

6. Place suction tube in oil pan and guide them into place. Using a new tube-to-block gasket, install and tighten the suction tube bolts by hand. Starting with the oil pump inlet bolts, tighten the bolts to 24 Nm (18 ft. lbs.). Tighten the remaining tube brace bolts to 43 Nm (32 ft. lbs.).
7. Starting in the center and working outward, tighten the oil pan bolts to 28 Nm (21 ft. lbs.).
8. Install the steering rack bolts.
9. Install the flex plate.
10. Install the flywheel to crankshaft adapter. Tighten to 137 Nm (101 ft. lbs.).
11. Install transmission and transfer case (if equipped).
12. Install the flywheel housing assembly with the starter motor attached and tighten bolts to 77 Nm (57 ft. lbs.).

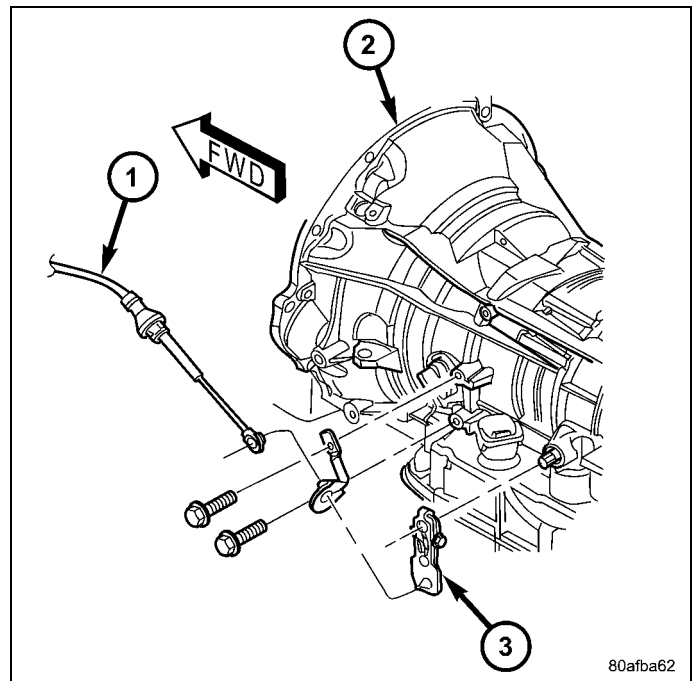
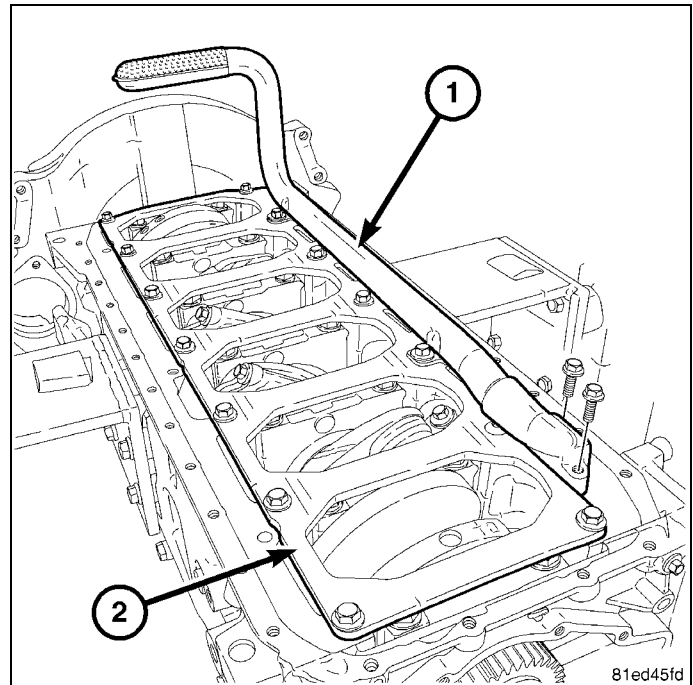
NOTE: A new clamping ring must be used on early or late builds, automatic or manual. Do not reuse clamping ring.

13. Install the EGR cooler.(Refer to 07 - Cooling/Engine/COOLER, EGR - Installation)

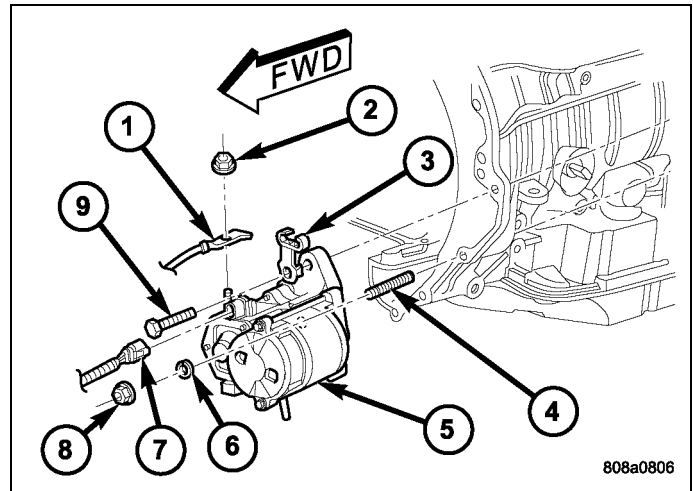
14. Install the fan and fan shroud.(Refer to 07 - Cooling/Engine/FAN, Cooling - Installation)

NOTE: Make sure that the fan shroud seal is properly seated in the radiator fan shroud and that it is not out of position causing excessive contact with the radiator coolant tubes.

