

2013 ENGINE**6.7L Diesel - Service Information - Ram Pickup****DESCRIPTION****DESCRIPTION**

The cylinder block is constructed of cast iron. The casting is a skirted design which incorporates longitudinal ribs for superior strength and noise reduction. The block incorporates metric straight thread O-ring fittings at lubrication oil access points. The engine is manufactured with the cylinders being a non-sleeved type cylinder.

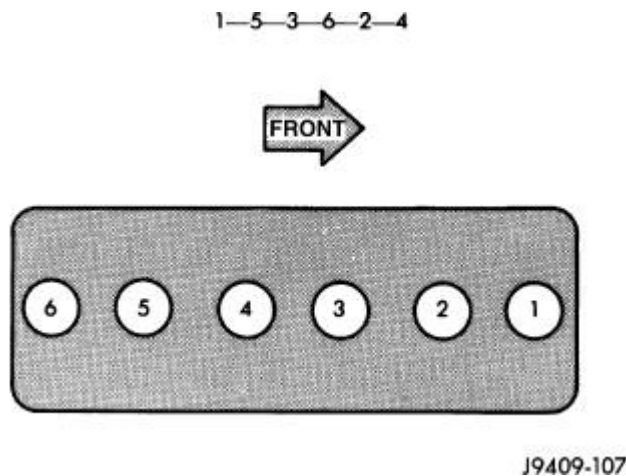


Fig. 1: Cylinder Numbering & Firing Order
Courtesy of CHRYSLER GROUP, LLC

The cylinders are numbered front to rear; 1 to 6. The firing order is 1-5-3-6-2-4.

DIAGNOSIS AND TESTING**ENGINE DIAGNOSIS - MECHANICAL**

CONDITION	POSSIBLE CAUSES	CORRECTION
LUBRICATING OIL PRESSURE LOW	1. Low oil level.	1. (a) Check and fill with clean engine oil. (b) Check for a severe external oil leak that could reduce the pressure.
	2. Oil viscosity thin, diluted or wrong specification.	2. (a) Verify the correct engine oil is being used. Refer to <u>CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION</u> . (b) Look for reduced viscosity from fuel dilution.
	3. Improperly operating	3. Verify the pressure switch is

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	pressure switch/gauge.	functioning correctly. If not, replace switch/gauge.
	4. Relief valve stuck open.	4. Check/replace valve.
	6. If cooler was replaced, shipping plugs may have been left in cooler	6. Check/remove shipping plugs.
	7. Worn oil pump.	7. Check and replace oil pump.
	8. Suction tube damaged, loose or seal leaking.	8. Check and replace suction tube and/or seal.
	9. Loose main bearing cap.	9. Check and install new bearing. Tighten cap to proper torque.
	10. Worn bearings or wrong bearings installed.	10. Inspect and replace connecting rod or main bearings. Check and replace directed piston cooling nozzles.
	11. Directed piston cooling nozzles under piston, bad fit into main carrier.	11. Check directed piston cooling nozzles position.
	12. Loose oil rifle plug with saddle-jet style nozzles	12. Tighten oil rifle plug.
	13. Loose directed piston cooling nozzle.	13. Tighten directed piston cooling nozzle.
	14. Both J-jet and saddle jet style cooling nozzle installed.	14. Install correct style jet.
LUBRICATING OIL PRESSURE TOO HIGH	1. Pressure switch/gauge not operating properly.	1. Verify pressure switch is functioning correctly. If not, replace switch/gauge.
	2. Engine running too cold.	2. Refer to Coolant Temperature Below Normal. Refer to <u>DIAGNOSIS AND TESTING</u> .
	3. Oil viscosity too thick.	3. Make sure the correct oil is being used. Refer to <u>CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION</u> .
	4. Oil pressure relief valve stuck closed or binding	4. Check and replace valve.
LUBRICATING OIL LOSS	1. External leaks.	1. Visually inspect for oil leaks. Repair as required.
	2. Crankcase being overfilled.	2. Verify that the correct dipstick is being used.
	3. Incorrect oil specification or viscosity.	3. (a) Make sure the correct oil is being used. Refer to <u>CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION</u> .
		(b) Look for reduced viscosity from dilution with fuel.

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		(c) Review/reduce oil change intervals.
	4. Oil cooler leak	4. Check and replace the oil cooler.
	5. High blow-by forcing oil out the breather.	5. Check the breather tube area for signs of oil loss. Perform the required repairs.
	6. Turbocharger leaking oil to the air intake.	6. Inspect the air ducts for evidence of oil transfer. Repair as required.
COMPRESSION KNOCKS	1. Air in the fuel system.	1. Identify location of air leak and repair. Do not bleed high pressure fuel system.
	2. Poor quality fuel or water/gasoline contaminated fuel.	2. Verify by operating from a temporary tank with good fuel. Clean and flush the fuel tank. Replace fuel/water separator filter.
	3. Engine overloaded.	3. Verify the engine load rating is not being exceeded.
	4. Improperly operating injectors.	4. Check and replace misfiring/inoperative injectors.
EXCESSIVE VIBRATION	1. Loose or broken engine mounts.	1. Replace engine mounts.
	2. Damaged fan or improperly operating accessories.	2. Check and replace the vibrating components.
	3. Improperly operating vibration damper	3. Inspect/replace vibration damper.
	4. Improperly operating electronically controlled viscous fan drive.	4. Inspect/replace fan drive.
	5. Worn or damaged generator bearing.	5. Check/replace generator.
	6. Flywheel housing misaligned.	6. Check/correct flywheel alignment.
	7. Loose or broken power component.	7. Inspect the crankshaft and rods for damage that causes an unbalance condition. Repair/replace as required.
	8. Worn or unbalanced driveline components.	8. Check/repair driveline components.
EXCESSIVE ENGINE NOISES	1. Drive belt squeal, insufficient tension or abnormally high loading.	1. Check the automatic tensioner and inspect the drive belt. Make sure water pump, tensioner pulley, fan hub, generator and power steering pump turn freely. Check for proper operation of over running alternator pulley.
	2. Intake air or exhaust leaks.	2. Refer to Excessive Exhaust Smoke. Refer to <u>SMOKE DIAGNOSIS CHARTS</u> .

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3. Excessive valve lash.	3. Adjust valves. Make sure the push rods are not bent and rocker arms, adjusting screws, crossheads, are not severely worn. Replace bent or severely worn components.
4. Turbocharger noise.	4. Check turbocharger impeller and turbine wheel for housing contact. Repair/replace as required.
5. Gear train noise.	5. Visually inspect and measure gear backlash. Replace gears as required.
6. Power function knock.	6. Check/replace rod and main bearings.
7. High Pitched Squeal.	7. Using soapy water solution check the EGR cooler to exhaust manifold joint. Check all clamps and hoses on the pressure side of the turbocharger

OFF-IDLE ENGINE SPEED LOW DURING COLD START

Dependent upon engine coolant temperature, the Powertrain Control Module (PCM) will temporarily delay (limit) the maximum engine speed when the vehicle is not moving. For automatic transmission equipped vehicles, the maximum engine speed is temporarily delayed when the vehicle speed is less than one MPH, and when the transmission selector is in either the neutral or park position. For manual transmission equipped vehicles, the maximum engine speed is temporarily delayed when the vehicle speed is less than one MPH. This PCM feature is used to protect the engine turbocharger. By temporarily limiting the engine speed, the shaft speed of the engine turbocharger is controlled to a low speed. This delay in maximum engine and turbocharger shaft speed allows for sufficient oil lubrication to the turbocharger shaft bearings. Satisfactory oil lubrication of the turbocharger shaft bearings is important for long term turbocharger durability. The 6.7L engine speed is temporarily limited to 1, 200 RPM's when the above conditions are met. The length of time that the maximum engine speed is temporarily limited is dependent upon engine coolant temperature. Refer to the chart below to determine the amount of Time Delay:

NOTE: The time delay values supplied in the table are an approximation and may vary per application.

ENGINE TEMPERATURE	TIME DELAY
- 35° F (-37°C)	45.2 secs.
- 20° F (-28°C)	34.6 secs.
- 10° F (-23°C)	28.8 secs.
- 0° F (-17°C)	24.2 secs.
+ 10° F (-12°C)	20.2 secs.
+ 20° F (-7°C)	17.0 secs.
+ 35° F (2°C)	13.0 secs.
+ 45° F (7°C)	10.8 secs.
+ 55° F (13°C)	9.0 secs.
+ 70° F (21°C)	7.0 secs.

SMOKE DIAGNOSIS CHARTS

The following charts include possible causes and corrections for **excess or abnormal** exhaust smoke. Small amounts of white smoke or water vapor (at certain times) are to be considered normal for a diesel powered engine.

NOTE: **Visible black smoke at the tail pipe is an indication of an after treatment (diesel particulate filter) failure. Follow inspection/replacement guidelines in EXHAUST SYSTEM - 2500 HD & 3500 HD to correct after treatment failure. The diesel particulate filter MAY have failed due to the possible causes listed below:**

EXCESSIVE BLACK SMOKE	
POSSIBLE CAUSE	CORRECTION
Aftermarket components installed.	Inspect for aftermarket components or evidence of modifications.
Air filter dirty or plugged.	Check the air filter. Refer to <u>AIR CLEANER, REMOVAL, 6.7L.</u>
Air intake system restricted.	Check entire air intake system including all hoses and tubes for restrictions, collapsed parts or damage. Repair/replace as necessary.
Air Leak in Intake System.	Check entire air intake system, including all hoses and tubes for cracks, loose clamps and/or holes in rubber ducts. Refer to <u>COOLER AND HOSES, CHARGE AIR, DIAGNOSIS AND TESTING, 6.7L.</u> Also check intake manifold for loose mounting hardware.
Diagnostic Trouble Codes (DTC's) active or multiple, intermittent DTC's.	Refer to appropriate Electrical Diagnostics article.
Powertrain Control Module (PCM) not calibrated or PCM calibration out of date.	Refer to appropriate Electrical Diagnostics article. Check for Technical Service Bulletin (TSB) updates.
Exhaust system restriction is above specifications.	Check exhaust pipes for damage/restrictions. Repair as necessary.
Fuel grade is not correct or fuel quality is poor.	Temporarily change fuel brands and note condition. Change brand if necessary. Refer to Owner's manual for proper fuel specifications.
Fuel injector malfunctioning.	A DTC may have been set (Refer to appropriate Electrical Diagnostics article). Perform "Cylinder Performance Test" or "Cylinder Cutout Test" using scan tool to isolate individual cylinders (Refer to <u>DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS - 2500 HD & 3500 HD .</u>
Fuel injection pump malfunctioning.	A DTC may have been set (Refer to appropriate Electrical Diagnostics article).
Fuel return system restricted.	Check fuel return lines for restriction. Refer to <u>DIAGNOSIS AND TESTING.</u> Also refer to <u>DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS - 2500 HD & 3500 HD .</u>

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Intake manifold restricted.	Remove restriction. Remove the intake air horn to inspect for grid heater fouling, inspect the EGR airflow control valve to ensure valve is in the open position
Raw fuel in intake manifold. Fuel injectors leaking on engine shutdown.	Fuel injectors leaking on engine shutdown. Perform Fuel Injector Test. Refer to <u>DIAGNOSIS AND TESTING</u> . Also refer to <u>DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS - 2500 HD & 3500 HD</u> .
Turbocharger air intake restriction.	Remove restriction.
Turbocharger damaged or malfunctioning.	Turbocharger damaged or malfunctioning. Refer to <u>TURBOCHARGER, INSPECTION, 6.7L</u> .
Turbocharger externally damaged.	Check for excessive oil in compressor and/or turbine housing and in turbocharger exhaust pipe. Refer to <u>TURBOCHARGER, INSPECTION, 6.7L</u> .
Turbocharger wheel clearance out of specification.	Refer to <u>TURBOCHARGER, INSPECTION, 6.7L</u> .

EXCESSIVE WHITE SMOKE

POSSIBLE CAUSE	CORRECTION
Aftermarket components installed.	Inspect for aftermarket components or evidence of modifications.
Diagnostic Trouble Codes (DTC's) active or multiple, intermittent DTC's.	Refer to appropriate Electrical Diagnostics article. Check for Technical Service Bulletin (TSB) updates.
Intake manifold heater circuit not functioning correctly in cold weather.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Also check heater elements for correct operation.
Coolant leaking into combustion chamber.	Do pressure test of cooling system. Refer to <u>DIAGNOSIS AND TESTING</u> .
In cold ambient temperatures, engine block heater is malfunctioning (if equipped).	Refer to <u>HEATER, ENGINE BLOCK, REMOVAL</u> .
Engine coolant temperature sensor malfunctioning.	A DTC should have been set (Refer to 28 - DTC Based Diagnostics). Also check thermostat operation. Refer to <u>THERMOSTAT, DIAGNOSIS AND TESTING</u> . Powertrain or Engine Control Module not calibrated or has incorrect calibration. A DTC should have been set (Refer to appropriate Electrical Diagnostics article).
Engine Control Module (ECM) not calibrated or has incorrect calibration.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Perform fuel injection pump performance test (Refer to <u>FUEL SYSTEM - 2500 HD & 3500 HD</u> .
Low supply flow to the injection pump.	Test the fuel delivery system (Refer to <u>FUEL SYSTEM - 2500 HD & 3500 HD</u>).
Fuel grade not correct or fuel quality is poor.	Temporarily change fuel brands and note condition. Change brand if necessary. Refer to Owner's Manual for correct fuel specification.
Fuel heater element or fuel heater temperature	Refer to Fuel Heater Testing. Refer to <u>HEATER, FUEL,</u>

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sensor malfunctioning. This will cause wax type build-up in fuel filter.	<u>DIAGNOSIS AND TESTING</u> .
Fuel injector malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Perform the cylinder cut-out test using a scan tool to isolate individual cylinders. If unable to isolate individual cylinder, perform Injector Return Flow Test to identify failed injector or fuel connector tube. In the event that return flow is normal, use Injector Blocking Tool 9864, to block the high pressure fuel line at the rail one at a time. This test may isolate and injector nozzle that is leaking fuel into the cylinder. Also refer to <u>DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS - 2500 HD & 3500 HD</u> .
Fuel injector protrusion not correct.	Check washer (shim) at bottom of fuel injector for correct thickness. Refer to <u>INJECTOR(S), FUEL, INSTALLATION</u> .
Fuel injection pump malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Perform fuel injection pump performance test (Refer to <u>FUEL SYSTEM - 2500 HD & 3500 HD</u>).
Fuel transfer (lift) pump malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article).
Intake/Exhaust valve adjustments not correct (too tight).	Refer to <u>STANDARD PROCEDURE</u> .
Intake manifold air temperature sensor malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article).
Internal engine damage (scuffed cylinder).	Analyze engine oil and inspect oil filter to locate area of probable damage.

NOTE: **Visible blue smoke at the tail pipe is an indication of an aftertreatment (diesel particulate filter) failure. Follow inspection/replacement guidelines in EXHAUST SYSTEM - 2500 HD & 3500 HD to correct aftertreatment failure. The diesel particulate filter MAY have failed due to the possible causes listed below:**

EXCESSIVE BLUE SMOKE	
POSSIBLE CAUSE	CORRECTION
Dirty air cleaner or restricted turbocharger intake duct.	Check the air filter housing. Refer to <u>AIR CLEANER, REMOVAL, 6.7L</u> .
Obstruction in exhaust manifold.	Remove exhaust manifold and inspect for blockage. Refer to <u>MANIFOLD, EXHAUST, REMOVAL, 6.7L</u> .
Restricted turbocharger drain tube.	Remove turbocharger drain tube and remove obstruction.
Crankcase ventilation system plugged.	Inspect crankcase ventilation system for function.
Valve seals are worn, brittle, or improperly installed.	Replace valve stem oil seals. Refer to <u>VALVES, INTAKE AND EXHAUST, REMOVAL, 6.7L</u> .
Valve stems and/or guides are worn.	Remove valves and inspect valves and guides. Refer to

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	<u>VALVES, INTAKE AND EXHAUST, REMOVAL, 6.7L.</u>
Broken or Improperly installed piston rings.	Tear down engine and inspect piston rings.
Excessive piston ring end gap.	Remove pistons and measure piston ring end gap. Refer to <u>STANDARD PROCEDURE</u> .
Excessive cylinder bore wear and taper.	Remove pistons and measure cylinder bore wear and taper. Refer to <u>ENGINE BLOCK, STANDARD PROCEDURE, 6.7L.</u>
Cylinder damage.	Remove pistons and inspect cylinder bore for cracks or porosity. Repair with cylinder liner if necessary. Refer to <u>ENGINE BLOCK, STANDARD PROCEDURE, 6.7L.</u>
Piston damage.	Remove pistons and inspect for cracks and/or holes. Measure piston for out-of-round and taper. Refer to <u>INSPECTION</u> .
Turbocharger failure.	Refer to <u>TURBOCHARGER, DIAGNOSIS AND TESTING, 6.7L.</u>
Fuel injector protrusion not correct.	Check washer (shim) at bottom of fuel injector for correct thickness. Refer to <u>INJECTOR(S), FUEL, INSTALLATION</u> .

CYLINDER COMPRESSION/LEAKAGE TESTS

CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure batteries are completely charged and the engine starter motor is in good operating condition. Otherwise, the indicated compression pressures may not be valid for diagnostic purposes.

1. Disconnect the fuel inlet line to the fuel filter housing. Plug the fuel line from the fuel tank.

NOTE: **Failure to plug fuel line will result in fuel leak.**

2. Remove fuel transfer pump relay from PDC.
3. Start the engine and idle until the engine stalls (runs out of fuel).
4. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L.**
5. Remove the high pressure fuel line between the cylinder head and fuel rail for the cylinder to be tested. Use Fuel Rail Cap (special tool #9864, Cap, Fuel Rail) to cap this fuel rail on the cylinder being tested.
6. Remove the fuel connector tube nut and fuel connector tube.
7. Remove the exhaust rocker lever.
8. Use the (special tool #9010A, Remover/Installer, Fuel Injector) to remove the injector and copper sealing washer.
9. Install Compression Test Adapter (special tool #9007, Adapter, Compression Test) into the injector bore.
10. Install the exhaust rocker lever and tighten to 36 N.m (27 ft. lbs.).
11. Cover the remaining rocker levers with clean shop towels to prevent any oil splatter under the hood.

12. Place a rag over the compression test tool fitting. Crank the engine for 2-3 seconds to purge any fuel that may have drained into the cylinder when the injector was removed.
13. Connect the compression test gauge.
14. Crank the engine for 5 seconds and record the pressure reading. Repeat this step three times and calculate the average of the three readings.

NOTE: **The minimum cylinder pressure is 350 psi. Cylinder pressure should be within 20% from cylinder to cylinder.**

15. Combustion pressure leakage can be checked if cylinder pressure is below the specification. Perform the leakage test procedure on each cylinder according to the tester manufacturer instructions.
16. Upon completion of the test check and erase any engine related fault codes.

CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
 - Leaks between adjacent cylinders or into water jacket.
 - Any causes for combustion/compression pressure loss
1. Start and operate the engine until it attains normal operating temperature.
 2. Disconnect injector harness connectors.
 3. Disconnect CCV tube and breather drain tube from valve cover.
 4. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
 5. Bring the cylinder to be tested to TDC.
 6. Remove the high pressure fuel line between the cylinder head and the fuel rail for the cylinder to be tested.
 7. Install Fuel Rail Cap (special tool #9864, Cap, Fuel Rail) onto the rail.
 8. Remove the high pressure connector nut and high pressure connector with High Pressure Connector Remover (special tool #9015, Remover, High Pressure Connector).
 9. Remove the exhaust and intake rocker lever.
 10. Use the (special tool #9010A, Remover/Installer, Fuel Injector) to remove the injector and copper sealing washer.
 11. Install Compression Test Adapter (special tool #9007, Adapter, Compression Test) into the injector bore.
 12. Connect the leakage tester and perform the leakage test procedure on each cylinder according to the tester manufacturer's instructions.
 13. Upon completion of the test check and erase any engine related fault codes.

STANDARD PROCEDURE

DUST COVERS AND CAPS

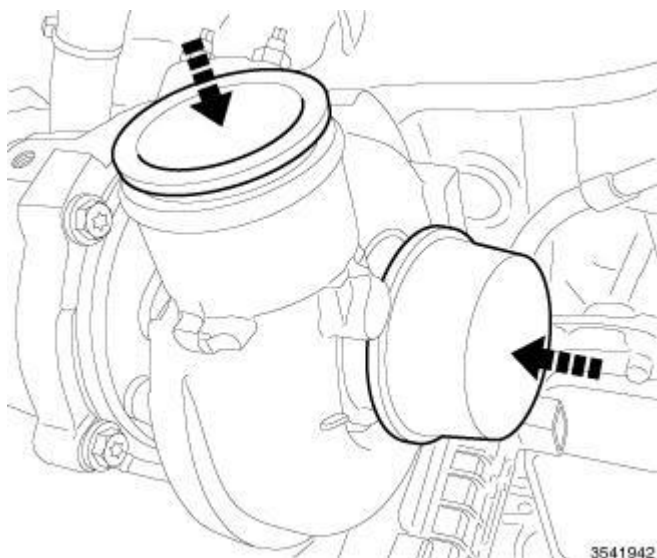


Fig. 2: Covers/Caps

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.

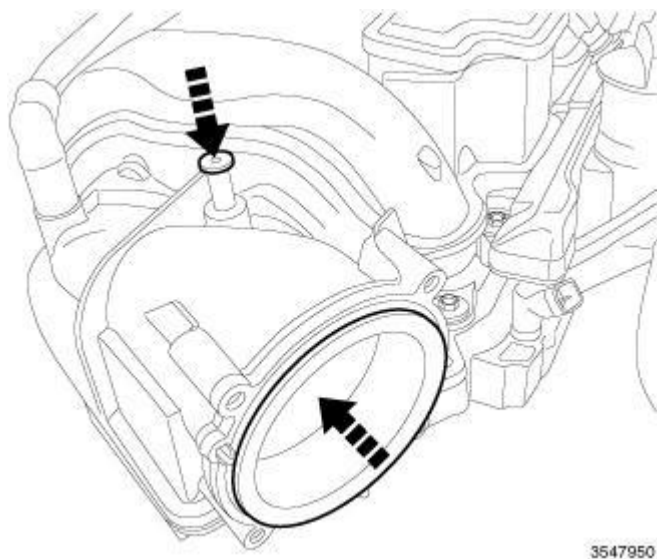


Fig. 3: Opening Cover

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

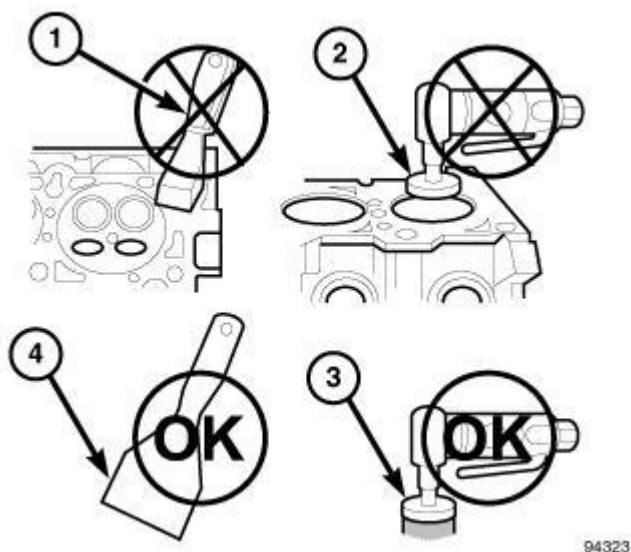


Fig. 4: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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).

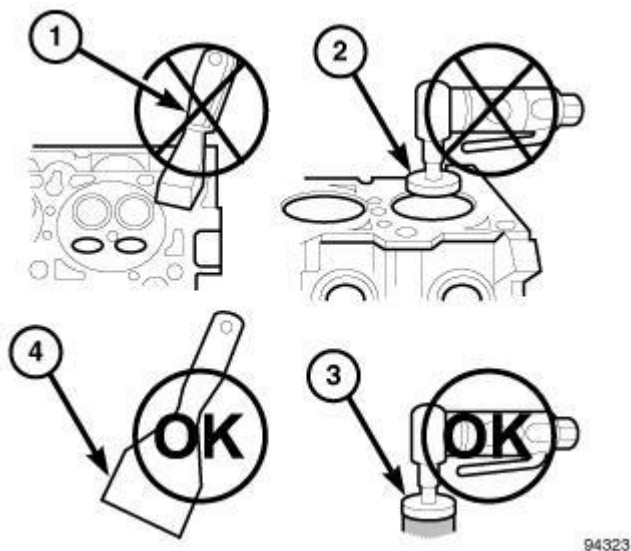


Fig. 5: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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 (3).

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

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets.

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

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier than using precut gaskets.

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

HYDROSTATIC LOCK

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

1. Disconnect the negative cable(s) from the battery.
2. Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign

material.

3. Place a shop towel around the fuel injectors to catch any fluid that may possibly be under pressure in the cylinder head. Remove the fuel injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .
4. With all injectors removed, rotate the crankshaft using the crankshaft barring tool (PN 7471B).
5. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
6. Be sure all fluid has been removed from the cylinders.
7. Repair engine or components as necessary to prevent this problem from occurring again.
8. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.
9. Install fuel injectors. Refer to **INJECTOR(S), FUEL, INSTALLATION** .
10. Drain engine oil. Remove and discard the oil filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 6.7L**.
11. Install the drain plug. Tighten the plug to 50 N.m (37 ft. lbs.).
12. Install a new oil filter. Refer to **FILTER, ENGINE OIL, INSTALLATION, 6.7L**.
13. Fill engine crankcase with the specified amount and grade of oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
14. Connect the negative cable(s) to the battery.
15. Start the engine and check for any leaks.

SPECIFICATIONS

6.7L DIESEL

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	In-Line 6 Cyl. Turbo Diesel
Displacement	6.7 Liters 409 (Cubic Inches)
Bore	107.0 mm (4.21 in.)
Stroke	124.0 mm (4.88 in.)
Compression Ratio	17.2:1
Cylinder Pressure (Minimum)	350 psi.
Horsepower High Output 68 RE A/T and G 56 M/T (pickup)	350 HP @ 3013 RPM
Horsepower High Output 68 RE A/T and G 56 M/T (cab chassis)	305 HP @ 3013 RPM
Maximum Compression Pressure Variation Between Cylinders	20% from cylinder to cylinder
Torque Rating High Output 68RE A/T and G 56 M/T (pickup)	650 ft. lbs. @ 1500 RPM (auto) 610 ft. lbs. @ 1500 RPM (manual)
Torque Rating High Output 68RE A/T and G 56 M/T (cab chassis)	610 ft. lbs. @ 1600 RPM (manual)

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Lubrication System	Pressure Feed-Full Flow With Bypass Valve
Firing Order	1-5-3-6-2-4
Cylinder Block	Cast Iron
Crankshaft	Induction Hardened Forged Steel
Cylinder Head	Cast Iron With Valve Seat Inserts
Combustion Chambers	High Swirl Bowl
Camshaft	Chilled Ductile Iron
Pistons	Cast Aluminum
Connecting Rods	Cross Rolled Micro Alloy

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Skirt Diameter (Measure the skirt 21.4 mm (0.84 in) from the bottom of the piston)	106.828 - 106.892 mm	4.2078 - 4.2083 in.
Ring Groove Clearance	The clearance for the top piston ring groove can not be measured accurately with a typical feeler gauge.	The clearance for the top piston ring groove can not be measured accurately with a typical feeler gauge.
Intermediate (Min)	0.040 mm	0.0016 in
(Max)	0.110 mm	0.0043 in.
Oil Control (Min)	0.040 mm	0.0016 in.
(Max)	0.085 mm	0.0033 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Pin Diameter (Min)	39.997 mm	1.5747 in.
(Max)	40.003 mm	1.5749 in.
Bore Diameter (Min)	40.006 mm	1.5750 in.
(Max)	40.012 mm	1.5753 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Ring	0.30 - 0.46 mm	0.012 - 0.018 in.
Intermediate	0.82 - 1.18 mm	0.032 - 0.047 in.
Oil Control	0.22 - 0.58 mm	0.010 - 0.023 in.
Ring Gap Wear Limit		
Top Ring	See Above	See Above

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Intermediate	See Above	See Above
Oil Control	See Above	See Above

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance		
Desired	0.04 - 0.12 mm	0.002 - 0.005 in.
Wear Limit	See Above	See Above
Pin Bore Diameter (Min. w/ bushing installed)	40.019 mm	1.5764 in.
Pin Bore Diameter (Max. w/ bushing installed)	40.042 mm	1.5765 in.
Side Clearance (Min)	0.100 mm	0.004 in.
Side Clearance (Max)	0.330 mm	0.013 in.

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Overall Flatness End To End (max)	0.305 mm	0.012 in.
Overall Flatness Side To Side (Max)	0.076 mm	0.003 in.
Intake Valve Seat Angle	30°	30°
Exhaust Valve Seat Angle	45°	45°
Valve Stem Diameter		
(Min)	6.96 mm	0.2740 in.
(Max)	7.01 mm	0.2760 in.
Valve Margin (Min.)	0.79 mm	0.031 in.

INJECTOR PROTRUSION

DESCRIPTION	Metric	Standard
MIN	2.45 mm	0.96 in.
MAX	3.15 mm	0.124 in.
NOTE: Do NOT use thicker or double stacked injector sealing washers to correct injector protrusion. This will cause misalignment of the high pressure fuel connector.		

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Tip Clearance Between Rotors (Max)	0.178 mm	0.007 in.

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OIL PRESSURE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
At Idle	69 kPa	10 psi
@ 2500 RPM	207 kPa	30 psi
Regulating Valve Opening Pressure	517 kPa	75 psi
Oil Filter Bypass Pressure Setting	344.75 kPa	50 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	New - 106.990 - 107.010 mm	New - 4.2122 - 4.2130 in.
	Used - 106.990 - 107.030 mm	Used - 4.2122 - 4.2138 in.
Out of Round (Max.)	0.038 mm	0.0015 in.
Taper (Max.)	0.076 mm	0.003 in.
Tappet Bore Diameter	16.000 - 16.055 mm	0.630 - 0.632 in.
Camshaft Bearing / Support Bore Diameter(s)	54.083 - 54.147 mm (Bushing Installed)	2.1293 - 2.1318 in. (Bushing Installed)

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	68.962 - 69.013 mm	2.7150 - 2.7170 in.
Out-of-Round (Max.)	0.050 mm	0.002 in.
Taper (Max.)	0.013 mm	0.0005 in.
End Play Range	0.120 - 0.432 mm	0.004 - 0.017 in.
Desired End-Play	See Above	See Above
Wear Limit	See Above	See Above
Main Bearing Clearance 1-6	0.04 - 0.12 mm	0.002 - 0.005 in.
Wear Limit	See Above	See Above

MAIN BEARING JOURNALS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter - High	83.013 mm	3.2682 in.
Diameter - Low	82.962 mm	3.2662 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journal Diameter	53.095 - 54.045 mm	2.0904 - 2.1278 in
Bore Diameter	See ENGINE BLOCK	See ENGINE BLOCK

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End Play

0.12 - 0.5 mm

0.005 - 0.02 in.

SOLID TAPPETS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Stem Diameter	15.936 - 15.977 mm	0.627 - 0.629 in.

VALVES

DESCRIPTION		SPECIFICATION	
		Metric	Standard
Valve Stem Diameter	(Min)	6.96 mm	0.2740 in.
	(Max.)	7.01 mm	0.2760 in.
Valve Margin - Intake		0.79 mm	0.031 in.
Valve - Exhaust		0.79 mm	0.031 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length - Spring	47.75 mm	1.88 in.

6.7L DIESEL D2 3500**GENERAL DESCRIPTION**

DESCRIPTION	SPECIFICATION
Engine Type	In-Line 6 Cyl. Turbo Diesel
Displacement	6.7 Liters 408 (Cubic Inches)
Bore	107.0 mm (4.21 in.)
Stroke	124.0 mm (4.88 in.)
Compression Ratio	16.2:1
Cylinder Pressure (Minimum)	350 psi.
Horsepower High Output 68 RE A/T and G 56 M/T (pickup)	350 HP @ 3013 RPM
Horsepower High Output 68 RE A/T and G 56 M/T (cab chassis)	305 HP @ 3013 RPM
Maximum Compression Pressure Variation Between Cylinders	20% from cylinder to cylinder
Torque Rating High Output 68RE A/T and G 56 M/T (pickup)	650 ft. lbs. @ 1500 RPM (auto) 610 ft. lbs. @ 1500 RPM (manual)
Torque Rating High Output 68RE A/T and G 56 M/T (cab chassis)	610 ft. lbs. @ 1600 RPM (manual)
Lubrication System	Pressure Feed-Full Flow With Bypass Valve
Firing Order	1-5-3-6-2-4

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Cylinder Block	Cast Iron
Crankshaft	Induction Hardened Forged Steel
Cylinder Head	Cast Iron With Valve Seat Inserts
Combustion Chambers	High Swirl Bowl
Camshaft	Chilled Ductile Iron
Pistons	Cast Aluminum
Connecting Rods	Cross Rolled Micro Alloy

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Skirt Diameter (Measure the skirt 21.4 mm (0.84 in) from the bottom of the piston)	106.818 - 106.882 mm	4.2054 - 4.2080 in.
Ring Groove Clearance	The clearance for the top piston ring groove can not be measured accurately with a typical feeler gauge.	The clearance for the top piston ring groove can not be measured accurately with a typical feeler gauge.
Intermediate (Min)	0.040 mm	0.0016 in.
(Max)	0.110 mm	0.0043 in.
Oil Control (Min)	0.040 mm	0.0016 in.
(Max)	0.085 mm	0.0033 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Pin Diameter (Min)	39.997 mm	1.5747 in.
(Max)	40.003 mm	1.5749 in.
Bore Diameter (Min)	40.006 mm	1.5750 in.
(Max)	40.012 mm	1.5753 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Ring	0.35 - 0.51 mm	0.014 - 0.020 in.
Intermediate	0.82 - 1.18 mm	0.032 - 0.047 in.
Oil Control	0.22 - 0.58 mm	0.010 - 0.023 in.
Ring Gap Wear Limit		
Top Ring	See Above	See Above
Intermediate	See Above	See Above
Oil Control	See Above	See Above

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CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance		
Desired	0.04 - 0.12 mm	0.002 - 0.005 in.
Wear Limit	See Above	See Above
Pin Bore Diameter (Min. w/ bushing installed)	40.019 mm	1.5764 in.
Pin Bore Diameter (Max. w/ bushing installed)	40.042 mm	1.5765 in.
Side Clearance (Min)	0.100 mm	0.004 in.
Side Clearance (Max)	0.330 mm	0.013 in.

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Overall Flatness End To End (max)	0.305 mm	0.012 in.
Overall Flatness Side To Side (Max)	0.076 mm	0.003 in.
Intake Valve Seat Angle	30°	30°
Exhaust Valve Seat Angle	45°	45°
Valve Stem Diameter		
(Min)	6.96 mm	0.2740 in.
(Max)	7.01 mm	0.2760 in.
Valve Margin (Min.)	0.79 mm	0.031 in.

INJECTOR PROTRUSION

DESCRIPTION	Metric	Standard
MIN	2.45 mm	0.96 in.
MAX	3.15 mm	0.124 in.
NOTE: Do NOT use thicker or double stacked injector sealing washers to correct injector protrusion. This will cause misalignment of the high pressure fuel connector.		

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Tip Clearance Between Rotors (Max)	0.178 mm	0.007 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATION	

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	Metric	Standard
At Idle	69 kPa	10 psi
@ 2500 RPM	207 kPa	30 psi
Regulating Valve Opening Pressure	517 kPa	75 psi
Oil Filter Bypass Pressure Setting	344.75 kPa	50 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	New - 106.990 - 107.010 mm	New - 4.2122 - 4.2130 in.
	Used - 106.990 - 107.030 mm	Used - 4.2122 - 4.2138 in.
Out of Round (Max.)	0.038 mm	0.0015 in.
Taper (Max.)	0.076 mm	0.003 in.
Tappet Bore Diameter	16.000 - 16.055 mm	0.630 - 0.632 in.
Camshaft Bearing / Support Bore Diameter(s)	54.083 - 54.147 mm (Bushing Installed)	2.1293 - 2.1318 in. (Bushing Installed)

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter	68.962 - 69.013 mm	2.7150 - 2.7170 in.
Out-of-Round (Max.)	0.050 mm	0.002 in.
Taper (Max.)	0.013 mm	0.0005 in.
End Play Range	0.120 - 0.432 mm	0.004 - 0.017 in.
Desired End-Play	See Above	See Above
Wear Limit	See Above	See Above
Main Bearing Clearance 1-6	0.04 - 0.12 mm	0.002 - 0.005 in.
Wear Limit	See Above	See Above

MAIN BEARING JOURNALS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter - High	83.013 mm	3.2682 in.
Diameter - Low	82.962 mm	3.2662 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Journal Diameter	53.095 - 54.045 mm	2.0904 - 2.1278 in.
Bore Diameter	See ENGINE BLOCK	See ENGINE BLOCK
End Play	0.12 - 0.5 mm	0.005 - 0.02 in.

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SOLID TAPPETS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Stem Diameter	15.936 - 15.977 mm	0.627 - 0.629 in.

VALVES

DESCRIPTION		SPECIFICATION	
		Metric	Standard
Valve Stem Diameter	(Min)	6.96 mm	0.2740 in.
	(Max.)	7.01 mm	0.2760 in.
Valve Margin - Intake		0.79 mm	0.031 in.
Valve - Exhaust		0.79 mm	0.031 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length - Spring	47.75 mm	1.88 in.

TORQUE**ENGINE BLOCK**

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Connecting Rod-Bolts			
Step 1	30	-	22
Step 2	60	-	44
Step 3	Rotate 60 degrees		
CAUTION: The 6.7L engine has different torque procedures for new and previously installed main bearing capscrews. Failure to use the correct torque procedure can result in engine damage.			
Crankshaft Main Cap-Bolts (Previously Used)			
Step 1	60	-	44
Step 2	80	-	59
Step 3	Rotate 90°		
Crankshaft Main Cap-Bolts (New Main Bearing Capscrews)			
Step 1	120	-	89
Step 2	Loosen 360°		
Step 3	60	-	44
Step 4	85	-	63
Step 5	Rotate 120°		
Bell Housing Access Cover Bolts	10	89	-
Camshaft Thrust Plate Bolts	24	-	18
Coolant Outlet Tube Bracket Bolt	10	89	-

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Coolant Outlet Tube Bracket Nut	24	-	18
Delta-P line Bracket Bolt	10	89	-
Delta-P line Bracket Nut	24	-	18
Delta-P Flare Nut	10	89	-
Engine Block Stiffener Bolts (bottom of engine)	43	-	32
Engine Block Stiffener Bolts (side of engine)	89	-	66
Engine Block Stiffener Bolts (top of engine)	89	-	66
Engine Mount Bolt	102	-	75
Engine Mount Through Bolt Nut	136	-	100
Engine Wire Harness P-clip Bolts (M6)	10	89	-
Engine Wire Harness P-clip Bolts (M8)	16	142	-
Coolant Outlet Tube Bracket Bolts	10	89	-
Coolant Outlet Tube Bolts	10	89	-
Coolant Vent Hose Banjo Bolt	11	97	-
Injector Connector Tube Nut	15	133	-
Step 2	50	-	37
Piston Cooling Oil Jet Bolt	15	133	-
Oil Cooler Bolts	24	-	18
Oil Dip Stick Tube Bolt	24	-	18
Oil Dip Stick Tube Nut	9	80	-
Oil Filter	11	97	-
Oil Pan Bolts	28	-	21
Oil Pan Drain Plug	50	-	37
Oil Pressure Regulator Plug	80	-	59
Oil Pressure Switch to Block Fitting	18	-	13
Oil Pressure Switch to Block Fitting to Block	30	-	22
Oil Pump-Bolts	Refer to <u>PUMP, ENGINE OIL, INSTALLATION, 6.7L.</u>		
Oil Suction Tube (Flange) Bolts M8	24	-	18
Oil Suction Tube (Brace) Bolt M10	43	-	32
Oxygen Sensor	41	-	30
P-Clip Bolt	24	-	18
Starter Motor B+ Cable Nut	24	-	18
Starter Motor Bolts	43	-	32
Torque Converter Bolts (68RFE)	95	-	70
Torque Converter Bolts (AS69RC)	110	-	81

CYLINDER HEAD

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Breather Cover Bolts	10	89	-
Cylinder Head-Bolts			

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Step 1	70	-	52
Step 2	Back off 360 degrees		
Step 3	105	-	77
Step 4 Verify	105	-	77
Step 5	Rotate All Bolts 1/4 Turn		
Cylinder Head Cover Bolts	24	-	18
Engine Coolant Temperature Sensor Shield Bolts	9	-	80
Engine Cover Bolts	10	89	-
Exhaust Manifold Bolts	53	-	39
Exhaust Manifold Heat Shield Nuts	24	-	18
Exhaust Manifold to EGR Cooler Studs	24	-	18
Front Engine Lifting Bracket Bolts	43	-	32
Fuel Delivery Lines-Banjo	24	-	18
Fuel Drain Line-Banjo	24	-	18
Fuel Injector Wire Harness Nuts	1.50	13	-
Fuel Injector Hold-down	5	44	-
Step 2	10	89	-
Fuel Tube, No. 6 Bracket Shield Bolts	43	-	32
Fuel Tube-Rail to Cylinder Head	40	-	30
Fuel Tube-Pump to Fuel Rail	40	-	30
Fuel Rail Hold-down Bolt	24	-	18
Generator Mounting Bolts	65	-	48
Generator Mounting Bracket Bolts (Exhaust Side)	33	-	24
Generator Mounting Bracket Bolts (Upper) (Intake Side)	60	-	44
Generator Mounting Bracket Bolts (Lower) (Intake Side)	33	-	24
Intake Manifold Bolts	24	-	18
Intake Manifold Grid Heater Wire Harness Bolts	10	89	-
Rear Engine Lifting Bracket Bolts	77	-	57
Rocker Arm/Pedestal-Bolts	36	-	27
Rocker Housing Bolts	24	-	18
Valve Lash Adjusting Nut	24	-	18

FRONT ENGINE

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Accessory Drive Belt Tensioner	43	32	-
Fan Shroud Support Bracket Bolts	32	24	-
Fan Shroud Nuts	22	16	-
Fan Support Hub	32	-	24

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Fan Shroud Support Bracket Bolts	32	-	24
Fuel Injection Pump Gear Access Cover	8	71	-
Fuel Injection Pump Nuts	24	-	18
Fuel Injection Pump Studs	24	-	18
Front Cover	24	-	18
Gear Housing Cover	24	-	18
Vibration Damper Bolts	40 + 60°	-	30 + 60°

REAR ENGINE

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Crankshaft Adapter Plate Bolts (G56 Trans)	146	-	108
Dual Mass Flywheel Bolts	61	-	45
Flexplate to Engine	137	-	100
Flywheel to Engine	137	-	100
Flywheel Housing Bolts	77	-	57
Rear Oil Seal Retainer Bolts	10	89	-
Transmission Adaptor Plate Bolts	77	-	57
Transmission to Engine Bolts (68RFE)	54	-	40
Transmission to Engine Bolts (AS69RC)	54	-	40
Transmission to Engine Bolts (G 56)	54	-	40
Transmission Mount to Crossmember Nuts	54	-	40
G 56 Transmission Mount Bolts	61	-	45
68RFE Transmission Mount Bolts	61	-	45

ACCESSORY DRIVE

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Accessory Drive Belt Tensioner Bolt	43	-	32

TURBOCHARGER

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Air Inlet to Intake Manifold Bolts	24	-	18
Air Cleaner Body Bolt	8	70	-
Air Cleaner Intake Air Tube Clamp	4	-	35
Charge Air Cooler Bolt	31	-	22
Charge Air Cooler Mounting Bracket (right side)	28	-	21
Charge Air Cooler Support Bracket (left side)	28	-	21
Charge Air Cooler Shroud	14	124	-
Charge Air Cooler Tube Clamps	14	124	-
Turbocharger Actuator Bolt	11	97	-
Turbocharger Actuator Wire Harness Clip Bolt	11	97	-
Turbocharger Air Inlet Tube Clamp	11	97	-

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Turbocharger Cleaning Port Plug	10	89	-
Turbocharger Coolant Return Line Banjo Bolt	24	-	18
Turbocharger Coolant Supply Line Banjo Bolt	24	-	18
Turbocharger Nuts	43	-	32
Turbocharger Studs	24	-	18
Turbocharger Oil Drain Tube Bolts	24	-	18
Turbocharger Oil Supply Line Union Nut	24	-	18
Turbocharger Speed Sensor Bolt	10	89	-
Turbocharger V-Band Clamp Nut	17	150	-

REMOVAL

REMOVAL



Fig. 6: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative and positive battery cables.
2. Remove the oil dipstick (3).
3. Remove fasteners (1, 4) the engine cover (2).
4. Disconnect the hood support struts and position hood out of the way.
5. Drain cooling system. Refer to **STANDARD PROCEDURE** .
6. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
7. Recover A/C refrigerant. Refer to **PLUMBING, STANDARD PROCEDURE** .
8. Drain engine oil.
9. Reinstall drain plug. Tighten to 50 N.m (37 ft. lbs.).

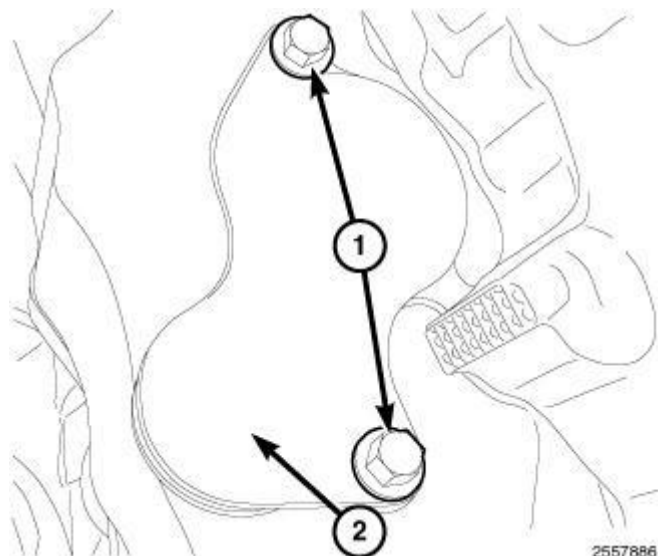


Fig. 7: Bolts & Bell Housing Access Cover
 Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the bell housing access cover (2).

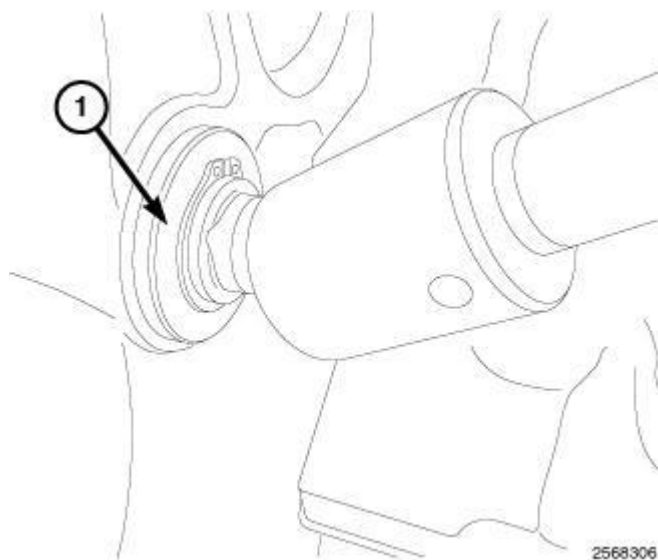


Fig. 8: Engine Barring Tool
 Courtesy of CHRYSLER GROUP, LLC

11. Install the Barring Tool (special tool #7471B, Barring Tool) (1).
12. Using the Barring Tool (special tool #7471B, Barring Tool) (1), rotate the engine and remove the torque converter bolts.
 - a. On manual transmission models, remove the dual mass flywheel bolts.
13. Remove the Barring Tool (special tool #7471B, Barring Tool) (1).
14. Remove the left ground strap.
15. Disconnect the transmission harness connector.

16. Remove the radiator closure panel. Refer to **PANEL, CLOSURE, RADIATOR, REMOVAL** .
17. Remove the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** or **FAN, COOLING, VISCOUS, REMOVAL** .
18. Disconnect the upper and lower radiator hoses and remove the radiator.
19. Remove the serpentine drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

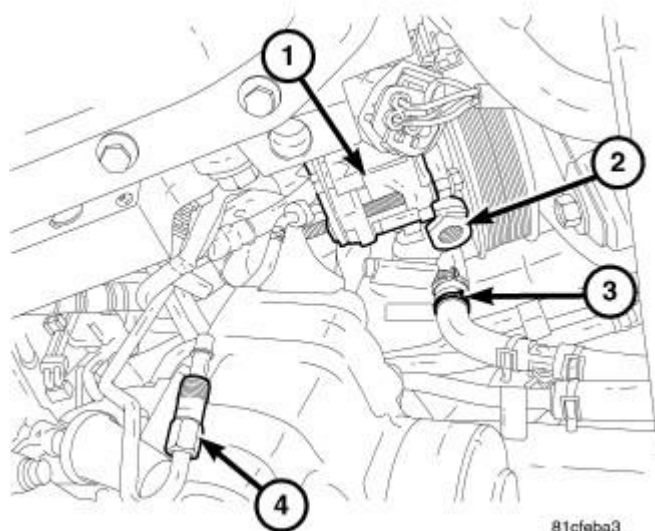


Fig. 9: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

20. Remove the power steering reservoir. Refer to **RESERVOIR, POWER STEERING PUMP, REMOVAL** .
21. Remove the power steering pump. Refer to **PUMP, REMOVAL** .

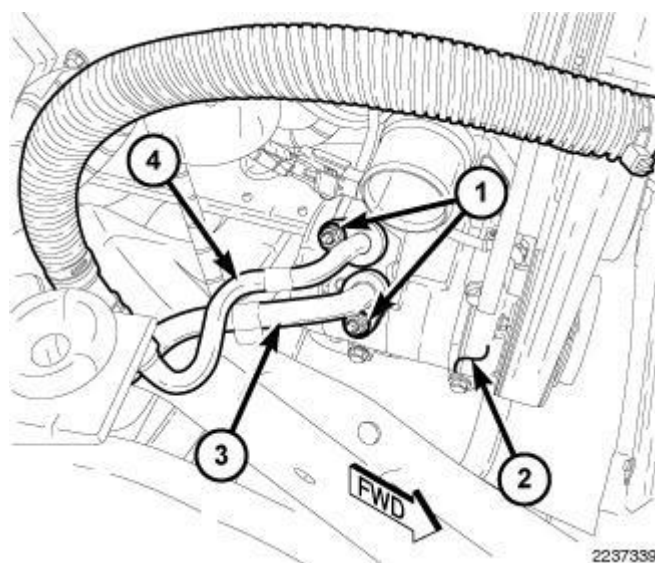


Fig. 10: Nuts, A/C Compressor, A/C Suction Line & A/C Discharge Line
Courtesy of CHRYSLER GROUP, LLC

NOTE: Illustration shown with lower radiator hose removed for clarity.

22. Remove the nuts (1) that secure the A/C suction line (3) and the A/C discharge line (4) to the A/C compressor (2).
23. Disconnect the A/C suction and discharge lines from the A/C compressor and remove and discard the O-ring seals and gaskets.
24. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.
25. Disconnect engine wiring harness connector from the Power Distribution Center (PDC).
26. Remove the starter cable at the left battery and power distribution center.
27. Disconnect the intake heater connector.
28. Remove the battery negative cables to the engine block on the driver and passenger side.
29. Disconnect the generator harness wires.
30. Disconnect the block heater harness connector.
31. Disconnect the left side, engine block to frame, ground wire.

NOTE: Do not remove the elbow (1) from the turbocharger.

32. Remove the V-clamp (2) from the exhaust pipe-to-turbocharger outlet elbow connection.
33. Disconnect the heater core supply and return hoses.
34. Disconnect the fuel supply and return lines from the fuel filter housing.
35. Remove the engine to transmission bolts.
36. Remove the cylinder head cover and rocker housing. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
37. Remove the EGR cooler. Refer to **COOLER, EGR, REMOVAL**.

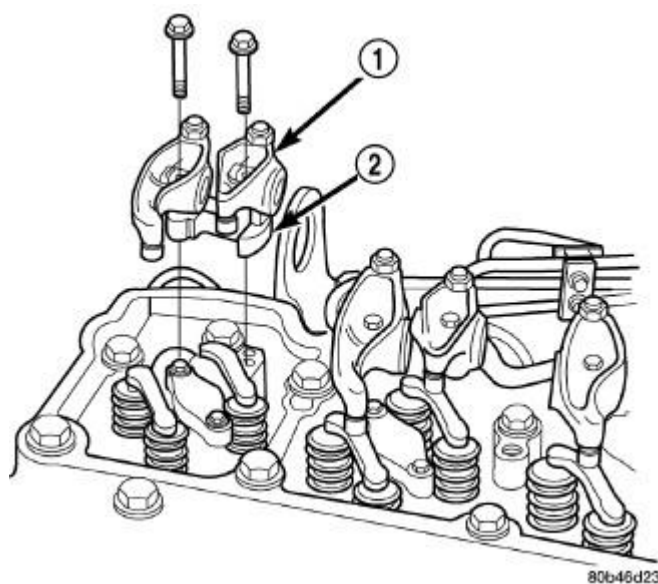


Fig. 11: Rocker Arms And Pedestal Removal
Courtesy of CHRYSLER GROUP, LLC

NOTE: Mark the location of pushrods and crossheads for reinstallation.

38. Remove the rocker arms (1), pedestals (2), and pushrods for cylinders No. 4, No 5, and No. 6.

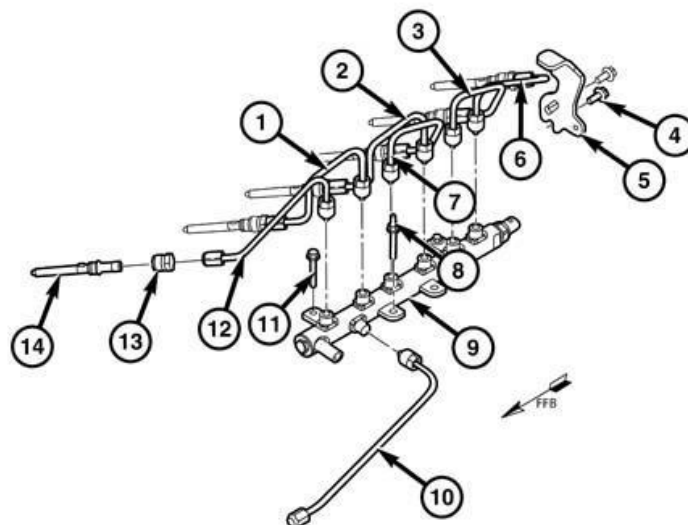


Fig. 12: Removing/Installing Fuel Line Shield, High Pressure Fuel Lines, HPC Connector Tube, Fuel Injectors & Bolts

Courtesy of CHRYSLER GROUP, LLC

NOTE: Extreme care should be used to keep dirt/debris from entering the fuel lines. Plastic caps should be used on the ends of the fuel lines.

39. Loosen bolts (4) and position the No. 6 high pressure fuel line shield (5) aside.
40. Remove the No. 5 (3) and No. 6 high pressure fuel line (6).
41. Remove the HPC connector nut (13) and tube (14).
42. Remove the No. 5 and No. 6 fuel injector.
43. Remove the No. 4 and No. 5 head bolts.

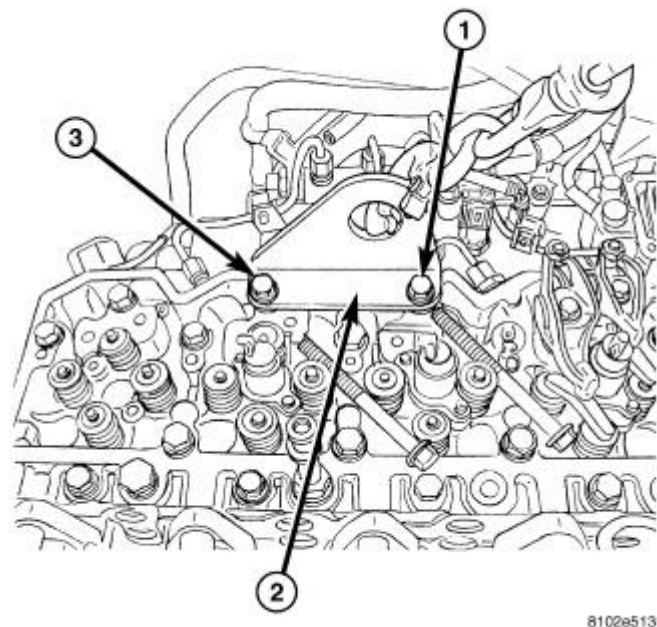


Fig. 13: Engine Lift Bracket

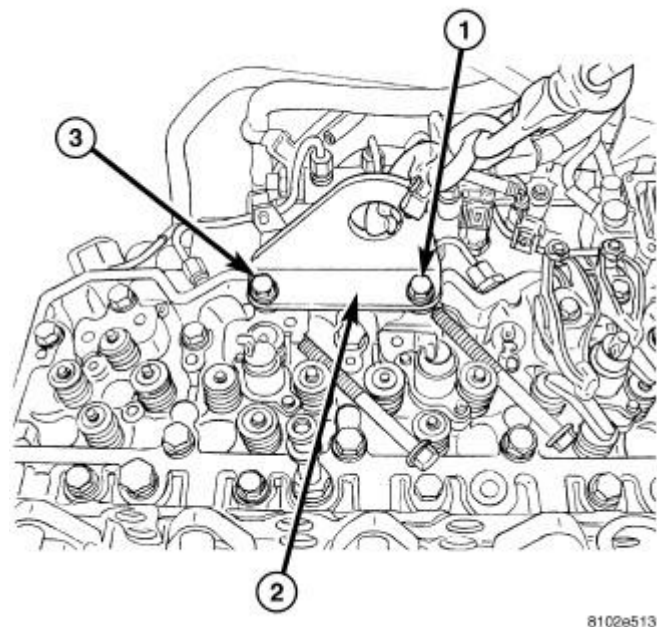
Courtesy of CHRYSLER GROUP, LLC

44. Install the front and rear engine lift bracket. Tighten to 77 N.m (57 ft. lbs.).
45. Remove the two cylinder head bolts (1 and 3) according to the diagram and install the Engine Lifting Bracket (special tool #9009, Bracket, Engine Lifting) (2). Tighten bolts to 105 N.m (77 ft. lbs.).
46. Attach a chain with two hooks to the engine lift brackets.
47. Remove the engine mount through bolts and nuts.
48. While keeping engine level, lift straight up out of the mounts.
49. Rotate the nose of engine upward and pull out of chassis.

INSTALLATION

INSTALLATION

1. If removed, install the transmission adapter plate. Refer to **PLATE, TRANSMISSION ADAPTER, INSTALLATION, 6.7L.**



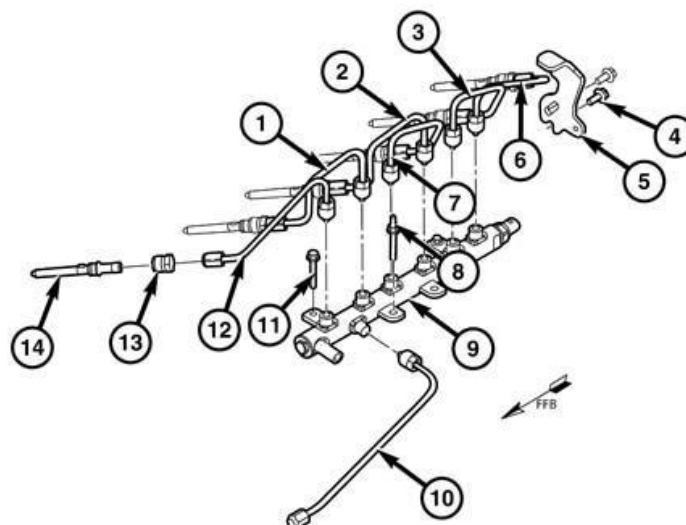
8102e513

Fig. 14: Engine Lift Bracket

Courtesy of CHRYSLER GROUP, LLC

2. Remove the cylinder head bolts (1 and 3) according to the diagram. Install special Tool (special tool #9009, Bracket, Engine Lifting) (2). Tighten bolts to 105 N.m (77 ft. lbs.).
3. Lower the engine into the engine compartment and install the engine mount through bolts and nuts.
4. Tighten the mount through bolts and nuts to 136 N.m (100 ft. lbs.).
5. Remove the chain with 2 hooks and the Engine Lifting Bracket (special tool #9009, Bracket, Engine Lifting) (2).
6. Check the cylinder head bolt length and install into cylinder head.
7. Torque in 4 steps to:
 - Step 1 Tighten to 70 N.m (52 ft. lbs.).
 - Step 2 Back off 360°.
 - Step 3 Tighten to 105 N.m (77 ft. lbs.).
 - Step 4 Rotate 90°.

Remove the front and rear engine lift bracket.



091174892

Fig. 15: Removing/Installing Fuel Line Shield, High Pressure Fuel Lines, HPC Connector Tube, Fuel Injectors & Bolts

Courtesy of CHRYSLER GROUP, LLC

8. Replace injector O-ring and sealing washer on injectors No. 5, No. 6. Install injectors and tighten using the following steps:
 - Step 1 Install the injector hold-down capscrews and tighten to 5 N.m (44 in. lbs.).
 - Step 2 Loosen the injector hold-down capscrews.
 - Step 3 Install the injector connector tube (14) and nut (13). Tighten nut (13) to 15 N.m (133 in. lbs.).
 - Step 4 Tighten the injector hold-down capscrews to 10 N.m (89 in. lbs.).
 - Step 5 Tighten the injector connector tube nut (13) to 50 N.m (37 ft. lbs.).

NOTE: If fuel tube at No. 6 cylinder has been removed, tilt metal bracket (5) upward to install the No. 6 fuel tube finger tight.

9. Install the No. 5 and No. 6 fuel tubes. Tighten fuel tube fittings to 40 N.m (35 ft. lbs.).
10. Position the metal bracket (5) at the rear of cylinder head back and tighten bolts (4) to 43 N.m (32 ft. lbs.).

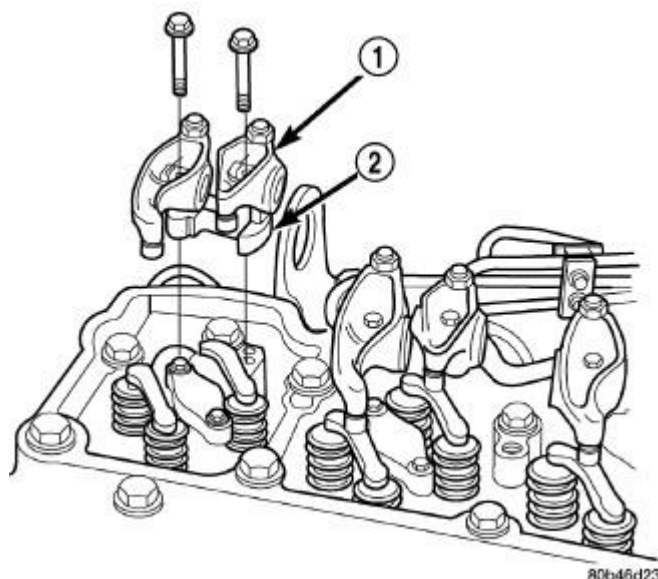


Fig. 16: Rocker Arms And Pedestal Removal
Courtesy of CHRYSLER GROUP, LLC

11. Install the pushrods, rocker arms (1), and pedestals (2) for cylinders No. 4, No. 5, and No. 6. Tighten the mounting bolts to 36 N.m (27 ft. lbs.).
12. Reset the valve lash on cylinders No. 4, No. 5, and No. 6. for the intake valve at 0.254 mm (0.010 in.) and exhaust valve at 0.66 mm (0.026 in.). Tighten adjusting nuts to 24 N.m (18 ft. lbs.).
13. Install the EGR cooler. Refer to **COOLER, EGR, INSTALLATION** .
14. Install the rocker housing and the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.
15. Install the transmission to engine bolts:
 - Automatic transmission, tighten bolts to 54 N.m (40 ft. lbs.).
 - Manual transmission, tighten bolts to 54 N.m (40 ft. lbs.).
16. Connect the fuel supply and return lines from the fuel filter housing.
17. Connect the heater core supply and return hoses.
18. Using a new V-clamp and gasket, install the exhaust pipe to the turbocharger elbow (1). Tighten V-clamp to 18 N.m (159 in. lbs.).
19. Connect left side, engine block to frame ground wire.
20. Connect the engine block heater harness connector.
21. Connect the generator harness wires.
22. Install the battery negative cables to the engine block on the driver and passenger side.
23. Connect the intake heater connector.
24. Install the starter cable to the left battery and power distribution center.
25. Connect engine wiring harness connector to the Power Distribution Center (PDC).

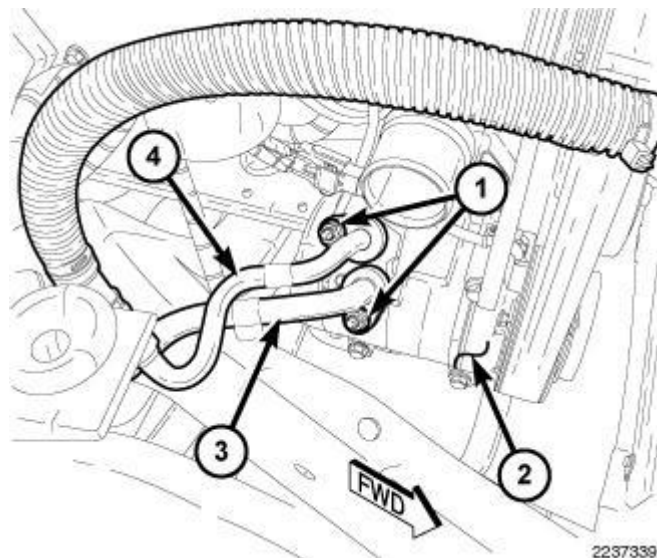


Fig. 17: Nuts, A/C Compressor, A/C Suction Line & A/C Discharge Line
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Illustration shown with lower radiator hose removed for clarity.

26. Remove the tape or plugs from the opened refrigerant line fittings and compressor ports.
27. Lubricate new O-ring seals with clean refrigerant oil and install them and a new gasket onto the refrigerant line fittings. Use only the specified O-ring seals 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.
28. Connect the A/C suction line (3) and A/C discharge line (4) to the A/C compressor (2).
29. Install the A/C suction and discharge line assembly to the compressor. Tighten the nuts to 23 N.m (17 ft. lbs.).

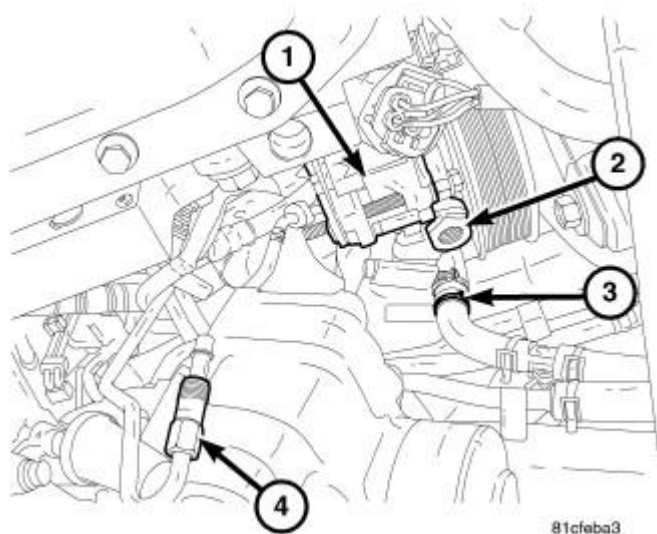


Fig. 18: Power Steering Pump Components
 Courtesy of CHRYSLER GROUP, LLC

30. Install the power steering pump. Refer to **PUMP, INSTALLATION** .
31. Install the power steering reservoir. Refer to **RESERVOIR, POWER STEERING PUMP, INSTALLATION** .
32. Install the serpentine drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
33. Install the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** or **FAN, COOLING, VISCOUS, INSTALLATION** .
34. Install the radiator and connect the upper and lower radiator hoses.

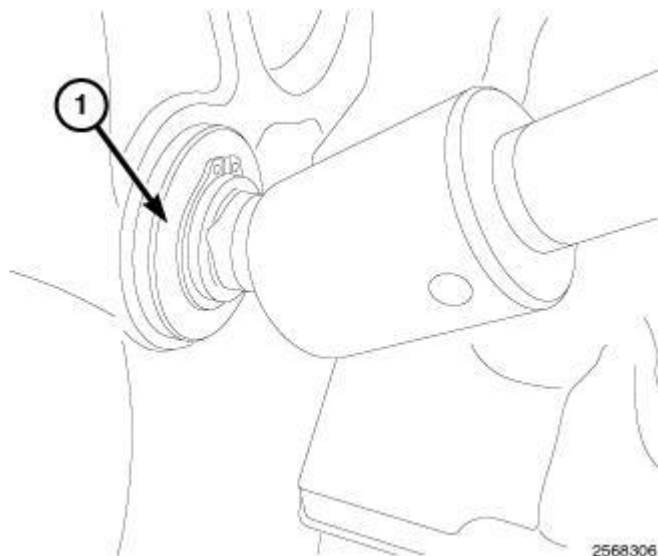


Fig. 19: Engine Barring Tool
Courtesy of CHRYSLER GROUP, LLC

35. Install the radiator closure panel. Refer to **PANEL, CLOSURE, RADIATOR, INSTALLATION** .
36. Connect the transmission harness connector.
37. Install the left ground strap.
38. Install the Barring Tool (special tool #7471B, Barring Tool) (1).
39. Using the Barring Tool (special tool #7471B, Barring Tool) (1), rotate the engine and install the torque converter bolts. Tighten bolts to 95 N.m (65 ft. lbs.).
 - a. On manual transmission models, install the dual mass flywheel bolts. Tighten bolts to 61 N.m (45 ft. lbs.).
40. Remove the Barring Tool (special tool #7471B, Barring Tool) (1).

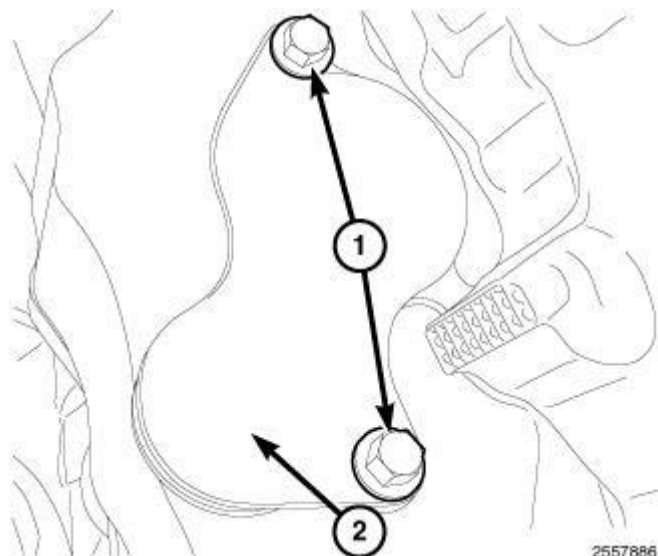


Fig. 20: Bolts & Bell Housing Access Cover
Courtesy of CHRYSLER GROUP, LLC

41. Install the bell housing access plate. Tighten bolts to 10 N.m (89 in. lbs.).
42. Change the oil filter and fill with recommended new engine oil.
43. Evacuate and recharge A/C system. Refer to **PLUMBING, STANDARD PROCEDURE** .
44. Fill the cooling system with coolant. Refer to **STANDARD PROCEDURE** .
45. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
46. Connect both negative and positive battery cables.
47. Start the engine and inspect for engine oil, coolant, and fuel leaks.

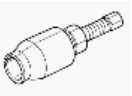
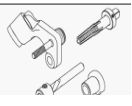
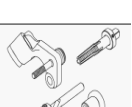
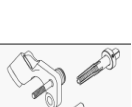
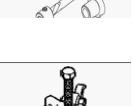
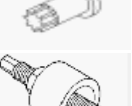
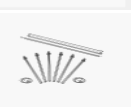


Fig. 21: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

48. Position the hood and connect hood support struts.
49. Install the engine cover (2) and fasteners (1, 4).
50. Install the oil dipstick (3).

SPECIAL TOOLS

SPECIAL TOOLS

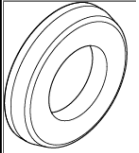
	10136 - Installer, Crankshaft Front Oil Seal (Originally Shipped In Kit Number(s) 10138.)
	10137 - Adapter, Charge Air (Originally Shipped In Kit Number(s) 10138.)
	10142 - Cummins Turbo Cleaning Kit (Originally Shipped In Kit Number(s) 10138-UPD.)
	10143 - Cummins Turbo Drilling Kit (Originally Shipped In Kit Number(s) 10138-UPD.)
	10143-4 - Drill Assembly (Originally Shipped In Kit Number(s) 10138-UPD.)
	10143-5 - Tap & Collar Assembly (Originally Shipped In Kit Number(s) 10138-UPD.)
	10368 - Set, Universal Protective Cap
	7471B - Barring Tool (Originally Shipped In Kit Number(s) 6860.)
	8281 - Installer, Seal (Originally Shipped In Kit Number(s) 8267, 8267CC, 9697, 9698.)
	8319 - Compressor, Valve Spring (Originally Shipped In Kit Number(s) 8267, 8267CC.)
	8502 - Remover/Installer
	8534B - Fixture, Driveline Support (Originally Shipped In Kit Number(s) 8534, 8534B, 8849, 9565.)

2013 RAM 3500 HD Big Horn

2013 ENGINE 6.7L Diesel - Service Information - Ram Pickup



9007 - Adapter, Compression Test
(Originally Shipped In Kit Number(s) 8848, 8849, 8849CC.)



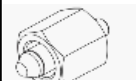
9009 - Bracket, Engine Lifting
(Originally Shipped In Kit Number(s) 8848, 8849, 8849CC.)



9010A - Remover/Installer, Fuel Injector
(Originally Shipped In Kit Number(s) 8848, 8849.)



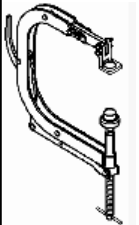
9015 - Remover, High Pressure Connector
(Originally Shipped In Kit Number(s) 8848, 8849, 8849CC.)



9864 - Cap, Fuel Rail
(Originally Shipped In Kit Number(s) 9860.)



9866 - Wrench, Turbo Charger Bolt
(Originally Shipped In Kit Number(s) 9860.)



C-3292A - Gauge, Pressure



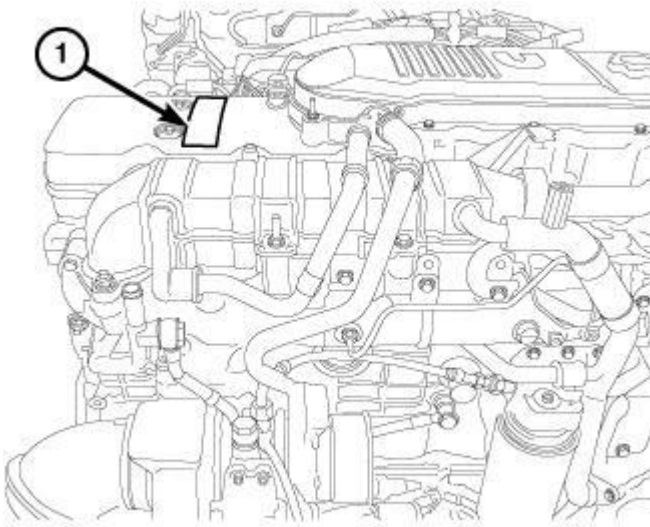
C-4171 - Driver Handle, Universal
(Originally Shipped In Kit Number(s) 9202, 9202A-CAN, 9202CC, 9299, 9299CC, 9300A-CAN.)

C-647 - Spring Tester

PLATE, IDENTIFICATION

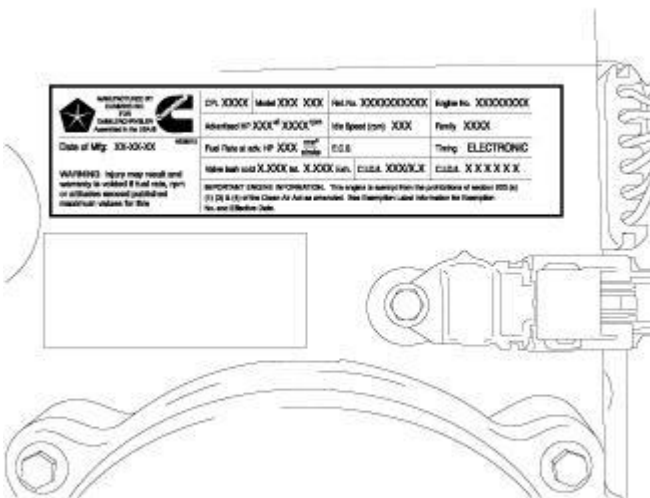
DESCRIPTION

DESCRIPTION



1304937

Fig. 22: Locating Engine Data Plate on Valve Cover
Courtesy of CHRYSLER GROUP, LLC



1806755

Fig. 23: Engine Data Plate Details
Courtesy of CHRYSLER GROUP, LLC

The engine data plate (1) contains specific information that is helpful to servicing and obtaining parts for the engine. The data plate is on the cylinder head cover. Information that can be found on the data plate includes:

- Engine Part Number
- Date of Engine Manufacture

- Engine Serial Number
- Control Parts List (CPL)
- Engine Rated Horsepower
- Engine Firing Order
- Engine Displacement
- Valve Lash Reset Specifications

If the engine data plate is missing or not legible, the engine serial number is used for engine identification. The engine serial number is stamped on the right side of the block, on top of the oil cooler cavity.

