2012 ENGINE

3.0L Turbo Diesel - Service Information - Chrysler 300

DESCRIPTION

3.0L COMMON RAIL DIESEL ENGINE

The 3.0L (183 C.I.D.) six - cylinder "common rail" direct injection engine is a 60° overhead valve design. The engine utilize a cast iron cylinder block. The engine has aluminum cross flow cylinder heads, four valves per cylinder, central injectors and dual overhead camshafts. The 3.0L is turbocharged, intercooled, and also equipped with a EGR cooler.

Additional features are:

- Finger Follower Actuated Valves with Hydraulic Adjusters
- Turbocharger and intercooler
- Oil Jet Cooled Pistons
- Swirl Intake Ports
- Water cooled exhaust gas recirculation, Compliance with EURO V emission regulations
- Chain driven D.O.H.C. per bank of cylinders, with 4 valves per cylinder

The engine identification stamp (3) for the 3.0L is located on the right side of the engine block, by the generator behind its mounting bracket.

DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
LUBRICATING OIL PRESSURE LOW	1. Low oil level.	1. (a) Check and fill with clean engine oil.
		(b) Check for a severe oil leak, worn rings (burning oil), oil leaking from the turbocharger to the intake, or other root causes for low oil level.
	2. Oil viscosity thin, diluted or wrong specification.	2. (a) Verify the correct engine oil is being used.
		(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.

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	5. If cooler was replaced, shipping plugs may have been left in cooler	5. Check/remove shipping plugs.
	6. Worn oil pump.	6. Check and replace oil pump.
	7. Suction tube loose or seal leaking.	7. Check and replace seal.
	8. Loose main bearing cap.	8. Check and install new bearing. Tighten cap to proper torque.
	9. Worn bearings or wrong bearings installed.	9. Inspect and replace connecting rod or main bearings. Check and replace directed piston cooling nozzles.
	10. Directed piston cooling nozzles under piston, bad fit into main carrier.	10. Check directed piston cooling nozzles position.
	12. Loose directed piston cooling nozzle.	12. Tighten directed piston cooling nozzle.
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. Coolant Temperature Below Normal
	3. Oil viscosity too thick.	3. Make sure the correct oil is being used.
	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 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.
		(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 (slight oil residue is normal).
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.

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	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 balance shaft	4. Inspect/replace balance shaft.
	5. Improperly operating electronically controlled viscous fan drive.	5. Inspect/replace fan drive.
	6. Worn or damaged generator bearing.	6. Check/replace generator.
	7. Flywheel housing misaligned.	7. Check/correct flywheel alignment.
	8. Loose or broken power component.	8. Inspect the crankshaft and rods for damage that causes an unbalance condition. Repair/replace as required.
	9. Worn or unbalanced driveline components.	9. 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.
	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 rocker arms are not bent. 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.

SMOKE DIAGNOSIS CHARTS

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

EXCESSIVE BLACK SMOKE	
POSSIBLE CAUSE	**CORRECTION**
Air filter dirty or plugged.	Check and replace the filter if necessary.
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 collapse, cracks, loose clamps, or holes in rubber ducts. Also check intake manifold for loose mounting hardware.
Diagnostic Trouble Codes (DTC's) active or multiple, intermittent DTC's.	Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Engine Control Module (ECM) has incorrect calibration.	Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
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.
Fuel injection pump malfunctioning.	A DTC may have been set. If so refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Fuel injector malfunctioning.	A DTC may have been set. Perform "Injector Classification Programming" using scan tool. Also refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article and Return Fuel Quantity Test.
Fuel injector lower washer doubled or missing.	Remove and inspect injector washer.
Fuel return system restricted.	Check fuel return lines for restriction.
Intake manifold restricted.	Remove restriction.
Manifold Air Pressure (Boost) Sensor or sensor circuit malfunctioning.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Turbocharger air intake restriction.	Remove restriction.
Turbocharger damaged.	Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING**.
Turbocharger has excess build up on compressor wheel or diffuser vanes.	Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING**.
Turbocharger wheel clearance out of specification.	Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING**.

EXCESSIVE WHITE SMOKE	
POSSIBLE CAUSE	**CORRECTION**
Air in fuel supply: Possible leak in fuel supply side.	Inspect fuel system
Coolant leaking into combustion chamber.	Perform pressure test of cooling system.

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Diagnostic Trouble Codes (DTC's) active or multiple, intermittent DTC's.	Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
In very cold ambient temperatures, engine block heater is malfunctioning (if equipped).	Refer to **HEATER, ENGINE BLOCK, DIAGNOSIS AND TESTING** .
Engine coolant temperature sensor malfunctioning.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article. Also check thermostat operation.
Engine Control Module (ECM) has incorrect calibration.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Fuel filter plugged.	Refer to **DIAGNOSIS AND TESTING** .
Fuel grade not correct or fuel quality is poor.	Temporarily change fuel brands and note condition. Change brand if necessary.
Fuel injector malfunctioning.	A DTC should have been set. Perform "Injector Identification Programming" or "Cylinder Cutout Test" using scan tool to isolate individual cylinders. Also refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Fuel injector hold-down(s) loose.	Replace the copper washer(s) (shim) and tighten to specifications.
Fuel injector protrusion not correct.	Check washer (shim) at bottom of fuel injector for correct thickness.
Fuel injection pump malfunctioning.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Fuel supply side restriction.	For fuel system testing. Refer to **DIAGNOSIS AND TESTING** .
Intake manifold air temperature sensor malfunctioning.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Intake manifold heater circuit not functioning correctly in cold weather.	A DTC should have been set. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article. Also check heater elements for correct operation.
Intake manifold heater elements not functioning correctly in cold weather.	A DTC should have been set if heater elements are malfunctioning. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** article.
Internal engine damage (scuffed cylinder).	Analyze engine oil and inspect oil filter to locate area of probable damage.
Restriction in fuel supply side of fuel system.	For fuel system testing. Refer to **DIAGNOSIS AND TESTING** .

EXCESSIVE BLUE SMOKE	
POSSIBLE CAUSE	**CORRECTION**
Dirty air cleaner or restricted turbocharger intake duct.	Check Air Cleaner Housing for debris and replace filter as necessary
Air leak in boost system between turbocharger compressor outlet and intake manifold.	Service charge air system.

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Obstruction in exhaust manifold.	Remove exhaust manifold and inspect for blockage.
Restricted turbocharger drain tube.	Remove turbocharger drain tube and remove obstruction.
Crankcase ventilation system plugged.	Inspect oil separator system for function and clear drain back hole in cylinder head cover/intake manifold
Valve seals are worn, brittle, or improperly installed.	Replace valve stem oil seals
Valve stems or guides are worn.	Remove valves and inspect valves and guides.
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.
Excessive cylinder liner wear and taper.	Remove pistons and measure cylinder liner wear and taper.
Cylinder damage.	Remove pistons and inspect cylinder liner for cracks or porosity. Repair with new cylinder liner if necessary.
Piston damage.	Remove pistons and inspect for cracks, holes. Measure piston for out-of-round and taper.
Turbocharger failure.	Refer to **TURBOCHARGER, DIAGNOSIS AND TESTING**.

STANDARD PROCEDURE

COMPRESSION TEST

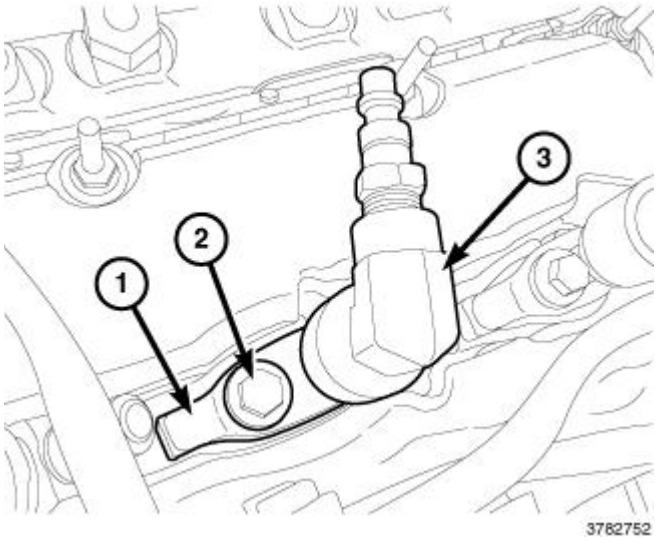


Fig. 1: Fuel Injector Clamp, Compression Test Adapter & Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Warm up engine to operating temperature (approximately 80 °C, 176 °F).
2. Shut off engine.

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3. Disable the low pressure fuel pump.
4. Remove the fuel injector. Refer to **INJECTOR(S), FUEL, REMOVAL** .
5. Crank engine several times with the starter to eliminate combustion residues in the cylinders.
6. Insert the (special tool #VM.10357, Adapter, Compression Test) (3) into fuel injector hole of cylinder to be tested. Install fuel injector clamp (1), bolt (2) and securely tighten.
7. Test compression pressure by cranking engine with starter for at least 8 revolutions.

Cylinder Compression Difference Between Cylinders	**5 Bar (73 psi)**

8. Carry out test procedure at the remaining cylinders in the same way.
9. Remove the (special tool #VM.10357, Adapter, Compression Test) from cylinder head.
10. Install the fuel injector. Refer to **INJECTOR(S), FUEL, INSTALLATION** .

DUST COVERS AND CAPS

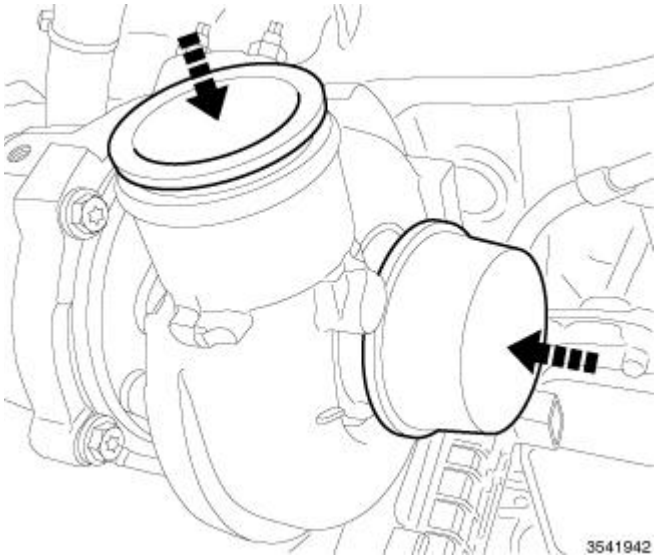


Fig. 2: Covers/Caps
Courtesy of CHRYSLER GROUP, LLC

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.

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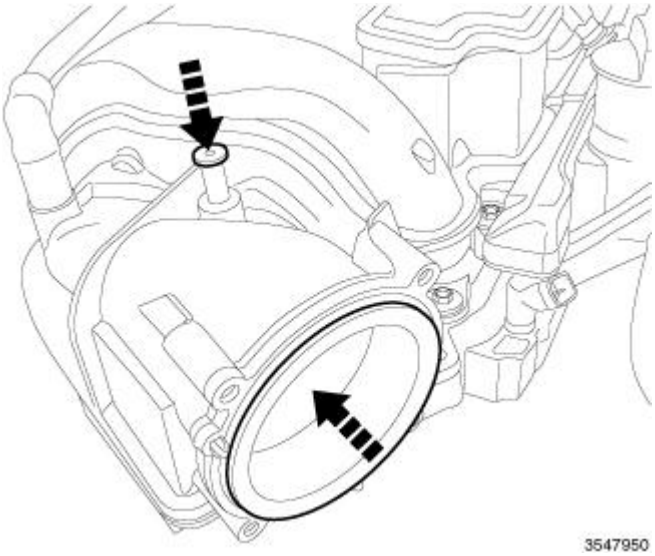


Fig. 3: Opening Cover
Courtesy of CHRYSLER GROUP, LLC

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

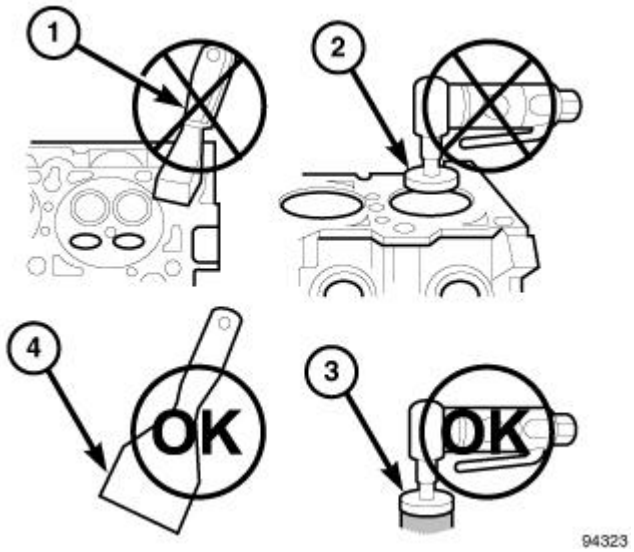


Fig. 4: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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:

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- 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).

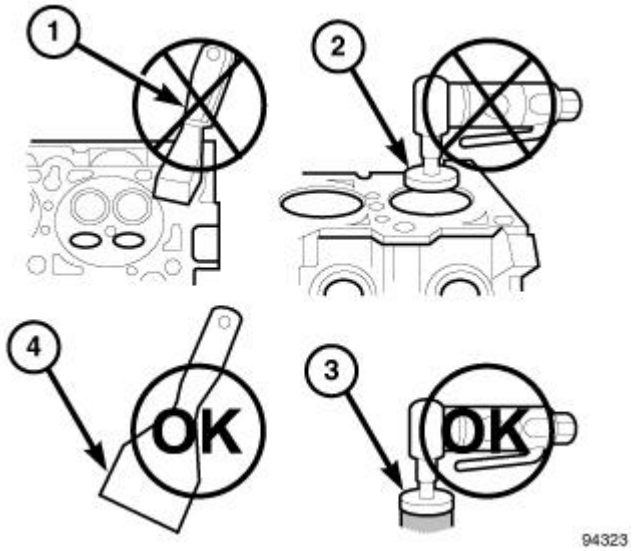


Fig. 5: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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.

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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 with applicator.

MOPAR® THREEBOND ENGINE RTV SEALANT

MOPAR® THREEBOND ENGINE RTV SEALANT is a unique gasket material that is specially made to retain adhesion and sealing properties when used to seal components exposed to engine oil.

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

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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 with 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** .

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

4. With all injectors removed, rotate the crankshaft using the crankshaft.
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.

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11. Install the drain plug. Tighten the plug to 50 N.m (37 ft. lbs.).
12. Install a new oil filter and tighten to 10 N.m 88 in. lbs.).
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, allow to warm, turn engine off and check for any leaks.

SPECIFICATIONS

ENGINE SPECIFICATIONS

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Displacement 3.0L	3.0L (2987 cc) (182 CID)
Bore	83 mm (3.26 in.)
Stroke	92 mm (3.62)
Compression Ratio	16.5 :1
Valves Per Cylinder	4
Weight	229 Kg (505 Lbs.)
Power Output	176 Kw (240 CV) @ 4000 RPM
Torque	550 N.m (406 Ft. Lbs.) @ 1600 RPM
Idle Speed - Warm	650 RPM
Max RPM in Gear	4200
Max RPM in Neutral	4800
Ribbed V-Belt Tension	Automatic Belt Tensioner Roller
Thermostat Opening	88°C (190°F)
Cooling System Capacity	4.6 Liters (4.9 Qt.)
Engine Oil Capacity	9.2 L (9.7 Qt.) W/Filter Change
Timing System	Chain Driven Dual Overhead Camshafts
Air Intake	Dry Filter With Turbocharger and Charge Air Cooler
Fuel Supply	Electric Pump In The Fuel Tank
Fuel System	Direct Fuel Injection Common Rail System
Combustion Cycle	4 Stroke Diesel
Cylinder Compression Difference Between Cylinders	5 Bar (73 psi.)
Cooling System	Water Cooling
Engine Pre Heat	Glow Plug
Glow Plug Type	GPL2-4
Glow Plug Voltage	4.4 Volts
Emission Standards	Euro 5
Injector Opening Pressure	230 Bar (3, 335 psi)

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Injection Pressure	1800 Bar (26, 106 psi)
Injection Pump	Bosch CP4.2, 2000 Bar (29008 psi)
Injection Order	1-4-2-5-3-6
Injector Type	CRI 2-18
Lubrication	Pressure Lubricated By Rotary Pump
Oil Quantity With Filter Change	9.2 Liters (9.7 Quarts)
Oil Pressure 80°C (176°F)	0.7 Bar (10 psi.) at Idle 2.5 Bar (36 psi) at 3800 RPM
Engine Rotation	Clockwise Viewed From Front Cover

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Crankshaft Journal Diameter		
Tolerance Class A	67.500 - 67.494 mm	2.6574 - 2.6572 in.
Tolerance Class B	67.494 - 67.488 mm	2.6572 - 2.657 in.
Tolerance Class C	67.488 - 67.482 mm	2.657 - 2.6567 in.
Main Bearing Journal Diameter 1 - 4		
Tolerance Class A	73.958 - 73.952 mm	2.9117 - 2.9114 in.
Tolerance Class B	73.952 - 73.946 mm	2.9114 - 2.9112 in.
Tolerance Class C	73.946 - 73.940 mm	2.9112 - 2.9110 in.
Axial play of crankshaft	0.12 - 0.31 mm	0.004 - 0.0122 in.

CRANKSHAFT BEARINGS

Block Bearing Tolerance Class	Cylinder Block Bearing Diameter		Crankshaft Bearing diameter Tolerance Class	Crankshaft Bearing Diameter		Crankshaft Bearing Tolerance Class	Crankshaft Bearing Shell Thickness	
A	78.000 - 78.006 mm	3.0708 - 3.0710	A	73.958 - 73.952 mm	2.9117 - 2.9114 in.	Red Red	1.982 - 1.988 1.982 - 1.988	0.0780 - 0.0782 0.0780 - 0.0782
			B	73.952 - 73.946 mm	2.9114 - 2.9112 in.	Red Blue	1.982 - 1.988 1.988 - 1.994	0.0780 - 0.0782 0.0782 - 0.0785
			C	73.946 - 73.940 mm	2.9112 - 2.9110 in.	Blue Blue	1.988 - 1.994 1.988 - 1.994	0.0782 - 0.0785 0.0782 - 0.0785
				73.958 -	2.9117 -	Red	1.982 - 1.988	0.0780 - 0.0782

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B	78.006 - 78.012	3.0710 - 3.0713	A	73.952 mm	2.9114 in.	Blue	1.988 - 1.994	0.0782 - 0.0785
			B	73.952 - 73.946 mm	2.9114 - 2.9112 in.	Blue Blue	1.988 - 1.994 1.988 - 1.994	0.0782 - 0.0785 0.0782 - 0.0785
			C	73.952 - 73.946 mm	2.9112 - 2.9110 in.	Blue Yellow	1.988 - 1.994 1.994 - 2.000	0.0782 - 0.0785 0.0785 - 0.0787
C	78.012 - 78.018	3.0713 - 3.0715	A	73.958 - 73.952 mm	2.9117 - 2.9114 in.	Blue Blue	1.988 - 1.994 1.988 - 1.994	0.0782 - 0.0785 0.0782 - 0.0785
			B	73.952 - 73.946 mm	2.9114 - 2.9112 in.	Blue Yellow	1.988 - 1.994 1.994 - 2.000	0.0782 - 0.0785 0.0785 - 0.0787
			C	73.952 - 73.946 mm	2.9112 - 2.9110 in.	Yellow Yellow	1.994 - 2.000 1.994 - 2.000	0.0785 - 0.0787 0.0785 - 0.0787

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Head Height	133 ± 0.06 mm	5.236 ± 0.002 in.
Cylinder Head Flatness deformation Tolerance	0.1 - 0.04 mm	0.003 - 0.001 in.
Valve Seat Width in Cylinder Head		
Exhaust valve	0.7 - 1.1 mm	0.0276 - 0.0434 in.
Intake valve	1.0 - 1.4 mm	0.0394 - 0.0552 in.
Cylinder Head Bolts		
Thread Diameter	14 x 1.5 mm	NA

HEAD GASKET SELECTION CHART

	Millimeters	Inches
PISTON CLEARANCE	0.130 - 0.220	0.0051 - 0.0086
CYLINDER HEAD GASKET THICKNESS	0.96	0.0377
GASKET	NO HOLE	

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IDENTIFICATION		
PISTON CLEARANCE	0.221 - 0.310	0.0087 - 0.0122
CYLINDER HEAD GASKET THICKNESS	1.06	0.0417
GASKET IDENTIFICATION	ONE HOLE	
PISTON CLEARANCE	0.311 - 0.402	0.0122 - 0.0158
CYLINDER HEAD GASKET THICKNESS	1.16	0.0456
GASKET IDENTIFICATION	TWO HOLES	

CYLINDER BORE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	82.995 - 83.025 mm	3.267 - 3.268 in.
Roundness Tolerance	0.006 mm	0.0002 in
Honing angle	40 - 60°	40 - 60°

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Head On Right Valve Timing At 2 mm Valve Lift And A New Timing Chain		
Inlet valve opens after TDC	19.6°	19.6°
Inlet valve closes after BDC	5.6°	5.6°
Outlet valve opens after TDC	17.9°	17.9°
Outlet valve closes after BDC	27.9°	27.9°
Cylinder Head On Right Valve Timing At 2 mm Valve Lift And Used Timing Chain		
Inlet valve opens after TDC	21.5°	21.5°
Inlet valve closes after BDC	3.7°	3.7°
Outlet valve opens after TDC	16.0°	16.0°
Outlet valve closes after BDC	26.0°	26.0°
Cylinder Head On Left Valve		

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Timing At 2 mm Valve Lift And A New Timing Chain		
Inlet valve opens after TDC	20.7°	20.7°
Inlet valve closes after BDC	4.5°	4.5°
Outlet valve opens after TDC	16.8°	16.8°
Outlet valve closes after BDC	26.8°	26.8°
Cylinder Head On Left Valve Timing At 2 mm Valve Lift And Used Timing Chain		
Inlet valve opens after TDC	21.5°	21.5°
Inlet valve closes after BDC	3.7°	3.7°
Outlet valve opens after TDC	16.0°	16.0°
Outlet valve closes after BDC	26.0°	26.0°

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Valve Disk Diameter		
Exhaust	25.3 - 25.5 mm	0.9961 - 1.004 in.
Intake	28.4 - 28.6 mm	1.1182 - 1.126 in.
Height Of Valve Disk		
Exhaust	1.4 - 1.6 mm	0.0552 - 0.063 in.
Intake	1.3 - 1.5 mm	0.0512 - 0.0591
Valve Seat Face Angle		
Exhaust	45° (+ 0.5°)	45° (+ 0.5°)
Intake	45° (+ 0.5°)	45° (+ 0.5°)
Valve Seat Back-cut Angle		
Exhaust	30° (±15')	30° (±15')
Intake	30° (±15')	30° (±15')
Valve Stem Diameter		
Exhaust	5.945 - 5.975 mm	0.2341 - 0.2353 in.
Intake	5.960 - 5.975 mm	0.2347 - 0.2353 in.
Length Of Valve		
Exhaust	102.1 - 102.5 mm	4.0197 - 4.0355 in.
Intake	102.1 - 102.5 mm	4.0197 - 4.0355 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Piston Diameter		
Tolerance Class A	82.930 - 82.940 mm	3.2649 - 3.2653 in.
Tolerance Class B	82.940 - 82.950 mm	3.2653 - 3.2657 in.

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Tolerance Class C	82.950 - 82.960 mm	3.2657 - 3.2661 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
No 1 Piston Ring		
Height	2 -0.01 / -0.03 mm	-0.000 - -0.001 in.
Gap	0.32 - 0.45 mm	0.01259 - 0.01771 in.
Vertical Play	0.13 - 0.17 mm	0.0051 - 0.0066 in.
Piston Ring End Gap		
Groove 1	0.12 - 0.16 mm	0.0048 - 0.0063
Groove 2	0.065 -- 0.110 mm	0.0026 - 0.0044
Groove 3	0.03 -- 0.07 mm	0.0012 - 0.0028
Dimensions Of The Piston Rings		
Keystone ring	NA	NA
Taper-faced ring	NA	NA
Bevel-edged ring	NA	NA
Piston Pin		
Diameter Bearing	29.975 - 29.980 mm	
Play in Piston	0.013 - 0.023 mm	in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Bolt		
Thread diameter	8 mm	0.315 in.
Shank length when new	47 mm	1.8504 in.
Maximum shank length	48 mm	1.8898 in.
Distance From Center Of Connecting Rod Bearing Bore To Connecting Rod Bushing Bore	167.97 - 168.03 mm	6.613 - 6.6154 in.
Width Of Connecting Rod At Connecting Rod Bearing Bore	17.90 - 18.10 mm	0.7048 - 0.7126 in.
Width Of Connecting Rod At Connecting Rod Bushing Bore	21.94 - 22.00 mm	0.8638 - 0.8662 in.
Connecting Rod Bushing Inner	30.038 - 30.044 mm	1.1826 - 1.1829 in.
Connecting Rod Bushing Outer Diameter	32.500 - 32.525 mm	1.2796 - 1.2806 in.
Piston Pin Play In Connecting Rod Bushing	0.028 - 0.034 mm	0.0012 - 0.0014 in.
Peak-To-Valley Height (Rz) Of Connecting Rod Bushing On	5 mm	0.1969 in.

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Inside		
Connecting Rod Bearing Shell Basic Bore	67.600 - 67.614 mm	2.6615 - 2.662 in.
Permissible Out-Of-Roundness And Concentricity Of Basic Bore	0.020 mm	0.0008 in.
Permissible Twist Of Connecting Rod Bearing Bore To Connecting Rod Bush Bore Over A Length Of 100 mm	0.1 mm	0.004 in.
Permissible Variation Of Axial Parallelism Of Connecting rod Bearing Bore To Connecting rod Bushing Bore Over A Length Of 100 mm	0.045 mm	0.0018 in.
Permissible Difference In Weight Of Complete Connecting Rod Of An Engine	2 grams	0.07 oz.

TORQUE SPECIFICATIONS

ENGINE BLOCK

DESCRIPTIONS	N.m	In. Lbs.	Ft. Lbs.
A/C Compressor Bolts	30	-	22
A/C Compressor Nut	30	-	22
A/C Compressor Stud	11	97	-
A/C Compressor Bracket Bolts	45	-	33
A/C Liquid Line Nuts	22	-	16
A/C Suction Line Nuts	22	-	16
Bedplate Bolts	Refer to **CRANKSHAFT, INSTALLATION**.		
Connecting Rod	Refer to **ROD, PISTON AND CONNECTING, INSTALLATION**.		
Dipstick Tube Bolt (head)	11	97	-
Dipstick Tube Bolt (sump)	11	97	-
Engine Block Timing Plug	30	-	-
Engine Lifting Brackets	45	-	33

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Generator Bolts	28	-	21
Generator Nut	28	-	21
Generator Stud	12	106	-
Generator Bracket Bolts	45	-	33
Generator B+ Cable Nut	11	97	-
Lower Oil Pan Bolts	Refer to **PAN, OIL, INSTALLATION**.		
Oil Cooler Bolts	30	-	22
Oil Cooler/Oil Filter Housing Adapter Bolts	30	-	22
Oil Drain Plug	45	-	33
Oil Filter Cap	25	-	18
Oil Filter Housing Bolts M6	15	133	-
Oil Filter Housing Bolts M8	30	-	22
Oil Filter Housing Bracket Bolts	15	133	-
Oil Jet Bolt (piston)	11	97	-
Oil Jet Bolt (timing chain)	11	97	-
Oil Pickup Tube Bolts	11	97	-
Oil Pressure Sensor	33	-	24
Oil Pump	14	124	-
Upper Oil Pan Bolts	Refer to **PAN, OIL, INSTALLATION**.		
Timing Chain Slide Rail Bolts	30	-	22
Timing Chain Tensioner	14	124	-
Transmission to Engine Bolts	39	-	29
Transmission to Oil Pan Bolts	39	-	29
Windage Tray	11	97	-

CYLINDER HEAD

	N.m	In.	Ft.

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DESCRIPTIONS		Lbs.	Lbs.
Camshaft Bearing Cap Bolts	11	97	-
Camshaft Drive Gear Bolt	100	-	74
Coolant Tube-to-Fuel Line Bracket Bolt	25	-	18
Cylinder Head Bolts (M14)	30	-	22
	Stage 2 - 75 Degrees	Stage 2 - 75 Degrees	Stage 2 - 75 Degrees
	Stage 3 - 75 Degrees	Stage 3 - 75 Degrees	Stage 3 - 75 Degrees
	Stage 4 - 75 Degrees	Stage 4 - 75 Degrees	Stage 4 - 75 Degrees
Cylinder Head Cover Bolts	10	89	-
EGR Air Flow Control Valve Bolts	9	-	80
EGR Cooler Adapter Bolts	45	-	33
EGR Cooler Coolant Feed Pipe Bolt	18	-	159
EGR Support Bracket Bolt	25	-	18
EGR Support Bracket Nut	25	-	18
Exhaust Manifold Nut	15	133	-
	Stage 2 - 40	-	30
Fuel Injector Clamp Bolt	33	-	24
Fuel Rail Bolts	25	-	18
Fuel Tube Bracket Bolt	11	97	-
Fuel Tubes Union Nut at Fuel Injector	11 + 75°	-	-
Fuel Tubes Union Nut at Fuel Injection Pump	11 + 75°	-	-
Fuel Tubes Union Nut at Fuel Rail	5 + 75°	-	-
Glow Plug	11	97	-
Intake Manifold Bolt	12	106	-

FRONT ENGINE

DESCRIPTIONS	N.m	In. Lbs.	Ft. Lbs.
Camshaft Position Sensor Bolt	8	71	-
Fuel Injection Pump Blocker Plate Bolts	25	-	18
Fuel Injection Pump Bolts	25	-	18
Oil Breather/Camshaft Seal Housing Bolts	14	124	-
Serpentine Belt Tensioner	45	-	33
Serpentine Belt Tensioner Bracket Bolts (M6)	11	97	-

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Serpentine Belt Tensioner Bracket Bolts (M10)	45	-	33
Vacuum Pump	9	80	-
Vibration Damper Bolt	100 + 125°	-	74 + 125°
Vibration Damper Cover Bolts	11	97	-

REAR ENGINE

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Crankshaft Position Sensor	6	53	-
Crankshaft Position Sensor Bracket	8	71	-
Flex Plate (ATX)	Refer to **FLEXPLATE, INSTALLATION**.		