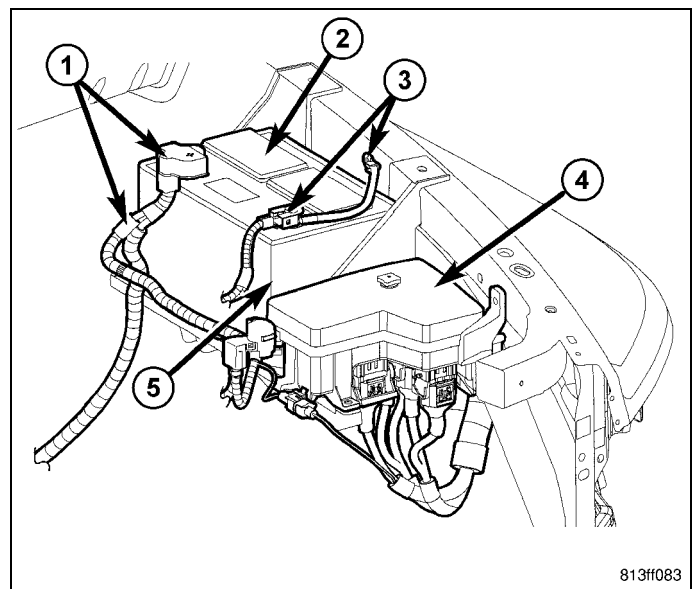
15. Remove the transmission jack.
16. Install the crossmember bolts.
17. Install the transmission mount.
18. Install the wiring harness.
19. Install the gear shift cable.
20. Install the exhaust hanger bolts.
21. Install the torque converter bolts.



22. Install the starter.
23. Install the starter bolts.
24. Install the transmission oil cooler lines.



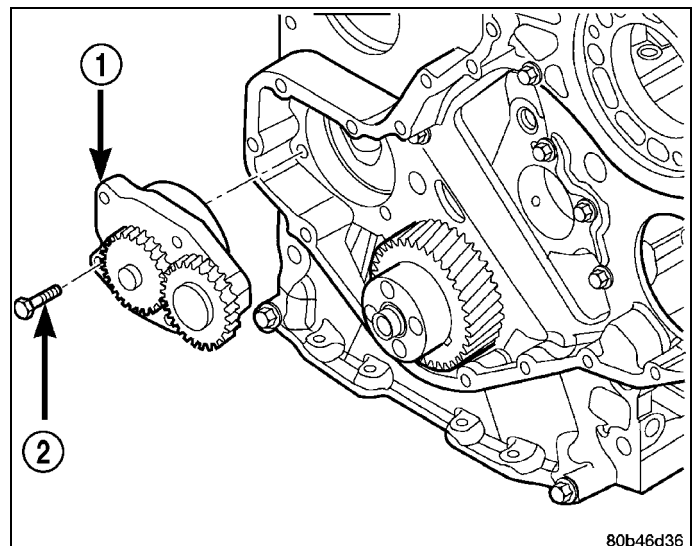
25. Connect the negative battery cables.
26. Close the hood.



PUMP, Engine Oil

Removal

1. Disconnect the battery negative cables.
2. Remove fan/drive assembly (Refer to 07 - Cooling/Engine/FAN, Cooling - Removal).
3. Remove the accessory drive belt (Refer to 07 - Cooling/Accessory Drive/BELT, Serpentine - Removal).
4. Remove the fan support/hub assembly.
5. Remove crankshaft damper (Refer to 09 - Engine/Engine Block/DAMPER, Vibration - Removal).
6. Remove power steering pump.
7. Remove accessory drive belt tensioner.
8. Remove the gear housing cover (Refer to 09 - Engine/Valve Timing/COVER(S), Engine Timing - Removal).
9. Remove the four mounting bolts (2) and pull the oil pump (1) from the bore in the cylinder block.



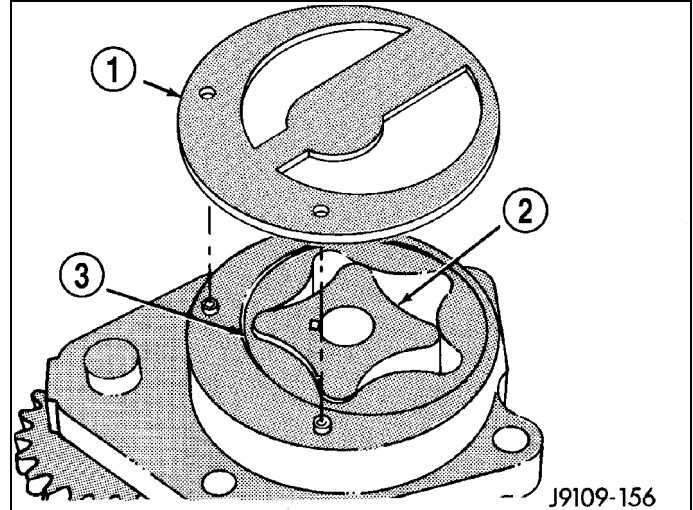
Cleaning

Clean all parts in solvent and dry with compressed air. Clean the old sealer residue from the back of the gear housing cover and front of the gear housing.

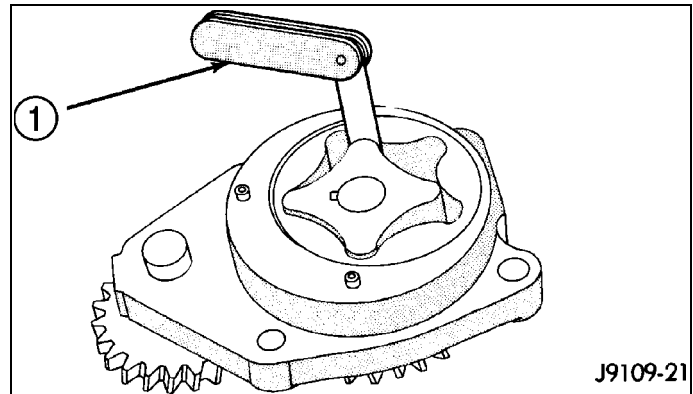
Inspection

Disassemble and inspect the oil pump as follows:

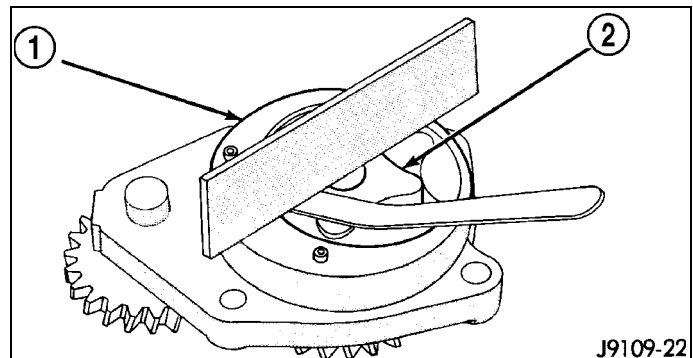
1. Visually inspect the lube pump gears for chips, cracks or excessive wear.
2. Remove the back plate (1).
3. Mark TOP on the gerotor planetary (3) using a felt tip pen.
4. Remove the gerotor planetary (3) inspect for excessive wear or damage. Inspect the pump housing and gerotor drive (2) for damaged and excessive wear.



