2012 ENGINE

6.7L Diesel, Service Information - Ram Pickup

DESCRIPTION

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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.

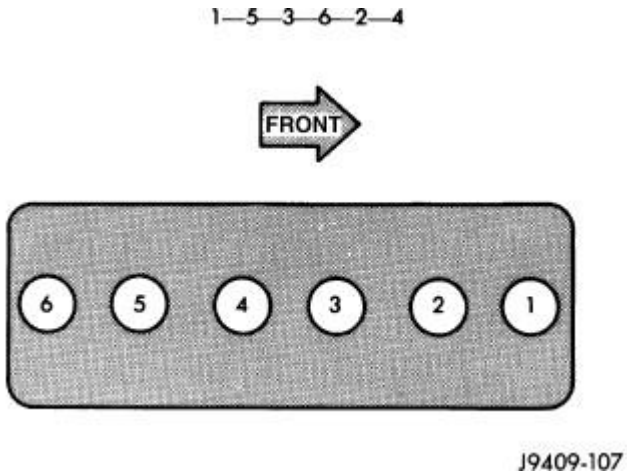


Fig. 1: Cylinder Numbering & Firing Order
Courtesy of CHRYSLER GROUP, LLC

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

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 **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION** .
		(b) Look for reduced viscosity from fuel dilution.

	3. Improperly operating pressure switch/gauge.	3. Verify the pressure switch is 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 **DIAGNOSIS AND TESTING** .
	3. Oil viscosity too thick.	3. Make sure the correct oil is being used. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION** .
	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 **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION** .
		(b) Look for reduced viscosity from dilution with fuel.
		(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 **SMOKE DIAGNOSIS CHARTS**.
	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 Engine Control Module (ECM) 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 ECM 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 table to determine the amount of Time Delay.

NOTE: The time delay values supplied in ENGINE TEMPERATURE VERSUS TIME DELAY are an approximation and may vary per application.

ENGINE TEMPERATURE VERSUS TIME DELAY

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 the EXHAUST SYSTEM article of the service information to correct after treatment failure. The diesel particulate filter MAY have failed due to the possible causes listed below.

EXCESSIVE BLACK SMOKE

EXCESSIVE BLACK SMOKE	
POSSIBLE CAUSE	**CORRECTION**
Aftermarket components installed.	Inspect for aftermarket components or evidence of modifications.
Air filter dirty or plugged.	Check Filter Minder® at air filter. Refer to **AIR CLEANER, REMOVAL, 6.7L**.
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 **COOLER AND HOSES, CHARGE AIR, DIAGNOSIS AND TESTING, 6.7L**. 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.
Engine Control Module (ECM) not calibrated or ECM 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 Owners 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 **DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS, 6.7L DIESEL** article).
Fuel injection pump malfunctioning.	A DTC may have been set (Refer to appropriate Electrical Diagnostics article). Also refer to **FUEL SYSTEM** article.

Fuel return system restricted.	Check fuel return lines for restriction. Refer to **DIAGNOSIS AND TESTING**. Also refer to **DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS, 6.7L DIESEL** article.
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. Do Fuel Injector Test. Refer to **DIAGNOSIS AND TESTING**. Also refer to **DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS, 6.7L DIESEL** article.
Turbocharger air intake restriction.	Remove restriction.
Turbocharger damaged or malfunctioning.	Turbocharger damaged or malfunctioning. Refer to **TURBOCHARGER, INSPECTION, 6.7L**.
Turbocharger has excess build up on compressor wheel and/or diffuser vanes.	Refer to **TURBOCHARGER SYSTEM, CLEANING, 6.7L**.
Turbocharger externally damaged.	Check for excessive oil in compressor and/or turbine housing and in turbocharger exhaust pipe. Refer to **TURBOCHARGER, INSPECTION, 6.7L**.
Turbocharger wheel clearance out of specification.	Refer to **TURBOCHARGER, INSPECTION, 6.7L**.

EXCESSIVE WHITE SMOKE

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 **DIAGNOSIS AND TESTING** .
In cold ambient temperatures, engine block heater is malfunctioning (if equipped).	Refer to **HEATER, ENGINE BLOCK, REMOVAL** .
Engine coolant temperature sensor malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Also check thermostat operation. Refer to **THERMOSTAT, DIAGNOSIS AND TESTING** . 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 **FUEL SYSTEM** article.
Low supply flow to the injection pump.	Test the fuel delivery system (Refer to **FUEL SYSTEM** article).
Fuel grade not correct or fuel quality is poor.	Temporarily change fuel brands and note condition. Change brand if necessary. Refer to Owners Manual for correct fuel specification.
Fuel heater element or fuel heater temperature sensor malfunctioning. This will cause wax type build-up in fuel filter.	Refer to Fuel Heater Testing. Refer to **HEATER, FUEL, DIAGNOSIS AND TESTING** .
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 **DRIVEABILITY - DIESEL - NON-DTC BASED DIAGNOSTICS, 6.7L DIESEL** article.
Fuel injector protrusion not correct.	Check washer (shim) at bottom of fuel injector for correct thickness. Refer to **INJECTOR(S), FUEL, INSTALLATION** .
Fuel injection pump malfunctioning.	A DTC should have been set (Refer to appropriate Electrical Diagnostics article). Perform fuel injection pump performance test. Refer to **FUEL SYSTEM** article.
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 **Engine/Cylinder Head/VALVES, Intake and Exhaust - Standard Procedure**.
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 after treatment (diesel particulate filter) failure. Follow inspection/replacement guidelines in the EXHAUST SYSTEM article of the service information to correct after treatment

failure. The diesel particulate filter MAY have failed due to the possible causes listed below.

EXCESSIVE BLUE SMOKE

EXCESSIVE BLUE SMOKE	
POSSIBLE CAUSE	**CORRECTION**
Dirty air cleaner or restricted turbocharger intake duct.	Check Filter Minder® at air filter housing. Refer to **AIR CLEANER, REMOVAL, 6.7L**.
Obstruction in exhaust manifold.	Remove exhaust manifold and inspect for blockage. Refer to **MANIFOLD, EXHAUST, REMOVAL, 6.7L**.
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 **VALVES, INTAKE AND EXHAUST, REMOVAL, 6.7L**.
Valve stems and/or guides are worn.	Remove valves and inspect valves and guides. Refer to **VALVES, INTAKE AND EXHAUST, REMOVAL, 6.7L**.
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 **Engine/Engine Block/RING(S), Piston - Standard Procedure**.
Excessive cylinder bore wear and taper.	Remove pistons and measure cylinder bore wear and taper. Refer to **Engine/Engine Block - Standard Procedure**.
Cylinder damage.	Remove pistons and inspect cylinder bore for cracks or porosity. Repair with cylinder liner if necessary. Refer to **Engine/Engine Block - Standard Procedure**.
Piston damage.	Remove pistons and inspect for cracks and/or holes. Measure piston for out-of-round and taper. Refer to **Engine/Engine Block/ROD, Piston and Connecting - Inspection**.
Turbocharger failure.	Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING, 6.7L**.
Fuel injector protrusion not correct.	Check washer (shim) at bottom of fuel injector for correct thickness. Refer to **INJECTOR(S), FUEL, INSTALLATION** .

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 cylinder head cover carrier gasket. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
6. 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.
7. Remove the fuel connector tube nut and fuel connector tube.
8. Remove the exhaust rocker lever.
9. Use Fuel Injector Remover\Installer (special tool #9010A, Remover/Installer, Fuel Injector) to remove the injector and copper sealing washer.
10. Install Compression Test Adapter (special tool #9007, Adapter, Compression Test) into the injector bore.
11. Install the exhaust rocker lever and tighten to 36 N.m (27 ft. lbs.).
12. Cover the remaining rocker levers with clean shop towels to prevent any oil splatter under the hood.
13. 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.
14. Connect the compression test gauge.
15. 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.

16. 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.
17. 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. Disconnect harness from injectors.
6. Remove the cylinder head cover carrier gasket. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
7. Bring the cylinder to be tested to TDC.
8. Remove the high pressure fuel line between the cylinder head and the fuel rail for the cylinder to be tested.
9. Install Fuel Rail Cap (special tool #9864, Cap, Fuel Rail) onto the rail.
10. Remove the high pressure connector nut and high pressure connector with High Pressure Connector Remover (special tool #9015, Remover, High Pressure Connector).
11. Remove the exhaust and intake rocker lever.
12. Use Fuel Injector Remover\Installer (special tool #9010A, Remover/Installer, Fuel Injector) to remove the injector and copper sealing washer.
13. Install Compression Test Adapter (special tool #9007, Adapter, Compression Test) into the injector bore.
14. Connect the leakage tester and perform the leakage test procedure on each cylinder according to the tester manufacturer's instructions.
15. Upon completion of the test check and erase any engine related fault codes.

STANDARD PROCEDURE

DUST COVERS AND CAPS

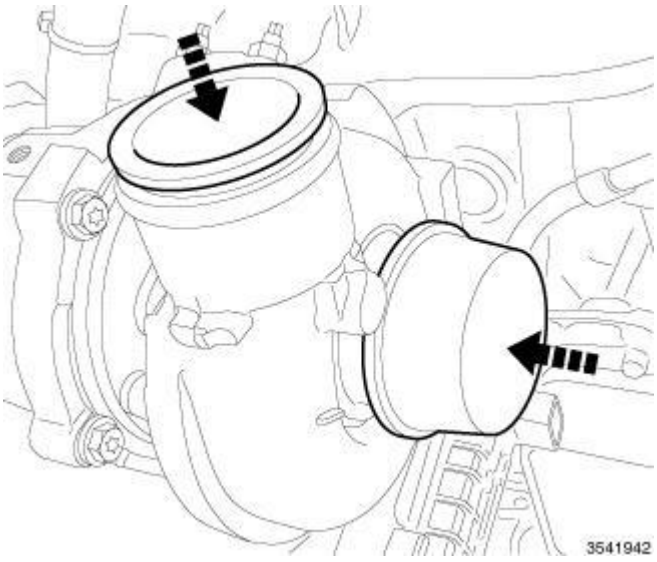


Fig. 2: Covers/Caps
Courtesy of CHRYSLER GROUP, LLC

Due to the high amounts of failures cased 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.

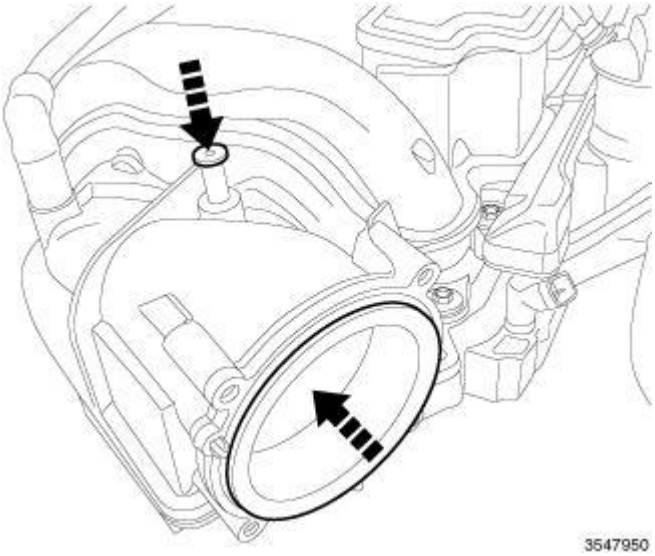


Fig. 3: Opening Cover
Courtesy of CHRYSLER GROUP, LLC

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.

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 4 oz. / 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)
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.
	The clearance for the top piston	The clearance for the top piston

Ring Groove Clearance	ring groove can not be measured accurately with a typical feeler gauge.	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) (Max)	39.997 mm 40.003 mm	1.5747 in. 1.5749 in.
Bore Diameter (Min) (Max)	40.006 mm 40.012 mm	1.5750 in. 1.5753 in.

PISTON RINGS

DESCRIPTION	**SPECIFICATION**	
	Metric	**Standard**
Ring Gap		
Ring Gap Wear Limit		
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.
Top Ring	See Above	See Above
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.

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.
Taper		
Out of Round (Max.)		

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Journal Diameter	53.095 - 54.045 mm	2.0904 - 2.1278 in
Bore Diameter	See Cylinder Block **CYLINDER BLOCK** table	See Cylinder Block **CYLINDER BLOCK** table
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.

TORQUE SPECIFICATIONS

6.7L DIESEL ENGINE

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)	**N.m**	**In. Lbs.**	**Ft. Lbs.**
Step 1	120	-	89
Step 2	Loosen completely	-	Loosen completely
Step 3	60	-	44
Step 4	85	-	63
Step 5	Rotate 120°		
Cylinder Head-Bolts			
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
Accessory Drive Belt Tensioner Bolt	43	-	32
Air Inlet to Intake Manifold Bolts	24	-	18

Air Cleaner Body Bolt	8	70	-
Air Cleaner Intake Air Tube Clamp	4	-	35
Bell Housing Access Cover Bolts	10	89	-
Block Stiffener Bolts	43	-	32
Breather Cover Bolts	10	89	-
Charge Air Cooler Bolt	2	18	-
Charge Air Tube Clamps	11	97	-
Coolant Outlet Tube Bracket Bolt	10	89	-
Coolant Outlet Tube Bracket Nut	24	-	18
Crankshaft Damper Bolts	40 + 60°	-	30 + 60°
Delta-P line Bracket Bolt	10	89	-
Delta-P line Bracket Nut	24	-	18
Delta-P Flare Nut	10	89	-
Dual Mass Flywheel Bolts	54	-	40
Engine Cover Bolts	10	89	-
Engine Mount Bolt	95	-	70
Engine Mount Through Bolt Nut	129	-	95
Engine Wire Harness P-clip Bolts	24	-	18
Exhaust Manifold Bolts	43	-	37
Exhaust Manifold Heat Shield Nuts	24	-	18
Fan Support Hub	32	-	24
Flexplate to Engine	137	-	100
Flywheel to Engine	137	-	100
Flywheel/Crankshaft Adapter	137	-	100
Flywheel Housing Bolts	77	-	57
Forward Coolant Tube Bracket Bolts	10	89	-
Forward Coolant Tube Bolts	10	89	-
Front Cover	24	-	18
Fuel Delivery Lines-Banjo	24	-	18
Fuel Drain Line-Banjo	24	-	18
Fuel Injector Harness Nuts	1.25	11	-
Fuel Injector Hold-down	5	44	-
Step 2	10	89	-
Fuel Injector Solenoid Nuts	1.25	11	-
Fuel Tube, No. 6 Bracket Shield Bolts	43	-	32
Fuel Tube-Rail to Cylinder Head	40	-	30
Fuel Tube-Pump to Fuel Rail	37	-	27
Fuel Rail Hold-down Bolt	24	-	18
Gear Housing Cover	24	-	18
HPC Nut	50	-	37
Intake Manifold Bolts	24	-	18
Intake Manifold Grid Heater Wire Harness Bolts			

	10	89	-
Oil Cooler Bolts	24	-	18
Oil Dip Stick Tube Bolt	24	-	18
Oil Dip Stick Tube Nut	9	80	-
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 **PUMP, ENGINE OIL, INSTALLATION, 6.7L**.		
Oil Suction Tube (Flange)-Bolts	24	-	18
Oil Suction Tube (Brace)-Bolt	43	-	32
Oxygen Sensor	41	-	30
P-Clip Bolt	24	-	18
Rack and Pinion Steering Gear to Frame Bolts (4X2)	251	-	185
Rocker Arm Housing Bolts	24	-	18
Rocker Arm/Pedestal-Bolts	36	-	27
Rocker Housing Bolts	24	-	18
Starter Motor Bolts	40	-	30
Torque Converter Bolts	88	-	65
Transmission to Engine Bolts (automatic)	41	-	30
Transmission to Engine Bolts (manual)	45	-	33
Transmission Mount to Crossmember Nuts	47	-	35
G 56 Transmission Mount Bolts	50	-	37
68RFE Transmission Mount Bolts	50	-	37
AS68RC Transmission Mount Nuts	47	-	35
AS68RC Transmission Mount Support Bracket Bolts	54	-	40
AS68RC Transmission Side Support Bracket Bolt	55	-	41
AS68RC Transmission Upper Bracket Nut	30	-	22
Turbocharger Actuator Bolt	11	97	-
Turbocharger Air Inlet Tube Clamp	11	97	-
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 Oil Drain Tube Bolt	36	-	27
Turbocharger Oil Supply Line Nut	36	-	27
Turbocharger Speed Sensor Bolt	10	89	-
Turbocharger V-Band Clamp Nut	10	89	-

Valve Lash Adjusting Nut	24	-	18

REMOVAL

REMOVAL

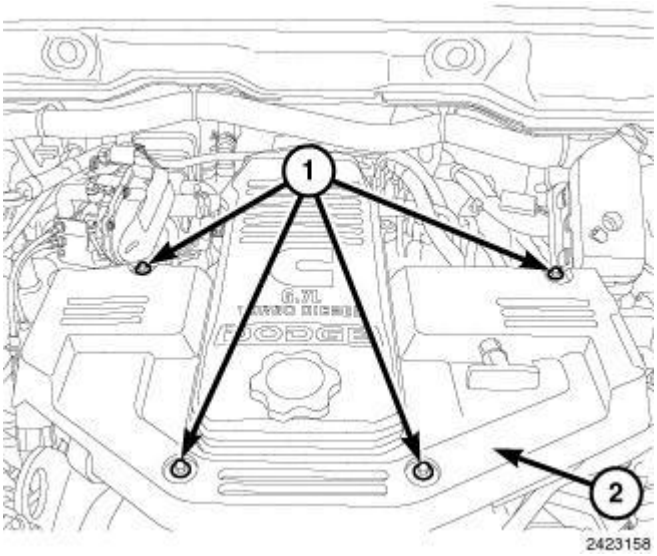


Fig. 6: Engine Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Remove bolts (1) and the engine cover (2).
2. Disconnect the hood support struts and position hood out of the way.
3. Disconnect both negative and positive battery cables.
4. Drain cooling system. Refer to **STANDARD PROCEDURE** .
5. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
6. Recover A/C refrigerant. Refer to **PLUMBING, STANDARD PROCEDURE** .

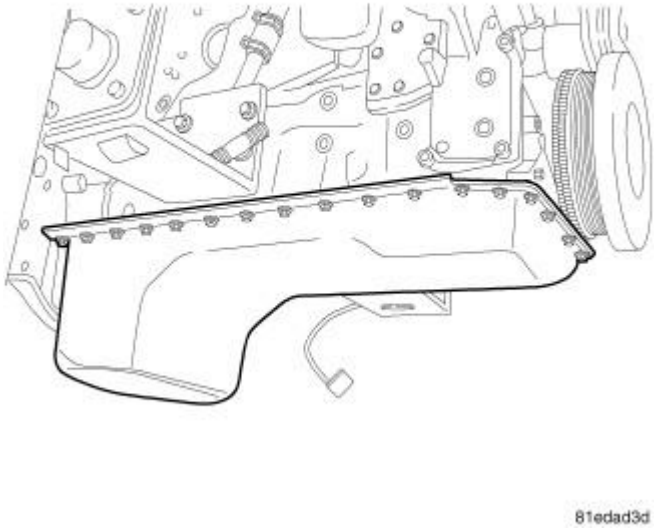


Fig. 7: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

7. Drain engine oil.
8. Reinstall drain plug. Tighten to 50 N.m (37 ft. lbs.).

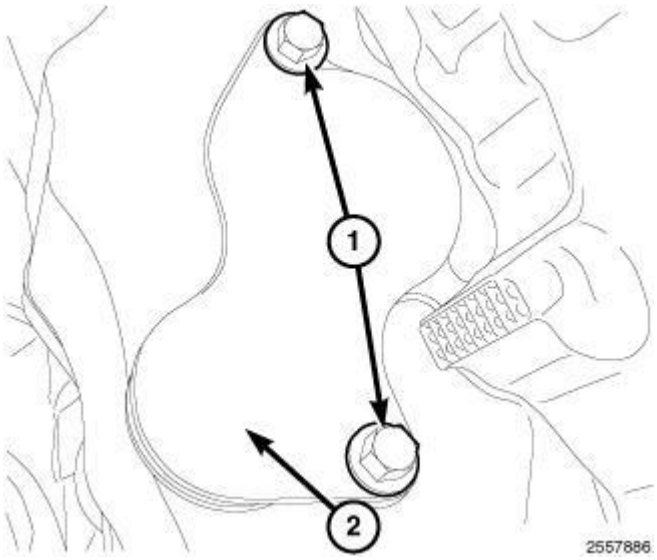


Fig. 8: Bolts & Bell Housing Access Cover
Courtesy of CHRYSLER GROUP, LLC

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

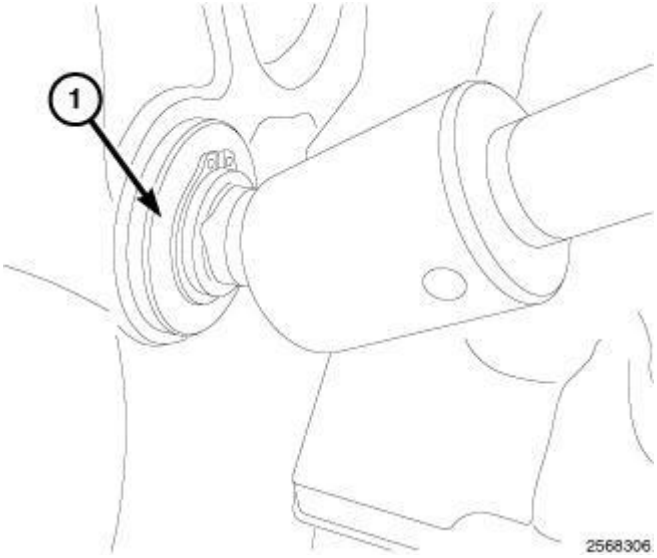


Fig. 9: Engine Barring Tool
Courtesy of CHRYSLER GROUP, LLC

10. Install the Barring Tool (special tool #7471B, Barring Tool) (1).
11. Using the Barring Tool (special tool #7471B, Barring Tool) (1), rotate the engine and remove the torque converter bolts.
    1. On manual transmission models, remove the dual mass flywheel bolts.
12. Remove the Barring Tool (special tool #7471B, Barring Tool) (1).
13. Remove the left ground strap.
14. Disconnect the transmission harness connector.
15. Remove the radiator closure panel. Refer to **PANEL, CLOSURE, RADIATOR, REMOVAL** .
16. Remove the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
17. Disconnect the upper and lower radiator hoses and remove the radiator.
18. Remove the serpentine drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

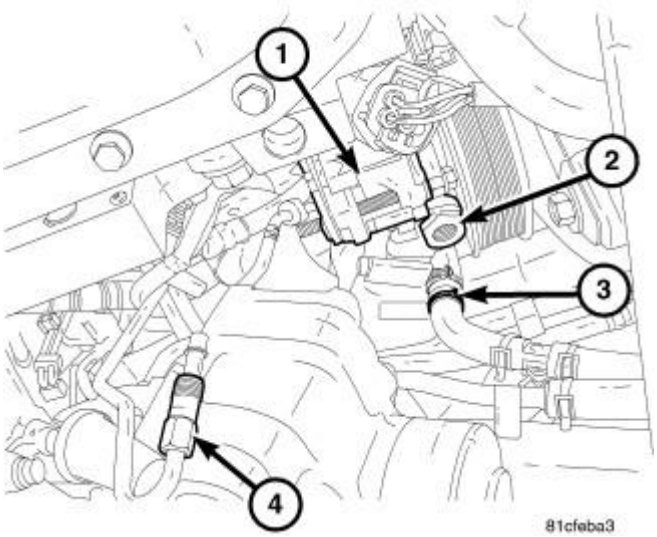


Fig. 10: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

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

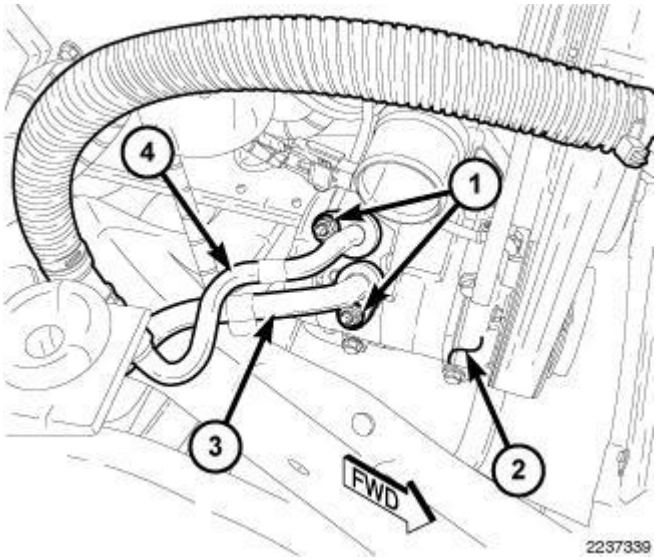


Fig. 11: Nuts, A/C Compressor, A/C Suction Line & A/C Discharge Line
Courtesy of CHRYSLER GROUP, LLC

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

21. 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).
22. Disconnect the A/C suction and discharge lines from the A/C compressor and remove and discard the O-ring seals and gaskets.

23. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.
24. Disconnect engine wiring harness connector from Totally Integrated Power Module (TIPM).
25. Remove the starter cable at the left battery and power distribution center.
26. Disconnect the intake heater connector.
27. Remove the battery negative cables to the engine block on the driver and passenger side.
28. Disconnect the generator harness wires.
29. Disconnect the block heater harness connector.
30. Disconnect the left side, engine block to frame, ground wire.

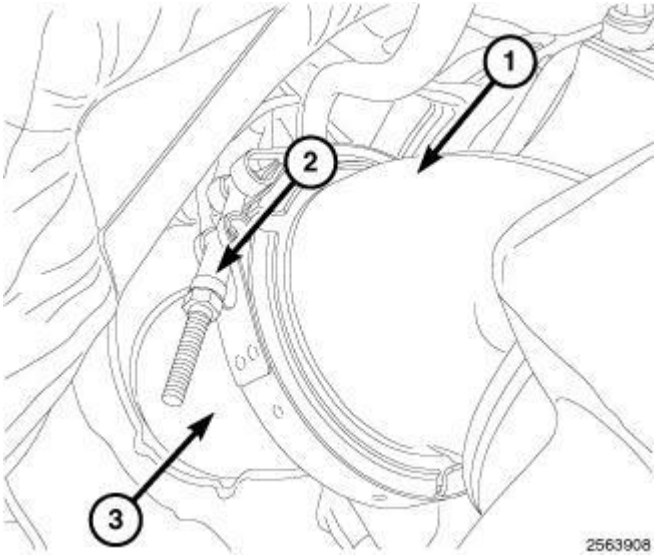


Fig. 12: V-Clamp & Elbow
Courtesy of CHRYSLER GROUP, LLC

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

31. Remove the V-clamp (2) from the exhaust pipe-to-tubrocharger outlet elbow connection.
32. Disconnect the heater core supply and return hoses.
33. Disconnect the fuel supply and return lines from the fuel filter housing.

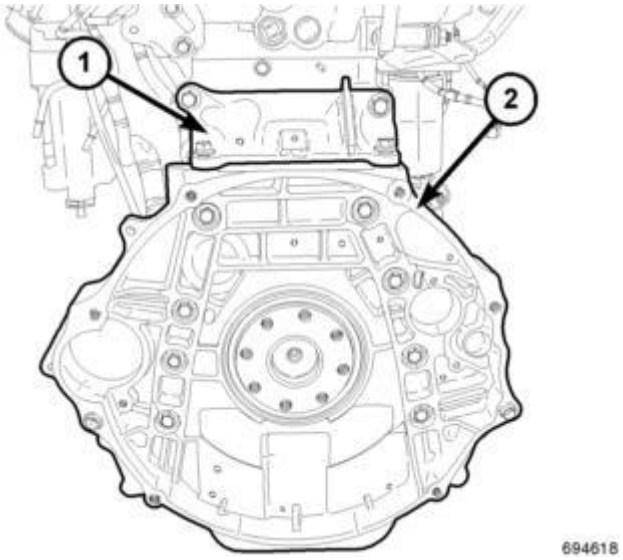


Fig. 13: Flywheel Housing & Collar
Courtesy of CHRYSLER GROUP, LLC

NOTE: Starter, transmission, and flex plate/flywheel removed for clarity.

34. Remove the transmission collar (1).
35. Remove the engine to transmission bolts.

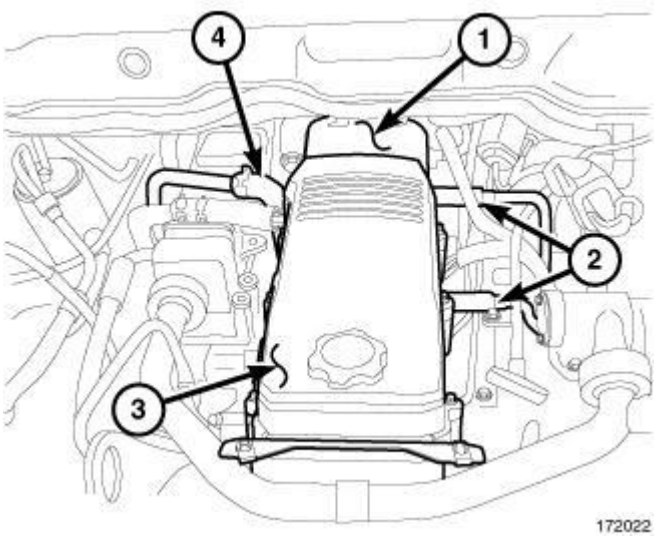


Fig. 14: Cylinder Head Cover Components
Courtesy of CHRYSLER GROUP, LLC

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

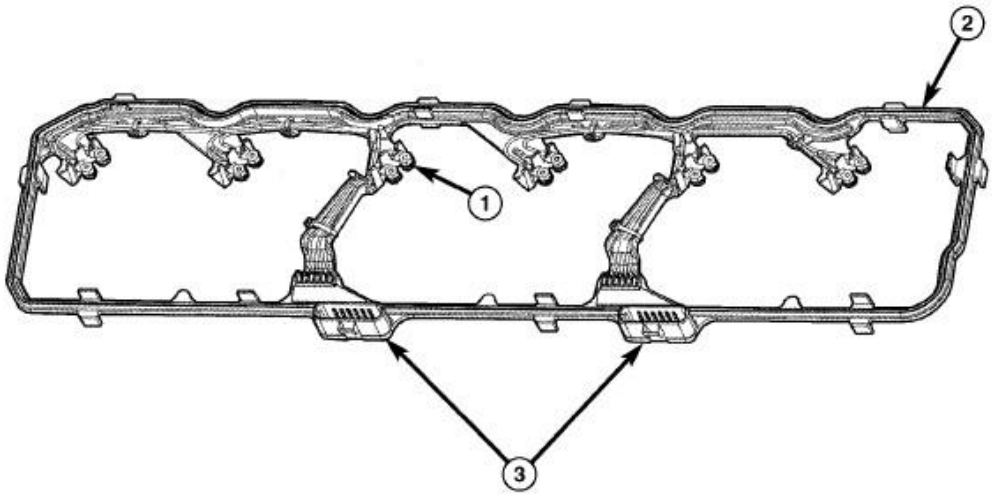


Fig. 15: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

37. Disconnect the injector wiring harness connectors to injector connections on cylinder head cover carrier gasket (3).
38. Remove the injector harness nuts to injectors (1).
39. Remove the cylinder head cover/injector wiring gasket (2).

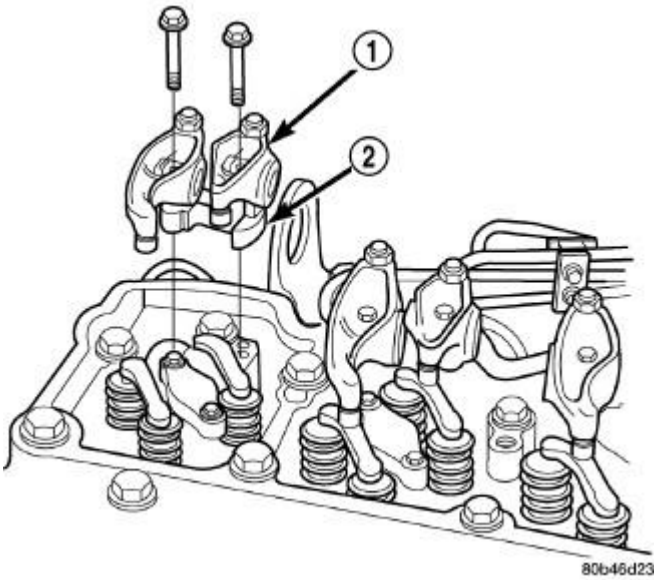


Fig. 16: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

40. Remove the EGR cooler. Refer to **COOLER, EGR, REMOVAL** .

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

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

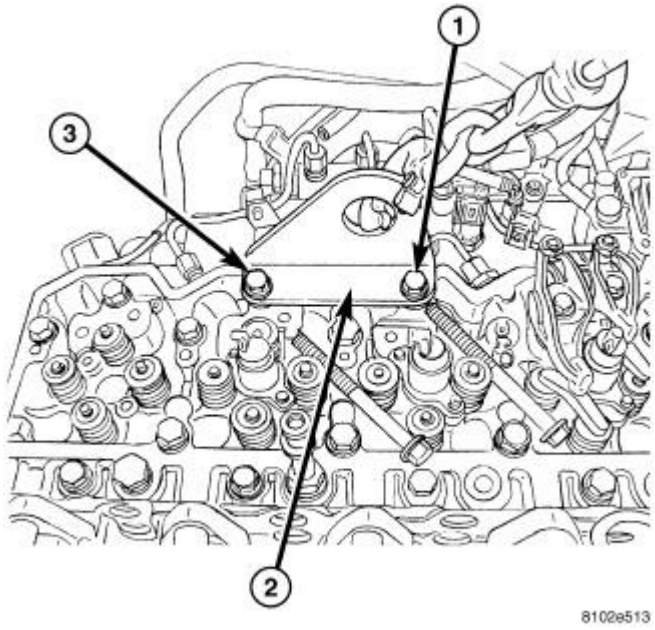


Fig. 17: Engine Lift Bracket
Courtesy of CHRYSLER GROUP, LLC

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.

42. Remove the No. 6 high pressure fuel line shield.
43. Remove the No. 5 and No. 6 high pressure fuel line.
44. Remove the HPC connector tube and nut.
45. Remove the No. 5 and No. 6 fuel injector.
46. Remove the No. 4 and No. 5 head bolts.
47. Install the front and rear engine lift bracket. Tighten to 77 N.m (57 ft. lbs).
48. 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.).
49. Attach a chain with two hooks to the engine lift brackets.
50. Remove the engine mount through bolts and nuts.

51. While keeping engine level, lift straight up out of the mounts.
52. Rotate the nose of engine upward and pull out of chassis.

INSTALLATION

INSTALLATION

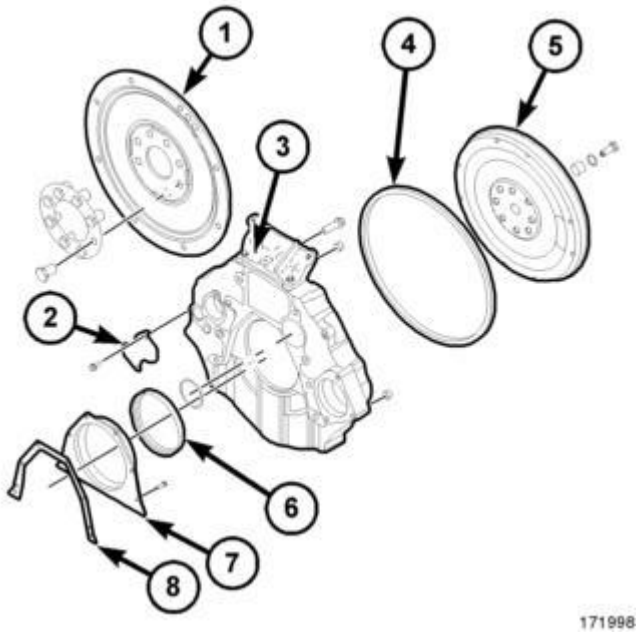


Fig. 18: Flywheel Housing, Adapter Plates & Rear Oil Seal
Courtesy of CHRYSLER GROUP, LLC

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

1. If removed, install the flywheel and adapter or flexplate. Tighten bolts to 137 N.m (100 ft. lbs).

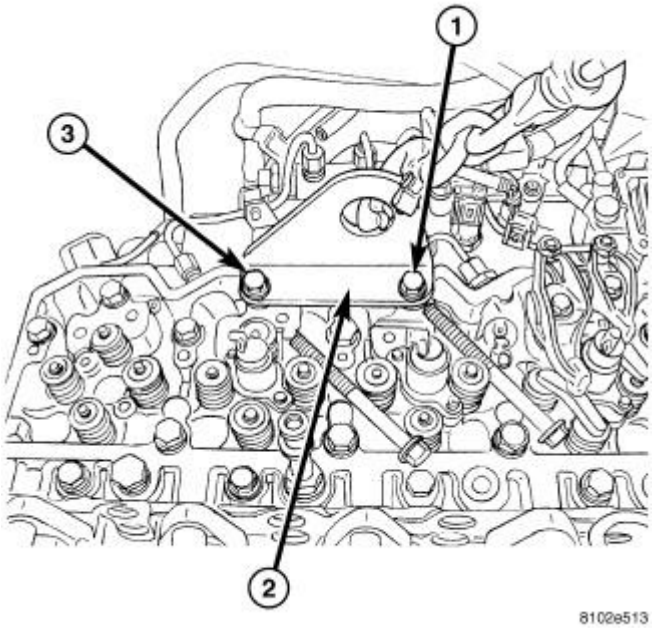


Fig. 19: Engine Lift Bracket
Courtesy of CHRYSLER GROUP, LLC

1 - Head bolt
2 - Engine Lift Bracket
3 - Head Bolt

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 129 N.m (95 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°.
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 HPC connector tube and nut. Tighten nut 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 HPC connector tube nut to 50 N.m (37 ft. lbs.).

9. Remove the front and rear engine lift bracket.

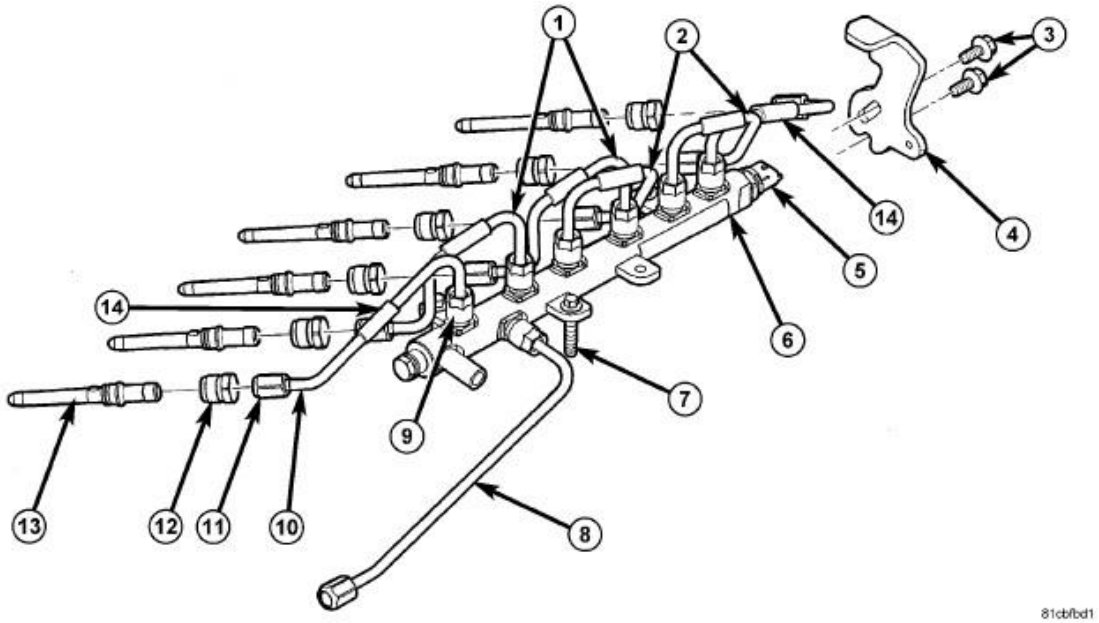


Fig. 20: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

10. If fuel tube at No. 6 cylinder has been removed, tilt metal bracket (4) upward to install the No. 6 fuel tube finger tight.
11. Install the No. 5 and No. 6 high pressure fuel lines. Tighten fuel line fittings to 40 N.m (35 ft. lbs.).
12. Position the metal bracket (4) at the rear of cylinder head back and tighten bolts (3) to 43 N.m (32 ft. lbs.).

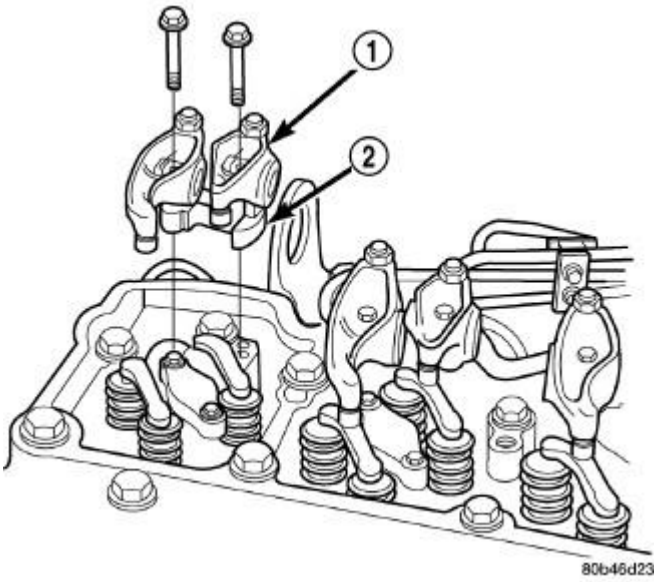


Fig. 21: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

13. 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).
14. 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.).
15. Install the EGR cooler. Refer to **COOLER, EGR, INSTALLATION** .

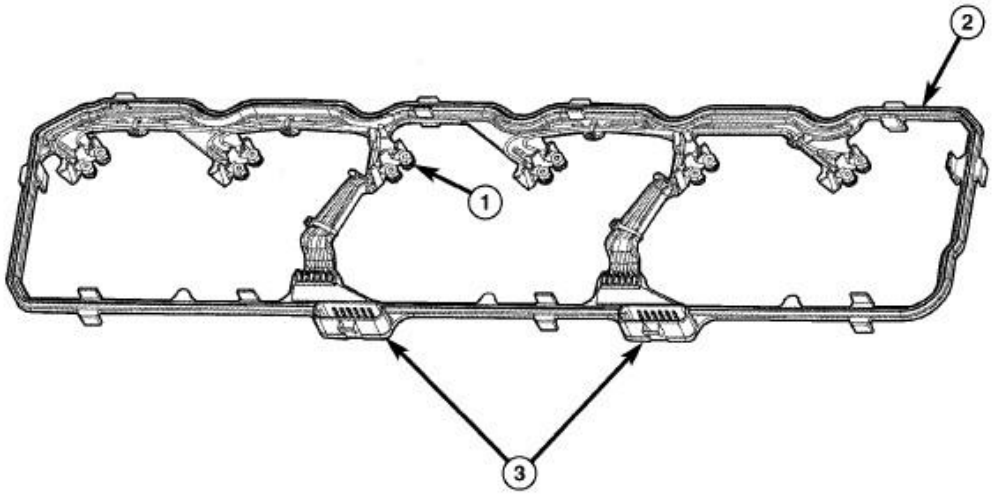


Fig. 22: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

16. Install the cylinder head cover/injector wiring gasket (2).
17. Install the injector harness nuts to injectors (1). Tighten to 1.25 N.m (11 in. lbs.).
18. Connect the injector wiring harness connectors to injector connections on cylinder head cover carrier gasket (3).

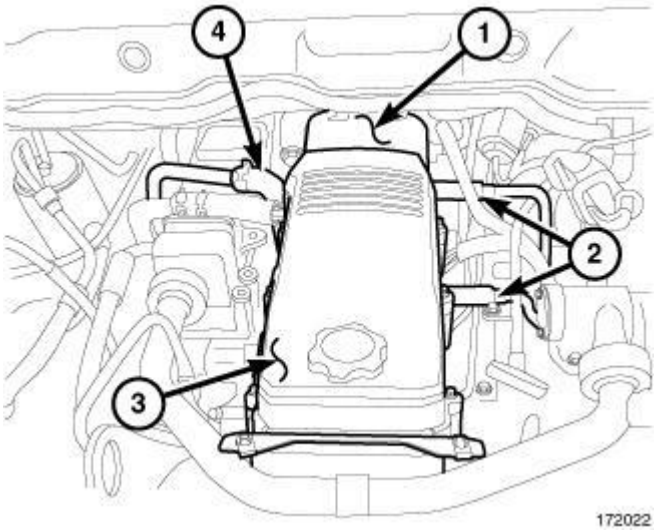


Fig. 23: Cylinder Head Cover Components
Courtesy of CHRYSLER GROUP, LLC

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

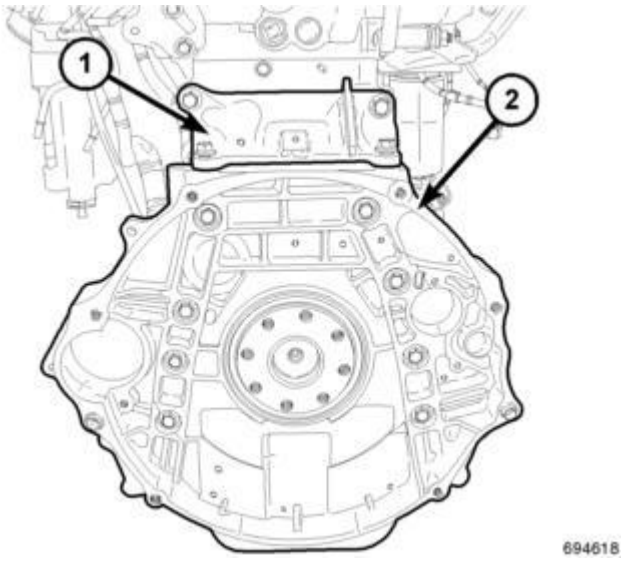


Fig. 24: Flywheel Housing & Collar
Courtesy of CHRYSLER GROUP, LLC

20. Install the transmission to engine bolts.
    - Automatic transmission, tighten bolts to 41 N.m (30 ft. lbs.).
    - Manual transmission, tighten bolts to 45 N.m (33 ft. lbs.).
21. Install the transmission collar (1). Tighten to 77 N.m (57 ft. lbs.).

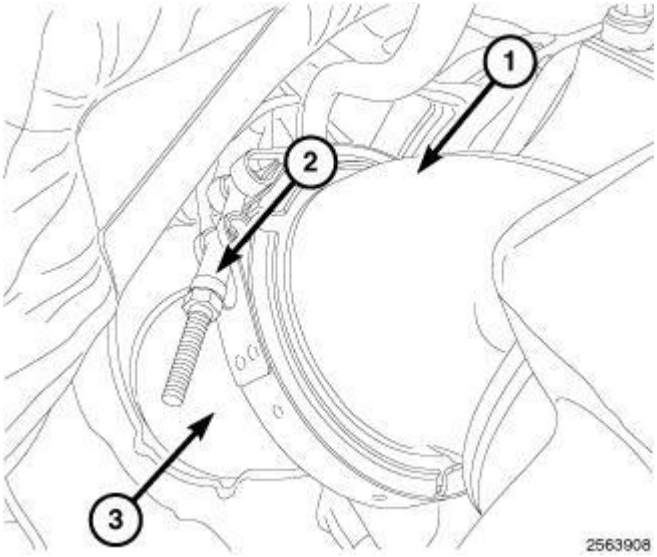


Fig. 25: V-Clamp & Elbow
Courtesy of CHRYSLER GROUP, LLC

22. Connect the fuel supply and return lines from the fuel filter housing.
23. Connect the heater core supply and return hoses.
24. Using a new V-clamp, install the exhaust pipe to the turbocharger elbow (1). Tighten V-clamp to 11 N.m (97 in. lbs.).
25. Connect left side, engine block to frame ground wire.
26. Connect the engine block heater harness connector.
27. Connect the generator harness wires.
28. Install the battery negative cables to the engine block on the driver and passenger side.
29. Connect the intake heater connector.
30. Install the starter cable to the left battery and power distribution center.
31. Connect engine wiring harness connector from Totally Integrated Power Module (TIPM).

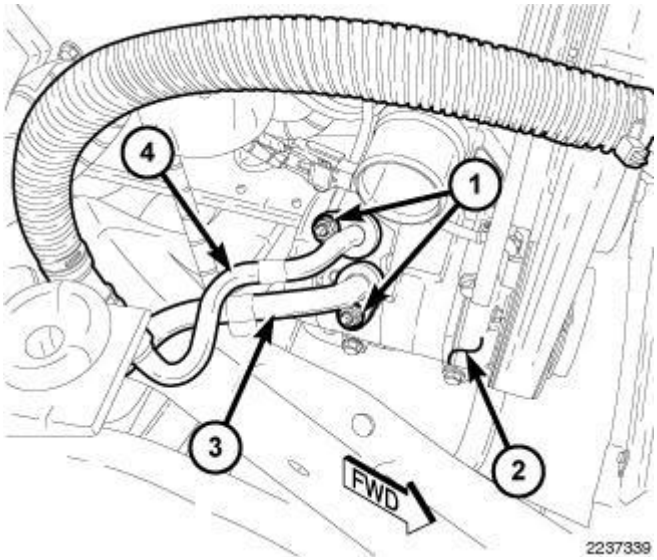


Fig. 26: Nuts, A/C Compressor, A/C Suction Line & A/C Discharge Line
Courtesy of CHRYSLER GROUP, LLC

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

32. Remove the tape or plugs from the opened refrigerant line fittings and compressor ports.
33. 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.
34. Connect the A/C suction line (3) and A/C discharge line (4) to the A/C compressor (2).
35. Install the A/C suction and discharge line assembly to the compressor. Tighten the nuts to 23 N.m (17 ft. lbs.).

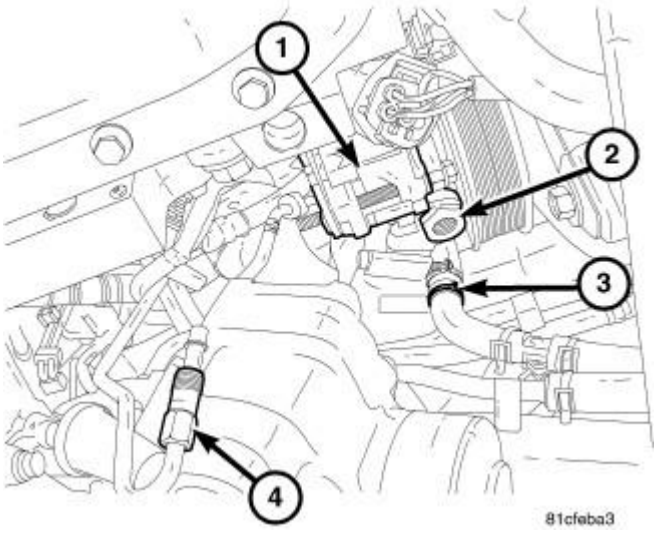


Fig. 27: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

36. Install the power steering pump. Refer to **PUMP, INSTALLATION** .
37. Install the power steering reservoir. Refer to **RESERVOIR, POWER STEERING PUMP, INSTALLATION** .
38. Install the serpentine drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
39. Install the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
40. Install the radiator and connect the upper and lower radiator hoses.

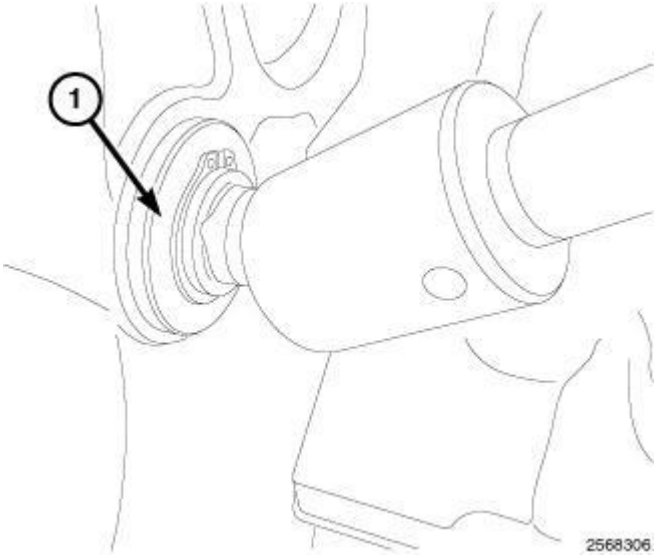


Fig. 28: Engine Barring Tool
Courtesy of CHRYSLER GROUP, LLC

41. Install the radiator closure panel. Refer to **PANEL, CLOSURE, RADIATOR, INSTALLATION** .
42. Connect the transmission harness connector.
43. Install the left ground strap.
44. Install the Barring Tool (special tool #7471B, Barring Tool) (1).
45. Using the Barring Tool (special tool #7471B, Barring Tool) (1), rotate the engine and install the torque converter bolts. Tighten bolts to 88 N.m (65 ft. lbs.).
    1. On manual transmission models, install the dual mass flywheel bolts. Tighten bolts to 88 N.m (65 ft. lbs.).
46. Remove the Barring Tool (special tool #7471B, Barring Tool) (1).

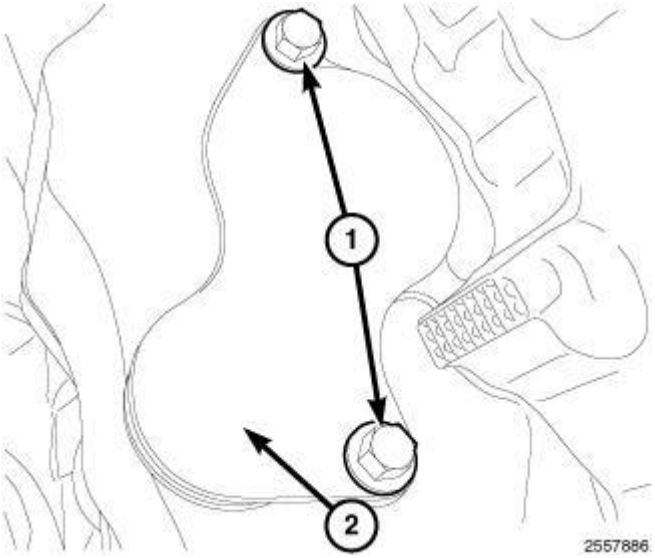


Fig. 29: Bolts & Bell Housing Access Cover
Courtesy of CHRYSLER GROUP, LLC

47. Install the bell housing access plate. Tighten bolts to 10 N.m (89 in. lbs.).

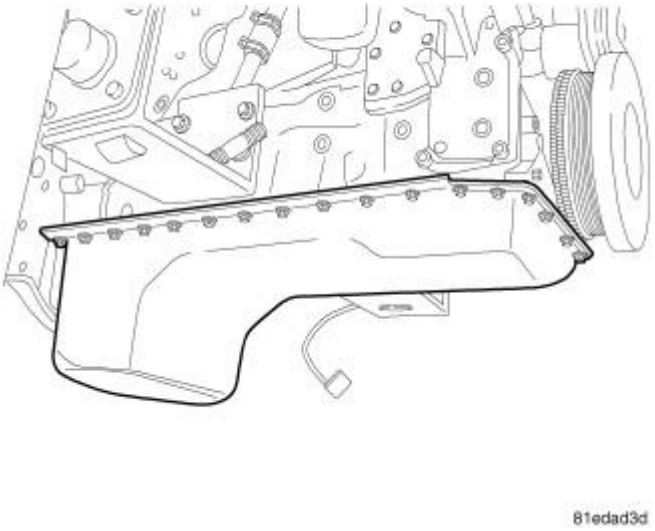


Fig. 30: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

48. Change the oil filter and fill with recommended new engine oil.
49. Evacuate and recharge A/C system. Refer to **PLUMBING, STANDARD PROCEDURE** .
50. Fill the cooling system with coolant. Refer to **STANDARD PROCEDURE** .
51. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
52. Connect both negative and positive battery cables.

53. Start the engine and inspect for engine oil, coolant, and fuel leaks.

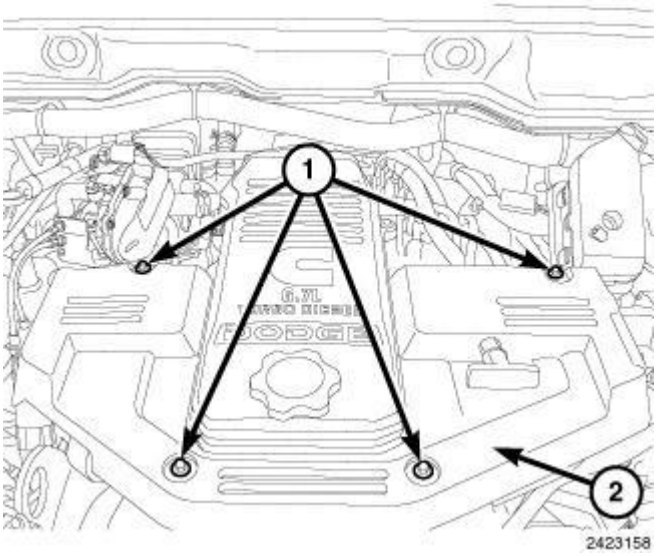


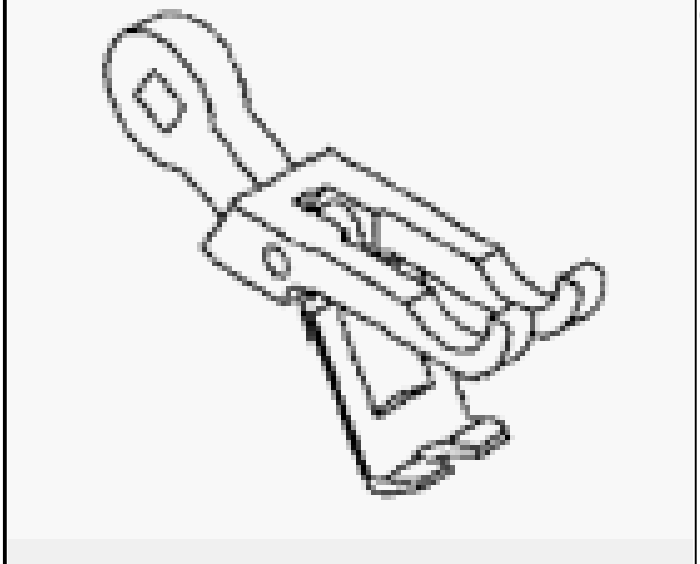
Fig. 31: Engine Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

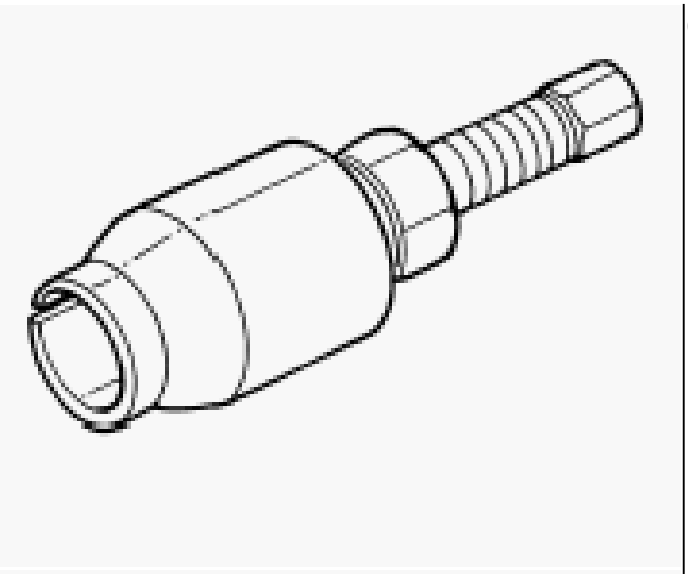
54. Position the hood and connect hood support struts.
55. Install the engine cover. Tighten bolts (1) to 10 N.m (89 in. lbs.).

SPECIAL TOOLS

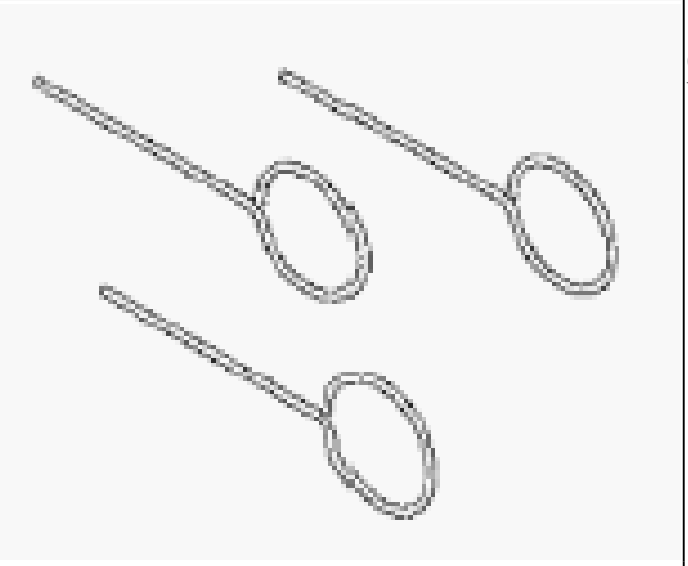
SPECIAL TOOLS

SPECIAL TOOLS

	10136 - Installer, Crankshaft Front Oil Seal (Originally Shipped In Kit Number(s) 10138.)
	10137 - Adapter, Charge Air

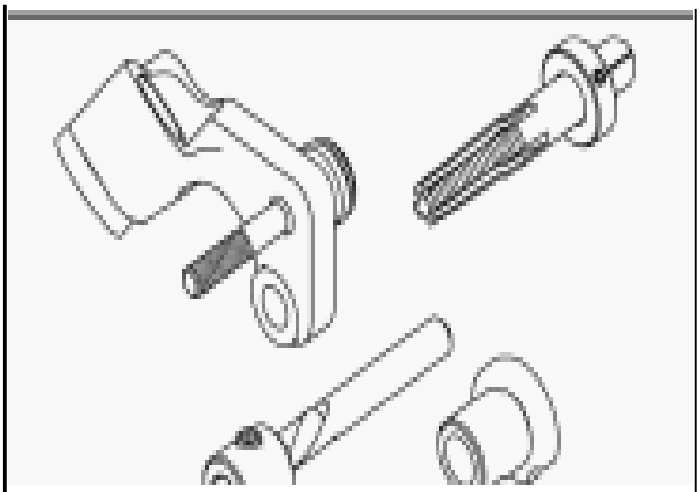


(Originally Shipped In Kit Number(s) 10138.)

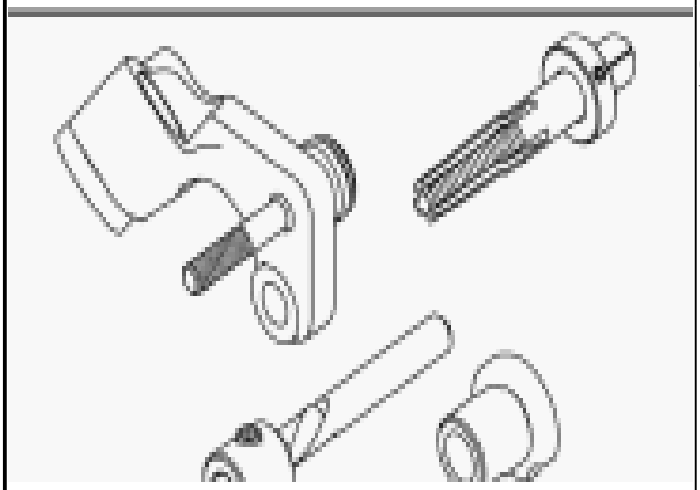


10142 - Cummins Turbo Cleaning Kit
(Originally Shipped In Kit Number(s) 10138-UPD.)

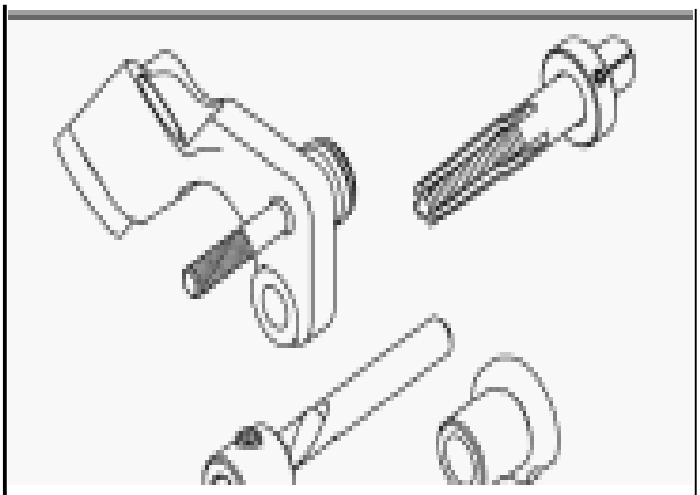
10143 - Cummins Turbo Drilling Kit
(Originally Shipped In Kit Number(s) 10138-UPD.)



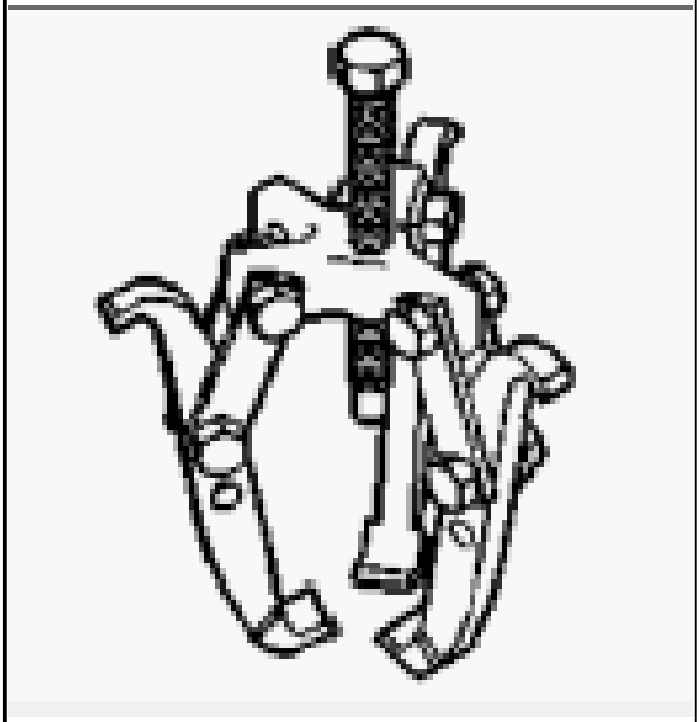
10143-4 - Drill Assembly
(Originally Shipped In Kit Number(s) 10138-UPD.)



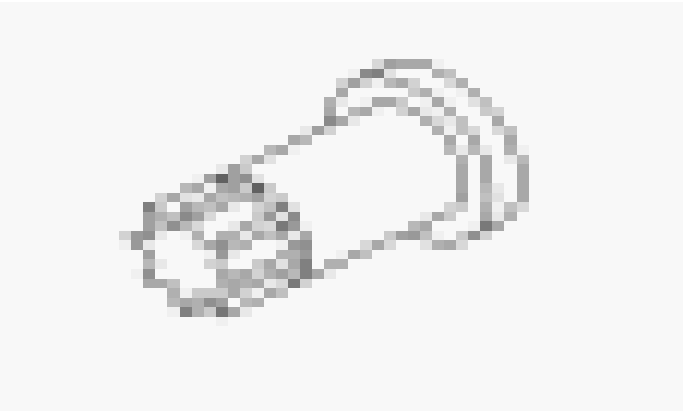
10143-5 - Tap & Collar Assembly
(Originally Shipped In Kit Number(s) 10138-UPD.)

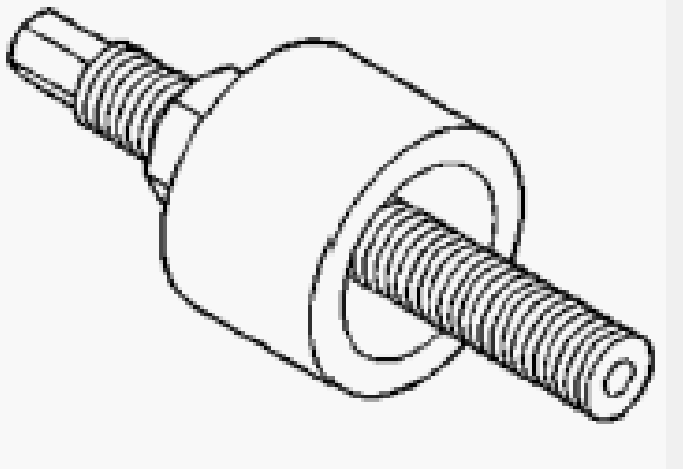


10368 - Set, Universal Protective Cap

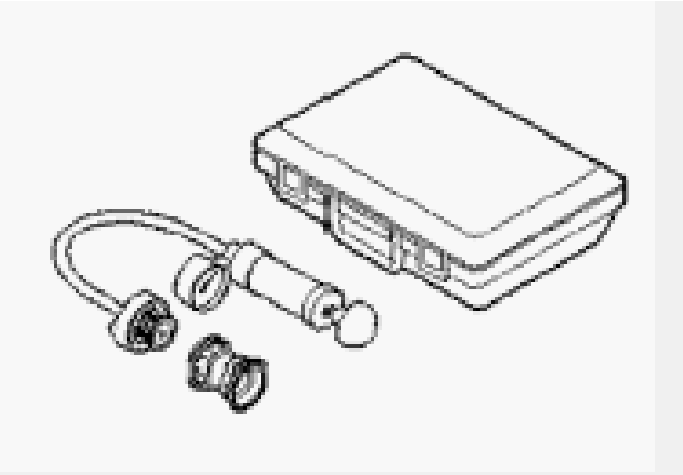


7471B - Barring Tool
(Originally Shipped In Kit Number(s) 6860.)



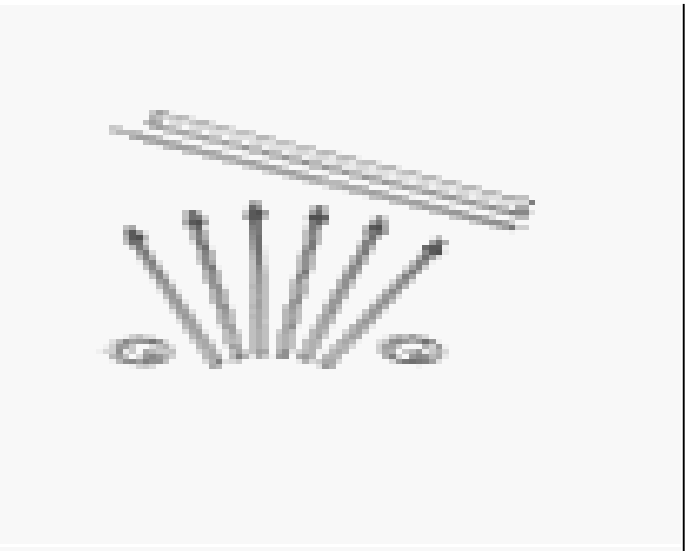


8281 - Installer, Seal
(Originally Shipped In Kit Number(s) 8267, 8267CC, 9697, 9698.)

