

2012 ENGINE**2.2L Diesel - Service Information - Compass & Patriot****DESCRIPTION****DESCRIPTION**

This 2.2 Liter four-cylinder Common Rail Diesel Injection (CDI) engine is an in-line overhead valve diesel engine. This engine utilizes a cast iron cylinder block and an aluminum cylinder head. The engine is turbocharged and intercooled. This engine also has four valve per cylinder and dual overhead camshafts.

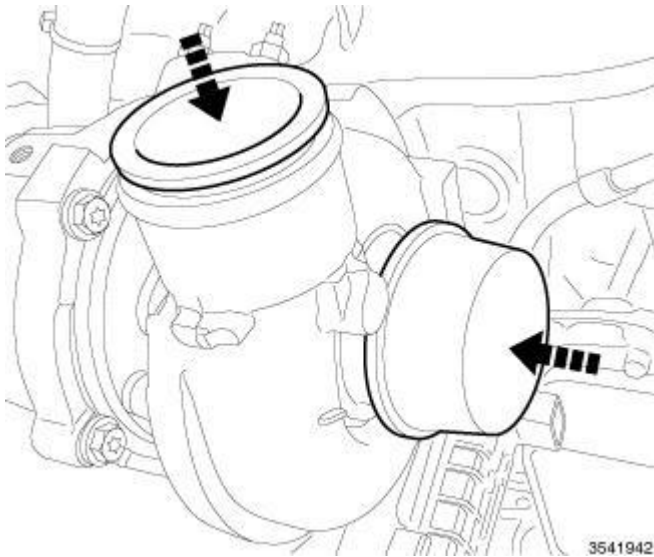
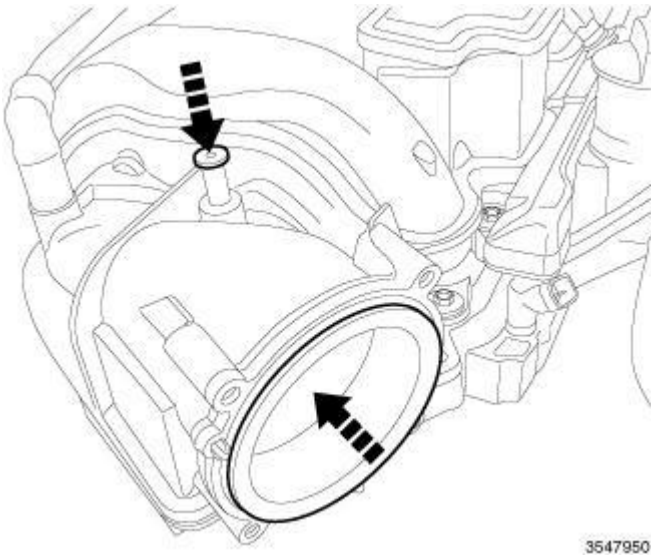
STANDARD PROCEDURE**DUST COVERS AND CAPS**

Fig. 1: Covers/Caps

Courtesy of CHRYSLER GROUP, LLC

Due to the high amounts of failures caused by dust, dirt, moisture and other foreign debris being introduced to the engine during service. Covers or caps are needed to reduce the possible damage that can be caused or created.



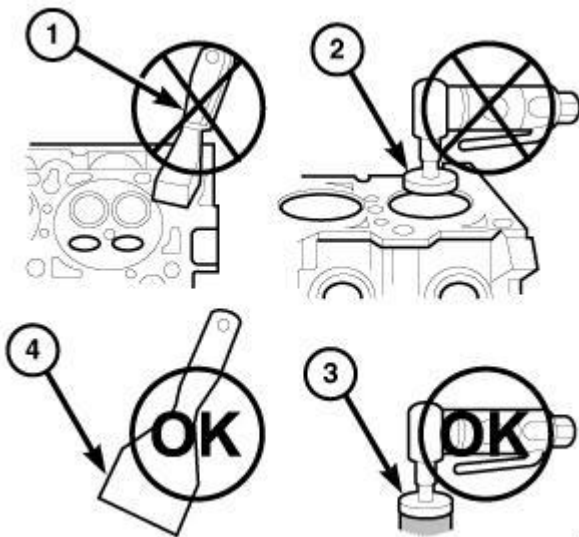
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Fig. 2: Opening Cover

Courtesy of CHRYSLER GROUP, LLC

Covers over openings will reduce any possibilities for foreign materials to enter the engine systems. Using miller tool (special tool #10368, Set, Universal Protective Cap), Select the appropriated cover needed to the procedure.

ENGINE GASKET SURFACE PREPARATION



94323

Fig. 3: Proper Tool Usage For Surface Preparation

Courtesy of CHRYSLER GROUP, LLC

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

Never use the following to clean gasket surfaces:

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

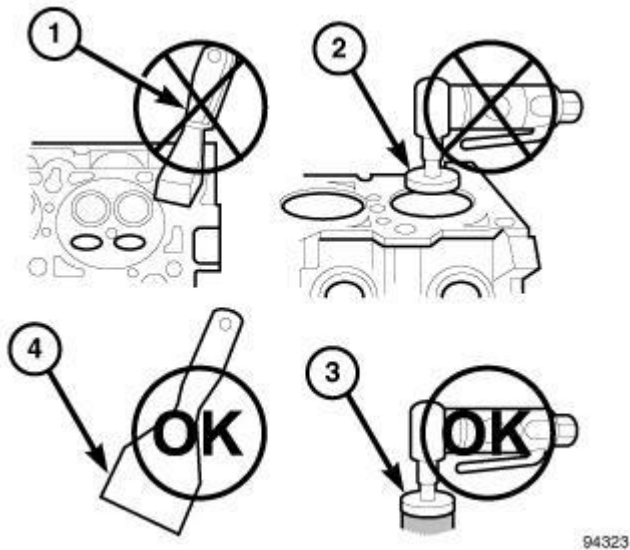


Fig. 4: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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

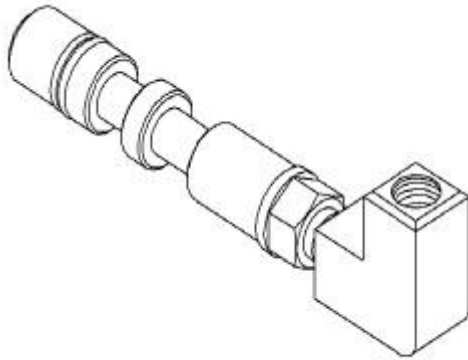
Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (4).
- High speed power tool with a plastic bristle brush style disc.

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

COMPRESSION TESTING ENGINE

1. Warm up engine to operating temperature (approximately 80°C, 176°F).
2. Shut off engine.
3. Remove engine cover.
4. Disable the fuel pump to prevent fuel from being pumped.
5. Remove injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .
6. Crank engine several times with the starter to eliminate combustion residues in the cylinders.

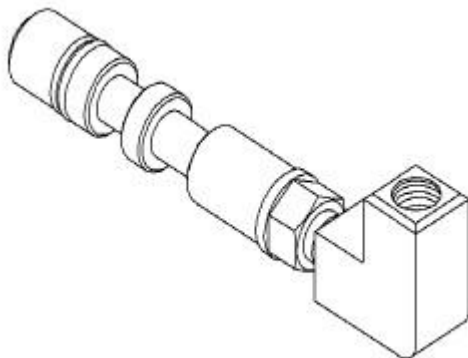
**Fig. 5: #9543 Adapter**

Courtesy of CHRYSLER GROUP, LLC

7. Insert Adapter (special tool #9543, Adapter, Compression Test) into injector hole of cylinder to be tested. Install injector retainer.
8. Test compression pressure by cranking engine with starter for at least 8 revolutions.
9. Carry out test procedure at the remaining cylinders in the same way.
10. Compare pressure readings obtained with the specified pressures. If the pressure reading is below the minimum compression pressure or if the permissible difference between the individual cylinders is exceeded. Refer to **Engine - Standard Procedure**.

2.2L

COMPRESSION SPECIFICATION	
Minimum Allowable	18 bar (261 psi.)
Maximum Allowable Difference Between Cylinders	3 bar (44 psi.)
Average Compression Ratio	24 - 30 bar (348 - 435 psi)

**Fig. 6: #9543 Adapter**

Courtesy of CHRYSLER GROUP, LLC

11. Remove Adapter (special tool #9543, Adapter, Compression Test) from cylinder head.
12. Install injectors. Refer to **INJECTOR(S), FUEL, INSTALLATION** .
13. Install engine cover. Refer to **INSTALLATION**.

CYLINDER LEAK DOWN TEST

1. Warm engine to operating temperature.

WARNING: Do not open cooling system unless coolant temperature is below 90° C (194°F). Risk of injury to skin and eyes as a result of scalding with hot coolant which splashes out. Risk of poisoning from swallowing coolant. Open cap slowly and release pressure. Store coolant in proper containers only. Wear protective gloves, clothing and eye protection.

NOTE: Turn cap carefully as far as first detent, release pressure, then unscrew cap.

2. Open cooling system cap at coolant recover pressure container.
3. Remove engine cover.
4. Unscrew oil filler cap.
5. Remove glow plugs. Refer to **PLUG, GLOW, REMOVAL** .

NOTE: Crank engine at crankshaft in direction of rotation of the engine (clockwise).

6. Position cylinder to be tested to ignition Top Dead Center (DTC).

NOTE: Calibrate cylinder leak down tester and remove check valve in screw-in fitting.

7. Connect cylinder leak down tester and follow INSPECTING Instruction.

INSPECTING

NOTE: If crankshaft rotates, install retaining lock for crankshaft/ring gear.

1. Pressurize cylinder with compressed air and read off pressure loss at cylinder leak tester. If excessive pressure loss exists, determine cause by viewing the paragraph below.

NOTE: If the retaining lock is installed, remove it, rotate engine and install lock once again.

2. Carry out test of other cylinders in the firing order of engine.

DETERMINING PRESSURE LOSS

If a great pressure loss was detected, listen using a stethoscope around suspected areas, such as the cylinder head gasket through the air suction area, the exhaust system, the oil filler neck, the pre-chamber, the bore wholes of the cylinder effected or neighboring cylinders. Observe the coolant in the expansion tank, looking for traces of bubbles.

The possible causes of pressure loss are:

- If air leak is detected through the prechamber, cylinder bore hole, from a neighboring cylinder or air bubbles in the coolant expansion tank, pressure loss may be caused by the cylinder head gasket.
- If the air leak occurs in the air suction area, the pressure loss may be caused by the intake valve(s).
- Air leak through the exhaust system, may be caused by the exhaust valve(s).
- Air leak through the oil filler neck, may be caused by piston, ring, or cylinder sleeve.

If none of the above evidence supports a failure, the engine may be assembled and run until operating temperature is reached. Reconnect engine leak down tester on a warm engine with a few drops of clean engine oil in the cylinder being tested. Engine oil seals the clearance between the piston and cylinder for a short length of time. If under this condition a smaller pressure loss occurs for a shorter length of time, it is possible that the cause is piston, ring or cylinder sleeve related.

CHECKING OIL PRESSURE

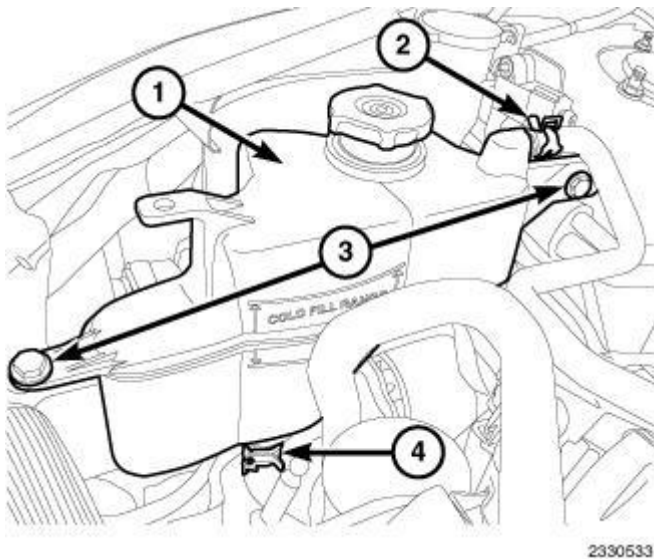
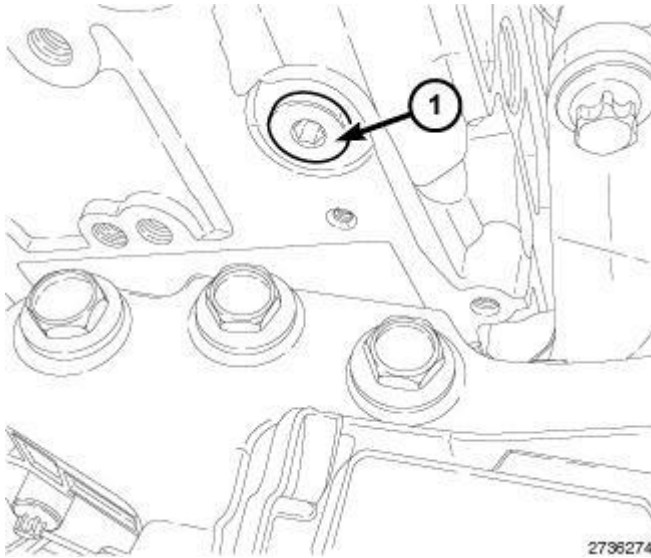


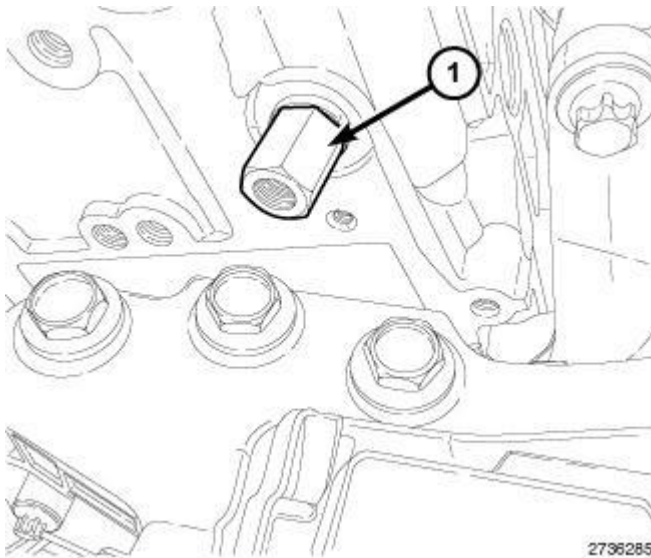
Fig. 7: Coolant Recovery Reservoir, Clamps & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Remove engine cover.
2. Remove the bolts (3) and position aside the coolant recovery reservoir (1).

**Fig. 8: Oil Galley Plug**

Courtesy of CHRYSLER GROUP, LLC

3. Remove oil galley plug (1) from the cylinder head.

**Fig. 9: Test Adaptor Fitting**

Courtesy of CHRYSLER GROUP, LLC

4. Install the Test Adaptor Fitting (special tool #10239, Adapter, Tester) (1) with seal onto cylinder head.
5. Install oil pressure gauge into Test Adaptor Fitting (special tool #10239, Adapter, Tester) (1).
6. Check oil level, adjust with correct engine oil if necessary.
7. Insert temperature probe or a remote thermometer into oil level indicator tube.

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

Do not wear loose clothes.

CAUTION: Ensure that fan and accessory drive belt DO NOT damage oil pressure gauge hose.

8. Start engine and bring to operating temperature 90°C (194°F).
9. Record engine oil pressure at idle.
10. Raise engine speed to 3000 RPM and record oil pressure.
11. At normal operating temperature the oil pressure must not drop below 3 bar (44 psi.). When engine speed is raised, oil pressure must rise with out delay and be no less than 3 bar (44 psi.) at 3000 RPM.
12. If oil pressure is out of range, determine cause.

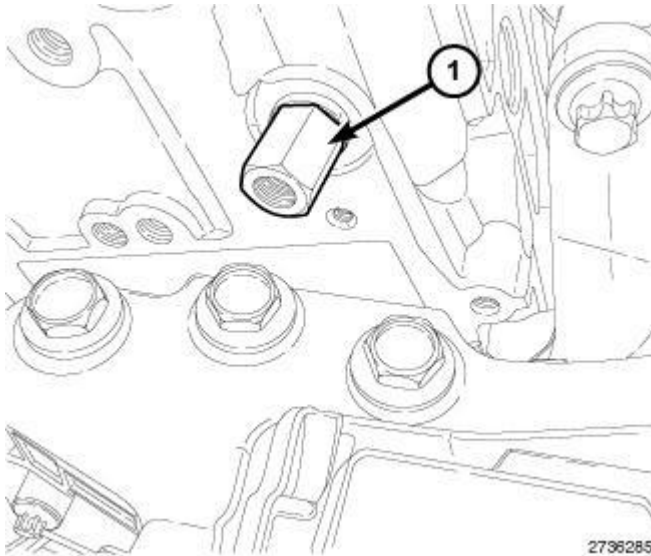


Fig. 10: Test Adaptor Fitting
Courtesy of CHRYSLER GROUP, LLC

13. Remove oil pressure gauge from Test Adaptor Fitting (special tool #10239, Adapter, Tester) (1).
14. Remove the Test Adaptor Fitting (special tool #10239, Adapter, Tester) (1) with seal from the cylinder head.

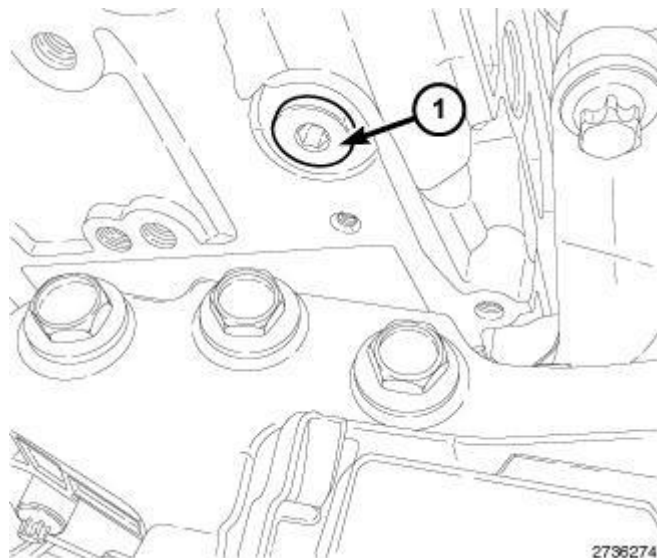


Fig. 11: Oil Galley Plug
Courtesy of CHRYSLER GROUP, LLC

15. Install the oil galley plug (1) into the cylinder head and securely tighten plug.

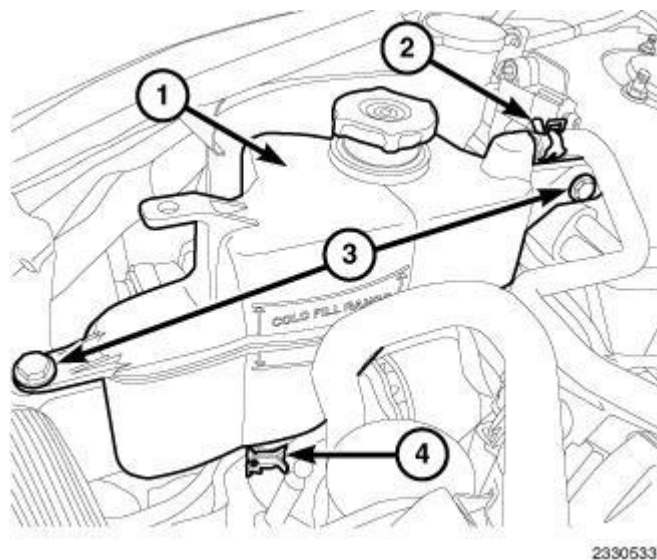


Fig. 12: Coolant Recovery Reservoir, Clamps & Bolts
Courtesy of CHRYSLER GROUP, LLC

16. Install coolant recovery bottle (1). Tighten bolts to 4 N.m (35 lbs. in.).
17. Install the engine cover.

SPECIFICATIONS

SPECIFICATION

2012 Jeep Patriot Latitude

2012 ENGINE 2.2L Diesel - Service Information - Compass & Patriot

DESCRIPTION	SPECIFICATION
Engine	2.2L CDI
Engine Description	4 Cylinder In-Line Engine With 4-Valve Technology
Fuel Injection System	Common Rail Diesel Injection (CDI)
Fuel	Diesel
Rated Output	85/4200 kW at RPM
Torque	250/1400-2600 N.m at RPM
Maximum Speed	4600 RPM
Compression Ratio	18:0
Bore/Stroke	88.0/88.3 mm
Eff. Displacement	2148 cm ³

CRANKSHAFT BEARINGS

Basic Bore Diameter	64.000 mm - 64.019 mm
Basic Bore With Fitted Bearing	21.447 mm - 21.480 mm
Permissible Out-of-Roundness	0.007 mm

CRANKSHAFT MAIN BEARING SHELLS

Replacement Part Number	Bearing Shell Thickness
52 Blue Color Coding	2.000 mm - 2.007 mm
54 Yellow Color Coding	2.007 mm - 2.014 mm
56 Red Color Coding	2.014 mm - 2.021 mm

CRANKSHAFT BEARING CLEARANCE (WHEN NEW)

Radial	0.028 mm - 0.063 mm
Axial	0.110 mm - 0.300 mm

PISTON RING VERTICAL CLEARANCE

Piston Ring Groove 1	0.12 mm - 0.16 mm
Piston Ring Groove 2	0.035 mm - 0.08 mm
Piston Ring Groove 3	0.03 mm - 0.07 mm

PISTON RING END GAP

Piston Ring Groove 1	0.27 mm - 0.37 mm
Piston Ring Groove 2	0.8 mm- 1.0 mm
Piston Ring Groove 3	0.2 mm - 0.4 mm

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.

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A/C Compressor Bolts	32	24	-
A/C Compressor Bracket Bolts	45	33	-
A/C Compressor Lines at Compressor	20	-	177
Accessory Drive Belt Tensioner			
M8 Bolt	20	-	177
M10 Bolt	45	33	-
Accessory Drive Idler Pulley Bolt	45	33	-
Accessory Carrier			
M6	9	-	80
M8	20	-	177
Air Cleaner Bracket Bolt	9	-	80
Air Cleaner Mounting Bracket Bolt	11	-	97
Air Cleaner Mounting Bracket Nut	11	-	97
Air Temp/Pressure Sensor	12	-	106
Balance Shaft/Crankshaft Bearing Cap Bolts	60 + 90°	44 + 90°	-
Balance Shaft Drive Gear Bolts	50 + 90°	37 + 90°	-
Battery Clamp Bolt	7	-	62
Battery Tray Bolts	11	-	97
Battery Tray Nut	11	-	97
Boost Pressure Sensor Bolts	8	-	71
Camshaft Bearing Cap Bolts	Refer to <u>CAMSHAFT, ENGINE, INSTALLATION.</u>		
Camshaft Position (CMP)	6	-	53

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Sensor			
Camshaft Sprocket Bolt	55 + 90°	41 + 90°	-
Charge Air Cooler (CAC) Clamp - Intercooler Side	25	18	-
Charge Air Cooler (CAC) Clamp - Turbocharger Side	5	-	44
Charge Air Muffler Bracket Bolt	9	-	80
Charge Air Cooler Tube Bolt	9	-	80
Coolant Recovery Bottle	4	-	35
Connecting Rod Caps Bolts	Refer to <u>ROD, PISTON AND CONNECTING, INSTALLATION</u> and <u>ROD, PISTON AND CONNECTING, INSTALLATION</u> .		
Crankshaft Position (CKP) Sensor	8	-	71
Cylinder Head Bolts	Refer to <u>CYLINDER HEAD, INSTALLATION</u> .		
Cylinder Head Cover Bolts	9	-	80
Cylinder Head to Timing Chain Cover Bolts	20	-	177
DRV Valve	Refer to <u>RAIL, FUEL, INSTALLATION</u> and <u>RAIL, FUEL, INSTALLATION</u> .		
EGR Air Flow Control Valve	9	-	80
EGR Back Pressure Transducer	25	18	-
EGR Bypass Vacuum Diaphragm Bolts	12	-	106
EGR Bypass Valve Bolts	9	-	80
EGR Cooler Bolts	9	-	80

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EGR Cooler Support Bracket Bolts	9	-	80
EGR Crossover Pipe to Exhaust Manifold Bolts	12 + 90°	-	106 + 90°
EGR Crossover Pipe Heat Shield Bolts	8	-	71
EGR Crossover Pipe to Upper Chain Case Cover Bolts	9	-	80
EGR Cooler Manifold Bolts	9	-	80
EGR Support Bracket Bolts	9	-	80
EGR Temperature Sensor	45	33	-
EGR Tube Bolts	9	-	80
EGR Vacuum Solenoid Bolts	9	-	80
EGR Valve Bolts	15	-	133
Engine Lifting Bracket Front	9	-	80
Engine Lifting Bracket Rear	9	-	80
Engine Carrier Mount at Engine Block Bolts	25	18	-
Engine Mount Bracket Bolt	68	50	-
Engine Mount to Frame Rail Bolts	75	55	-
Engine Mount Through Bolt	88	65	-
Exhaust Flex Coupler to Catalytic Converter Nuts	29	21	-
Exhaust Manifold Nuts	30	22	-
Exhaust			

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Manifold Heat Shield Bolts	8	-	71
Flywheel Bolts	45 + 90°	33 + 90°	-
Front Coolant Tube Bolts	9	-	80
Front Fore/aft Member Bolts	78	58	-
Front Roll Mount Through Bolt	65	48	-
Front Roll Mount to Fore/aft Member	63	46	-
Front Oil Seal Carrier	9	-	80
Fuel Injector Tensioning Claw Bolt	15 + 90°	-	133 + 90°
Stage 2	+ 90°	-	+ 90°
Fuel Injector Pressure Lines at Injector Union Nut			
Stage 1	7	-	62
Stage 2	33	24	-
Fuel Injector Pressure Lines at Fuel Rail Union Nut			
Stage 1	7	-	62
Stage 2	33	24	-
Fuel Line Bracket Bolts	9	-	80
Fuel Line Heat Shield Bolts	9	-	80
Fuel Rail Bolts	14	-	124
Fuel Return Line Banjo Bolt	32	24	-
Generator Bolts	20	-	177
Generator B+ Nut	18	-	159
Generator Bracket	45	33	-
Generator D+ Nut	4	-	35
Glow Plugs	11	-	97
Glow Plugs Module Bolts	9	-	80
Glow Plugs Module Ground	9	-	80

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Wire Bolts			
High Pressure Fuel Feed Line at High Pressure Pump Union Nut			
Stage 1	7	-	62
Stage 2	33	24	-
High Pressure Fuel Feed Line at Fuel Rail Union Nut			
Stage 1	7	-	62
Stage 2	33	24	-
High Pressure Fuel Line P-clamp Bolts	9	-	80
Idle Pulley Bolt	45	33	-
Intake Manifold Bolts	14	-	124
Intermediate Gear to Engine Block Bolt	80	59	-
Knock Sensor	20	-	177
Main Bearing Caps Bolts	Refer to <u>CRANKSHAFT, INSTALLATION.</u>		
Mixing Chamber Bolts	9	-	80
Mixing Chamber Support Bracket Bolts	9	-	80
Oil Control Valve	20	-	177
Oil Cooler Bolts	10	-	89
Oil Cooler Adapter to Engine Block Bolts	20	-	177
Oil Dipstick Tube Bolt	9	-	80
Oil Drain Plug	30	22	-
Oil Filter Cap	25	18	-
Oil Filter Housing Bolts			
M6	10	-	89
M8	20	-	177
Oil Jet	5	-	44
Oil Level Sensor	9	-	80
Oil Pan Bolts	Refer to <u>PAN, OIL, INSTALLATION.</u>		
Oil Pump Bolts	6 + 90°	-	53 + 90°
Oil Pump			

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Suction Tube Bolts	6 + 90°	-	53 + 90°
Oil Temperature Sensor	26	18	-
Power Steering Pressure Hose at Steering Gear	32	24	-
Power Steering Pressure Hose at Pump	32	24	-
Power Steering Pressure Hose Support Bracket Bolt	9	-	80
Power Steering Pump/Water Pump to Oil Pan Bolts	20	-	177
Power Steering Pump Bracket at Pump	14	-	124
Power Steering Pump Bracket at Engine Block Bolts	9	-	80
Rear Fore/aft Member Bolt	129	95	-
Rear Roll Mount to Crossmember Bolts	153	112	-
Rear Roll Mount Through Bolt	65	48	-
Starter Motor Bolts	40	30	-
Starter Motor B+ Cable Nut	14	-	124
Starter Motor Relay Cable Nut	6	-	53
Swirl Valve Actuator Bolts	9	-	80
Thermostat Housing to Engine Block Bolts	9	-	80
Timing Chain			

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Press Thrust Spindle	32	24	-
Timing Chain Tensioner	70	52	-
Timing Cover to Engine Block Bolts	20	-	177
Transmission to Engine Bolts	48	35	-
Transmission Mount Bolts	61	45	-
Transmission Mount to Frame Rail Bolts	75	55	-
Transmission Mount Through Bolt	100	74	-
Turbocharger to Engine Block Support Bracket	20	-	177
Turbocharger Support Bracket at Turbocharger Bolts	20	-	177
Turbocharger to Exhaust Manifold Nuts	20 + 90°	-	177 + 90°
Turbocharger Oil Feed Line Banjo Bolt at Turbocharger	24	18	-
Turbocharger Oil Feed Line Bolts at Engine Block	9	-	80
Turbocharger Oil Return Line at Turbocharger Bolts	9	-	80
Turbocharger Oil Return Line at Engine Block Bolts	9	-	80
Upper Timing Chain Cover	9	-	80

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Vacuum Pump Bolts	9	-	80
Vacuum Tube Bolt	9	-	80
Vibration Damper Bolts	80 + 90°	59 + 90°	-
Wire Harness Support Bracket Bolts	9	-	80

REMOVAL

REMOVAL

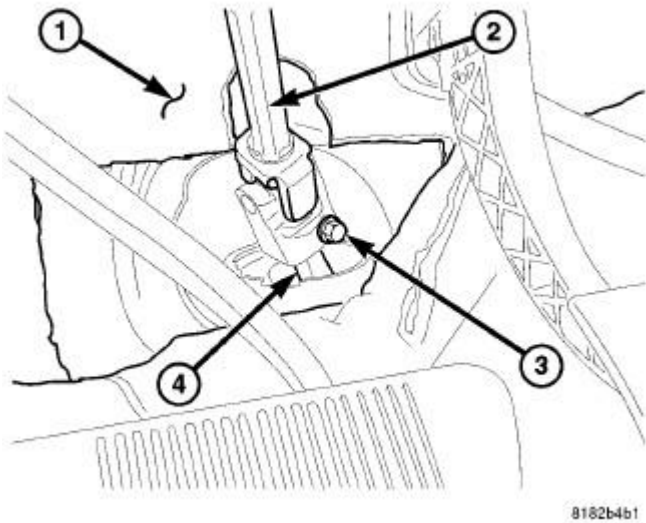


Fig. 13: Floor Carpet, Intermediate Shaft, Coupling Bolt & Steering Gear Pinion Shaft
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When removing ancillary components, plug all inlet/outlet and fluid lines to prevent residual leakage and contamination.

1. Disconnect the positive and negative battery cable.
2. Reposition the floor carpeting to access the intermediate shaft coupling at the base of the column.
3. Position the front wheels of vehicle in the STRAIGHT-AHEAD position, then turn the steering wheel to the right until the intermediate shaft coupling bolt (3) at the base of the column can be accessed.
4. Remove the intermediate shaft coupling bolt (3). Do not separate the intermediate shaft (2) from the steering gear pinion shaft (4) at this time.

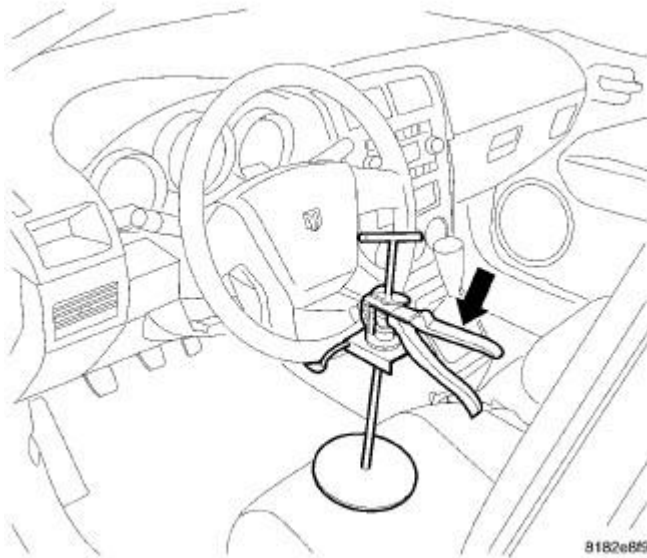


Fig. 14: Steering Wheel Holding Tool
Courtesy of CHRYSLER GROUP, LLC

5. Return the front wheels of vehicle (and steering wheel) to the STRAIGHT-AHEAD position. Using a steering wheel holder, lock the steering wheel in place to keep it from rotating. This keeps the clockspring in the proper
6. Position the steering wheel in the straight ahead position and lock wheel.
7. Remove engine cover.
8. Remove the belly pan.
9. Drain cooling system. Refer to **STANDARD PROCEDURE** .
10. Recover the air conditioning refrigerant. Refer to **PLUMBING, STANDARD PROCEDURE** .

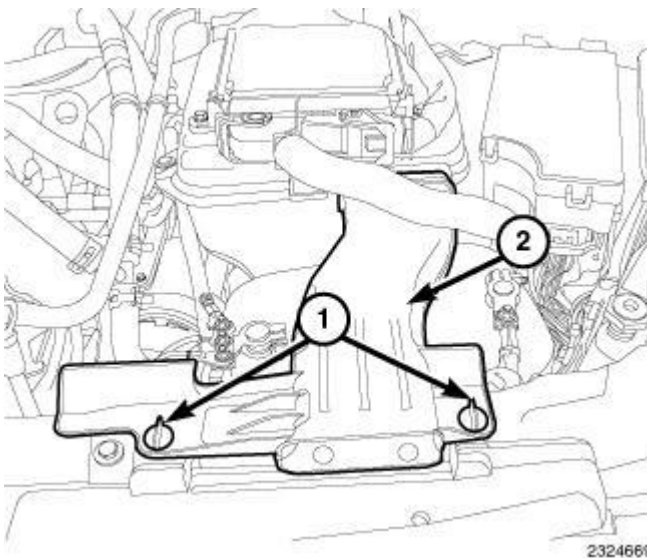


Fig. 15: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

11. Remove air inlet duct (2).

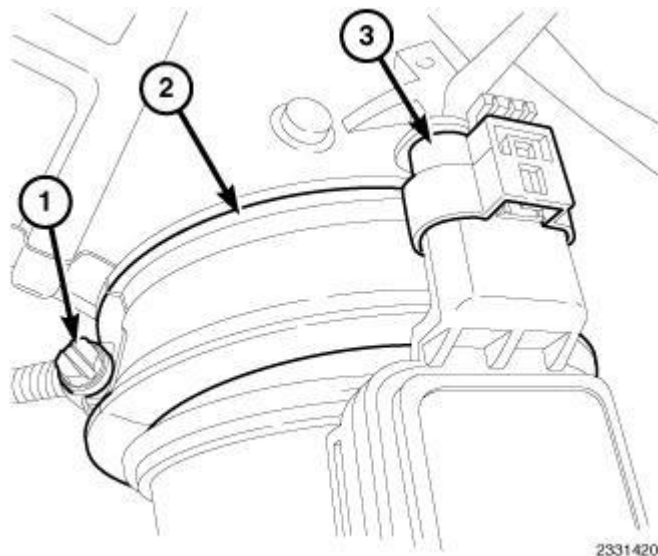


Fig. 16: Mass Air Flow Sensor Harness Connector, Air Cleaner-To-Turbocharger Inlet Tube & Clamp

Courtesy of CHRYSLER GROUP, LLC

12. Disconnect the Mass air flow sensor harness connector (3).
13. Loosen the clamp (1) and disconnect the air cleaner-to-turbocharger inlet tube (2).

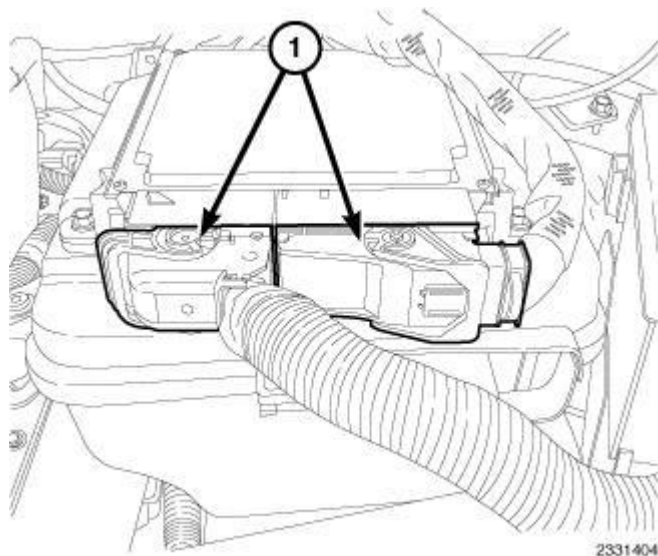


Fig. 17: PCM Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

14. Disconnect Powertrain Control Module (PCM) harness connectors (1).

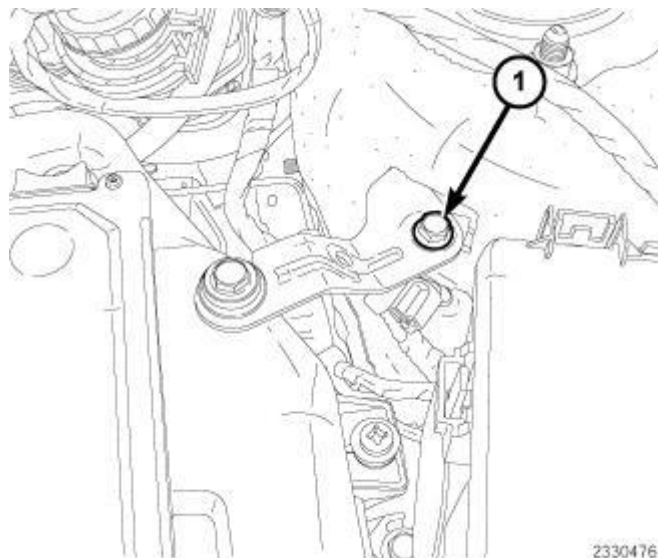


Fig. 18: Air Cleaner Upper Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

15. Remove the air cleaner upper support bracket retaining bolt (1).

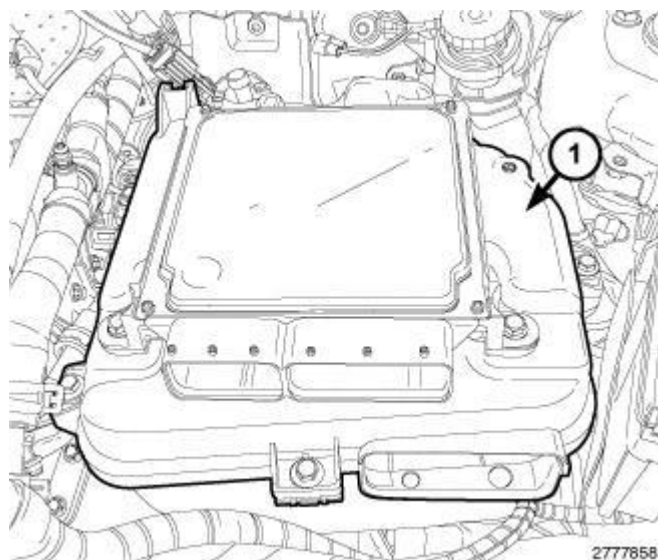


Fig. 19: Air Cleaner Assembly
Courtesy of CHRYSLER GROUP, LLC

16. Remove air cleaner assembly (1).

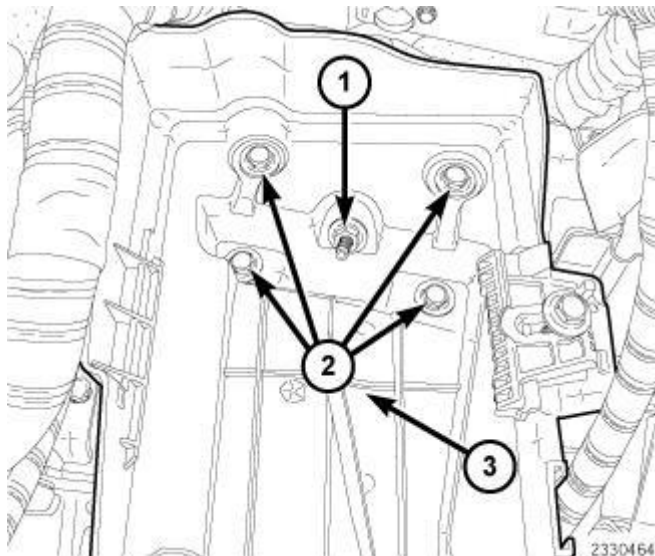


Fig. 20: Battery Tray, Nut & Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

17. Remove the battery.
18. Remove the nut (1), retaining bolts (2) and the battery tray (3).

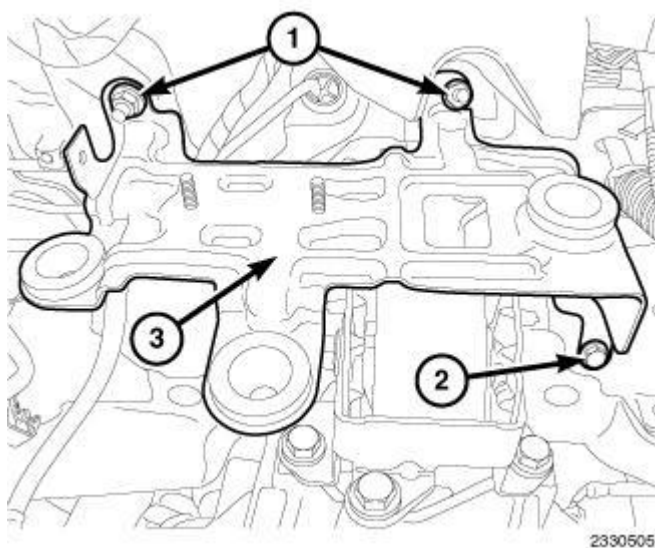


Fig. 21: Air Cleaner Mounting Bracket, Nuts & Bolt
 Courtesy of CHRYSLER GROUP, LLC

19. Remove the two nuts, bolt (2), and the air cleaner mounting bracket (3).

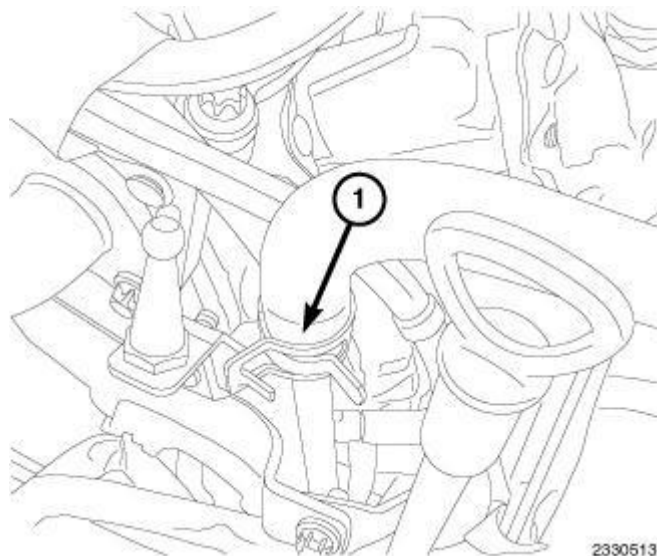


Fig. 22: Brake Booster Vacuum Hose
Courtesy of CHRYSLER GROUP, LLC

20. Disconnect the brake booster vacuum hose.
21. Remove cooling fan assembly. Refer to **FAN, COOLING, REMOVAL** .

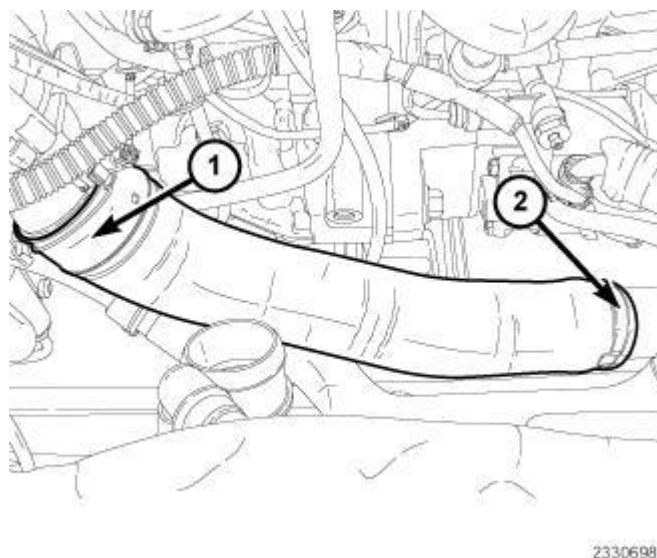


Fig. 23: EGR Air Flow Control Valve & Clamp
Courtesy of CHRYSLER GROUP, LLC

22. Loosen the clamp and disconnect the charge air outlet tube from the charge air cooler (CAC).
23. Remove air inlet tube to EGR air flow control valve (1).

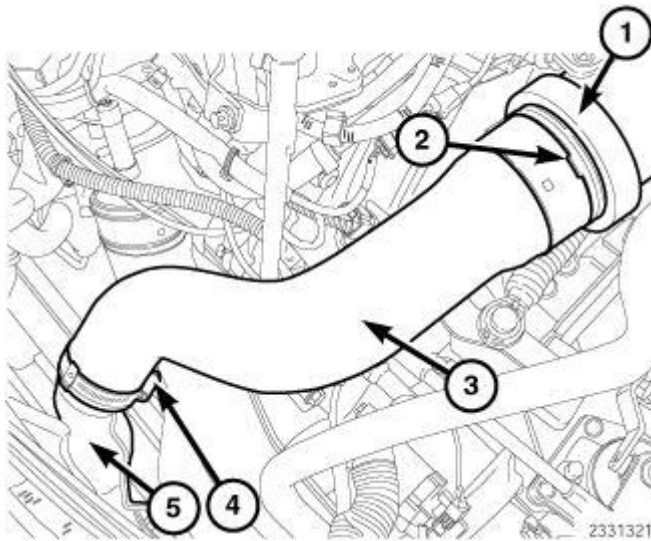


Fig. 24: Upper Charge Air Tube, Lock Ring, Lower Charge Air Tube, Clamp & Charge Air Cooler (CAC) Inlet

Courtesy of CHRYSLER GROUP, LLC

24. Loosen the clamp (4) and disconnect the lower charge air tube (3) from the charge air cooler (CAC) inlet (5).
25. Release the lock ring (2) and remove the lower charge air tube from upper charge air tube (1) to turbocharger.

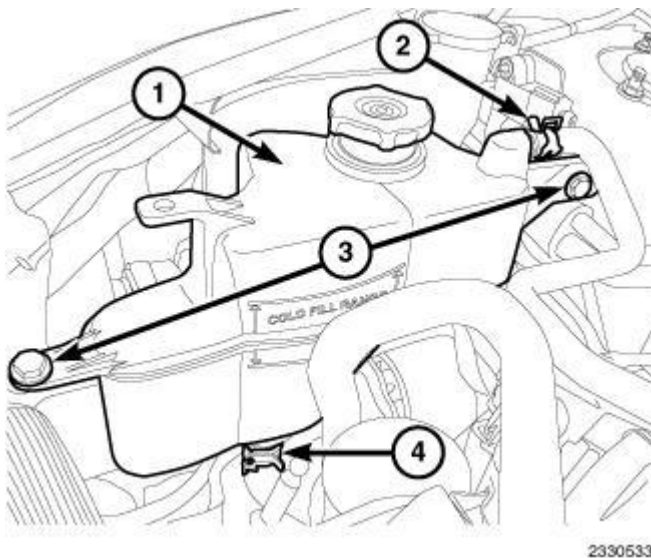


Fig. 25: Coolant Recovery Reservoir, Clamps & Bolts

Courtesy of CHRYSLER GROUP, LLC

26. Disconnect the coolant hoses (2) and (4).
27. Remove the bolts (3) and the coolant recovery reservoir (1).

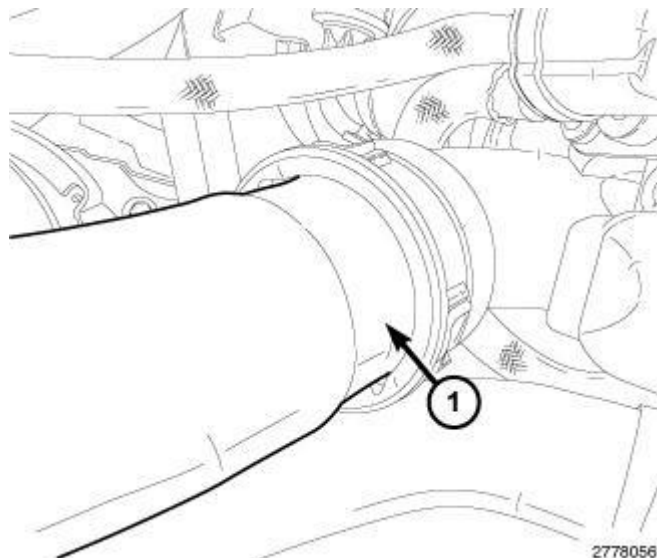


Fig. 26: Lower Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

28. Remove the lower radiator hose (2).

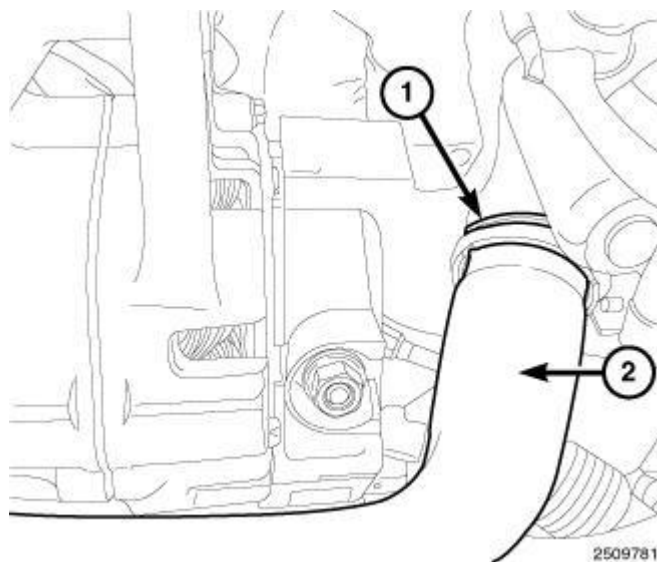


Fig. 27: Upper Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

29. Disconnect the upper radiator hose (2) at engine (1).
30. Disconnect and remove the upper radiator hose (2) at radiator.

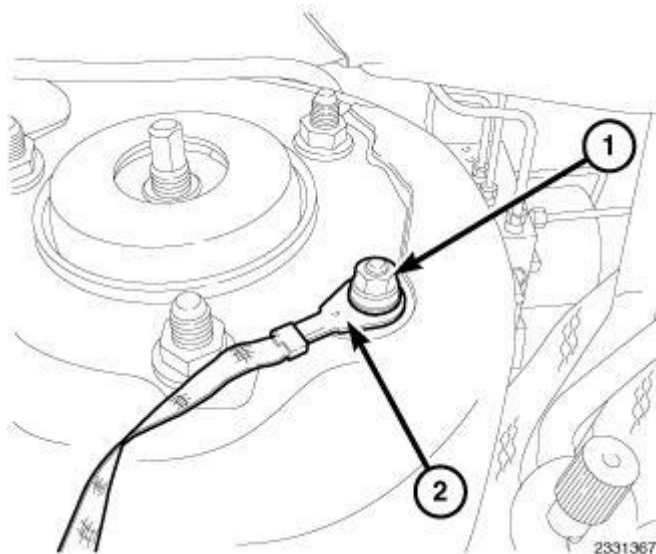


Fig. 28: Engine Ground Strap & Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

31. Remove the retaining nut (1) and the engine ground strap (2) from right strut tower.

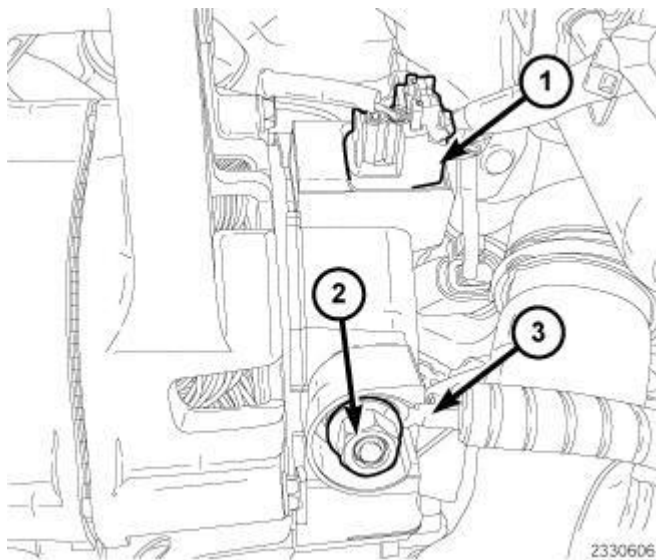


Fig. 29: Battery Feed Wire, Generator Harness Connectors & Nut
Courtesy of CHRYSLER GROUP, LLC

32. Remove nut (2) and the battery feed wire (3) to generator.
33. Disconnect the generator harness connectors (1).

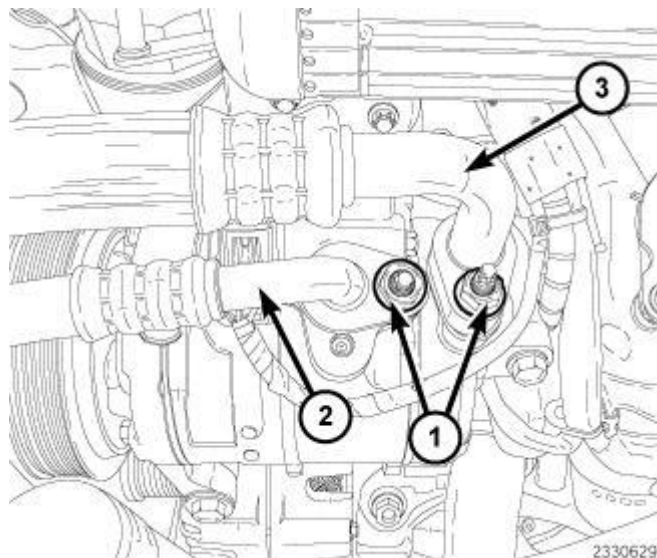


Fig. 30: A/C Lines & Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

34. Remove the retaining nuts (1) and disconnect A/C lines (2) and (3) at the compressor.

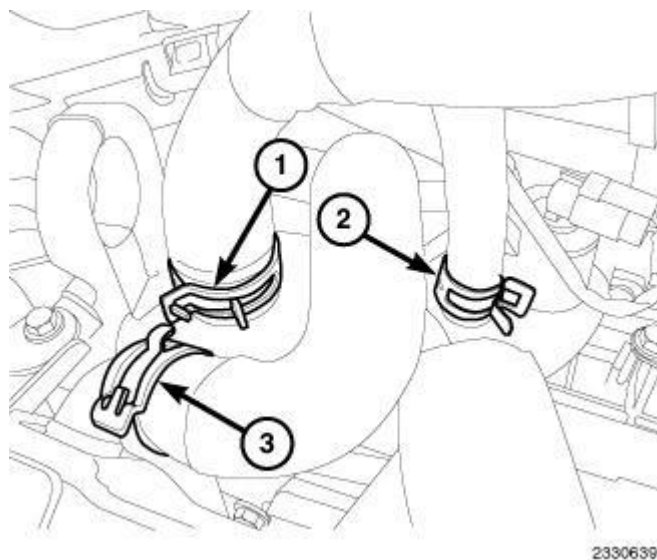


Fig. 31: Heater Hoses & Clamps At Engine
Courtesy of CHRYSLER GROUP, LLC

35. Disconnect heater hoses at engine.

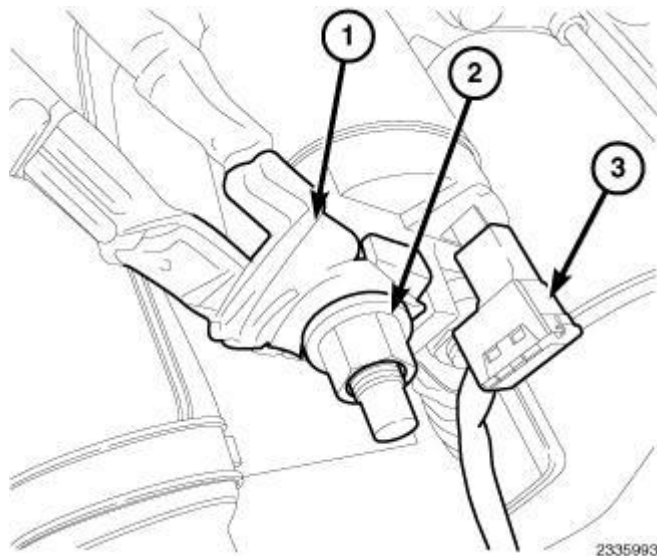


Fig. 32: Battery Feed Wire To Starter, Starter Harness Connections & Nut
Courtesy of CHRYSLER GROUP, LLC

36. Remove nut (2) and battery feed wire (2) to starter.
37. Disconnect the starter harness connections (3).

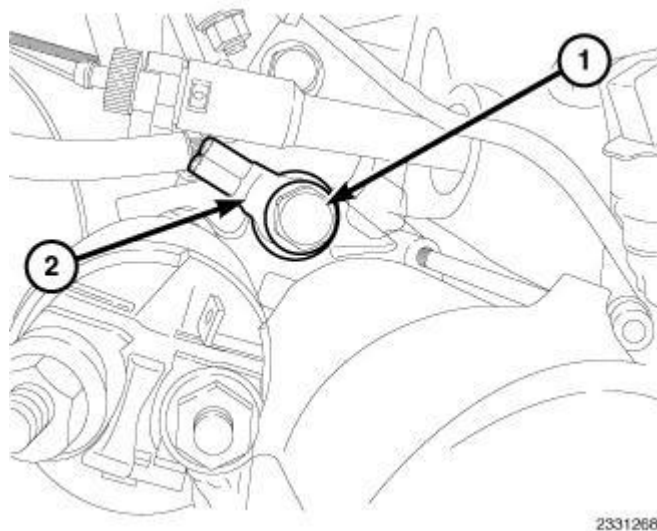


Fig. 33: Battery Ground Cable & Bolt At Engine Block
Courtesy of CHRYSLER GROUP, LLC

38. Remove the battery ground cable (2) from the engine block.
39. Remove lower bolt and the starter motor.

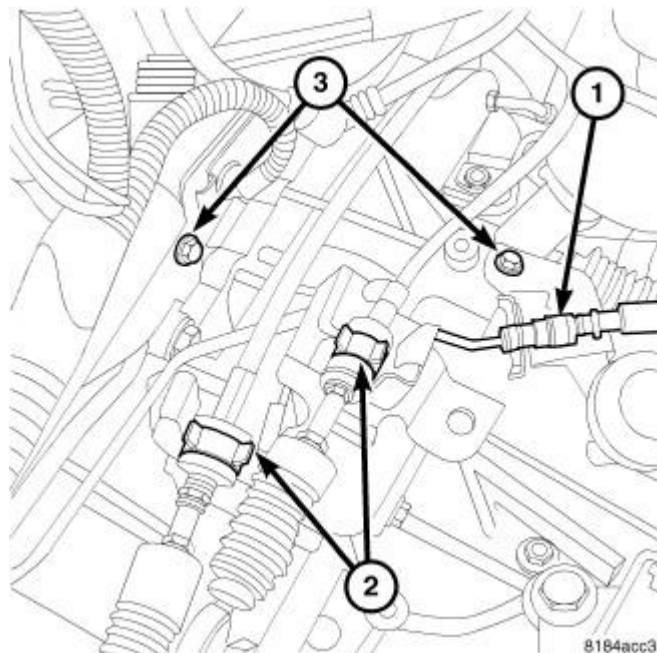


Fig. 34: Hydraulic Line, Shift Cables & Bolts
Courtesy of CHRYSLER GROUP, LLC

40. Remove shift cables (2) from transaxle.
41. Disconnect hydraulic clutch line (1).

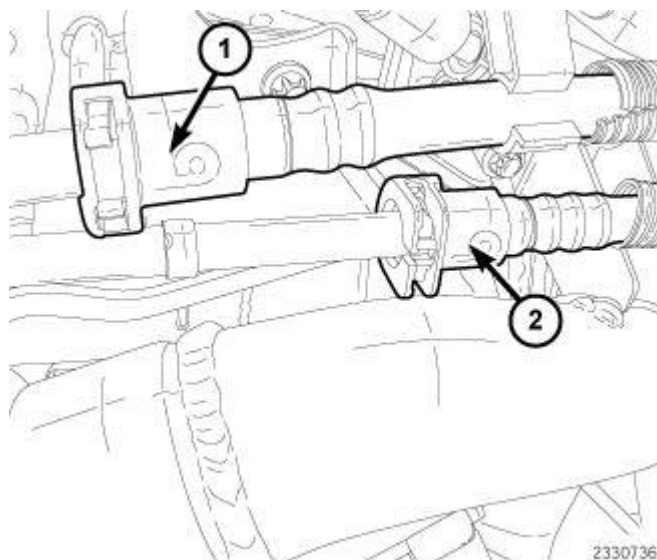


Fig. 35: Fuel Feed & Return Lines
Courtesy of CHRYSLER GROUP, LLC

42. Disconnect the fuel feed and return lines.

NOTE: When removing tripod joint, DO NOT let spline or snap ring drag across transaxle oil seal lip.

43. Remove the left and right axle half shafts. Refer to REMOVAL , REMOVAL and REMOVAL .

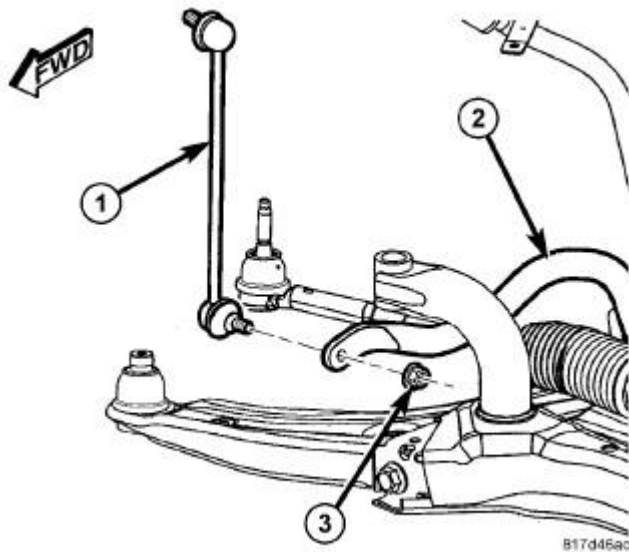


Fig. 36: Stabilizer Bar Link, Stabilizer Bar & Nut
Courtesy of CHRYSLER GROUP, LLC

44. At each end of the stabilizer bar, while holding the stabilizer bar link (1) lower stud stationary, remove the nut (3) securing the link to the stabilizer bar (2).

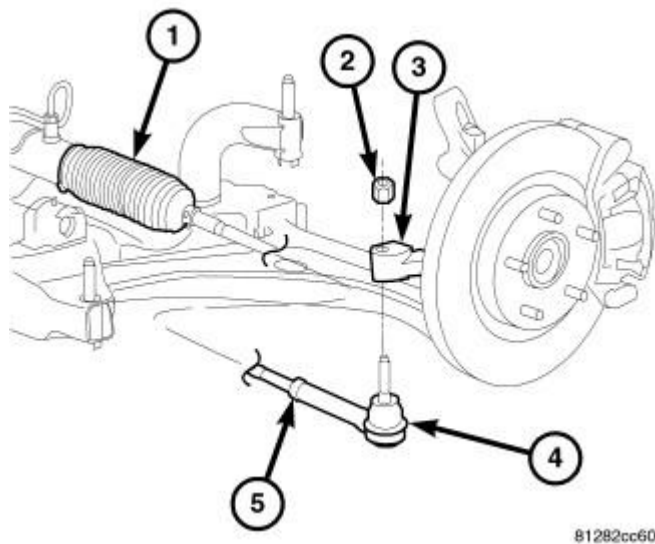


Fig. 37: Tie Rod Assembly
Courtesy of CHRYSLER GROUP, LLC

NOTE: Right side shown in illustration left side similar.

45. On both sides, remove the nut (2) attaching the outer tie rod (4) to the knuckle (3).

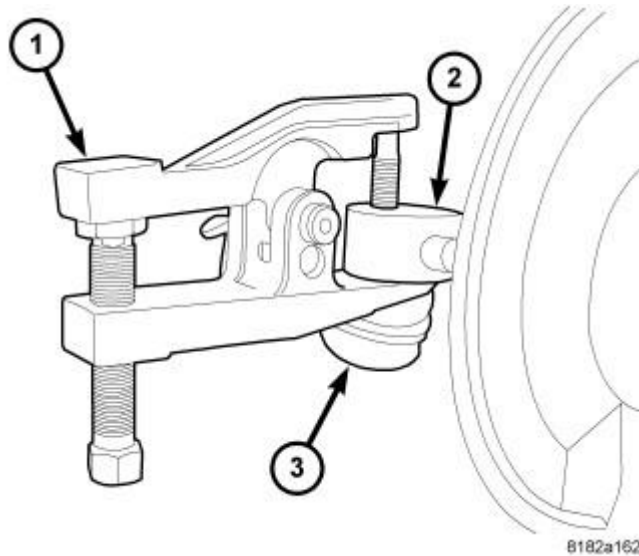


Fig. 38: Separating Tie Rod End From Knuckle Using Ball Joint Remover
 Courtesy of CHRYSLER GROUP, LLC

46. On both sides, release the tie rod end (3) from the knuckle (2) using Remover, Special Tool (special tool #9360, Remover, Ball Joint) (1).

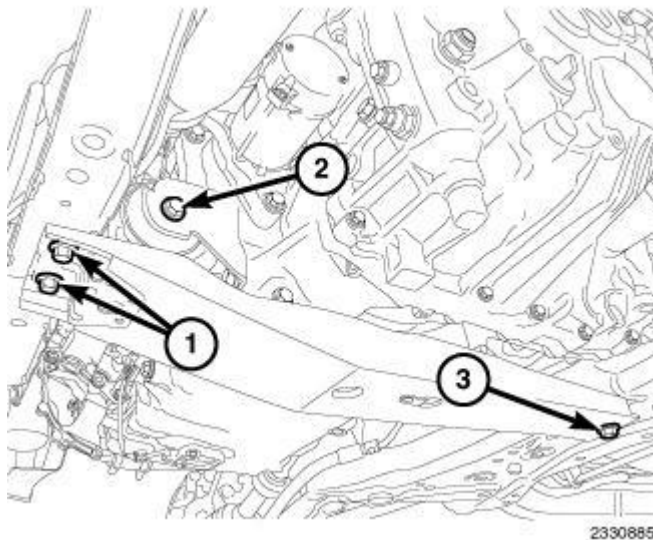


Fig. 39: Fore/Aft Crossmember Fasteners & Transaxle Mount Through Bolt
 Courtesy of CHRYSLER GROUP, LLC

47. Remove front transaxle mount through bolt (2).
48. Remove fore/aft member retaining bolts (1, 3) and fore/aft member.
49. On AWD models, remove the driveline propeller shaft.
50. Remove the Diesel Particulate Filter (DEF). Refer to **FILTER, DIESEL PARTICULATE, REMOVAL**.

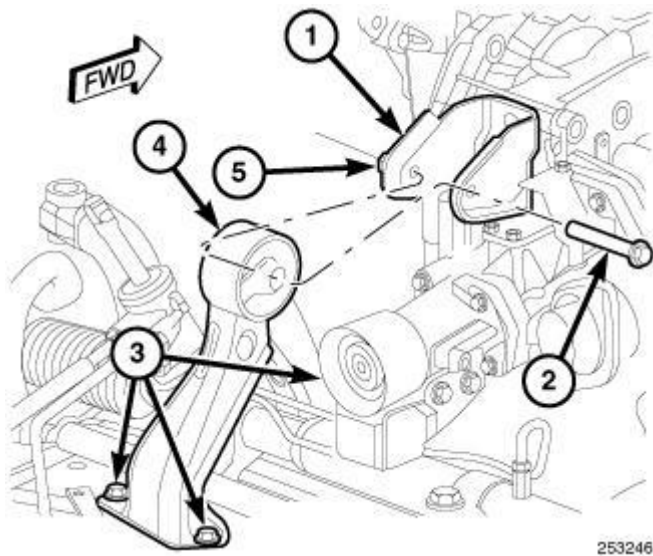


Fig. 40: Rear Roll Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: AWD shown in illustration, FWD similar.

51. Remove the rear roll mount (4) through bolt (2).

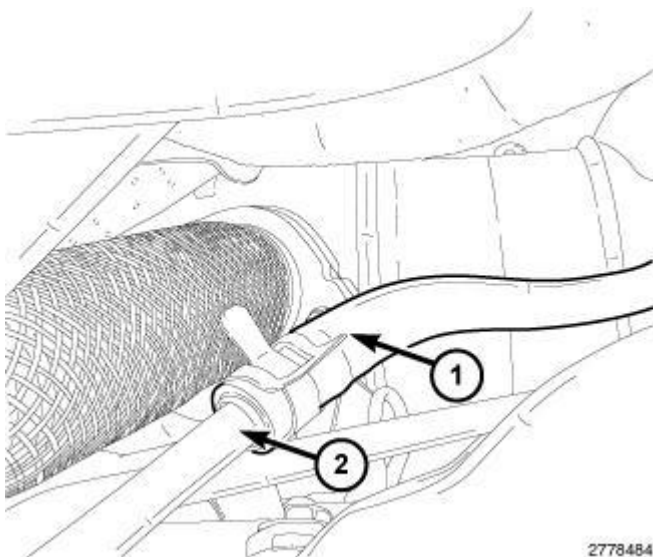
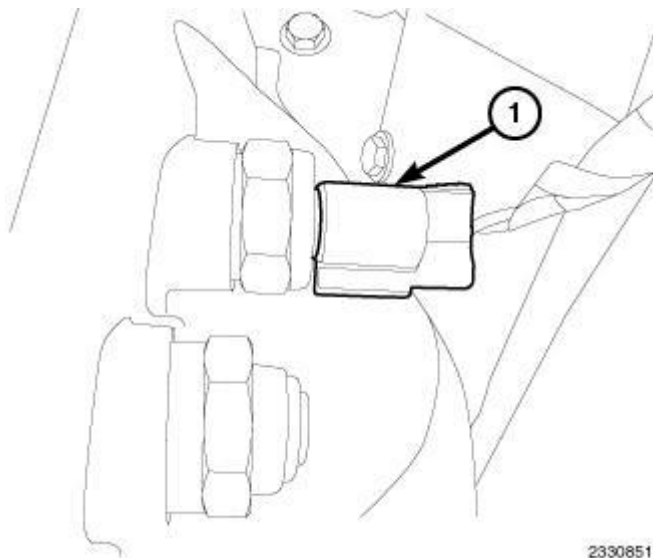


Fig. 41: Power Steering Return Hose & Tube
Courtesy of CHRYSLER GROUP, LLC

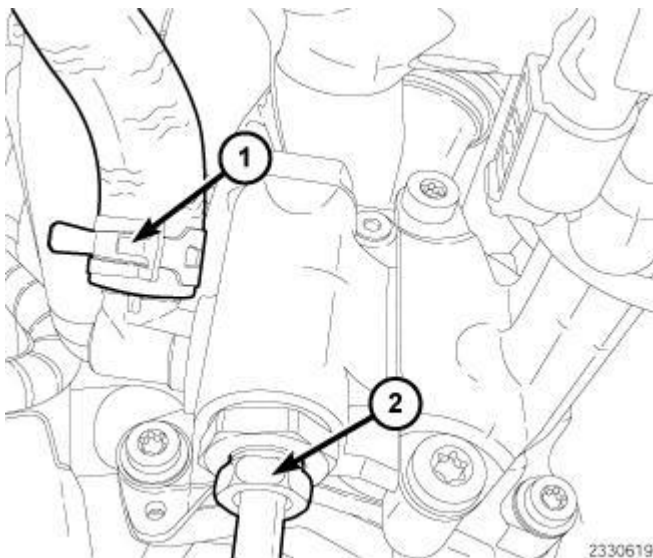
52. Remove the power steering return hose from tube.



2330851

Fig. 42: Reverse Lamp Switch Harness Connector
Courtesy of CHRYSLER GROUP, LLC

53. Disconnect the reverse lamp switch harness connector (1).
54. Remove the reverse lamp switch wire harness clip at transmission.



2330619

Fig. 43: Power Steering Supply Line & Feed Line
Courtesy of CHRYSLER GROUP, LLC

55. Disconnect the power steering supply line (1) from pump.
56. Remove the power steering feed line (2) from pump.

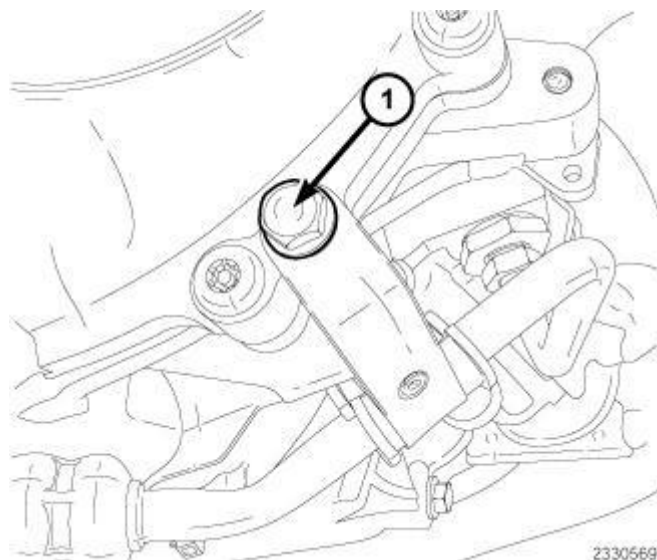


Fig. 44: Power Steering Line Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

57. Remove power steering line support bracket retaining bolt (2).

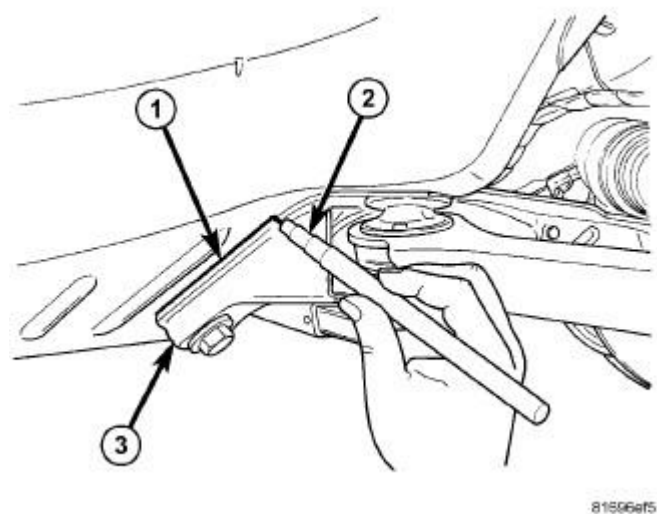


Fig. 45: Marking Crossmember Location
Courtesy of CHRYSLER GROUP, LLC

58. Mark the crossmember (3) to body location (1) using a grease pencil (2) or equivalent.

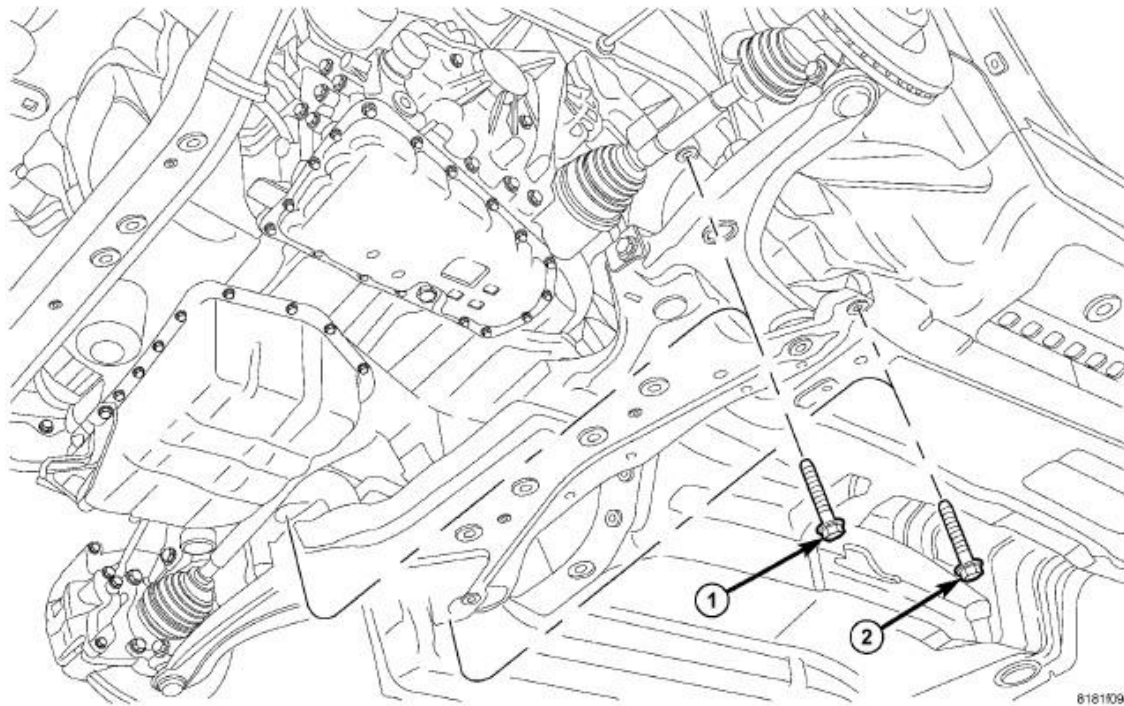


Fig. 46: Front Crossmember Bolts
Courtesy of CHRYSLER GROUP, LLC

59. Support the crossmember with a suitable lifting device.
60. Remove the crossmember bolts (1 and 2) and lower the crossmember from the vehicle.

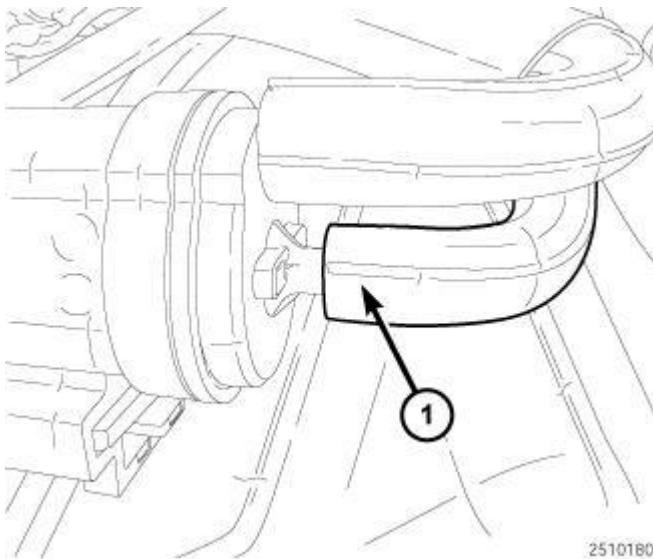
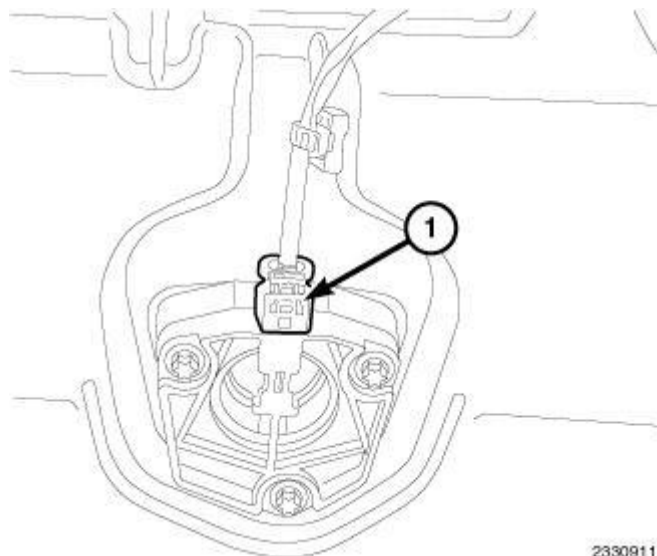


Fig. 47: Coolant Pump Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

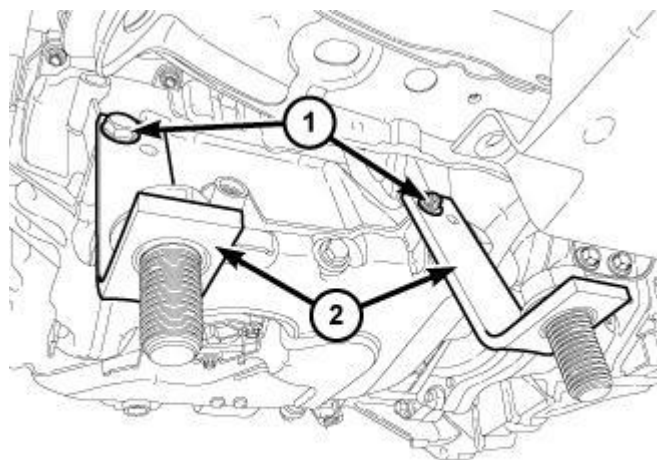
61. Remove the serpentine belt. Refer to **BELT, SERPENTINE, REMOVAL**.
62. Disconnect the coolant pump actuator vacuum line (1).



2330911

Fig. 48: Oil Level Switch/Life Monitor Wire Harness Connector
 Courtesy of CHRYSLER GROUP, LLC

63. Disconnect the oil level switch wire harness connector (1) and wire harness retainers.
64. Remove the coolant/power steering pump assembly. Refer to **PUMP, WATER, REMOVAL**.



2777382

Fig. 49: Engine Cradle Post Kit Adapter Brackets & Bolts
 Courtesy of CHRYSLER GROUP, LLC

65. Install the (special tool #10205, Fixtures, Power Train Dolly Engine Support) (2) to oil pan and tighten bolts finger tight (1).

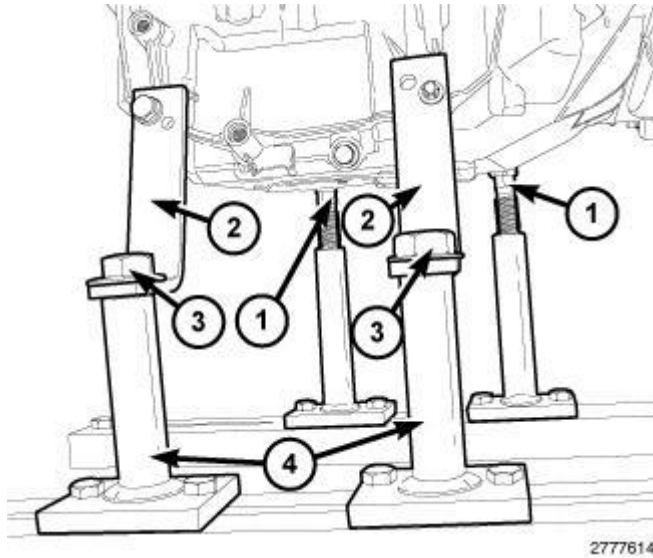


Fig. 50: Dolly, Cradle & Engine Cradle Post Kit Components
Courtesy of CHRYSLER GROUP, LLC

66. Assemble the (special tool #6135, Dolly, Power Train), (special tool #6710A, Cradle, Engine Support) and (special tool #6848, Posts, Cradle).
67. Carefully lower the vehicle and position the (special tool #6135, Dolly, Power Train), (special tool #6710A, Cradle, Engine Support) under engine.
68. Align the back posts (1) and adjust the height to the bosses in the oil pan.
69. Position (special tool #10205, Fixtures, Power Train Dolly Engine Support) (2) to the front posts (4) and install bolts (3).
70. Tighten the support posts and cradle fasteners.

WARNING: Safety straps must be use to secure engine to the dolly fixture.

71. Install, tighten and lock safety straps around engine and attach them to the cradle.
72. Lower vehicle so that only the weight of the engine and transmission assembly is on dolly fixture.

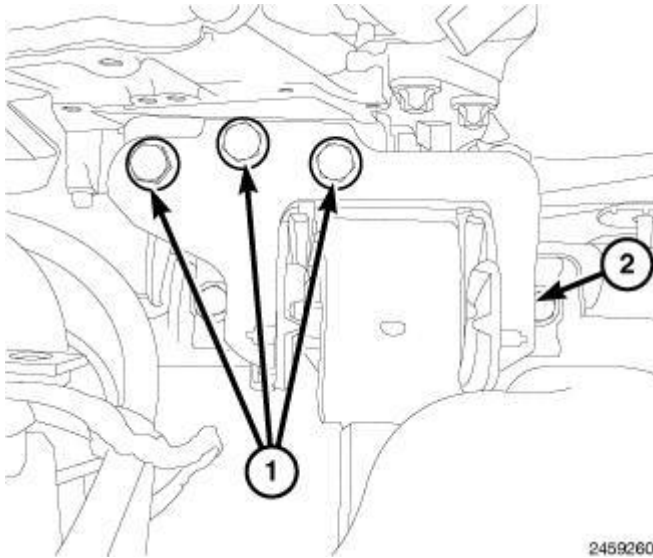


Fig. 51: Engine Mount Through Bolt & Right Engine Mount Bolts
Courtesy of CHRYSLER GROUP, LLC

73. Remove the engine mount through bolt (2).
74. Remove bolts (1) and the right engine mount.

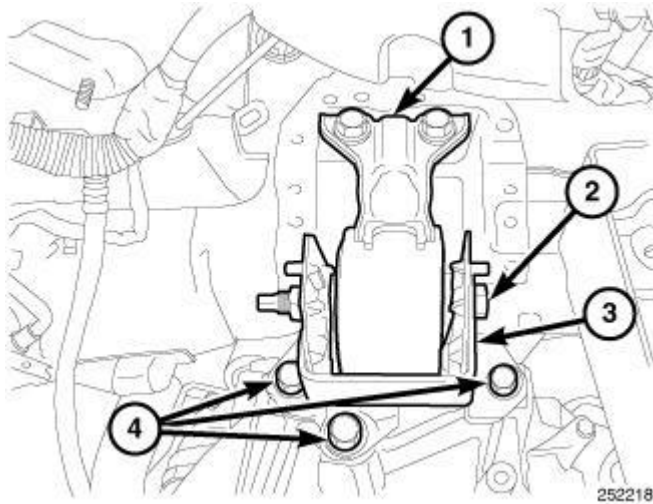
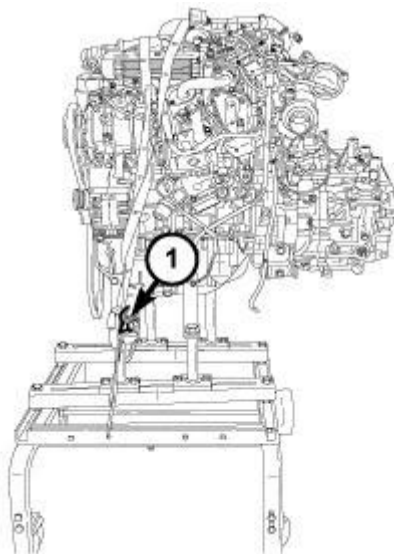


Fig. 52: Left Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

75. Remove left mount (3) to transaxle retaining bolts (4).

CAUTION: It may be necessary to adjust the engine and transmission assembly, with the dolly fixture attached, to successfully clear the engine compartment.

76. While watching for obstructions, slowly raise the vehicle until the engine and transmission assembly clear the engine compartment.



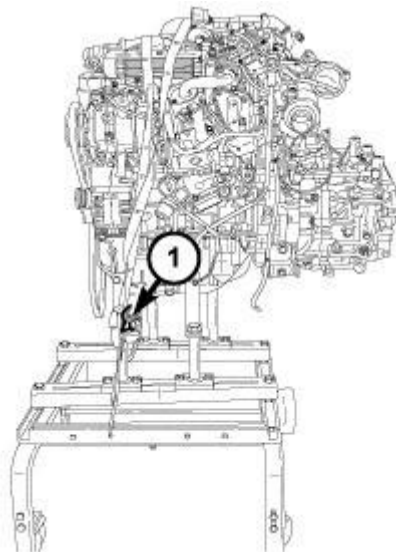
2778440

Fig. 53: Safety Straps & Dolly Fixture
Courtesy of CHRYSLER GROUP, LLC

- 77. On AWD models, remove the PTU.
- 78. Separate the transmission from the engine.

INSTALLATION

INSTALLATION



2778440

Fig. 54: Safety Straps & Dolly Fixture
Courtesy of CHRYSLER GROUP, LLC

WARNING: Safety straps must be used to secure engine to the dolly fixture.

1. Seat engine onto fixture support posts then install, tighten and lock safety straps (1) around engine, securing it to the cradle.
2. Install the transmission to the engine. Tighten bolts to 48 N.m (35 ft. lbs.).
3. On AWD models, install the Power Transfer Unit (PTU).
4. Position the engine and transmission assemblies below vehicle engine compartment.

CAUTION: It may be necessary to adjust the engine and transmission assembly, with the dolly fixture attached, to successfully clear the engine compartment.

5. While watching for obstructions, slowly lower the vehicle until the engine and transmission assembly clearly fit the engine compartment.

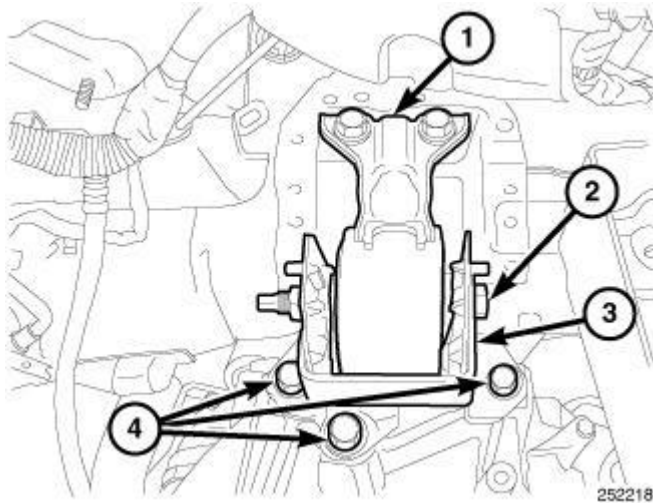


Fig. 55: Left Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Install left mount bracket (3) to transaxle retaining bolts and tighten to 61 N.m (45 ft. lbs.).

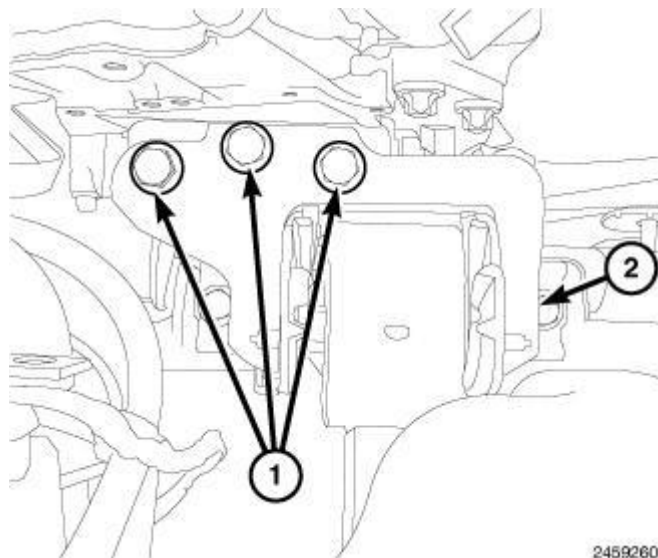


Fig. 56: Engine Mount Through Bolt & Right Engine Mount Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Install right engine mount. Tighten bolts (1) to 65 N.m (50 ft. lbs.).
8. Install the engine mount through bolt and tighten bolt (2) to 65 N.m (50 ft. lbs.).

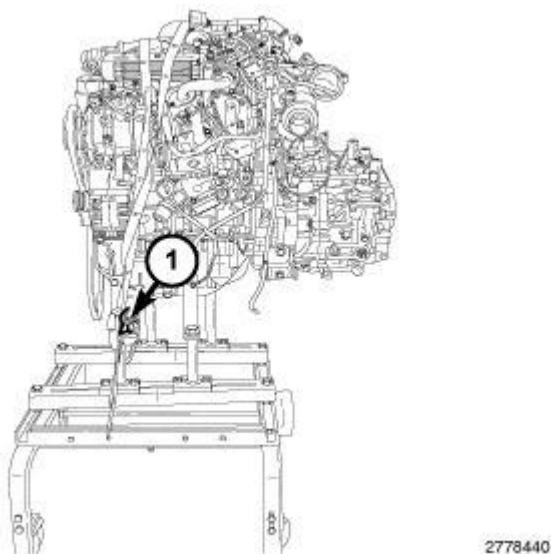


Fig. 57: Safety Straps & Dolly Fixture
Courtesy of CHRYSLER GROUP, LLC

9. Remove safety straps (1).

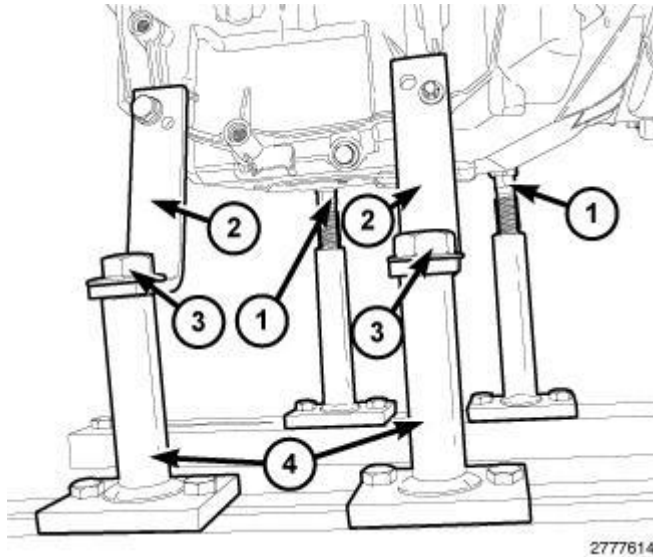


Fig. 58: Dolly, Cradle & Engine Cradle Post Kit Components
 Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (3) securing (special tool #10205, Fixtures, Power Train Dolly Engine Support) (2) from the front post (4).
11. Carefully raise the vehicle enough to clear the cradle and support post and remove the cradle.

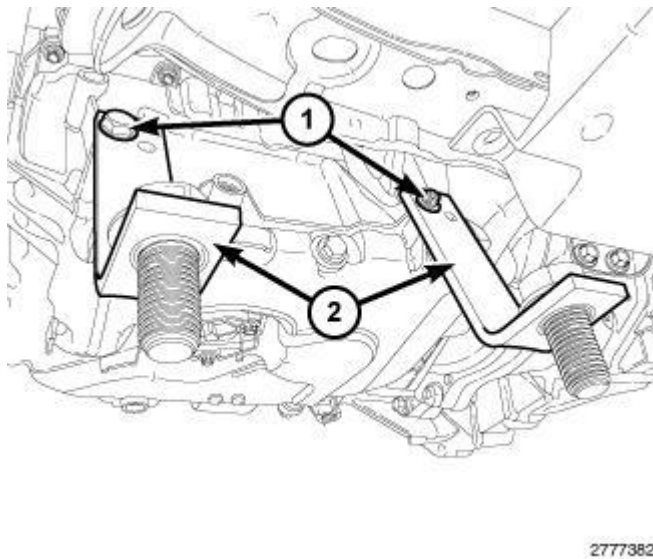


Fig. 59: Engine Cradle Post Kit Adapter Brackets & Bolts
 Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (2) the (special tool #10205, Fixtures, Power Train Dolly Engine Support) (1) from the oil pan.
13. Install the coolant/power steering pump assembly. Refer to **PUMP, WATER, INSTALLATION** .

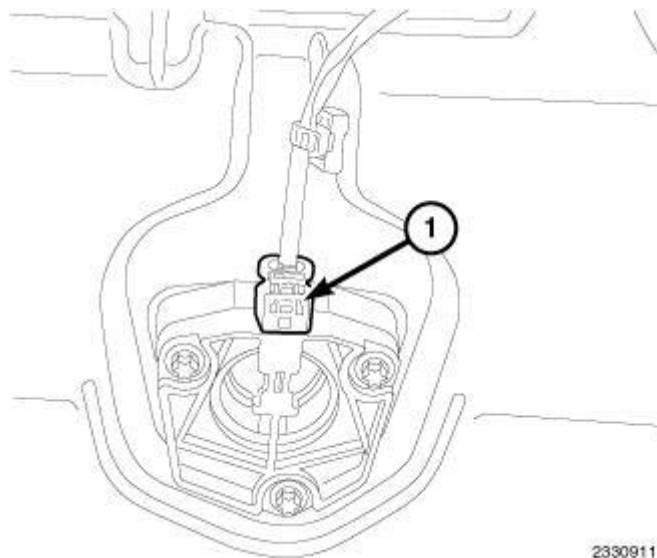


Fig. 60: Oil Level Switch/Life Monitor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

14. Connect the oil level switch wire harness connector and wire harness retainers (1).

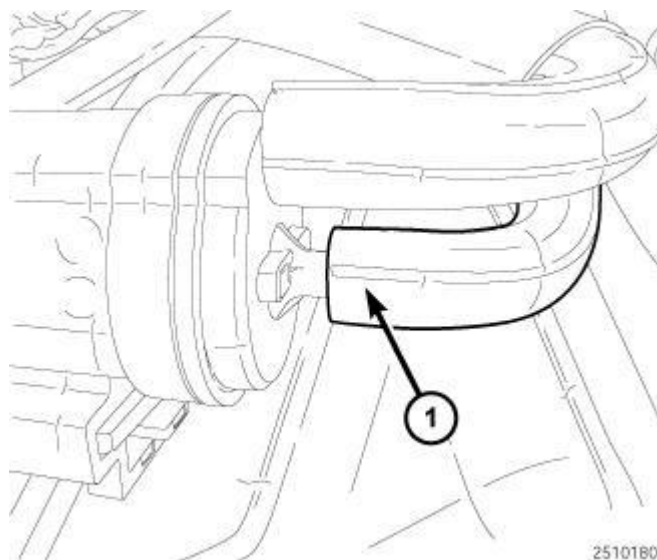


Fig. 61: Coolant Pump Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

15. Connect the coolant pump actuator vacuum line (1).
16. Install the serpentine belt. Refer to **BELT, SERPENTINE, INSTALLATION**.

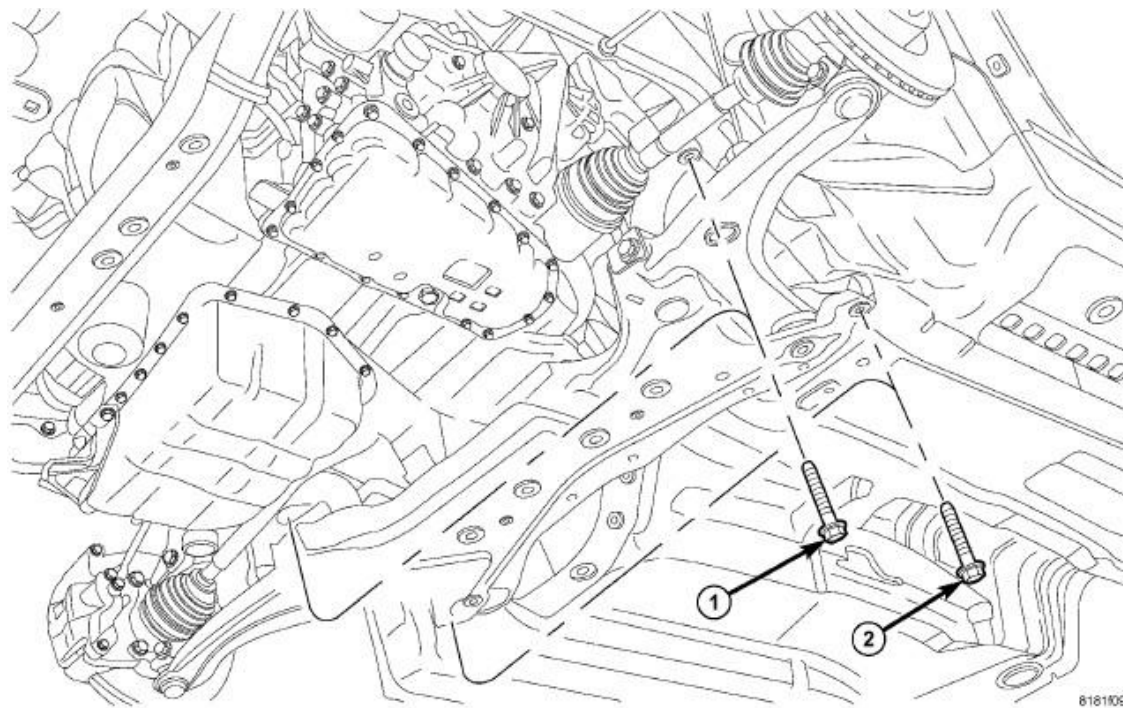


Fig. 62: Front Crossmember Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Support the crossmember on a suitable lifting device.
18. Raise the crossmember into position onto the vehicle.
19. Install the bolts (1 and 2) and align the engine cradle to the marks made during removal.
20. Tighten the bolts to 150 N.m (111 ft. lbs.).

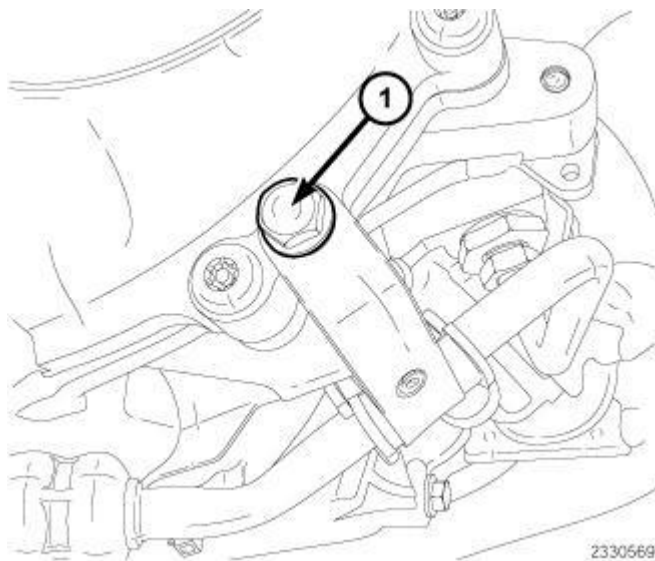


Fig. 63: Power Steering Line Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

21. Install the power steering line support bracket. Tighten bolt (1) to 9 N.m (80 in. lbs.).

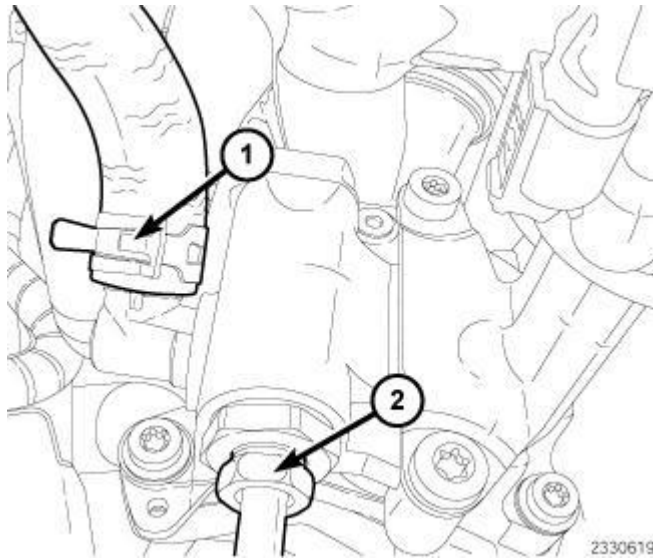


Fig. 64: Power Steering Supply Line & Feed Line
Courtesy of CHRYSLER GROUP, LLC

22. Install the power steering pressure line from pump. Tighten pressure line fitting to 32 N.m (24 ft. lbs.).
23. Connect the power steering return line from pump.

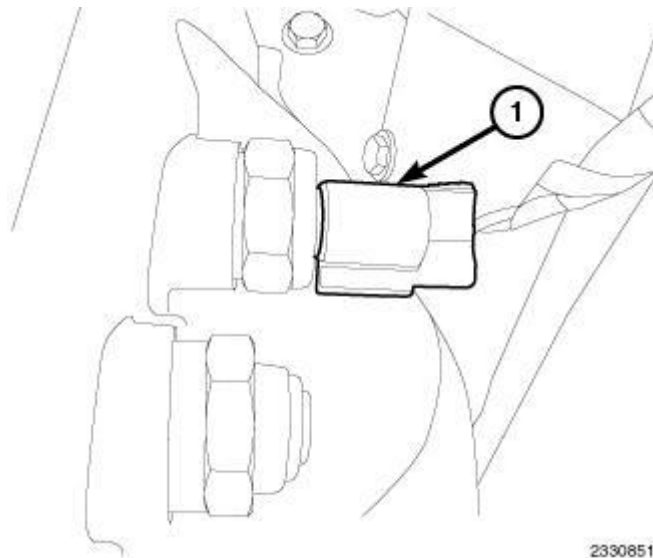


Fig. 65: Reverse Lamp Switch Harness Connector
Courtesy of CHRYSLER GROUP, LLC

24. Install the reverse lamp switch wire harness clip at transmission.
25. Connect the reverse switch harness connector (1).

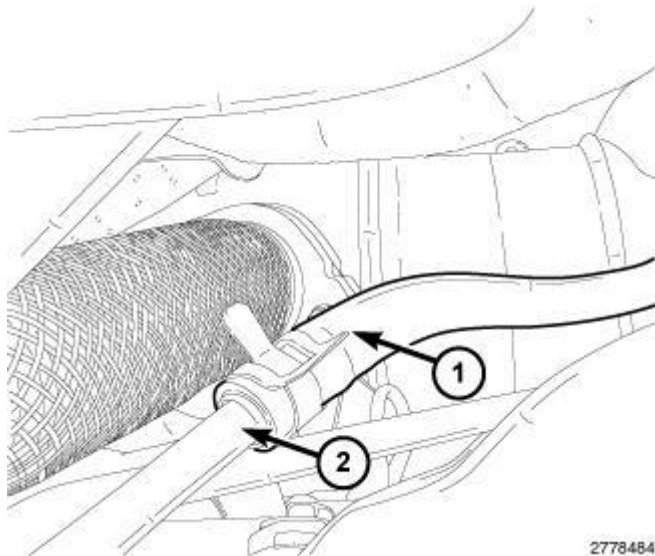


Fig. 66: Power Steering Return Hose & Tube
Courtesy of CHRYSLER GROUP, LLC

26. Install the power steering return hose at tube.

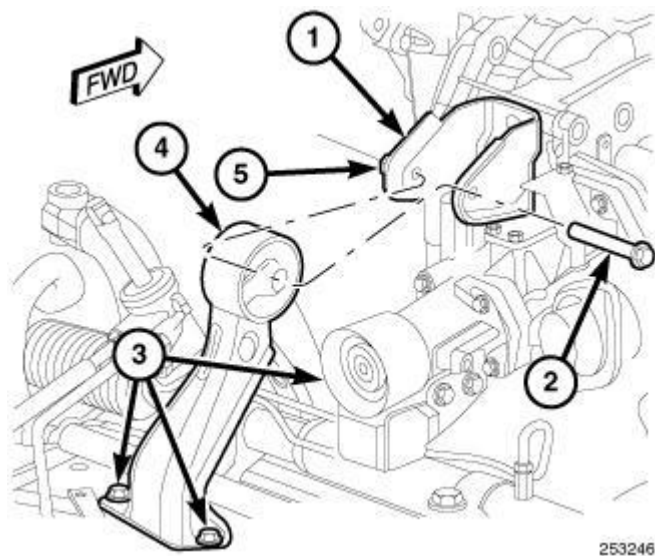


Fig. 67: Rear Roll Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: AWD shown in illustration, FWD similar.

27. Install the through bolt (2) and tighten to 65 N.m (48 ft. lbs.).

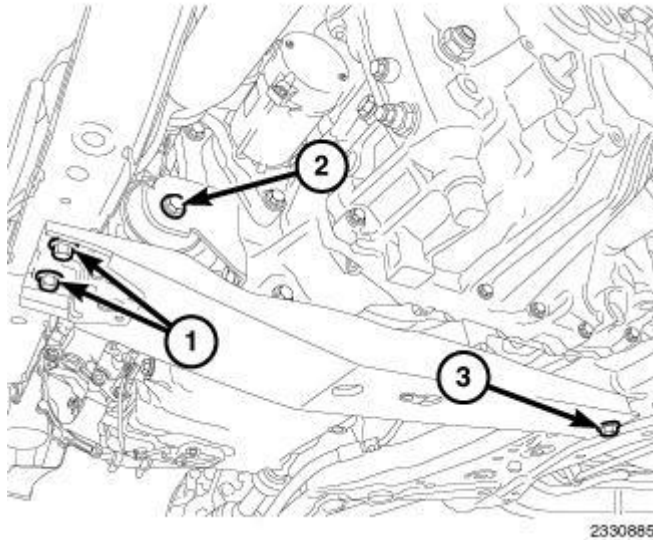


Fig. 68: Fore/Aft Crossmember Fasteners & Transaxle Mount Through Bolt
Courtesy of CHRYSLER GROUP, LLC

28. Install the Diesel Particulate Filter (DEF). Refer to **FILTER, DIESEL PARTICULATE, INSTALLATION**.
29. On AWD models, Install the driveline propeller shaft.
30. Install the fore/aft member and tighten using the following sequence:
 1. Tighten the bolts (1) to 78 N.m (58 ft. lbs.).
 2. Tighten the bolt (3) to 129 N.m (95 ft. lbs.).
 3. Tighten the bolt (2) to 65 N.m (48 ft. lbs.).

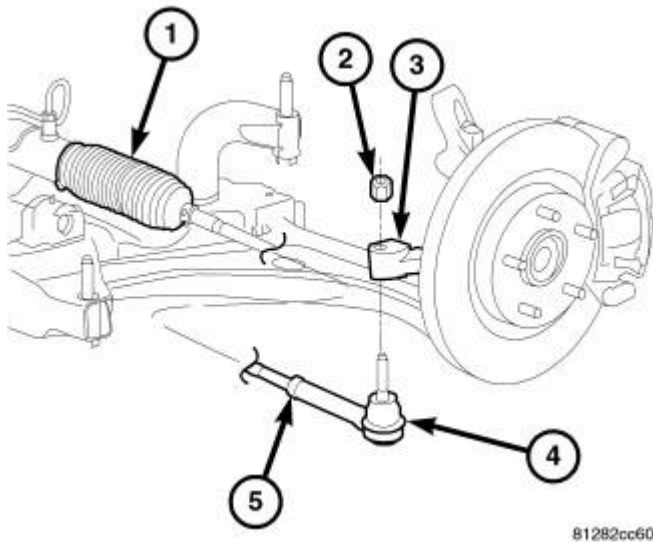


Fig. 69: Tie Rod Assembly
Courtesy of CHRYSLER GROUP, LLC

NOTE: Right side shown in illustration left side similar.

31. Install the outer tie rod ball stud into the hole in the knuckle arm (3). Tighten the nut to 132 N.m (97 ft. lbs.).

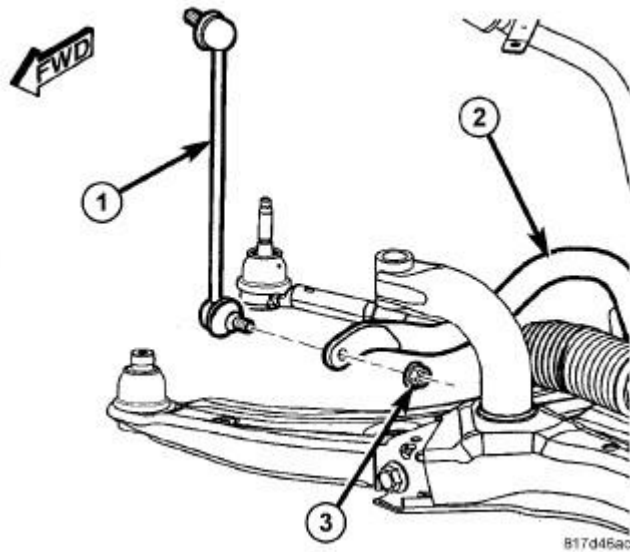


Fig. 70: Stabilizer Bar Link, Stabilizer Bar & Nut
Courtesy of CHRYSLER GROUP, LLC

32. Attach the stabilizer bar link (1) at each end of the stabilizer bar (2). At each link, install and tighten the nut (3) while holding the stabilizer bar link lower stud stationary. Tighten the nuts to 58 N.m (43 ft. lbs.).

NOTE: When removing tripod joint, DO NOT let spline or snap ring drag across transaxle oil seal lip.

33. Install the right and left axle half shafts. Refer to INSTALLATION , INSTALLATION and INSTALLATION .

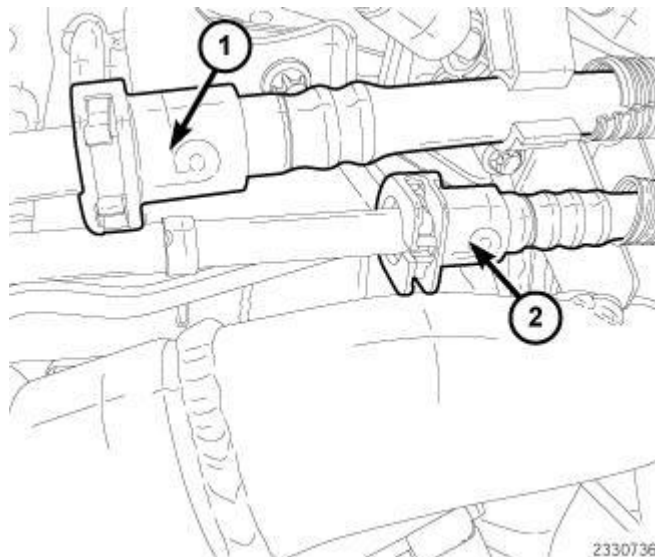


Fig. 71: Fuel Feed & Return Lines
Courtesy of CHRYSLER GROUP, LLC

34. Connect the fuel feed and return lines.

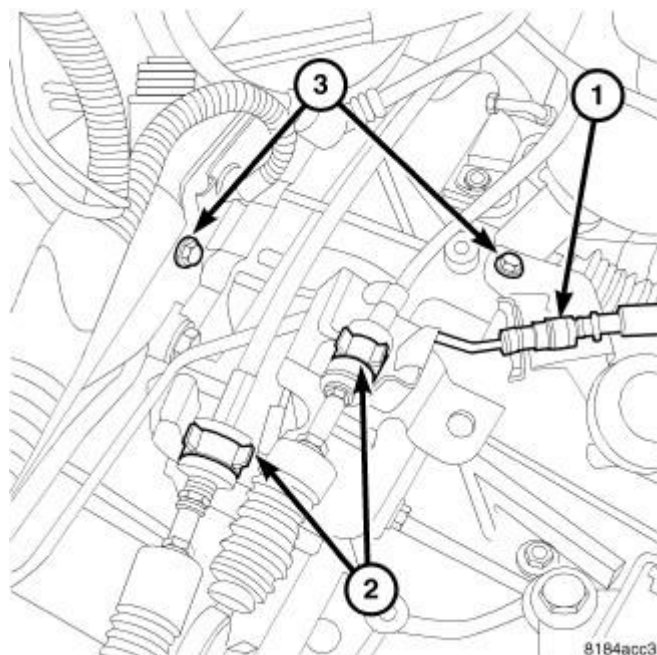


Fig. 72: Hydraulic Line, Shift Cables & Bolts
Courtesy of CHRYSLER GROUP, LLC

35. Connect hydraulic clutch line (1).
36. Install shift cables (2) to transaxle.

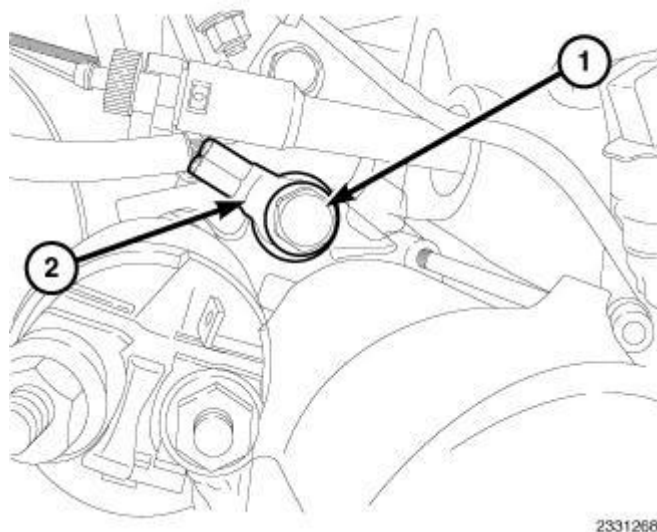


Fig. 73: Battery Ground Cable & Bolt At Engine Block
Courtesy of CHRYSLER GROUP, LLC

37. Install the starter motor. Tighten bolt to 40 N.m (30 ft. lbs.).
38. Install the battery ground cable to the engine block (2). Tighten bolt (1) to 40 N.m (30 ft. lbs.).