TURBOCHARGER

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Turbocharger to Engine Block Bolt	55	-	41
Turbocharger to Cylinder Head Bolt	25	-	18
Turbocharger Heat Shield Bolt	11	97	-
Turbocharger Oil Feed Line at Engine Block Banjo Bolt	35	-	26
Turbocharger Oil Feed Line at Turbocharger Banjo Bolt	25	-	18
Turbocharger Oil Return Line Bolts	15	133	-

ENGINE MOUNTING

DESCRIPTION	N.m	In. Lbs.	Ft. Lbs.
Engine Mount Bracket Bolts	61	-	45
Engine Mount to Bracket Nut	61	-	45
Engine Mount to Cradle Bolts	61	-	45
Rear Mount Bracket Bolts	33	-	24
Rear Mount Bolts	61	-	45

REMOVAL

REMOVAL

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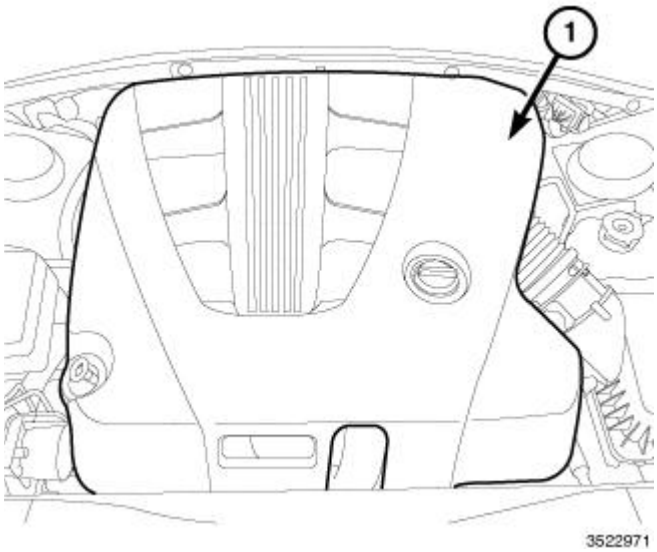


Fig. 6: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

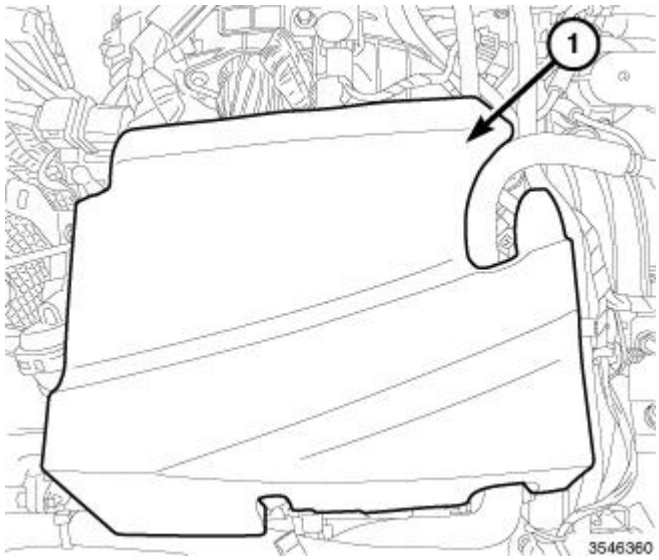


Fig. 7: Right Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

3. Remove the right side fuel injector silencer (1).
4. Recover the A/C refrigerant. Refer to **PLUMBING, STANDARD PROCEDURE** .
5. Remove the hood. Refer to **HOOD, REMOVAL** .

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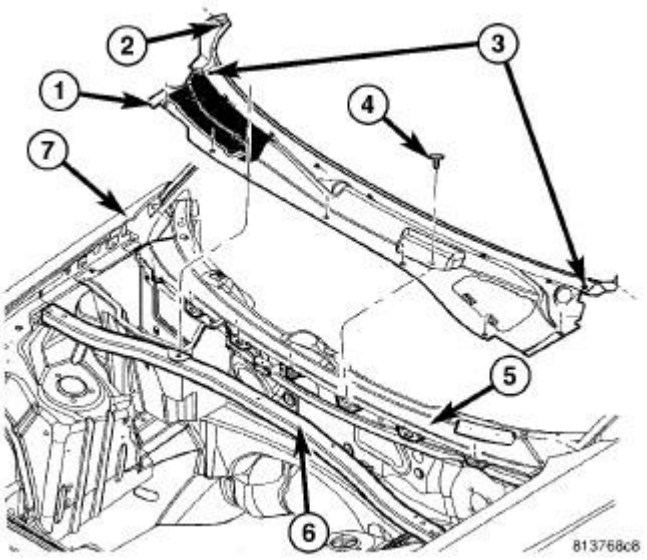


Fig. 8: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Remove the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, REMOVAL** .
7. Remove bolts and the strut support brace (6).
8. Remove air cleaner body and turbocharger inlet hose. Refer to **BODY, AIR CLEANER, REMOVAL**.
9. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
10. Remove the transmission belly pan.
11. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
12. Drain the engine oil. Using a new sealing washer, install and tighten the drain plug to 45 N.m (33 ft. lbs.).

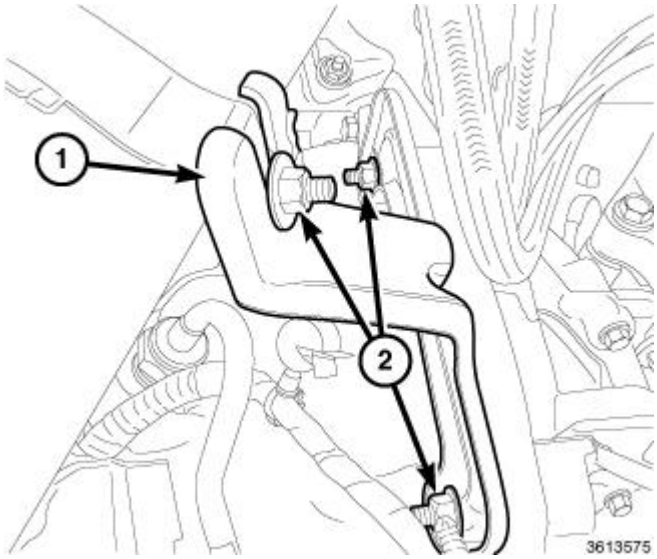


Fig. 9: Exhaust Steady Rest Bracket & Nuts
Courtesy of CHRYSLER GROUP, LLC

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13. Detach the wire harness retainer from exhaust steady rest bracket.
14. Remove nuts (2) and the exhaust steady rest bracket (1).
15. Remove the left side Charge Air Cooler (CAC) hose at cooler.
16. Remove the right side CAC hose at cooler.
17. Remove the right side splash shield.
18. Remove the left side splash shield.
19. Lower the vehicle.

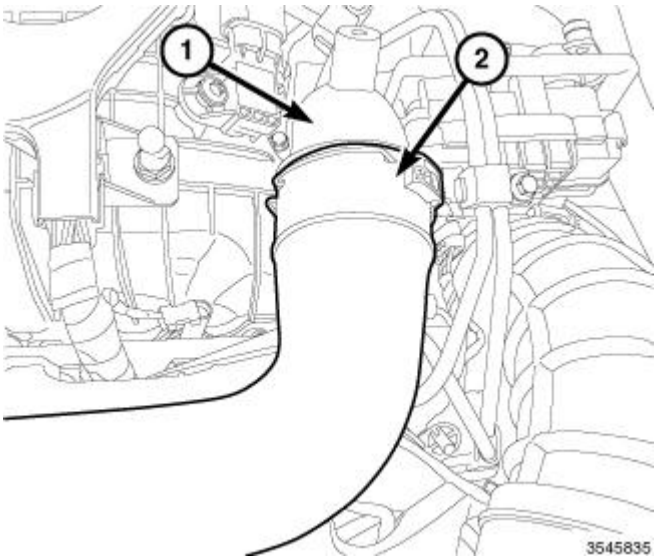
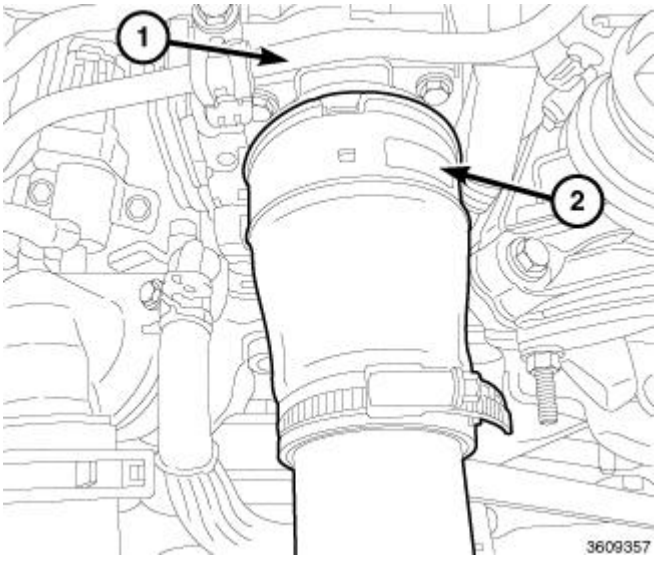


Fig. 10: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

20. Disconnect the Charge Air Cooler (CAC) hose (2) from turbocharger (1).
21. Remove the two bolts securing the CAC hose to timing cover.



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Fig. 11: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

22. Disconnect the CAC hose (1) from the EGR air flow control valve.
23. Remove bolt securing CAC hose to lower timing cover.

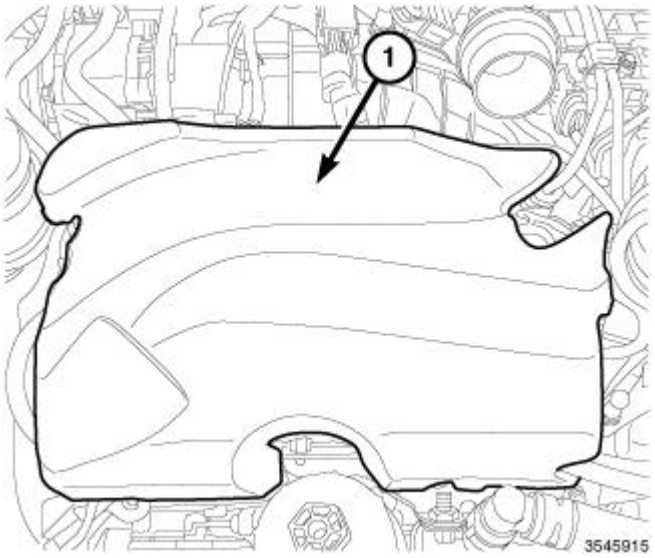


Fig. 12: Left Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

24. Remove the left side fuel injector silencer (1).
25. Remove the upper radiator hose.
26. Remove the lower radiator hose.
27. Remove the degas hose at thermostat housing.

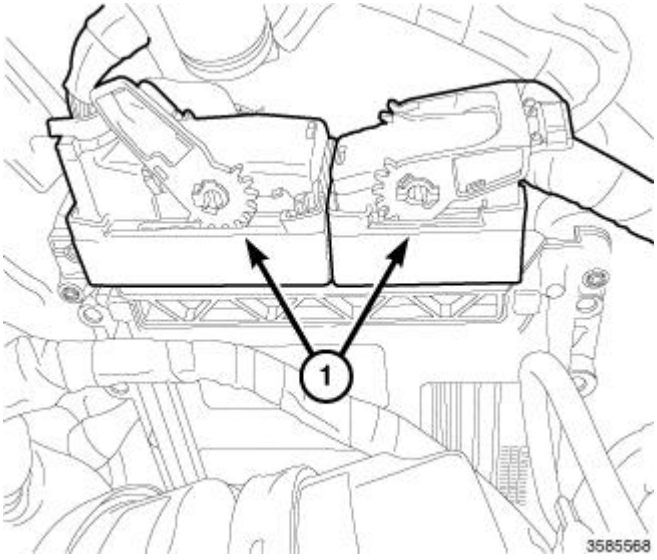


Fig. 13: Powertrain Control Module (PCM) Connectors

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Courtesy of CHRYSLER GROUP, LLC

28. Disconnect the engine wire harness at the Powertrain Control Module (PCM).
29. Disconnect the second engine wire harness near master cylinder.
30. Remove the oxygen sensor. Refer to **SENSOR, OXYGEN, REMOVAL** .

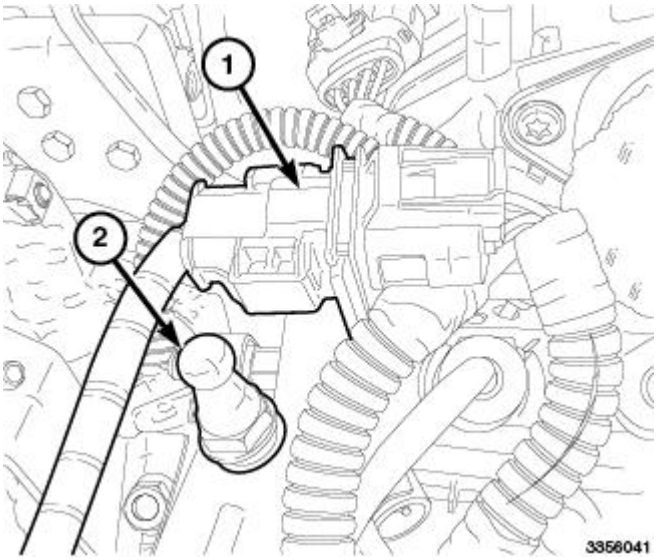


Fig. 14: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

31. Remove the ball stud bolt (2) securing the transmission fill tube.

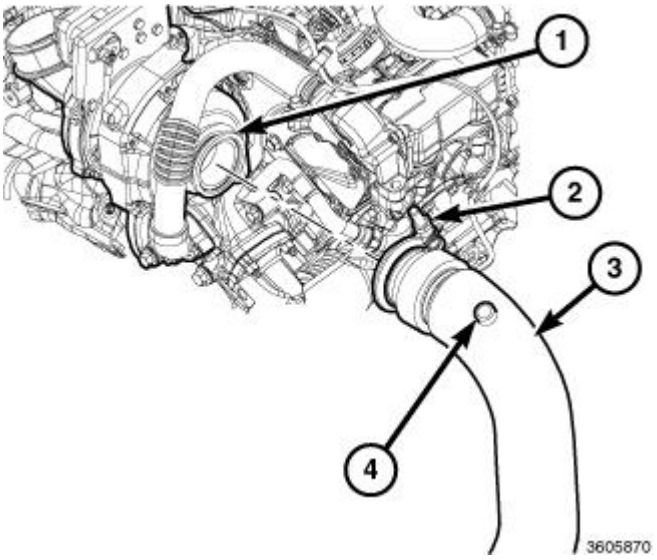


Fig. 15: Turbocharger Flange, Band Clamp & Down-Pipe
Courtesy of CHRYSLER GROUP, LLC

32. Remove the band clamp (2) and separate the down-pipe (3) from the turbocharger flange (1).
33. Disconnect the differential pressure sensor hoses.

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34. Disconnect the upstream stream exhaust temperature sensor.
35. Disconnect both heater hoses at engine.
36. Disconnect the brake booster vacuum hose.

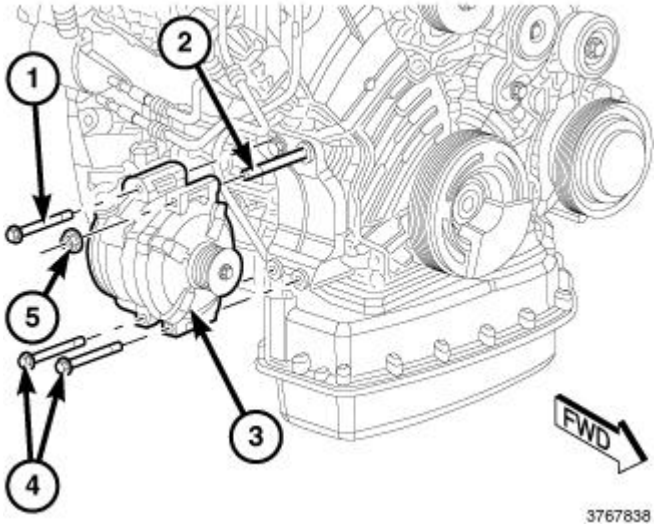


Fig. 16: Generator & Fasteners
Courtesy of CHRYSLER GROUP, LLC

37. Remove the generator (3). Refer to **GENERATOR, REMOVAL** .

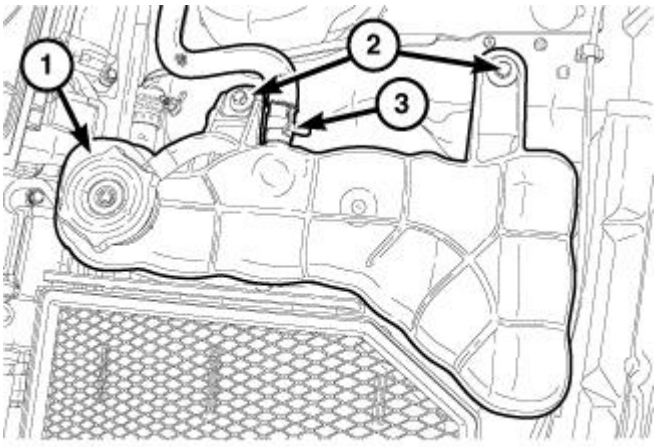


Fig. 17: Coolant Recovery Container Pressure Cap, Tube & Screws
Courtesy of CHRYSLER GROUP, LLC

38. Remove the coolant recovery bottle. Refer to **BOTTLE, COOLANT RECOVERY, REMOVAL** .

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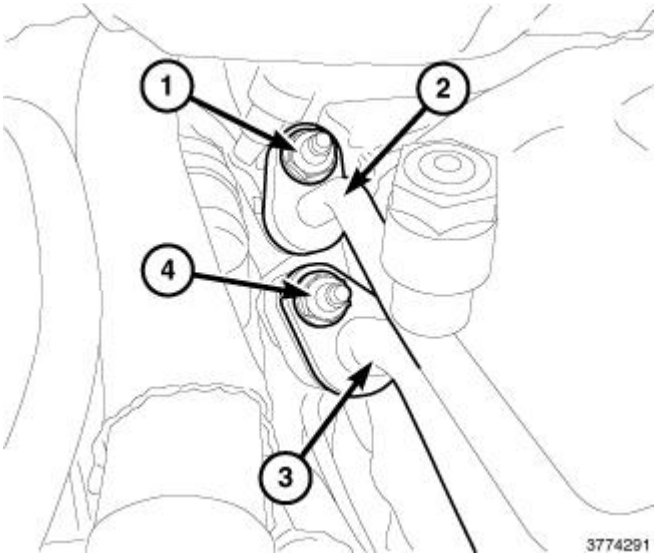


Fig. 18: A/C Liquid Line, A/C Suction Line & Fasteners
Courtesy of CHRYSLER GROUP, LLC

39. Remove nut and disconnect the A/C line junction near left strut tower. Install protective cap in openings.
40. Remove nut (4) and disconnect the A/C suction line (3). Install protective cap in openings.

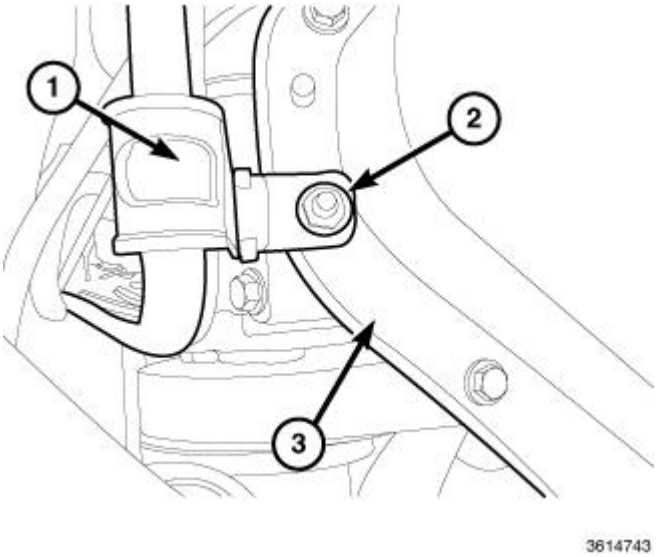


Fig. 19: Transmission Cooler Line Bracket, Nut & Oil Pan
Courtesy of CHRYSLER GROUP, LLC

41. Raise the vehicle.
42. Remove nut (2) securing the transmission cooler line bracket (1) to oil pan (3).
43. Lower the vehicle.

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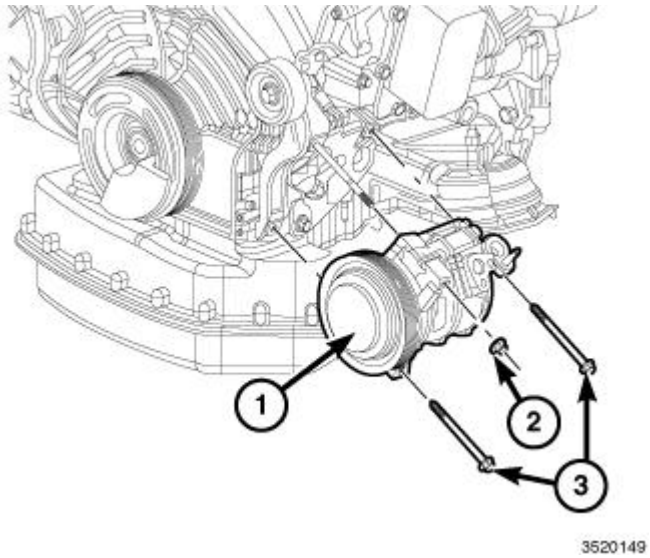


Fig. 20: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

44. Disconnect the A/C compressor wire harness connector.
45. Remove nut and the A/C suction line at compressor. Install protective cap in openings.
46. Remove nut and the A/C discharge line at compressor. Install protective cap in openings.
47. Remove the nut (2) and stud securing the A/C compressor (1).
48. Remove bolts (3) securing the A/C compressor and position aside the A/C compressor.

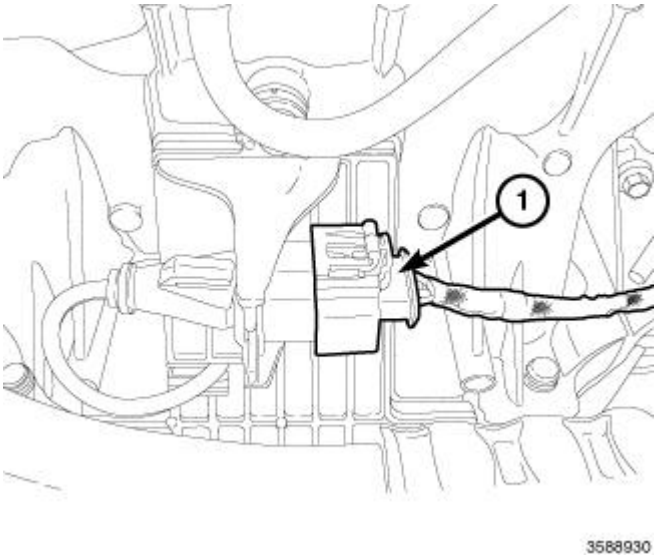


Fig. 21: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

49. Raise the vehicle.
50. Disconnect the Crankshaft Position Sensor (CKP) wiring harness connector (1).
51. Remove the starter. Refer to **STARTER, REMOVAL** .

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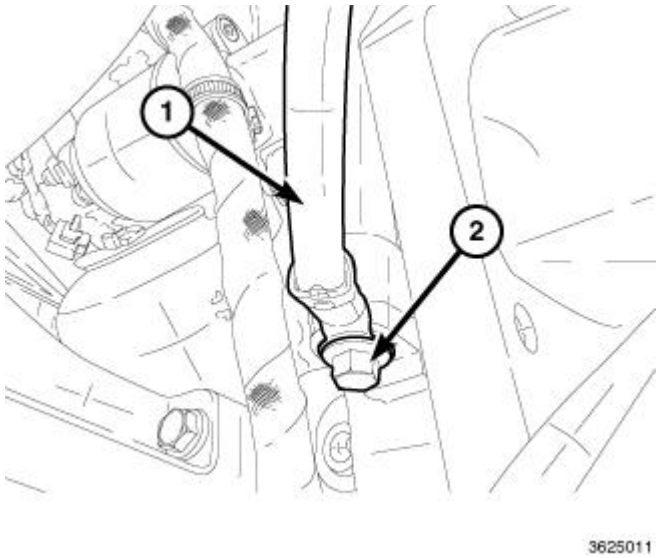


Fig. 22: Engine Ground Cable & Bolt
Courtesy of CHRYSLER GROUP, LLC

52. Remove bolt (2) and the engine ground cable (1).

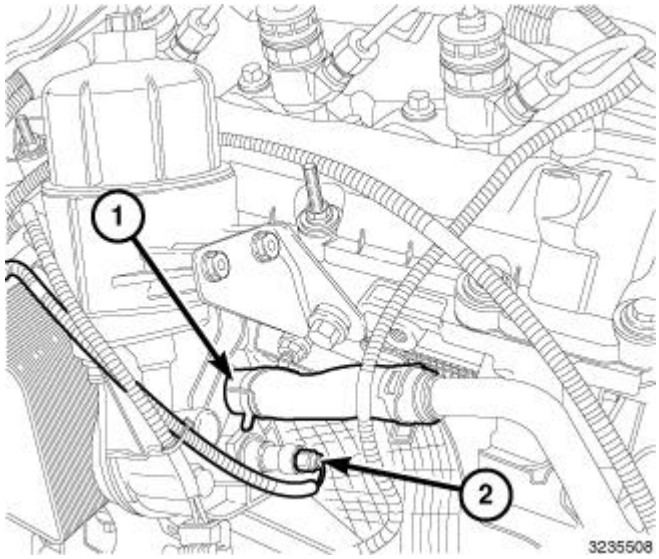


Fig. 23: Coolant Hose & Oil Pressure Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

53. Detach the wire harness retainer and disconnect the oil pressure switch wire harness connector (2).

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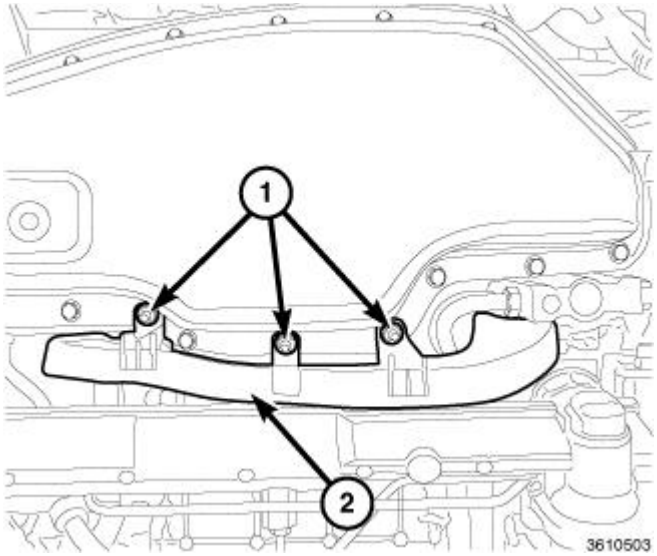


Fig. 24: Lower Engine Wire Harness & Nuts
Courtesy of CHRYSLER GROUP, LLC

54. Remove nuts (1) and allow wire harness (2) to drop down for clearance.
55. Detach the lower engine wire harness from upper oil pan.
56. Detach the wire harness retainer from oil dipstick tube.
57. Remove the torque converter bolts.

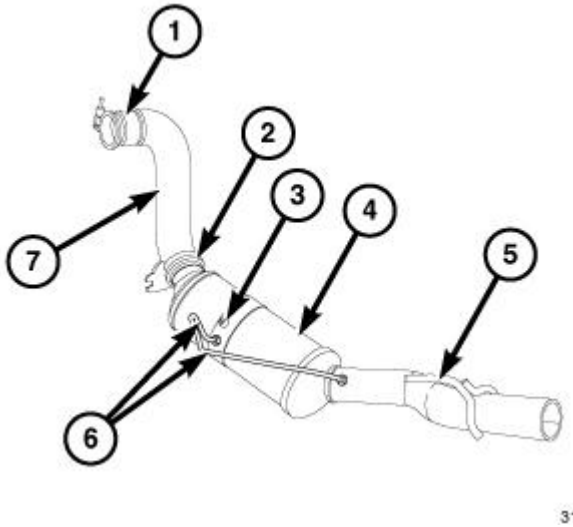


Fig. 25: Differential Pressure Sensor Tubing & Diesel Particulate Filter
Courtesy of CHRYSLER GROUP, LLC

58. Remove the diesel particulate filter. Refer to **FILTER, DIESEL PARTICULATE, REMOVAL** .

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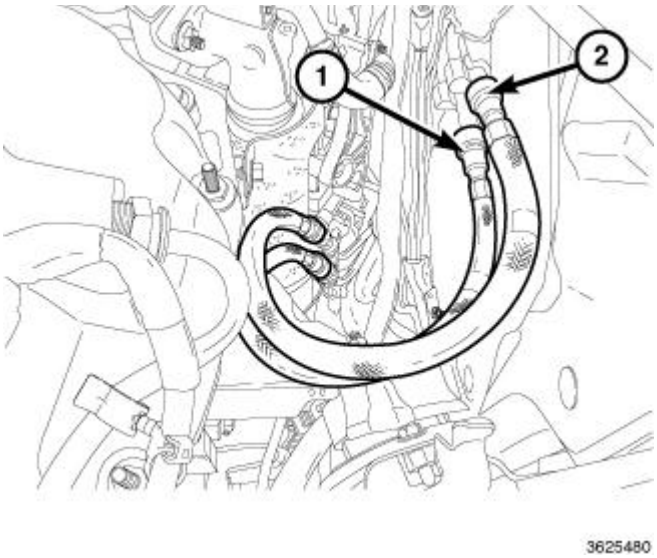


Fig. 26: Low Pressure Supply & Return Line
Courtesy of CHRYSLER GROUP, LLC

59. Disconnect the low pressure supply (1) and return (2) lines. Refer to **FITTING, QUICK CONNECT** .
60. Remove the four transmission-to-oil pan bolts.
61. Lower the vehicle.