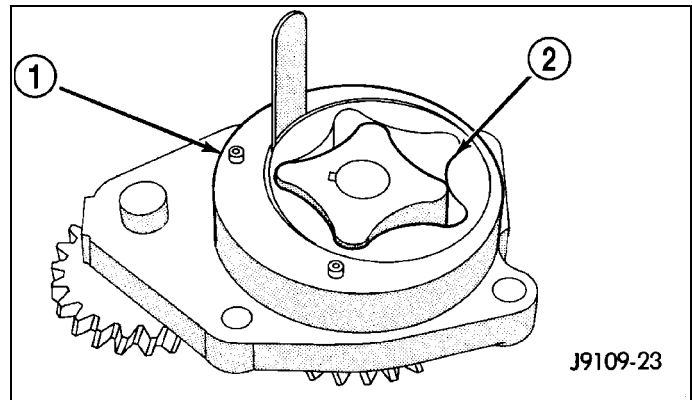
5. Install the gerotor planetary in the original position.
6. Measure the tip clearance (1). Maximum clearance is 0.1778 mm (0.007 inch). If the oil pump is out of limits, replace the pump.



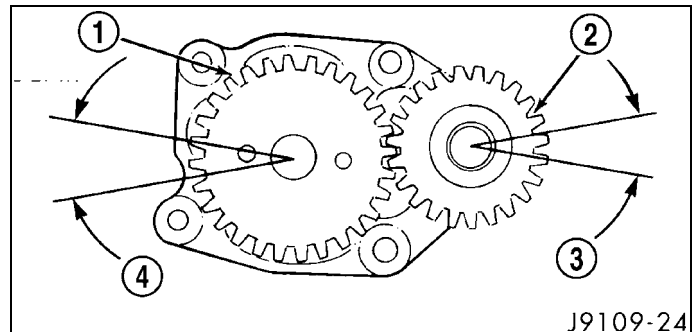
7. Measure the clearance of the gerotor drive/gerotor planetary (2) to port plate (1). Maximum clearance is 0.127 mm (0.005 inch). If the oil pump is out of limits, replace the pump.



8. Measure the clearance of the gerotor planetary to the body bore (1). Maximum clearance is 0.381 mm (0.015 inch). If the oil pump is out of limits, replace the pump.

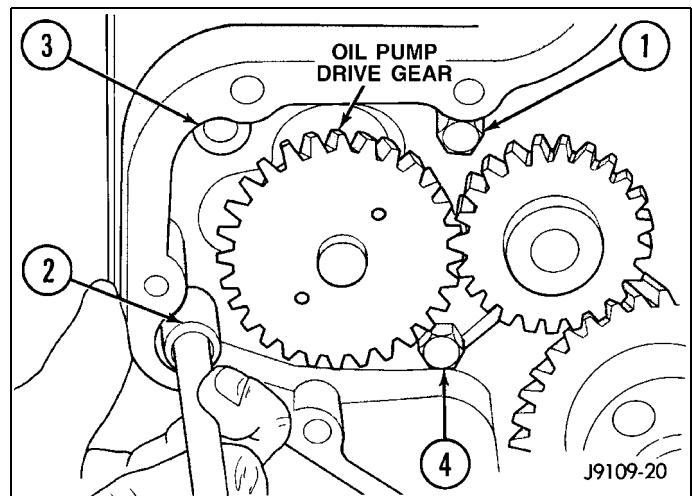


9. Measure the gears backlash (3,4). The limits of a used pump is 0.15- 0.25 mm (0.006-0.010 inch). If the backlash is out of limits, replace the oil pump.
10. Install the back plate.

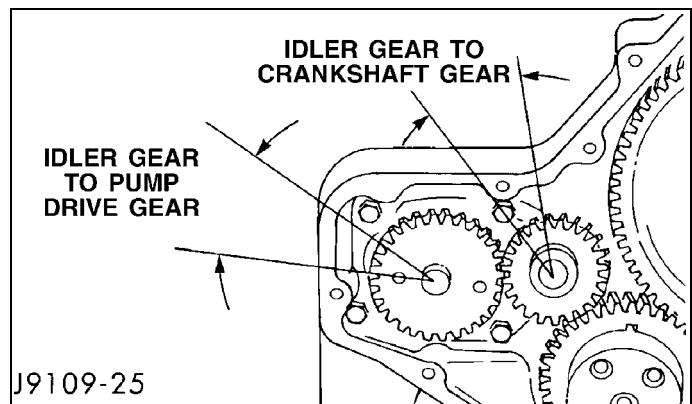


Installation

- Lubricate the pump with clean engine oil. Filling the pump with clean engine oil during installation will help to prime the pump at engine start up.
- Install the pump. Verify the idler gear pin is installed in the locating bore in the cylinder block. Tighten the oil pump in 3 steps, in the following sequence.
 - Step 1: Push the pump firmly against the cylinder block and install the four (4) bolts finger tight.
 - Step 2: Tighten the bolts to 8 N·m (72 in. lbs).
 - Step 3: Tighten the bolts to 24 N·m (18 ft. lbs)



- The back plate on the pump seats against the bottom of the bore in the cylinder block. When the pump is correctly installed, the flange on the pump will not touch the cylinder block.
- Measure the idler gear to pump drive gear backlash and the idler gear to crankshaft gear backlash. The backlash should be 0.15- 0.25 mm (0.006-0.010 inch). If the backlash is out of limits, replace the oil pump.
- If the adjoining gear moves when you measure the backlash, the reading will be incorrect.



- Apply a bead of silicone rubber adhesive sealant or equivalent to the gear housing cover sealing surface.
- Install the gear housing cover (Refer to 09 - Engine/Valve Timing/COVER(S), Engine Timing - Installation).