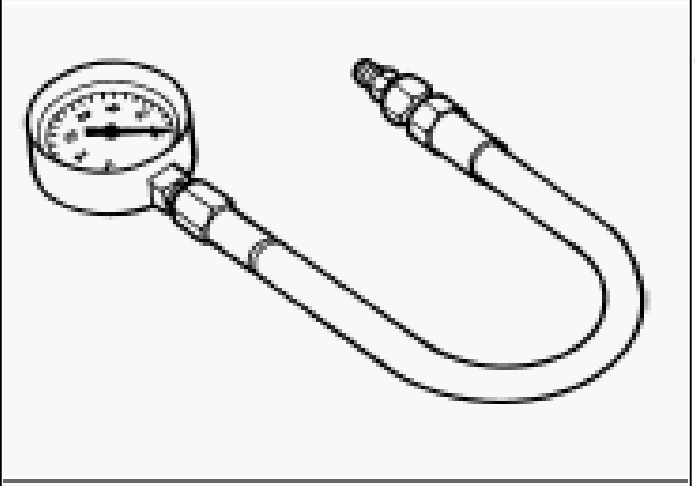


8319 - Compressor, Valve Spring
(Originally Shipped In Kit Number(s) 8267, 8267CC.)

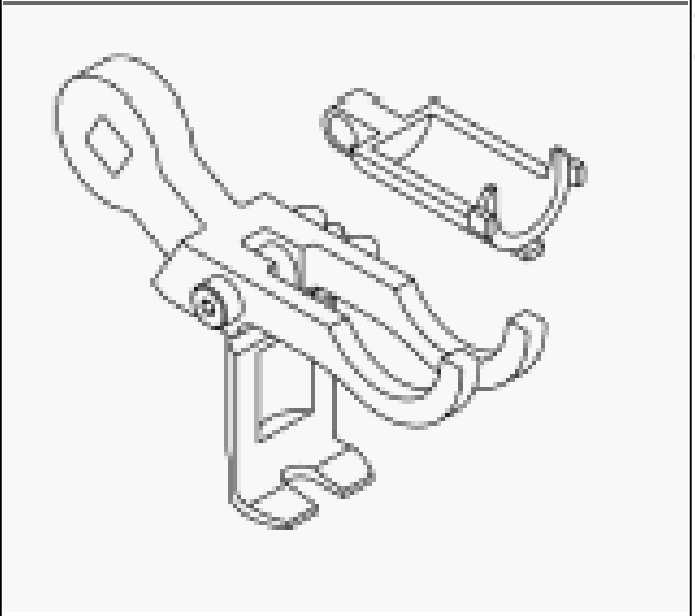
8502 - Remover/Installer



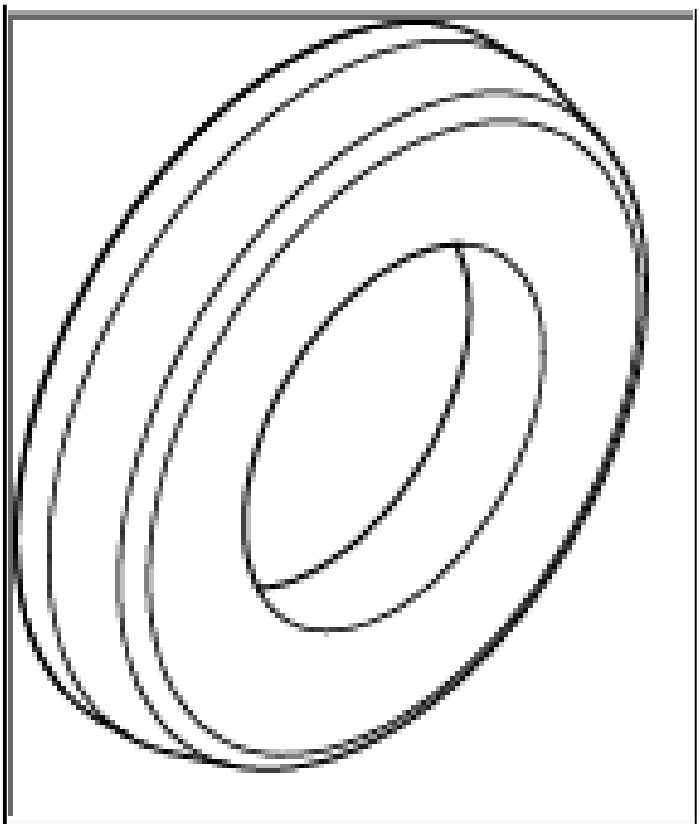
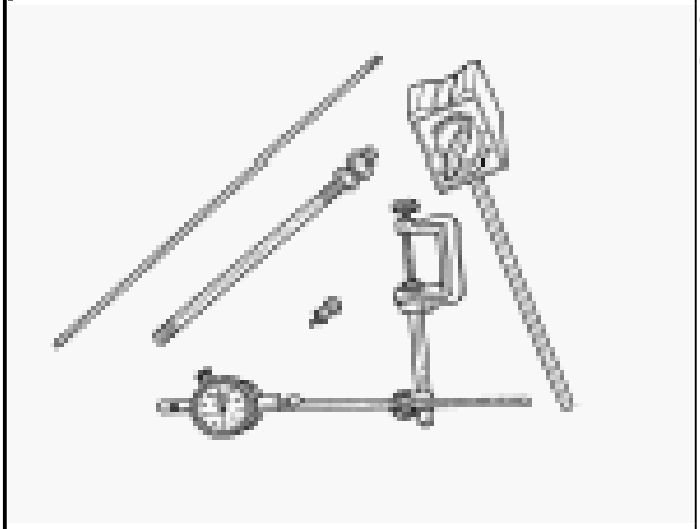
8534B - Fixture, Driveline Support
(Originally Shipped In Kit Number(s) 8534, 8534B, 8849, 9565.)

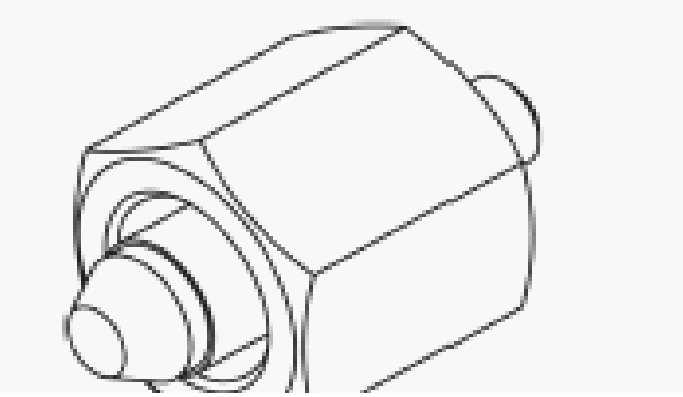


9007 - Adapter, Compression Test
(Originally Shipped In Kit Number(s) 8848, 8849, 8849CC.)

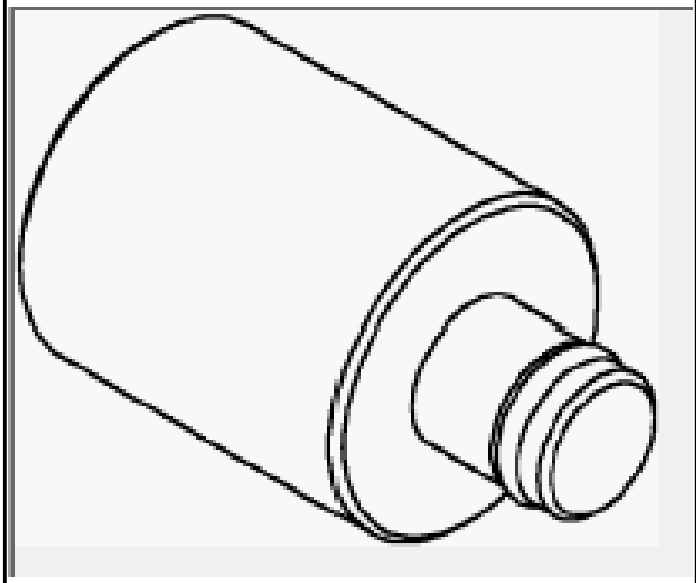


9009 - Bracket, Engine Lifting
(Originally Shipped In Kit Number(s) 8848, 8849,

	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.)

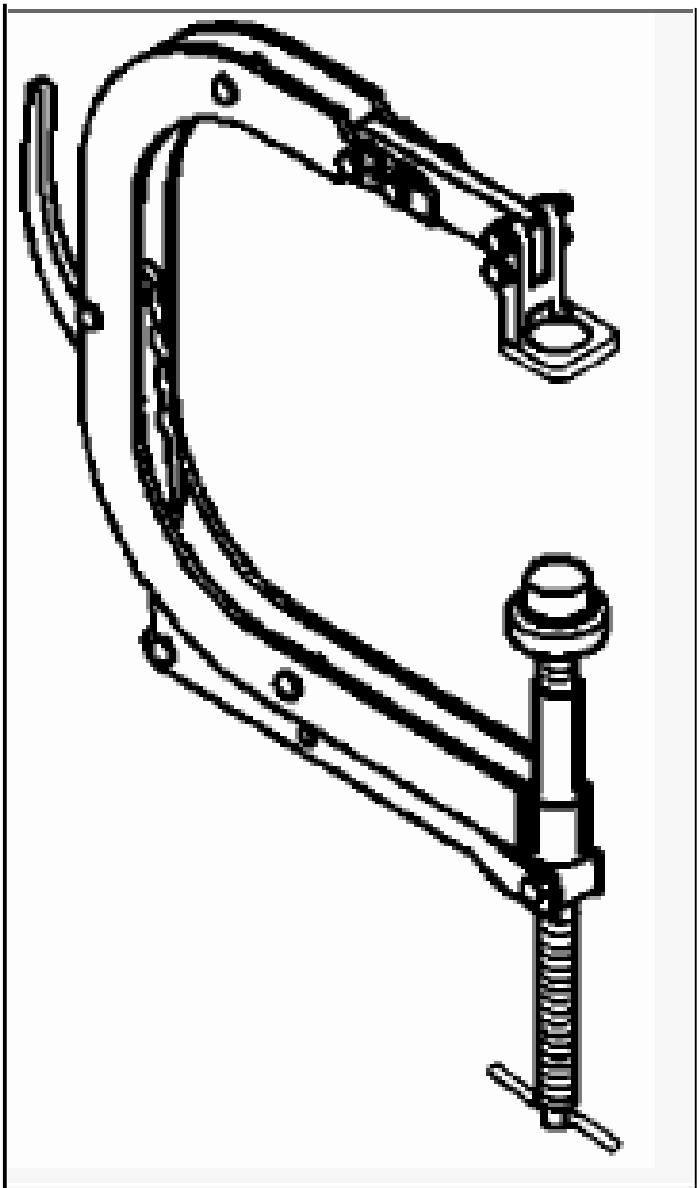


9864 - Cap, Fuel Rail
(Originally Shipped In Kit Number(s) 9860.)



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, 9299CC, 9300A-CAN.)

	C-647 - Spring Tester

PLATE, IDENTIFICATION

DESCRIPTION

DESCRIPTION

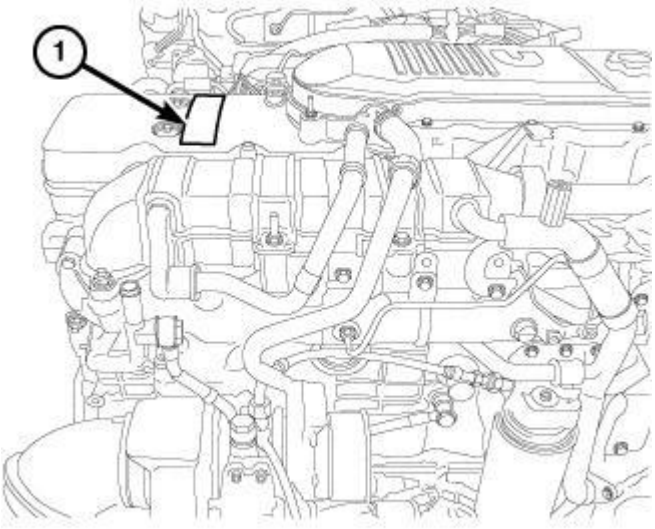


Fig. 32: Locating Engine Data Plate On Valve Cover
Courtesy of CHRYSLER GROUP, LLC

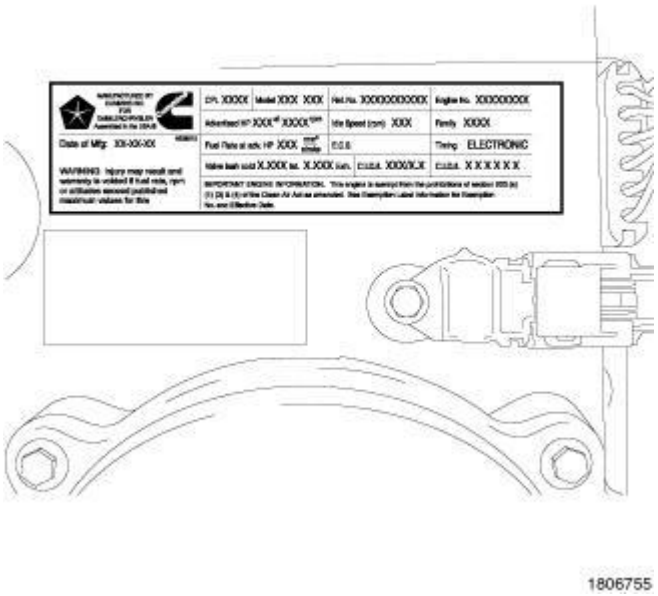


Fig. 33: Engine Data Plate Details
Courtesy of CHRYSLER GROUP, LLC

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).

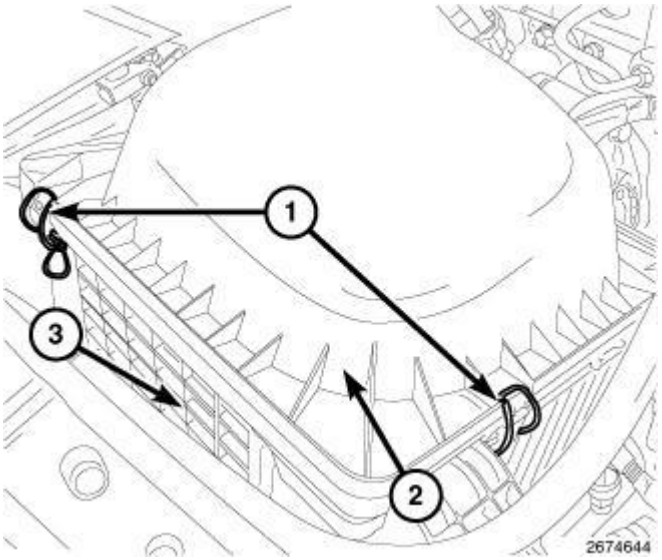


Fig. 34: Air Cleaner Housing & Clips
Courtesy of CHRYSLER GROUP, LLC

1. The housing cover is equipped with over center clips (1) and is hinged with plastic tabs. Unlatch clips (1) from top of air cleaner housing (2) and tilt housing cover up for removal.

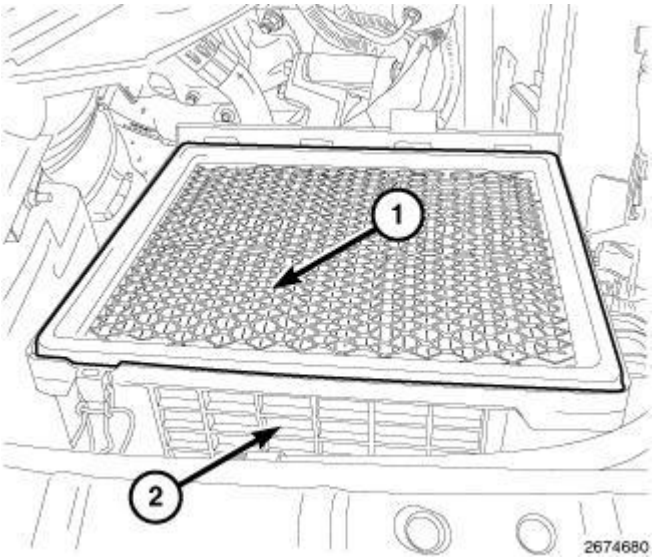


Fig. 35: Air Cleaner Housing & Filter
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

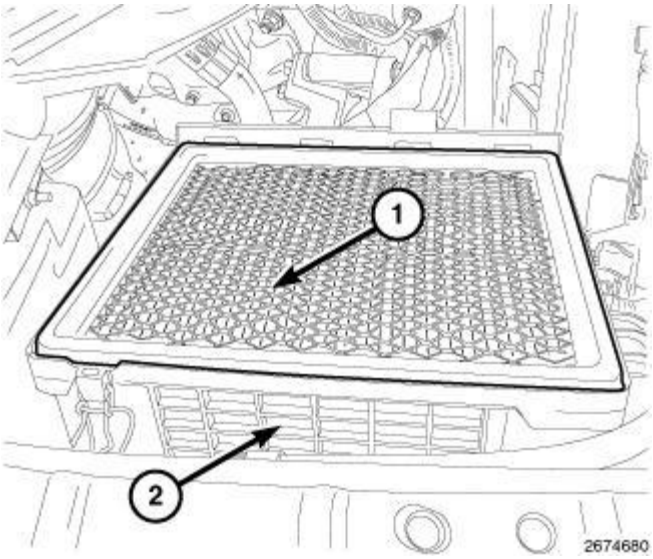


Fig. 36: Air Cleaner Housing & Filter
Courtesy of CHRYSLER GROUP, LLC

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

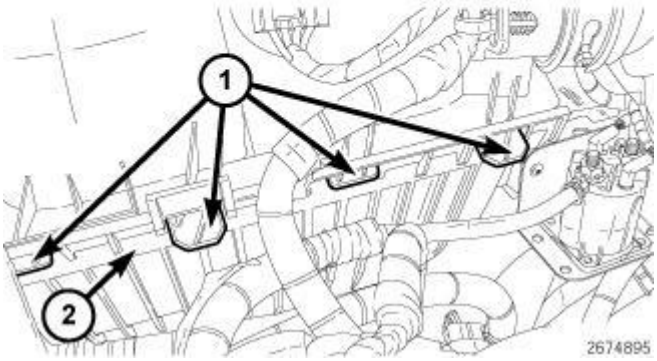


Fig. 37: Air Cleaner Cover Alignment Tabs & Housing Slots
Courtesy of CHRYSLER GROUP, LLC

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.

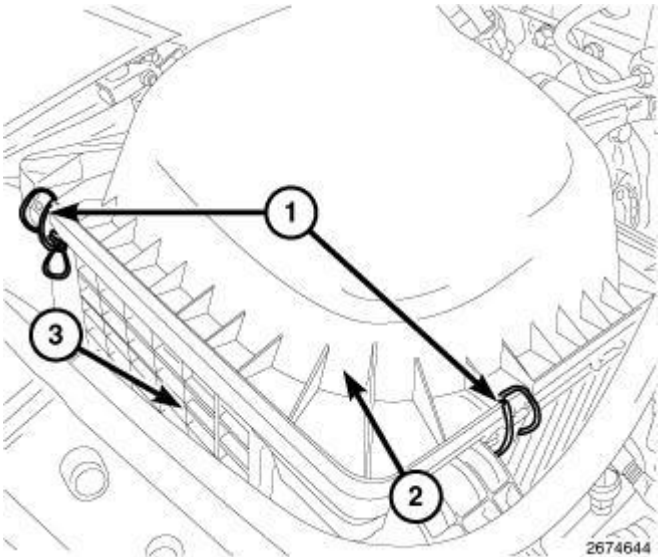


Fig. 38: Air Cleaner Housing & Clips
Courtesy of CHRYSLER GROUP, LLC

4. Latch the over center clips (1)) to clamp air cleaner cover (2).

BODY, AIR CLEANER

REMOVAL

REMOVAL

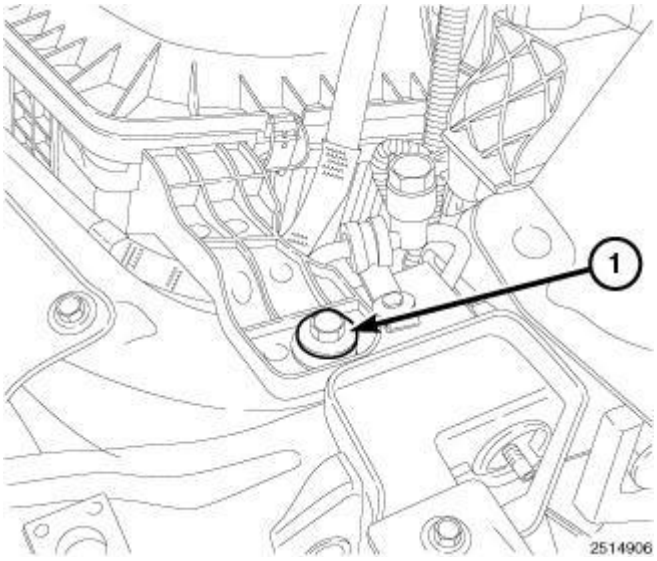


Fig. 39: Intake Air Housing Bolt
Courtesy of CHRYSLER GROUP, LLC

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

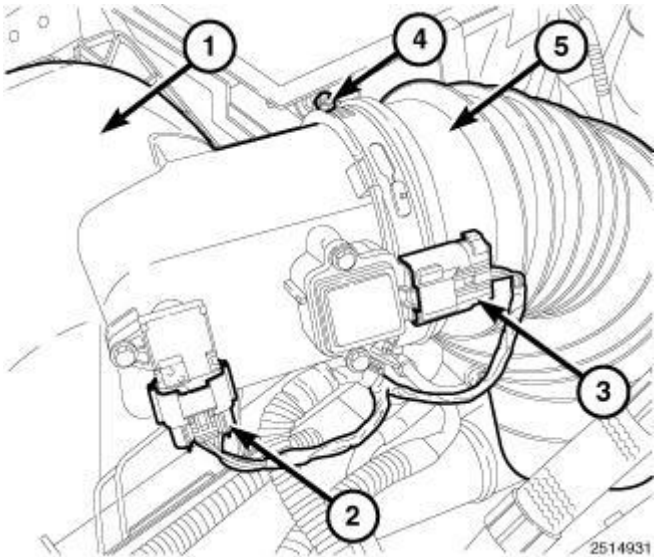


Fig. 40: Air Cleaner Body, TBAP Sensor, MAF Sensor, Clamp & Intake Air Tube
Courtesy of CHRYSLER GROUP, LLC

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).

INTAKE AIR TUBE

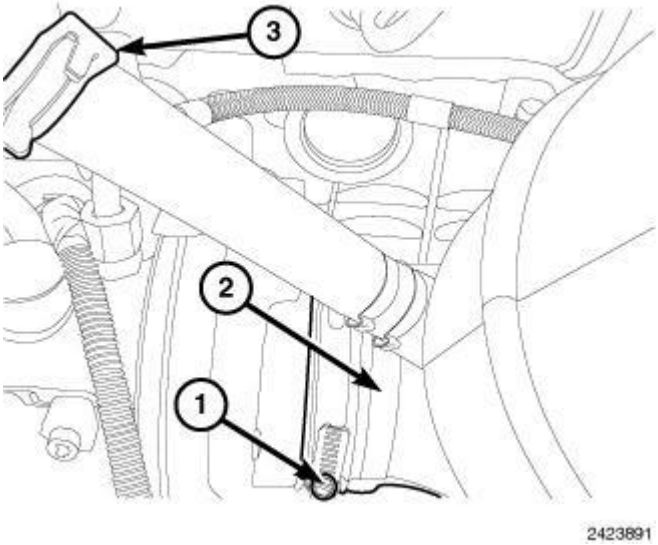


Fig. 41: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

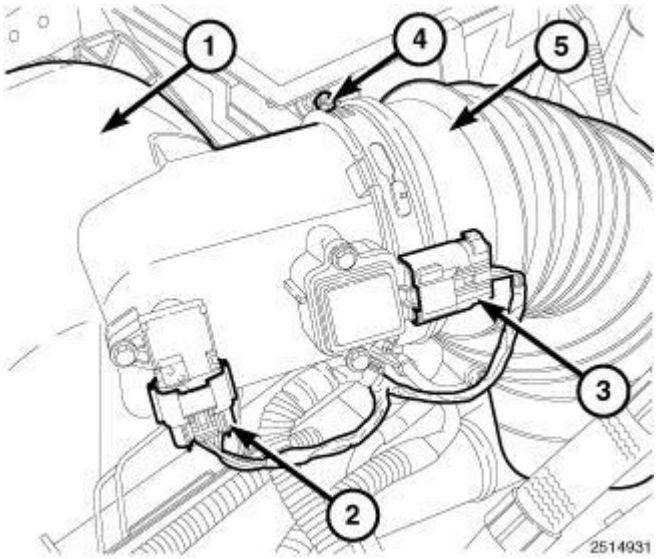


Fig. 42: Air Cleaner Body, TBAP Sensor, MAF Sensor, Clamp & Intake Air Tube
Courtesy of CHRYSLER GROUP, LLC

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

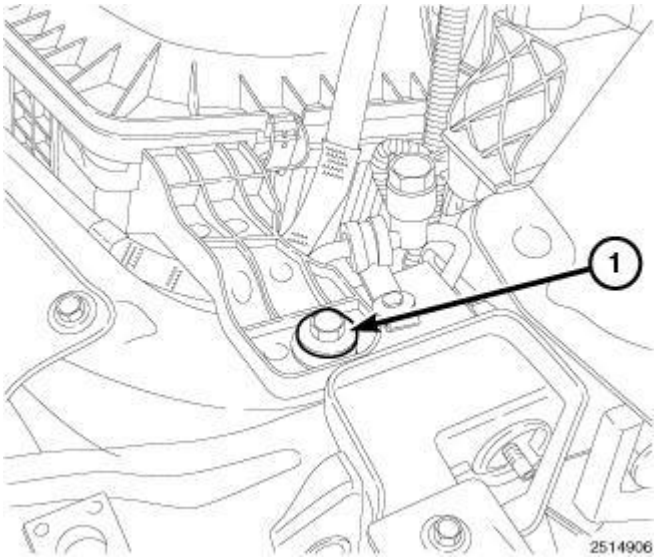


Fig. 43: Intake Air Housing Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Install the housing bolt (1). Tighten bolt (1) 8 N.m (71 in. lbs).

6. Connect both negative battery cable.

INTAKE AIR TUBE

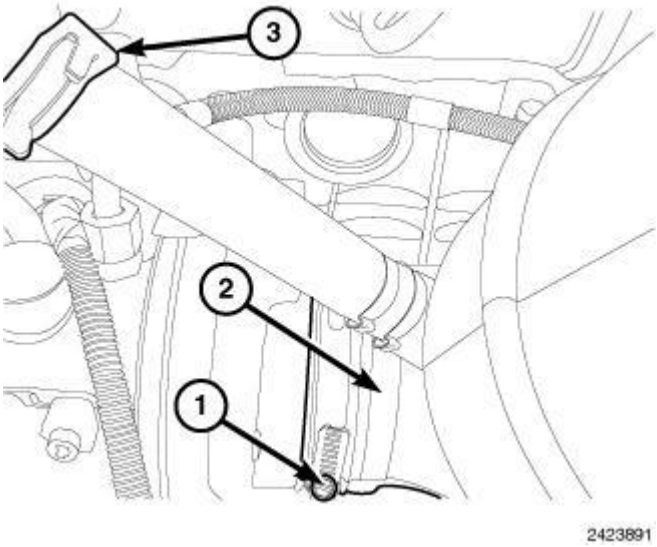


Fig. 44: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

1. Install the outlet tube (2) to the turbocharger. Tighten the clamp (1) 4 N.m (35 in. lbs.).
2. Connect the breather hose (3).

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

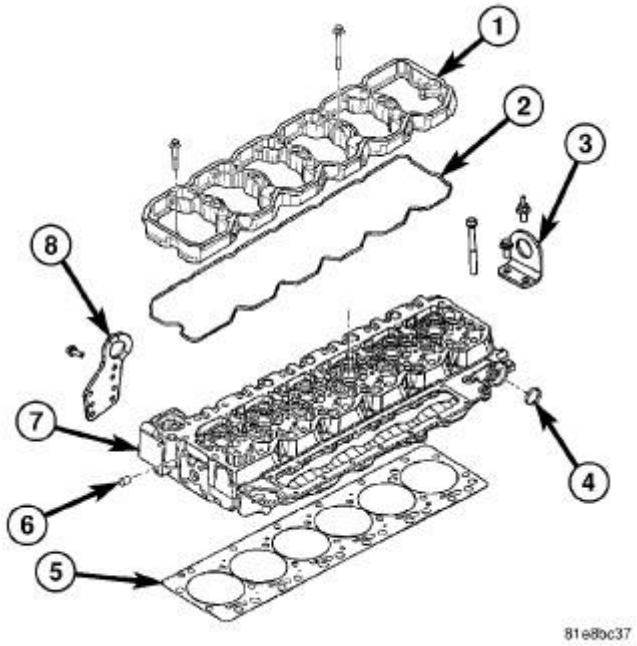


Fig. 45: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

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

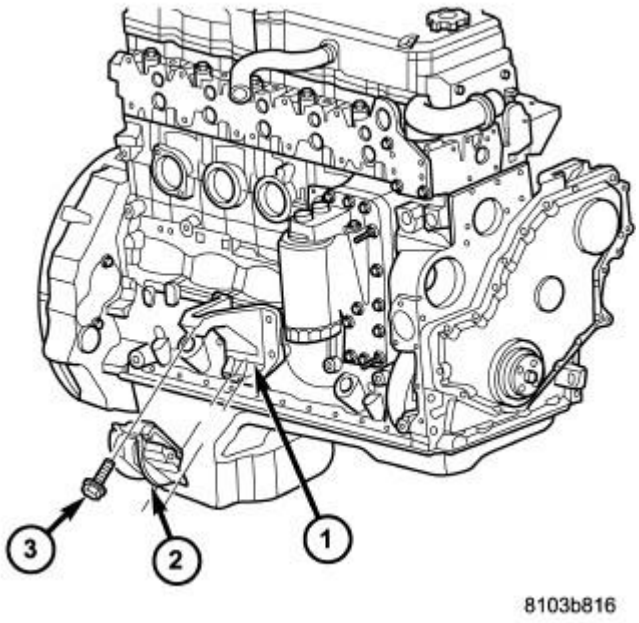


Fig. 46: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Mount
2 - Insulator
3 - Bolt

1. Disconnect both negative battery cables.
2. Drain engine coolant. Refer to **STANDARD PROCEDURE** .
3. Disconnect exhaust pipe from turbocharger elbow.
4. Remove the right engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.
5. Remove turbocharger drain tube bolts at turbocharger. Cap off ports to prevent dirt or foreign material from entering.
6. Disconnect air inlet temperature/pressure sensor.
7. Remove air cleaner housing and snorkel from the vehicle. Cap off turbocharger air inlet to prevent intrusion of dirt or foreign material.
8. Disconnect cab heater core supply and return hoses from the cylinder head and heater pipe.
9. Disconnect turbocharger oil supply line at the turbocharger end. Cap off open ports to prevent intrusion of dirt or foreign material.
10. Remove the turbocharger coolant lines.
11. Remove EGR cooler and associated hardware. Refer to **COOLER, EGR, REMOVAL** .

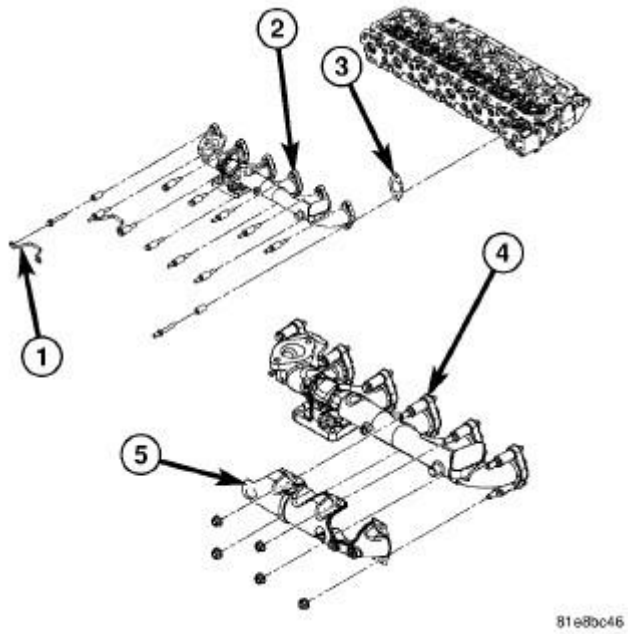


Fig. 47: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - Retainer
2 - Exhaust Manifold
3 - Gasket
4 - Bolt
5 - Heat Shield

12. Remove exhaust manifold-to-cylinder head bolts, spacers, heat shield, retention straps, and cab heater plumbing. Remove exhaust manifold and turbocharger from the vehicle as an assembly.
13. Remove cooling fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
14. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
15. Remove cooling fan support from cylinder block.

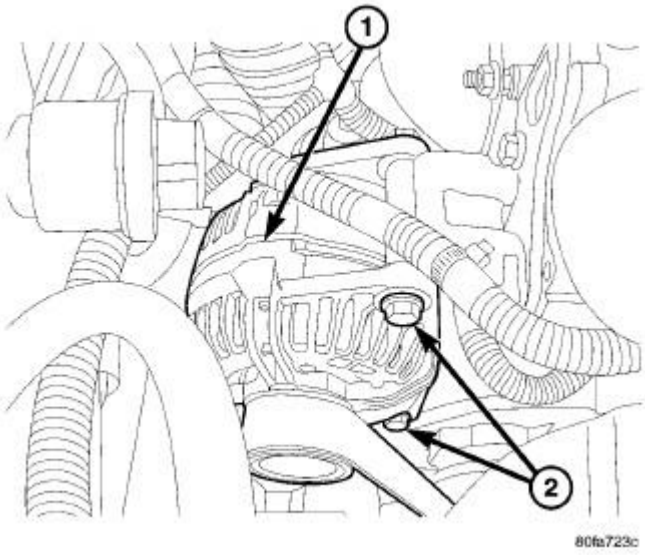


Fig. 48: Generator & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - GENERATOR
2 - MOUNTING BOLTS

16. Remove upper generator bolt, loosen lower generator bolt, and rotate generator away from cylinder head.
17. Disconnect radiator upper hose from the thermostat housing.
18. Disconnect the Intake Air Temperature/Manifold Air Pressure, and Coolant Temperature sensor connectors.
19. Remove the engine harness to cylinder head attaching bolts and P-clips at front of head.

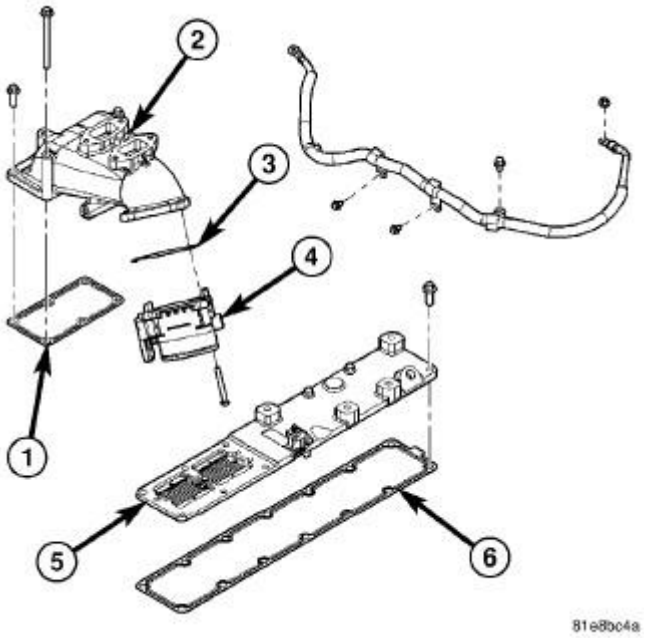


Fig. 49: Intake Air Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

20. Remove the intake air grid heater wire from the grid heater.
21. Remove engine oil level indicator tube attaching bolt at fuel filter housing bracket and inlet air connection.
22. Remove the charge air cooler-to-air inlet housing pipe.
23. Remove the engine wire harness attaching bolt and wire harness push-in fastener from air inlet housing.
24. Remove the air inlet housing.
25. Remove the two grid heater harness-to-cylinder head attaching bolts at front of cylinder head.

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.

26. **Remove the high pressure pump to fuel rail fuel line as follows:**
    1. Loosen fuel line nuts at fuel pump and at fuel rail.
    2. Use a back-up wrench on the fitting at the fuel pump to keep it from loosening.
27. Remove the fuel rail to cylinder head fuel lines as follows:
    1. Loosen No. 6 high pressure fuel line shield and position out of way.
    2. Loosen the fuel line nuts at the fuel rail and at the cylinder head. Use a back-up wrench on HPC nut.

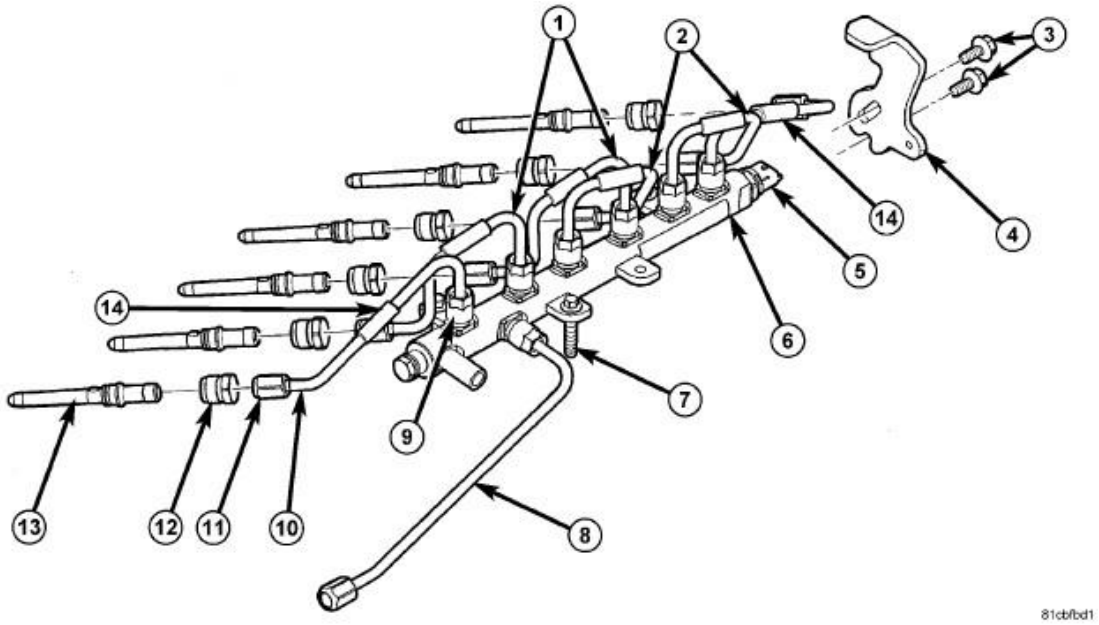


Fig. 50: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

28. Remove the engine lift bracket from the rear of the cylinder head.
29. Remove the fuel rail as follows:
    1. Remove fuel rail pressure sensor connector.
    2. Remove banjo fitting at pressure limiting valve.
    3. Remove the banjo fitting at fuel rail.
    4. Remove fuel rail bolts and fuel rail.
30. Remove P-clip from cylinder head.
31. Remove the breather cover and cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
32. Remove injector harness nuts from injectors.

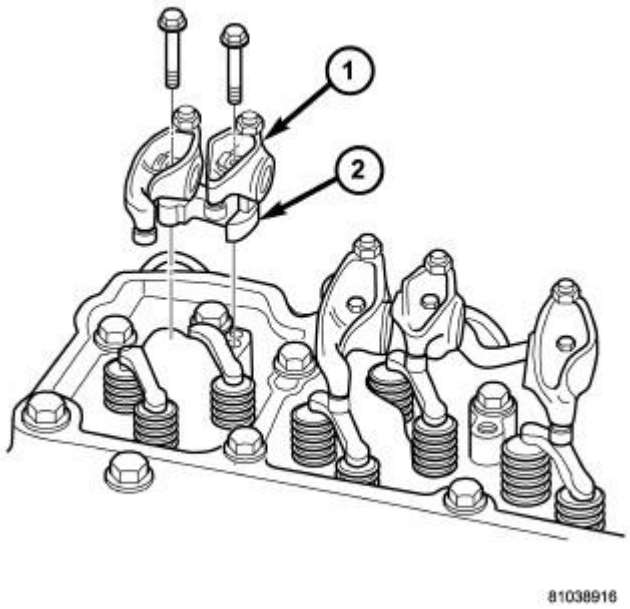


Fig. 51: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

1 - ROCKER ARM
2 - PEDESTAL

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

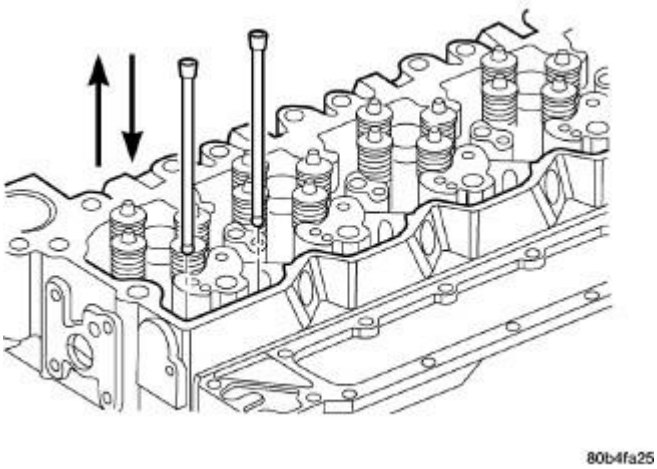


Fig. 52: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: The No. 5 cylinder exhaust and the No. 6 cylinder intake and exhaust push rods are removed by lifting them up and through the provided cowl panel

access holes. Remove the rubber plugs to expose these relief holes.

34. Remove the fuel return line and banjo bolt at the rear of the cylinder head. Be careful not to drop the two (2) sealing washers.
35. Remove the fuel injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .

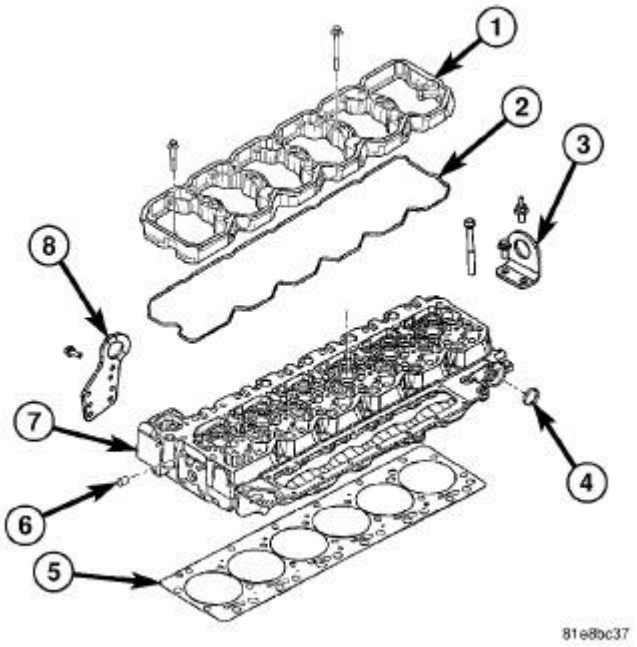


Fig. 53: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

36. Remove rocker housing bolts and rocker housing and gasket.
37. Reinstall the engine lift bracket at the rear of cylinder head. Tighten to 77 N.m (57 ft. lbs.).
38. Starting on the outside and working towards the center, remove twenty six (26) cylinder head bolts.
39. Attach an engine lift crane to engine lift brackets and lift cylinder head off engine and out of vehicle.
40. 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

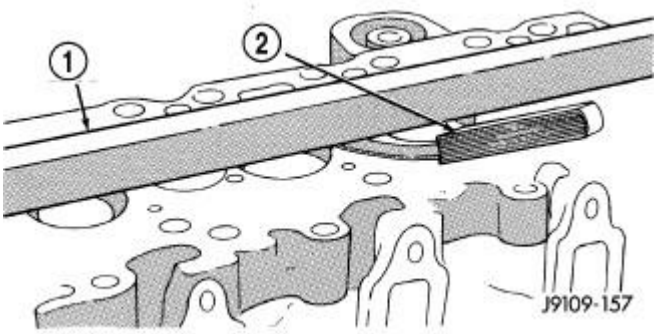


Fig. 54: Inspecting Cylinder Head Combustion Deck Face For Warpage
Courtesy of CHRYSLER GROUP, LLC

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 surfaced.

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).

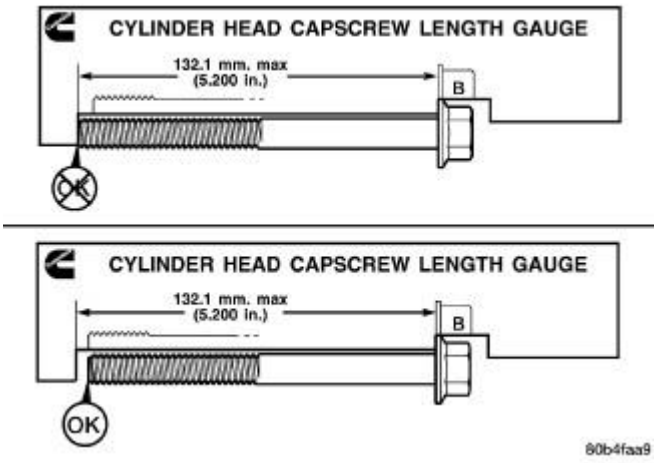


Fig. 55: Head Bolt Stretch Gauge
Courtesy of CHRYSLER GROUP, LLC

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

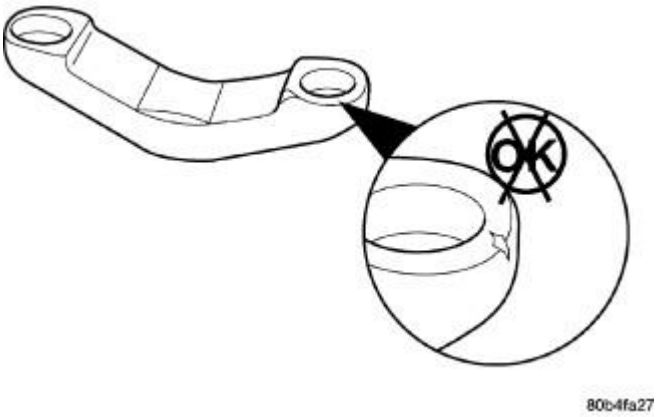


Fig. 56: Inspecting Crosshead For Cracks
Courtesy of CHRYSLER GROUP, LLC

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

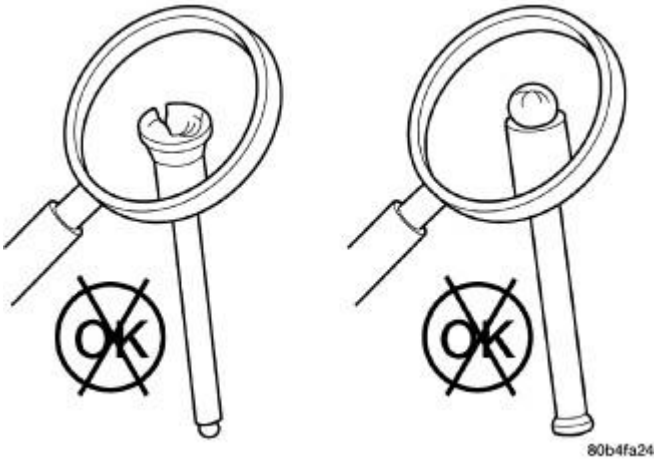


Fig. 57: Inspecting Push Rod For Cracks
Courtesy of CHRYSLER GROUP, LLC

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

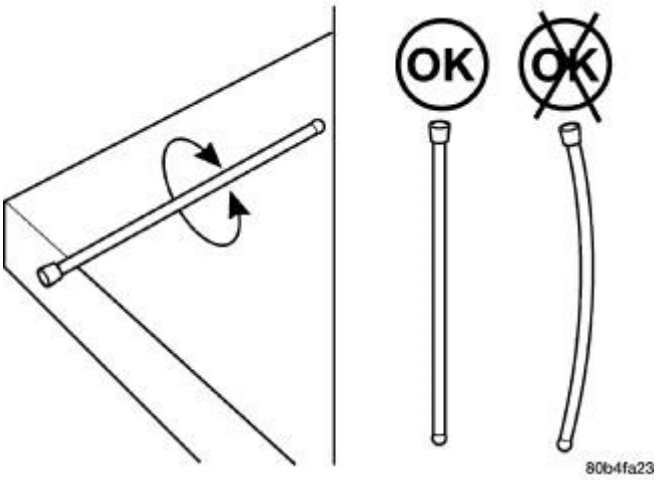


Fig. 58: Inspecting Push Rod For Flatness
Courtesy of CHRYSLER GROUP, LLC

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

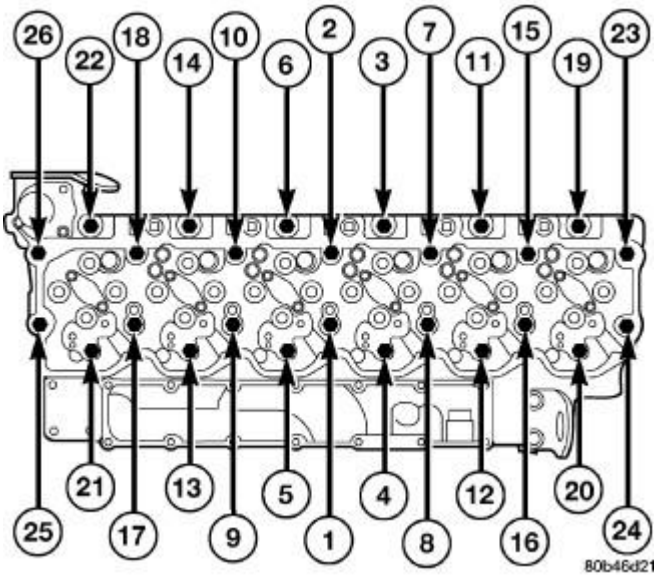


Fig. 59: Cylinder Head Bolt Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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

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

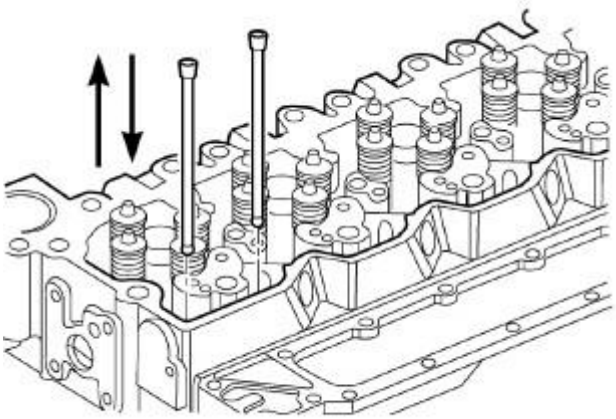


Fig. 60: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

4. Install push rods into their original locations. **Verify that they are seated in the tappets** .
5. Inspect rocker housing gasket for cuts and proper installation into groove. Replace if damaged.
6. Install rocker housing. Tighten bolts to 24 N.m (18 ft. lbs.).
7. Install fuel injector. Refer to **INJECTOR(S), FUEL, INSTALLATION** .

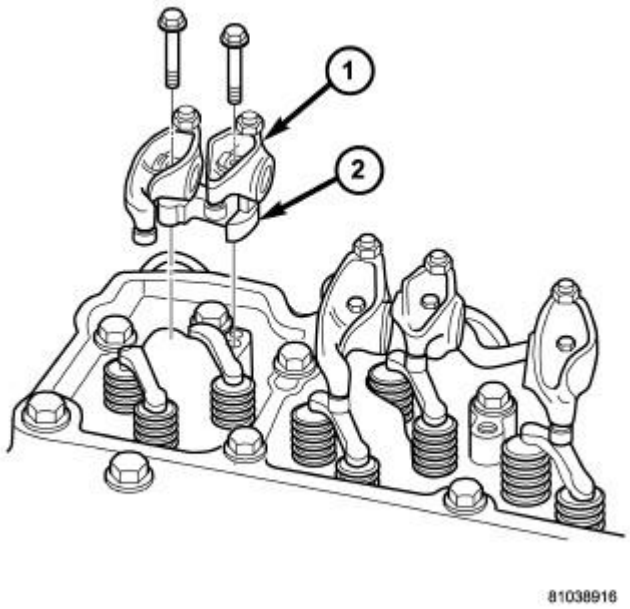


Fig. 61: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

1 - ROCKER ARM
2 - PEDESTAL

8. Lubricate valve stem tips and install the crossheads in their original locations.
9. 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.).
10. 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 **VALVE LASH ADJUSTMENT AND VERIFICATION**.

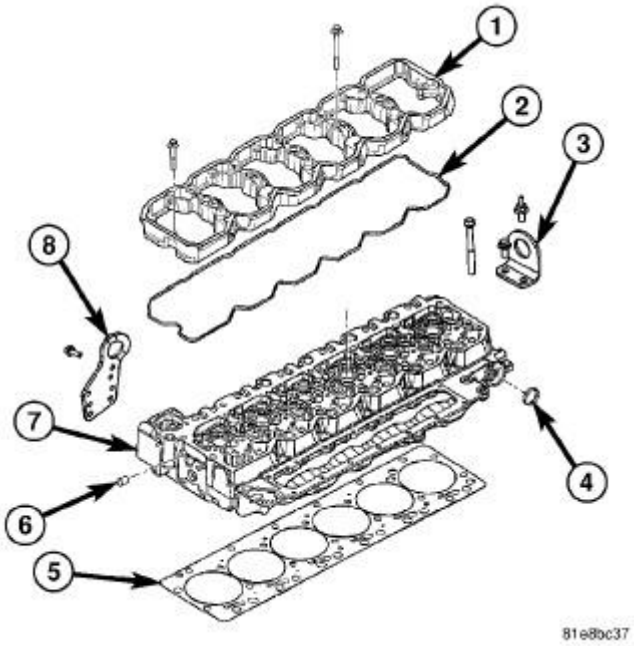


Fig. 62: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

11. Install cylinder head cover gasket onto rocker housing.
12. Install injector harness nuts. Tighten to 1.25 N.m (11 in. lbs.).
13. Connect injector harness connectors at cylinder head cover gasket.
14. Install P-clip to cylinder head and tighten to 24 N.m (18 ft. lbs.).
15. Connect the IAT/MAP sensor connector.

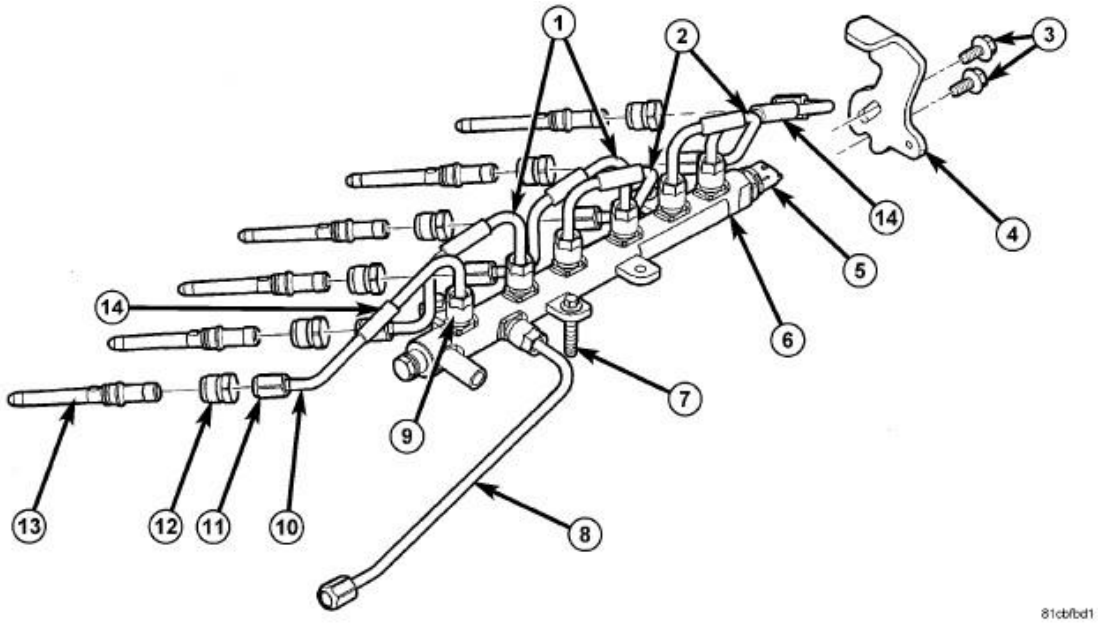


Fig. 63: Exploded View Of Fuel Lines, Fuel Rail & Injectors
Courtesy of CHRYSLER GROUP, LLC

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

16. **Install the fuel rail and high pressure fuel lines as follows:**
    1. Hand tighten fuel rail bolts.
    2. Hand tighten fuel drain line to pressure limiting valve.
    3. Hand tighten fuel rail-to-cylinder head high pressure fuel lines.
    4. Hand tighten fuel pump to fuel rail line.
    5. Tighten fuel line nuts at cylinder head to 40 N.m (30 ft. lbs.).
    6. Tighten fuel line nuts at fuel rail to 40 N.m (30 ft. lbs.)
    7. Using a back up wrench, tighten fuel pump to fuel rail line to 40 N.m (30 ft. lbs.). At injection pump.
    8. Tighten fuel pump to fuel rail line to 40 N.m (30 ft. lbs.) at fuel rail.
    9. Tighten banjo bolt at pressure limiting valve and fuel rail to 24 N.m (18 ft. lbs.).
    10. Tighten rail bolts to 24 N.m (18 ft. lbs.).
    11. Connect fuel pressure sensor.
17. Reposition No. 6 fuel line shield and tighten to 43 N.m (32 ft. lbs.).
18. Install the fuel filter to injection pump low pressure line. Inspect and replace sealing washers if necessary.
19. Connect fuel return line at back of cylinder head hand tight.
20. Tighten banjo connections at cylinder head to 24 N.m (18 ft. lbs.).
21. Using new gaskets, install the air inlet housing. Tighten bolts to 24 N.m (18 ft. lbs.).
22. Install wire harness P-clip and push on clip to air inlet housing.
23. Connect engine oil level indicator tube at fuel filter housing and at air inlet housing.
24. Install the charge air cooler-to-air inlet housing duct assembly. Tighten all clamps to 11 N.m (97 in. lbs.).

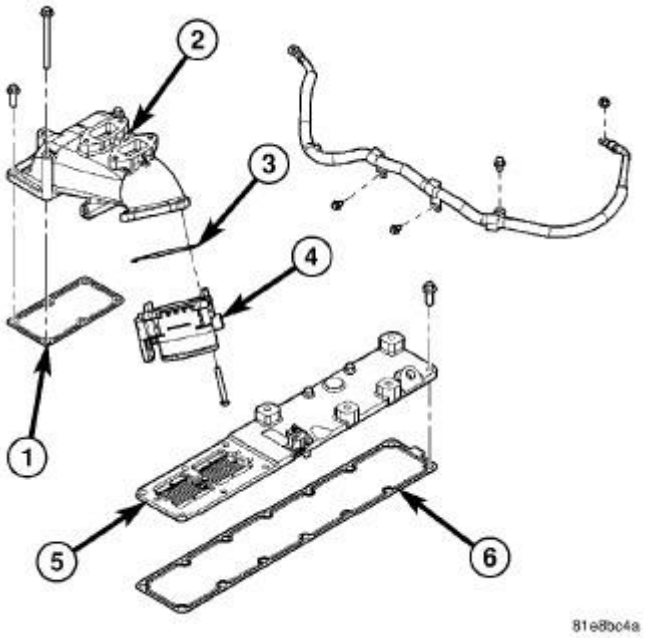


Fig. 64: Intake Air Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

25. Connect intake grid heater wire.
26. Secure engine harness to front of cylinder head with bolt at four locations.
27. Connect engine coolant temperature sensor connector.
28. Connect radiator upper hose to thermostat housing.

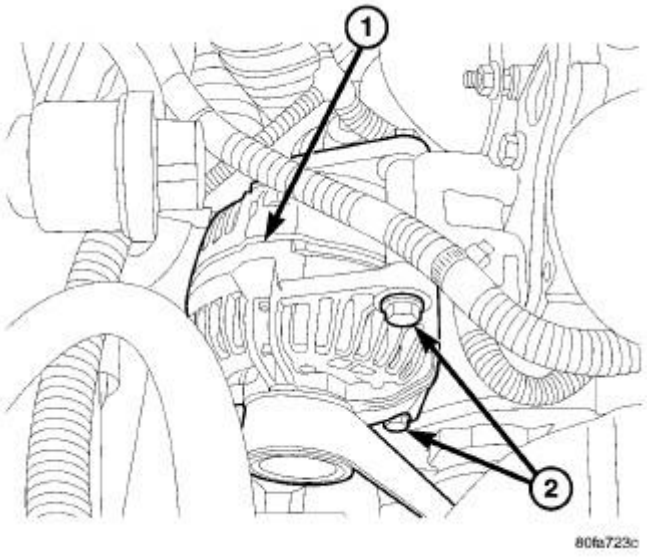


Fig. 65: Generator & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - GENERATOR
2 - MOUNTING BOLTS

29. Rotate generator into position. Install upper bolt and tighten upper and lower bolts.
30. Install wire harness push-on clip below bracket.
31. Install wire harness P-clip to top of bracket.
32. Install fan support and tighten to 32 N.m (24 ft. lbs.).
33. Install cooling fan/drive. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
34. Install accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

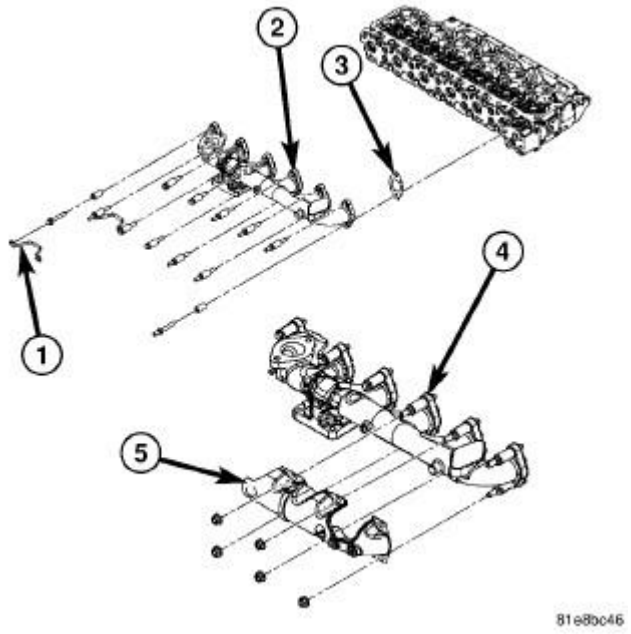


Fig. 66: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - Retainer
2 - Exhaust Manifold
3 - Gasket
4 - Bolt
5 - Heat Shield

35. Install exhaust manifold/turbocharger assembly, using new gaskets. Start all bolts/spacers by hand. Starting from the center bolts out, Tighten bolts to 43 N.m (32 ft. lbs.), then retighten from the center out again.
36. Install exhaust manifold heat shield to exhaust manifold studs. Install retaining nuts. Tighten to 24 N.m (18 ft. lbs.).

37. Install exhaust bolt retention straps across cylinders No. 5 and No. 6.
38. Using a new gasket, connect the turbocharger oil drain tube. Tighten to 24 N.m (18 ft. lbs.).

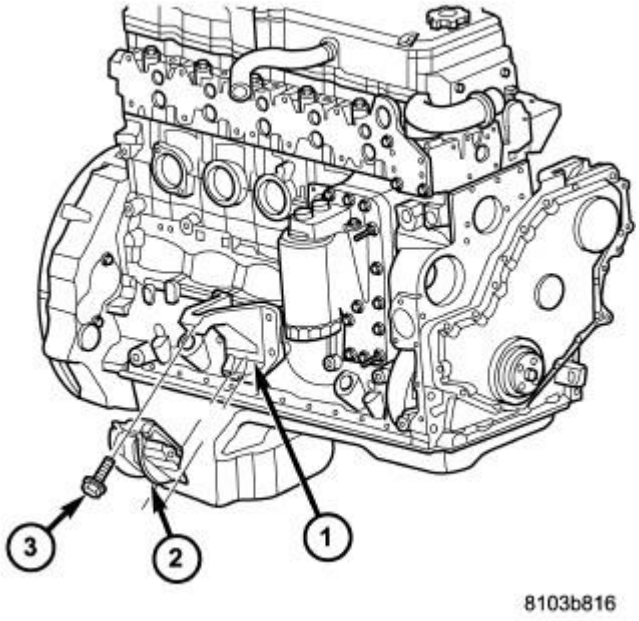


Fig. 67: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Mount
2 - Insulator
3 - Bolt

39. Install the right motor mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.

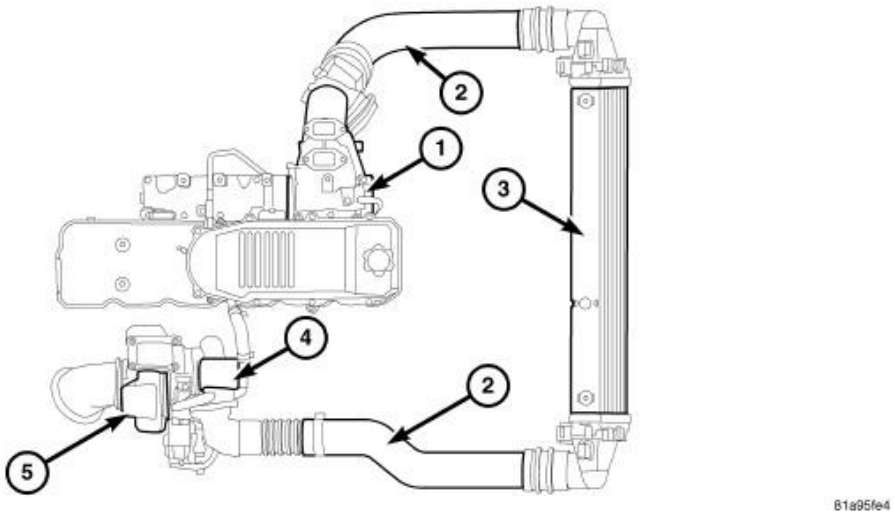


Fig. 68: Charge Air Cooler Assembly Components
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE MANIFOLD
2 - CHARGE AIR COOLER TUBE
3 - CHARGE AIR COOLER
4 - TURBOCHARGER FRESH AIR INTAKE
5 - TURBOCHARGER

40. Perform the turbocharger pre-lube procedure. Refer to **TURBOCHARGER, INSTALLATION, 6.7L**.
41. Connect the turbocharger oil supply line. Tighten to 24 N.m (18 ft. lbs.).
42. Connect the turbocharger coolant lines. Tighten the banjo bolts to 24 N.m (18 ft. lbs.)
43. Install the EGR cooler and associated hardware. Refer to **COOLER, EGR, INSTALLATION** .
44. Install air cleaner housing and duct.
45. Connect air inlet temperature/pressure sensor.
46. Raise vehicle on hoist.

NOTE: Do not reuse the clamp for the exhaust pipe to turbocharger elbow connection.

47. Install the exhaust pipe to turbocharger elbow using a new clamp. Tighten bolts to 10 N.m (89 in. lbs.).

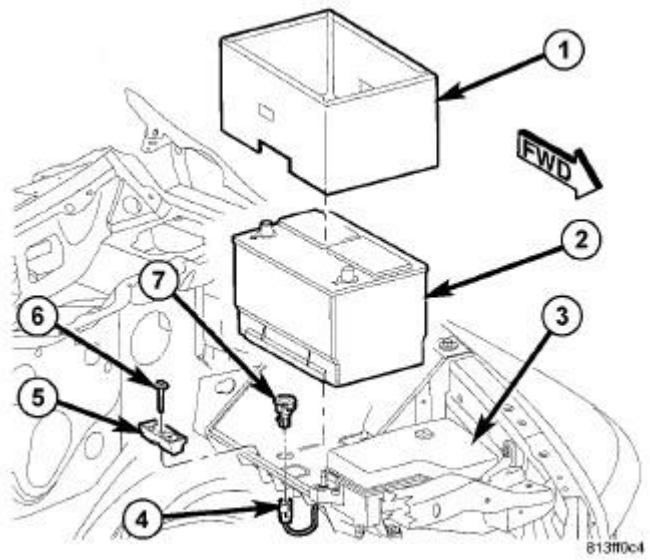


Fig. 69: Battery & Components
Courtesy of CHRYSLER GROUP, LLC

48. Lower vehicle.
49. Connect both negative battery cables.
50. Fill engine coolant. Refer to **STANDARD PROCEDURE** .
51. Start engine and check for leaks.

COVER(S), CYLINDER HEAD

REMOVAL

ROCKER HOUSING

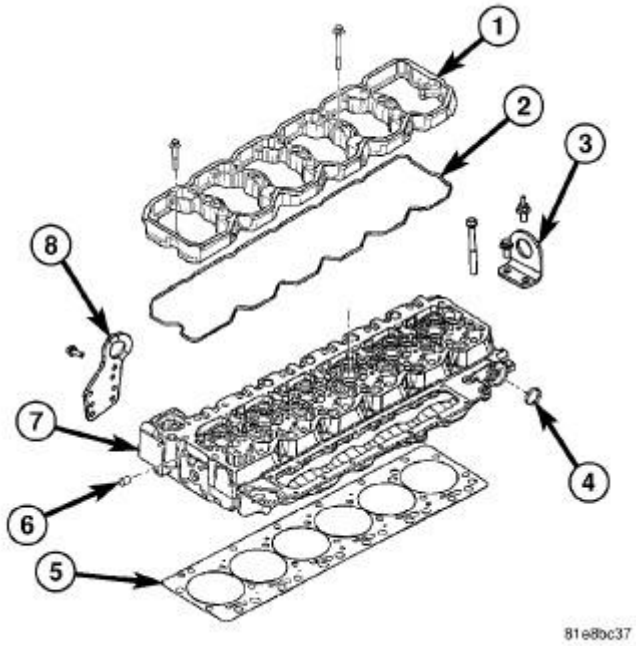


Fig. 70: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
2. Remove injector harness nuts from injectors.
3. Remove cylinder head cover gasket.
4. Remove rocker housing bolts.
5. Remove rocker housing and gasket.

CYLINDER HEAD COVER

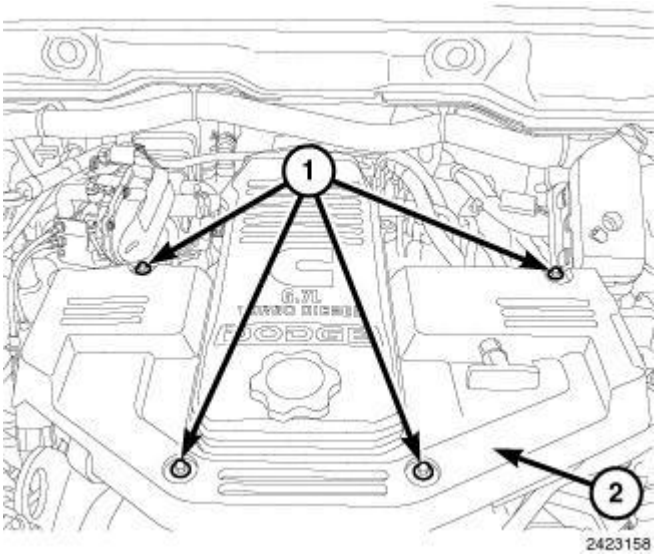


Fig. 71: Engine Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Remove the bolts (1) and the engine cover.
2. Disconnect both negative battery cables.