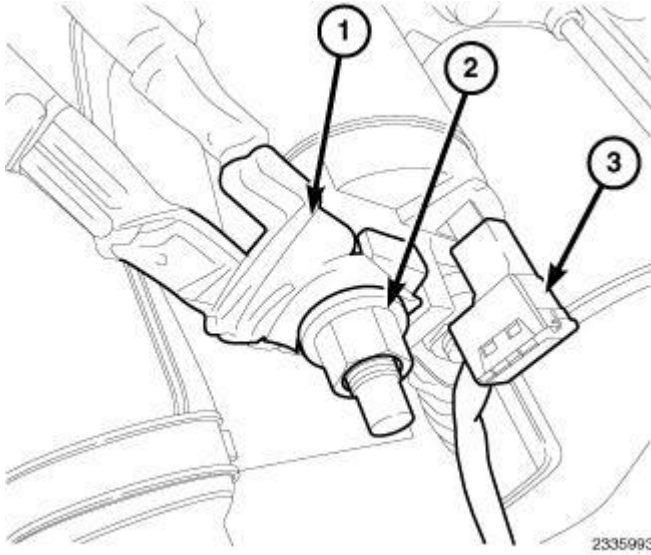


Fig. 74: Battery Feed Wire To Starter, Starter Harness Connections & Nut
Courtesy of CHRYSLER GROUP, LLC

39. Connect the starter harness connectors (3).
40. Install the battery feed wire (1) to starter. Tighten nut (2) to 10 N.m (89 In. lbs.).

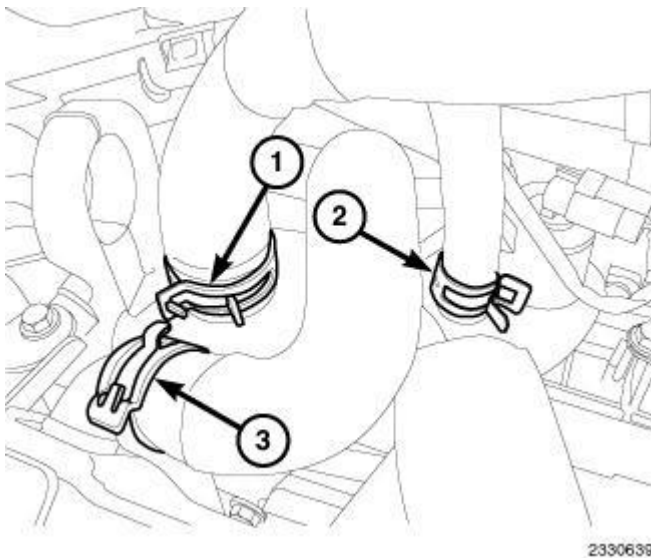


Fig. 75: Heater Hoses & Clamps At Engine
Courtesy of CHRYSLER GROUP, LLC

41. Connect heater hoses at engine.

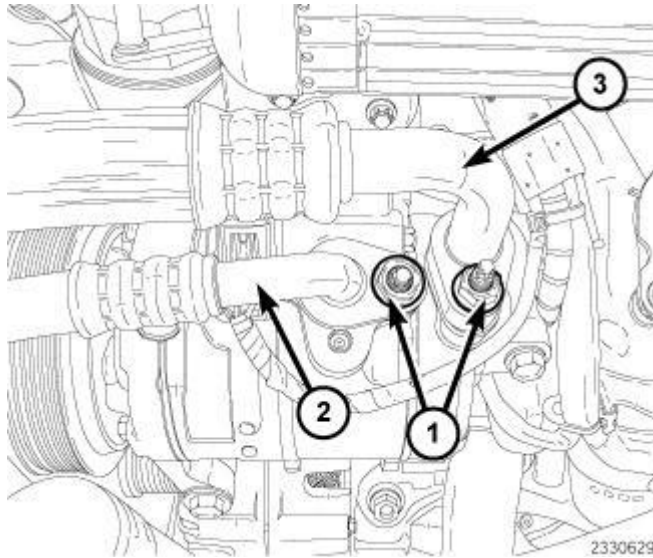


Fig. 76: A/C Lines & Retaining Nuts
 Courtesy of CHRYSLER GROUP, LLC

42. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
43. Install A/C compressor lines. Tighten nuts to 20 N.m (177 In. lbs.).

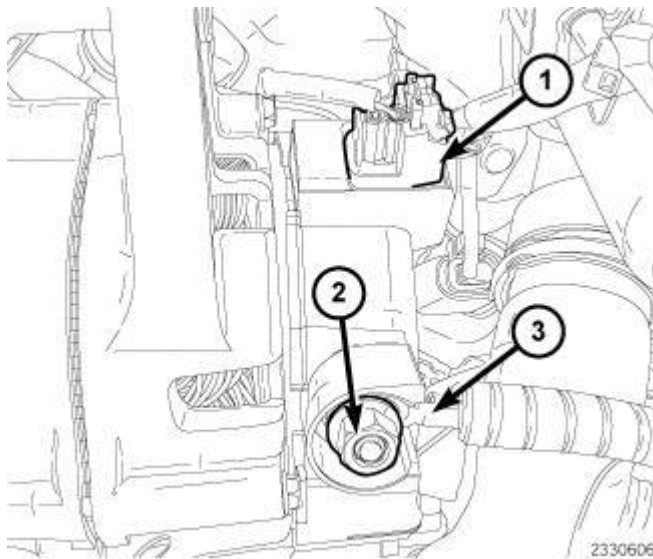


Fig. 77: Battery Feed Wire, Generator Harness Connectors & Nut
 Courtesy of CHRYSLER GROUP, LLC

44. Connect the generator harness connectors (1).
45. Install the battery feed wire (3) to generator. Tighten nut (2) to 18 N.m (159 in. lbs.).

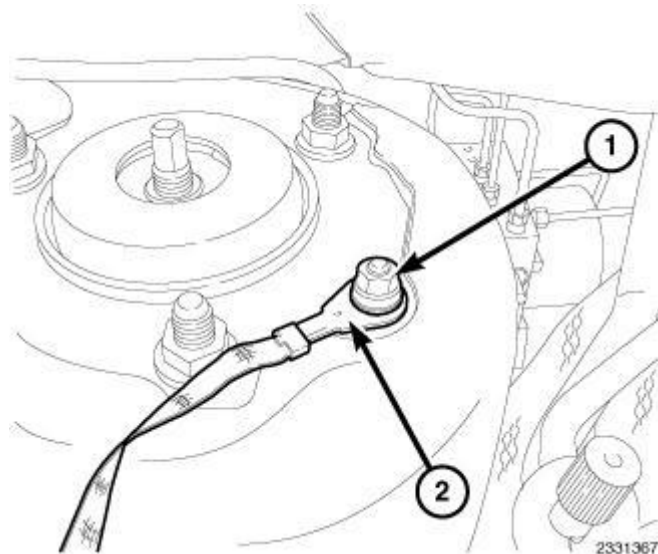


Fig. 78: Engine Ground Strap & Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

46. Install the engine ground strap (2) to the right strut tower and securely tighten nut (1).

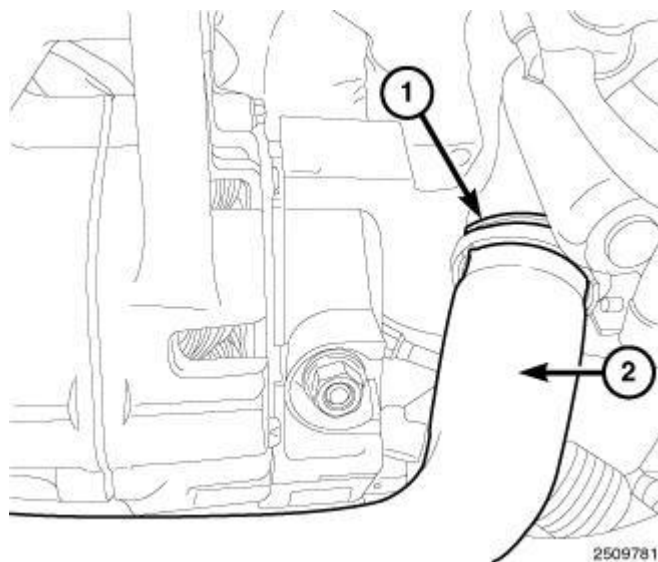


Fig. 79: Upper Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

47. Install the upper radiator hose (2) at radiator.
48. Connect the upper radiator hose (2) at engine (1).

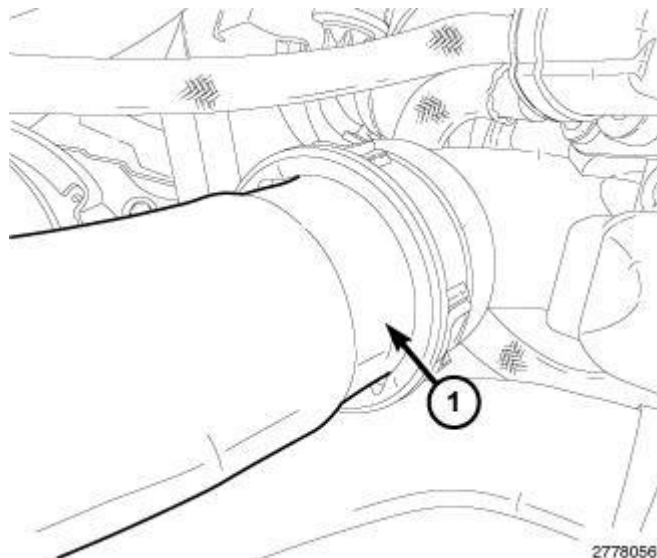


Fig. 80: Lower Radiator Hose
 Courtesy of CHRYSLER GROUP, LLC

49. Install the lower radiator hose (2).

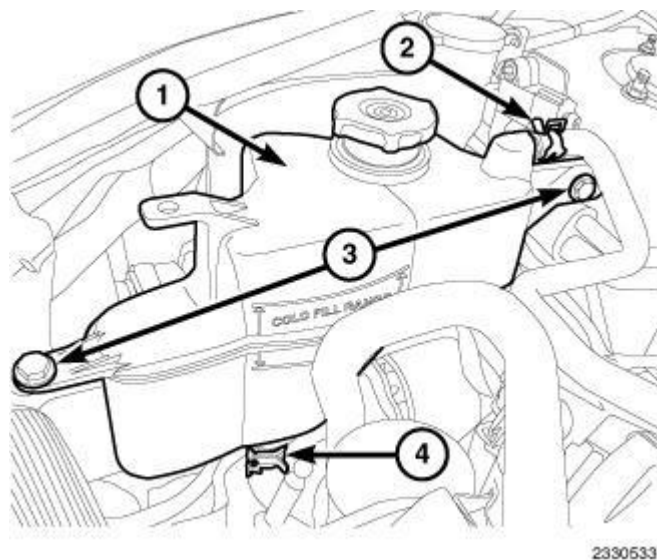


Fig. 81: Coolant Recovery Reservoir, Clamps & Bolts
 Courtesy of CHRYSLER GROUP, LLC

50. Install coolant recovery bottle (1). Tighten the mounting bolts to 4 N.m (35 in. lbs.).
 51. Connect the coolant hoses (2 and 4).

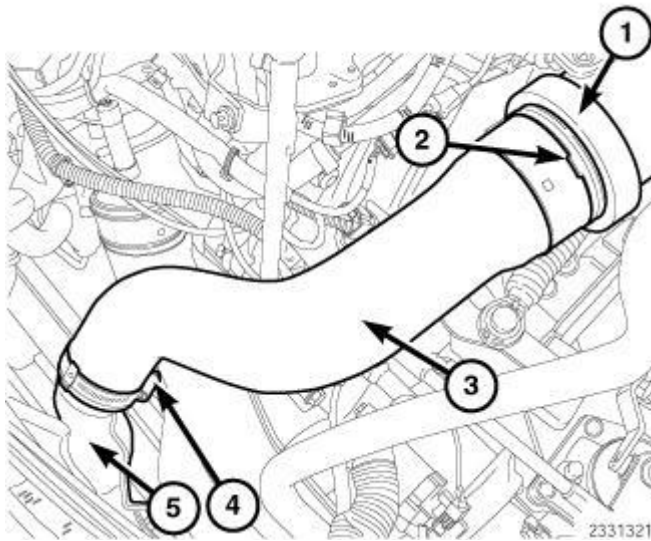


Fig. 82: Upper Charge Air Tube, Lock Ring, Lower Charge Air Tube, Clamp & Charge Air Cooler (CAC) Inlet

Courtesy of CHRYSLER GROUP, LLC

52. Connect the lower charge air tube (3) from the charge air cooler (CAC) inlet (5). Tighten clamp (4) to 5 N.m (44 in. lbs.).
53. Install the lower charge air tube (3) to the upper charge air tube (1) to turbocharger and lock the lock ring in place.

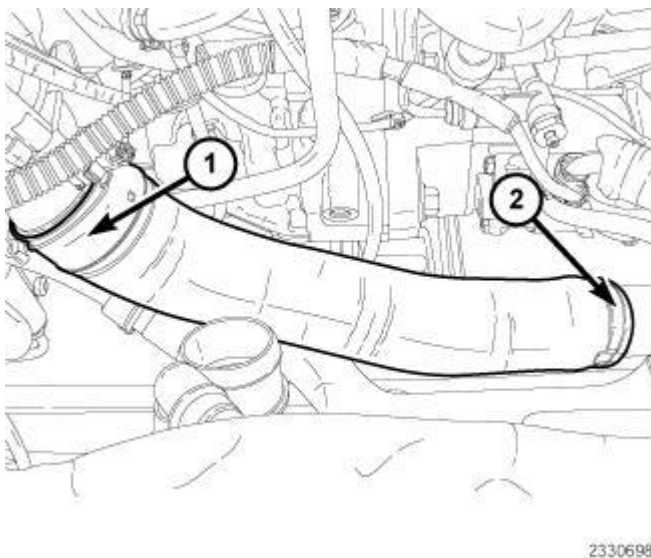


Fig. 83: EGR Air Flow Control Valve & Clamp

Courtesy of CHRYSLER GROUP, LLC

54. Install charge air inlet tube to the charge air cooler (CAC) and the EGR air control valve.
55. Install coolant fan assembly. Refer to **FAN, COOLING, INSTALLATION** .

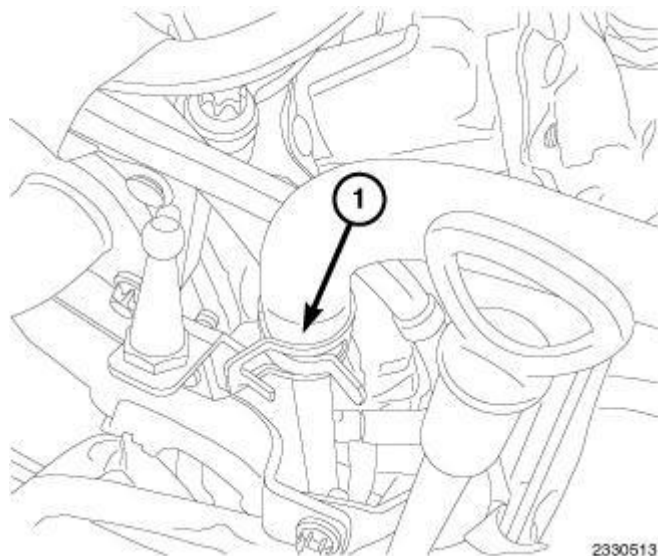


Fig. 84: Brake Booster Vacuum Hose
Courtesy of CHRYSLER GROUP, LLC

56. Connect the brake booster vacuum hose.

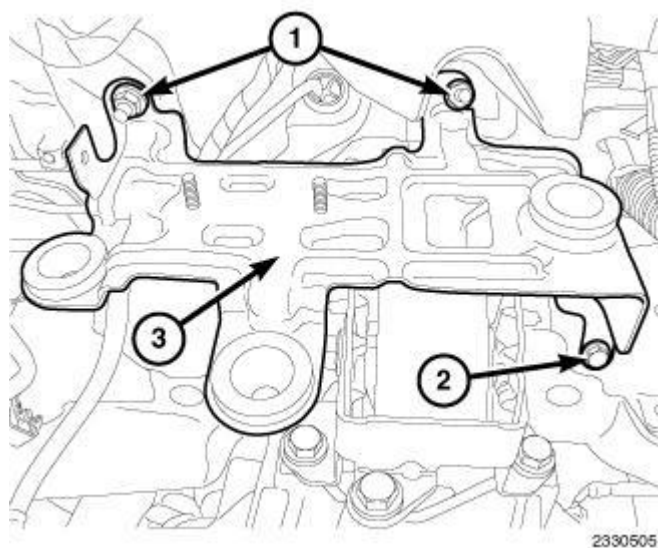


Fig. 85: Air Cleaner Mounting Bracket, Nuts & Bolt
Courtesy of CHRYSLER GROUP, LLC

57. Install the air cleaner mounting bracket (3)
1. Tighten bolt (2) to 11 N.m (97 in. lbs.).
 2. Tighten nuts (1) to 11 N.m (97 in. lbs.).

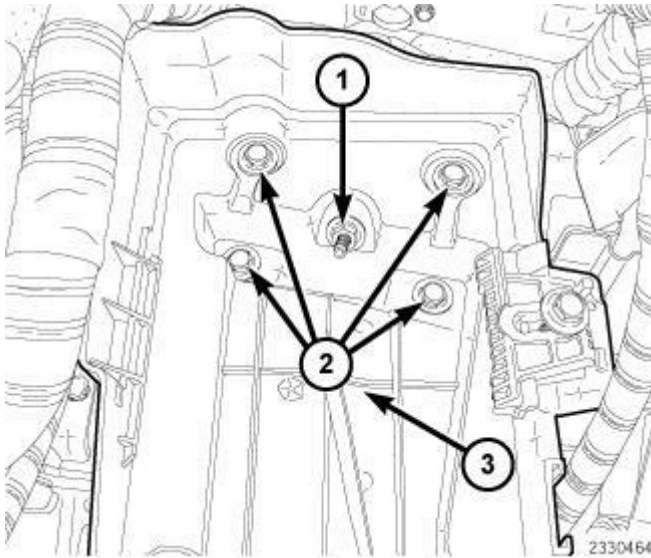


Fig. 86: Battery Tray, Nut & Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

58. Install the battery tray (3):
1. Tighten bolt (2) to 11 N.m (97 in. lbs.).
 2. Tighten nuts (1) to 11 N.m (97 in. lbs.).

NOTE: Do not connect the battery cables at this time.

59. Install the battery. Tighten bolt to 7 N.m (62 in. lbs.).

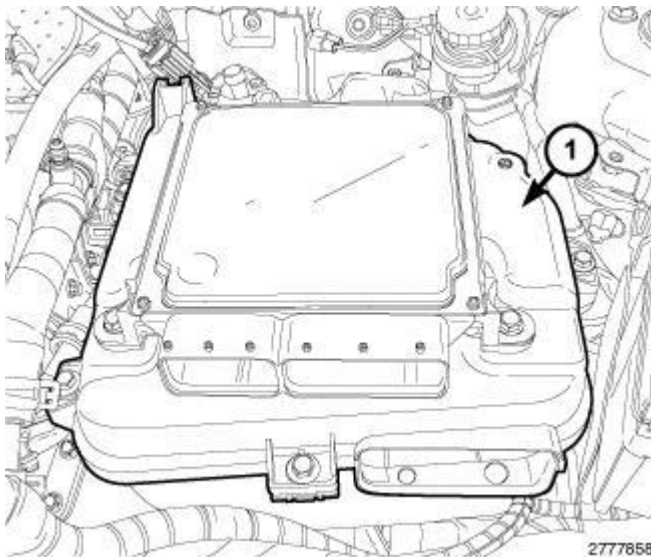


Fig. 87: Air Cleaner Assembly
Courtesy of CHRYSLER GROUP, LLC

60. Install the air cleaner assembly (1).

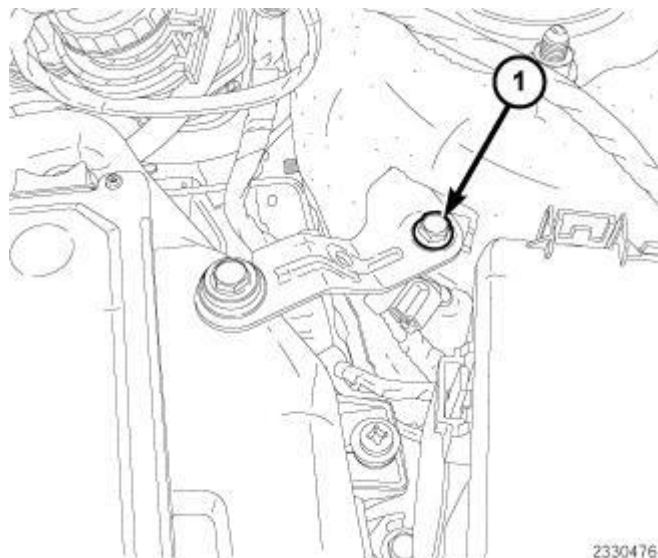


Fig. 88: Air Cleaner Upper Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

61. Install the air cleaner upper support bracket retaining bolt (1). Tighten bolt to (9 N.m 80 in. lbs.).

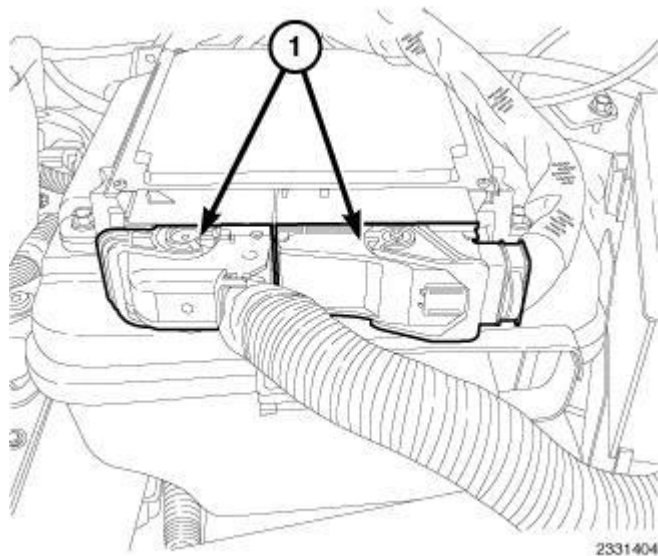


Fig. 89: PCM Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

62. Connect Powertrain Control Module (PCM) harness connectors (1).

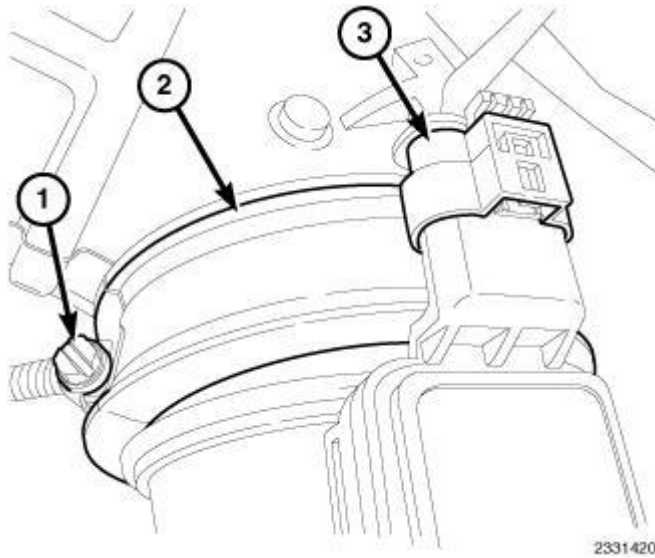


Fig. 90: Mass Air Flow Sensor Harness Connector, Air Cleaner-To-Turbocharger Inlet Tube & Clamp

Courtesy of CHRYSLER GROUP, LLC

63. Connect the air cleaner-to-turbocharger inlet tube (2) and tighten the clamp (1).
64. Connect the Mass Air Flow (MAF) sensor harness connector (3).

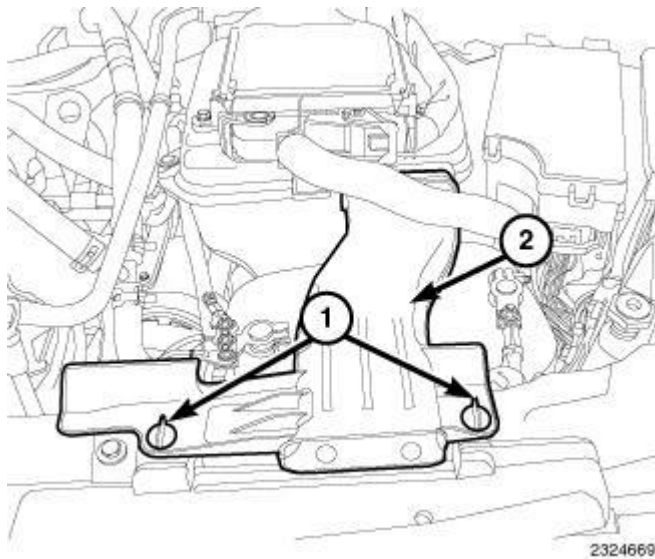


Fig. 91: Quarter Turn Lock Tabs & Air Inlet Duct

Courtesy of CHRYSLER GROUP, LLC

65. Install the air inlet duct (1).

CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

66. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE** .
67. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE** .
68. Fill engine with coolant.
69. Install new oil filter and fill engine with oil.

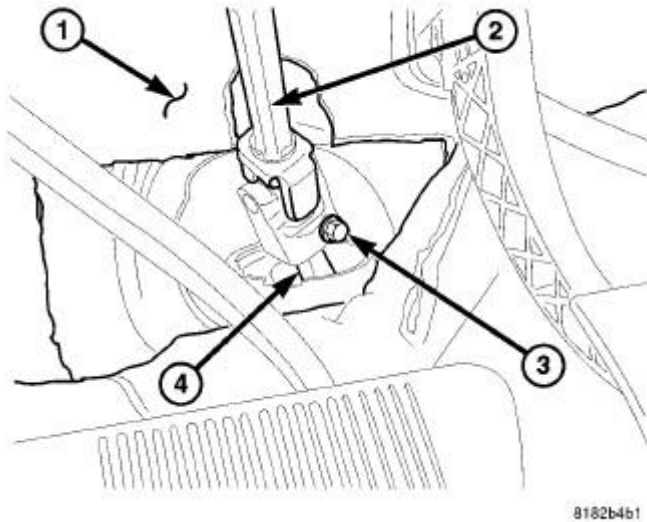


Fig. 92: Floor Carpet, Intermediate Shaft, Coupling Bolt & Steering Gear Pinion Shaft
Courtesy of CHRYSLER GROUP, LLC

70. Verify the front wheels of vehicle are in the STRAIGHT-AHEAD position.
71. Center the intermediate shaft (2) over the steering gear pinion shaft (4), lining up the ends, then slide the intermediate shaft onto the steering gear pinion shaft.
72. From center, rotate the steering wheel to the right approximately 90° or until the intermediate shaft coupling bolt (3) can be easily installed.
73. Install the intermediate shaft coupling bolt (3). Tighten the bolt to 42 N.m (31 ft. lbs.).
74. Reposition the floor carpet (1) in place.

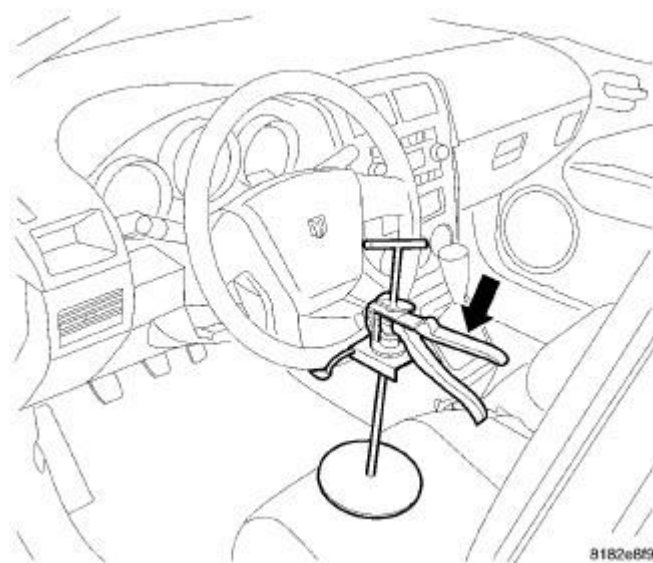


Fig. 93: Steering Wheel Holding Tool
Courtesy of CHRYSLER GROUP, LLC

75. Remove the steering wheel holder.
76. Connect the positive and negative battery cables.
77. Start engine and check for leaks.
78. Install engine cover (1).

SPECIAL TOOLS

SPECIAL TOOLS

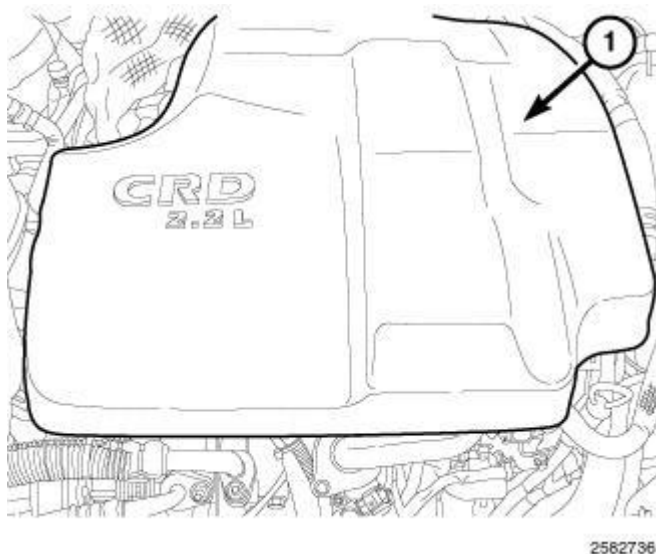
10205 - Fixtures, Power Train Dolly Engine Support
10228 - Assembly, Inserts Timing Chain
10228-D14 - Thrust Piece
10228-F12 - Guide Piece
10231 - Lock, Balance Shaft
10232 - Lock, Flywheel/Clutch Plate
10233 - Install, Rear Crankshaft Seal
10234 - Lock, Camshaft
10235 - Install, Front Crankshaft Seal Ring
10236 - Holder, Vibration Damper
10237 - Socket, Shift Valve
10238 - Claw, Extraction
10239 - Adapter, Tester
10240 - Bolt, Extractor
10241 - Screw, Forcing
10368 - Set, Universal Protective Cap

6135 - Dolly, Power Train
(Originally Shipped In Kit Number(s) 6784C.)
6710A - Cradle, Engine Support
(Originally Shipped In Kit Number(s) 6784, 6809.)
6848 - Posts, Cradle
(Originally Shipped In Kit Number(s) 6880, 6881, 6882, 6883.)
8941 - Puller
(Originally Shipped In Kit Number(s) 9299, 9299CC, 9299CC, 9300A-CAN, 9550, 9560.)
8951 - Assembly Links
(Originally Shipped In Kit Number(s) 9550, 9560, 9566.)
9307 - Compressor, Valve Spring
(Originally Shipped In Kit Number(s) 9300, 9300A-CAN, 9300-CAN, 9300-CAN.)
9312-1 - Block, Pressing
(Originally Shipped In Kit Number(s) 9550, 9560, 9580.)
9312-13 - Guide, Pin Removal
(Originally Shipped In Kit Number(s) 9550, 9560, 9580.)
9312-2 - Handle
(Originally Shipped In Kit Number(s) 9550, 9560, 9580.)
9312-4 - Assembly, Screw, Forcing
(Originally Shipped In Kit Number(s) 9550, 9560, 9580.)
9360 - Remover, Ball Joint
(Originally Shipped In Kit Number(s) 9329, 9515, 9516, 9516-CAN, 9517, 9517-CAN, 9518, 9519, 9540, 9541.)
9543 - Adapter, Compression Test
(Originally Shipped In Kit Number(s) 9300A-CAN, 9550, 9560, 9580.)
9717 - Brush, Injector Bore
(Originally Shipped In Kit Number(s) 9910.)
9723 - Installer, Bearing
(Originally Shipped In Kit Number(s) 9720, 9967.)

COVER, ENGINE

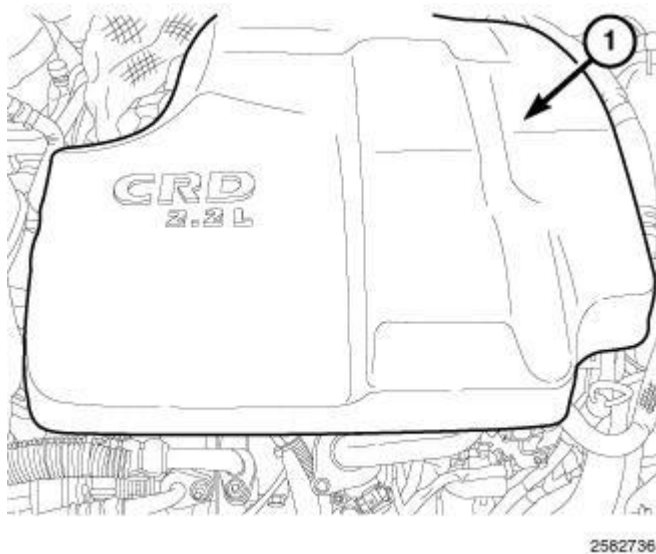
REMOVAL

REMOVAL

**Fig. 94: Engine Cover**

Courtesy of CHRYSLER GROUP, LLC

1. Lift up to release engine cover (1) from engine cover mounts and remove the engine cover from engine.

INSTALLATION**INSTALLATION****Fig. 95: Engine Cover**

Courtesy of CHRYSLER GROUP, LLC

1. Align engine cover (1) to mounting studs and firmly press down to lock in place.

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

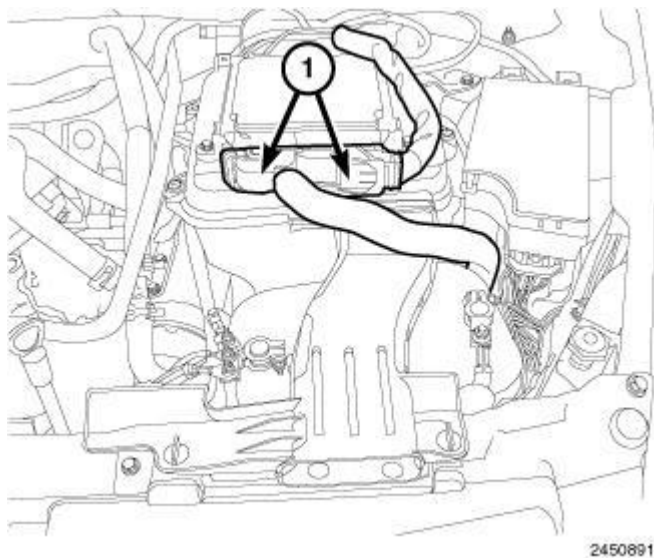


Fig. 96: PCM Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Disconnect the Powertrain Control Module (PCM) harness connectors (1).

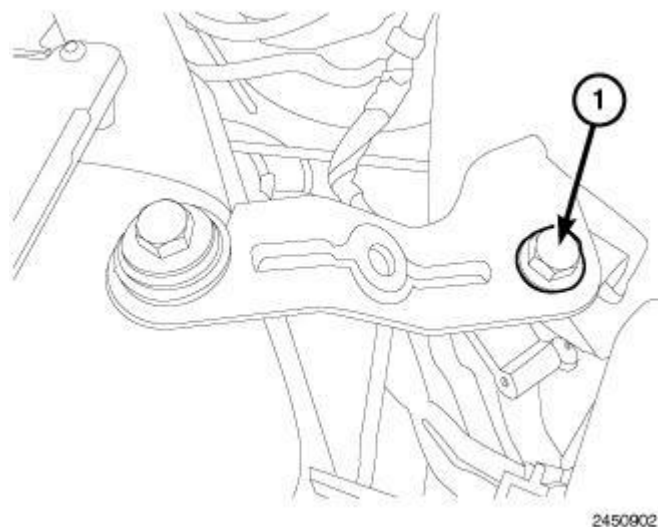


Fig. 97: Air Cleaner Support Bracket Bolt

Courtesy of CHRYSLER GROUP, LLC

3. Remove bolt (1) from the air cleaner support bracket.

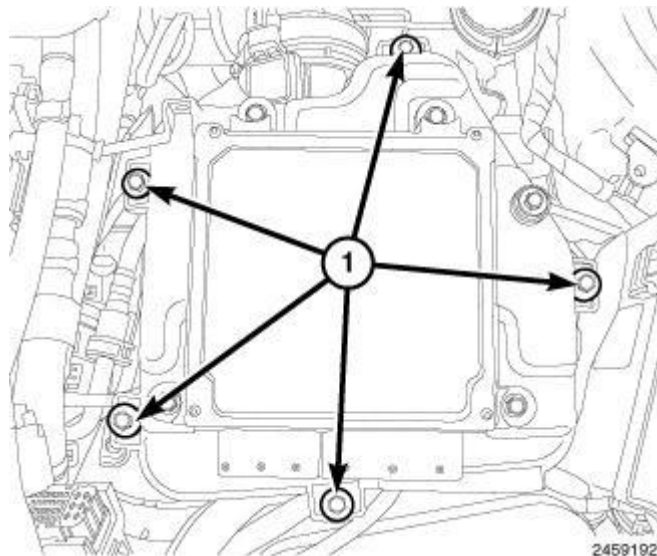


Fig. 98: Air Cleaner Cover Screws
 Courtesy of CHRYSLER GROUP, LLC

4. Loosen the five screws (1) securing the air cleaner cover and remove the air cleaner cover.

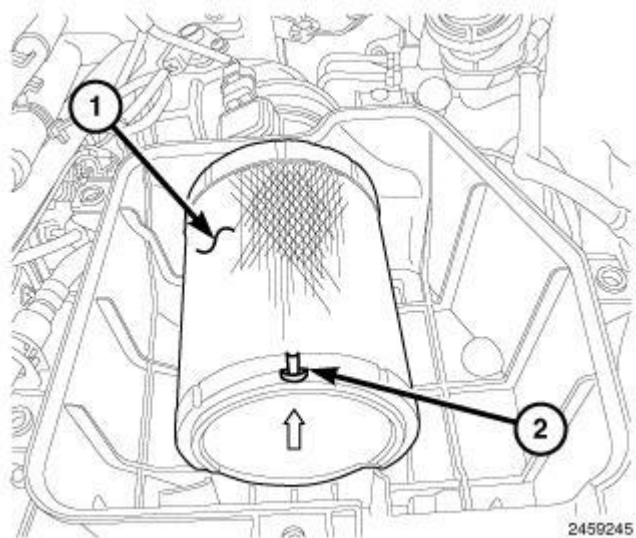


Fig. 99: Air Filter Element
 Courtesy of CHRYSLER GROUP, LLC

5. Remove air filter element (1).
6. If necessary, clean the inside of the air cleaner housing.

INSTALLATION

INSTALLATION

CAUTION: Only use Chrysler/Mopar Air Cleaner Filter. Failure to use the

recommended Air Cleaner Filter may result in MIL illumination along with the following DTC P2073, P2074, and P2279 being set.

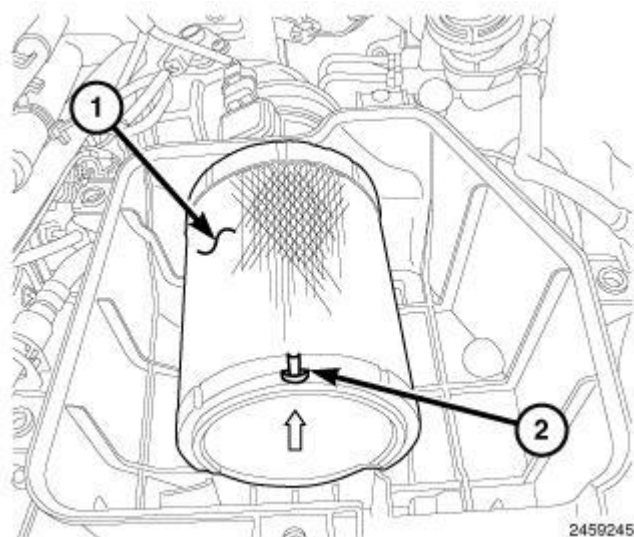


Fig. 100: Air Filter Element
Courtesy of CHRYSLER GROUP, LLC

NOTE: Proper installing and orientation for the air cleaner is with the arrows pointing up.

1. Install new air cleaner filter element (1) with the directional arrow and notch (2) pointing up.

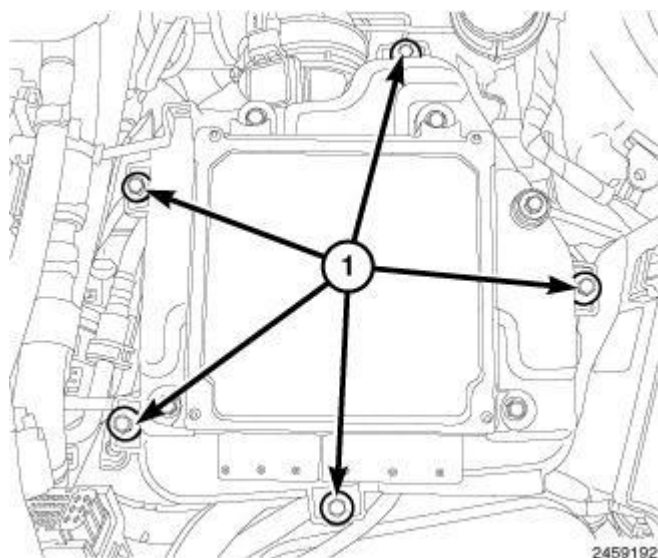


Fig. 101: Air Cleaner Cover Screws
Courtesy of CHRYSLER GROUP, LLC

2. Install the air cleaner cover and tighten the five screws (1) securing the air cleaner cover.

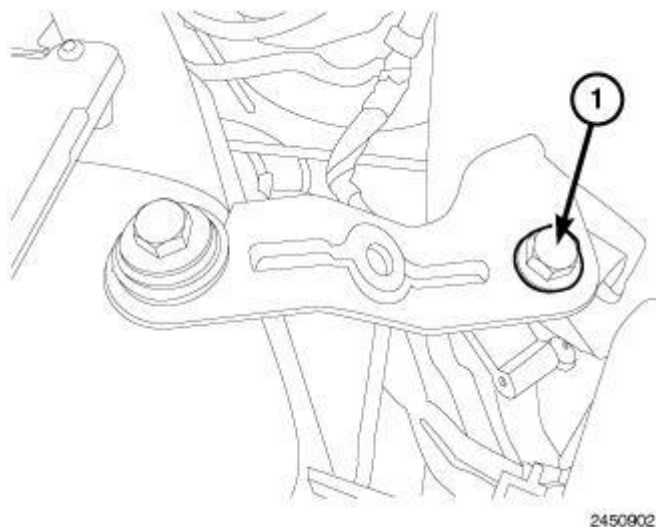


Fig. 102: Air Cleaner Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Install the air cleaner support bracket bolt (1).

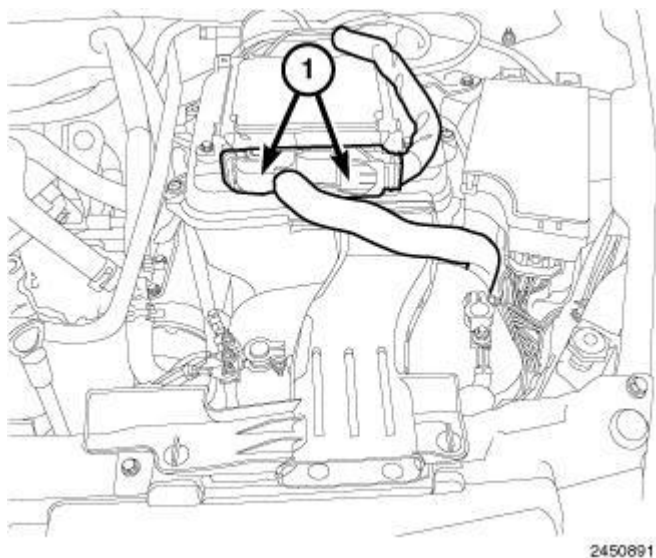


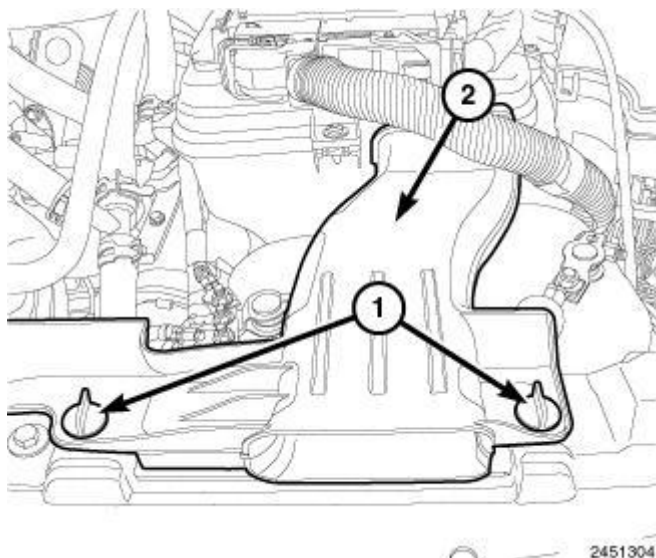
Fig. 103: PCM Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

4. Connect the Powertrain Control Module (PCM) harness connectors (1).
5. Connect the negative battery cable.

BODY, AIR CLEANER

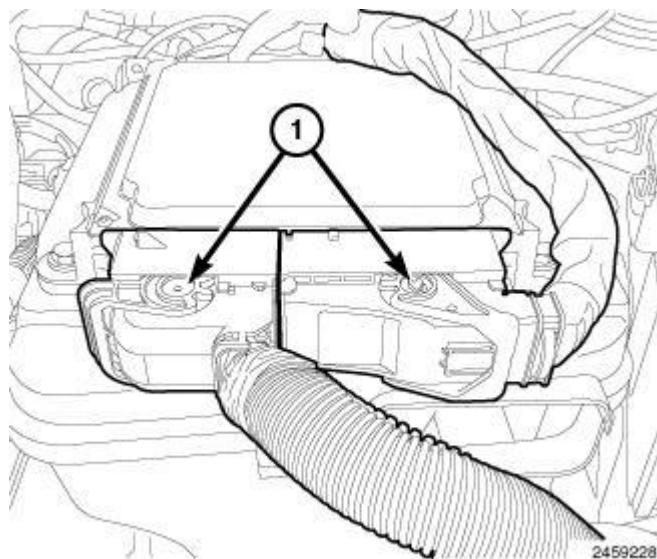
REMOVAL

REMOVAL

**Fig. 104: Air Inlet Duct & Fasteners**

Courtesy of CHRYSLER GROUP, LLC

1. Remove the engine cover.
2. Turn the fasteners (1) a quarter turn to release the lock tabs and remove the air inlet duct (2).
3. Disconnect the negative battery cable.

**Fig. 105: PCM Harness Connectors**

Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the Powertrain Control Module (PCM) harness connectors (1).

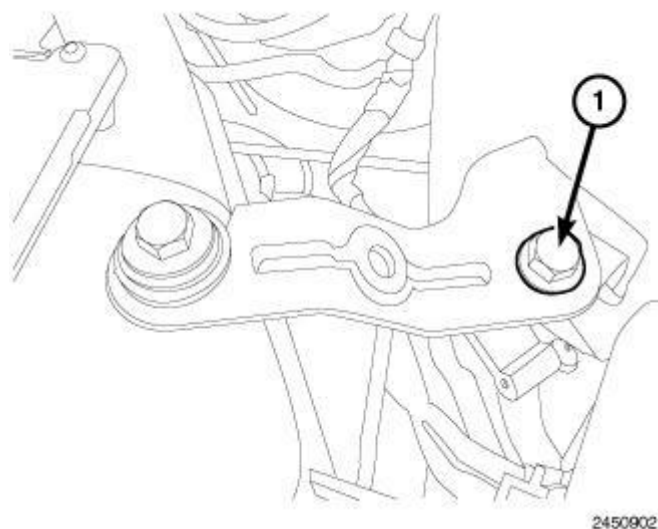


Fig. 106: Air Cleaner Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Remove the bolt from air cleaner support bracket (1).

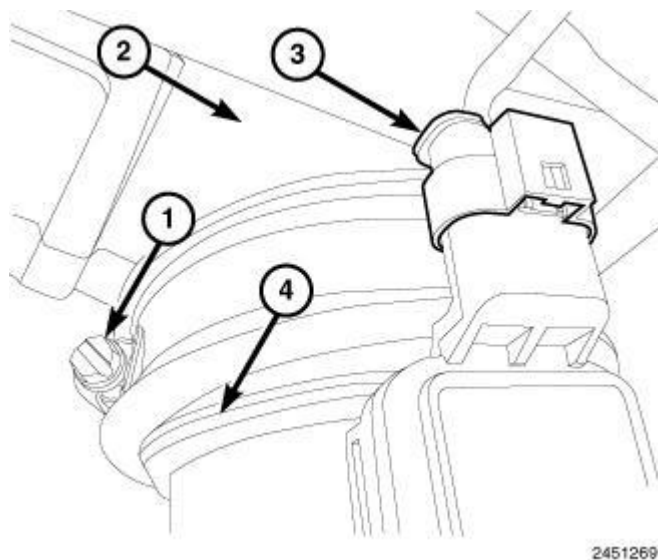


Fig. 107: Mass Air Flow Sensor, Harness Connector, Turbocharger Inlet Tube & Clamp
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the Mass Air Flow (MAF) sensor (3) harness connector.
7. Loosen the clamp (1) and disconnect the turbocharger inlet tube (2) from (MAF) sensor (4).

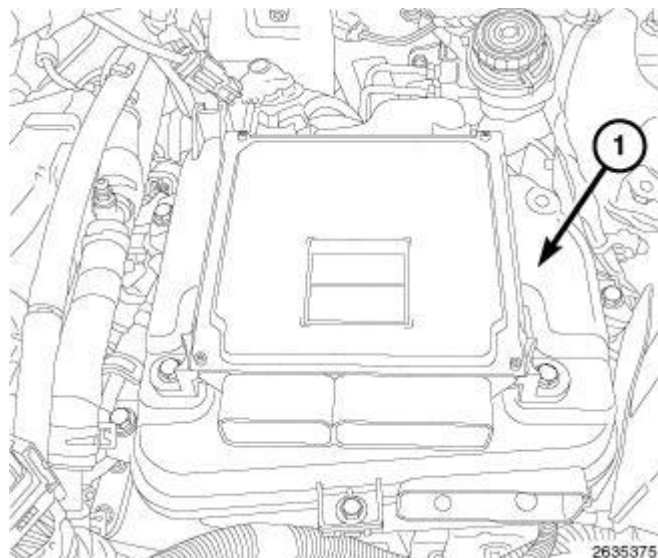


Fig. 108: Air Cleaner Housing Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Lift up and remove the air cleaner housing assembly.

TURBOCHARGER AIR INLET TUBE

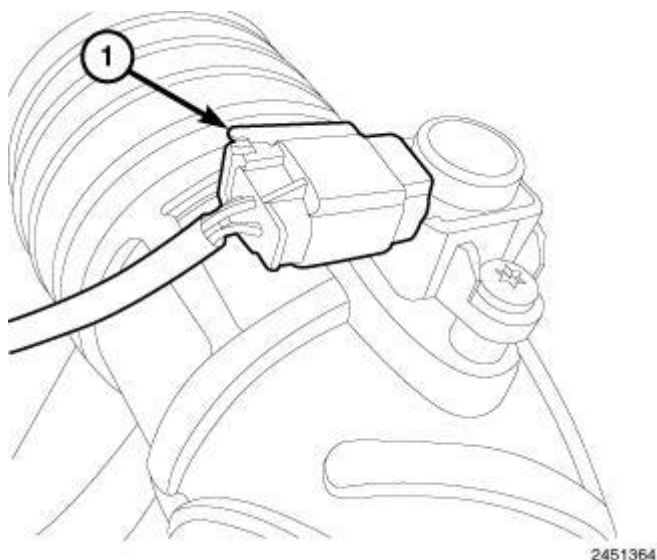


Fig. 109: Intake Air Temperature/Boost Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the intake air temperature/boost pressure sensor (1).

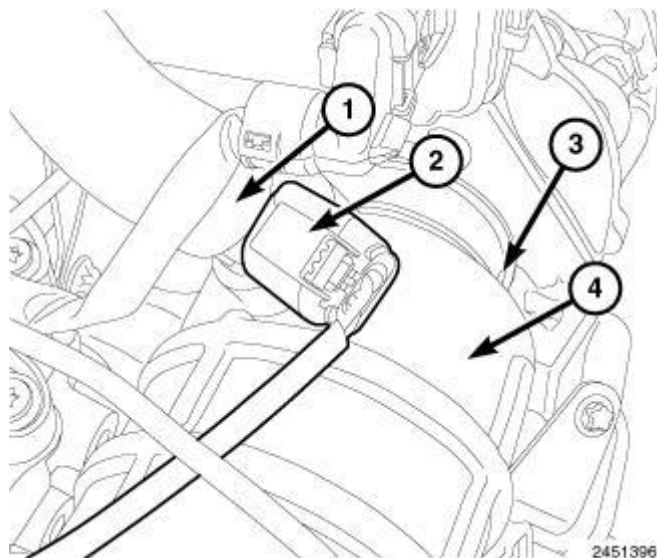


Fig. 110: CCV Hose, Heater Harness Connector, Turbocharger Inlet Tube & Clamp
 Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the Crankcase Vent (CCV) heater harness connector (2).
3. Remove the CCV hose (1) from the turbocharger inlet tube (4).
4. Loosen the clamp (3) and remove the turbocharger air inlet tube (4) from the turbocharger.

INSTALLATION

INSTALLATION

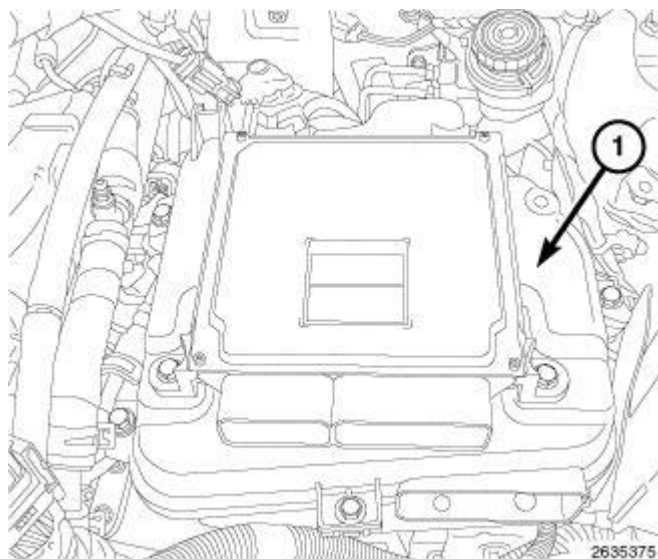


Fig. 111: Air Cleaner Housing Assembly
 Courtesy of CHRYSLER GROUP, LLC

1. Position the air cleaner housing assembly and push down to lock in place.

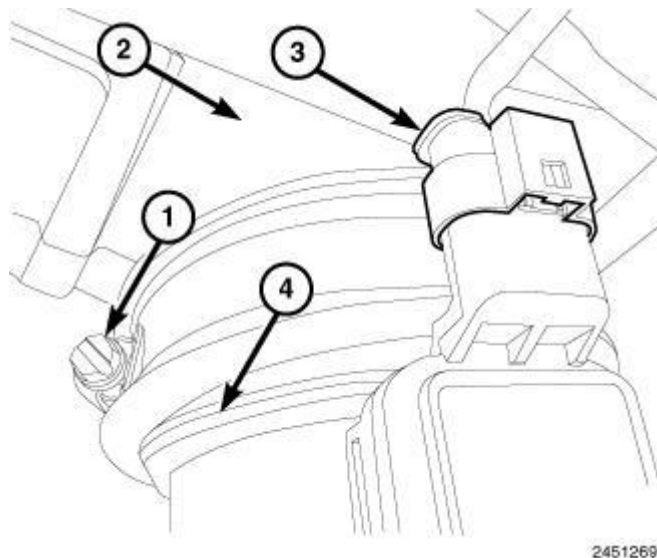


Fig. 112: Mass Air Flow Sensor, Harness Connector, Turbocharger Inlet Tube & Clamp
Courtesy of CHRYSLER GROUP, LLC

2. Connect the turbocharger inlet tube (2) to the Mass Air Flow (MAF) sensor (4) and securely tighten the clamp (1).
3. Connect the (MAF) sensor (3) harness connector.

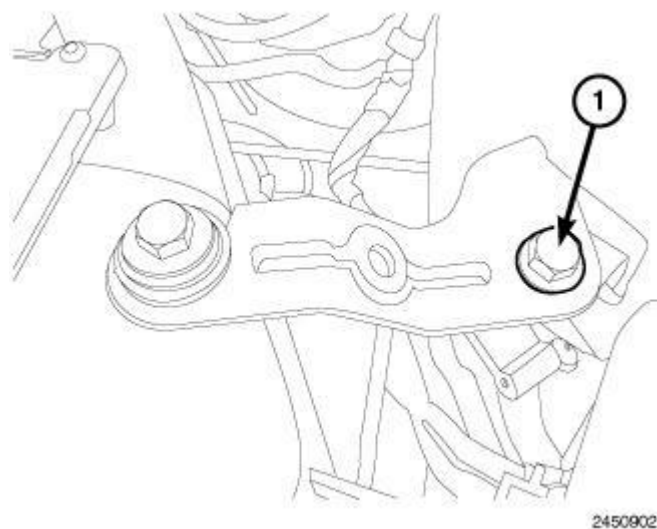


Fig. 113: Air Cleaner Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Install the air cleaner support bracket bolt (1).

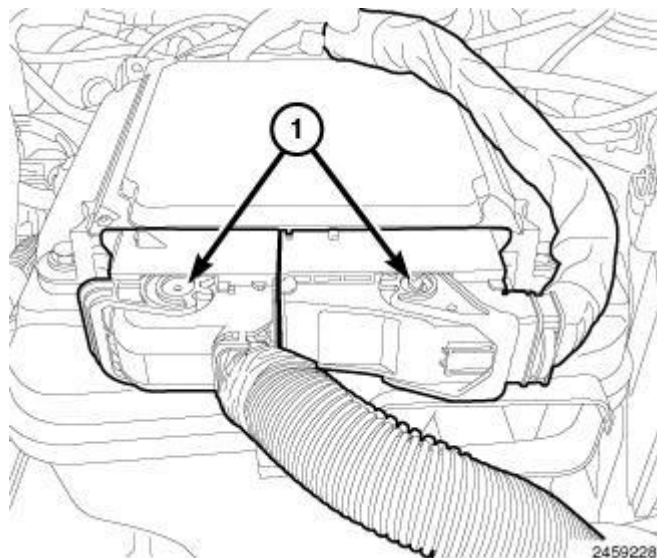


Fig. 114: PCM Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

5. Connect the Powertrain Control Module (PCM) harness connectors (1).

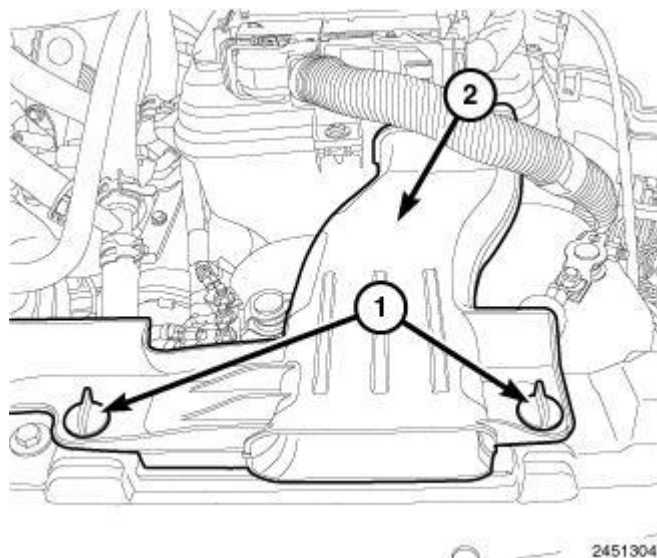


Fig. 115: Air Inlet Duct & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the negative battery cable.
7. Install the air inlet duct (2) and turn the fasteners (1) a quarter turn to lock the lock tabs.
8. Install engine cover.

Turbocharger Air Inlet Tube

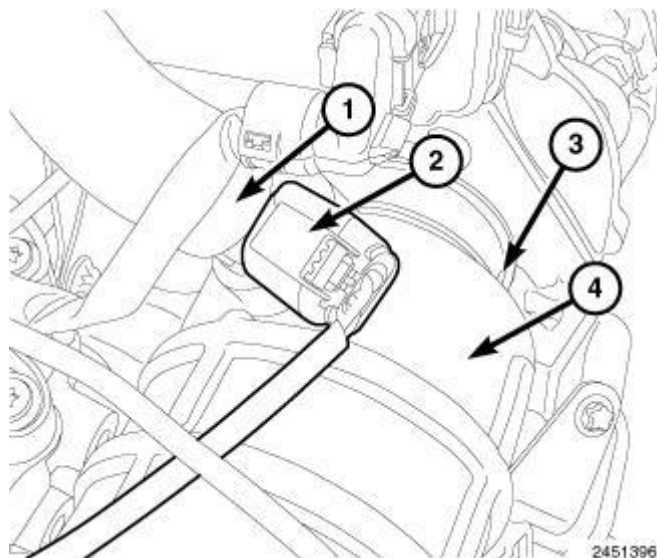


Fig. 116: CCV Hose, Heater Harness Connector, Turbocharger Inlet Tube & Clamp
 Courtesy of CHRYSLER GROUP, LLC

9. Connect turbocharger inlet hose (4) to the turbocharger and securely tighten clamp (3).
10. Connect the CCV hose (1) to the turbocharger inlet tube (4).
11. Connect the Crankcase Vent (CCV) heater harness connector (2).

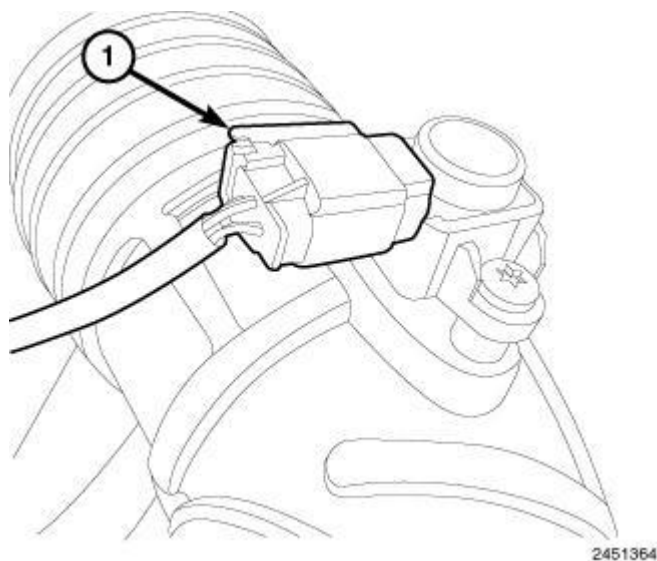
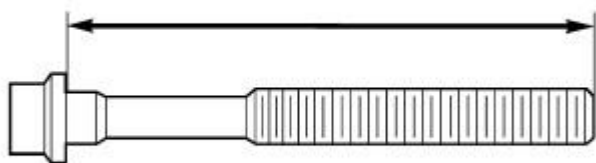


Fig. 117: Intake Air Temperature/Boost Pressure Sensor
 Courtesy of CHRYSLER GROUP, LLC

12. Connect the intake air temperature sensor (1).

CYLINDER HEAD

STANDARD PROCEDURE

CYLINDER HEAD BOLT INSPECTION

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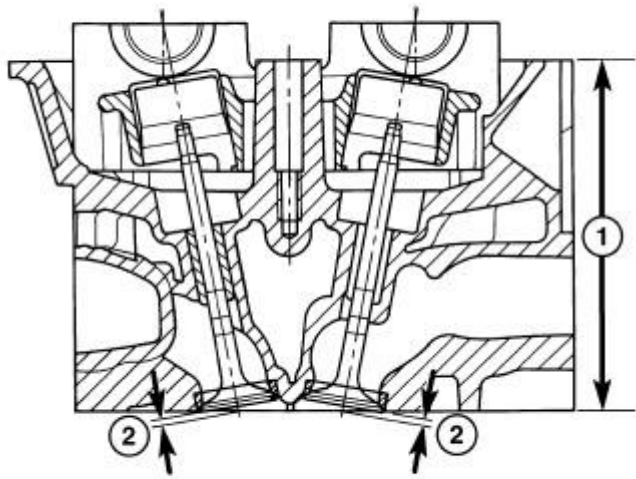
Fig. 118: Measuring Cylinder Head Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Measure cylinder head bolts between points shown in illustration.

Cylinder Head Bolts Dimensions	
Thread Diameter	M 12
Length When New	226 mm (± 0.5)
Maximum Length	227.5 mm

2. If the cylinder head bolt length is greater than the maximum allowable measurement, replace the cylinder head bolts.

MEASURE CYLINDER HEAD SURFACE



80e462fd

Fig. 119: Cylinder Head Measurements
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER HEAD HEIGHT

2 - VALVE SETBACK

NOTE: Only resurface cylinder head contact surface if porous or damaged. IT IS NOT necessary to rework minor variations in flatness in the longitudinal direction.

1. Disconnect negative battery cable.
2. Remove cylinder head. Refer to CYLINDER HEAD, REMOVAL.
3. Remove valves.
4. Inspect cylinder head contact surface for flatness, porous and damage.
5. Using a straight edge, measure cylinder head and cylinder block flatness.
6. Measure cylinder head height at point (1) indicated and retain reading.

NOTE: The camshaft housing Must Not be machined. Basic bore of the camshaft bearings will be altered.

7. Machine cylinder head contact surface, if necessary.
8. Measure cylinder head height (1) at point indicated, record stock removal.
9. Measure valve setback at points (2) indicated.

NOTE: If measurement is less than dimension "2" no further correct valve clearance

compensation is possible; replace valve seat ring or cylinder head if measurement is greater than specification.

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD SPECIFICATIONS

Description	Specification
Height of Cylinder Head (1), With Out Camshaft Housing	134.35 mm to 134.65 mm
Valve Set Back (2) With New Valves and New Valve Seat Rings	Exhaust Valve: 7 mm - 1.1 mm Intake Valve: 1.0 mm - 1.4 mm
Wear Limit After Machining	134.15 mm

REMOVAL

REMOVAL

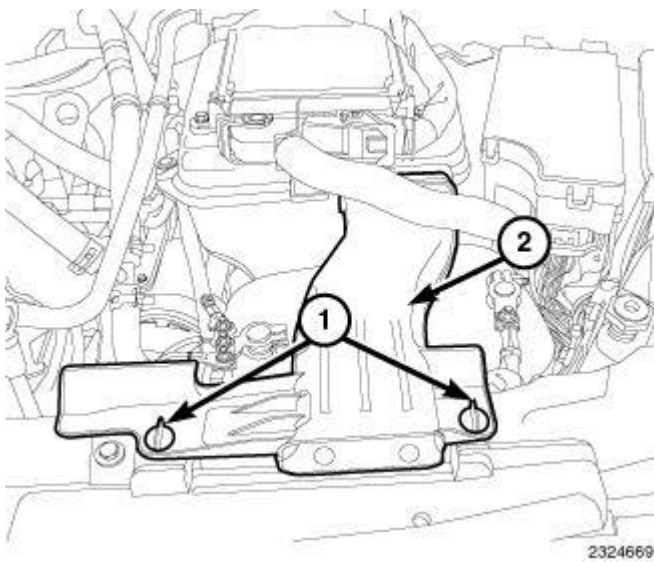


Fig. 120: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove the engine cover.
4. Remove air cleaner housing assembly. Refer to **BODY, AIR CLEANER, REMOVAL**.
5. Remove air inlet tube to the turbocharger.
6. Remove the belly pan.
7. Drain cooling system. Refer to **STANDARD PROCEDURE** .

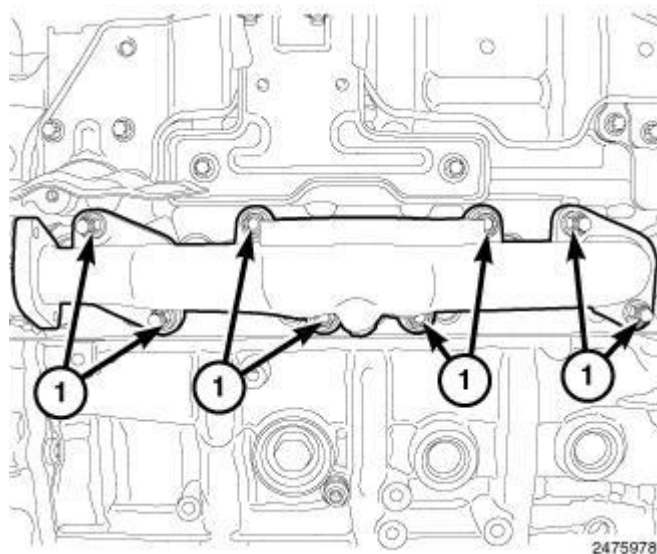


Fig. 121: Exhaust Manifold Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

8. Remove exhaust manifold. Refer to **MANIFOLD, EXHAUST, REMOVAL**.
9. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.

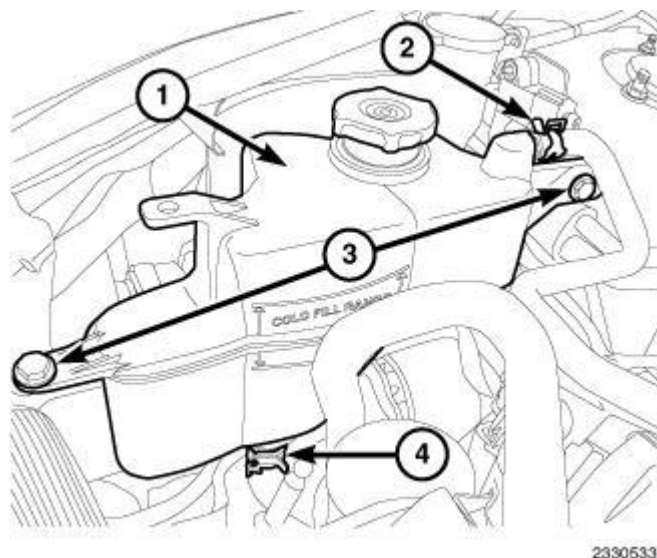
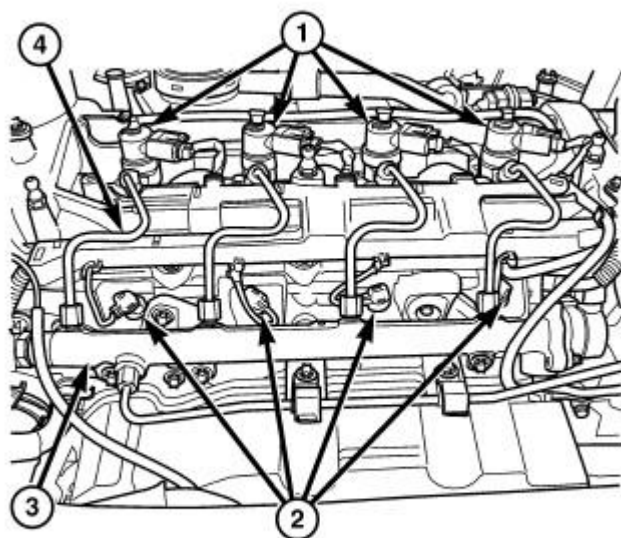


Fig. 122: Coolant Recovery Reservoir, Clamps & Bolts
Courtesy of CHRYSLER GROUP, LLC

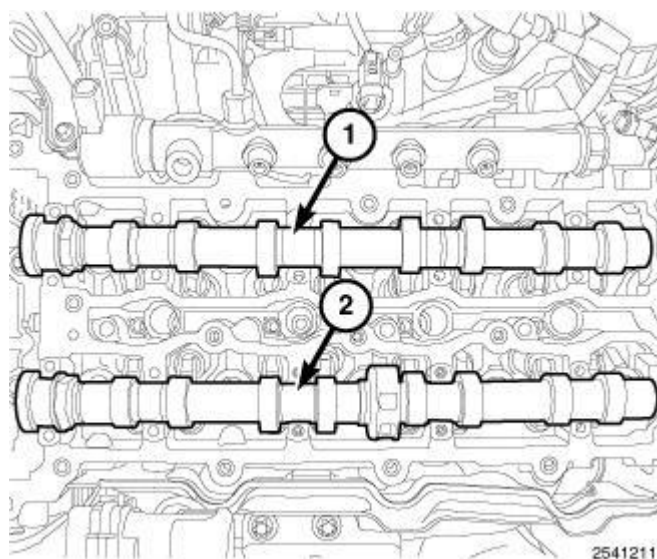
10. Disconnect the coolant hoses (2 and 4).
11. Remove the bolts (3) and the coolant recovery reservoir (1).



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Fig. 123: Glow Plugs, Harness Connectors & Fuel Rails
 Courtesy of CHRYSLER GROUP, LLC

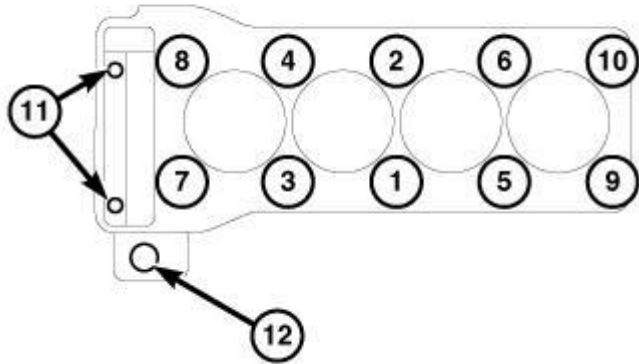
12. Disconnect the glow plug (2) harness connectors.



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Fig. 124: Camshafts
 Courtesy of CHRYSLER GROUP, LLC

13. Remove the camshafts. Refer to CAMSHAFT, ENGINE, REMOVAL.



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Fig. 125: Cylinder Head Bolt Removal Sequence
Courtesy of CHRYSLER GROUP, LLC

14. Remove the rocker arms from cylinder head.
15. Remove the hydraulic lifters from cylinder head.
16. Remove cylinder head bolts in reverse order of the tightening sequence and inspect bolts. Refer to **CYLINDER HEAD, STANDARD PROCEDURE**.
17. Remove cylinder head assembly from engine.
18. Remove and discard cylinder head gasket.
19. Disassemble cylinder head assembly as necessary for service.

CLEANING

CLEANING

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

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

Remove all gasket material from cylinder head and block. Refer to **Engine - Standard Procedure**. Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

INSTALLATION

INSTALLATION

WARNING: NO FIRE, OPEN FLAMES OR SMOKING. SERVICE VEHICLES IN WELL

VENTILATED AREAS. RISK OF POISONING FROM INHALING OR SWALLOWING FUEL. RISK OF INJURY FROM SKIN AND EYE CONTACT WITH FUEL. WEAR PROTECTIVE CLOTHING.

- NOTE:** Thoroughly clean all mating surfaces with appropriate solvents and blow out bolt holes, to assure that no grease or oil is present during reassembly.
- NOTE:** If piston or connecting rods have been replaced, measure piston projection.
- NOTE:** Check facing on cylinder head contact surface.

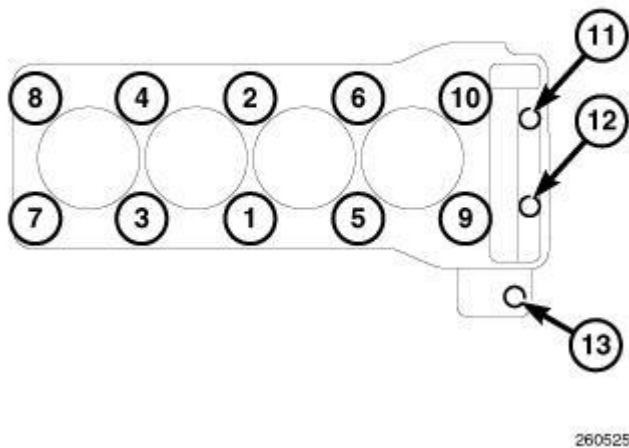


Fig. 126: Cylinder Head Bolts Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Position the cylinder head gasket properly on engine using the dowel pins as guide.

NOTE: Inspect all cylinder head bolts for defects and stretching before installation. Refer to CYLINDER HEAD, STANDARD PROCEDURE.

2. Install cylinder head assembly on engine block.

NOTE: The M12 cylinder head bolts must be tightened in 5 stages.

NOTE: M12 bolts are (1 - 10) and M8 bolts are (11 - 13).

3. Install M12 cylinder head bolts. Tighten bolts in numeric order starting with number 1 to 10 N.m (89 in. lbs.).
4. Install M8 cylinder head-to-timing chain cover bolts. Tighten bolts (11, 12, and 13) to 20 N.m (177 in. lbs.).

5. Tighten M12 cylinder head bolts in numeric order starting with number 1 to:
 - 50 N.m (37 ft. lbs.).
 - Plus an additional 90 °
 - Plus an additional 90 °
 - Plus an additional 90 °
 - Plus an additional 90 °
6. Install the hydraulic lifters into cylinder head.
7. Install the rocker arms into cylinder head.

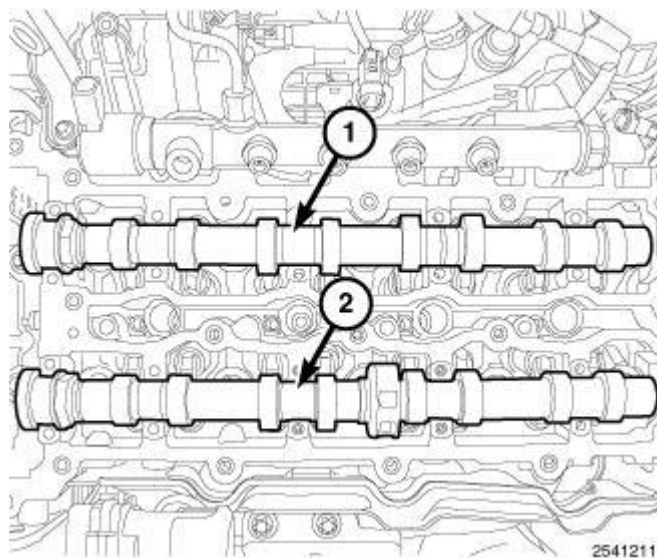
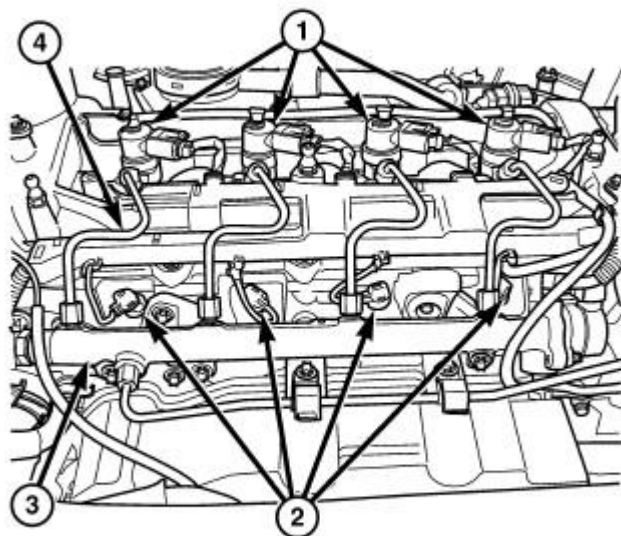


Fig. 127: Camshafts

Courtesy of CHRYSLER GROUP, LLC

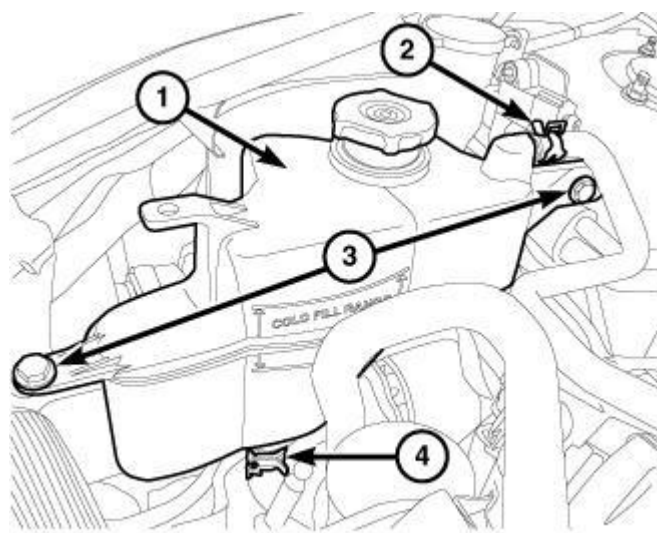
8. Install the camshafts. Refer to **CAMSHAFT, ENGINE, INSTALLATION.**



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Fig. 128: Glow Plugs, Harness Connectors & Fuel Rails
 Courtesy of CHRYSLER GROUP, LLC

9. Connect the glow plug (2) harness connectors.



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Fig. 129: Coolant Recovery Reservoir, Clamps & Bolts
 Courtesy of CHRYSLER GROUP, LLC

10. Install the coolant recovery reservoir (1). Tighten bolts (3) to 4 N.m (35 in. lbs.).

11. Connect the coolant hoses (2 and 4).
12. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION**.

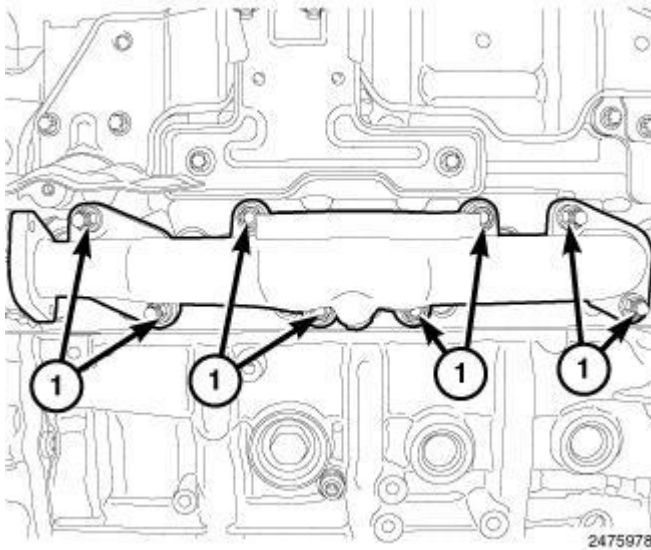


Fig. 130: Exhaust Manifold Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

13. Install the exhaust manifold. Refer to **MANIFOLD, EXHAUST, INSTALLATION**.

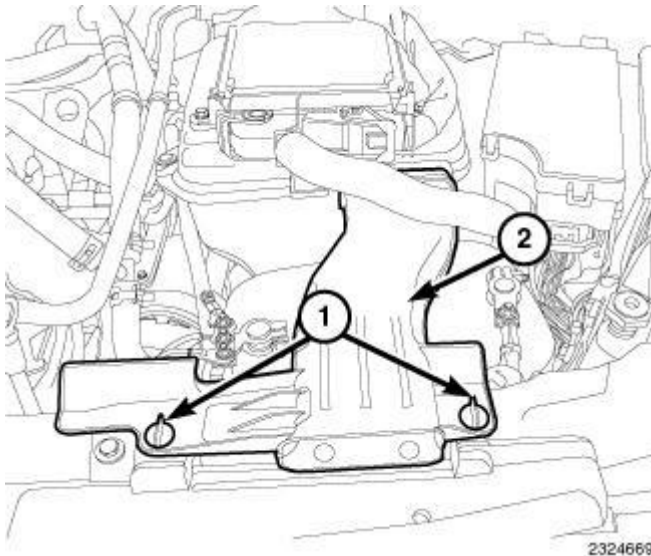


Fig. 131: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

14. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
15. Install the belly pan.
16. Install the air inlet tube to the turbocharger.
17. Install the air cleaner housing assembly. Refer to **BODY, AIR CLEANER, INSTALLATION**.

18. Connect the negative battery cable.
19. Start engine and check for leaks.
20. Install engine cover.
21. Install the air inlet duct (2) and lock the quarter turn lock tabs (1).

CAMSHAFT, ENGINE

STANDARD PROCEDURE

STANDARD PROCEDURE - CHECKING CAMSHAFT POSITION

1. Disconnect the negative battery cable.
2. Remove engine cover.
3. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.
4. Clean injectors and recesses. Refer to **Fuel System/Fuel Injection/INJECTOR(S), Fuel - Standard Procedure**.

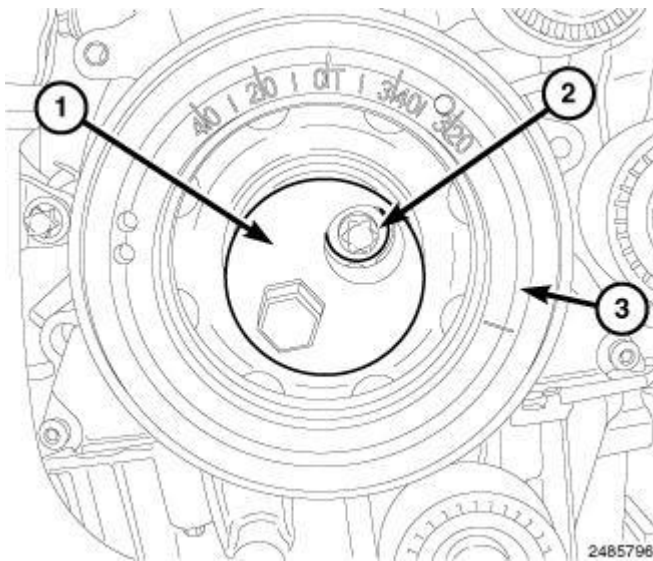


Fig. 132: Vibration Damper Holder, Bolts & Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

NOTE: Rotate engine at crankshaft only. DO NOT crank engine at the camshaft and DO NOT rotate the engine backward.

5. Using Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), to rotate engine.

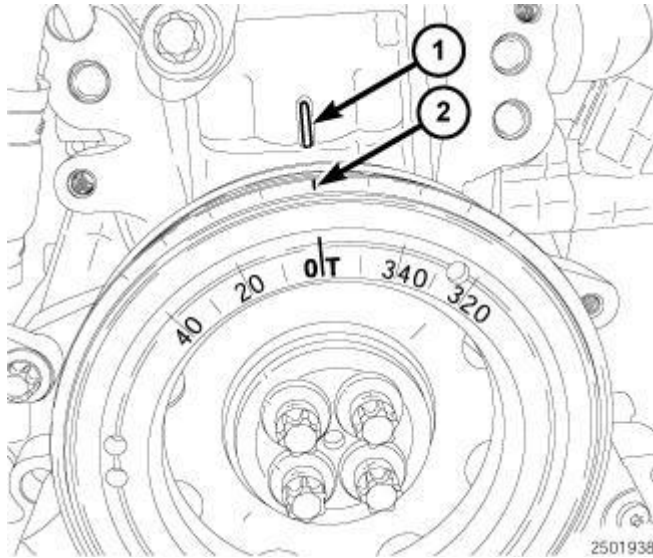


Fig. 133: Positioning Cylinder No. 1 Piston To Ignition TDC
Courtesy of CHRYSLER GROUP, LLC

6. Rotate engine to position cylinder No. 1 piston to ignition TDC.

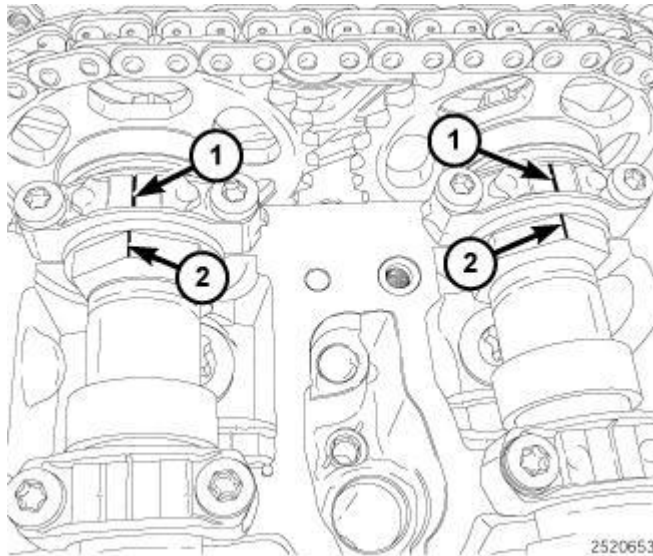


Fig. 134: Ensuring Camshaft Mark Is Aligned With Bearing Cap Mark
Courtesy of CHRYSLER GROUP, LLC

7. Verify the alignment of the camshaft mark (2) is aligned with the bearing cap mark (1) is at (TDC).
8. Install cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION.**
9. Connect the negative battery cable.
10. Start the engine and inspect for leaks.
11. Install engine cover.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove engine cover.
3. Remove the belly pan.
4. Remove the upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

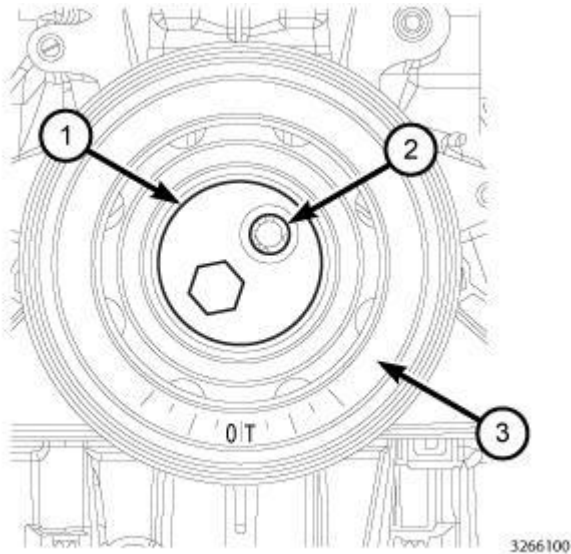


Fig. 135: Vibration Damper Holder Tool, Vibration Damper & Bolts
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Rotate engine at crankshaft only. DO NOT crank engine at the camshaft and DO NOT rotate the engine backward.

5. Using Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), to rotate engine.

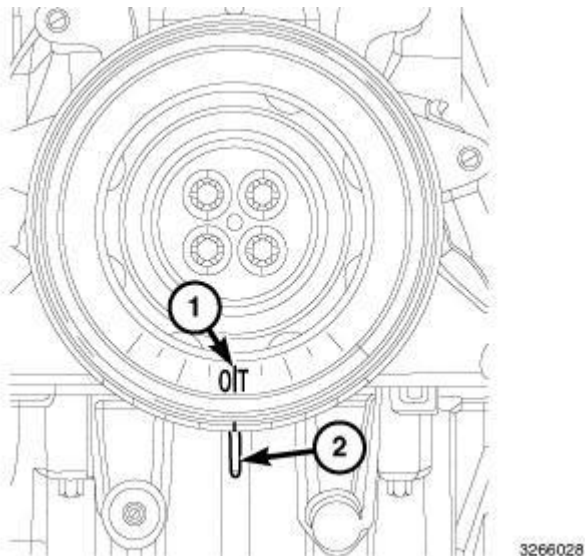
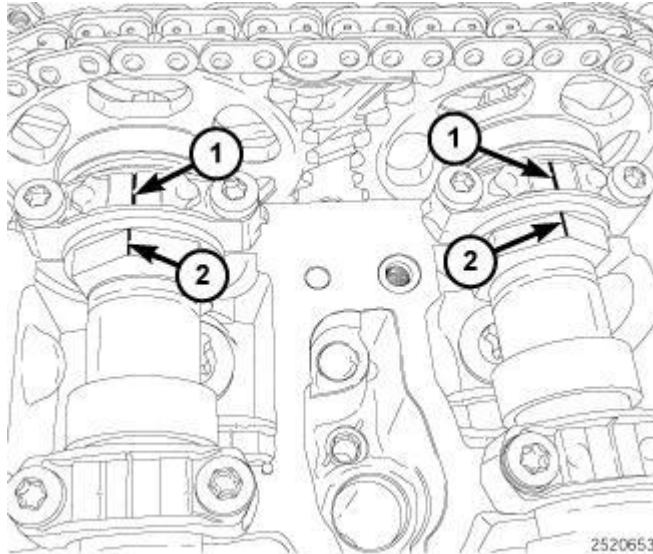


Fig. 136: Crankshaft Alignment Timing Marks

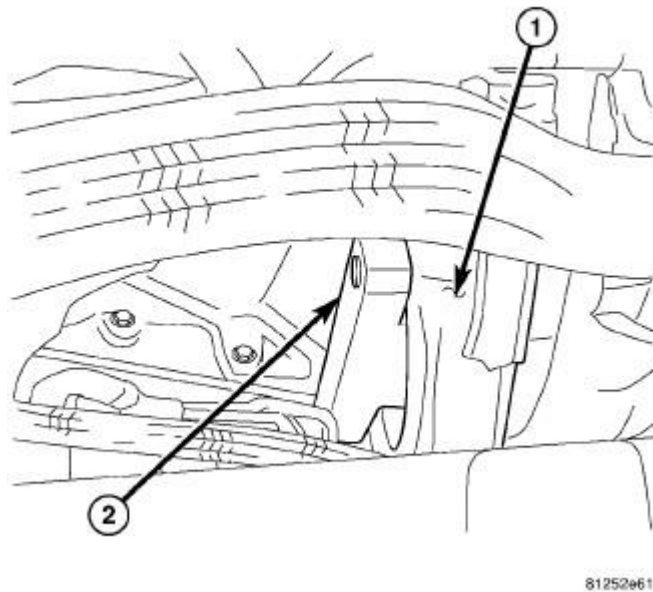
Courtesy of CHRYSLER GROUP, LLC

6. Rotate the crankshaft to align the timing mark (1) with mark (2) to set cylinder No. 1 at Top Dead Center (TDC).

**Fig. 137: Ensuring Camshaft Mark Is Aligned With Bearing Cap Mark**

Courtesy of CHRYSLER GROUP, LLC

7. Verify the alignment of the camshaft mark (2) is aligned with the bearing cap mark (1) is at (TDC).

**Fig. 138: Flywheel/Clutch Plate Lock**

Courtesy of CHRYSLER GROUP, LLC

8. Remove the starter. Refer to **STARTER, REMOVAL**.
9. Install the Flywheel/Clutch Plate Lock (special tool #10232, Lock, Flywheel/Clutch Plate) (2).

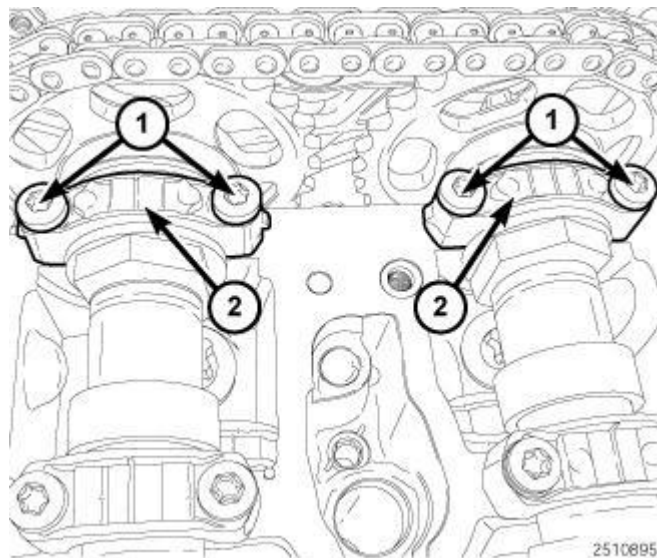


Fig. 139: No. 1 Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the number one camshaft bearing caps (2).

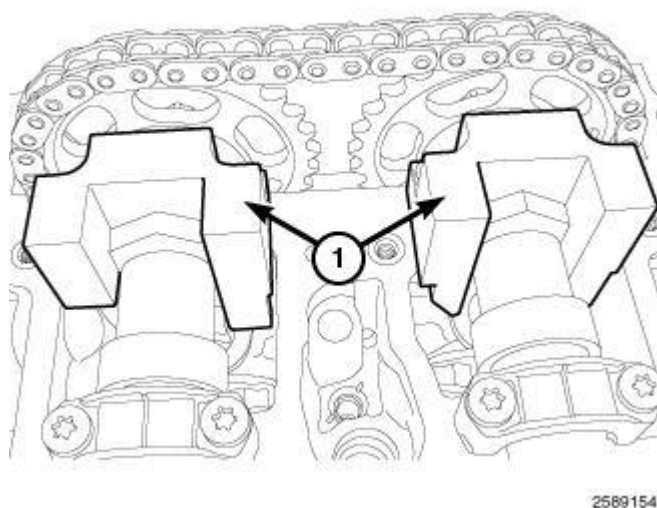


Fig. 140: Camshaft Lock Tools
Courtesy of CHRYSLER GROUP, LLC

11. Install the Camshaft Lock Tools (1) (special tool #10234, Lock, Camshaft) and tighten bolts finger tight.

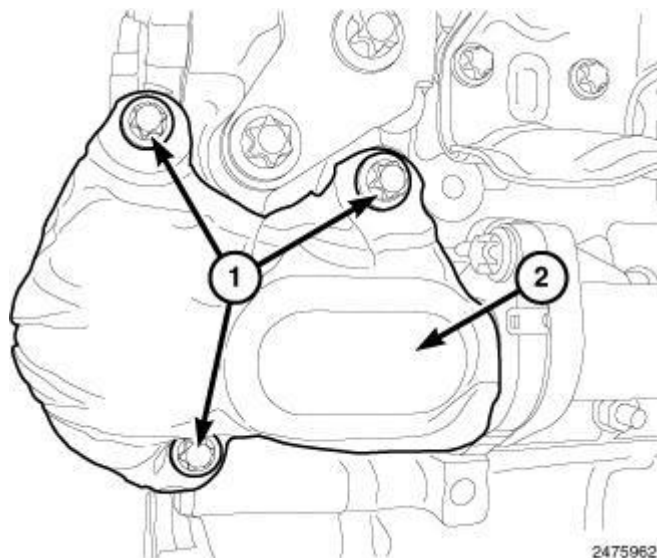


Fig. 141: EGR Pipe Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (1) and the EGR pipe heat shield (2).

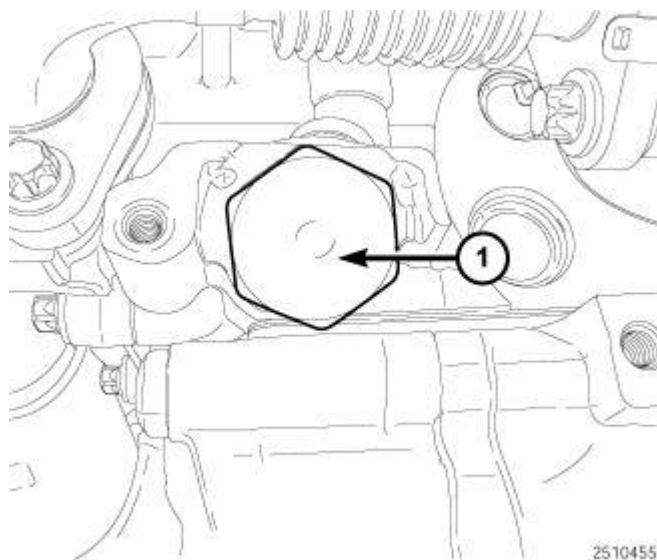
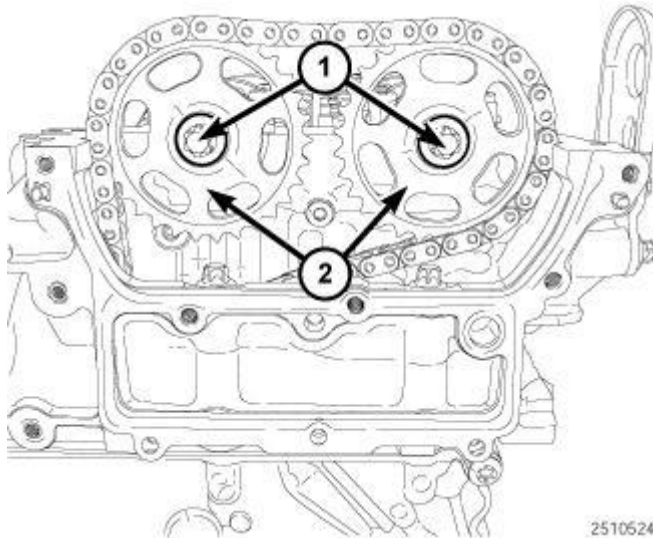


Fig. 142: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

13. Remove timing chain tensioner (1).

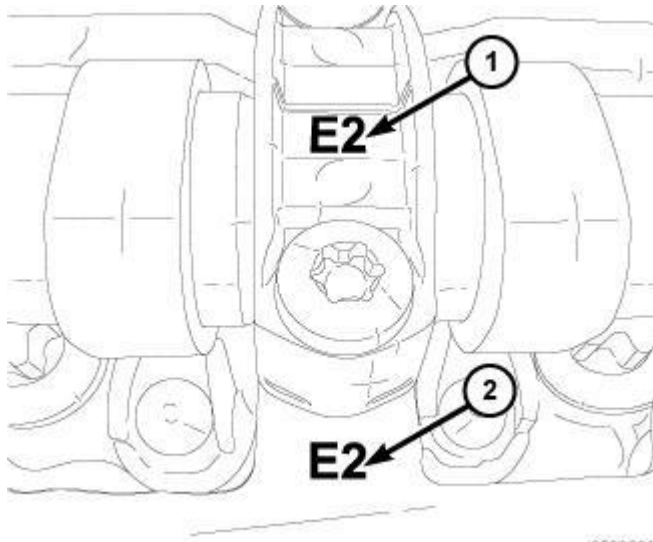


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Fig. 143: Camshaft Sprockets & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Camshaft sprocket bolts (1) are left hand thread.

14. Remove bolts (1) and the camshaft sprockets (2) and secure the timing chain from falling down.



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Fig. 144: Mark And Number Camshaft Caps & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

NOTE: Intake camshaft "E" shown in illustration exhaust similar.

NOTE: Verify that the intake and exhaust camshaft caps (1) along with cylinder head (2) are marked. "A" exhaust and "E" intake and are numbered.

15. If there are no mark on the camshafts bearing caps, mark each bearing cap to its location.
16. Remove the intake and exhaust camshaft bearing caps in the following order (E 1, E 3, E 5) and (A 1, A 3, A 5).
17. Remove the intake and exhaust camshaft bearing caps the following order (E 2, E 4) and (A 2, A 4) in half turn increments.

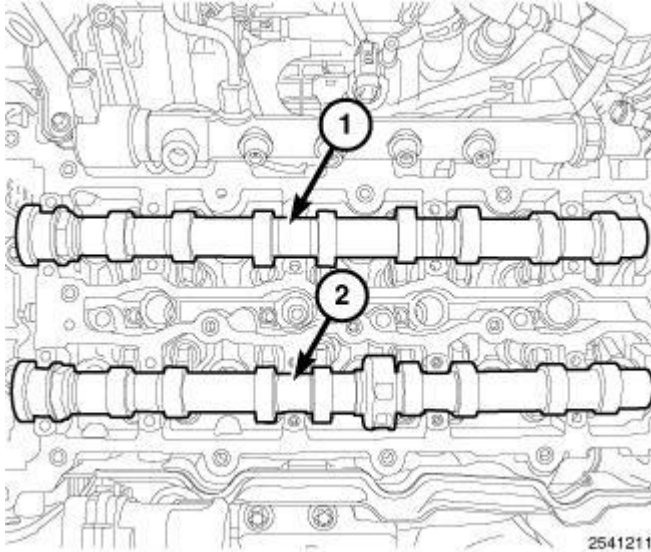


Fig. 145: Camshafts
Courtesy of CHRYSLER GROUP, LLC

18. Remove the intake (1) and exhaust (2) camshafts.

NOTE: **Number the location of each rocker arm.**

19. Remove the rocker arm assembly from the cylinder head.

INSTALLATION

INSTALLATION

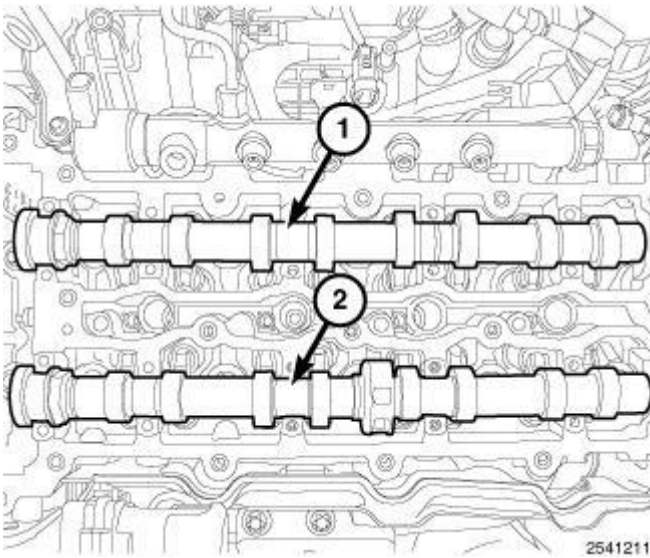


Fig. 146: Camshafts

Courtesy of CHRYSLER GROUP, LLC

CAUTION: The camshafts are sensitive to fracturing. Ensure they are installed free of stress.

1. Inspect rocker arms for wear or damage and replace as necessary.
2. Inspect the hydraulic lifters for wear or damage and replace as necessary.
3. Install the intake (1) and exhaust (2) camshafts.

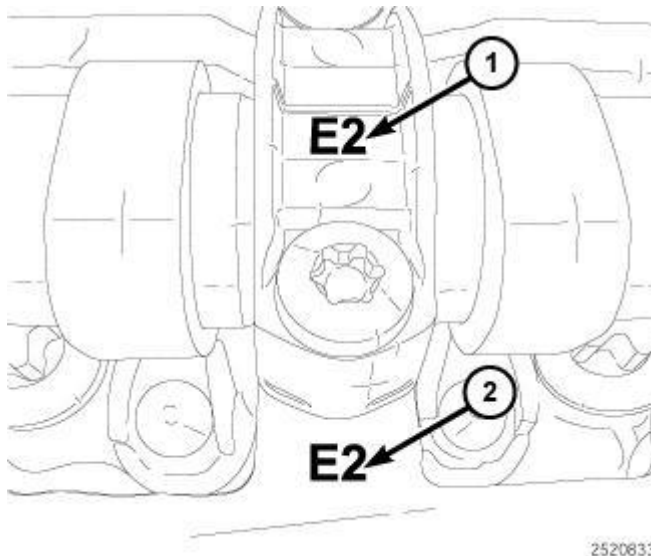


Fig. 147: Mark And Number Camshaft Caps & Cylinder Head

Courtesy of CHRYSLER GROUP, LLC

NOTE: Pay attention to markings on camshaft bearing caps (1) to cylinder head (2).

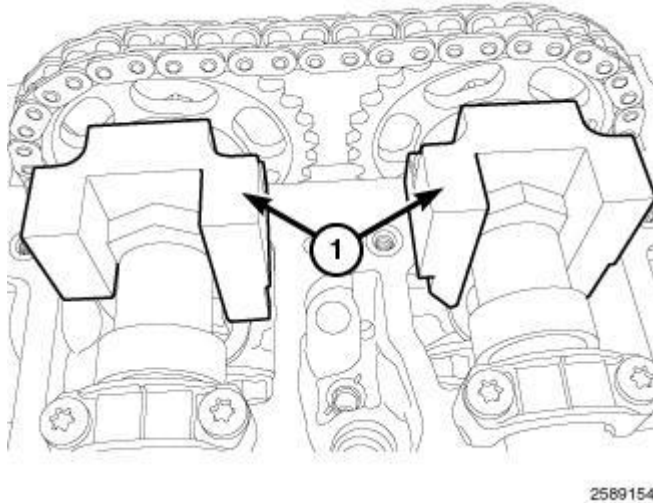


Fig. 148: Camshaft Lock Tools
 Courtesy of CHRYSLER GROUP, LLC

4. Using new bolts, install camshaft bearing caps the following order (A 2, A 4) and (E 2, E 4) and tighten bolts finger tight.
5. Using new bolts, install and the remaining intake and exhaust camshaft bearing caps in the following order (E 3, E 5) and (A 3, A 5). Tighten bolts finger tight.
6. Using the old bolts, install the Camshaft Lock Tool (1) (special tool #10234, Lock, Camshaft).
7. Tighten the camshaft bolts to:
 - 5 N.m (44 in. lbs.).
 - 9 N.m (80 in. lbs.).

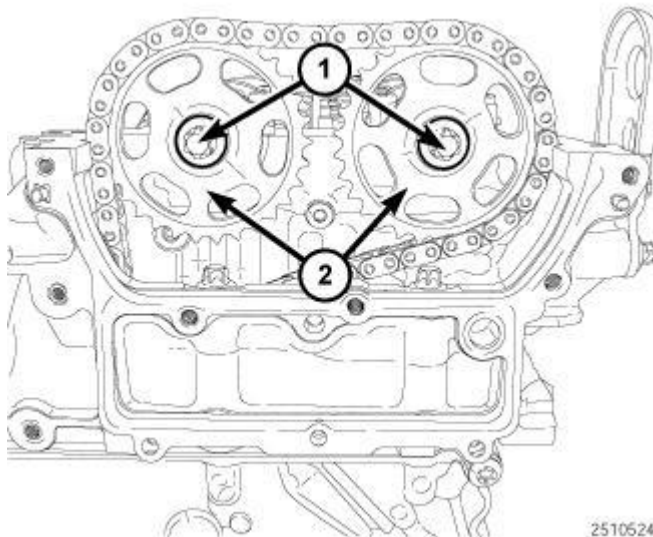


Fig. 149: Camshaft Sprockets & Bolts
 Courtesy of CHRYSLER GROUP, LLC

8. Position the timing chain unto the camshaft sprockets (2) and install onto camshaft. Using new bolts, tighten the camshaft bolts (1) finger tight.

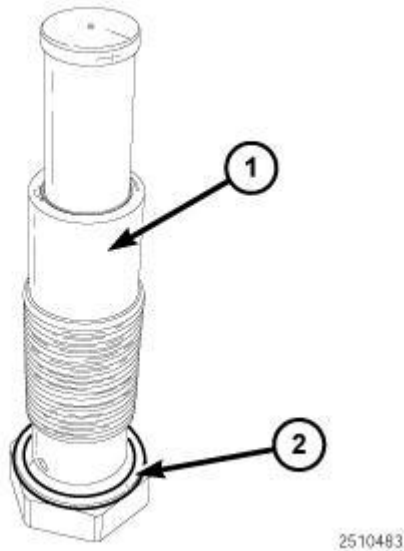


Fig. 150: Sealing Washer & Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

9. Install a new sealing washer (2) onto the timing chain tensioner (1).

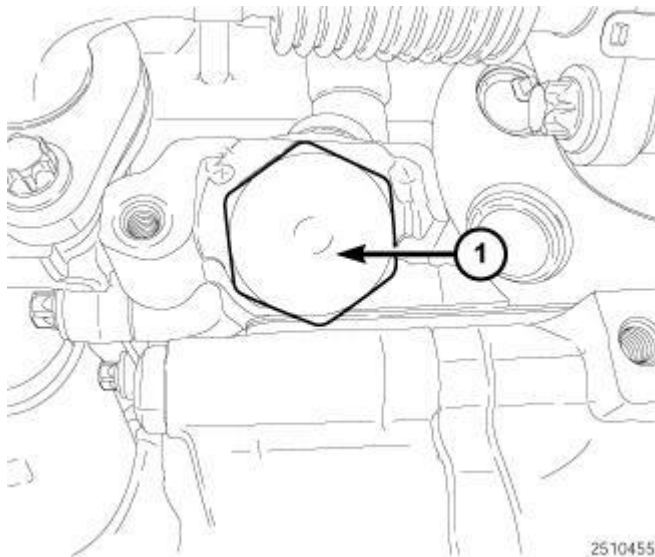


Fig. 151: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

10. Install timing chain tensioner (1) and tighten to 80 N.m (59 ft. lbs.).
11. Tighten the camshaft bolts (1) to 55 N.m (41 ft. lbs.) plus an additional 90°.
12. Install the upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION.**

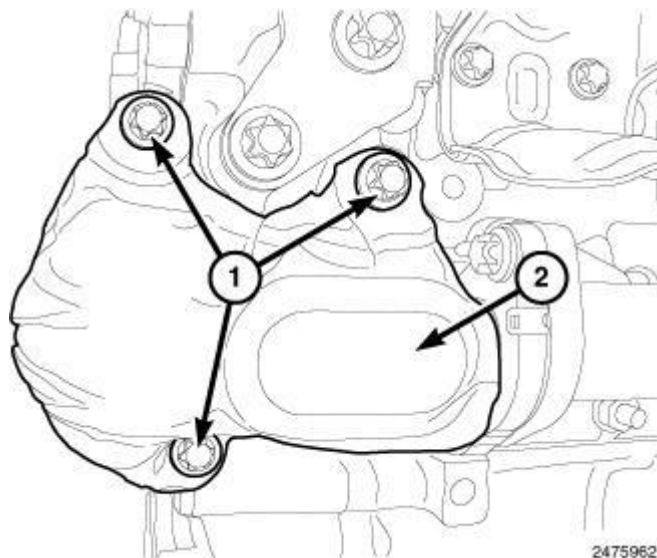


Fig. 152: EGR Pipe Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Install the EGR pipe heat shield. Tighten bolts to 9 N.m (80 in. lbs.).

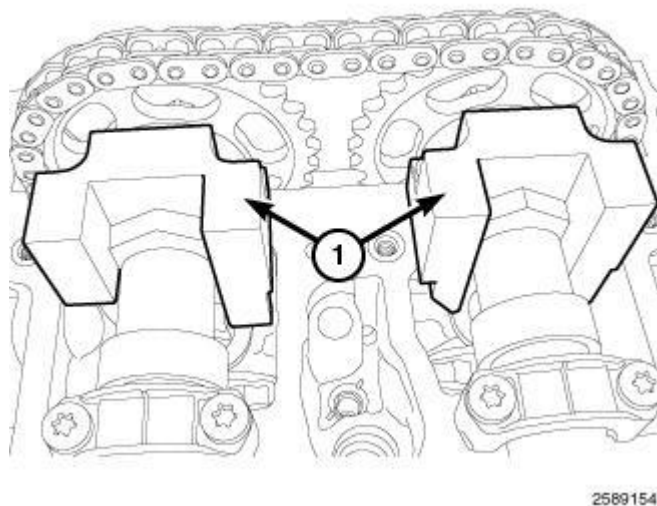


Fig. 153: Camshaft Lock Tools
Courtesy of CHRYSLER GROUP, LLC

14. Remove bolts and the Camshaft Lock Tool (1) (special tool #10234, Lock, Camshaft).

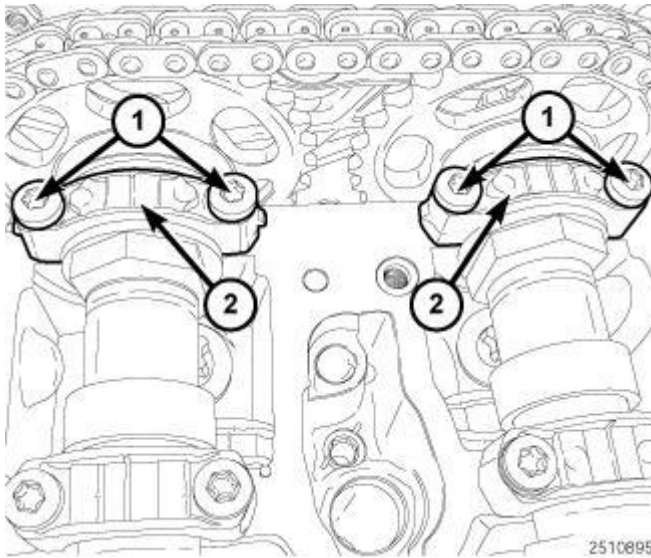


Fig. 154: No. 1 Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Using new bolts (1), install the camshaft bearing caps (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

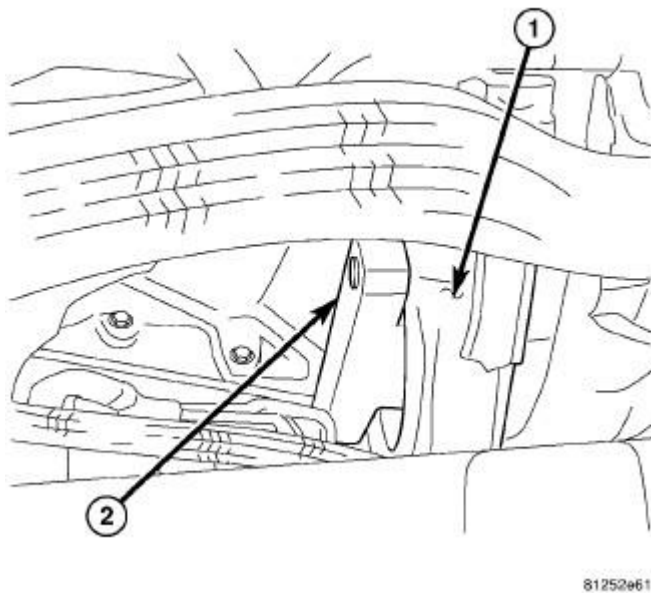


Fig. 155: Flywheel/Clutch Plate Lock
Courtesy of CHRYSLER GROUP, LLC

16. Remove the Flywheel/Clutch Plate Lock (special tool #10232, Lock, Flywheel/Clutch Plate) (2).
17. Install the starter. Refer to **STARTER, INSTALLATION**.
18. Connect negative battery cable.
19. Start engine and inspect for leaks.

20. Install the belly pan.

21. Install engine cover.

COVER(S), CYLINDER HEAD

REMOVAL

REMOVAL

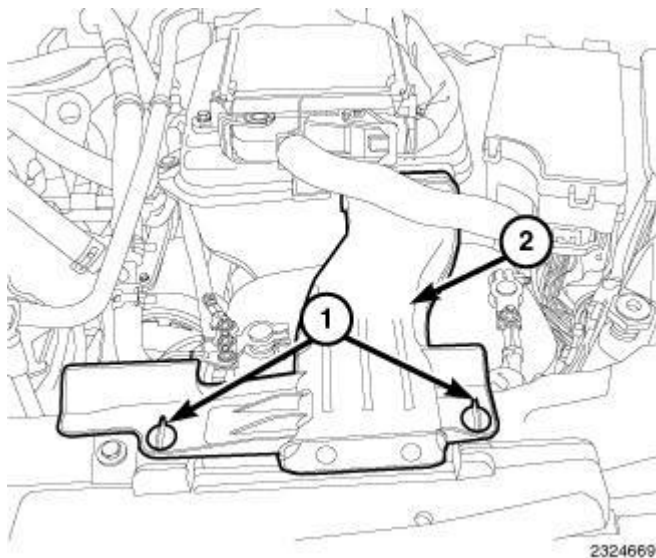
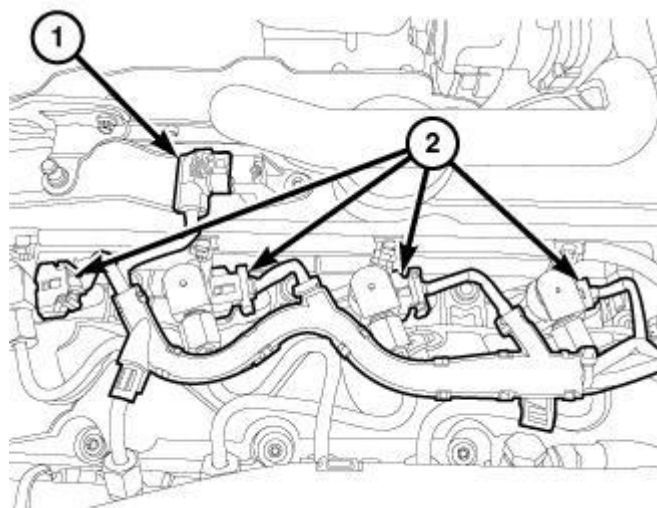


Fig. 156: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove engine cover.