8. Install the vibration damper (Refer to 09 - Engine/Engine Block/DAMPER, Vibration - Installation).
9. Install the fan support/hub assembly Refer to (Refer to 07 - Cooling/Engine/FAN, Cooling - Installation)
10. Install power steering pump.
11. Install accessory drive belt tensioner. Tighten bolt to 43 N·m (32 ft. lbs.).
12. Install the accessory drive belt (Refer to 07 - Cooling/Accessory Drive/BELT, Serpentine - Installation).
13. Install the cooling fan (Refer to 07 - Cooling/Engine/FAN, Cooling - Installation).
14. Connect battery negative cables.
15. Start engine and check for oil leaks.

SWITCH, Oil Pressure

Removal

NOTE: When installing a new oil pressure switch, the kit will include a special 90° fitting that must be installed. Clock the fitting and switch assembly between the 1:00 o'clock and 2:00 o'clock position. Torque the fitting bolt to 18 N·m (13 ft. lbs)

1. Disconnect the battery negative cables.
2. Disconnect the oil pressure switch connector.
3. Using a suitable socket, remove the oil pressure switch from the block (counter-clockwise).
4. Remove the banjo screw from the oil pressure switch mounting block.

Installation

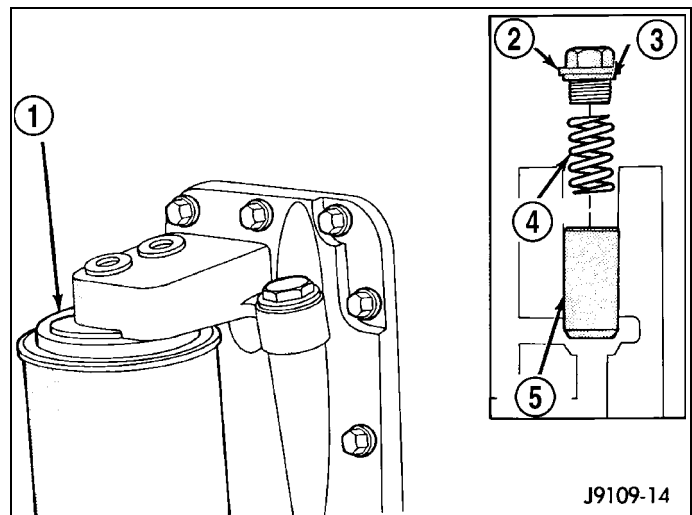
1. Install banjo screw through the oil pressure switch mounting block. The switch mounting block port (oil switch port) should point to the 2 o'clock position. Tighten the banjo screw to 24 Nm or 18 ft lbs.
2. If the switch is not being replaced, replace and lubricate the o-ring.
3. Install the oil pressure switch and tighten to 18 N·m (159 in. lbs.).
4. Connect oil pressure switch connector.
5. Connect the battery negative cables.
6. Start engine and check for oil leaks at the switch.

VALVE, Oil Pressure Relief

Removal

1. Disconnect the battery negative cables.
2. Remove the threaded plug (2), spring (4) and valve (5). Insert a finger or a seal pick to lift the plunger from the bore.

NOTE: If the plunger is stuck in the bore, it will be necessary to remove the filter head.



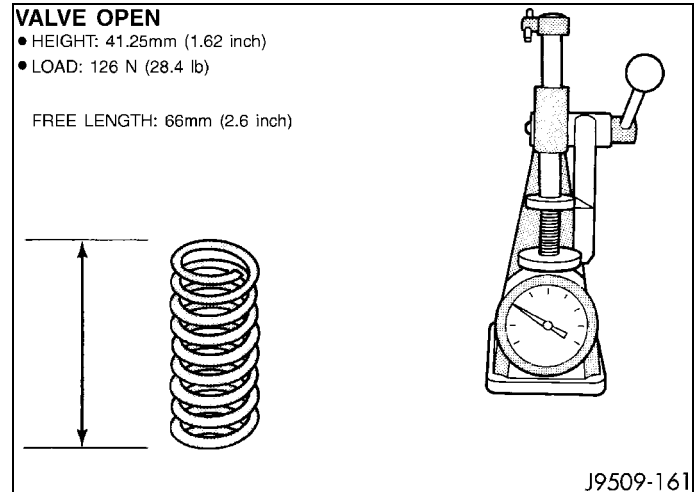
Cleaning

1. Clean the regulator spring and plunger with a suitable solvent and blow dry with compressed air. If the plunger bore requires cleaning, it is necessary to remove the oil filter head to avoid getting debris into the engine.

Inspection

Inspect the plunger and plunger bore for cracks and excessive wear. Polished surfaces are acceptable. Verify that the plunger moves freely in the bore.

Check the spring for height and load limitations. Replace the spring if out of limits shown in the figure.



Installation

1. Install the plunger, spring, and plug as shown in . Tighten the plug to 80 N·m (59 ft. lbs.).
2. Connect the battery negative cables.
3. Start the engine and verify that it has oil pressure.

MANIFOLDS

TABLE OF CONTENTS

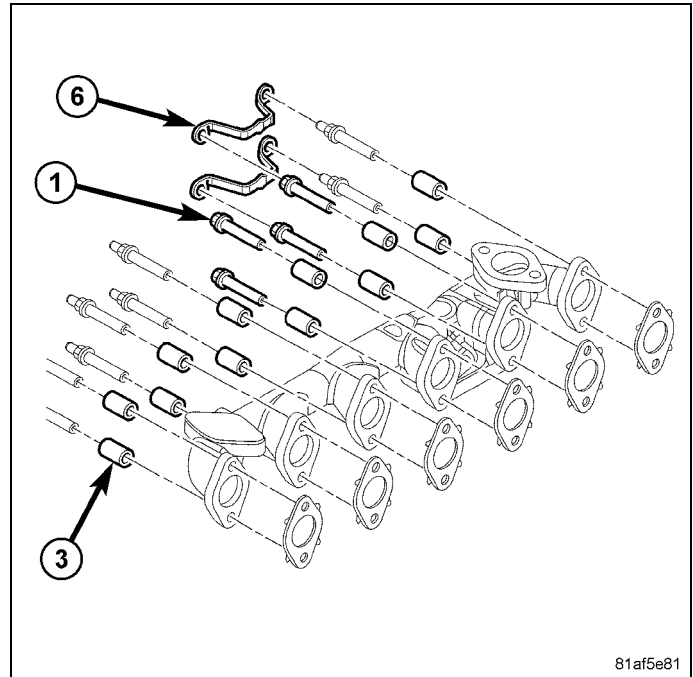
	page		page
MANIFOLDS		MANIFOLD, INTAKE	
MANIFOLD, EXHAUST		REMOVAL	166
REMOVAL	164	CLEANING	167
CLEANING	164	INSPECTION.	167
INSPECTION.	164	INSTALLATION	168
INSTALLATION	165		