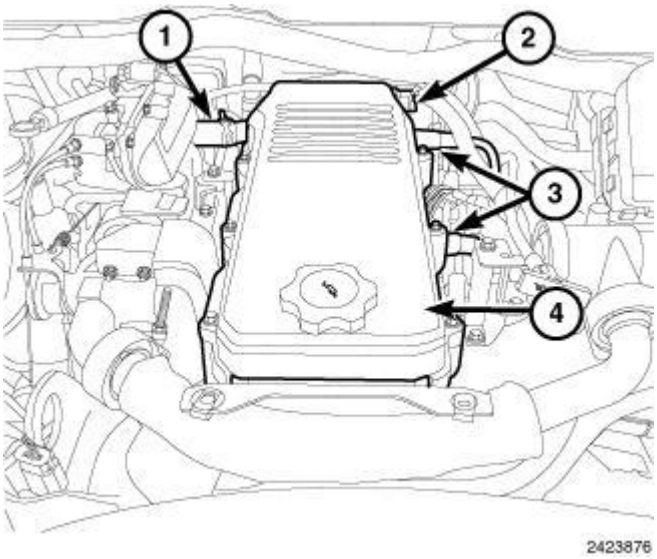


Fig. 72: Cylinder Head Cover Components
Courtesy of CHRYSLER GROUP, LLC

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

3. Remove the oil fill cap.
4. Remove the breather cover capscrews.
5. Remove the Close Crankcase Ventilation (CCV) cover (4) and breather filter.
6. Disconnect the CCV Tube (1) at the Crankcase Depression Regular (CDR) valve.
7. Disconnect the crankcase pressure sensor connector (2).
8. Remove the CCV oil drains (3) from cylinder head cover (2 hoses).
9. Remove the cylinder head cover capscrews.
10. Remove the cylinder head cover.

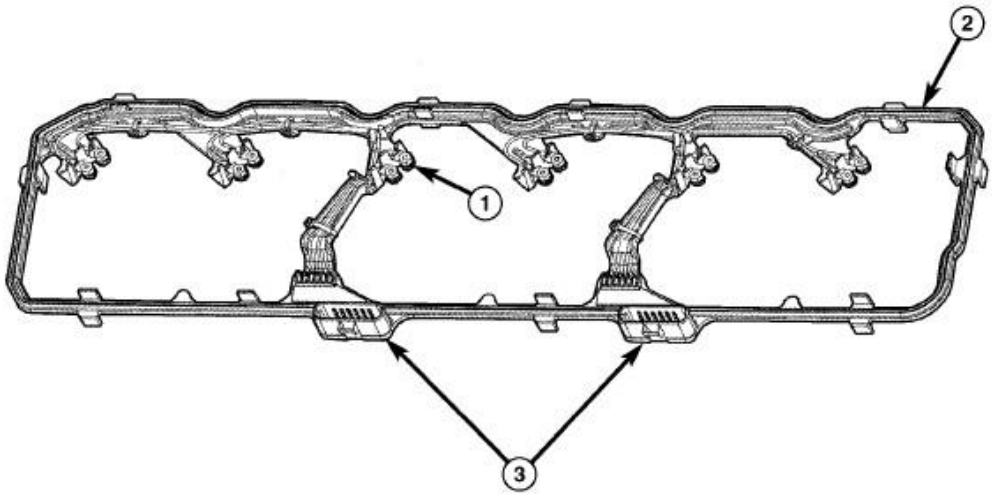


Fig. 73: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect both injector harness connectors.
12. Remove the injector wire nuts (1) from the valve cover gasket.
13. Remove the cylinder head cover gasket (2).

CYLINDER HEAD COVER GASKET

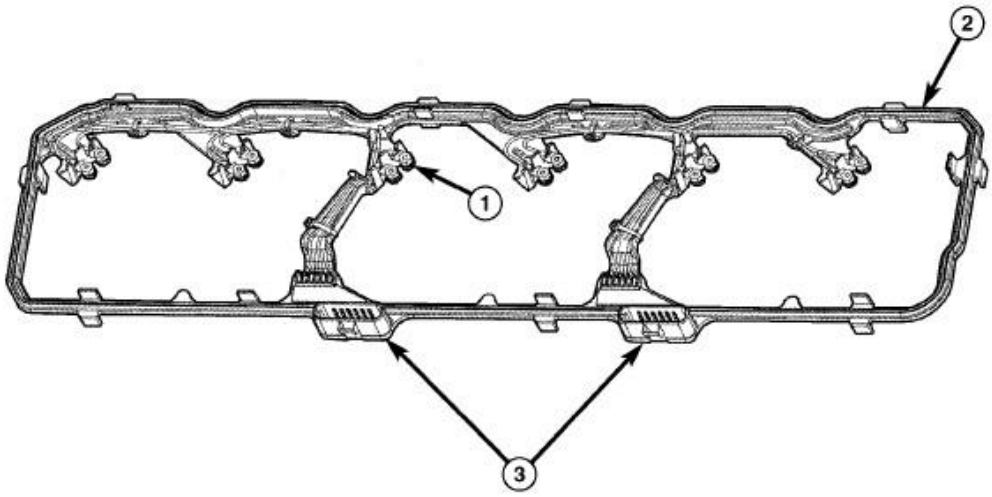


Fig. 74: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - INJECTOR NUTS
2 - GASKET
3 - INJECTOR HARNESS CONNECTORS

1. Remove cylinder head cover.
2. Disconnect injector harness connectors (3) at cylinder head cover gasket.
3. Remove injector solenoid nuts (1) at injectors.
4. Remove 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

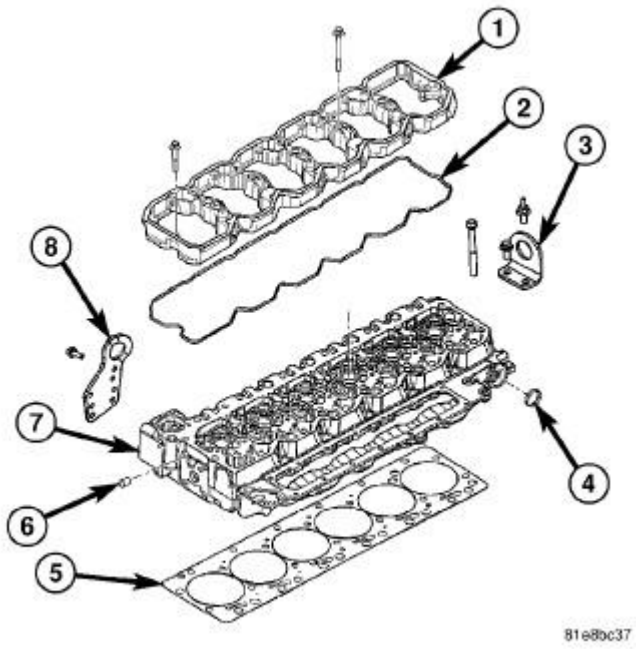


Fig. 75: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Inspect rocker housing gasket for cuts, nicks, or tears. Replace if damaged or if gasket has come out of groove.
2. Inspect rocker housing gasket for proper installation in groove. Gasket bead must be centered in groove. A 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. Carefully guide the rocker housing evenly down onto the cylinder head.
4. Install rocker housing bolts and tighten finger tight.
5. Tighten bolts, working from center out, to 24 N.m (18 ft. lbs.).

CYLINDER HEAD COVER

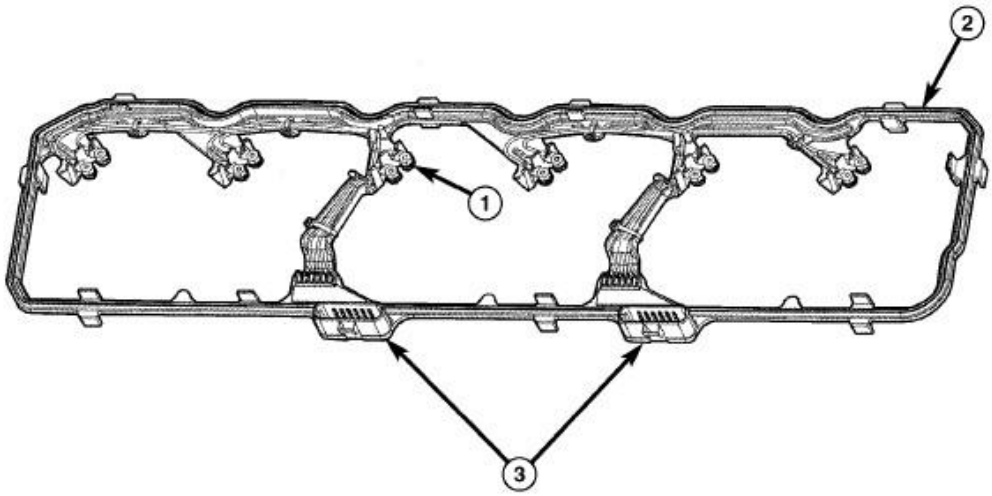


Fig. 76: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

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. Wipe oil from the cylinder head cover gasket (2), rocker box, and cylinder head cover.
2. Inspect cylinder head cover gasket (2) for tears, or splits. Replace if necessary.
3. Install the cylinder head cover gasket (2) on the rocker box.
4. Install the injector nuts to injector studs. Tighten nuts to 1.25 N.m (11 in. lbs.).
5. Connect both injector harness connectors.

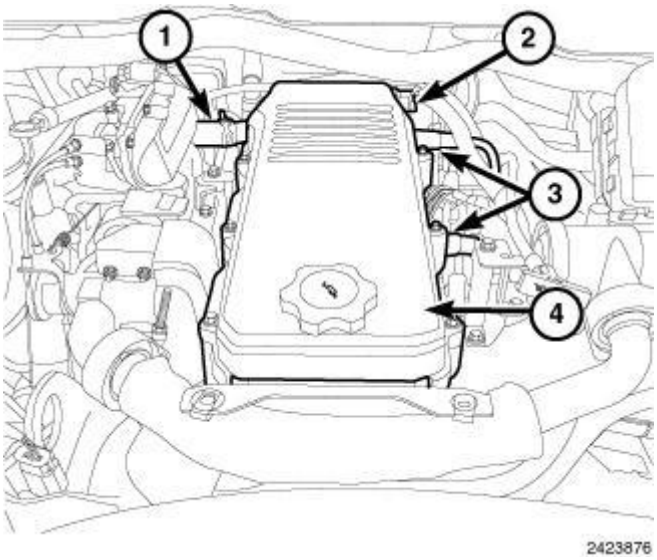


Fig. 77: Cylinder Head Cover Components
Courtesy of CHRYSLER GROUP, LLC

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

6. Install cylinder head cover and cylinder head cover capscrews. Tighten from center out. Tighten to 24 N.m (18 ft. lbs.).
7. Install the Close Crankcase Ventilation (CCV) drain hoses (3) to the cylinder head cover.
8. Connect the crankcase pressure sensor connector (2).
9. Connect the CCV Tube (1) at the Crankcase Depression Regular (CDR) valve.
10. Remove any oil from the CCV seal area and install the CCV breather filter.
11. Install the CCV cover (4) and capscrews. Tighten to 10 N.m (89 in. lbs.).
12. Install the oil fill cap.

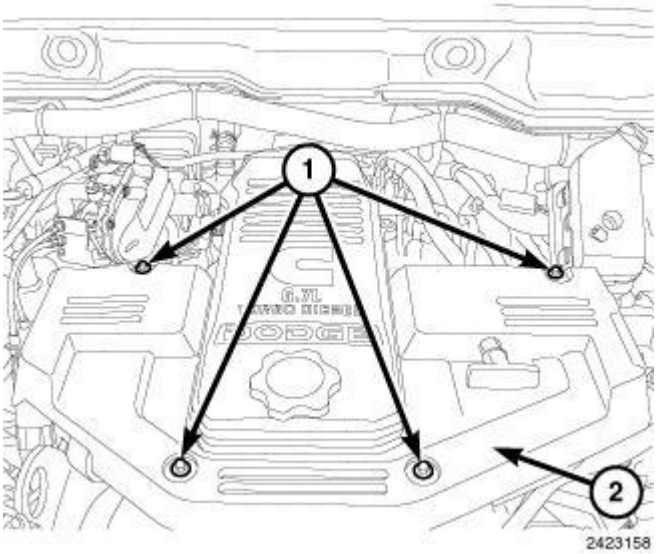


Fig. 78: Engine Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Connect both negative battery cables.
14. Install the engine cover. Tighten the bolts (1) 10 N.m (89 in. lbs.).
15. Start the vehicle and check for leaks.

CYLINDER HEAD COVER GASKET

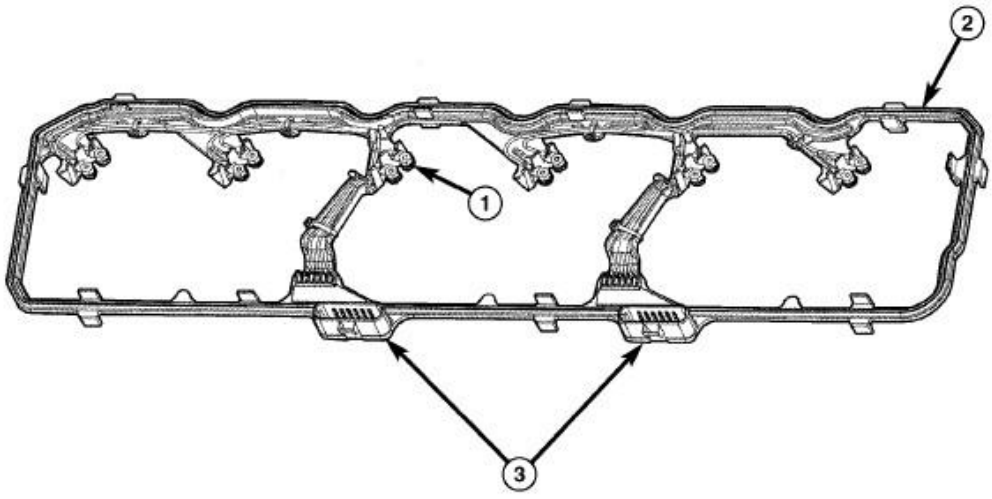


Fig. 79: Injector Harness Nuts, Cylinder Head Cover/Injector Wiring Gasket & Injector Wiring Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - INJECTOR NUTS
2 - GASKET
3 - INJECTOR HARNESS CONNECTORS

1. Clean off any oil from cylinder head cover gasket
2. Inspect cylinder head cover gasket for cuts or damage. Replace if damaged.
3. Install cylinder head cover gasket (2).
4. Install injector solenoid nuts (1) at injectors. Tighten to 1.25 Nm (11 in. lbs.).
5. Connect injector harness connectors (3) at cylinder head cover gasket.

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

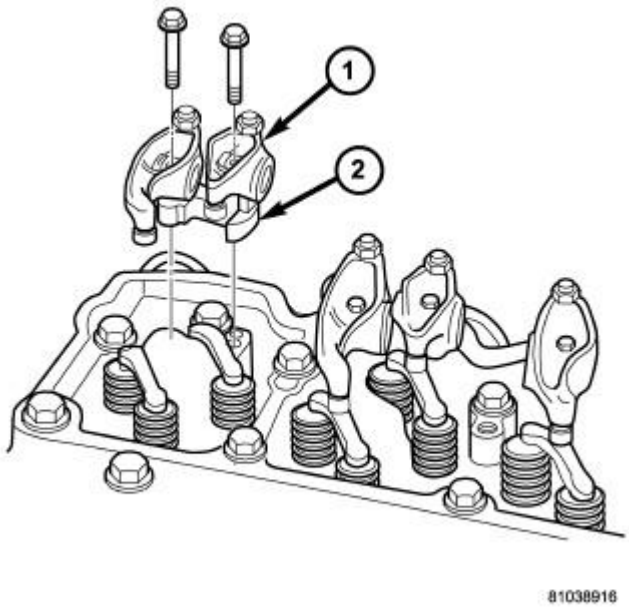


Fig. 80: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

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.

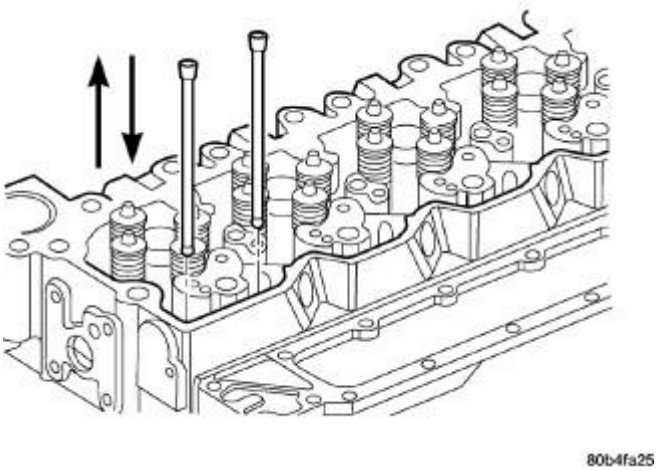


Fig. 81: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

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

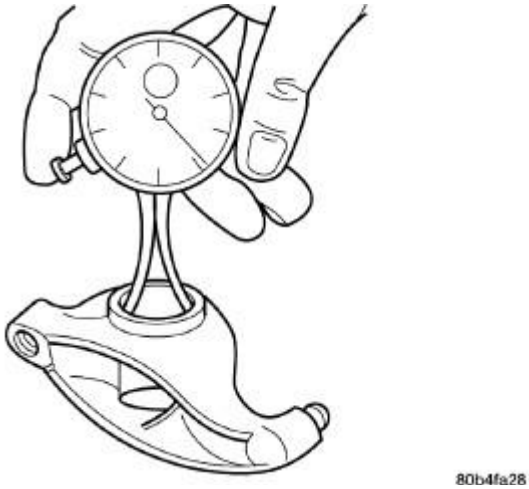


Fig. 82: Measuring Rocker Arm Bore
Courtesy of CHRYSLER GROUP, LLC

ROCKER ARM BORE (MAX.) SPECIFICATIONS

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

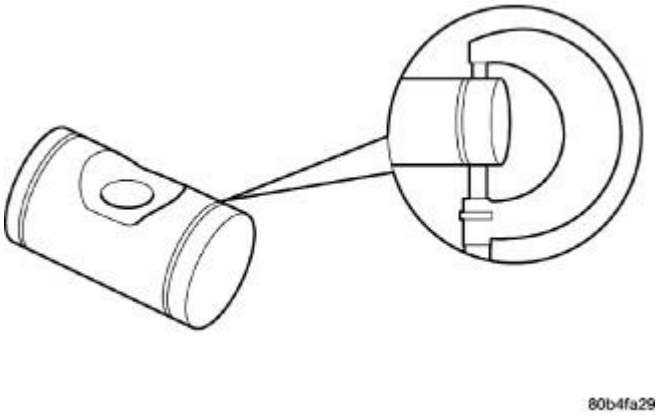


Fig. 83: Measuring Rocker Arm Shaft
Courtesy of CHRYSLER GROUP, LLC

ROCKER ARM SHAFT (MIN.) SPECIFICATIONS

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

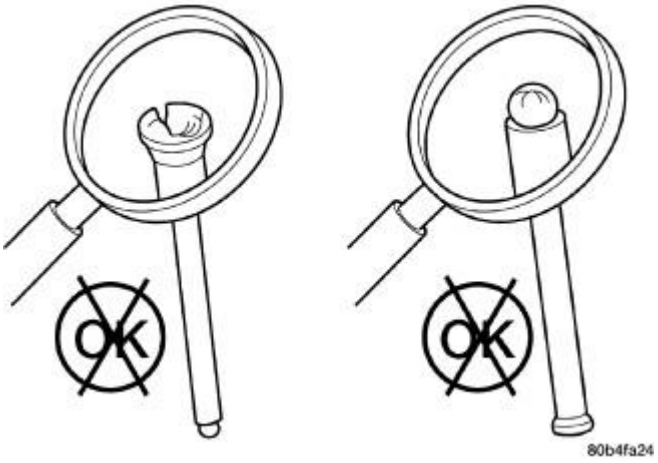


Fig. 84: Inspecting Push Rod For Cracks
Courtesy of CHRYSLER GROUP, LLC

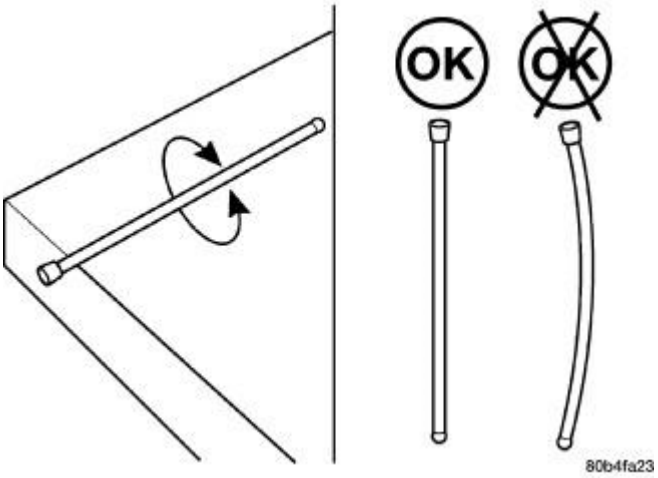


Fig. 85: Inspecting For Bent Push Rods
Courtesy of CHRYSLER GROUP, LLC

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

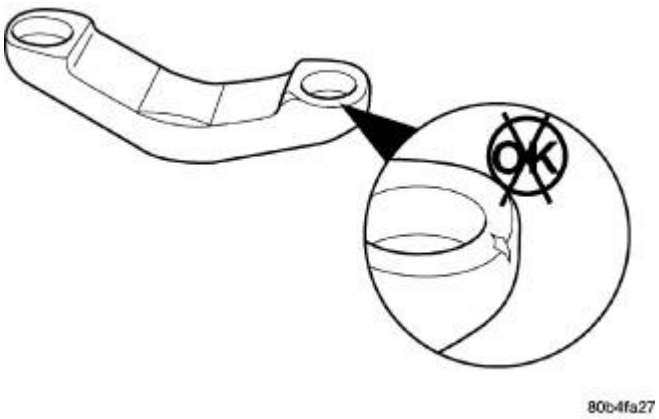


Fig. 86: Inspecting Crosshead For Cracks
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

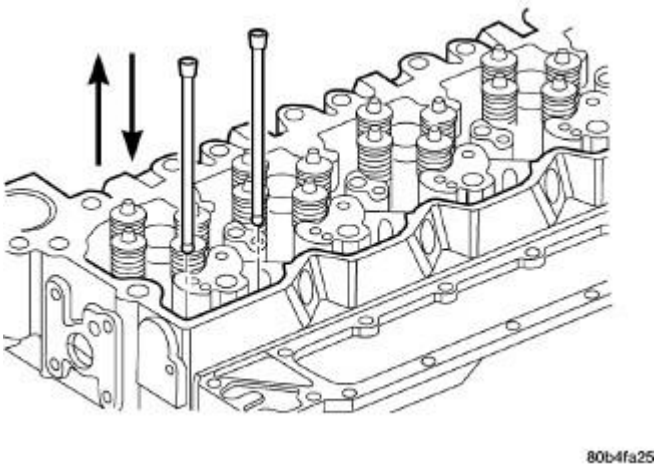


Fig. 87: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

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.).

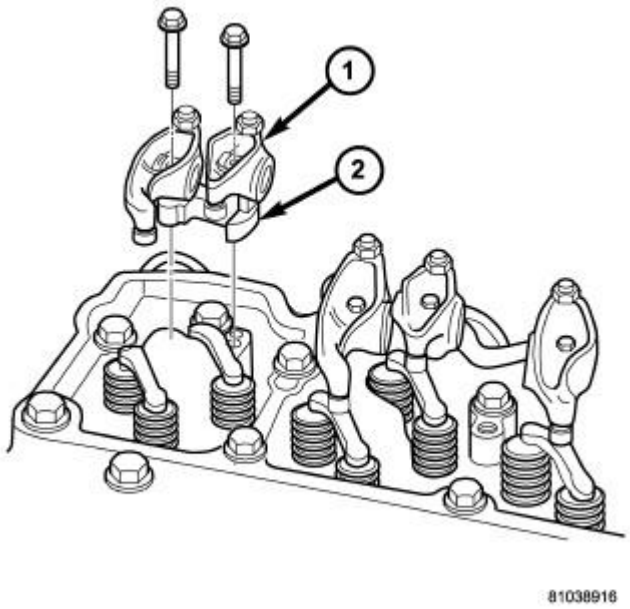


Fig. 88: Rocker Arms & Pedestals
Courtesy of CHRYSLER GROUP, LLC

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

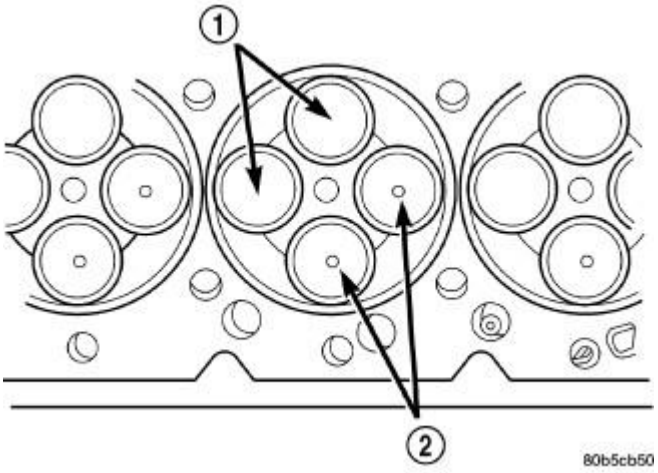


Fig. 89: Intake & Exhaust Valve Identification
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE VALVES
2 - EXHAUST VALVES

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, GUIDES AND SPRINGS

REMOVAL

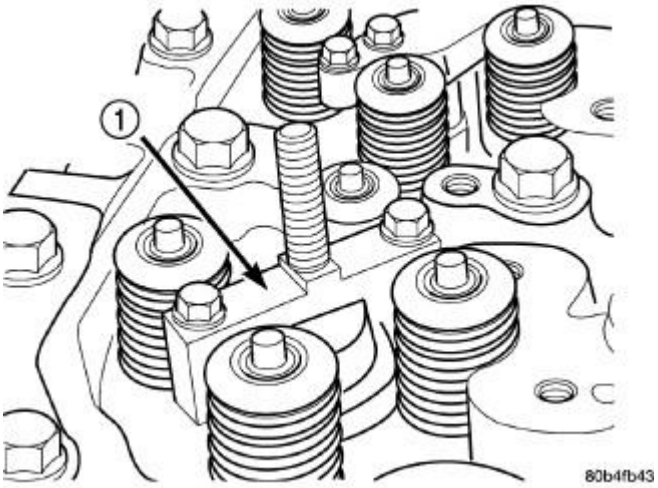


Fig. 90: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

1 - COMPRESSOR MOUNTING BASE

1. Remove cylinder head. Refer to **CYLINDER HEAD, REMOVAL, 6.7L**.
2. Support cylinder head on stands, or install head bolts upside down (through combustion surface side) to protect injector tips from damage from work bench.
3. Install the valve spring compressor base 8313A (1) as shown in illustration.

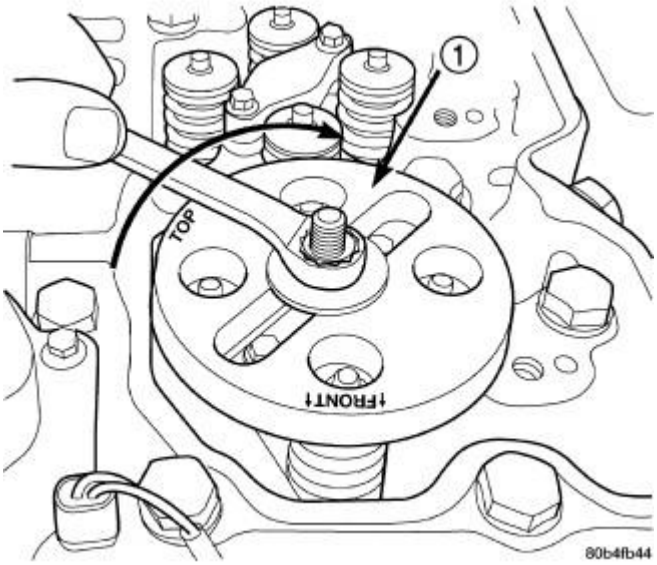


Fig. 91: Compressing Valve Springs With Tool 8319
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8319

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).

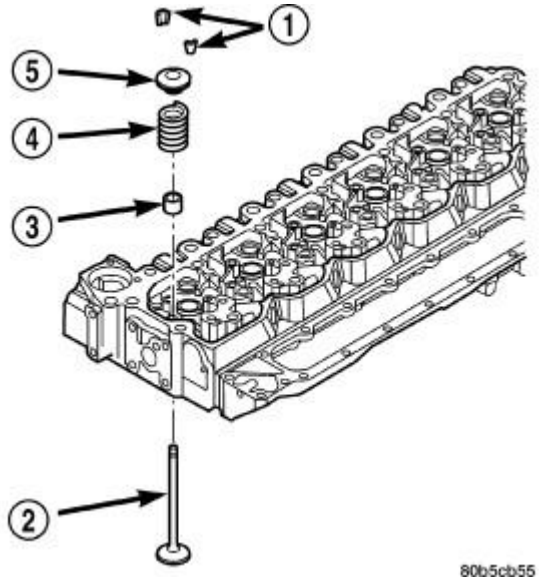


Fig. 92: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

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

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.

CLEANING

Clean the valve stems with crocus cloth or a Scotch-Brite™ pad. Remove carbon with a soft wire brush. Clean valves, springs, retainers, and valve retaining locks in a suitable solvent. Rinse in hot water and blow dry with compressed air.

INSPECTION

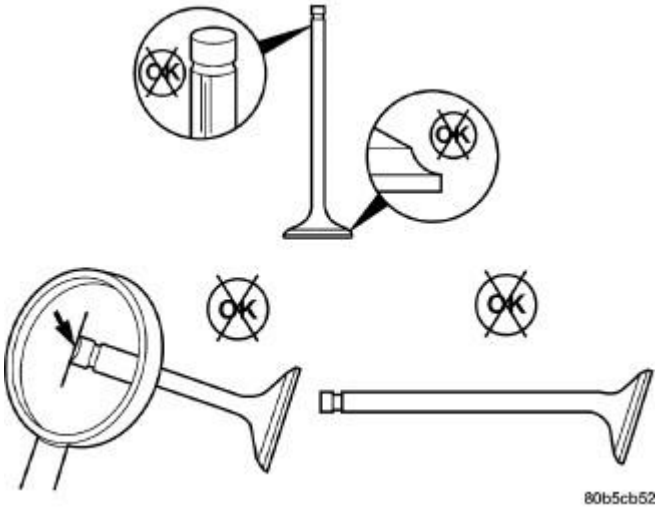


Fig. 93: Visually Inspect Valves For Abnormal Wear
Courtesy of CHRYSLER GROUP, LLC

Visually inspect the valves for abnormal wear on the heads, stems, and tips. Replace any valve that is worn out or bent.

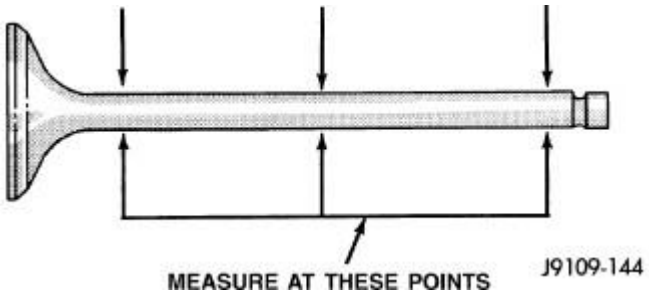


Fig. 94: Measuring Points Of Valve Stem
Courtesy of CHRYSLER GROUP, LLC

VALVE STEM DIAMETER SPECIFICATIONS

VALVE STEM DIAMETER
6.96 mm (0.2740 in.) MIN 7.010 mm (0.2760 in.) MAX

Measure the valve stem diameter in three places as shown in illustration.

VALVE GUIDE BORE SPECIFICATIONS

VALVE GUIDE BORE SPECIFICATIONS	
Valve guide bore diameter	
Min.	7.027 mm (0.2767 in.)
Max.	7.077 mm (0.2786 in.)
Installed valve guide depth	
Intake	

Min.	0.584 mm (0.023 in.)
Max.	1.092 mm (0.043 in.)
Exhaust	
Min.	0.965 mm (0.028 in.)
Max.	1.473 mm (0.058 in.)

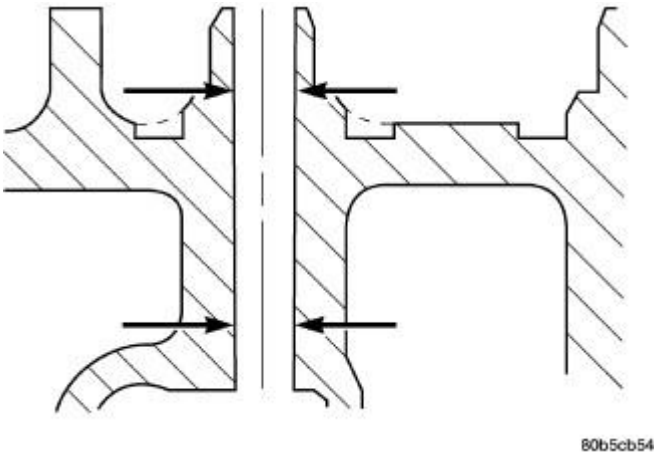


Fig. 95: Measuring Points Of Valve Guide Bore
Courtesy of CHRYSLER GROUP, LLC

Measure the cylinder head valve guide bore.

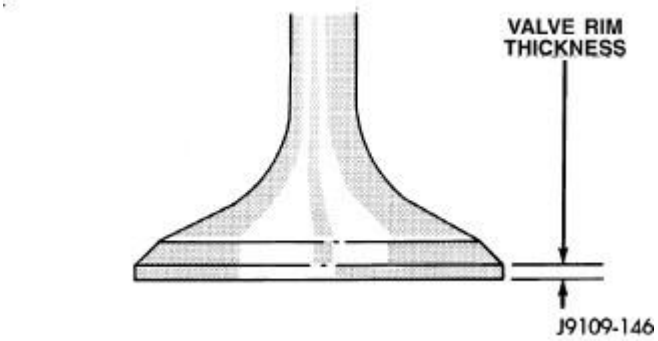


Fig. 96: Measuring Points Of Valve Margin (Rim Thickness)
Courtesy of CHRYSLER GROUP, LLC

VALVE MARGIN (RIM THICKNESS) SPECIFICATIONS

VALVE MARGIN (RIM THICKNESS)
0.79 mm (0.031 in.) MIN.

Measure valve margin (rim thickness).

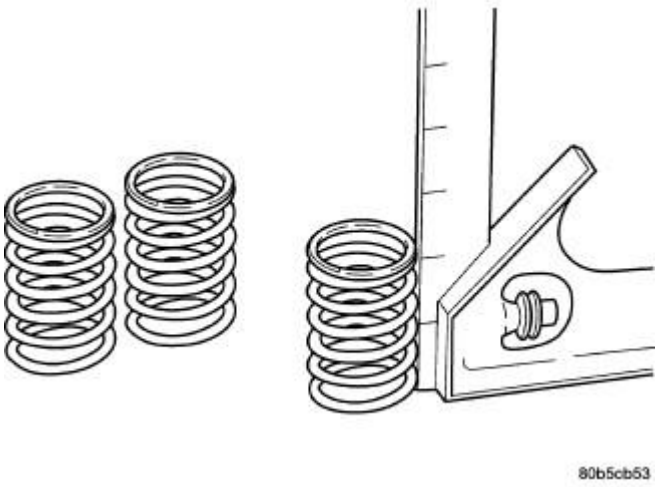


Fig. 97: Measure Valve Spring Free Length And Maximum Inclination
Courtesy of CHRYSLER GROUP, LLC

ALVE SPRING FREE LENGTH & INCLINATION SPECIFICATIONS

APPROXIMATE VALVE SPRING FREE LENGTH
47.75 mm (1.88 in.)
MAX INCLINATION
1.5 mm (.059 in.)

Measure the valve spring free length and maximum inclination.

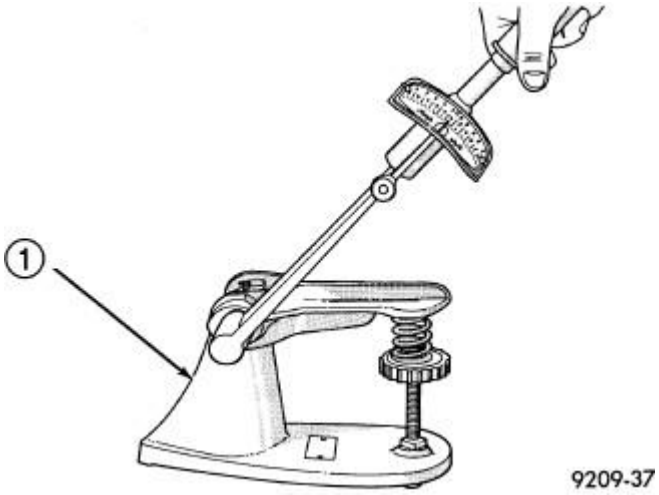


Fig. 98: Testing Valve Spring With Tool C-647
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL C-647

Test valve spring force with tool (special tool #C-647, Spring Tester) (1). Specification 72.0 - 80.7 lbs. when

compressed to 35.33 mm (1.39 in.).

INSTALLATION

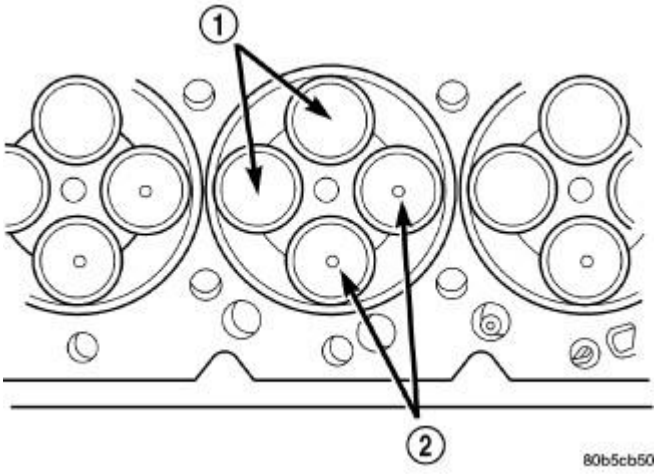


Fig. 99: Intake & Exhaust Valve Identification
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE VALVES
2 - EXHAUST VALVES

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.

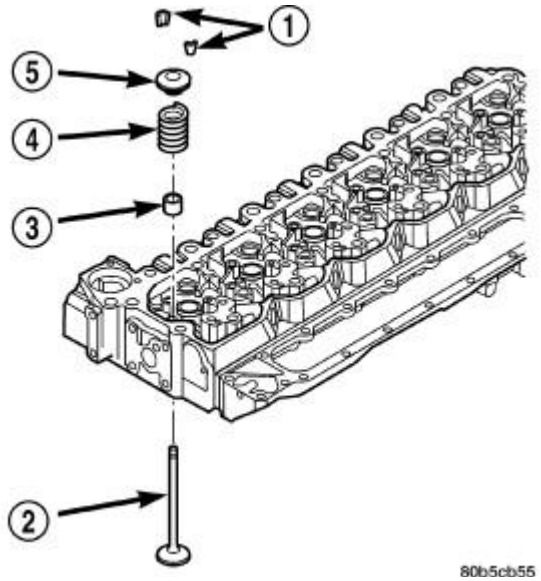


Fig. 100: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

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

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

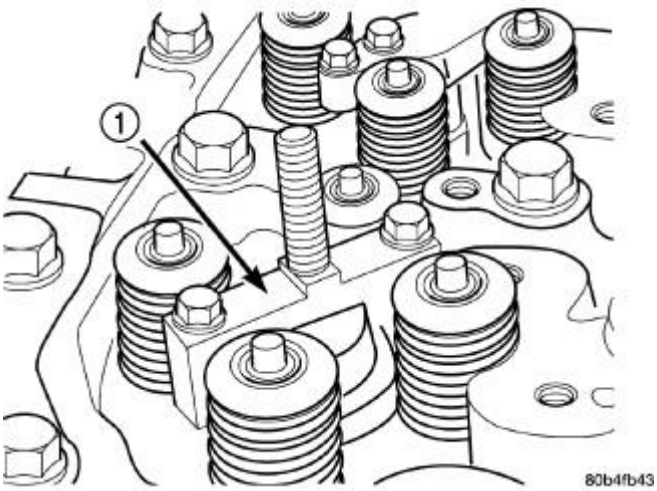


Fig. 101: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

1 - COMPRESSOR MOUNTING BASE

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

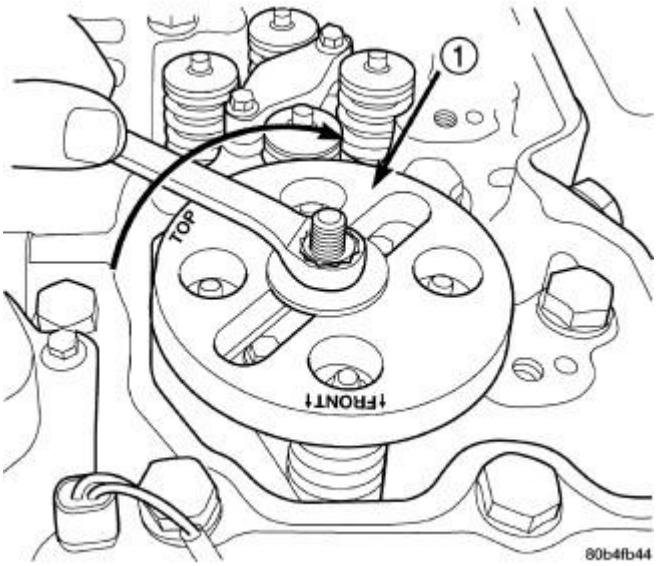


Fig. 102: Compressing Valve Springs With Tool 8319
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8319

5. Install the valve spring compressor top plate, 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 new o-ring and sealing washer on injector.
9. Lubricate o-ring and injector bore.
10. Verify sealing washer (shim) was removed with old injector.
11. Install injector. Refer to **INJECTOR(S), FUEL, INSTALLATION** .
12. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION, 6.7L**.

VALVE LASH ADJUSTMENT AND VERIFICATION

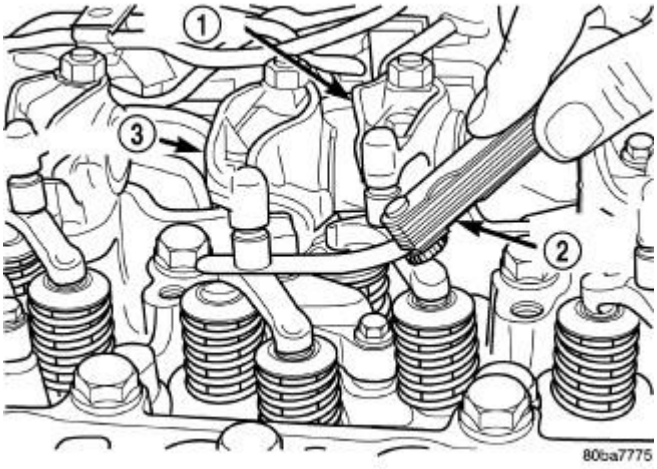


Fig. 103: Measuring Valve Lash
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE
2 - FEELER GAUGE
3 - EXHAUST

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 24-valve overhead system is a "low-maintenance" design. Routine adjustments are no longer necessary, however, measurement 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.
    1. If both number one cylinder rocker levers are loose, continue to next step.
    2. 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 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.**	

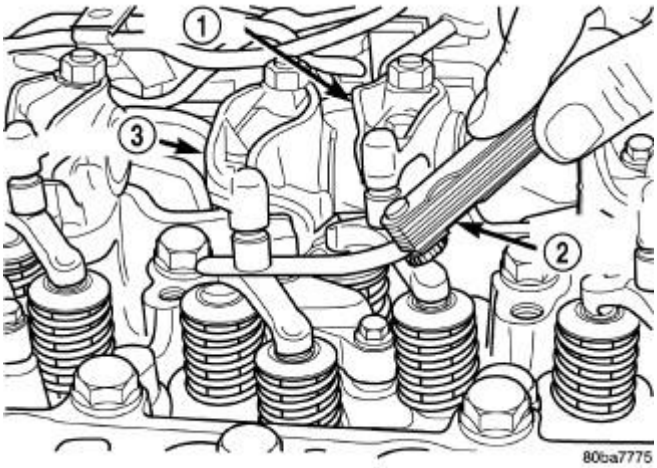


Fig. 104: Measuring Valve Lash
Courtesy of CHRYSLER GROUP, LLC

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 the battery negative cables.

REMOVAL

REMOVAL

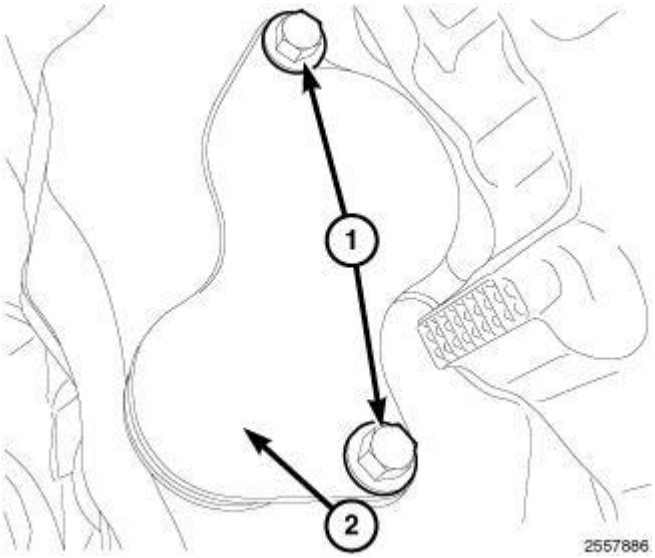


Fig. 105: Bolts & Bell Housing Access Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
3. Disconnect the injector harness connectors at cylinder head cover gasket. Remove all injector solenoid nuts. Remove cylinder head cover gasket.
4. Remove injector(s) for cylinder(s) to be serviced. Refer to **INJECTOR(S), FUEL, REMOVAL** .
5. Remove the rocker housing.
6. 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.

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

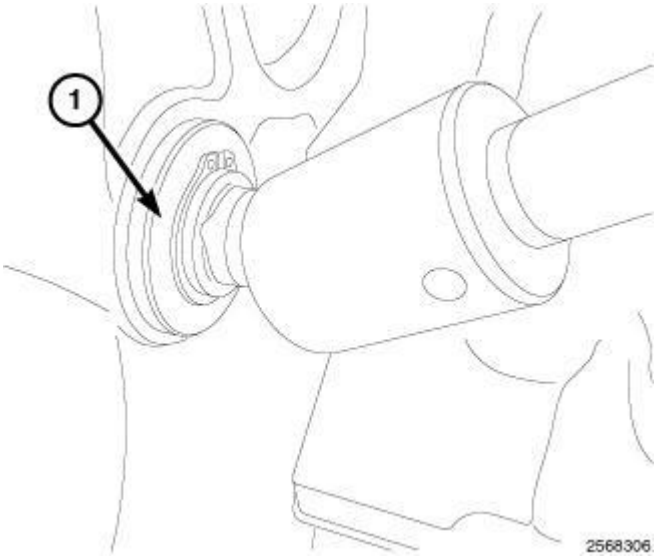


Fig. 106: Engine Barring Tool
Courtesy of CHRYSLER GROUP, LLC

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

8. Using the barring tool (special tool #7471B, Barring Tool) (1), rotate the engine to position the damper mark in the 12 o'clock position.
9. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
10. 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.
11. Divide the crankshaft damper into three equally sized segments as follows:
    1. Using a tape measure, measure the circumference of the crankshaft damper and divide the measurement by three (3).
    2. Measure that distance in a counterclockwise direction from the first balancer mark and place another mark on the balancer.
    3. 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.
    4. Remove injectors, fuel lines, and high pressure connectors for every cylinder that requires repair.

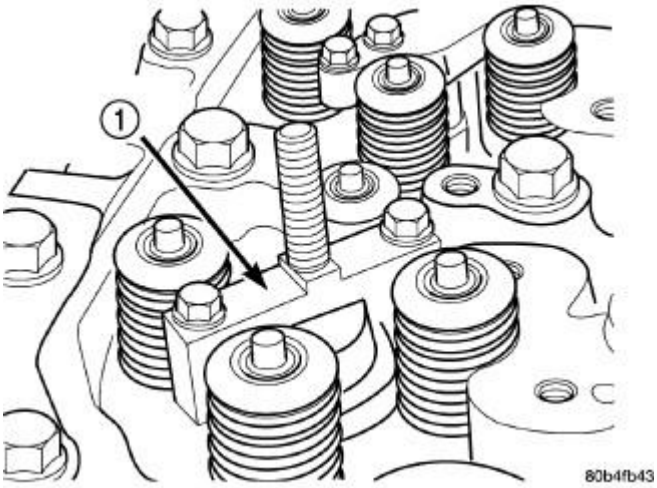


Fig. 107: Spring Compressor Mounting Base
Courtesy of CHRYSLER GROUP, LLC

1 - COMPRESSOR MOUNTING BASE

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

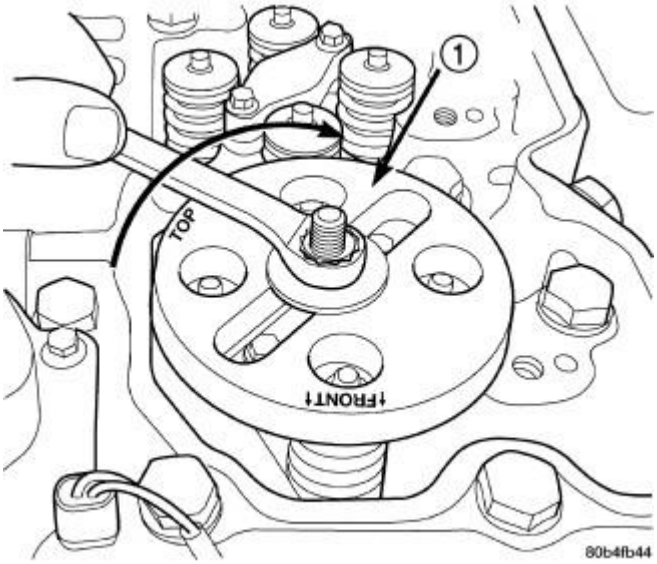


Fig. 108: Compressing Valve Springs With Tool 8319-A
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8319

13. Install the Valve Spring Compressor Tool (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 collets.

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

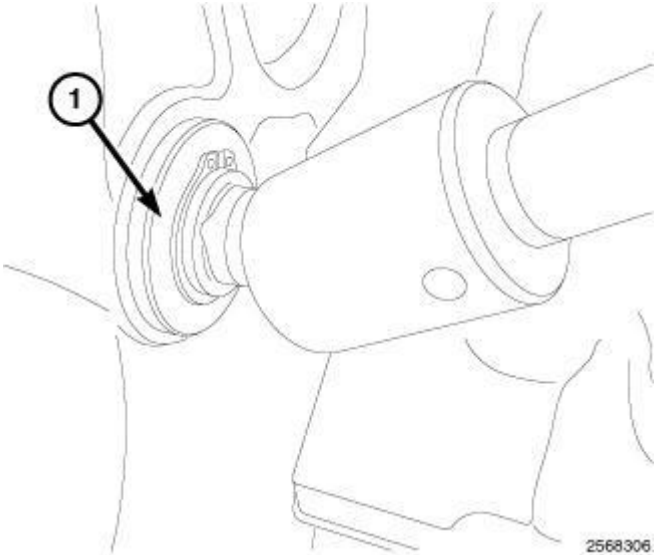


Fig. 109: Engine Barring Tool
Courtesy of CHRYSLER GROUP, LLC

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

14. Using the barring tool (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.
15. 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.

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

INSTALLATION

INSTALLATION

1. Install rocker housing. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.
2. Install fuel injectors and high pressure fuel lines. 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 gasket onto rocker housing. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.
7. Install injector solenoid nuts.
8. Connect injector harness connectors.
9. Install cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 6.7L**.
10. Connect both negative battery cables.

ENGINE BLOCK

STANDARD PROCEDURE

CYLINDER BLOCK REFACING

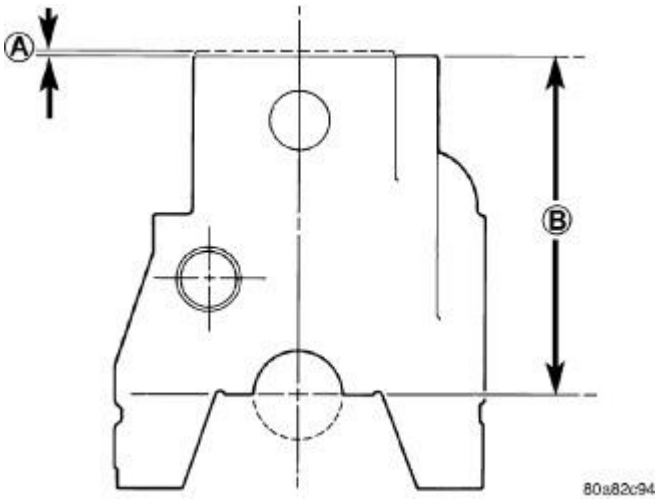


Fig. 110: Refacing Dimensions Of Cylinder Block
Courtesy of CHRYSLER GROUP, LLC

1. Prior to removing the piston and connecting rod assemblies, measure and record piston protrusion. Piston protrusion (A) must be with in 0.151 - 0485 mm (0.006 - 0.019 in.). Measuring piston protrusion prior to disassembly will aid in determining if the cylinder block, if required, can be resurfaced.
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 head deck MUST be resurfaced.

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 an be reached, the cylinder block MUST be replaced.

CYLINDER BORE - DE-GLAZE

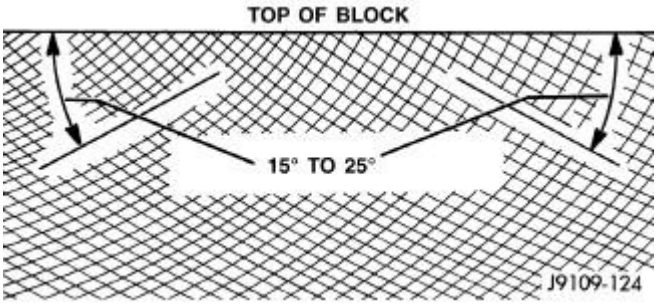


Fig. 111: Cylinder Bore Crosshatch Pattern
Courtesy of CHRYSLER GROUP, LLC

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.

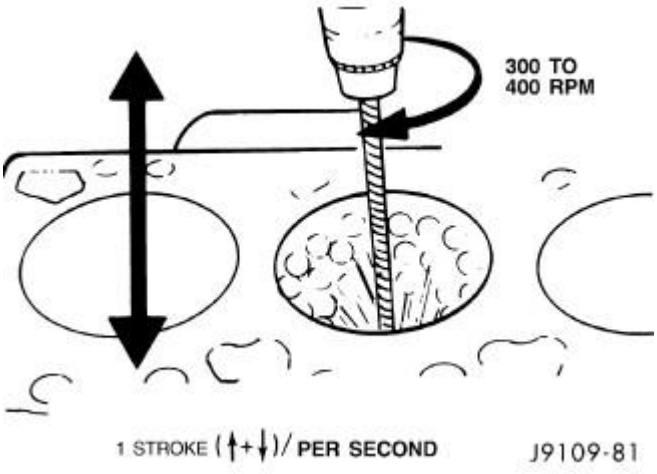


Fig. 112: De-Glazing Cylinder Bore
Courtesy of CHRYSLER GROUP, LLC

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°

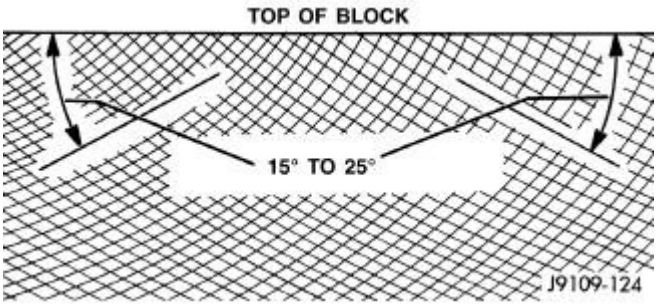


Fig. 113: Crosshatch Pattern Of Repaired Sleeve(s)

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

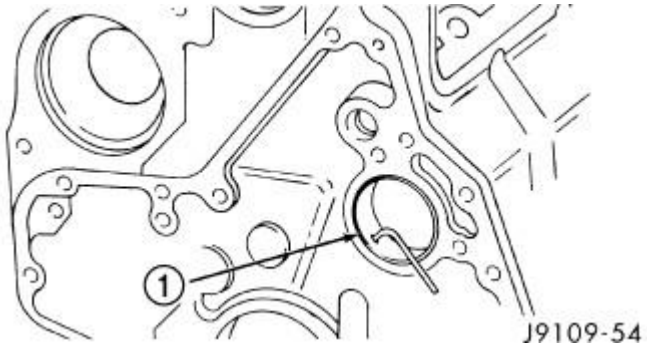


Fig. 114: Camshaft Bushing
Courtesy of CHRYSLER GROUP, LLC

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

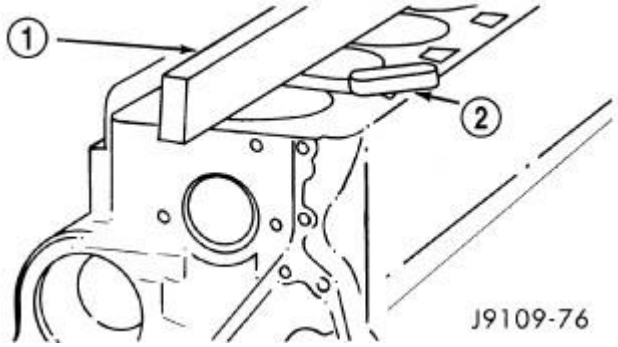


Fig. 115: Combustion Deck Face Measurement
Courtesy of CHRYSLER GROUP, LLC

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/Engine Block - Standard Procedure**.

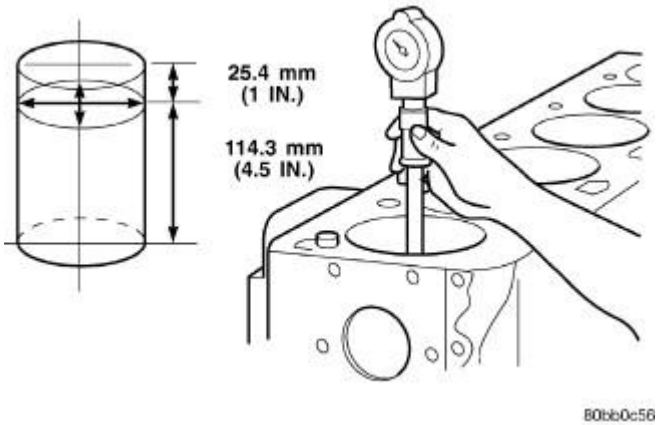


Fig. 116: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

Inspect the cylinder bores for damage or excessive wear.

Measure the cylinder bores. If the cylinder bores exceed the limit. Refer to **Engine/Engine Block - Standard**

Procedure.

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 **Engine - Specifications**.

If a bore exceeds the limit. Refer to **Engine/Engine Block - Standard Procedure**.

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

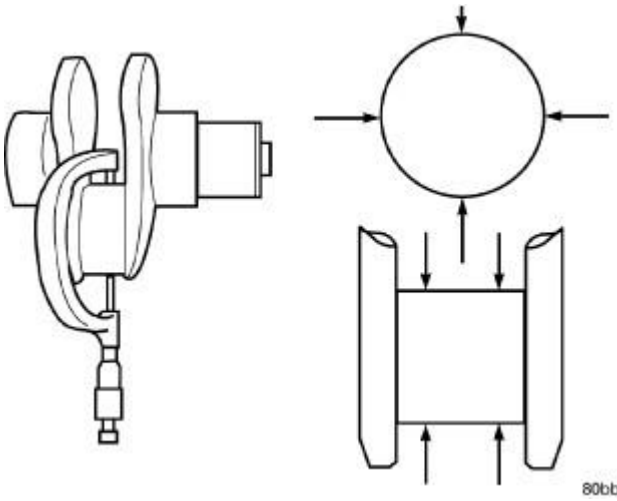


Fig. 117: Measuring Connecting Rod Journal Diameter

Courtesy of CHRYSLER GROUP, LLC

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

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 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

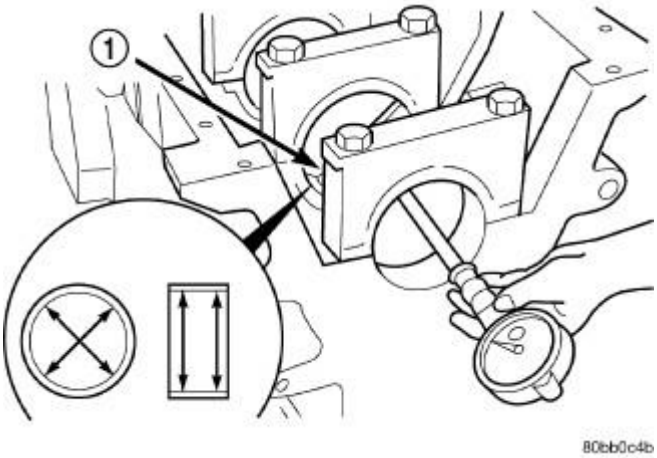


Fig. 118: Measuring Main Bearing Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

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.)

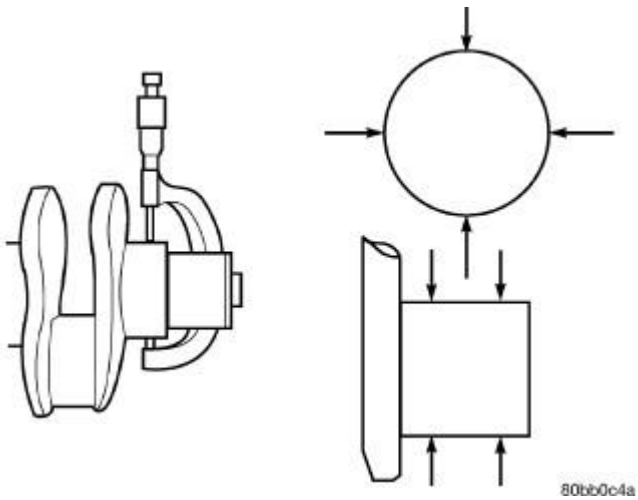


Fig. 119: Measuring Crankshaft Main Journal Diameter
Courtesy of CHRYSLER GROUP, LLC

4. Measure the diameter of the crankshaft main journal at the locations shown in illustration. Calculate the average diameter for each side of the journal.
5. 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.
6. 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.)
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.)

CAMSHAFT, ENGINE

REMOVAL

CAMSHAFT BEARINGS

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 camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L**.
2. Remove the bushing from the No. 1 bore.
3. Mark the cylinder block so you can align the oil hole in the cylinder block with the oil hole in the bushing.

CAMSHAFT - REMOVAL

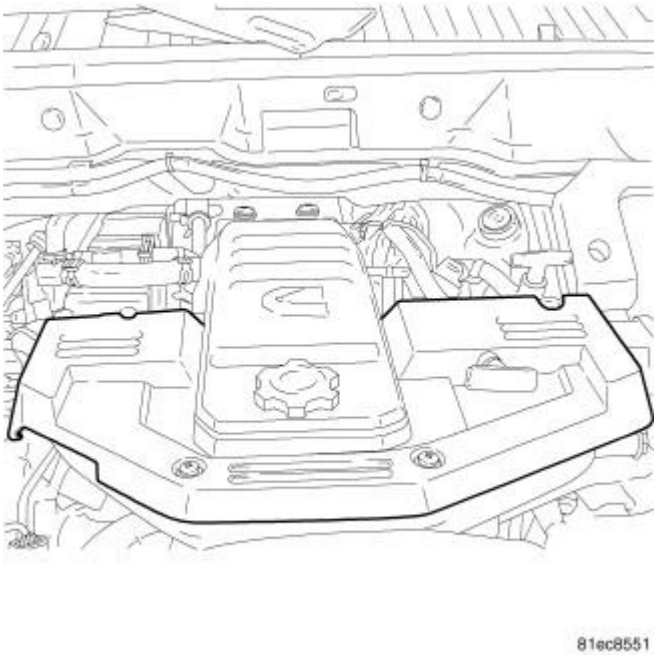


Fig. 120: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the engine cover.
3. Recover A/C refrigerant (if A/C equipped). Refer to **PLUMBING, STANDARD PROCEDURE** .
4. Drain engine coolant. Refer to **STANDARD PROCEDURE** .
5. Remove radiator upper hose.
6. Remove viscous fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
7. Disconnect the coolant recovery bottle hose from the radiator filler neck.
8. Disconnect lower radiator hose from radiator outlet.
9. On automatic transmission equipped models, disconnect transmission oil cooler lines from radiator.
10. Remove radiator mounting screws and lift radiator out of engine compartment.
11. Remove upper radiator support panel.

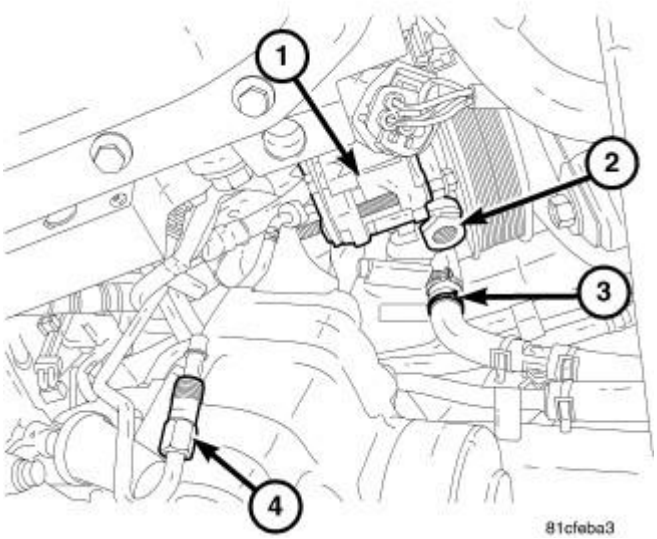


Fig. 121: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

12. If A/C equipped, disconnect A/C condenser refrigerant lines.
13. Disconnect charge air cooler piping from the cooler inlet and outlet.
14. Remove the two charge air cooler mounting bolts.
15. Remove charge air cooler (and A/C condenser if equipped) from vehicle.
16. Remove the power steering pump and position aside.
17. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

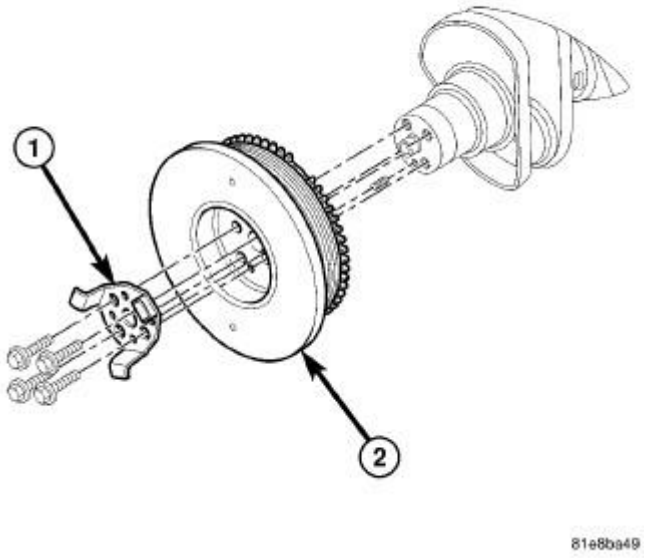


Fig. 122: Crankshaft Damper (Non-High Output Engine)

Courtesy of CHRYSLER GROUP, LLC

18. Remove accessory drive belt tensioner.
19. Remove the fan support/hub assembly.
20. Remove crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 6.7L**.

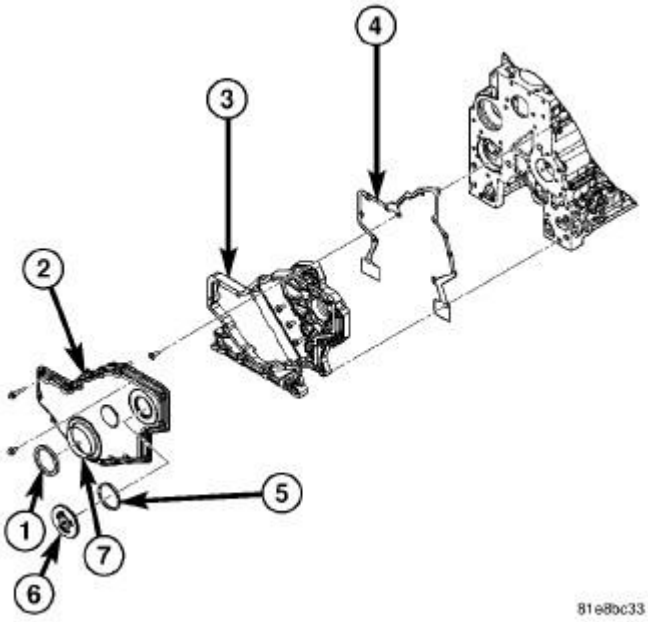


Fig. 123: Front Cover Assembly Components
Courtesy of CHRYSLER GROUP, LLC

21. Remove the gear cover-to-housing bolts and gently pry the cover away from the housing, taking care not to mar the sealing surfaces. Remove dust seal with cover.
22. Using Barring Tool (special tool #7471B, Barring Tool) or equivalent, rotate the crankshaft to align the timing marks on the crankshaft and the camshaft gears.
23. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.

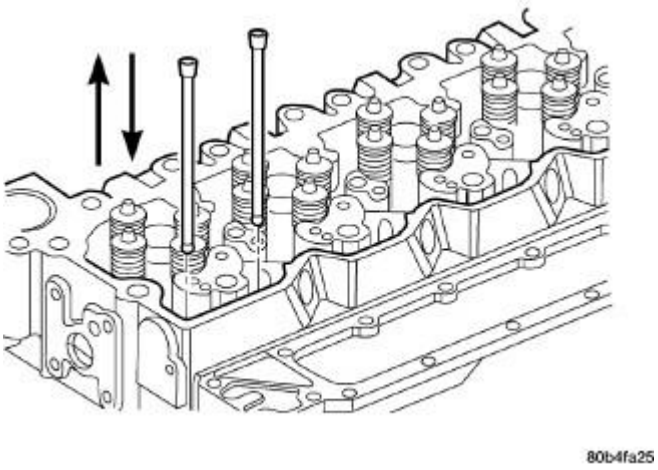


Fig. 124: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

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.

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

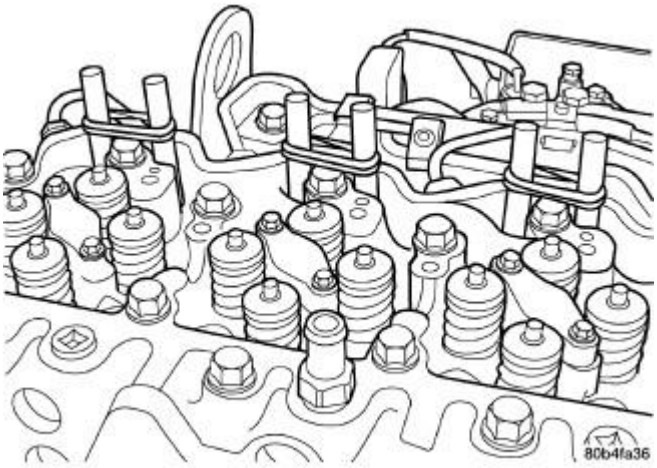


Fig. 125: Tappets Secured In Place Using Wooden Dowel Rods
Courtesy of CHRYSLER GROUP, LLC

25. Raise the tappets as follows, using the wooden dowel rods provided with the Tool Kit (special tool #8502, Remover/Installer).
    1. 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.
    2. 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.