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Fig. 157: Camshaft Position Sensor (CMP) Harness Connector & Fuel Injector Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the Camshaft Position Sensor (CMP) (1) harness connector.
5. Disconnect the fuel injector harness connector (2).
6. Lift up on fuel injector wire harness and position aside.

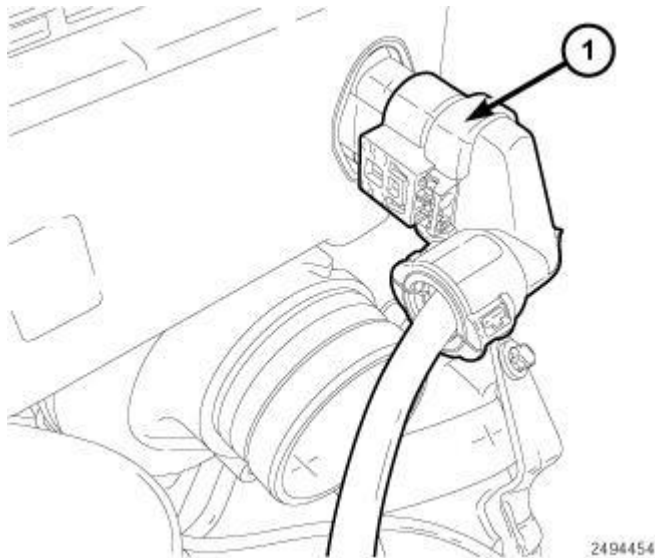


Fig. 158: Turbocharger Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect the turbocharger actuator (1) harness connector.
8. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL**.

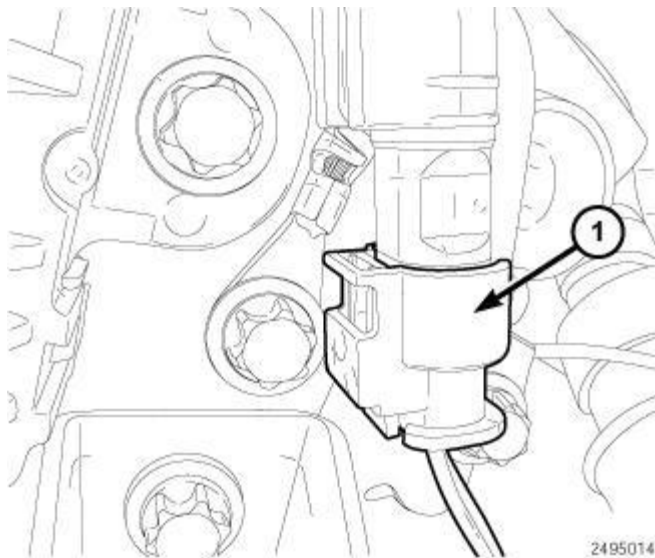


Fig. 159: Turbocharger Exhaust Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the turbocharger exhaust temperature sensor (1) harness connector.

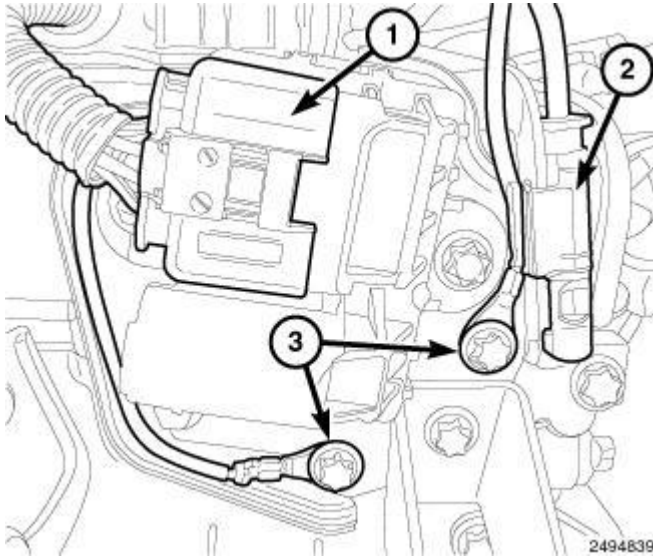


Fig. 160: Glow Plug Module Harness Connector, Bolts & Turbocharger Exhaust Temperature Sensor Harness Connector

Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the turbocharger exhaust temperature sensor harness connector (2) from bracket.
11. Remove the two bolts (3) and position aside the ground wires.
12. Disconnect the glow plug module harness connector (1).

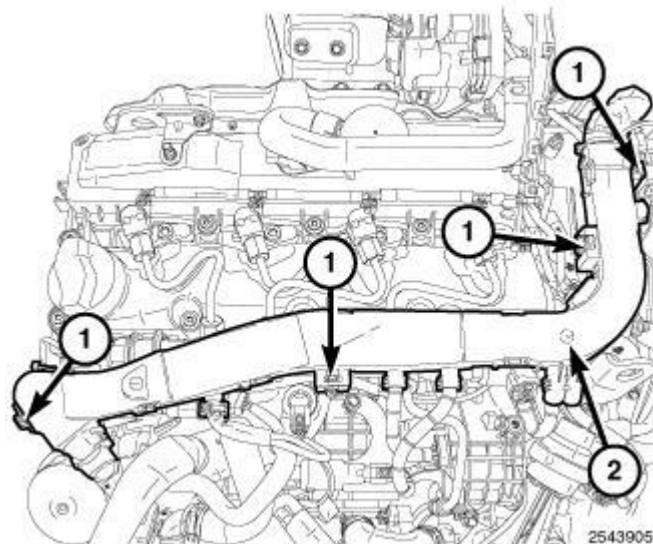
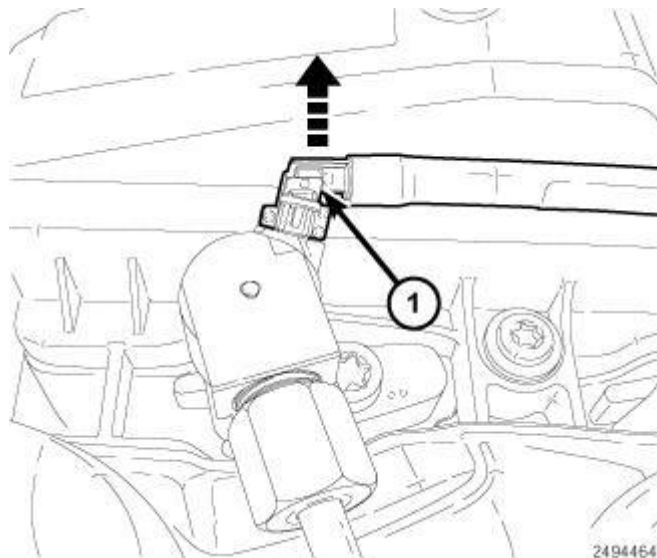


Fig. 161: Lock Tabs & Engine Wire Harness

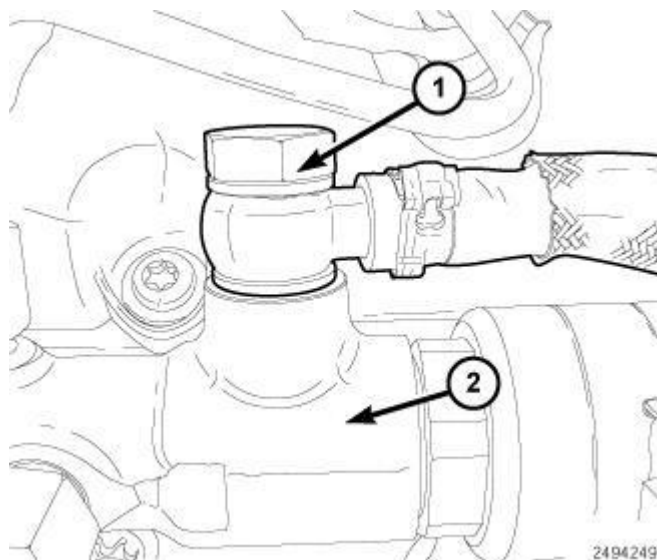
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the fuel rail pressure sensor.
14. Release the four lock tabs (1) position aside engine wire harness (2).

**Fig. 162: Releasing Lock Tab**

Courtesy of CHRYSLER GROUP, LLC

15. Release the lock tab (1) and disconnect the four fuel injector return lines and position aside.

**Fig. 163: Banjo Bolt & Rail**

Courtesy of CHRYSLER GROUP, LLC

16. Remove fuel rail return line banjo bolt (1) at rail (2).

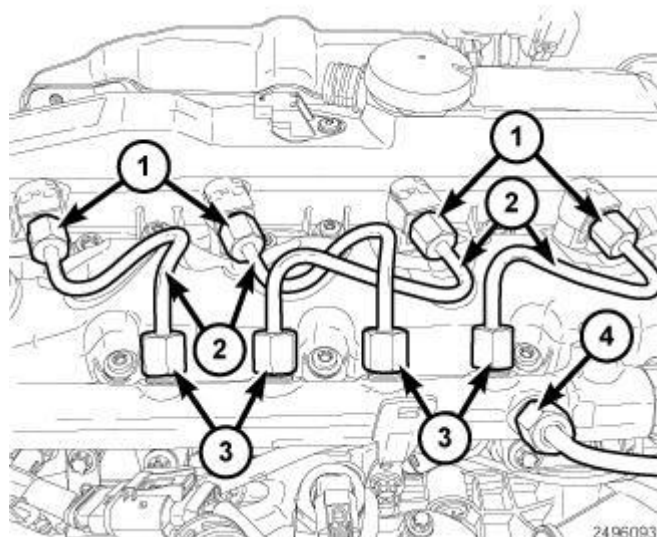


Fig. 164: Fuel Injectors, High Pressure Fuel Tubes, Fuel Rail & High Pressure Feed Line
Courtesy of CHRYSLER GROUP, LLC

17. Remove high pressure fuel lines (2) at fuel injectors (1) and fuel rail (3).
18. Install protective caps onto fuel rail and fuel injectors.

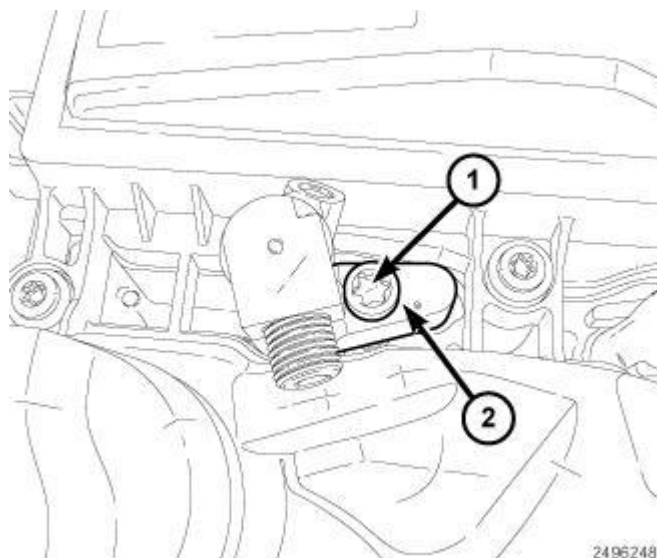


Fig. 165: Bolt & Clamping Claw
Courtesy of CHRYSLER GROUP, LLC

NOTE: Mark the location of each injector.

19. Remove bolt (1) and fuel injector clamping claw (2).

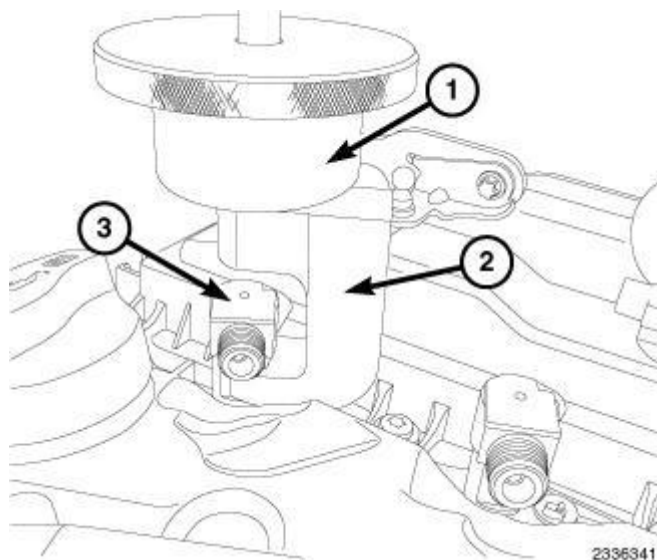


Fig. 166: Puller, Extraction Claw & Fuel Injector
 Courtesy of CHRYSLER GROUP, LLC

20. Using Puller (special tool #8941, Puller) (1) and Extraction Claw (special tool #10238, Claw, Extraction) (2) remove the fuel injectors (3).

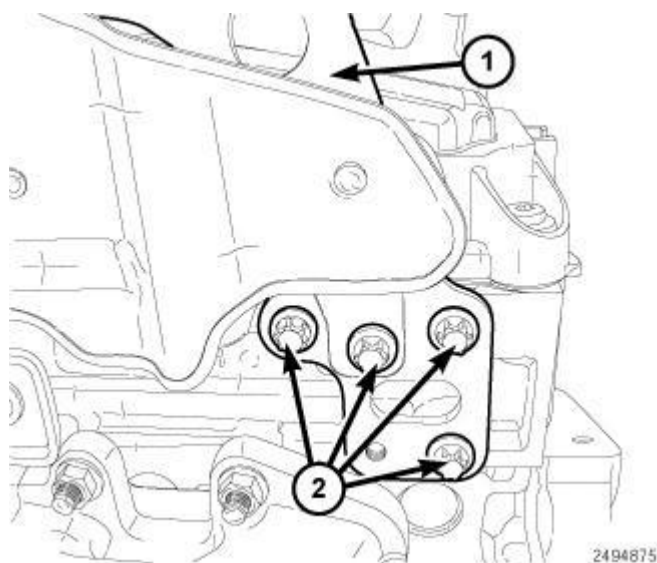


Fig. 167: Engine Lifting Eye & Bolts
 Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (2) and the engine lifting eye (1).

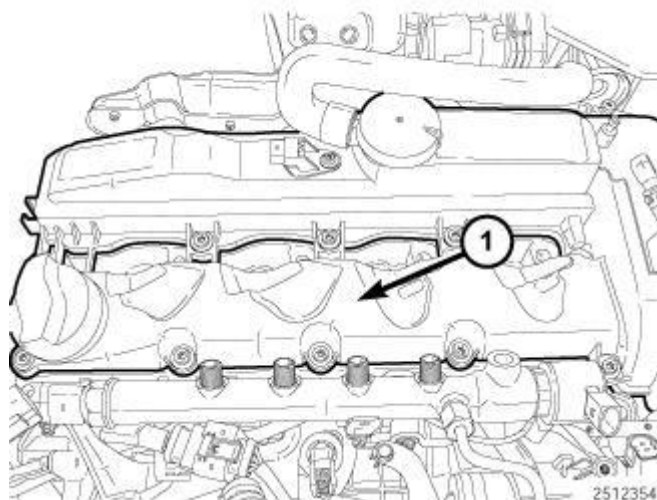


Fig. 168: Cylinder Head Cover
 Courtesy of CHRYSLER GROUP, LLC

22. Remove the 18 bolts and the cylinder head cover (1) and detach the breather hose.

INSTALLATION

INSTALLATION

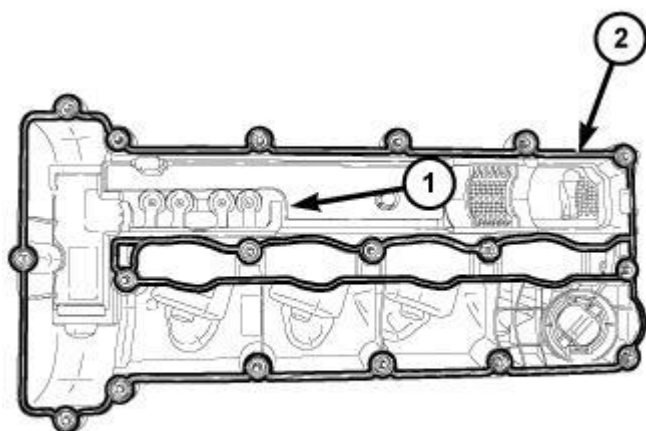


Fig. 169: Cylinder Head Cover & Gasket
 Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket mating surfaces.
2. Install new gasket (2) on to the cylinder head cover (1).
3. Attach breather hose and install the cylinder head cover (1). Tighten bolts 9 N.m (80 lbs. in.).

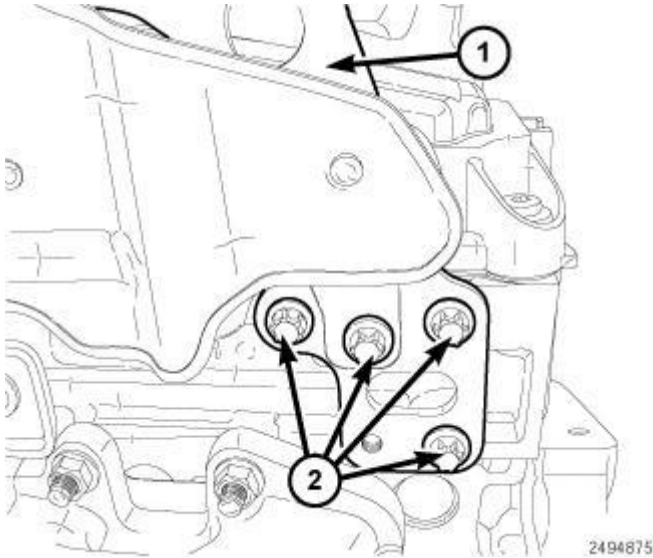


Fig. 170: Engine Lifting Eye & Bolts
 Courtesy of CHRYSLER GROUP, LLC

4. Install the engine lifting eye (1). Tighten bolts (2) to 9 N.m (80 in. lbs.).
5. Clean the fuel injectors with a non-fibrous cloth.
6. Clean the fuel injector bore using Injector Bore Brush Tool (special tool #9717, Brush, Injector Bore).

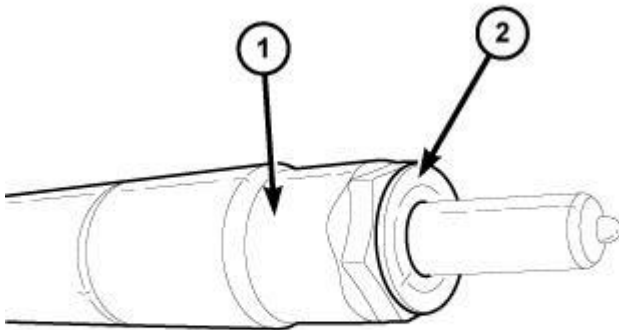


Fig. 171: Injector & Sealing Ring
 Courtesy of CHRYSLER GROUP, LLC

7. Using Mopar® White Lithium Grease, coat the shaft of the injectors (1).
8. Using new sealing rings (2), install fuel injectors (1) into cylinder head as numbered.

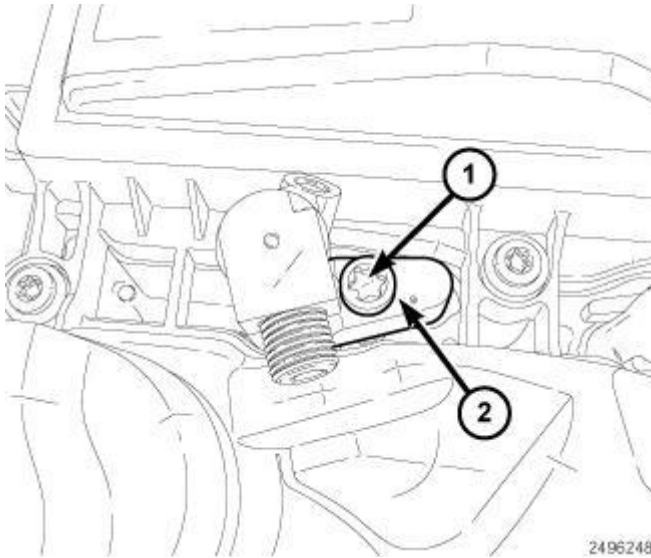


Fig. 172: Bolt & Clamping Claw
Courtesy of CHRYSLER GROUP, LLC

9. Install the fuel clamping claw (2) and a new bolts (1).
10. Tighten bolts (1) to 15 N.m (133 in. lbs.).
 1. Plus an additional 90 degrees.
 2. Plus an additional 90 degrees.

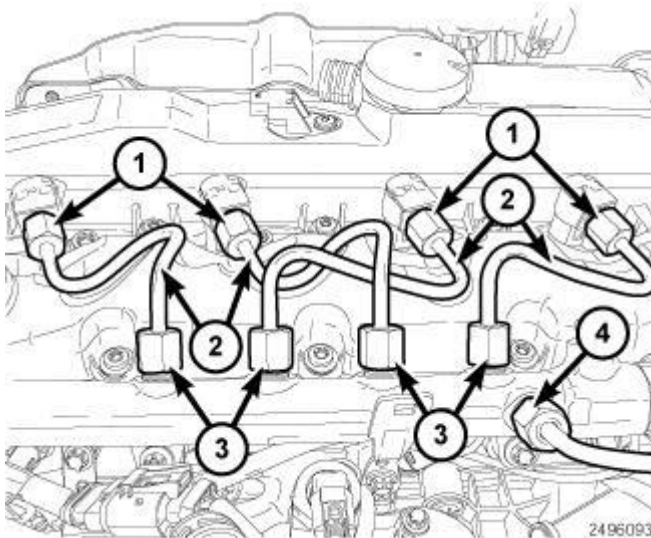


Fig. 173: Fuel Injectors, High Pressure Fuel Tubes, Fuel Rail & High Pressure Feed Line
Courtesy of CHRYSLER GROUP, LLC

11. Remove protective caps from fuel rail and fuel injectors.
12. Install the new high pressure fuel lines (2) at fuel injectors (1) and fuel rail (3).
13. Tighten the high pressure fuel lines (2) at fuel injectors (1) to 7 N.m (62 in. lbs.).
14. Tighten the high pressure fuel lines (2) and fuel rail (3) to 7 N.m (62 in. lbs.).

15. Tighten the high pressure fuel lines (2) at fuel injectors (1) to 33 N.m (24 ft. lbs.).
16. Tighten the high pressure fuel lines (2) and fuel rail (3) to 33 N.m (24 ft. lbs.).

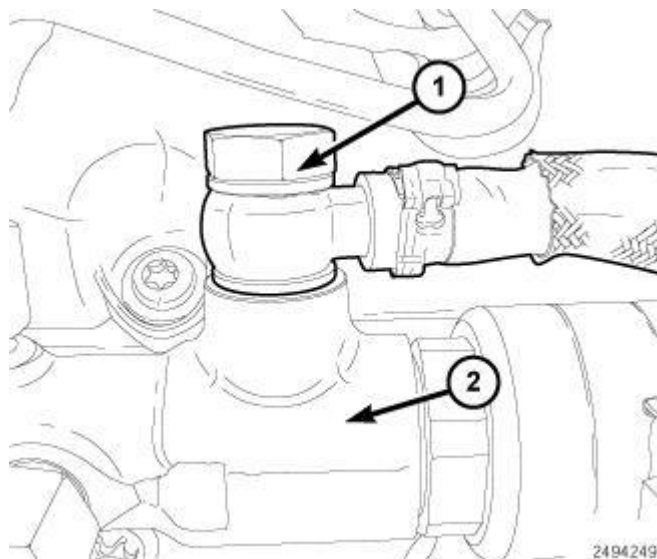


Fig. 174: Banjo Bolt & Rail

Courtesy of CHRYSLER GROUP, LLC

17. Using new sealing washers, install fuel rail return line at rail (2). Tighten the banjo bolt (1) to 32 N.m (24 ft. lbs.).

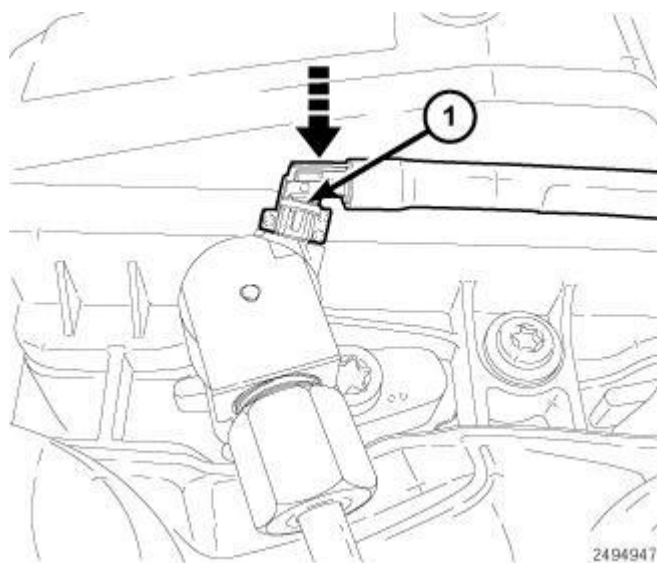


Fig. 175: Installing Lock Tab

Courtesy of CHRYSLER GROUP, LLC

18. Reposition and install the fuel injector return line and set the lock tab (1).

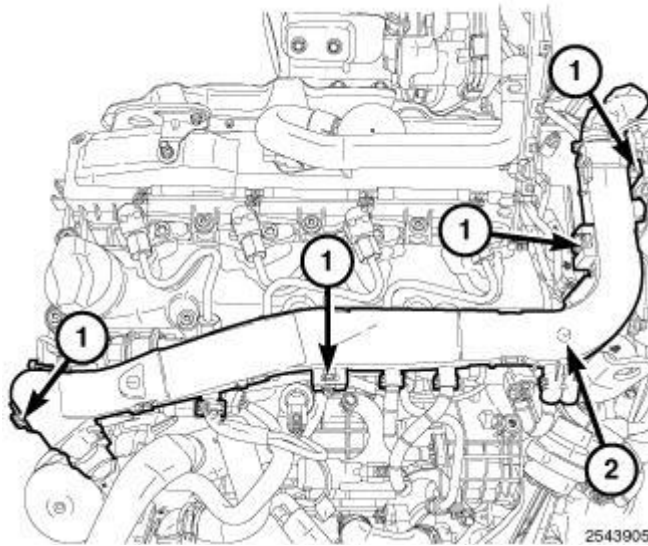


Fig. 176: Lock Tabs & Engine Wire Harness
Courtesy of CHRYSLER GROUP, LLC

19. Reposition the engine wire harness (2) and push down to lock tabs (1).
20. Connect the fuel rail pressure sensor.

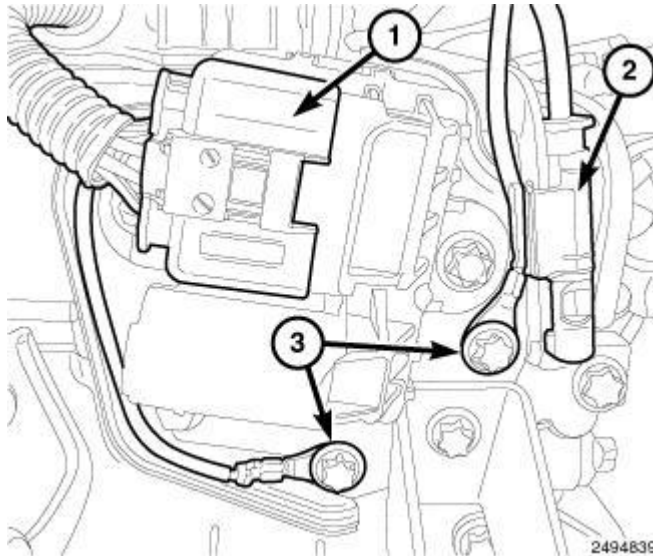


Fig. 177: Glow Plug Module Harness Connector, Bolts & Turbocharger Exhaust Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

21. Connect the glow plug module harness connector (1).
22. Reposition ground wires and tighten bolts (3) to 9 N.m (80 in. lbs.).
23. Connect the turbocharger exhaust temperature sensor harness connector (2) to bracket.

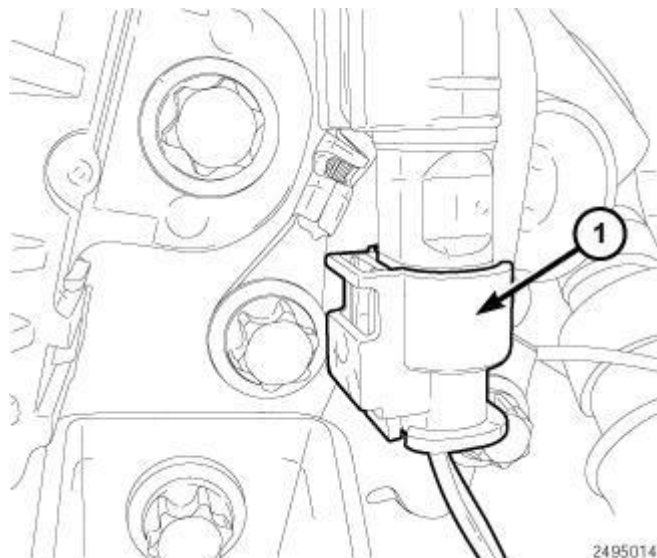


Fig. 178: Turbocharger Exhaust Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

24. Connect the turbocharger exhaust temperature sensor (1) harness connector.

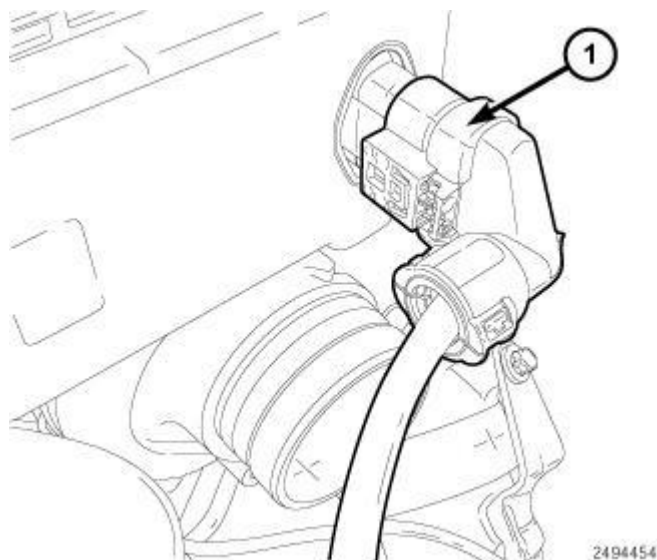
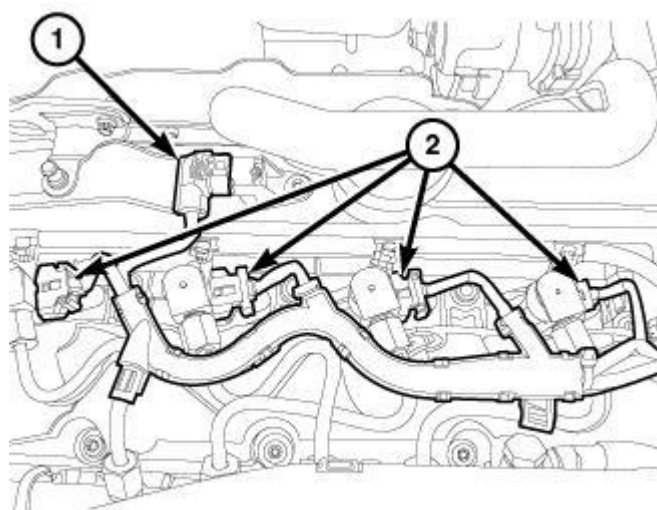


Fig. 179: Turbocharger Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

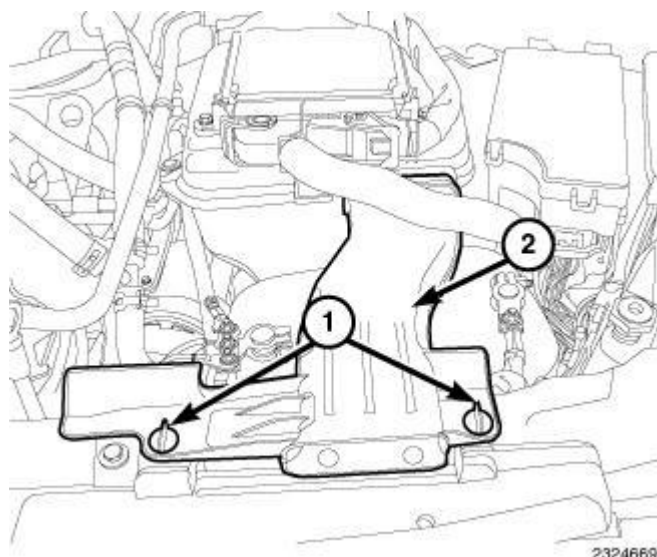
25. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.
26. Connect the turbocharger actuator (1) harness connector.



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Fig. 180: Camshaft Position Sensor (CMP) Harness Connector & Fuel Injector Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

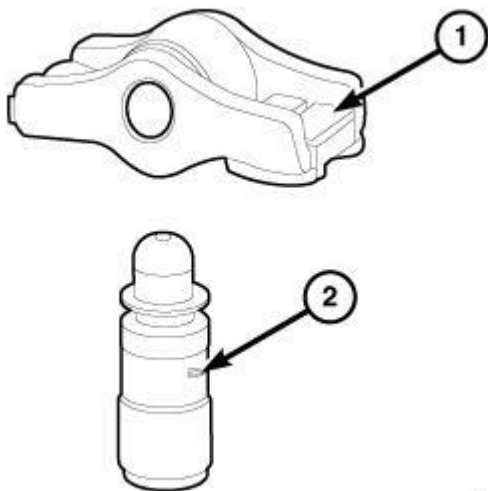
27. Position the fuel injector wire harness and push down to lock in place.
28. Connect the fuel injector (2) harness connector.
29. Connect the Camshaft Position Sensor (CMP) (1) harness connector.



2324669

Fig. 181: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

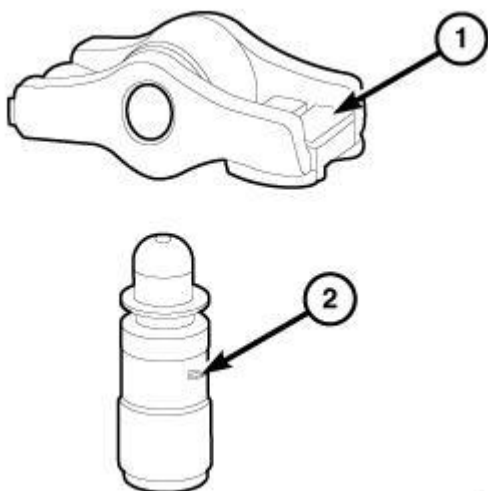
30. Connect negative battery cable.
31. Start engine and inspect for leaks.
32. Install engine cover.
33. Install the air inlet duct (2) and lock the quarter turn lock tabs (1).

LIFTER(S), HYDRAULIC**DESCRIPTION****DESCRIPTION**

2606373

Fig. 182: Hydraulic Lifter & Rocker Arm
Courtesy of CHRYSLER GROUP, LLC

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

REMOVAL**REMOVAL**

2606373

Fig. 183: Hydraulic Lifter & Rocker Arm

Courtesy of CHRYSLER GROUP, LLC

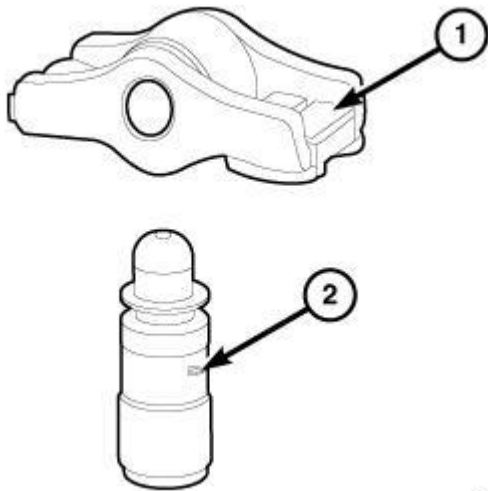
1. Remove the camshafts. Refer to CAMSHAFT, ENGINE, REMOVAL.
2. Remove the rocker arm (1) from cylinder head.

NOTE: When the hydraulic lifters are removed from the engine, they must be stored upright and in clean conditions.

3. Remove the hydraulic lifter (2) from cylinder head.

INSPECTION

INSPECTION



2606373

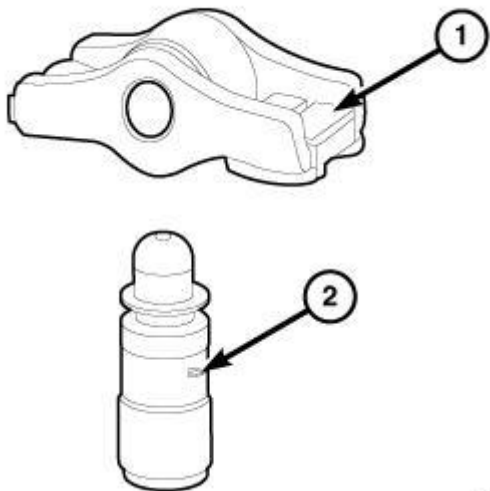
Fig. 184: Hydraulic Lifter & Rocker Arm

Courtesy of CHRYSLER GROUP, LLC

1. Clean each lifter assembly (2) in cleaning solvent to remove all varnish and sludge deposits. Inspect for indications of scuffing on the side and base of each lifter body (2).
2. Squeeze the lifter (2) and be sure that the spring returns the lifter to its correct position.
3. Inspect the and rocker arm (1) roller for damage or excessive wear.
4. Replace any worn or damaged components.

INSTALLATION

INSTALLATION



2606373

Fig. 185: Hydraulic Lifter & Rocker Arm

Courtesy of CHRYSLER GROUP, LLC

NOTE: Install the rocker arms and hydraulic lifters in the same location as removed.

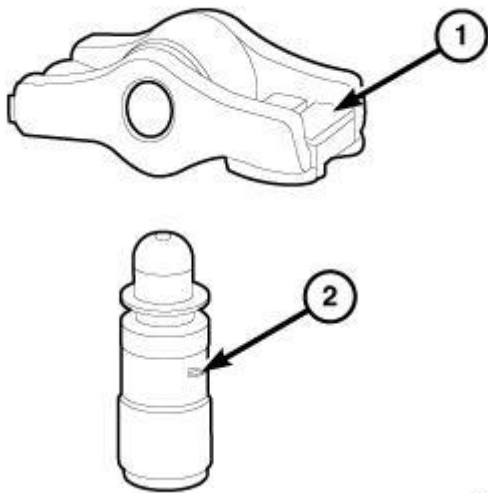
NOTE: Replacement of the camshaft will also require replacement of the finger followers and hydraulic lifters.

1. Install the hydraulic lifter (2) into the cylinder head.
2. Install the rocker arm.
3. Install the camshaft(s). Refer to CAMSHAFT, ENGINE, INSTALLATION.

ROCKER ARM, VALVE

DESCRIPTION

DESCRIPTION



2606373

Fig. 186: Hydraulic Lifter & Rocker Arm
Courtesy of CHRYSLER GROUP, LLC

The rocker arms (1) are located on the top of the hydraulic lifters (2) and the valves. The rocker arms are not held rigidly into position; instead they are held in position by resting on top of the valve stem and the hydraulic lifter pivoting ball. The camshaft applies downward pressure holding the rocker arm in position.

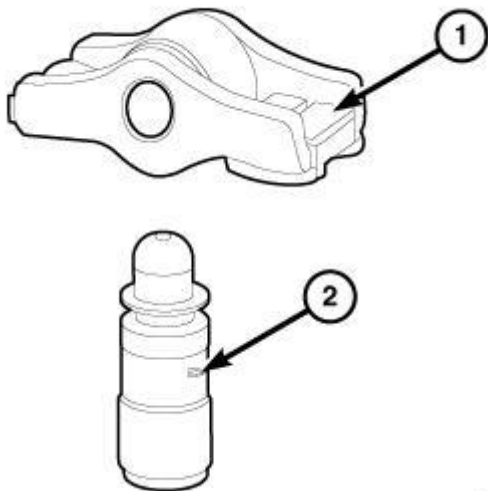
OPERATION

OPERATION

The rocker arms 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. This pressure is then transmitted to the valves which causes the valves to open.

REMOVAL

REMOVAL



2606373

Fig. 187: Hydraulic Lifter & Rocker Arm
Courtesy of CHRYSLER GROUP, LLC

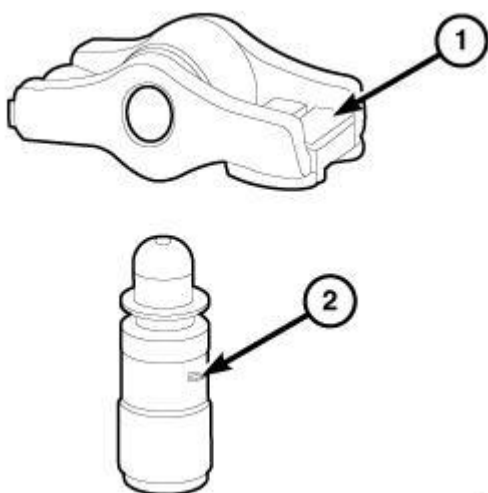
1. Remove the appropriate camshafts. Refer to CAMSHAFT, ENGINE, REMOVAL.

NOTE: Keep the rocker arm in a numerical order as they were removed.

2. Remove the rocker arm (1) assembly from the cylinder head and inspect for wear or damage.

INSTALLATION

INSTALLATION



2606373

Fig. 188: Hydraulic Lifter & Rocker Arm
Courtesy of CHRYSLER GROUP, LLC

NOTE: Replacement of the camshaft will also require replacement of the rocker arms and hydraulic lifters.

1. Install the rocker arm assembly in the same location as removed.
2. Install the camshaft(s). Refer to CAMSHAFT, ENGINE, INSTALLATION.

SPRING(S), VALVE

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove engine cover.
3. Remove the intake and exhaust camshafts. Refer to CAMSHAFT, ENGINE, REMOVAL.
4. Position the cylinder being worked on at Top Dead Center (TDC).
5. Remove the Starter. Refer to STARTER, REMOVAL.
6. Install the Flywheel/Clutch Plate Locking Tool (special tool #10232, Lock, Flywheel/Clutch Plate).

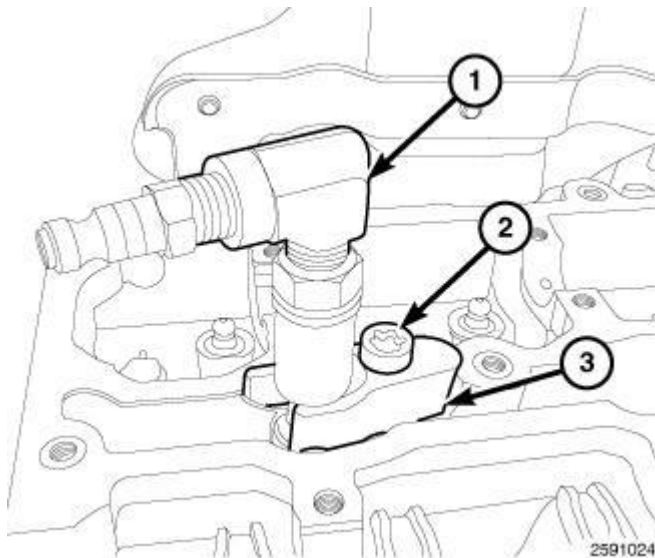


Fig. 189: Compression Test Adapter, Tensioning Claw & Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Install the Compression Test Adapter (special tool #9543, Adapter, Compression Test) (1) into fuel injector hole along with the tensioning claw (3) and securely tighten bolt (2).
8. Connect air supply to the Compression Test Adapter (1) and pressurize the cylinder to 5 bar (73 psi).

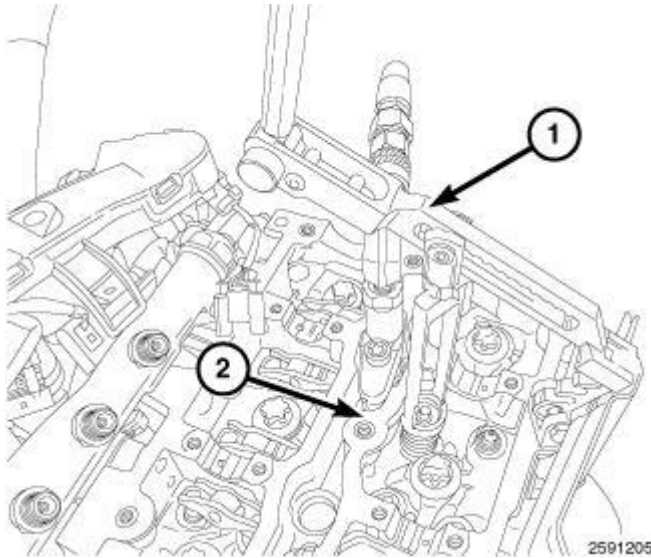


Fig. 190: Valve Spring Compressor & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

NOTE: **Valve springs and retainers must be kept in order of the cylinder they were removed.**

9. Install the valve spring compressor (special tool #9307, Compressor, Valve Spring) (1) onto cylinder head (2).
10. Compress valve spring and remove the keepers.
11. Remove valve spring retainer and valve spring.
12. Remove valve stem seals.
13. Remove valve spring seat.
14. Inspect all cylinder head components for wear or damage.
15. Repeat procedure for each cylinder as necessary.

INSTALLATION

INSTALLATION

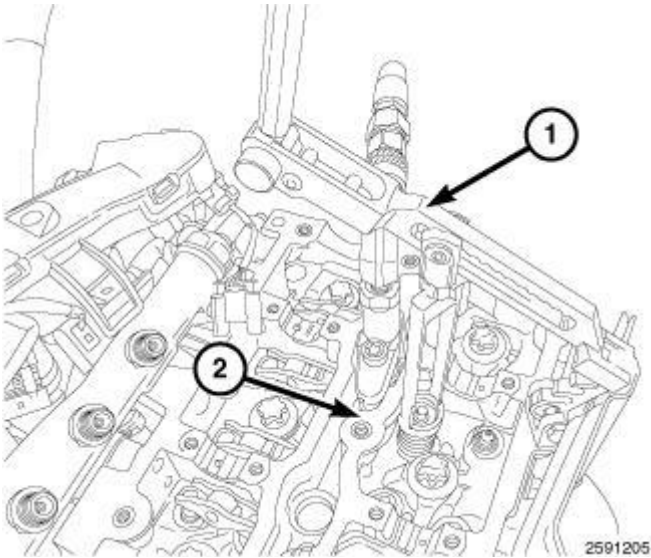


Fig. 191: Valve Spring Compressor & Cylinder Head
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Ensure that the valve keepers are seated properly.

1. Install lower valve spring seat.
2. Install valve stem seal.
3. Install valve spring.
4. Install valve spring retainer.
5. Position the Valve Spring Compressor (special tool #9307, Compressor, Valve Spring) (1) on to valve spring retainer. Now compress the valve spring and install valve keepers.
6. Repeat procedure for each cylinder as necessary.
7. Remove the Valve Spring Compressor (special tool #9307, Compressor, Valve Spring) (1) from cylinder head (2).

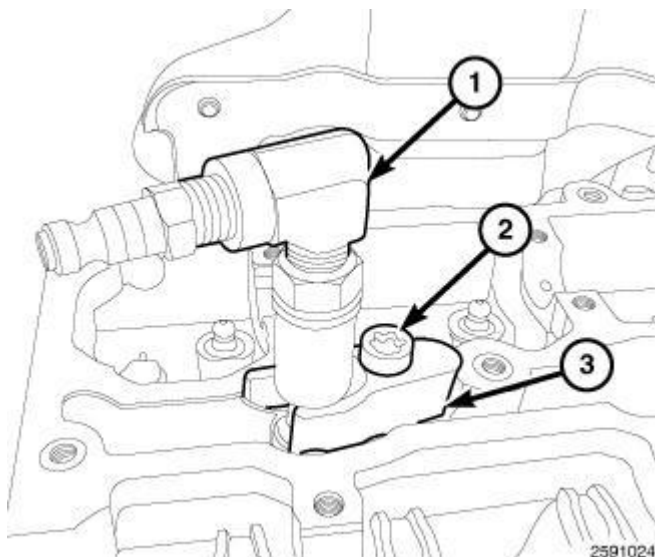


Fig. 192: Compression Test Adapter, Tensioning Claw & Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect air supply from the Compression Test Adapter (special tool #9543, Adapter, Compression Test) (1).
9. Remove the bolt, tensioning claw, and Compression Test Adapter (special tool #9543, Adapter, Compression Test) (1).
10. Remove the Flywheel/Clutch Plate Locking Tool (special tool #10232, Lock, Flywheel/Clutch Plate).
11. Install the Starter. Refer to **STARTER, INSTALLATION**.
12. Install the intake and exhaust camshafts. Refer to **CAMSHAFT, ENGINE, INSTALLATION**.
13. Connect the negative battery cable.
14. Start the engine and inspect for leaks.
15. Install engine cover.

VALVES, INTAKE AND EXHAUST

REMOVAL

REMOVAL

1. Remove cylinder head. Refer to **CYLINDER HEAD, REMOVAL**.

CAUTION: Suitably mark the valve and the position in the cylinder head before removal. Failure to do so will result in improperly seated valves and possible engine damage after reassembly.

CAUTION: Valves, springs and retainers must be kept in order of the cylinder they were removed.

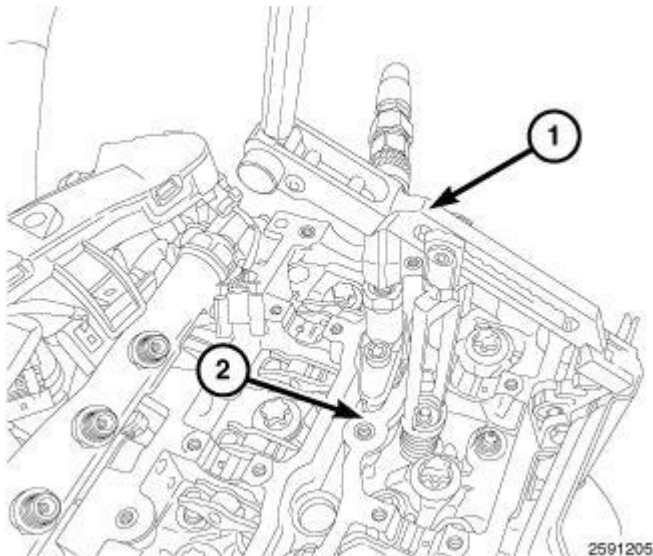


Fig. 193: Valve Spring Compressor & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

2. Install the Valve Spring Compressor (special tool #9307, Compressor, Valve Spring) (1) onto cylinder head (2).

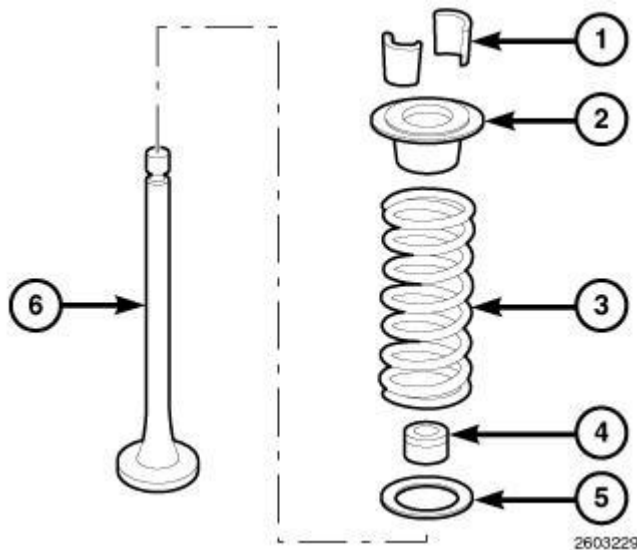


Fig. 194: Valve Spring, Keeper, Retainer, Spring Seat, Valve Stem Seals & Valve
Courtesy of CHRYSLER GROUP, LLC

3. Compress the valve spring (3) and remove valve keepers (1).
4. Remove valve spring retainer (2) and valve spring (3) and spring seat (5).
5. Remove valve stem seals (4).
6. Remove valves (6).
7. Repeat steps 5 through 9 for each valve as necessary.

INSTALLATION

INSTALLATION

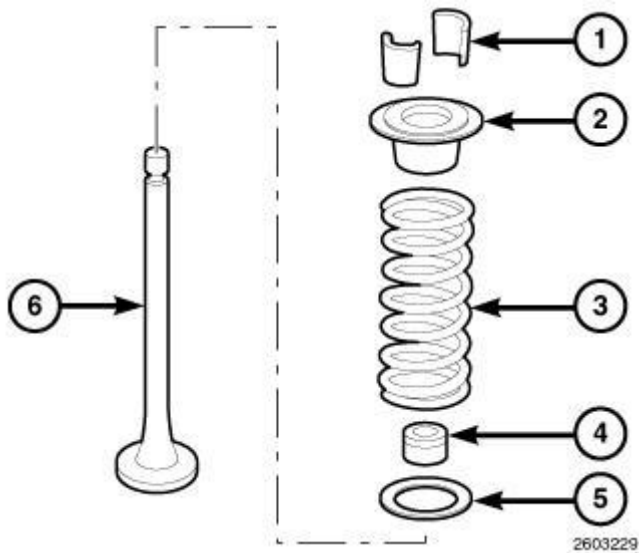


Fig. 195: Valve Spring, Keeper, Retainer, Spring Seat, Valve Stem Seals & Valve
 Courtesy of CHRYSLER GROUP, LLC

CAUTION: Valves must be kept in their original positions in cylinder head. Failure to do so will result in engine damage.

NOTE: Inspect all valves, springs and retainers for wear or damage. Replace as necessary.

1. Install valves (6) in their original position in the cylinder head.
2. Install valve spring seat (5).
3. Install valve stem seal (4).
4. Install valve spring (3).
5. Install valve spring retainer (2).

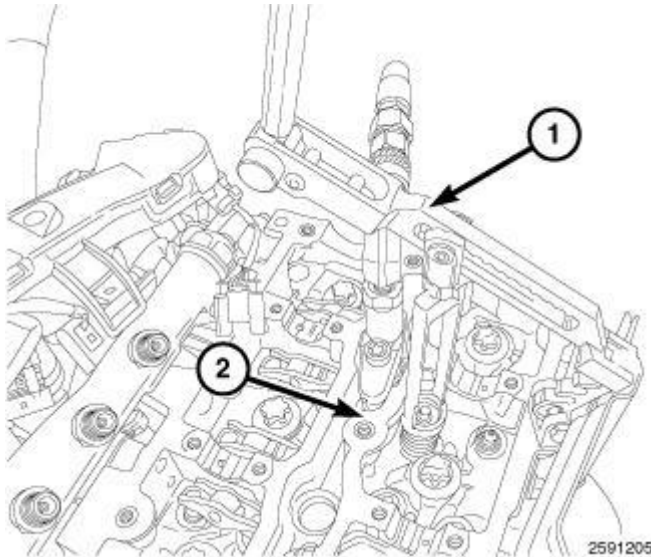


Fig. 196: Valve Spring Compressor & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

NOTE: Ensure that the valve keepers are seated properly.

6. Using Valve Spring Compressor (special tool #9307, Compressor, Valve Spring), compress valve spring (3) and install valve keepers (1).
7. Repeat steps 3 through 7 for each valve as necessary.
8. Install cylinder head. Refer to **CYLINDER HEAD, INSTALLATION.**

ENGINE BLOCK

STANDARD PROCEDURE

REPLACING ENGINE CORE AND OIL GALLERY PLUGS

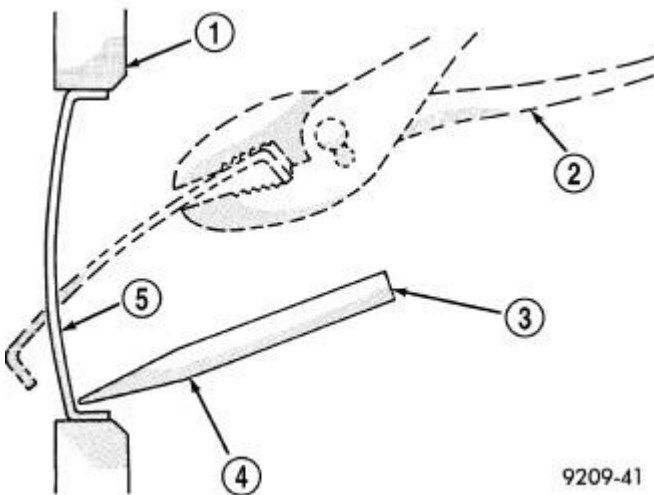


Fig. 197: Core Hole Plug Removal

Courtesy of CHRYSLER GROUP, LLC

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

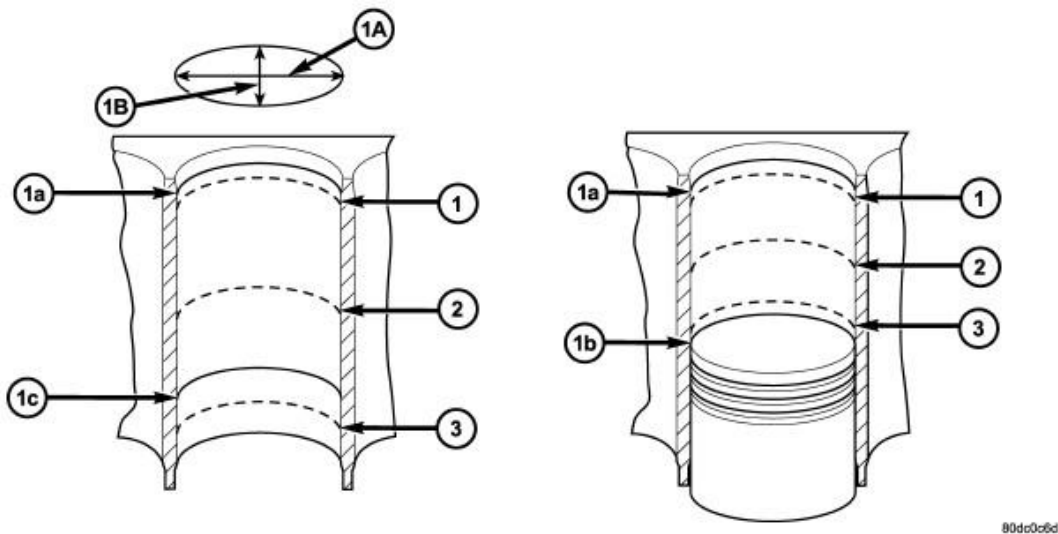
Using a blunt tool such as a drift (4) and a hammer, strike the bottom edge of the cup plug (5). With the cup plug (5) rotated, grasp firmly with pliers (2) or other suitable tool and remove plug. Refer to **Fig. 197**.

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

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

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

MEASURING CYLINDER BORES

**Fig. 198: Cylinder Bores Measuring Points**

Courtesy of CHRYSLER GROUP, LLC

- | |
|--------------------------------------|
| 1 - MEASURING POINT OF CYLINDER BORE |
| 2 - MEASURING POINT OF CYLINDER BORE |

3 - MEASURING POINT OF CYLINDER BORE

1a - UPPER REVERSAL POINT OF #1 PISTON RING

1b - BOTTOM DEAD CENTER OF PISTON

1c - BOTTOM REVERSAL POINT OF OIL SCRAPER RING

1A - LONGITUDINAL DIRECTION

1B - TRANSVERSE DIRECTION

NOTE: This must be done with engine completely disassembled.

1. Thoroughly clean all cylinder bores with appropriate cleaning solvent.
2. Measure each cylinder at the three measuring points shown in illustration (1, 2, 3).
3. Using the three measurement points, measure cylinder in the longitudinal and in the transverse direction.

Cylinder Bore Measurement	
Standard size	88.0 mm
Group code letter A	88.000-88.006 mm
Group code letter X	88.006-88.012 mm
Group code letter B	88.012-88.018 mm
Wear limit in longitudinal in transverse direction	0.020 mm
Permissible variation of cylinder shape (when new)	0.000-0.014 mm

4. Use the measurement and table above to group cylinder bores.

BEARING(S), CRANKSHAFT**REMOVAL****REMOVAL**

1. Remove the engine. Refer to **REMOVAL**.
2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL**.
3. Remove the balance shaft module. Refer to **MODULE, BALANCE SHAFT, REMOVAL**.
4. Remove crankshaft bearings one at a time.

INSTALLATION**INSTALLATION****NOTE: Oil bearing shells before inserting crankshaft.****NOTE: Oil grooves in thrust washers must point toward the thrust collars of the**

crankshaft.

NOTE: Thrust washers in bearing cap each have one retaining lugs as a anti-twist lock.

NOTE: Oil thread and head contact surfaces of bolts that retain crankshaft bearing caps; tighten bolts from inside to outside, beginning at fit bearing. Rotate crankshaft to check clearance.

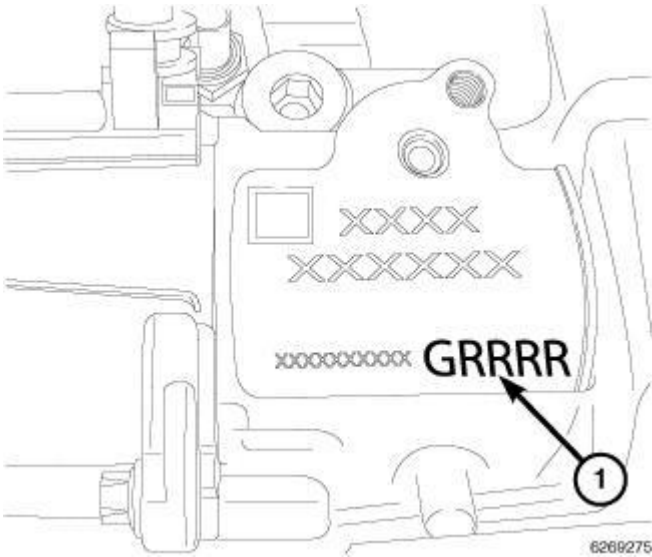
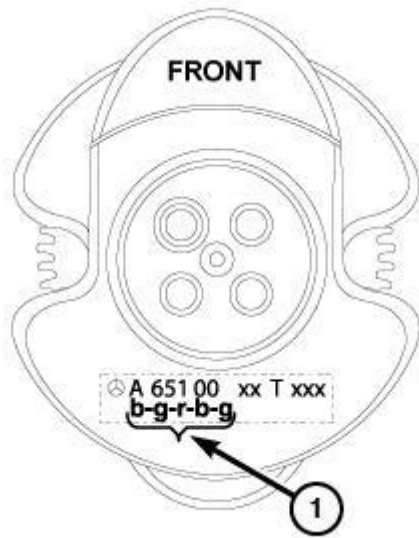


Fig. 199: Bearing Selection Letters On Engine Block
Courtesy of CHRYSLER GROUP, LLC

NOTE: The engine block is marked for main bearing shell selection located by the vacuum pump.

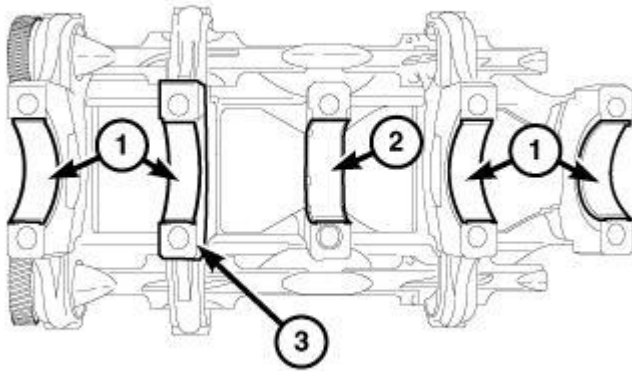
1. Using the bearing selection letters (1) on engine block, install bearing halves into engine block and lubricate bearing with clean engine oil.
 - B = blue bearing
 - G = yellow bearing
 - R = red bearing



2629230

Fig. 200: Letters Stamped On Crankshaft
Courtesy of CHRYSLER GROUP, LLC

2. The letters stamped on crankshaft (1) are the bearing halves which are to be selected for the crankshaft bearing caps.
 - B = blue bearing
 - G = yellow bearing
 - R = red bearing



2629451

Fig. 201: Bearing Halves Into Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

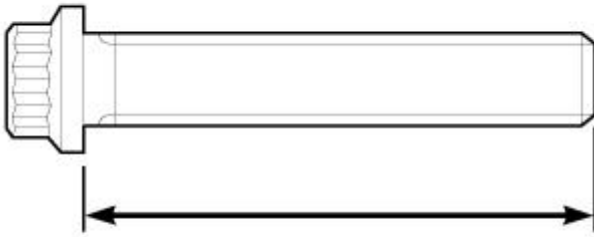
3. Install bearing halves (1 and 2) into bearing caps and lubricate bearing with clean engine oil.
4. Install the balance shaft module and check bearing clearance. Refer to **MODULE, BALANCE SHAFT, INSTALLATION**.

5. Check crankshaft endplay.
6. Install the balance shaft module. Refer to **MODULE, BALANCE SHAFT, INSTALLATION**.
7. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.
8. Install the engine. Refer to **INSTALLATION**.

CRANKSHAFT

STANDARD PROCEDURE

STANDARD PROCEDURE - CRANKSHAFT BOLT INSPECTION



2672220

Fig. 202: Measuring Crankshaft Bolt
 Courtesy of CHRYSLER GROUP, LLC

1. Measure crankshaft bolt between points shown in illustration.

Crankshaft Bearing Cap Bolt Dimensions	
Thread Diameter	M 12
Length When New	104.7 mm to 103.5 mm
Maximum Length	106.5 mm

2. If the bolt length is greater than the maximum allowable measurement, replace the bolts.

MEASURE CRANKSHAFT AND BLOCK JOURNALS

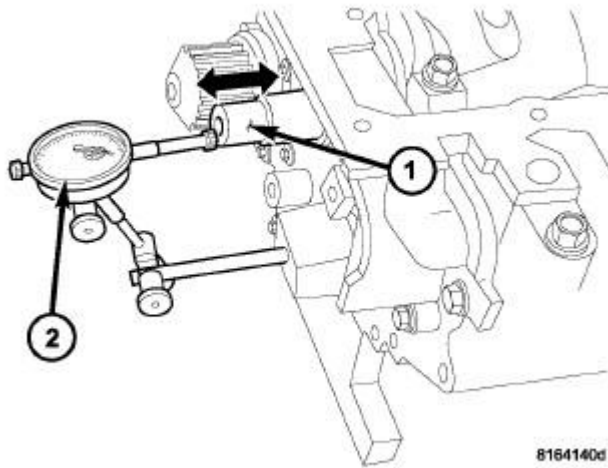


Fig. 203: Checking Crankshaft End Play Using Dial Indicator
Courtesy of CHRYSLER GROUP, LLC

NOTE: After any bearing damage occurred, remove all debris which is present in the main oil gallery, connecting rod bores, and in the crankshaft and oil galleries. Include removal of the inserting steel ball of the main oil gallery before cleaning.

1. Using a dial indicator (2) check crankshaft (1) end play by moving the crankshaft back and forth in the direction shown in illustration.
2. Remove crankshaft. Refer to **CRANKSHAFT, REMOVAL**.
3. Clean all engine parts thoroughly.

CAUTION: After bearing has damage has occurred, replace connecting rods which have suffered overheating because of bearing damage. The connecting rod must not have any cross scores and notches.

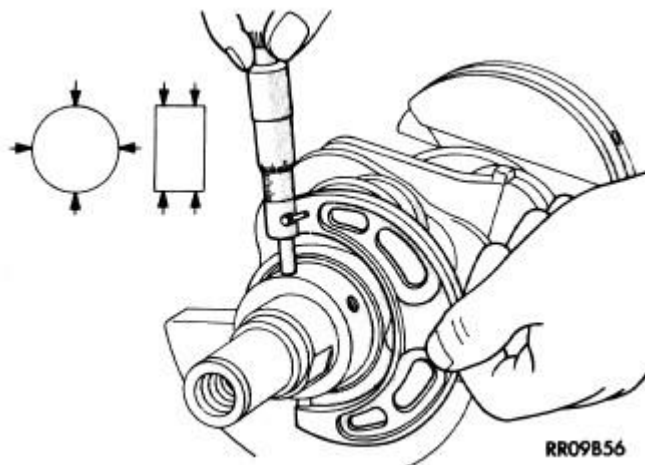


Fig. 204: Checking Crankshaft Journal Measurements
Courtesy of CHRYSLER GROUP, LLC

4. Inspect connecting rod. If damage is present, inspect crankshaft, replace as necessary.
5. Inspect crankcase.
6. Inspect standard size of crankshaft bearing shells.
7. Inspect crankshaft bearing cap.
8. Measure crankshaft rod and main bearing journals with a micrometer as shown in illustration.

REMOVAL

REMOVAL

1. Remove the engine. Refer to **REMOVAL**.
2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL**.
3. Remove the balance shaft module. Refer to **MODULE, BALANCE SHAFT, REMOVAL**.

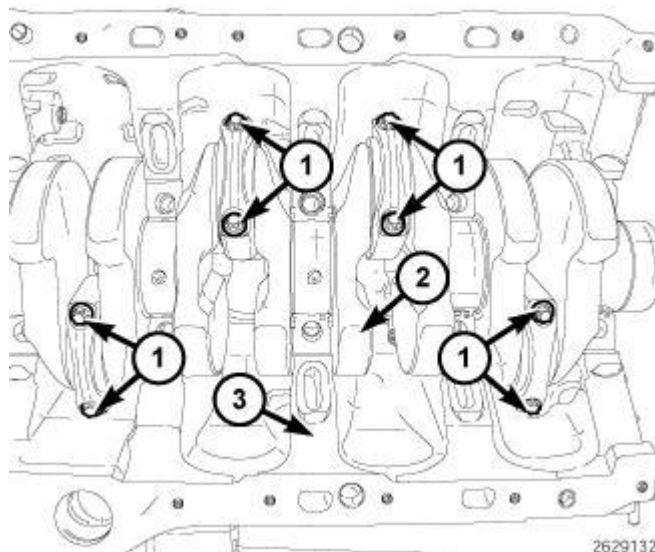


Fig. 205: Crankshaft, Engine Block, Connecting Rod Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (1) and the connecting rod bearing caps.
5. Remove the crankshaft (2) from engine block (3).

INSTALLATION

INSTALLATION

- NOTE:** Oil bearing shells before inserting crankshaft.
- NOTE:** Oil grooves in thrust washers must point toward the thrust collars of the crankshaft.
- NOTE:** Thrust washers in bearing cap each have one retaining lugs as a anti-twist lock.
- NOTE:** Oil thread and head contact surfaces of bolts that retain crankshaft bearing caps; tighten bolts from inside to outside, beginning at fit bearing. Rotate crankshaft to check clearance.

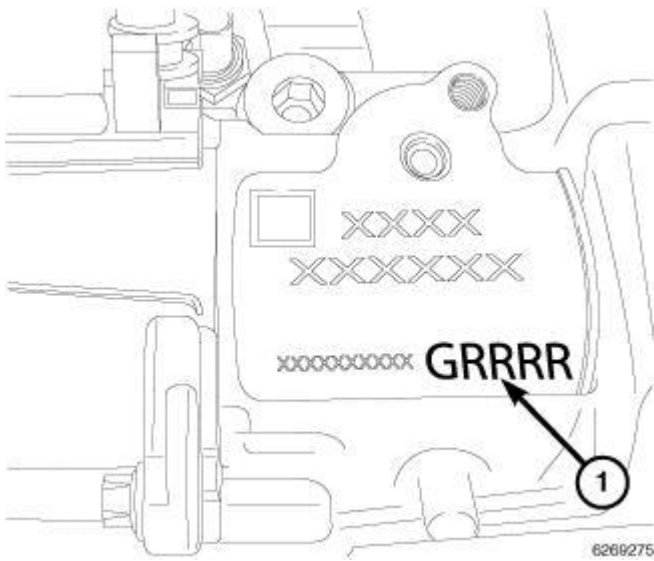


Fig. 206: Bearing Selection Letters On Engine Block
Courtesy of CHRYSLER GROUP, LLC

- NOTE:** The engine block is marked for main bearing shell selection located by the vacuum pump.
1. Using the bearing selection letters (1) on engine block, install bearing halves into engine block and lubricate bearing with clean engine oil.
 - B = blue bearing

- G = yellow bearing
- R = red bearing

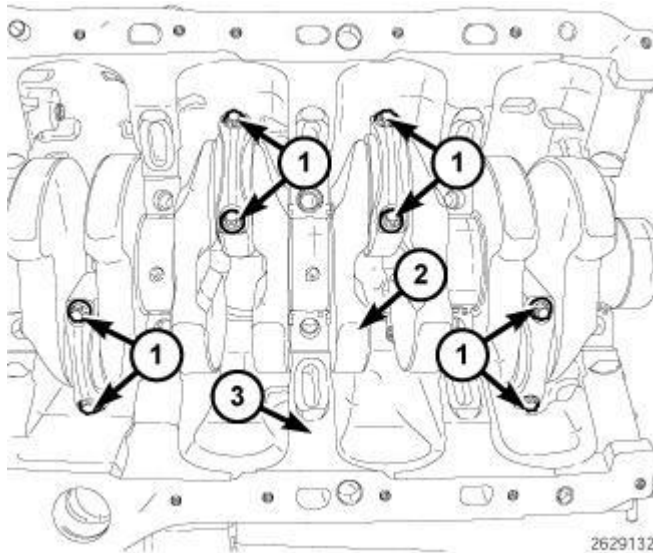
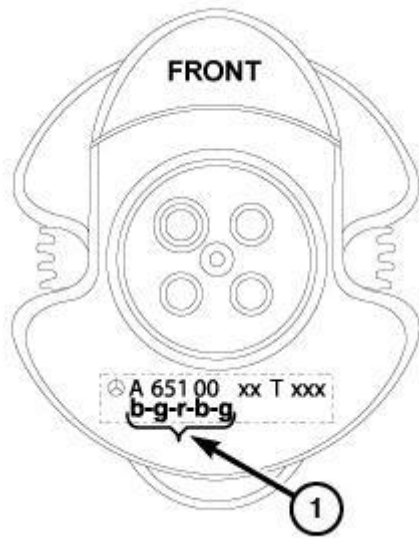


Fig. 207: Crankshaft, Engine Block, Connecting Rod Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

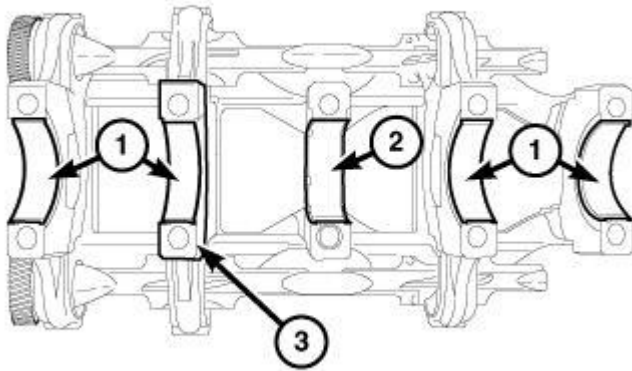
2. Install crankshaft (2) into engine block (3).
3. Install new rod bearings and check bearing clearance.
4. Install the connecting rod bearing caps.
5. For new connecting rods, tighten bolts to:
 - 5 N.m (44 in. lbs.)
 - 25 N.m (18 ft. lbs.)
 - plus an additional 180°
6. For used connecting rods, tighten bolts to:
 - 5 N.m (44 in. lbs.)
 - 25 N.m (18 ft. lbs.)
 - plus an additional 90°



2629230

Fig. 208: Letters Stamped On Crankshaft
Courtesy of CHRYSLER GROUP, LLC

7. The letters stamped on crankshaft (1) are the bearing halves which are to be selected for the crankshaft bearing caps.
 - B = blue bearing
 - G = yellow bearing
 - R = red bearing



2629451

Fig. 209: Bearing Halves Into Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

8. Install bearing halves (1 and 2) into bearing caps and lubricate bearing with clean engine oil.
9. Install the balance shaft module and check bearing clearance. Refer to **MODULE, BALANCE SHAFT, INSTALLATION**.

10. Check crankshaft endplay.
11. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.
12. Install the engine. Refer to **INSTALLATION**.

DAMPER, VIBRATION

REMOVAL

REMOVAL

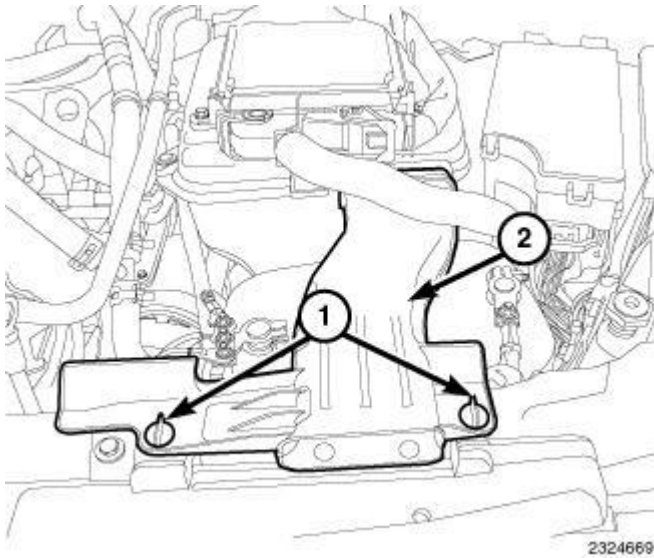


Fig. 210: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove the right front tire. Refer to **REMOVAL** .
4. Remove the belly pan.
5. Remove the serpentine belt. Refer to **BELT, SERPENTINE, REMOVAL** .

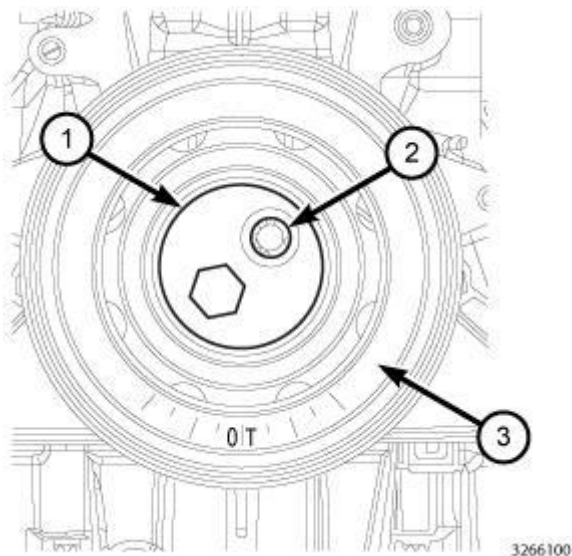


Fig. 211: Vibration Damper Holder Tool, Vibration Damper & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Using the Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), remove bolts (2) and the vibration damper (3).

INSTALLATION

INSTALLATION

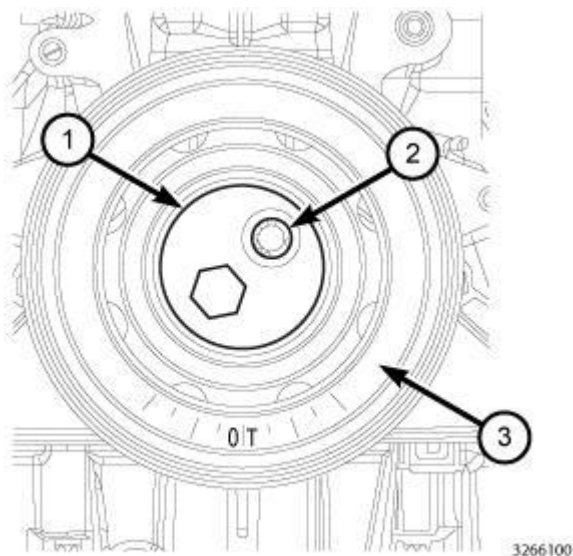


Fig. 212: Vibration Damper Holder Tool, Vibration Damper & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Install the vibration damper (3) and bolts (2).
2. Using Vibration Damper Holder Tool (special tool #10236, Holder, Vibration Damper) (1), tighten bolts to 80 N.m (59 ft. lbs.) plus additional 90°.

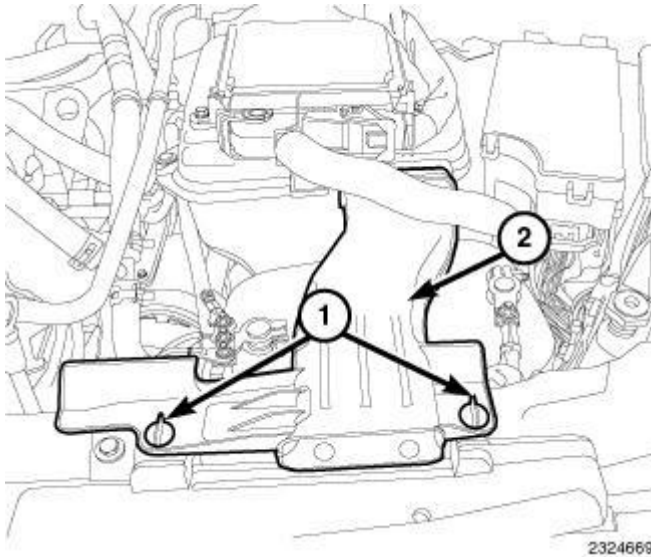


Fig. 213: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

3. Install the serpentine belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
4. Install the belly pan.
5. Install the right front tire. Refer to **INSTALLATION** .
6. Connect the negative battery cable.
7. Install air inlet duct (2).

MODULE, BALANCE SHAFT

DESCRIPTION

DESCRIPTION

The 2.2L engine is equipped with two cast iron balance shafts and is installed in a cast iron carrier. The cast iron carrier also incorporates the crankshaft bearing caps used to hold the crankshaft to the engine block.

OPERATION

OPERATION

The balance shafts are driven by the crankshaft via two helical gears. The balance shafts are connected to the helical gears. The dual counter rotating shafts decrease second order vertical shaking forces caused by component movement.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.

2. Set the engine to Top Dead Center (TDC).
3. Remove the lower timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

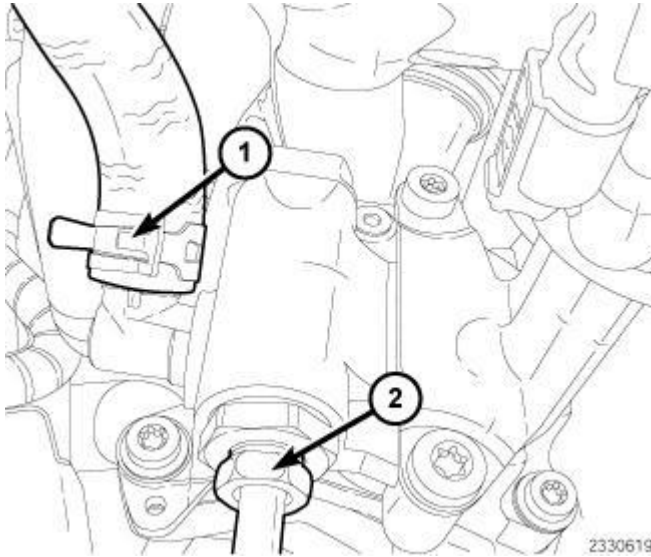


Fig. 214: Power Steering Supply Line & Feed Line
Courtesy of CHRYSLER GROUP, LLC

4. Remove the bolts and the oil dipstick tube.
5. Disconnect the power steering return line (1) from pump.
6. Remove the power steering feed line (2) from pump.

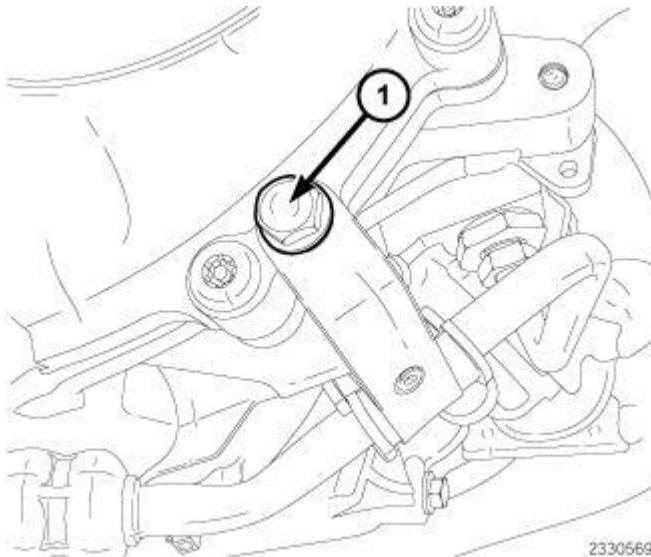


Fig. 215: Power Steering Line Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Remove power steering line support bracket bolt (2).
8. Disconnect power steering line from steering gear and reposition out of way.

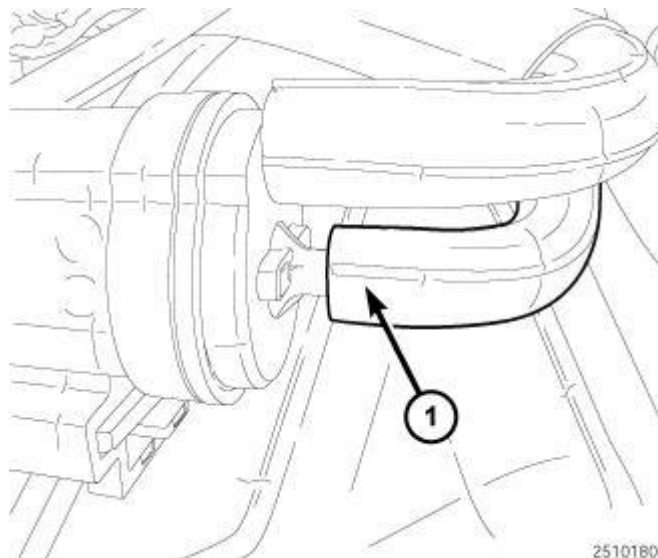


Fig. 216: Coolant Pump Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the coolant pump actuator vacuum line (1).
10. Remove the water pump/power steering assembly.

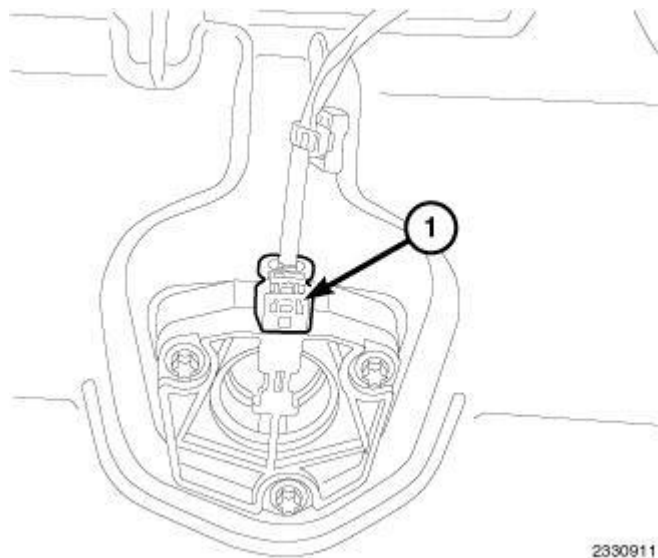


Fig. 217: Oil Level Switch/Life Monitor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect the oil life monitor harness connector (1).
12. Remove bolts and the oil pan from engine.

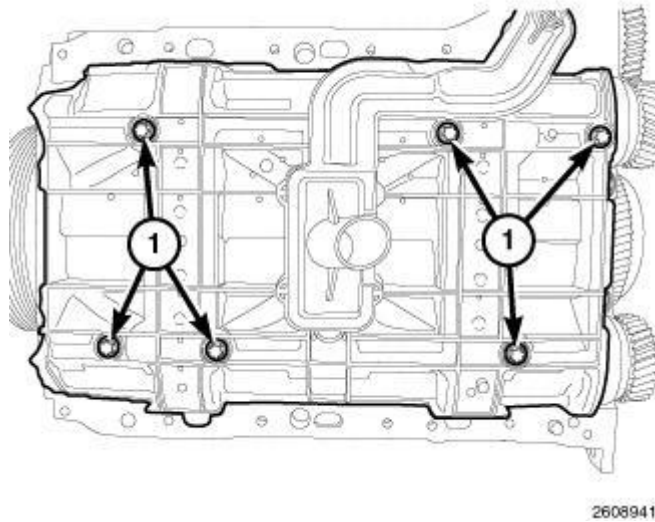


Fig. 218: Oil Pump Pickup Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Remove bolts and the oil pump pickup.
14. Remove the front oil seal carrier. Refer to **SEAL, CRANKSHAFT OIL, FRONT, REMOVAL**.

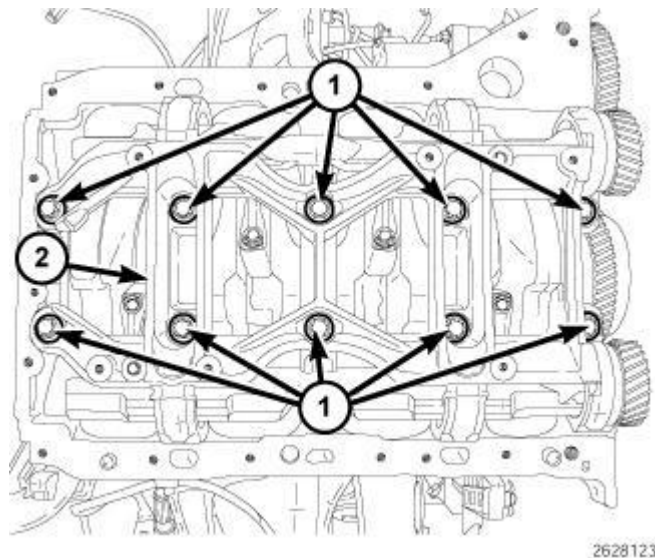
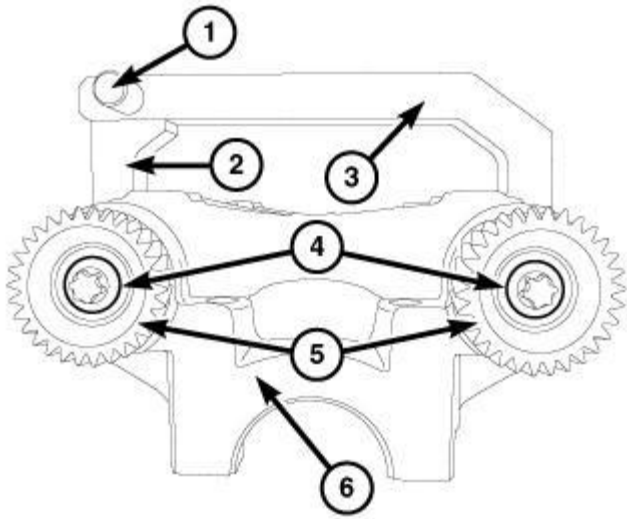


Fig. 219: Crankshaft Main Bearing Cap/Balance Shaft Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Remove bolts (1) and the crankshaft main bearing cap/balance shaft assembly (2) from engine block.
16. Inspect crankshaft bearing caps (2) for wear.
17. Inspect the crankshaft bearing caps bolts (1) for stretching. Refer to **Engine/Engine Block/CRANKSHAFT - Standard Procedure**.

INSTALLATION

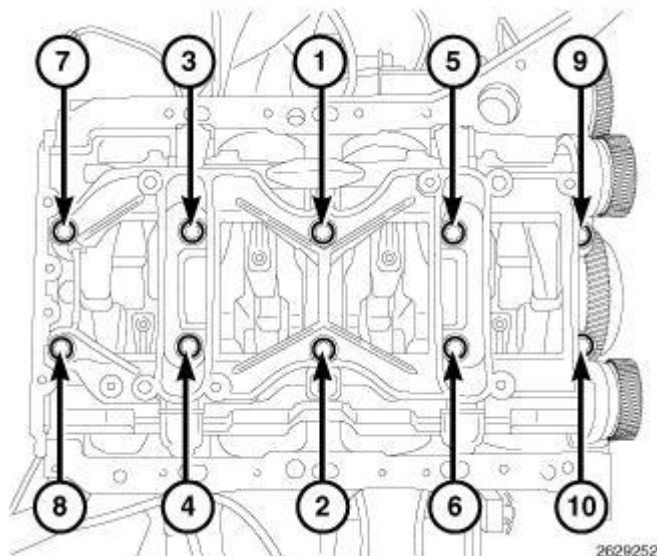
INSTALLATION



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Fig. 220: Balance Shaft Drive Gears Installation
Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket mating surfaces.
2. Install into the Balance Shaft Lock Tool (special tool #10231, Lock, Balance Shaft) and rotate halves (2 and 3) into the locked position and insert the locking pin (1).
3. Loosen the bolts (4) securing balance shaft drive gears (5).
4. Install crankshaft main bearing cap/balance shaft onto engine block while ensuring the balance shaft drive gears are meshed properly and install crankshaft main bearing cap bolts finger tight.
5. Tighten balance shaft drive gear bolts to 50 N.m (37 ft. lbs.) plus an additional 90 degrees.
6. Remove Balance Shaft Locking Tool (special tool #10231, Lock, Balance Shaft).



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Fig. 221: Crankshaft Main Bearing Cap Bolts Torque Sequence

Courtesy of CHRYSLER GROUP, LLC

7. Using the sequence shown in illustration, tighten bolts to 60 N.m (44 ft. lbs.) plus an additional 90 degrees.
8. Install the front oil seal carrier. Refer to **SEAL, CRANKSHAFT OIL, FRONT, INSTALLATION**.

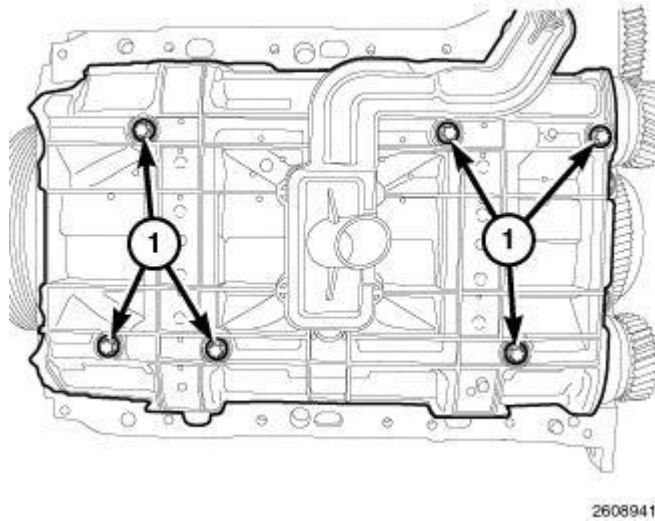


Fig. 222: Oil Pump Pickup Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the oil pump pickup. Tighten bolts to 6 N.m (53 in. lbs.) plus additional 90 degrees.

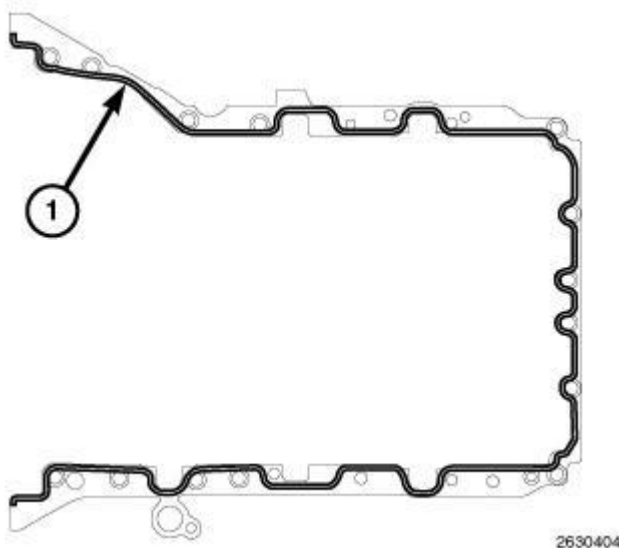


Fig. 223: Engine Sealant RTV Onto Oil Pan Mating Surface
Courtesy of CHRYSLER GROUP, LLC

10. Apply a 2 mm bead of Engine Sealant RTV onto the oil pan mating surface (1).

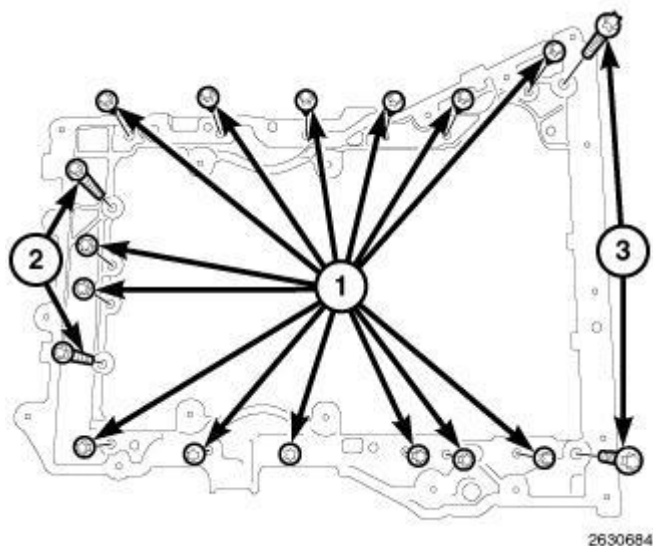


Fig. 224: Oil Pan Bolts

Courtesy of CHRYSLER GROUP, LLC

11. Install oil pan.

- Tighten M6 bolts to 9 N.m (80 in. lbs.).
- Tighten M8 bolts to 20 N.m (177 in. lbs.).
- Tighten transmission-to-oil pan bolts to 40 N.m (30 ft. lbs.).

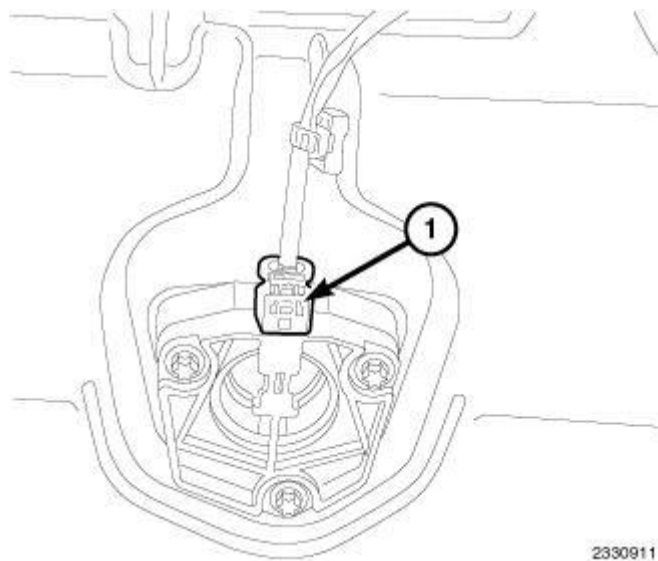


Fig. 225: Oil Level Switch/Life Monitor Wire Harness Connector

Courtesy of CHRYSLER GROUP, LLC

12. Connect the oil life monitor harness connector.

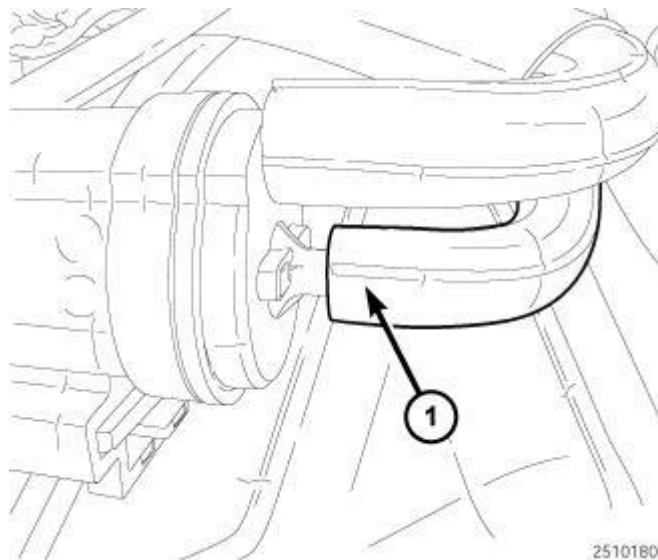


Fig. 226: Coolant Pump Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

13. Install the water pump/power steering pump assembly.
14. Connect the coolant pump actuator vacuum line (1).

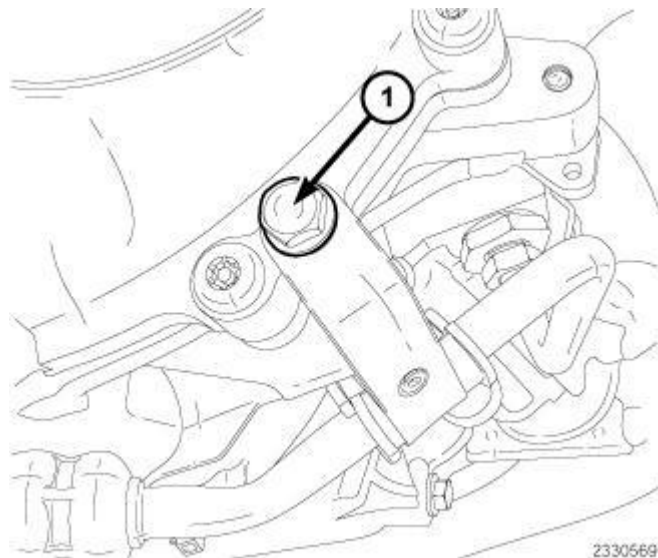


Fig. 227: Power Steering Line Support Bracket Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

15. Install the power steering line to steering gear. Tighten the tube nut to 32 N.m (24 ft. lbs.).
16. Install the power steering line support bracket bolt (2) and tighten bolt to 11 N.m (97 in. lbs.).

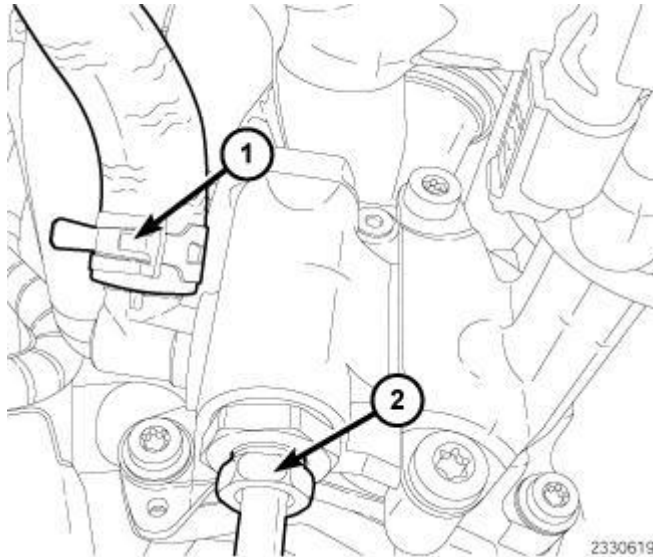


Fig. 228: Power Steering Supply Line & Feed Line
Courtesy of CHRYSLER GROUP, LLC

17. Install the power steering feed line (2) to pump. Tighten the tube nut to 32 N.m (24 ft. lbs.).
18. Connect the power steering return line (1) to pump.
19. Install the oil dipstick tube. Tighten bolts to 9 N.m. 80 in. lbs.).
20. Install the lower timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
21. Connect the negative battery cable.

PUMP, VACUUM

DESCRIPTION

DESCRIPTION

The vacuum pump (1) is mounted to the rear of the oil pump. The vacuum pump is of the vane-type pump that is driven by a hex drive on the rear of the oil pump. The vacuum pump supplies vacuum to the brake booster, EGR system, coolant pump solenoid.

DIAGNOSIS AND TESTING

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.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the thermostat housing. Refer to **THERMOSTAT, REMOVAL** .

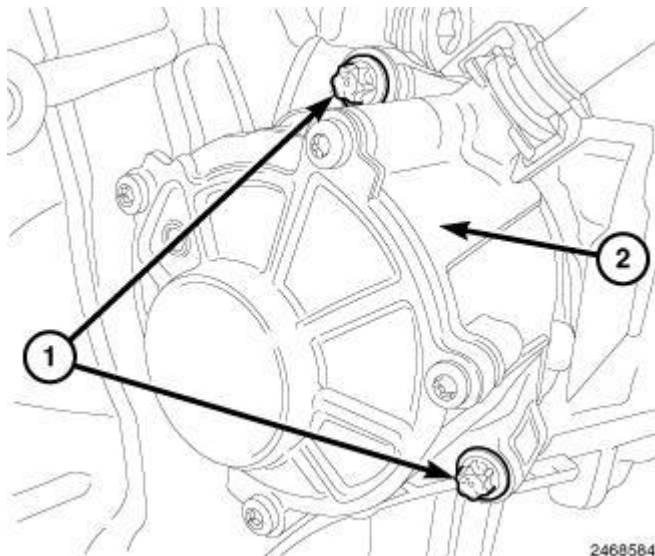


Fig. 229: Vacuum Pump & Bolts
 Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (1) and remove the vacuum pump (2).

INSTALLATION

INSTALLATION

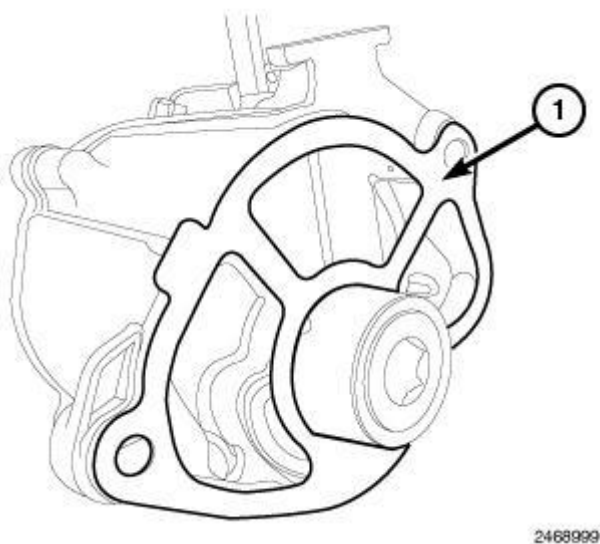


Fig. 230: Vacuum Pump Gasket
 Courtesy of CHRYSLER GROUP, LLC

1. Position a new gasket onto the vacuum pump (1).

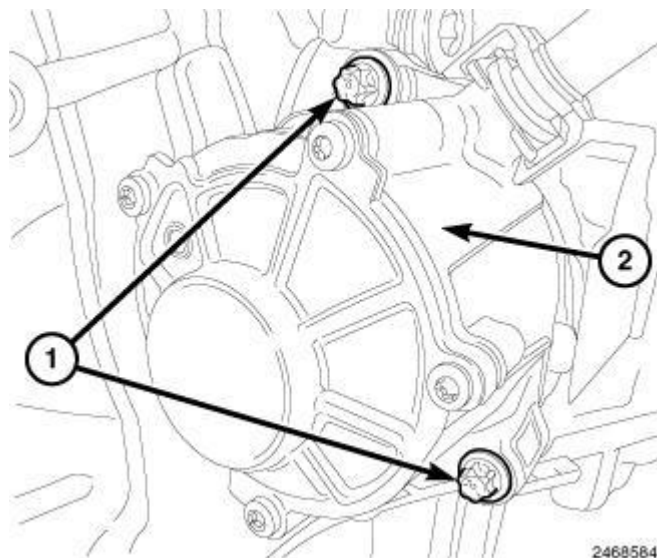


Fig. 231: Vacuum Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Slide vacuum pump (2) onto oil pump hex drive and seat against the block. Tighten bolts (1) to 9 N.m (80 in. lbs.).
3. Install the thermostat housing. Refer to **THERMOSTAT, INSTALLATION** .
4. Install the engine cover.
5. Connect the negative battery cable.

SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

REMOVAL

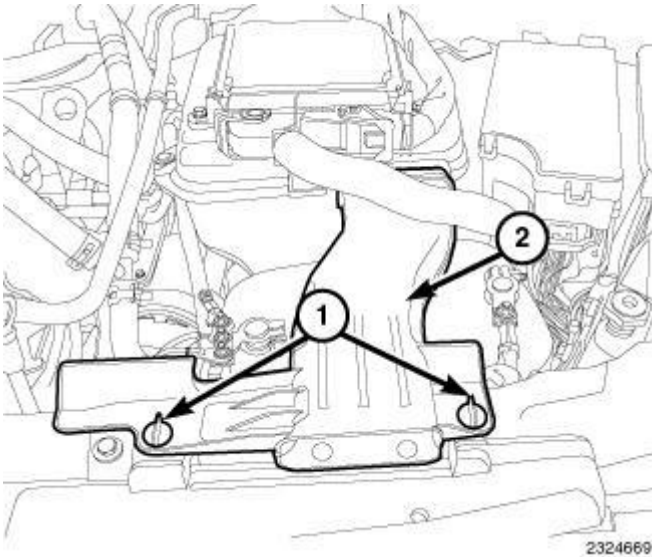


Fig. 232: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove the right front tire. Refer to **REMOVAL** .
4. Remove the belly pan.
5. Partially remove the serpentine belt. Refer to **BELT, SERPENTINE, REMOVAL** .

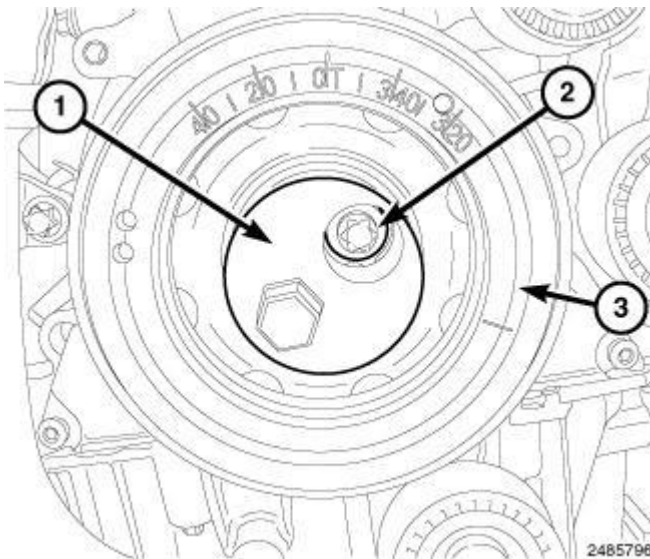


Fig. 233: Vibration Damper Holder, Bolts & Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

NOTE: DO NOT rotate the engine backward.

6. Using Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), remove bolts (2)

and the vibration damper (3).

7. Place a suitable tool behind the lip of the oil seal to pry the oil seal outward. Be careful not to damage the crankshaft seal bore of cover.

REMOVAL - FRONT SEAL CARRIER

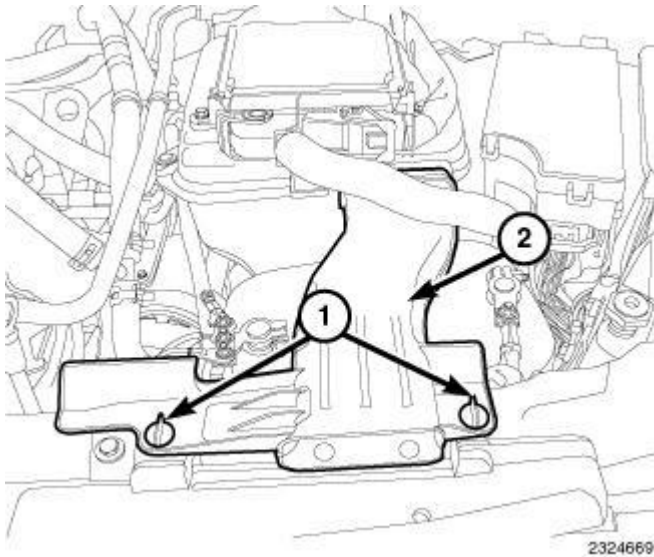


Fig. 234: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove the right front tire. Refer to **REMOVAL** .
4. Remove the belly pan.
5. Partially remove the serpentine belt. Refer to **BELT, SERPENTINE, REMOVAL** .

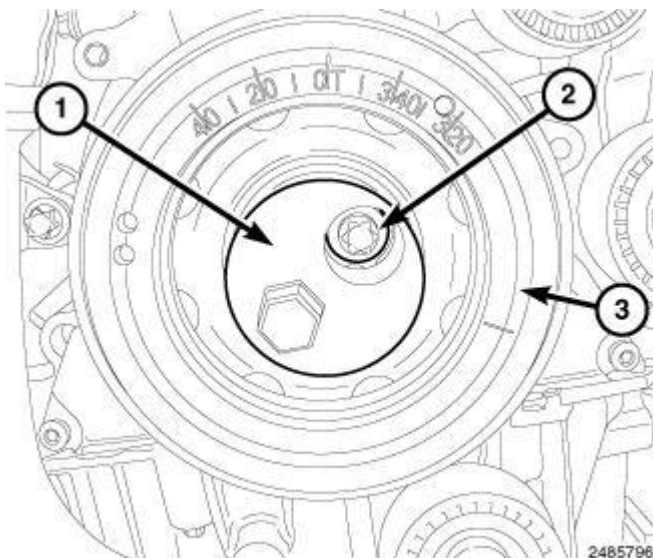


Fig. 235: Vibration Damper Holder, Bolts & Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

NOTE: DO NOT rotate the engine backward.

6. Using Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), remove bolts (2) and the vibration damper (3).

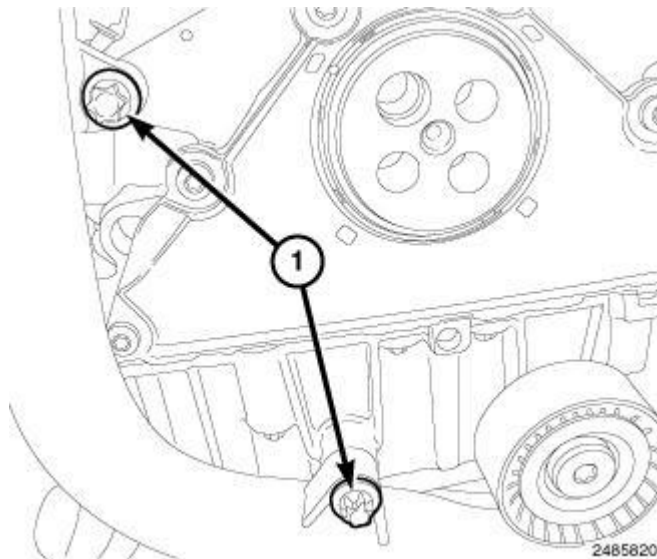


Fig. 236: Coolant Tube Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove the bolts (1) from the coolant tube.

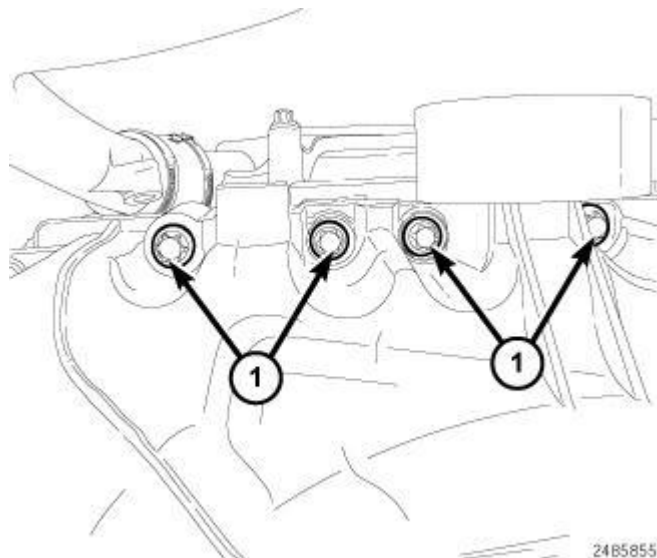


Fig. 237: Front Oil Pan Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove the front oil pan bolts (1).

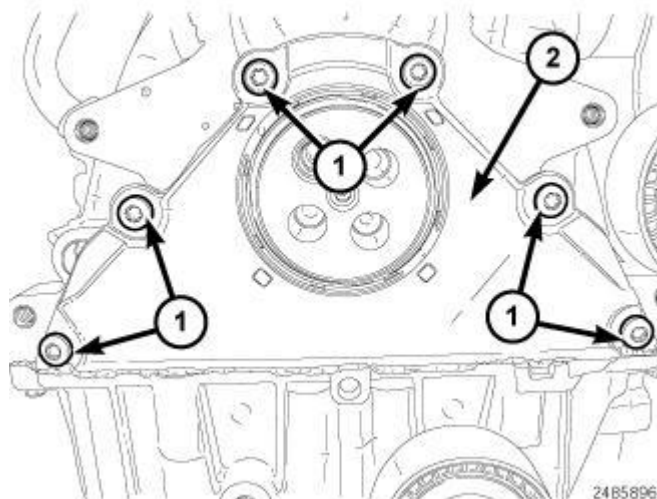


Fig. 238: Front Oil Seal Carrier & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (1) and the front oil seal carrier (2).

INSTALLATION

FRONT SEAL CARRIER

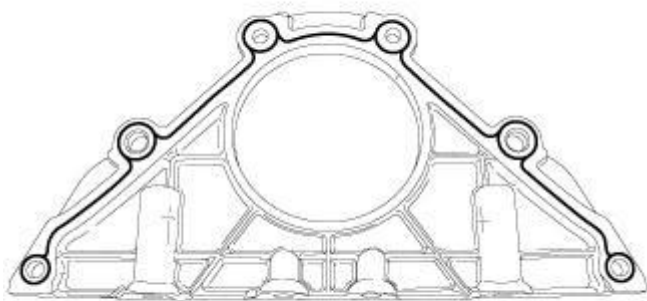


Fig. 239: Bead Of Engine Sealant RTV To Front Seal Carrier
Courtesy of CHRYSLER GROUP, LLC

2/2/10

1. Clean the gasket mating surfaces.
2. Apply a 2 mm bead of engine sealant RTV to the front seal carrier as illustrated and to the front of oil pan.

