Connect negative battery cable.
6. Start engine and check for leaks.

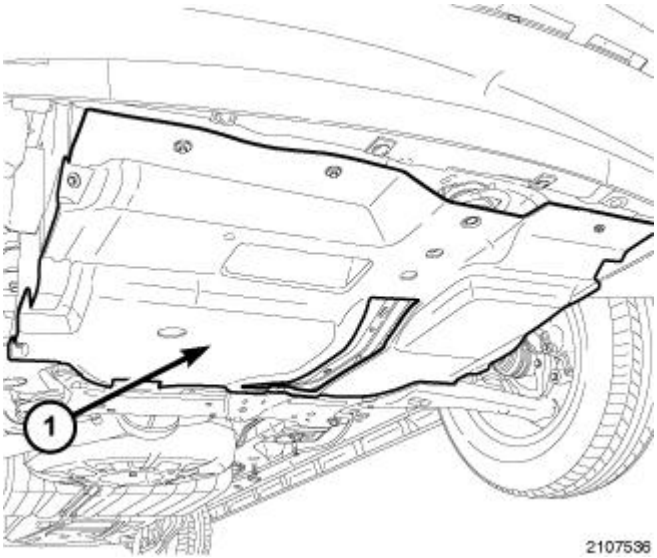


Fig. 356: Underbody Splash Shield
Courtesy of CHRYSLER LLC

7. Install the underbody splash shield (1) and securely tighten fasteners.

PUMP, ENGINE OIL

Removal

REMOVAL - OIL PUMP

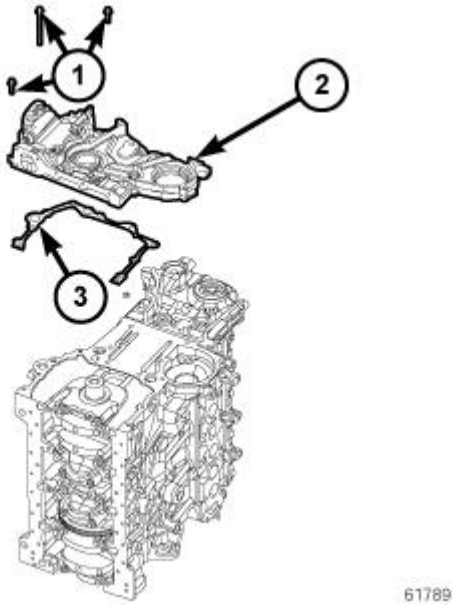


Fig. 357: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

NOTE: The oil pump is not a serviceable item, it is part of the front cover. If diagnosis has directed you to replace the oil pump, then the front cover needs to be replaced.

1. Disconnect negative battery cable.
2. Remove the front cover. See **Engine/Engine Block/COVER, Engine - Removal**.

Installation

INSTALLATION - OIL PUMP

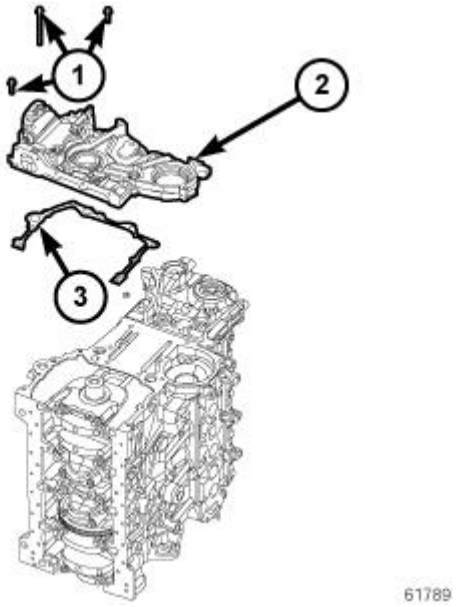


Fig. 358: FRONT COVER AND GASKET
Courtesy of CHRYSLER LLC

1. Clean the gasket mating surfaces.
2. Lubricate oil pump rotor with engine oil.
3. Install front cover assembly (2). See **Engine/Engine Block/COVER, Engine - Installation**.

SENSOR, OIL PRESSURE

Description

DESCRIPTION

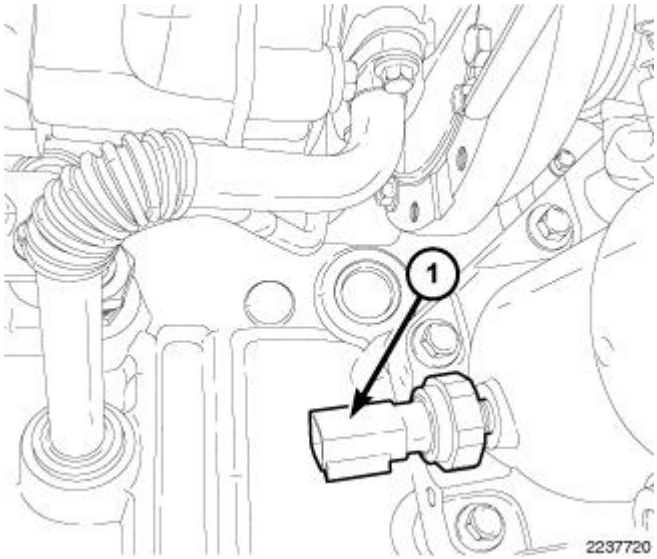


Fig. 359: Oil Pressure Switch
Courtesy of CHRYSLER LLC

The oil pressure sending unit uses three circuits. They are:

- A signal circuit to the ECM.
- A sensor ground circuit through the ECM.
- A 5 volt reference circuit from the ECM.

The oil pressure sending unit returns a voltage signal back to the ECM relating oil pressure. Ground for the sensor is supplied by the ECM.

The oil pressure switch (1) is located on the left side of the oil filter housing. The switch screws into the engines main oil gallery.

Removal

REMOVAL - OIL PRESSURE SENSOR

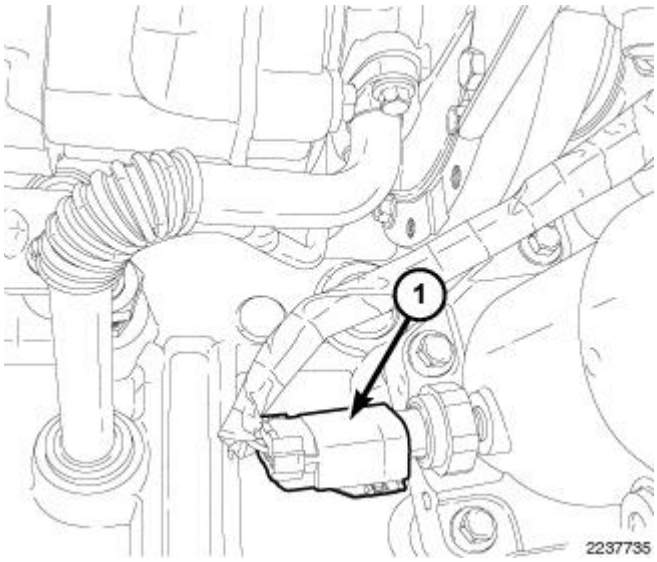


Fig. 360: Oil Pressure Switch Harness Connector
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the belly pan.
3. Disconnect the oil pressure sensor harness connector (1).

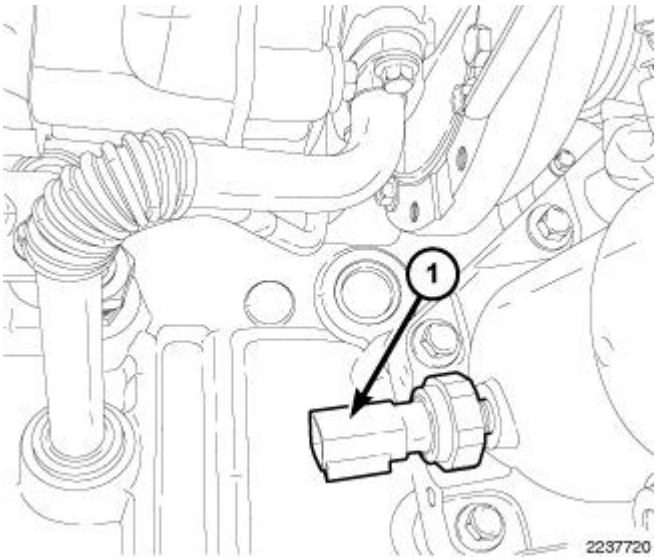


Fig. 361: Oil Pressure Switch
Courtesy of CHRYSLER LLC

4. Remove the oil pressure sensor (1).

Installation

INSTALLATION - OIL PRESSURE SENSOR

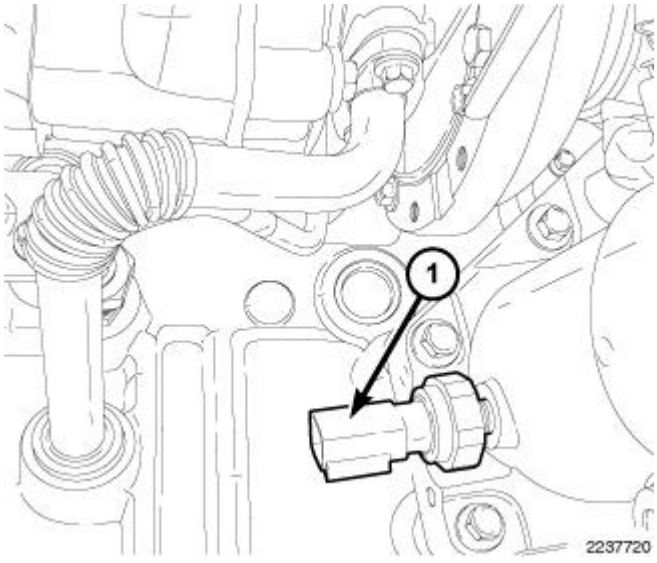


Fig. 362: Oil Pressure Switch
Courtesy of CHRYSLER LLC

1. Install the oil pressure sensor. Tighten to 14 N.m (124 in. lbs.).

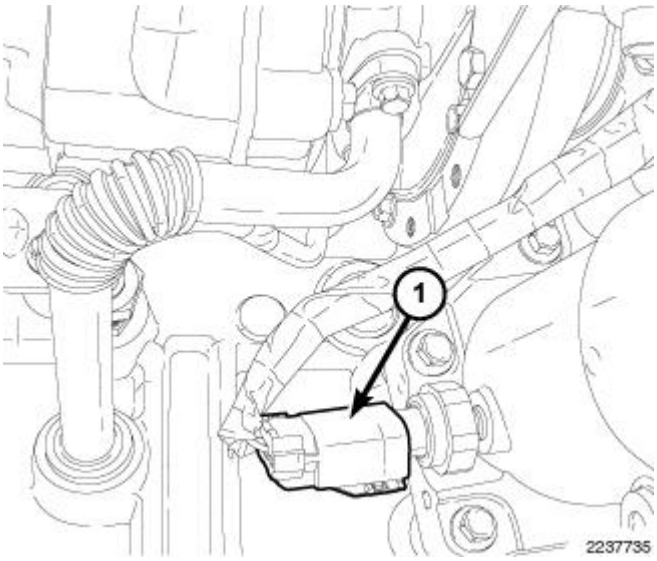


Fig. 363: Oil Pressure Switch Harness Connector
Courtesy of CHRYSLER LLC

2. Connect the oil pressure sensor harness connector (1).
3. Install the belly pan.
4. Connect the negative battery cable.
5. Start engine and check for oil leaks.

SEPARATOR, OIL

Removal

REMOVAL - OIL SEPARATOR

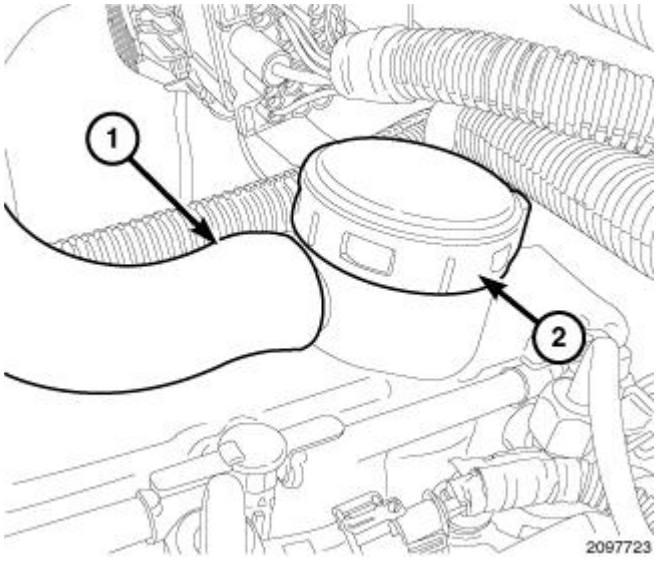


Fig. 364: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal**.
4. Remove the oil separator cover (2).

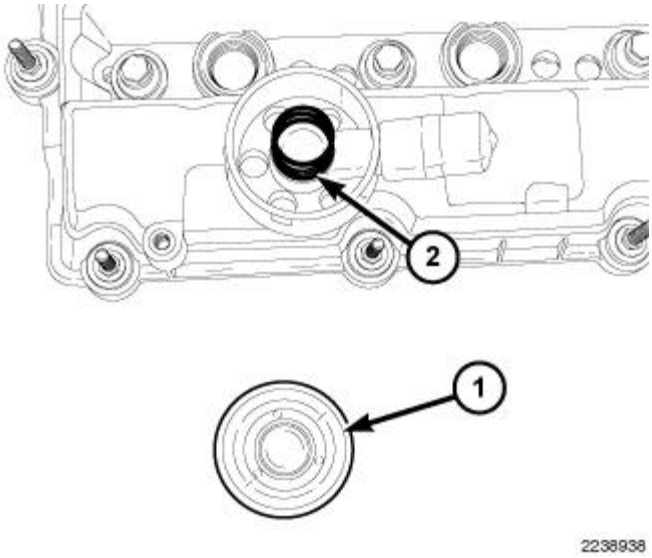


Fig. 365: Diaphragm & Spring
Courtesy of CHRYSLER LLC

5. Remove diaphragm (1) and the diaphragm spring (2).

Installation

INSTALLATION - OIL SEPARATOR

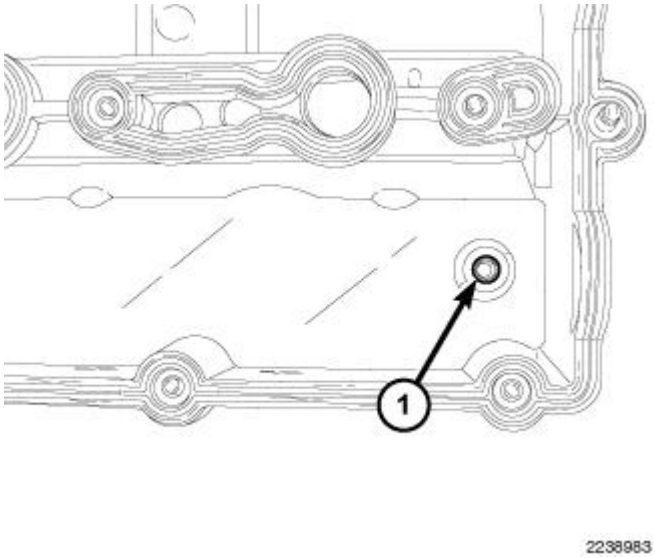


Fig. 366: Oil Drain Back Access Hole
Courtesy of CHRYSLER LLC

1. Inspect the oil drain back access hole (1) in the cylinder head cover to assure that it is free of obstruction.

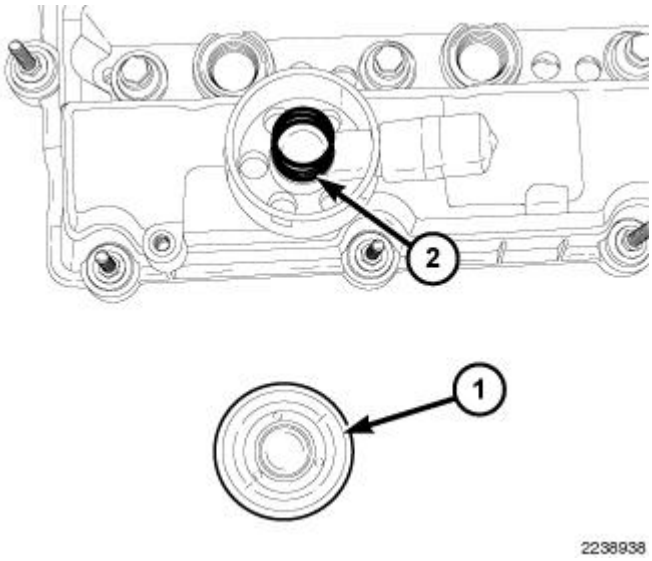


Fig. 367: Diaphragm & Spring
Courtesy of CHRYSLER LLC

2. Lubricate the oil separator O-rings with clean engine oil.
3. Install the diaphragm spring (2) and the diaphragm (1).

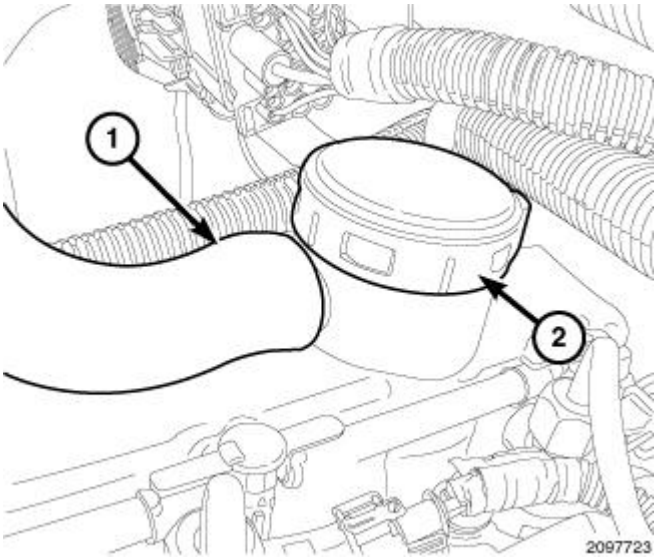


Fig. 368: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

4. Carefully position and push down on the oil separator cover (2) to seat.
5. Install the cylinder head cover. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation**.
6. Install the engine cover.
7. Connect the negative battery cable.

VALVE, OIL PRESSURE RELIEF

Description

DESCRIPTION

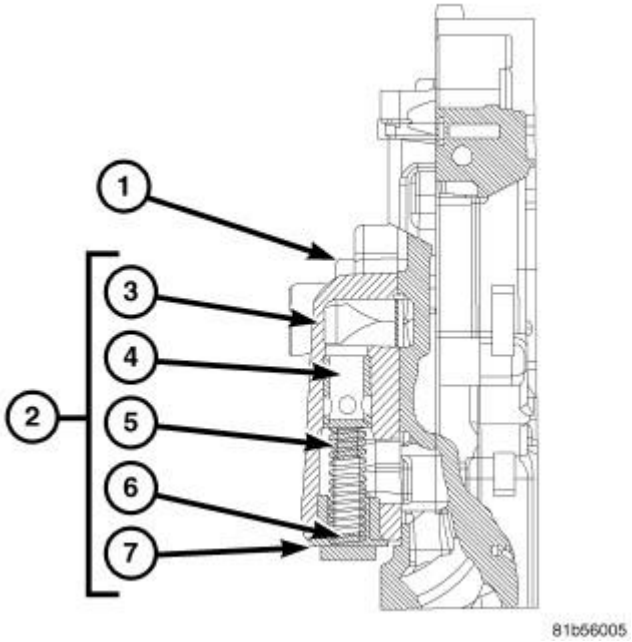


Fig. 369: Oil Pressure Relief Valve Components
Courtesy of CHRYSLER LLC

The oil pressure relief valve is build into the front cover (1). The oil pressure relief valve assembly (2) consists of several components. The plunger (4) is held in place by the spring (5). The plug (6) keeps the plug and spring in place, and the o-ring (7) prevents oil from leaking past the plug (6).

In the case of excessively high oil pressure, the oil pressure on the piston (4) overcomes the spring (5) pressure and the piston is forced off its seat. When the piston is forced off its seat, a drain back passage is opened and the excess oil pressure is vented back into the crankcase.

MANIFOLDS

MANIFOLD, EXHAUST

Removal

REMOVAL - EXHAUST MANIFOLD

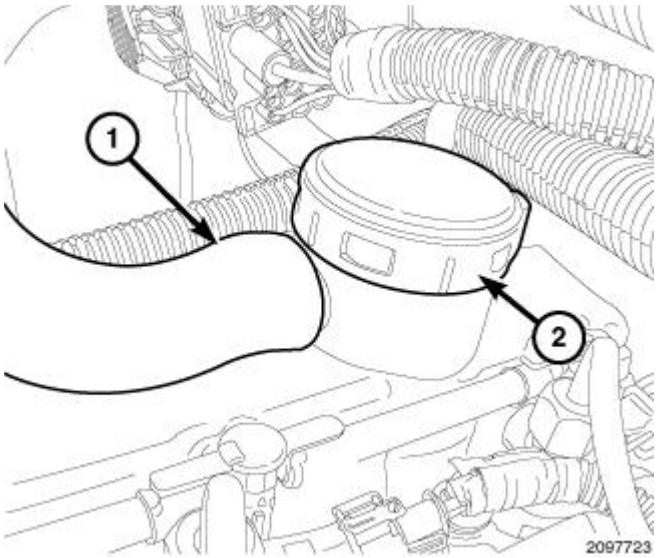


Fig. 370: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
4. Disconnect the crankcase vent hose (1) from the oil separator (2).