3. Repeat this procedure for the remaining cylinders.

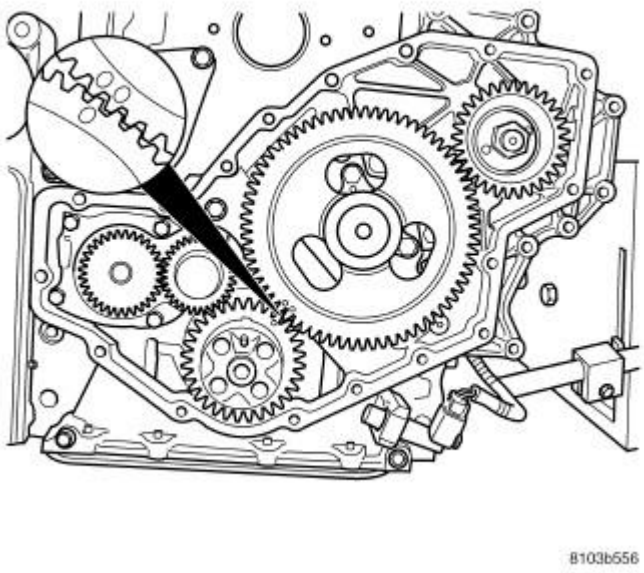


Fig. 126: Camshaft Gear & Crankshaft Gear Timing Mark Alignment
Courtesy of CHRYSLER GROUP, LLC

26. Verify that the camshaft timing marks are aligned with the crankshaft mark.
27. Remove the bolts from the thrust plate.
28. Remove engine mount through bolts.
29. Install Engine Support Fixture (special tool #8534B, Fixture, Driveline Support).

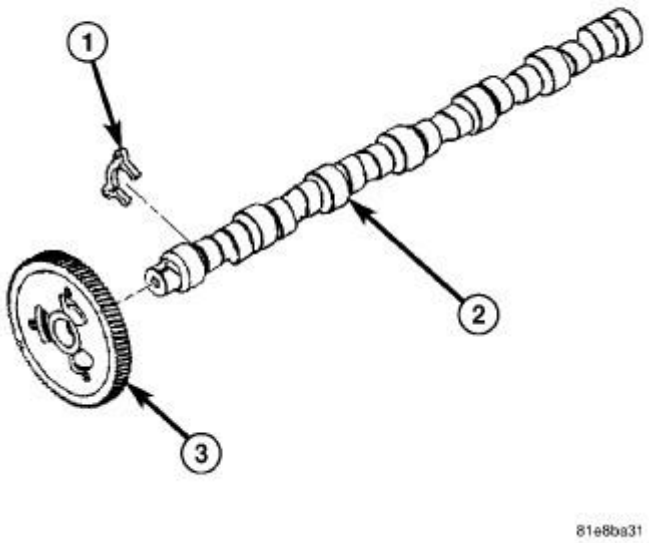


Fig. 127: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

30. Raise engine enough to allow camshaft removal.
31. Remove 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. Refer to TAPPET(S), VALVE, REMOVAL, 6.7L.

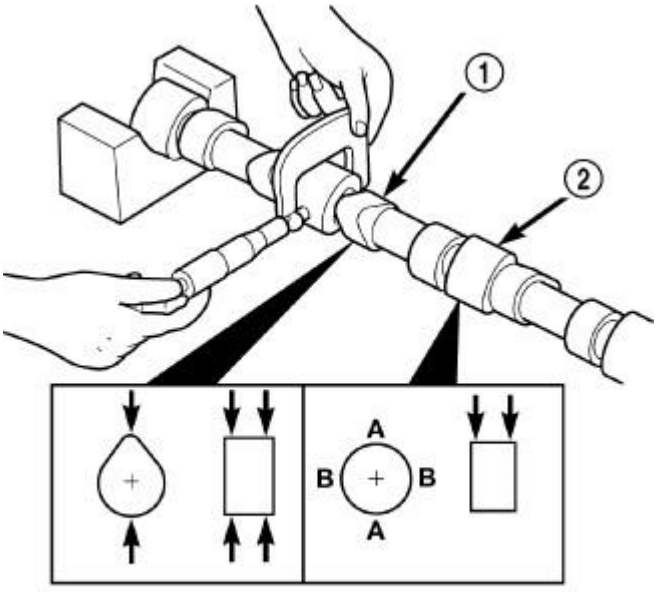


Fig. 128: Measuring Camshaft Lobes & Bearing Journals
Courtesy of CHRYSLER GROUP, LLC

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.
Exhaust	
Min.	45.632 mm. (1.797 in.)
Max.	46.312 mm. (1.823 in.)

CAMSHAFT BUSHING/BORES

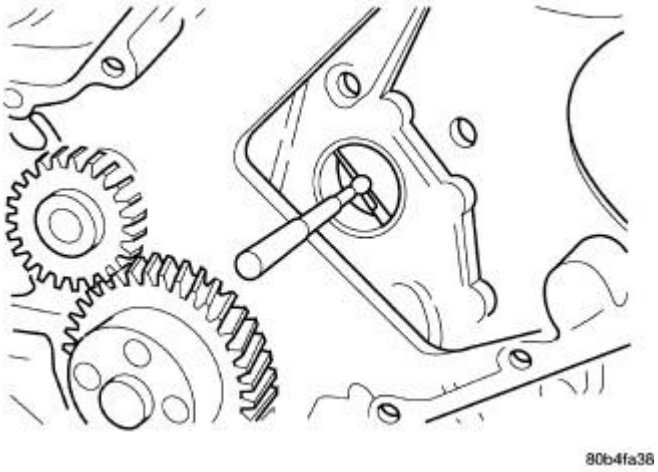


Fig. 129: Measuring Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

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

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

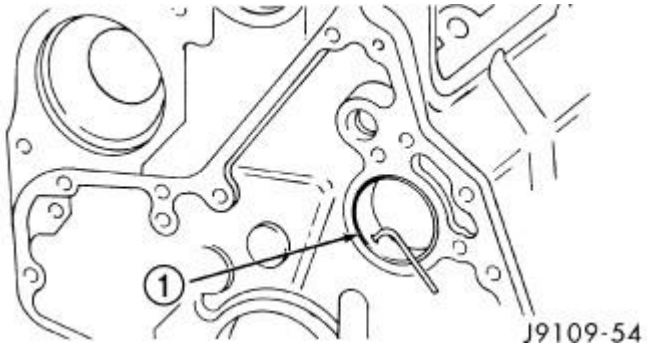


Fig. 130: Camshaft Bushing
Courtesy of CHRYSLER GROUP, LLC

3. Inspect the camshaft bushing (1) 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

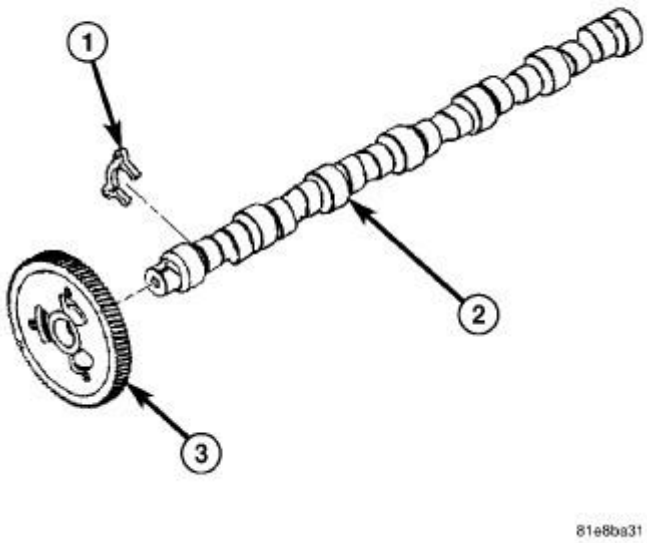


Fig. 131: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

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 BEARINGS

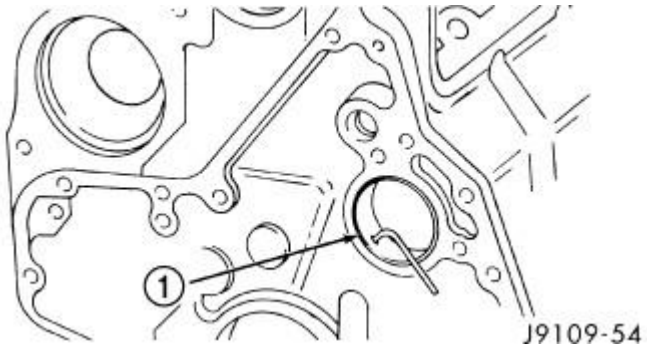


Fig. 132: Camshaft Bushing
Courtesy of CHRYSLER GROUP, LLC

1 - CAMSHAFT BUSHING

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 front bushing (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.
3. Measure the installed bushings at the front bore. The minimum inside diameter is 54.083 mm (2.1293 inch), and the maximum inside diameter is 54.147 mm. (2.1318 in.).

CAMSHAFT INSTALLATION

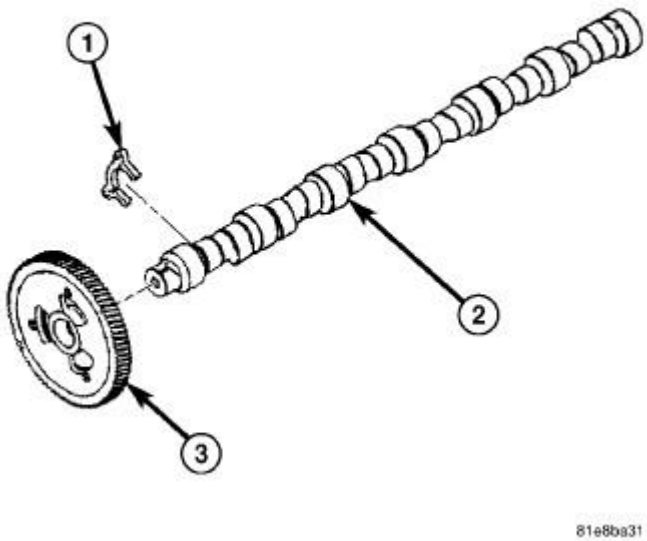


Fig. 133: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

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.

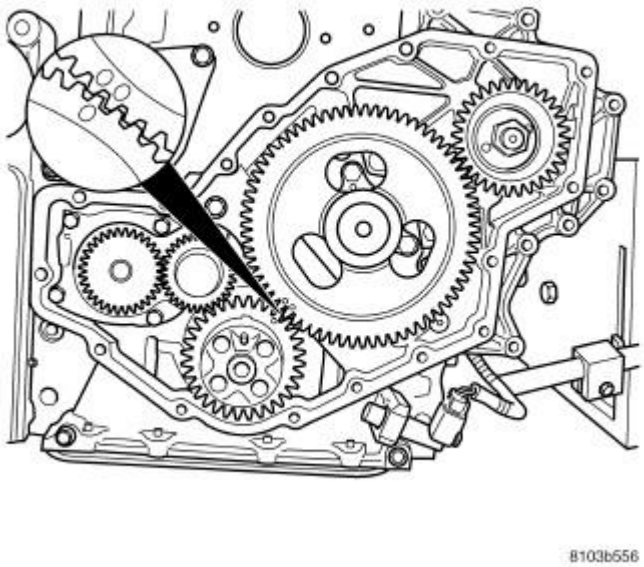


Fig. 134: Camshaft Gear & Crankshaft Gear Timing Mark Alignment
Courtesy of CHRYSLER GROUP, LLC

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 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).

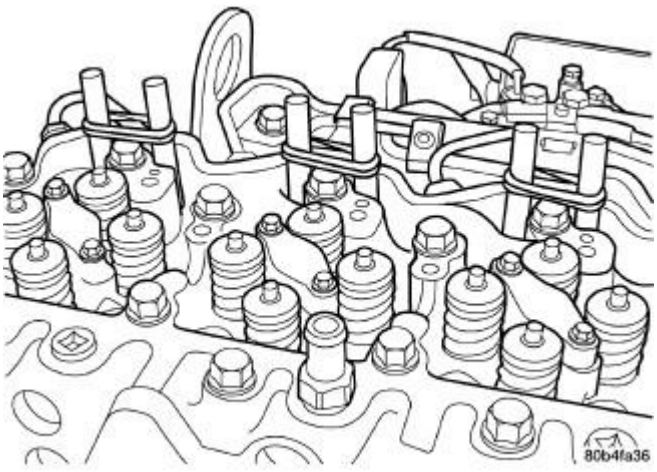


Fig. 135: Tappets Secured In Place Using Wooden Dowel Rods

Courtesy of CHRYSLER GROUP, LLC

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

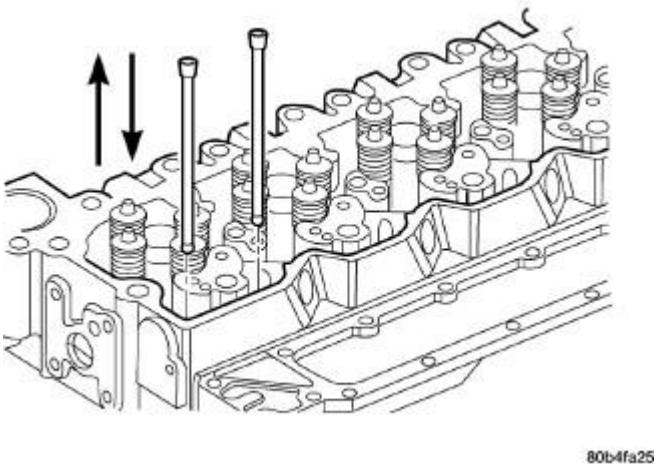


Fig. 136: Push Rod Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

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**.

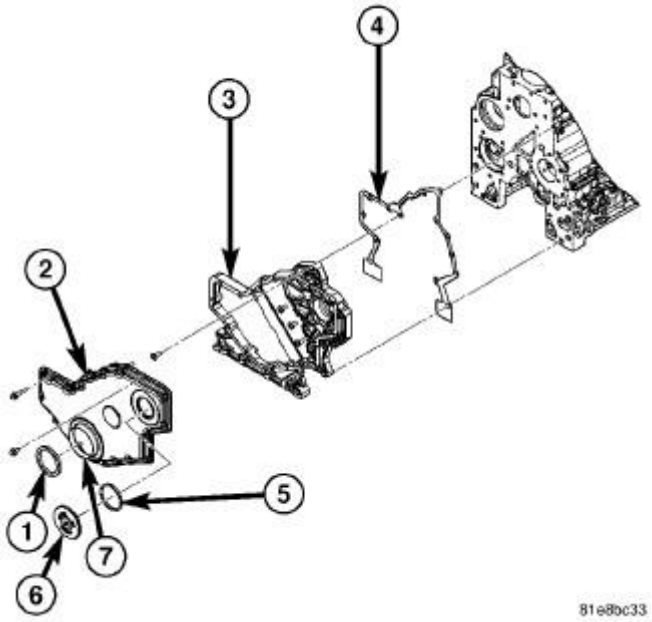


Fig. 137: Front Cover Assembly Components
Courtesy of CHRYSLER GROUP, LLC

13. Install gear housing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 6.7L**.
14. Install front crankshaft dust seal.

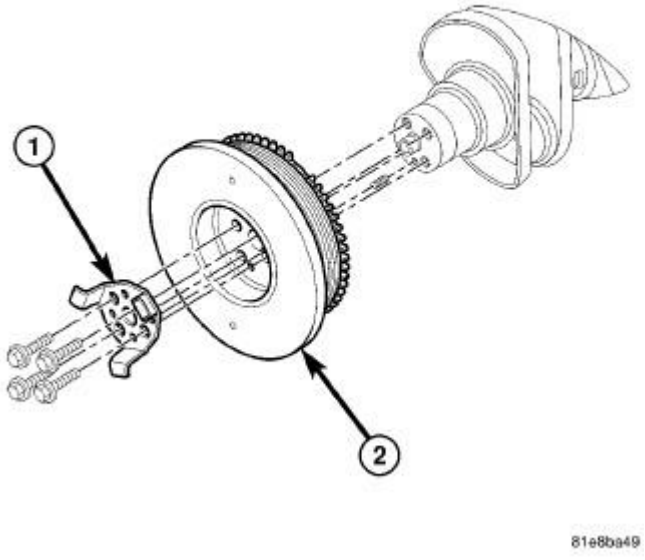


Fig. 138: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

15. Install the crankshaft damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 6.7L**.
16. Install the fan support/hub assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .

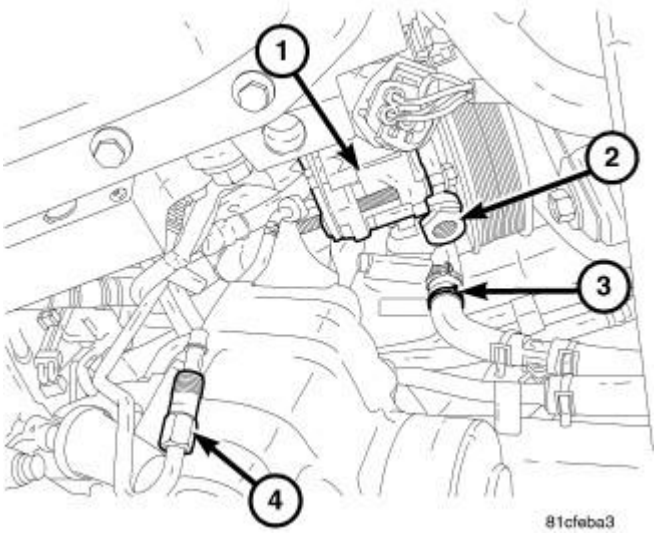


Fig. 139: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

17. Install the power steering pump. Refer to **PUMP, INSTALLATION** .
18. Install the accessory drive belt tensioner. Tighten bolt to 43 N.m (32 ft. lbs.).
19. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

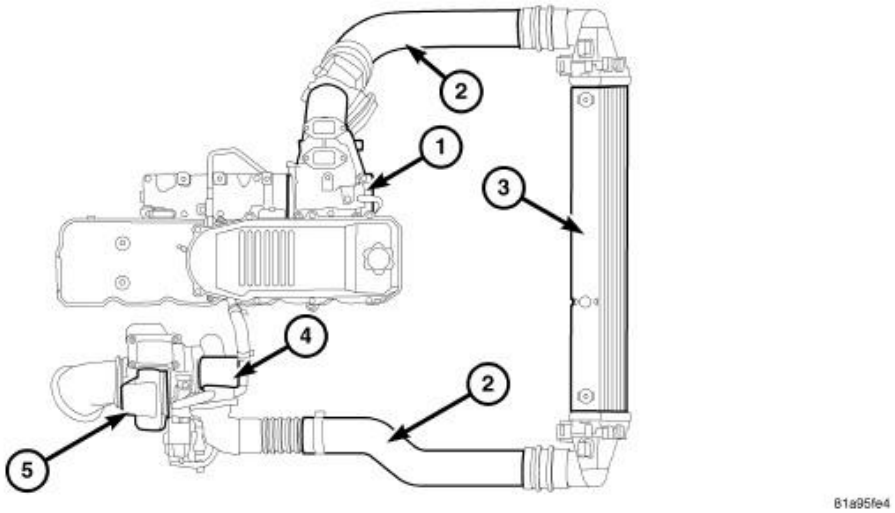


Fig. 140: Charge Air Cooler Assembly Components
Courtesy of CHRYSLER GROUP, LLC

1 - INTAKE MANIFOLD
2 - CHARGE AIR COOLER TUBE

3 - CHARGE AIR COOLER 4 - TURBOCHARGER FRESH AIR INTAKE 5 - TURBOCHARGER

20. Install the charge air cooler (with a/c condenser and auxiliary transmission oil cooler, if equipped) and tighten the mounting bolts to 2 N.m (18 in. lbs.).
21. Connect charge air cooler inlet and outlet pipes (2). Tighten clamps to 11 N.m (97 in. lbs.).
22. Install the radiator upper support panel.
23. Close radiator petcock and lower the radiator into the engine compartment. Tighten the mounting bolts to 11 N.m (97 in. lbs.).
24. Raise vehicle on hoist.
25. Connect radiator lower hose and install clamp.
26. Connect transmission auxiliary oil cooler lines (if equipped).
27. Lower vehicle.
28. Install the fan drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
29. Install the coolant recovery and windshield washer fluid reservoirs to the fan shroud.
30. Connect the coolant recovery hose to the radiator filler neck.
31. Add engine coolant. Refer to **STANDARD PROCEDURE** .
32. Charge A/C system (if A/C equipped). Refer to **PLUMBING, STANDARD PROCEDURE** .
33. Connect the negative battery cables.

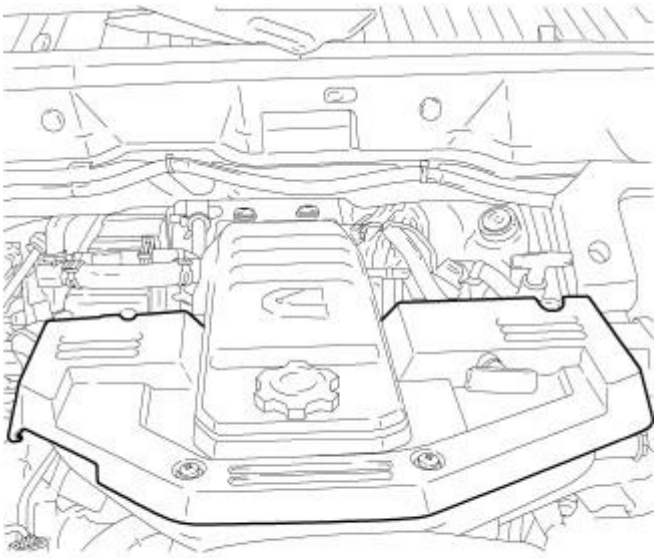


Fig. 141: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

34. Start engine and check for engine oil and coolant leaks.
35. Install the engine cover.

CRANKSHAFT

DESCRIPTION

DESCRIPTION

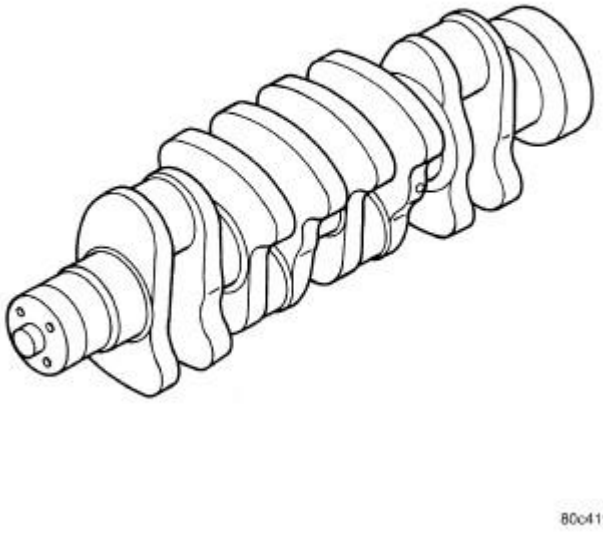


Fig. 142: Crankshaft
Courtesy of CHRYSLER GROUP, LLC

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 capscrews. The crankshaft also has internal cross drillings to supply the connecting rods with engine oil.

REMOVAL

REMOVAL

1. Remove the gear housing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 6.7L**.
2. Split the gear and remove it from the crankshaft.

INSTALLATION

INSTALLATION

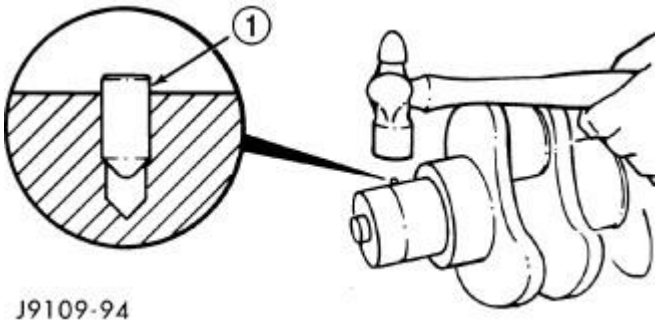


Fig. 143: Installing Alignment Pin
Courtesy of CHRYSLER GROUP, LLC

1 - ALIGNMENT PIN

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. 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.

DAMPER, VIBRATION

REMOVAL

REMOVAL

NON-HIGH OUTPUT ENGINE

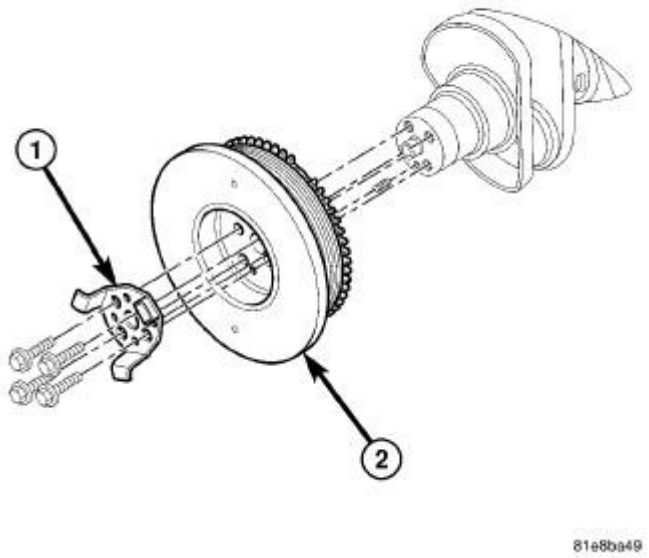


Fig. 144: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

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

HIGH OUTPUT ENGINE

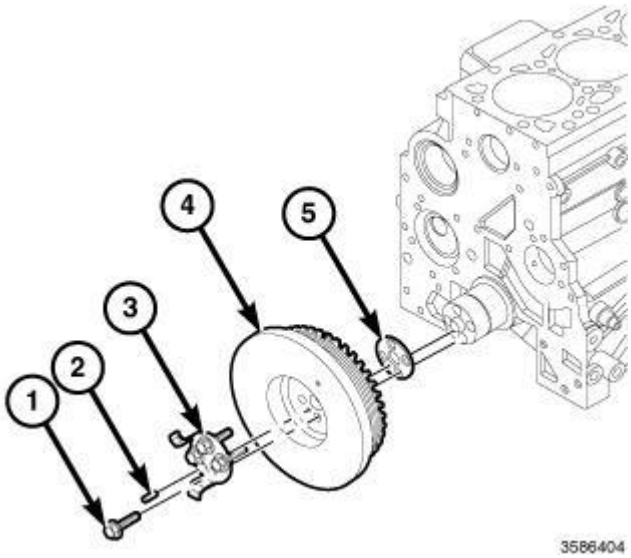


Fig. 145: Crankshaft Damper (High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

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

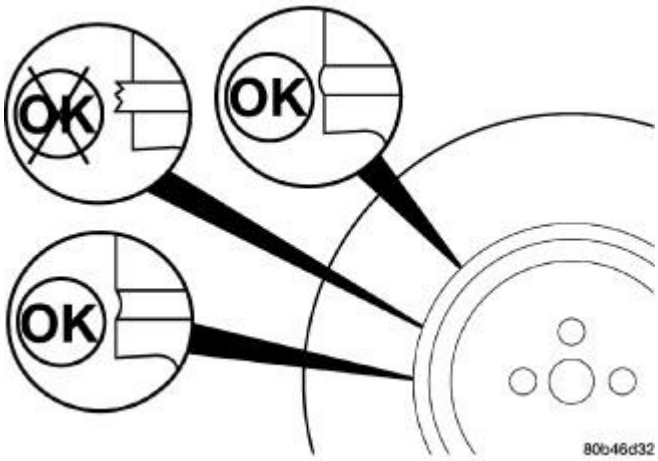


Fig. 146: Inspect Damper Rubber Member
Courtesy of CHRYSLER GROUP, LLC

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

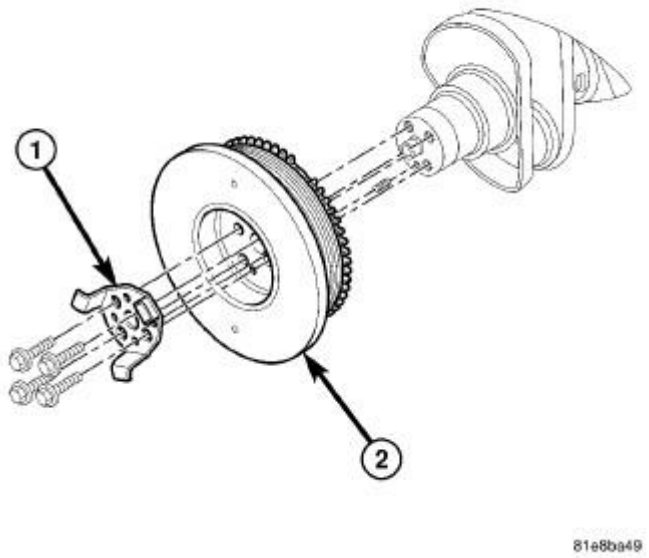


Fig. 147: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

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

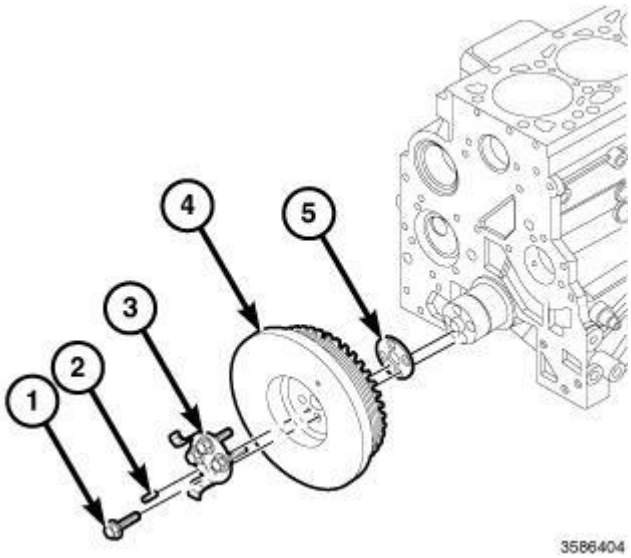


Fig. 148: Crankshaft Damper (High Output Engine)

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** .

RETAINER, CRANKSHAFT REAR OIL SEAL

REMOVAL

REMOVAL

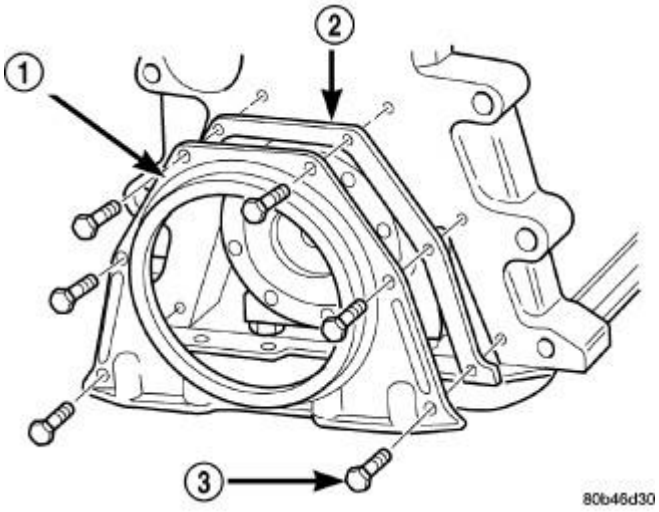


Fig. 149: Crankshaft Rear Seal Retainer, Gasket & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - RETAINER
2 - GASKET
3 - BOLT

1. Disconnect the battery negative cables.
2. Remove the oil pan drain plug and drain the engine oil. Re-install plug and tighten to 50 N.m (37 ft. lbs.).
3. Remove transmission and transfer case (if equipped) from vehicle.
4. Remove flywheel or torque converter drive plate.
5. Remove flywheel adapter plate.
6. Disconnect starter cables from starter motor.
7. Remove starter motor and transmission adapter plate assembly. Refer to **STARTER, REMOVAL** .
8. Remove four oil pan rear bolts. Slide a feeler gauge between the seal retainer and oil pan gasket to break

the seal.

9. Remove the six retainer-to-block bolts (3).
10. Remove the rear seal retainer, and gasket (2).
11. 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 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.

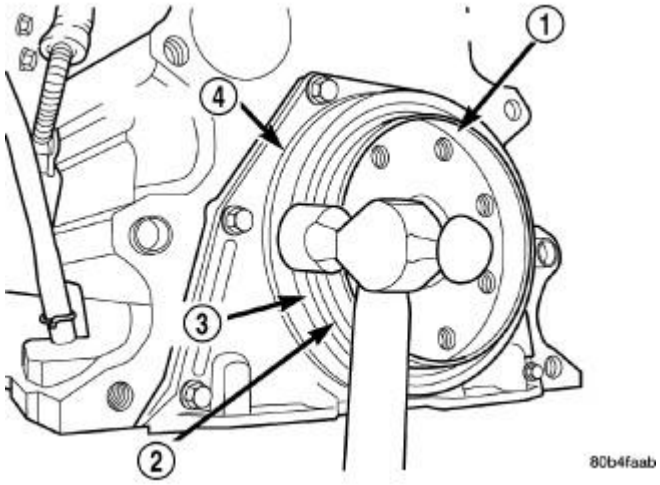


Fig. 150: Installing Seal Using Alignment Tool & Hammer
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL PILOT TOOL
2 - INSTALLATION TOOL
3 - SEAL
4 - RETAINER

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

7. Install the flywheel or converter drive plate, and clamping ring. Tighten the bolts to 137 N.m (101 ft. lbs.).
8. Install the clutch cover and disc (if equipped). Refer to **DISC, CLUTCH, INSTALLATION** .
9. Install the transmission and transfer case (if equipped).
10. Connect the negative battery cables.
11. Check engine oil level and adjust, if necessary.
12. Start engine and check for oil leaks.

RING(S), PISTON

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON RING FITTING

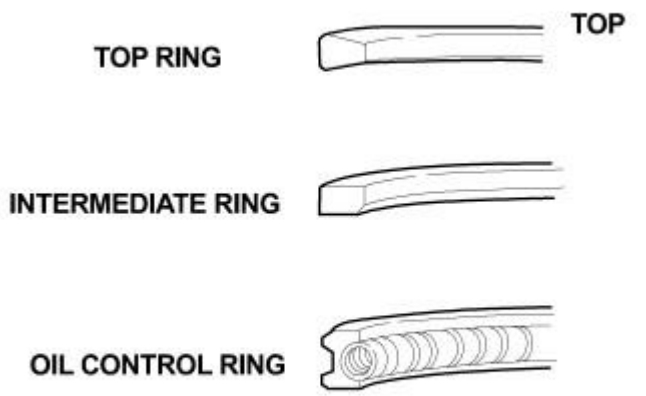


Fig. 151: Piston Ring Identification
Courtesy of CHRYSLER GROUP, LLC

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

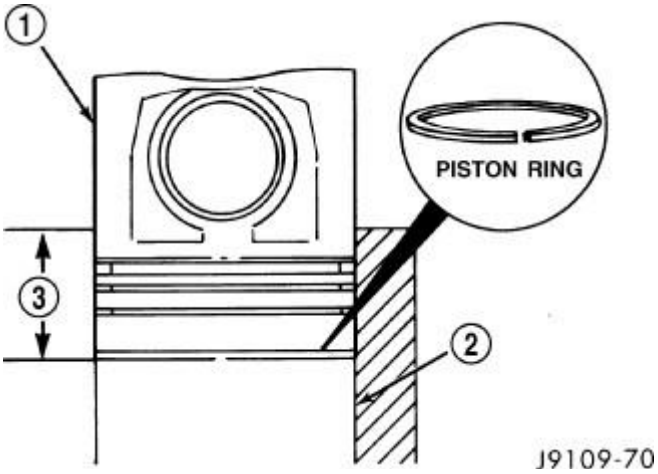


Fig. 152: Position Of Ring In Cylinder Bore
Courtesy of CHRYSLER GROUP, LLC

1 - PISTON
2 - CYLINDER BORE
3 - DEPTH

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.).

ISTON RING GAP SPECIFICATIONS

PISTON RING GAP		
TOP RING	0.30 - 0. 46 mm	(0.012 - 0.018 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.

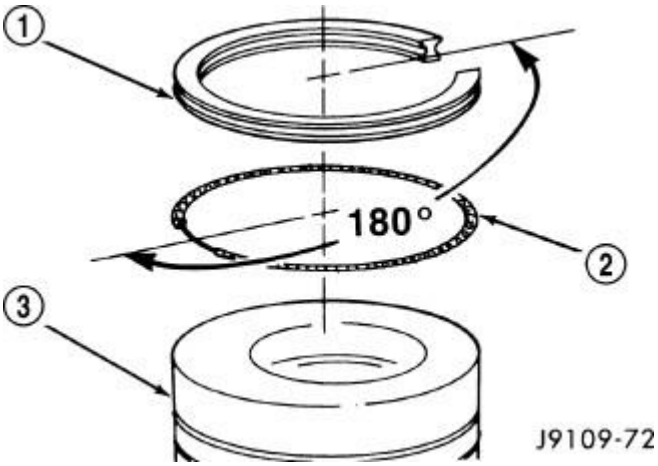


Fig. 153: Oil Control Ring, Expander & Piston
Courtesy of CHRYSLER GROUP, LLC

1 - OIL CONTROL RING
2 - EXPANDER
3 - PISTON

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.

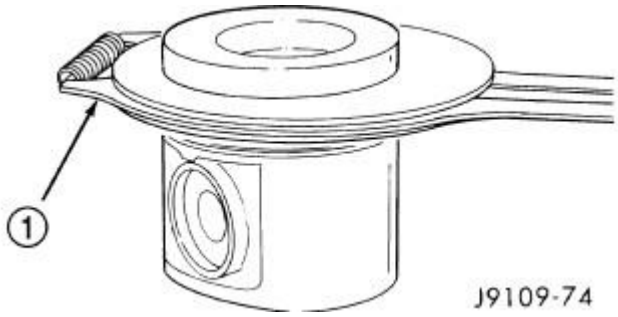


Fig. 154: Piston Ring Installation Tool
Courtesy of CHRYSLER GROUP, LLC

1 - PISTON RING INSTALLATION TOOL

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

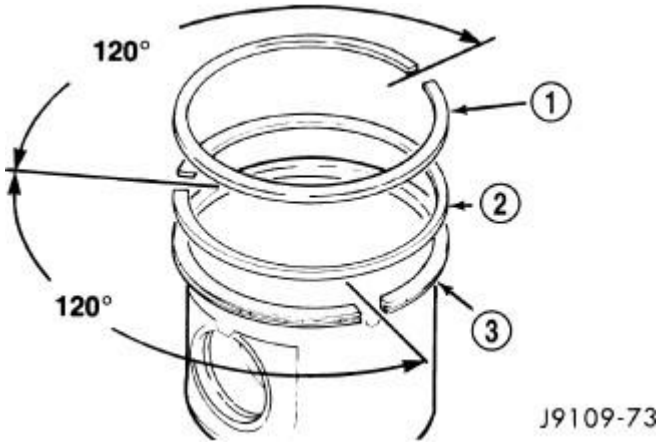


Fig. 155: Piston Ring Orientation
Courtesy of CHRYSLER GROUP, LLC

1 - TOP RING
2 - INTERMEDIATE RING
3 - OIL CONTROL RING

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

ROD, PISTON AND CONNECTING

DESCRIPTION

DESCRIPTION

PISTONS

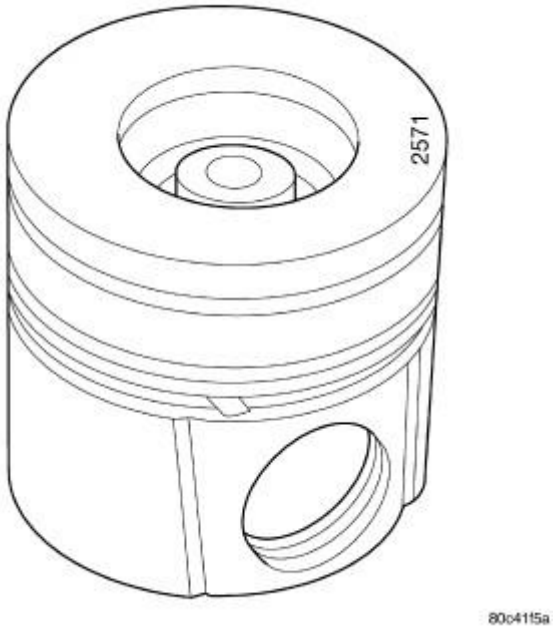


Fig. 156: Piston
Courtesy of CHRYSLER GROUP, LLC

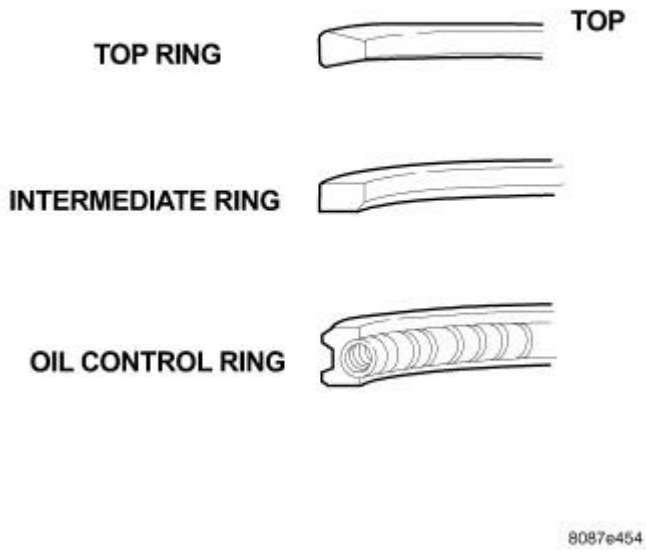


Fig. 157: Piston Ring Identification
Courtesy of CHRYSLER GROUP, LLC

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

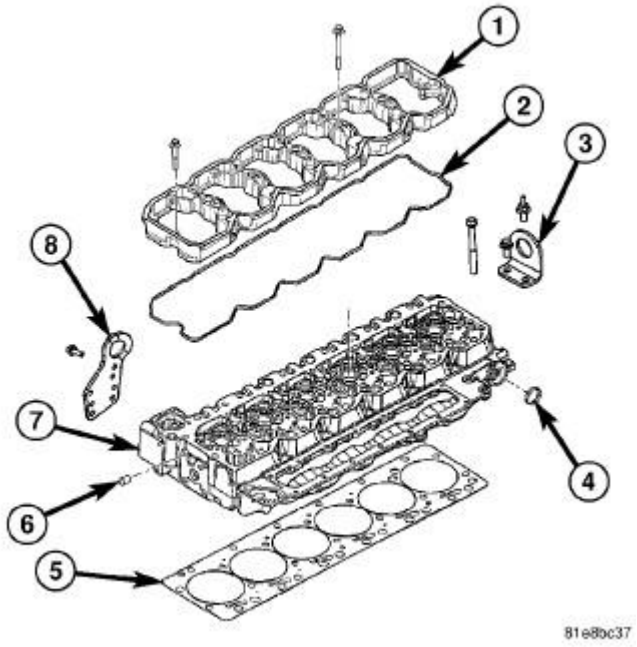


Fig. 158: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL, 6.7L**.

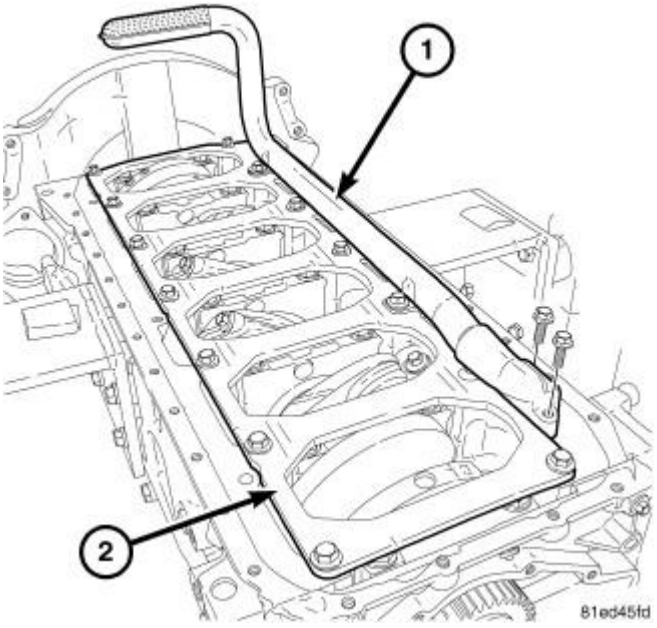


Fig. 159: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

3. Remove the oil pan and suction tube. Refer to **PAN, OIL, REMOVAL, 6.7L**.

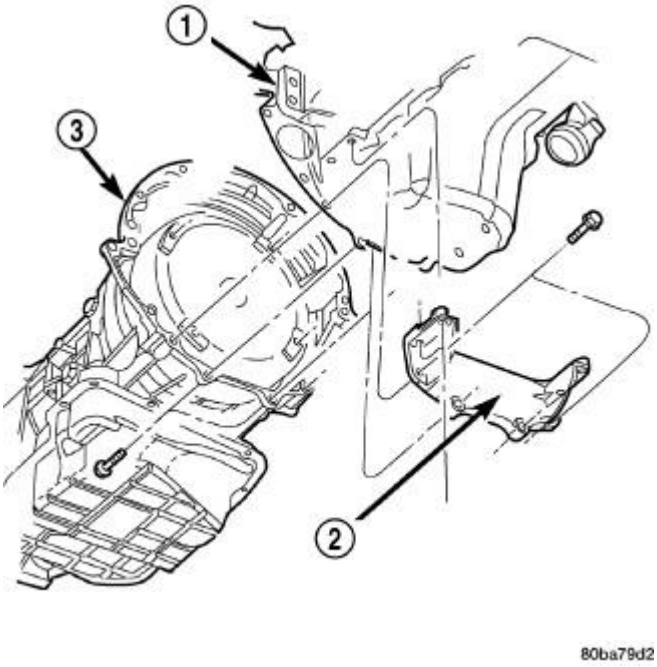


Fig. 160: Structural Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE
2 - STRUCTURAL DUST COVER

3 - TRANSMISSION

4. Remove bolts and the block stiffener.

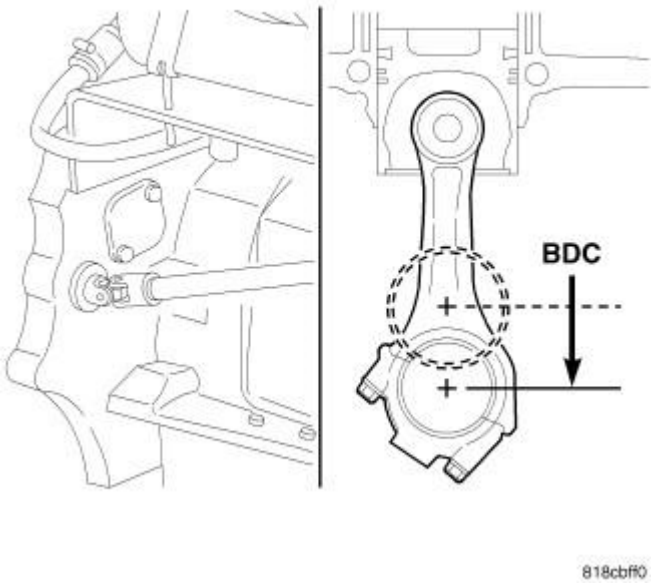


Fig. 161: Piston/Rod Assembly At BDC
Courtesy of CHRYSLER GROUP, LLC

5. Using Miller Tool (special tool #7471B, Barring Tool) crankshaft barring tool, rotate the crankshaft so all of the pistons are below TDC.
6. Before removing the piston(s) from the bore(s):
    1. Remove any carbon ridge formations or deposits at the top of the bore with a dull scraper or soft wire brush.
    2. 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.

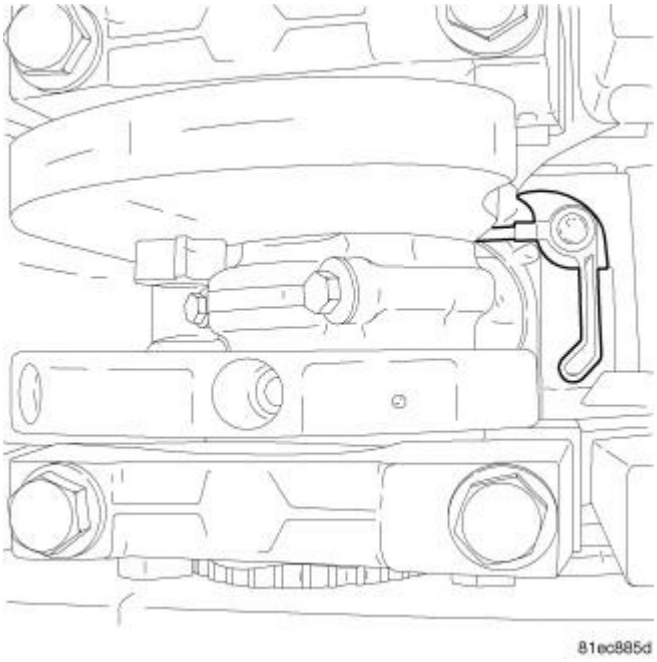


Fig. 162: J-Jet Piston Cooling Nozzle
Courtesy of CHRYSLER GROUP, LLC

7. Remove the J-jet cooling nozzles.

NOTE: If cylinders have ridges, the cylinders are oversize and will more than likely need boring.

8. 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.
9. Mark the connecting rod and cap with the corresponding cylinder numbers.
10. Remove the connecting rod bolts and rod caps. Use care so the cylinder bores and connecting rods are not damaged.
11. Use a hammer handle or similar object to push the piston and connecting rod through the cylinder bore.
12. 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.

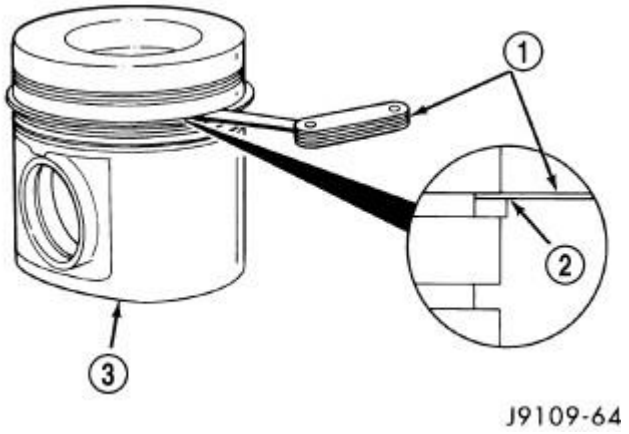


Fig. 163: Intermediate And Oil Ring To Piston Groove Clearances
Courtesy of CHRYSLER GROUP, LLC

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.

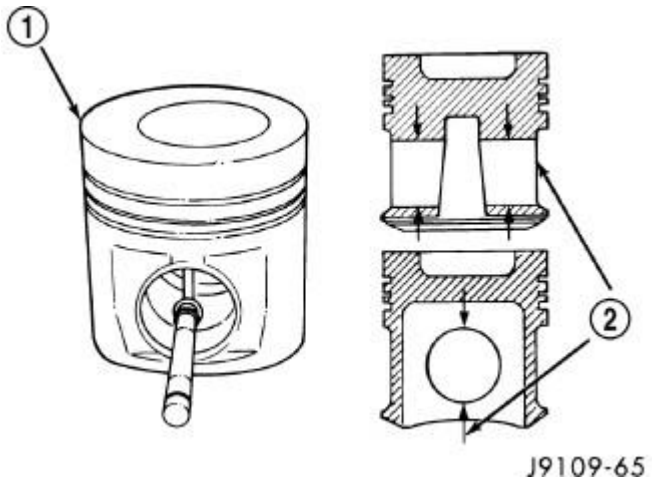


Fig. 164: Piston & Pin Bore
Courtesy of CHRYSLER GROUP, LLC

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).

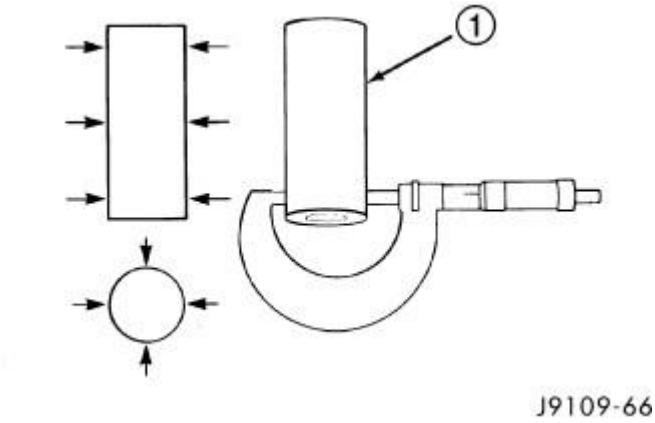


Fig. 165: Measuring Piston Pin Diameter
Courtesy of CHRYSLER GROUP, LLC

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

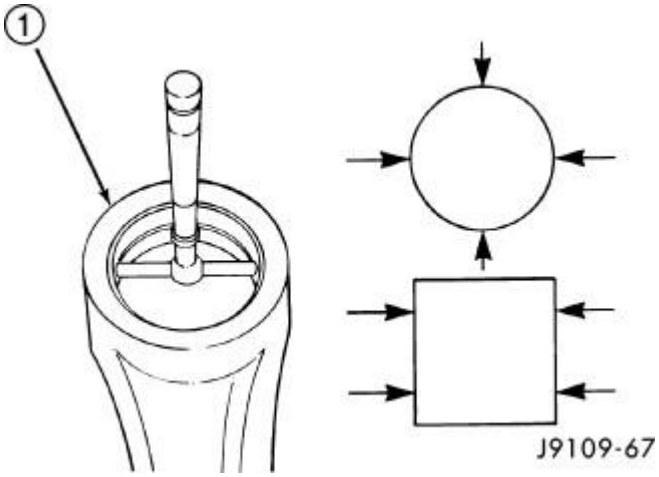


Fig. 166: Measuring Connecting Rod Pin Bore
Courtesy of CHRYSLER GROUP, LLC

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

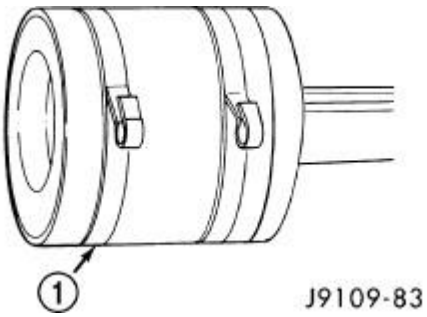


Fig. 167: Piston Ring Compressor Tool
Courtesy of CHRYSLER GROUP, LLC

1 - PISTON RING COMPRESSOR TOOL

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 **Engine/Engine Block/RING(S), Piston - Standard Procedure**.
4. Compress the rings using a piston ring compressor tool (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.

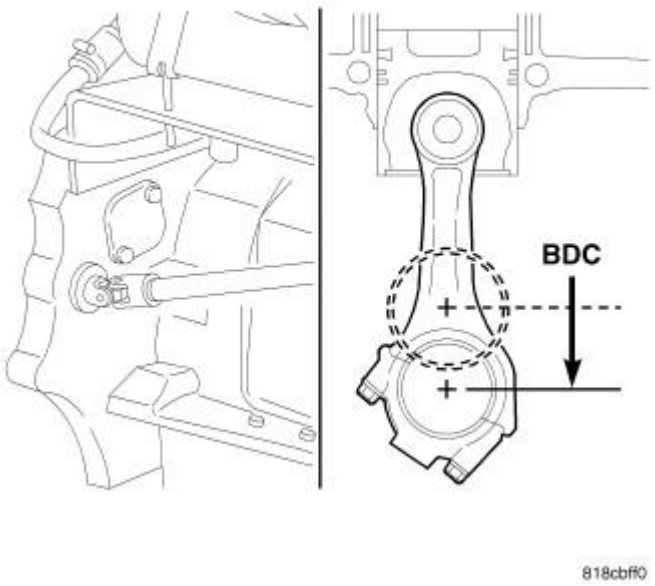


Fig. 168: Piston/Rod Assembly At BDC
Courtesy of CHRYSLER GROUP, LLC

5. Bar 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. Use clean engine oil to lubricate the threads and under the heads of the connecting rod bolts.
10. **For fractured/split type connecting rods,** the long end of the rod must be installed away from the intake side of the engine.
    1. 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.
11. Install the rod cap and bolts to the connecting rod. Tighten the connecting rod bolts evenly in 3 steps.
    - Tighten the bolts to 30 Nm (22 ft. lbs.).

- Tighten the bolts to 60 Nm (44 ft. lbs.).
- Rotate 60° clockwise.

12. 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.
13. Measure the side clearance between the connecting rod and the crankshaft. DO NOT measure the clearance between the cap and crankshaft.

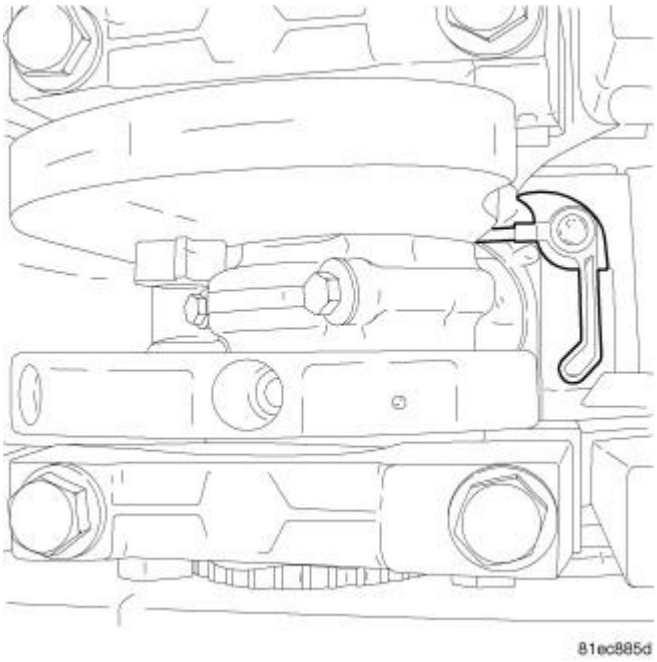


Fig. 169: J-Jet Piston Cooling Nozzle
Courtesy of CHRYSLER GROUP, LLC

14. Install J-jet piston cooling nozzles.

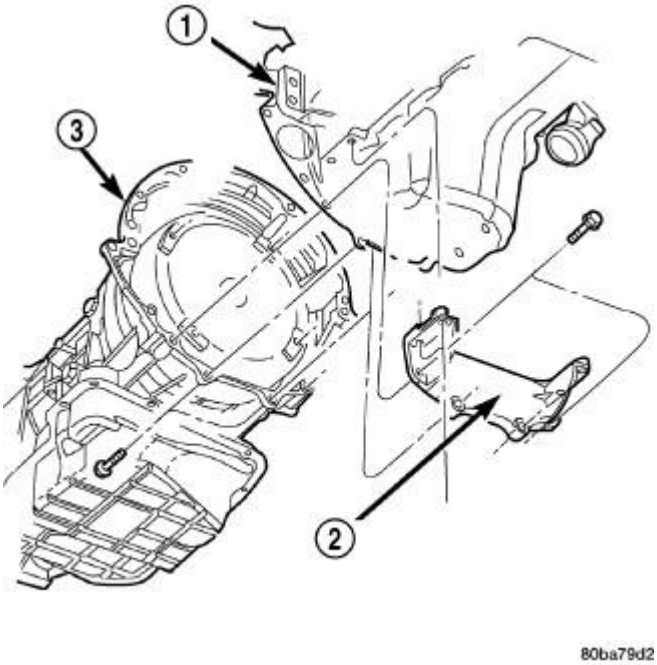


Fig. 170: Structural Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE
2 - STRUCTURAL DUST COVER
3 - TRANSMISSION

15. Install block stiffener. Tighten to 43 Nm (32 ft. lbs.).

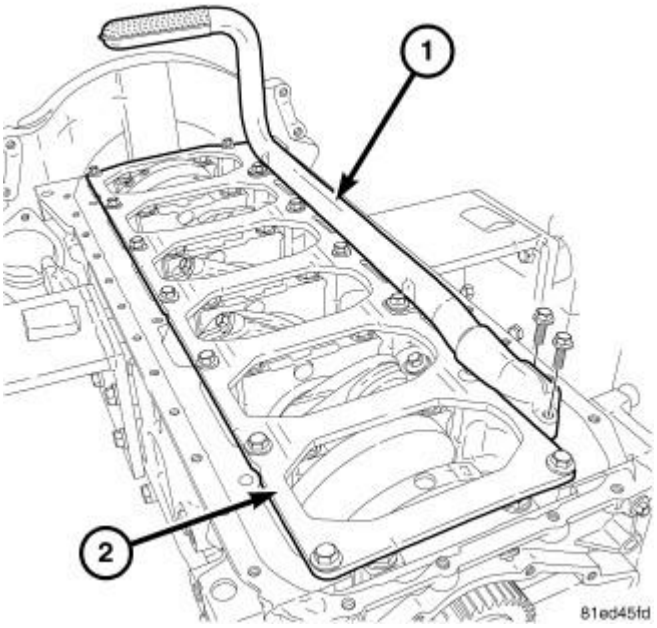


Fig. 171: Oil Pickup Tube

Courtesy of CHRYSLER GROUP, LLC

16. Install the suction tube and oil pan. Refer to **PAN, OIL, INSTALLATION, 6.7L**.

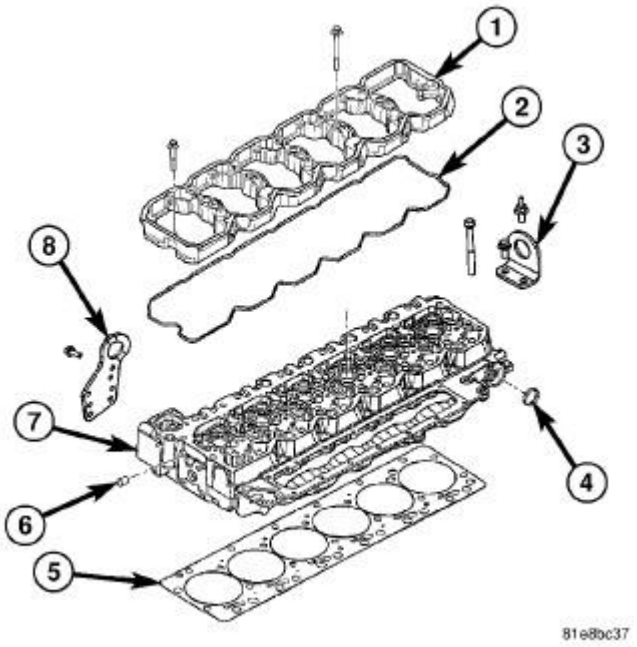


Fig. 172: Cylinder Head Assembly & Gasket
Courtesy of CHRYSLER GROUP, LLC

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

SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

REMOVAL

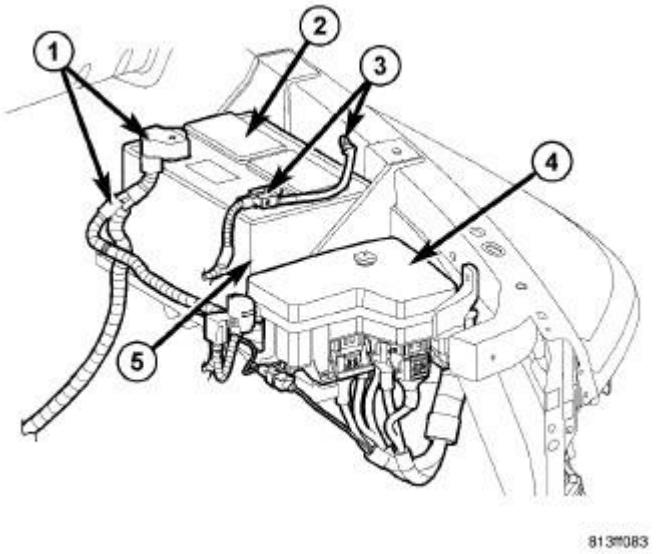


Fig. 173: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery cables (1, 3).
2. Raise vehicle on hoist.
3. Partially drain engine coolant into container suitable for re-use. Refer to **STANDARD PROCEDURE** .
4. Lower vehicle.
5. Remove radiator upper hose.
6. Disconnect coolant recovery bottle hose from radiator filler neck.
7. Disconnect windshield washer pump supply hose and electrical connections and lift washer bottle off of fan shroud.
8. Remove viscous fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
9. Remove cooling fan shroud and fan assembly from the vehicle.
10. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
11. Remove the cooling fan support/hub from the front of the engine.
12. Raise the vehicle on hoist.

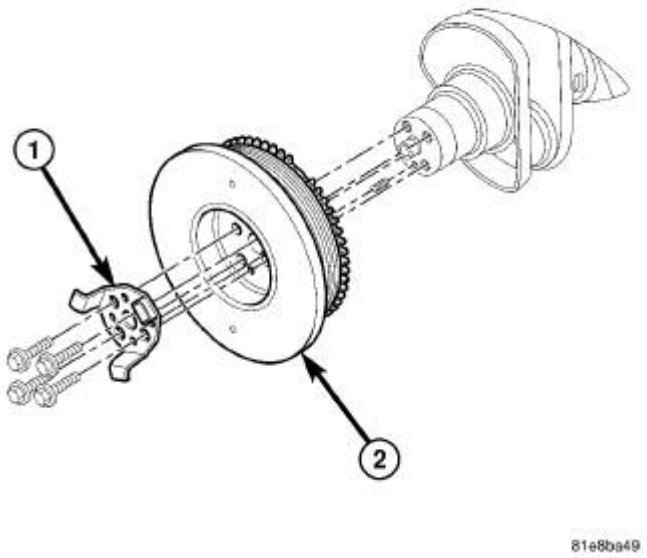


Fig. 174: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

13. Remove the crankshaft damper.

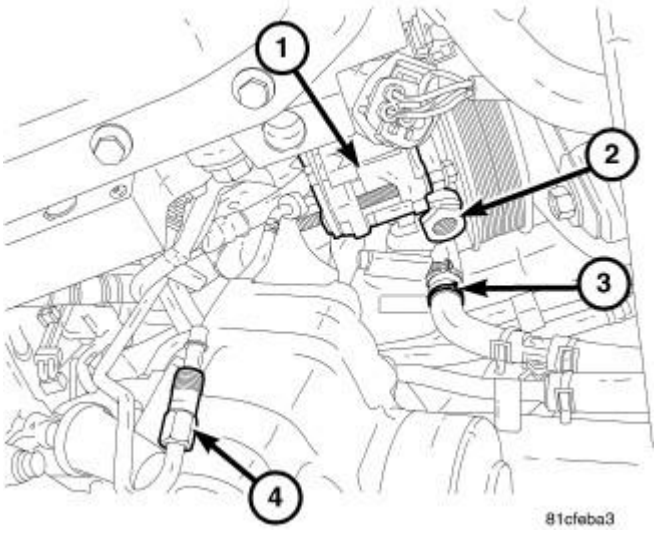


Fig. 175: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

14. Remove power steering pump.
15. Remove accessory drive belt tensioner.

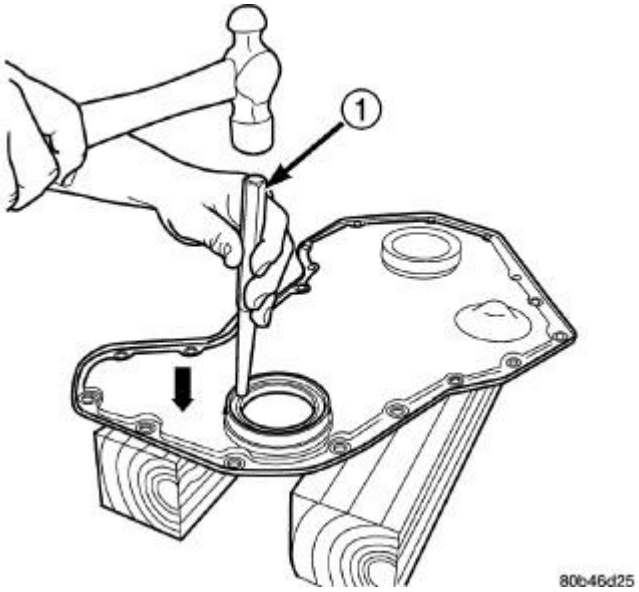


Fig. 176: Removing Seal From Cover
Courtesy of CHRYSLER GROUP, LLC

1 - PUNCH

16. Remove the gear cover-to-housing bolts and gently pry the cover away from the housing, taking care not to mar the gasket surfaces. Remove crank seal dust shield with cover.
17. Support the cover on a flat work surface with wooden blocks, and using a suitable punch (1) and hammer, drive the old seal out of the cover from the back side of the cover to the front side.

INSTALLATION

INSTALLATION

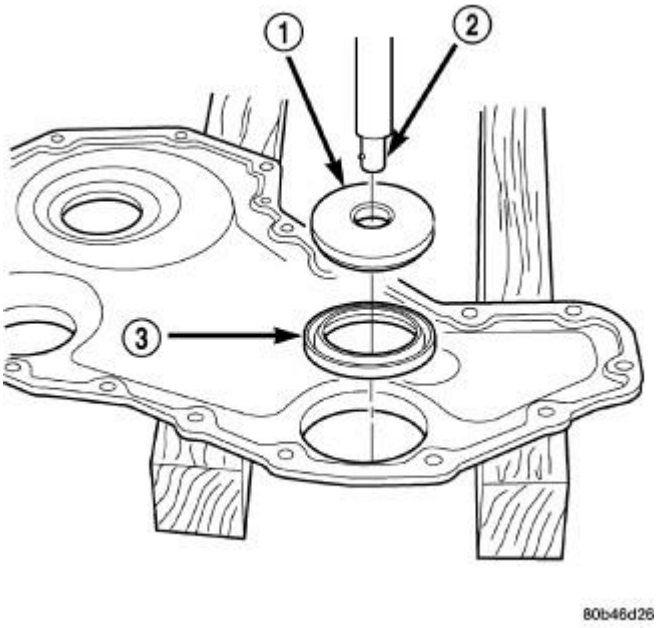


Fig. 177: Installing Seal Into Cover With Tool 8281
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL INSTALLER 8281
2 - DRIVER HANDLE C4171
3 - SEAL

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 crankshaft seal installer Special Tool (special tool #8281, Installer, Seal) used up to 2006. New Special Tool (special tool #10136, Installer, Crankshaft Front Oil Seal) used 2007 to present 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.

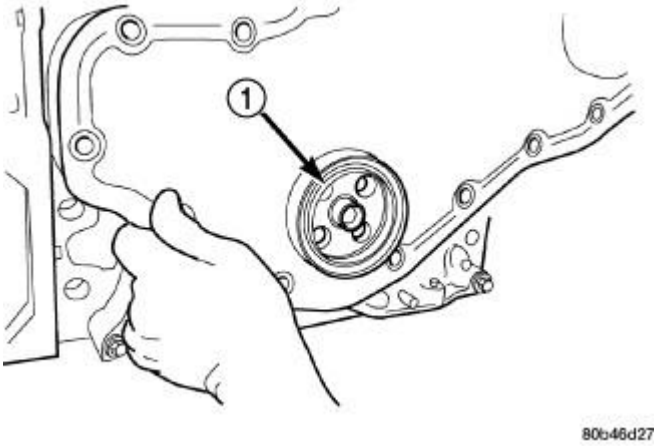


Fig. 178: Installing Front Cover With Seal Pilot
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL PILOT

5. Install the plastic seal pilot (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.
7. Install the cover to the gear housing, aligning the seal pilot with the nose of the crankshaft.

NOTE: Failure to follow the cover installation procedure can result in misalignment of the crankshaft seal to the crankshaft, causing an oil leak.

8. Install the cover bolts and hand snug 2 capscrews at the 3 o'clock and 9 o'clock position, to keep the cover from moving when the first capscrew is torqued. Tighten to 24 Nm (18 ft. lbs.). Remove pilot tool.
9. Install accessory drive belt tensioner. Tighten bolt to 43 Nm (32 ft. lbs.).