Manifolds

MANIFOLD, Exhaust

Removal

1. Disconnect the battery negative cables.(Refer to 08 - Electrical/8F - Engine Systems/Battery System/CABLES, Battery - Removal)
2. Drain the coolant.(Refer to 07 - Cooling - Standard Procedure)
3. Raise vehicle on hoist.
4. Remove the EGR cooler.(Refer to 07 - Cooling/Engine/COOLER, EGR - Removal)
5. Remove the air filter housing.(Refer to 09 - Engine/Air Intake System/BODY, Air Cleaner - Removal)
6. Remove the air filter inlet hose from the turbo inlet.
7. Remove the delta-P line bracket capscrew nuts and remove the delta-P line from the exhaust manifold and thermostat housing.
8. Remove the heat shield and noise panel (if equipped) from the exhaust manifold.
9. Remove the four (4) turbo to exhaust manifold nuts.
10. Remove the two (2) rear exhaust manifold capscrew lock plates.
11. Remove the Cab Heater tubing/bracket from the exhaust manifold stud.
12. Remove the exhaust manifold.



81af5e81

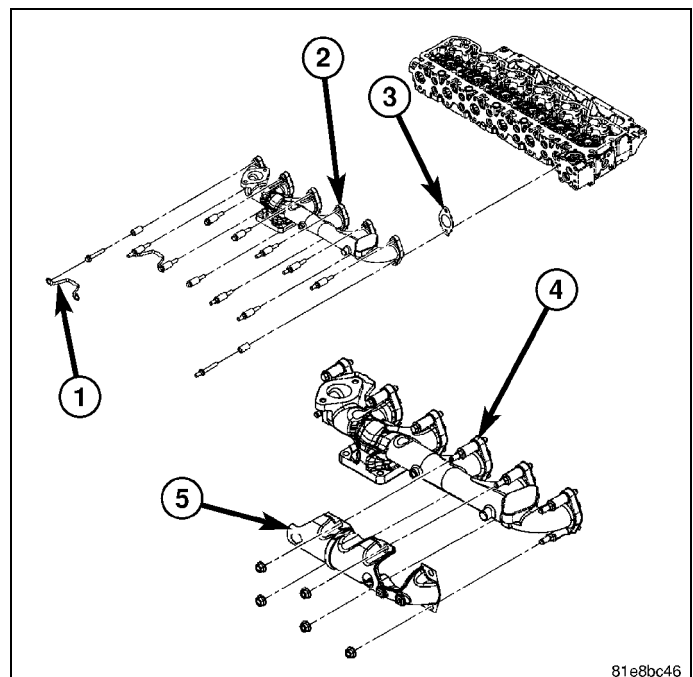
Cleaning

Clean the cylinder head and exhaust manifold sealing surfaces with a suitable scraper. Use a Scotch-Brite™ pad or equivalent.

Inspection

Inspect the exhaust manifold for cracks. Measure the exhaust manifold for flatness. Place a ruler over all of the exhaust ports and insert a feeler gauge between the port flange and the ruler. Maximum deviation from flat is 0.20 mm (.008 inch).

Inspection of turbocharger mounting flange: Using a straight edge across the longest sections of the flange, measure the flatness using a feeler gauge. Warpage shall not exceed 0.1mm (0.0039 in). When measuring the exhaust manifold flanges, the total sum of exhaust flange and the turbocharger flange cannot exceed 0.1 mm (0.00039 in). If this is the case, the component with the greatest warpage must be replaced.



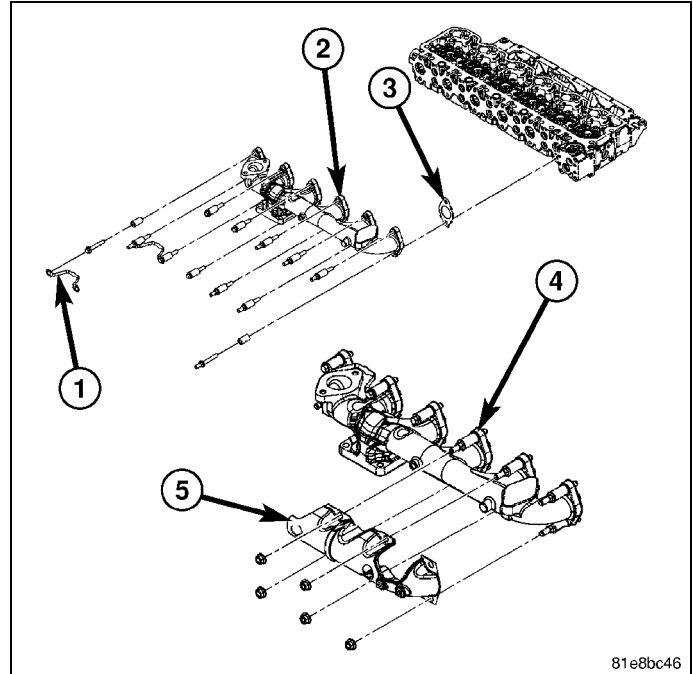
81e8bc46

Installation

1. Clean the exhaust manifold gasket surfaces.
2. Clean the cylinder head exhaust port gasket surfaces.
3. Clean the turbo mounting flange on the exhaust manifold.
4. Clean the turbo mounting flange on the turbocharger.
5. Install the exhaust manifold to turbocharger gasket and capscrews.
6. Install the exhaust manifold gasket.