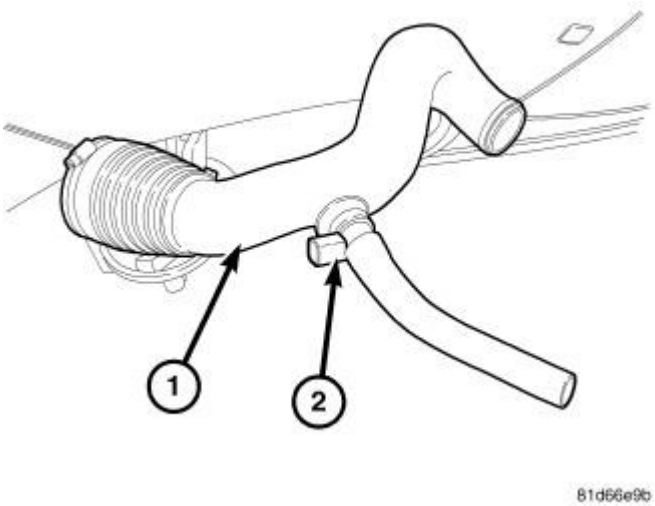


Fig. 371: Turbocharger Air Inlet Tube & Crankcase Vent Hose Heater Electrical Connector
Courtesy of CHRYSLER LLC

5. Disconnect the crankcase vent hose heater electrical connector (2).
6. Remove the turbocharger air inlet tube (1) from turbocharger.

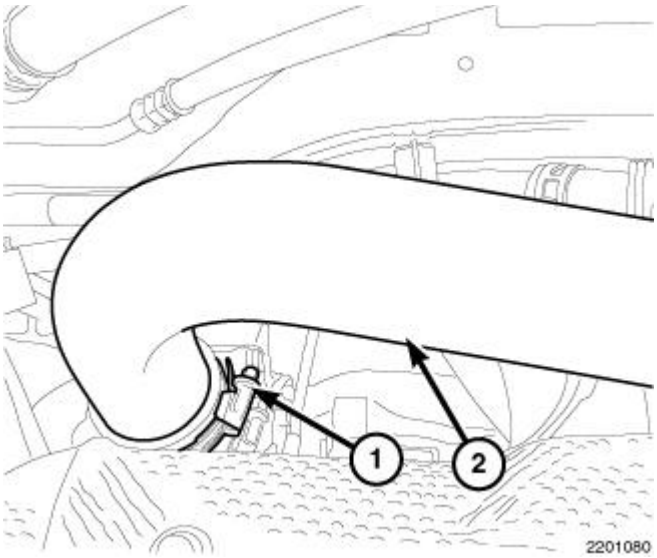


Fig. 372: Charge Air Cooler Inlet Hose
Courtesy of CHRYSLER LLC

7. Loosen clamp (1) and disconnect the charge air cooler inlet hose (2) from turbocharger.

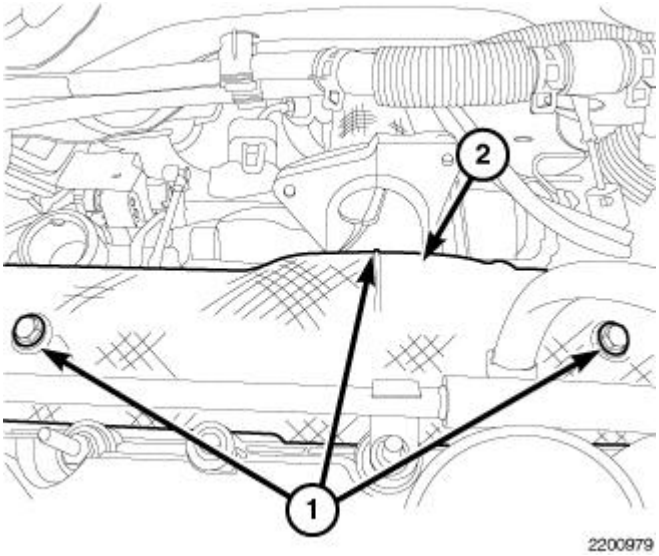


Fig. 373: Exhaust Manifold Heat Shield Bolts
Courtesy of CHRYSLER LLC

8. Remove the three bolts (1) and the exhaust manifold heat shield (2).
9. Remove the belly pan.
10. Remove the right front inner splash shield.

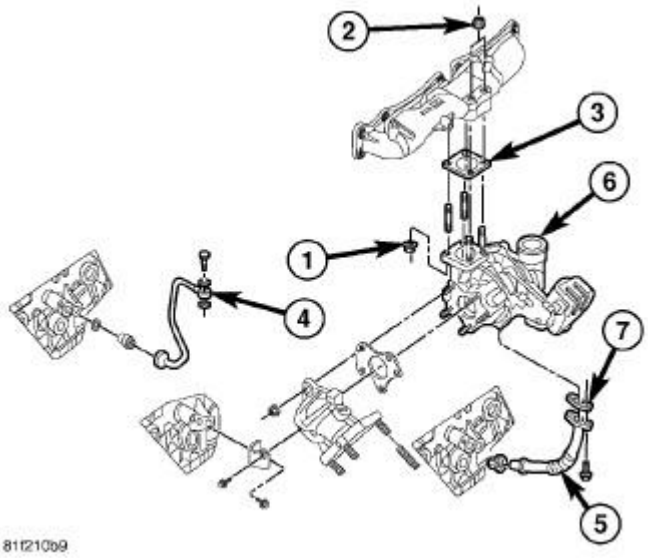


Fig. 374: Turbocharger Retaining Nuts
Courtesy of CHRYSLER LLC

11. Remove the turbocharger (6). See **Engine/Turbocharger System/TURBOCHARGER - Removal**.
12. Remove nuts and the exhaust manifold.

Installation

INSTALLATION - EXHAUST MANIFOLD

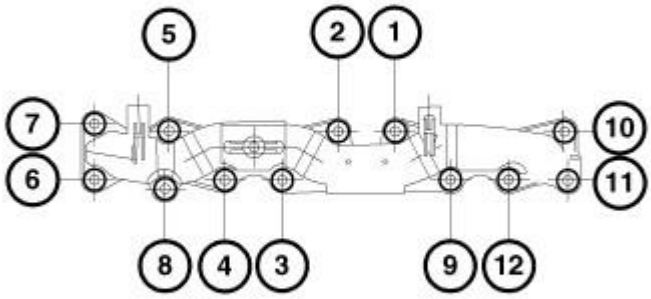


Fig. 375: EXHAUST MANIFOLD TORQUE SEQUENCE
Courtesy of CHRYSLER LLC

1. Clean the exhaust manifold and cylinder head surfaces.
2. Install a new exhaust manifold gasket.
3. Install exhaust manifold and tighten nuts finger.
4. Using the sequence shown in illustration, tighten nuts to 36 N.m (27 ft. lbs.).
5. Repeat the tightening procedure at the same torque.

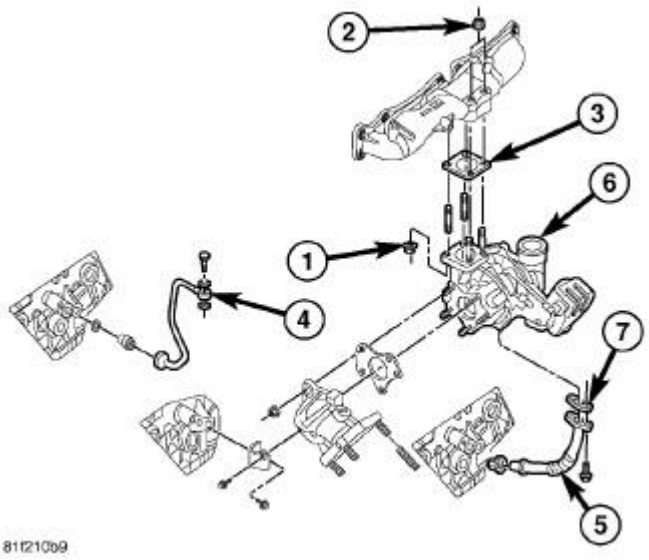


Fig. 376: Turbocharger Retaining Nuts
Courtesy of CHRYSLER LLC

6. Install the turbocharger (6). See **Engine/Turbocharger System/TURBOCHARGER - Installation**.

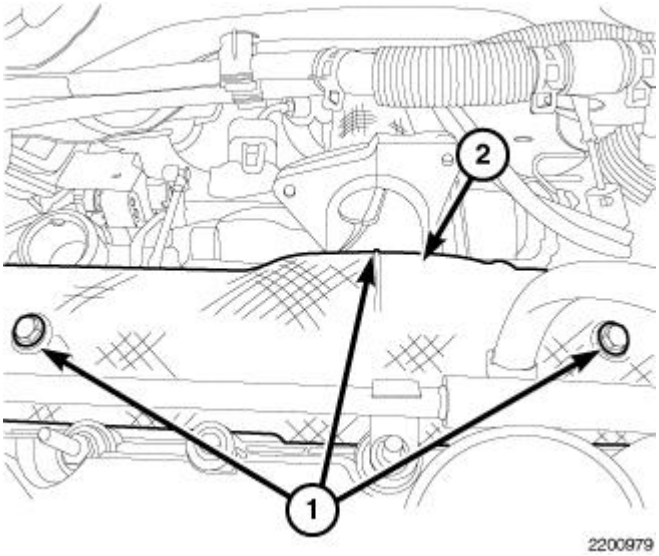


Fig. 377: Exhaust Manifold Heat Shield Bolts
Courtesy of CHRYSLER LLC

7. Install the right front inner splash shield.
8. Install the belly pan.
9. Install the exhaust manifold heat shield (2). Tighten bolts to 33 N.m (24 ft. lbs.).

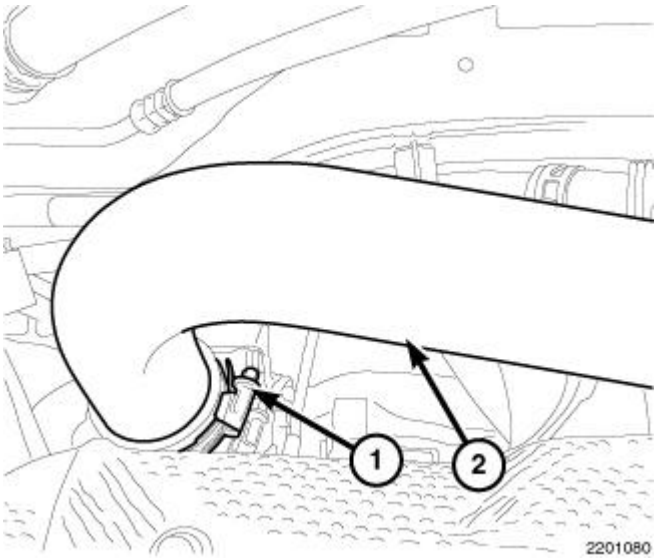


Fig. 378: Charge Air Cooler Inlet Hose
Courtesy of CHRYSLER LLC

10. Connect the charge air cooler inlet hose (2) to the turbocharger and tighten clamp (1).

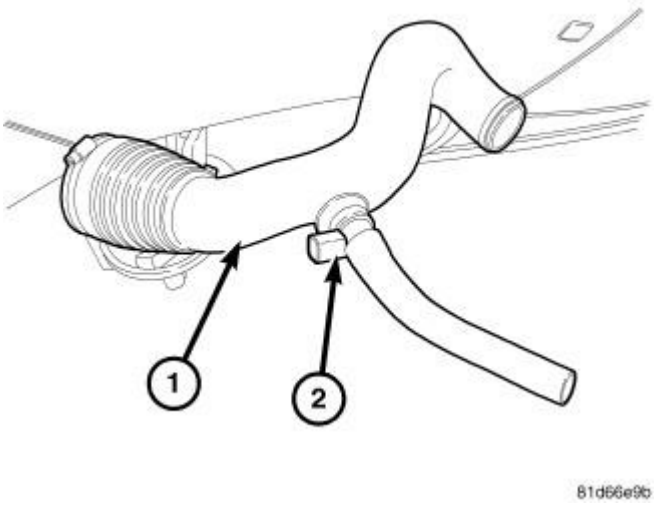


Fig. 379: Turbocharger Air Inlet Tube & Crankcase Vent Hose Heater Electrical Connector
Courtesy of CHRYSLER LLC

11. Install the air inlet tube to the turbocharger.
12. Connect the crankcase vent hose heater electrical connector (2).

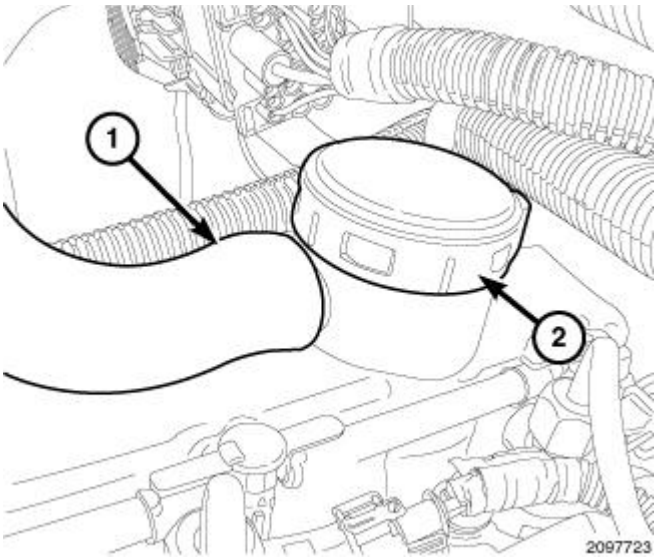


Fig. 380: Crankcase Vent Hose & Oil Separator
Courtesy of CHRYSLER LLC

13. Connect the crankcase vent hose (1) to the oil separator (2).
14. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.
15. Install the engine cover.
16. Connect the negative battery cable.

MANIFOLD, INTAKE

Removal

REMOVAL - INTAKE MANIFOLD

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Drain the coolant. Refer to **Cooling - Standard Procedure** .

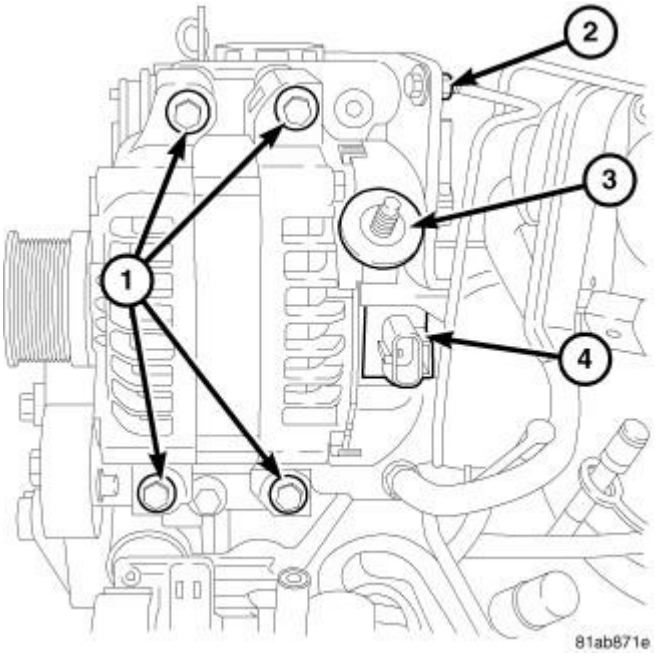


Fig. 381: Generator
Courtesy of CHRYSLER LLC

4. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
5. Disconnect the generator connector (4).
6. Remove the generator feed wire (3).
7. Remove the bolts (1) and the generator.
8. Remove the generator brace bolt (2).
9. Remove the generator mounting bracket.

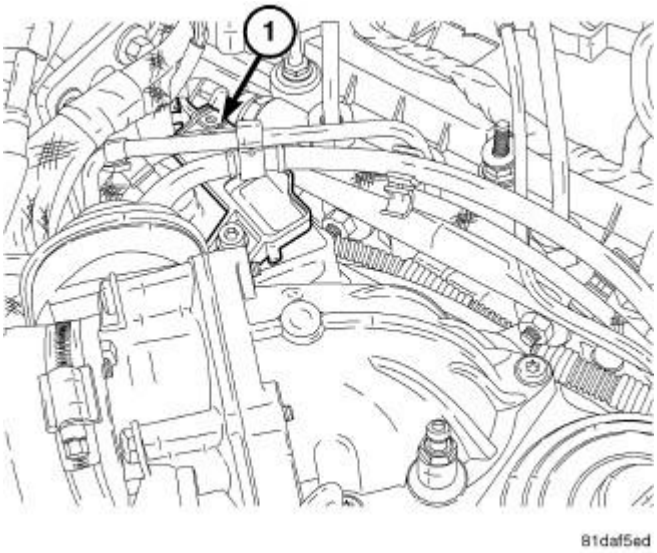


Fig. 382: IAT/BPS Sensor Harness Connector
Courtesy of CHRYSLER LLC

10. Disconnect the IAT/BPS sensor harness connector (1).

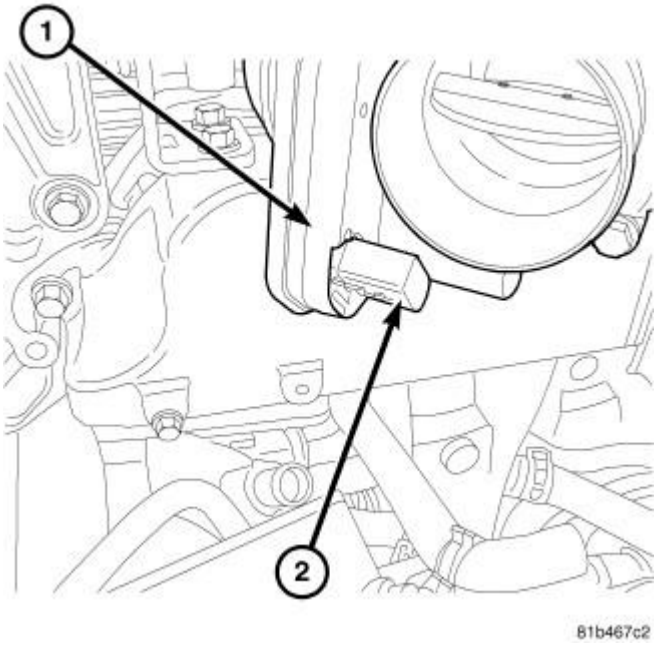


Fig. 383: Electrical Connector - EGR Air Valve
Courtesy of CHRYSLER LLC

11. Disconnect the EGR air flow control valve harness connector (2).

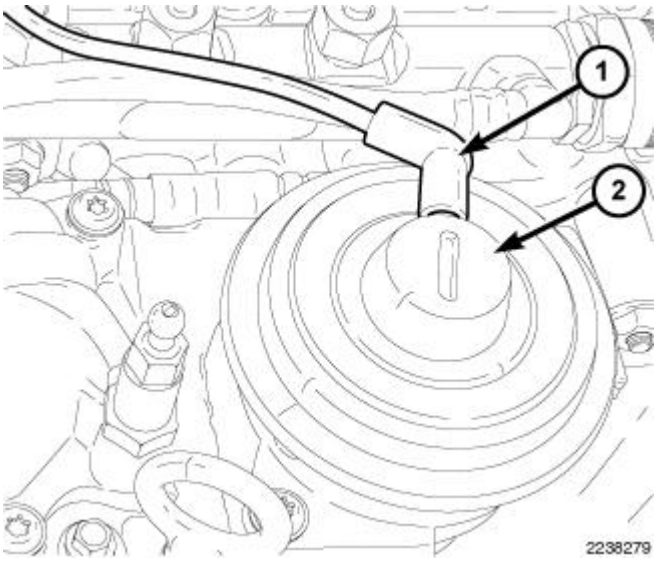


Fig. 384: Vacuum Line & EGR Valve
Courtesy of CHRYSLER LLC

12. Disconnect the vacuum line (1) to the EGR valve (2).

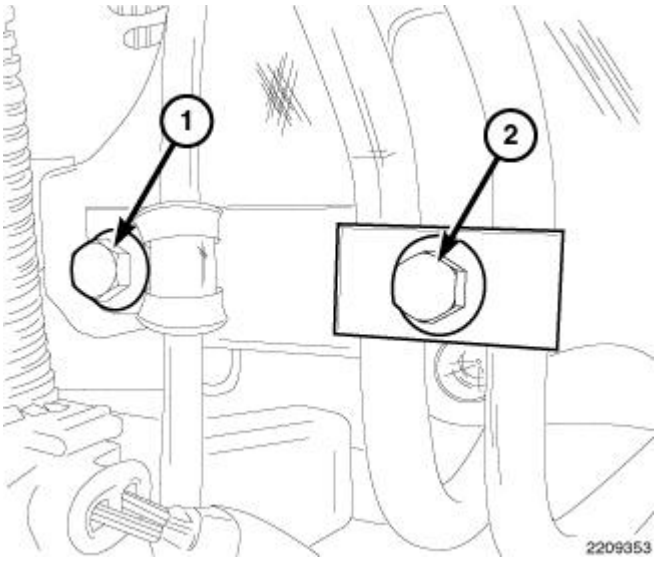


Fig. 385: Fuel Feed & Return Line Bracket Bolt With High Pressure Fuel Feed Line To Fuel Rail Bolt
Courtesy of CHRYSLER LLC

13. Remove the high pressure fuel feed line to fuel rail bolt (1) attaching fuel line to intake manifold.
14. Remove the fuel feed and return line bracket bolt (2) attaching fuel lines to intake manifold.