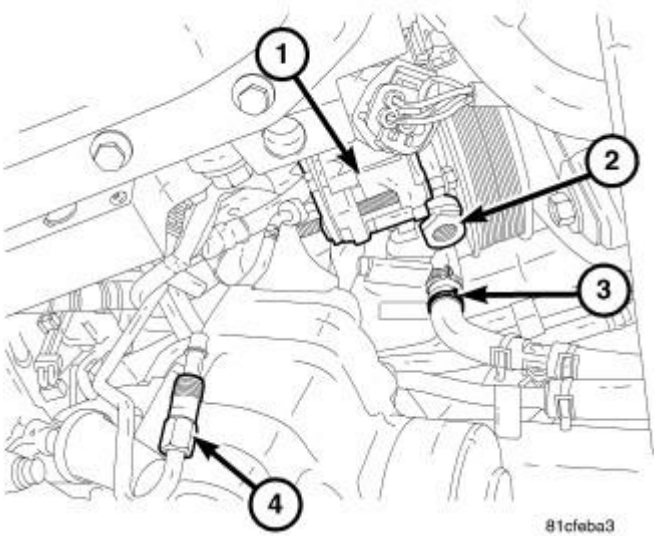


Fig. 179: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

10. Install power steering pump.

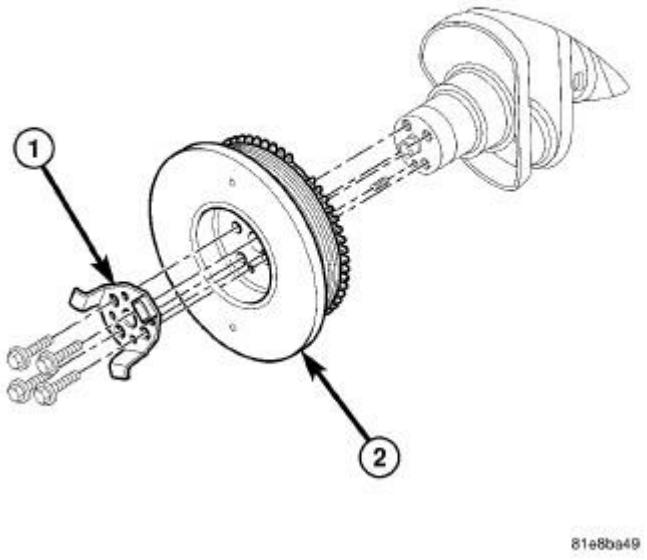


Fig. 180: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

11. Install the crankshaft damper. Tighten the bolts to 40 Nm (30 ft. lbs.). Then rotate an additional 60°. Use the engine barring tool to keep the engine from rotating during tightening operation.
12. Install the fan support/hub assembly and tighten bolts to 32 Nm (24 ft. lbs.).
13. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

14. Install cooling fan. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
15. Install the viscous fan/drive assemble. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
16. Connect the windshield washer pump supply hose and electrical connections and attach the washer bottle to the fan shroud.
17. Connect the coolant recovery bottle hose to the radiator fill neck.
18. Install the radiator upper hose.
19. Refill cooling system. Refer to **STANDARD PROCEDURE** .

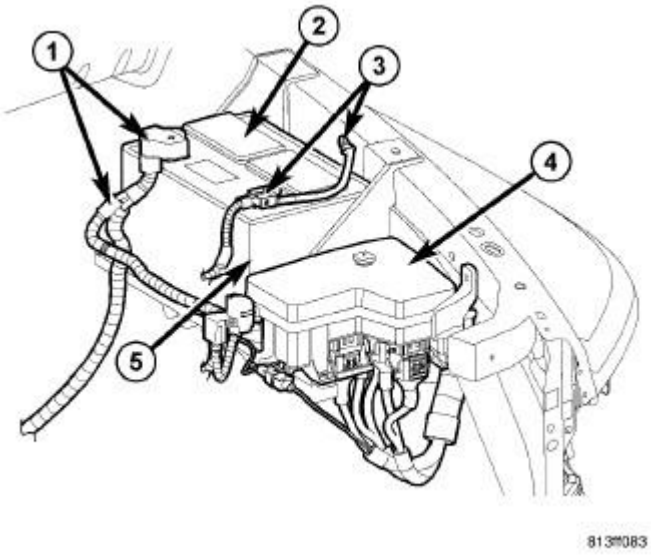


Fig. 181: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

20. Connect the battery cables (1, 3).
21. Start the engine and check for oil leaks.

SEAL, CRANKSHAFT OIL, REAR

REMOVAL

REMOVAL

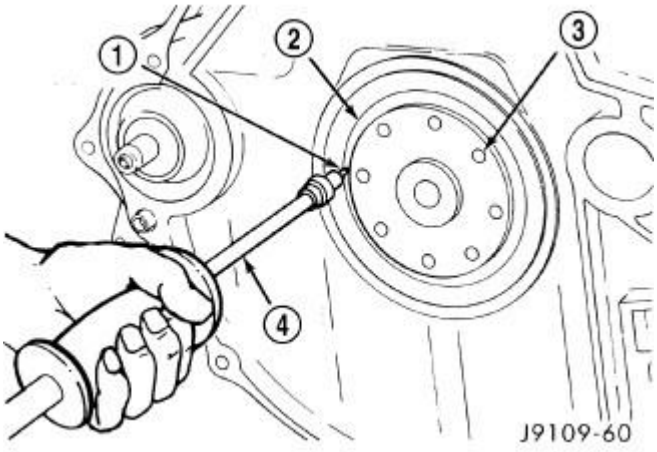


Fig. 182: Crankshaft Rear Seal Removal
Courtesy of CHRYSLER GROUP, LLC

1 - NO. 10 SCREW
2 - REAR SEAL
3 - CRANKSHAFT
4 - SLIDE HAMMER

1. Disconnect the battery negative cables.
2. Remove the transmission and transfer case (if equipped).
3. Remove the clutch cover and disc (if manual transmission equipped). Refer to **DISC, CLUTCH, REMOVAL** .
4. Remove the flywheel or converter drive plate.
5. Remove the flywheel adapter plate.
6. Drill holes 180° apart into the seal. Be careful not to contact the drill against the crankshaft.
7. Install # 10 sheet metal screws (1) in the drilled 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.

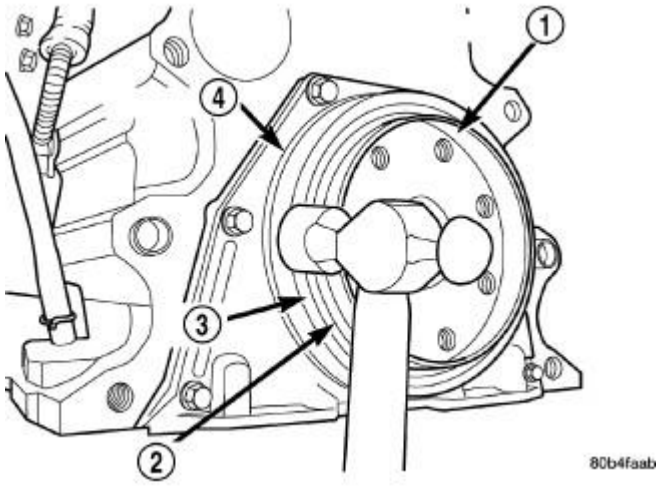


Fig. 183: Seal Installation Using Alignment Tool & Hammer
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL PILOT TOOL
2 - INSTALLATION TOOL
3 - SEAL
4 - RETAINER

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. Install the flywheel or converter drive plate, and clamping ring. Tighten the bolts to 137 N.m (101 ft. lbs.).
8. Install the clutch cover and disc (if equipped). Refer to **DISC, CLUTCH, INSTALLATION** .
9. Install the transmission and transfer case (if equipped).
10. Lower vehicle.
11. Connect battery negative cables.
12. Check engine oil level and adjust, if necessary.
13. Start engine and check for oil leaks.

TAPPET(S), VALVE

REMOVAL

REMOVAL

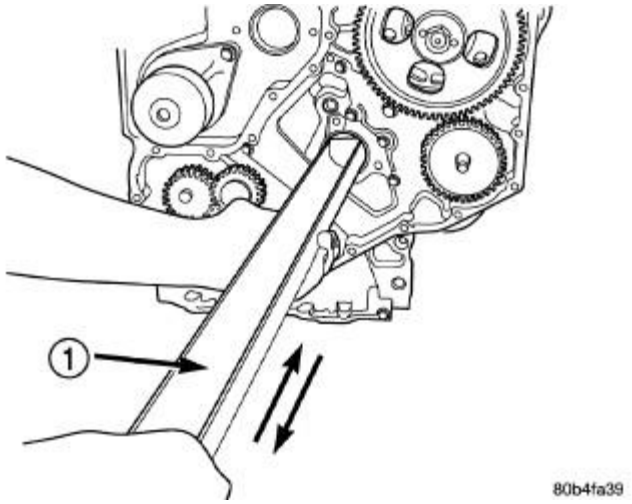


Fig. 184: Inserting The Trough Into Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

1 - TROUGH

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).

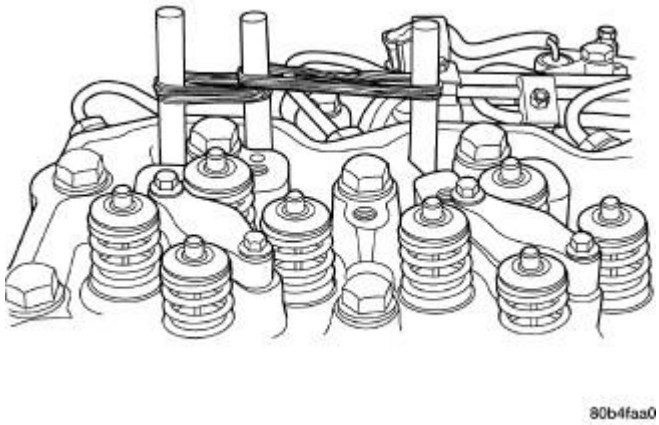


Fig. 185: Tappets Secured In Place Using Wooden Dowel Rods
Courtesy of CHRYSLER GROUP, LLC

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.

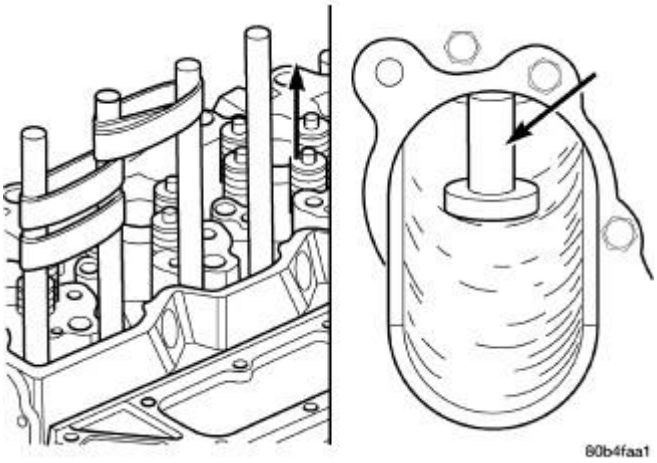


Fig. 186: Lift Dowel Rod To Disengage From Tappet
Courtesy of CHRYSLER GROUP, LLC

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.

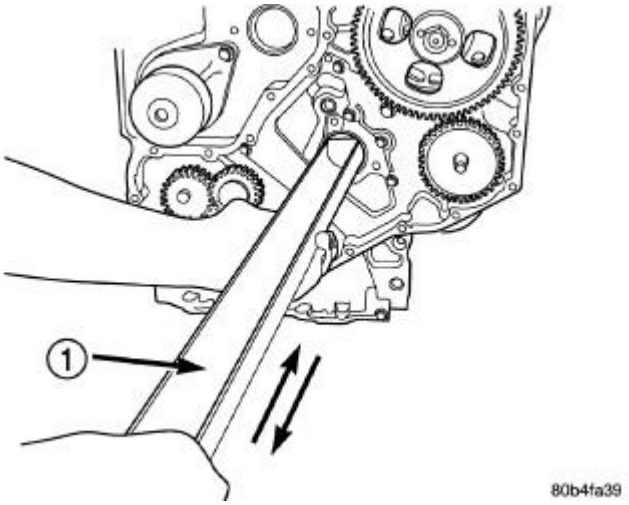


Fig. 187: Inserting The Trough Into Camshaft Bore
Courtesy of CHRYSLER GROUP, LLC

1 - TROUGH

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

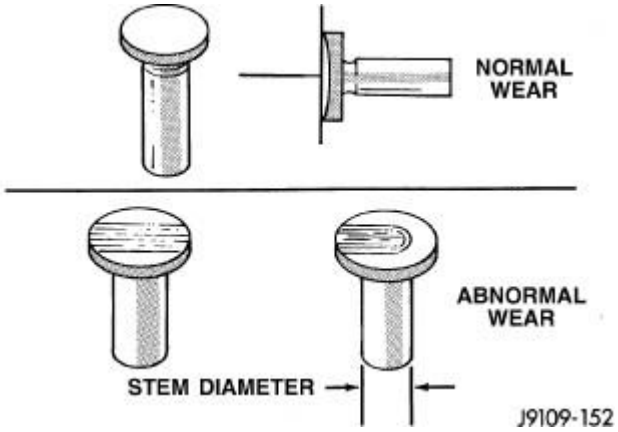


Fig. 188: Tappet Inspection
Courtesy of CHRYSLER GROUP, LLC

TAPPET STEM DIAMETER SPECIFICATIONS

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

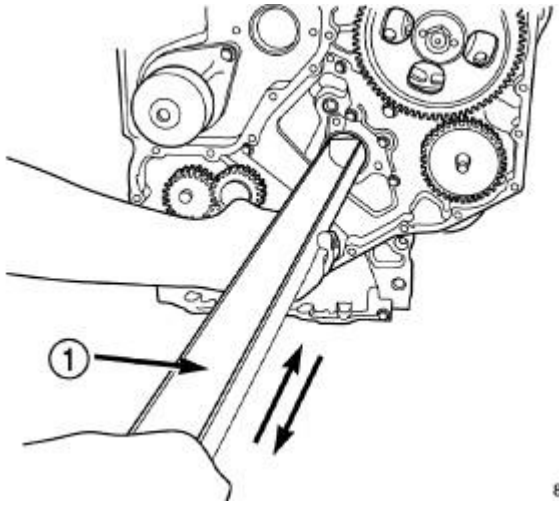


Fig. 189: Inserting The Trough Into Camshaft Bore

Courtesy of CHRYSLER GROUP, LLC

1 - TROUGH

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).

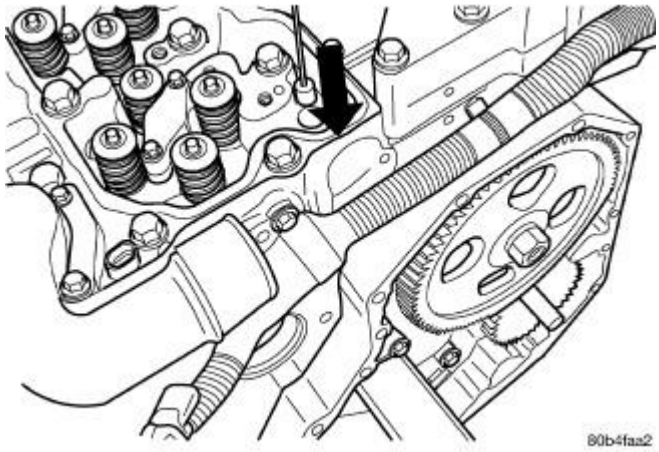


Fig. 190: Insert Installation Tool Through Push Rod Hole
Courtesy of CHRYSLER GROUP, LLC

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

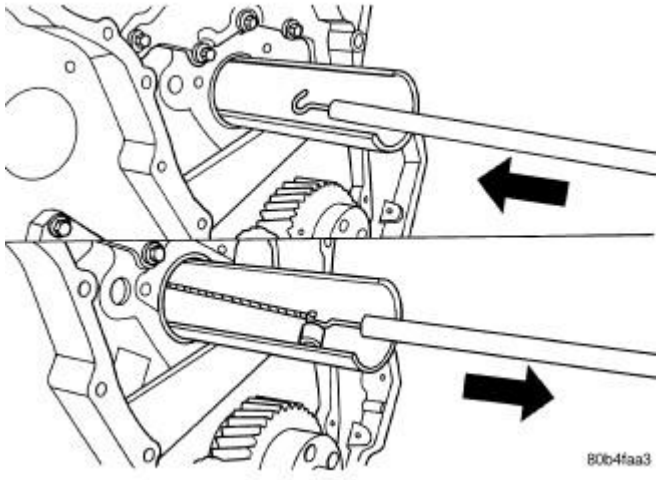


Fig. 191: Retrieve Tappet Installation Tool Through Cam Bore
Courtesy of CHRYSLER GROUP, LLC

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

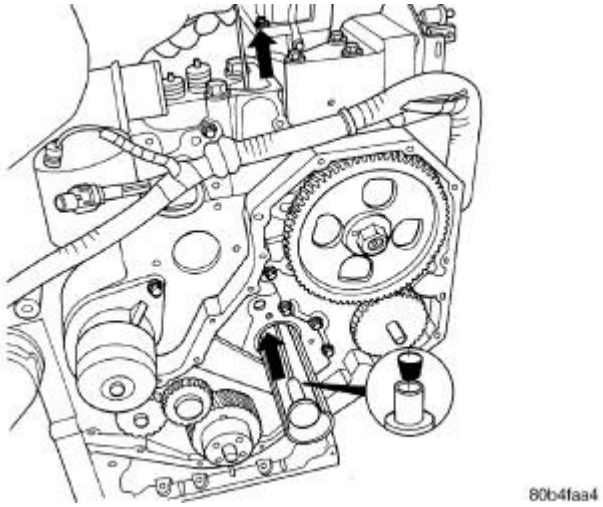


Fig. 192: Inserting Tool & Pulling Tappet Into Place
Courtesy of CHRYSLER GROUP, LLC

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.

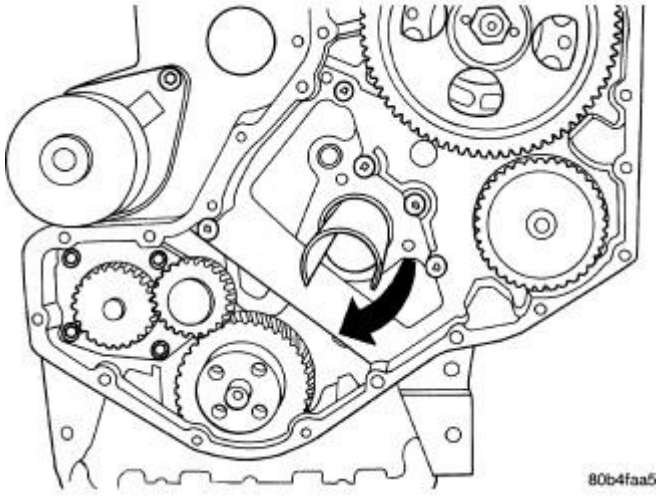


Fig. 193: Rotate Trough One Half Turn (180°)
Courtesy of CHRYSLER GROUP, LLC

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.

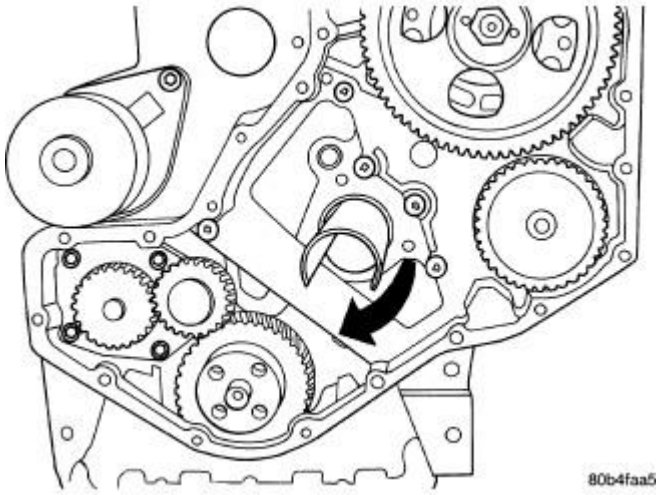


Fig. 194: Rotate Trough One Half Turn (180°)
Courtesy of CHRYSLER GROUP, LLC

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

CAB CHASSIS

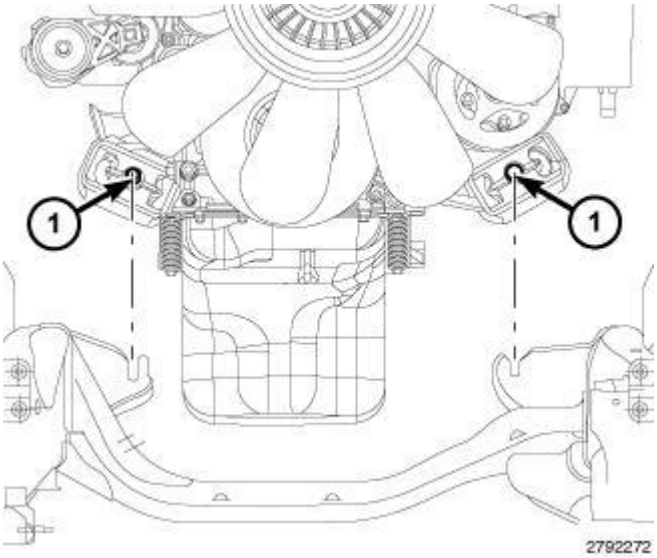


Fig. 195: Frame Mount Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.

2. Remove the viscous fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
3. Install Engine Support Fixture tool (special tool #8534B, Fixture, Driveline Support).
4. Loosen the right side and left side thru-bolt and nut (1).
5. Lift the engine **SLIGHTLY** and remove the thru-bolt and nut (1).

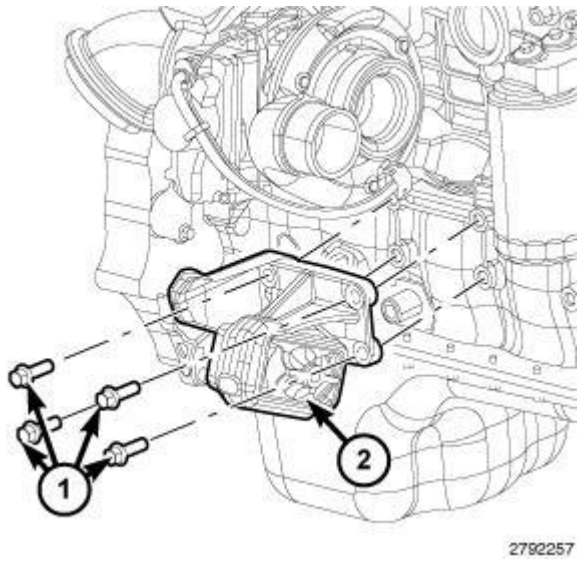


Fig. 196: RH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

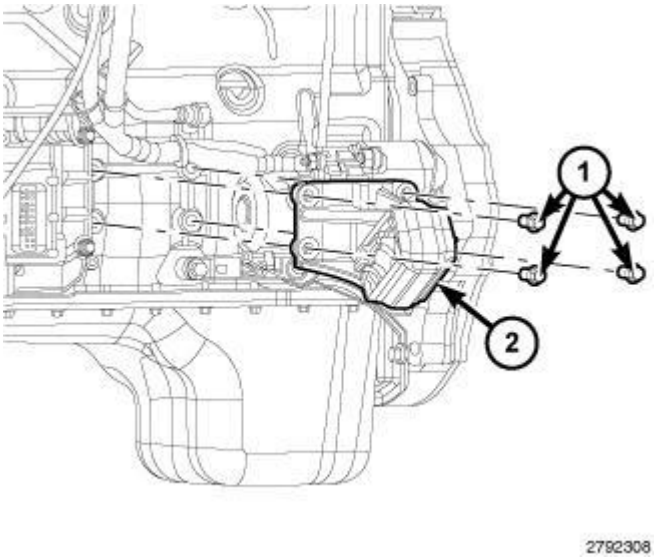


Fig. 197: LH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

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

PICK UP

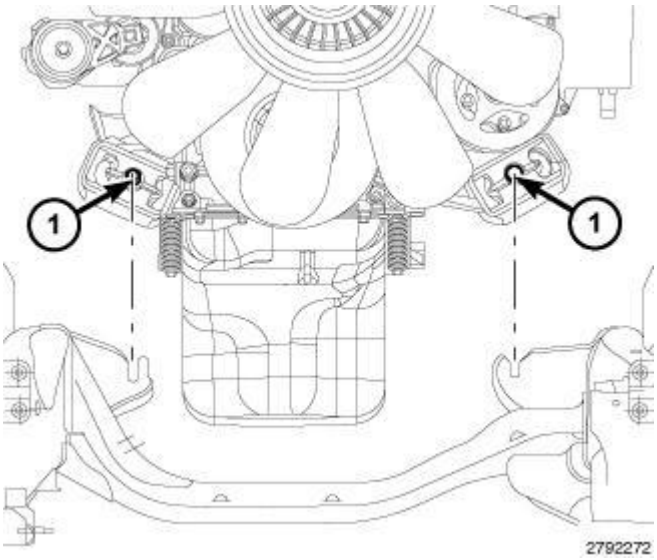


Fig. 198: Frame Mount Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Remove the viscous fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
3. Install Engine Support Fixture tool (special tool #8534B, Fixture, Driveline Support).
4. Loosen the right side and left side thru-bolt and nut (1).
5. Lift the engine **SLIGHTLY** and remove the thru-bolt and nut (1).

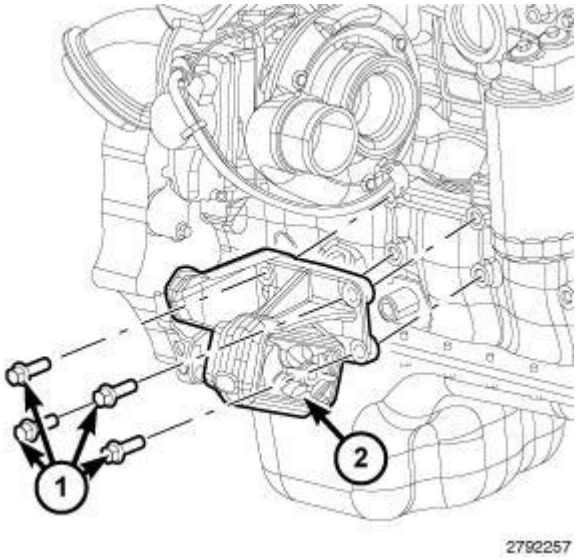


Fig. 199: RH Engine Mount & Bolts

Courtesy of CHRYSLER GROUP, LLC

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

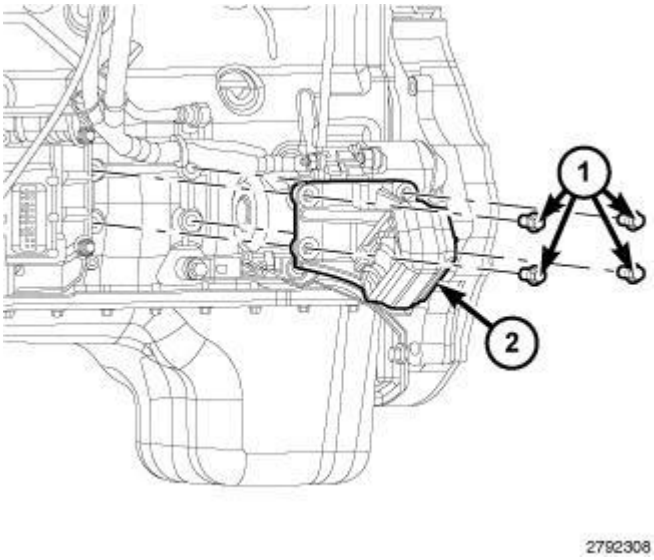


Fig. 200: LH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

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

INSTALLATION

CAB CHASSIS

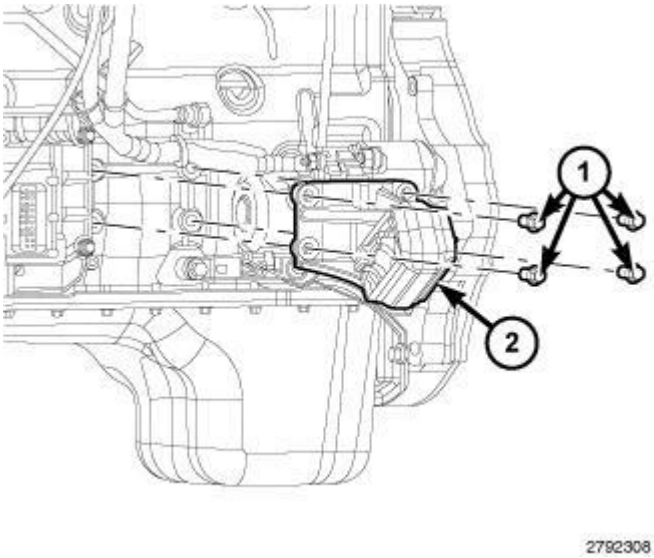


Fig. 201: LH Engine Mount & Bolts

Courtesy of CHRYSLER GROUP, LLC

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

1. With engine raised **SLIGHTLY** , install the LH mount (2) to engine. Tighten bolts (1) to 95 N.m (70 ft. lbs.).

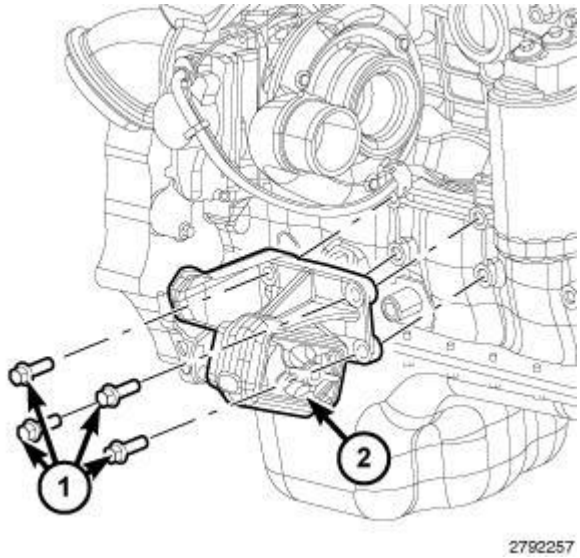


Fig. 202: RH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. With engine raised **SLIGHTLY** , install the RH mount (2) to engine. Tighten bolts (1) to 95 N.m (70 ft. lbs.).

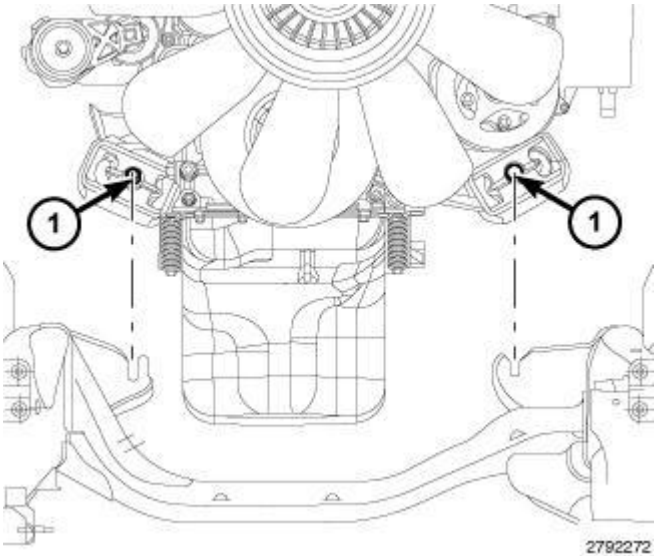


Fig. 203: Frame Mount Fasteners
Courtesy of CHRYSLER GROUP, LLC

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 129 N.m (95 ft. lbs.).
5. Remove the engine support fixture tool (special tool #8534B, Fixture, Driveline Support).
6. Install the viscous fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
7. Connect both negative battery cables.

PICK UP

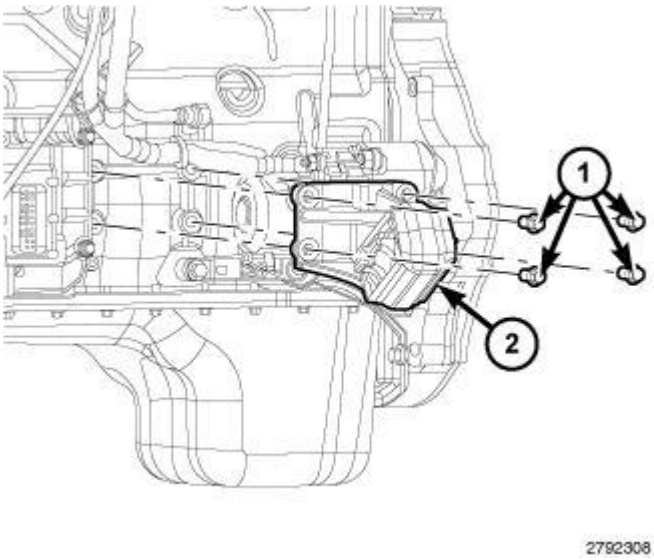


Fig. 204: LH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

1. With engine raised **SLIGHTLY** , install the LH mount (2) to engine. Tighten bolts (1) to 95 N.m (70 ft. lbs.).

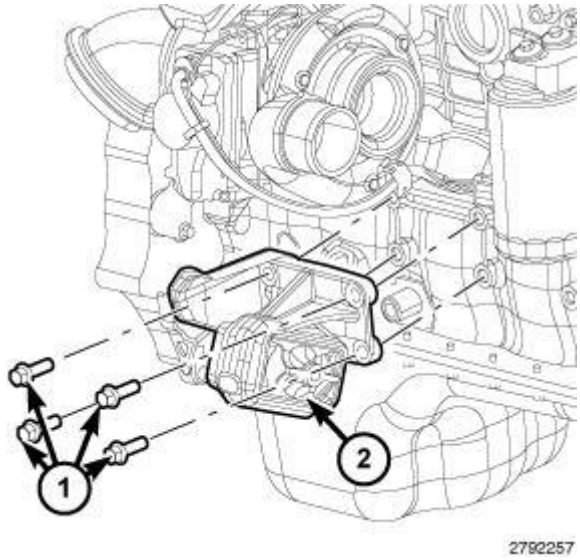


Fig. 205: RH Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. With engine raised **SLIGHTLY** , install the RH mount (2) to engine. Tighten bolts (1) to 95 N.m (70 ft. lbs.).

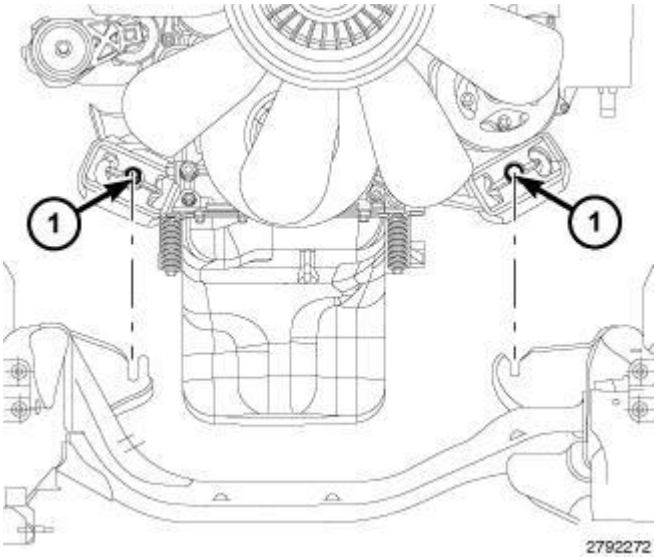


Fig. 206: Frame Mount Fasteners
Courtesy of CHRYSLER GROUP, LLC

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 129 N.m (95 ft. lbs.).
5. Remove the engine support fixture tool (special tool #8534B, Fixture, Driveline Support).
6. Install the viscous fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .

7. Connect both negative battery cables.

INSULATOR, ENGINE MOUNT, REAR

REMOVAL

AS68RC 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.

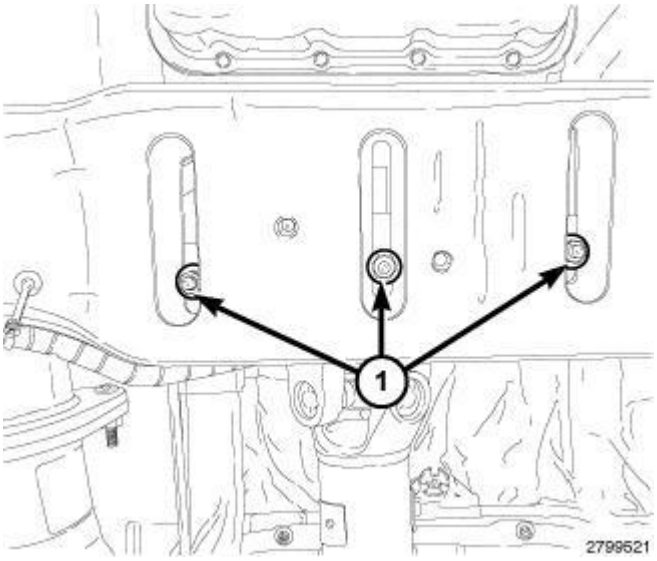


Fig. 207: Rear Transmission Mount To Crossmember Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

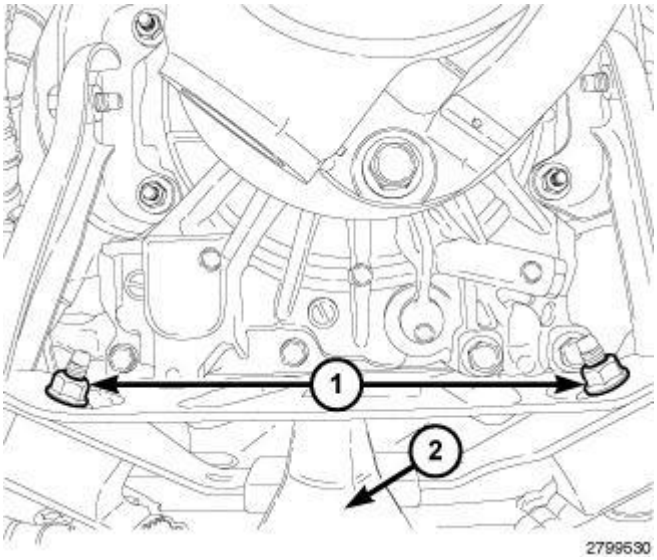


Fig. 208: Rear Transmission Mount & Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

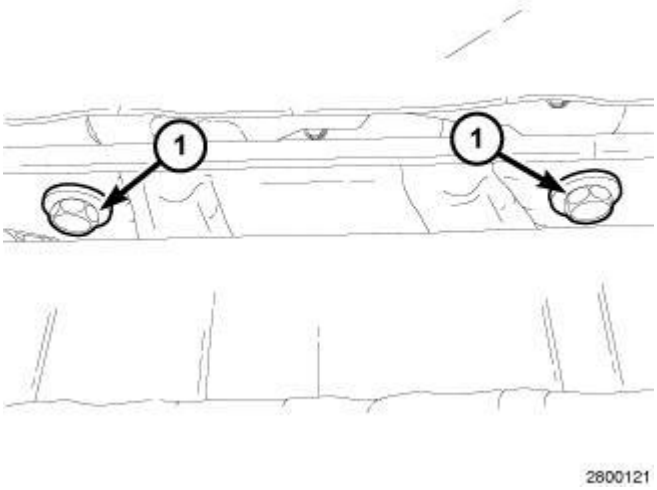


Fig. 209: Transmission Mount Support Bracket Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

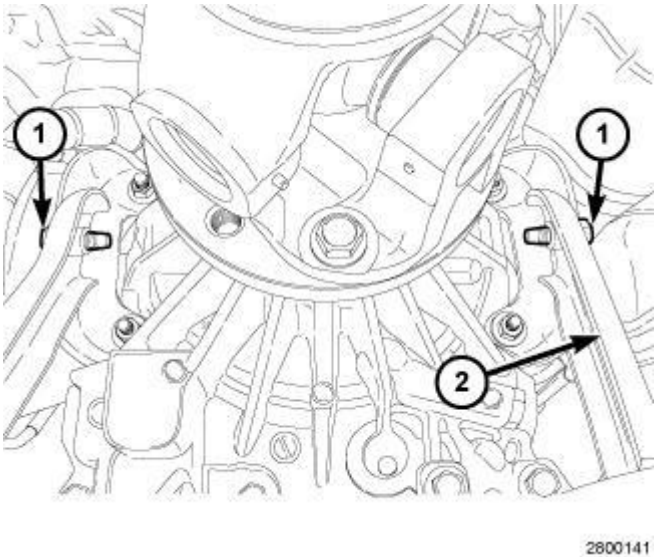


Fig. 210: Transmission Side Support Bracket & Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

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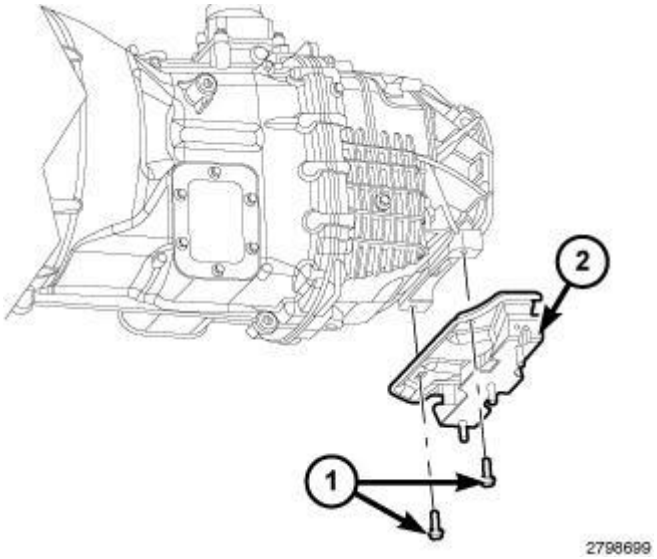


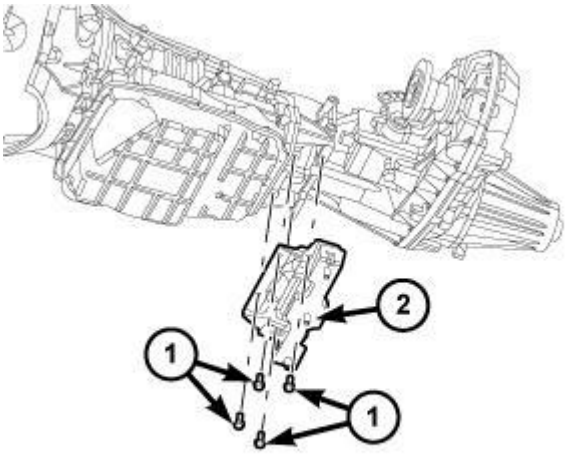
Fig. 211: Rear Transmission Mount & Bolts (M/T)
Courtesy of CHRYSLER GROUP, LLC

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. 212: 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).

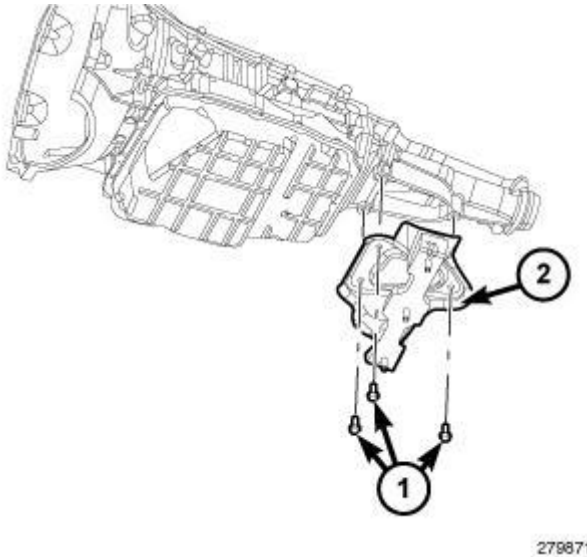


Fig. 213: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Regular Cab Models
Courtesy of CHRYSLER GROUP, LLC

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).

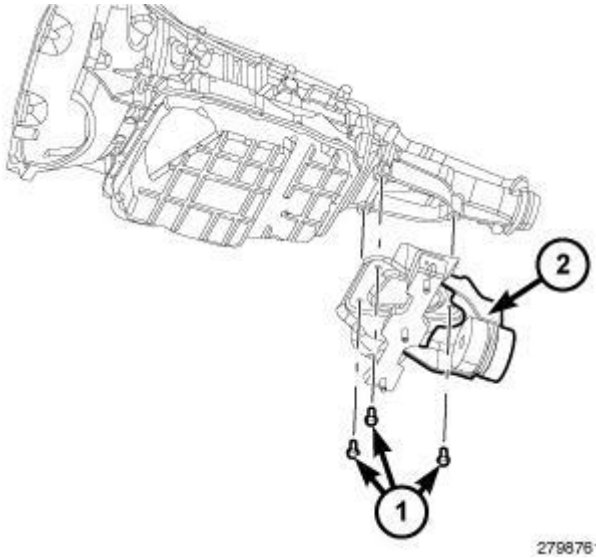


Fig. 214: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Crew & Mega Cab Models
Courtesy of CHRYSLER GROUP, LLC

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).

INSTALLATION

AS68RC 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.

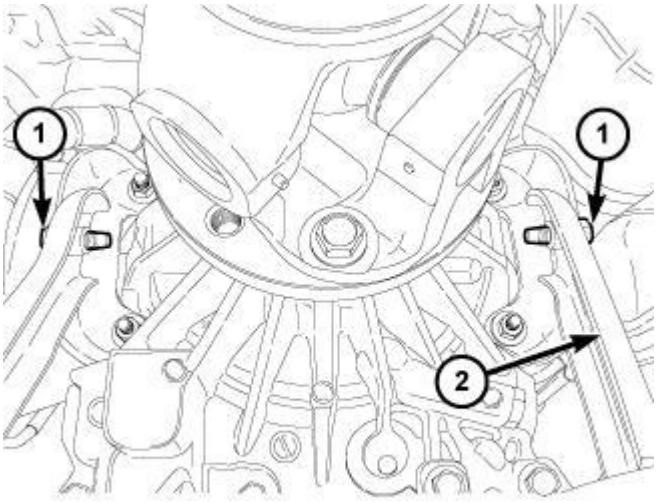


Fig. 215: Transmission Side Support Bracket & Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

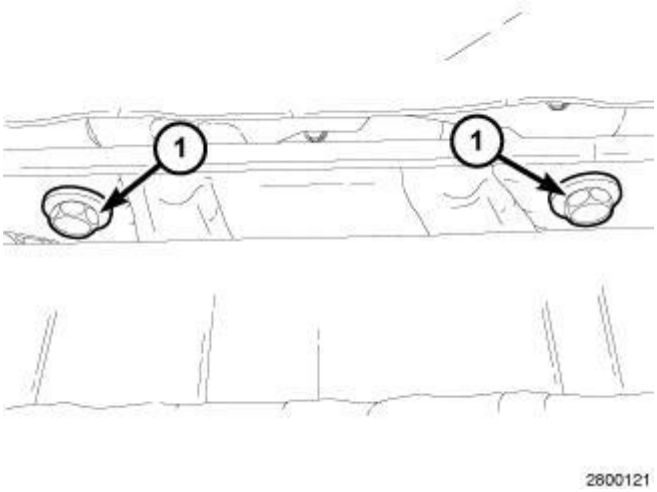


Fig. 216: Transmission Mount Support Bracket Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

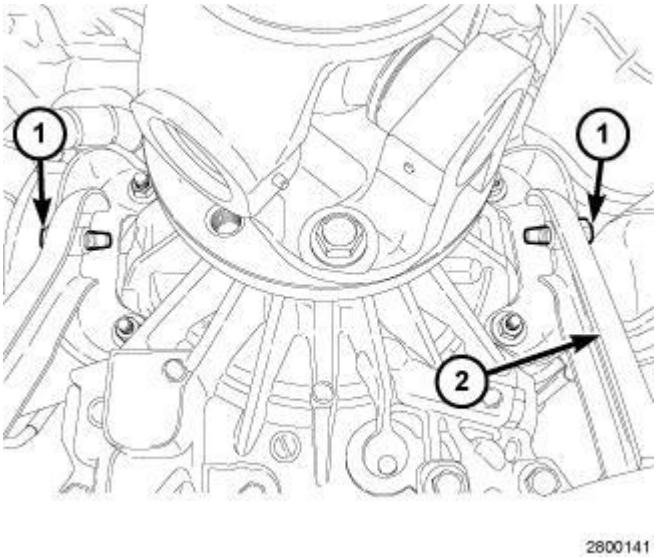


Fig. 217: Transmission Side Support Bracket & Bolts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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

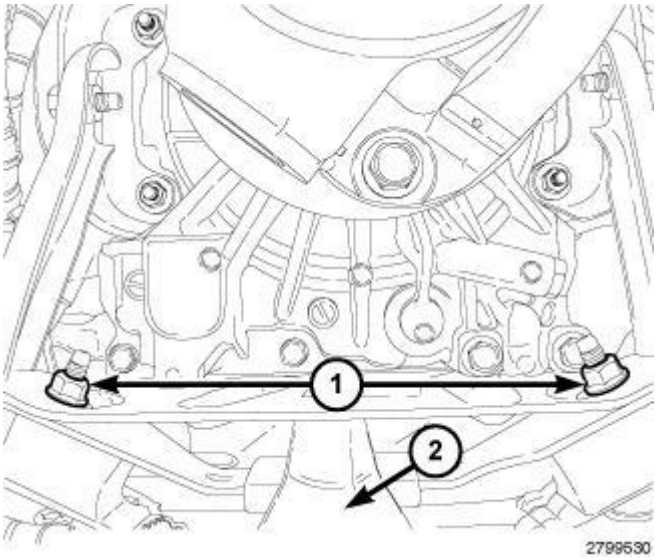


Fig. 218: Rear Transmission Mount & Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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.

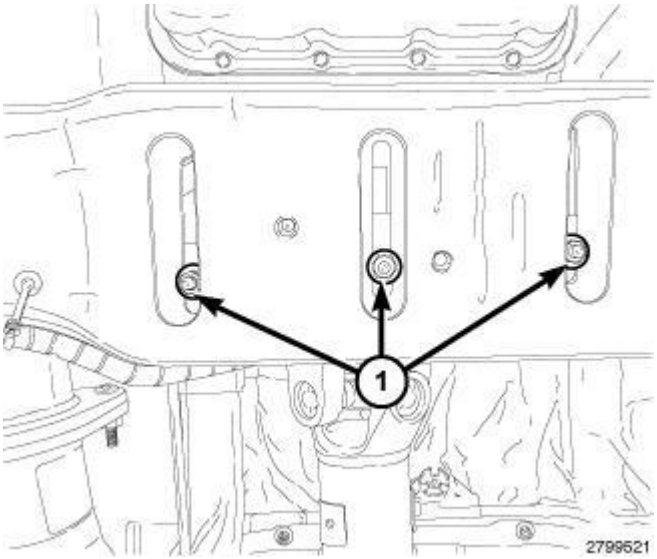


Fig. 219: Rear Transmission Mount To Crossmember Nuts - AS68RC A/T
Courtesy of CHRYSLER GROUP, LLC

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.

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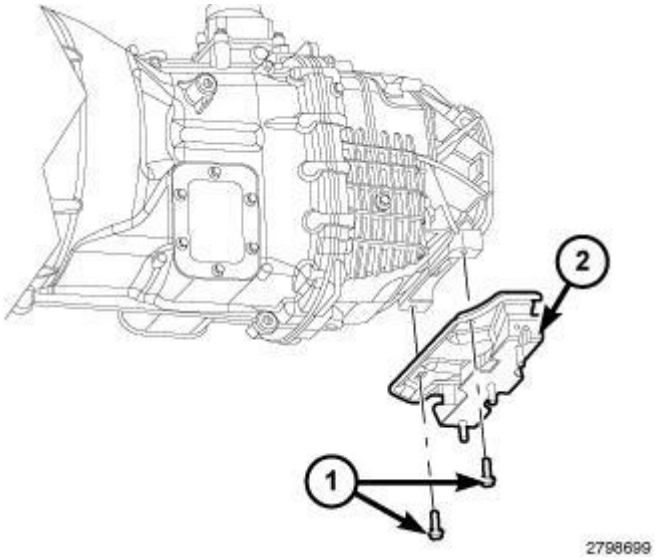

Fig. 220: Rear Transmission Mount & Bolts (M/T)
Courtesy of CHRYSLER GROUP, LLC

1. Install the rear transmission mount (2). Tighten bolts (1) to 50 N.m (37 ft. lbs.).
2. Lower the transmission.
3. Install nuts securing transmission mount to crossmember. Tighten nuts to 47 N.m (35 ft. lbs.).
4. Remove transmission jack.
5. Lower the vehicle.

68 RFE AUTOMATIC

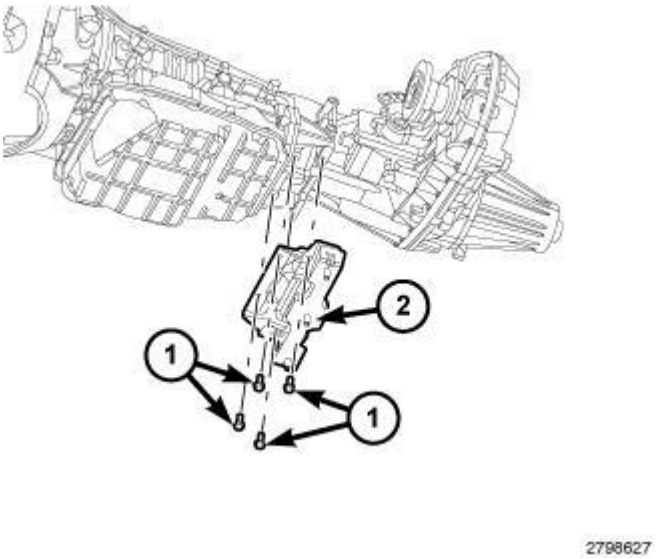

Fig. 221: Rear Transmission Mount & Bolts - 68RFE A/T - 4WD
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x4 Models

1. Install the rear transmission mount (2). Tighten bolts (1) to 50 N.m (37 ft. lbs.).
2. Lower the transmission.
3. Install nuts securing transmission mount to crossmember. Tighten nuts to 47 N.m (35 ft. lbs.).
4. Remove transmission jack.
5. Lower the vehicle.

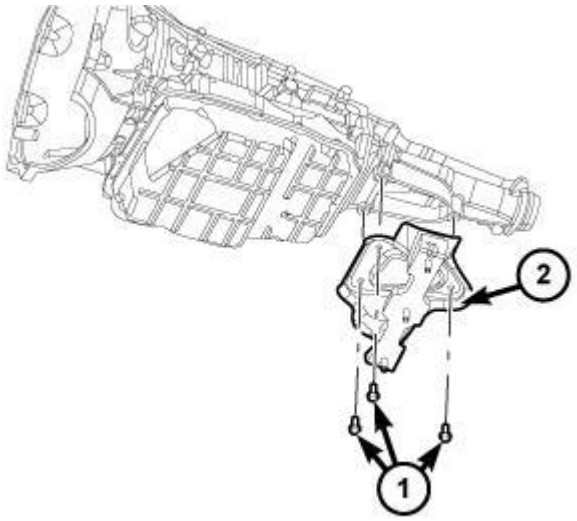

Fig. 222: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Regular Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Regular Cab Models.

6. Install the rear transmission mount (2). Tighten bolts (1) to 50 N.m (37 ft. lbs.).
7. Lower the transmission.
8. Install nuts securing transmission mount to crossmember. Tighten nuts to 47 N.m (35 ft. lbs.).
9. Remove transmission jack.
10. Lower the vehicle.

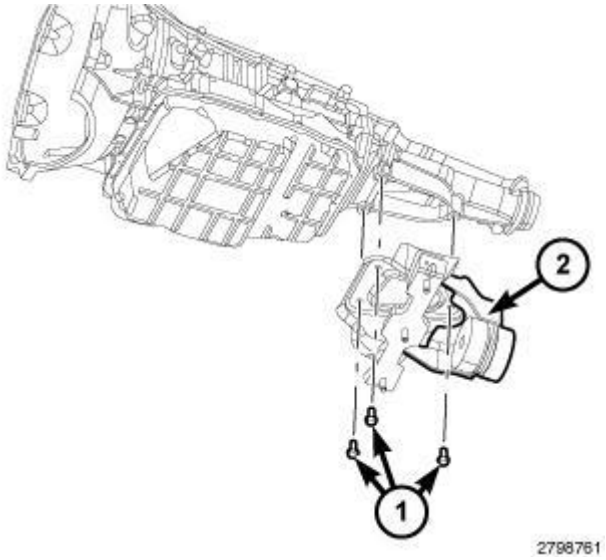

Fig. 223: Rear Transmission Mount & Bolts - 68RFE A/T - 4X2 Crew & Mega Cab Models
Courtesy of CHRYSLER GROUP, LLC

NOTE: 4x2 Crew and Mega Cab Models.

11. Install the rear transmission mount (2). Tighten bolts (1) to 50 N.m (37 ft. lbs.).
12. Lower the transmission.
13. Install nuts securing transmission mount to crossmember. Tighten nuts to 47 N.m (35 ft. lbs.).
14. Remove transmission jack.
15. Lower the vehicle.

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 owners 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.

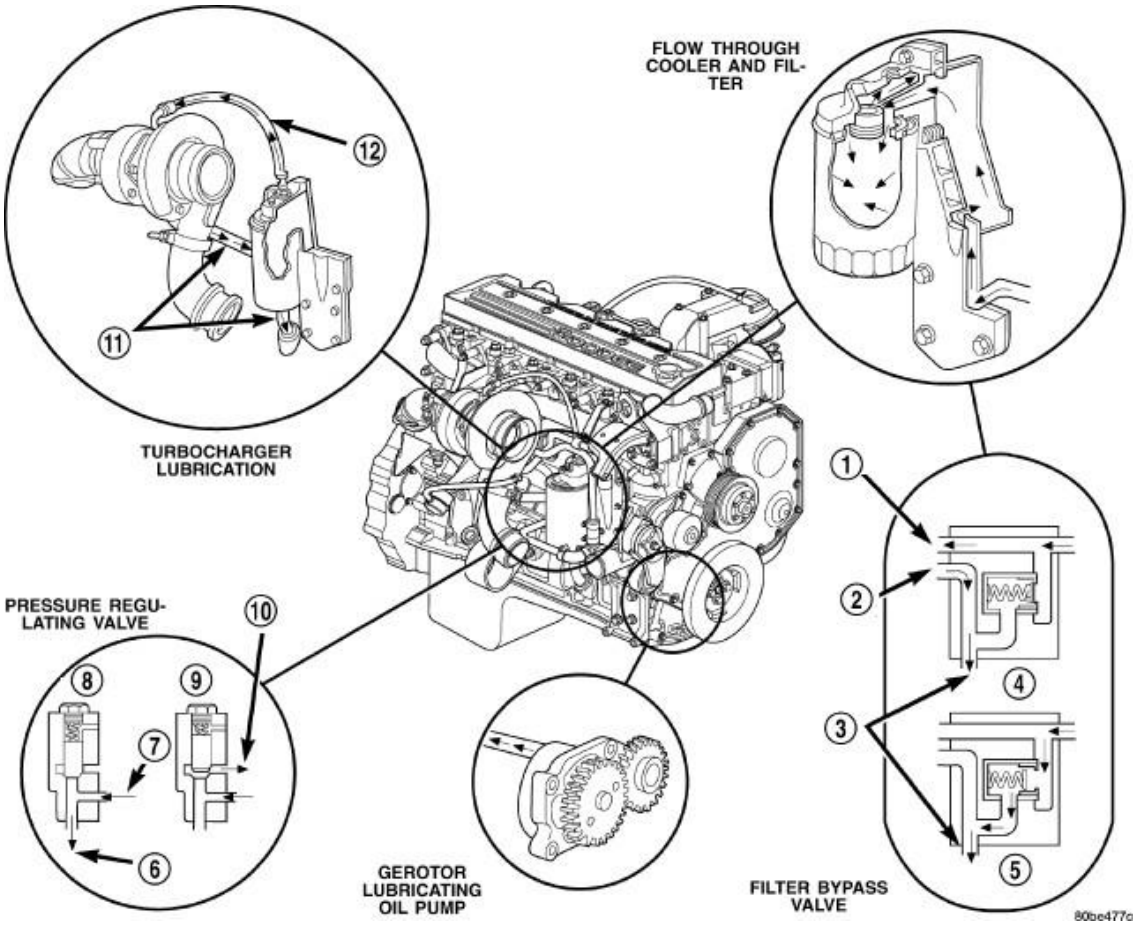

Fig. 224: Lubrication System Circulation (1 Of 2)
Courtesy of CHRYSLER GROUP, LLC

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

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.

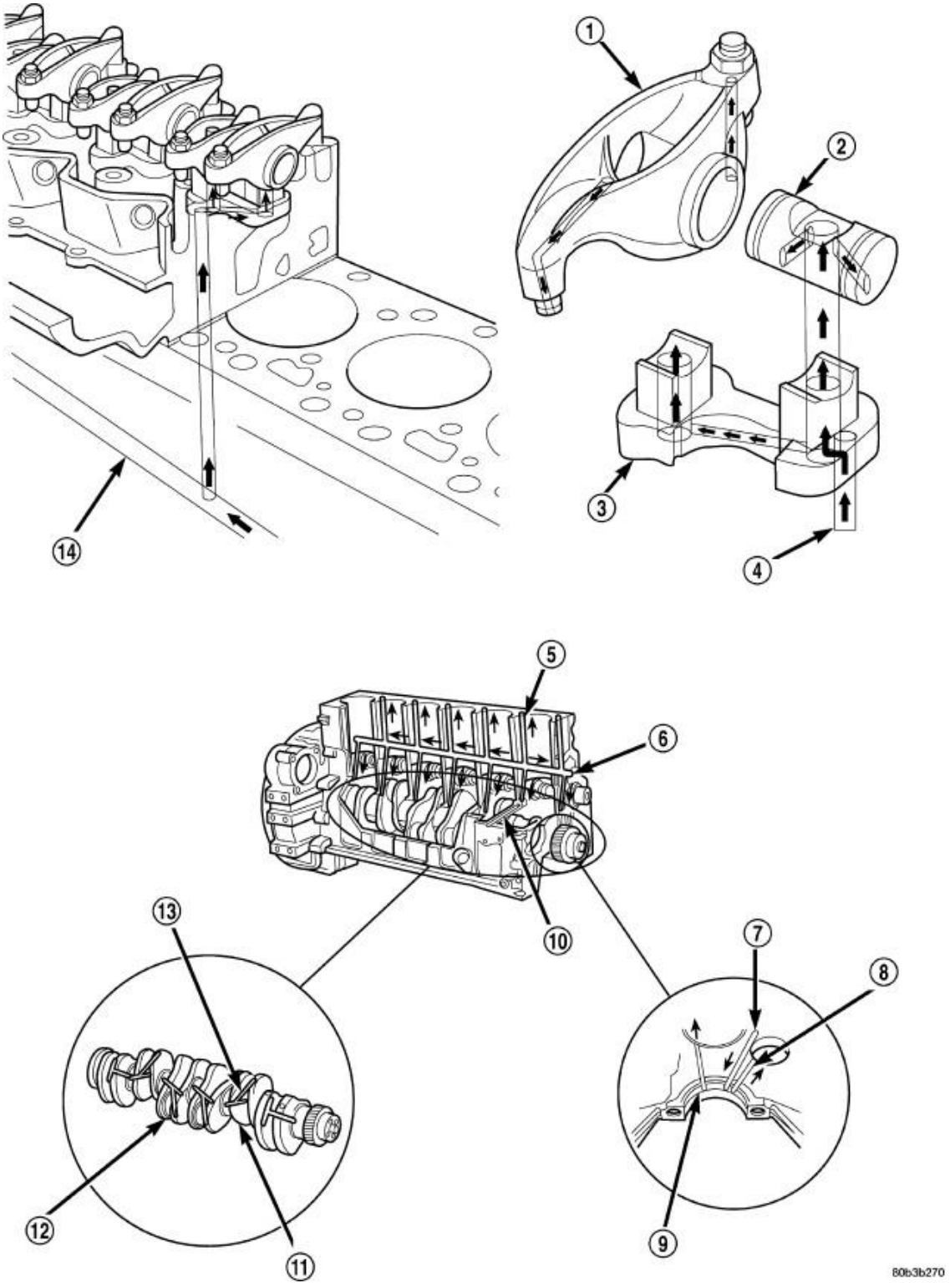

Fig. 225: Lubrication System Circulation (2 Of 2)
Courtesy of CHRYSLER GROUP, LLC

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.) SPECIFICATIONS

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

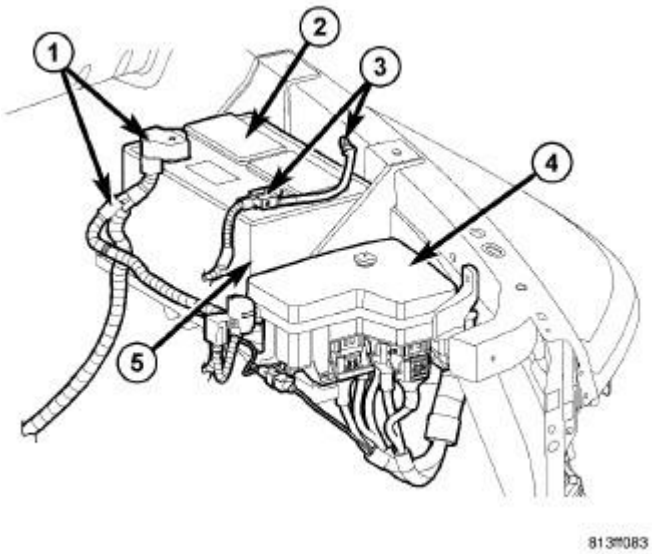

Fig. 226: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Drain the coolant. Refer to **STANDARD PROCEDURE** .

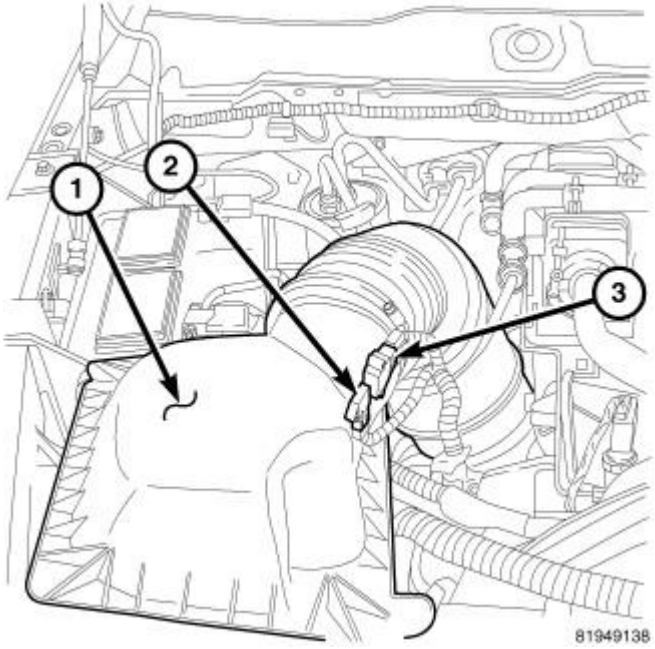

Fig. 227: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

3. Remove air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.

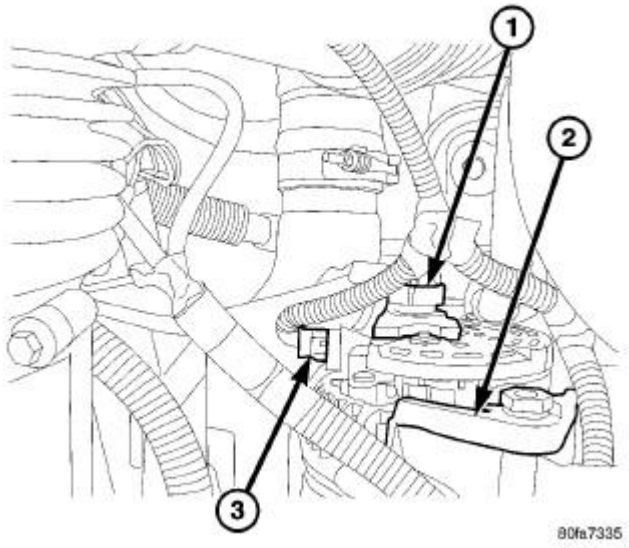

Fig. 228: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - B+ CONNECTOR
2 - GENERATOR
3 - FIELD WIRE CONNECTOR

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

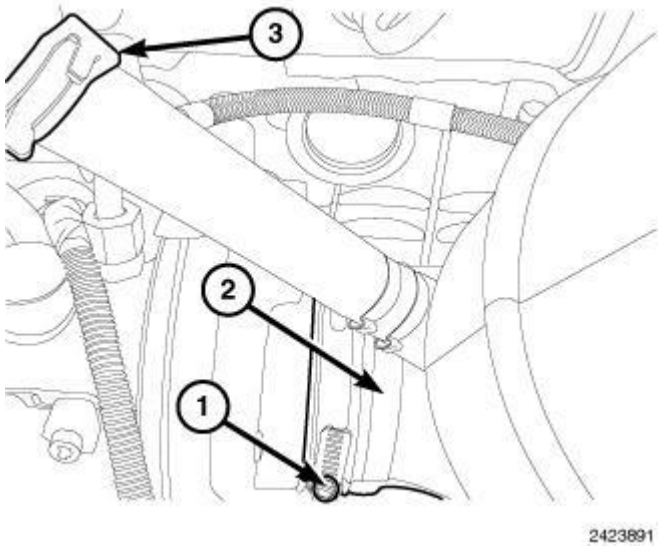

Fig. 229: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

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

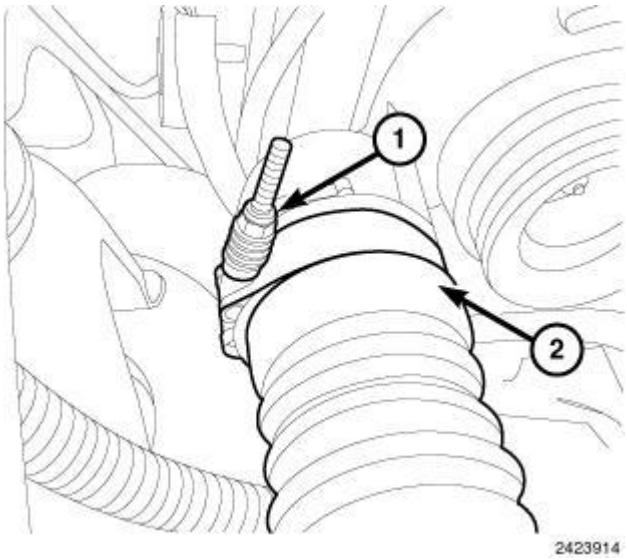

Fig. 230: Charge Air Inlet Tube & Clamp
Courtesy of CHRYSLER GROUP, LLC

7. Loosen clamp and disconnect the charge air inlet tube from the turbocharger.

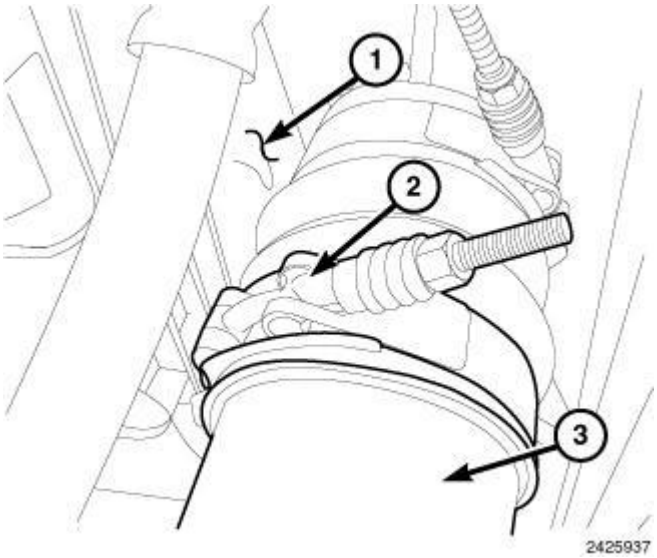

Fig. 231: Charge Air Cooler (CAC), Clamp & Charge Inlet Tube
Courtesy of CHRYSLER GROUP, LLC

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

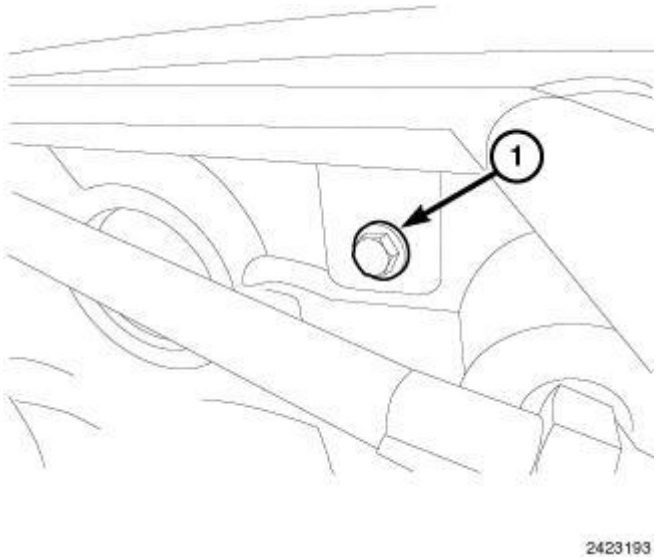

Fig. 232: Coolant Outlet Tube Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Remove the coolant outlet tube bracket bolt (1).