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

NOTE: There is no filter minder on the air intake for the 6.7L. There will be an EVIC message which will display when the filter restriction reaches it's maximum. The customer will be required to replace it with-in 250 miles (402 KM).

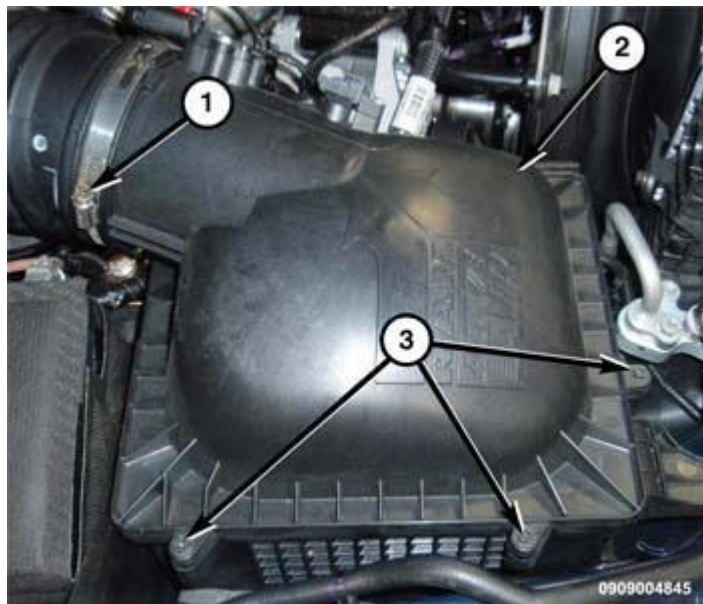


Fig. 24: Clamp, Air Cleaner Cover & Screws
Courtesy of CHRYSLER GROUP, LLC

1. Loosen clamp (1) and disconnect air tube.
2. Loosen screws (3) from top of air cleaner cover (2) and tilt housing cover up for removal.

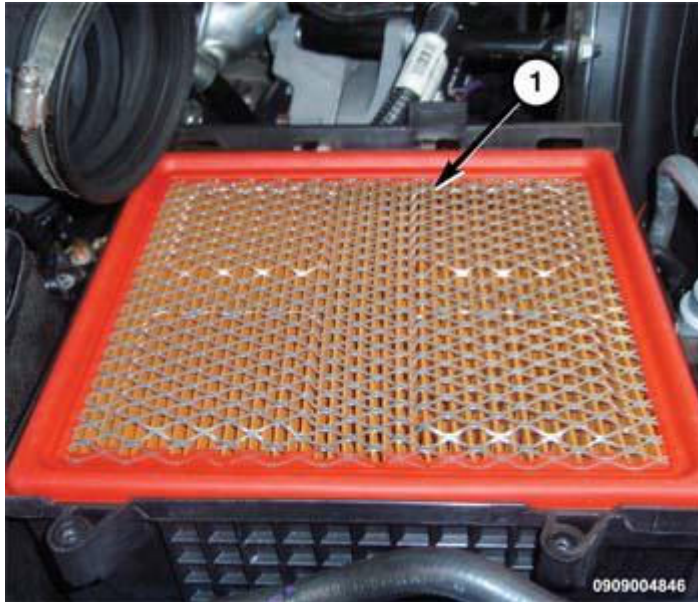


Fig. 25: Air Cleaner Filter
Courtesy of CHRYSLER GROUP, LLC

3. Remove air cleaner filter (1) from air cleaner housing (2).

INSTALLATION

INSTALLATION

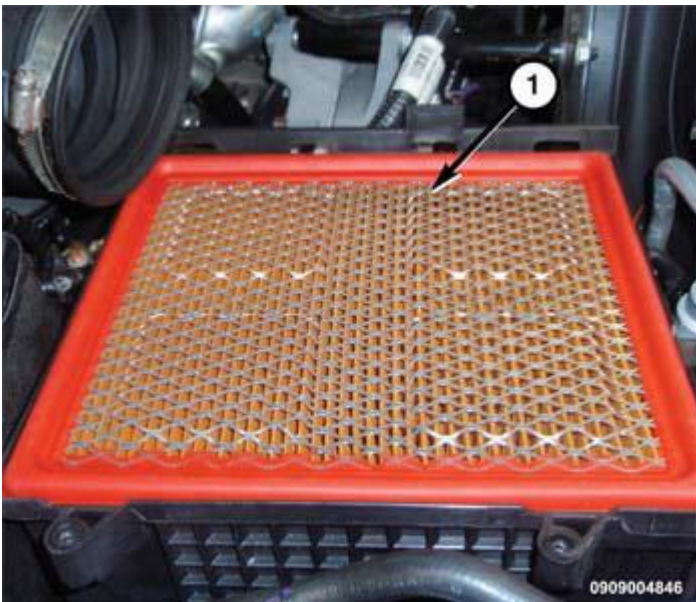


Fig. 26: Air Cleaner Filter
Courtesy of CHRYSLER GROUP, LLC

1. Clean out the inside of air cleaner housing.
2. Install the new air filter element (1) and make sure the air filter element is fully seated in housing.

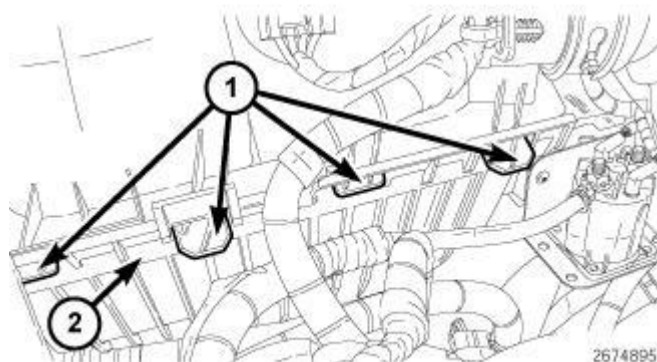


Fig. 27: Identifying Air Cleaner Cover Alignment Tabs & Housing Slots
Courtesy of CHRYSLER GROUP, LLC

3. Position air cleaner cover alignment tabs (1) into the housing slots (2) in all four locations and make sure the air cleaner cover is properly seated.

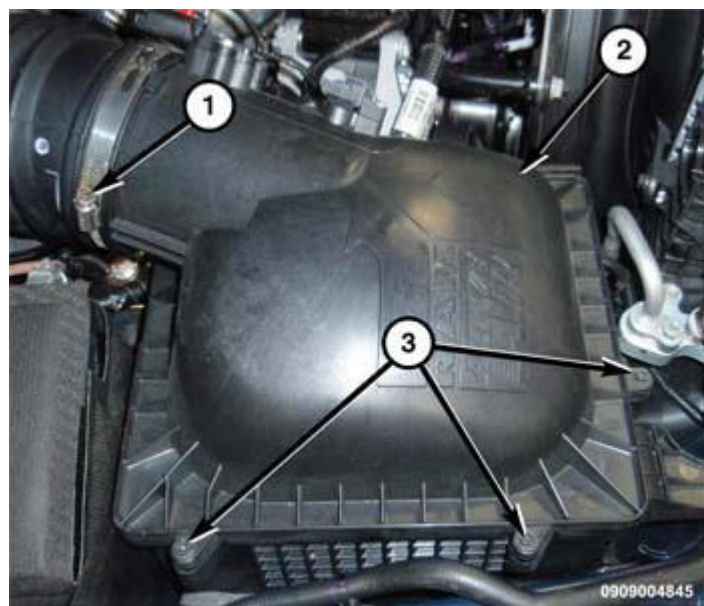


Fig. 28: Clamp, Air Cleaner Cover & Screws
Courtesy of CHRYSLER GROUP, LLC

4. Securely tighten the air cleaner cover screws (3).
5. Connect the air tube to air cleaner cover (2) and securely tighten clamp (1).

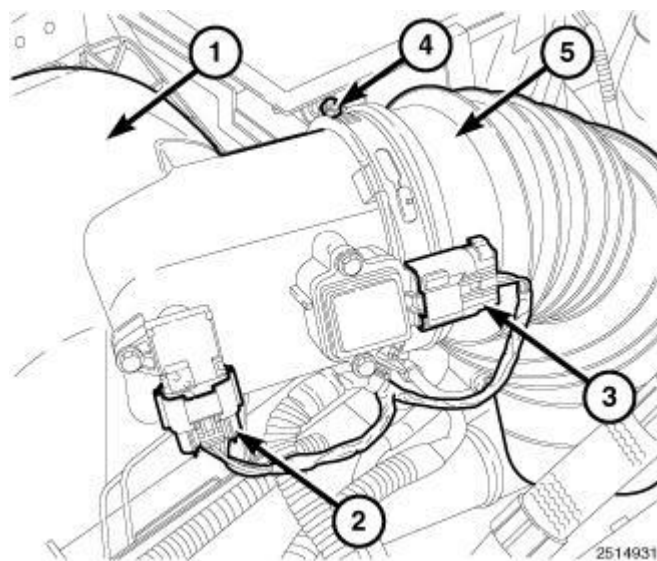
BODY, AIR CLEANER

REMOVAL

REMOVAL**Fig. 29: Intake Air Housing & Bolt**

Courtesy of CHRYSLER GROUP, LLC

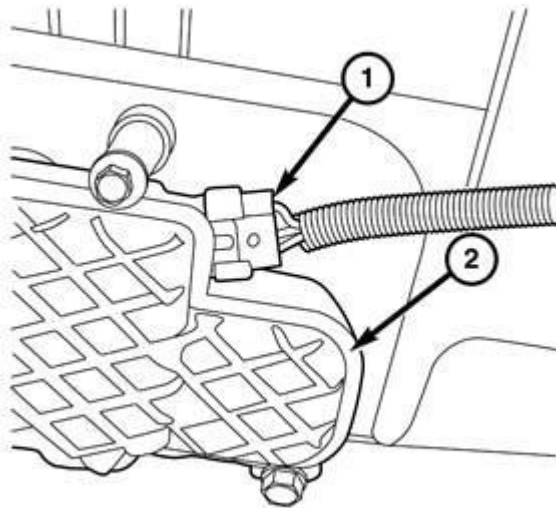
1. Disconnect both negative battery cable.
2. Remove the intake air housing bolt (2).

**Fig. 30: Air Cleaner Body, TBAP Sensor, MAF Sensor, Clamp & Intake Air Tube**

Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the Mass Air Flow (MAF) (3) sensor.
4. Disconnect the TBAP (2) sensor.
5. Loosen clamp (4) and disconnect the intake air tube (5) from the air cleaner body (1).

6. Lift up and remove air cleaner body (1).



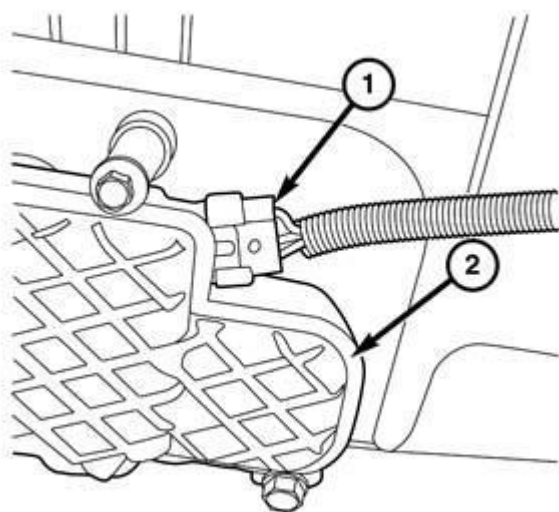
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Fig. 31: Ram Air Actuator & Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

7. Disconnect the ram air actuator wire harness connector (1).

INSTALLATION

INSTALLATION



0909002130

Fig. 32: Ram Air Actuator & Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

1. Connect the ram air actuator wire harness connector (1).

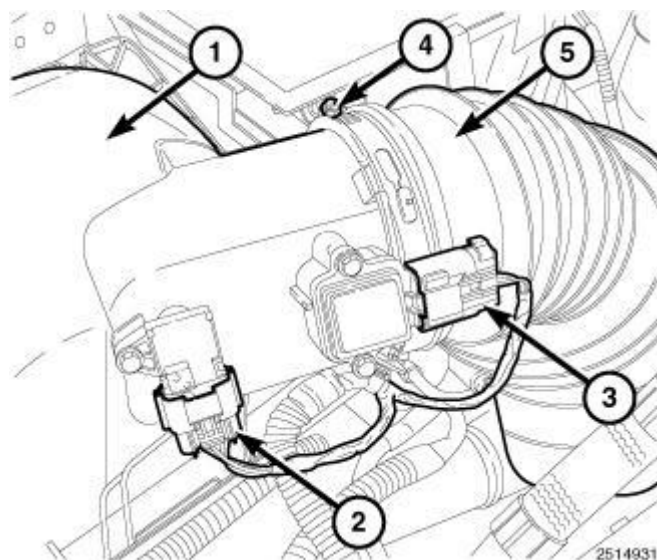


Fig. 33: Air Cleaner Body, TBAP Sensor, MAF Sensor, Clamp & Intake Air Tube
Courtesy of CHRYSLER GROUP, LLC

2. Position the air cleaner body (1) rear pegs to battery tray and push down to lock in place.
3. Install the intake air tube (5) to the air cleaner body (1). Tighten clamp (4) 4 N.m (35 in. lbs.).
4. Connect the TBAP (2) sensor.

5. Connect the Mass Air Flow (MAF) (3) sensor.



Fig. 34: Intake Air Housing & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Install the housing bolt (1). Tighten bolt (1) 8 N.m (71 in. lbs.).
7. Connect both negative battery cable.

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

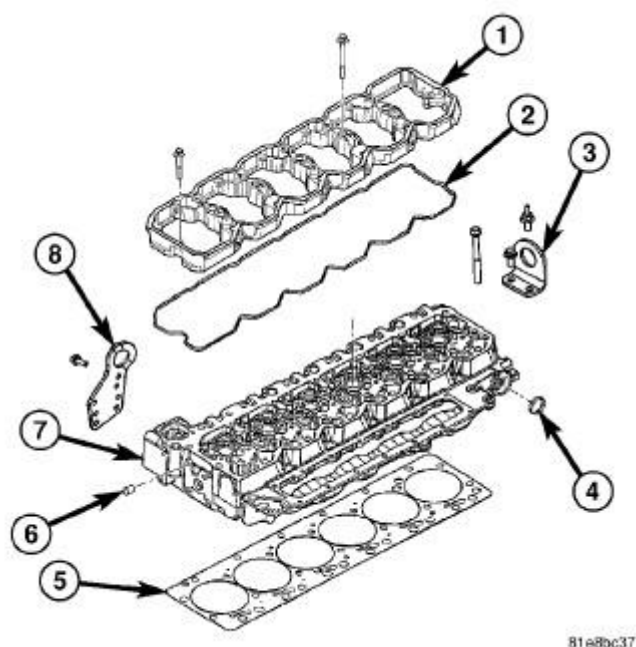


Fig. 35: Cylinder Head Assembly & Gasket

Courtesy of CHRYSLER GROUP, LLC

The cylinder head is constructed of cast iron and is a one piece cross flow design with four valves per cylinder. The arrangement of two intake and two exhaust valves per cylinder allows for a centrally located injector. The cylinder head also includes an integral intake manifold, an integral thermostat housing, and a longitudinal fuel return rifle, which exits at the rear of the head. The 24 valve design also includes integrally cast valve guides and hardened intake and exhaust valve seat inserts.

REMOVAL

REMOVAL

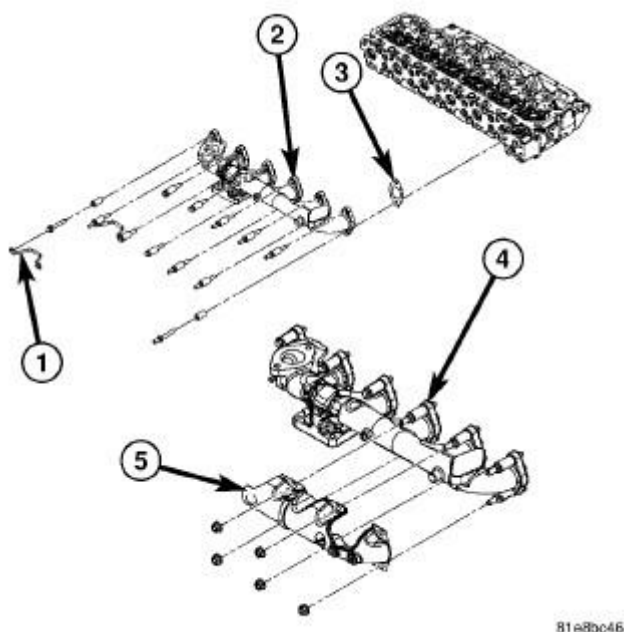


Fig. 36: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
 Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate both negative battery cables.
2. Remove the exhaust manifold. Refer to **MANIFOLD, EXHAUST, REMOVAL, 6.7L**.
3. Disconnect the heater core supply and return hoses from the cylinder head and heater pipe.
4. Remove cooling fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** or **FAN, COOLING, VISCOUS, REMOVAL**.
5. Remove cooling fan support from cylinder block.

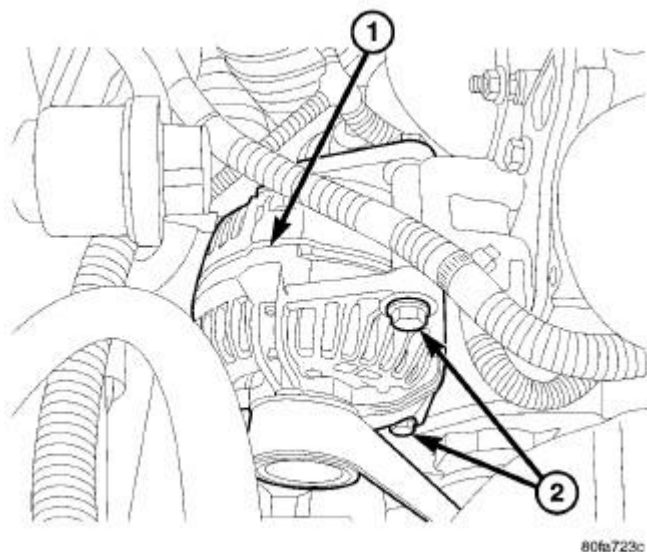
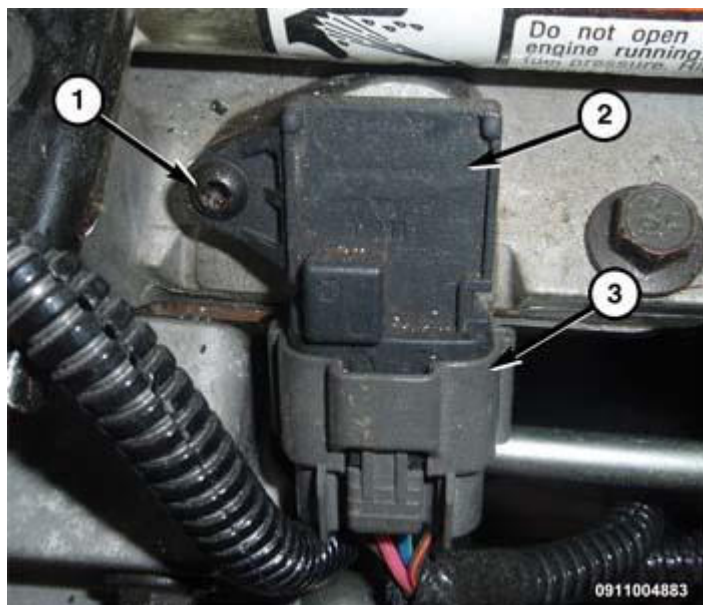


Fig. 37: Generator & Mounting Bolts

Courtesy of CHRYSLER GROUP, LLC

6. Remove the generator (1). Refer to **GENERATOR, REMOVAL**.
7. Disconnect the upper radiator hose from the thermostat housing.

**Fig. 38: TMAP Sensor, Wire Harness Connector & Bolt**

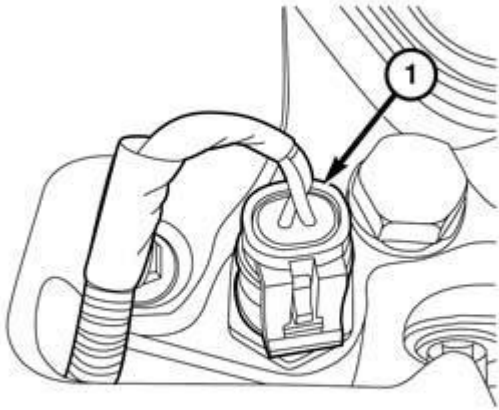
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the TMAP sensor wire harness connector (3).

**Fig. 39: ECT Sensor Shield & Bolts**

Courtesy of CHRYSLER GROUP, LLC

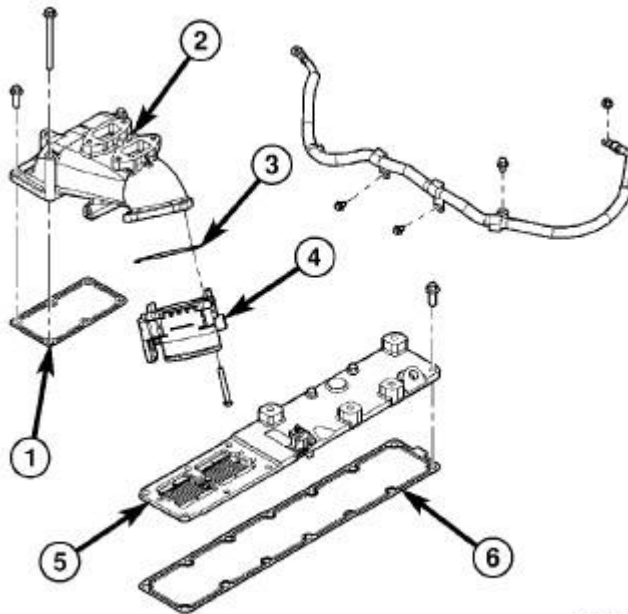
9. If equipped, remove bolts (2) and the Engine Coolant Temperature (ECT) sensor shield (1).



070973338

Fig. 40: ECT Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the ECT sensor wire harness connector (1).

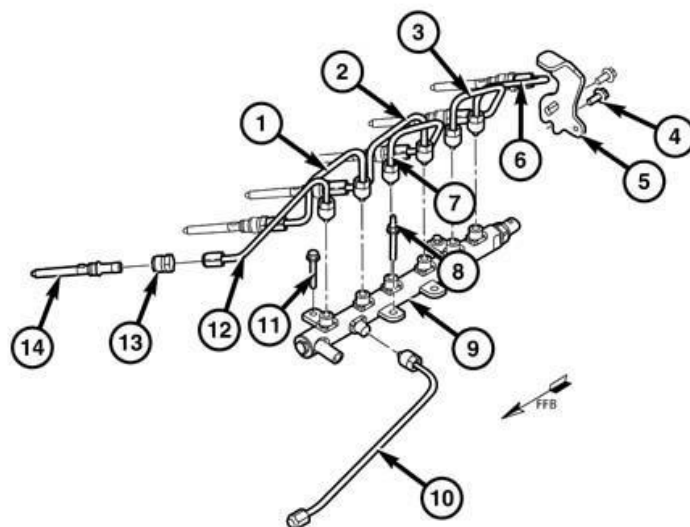


81e8bc4a

Fig. 41: Intake Air Heater Assembly

Courtesy of CHRYSLER GROUP, LLC

11. Remove fasteners securing the oil dip stick tube.
12. Remove the intake manifold (2). Refer to **MANIFOLD, INTAKE, REMOVAL, 6.7L**.
13. Remove three bolts attaching the air intake heater wire to front of cylinder head.
14. Remove nut and the air intake heater wire harness.



091174892

Fig. 42: Removing/Installing Fuel Line Shield, High Pressure Fuel Lines, HPC Connector Tube, Fuel Injectors & Bolts

Courtesy of CHRYSLER GROUP, LLC

15. Remove the fuel rail (9). Refer to **RAIL, FUEL, REMOVAL** .

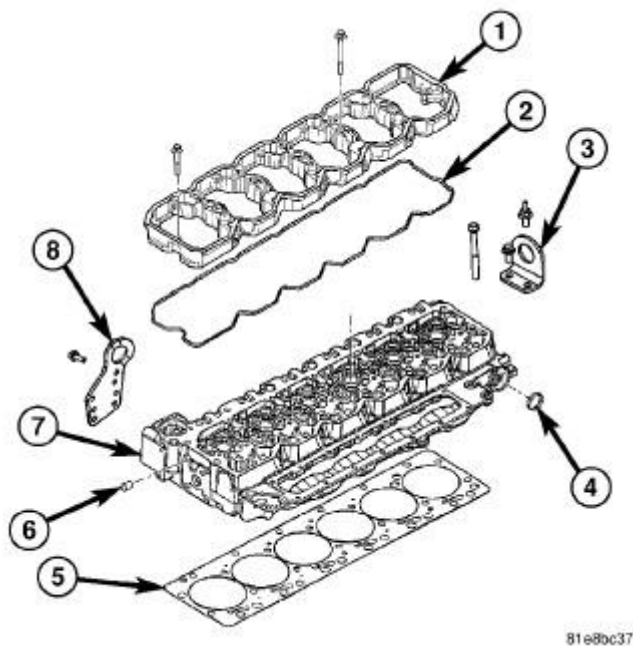


Fig. 43: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

16. Remove the cylinder head cover, rocker housing (1), and gasket (2). Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L.**

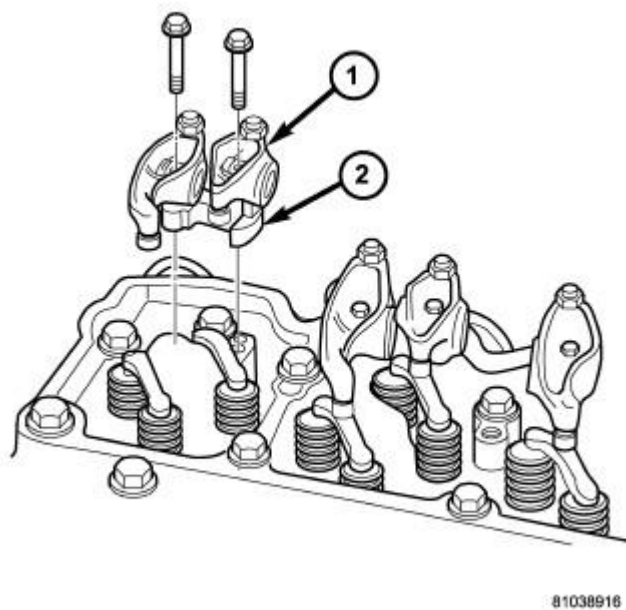
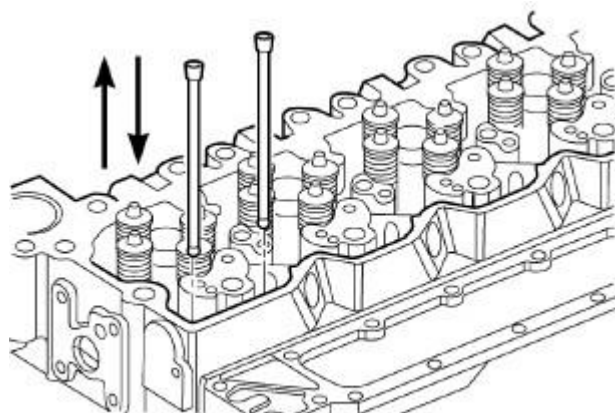


Fig. 44: Rocker Arm & Pedestal
Courtesy of CHRYSLER GROUP, LLC

17. Remove the rocker levers (1), cross heads and push rods. Mark each component so they can be installed in their original positions.



80b4fa25

Fig. 45: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: The No. 5 cylinder exhaust and the No. 6 cylinder intake and exhaust push rods are removed by lifting them up and through the provided cowl panel access holes. Remove the rubber plugs to expose these relief holes.

18. Remove the fuel injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .
19. Reinstall the engine lift bracket at the rear of cylinder head. Tighten to 77 N.m (57 ft. lbs.).
20. Starting on the outside and working towards the center, remove twenty six (26) cylinder head bolts.
21. Attach an engine lift crane to engine lift brackets and lift cylinder head off engine and out of vehicle.
22. Remove the head gasket and inspect.

CLEANING

CYLINDER HEAD

CAUTION: Do not wire brush head surface while fuel injectors are still installed. Fuel injector damage can result.

Remove fuel injectors before cleaning (if not already removed during cylinder head removal).

Clean the carbon from the injector nozzle seat with a nylon or brass brush.

Scrape the gasket residue from all gasket surfaces.

Wash the cylinder head in hot soapy water solution (88°C or 140°F).

After rinsing, use compressed air to dry the cylinder head.

Polish the gasket surface with 400 grit paper. Use a sanding block to maintain a flat surface.

CROSSHEADS

Clean all crossheads in a suitable solvent. If necessary, use a wire brush or wheel to remove stubborn deposits. Rinse in hot water and blow dry with compressed air.

PUSHRODS

Clean the pushrods in a suitable solvent. Rinse in hot water and blow dry with compressed air. If necessary, use a wire brush or wheel to remove stubborn deposits.

INSPECTION

CYLINDER HEAD

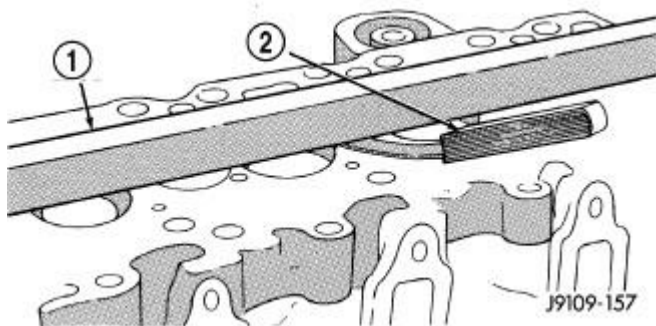


Fig. 46: Inspecting Cylinder Head Combustion Deck Face For Warpage
Courtesy of CHRYSLER GROUP, LLC

- | |
|---------------------------------------|
| 1 - STRAIGHT EDGE
2 - FEELER GAUGE |
|---------------------------------------|

Inspect the cylinder head for cracks in the combustion surface. Pressure test any cylinder head that is visibly cracked. A cylinder head that is cracked between the injector bore and valve seat can be pressure tested and reused if OK; however, if the crack extends **into** the valve seat insert bore, the cylinder head **must** be replaced.

Visually inspect the cylinder block and head combustion surfaces for localized dips or imperfections. Check the cylinder head and block combustion surfaces for overall out-of-flatness. If either the visual or manual inspection exceeds the limits, then the head or block **must** be replaced.

Check the top surface for damage caused by the cylinder head gasket leaking between cylinders.

Inspect the block and head surface for nicks, erosion, etc.

Check the head distortion. Maximum overall variation end to end is 0.305 mm (0.012 inch), and maximum overall variation side to side 0.076 mm (.003 in.).

DO NOT proceed with the in-chassis overhaul if the cylinder head or block surface is damaged or not flat

(within specifications).

Check block surface for distortion. Maximum variation end-to-end is 0.076 mm (.003 in.), side-to-side 0.051 mm (.002).

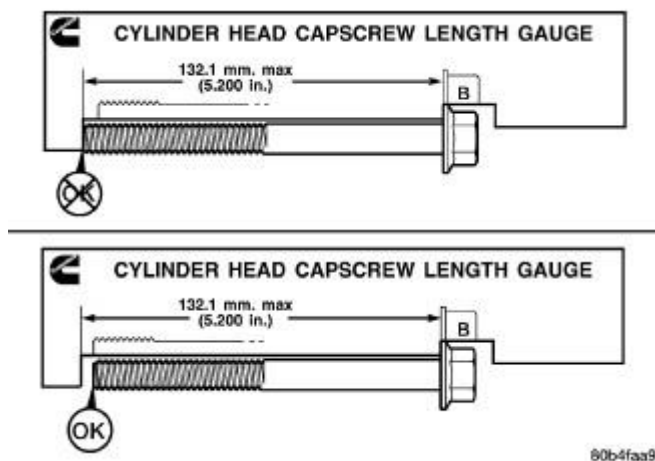


Fig. 47: Head Bolt Stretch Gauge
Courtesy of CHRYSLER GROUP, LLC

Visually inspect the cylinder head bolts for damaged threads, corroded/pitted surfaces, or a reduced diameter due to bolt stretching.

If the bolts are not damaged, their "free length" should be measured using the cap screw stretch gauge provided with the replacement head gasket. Place the head of the bolt against the base of the slot and align the bolt with the straight edge of gauge. If the end of the bolt touches the foot of the gauge, the bolt **must** be discarded. **The maximum bolt free length is 132.1 mm (5.200 in.).**

CROSSHEADS

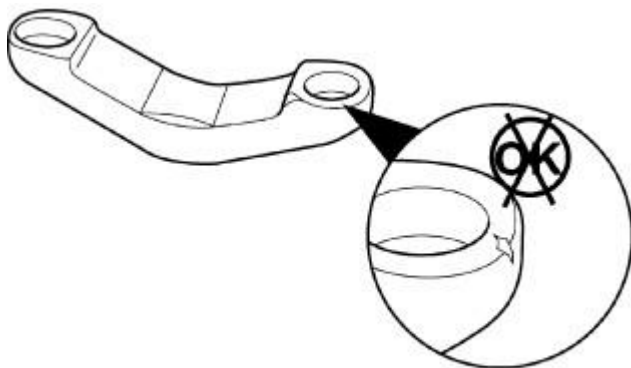


Fig. 48: Inspecting Crosshead For Cracks
Courtesy of CHRYSLER GROUP, LLC

Inspect the crossheads for cracks and/or excessive wear on rocker lever and valve tip mating surfaces. Replace

any crossheads that exhibit abnormal wear or cracks.

PUSHRODS

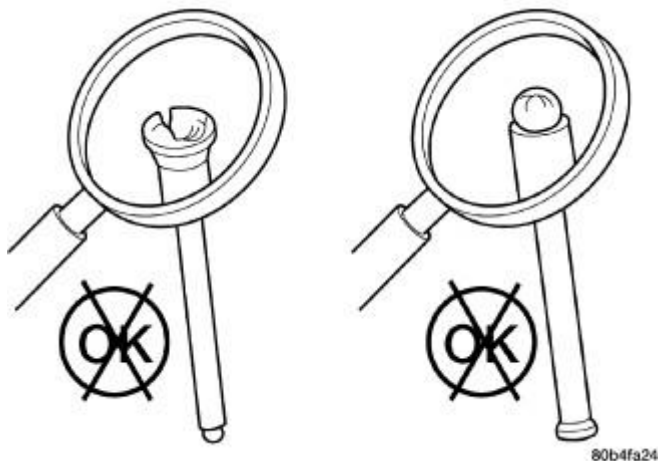


Fig. 49: Inspecting Push Rod For Cracks
Courtesy of CHRYSLER GROUP, LLC

Inspect the pushrod ball and socket for signs of scoring. Check for cracks where the ball and the socket are pressed into the tube.

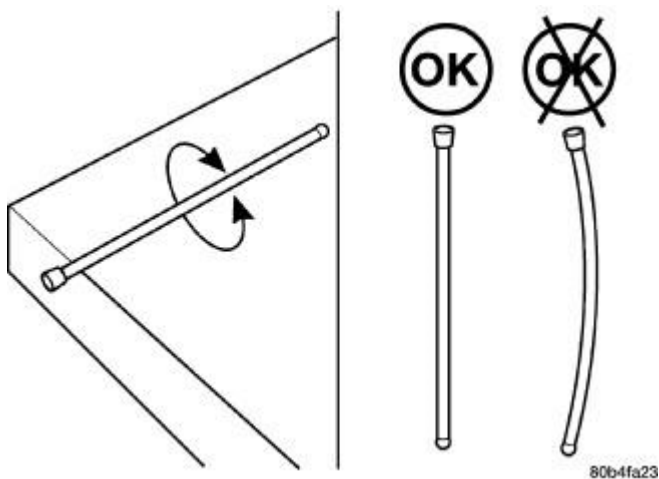


Fig. 50: Inspecting Push Rod For Flatness
Courtesy of CHRYSLER GROUP, LLC

Roll the pushrod on a flat work surface with the socket end hanging off the edge. Replace any pushrod that appears to be bent.

INSTALLATION

INSTALLATION

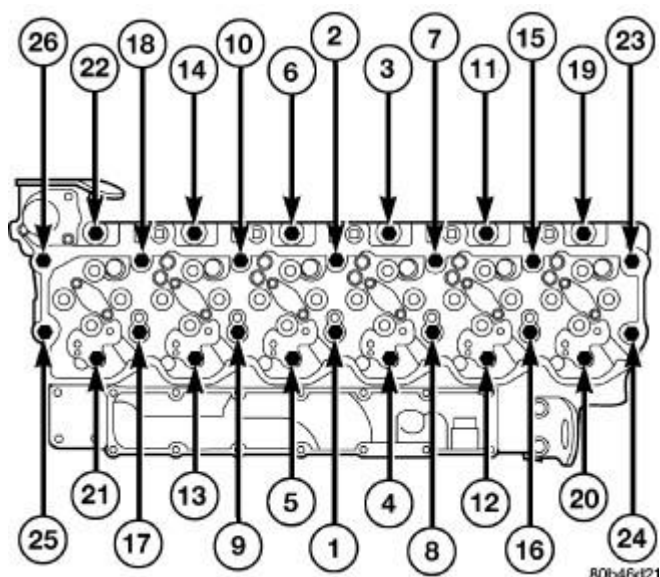
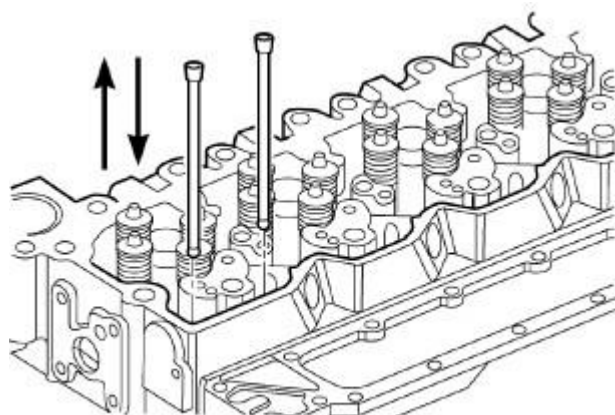


Fig. 51: Cylinder Head Bolt Torque Sequence
 Courtesy of CHRYSLER GROUP, LLC

WARNING: THE OUTSIDE EDGE OF THE HEAD GASKET IS VERY SHARP. WHEN HANDLING THE NEW HEAD GASKET, USE CARE NOT TO INJURE YOURSELF.

1. Clean the gasket sealing surfaces. Refer to ENGINE GASKET SURFACE PREPARATION .
2. Install a new cylinder head gasket with the part number side up, and locate the gasket over the dowel sleeves.
3. Using an engine lifting crane, lower the cylinder head onto the engine.
4. Lightly lubricate underneath bolt head and on threads, with engine oil and install. Using the sequence shown in the illustration, tighten bolts in the following steps:
 - a. Tighten bolts to 70 N.m (52 ft. lbs.).
 - b. Back off 360° in sequence.
 - c. Tighten bolts to 105 N.m (77 ft. lbs.).
 - d. Re-check all bolts to 105 N.m (77 ft. lbs.).
 - e. Tighten all bolts an additional 1/4 turn (90°).

Install fuel injector. Refer to INJECTOR(S), FUEL, INSTALLATION .

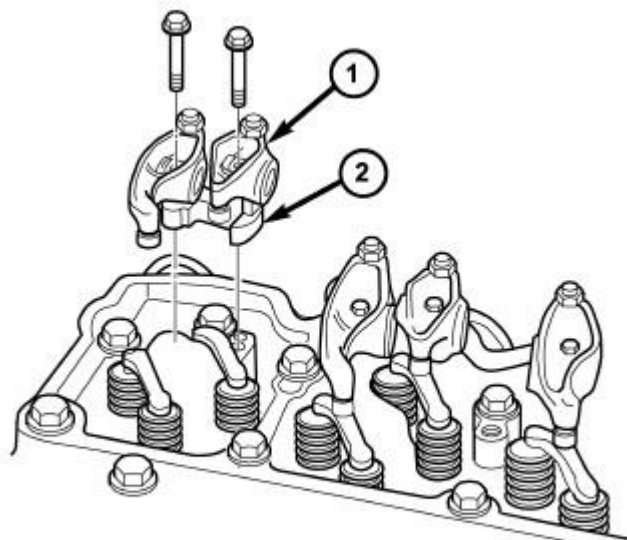


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Fig. 52: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: The No. 5 cylinder exhaust and the No. 6 cylinder intake and exhaust push rods are installed by inserting them through the provided cowl panel access holes. Install the rubber plugs in the access holes.

5. Install push rods into their original locations. **Verify that they are seated in the tappets .**



81038916

Fig. 53: Rocker Arm & Pedestal
Courtesy of CHRYSLER GROUP, LLC

6. Lubricate valve stem tips and install the crossheads in their original locations.
7. Lubricate the rocker arms (1) and pedestals (2) and install them in their original locations. Install the bolts

and tighten them to 36 N.m (27 ft. lbs.).

8. Verify that the valve lash settings are maintained at 0.254 mm (0.010 in) for the intake valve and 0.660 mm (0.026 in) for the exhaust valve. Refer to **STANDARD PROCEDURE**.

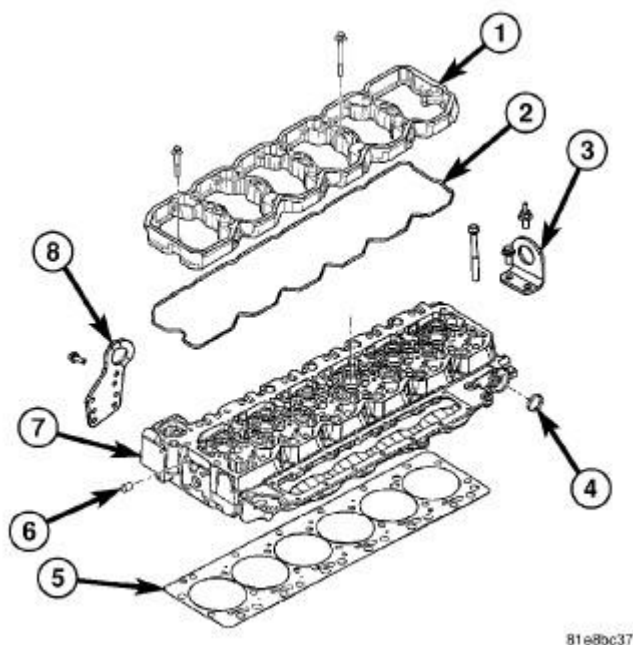


Fig. 54: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

9. Install rocker housing (1) and cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.

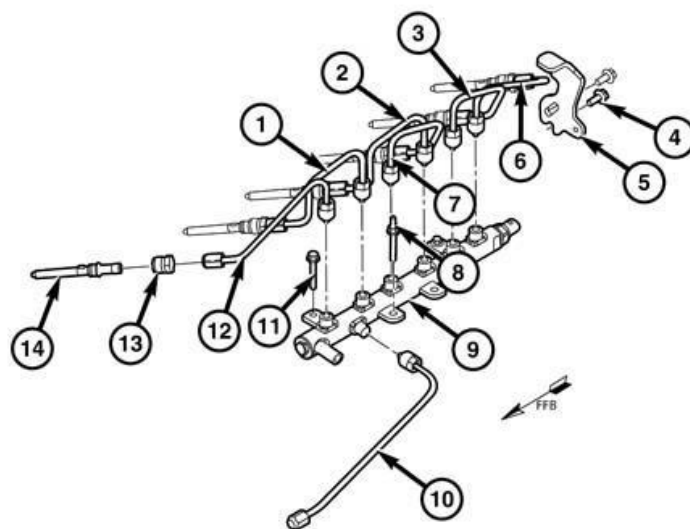
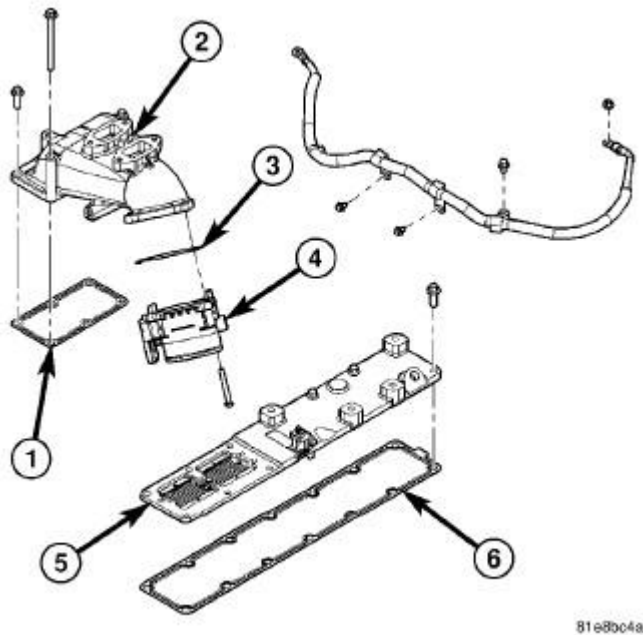


Fig. 55: Removing/Installing Fuel Line Shield, High Pressure Fuel Lines, HPC Connector Tube, Fuel Injectors & Bolts
 Courtesy of CHRYSLER GROUP, LLC

CAUTION: Failure to follow procedure will result in fuel leaks and/or fuel system failure.

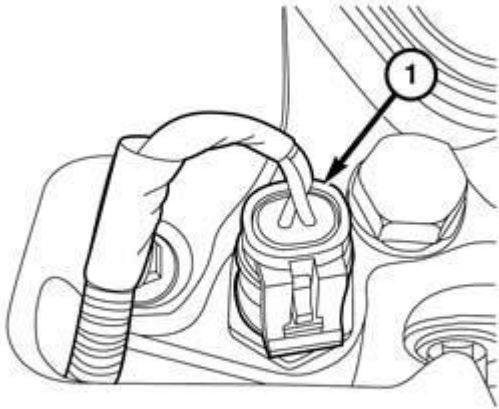
10. Install the fuel rail (9). Refer to **RAIL, FUEL, INSTALLATION** .



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Fig. 56: Intake Air Heater Assembly
 Courtesy of CHRYSLER GROUP, LLC

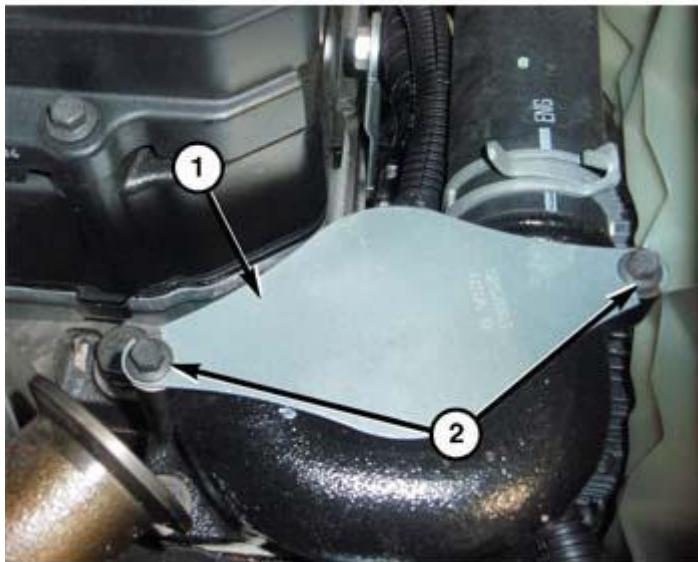
11. Install the air intake heater wire harness. Tighten nut to 10 N.m (89 in. lbs.).
12. Install the air intake heater wire to front of cylinder head. Tighten the three bolts to 24 N.m (18 ft. lbs.).
13. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION, 6.7L**.
14. Install fasteners securing the oil dip stick tube. Tighten fasteners to:
 - Tighten bolt to 24 N.m (18 ft. lbs.).
 - Tighten nut to 9 N.m (80 in. lbs.).



070973338

Fig. 57: ECT Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

15. Connect Engine Coolant Temperature (ECT) sensor connector (1).



0911004882

Fig. 58: ECT Sensor Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

16. If equipped, install the ECT sensor shield (1). Tighten bolts (2) to 9 N.m (80 in. lbs.).

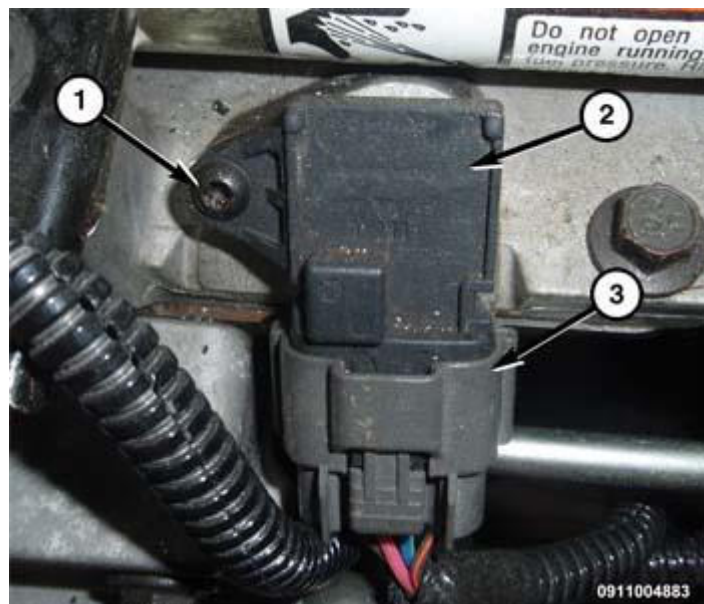


Fig. 59: TMAP Sensor, Wire Harness Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

17. Connect the TMAP sensor wire harness connector (3).
18. Install the Charge Air Cooler-to-air inlet housing tube. Tighten all clamps to 11 N.m (97 in. lbs.).

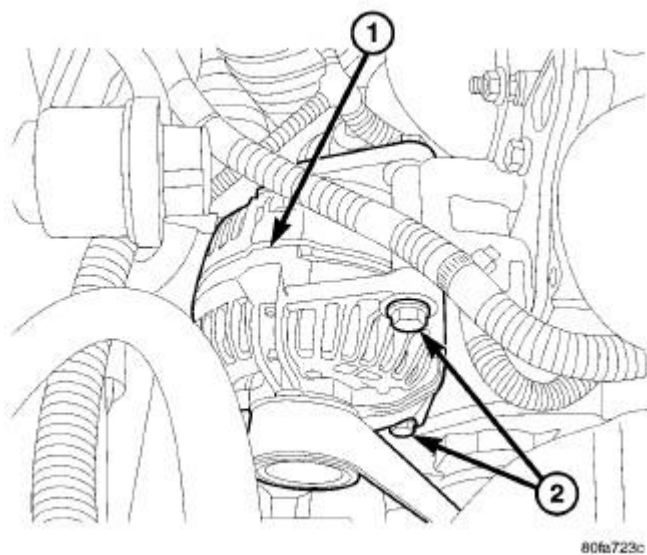


Fig. 60: Generator & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Connect the upper radiator hose to thermostat housing.
20. Install the generator (1). Refer to **GENERATOR, INSTALLATION**.

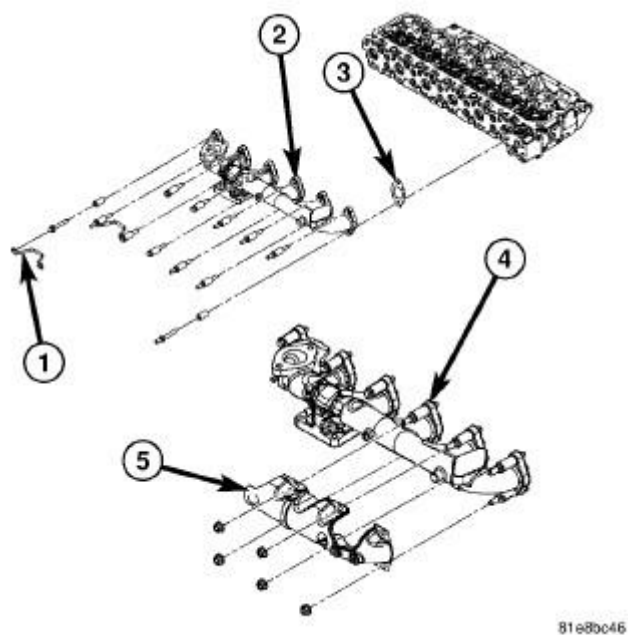


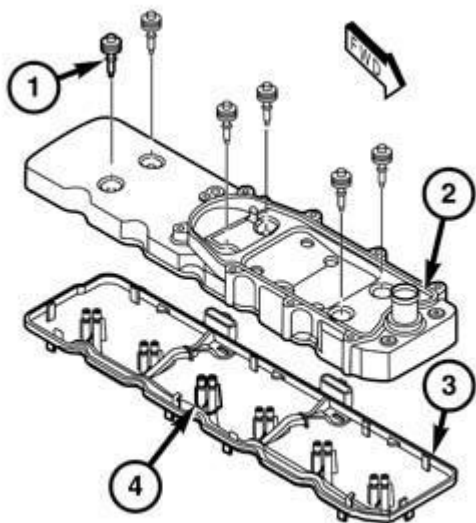
Fig. 61: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
 Courtesy of CHRYSLER GROUP, LLC

21. Install fan shroud support brackets and tighten to 32 N.m (24 ft. lbs.).
22. Install cooling fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** or **FAN, COOLING, VISCOUS, INSTALLATION**.
23. Connect the heater core supply and return hoses to the cylinder head and heater pipe.
24. Install the exhaust manifold. Refer to **MANIFOLD, EXHAUST, INSTALLATION, 6.7L**.
25. Connect both negative battery cables.
26. Fill engine coolant. Refer to **STANDARD PROCEDURE**.
27. Start engine and check for leaks.

COVER(S), CYLINDER HEAD

REMOVAL

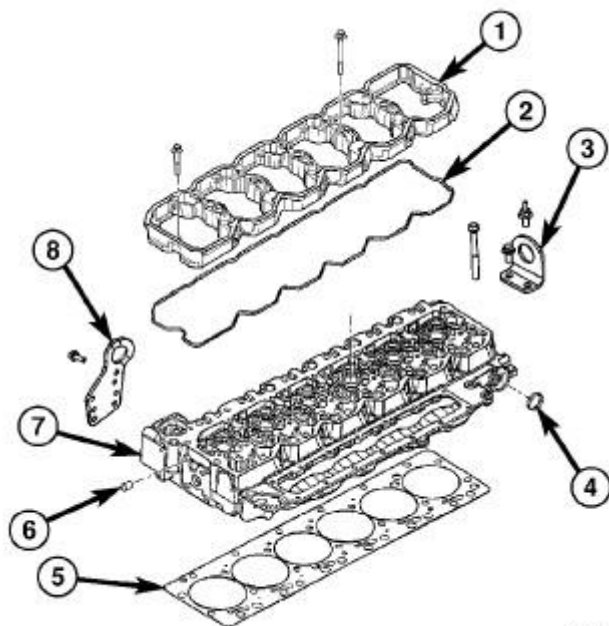
ROCKER HOUSING



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Fig. 62: Cylinder Head Cover & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Remove the cylinder head cover (2). Refer to COVER(S), CYLINDER HEAD, REMOVAL, 6.7L.



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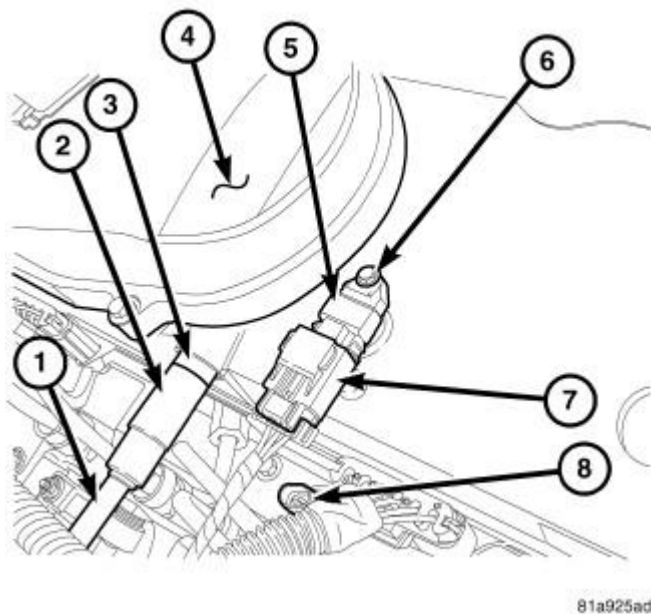
Fig. 63: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

2. Remove bolts and the rocker housing (1).
3. Remove and discard the rocker housing gasket (2).

CYLINDER HEAD COVER

Fig. 64: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate both negative battery cables.
2. Remove the engine oil dipstick (3).
3. Remove fasteners (1, 4) and the engine cover (2).



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Fig. 65: Locating Crankcase Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the crankcase pressure sensor 1 wire harness connector (7).

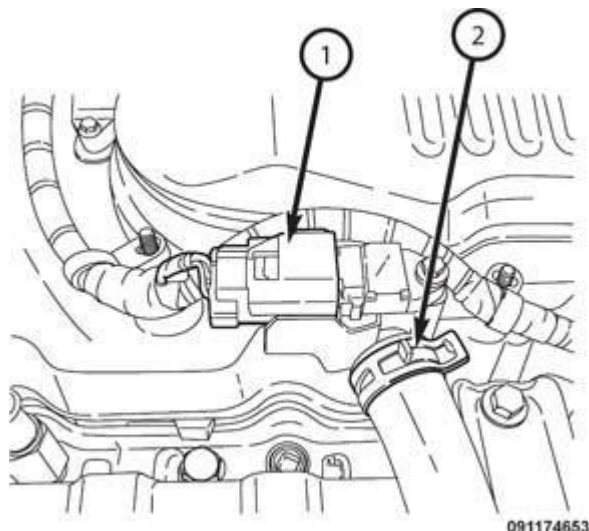


Fig. 66: Crankcase Pressure Sensor Wire Harness Connector & Clamp
Courtesy of CHRYSLER GROUP, LLC

5. Disconnect the crankcase pressure sensor 2 wire harness connector (1).

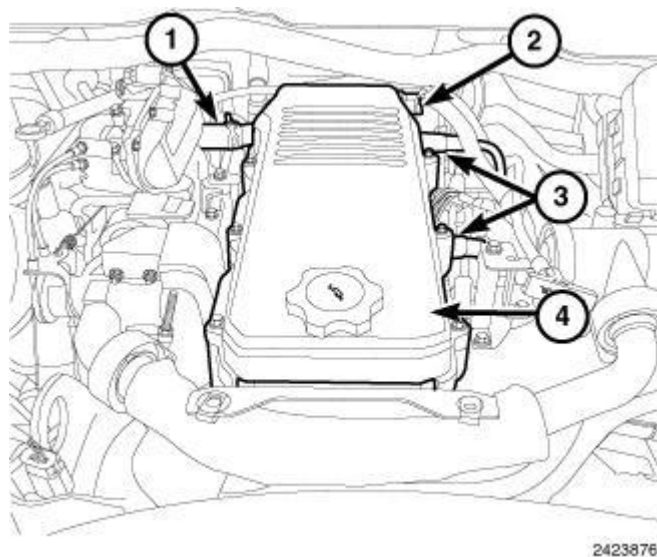
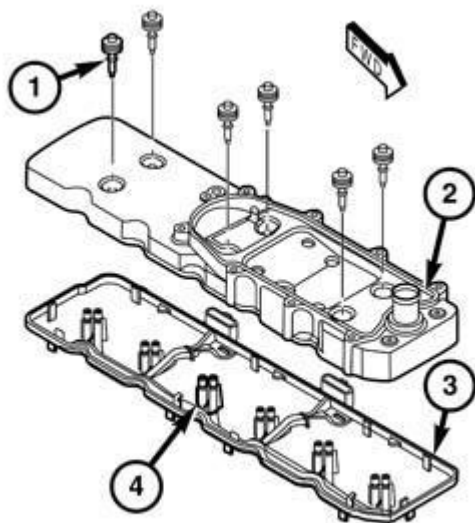


Fig. 67: Cylinder Head Cover Components
Courtesy of CHRYSLER GROUP, LLC

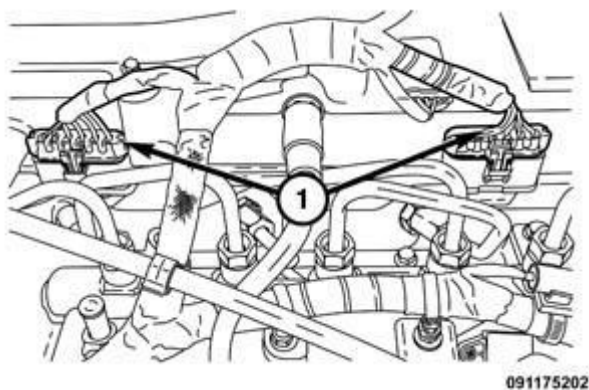
6. Remove the Close Crankcase Ventilation (CCV) cover (4) and crankcase breather. Refer to **SYSTEM, CLOSED CRANKCASE VENTILATION (CCV), REMOVAL**.
7. Remove the two CCV oil drains tubes (3) from cylinder head cover (4).



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Fig. 68: Cylinder Head Cover & Gasket
Courtesy of CHRYSLER GROUP, LLC

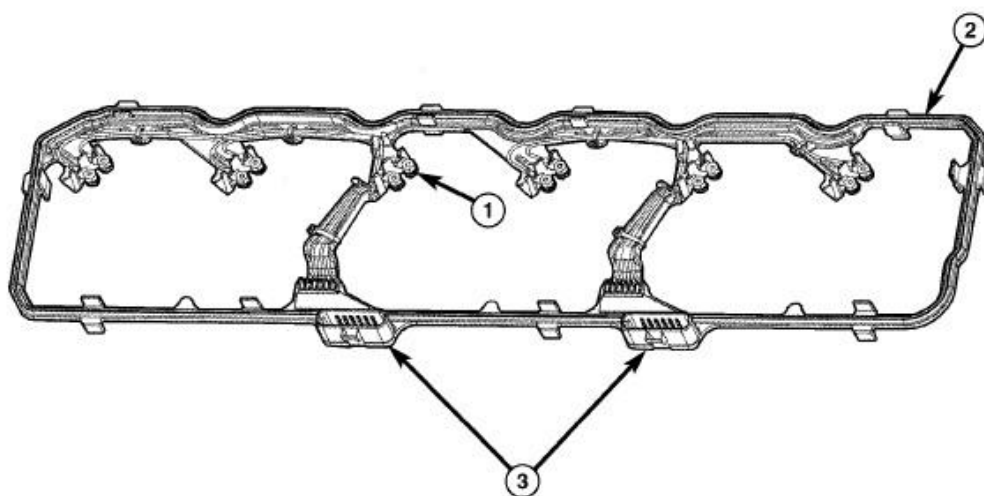
8. Remove bolts (1) and the cylinder head cover (2).



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Fig. 69: Injector Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

9. If necessary, disconnect both injector harness connectors (1).



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Fig. 70: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

10. If necessary, loosen the fuel injector wire harness nuts (1) on the cylinder head cover gasket (2).
11. If necessary, remove the cylinder head cover gasket (2).

CLEANING

CLEANING

Using a suitable solvent, Clean and dry gasket mating surfaces on cylinder head and rocker housing. Wipe gasket dry and inspect for re-use.

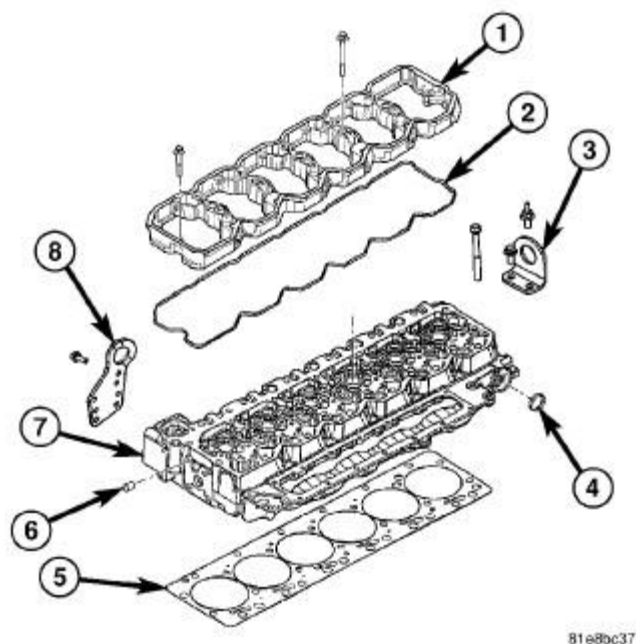
INSPECTION

INSPECTION

The cylinder head cover gasket and rocker housing gasket, are reusable. However, should cracks, nicks, or tears be present in the rubber/silicone construction, the defective components should be replaced. Also replace gasket if it is no longer flexible. Inspect cylinder head cover rubber isolated capscrews for cracks, nicks, or tears. **Do not reuse gasket if it has been removed from the groove in the rocker housing or cylinder head cover.**

INSTALLATION

ROCKER HOUSING

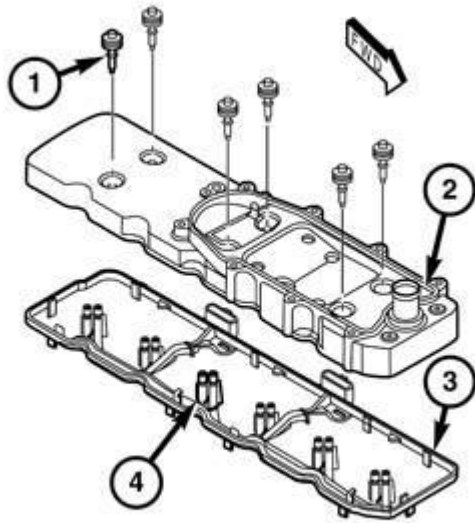
**Fig. 71: Cylinder Head Assembly & Gasket**

Courtesy of CHRYSLER GROUP, LLC

1. Clean all the gasket sealing surfaces. Refer to **ENGINE GASKET SURFACE PREPARATION**.
2. Install and center rocker housing gasket (2) in groove. If gasket bead that is tilted to the side will cause an oil leak.

CAUTION: When installing rocker housing onto cylinder head, do not slide housing from side to side, The gasket could fall out or be damaged.

3. Install the rocker housing (1) and tighten bolts finger tight. Working from center out, tighten bolts to 24 N.m (18 ft. lbs.).

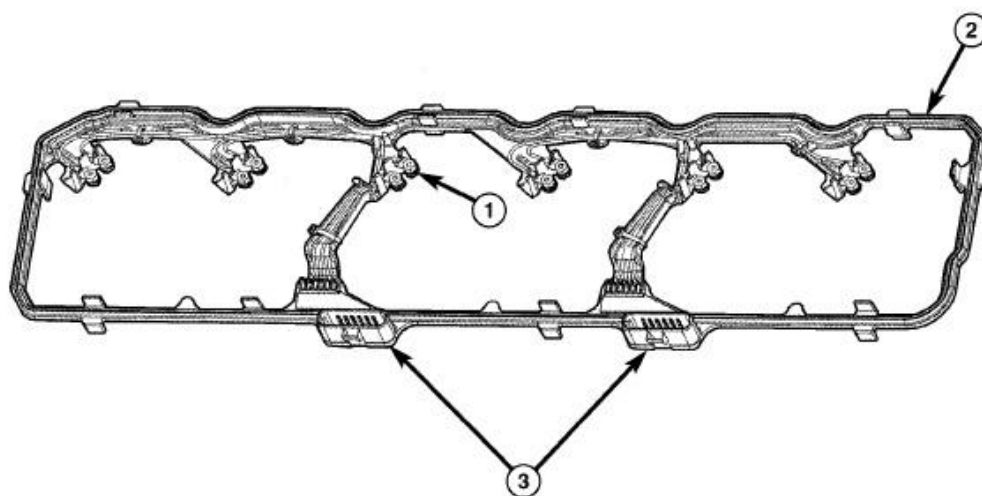


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Fig. 72: Cylinder Head Cover & Gasket
Courtesy of CHRYSLER GROUP, LLC

4. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L.**

CYLINDER HEAD COVER



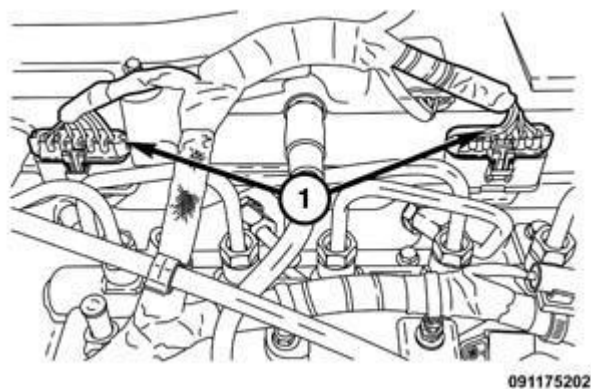
814b3452

Fig. 73: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

NOTE: Gasket must be completely dry and free of oil before installation. Pneumatic tools should NOT be used to remove or install the cover.

1. Clean all the gasket sealing surfaces. Refer to **ENGINE GASKET SURFACE PREPARATION** .
2. Inspect cylinder head cover gasket (2) for tears, or splits. Replace if necessary.
3. If removed, install the cylinder head cover gasket (2) on the rocker box. Tighten the fuel injector wire harness nuts (1) to 1.50 N.m (13 in. lbs.).

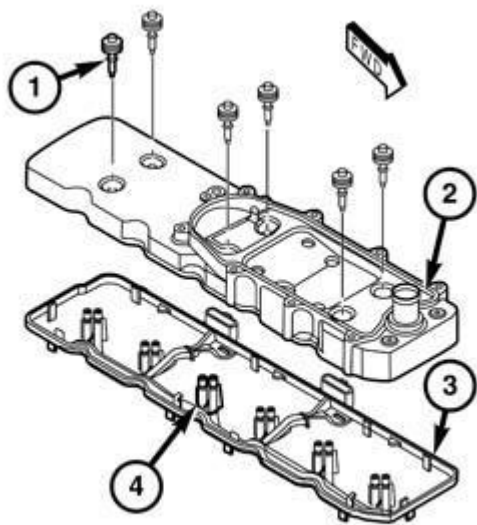


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Fig. 74: Injector Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

4. If removed, connect both fuel injector wire harness connectors (1).

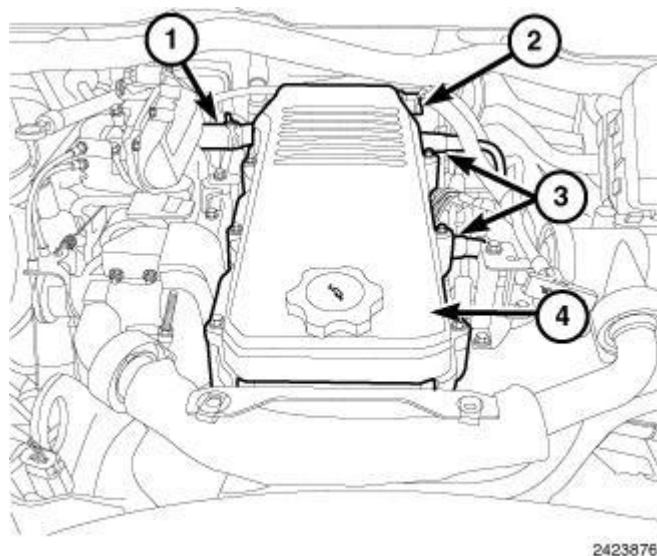


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Fig. 75: Cylinder Head Cover & Gasket
Courtesy of CHRYSLER GROUP, LLC

NOTE: Pneumatic tools should NOT be used to remove or install the cover.

5. Install the cylinder head cover (2). Tighten bolts (1) from the center out to 24 N.m (18 ft. lbs.).



2423876

Fig. 76: Cylinder Head Cover Components

Courtesy of CHRYSLER GROUP, LLC

6. Install the Close Crankcase Ventilation (CCV) drain tubes (3) to the cylinder head cover (4).
7. Install the crankcase breather and CCV cover (4). Refer to **SYSTEM, CLOSED CRANKCASE VENTILATION (CCV), INSTALLATION**.

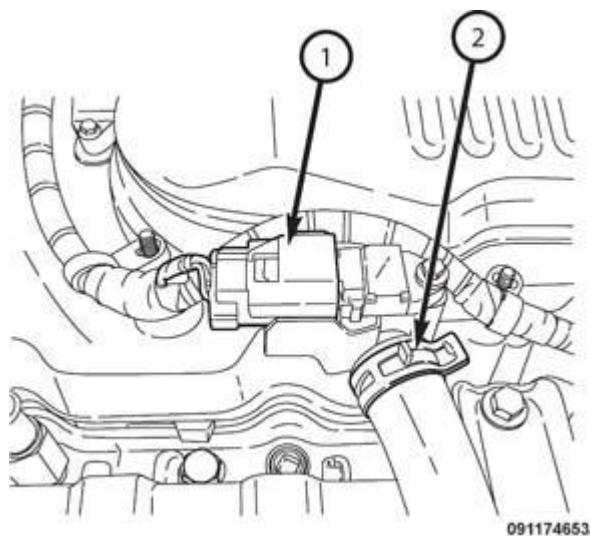


Fig. 77: Crankcase Pressure Sensor Wire Harness Connector & Clamp
Courtesy of CHRYSLER GROUP, LLC

8. Connect the crankcase pressure sensor 2 wire harness connector (1).

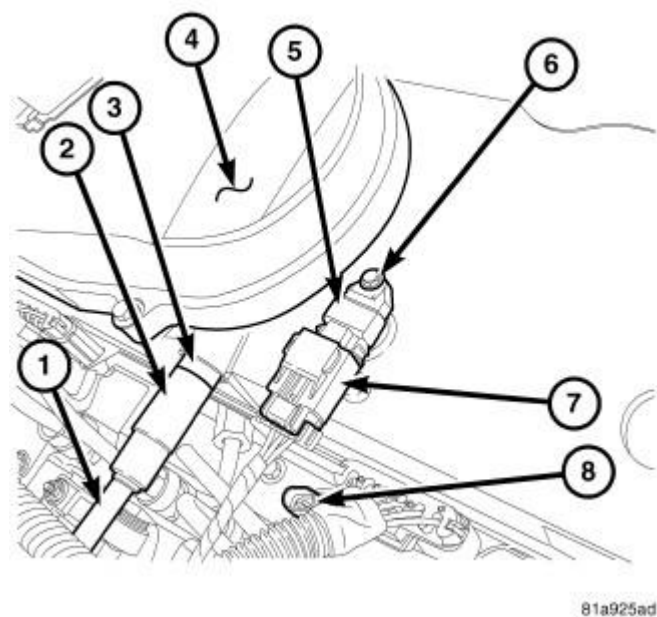


Fig. 78: Locating Crankcase Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

9. Connect the crankcase pressure sensor 1 wire harness connector (7).



Fig. 79: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

10. Install the engine cover (2) and fasteners (1, 4).
11. Install the engine oil dipstick.
12. Connect both negative battery cables.
13. Start the vehicle and check for leaks.

ROCKER ARM, VALVE

DESCRIPTION

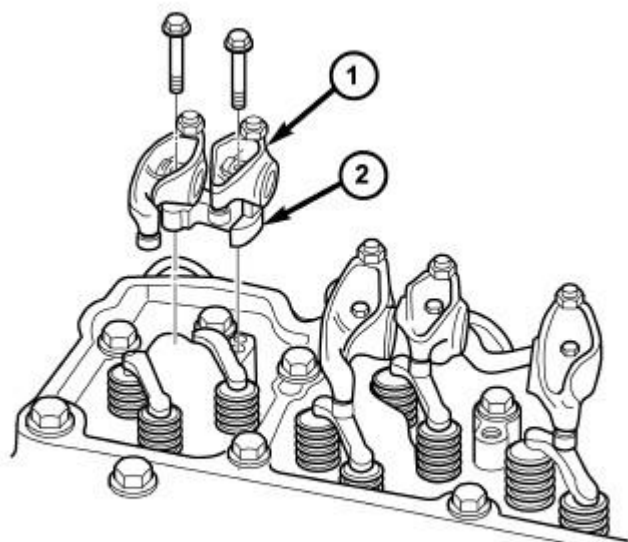
DESCRIPTION

The unique intake and exhaust rocker arms have their own rocker shafts and are lubricated by passages intersecting the cylinder block main oil rifle. Crossheads are used, which allow each rocker arm to operate two valves.

The solid push rods are hardened at the rocker arm and tappet contact areas for superior strength and durability.

REMOVAL

REMOVAL



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Fig. 80: Rocker Arm & Pedestal

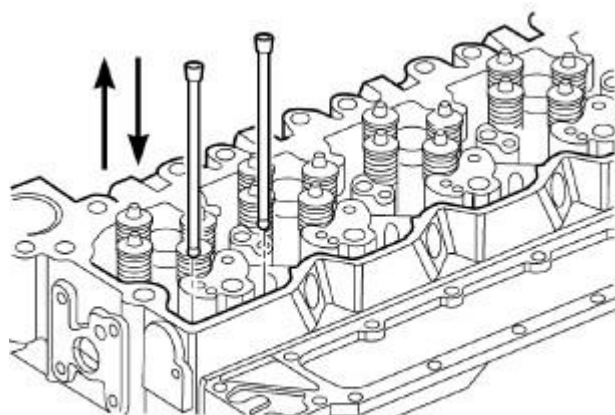
Courtesy of CHRYSLER GROUP, LLC

1 - ROCKER ARM

2 - PEDESTAL

1. Disconnect both negative battery cables.
2. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
3. Remove the rocker arm/pedestal fasteners and remove rocker arm (1) and pedestal (2) from cylinder head. Mark the arms and pedestals so they can be installed in their original position.