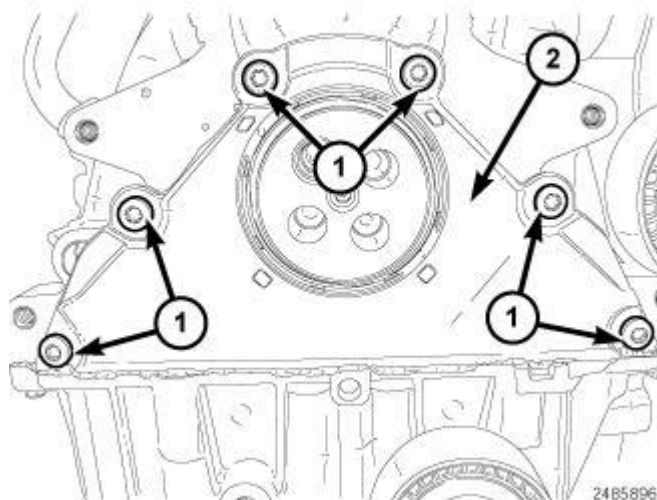


Fig. 240: Front Oil Seal Carrier & Bolts
 Courtesy of CHRYSLER GROUP, LLC

3. Install the front oil seal carrier (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

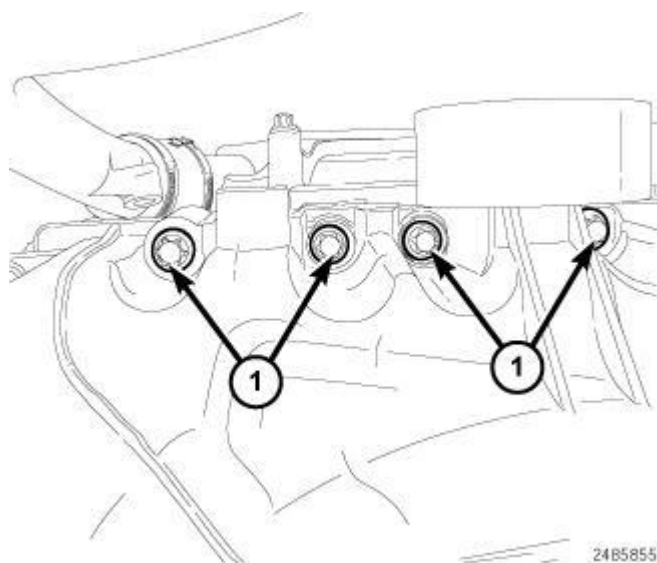


Fig. 241: Front Oil Pan Bolts
 Courtesy of CHRYSLER GROUP, LLC

4. Install the front oil pan bolts. Tighten bolts to 9 N.m (80 in. lbs.).

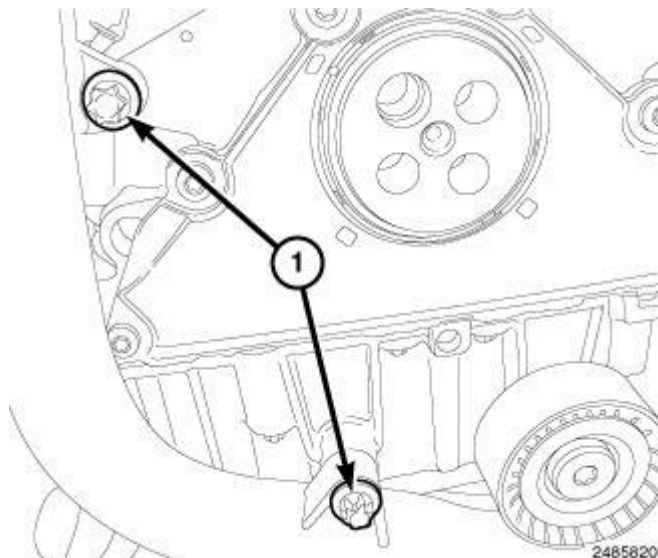


Fig. 242: Coolant Tube Bolts

Courtesy of CHRYSLER GROUP, LLC

5. Install the bolts to the coolant tube. Tighten bolts to 9 N.m (80 in. lbs.).

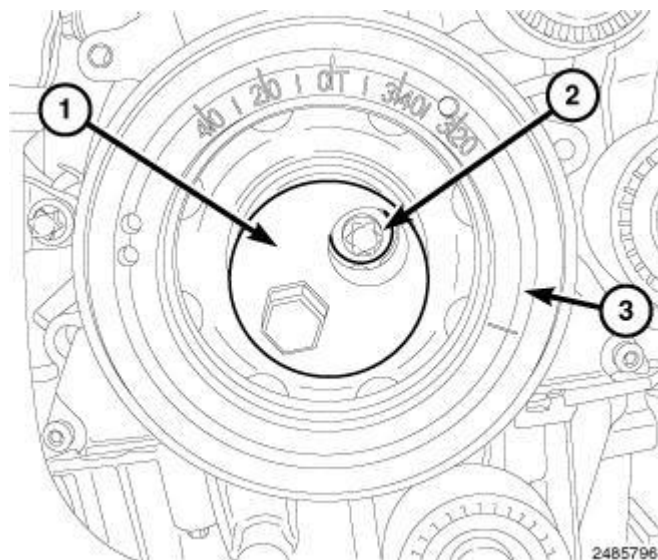


Fig. 243: Vibration Damper Holder, Bolts & Vibration Damper

Courtesy of CHRYSLER GROUP, LLC

6. Install the vibration damper and bolts.
7. Using Vibration Damper Holder Tool (special tool #10236, Holder, Vibration Damper), tighten bolts to 80 N.m (59 ft. lbs.) plus additional 90 degrees.

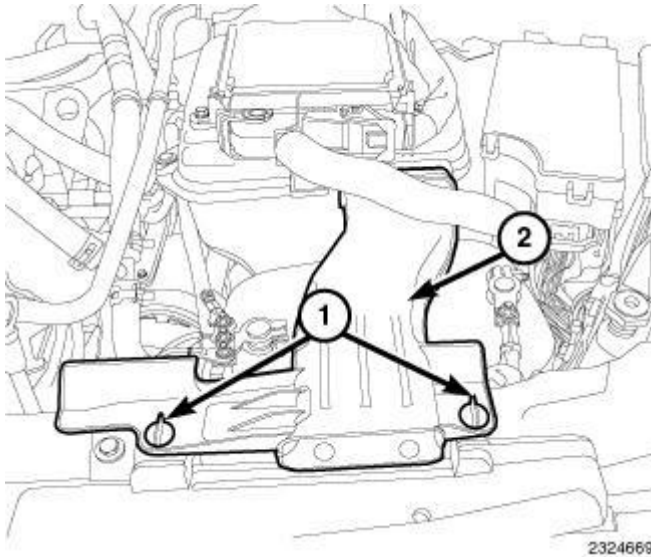


Fig. 244: Quarter Turn Lock Tabs & Air Inlet Duct
 Courtesy of CHRYSLER GROUP, LLC

8. Install the serpentine belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
9. Install the belly pan.
10. Install the right front tire. Refer to **INSTALLATION** .
11. Connect the negative battery cable.
12. Install air inlet duct (2) and lock the quarter turn lock tabs (1).

INSTALLATION

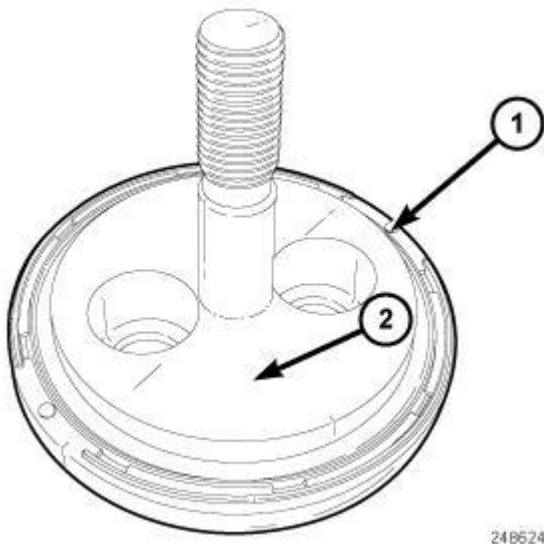


Fig. 245: Front Crankshaft Oil Seal & Front Crankshaft Seal Adapter
 Courtesy of CHRYSLER GROUP, LLC

1. Position the front crankshaft oil seal (1) onto the Front Crankshaft Seal adapter (special tool #10235, Install, Front Crankshaft Seal Ring) (2).

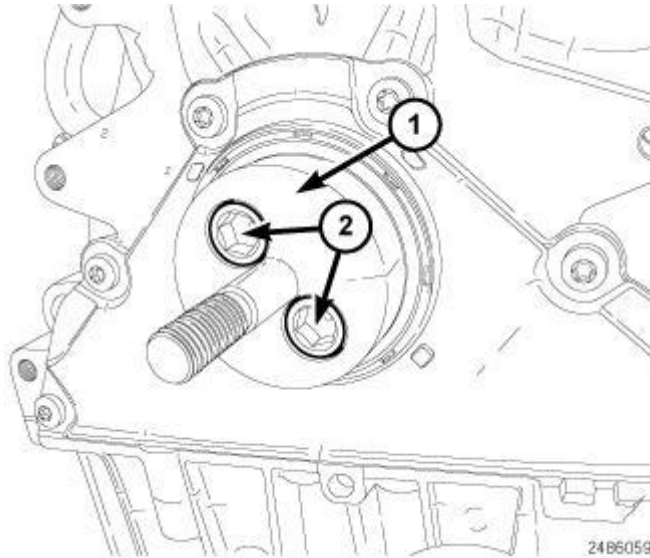


Fig. 246: Front Crankshaft Seal Adapter & Bolts
 Courtesy of CHRYSLER GROUP, LLC

2. Position the Front Crankshaft Seal Installer Adapter (special tool #10235, Install, Front Crankshaft Seal Ring) (1) to crankshaft and install the bolts (2).

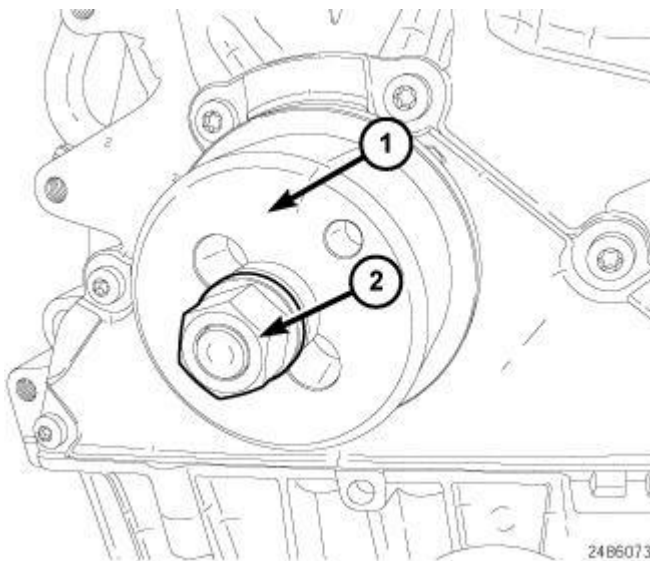


Fig. 247: Front Crankshaft Seal Adapter & Nut
 Courtesy of CHRYSLER GROUP, LLC

3. Position the Front Crankshaft Seal Installer (special tool #10235, Install, Front Crankshaft Seal Ring) (1) onto the seal/adaptor and install the nut (2).
4. Turn the nut (2) to draw the seal in. When the nut (2) can no longer turn the seal is fully installed.
5. Remove the rear seal installer assembly.

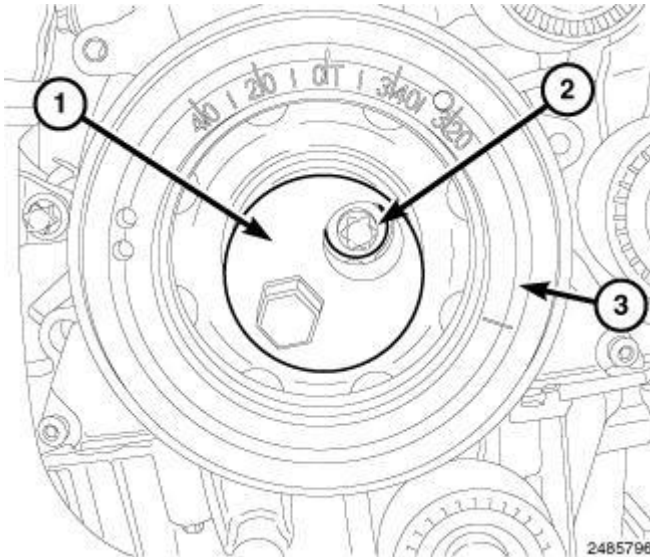


Fig. 248: Vibration Damper Holder, Bolts & Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

6. Install the vibration damper and bolts.
7. Using Vibration Damper Holder tool (special tool #10236, Holder, Vibration Damper), tighten bolts to 80 N.m (59 ft. lbs.) plus additional 90 degrees.

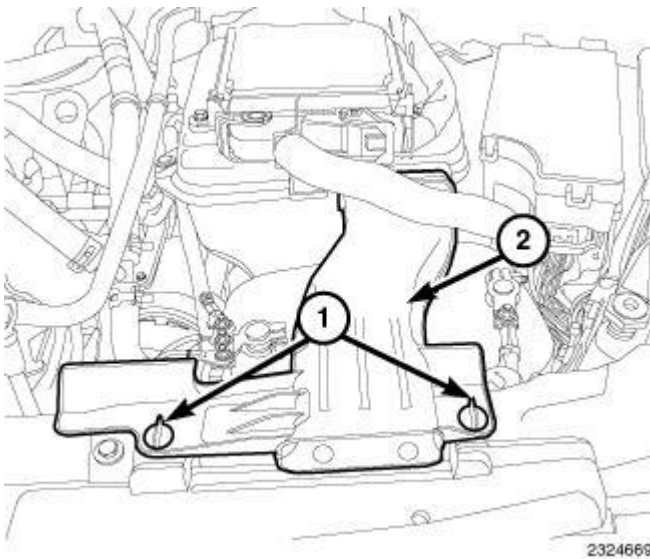
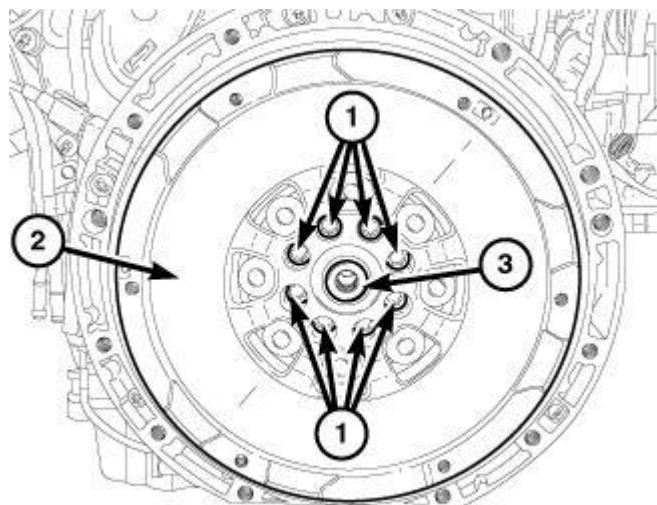


Fig. 249: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

8. Install the serpentine belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
9. Install the belly pan.
10. Install the right front tire. Refer to **INSTALLATION**.
11. Connect the negative battery cable.
12. Install air inlet duct (2) and lock the quarter turn lock tabs (1).

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

1. Disconnect the negative battery cable.
2. Remove the clutch assembly. Refer to **DISC, CLUTCH, REMOVAL**.

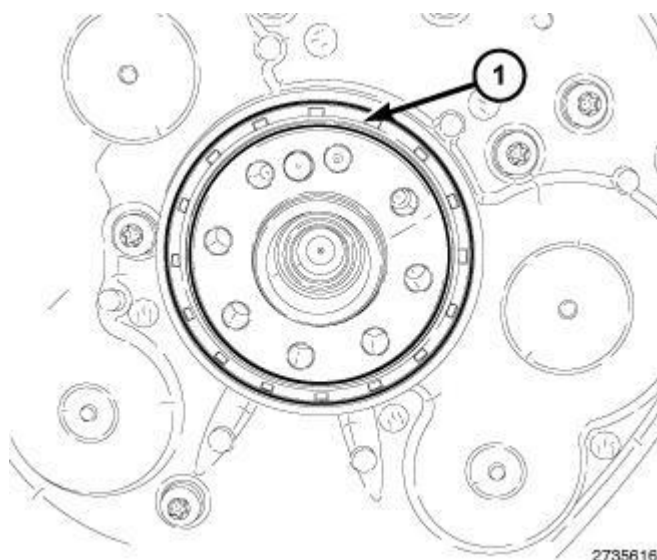


24B5265

Fig. 250: Flywheel & Bolts

Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the flywheel (2).



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Fig. 251: Rear Crankshaft Oil Seal

Courtesy of CHRYSLER GROUP, LLC

4. Place a suitable tool behind the lips of the oil seal to pry the oil seal outward. Be careful not to damage the crankshaft seal bore of cover.

INSTALLATION

INSTALLATION

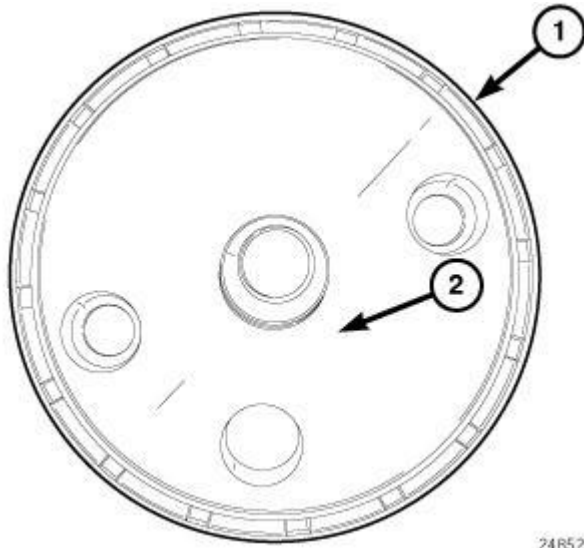


Fig. 252: Rear Crankshaft Oil Seal & Rear Main Seal Ring Installer Adaptor
Courtesy of CHRYSLER GROUP, LLC

1. Position the rear crankshaft oil seal (1) onto the Rear Main Seal Ring Installer Adaptor (special tool #10233, Install, Rear Crankshaft Seal) (2).

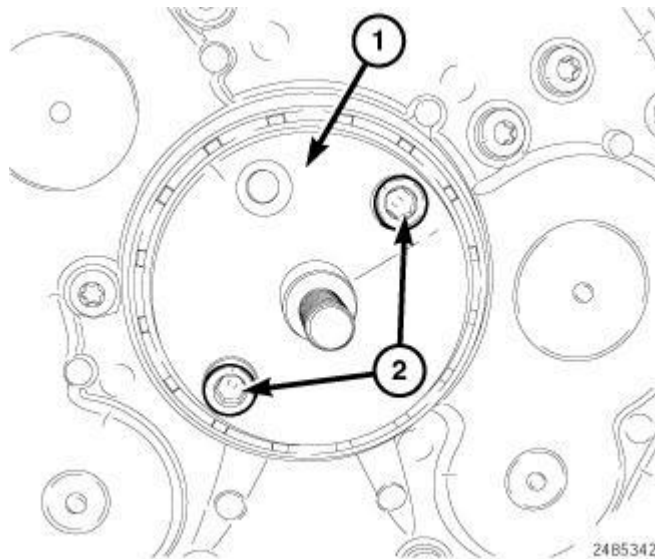


Fig. 253: Rear Main Seal Ring Adaptor & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Position the Rear Main Seal Ring Adaptor (special tool #10233, Install, Rear Crankshaft Seal) (1) to crankshaft and install the bolts (2).

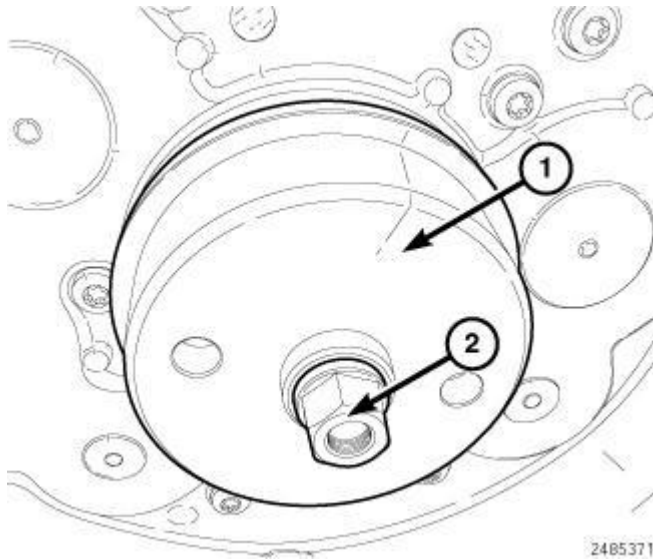


Fig. 254: Seal Installer & Nut
Courtesy of CHRYSLER GROUP, LLC

3. Position the Seal Installer (special tool #10233, Install, Rear Crankshaft Seal) (1) onto the seal/adaptor (special tool #10233, Install, Rear Crankshaft Seal) and install the nut (2).
4. Turn the nut (2) to draw the seal in. When the nut (2) can no longer turn the seal is fully installed.
5. Remove the rear seal installer assembly.

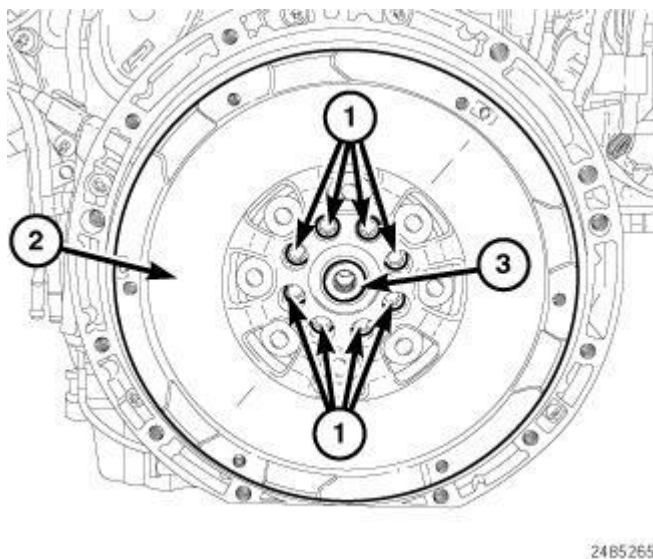


Fig. 255: Flywheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install dual mass flywheel (2) and the bolts (1). Tighten bolts to 45 N.m (33 ft. lbs.) plus an additional 90 degrees.

7. Install the clutch assembly. Refer to **DISC, CLUTCH, INSTALLATION** .
8. Connect negative battery cable.

ENGINE MOUNTING

DESCRIPTION

DESCRIPTION

The engine mounting system consists of a four-point system utilizing two load-carrying mounts and two torque struts. The load-carrying mounts are located on each frame rail. The right mount is a hydro-elastic mount and left mount is a conventional elastomeric isolator. The two torque controlling struts are attached at the front of the engine, straddling the right side load-carrying mount. The upper strut connects to the suspension strut tower and the lower to the suspension crossmember.

OPERATION

OPERATION

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

INSULATOR, ENGINE MOUNT, FRONT MOUNT

REMOVAL

REMOVAL

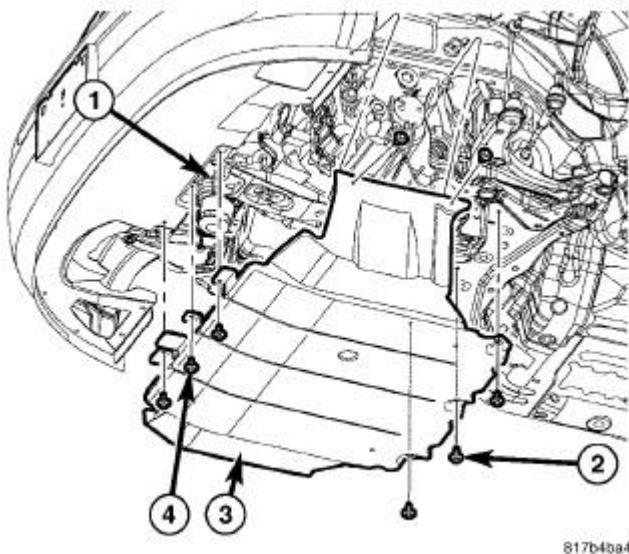


Fig. 256: Belly Pan & Fasteners

Courtesy of CHRYSLER GROUP, LLC

1. Raise and support the vehicle.
2. Remove the four wheel well push pin retainers.
3. Remove the three front screws (4), the three rear screws (2) the center bolt and the belly pan.

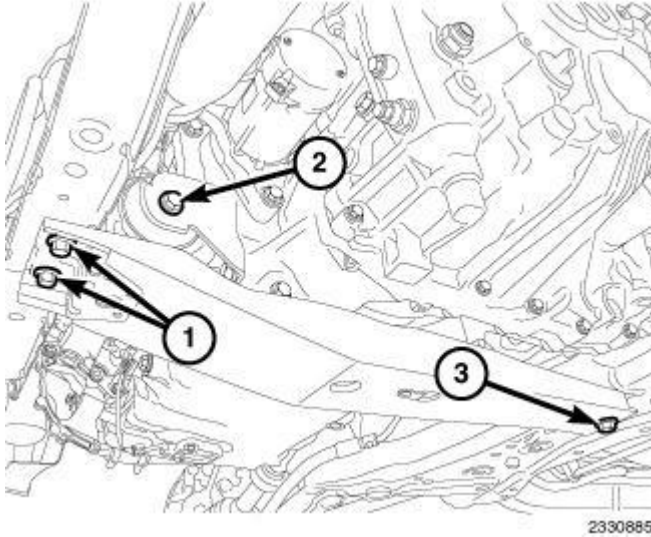


Fig. 257: Fore/Aft Crossmember Fasteners & Transaxle Mount Through Bolt
 Courtesy of CHRYSLER GROUP, LLC

4. Remove front mount through bolt (2).
5. Remove fore/aft member retaining bolts (1 and 3) and remove fore/aft member.
6. Remove the bolts and the front engine mount from the fore/aft member.

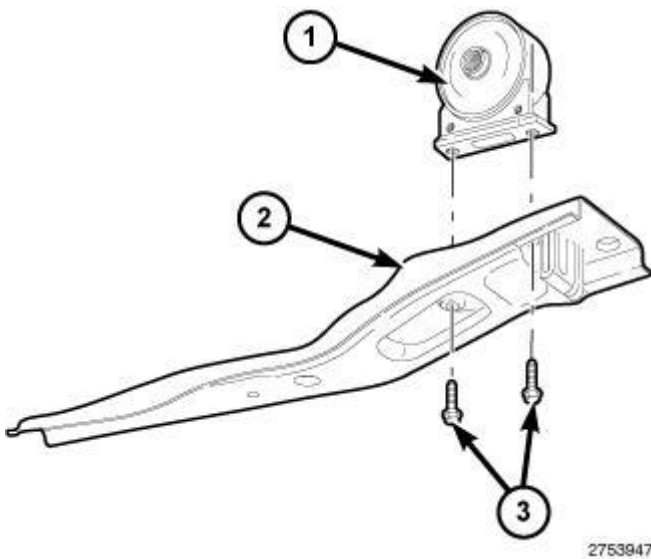


Fig. 258: Front Engine Mount Assembly
 Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (2) and the front engine mount (1).

INSTALLATION

INSTALLATION

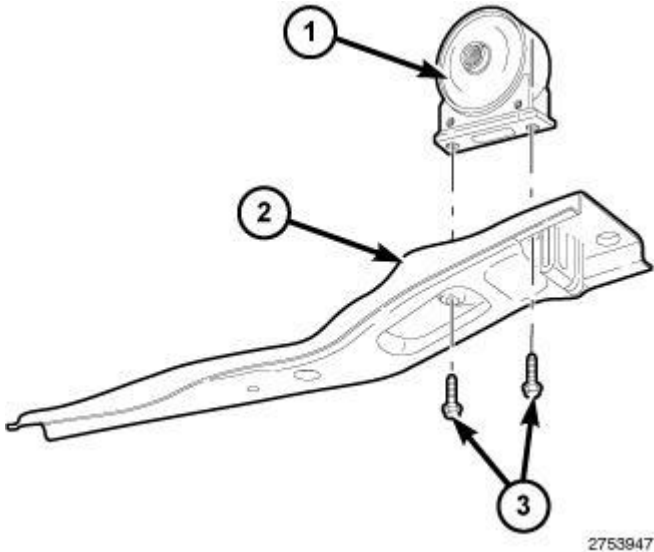


Fig. 259: Front Engine Mount Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Install the front engine mount (1) to the fore/aft member (2). Tighten bolts (3) to 60 N.m (44 ft. lbs.).

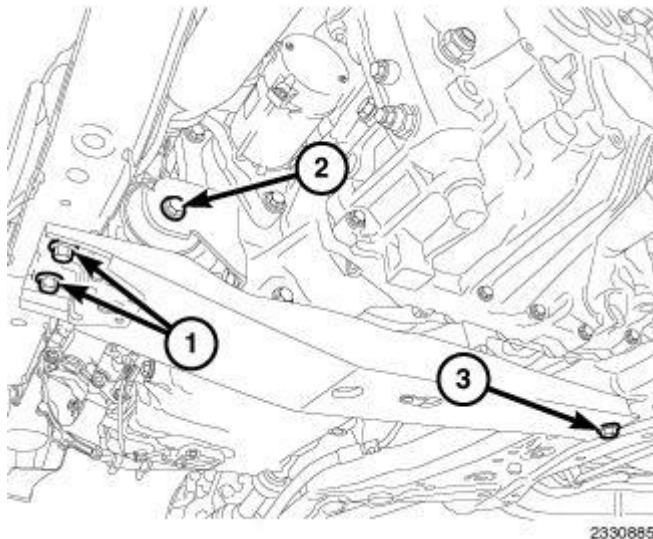


Fig. 260: Fore/Aft Crossmember Fasteners & Transaxle Mount Through Bolt
Courtesy of CHRYSLER GROUP, LLC

2. Install the front mount to the crossmember.
3. Install the fore/aft member and tighten bolts (1 and 3) finger tight.

4. Install the front mount through bolt (2) finger tight.
5. Tighten bolts in the following sequence:
 1. Tighten the bolt (1) to 78 N.m (58 ft. lbs.).
 2. Tighten the bolt (3) to 129 N.m (95 ft. lbs.).
 3. Tighten the bolt (2) to 65 N.m (48 ft. lbs.).

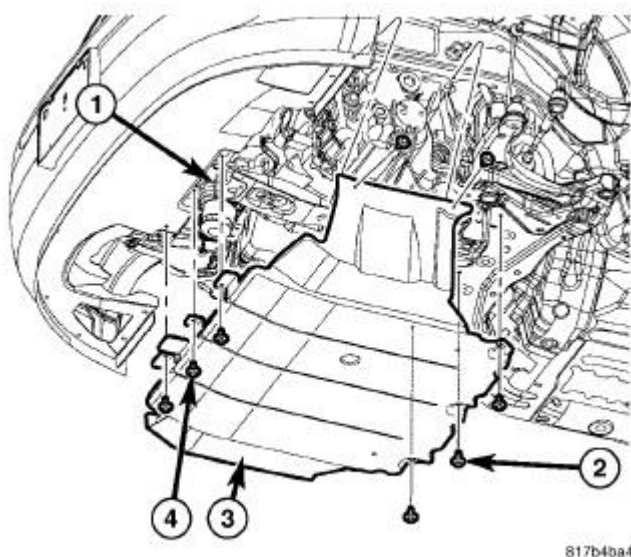


Fig. 261: Belly Pan & Fasteners
 Courtesy of CHRYSLER GROUP, LLC

6. Position the belly pan and install the three front bolts (4), the three rear bolts (2) and the center belly pan bolt.
7. Install the four wheel well push pin retainers.
8. Lower the vehicle.

INSULATOR, ENGINE MOUNT, REAR MOUNT

REMOVAL

REMOVAL

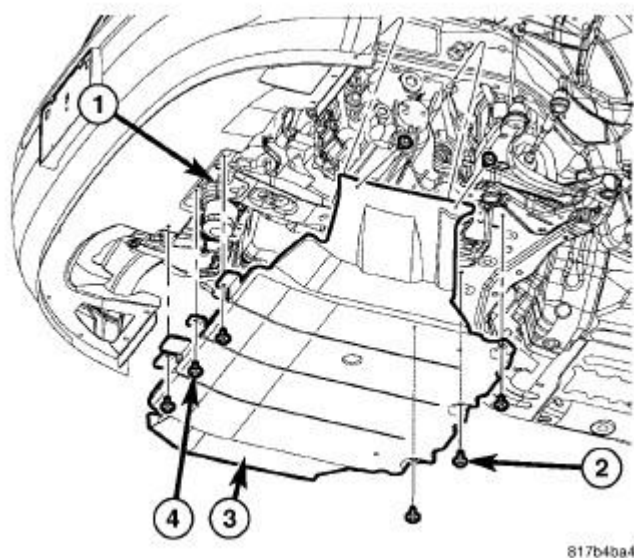


Fig. 262: Belly Pan & Fasteners

Courtesy of CHRYSLER GROUP, LLC

1. Raise and support the vehicle.
2. Remove the four wheel well push pin retainers.
3. Remove the three front screws (4), the three rear screws (2) the center bolt and the belly pan.
4. Position a transmission jack under transmission and slightly raise.

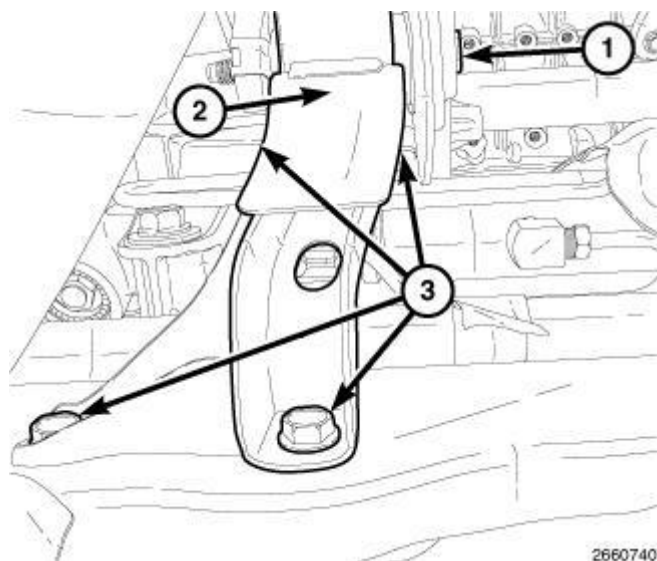


Fig. 263: Rear Roll Mount Assembly

Courtesy of CHRYSLER GROUP, LLC

5. Remove the rear roll mount (2) through bolt (1).
6. Remove the four bolts (3) attaching the rear roll mount (5) to the crossmember and remove the mount.

INSTALLATION

INSTALLATION

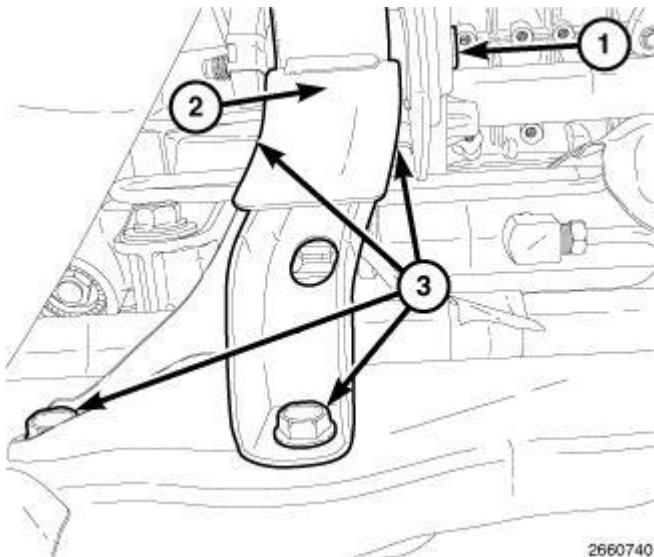


Fig. 264: Rear Roll Mount Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Install the rear roll mount (2) to the crossmember. Tighten the bolts (3) to 153 N.m (112 ft. lbs.).
2. Install the rear roll mount through bolt (1) and tighten to 65 N.m (48 ft. lbs.).

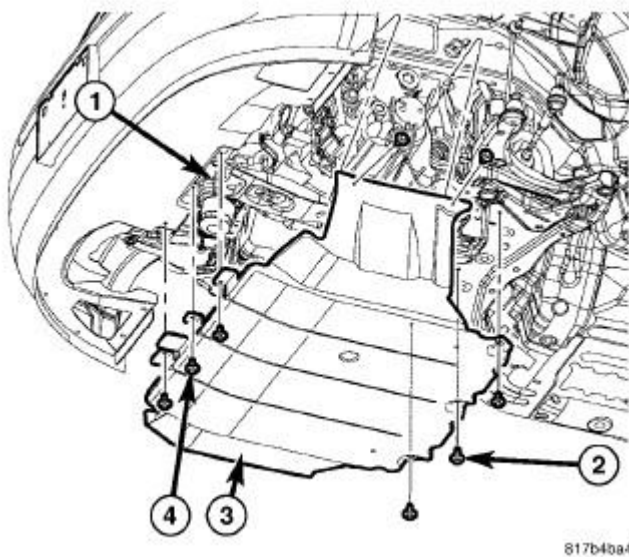


Fig. 265: Belly Pan & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Lower the transmission and remove the transmission jack.
4. Position the belly pan and install the three front bolts (4), the three rear bolts (2) and the center belly pan

bolt.

5. Install the four wheel well push pin retainers.
6. Lower the vehicle.

INSULATOR, ENGINE MOUNT, LEFT

REMOVAL

REMOVAL

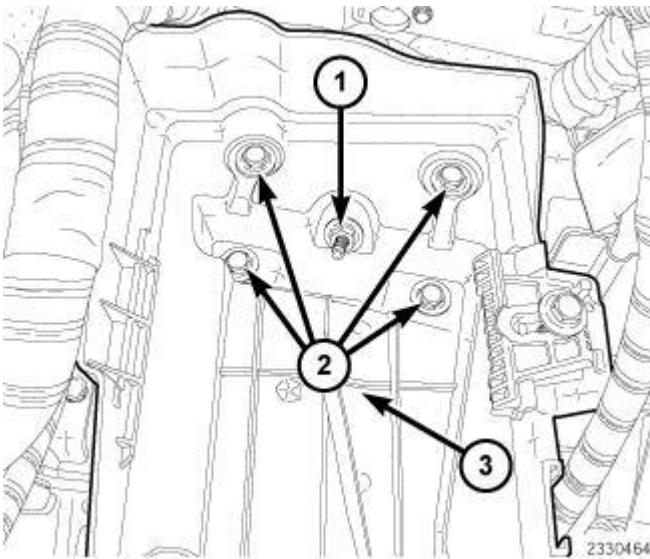


Fig. 266: Battery Tray, Nut & Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the positive and negative battery cables.
2. Remove air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL**.
3. Remove the battery.
4. Release the lock tabs, lift up and position aside the TIPM.
5. Remove the nut (1), retaining bolts (2) and the battery tray (3).

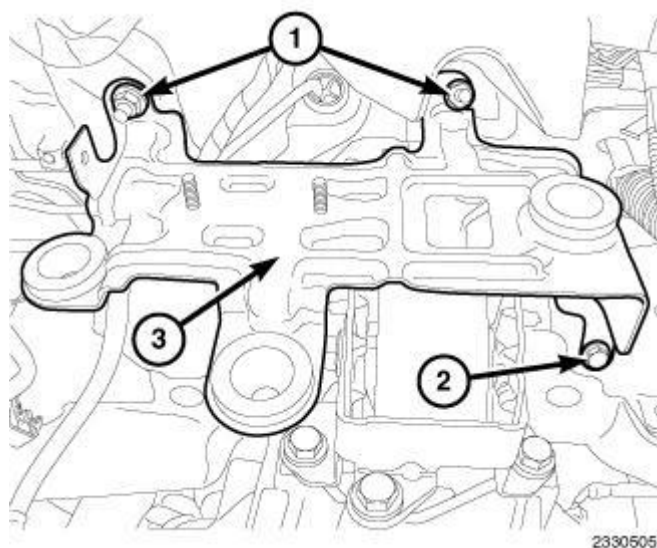


Fig. 267: Air Cleaner Mounting Bracket, Nuts & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Remove the two nuts (1), bolt (2), and the air cleaner mounting bracket (3).

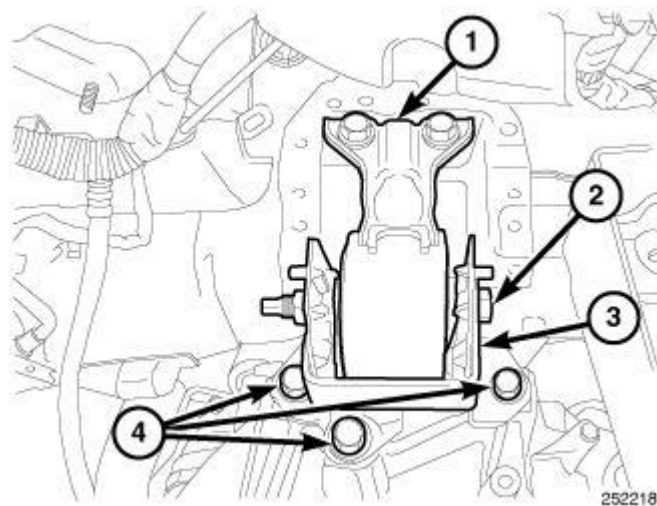


Fig. 268: Left Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

7. Support transaxle with floor jack.
8. Remove mount to transaxle through bolt (2).
9. Remove the three bolts (4) and the left mount bracket (3).

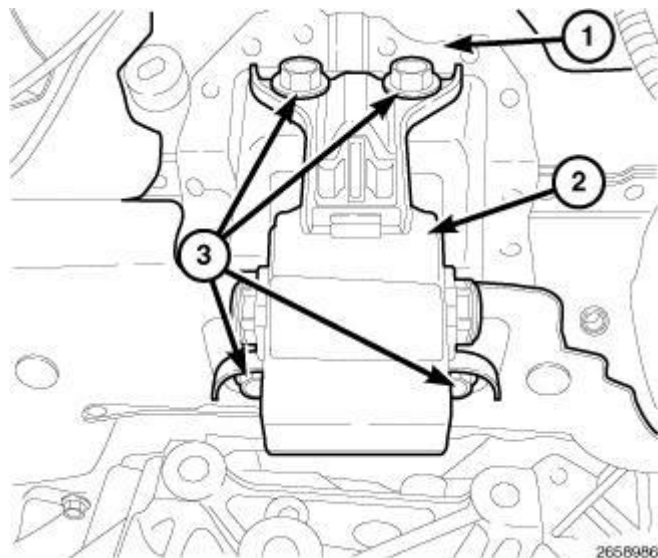


Fig. 269: Left Side Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Remove four bolts (3) and the left side engine mount (2).

INSTALLATION

INSTALLATION

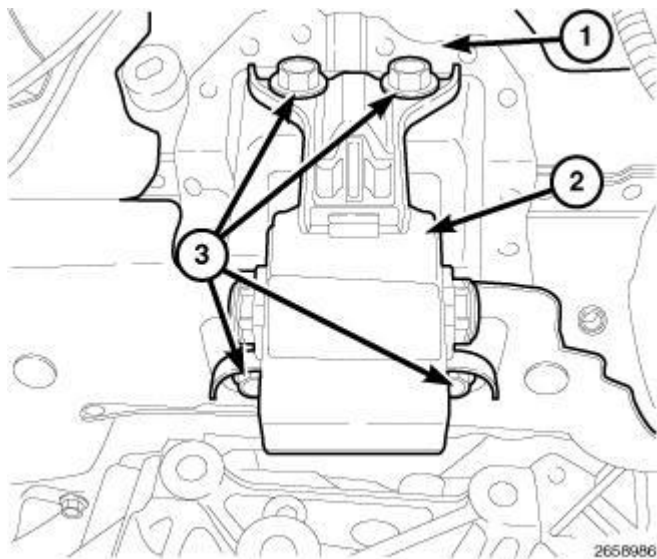


Fig. 270: Left Side Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Install left transmission mount (2) to body frame rail. Tighten Bolts (3) 75 N.m (55 ft. lbs.).

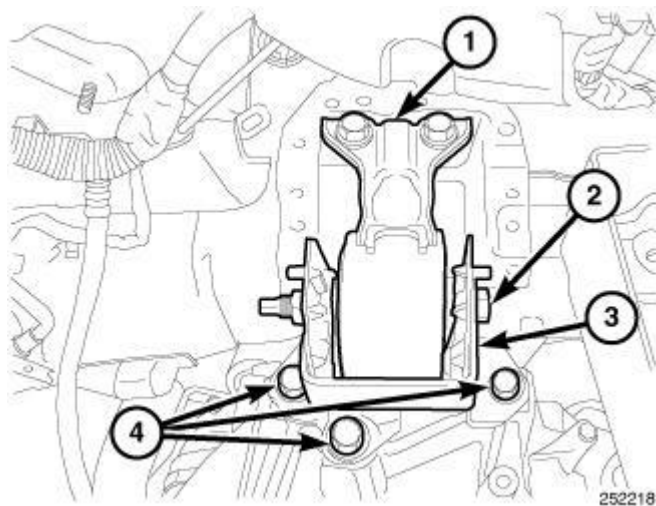


Fig. 271: Left Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Raise transaxle with a floor jack.
3. Install the left mount bracket (3). Tighten bolts (4) to 61 N.m (45 ft. lbs.).
4. Install left transmission mount through bolt (2) and tighten to 100 N.m (74 ft. lbs.).
5. Remove floor jack.

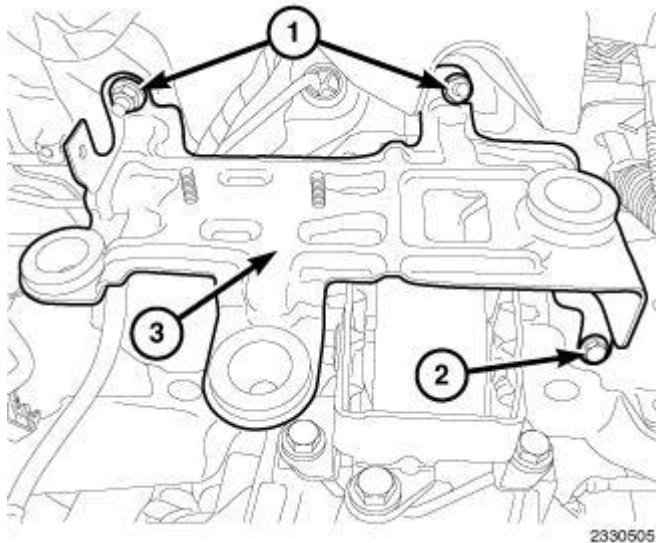


Fig. 272: Air Cleaner Mounting Bracket, Nuts & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Install the air cleaner mounting bracket (3).
 1. Tighten nuts (1) to 11 N.m (97 in. lbs.).
 2. Tighten bolt (2) to 11 N.m (97 in. lbs.).

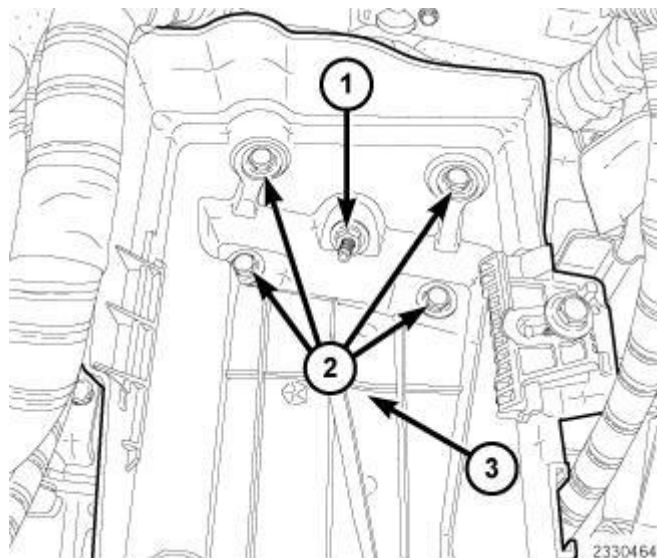


Fig. 273: Battery Tray, Nut & Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

7. Install the battery tray (3).
 1. Tighten bolts (2) to 11 N.m (97 in. lbs.).
 2. Tighten Nut (1) to 11 N.m (97 in. lbs.).
8. Position TIPM the into bracket and push down to lock in place.
9. Install the battery. Tighten bolt to 7 N.m (62 in. lbs.).
10. Install air cleaner assembly. Refer to **BODY, AIR CLEANER, INSTALLATION.**
11. Connect negative and positive battery cables.

INSULATOR, ENGINE MOUNT, RIGHT

REMOVAL

ENGINE MOUNT CARRIER BRACKET

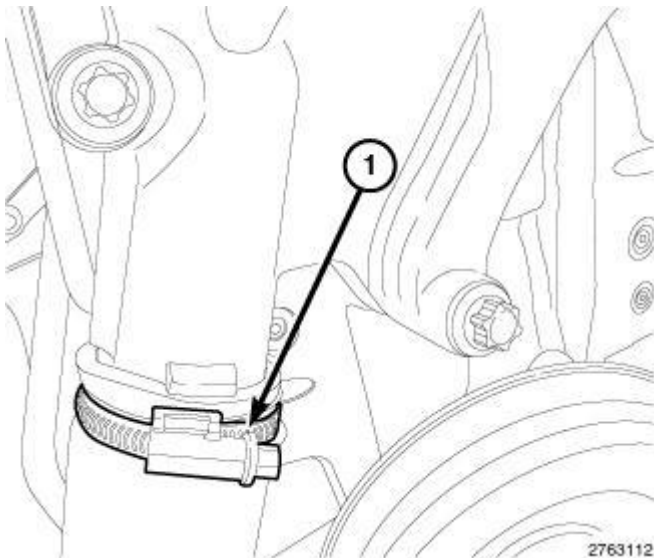


Fig. 274: Hose Clamp

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the belly pan.
4. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
5. Loosen hose clamp (1) and position it aside.

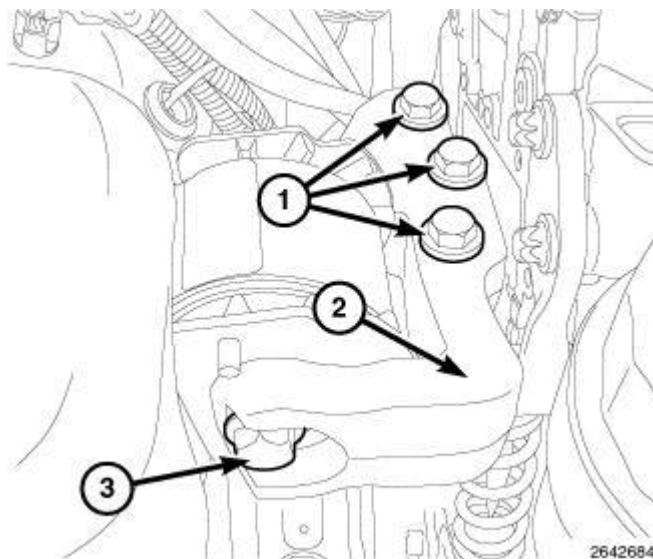


Fig. 275: Engine Mount, Bracket & Through Bolt

Courtesy of CHRYSLER GROUP, LLC

NOTE: Use care in positioning the floor jack to oil pan.

6. Position a floor jack under the oil pan.

7. Remove the engine mount through bolt (3).
8. Remove bolts (1) and the engine mount bracket (2).

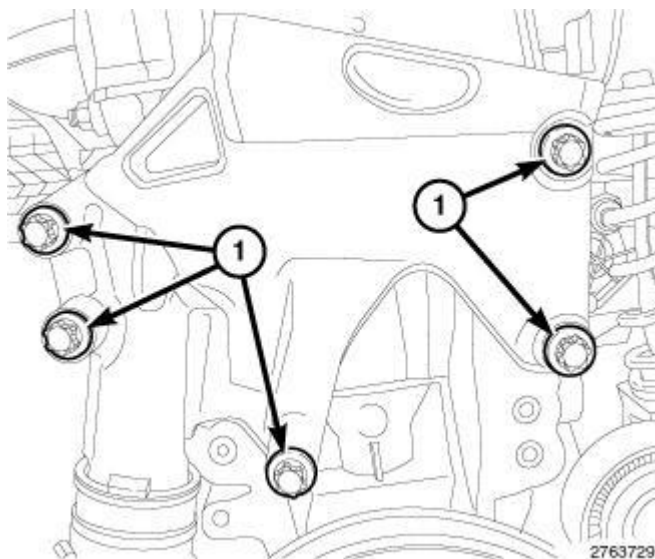


Fig. 276: Engine Mount Carrier Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (1) and the engine mount carrier bracket.
10. Remove and discard gasket.

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the windshield washer reservoir. Refer to **RESERVOIR, WINDSHIELD WASHER, REMOVAL**.

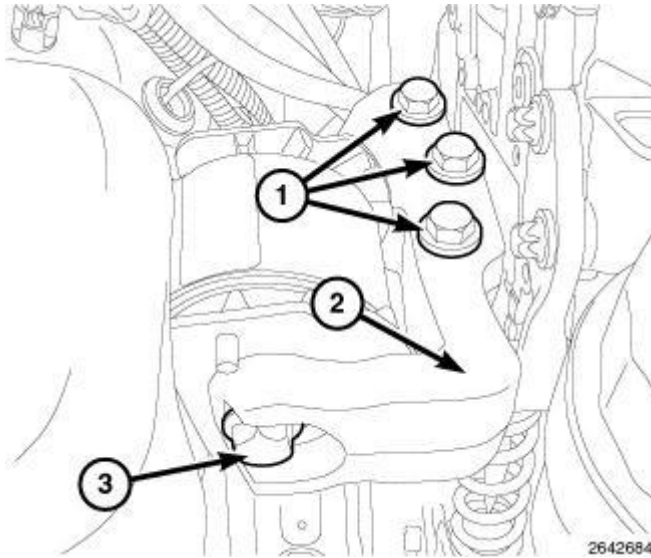


Fig. 277: Engine Mount, Bracket & Through Bolt
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Use care in positioning the floor jack to oil pan.

4. Position a floor jack under the oil pan.
5. Remove the engine mount through bolt (3).
6. Remove bolts (1) and the engine mount bracket (2).

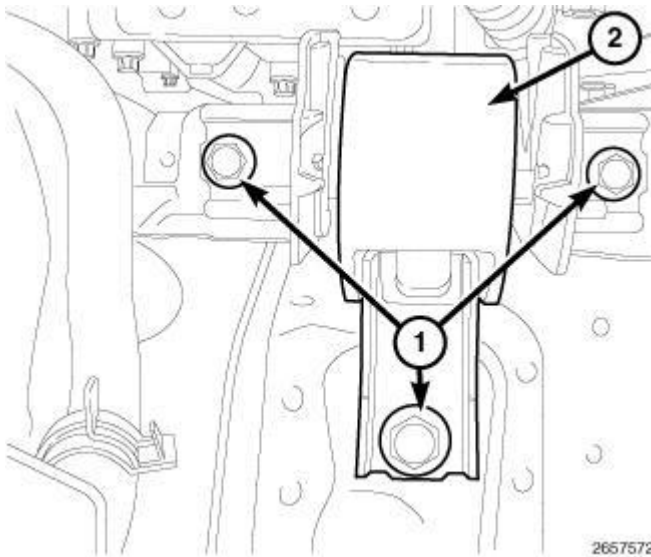


Fig. 278: Engine Mount At Body Frame Rail & Bolts
 Courtesy of CHRYSLER GROUP, LLC

7. Using a permanent ink marker or equivalent, mark the position of engine mount (2) to the body frame rail.
8. Remove bolts (1) and engine mount (2) from body frame rail.

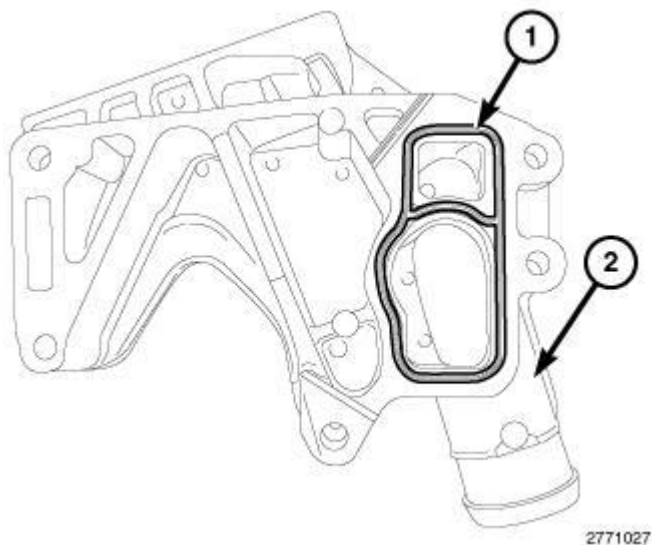
INSTALLATION**ENGINE MOUNT CARRIER BRACKET**

Fig. 279: Engine Mount Carrier Bracket & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket mating surfaces.
2. Install a new gasket (1) onto the engine mount carrier bracket (2).

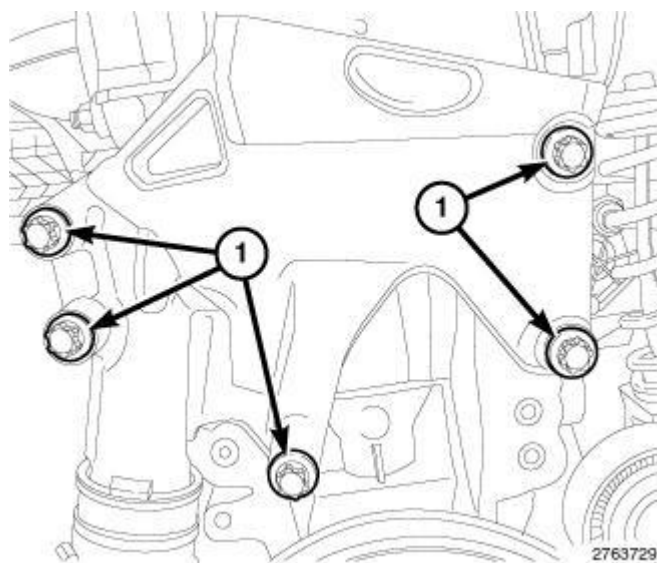


Fig. 280: Engine Mount Carrier Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the engine mount carrier bracket. Tighten bolts (1) to 25 N.m (18 ft. lbs.).

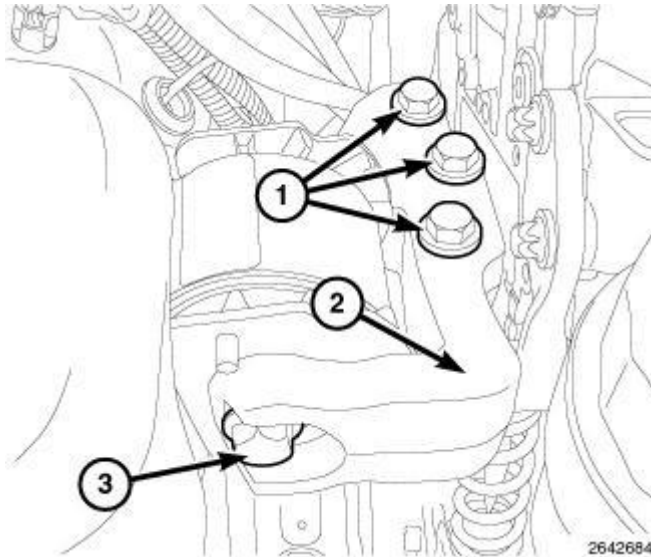


Fig. 281: Engine Mount, Bracket & Through Bolt
 Courtesy of CHRYSLER GROUP, LLC

4. Install the engine mount bracket (2) and tighten bolts (1) finger tight.
5. Install engine mount through bolt (3) and tighten to 88 N.m (65 ft. lbs.).
 - Tighten engine mount bracket bolts (1) to 68 N.m (50 ft. lbs.).
6. Remove the floor jack.

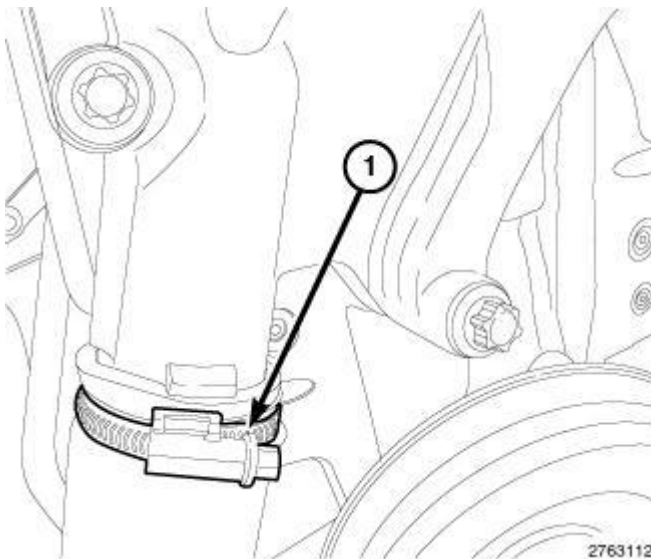


Fig. 282: Hose Clamp
 Courtesy of CHRYSLER GROUP, LLC

7. Position hose clamp (1) and securely tighten.
8. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
9. Install the belly pan.
10. Install the engine cover.

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

INSTALLATION

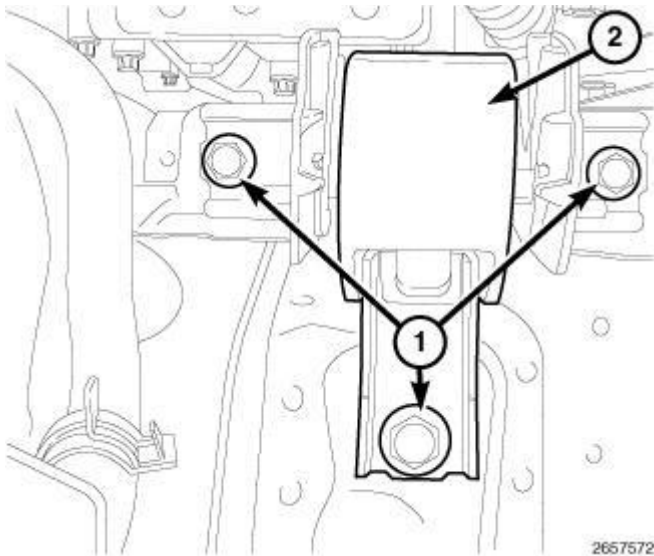


Fig. 283: Engine Mount At Body Frame Rail & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Install the engine mount (2) onto the body frame rail. Tighten bolts (1) 75 N.m (55 ft. lbs.).

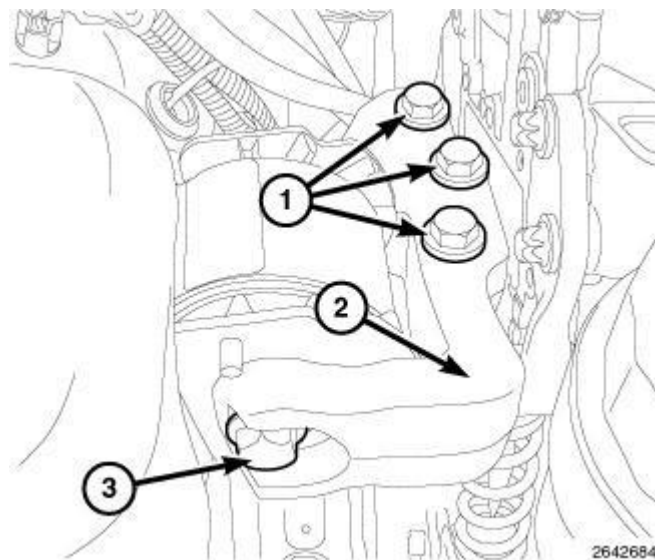


Fig. 284: Engine Mount, Bracket & Through Bolt
Courtesy of CHRYSLER GROUP, LLC

2. Install the engine mount bracket (2) and tighten bolts (1) finger tight.
3. Install engine mount through bolt (3) and tighten to 88 N.m (65 ft. lbs.).

1. Tighten engine mount bracket bolts (1) to 68 N.m (50 ft. lbs.).
4. Remove the floor jack.
5. Install the windshield reservoir. Refer to **RESERVOIR, WINDSHIELD WASHER, INSTALLATION**.
6. Install the engine cover.
7. Connect the negative battery cable.

LUBRICATION

CONTROL VALVE, OIL INTAKE

REMOVAL

REMOVAL

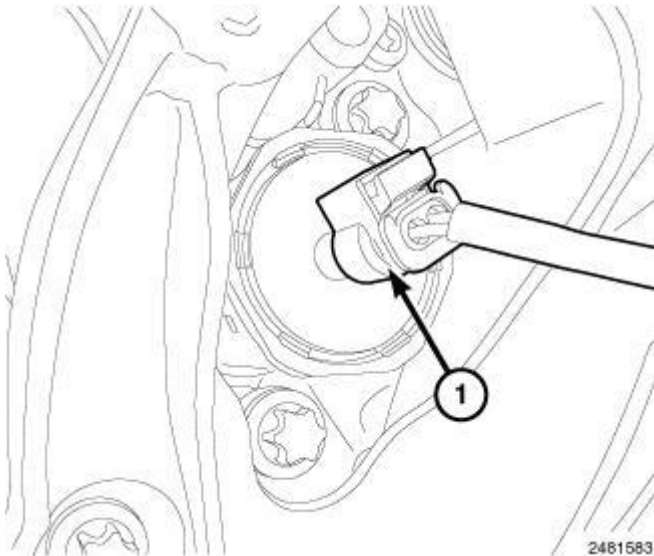


Fig. 285: Piston Cooling Oil Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Disconnect the piston cooling oil control valve harness connector (1).

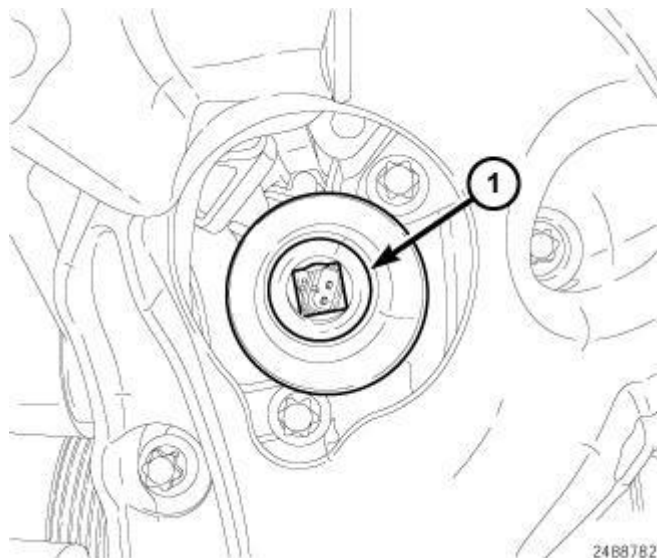


Fig. 286: Removing/Installing Piston Cooling Oil Control Valve Using Shift Valve Socket
 Courtesy of CHRYSLER GROUP, LLC

3. Using Shift Valve Socket (special tool #10237, Socket, Shift Valve) (1), remove the piston cooling oil control valve.

INSTALLATION

INSTALLATION



Fig. 287: O-Ring Seal
 Courtesy of CHRYSLER GROUP, LLC

1. Replace the O-ring seal.

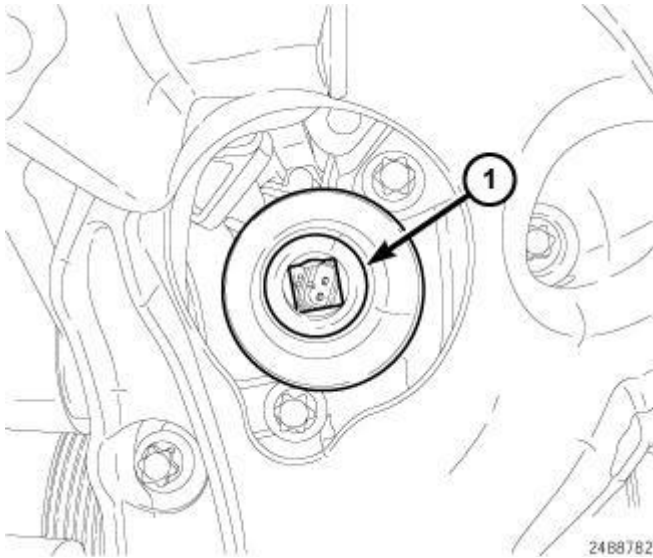


Fig. 288: Removing/Installing Piston Cooling Oil Control Valve Using Shift Valve Socket
Courtesy of CHRYSLER GROUP, LLC

2. Using the Shift Valve Socket (special tool #10237, Socket, Shift Valve) (1), install the piston cooling oil control valve. Tighten to 20 N.m (177 in. lbs.).

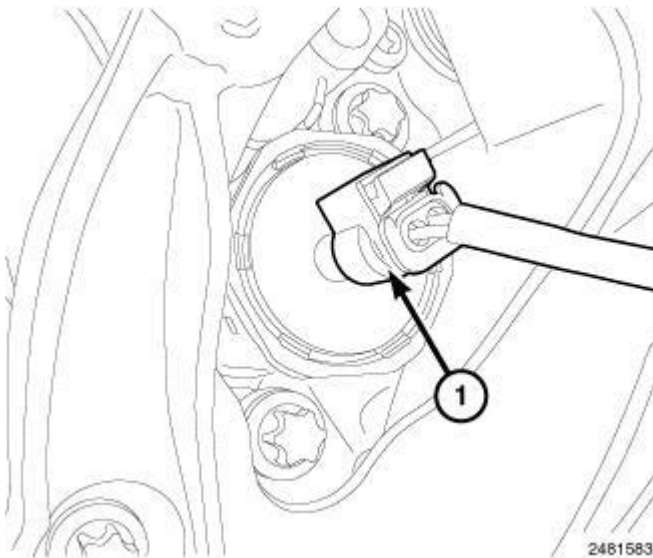


Fig. 289: Piston Cooling Oil Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

3. Connect the piston cooling oil control valve harness connector.
4. Connect the negative battery cable.
5. Start the engine and check for leaks.

COOLER, OIL

REMOVAL

REMOVAL

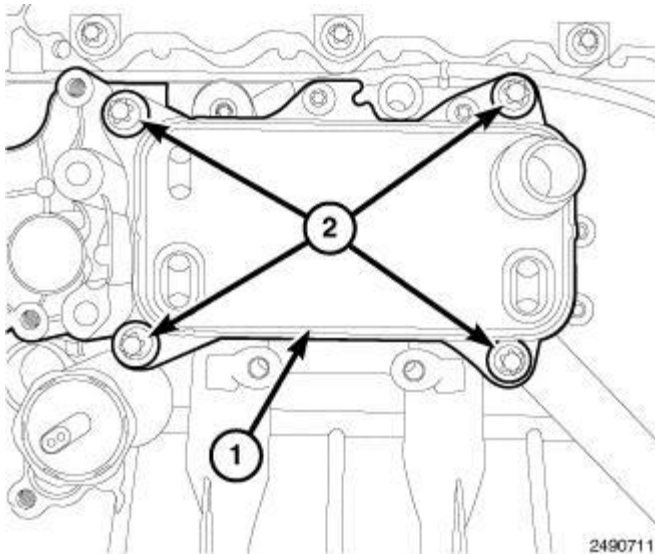


Fig. 290: Oil Cooler Adapter & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove the oil filter housing. Refer to **HOUSING, OIL FILTER, REMOVAL**.
4. Remove bolts (2) and the oil cooler adapter (1).

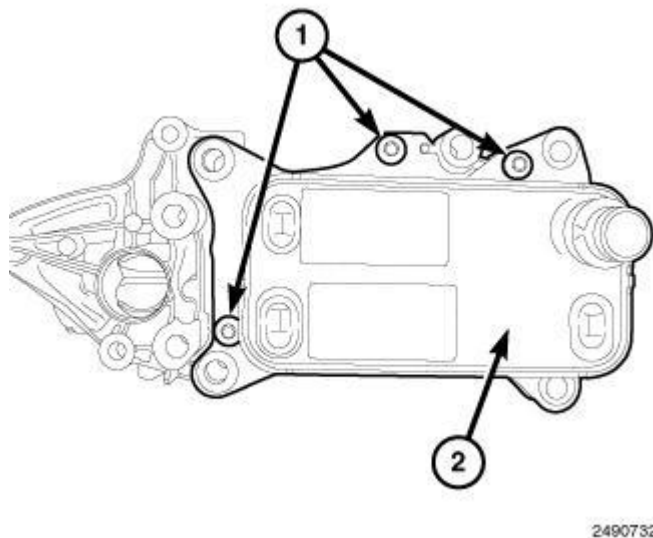
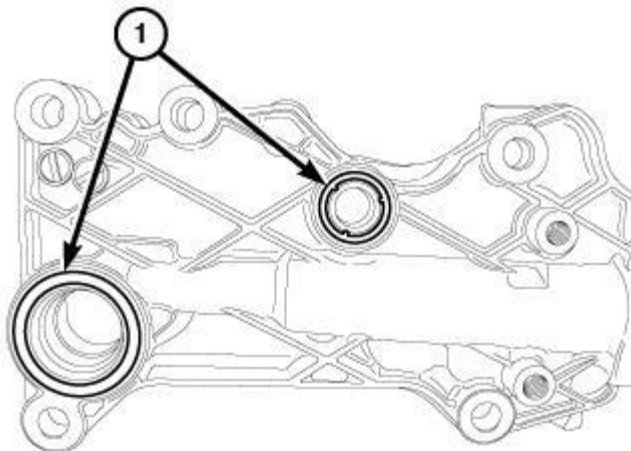


Fig. 291: Oil Cooler & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolts (1) and the oil cooler (2).

INSTALLATION

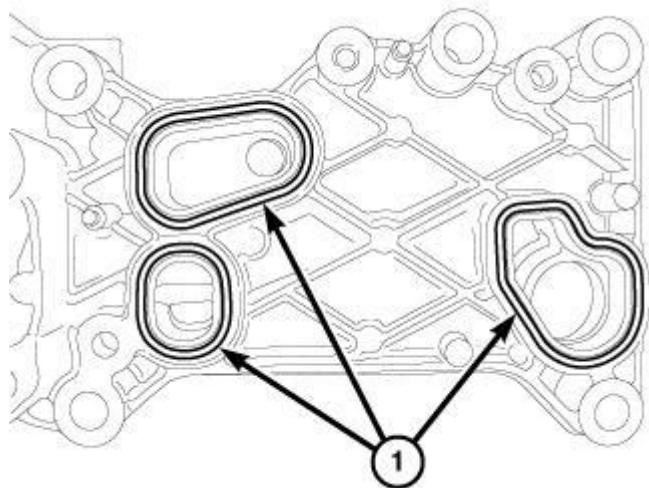
INSTALLATION



2491723

Fig. 292: O-Ring Seals On Back Side Of Adapter
Courtesy of CHRYSLER GROUP, LLC

1. Clean the sealing surfaces and install new O-ring seals (1) on the back side of adapter.



2491733

Fig. 293: O-Ring Seals On Front Side Of Adapter
Courtesy of CHRYSLER GROUP, LLC

2. Clean the sealing surfaces and install new O-ring seals (1) on the front side of adapter.

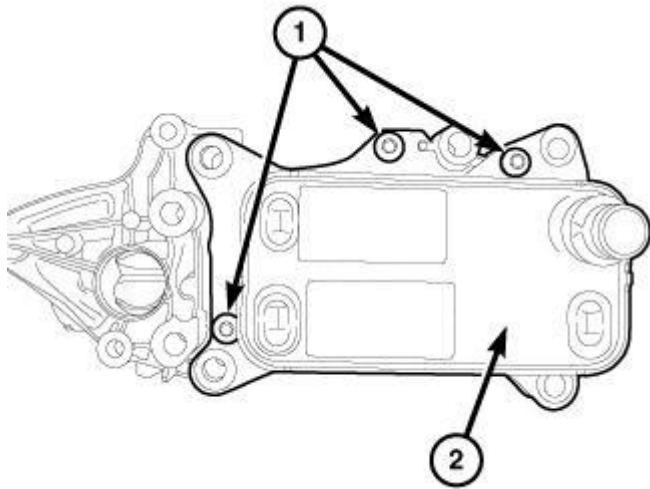


Fig. 294: Oil Cooler & Bolts

Courtesy of CHRYSLER GROUP, LLC

3. Install the oil cooler (1) onto the oil cooler adapter. Tighten bolts (1) to 10 N.m (89 in. lbs.).

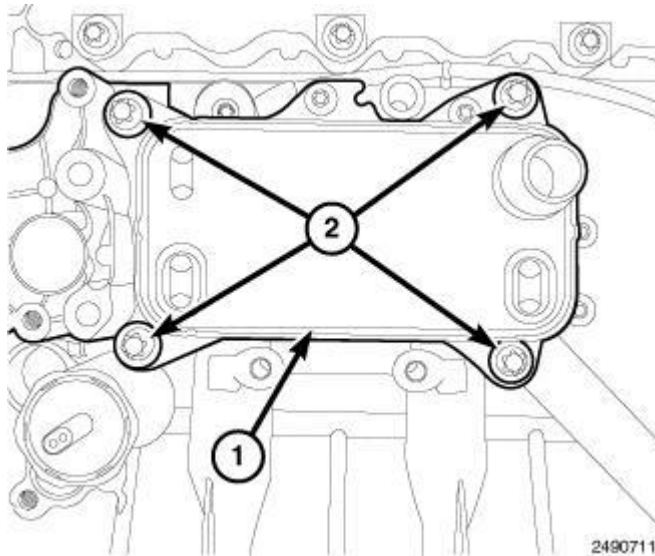


Fig. 295: Oil Cooler Adapter & Bolts

Courtesy of CHRYSLER GROUP, LLC

4. Install the oil cooler adapter (1) to the engine block. Tighten bolts (2) to 20 N.m (177 in. lbs.).
5. Install the oil filter housing (1). Refer to **HOUSING, OIL FILTER, INSTALLATION**.
6. Fill the engine with the recommended oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS**.
7. Install engine cover.
8. Connect the negative battery cable.
9. Start the engine and check for leaks.

HOUSING, OIL FILTER**REMOVAL****REMOVAL**

1. Disconnect the negative battery cable.
2. Remove engine cover.
3. Remove the underbody belly pan.
4. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE** .
5. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
6. Disconnect upper radiator hose from radiator.
7. Disconnect lower radiator hose at radiator.
8. Disconnect cooling fan electrical connector.
9. Disconnect both A/C lines at condenser.
10. Remove A/C condenser to radiator mounting screws and remove condenser.
11. Unclip charge air cooler from radiator.
12. Lift radiator and cooling fan assembly from vehicle.
13. Remove the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION** .
14. Remove the generator. Refer to **GENERATOR, REMOVAL** .
15. Remove the mixing chamber (3). Refer to **MANIFOLD, INTAKE, REMOVAL**.

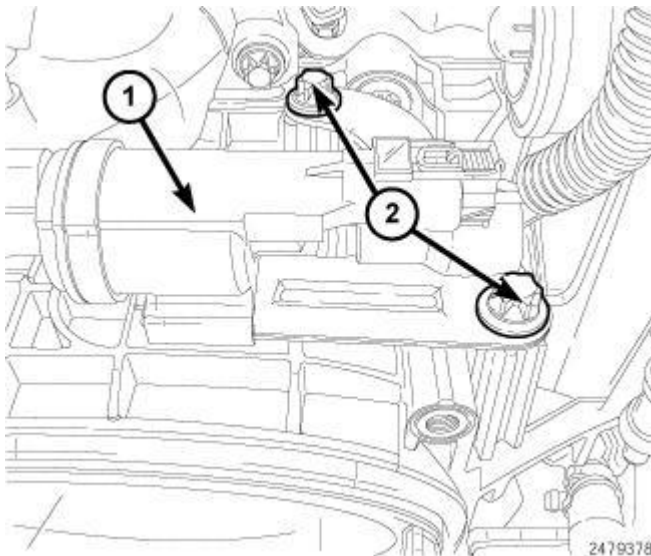
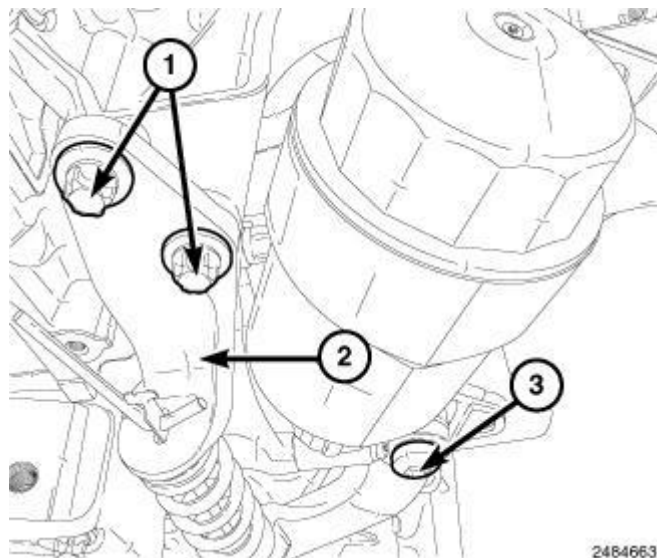


Fig. 296: EGR Vacuum Solenoid & Bolts
Courtesy of CHRYSLER GROUP, LLC

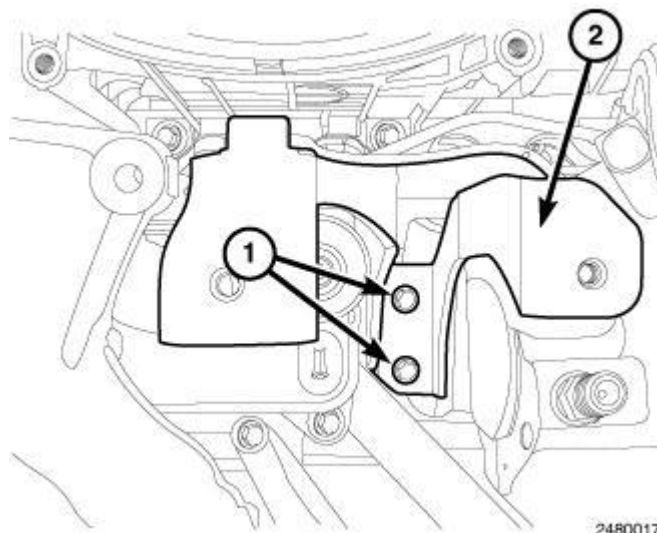
16. Remove bolts (2) and the EGR vacuum solenoid (1).



2484653

Fig. 297: Accessory Drive Belt Tensioner & Bolts
 Courtesy of CHRYSLER GROUP, LLC

17. Remove the bolts (1 and 3) and accessory drive belt tensioner (2).



2480017

Fig. 298: Intake Manifold Support Bracket & Bolts
 Courtesy of CHRYSLER GROUP, LLC

18. Remove bolts (1) and the intake manifold support bracket (2).

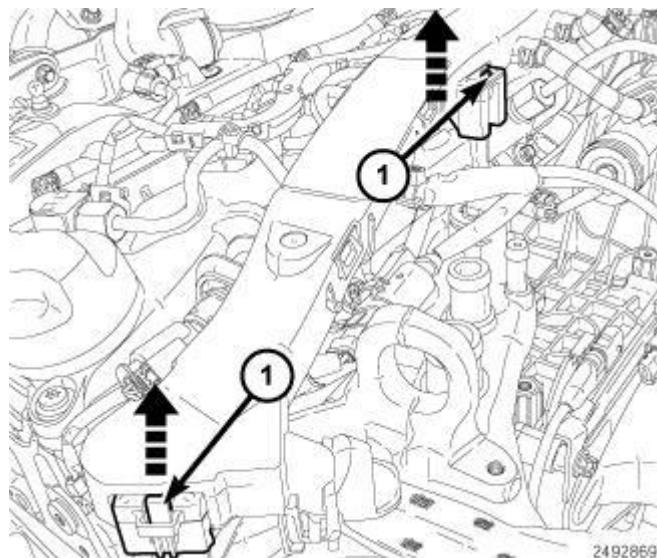


Fig. 299: Locating Lock Tabs And Lifting Up On Wire Harness
Courtesy of CHRYSLER GROUP, LLC

19. Release the lock tabs and lift up on wire harness.

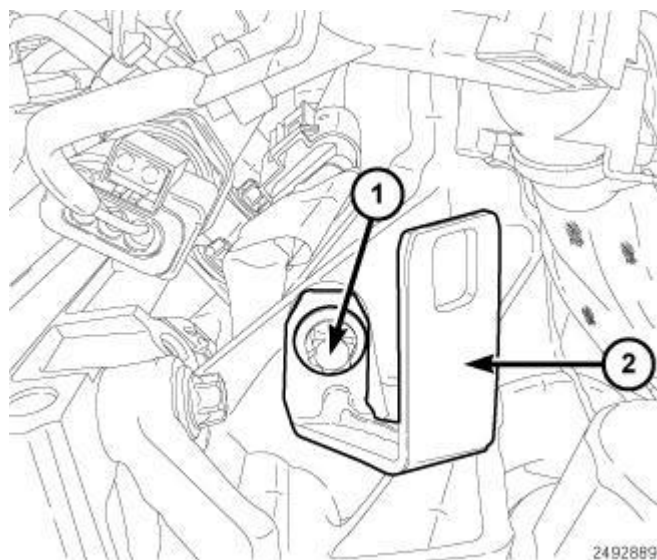


Fig. 300: Wire Harness Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

20. Remove bolt (1) and wire harness support bracket (2).

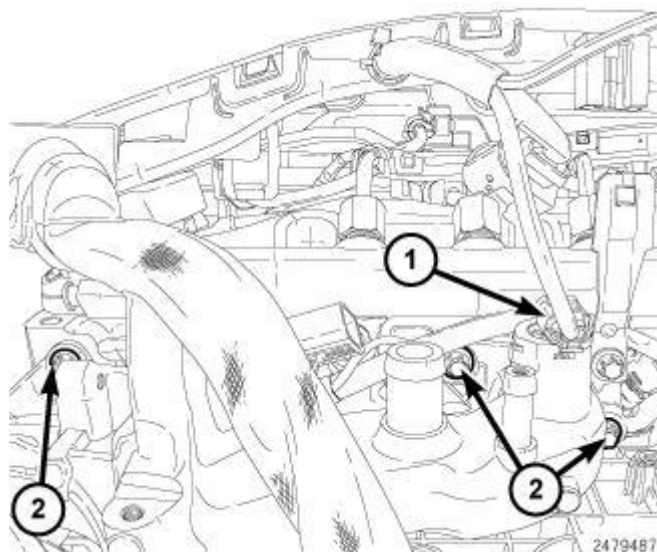


Fig. 301: Coolant Temp Sensor & Cooling Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Disconnect the coolant temp sensor (1).
22. Remove the three upper bolts (2).

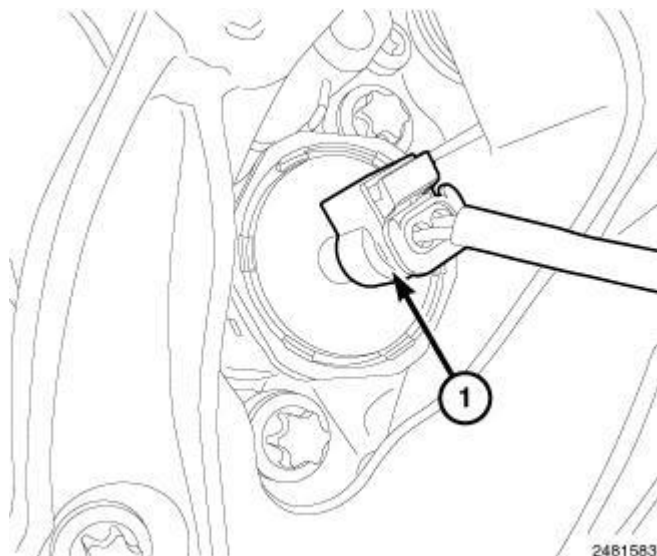


Fig. 302: Piston Cooling Oil Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

23. Disconnect the piston cooling oil control valve harness connector (1).

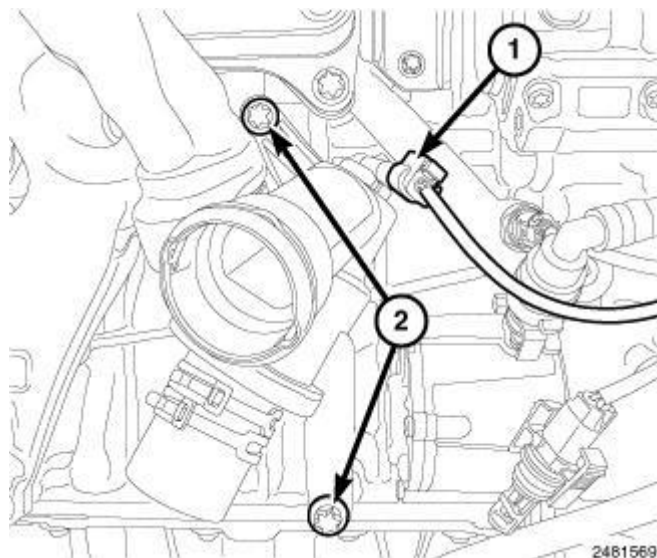


Fig. 303: ECT Sensor Connector & Thermostat Housing Bolts
 Courtesy of CHRYSLER GROUP, LLC

24. Disconnect the coolant temperature sensor (1).
25. Remove the two bolt (2) securing the thermostat housing.

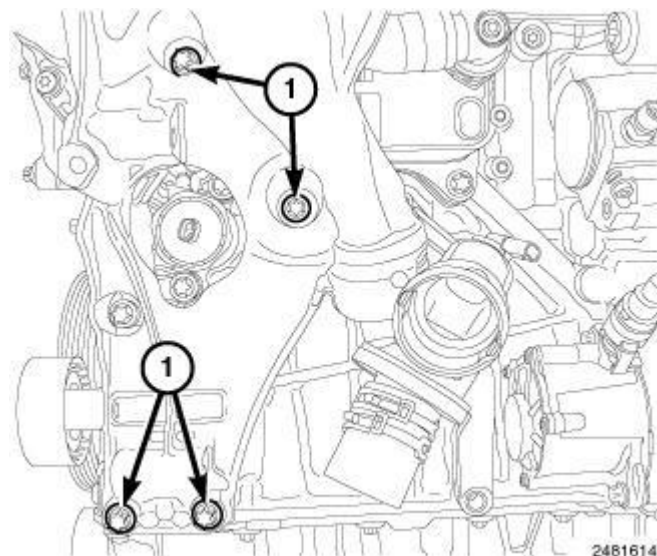
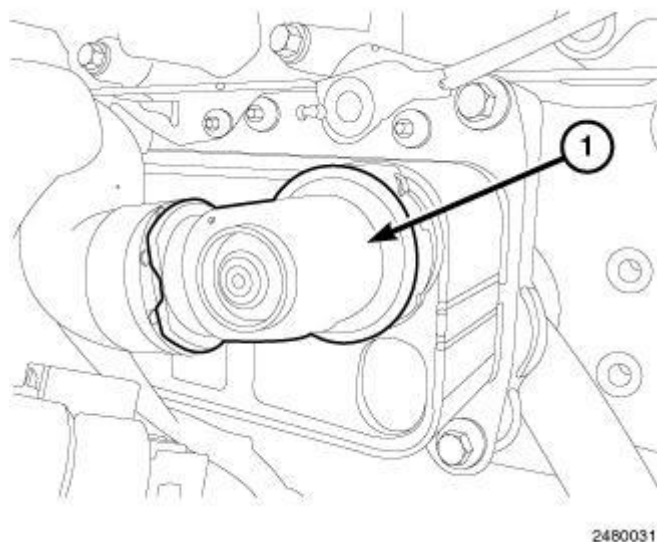


Fig. 304: Accessory Carrier Bolts
 Courtesy of CHRYSLER GROUP, LLC

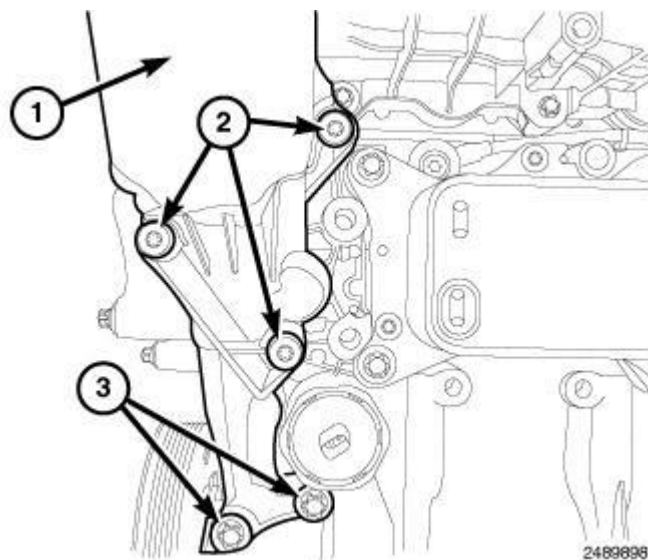
26. Remove the bolts (1) from the accessory carrier.



2480031

Fig. 305: Coolant Hose To Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

27. Disconnect the coolant hose (1) to the oil cooler and remove the accessory carrier.



2489898

Fig. 306: Oil Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

28. Remove upper bolts (2).
29. Remove lower bolts (3) and the oil filter housing (1).
30. Remove and discard O-ring seals.

INSTALLATION

INSTALLATION

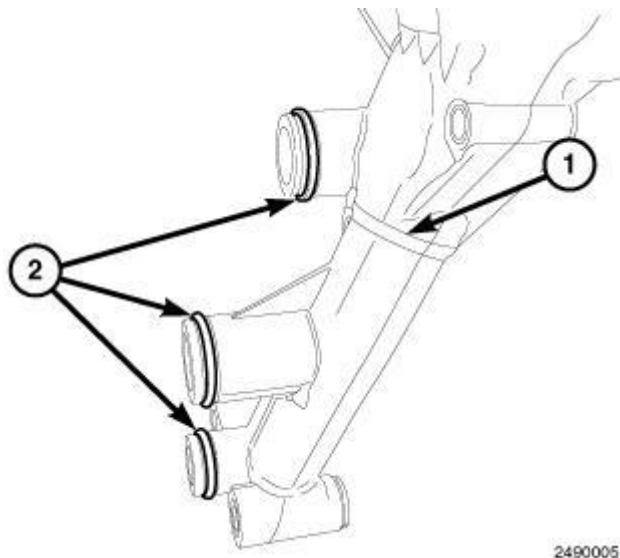


Fig. 307: Oil Filter Housing & O-Ring Seals
Courtesy of CHRYSLER GROUP, LLC

1. Install new O-ring seals (2) onto the oil filter housing (1).

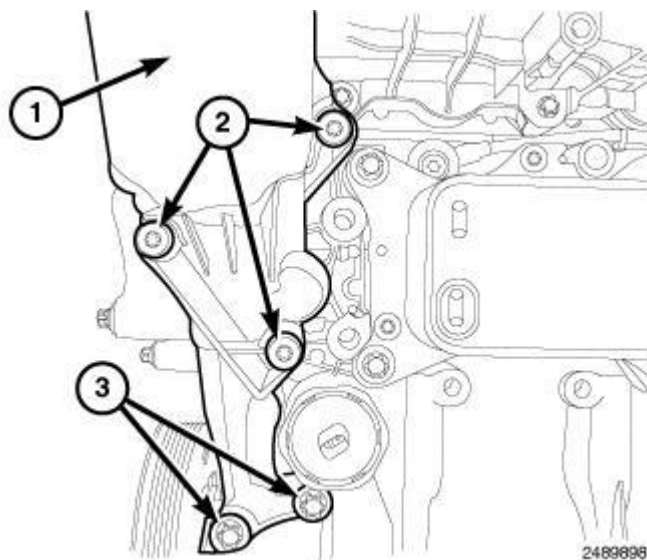


Fig. 308: Oil Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Install the oil filter housing (1).
 - Tighten the M6 bolts (2) to 10 N.m (89 in. lbs.).
 - Tighten the M8 bolts (3) to 20 N.m (177 in. lbs.).

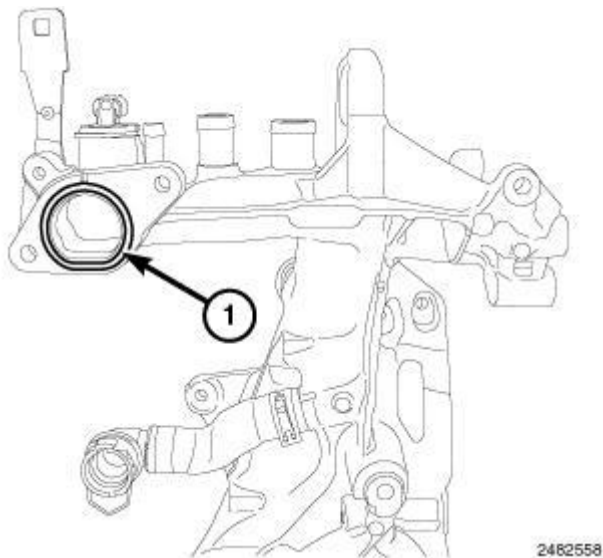


Fig. 309: Accessory Carrier & O-Ring Gasket
Courtesy of CHRYSLER GROUP, LLC

3. Clean the gasket surfaces and install a new O-ring gasket (1) onto the accessory carrier.
4. Position the accessory carrier to the engine and install bolts finger tight.

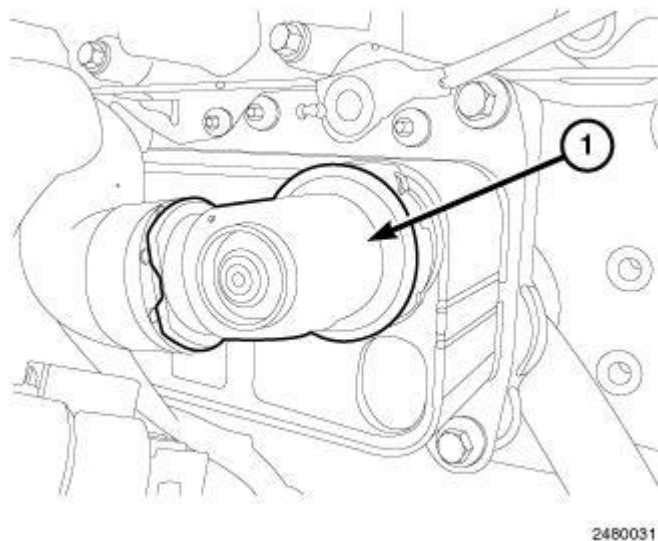


Fig. 310: Coolant Hose To Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

5. Connect the coolant hose (1) to the oil cooler and set the lock tab.

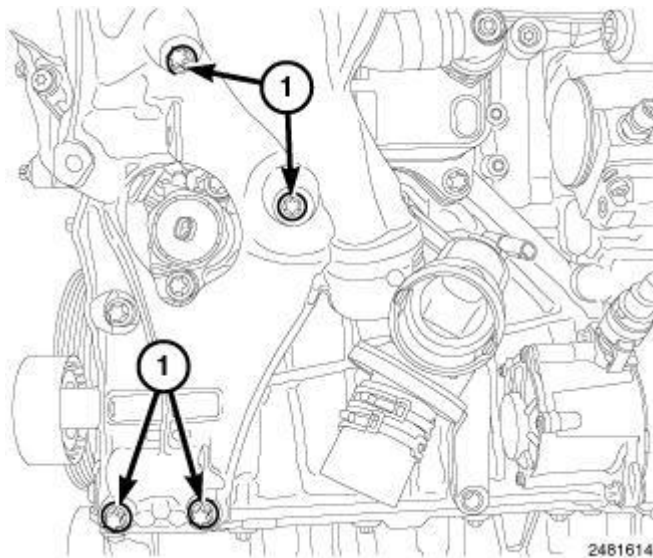


Fig. 311: Accessory Carrier Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Tighten the accessory carrier bolts (1) to 20 N.m (177 in. lbs.)

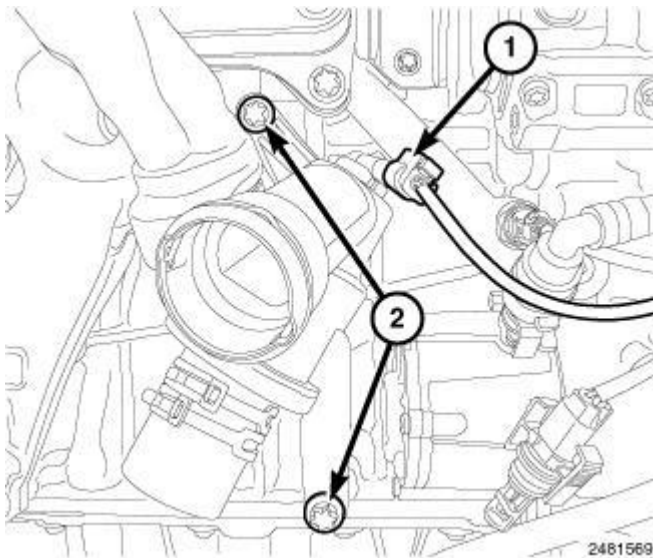


Fig. 312: ECT Sensor Connector & Thermostat Housing Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Install the two bolt (2) securing the thermostat housing to engine block. Tighten bolts to 9 N.m (80 in. lbs.).
8. Connect the coolant temperature sensor (1) harness connector.

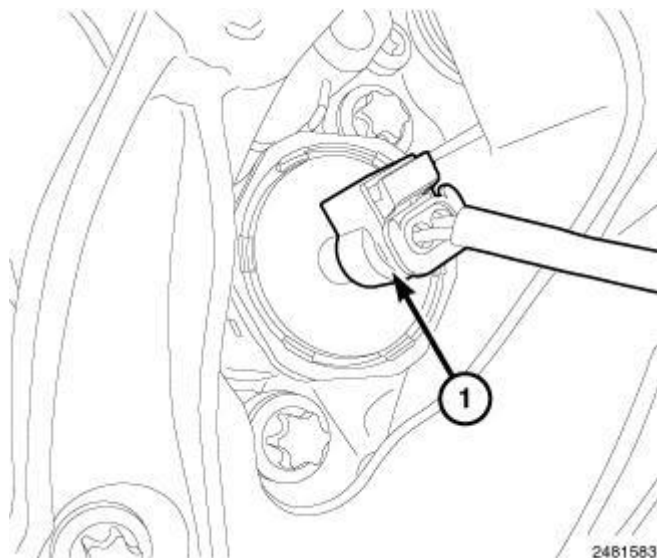


Fig. 313: Piston Cooling Oil Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

9. Connect the piston cooling oil control valve harness connector (1).

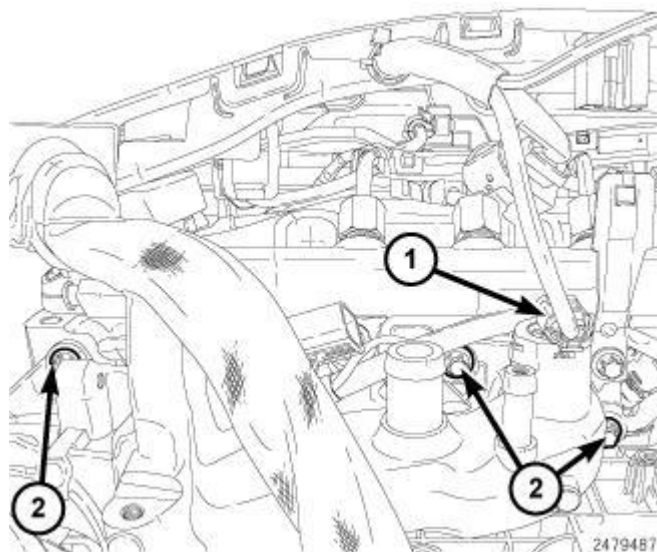


Fig. 314: Coolant Temp Sensor & Cooling Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Install the three accessory carrier upper bolts (2). Tighten bolts to 9 N.m (80 in. lbs.).
11. Connect the coolant temp sensor (1) harness connector.

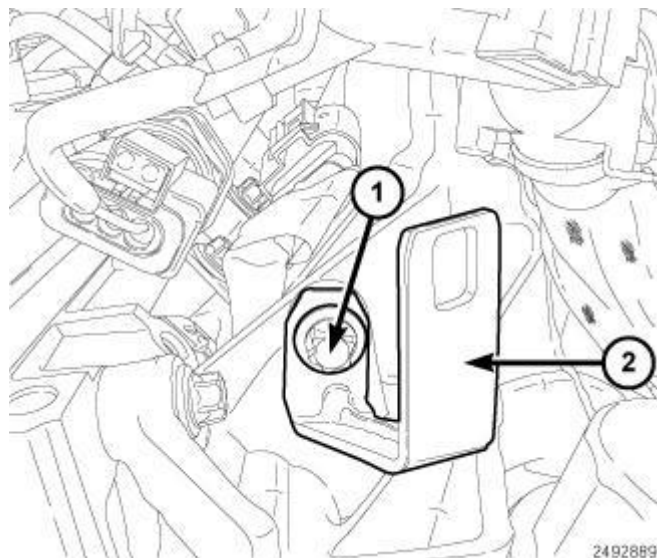


Fig. 315: Wire Harness Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Install the wire harness support bracket (2). Tighten bolt (1) to 9 N.m (80 in. lbs.).

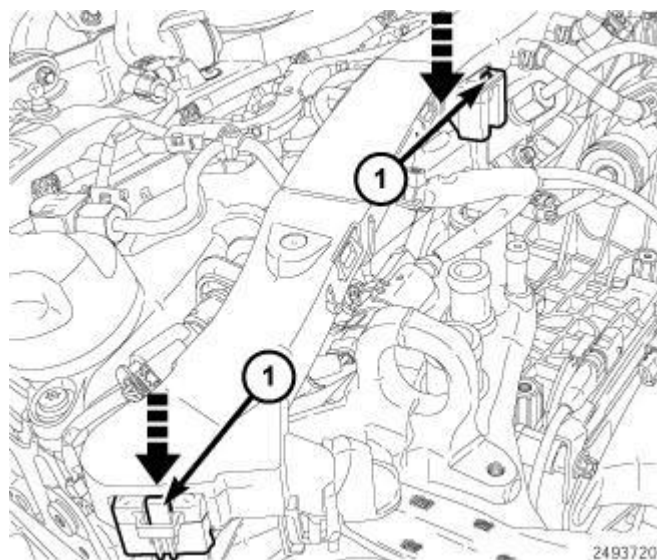


Fig. 316: Positioning Wire Harness And Pushing Down To Lock Tabs
Courtesy of CHRYSLER GROUP, LLC

13. Position the wire harness and push down to lock tabs (1).

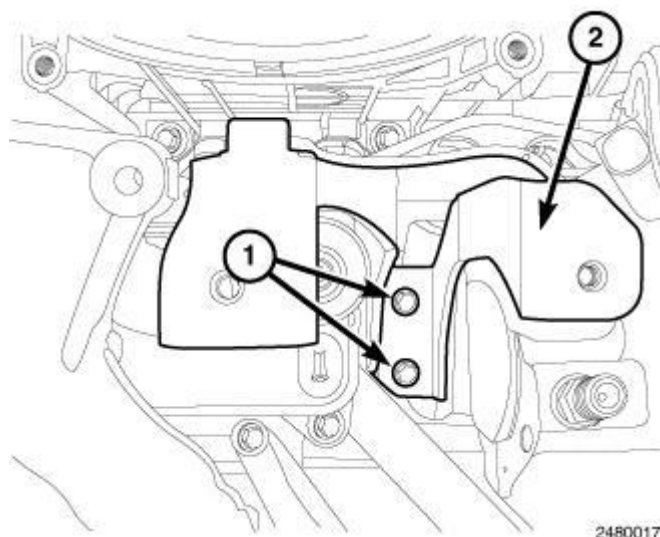


Fig. 317: Intake Manifold Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Install the mixing chamber support bracket (2). Tighten bolts to 9 N.m (80 in. lbs.).

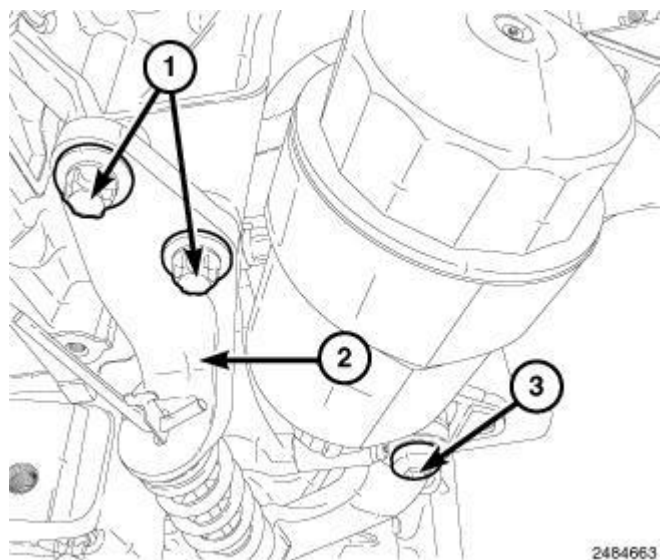


Fig. 318: Accessory Drive Belt Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Install accessory drive belt tensioner (2).
 - Tighten M8 bolts (1) to 20 N.m (177 in. lbs.).
 - Tighten M10 bolt (3) to 45 N.m (33 ft. lbs.).

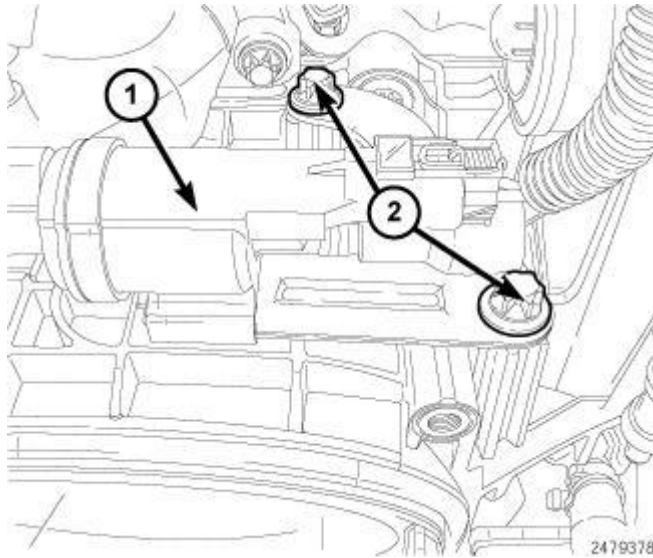


Fig. 319: EGR Vacuum Solenoid & Bolts
 Courtesy of CHRYSLER GROUP, LLC

16. Install the EGR vacuum solenoid (1). Tighten bolts (2) to 9 N.m (80 in. lbs.).
17. Install the mixing chamber (3). Refer to **MANIFOLD, INTAKE, INSTALLATION**.
18. Install the generator. Refer to **GENERATOR, INSTALLATION**.
19. Install the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION**.
20. Connect air inlet hose at intake manifold.
21. Lower radiator and cooling fan assembly in vehicle. Attach charge air cooler to radiator.
22. Attach A/C condenser to radiator. Tighten the bolts to 5 N.m (44 in. lbs.).
23. Remove the tape or plug from the condenser ports.
24. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
25. Connect both A/C lines to the condenser. Tighten the nuts to 5 N.m (44 in. lbs.).
26. Connect cooling fan electrical connector.
27. Connect lower radiator hose at radiator.
28. Connect upper radiator hose at radiator.
29. Install the underbody belly pan.
30. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
31. Fill the engine oil.
32. Install engine cover.
33. Connect the negative battery cable.
34. Start the engine and check for leaks.

JET, PISTON OIL COOLER

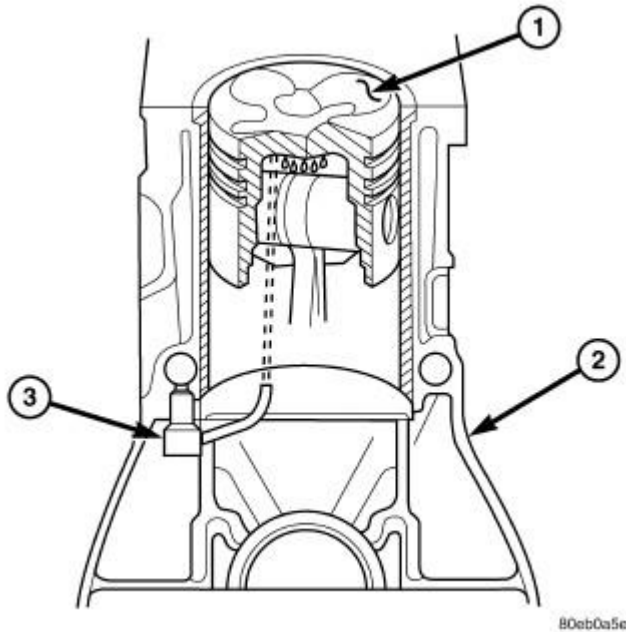
DESCRIPTION**DESCRIPTION**

Fig. 320: Piston Assembly, Engine Block & Oil Jet
Courtesy of CHRYSLER GROUP, LLC

1 - PISTON ASSEMBLY

2 - ENGINE BLOCK

3 - OIL JET

There are four oil jets (3) installed in the engine block (2). These oil jets are used to cool and lubricate the piston assemblies.

REMOVAL**REMOVAL**

The engine must be removed from the vehicle and completely disassembled to replace the oil jets (2).

1. Remove engine from vehicle. Refer to **REMOVAL**.
2. Remove the crankshaft. Refer to **CRANKSHAFT, REMOVAL**.

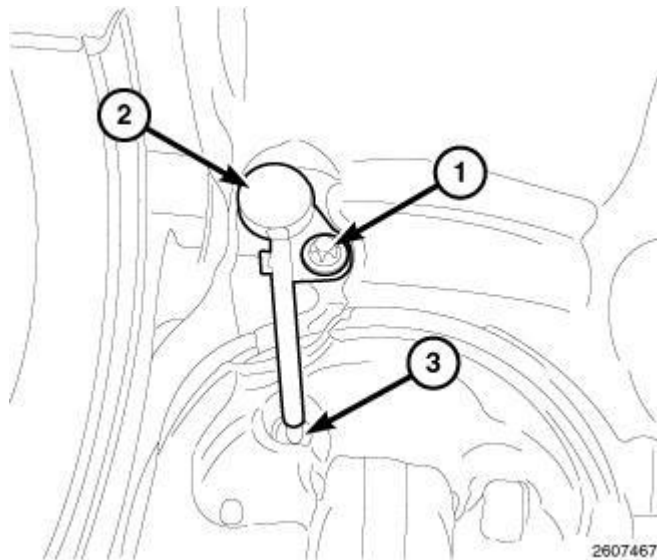


Fig. 321: Oil Jet, Bolt & Engine Block
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolt (1) and oil jets (2) from the engine block.

INSTALLATION

INSTALLATION

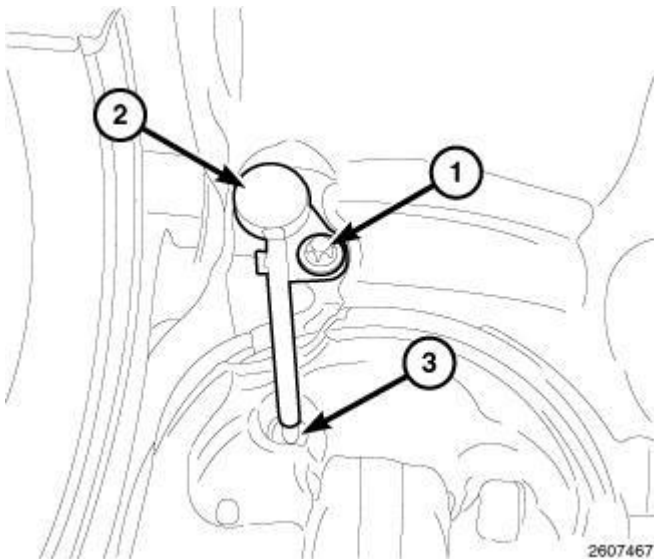


Fig. 322: Oil Jet, Bolt & Engine Block
Courtesy of CHRYSLER GROUP, LLC

1. Install oil jet (2) into the engine block. Tighten bolt to 5 N.m (44 in. lbs.).
2. Install the crankshaft. Refer to **CRANKSHAFT, INSTALLATION**.
3. Install engine into vehicle. Refer to **INSTALLATION**.

PAN, OIL

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the belly pan.
3. Drain engine oil. Tighten drain plug to 25 N.m (18 ft. lbs.).
4. Remove the flywheel. Refer to **FLYWHEEL, REMOVAL** .
5. Remove the oil dipstick tube.
6. Remove the water pump/power steering assembly. Refer to **PUMP, WATER, REMOVAL** .