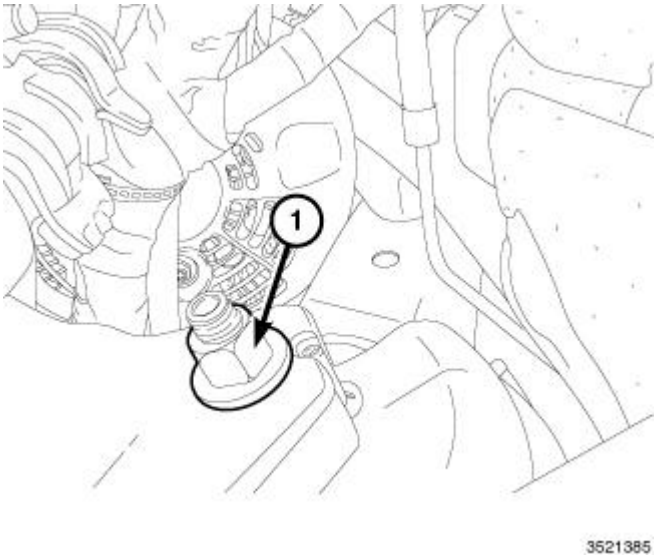


Fig. 27: Engine Mount Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Right side shown in illustration, left side similar.

62. Remove the right and left engine mount retaining nuts (1).

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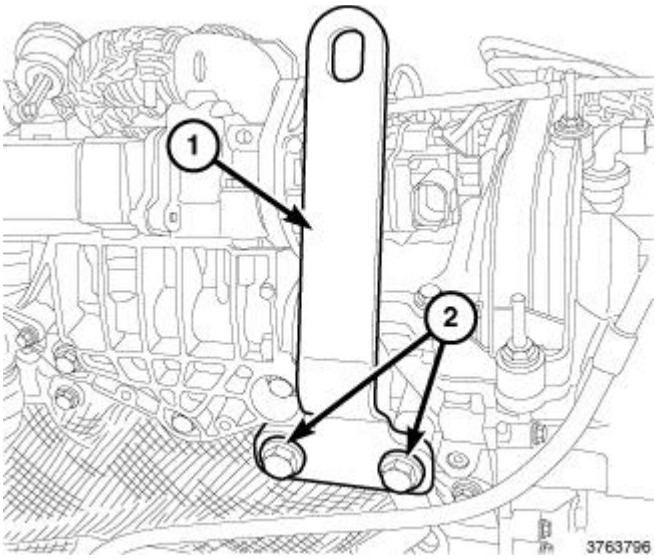


Fig. 28: Engine Lifting Bracket & Bolts - Right
Courtesy of CHRYSLER GROUP, LLC

63. Install the (special tool #VM.10360-2, Bracket, Engine Lifting (Right)) (1) and securely tighten bolts (2).

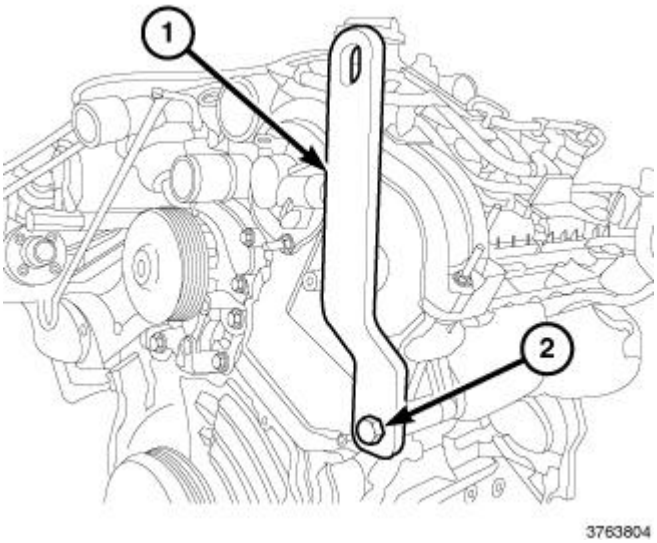


Fig. 29: Engine Lifting Bracket & Bolts - Left Front
Courtesy of CHRYSLER GROUP, LLC

64. Install the (special tool #VM.10360-3, Bracket, Engine Lifting (Left Front)) (1) and securely tighten bolt (2).

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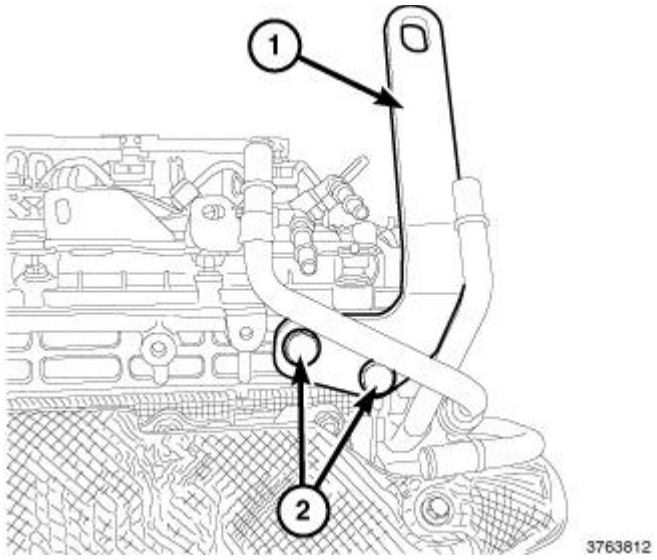
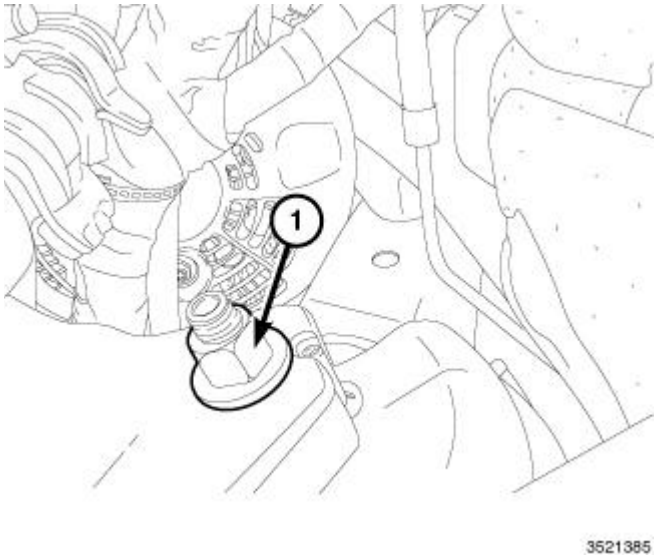


Fig. 30: Engine Lifting Bracket & Bolts - Left Rear
Courtesy of CHRYSLER GROUP, LLC

65. Install the (special tool #VM.10360-1, Bracket, Engine Lifting (Left Rear)) (1) and securely tighten bolts (2).
66. Position the engine hoist and connect engine lift chain to engine lift fixtures.
67. Position floor jack under the transmission.
68. Remove the upper five transmission-to-engine bolts.
69. Slightly raise the transmission.
70. Remove engine from vehicle.

INSTALLATION

INSTALLATION



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Fig. 31: Engine Mount Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

1. Carefully align the engine assembly in the engine bay area and align with the transmission, **Do Not** lower the engine.
2. Align the engine to transmission, and lower the engine mounts into position.

NOTE: Right side shown in illustration, left side similar.

3. Install the right and left engine mount retaining nuts (1) and tighten to 61 N.m (45 ft. lbs.).
4. Remove engine lifting device.
5. Lower the transmission and remove floor jack from under transmission.
6. Install the upper five transmission-to-engine bolts and tighten to 39 N.m (29 ft. lbs.).

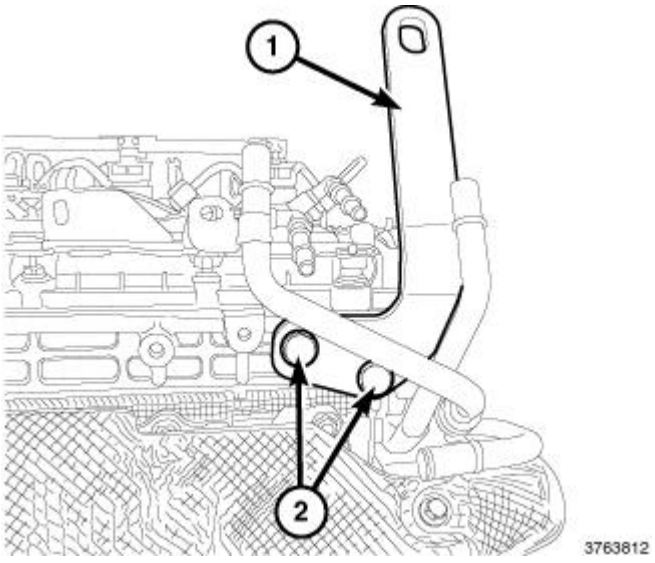


Fig. 32: Engine Lifting Bracket & Bolts - Left Rear
Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (2) and the (special tool #VM.10360-1, Bracket, Engine Lifting (Left Rear)) (1).

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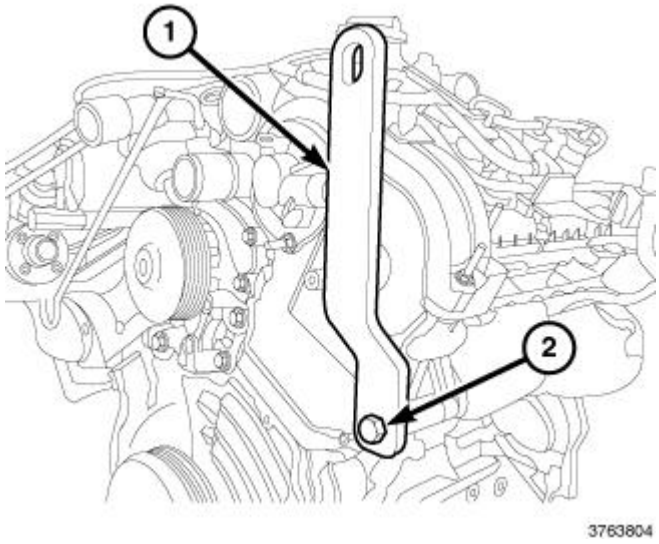


Fig. 33: Engine Lifting Bracket & Bolts - Left Front
Courtesy of CHRYSLER GROUP, LLC

8. Remove bolt (2) and the (special tool #VM.10360-3, Bracket, Engine Lifting (Left Front)) (1).

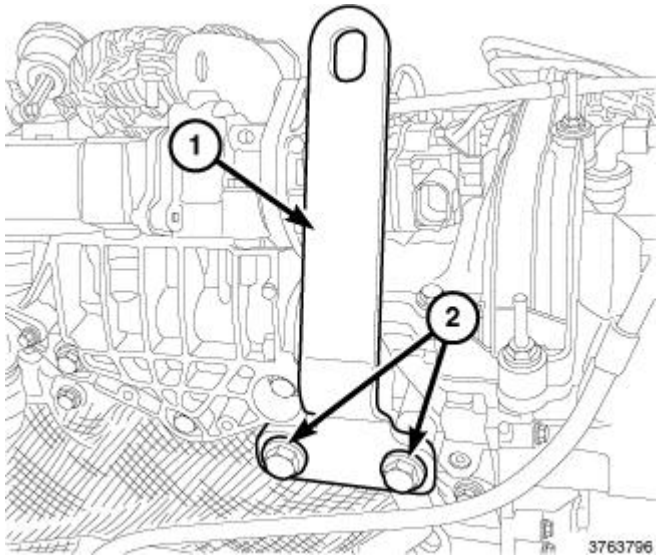


Fig. 34: Engine Lifting Bracket & Bolts - Right
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (2) and the (special tool #VM.10360-2, Bracket, Engine Lifting (Right)) (1).
10. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
11. Install the four transmission-to-oil pan bolts and tighten to 39 N.m (29 ft. lbs.).

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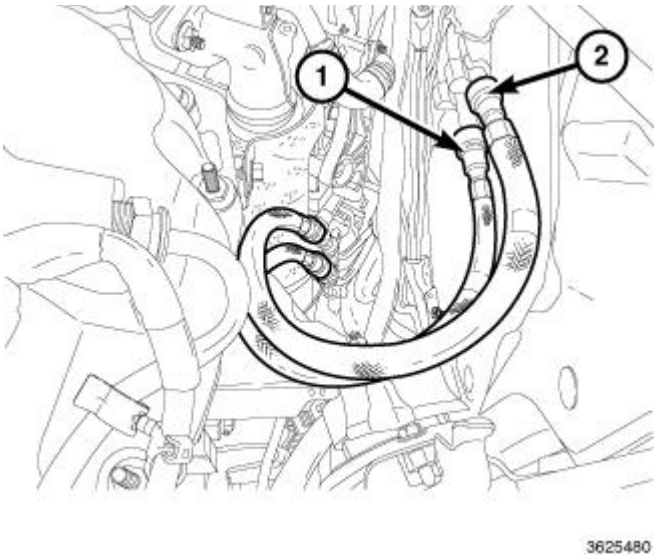


Fig. 35: Low Pressure Supply & Return Line
Courtesy of CHRYSLER GROUP, LLC

12. Connect the low pressure supply (1) and return (2) lines.
13. Install bolts securing the transmission cooler liner to oil pan and securely tighten bolts.

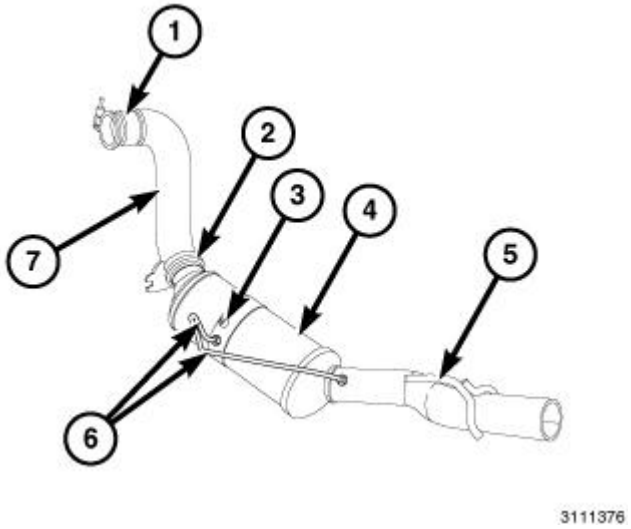


Fig. 36: Differential Pressure Sensor Tubing & Diesel Particulate Filter
Courtesy of CHRYSLER GROUP, LLC

14. Install the diesel particulate filter. Refer to **FILTER, DIESEL PARTICULATE, INSTALLATION** .

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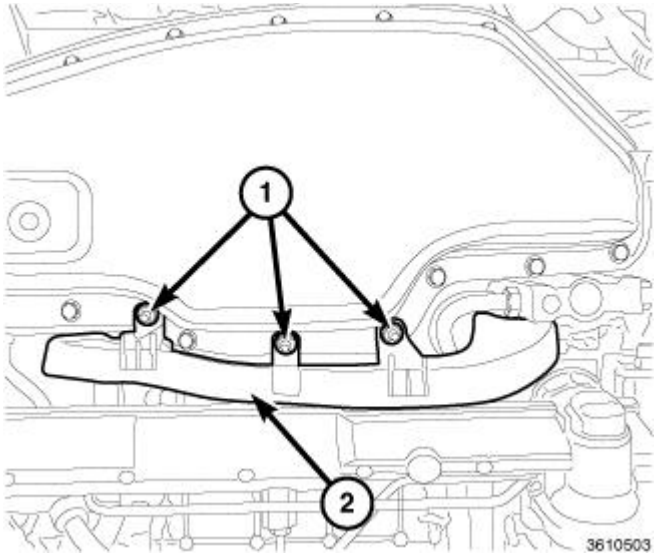


Fig. 37: Lower Engine Wire Harness & Nuts
Courtesy of CHRYSLER GROUP, LLC

15. Verify that the torque converter is pulled flush to the flexplate. Tighten bolts to 42 N.m (31 ft. lbs.).
16. Attach the wire harness retainer to the oil dipstick tube.
17. Attach the lower engine wire harness from upper oil pan.
18. Install the wire harness (2). Tighten nuts (1) to 11 N.m (97 in. lbs.).

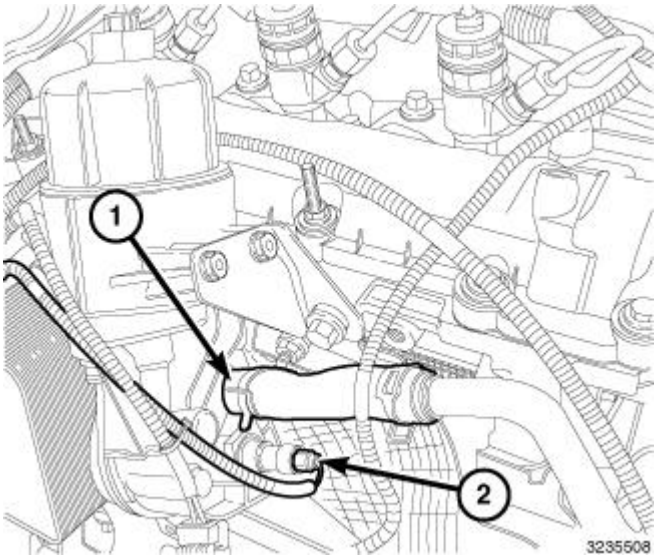


Fig. 38: Coolant Hose & Oil Pressure Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

19. Connect the oil pressure switch wire harness connector (2) and attach the wire harness retainer.

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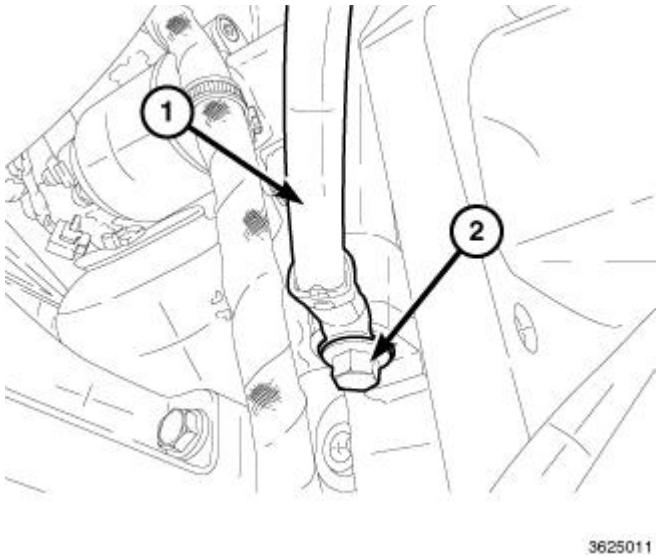


Fig. 39: Engine Ground Cable & Bolt
Courtesy of CHRYSLER GROUP, LLC

20. Install the engine ground cable (1). Tighten bolt (2) to 30 N.m (22 ft. lbs.).

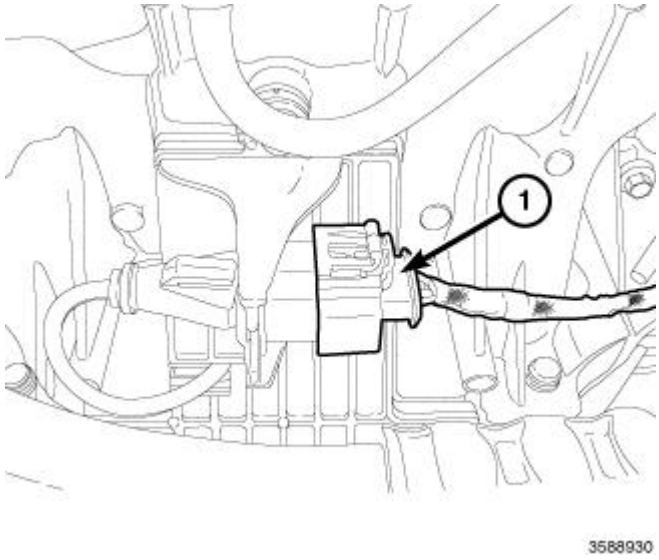


Fig. 40: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

21. Install the starter. Refer to **STARTER, INSTALLATION** .
22. Disconnect the Crankshaft Position Sensor (CKP) wiring harness connector (1).
23. Lower the vehicle.

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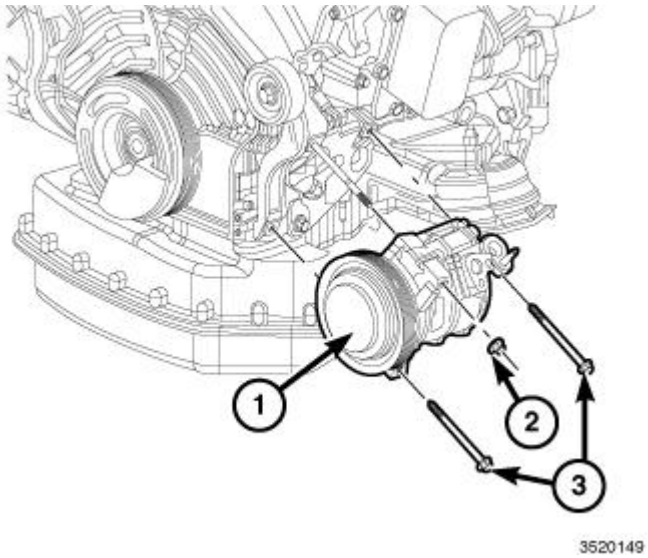


Fig. 41: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

24. Install the A/C compressor. Tighten bolts (3) to 30 N.m (22 ft. lbs.).
25. Install the A/C compressor mounting stud and tighten to 11 N.m (97 in. lbs.).
26. Install the A/C compressor mounting nut (2) and tighten to 30 N.m (22 ft. lbs.).
27. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
28. Remove protective cap and install the A/C discharge line at compressor. Tighten nut to 22 N.m (16 ft. lbs.).
29. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
30. Remove protective cap and install the A/C suction line at compressor. Tighten nut to 22 N.m (16 ft. lbs.).
31. Connect the A/C compressor wire harness connector.

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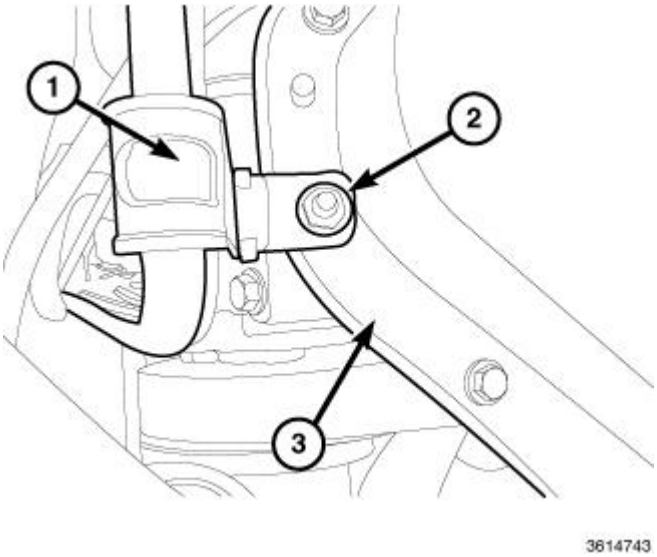


Fig. 42: Transmission Cooler Line Bracket, Nut & Oil Pan
Courtesy of CHRYSLER GROUP, LLC

32. Raise the vehicle.
33. Install the transmission cooler line bracket (1) and tighten nuts (2) to 11 N.m (97 in. lbs.).
34. Lower the vehicle.

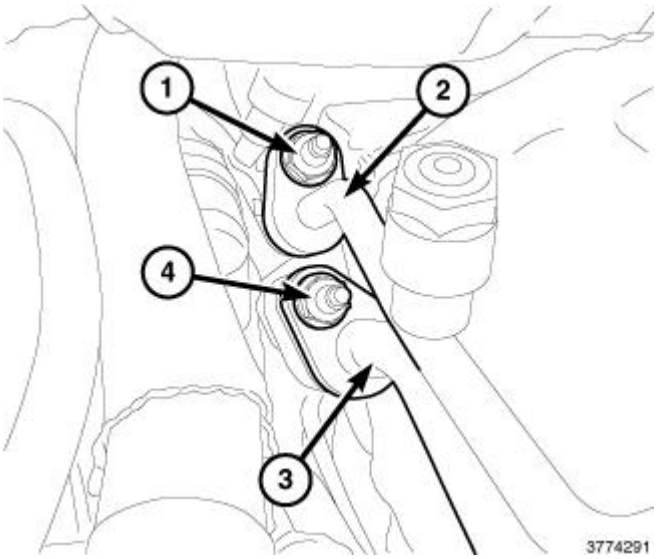


Fig. 43: A/C Liquid Line, A/C Suction Line & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

35. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil

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of the type recommended for the A/C compressor in the vehicle.

36. Remove the protective caps from opening and connect the A/C suction line (3). Tighten nut (4) to 22 N.m (16 ft. lbs.).
37. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
38. Remove the protective caps from opening and connect the A/C liquid line (2). Tighten nut (4) to 22 N.m (16 ft. lbs.).

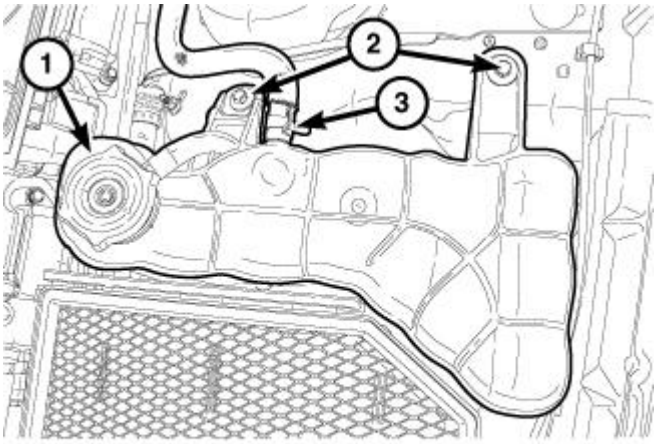


Fig. 44: Coolant Recovery Container Pressure Cap, Tube & Screws
Courtesy of CHRYSLER GROUP, LLC

39. Install the coolant recovery bottle. Refer to **BOTTLE, COOLANT RECOVERY, INSTALLATION** .

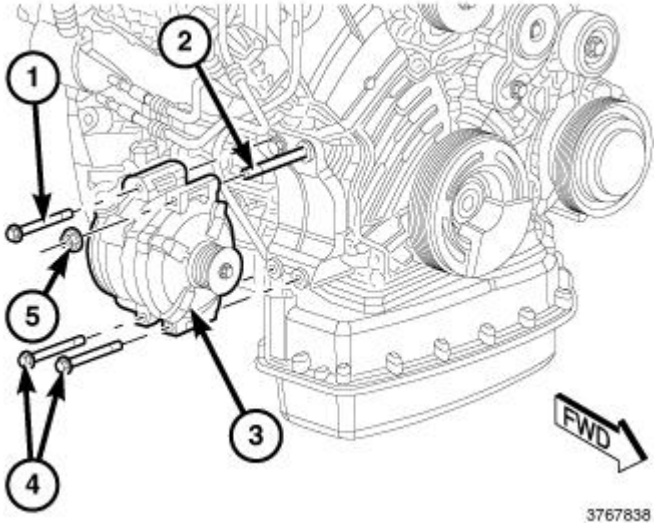


Fig. 45: Generator & Fasteners
Courtesy of CHRYSLER GROUP, LLC

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40. Install the generator (3). Refer to **GENERATOR, INSTALLATION** .

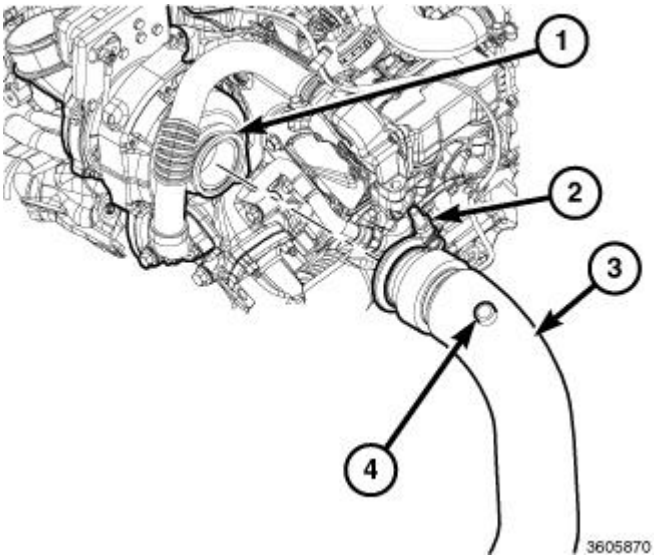


Fig. 46: Turbocharger Flange, Band Clamp & Down-Pipe
Courtesy of CHRYSLER GROUP, LLC

41. Connect the brake booster vacuum hose.
42. Connect both heater hoses at engine.
43. Connect the upstream stream exhaust gas temperature sensor.
44. Connect the differential pressure sensor hoses.
45. Connect the down-pipe (3) to the turbocharger flange (1) and install the band clamp (2). Tighten band clamp to (2) to 25 N.m (18 ft. lbs.).

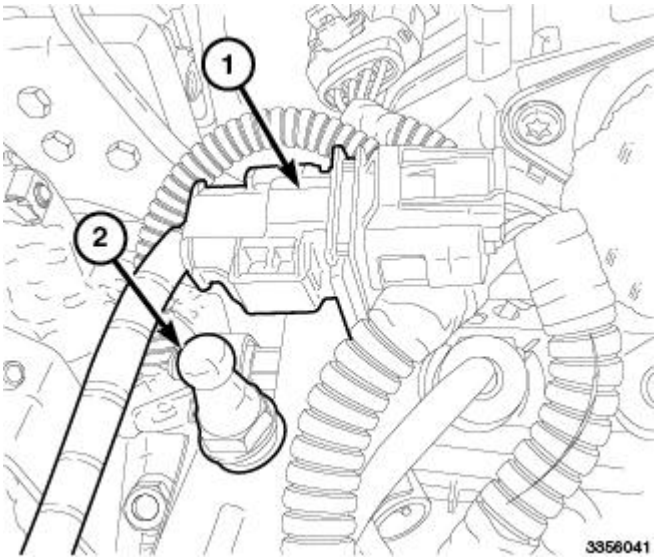


Fig. 47: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

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46. Install the ball stud bolt (2) securing the transmission fill tube and securely tighten.