CAUTION: When removing the rocker arms, the sockets may come loose and fall into the engine. Make sure they stay with the arm upon removal/installation.



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Fig. 81: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

4. Lift the push rod(s) up and out of the engine. Mark them so they can be installed in their original position.

NOTE: **The No. 5 cylinder intake and exhaust, and No. 6 cylinder intake and exhaust push rods must be raised through the provided cowl panel access holes.**

5. Lift the crossheads off of the valve stems. Mark them so they can be installed in their original position.

CLEANING

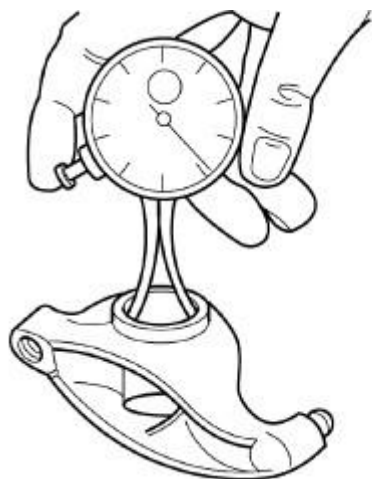
CLEANING

Clean all components in a suitable solvent. If necessary, use a wire brush or wheel to remove stubborn deposits. Rinse in hot water and blow dry with compressed air. Inspect oil passages in rocker arms and pedestals. Apply compressed air to lubrication orifices to purge contaminants.

INSPECTION

INSPECTION

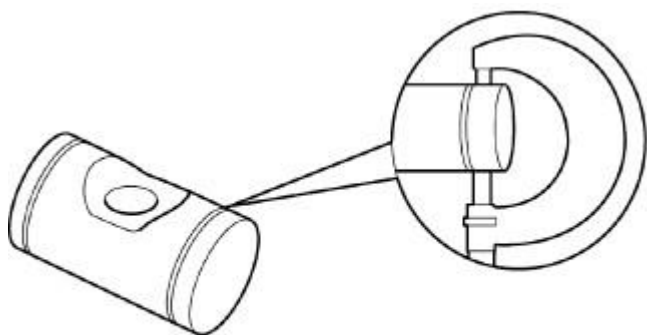
ROCKER ARMS



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Fig. 82: Measuring Rocker Arm Bore
Courtesy of CHRYSLER GROUP, LLC

ROCKER ARM BORE (MAX.)
22.027 mm (.867 in.)



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Fig. 83: Measuring Rocker Arm Shaft
Courtesy of CHRYSLER GROUP, LLC

ROCKER ARM SHAFT (MIN.)
21.965 mm (.865 in.)

1. Remove rocker shaft and inspect for cracks and excessive wear in the bore or shaft. Remove socket and inspect ball insert and socket for signs of wear. Replace retainer if necessary.

Measure the rocker arm bore and shaft.

PUSH RODS

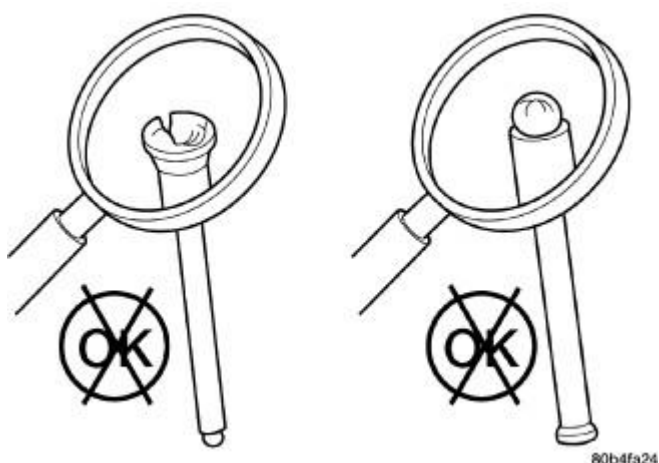


Fig. 84: Inspecting Push Rod For Cracks
Courtesy of CHRYSLER GROUP, LLC

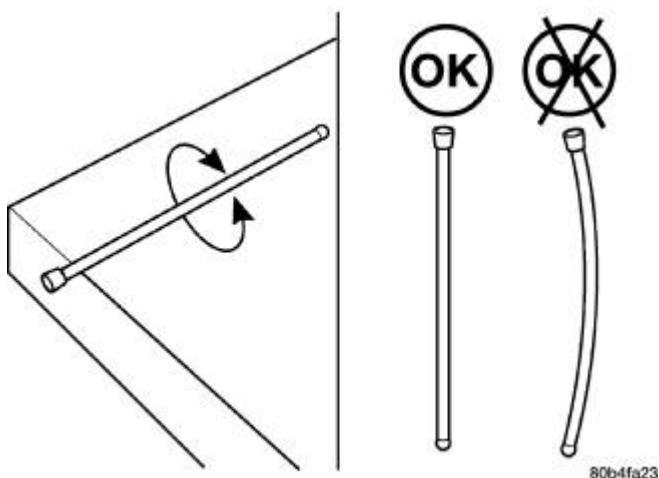
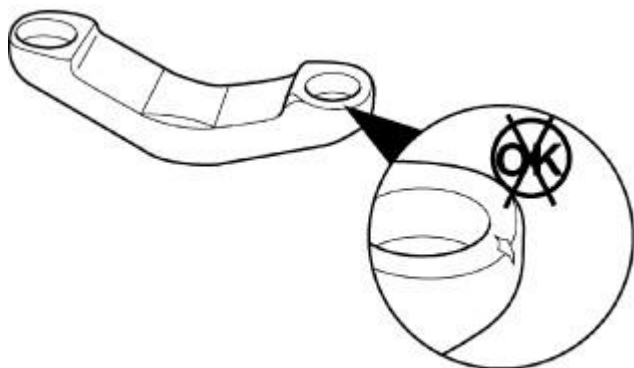


Fig. 85: Inspecting For Bent Push Rods
Courtesy of CHRYSLER GROUP, LLC

Inspect the push rod ball and socket for signs of scoring. Check for cracks where the ball and the socket are pressed into the tube.

Roll the push rod on a flat work surface with the socket end hanging off the edge. Replace any push rod that appears to be bent.

CROSSHEADS



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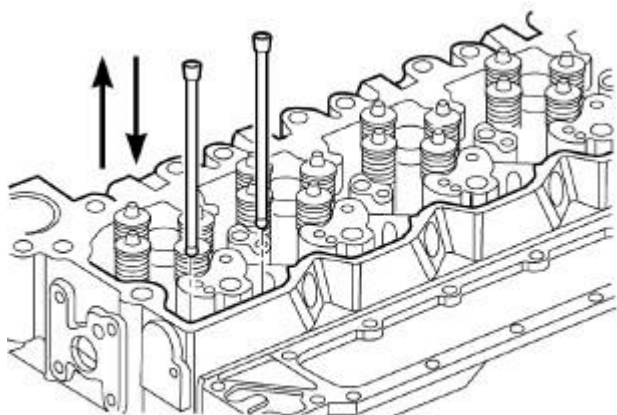
Fig. 86: Inspecting Crosshead For Cracks

Courtesy of CHRYSLER GROUP, LLC

Inspect the crossheads for cracks and/or excessive wear on rocker lever and valve tip mating surfaces.

INSTALLATION

INSTALLATION

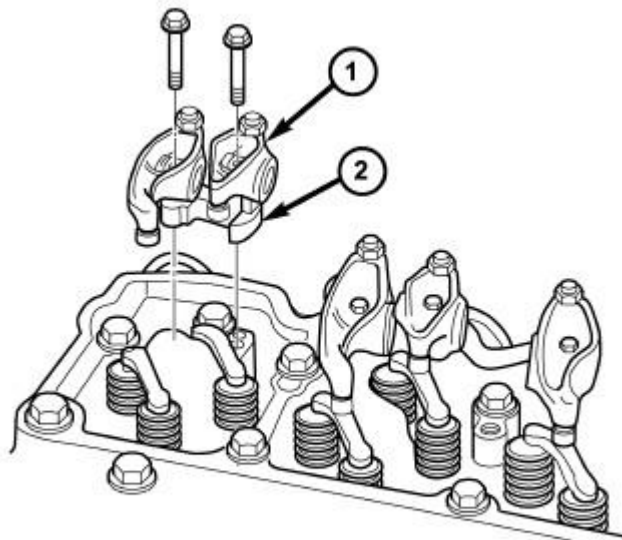


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Fig. 87: Push Rod Removal/Installation

Courtesy of CHRYSLER GROUP, LLC

1. If previously removed, install the push rods in their original location. **Verify that they are seated in the tappets.**
2. Lubricate the valve tips and install the crossheads in their original locations.
3. Lubricate the crossheads and push rod sockets and install the rocker arms and pedestals in their original locations. Tighten bolts to 36 N.m (27 ft. lbs.).



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Fig. 88: Rocker Arm & Pedestal
Courtesy of CHRYSLER GROUP, LLC

1 - ROCKER
ARM
2 -
PEDESTAL

4. Verify valve lash adjustment. Refer to **VALVE LASH ADJUSTMENT AND VERIFICATION** .
5. Install cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.
6. Connect both negative battery negative cables.

VALVES, INTAKE AND EXHAUST

DESCRIPTION

DESCRIPTION

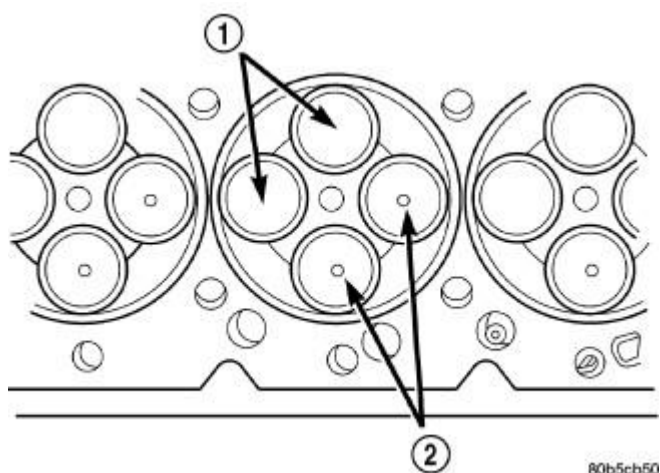


Fig. 89: Intake & Exhaust Valve Identification
Courtesy of CHRYSLER GROUP, LLC

The intake valves (1) are made of heat resistant steel, and have chrome plated stems to prevent scuffing. The exhaust valves are made of iron alloys (2). The intake and exhaust valves are both similar in head diameter and overall length, but they have unique face angles which makes them non-interchangeable. The valves are distinguished by unique dimples on the exhaust valve head (2).

The exhaust valve springs are made from high strength, chrome silicon steel. The exhaust valve springs are also exhaust brake compatible.

STANDARD PROCEDURE

VALVES, SEALS IN VEHICLE

REMOVAL

1. Disconnect both negative battery cables.
2. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
3. Remove injector(s) from the cylinder(s) being serviced. Refer to **INJECTOR(S), FUEL, REMOVAL**.

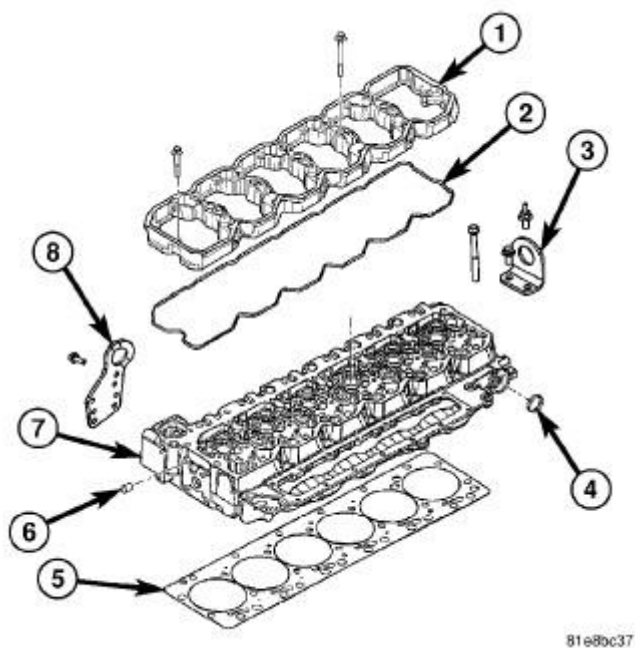


Fig. 90: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts and the rocker housing (1).
5. Remove the rocker arms and crossheads from the cylinder(s) to be serviced. Mark each component so they can be installed in their original position.

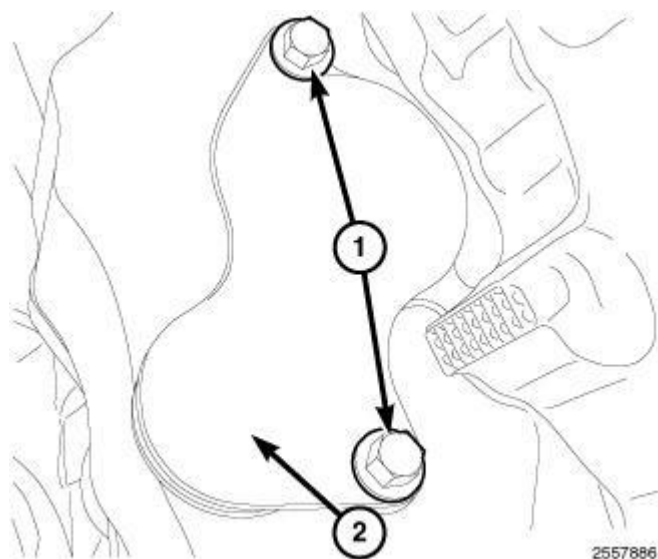


Fig. 91: Bolts & Bell Housing Access Cover
Courtesy of CHRYSLER GROUP, LLC

6. Remove bolts (1) and the bell housing access cover (2).

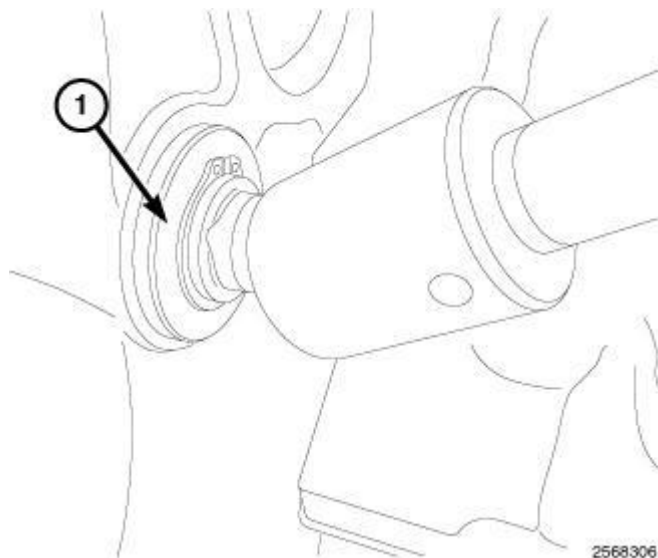


Fig. 92: Engine Barring Tool

Courtesy of CHRYSLER GROUP, LLC

NOTE: At this engine position, cylinders No. 1 and No. 6 can be serviced.

7. Using the barring tool (special tool #7471B, Barring Tool) (1), rotate the engine to position the damper mark in the 12 o'clock position.
8. Remove the serpentine drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
9. With the damper TDC mark in the 12 o'clock position, add a paint mark anywhere on the gear housing cover next to the crankshaft damper. Place another mark on the vibration damper in alignment with the mark you just made on the cover.
10. Divide the crankshaft damper into three equally sized segments as follows:
 - a. Using a tape measure, measure the circumference of the crankshaft damper and divide the measurement by three (3).
 - b. Measure that distance in a counterclockwise direction from the first balancer mark and place another mark on the balancer.
 - c. From the second damper mark, again measure in a counterclockwise direction and place a mark on the damper at the same distance you measured when placing the second damper mark. The damper should now be marked in three equally spaced locations and the damper TDC mark should be in the 12 o'clock position.

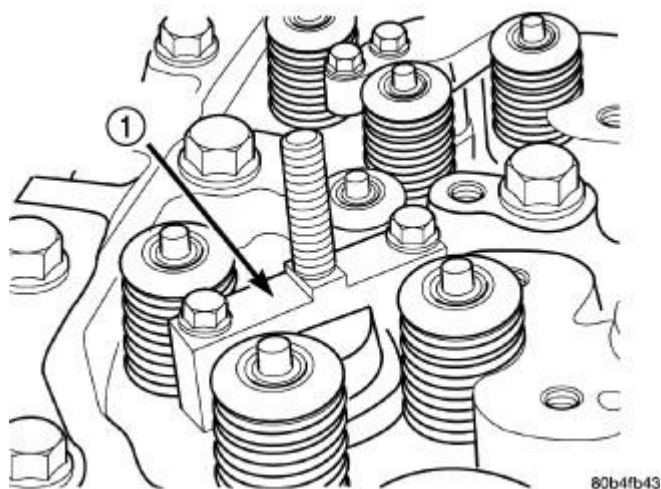


Fig. 93: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

1 -
COMPRESSOR
MOUNTING
BASE

11. Compress the valve springs at cylinders. No. 1 and No. 6 as follows:
 - a. Install the Valve Spring Compressor Tool (special tool #8319, Compressor, Valve Spring) base (1) as shown in the illustration.

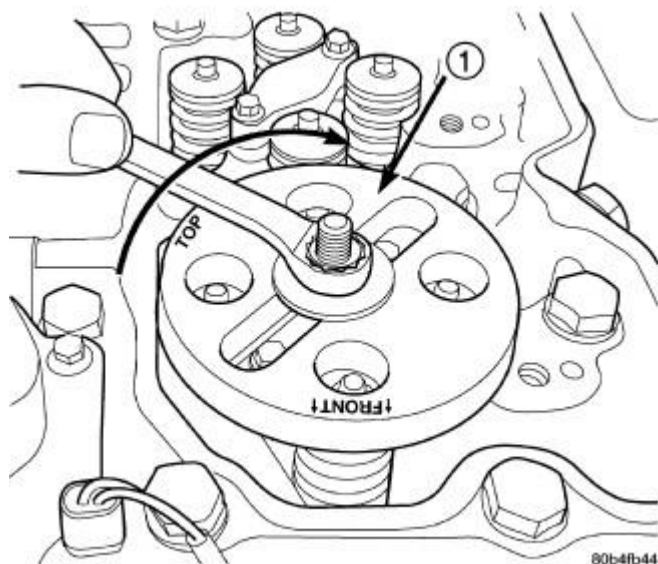


Fig. 94: Compressing Valve Springs With Tool 8319-A
Courtesy of CHRYSLER GROUP, LLC

12. Install the (special tool #8319, Compressor, Valve Spring) tool top plate, washer, and nut. Using a

suitable wrench tighten the nut (clockwise) to compress the valve springs and remove the collets.

- a. Rotate the compressor nut counterclockwise to relieve tension on springs. Remove spring compressor.
- b. Remove and replace retainers, springs, and seals as necessary.
- c. **Do not rotate the engine until the springs and retainers are reinstalled.**
- d. Install seals, springs and retainers. Install spring compressor, compress valve springs and install the collets.
- e. Release the spring tension and remove the compressor. Verify that the collets are seated by tapping on the valve stem with a plastic hammer.

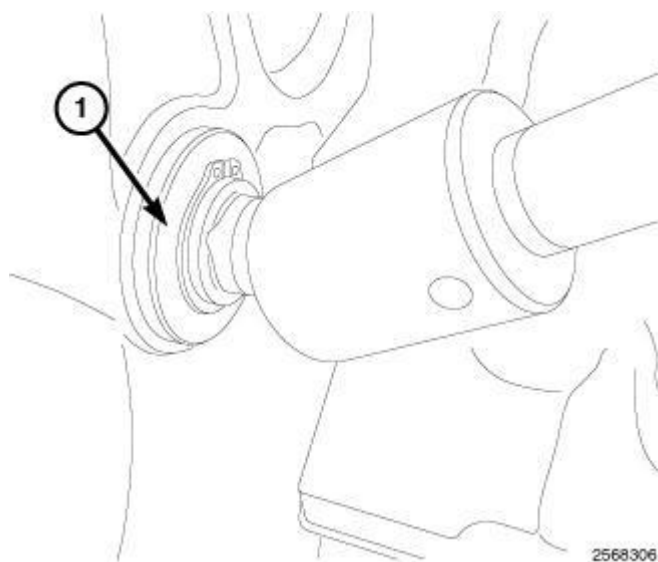


Fig. 95: Engine Barring Tool

Courtesy of CHRYSLER GROUP, LLC

NOTE: In this position, cylinders No. 2 and No. 5 can be serviced.

13. Using the (special tool #7471B, Barring Tool) (1), rotate the engine until the next crankshaft damper paint mark aligns with the mark you placed on the cover.
14. Repeat the valve spring compressing procedure previously performed and service the retainers, springs, and seals as necessary.

NOTE: In this position, cylinders No. 3 and No. 4 can be serviced.

15. Using the (special tool #7471B, Barring Tool), rotate the engine until the next crankshaft damper paint mark aligns with the mark you placed on the cover.
16. Repeat the spring compressing procedure previously performed and service the retainers, springs, and seals as necessary.

INSTALLATION

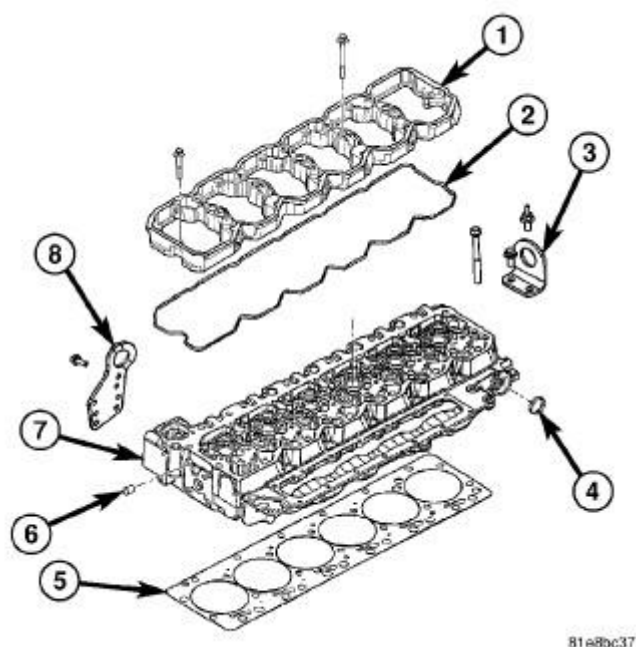


Fig. 96: Cylinder Head Assembly & Gasket

Courtesy of CHRYSLER GROUP, LLC

1. Install rocker housing (1). Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L.**
2. Install fuel injectors. Refer to **INJECTOR(S), FUEL, INSTALLATION** .
3. Lubricate the valve tips and install the crossheads in their original locations.
4. Lubricate the crossheads and push rod sockets and install the rocker arms and pedestals in their original locations. Tighten bolts to 36 N.m (27 ft. lbs.).
5. Verify valve lash adjustment. Refer to **VALVE LASH ADJUSTMENT AND VERIFICATION** .
6. Install cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L.**
7. Connect both negative battery cables.

VALVE LASH ADJUSTMENT AND VERIFICATION

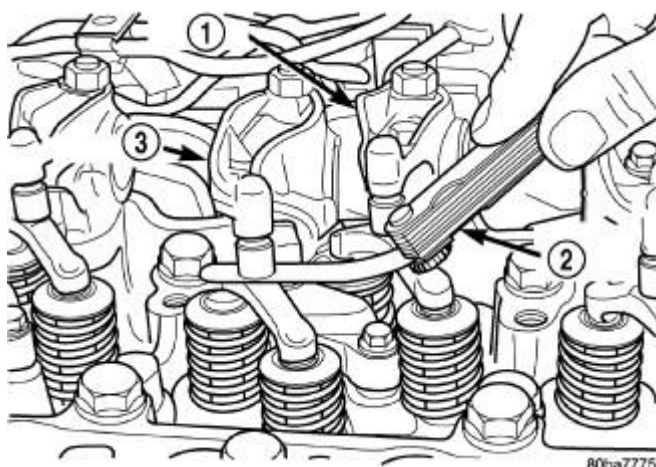


Fig. 97: Measuring Valve Lash
Courtesy of CHRYSLER GROUP, LLC

NOTE: To obtain accurate readings, valve lash measurements and adjustments should only be performed when the engine coolant temperature is less than 60° C (140° F.).

The overhead setting is only required at the interval specified in the owner's manual. However, measurements should still take place when troubleshooting performance problems, or upon completion of a repair that includes removal and installation of the valve train components or injectors.

1. Disconnect battery negative cables.
2. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
3. Using the barring tool (special tool #7471B, Barring Tool), rotate crankshaft to align damper TDC mark to 12:00 o'clock position.
 - a. If both number one cylinder rocker levers are loose, continue to next step.
 - b. If both number one cylinder rocker levers are not loose, rotate crankshaft 360°.
4. With the engine in this position, valve lash can be measured at the following rocker arms: **INTAKE 1-2-4 / EXHAUST 1-3-5**. Measure the valve lash by inserting a feeler gauge between the rocker arm socket and crosshead. Refer to **VALVE LASH LIMIT CHART** for the correct specifications. If the measurement falls within the limits, adjustment/resetting is not necessary. If measurement finds the lash outside of the limits, adjustment/resetting is required.

VALVE LASH LIMIT CHART

INTAKE	EXHAUST
0.152 mm (0.006 in.) MIN.	0.533 mm (0.021 in.) MIN.
0.381 mm (0.015 in.) MAX.	0.863 mm (0.034 in.) MAX.

NOTE:

If measured valve lash falls within these specifications, no adjustment/reset is necessary. Engine operation within these ranges has no adverse affect on performance, emissions, fuel economy or level of engine noise.

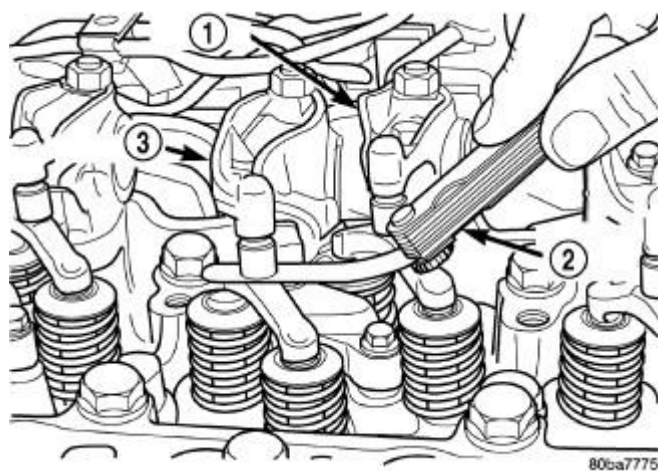


Fig. 98: Measuring Valve Lash

Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE
2 - FEELER
GAUGE
3 - EXHAUST

5. If adjustment/resetting is required, loosen the lock nut on rocker arms and turn the adjusting screw until the desired lash is obtained:
 - **INTAKE** 0.254 mm (0.010 in.)
 - **EXHAUST** 0.660 mm (0.026 in.)

Tighten the lock nut to 24 N.m (18 ft. lbs.) and recheck the valve lash.

6. Using the crankshaft barring tool, rotate the crankshaft one revolution (360°) to align the damper TDC mark to the 12 o'clock position.
7. With the engine in this position, valve lash can be measured at the remaining rocker arms: **INTAKE 3-5-6 / EXHAUST 2-4-6**. Use the same method as above for determining whether adjustment is necessary, and adjust those that are found to be outside of the limits.
8. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.

9. Connect both negative battery cables.

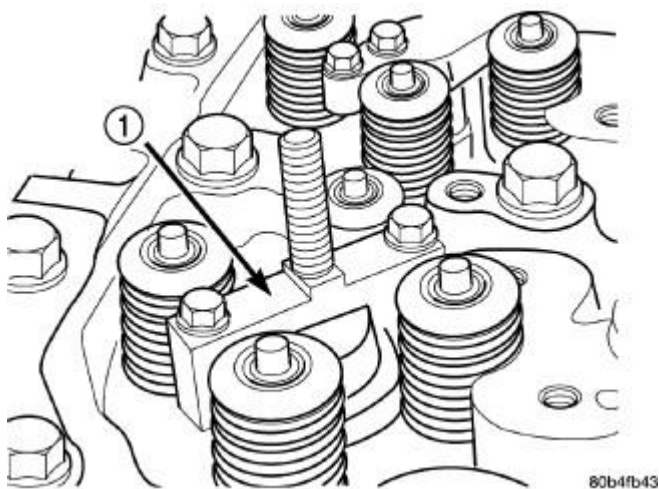
REMOVAL**REMOVAL**

Fig. 99: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

1. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL, 6.7L**.
2. Support cylinder head on stands.
3. Install the valve spring compressor base 8313A (1) as shown in the illustration.

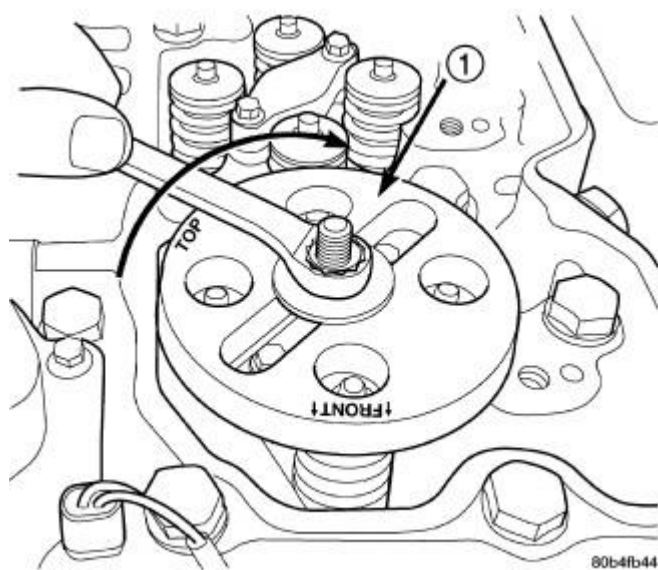
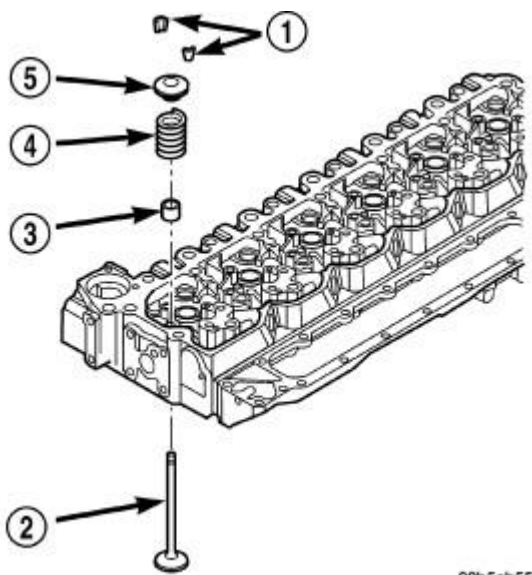


Fig. 100: Compressing Valve Springs With Tool 8319
Courtesy of CHRYSLER GROUP, LLC

4. Install the valve spring compressor (special tool #8319, Compressor, Valve Spring) top plate, washer, and nut. Using a suitable wrench, tighten the nut (clockwise) to compress the valve springs and remove the locks.
5. Rotate the compressor nut counter-clockwise to relieve tension on the springs. Remove the spring compressor (1).



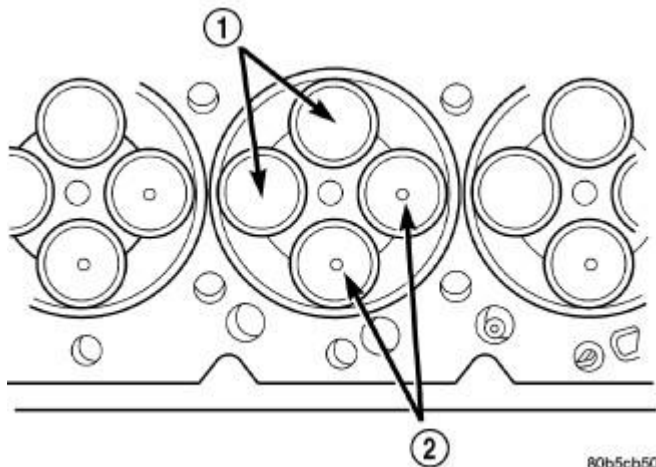
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Fig. 101: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

6. Remove the retainers (5), springs (4), valve seals (3) (if necessary), and valves (2). Arrange or number all components so they can be installed in their original locations.
7. Repeat the procedure on all cylinders to be serviced.

INSTALLATION

INSTALLATION



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Fig. 102: Intake & Exhaust Valve Identification
Courtesy of CHRYSLER GROUP, LLC

1. Install new valve seals. The yellow seals are for the intake valves and the green seals are for the exhaust valves.
2. Install the valves in their original position. The exhaust valves are identified by a dimple on the valve head.

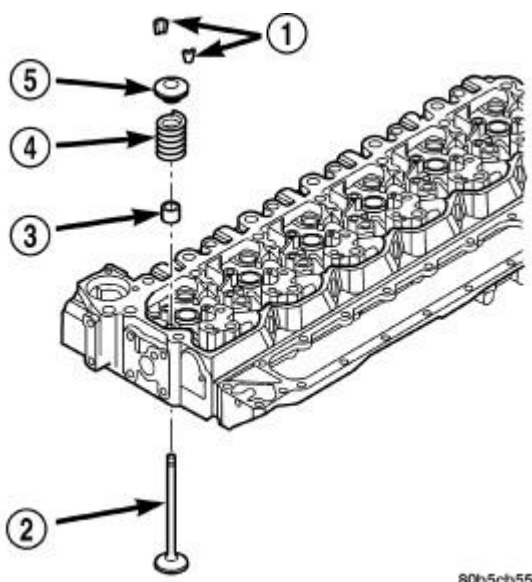


Fig. 103: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

3. Install the valve (2), springs (4), and retainer (5).

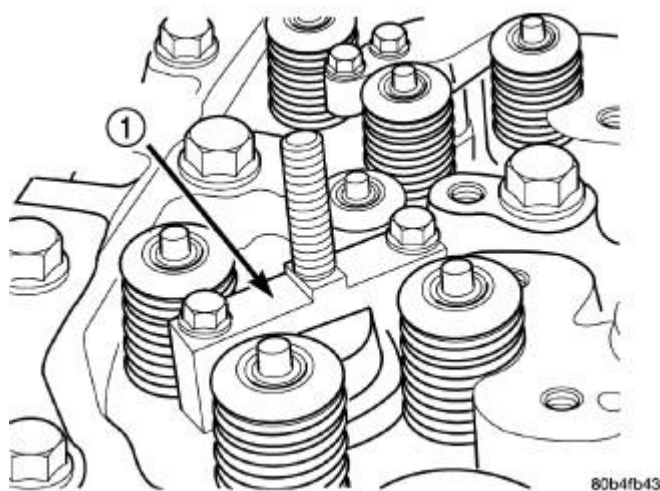


Fig. 104: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

4. Install the valve spring compressor tool base (special tool #8319, Compressor, Valve Spring) (1) as

shown in the illustration.

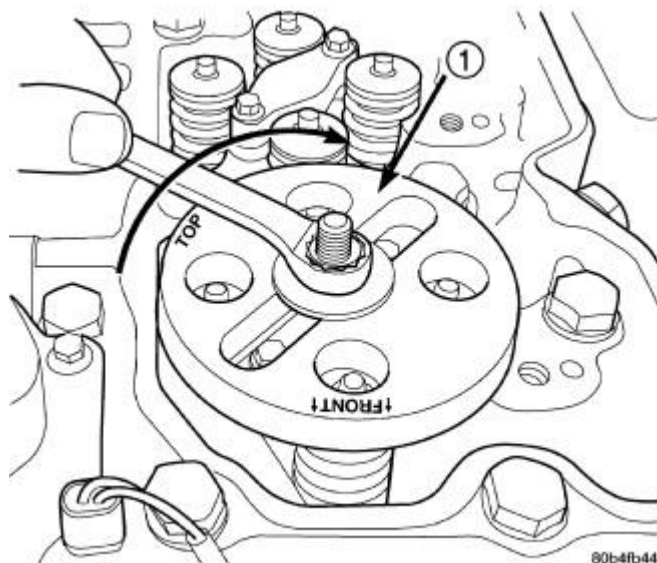


Fig. 105: Compressing Valve Springs With Tool 8319

Courtesy of CHRYSLER GROUP, LLC

5. Install the valve spring compressor top plate (1), washer, and nut (special tool #8319, Compressor, Valve Spring).
6. Compress the valve springs and install the valve retaining locks.
7. Remove the valve spring compressor tool (special tool #8319, Compressor, Valve Spring) and repeat the procedure on the remaining cylinders.
8. Install the fuel injectors. Refer to **INJECTOR(S), FUEL, INSTALLATION**.
9. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION, 6.7L**.

ENGINE BLOCK

STANDARD PROCEDURE

CYLINDER BLOCK REFACING

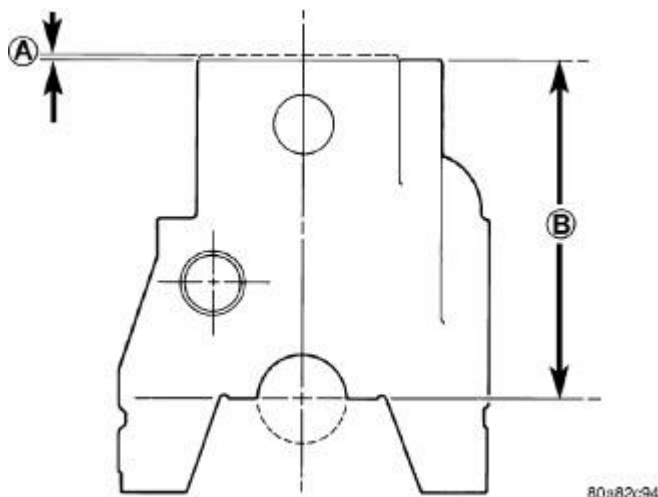


Fig. 106: Refacing Dimensions Of The Cylinder Block
Courtesy of CHRYSLER GROUP, LLC

1. Prior to removing the piston and connecting rod assemblies, measure and record piston protrusion. Piston protrusion (A) must be within 0.151 - 0.485 mm (0.006 - 0.019 in.). Measuring piston protrusion prior to disassembly will aid in determining if the cylinder block needs to be replaced.
2. Measure the overall flatness of the engine block.
3. The engine block must be within 0.076 mm (0.003 in) end-to-end and 0.051 mm (.002 in.) side-to-side.
4. Inspect for any localized dips or imperfections. If present, the cylinder block **MUST** be replaced.

NOTE: The combustion deck of the block can **ONLY** be resurfaced if after the resurface, the correct piston protrusion can be achieved.

No specific head gasket with an increased thickness is available for combustion deck resurfacing. If the combustion deck can **NOT** be resurfaced such that the correct piston protrusion can be reached, the cylinder block **MUST** be replaced.

CYLINDER BORE - DE-GLAZE

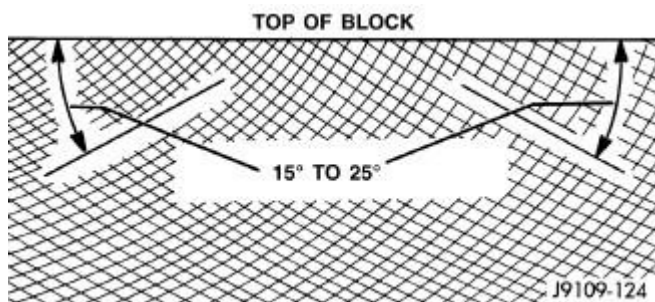


Fig. 107: Cylinder Bore Crosshatch Pattern
Courtesy of CHRYSLER GROUP, LLC

1. New piston rings may not seat in glazed cylinder bores.

2. De-glazing gives the bore the correct surface finish required to seat the rings. The size of the bore is not changed by proper de-glazing.
3. Cover the lube and tappet holes in the top of the block with waterproof tape.
4. If crankshaft is installed, wrap connecting rod journals with clean cloth. Cover cloth with waterproof tape.
5. A correctly honed surface will have a crosshatch appearance with the lines at 15° to 25° angles. For the rough hone, use 80 grit honing stones. To finish hone, use 280 grit honing stones.

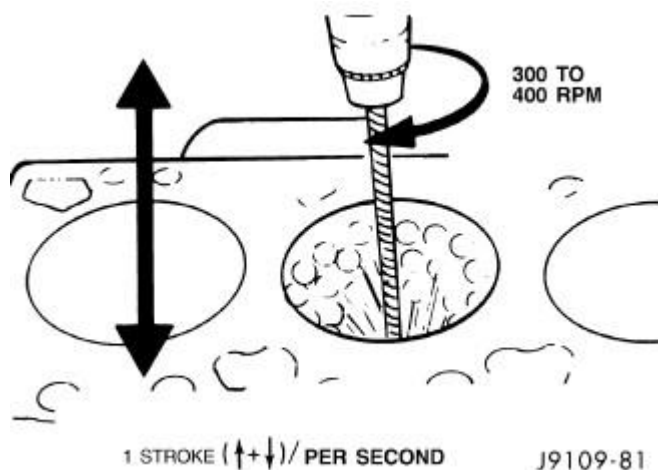


Fig. 108: De-Glazing Cylinder Bore
Courtesy of CHRYSLER GROUP, LLC

6. Use a drill, a fine grit Flex-hone and a mixture of equal parts of mineral spirits and SAE 30W engine oil to de-glaze the bores.
7. The crosshatch angle is a function of drill speed and how fast the hone is moved vertically.
8. Vertical strokes MUST be smooth continuous passes along the full length of the bore.
9. Inspect the bore after 10 strokes.
10. Use a strong solution of hot water and laundry detergent to clean the bores. Clean the cylinder bores immediately after de-glazing.
11. Rinse the bores until the detergent is removed and blow the block dry with compressed air.
12. Check the bore cleanliness by wiping with a white, lint free, lightly oiled cloth. If grit residue is still present, repeat the cleaning process until all residue is removed. Wash the bores and the complete block assembly with solvent and dry with compressed air. Place a clean shop towel around the top main bearing saddle to deflect water and residue from piston cooling nozzles. Remove directed piston cooling nozzles if installed.
13. Be sure to remove the tape covering the lube holes, rod journals, and piston cooling nozzles after the cleaning process is complete.

OVERSIZE BORE

Oversize pistons and rings are available in one size - 0.50 mm (0.0197 inch).

Any combination of standard or 0.50 mm (0.0197 inch) overbore may be used in the same engine.

If more than 0.50 mm (0.0197 inch) overbore is needed the block must be replaced.

Cylinder block bores may be bored one time. The bore size is 0.50 mm (0.0197 inch) oversize.

After boring to size, use a honing stone to chamfer the edge of the bore.

CYLINDER BORE DIMENSION CHART

DESCRIPTION	MEASUREMENT
BORING DIAMETER DIMENSION	REBORE - 107.490 mm (4.2319 in.) Minimum
	REBORE - 107.510 mm (4.2327 in.) Maximum
HONING DIAMETER DIMENSIONS	STANDARD - 102.020 ± 0.020 mm (4.0165 ± 0.0008 in.)
	REBORE - 107.45 mm (4.2303 in.) Nominal
CHAMFER DIMENSIONS	Approx. 1.25 mm (0.049 in.) by 30°

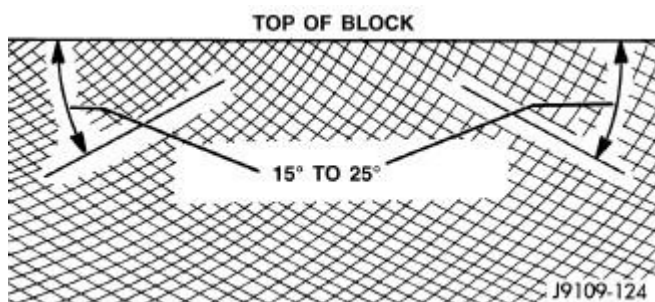


Fig. 109: Crosshatch Pattern Of Repaired Sleeve(s)
Courtesy of CHRYSLER GROUP, LLC

A correctly honed surface will have a crosshatch appearance with the lines at 15° to 25° angles with the top of the cylinder block. For the rough hone, use 80 grit honing stones. To finish hone, use 280 grit honing stones.

A maximum of 1.2 micrometer (48 microinch) surface finish must be obtained.

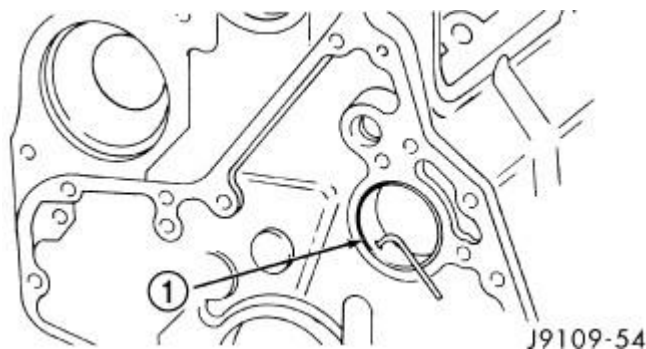
After finish honing is complete, immediately clean the cylinder bores with a strong solution of laundry detergent and hot water.

After rinsing, blow the block dry.

Check the bore cleanliness by wiping with a white, lint-free, lightly- oiled cloth. There should be no grit residue present.

If the block is not to be used right away, coat it with a rust- preventing compound.

CAM BORE REPAIR

**Fig. 110: Camshaft Bushing**

Courtesy of CHRYSLER GROUP, LLC

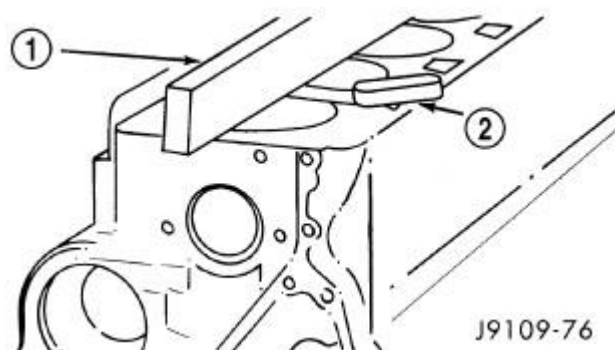
1 - CAMSHAFT BUSHING

For standard bushings, not oversized, maximum front and rear cam bushing bore diameter is 59.248 mm. (2.3326 in.). DO NOT bore the intermediate cam bore to the front cam bore oversize dimensions. Maximum front and rear camshaft bushing installed diameter is 54.147 mm. (2.1318 in.). Minimum installed diameter is 54.083 mm. (2.1293 in.). Maximum intermediate camshaft bore diameter is 54.164 mm. (2.1324 in.).

A surface finish of 2.3 micrometers (92 microinch) must be maintained. Not more than 20% of an area of any one bore may be 3.2 micrometers (126 microinch).

Camshaft bores can be repaired individually. It is not necessary to repair undamaged cam bores in order to repair individually damaged cam bores. The standard front and rear bushing (1) cannot be used to repair intermediate bores.

Install all cam bushings flush or below the front and rear cam bore surface. The front camshaft bushing should be installed flush with front face of block. The oil hole must align to allow a 3.2 mm (0.125 inch) rod to pass through freely.

INSPECTION**INSPECTION****Fig. 111: Combustion Deck Face Measurement**

Courtesy of CHRYSLER GROUP, LLC

- 1 - STRAIGHT EDGE
- 2 - FEELER GAUGE

Measure the combustion deck face using a straight edge (1) and a feeler gauge (2). Cylinder block flatness: End-to-end 0.076 mm (.003 in.). Maximum variation side-to-side 0.051 mm (.002 in.).

Inspect for any localized dips or imperfections.

If the surface exceeds the limit. Refer to **ENGINE BLOCK, STANDARD PROCEDURE, 6.7L**.

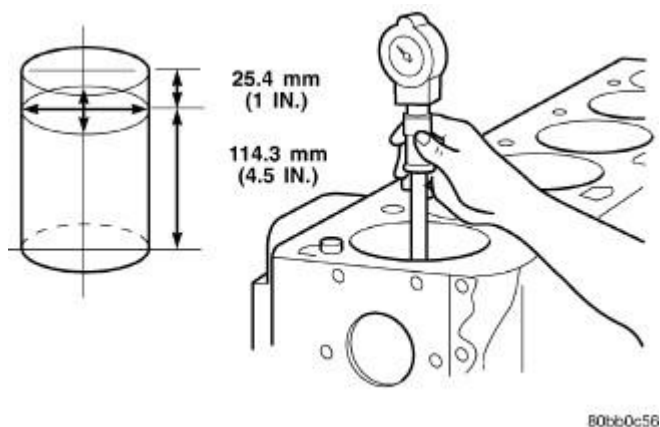


Fig. 112: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

Inspect the cylinder bores for damage or excessive wear.

Measure the cylinder bores. If the cylinder bores exceed the limit. Refer to **ENGINE BLOCK, STANDARD PROCEDURE, 6.7L**.

BORE SPECIFICATIONS

BORE SPECIFICATIONS	
BORE DIAMETER	Min. 106.990 mm (4.2122 in.)
	Max. 107.010 mm (4.2130 in.)
OUT OF ROUNDNESS	Max. 0.038 mm (0.0015 in.)
TAPER	Max. 0.076 mm (.003 in.)

Inspect the camshaft bores for scoring or excessive wear.

Measure the camshaft bores. Refer to **SPECIFICATIONS**.

If a bore exceeds the limit. Refer to **ENGINE BLOCK, STANDARD PROCEDURE, 6.7L**.

Inspect the tappet bores for scoring or excessive wear.

Measure tappet bore from bottom of block. Minimum tappet bore diameter 16.000 mm (0.630 in.). Maximum tappet bore 16.055 mm (0.632 in.).

If out of limits, replace the cylinder block.

BEARING(S), CONNECTING ROD

STANDARD PROCEDURE

STANDARD PROCEDURE - CONNECTING ROD BEARING AND CRANKSHAFT JOURNAL CLEARANCE

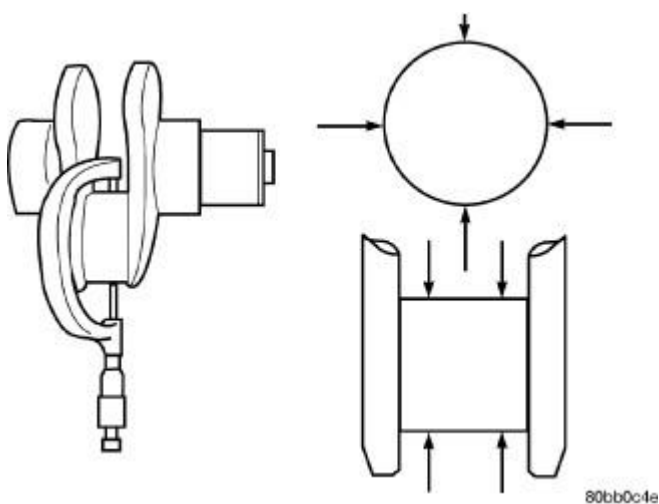


Fig. 113: Measuring Connecting Rod Journal Diameter

Courtesy of CHRYSLER GROUP, LLC

1. Measure the connecting rod bore with bearings **removed** and the bolts tightened to 100 N.m (73 ft. lbs.).
2. Measure the connecting rod bore with the bearings **installed** and the bolts tightened to 100 N.m (73 ft. lbs.).

Measure within 20° arc from each side of the parting line. Also measure 90° from parting line.

Record the smallest and largest diameter.

Measure the diameter of the rod journal at the location shown in the illustration. Calculate the average diameter for each side of the journal.

Determine minimum bearing clearance by calculating the difference between the smallest connecting rod bore diameter with the bearing installed and the average diameter for each side of the crankshaft connecting rod journal. See charts below.

Determine the maximum bearing clearance by calculating the difference between the largest connecting rod bore diameter and the average diameter with the bearing installed for each side of the crankshaft connecting rod

journal. See charts below.

If the crankshaft is within limits, replace the bearing. If the crankshaft is out of limits, grind the crankshaft to the next smaller size and use oversize rod bearings.

CONNECTING ROD BORE DIAMETER LIMITS

DESCRIPTION	MEASUREMENT
CONNECTING ROD BORE, BEARINGS REMOVED	MIN. 72.99 mm (2.874 in.) MAX. 73.01 mm (2.875 in.)
CONNECTING ROD BORE, BEARINGS INSTALLED	MIN. 69.05 mm (2.719 in.) MAX. 69.10 mm (2.720 in.)

CONNECTING ROD JOURNAL DIAMETER LIMITS

DESCRIPTION	MEASUREMENT
CRANKSHAFT ROD JOURNAL DIAMETER	Min. 68.96 mm (2.715 in.) Max. 69.01 mm (2.717 in.)
BEARING CLEARANCE	Min. 0.04 mm (.002 in.) Max. 0.12 mm (0.005 in.)

BEARING(S), CRANKSHAFT, MAIN

STANDARD PROCEDURE

STANDARD PROCEDURE - MAIN BEARING CLEARANCE

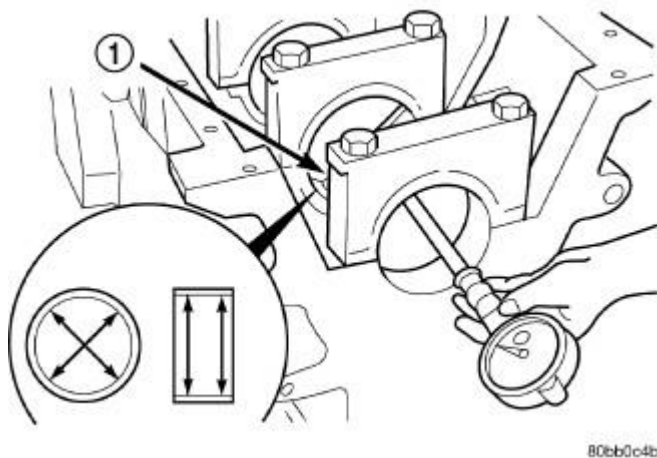


Fig. 114: Measuring Main Bearing Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

1. Remove bearings and inspect the main bearing bores for damage or abnormal wear.
2. Measure main bearing bore diameter (1) after tightening main bearing cap bolts to 176 N.m (130 ft. lbs.). See **MAIN BEARING BORE DIAMETER** table for specifications.
3. Install the crankshaft main bearings and measure main bearing bore diameter with the main bolts

tightened to 176 N.m (130 ft. lbs.). See **MAIN BEARING BORE DIAMETER** table for specifications.

MAIN BEARING BORE DIAMETER

ITEM	MAIN BEARING BORE DIAMETER (MAXIMUM)
BEARINGS INSTALLED	83.106 mm (3.2719 in.)
BEARINGS REMOVED	Min 87.983 mm (3.4639 in.) Max. 88.019 mm (3.4653 in.)

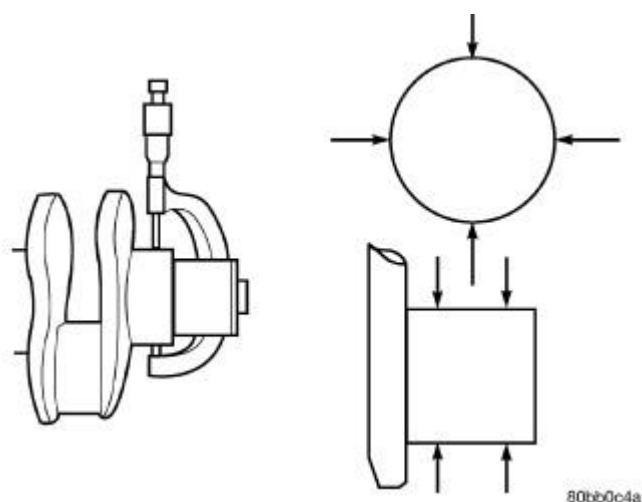


Fig. 115: Measuring Crankshaft Main Journal Diameter
Courtesy of CHRYSLER GROUP, LLC

- Measure the diameter of the crankshaft main journal at the locations shown in the illustration. Calculate the average diameter for each side of the journal.
- Calculate the main bearing journal to bearing clearance. Maximum clearance is 0.119 mm (0.00475 inch). If the crankshaft journal is within limits, replace the main bearings. If not within limits, grind the crankshaft to next size and use oversize bearings. See **CRANKSHAFT MAIN JOURNAL DIAMETER** table for specifications.
- Measure thrust distance at the No. 6 position.

CRANKSHAFT MAIN JOURNAL DIAMETER

ITEM	SPECIFICATION
Minimum diameter	82.962 mm (3.2662 in.)
Maximum diameter	83.013 mm (3.2682 in.)

2013 RAM 3500 HD Big Horn

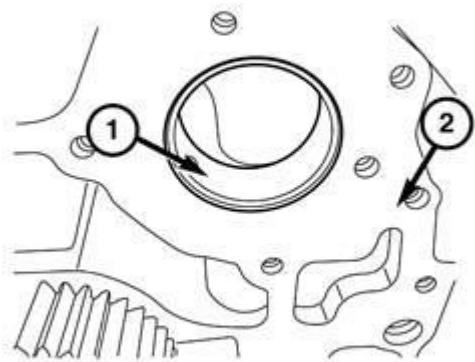
2013 ENGINE 6.7L Diesel - Service Information - Ram Pickup

Maximum out of roundness	0.050 mm (.002 in.)
Maximum taper	0.013 mm (.0005 in.)
Thrust distance (at No. 6 position)	Min. 0.065 mm (.003 in.) Max. 0.432 mm (.017 in.)

BEARING(S), CAMSHAFT

DESCRIPTION

DESCRIPTION

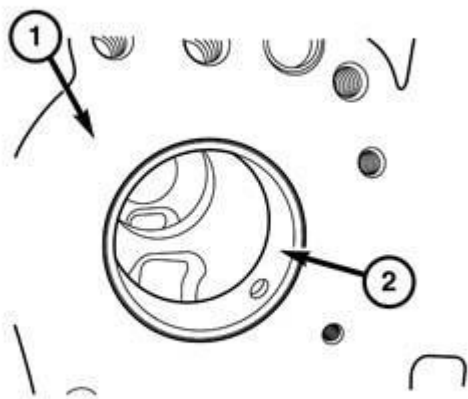


0913002107

Fig. 116: Front Camshaft Bearing & Front Of Engine Block

Courtesy of CHRYSLER GROUP, LLC

There are two camshaft bearings used in the Cummins 6.7L diesel engine. Both bearings are serviceable; the front bearing (1) is located in the front of engine block (2).



0913002111

Fig. 117: Rear Camshaft Bearing & Rear Of Engine Block
Courtesy of CHRYSLER GROUP, LLC

The rear bearing (2) is located in the rear of the engine block (1).

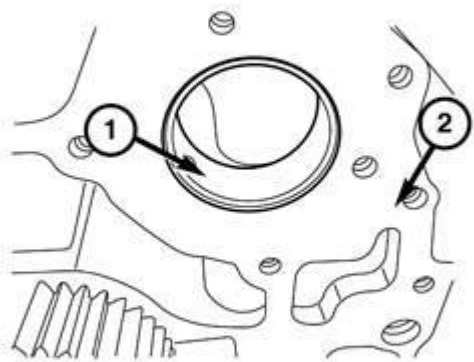
REMOVAL

REMOVAL

NOTE: Measure the diameter of each bore. If the camshaft bore for the cam bushing is worn beyond the limit, install a new service bushing. Inspect the rest of the camshaft bores for damage or excessive wear.

If the bores without a bushing are worn beyond the limit, the engine must be removed for machining and installation of service bushings. If badly worn, replace the cylinder block.

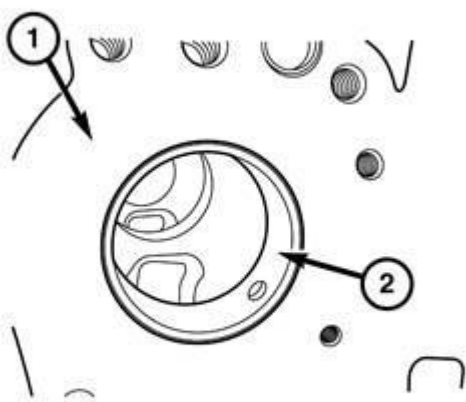
1. Remove the transmission adapter plate. Refer to **PLATE, TRANSMISSION ADAPTER, REMOVAL, 6.7L.**
2. Remove the front timing case housing. Refer to **HOUSING, TIMING CASE, FRONT, REMOVAL, 6.7L.**



0913002107

Fig. 118: Front Camshaft Bearing & Front Of Engine Block
Courtesy of CHRYSLER GROUP, LLC

3. Using a universal cam bushing removal tool, remove the front camshaft bearing (1).
4. Mark the cylinder block so you can align the oil hole in the cylinder block with the oil hole in the bushing.

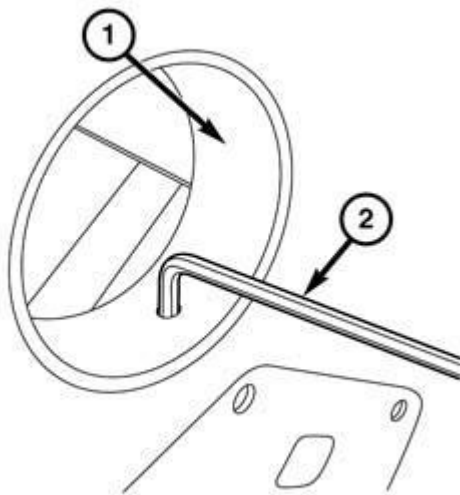


0913002111

Fig. 119: Rear Camshaft Bearing & Rear Of Engine Block

Courtesy of CHRYSLER GROUP, LLC

5. Using a universal cam bushing removal tool, remove the rear camshaft bearing (2).
6. Mark the cylinder block so you can align the oil hole in the cylinder block with the oil hole in the bushing.

INSTALLATION**INSTALLATION**

0913002091

Fig. 120: Installing Rear Bearing**Courtesy of CHRYSLER GROUP, LLC**

1. Apply a coating of Loctite® 640 Adhesive to the backside of the new bushing. Avoid getting adhesive in the oil hole.
2. Use a universal cam bushing installation tool and install the rear bearing (1) so that it is even with the rear face of the cylinder block. The oil hole must be aligned. A 3.2 mm (0.128 inch) diameter rod (2) must be able to pass through the hole.

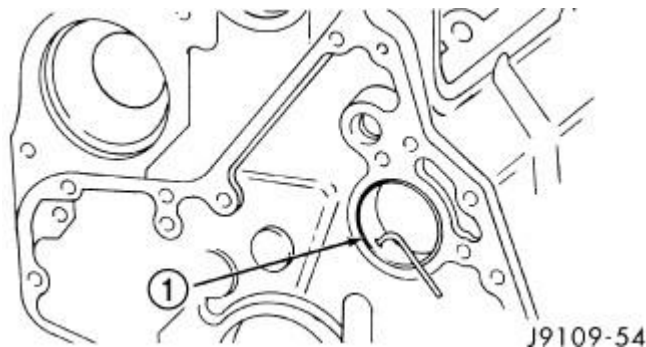


Fig. 121: Camshaft Bushing

Courtesy of CHRYSLER GROUP, LLC

3. Use a universal cam bushing installation tool and install the front bearing (1) so that it is even with the front face of the cylinder block. The oil hole must be aligned. A 3.2 mm (0.128 inch) diameter rod must be able to pass through the hole.
4. Measure the installed bushings at the front bore. The minimum inside diameter is 54.083 mm (2.129 in.), and the maximum inside diameter is 54.147 mm (2.131 in.).
5. Install the front timing case housing. Refer to **HOUSING, TIMING CASE, FRONT, INSTALLATION, 6.7L**.
6. Install the transmission adapter plate. Refer to **PLATE, TRANSMISSION ADAPTER, INSTALLATION, 6.7L**.

CAMSHAFT, ENGINE

REMOVAL

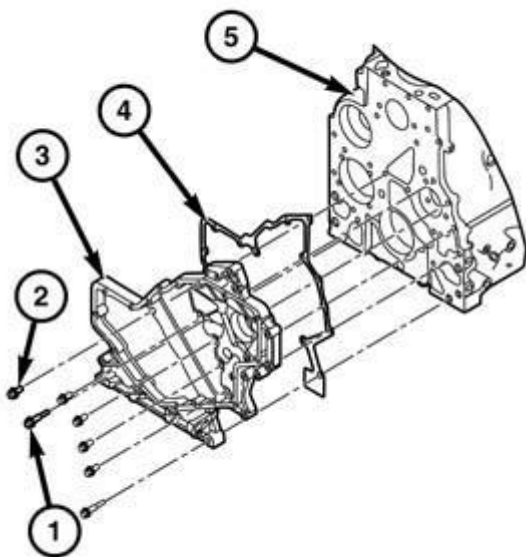
CAMSHAFT - REMOVAL



Fig. 122: Engine Cover, Bolts & Oil Dipstick

Courtesy of CHRYSLER GROUP, LLC

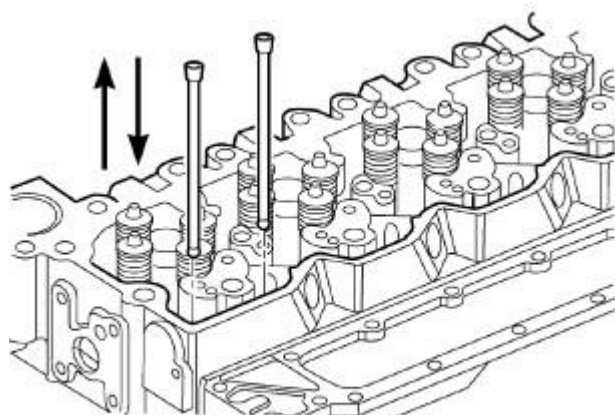
1. Disconnect both negative battery cables.
2. Remove the engine oil dip stick (3).
3. Remove fasteners (1, 4) and the engine cover (2).
4. Remove the radiator. Refer to **RADIATOR, ENGINE COOLING, REMOVAL** .



091175195

Fig. 123: Front Timing Case Housing Components
 Courtesy of CHRYSLER GROUP, LLC

5. Remove the front timing case housing. Refer to **HOUSING, TIMING CASE, FRONT, REMOVAL, 6.7L**.
6. Using the (special tool #7471B, Barring Tool) or equivalent, rotate the crankshaft to align the timing marks on the crankshaft and the camshaft gears.
7. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.

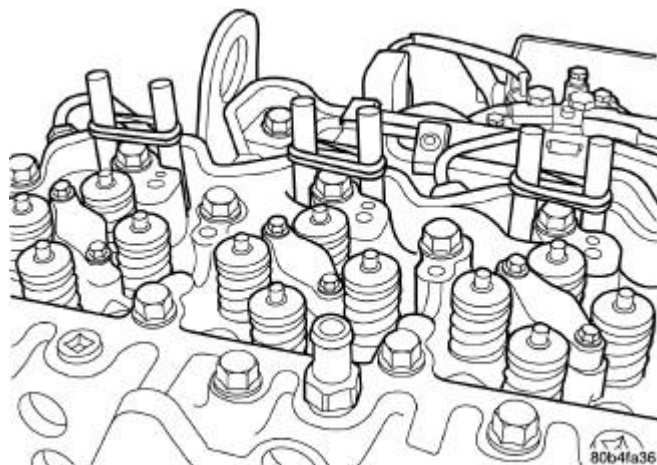


80b4fa25

Fig. 124: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: The No. 5 cylinder intake and the No. 6 cylinder intake and exhaust pushrods are removed by lifting them up and through the provided cowl panel access holes. Remove the rubber plugs to expose these relief holes.

8. Remove the rocker arms, cross heads and push rods. Mark each component so they can be installed in their original positions.

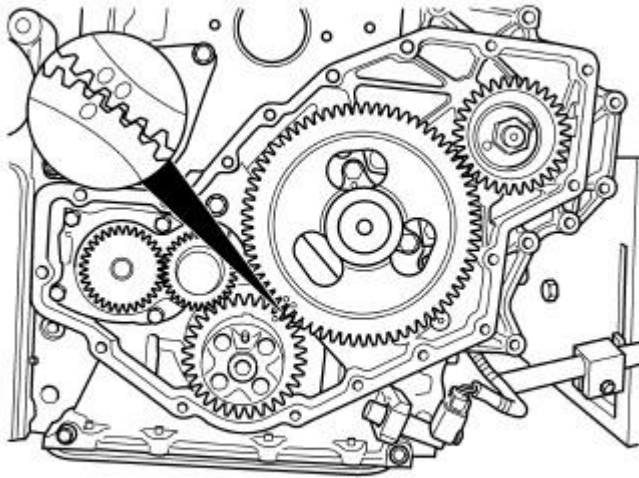


80b4fa36

Fig. 125: Tappets Secured In Place Using Wooden Dowel Rods
Courtesy of CHRYSLER GROUP, LLC

9. Raise the tappets as follows, using the wooden dowel rods provided with the Tool Kit (special tool #8502, Remover/Installer).
 - a. Insert the slotted end of the dowel rod into the tappet. **The dowel rods for the rear two cylinders will have to be cut for cowl panel clearance.** Press firmly to ensure that it is seated in the tappet.
 - b. Raise the dowel rod to bring the tappet to the top of its travel, and wrap a rubber band around the dowel rods to prevent the tappets from dropping into the crankcase.

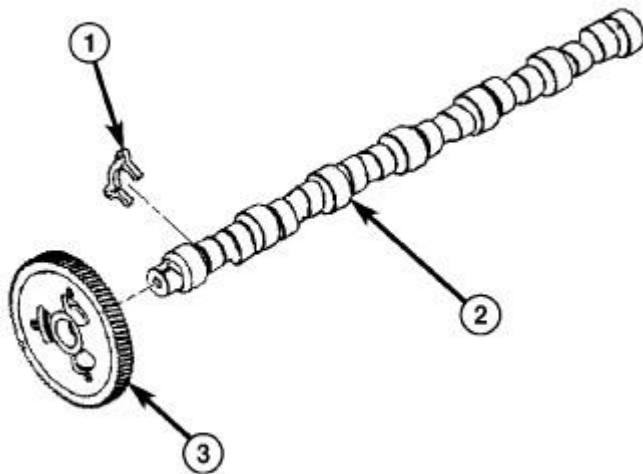
- c. Repeat this procedure for the remaining cylinders.



8103b556

Fig. 126: Camshaft Gear & Crankshaft Gear Timing Mark Alignment
Courtesy of CHRYSLER GROUP, LLC

10. Verify that the camshaft timing marks are aligned with the crankshaft mark.



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Fig. 127: Camshaft, Gear & Thrust Plate

Courtesy of CHRYSLER GROUP, LLC

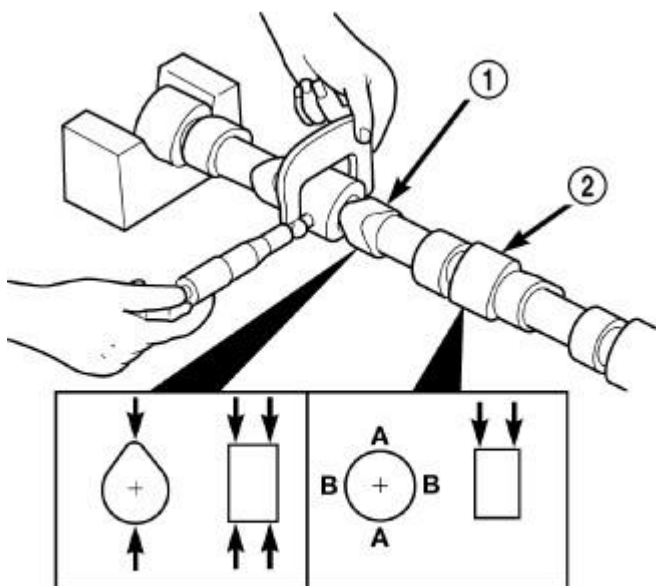
11. Remove bolts and the camshaft (2), gear (3) and thrust plate (1).

INSPECTION

INSPECTION

CAMSHAFT

CAUTION: If Camshaft lobes are worn, requiring camshaft replacement, it is necessary to replace the tappets also.



80b4fa37

Fig. 128: Measuring Camshaft Lobes & Bearing Journals

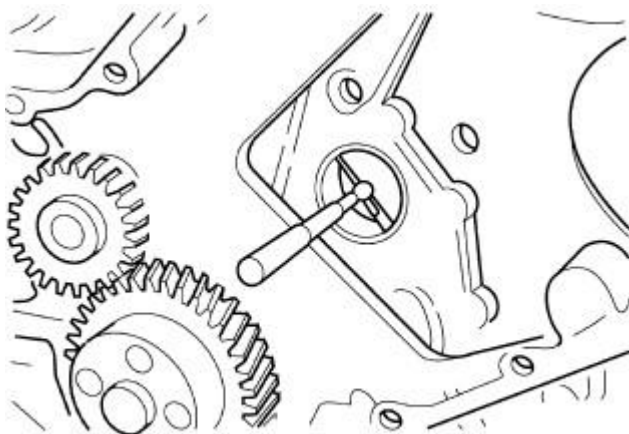
Courtesy of CHRYSLER GROUP, LLC

1. Inspect the valve lobes (1) and bearing journals (2) for cracks, pitting, scoring or excessive wear. Replace any camshaft that exceeds the allowable limits.
2. Measure the bearing journals and lobes.

CAMSHAFT DIMENSIONS

CAMSHAFT DIMENSIONS	
Journal diameter (No. 1 and No. 7)	
Min.	54.028 mm (2.127 in.)
Max.	54.048 mm (2.128 in.)
Journal diameter (No. 2 through No. 6)	
Min.	53.962 mm (2.1245 in.)

	Max.	54.013 mm (2.1265 in.)
DIAMETER OF PEAK OF LOBE		
Intake		
	Min.	47.175 mm (1.857 in.)
	Max.	47.855 mm (1.884 in.)
Exhaust		
	Min.	45.632 mm (1.797 in.)
	Max.	46.312 mm (1.823 in.)

CAMSHAFT BEARINGS/BORES

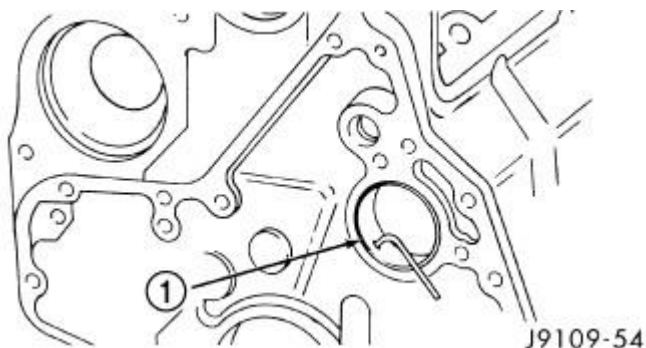
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Fig. 129: Measuring Camshaft Bore

Courtesy of CHRYSLER GROUP, LLC

Camshaft bores No. 2-6 **do not** use a bearing.

1. Inspect the camshaft bearing and bores for signs of excessive wear.
2. Measure the camshaft bearing and bores with a telescoping bore gauge and micrometer. If out of specification. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L**.

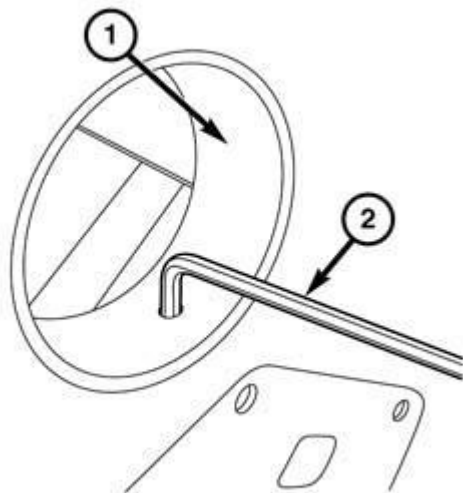


J9109-54

Fig. 130: Camshaft Bushing

Courtesy of CHRYSLER GROUP, LLC

3. Inspect the front camshaft bearing (1) oil holes for alignment with cylinder block.



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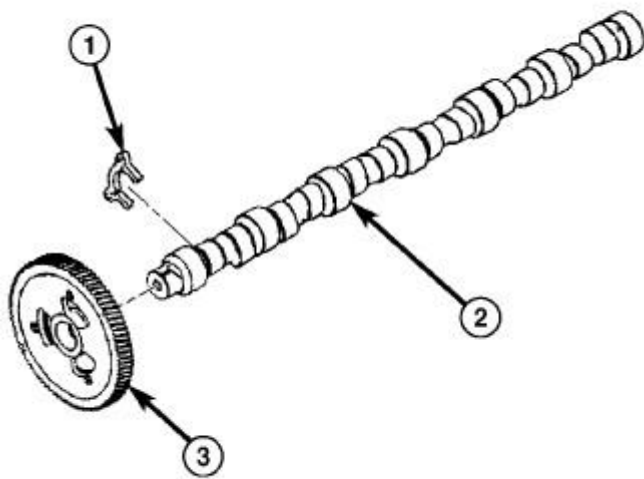
Fig. 131: Installing Rear Bearing
Courtesy of CHRYSLER GROUP, LLC

4. Inspect the rear camshaft bearing (2) oil holes for alignment with cylinder block.

CAMSHAFT GEAR

Inspect the camshaft gear for cracks (gear and hub) and chipped/broken/fretted teeth. If replacement is necessary, camshaft and gear are replaced as an assembly. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L.**

THRUST PLATE



81e8ba31

Fig. 132: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

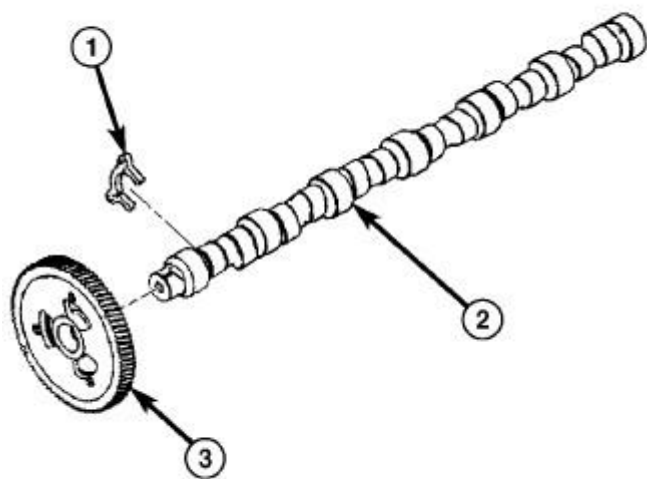
Inspect the camshaft thrust plate (1) for excessive wear in the camshaft contact area. Measure thrust plate thickness. Replace any thrust plate that falls outside of the allowable limits.