NOTE: The five (5) exhaust manifold capscrews with studs are used at the #1 and #2 cylinder locations for the heat shield mounting and one on the rear lower corner of the manifold for the cabin heater tube bracket.

7. Install the exhaust manifold spacers and capscrews.
8. Starting from the center and moving in a pattern outward, tighten the exhaust manifold bolts to 43 Nm (32 ft. lbs.)

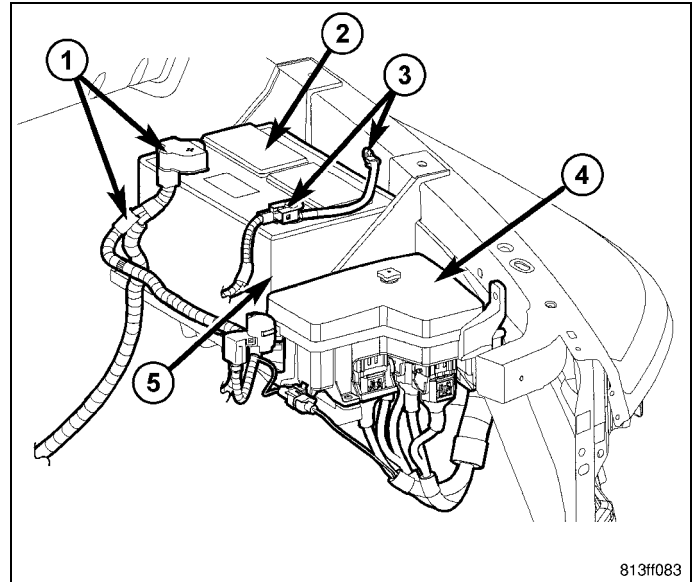


9. Install the exhaust manifold capscrew lock plates.
10. Install the exhaust manifold heat shields/noise panels. Tighten the mounting nuts to 24 N.m (18 ft. lbs.).
11. Tighten the turbocharger mounting nuts to 43 Nm (32 ft. lbs.).
12. Attach the mounting tabs and start the delta-P tube to exhaust manifold and thermostat capscrews.
13. Tighten the delta-P line bracket nut to 24 Nm (18 ft. lbs.).
14. Tighten the delta-P line bracket bolt to 10 Nm (89 in. lbs.).
15. Tighten the delta-P flare nuts to 10 Nm (89 in. lbs.).
16. Install the EGR cooler.(Refer to 07 - Cooling/Engine/COOLER, EGR - Installation)
17. Install the air filter housing.10(Refer to 09 - Engine/Air Intake System/BODY, Air Cleaner - Removal)
18. Fill the coolant.(Refer to 07 - Cooling - Standard Procedure)
19. Connect the battery negative cables.(Refer to 08 - Electrical/8F - Engine Systems/Battery System/CABLES, Battery - Installation)
20. Start the engine to check for leaks.

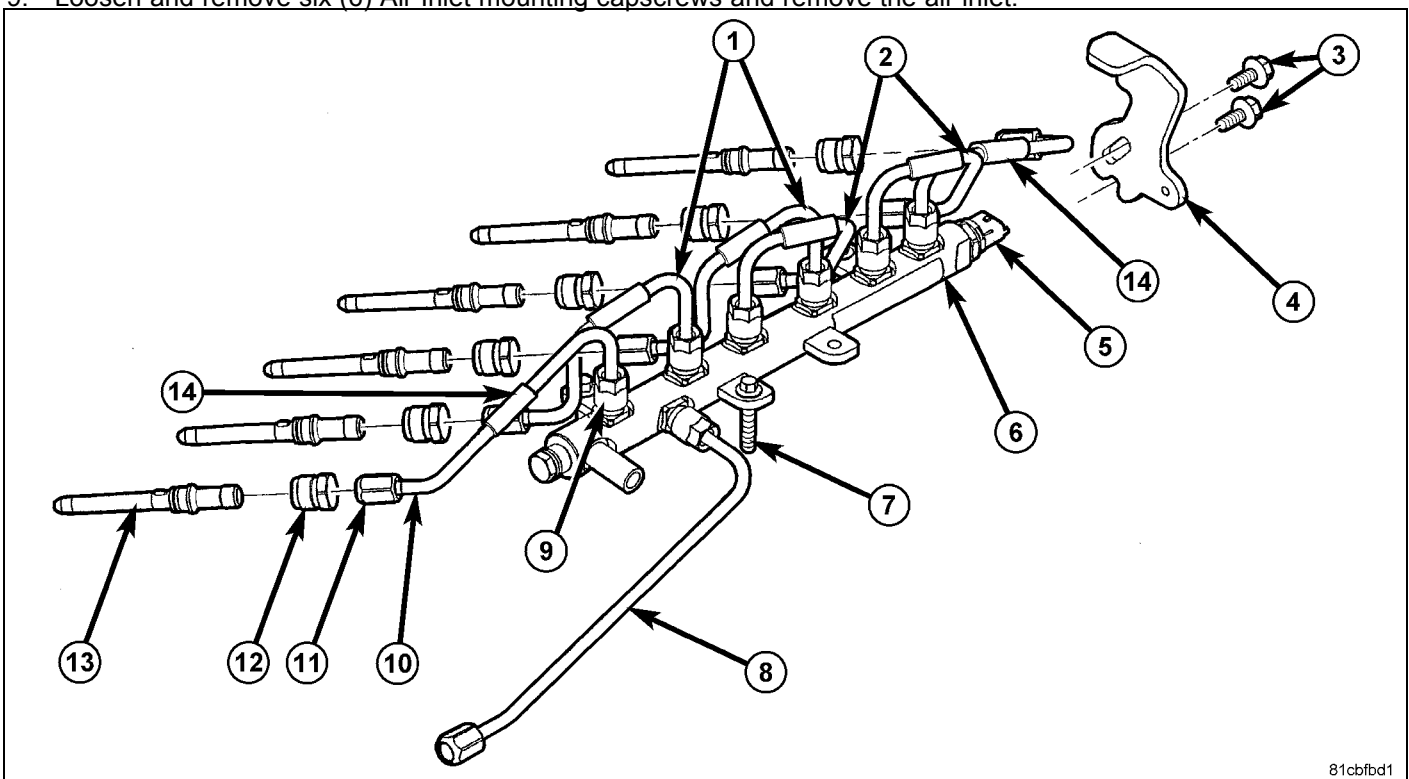
MANIFOLD, Intake

Removal

1. Disconnect the battery cables (1) and (3). (Refer to 08 - Electrical/8F - Engine Systems/Battery System/CABLES, Battery - Removal)