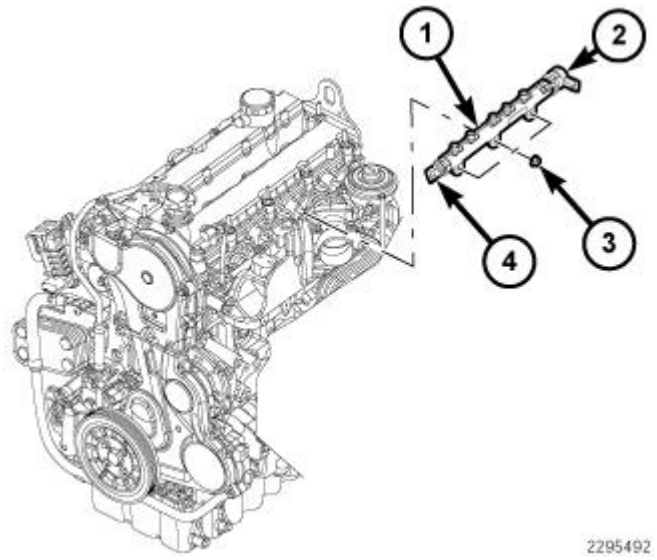


Fig. 386: Fuel Rail Components
Courtesy of CHRYSLER LLC

15. Remove the fuel rail (1). Refer to **Fuel System/Fuel Delivery/RAIL, Fuel - Removal** .

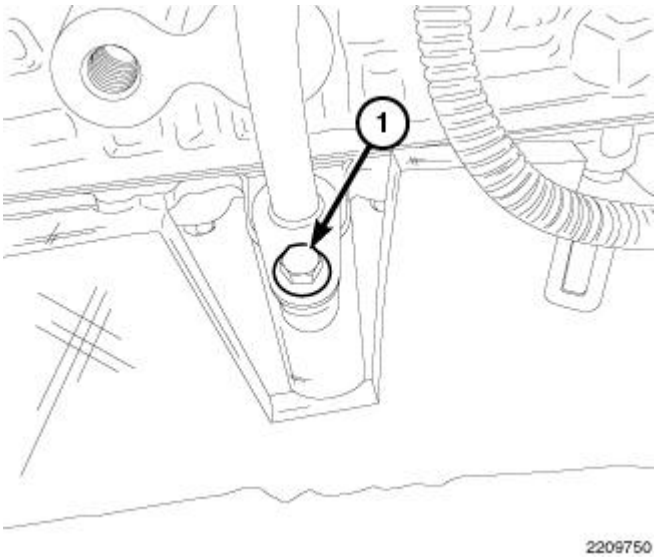


Fig. 387: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

16. Remove lower bolt (1) from the oil indicator tube.

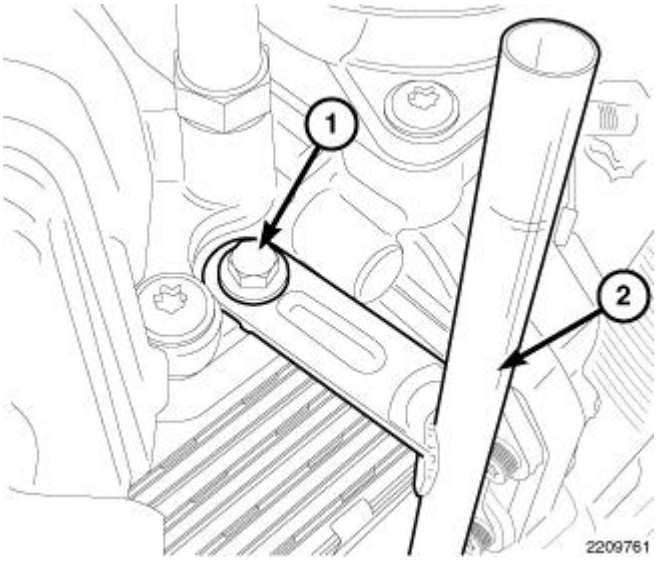


Fig. 388: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

17. Remove upper bolt (1) and the oil level indicator tube.

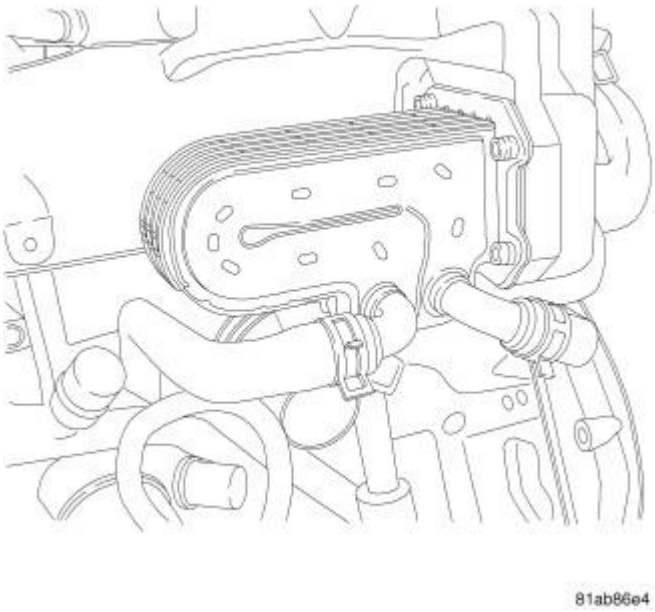


Fig. 389: EGR COOLER
Courtesy of CHRYSLER LLC

18. Remove coolant hoses from the EGR cooler.
19. Remove bolts and the EGR cooler.

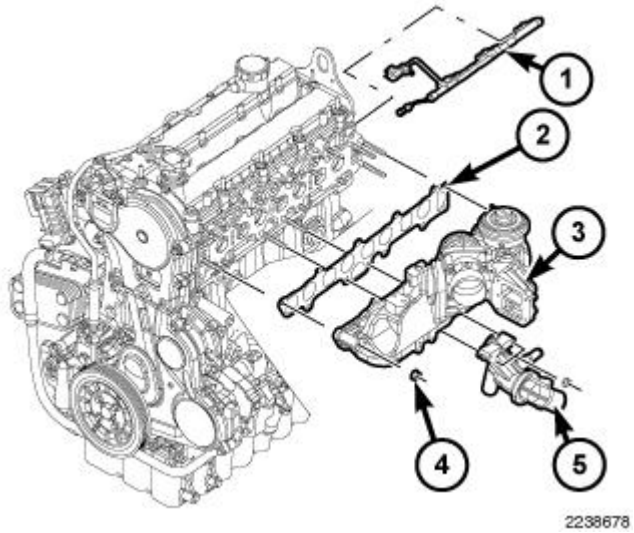


Fig. 390: Intake Manifold & Thermostat Housing
Courtesy of CHRYSLER LLC

20. Disconnect and position aside the glow plug harness (1).
21. Remove the thermostat housing (5).
22. Remove the intake manifold fasteners (4).
23. Remove the intake manifold (3) and the gasket (2).

Installation

INSTALLATION - INTAKE MANIFOLD

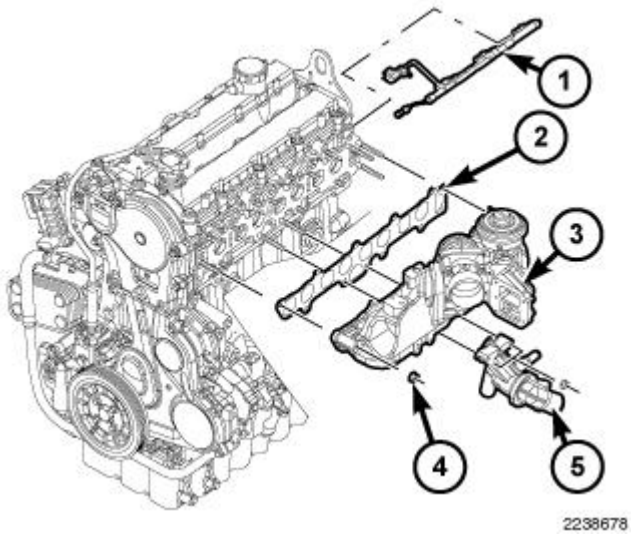


Fig. 391: Intake Manifold & Thermostat Housing
Courtesy of CHRYSLER LLC

1. Clean and inspect the gasket surface area of the intake manifold and the cylinder head.
2. Install a new intake manifold gasket (2).
3. Install the intake manifold (3).
4. Install the thermostat housing (5).
5. Reposition glow plug harness (1) and connect the glow plug connectors.

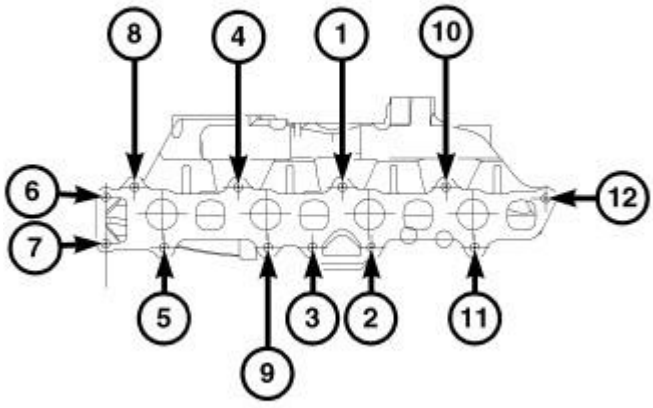


Fig. 392: Intake Manifold Bolt Tightening Sequence
Courtesy of CHRYSLER LLC

6. Using the tightening sequence in the illustration, tighten the intake manifold nuts to 25 N.m (18 ft. lbs.).

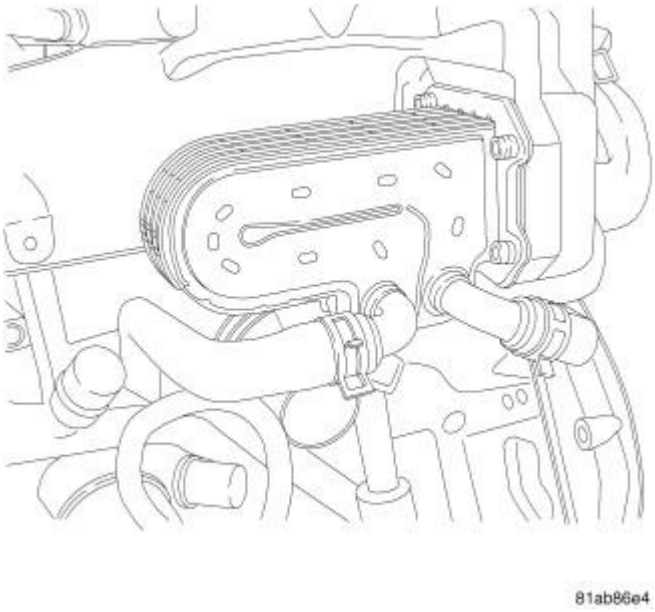


Fig. 393: EGR COOLER
Courtesy of CHRYSLER LLC

7. Install the EGR cooler. Tighten bolts to 15 N.m (133 in. lbs.).
8. Install coolant hoses to the EGR cooler.

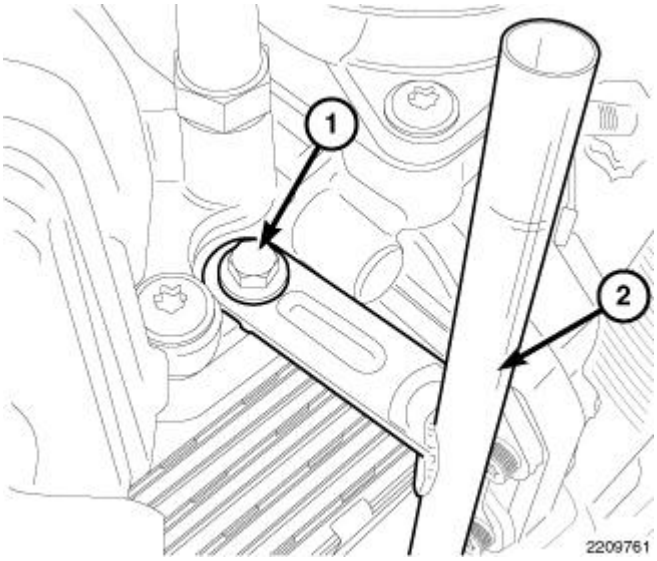


Fig. 394: Oil Level Indicator Tube Upper Bolt
Courtesy of CHRYSLER LLC

9. Install the oil level indicator tube (2). Tighten upper bolt (1) to 11 N.m (97 in. lbs.).

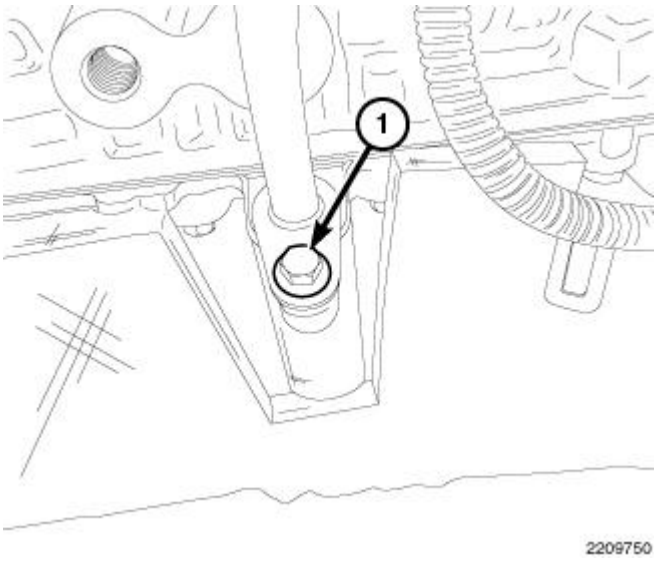


Fig. 395: Oil Indicator Tube Lower Bolt
Courtesy of CHRYSLER LLC

10. Install the oil indicator lower bolt. Tighten to lower bolt (1) to 11 N.m (97 in. lbs.).

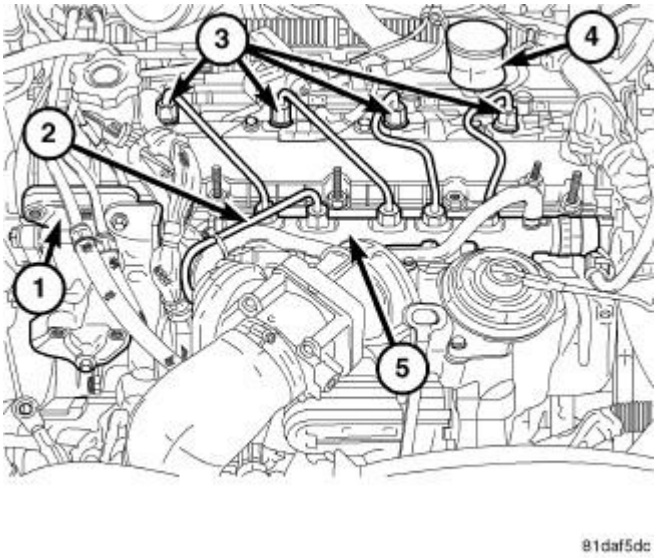


Fig. 396: Fuel Rail
Courtesy of CHRYSLER LLC

11. Install the fuel rail (5). Refer to **Fuel System/Fuel Delivery/RAIL, Fuel - Installation** .

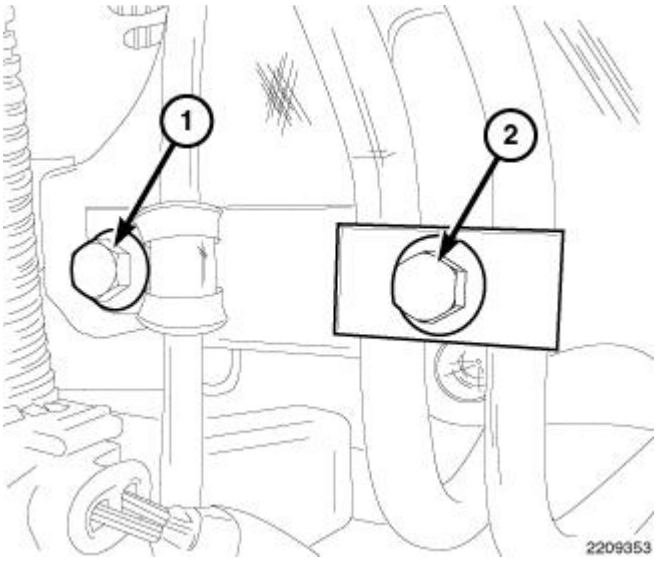


Fig. 397: Fuel Feed & Return Line Bracket Bolt With High Pressure Fuel Feed Line To Fuel Rail Bolt
Courtesy of CHRYSLER LLC

12. Install the fuel feed and return line bracket bolt (2) attaching fuel lines to intake manifold. Tighten bolt to 15 N.m (133 in. lbs.).
13. Install the high pressure fuel feed line to fuel rail bolt (1) attaching fuel line to intake manifold. Tighten bolt to 15 N.m (133 in. lbs.).

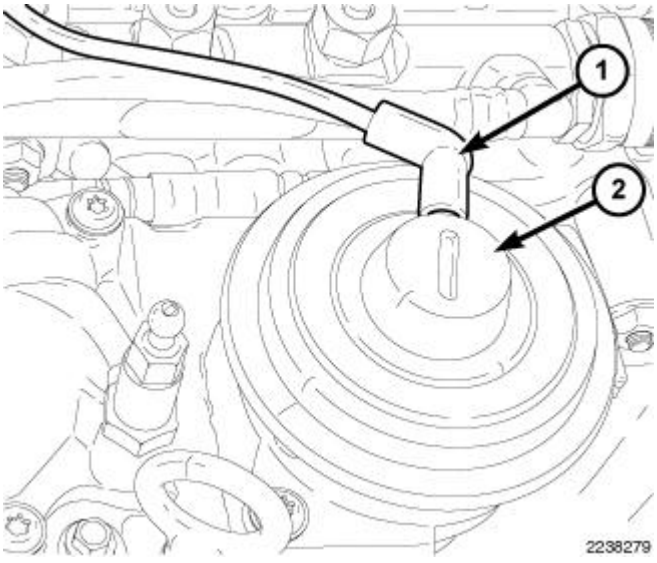


Fig. 398: Vacuum Line & EGR Valve
Courtesy of CHRYSLER LLC

14. Connect the vacuum line (1) to the EGR valve (2).

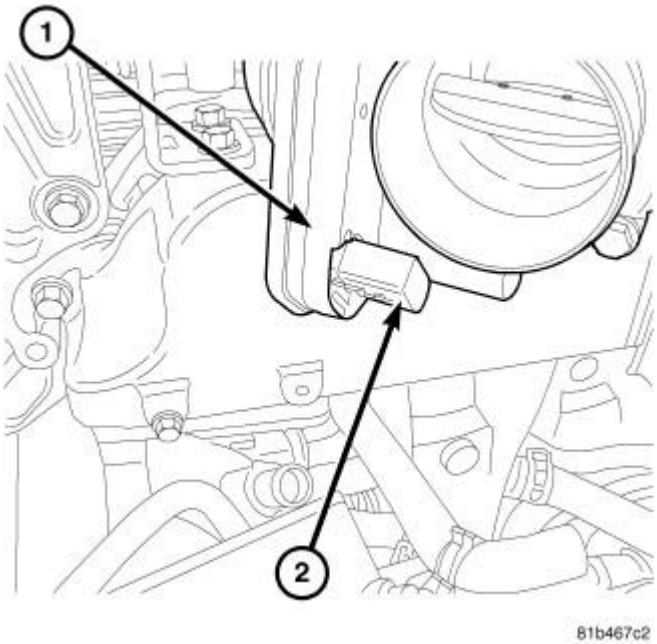


Fig. 399: Electrical Connector - EGR Air Valve
Courtesy of CHRYSLER LLC

15. Connect the EGR air flow control valve harness connector (2).

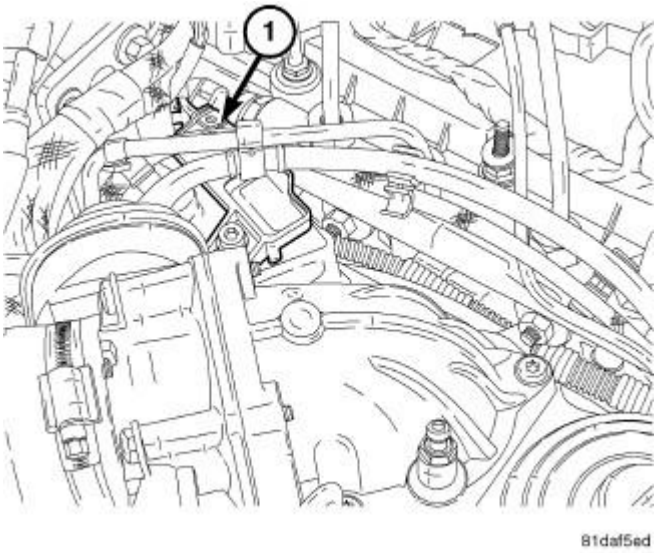


Fig. 400: IAT/BPS Sensor Harness Connector
Courtesy of CHRYSLER LLC

16. Connect the IAT/BPS sensor harness connector (1).

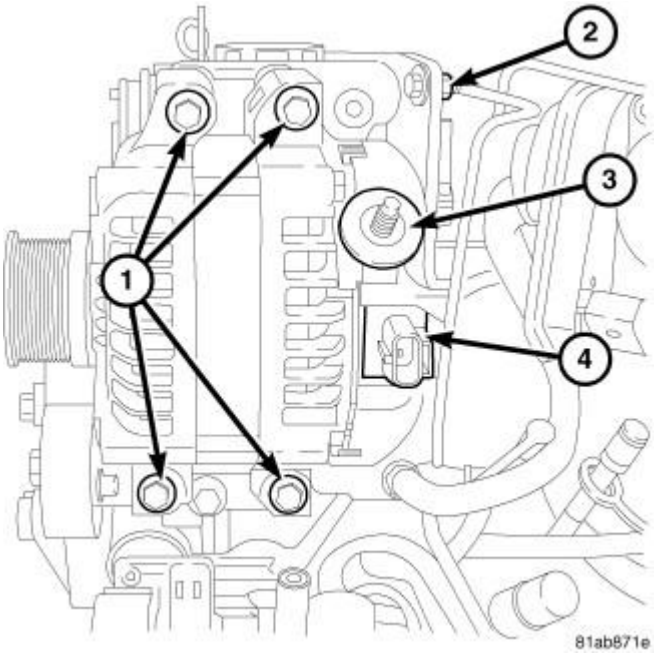


Fig. 401: Generator
Courtesy of CHRYSLER LLC

17. Install the generator mounting bracket. Tighten bolts to 45 N.m (33 ft. lbs.).
18. Install the generator brace bolt (2) Tighten bolt to 11 N.m (97 in. lbs.).
19. Install the generator. Tighten bolts (1) to 33 N.m (24 ft. lbs.).
20. Connect the generator connector (4).
21. Install the battery feed wire to the generator (3).
22. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
23. Fill the coolant. Refer to **Cooling - Standard Procedure** .
24. Connect the negative battery cable.
25. Install the engine cover.