CAMSHAFT THRUST PLATE THICKNESS

THRUST PLATE DIMENSIONS	
MIN.	9.34 mm (0.368 in.)
MAX.	9.60 mm (0.378 in.)

INSTALLATION

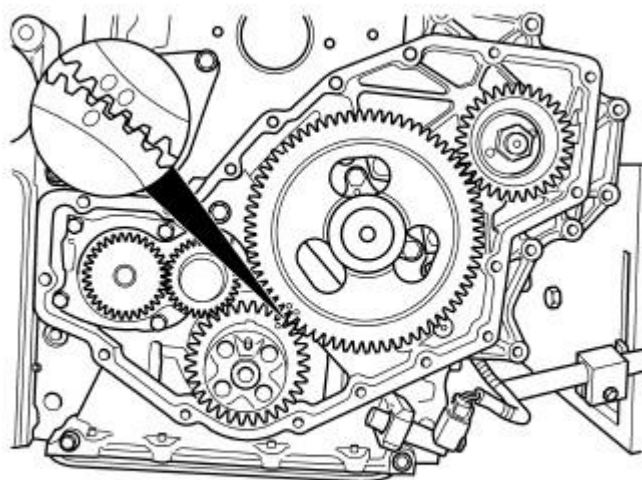
CAMSHAFT - INSTALLATION



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Fig. 133: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the camshaft bearings and with fresh engine oil or suitable equivalent.
2. Liberally coat the thrust plate (1) and the lobes and journals of the camshaft (2) with fresh engine oil or suitable equivalent.



8103b556

Fig. 134: Camshaft Gear & Crankshaft Gear Timing Mark Alignment

Courtesy of CHRYSLER GROUP, LLC

CAUTION: When installing the camshaft, **DO NOT** push it in farther than it will go with the thrust plate in place.

3. Install the camshaft and thrust plate. Align the timing marks as shown in the illustration.
4. Install the thrust plate bolts and tighten to 24 N.m (18 ft. lbs.).
5. Measure camshaft back lash. Backlash should be within 0.075-0.250 mm (0.003-0.010 inch).
6. Measure camshaft end clearance. End clearance should be within 0.025 - 0.500 mm (0.001 - 0.020 inch).

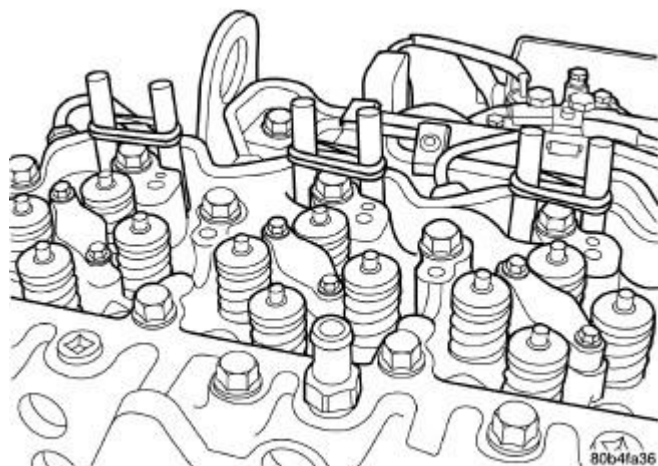
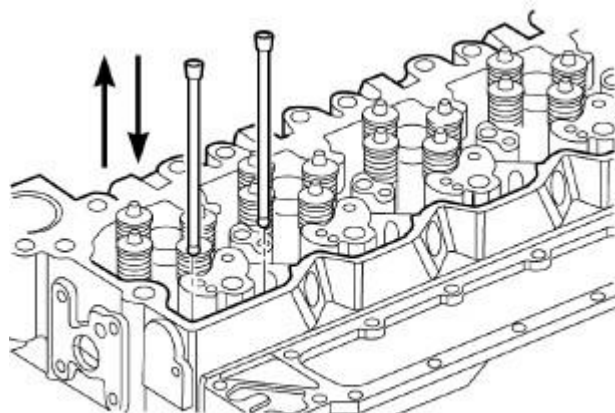


Fig. 135: Tappets Secured In Place Using Wooden Dowel Rods
Courtesy of CHRYSLER GROUP, LLC

7. Remove the wooden dowel rods and rubber bands from the tappets.



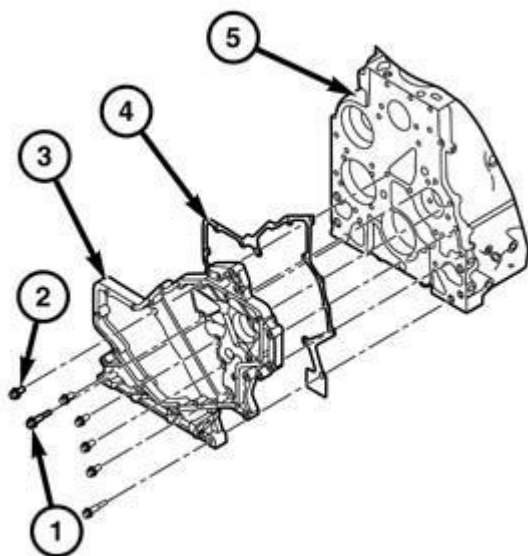
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Fig. 136: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

8. Lubricate the push rods with engine oil and install in their original location. **Verify that they are seated**

in the tappets.

9. Lubricate the valve tips with engine oil and install the crossheads in their original locations.
10. Lubricate the crossheads and push rod sockets with engine oil and install the rocker arms and pedestals in their original locations. Tighten bolts to 36 N.m (27 ft. lbs.).
11. Verify valve lash adjustment. Refer to **VALVE LASH ADJUSTMENT AND VERIFICATION** .
12. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.



091175195

Fig. 137: Front Timing Case Housing Components
Courtesy of CHRYSLER GROUP, LLC

13. Install the front timing case housing. Refer to **HOUSING, TIMING CASE, FRONT, INSTALLATION, 6.7L**.
14. Install the radiator. Refer to **RADIATOR, ENGINE COOLING, INSTALLATION** .
15. Connect the negative battery cables.



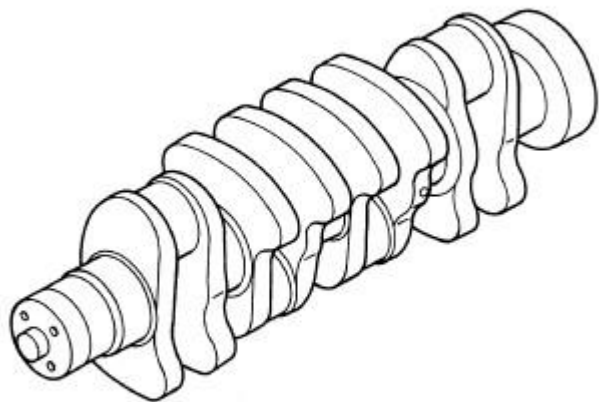
Fig. 138: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

16. Start engine and check for engine oil and coolant leaks.
17. Install the engine cover (2) and fasteners (1, 4).
18. Install the engine oil dip stick (3).

CRANKSHAFT

DESCRIPTION

DESCRIPTION



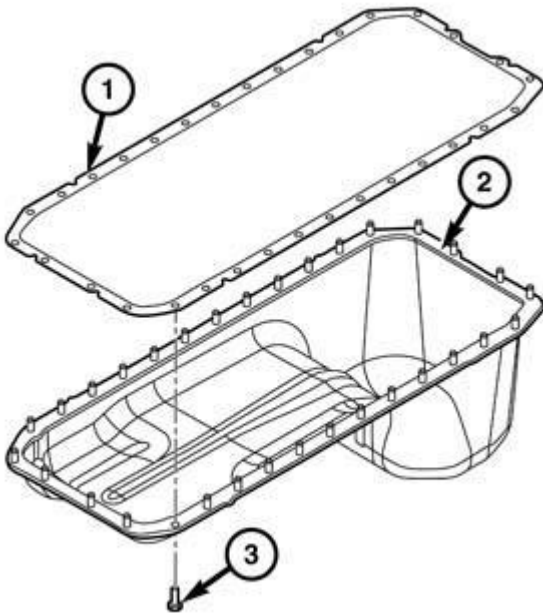
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Fig. 139: Crankshaft**Courtesy of CHRYSLER GROUP, LLC**

The crankshaft is a forged steel, internally balanced unit. It is supported by seven main bearings, with position number six designated as the thrust journal. The crankshaft is held in place by main caps and 12 mm bolts. The crankshaft also has internal cross drillings to supply the connecting rods with engine oil.

REMOVAL**REMOVAL**

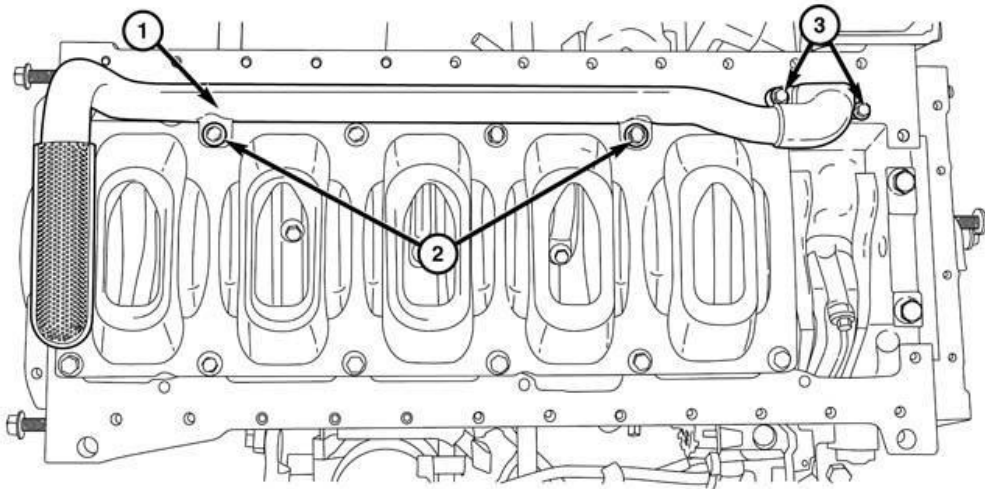
1. Disconnect both negative battery cables.
2. Remove the engine from vehicle and mount on a suitable engine stand. Refer to **REMOVAL, 6.7L**.



91175197

Fig. 140: Oil Pan, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

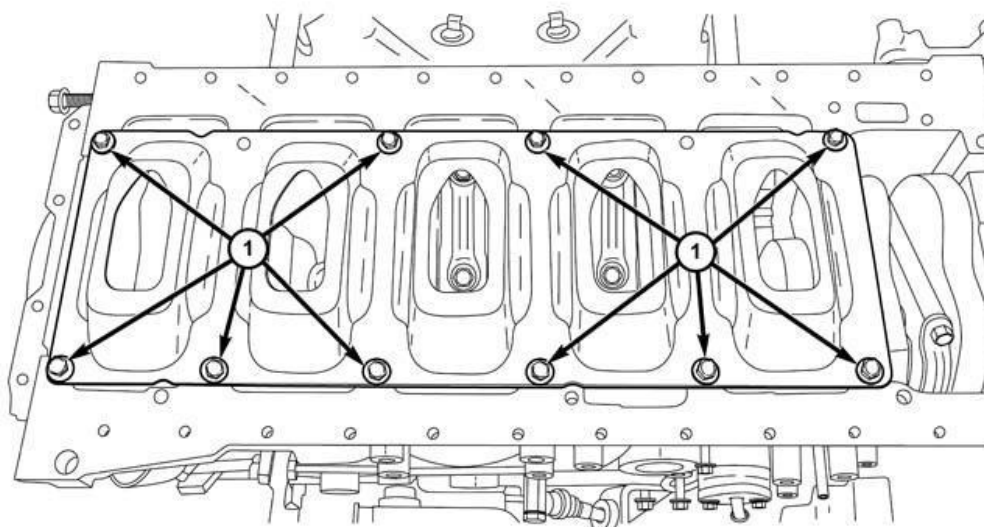
3. Remove bolts (3) and the oil pan (2).



091175198

Fig. 141: Oil Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (2 and 3) and the oil pickup tube (1).

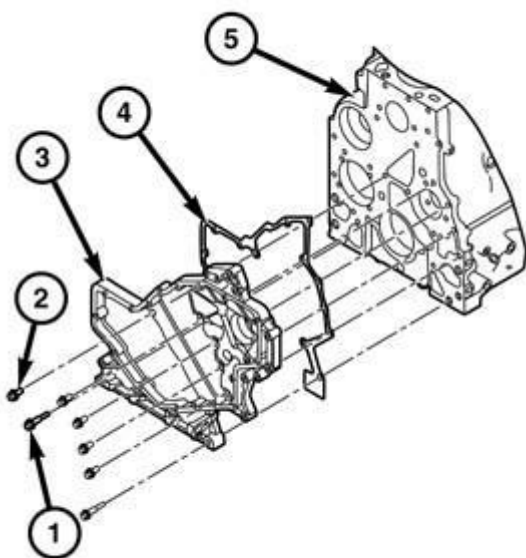


091175190

Fig. 142: Block Stiffener & Bolts

Courtesy of CHRYSLER GROUP, LLC

5. Remove bolts (1) and the block stiffener.



091175195

Fig. 143: Front Timing Case Housing Components

Courtesy of CHRYSLER GROUP, LLC

6. Remove the front timing case housing (2). Refer to **HOUSING, TIMING CASE, FRONT, REMOVAL, 6.7L**.

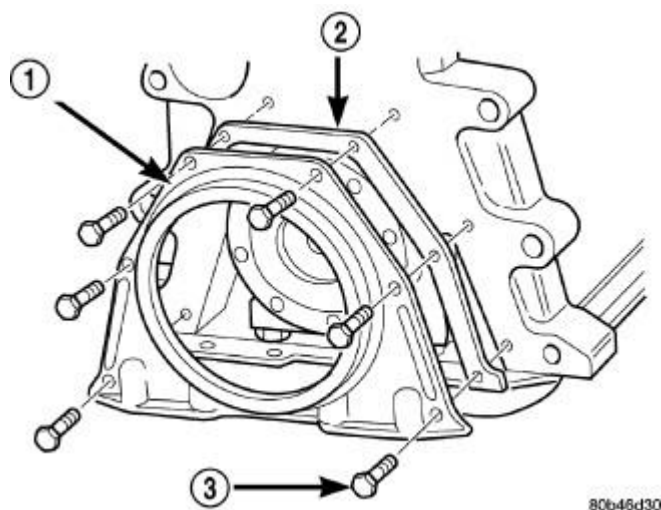


Fig. 144: Crankshaft Rear Seal Retainer, Gasket & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove the crankshaft rear oil seal retainer (1). Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, REMOVAL, 6.7L**.

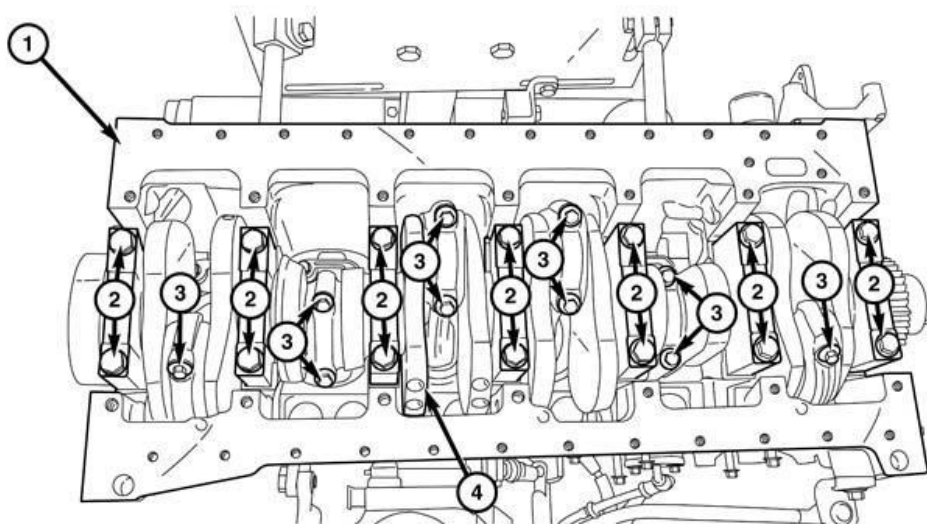
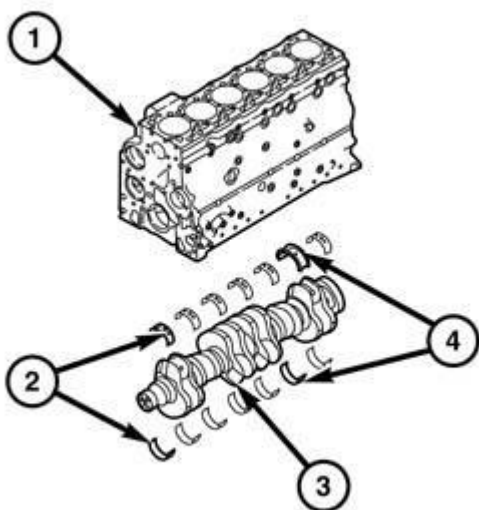


Fig. 145: Connecting Rod Bearing Cap Bolts & Crankshaft Main Bearing Cap Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove bolts (3) and the connecting rod bearing cap for each piston.
9. Remove bolts (2) and the crankshaft main bearing caps.



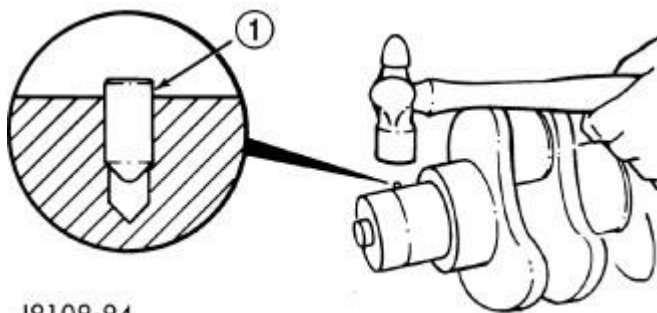
091175191

Fig. 146: Engine Block & Crankshaft Components
Courtesy of CHRYSLER GROUP, LLC

10. Carefully remove the crankshaft (3) from the engine block (1).
11. If required, remove the timing gear from the crankshaft.

INSTALLATION

INSTALLATION



J9109-94

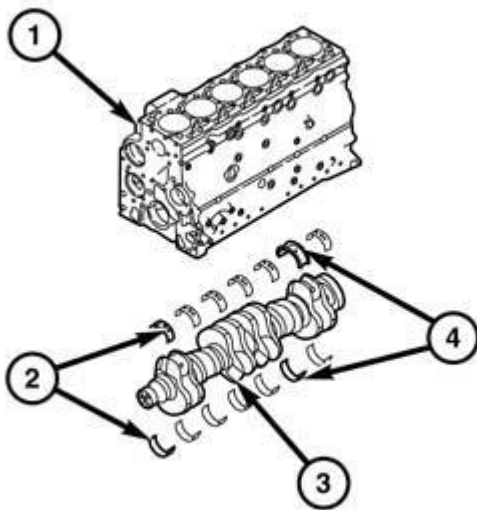
Fig. 147: Installing Alignment Pin
Courtesy of CHRYSLER GROUP, LLC

1. Remove all burrs and make sure the gear surface on the end of the crankshaft is smooth.
2. If removed, install a new alignment pin (1). Drive the pin in using a ball- peen hammer, leaving it protruding 1.0 mm (0.039 inch) to 1.5 mm (0.059 inch) above the crankshaft.

WARNING: WEAR PROTECTIVE GLOVES TO PREVENT INJURY.

CAUTION: DO NOT heat the gear longer than 45 minutes.

3. Heat the crankshaft gear for 45 minutes at a temperature of 149°C (300°F). **Do not use torch, gear failure will occur.**
4. Apply a thin coat of lubricant to the nose of the crankshaft.
5. Position the gear with the timing mark out and install it on the crankshaft using the alignment pin. Make sure the gear contacts the shoulder.
6. Measure the connecting rod bearing journals and crankshaft prior to bearing installation. Refer to **BEARING(S), CONNECTING ROD, STANDARD PROCEDURE, 6.7L**.
7. Measure the crankshaft bearing journals and crankshaft prior to bearing installation. Refer to **STANDARD PROCEDURE**.



091175191

Fig. 148: Engine Block & Crankshaft Components
Courtesy of CHRYSLER GROUP, LLC

8. Install the crankshaft main bearings (2) and thrust bearings (4) into engine block (1).
9. Install the crankshaft (3) into engine block (1).
10. Install the connecting rod bearings onto connecting rod and bearing cap for each piston. Tighten bolts finger tight.

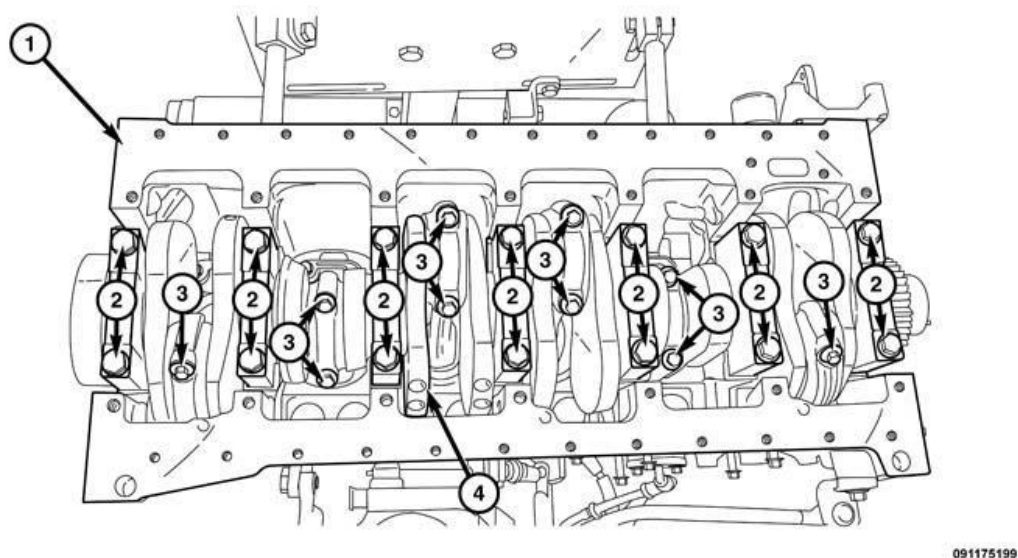


Fig. 149: Connecting Rod Bearing Cap Bolts & Crankshaft Main Bearing Cap Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Position the main bearing into main bearing cap and install the bearing cap onto engine block.
12. If

NEW

bolts (2) are being used then tighten the bolts in the following order:

- Tighten bolts to 120 N.m (89 ft. lbs.).
- Loosen bolts 360°.
- Tighten bolts to 60 N.m (44 ft. lbs.).
- Tighten bolts to 85 N.m (63 ft. lbs.).
- Tighten bolts an additional 120° turn.

13. If

USED

bolts (2) are being used then tighten the bolts in the following order:

- Tighten bolts to 60 N.m (44 ft. lbs.).
- Tighten bolts to 80 N.m (59 ft. lbs.).
- Tighten bolts an additional 90° turn.

14. Tighten the connecting rod bolts to (3) in the following order:
 - Tighten bolts to 30 N.m (22 ft. lbs.).
 - Tighten bolts to 60 N.m (44 ft. lbs.).

- Tighten bolts an additional 60° turn.

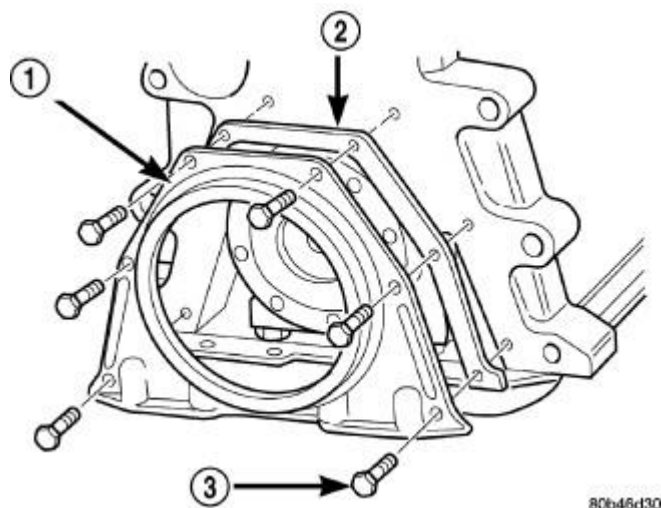
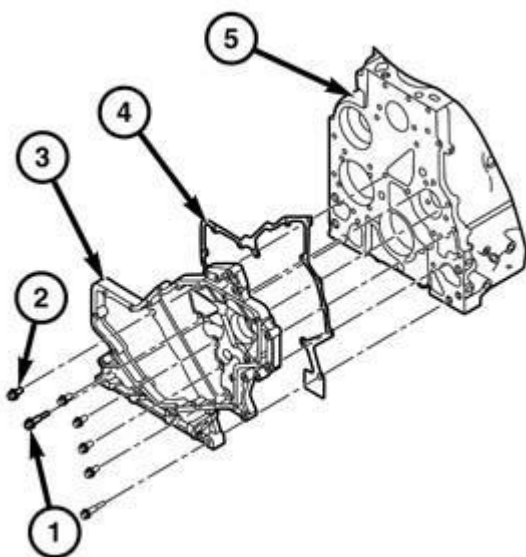


Fig. 150: Crankshaft Rear Seal Retainer, Gasket & Bolts
Courtesy of CHRYSLER GROUP, LLC

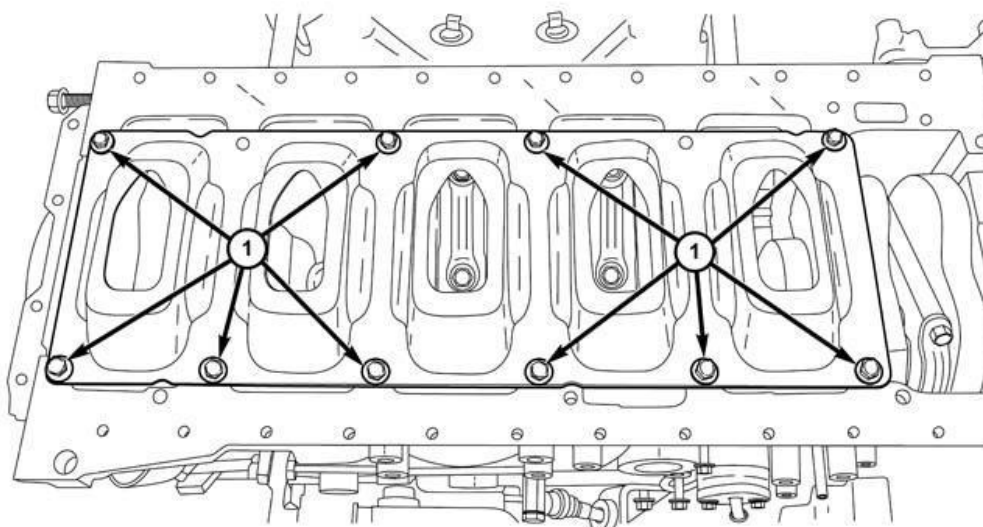
15. Install the crankshaft rear oil seal retainer (1). Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, INSTALLATION, 6.7L**.



091175195

Fig. 151: Front Timing Case Housing Components
Courtesy of CHRYSLER GROUP, LLC

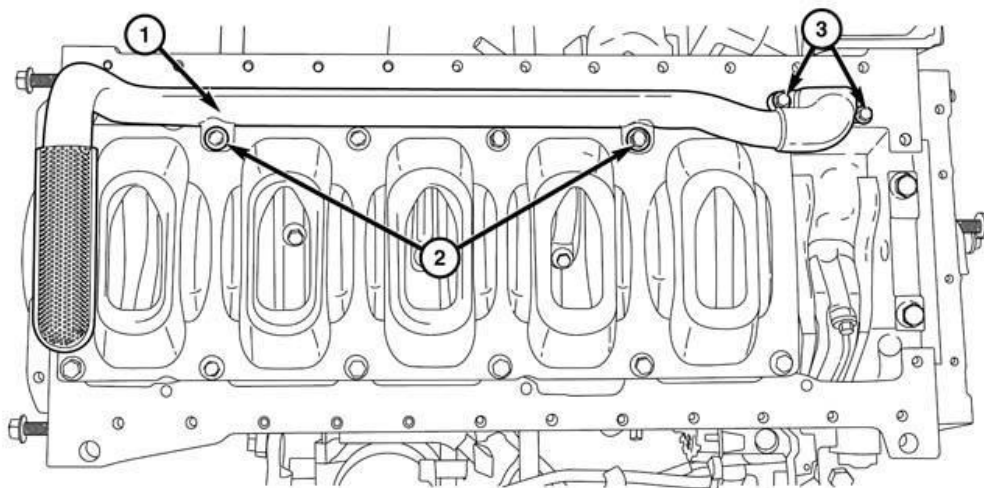
16. Install the front timing case housing (2). Refer to **HOUSING, TIMING CASE, FRONT, INSTALLATION, 6.7L**.



091175190

Fig. 152: Block Stiffener & Bolts
 Courtesy of CHRYSLER GROUP, LLC

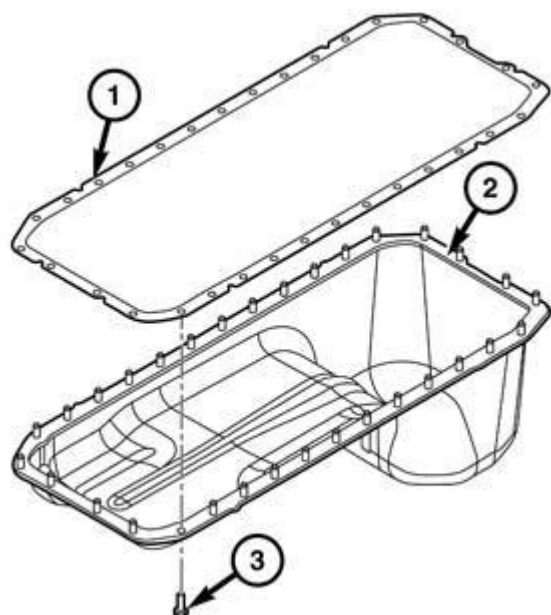
17. Install the engine block stiffener. Tighten bolts (1) to 43 N.m (32 ft. lbs.).



091175198

Fig. 153: Oil Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

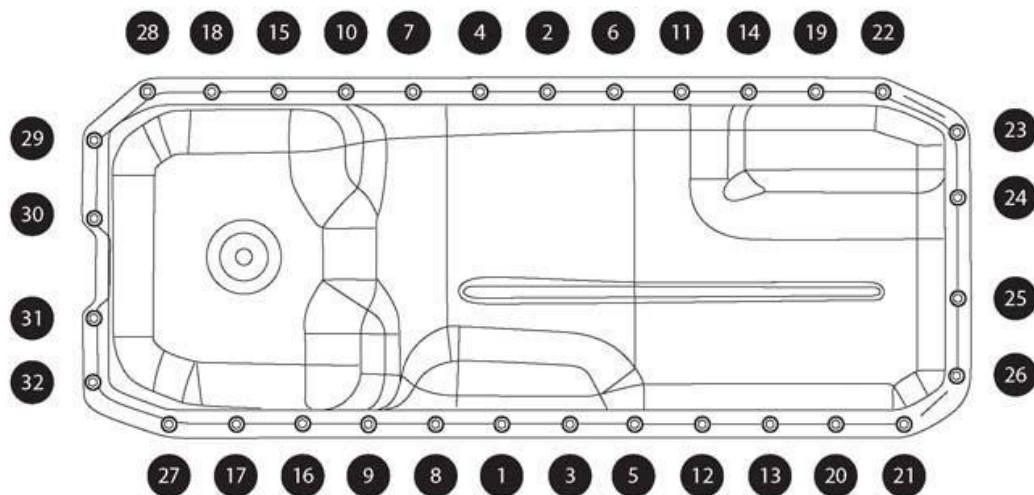
18. Install the oil suction tube (1). Tighten bolts (1) to:
 - M8 bolts, 24 N.m (18 ft. lbs.).
 - M10 bolts, 43 N.m (32 ft. lbs.).



91175197

Fig. 154: Oil Pan, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

19. Using a new gasket (1), install the oil pan (2). Tighten bolts (3) finger tight.



070974628

Fig. 155: Oil Pan Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

20. Using the tightening sequence shown in the illustration, tighten bolts to 28 N.m (21 ft. lbs.).
21. Install the engine. Refer to **INSTALLATION, 6.7L**.

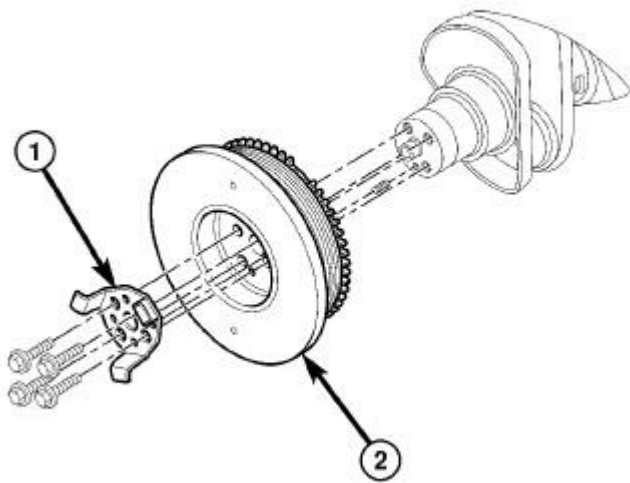
22. Connect both negative battery cables.

DAMPER, VIBRATION

REMOVAL

REMOVAL

NON-HIGH OUTPUT ENGINE



81e6ba49

Fig. 156: Crankshaft Damper (Non-High Output Engine)

Courtesy of CHRYSLER GROUP, LLC

1. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
2. Remove the four bolts and the vibration damper.

HIGH OUTPUT ENGINE

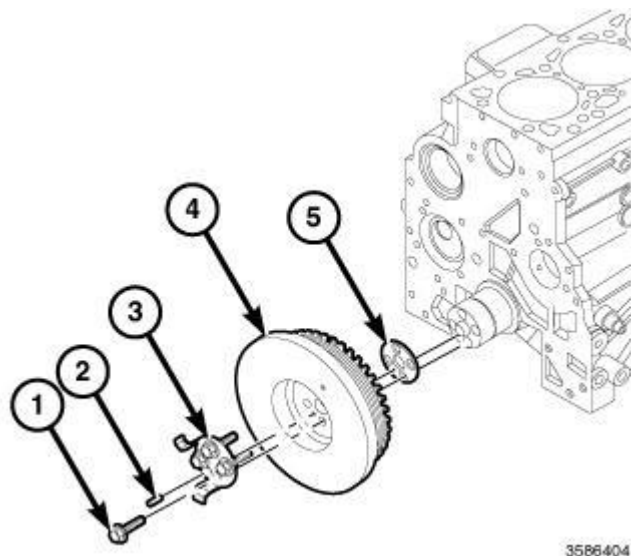


Fig. 157: Crankshaft Damper (High Output Engine)

Courtesy of CHRYSLER GROUP, LLC

1. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

NOTE: Ensure that the friction shim stays with the damper when it is removed. It will need to be reinstalled with the damper.

2. Remove the four bolts (1), vibration damper (4), and friction shim (5).

INSPECTION

INSPECTION

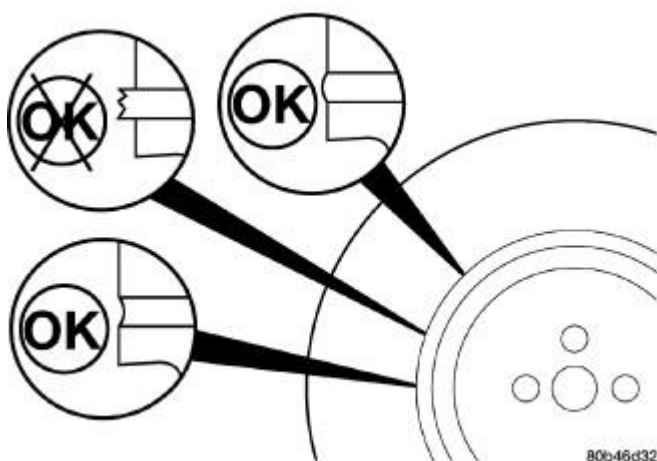


Fig. 158: Inspect Damper Rubber Member

Courtesy of CHRYSLER GROUP, LLC

NOTE: The Crankshaft damper is of viscous design and the speed indicator is

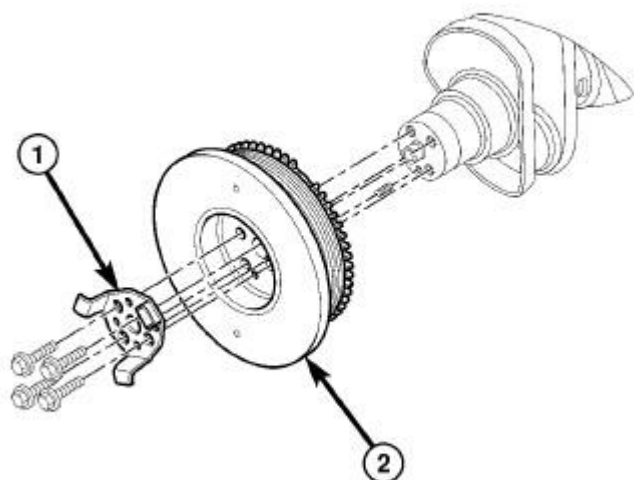
incorporated into the crankshaft damper.

1. Inspect the damper hub for cracks and replace if any are found.
2. If the crankshaft damper is leaking fluid, discard and replace the crankshaft damper.

INSTALLATION

INSTALLATION

NON-HIGH OUTPUT ENGINE



81e8ba49

Fig. 159: Crankshaft Damper (Non-High Output Engine)

Courtesy of CHRYSLER GROUP, LLC

NOTE: The damper must be installed so the hole is located over the dowel pin.

1. Install the crankshaft damper and bolts. Tighten bolts to 40 N.m (30 ft. lbs.) plus an additional 60° in a criss-cross pattern.
2. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

HIGH OUTPUT ENGINE

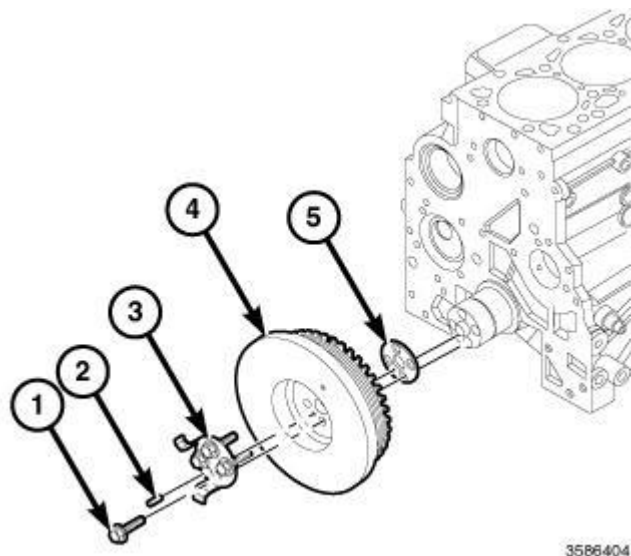


Fig. 160: Crankshaft Damper (High Output Engine)

Courtesy of CHRYSLER GROUP, LLC

NOTE: Ensure that the friction shim is installed, and that the damper is installed so the hole is located over the dowel pin (2).

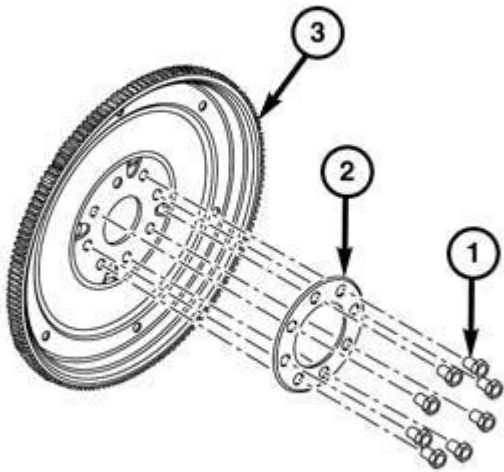
1. Install the friction shim (5) vibration damper (4). Tighten bolts (1) to 40 N.m (30 ft. lbs.) plus an additional 60° in a criss-cross pattern.
2. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

FLEXPLATE

REMOVAL

REMOVAL

NON-HIGH OUTPUT ENGINE

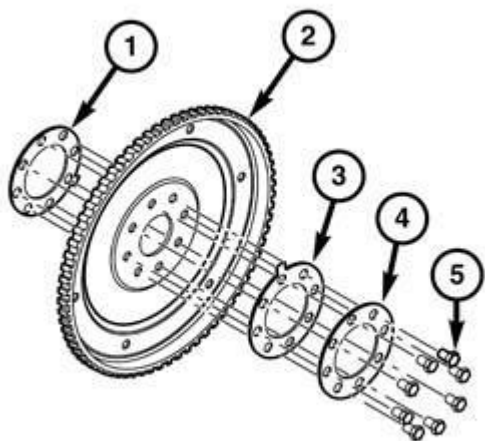


091170925

Fig. 161: Flexplate Components**Courtesy of CHRYSLER GROUP, LLC**

1. Remove the transmission. Refer to appropriate Transmission Service Information article.
2. Paint mark the flex plate hub to flex plate relation.
3. Remove bolts (1), clamp ring (2), and the flex plate (3).
4. Inspect flex plate for damage.

HIGH OUTPUT ENGINE

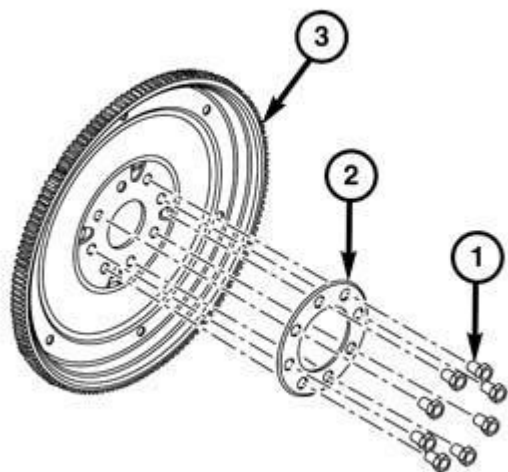


0913002106

Fig. 162: Flexplate Components**Courtesy of CHRYSLER GROUP, LLC**

1. Remove the transmission. Refer to appropriate Transmission Service Information article.
2. Paint mark the flex plate hub to flex plate relation.
3. Remove bolts (5), clamping ring (4), friction shim (3), flex plate (2) and the friction shim (1).
4. Inspect flex plate for damage.

INSTALLATION**INSTALLATION****NON-HIGH OUTPUT ENGINE**



091170925

Fig. 163: Flexplate Components

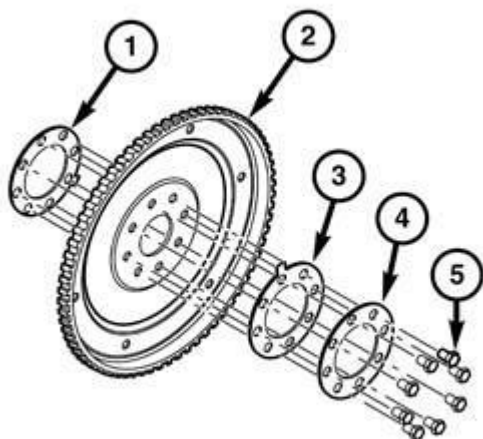
Courtesy of CHRYSLER GROUP, LLC

NOTE: A new clamp ring (2) must be used anytime the flex plate has been removed.

NOTE: Align the flex plate to hub paint marks, where applicable.

1. Use a crisscross pattern to tighten bolts to 137 N.m (100 ft. lbs.).
2. Install the transmission (Refer to appropriate Transmission Service Information article.).

HIGH OUTPUT ENGINE



0913002106

Fig. 164: Flexplate Components

Courtesy of CHRYSLER GROUP, LLC

NOTE: A new clamping ring must be used any time the flex plate or flywheel adapter is removed.

NOTE: Always use new bolts when installing the flex plate and do not lubricate new bolts as they are already coated with an anti-scuff treatment.

NOTE: Align the flex plate to hub paint marks, where applicable.

1. Install the friction shim (1), flex plate (2), friction shim (3), clamping ring (4) and tighten bolts (5) finger tight.
2. Use a crisscross pattern to tighten bolts to 137 N.m (100 ft. lbs.).
3. Install the transmission (Refer to appropriate Transmission Service Information article.).

RETAINER, CRANKSHAFT REAR OIL SEAL

REMOVAL

REMOVAL

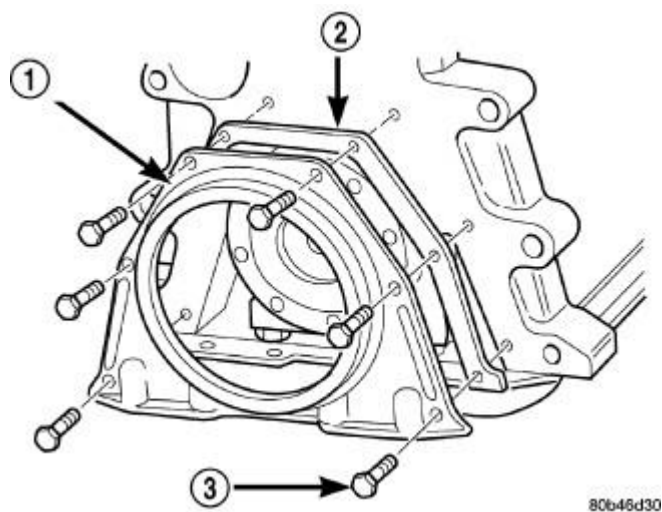


Fig. 165: Crankshaft Rear Seal Retainer, Gasket & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the transmission adapter plate. Refer to **PLATE, TRANSMISSION ADAPTER, REMOVAL, 6.7L**.
3. Remove four rear oil pan bolts. Slide a feeler gauge between the seal retainer and oil pan gasket to break the seal.
4. Remove bolts (3), the rear seal retainer (1).
5. Remove and discard gasket (2).
6. Support the seal retainer and drive out the crankshaft seal with a hammer and suitable punch.

INSTALLATION

INSTALLATION

CAUTION: The seal lip and the sealing surface on the crankshaft must be free from all oil residue to prevent seal leaks. The crankshaft and seal surfaces must be completely dry when the seal is installed. Use a soap and water solution on outside diameter of seal to ease assembly.

1. Clean the crankshaft journal with a suitable solvent and dry with a clean shop towel or compressed air. Wipe the inside bore of the crankshaft seal retainer with a clean shop towel.
2. Inspect the crankshaft journal for gouges, nicks, or other imperfections. If the seal groove in the crankshaft is excessively deep, install the new seal 1/8" deeper into the retainer bore, or obtain a crankshaft wear sleeve that is available in the aftermarket.
3. Install a new crankshaft rear oil seal retainer gasket
4. Install the seal pilot and new seal, provided in the replacement kit, onto the crankshaft.
5. Remove the seal pilot.
6. Install the installation tool over crankshaft.

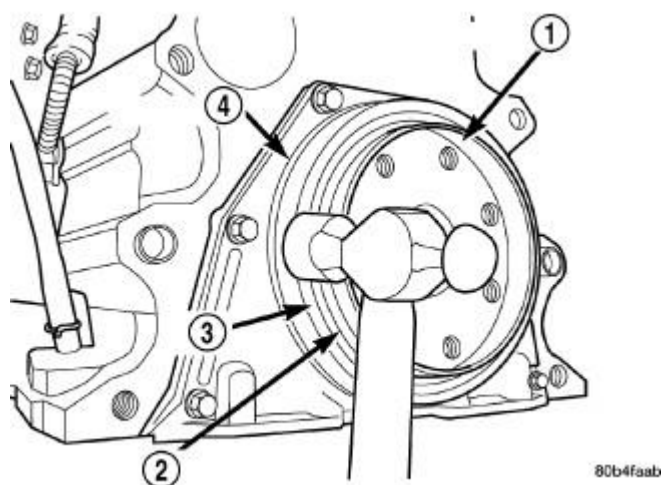


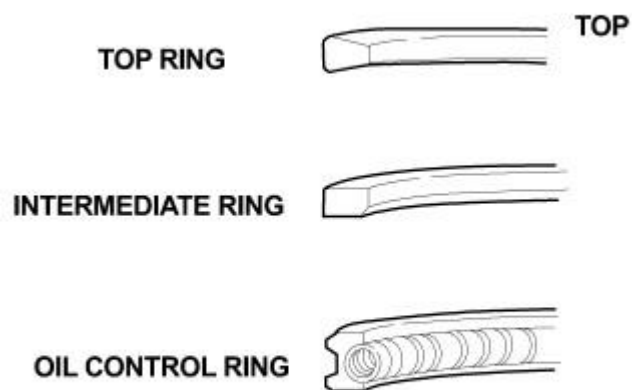
Fig. 166: Installing Seal Using Alignment Tool & Hammer
Courtesy of CHRYSLER GROUP, LLC

7. Using a ball peen hammer, strike the tool (2) at the 12, 3, 6, and 9 o'clock positions until the alignment tool bottoms out on the retainer.
8. Install the rear oil seal retainer bolts and tighten to 10 N.m (89 in. lbs.).
9. Install the transmission adapter plate. Refer to **PLATE, TRANSMISSION ADAPTER, INSTALLATION, 6.7L**.
10. Connect both negative battery cables.
11. Start engine and check for oil leaks.

RING(S), PISTON

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON RING FITTING

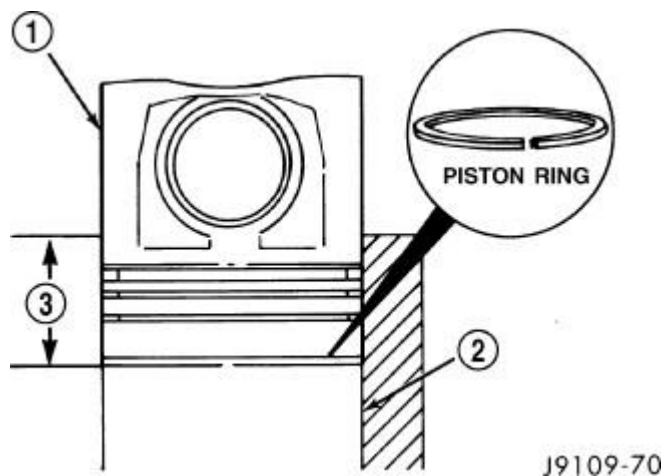


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Fig. 167: Piston Ring Identification

Courtesy of CHRYSLER GROUP, LLC

1. Determine the piston diameter and obtain the appropriate ring set. The piston rings can be identified as shown in the illustration.



J9109-70

Fig. 168: Position Of Ring In Cylinder Bore

Courtesy of CHRYSLER GROUP, LLC

2. Position each ring in the cylinder and use a piston (1) to square it with the bore at a depth (3) of 89.0 mm (3.5 in.).

PISTON RING GAP CHART		
TOP RING	0.35 - 0.51 mm	(0.014 - 0.020 in.)

INTERMEDIATE RING	0.82 - 1.18 mm	(0.032 - 0.047 in.)
OIL CONTROL RING	0.22 - 0.58 mm	(0.010 - 0.023 in.)

3. Use a feeler gauge to measure the piston ring gap.

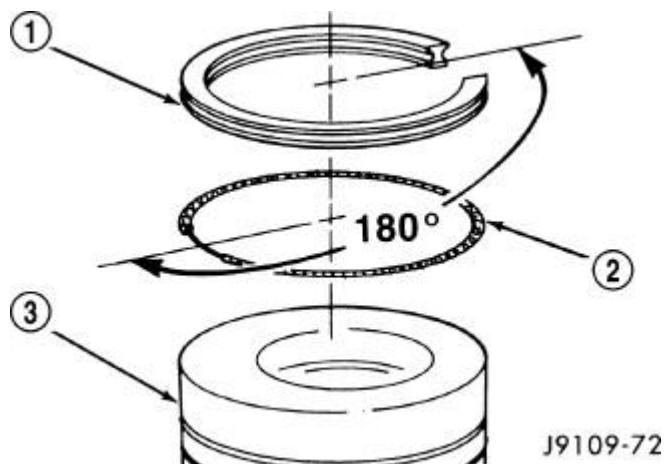


Fig. 169: Oil Control Ring, Expander & Piston
Courtesy of CHRYSLER GROUP, LLC

4. The top surface of all of the compression rings are identified with the word TOP or the supplier's MARK. Assemble the rings with the word TOP or the supplier's MARK up.
5. Lubricate the piston rings and piston ring grooves with clean CJ-4 engine oil.
6. Position the oil ring expander (2) in the oil control ring (1) groove (bottom groove).

NOTE: There is no (TOP) mark on the oil ring.

7. Install the oil control ring (1) with the end gap OPPOSITE the ends on the expander.



Fig. 170: Piston Ring Installation Tool
Courtesy of CHRYSLER GROUP, LLC

8. Install the intermediate piston ring in the second groove.
9. Install the top piston ring in the top groove.

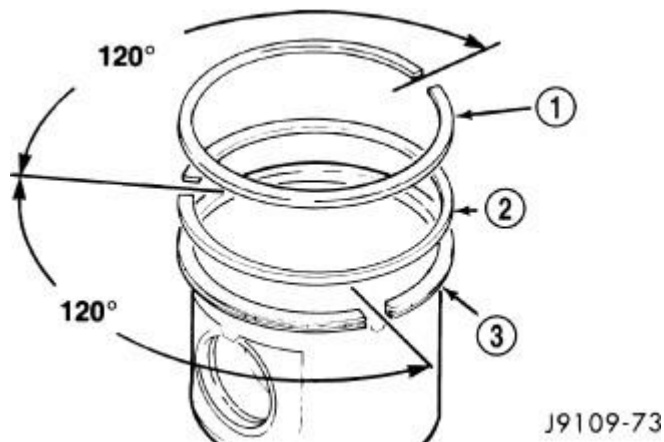


Fig. 171: Piston Ring Orientation

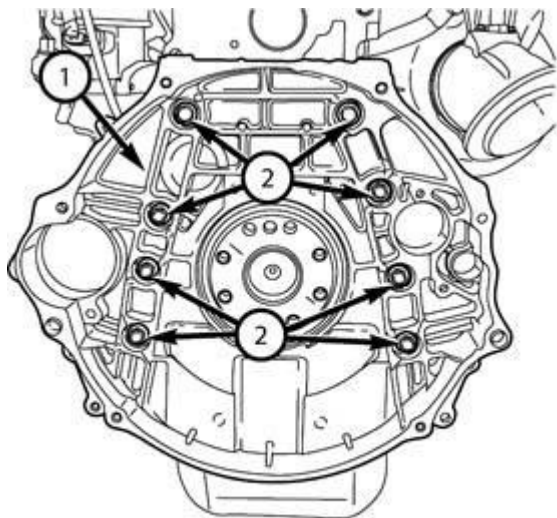
Courtesy of CHRYSLER GROUP, LLC

10. Install the piston rings with ring gaps 120 degrees apart. **Do not position ring gaps over the wrist pin hole.**

PLATE, TRANSMISSION ADAPTER

DESCRIPTION

DESCRIPTION



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Fig. 172: Transmission Adapter Plate & Bolts

Courtesy of CHRYSLER GROUP, LLC

The transmission adapter plate (1) is the component that allows the transmission to be bolted to the engine.

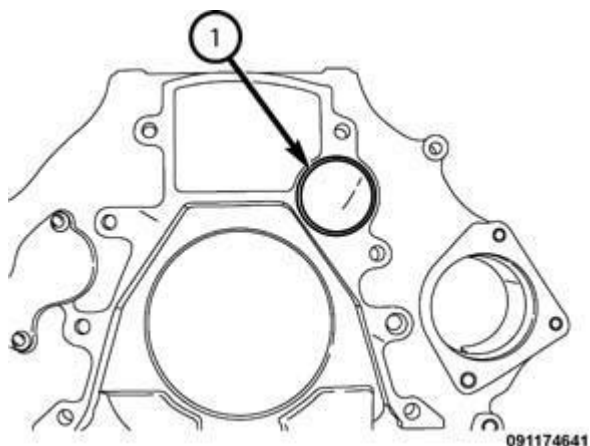


Fig. 173: Camshaft Seal

Courtesy of CHRYSLER GROUP, LLC

The back side of the transmission adapter plate has a camshaft seal (1) on the engine side.

REMOVAL

REMOVAL

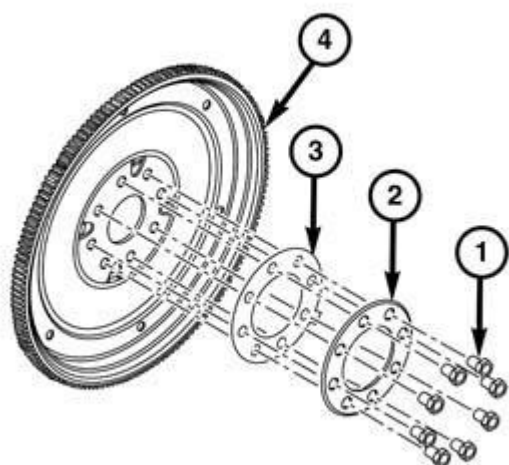


Fig. 174: Bolts, Clamping Ring, Friction Shim & Flex Plate

Courtesy of CHRYSLER GROUP, LLC

1. Remove the flex plate (4). Refer to **FLEXPLATE, REMOVAL, 6.7L**.
2. On manual transmission models, remove the flywheel. Refer to **FLYWHEEL, REMOVAL**.
3. Remove starter motor. Refer to **STARTER, REMOVAL**.

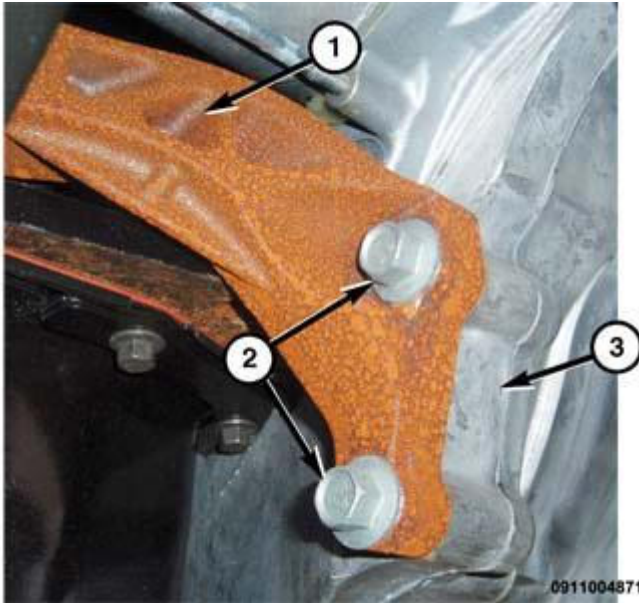


Fig. 175: Left Engine Block Stiffener, Bolts & Engine Block
Courtesy of CHRYSLER GROUP, LLC

4. If equipped, remove the left engine block stiffener bolts (2).

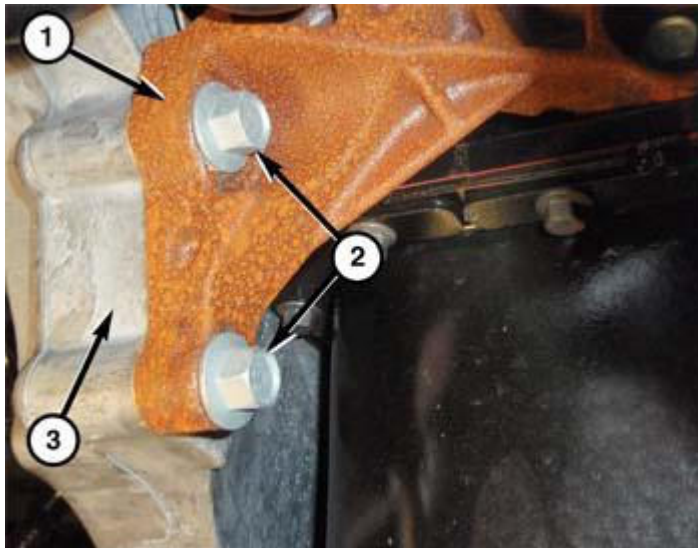
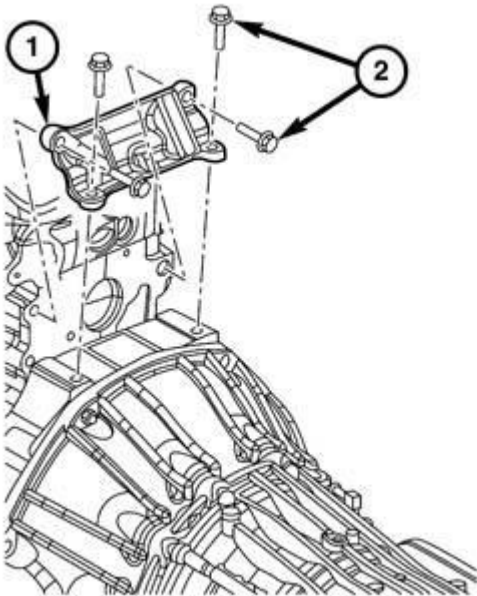


Fig. 176: Right Engine Block Stiffener, Bolts & Engine Block
Courtesy of CHRYSLER GROUP, LLC

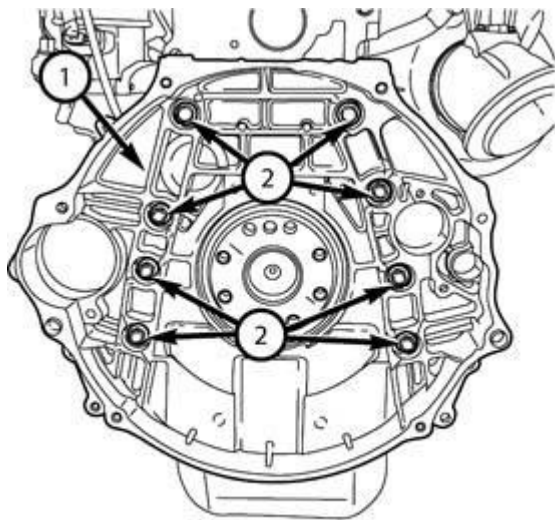
5. If equipped, remove the right engine block stiffener bolts (2).



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Fig. 177: Top Engine Block Stiffener & Bolts
Courtesy of CHRYSLER GROUP, LLC

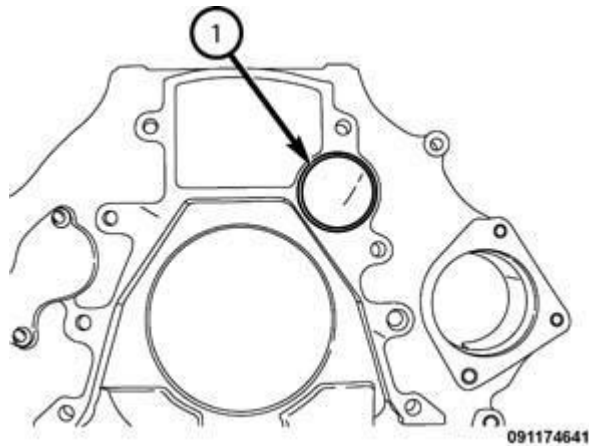
6. If equipped, remove bolts (2) and the top engine block stiffener (1).



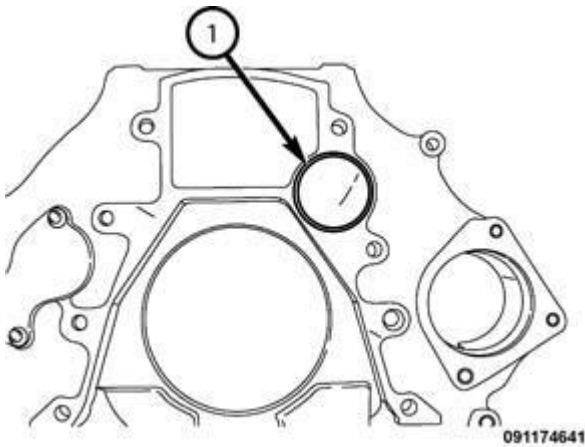
091174642

Fig. 178: Transmission Adapter Plate & Bolts
Courtesy of CHRYSLER GROUP, LLC

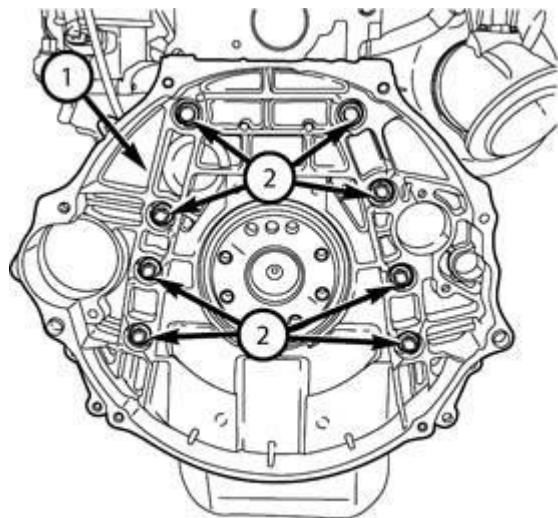
7. Remove bolts (2) and the transmission adapter plate (1).

**Fig. 179: Camshaft Seal****Courtesy of CHRYSLER GROUP, LLC**

8. Remove and discard the camshaft O-ring seal (1).

INSTALLATION**INSTALLATION****Fig. 180: Camshaft Seal****Courtesy of CHRYSLER GROUP, LLC**

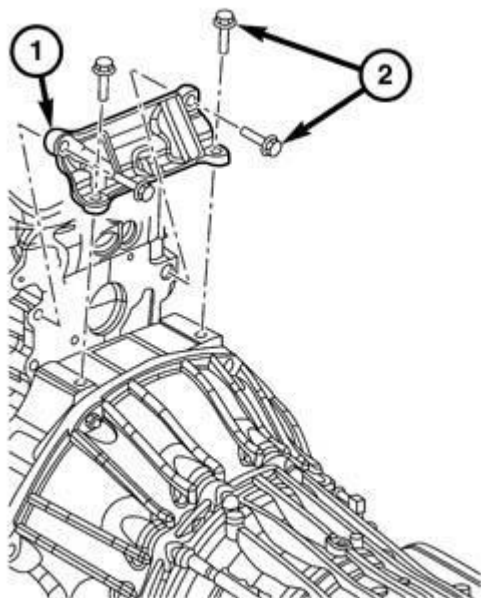
1. Replace the camshaft O-ring seal (1).



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Fig. 181: Transmission Adapter Plate & Bolts
 Courtesy of CHRYSLER GROUP, LLC

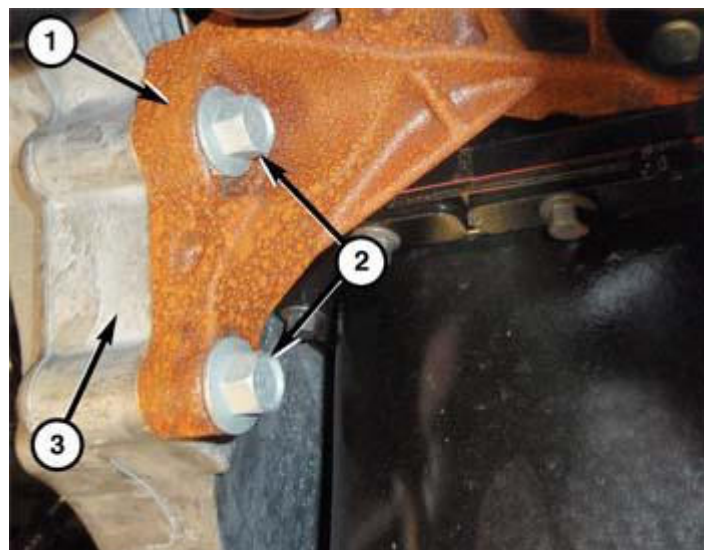
2. Install the transmission adapter plate (1). Tighten bolts (2) in a criss-cross pattern to 77 N.m (57 ft. lbs.).
3. Install the starter motor. Refer to **STARTER, INSTALLATION** .



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Fig. 182: Top Engine Block Stiffener & Bolts
 Courtesy of CHRYSLER GROUP, LLC

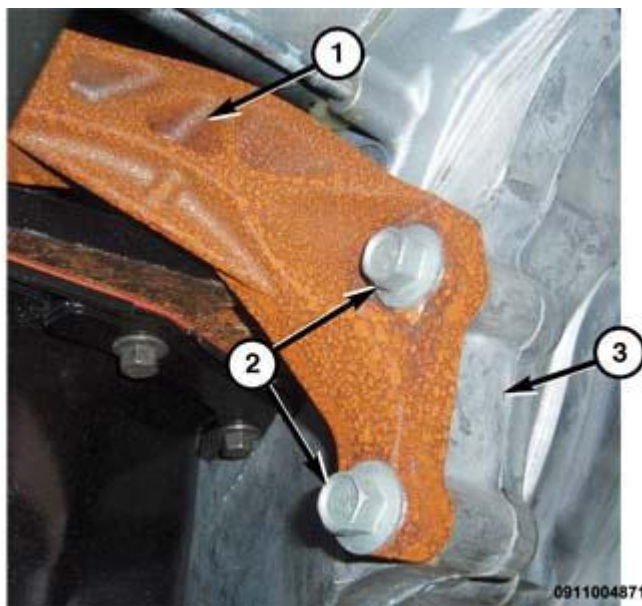
4. If equipped, Install the top engine block stiffener (1). Tighten bolts (2) to 89 N.m (66 ft. lbs.).



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Fig. 183: Right Engine Block Stiffener, Bolts & Engine Block
Courtesy of CHRYSLER GROUP, LLC

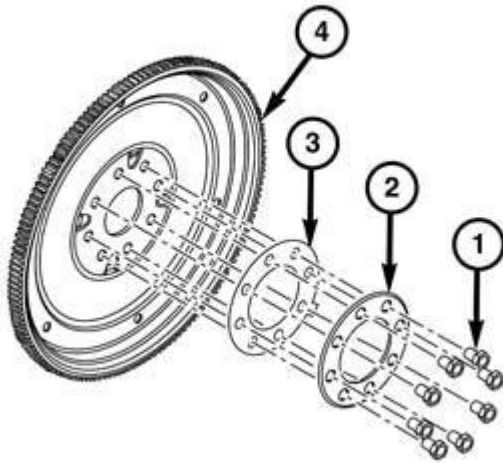
5. If equipped, Install the right engine block stiffener bolts (2) and tighten bolts to 89 N.m (66 ft. lbs.).



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Fig. 184: Left Engine Block Stiffener, Bolts & Engine Block
Courtesy of CHRYSLER GROUP, LLC

6. If equipped, Install the left engine block stiffener bolts (2) and tighten bolts to 89 N.m (66 ft. lbs.).
7. On manual transmission models, install the flywheel. Refer to **FLYWHEEL, INSTALLATION**.



091170924

Fig. 185: Bolts, Clamping Ring, Friction Shim & Flex Plate
Courtesy of CHRYSLER GROUP, LLC

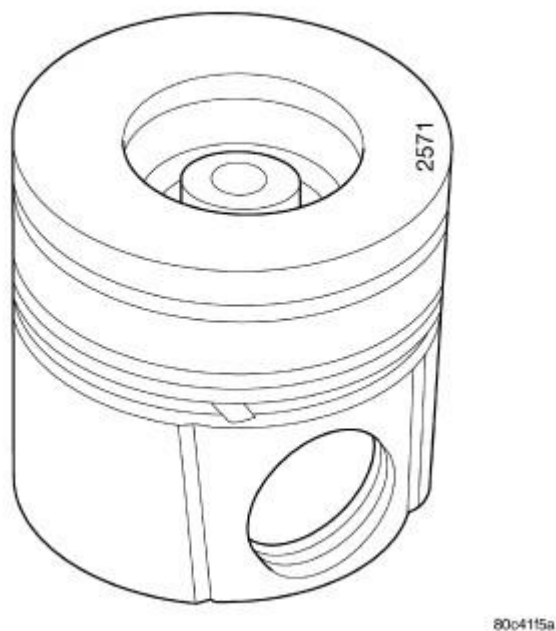
8. Install the flex plate. Refer to **FLEXPLATE, INSTALLATION, 6.7L**.

ROD, PISTON AND CONNECTING

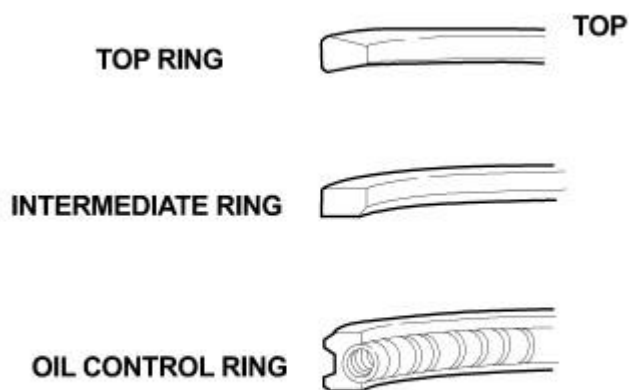
DESCRIPTION

DESCRIPTION

PISTONS

**Fig. 186: Piston**

Courtesy of CHRYSLER GROUP, LLC

**Fig. 187: Piston Ring Identification**

Courtesy of CHRYSLER GROUP, LLC

The piston is constructed of aluminum and is gravity cast, free floating design. The piston incorporates a centrally located high swirl combustion bowl, and utilizes a "keystone" style top compression ring, and a "Tapered Face" intermediate ring, for superior cylinder wall scraping. Piston cooling nozzles cool the piston and pin with engine oil supplied by the crankshaft main journals. All pistons are gallery cooled and utilize J-jet

piston cooling nozzles. Pistons are directional in order to provide clearance to piston cooling nozzles.

CONNECTING RODS

The connecting rods are a split angle design. They have a pressed-in-place wrist pin bushing that is lubricated by piston cooling nozzle oil spray.

Machined connecting rods are no longer used in the diesel engine. Do not install machined connecting rods into an engine that has fractured split connecting rods.

Fractured split connecting rods are first manufactured as a single piece and then fractured into two pieces. Fractured split connecting rods can be identified by a rough and irregular surface at the connecting rod split face. To properly assemble the rod cap to the connecting rod, the bearing tangs on the connecting rod and cap must be located on the same side of the rod. The long end of the connecting rod must be assembled on the intake or camshaft side of the engine.

NOTE: Two different type of connecting rods have been used on the 6.7L. One type connecting rod has three bumps on the cap end and the other does not; due to weight differences in the rods, engine vibration will result if the rods are mixed in one engine. Special consideration must be given not to mix connecting rods. Only use the same type connecting rod when replacing.

Each matched fractured split connecting rod and cap is an assembly and are not interchangeable. If a connecting rod or cap is damaged, the entire assembly must be replaced.

STANDARD PROCEDURE

STANDARD PROCEDURE - HEAD GASKET SELECTION

1. Measure piston protrusion for all six pistons.
2. Calculate the average piston protrusion. Maximum allowable protrusion is 0.516 - 0.485 mm (0.006 - 0.019 in.).

NOTE: There is only one head gasket available for the 6.7L engine.

REMOVAL

REMOVAL

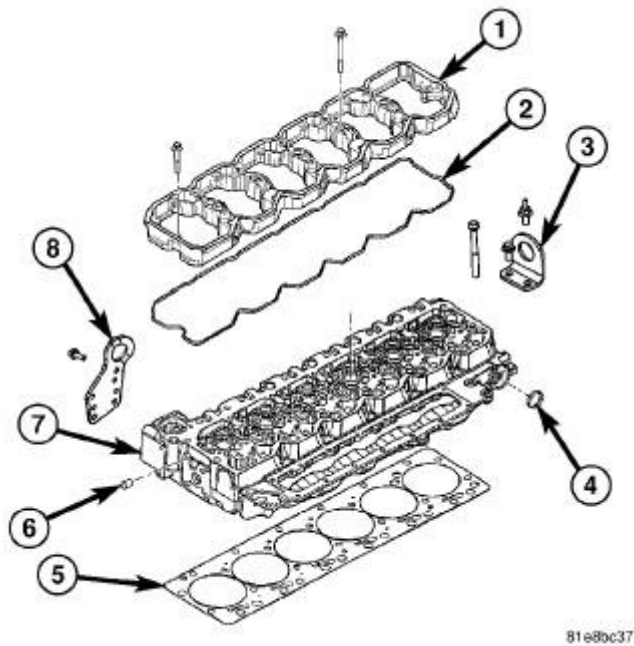
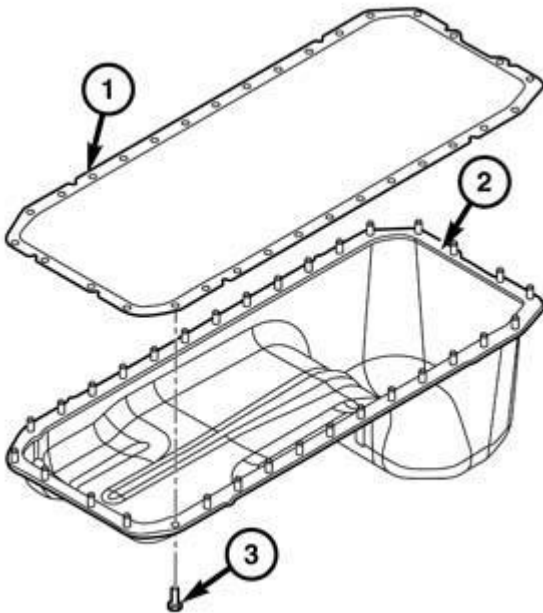


Fig. 188: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the engine from vehicle and mount on engine stand

Refer to **REMOVAL, 6.7L**.