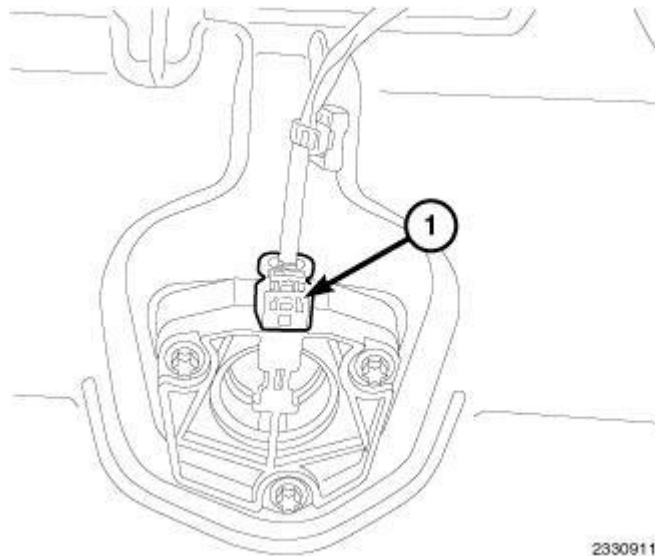


Fig. 323: Oil Level Switch/Life Monitor Wire Harness Connector
 Courtesy of CHRYSLER GROUP, LLC

7. Disconnect the oil level switch wire harness connector (1).
8. Remove bolts and remove oil pan.

INSTALLATION

INSTALLATION

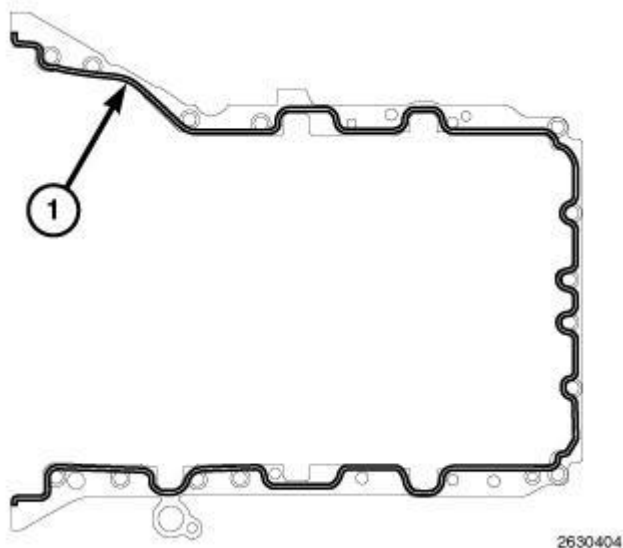


Fig. 324: Engine Sealant RTV Onto Oil Pan Mating Surface
 Courtesy of CHRYSLER GROUP, LLC

1. Thoroughly clean oil pan and all sealing surfaces to be free of any oil residue.
2. Apply a 3 mm bead of Loctite® 5970 RTV or equivalent onto the oil pan mating surface (1).

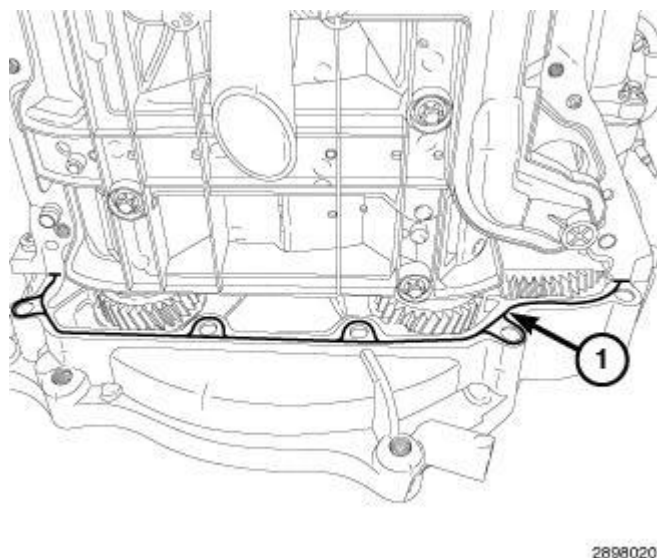
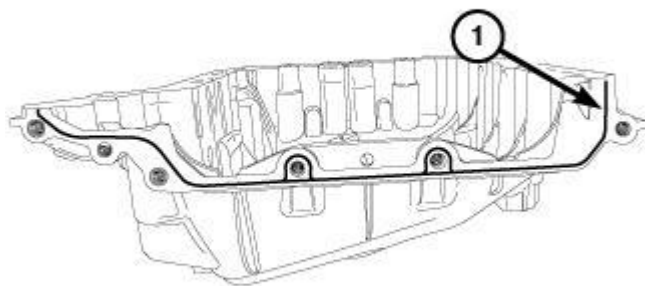


Fig. 325: Applying A 2-mm Bead Of Loctite® Onto Timing Cover Mating Surface
 Courtesy of CHRYSLER GROUP, LLC

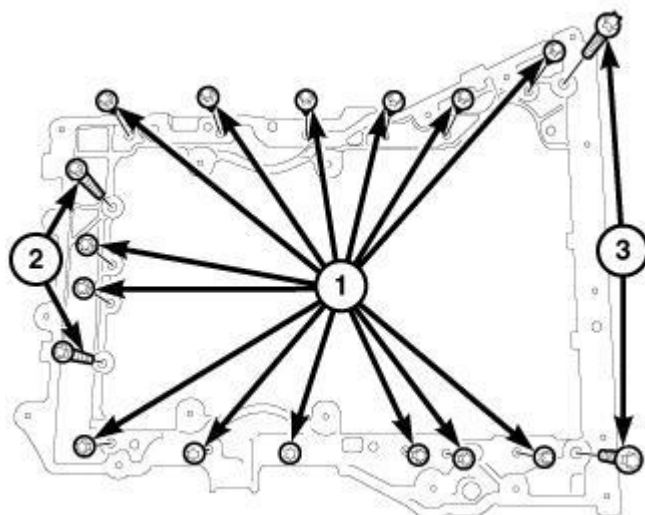
3. Apply a 3 mm bead of Loctite® 5970 RTV or equivalent onto timing cover mating surface as illustrated (1).



2898006

Fig. 326: Applying Small Amount Of Loctite® Onto Timing Cover Mating Surface
 Courtesy of CHRYSLER GROUP, LLC

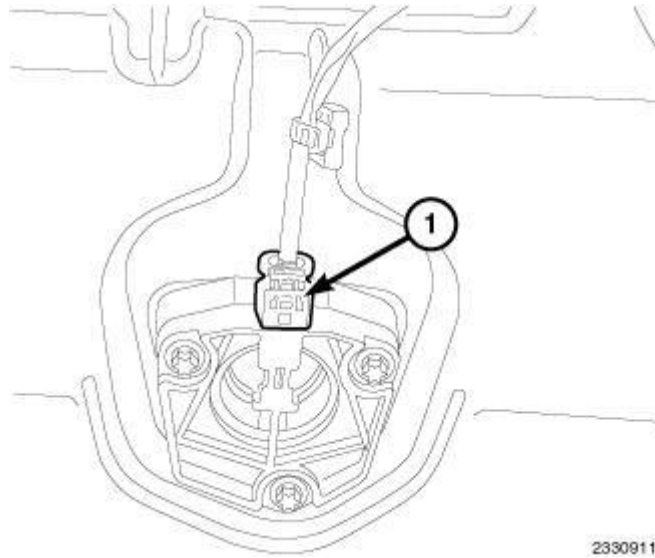
4. Apply a small amount of Loctite® 5970 RTV or equivalent onto timing cover mating surface.



2630684

Fig. 327: Oil Pan Bolts
 Courtesy of CHRYSLER GROUP, LLC

5. Install oil pan. Tighten bolts to:
 - M6 bolts to 9 N.m (80 in. lbs.).
 - M8 bolts to 20 N.m (177 in. lbs.)
 - M8 bolts timing cover to oil pan 20 N.m (177 in. lbs.).



2330911

Fig. 328: Oil Level Switch/Life Monitor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

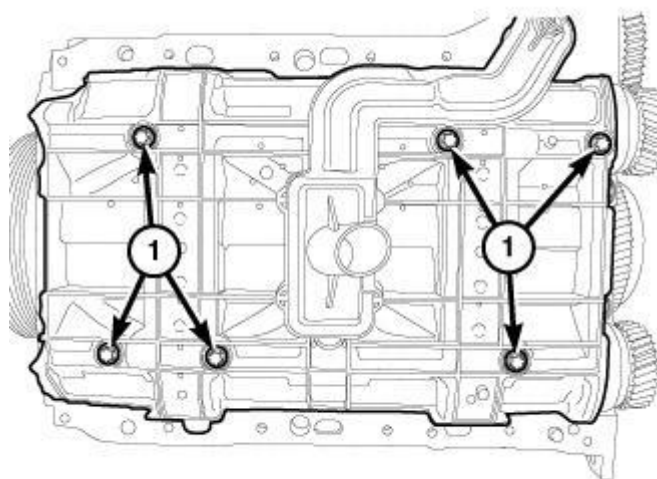
6. Connect the oil level switch wire harness connector (1).
7. Install the water pump/power steering pump assembly. Refer to **PUMP, WATER, INSTALLATION**.
8. Install the oil dip stick tube. Tighten bolt to 9 N.m. 80 in. lbs.).
9. Install the transmission. Refer to **INSTALLATION** and **INSTALLATION**.
10. Fill engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS**.
11. Connect the negative battery cable.
12. Start engine and check for leaks.
13. Install the belly pan.

PUMP, ENGINE OIL

REMOVAL

REMOVAL

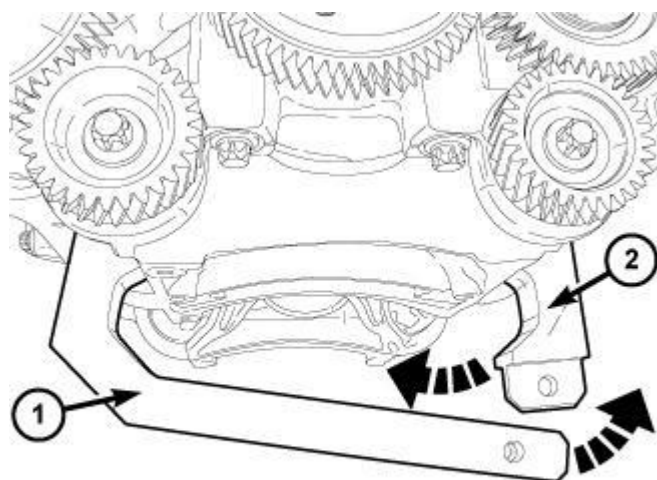
1. Disconnect negative battery cable.
2. Raise vehicle on hoist.
3. Remove the lower timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.
4. Remove oil pan. Refer to **PAN, OIL, REMOVAL**.



2608941

Fig. 329: Oil Pump Pickup Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the bolts (1) and the oil pump pickup.



2626810

Fig. 330: Installing Balance Shaft Lock Tool Halves & Rotating Into Locked Position
Courtesy of CHRYSLER GROUP, LLC

6. Install the Balance Shaft Lock Tool (special tool #10231, Lock, Balance Shaft) halves (1 and 2) and rotate halves into the locked position.

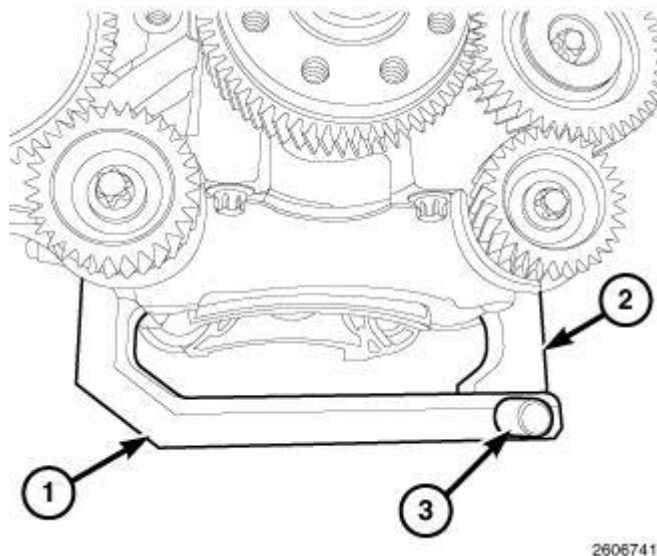


Fig. 331: Removing/Installing Locking Pin At Balance Shaft Lock Tool Halves
Courtesy of CHRYSLER GROUP, LLC

7. Install locking pin (3) into the Balance Shaft Lock Tool (special tool #10231, Lock, Balance Shaft) halves (1 and 2) together.

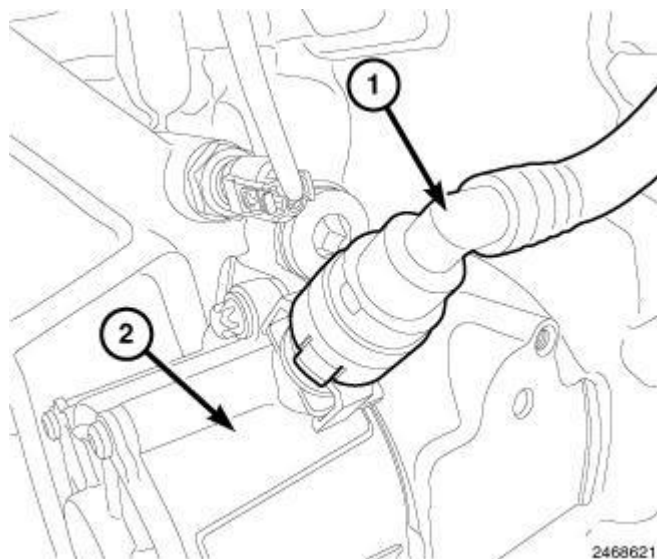


Fig. 332: Vacuum Hose At Vacuum Pump
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect vacuum hose from vacuum pump (2).

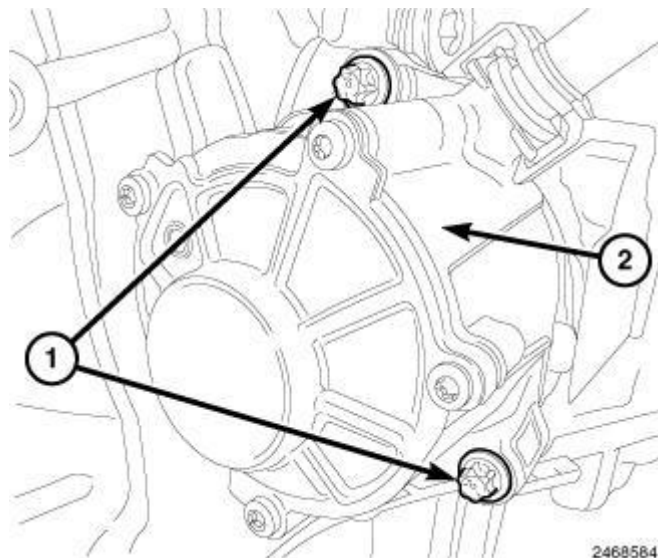


Fig. 333: Vacuum Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (1) and the vacuum pump (2).

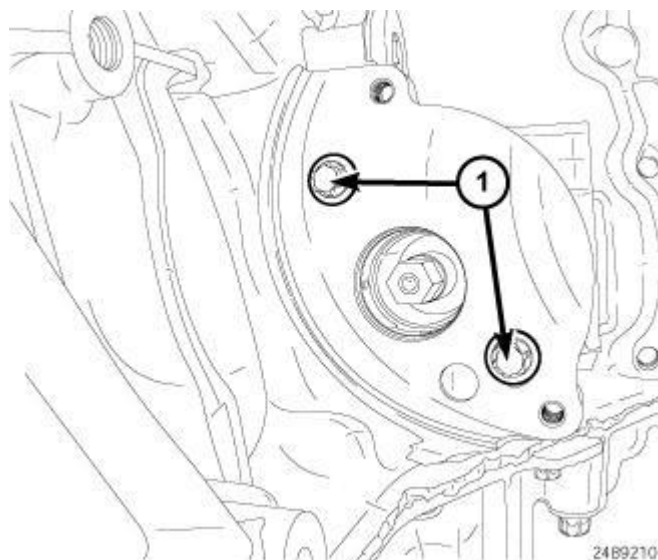
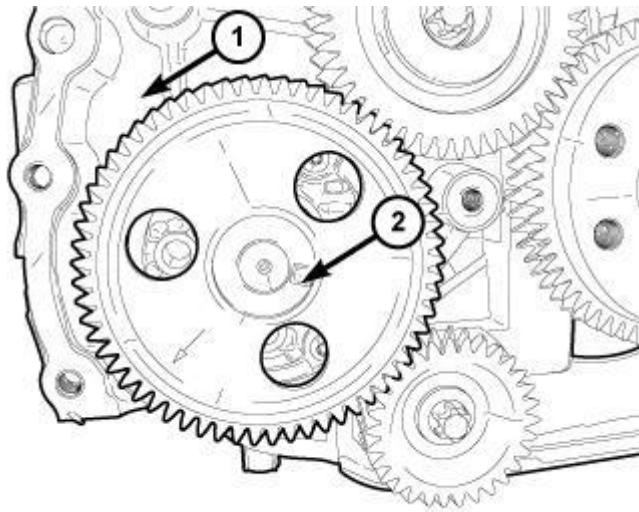


Fig. 334: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Remove oil pump retaining bolts (1).



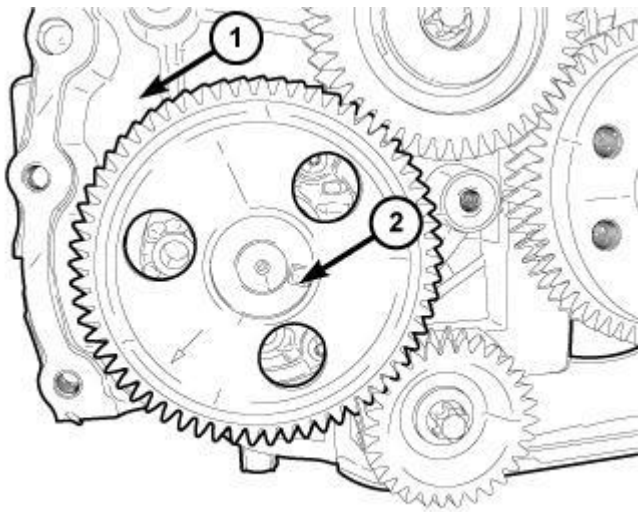
2628334

Fig. 335: Oil Pump And Drive Gear Assembly At Engine Block
 Courtesy of CHRYSLER GROUP, LLC

11. Carefully pull forward on pump gear (2) while rotating gear clockwise and remove the oil pump and gear assembly (2).

INSTALLATION

INSTALLATION



2628334

Fig. 336: Oil Pump And Drive Gear Assembly At Engine Block
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Carefully turn pump gear counter clockwise while installing pump to get gears to mesh together.

1. Install the oil pump and drive gear assembly (2) onto engine block (1).

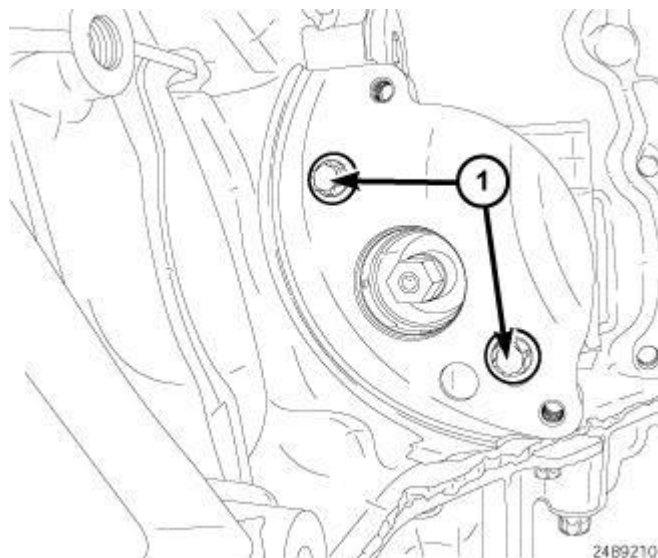


Fig. 337: Oil Pump Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

2. Install oil pump bolts (1). Tighten bolts to 6 N.m (53 in. lbs.) plus additional 90°.

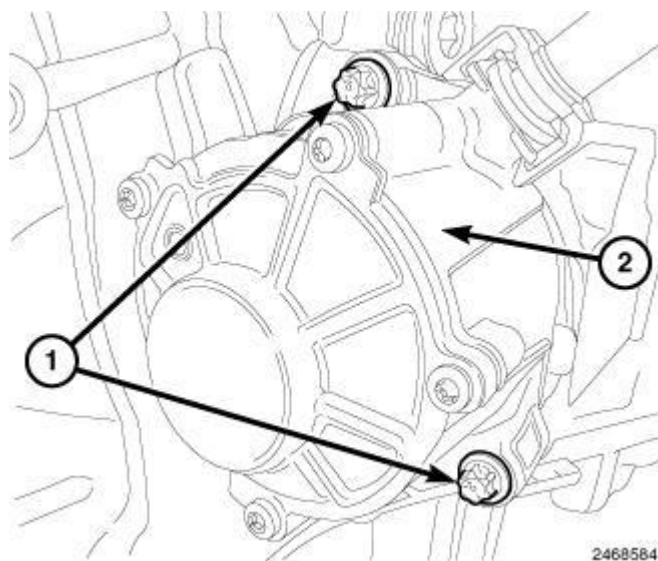


Fig. 338: Vacuum Pump & Bolts
 Courtesy of CHRYSLER GROUP, LLC

3. Install the vacuum pump (2). Tighten bolts to 9 N.m (80 in. lbs.).

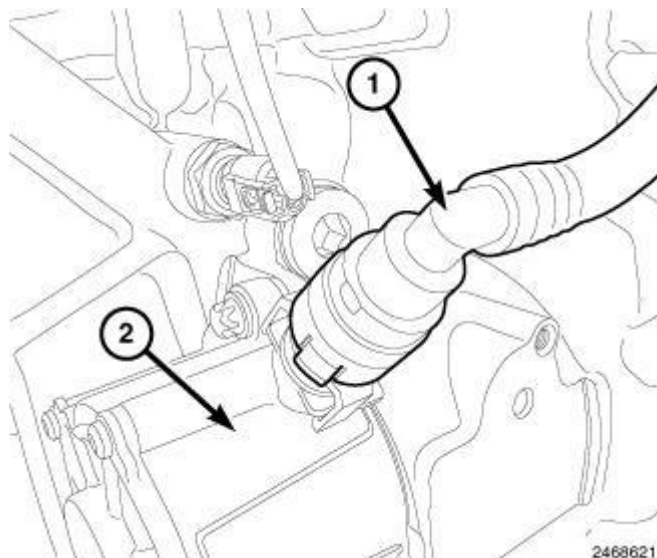


Fig. 339: Vacuum Hose At Vacuum Pump
Courtesy of CHRYSLER GROUP, LLC

4. Connect vacuum hose from vacuum pump (2).

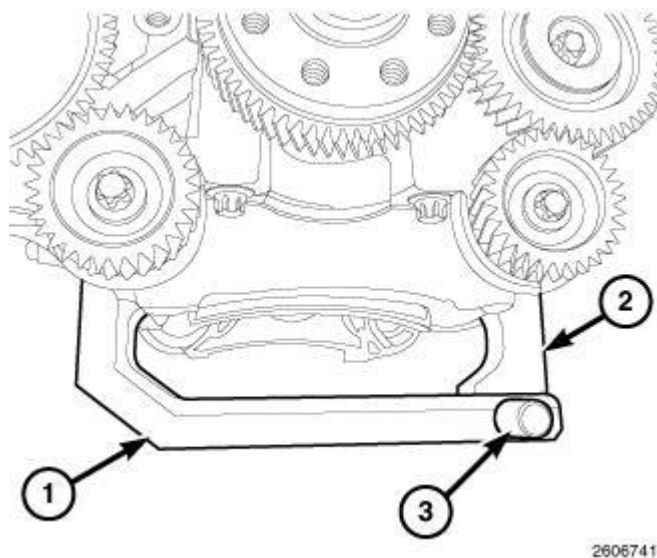


Fig. 340: Removing/Installing Locking Pin At Balance Shaft Lock Tool Halves
Courtesy of CHRYSLER GROUP, LLC

5. Remove locking pin (3) and the Balance Shaft Lock Tool (special tool #10231, Lock, Balance Shaft) halves (1 and 2).

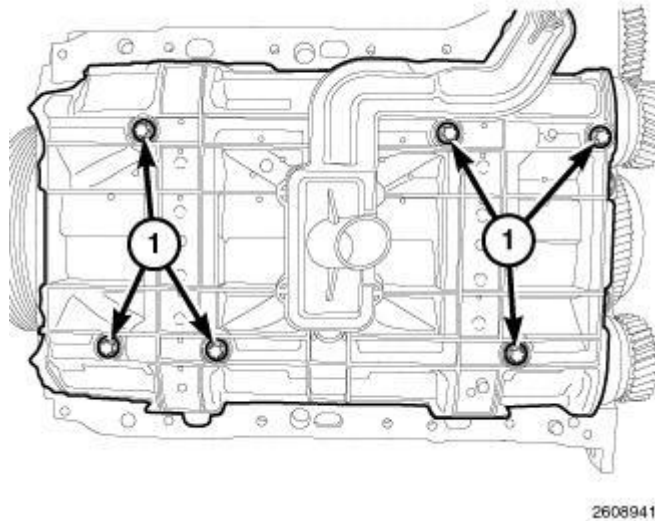


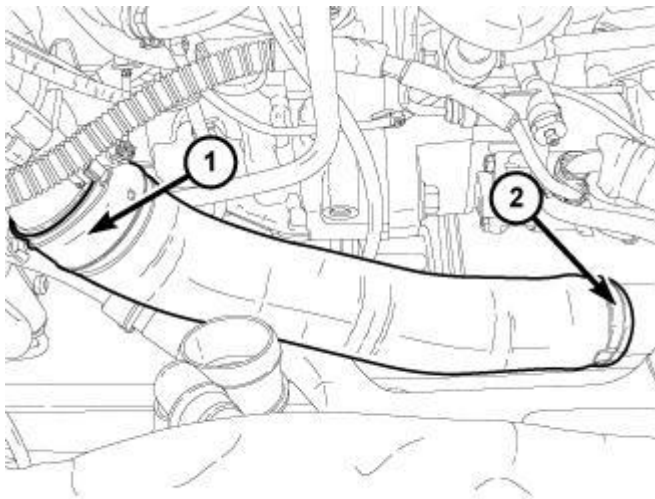
Fig. 341: Oil Pump Pickup Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the oil pump pickup. Tighten bolts to 6 N.m (53 in. lbs.) plus additional 90 degrees.
7. Install oil pan. Refer to **PAN, OIL, INSTALLATION**.
8. Install the timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
9. Lower vehicle from hoist.
10. Refill engine with recommended oil.
11. Connect negative battery cable.
12. Start engine and check for leaks.

SENSOR, OIL TEMPERATURE

REMOVAL

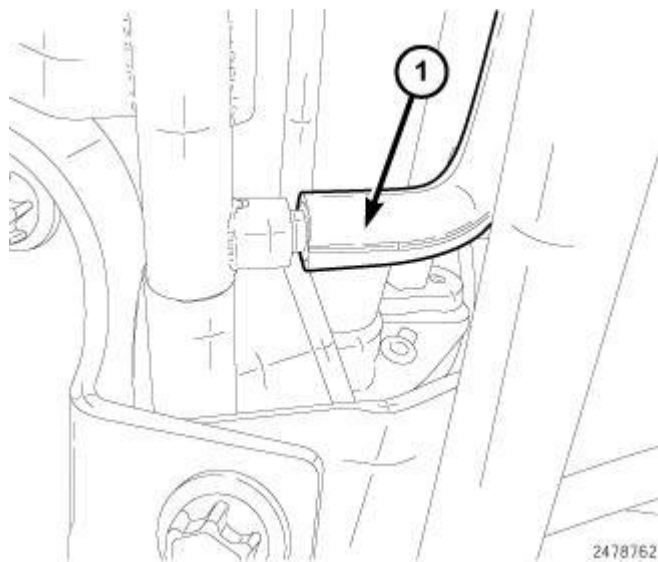
REMOVAL



2330698

Fig. 342: EGR Air Flow Control Valve & Clamp
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Loosen the clamp and disconnect the charge air outlet tube from the charge air cooler (CAC).
3. Remove air inlet tube to EGR air flow control valve (1).



2478762

Fig. 343: Vacuum Supply Line At EGR Solenoid
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the vacuum supply line (1) to the EGR solenoid.

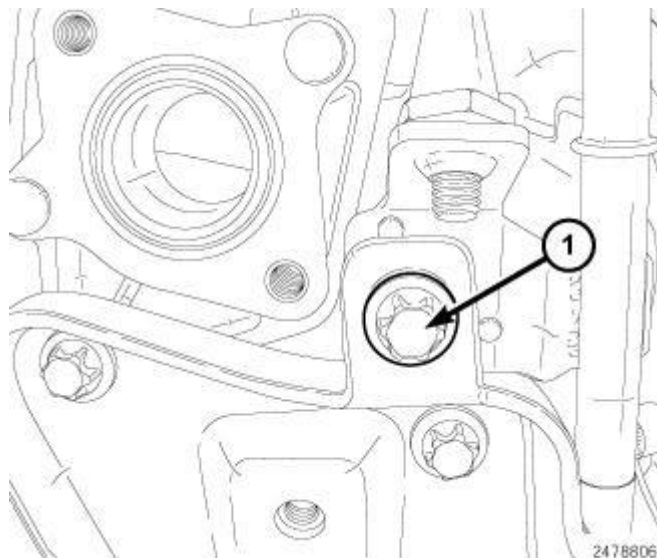


Fig. 344: Vacuum Tube Bolt

Courtesy of CHRYSLER GROUP, LLC

5. Remove the bolt (1) securing the vacuum tube.

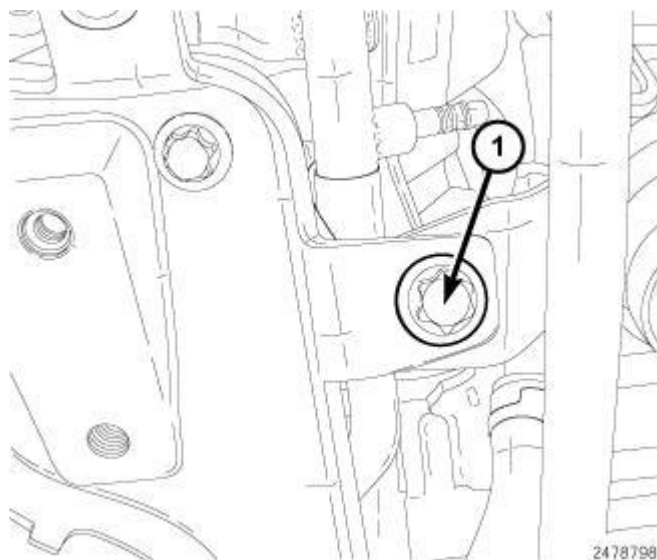


Fig. 345: Oil Dip Stick Bolt

Courtesy of CHRYSLER GROUP, LLC

6. Remove the bolt (1) securing the oil dip stick tube.

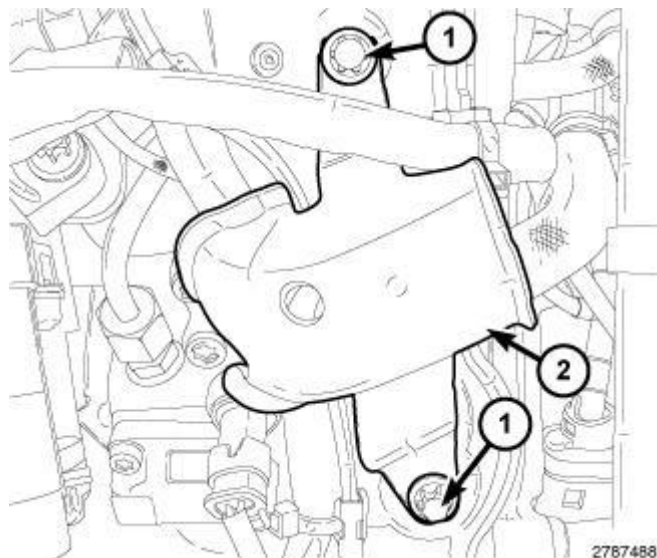


Fig. 346: Bolts & Heat Shield
Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (1) and the heat shield (2).

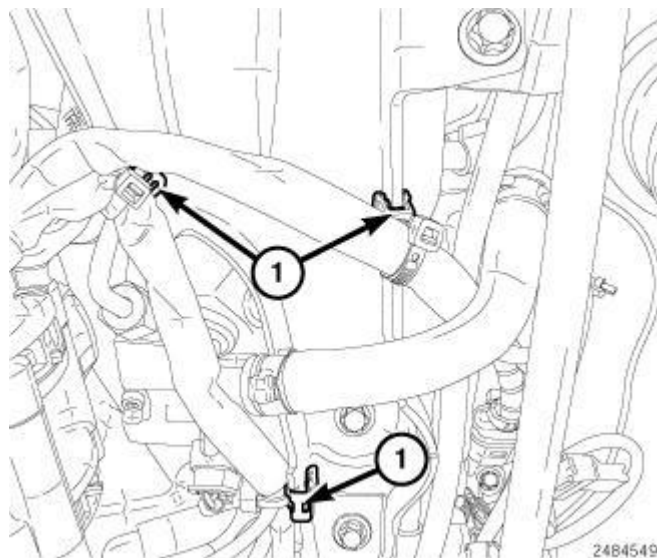


Fig. 347: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the wire harness retainers (1).

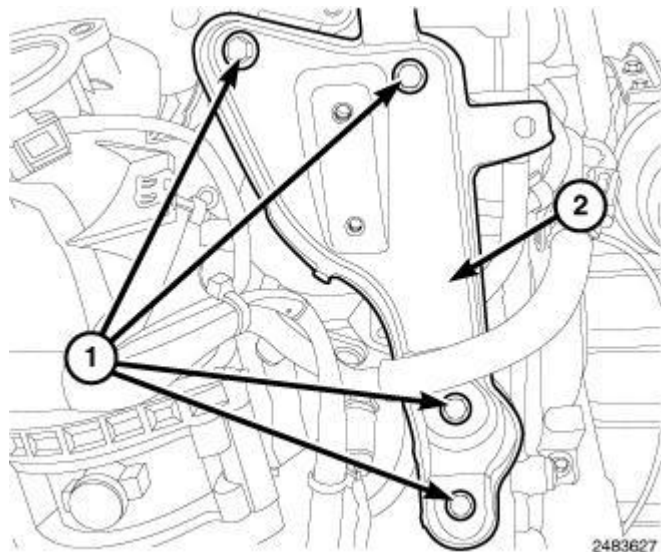


Fig. 348: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (1) and position aside the EGR support bracket (2).

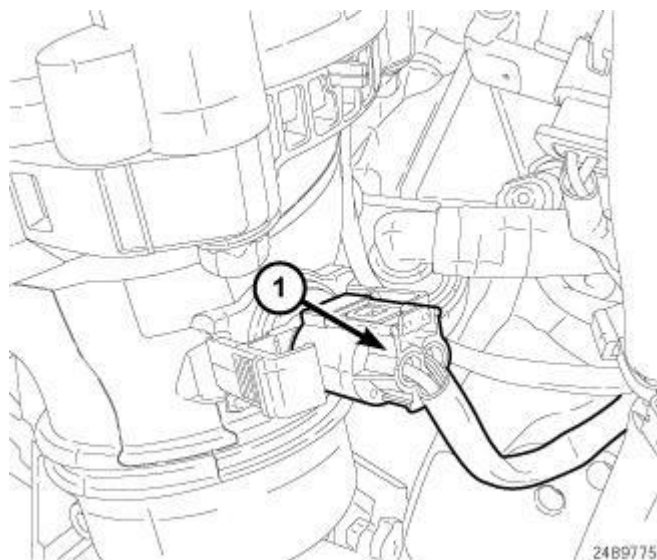


Fig. 349: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the charge air inlet temperature sensor (1) harness connector.

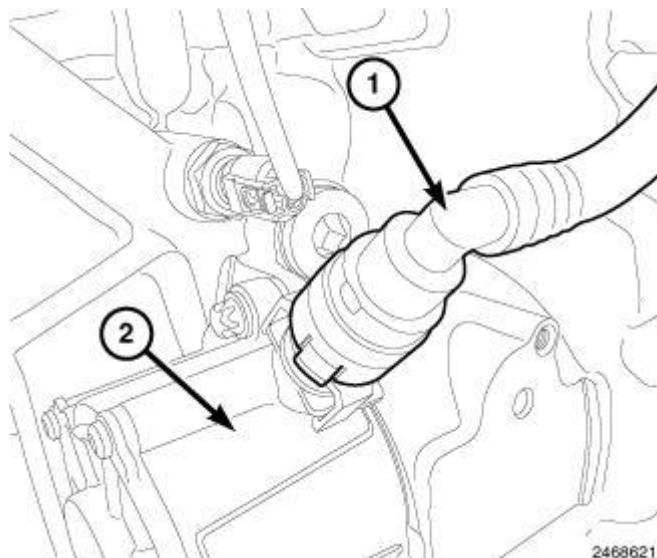


Fig. 350: Vacuum Hose At Vacuum Pump
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect vacuum hose (1) from vacuum pump (2).

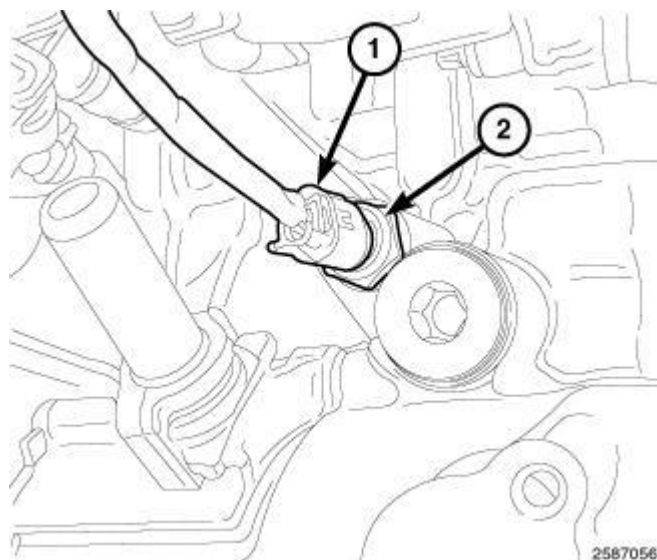


Fig. 351: Oil Temperature Sensor Harness Connector & Sensor
Courtesy of CHRYSLER GROUP, LLC

12. Disconnect the oil temperature sensor harness connector (1).
13. Remove the oil temperature sensor (2).

INSTALLATION

INSTALLATION

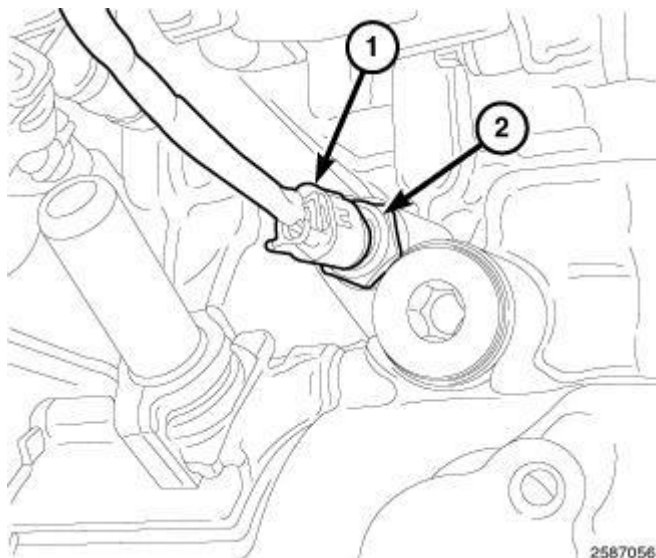


Fig. 352: Oil Temperature Sensor Harness Connector & Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Install the oil temperature sensor (2). Tighten sensor (2) to 26 N.m (19 ft. lbs.).
2. Connect the oil temperature sensor harness connector (1).

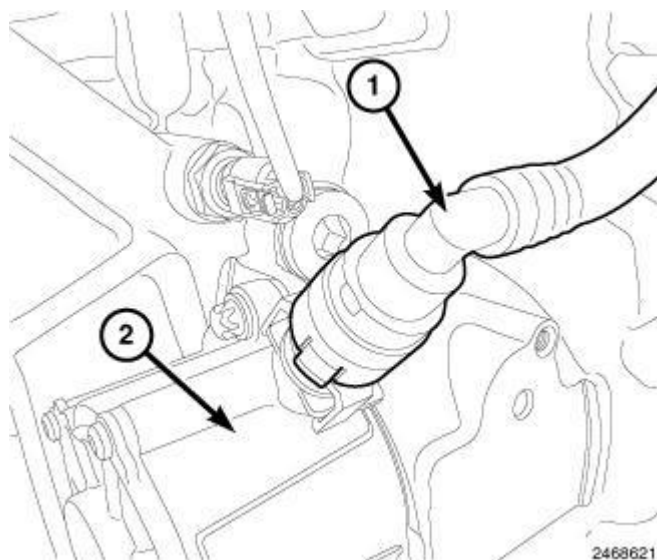


Fig. 353: Vacuum Hose At Vacuum Pump
Courtesy of CHRYSLER GROUP, LLC

3. Connect vacuum hose (1) to the vacuum pump (2).

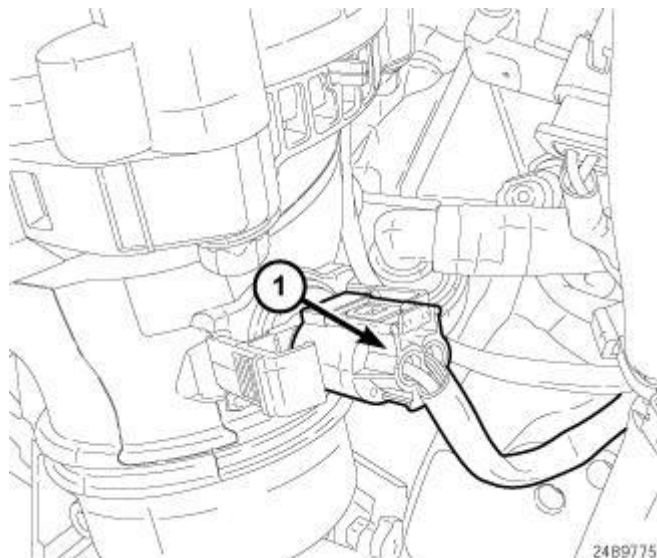


Fig. 354: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

4. Connect the charge air inlet temperature sensor (1) harness connector.

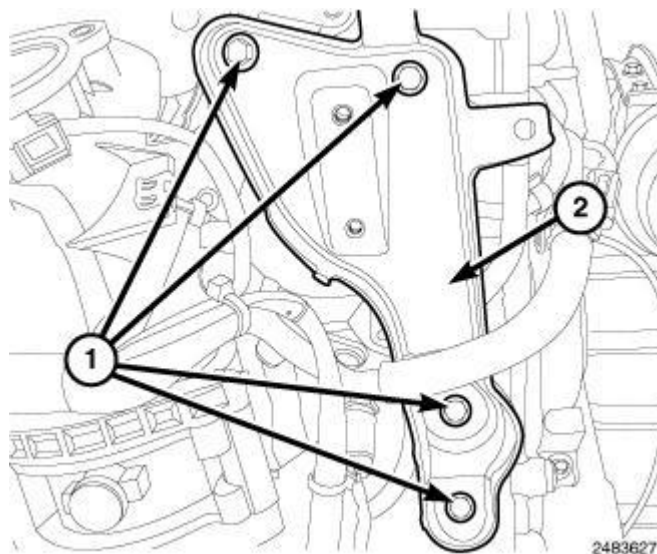


Fig. 355: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

5. Install the EGR support bracket (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

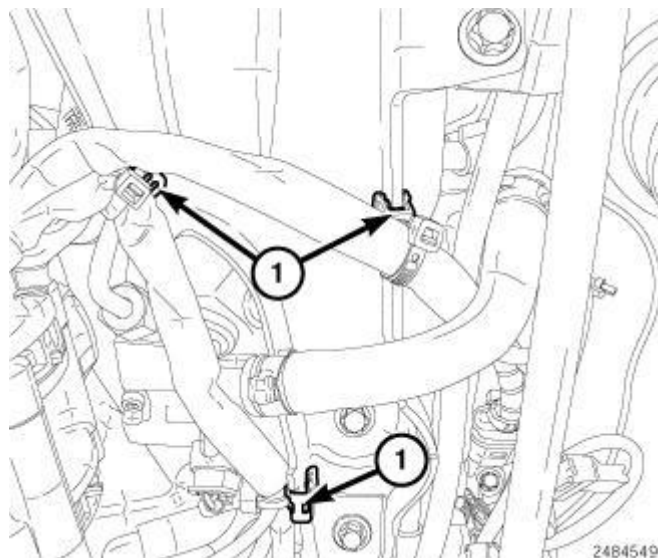


Fig. 356: Wire Harness Retainers
 Courtesy of CHRYSLER GROUP, LLC

6. Connect the wire harness retainers (1).

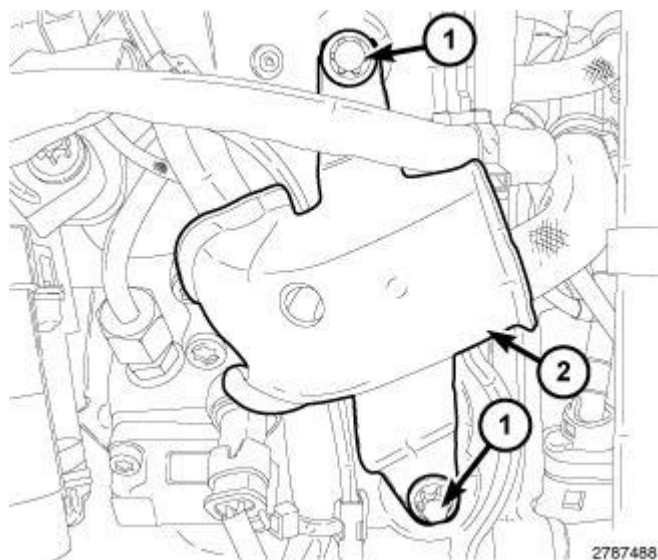
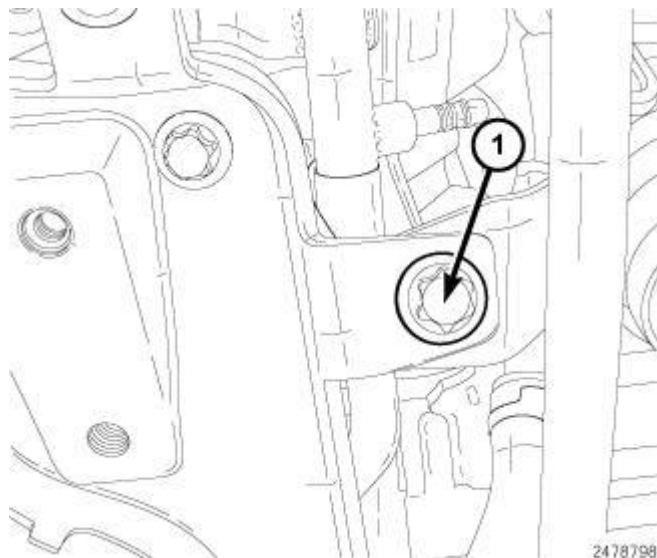
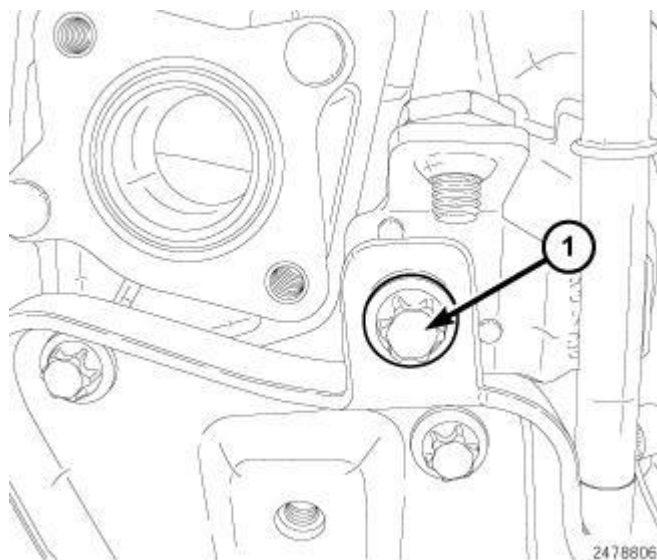


Fig. 357: Bolts & Heat Shield
 Courtesy of CHRYSLER GROUP, LLC

7. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

**Fig. 358: Oil Dip Stick Bolt****Courtesy of CHRYSLER GROUP, LLC**

8. Install the bolt securing the oil dip stick tube. Tighten bolt to 9 N.m (80 in. lbs.).

**Fig. 359: Vacuum Tube Bolt****Courtesy of CHRYSLER GROUP, LLC**

9. Install the bolt securing the vacuum tube (1). Tighten bolt to 9 N.m (80 in. lbs.).

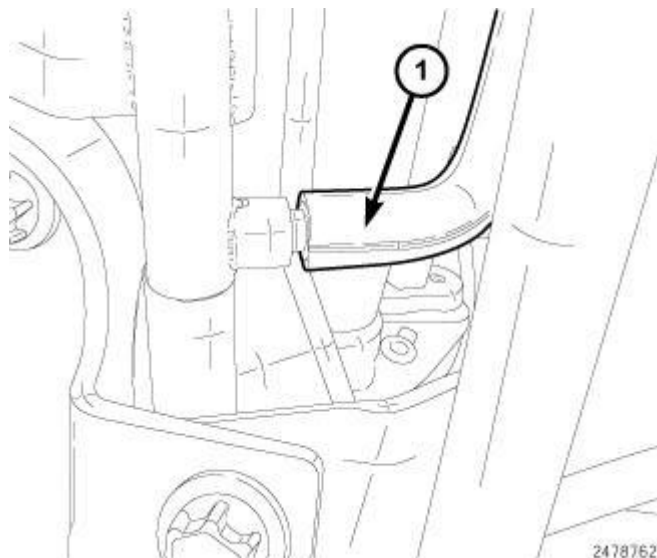


Fig. 360: Vacuum Supply Line At EGR Solenoid
 Courtesy of CHRYSLER GROUP, LLC

10. Connect the vacuum supply line (1) to the EGR solenoid.

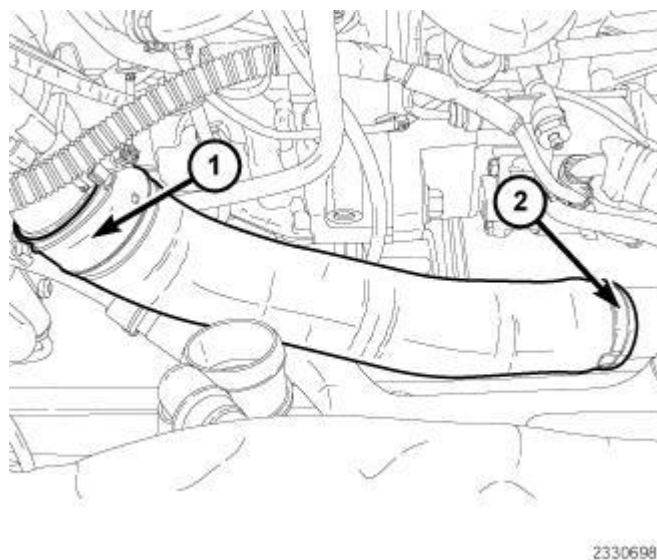


Fig. 361: EGR Air Flow Control Valve & Clamp
 Courtesy of CHRYSLER GROUP, LLC

11. Install charge air inlet tube to the charge air cooler (CAC) and the EGR air control valve.
12. Connect the negative battery cable.

SWITCH, OIL LEVEL

DESCRIPTION

DESCRIPTION

The oil level switch is located on the bottom of the oil pan. The oil level switch sends a signal to the Powertrain Control Module (PCM) which turns the oil light on in the cluster when oil level is below its threshold.

If the engine oil light is on while engine is running perform the **DIAGNOSING AN OIL LIGHT ON** test procedure. Refer to **DIAGNOSIS AND TESTING**.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.
3. Remove the belly pan.
4. Drain engine oil. Tighten drain plug to 25 N.m (18 ft. lbs.).

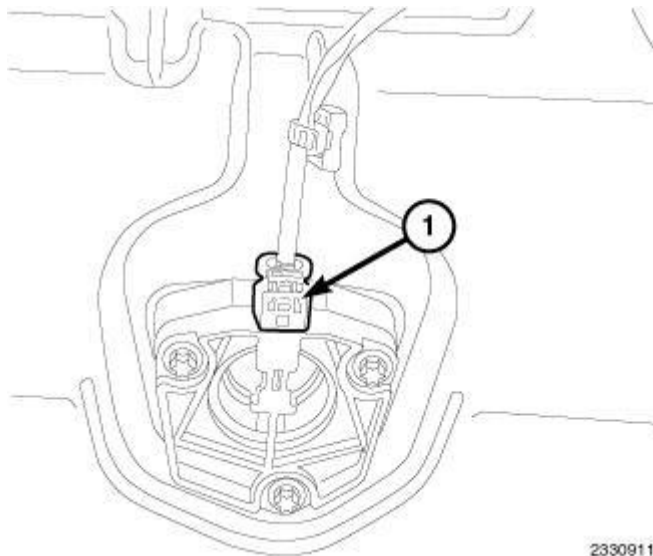
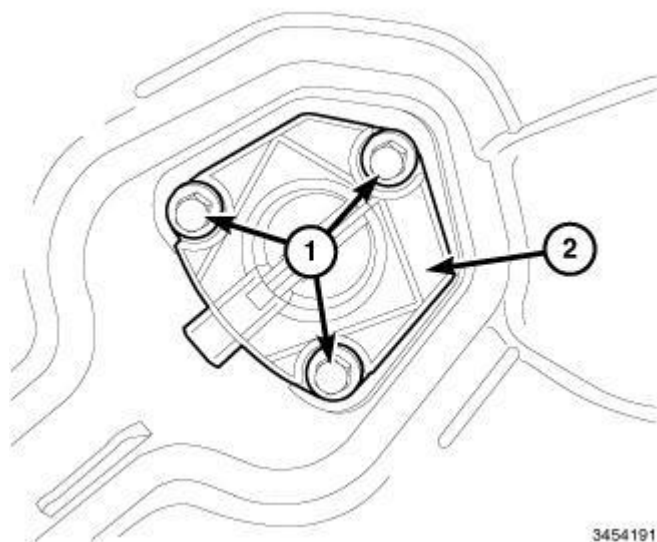


Fig. 362: Oil Level Switch/Life Monitor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

5. Disconnect oil level switch harness connector (1).



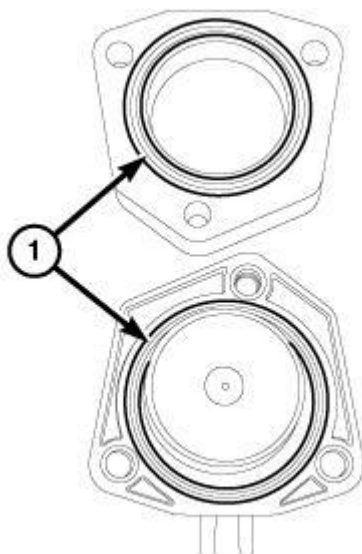
3454191

Fig. 363: Oil Level Switch & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove bolts (1) and the oil level switch (2).

INSTALLATION

INSTALLATION



3454249

Fig. 364: O-Ring Seals
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket sealing area on oil pan.
2. Inspect the O-ring seals (1) and replace as necessary.

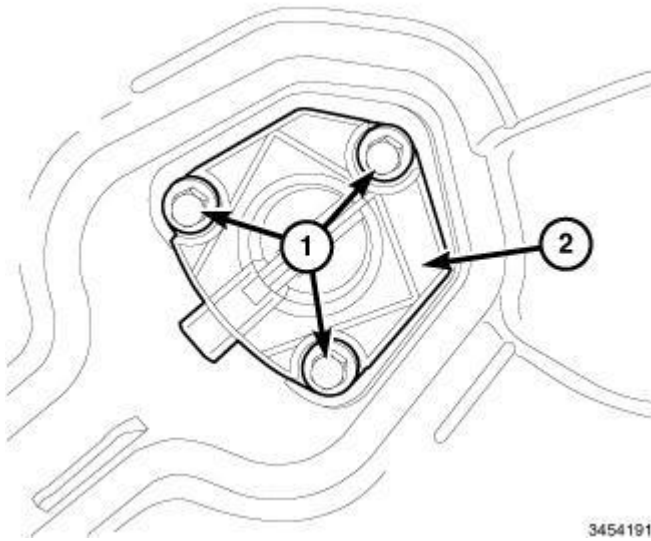


Fig. 365: Oil Level Switch & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the oil level switch. Tighten bolts to 9 N.m (80 in. lbs.).

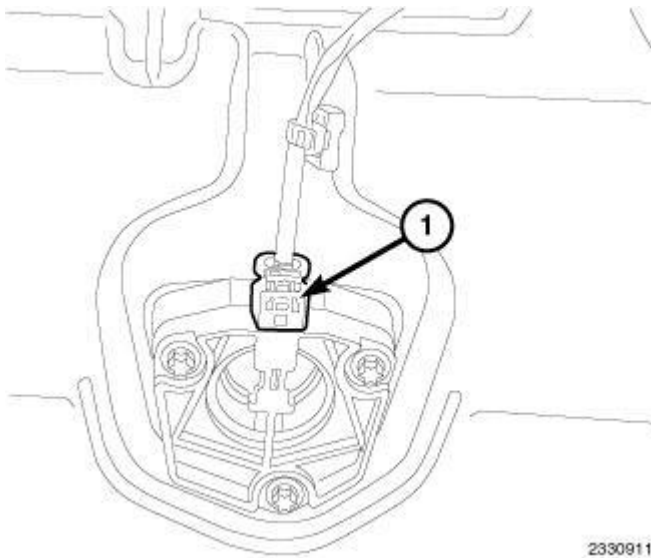


Fig. 366: Oil Level Switch/Life Monitor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

4. Connect oil level switch harness connector (1).
5. Install the belly pan.
6. Lower the vehicle
7. Fill the engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
8. Connect the negative battery cable.

MANIFOLDS

ACTUATOR, SWIRL VALVE

DESCRIPTION

DESCRIPTION

The intake manifold swirl valve is located inside the intake manifold. The swirl valve actuator is mounted on top of the intake manifold.

OPERATION

OPERATION

The swirl and charge inlet port are provided in the intake manifold for each cylinder. The charge inlet port can be closed by means of flaps. The flaps are connected to each other by means of a shaft, which is operated by the swirl valve actuator. They are held in the open position by means of spring force.

At lower engine speed and load range, all the charge inlet ports are sealed off by the flaps. The entire air flows is through the swirl inlet ports only. This results in high air swirling which in turn produces more effective mixing of the fuel with the air, which improves combustion and reduces the amount of soot particulants in the exhaust.

As engine speed and load increases, the charge inlet ports are continuously opened to obtain the best possible ratio between air swirling and air mass for each engine operating point, which will optimize exhaust characteristics and engine power output.

The position of the flaps in the charge inlet ports is determined by the map stored in the Powertrain Control Module (PCM).

REMOVAL

REMOVAL

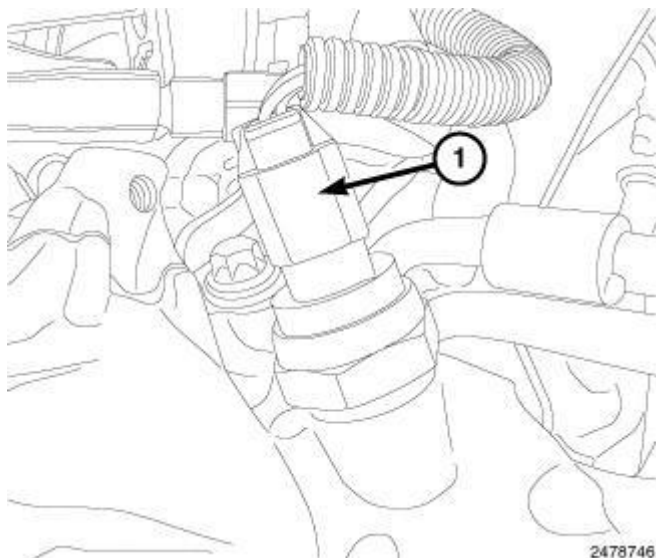


Fig. 367: EGR Back Pressure Transducer Harness Connector
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Drain cooling system. Refer to **STANDARD PROCEDURE** .
4. Disconnect the EGR back pressure transducer harness connector (1).

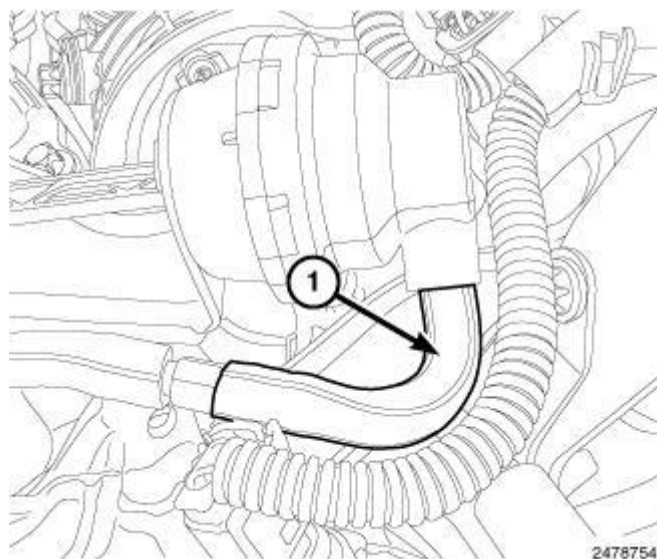


Fig. 368: EGR Control Valve Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

5. Disconnect the vacuum line (1) from the EGR control valve actuator.

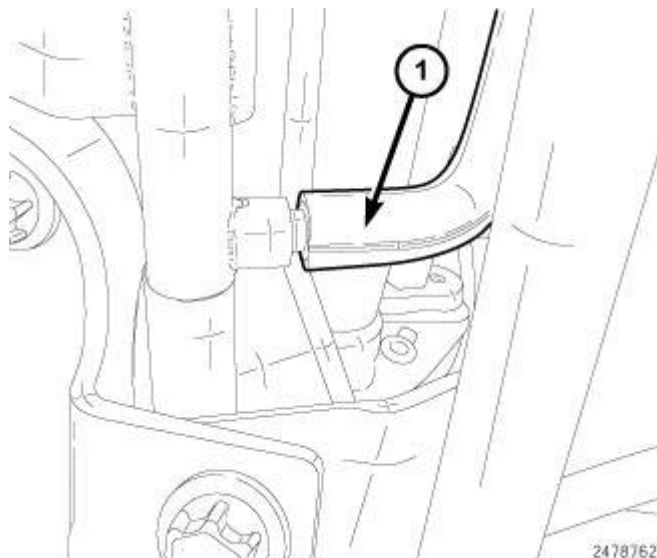


Fig. 369: Vacuum Supply Line At EGR Solenoid
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the vacuum supply line (1) to the EGR solenoid.

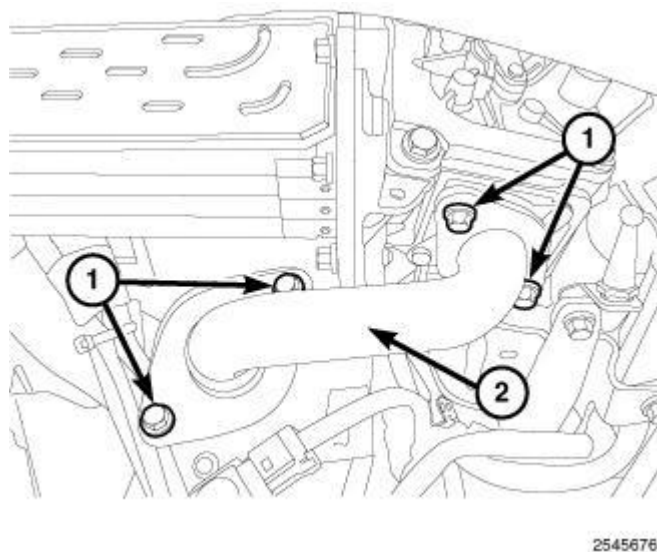
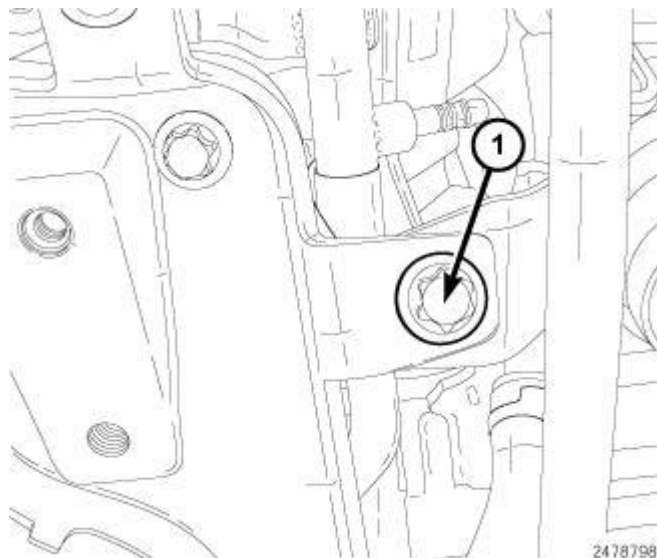


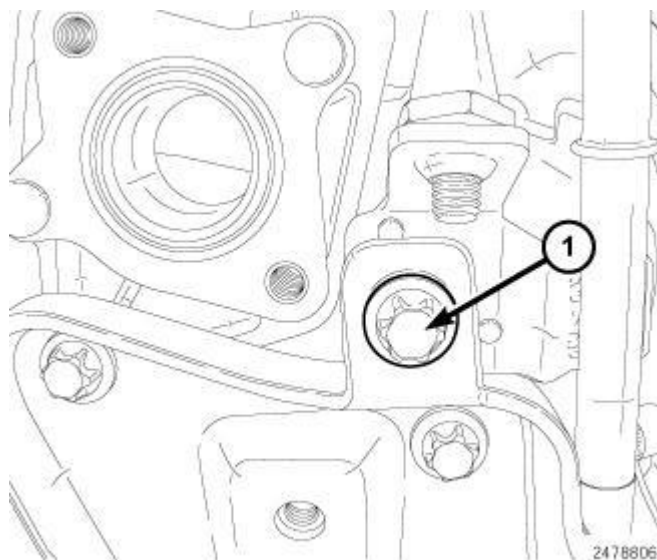
Fig. 370: EGR Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (1) and the EGR tube (2).

**Fig. 371: Oil Dip Stick Bolt**

Courtesy of CHRYSLER GROUP, LLC

8. Remove the bolt (1) securing the oil dip stick tube.

**Fig. 372: Vacuum Tube Bolt**

Courtesy of CHRYSLER GROUP, LLC

9. Remove the bolt (1) securing the vacuum tube.

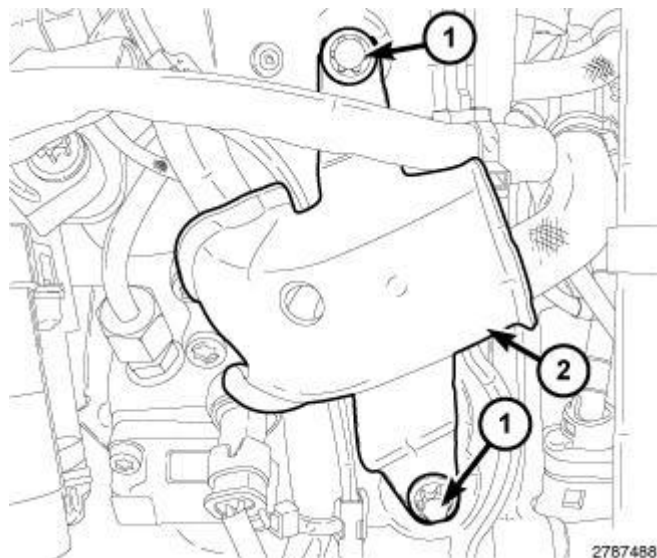


Fig. 373: Bolts & Heat Shield
Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the heat shield (2).

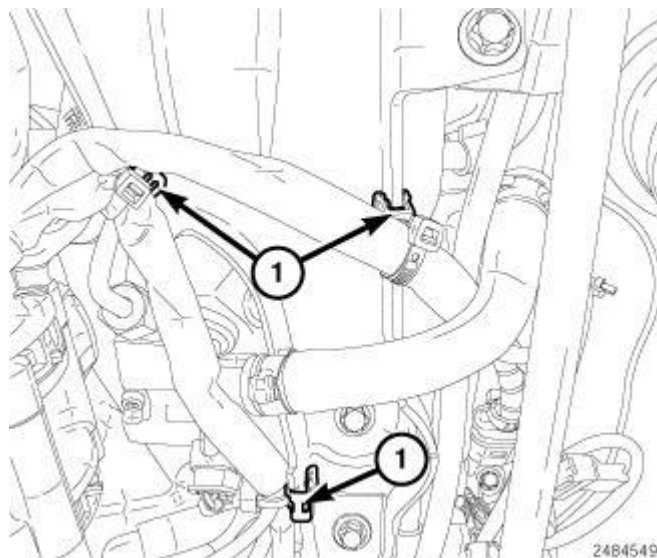


Fig. 374: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect the wire harness retainers (1).

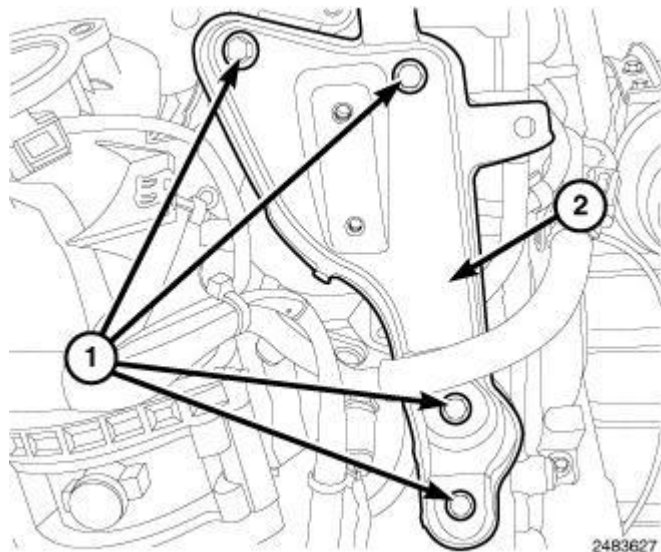


Fig. 375: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (1) and the EGR support bracket (2).

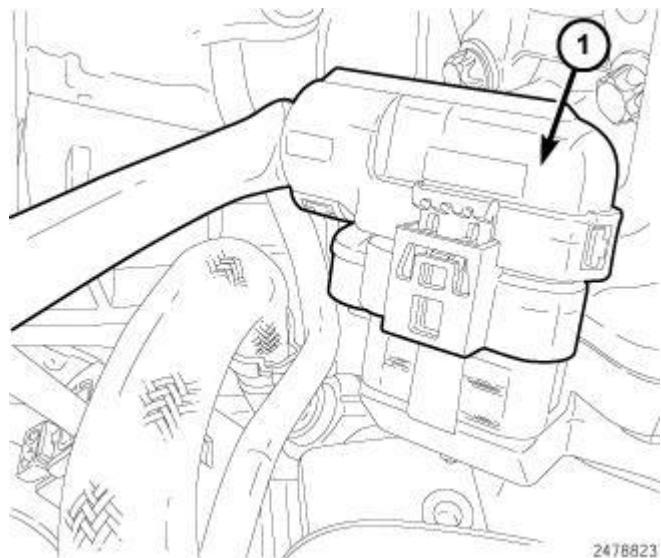


Fig. 376: EGR Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the EGR valve harness connector (1).

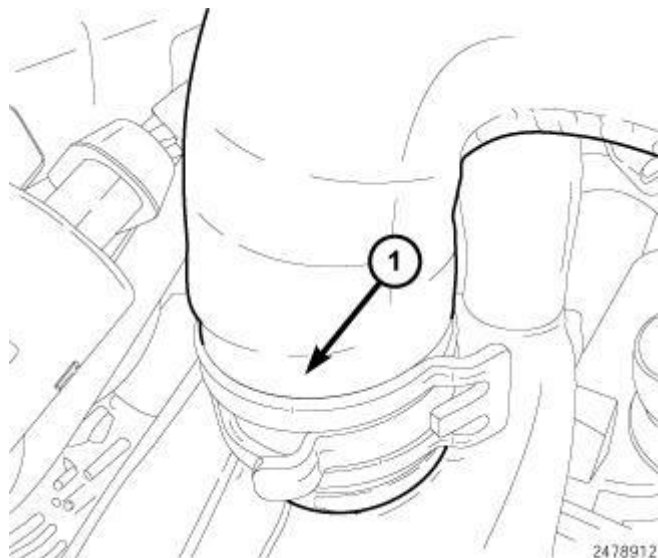


Fig. 377: EGR Coolant Hose
Courtesy of CHRYSLER GROUP, LLC

14. Disconnect the EGR coolant hose (1).

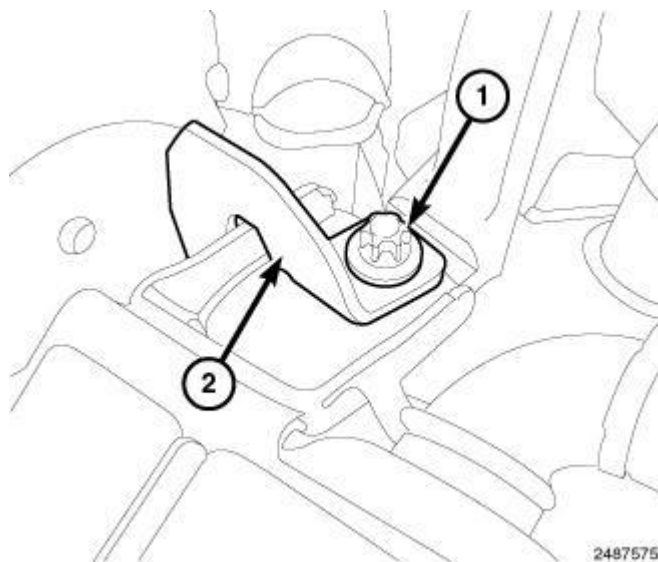


Fig. 378: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

15. Remove the upper EGR cooler bolt (1) and bracket (2).

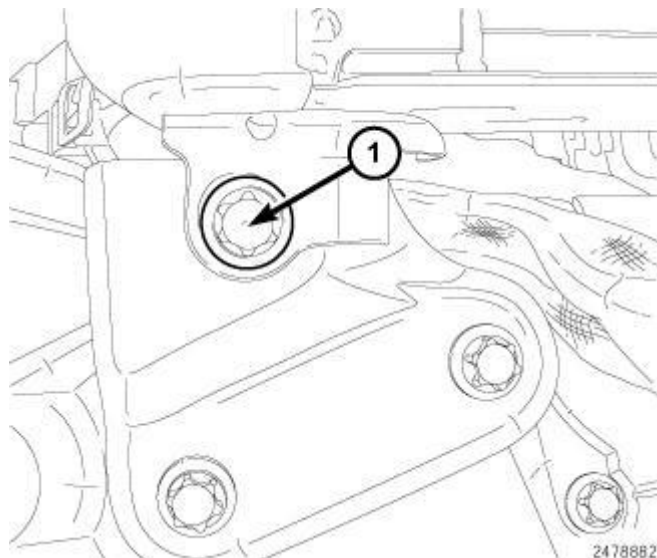


Fig. 379: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

16. Remove the lower EGR cooler bolt (1).

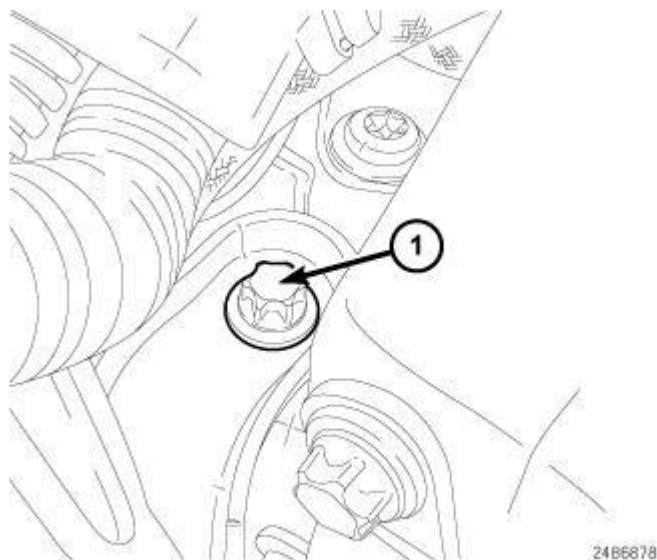


Fig. 380: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

17. Remove the support bracket bolt (1).

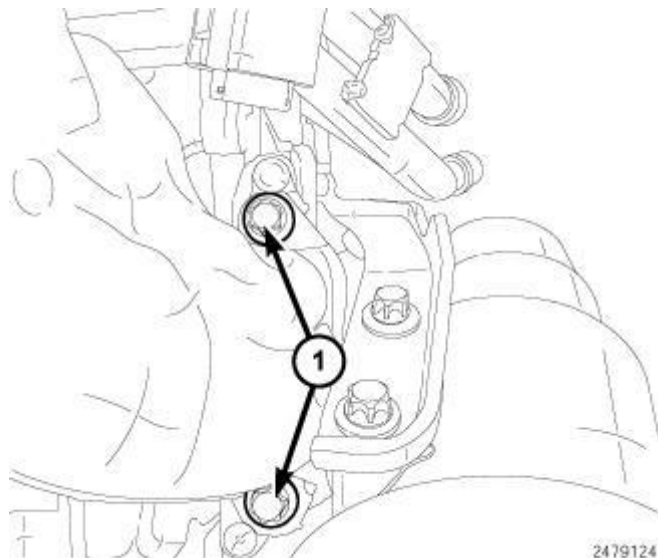


Fig. 381: EGR Cooler Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Remove two bolts (1) and the EGR cooler manifold.

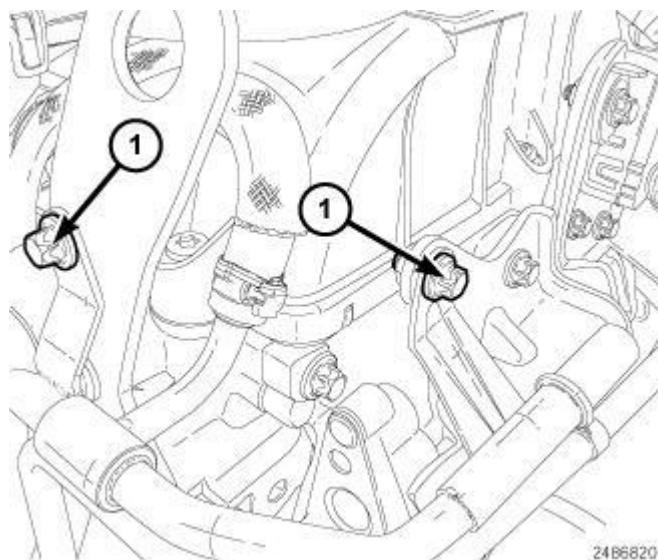


Fig. 382: Upper Fuel Line Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Remove the two upper fuel line bracket bolts (1).

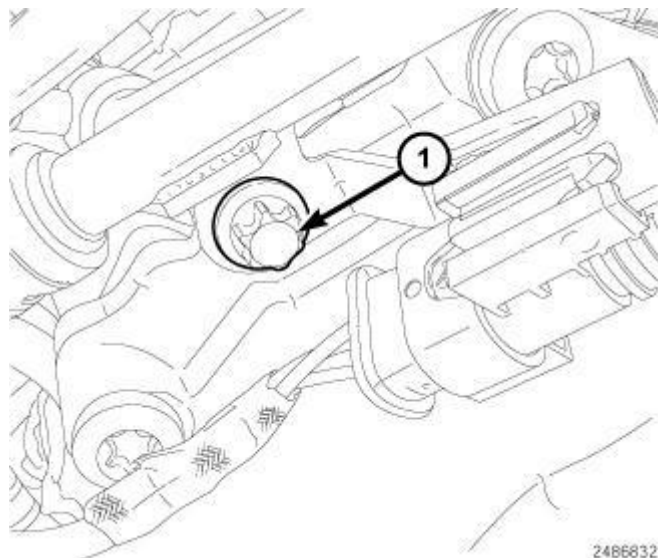


Fig. 383: Lower Fuel Line Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

20. Remove the lower fuel line bracket bolt (1).

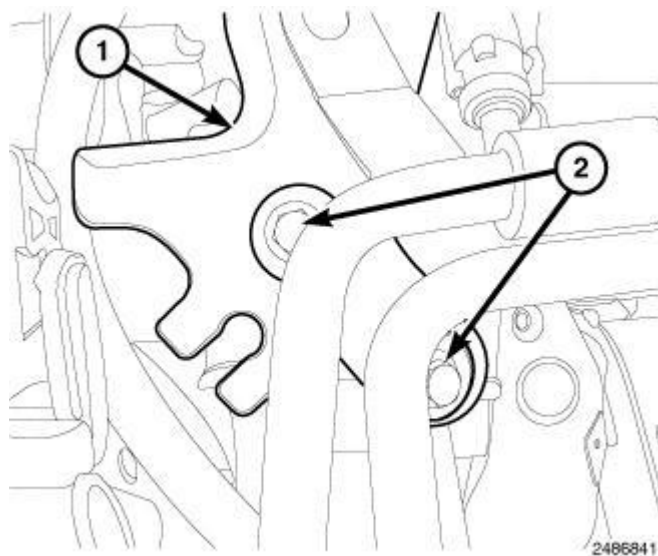


Fig. 384: Engine Lifting Eye & Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (2) and the engine lifting eye (1).

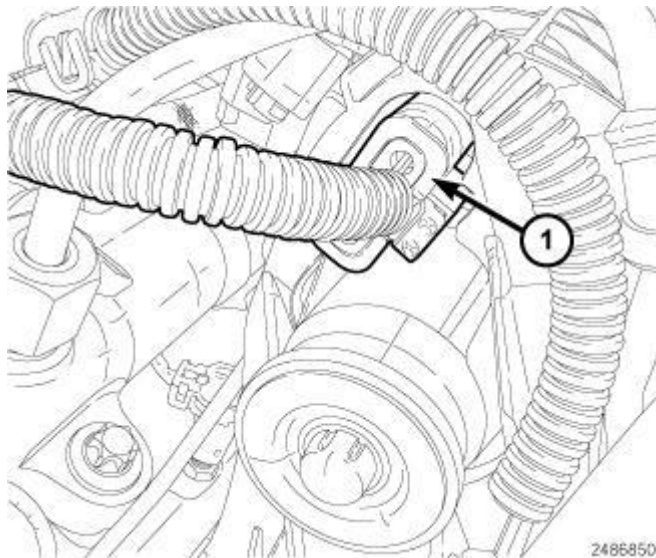


Fig. 385: Swirl Valve Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

22. Disconnect the swirl valve actuator harness connector (1).

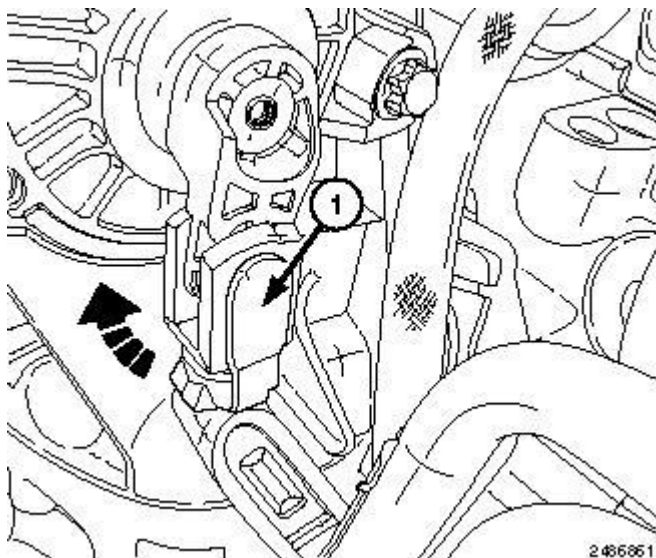


Fig. 386: Releasing Lock Clip At Swirl Valve Linkage
Courtesy of CHRYSLER GROUP, LLC

23. Release the lock clip (1) and disconnect the swirl valve linkage.

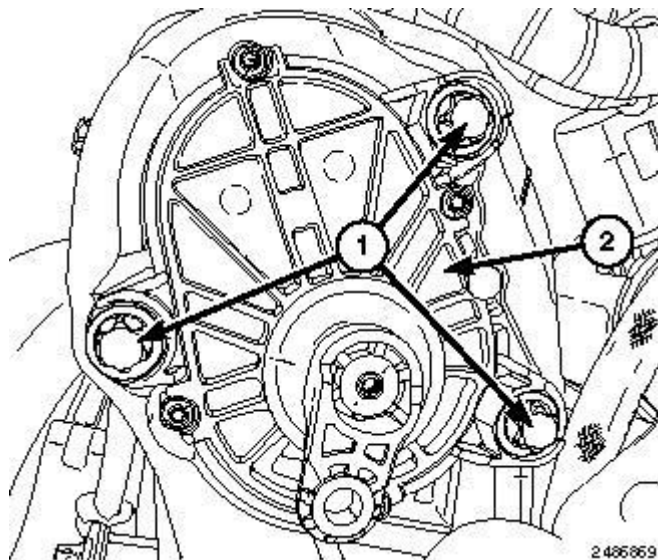


Fig. 387: Swirl Valve Actuator & Bolts
Courtesy of CHRYSLER GROUP, LLC

24. Remove the bolts (1) and the swirl valve actuator (2).

INSTALLATION

INSTALLATION

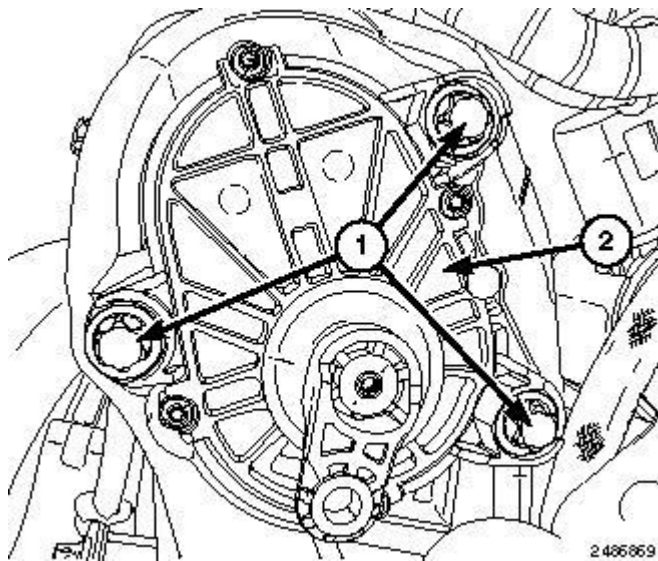


Fig. 388: Swirl Valve Actuator & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Install swirl valve motor (2). Tighten bolts (1) to 9 N.m 80 (in. lbs.).

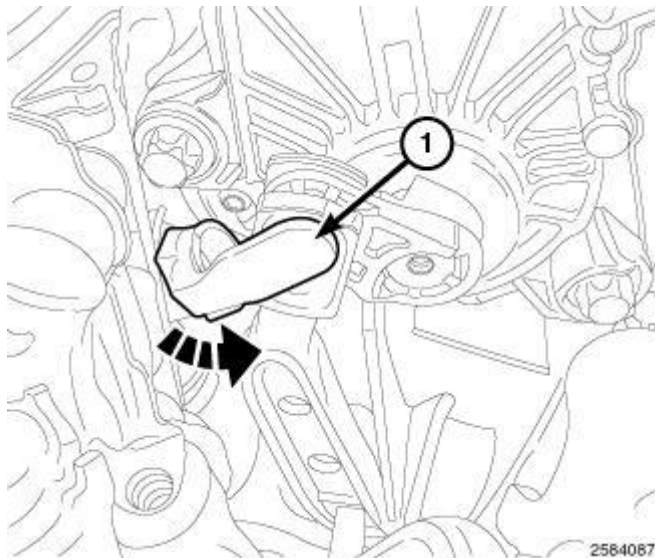


Fig. 389: Installing Lock Clip On Swirl Valve Linkage
Courtesy of CHRYSLER GROUP, LLC

2. Position the swirl valve linkage and install the lock clip (1).

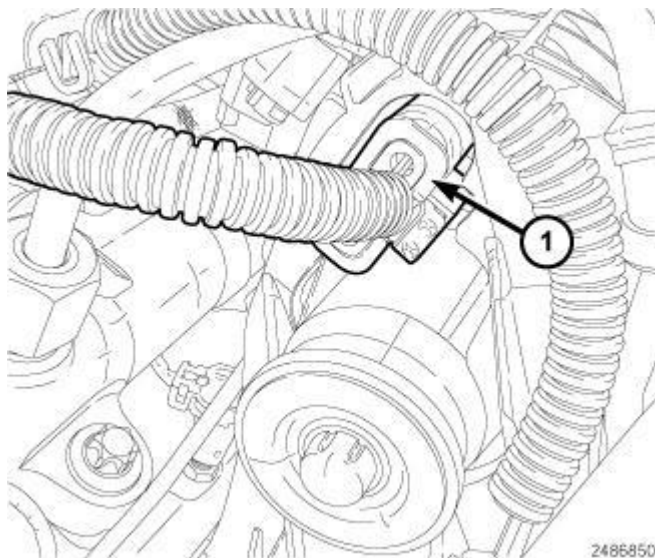


Fig. 390: Swirl Valve Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

3. Connect the swirl valve motor harness connector (1).

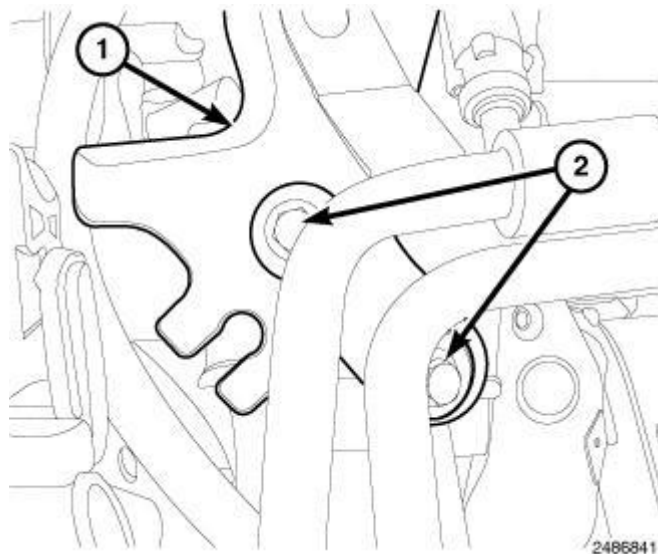


Fig. 391: Engine Lifting Eye & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the engine lifting bracket (1). Tighten bolts (2) to 9 N.m 80 (in. lbs.).

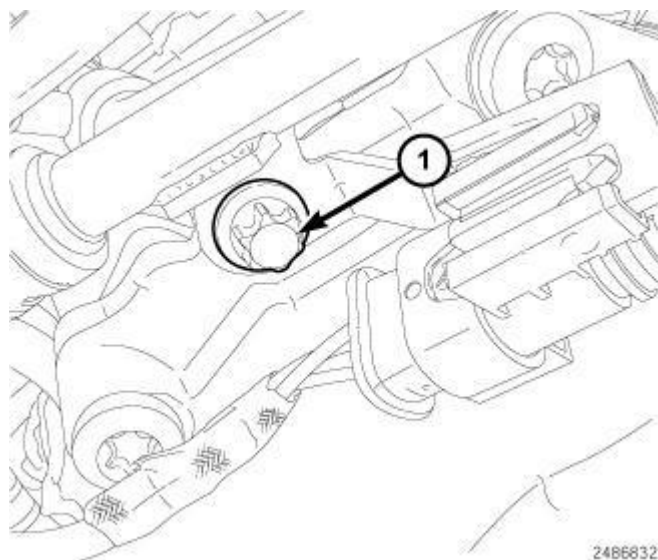


Fig. 392: Lower Fuel Line Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Install the lower fuel line bracket bolt (1). Tighten bolt to 9 N.m 80 (in. lbs.).

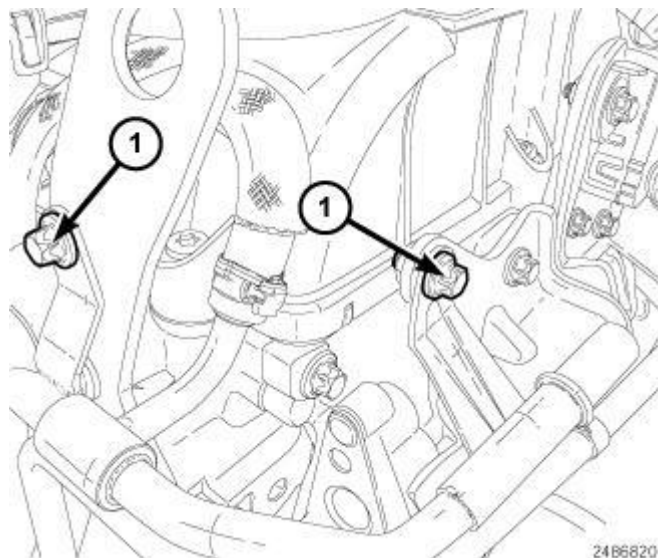


Fig. 393: Upper Fuel Line Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the two upper fuel line bracket bolts. Tighten bolts to 9 N.m 80 (in. lbs.).

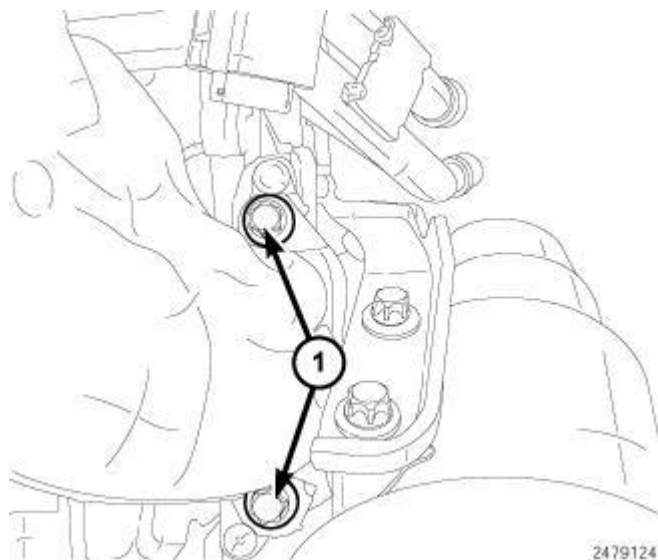


Fig. 394: EGR Cooler Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Install the EGR cooler manifold. Tighten bolts (1) to 9 N.m 80 (in. lbs.).

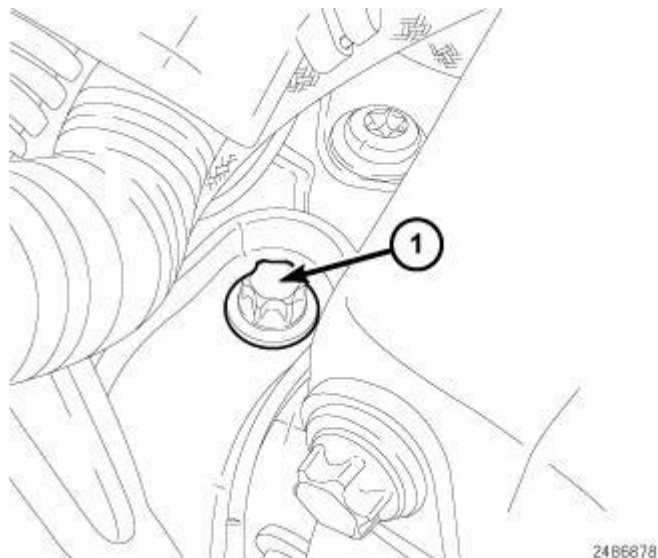


Fig. 395: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Install the upper EGR cooler support bracket bolt (1). Tighten bolt (1) to 9 N.m 80 (in. lbs.).

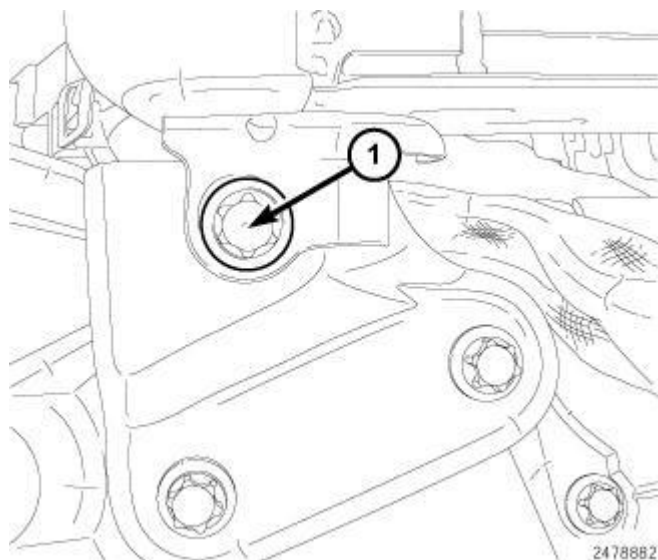


Fig. 396: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Install the lower EGR cooler support bracket bolt (1). Tighten bolt (1) to 9 N.m 80 (in. lbs.).

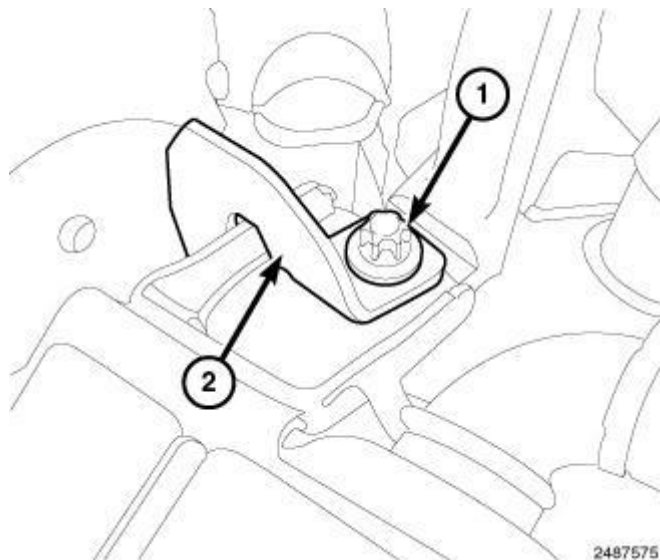


Fig. 397: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

10. Install the upper EGR cooler bracket (2) and bolt (1). Tighten bolt (1) to 9 N.m 80 (in. lbs.).

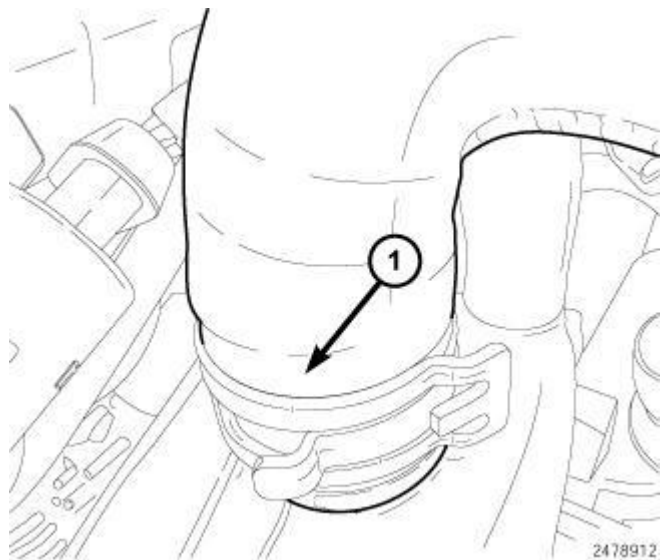


Fig. 398: EGR Coolant Hose
Courtesy of CHRYSLER GROUP, LLC

11. Connect the EGR coolant hose (1).

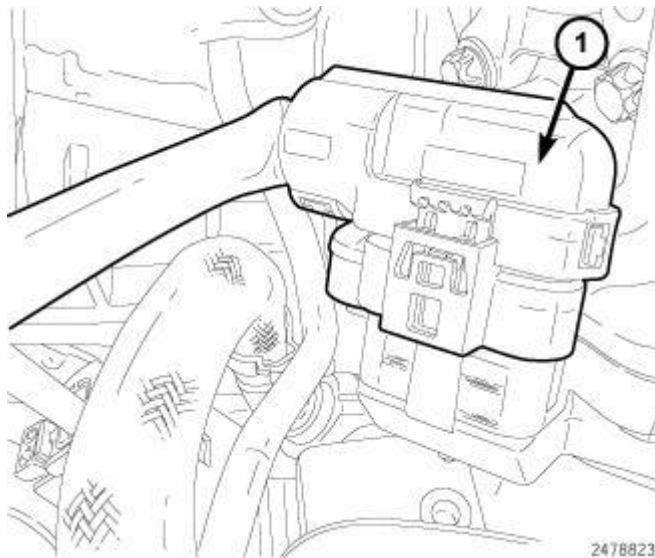


Fig. 399: EGR Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

12. Connect the EGR valve electrical connector (1).

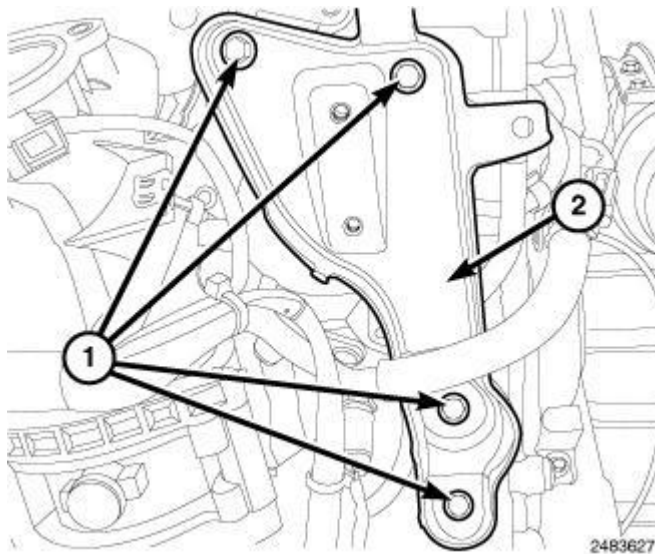


Fig. 400: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

13. Install the EGR support bracket (2). Tighten bolts (1) to 9 N.m 80 (in. lbs.).

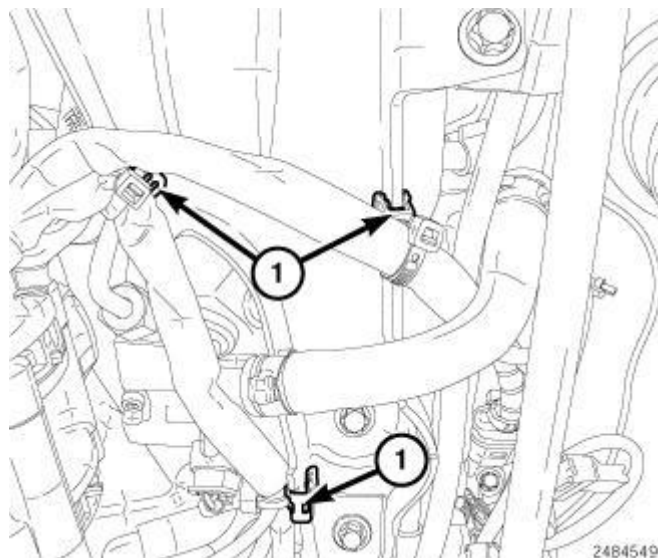


Fig. 401: Wire Harness Retainers
 Courtesy of CHRYSLER GROUP, LLC

14. Connect the wire harness retainers (1).

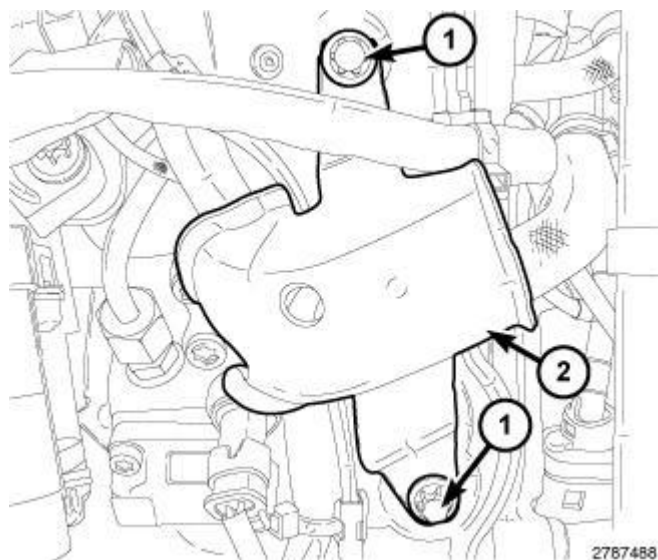
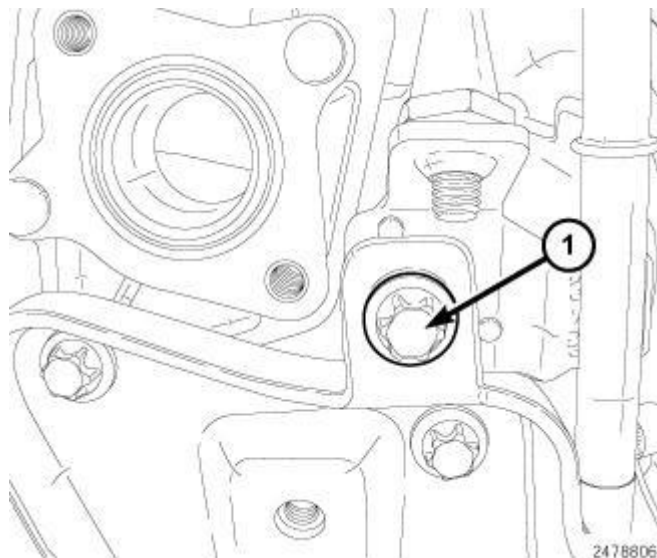
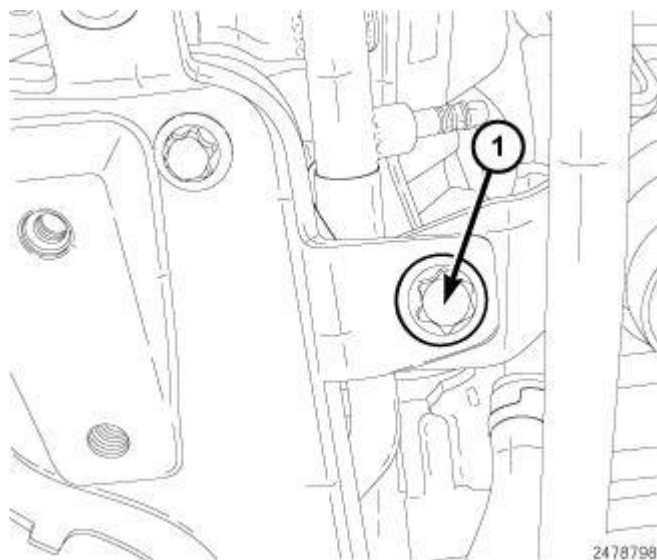


Fig. 402: Bolts & Heat Shield
 Courtesy of CHRYSLER GROUP, LLC

15. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

**Fig. 403: Vacuum Tube Bolt****Courtesy of CHRYSLER GROUP, LLC**

16. Install the bolt (1) securing the vacuum tube. Tighten bolt (1) to 9 N.m 80 (in. lbs.).

**Fig. 404: Oil Dip Stick Bolt****Courtesy of CHRYSLER GROUP, LLC**

17. Install the bolt (1) securing the oil dip stick tube. Tighten bolt (1) to 9 N.m 80 (in. lbs.).

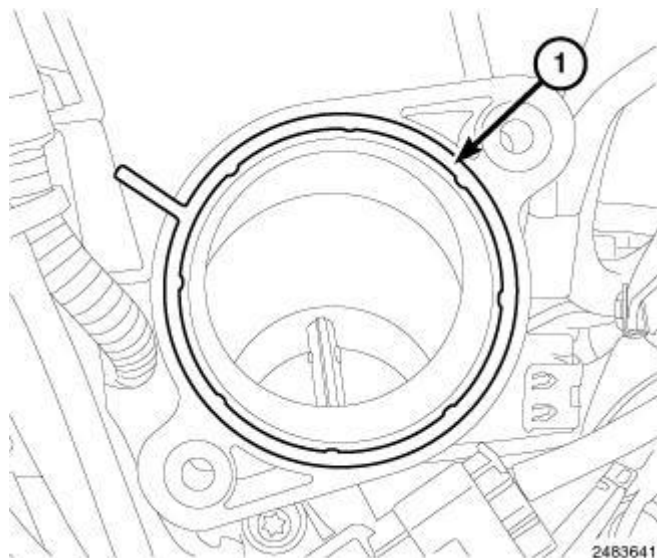


Fig. 405: EGR Tube Gasket Onto Mixing Chamber
Courtesy of CHRYSLER GROUP, LLC

18. Clean the gasket surfaces and install a new gasket (1).

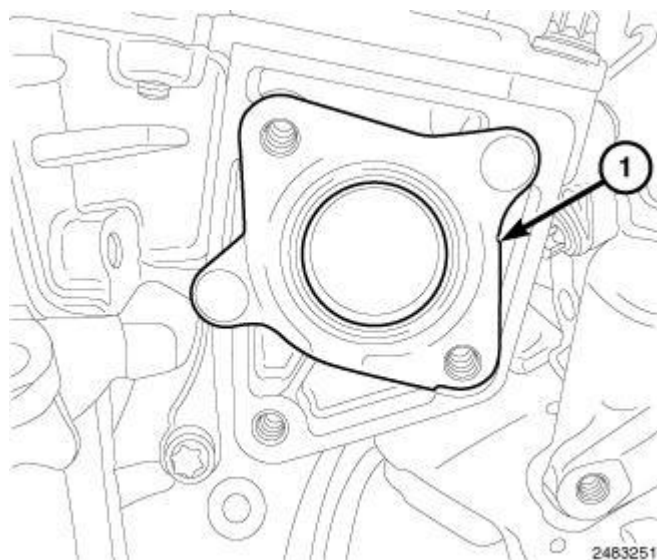
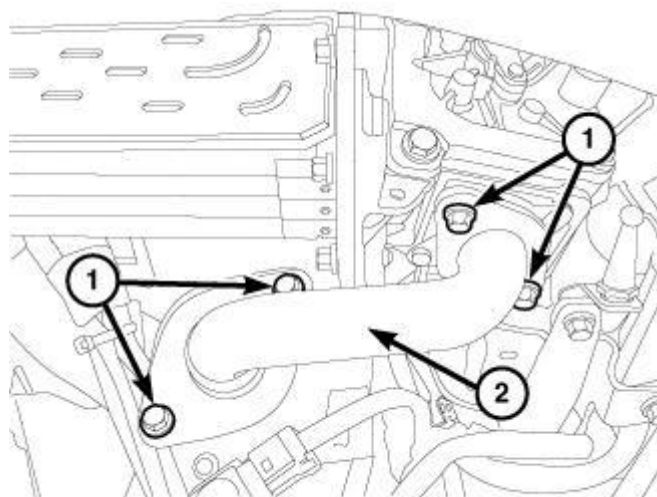


Fig. 406: EGR Tube Gasket Onto EGR Actuator
Courtesy of CHRYSLER GROUP, LLC

19. Clean the gasket surfaces and install a new gasket (1).

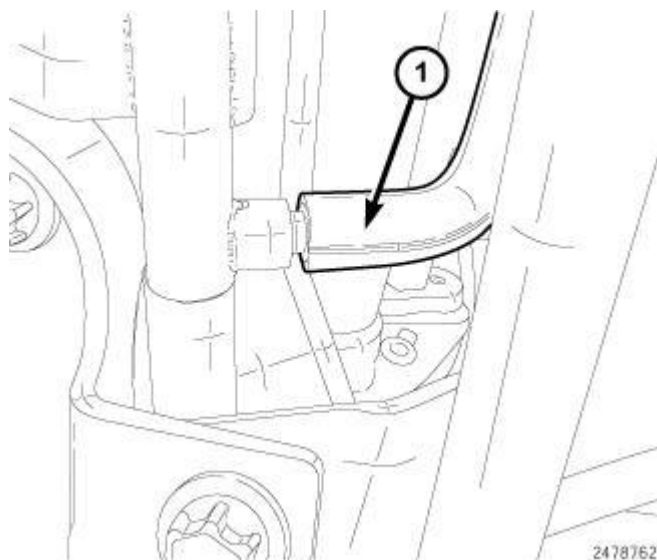


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Fig. 407: EGR Tube & Bolts

Courtesy of CHRYSLER GROUP, LLC

20. Install the EGR tube (2). Tighten bolts (1) to 9 N.m 80 (in. lbs.).



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Fig. 408: Vacuum Supply Line At EGR Solenoid

Courtesy of CHRYSLER GROUP, LLC

21. Connect the vacuum supply line (1) to the EGR solenoid.

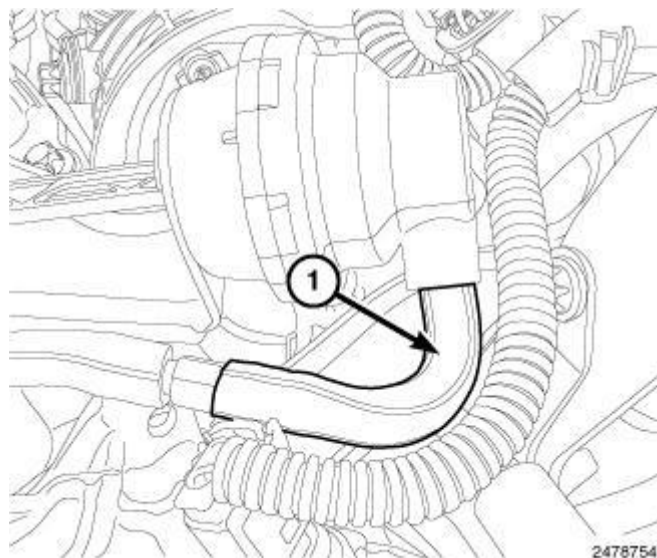


Fig. 409: EGR Control Valve Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

22. Connect the vacuum line (1) from the EGR control valve actuator.

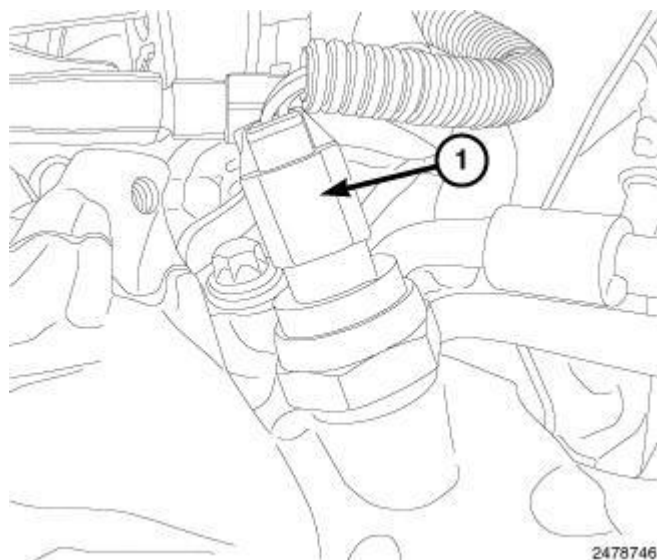


Fig. 410: EGR Back Pressure Transducer Harness Connector
Courtesy of CHRYSLER GROUP, LLC

23. Connect the EGR back pressure transducer harness connector (1).
24. Fill cooling system. Refer to **STANDARD PROCEDURE** .
25. Install the engine cover.
26. Connect the negative battery cable.

MANIFOLD, EXHAUST

REMOVAL

REMOVAL

1. Disconnect negative battery cable.
2. Remove the turbocharger. Refer to **TURBOCHARGER, REMOVAL**.

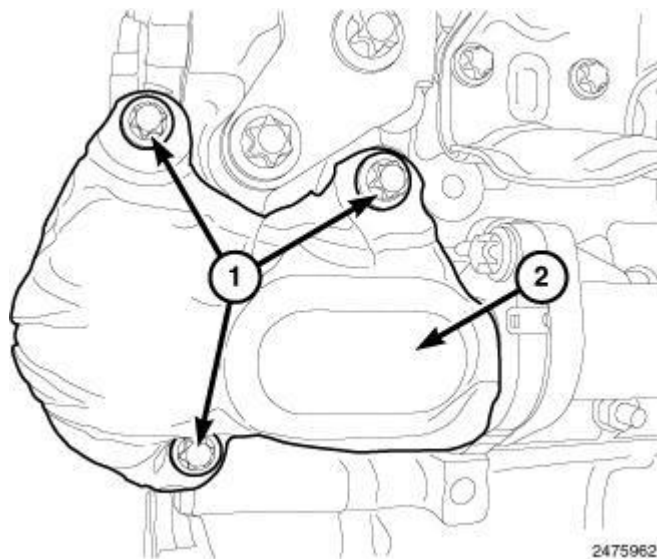


Fig. 411: EGR Pipe Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the EGR pipe heat shield (2).

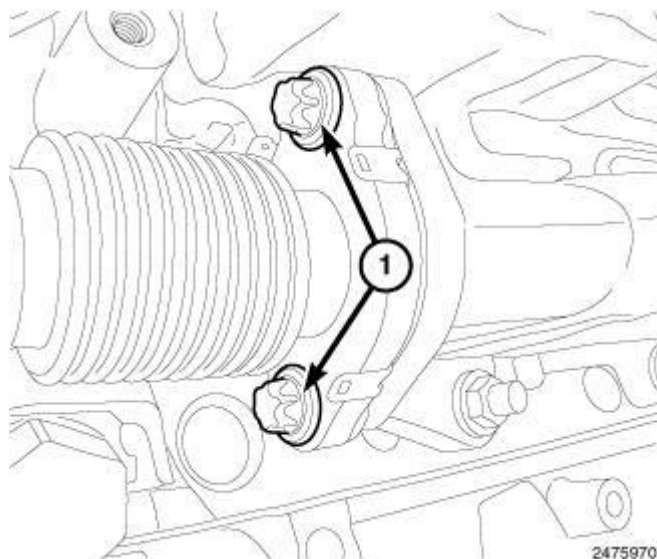


Fig. 412: EGR Crossover Pipe Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove the two bolts (1) from the EGR crossover pipe.