TURBOCHARGER SYSTEM

COOLER AND HOSES, CHARGE AIR

Removal

REMOVAL

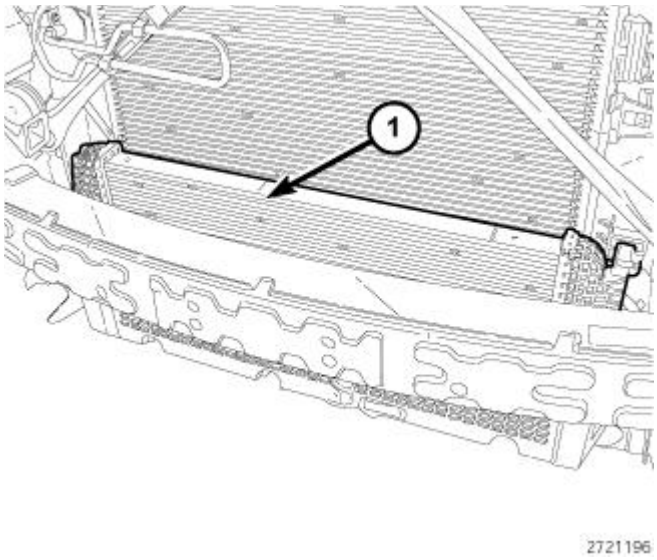


Fig. 402: Charge Air Cleaner
Courtesy of CHRYSLER LLC

WARNING: If the engine was just turned off, the air intake system tubes may be hot.

NOTE: When servicing the Air Charge Cooler and/or Turbocharger, the Air Charger Hose (orange) seal located between the Air Charge Hose and Turbocharger must be replaced.

NOTE: Note the location of the rubber charge air cooler to A/C condenser and air charger cooler to radiator air seals. The seals are use to prevent overheating and improve charge air and A/C efficiency.

1. To remove the charge air cleaner (1), refer to the radiator removal procedure. Refer to **Cooling/Engine/RADIATOR, Engine Cooling - Removal**

Installation

INSTALLATION

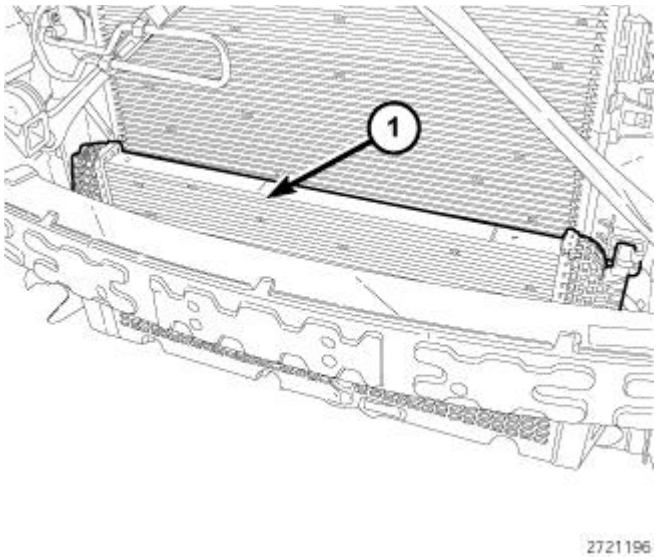


Fig. 403: Charge Air Cleaner
Courtesy of CHRYSLER LLC

NOTE: When servicing the Air Charge Cooler and/or Turbocharger, the Air Charger Hose (orange) seal located between the Air Charge Hose and Turbocharger must be replaced.

NOTE: Care must be taken not to damage the charge air cooler fins and the fins of other ancillary cooler components.

1. To install the charge air cooler (1), refer to the radiator installation procedure. Refer to **Cooling/Engine/RADIATOR, Engine Cooling - Installation** .

TURBOCHARGER

Removal

TURBOCHARGER

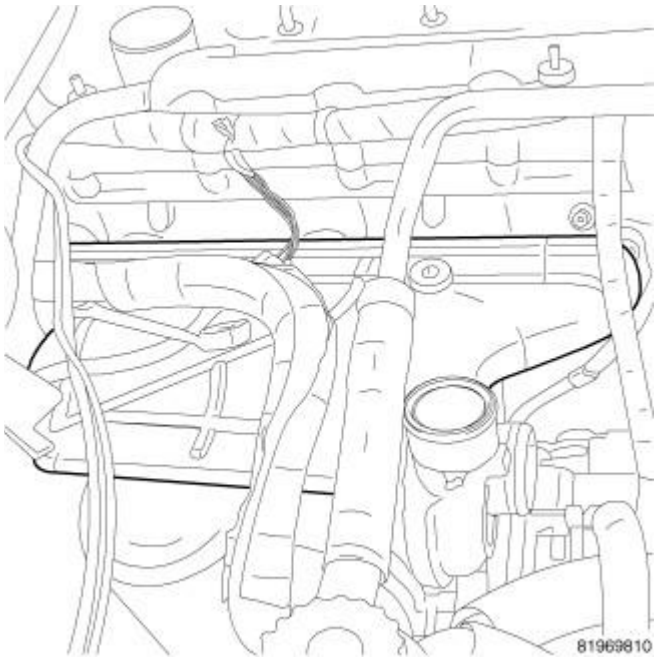


Fig. 404: Heat Shield
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove engine cover.
3. Disconnect the inlet air pressure sensor wiring harness connector and disconnect the air outlet duct from the turbocharger.
4. Remove air inlet tube from turbocharger.
5. Remove the exhaust manifold heat shield. See **Engine/Manifolds/MANIFOLD, Exhaust - Removal**.

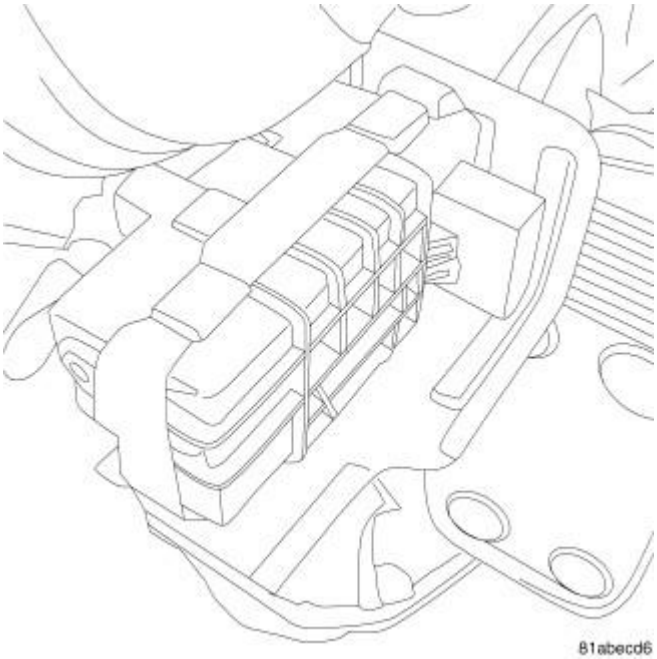


Fig. 405: Turbocharger Module
Courtesy of CHRYSLER LLC

6. Disconnect the boost pressure solenoid harness connector.

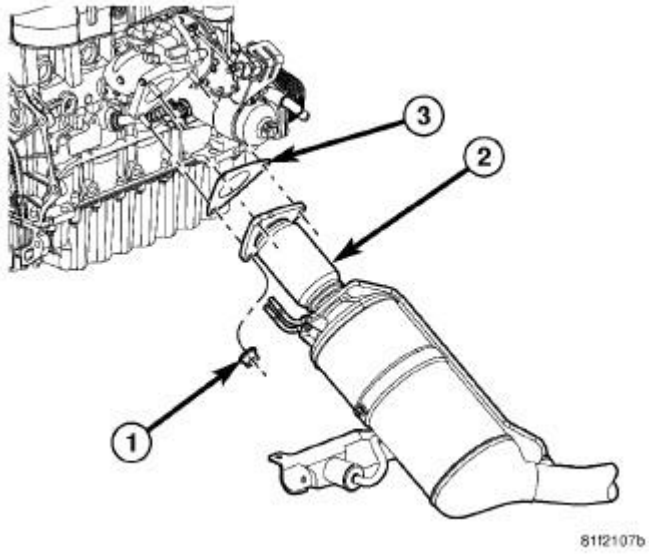


Fig. 406: Diesel Particulate Filter Fasteners
Courtesy of CHRYSLER LLC

7. Remove the fasteners (1) from the upstream side of the diesel particulate filter (2).

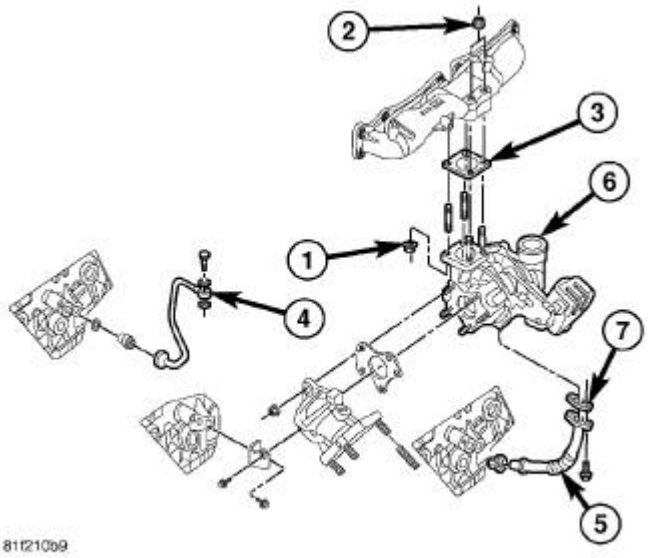


Fig. 407: Turbocharger Retaining Nuts
Courtesy of CHRYSLER LLC

8. Remove the bolts from the turbocharger to engine bracket.

9. Remove the engine oil cooler. Refer to **COOLER, Oil**.
10. Remove the turbocharger oil lines (4 and 5).
11. Remove the turbocharger to exhaust manifold fasteners (1 and 2).
12. Remove turbocharger (6).
13. If damaged, remove oil line fitting from cylinder block.

Installation

TURBOCHARGER

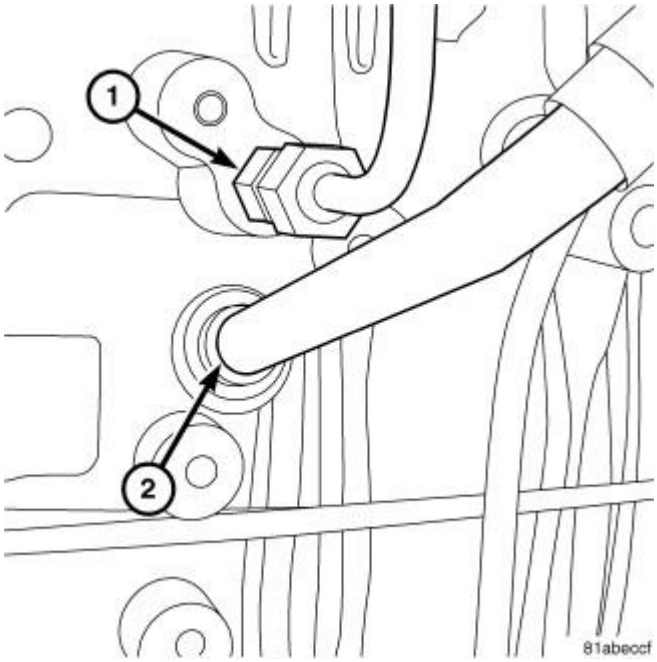


Fig. 408: Turbocharger Oil Lines
Courtesy of CHRYSLER LLC

1. If removed, install oil line fitting (1). Tighten to 54 N.m (39 ft. lbs.)

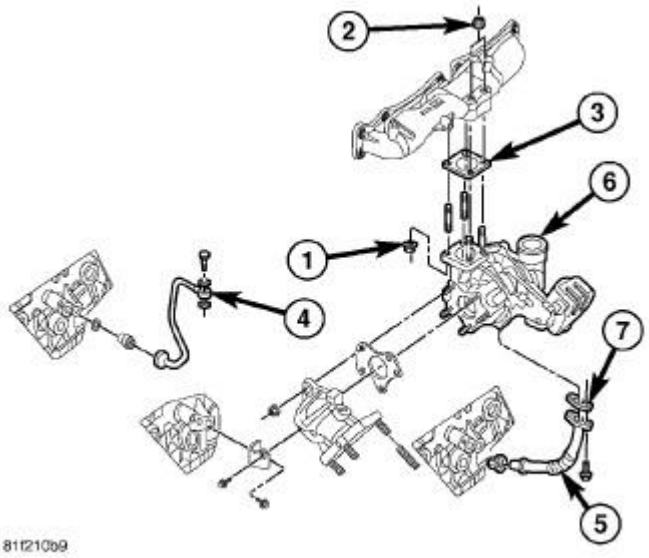


Fig. 409: Turbocharger Retaining Nuts
Courtesy of CHRYSLER LLC

2. Position turbocharger (6) to exhaust manifold with new gasket (3). Tighten retaining nuts (1) and (2) to 32 N.m (24 lbs. ft.).
3. Install the turbocharger oil lines (4 and 5). Tighten to 4.7 N.m (41 in. lbs.).

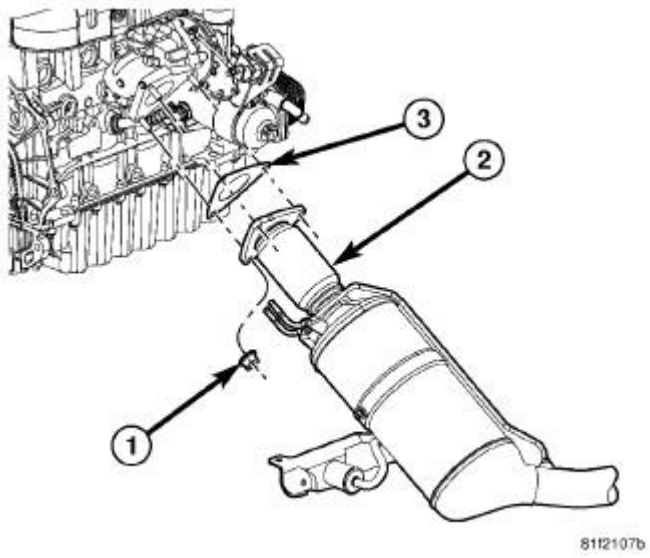


Fig. 410: Diesel Particulate Filter Fasteners
Courtesy of CHRYSLER LLC

4. Install the engine oil cooler. Refer to **COOLER, Oil**.
5. Install the diesel particulate filter fasteners (1). Tighten to 34 N.m (25 ft. lbs.).

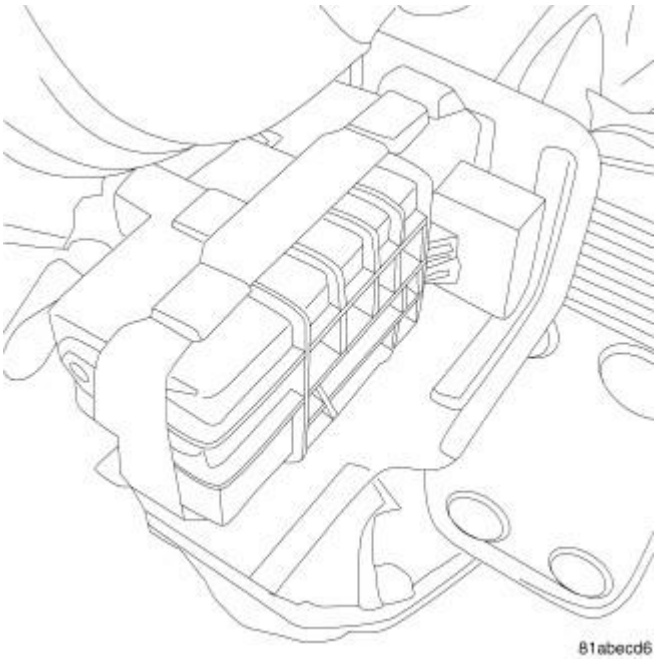


Fig. 411: Turbocharger Module
Courtesy of CHRYSLER LLC

6. Connect the boost pressure solenoid harness connector.

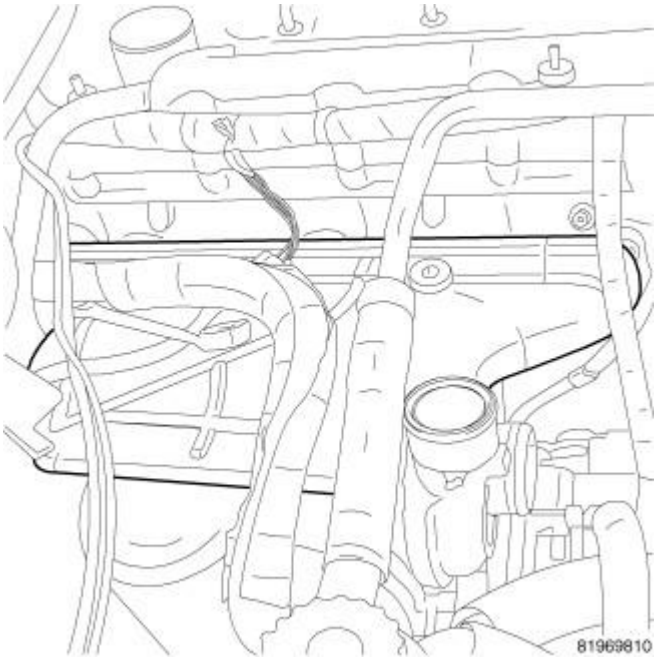


Fig. 412: Exhaust Manifold Heat Shield
Courtesy of CHRYSLER LLC

7. Install the exhaust manifold heat shield. See **Engine/Manifolds/MANIFOLD, Exhaust - Installation**.
8. Install the inlet air tube from the turbocharger.

9. Install the engine cover.

VALVE TIMING

STANDARD PROCEDURE

LOCKING ENGINE 90 DEGREES AFTER TDC

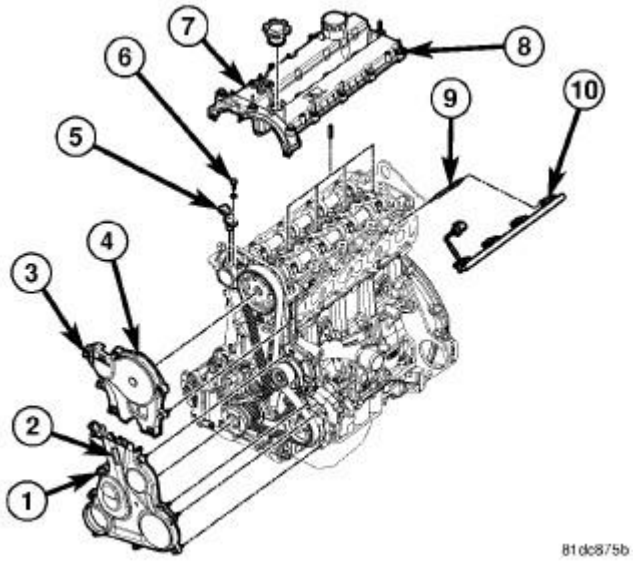


Fig. 413: Upper & Lower Front Covers
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove the upper (4) and lower (2) front covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.

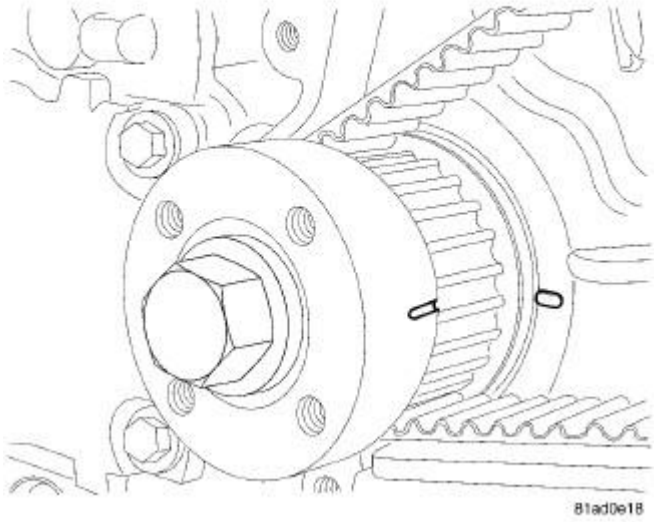


Fig. 414: Crankshaft Timing Belt Drive Sprocket & Timing Belt Cover Aligned
Courtesy of CHRYSLER LLC

3. Rotate the engine until the 90 degrees ATDC marks on the crankshaft timing belt drive sprocket and timing belt cover are aligned.