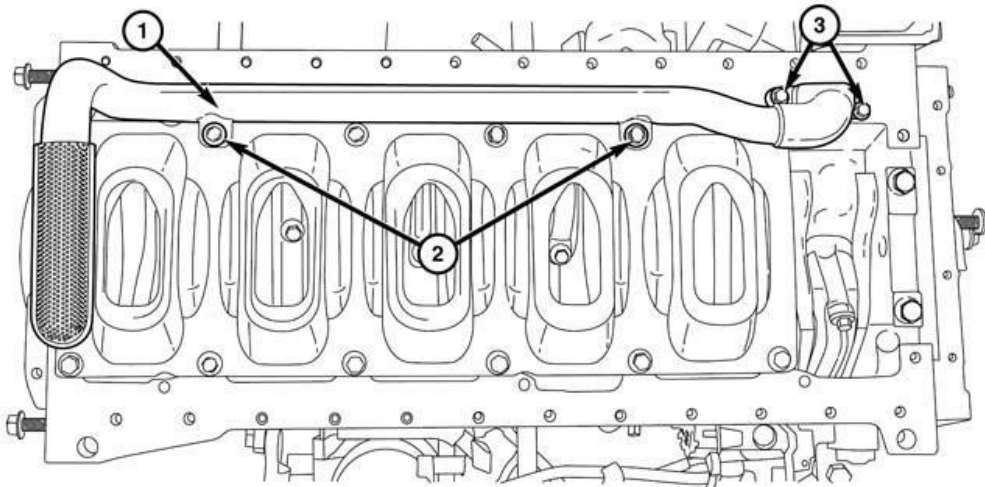
3. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL, 6.7L**.



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Fig. 189: Oil Pan, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

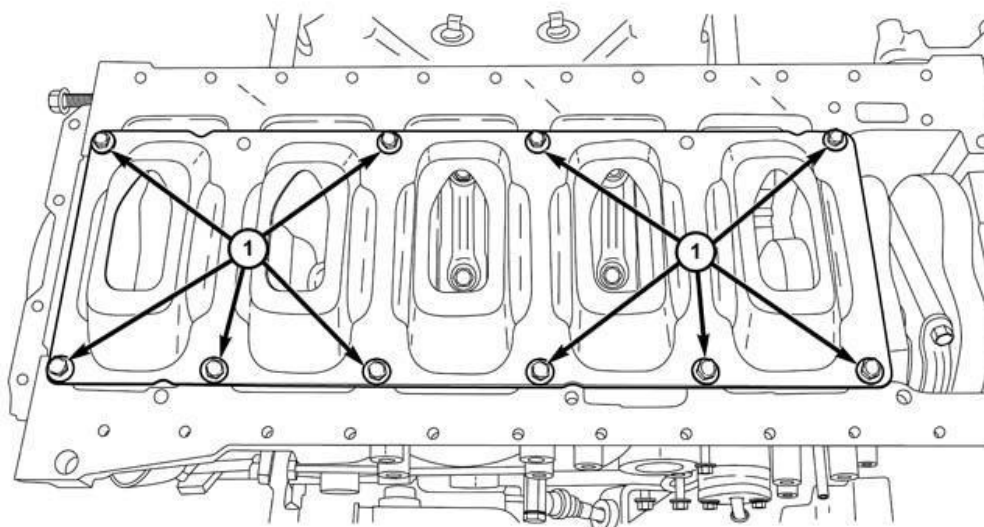
4. Remove bolts (3) and the oil pan (2).



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Fig. 190: Oil Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

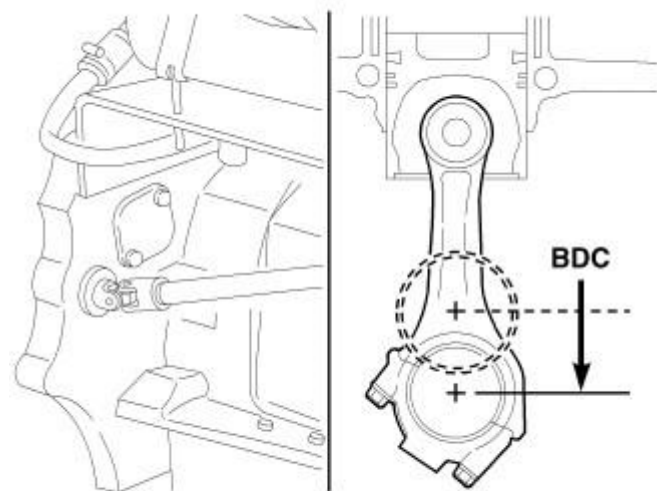
5. Remove bolts (2 and 3) and the oil suction tube (1).



091175190

Fig. 191: Block Stiffener & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove bolts (1) and the block stiffener.



818cbff0

Fig. 192: Piston/Rod Assembly At BDC
Courtesy of CHRYSLER GROUP, LLC

7. Using the (special tool #7471B, Barring Tool) crankshaft barring tool, rotate the crankshaft so all of the pistons are below TDC.
8. Before removing the piston(s) from the bore(s):

- a. Remove any carbon ridge formations or deposits at the top of the bore with a dull scraper or soft wire brush.
- b. If cylinder bore wear ridges are found, use a ridge reamer to cut the ridge from the bore. DO NOT remove more metal than necessary to remove the ridge.

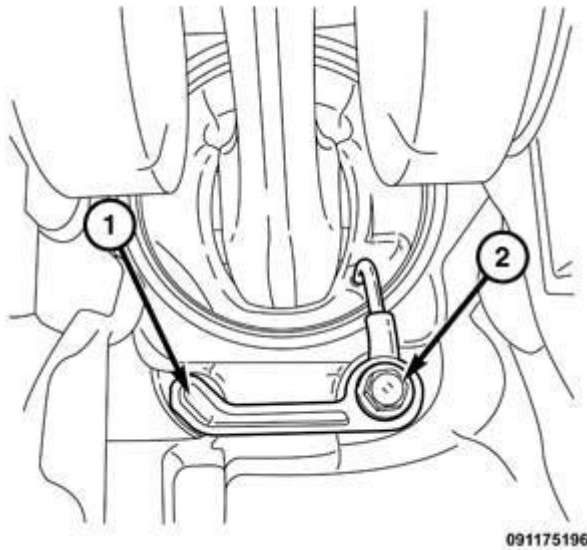


Fig. 193: Removing/Installing Oil Jet Piston Cooling Nozzles
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolt (2) and the oil jet piston cooling nozzles (1).

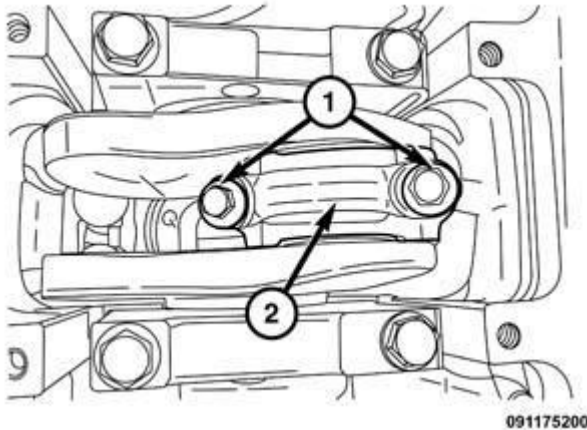


Fig. 194: Rod Cap & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Using a hammer and steel stamp, stamp the cylinder number in the top of each piston. The front of the piston is identified by a stamping on the top of the piston. DO NOT stamp in the outside 5 mm (.197 in.) of the piston diameter. DO NOT stamp over the piston pin.
11. Mark the connecting rod and cap with the corresponding cylinder numbers.
12. Remove bolts (1) and rod cap (2).

13. Use a hammer handle or similar object to push the piston and connecting rod through the cylinder bore. Use care so the cylinder bores and connecting rods are not damaged.
14. Store the piston/rod assemblies in a rack.

CLEANING

CLEANING

CAUTION: DO NOT use bead blast to clean the pistons. DO NOT clean the pistons and rods in an acid tank.

PISTON

Clean the pistons and pins in a suitable solvent, rinse in hot water and blow dry with compressed air. Soaking the pistons over night will loosen most of the carbon build up. De-carbon the ring grooves with a broken piston ring and again clean the pistons in solvent. Rinse in hot water and blow dry with compressed air.

CONNECTING ROD

Clean the connecting rods in a suitable solvent, rinse in hot water and blow dry with compressed air.

INSPECTION

PISTONS

PISTON SKIRT DIAMETER (MIN.)

Inspect the pistons for damage and excessive wear. Check top of the piston, ring grooves, skirt and pin bore. Measure the piston skirt diameter. If the piston is out of limits, replace the piston.

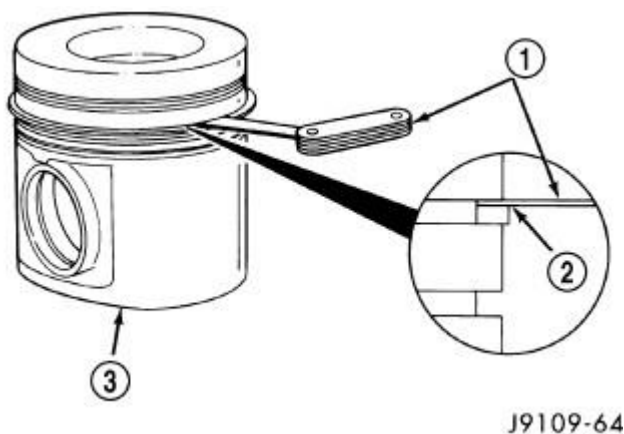


Fig. 195: Intermediate And Oil Ring Clearances
Courtesy of CHRYSLER GROUP, LLC

- 1 - FEELER GAUGE
- 2 - RING

3 - PISTON

The upper groove only needs to be inspected for damage. Use a new piston ring (2) to measure the clearance in the intermediate ring groove. Minimum clearance is 0.040 mm (0.0016 inch), maximum clearance is 0.110 mm (.0043 inch). If the clearance of the intermediate ring exceeds specifications, replace the piston (3).

Use a new oil ring to measure the clearance in the oil groove. Minimum clearance is 0.040 mm (0.0016 inch), maximum clearance is 0.085 mm (.0033 inch). If the clearance exceeds specifications, replace the piston.

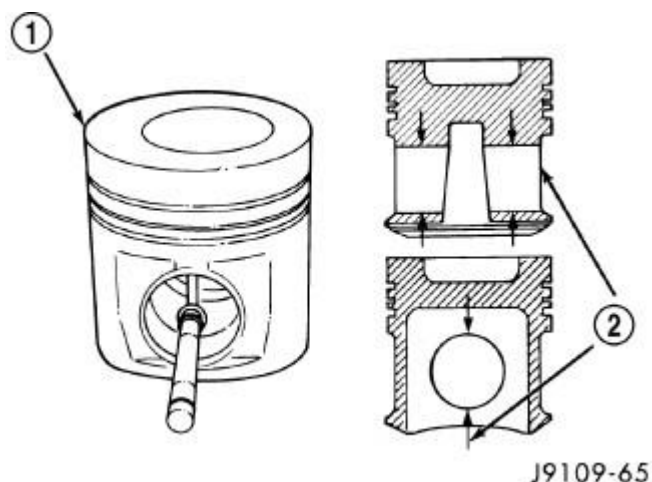


Fig. 196: Piston Pin & Bore

Courtesy of CHRYSLER GROUP, LLC

1 - PISTON

2 - PIN BORE

Measure the pin bore (2). The maximum diameter is 40.012 mm (1.5753 inch), Minimum is 40.006 mm (1.575 inch). If the bore is over limits, replace the piston (1).

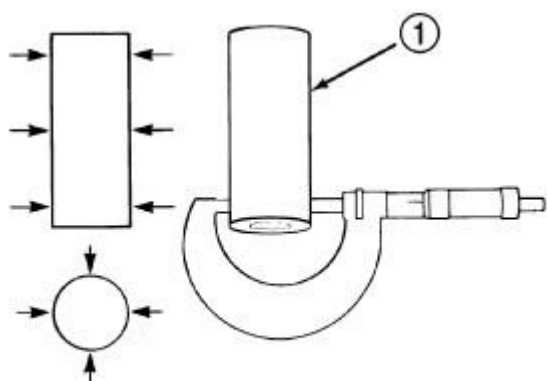


Fig. 197: Measuring Piston Pin Diameter

Courtesy of CHRYSLER GROUP, LLC

1 - PISTON PIN

Inspect the piston pin for nicks, gouges and excessive wear. Measure the pin diameter (1). The minimum diameter is 39.997 mm (1.5747 inch), maximum 40.003 mm (1.5749 inch). If the diameter is out of limits, replace the pin (1).

CONNECTING ROD

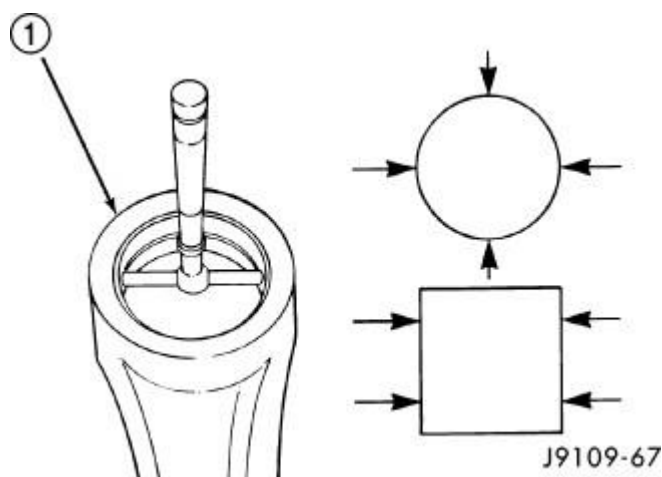


Fig. 198: Measuring Connecting Rod Pin Bore
Courtesy of CHRYSLER GROUP, LLC

1 - CONNECTING ROD

Inspect the connecting rod for damage and wear. The I-Beam section of the connecting rod cannot have dents or other damage. Damage to this part can cause stress risers which will progress to breakage.

Measure the connecting rod pin bore (1). The maximum diameter is 40.042 mm (1.5765 inch), minimum diameter is 40.019 mm (1.5756 inch). If out of limits, replace the connecting rod.

NOTE: Two different type of connecting rods have been used on the 6.7L. One type connecting rod has three bumps on the cap end and the other does not; due to weight differences in the rods, engine vibration will result. Special consideration must be given not to mix connecting rods. Only use the same type connecting rod when replacing.

INSTALLATION

INSTALLATION

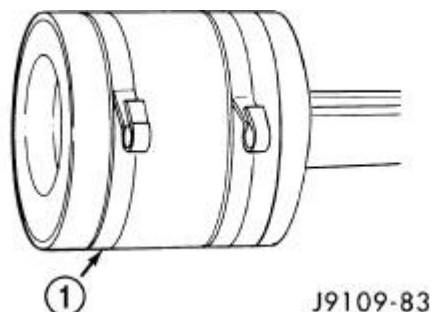
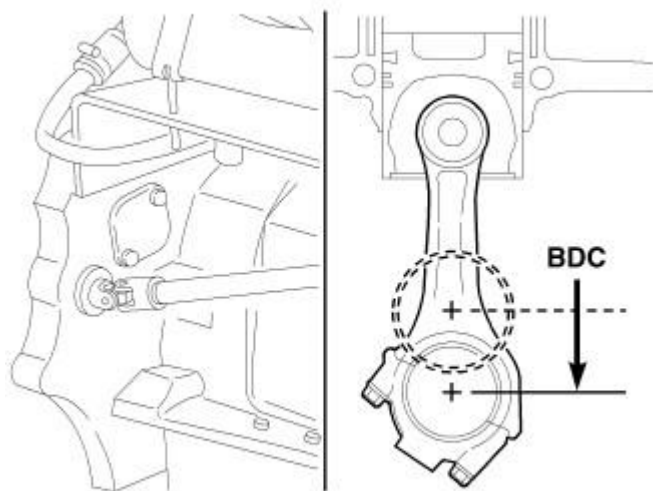


Fig. 199: Piston Ring Compressor Tool
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the cylinder bores with clean engine oil.
2. Generously lubricate the rings and piston skirts with clean engine oil.
3. Orientate the rings on the piston. Refer to **STANDARD PROCEDURE**.
4. Using a piston ring compressor, compress the rings (1). If using a strap-type ring compressor, make sure the inside end of the strap does not hook on a ring gap and break the ring.

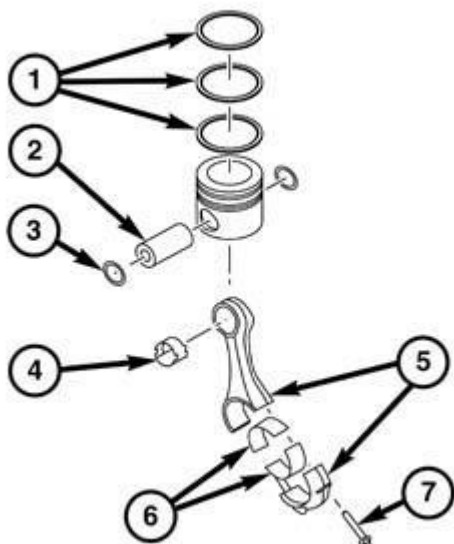


818cbff0

Fig. 200: Piston/Rod Assembly At BDC
Courtesy of CHRYSLER GROUP, LLC

5. Rotate the crankshaft so the rod journal for the piston to be installed is at BDC (Bottom Dead Center).
6. Make sure the front of the piston is oriented properly according to the marking on the top of the piston and the connecting rod is oriented properly.
7. Position the piston and rod assembly into the cylinder bore with the front of the piston oriented properly according to the stamping in the top of the piston. Use care when you install the piston and connecting rod so the cylinder bore is not damaged. The long side of the connecting rod must be installed on the exhaust side of the engine.

8. Push the piston into the bore until the top of the piston is approximately 50 mm (2 in.) below the top of the block. Carefully pull the connecting rod onto the crankshaft journal.
9. **For fractured/split type connecting rods**, the long end of the rod must be installed away from the intake side of the engine. The connecting rod split/face must face toward the same side as the piston notch feature on the skirt. The split face will face toward the exhaust side of the engine if properly installed.

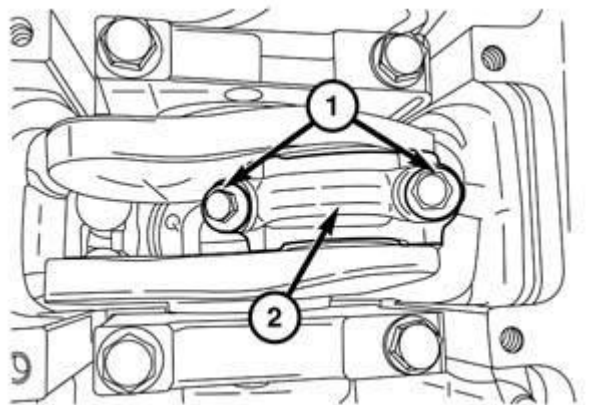


0913002110

Fig. 201: Piston & Rod Components

Courtesy of CHRYSLER GROUP, LLC

10. Using clean engine oil, lubricate and install the correct size connecting rod bearings (6).
11. Using clean engine oil, lubricate the threads and under the heads of the connecting rod bolts (7).

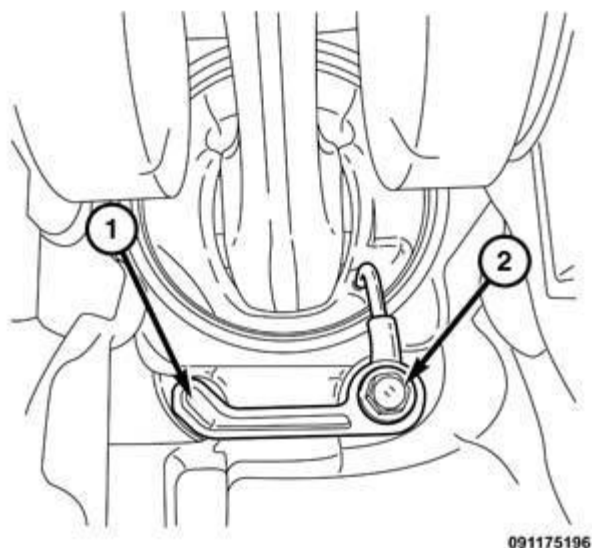


091175200

Fig. 202: Rod Cap & Bolts

Courtesy of CHRYSLER GROUP, LLC

12. Install the rod cap (2) and bolts (1) to the connecting rod. Tighten the connecting rod bolts evenly in 3 steps:
 - Tighten bolts (1) to 30 N.m (22 ft. lbs.).
 - Tighten bolts (1) to 60 N.m (44 ft. lbs.).
 - Tighten bolts (1) an additional 60° clockwise.
13. The crankshaft must rotate freely. Check for freedom of rotation as the caps are installed. If the crankshaft does not rotate freely, check the installation of the rod bearing and the bearing size.
14. Measure the side clearance between the connecting rod and the crankshaft. DO NOT measure the clearance between the cap and crankshaft.

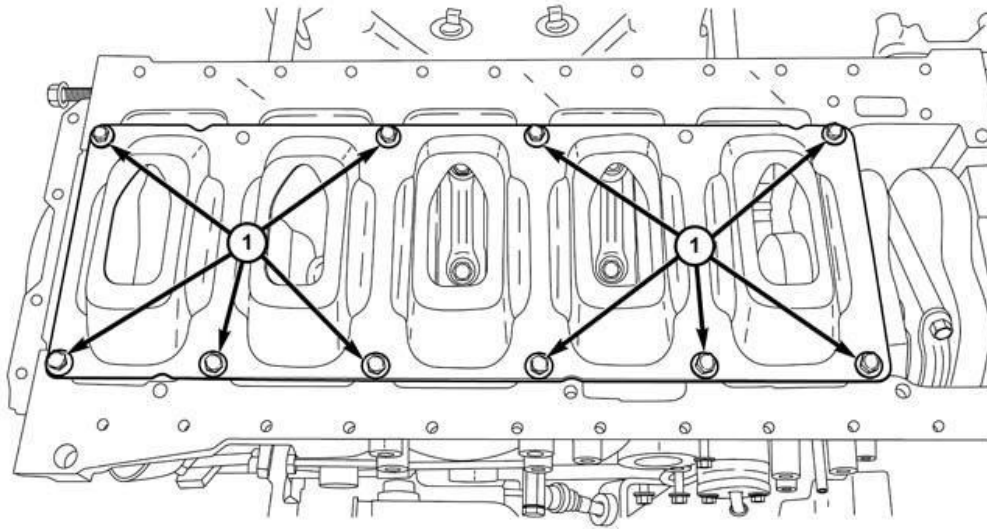


091175196

Fig. 203: Removing/Installing Oil Jet Piston Cooling Nozzles
Courtesy of CHRYSLER GROUP, LLC

NOTE: **Note: For 2013 the oil jet cooling nozzle is green in color and can't be used in older prior model years and older model years can't be used in 2013 model year engine.**

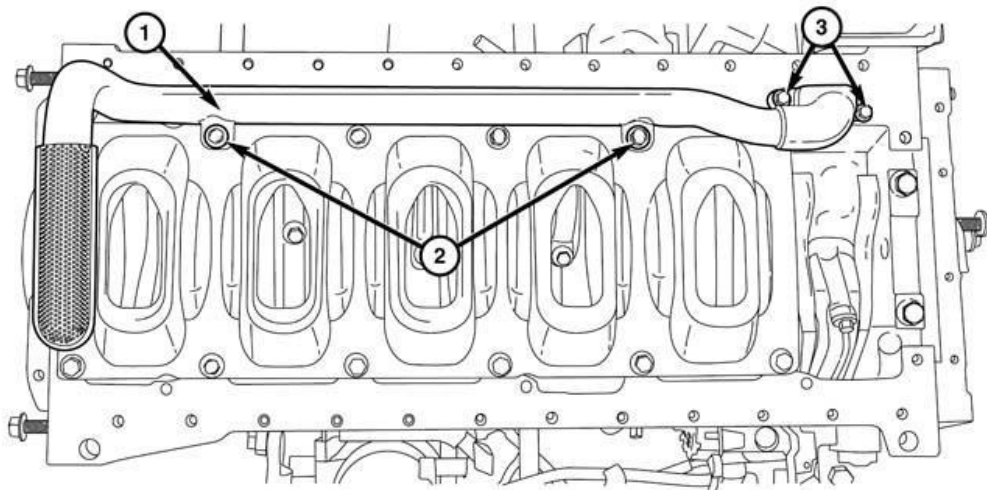
15. Install the oil jet piston cooling nozzles (1). Tighten bolt (2) to 15 N.m (133 in. lbs.).



091175190

Fig. 204: Block Stiffener & Bolts
Courtesy of CHRYSLER GROUP, LLC

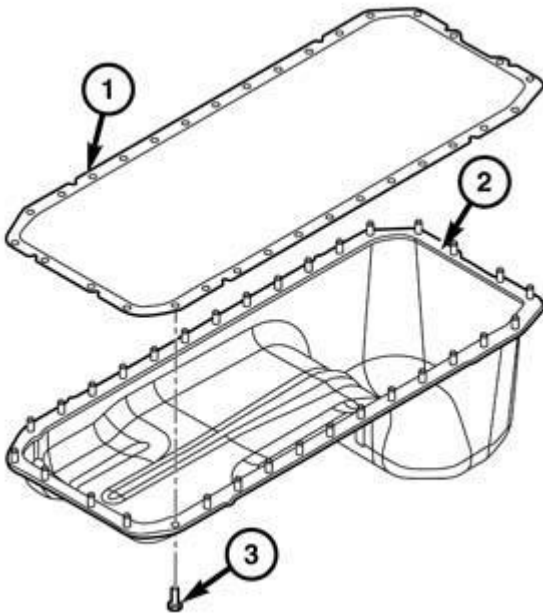
16. Install block stiffener (2). Tighten bolts to (1) 43 N.m (32 ft. lbs.).



091175198

Fig. 205: Oil Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

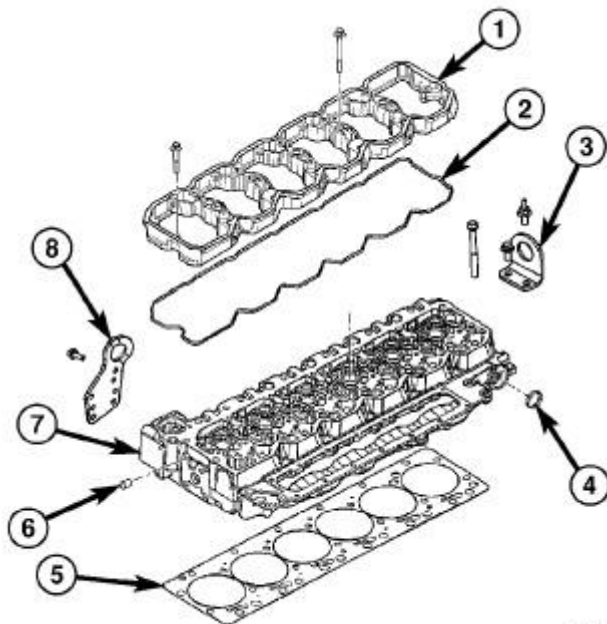
17. Using a new gasket, Install the suction tube (1). Tighten bolts:
- M8 bolts (3) to 24 N.m (18 ft. lbs.).
 - M10 bolts (2) to 43 N.m (32 ft. lbs.).



91175197

Fig. 206: Oil Pan, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

18. Install the oil pan (2). Refer to PAN, OIL, INSTALLATION, 6.7L.



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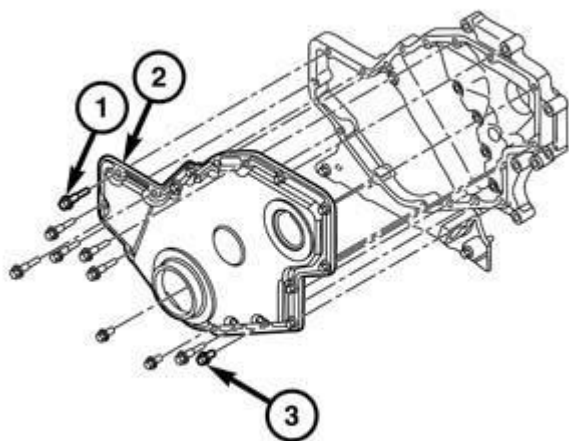
Fig. 207: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

19. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION, 6.7L**.
20. Install the engine into vehicle. Refer to **INSTALLATION, 6.7L**.
21. Install a new filter and fill the crankcase with new engine oil. **Prefill the filter with clean oil.**
22. Connect both negative battery cables.
23. Start engine and check for leaks.

SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

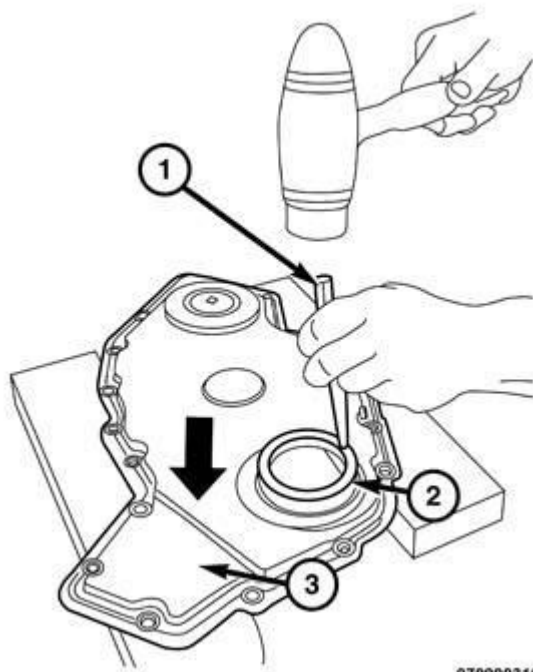
REMOVAL



091175201

Fig. 208: Engine Timing Cover Components
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate both negative battery cables.
2. Remove the engine timing cover (2). Refer to **COVER(S), ENGINE TIMING, REMOVAL, 6.7L**.



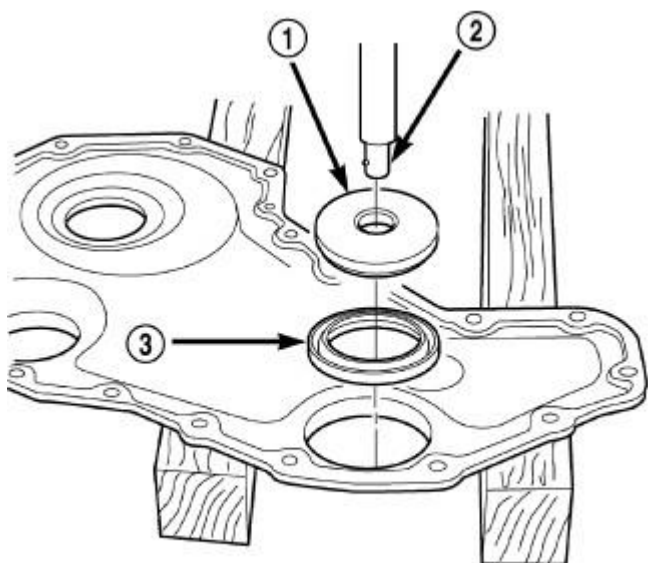
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Fig. 209: Driving Seal Out Of The Cover
Courtesy of CHRYSLER GROUP, LLC

3. Support the engine timing cover on a flat work surface with wooden blocks, and using a suitable punch (1) and hammer, drive the old seal (2) out of the cover from the front side of the cover to the back side.

INSTALLATION

INSTALLATION



80b46d26

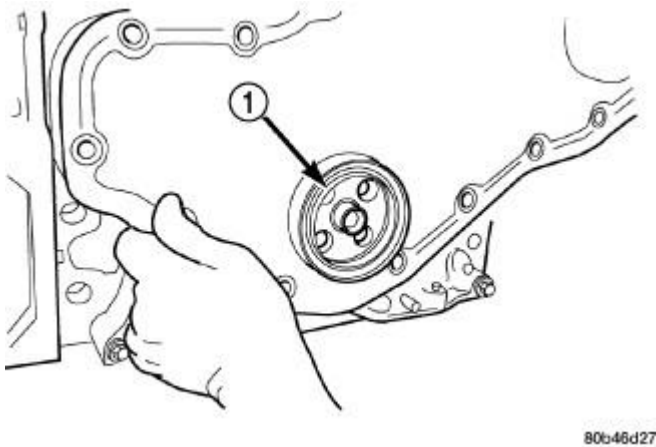
Fig. 210: Installing Seal Into Cover With Tool 8281

Courtesy of CHRYSLER GROUP, LLC

CAUTION: The seal lip and the sealing surface on the crankshaft must be free of all oil residue, to prevent leaks. The crankshaft and seal surface must be completely dry when the seal is installed.

1. Clean cover and housing gasket mating surfaces. Use a suitable scraper and be careful not to damage the gear housing surface. Remove any old sealer from the oil seal bore. Thoroughly clean the front seal area of the crankshaft. Do not sand this surface. The seal lip and the sealing surface on the crankshaft must be free from all oil residue to prevent seal leaks.
2. Inspect the gear housing and cover for cracks and replace if necessary. Carefully straighten any bends or imperfections in the gear cover with a ball-peen hammer on a flat surface. Inspect the crankshaft front journal for any grooves or nicks that would affect the integrity of the new seal.
3. Apply a bead of Mopar® Stud AND Bearing Mount to the outside diameter of the seal. Do not lubricate the inside diameter of the new seal.
4. With the cover supported by wood blocks, install the seal into the rear of the cover using the Front Crankshaft Oil Seal Installer (special tool #10136, Installer, Crankshaft Front Oil Seal) and driver handle (special tool #C-4171, Driver Handle, Universal). Strike the driver handle until the installation tool bottoms out on the inside of the cover.

CAUTION: Do not distort or damage seal.

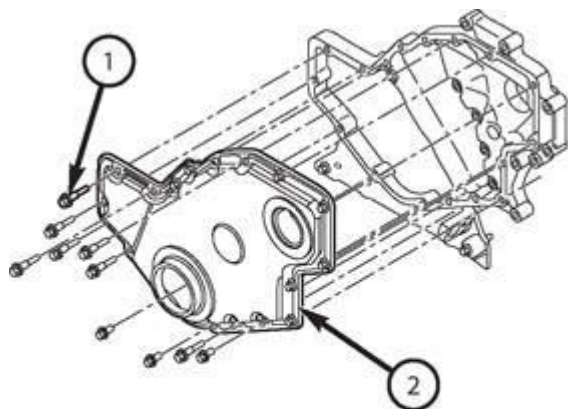
**Fig. 211: Installing Front Cover With Seal Pilot**

Courtesy of CHRYSLER GROUP, LLC

5. Install the plastic seal pilot (1) (provided with seal kit) into the crankshaft seal.
6. Apply a bead of Mopar® Silicone Rubber Adhesive Sealant or equivalent to the gear housing cover sealing surface.

NOTE: Failure to follow the cover installation procedure can result in

misalignment of the crankshaft seal to the crankshaft, causing an oil leak.



070974630

Fig. 212: Engine Timing Cover Components

Courtesy of CHRYSLER GROUP, LLC

7. Install the engine timing cover (2) while aligning the seal pilot with the nose of the crankshaft. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 6.7L**.
8. Connect both negative battery cables.
9. Start the engine and check for oil leaks.

SEAL, CRANKSHAFT OIL, REAR

REMOVAL

REMOVAL

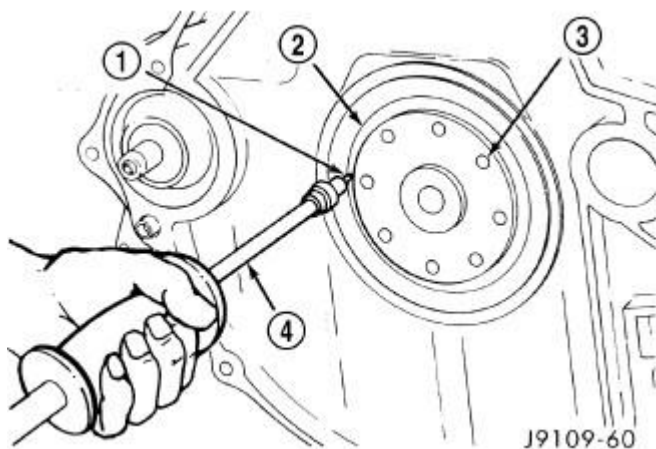


Fig. 213: Crankshaft Rear Seal Removal

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cables.
2. On automatic transmission vehicles, remove the flexplate. Refer to **FLEXPLATE, REMOVAL, 6.7L**.
3. On Manual transmission vehicles, remove the flywheel. Refer to **FLYWHEEL, REMOVAL**.
4. Using a 3/32 (0.0938 in.) drill bit, drill two pilot holes 180° apart into the rear seal (2). Use caution not to contact the crankshaft (3) or the seal retainer when drilling pilot holes.
5. Install a No. 10 sheet metal screws (1) in the drilled pilot holes and remove the rear seal with a slide hammer (4).

INSTALLATION

INSTALLATION

CAUTION: The seal lip and the sealing surface on the crankshaft must be free from all oil residue to prevent seal leaks. The crankshaft and seal surfaces must be completely dry when the seal is installed. Use a soap and water solution on outside diameter of seal to ease assembly.

1. Clean the crankshaft journal with a suitable solvent and dry with a clean shop towel or compressed air. Wipe the inside bore of the crankshaft seal retainer with a clean shop towel.
2. Inspect the crankshaft journal for gouges, nicks, or other imperfections. If the seal groove in the crankshaft is excessively deep, install the new seal 1/8" deeper into the retainer bore, or obtain a crankshaft wear sleeve that is available in the aftermarket.
3. Install the seal pilot and new seal, provided in the replacement kit, onto the crankshaft.
4. Remove the seal pilot.
5. Install the installation tool over crankshaft.

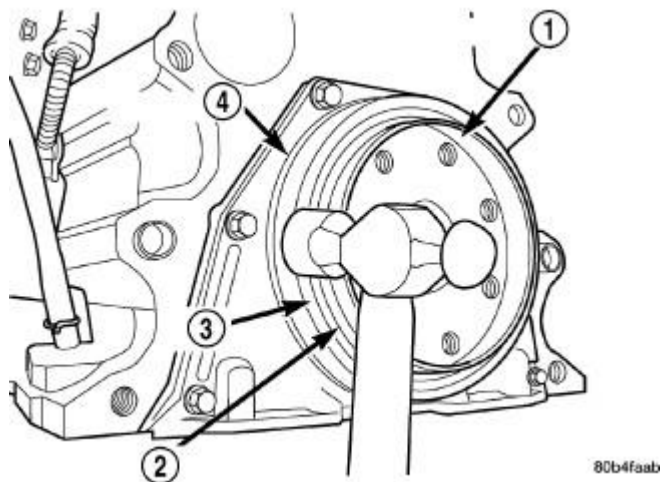


Fig. 214: Seal Installation Using Alignment Tool And Hammer
Courtesy of CHRYSLER GROUP, LLC

6. Using a ball peen hammer, strike the tool (2) at the 12, 3, 6, and 9 o'clock positions until the alignment tool bottoms out on the retainer.

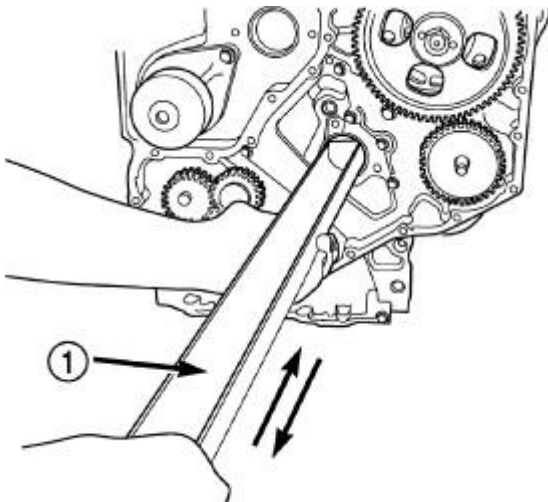
NOTE: Always install a new clamping ring, never reuse the old clamping ring.

7. On manual transmission vehicles, install the flywheel. Refer to **FLYWHEEL, INSTALLATION**.
8. On automatic transmission vehicles, install the flexplate. Refer to **FLEXPLATE, INSTALLATION, 6.7L**.
9. Connect both negative battery cables.
10. Check engine oil level and adjust, if necessary.
11. Start engine and check for oil leaks.

TAPPET(S), VALVE

REMOVAL

REMOVAL

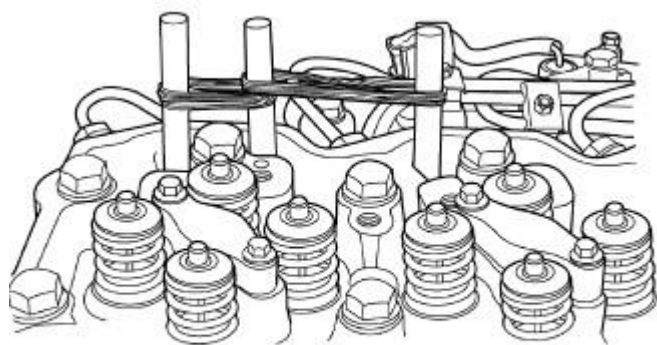


80b4fa39

Fig. 215: Inserting The Trough Into Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

NOTE: This procedure requires use of Miller Tool (special tool #8502, Remover/Installer) Tappet Replacement Kit.

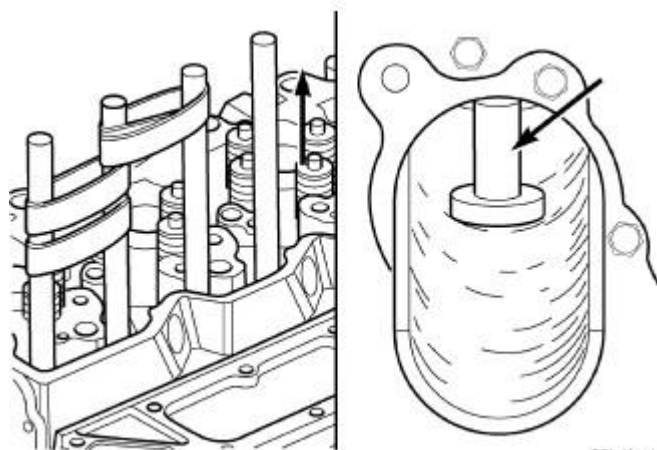
1. Remove camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L**.
2. Insert the trough (1) (provided with tool kit) the full length of the camshaft bore. Make sure the cap end goes in first and the open side faces up (towards tappets).



80b4faa0

Fig. 216: Tappets Secured In Place Using Wooden Dowel Rods
Courtesy of CHRYSLER GROUP, LLC

3. **Remove only one tappet at a time.** Remove rubber band from one cylinder pair and attach tappet dowel not being removed to the next cylinder pair.



80b4faa1

Fig. 217: Lift Dowel Rod To Disengage From Tappet
Courtesy of CHRYSLER GROUP, LLC

4. Raise dowel rod (disengage from tappet) and allow tappet to fall into trough.
5. Carefully remove trough (**do not rotate**) and tappet. If the tappet is not being replaced, mark it so it can be installed in its original location.

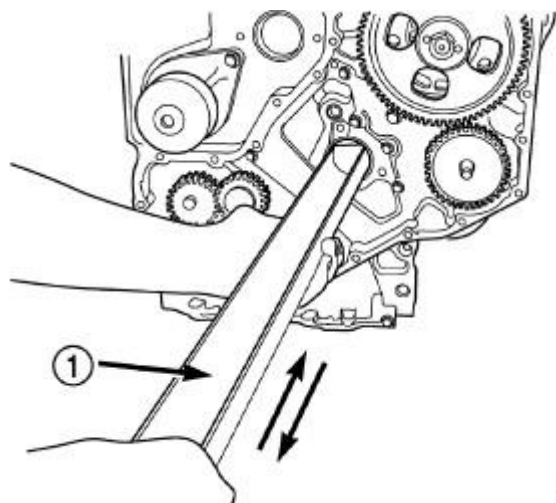


Fig. 218: Inserting The Trough Into Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

6. Re-install trough (1) and repeat procedure on remaining tappets.

CLEANING

CLEANING

Clean tappet with a suitable solvent. Rinse in hot water and blow dry with a clean shop rag or compressed air.

INSPECTION

INSPECTION

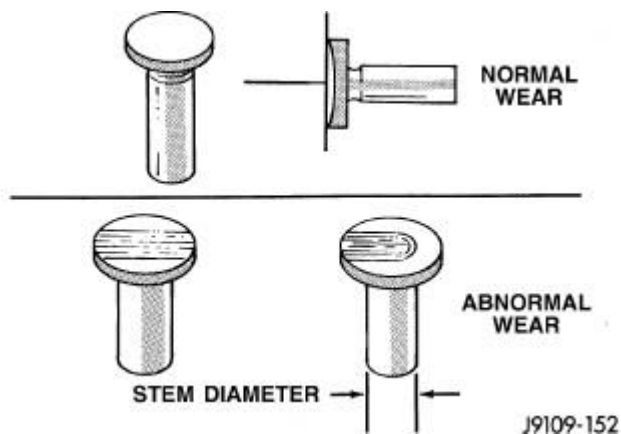


Fig. 219: Tappet Inspection
Courtesy of CHRYSLER GROUP, LLC

TAPPET STEM DIAMETER

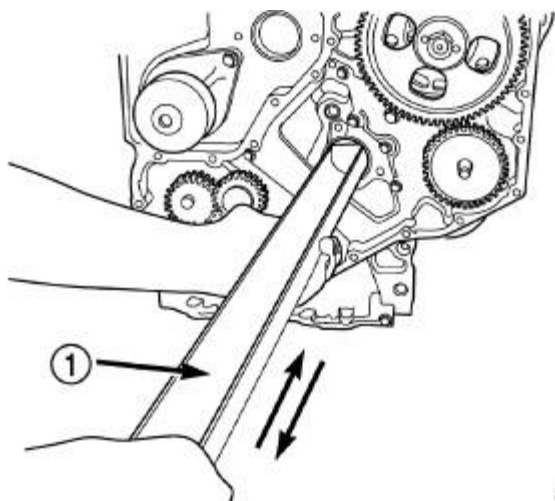
15.936 mm (0.627 in.) MIN.

15.977 mm (0.629 in.) MAX.

1. Visually inspect the tappet the tappet socket, stem, and face for excessive wear, cracks, or obvious damage.
2. Measure the tappet stem diameter. Replace the tappet if it falls below the minimum size.

INSTALLATION

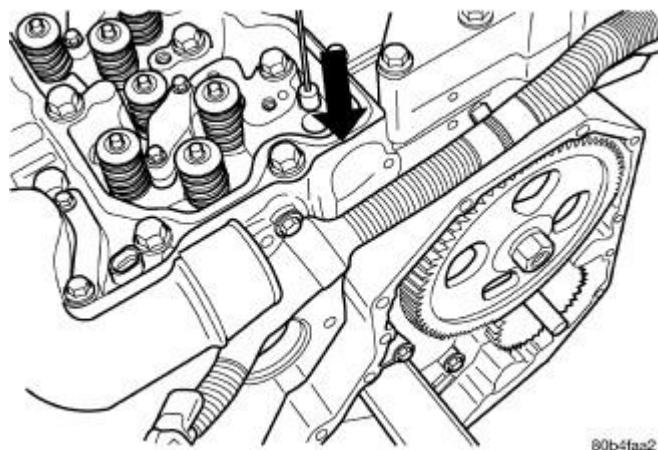
INSTALLATION



80b4fa39

Fig. 220: Inserting The Trough Into Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

1. Insert the trough (1) the full length of the camshaft bore. Again, make sure the cap end goes in first and the open side faces up (towards tappets).



80b4faa2

Fig. 221: Insert Installation Tool Through Push Rod Hole
Courtesy of CHRYSLER GROUP, LLC

2. Lower the tappet installation tool through the push rod hole and into the trough.

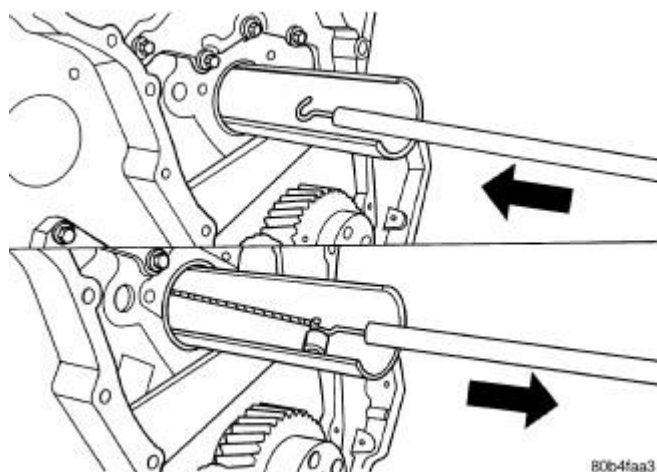


Fig. 222: Retrieve Tappet Installation Tool Through Cam Bore
 Courtesy of CHRYSLER GROUP, LLC

3. Retrieve the tappet installation tool using the hooked rod provided with the tool kit.

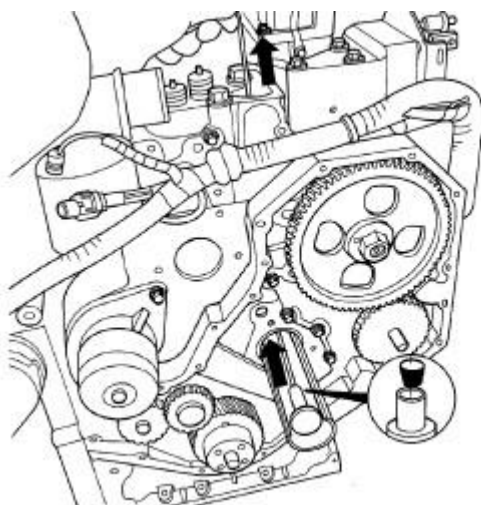


Fig. 223: Inserting Tool & Pulling Tappet Into Place
 Courtesy of CHRYSLER GROUP, LLC

4. Lubricate the tappet with clean engine oil or suitable equivalent and install the tappet to the installation tool.
5. Pull the tappet up and into position. If difficulty is experienced getting the tappet to make the turn into the tappet bore, wiggle the trough while **gently** pulling up on the tappet.

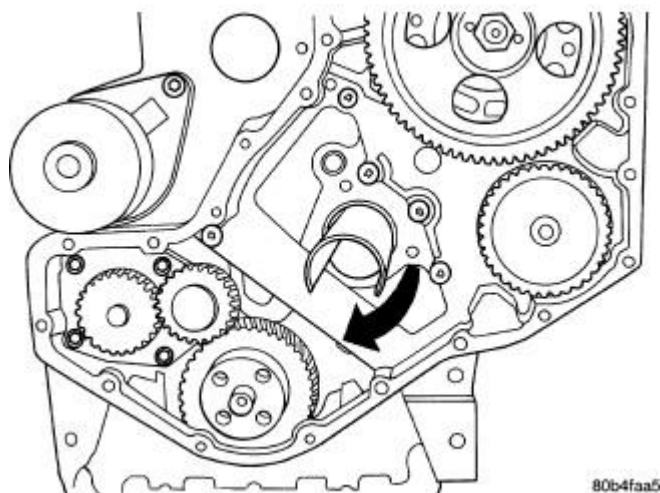


Fig. 224: Rotate Trough One Half Turn (180°)
 Courtesy of CHRYSLER GROUP, LLC

6. With the tappet in place, rotate the trough one half turn so the open side is down (toward crankshaft).
7. Remove the tappet installation tool from the tappet.
8. Re-install a dowel rod and secure the rod with a rubber band.

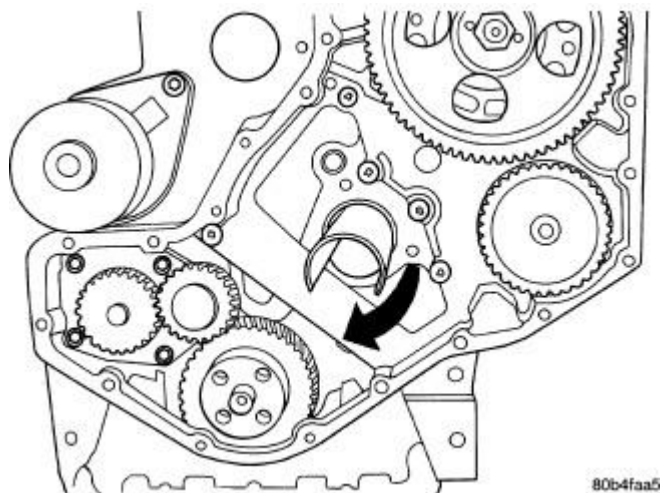


Fig. 225: Rotate Trough One Half Turn (180°)
 Courtesy of CHRYSLER GROUP, LLC

9. Rotate the trough one half turn and repeat the procedure for the remaining tappets.
10. Install the camshaft. Refer to **CAMSHAFT, ENGINE, INSTALLATION, 6.7L**.

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, FRONT

REMOVAL

REMOVAL



Fig. 226: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

- 1.
2. Disconnect both negative battery cables.
3. Remove the engine oil dipstick (3).
4. Remove fasteners (1, 4) and the engine cover (2).
5. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L.**
6. Install the Engine Lifting Bracket (special tool #10474, Brackets, Engine Lifting) and securely tighten bolts.
7. Install Engine Support Fixture tool (special tool #8534B, Fixture, Driveline Support).

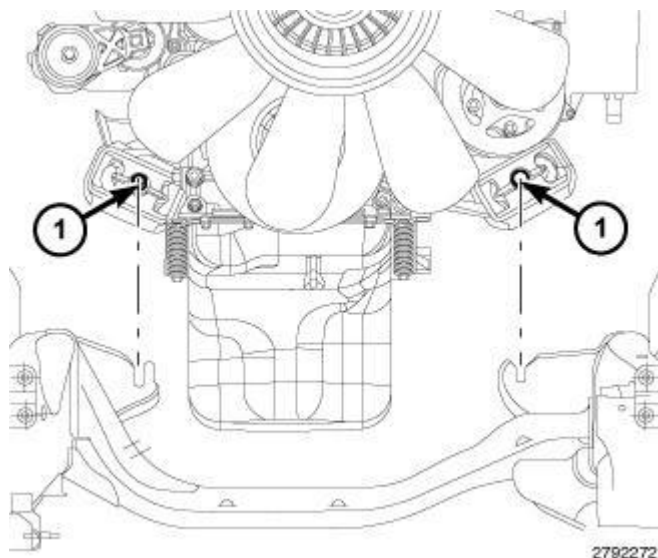
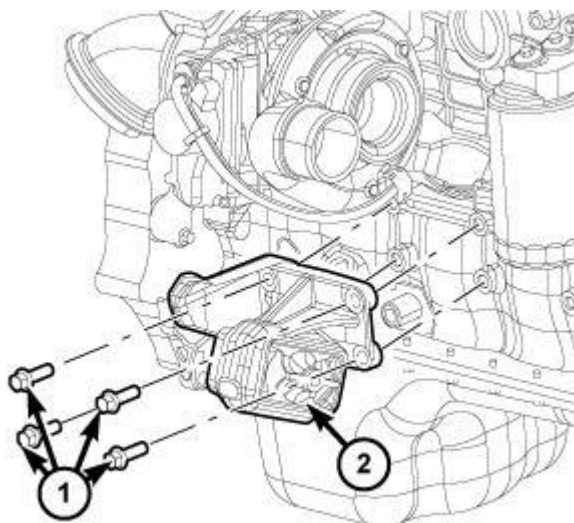


Fig. 227: Frame Mount Fasteners

Courtesy of CHRYSLER GROUP, LLC

8. Loosen the right side and left side thru-bolt and nut (1).
9. Lift the engine **SLIGHTLY** and remove the thru-bolt and nut (1).

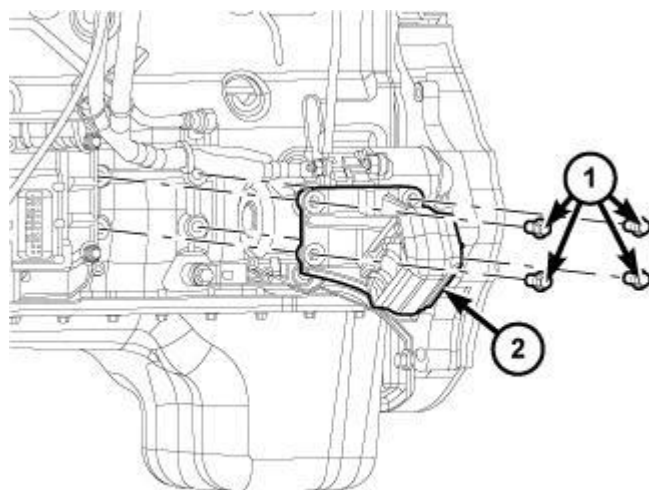


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Fig. 228: RH Engine Mount & Bolts

Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the RH mount (2) from engine.



2792308

Fig. 229: LH Engine Mount & Bolts

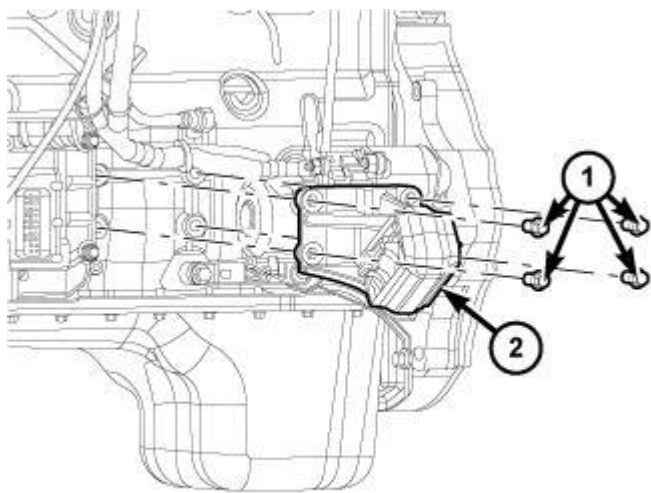
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x4 engine mount shown in the illustration 4x2 similar.

11. Remove bolts (1) and the LH mount (2) from engine.

INSTALLATION

INSTALLATION

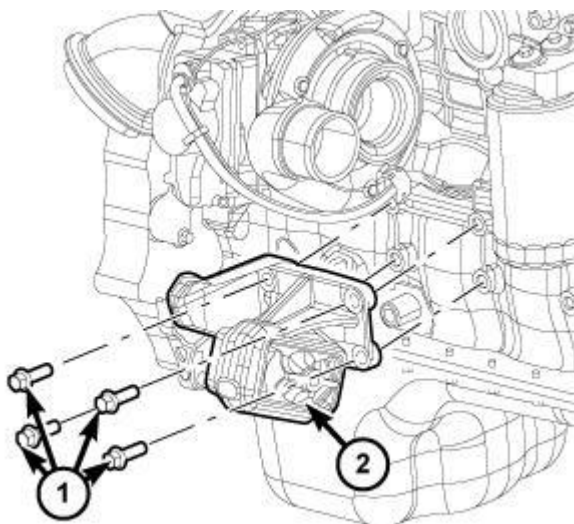


2792308

Fig. 230: LH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x4 engine mount shown in the illustration 4x2 similar.

1. With engine raised **SLIGHTLY** , install the left mount (2) to engine. Tighten bolts (1) to 102 N.m (75 ft. lbs.).



2792257

Fig. 231: RH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. With engine raised **SLIGHTLY** , install the right mount (2) to engine. Tighten bolts (1) to 102 N.m (75 ft. lbs.).

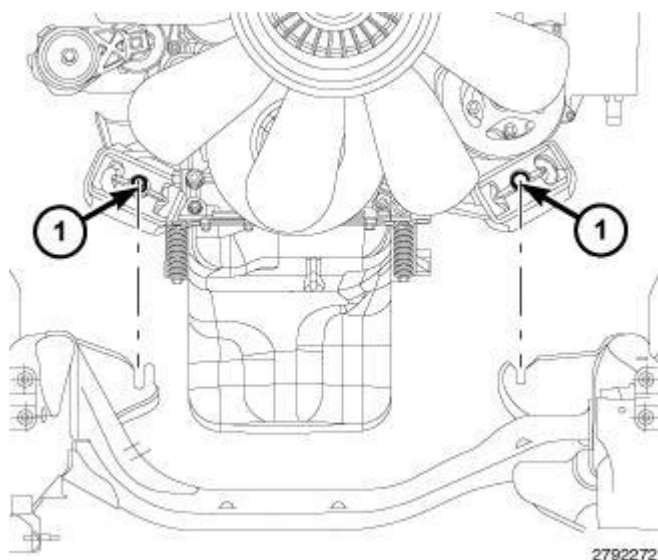


Fig. 232: Frame Mount Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Lower the engine support fixture tool (special tool #8534B, Fixture, Driveline Support), while guiding the mount and thru-bolt into the frame mounted brackets.
4. Install the thru-bolt nut (1). Tighten nut (1) to 136 N.m (100 ft. lbs.).
5. Remove the Driveline Support Fixture (special tool #8534B, Fixture, Driveline Support).
6. Remove bolts and the Engine Lifting Bracket (special tool #10474, Brackets, Engine Lifting)
7. If equipped, install the left generator mounting bracket and generator. Refer to **GENERATOR, INSTALLATION** .
8. Check the viscous fan shroud seal for properly alignment.
9. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.



Fig. 233: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

10. Install the engine cover (2) and fasteners (1, 4).
11. Install the engine oil dipstick (3).
12. Connect both negative battery cables.

INSULATOR, ENGINE MOUNT, REAR

REMOVAL

G 56 MANUAL

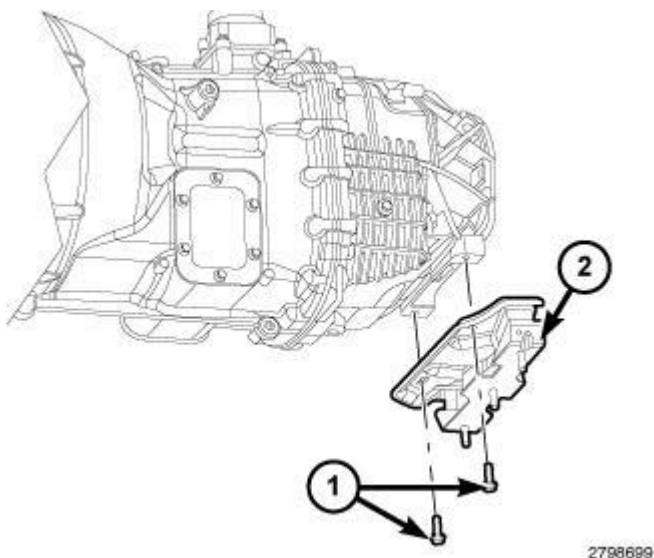
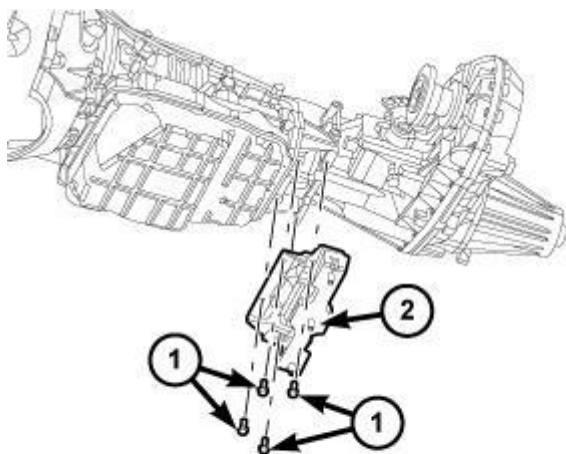


Fig. 234: Rear Transmission Mount & Bolts (M/T)
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.

1. Raise the vehicle on a hoist.
2. Position transmission jack in place.
3. Remove nuts securing transmission mount to crossmember.
4. Raise the transmission.
5. Remove bolts (1) and the rear transmission mount (2).

68 RFE AUTOMATIC



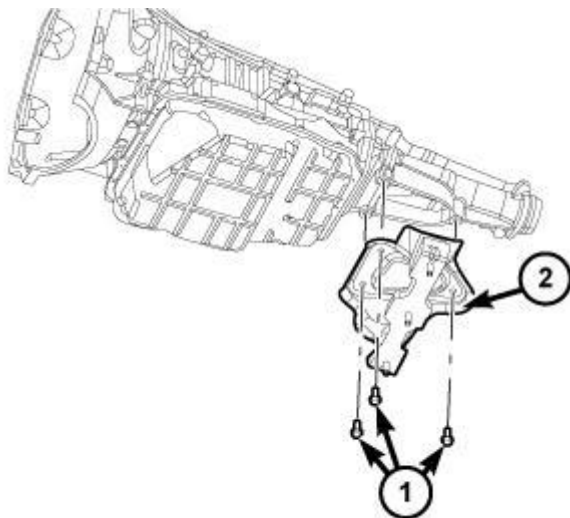
2798627

Fig. 235: Rear Transmission Mount & Bolts - 68RFE A/T - 4WD
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x4 Models.

CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.

1. Raise the vehicle on a hoist.
2. Position a transmission jack in place.
3. Remove nuts securing transmission mount to crossmember.
4. Raise the transmission.
5. Remove bolts (1) and the rear transmission mount (2).



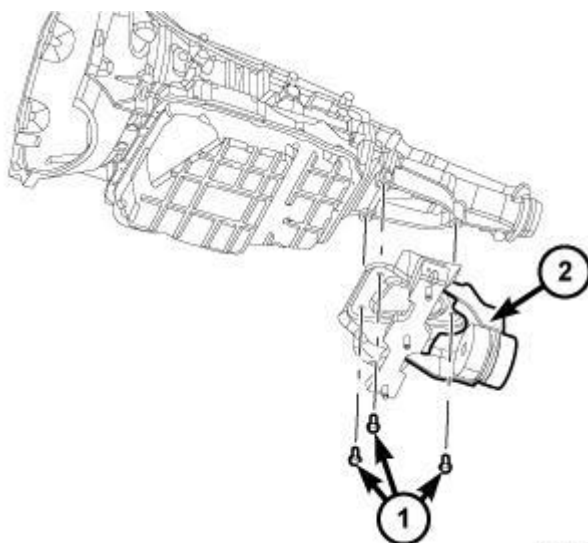
2798718

Fig. 236: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Regular Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Regular Cab Models.

CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.

6. Raise the vehicle on a hoist.
7. Position a transmission jack in place.
8. Remove nuts securing transmission mount to crossmember.
9. Raise the transmission.
10. Remove bolts (1) and the rear transmission mount (2).



2798751

Fig. 237: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Crew & Mega Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Crew and Mega Cab Models.

CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.

11. Raise the vehicle on a hoist.
12. Position a transmission jack in place.
13. Remove nuts securing transmission mount to crossmember.
14. Raise the transmission.
15. Remove bolts (1) and the rear transmission mount (2).

AS69RC AUTOMATIC

CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.

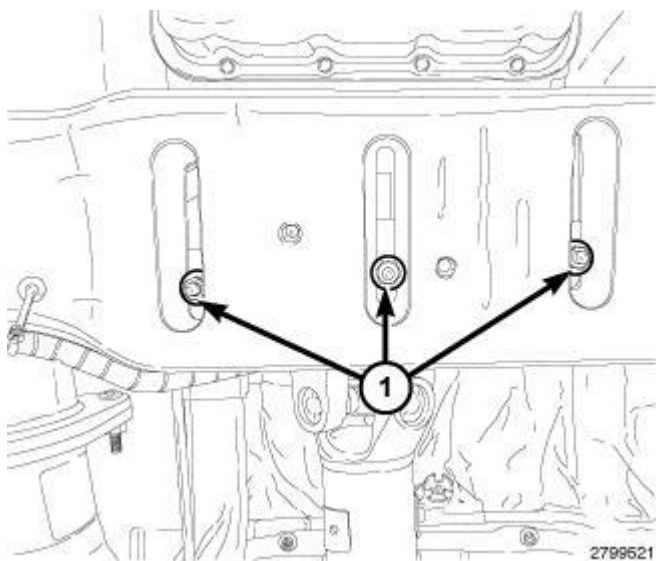


Fig. 238: Rear Transmission Mount To Crossmember Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

1. Raise the vehicle on a hoist.
2. Position a transmission jack in place.
3. Remove the rear transmission mount to crossmember nuts (1).

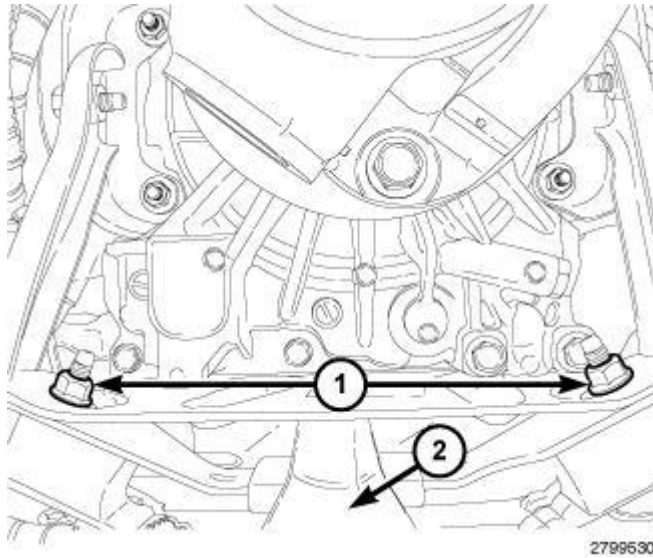


Fig. 239: Rear Transmission Mount & Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

4. Remove nuts (4) securing the rear transmission mount.
5. Using the transmission jack, raise the transmission.
6. Remove the rear transmission mount (2).

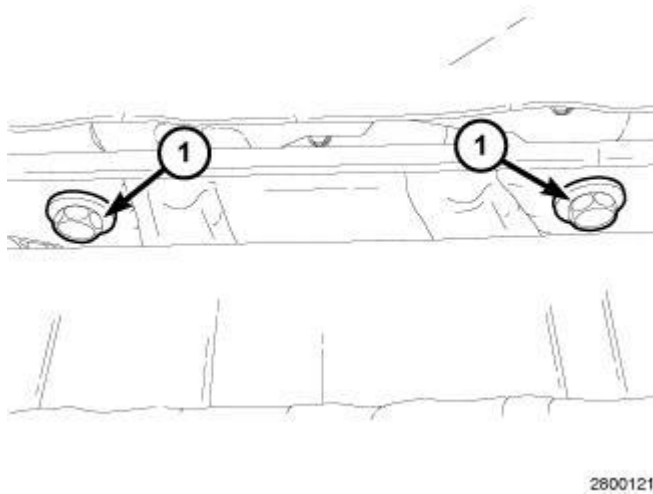
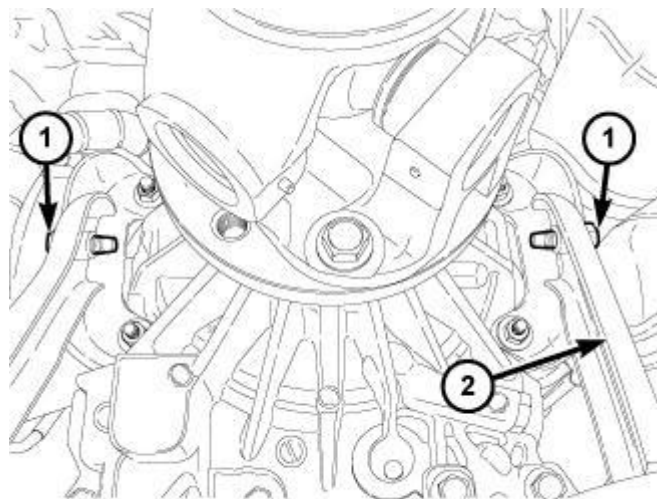


Fig. 240: Transmission Mount Support Bracket Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

7. With the transmission raised, remove bolts (1) from the transmission mount support bracket to transmission.



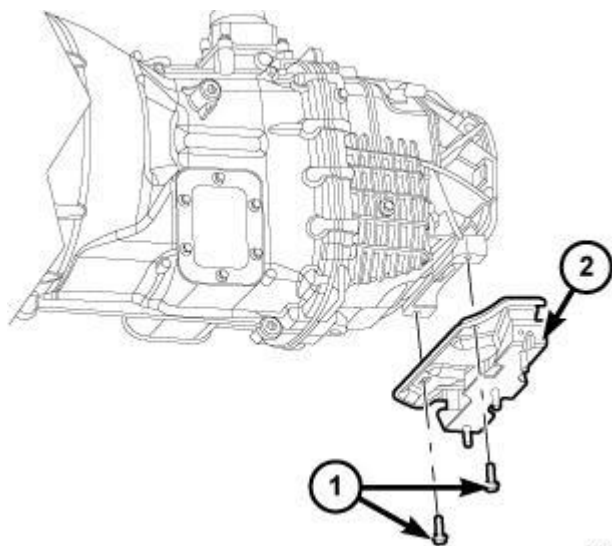
2800141

Fig. 241: Transmission Side Support Bracket & Bolts - AS68RC A/T
 Courtesy of CHRYSLER GROUP, LLC

8. Remove the bolts (1) and the transmission support bracket (2).

INSTALLATION

G 56 MANUAL



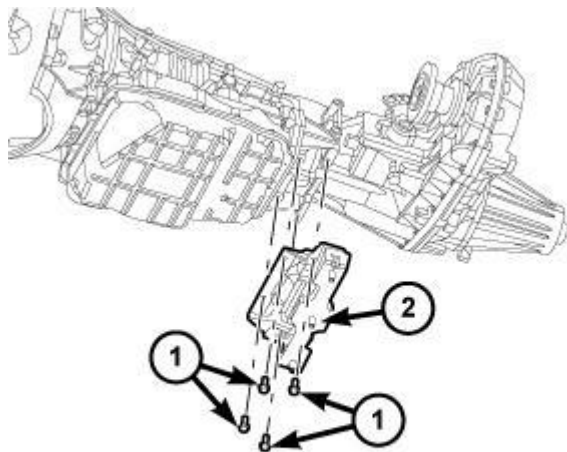
2798699

Fig. 242: Rear Transmission Mount & Bolts (M/T)
 Courtesy of CHRYSLER GROUP, LLC

1. Install the rear transmission mount (2). Tighten bolts (1) to 61 N.m (45 ft. lbs.).
2. Lower the transmission.
3. Install nuts securing transmission mount to crossmember. Tighten nuts to 54 N.m (40 ft. lbs.).
4. Remove transmission jack.

5. Lower the vehicle.

68 RFE AUTOMATIC

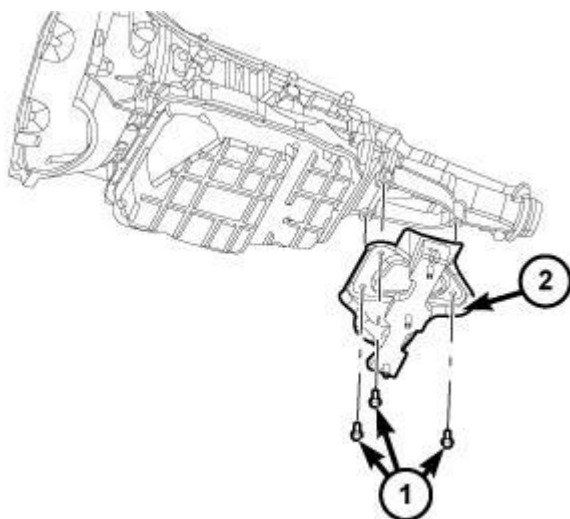


2798627

Fig. 243: Rear Transmission Mount & Bolts - 68RFE A/T - 4WD
 Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x4 Models

1. Install the rear transmission mount (2). Tighten bolts (1) to 61 N.m (45 ft. lbs.).
2. Lower the transmission.
3. Install nuts securing transmission mount to crossmember. Tighten nuts to 54 N.m (40 ft. lbs.).
4. Remove transmission jack.
5. Lower the vehicle.



2798718

Fig. 244: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Regular Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Regular Cab Models.

6. Install the rear transmission mount (2). Tighten bolts (1) to 61 N.m (45 ft. lbs.).
7. Lower the transmission.
8. Install nuts securing transmission mount to crossmember. Tighten nuts to 54 N.m (40 ft. lbs.).
9. Remove transmission jack.
10. Lower the vehicle.