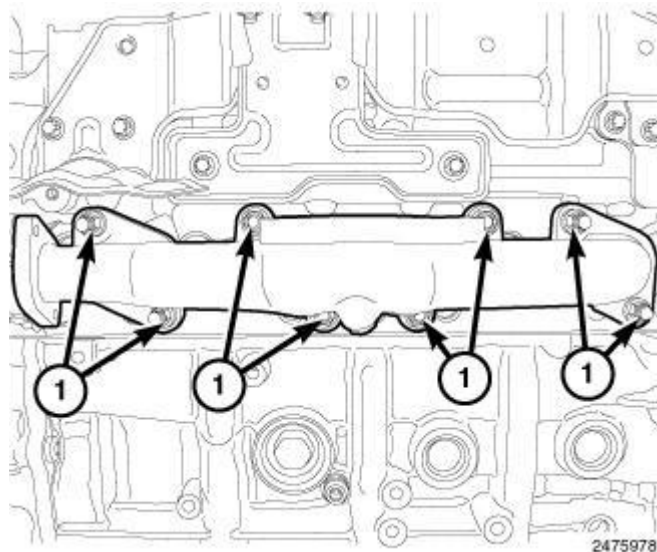


Fig. 413: Exhaust Manifold Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

5. Remove exhaust manifold retaining nuts (1) and remove manifold.

INSPECTION

INSPECTION

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

INSTALLATION

INSTALLATION

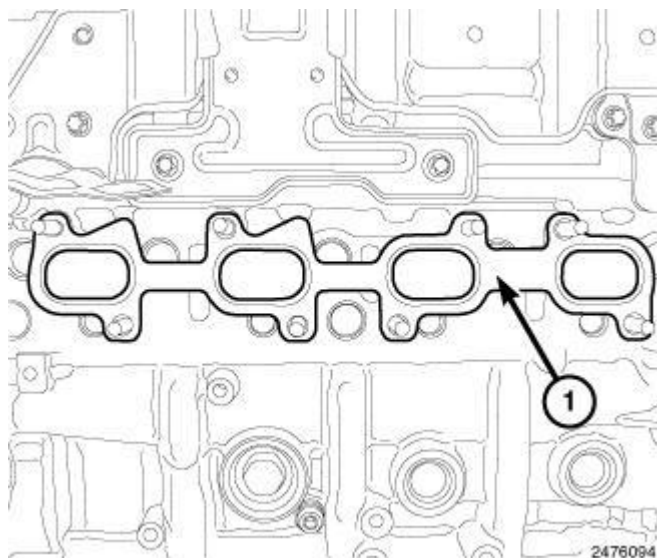


Fig. 414: Exhaust Manifold Gasket

Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket surfaces and install a new gasket (1).

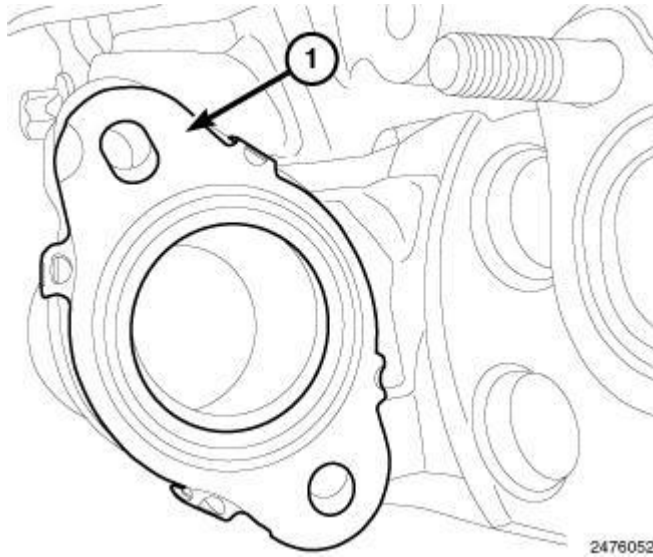


Fig. 415: EGR Pipe Gasket

Courtesy of CHRYSLER GROUP, LLC

2. Clean the gasket surface and install a new gasket (1) onto the EGR pipe.

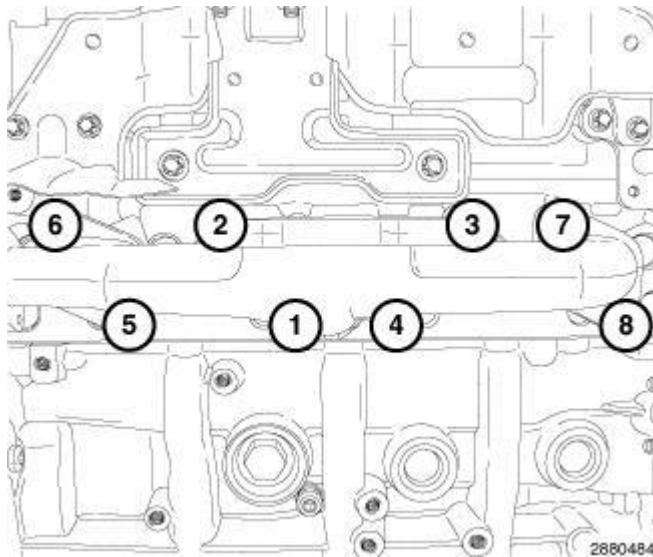


Fig. 416: Exhaust Manifold Bolt Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

3. Install exhaust manifold and tighten nuts finger tight.
4. Using the sequence shown in illustration tighten nuts to 30 N.m (22 ft. lbs.).

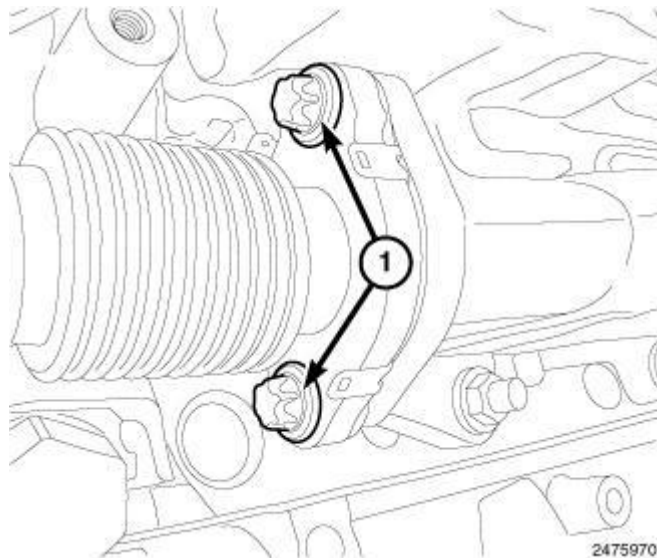


Fig. 417: EGR Crossover Pipe Bolts
 Courtesy of CHRYSLER GROUP, LLC

5. Install the two bolts (1) into the EGR crossover pipe. Tighten bolts (1) to 12 N.m (106 in. lbs.) plus an additional 90 degrees.

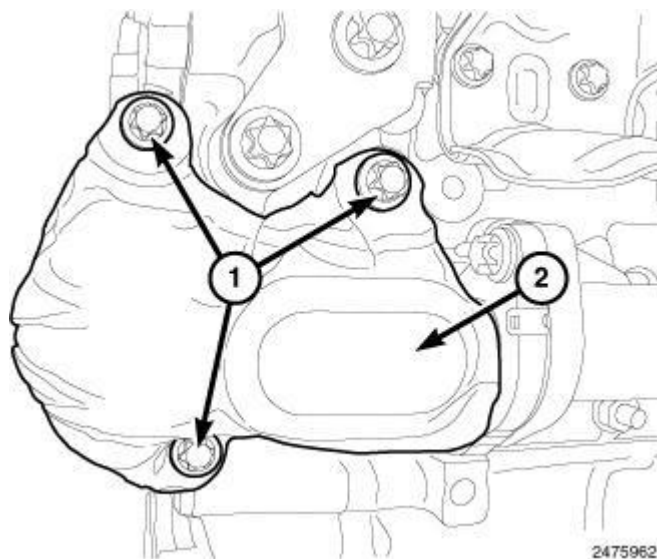


Fig. 418: EGR Pipe Heat Shield & Bolts
 Courtesy of CHRYSLER GROUP, LLC

6. Install the heat shield (2). Tighten bolts (1) to 8 N.m (71 in. lbs.).
7. Install turbocharger. Refer to **TURBOCHARGER, INSTALLATION.**
8. Connect the negative battery cable.

MANIFOLD, INTAKE

DESCRIPTION

DESCRIPTION

The intake manifold is two-piece design and is made of a composite material.

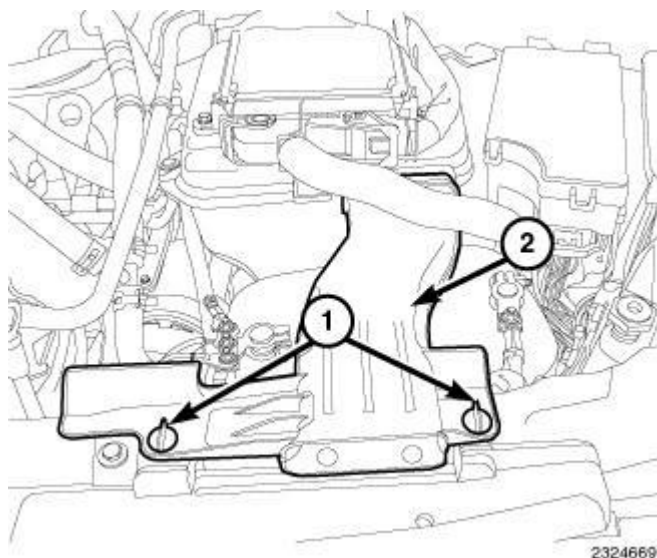
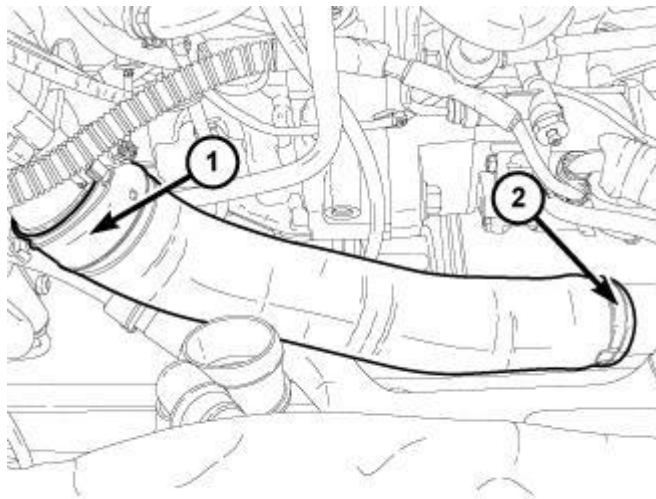
REMOVAL**MIXING CHAMBER**

Fig. 419: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

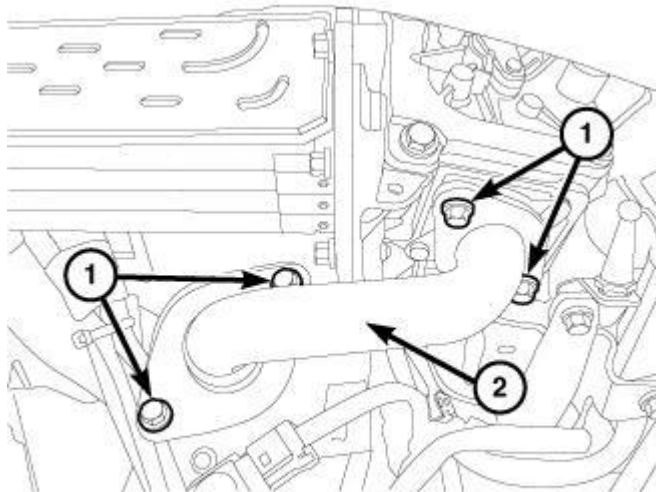
1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove the engine cover.
4. Remove the belly pan.
5. Remove the EGR Cooler. Refer to **COOLER, EGR, REMOVAL** .



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Fig. 420: EGR Air Flow Control Valve & Clamp
Courtesy of CHRYSLER GROUP, LLC

6. Loosen the clamp and disconnect the charge air outlet tube from the charge air cooler (CAC).
7. Remove air inlet tube to EGR air flow control valve (1).
8. Remove the cooling fan module. Refer to **FAN, COOLING, REMOVAL** .



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Fig. 421: EGR Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Remove EGR tube bolts (1) and the EGR tube (2).

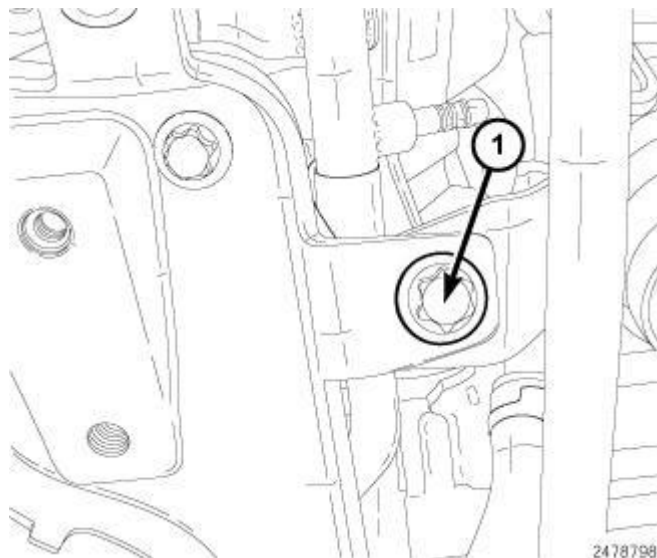


Fig. 422: Oil Dip Stick Bolt

Courtesy of CHRYSLER GROUP, LLC

10. Remove the bolt (1) securing the oil dip stick tube.

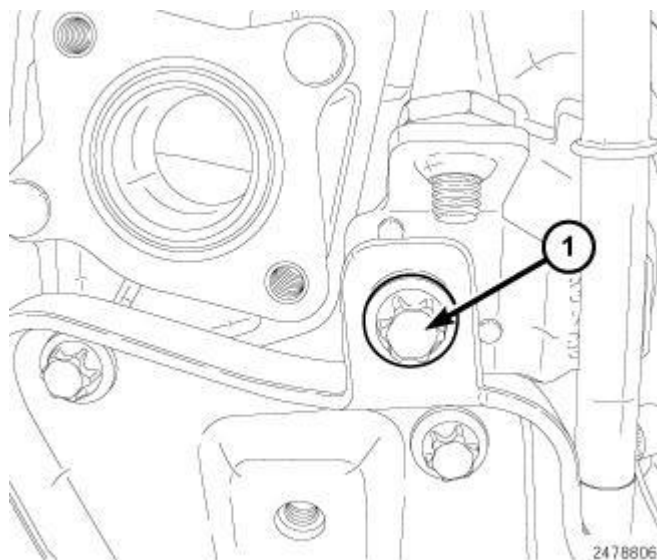


Fig. 423: Vacuum Tube Bolt

Courtesy of CHRYSLER GROUP, LLC

11. Remove the bolt (1) securing the vacuum tube.

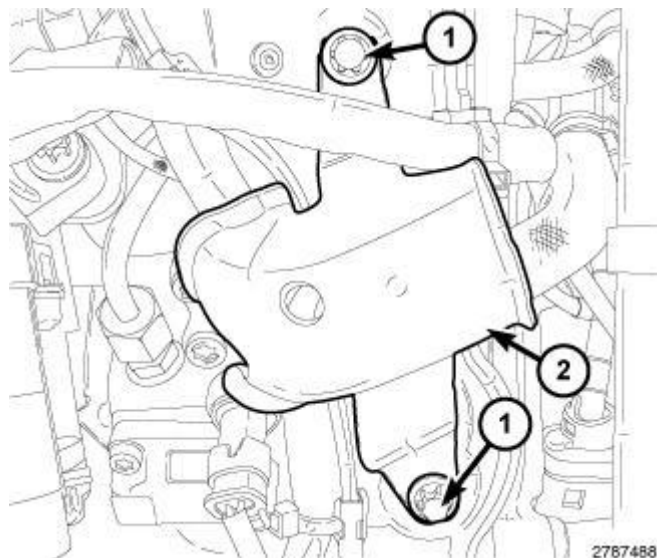


Fig. 424: Bolts & Heat Shield
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (1) and the heat shield (2).

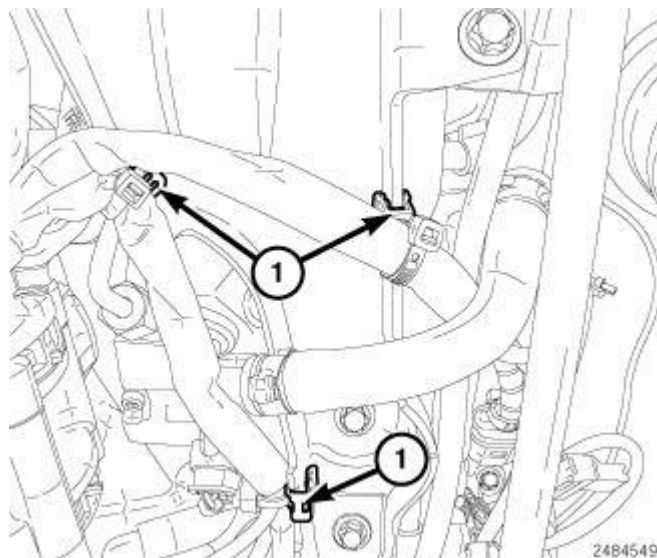


Fig. 425: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the wire harness retainers (1).

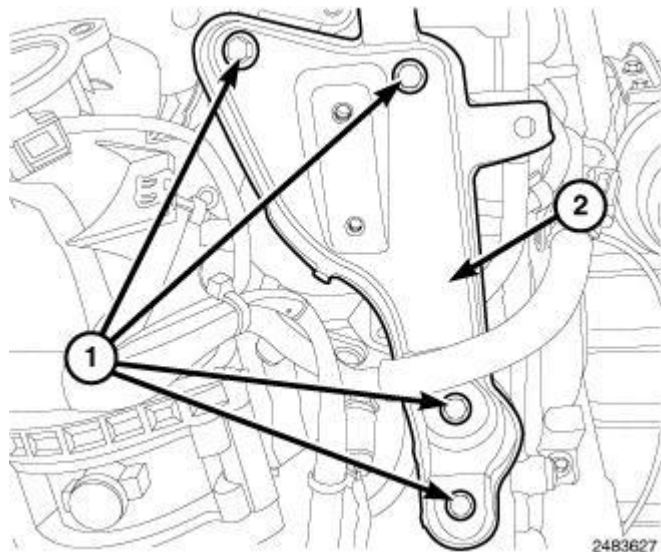


Fig. 426: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

14. Remove bolts (1) and the EGR support bracket (2).

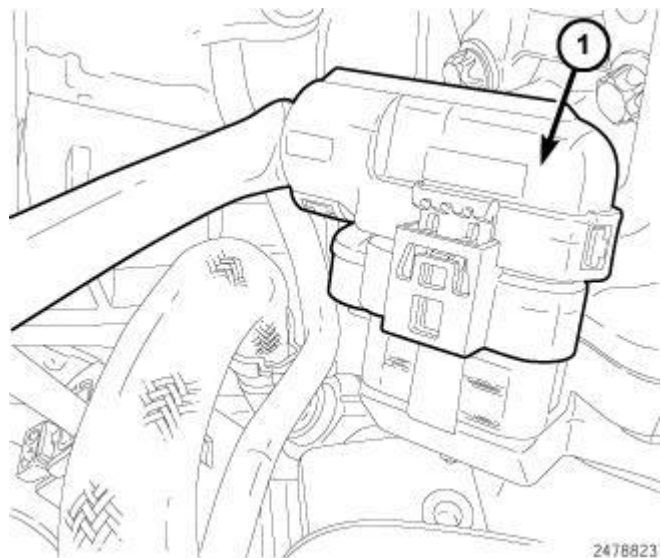


Fig. 427: EGR Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

15. Disconnect the EGR valve (1) harness connector.

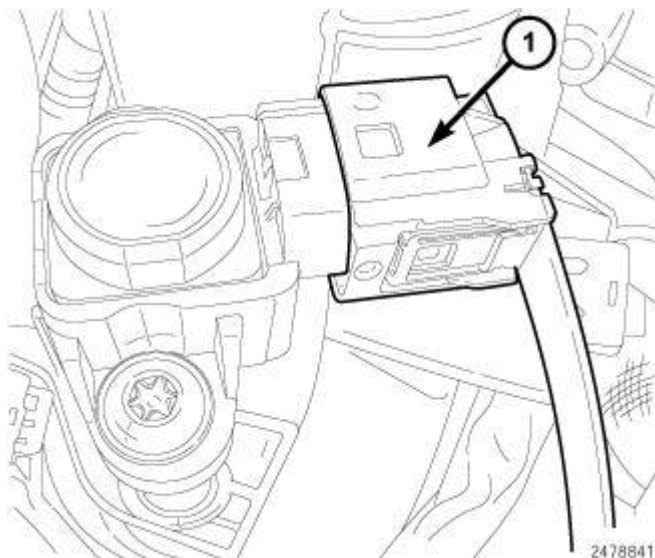


Fig. 428: Boost Pressure Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

16. Disconnect the boost pressure sensor harness connector (1).

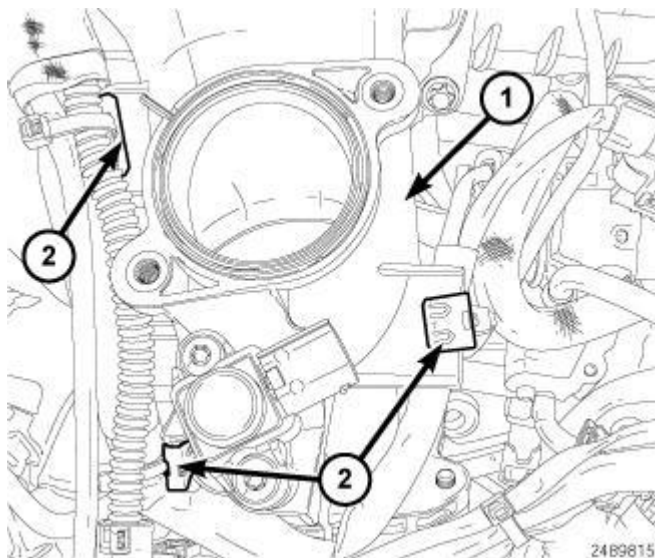


Fig. 429: Mixing Chamber & Wire Harness Retainer Clips
Courtesy of CHRYSLER GROUP, LLC

17. Disconnect the wire harness retainer clips (2) from the mixing chamber (1).

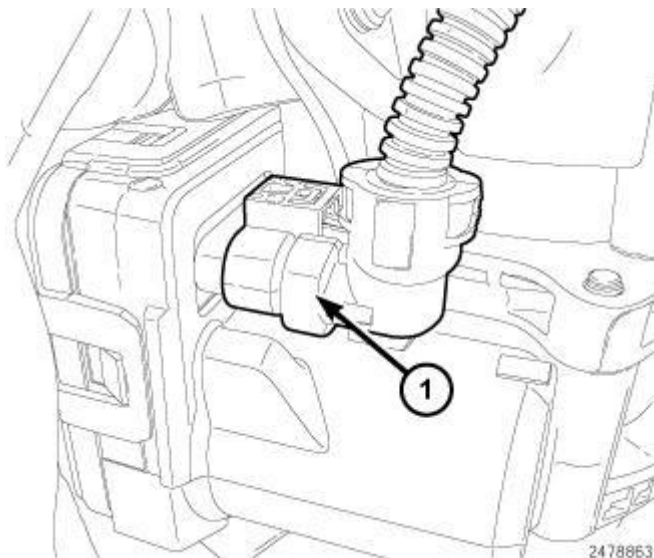


Fig. 430: EGR Air Flow Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

18. Disconnect the EGR air flow control valve (1) harness connector.

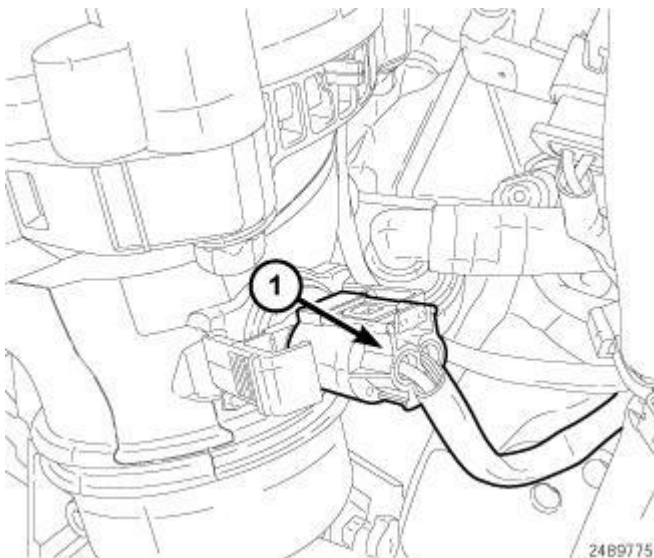


Fig. 431: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

19. Disconnect the charge air inlet temperature sensor (1).

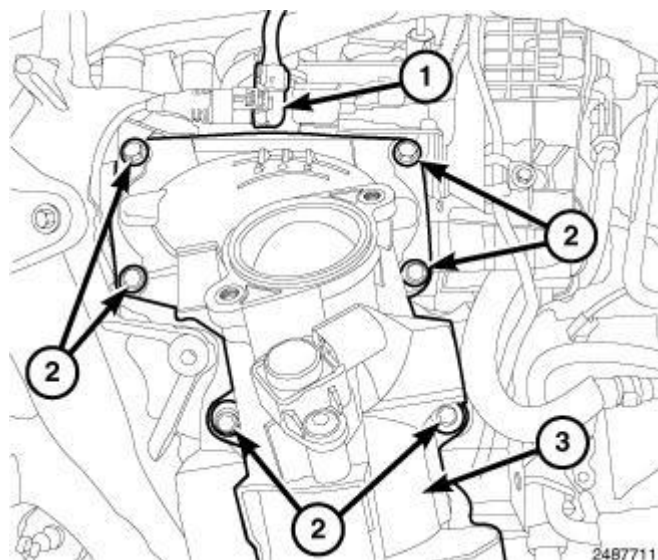


Fig. 432: Knock Sensor Electrical Connector, Mixing Chamber & Bolts
Courtesy of CHRYSLER GROUP, LLC

20. Disconnect the knock sensor electrical connector (1).
21. Remove bolts (2) and the mixing chamber (3).

INTAKE MANIFOLD

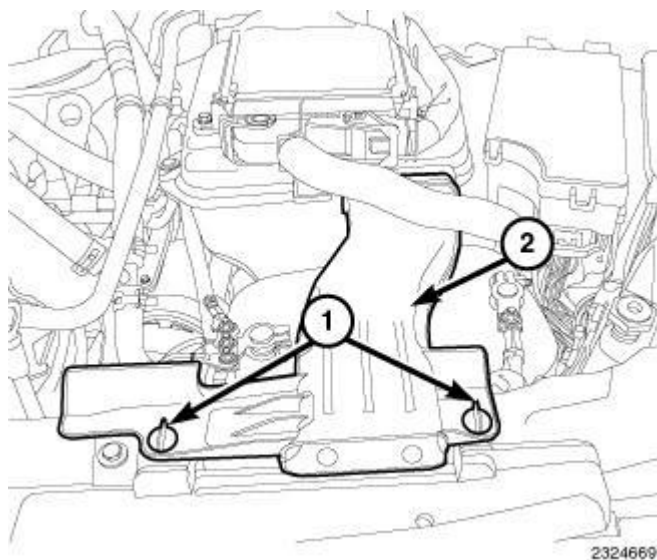


Fig. 433: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

1. Release quarter turn lock tabs (1) and remove air inlet duct (2).
2. Disconnect the negative battery cable.
3. Remove engine cover.
4. Remove the belly pan.

5. Drain cooling system. Refer to **STANDARD PROCEDURE** .
6. Disconnect upper radiator hose from radiator.
7. Remove the cooling fan module. Refer to **FAN, COOLING, REMOVAL** .
8. Remove the coolant pump. Refer to **PUMP, WATER, REMOVAL** .
9. Remove the A/C compressor. Refer to **COMPRESSOR, A/C, REMOVAL** .

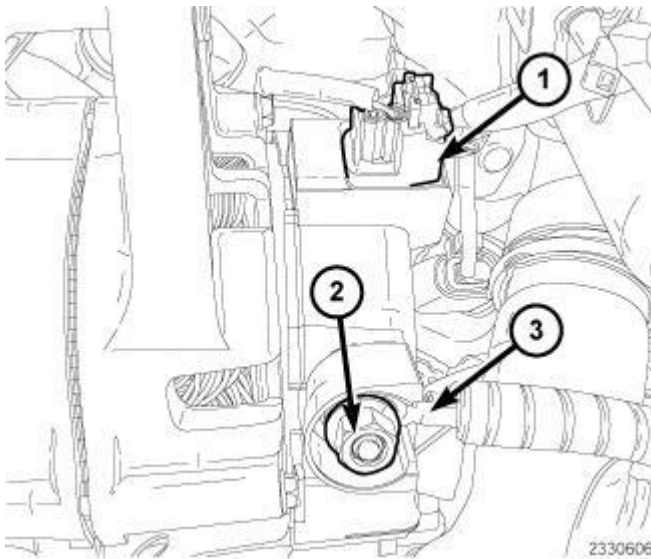


Fig. 434: Battery Feed Wire, Generator Harness Connectors & Nut
 Courtesy of CHRYSLER GROUP, LLC

10. Remove nut (2) and the battery feed wire (3) to generator.
11. Disconnect the generator harness connectors (1).
12. Remove bolts and the generator.

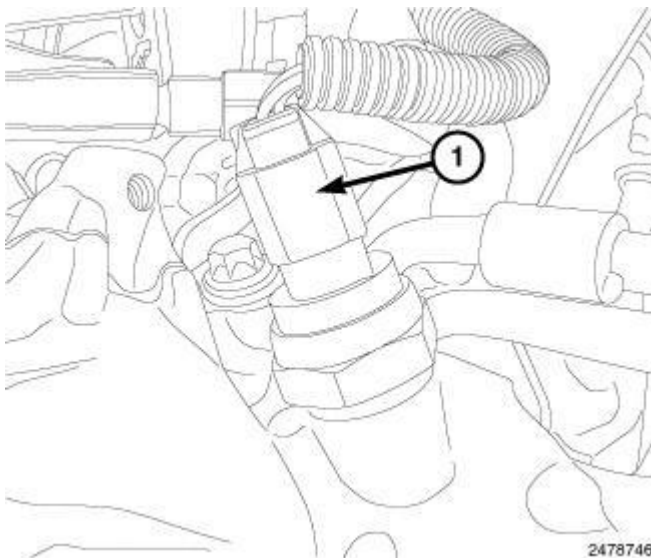


Fig. 435: EGR Back Pressure Transducer Harness Connector
 Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the EGR back pressure transducer harness connector (1).

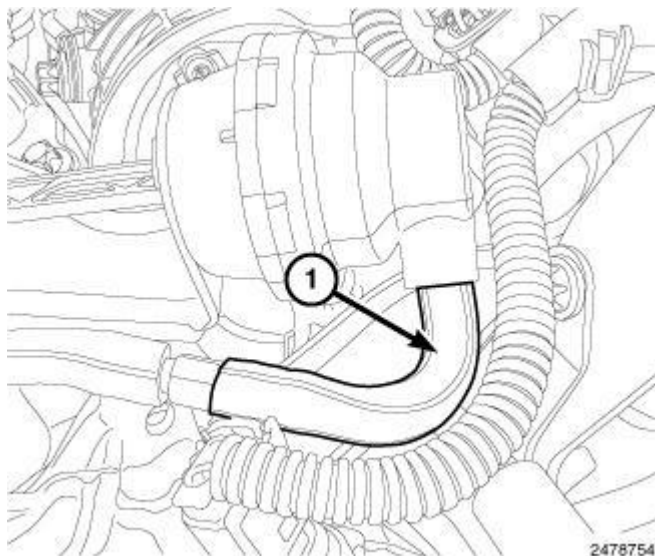


Fig. 436: EGR Control Valve Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

14. Disconnect the vacuum line (1) from the EGR control valve actuator.

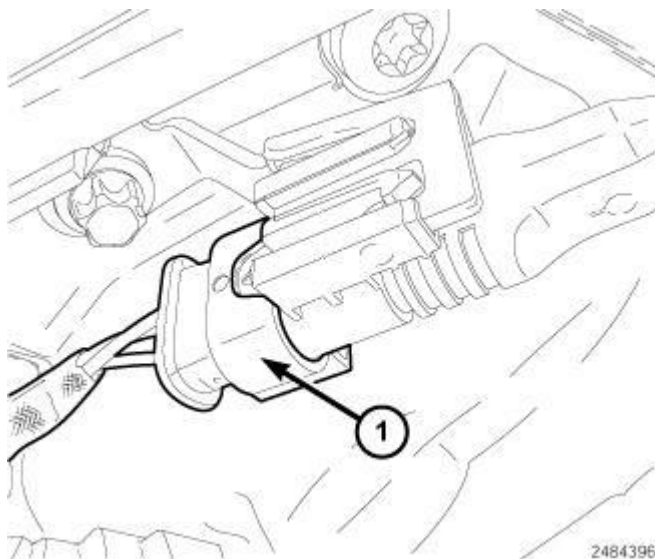


Fig. 437: Knock Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

15. Disconnect the knock sensor (1) harness connector.

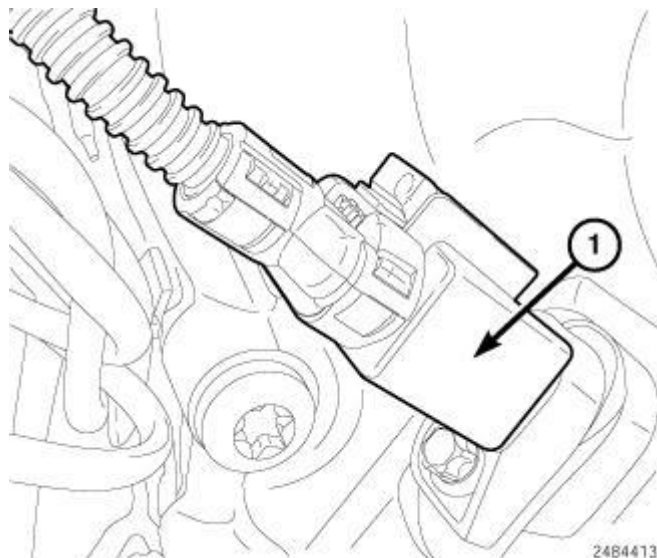


Fig. 438: Crankshaft Position Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

16. Disconnect the Crankshaft Position Sensor (CKP) (1) harness connector.

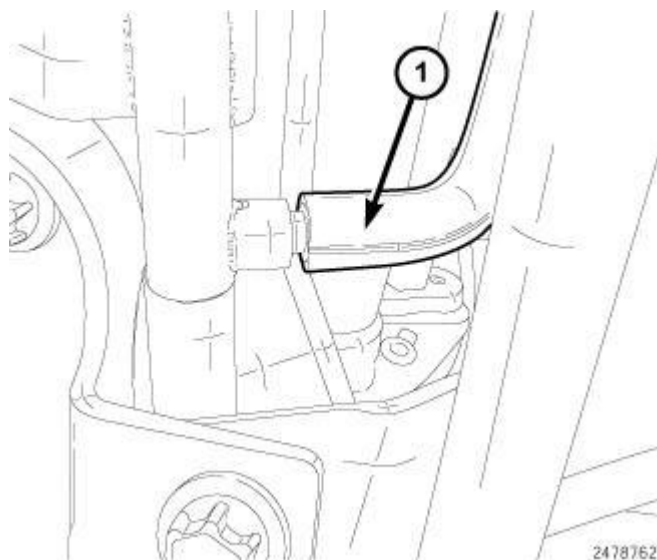
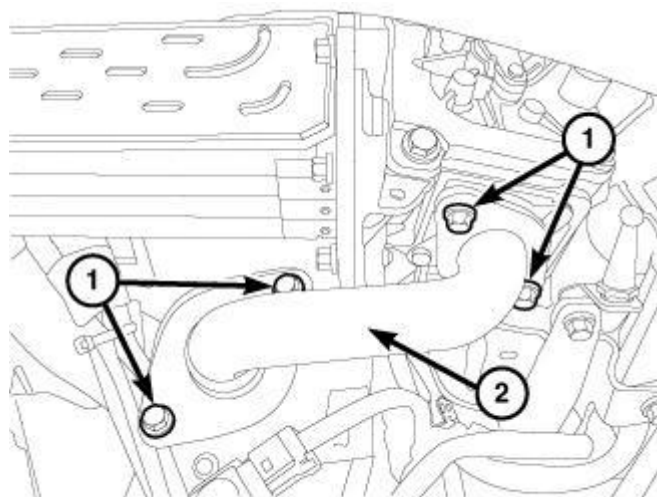


Fig. 439: Vacuum Supply Line At EGR Solenoid
Courtesy of CHRYSLER GROUP, LLC

17. Disconnect the vacuum supply line (1) to the EGR solenoid.

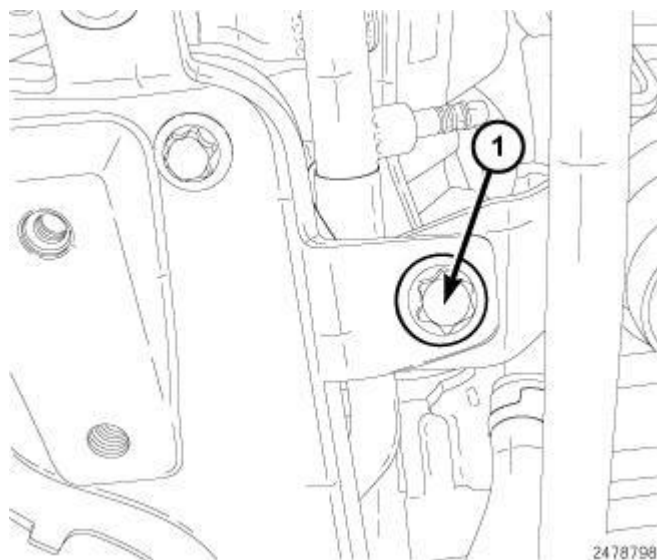


2545676

Fig. 440: EGR Tube & Bolts

Courtesy of CHRYSLER GROUP, LLC

18. Remove bolts (1) and the EGR tube (2).

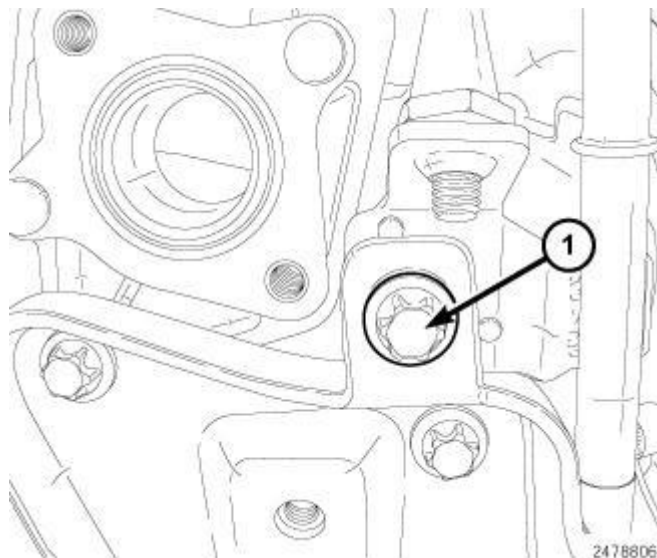


2478798

Fig. 441: Oil Dip Stick Bolt

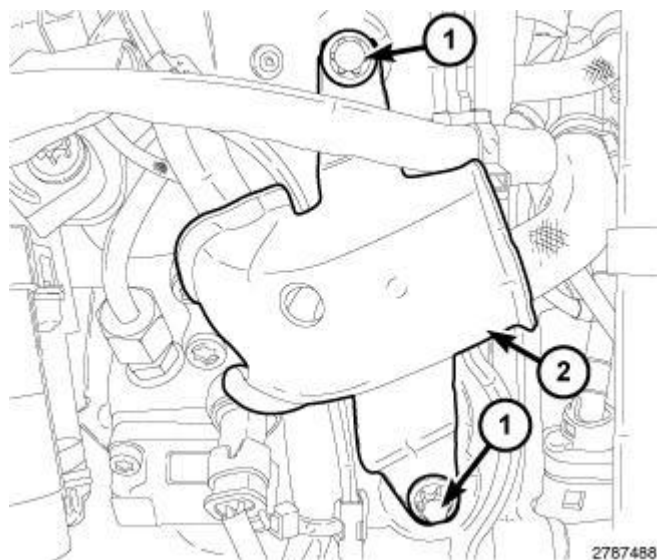
Courtesy of CHRYSLER GROUP, LLC

19. Remove the bolt (1) securing the oil dip stick tube.

**Fig. 442: Vacuum Tube Bolt**

Courtesy of CHRYSLER GROUP, LLC

20. Remove the bolt (1) securing the vacuum tube.

**Fig. 443: Bolts & Heat Shield**

Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (1) and the heat shield (2).

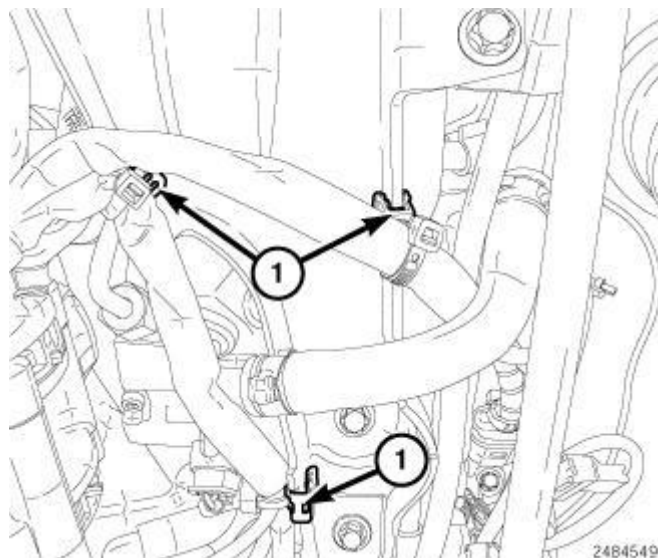


Fig. 444: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

22. Disconnect the wire harness retainers (1).

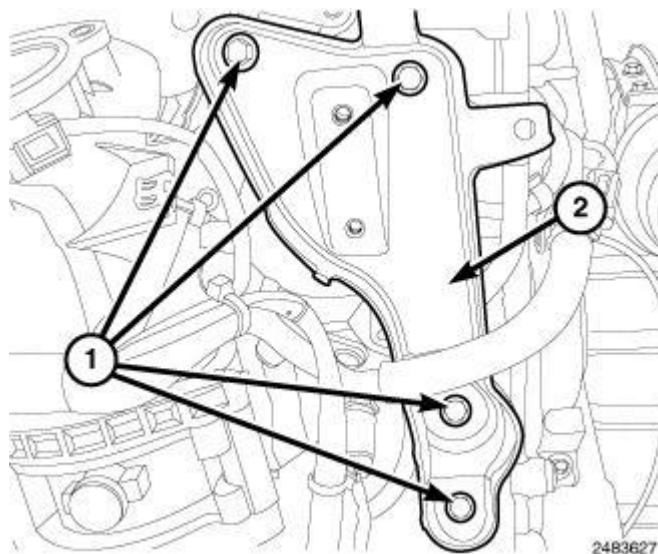


Fig. 445: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

23. Remove bolts (1) and the EGR support bracket (2).

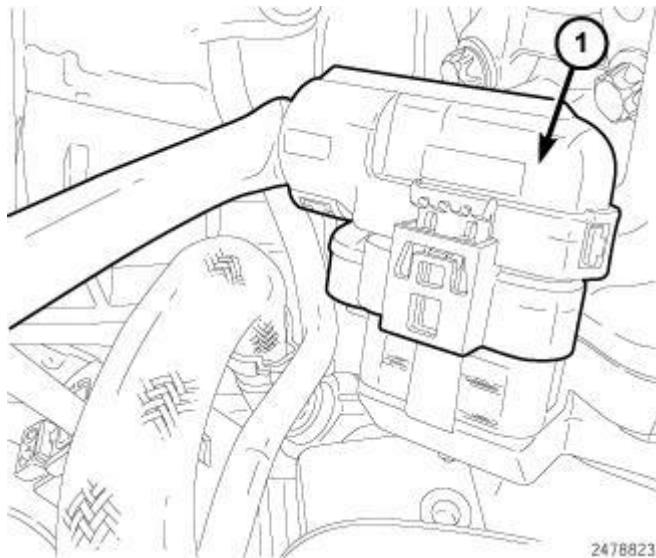


Fig. 446: EGR Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

24. Disconnect the EGR valve (1) harness connector.

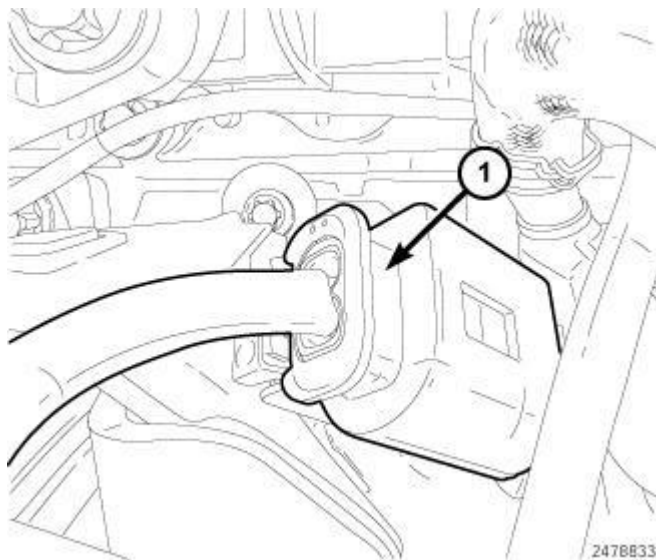


Fig. 447: Fuel Quality Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

25. Disconnect the fuel quality sensor (1) harness connector.

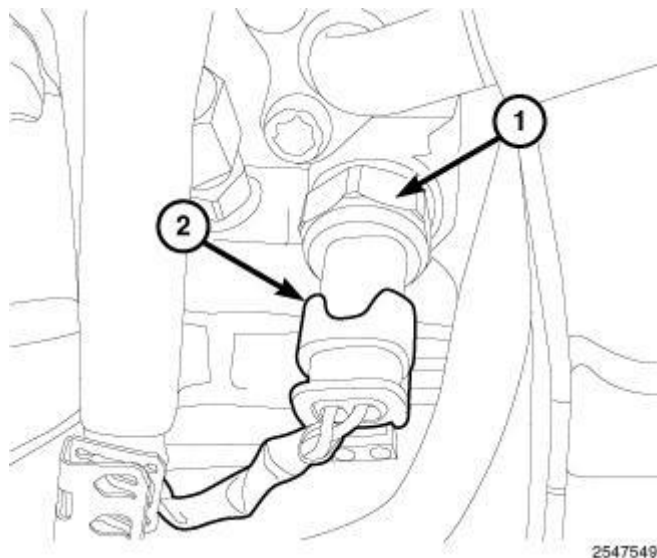


Fig. 448: Fuel Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

26. Disconnect the fuel temperature sensor harness connector (2).

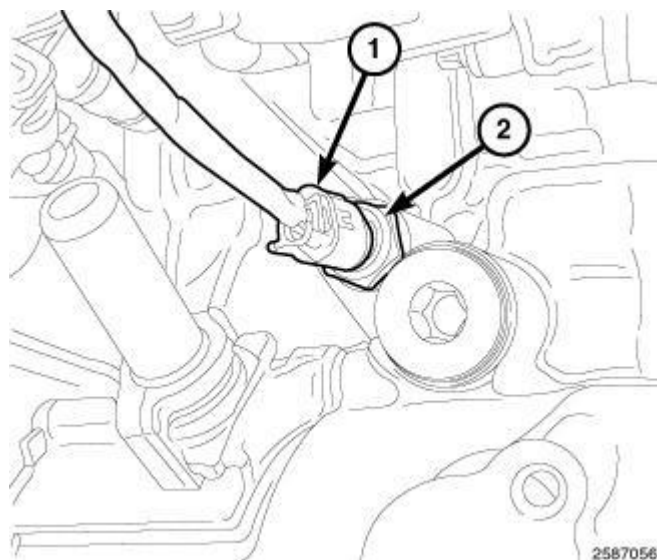


Fig. 449: Oil Temperature Sensor Harness Connector & Sensor
Courtesy of CHRYSLER GROUP, LLC

27. Disconnect the oil temperature sensor harness connector.

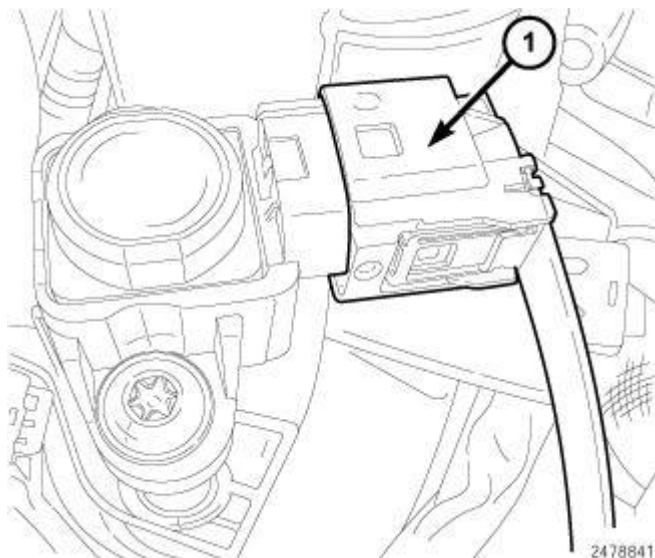


Fig. 450: Boost Pressure Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

28. Disconnect the boost pressure sensor harness connector (1).

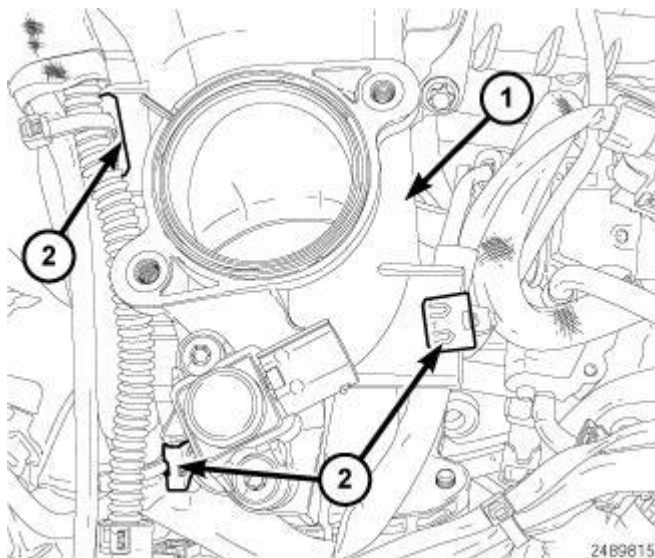


Fig. 451: Mixing Chamber & Wire Harness Retainer Clips
Courtesy of CHRYSLER GROUP, LLC

29. Disconnect the wire harness retainer clips (2) from the mixing chamber (1).

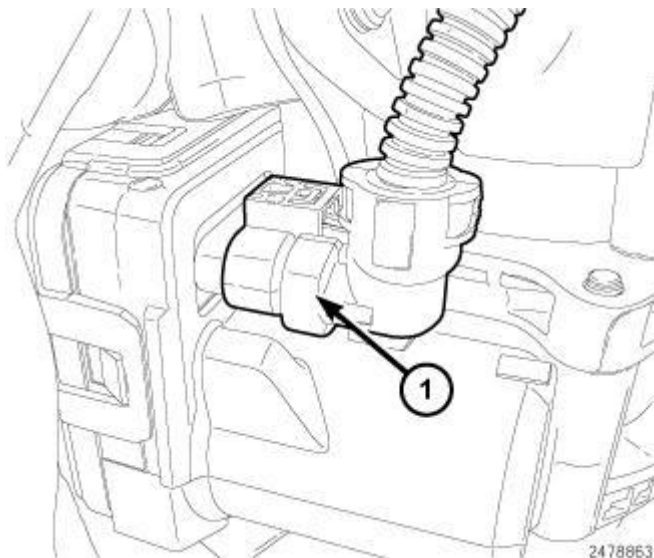


Fig. 452: EGR Air Flow Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

30. Disconnect the EGR air flow control valve (1) harness connector.

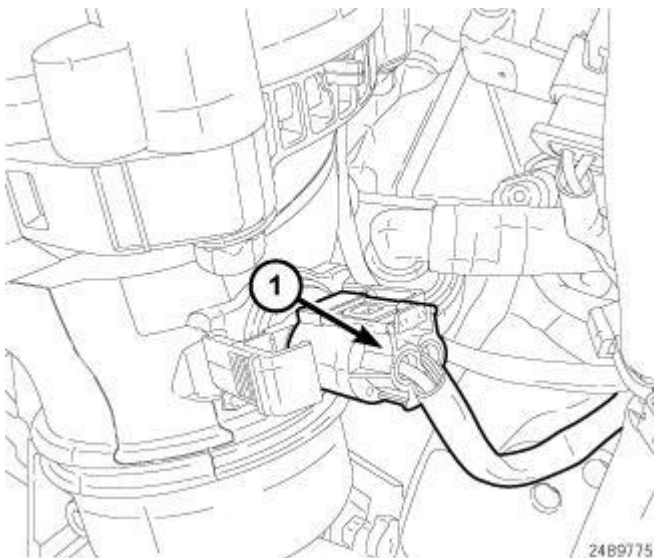


Fig. 453: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

31. Disconnect the charge air inlet temperature sensor (1).

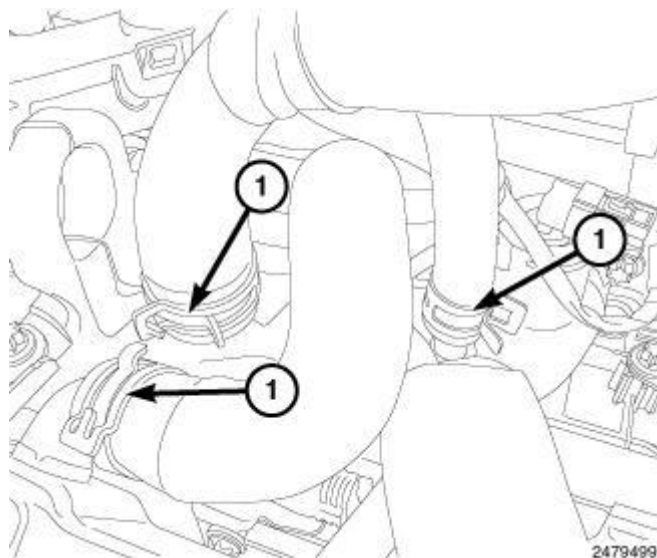


Fig. 454: Coolant Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

32. Disconnect the coolant hoses (1).

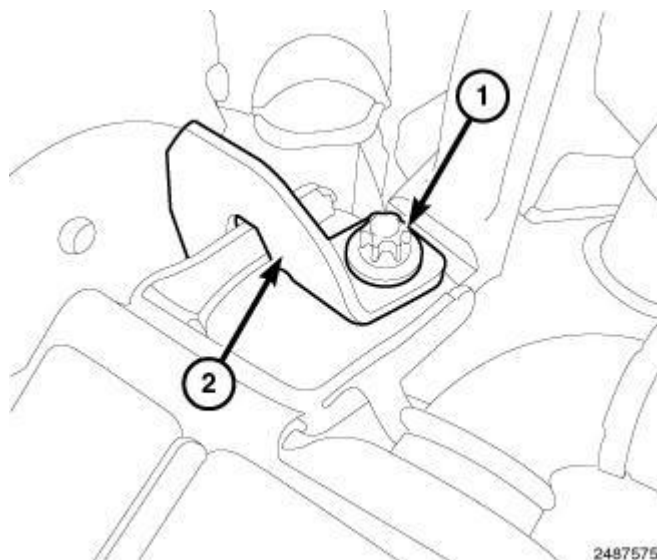


Fig. 455: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

33. Remove the upper EGR cooler bolt (1) and bracket (2).

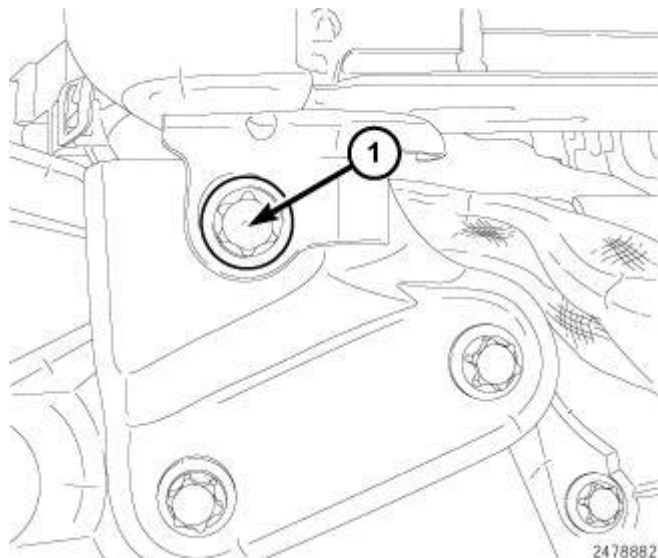


Fig. 456: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

34. Remove the lower EGR cooler bolt (1).

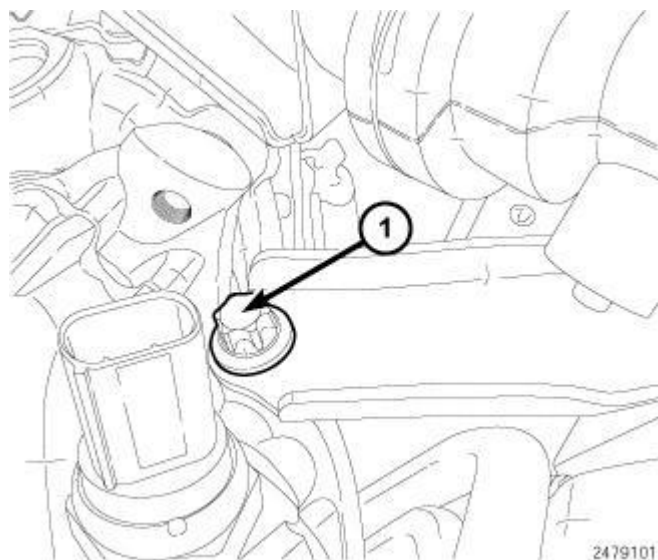


Fig. 457: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

35. Remove the support bracket bolt (1).

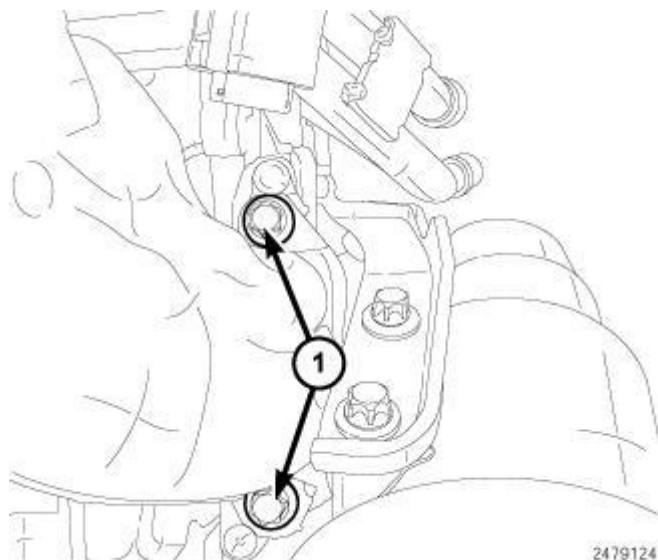


Fig. 458: EGR Cooler Manifold Bolts
 Courtesy of CHRYSLER GROUP, LLC

36. Remove two bolts (1) and the EGR cooler manifold.

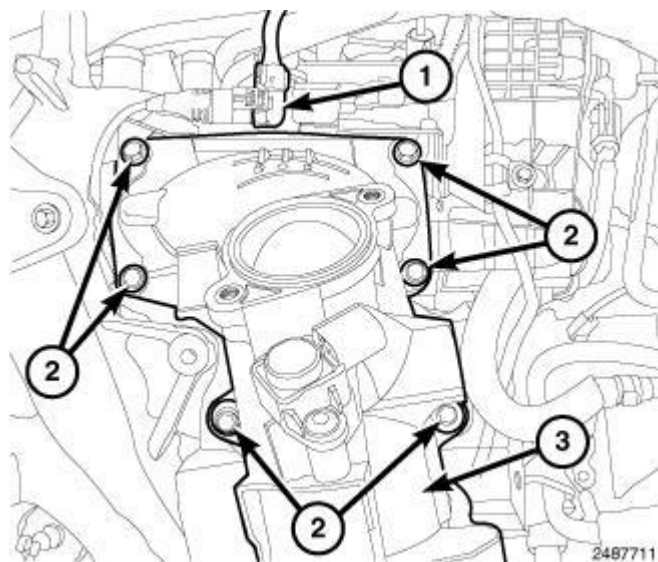


Fig. 459: Knock Sensor Electrical Connector, Mixing Chamber & Bolts
 Courtesy of CHRYSLER GROUP, LLC

37. Disconnect the knock sensor harness connector (1).
38. Remove bolts (2) and the mixing chamber (3).

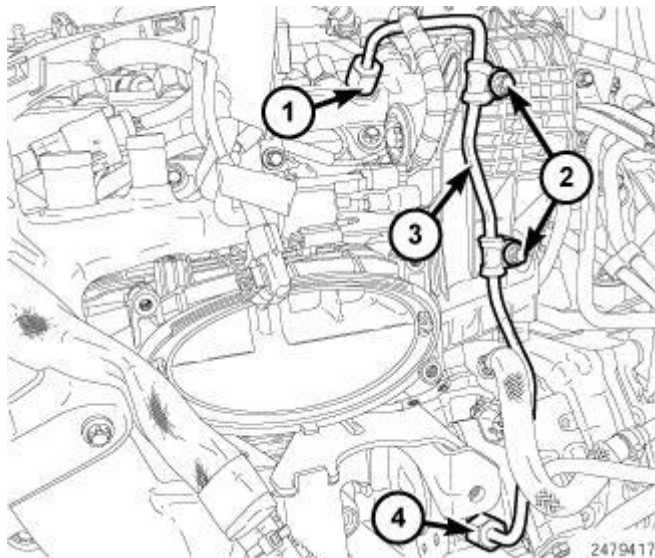


Fig. 460: Fuel Rail, Bolts, High Pressure Fuel Tube & Pump
Courtesy of CHRYSLER GROUP, LLC

39. Remove the two bolts (2) securing the high pressure fuel line (3).
40. Disconnect the high pressure fuel line at pump (4).
41. Disconnect the high pressure line at fuel rail (1) and remove the high pressure fuel line (3).

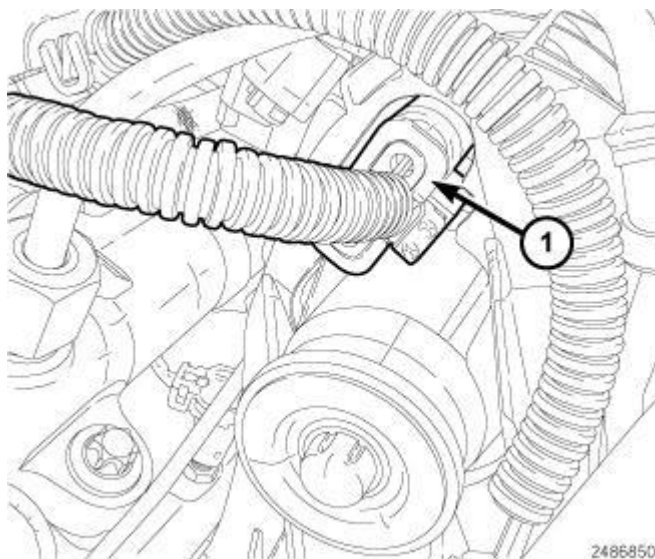


Fig. 461: Swirl Valve Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

42. Disconnect the swirl valve actuator harness connector (1).

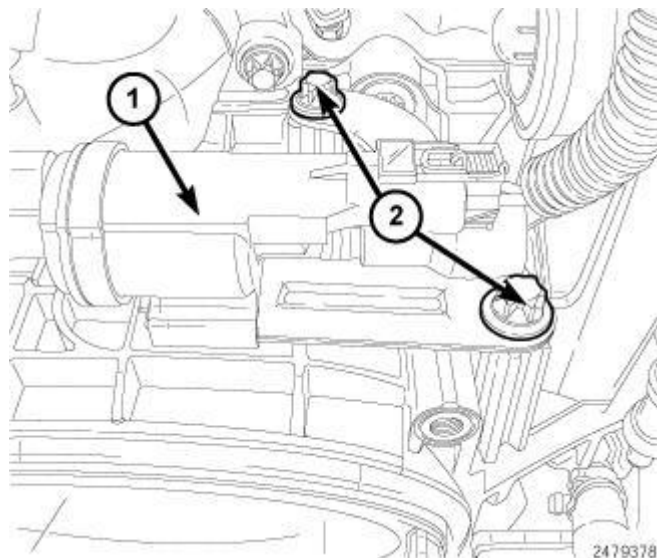


Fig. 462: EGR Vacuum Solenoid & Bolts
 Courtesy of CHRYSLER GROUP, LLC

43. Remove bolts (2) and the EGR vacuum solenoid (1).

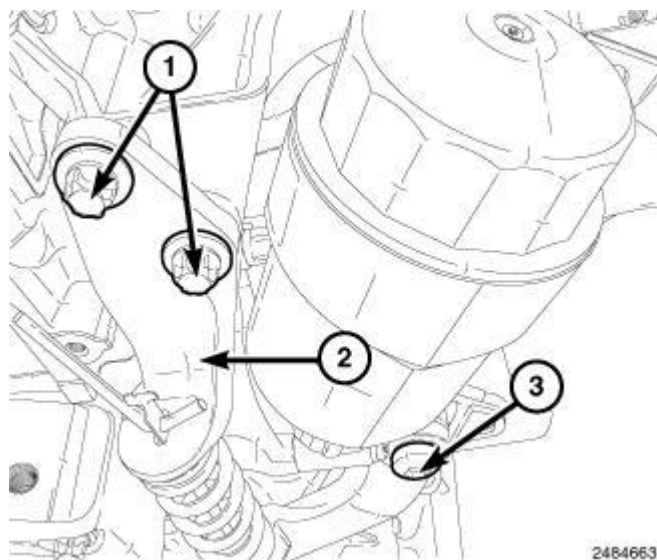


Fig. 463: Accessory Drive Belt Tensioner & Bolts
 Courtesy of CHRYSLER GROUP, LLC

44. Remove the bolts (1, 3) and accessory drive belt tensioner (2).

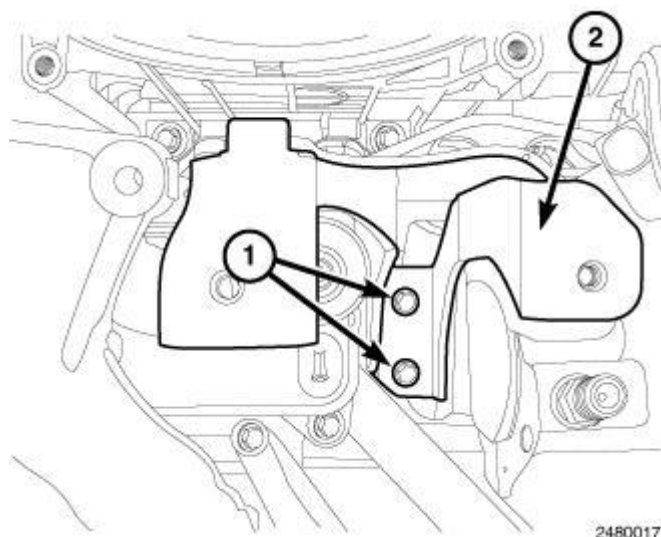


Fig. 464: Intake Manifold Support Bracket & Bolts
 Courtesy of CHRYSLER GROUP, LLC

45. Remove bolts (1) and the intake manifold support bracket (2).

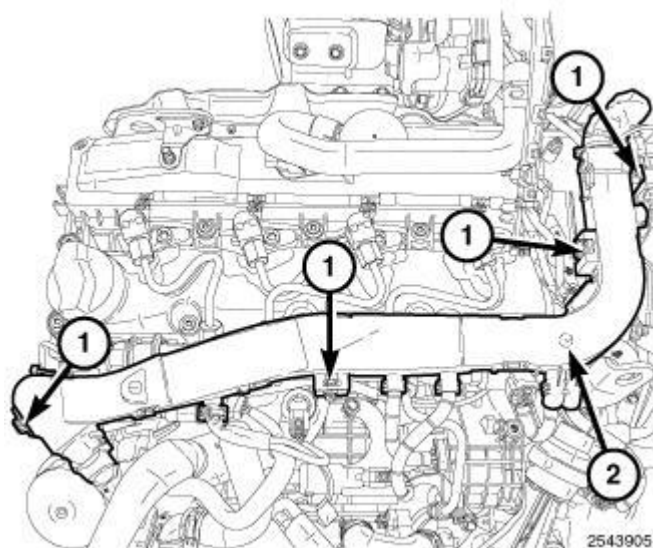


Fig. 465: Lock Tabs & Engine Wire Harness
 Courtesy of CHRYSLER GROUP, LLC

46. Disconnect the fuel rail pressure sensor.
47. Release the lock tabs (1) and lift up on the wire harness (2) and position aside.

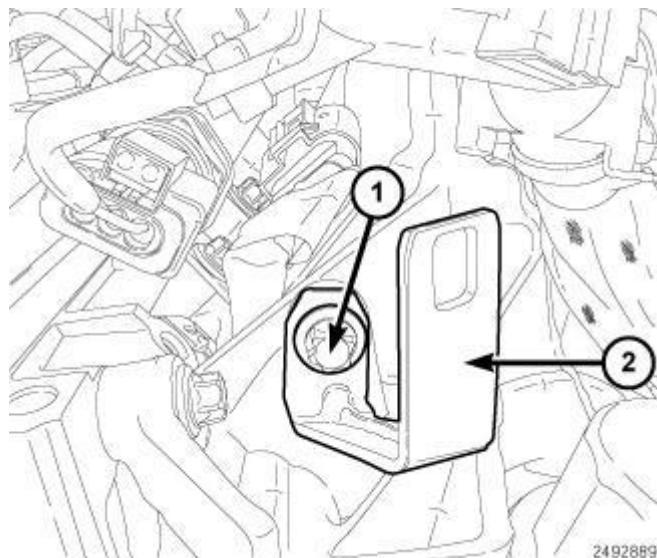


Fig. 466: Wire Harness Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

48. Remove bolt (1) and wire harness support bracket (2).

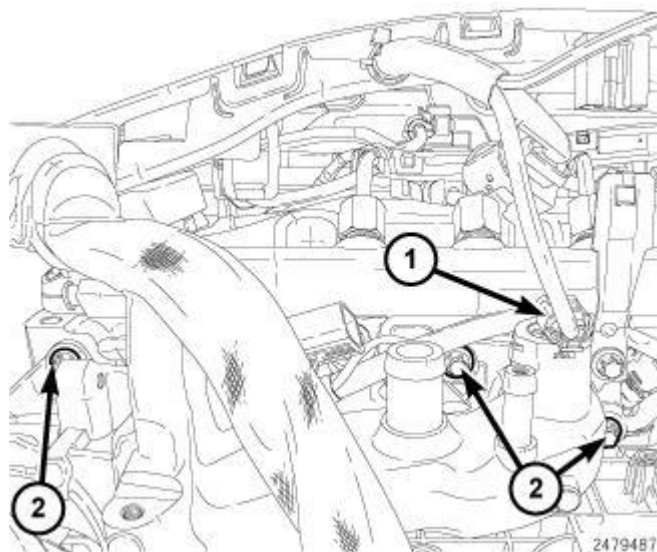


Fig. 467: Coolant Temp Sensor & Cooling Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

49. Disconnect the coolant temp sensor (1) harness connector.
50. Remove the three accessory carrier bracket bolts (2).

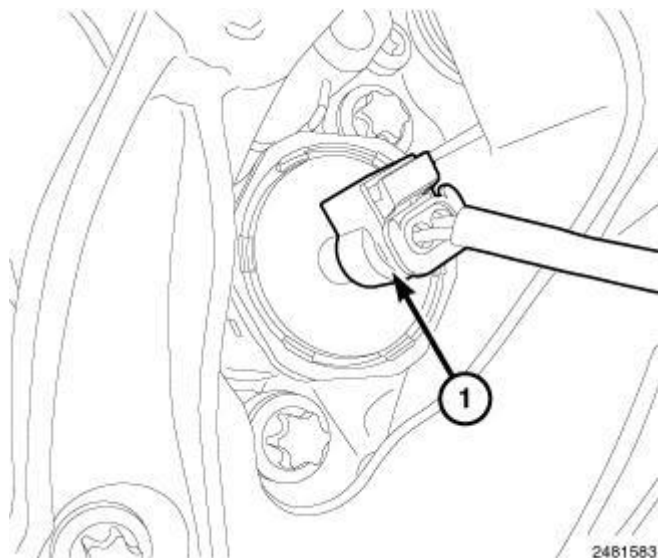


Fig. 468: Piston Cooling Oil Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

51. Disconnect the oil jet control valve (1) harness connector.

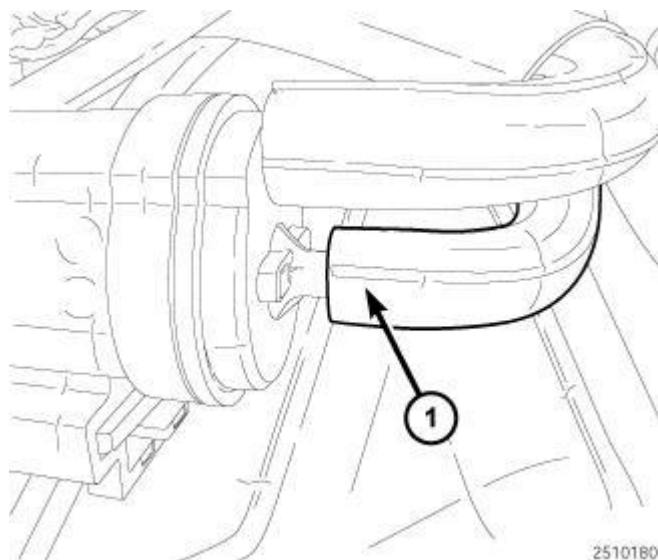


Fig. 469: Coolant Pump Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

52. Disconnect the coolant pump actuator vacuum line (1).

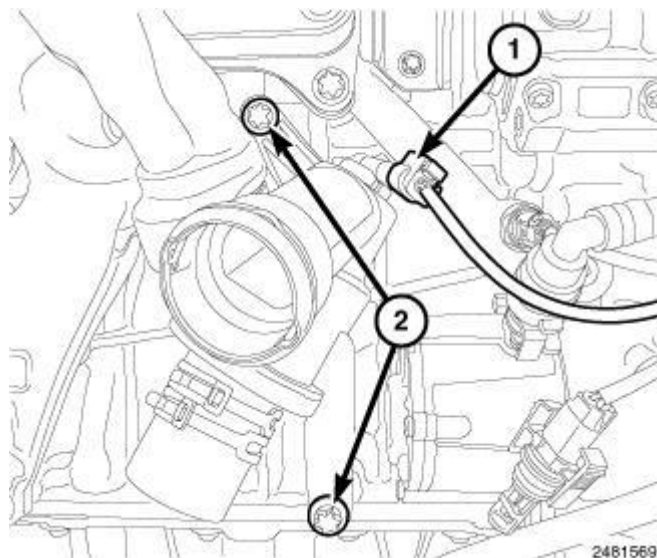


Fig. 470: ECT Sensor Connector & Thermostat Housing Bolts
Courtesy of CHRYSLER GROUP, LLC

53. Disconnect the coolant temperature sensor (1) harness connector.
54. Remove the two bolt (2) from thermostat housing.

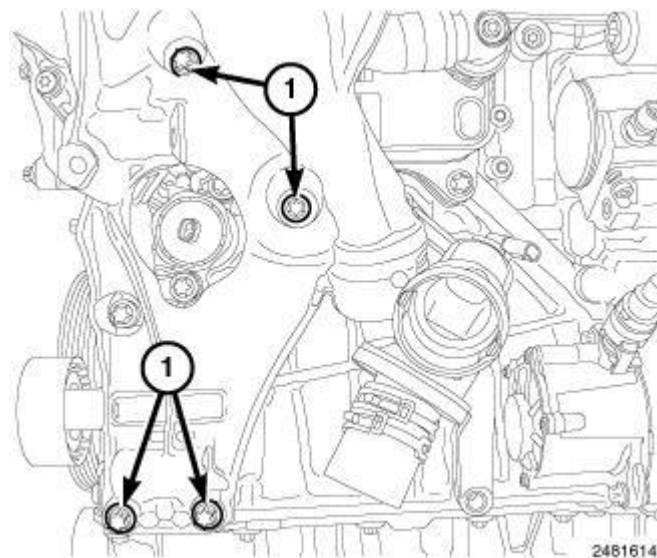


Fig. 471: Accessory Carrier Bolts
Courtesy of CHRYSLER GROUP, LLC

55. Remove oil filter cap.
56. Remove the bolts (1) from the accessory carrier.

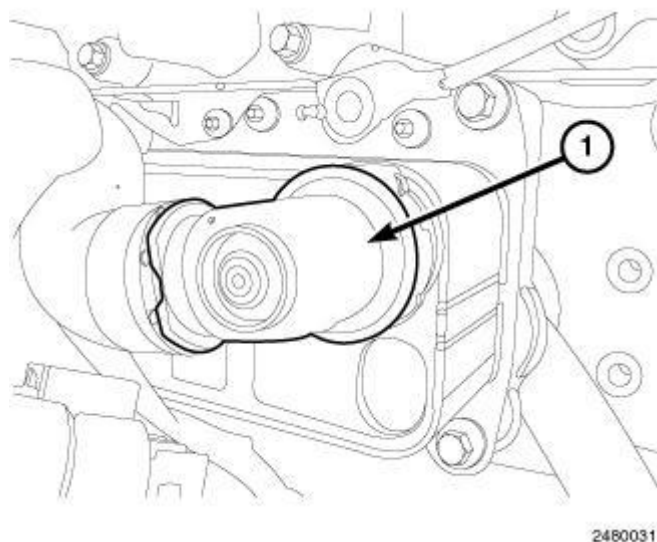


Fig. 472: Coolant Hose To Oil Cooler
 Courtesy of CHRYSLER GROUP, LLC

57. Disconnect coolant hose (1) to the oil cooler and remove the accessory carrier.

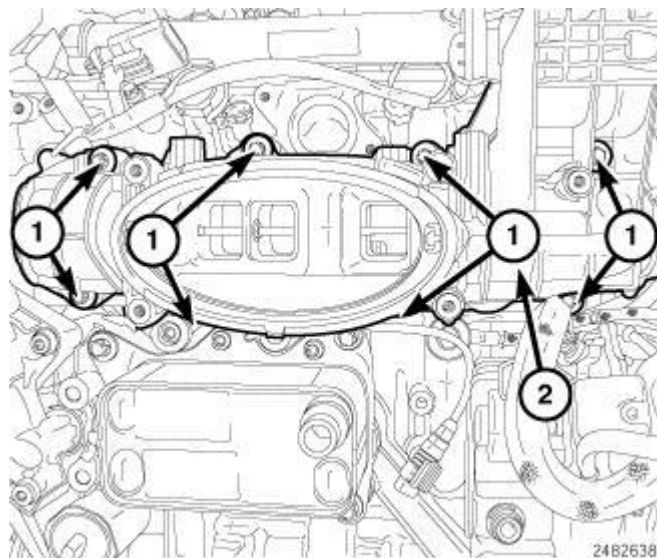


Fig. 473: Intake Manifold & Bolts
 Courtesy of CHRYSLER GROUP, LLC

58. Remove the bolts (1) and the intake manifold (2).
59. Inspect intake manifold for cracks or distortion. Replace manifold if necessary.
60. Inspect manifold for gasket surface damage or warpage. Replace manifold if necessary.

INSTALLATION

MIXING CHAMBER

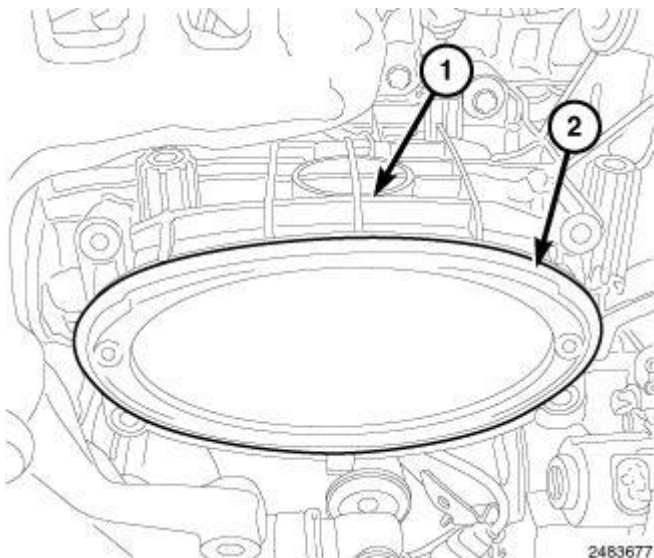


Fig. 474: Intake Manifold & O-Ring Seal
 Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket mating surfaces
2. Install a new O-ring seal (2) onto the intake manifold (1).

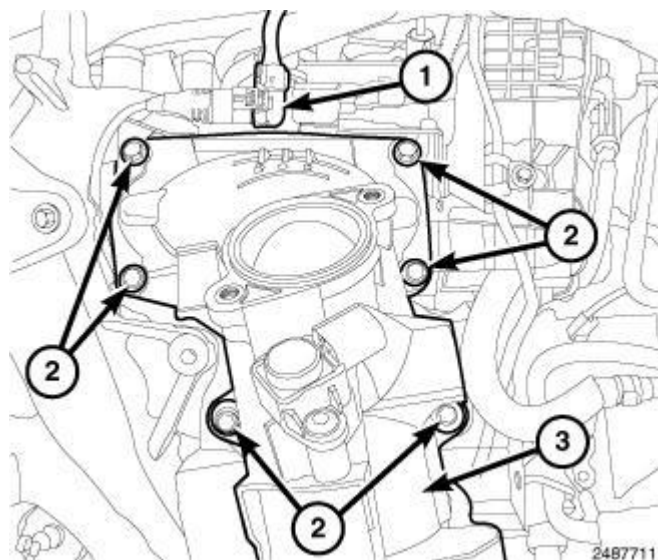


Fig. 475: Knock Sensor Electrical Connector, Mixing Chamber & Bolts
 Courtesy of CHRYSLER GROUP, LLC

3. Install the mixing chamber (3). Tighten bolts (2) to 9 N.m (80 in. lbs.).
4. Connect the knock sensor harness connector (1).

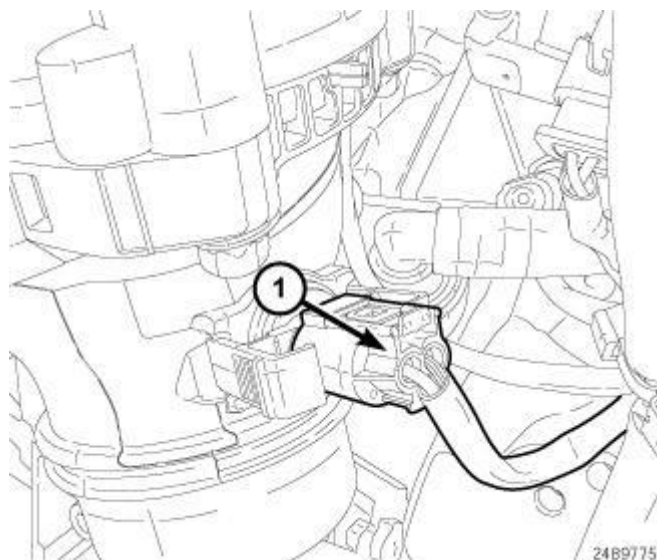


Fig. 476: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

5. Connect the Charge Air inlet temperature sensor harness connector.

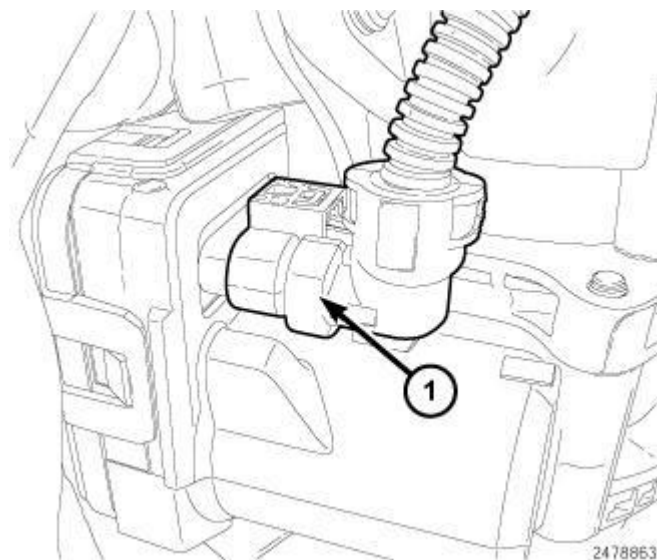


Fig. 477: EGR Air Flow Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

6. Connect the EGR air control valve harness connector.

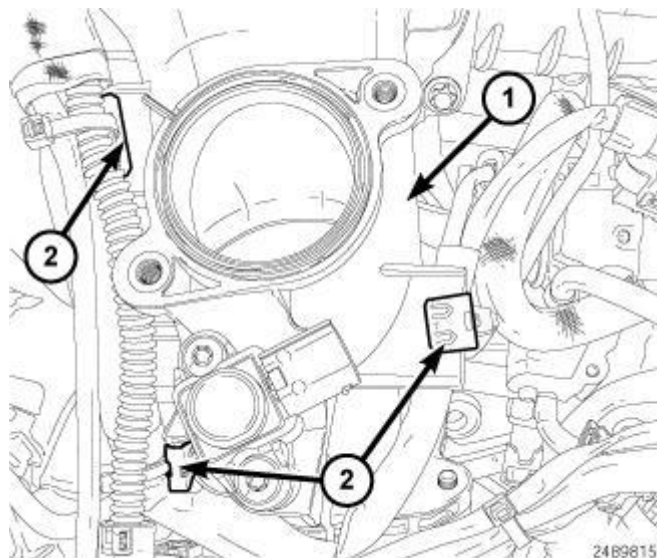


Fig. 478: Mixing Chamber & Wire Harness Retainer Clips
Courtesy of CHRYSLER GROUP, LLC

7. Connect the wire harness retainer clips (2) to the mixing chamber (1).

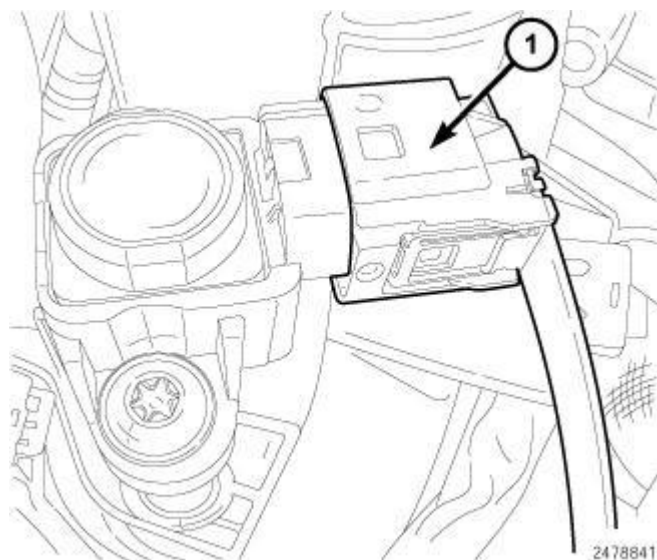


Fig. 479: Boost Pressure Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

8. Connect the boost pressure sensor (1) harness connector.

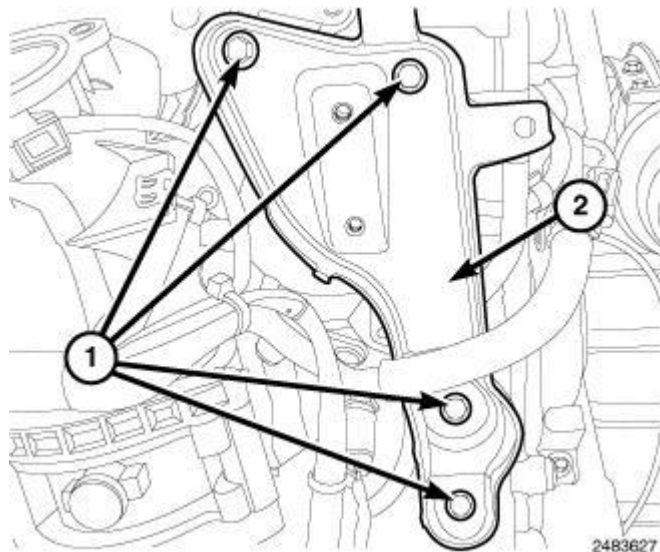


Fig. 480: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

9. Install the EGR support bracket (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

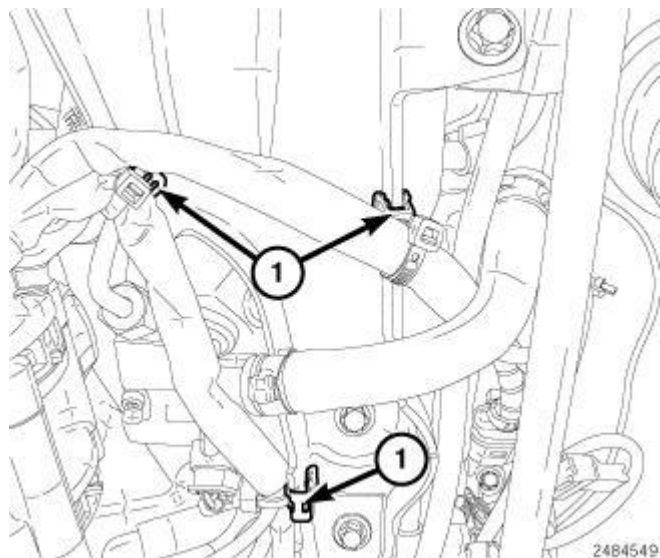
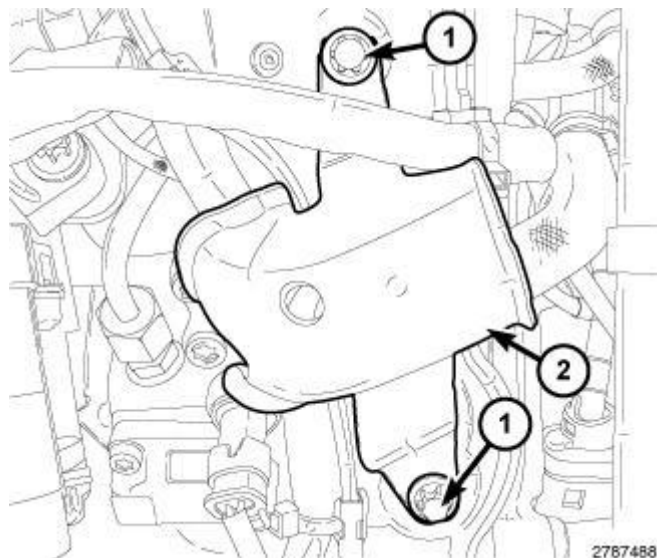


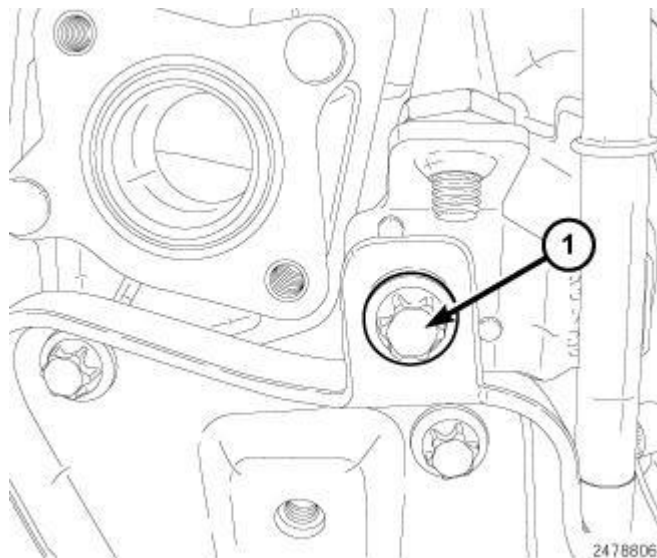
Fig. 481: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

10. Connect the wire harness retainers (1).

**Fig. 482: Bolts & Heat Shield**

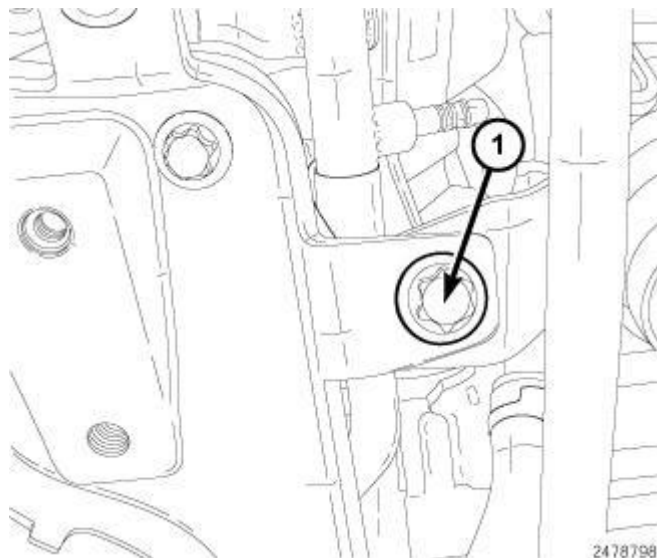
Courtesy of CHRYSLER GROUP, LLC

11. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

**Fig. 483: Vacuum Tube Bolt**

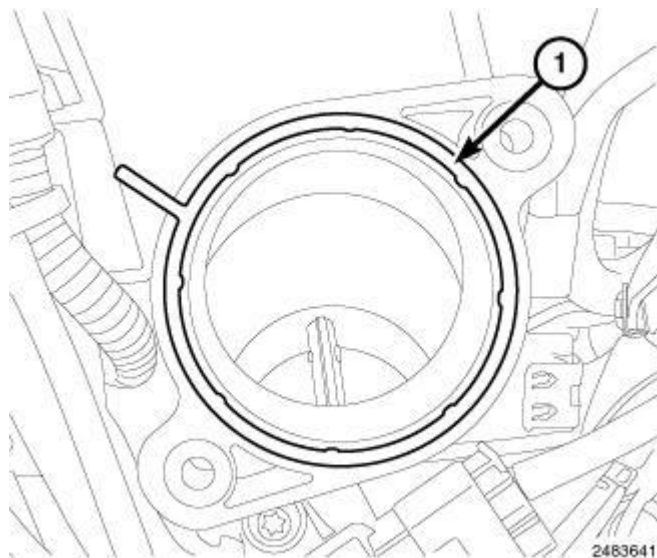
Courtesy of CHRYSLER GROUP, LLC

12. Install the bolt securing the vacuum tube (1). Tighten bolt to 9 N.m (80 in. lbs.).

**Fig. 484: Oil Dip Stick Bolt**

Courtesy of CHRYSLER GROUP, LLC

13. Install the bolt securing the oil dip stick tube. Tighten bolt to 9 N.m (80 in. lbs.).

**Fig. 485: EGR Tube Gasket Onto Mixing Chamber**

Courtesy of CHRYSLER GROUP, LLC

14. Clean the gasket surfaces and install a new gasket (1).

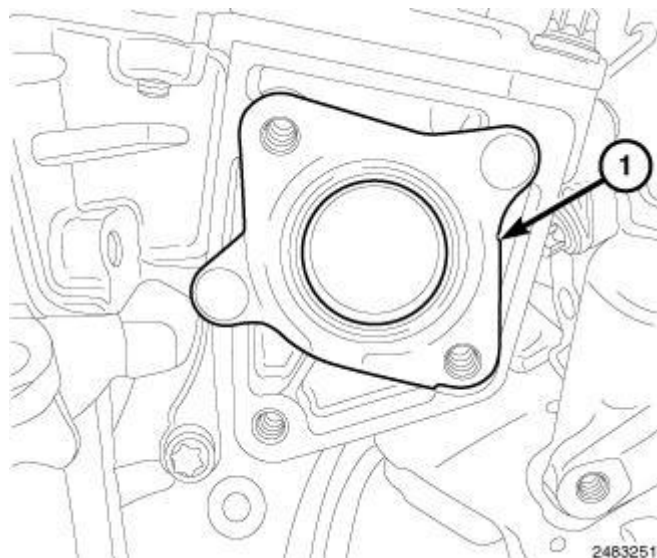


Fig. 486: EGR Tube Gasket Onto EGR Actuator
Courtesy of CHRYSLER GROUP, LLC

15. Clean the gasket surfaces and install a new gasket (1).

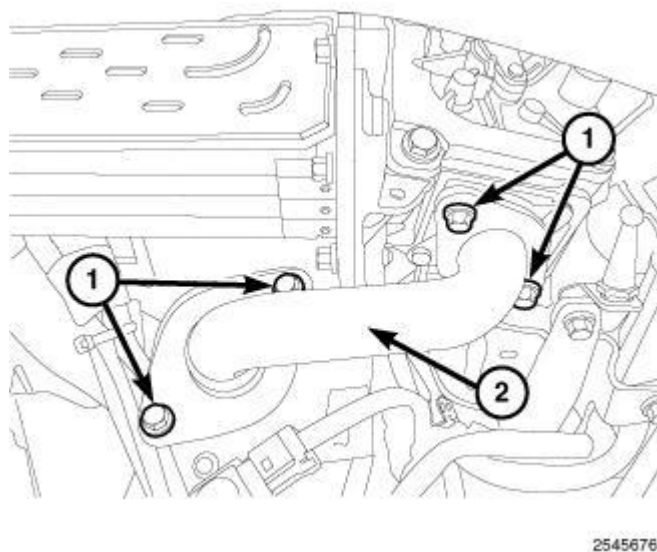
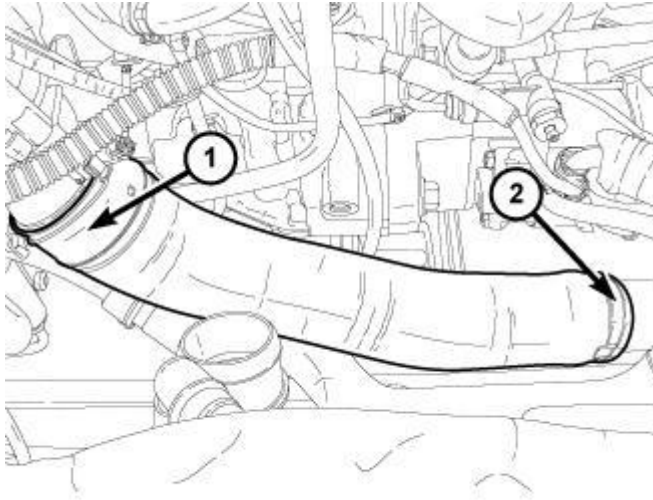


Fig. 487: EGR Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

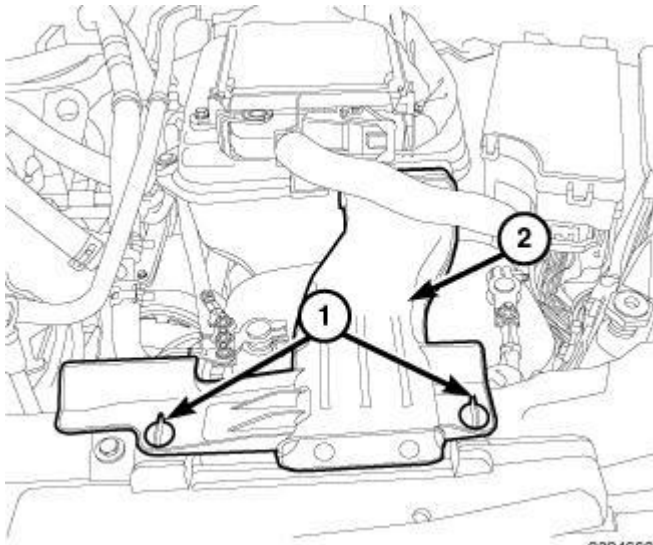
16. Install the EGR tube (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).



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Fig. 488: EGR Air Flow Control Valve & Clamp
Courtesy of CHRYSLER GROUP, LLC

17. Install the cooling fan module. Refer to **FAN, COOLING, INSTALLATION** .
18. Install air inlet tube to EGR air flow control valve (1).
19. Connect the charge air outlet tube from the Charge Air Cooler (CAC) and tighten clamp.

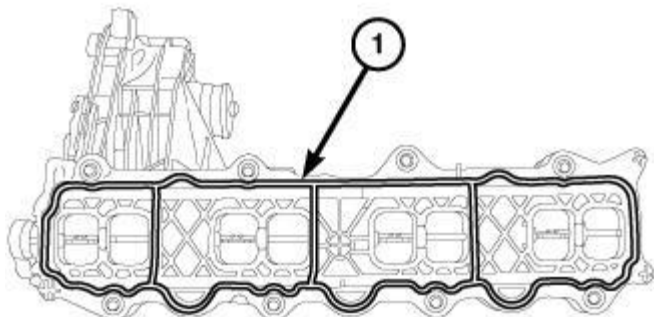


2324669

Fig. 489: Quarter Turn Lock Tabs & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

20. Install the EGR cooler. Refer to **COOLER, EGR, INSTALLATION** .
21. Install the belly pan.
22. Install the engine cover.
23. Connect the negative battery cable.
24. Install the air inlet duct (2) and lock the quarter turn lock tabs (1).

INTAKE MANIFOLD

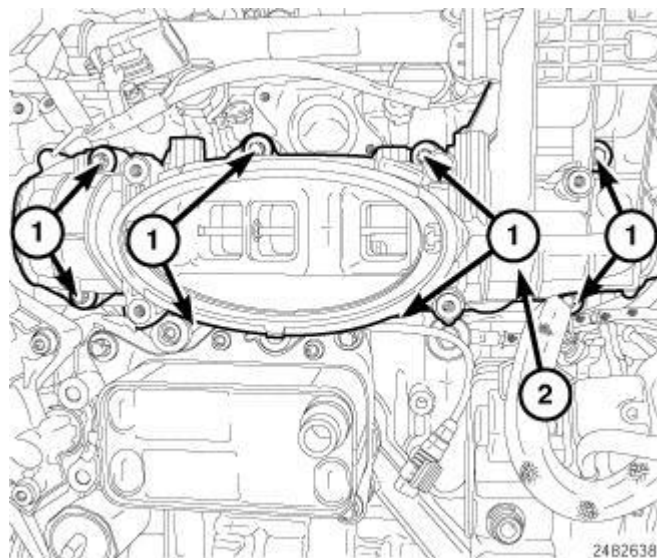


24B2041

Fig. 490: Intake Manifold Gasket

Courtesy of CHRYSLER GROUP, LLC

1. Clean gasket mating surfaces.
2. Install new intake manifold gasket (1) on intake manifold.

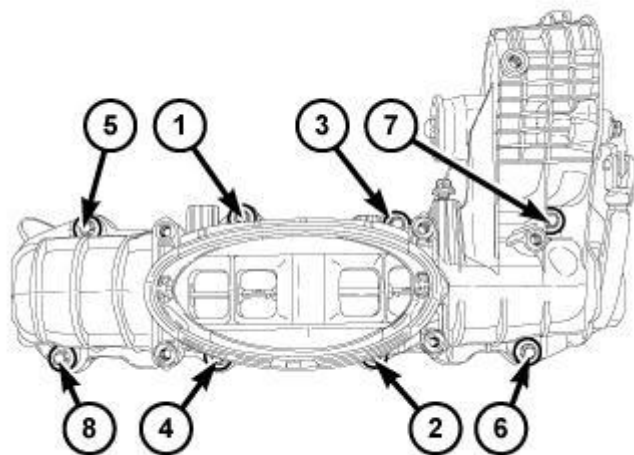


24B2638

Fig. 491: Intake Manifold & Bolts

Courtesy of CHRYSLER GROUP, LLC

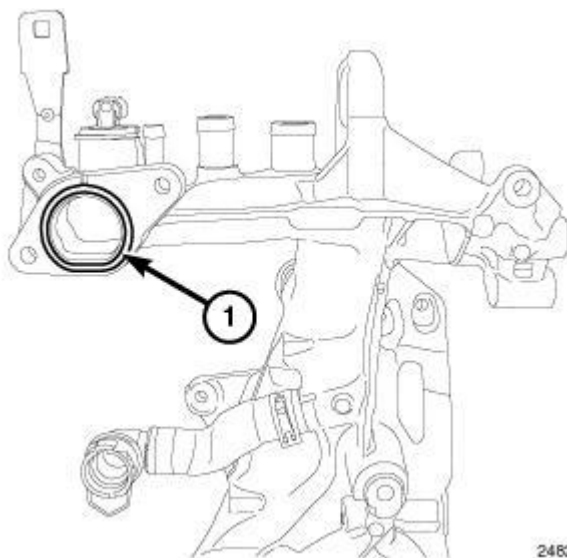
3. Install the intake manifold (2) and tighten bolts (1) finger tight.



2719751

Fig. 492: Intake Manifold Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

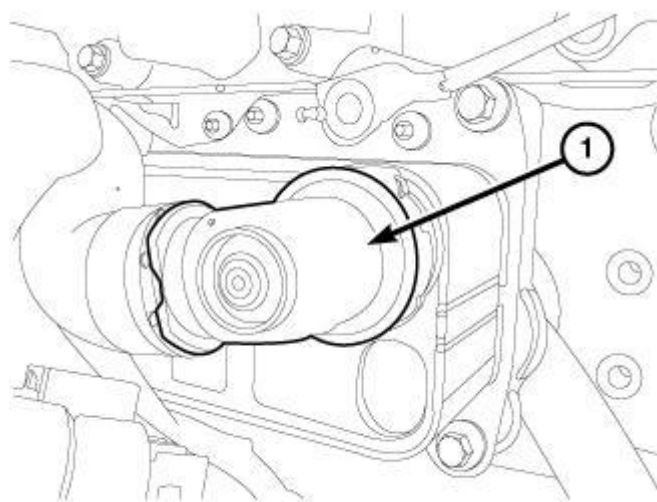
4. Using the sequence shown in illustration, tighten bolts to 14 N.m (124 in. lbs.).



2462558

Fig. 493: Accessory Carrier & O-Ring Gasket
Courtesy of CHRYSLER GROUP, LLC

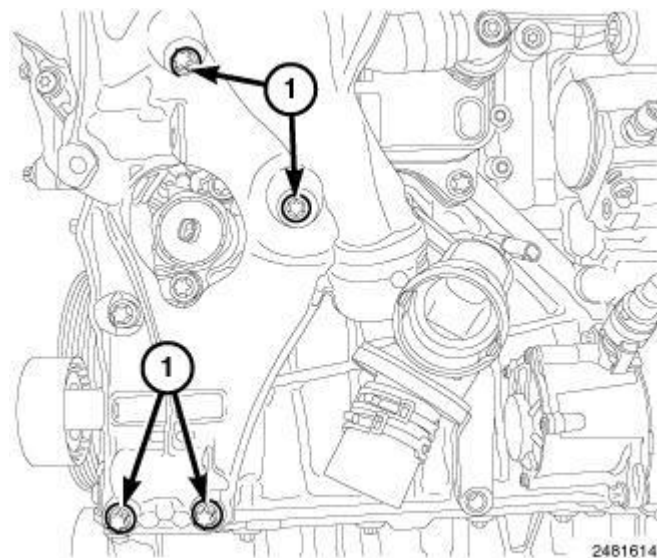
5. Clean the gasket surfaces and install a new gasket (1) and inspect the O-ring (2).
6. Position the accessory carrier to the engine and install bolts finger tight.



2480031

Fig. 494: Coolant Hose To Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

7. Connect the coolant hose (1) to the oil cooler.



2481614

Fig. 495: Accessory Carrier Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Tighten the lower accessory carrier bolts (1) to 20 N.m (177 in. lbs.).
9. Install the oil filter cap. Tighten cap to 25 N.m (18 ft. lbs.).

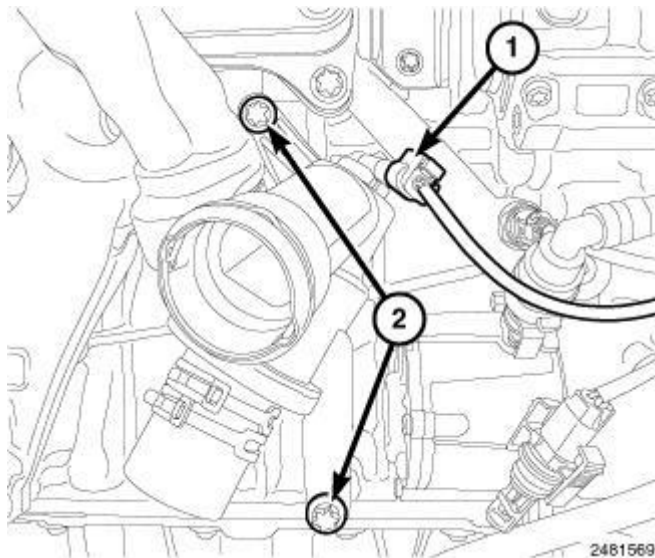


Fig. 496: ECT Sensor Connector & Thermostat Housing Bolts
 Courtesy of CHRYSLER GROUP, LLC

10. Install the two bolt securing the thermostat housing to engine block and tighten bolts to 9 N.m (80 in. lbs.).
11. Connect the coolant temperature sensor harness connector (1).

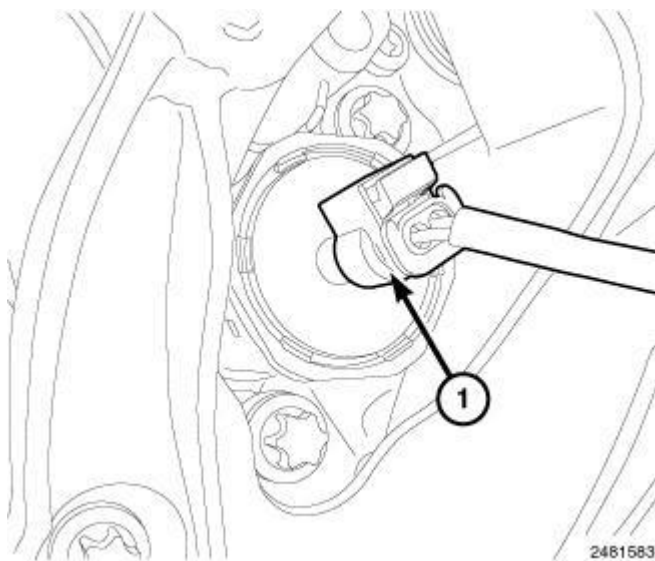


Fig. 497: Piston Cooling Oil Control Valve Harness Connector
 Courtesy of CHRYSLER GROUP, LLC

12. Connect the oil control valve harness connector.

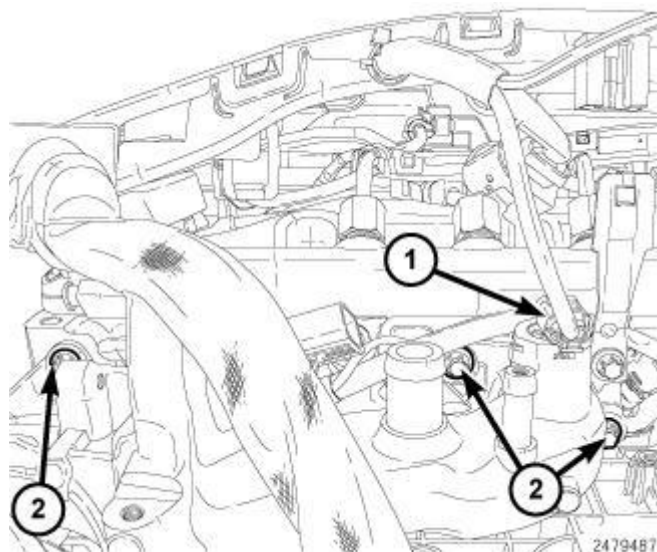


Fig. 498: Coolant Temp Sensor & Cooling Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Tighten the three upper accessory carrier bolts (2) to 9 N.m (80 in. lbs.).
14. Connect the coolant temp sensor (1) harness connector.

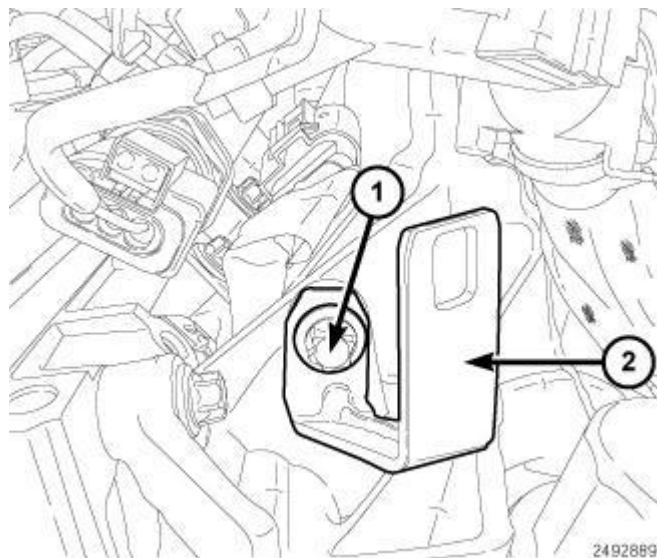


Fig. 499: Wire Harness Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Install the wire harness support bracket. Tighten bolt to 9 N.m (80 in. lbs.).

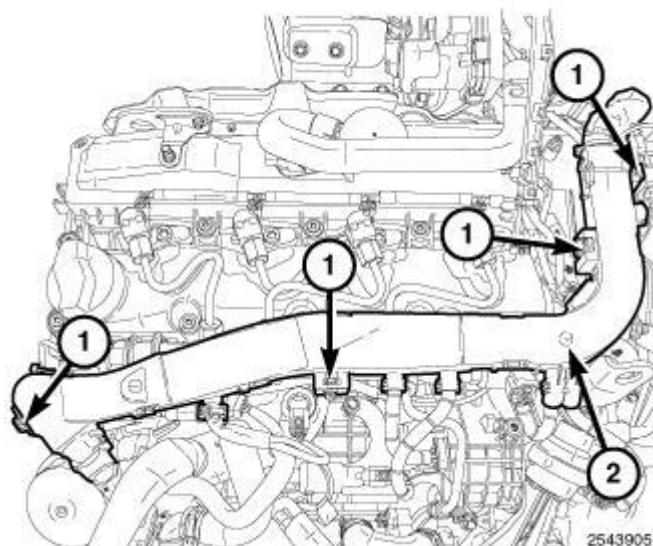


Fig. 500: Lock Tabs & Engine Wire Harness
Courtesy of CHRYSLER GROUP, LLC

16. Position the wire harness (2) and push down to lock tabs (1).

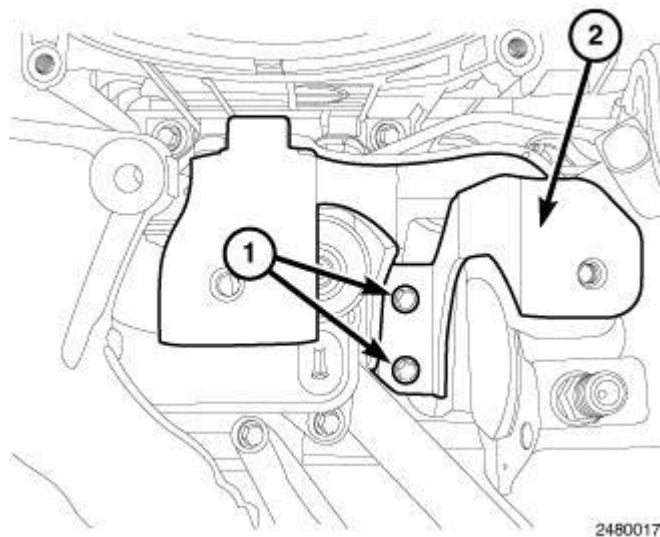


Fig. 501: Intake Manifold Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Install the mixing chamber support bracket (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

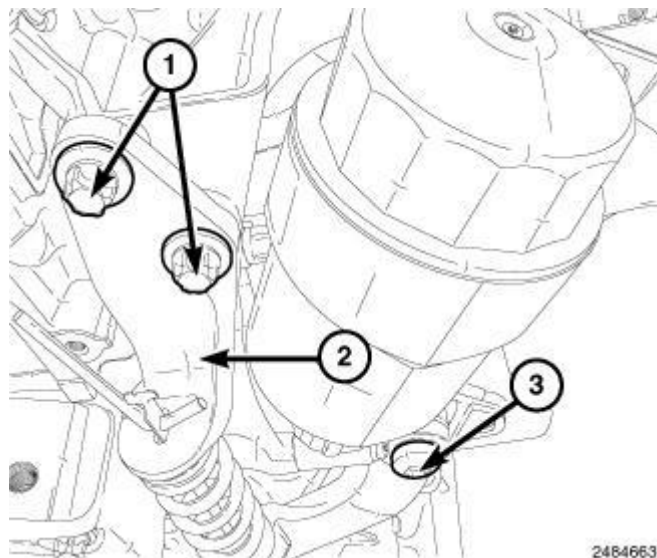


Fig. 502: Accessory Drive Belt Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Install the accessory drive belt tensioner.
 - Tighten bolts (1) to 20 N.m (177 in. lbs.).
 - Tighten bolt (3) to 45 N.m (33 ft. lbs.).

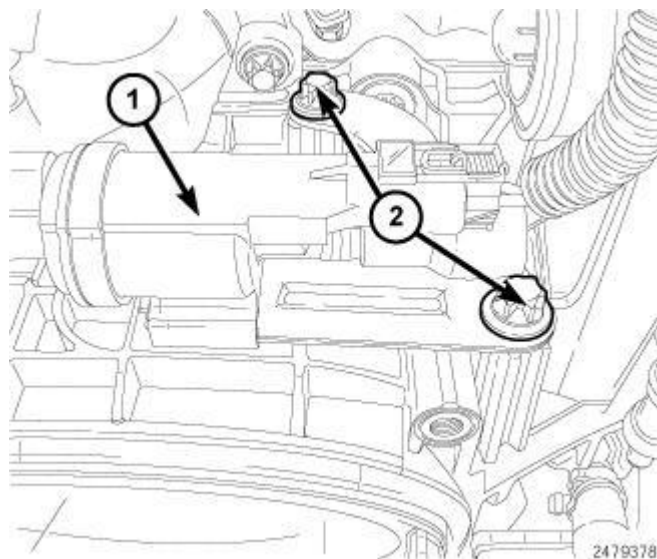


Fig. 503: EGR Vacuum Solenoid & Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Install the EGR vacuum solenoid (1). Tighten bolts (2) to 9 N.m (80 in. lbs.).