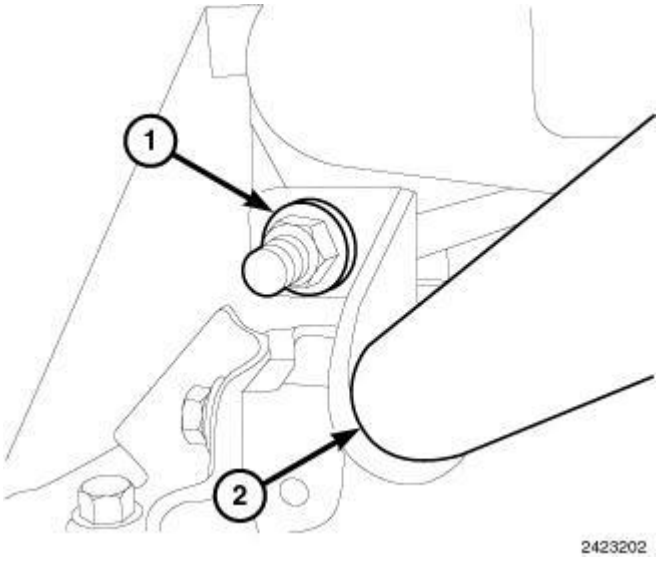

Fig. 233: Coolant Outlet Tube Bracket Nut
Courtesy of CHRYSLER GROUP, LLC

10. Remove the coolant outlet tube bracket nut (1).

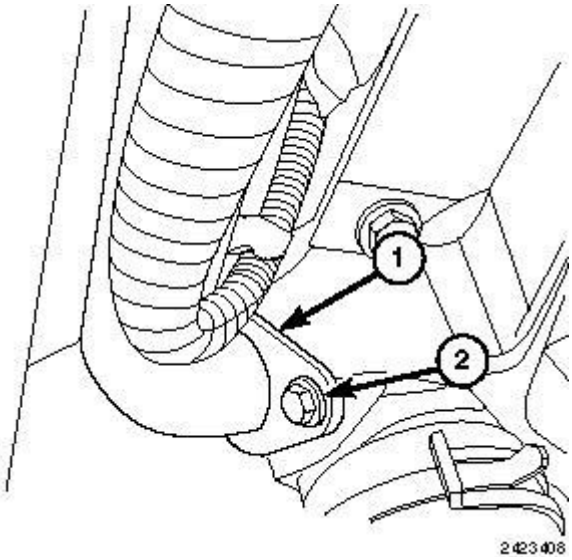

Fig. 234: Front Coolant Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

11. Remove the front coolant tube bolt (2).

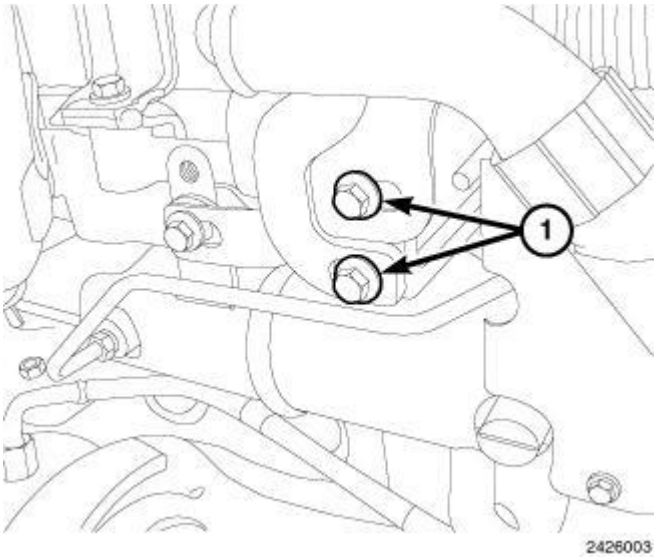

Fig. 235: Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove the two bracket bolts.

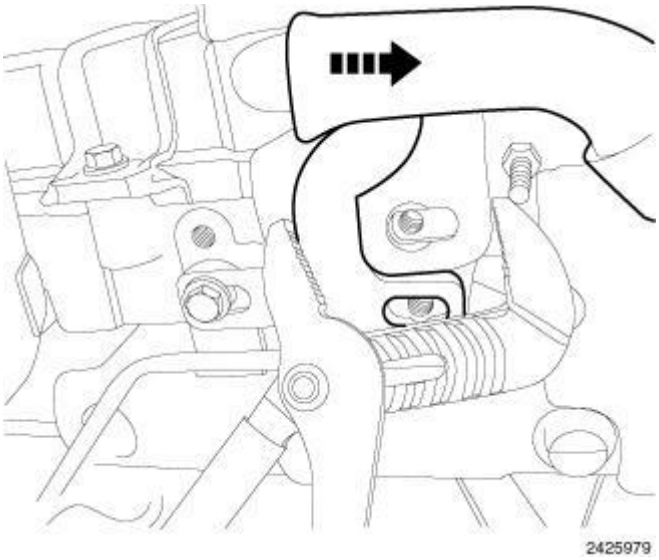

Fig. 236: Using Channel Lock Pliers To Separate Top Connection Of Front Coolant Tube From EGR Cooler
Courtesy of CHRYSLER GROUP, LLC

13. Using a suitable pair of channel lock pliers, separate the top connection of the front coolant tube from the EGR cooler.

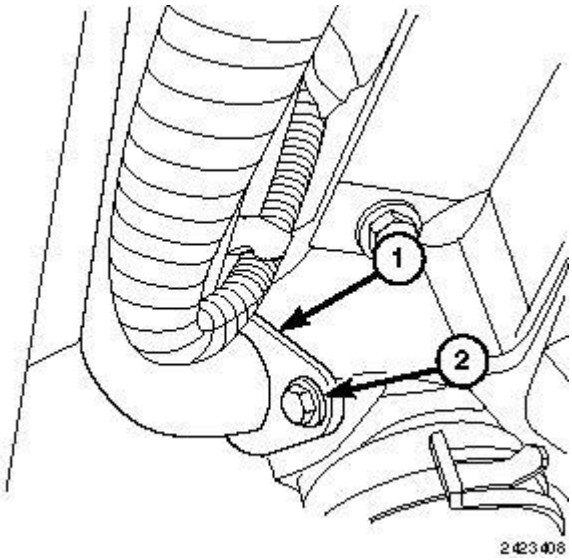

Fig. 237: Front Coolant Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

14. Disconnect the front coolant tube (1) from lower the radiator port and remove the front coolant outlet tube (1).

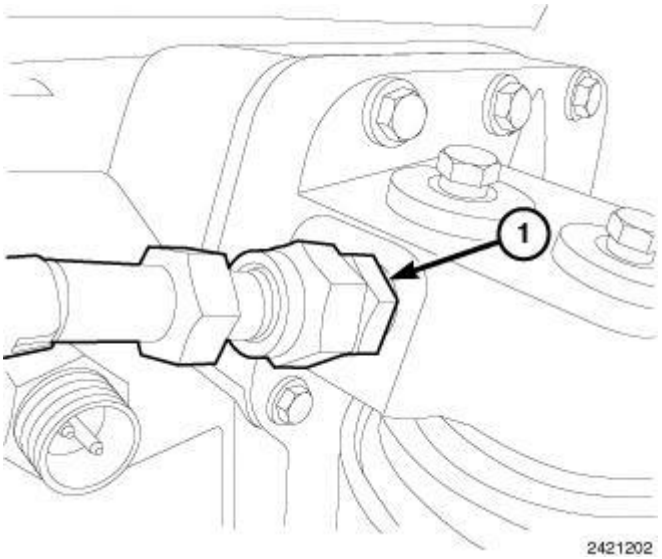

Fig. 238: Turbocharger Oil Supply Line
Courtesy of CHRYSLER GROUP, LLC

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

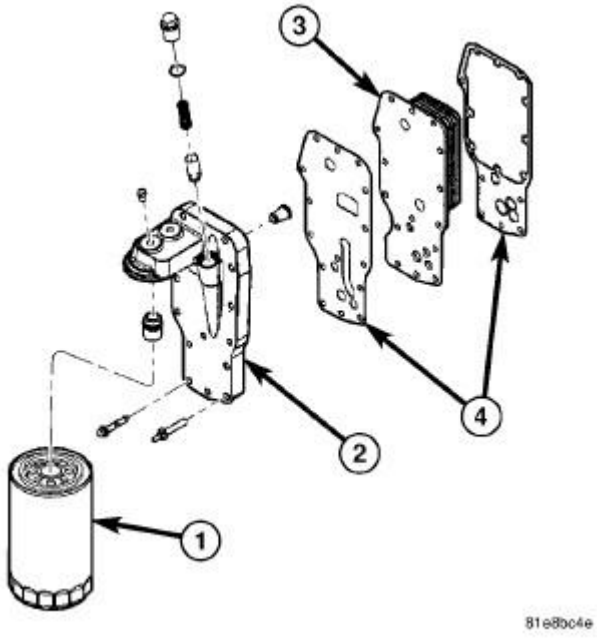

Fig. 239: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

16. Remove the oil filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 6.7L**.
17. Remove and remove the 14 oil cooler capscrews and remove oil cooler housing and 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

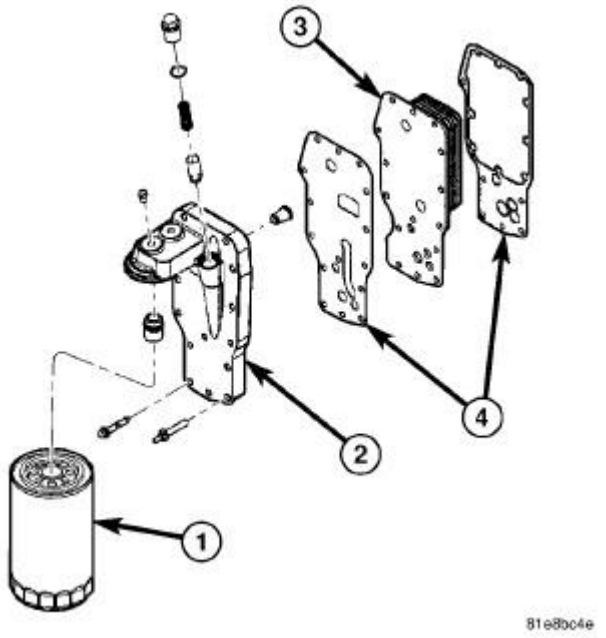

Fig. 240: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

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 capscrews 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**.

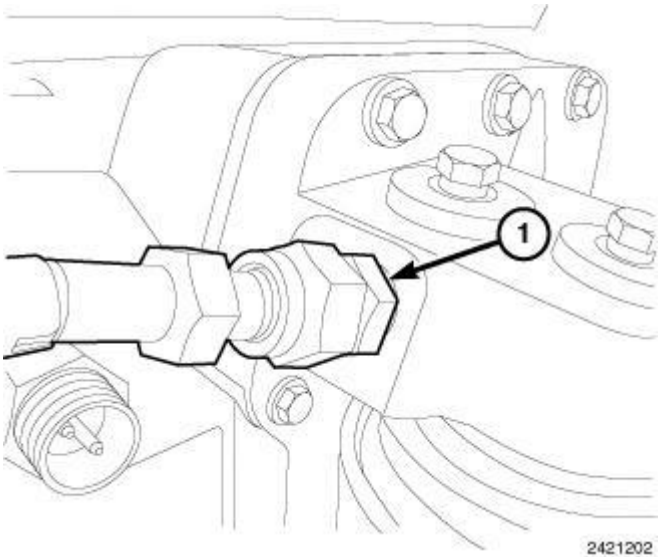

Fig. 241: Turbocharger Oil Supply Line
Courtesy of CHRYSLER GROUP, LLC

4. Install the turbocharger oil supply line to the oil cooler housing. Tighten to 36 N.m (27 ft. lbs.).

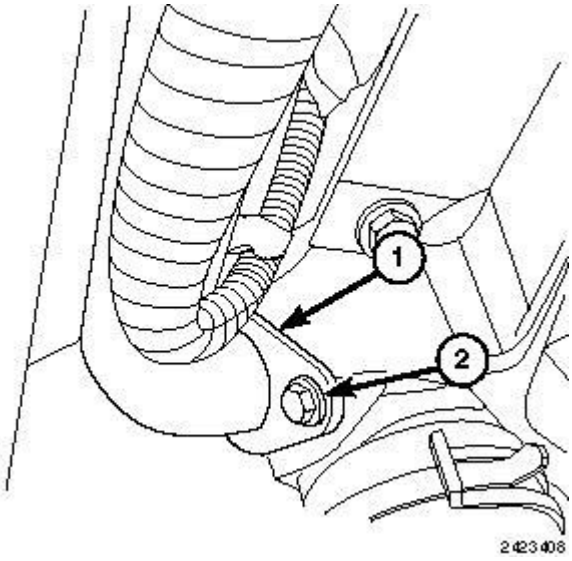

Fig. 242: Front Coolant Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: Lubricate the new O-ring with a soap-water solution.

5. Using a new O-ring, install the coolant outlet tube.
6. Using a new O-ring, position the front coolant tube (1) back and install into the engine block lower radiator hose port. Install the bolt but do not tighten it at this time.

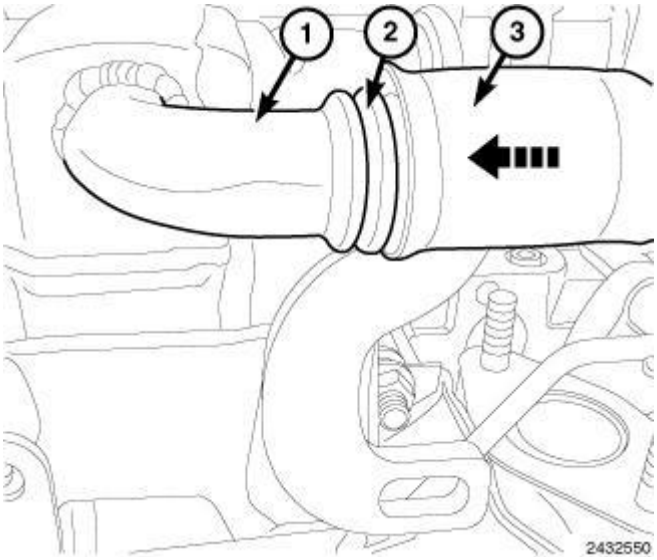

Fig. 243: EGR Cooler, O-ring & Forward Coolant Tube
Courtesy of CHRYSLER GROUP, LLC

NOTE: Lubricate the new O-rings with a soapy water solution.

7. Using a new O-ring (2), install forward coolant tube (3) to EGR cooler (1).

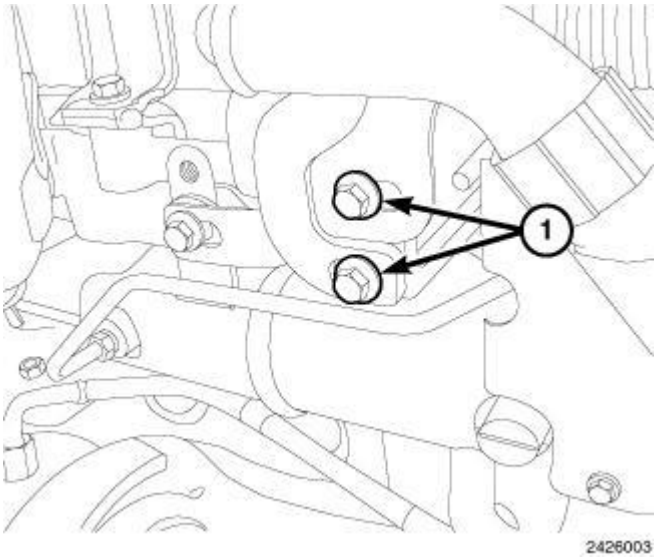

Fig. 244: Bracket Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install the two bracket bolts. Tighten bolts to 10 N.m (89 in. lbs.).

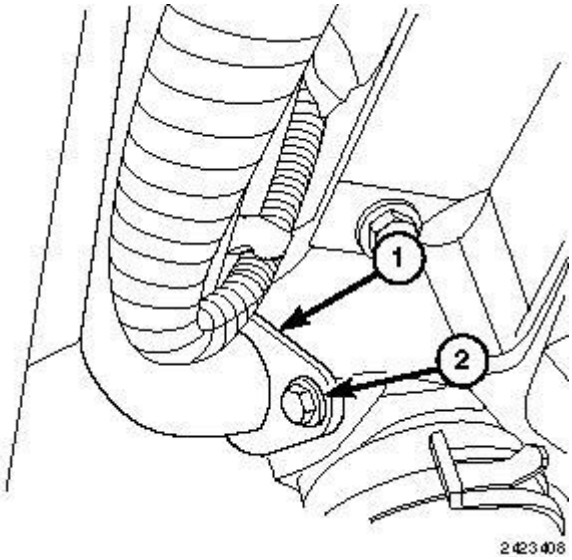

Fig. 245: Front Coolant Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Tighten the front coolant tube bolt (2) to 10 N.m (89 in. lbs.).

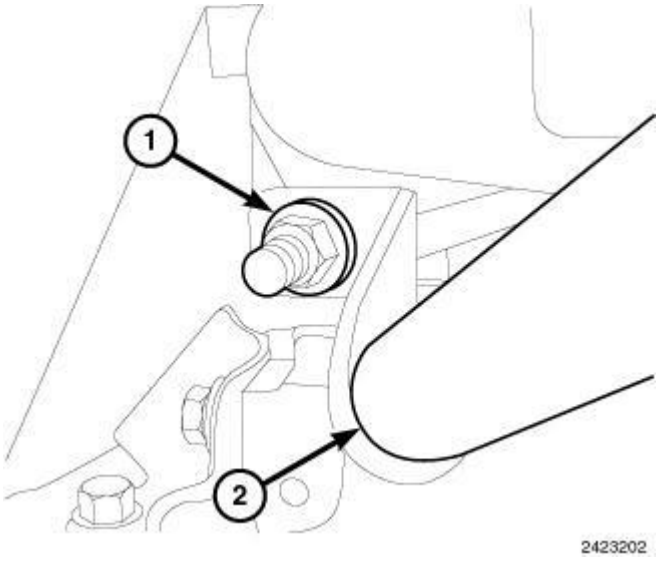

Fig. 246: Coolant Outlet Tube Bracket Nut
Courtesy of CHRYSLER GROUP, LLC

10. Install the coolant outlet tube bracket nut (1). Tighten to 24 N.m (18 ft. lbs.).

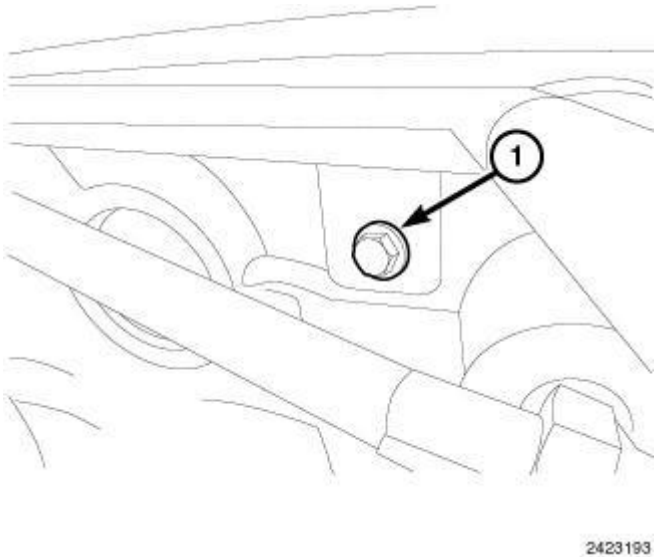

Fig. 247: Coolant Outlet Tube Bracket Bolt
Courtesy of CHRYSLER GROUP, LLC

11. Install the coolant outlet tube bracket bolt (1). Tighten bolt to 10 N.m (89 in. lbs.).

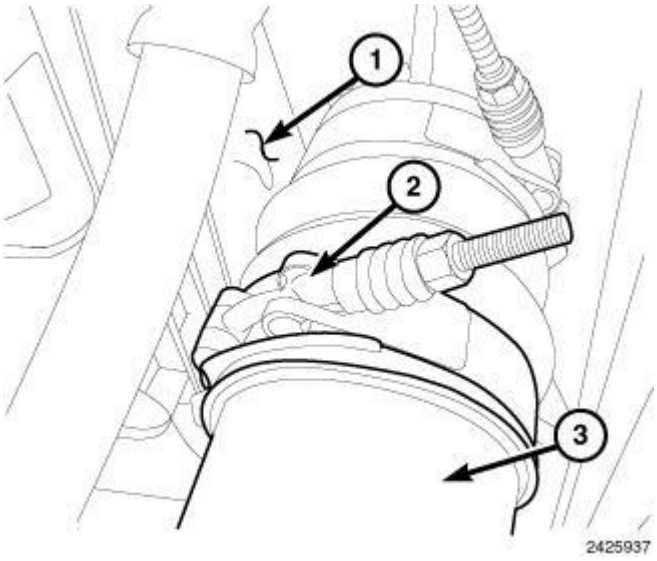

Fig. 248: Charge Air Cooler (CAC), Clamp & Charge Inlet Tube
Courtesy of CHRYSLER GROUP, LLC

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

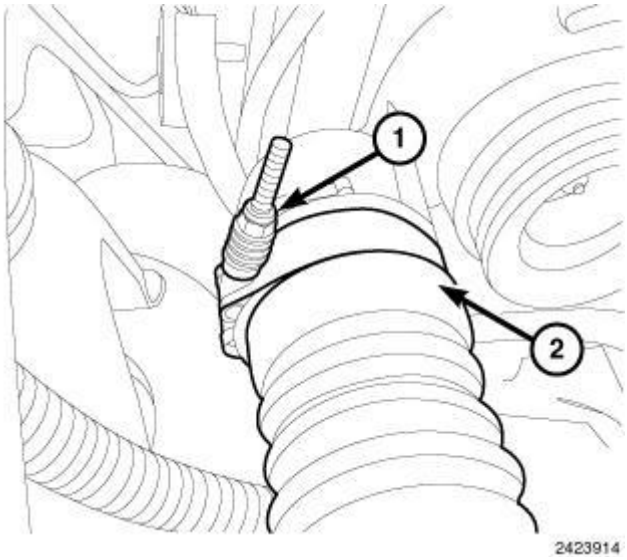

Fig. 249: Charge Air Inlet Tube & Clamp
Courtesy of CHRYSLER GROUP, LLC

13. Connect the charge air inlet tube (2) to the turbocharger. Tighten the clamp (1) to 11 N.m (95 in. lbs.).

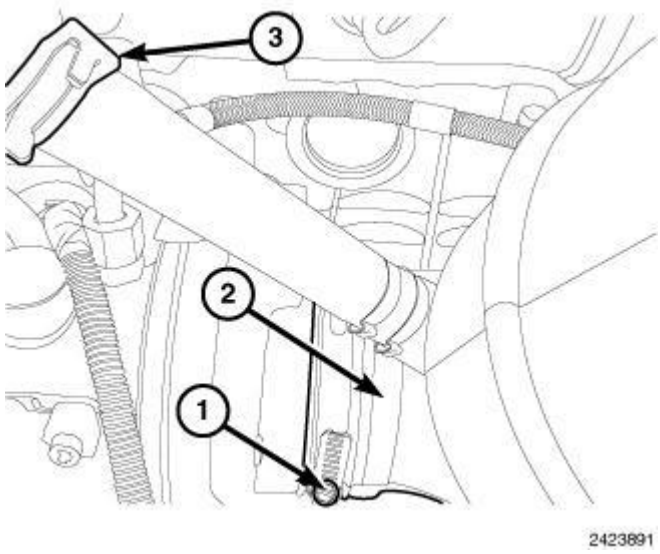

Fig. 250: Clamp, Outlet Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

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).

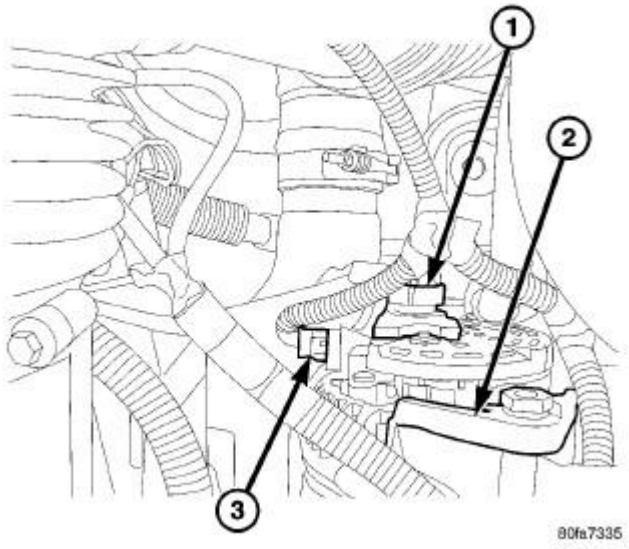

Fig. 251: Diesel Generator Connectors
Courtesy of CHRYSLER GROUP, LLC

1 - B+ CONNECTOR
2 - GENERATOR
3 - FIELD WIRE CONNECTOR

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

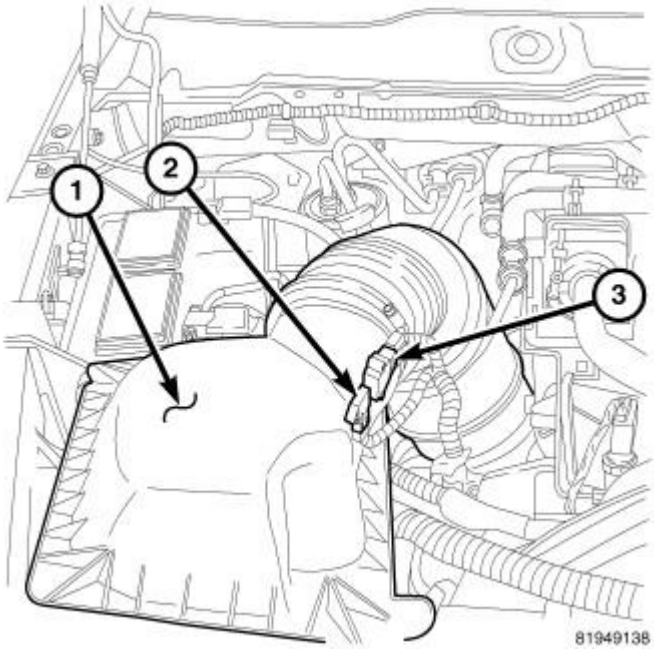

Fig. 252: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

17. Install the Air Filter housing. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.

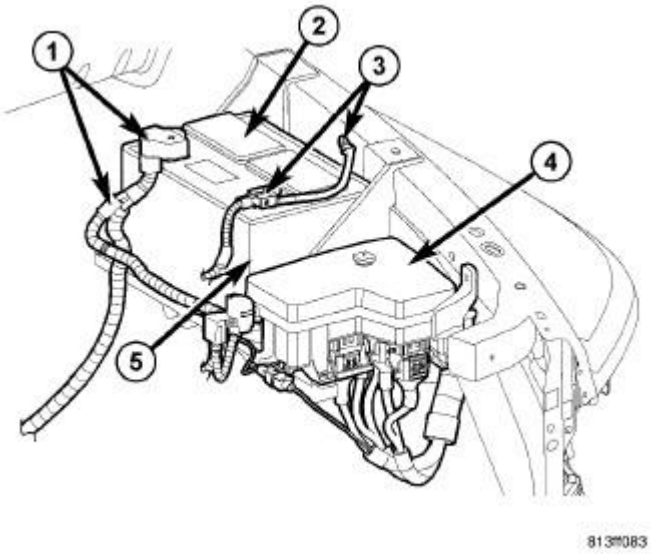

Fig. 253: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

18. Fill Engine with coolant. Refer to **STANDARD PROCEDURE** .
19. Connect both negative battery cables.
20. Start engine and check for leaks.

FILTER, ENGINE OIL

REMOVAL

REMOVAL

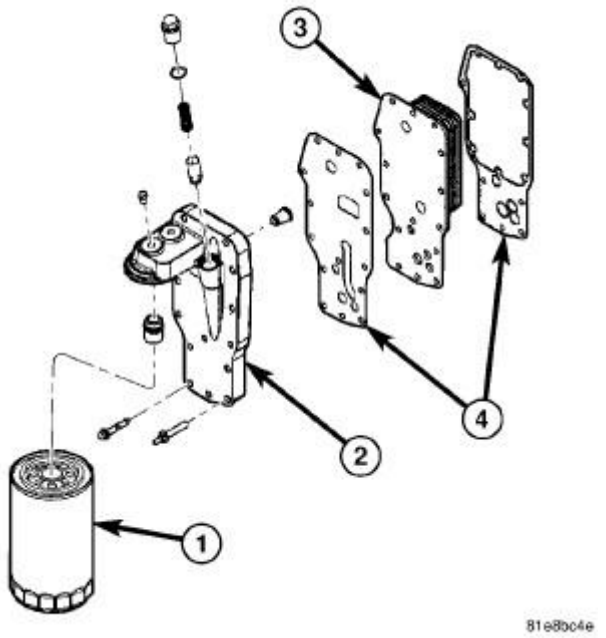

Fig. 254: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

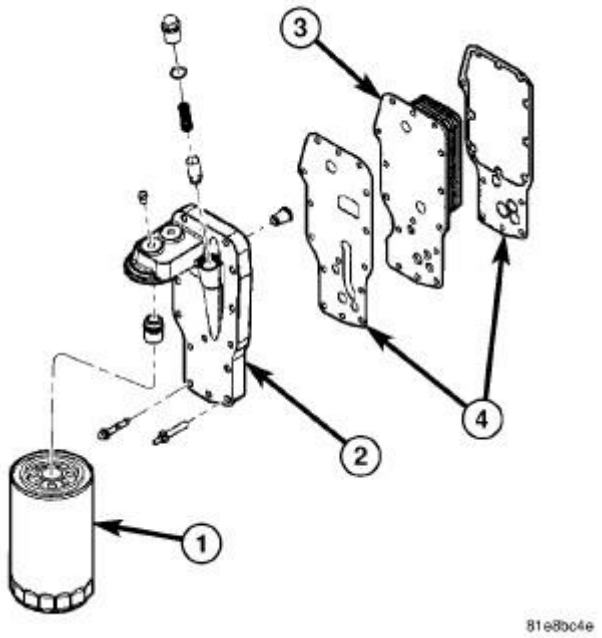

Fig. 255: Oil Filter, Oil Cooler Housing, Oil Cooler & Gaskets
Courtesy of CHRYSLER GROUP, LLC

1. Fill the oil filter element 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 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 filter an additional 1/2 turn.

GASKET, OIL PAN

REMOVAL

REMOVAL

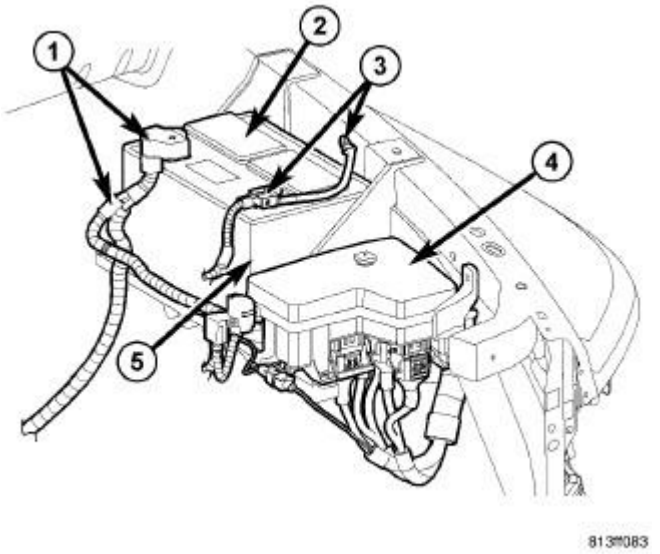

Fig. 256: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery cables (1, 3).

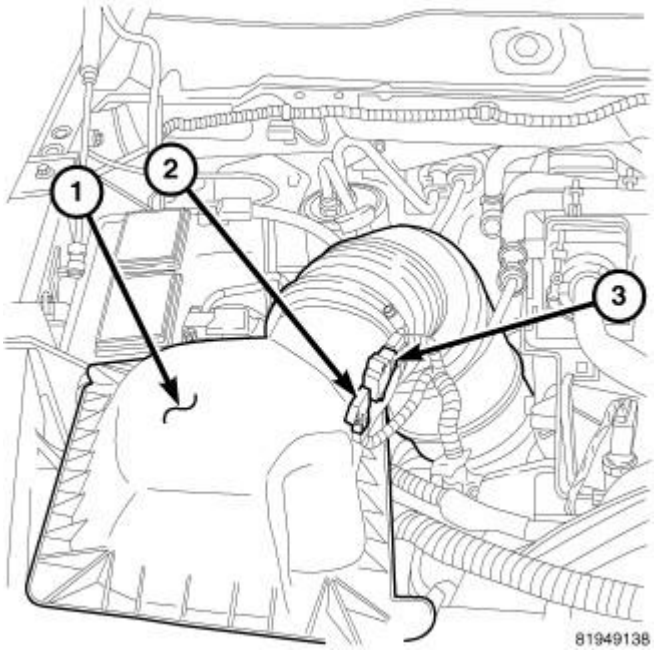

Fig. 257: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

2. Remove the intake air assembly.
3. Remove the inner radiator shroud retaining bolts.
4. Remove the inner radiator shroud.
5. Raise and support the vehicle.

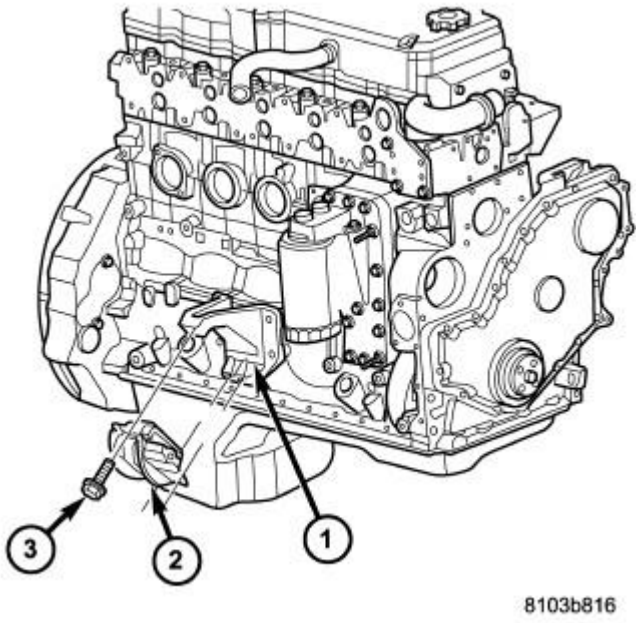

Fig. 258: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Mount
2 - Insulator
3 - Bolt

6. Remove the front suspension track bar. Refer to **TRACK BAR, FRONT, REMOVAL** .
7. Remove the right and left engine mount through bolt. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.
8. Remove the steering gear retaining bolts. Refer to **GEAR, INDEPENDENT FRONT SUSPENSION, INSTALLATION** and **GEAR, LINK AND COIL, INSTALLATION** .

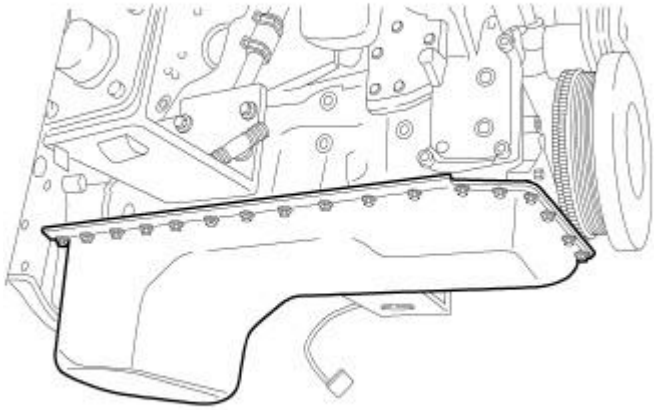

Fig. 259: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

9. Drain the engine oil.
10. Lower the vehicle.
11. Install the engine lift fixture.
12. Use the engine lift fixture to raise the engine.
13. Raise the vehicle on the hoist.
14. Remove the oil pan retaining bolts.
15. Lower the oil pan enough to allow the removal of the oil pan gasket.
16. Remove the oil pan gasket.

INSTALLATION

INSTALLATION

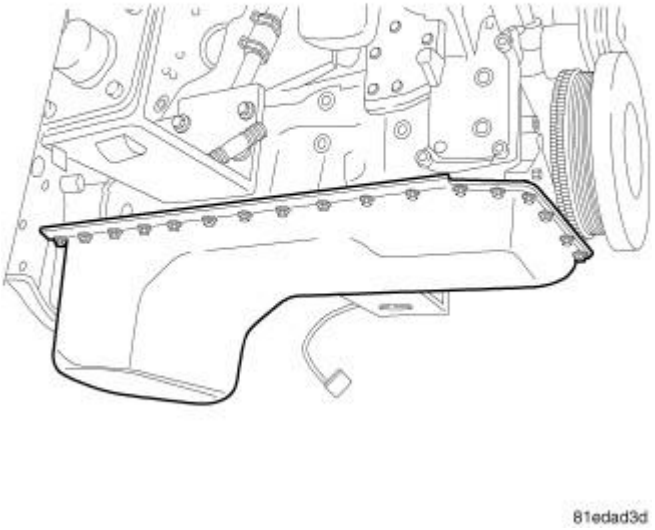

Fig. 260: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

1. Clean the oil pan gasket surfaces to be sure the surfaces are free of debris and oil.
2. Install a new oil pan gasket.
3. Install the oil pan bolts in a cross pattern. Refer to **PAN, OIL, INSTALLATION, 6.7L**.
4. Install the steering gear retaining bolts. Refer to **GEAR, INDEPENDENT FRONT SUSPENSION, INSTALLATION** and **GEAR, LINK AND COIL, INSTALLATION** .
5. Lower the vehicle.
6. Lower the engine into the mounts.
7. Remove the engine lift fixture.
8. Fill the engine with oil.
9. Raise and support the vehicle.

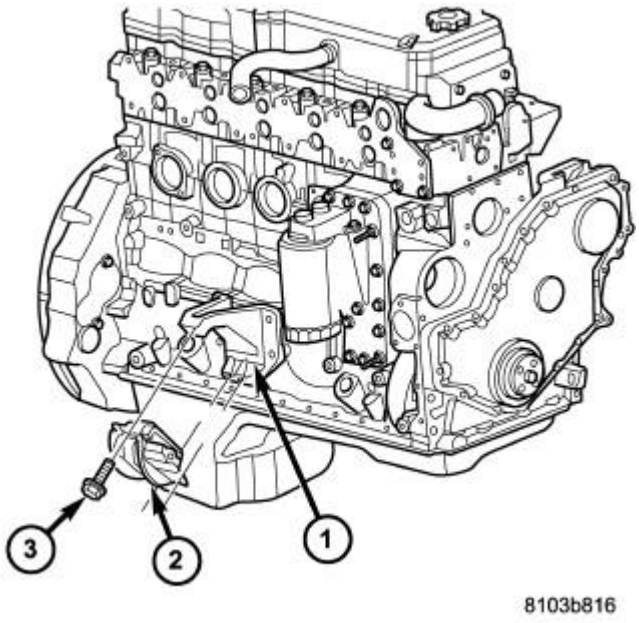

Fig. 261: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Mount
2 - Insulator
3 - Bolt

10. Install the left and right engine mount through bolt. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.
11. Install the front suspension track bar. Refer to **TRACK BAR, FRONT, INSTALLATION** .
12. Lower the vehicle.
13. Install the radiator shroud.
14. Install the radiator shroud bolts.

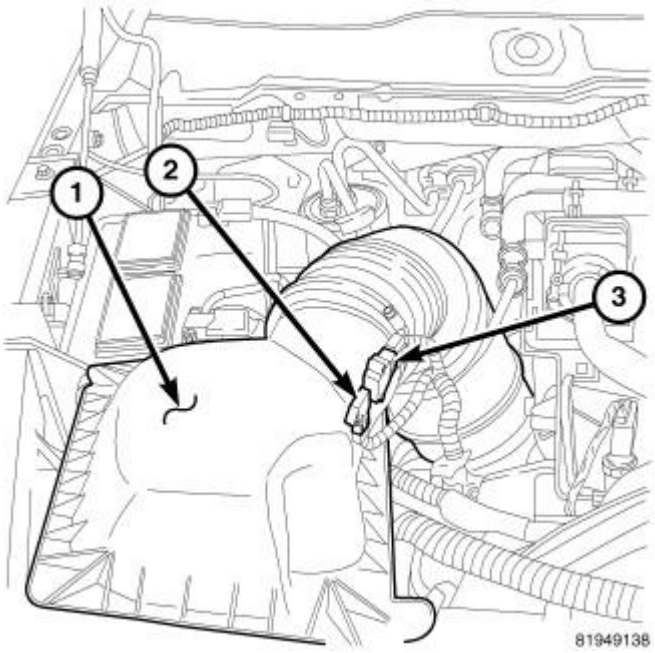

Fig. 262: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

15. Install the intake air assembly. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.

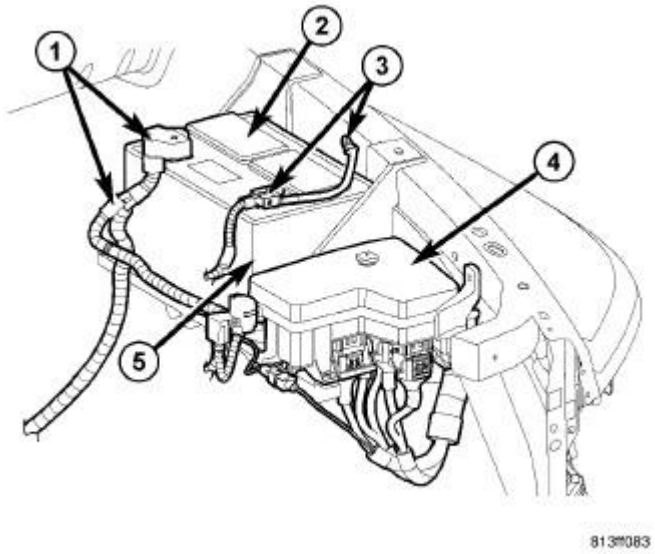

Fig. 263: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

16. Connect the battery cables (1, 3).

OIL

STANDARD PROCEDURE

ENGINE OIL LEVEL

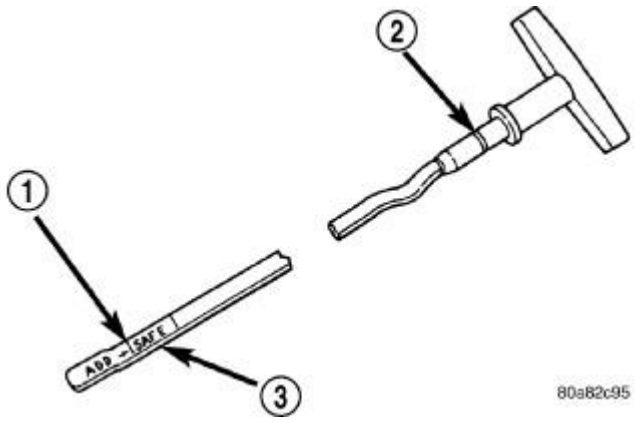

Fig. 264: Oil Level Indicator (Dipstick)
Courtesy of CHRYSLER GROUP, LLC

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.
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.

PAN, OIL

REMOVAL

REMOVAL

4X4

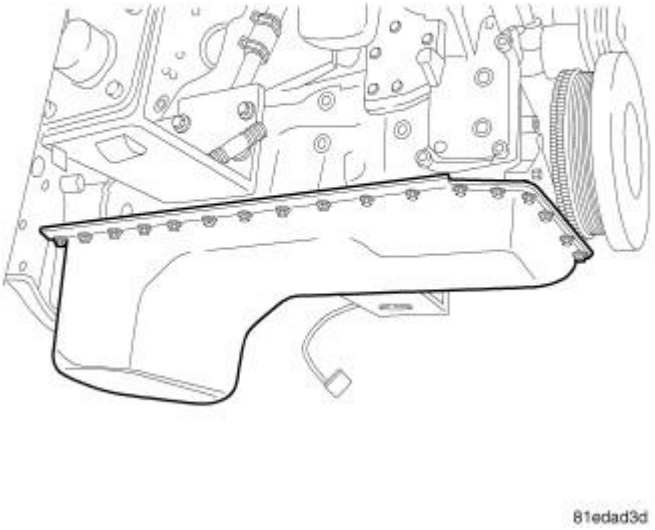

Fig. 265: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery negative cables.
2. Remove the intake air assembly.
3. Remove the radiator shroud retaining bolts.
4. Install Engine Support Fixture No. (special tool #8534B, Fixture, Driveline Support).
5. Raise and support the vehicle.

WARNING: HOT OIL CAN CAUSE PERSONAL INJURY.

6. Drain the engine oil. Refer to **Engine/Lubrication/OIL - Standard Procedure**.

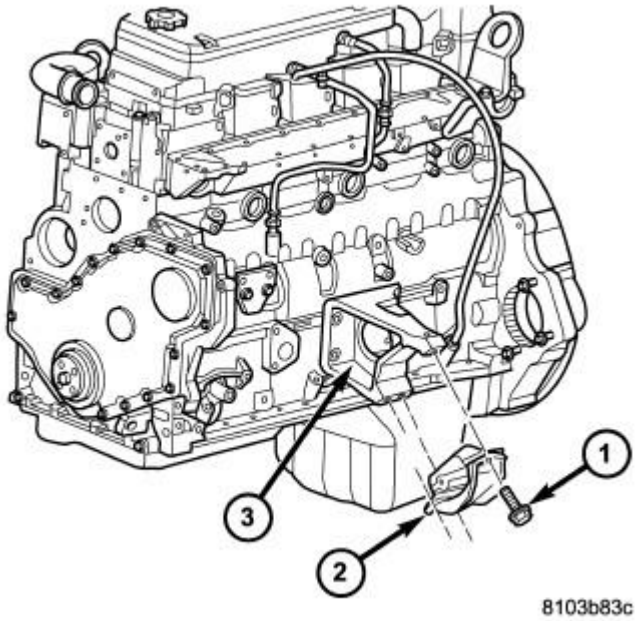

Fig. 266: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Bolt
2 - Insulator
3 - Mount

7. Loosen the front engine mount bolts.
8. Use the Engine Support Fixture No. (special tool #8534B, Fixture, Driveline Support) to raise engine out of the front mounts.
9. Remove the engine oil dipstick.

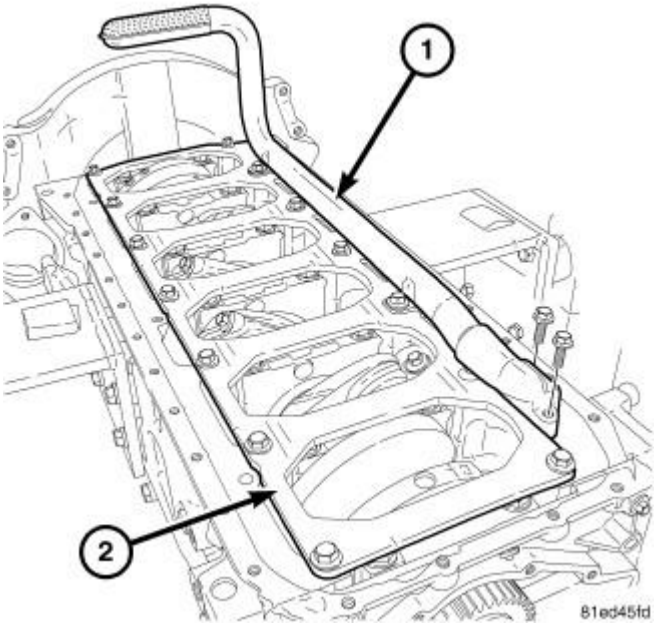

Fig. 267: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

10. Remove oil pan bolts, break the pan to block seal, and lower pan slightly.
11. Remove oil suction tube bolts and lower the suction tube into oil pan.
12. Remove the 2 bolts from the front of the engine block stiffener.
13. Remove the oil pan.

4X2

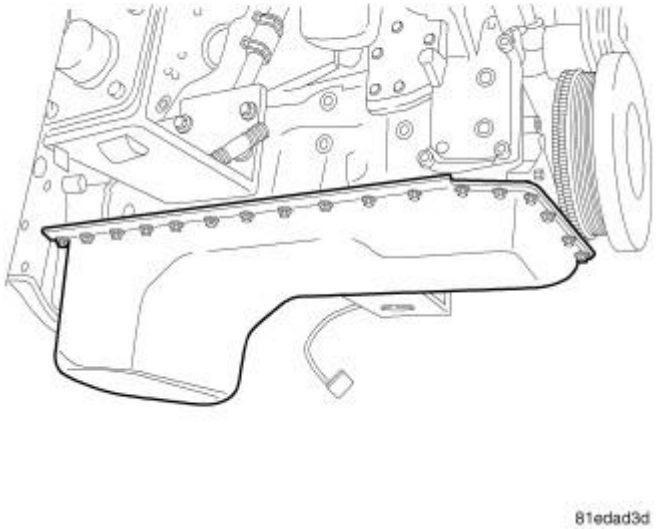

Fig. 268: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Raise and support the vehicle.
3. Remove the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
4. Remove the starter. Refer to **STARTER, REMOVAL** .

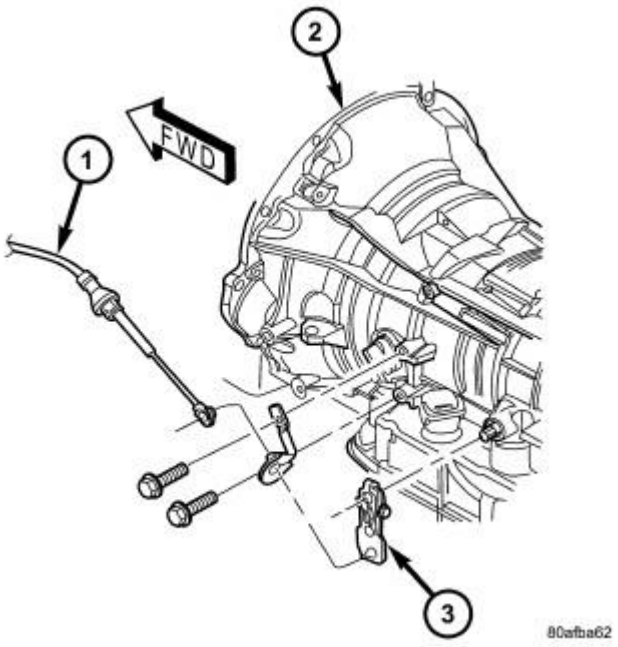

Fig. 269: Gearshift Cable, RFE Transmission & Manual Lever
Courtesy of CHRYSLER GROUP, LLC

1 - GEARSHIFT CABLE
2 - RFE TRANSMISSION
3 - MANUAL LEVER

5. Remove the transmission. Refer to appropriate Transmission Service Information article.
6. Remove the flywheel housing bolts (8).
7. Remove the flex plate bolts (8).
8. Remove the engine oil dip stick.
9. Drain the oil.
10. Remove the steering rack bolts.
11. Remove the oil pan bolts.

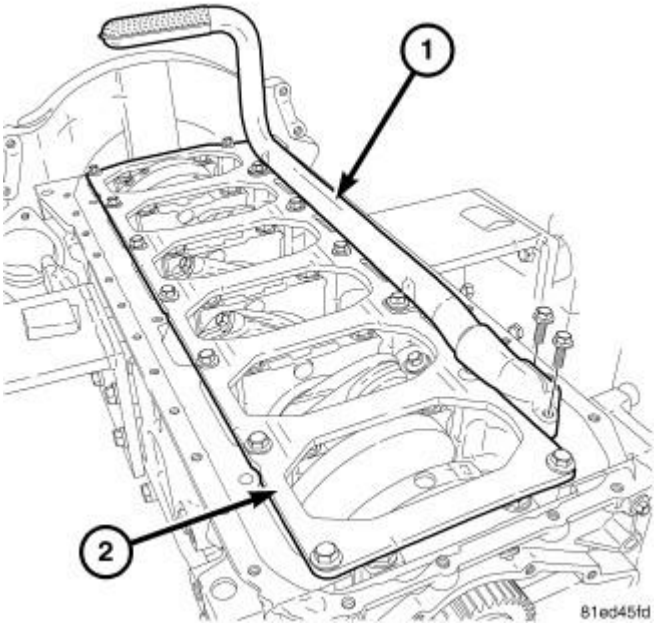

Fig. 270: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

12. Remove the oil pickup bolts.
13. Remove the oil pan.

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

INSTALLATION

4X4

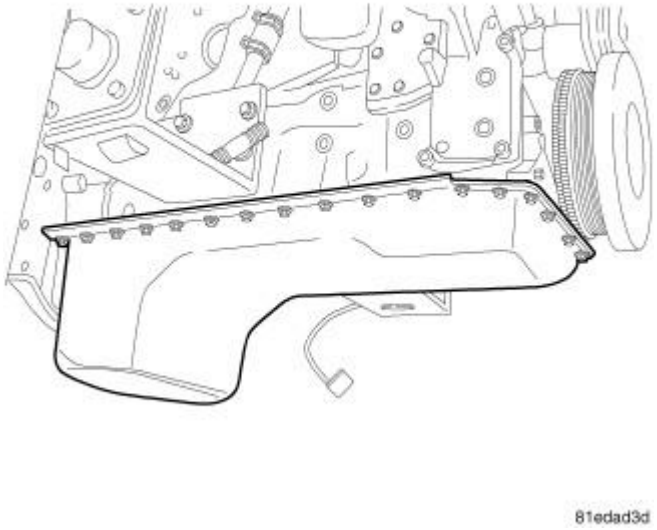

Fig. 271: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

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.

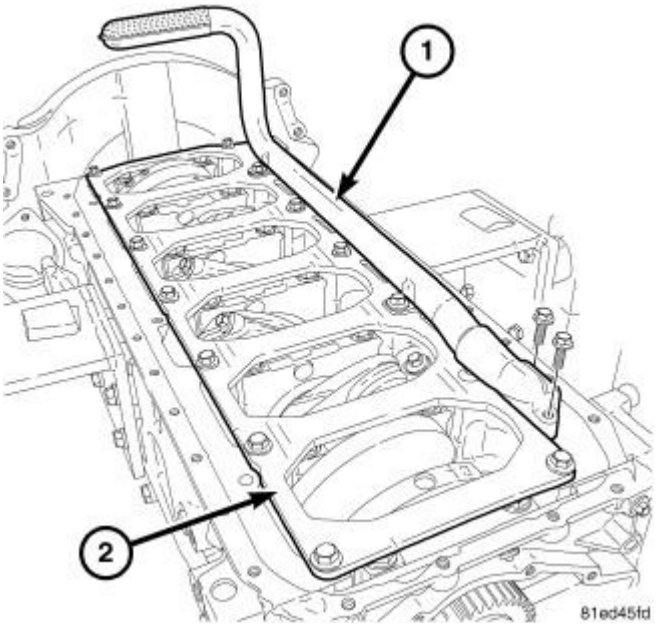

Fig. 272: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

6. Place suction tube in oil pan and guide them into place. Using a new tube-to-block gasket, install the suction tube. Tighten the bolts to 24 N.m (18 ft. lbs.).
7. Install the engine block stiffener. Tighten bolts to 43 N.m (32 ft. lbs.).
8. Install the oil pan. Starting from the center and working outward, tighten the oil pan bolts to 28 N.m (21 ft. lbs.).
9. Install the engine oil dipstick.
10. Install the flywheel to crankshaft adapter. Tighten to 137 N.m (101 ft. lbs.).

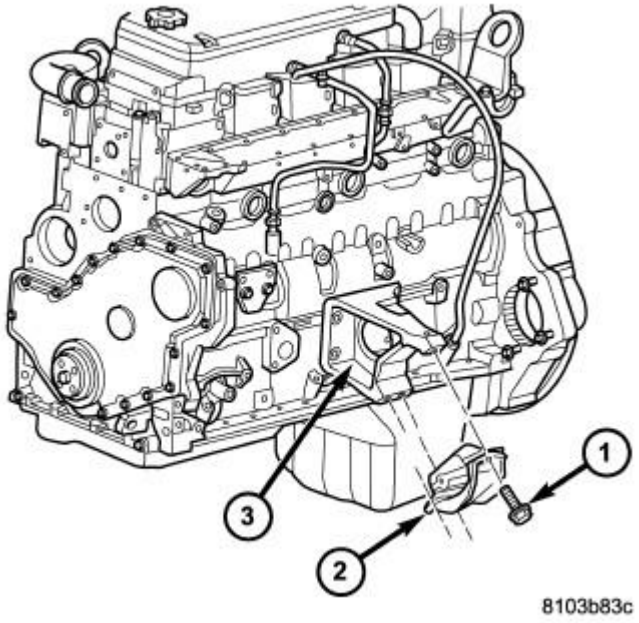

Fig. 273: Mount, Insulator & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - Bolt
2 - Insulator
3 - Mount

11. Lower the engine into the motor mounts and tighten the through bolts to 88 N.m (64 ft. lbs.).
12. Remove the Engine Support Fixture No. (special tool #8534B, Fixture, Driveline Support).

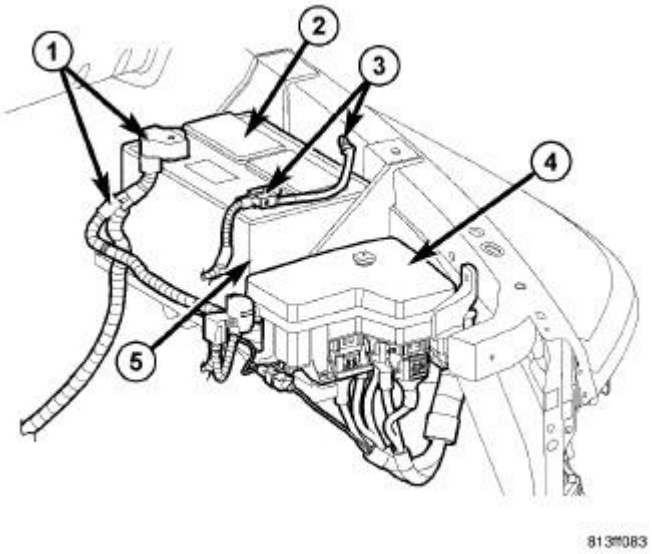

Fig. 274: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

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

13. Install the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
14. Connect both negative battery cables.
15. Fill the crankcase with new engine oil.
16. Start engine and check for leaks. Stop engine, check oil level, and adjust, if necessary.

4X2

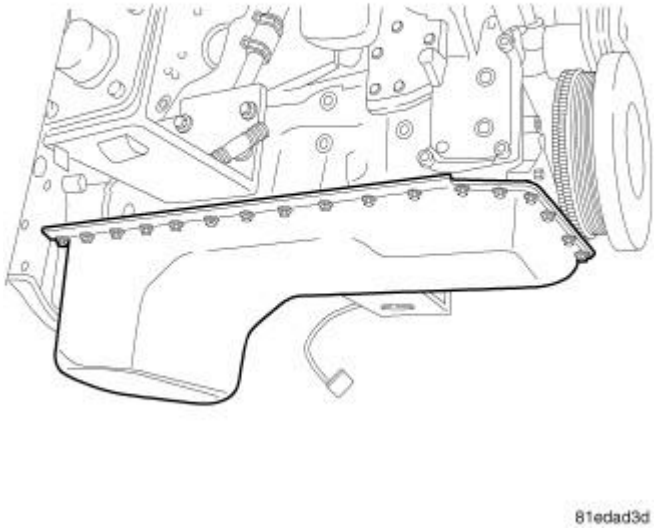

Fig. 275: Oil Pan
Courtesy of CHRYSLER GROUP, LLC

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.

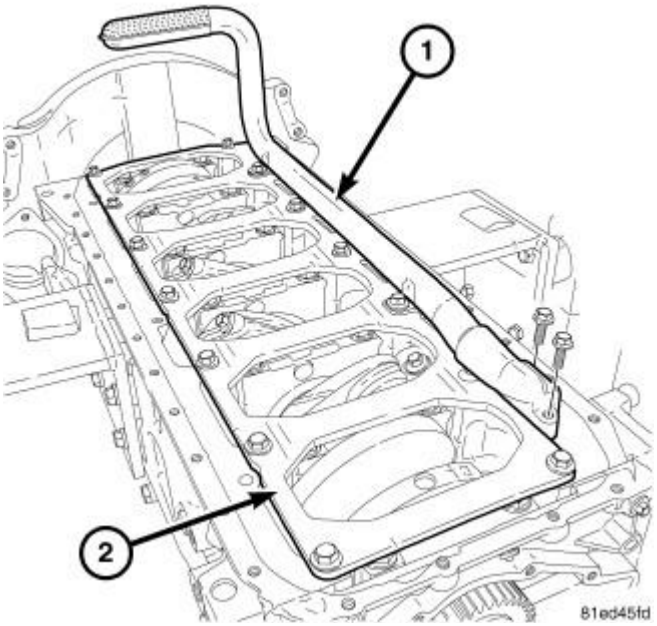

Fig. 276: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

6. Place suction tube in oil pan and guide them into place. Using a new tube-to-block gasket, install the suction tube bolts. Tighten the bolts to 24 N.m (18 ft. lbs.). Tighten the remaining tube brace bolts to 43 N.m (32 ft. lbs.).
7. Starting in the center and working outward, tighten the oil pan bolts to 28 N.m (21 ft. lbs.).
8. Install the steering rack bolts. Tighten bolts to 251 N.m (185 ft. lbs.).
9. Install the flex plate. Tighten bolts to 137 N.m (101 ft. lbs.).
10. Install the flywheel to crankshaft adapter. Tighten to 137 N.m (101 ft. lbs.).
11. Install the flywheel housing assembly with the starter motor attached and tighten bolts to 77 N.m (57 ft. lbs.).

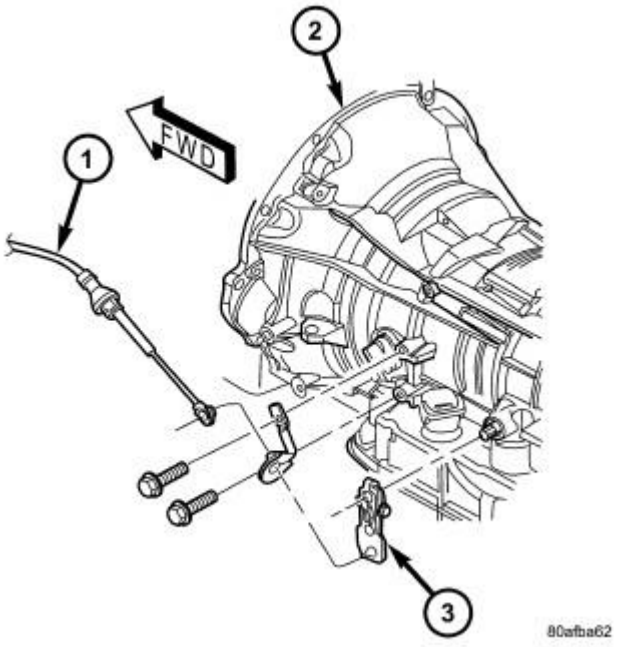

Fig. 277: Gearshift Cable, RFE Transmission & Manual Lever
Courtesy of CHRYSLER GROUP, LLC

1 - GEARSHIFT CABLE
2 - RFE TRANSMISSION
3 - MANUAL LEVER

12. Install transmission. Refer to appropriate Transmission Service Information article.
13. Install the starter. Refer to **STARTER, INSTALLATION** .

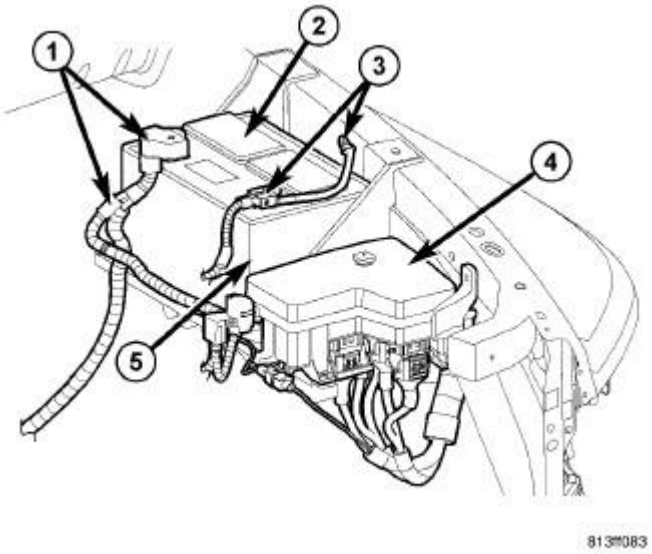

Fig. 278: Battery Cables
Courtesy of CHRYSLER GROUP, LLC

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

14. Install the fan and fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
15. Connect both negative battery cables.

PUMP, ENGINE OIL

REMOVAL

REMOVAL

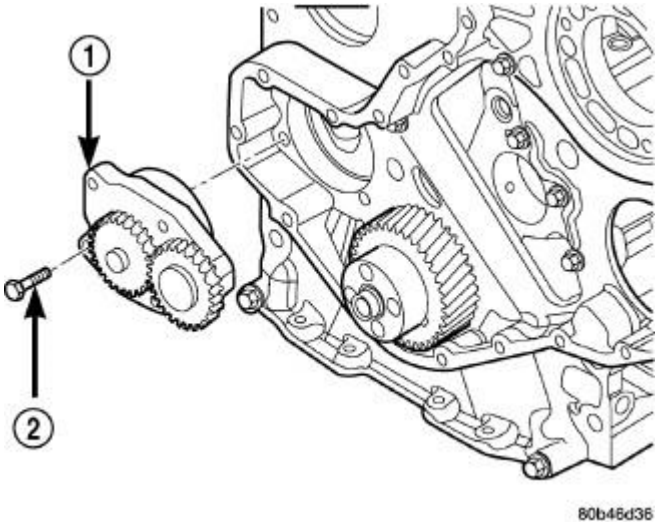

Fig. 279: Oil Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - OIL PUMP
2 - BOLT (4)

1. Disconnect the battery negative cables.
2. Remove fan/drive assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
3. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
4. Remove the fan support/hub assembly.
5. Remove crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 6.7L**.
6. Remove power steering pump.
7. Remove accessory drive belt tensioner.
8. Remove the gear housing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 6.7L**.
9. 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:

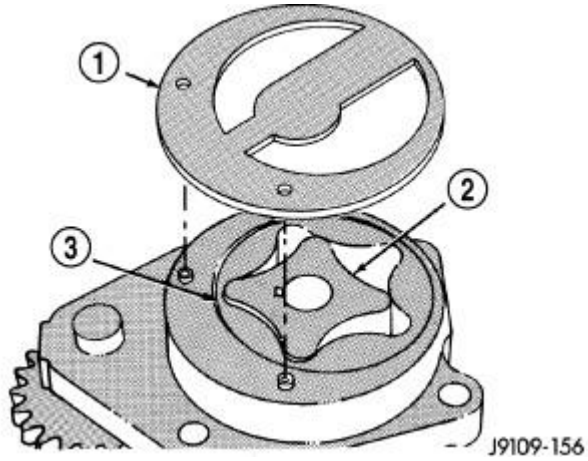

Fig. 280: Oil Pump Back Plate, Gerotor & Gerotor Planetary
Courtesy of CHRYSLER GROUP, LLC

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.

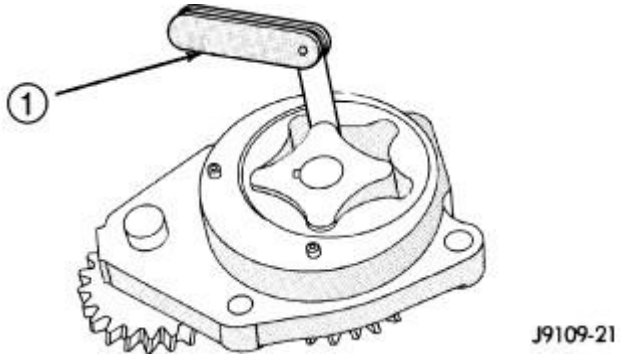

Fig. 281: Measuring Clearance Between Gerotor Tip & Housing
Courtesy of CHRYSLER GROUP, LLC

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.

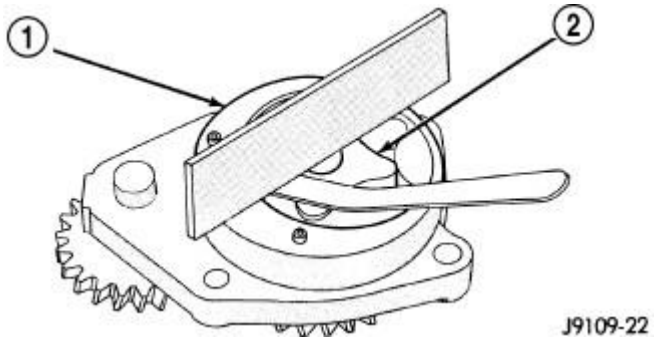

Fig. 282: Measuring Gerotor To Port Plate Clearance
Courtesy of CHRYSLER GROUP, LLC

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.

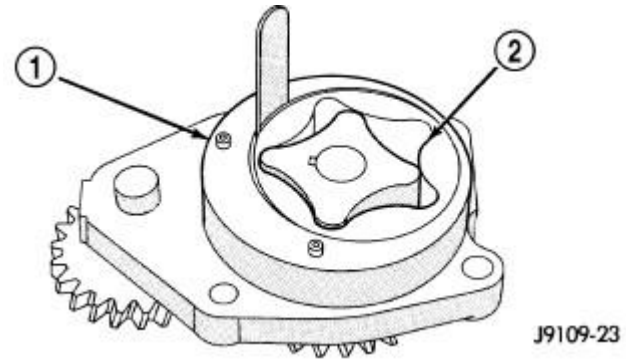

Fig. 283: Measuring Gerotor Planetary To Body Bore Clearance
Courtesy of CHRYSLER GROUP, LLC

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.