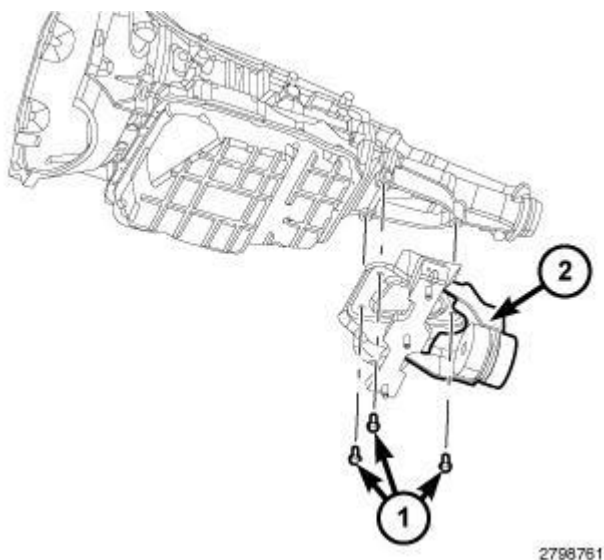


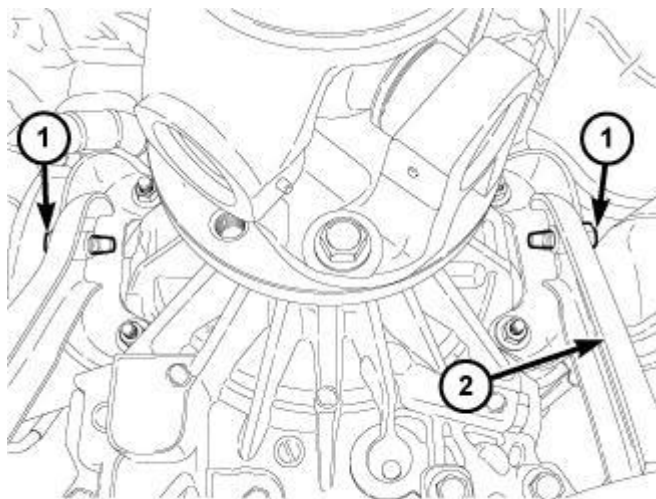
Fig. 245: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Crew & Mega Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Crew and Mega Cab Models.

11. Install the rear transmission mount (2). Tighten bolts (1) to 61 N.m (45 ft. lbs.).
12. Lower the transmission.
13. Install nuts securing transmission mount to crossmember. Tighten nuts to 54 N.m (40 ft. lbs.).
14. Remove transmission jack.
15. Lower the vehicle.

AS69RC AUTOMATIC

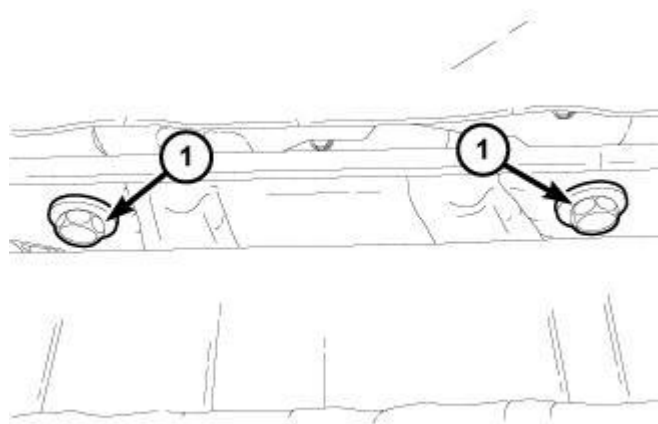
CAUTION: If replacing a engine mount/bracket, be certain to inspect all other engine mounts/brackets in the system. Failure to follow this caution may result in damage to the vehicle.



2800141

Fig. 246: Transmission Side Support Bracket & Bolts - AS68RC A/T
 Courtesy of CHRYSLER GROUP, LLC

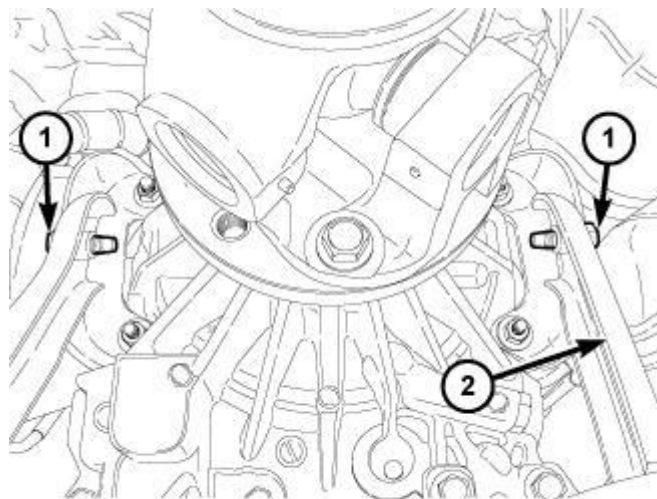
1. Position the transmission mount support bracket (2). Install bolts (1) finger tight.



2800121

Fig. 247: Transmission Mount Support Bracket Bolts - AS68RC A/T
 Courtesy of CHRYSLER GROUP, LLC

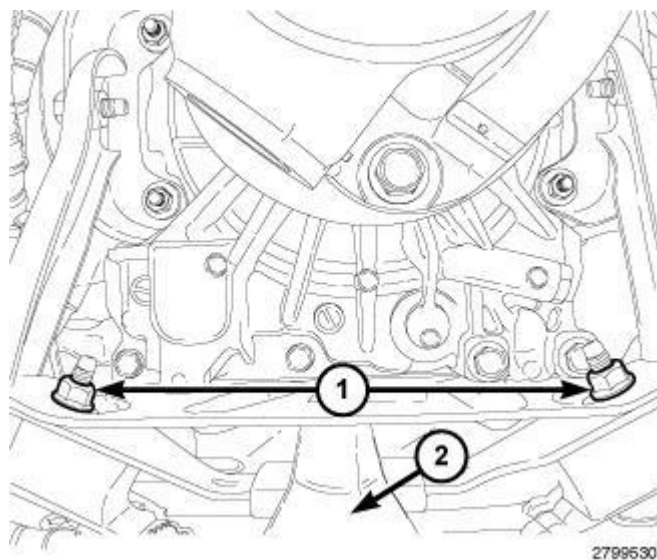
2. With the transmission raised, install the transmission mount support bracket to transmission bolts (1) and tighten to 54 N.m (40 ft. lbs.).



2800141

Fig. 248: Transmission Side Support Bracket & Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

3. Tighten the side support bracket bolts (1) to 55 N.m (41 ft. lbs.).



2799630

Fig. 249: Rear Transmission Mount & Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

4. Install the rear transmission mount (2). Tighten nuts (1) to 47 N.m (35 ft. lbs.).
5. Using the transmission jack, lower the transmission onto the crossmember.

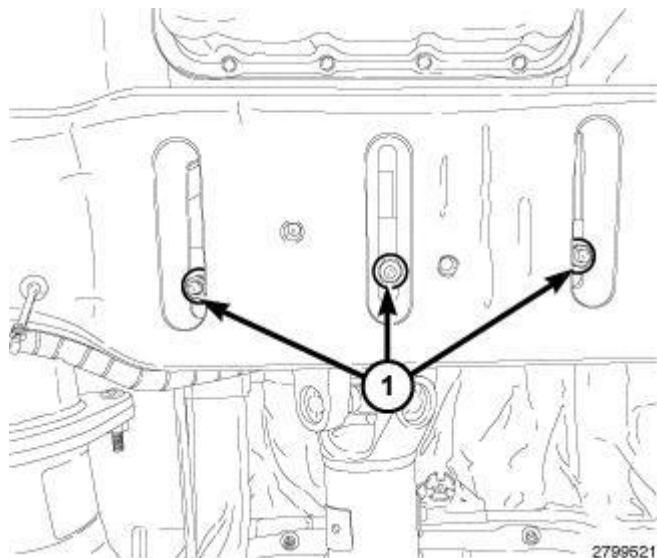


Fig. 250: Rear Transmission Mount To Crossmember Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

6. Install the transmission mount to crossmember nuts (1) Tighten nuts (1) to 47 N.m (35 ft. lbs.).
7. Remove the transmission jack.
8. Lower the vehicle on a hoist.

LUBRICATION

DESCRIPTION

DESCRIPTION

A gear driven gerotor type oil pump is mounted behind the front gear cover in the lower right portion on the engine.

OPERATION

OPERATION

A gerotor style oil pump draws oil from the crankcase through the suction tube and delivers it through the block where it enters the oil cooler cover and pressure regulator valve. When oil pressure exceeds 517 kPa (75 PSI), the valve opens exposing the dump port, which routes excess oil back to the oil pump.

At the same time, oil is directed to a cast in passage in the oil cooler cover, leading to the oil cooler element. As the oil travels through the element plates, it is cooled by engine coolant traveling past the outside of the plates. It is then routed to the oil filter head and through a full flow oil filter. If a plugged filter is encountered, the filter by-pass valve opens, allowing unfiltered oil to lubricate the engine. This condition can be avoided by frequent oil and filter changes, per the maintenance schedules found in the owner's manual. The by-pass valve is calibrated to open when it sees a pressure drop of more than 345 kPa (50 psi) across the oil filter.

The oil filter head then divides the oil between the engine and the turbocharger. The turbocharger receives filtered, cooled and pressurized oil through a supply line from the filter head. The oil lubricates the turbocharger and returns to the pan by way of a drain tube connecting the bottom of the turbocharger to a tube in the cylinder block.

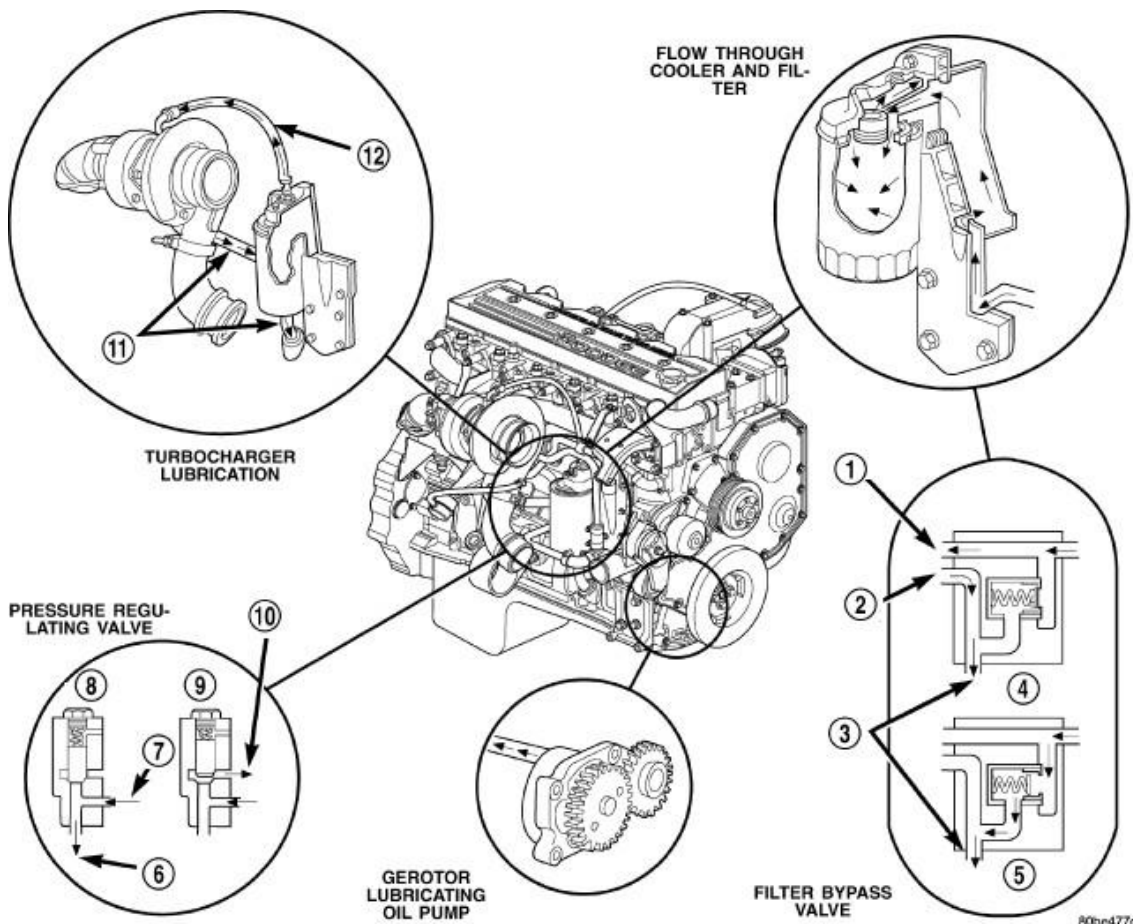


Fig. 251: Lubrication System Circulation (1 Of 2)

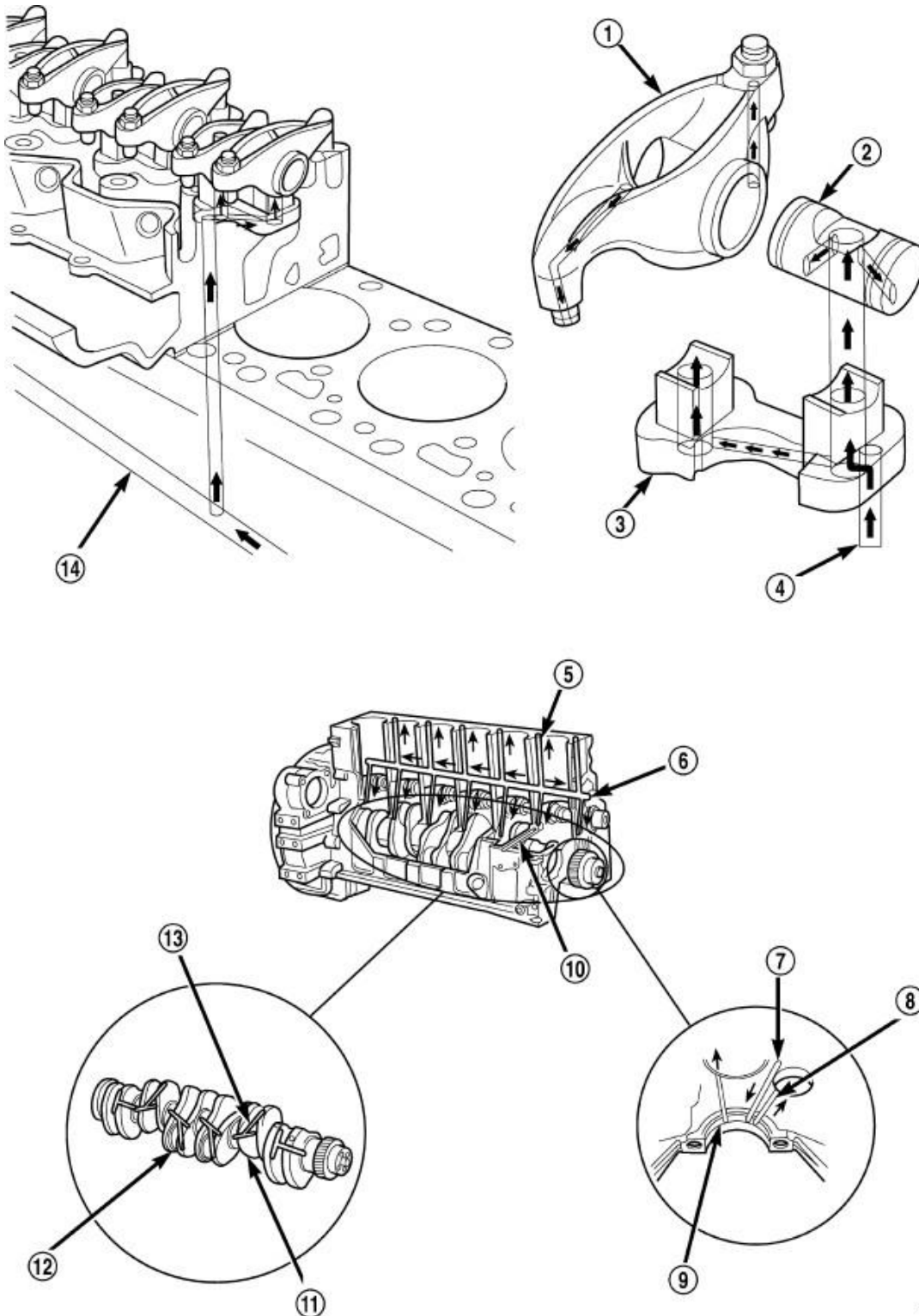
Courtesy of CHRYSLER GROUP, LLC

- 1 - TO FILTER
- 2 - FROM FILTER
- 3 - TO MAIN OIL RIFLE
- 4 - CLOSED
- 5 - OPEN
- 6 - TO COOLER
- 7 - FROM PUMP
- 8 - CLOSED
- 9 - OPEN
- 10 - OIL DRAINS BACK TO THE PUMP
- 11 - OIL DRAIN
- 12 - OIL SUPPLY

2013 RAM 3500 HD Big Horn

2013 ENGINE 6.7L Diesel - Service Information - Ram Pickup

Oil is then carried across the block to an angle drilling which intersects the main oil rifle (3). The main oil rifle (3) runs the length of the block and delivers oil to the crankshaft main journals and valve train. Oil travels to the crankshaft through a series of transfer drillings (one for each main bearing) and lubricates a groove in the main bearing upper shell. From there another drilling feeds the camshaft main journals. J-jet piston cooling nozzles (1, 4) are supplied by a separate oil rifle. Plugs are used in place of saddle jets when J-jets are used. Crankshaft internal cross-drillings supply oil to the connecting rod journals.



80b3b270

Fig. 252: Lubrication System Circulation (2 Of 2)
Courtesy of CHRYSLER GROUP, LLC

1 - ROCKER ARM

- 2 - ROCKER SHAFT
- 3 - PEDESTAL
- 4 - FROM MAIN OIL RIFLE
- 5 - TO VALVE TRAIN
- 6 - MAIN OIL RIFLE
- 7 - FROM MAIN OIL RIFLE
- 8 - TO CAMSHAFT
- 9 - TO PISTON COOLING NOZZLE
- 10 - FROM OIL COOLER
- 11 - CRANKSHAFT MAIN JOURNAL
- 12 - ROD JOURNAL
- 13 - TO ROD BEARING
- 14 - MAIN OIL RIFLE

Another series of transfer drillings intersecting the main oil rifle supply (14) the valve train components. Oil travels up the drilling, through a hole in the head gasket, and through a drilling in the cylinder head (one per cylinder), where it enters the rocker arm pedestal (3) and is divided between the intake and exhaust rocker arm (1). Oil travels up and around the rocker arm mounting bolt, and lubricates the rocker shaft (2) by cross drillings that intersect the mounting bolt hole. Grooves at both ends of the rocker shaft supply oil through the rocker arm where the oil travels to the push rod and socket balls.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE OIL PRESSURE

1. Remove the 1/8 NPT plug from the top of the oil filter housing.
2. Install Oil Pressure Line and Gauge Tool (special tool #C-3292A, Gauge, Pressure) with a suitable adapter.
3. Start engine and warm to operating temperature.
4. Record engine oil pressure and compare with engine oil pressure chart.

CAUTION: If engine oil pressure is zero at idle, DO NOT RUN THE ENGINE.

Engine Oil Pressure (MIN)	
At Idle	68.9 kPa (10 psi)
At 2500 RPM	206.9 kPa (30 psi)

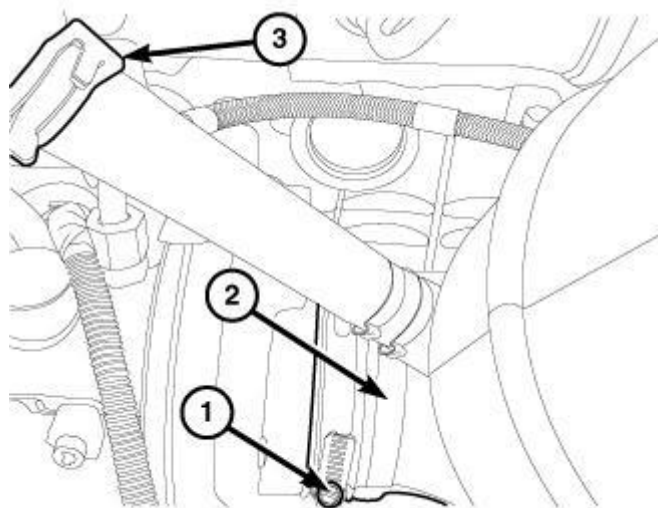
If minimum engine oil pressure is below these ranges. Refer to **DIAGNOSIS AND TESTING** .

5. Remove oil pressure gauge and install the 1/8 NPT plug.

COOLER AND LINES, OIL**REMOVAL****REMOVAL**

Fig. 253: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

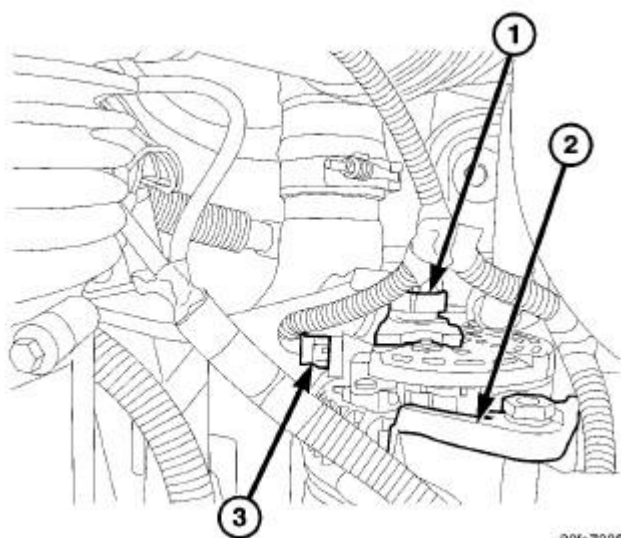
1. Disconnect both negative battery cables.
2. Remove the oil dipstick (3).
3. Remove fasteners (1, 4) and the engine cover (2).
4. Drain the coolant. Refer to **STANDARD PROCEDURE** .
5. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.



2423891

Fig. 254: Identifying Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the breather hose (3).
7. Loosen the clamp (1) and remove the outlet tube (2) from the turbocharger.



80fa7335

Fig. 255: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

8. Remove the generator. Refer to **GENERATOR, REMOVAL**.

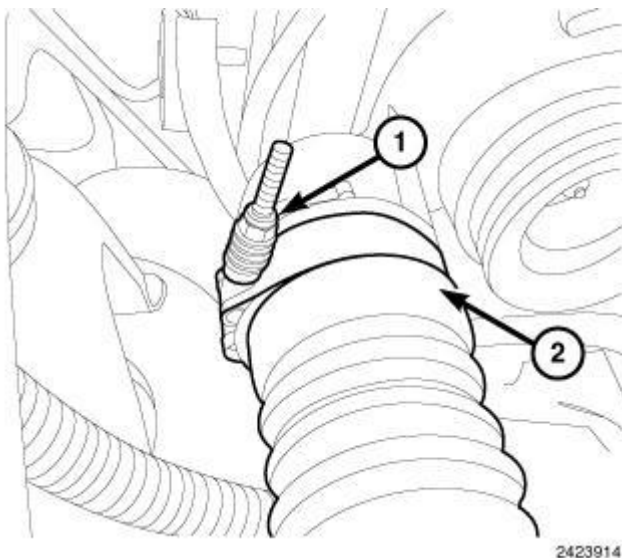


Fig. 256: Identifying Clamp & Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

9. Loosen clamp and disconnect the charge air inlet tube (4) from the turbocharger.

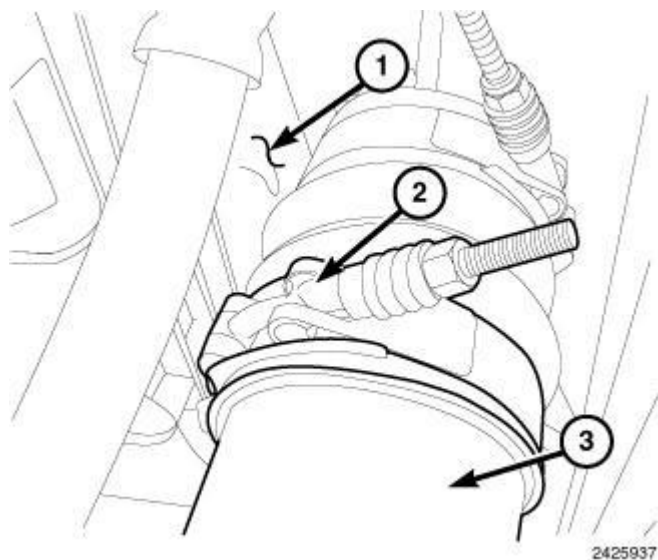
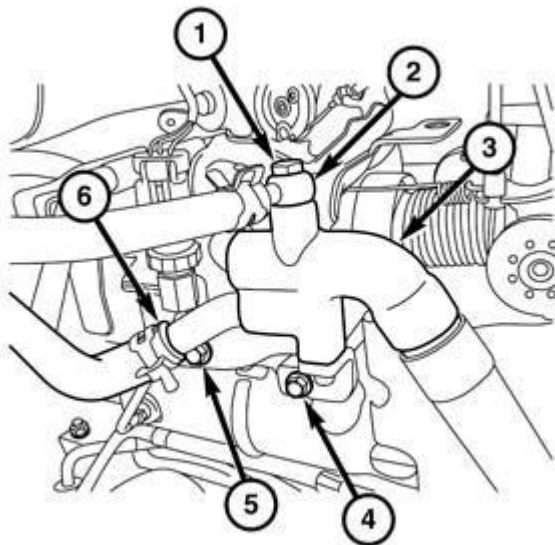


Fig. 257: Identifying Clamp, Charge Inlet Tube & Charge Air Cooler (CAC)
Courtesy of CHRYSLER GROUP, LLC

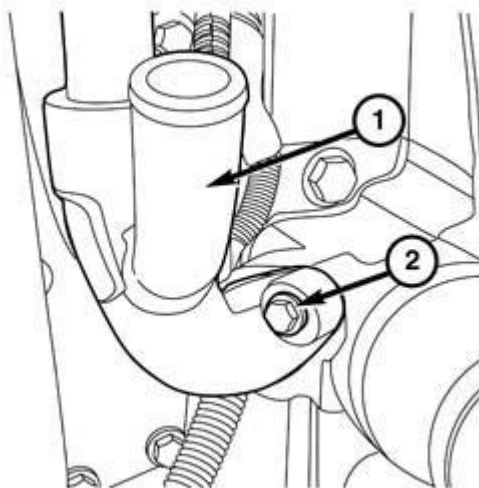
10. Loosen the clamp (2), disconnect the charge inlet tube (3) from Charge Air Cooler (CAC) (1) and remove charge inlet tube (3).



0911005512

Fig. 258: Upper Coolant Outlet Tube Components
Courtesy of CHRYSLER GROUP, LLC

11. Remove the banjo bolt (1) securing coolant hose (2).
12. Remove bolt (4) and the upper coolant outlet tube (3) from EGR cooler.



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Fig. 259: Removing/Installing Lower Coolant Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

13. Remove bolt (2) and the lower coolant outlet tube (1).

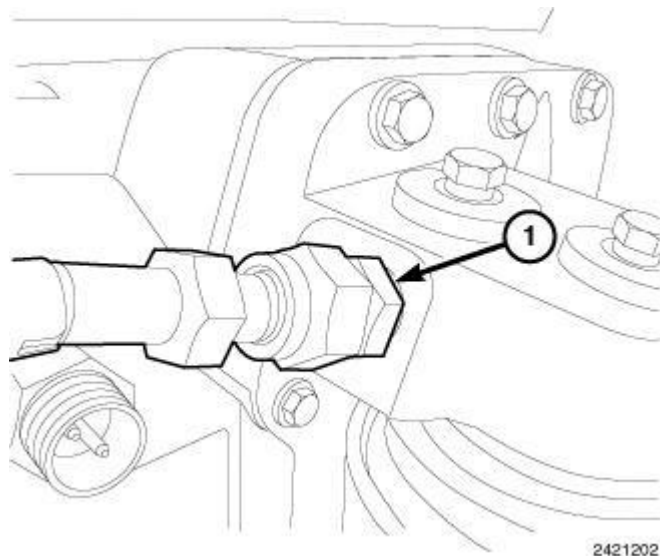


Fig. 260: Turbocharger Oil Supply Line
Courtesy of CHRYSLER GROUP, LLC

14. Remove the turbocharger oil supply line from oil cooler housing.

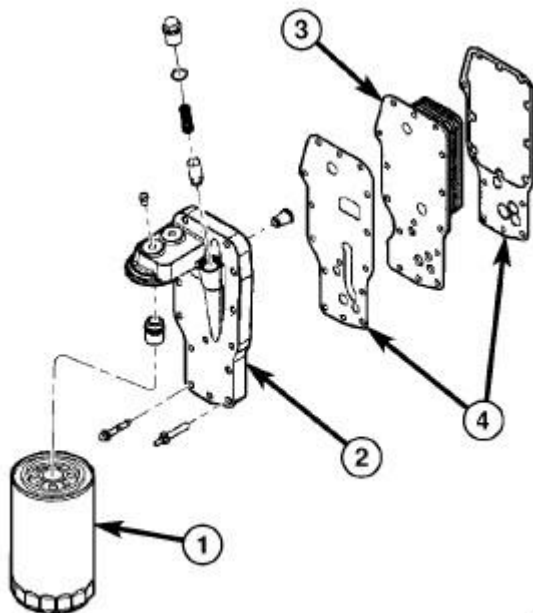


Fig. 261: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

15. Remove the oil filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 6.7L**.
16. Remove 14 bolts and the oil cooler from engine block.

CLEANING**CLEANING**

Clean the sealing surfaces.

Apply 483 kPa (70 psi) air pressure to the element to check for leaks. If the element leaks, replace the element.

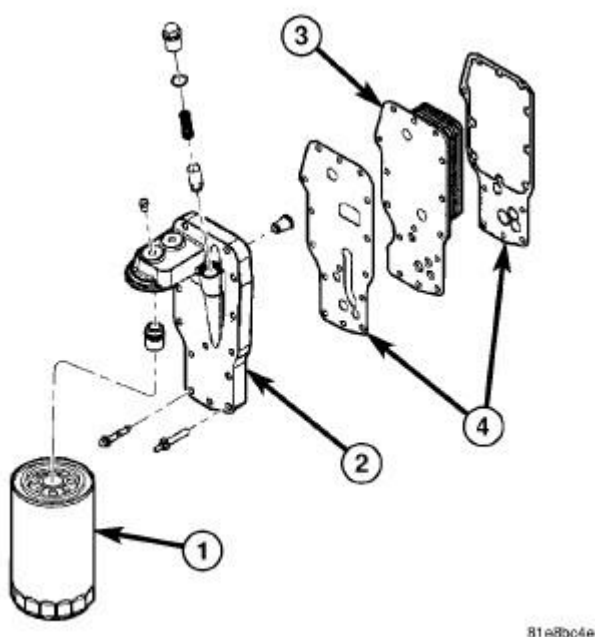
INSTALLATION**INSTALLATION**

Fig. 262: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

1. Clean block surface, oil cooler, and oil cooler housing of debris, dirt and remaining gasket material.

NOTE: Depending on the revision of oil cooler, mounting gaskets will differ. Make sure the gaskets line up with the oil cooler element and housing correctly. Failure to use correct gaskets will result in severe engine damage.

2. Using new gaskets (4) install the oil cooler (3) and the oil cooler housing (2) to engine block. Tighten the 14 bolts in a crisscross pattern to 24 N.m (18 ft. lbs.).
3. Install the new oil filter. Refer to **FILTER, ENGINE OIL, INSTALLATION, 6.7L**.

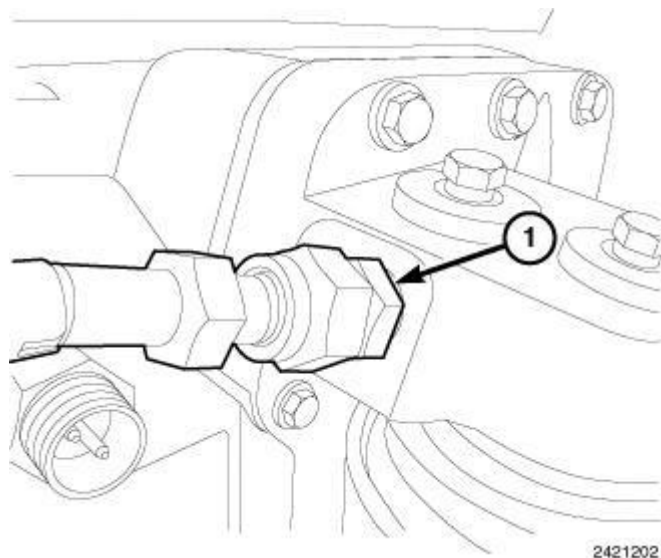


Fig. 263: Turbocharger Oil Supply Line
Courtesy of CHRYSLER GROUP, LLC

4. Install the turbocharger oil supply line to the oil cooler housing. Tighten to 24 N.m (18 ft. lbs.).

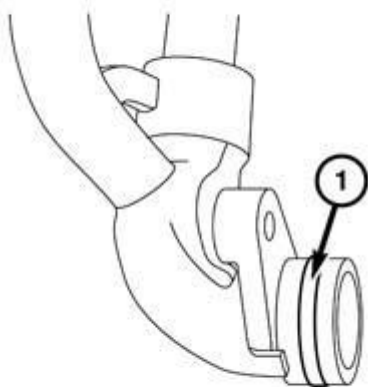
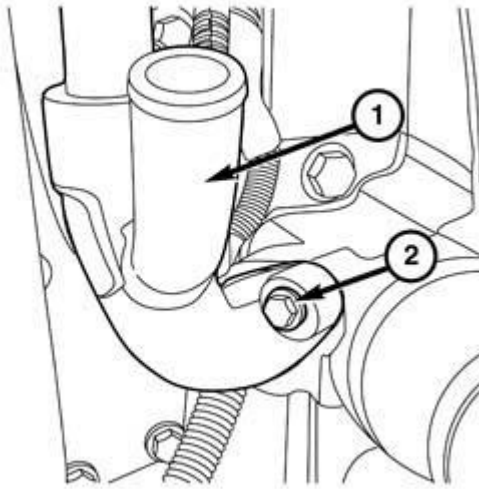


Fig. 264: O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

5. Lubricate the new O-ring seal (1) with a soap-water solution and install on coolant tube.



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Fig. 265: Removing/Installing Lower Coolant Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

6. Install the lower coolant outlet tube (1). Tighten bolt (2) to 10 N.m (89 in. lbs.).

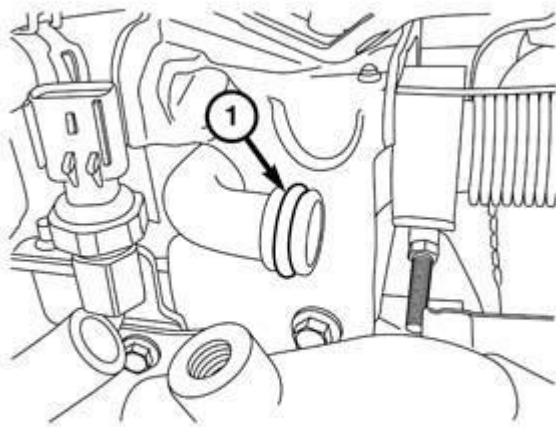
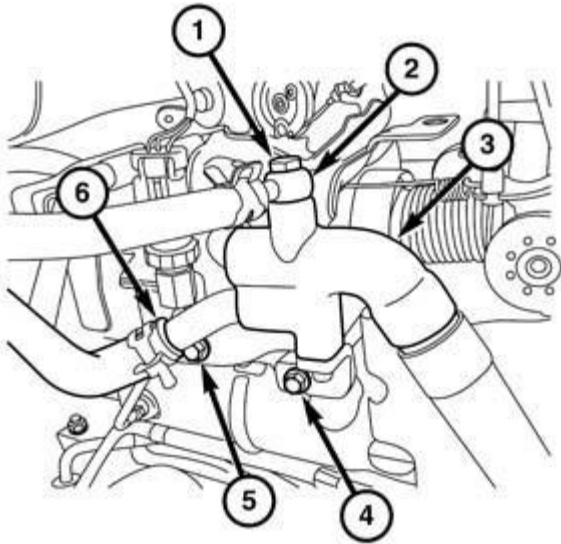


Fig. 266: O-Ring
Courtesy of CHRYSLER GROUP, LLC

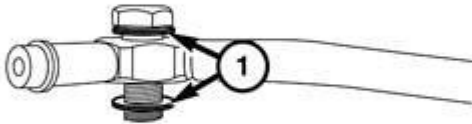
7. Lubricate the new O-rings with a soapy water solution and install O-ring (1) on the EGR cooler outlet tube.



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Fig. 267: Upper Coolant Outlet Tube Components
Courtesy of CHRYSLER GROUP, LLC

8. Install the upper coolant outlet tube (3). Tighten bolt (4) to 10 N.m (89 in. lbs.).

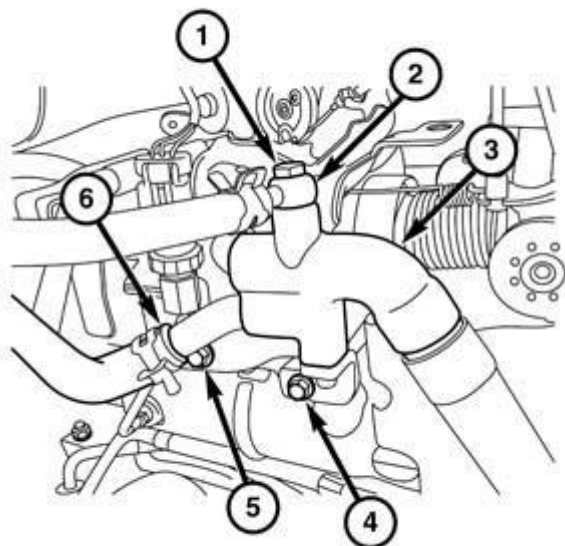


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Fig. 268: Sealing Washers

Courtesy of CHRYSLER GROUP, LLC

9. Install new sealing washers (1) onto banjo bolt.

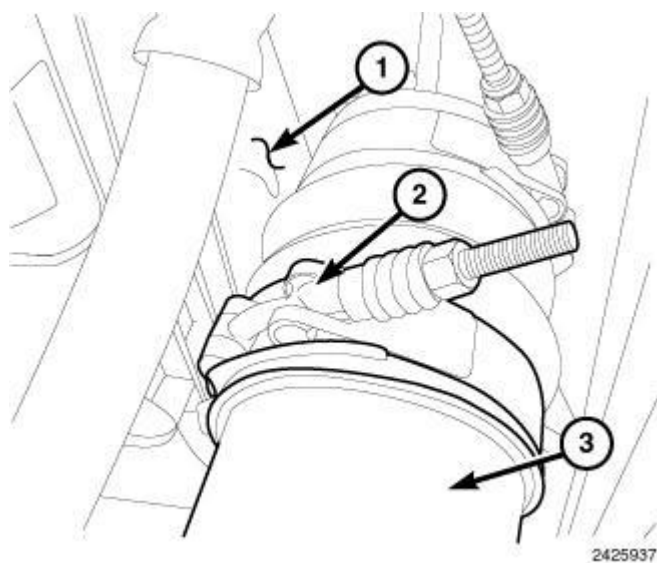


0911005512

Fig. 269: Upper Coolant Outlet Tube Components

Courtesy of CHRYSLER GROUP, LLC

10. Install the coolant vent hose (2). Tighten banjo bolt (1) to 11 N.m (97 in. lbs.).



2425937

Fig. 270: Identifying Clamp, Charge Inlet Tube & Charge Air Cooler (CAC)

Courtesy of CHRYSLER GROUP, LLC

11. Install charge inlet tube (3) to the Charge Air Cooler (CAC) (1). Tighten the clamp (2) to 11 N.m (95 in. lbs.).

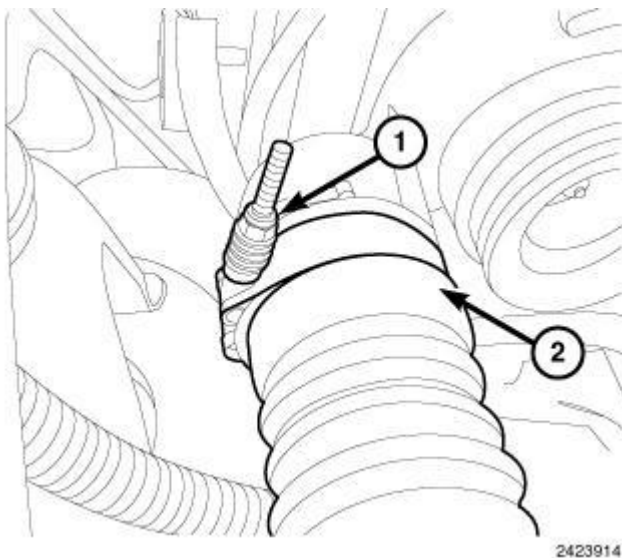


Fig. 271: Identifying Clamp & Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

12. Connect the charge air inlet tube (2) to the turbocharger. Tighten the clamp (2) to 11 N.m (95 in. lbs.).

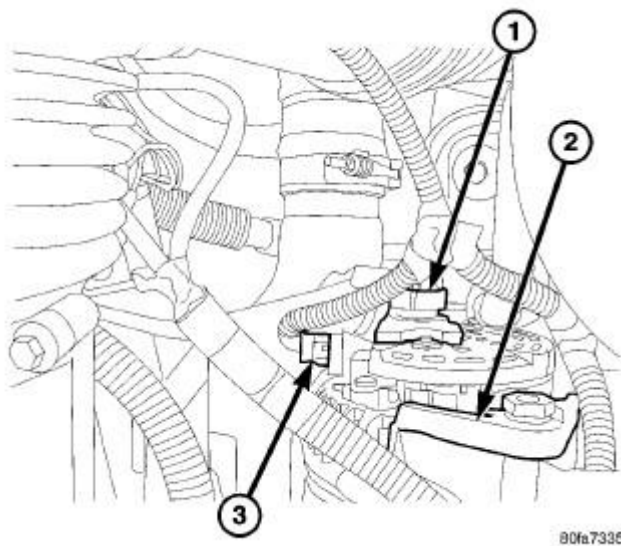
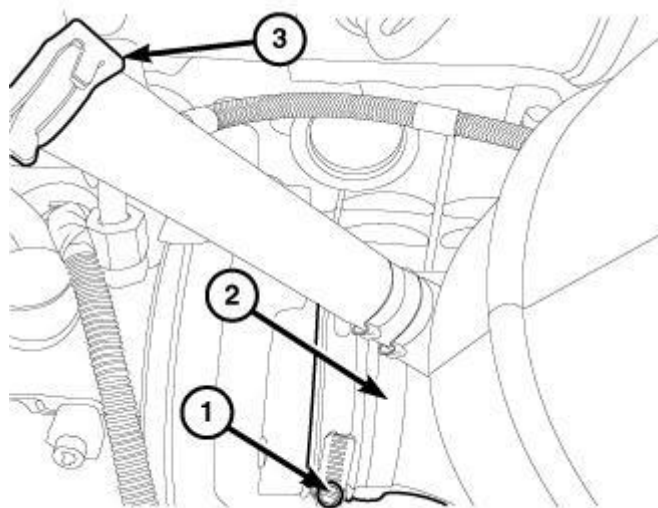


Fig. 272: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

13. Install the generator. Refer to **GENERATOR, INSTALLATION** .



2423891

Fig. 273: Identifying Clamp, Outlet Tube & Breather Hose
 Courtesy of CHRYSLER GROUP, LLC

14. Install the outlet tube (2) to the turbocharger. Tighten the clamp (1) to 11 N.m (95 in. lbs.).
15. Connect the breather hose (3).
16. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
17. Fill Engine with coolant. Refer to **STANDARD PROCEDURE**.



Fig. 274: Engine Cover, Bolts & Oil Dipstick
 Courtesy of CHRYSLER GROUP, LLC

18. Install the engine cover (2) and fasteners (1, 4).
19. Install the oil dipstick (3).
20. Connect both negative battery cables.

21. Start engine and check for leaks.

FILTER, ENGINE OIL

REMOVAL

DJ - REMOVAL

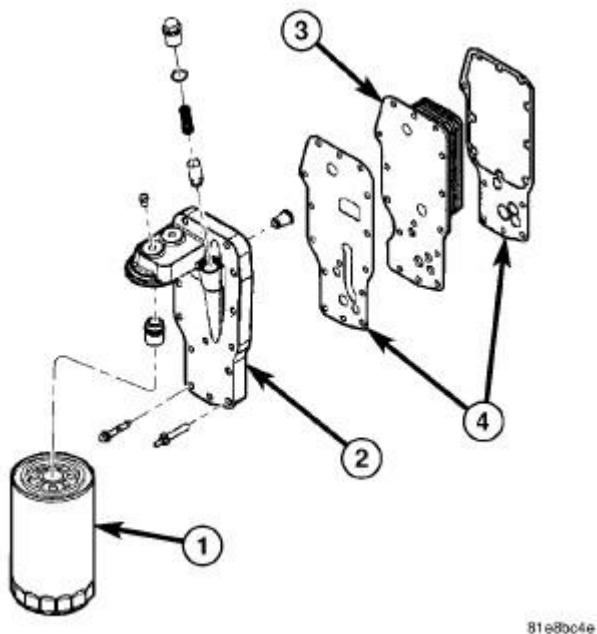


Fig. 275: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

1. Clean the area around the oil filter head. Remove the oil filter from below using a cap-style filter wrench.
2. Clean the gasket surface of the filter head. The oil filter canister O-ring seal can stick on the filter head. Make sure it is removed.

D2 - REMOVAL

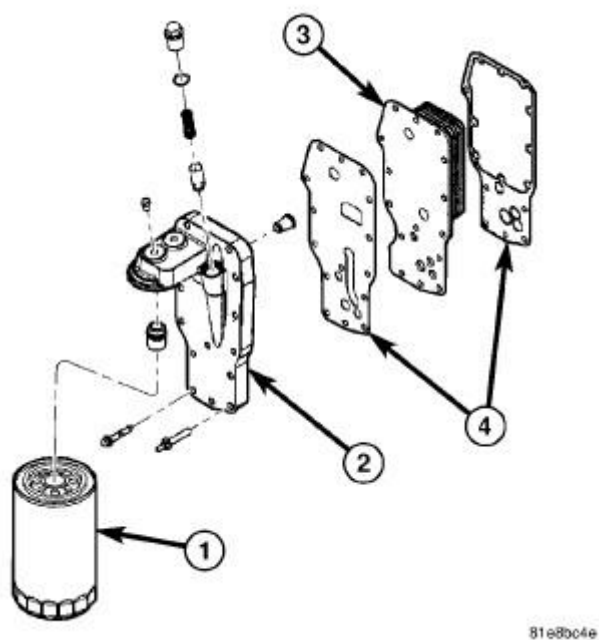


Fig. 276: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
 Courtesy of CHRYSLER GROUP, LLC

1. Clean the area around the oil filter head. Using a suitable filter wrench, remove the oil filter from top.
2. Clean the gasket surface of the filter head. The oil filter canister O-ring seal can stick on the filter head. Make sure it is removed.

INSTALLATION

DJ - INSTALLATION

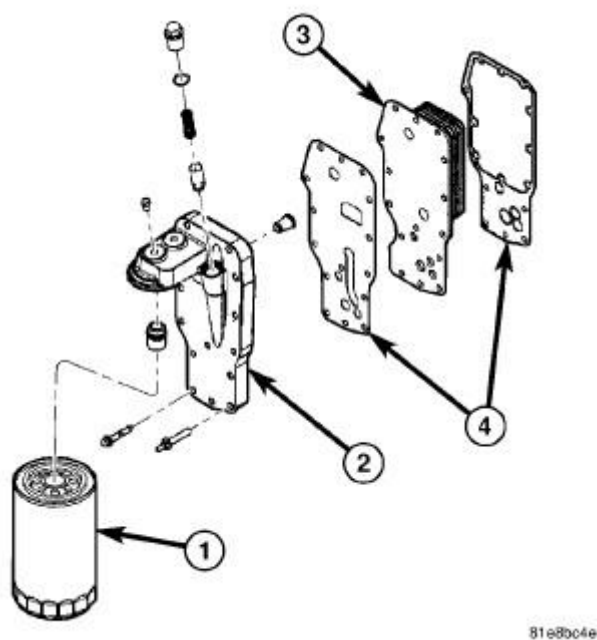


Fig. 277: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
 Courtesy of CHRYSLER GROUP, LLC

1. Fill the oil filter canister with clean oil before installation. Use the same type oil that will be used in the engine.
2. Apply a light film of lubricating oil to the O-ring sealing surface before installing the filter.

CAUTION: Mechanical over-tightening may distort the threads or damage the filter element seal.

3. Install the filter until it contacts the sealing surface of the oil filter adapter. Tighten oil filter an additional 3/4 turn.

D2 - INSTALLATION

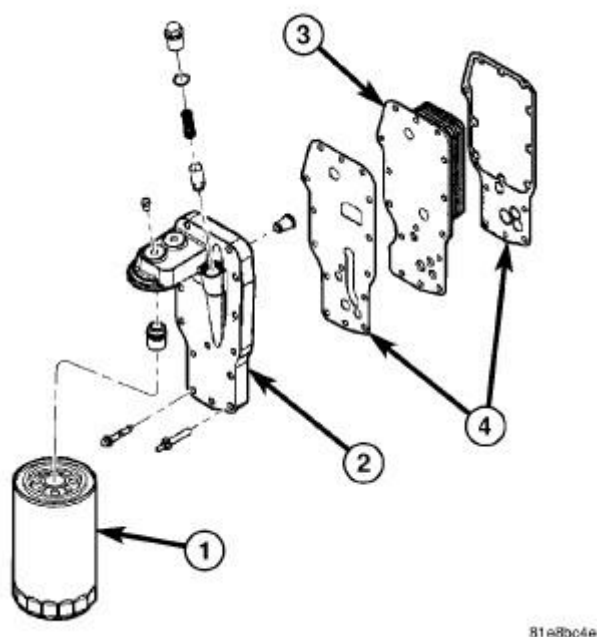


Fig. 278: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets

Courtesy of CHRYSLER GROUP, LLC

1. Fill the oil filter canister with clean oil before installation. Use the same type oil that will be used in the engine.
2. Apply a light film of lubricating oil to the O-ring sealing surface before installing the filter.

CAUTION: Mechanical over-tightening may distort the threads or damage the filter element seal.

3. Install the filter until it contacts the sealing surface of the oil filter adapter. Tighten oil filter an additional 3/4 turn.

OIL

STANDARD PROCEDURE

ENGINE OIL LEVEL

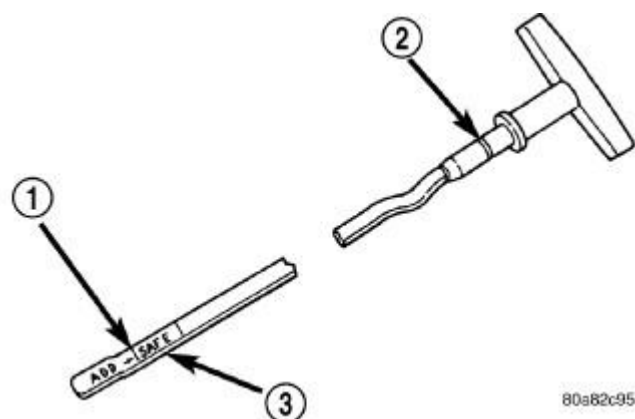


Fig. 279: Oil Level Indicator (Dipstick)

Courtesy of CHRYSLER GROUP, LLC

1 - ADD OIL MARK

2 - O-RING

3 - SAFE RANGE

CAUTION: Do not overfill crankcase with engine oil, oil foaming and oil pressure loss can result.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable oil level is in the SAFE RANGE (3) on the engine oil dipstick.

NOTE: Note: The best time to check the engine oil level is after the engine is at operating temperature and has been turned off (not running) for 30 minutes.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately 30 minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Replace dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the SAFE RANGE area on the dipstick.
7. Replace dipstick.

ENGINE OIL SERVICE

WARNING: Hot oil can cause personal injury.

NOTE: Change engine oil and filter at intervals specified in the owner's manual.

1. Operate the engine until the water temperature reaches 60°C (140°F). Shut the engine off.
2. Use a container that can hold at least 14 liters (15 quarts) to hold the used oil. Remove the oil drain plug and drain the used engine oil into the container. Allow 30 minutes for the oil to drain.
3. Always check the condition of the used oil. This can give you an indication of engine problems that might exist.
 - Thin, black oil indicates fuel dilution.
 - Milky discoloration indicates coolant dilution.
4. Clean the area around the oil filter head. Remove the filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 6.7L**.
5. Install new oil filter. Refer to **FILTER, ENGINE OIL, INSTALLATION, 6.7L**.
6. Clean the drain plug and the sealing surface of the pan. Check the condition of the threads and sealing surface on the oil pan and drain plug.
7. Install the drain plug. Tighten the plug to 50 N.m (37 ft. lbs.).
8. Use only High-Quality Low Ash Multi-Viscosity lubricating oil in the Cummins Turbo Diesel engine. Choose the correct oil for the operating conditions. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION**.
9. Fill the engine with the correct grade of new oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS**.
10. Start the engine and operate it at idle for several minutes. Check for leaks at the filter and drain plug.
11. Stop engine. Wait 30 minutes to allow the oil to drain back to the pan and check the level again.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing of used engine oil after it has been drained from a vehicle's engine.

JET, PISTON OIL COOLER**DESCRIPTION****DESCRIPTION**

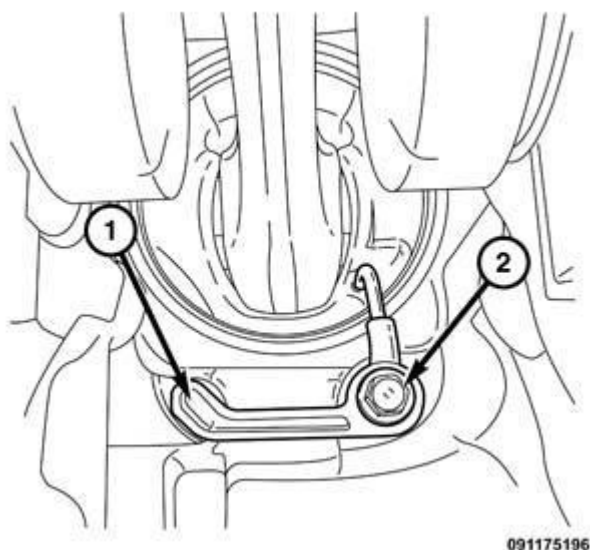


Fig. 280: Removing/Installing Oil Jet Piston Cooling Nozzles
Courtesy of CHRYSLER GROUP, LLC

In model year 2013 the piston cooling oil jets are green in color and should not be used in older model year engines.

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

REMOVAL

REMOVAL

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

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

1. Disconnect the negative battery cable.
2. Remove the oil pan. Refer to **PAN, OIL, REMOVAL, 6.7L**.

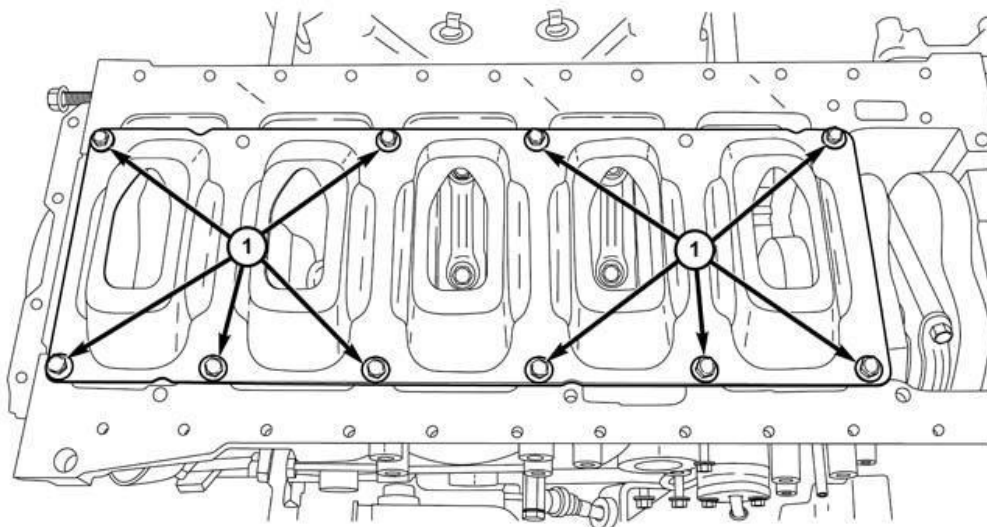


Fig. 281: Block Stiffener & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the engine block stiffener.

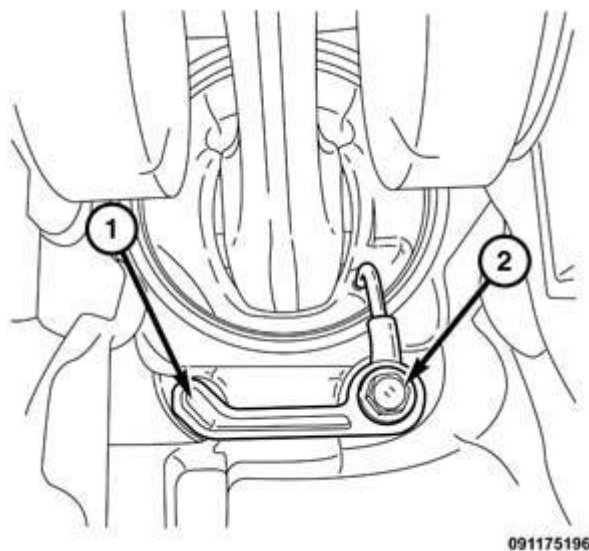


Fig. 282: Removing/Installing Oil Jet Piston Cooling Nozzles
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolt (2) and the oil jet (1).

INSTALLATION

INSTALLATION

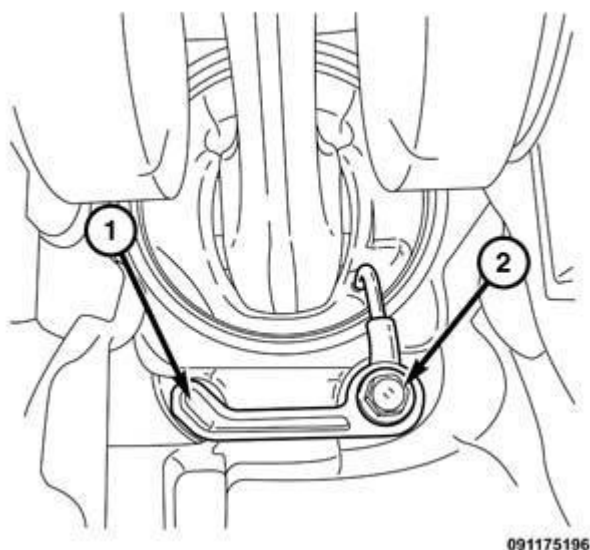


Fig. 283: Removing/Installing Oil Jet Piston Cooling Nozzles
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage.

1. Lubricate oil jet O-ring seal.
2. Install oil jet (1). Tighten bolt to 15 N.m (133 in. lbs.).

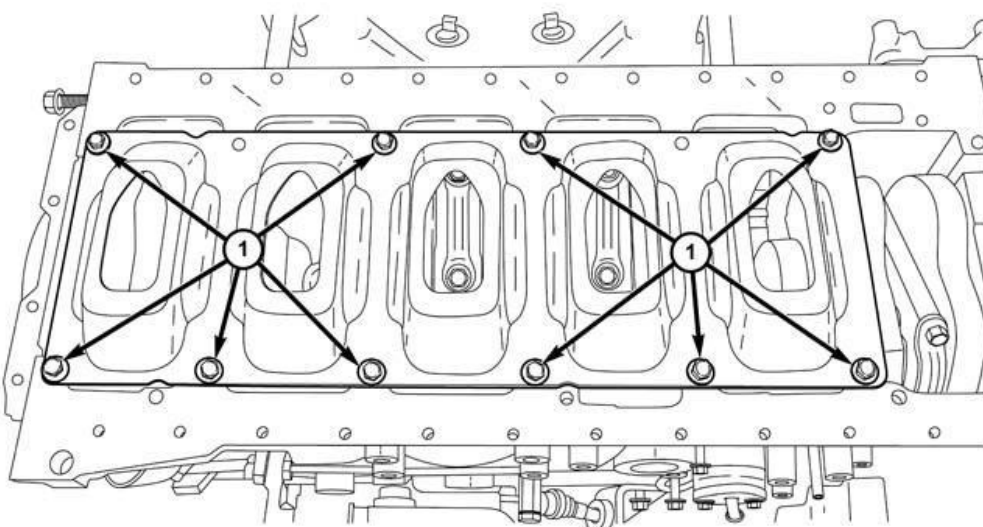


Fig. 284: Block Stiffener & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the engine block stiffener. Tighten bolts (1) to 43 N.m (32 ft. lbs.).

4. Install the oil pan. Refer to **PAN, OIL, INSTALLATION, 6.7L.**
5. Connect the negative battery cable.

PAN, OIL

REMOVAL

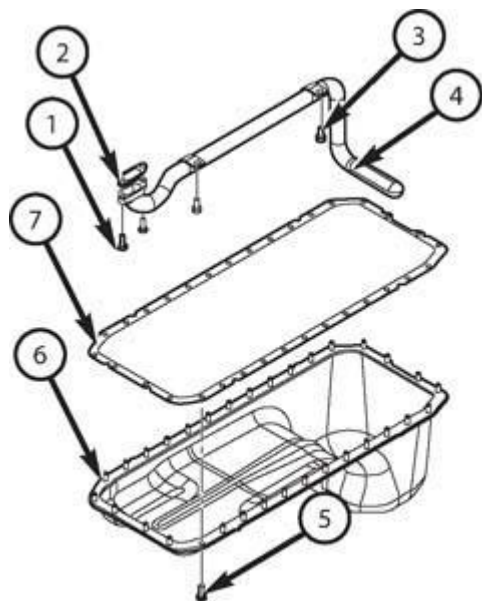
DJ - REMOVAL



Fig. 285: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate both negative battery cables.
2. Remove the engine oil dipstick (3).
3. Remove fasteners (1, 4) and the engine cover (2).
4. Remove the air body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L.**
5. Remove bolt securing upper radiator hose support bracket.
6. If equipped, remove the left generator and mounting brackets. Refer to **GENERATOR, REMOVAL**.
7. Install the (special tool #10474, Brackets, Engine Lifting) and securely tighten bolts.
8. Remove the oil fill cap.
9. Install Driveline Support Fixture (special tool #8534B, Fixture, Driveline Support).
10. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.
11. Drain the engine oil. Refer to **OIL**.
12. Loosen the right and left engine mount bolts.
13. Lower the vehicle.
14. Use the Engine Support Fixture No. (special tool #8534B, Fixture, Driveline Support) to raise engine out of the front mounts.

15. Raise the vehicle.



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Fig. 286: Removing/Installing Oil Pan
Courtesy of CHRYSLER GROUP, LLC

16. Remove oil pan bolts (5), break the oil pan to block seal, and lower pan slightly.
17. Remove oil suction tube bolts (1 and 3) and lower the suction tube (4) into oil pan (6).
18. Remove the oil pan (6) and gasket (7).

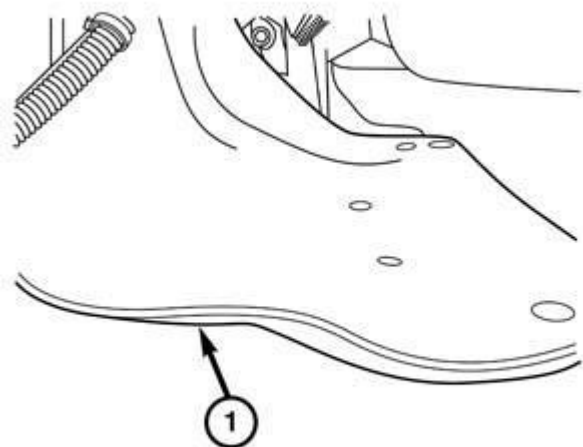
D2 - REMOVAL



Fig. 287: Engine Cover, Bolts & Oil Dipstick

Courtesy of CHRYSLER GROUP, LLC

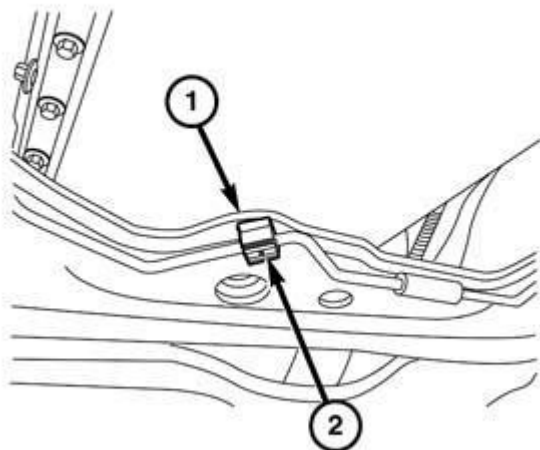
- 1.
2. Disconnect both negative battery cables.
3. Remove the engine oil dipstick (3).
4. Remove fasteners (1, 4) and the engine cover (2).
5. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
6. Remove bolt securing upper radiator hose support bracket.
7. If equipped, remove the left generator and mounting brackets. Refer to **GENERATOR, REMOVAL**.
8. Install the (special tool #10474, Brackets, Engine Lifting) and securely tighten bolts.
9. Remove the oil fill cap.
10. Install Driveline Support Fixture (special tool #8534B, Fixture, Driveline Support).
11. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.
12. Drain the engine oil. Refer to **OIL**.
13. Loosen the right and left engine mount bolts.
14. Lower the vehicle.
15. Use the Driveline Support Fixture (special tool #8534B, Fixture, Driveline Support) to raise engine out of the front mounts.
16. Raise the vehicle.



0911004865

Fig. 288: Oil Drip Tray**Courtesy of CHRYSLER GROUP, LLC**

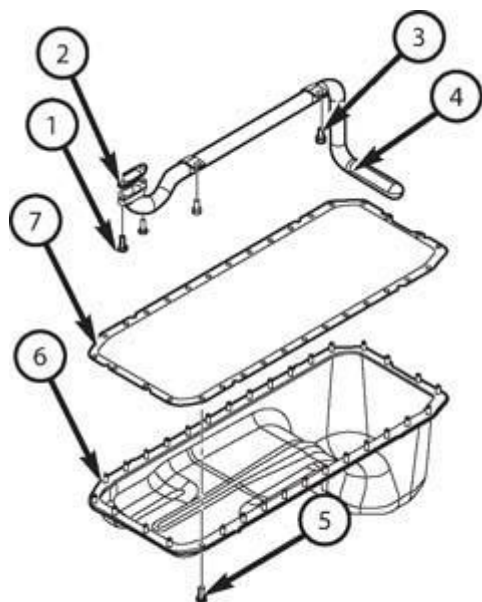
17. Remove retainers and the oil drip tray (1).



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Fig. 289: Brake Line Retaining & Tap
Courtesy of CHRYSLER GROUP, LLC

18. If necessary, remove the brake line retaining (2) and slightly bend the tap (1) down to allow for clearance.



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Fig. 290: Removing/Installing Oil Pan
Courtesy of CHRYSLER GROUP, LLC

19. Remove the oil pan bolts (5), break the pan to block seal, and lower pan slightly.

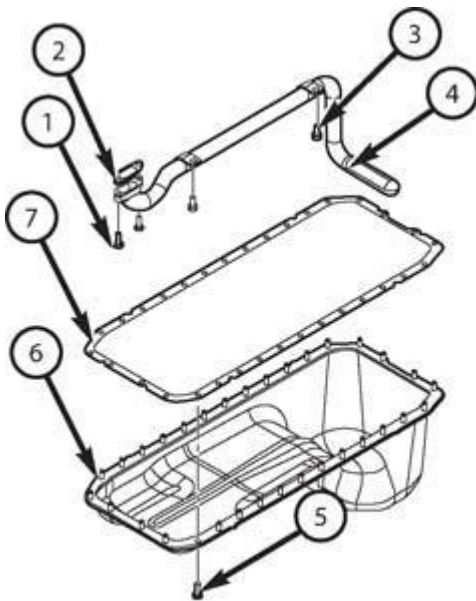
20. Remove oil suction tube bolts (1 and 3) and lower the suction tube (4) into oil pan (6).
21. Remove the oil pan (6) and gasket (7).

CLEANING**CLEANING**

Remove all gasket material from the oil pan and cylinder block sealing surfaces. Extra effort may be required around T-joint areas. Clean oil pan and flush suction tube with a suitable solvent.

INSPECTION**INSPECTION**

Inspect the oil pan, suction tube, and tube braces for cracks and damage. Replace any defective component. Inspect the oil drain plug and drain hole threads. Inspect the oil pan sealing surface for straightness. Repair any minor imperfections with a ball-peen hammer. Do not attempt to repair an oil pan by welding.

INSTALLATION**DJ - INSTALLATION**

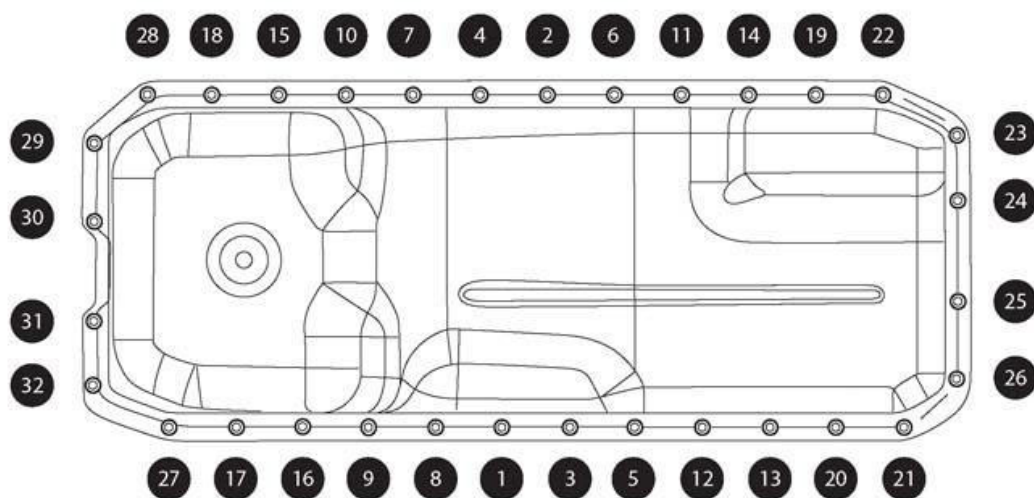
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Fig. 291: Removing/Installing Oil Pan
Courtesy of CHRYSLER GROUP, LLC

1. Clean the sealing surfaces of the cylinder block and oil pan with a suitable cleaner.
2. Clean the oil pan.
3. Clean the oil pan T-joints.
4. Fill the T-joint between the pan rail/gear housing and pan rail/rear seal retainer with sealant. Use Mopar®

Silicone Rubber Adhesive Sealant or equivalent.

5. Position the new oil pan gasket (7) onto oil pan.
6. Place suction tube (4) in oil pan and guide them into place. Using a new tube-to-block gasket (2), install the suction tube (4). Tighten the bolts (1 and 3) to 24 N.m (18 ft. lbs.).
7. Install the oil pan (6) and tighten bolts finger tight.



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Fig. 292: Oil Pan Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

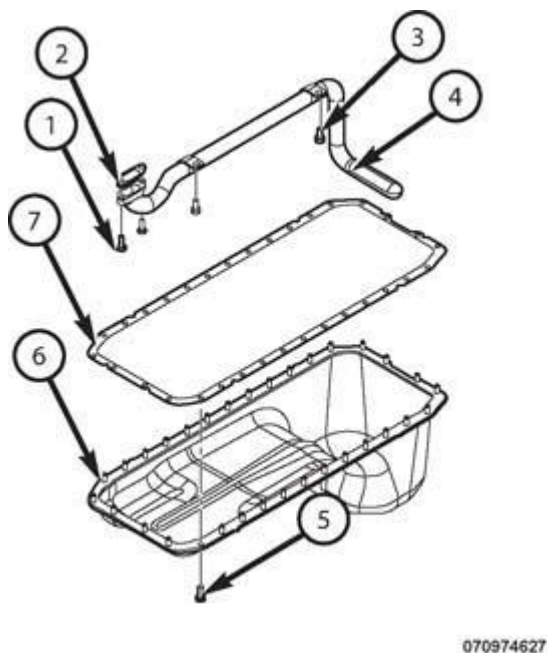
8. Starting from the center and working outward, tighten the oil pan bolts to 28 N.m (21 ft. lbs.).
9. Lower the vehicle.
10. Use the Drive Line Fixture (special tool #8534B, Fixture, Driveline Support) to lower engine into the front mounts.
11. Raise the vehicle.
12. Tighten the right side and left side motor mount through bolts to 136 N.m (100 ft. lbs.).
13. Lower the vehicle.
14. Remove the Drive Line Fixture (special tool #8534B, Fixture, Driveline Support).
15. Remove bolts and the (special tool #10474, Brackets, Engine Lifting).
16. If equipped, install the left generator mounting bracket and generator. Refer to **GENERATOR, INSTALLATION**.
17. 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.
18. Install the bolt securing upper radiator hose support bracket and securely tighten.
19. Install the engine oil fill cap.
20. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.



Fig. 293: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

21. Install the engine cover (2) and fasteners (1, 4).
22. Install the engine oil dipstick (3).
23. Connect both negative battery cables.
24. Fill the crankcase with new engine oil.
25. Start engine and check for leaks. Stop engine, check oil level, and adjust, if necessary.

D2 - INSTALLATION

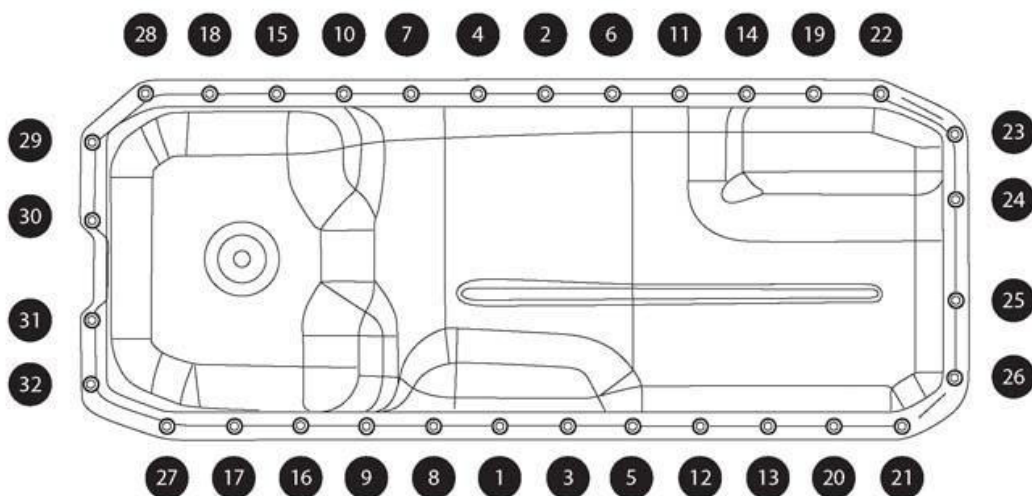


070974627

Fig. 294: Removing/Installing Oil Pan

Courtesy of CHRYSLER GROUP, LLC

1. Clean the sealing surfaces of the cylinder block and oil pan with a suitable cleaner.
2. Clean the oil pan.
3. Clean the oil pan T-joints.
4. Fill the T-joint between the pan rail/gear housing and pan rail/rear seal retainer with sealant. Use Mopar® Silicone Rubber Adhesive Sealant or equivalent.
5. Position the new oil pan gasket (7) onto oil pan.
6. Place suction tube (4) in oil pan and guide them into place. Using a new tube-to-block gasket (2), install the suction tube (4). Tighten the bolts (1 and 3) to 24 N.m (18 ft. lbs.).
7. Install the oil pan (6) and tighten bolts finger tight.

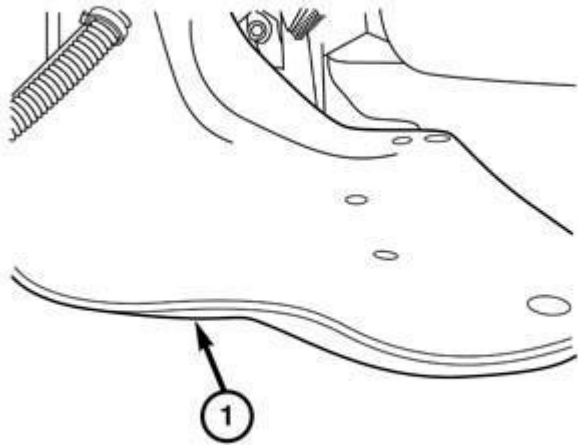


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Fig. 295: Oil Pan Bolt Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

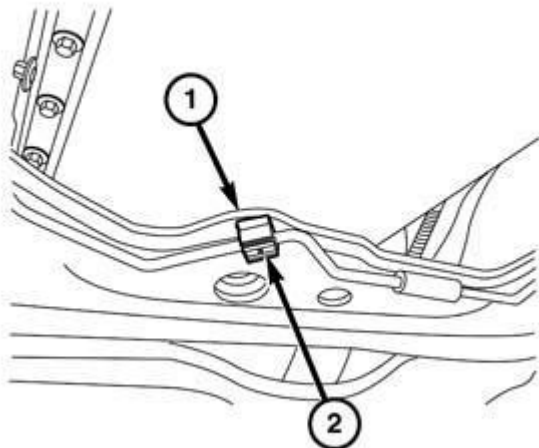
8. Starting from the center and working outward, tighten the oil pan bolts to 28 N.m (21 ft. lbs.).



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Fig. 296: Oil Drip Tray
Courtesy of CHRYSLER GROUP, LLC

9. Install the oil drip tray (1) and retainers.



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Fig. 297: Brake Line Retaining & Tap
Courtesy of CHRYSLER GROUP, LLC

10. If necessary, straighten tab (1) and install brake line retainer (2).
11. Lower the vehicle.
12. Lower the engine into the motor mounts.
13. Raise the vehicle.
14. Tighten the right side and left side motor mount through bolts to 136 N.m (100 ft. lbs.).
15. Lower the vehicle.
16. Remove the Drive Line Fixture (special tool #8534B, Fixture, Driveline Support).
17. Remove bolts and the (special tool #10474, Brackets, Engine Lifting).
18. If equipped, install the left generator mounting bracket and generator. Refer to **GENERATOR, INSTALLATION**.
19. 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.
20. Install the bolt securing upper radiator hose support bracket and securely tighten.
21. Install the engine oil fill cap.
22. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.