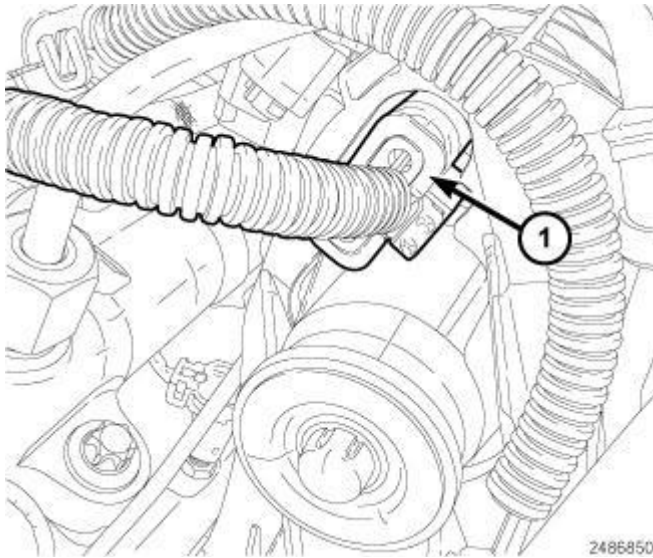


Fig. 504: Swirl Valve Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

20. Connect the swirl valve actuator harness connector (1).

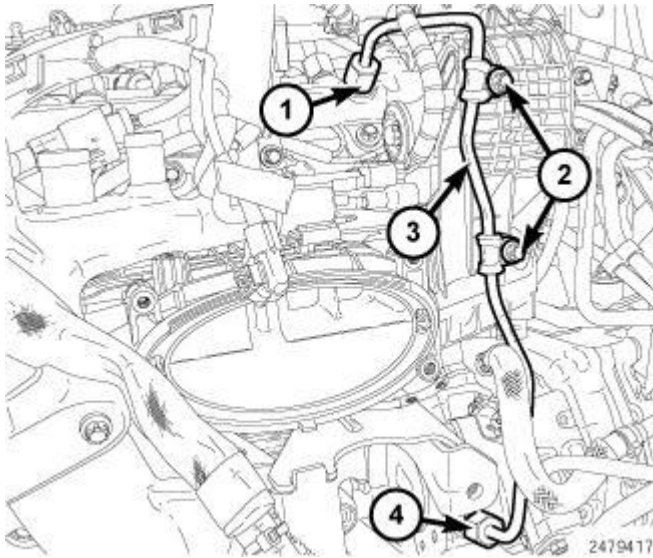


Fig. 505: Fuel Rail, Bolts, High Pressure Fuel Tube & Pump
Courtesy of CHRYSLER GROUP, LLC

21. Install the new high pressure fuel line (3) at fuel rail (1) and high pressure pump (4).
22. Tighten the high pressure fuel line (3) at fuel rail (1) and high pressure pump (4) to 7 N.m (62 in. lbs.).
23. Tighten the high pressure fuel line (3) at fuel rail (1) and high pressure pump (4) to 33 N.m (24 ft. lbs.).
24. Install the two bolts (2) securing the high pressure fuel line and tighten to 9 N.m (80 in. lbs.).

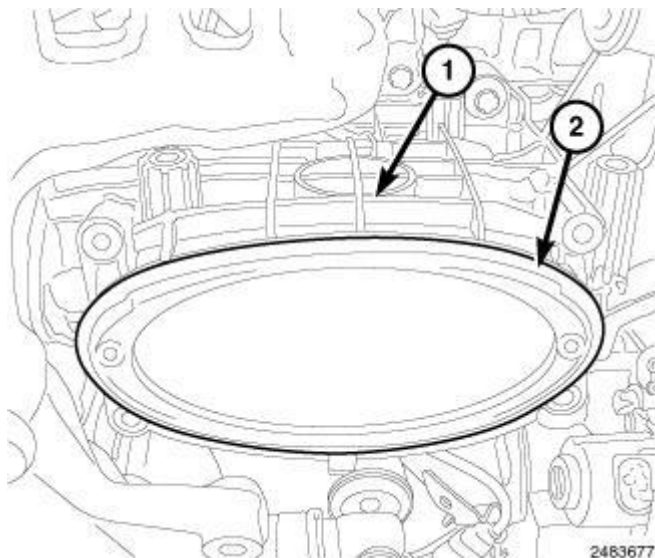


Fig. 506: Intake Manifold & O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

25. Install a new O-ring seal (2) onto the intake manifold (1).

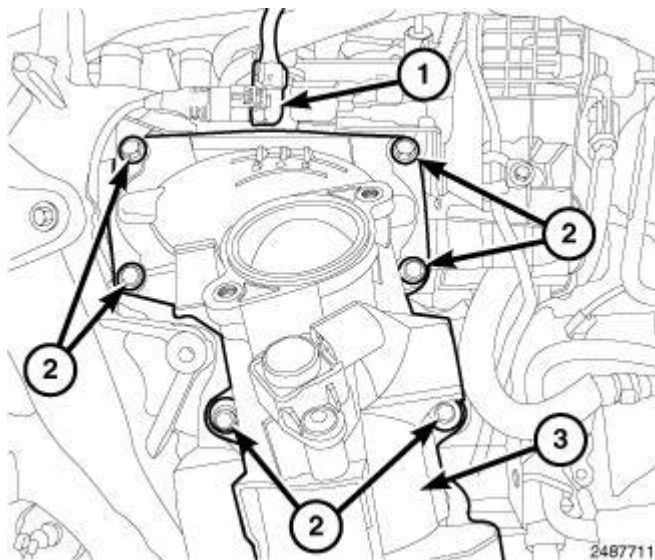


Fig. 507: Knock Sensor Electrical Connector, Mixing Chamber & Bolts
Courtesy of CHRYSLER GROUP, LLC

26. Install the mixing chamber (3). Tighten bolts (2) to 9 N.m (80 in. lbs.).
27. Connect the knock sensor harness connector (1).

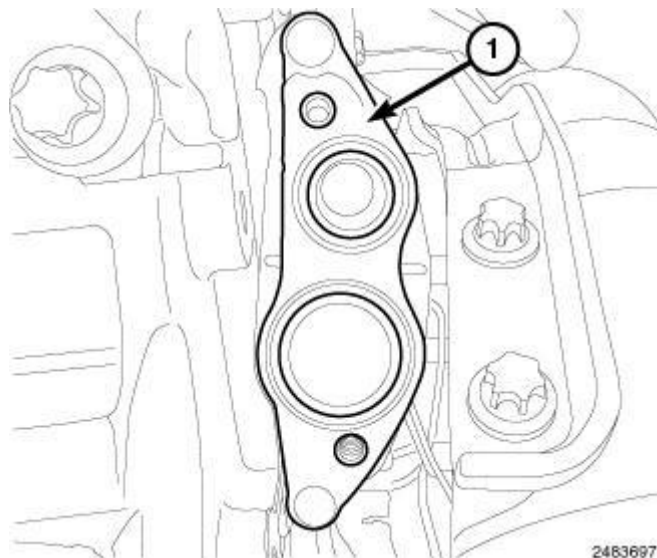


Fig. 508: EGR Manifold Gasket
Courtesy of CHRYSLER GROUP, LLC

28. Clean the gasket surfaces and install a new EGR manifold gasket.

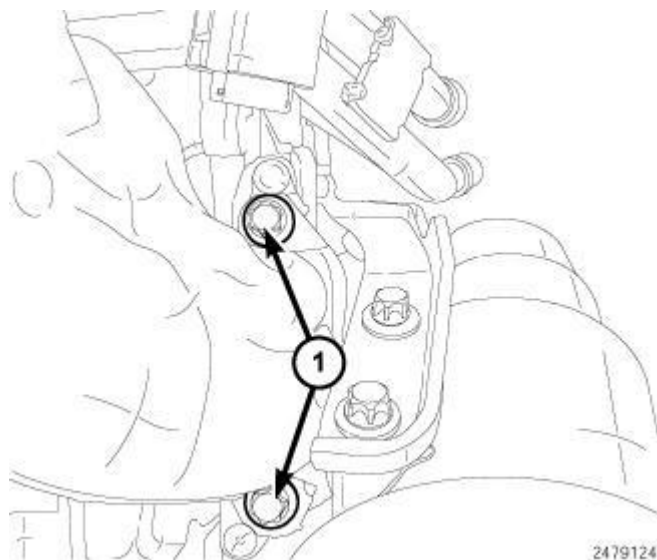


Fig. 509: EGR Cooler Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

29. Install the EGR manifold. Tighten bolts (1) to 9 N.m (80 in. lbs.).

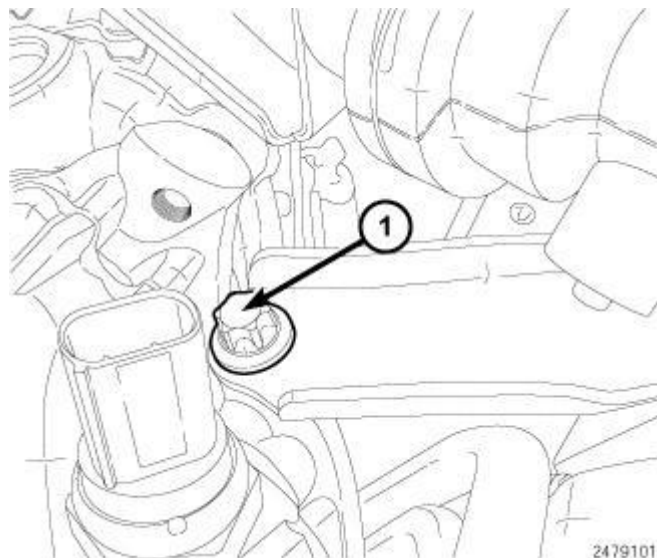


Fig. 510: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

30. Install the EGR support bracket bolt (1). Tighten to 9 N.m (80 in. lbs.).

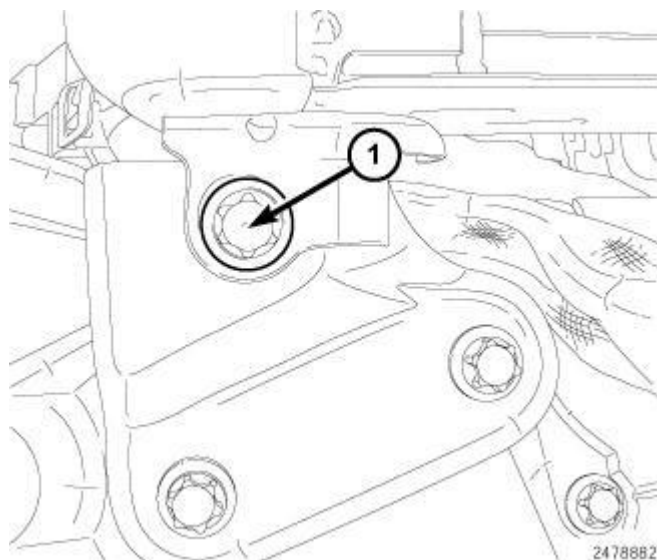


Fig. 511: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

31. Install the lower EGR cooler bracket bolt (1). Tighten to 9 N.m (80 in. lbs.).

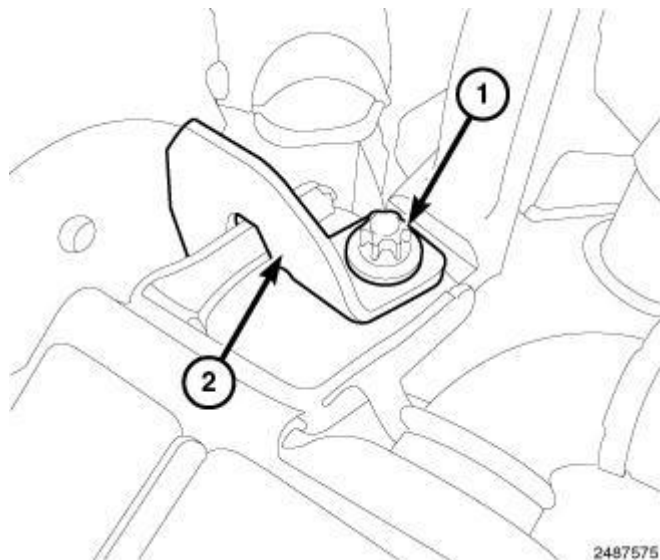


Fig. 512: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

32. Install the upper EGR cooler bolt. Tighten bolt to 9 N.m (80 in. lbs.).

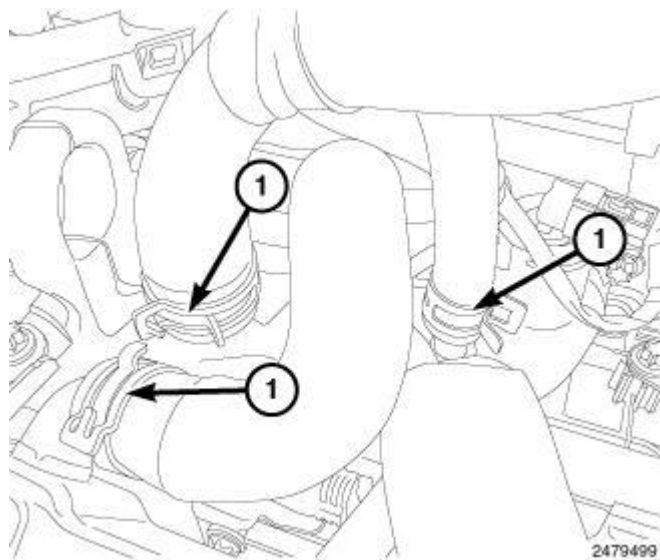


Fig. 513: Coolant Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

33. Connect the coolant hoses (1).

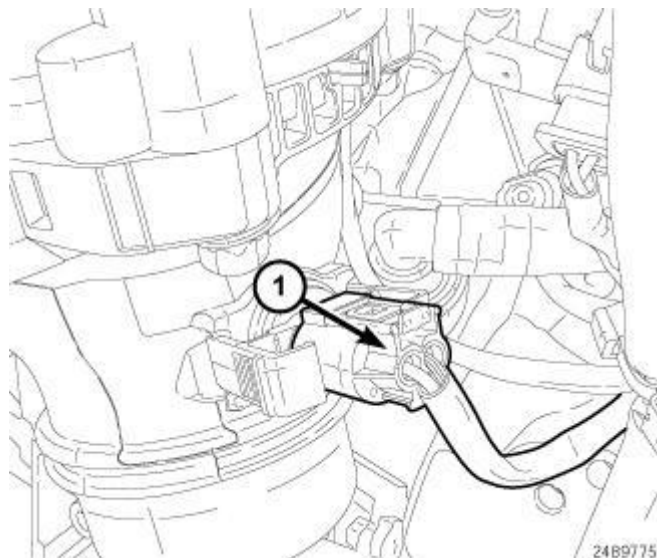


Fig. 514: Charge Air Inlet Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

34. Connect the Charge Air inlet temperature sensor harness connector.

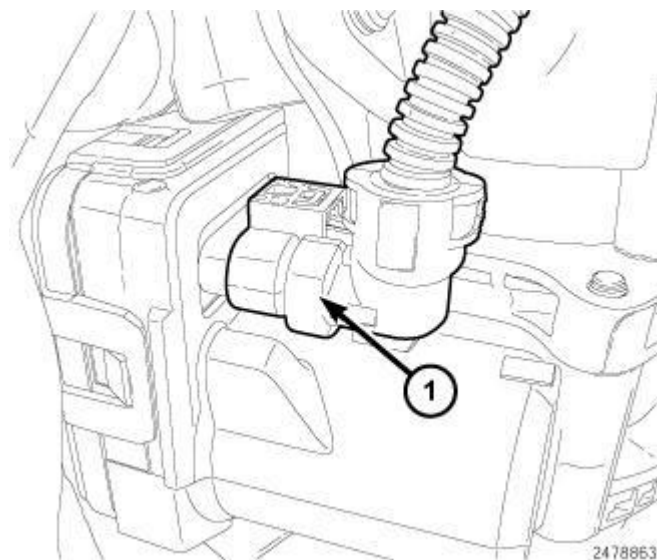


Fig. 515: EGR Air Flow Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

35. Connect the EGR air control valve harness connector.

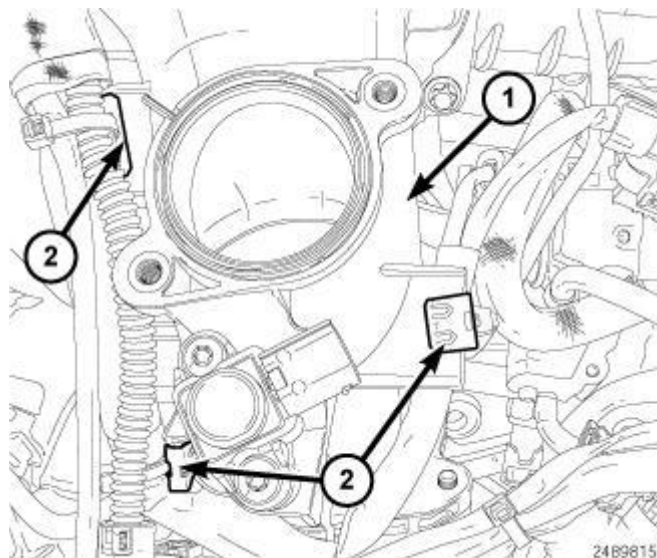


Fig. 516: Mixing Chamber & Wire Harness Retainer Clips
Courtesy of CHRYSLER GROUP, LLC

36. Connect the wire harness retainer clips (2) to the mixing chamber (1).

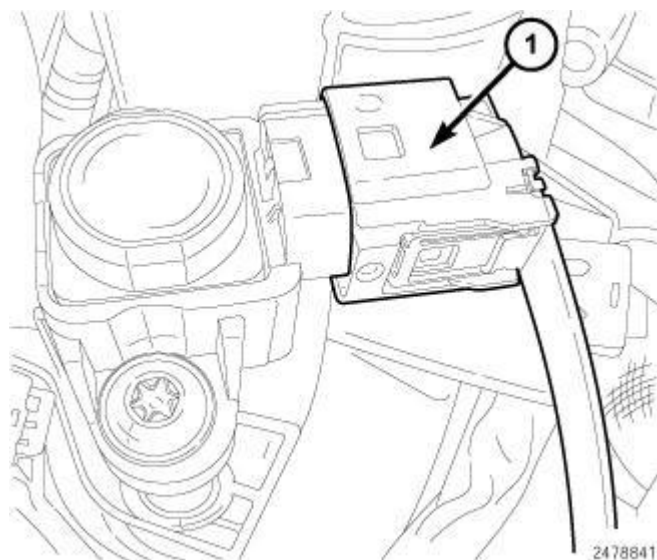


Fig. 517: Boost Pressure Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

37. Connect the boost pressure sensor (1) harness connector.

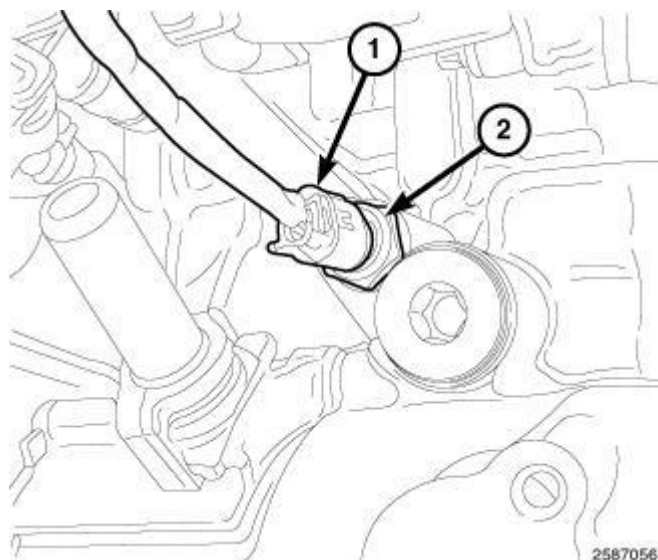


Fig. 518: Oil Temperature Sensor Harness Connector & Sensor
Courtesy of CHRYSLER GROUP, LLC

38. Connect the oil temperature sensor harness connector.

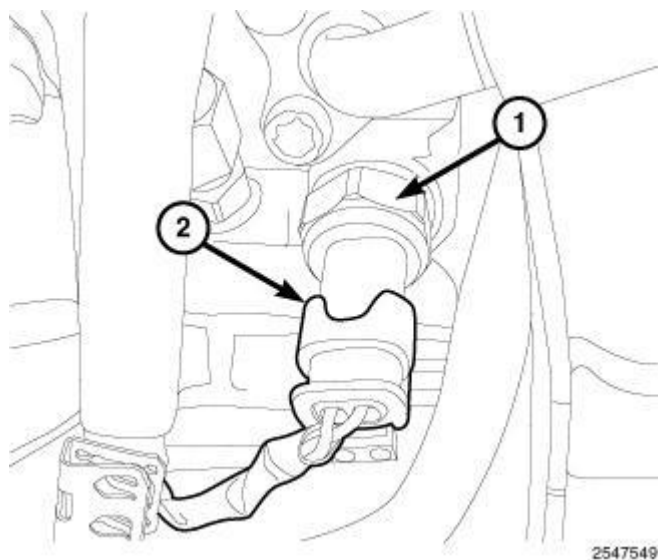


Fig. 519: Fuel Temperature Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

39. Connect the fuel temperature sensor harness connector (2).

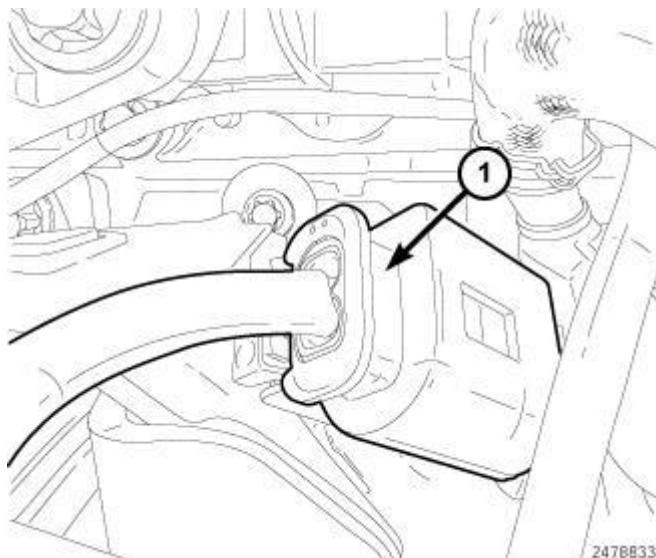


Fig. 520: Fuel Quality Control Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

40. Connect the fuel quality sensor harness connector (1).

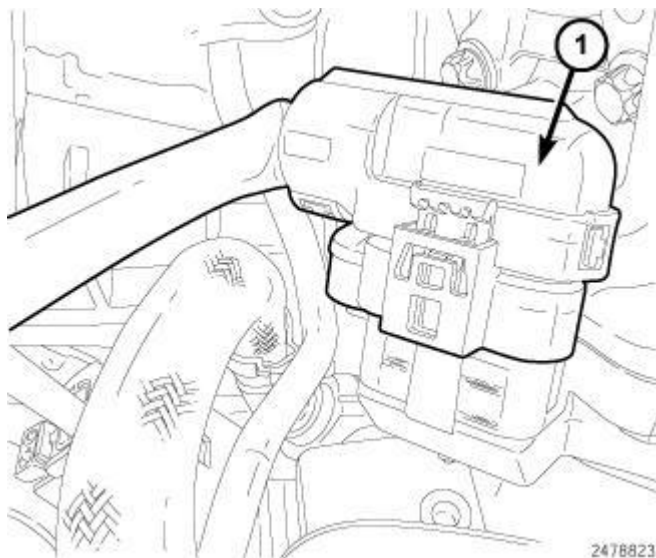


Fig. 521: EGR Valve Harness Connector
Courtesy of CHRYSLER GROUP, LLC

41. Connect the EGR valve harness connector (1).

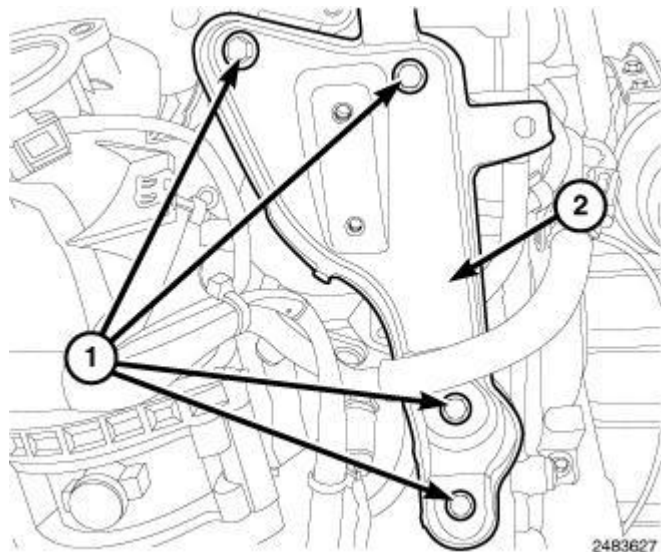


Fig. 522: Bolts & EGR Support Bracket
Courtesy of CHRYSLER GROUP, LLC

42. Install the EGR support bracket (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

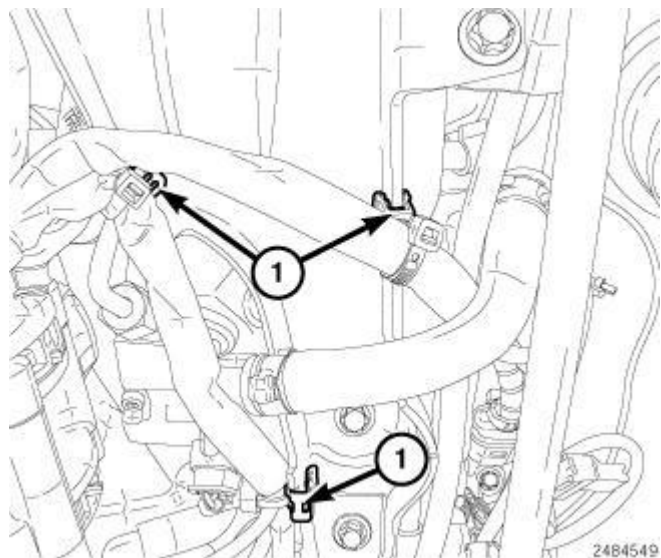
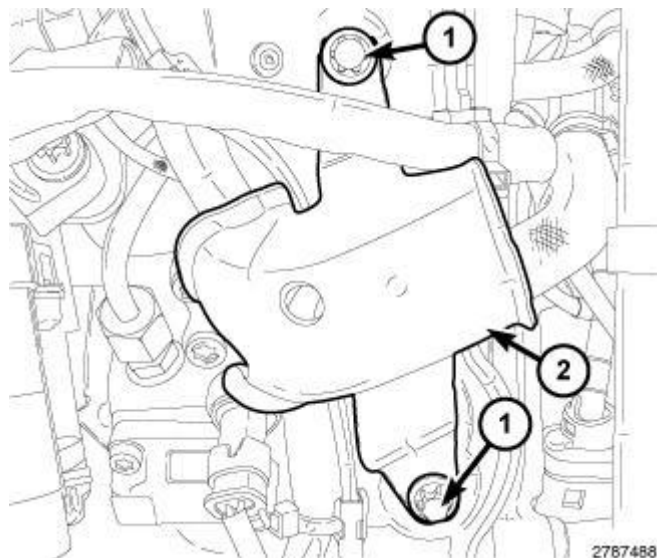


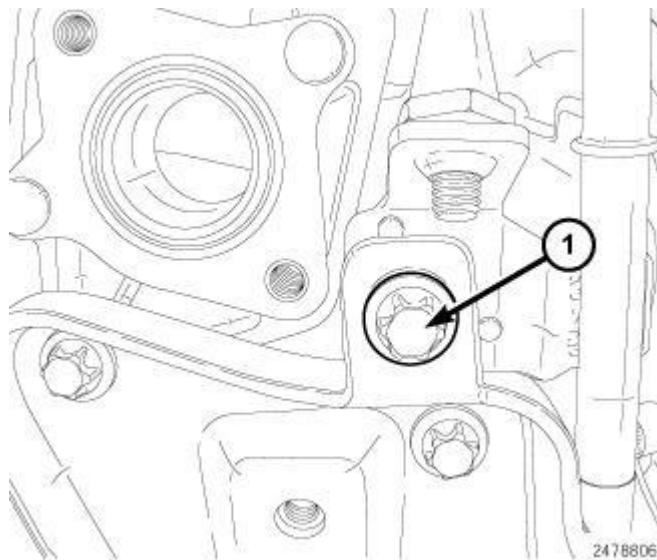
Fig. 523: Wire Harness Retainers
Courtesy of CHRYSLER GROUP, LLC

43. Connect the wire harness retainers (1).

**Fig. 524: Bolts & Heat Shield**

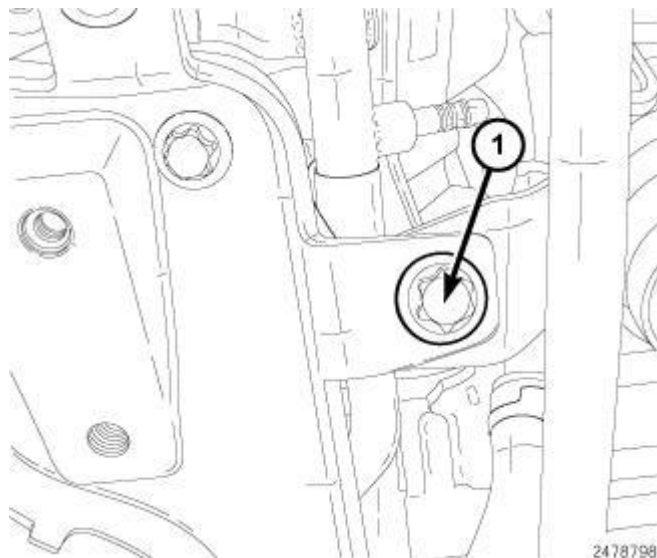
Courtesy of CHRYSLER GROUP, LLC

44. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

**Fig. 525: Vacuum Tube Bolt**

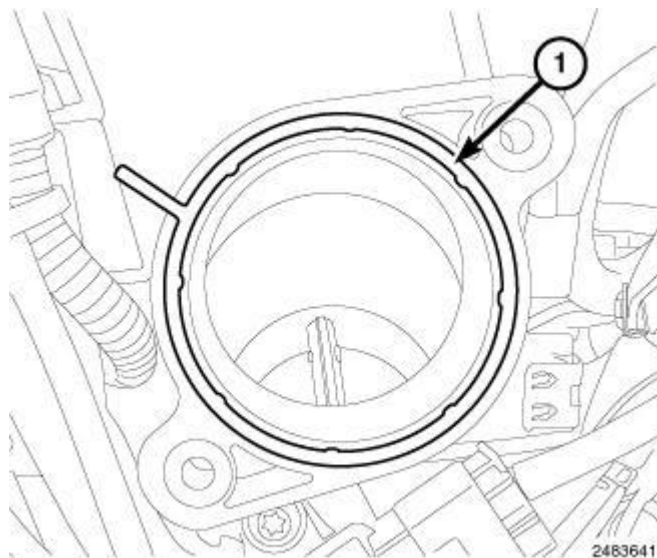
Courtesy of CHRYSLER GROUP, LLC

45. Install the bolt securing the vacuum tube (1). Tighten bolt to 9 N.m (80 in. lbs.).

**Fig. 526: Oil Dip Stick Bolt**

Courtesy of CHRYSLER GROUP, LLC

46. Install the bolt securing the oil dip stick tube. Tighten bolt to 9 N.m (80 in. lbs.).

**Fig. 527: EGR Tube Gasket Onto Mixing Chamber**

Courtesy of CHRYSLER GROUP, LLC

47. Clean the gasket surfaces and install a new gasket (1).

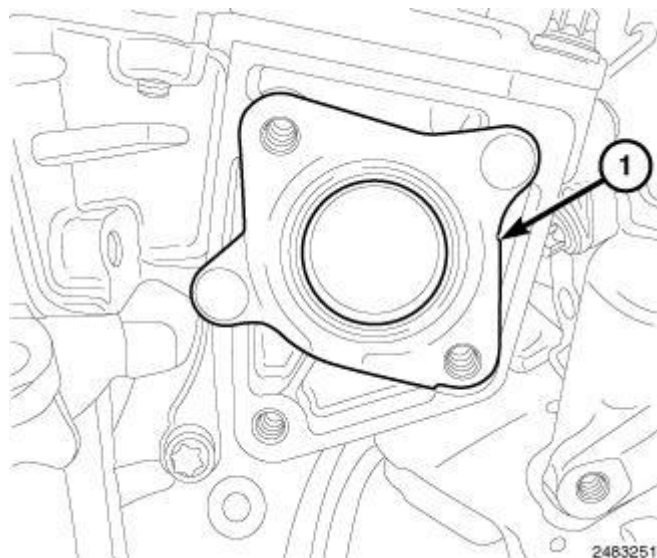


Fig. 528: EGR Tube Gasket Onto EGR Actuator
Courtesy of CHRYSLER GROUP, LLC

48. Clean the gasket surfaces and install a new gasket (1).

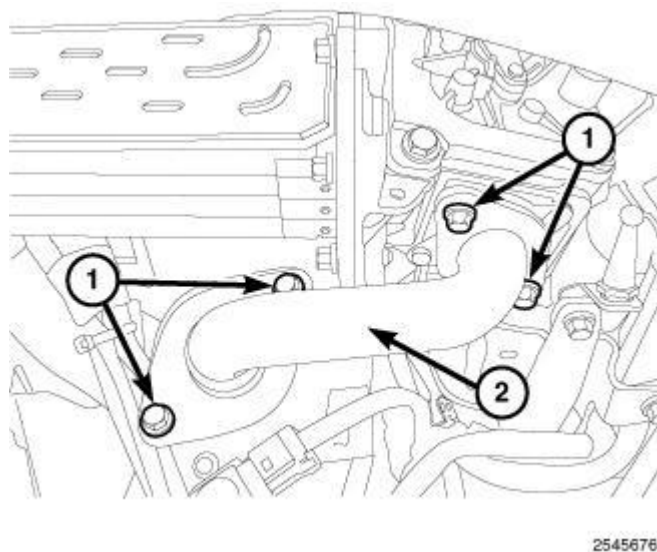


Fig. 529: EGR Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

49. Install the EGR tube (2). Tighten bolt (1) to 9 N.m (80 in. lbs.).

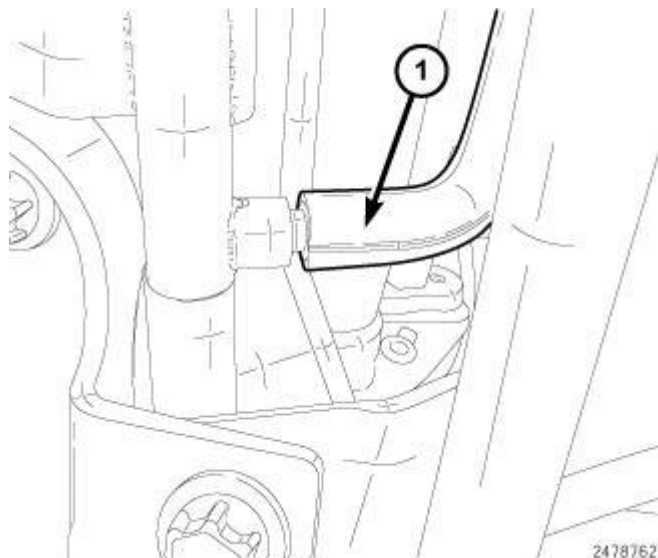


Fig. 530: Vacuum Supply Line At EGR Solenoid
Courtesy of CHRYSLER GROUP, LLC

50. Connect the vacuum supply line to the EGR solenoid (1).

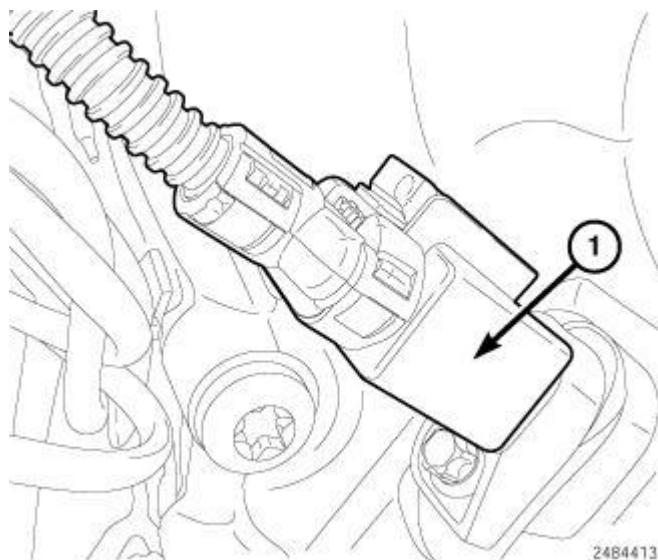


Fig. 531: Crankshaft Position Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

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

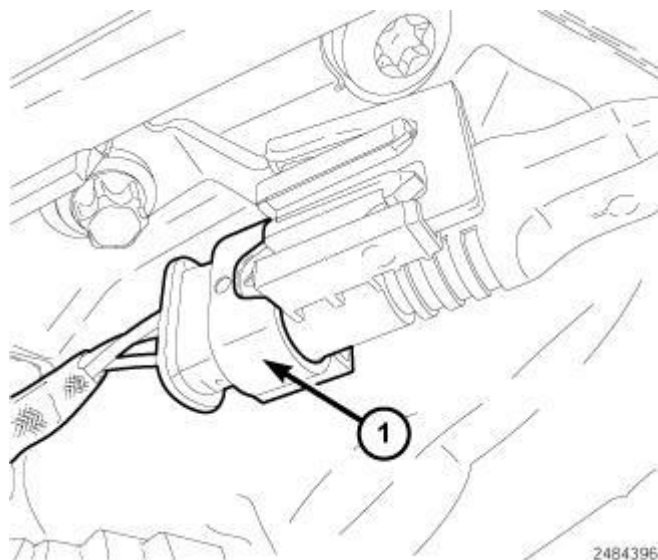


Fig. 532: Knock Sensor Harness Connector
Courtesy of CHRYSLER GROUP, LLC

52. Connect the knock sensor (1) harness connector.

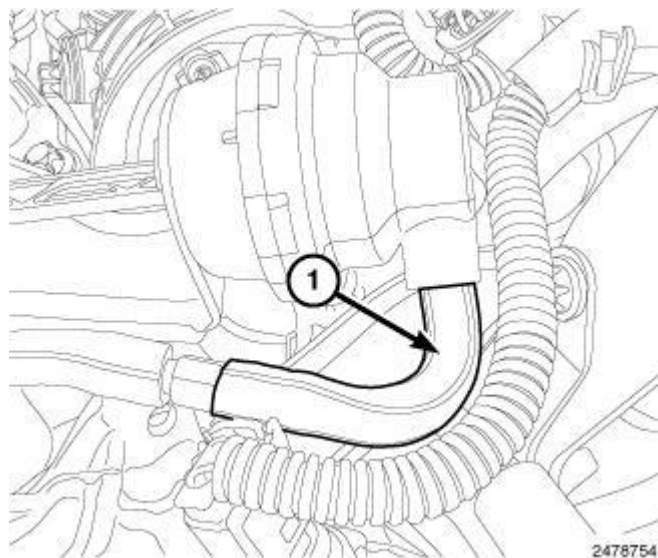


Fig. 533: EGR Control Valve Actuator Vacuum Line
Courtesy of CHRYSLER GROUP, LLC

53. Connect the vacuum line from the EGR control valve actuator.

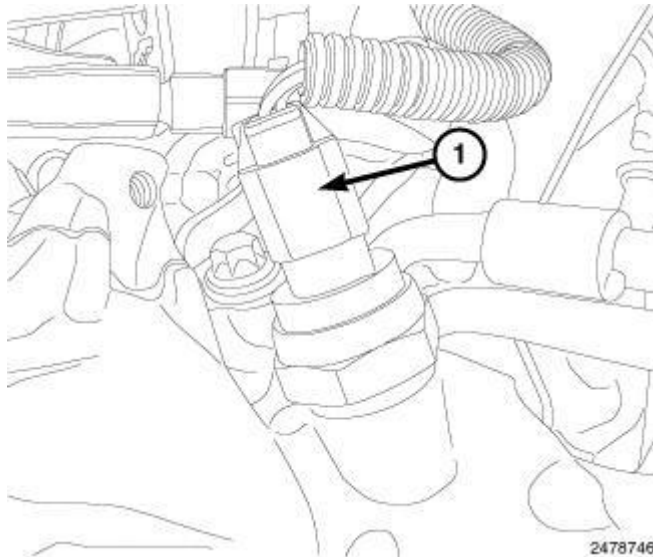


Fig. 534: EGR Back Pressure Transducer Harness Connector
Courtesy of CHRYSLER GROUP, LLC

54. Connect the EGR back pressure transducer harness connector.

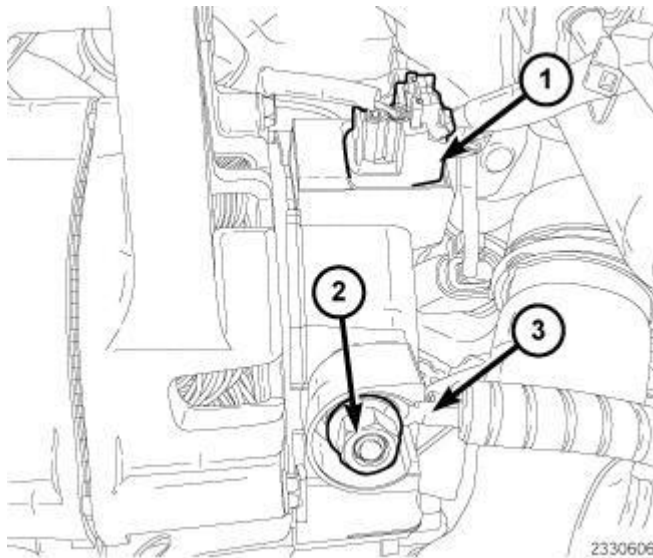


Fig. 535: Battery Feed Wire, Generator Harness Connectors & Nut
Courtesy of CHRYSLER GROUP, LLC

55. Install the generator. Tighten bolts to 20 N.m (177 in. lbs.).
56. Connect the generator harness connectors (1).
57. Install the battery feed wire (3) to generator. Tighten nut (2) to 18 N.m (159 in. lbs.).

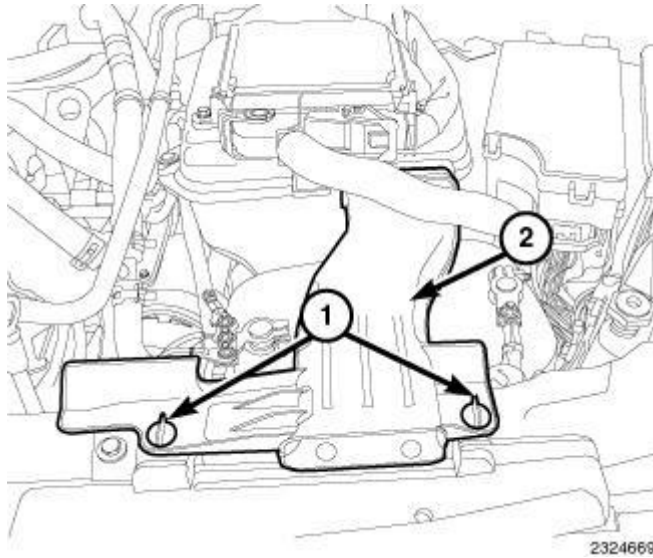


Fig. 536: Quarter Turn Lock Tabs & Air Inlet Duct
 Courtesy of CHRYSLER GROUP, LLC

58. Install the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION** .
59. Install the coolant pump. Refer to **PUMP, WATER, INSTALLATION** .
60. Install cooling fan module. Refer to **FAN, COOLING, INSTALLATION** .
61. Connect upper radiator hose at radiator.
62. Refill cooling system. Refer to **STANDARD PROCEDURE** .
63. Install the belly pan.
64. Install engine cover.
65. Connect the negative battery cable.
66. Install the air inlet duct (2) and lock the quarter turn lock tabs (1).

TURBOCHARGER SYSTEM

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TURBOCHARGER

Check for Diagnostic Trouble Codes (DTCs) stored in PCM memory. If any DTCs are present, refer to the appropriate Powertrain Diagnostic Information.

TURBOCHARGER DIAGNOSIS

CONDITION	POSSIBLE CAUSES
Low boost pressure, lack of power	Clogged air filter
	Leaks between engine and turbocharger
	Exhaust restriction
	Restriction in charge air cooler hose(s)
	Wastegate stuck open

2012 Jeep Patriot Latitude

2012 ENGINE 2.2L Diesel - Service Information - Compass & Patriot

	Wastegate actuator malfunction
	Seized turbocharger shaft
Overboost	Wastegate stuck shut Wastegate actuator malfunction
Noisy operation or vibration	Leak(s) in charge air cooler hose(s) Intake or exhaust leaks Oil starvation Worn turbocharger bearings Damaged turbine/compressor fins
Blue smoke from exhaust	Oil return line blocked Engine breather clogged Turbocharger shaft seals damaged

LEAK TESTING

NOTE: Slight engine oil pooling in the charge air inlet hose IS NOT premature turbocharger failure. Slight pooling is the normal result of the breather system.

1. Remove the air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL**.

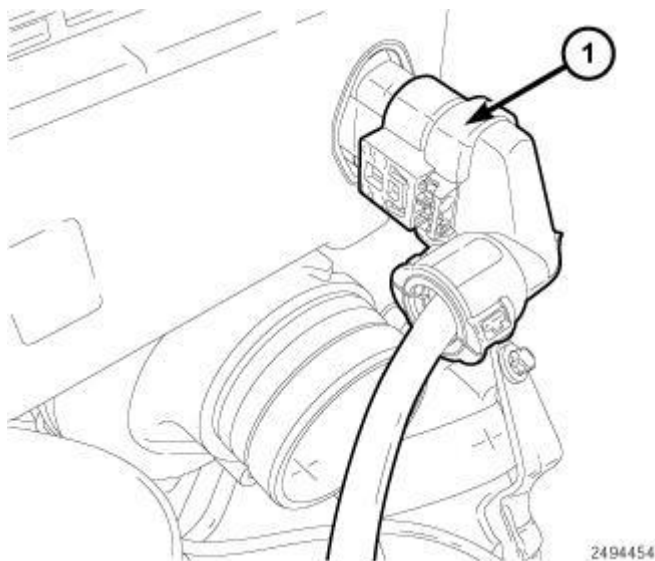


Fig. 537: Turbocharger Actuator Harness Connector
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the turbocharger actuator electrical connector (1).
3. Remove Intake Hose between Air Filter and Turbo.

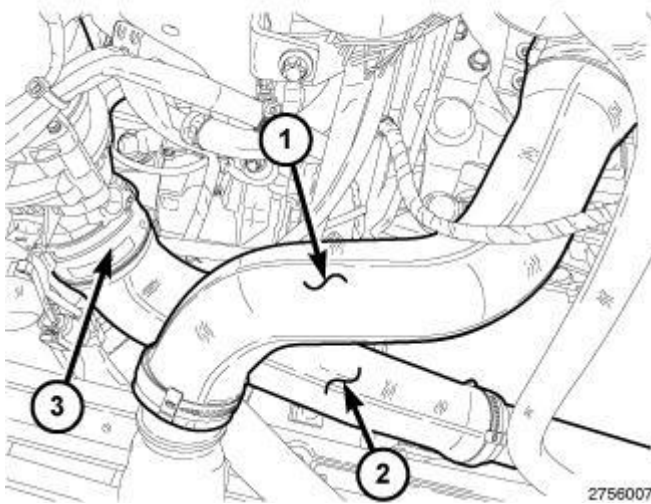


Fig. 538: Front Upper, Lower Air Charge Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

4. Raise vehicle.
5. Remove lower engine cover.
6. Remove the front lower aircharge tube (2) from the intercooler outlet tube and position aside.
7. Plug the bore on the intercooler outlet tube.
8. Lower vehicle.
9. Remove the oil fill hole cap.
10. Add the air pressure to the intercooler system through the turbo. Only add up to 28 KPA (4 PSI).
11. Using soapy water. Check the air inlet ducts, rubber sleeves and intercooler.

COOLER AND HOSES, CHARGE AIR

REMOVAL

CHARGE AIR COOLER HOSES

1. Remove the upper engine cover.
2. Remove the fan module. Refer to **FAN, COOLING, REMOVAL**.

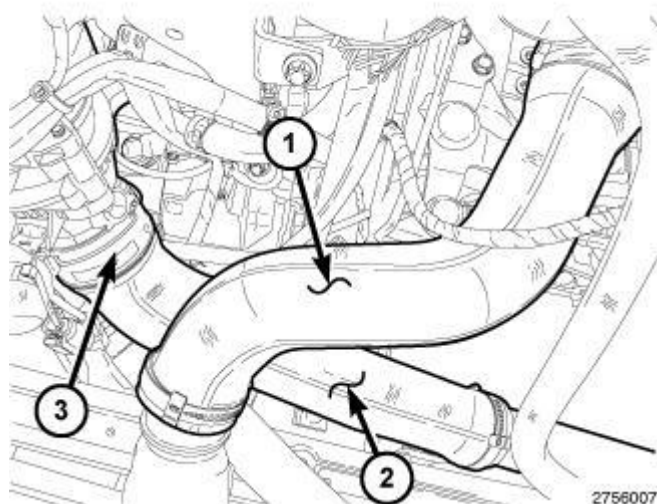


Fig. 539: Front Upper, Lower Air Charge Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

3. Remove the front charge air inlet tube (1).
4. Remove the lower charge air tube (2).

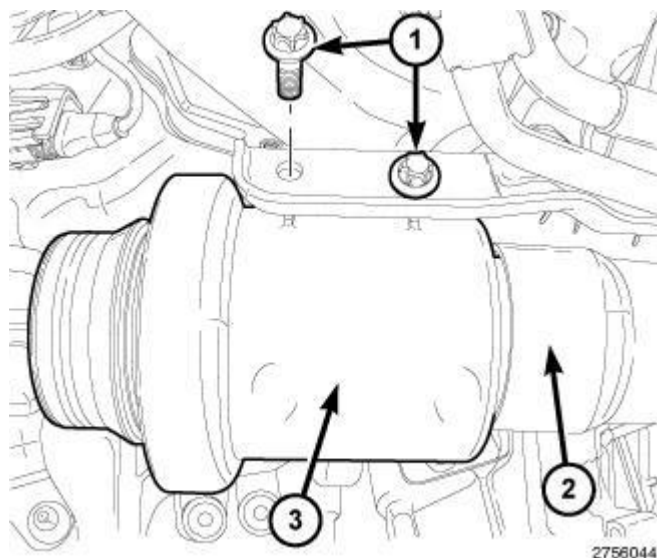
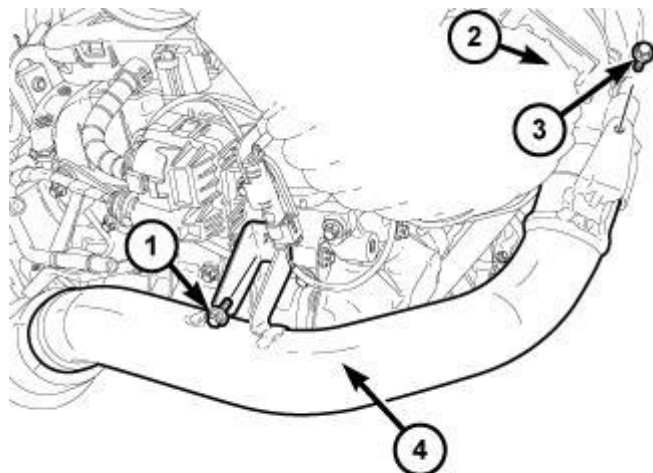


Fig. 540: Air Charge Resonator, Rear Air Charge Tube & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL**.
6. Remove the two mounting bolts (1) from the air charge resonator (3).
7. Separate the resonator (3) from the rear air charge tube (2).

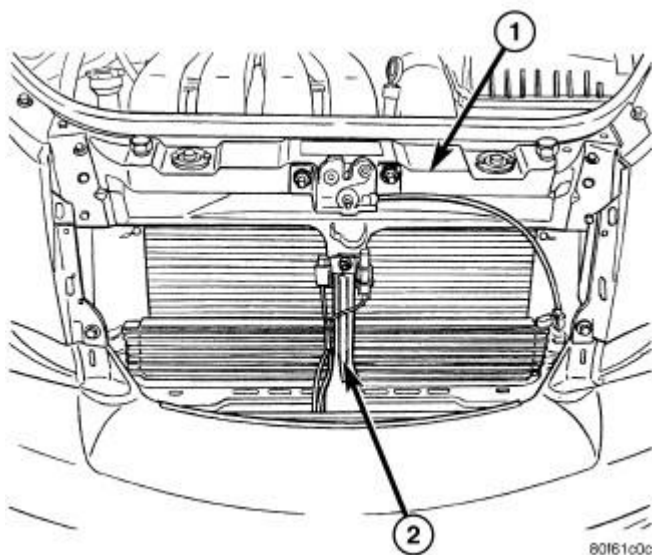


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Fig. 541: Rear Air Charge Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove the bolt (1) holding the front of the rear air charge tube (4) to the cylinder head.
9. Remove the mounting bolt (3) holding the air charge tube (4) to the turbo.
10. Remove the rear air charge tube.

CHARGE AIR COOLER



80161c0c

Fig. 542: Upper Radiator Closure Panel & Center Brace
Courtesy of CHRYSLER GROUP, LLC

1 - UPPER RADIATOR CLOSURE PANEL

2 - CENTER BRACE

1. Drain cooling system. Refer to **STANDARD PROCEDURE** .
2. Remove air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL**.
3. Disconnect negative battery cable.
4. Disconnect positive battery cable.
5. Remove battery and battery tray. Refer to **BATTERY, REMOVAL** .
6. Remove grille. Refer to **BODY - INTERIOR & EXTERIOR** .
7. Remove upper radiator closure panel (1) and center brace (2). Refer to **CROSSMEMBER, RADIATOR, REMOVAL** .

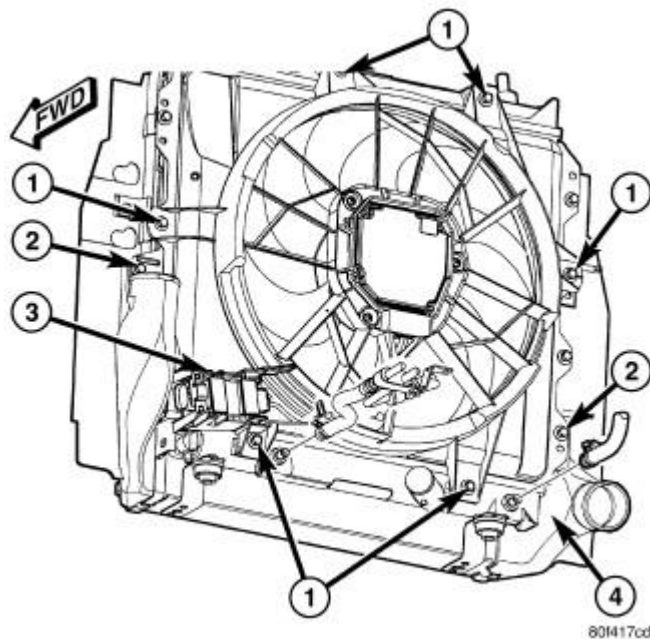


Fig. 543: Cooling Fan Assembly
 Courtesy of CHRYSLER GROUP, LLC

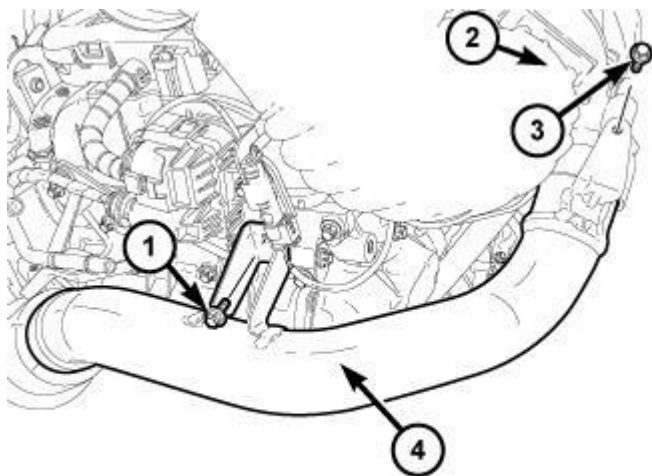
1 - RADIATOR FAN FASTENERS
2 - CHARGE AIR COOLER FASTENERS
3 - RADIATOR FAN CONNECTOR
4 - CHARGE AIR COOLER

8. Remove front bumper fascia. Refer to **FASCIA, FRONT, REMOVAL** .
9. Remove front bumper. Refer to **REINFORCEMENT, BUMPER, FRONT, REMOVAL** and **REINFORCEMENT, BUMPER, REAR, REMOVAL** .
10. Loosen charge air cooler hose clamps. Disconnect charge air cooler hoses.
11. Remove radiator fan. Refer to **FAN, COOLING, REMOVAL** .
12. Remove charge air cooler fasteners (2).
13. Remove radiator. Refer to **RADIATOR, ENGINE COOLING, REMOVAL** .

14. Remove charge air cooler.

INSTALLATION

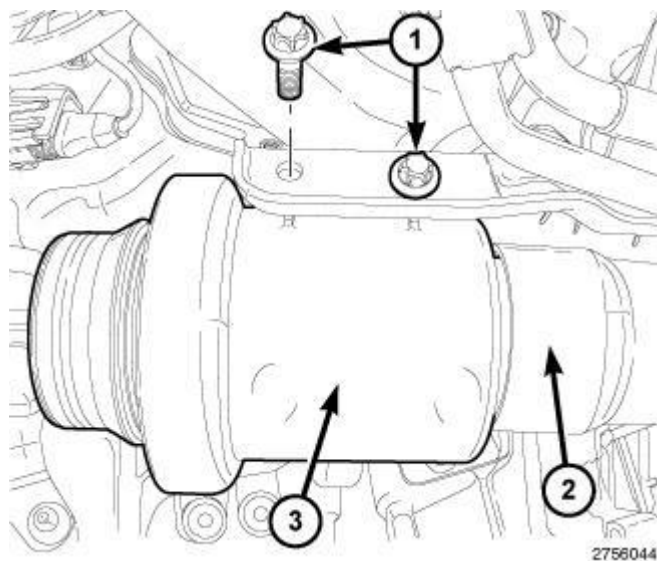
CHARGE AIR COOLER HOSES



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Fig. 544: Rear Air Charge Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Position pipe (4) to mounting location.
2. Connect pipe (4) to turbo body (2).
3. Install mounting bolts (1, 3). Tighten bolts to 16 N.m (12 ft. lbs.).



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Fig. 545: Air Charge Resonator, Rear Air Charge Tube & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Apply a light coating of oil to the o-ring on the resonator so no damage would occur to the o-ring.
5. Connect resonator (3) to the rear charge air cooler pipe (2).
6. Install the bolts (1) to the resonator. Tighten bolts to 8 N.m (70 in. lbs.).
7. Install air cleaner housing assembly. Refer to **BODY, AIR CLEANER, INSTALLATION**.

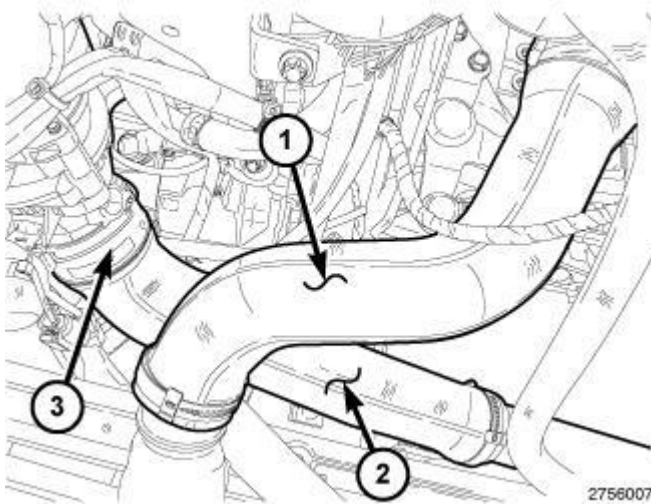


Fig. 546: Front Upper, Lower Air Charge Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

8. Install the lower front air charge hose (2).
9. Tighten hose clamps to 6 N.m (53 in. lbs.).
10. Install the front upper air charge hose (1).
11. Install the fan module. Refer to **FAN, COOLING, INSTALLATION**.
12. Install engine cover.

CHARGE AIR COOLER

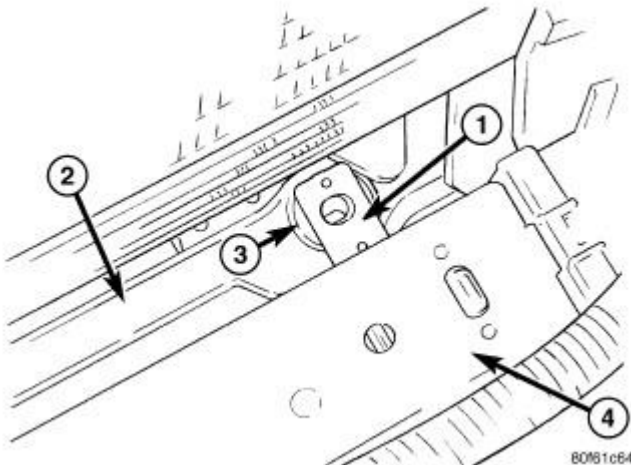


Fig. 547: Charge Air Cooler Assembly

Courtesy of CHRYSLER GROUP, LLC

1 - LOCATING TAB
2 - LOWER RADIATOR SUPPORT CROSSMEMBER
3 - RADIATOR MOUNT BUSHING
4 - CHARGE AIR COOLER

1. Position charge air cooler to mounting location.

NOTE: When lowering radiator, make sure lower radiator pins engage properly through charge air cooler tabs. Refer to **Fig. 547**.

2. Install radiator. Refer to **RADIATOR, ENGINE COOLING, INSTALLATION**.
3. Install fasteners attaching charge air cooler to radiator. Tighten fasteners to 8 N.m (70 in. lbs.).
4. Install radiator fan. Refer to **FAN, COOLING, INSTALLATION**.
5. Connect charge air cooler hoses. Tighten hose clamps to 1.7 N.m (15 in. lbs.).
6. Install front bumper. Refer to **REINFORCEMENT, BUMPER, FRONT, INSTALLATION** and **REINFORCEMENT, BUMPER, REAR, INSTALLATION**.
7. Install front bumper fascia. Refer to **FASCIA, FRONT, INSTALLATION**.
8. Install upper radiator closure panel and center brace. Refer to **CROSSMEMBER, RADIATOR, INSTALLATION**.
9. Install grille. Refer to **BODY - INTERIOR & EXTERIOR**.
10. Install battery tray and battery. Refer to **BATTERY, INSTALLATION**.
11. Connect positive battery cable.
12. Connect negative battery cable.
13. Install air cleaner housing. Refer to **BODY, AIR CLEANER, INSTALLATION**.
14. Fill cooling system. Refer to **STANDARD PROCEDURE**.

LINES AND HOSES, TURBOCHARGER, OIL AND COOLANT**REMOVAL****REMOVAL****COOLANT SUPPLY LINE**

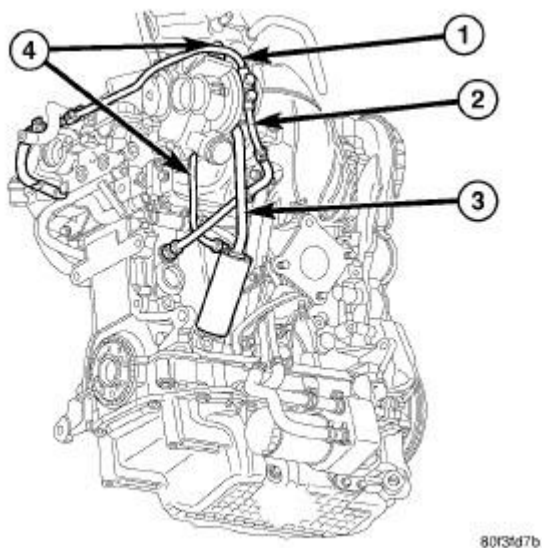


Fig. 548: Turbocharger Lines & Hoses
Courtesy of CHRYSLER GROUP, LLC

1. Raise vehicle on hoist.

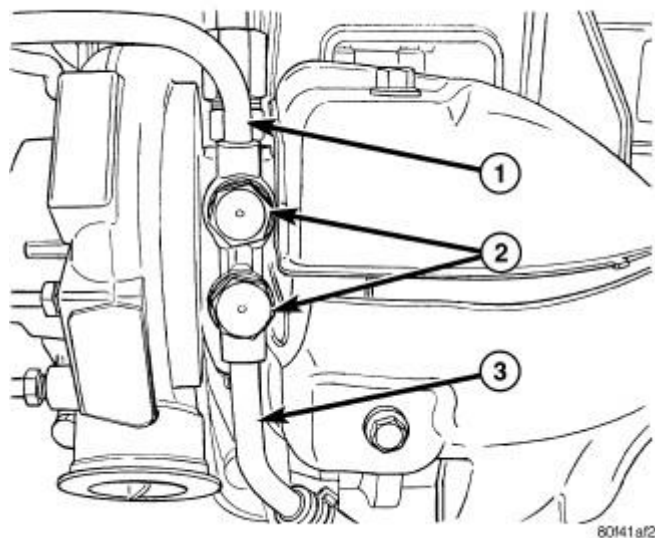


Fig. 549: Coolant Lines & Banjo Fittings
Courtesy of CHRYSLER GROUP, LLC

1 - COOLANT RETURN LINE
2 - BANJO BOLTS - 30 N.m (22 ft. lbs.)
3 - COOLANT SUPPLY LINE

2. Drain cooling system. Refer to **STANDARD PROCEDURE**.

3. Remove banjo bolt (2) from coolant supply line (3) at turbocharger.

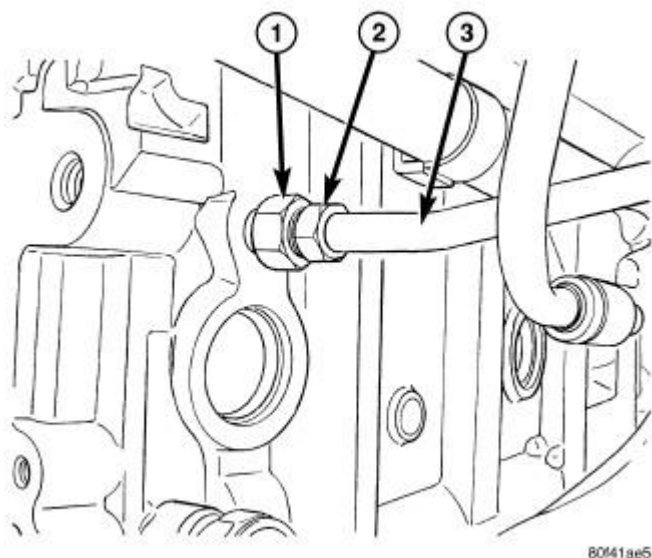


Fig. 550: Coolant Supply Line & Fittings
Courtesy of CHRYSLER GROUP, LLC

1 - BRASS FITTING - 41 N.m (30 ft. lbs.)
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - COOLANT SUPPLY LINE

4. Disconnect coolant supply line (3) flared fitting (2) from brass fitting (1) at engine block.
5. Remove coolant supply line.

COOLANT RETURN LINE

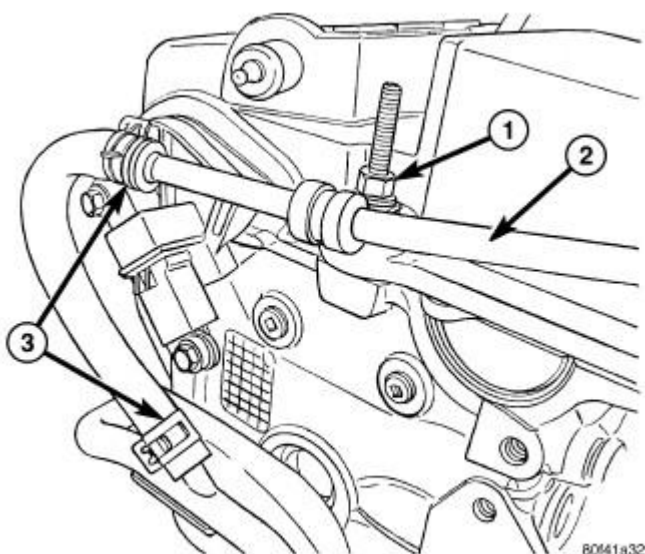


Fig. 551: Coolant Return Line, Nut & Clamps
Courtesy of CHRYSLER GROUP, LLC

1 - NUT

2 - COOLANT RETURN LINE

3 - HOSE CLAMPS

1. Drain cooling system. Refer to **STANDARD PROCEDURE** .
2. Remove air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL**.
3. Disconnect Inlet Air Temperature (IAT) sensor connector.
4. Disconnect Throttle Inlet Pressure (TIP) hose from charge air cooler hose.
5. Loosen hose clamp at throttle body.
6. Disconnect charge air cooler hose from throttle body. Reposition charge air cooler hose.
7. Remove fastener securing coolant return line bracket to cylinder head cover stud.
8. Remove hose clamp from coolant return line (2) at heater tube. Disconnect hose from heater tube.
9. Remove banjo bolt from coolant return line at turbocharger.
10. Remove coolant return line.

OIL SUPPLY LINE

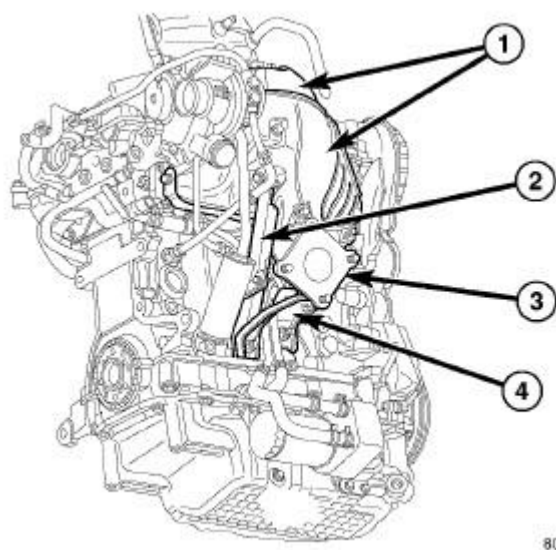


Fig. 552: Turbocharger Brackets & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

1 - UPPER/LOWER HEAT SHIELDS
2 - TURBOCHARGER SUPPORT BRACKET
3 - ELBOW
4 - ELBOW SUPPORT BRACKET

1. Raise vehicle on hoist.
2. Remove elbow support bracket (4).

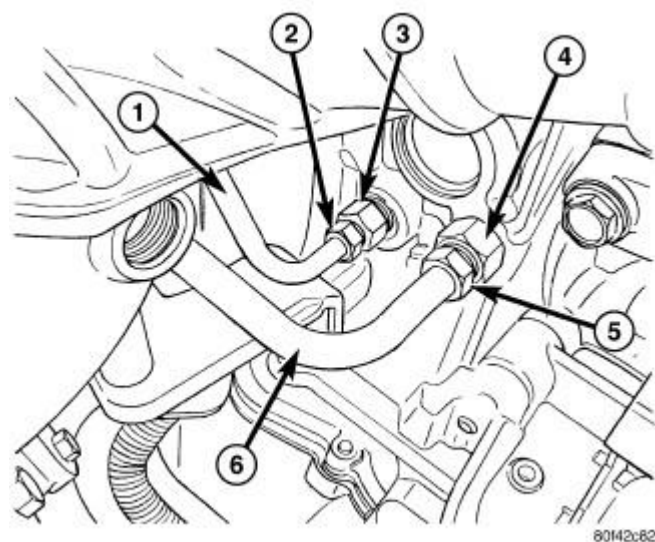


Fig. 553: Oil Supply Line, Oil Cooler Coolant Line & Fittings
Courtesy of CHRYSLER GROUP, LLC

1 - OIL SUPPLY LINE
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - BRASS FITTING - 41 N.m (30 ft. lbs.)
4 - BRASS FITTING - 41 N.m (30 ft. lbs.)
5 - FLARED FITTING - 31 N.m (23 ft. lbs.)
6 - OIL COOLER COOLANT LINE

3. Disconnect oil supply line flared fitting (2) from brass fitting (3) at engine block.
4. Lower vehicle.
5. Disconnect oil supply line flared fitting (2) from brass fitting (3) at turbocharger.

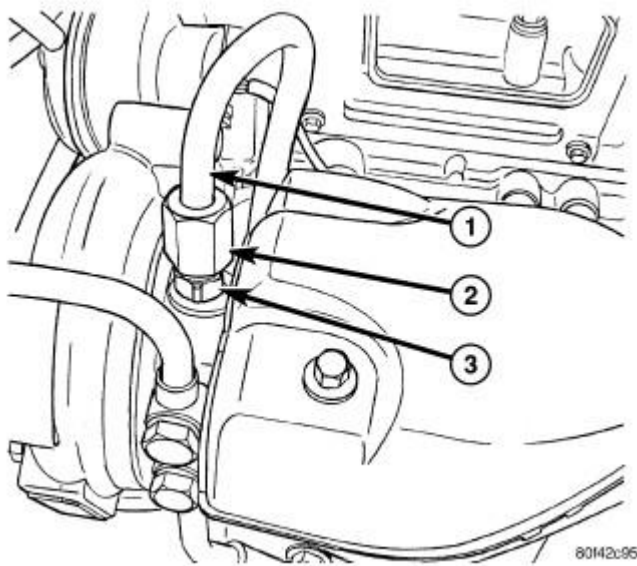


Fig. 554: Oil Supply Line & Fittings
Courtesy of CHRYSLER GROUP, LLC

1 - OIL SUPPLY LINE
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - BRASS FITTING - 41 N.m (30 ft. lbs.)

6. Remove oil supply line (1).

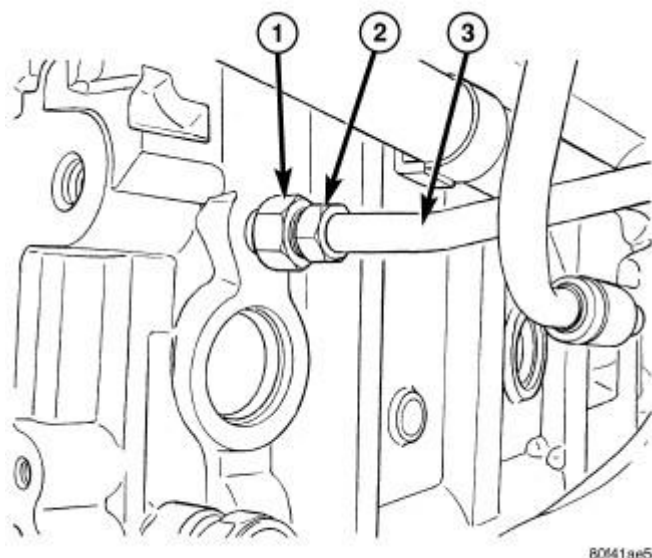
OIL RETURN LINE

1. Raise vehicle on hoist.
2. Remove the two fasteners securing the oil return line to the turbocharger.
3. Remove hose clamp from oil return line.
4. Remove oil return line from crankcase nipple.

INSTALLATION

INSTALLATION

COOLANT SUPPLY LINE

**Fig. 555: Coolant Supply Line & Fittings**

Courtesy of CHRYSLER GROUP, LLC

1 - BRASS FITTING - 41 N.m (30 ft. lbs.)
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - COOLANT SUPPLY LINE

1. If the brass fitting (1) was removed from the engine block, apply thread sealer to the threads and install into the engine block. Tighten the brass fitting (1) to 41 N.m (30 ft. lbs.).
2. Position the coolant supply line tube (3) onto the brass fitting (1) at the engine block.
3. Install the after run pump hoses to the after run pump.
4. Install **NEW** washers on the banjo fitting of coolant supply line. Hand start the banjo bolt.
5. Tighten the flared fitting (2) to 31 N.m (23 ft. lbs.).

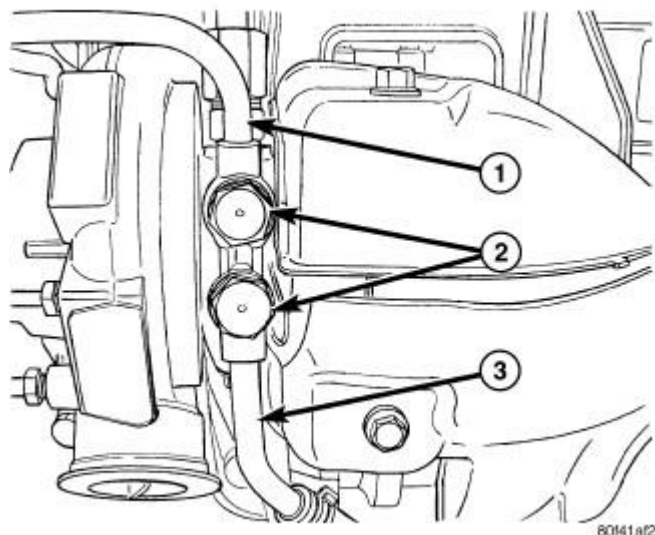
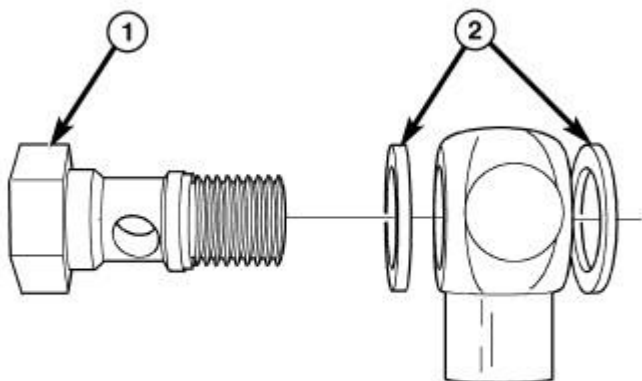


Fig. 556: Coolant Lines & Banjo Fittings
 Courtesy of CHRYSLER GROUP, LLC

1 - COOLANT RETURN LINE
2 - BANJO BOLTS - 30 N.m (22 ft. lbs.)
3 - COOLANT SUPPLY LINE

6. Tighten the banjo fitting bolts (2) to 30 N.m (22 ft. lbs.).
7. Lower the vehicle.
8. Fill the cooling system. Refer to **STANDARD PROCEDURE** .

COOLANT RETURN LINE



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Fig. 557: Banjo Bolt & Washers

Courtesy of CHRYSLER GROUP, LLC

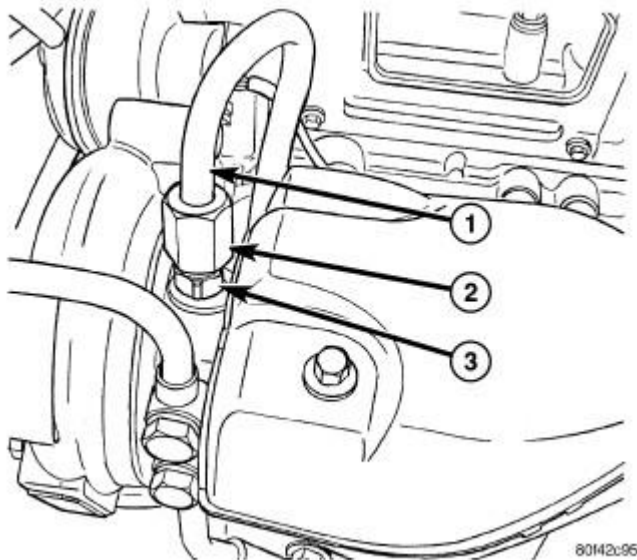
1 - BANJO BOLT

2 - WASHERS

1. Position the coolant return line on the turbocharger.
2. Install **NEW** washers (2) onto the banjo fitting of the coolant return line. Hand start the banjo bolt.
3. Install the hose onto the thermostat housing.
4. Tighten the banjo bolt to 40 N.m (29.5 ft. lbs.).
5. Secure the coolant return line bracket to the turbocharger housing tighten to 12 N.m (9 ft. lbs.).
6. Fill the cooling system. Refer to **STANDARD PROCEDURE** .

OIL SUPPLY LINE

1. If the engine block brass fitting (3) or turbocharger brass fitting was removed, apply thread sealer to threads and install. Tighten the brass fittings (3) to 41 N.m (30 ft. lbs.).
2. Position the oil supply line (1) to the mounting location.

**Fig. 558: Oil Supply Line & Fittings**

Courtesy of CHRYSLER GROUP, LLC

1 - OIL SUPPLY LINE

2 - FLARED FITTING - 31 N.m (23 ft. lbs.)

3 - BRASS FITTING - 41 N.m (30 ft. lbs.)

3. Hand start the flared fitting (2) at turbocharger.
4. Raise the vehicle on hoist.

5. Hand start the flared fitting (2) on the line to the engine block brass fitting (3).

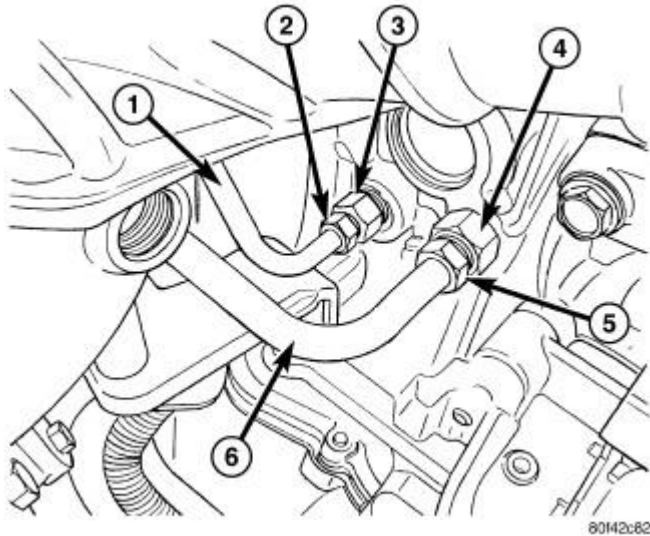


Fig. 559: Oil Supply Line, Oil Cooler Coolant Line & Fittings
 Courtesy of CHRYSLER GROUP, LLC

1 - OIL SUPPLY LINE
2 - FLARED FITTING - 31 N.m (23 ft. lbs.)
3 - BRASS FITTING - 41 N.m (30 ft. lbs.)
4 - BRASS FITTING - 41 N.m (30 ft. lbs.)
5 - FLARED FITTING - 31 N.m (23 ft. lbs.)
6 - OIL COOLER COOLANT LINE

6. Tighten the flared fittings to 31 N.m (23 ft. lbs.).
7. Lower the vehicle.

OIL RETURN LINE

NOTE: If drain back nipple is not damaged or showing signs of leakage, steps 2, 3, 4, and 9 can be skipped.

1. Clean gasket surfaces.
2. Using a paint pen, mark the new drain back nipple to a depth of 17 mm (0.669 in.) from the end to be installed in block.
3. Apply MOPAR® Stud'n Bearing mount and adhesive to the drain back nipple.
4. Using Bearing Installer (special tool #9723, Installer, Bearing), install the drainback nipple.
5. Install the oil return line hose over the drain back nipple.
6. Install a new gasket.

7. Install the two fasteners securing the oil return tube to the turbocharger. Tighten the fasteners to 12 N.m (105 in. lbs.).
8. Perform oil change. Refer to **LUBRICATION**.
9. Lower the vehicle.

SOLENOID, WASTEGATE

DESCRIPTION

DESCRIPTION

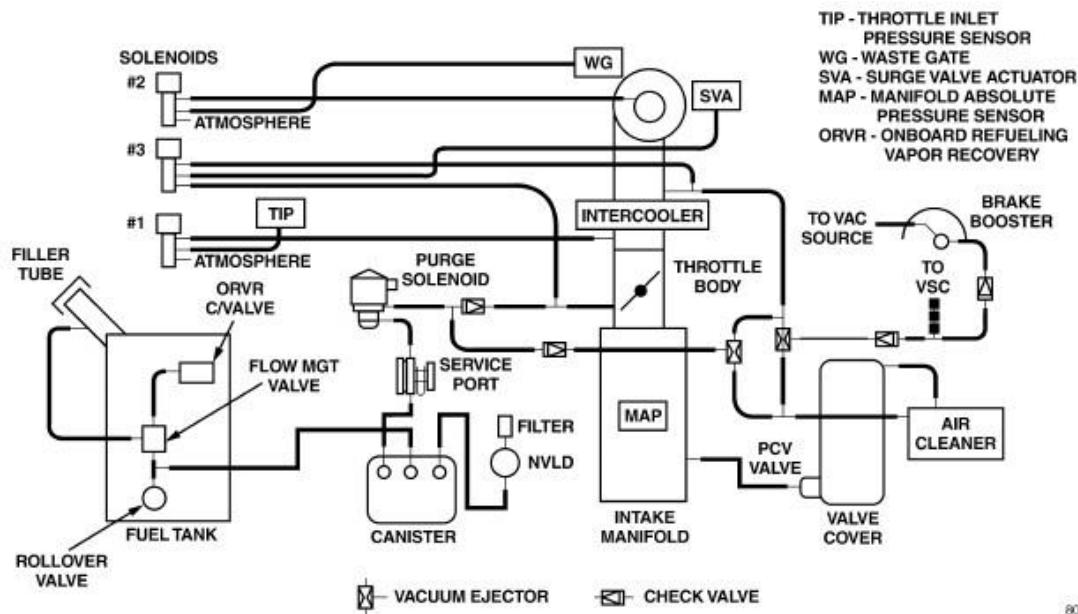


Fig. 560: Vacuum Harness Schematic
 Courtesy of CHRYSLER GROUP, LLC

Turbocharged vehicles are equipped with three solenoids that are PCM controlled. They are mounted to the right shock tower. A vacuum harness connects the solenoids to their respective component.

- Wastegate Actuator Solenoid
- Surge Valve Actuator Solenoid
- Throttle Inlet Pressure (TIP) Solenoid

REMOVAL

REMOVAL

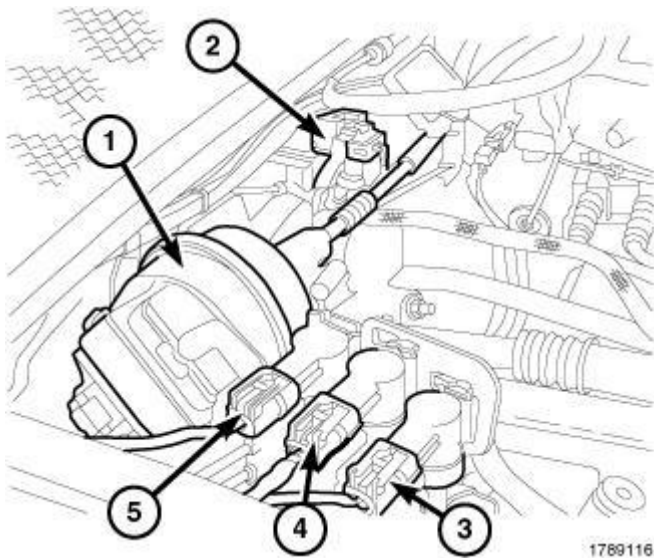


Fig. 561: Wastegate Solenoid & Electrical Connectors
 Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the electrical connectors (3, 4 and 5).
2. Remove the nuts (1) the securing the solenoid mounting bracket to the shock tower.

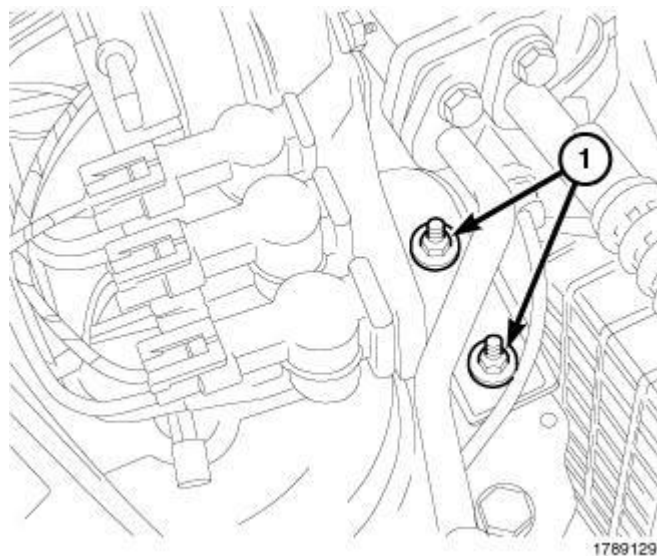


Fig. 562: Nuts Securing Solenoid Mounting Bracket
 Courtesy of CHRYSLER GROUP, LLC

3. Disconnect vacuum harness connector from solenoid.
4. Push on the solenoid lock tab and slide solenoid off the bracket.

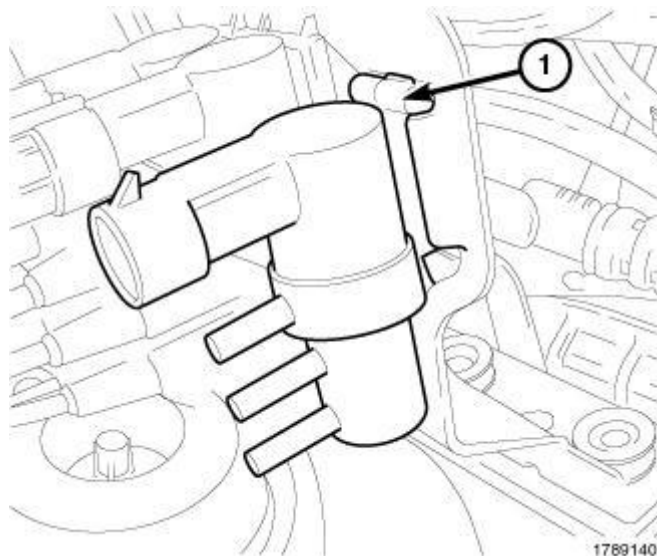


Fig. 563: Solenoid Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

5. If necessary, remove the solenoid mounting bracket.

INSTALLATION

INSTALLATION

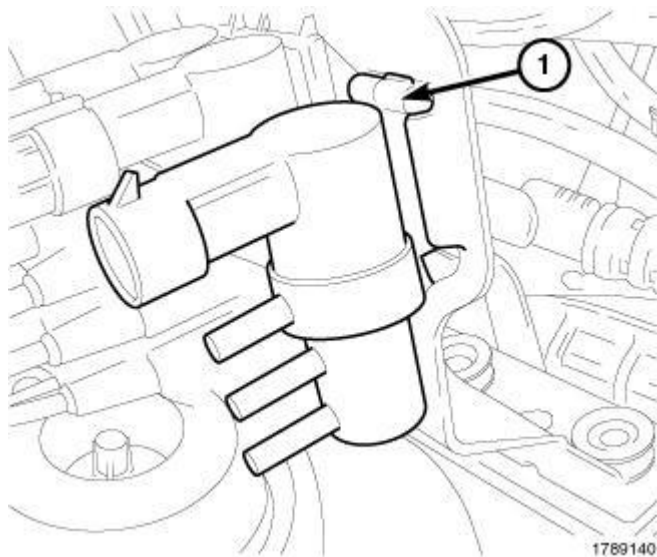


Fig. 564: Solenoid Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

1. If removed, install the solenoid mounting bracket.
2. Slide the solenoids onto the mounting tab until the lock tab (1) engages.
3. Connect vacuum harness connector to solenoid.

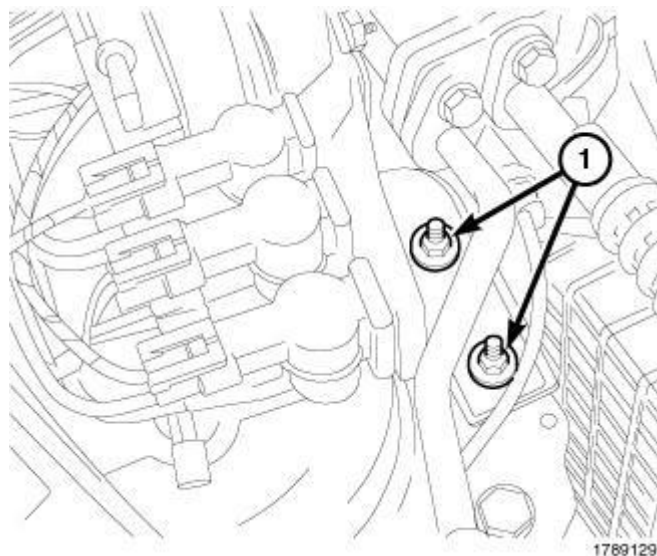


Fig. 565: Nuts Securing Solenoid Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

4. Install the nuts securing the solenoid mounting bracket to the shock tower (1).

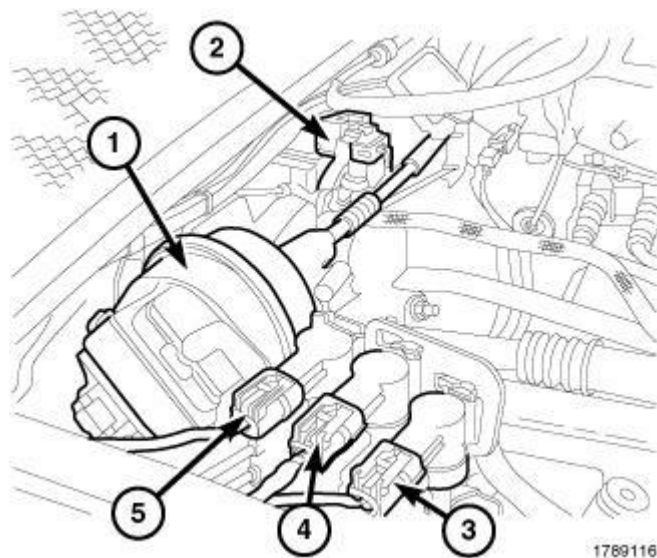


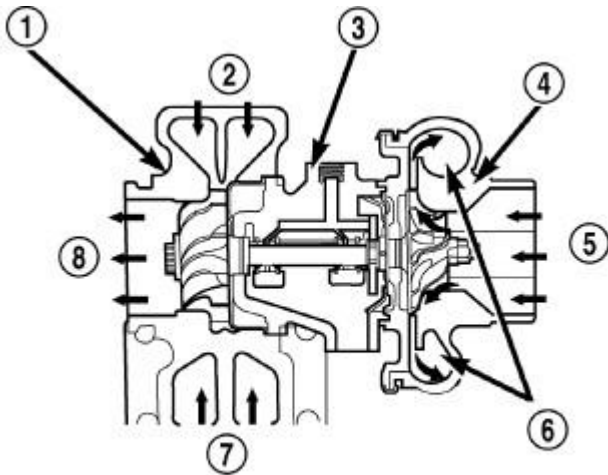
Fig. 566: Wastegate Solenoid & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

5. Connect solenoid electrical connectors (3, 4 and 5).

TURBOCHARGER

DESCRIPTION

DESCRIPTION



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Fig. 567: Turbocharger Description
 Courtesy of CHRYSLER GROUP, LLC

1 - TURBINE SECTION
2 - EXHAUST GAS
3 - BEARING HOUSING
4 - COMPRESSOR SECTION
5 - INLET AIR
6 - COMPRESSED AIR TO ENGINE
7 - EXHAUST GAS
8 - EXHAUST GAS TO EXHAUST PIPE

CAUTION: The turbocharger is a performance part and must not be tampered with. Tampering with the variable vane components can reduce durability by increasing cylinder pressure and thermal loading due to incorrect inlet and exhaust manifold pressure. Poor fuel economy and failure to meet regulatory emissions laws may result. Increasing the turbocharger boost **WILL NOT** increase engine power.

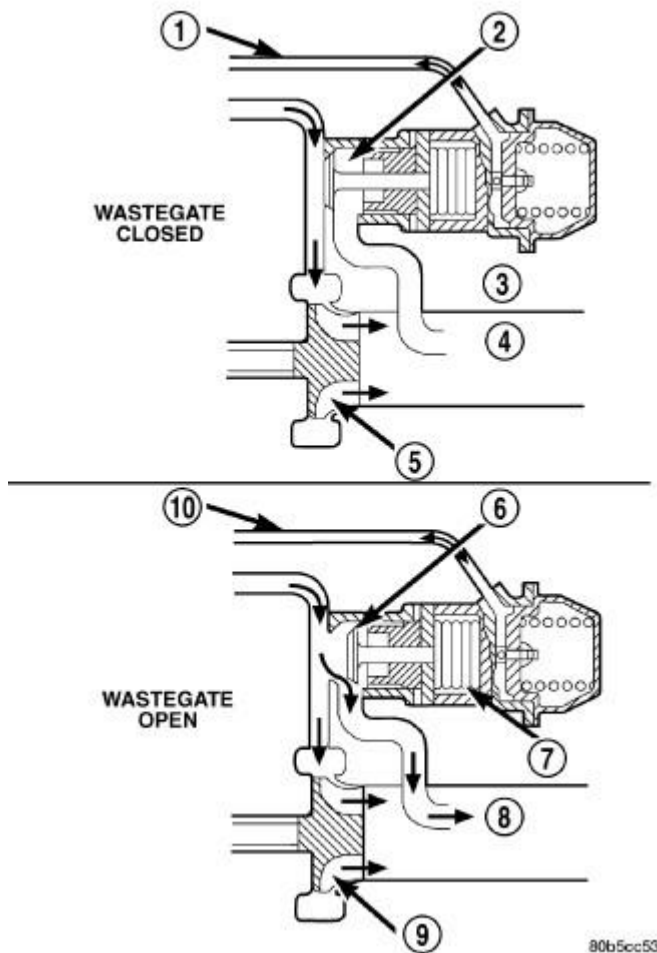
The turbocharger is an exhaust-driven supercharger which increases the pressure and density of the air entering the engine. With the increase of air entering the engine, more fuel can be injected into the cylinders, which creates more power during combustion.

The turbocharger assembly consists of four (4) major component systems:

- Turbine section (1)
- Compressor section (4)
- Bearing housing (3)
- Wastegate

OPERATION

OPERATION



80b5cc53

Fig. 568: Wastegate Operation

Courtesy of CHRYSLER GROUP, LLC

- | |
|--------------------------|
| 1 - SIGNAL LINE |
| 2 - EXHAUST BYPASS VALVE |
| 3 - WASTEGATE |
| 4 - EXHAUST |
| 5 - TURBINE |
| 6 - EXHAUST BYPASS VALVE |
| 7 - WASTEGATE |
| 8 - EXHAUST |
| 9 - TURBINE |
| 10 - SIGNAL LINE |

Exhaust gas pressure and energy drive the turbine, which in turn drives a centrifugal compressor that compresses the inlet air, and forces the air into the engine through the charge air cooler and plumbing. Since heat is a by-product of this compression, the air must pass through a charge air cooler to cool the incoming air and maintain power and efficiency.

Increasing air flow to the engine provides:

- Improved engine performance
- Improved operating economy
- Altitude compensation

The turbocharger also uses a wastegate (3), which regulates intake manifold air pressure and prevents over boosting at high engine speeds. When the wastegate valve is closed, all of the exhaust gases flow through the turbine wheel. As the intake manifold pressure increases, the wastegate actuator opens the valve, diverting some of the exhaust gases away from the turbine wheel. This limits turbine shaft speed and air output from the impeller.

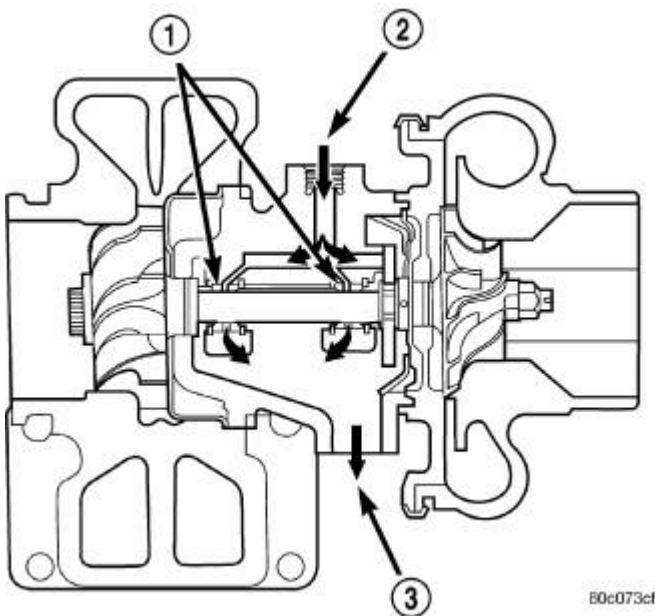


Fig. 569: Turbocharger Bearings, Oil Supply & Drain
Courtesy of CHRYSLER GROUP, LLC

1 - BEARINGS

2 - OIL SUPPLY (FROM ENGINE BLOCK)

3 - OIL RETURN (TO OIL PAN)

The turbocharger is cooled by engine coolant. The coolant is delivered to the turbocharger by a supply line that connects from engine block to the turbocharger. A coolant return line connects the turbocharger to heater tubes.

The turbocharger is lubricated by engine oil that is pressurized, cooled, and filtered. The oil is delivered to the turbocharger by a supply line that is tapped into the cylinder block. The oil travels into the bearing housing,

where it lubricates the shaft and bearings (1). A return pipe at the bottom of the bearing housing, routes the engine oil back to the crankcase.

The most common turbocharger failure is bearing failure related to repeated hot shutdowns with inadequate "cool-down" periods. A sudden engine shut down after prolonged operation will result in the transfer of heat from the turbine section of the turbocharger to the bearing housing. This causes the oil to overheat and break down, which causes bearing and shaft damage the next time the vehicle is started.

Letting the engine idle after extended operation allows the turbine housing to cool to normal operating temperature. The following chart should be used as a guide in determining the amount of engine idle time required to sufficiently cool down the turbocharger before shut down, depending upon the type of driving and the amount of cargo.

TURBOCHARGER "COOL DOWN" CHART	
Driving Conditions	Idle Time (in minutes) Before Shut Down
Normal Driving	Not required
Aggressive Driving or Heavily Loaded	3
Trailer Tow	5

REMOVAL

REMOVAL

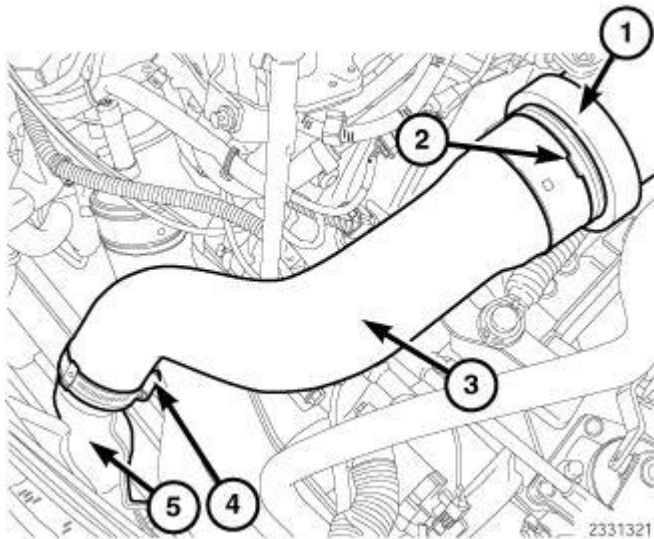


Fig. 570: Upper Charge Air Tube, Lock Ring, Lower Charge Air Tube, Clamp & Charge Air Cooler (CAC) Inlet

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine trim cover.
3. Remove the air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL**.

4. Release the lock ring (2) and remove the lower charge air tube (3) from the upper charge air to turbocharger tube (1).
5. Remove the upper charge air to turbocharger tube (1).

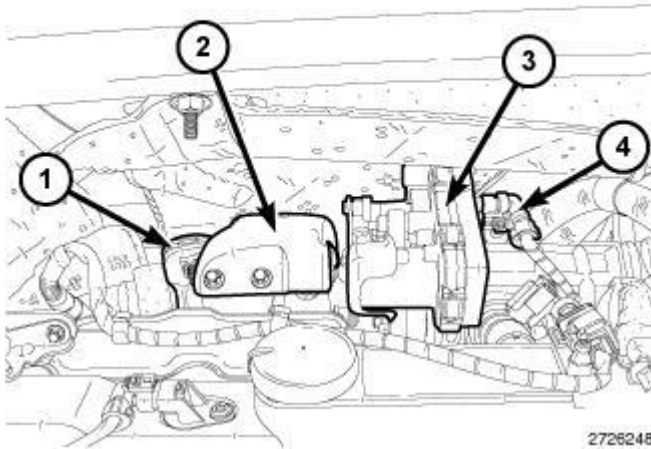


Fig. 571: Catalytic Converter, Turbocharger Heat Shield, Catalytic Converter Band Clamp & Upstream Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the electrical connector (4) from the turbocharger actuator (3).
7. Remove the catalytic converter. Refer to **CONVERTER, CATALYTIC, REMOVAL** .

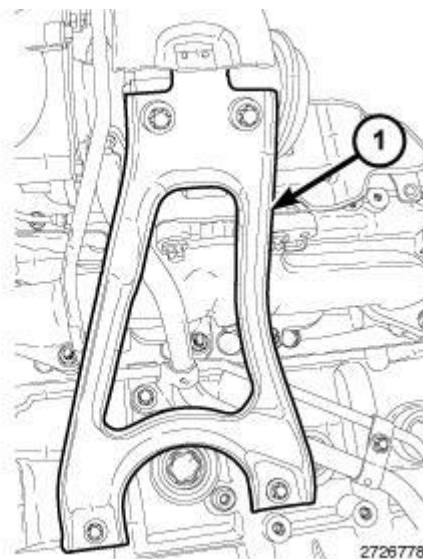


Fig. 572: Turbocharger Bracket
Courtesy of CHRYSLER GROUP, LLC

8. Remove the turbocharger bracket (1).

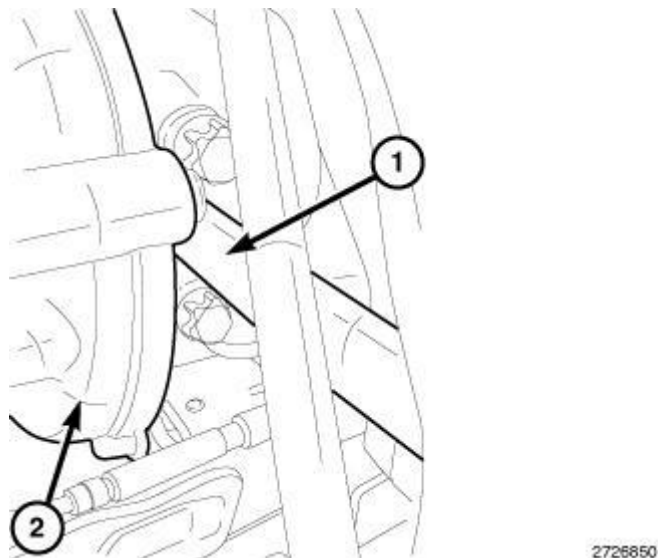


Fig. 573: Oil Return Line At Turbocharger
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the turbocharger temperature sensor from the engine wiring harness.
10. Remove the turbocharger oil return line (1) from the turbocharger (2).

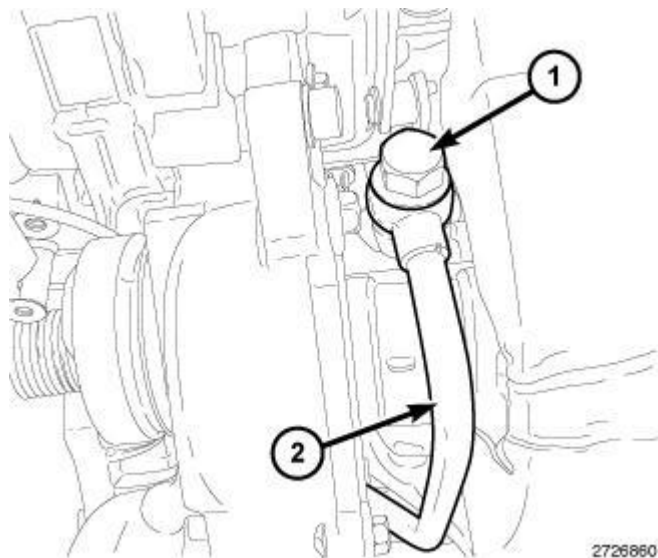


Fig. 574: Oil Supply Line & Banjo Bolt At Turbocharger
Courtesy of CHRYSLER GROUP, LLC

11. Remove the turbocharger oil send line (2) from the turbocharger.

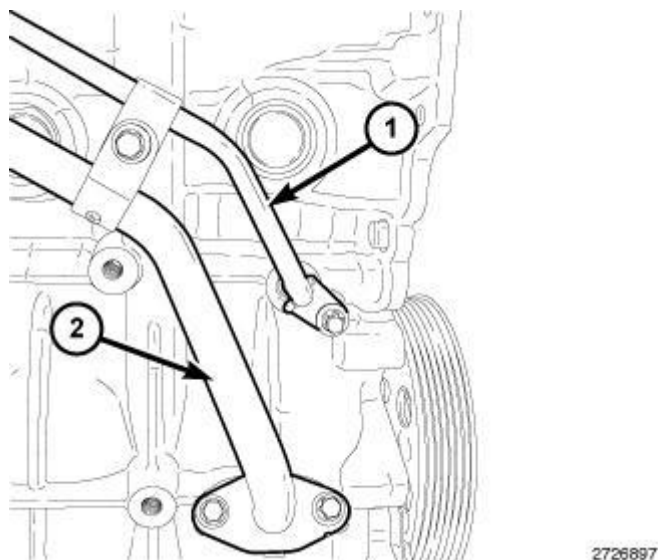


Fig. 575: Oil Supply & Return Lines
Courtesy of CHRYSLER GROUP, LLC

12. Remove the turbocharger oil send and return lines (1, 2) from the engine block and position aside.

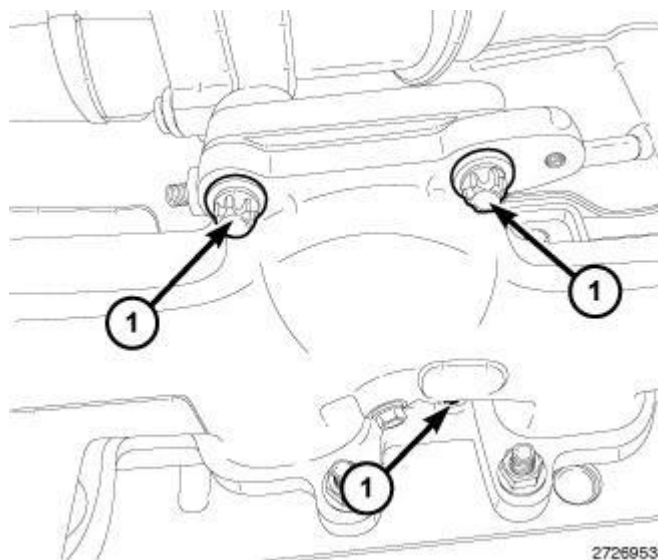


Fig. 576: Turbocharger-To-Exhaust Manifold Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Remove the turbocharger to exhaust manifold mounting bolts (1) from under the exhaust manifold.
14. Remove the turbocharger from underneath the vehicle.

INSPECTION

INSPECTION

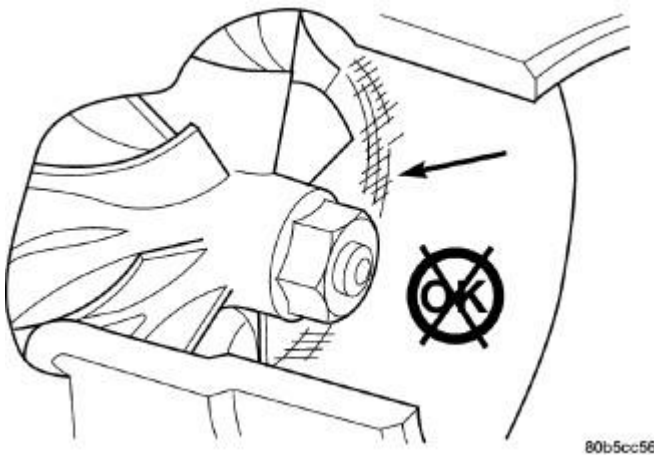


Fig. 577: Inspect Compressor Housing For Impeller Rubbing Condition
 Courtesy of CHRYSLER GROUP, LLC

Visually inspect the turbocharger and exhaust manifold gasket surfaces. Replace stripped or eroded mounting studs.

1. Visually inspect the turbocharger for cracks. The following cracks are NOT acceptable:
 - Cracks in the turbine and compressor housing that go completely through.
 - Cracks in the mounting flange that are longer than 15 mm (0.6 in.).
 - Cracks in the mounting flange that intersect bolt through-holes.
 - Two (2) Cracks in the mounting flange that are closer than 6.4 mm (0.25 in.) together.
2. Visually inspect the impeller and compressor wheel fins for nicks, cracks, or chips.
3. Visually inspect the turbocharger compressor housing for an impeller rubbing condition. Replace the turbocharger if the condition exists.

INSTALLATION

INSTALLATION

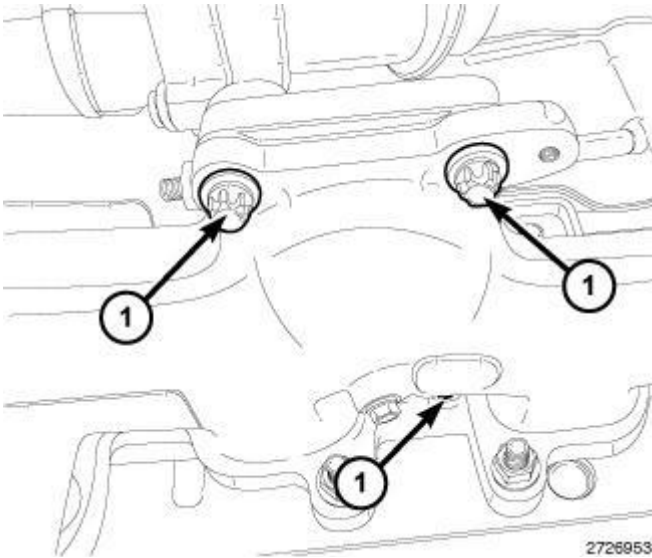


Fig. 578: Turbocharger-To-Exhaust Manifold Mounting Bolts
 Courtesy of CHRYSLER GROUP, LLC

1. From under the vehicle, position the turbocharger assembly to the exhaust manifold.
2. Install the turbocharger to exhaust manifold mounting bolts (1). Tighten the bolts to 20 N.m + 90° (177 ft.lbs + 90°)

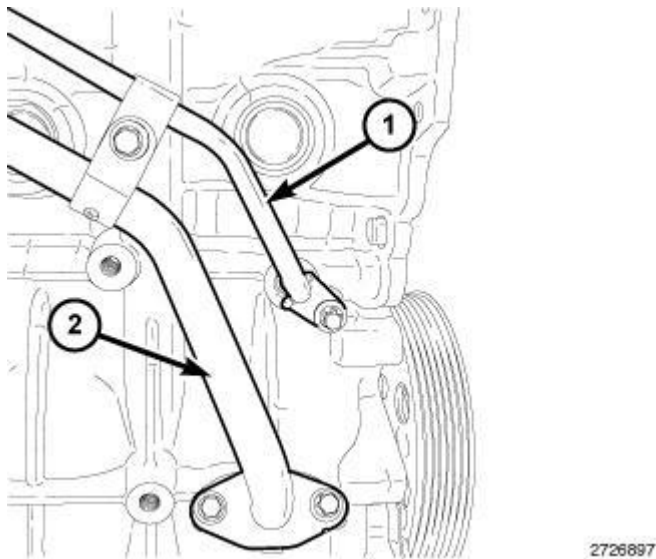


Fig. 579: Oil Supply & Return Lines
 Courtesy of CHRYSLER GROUP, LLC

3. Install the turbocharger oil send and return lines (1, 2) to the engine block. Tighten the bolts to 9 N.m (80 in. lbs.).

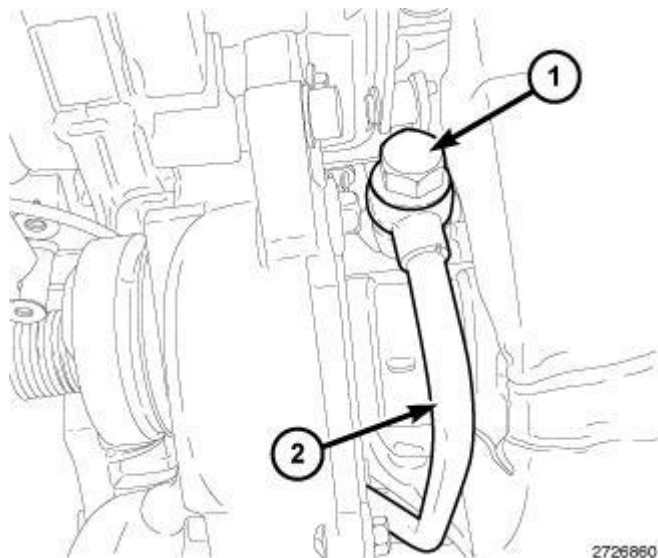


Fig. 580: Oil Supply Line & Banjo Bolt At Turbocharger
Courtesy of CHRYSLER GROUP, LLC

4. Install the turbocharger oil feed line (2) to the turbocharger. Tighten the banjo bolt (1) to 24 N.m (18 ft.lbs.).

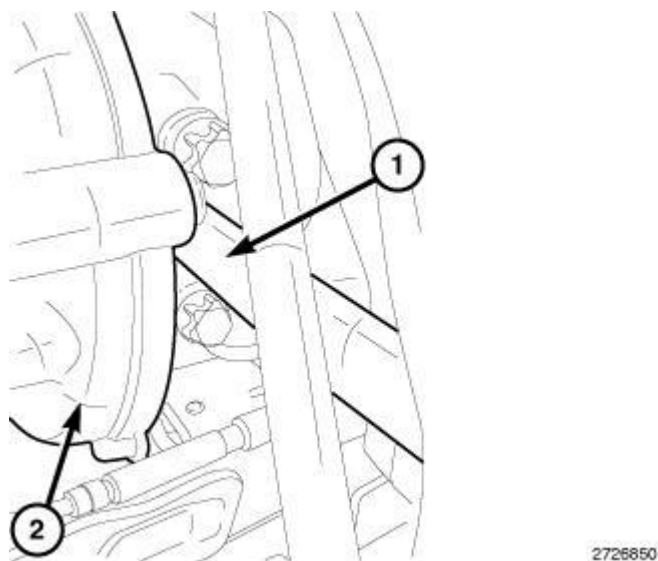


Fig. 581: Oil Return Line At Turbocharger
Courtesy of CHRYSLER GROUP, LLC

5. Install the turbocharger oil return line to the turbocharger assembly. Tighten the fasteners to 9 N.m (80 in. lbs.).
6. Connect the turbocharger temperature sensor to the engine wiring harness.