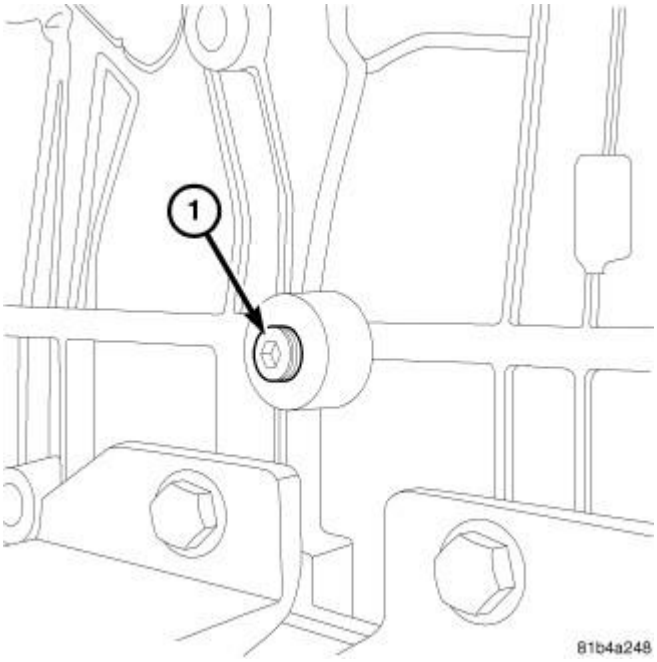


Fig. 415: Engine Block Plug
Courtesy of CHRYSLER LLC

4. Remove the engine block plug (1).

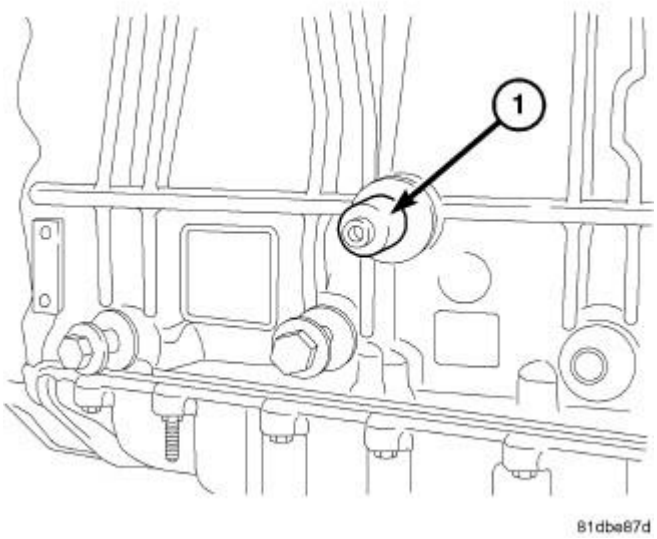


Fig. 416: Crankshaft Locking Tool
Courtesy of CHRYSLER LLC

5. Install the Crankshaft Locking Tool VM.9992 into engine block. Make sure the Crankshaft Locking Tool VM.9992 threads into the crankshaft. If it does not thread into the crankshaft, the crankshaft is not at 90 degrees ATDC. If necessary, realign the 90 degrees ATDC marks on the crankshaft timing belt drive sprocket and timing belt cover.

CAMSHAFT TIMING PROCEDURE

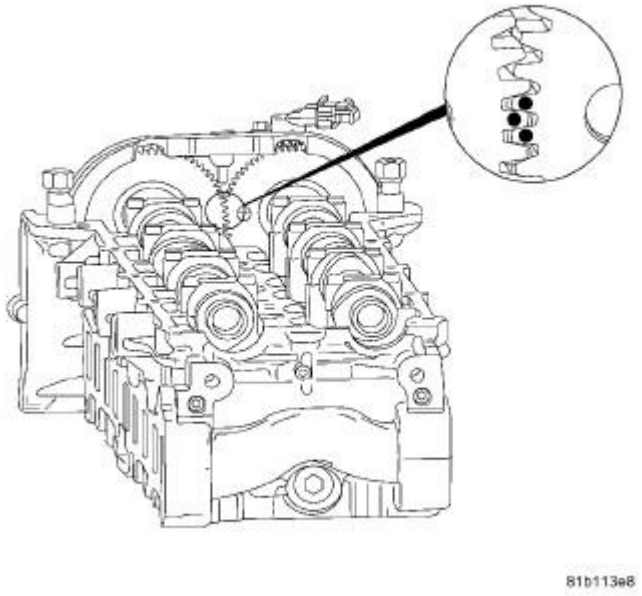


Fig. 417: Camshaft Timing Dots
Courtesy of CHRYSLER LLC

NOTE: In order to validate camshaft timing, the cylinder head cover and timing belt should already have been removed.

1. Line up the camshaft dots.

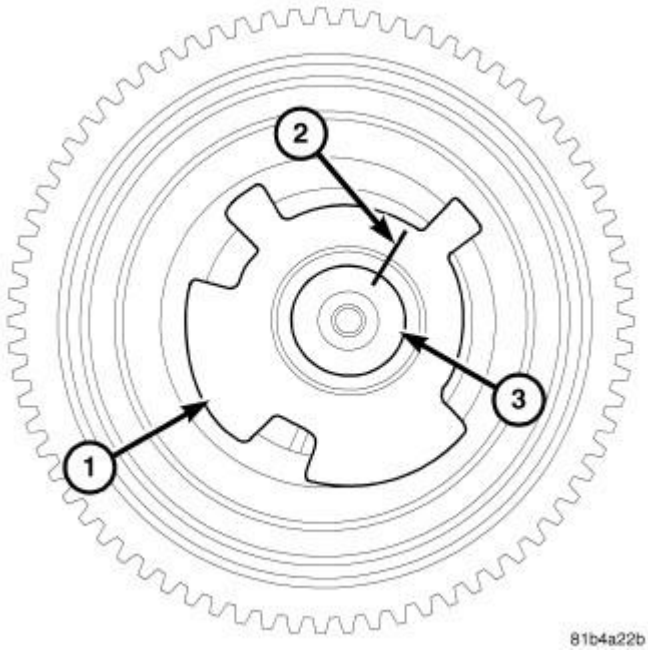


Fig. 418: Marking CMP Sensor Reluctor Wheel & Exhaust Camshaft
Courtesy of CHRYSLER LLC

CAUTION: Do not rotate the camshaft using the camshaft locking tool. The tone wheel may spin on the camshaft. If the tone wheel is rotated on the camshaft, the camshaft must be replaced.

2. Mark the camshaft tone wheel with a paint marker.

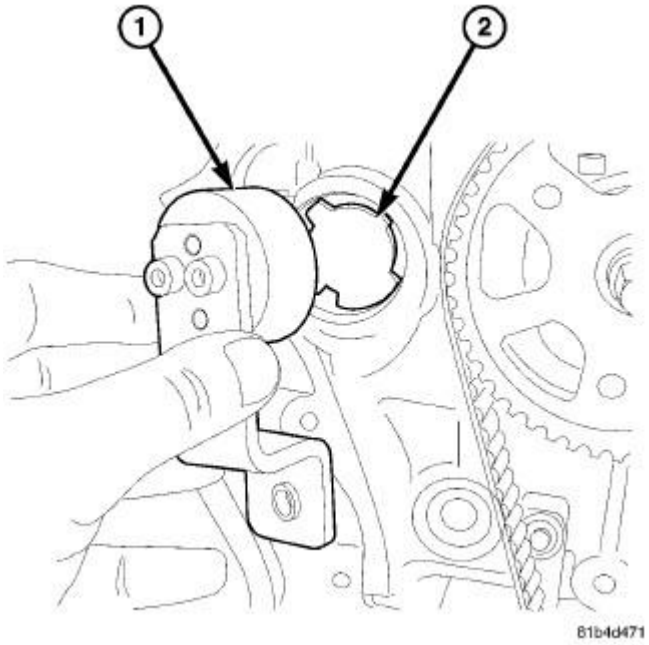


Fig. 419: INSTALLING CAMSHAFT LOCK TOOL
Courtesy of CHRYSLER LLC

3. Rotate the camshafts until the Camshaft Locking Tool VM.9991 can be installed.
4. Install the Camshaft Locking Tool VM.9991 (1).

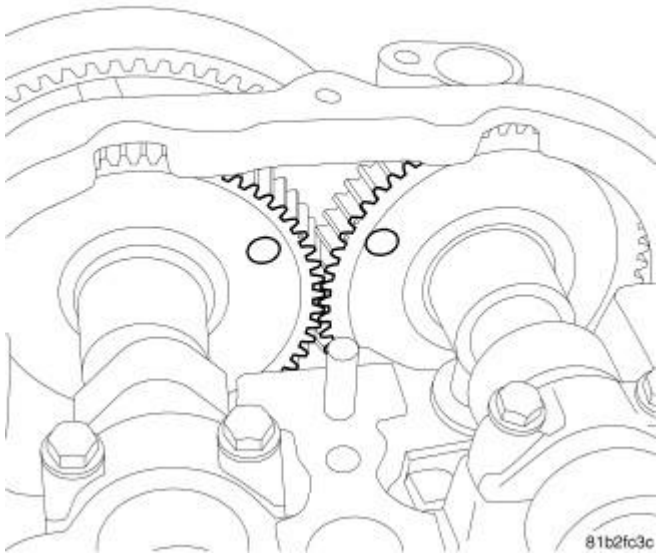


Fig. 420: Camshaft Marks At 90 Degrees ATDC
Courtesy of CHRYSLER LLC

5. Verify the camshafts are set correctly at 90 degrees ATDC as illustrated.

BELT, TIMING

Removal

REMOVAL - TIMING BELT

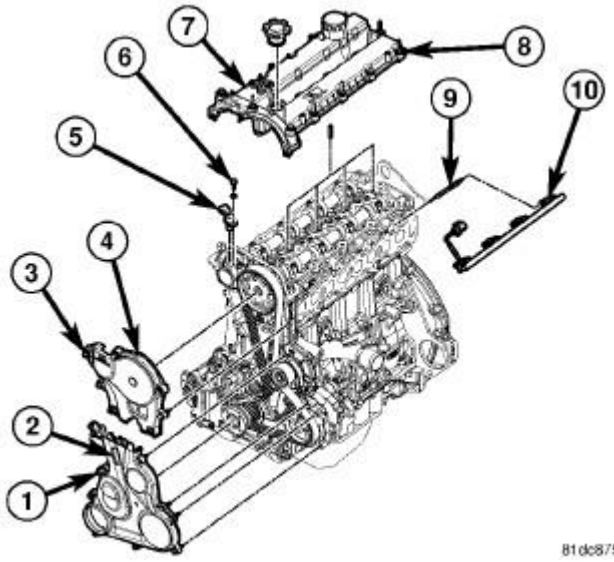


Fig. 421: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the upper (4) and lower (2) outer timing belt covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.

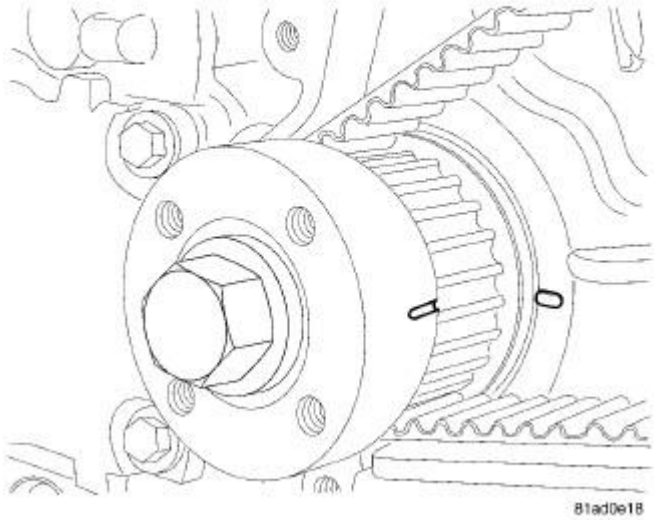


Fig. 422: Crank Timing Mark
Courtesy of CHRYSLER LLC

3. Rotate the engine by hand until the crankshaft 90° ATDC marks are aligned.

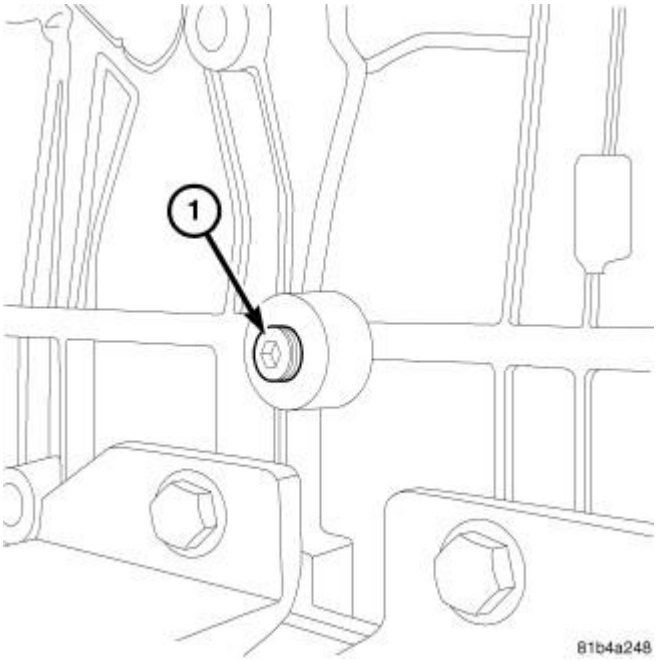


Fig. 423: Engine Block Plug
Courtesy of CHRYSLER LLC

4. Remove the engine block plug (1).

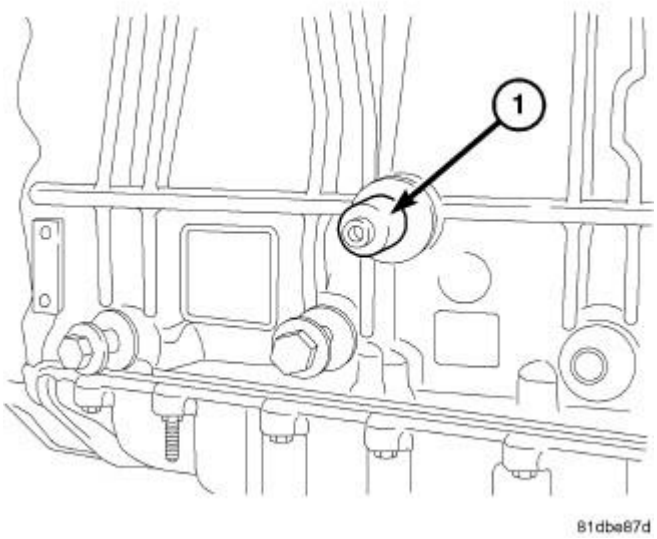


Fig. 424: Crankshaft Locking Tool
Courtesy of CHRYSLER LLC

5. Install the Crankshaft Locking Tool VM.9992 (1).

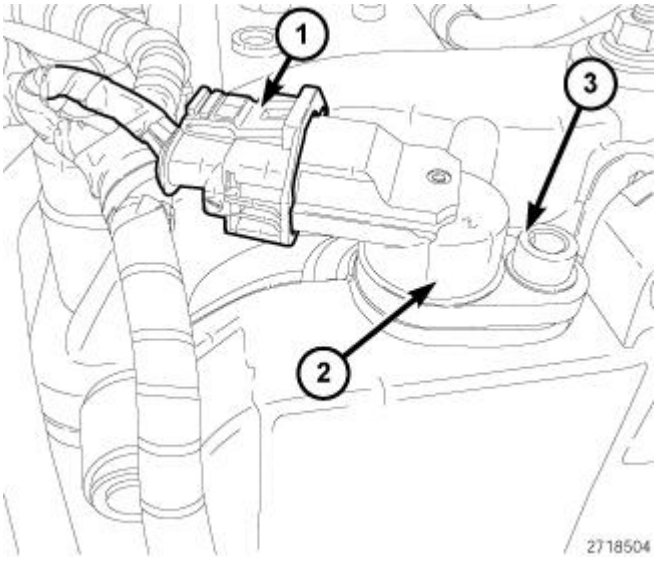


Fig. 425: CAMSHAFT POSITION SENSOR HARNESS CONNECTOR
Courtesy of CHRYSLER LLC

6. Disconnect the Camshaft Position Sensor (CMP) harness connector (1).
7. Remove bolt (3) the CMP sensor (2).

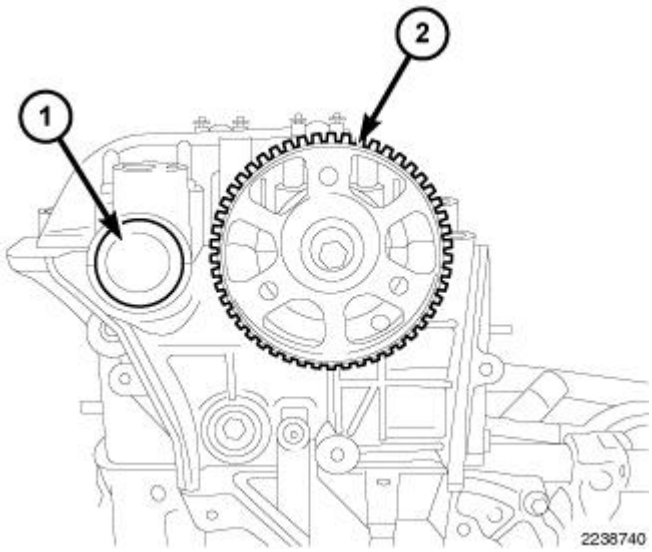


Fig. 426: Camshaft Sprocket
Courtesy of CHRYSLER LLC

8. Remove the exhaust camshaft oil seal (1).

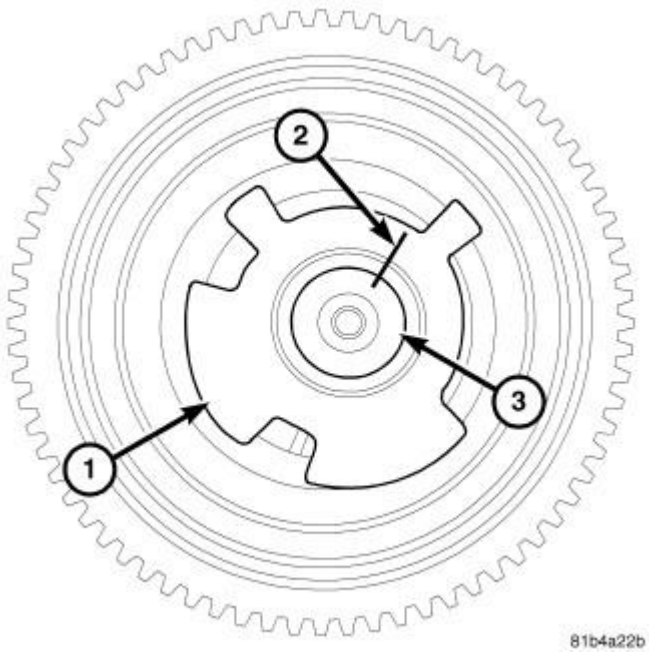


Fig. 427: Mark Across Reluctor Wheel & Exhaust Camshaft
Courtesy of CHRYSLER LLC

9. Make a mark (2) across the reluctor wheel (1) and the exhaust camshaft (3). This mark will be used to verify that the reluctor wheel did not rotate on the camshaft during assembly.

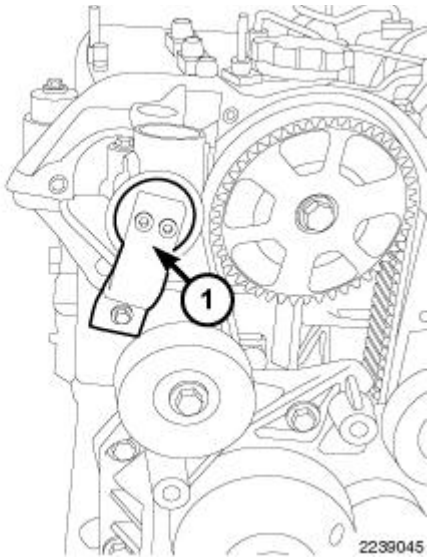


Fig. 428: Camshaft Locking Tool
Courtesy of CHRYSLER LLC

NOTE: If it is suspected that the camshafts are not correctly timed to each other, refer to the camshaft timing procedure to reset the camshaft timing. See ENGINE/VALVE TIMING - STANDARD PROCEDURE.

10. Install the Camshaft Locking Tool VM.9991 (1). The crankshaft and camshafts are now locked at 90° ATDC.

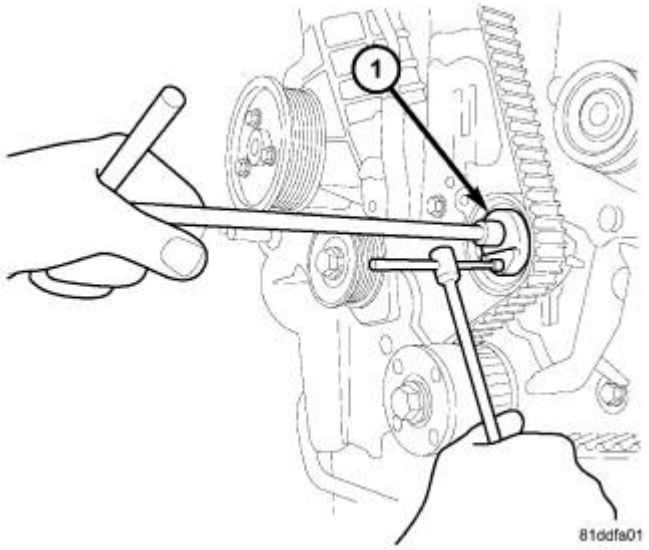


Fig. 429: Timing Belt Tensioner Bolt
Courtesy of CHRYSLER LLC

11. Loosen the timing belt tensioner bolt (1), and remove the timing belt.

Installation

INSTALLATION - TIMING BELT

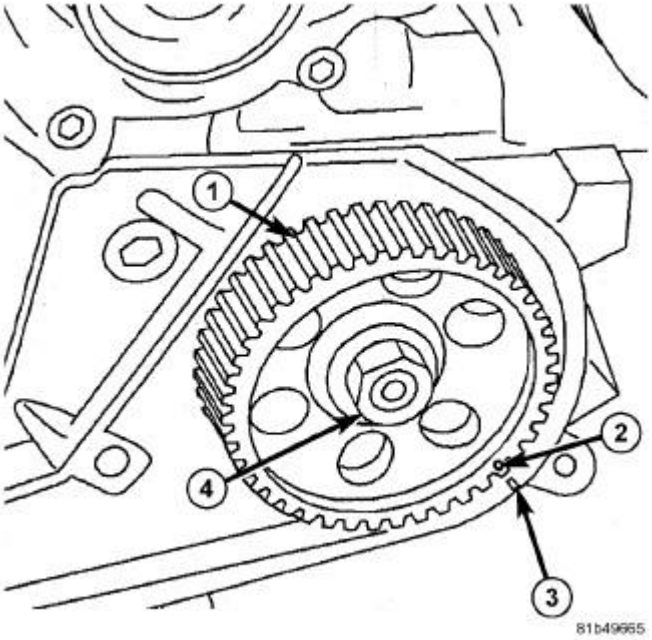


Fig. 430: Fuel Injection Pump Timing Marks
Courtesy of CHRYSLER LLC

1. Align the high pressure fuel pump sprocket timing mark (2) with the timing mark (3) on the block.

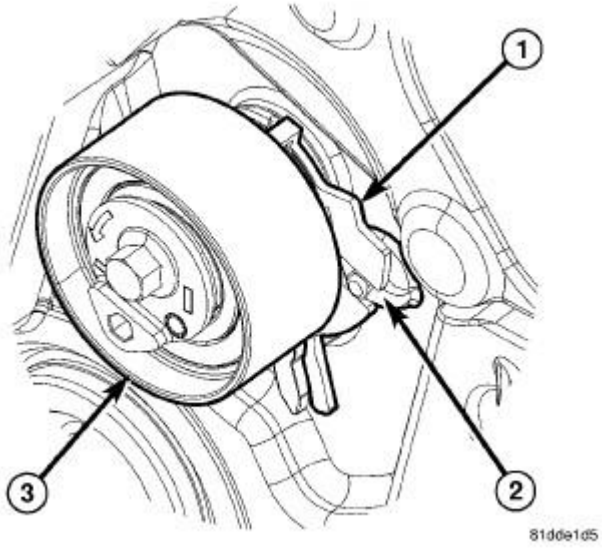


Fig. 431: Tensioner Alignment Plate
Courtesy of CHRYSLER LLC

2. Verify that the bolt is finger tight and tensioner alignment plate (1) is aligned with the boss (2) on the front engine cover.