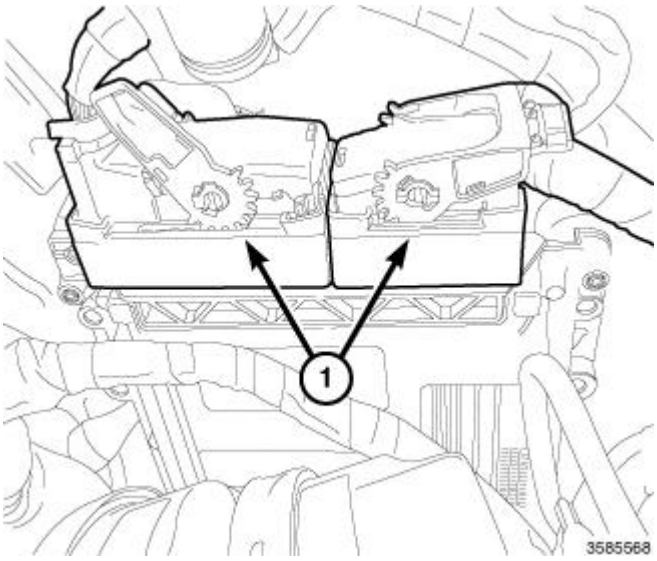


Fig. 48: Powertrain Control Module (PCM) Connectors
Courtesy of CHRYSLER GROUP, LLC

47. Install the oxygen sensor. Refer to **SENSOR, OXYGEN, INSTALLATION** .
48. Connect the second engine wire harness near master cylinder.
49. Connect the engine wire harness at the Powertrain Control Module (PCM).

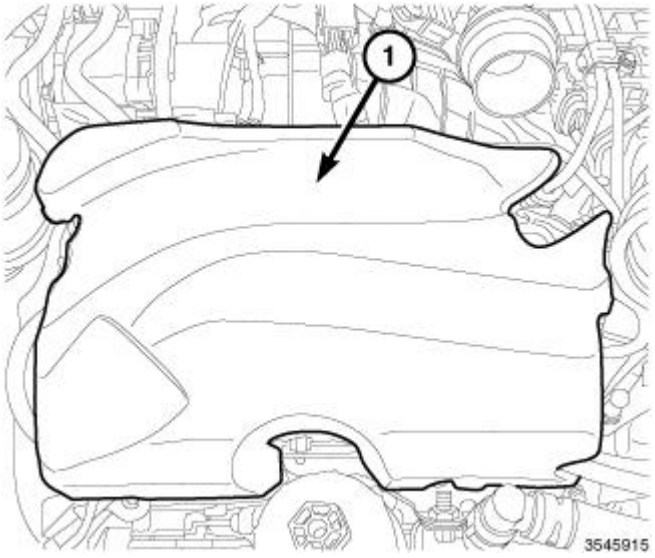


Fig. 49: Left Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

50. Install the degas hose at thermostat housing.
51. Install the lower radiator hose.
52. Install the upper radiator hose.

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53. Install the left side fuel injector silencer (1).

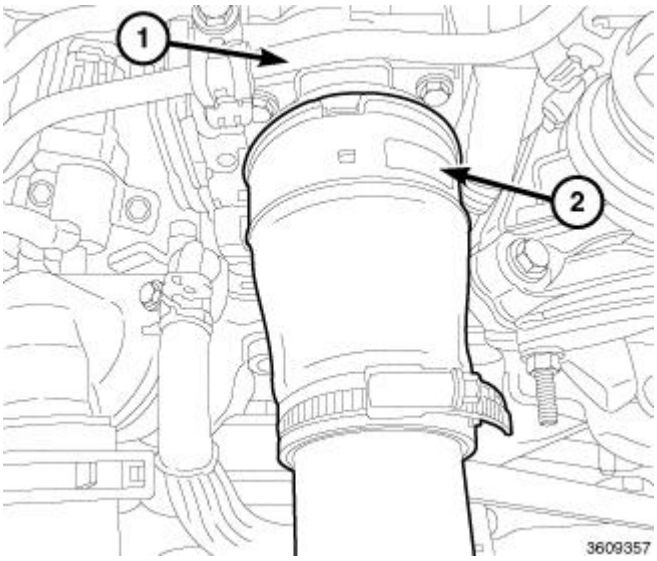


Fig. 50: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

54. Install bolt securing CAC hose to lower timing cover and securely tighten.
55. Connect the CAC hose (2) from the EGR air flow control valve.

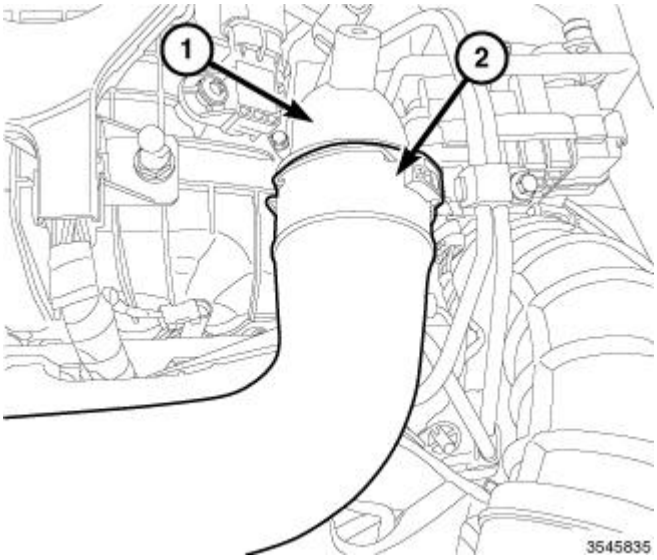


Fig. 51: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

56. Install the two bolts securing the CAC hose to timing cover and securely tighten.
57. Connect the Charge Air Cooler (CAC) hose (2) from turbocharger (1).

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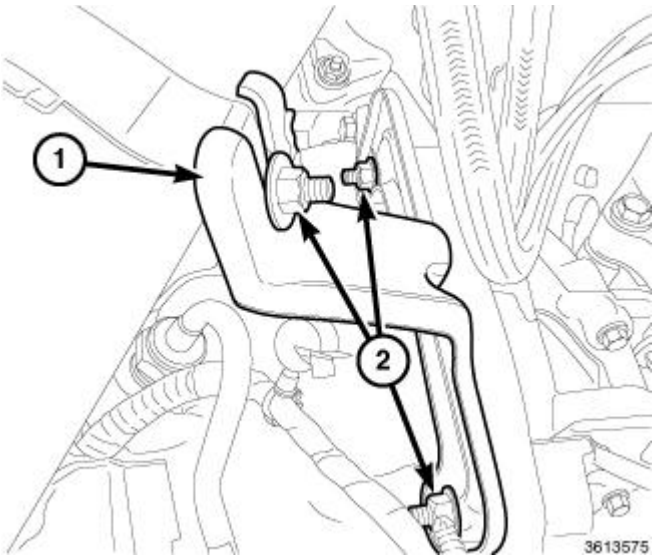


Fig. 52: Exhaust Steady Rest Bracket & Nuts
Courtesy of CHRYSLER GROUP, LLC

58. Raise the vehicle.
59. Install the lower generator bolt, nut, and ground wire:
    - Tighten bolt to 28 N.m (21 ft. lbs.).
    - Tighten nut to 28 N.m (21 ft. lbs.).
60. Install the left side splash shield.
61. Install the right side splash shield.
62. Install the right side CAC hose at cooler.
63. Install the left side Charge Air Cooler (CAC) hose at cooler.
64. Install the exhaust steady rest bracket (1). Tighten nuts (2) to 26 N.m (19 ft. lbs.).
65. Attach the wire harness retainer from exhaust steady rest bracket.
66. Install the transmission belly pan.
67. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .

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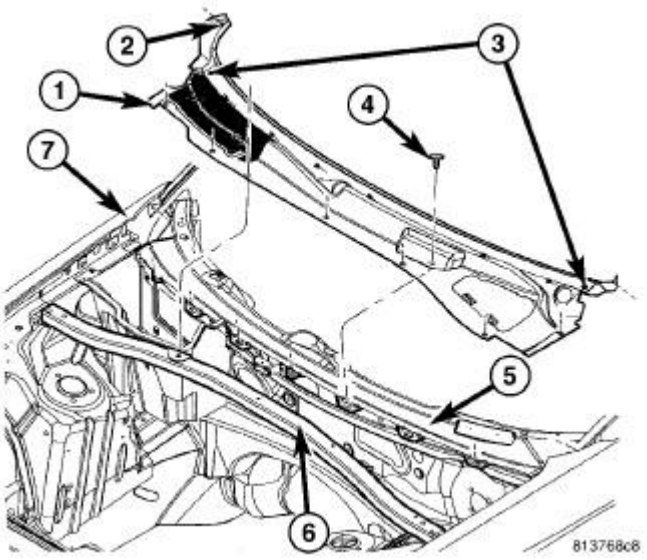


Fig. 53: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

68. Install air cleaner body and intake air tube. Refer to **BODY, AIR CLEANER, INSTALLATION**.
69. Install the strut support brace (6). Tighten bolts to 38 N.m (28 ft. lbs.).
70. Install the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, INSTALLATION** .

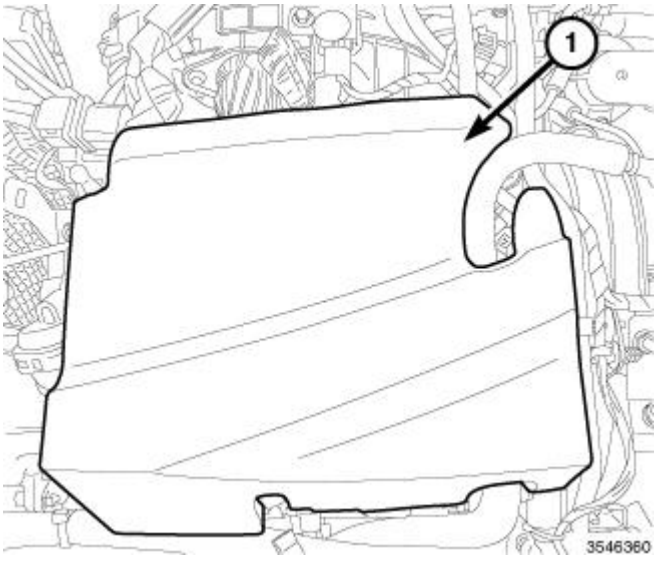


Fig. 54: Right Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

71. Install the hood. Refer to **HOOD, INSTALLATION** .
72. Charge the A/C system with refrigerant. Refer to **PLUMBING, STANDARD PROCEDURE** .
73. Install the right side fuel injector silencer (1).
74. Install a new oil filter. Refer to **FILTER, ENGINE OIL, INSTALLATION**.

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75. Fill engine with the recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
76. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
77. Install the hood. Refer to **HOOD, INSTALLATION** .

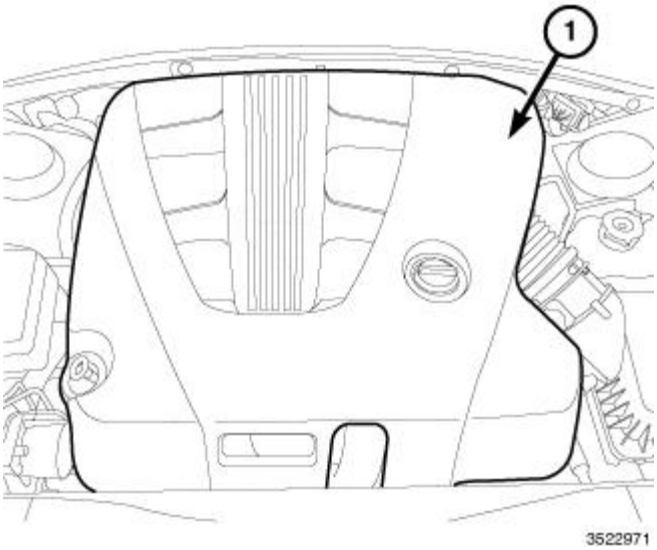


Fig. 55: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

78. Connect the negative battery cable.
79. Start engine and inspect for leaks.
80. Install engine cover (1).

SPECIAL TOOLS

SPECIAL TOOLS

10224 - Adapter, Valve Spring (Originally Shipped In Kit Number(s) 10223.) 10368 - Set, Universal Protective Cap 8534B - Fixture, Driveline Support (Originally Shipped In Kit Number(s) 8534, 8534B, 8849, 9565.) C-3339A - Set, Dial Indicator (Originally Shipped In Kit Number(s) 9202.) C-3422-D - Compressor, Valve Spring VM.10338 - Tool, Camshaft Timing VM.10338-1 - Timing Tool, Camshaft (Right) VM.10338-2 - Timing Tool, Camshaft (Left) VM.10339 - Tool, Crankshaft Timing VM.10340-1 - Guide, Front Seal

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VM.10340-2 - Installer Tool, Front Seal
VM.10341-1 - Guide, Rear Seal
VM.10341-2 - Installer Tool, Rear Seal
VM.10342 - Tool, Crankshaft Bearing Positioning
VM.10343-1 - Alignment Tool, Cylinder Head (Right Intake)
VM.10343-2 - Alignment Tool, Cylinder Head (Left Intake)
VM.10343-3 - Alignment Tool, Cylinder Head (Left Exhaust)
VM.10343-4 - Alignment Tool, Cylinder Head (Right Exhaust)
VM.10344 - Tool, Oil Separator Remover/Installer
VM.10357 - Adapter, Compression Test
VM.10359 - Pin, Tensioner
VM.10360-1 - Bracket, Engine Lifting (Left Rear)
VM.10360-2 - Bracket, Engine Lifting (Right)
VM.10360-3 - Bracket, Engine Lifting (Left Front)
VM.10362 - Tool, Bedplate Removal

COVER, ENGINE

DESCRIPTION

DESCRIPTION

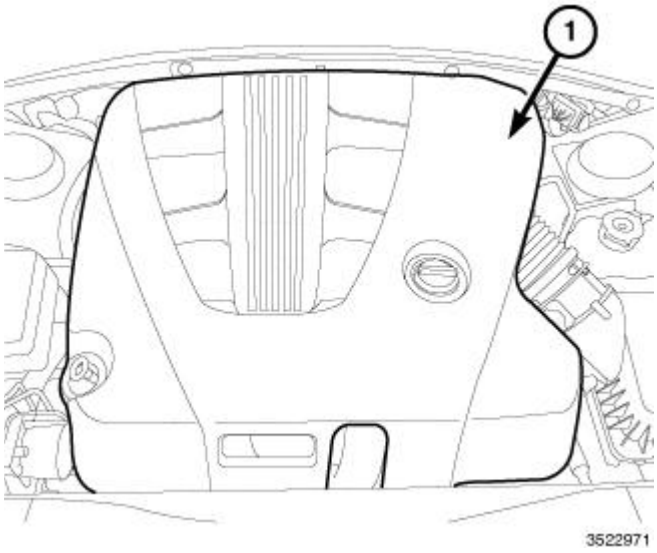


Fig. 56: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

The insulated engine cover (1) is made of composite material and used cosmetically to cover the top of the engine and greatly reduce engine noise. Four brackets secure the cover to the engine. Also there is an insulated pad on the each of the cylinder head covers to insulate the fuel injectors.

REMOVAL

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REMOVAL

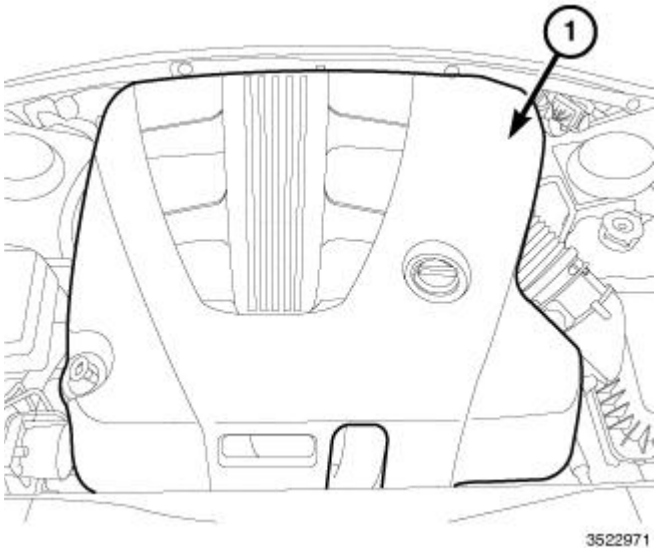


Fig. 57: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Pull upward on the engine cover (1) to release from mounting brackets and remove the engine cover (1).

INSTALLATION

INSTALLATION

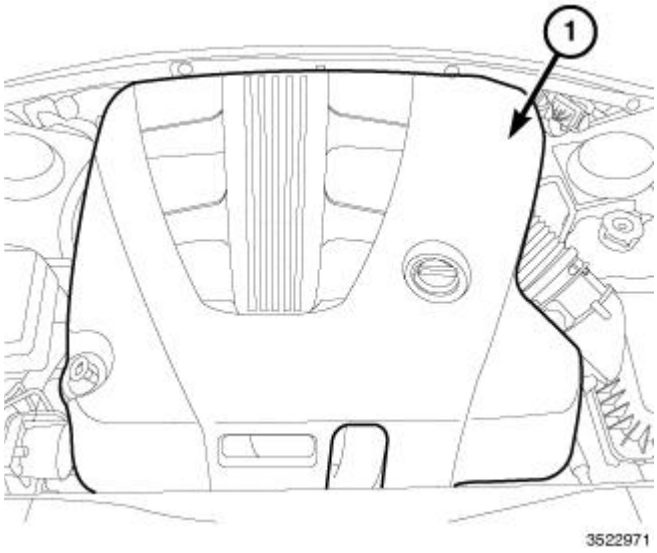


Fig. 58: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Align the engine cover (1) with the mounting bracket and push down to seat the cover.

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CYLINDER HEAD

DESCRIPTION

DESCRIPTION

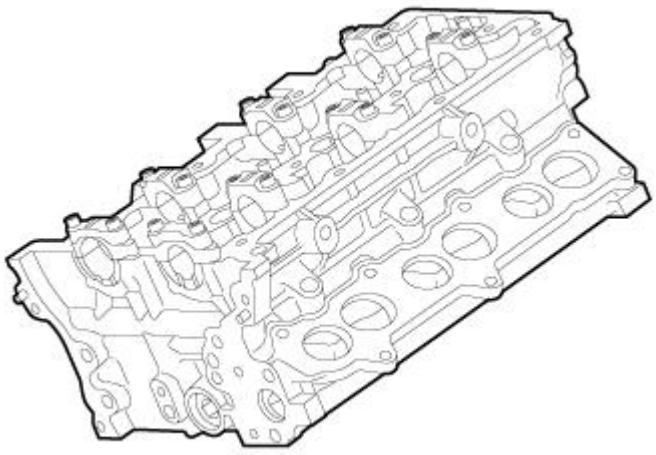


Fig. 59: Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

The cylinder heads on the 3.0L V-6 are of a cross-flow design and have the following features:

- High-Strength Cast Aluminum Alloy Construction.
- Four Valves per Cylinder.
- Roller Finger Followers/Lifter Assemblies.
- Pressed-in Valve Guides and Valve Seats.

The 3.0L aluminum, overhead valve cylinder heads are made of high strength aluminum alloy and are each equipped with two camshafts, roller finger followers/lifter assemblies and four valve technology. The cylinder head can not be resurfaced. The cylinder head uses a Multi-layered Steel gasket for sealing.

The valve seats and valve guides are not serviceable.

STANDARD PROCEDURE

INSPECTION

1. Measure cylinder head bolts between points shown.

Cylinder Head Bolts	Thread Diameter	14 x 1.5 mm
	Length When New	155 mm

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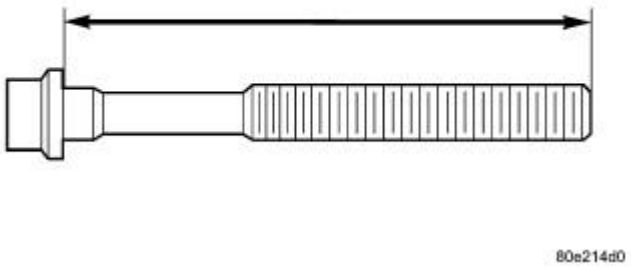


Fig. 60: Measuring Cylinder Head Bolts
Courtesy of CHRYSLER GROUP, LLC

2. The cylinder head bolts are a one time use bolt that needs to be replace anytime they have been removed from the cylinder head.

REMOVAL

LEFT BANK

1. Disconnect the negative and positive battery cables.
2. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
3. Remove the glow plugs.
4. Remove the left side intake and exhaust camshafts. Refer to **CAMSHAFT, ENGINE, REMOVAL**.
5. Remove the rocker arms and lifters and note their original position.
6. Remove the water pump housing assembly. Refer to **PUMP, WATER, REMOVAL** .

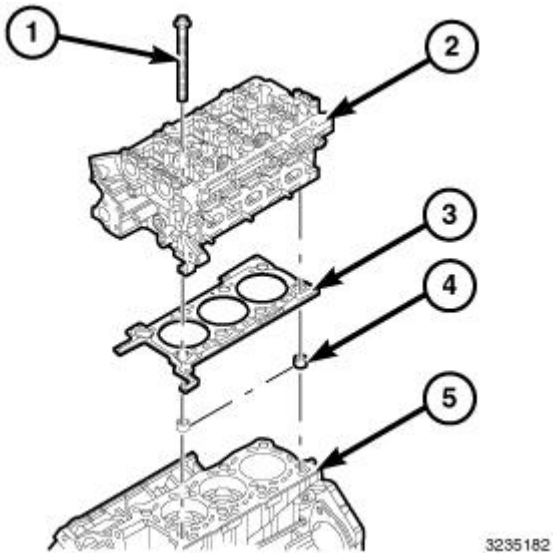


Fig. 61: Cylinder Head, Head Gasket, Engine Block & Bolts
Courtesy of CHRYSLER GROUP, LLC

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NOTE: Do Not store the cylinder head on the sealing surface.

7. Remove and discard bolts (1) and the cylinder head (2) from the engine block (5).
8. Remove and discard the head gasket (3).

RIGHT BANK

1. Disconnect the negative and positive battery cables.
2. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
3. Remove the glow plugs.
4. Remove the right side intake and exhaust camshaft shafts. Refer to **CAMSHAFT, ENGINE, REMOVAL**.
5. Remove the rocker arms and lifters and note their original position.
6. Remove the water pump housing assembly. Refer to **PUMP, WATER, REMOVAL** .

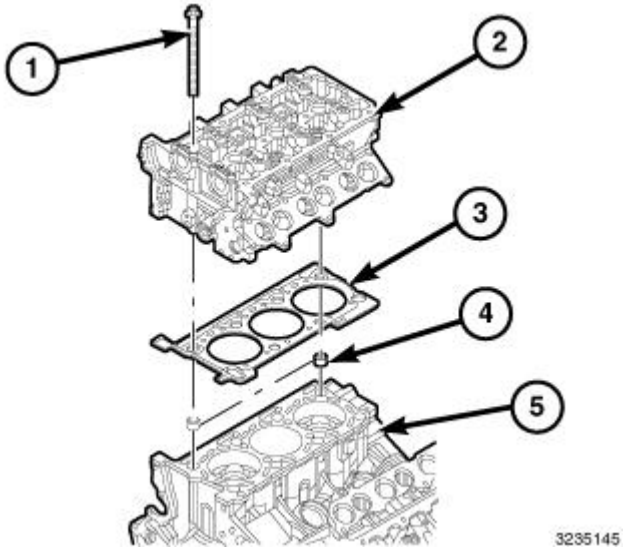


Fig. 62: Cylinder Head, Head Gasket, Engine Block & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do Not store the cylinder head on the sealing surface.

7. Remove bolts (1) and the cylinder head (2) from the engine block (5).
8. Remove and discard the head gasket (3).

CLEANING

CLEANING

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

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Check to ensure that no fuel injector washer seals are left in the injector bores.

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

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

INSPECTION

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and engine block mating surfaces.

The cylinder head thickness is 133 ± 0.06 mm (5.2362 ± 0.0023 in.).

Cylinder head flatness tolerance 0.1 mm (0.0039 in.).

INSTALLATION

LEFT BANK

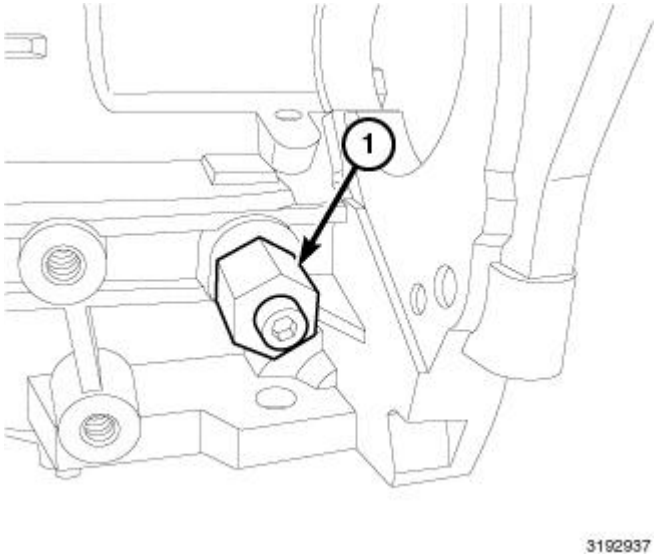


Fig. 63: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect gasket mating surfaces. Refer to **Engine/Cylinder Head - Cleaning**.
2. Remove the (special tool #VM.10339, Tool, Crankshaft Timing) (1).

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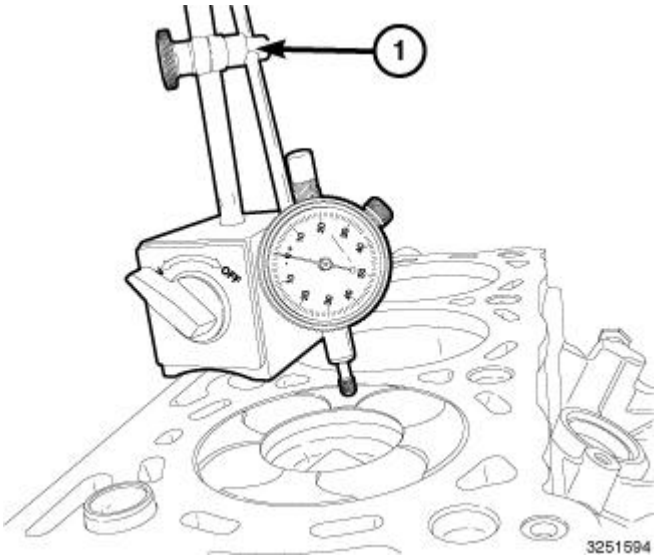


Fig. 64: Setting Number One Piston At Top Dead Center Using Dial Indicator
Courtesy of CHRYSLER GROUP, LLC

3. Set the number one piston to top dead center (TDC).
4. Using the (special tool #C-3339A, Set, Dial Indicator) (1), assemble as illustrated.

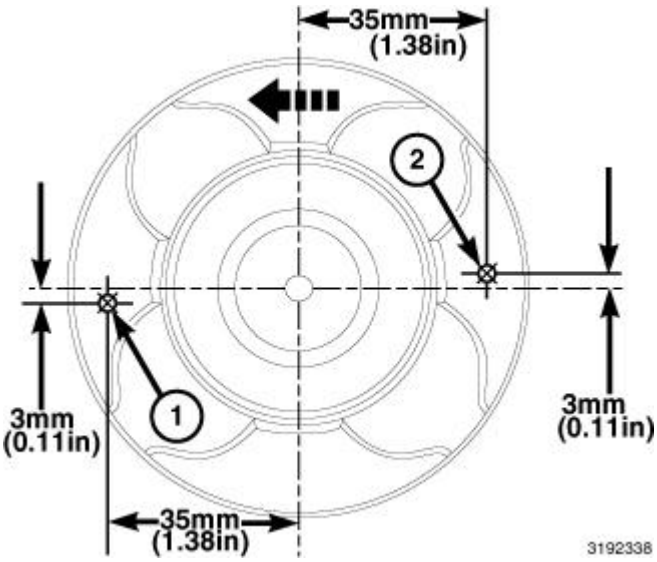


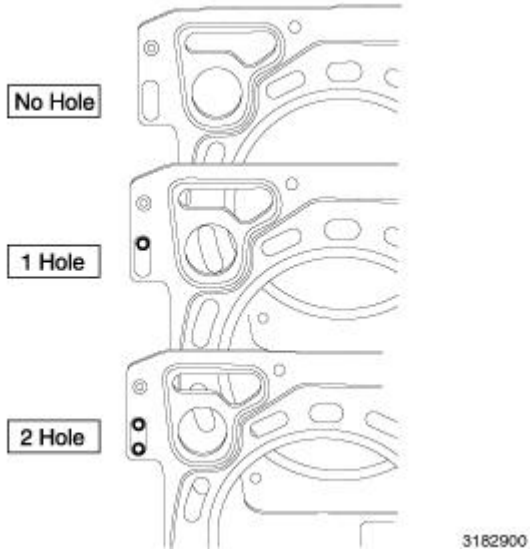
Fig. 65: Measuring Height Of The Piston At Top Dead Center
Courtesy of CHRYSLER GROUP, LLC

5. Zero the dial indicator on the top of the piston at location shown in illustration (1).
6. Use the dial indicator to measure the height of the piston at top dead center to the cylinder block and record measurements.
7. Zero the dial indicator on the top of the piston at location shown in illustration (2).
8. Use the dial indicator to measure the height of the piston at top dead center to cylinder block and record measurements.

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9. Repeat the procedure for each cylinder.
10. Average the 3 piston protrusion readings to determine the required gasket thickness.

HEAD GASKET SELECTION CHART		
	Millimeters	Inches
PISTON CLEARANCE	0.130 - 0.220	0.0051 - 0.0086
CYLINDER HEAD GASKET THICKNESS	0.96	0.0377
GASKET IDENTIFICATION	NO HOLE	
PISTON CLEARANCE	0.221 - 0.310	0.0087 - 0.0122
CYLINDER HEAD GASKET THICKNESS	1.06	0.0417
GASKET IDENTIFICATION	ONE HOLE	
PISTON CLEARANCE	0.311 - 0.402	0.0122 - 0.0158
CYLINDER HEAD GASKET THICKNESS	1.16	0.0456
GASKET IDENTIFICATION	TWO HOLES	



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Fig. 66: Cylinder Head Gasket Identification
Courtesy of CHRYSLER GROUP, LLC

NOTE: The illustration shows gasket identification marks.