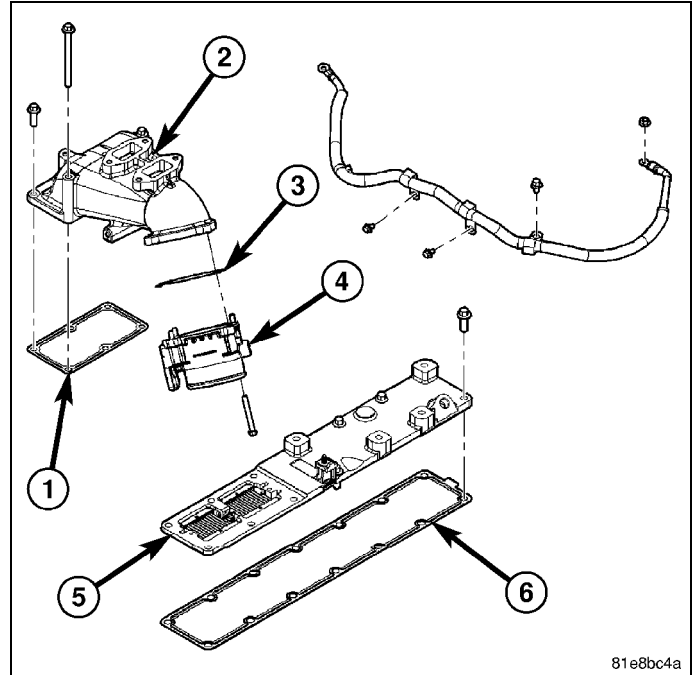


2. Disconnect the EGR Temperature sensor wire harness connector.
3. Disconnect the EGR Valve Actuator wire harness connector.
4. Remove bolt for the oil dipstick tube at the Air Inlet bracket and the nut from .
5. Loosen the CAC tube clamps at the CAC Outlet and Air Inlet and remove the tube. (Refer to 09 - Engine/Turbocharger System/COOLER and HOSES, Charge Air - Removal)
6. Loosen and remove both v-band clamps at each end of the Air Transfer tube.
7. Remove the P-clip mounting capscrew.
8. Remove the Air Transfer tube.
9. Loosen and remove six (6) Air Inlet mounting capscrews and remove the air inlet.



10. Remove the injector fuel lines. (Refer to 14 - Fuel System/Fuel Delivery/TUBE(S), Fuel - Removal)

11. Disconnect the Fuel Rail Pressure sensor at the rear of the fuel rail manifold (5).
12. Remove the High Pressure fuel line from the dump/overflow valve.
13. Remove the fuel rail.
14. Remove the intake manifold grid heater wire harness.
15. Disconnect the TMAP sensor wire harness connector.
16. Remove the intake manifold capscrews.
17. Remove the intake manifold.

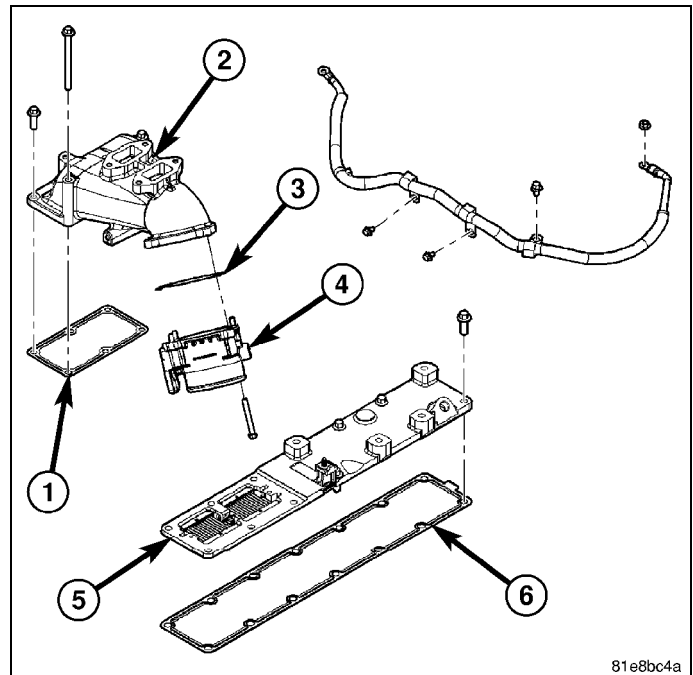


Cleaning

Clean manifold in solvent and blow dry with compressed air.

Clean cylinder block gasket surfaces using a suitable solvent.

The plenum pan rail must be clean and dry (free of all foreign material).