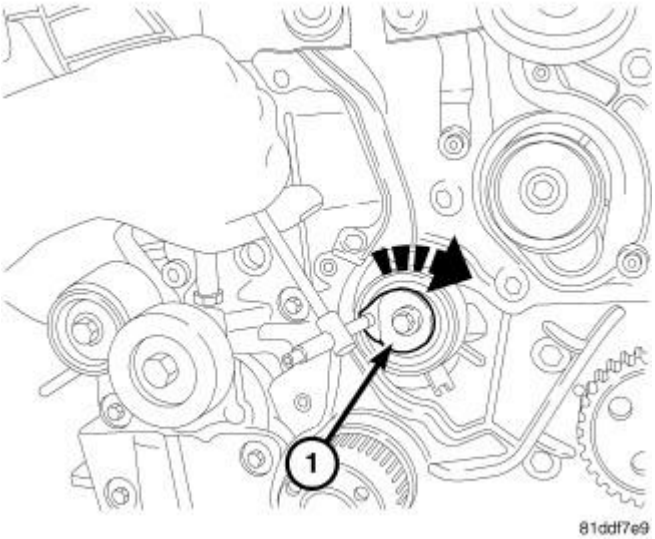


Fig. 432: Turning Timing Belt Tensioner Clockwise
Courtesy of CHRYSLER LLC

3. Turn the timing belt tensioner (1) clockwise to unload the tensioner enough for the timing belt to be installed.

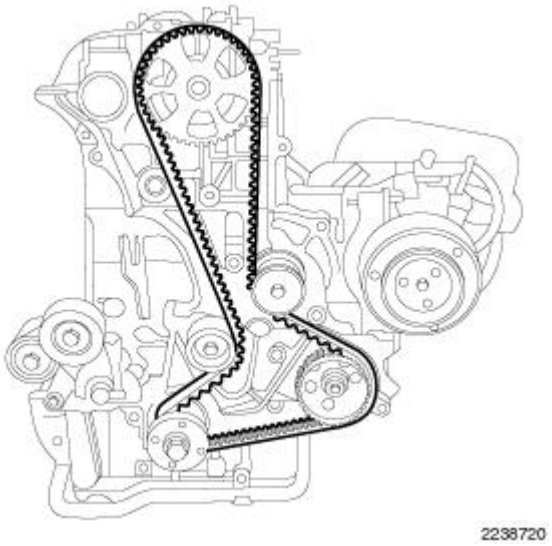


Fig. 433: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

NOTE: DO NOT remove the timing belt from the package until it is going to be installed. DO NOT expose timing belt to oil, grease or water contamination. DO NOT crimp belt at a sharp angle. DO NOT clean belt, pulleys or tensioner with solvent. Check that pulleys and bearings are not seized or

damaged before installing belt.

4. Install the timing belt on the components in the following order:

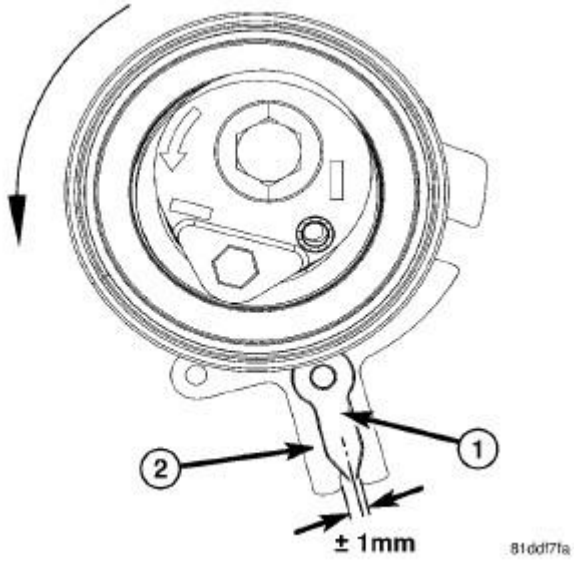


Fig. 434: Timing Belt Tensioner Load Indicator & Gauge
Courtesy of CHRYSLER LLC

NOTE: Turning the belt tensioner counter clockwise moves the pointer in a clockwise direction. Also, if the tensioner bolt is too loose this will cause the tensioner alignment slot to jump off the alignment boss on timing cover.

- Crankshaft sprocket (1)
- High pressure fuel pump (2)
- Water pump pulley (3)
- Intake camshaft pulley (4)
- Timing belt tensioner (5)

5. Adjust timing belt tensioner by lining up the load indicator arrow (1) to the center of the (2) tensioner load gage as illustrated.

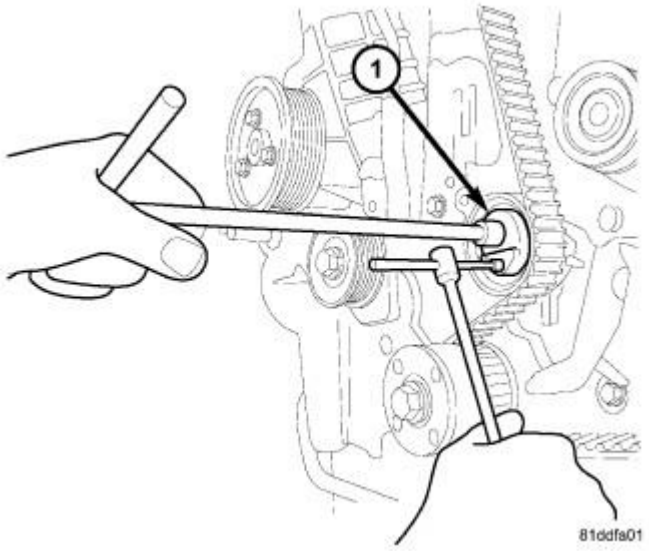


Fig. 435: Tightening Timing Belt Tensioner Bolt
Courtesy of CHRYSLER LLC

6. Tighten the timing belt tensioner bolt to 28 N.m (21 ft. lbs.).

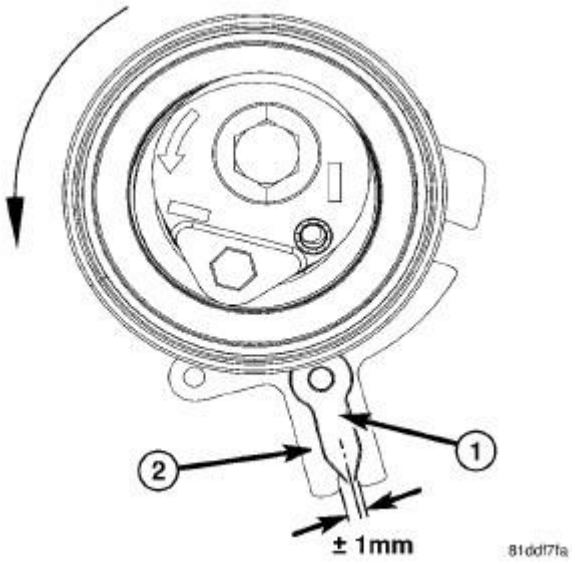


Fig. 436: Timing Belt Tensioner Load Indicator & Gauge
Courtesy of CHRYSLER LLC

7. Verify the tensioner load indicator (1) is still centered in the tensioner load gage (2).

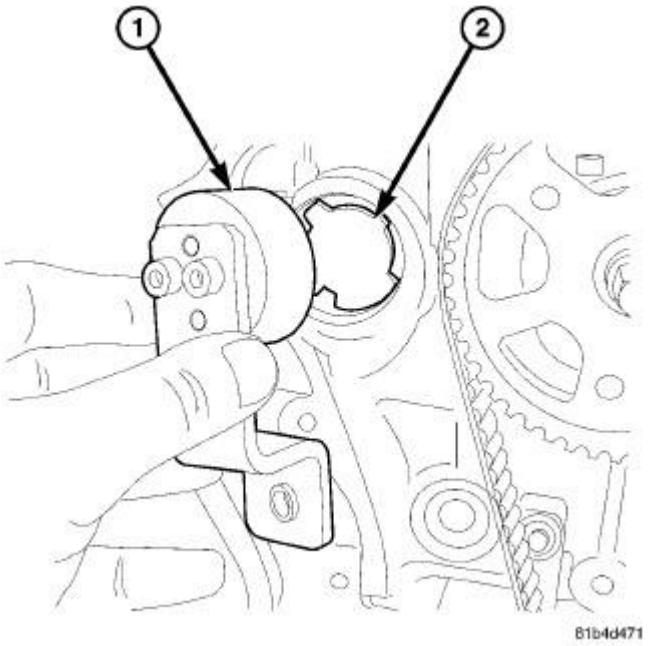


Fig. 437: Camshaft Lock Tool
Courtesy of CHRYSLER LLC

8. Remove the Camshaft Locking Tool VM.9991 (1).

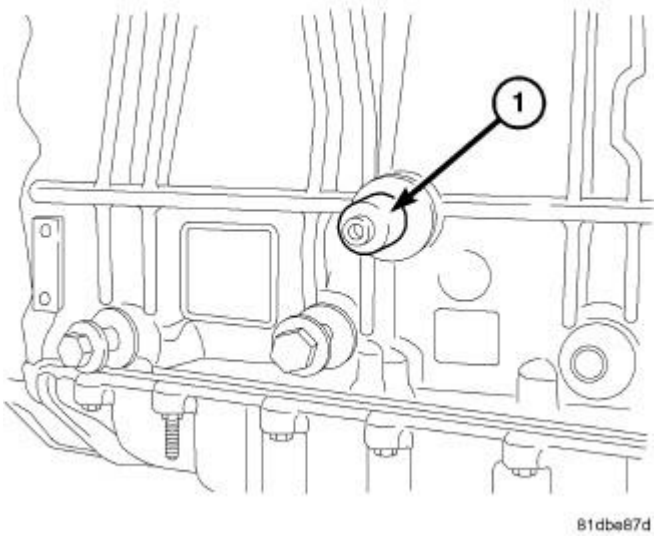


Fig. 438: Crankshaft Locking Tool
Courtesy of CHRYSLER LLC

9. Remove the Crankshaft Locking Tool VM.9992 (1).

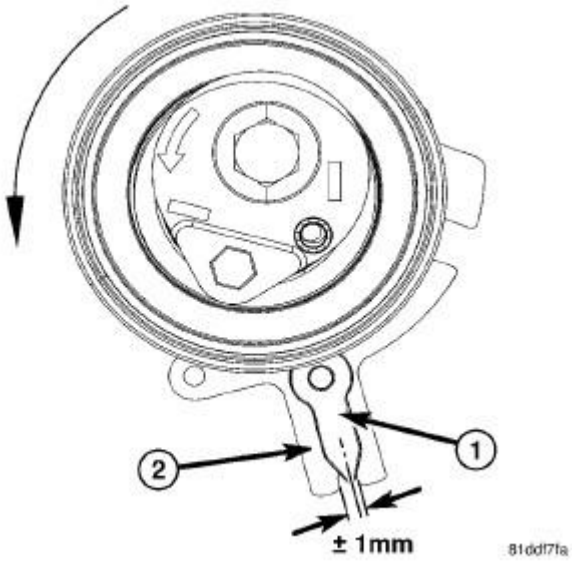


Fig. 439: Timing Belt Tensioner Load Indicator & Gauge
Courtesy of CHRYSLER LLC

NOTE: In order to rotate the engine, the Camshaft Locking Tool VM.9991 and the Crankshaft Locking Tool VM.9992 need to be removed.

10. Rotate engine 2 complete revolutions and then recheck tensioner alignment. Verify that the tension indicator (1) is centered in the slot on the tensioner gage (2) slot as shown in illustration. Readjust tensioner alignment is necessary.

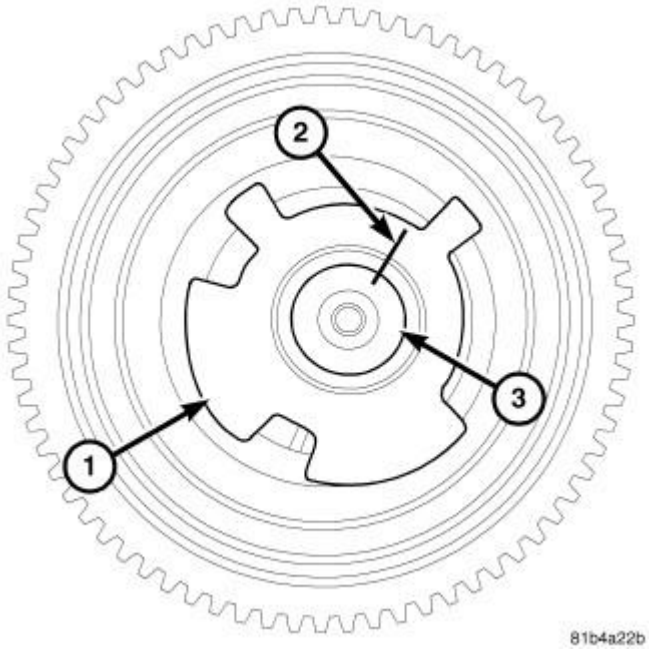


Fig. 440: Mark Across Reluctor Wheel & Exhaust Camshaft
Courtesy of CHRYSLER LLC

11. Verify that the reluctor wheel (1) has not moved on the camshaft. If the witness marks are not aligned, the reluctor wheel (1) has spun on the camshaft (3) during the assembly process. If so, the exhaust camshaft must be replaced.

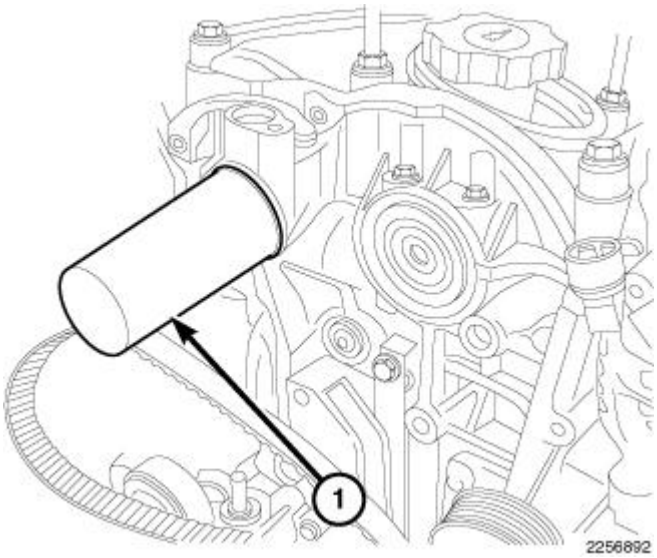


Fig. 441: Seal Installer VM 1057
Courtesy of CHRYSLER LLC

12. Using Seal Installer VM.1057 (1), install the exhaust camshaft seal using.

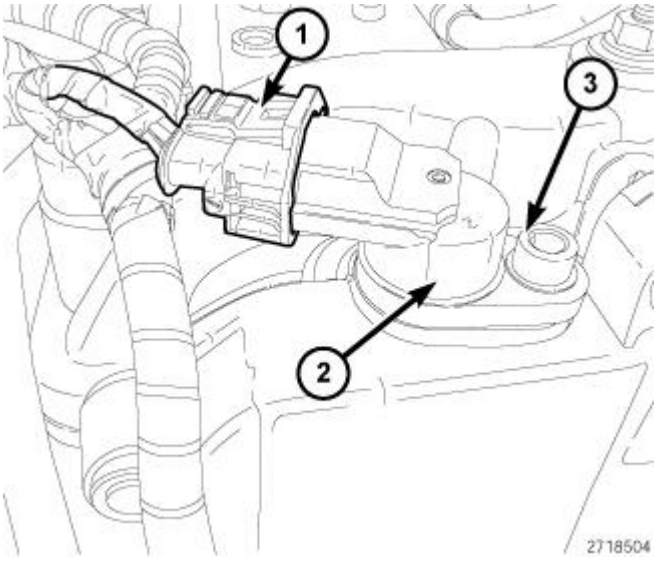


Fig. 442: CAMSHAFT POSITION SENSOR HARNESS CONNECTOR
Courtesy of CHRYSLER LLC

13. Install the Camshaft Position Sensor CMP sensor (2). Tighten bolt (3) to 11 N.m (97 in. lbs.).
14. Connect the (CMP) harness connector (1).

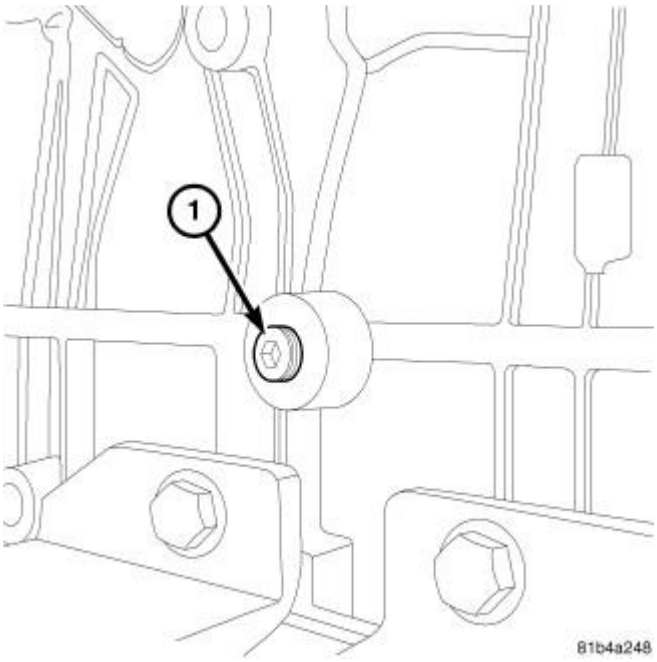


Fig. 443: Engine Block Plug
Courtesy of CHRYSLER LLC

15. Install the engine block plug (1). Tighten block plug to 30 N.m (22 ft. lbs.).

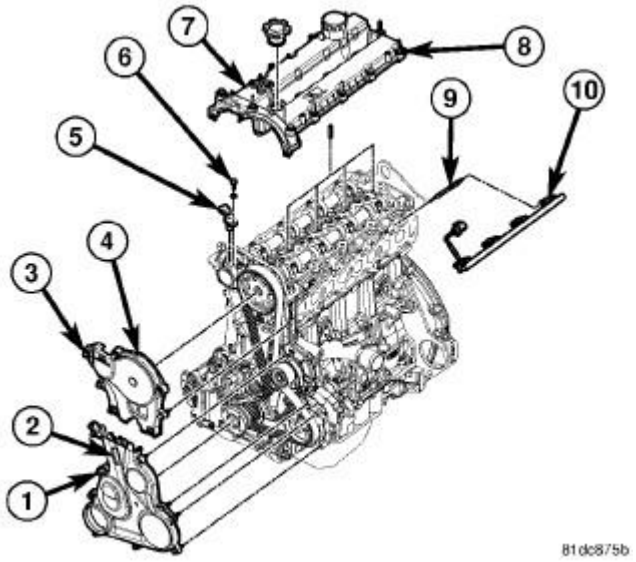


Fig. 444: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

16. Install the upper (4) and lower (2) outer timing belt covers. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation**.
17. Connect the negative battery cable.

COVER(S), ENGINE TIMING

Removal

REMOVAL - TIMING BELT INNER COVER

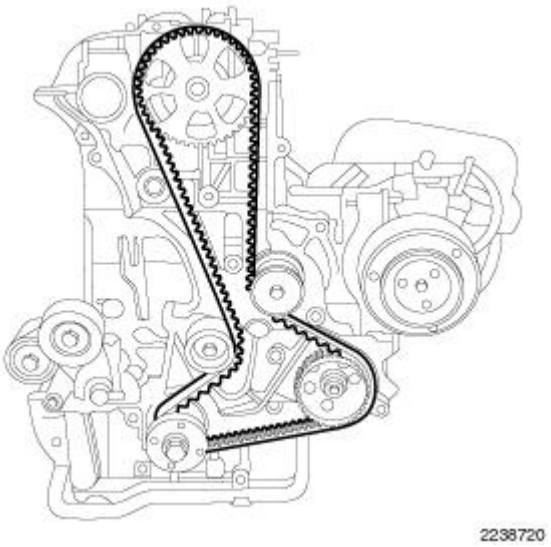


Fig. 445: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the timing belt. See **Engine/Valve Timing/BELT, Timing - Removal**.