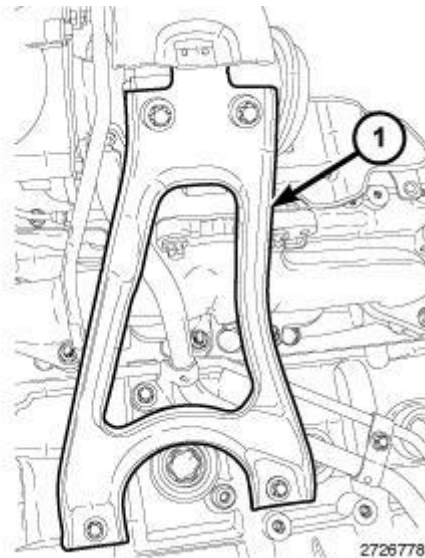


Fig. 582: Turbocharger Bracket
 Courtesy of CHRYSLER GROUP, LLC

7. Install the turbocharger bracket (1). Tighten the fasteners to 20 N.m (15 ft. lbs.).

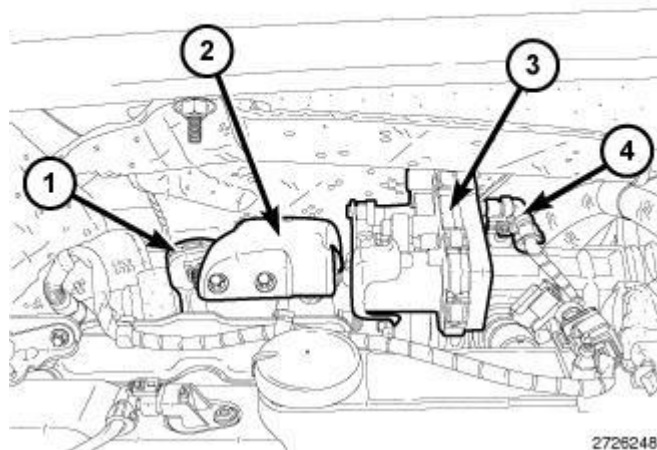


Fig. 583: Catalytic Converter, Turbocharger Heat Shield, Catalytic Converter Band Clamp & Upstream Temperature Sensor
 Courtesy of CHRYSLER GROUP, LLC

8. Install the catalytic converter. Refer to **CONVERTER, CATALYTIC, INSTALLATION**.
9. Connect the electrical connector (4) to the turbocharger actuator (3).

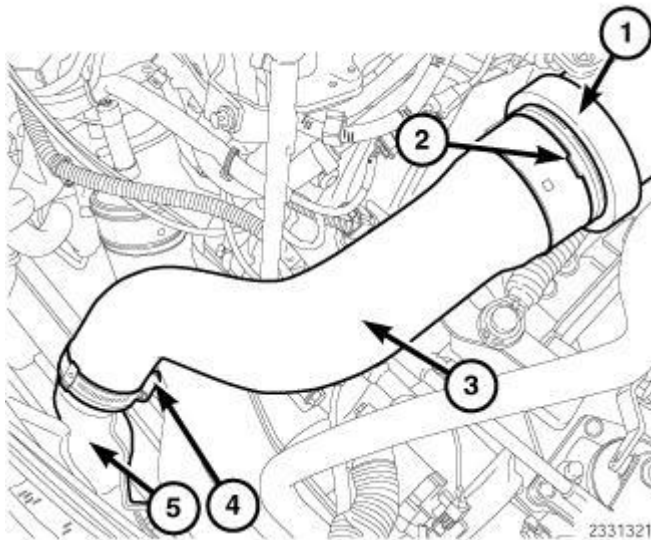


Fig. 584: Upper Charge Air Tube, Lock Ring, Lower Charge Air Tube, Clamp & Charge Air Cooler (CAC) Inlet

Courtesy of CHRYSLER GROUP, LLC

10. Install the upper charge air to turbocharger tube.
11. Install the upper charge air tube (1) to the lower charge air tube (3). Connect the lock ring (2).
12. Install the air cleaner assembly. Refer to **BODY, AIR CLEANER, INSTALLATION**.
13. Install the engine trim cover.
14. Connect negative battery cable.

VALVE TIMING

CHAIN, TIMING

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.

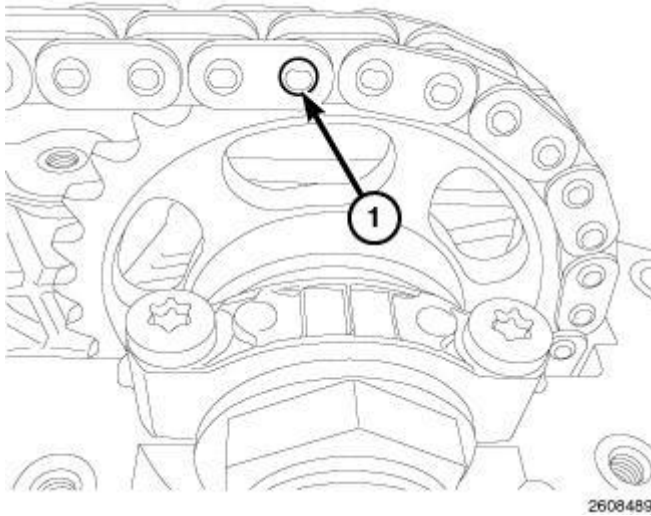


Fig. 585: Timing Chain Pin At Chain Link
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Be sure that the thrust pin is centered on the chain link before attempting to remove pin or damage to chain or tools may result

4. When fitting the Chain Link Tool (special tool #9312-1, Block, Pressing) thrust spindle, ensure that the thrust pin is positioned at the left timing chain pin of a chain link (1) and is centered or damage to chain result.

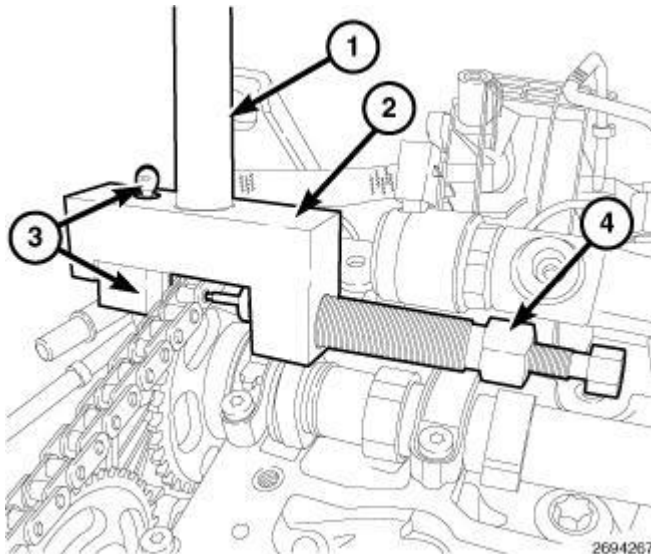


Fig. 586: Chain Link Tool, Handle, Insert & Thrust Screw/Pin
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Cover timing chain cover recess to prevent foreign material from entering engine.

5. Assemble Chain Link Tool (special tool #9312-1, Block, Pressing) (2) using (special tool #9312-2, Handle) handle (1), and (special tool #9312-4, Assembly, Screw, Forcing) (4) thrust screw/pin. Install insert (special tool #9312-13, Guide, Pin Removal) (3) and retain with screw provided and install into timing chain.

CAUTION: Care must be taken not to drop timing chain plates into the engine once the timing chain is separated.

NOTE: when installing Chain Link Tool (special tool #9312-1, Block, Pressing) onto timing chain link, be sure to back off the smaller nut of the thrust pin (special tool #9312-4, Assembly, Screw, Forcing) so tool can be installed on timing chain. Screw the thrust spindle #(special tool #9312-4, Assembly, Screw, Forcing) in until it is seated and aligned properly over the left timing chain pin of a chain link, as viewed.

6. Screw the thrust pin in and separate the timing chain.
7. Unscrew the thrust spindle and remove the tool.
8. Remove pressed - out timing chain pin from chain separation tool.
9. Remove the camshaft. Refer to CAMSHAFT, ENGINE, REMOVAL.

INSTALLATION

INSTALLATION

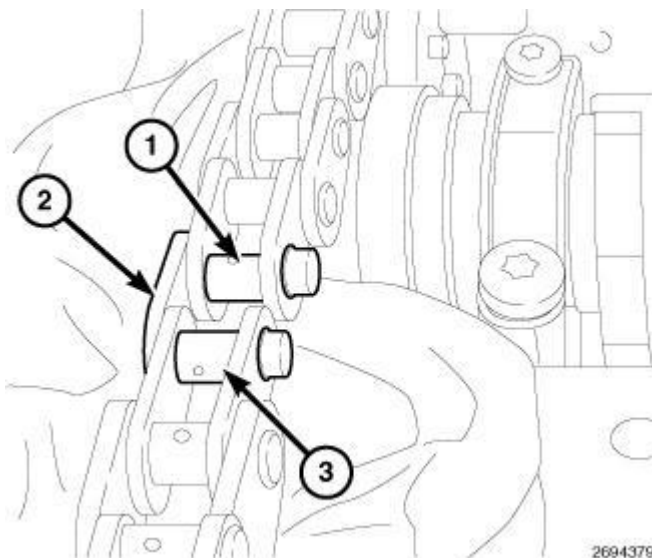


Fig. 587: Connecting New Timing Chain With Old Timing Chain With Assembly Link
Courtesy of CHRYSLER GROUP, LLC

CAUTION: IT IS ESSENTIAL that the installation procedure is followed exactly. Failure to do so will result in severe engine damage.

CAUTION: Cover timing case recesses to prevent foreign material from entering engine.

1. Connect new timing chain (3) and old timing chain (1) with assembly link (special tool #8951, Assembly Links) (2), assembly plate and locking element, and secure.

NOTE: Rotate engine at crankshaft only. DO NOT rotate engine backward.

NOTE: Draw out the end of old timing chain evenly as it becomes free, to the same extent that new timing chain is drawn in.

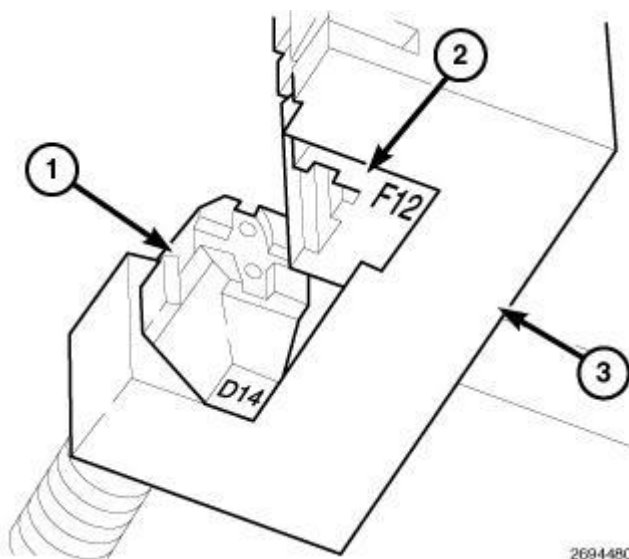
2. Using the Vibration Damper Holder (special tool #10236, Holder, Vibration Damper), draw in new timing chain by rotating the crankshaft slowly in direction of rotation of engine until the ends of the new timing chain meet and can be connected.
3. Verify that the engine is at TDC.

NOTE: Install the camshafts and stop at step 8. Now continue with the timing chain installation procedure and then resume with camshaft installation procedure.

4. Install the camshafts. Refer to CAMSHAFT, ENGINE, INSTALLATION.

NOTE: Assembly link is only an assembly aid and NOT designed for engine running.

5. Remove assembly link (special tool #8951, Assembly Links) locking element, outer plate, and link (2).
6. Engage both halves of the new timing chain into the timing chain gear.
7. Install the new chain center link plate (2).



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Fig. 588: Rivet Press Tool, Anvil & Thrust Piece

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Cover voids in timing chain cover. Be careful not to allow the guide link to fall into the timing chain cover as the new link is pressed in.

NOTE: The outer plate is held magnetically by link plate installation tool.

8. Assemble the Rivet Press Tool (special tool #10241, Screw, Forcing) (3), with the anvil (special tool #10228-F12, Guide Piece) (2), and thrust piece (special tool #10228-D14, Thrust Piece) (1).

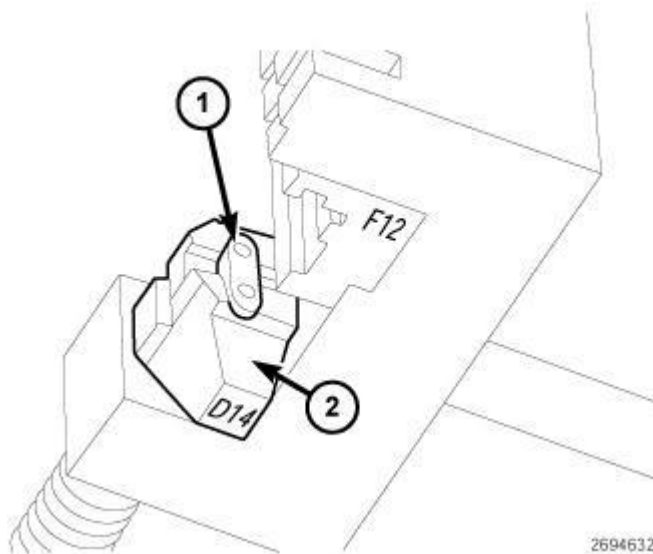


Fig. 589: Placing Outer Plate Into Thrust Piece With Digit D14

Courtesy of CHRYSLER GROUP, LLC

NOTE: The outer plate (1) is retained magnetically.

9. Place outer plate (1) into thrust piece (special tool #10228, Assembly, Inserts Timing Chain) with digit D14 (2).

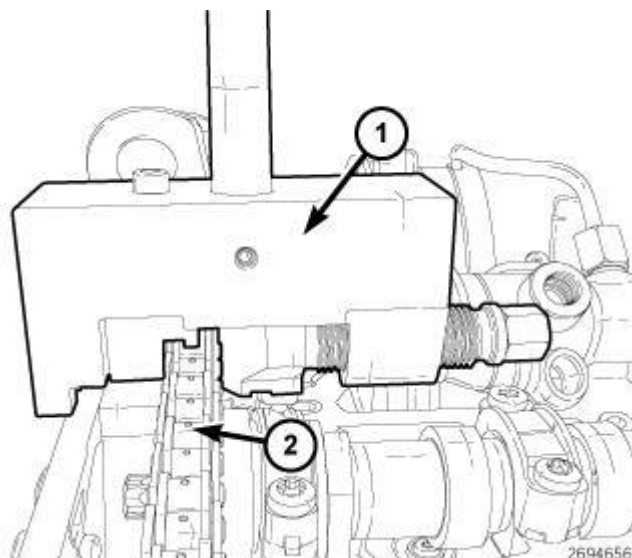


Fig. 590: Installing Rivet Press Tool Onto Timing Chain
 Courtesy of CHRYSLER GROUP, LLC

10. Install Rivet Press Tool (special tool #10241, Screw, Forcing) (1) onto the timing chain (2) and tighten spindle until link plate is fully seated and remove tool (1).

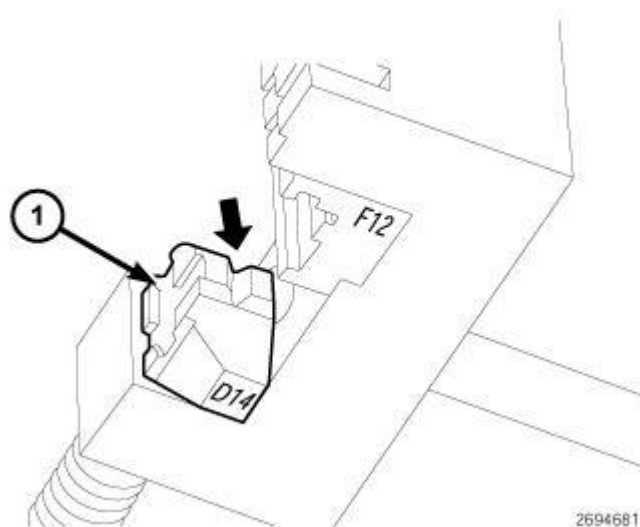


Fig. 591: Turning Over Thrust Piece With Digit D14
 Courtesy of CHRYSLER GROUP, LLC

11. Turn over thrust piece (special tool #10228, Assembly, Inserts Timing Chain) (1) with digit D14 on the riveted profile as indicated by arrow.

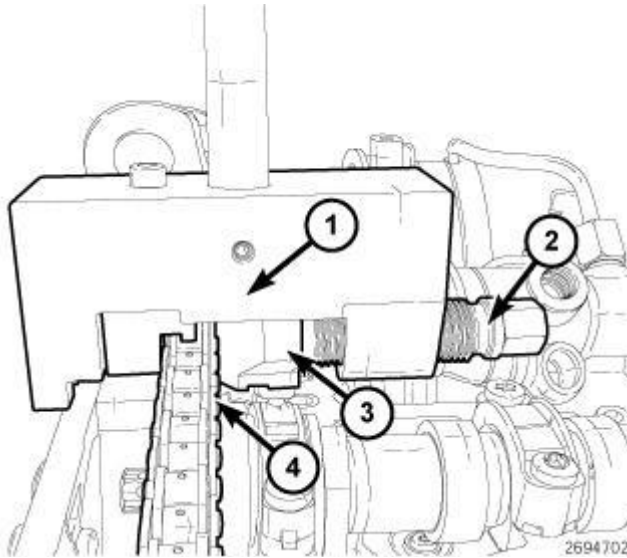


Fig. 592: Riveting Press Tool, Timing Chain Thrust Spindle, Thrust Piece & Timing Chain
Courtesy of CHRYSLER GROUP, LLC

NOTE: Ensure that the riveted link and riveting tool are aligned.

12. Position Riveting Press Tool (special tool #10241, Screw, Forcing) (1) exactly over middle of pin.
13. Tighten the timing chain thrust spindle (2) until thrust piece (3) is fully seated against the timing chain (4) to 32 N.m (24 ft. lbs.). Repeat process for both link rivets.

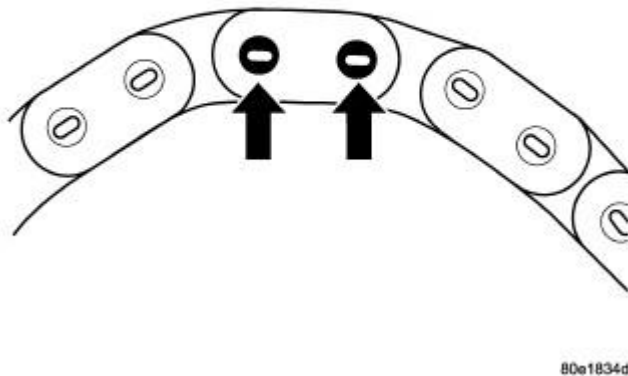


Fig. 593: Rivet Inspection
Courtesy of CHRYSLER GROUP, LLC

14. Remove Riveting Press Tool (special tool #10241, Screw, Forcing) and inspect rivets to ensure they have been properly peened as indicated. Repeat process if necessary.

15. Install cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION.**
16. Install engine cover.
17. Connect the negative battery cable.

COVER(S), ENGINE TIMING

REMOVAL

UPPER TIMING CHAIN COVER

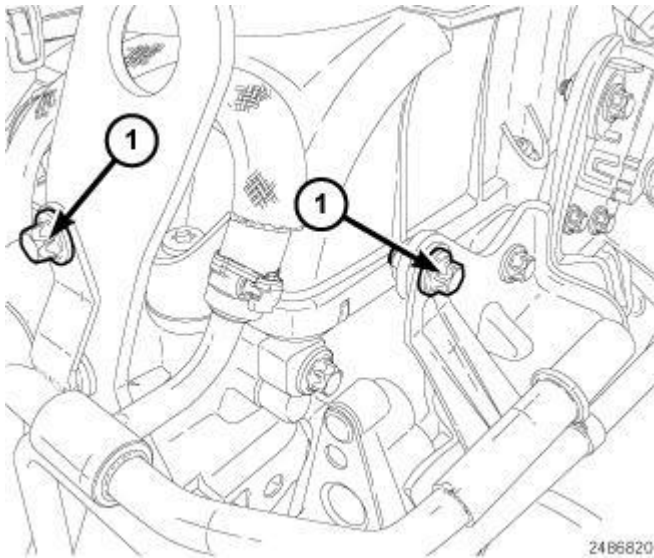


Fig. 594: Upper Fuel Line Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL.**
3. Remove the two upper fuel line bracket bolts (1).

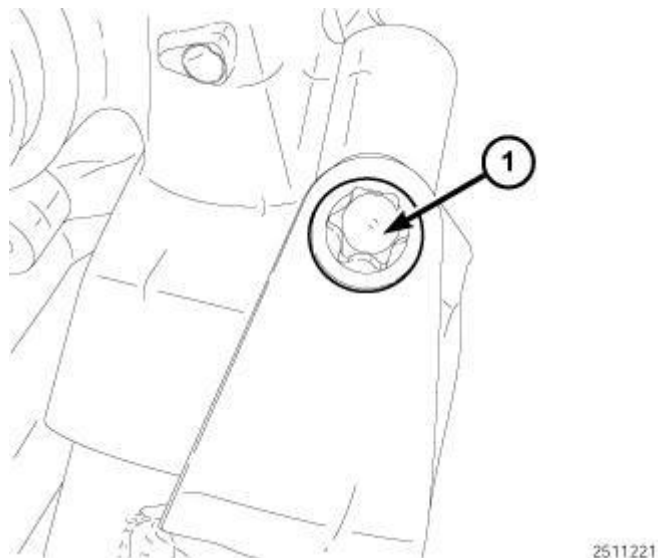


Fig. 595: Charge Air Cooler (CAC) Tube Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Remove the bolt (1) securing the Charge Air Cooler (CAC) tube to turbocharger.

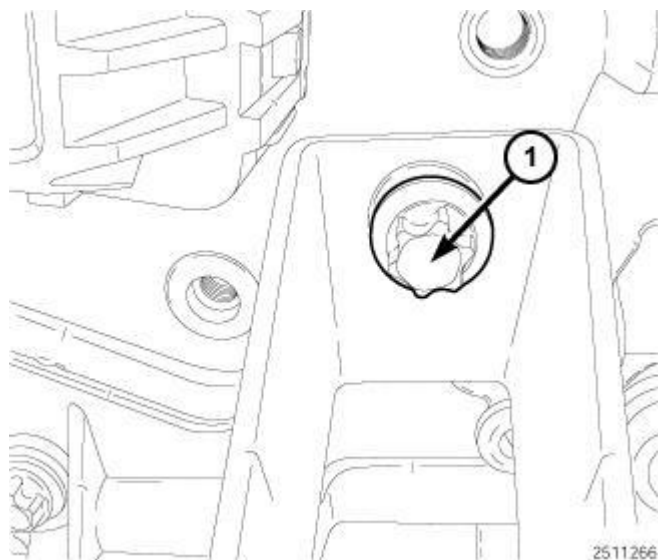


Fig. 596: Bolt Securing CAC Tube To Glow Plug Module
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolt (1) securing the (CAC) tube to glow plug module.

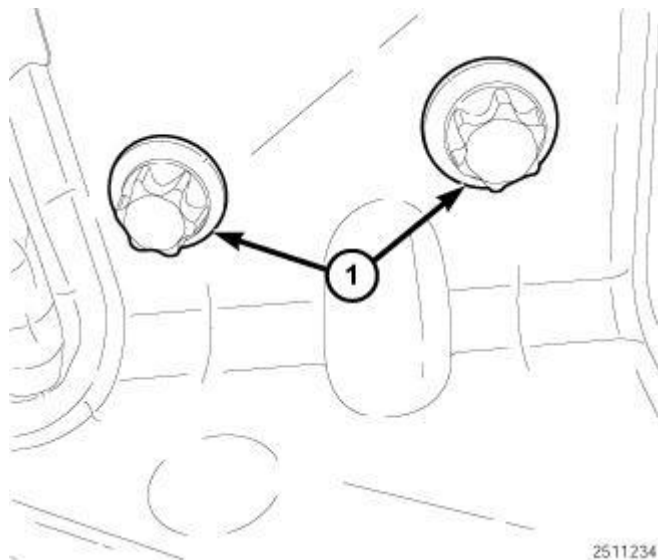


Fig. 597: CAC Tube & Bracket Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove bolts (1) and the (CAC) tube and bracket assembly.

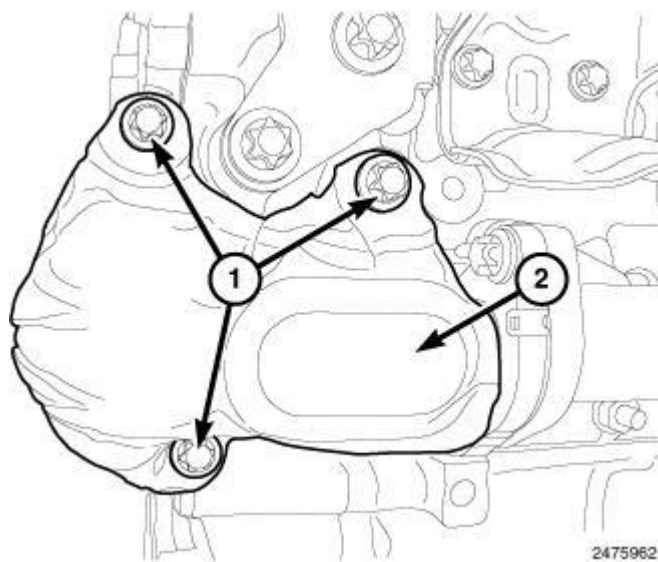


Fig. 598: EGR Pipe Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (1) and the EGR pipe heat shield (2).

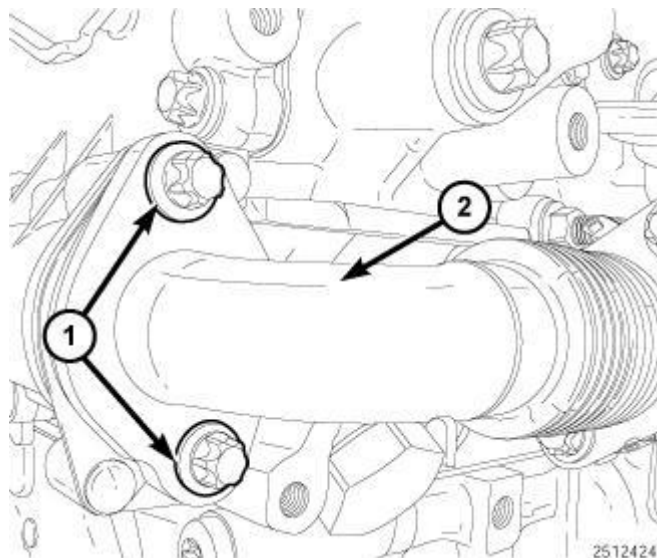


Fig. 599: EGR Pipe & Bolts

Courtesy of CHRYSLER GROUP, LLC

8. Remove bolts (1) from the EGR pipe (2).
9. Remove the cooling fan module. Refer to **FAN, COOLING, REMOVAL** .

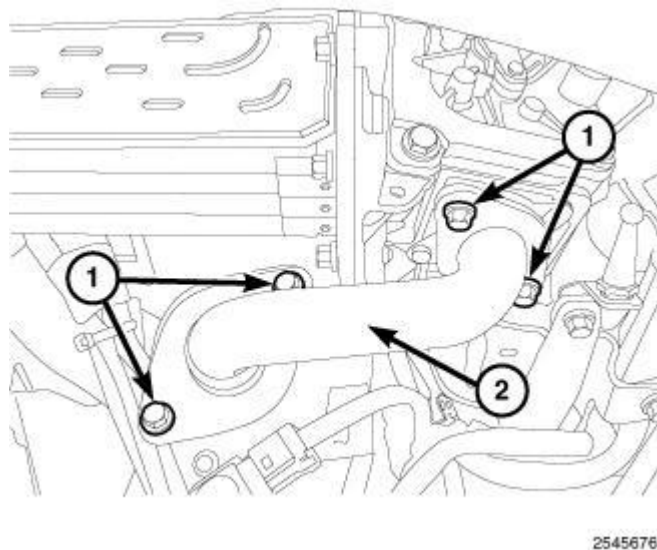
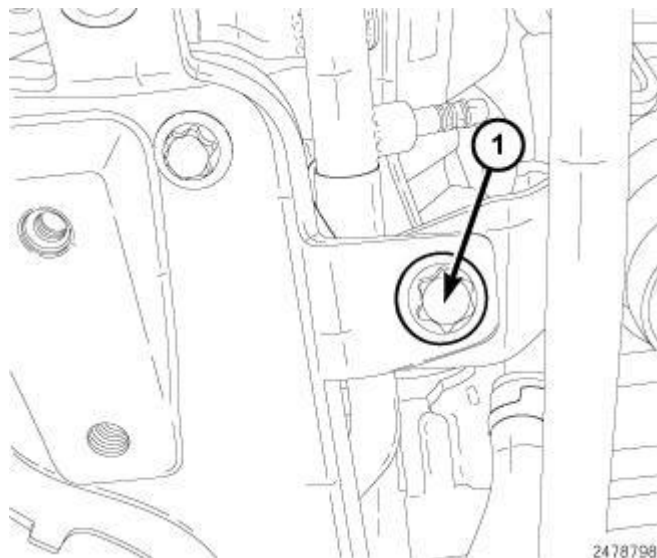


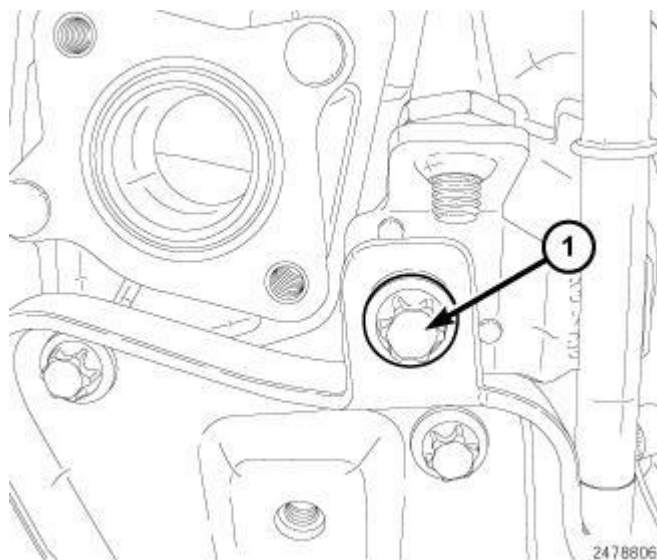
Fig. 600: EGR Tube & Bolts

Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the EGR tube (2).

**Fig. 601: Oil Dip Stick Bolt****Courtesy of CHRYSLER GROUP, LLC**

11. Remove the bolt (1) securing the oil dip stick tube.

**Fig. 602: Vacuum Tube Bolt****Courtesy of CHRYSLER GROUP, LLC**

12. Remove the bolt (1) securing the vacuum tube.

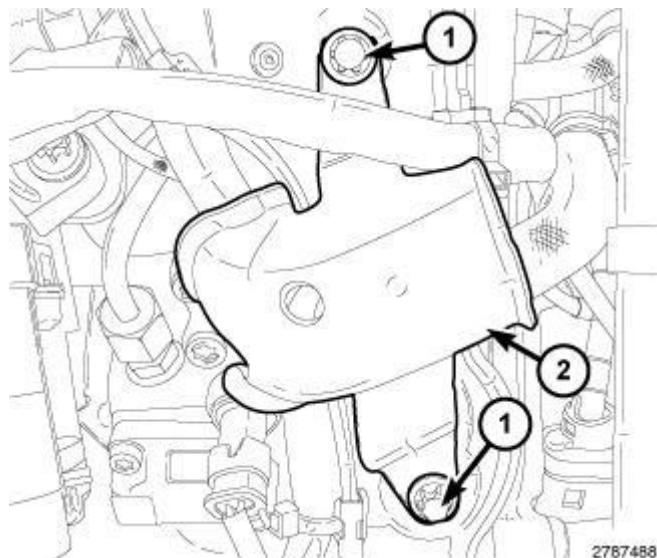


Fig. 603: Bolts & Heat Shield
Courtesy of CHRYSLER GROUP, LLC

13. Remove bolts (1) and the heat shield (2).

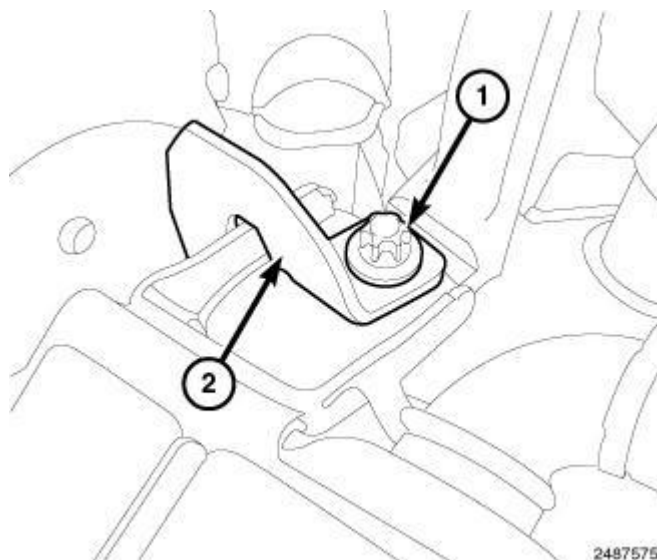


Fig. 604: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

14. Loosen the upper EGR cooler bolt (1).

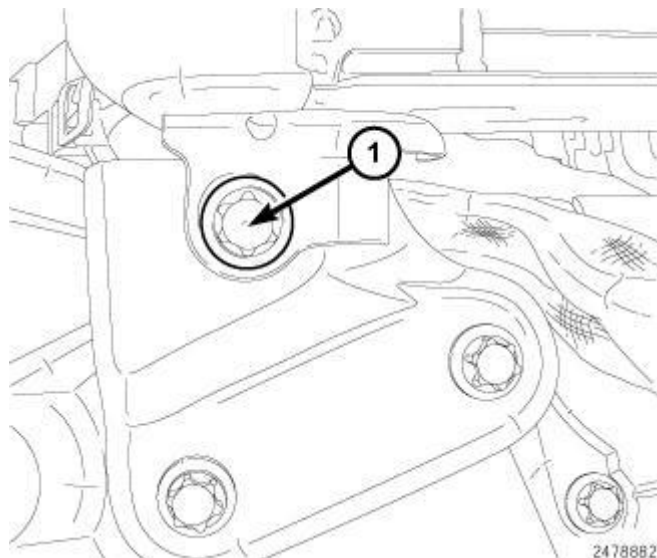


Fig. 605: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

15. Loosen the lower EGR cooler bolt (1).

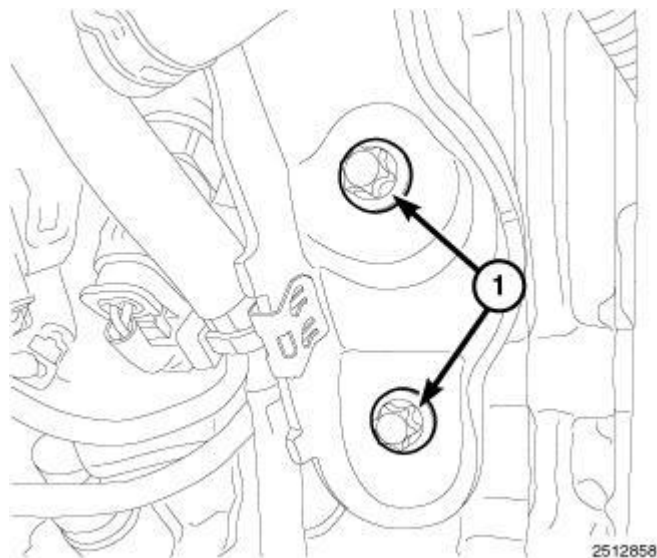


Fig. 606: EGR Support Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

16. Loosen the EGR support bracket bolts (1).

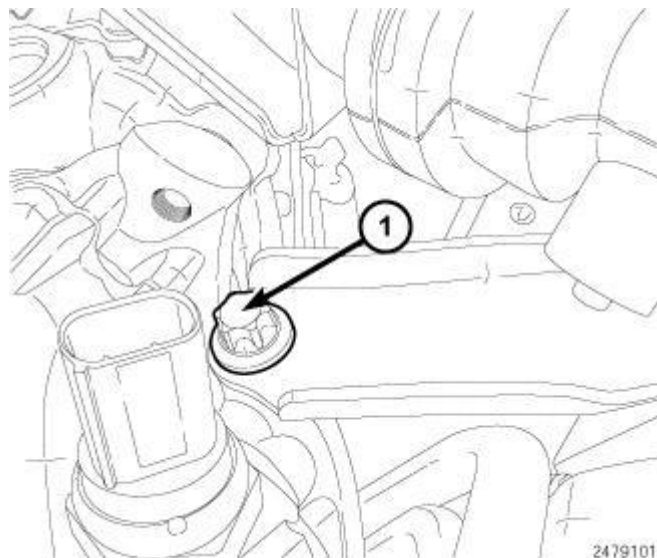


Fig. 607: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

17. Remove the support bracket bolt (1).

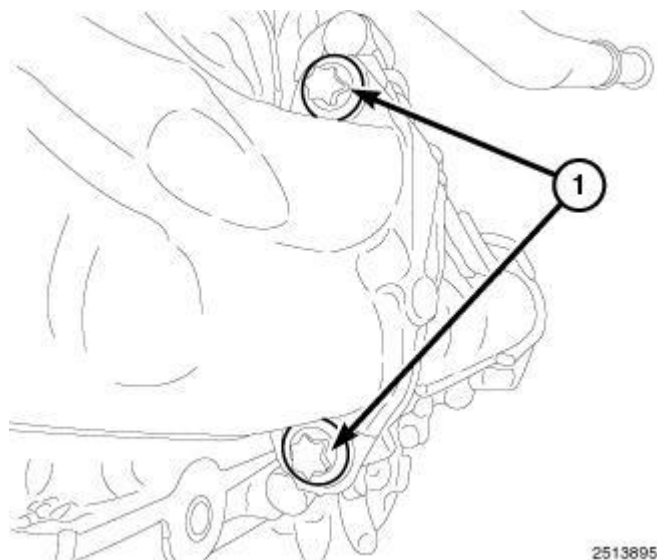


Fig. 608: EGR Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Remove two bolts (1) and pull back on the EGR assembly.

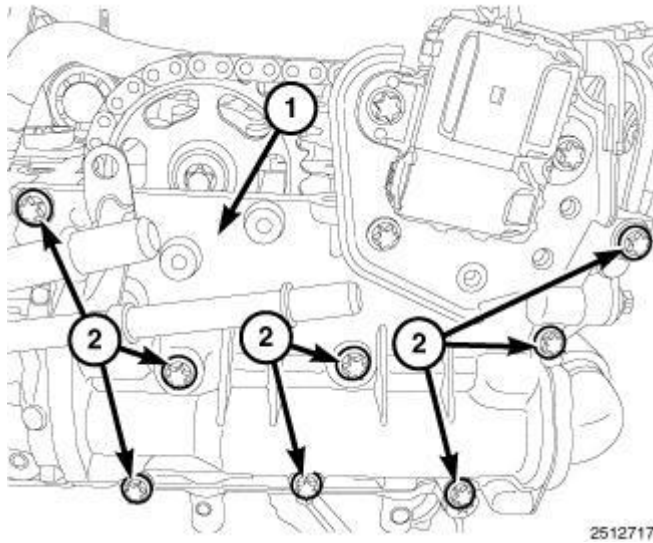


Fig. 609: Timing Chain Upper Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Remove bolts (2) and the timing chain upper cover (1).

LOWER TIMING CHAIN COVER

NOTE: The engine must be removed from the vehicle to remove the timing chain cover.

1. Remove the engine. Refer to **REMOVAL**.
2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL**.
3. Remove the flywheel assembly. Refer to **FLYWHEEL, REMOVAL**.

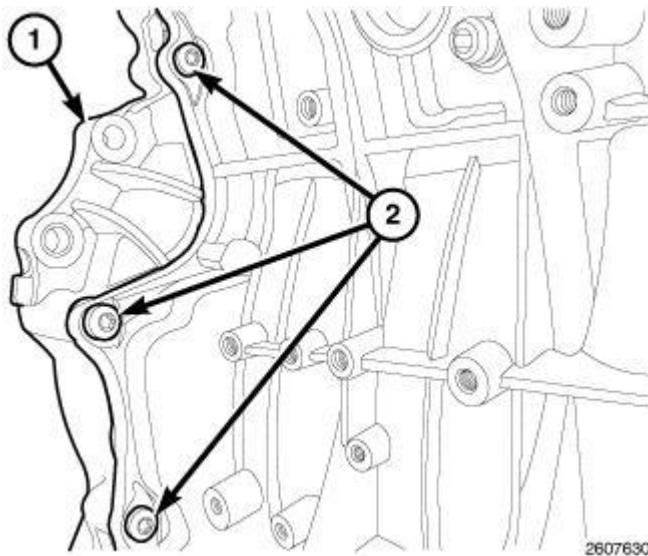


Fig. 610: Locating Bolts At Backside Of Timing Cover
Courtesy of CHRYSLER GROUP, LLC

4. Remove the bolts (2) from backside of timing cover.

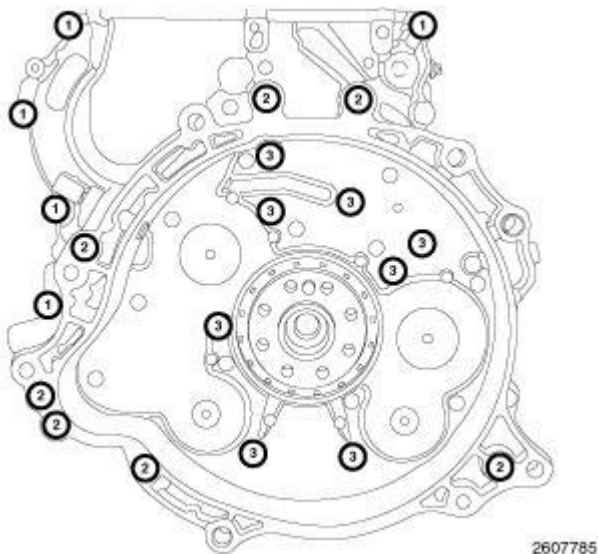


Fig. 611: Timing Chain Cover At Engine Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolts (1, 2, and 3) and the timing chain cover from engine.

INSTALLATION

UPPER TIMING CHAIN COVER

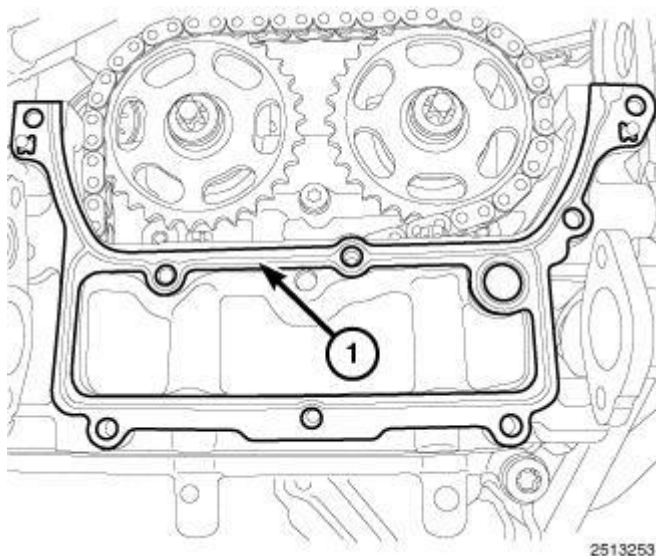
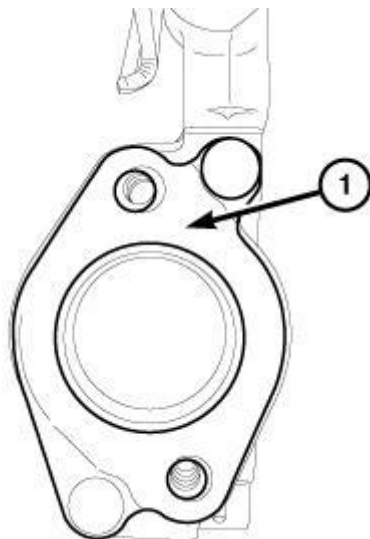


Fig. 612: Upper Timing Cover Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket mating surfaces install a new upper timing cover gasket (1).



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Fig. 613: Upper Timing Cover-To-EGR Pipe Gasket
Courtesy of CHRYSLER GROUP, LLC

2. Install a new gasket (1) onto upper timing cover to EGR pipe.



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Fig. 614: Cylinder Head Rear Cover-To-EGR Gasket
Courtesy of CHRYSLER GROUP, LLC

3. Install a new gasket (1) onto cylinder head rear cover to EGR.

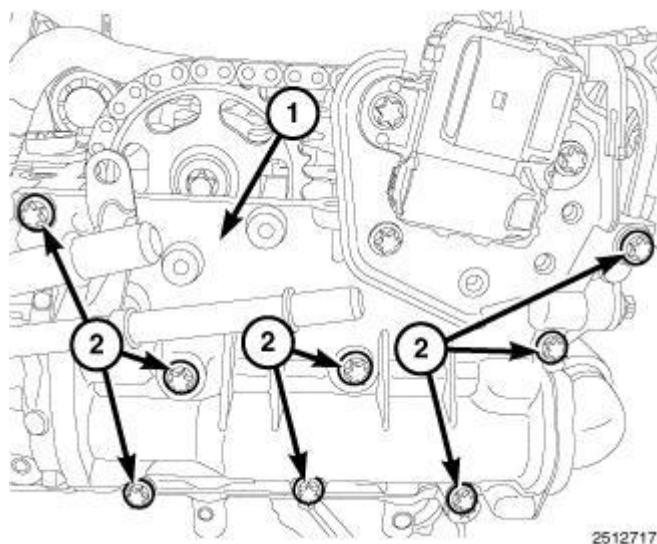


Fig. 615: Timing Chain Upper Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the cylinder head rear cover (1). Tighten bolts (2) to 9 N.m (80 in. lbs.).

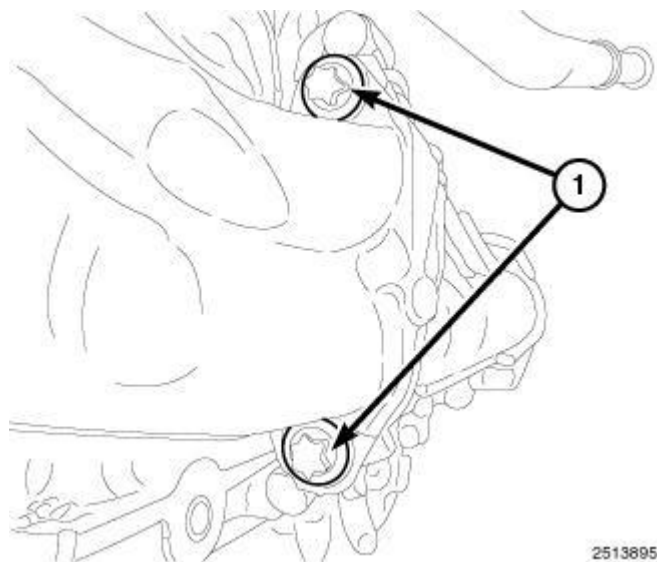


Fig. 616: EGR Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Install the EGR cooler manifold. Tighten bolts (1) to 9 N.m (80 in. lbs.).

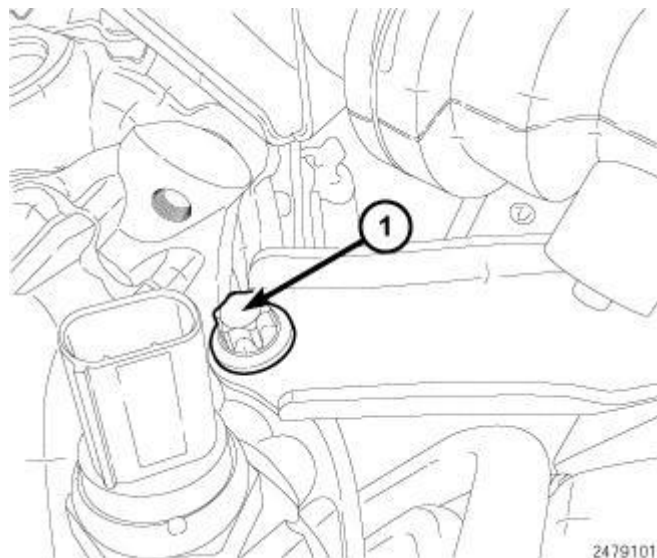


Fig. 617: Support Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Install the support bracket bolt (1). Tighten bolts (1) to 9 N.m (80 in. lbs.).

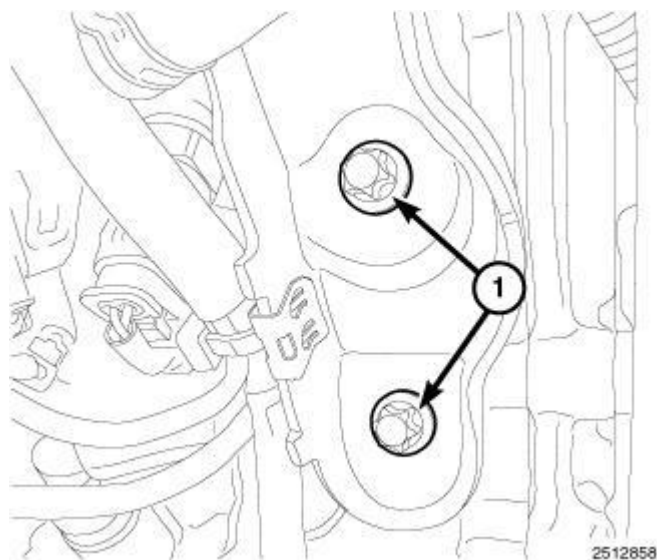


Fig. 618: EGR Support Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Tighten the EGR support bracket bolts (1) to 9 N.m (80 in. lbs.).

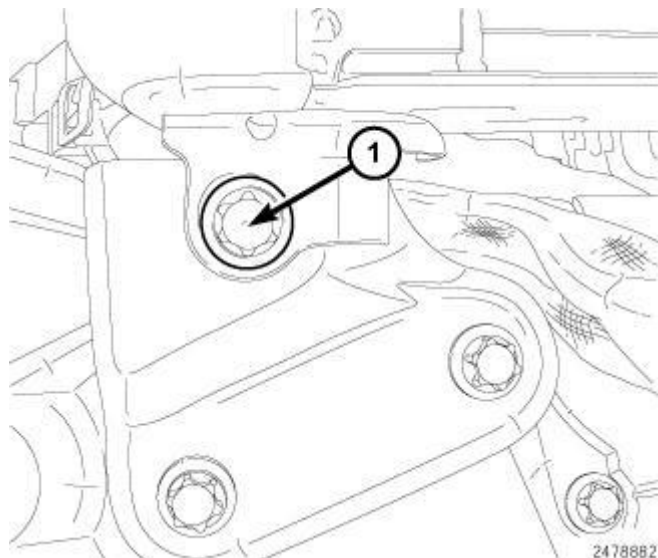


Fig. 619: Lower EGR Cooler Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Tighten the lower EGR cooler bolt (1) to 9 N.m (80 in. lbs.).

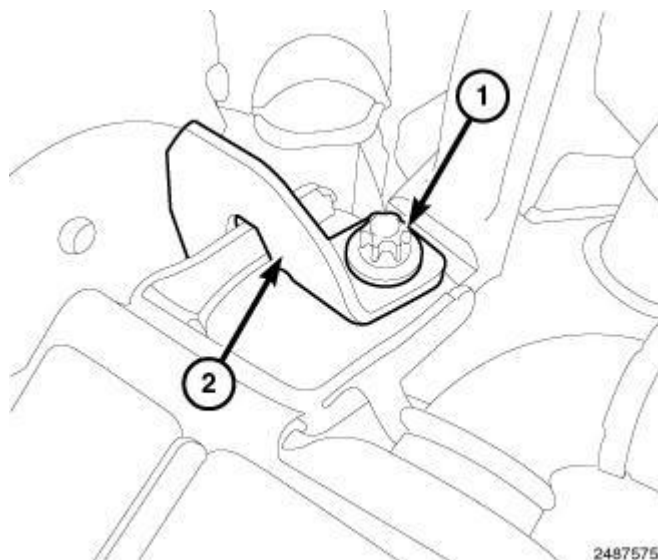
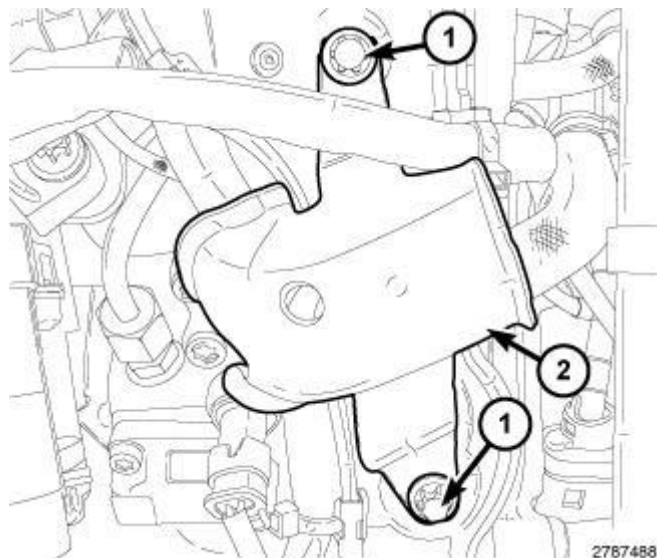
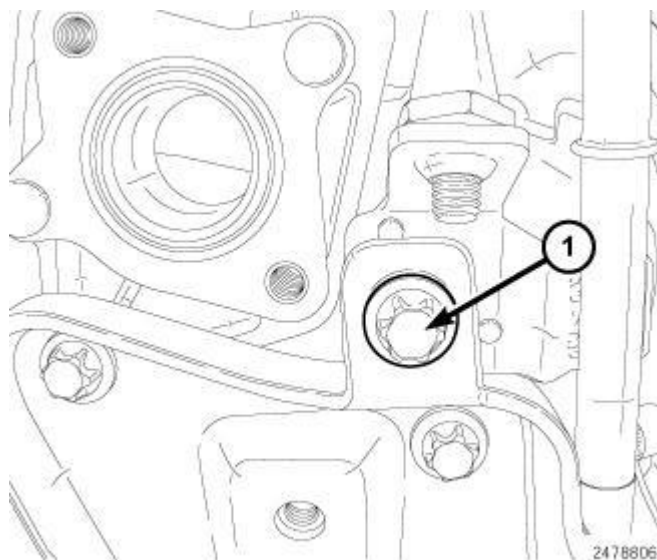


Fig. 620: Upper EGR Cooler Bolt & Bracket
Courtesy of CHRYSLER GROUP, LLC

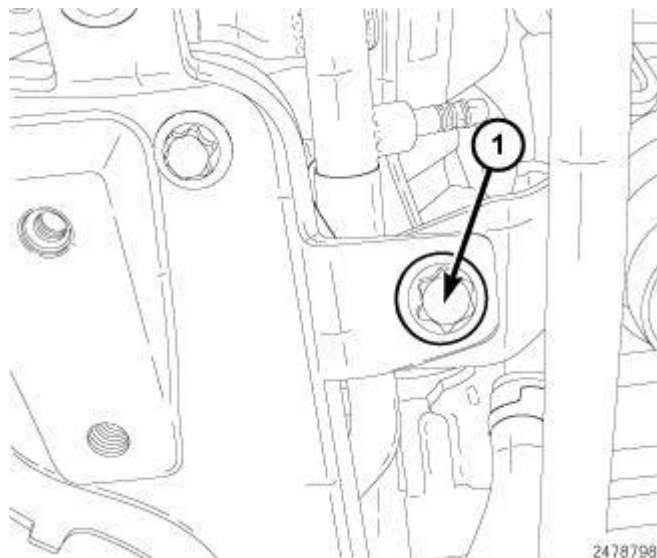
9. Tighten the upper EGR cooler bolt (1) to 9 N.m (80 in. lbs.).

**Fig. 621: Bolts & Heat Shield****Courtesy of CHRYSLER GROUP, LLC**

10. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

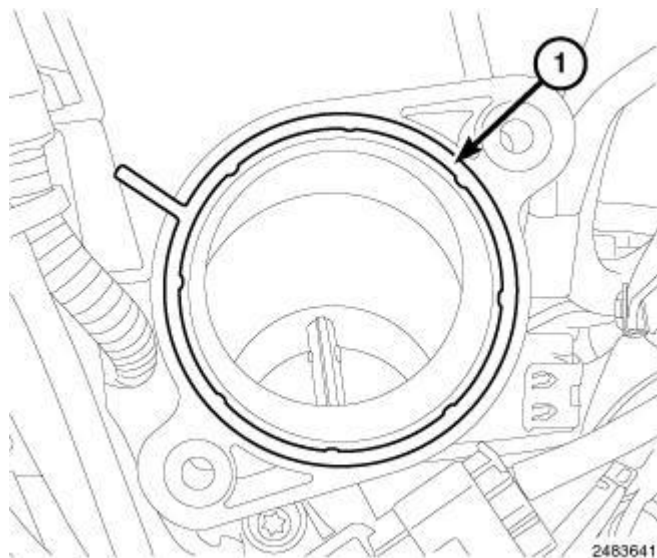
**Fig. 622: Vacuum Tube Bolt****Courtesy of CHRYSLER GROUP, LLC**

11. Install the bolt (1) securing the vacuum tube. Tighten bolt (1) to 9 N.m (80 in. lbs.).

**Fig. 623: Oil Dip Stick Bolt**

Courtesy of CHRYSLER GROUP, LLC

12. Install the bolt (1) securing the oil dip stick tube. Tighten bolt (1) to 9 N.m (80 in. lbs.).

**Fig. 624: EGR Tube Gasket Onto Mixing Chamber**

Courtesy of CHRYSLER GROUP, LLC

13. Clean the gasket surfaces and install a new gasket (1).

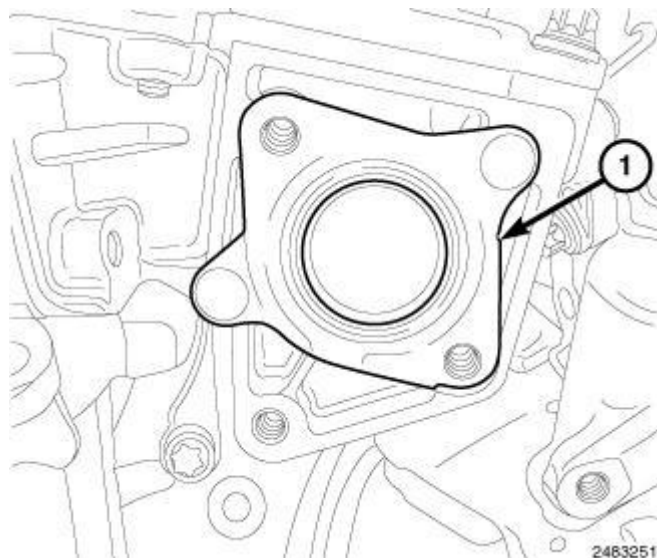


Fig. 625: EGR Tube Gasket Onto EGR Actuator
Courtesy of CHRYSLER GROUP, LLC

14. Clean the gasket surfaces and install a new gasket (1).

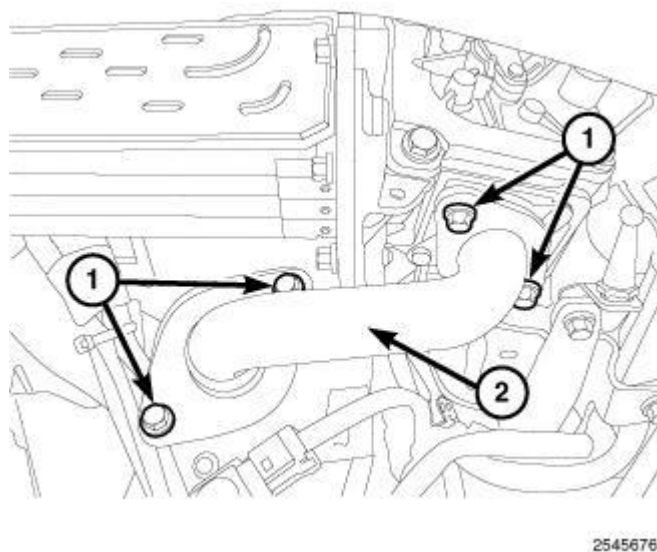
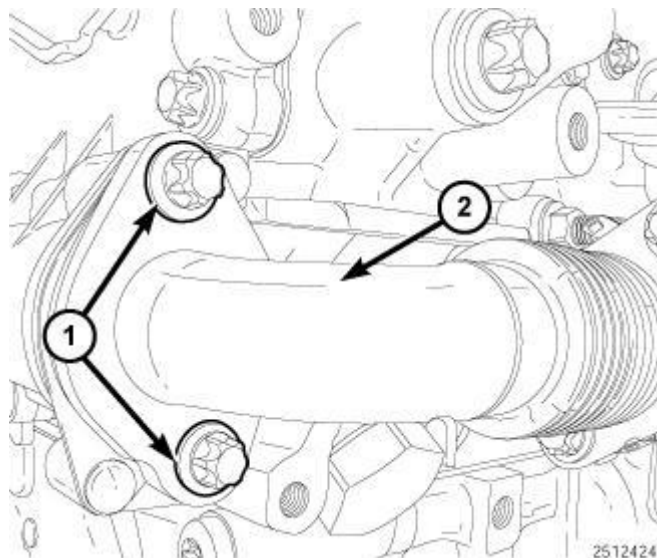


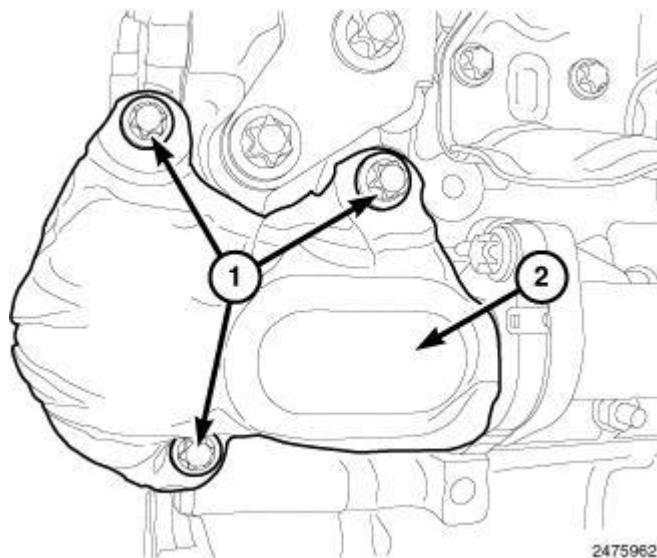
Fig. 626: EGR Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Install the EGR tube (2). Tighten bolt (1) to 9 N.m (80 in. lbs.).

**Fig. 627: EGR Pipe & Bolts**

Courtesy of CHRYSLER GROUP, LLC

16. Install bolts (1) to the EGR pipe (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

**Fig. 628: EGR Pipe Heat Shield & Bolts**

Courtesy of CHRYSLER GROUP, LLC

17. Install the heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

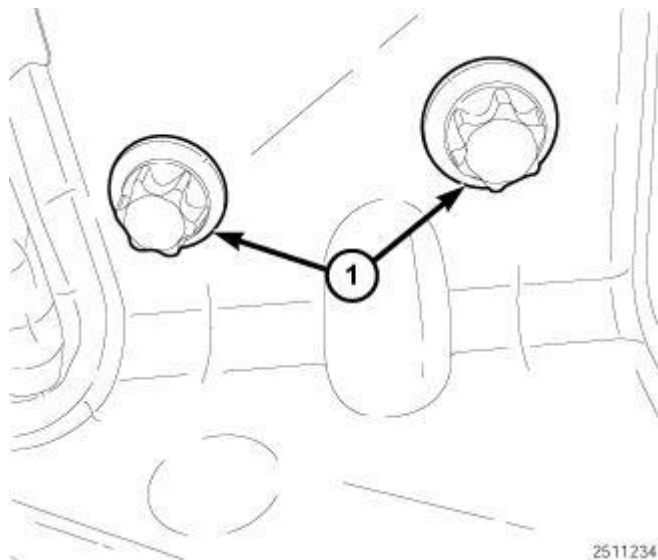


Fig. 629: CAC Tube & Bracket Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Install the (CAC) tube and bracket assembly. Tighten bolts (1) to 9 N.m (80 in. lbs.).

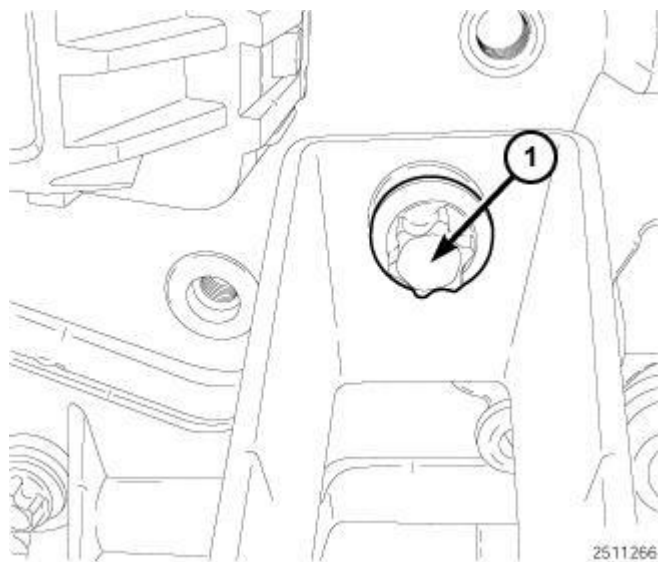


Fig. 630: Bolt Securing CAC Tube To Glow Plug Module
Courtesy of CHRYSLER GROUP, LLC

19. Install bolt (1) securing the (CAC) tube to glow plug module bracket. Tighten bolt (1) to 9 N.m (80 in. lbs.).

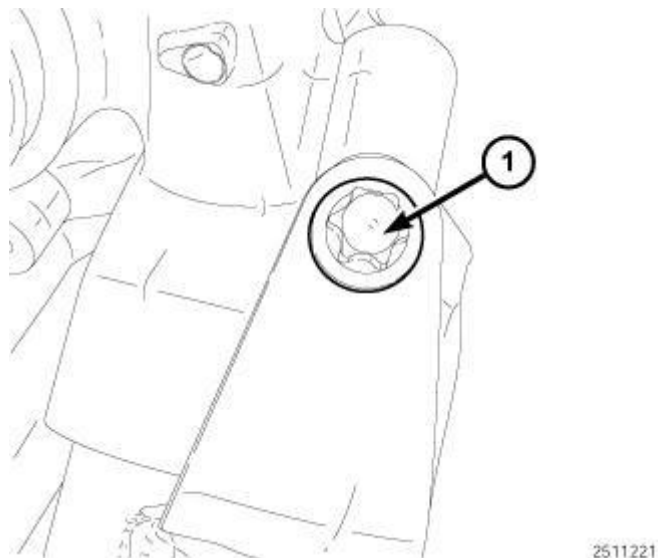


Fig. 631: Charge Air Cooler (CAC) Tube Bolt
 Courtesy of CHRYSLER GROUP, LLC

20. Tighten bolt (1) securing the Charge Air Cooler (CAC) tube to turbocharger to 9 N.m (80 in. lbs.).

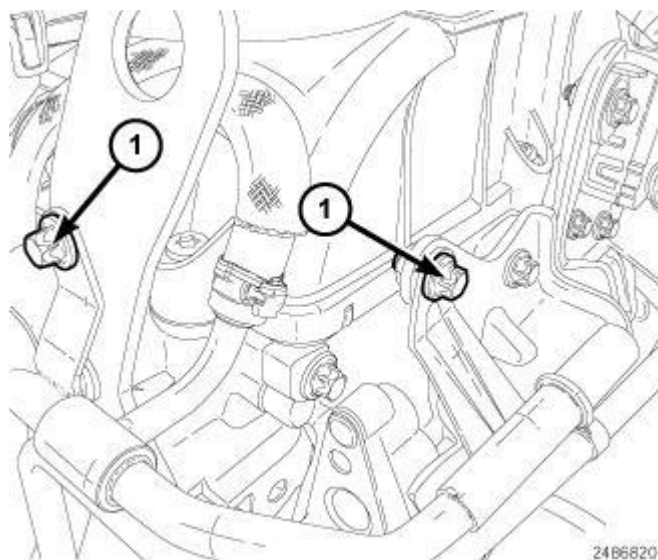
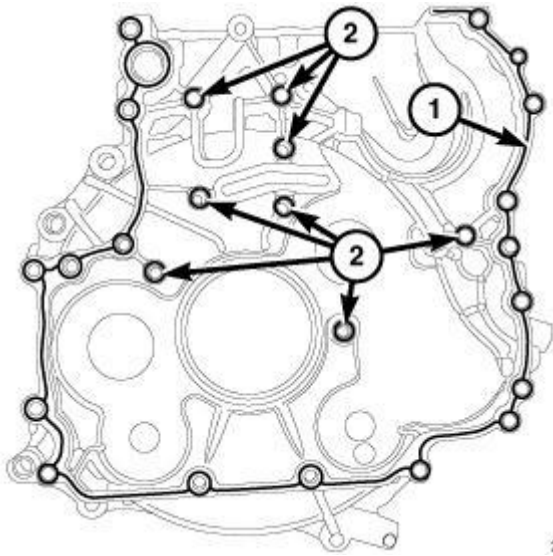


Fig. 632: Upper Fuel Line Bracket Bolts
 Courtesy of CHRYSLER GROUP, LLC

21. Install the two upper fuel line bracket bolts (1) and tighten to 9 N.m (80 in. lbs.).
22. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION.**
23. Connect negative battery cable.
24. Start the engine and inspect for leaks.
25. Install engine cover.

LOWER TIMING CHAIN COVER



2607928

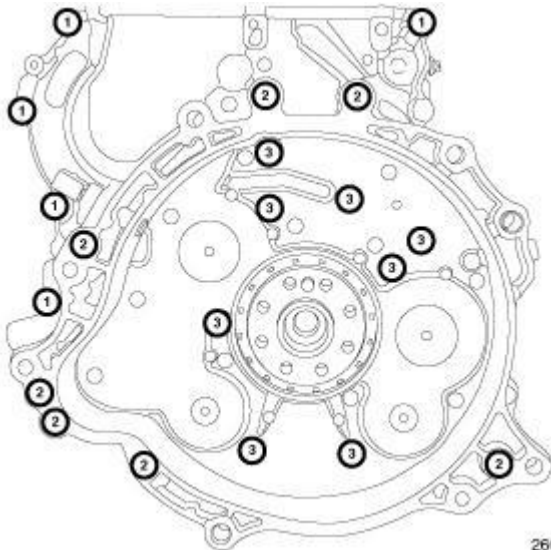
Fig. 633: Sealant To Lower Timing Chain Cover Mating Surfaces

Courtesy of CHRYSLER GROUP, LLC

1. Thoroughly clean all gasket mating surfaces.

NOTE: Install timing cover within 10 minutes after applying sealant. Do not spread sealant bead.

2. Apply a 2 mm bead of Engine Sealant RTV to the mating surfaces (1 and 2).



2607785

Fig. 634: Timing Chain Cover At Engine Bolts

Courtesy of CHRYSLER GROUP, LLC

NOTE: Bolts (1 and 3) are M8 x 30. Bolts (2) are M8 x 60.

3. Install timing chain cover. Tighten bolts (1, 2, and 3) to 20 N.m (177 in. lbs.).

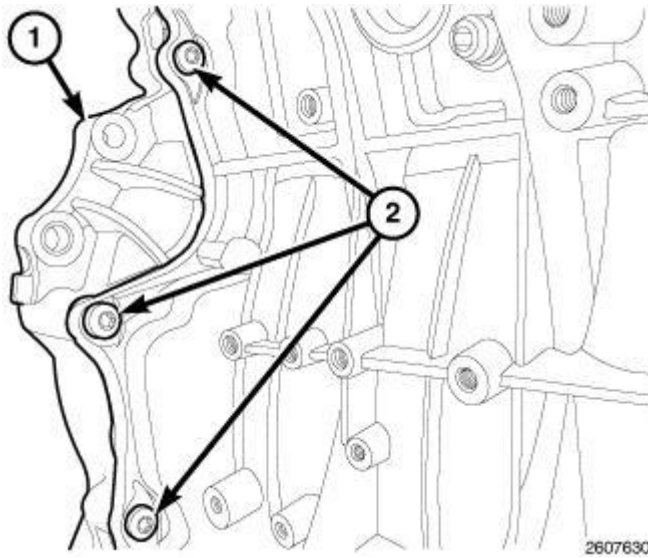


Fig. 635: Locating Bolts At Backside Of Timing Cover
Courtesy of CHRYSLER GROUP, LLC

4. Install the M8 X 30 bolts (2) to the backside of timing cover and tighten to 20 N.m (177 in. lbs.).
5. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.
6. Install the engine. Refer to **INSTALLATION**.

GUIDES, TIMING CHAIN

REMOVAL

REMOVAL - TIMING CHAIN GUIDE - CYLINDER HEAD

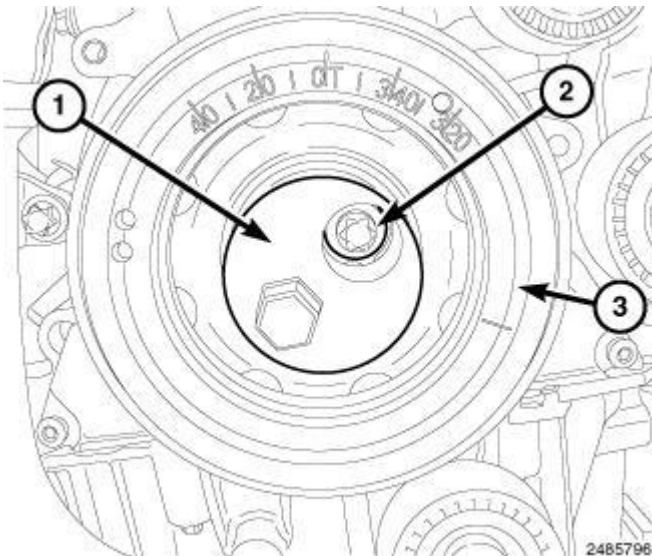


Fig. 636: Vibration Damper Holder, Bolts & Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the belly pan.

NOTE: Rotate engine at crankshaft only. **DO NOT** crank engine at the camshaft and **DO NOT** rotate the engine backward.

4. Using Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), to rotate engine.

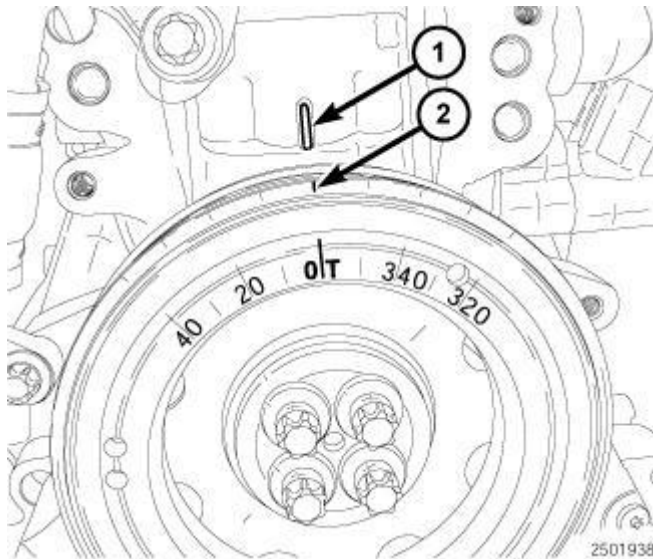


Fig. 637: Positioning Cylinder No. 1 Piston To Ignition TDC
Courtesy of CHRYSLER GROUP, LLC

5. Rotate the crankshaft to align the timing mark (1) with mark (2) to set cylinder No. 1 at Top Dead Center (TDC).
6. Remove the upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

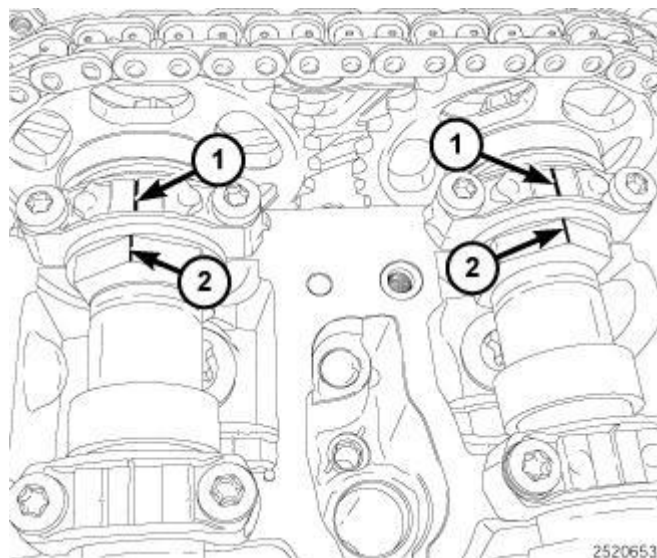


Fig. 638: Ensuring Camshaft Mark Is Aligned With Bearing Cap Mark
 Courtesy of CHRYSLER GROUP, LLC

7. Verify the alignment of the camshaft mark (2) is aligned with the bearing cap mark (1) is at (TDC).

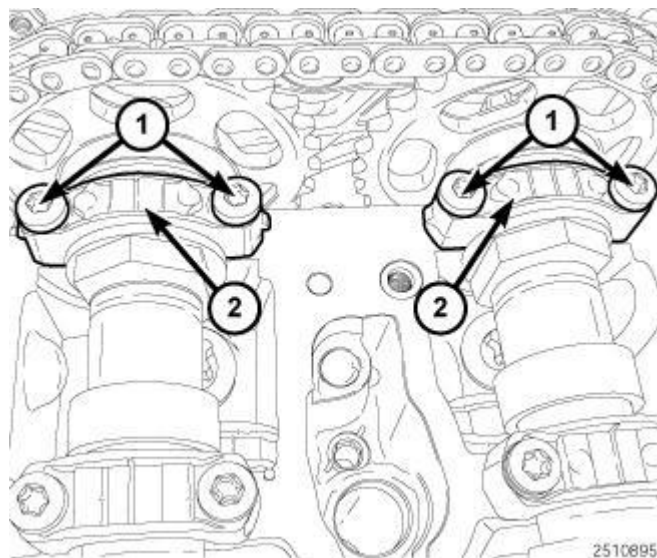
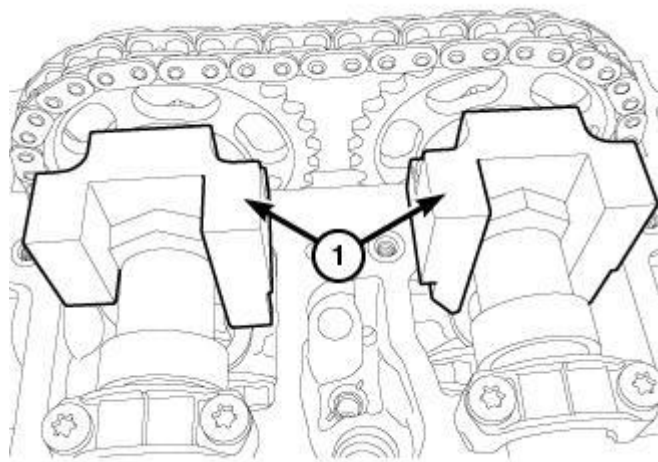


Fig. 639: No. 1 Camshaft Bearing Caps & Bolts
 Courtesy of CHRYSLER GROUP, LLC

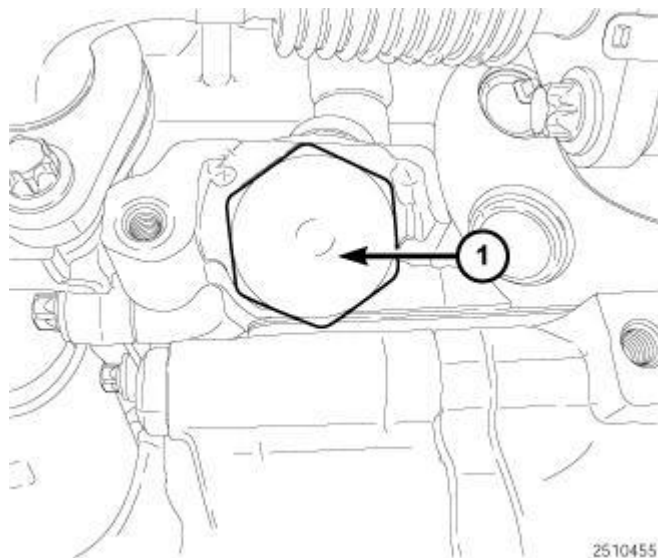
8. Remove bolts (1) and the number one camshaft bearing caps (2).



2569154

Fig. 640: Camshaft Lock Tools
Courtesy of CHRYSLER GROUP, LLC

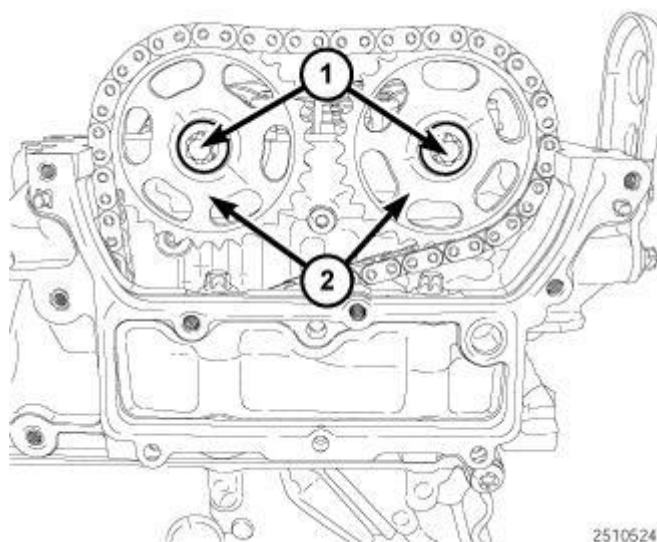
9. Install the Camshaft Lock Tools (special tool #10234, Lock, Camshaft) (1) and tighten bolts finger tight.



2510455

Fig. 641: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

10. Remove timing chain tensioner (1).

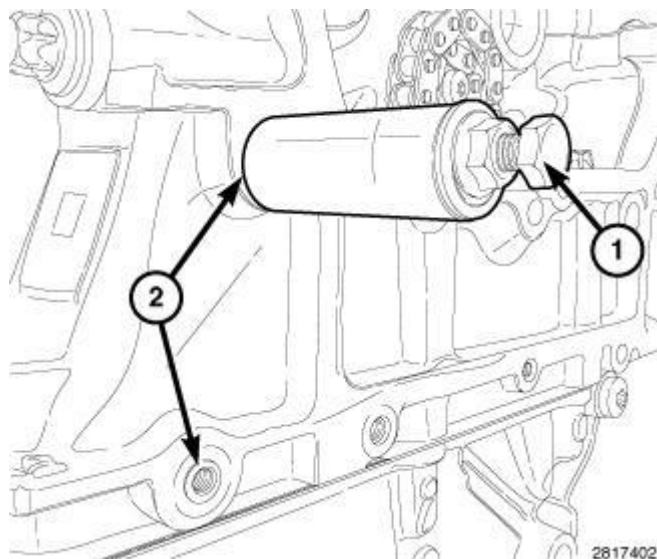


2510524

Fig. 642: Camshaft Sprockets & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Camshaft sprocket bolts (1) are left hand thread.

11. Remove bolts (1) and the camshaft sprockets (2) and secure the timing chain from falling into the engine.



2817402

Fig. 643: Extractor Bolt Tool & Timing Guide Pin
Courtesy of CHRYSLER GROUP, LLC

NOTE: Care should be given not to drop the timing chain guide into the cylinder head.

12. Using Extractor Bolt Tool (special tool #10240, Bolt, Extractor) (1), remove the timing guide pins (2) and guide from cylinder head.

TIMING CHAIN TENSIONING RAIL

1. Disconnect negative battery cable.
2. Remove the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

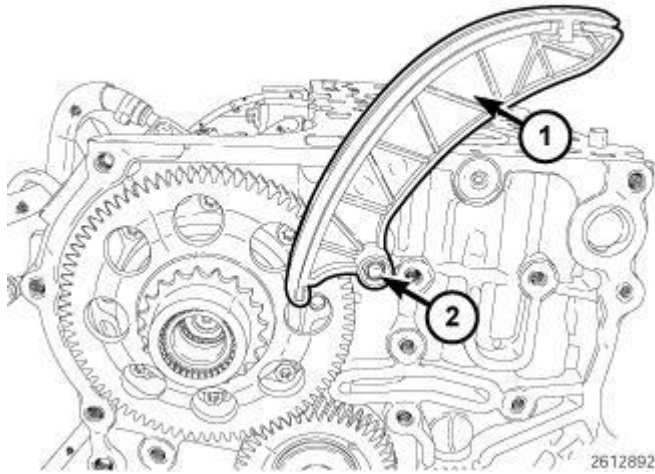


Fig. 644: Tensioning Rail & Pin
Courtesy of CHRYSLER GROUP, LLC

3. Remove tensioning rail (1) from pin (2).

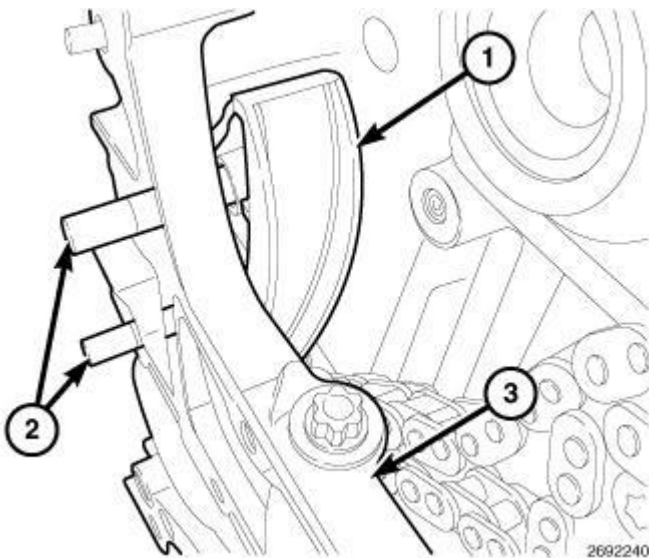
INSTALLATION**INSTALLATION - TIMING CHAIN GUIDE - CYLINDER HEAD**

Fig. 645: Timing Chain Guide, Guide Pins & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

NOTE: Care should be given not to drop the timing chain guide into the cylinder head.

1. Install the timing chain guide (1) and guide pins (2) into the cylinder head (3).
2. Using a small brass hammer gently tap in the guide pins (2) into the cylinder head (3).

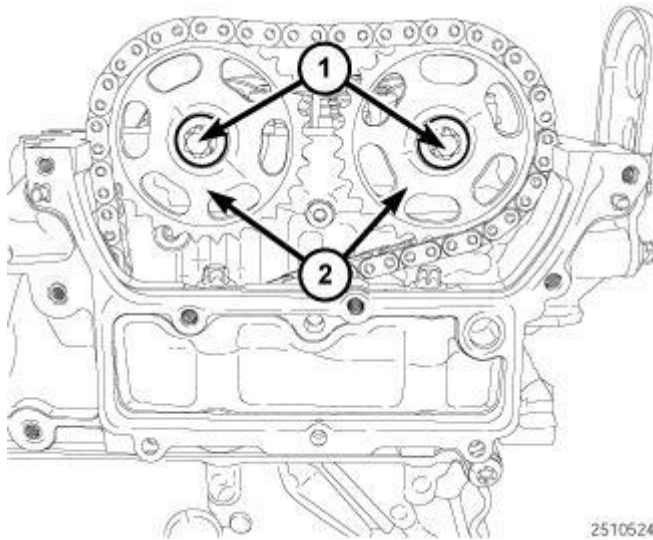


Fig. 646: Camshaft Sprockets & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Camshaft sprocket bolts (1) are left hand thread.

3. Position the timing chain onto the camshaft sprockets (2) and install onto camshaft. Using new bolts (1), tighten to 55 N.m (41 ft. lbs.) plus an additional 90 degrees.

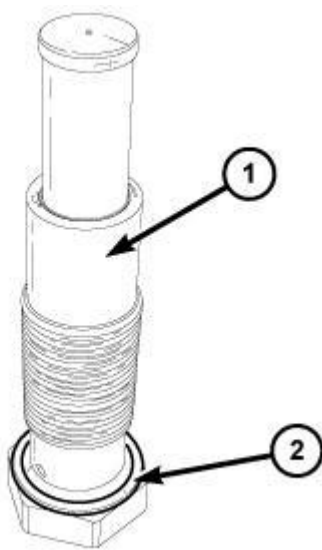


Fig. 647: Sealing Washer & Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

4. Install a new sealing washer (2) onto the timing chain tensioner (1).

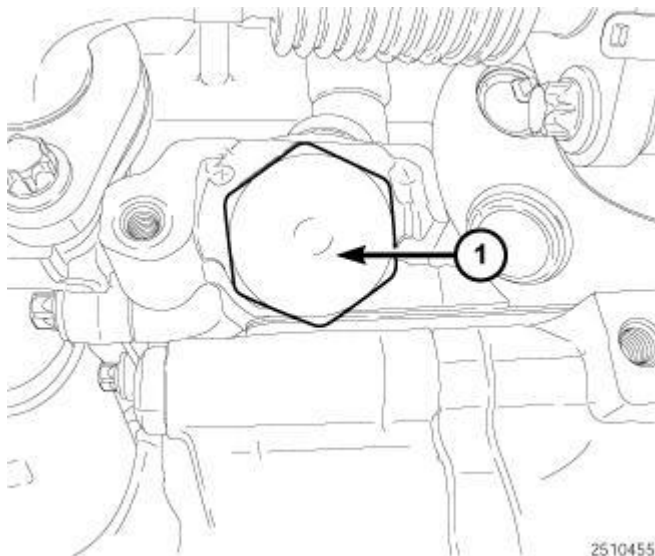


Fig. 648: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

5. Install timing chain tensioner (1). Tighten to 70 N.m (52 ft. lbs.).

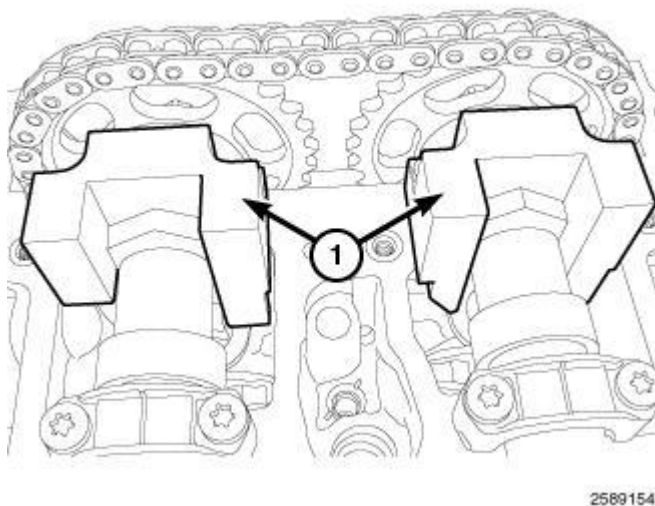


Fig. 649: Camshaft Lock Tools
Courtesy of CHRYSLER GROUP, LLC

6. Remove bolts and the Camshaft Lock Tool (1) (special tool #10234, Lock, Camshaft).

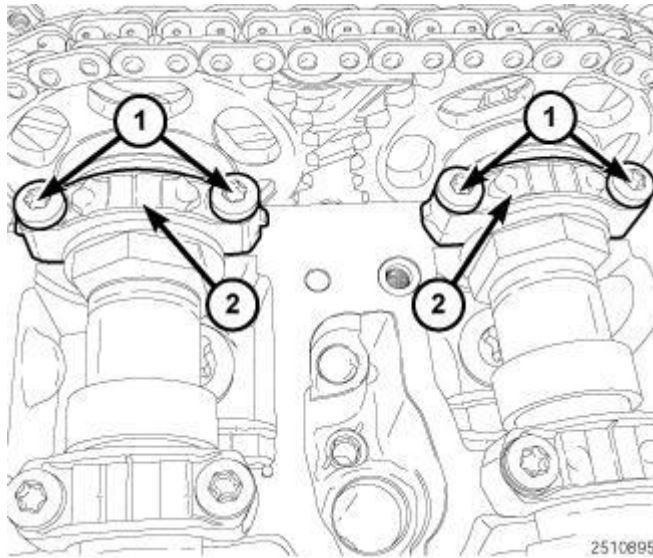


Fig. 650: No. 1 Camshaft Bearing Caps & Bolts
 Courtesy of CHRYSLER GROUP, LLC

7. Using new bolts (1), install the camshaft bearing caps (2). Tighten bolts (1) in two stages,
 - Stage 1: 5 N.m (44 in. lbs.)
 - Stage 2: 9 N.m (80 in. lbs.).
8. Install the upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
9. Install the belly pan.
10. Install the engine cover.
11. Connect the negative battery cable.

TIMING CHAIN TENSIONING RAIL

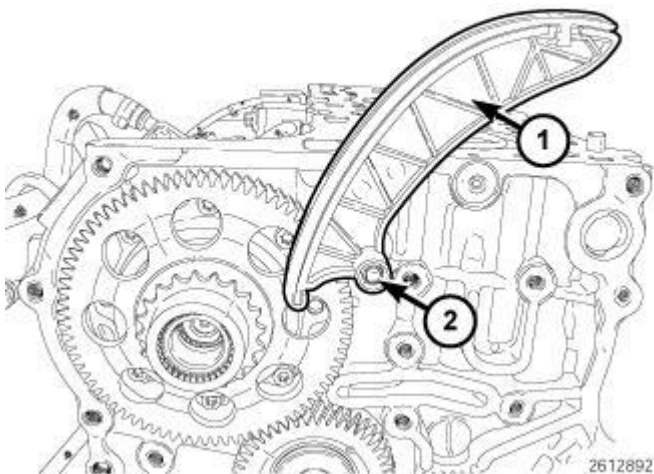


Fig. 651: Tensioning Rail & Pin
 Courtesy of CHRYSLER GROUP, LLC

1. Install tensioning rail (1) on dowel pin (2).
2. Install timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
3. Connect negative battery cable.
4. Start the engine and inspect for leaks.

TENSIONER, ENGINE TIMING**REMOVAL****REMOVAL**

1. Disconnect negative battery cable.
2. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.

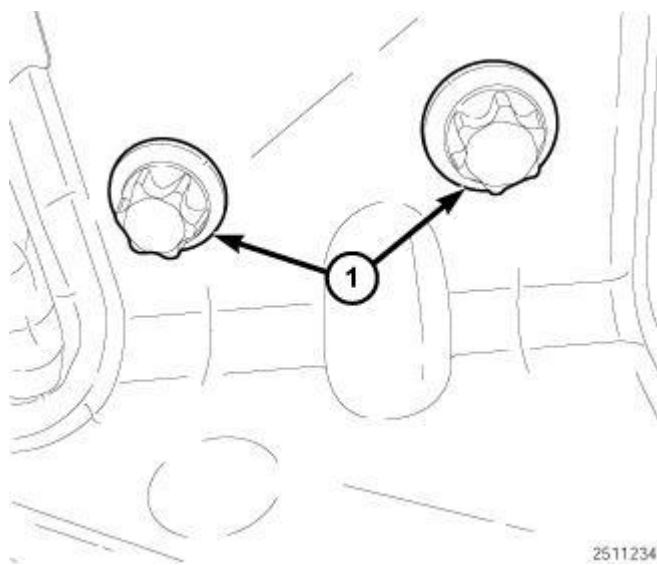


Fig. 652: CAC Tube & Bracket Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the (CAC) tube and bracket assembly.

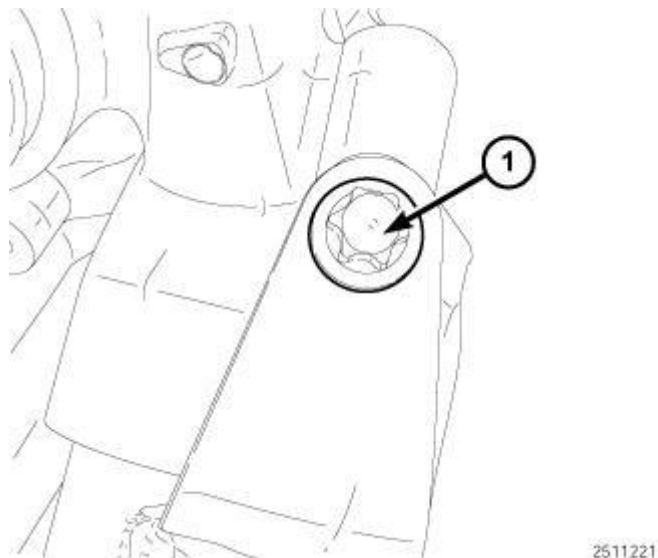


Fig. 653: Charge Air Cooler (CAC) Tube Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Remove the bolt (1) securing the Charge Air Cooler (CAC) tube to turbocharger.

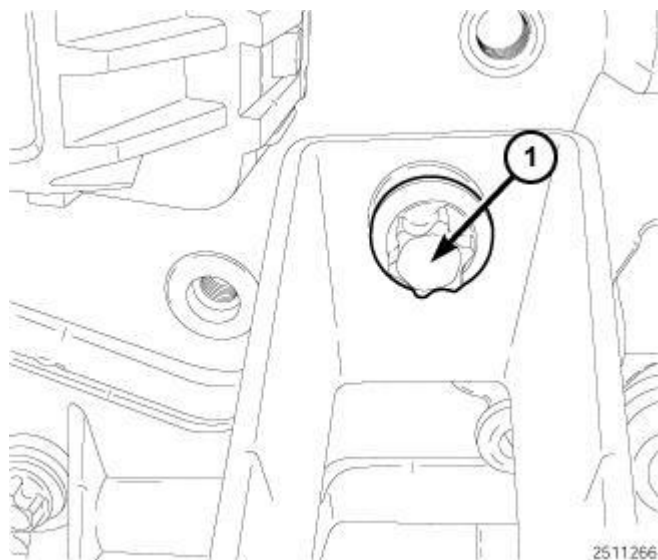


Fig. 654: Bolt Securing CAC Tube To Glow Plug Module
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolt (1) securing the (CAC) tube to glow plug module.

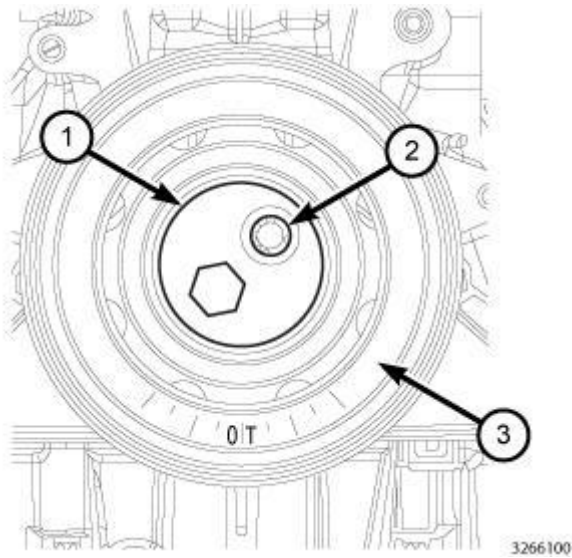


Fig. 655: Vibration Damper Holder Tool, Vibration Damper & Bolts
 Courtesy of CHRYSLER GROUP, LLC

CAUTION: Rotate engine at crankshaft only. DO NOT rotate the engine with the bolt of the camshaft sprocket. DO NOT rotate the engine counter clockwise.

6. Remove the belly pan.
7. Install Vibration Damper Holder (special tool #10236, Holder, Vibration Damper) (1), to rotate the engine.

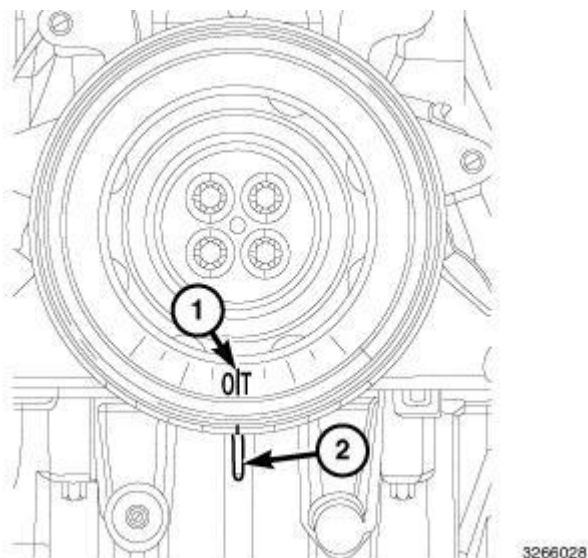


Fig. 656: Crankshaft Alignment Timing Marks
 Courtesy of CHRYSLER GROUP, LLC

8. Rotate the engine clockwise to align the timing mark (1) with mark (2) to set cylinder No. 1 at Top Dead Center (TDC).

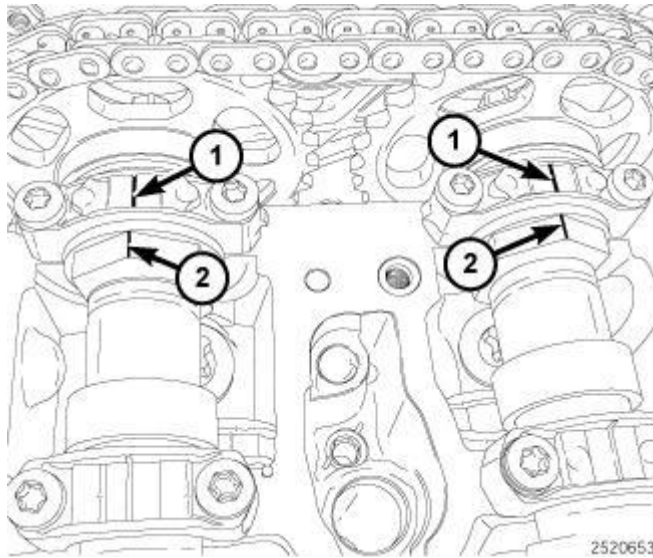


Fig. 657: Ensuring Camshaft Mark Is Aligned With Bearing Cap Mark
Courtesy of CHRYSLER GROUP, LLC

9. Verify the alignment of the camshaft mark (2) is aligned with the bearing cap mark (1) is at (TDC).

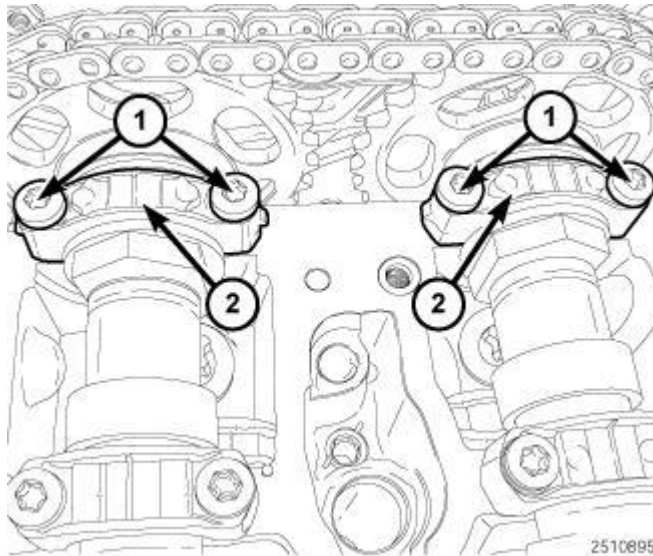
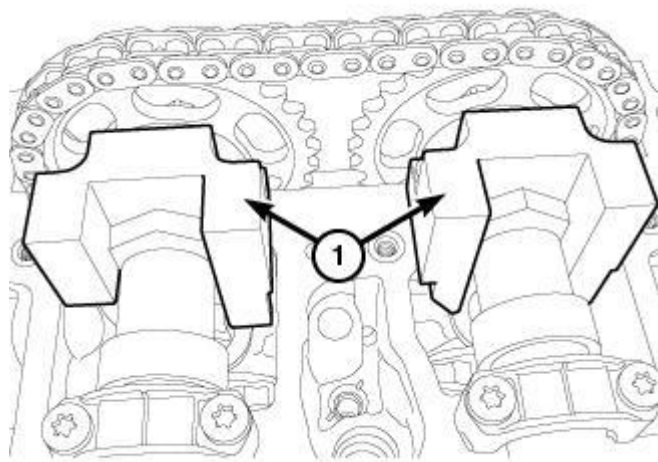


Fig. 658: No. 1 Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

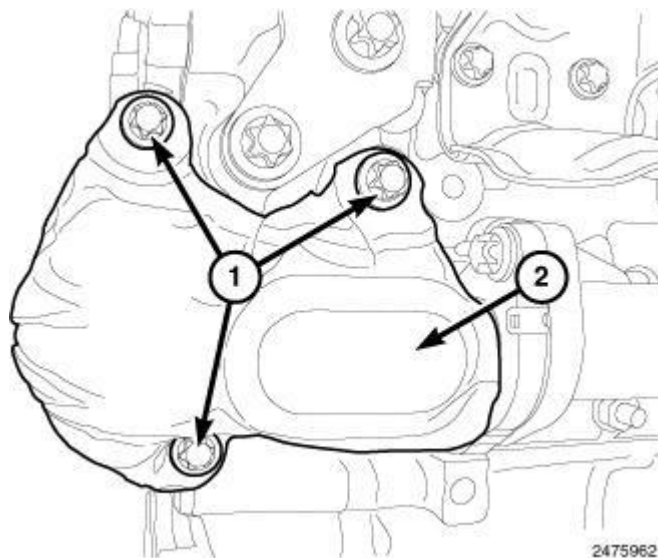
10. Remove bolts (1) and the number one camshaft bearing caps (2).



2589154

Fig. 659: Camshaft Lock Tools**Courtesy of CHRYSLER GROUP, LLC**

11. Install the Camshaft Lock Tools (1) (special tool #10234, Lock, Camshaft) and tighten bolts finger tight.



2475962

Fig. 660: EGR Pipe Heat Shield & Bolts**Courtesy of CHRYSLER GROUP, LLC**

12. Remove bolts (1) and the EGR pipe heat shield (2).

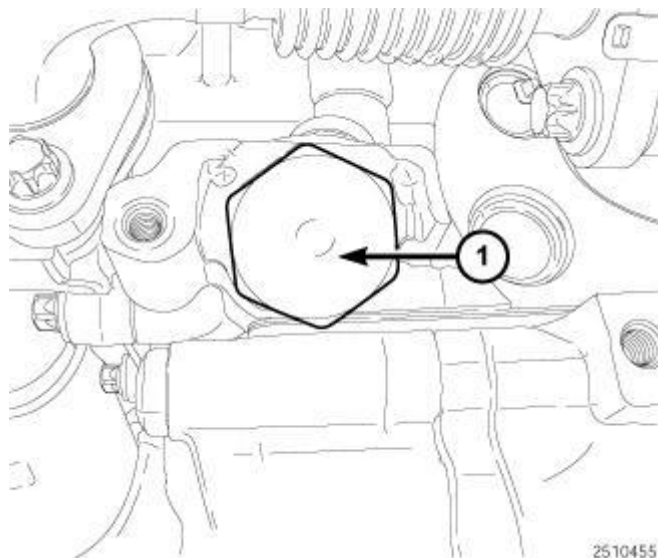


Fig. 661: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

13. Remove timing chain tensioner (1).

INSTALLATION

INSTALLATION

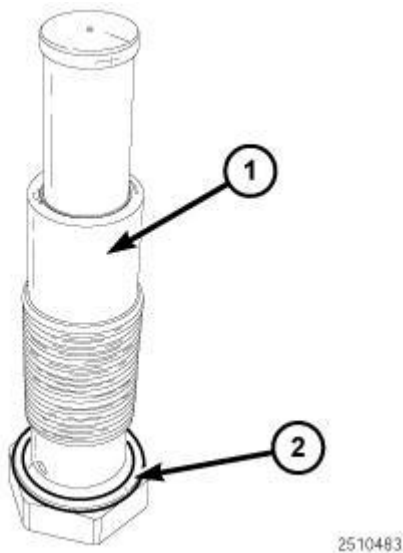


Fig. 662: Sealing Washer & Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

1. Install a new timing chain tensioner (1) seal washer (2).

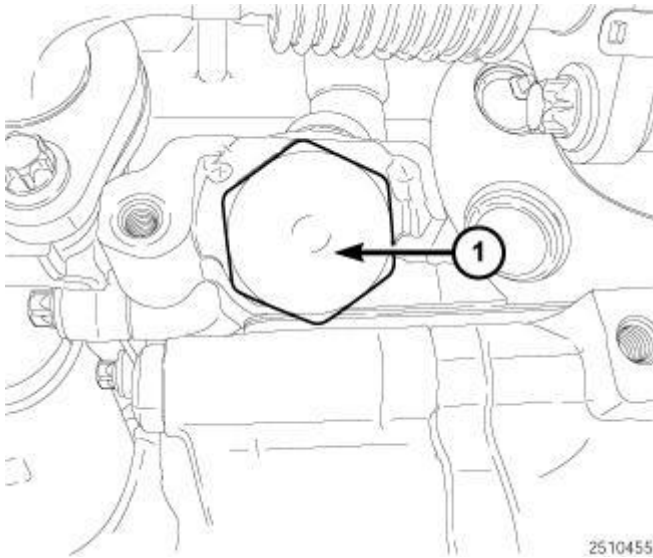


Fig. 663: Timing Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

NOTE: Carefully clean all mating surfaces with appropriate solvents to assure that no grease or oil is present during reassembly.

2. Install timing chain tensioner (1). Tighten to 70 N.m (52 ft. lbs.).

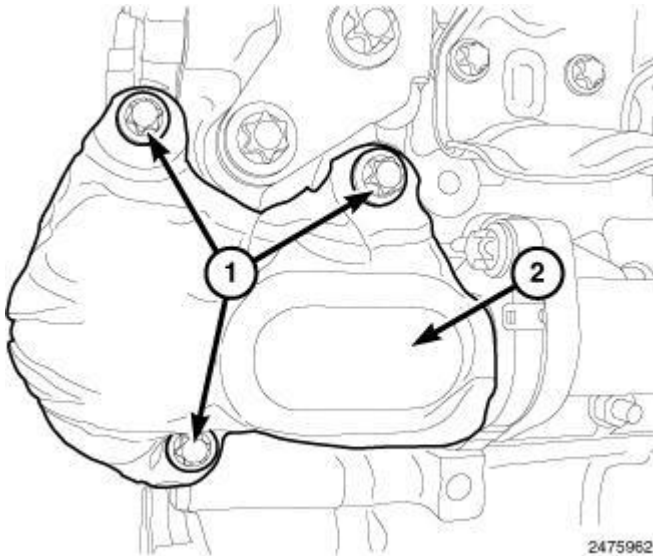
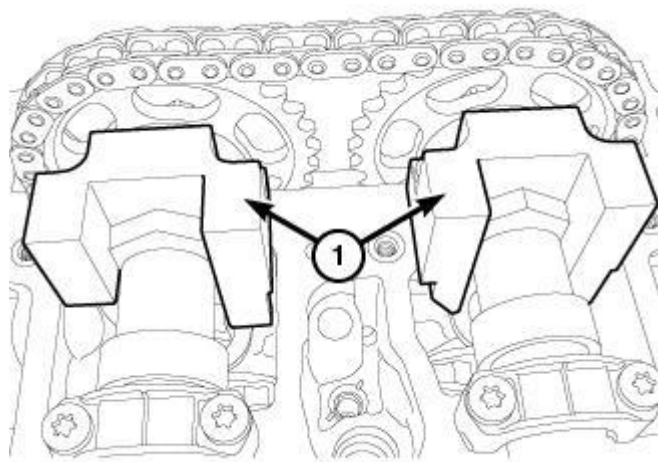


Fig. 664: EGR Pipe Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

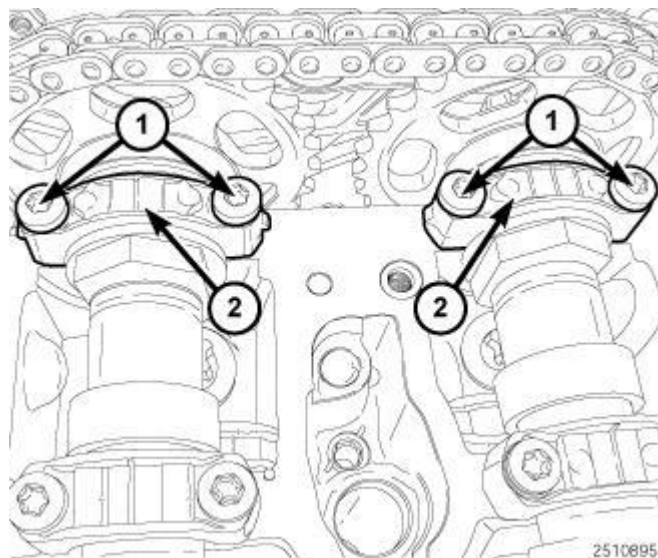
3. Install the EGR pipe heat shield (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).



2569154

Fig. 665: Camshaft Lock Tools
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts and the Camshaft Lock Tool (1) (special tool #10234, Lock, Camshaft).



2510895

Fig. 666: No. 1 Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Using new bolts (1), install the camshaft bearing caps (2). Tighten bolts (1) to 9 N.m (80 in. lbs.).

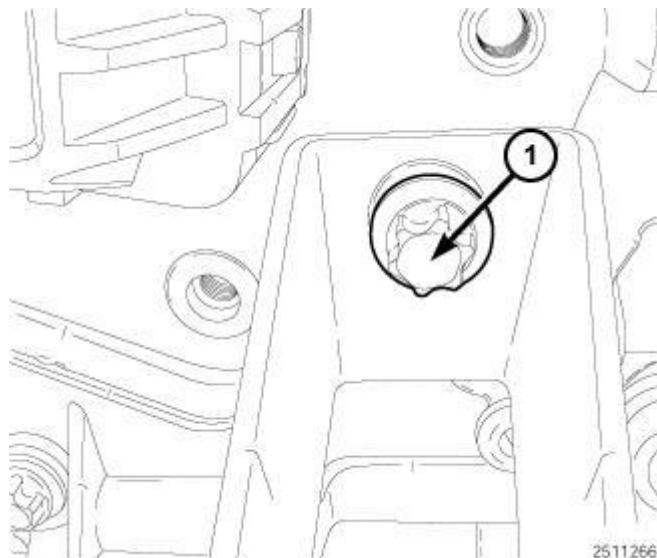


Fig. 667: Bolt Securing CAC Tube To Glow Plug Module
Courtesy of CHRYSLER GROUP, LLC

6. Install bolt (1) securing the (CAC) tube to glow plug module bracket. Tighten bolt (1) to 9 N.m (80 in. lbs.).

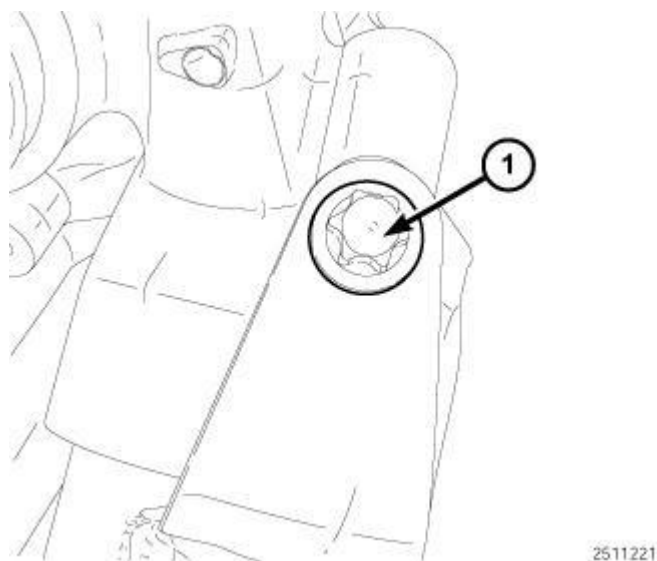


Fig. 668: Charge Air Cooler (CAC) Tube Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Tighten bolt (1) securing the Charge Air Cooler (CAC) tube to turbocharger to 9 N.m (80 in. lbs.).

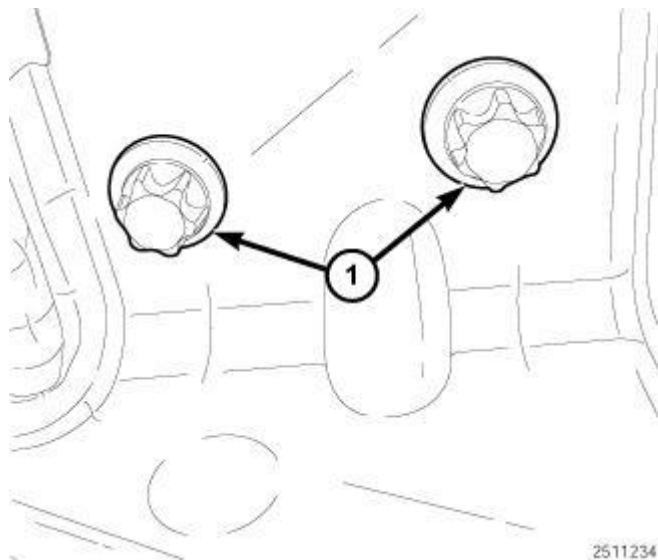


Fig. 669: CAC Tube & Bracket Assembly Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install the charge air muffler bracket. Tighten bolts (1) to 9 N.m (80 in. lbs.).
9. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION.**
10. Connect negative battery cable.