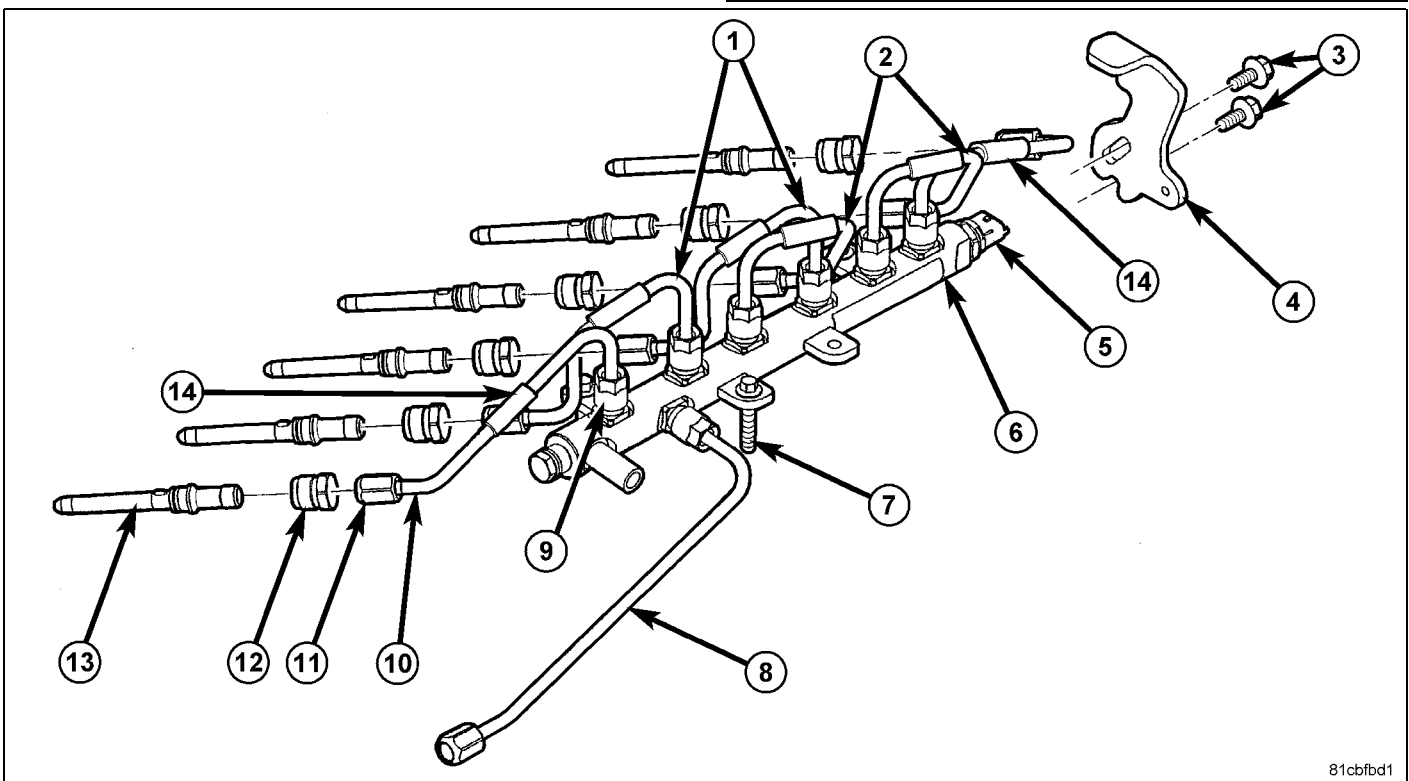
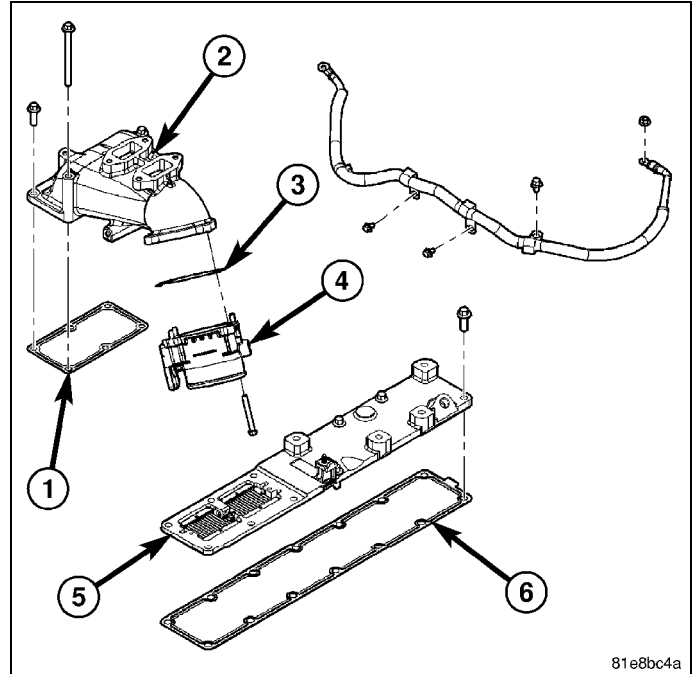
Inspection

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straightedge.

Installation

1. Clean the Intake Manifold and Cylinder Head gasket area.
2. Install a new intake manifold gasket.
3. Position the intake manifold and Install the intake manifold capscrews finger tight.



4. Install the fuel rail and the fuel rail manifold capscrews finger tight.
5. Tighten the intake manifold capscrews to 24 Nm (18 ft. lbs.).
6. Connect the High Pressure fuel line from the dump/overflow valve.
7. Connect the fuel rail pressure sensor at the rear of the fuel rail manifold (5).
8. Connect the TMAP sensor wire harness connector.
9. Install the intake manifold grid heater wire harness. Tighten the capscrew to 10 Nm (89 in. lbs.).
10. Install the injector fuel lines.(Refer to 14 - Fuel System/Fuel Delivery/TUBE(S), Fuel - Installation)
11. Tighten the fuel rail mounting capscrews to 24 Nm (18 ft. lbs.).
12. Clean the Air Inlet gasket area.
13. Clean the Intake Manifold gasket area.

14. Install the new Air Intake connection gasket.
15. Install the air inlet to the intake manifold. Tighten the six (6) air inlet mounting capscrews to 24 Nm (18 ft. lbs.).
16. Install the CAC Outlet and Air Inlet tube and tighten the clamps. (Refer to 09 - Engine/Turbocharger System/COOLER and HOSES, Charge Air - Installation)
17. Install bolt for the oil dipstick tube at the Air Inlet bracket and the retaining nut on the fuel rail. Tighten bolt to 24 Nm (18 ft. lbs.) and the retaining nut to (9 Nm 5 ft. lbs.)
18. Clean the gasket area of the Air Transfer Tube (both ends).
19. Clean the EGR cooler and EGR control valve gasket area.
20. Using new gaskets, install the Air Transfer Tube.
21. Install the V-band clamps. Tighten the V-band clamps to 10 Nm (89 in. lbs.).
22. Install the P-clip to the bracket. Tighten the mounting capscrew to 24 Nm (18 ft. lbs.).
23. Connect the EGR Valve Actuator wire harness connector.
24. Connect the EGR Temperature sensor wire harness connector.
25. Connect the battery cables (1) and (3). (Refer to 08 - Electrical/8F - Engine Systems/Battery System/CABLES, Battery - Installation)
26. Start the engine and check for leaks.