11. Select the appropriate cylinder head gasket from the cylinder head gasket chart.

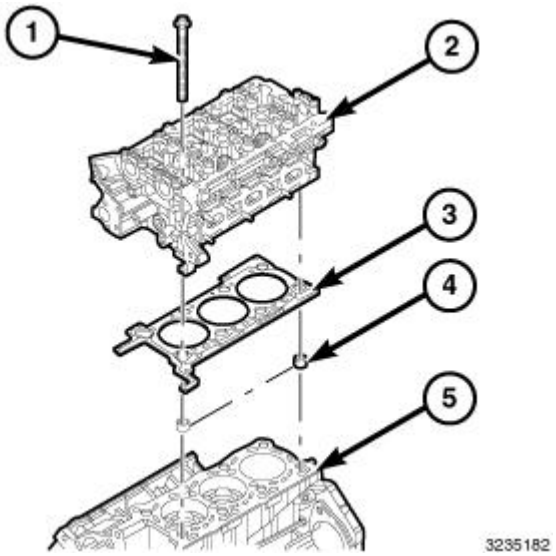


Fig. 67: Cylinder Head, Head Gasket, Engine Block & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Install the head gasket (3) onto the engine block (5). Be sure the coolant passages align (part number should be facing up).
13. Install the cylinder head (2) onto the engine block (5) and install bolts (1) finger tight.

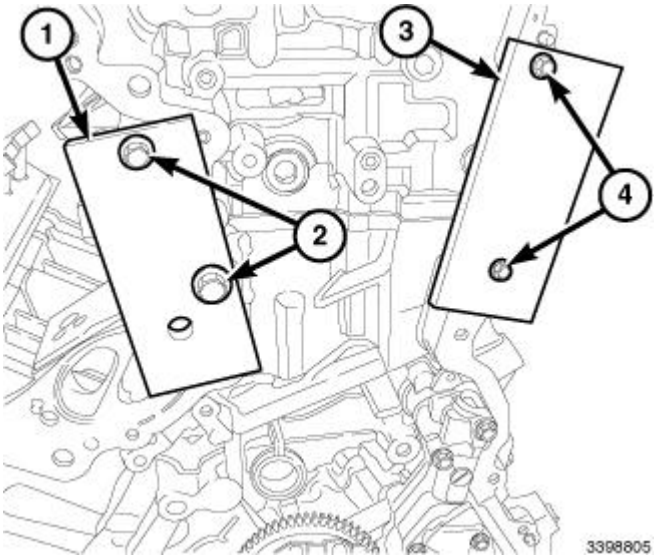


Fig. 68: Cylinder Head Alignment Tools & Bolts
Courtesy of CHRYSLER GROUP, LLC

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14. Install the (special tool #VM.10343-2, Alignment Tool, Cylinder Head (Left Intake)) (1) an securely tighten bolts (2).
15. Install the (special tool #VM.10343-3, Alignment Tool, Cylinder Head (Left Exhaust)) (3) an securely tighten bolts (4).

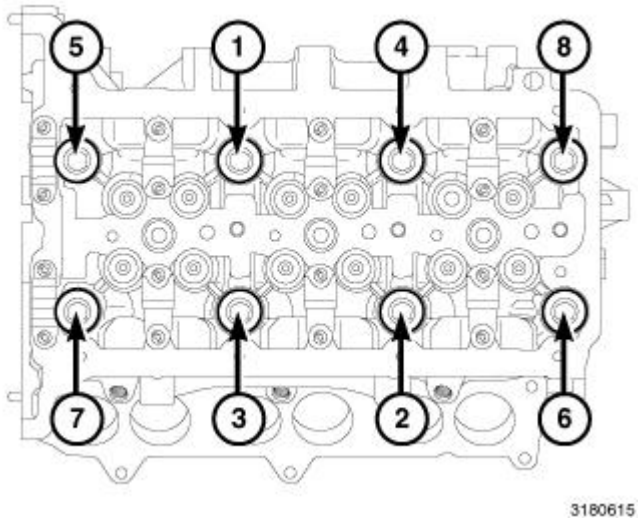


Fig. 69: Cylinder Head Bolts Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

16. Using the tighten sequence shown in illustration, tighten the cylinder head bolts to:
    - 30 N.m (22 ft. lbs.).
    - Tighten bolts an additional 75° turn.
    - Tighten bolts an additional 75° turn.
    - Tighten bolts an additional 75° turn.

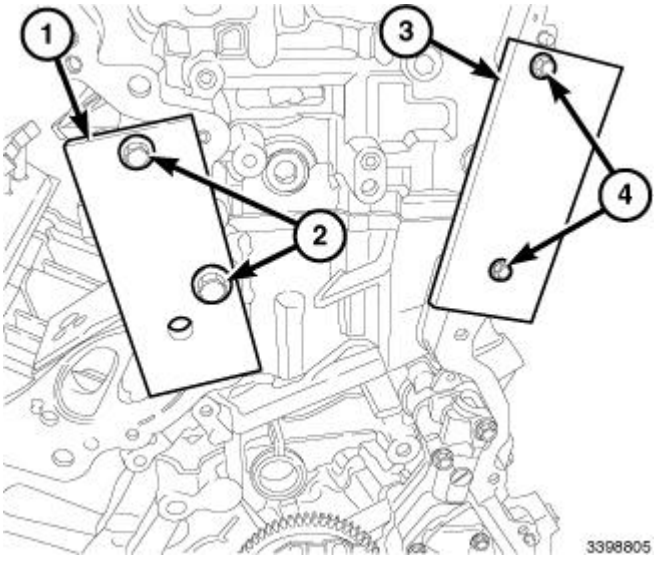


Fig. 70: Cylinder Head Alignment Tools & Bolts

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Courtesy of CHRYSLER GROUP, LLC

17. Remove bolts (2) and (special tool #VM.10343-3, Alignment Tool, Cylinder Head (Left Exhaust)) (1).
18. Remove bolts (4) and (special tool #VM.10343-2, Alignment Tool, Cylinder Head (Left Intake)) (3).
19. Install the water pump housing assembly. Refer to **PUMP, WATER, INSTALLATION** .

NOTE: Follower and tappet assemblies must be installed in same location as when removed.

20. Install the lifters and rocker arms into their original position as noted during removal.
21. Install the left side intake and exhaust camshafts. Refer to **CAMSHAFT, ENGINE, INSTALLATION**.
22. Install the glow plugs and tighten to 11 N.m (97 in. lbs.).
23. Install the oil cooler adapter. Refer to **ADAPTER, OIL COOLER, INSTALLATION**.
24. Install the intake manifold (4). Refer to **MANIFOLD, INTAKE, INSTALLATION**.

RIGHT BANK

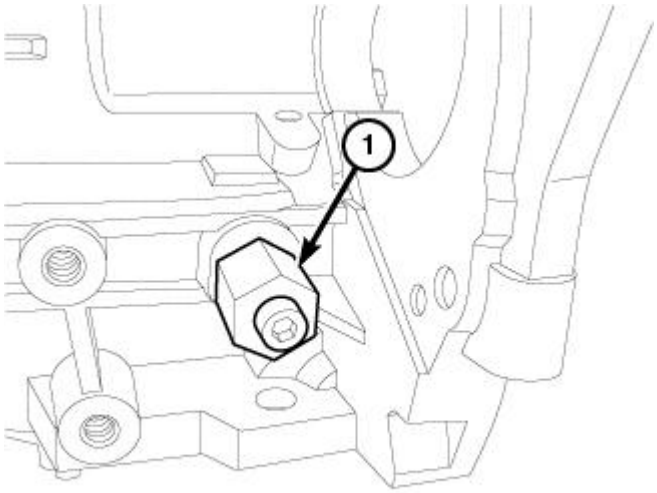


Fig. 71: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect gasket mating surfaces. Refer to **Engine/Cylinder Head - Cleaning**.
2. Remove the (special tool #VM.10339, Tool, Crankshaft Timing) (1).

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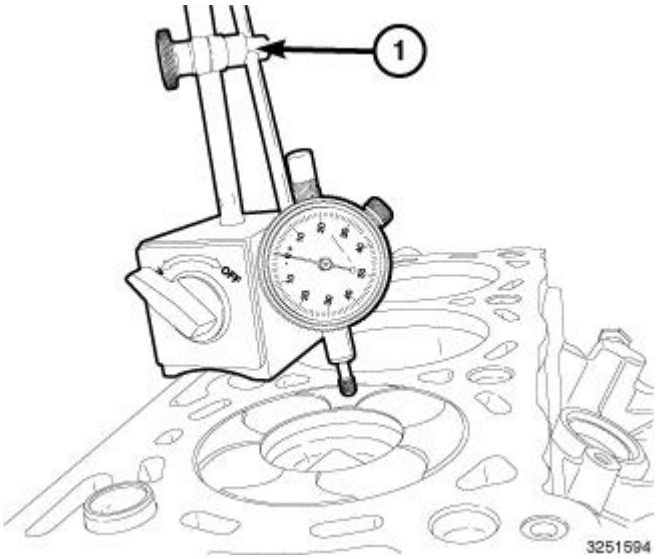


Fig. 72: Setting Number One Piston At Top Dead Center Using Dial Indicator
Courtesy of CHRYSLER GROUP, LLC

3. Set the number one piston to top dead center (TDC).
4. Using the (special tool #C-3339A, Set, Dial Indicator) (1), assemble as illustrated.

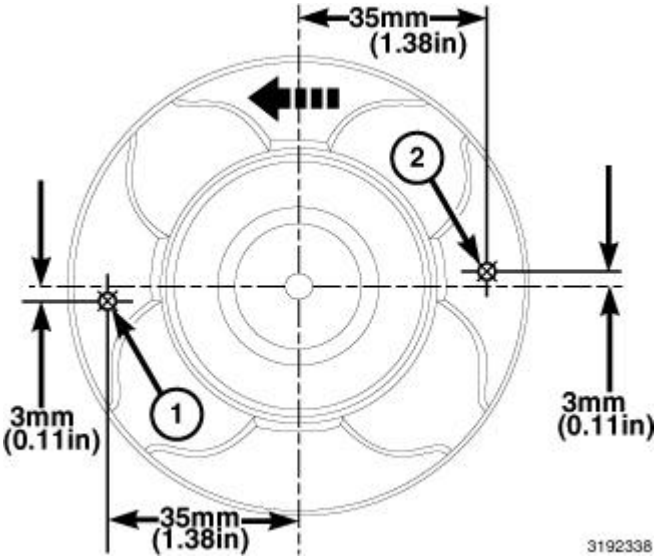


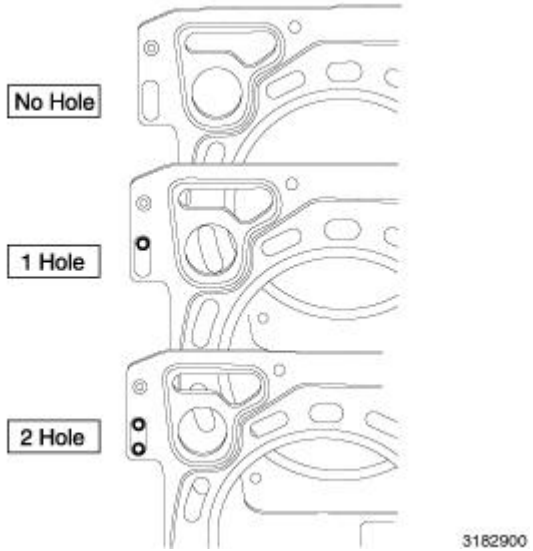
Fig. 73: Measuring Height Of The Piston At Top Dead Center
Courtesy of CHRYSLER GROUP, LLC

5. Zero the dial indicator on the top of the piston at location shown in illustration (1).
6. Use the dial indicator to measure the height of the piston at top dead center to the cylinder block and record measurements.
7. Zero the dial indicator on the top of the piston at location shown in illustration (2).
8. Use the dial indicator to measure the height of the piston at top dead center to cylinder block and record measurements.

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9. Repeat the procedure for each cylinder.
10. Average the 3 pistons protrusion readings to determine the required gasket thickness.

HEAD GASKET SELECTION CHART		
	Millimeters	Inches
PISTON CLEARANCE	0.130 - 0.220	0.0051 - 0.0086
CYLINDER HEAD GASKET THICKNESS	0.96	0.0377
GASKET IDENTIFICATION	NO HOLE	
PISTON CLEARANCE	0.221 - 0.310	0.0087 - 0.0122
CYLINDER HEAD GASKET THICKNESS	1.06	0.0417
GASKET IDENTIFICATION	ONE HOLE	
PISTON CLEARANCE	0.311 - 0.402	0.0122 - 0.0158
CYLINDER HEAD GASKET THICKNESS	1.16	0.0456
GASKET IDENTIFICATION	TWO HOLES	



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Fig. 74: Cylinder Head Gasket Identification
Courtesy of CHRYSLER GROUP, LLC

NOTE: The illustration shows gasket identification marks.

11. Select the appropriate cylinder head gasket from the cylinder head gasket chart.

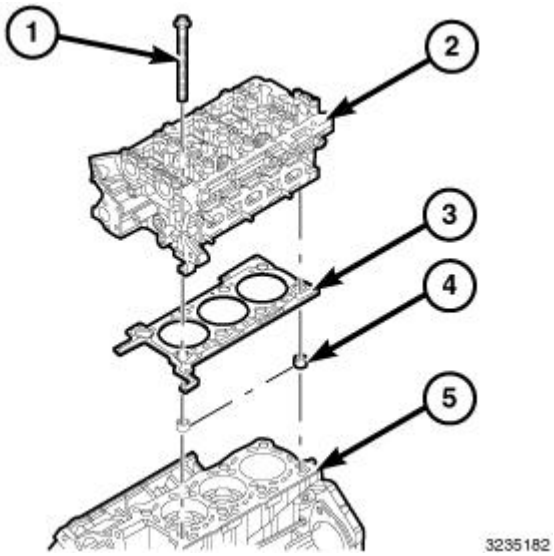


Fig. 75: Cylinder Head, Head Gasket, Engine Block & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Install the head gasket (3) onto the engine block (5). Be sure the coolant passages align (part number should be facing up).
13. Install the cylinder head (2) onto the engine block (5) and install bolts (1) finger tight.

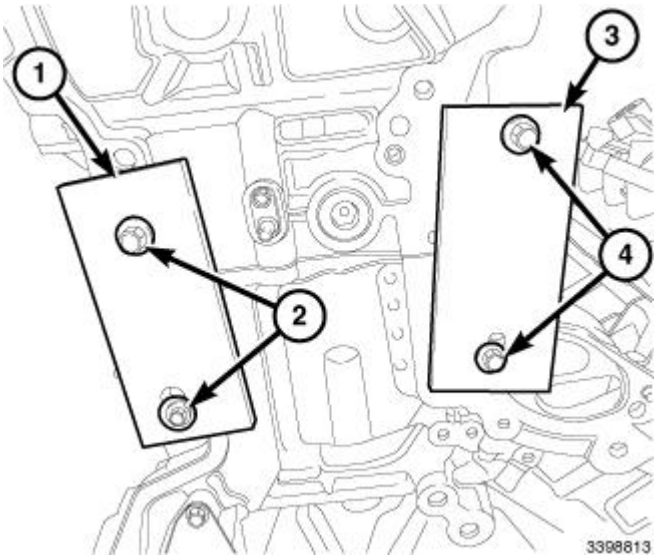


Fig. 76: Cylinder Head Alignment Tools & Bolts
Courtesy of CHRYSLER GROUP, LLC

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14. Install the (special tool #VM.10343-4, Alignment Tool, Cylinder Head (Right Exhaust)) (1) an securely tighten bolts (2).
15. Install the (special tool #VM.10343-1, Alignment Tool, Cylinder Head (Right Intake)) (3) an securely tighten bolts (4).

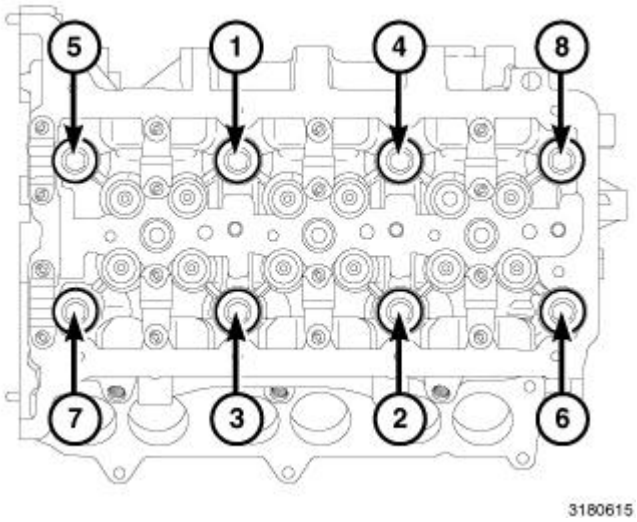


Fig. 77: Cylinder Head Bolts Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

16. Using the tighten sequence shown in illustration, tighten the cylinder head bolts to:
    - 30 N.m (22 ft. lbs.).
    - Tighten bolts an additional 75° turn.
    - Tighten bolts an additional 75° turn.
    - Tighten bolts an additional 75° turn.

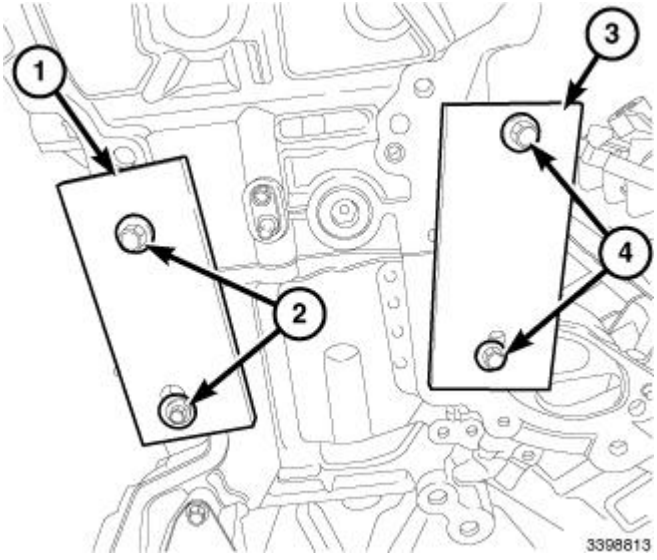


Fig. 78: Cylinder Head Alignment Tools & Bolts

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Courtesy of CHRYSLER GROUP, LLC

17. Remove bolts (4) and (special tool #VM.10343-1, Alignment Tool, Cylinder Head (Right Intake)) (3).
18. Remove bolts (2) and (special tool #VM.10343-4, Alignment Tool, Cylinder Head (Right Exhaust)) (1).
19. Install the water pump housing assembly. Refer to **PUMP, WATER, INSTALLATION** .

NOTE: Follower and tappet assemblies must be installed in same location as when removed.

20. Install the lifters and rocker arms into their original position as noted during removal.
21. Install the right side intake and exhaust camshafts. Refer to **CAMSHAFT, ENGINE, INSTALLATION**.
22. Install the glow plugs and tighten to 11 N.m (97 in. lbs.).
23. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION**.

CAMSHAFT, ENGINE

DESCRIPTION

DESCRIPTION

The camshafts are multiple-piece components with six machined lobes that are mounted to a hollow shaft with an interference fit. The cam lobes are induction hardened. Each camshaft has four bearing journals except for the right-bank intake camshaft. Due to the longer length needed to accommodate the centrifugal oil separator, the right-bank intake camshaft has five bearing journals. The camshaft journals have the same diameter and are supplied with oil pressure through lubrication passages in the cylinder head journals.

OPERATION

OPERATION

Each cylinder has two intake and two exhaust valves, and one glow plug. Valve lash is controlled by hydraulic lifter/roller finger followers inside the cylinder head, in bores under the camshafts. The finger followers transfer the camshaft lobe movement into vertical valve movement. The valve moves by the lobe of the camshaft pressing down on the finger follower roller.

The finger followers are located on top of the hydraulic lifters and the valves. The finger followers are not held rigidly into position; instead, they are held in position by resting on top of the valve and the hydraulic lifter pivoting ball.

WARNING: When the hydraulic lash adjusters are removed from the engine, they must be stored upright and in clean conditions. Install the finger followers and hydraulic lifters in the same location as removed.

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

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REMOVAL

LEFT BANK

1. Disconnect the negative battery cable.
2. Remove the high pressure pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, REMOVAL** .
3. Remove the timing chain and sprockets. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL**.

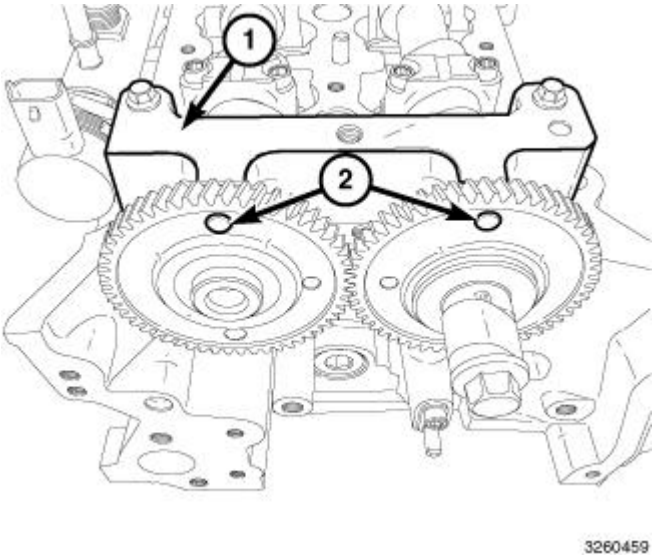


Fig. 79: Camshaft Timing Tool & Sprockets Holes - Left
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts and the left (special tool #VM.10338-2, Timing Tool, Camshaft (Left)) (1).
5. **Check the camshafts end play using (special tool #C-3339A, Set, Dial Indicator). End play should be between 0.1 mm - 0.3 mm (0.003 in. - 0.011 in.). If the camshaft endplay is not within specification, replace the cylinder head.**

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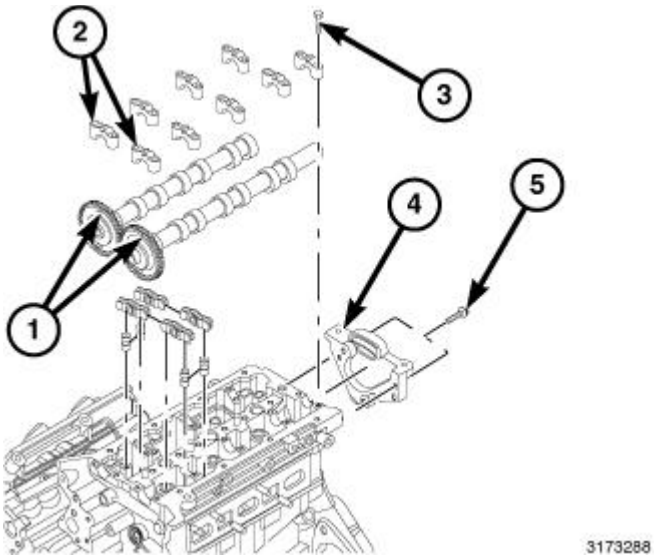


Fig. 80: Left Side Intake & Exhaust Camshaft, Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Make a reference in the order the camshaft bearing caps were removed.

6. Remove bolts (3) and the intake and exhaust camshaft bearing caps (2).
7. Remove the left side intake and exhaust camshaft (1).

RIGHT BANK

1. Disconnect the negative battery cable.
2. Remove the right timing chain and sprocket. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL**.

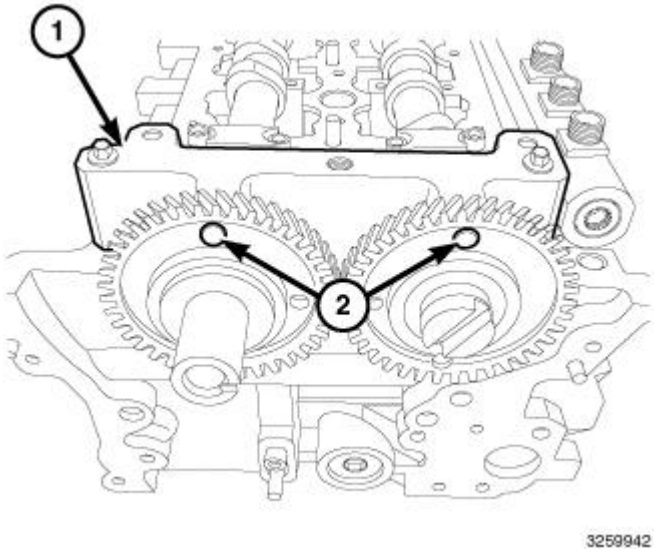


Fig. 81: Camshaft Timing Tool & Sprockets Holes - Right
Courtesy of CHRYSLER GROUP, LLC

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3. Remove bolts and the right (special tool #VM.10338-1, Timing Tool, Camshaft (Right)) (1).
4. **Check the camshafts end play using (special tool #C-3339A, Set, Dial Indicator). End play should be between 0.1 mm - 0.3 mm (0.003 in. - 0.011 in.). If the camshaft endplay is not within specification, replace the cylinder head.**

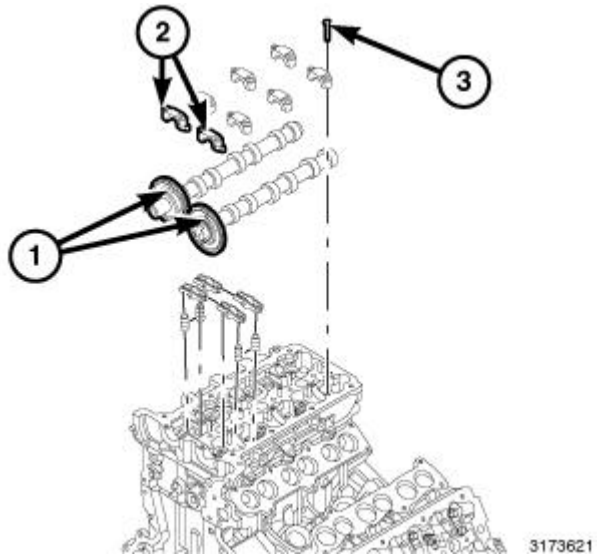


Fig. 82: Right Side Intake & Exhaust Camshaft, Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Make a reference in the order the camshaft bearing caps were removed.

5. Remove bolts (3) and the intake and exhaust camshaft bearing caps (2).
6. Remove the right side intake and exhaust camshaft (1).

INSTALLATION

LEFT BANK

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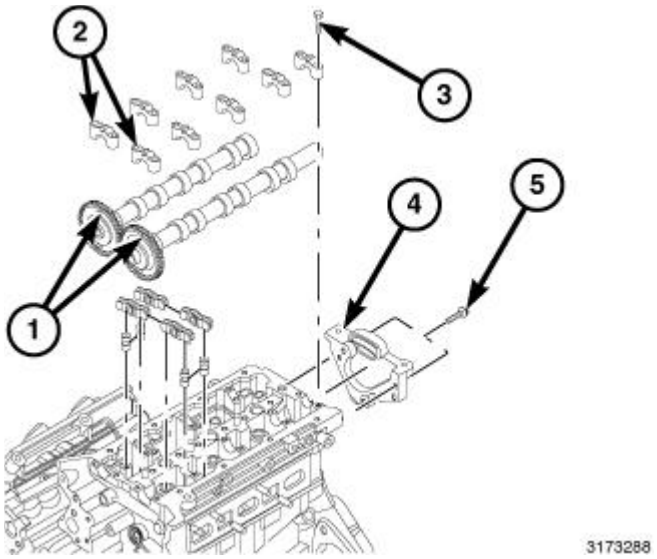


Fig. 83: Left Side Intake & Exhaust Camshaft, Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket sealing and mating surfaces.
2. Lubricate camshafts with Mopar® Engine Oil Supplement, or equivalent. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
3. Carefully install camshafts (1) onto cylinder head journals.

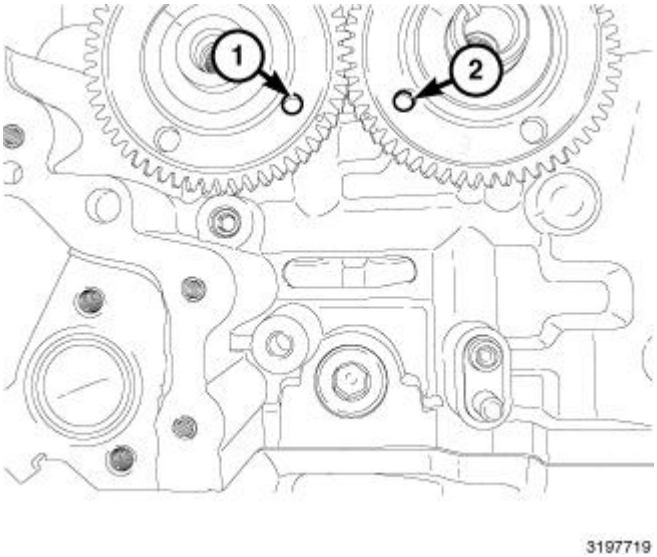


Fig. 84: Intake Camshaft Gear Timing Mark & Exhaust Camshaft Timing Gear Mark
Courtesy of CHRYSLER GROUP, LLC

4. Set the intake camshaft gear timing mark (1) at the four O'clock position and the exhaust camshaft timing gear mark (2) to the eight O'clock position as shown in illustration.

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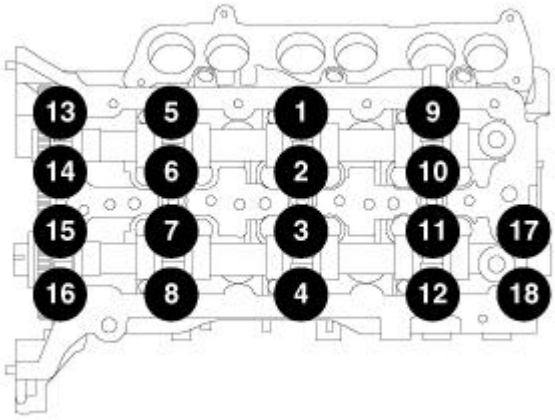


Fig. 85: Camshaft Bearing Cap Tightening Sequence - Left
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the bearing caps, be sure to install the "A" is on the intake side and the "S" is on the exhaust side in the rightful order.

5. Install the camshaft bearing caps 1 through 12, 17 and 18 in the rightful order and tighten each retaining bolt finger tight.
6. Check the camshaft for proper timing. Refer to **Engine/Valve Timing - Standard Procedure**.