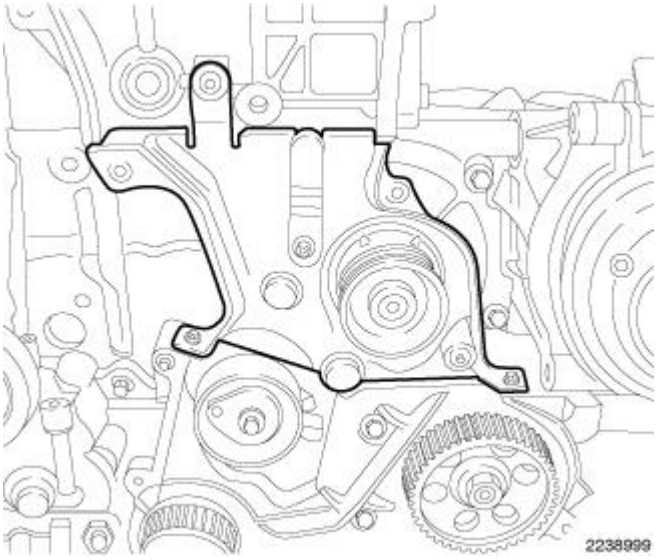


Fig. 446: Inner Timing Belt Cover
Courtesy of CHRYSLER LLC

3. Remove the inner timing belt cover.

UPPER AND LOWER TIMING BELT OUTER COVERS

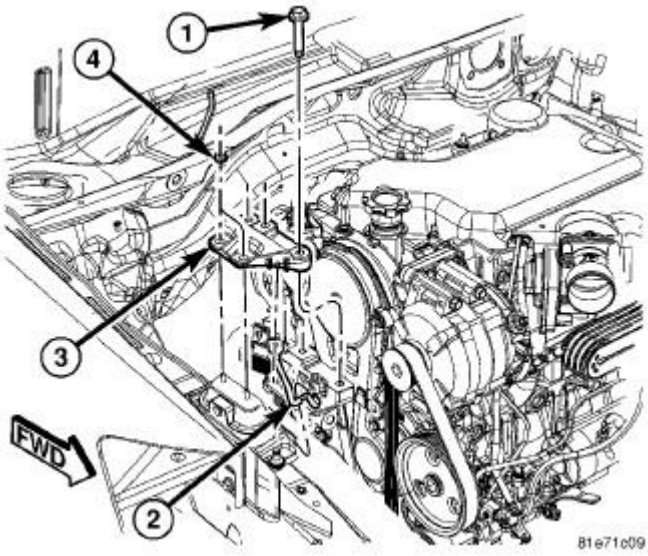


Fig. 447: Right Front Engine Mount Bracket
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Removal**.
4. Remove the right engine mount bracket (2). See **Engine/Engine Mounting/INSULATOR, Engine Mount - Removal**.
5. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
6. Remove the accessory drive idler pulley.

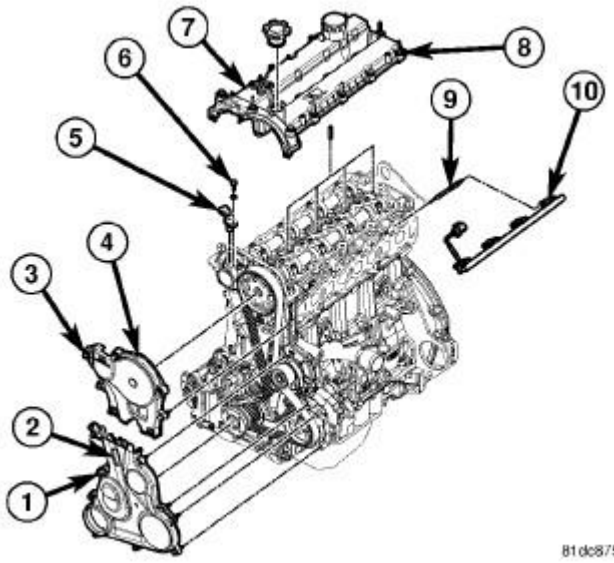


Fig. 448: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

7. Remove the upper timing belt cover (4).

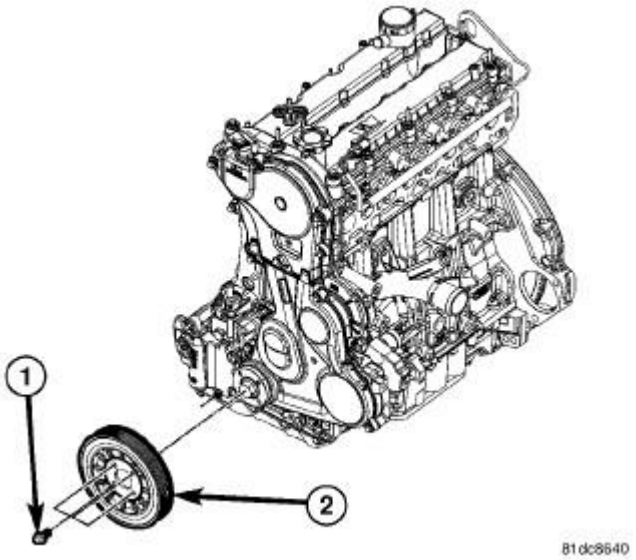


Fig. 449: Crankshaft Damper Bolts
Courtesy of CHRYSLER LLC

8. Remove the bolts (1) and the crankshaft damper (2).

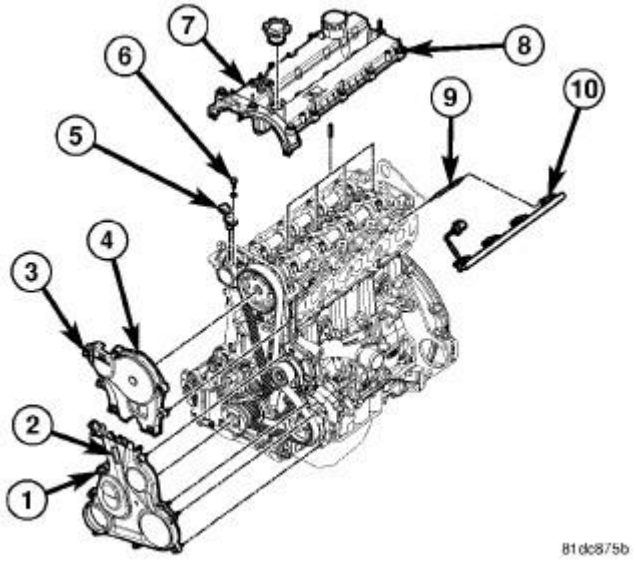


Fig. 450: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

9. Remove the bolts (1), and the lower timing belt cover (2).

Installation

INSTALLATION - TIMING BELT INNER COVER

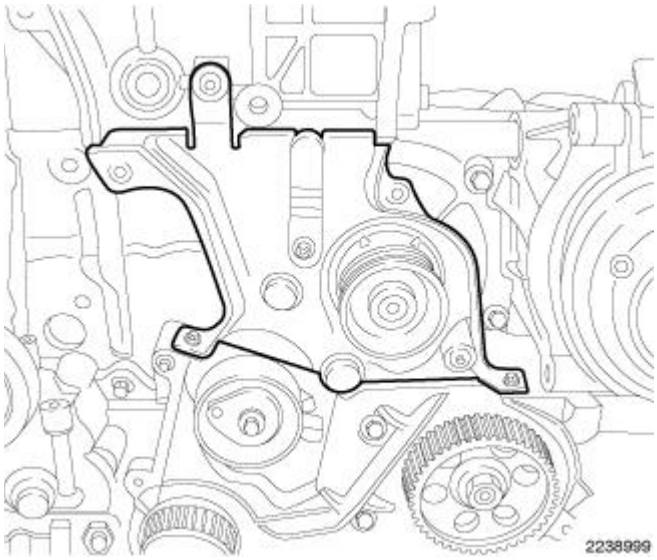


Fig. 451: Inner Timing Belt Cover
Courtesy of CHRYSLER LLC

1. Install the inner timing belt cover. Tighten the bolts to 11 N.m (97 in. lbs.).

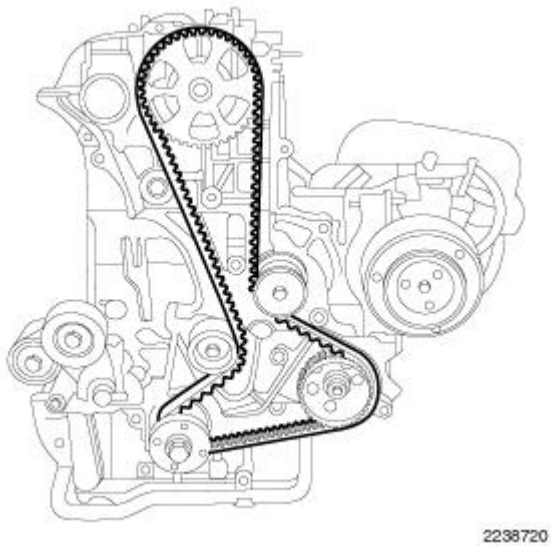


Fig. 452: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

2. Install the timing belt. See **Engine/Valve Timing/BELT, Timing - Installation**.
3. Connect the negative battery cable.

UPPER AND LOWER OUTER TIMING BELT COVERS

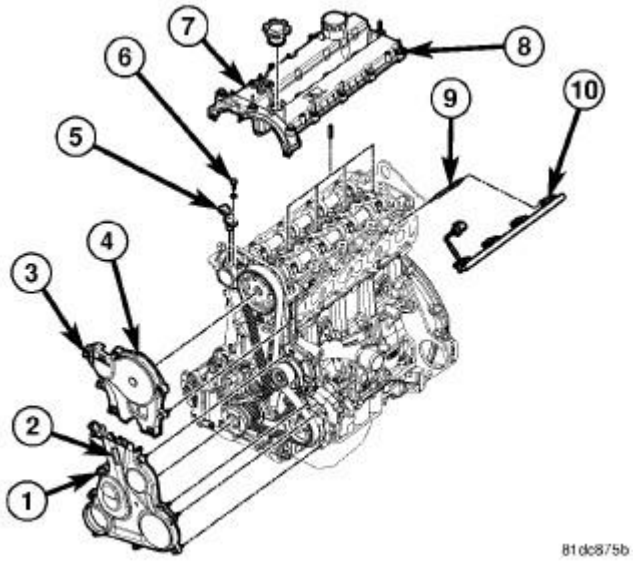


Fig. 453: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

1. Install the lower timing belt cover (2). Tighten the bolts to 8 N.m (71 in. lbs.).

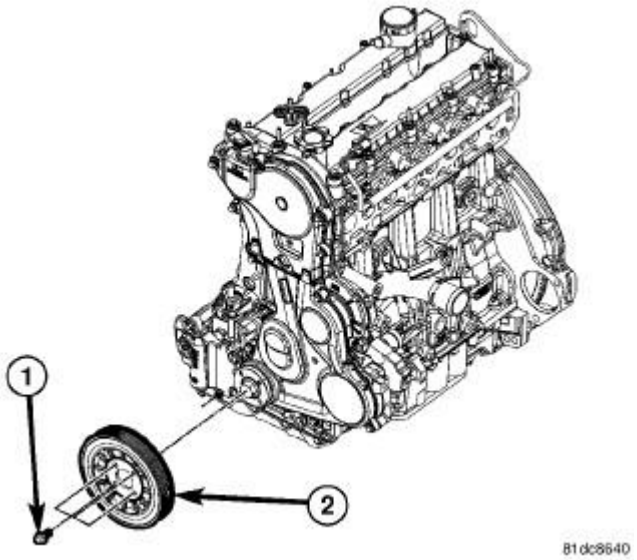


Fig. 454: Crankshaft Damper
Courtesy of CHRYSLER LLC

2. Install the crankshaft damper (1). Tighten the bolts to 32 N.m (24 ft. lbs.).

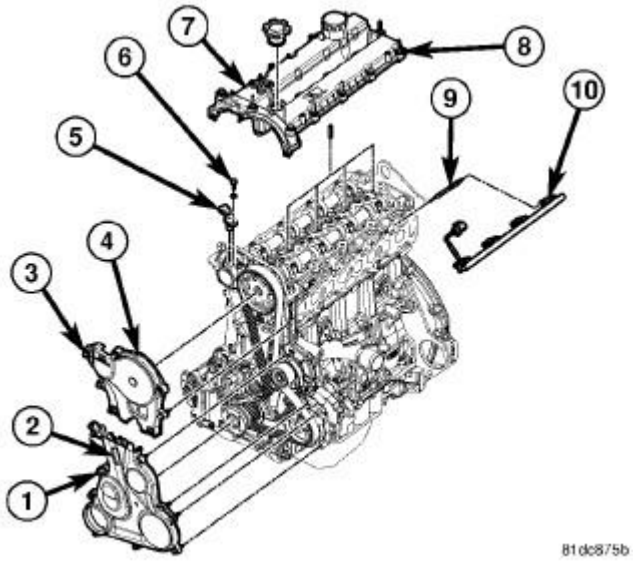


Fig. 455: Upper & Lower Outer Timing Belt Covers
Courtesy of CHRYSLER LLC

3. Install the upper timing cover (4). Tighten the bolts to 8 N.m (71 in. lbs.).

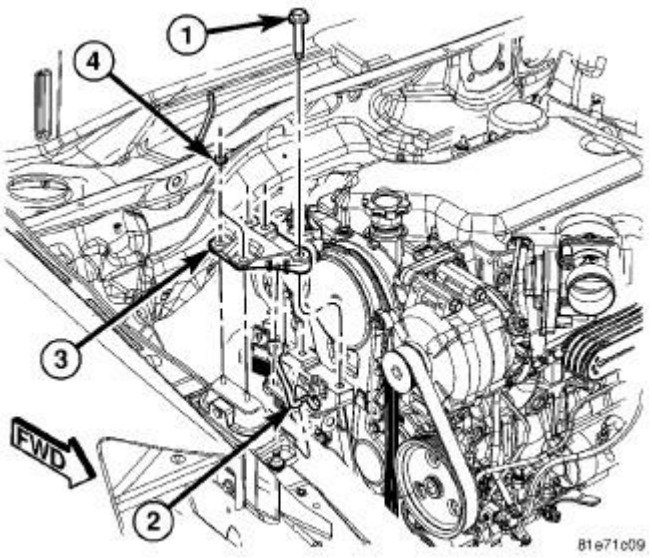


Fig. 456: Right Front Engine Mount Bracket
Courtesy of CHRYSLER LLC

4. Install the accessory drive idler pulley. Tighten bolts to 45 N.m (33 ft. lbs.).
5. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
6. Install the right front engine mount bracket (2). See **Engine/Engine Mounting/INSULATOR, Engine Mount - Installation**.
7. Install the air cleaner body. See **Engine/Air Intake System/BODY, Air Cleaner - Installation**.

8. Install the engine cover.
9. Connect the negative battery cable.

SPROCKET(S), TIMING BELT AND CHAIN

Removal

REMOVAL - CAMSHAFT SPROCKET

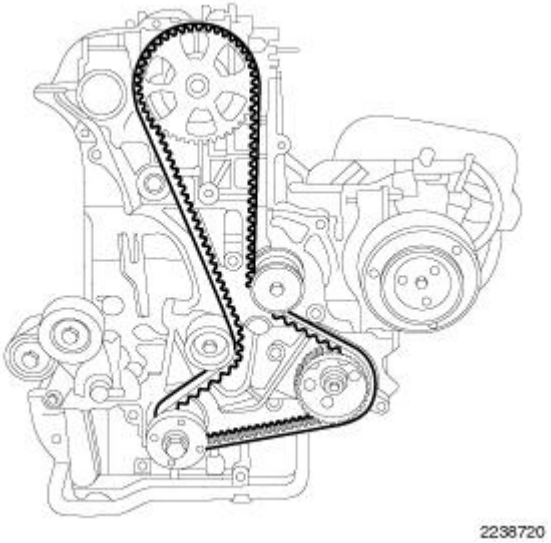


Fig. 457: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Remove the timing belt. See **Engine/Valve Timing/BELT, Timing - Removal**.

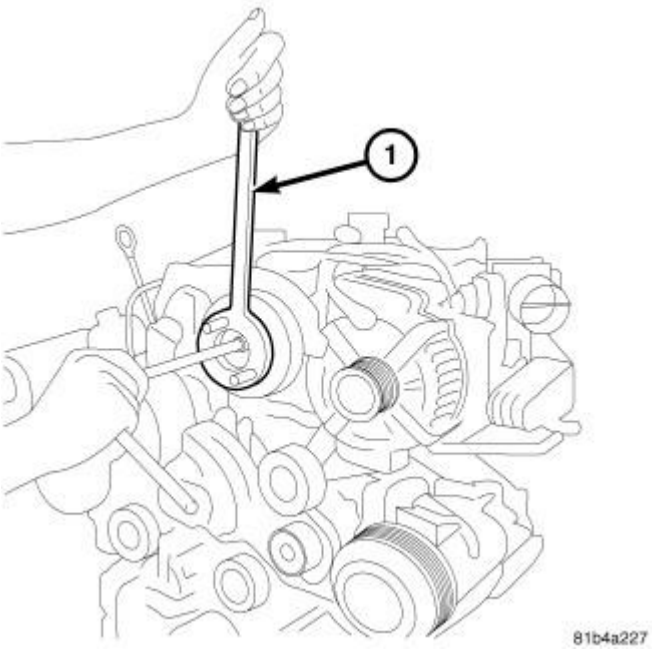


Fig. 458: Tightening Camshaft Sprocket
Courtesy of CHRYSLER LLC

CAUTION: Always use VM.1055 to hold the camshaft while loosening the camshafts. Failure to use this tool can cause the camshaft holding tool to rotate the tone wheel on the camshaft. If the tone wheel is spun on the camshaft, the camshaft must be replaced.

3. Using the Locking Tool VM.1055 to hold the intake camshaft sprocket, remove the bolt.

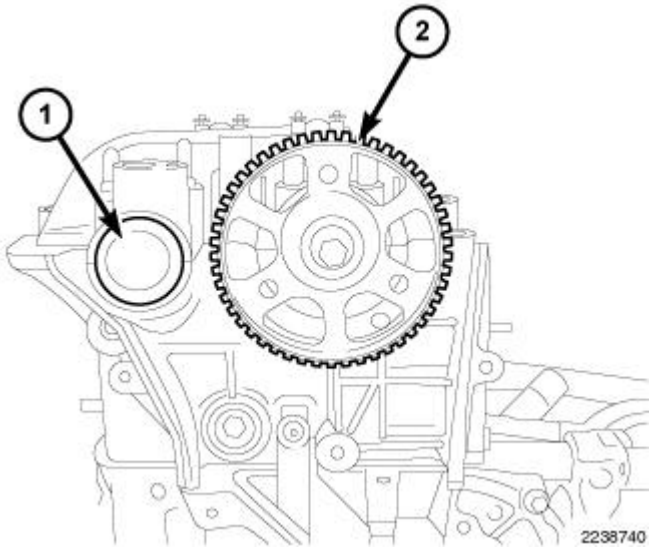


Fig. 459: Camshaft Sprocket
Courtesy of CHRYSLER LLC

4. Remove the camshaft sprocket (2).

Installation

INSTALLATION - CAMSHAFT SPROCKET

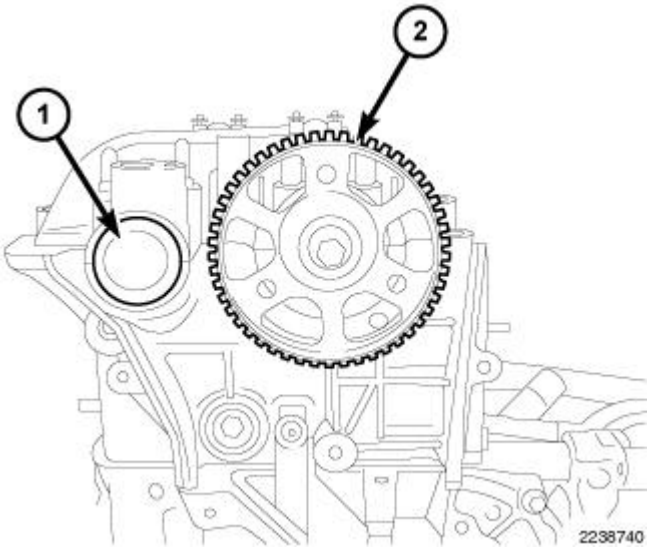


Fig. 460: Camshaft Sprocket
Courtesy of CHRYSLER LLC

1. Install the intake camshaft sprocket (2) and finger tighten bolt.

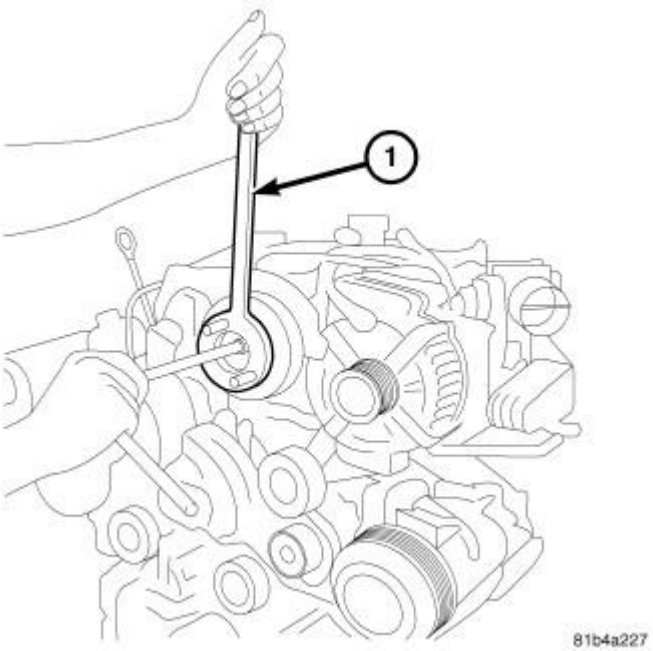


Fig. 461: Tightening Camshaft Sprocket
Courtesy of CHRYSLER LLC

2. Using the Locking Tool VM.1055, tighten bolt to 64 N.m (47 ft. lbs.).

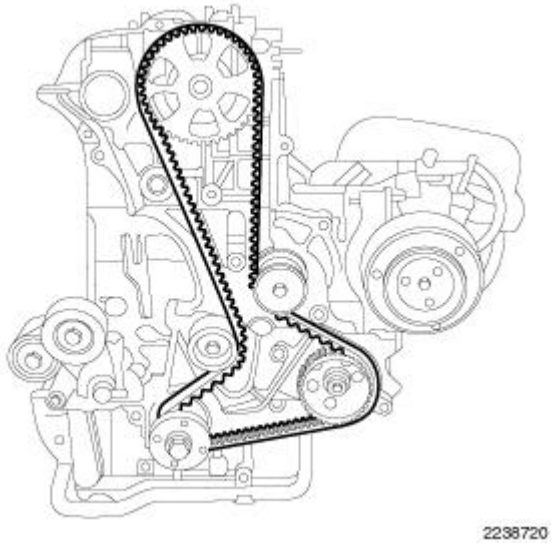


Fig. 462: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

3. Install the timing belt. See **Engine/Valve Timing/BELT, Timing - Installation**.

TENSIONER, ENGINE TIMING

Removal

REMOVAL - ENGINE TIMING TENSIONER

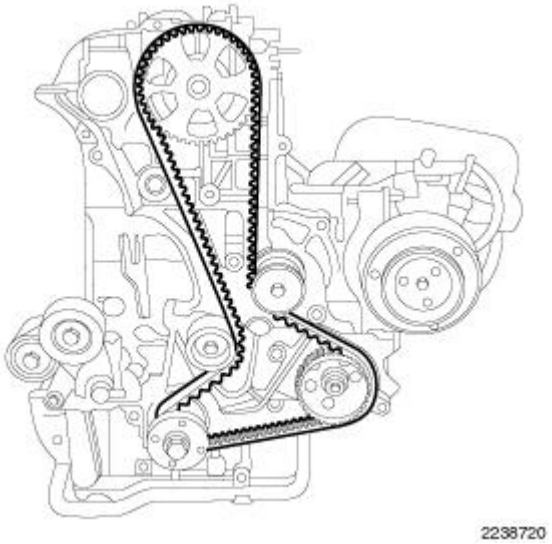


Fig. 463: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove the timing belt. See **Engine/Valve Timing/BELT, Timing - Removal**.