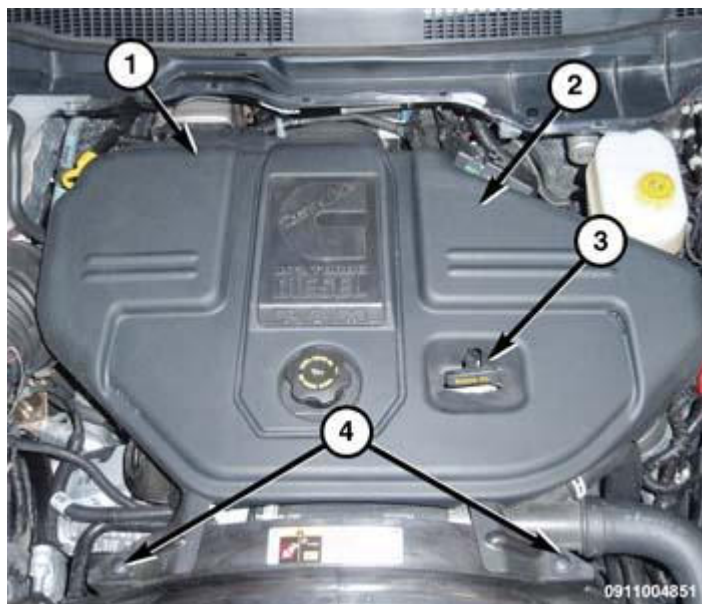
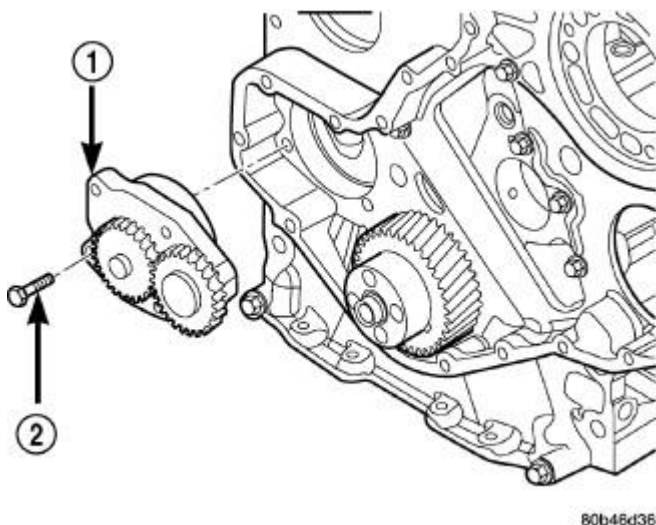


Fig. 298: Engine Cover, Bolts & Oil Dipstick
 Courtesy of CHRYSLER GROUP, LLC

23. Install the engine cover (2) and fasteners (1, 4).
24. Install the engine oil dipstick (3).
25. Connect both negative battery cables.
26. Fill the crankcase with new engine oil.
27. Start engine and check for leaks. Stop engine, check oil level, and adjust, if necessary.

PUMP, ENGINE OIL

REMOVAL**REMOVAL****Fig. 299: Oil Pump & Bolts**

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both battery negative cables.
2. Remove the engine timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 6.7L**.
3. Remove the four mounting bolts (2) and pull the oil pump (1) from the bore in the cylinder block.

CLEANING**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**INSPECTION**

Disassemble and inspect the oil pump as follows:

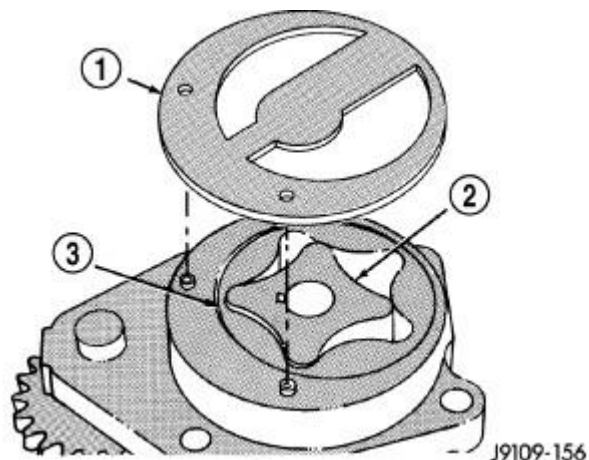


Fig. 300: Oil Pump Back Plate, Gerotor & Gerotor Planetary
Courtesy of CHRYSLER GROUP, LLC

- 1 - OIL PUMP BACK PLATE
- 2 - GEROTOR
- 3 - GEROTOR PLANETARY

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.

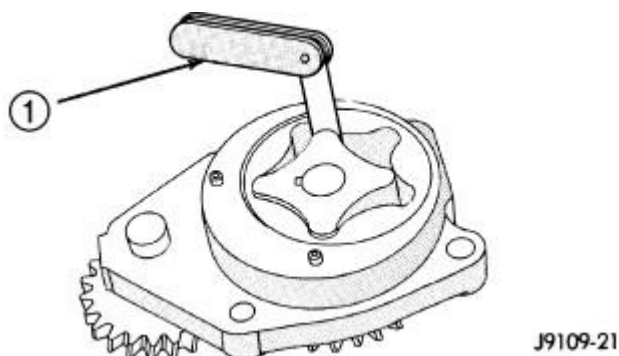


Fig. 301: Measuring Clearance Between Gerotor Tip & Housing
Courtesy of CHRYSLER GROUP, LLC

- 1 - FEELER GAUGE

5. Install the gerotor planetary in the original position.
6. Measure the tip clearance (1). Maximum clearance is 0.178 mm (0.007 inch). If the oil pump is out of limits, replace the pump.

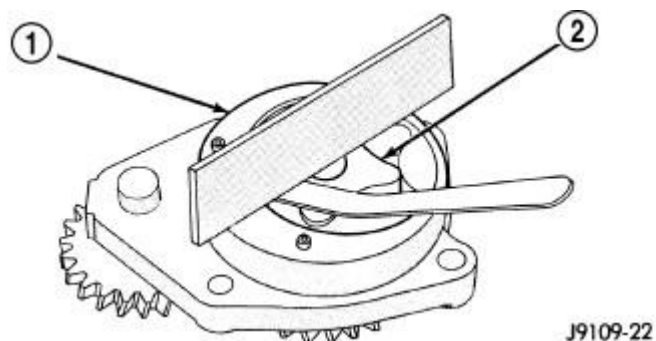


Fig. 302: Measuring Gerotor To Port Plate Clearance
Courtesy of CHRYSLER GROUP, LLC

1 - PORT
PLATE
2 - GEROTOR

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.

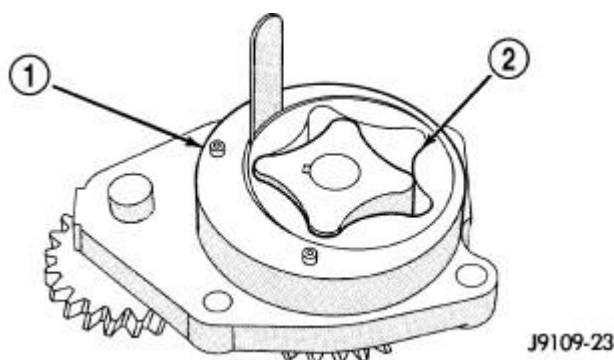


Fig. 303: Measuring Gerotor Planetary To Body Bore Clearance
Courtesy of CHRYSLER GROUP, LLC

1 - BODY
BORE
2 - GEROTOR
PLANETARY

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.

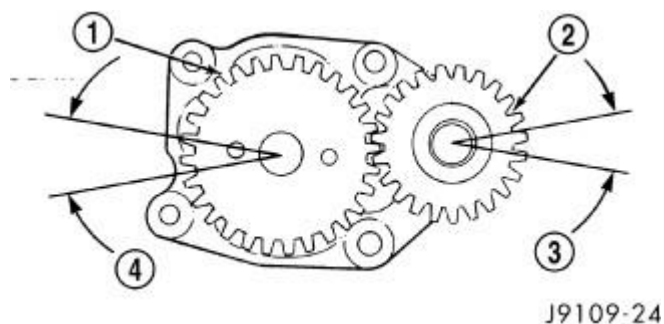


Fig. 304: Measure Gear Backlash
Courtesy of CHRYSLER GROUP, LLC

1 - OIL PUMP
DRIVE GEAR
2 - IDLER
GEAR
3 -
BACKLASH
4 -
BACKLASH

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

INSTALLATION

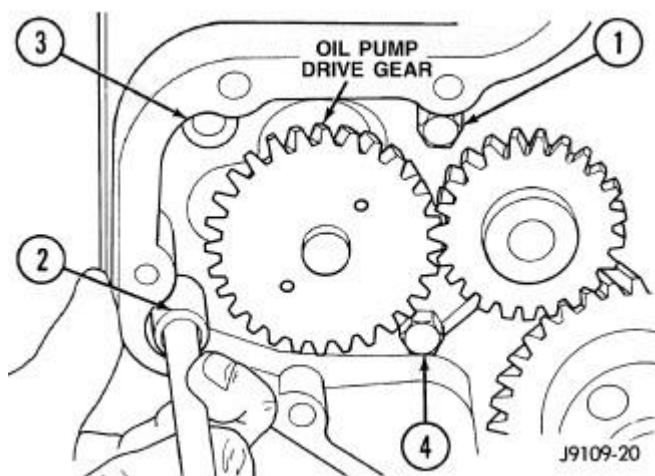


Fig. 305: Oil Pump Mounting Bolt Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

1. 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.

2. 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 (71 in. lbs.).
 - Step 3: Tighten the bolts to 24 N.m (18 ft. lbs.).

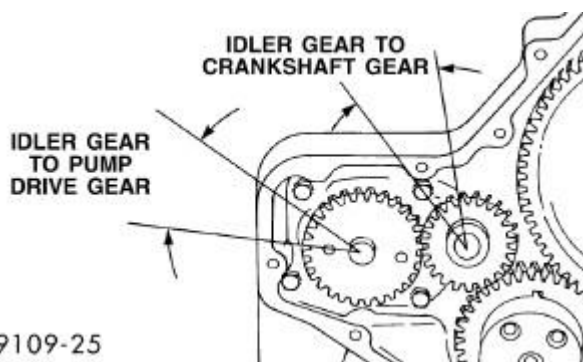


Fig. 306: Idler Gear To Pump Drive Gear & Crankshaft Gear Backlash
Courtesy of CHRYSLER GROUP, LLC

3. 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.
4. 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.
5. If the adjoining gear moves when you measure the backlash, the reading will be incorrect.
6. Install the engine timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 6.7L**.
7. Connect both battery negative cables.
8. Start engine and check for oil leaks.

SWITCH, OIL PRESSURE

REMOVAL

REMOVAL



Fig. 307: Oil Pressure Switch Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Disconnect the oil pressure switch wire harness connector (1).

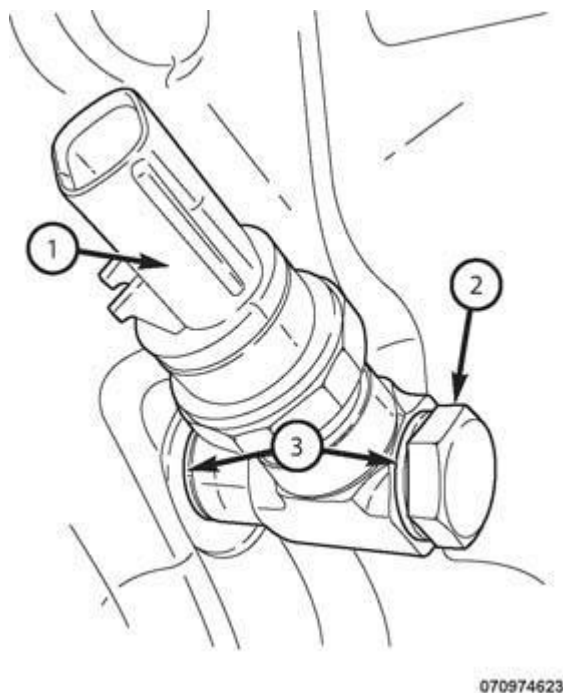


Fig. 308: Oil Pressure Switch, Bolt & O-Ring Washer Seals
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolt (2) and the oil pressure switch (1) and elbow from the engine block.

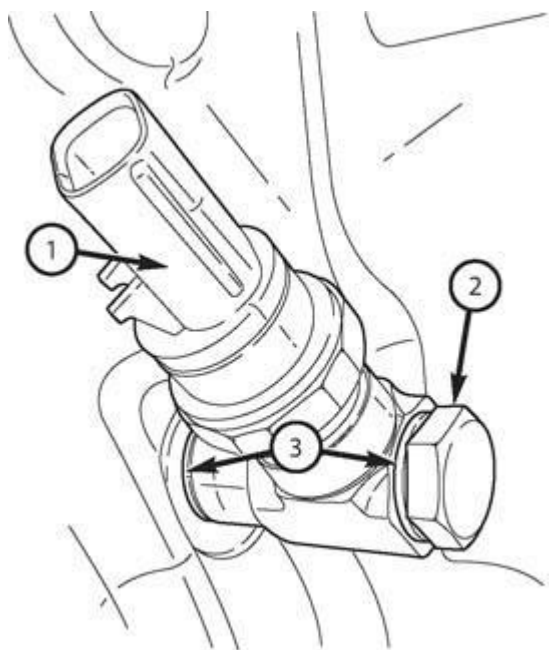
INSTALLATION**INSTALLATION**

Fig. 309: Oil Pressure Switch, Bolt & O-Ring Washer Seals
Courtesy of CHRYSLER GROUP, LLC

1. Using a new O-ring washer seals (3), install the oil pressure switch (1) and elbow. Tighten bolt (2) to 18 N.m (159 in. lbs.).



Fig. 310: Oil Pressure Switch Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

2. Connect oil pressure switch wire harness connector (1).
3. Connect both negative battery cables.
4. Start engine and check for oil leaks at the switch.

VALVE, OIL PRESSURE RELIEF

REMOVAL

REMOVAL

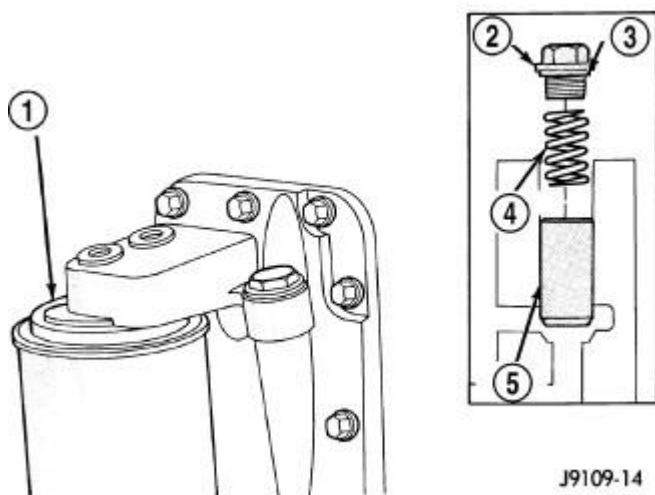


Fig. 311: Oil Filter & Oil Pressure Relief Valve
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: If the plunger is stuck in the bore, it will be necessary to remove the filter head. Also, the pressure relief valve (not shown in the illustration) is located behind filter head.

CLEANING

CLEANING

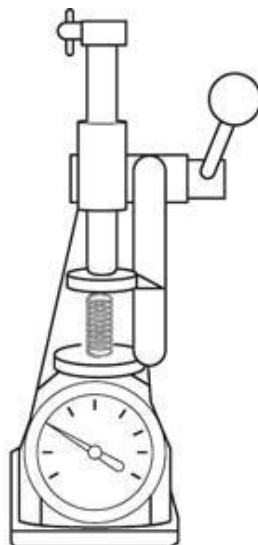
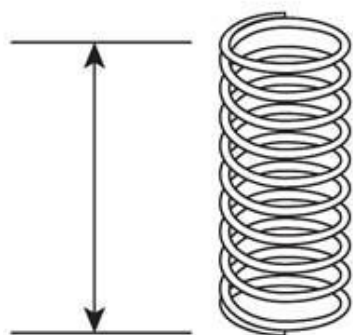
1. Clean the regulator spring and plunger with a suitable solvent and blow dry with compressed air. If the plunger bore requires cleaning, it is necessary to remove the oil filter head to avoid getting debris into the engine.

INSPECTION

INSPECTION

VALVE OPEN

- HEIGHT: 38.75 mm (1.53 inches)
 - LOAD: 147N (33.05 lb)
- FREE LENGTH: 45.2 mm (1.78 inches)



0911004879

Fig. 312: Oil Pressure Regulator Spring Check
 Courtesy of CHRYSLER GROUP, LLC

Description	Metric	Standard
Valve Open		
Height	38.75 mm	1.53 in.
Load	147 N.m	33.05 lbs.
Free Length	45.2 mm	1.78 in.

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 illustration.

INSTALLATION**INSTALLATION**

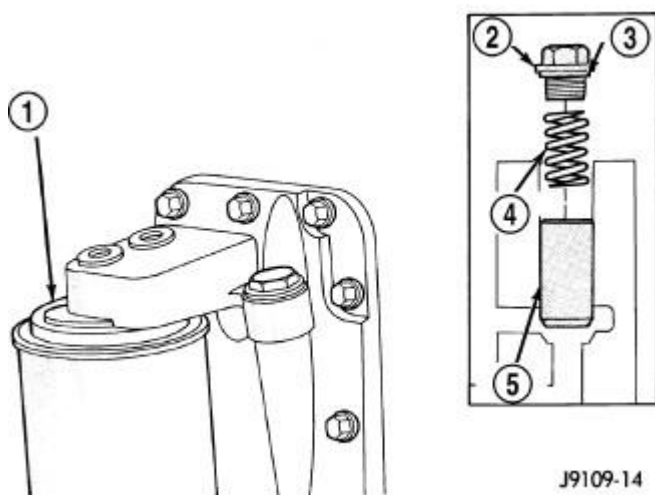


Fig. 313: Oil Filter & Oil Pressure Relief Valve
 Courtesy of CHRYSLER GROUP, LLC

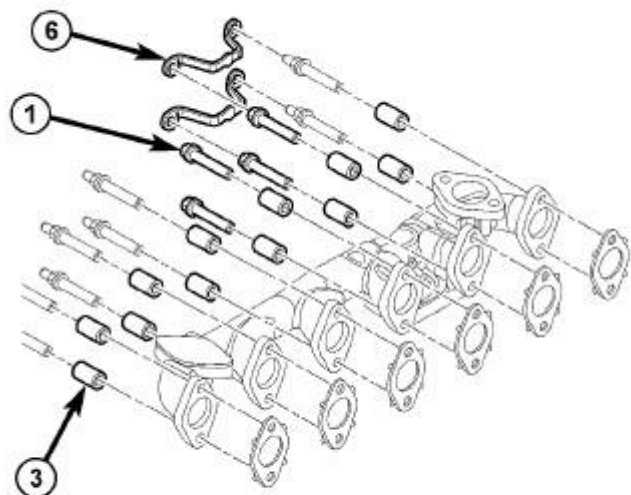
1. Clean the plunger bore and O-ring sealing surface.
2. Install the plunger (5), spring (4) into bore as shown in the illustration.
3. Using a O-ring (3), install the plug (2). Tighten the plug (2) to 80 N.m (59 ft. lbs.).
4. Connect both negative battery cables.
5. Start the engine and verify that it has oil pressure.

MANIFOLDS

MANIFOLD, EXHAUST

REMOVAL

REMOVAL



81af5e81

Fig. 314: Exhaust Manifold Assembly

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the EGR cooler. Refer to **COOLER, EGR, REMOVAL** .
3. Remove the exhaust pressure tube. Refer to **SENSOR, EXHAUST PRESSURE, REMOVAL** .
4. Remove nuts and the exhaust manifold heat shield.
5. Remove the turbocharger. Refer to **TURBOCHARGER, REMOVAL, 6.7L**.
6. Remove the two (2) rear exhaust manifold bolt lock plates (6).
7. Remove bolts (1), spacers (3), and the exhaust manifold.

CLEANING**CLEANING**

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

INSPECTION**INSPECTION**

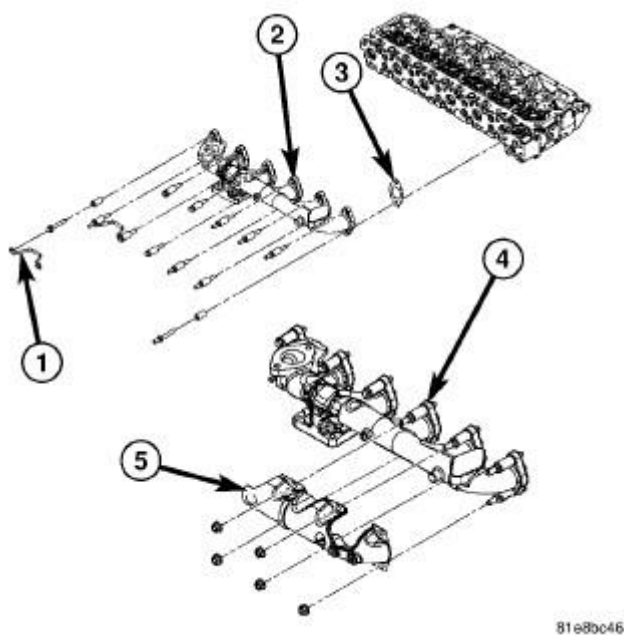


Fig. 315: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
Courtesy of CHRYSLER GROUP, LLC

- 1 - Item_1
- 2 - Item_2

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 (0.0039 in). If this is the case, the component with the greatest warpage must be replaced.

INSTALLATION

INSTALLATION

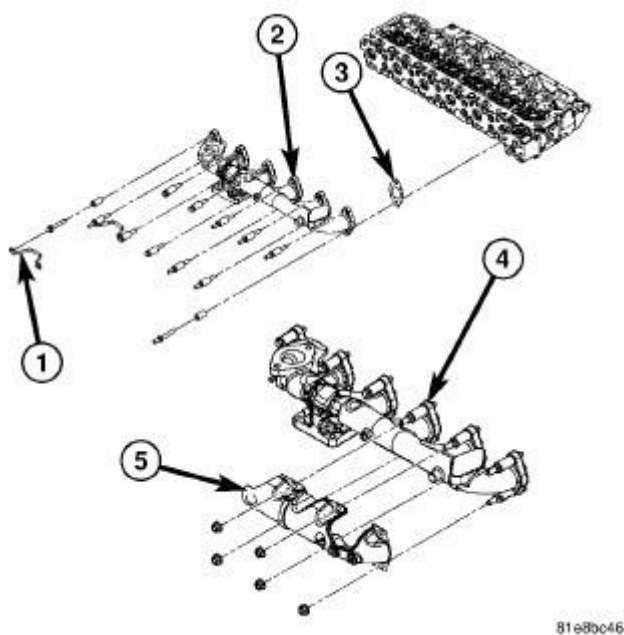


Fig. 316: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
 Courtesy of CHRYSLER GROUP, LLC

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. Using a new gasket, install the exhaust manifold.

NOTE: The six exhaust manifold capscrews with studs are used at the No. 1, 2, and 3 cylinder locations for the heat shield mounting.

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 53 N.m (39 ft. lbs.).
9. Install the exhaust manifold bolt lock plates.
10. Install the exhaust manifold heat shields/noise panels. Tighten the mounting nuts to 24 N.m (18 ft. lbs.).
11. Install the turbocharger. Refer to **TURBOCHARGER, INSTALLATION, 6.7L**.
12. Install the exhaust pressure sensor tube. Refer to **SENSOR, EXHAUST PRESSURE, INSTALLATION**.
13. Install the EGR cooler. Refer to **COOLER, EGR, INSTALLATION**.
14. Install the air filter housing. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
15. Fill the coolant. Refer to **STANDARD PROCEDURE**.

16. Connect both negative battery cables.
17. Start the engine to check for leaks.

MANIFOLD, INTAKE

REMOVAL

REMOVAL



Fig. 317: Clamps, EGR Air Flow Control Valve Wire Harness Connector & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the EGR crossover tube Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, REMOVAL** .
3. Loosen clamps (1) and remove the Charge Air Cooler (CAC) hose (3) from the EGR air flow control valve.
4. Disconnect EGR air flow control valve wire harness connector (2).
5. Disconnect the EGR valve wire harness connector.

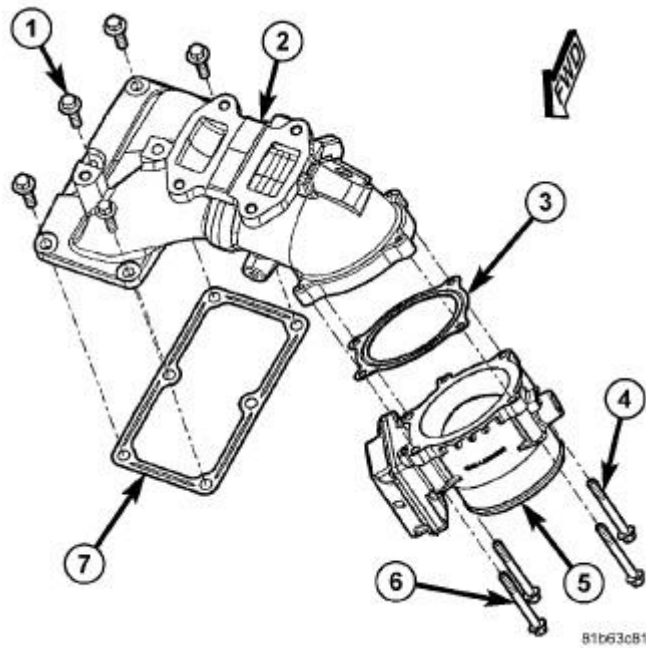
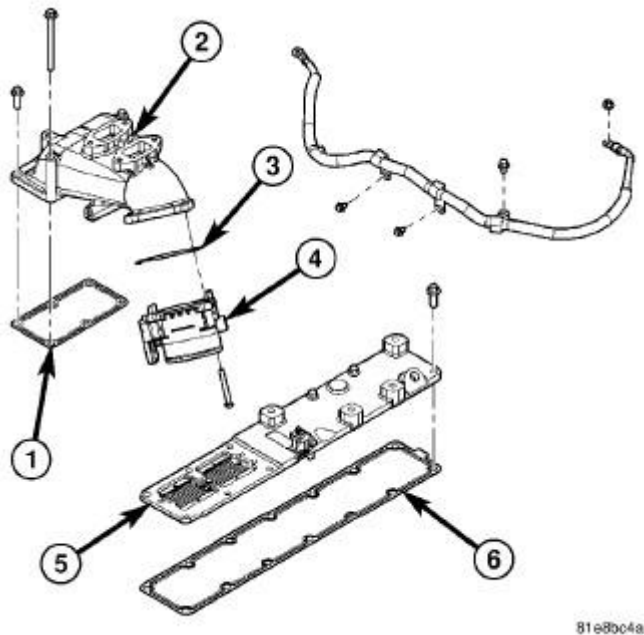


Fig. 318: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

6. Remove cylinder No. 1 fuel tube. Refer to **TUBE(S), FUEL, REMOVAL** .
7. Remove bolt and nut securing oil dipstick tube.
8. Remove bolts (1) and the intake manifold (2).

CLEANING

CLEANING



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Fig. 319: Intake Air Heater Assembly

Courtesy of CHRYSLER GROUP, LLC

Clean the intake manifold in solvent and blow dry with compressed air.

Clean cylinder head gasket surfaces using a suitable solvent.

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

INSPECTION

INSPECTION

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straightedge.

INSTALLATION

INSTALLATION

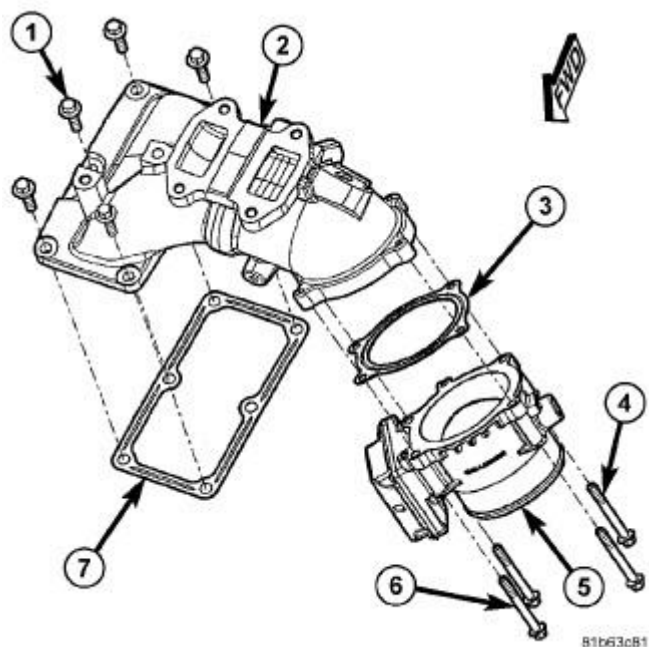


Fig. 320: EGR Air Flow Control - Exploded View

Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket mating surfaces.
2. Using a new gasket, install the intake manifold (2). Tighten bolts to 24 N.m (18 ft. lbs.).
3. Install bolt securing the oil dip stick tube-to-intake manifold and tighten to 24 N.m (18 ft. lbs.).
4. Install cylinder No. 1 fuel tube. Refer to **TUBE(S), FUEL, INSTALLATION** .



Fig. 321: Clamps, EGR Air Flow Control Valve Wire Harness Connector & CAC Hose

Courtesy of CHRYSLER GROUP, LLC

5. Connect the EGR valve wire harness connector.
6. Connect EGR air flow control valve wire harness connector (2).
7. Install the Charge Air Cooler (CAC) hose (3) to the EGR air flow control valve. Tighten clamp (1) to 14 N.m (124 in. lbs.).
8. Install the EGR crossover tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, INSTALLATION** .
9. Connect both negative battery cables.

TURBOCHARGER SYSTEM

ACTUATOR, TURBOCHARGER

DESCRIPTION

DESCRIPTION

ELECTRONICALLY CONTROLLED ACTUATOR

The Electronically Controlled Actuator is mounted to the turbocharger bearing housing. The actuator consists of an integrated controller and a gear train that controls the position of the sliding nozzle ring. The actuator uses a signal from the Powertrain Control Module (PCM) to control the relationship between the sliding nozzle ring and turbine blades.

Moving the nozzle ring rearward or forward redirects the exhaust flow so that the turbine wheel spins faster or slower as needed

- If the sliding nozzle is moved rearward, the turbocharger builds more pressure (turbine wheel moves faster)
- If the sliding nozzle is moved forward, the turbocharger builds less pressure (turbine wheel moves slower)

VGT EXHAUST BRAKE

The VGT Exhaust Brake works in conjunction with the engine and transmission to provide an integrated braking system to help slow the vehicle. This is commonly referred to as exhaust braking. Braking power is achieved by modulating the sliding nozzle ring to restrict the flow of exhaust gasses from the engine, this will create high back pressure on the engine. The high back pressure creates a high level of resistance to the motion of the pistons within the engine and this resistance is used to reduce engine speed and thus vehicle.

The exhaust brake feature will only function when the Exhaust Brake Switch to the ON position. With the switch in the ON Position and the vehicle moving faster then 5 MPH; the exhaust brake will automatically operate when pressure is removed from the accelerator pedal allowing the Powertrain Control Module (PCM) to see 0% throttle and 0% fuel delivery.

REMOVAL

REMOVAL

1. Disconnect both negative battery cables.
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
4. Remove the right wheel house splash shield. Refer to.
5. Remove air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.

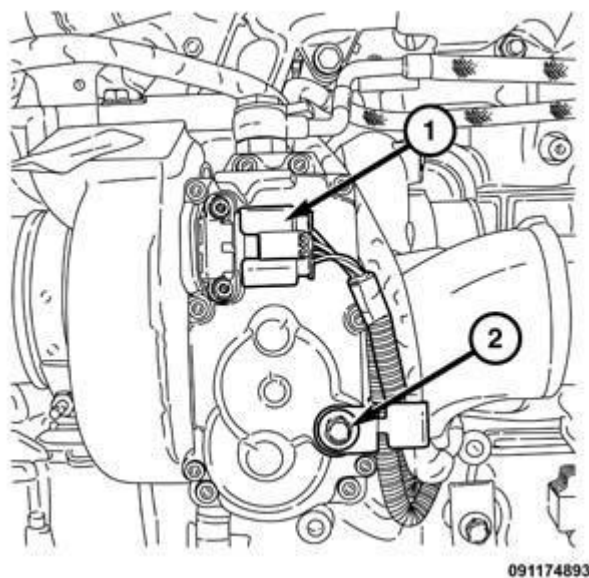
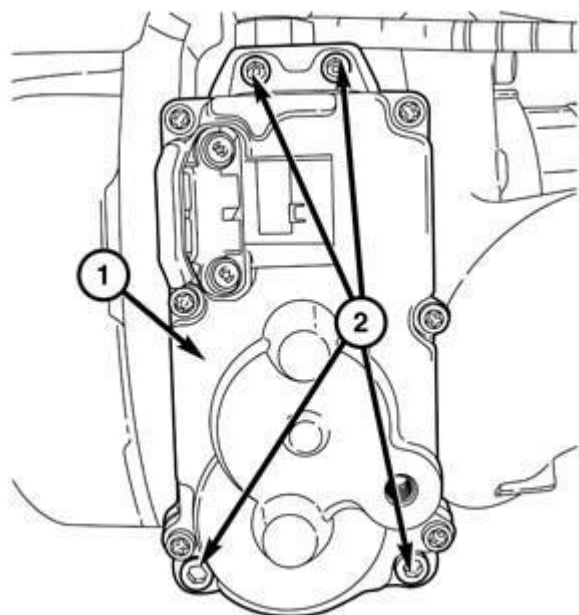


Fig. 322: Turbocharger Actuator Wire Harness Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Remove the bolt (2) securing wire harness to turbocharger actuator.
7. Disconnect turbocharger actuator wire harness connector (1) from the turbocharger by cleaning the connector to remove debris, pulling the light gray release lever away from the locked position with your thumb nail until it clicks into the unlocked position, then holding the light grey release lever down while pulling the connector apart.



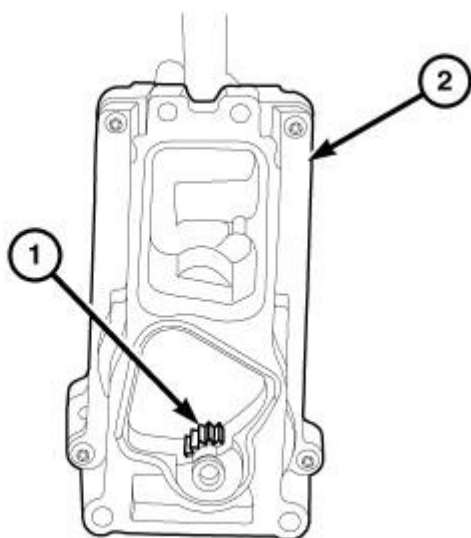
091174901

Fig. 323: Turbo Charger Actuator & Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove bolts (2) and the turbocharger actuator (1).
9. Remove and discard gasket.

INSTALLATION

INSTALLATION



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Fig. 324: Turbocharger Actuator & Actuator Gear
Courtesy of CHRYSLER GROUP, LLC

1. Clean turbocharger actuator housing (2) and turbocharger mounting surfaces.

CAUTION: The electronic turbocharger actuator (2) must be removed from the turbocharger to perform this function. Turbocharger failure could result if the electronic turbocharger actuator (2) is not removed from the turbocharger.

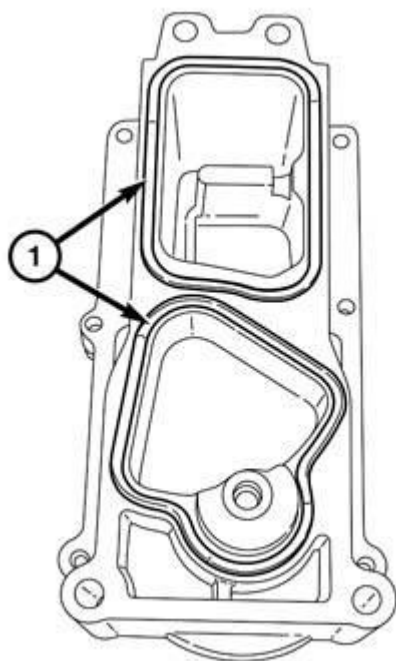
2. Position the turbocharger actuator (2) into the engine compartment so the actuator gear (1) will be free to rotate.
3. Connect turbocharger actuator wire harness connector.
4. Connect both negative battery cables.
5. Turn ignition to on position, **do not start engine**.
6. Using a scan tool function "Misc functions" under PCM, perform VG Turbocharger Actuator Pre-Alignment/Self Calibrate.

NOTE: This is a two step process, the tool will perform the Pre-align portion first followed by the Self Calibration portion.

NOTE: Do not turn off the ignition or disconnect the tool after performing the turbocharger actuator pre-align portion of the routine.

CAUTION: Use only turbocharger actuator grease supplied in the service kit. Use of any other type of grease or too much grease may result in damage to turbocharger. Use the full amount of grease supplied with the service kit.

7. Coat the teeth on the sector gear (1) with the full amount of grease supplied in the packet from installation kit.

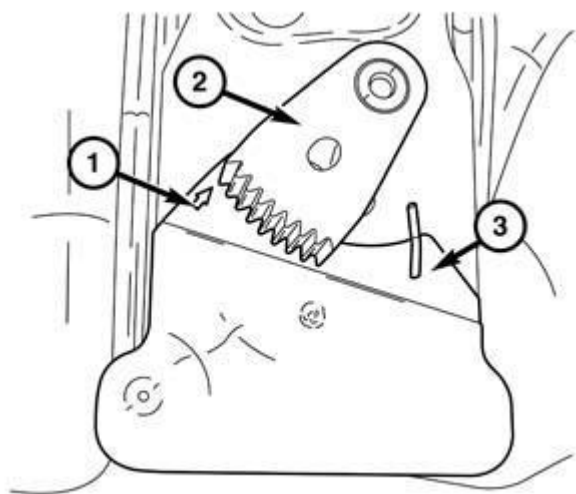


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Fig. 325: O-Ring Seals

Courtesy of CHRYSLER GROUP, LLC

8. Install a new O-ring seals (1) on the turbocharger actuator.



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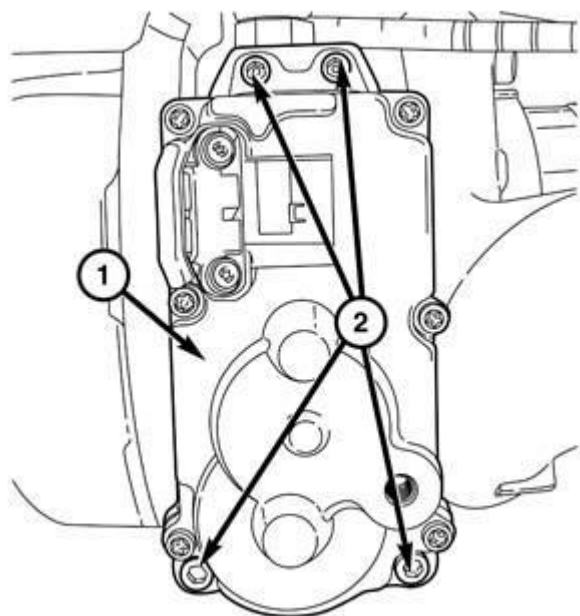
Fig. 326: Install Position Arrow, Sector Gear & Sector Gear Travel Gauge

Courtesy of CHRYSLER GROUP, LLC

9. Install the sector gear travel gauge (3) (provided in actuator kit) onto the turbocharger.
10. With the sector gear travel gauge installed (3), grasp the sector gear (2) by hand and rotate the sector gear (2) toward the turbocharger turbine housing. Be sure the sector gear (2) is rotated all the way toward the install position arrow (1).

NOTE: It is critical for smooth reliable operation of the actuator to use the full amount of the Holset® supplied grease.

11. Coat the teeth on the sector with the grease packet supplied in the installation kit.
12. Remove the sector travel gauge. **Do not** move the sector gear after this point.
13. Install the guide pins onto turbocharger.
14. Position turbocharger actuator onto guide pins and install.
15. Install two mounting screws finger tight.



091174901

Fig. 327: Turbo Charger Actuator & Bolts
Courtesy of CHRYSLER GROUP, LLC

16. Remove the two guide. Install the two remaining bolts. Tighten bolts (2) in a cross pattern to 11 N.m (97 in. lbs.).

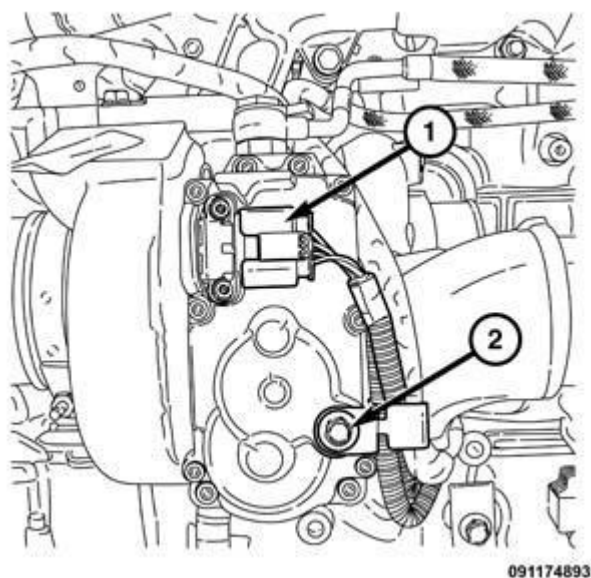


Fig. 328: Turbocharger Actuator Wire Harness Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

17. Install bolt (2) securing the wire harness to the turbocharger actuator and tighten bolt to 11 N.m (97 in. lbs.).
18. Using Witech tool, perform the self calibration portion of the "VG Turbocharger Actuator Pre-Alignment/Self Calibrate routine.

NOTE: If the **TURBOCHARGER ACTUATOR SELF CALIBRATION** procedure fails, remove the actuator and repeat installation one additional time. If this fails to clear error, replace turbocharger.

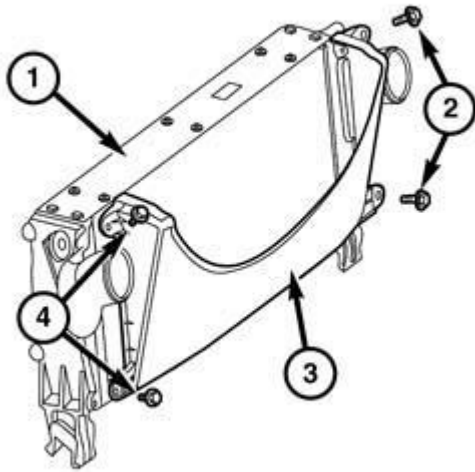
19. Place ignition in the OFF position.
20. Lower the engine into mounts. Install the thru-bolt and nut. Tighten nut to 136 N.m (100 ft. lbs.).
21. Install the right wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** or **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION** .
22. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
23. Fill cooling system. Refer to **STANDARD PROCEDURE** .

COOLER AND HOSES, CHARGE AIR

DESCRIPTION

DESCRIPTION

The charge air system consists of the charge air cooler piping, charge air cooler and intake air grid heater for cold weather operation.



2410003070

Fig. 329: Charge Air Cooler**Courtesy of CHRYSLER GROUP, LLC**

The Charge Air Cooler (1) is a heat exchanger that uses air flow from vehicle motion to dissipate heat from the intake air. As the turbocharger increases air pressure, the air temperature increases. Lowering the intake air temperature increases engine efficiency and power.

DIAGNOSIS AND TESTING**DIAGNOSIS AND TESTING - LEAKS**

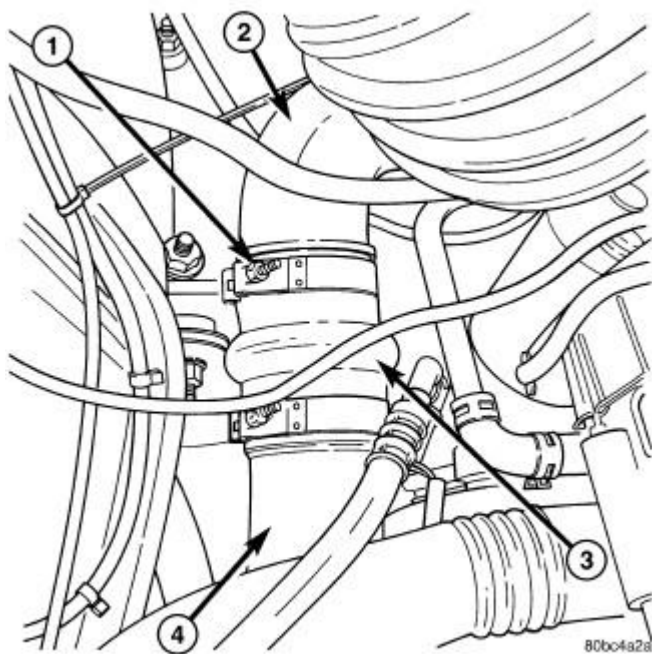


Fig. 330: Clamp, Turbocharger, Air Duct Rubber Sleeve & Air Inlet Duct
Courtesy of CHRYSLER GROUP, LLC

Low turbocharger boost pressure and low engine performance can be caused by leaks in the charge air cooler or plumbing. Fuel staining on the exhaust manifold can also be an indication that there are leaks in the air system. The following procedure outlines how to check for leaks in the charge air cooler system.

1. Loosen clamp and remove air inlet hose from turbocharger.
2. Insert CAC Tester Tool (special tool #10137, Adapter, Charge Air) into the turbocharger inlet. Tighten tool clamp to 8 N.m (72 in. lbs.).

CAUTION: Do not apply more than 138 kPa (20 psi) air pressure to the charge air cooler system, severe damage to the charge air cooler system may occur.

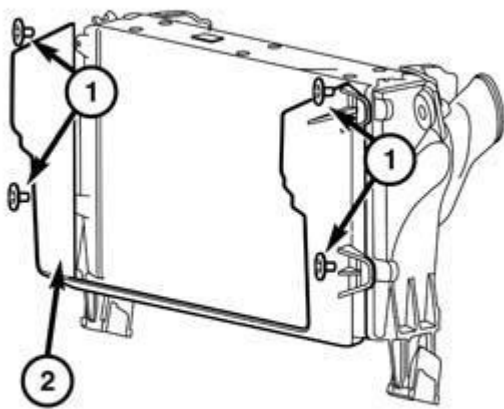
3. Connect a regulated air supply to air fitting on CAC Tester (special tool #10137, Adapter, Charge Air). Apply 27.5 - 55 kPa (4 - 20 psi) to Tool (special tool #10137, Adapter, Charge Air).
4. Using MOPAR® Air Leak Detector, check the rubber sleeves, clamps, charge air cooler and intake manifold for leaks.

REMOVAL

REMOVAL

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

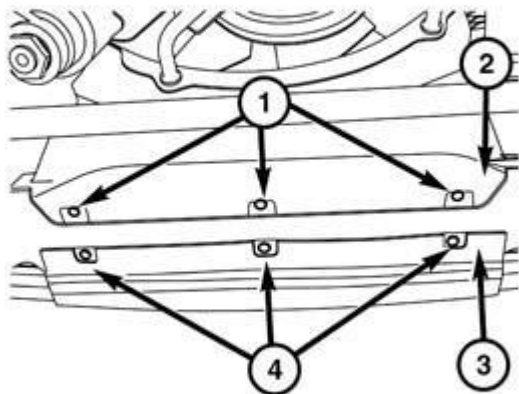
1. Disconnect both negative battery cables.
2. Raise and support the vehicle Refer to **HOISTING, STANDARD PROCEDURE** .
3. Remove the right wheel house splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** or **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL** .
4. Remove the left wheel house splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** or **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL** .



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Fig. 331: CAC Front Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

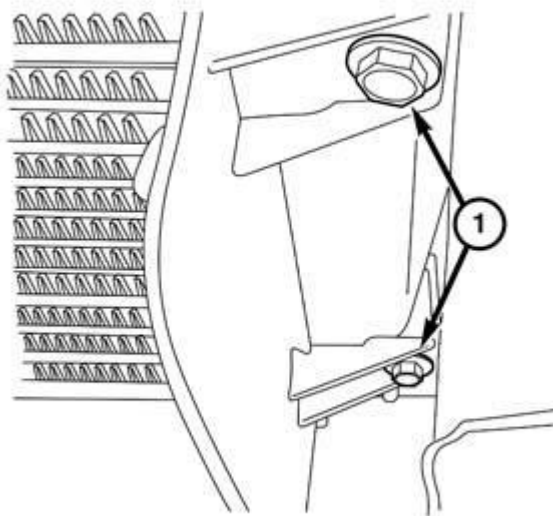
5. Remove the four bolts (1) from the Charge Air Cooler (CAC) front shroud (2).



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Fig. 332: Push Pins & CAC Shrouds
Courtesy of CHRYSLER GROUP, LLC

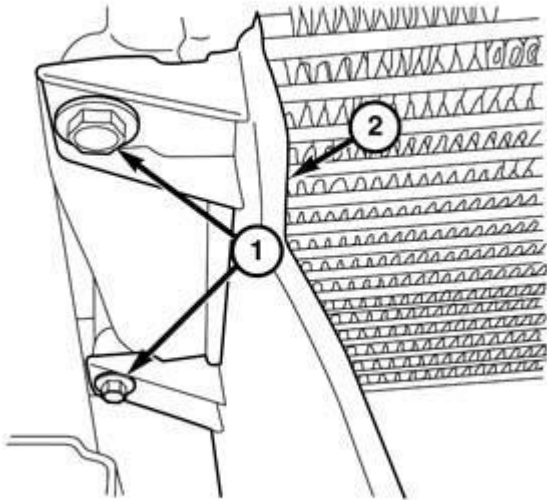
6. Remove push pins (4) and the front CAC Shroud (3).
7. Remove push pins (1) and the rear CAC Shroud (2).



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Fig. 333: CAC Right Side Rear Shroud Bolts
Courtesy of CHRYSLER GROUP, LLC

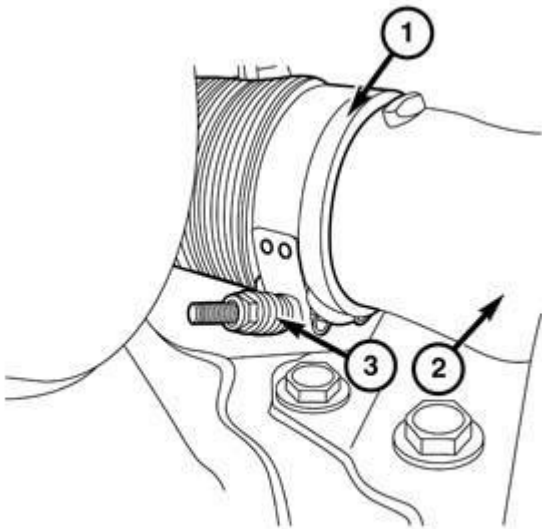
8. Remove the right side bolts (1) from the CAC rear shroud.



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Fig. 334: CAC Left Side Rear Shroud Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Remove the left side bolts (1) from the CAC rear shroud (2).

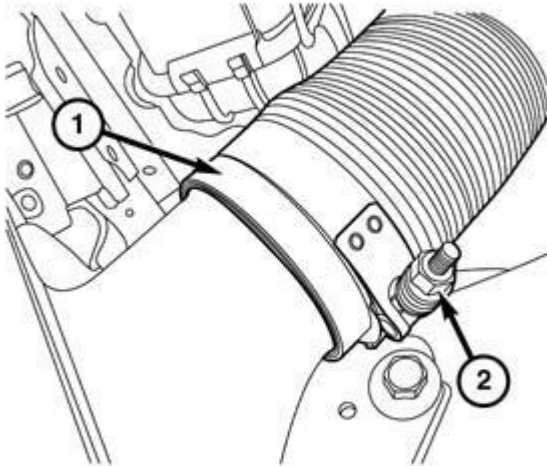


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Fig. 335: CAC Hose, Cooler & Clamp

Courtesy of CHRYSLER GROUP, LLC

10. Loosen clamp (3) and disconnect the right CAC hose (1) from cooler (2).

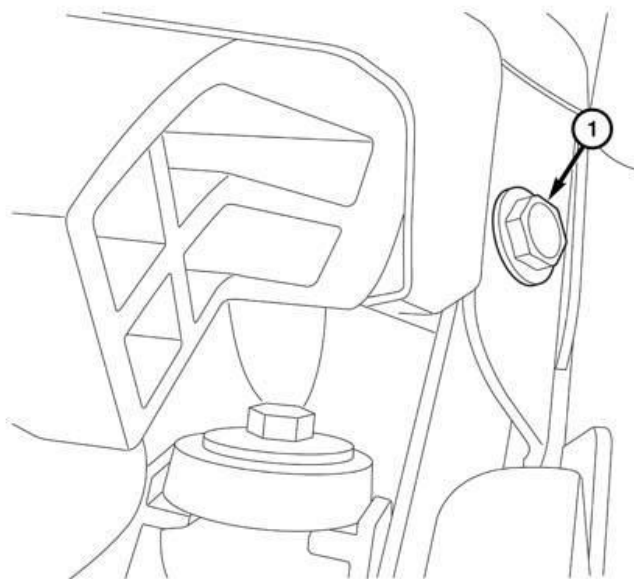


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Fig. 336: CAC Hose & Clamp

Courtesy of CHRYSLER GROUP, LLC

11. Loosen clamp (2) and disconnect the left CAC hose (1) from cooler.

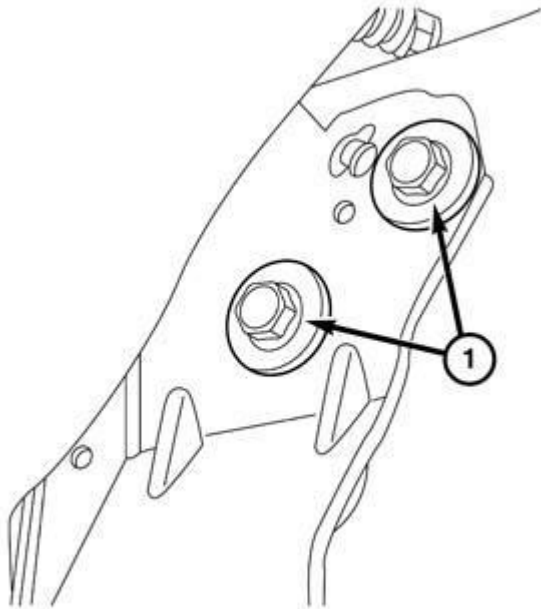


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Fig. 337: CAC Left Side Bracket Bolt

Courtesy of CHRYSLER GROUP, LLC

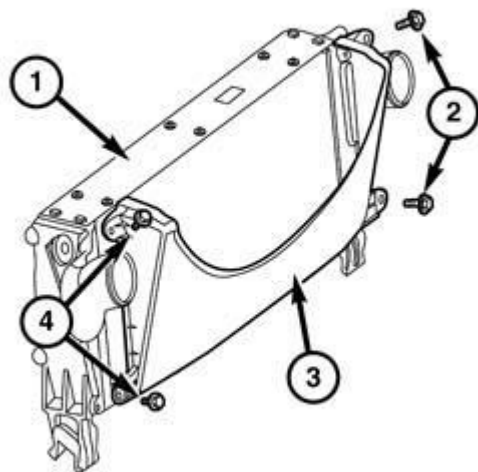
12. Remove the left side CAC bracket bolt (1).



2410003071

Fig. 338: CAC Right Side Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Remove right side bolts (1) and the CAC
14. If required, remove bolt and the right side CAC mounting bracket.
15. If required, remove bolt and the left side CAC support bracket.



2410003070

Fig. 339: Charge Air Cooler

Courtesy of CHRYSLER GROUP, LLC

CLEANING**CLEANING**

CAUTION: Do not use caustic or acid based cleaners to clean the charge air cooler. Damage to the charge air cooler will result.

NOTE: If internal debris cannot be removed from the cooler, the charge air cooler **MUST** be replaced.

NOTE: Charge air cooler must be a room temperature for this procedure.

1. If the engine experiences a turbocharger failure or any other situation where oil or debris get into the charge air cooler, the charge air cooler must be cleaned internally.
2. Remove charge air cooler Refer to **COOLER AND HOSES, CHARGE AIR, REMOVAL, 6.7L**.
3. Position the charge air cooler so the inlet and outlet tubes are vertical.
4. Thoroughly clean the charger air cooler internally with a non-caustic solvent (i.e. dish soap or laundry detergent / water mixture) in the direction opposite of the normal air flow.

WARNING: DO NOT use mineral spirits, combustion cleaners or equivalents to clean the charge air cooler and hoses. Residue from these chemicals may enter the engine combustion chamber, enabling the engine to over rev and could possibly cause damage to the engine.

5. Shake the cooler and lightly tap on the end tanks with a rubber mallet to dislodge trapped debris.
6. Continue flushing until all debris or oil are removed.
7. Rinse the cooler with hot soapy water to remove any remaining solvent.
8. Rinse thoroughly with clean water and blow dry with compressed air.

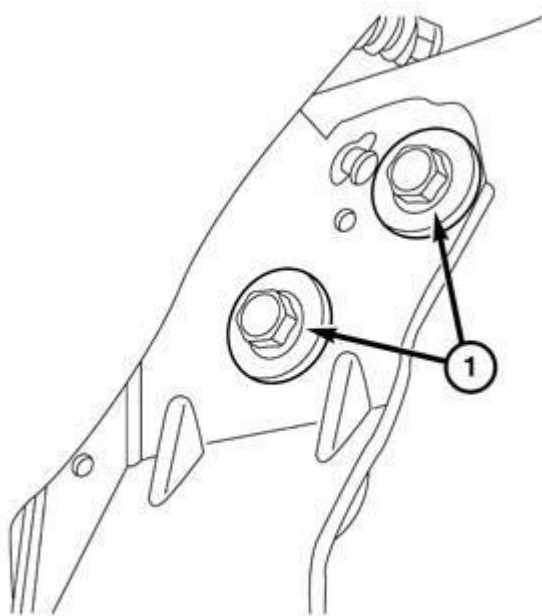
INSPECTION**INSPECTION**

Visually inspect the charge air cooler for cracks, holes, or damage. Inspect the tubes, fins, and welds for tears, breaks, or other damage. Replace the charge air cooler if damage is found.

Pressure test the charge air cooler using Charge Air Cooler Tester Kit No. 3824556. This kit is available through Cummins® Service Products. Instructions are provided with the kit.

INSTALLATION**INSTALLATION**

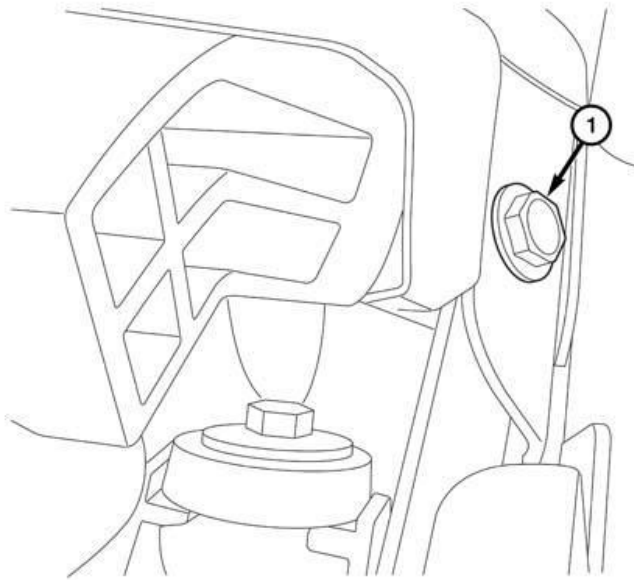
1. If removed, the left side CAC support bracket. Tighten bolt to 28 N.m (21 ft. lbs.).
2. If removed, the right side CAC mounting bracket. Tighten bolt to 28 N.m (21 ft. lbs.).



2410003071

Fig. 340: CAC Right Side Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

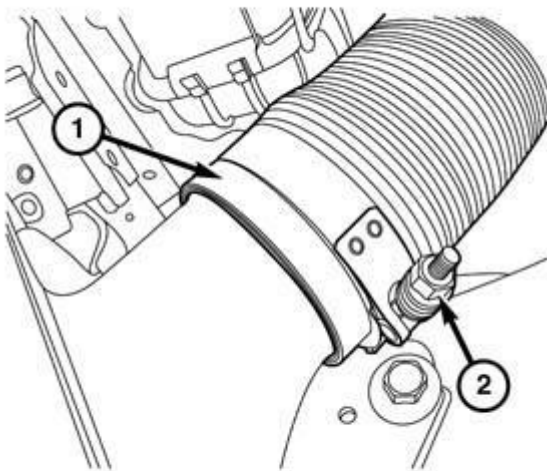
3. Install the Charge Air Cooler (CAC) (2). Tighten the right side bolts (1) to 31 N.m (22 ft. lbs.).



0709003077

Fig. 341: CAC Left Side Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

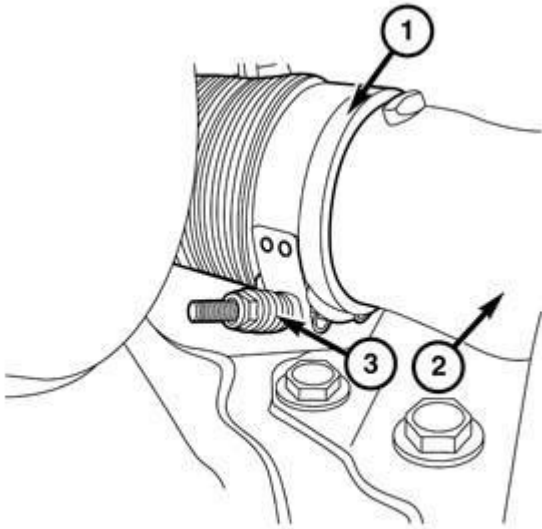
4. Install the left side CAC bolt (1) and tighten to 31 N.m (22 ft. lbs.).



2410003072

Fig. 342: CAC Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

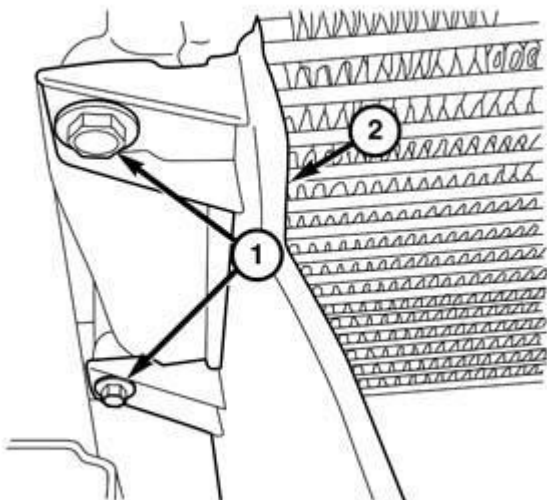
5. Connect the left CAC hose to cooler. Tighten clamp to 14 N.m (124 in. lbs.).



2410003064

Fig. 343: CAC Hose, Cooler & Clamp
Courtesy of CHRYSLER GROUP, LLC

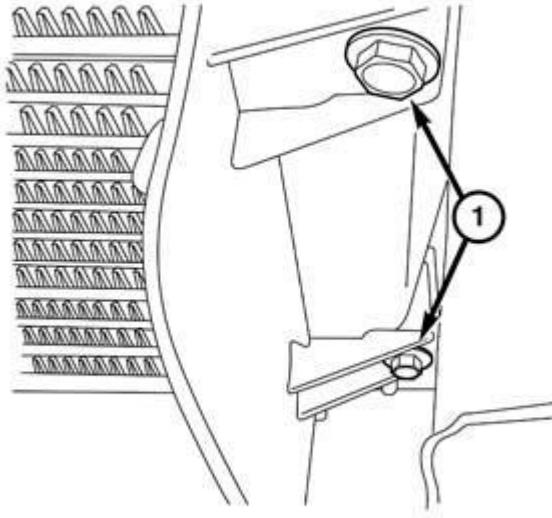
6. Connect the right CAC hose to cooler. Tighten clamp to 14 N.m (124 in. lbs.).



0709003089

Fig. 344: CAC Left Side Rear Shroud Bolts
Courtesy of CHRYSLER GROUP, LLC

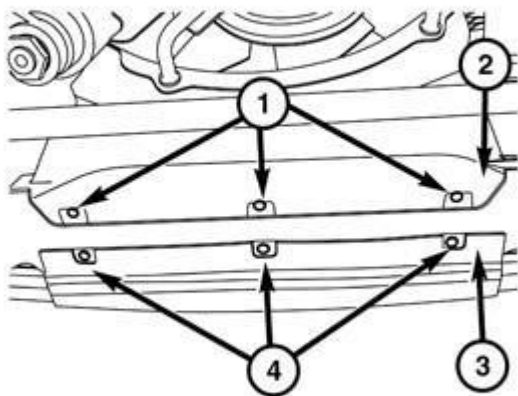
7. Install the rear CAC shroud (2). Tighten bolts (1) to 14 N.m (124 in. lbs.).



0709003088

Fig. 345: CAC Right Side Rear Shroud Bolts
 Courtesy of CHRYSLER GROUP, LLC

8. Install the right side CAC rear shroud bolts (1) and tighten to 14 N.m (124 in. lbs.).

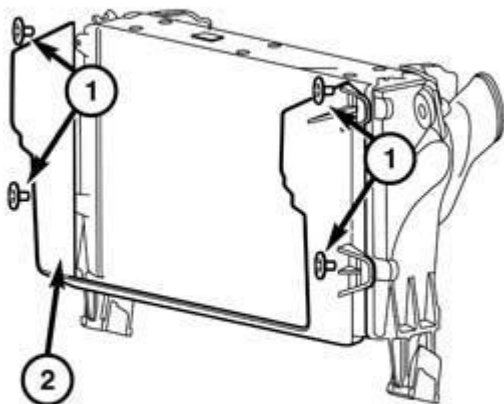


0709003074

Fig. 346: Push Pins & CAC Shrouds

Courtesy of CHRYSLER GROUP, LLC

9. Install the rear CAC shroud (3) push pins (4).
10. Position the front CAC shroud (2) and install push pins (1).



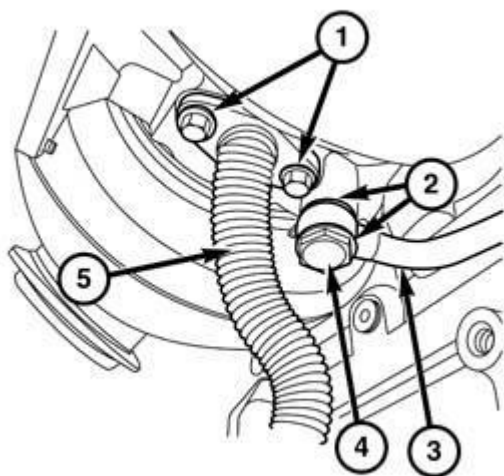
0709003078

Fig. 347: CAC Front Shroud & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Install the front four CAC shroud bolts (1). Tighten bolts to 14 N.m (124 in. lbs.).
12. Install the left wheel house splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** or **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION** .
13. Install the right wheel house splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** or **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION** .
14. Lower the vehicle.
15. Connect both negative battery cables.
16. Start engine and check for boost system leaks.

LINES AND HOSES, TURBOCHARGER, OIL AND COOLANT**REMOVAL****REMOVAL**

1. Remove RH engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.

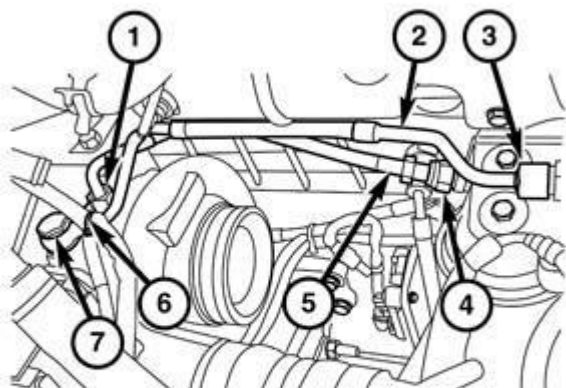


0911005528

Fig. 348: Bolts, Sealing Washers, Turbocharger Coolant Tube, Banjo Bolt & Turbocharger Drain Tube

Courtesy of CHRYSLER GROUP, LLC

2. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
3. Remove bolts (1) and the turbocharger oil drain tube (5) from the turbocharger.
4. Remove banjo bolt (4) and the turbocharger coolant tube (3) from the turbocharger.



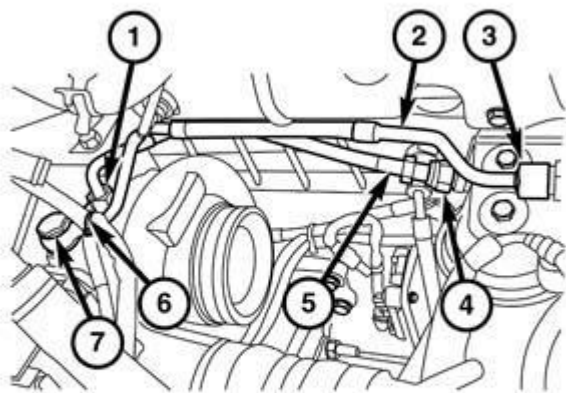
0911005529

Fig. 349: Union Nuts, Coolant Tube, Turbocharger Oil Supply Line, Cable tie & Banjo Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Cut the cable tie (6) securing the NOx sensor wire to coolant tube (2).
6. Remove the coolant tube (2) banjo bolt (7) from turbocharger.
7. Remove union nut (3) and the coolant tube (2).
8. Remove the turbocharger oil supply line (5) union nut (4).
9. Remove union nut (1) and the oil supply line (5).

INSTALLATION

INSTALLATION



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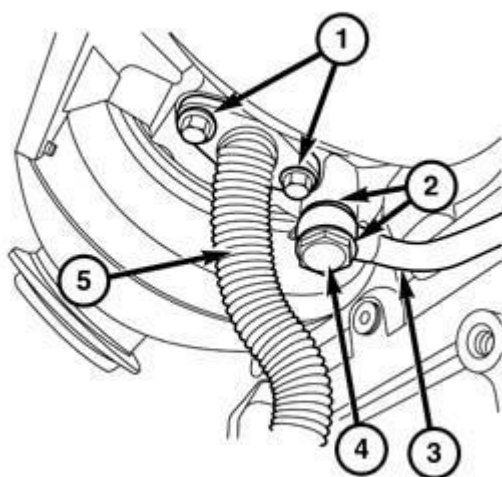
Fig. 350: Union Nuts, Coolant Tube, Turbocharger Oil Supply Line, Cable tie & Banjo Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Install the turbocharger oil supply line (5). Tighten union nut (1) to 24 N.m (18 ft. lbs.).
2. Install the oil supply line (5) union nut (4) at turbocharger and tighten to 24 N.m (18 ft. lbs.).
3. Install the turbocharger coolant tube (2). Tighten union nut to 24 N.m (18 ft. lbs.).
4. Using new sealing washers, install the turbocharger coolant tube banjo bolt to 24 N.m (18 ft. lbs.).
5. Install a cable tie (6) to secure the NOx sensor wire to coolant tube (2).



Fig. 351: Turbocharger Drain Tube & O-Rings
Courtesy of CHRYSLER GROUP, LLC

6. Clean turbocharger drain tube (1) mounting surfaces.
7. Install new O-rings (2) on turbocharger drain tube (1). Lubricate with clean engine oil.
8. Install turbocharger drain tube (1) into cylinder block.



0911005528

Fig. 352: Bolts, Sealing Washers, Turbocharger Coolant Tube, Banjo Bolt & Turbocharger Drain Tube
Courtesy of CHRYSLER GROUP, LLC

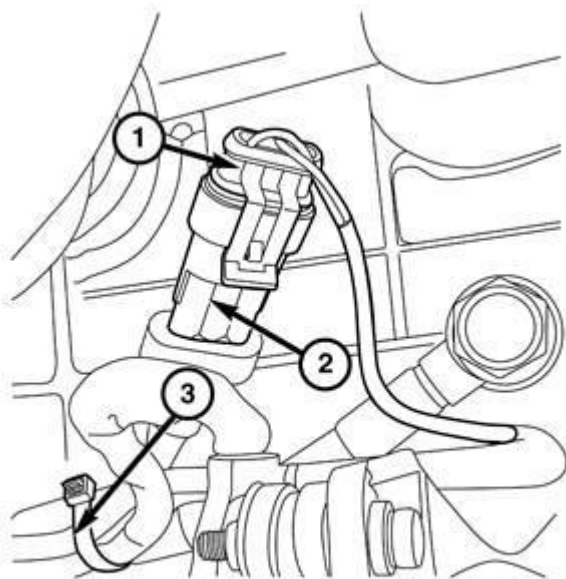
9. Using a new gasket, install the turbocharger drain tube (2) mounting bolts (1) at turbocharger. Tighten bolts to 24 N.m (18 ft. lbs.).
10. Using new sealing washers (2), install the turbocharger coolant tube (3) banjo bolt (4). Tighten banjo bolt to 24 N.m (18 ft. lbs.).
11. Install right engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.
12. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
13. Start engine and check for leaks.

SENSOR, TURBOCHARGER SPEED

REMOVAL

REMOVAL

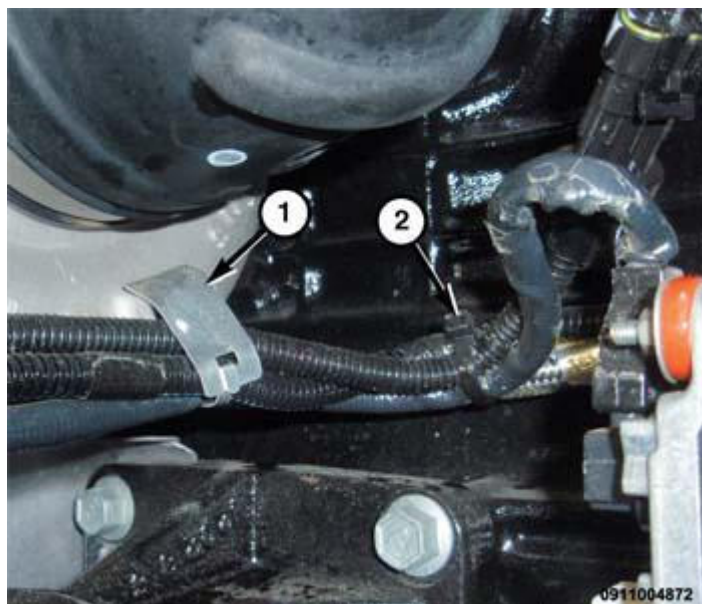
1. Disconnect and isolate both negative battery cables.
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.
3. Remove the right wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** or **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL**.



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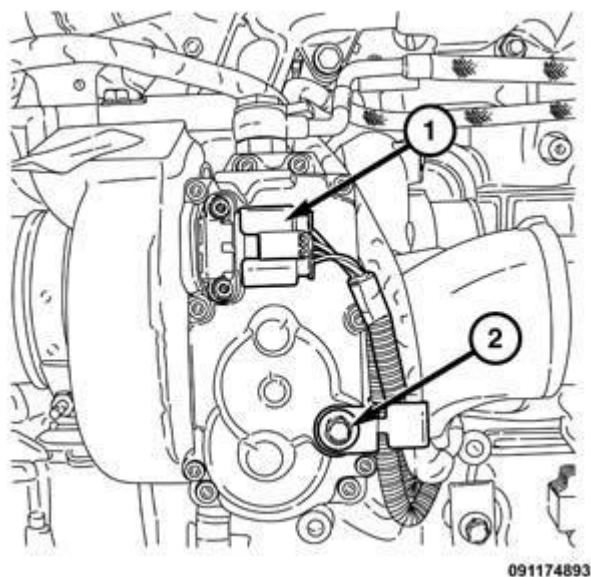
Fig. 353: Speed Sensor Wire Harness Connector, Speed Sensor & Cable Tie
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect speed sensor wire harness connector (1).

**Fig. 354: Clip & Cable Tie**

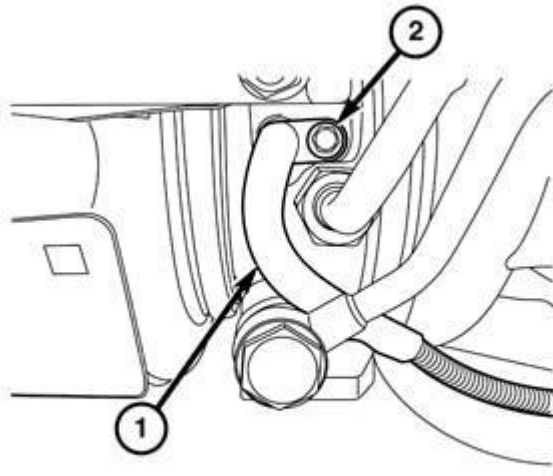
Courtesy of CHRYSLER GROUP, LLC

5. Cut the cable tie (2) securing the speed sensor wire harness to the turbocharger speed sensor wire harness.
6. Open clip (1) securing NOx wire harness and the turbocharger speed sensor wire harness.
7. Lower the vehicle.

**Fig. 355: Turbocharger Actuator Wire Harness Connector & Bolt**

Courtesy of CHRYSLER GROUP, LLC

8. Remove bolt (2) and separate retainer clip securing NOx wire harness and the turbocharger speed sensor wire harness to turbocharger actuator.