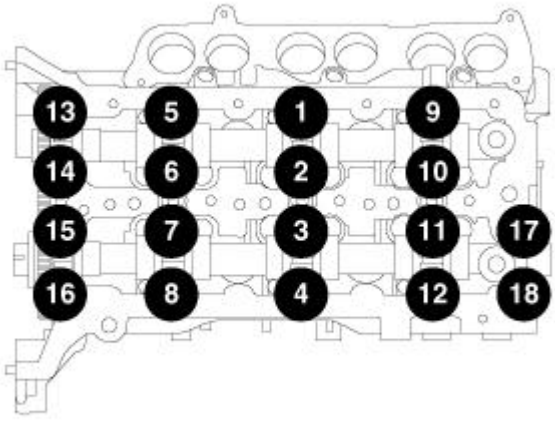


Fig. 86: Camshaft Bearing Cap Tightening Sequence - Left
Courtesy of CHRYSLER GROUP, LLC

7. Using the tightening sequence shown in illustration, tighten bolts to 11 N.m (97 in. lbs.).
8. Install the timing chain and sprocket. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.

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9. Install the high pressure pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, INSTALLATION** .
10. Connect the negative battery cable.
11. Start engine and inspect for leaks.

RIGHT BANK

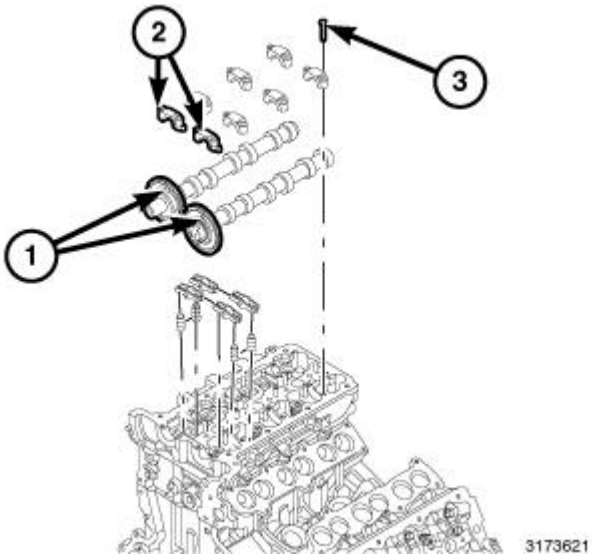
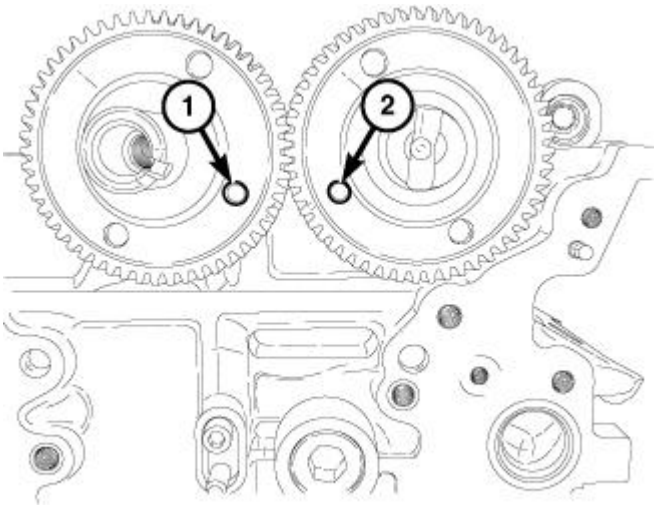


Fig. 87: Right Side Intake & Exhaust Camshaft, Camshaft Bearing Caps & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Clean all mating surfaces.
2. Lubricate camshafts with Mopar® Engine Oil Supplement, or equivalent. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
3. Carefully install camshafts (1) onto cylinder head journals.



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Fig. 88: Exhaust Camshaft Gear Timing Mark & Intake Camshaft Timing Gear Mark
Courtesy of CHRYSLER GROUP, LLC

4. Set the exhaust camshaft gear timing mark (1) at the four O'clock position and the intake camshaft timing gear mark (2) to the eight O'clock position.

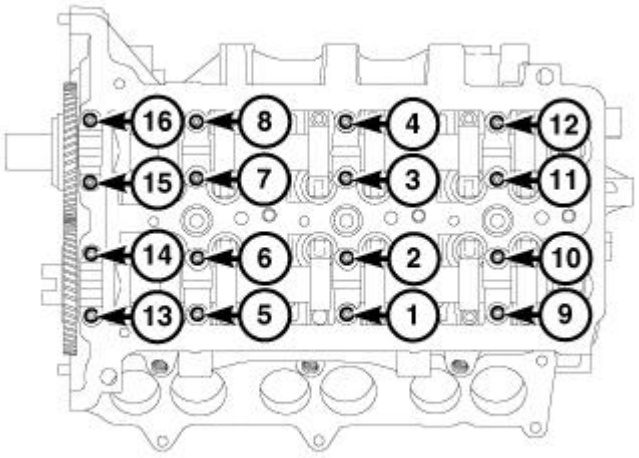
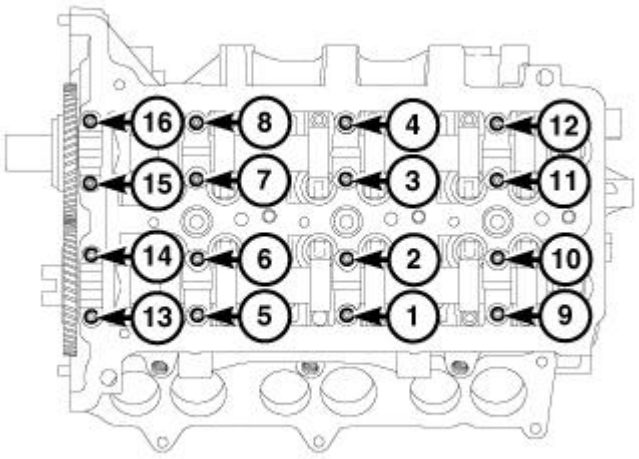


Fig. 89: Camshaft Bearing Cap Tightening Sequence - Right
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the bearing caps, be sure to install the "A" is on the intake side and the "S" is on the exhaust side in the rightful order.

5. Install the camshaft bearing caps 1 through 12, in the rightful order and tighten each retaining bolt finger tight.
6. Check the camshaft for proper timing. Refer to **Engine/Valve Timing - Standard Procedure**.



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Fig. 90: Camshaft Bearing Cap Tightening Sequence - Right
Courtesy of CHRYSLER GROUP, LLC

7. Using the tightening sequence shown in illustration, tighten bolts to 11 N.m (97 in. lbs.).
8. Install the right timing chain sprocket. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
9. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
10. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
11. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
12. Connect the negative battery cable.
13. Start engine and inspect for leaks.

COVER(S), CYLINDER HEAD

DESCRIPTION

DESCRIPTION

The 3.0L cylinder head cover is made of an injection molded composite and is used to cover the camshafts, lifters and followers.

REMOVAL

RIGHT BANK

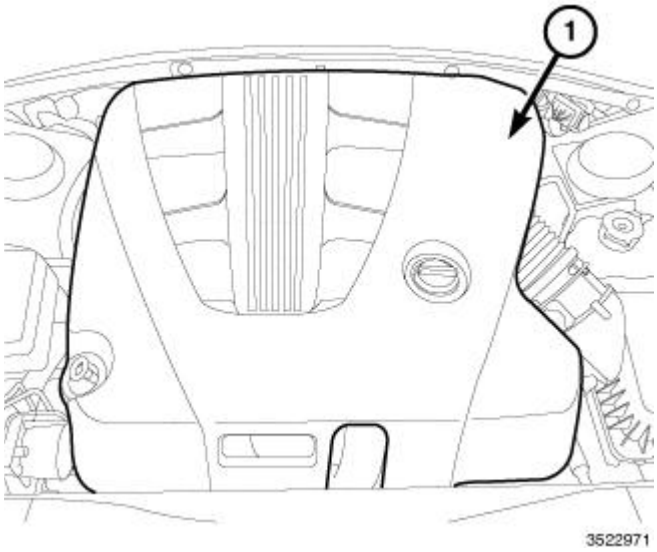


Fig. 91: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

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3. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
4. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
5. Remove the lower engine oil dipstick bolt.
6. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
7. Lower the vehicle.

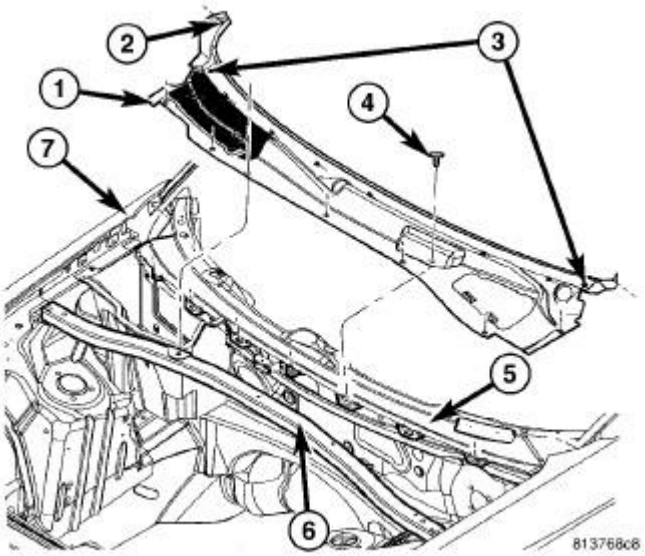
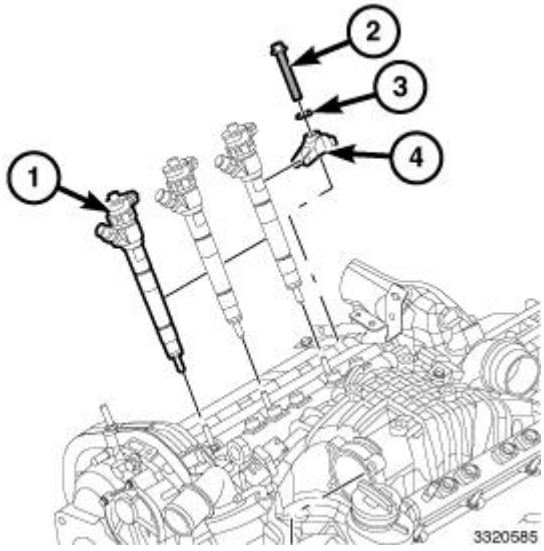


Fig. 92: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

8. Remove the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, REMOVAL** .
9. Remove bolts and the strut support brace (6).
10. Remove fasteners and the rear engine compartment heat shield.



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Fig. 93: Fuel Injector, Hold Down Bolt, Washer & Retaining Claw
Courtesy of CHRYSLER GROUP, LLC

11. Remove the right side fuel injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .
12. Remove the generator. Refer to **GENERATOR, REMOVAL** .

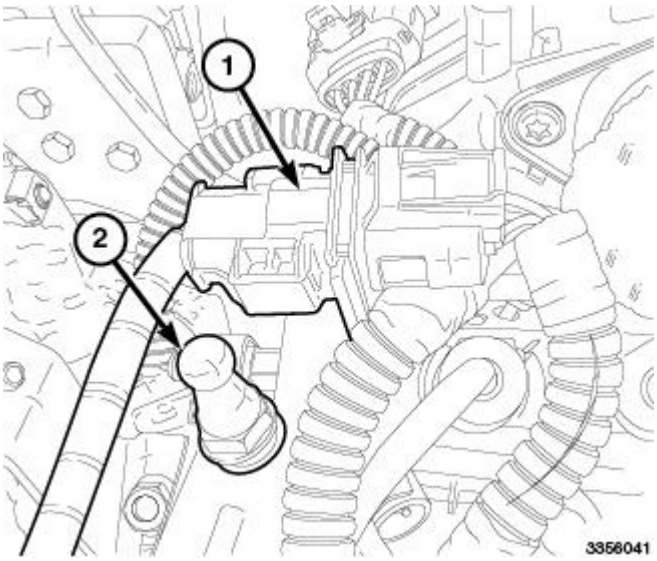


Fig. 94: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the oxygen sensor wiring harness connector (1).
14. Remove the ball stud fastener (2) securing upper trans fill tube bracket.
15. Remove nut and the engine oil dip stick.

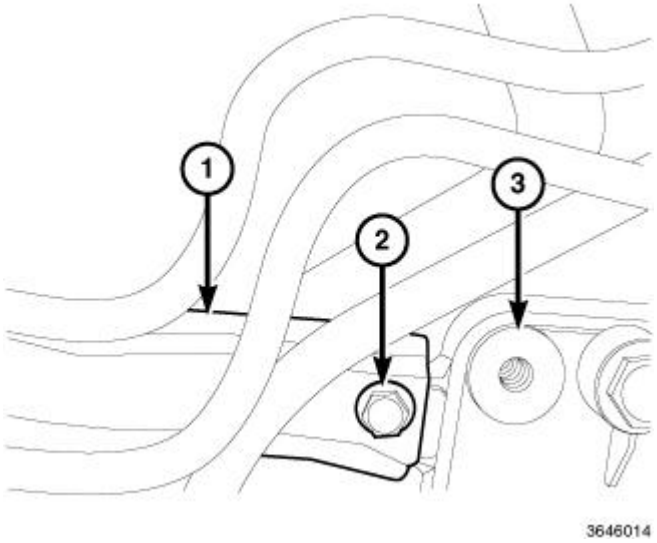


Fig. 95: Fuel Line Support Bracket, Generator Mounting Bracket & Bolt
Courtesy of CHRYSLER GROUP, LLC

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16. Remove bolt (2) securing the fuel line support bracket (1) to generator mounting bracket (3).

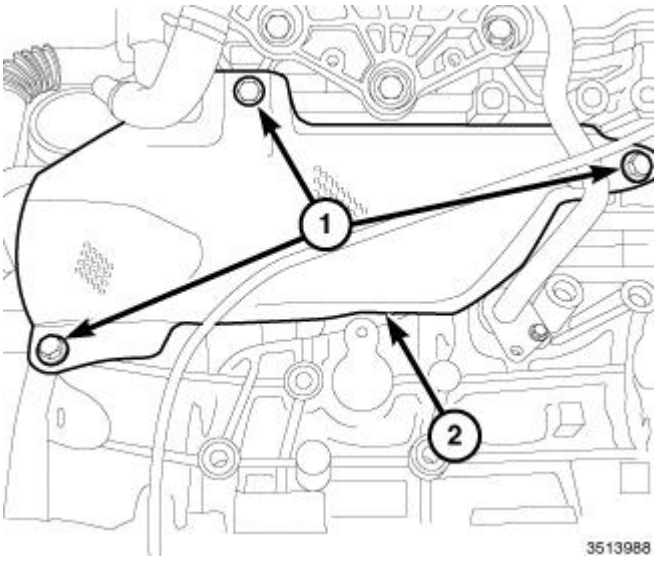


Fig. 96: Right Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Remove bolts (1) and the right exhaust manifold heat shield (2).

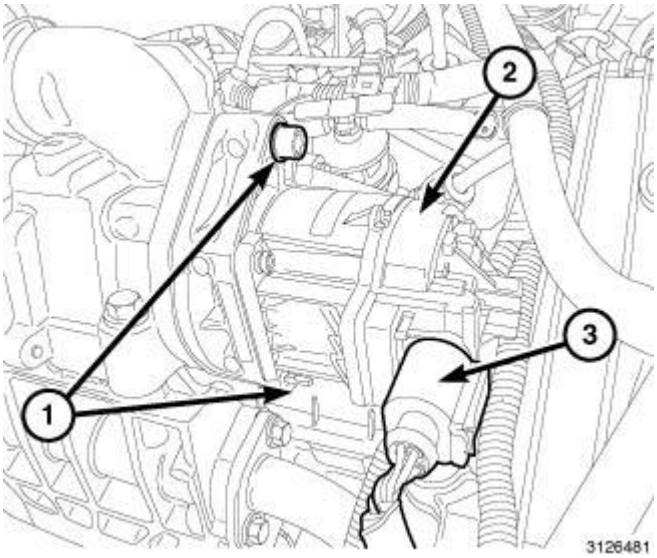


Fig. 97: EGR Valve, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

18. Disconnect the EGR valve harness connector (2).

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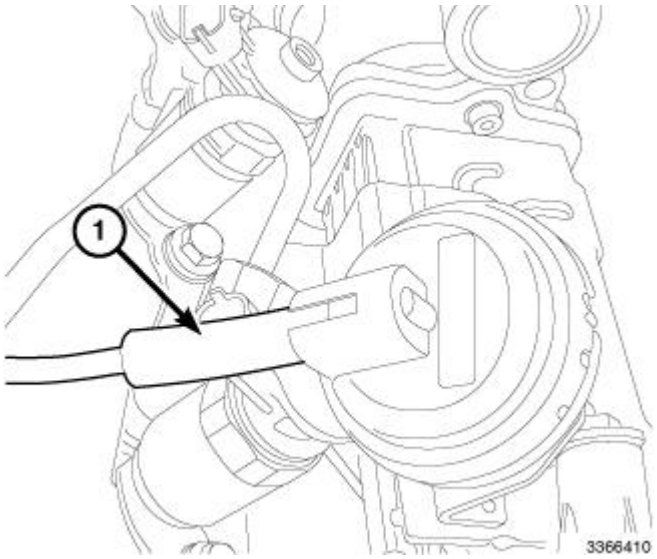


Fig. 98: EGR Cooler Vacuum Bypass Hose
Courtesy of CHRYSLER GROUP, LLC

19. Disconnect the EGR cooler vacuum bypass hose (1).

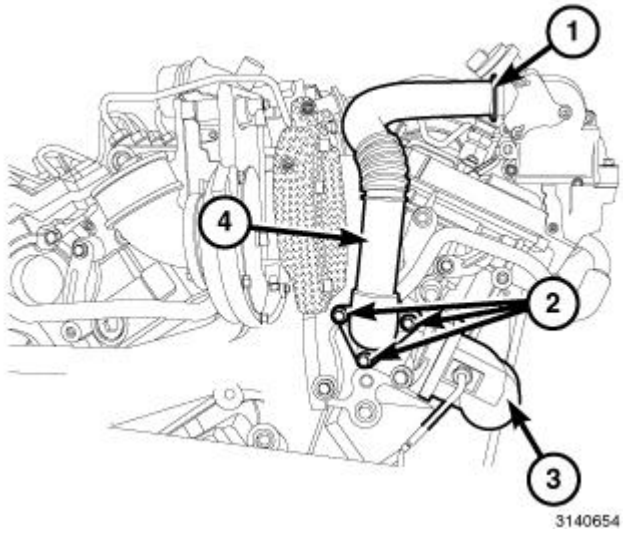


Fig. 99: Turbocharger-To-EGR Cooler Tube Clamp
Courtesy of CHRYSLER GROUP, LLC

20. Remove the turbocharger-to-EGR cooler tube clamp (1).

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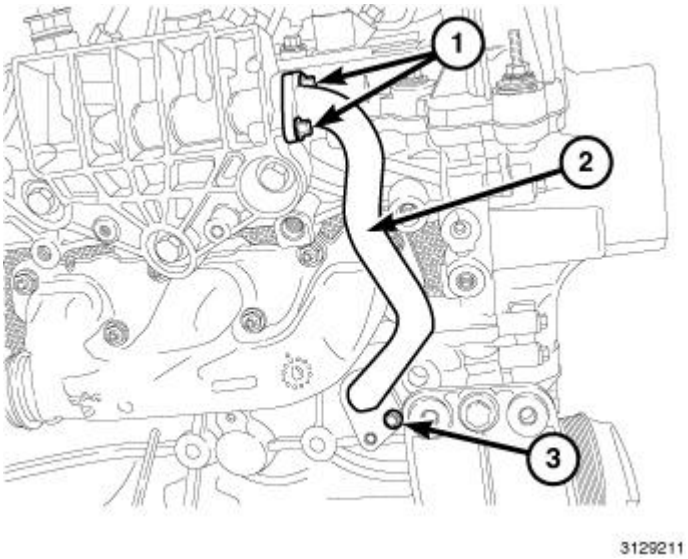


Fig. 100: EGR Cooler Coolant Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (1 and 3) and the EGR cooler coolant tube (2).

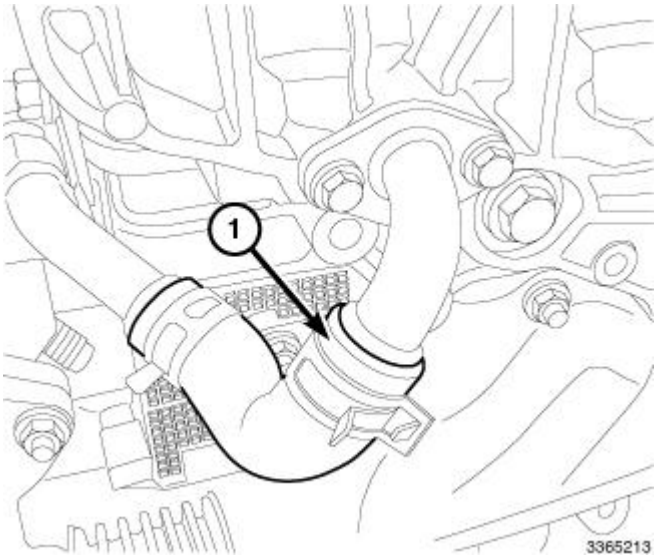


Fig. 101: EGR Cooler Supply Hose
Courtesy of CHRYSLER GROUP, LLC

22. Disconnect the EGR cooler supply hose (1).

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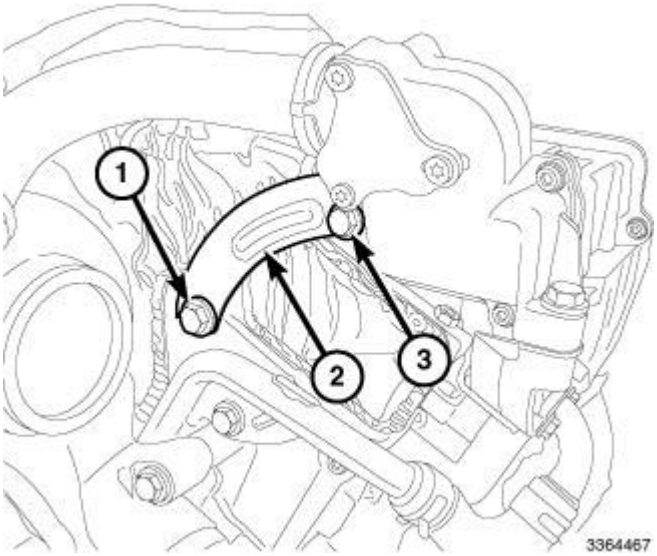


Fig. 102: EGR Cooler Bypass Valve Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

23. Loosen bolt (1) securing EGR cooler bypass valve support bracket (2).
24. Remove bolt (3) at the rear EGR cooler bypass valve support bracket (2).

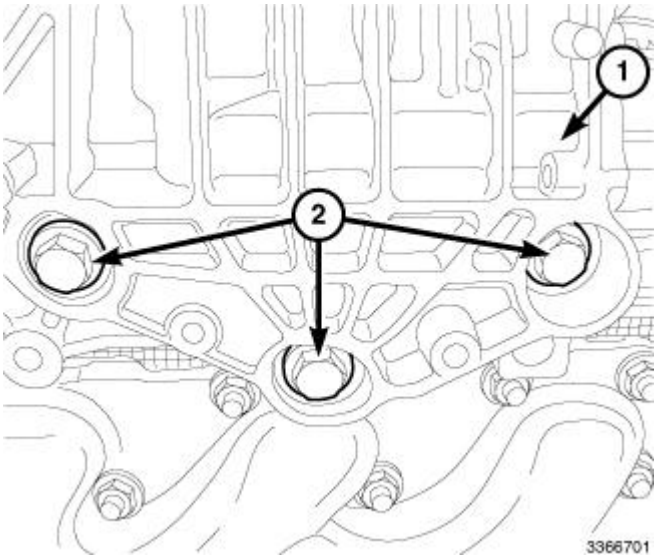


Fig. 103: Cooler Assembly Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

25. Remove bolts (2) and the EGR and cooler assembly bracket (1).

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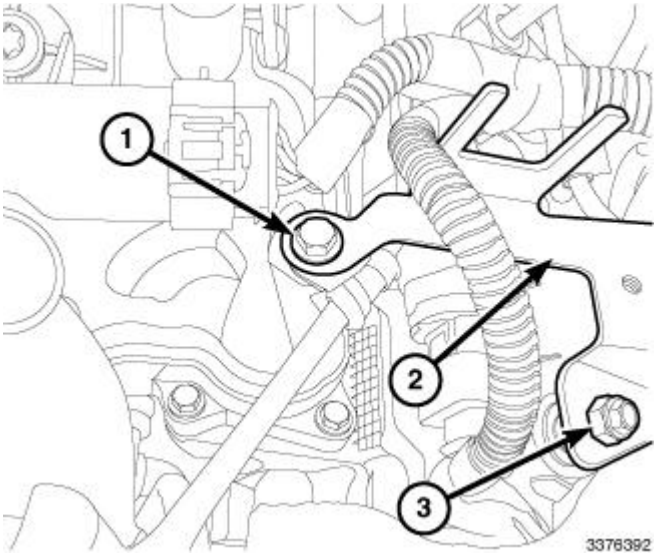


Fig. 104: Oxygen Sensor Harness Connector Bracket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

26. Remove the engine cover ball stud bracket at front of right cylinder head cover.
27. Remove bolt (1), nut (3) and the oxygen sensor harness connector bracket (2).

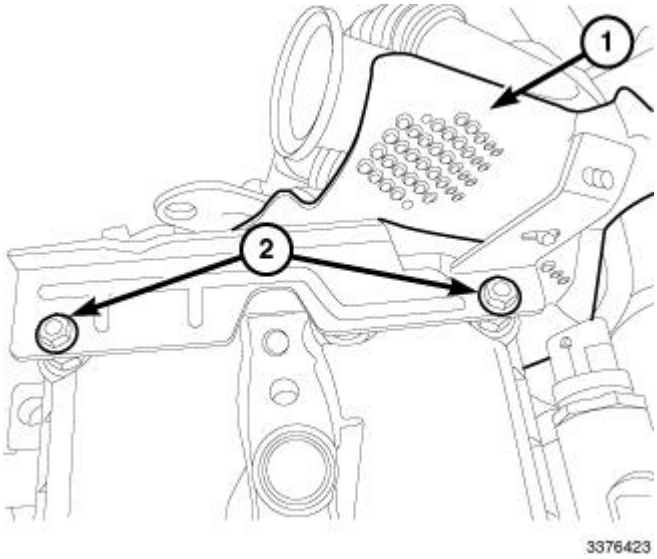


Fig. 105: Turbocharger-To-EGR Supply Tube Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

28. Remove nuts (2) and the turbocharger-to-EGR supply tube heat shield (1).

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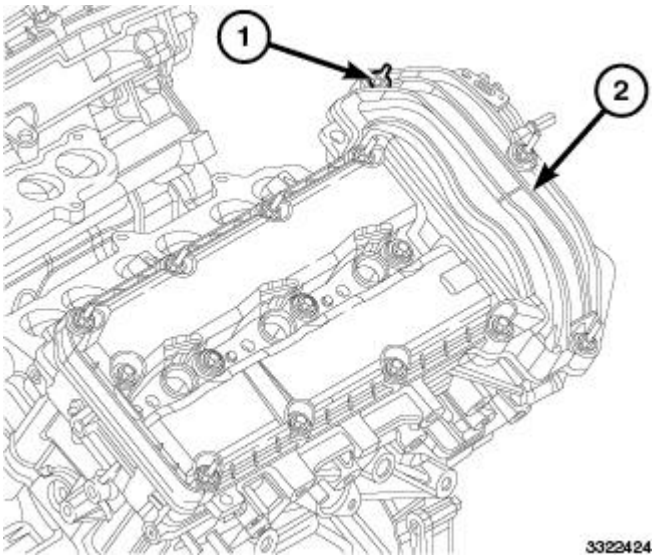


Fig. 106: Cylinder Head Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

LEFT BANK

1. Disconnect the negative battery cable.
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
4. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
5. Lower the vehicle.

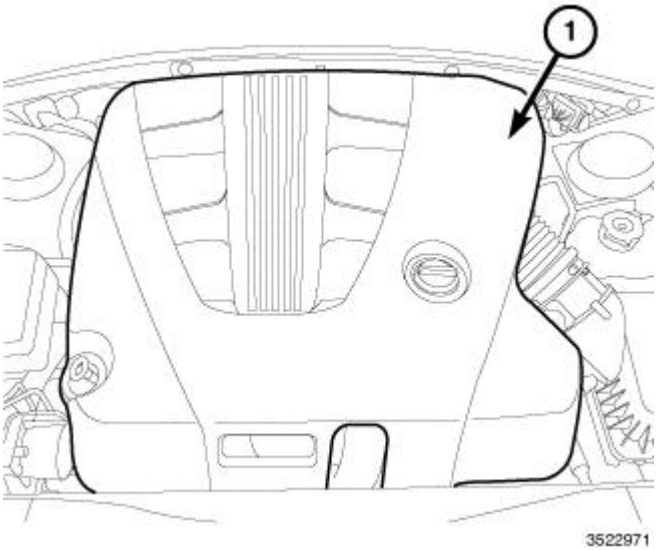


Fig. 107: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

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6. Remove the engine cover (1).

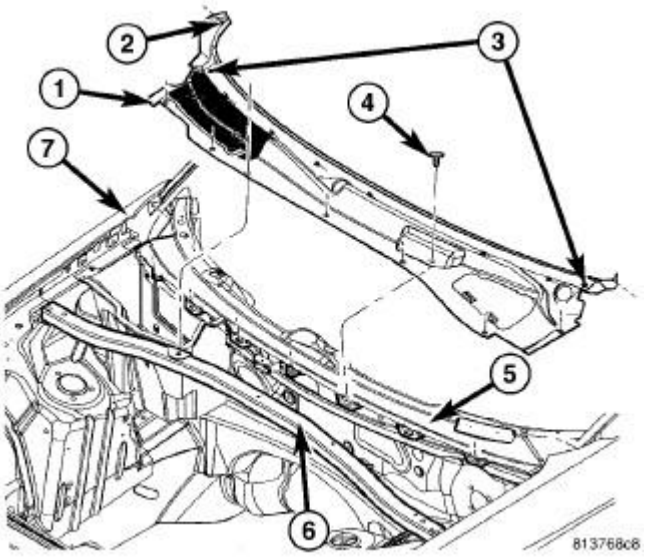


Fig. 108: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

7. Remove the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, REMOVAL** .
8. Remove bolts and the strut support brace (6).
9. Remove fasteners and the rear engine compartment heat shield.
10. Remove air cleaner body and intake air tube. Refer to **BODY, AIR CLEANER, REMOVAL**.