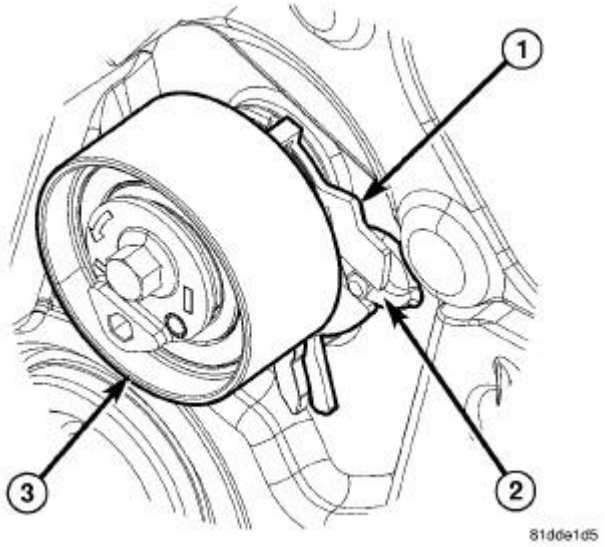


Fig. 464: Timing Belt Tensioner & Tensioner Alignment Plate
Courtesy of CHRYSLER LLC

3. Remove bolt, and the timing belt tensioner (3).

Installation

INSTALLATION - ENGINE TIMING TENSIONER

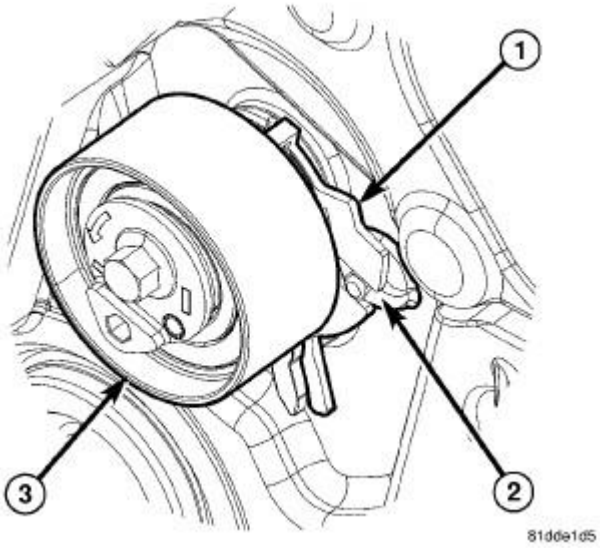


Fig. 465: Timing Belt Tensioner & Tensioner Alignment Plate
Courtesy of CHRYSLER LLC

1. Install the timing belt tensioner (3). Do not tighten at this time. Verify that the slot in the tensioner alignment plate (1) is aligned with the boss (2) on the engine cover.

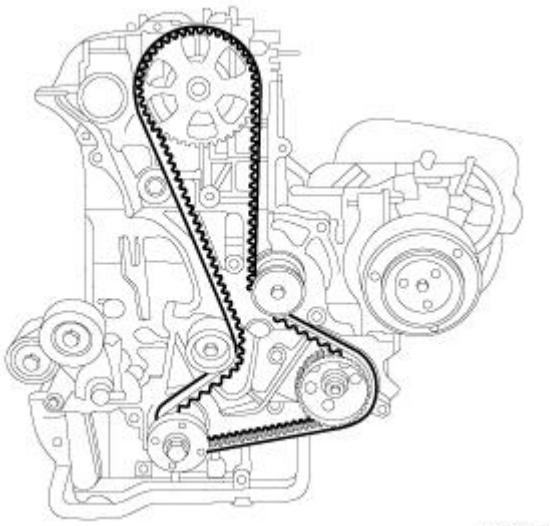


Fig. 466: Exploded View Of Timing Belt
Courtesy of CHRYSLER LLC

2. Install the timing belt. See **Engine/Valve Timing/BELT, Timing - Installation**.
3. Connect the negative battery cable.

Adjustments

ADJUSTMENT

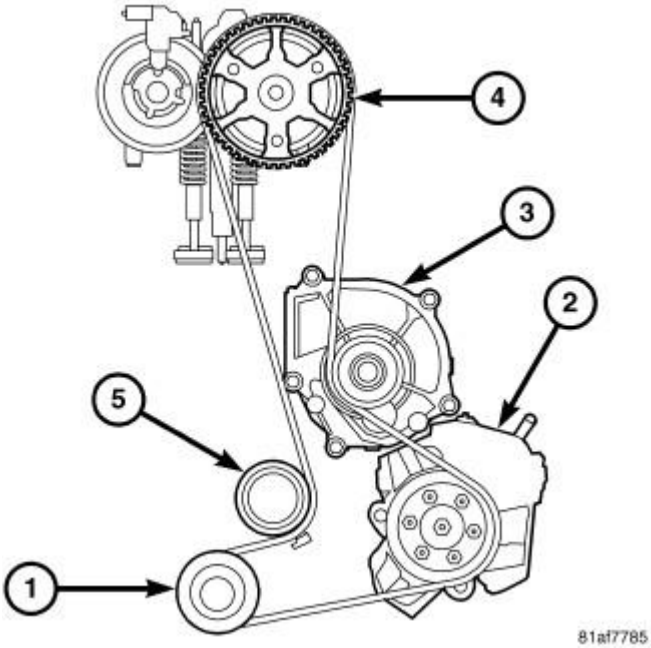


Fig. 467: Timing Belt Tensioner
Courtesy of CHRYSLER LLC

1. With the upper and lower front covers removed and the timing belt installed, loosen timing belt tensioner (5).

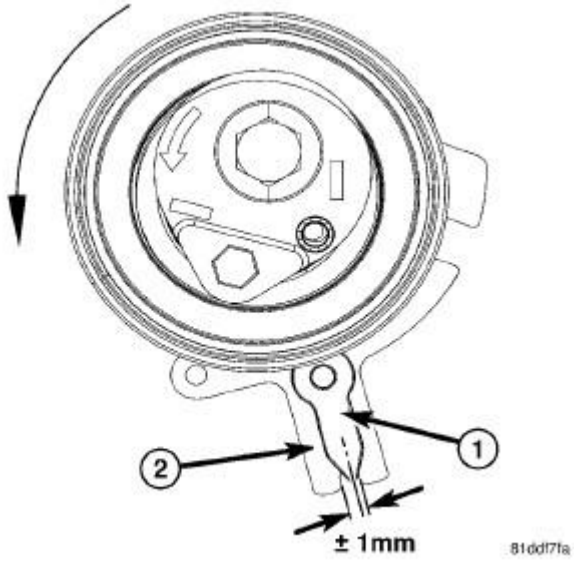


Fig. 468: Timing Belt Tensioner Load Indicator & Gauge
Courtesy of CHRYSLER LLC

NOTE: Turning the belt tensioner counter clockwise moves the pointer in a clockwise direction. Also, if the tensioner bolt is too loose this will cause the tensioner alignment slot to jump off the alignment boss on timing cover.

2. Align timing belt tensioner pointer (1) so that it is centered in the notch (2) and tighten timing belt tensioner retaining bolt to 28 N.m (21 ft. lbs.).

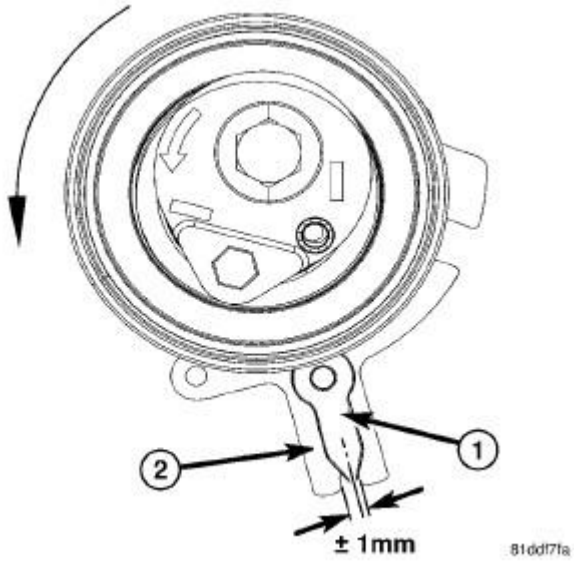


Fig. 469: Timing Belt Tensioner Load Indicator & Gauge
Courtesy of CHRYSLER LLC

3. Rotate engine 2 complete revolutions and then recheck tensioner alignment. Verify that the tension indicator (1) is centered in the slot on the tensioner gage (2) as shown in illustration. Readjust tensioner alignment as necessary.

AIR INTAKE SYSTEM

AIR CLEANER

Removal

REMOVAL - AIR CLEANER

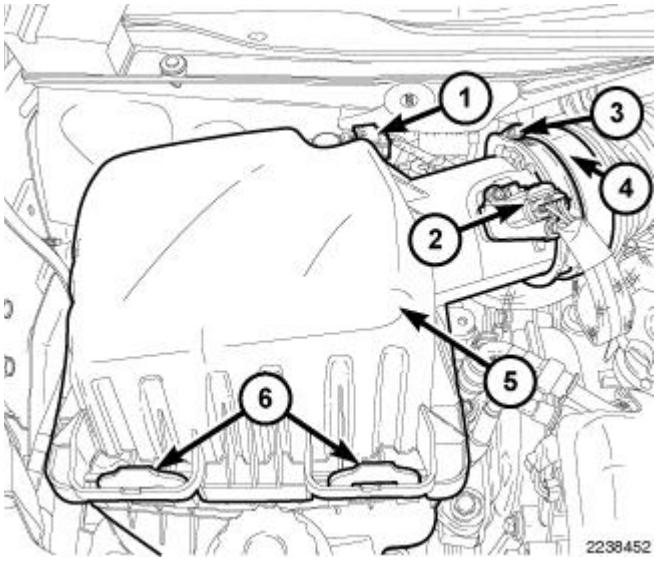


Fig. 470: Intake Air Housing Cover
Courtesy of CHRYSLER LLC

1. Release the lock tabs (6) and remove the intake air body cover (5).

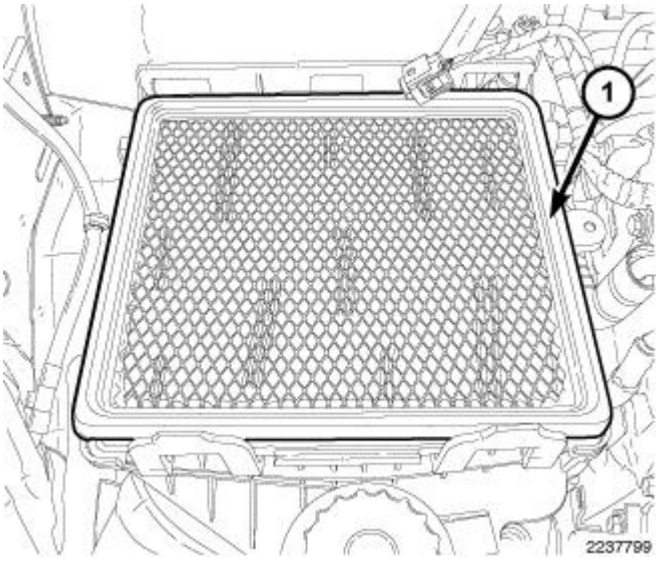


Fig. 471: Air Filter
Courtesy of CHRYSLER LLC

2. Lift up and remove the air cleaner (1) from air cleaner body.

Installation

INSTALLATION

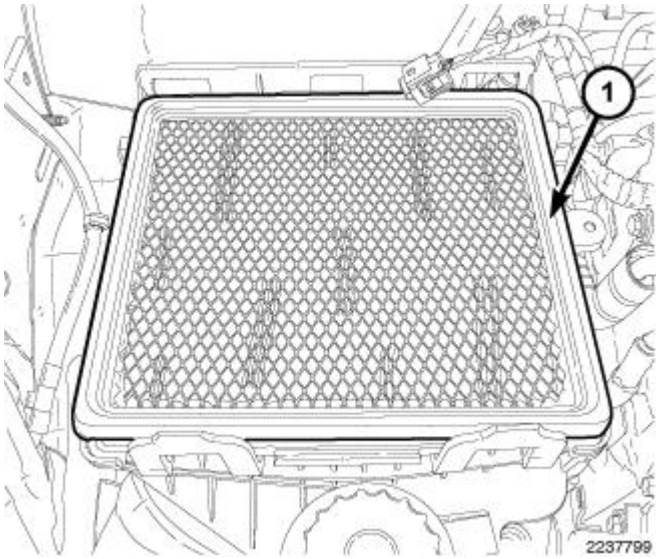


Fig. 472: Air Filter
Courtesy of CHRYSLER LLC

1. Clean out the inside of air cleaner body.
2. Install the new air cleaner (1).

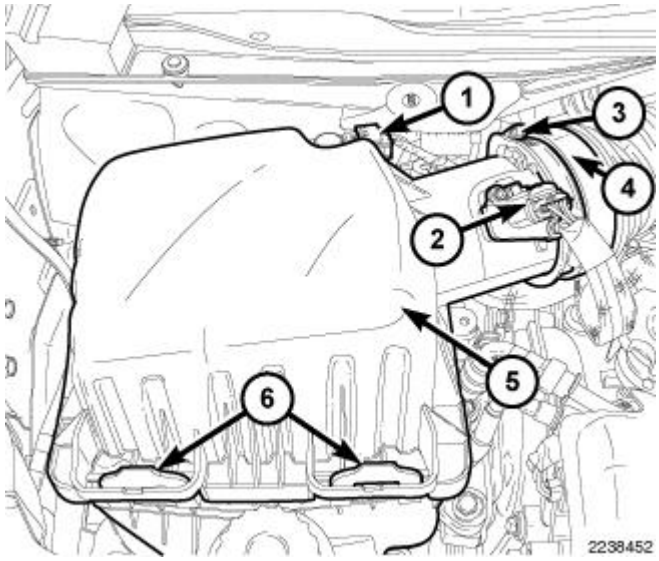


Fig. 473: Intake Air Housing Cover
Courtesy of CHRYSLER LLC

3. Install the intake air body cover (5) and push down to lock the tabs (6).

BODY, AIR CLEANER

Removal

REMOVAL

1. Disconnect and isolate the negative battery cable.

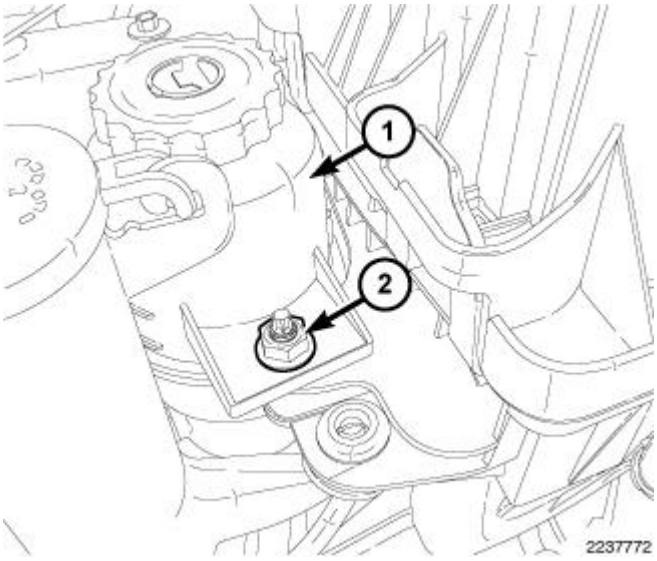


Fig. 474: Power Steering Reservoir
Courtesy of CHRYSLER LLC

2. Remove the retaining nut (2) and position the power steering reservoir (1) aside.

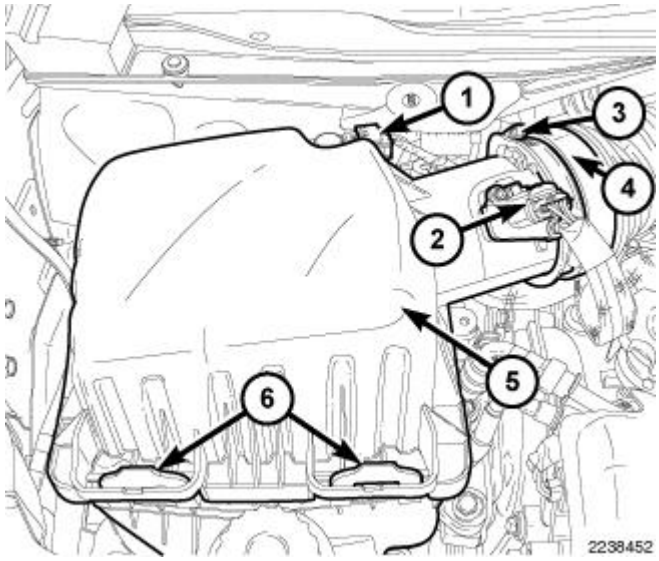


Fig. 475: Intake Air Housing Cover
Courtesy of CHRYSLER LLC

3. Disconnect the Inlet Air Pressure (IAP) sensor harness connector (1).
4. Disconnect the Mass Airflow (MAF) sensor harness connector (2).
5. Loosen clamp (3) and disconnect the turbocharger air inlet tube (4) from the intake air housing (5).
6. Pull upward on the intake air housing (5) to release it from the grommets, and remove the intake air housing.

Installation

INSTALLATION

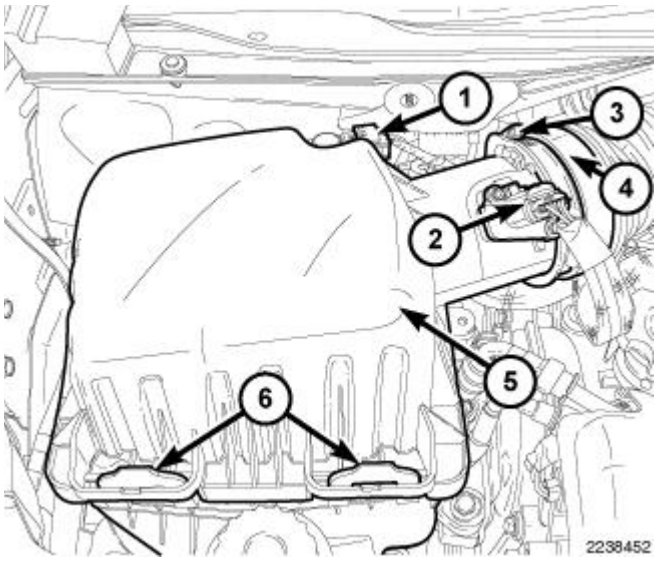


Fig. 476: Intake Air Housing Cover
Courtesy of CHRYSLER LLC

1. Position the intake air housing (5) in the grommets, and push down on the intake air housing to seat it.
2. Connect the turbocharger air inlet tube (4) to the intake air housing (5) and tighten the clamp (3).
3. Connect the Mass Airflow (MAF) sensor harness connector (2).
4. Connect the Inlet Air Pressure (IAP) sensor harness connector (1).

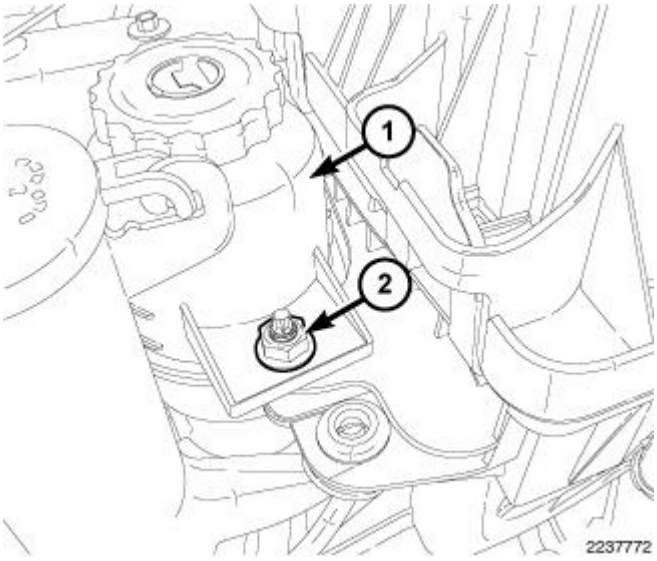


Fig. 477: Power Steering Reservoir
Courtesy of CHRYSLER LLC

5. Position the power steering reservoir (1) to the intake air housing. Tighten retaining nut (2) to 12 N.m (105 in. lbs.).
6. Reconnect the negative battery cable.