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Fig. 356: Turbocharger Coolant Line & Bolt
Courtesy of CHRYSLER GROUP, LLC

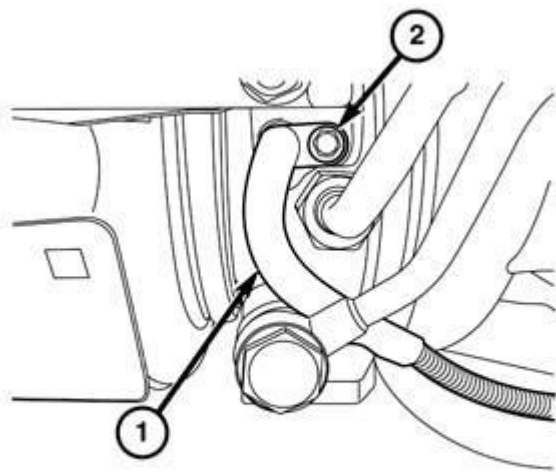
9. Remove banjo bolt (2) and the turbocharger coolant line (1).

CAUTION: Do not use a screw driver or tool to pry sensor out of the turbocharger bearing housing. Damage to sensor may result. If sensor is damaged during removal, install a new sensor.

10. Remove bolt (2) and the turbocharger speed sensor (1).

INSTALLATION

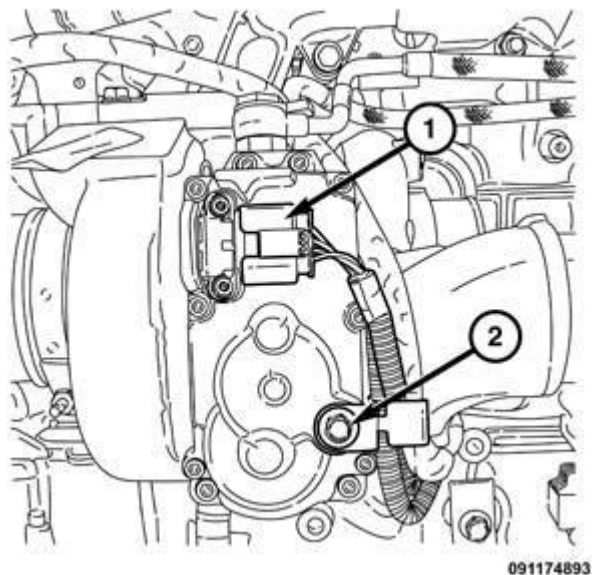
INSTALLATION



0915003262

Fig. 357: Turbocharger Coolant Line & Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Install turbocharger speed sensor (1). Tighten bolt (2) to 10 N.m (89 in. lbs.).
2. Using new sealing washers, install turbocharger coolant line. Tighten banjo bolt to 24 N.m (18 ft. lbs.).



091174893

Fig. 358: Turbocharger Actuator Wire Harness Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Position the NOx wire harness and the turbocharger speed sensor wire harness into retainer clip and install bolt to turbocharger actuator. Tighten bolt to 11 N.m (97 in. lbs.).

4. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

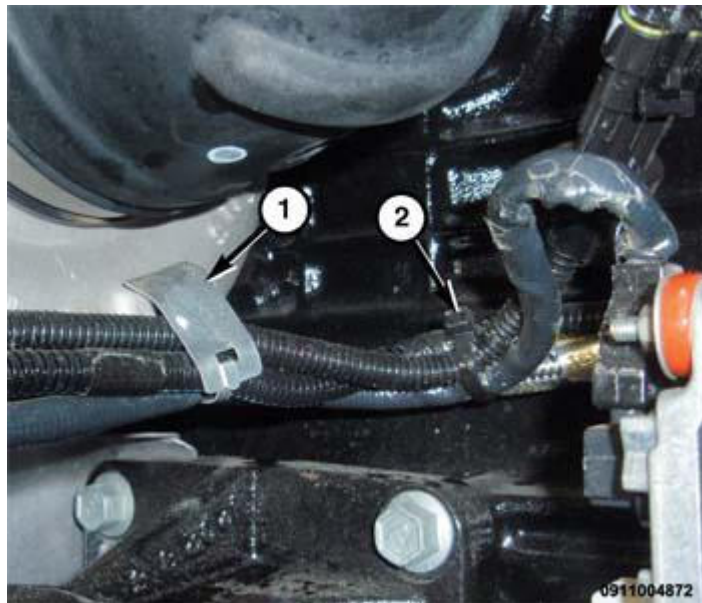


Fig. 359: Clip & Cable Tie

Courtesy of CHRYSLER GROUP, LLC

5. Position the NOx wire harness and the turbocharger speed sensor wire harness and close retainer clip (1).
6. Using a cable tie, tie (2) the NOx sensor wire harness and turbocharger speed sensor wire harness together.

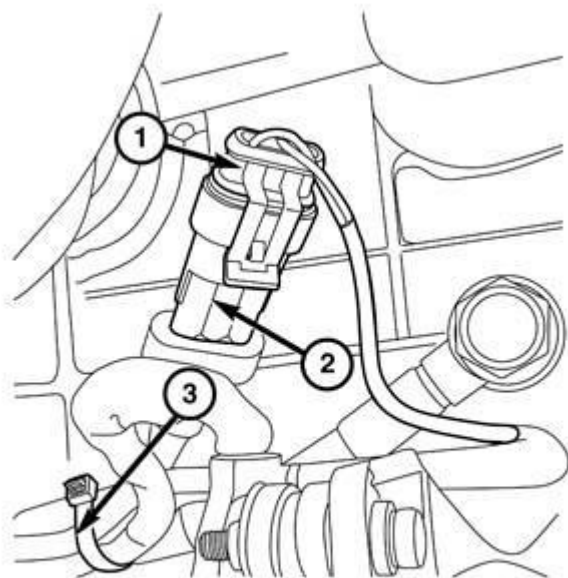


Fig. 360: Speed Sensor Wire Harness Connector, Speed Sensor & Cable Tie

Courtesy of CHRYSLER GROUP, LLC

7. Connect speed sensor wire harness connector (1).
8. Install the right wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** or **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION** .
9. Lower the vehicle.
10. Connect both negative battery cables.

TURBOCHARGER

DESCRIPTION

DESCRIPTION

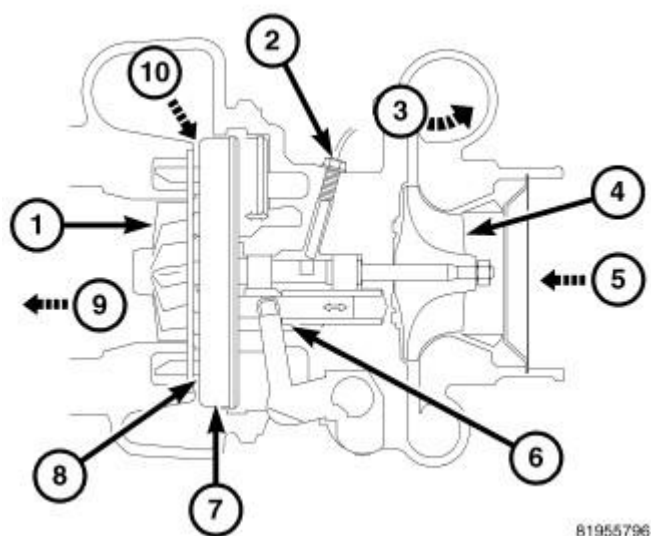


Fig. 361: 6.7L Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

- | |
|--|
| 1 - TURBINE
2 - TURBOCHARGER SPEED SENSOR
3 - COMPRESSED AIR FLOW
4 - COMPRESSOR
5 - FRESH AIR FLOW
6 - YOKE MECHANISM
7 - NOZZLE RING
8 - SHROUD PLATE
9 - AIR FLOW TO ENGINE
10 - VANES |
|--|

The electronically controlled Variable Geometry (VG) turbocharger is a water cooled, exhaust-driven, oil lubricated compressor that 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 VG turbocharger allows the engine to operate in a wide power and speed range to achieve the best power, torque, and engine operating conditions.

The VG turbocharger can also provide engine braking and to reduce engine warm up time.

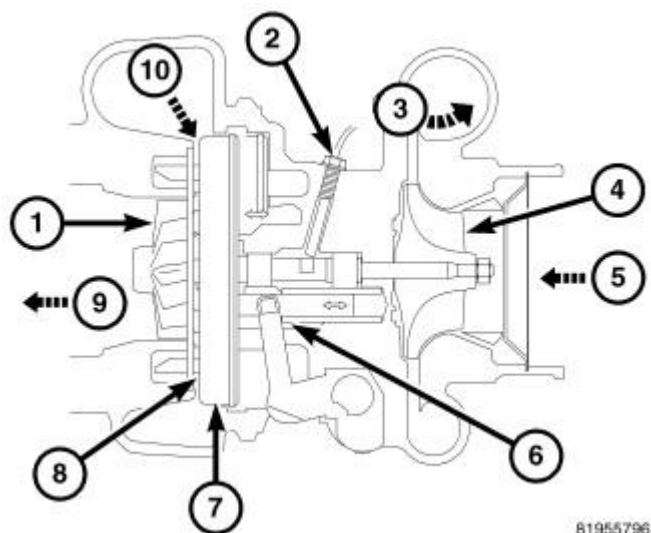
The VG turbocharger assembly consists of:

- Turbocharger assembly
- Variable Geometry Nozzle (7)
- Water Cooled Bearing housing
- Electronically Controlled Actuator

OPERATION

OPERATION

OPERATION



81955796

Fig. 362: 6.7L Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

- 1 - TURBINE
- 2 - TURBOCHARGER SPEED SENSOR
- 3 - COMPRESSED AIR FLOW
- 4 - COMPRESSOR
- 5 - FRESH AIR FLOW
- 6 - YOKE MECHANISM
- 7 - NOZZLE RING

8 - SHROUD PLATE
9 - AIR FLOW TO ENGINE
10 - VANES

The turbocharger is water cooled and 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 oil filter head. The oil travels into the bearing housing, where it lubricates the shaft and bearings. A return pipe at the bottom of the bearing housing, routes the engine oil back to the crankcase.

Exhaust gas enters the turbine section of the turbocharger as it leaves the combustion chamber. Heat and pressure are extracted from the exhaust gas and cause the turbine to rotate. The turbine is connected by shaft to the compressor section of the turbocharger. The rotating compressor draws in inlet air, compresses it and sends the compressed air through the Charge Air Cooler to the engine.

The Variable Geometry Turbocharger (VGT) uses a one piece sliding nozzle that moves continuously to vary the power of turbine and the amount of air delivered to the engine. This allows turbine power to be set to provide just enough energy to drive the compressor at the desired boost level in all engine operating modes.

Turbine power level changes are achieved by varying the position of the nozzle ring in relation to a set of guide vanes that control the flow through the turbine. An electrically controlled actuator positions the sliding nozzle over the guide vanes.

TURBOCHARGER EXHAUST BRAKE FUNCTION

The VGT works in conjunction with the engine and the transmission to provide an integrated braking system used to help slow the vehicle. This is commonly called exhaust braking. This braking power is achieved by modulating the turbo sliding nozzle ring to restrict the flow of exhaust gases from the engine, which in turn creates a high back pressure on the engine. The high back pressure creates a high level of resistance to the motion of the pistons within the engine and this resistance is used to reduce engine speed and thus vehicle speed.

The exhaust brake feature will only function when the driver turns the exhaust brake switch to the on position. Once the switch is in the on position and the vehicle is moving faster than 8 k/h (5 MPH); the exhaust brake will automatically operate when the driver removes pressure from the throttle pedal allowing the engine to see 0% throttle and 0 fuel delivery.

Exhaust braking is most effective when the engine RPM is higher. The automatic transmission has been programmed to downshift more aggressively when the exhaust brake is enabled to increase brake performance. Use of automatic transmission Tow/Haul Mode improves interaction between the engine and transmission. Inputs to the exhaust brake feature include:

- Coolant temperature
- Ambient air temperature
- Exhaust manifold pressure sensor
- Throttle pedal position sensor

Fault codes with any of these sensors will cause the exhaust brake feature to be disabled.

The exhaust brake feature can also be used to reduce the engine warm up time. To use the exhaust brake as a warm-up device, the vehicle must be moving less than 8 k/h (5 MPH), the exhaust brake switch must be in the on position, and the coolant temperature must below 82°C (180° F) and ambient temperature below 15.5°C (60° F).

TURBOCHARGER COOL DOWN

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 Condition	Load	Turbocharger Temperature	Idle Time (in minutes) Before Shut Down
Stop AND Go	Empty	Cool	Less than 1
Stop AND Go	Medium	Warm	1
Highway Speeds	Medium	Warm	2
City Traffic	Max. GCWR	Warm	3
Highway Speeds	Max. GCWR	Warm	4
Uphill Grade	Max. GCWR	Hot	5

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TURBOCHARGER BOOST PRESSURE

Low turbocharger boost pressure can cause poor engine performance and driveability concerns. The following procedure will test the turbocharger boost pressure.

Causes of low boost pressure include the following:

- Restricted air inlet system
- Leak in charge air cooler system
- Restricted/high pressure drop across charge air cooler
- Damaged turbocharger compressor wheel housing
- Excessive exhaust restriction
- Stuck or sticking variable geometry components (6.7L diesel engine)
- Stuck or inoperative variable geometry actuator (6.7L diesel engine)

Causes of excessively high boost pressure include:

- Damaged turbocharger actuator O-ring (6.7L Diesel)
- Stuck or sticking variable geometry components (6.7L diesel engine)
- stuck or inoperative variable geometry actuator (6.7L diesel engine)

Several Diagnostic Trouble Codes (DTCs) can be set that will indicate high or low system boost levels.

Refer to **COOLER AND HOSES, CHARGE AIR, DIAGNOSIS AND TESTING, 6.7L** for diagnosing of low or high boost pressure due to leaks.

NOTE: If oil is present on either the inlet or exhaust side of the turbo charger, check the charge air cooler for evidence of oil. Clean charge air cooler of any oil before starting the engine. Failure to do this can result in severe engine damage.

VARIABLE GEOMETRY MECHANISM CHECKS - 6.7L

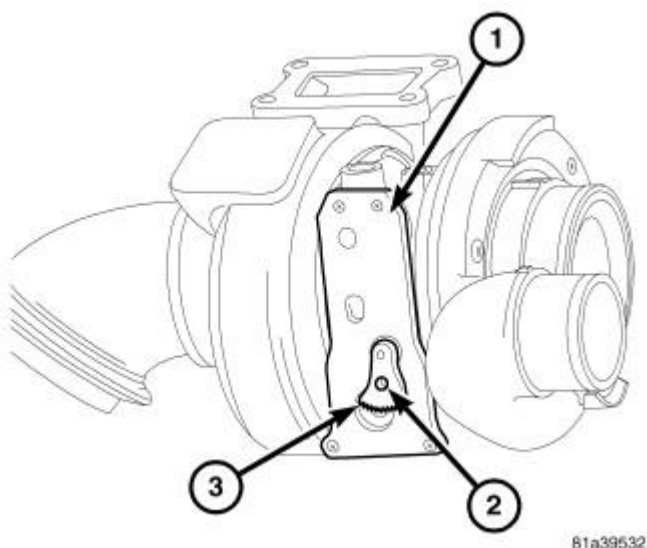
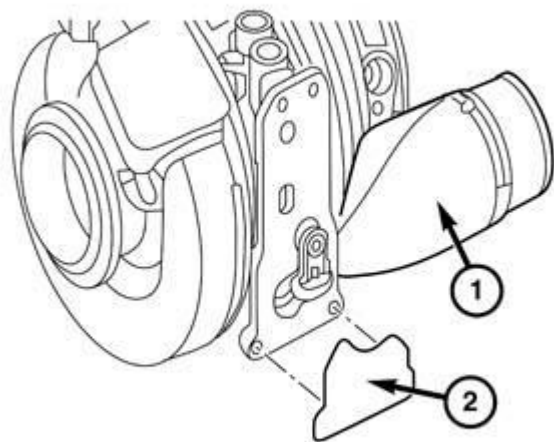


Fig. 363: Turbocharger Bearing Housing, Alignment Hole & Turbocharger Sector Gear
Courtesy of CHRYSLER GROUP, LLC

1. Remove turbocharger electronic actuator. Refer to **ACTUATOR, TURBOCHARGER, REMOVAL, 6.7L**.
2. Inspect turbocharger sector gear (3) and bearing housing (1) surface for damage. Replace turbocharger if damaged.

NOTE: Only moderate force should be required to rotate sector gear (3). Do not use tools of any kind to force sector gear to move.

3. Rotate sector gear (3) clockwise and counterclockwise. Movement should be smooth, without binding and require only moderate force. If the turbocharger sector gear (3) binds or does not move with moderate force, replace turbocharger.

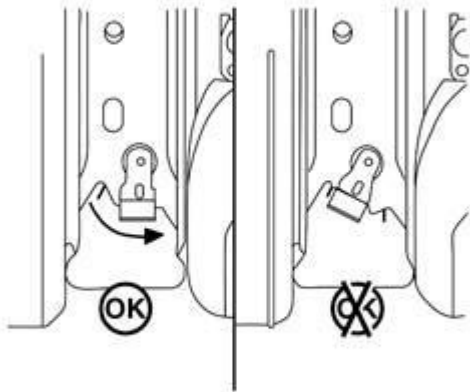


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Fig. 364: Sector Gear Travel Gauge
Courtesy of CHRYSLER GROUP, LLC

NOTE: Use the sector gear travel gauge, Part Number 4919281 that comes with new actuator, to be sure the sector gear moves through its operating range.

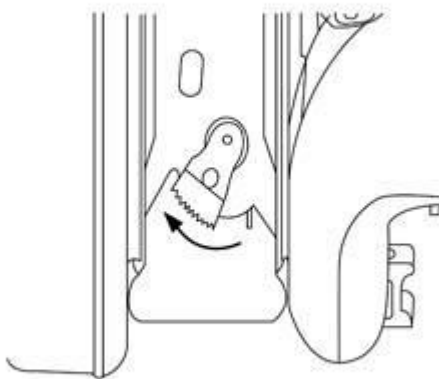
4. Install the sector gear travel gauge (2) by carefully bending the gauge and slide the thin section under the sector gear. If necessary, pull the sector gear out by hand to allow more clearance for the gauge. Verify that the three alignment bosses are fully engaged in the bearing housing.



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Fig. 365: Rotating Sector Gear Counterclockwise
 Courtesy of CHRYSLER GROUP, LLC

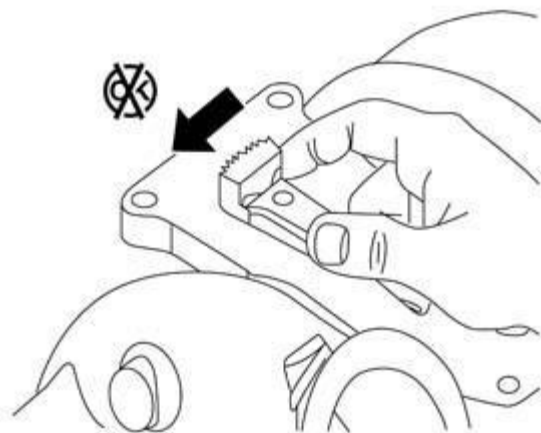
5. Rotate the sector gear **counterclockwise** towards the turbocharger compressor cover. The edge of the sector gear **must** be in the green acceptance zone of the gauge.



0911004864

Fig. 366: Rotating Sector Gear Clockwise
 Courtesy of CHRYSLER GROUP, LLC

6. Rotate sector gear (1) clockwise toward the turbocharger turbine housing. The edge of the sector gear **must** be in the green acceptance zone of the gauge.



0915003259

Fig. 367: Checking Sector Gear Range Of Motion
Courtesy of CHRYSLER GROUP, LLC

7. If the sector gear does not go through its entire range of motion, or if the sector gear is seized, the entire turbocharger assembly must be replaced.
8. Install the turbocharger actuator. Refer to **ACTUATOR, TURBOCHARGER, INSTALLATION, 6.7L**.

REMOVAL

REMOVAL

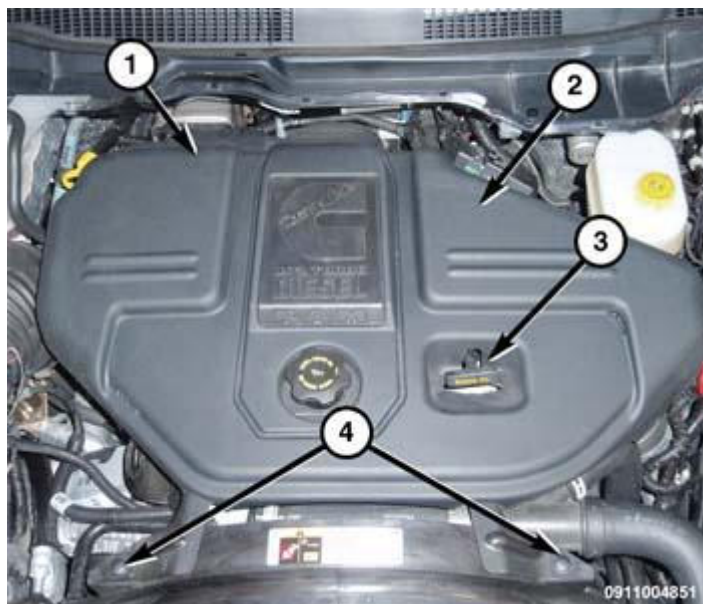


Fig. 368: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Disconnect and isolate the right side positive battery cable.
3. Remove the engine oil dip stick (3).
4. Remove fasteners (1, 4) and the engine cover (2).
5. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L.**

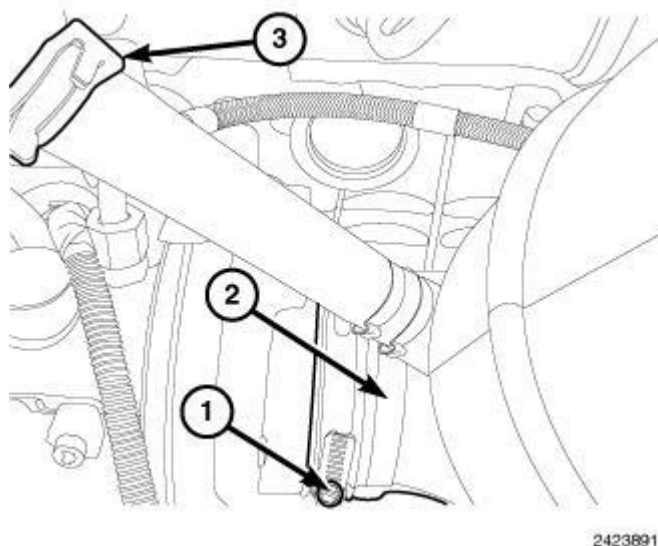


Fig. 369: Identifying Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the breather hose (3).
7. Loosen the clamp (1) and remove the outlet tube (2) from the turbocharger.

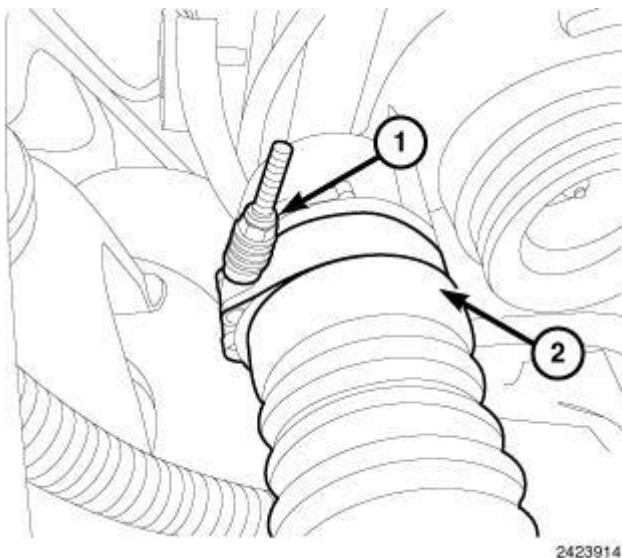


Fig. 370: Identifying Clamp & Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

8. Remove the right side wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** or **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL**.
9. Remove the Charge Air Cooler (CAC) inlet tube at the turbocharger inlet.
10. Drain the coolant system. Refer to **STANDARD PROCEDURE**.

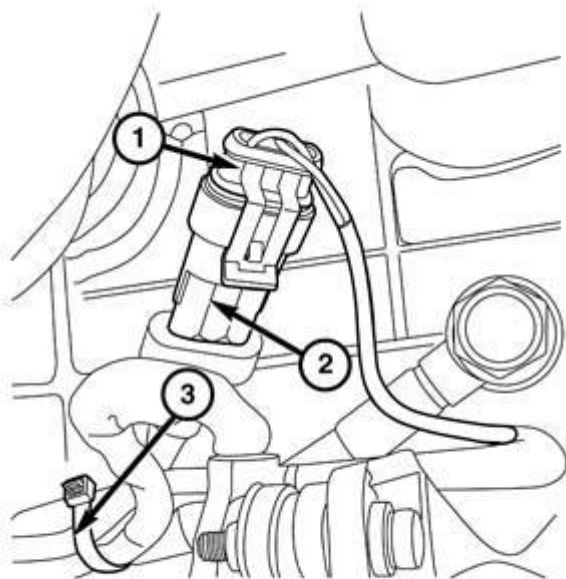
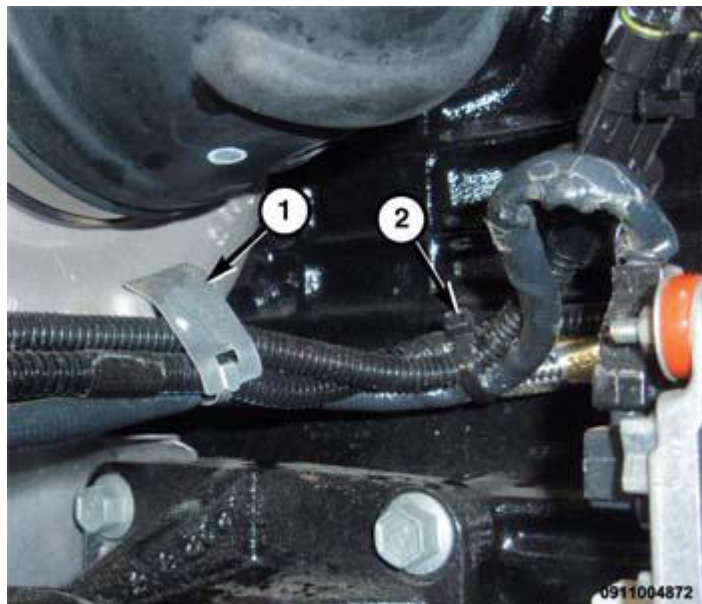


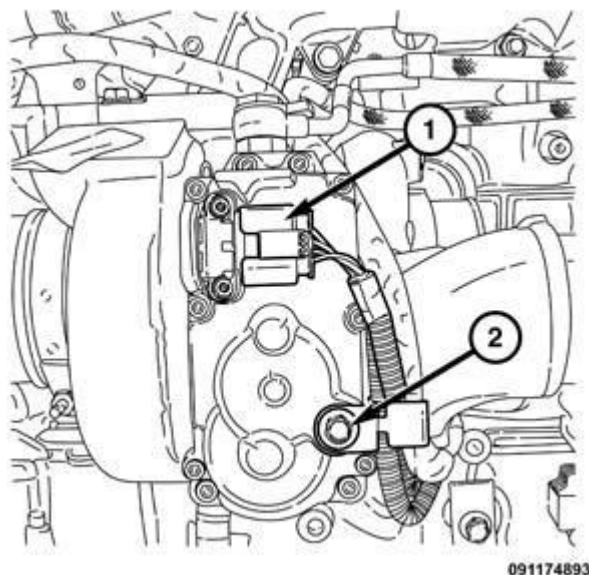
Fig. 371: Speed Sensor Wire Harness Connector, Speed Sensor & Cable Tie
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect the turbocharger speed sensor wire harness connector (1).

**Fig. 372: Clip & Cable Tie**

Courtesy of CHRYSLER GROUP, LLC

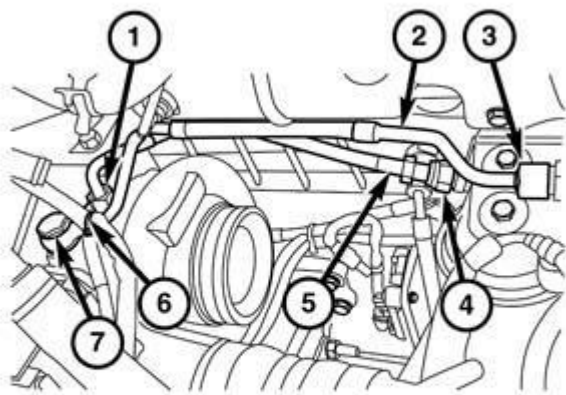
12. Cut the cable tie (2) securing the speed sensor wire harness to the turbocharger speed sensor wire harness.
13. Open clip (1) securing NOx wire harness and the turbocharger speed sensor wire harness.

**Fig. 373: Turbocharger Actuator Wire Harness Connector & Bolt**

Courtesy of CHRYSLER GROUP, LLC

14. Remove bolt (2) and separate retainer clip securing NOx wire harness and the turbocharger speed sensor wire harness to turbocharger actuator.
15. Disconnect turbocharger actuator wire harness connector (1) from the turbocharger by cleaning the connector to remove debris, pulling the light gray release lever away from the locked position with your thumb nail until it clicks into the unlocked position, then holding the light gray release lever down while

pulling the connector apart.



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Fig. 374: Union Nuts, Coolant Tube, Turbocharger Oil Supply Line, Cable tie & Banjo Bolt
Courtesy of CHRYSLER GROUP, LLC

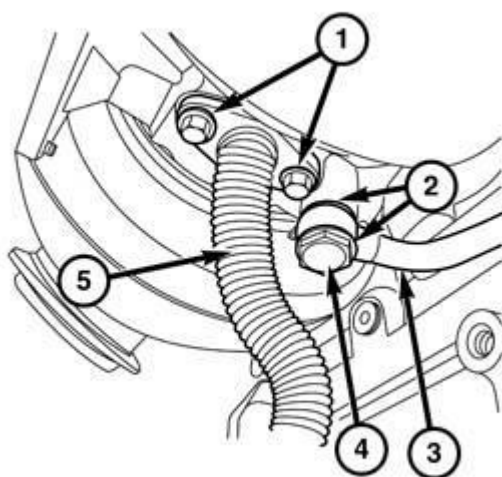
16. Remove the turbocharger oil pressure line (1).
17. Remove banjo bolt (7) and the turbocharger coolant line (2).
18. Remove the right hand side engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.



0911004863

Fig. 375: Turbocharger Exhaust Outlet & V-Clamp
Courtesy of CHRYSLER GROUP, LLC

19. Raise and support the vehicle.
20. Remove the exhaust steady rest bracket from transmission.
21. Remove the V-clamp (2) from the turbocharger exhaust outlet (1).



0911005528

Fig. 376: Bolts, Sealing Washers, Turbocharger Coolant Tube, Banjo Bolt & Turbocharger Drain Tube
Courtesy of CHRYSLER GROUP, LLC

22. Remove bolts (1) and the turbocharger drain tube (5) at the turbocharger.
23. Remove the turbocharger oil drain tube (5) from the cylinder block.
24. Remove banjo bolt (4) and the coolant tube (3) from turbocharger.
25. Lower the vehicle.
26. Remove the intake air heater relay from the battery tray. Refer to **RELAY, INTAKE AIR HEATER, REMOVAL**.
27. Using Tool (special tool #9866, Wrench, Turbo Charger Bolt), remove the turbocharger to exhaust manifold mounting nuts.
28. Remove the turbocharger from the vehicle by lifting from the top of the engine compartment.
29. Clean the turbocharger mating surfaces.
30. Inspect the turbocharger for damage, if necessary replace the turbocharger. Refer to **TURBOCHARGER, INSPECTION, 6.7L**.

INSPECTION

INSPECTION

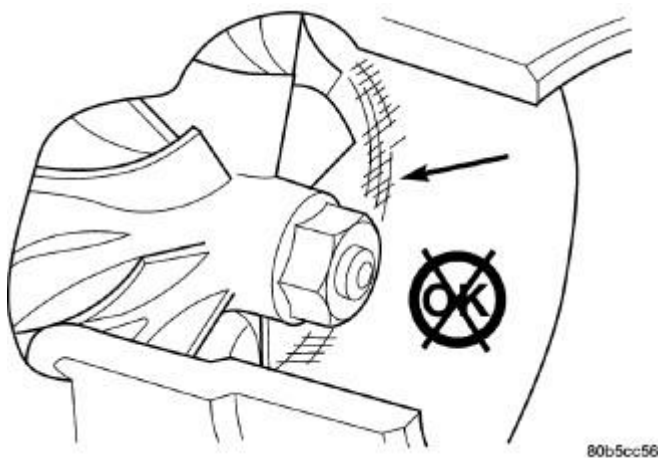


Fig. 377: Inspecting Compressor Housing For Impeller Rubbing Condition
Courtesy of CHRYSLER GROUP, LLC

Visually inspect charge air cooler tubing for excessive oil residue. Clean charge air cooler tubing if necessary. Refer to **COOLER AND HOSES, CHARGE AIR, CLEANING, 6.7L**.

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. Using a straight edge and feeler gauge, measure the flatness between the two longest sections of the turbocharger mounting flange. Specification is 0.1 mm (0.0039 in.) maximum.
3. Using a straight edge and feeler gauge, the exhaust manifold flange. Specification is 0.1 mm (0.0039 in.) maximum. The combined measurements of the turbocharger and the exhaust manifold flanges must not exceed the maximum spec of either of the two flanges. Example: if the turbocharger flange measured 0.005 mm and the exhaust manifold flange measures 0.005 mm then the spec
4. Visually inspect the impeller and compressor wheel fins for nicks, cracks, or chips. Note: Some impellers may have a factory placed paint mark which, after normal operation, appears to be a crack. Remove this mark with a suitable solvent to verify that it is not a crack.
5. Visually inspect the turbocharger compressor housing for an impeller rubbing condition. Replace the turbocharger if the condition exists.

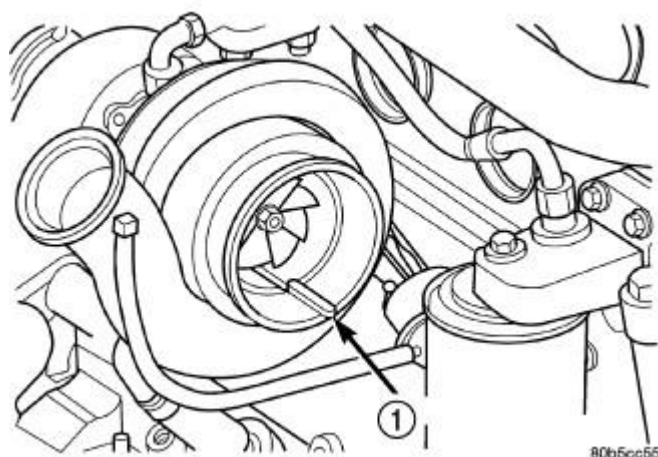
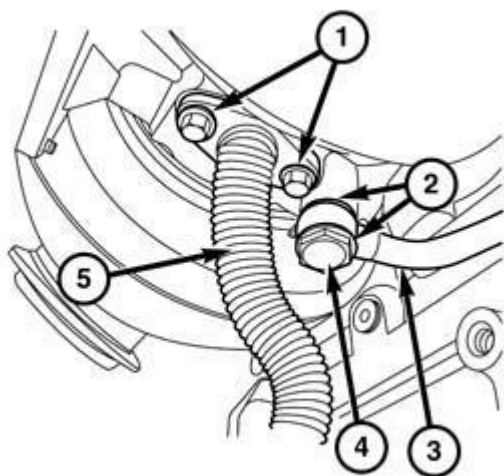


Fig. 378: Measuring Turbocharger Bearing Radial Clearance
Courtesy of CHRYSLER GROUP, LLC

6. Measure the turbocharger bearing radial clearance:
 - a. Insert a narrow blade or wire style feeler gauge between the compressor wheel and the housing.
 - b. Gently push the compressor wheel toward the housing and record the clearance.
 - c. With the feeler gauge in the same location, gently push the compressor wheel away from the housing and again record the clearance.
 - d. Subtract the smaller clearance from the larger clearance. This is the radial bearing clearance.
 - e. Allowable radial bearing clearance is 0.33 mm (0.013 in.) MIN. and 0.50 mm (0.020 in.) MAX. If the recorded measurement falls outside these specifications, replace the turbocharger assembly.

INSTALLATION

INSTALLATION



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Fig. 379: Bolts, Sealing Washers, Turbocharger Coolant Tube, Banjo Bolt & Turbocharger Drain Tube
 Courtesy of CHRYSLER GROUP, LLC

CAUTION: Insure that turbocharger and charge air cooler are free of excess oil and debris. Do not allow any water or solvents to enter the turbocharger inlet or outlet. If necessary, clean turbocharger and the charge air cooler. and

1. Clean the turbocharger mating surfaces.
2. Pre-lube the turbocharger with 29.9 - 59.14 ml (1 - 2 oz.) clean engine oil.
3. Replace the banjo fitting seals (2) on the turbocharger coolant lines.
4. Using a new gasket, position the turbocharger onto the exhaust manifold studs by lowering the turbocharger through the engine compartment.

NOTE: If old gasket appeared to be leaking, check the turbocharger/exhaust manifold mounting flanges for warping. Using a straight edge and feeler gauge measure along the two longest sides of the flanges for warpage. Spec is 0.1 mm (0.0039 inch) for the turbocharger flange and 0.05 mm (0.002 inch) maximum.

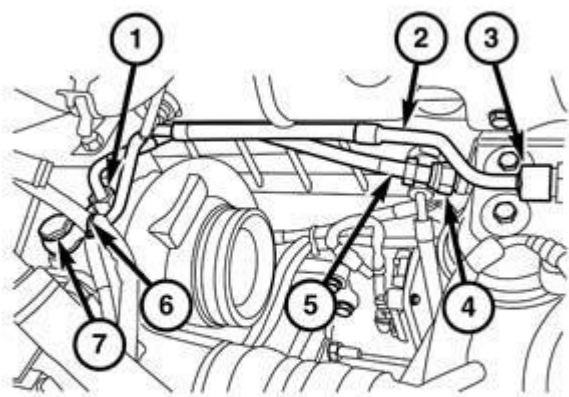
5. Install the turbocharger mounting nuts. Using Turbocharger Tool (special tool #9866, Wrench, Turbo Charger Bolt), using a cross pattern, tighten the nuts to 43 N.m (32 ft. lbs.).
6. Install the intake air heater relay to the battery tray. Refer to HEATER, AIR INTAKE, INSTALLATION.
7. Raise and support the vehicle.
8. Inspect the oil drain tube O-rings for nicks or cuts. Replace if necessary. Oil the O-rings with new oil.

9. Position the turbocharger drain tube (5) into engine block.
10. Using a new gasket, install the turbocharger drain tube mounting bolts (1). Tighten bolts (1) to 24 N.m (18 ft. lbs.).



Fig. 380: Turbocharger Exhaust Outlet & V-Clamp
Courtesy of CHRYSLER GROUP, LLC

11. Using a gasket and new clamp (2), connect the exhaust pipe to the turbocharger exhaust outlet (1) with the clamp facing down as shown in the illustration. Tighten the clamp (2) to 17 N.m (13 ft. lbs.). Using a rubber mallet, hit the exhaust pipe to turbocharger clamp three times around the perimeter of the clamp (2) and tighten the clamp (2) to 17 N.m (13 ft. lbs.).
12. Install the exhaust steady rest bracket to the transmission. Tighten bolts to 43 N.m (32 ft. lbs.).
13. Install the right side engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.



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Fig. 381: Union Nuts, Coolant Tube, Turbocharger Oil Supply Line, Cable tie & Banjo Bolt
Courtesy of CHRYSLER GROUP, LLC

14. Using new sealing washers, install the coolant line (2) to the turbocharger. Tighten the banjo bolt (7) and fitting (3) 24 N.m (18 ft. lbs.).

NOTE: Maintain 10 mm minimum distance between oil supply line and turbine housing or exhaust manifold. Maintain 5 mm minimum distance between oil supply line and any other component.

15. Install the turbocharger oil pressure line (1, 4). Tighten the fitting to 24 N.m (18 ft. lbs.).

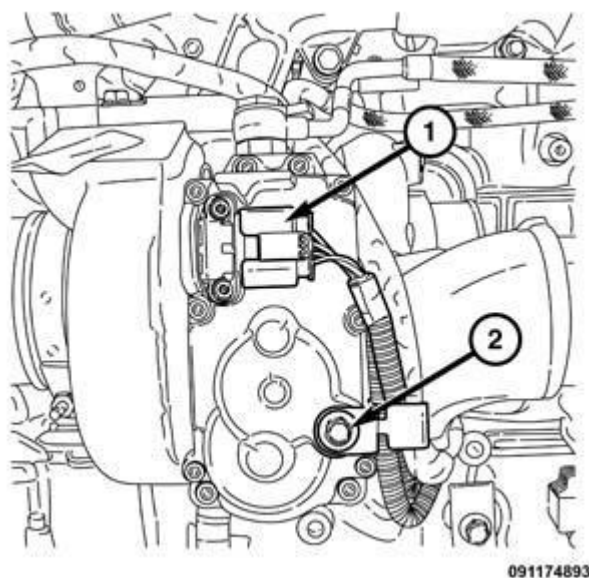


Fig. 382: Turbocharger Actuator Wire Harness Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

16. Connect the turbocharger actuator wire harness connector (1).
17. Position the NOx wire harness and the turbocharger speed sensor wire harness into retainer clip and install bolt to turbocharger actuator. Tighten bolt to 11 N.m (97 in. lbs.).

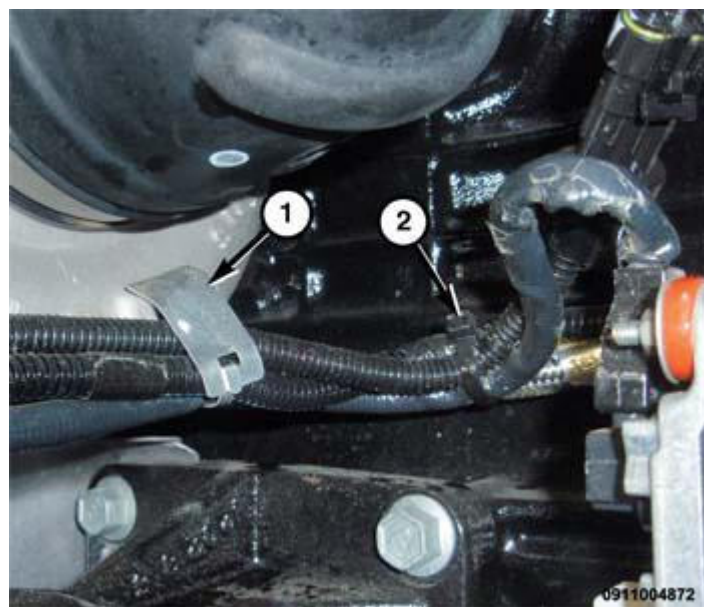
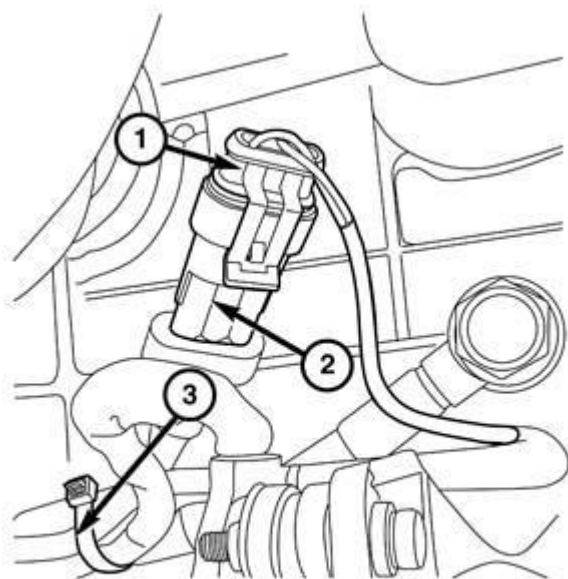


Fig. 383: Clip & Cable Tie
Courtesy of CHRYSLER GROUP, LLC

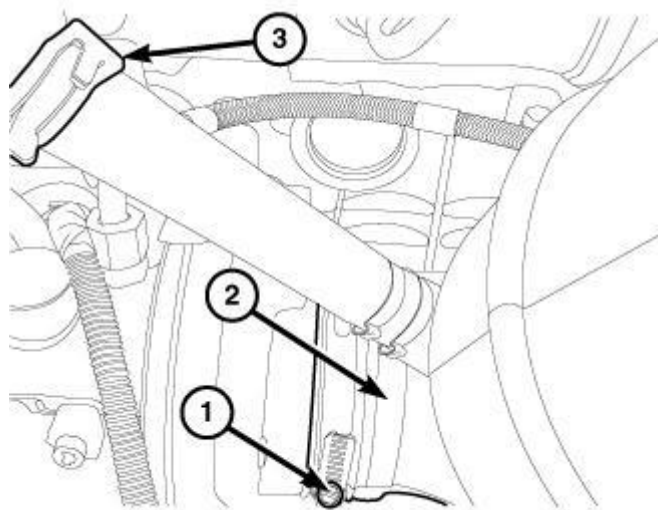
18. Position the NOx wire harness and the turbocharger speed sensor wire harness and close retainer clip (1).
19. Using a cable tie (2), tie the NOx sensor wire harness and turbocharger speed sensor wire harness together.



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Fig. 384: Speed Sensor Wire Harness Connector, Speed Sensor & Cable Tie
Courtesy of CHRYSLER GROUP, LLC

20. Connect the turbocharger speed sensor wire harness connector (1).



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Fig. 385: Identifying Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

21. Install the outlet tube (2) to the turbocharger. Tighten the clamp (1) to 11 N.m (97 in. lbs.).
22. Connect the breather hose (3).

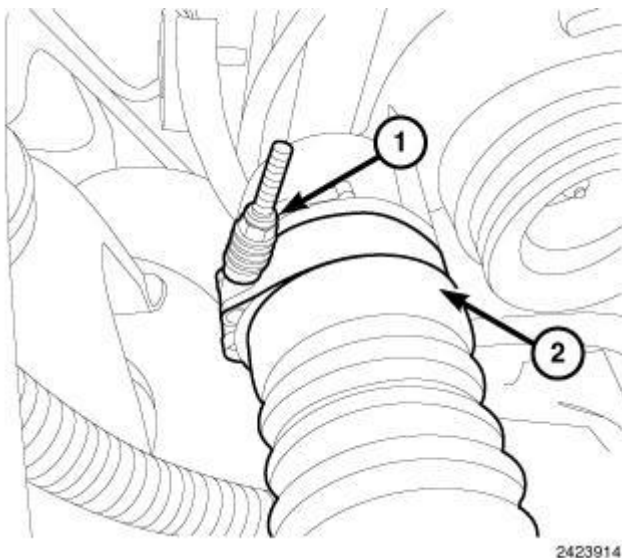


Fig. 386: Identifying Clamp & Outlet Tube
Courtesy of CHRYSLER GROUP, LLC

23. Install the Charge Air Cooler (CAC) inlet tube to the turbocharger inlet. Tighten the clamp to 11 N.m (8 ft. lbs.).
24. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
25. Install the right side wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** or **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION**.
26. Lower the vehicle.
27. Fill the cooling system. Refer to **STANDARD PROCEDURE**.



Fig. 387: Engine Cover, Bolts & Oil Dipstick
Courtesy of CHRYSLER GROUP, LLC

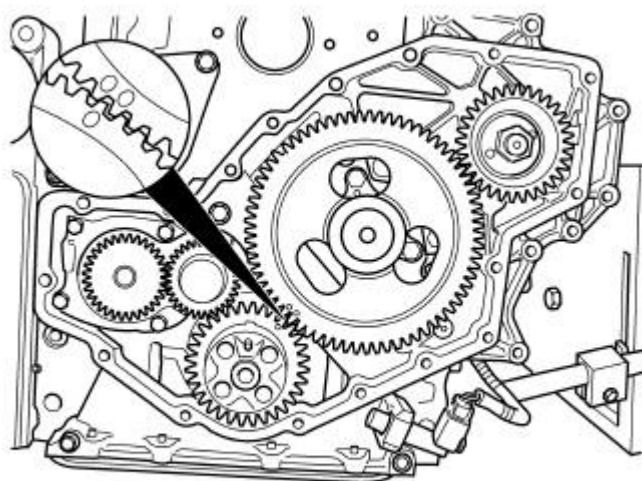
28. Install the engine cover (2) and fasteners (1, 4).
29. Install the engine oil dip stick (3).
30. Position and connect the right hand side positive battery cable
31. Connect the negative battery cable on both batteries.
32. Check for any cooling or exhaust leaks and confirm the turbocharger is operating properly. Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING, 6.7L.**

VALVE TIMING

STANDARD PROCEDURE

TIMING VERIFICATION

1. Remove fuel injector from cylinder No. 1. Refer to **INJECTOR(S), FUEL, REMOVAL** .
2. Using Barring Tool (special tool #7471B, Barring Tool) rotate the engine until the TDC mark on the damper is at 12 o'clock.
3. Using a 8 in. x 1/4 in. dowel rod inserted into cylinder No. 1, rock the crankshaft back and forth to verify piston No. 1 is at TDC.
4. With cylinder number still at TDC, inspect the keyway on the crankshaft gear for proper alignment (12 o'clock position).
5. If the keyway is not at 12 o'clock position replace the crankshaft gear assembly.



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Fig. 388: Camshaft Gear & Crankshaft Gear Timing Mark Alignment
Courtesy of CHRYSLER GROUP, LLC

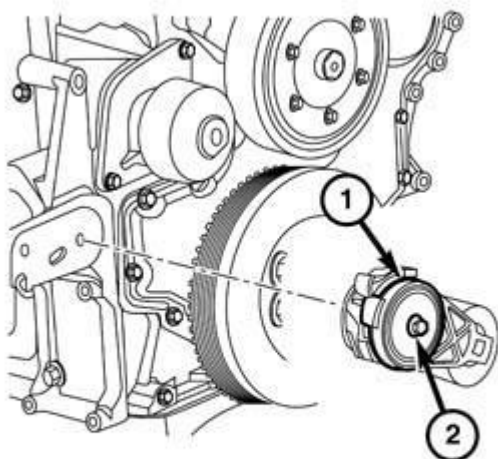
6. If the keyway is at 12 o'clock position, remove front gear cover and verify timing mark alignment between the camshaft gear and crankshaft gear, if not aligned inspect keyway on camshaft gear.
7. Inspect keyway on camshaft gear for proper alignment with the key in the camshaft, if alignment is off replace the camshaft/gear assembly.
8. If timing marks alignment is off and no damage is found at either the crankshaft or camshaft gear keyways, realign timing marks as necessary.

COVER(S), ENGINE TIMING

REMOVAL

REMOVAL

1. Disconnect both battery negative cables.
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Partially drain engine coolant. Refer to **STANDARD PROCEDURE** .
4. Lower the vehicle.
5. Remove the radiator upper hose.
6. Remove shroud assembly, viscous fan, and fan drive. Refer to **FAN, COOLING, VISCOUS, REMOVAL** .

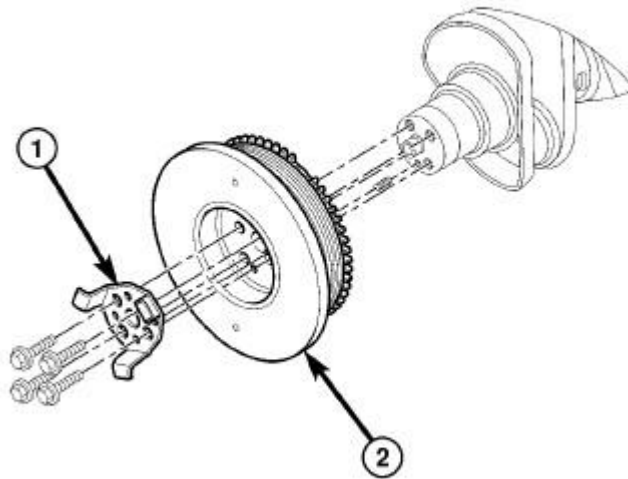


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Fig. 389: Accessory Drive Belt Tensioner & Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Remove Bolt (2) and the accessory drive belt tensioner (1).
8. Raise and support the vehicle.

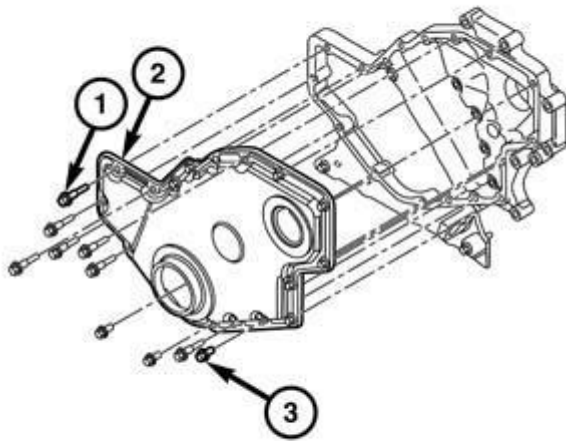
9. Remove the power steering pump. Refer to **PUMP, REMOVAL** .



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Fig. 390: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

10. Remove the crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 6.7L**.
11. Lower the vehicle.



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Fig. 391: Engine Timing Cover Components
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (1, 3) and the timing cover by gently prying the cover away from the housing, taking care not to mar the gasket surfaces.

Remove the engine timing housing (2). Refer to **COVER(S), ENGINE TIMING, REMOVAL, 6.7L**.

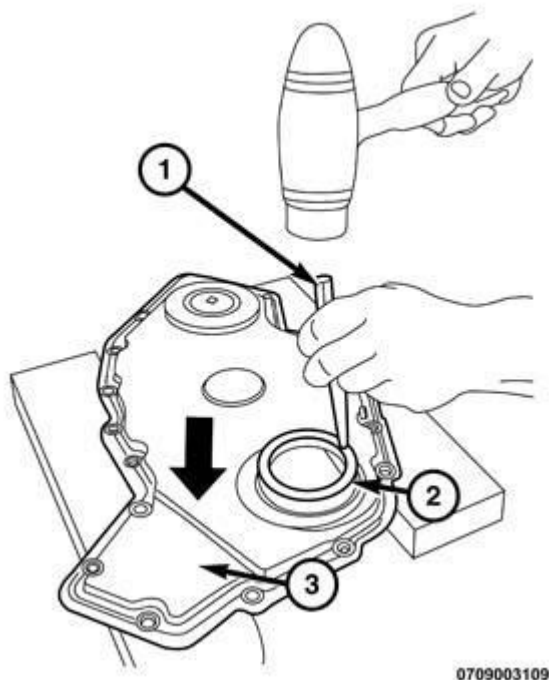
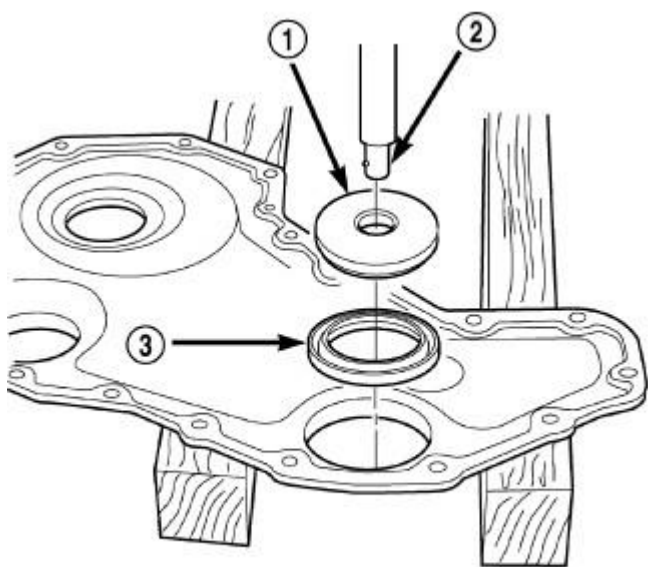


Fig. 392: Driving Seal Out Of The Cover
Courtesy of CHRYSLER GROUP, LLC

13. Support the engine timing cover on a flat work surface with wooden blocks, and using a suitable punch (1) and hammer, drive the old seal (2) out of the engine timing cover from the front side.

INSTALLATION

INSTALLATION

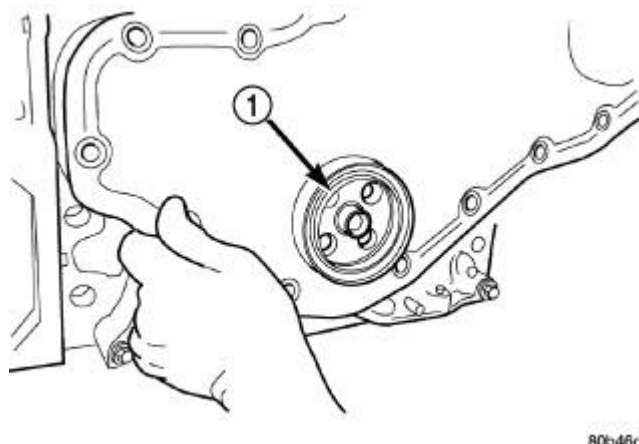


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Fig. 393: Installing Seal Into Cover With Tool 8281
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The seal lip and the sealing surface on the crankshaft must be free of all oil residue, to prevent leaks. The crankshaft and seal surface must be completely dry when the seal is installed.

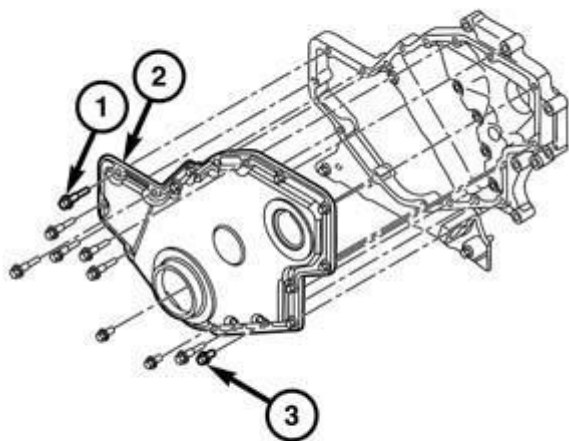
1. Clean cover and housing gasket mating surfaces. Use a suitable scraper and be careful not to damage the gear housing surface. Remove any old sealer from the oil seal bore. Thoroughly clean the front seal area of the crankshaft. Do not sand this surface. The seal lip and the sealing surface on the crankshaft must be free from all oil residue to prevent seal leaks.
2. Inspect the gear housing and cover for cracks and replace if necessary. Carefully straighten any bends or imperfections in the gear cover with a ball-peen hammer on a flat surface. Inspect the crankshaft front journal for any grooves or nicks that would affect the integrity of the new seal.
3. Apply a bead of Mopar® Stud AND Bearing Mount to the outside diameter of the seal. Do not lubricate the inside diameter of the new seal.
4. With the engine timing cover supported by wood blocks, install the seal (2) into the rear of the cover using the (special tool #10136, Installer, Crankshaft Front Oil Seal) (1) and (special tool #C-4171, Driver Handle, Universal) (2). Strike the driver handle until the installation tool bottoms out on the inside of the engine timing cover.



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Fig. 394: Installing Front Cover With Seal Pilot
Courtesy of CHRYSLER GROUP, LLC

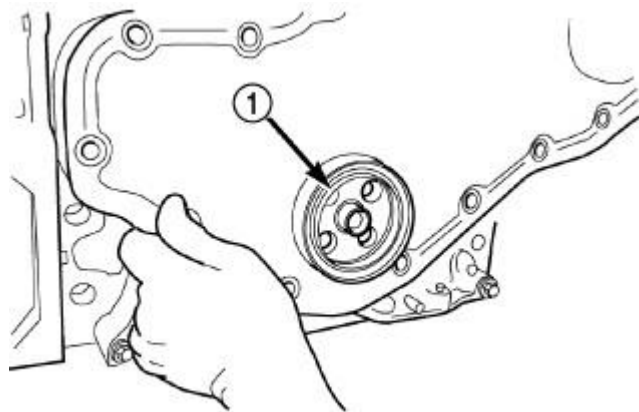
5. Obtain a seal pilot (1) installation tool from a crankshaft front seal service kit and install the pilot into the seal.
6. Apply a bead of Mopar® Silicone Rubber Adhesive Sealant or equivalent to the gear housing cover. Be sure to surround all through holes.
7. Using the seal pilot (1) to align the engine timing cover the onto the front timing case housing. Install one bolt at the 3 o'clock and another at the 9 o'clock positions. Tighten both bolts finger tight.



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Fig. 395: Engine Timing Cover Components
Courtesy of CHRYSLER GROUP, LLC

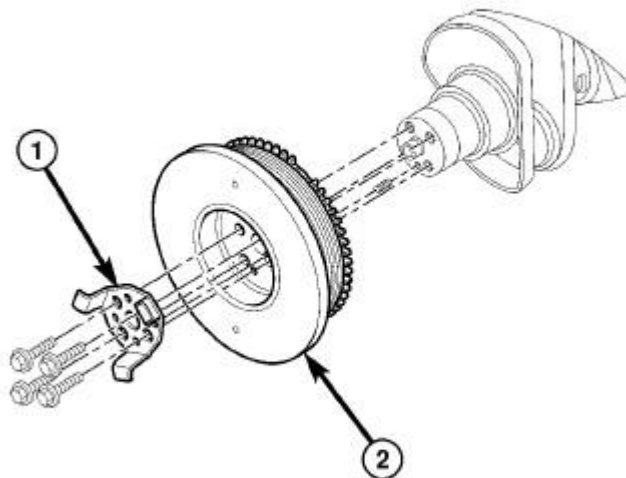
8. Install the remaining bolts (1, 3) finger tight. Tighten the bolts in a clockwise direction starting at the 3 o'clock position to 24 N.m (18 ft. lbs.).



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Fig. 396: Installing Front Cover With Seal Pilot
Courtesy of CHRYSLER GROUP, LLC

9. Remove the seal pilot (1).



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Fig. 397: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

10. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.
11. Install the vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 6.7L**.

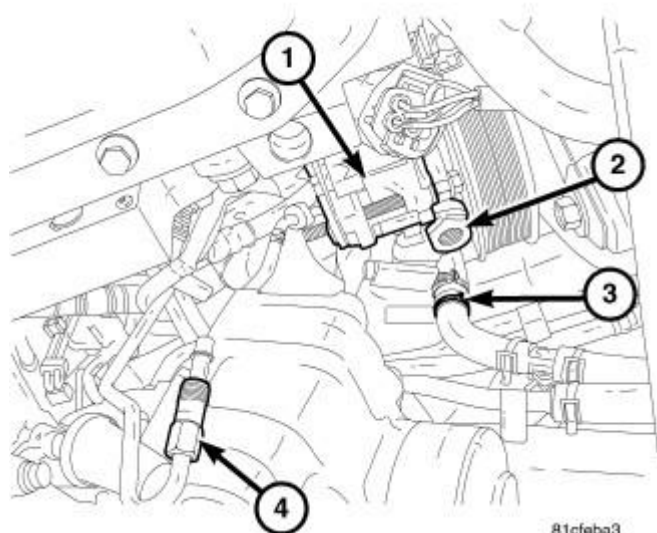


Fig. 398: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

12. Install the power steering pump. Refer to **PUMP, INSTALLATION** .

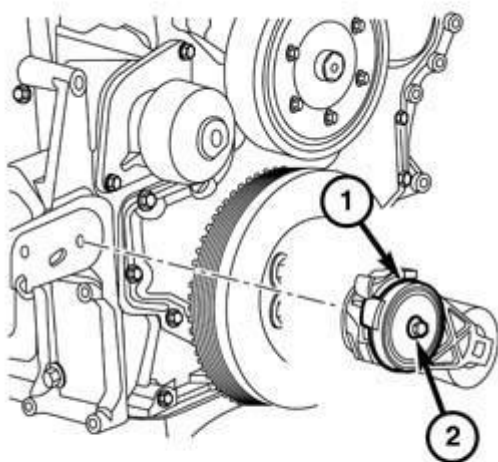


Fig. 399: Accessory Drive Belt Tensioner & Bolt
Courtesy of CHRYSLER GROUP, LLC

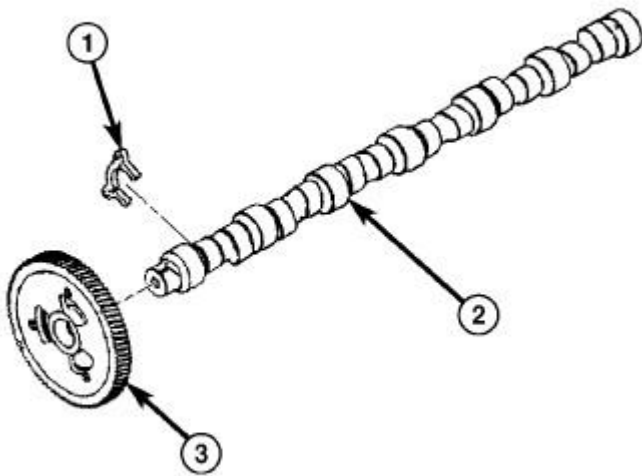
13. Install the accessory drive belt tensioner (1). Tighten bolt (2) to 43 N.m (32 ft. lbs.).
14. Install the fan drive, viscous fan, and shroud assembly. Refer to **FAN, COOLING, VISCOUS, INSTALLATION** .
15. Install the radiator upper hose.

16. Fill the coolant system. Refer to **STANDARD PROCEDURE** .
17. Connect both battery negative cables.
18. Start engine and inspect for leaks.

HOUSING, TIMING CASE, FRONT

REMOVAL

REMOVAL



81e8ba31

Fig. 400: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L.**

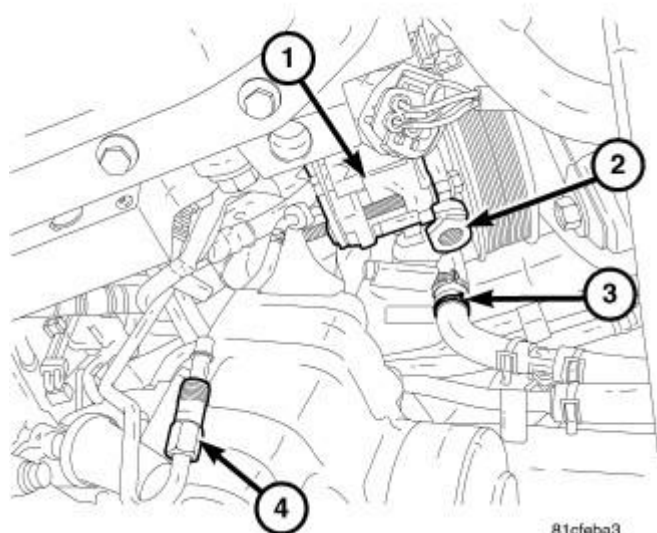


Fig. 401: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

3. Remove the power steering pump. Refer to **PUMP, REMOVAL** .

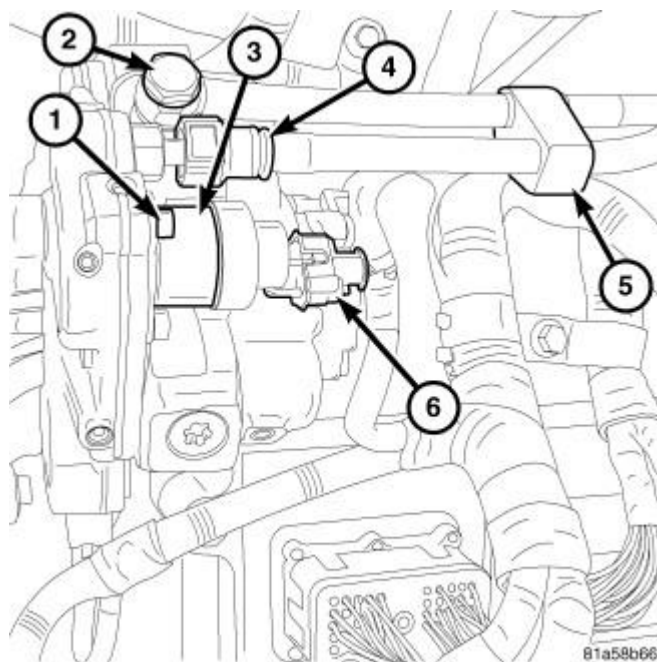
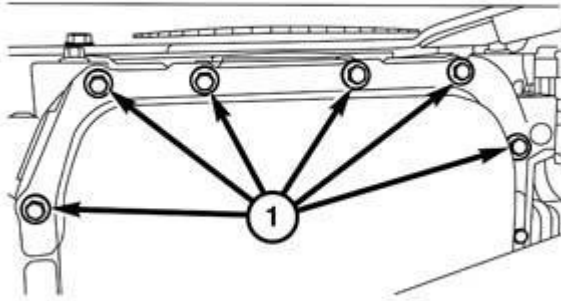


Fig. 402: Fuel Injection Pump Components - Rear View
Courtesy of CHRYSLER GROUP, LLC

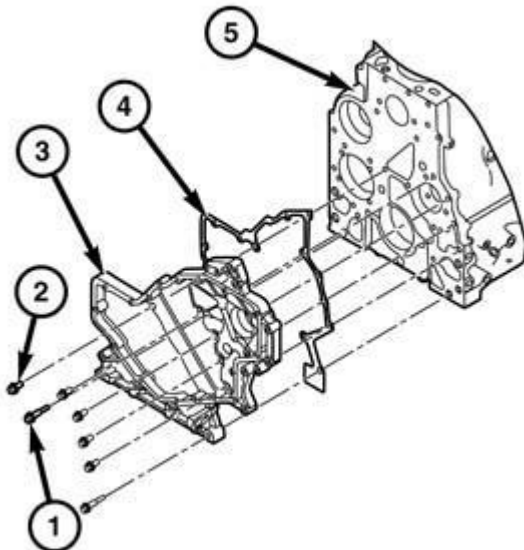
4. Remove the fuel injection pump. Refer to **PUMP, FUEL INJECTION, REMOVAL** .
5. Remove the crankshaft position sensor. Refer to **SENSOR, CRANKSHAFT POSITION, REMOVAL** .



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Fig. 403: Oil Pan Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove the front six oil pan bolts (1).



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Fig. 404: Front Timing Case Housing Components
Courtesy of CHRYSLER GROUP, LLC

7. Remove the front timing case housing bolts (1, 2).

NOTE: Use care when removing the front timing case housing, to avoid damage to the oil pan gasket.

8. Slide a feeler gauge between the front timing case housing and oil pan gasket, to break the gasket seal.
9. Remove the front timing case housing and gasket.
10. Clean the gasket material from the cylinder block and front timing case housing.

INSTALLATION

INSTALLATION

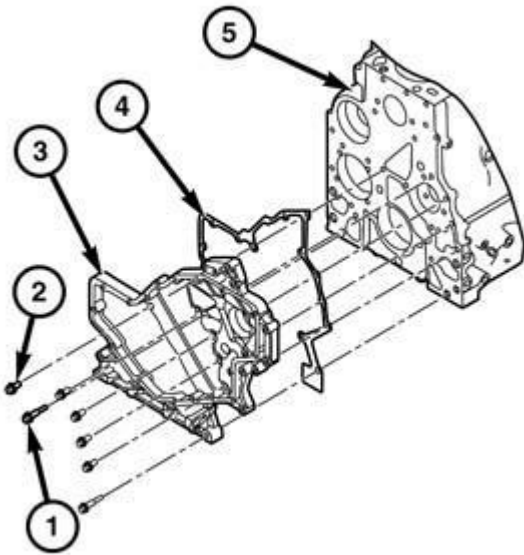
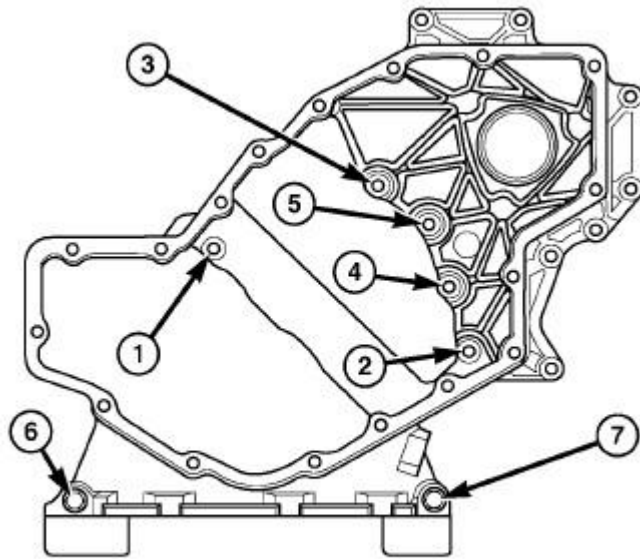


Fig. 405: Front Timing Case Housing Components

Courtesy of CHRYSLER GROUP, LLC

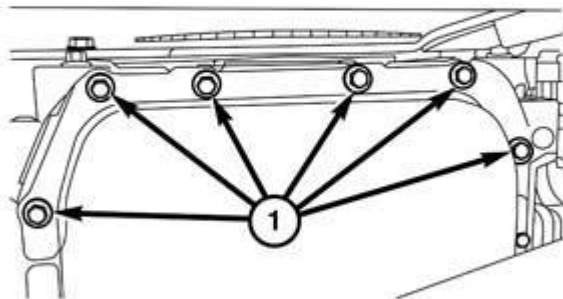
1. Inspect oil pan gasket. If torn, gasket must be replaced.
2. Install a new front timing case housing gasket (4).
3. Place a small amount of Mopar® engine RTV to the corners of the block and pan gasket T-joint to ensure a good seal.
4. Install the front timing case housing (3) and tighten bolts (1, 3) finger tight.



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Fig. 406: Gear Housing Capscrew Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

5. Using the tightening sequence shown in the illustration, tighten bolts to 24 N.m (18 ft. lbs.).



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Fig. 407: Oil Pan Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the front six oil pan bolts (1) and tighten to 43 N.m (32 ft. lbs.).

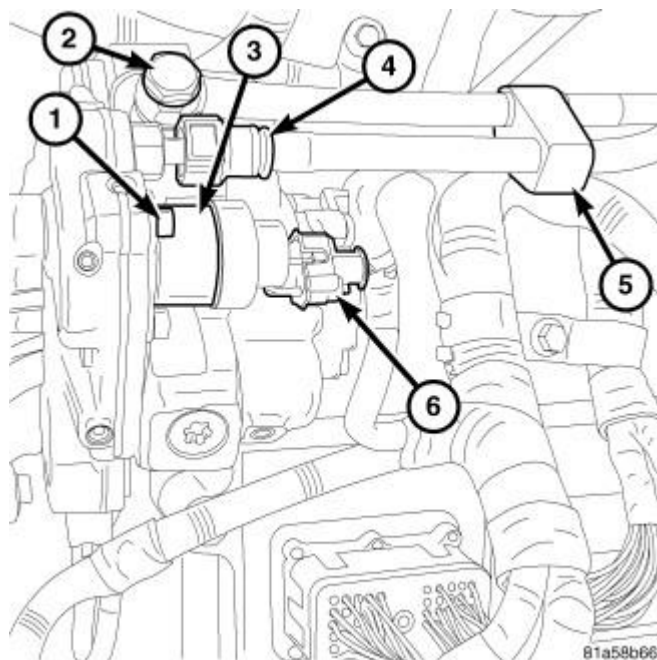


Fig. 408: Fuel Injection Pump Components - Rear View
Courtesy of CHRYSLER GROUP, LLC

7. Install Crankshaft Position (CKP) sensor. Refer to **SENSOR, CRANKSHAFT POSITION, INSTALLATION**.
8. Install the fuel injection pump. Refer to **PUMP, FUEL INJECTION, INSTALLATION**.

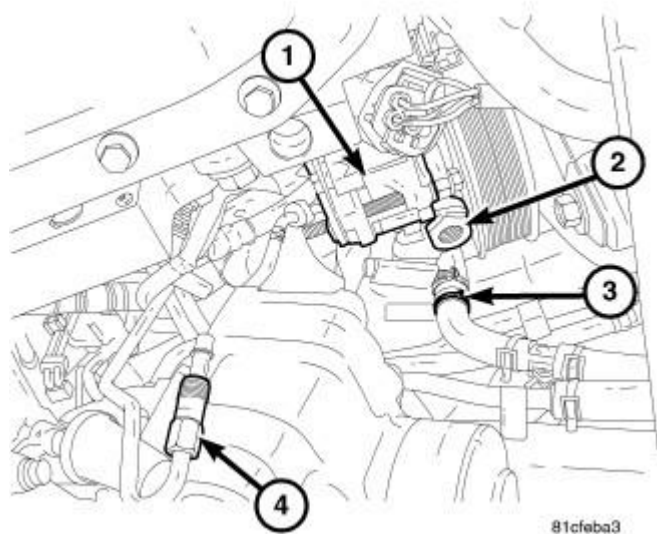
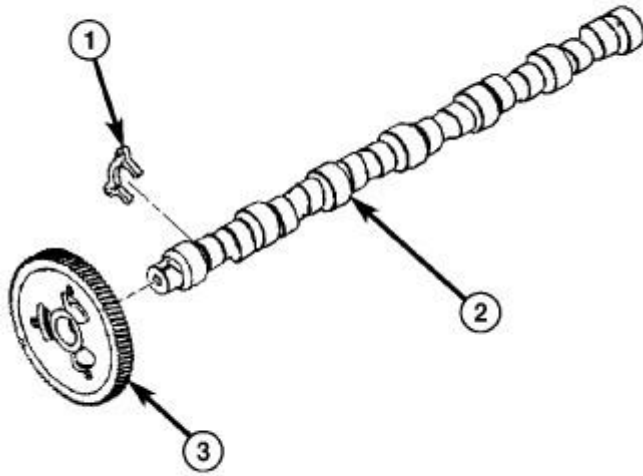


Fig. 409: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

9. Install the power steering pump. Refer to **PUMP, INSTALLATION**.



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Fig. 410: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

10. Install the camshaft. Refer to CAMSHAFT, ENGINE, INSTALLATION, 6.7L.
11. Connect both negative battery cables.
12. Start engine and inspect for leaks.