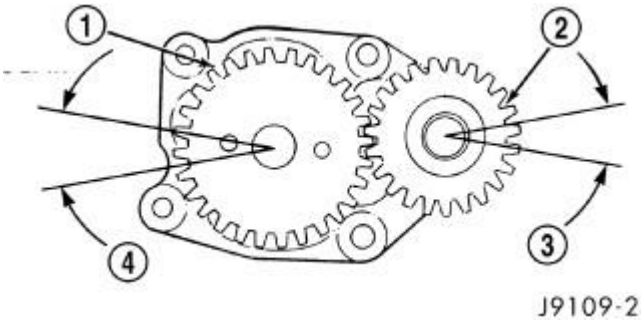

Fig. 284: Measure Gear Backlash
Courtesy of CHRYSLER GROUP, LLC

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

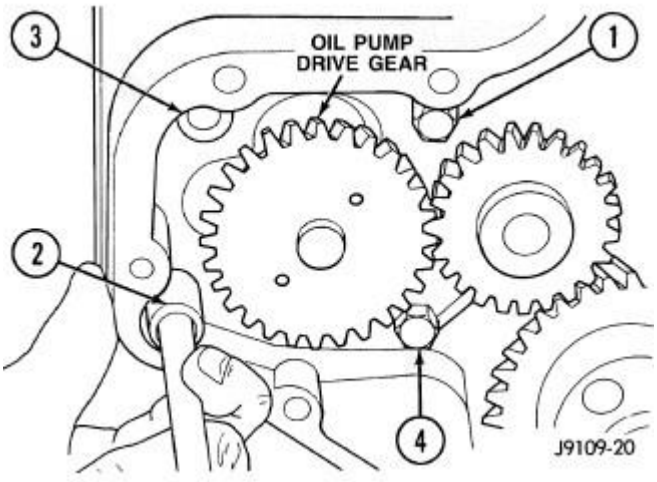

Fig. 285: Oil Pump Mounting Bolt Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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 (72 in. lbs).
    - Step 3: Tighten the bolts to 24 N.m (18 ft. lbs)

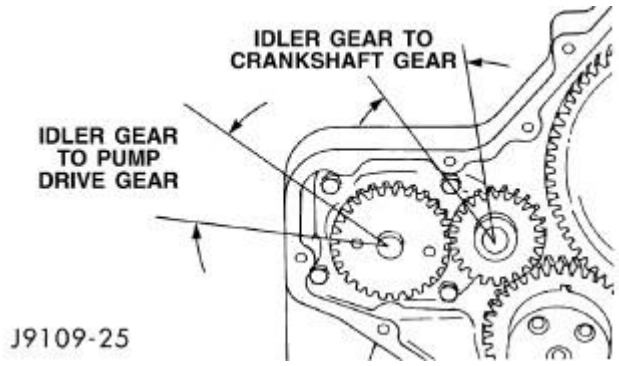

Fig. 286: Idler Gear To Pump Drive Gear & Crankshaft Gear Backlash
Courtesy of CHRYSLER GROUP, LLC

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. Apply a bead of Mopar® Silicone Rubber Adhesive Sealant or equivalent to the gear housing cover sealing surface.
7. Install the gear housing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 6.7L**.
8. Install the vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 6.7L**.
9. Install the fan support/hub assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
10. Install power steering pump.
11. Install accessory drive belt tensioner. Tighten bolt to 43 N.m (32 ft. lbs.).
12. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
13. Install the cooling fan. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
14. Connect battery negative cables.
15. Start engine and check for oil leaks.

SWITCH, OIL PRESSURE

REMOVAL

REMOVAL

1. Disconnect the battery negative cables.
2. Disconnect the oil pressure switch harness connector.
3. Remove the oil pressure switch from the engine block.

INSTALLATION

INSTALLATION

1. Using a new O-ring, install the oil pressure switch. Tighten to 18 N.m (159 in. lbs.).
2. Connect oil pressure switch harness connector.
3. Connect the battery negative cables.
4. Start engine and check for oil leaks at the switch.

VALVE, OIL PRESSURE RELIEF

REMOVAL

REMOVAL

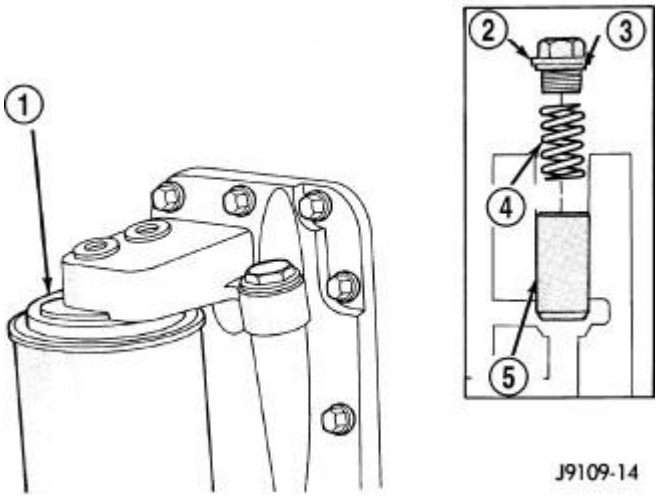

Fig. 287: Oil Filter & Oil Pressure Relief Valve
Courtesy of CHRYSLER GROUP, LLC

1 - OIL FILTER
2 - PLUG
3 - GASKET
4 - SPRING
5 - VALVE

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

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

CLEANING

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

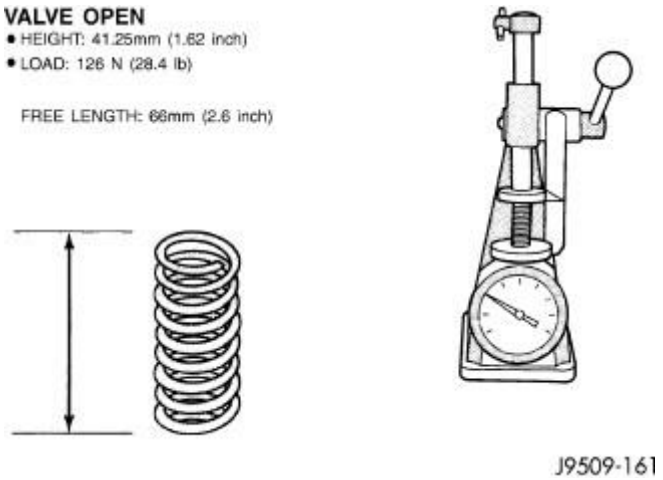

Fig. 288: Oil Pressure Regulator Spring Check
Courtesy of CHRYSLER GROUP, LLC

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

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

INSTALLATION

INSTALLATION

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

MANIFOLDS

MANIFOLD, EXHAUST

REMOVAL

REMOVAL

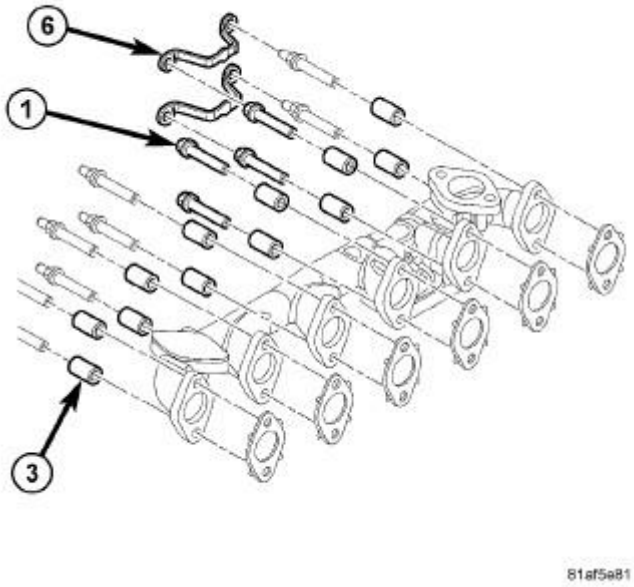

Fig. 289: Exhaust Manifold Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery negative cables.
2. Drain the coolant. Refer to **STANDARD PROCEDURE** .
3. Raise vehicle on hoist.
4. Remove the EGR cooler. Refer to **COOLER, EGR, REMOVAL** .
5. Remove the air filter housing. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
6. Remove the air filter inlet hose from the turbo inlet.
7. Remove the delta-P line bracket capscrew nuts and remove the delta-P line from the exhaust manifold and thermostat housing.
8. Remove the heat shield and noise panel (if equipped) from the exhaust manifold.
9. Remove the turbocharger. Refer to **TURBOCHARGER, REMOVAL, 6.7L**.
10. Remove the two (2) rear exhaust manifold capscrew lock plates.
11. Remove the Cab Heater tubing/bracket from the exhaust manifold stud.
12. Remove the exhaust manifold.

CLEANING

CLEANING

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

INSPECTION

INSPECTION

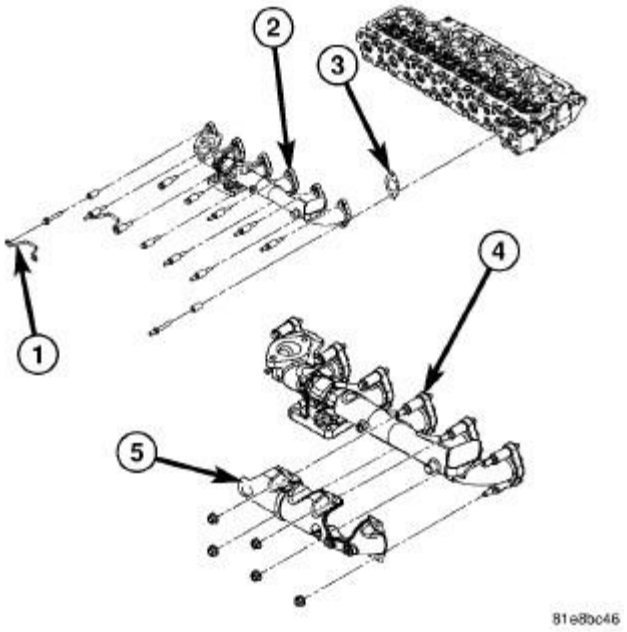

Fig. 290: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
Courtesy of CHRYSLER GROUP, LLC

1 - Retainer
2 - Exhaust Manifold
3 - Gasket
4 - Bolt
5 - Heat Shield

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 0.1 mm (0.0039 in). When measuring the exhaust manifold flanges, the total sum of exhaust flange and the turbocharger flange cannot exceed 0.1 mm (0.00039 in). If this is the case, the component with the greatest warpage must be replaced.

INSTALLATION

INSTALLATION

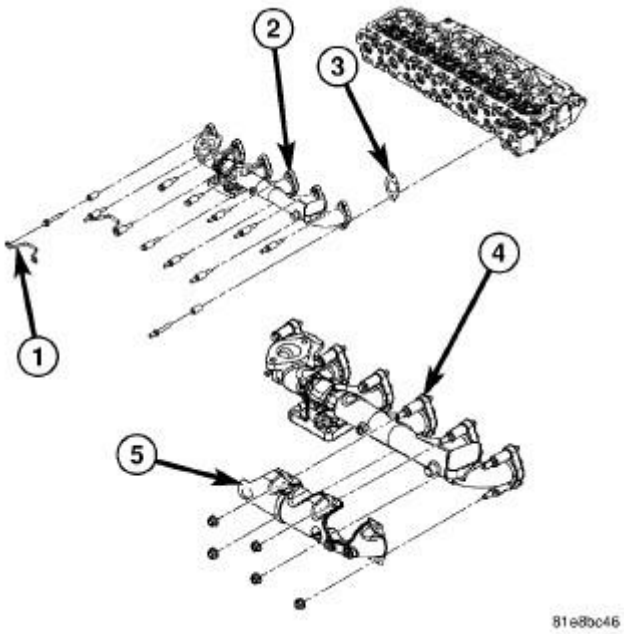

Fig. 291: Exhaust Manifold, Gasket, Heat Shield, Retainer & Bolts
Courtesy of CHRYSLER GROUP, LLC

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. Install the exhaust manifold gasket.

NOTE: The five exhaust manifold capscrews with studs are used at the No. 1 and No. 2 cylinder locations for the heat shield mounting and one on the rear lower corner of the manifold for the cabin heater tube bracket.

7. Install the exhaust manifold spacers and capscrews.
8. Starting from the center and moving in a pattern outward, tighten the exhaust manifold bolts to 43 N.m (32 ft. lbs.)
9. Install the exhaust manifold capscrew lock plates.
10. Install the exhaust manifold heat shields/noise panels. Tighten the mounting nuts to 24 N.m (18 ft. lbs.).
11. Install the turbocharger. Refer to **TURBOCHARGER, INSTALLATION, 6.7L**.
12. Attach the mounting tabs and start the delta-P tube to exhaust manifold and thermostat capscrews.
13. Tighten the delta-P line bracket nut to 24 N.m (18 ft. lbs.).
14. Tighten the delta-P line bracket bolt to 10 N.m (89 in. lbs.).
15. Tighten the delta-P flare nuts to 10 N.m (89 in. lbs.).

16. Install the EGR cooler. Refer to **COOLER, EGR, INSTALLATION** .
17. Install the air filter housing. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
18. Fill the coolant. Refer to **STANDARD PROCEDURE** .
19. Connect the battery negative cables.
20. Start the engine to check for leaks.

MANIFOLD, INTAKE

REMOVAL

REMOVAL

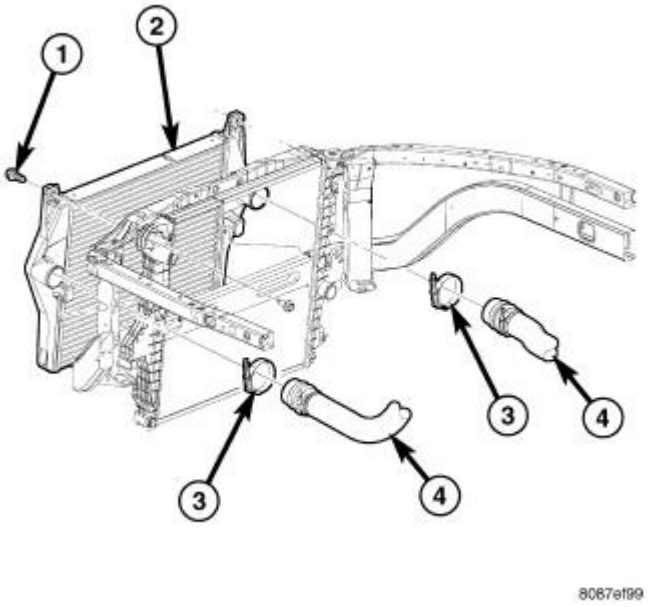

Fig. 292: Air Intake System Tubes
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both negative battery cables.
2. Disconnect the Charge Air Cooler (CAC) tube (4) from the EGR air flow control valve.

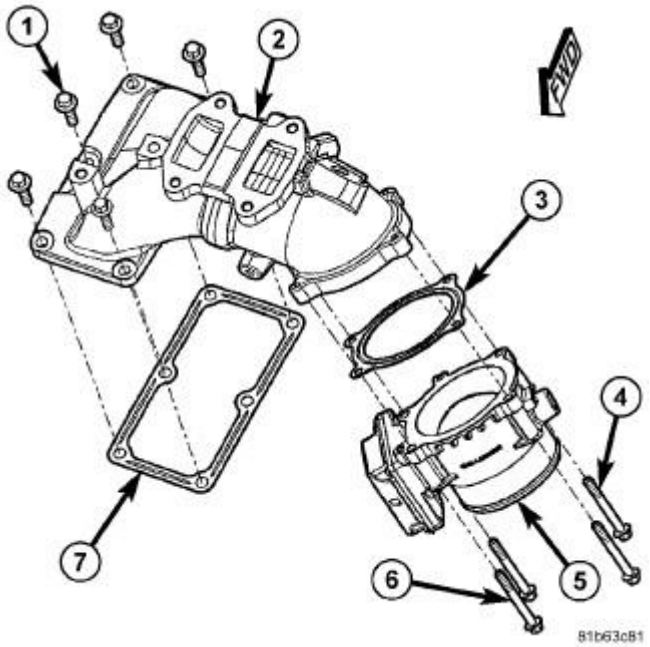

Fig. 293: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

3. Remove the EGR crossover tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, REMOVAL** .
4. Disconnect EGR air flow control valve harness connector.
5. Disconnect the EGR valve harness connector.
6. Disconnect the boost pressure sensor harness connector.
7. Remove bolt and nut securing oil dipstick tube.
8. Remove bolts (1) and the intake manifold (2).

CLEANING

CLEANING

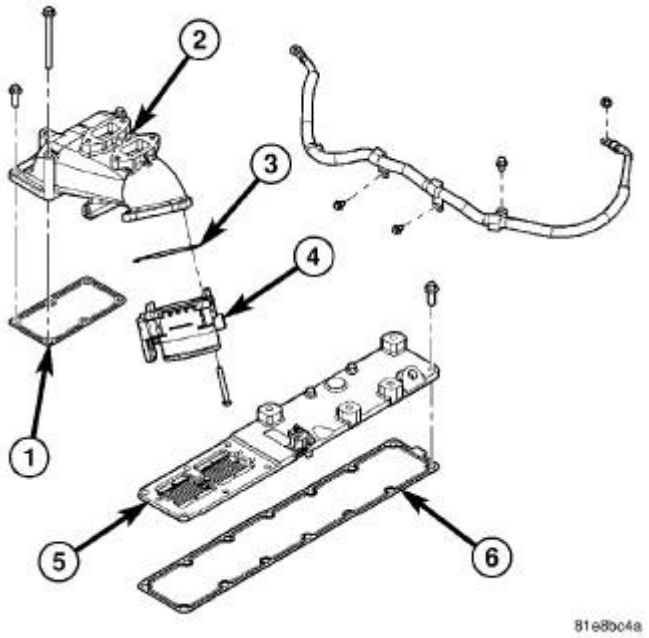

Fig. 294: Intake Air Heater Assembly
Courtesy of CHRYSLER GROUP, LLC

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

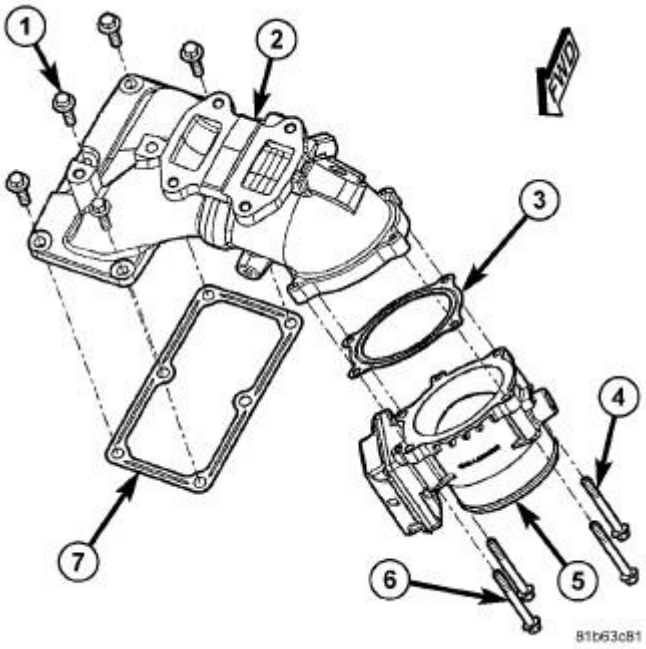

Fig. 295: EGR Air Flow Control - Exploded View
Courtesy of CHRYSLER GROUP, LLC

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. Connect the boost pressure sensor harness connector.
5. Connect the EGR valve harness connector.
6. Connect EGR air flow control valve harness connector.
7. Install the EGR crossover tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), CROSSOVER, INSTALLATION** .

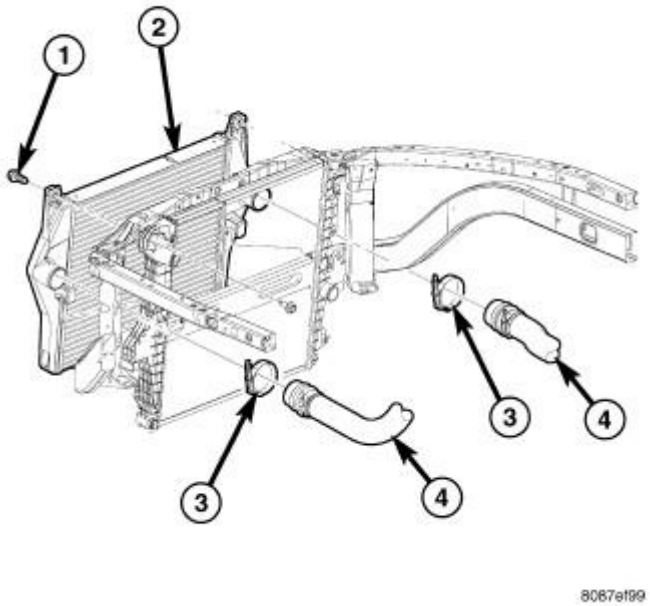

Fig. 296: Air Intake System Tubes
Courtesy of CHRYSLER GROUP, LLC

8. Connect the Charge Air Cooler (CAC) tube (4) to the EGR air flow control valve. Tighten clamp to 11 N.m (97 in. lbs.).
9. Connect both negative battery cables.

TURBOCHARGER SYSTEM

CLEANING

CLEANING

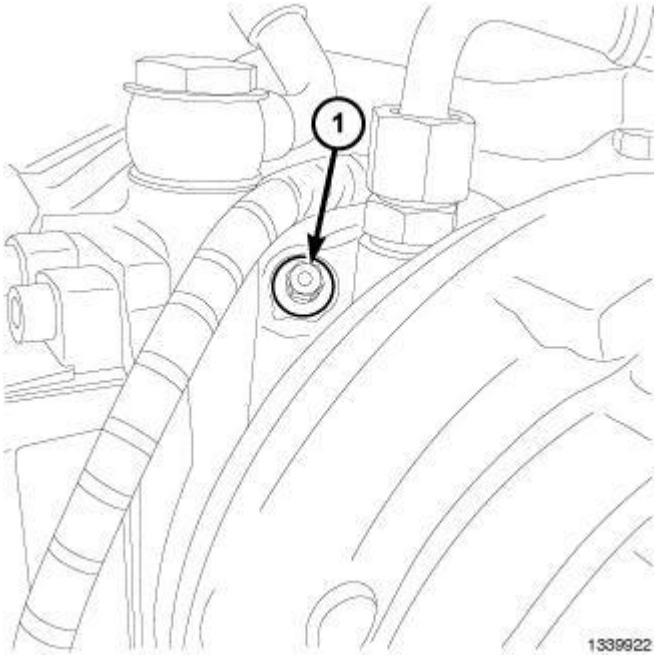

Fig. 297: Turbocharger Cleaning Port Plug
Courtesy of CHRYSLER GROUP, LLC

DETERMINE IF TURBOCHARGER HAS A CLEANING PORT

1. Inspect the engine turbocharger to determine if the turbocharger is equipped with a cleaning port
2. Does the turbocharger have a cleaning port?
3. **If YES GO TO , TURBOCHARGER CLEANING PROCEDURE**
4. **If NO GO TO , INSTALL A TURBOCHARGER CLEANING PORT**

INSTALL A TURBOCHARGER CLEANING PORT

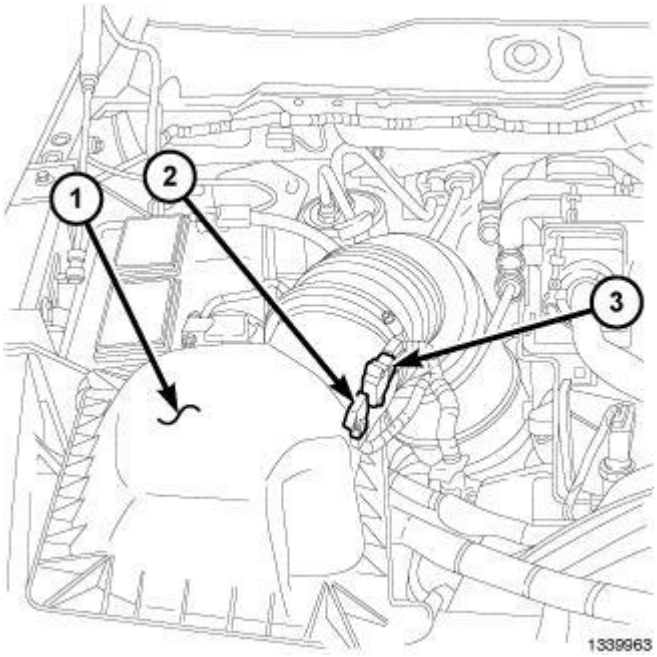

Fig. 298: Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

WARNING: At no time should a combustible cleaner be used. To introduce a combustible cleaner to the engine and/or exhaust after treatment system may cause damage to those systems and possible personal injury.

1. At the air filter housing cover, disconnect the Mass Air Flow (MAF) and the Inlet Air Temperature / Pressure (TBAP) sensors electrical connectors from the engine harness.
2. Remove the air filter housing cover (1) and fresh air tube together as an assembly.
3. With the turbocharger actuator electrical connector connected, turn the vehicle ignition switch to "ON/RUN" position. **DO NOT start the engine.**

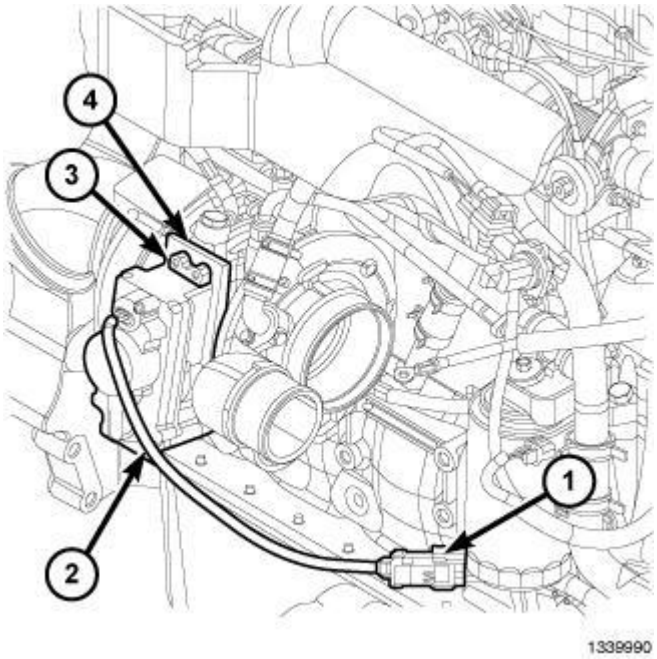

Fig. 299: Turbocharger Actuator Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the turbocharger actuator electrical connector (1) from the engine harness.
5. Turn the vehicle ignition switch to the "OFF" position.
6. Disconnect and isolate negative battery cables on each battery.

CAUTION: Performing the above steps now will become very important later in this procedure. The above steps should not be overlooked. The above steps will insure that the nozzle ring inside the turbocharger is moved so that it will not come in contact with the drill bit or tap. Failure to perform the above steps may damage the turbocharger mechanism.

7. Locate the Closed Crankcase Ventilation (CCV) tube hold down cap screw on the steel section of the CCV tube. Remove the CCV tube hold down cap screw.
8. Rotate the CCV tube upward and out of the way of the turbocharger.
9. Locate the turbocharger speed sensor that is mounted on top of the center section (bearing housing) of the turbocharger housing.

NOTE: Clean the area of any dirt and/or debris that may be around the turbocharger speed sensor prior to removal.

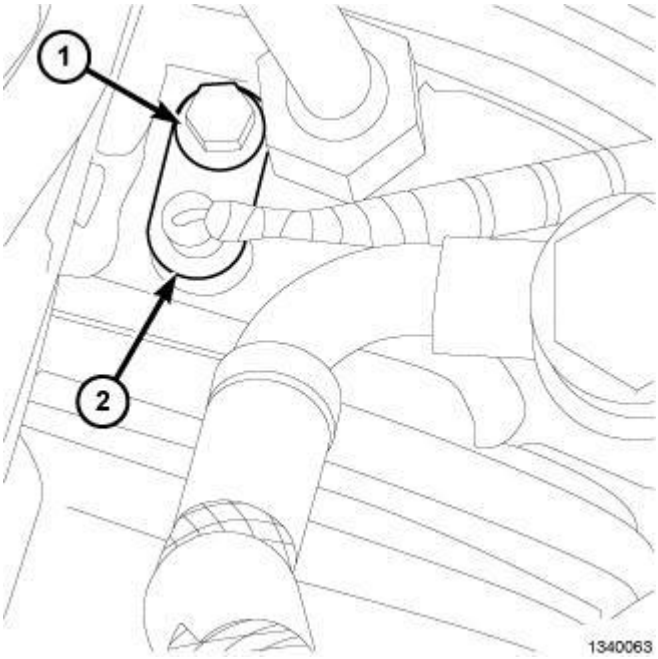

Fig. 300: Turbocharger Speed Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

10. Remove the turbocharger speed sensor attaching bolt (1). The bolt will be used later to hold in place the drill/tap guide of the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit
11. Remove the turbocharger speed sensor (2). Verify that the speed sensor o-ring remains with the speed sensor and does not remain in the turbocharger center section / bearing housing.

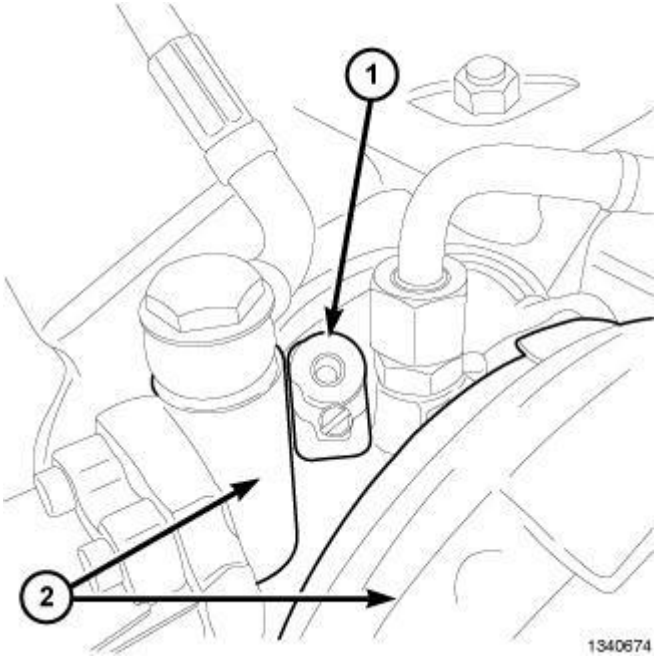

Fig. 301: Drill/Tap Guide
Courtesy of CHRYSLER GROUP, LLC

12. Using the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit, install the drill/tap guide (1) into the turbocharger center section / bearing housing. Secure the drill/tap guide (1) in place with the previously removed turbocharger speed sensor attaching bolt. Tighten the bolt to 10 N.m. (89 in. lbs.)

NOTE: There are two different size guide bushings that come with the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit. The guide bushing with the smaller inner diameter center bore is used for guiding the drill bit. The guide bushing with the larger inner diameter center bore is used to guide the tap.

13. Using the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit, install and secure the guide bushing with the small diameter bore hole (drill bit guide bushing) into the drill/tap guide bore.

NOTE: Only use special tool drill bit and stop (#(special tool #10143-4, Drill Assembly)) and tap (#(special tool #10143-5, Tap & Collar Assembly)) supplied in the Turbocharger Drill/Tap Kit #10143 to perform this Repair Procedure. ALWAYS check the drill stop to see if it is set correctly. It should be 42 mm (1 5/8 in.) from drill bit tip to bottom surface of the stop. VERIFY that the drill stop is set to the correct depth. VERIFY that the stop set screws are fully tightened. DO NOT over drill the hole.

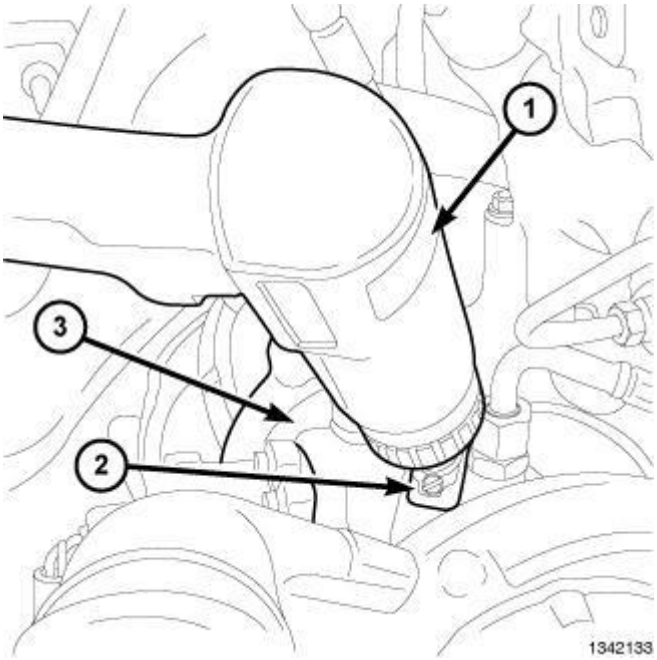

Fig. 302: Drilling Hole Through Turbocharger Center Housing
Courtesy of CHRYSLER GROUP, LLC

14. Obtain a shop vacuum with a crevice attachment end to collect drill bit fillings. Make certain that the crevice tool is held as close as possible to the drill tip when drilling, and to the tap tip when taping the

drilled hole. A small amount of filings that may enter into the drilled hole is acceptable.

NOTE: DO NOT use any machining oil or other lubrication oil during the drilling and tapping operation. Use of machining oil or other lubricating oil may increase the number of drill and tap shavings introduced into the turbocharger, potentially leading to turbocharger mechanism failure.

15. Using a drill on **SLOW speed** and the shop vacuum to collect filings, drill a hole through the turbocharger center housing casting to the correct depth. Continue to drill until the drill stop just makes contact with the turbocharger housing.
16. Remove the drill bit from the drill/tap guide. Remove the drill guide bushing from the drill/tap guide. First, **vacuum** any excess metal filings. Next, using a **pencil magnet** with a magnetic tip smaller than the drilled hole, insert the magnet through the drilled hole and remove shavings as possible. **DO NOT** use the magnet during the process of drilling and taping as this would cause the drill/tap fixture and the turbocharger housing to become magnetized.
17. Using the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit, install and secure the guide bushing with the larger diameter guide bore (tap guide bushing) into the drill/tap guide bore.

NOTE: Only use special tool drill bit and stop (#(special tool #10143-4, Drill Assembly)) and tap (#(special tool #10143-5, Tap & Collar Assembly)) supplied in the Turbocharger Drill/Tap Kit #10143 to perform this Repair Procedure. ALWAYS check the drill stop to see if it is set correctly. It should be 42 mm (1 5/8 in.) from drill bit tip to bottom surface of the stop. VERIFY that the drill stop is set to the correct depth. VERIFY that the stop set screws are fully tightened. DO NOT over drill the hole.

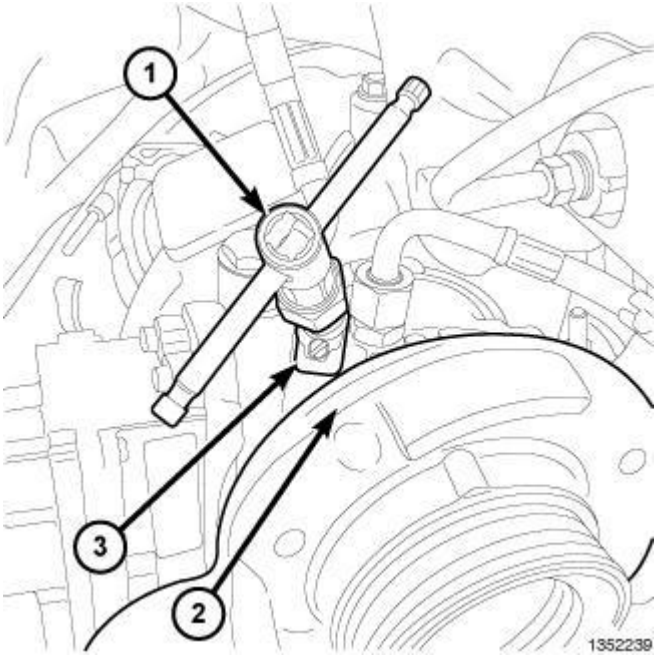

Fig. 303: Removing/Installing Tap

Courtesy of CHRYSLER GROUP, LLC

18. Using the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit, install the tap into the tap bushing bore of the drill/tap guide.
19. Using the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit, install the tap handle to the drive end of the tap. If additional clearance is desired, install the female end of a 3 inch or 6 inch long 1/4 inch drive socket extension to the tap and then install the male end of the 1/4 inch extension to the tap handle.

NOTE: DO NOT use any machining oil or other lubrication oil during the drilling and tapping operation. Use of machining oil or other lubricating oil may increase the number of drill and tap shavings introduced into the turbocharger, potentially leading to turbocharger mechanism failure.

20. Using the tap and tap handle from the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger drill/tap kit in conjunction with the shop vacuum to collect filings, tap the previously drilled hole made in the turbocharger center housing casting approximately **11 1/2 turns** . This should be just about when turbocharger housing just touches the bottom of the tap stop. **DO NOT OVER TAP THE HOLE** .
21. Remove the tap from the drill/tap guide. Remove the tap bushing from the drill/tap guide. First, **vacuum** any excess metal filings. Next, using a **pencil magnet** with a magnetic tip smaller than the drilled hole, insert the magnet through the drilled hole and remove as many shavings as possible. **DO NOT** use the magnet during the process of drilling and taping as this would cause the drill/tap fixture and the turbocharger housing to become magnetized.
22. Remove the drill/tap guide from the turbocharger center housing. First, **vacuum** any excess metal filings. Next, using a **pencil magnet** with a magnetic tip smaller than the drilled hole, insert the magnet through the drilled hole and remove as many shavings as possible.
23. Install the turbocharger speed sensor and attaching bolt to the turbocharger center housing. Tighten the attaching bolt to 10 N.m. (89 in. lbs.).
24. Install the stainless steel Mopar® turbocharger cleaning port plug into the cleaning port of the turbocharger. Tighten the plug to 10 N.m. (89 in. lbs.). Verify correct fit before proceeding.

NOTE: The use of the proper Mopar® Turbocharger Cleaning Port plug is critical. Use of an unapproved plug of different material type and/or thread may cause damage to the turbocharger.

25. Connect the engine harness connector to the turbocharger actuator connector.
26. Rotate the CCV tube into position and install the CCV tube cap screw. Tighten the cap screw to 10 N.m. (89 in. lbs.).
27. Install the air filter housing cover and fresh air tube hose. Tighten the fresh air hose clamp to 4 N.m. (35 in. lbs.). Verify that there is a good seal at each end of the air tube hose.
28. Connect the engine harness connectors to the MAF and the inlet air temperature / pressure (TBAP) sensor connectors.
29. Connect the negative battery cable to each battery.
30. Start the vehicle engine and verify correct engine operation.

31. Turn off vehicle engine. Verify that the ignition switch is in the "OFF" position.

TURBOCHARGER CLEANING PROCEDURE

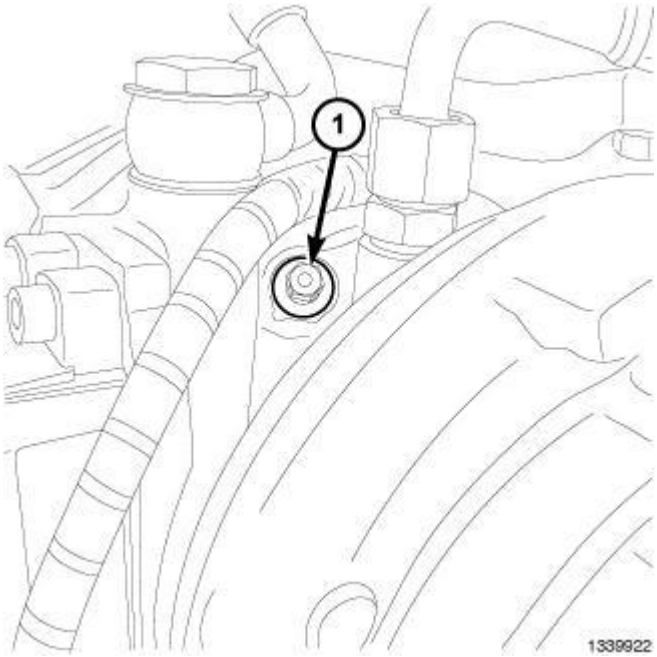

Fig. 304: Turbocharger Cleaning Port Plug
Courtesy of CHRYSLER GROUP, LLC

WARNING: Use ONLY Mopar® Diesel Turbocharger Cleaner (# 68044565AA) to perform this repair. Mopar® Diesel Turbocharger Cleaner is a specially made WATER BASED solvent. Use of a flammable, or any low temperature combustible liquid/solvent, may cause severe damage to the engine and exhaust after treatment system components. Introduction of a flammable liquid/solvent to the engine intake system may cause engine run away, engine damage, and possible personal injury.

1. Connect the vehicle tailpipe to the shop exhaust ventilation system. Turn the shop exhaust ventilation system ON.
2. If installed, remove the turbocharger cleaning port access plug (1).

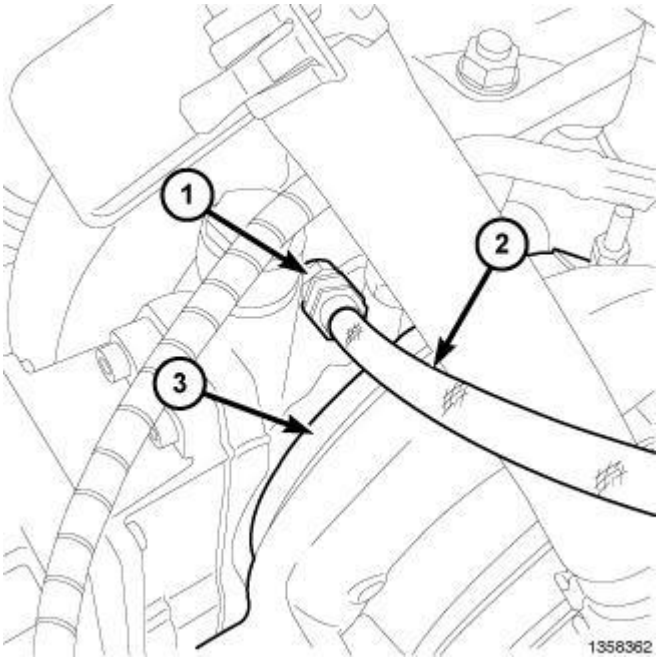

Fig. 305: Nozzle, Cleaning Tool Hose & Turbocharger
Courtesy of CHRYSLER GROUP, LLC

3. Locate the cleaning tool's hose and nozzle (1, 2) from the #(special tool #10142, Cummins Turbo Cleaning Kit) turbocharger cleaning kit special tool.

NOTE: The spray nozzle in the #(special tool #10142, Cummins Turbo Cleaning Kit) Turbocharger Cleaning Kit uses a very small orifice for the cleaner to pass through. The design of the nozzle is important for the proper application of the chemical. If the orifice in the spray nozzle becomes restricted, carefully inspect and clean the filtering screen at the entrance to the nozzle of any debris. If careful, the nozzle may be partially disassembled for cleaning, should this be needed.

4. Using the #(special tool #10142, Cummins Turbo Cleaning Kit) turbocharger cleaning kit, install the nozzle (1) of the turbocharger cleaning tool into the turbocharger cleaning port tapped hole. Use care not to cross-thread the tapped hole. Tighten the nozzle to 5.6 N.m. (50 in. lbs.).
5. Place a fender cover over the top of the right battery to isolate/insulate the battery terminal ends from the cleaning tool hose (2).

NOTE: In the following steps, DO NOT INSTALL the cleaner can on the tool. In some instances, the scan tool may perform a series of tests that may instruct the technician NOT to clean the turbocharger. The tool is installed prior to warming the engine to prevent the technician from having to work on a hot turbocharger. Installing the can on the hose will puncture the can.

6. Using the #(special tool #10142, Cummins Turbo Cleaning Kit) turbocharger cleaning kit, install the hose (2) of the turbocharger to the other end of the cleaning nozzle (1).

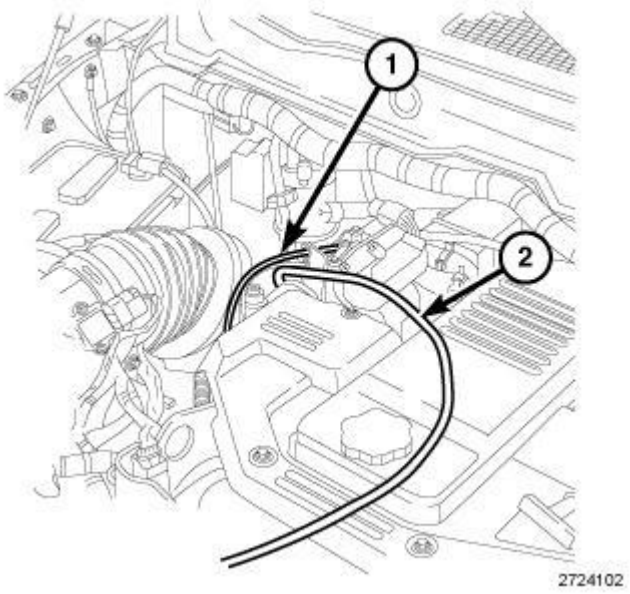

Fig. 306: Cleaning Tool Hose
Courtesy of CHRYSLER GROUP, LLC

7. Route the tap end of the cleaning tool hose under both cable sleeves of the EGR Cooler By-Pass Valve Assembly so that the cleaning tool hose is held away from the positive battery terminal by the throttle body cable sleeves.

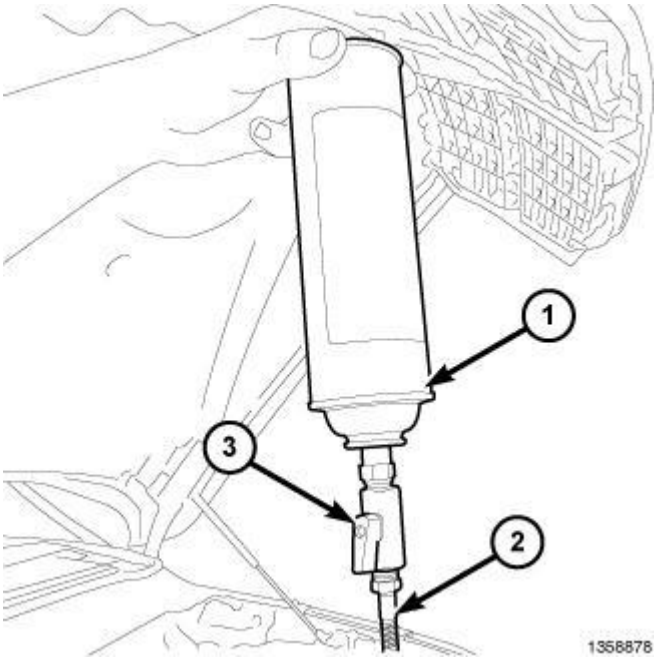

Fig. 307: Turbocharger Cleaner Can, Handle & Hose
Courtesy of CHRYSLER GROUP, LLC

8. Verify that the turbocharger cleaning tool tap cutoff valve is in the CLOSED position, the handle (3)

should be positioned 90° to the hose (2). **Do not install cleaner can (1) at this time.**

9. Make sure the truck is in "Park" (automatic transmission equipped) or "Neutral" (manual transmission equipped) and the parking brake is ON.
10. Start the vehicle engine and allow the engine to idle and warm.
11. Using the scan tool, from the "HOME" menu select, "PCM".
12. Using the scan tool, select "More Options".
13. Using the scan tool, select "System Test".
14. Using the scan tool, select "Start".
15. Using the scan tool, select "Set engine speed to 2, 000 RPM".
16. Follow the scan tool prompts, then select "Actuate".
17. Monitor the engine temperature and continue to run the vehicle engine until the engine temperature is **ABOVE 82C (180F).**

NOTE: The vehicle engine must be fully warmed (82C/180F or higher) so that the turbocharger and accumulated soot are at the correct higher temperatures for this repair to be effective. The exhaust side of the turbocharger will be significantly higher in temperature than the 82C/180F engine operating temperature.

NOTE: If the following function does not appear on the scan tool, ensure the scan tool software is version 10.02 or later. If the scan tool has 10.02 or later, the PCM will need to be flashed to the latest available software before proceeding.

18. Using the scan tool, from the "HOME" menu select, "ECU View".
19. Using the scan tool, select "PCM".
20. Using the scan tool, select "Misc Functions".
21. Using the scan tool, select "VG Turbo Cleaning Procedure".
22. Using the scan tool, select "Start".
23. Follow the scan tool prompts. When instructed, verify that the turbocharger cleaning tool tap cutoff valve is in the CLOSED position and install the Mopar® Diesel Turbocharger Cleaner # 68044565AA (1).
24. Continue to follow the scan tool prompts. The prompts in the cleaning process may instruct the technician to clean the turbocharger using a second or possibly a third can of Mopar® Diesel Turbocharger Cleaner # 68044565AA. Use as many cans as requested but **no more than 3 cans.** If cleaning is ineffective, the scan tool may prompt the technician to replace the turbocharger.

NOTE: During the cleaning process, be sure to follow the on screen instructions carefully. Specifically, do not key off, press the accelerator or brake pedals, unplug the scan tool, release

NOTE: To dispense the full contents of the cleaner correctly, the Mopar® Diesel Turbocharger Cleaner can # 68044565AA (1) must be UPSIDE DOWN (can

nozzle pointing towards the ground). It is preferred that the Mopar® Diesel Turbocharger Cleaner can # 68044565AA (1) be higher than the level of the turbocharger while the cleaner is being dispensed, if possible, hang the cleaner can on the hood latch.

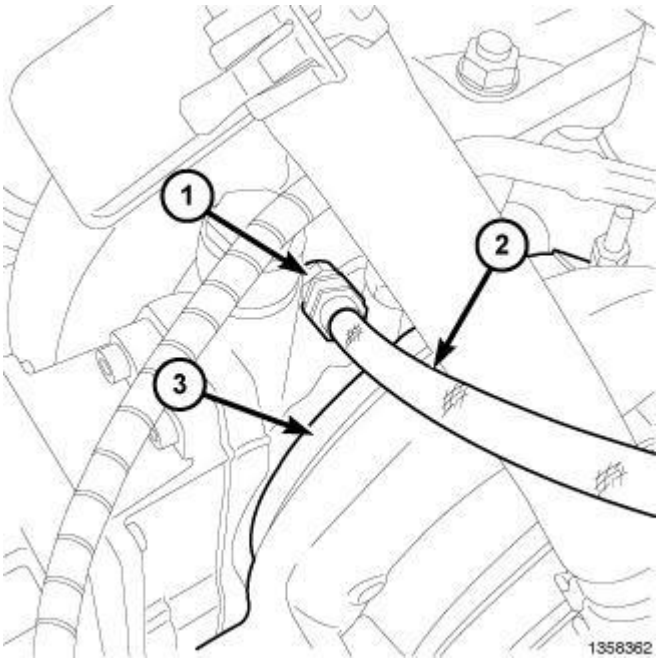

Fig. 308: Nozzle, Cleaning Tool Hose & Turbocharger
Courtesy of CHRYSLER GROUP, LLC

25. After completing the cleaning procedure via the scan tool, remove the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger cleaning tool hose (2) from the cleaning tool nozzle.
26. Remove the #(special tool #10143, Cummins Turbo Drilling Kit) turbocharger cleaning tool nozzle (1) from the turbocharger housing (3).

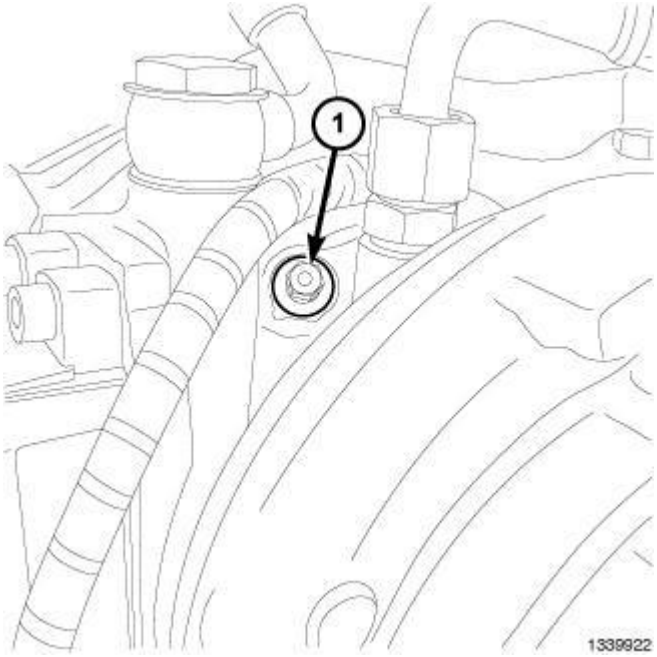

Fig. 309: Turbocharger Cleaning Port Plug
Courtesy of CHRYSLER GROUP, LLC

27. Install the stainless steel Mopar® turbocharger cleaning port plug (1) into the cleaning port of the turbocharger. Tighten the plug to 10 N.m. (89 in. lbs.).

NOTE: The use of the proper Mopar® plug is critical. Use of an unapproved plug of different material type and/or thread may cause damage to the turbocharger.

28. Remove the protective fender cover from the right battery.
29. Perform a powertrain verification test to ensure there are no additional issues.

NOTE: It is important to perform the complete repair when cleaning a turbocharger. DO NOT omit any steps in the cleaning process

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 Engine Control Module (ECM) 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 ECM to see 0% throttle and 0% fuel delivery.

REMOVAL

REMOVAL

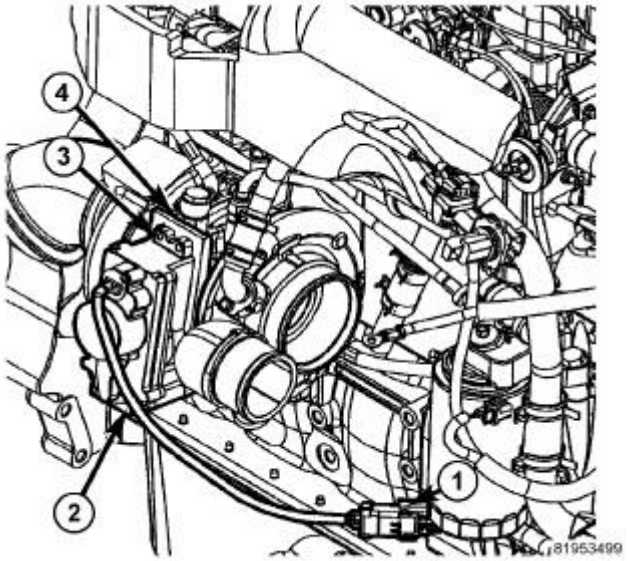

Fig. 310: Electrical Connector, Turbocharger Actuator, Mounting Bolts & Turbocharger
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - TURBOCHARGER ACTUATOR

3 - MOUNTING BOLTS
4 - TURBOCHARGER

1. Disconnect the battery negative cables.
2. Raise vehicle on hoist.
3. Drain cooling system. Refer to **STANDARD PROCEDURE** .
4. Remove air filter housing. Refer to **BODY, AIR CLEANER, REMOVAL, 6.7L**.
5. Disconnect turbocharger actuator electrical connector (1).
6. Remove turbocharger actuator mounting bolts (3).
7. Remove turbocharger actuator (2).
8. Clean mounting surface.

INSTALLATION

INSTALLATION

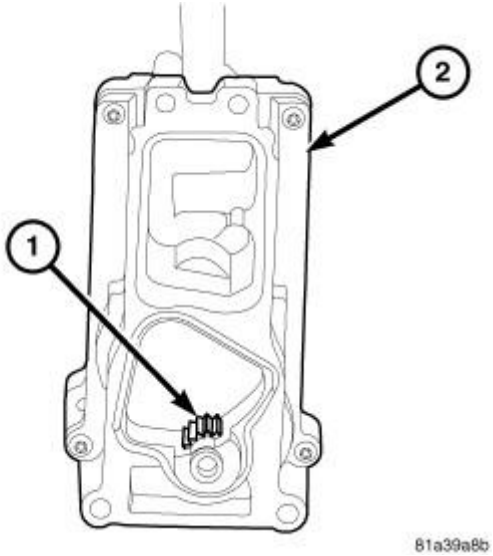

Fig. 311: Turbocharger Actuator Gear & Housing
Courtesy of CHRYSLER GROUP, LLC

1 - ACTUATOR GEAR
2 - ACTUATOR HOUSING

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 turbocharger actuator (2) in engine compartment so the actuator gear (1) will be free to rotate.
3. Connect turbocharger actuator electrical connector.
4. Connect negative battery cable.
5. Turn key on, **do not start engine.**
6. Using a scan tool function "Misc functions" under ECU, perform VG Turbo Actuator Pre-Align/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 key off or disconnect the tool after performing the turbo 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. Apply grease to turbocharger actuator sector gear in a line across center of all teeth.
8. Install O-ring on turbocharger actuator.

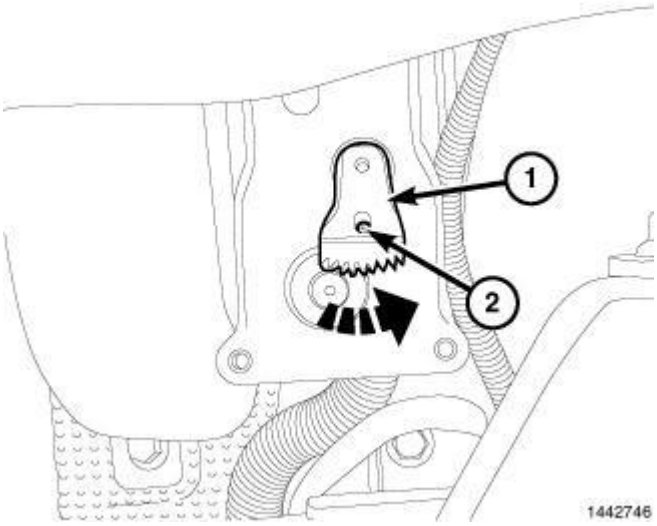

Fig. 312: Selector Gear - Forward Position & Selector Gear Alignment Hole
Courtesy of CHRYSLER GROUP, LLC

1 - SELECTOR GEAR - FORWARD POSITION
2 - SELECTOR GEAR ALIGNMENT HOLE

9. Rotate turbocharger sector gear (1) counterclockwise (forward). Insert large end of alignment pin (or a 0.187 in. pin or a 3/16 in. drill) through sector gear alignment hole (2) until it engages hole in

turbocharger bearing housing and sector gear will not rotate. Remove alignment pin from turbocharger actuator sector gear.

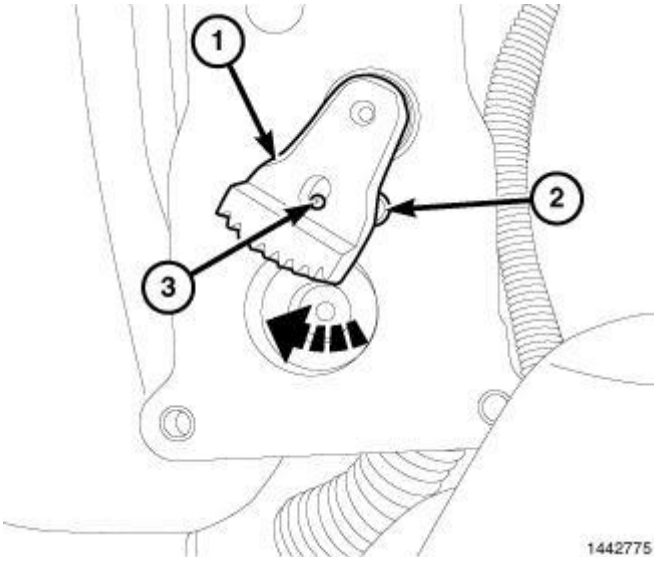

Fig. 313: Selector Gear - Rearward Position, Bearing Housing Alignment Hole & Selector Gear Alignment Hole
Courtesy of CHRYSLER GROUP, LLC

1 - SELECTOR GEAR - REARWARD POSITION
2 - BEARING HOUSING ALIGNMENT HOLE
3 - SELECTOR GEAR ALIGNMENT HOLE

10. Rotate the sector gear (1) clockwise (rearward) and insert small end of alignment tool (or 0.125 in. pin or a 1/8 in drill.) through the sector gear alignment hole (3) until it engages the alignment hole in turbocharger bearing housing (2) and sector gear will not rotate. If alignment pin does not engage hole in turbocharger bearing housing (2), variable geometry mechanism is not opening completely. Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING, 6.7L**.
11. Install guide pins on turbocharger.
12. Remove alignment pin from turbocharger actuator sector gear. **Do not move the sector gear at this point.**
13. Position turbocharger actuator on guide pins and install.
14. Install two mounting screws. Hand tighten only.
15. Remove guide pins. Install remaining two mounting screws. Tighten mounting screws in a cross pattern to 11 N.m (96 in. lbs.).

CAUTION: The electronic turbocharger actuator must be installed on the turbocharger before performing this step. Incomplete installation of the electronic turbocharger actuator will result in failure of the calibration procedure.

16. Using the scan tool, perform the Self Calibrate portion of the "VG Turbo Actuator Pre-Align/Self

Calibrate" routine.

NOTE: If the TURBO ACTUATOR SELF CALIBRATE procedure fails, remove actuator and repeat installation one additional time. If this fails to clear error, replace turbocharger.

17. Place ignition in the OFF position.
18. Install air filter housing. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
19. 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.

The Charge Air Cooler 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

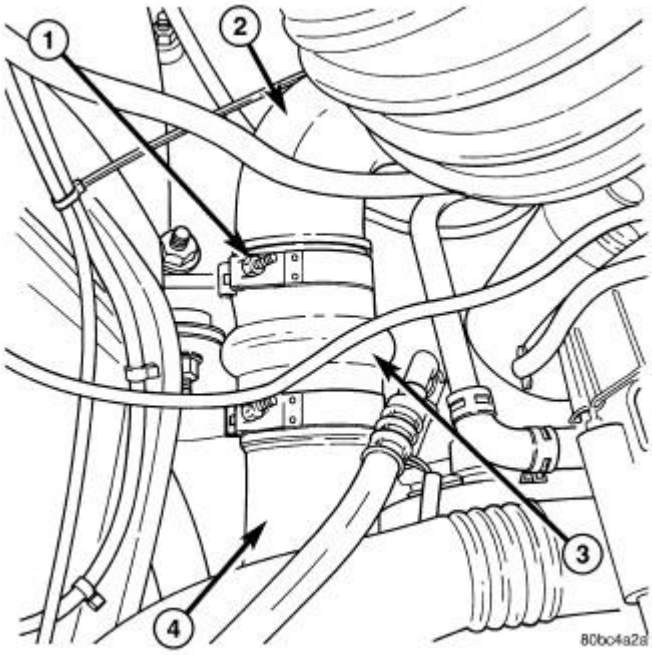

Fig. 314: Clamp, Turbocharger, Air Duct Rubber Sleeve & Air Inlet Duct

Courtesy of CHRYSLER GROUP, LLC

1 - CLAMP
2 - TURBOCHARGER
3 - AIR DUCT RUBBER SLEEVE
4 - AIR INLET DUCT

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.

This procedure can also be used to check for leaks in the wastegate signal line or the wastegate canister.

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.
5. Using MOPAR® Air Leak Detector check for leaks at the wastegate signal line, wastegate canister and wastegate command valve.

REMOVAL

REMOVAL

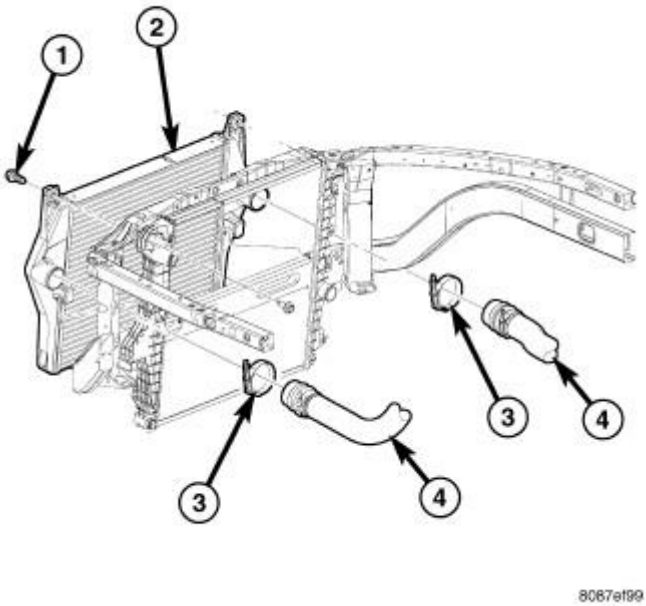

Fig. 315: Air Intake System Tubes
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - CHARGE AIR COOLER
3 - CLAMP
4 - BOOST TUBE

WARNING: IF THE ENGINE WAS JUST TURNED OFF, THE AIR INTAKE SYSTEM TUBES MAY BE HOT.

1. Disconnect the battery negative cables.
2. Discharge the A/C system and remove the A/C condenser. Refer to **PLUMBING, STANDARD PROCEDURE** . If A/C equipped, refer to **CONDENSER, A/C, REMOVAL** .
3. Remove the front grille assembly. Refer to **GRILLE, REMOVAL** .
4. Remove the transmission auxiliary cooler. Refer to **COOLER, TRANSMISSION OIL, REMOVAL** .
5. Remove the intake air tubing (4) from the charge air cooler (2).
6. Remove the charge air cooler bolts. Pivot the charge air cooler (2) forward and up to remove.

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

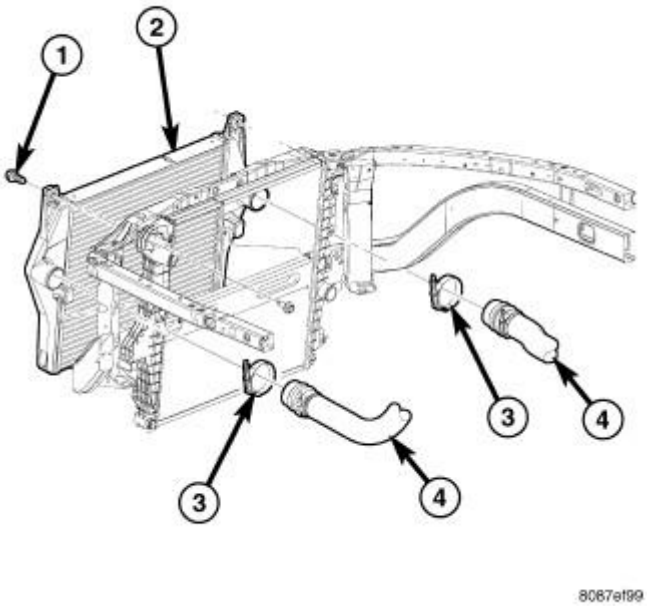

Fig. 316: Air Intake System Tubes
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - CHARGE AIR COOLER
3 - CLAMP
4 - BOOST TUBE

1. Position the charge air cooler (2). Install the bolts (1) and tighten to 2 N.m (17 in. lbs.) torque.
2. Install the air intake system tubes (4) to the charge air cooler (2). With the clamps in position, tighten the clamps to 11 N.m (95 in. lbs.) torque.
3. Install the transmission auxiliary cooler (if equipped). Refer to **COOLER, TRANSMISSION OIL, INSTALLATION** .
4. Install the A/C condenser (if A/C equipped). Refer to **CONDENSER, A/C, INSTALLATION** . Recharge A/C system. Refer to **PLUMBING, STANDARD PROCEDURE** .
5. Connect the battery negative cables.
6. Start engine and check for boost system leaks.
7. Install the front grille assembly. Refer to **GRILLE, INSTALLATION** .

LINES AND HOSES, TURBOCHARGER, OIL AND COOLANT

REMOVAL

REMOVAL

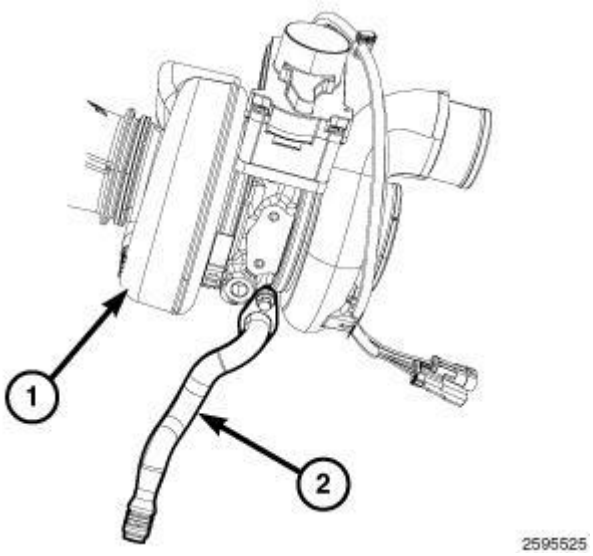

Fig. 317: Turbocharger & Drain Tube
Courtesy of CHRYSLER GROUP, LLC

1. Remove RH engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.
2. Remove turbocharger drain tube (2) mounting bolts.
3. Remove turbocharger drain tube (2) from the turbocharger (1).

INSTALLATION

INSTALLATION

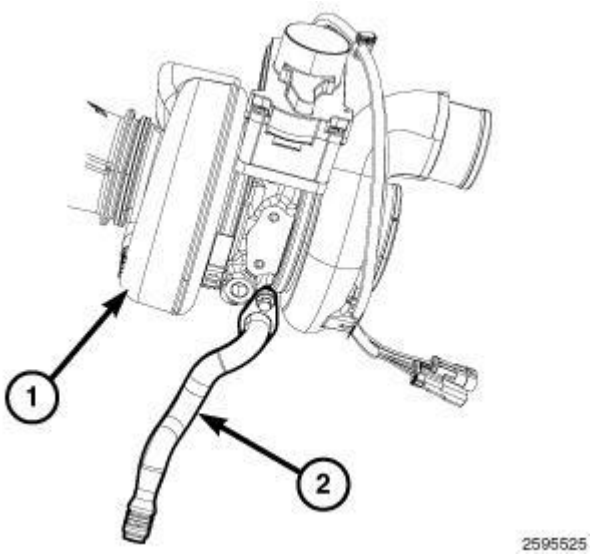

Fig. 318: Turbocharger & Drain Tube
Courtesy of CHRYSLER GROUP, LLC

1. Clean turbocharger drain tube (2) mounting surfaces.

2. Install new O-rings on turbocharger drain tube (2). Lubricate with clean engine oil.
3. Install turbocharger drain tube (2) into cylinder block.
4. Install new gasket and turbocharger drain tube (2) mounting bolts at turbocharger (1).
5. Tighten bolts to 24 N.m (18 ft. lbs.).
6. Install RH engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.
7. Start engine and check for leaks.

SENSOR, TURBOCHARGER SPEED

REMOVAL

REMOVAL

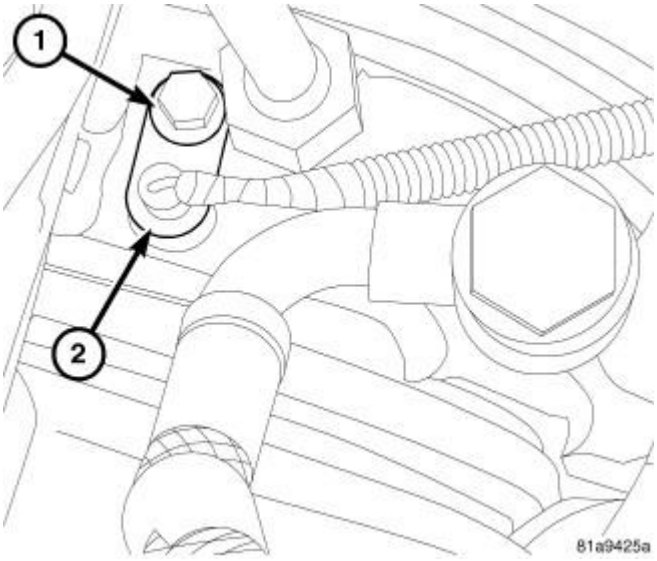

Fig. 319: Turbocharger Speed Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - TURBOCHARGER SPEED SENSOR

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.