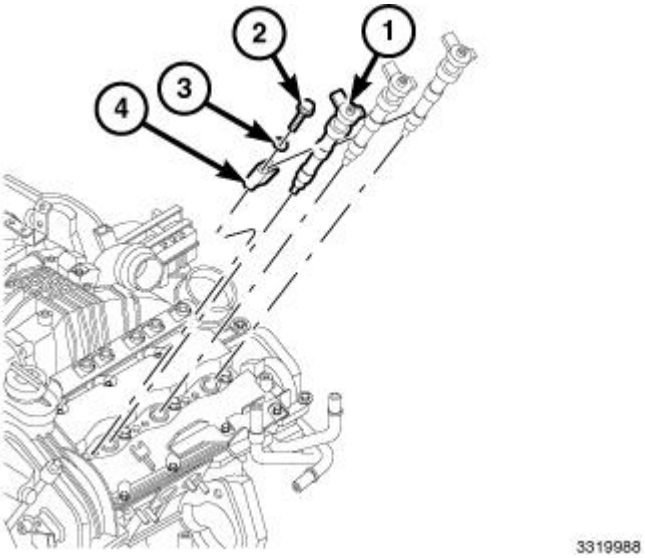


Fig. 109: Fuel Injector, Hold Down Bolt, Washer & Retaining Claw
Courtesy of CHRYSLER GROUP, LLC

11. Remove the fuel injectors. Refer to **INJECTOR(S), FUEL, REMOVAL** .

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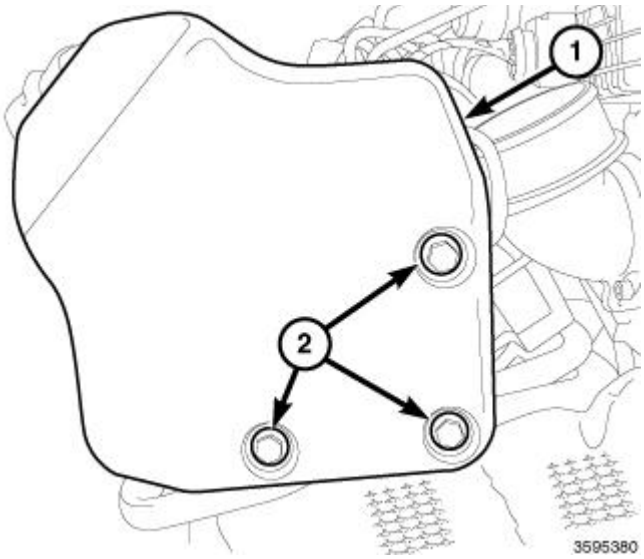


Fig. 110: High Pressure Pump Blocker & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (2) and the high pressure pump blocker (1).

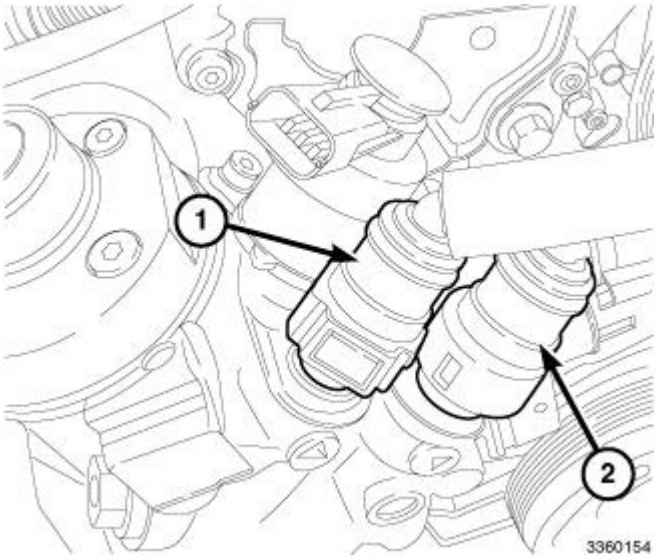


Fig. 111: Return Line & Low Pressure Supply Line
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the low pressure supply (2) and return (1) lines from high pressure pump. Refer to **FITTING, QUICK CONNECT** .
14. Disconnect the brake booster vacuum hose.
15. Disconnect the two heater hoses at bulk head.
16. Remove nuts and the support bracket securing coolant tube, brake booster hose, and fuel lines.

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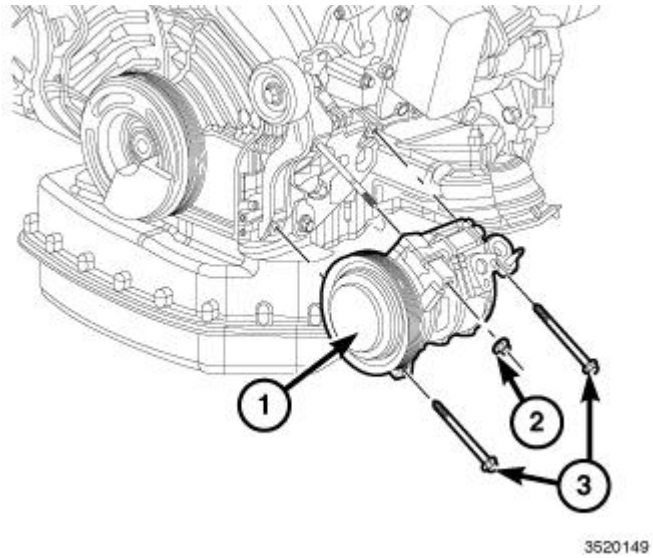


Fig. 112: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

17. Disconnect the A/C compressor (1) wire harness connector.

NOTE: Removal of the A/C compressor does not require the refrigerant to be evacuated.

18. Remove nut (2) and two bolts (3) and position aside A/C compressor (1).

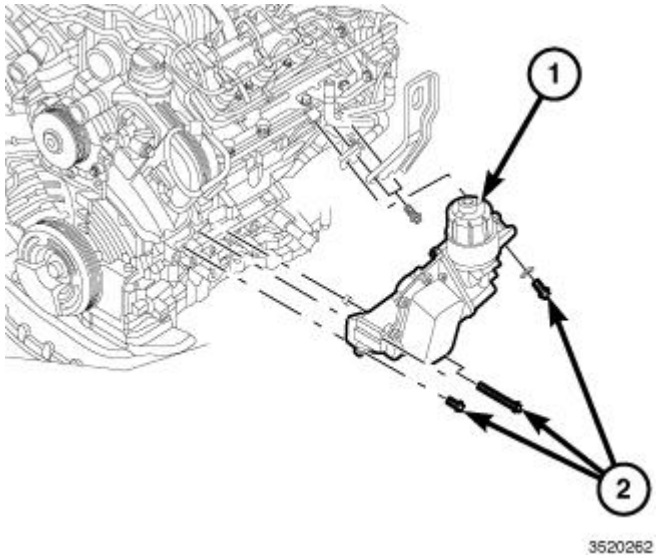


Fig. 113: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

19. Remove the oil cooler adapter assembly. Refer to **ADAPTER, OIL COOLER, REMOVAL**.

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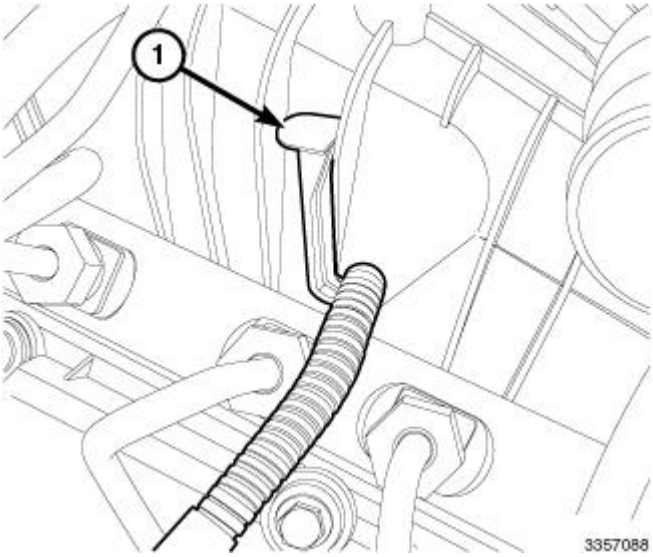


Fig. 114: Glow Plug Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

20. Disconnect glow plug wire harness connector (1).

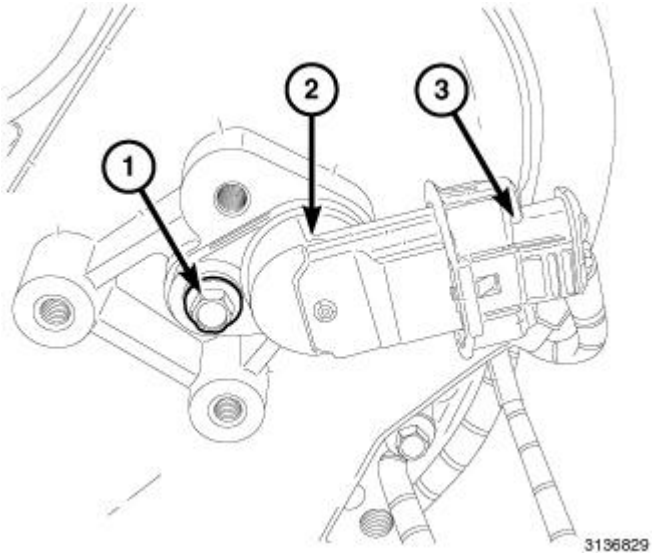


Fig. 115: Camshaft Position Sensor, Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

21. Disconnect Camshaft Position (CMP) sensor wire harness connector (3).

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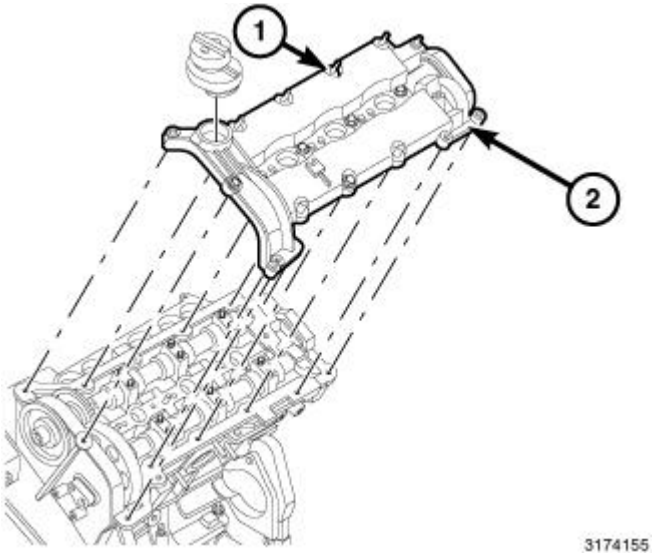


Fig. 116: Left Cylinder Head Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

22. Loosen bolts (1) and remove the left cylinder head cover (2).

INSTALLATION

RIGHT BANK

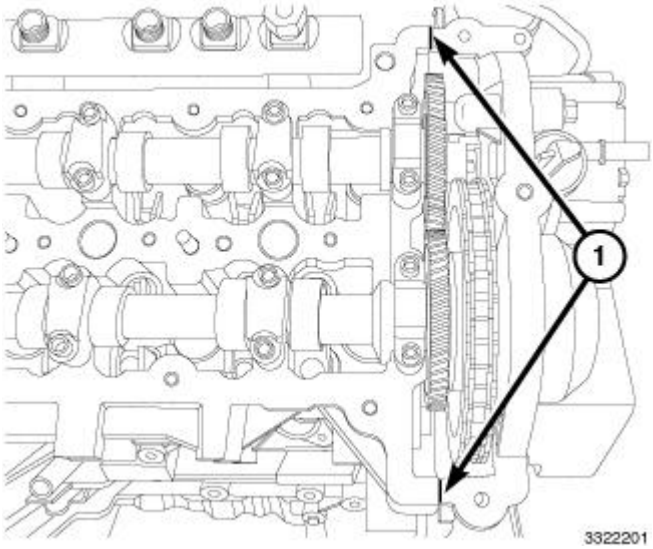


Fig. 117: RTV Sealant At The T-Joints
Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect all sealing surfaces. Refer to **Engine - Standard Procedure**.
2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant at the T-joint (1). Refer to **Engine - Standard Procedure**.

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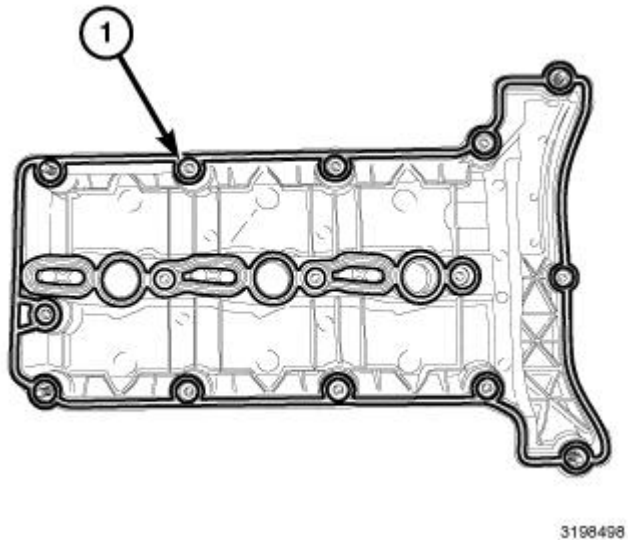


Fig. 118: Cylinder Head Cover Gasket
Courtesy of CHRYSLER GROUP, LLC

NOTE: Cylinder head cover gasket is not a serviceable item.

3. Inspect the cylinder head cover gasket (1), if damaged replace the cylinder cover.

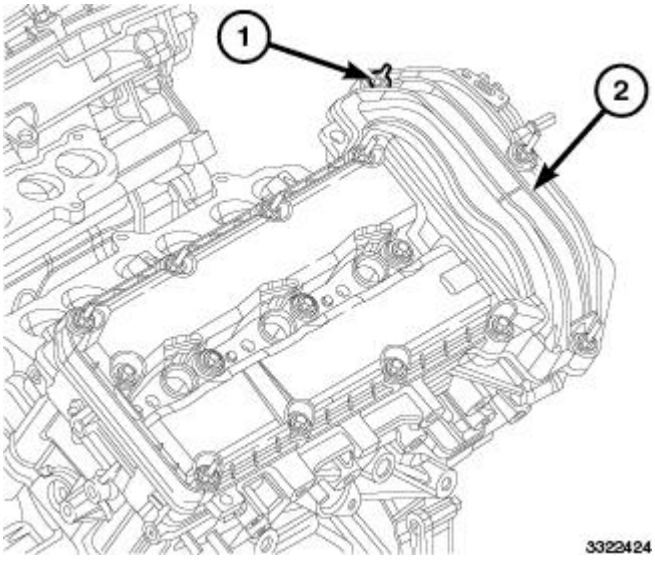


Fig. 119: Cylinder Head Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the cylinder head cover (2) and tighten bolts finger tight (1).

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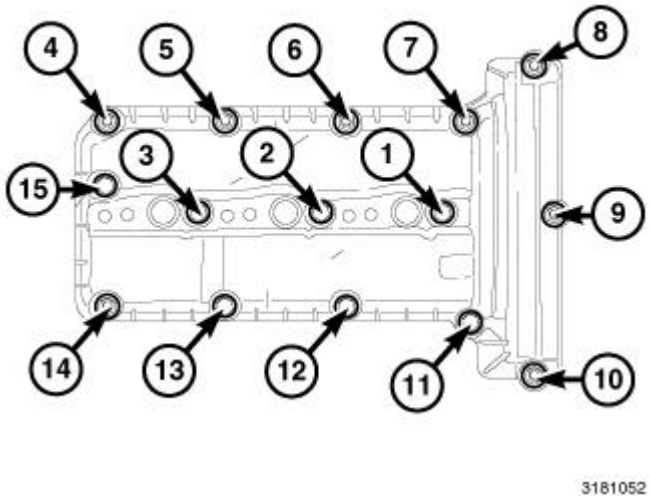


Fig. 120: Cylinder Head Cover Bolt Tightening Sequence - Right
Courtesy of CHRYSLER GROUP, LLC

5. Using the tightening sequence shown in illustration, tighten the bolts to 10 N.m (89 in. lbs.).

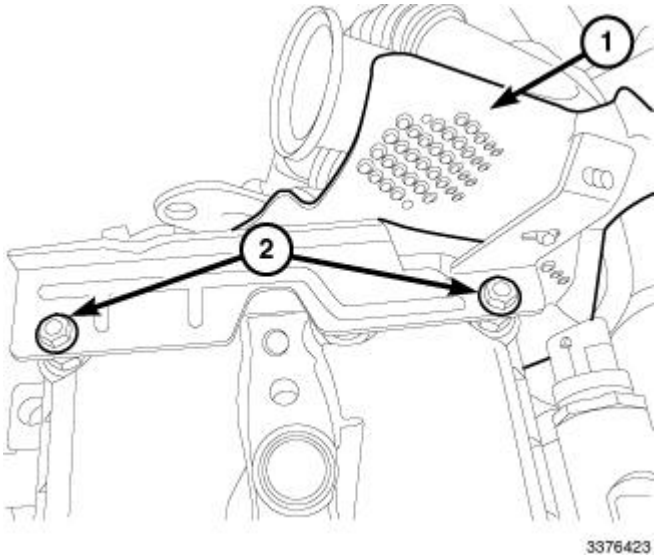


Fig. 121: Turbocharger-To-EGR Supply Tube Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the turbocharger-to-EGR supply tube heat shield (1). Tighten nuts (2) to 11 N.m (97 in. lbs.).

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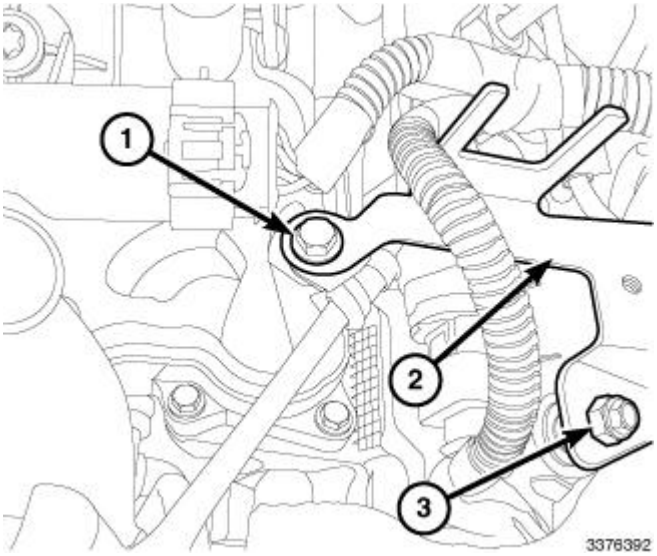


Fig. 122: Oxygen Sensor Harness Connector Bracket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

7. Install the oxygen sensor harness connector bracket (2). Tighten nut (3) and bolt (1) to 11 N.m (97 in. lbs.).
8. Remove the engine cover ball stud bracket at front of right cylinder head cover and tighten to 11 N.m (97 in. lbs.).

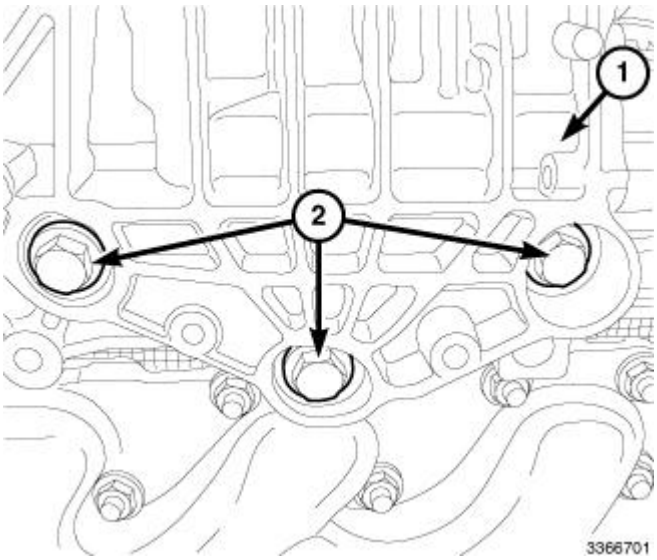


Fig. 123: Cooler Assembly Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the EGR and cooler assembly bracket (2). Tighten bolts to 45 N.m (33 ft. lbs.).

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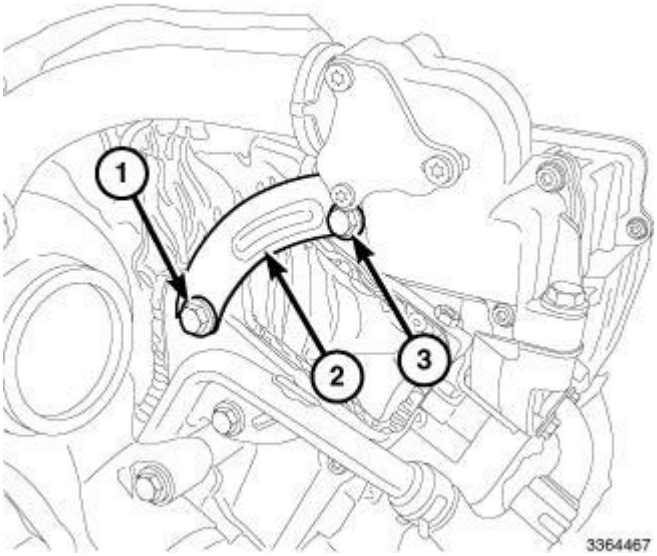


Fig. 124: EGR Cooler Bypass Valve Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Install bolt (3) at the rear EGR cooler bypass valve support bracket (2) and tighten to 25 N.m (18 ft. lbs.).
11. Tighten bolt (1) securing EGR cooler bypass valve support bracket (2) to 25 N.m (18 ft. lbs.).

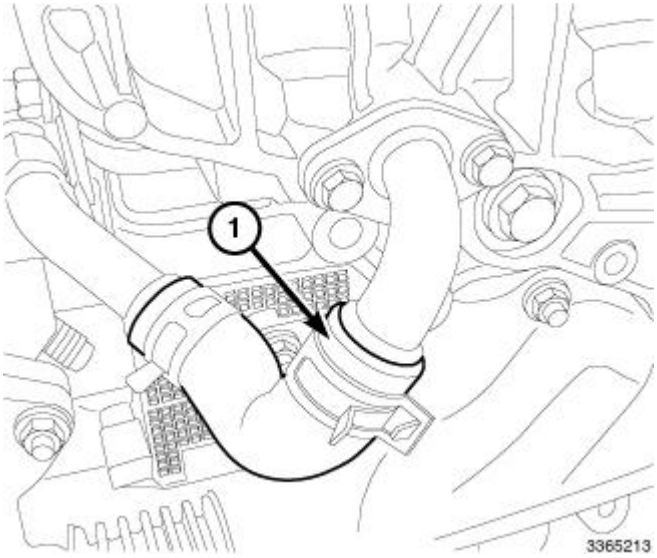


Fig. 125: EGR Cooler Supply Hose
Courtesy of CHRYSLER GROUP, LLC

12. Connect the EGR cooler supply hose (1).

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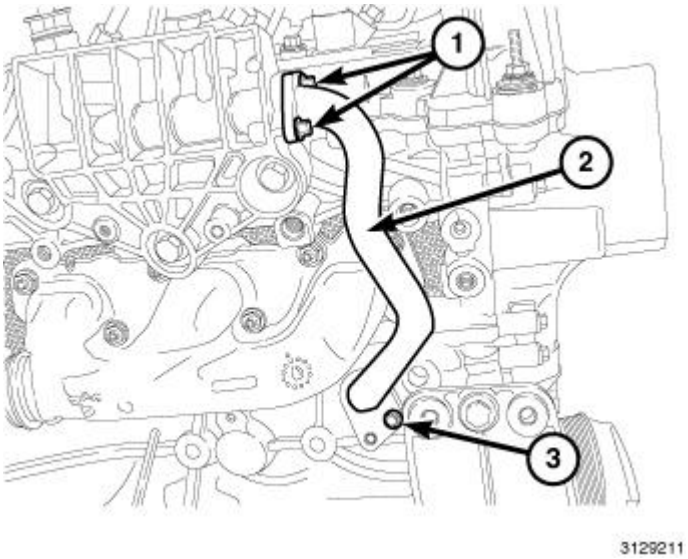


Fig. 126: EGR Cooler Coolant Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Using a new O-ring seal and gasket install the EGR cooler coolant tube (2). Tighten bolts (1 and 3) to 18 N.m (159 in. lbs.).

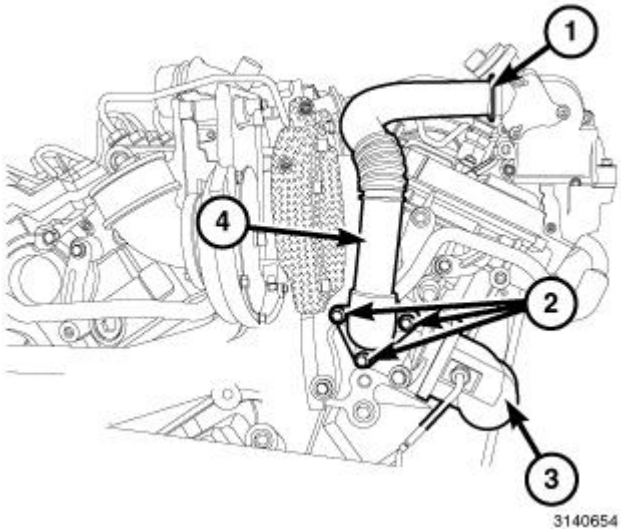


Fig. 127: Turbocharger-To-EGR Cooler Tube Clamp
Courtesy of CHRYSLER GROUP, LLC

14. Using a new gasket the turbocharger-to-EGR cooler tube and securely tighten clamp (1).

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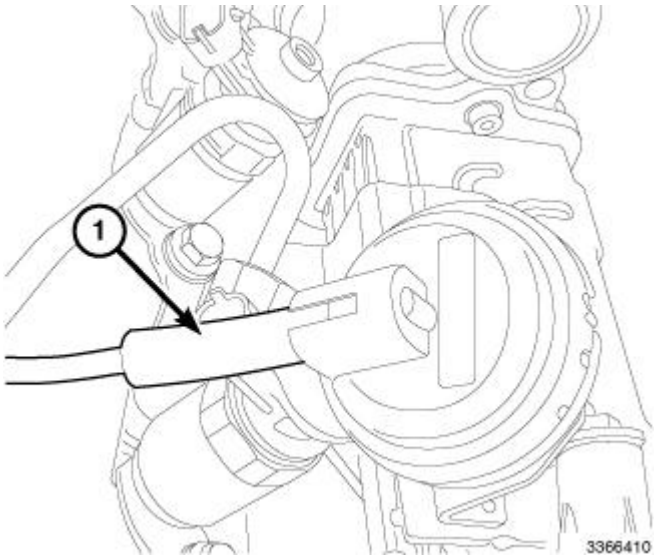


Fig. 128: EGR Cooler Vacuum Bypass Hose
Courtesy of CHRYSLER GROUP, LLC

15. Connect the EGR cooler vacuum bypass hose (1).

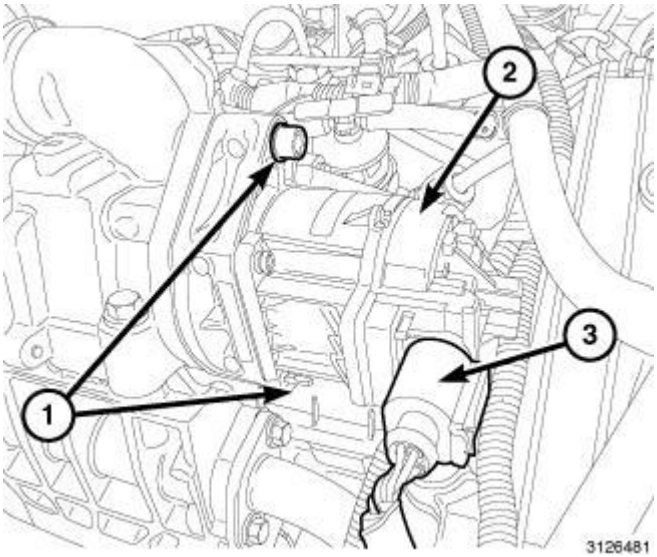


Fig. 129: EGR Valve, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

16. Connect the EGR valve harness connector (2).

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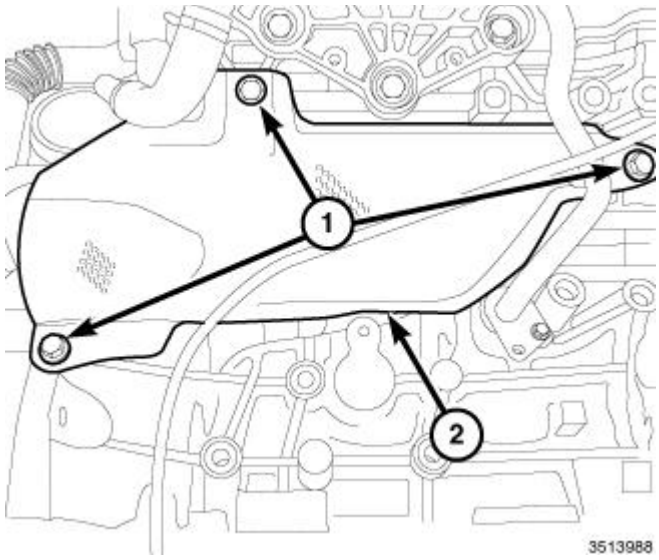


Fig. 130: Right Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Install the right exhaust manifold heat shield (2). Tighten bolts (1) to 15 N.m (133 in. lbs.).