1. Disconnect negative battery cable.
2. Remove turbocharger oil supply line.
3. Disconnect speed sensor electrical connector.
4. Remove turbocharger speed sensor mounting bolt (1).
5. Remove turbocharger speed sensor (2).

INSTALLATION

INSTALLATION

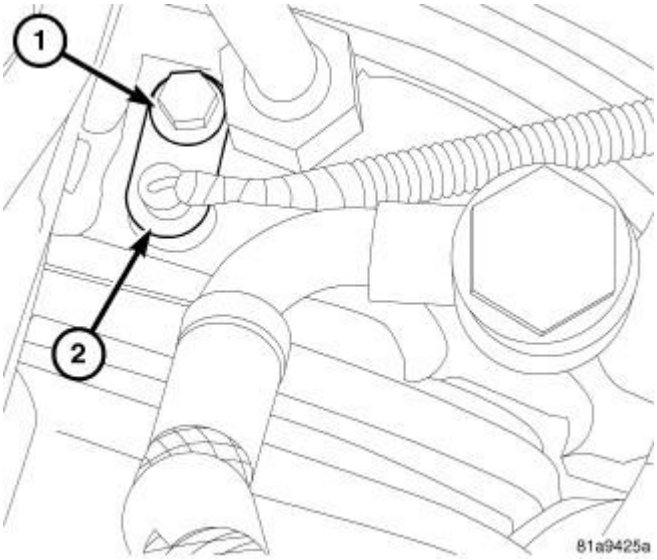

Fig. 320: Turbocharger Speed Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - TURBOCHARGER SPEED SENSOR

1. Install turbocharger speed sensor.
2. Install turbocharger speed sensor mounting bolt.
3. Tighten bolt to 10 N.m (89 in. lbs.).
4. Connect speed sensor electrical connector.
5. Install turbocharger oil supply line. Tighten fitting to 24 N.m (18 ft. lbs.)

TURBOCHARGER

DESCRIPTION

DESCRIPTION

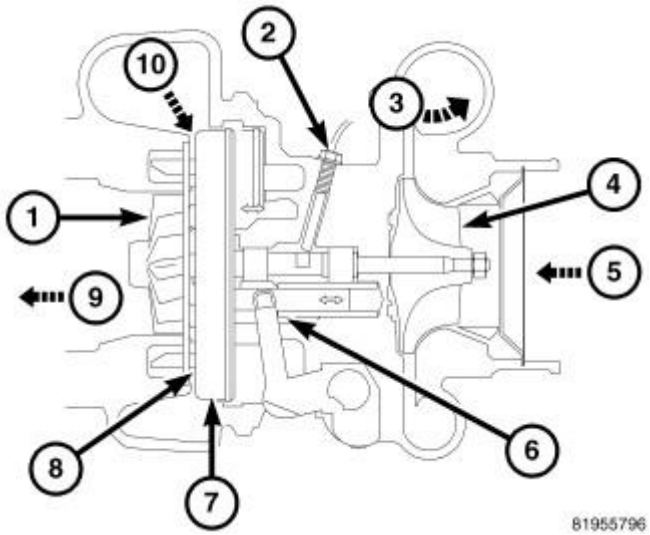

Fig. 321: 6.7L Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

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

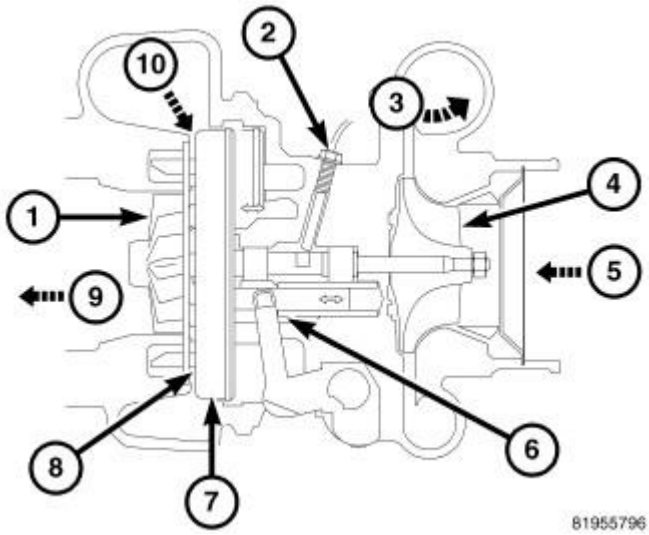

Fig. 322: 6.7L Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

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
- Damaged wastegate command valve O-rings
- Restricted/high pressure drop across charge air cooler
- Damaged turbocharger compressor wheel housing
- Turbocharger wastegate stuck open
- 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:

- Turbocharger wastegate stuck closed
- Turbocharger wastegate signal line leaking or damaged
- Damaged turbocharger actuator O-ring (6.7L Diesel)
- Wastegate command valve mechanically stuck in actuated position
- 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. There is

a DTC for circuit faults relating to the electronically controlled wastegate command valve.

for diagnosing of low or high boost pressure due to leaks. Refer to **COOLER AND HOSES, CHARGE AIR, DIAGNOSIS AND TESTING, 6.7L**.

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

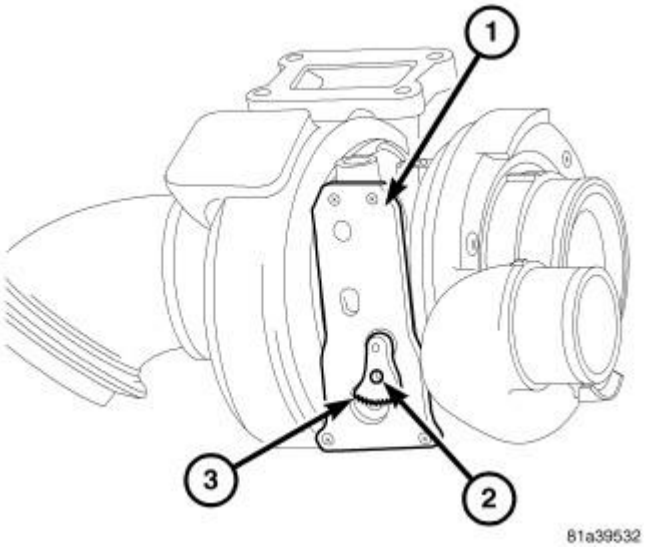

Fig. 323: Turbocharger Bearing Housing, Alignment Hole & Turbocharger Sector Gear
Courtesy of CHRYSLER GROUP, LLC

1 - TURBOCHARGER BEARING HOUSING
2 - ALIGNMENT HOLE
3 - TURBOCHARGER SECTOR GEAR

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.

NOTE: Use stepped alignment pin from turbocharger actuator service kit. If service kit is not available, use pin or drill bit of specified size.

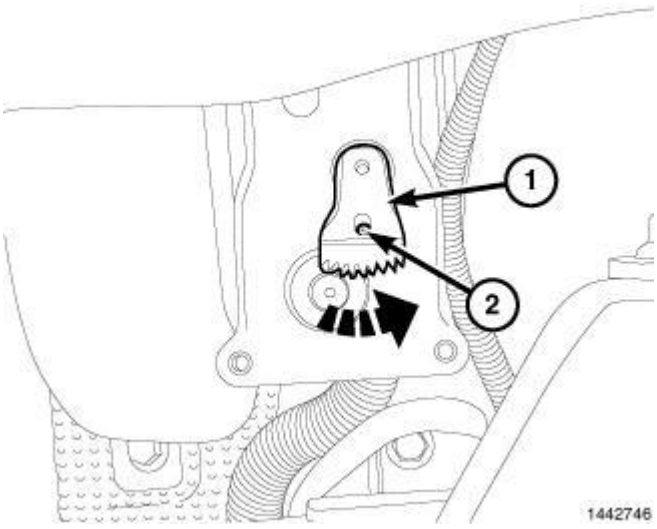

Fig. 324: Selector Gear - Forward Position & Selector Gear Alignment Hole
Courtesy of CHRYSLER GROUP, LLC

1 - SELECTOR GEAR - FORWARD POSITION
2 - SELECTOR GEAR ALIGNMENT HOLE

4. Rotate turbocharger sector gear (1) counterclockwise (forward). Insert large end of alignment pin (or a 0.187 in. pin or a 3/16 in. drill) through the turbocharger sector gear alignment hole (2) until it engages hole in turbocharger bearing housing and sector gear (1) will not rotate. If alignment pin does not engage hole in turbocharger bearing housing, variable geometry mechanism is not closing completely. Turbocharger must be replaced.

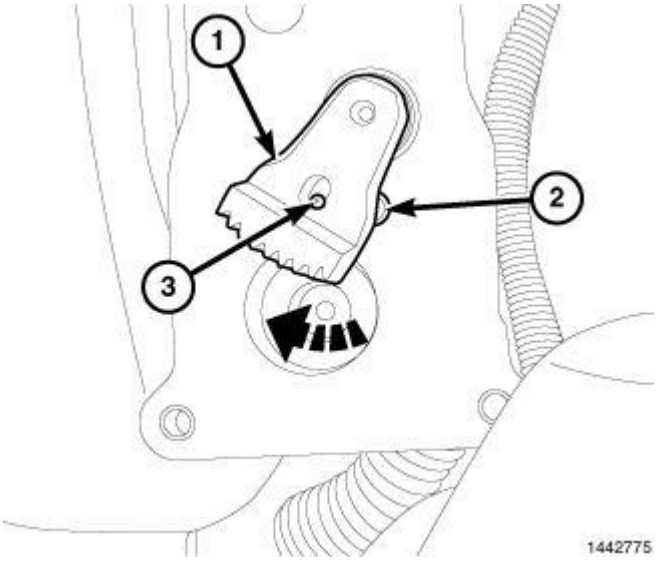

Fig. 325: Selector Gear - Rearward Position, Bearing Housing Alignment Hole & Selector Gear

Alignment Hole
Courtesy of CHRYSLER GROUP, LLC

1 - SELECTOR GEAR - REARWARD POSITION
2 - BEARING HOUSING ALIGNMENT HOLE
3 - SELECTOR GEAR ALIGNMENT HOLE

5. Remove alignment pin from sector gear and rotate sector gear (1) clockwise (rearward) and insert small end of alignment tool (or 0.125 in. pin or a 1/8 in drill.) through the sector gear alignment hole (3) until it engages the alignment hole (2) in turbocharger bearing housing and sector gear will not rotate. If alignment pin does not engage hole (2) in turbocharger bearing housing, variable geometry mechanism is not opening completely. Turbocharger must be replaced.

NOTE: If turbocharger has passed sector gear movement checks, turbocharger is functional. Turbocharger actuator must be replaced. Leave alignment pin in place.

6. Install electronic turbocharger actuator, refer to **ACTUATOR, TURBOCHARGER, INSTALLATION, 6.7L**.

REMOVAL

REMOVAL

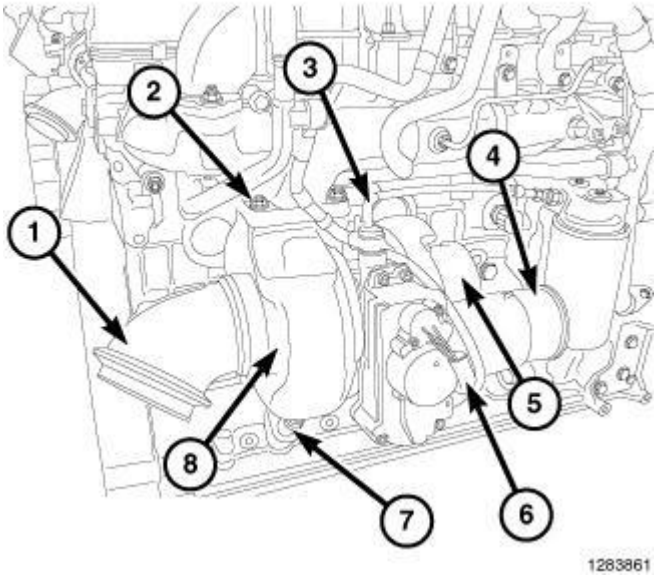

Fig. 326: Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable on both batteries.

2. Disconnect and re-position the right hand side positive battery cable.
3. Drain the coolant from the radiator and engine. Refer to **STANDARD PROCEDURE** .
4. Remove the air filter housing. Refer to **AIR CLEANER, REMOVAL, 6.7L**.
5. Disconnect the crankcase vent hose at the turbocharger air intake.
6. Remove the intake air tube at the turbocharger (5).
7. Remove the charge air cooler inlet tube at the turbocharger inlet (4).
8. Disconnect the turbocharger speed sensor electrical connector.
9. Disconnect the turbocharger actuator electrical connector (6).
10. Remove the turbocharger oil pressure line (3).
11. Remove the turbocharger coolant lines at the engine block and turbocharger.

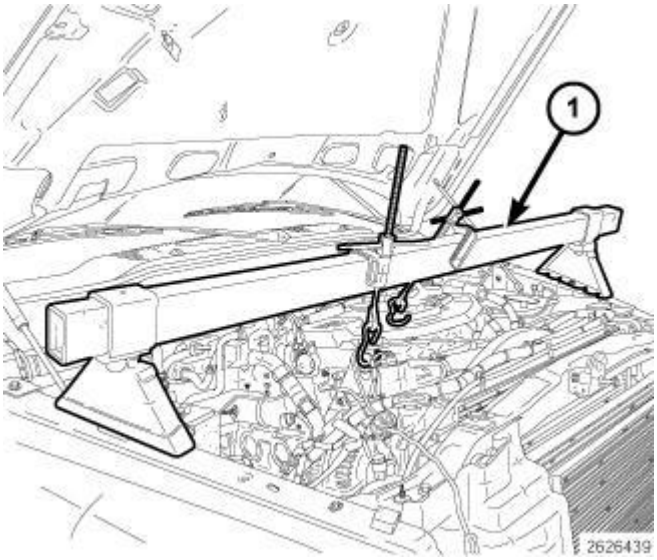

Fig. 327: Engine Support Fixture Tool 8534B
Courtesy of CHRYSLER GROUP, LLC

12. Remove the right side wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** and **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL** .
13. Lower the vehicle.
14. Install the engine support fixture tool (special tool #8534B, Fixture, Driveline Support) (1).
15. Remove the right hand side engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, REMOVAL, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, REMOVAL, 6.7L**.

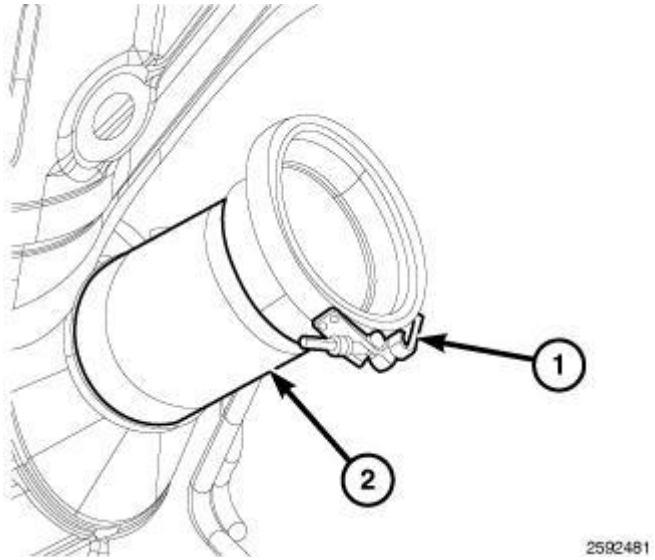

Fig. 328: Turbocharger Exhaust Outlet V-Clamp
Courtesy of CHRYSLER GROUP, LLC

16. Raise and support the vehicle.
17. Remove the exhaust steady rest bracket from transmission.
18. Remove the V-clamp (1) from the turbocharger exhaust outlet.

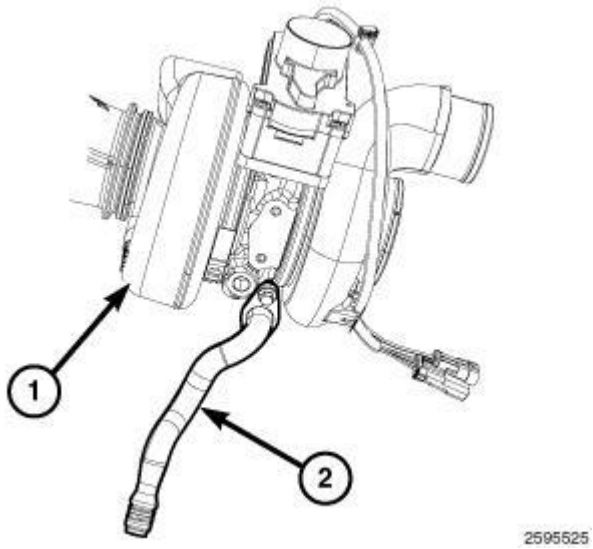

Fig. 329: Turbocharger & Drain Tube
Courtesy of CHRYSLER GROUP, LLC

19. Remove the turbocharger drain tube (2) at the turbocharger (1).
20. Remove the turbocharger drain tube from the cylinder block.
21. Lower the vehicle.
22. Remove and re-position the grid heater relay from the battery tray.
23. Using Tool (special tool #9866, Wrench, Turbo Charger Bolt), remove the turbocharger to exhaust

manifold mounting nuts.

24. Remove the turbocharger (1) from the vehicle by lifting from the top of the engine compartment.
25. Clean the turbocharger mating surfaces.
26. Inspect the turbocharger for damage, if necessary replace the turbocharger. Refer to **TURBOCHARGER, INSPECTION, 6.7L**.

INSPECTION

INSPECTION

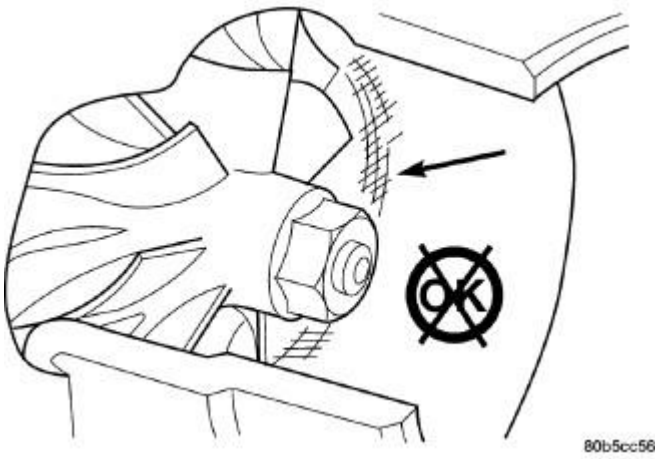

Fig. 330: Inspecting Compressor Housing For Impeller Rubbing Condition
Courtesy of CHRYSLER GROUP, LLC

Visually inspect turbocharger for excessive oil residue. Clean turbocharger if necessary. Refer to **TURBOCHARGER SYSTEM, CLEANING, 6.7L**.

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.

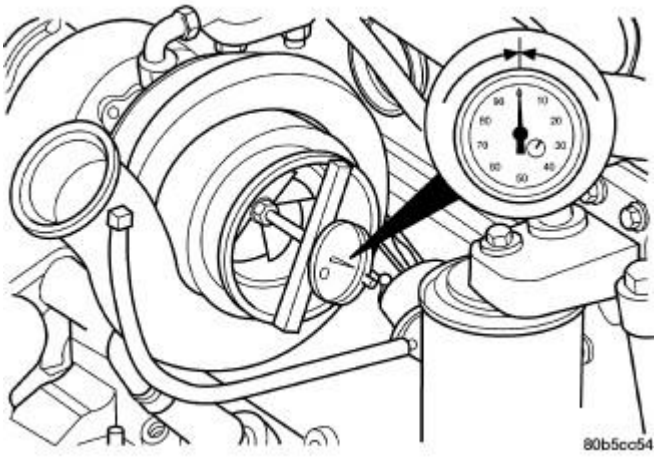

Fig. 331: Measure Turbocharger Axial End Play
Courtesy of CHRYSLER GROUP, LLC

6. Measure the turbocharger axial end play:
    1. Install a dial indicator as shown in illustration. Zero the indicator at one end of travel.
    2. Move the impeller shaft fore and aft and record the measurement. Allowable end play is 0.038 mm (0.00015 in.) MIN. and 0.093 mm (0.0037 in.) MAX. If the recorded measurement falls outside these parameters, replace the turbocharger assembly.

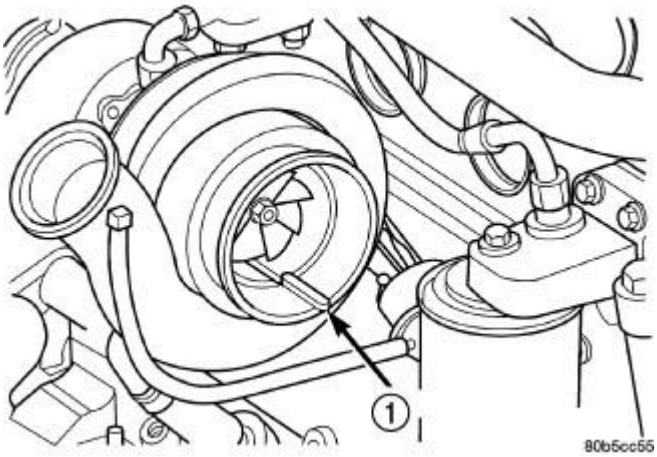

Fig. 332: Measuring Turbocharger Bearing Radial Clearance
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAUGE

7. Measure the turbocharger bearing radial clearance:
    1. Insert a narrow blade or wire style feeler gauge between the compressor wheel and the housing.
    2. Gently push the compressor wheel toward the housing and record the clearance.
    3. With the feeler gauge in the same location, gently push the compressor wheel away from the housing and again record the clearance.
    4. Subtract the smaller clearance from the larger clearance. This is the radial bearing clearance.
    5. 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

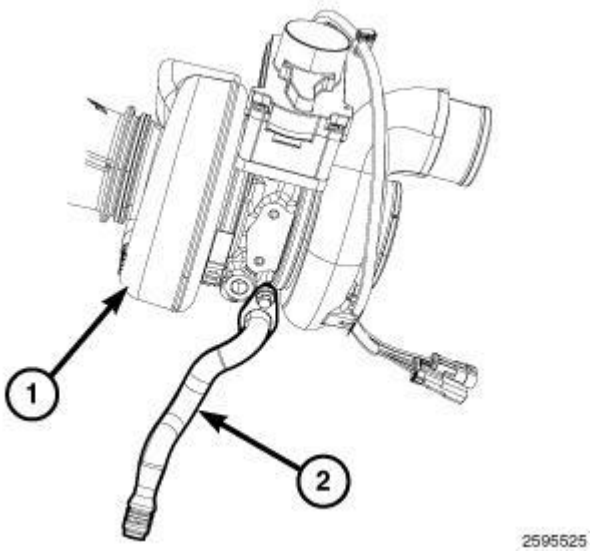

Fig. 333: Turbocharger & Drain Tube
Courtesy of CHRYSLER GROUP, LLC

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. Refer to TURBOCHARGER SYSTEM, CLEANING, 6.7L. Refer to COOLER AND HOSES, CHARGE AIR, CLEANING, 6.7L.

1. Prior to installation, inspect the turbocharger for any damage. Refer to **TURBOCHARGER, INSPECTION, 6.7L**.
2. Clean the turbocharger mating surfaces.
3. Replace the banjo fitting seals 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 grid heater relay to the battery tray.
7. Inspect the oil drain tube O-rings for nicks or cuts. Replace if necessary. Oil the O-rings with new oil.
8. Raise and support the vehicle.
9. Position the turbocharger drain tube (2) into engine block.
10. Using a new gasket, install the turbocharger drain tube (2) mounting bolts. Tighten the mounting bolts to 24 N.m (18 ft. lbs.).

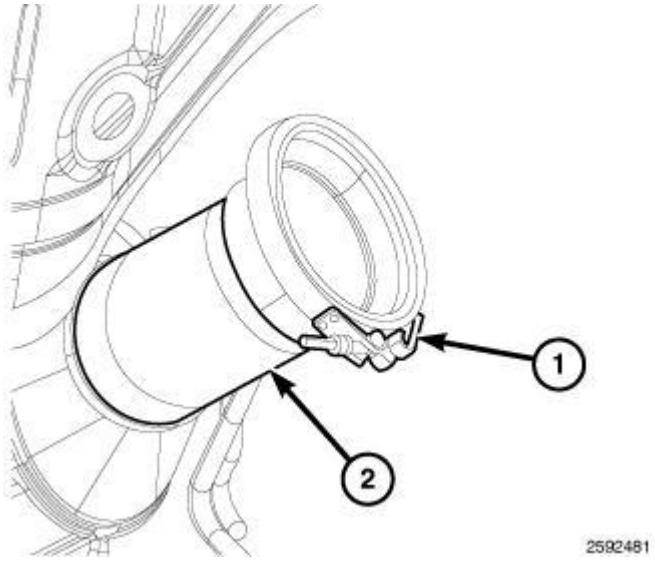

Fig. 334: Turbocharger Exhaust Outlet V-Clamp
Courtesy of CHRYSLER GROUP, LLC

11. Using a new clamp (1), connect the exhaust pipe to the turbocharger exhaust outlet with the clamp facing down as shown in illustration. Tighten the clamp (1) 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 (1) and tighten the clamp (1) 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 hand side engine mount. Refer to **INSULATOR, ENGINE MOUNT, FRONT, INSTALLATION, 6.7L** and **INSULATOR, ENGINE MOUNT, REAR, INSTALLATION, 6.7L**.
14. Install the right side wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, INSTALLATION** and **SHIELD, SPLASH, REAR WHEELHOUSE, INSTALLATION** .

15. Lower the vehicle.

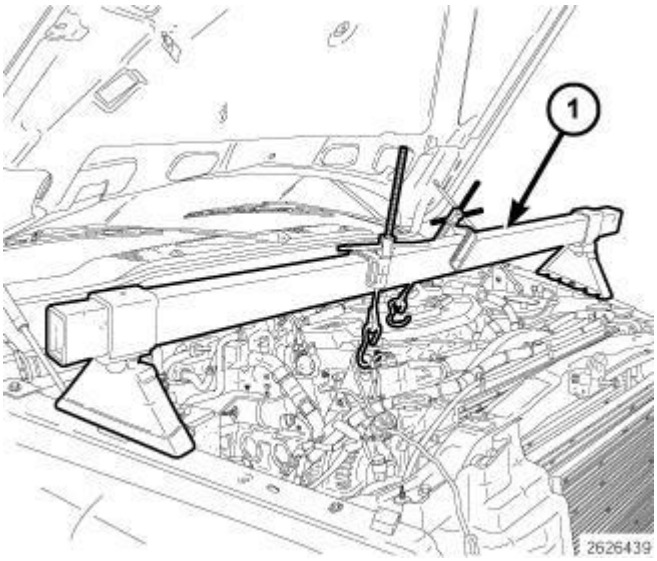

Fig. 335: Engine Support Fixture Tool 8534B
Courtesy of CHRYSLER GROUP, LLC

16. Remove the engine support fixture tool (special tool #8534B, Fixture, Driveline Support) (1).

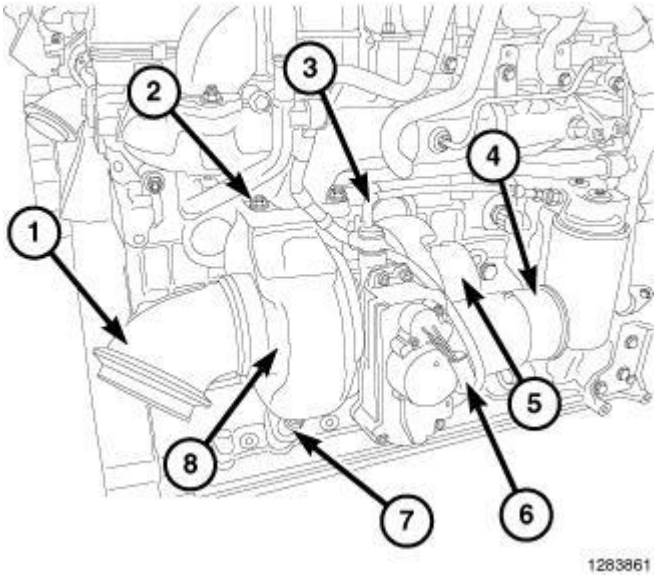

Fig. 336: Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

NOTE: Exhaust pipe removed for clarity.

17. Install the coolant lines at the engine block and turbocharger. Tighten the banjo fittings 24 N.m (18 ft.

lbs.).

18. Install the turbocharger oil return line. Tighten the fitting to 36 N.m (27 ft. lbs.).
19. Install the turbocharger oil pressure line (3). Tighten the fitting to 36 N.m (27 ft. lbs.).
20. Connect the turbocharger actuator electrical connector.
21. Connect the turbocharger speed sensor electrical connector.
22. Install the charge air tube to turbocharger inlet (4). Tighten the clamp to 11 N.m (8 ft. lbs.).
23. Pre-lube the turbocharger with 29.9 - 59.14 ml (1 - 2 oz.) clean engine oil.
24. Install the intake air tube at the turbocharger (5). Tighten the clamp to 11 N.m (8 ft. lbs.).
25. Connect the crankcase vent hose at the turbocharger air intake.
26. Install the air filter housing. Refer to **BODY, AIR CLEANER, INSTALLATION, 6.7L**.
27. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
28. Position and connect the right hand side positive battery cable
29. Connect the negative battery cable on both batteries.
30. Check for any cooling or exhaust leaks and confirm the turbocharger is operating properly. Refer to **DIAGNOSIS AND TESTING** . Refer to **DIAGNOSIS AND TESTING** . Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING, 6.7L**.

VALVE TIMING

STANDARD PROCEDURE

STANDARD PROCEDURE - TIMING VERIFICATION

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 6.7L**.
2. Remove fuel injector from cylinder No. 1. Refer to **INJECTOR(S), FUEL, REMOVAL** .
3. Using Barring Tool (special tool #7471B, Barring Tool) rotate the engine until the TDC mark on the damper is at 12 o'clock.
4. 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.
5. With cylinder number still at TDC, inspect the keyway on the crankshaft gear for proper alignment (12 o'clock position).
6. If the keyway is not at 12 o'clock position replace the crankshaft gear assembly.
7. 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.
8. Inspect keyway on camshaft gear for proper alignment with the key in the camshaft, if alignment is off replace the camshaft/gear assembly.
9. 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

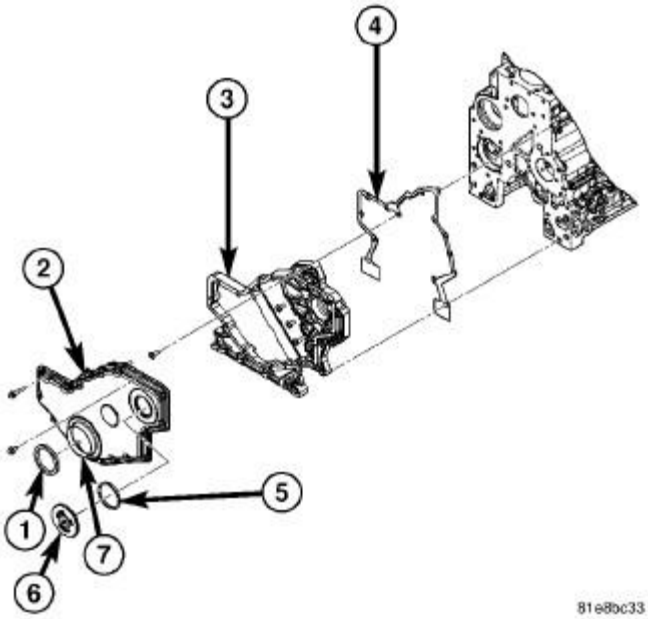

Fig. 337: Front Cover Assembly Components
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect both battery negative cables.
2. Raise vehicle on hoist.
3. Partially drain engine coolant into container suitable for re-use. Refer to **STANDARD PROCEDURE** .
4. Lower vehicle.
5. Remove radiator upper hose.
6. Remove viscous fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
7. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

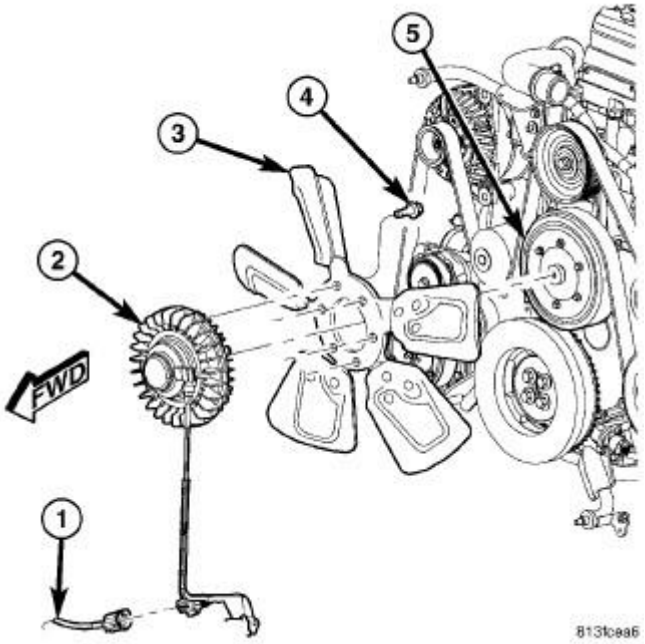

Fig. 338: Fan Blade/Viscous Fan Drive
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - VISCOUS FAN DRIVE
3 - FAN BLADE
4 - BOLT (6)
5 - RADIATOR FAN PULLEY

8. Remove the cooling fan support/hub from the front of the engine.
9. Raise the vehicle on hoist.
10. Remove power steering pump. Refer to **PUMP, REMOVAL** .
11. Remove accessory drive belt tensioner.
12. Remove the crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 6.7L**.
13. Lower the vehicle.
14. Remove the gear cover-to-housing bolts and gently pry the cover away from the housing, taking care not to mar the gasket surfaces.

INSTALLATION

INSTALLATION

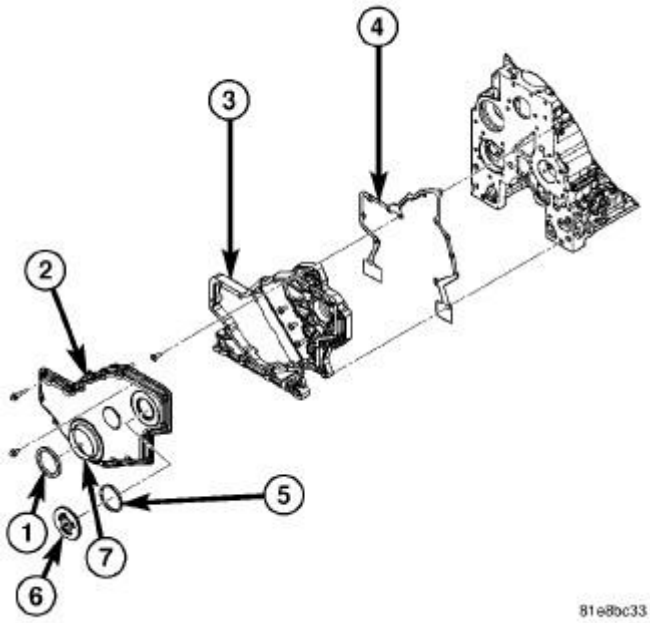

Fig. 339: Front Cover Assembly Components
Courtesy of CHRYSLER GROUP, LLC

1. Install a new front crankshaft oil seal.
2. Obtain a seal pilot (1) installation tool from a crankshaft front seal service kit and install the pilot into the seal.
3. Apply a bead of Mopar® Silicone Rubber Adhesive Sealant or equivalent to the gear housing cover. Be sure to surround all through holes.

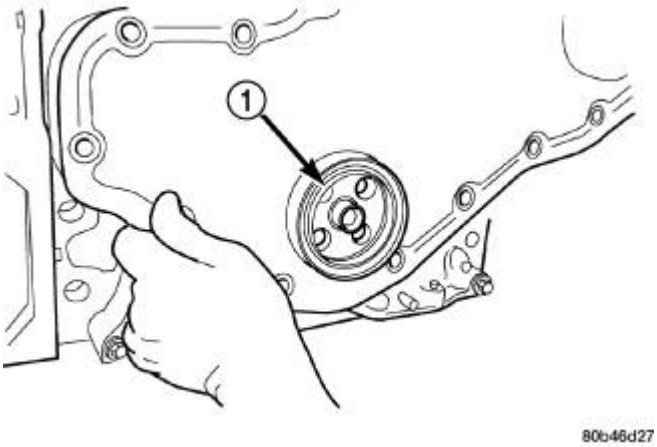

Fig. 340: Installing Front Cover With Seal Pilot
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL PILOT

4. Using the seal pilot to (1) align the cover, install the cover to the housing and install the bolts. Tighten the bolts at the 3 and 9 o'clock position finger tight, then in a clockwise direction starting at the 3 o'clock position, tighten to 24 N.m (18 ft. lbs).
5. Snug, but do not torque one bolt at the 3 o'clock and 9 o'clock positions. This centers the seal on the crankshaft.
6. Tighten the bolts to 24 N.m (18 ft. lbs.) in a circular pattern.
7. Remove the seal pilot. Install front seal dust shield.
8. Raise and support vehicle.
9. Install the crankshaft damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 6.7L**.

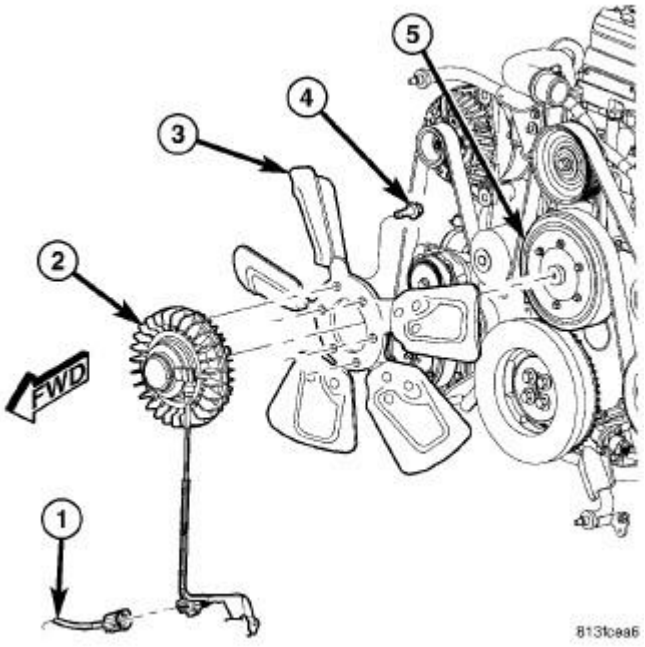

Fig. 341: Fan Blade/Viscous Fan Drive
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - VISCOUS FAN DRIVE
3 - FAN BLADE
4 - BOLT (6)
5 - RADIATOR FAN PULLEY

10. Install the fan support/hub assembly, and tighten bolts to 32 N.m (24 ft. lbs.).

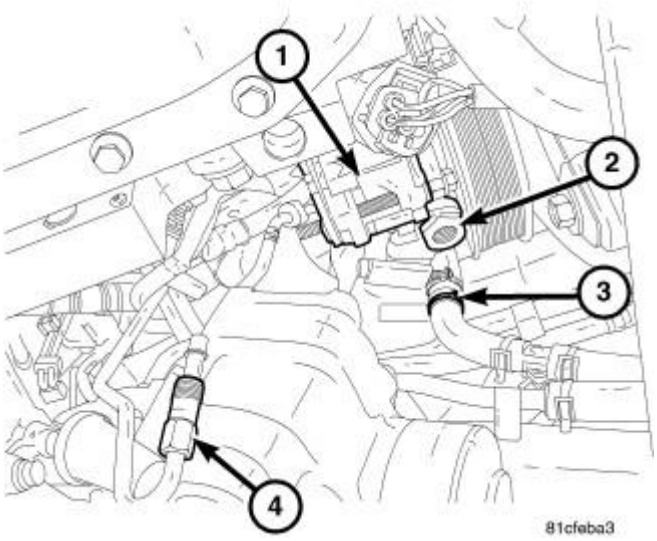

Fig. 342: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

11. Install power steering pump. Refer to **PUMP, INSTALLATION** .
12. Install accessory drive belt tensioner. Tighten bolt to 43 N.m (32 ft. lbs.).
13. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
14. Install the cooling fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
15. Install the radiator upper hose and clamps.
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

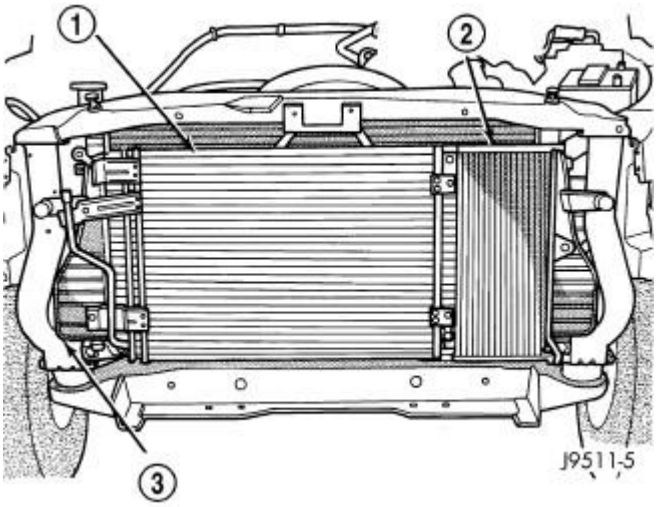

Fig. 343: A/C Condenser, Transmission Cooler & Intercooler
Courtesy of CHRYSLER GROUP, LLC

1 - A/C CONDENSER
2 - TRANSMISSION COOLER
3 - INTERCOOLER

1. Disconnect the negative battery cables.
2. Raise vehicle on hoist.
3. Partially drain engine coolant. Refer to **STANDARD PROCEDURE** .
4. Lower vehicle.
5. Remove radiator upper hose.
6. Disconnect coolant recovery bottle hose from radiator filler neck.
7. Remove viscous fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
8. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
9. Remove the accessory drive belt tensioner.

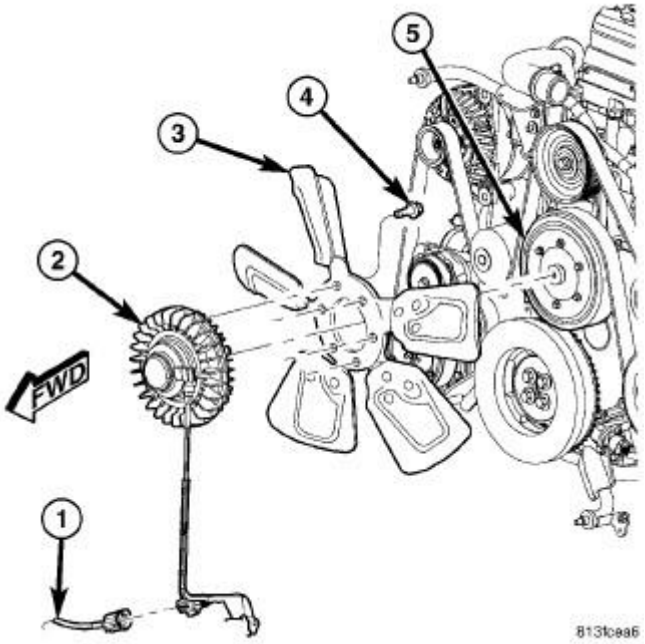

Fig. 344: Fan Blade/Viscous Fan Drive
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - VISCOUS FAN DRIVE
3 - FAN BLADE
4 - BOLT (6)
5 - RADIATOR FAN PULLEY

10. Remove the cooling fan support/hub from the front of the engine.
11. Raise the vehicle on hoist.

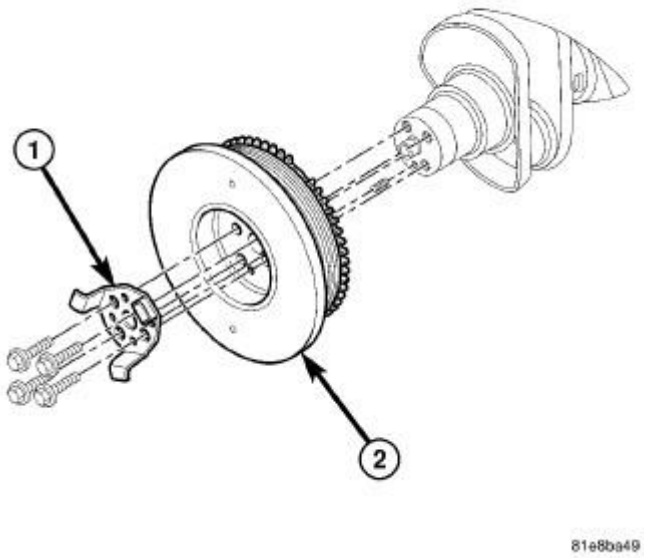

Fig. 345: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

12. Remove the crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 6.7L**.

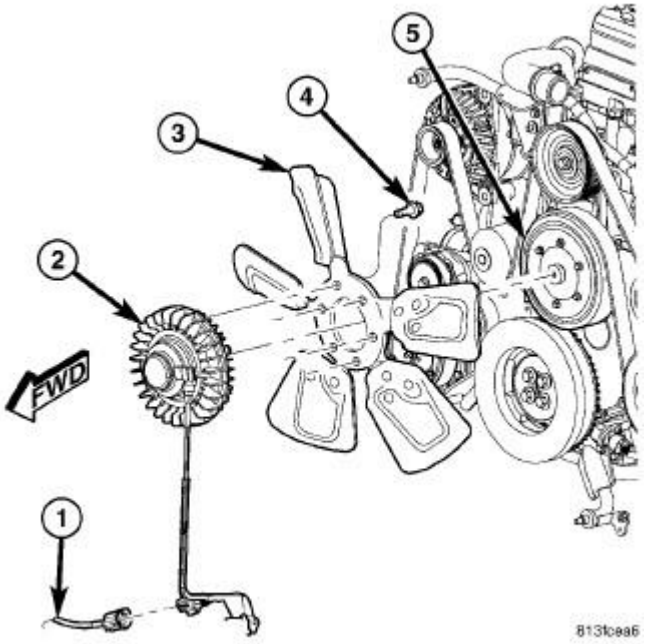

Fig. 346: Fan Blade/Viscous Fan Drive
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - VISCOUS FAN DRIVE
3 - FAN BLADE
4 - BOLT (6)
5 - RADIATOR FAN PULLEY

13. Remove the lower fan shroud bracket.
14. Remove the upper fan shroud bracket that is mounted to the gear housing.
15. Lower the vehicle.

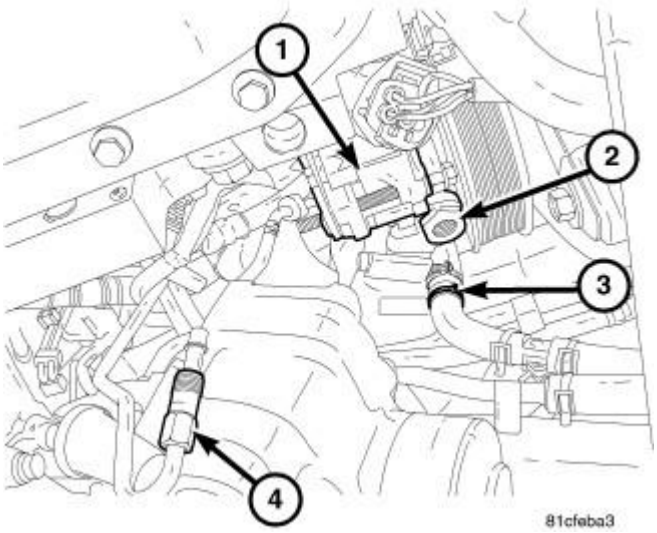

Fig. 347: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

16. Remove the power steering pump. Refer to **PUMP, REMOVAL** .

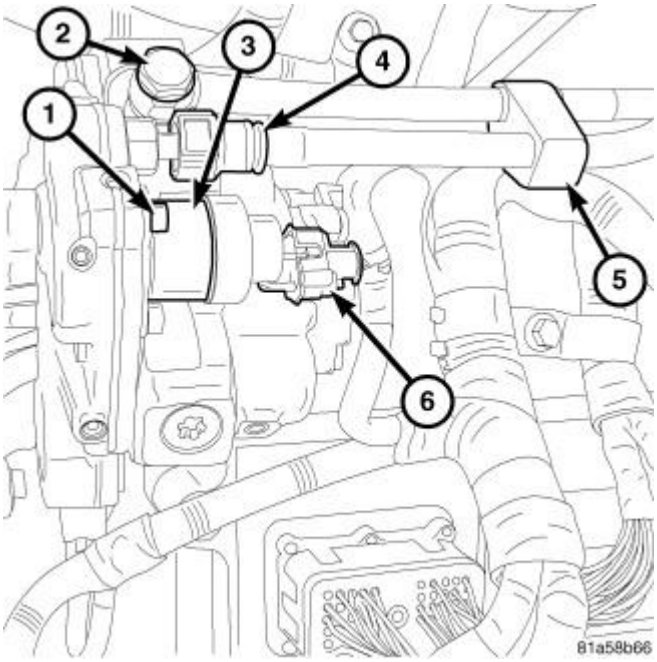

Fig. 348: Fuel Injection Pump Components - Rear View
Courtesy of CHRYSLER GROUP, LLC

17. Remove the fuel injection pump. Refer to **PUMP, FUEL INJECTION, REMOVAL** .

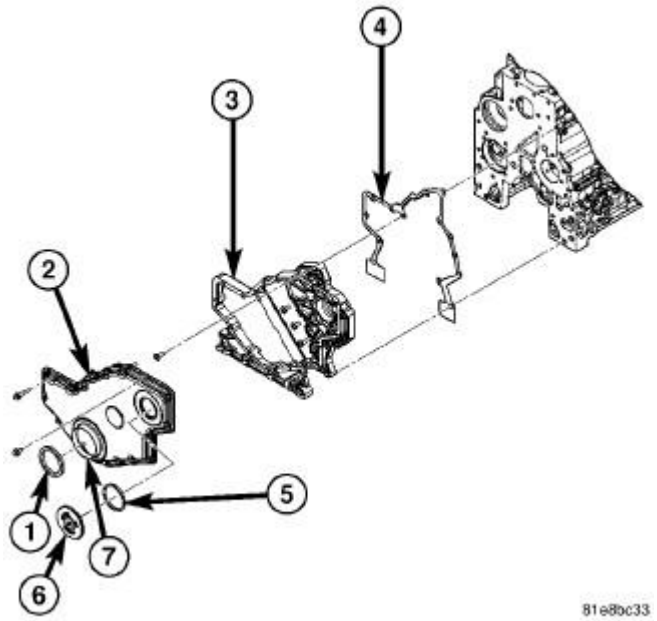

Fig. 349: Front Cover Assembly Components
Courtesy of CHRYSLER GROUP, LLC

18. Remove the gear cover-to-housing bolts and gently pry the cover away from the housing, taking care not to mar the gasket surfaces.

19. Disconnect the camshaft position sensor connector.
20. Disconnect and remove engine speed sensor.

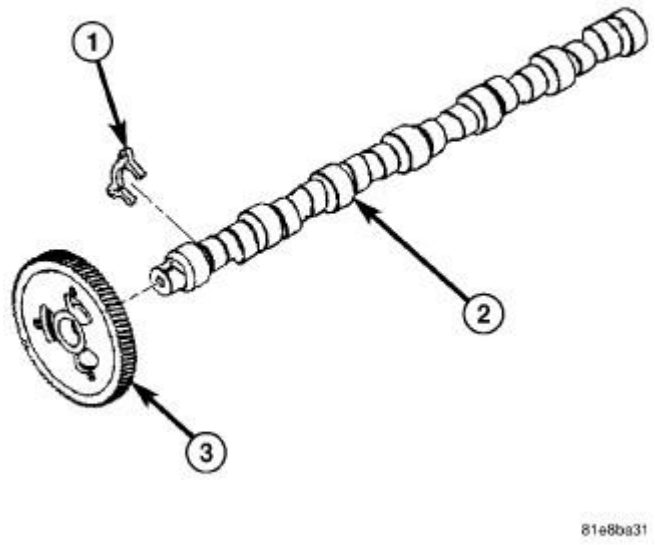

Fig. 350: Camshaft, Gear & Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

21. Remove the camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL, 6.7L**.

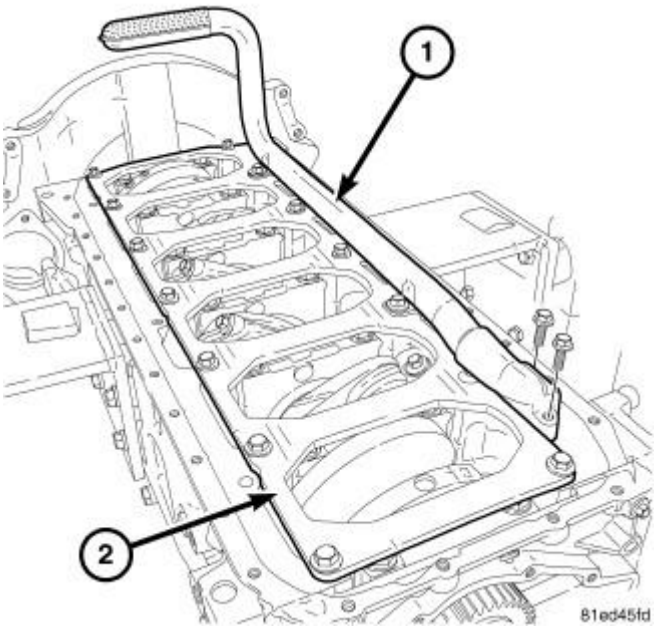

Fig. 351: Oil Pickup Tube

Courtesy of CHRYSLER GROUP, LLC

22. Remove the front six oil pan fasteners.
23. Remove the gear housing fasteners.

NOTE: Use care when removing the gear housing, to avoid damage to the oil pan gasket, as the gasket will be reused if it is not damaged.

24. Slide a feeler gauge between the gear housing and oil pan gasket, to break the gasket seal.
25. Remove the gear housing and gasket.
26. Clean the gasket material from the cylinder block and gear housing.

INSTALLATION

INSTALLATION

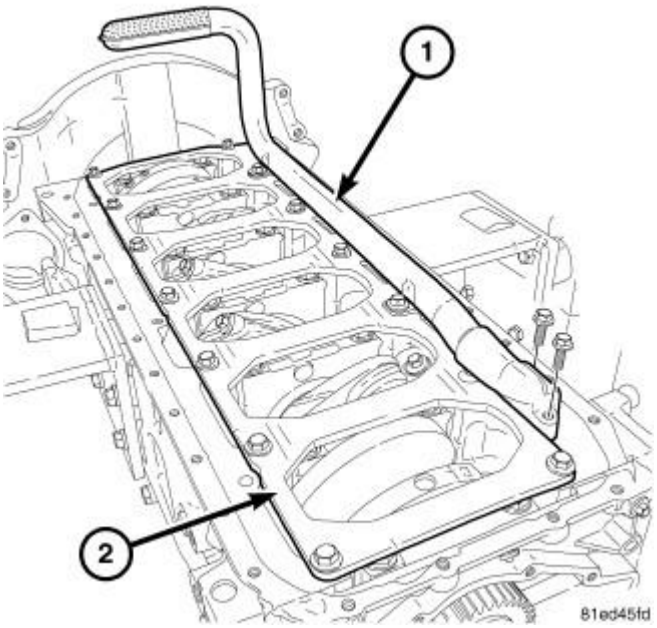

Fig. 352: Oil Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

1. Inspect oil pan gasket. If torn, gasket must be replaced.
2. Install a new gear housing gasket onto cylinder block and trim any excess gasket material flush to oil pan rail.
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.

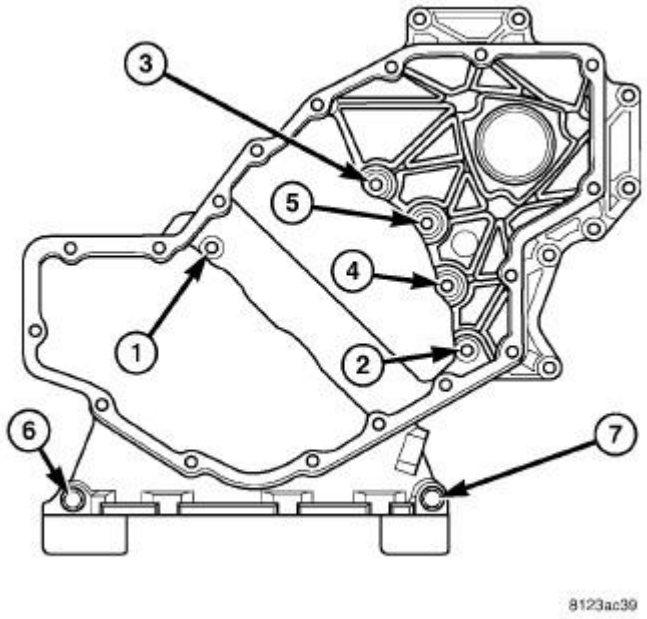

Fig. 353: Gear Housing Capscrew Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Install the gear housing. Tighten bolts to 24 N.m (18 ft. lbs.).
5. If a new housing is installed, the camshaft position sensor, and engine speed sensor must be transferred to the new housing.
6. Connect the camshaft position sensor connector.
7. Install and connect engine speed sensor.

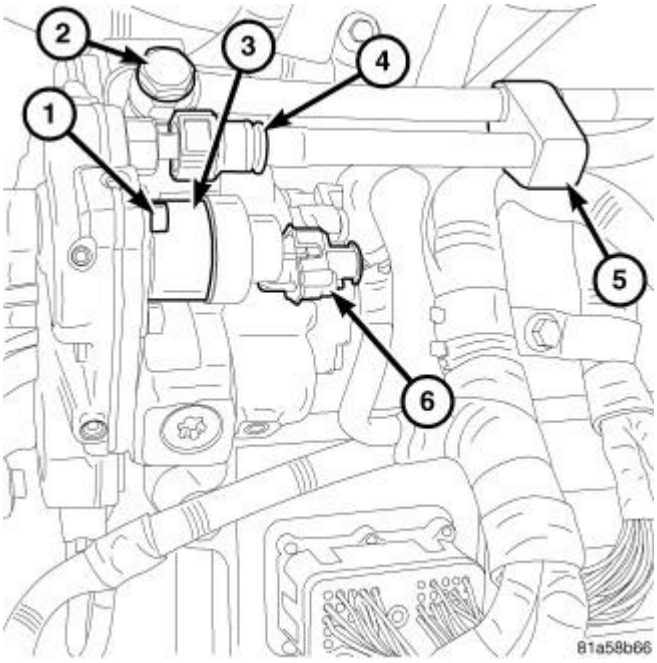

Fig. 354: Fuel Injection Pump Components - Rear View
Courtesy of CHRYSLER GROUP, LLC

8. Install the injection pump. Refer to **PUMP, FUEL INJECTION, INSTALLATION** .

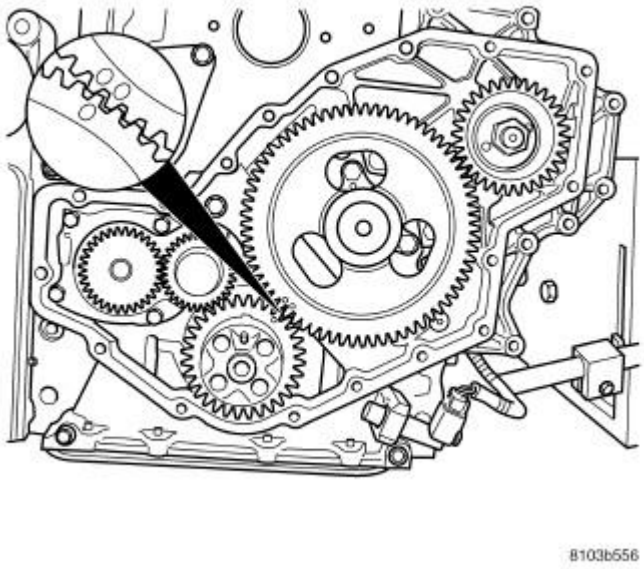

Fig. 355: Camshaft Gear & Crankshaft Gear Timing Mark Alignment
Courtesy of CHRYSLER GROUP, LLC

9. Install the camshaft Align the crankshaft and camshaft gear marks as shown in illustration. Refer to **CAMSHAFT, ENGINE, INSTALLATION, 6.7L**.

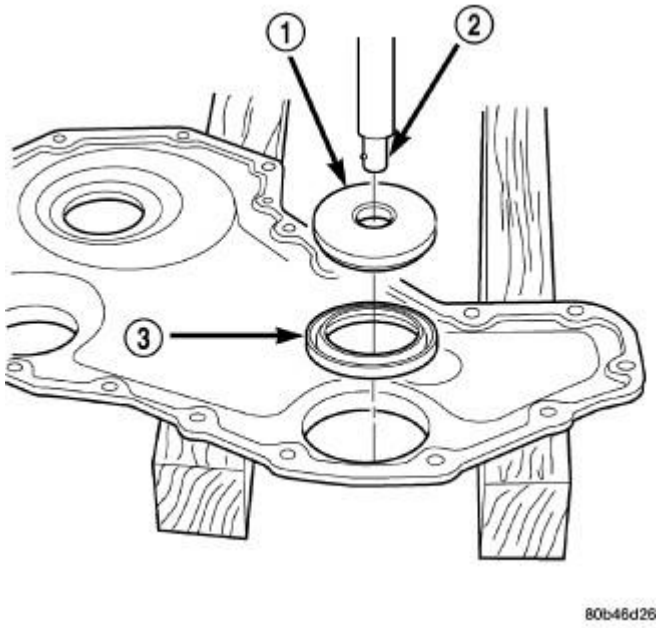

Fig. 356: Installing Seal Into Cover With Tool 8281
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL INSTALLER 8281
2 - DRIVER HANDLE C4171
3 - SEAL

10. Install a new front crankshaft seal into the gear cover. Refer to **SEAL, CRANKSHAFT OIL, FRONT, INSTALLATION, 6.7L**.
11. Apply a bead of Mopar® Silicone Rubber Adhesive Sealant or equivalent to the gear housing cover. Be sure to surround all through holes.

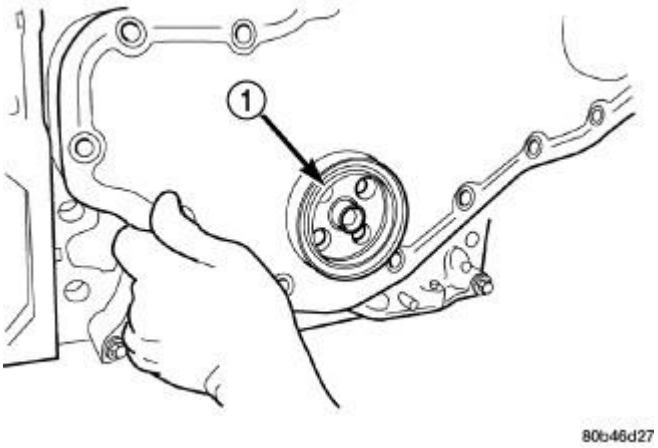

Fig. 357: Installing Front Cover With Seal Pilot
Courtesy of CHRYSLER GROUP, LLC

1 - SEAL PILOT

12. Using the seal pilot to align the cover, install the cover to the housing and install the bolts. Tighten the bolts at the 3 and 9 o'clock position finger tight, then in a clockwise direction starting at the 3 o'clock position, tighten to 24 N.m (18 ft. lbs.).
13. Snug, but do not torque one bolt at the 3 o'clock and 9 o'clock positions. This center's the seal on the crankshaft.
14. Tighten the bolt to 24 N.m (18 ft. lbs.) in a circular pattern.
15. Remove the seal pilot. Install front seal dust shield.

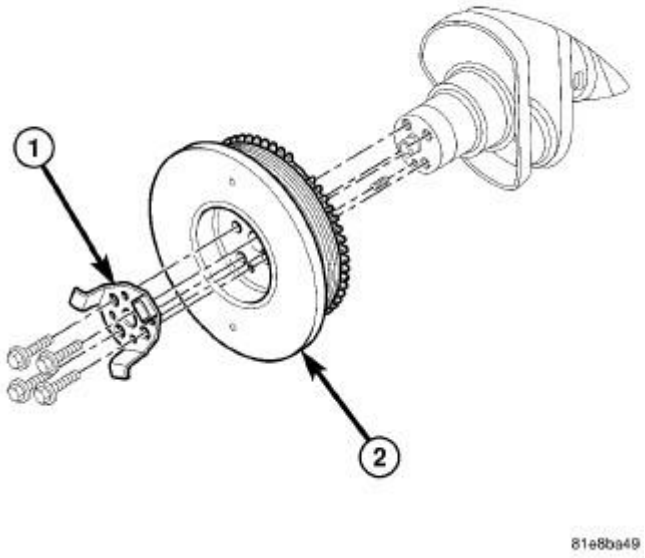

Fig. 358: Crankshaft Damper (Non-High Output Engine)
Courtesy of CHRYSLER GROUP, LLC

16. Install the crankshaft damper. Tighten bolts to 40 N.m (30 ft. lbs.), plus an additional 60°.
17. Install the lower fan shroud bracket. Tighten bolts to 24 N.m (18 ft. lbs.).
18. Install the upper fan shroud brackets. Hand tighten only.

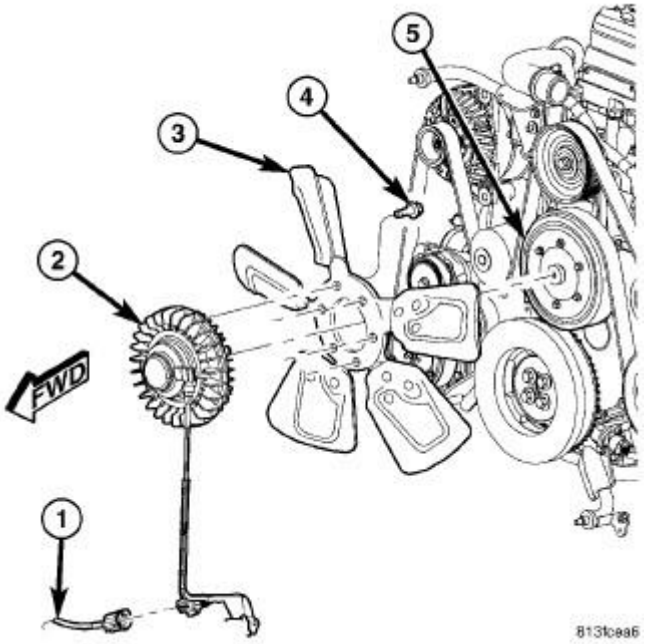

Fig. 359: Fan Blade/Viscous Fan Drive
Courtesy of CHRYSLER GROUP, LLC

1 - ELECTRICAL CONNECTOR
2 - VISCOUS FAN DRIVE
3 - FAN BLADE
4 - BOLT (6)
5 - RADIATOR FAN PULLEY

19. Install the fan support/hub assembly and tighten bolts to 32 N.m (24 ft. lbs.).

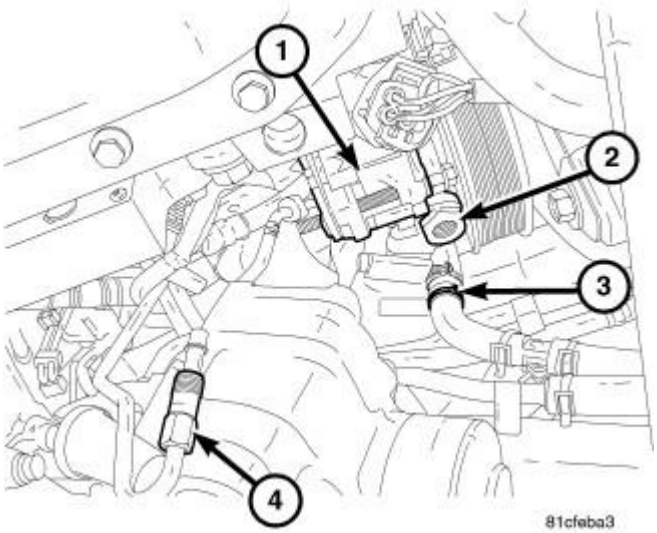

Fig. 360: Power Steering Pump Components
Courtesy of CHRYSLER GROUP, LLC

20. Install the power steering pump. Refer to **PUMP, INSTALLATION** .

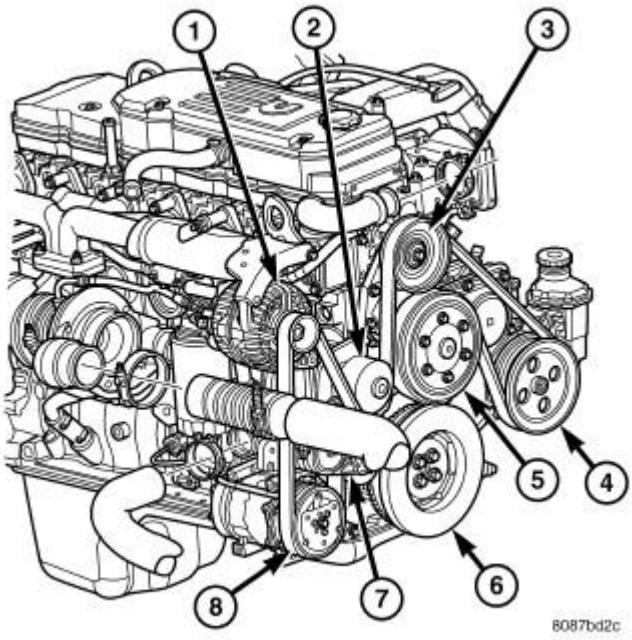

Fig. 361: Accessory Drive Belt & Driven Components
Courtesy of CHRYSLER GROUP, LLC

1 - GENERATOR
2 - WATER PUMP
3 - IDLER
4 - POWER STEERING PUMP
5 - RADIATOR FAN PULLEY
6 - CRANKSHAFT
7 - AUTOMATIC TENSIONER
8 - A/C COMPRESSOR

21. Install the accessory drive belt tensioner. Tighten bolt to 43 N.m (32 ft. lbs.).
22. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
23. Install the upper cooling fan/drive/shroud assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .

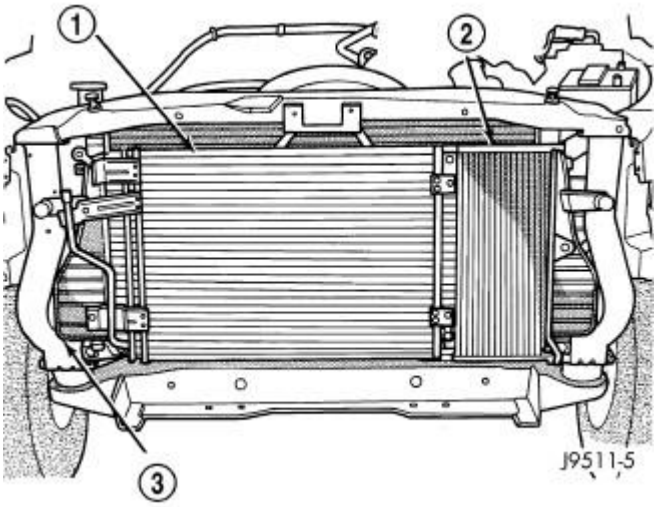

Fig. 362: A/C Condenser, Transmission Cooler & Intercooler
Courtesy of CHRYSLER GROUP, LLC

1 - A/C CONDENSER
2 - TRANSMISSION COOLER
3 - INTERCOOLER

24. Connect the coolant recovery bottle hose to the radiator filler neck.
25. Install the radiator upper hose and clamps.
26. Check engine oil level.
27. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
28. Connect the negative battery cables.
29. Start engine and inspect for leaks.