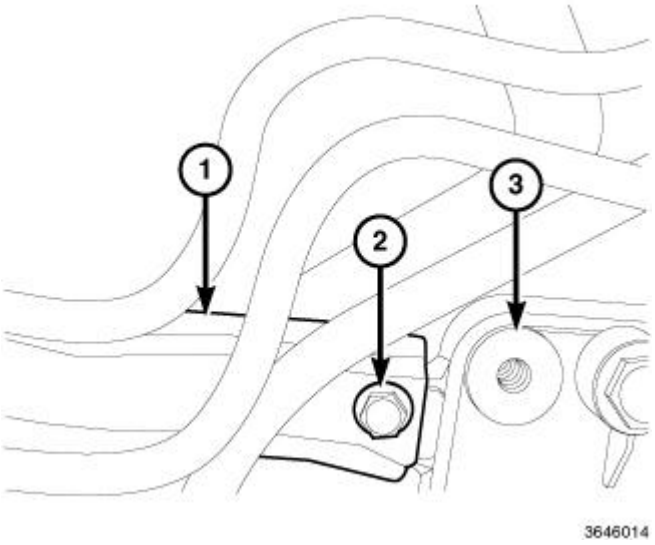


Fig. 131: Fuel Line Support Bracket, Generator Mounting Bracket & Bolt
Courtesy of CHRYSLER GROUP, LLC

18. Install bolt (2) securing the fuel line support bracket (1) to generator mounting bracket (3) and tighten to 11 N.m (97 in. lbs.).

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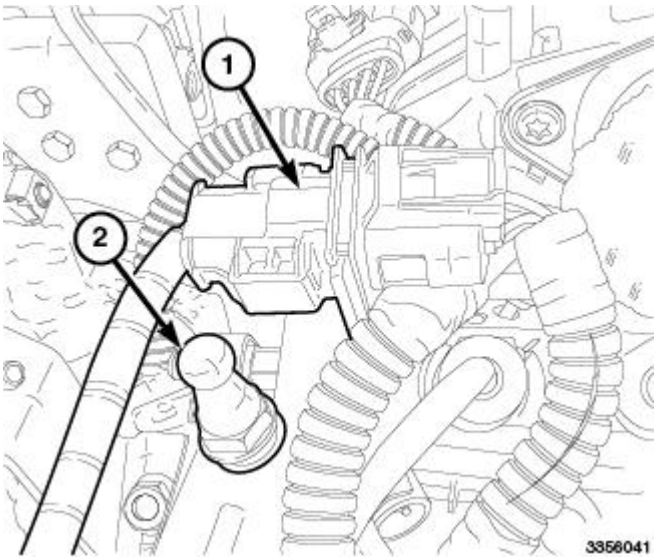


Fig. 132: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

19. Install the engine oil dip stick. Tighten nut to 11 N.m (97 in. lbs.).
20. Install the ball stud fastener (2) securing upper trans fill tube and tighten to 11 N.m (97 in. lbs.).
21. Connect the oxygen sensor wiring harness connector (1).
22. Install the generator. Refer to **GENERATOR, INSTALLATION** .

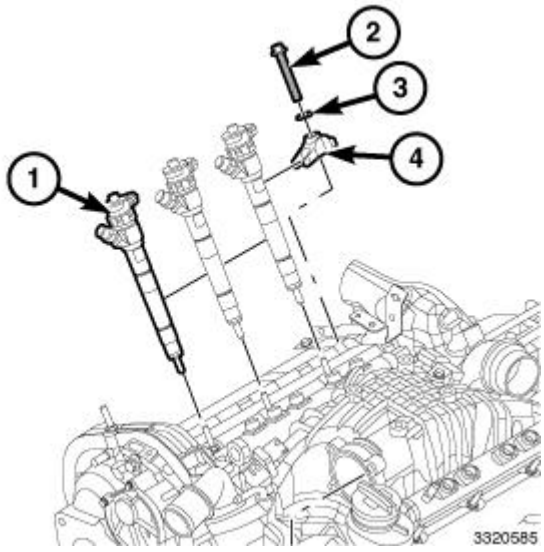


Fig. 133: Fuel Injector, Hold Down Bolt, Washer & Retaining Claw
Courtesy of CHRYSLER GROUP, LLC

23. Install the right side fuel injector. Refer to **INJECTOR(S), FUEL, INSTALLATION** .

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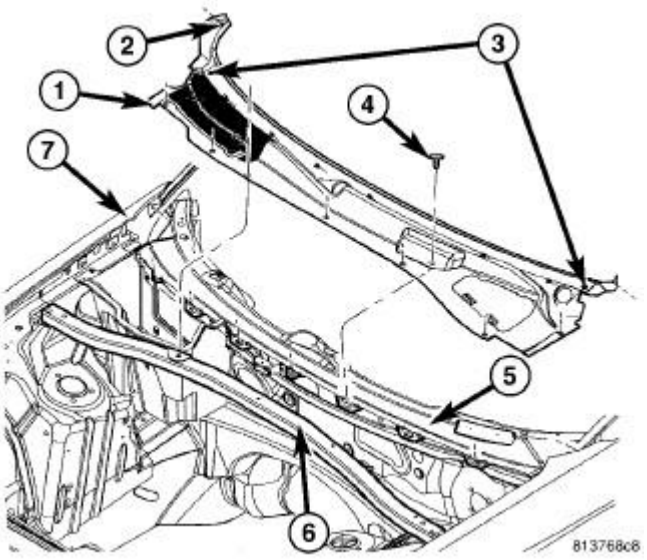


Fig. 134: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

24. Install the rear engine compartment heat shield and securely tighten the fasteners.
25. Install the strut support brace (6). Tighten bolts to 38 N.m (28 ft. lbs.).
26. Install the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, INSTALLATION** .
27. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
28. Install the lower engine oil dipstick bolt. Tighten bolt to 11 N.m (97 in. lbs.).
29. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
30. Lower the vehicle.

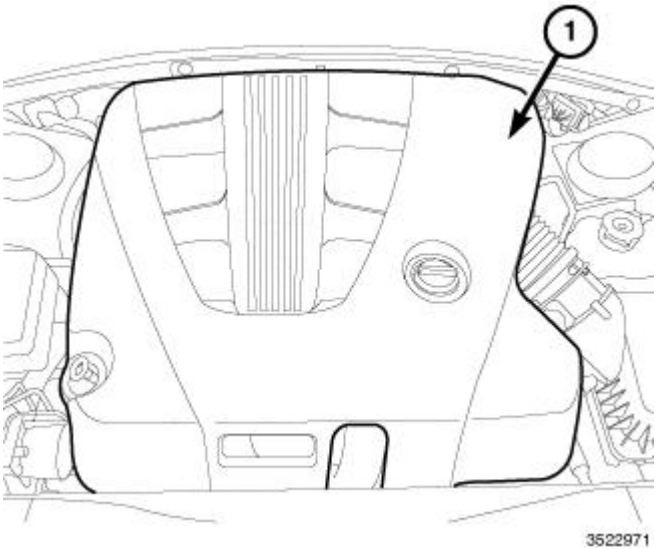


Fig. 135: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

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31. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
32. Start the engine and inspect for leaks.
33. Install the engine cover (1).

LEFT BANK

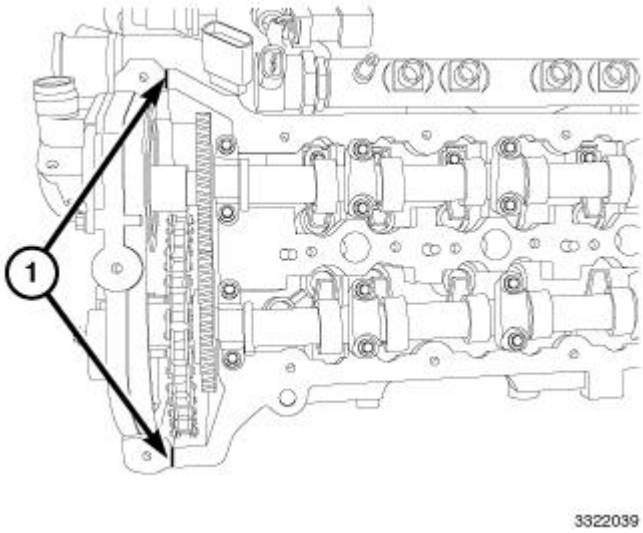


Fig. 136: Left Upper Timing Cover Excess RTV Sealant Locations
Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect all sealing surfaces.
2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant at the T-joint (1).

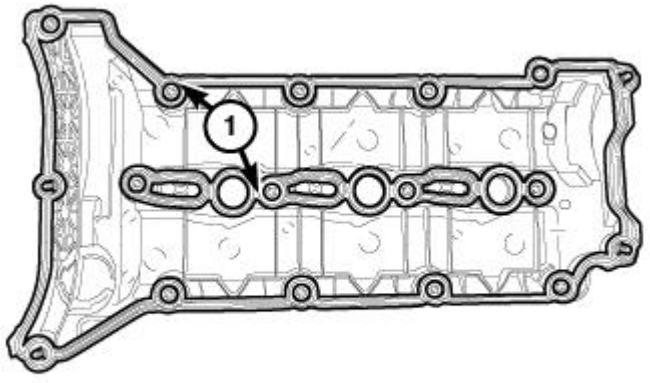


Fig. 137: Cylinder Head Cover Gasket
Courtesy of CHRYSLER GROUP, LLC

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NOTE: Cylinder head cover gasket is not a serviceable item.

3. Inspect the cylinder head cover gasket (1), if damaged replace the cylinder cover.

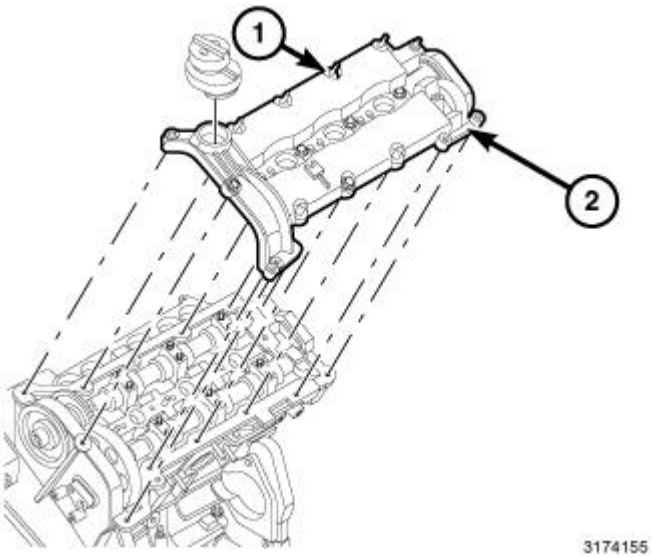


Fig. 138: Left Cylinder Head Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the cylinder head cover (2) and tighten bolts (1) finger tight.

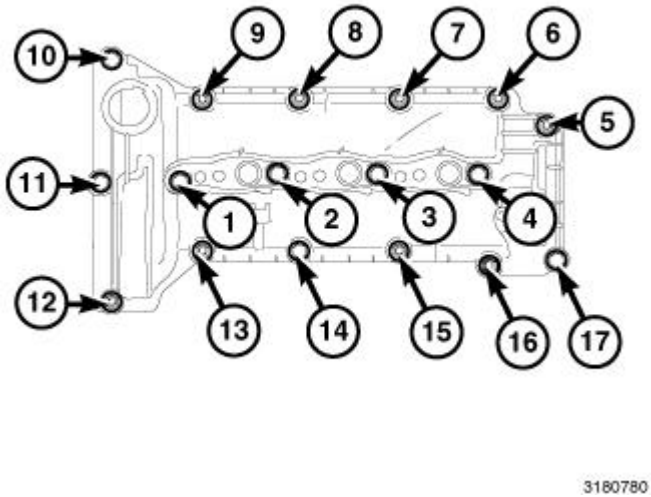


Fig. 139: Cylinder Head Cover Bolt Tightening Sequence - Left
Courtesy of CHRYSLER GROUP, LLC

5. Using the tightening sequence shown in illustration, tighten bolts to 10 N.m (89 in. lbs.).

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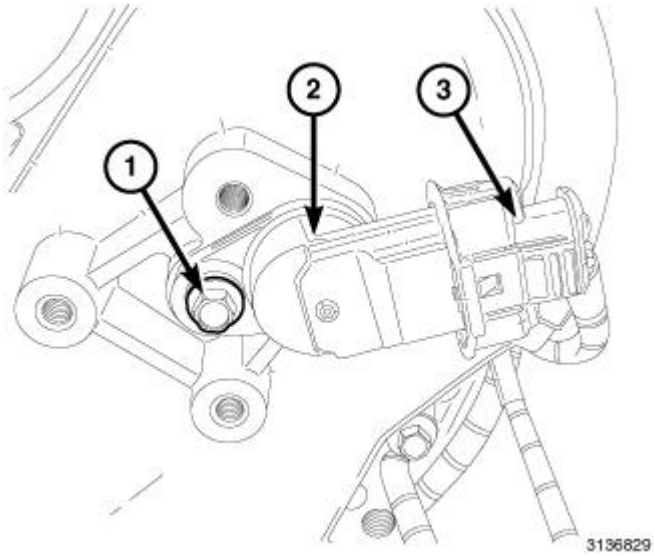


Fig. 140: Camshaft Position Sensor, Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Connect Camshaft Position (CMP) sensor wire harness connector (3).

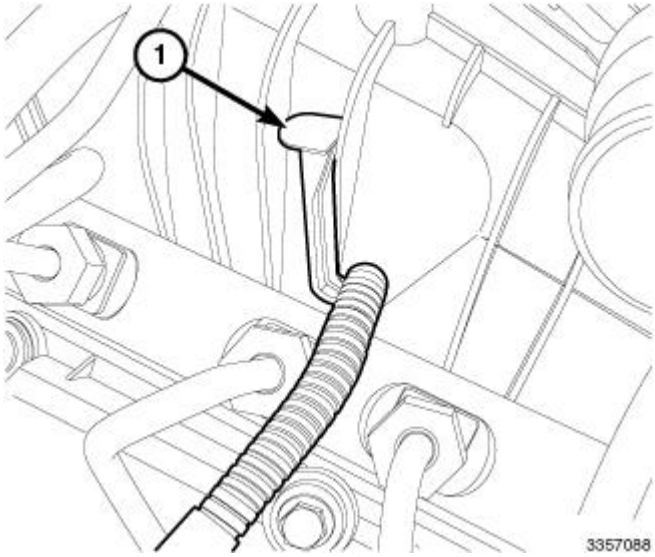


Fig. 141: Glow Plug Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

7. Connect glow plug wire harness connector (1).

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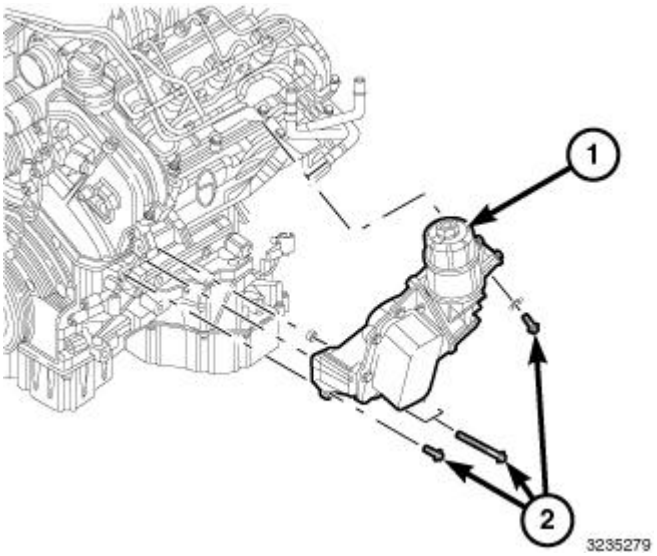


Fig. 142: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Install the oil cooler adapter assembly. Refer to **ADAPTER, OIL COOLER, INSTALLATION**.

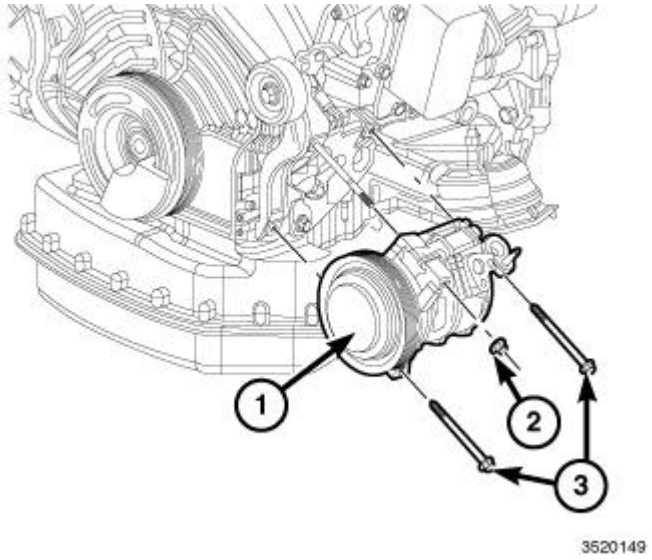


Fig. 143: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

9. Install the A/C compressor (1). Tighten bolts (3) to 28 N.m (21 ft. lbs.).
10. Install the A/C compressor mounting stud. Tighten nut (2) to 28 N.m (21 ft. lbs.).
11. Connect the A/C compressor (1) wire harness connector.

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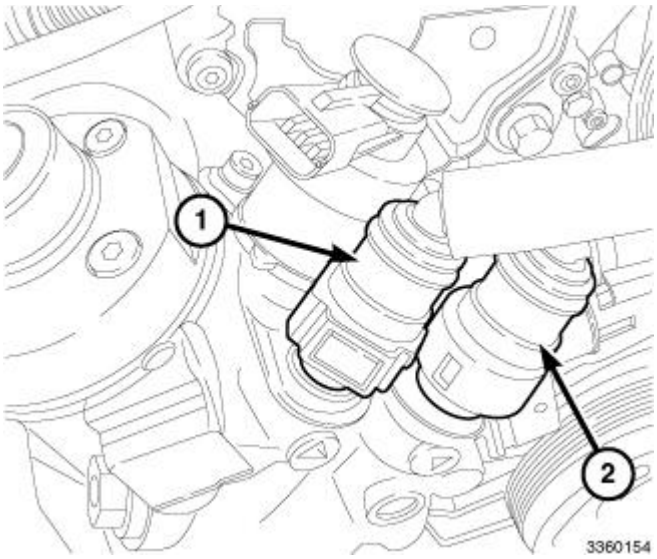


Fig. 144: Return Line & Low Pressure Supply Line
Courtesy of CHRYSLER GROUP, LLC

12. Install the support bracket securing coolant tube, brake booster hose, and fuel lines. Tighten nuts (2) to 11 N.m (97 in. lbs.).
13. Connect the two heater hoses at bulk head.
14. Connect the brake booster vacuum hose.
15. Connect the low pressure supply (2) and return (1) lines to the high pressure pump.

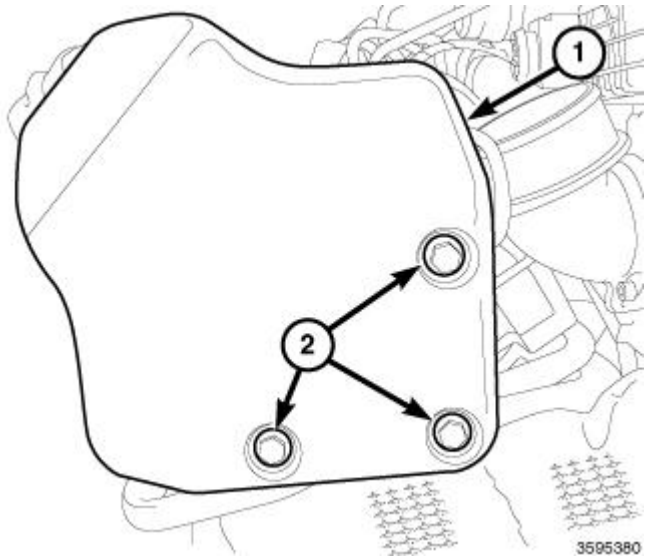


Fig. 145: High Pressure Pump Blocker & Bolts
Courtesy of CHRYSLER GROUP, LLC

16. Install the fuel pump blocker (1). Tighten bolts (2) to 25 N.m (18 ft. lbs.).

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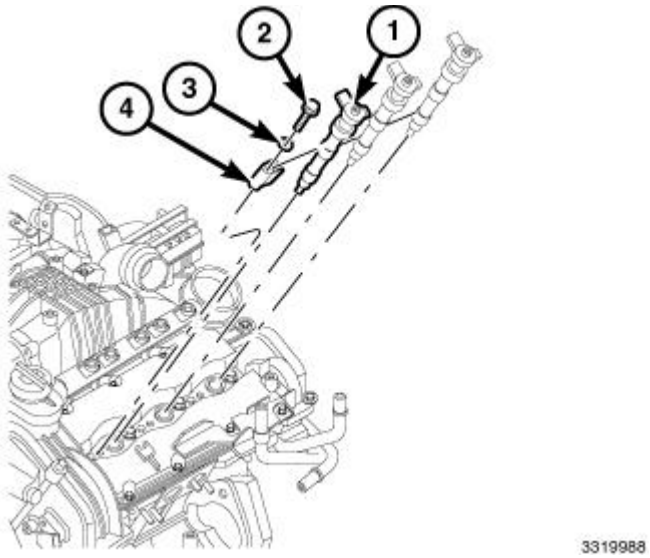


Fig. 146: Fuel Injector, Hold Down Bolt, Washer & Retaining Claw
Courtesy of CHRYSLER GROUP, LLC

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

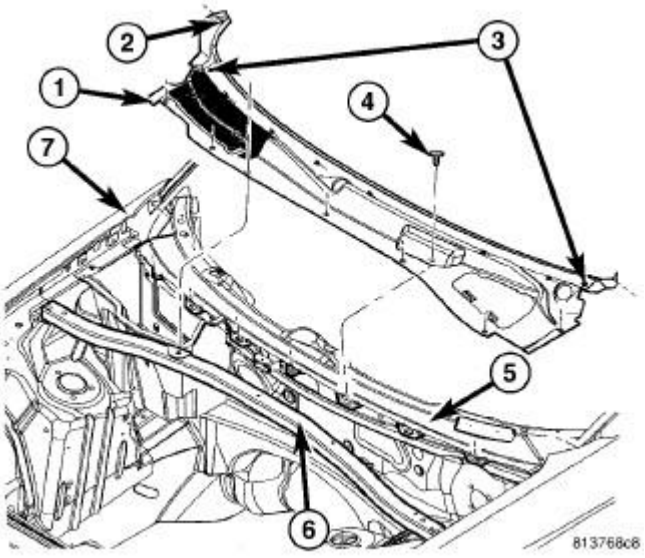


Fig. 147: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

18. Install air cleaner body and turbocharger inlet hose. Refer to **BODY, AIR CLEANER, INSTALLATION**.
19. Install the rear engine compartment heat shield and securely tighten the fasteners.
20. Install the strut support brace (6). Tighten bolts to 38 N.m (28 ft. lbs.).
21. Install the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, INSTALLATION** .
22. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

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23. Install the belly pan. Refer to **BELLY PAN, INSTALLATION** .
24. Lower the vehicle.

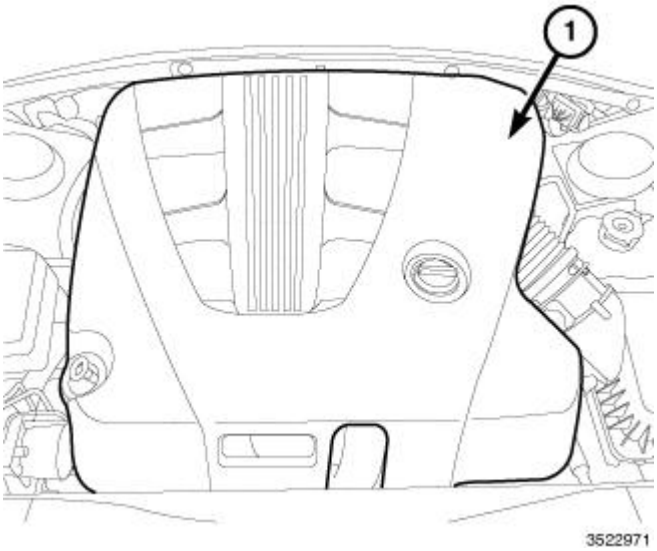


Fig. 148: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

25. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
26. Connect the negative battery cable.
27. Start the engine and inspect for leaks.
28. Install the engine cover (1).

LIFTER(S), HYDRAULIC

DESCRIPTION

DESCRIPTION

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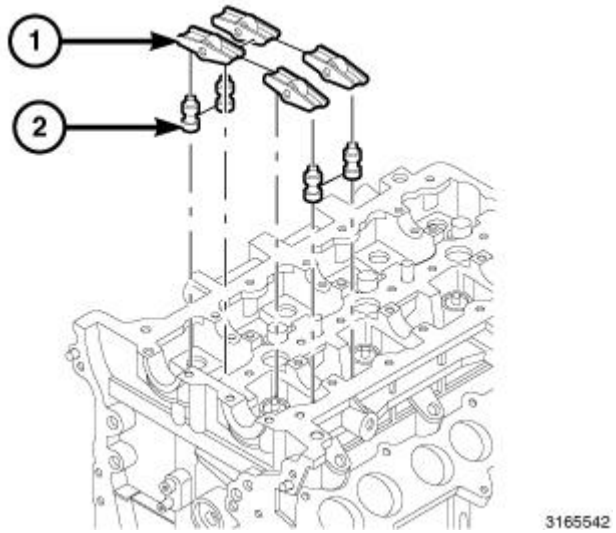


Fig. 149: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

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

REMOVAL

REMOVAL

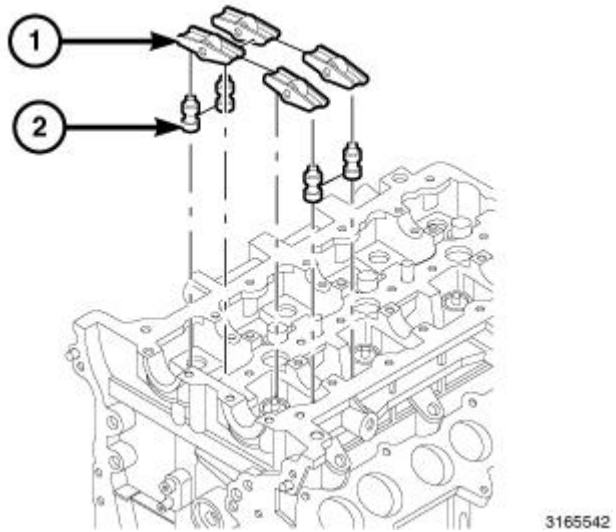


Fig. 150: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: When the lifters are removed from the engine, they must be stored upright

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and in clean conditions.

2. Remove the rocker arm (1) and lifter (2) assembly.

INSPECTION

INSPECTION

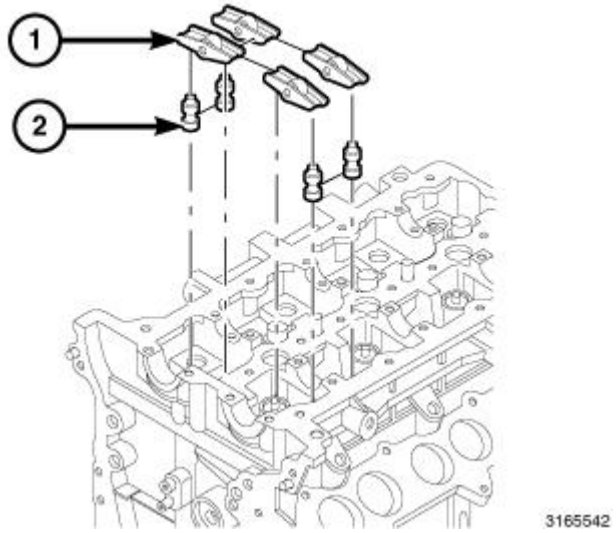


Fig. 151: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

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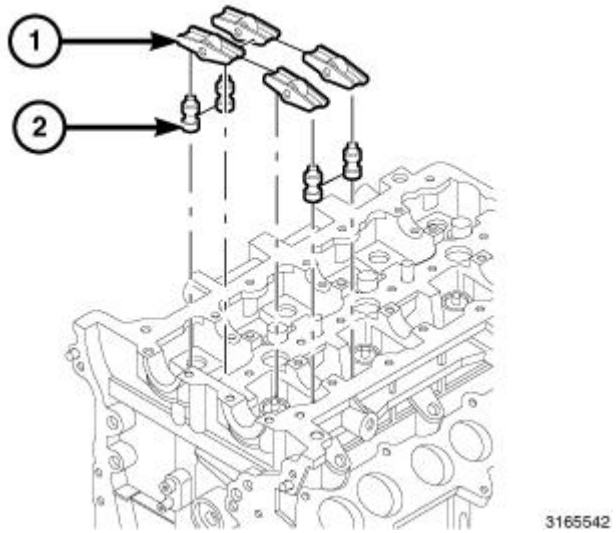


Fig. 152: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When the lifters are removed from the engine, they must be stored upright and in clean conditions. Install the rocker arms and lifters in the same location as when removed.

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

NOTE: Rocker arms and lifters must be installed in the same location as when removed.

1. Install the lifter (2) and the rocker arm (1) in the same location as noted during removal.
2. Install the camshaft(s). Refer to **CAMSHAFT, ENGINE, INSTALLATION**.

ROCKER ARM, VALVE

DESCRIPTION

DESCRIPTION

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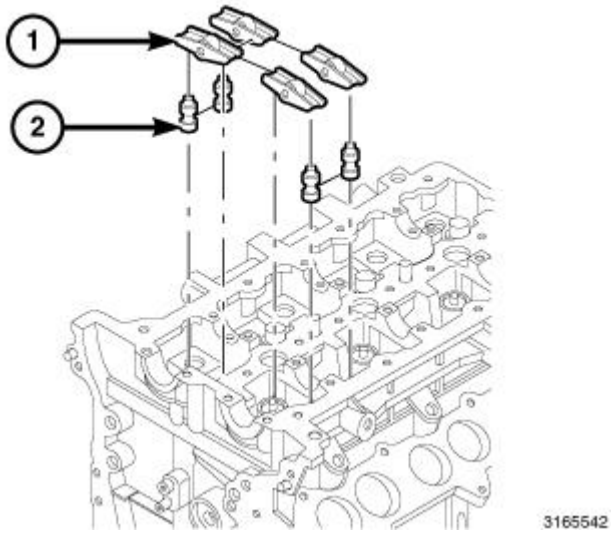


Fig. 153: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

The rocker arms (1) are located on the top of the hydraulic lifters (2) and the valves. The rocker arms are held in position by resting on top of the valve and the hydraulic lifter pivoting ball. There is a spring clip that holds the rocker arm to the hydraulic lifters pivoting ball.

OPERATION

OPERATION

The rocker arms are used as a link between the camshaft and valves. As the camshaft rotates, the lobes of the camshafts apply downward pressure on the rocker arms. This pressure is then transmitted to the valves which causes the valves to open.

REMOVAL

REMOVAL

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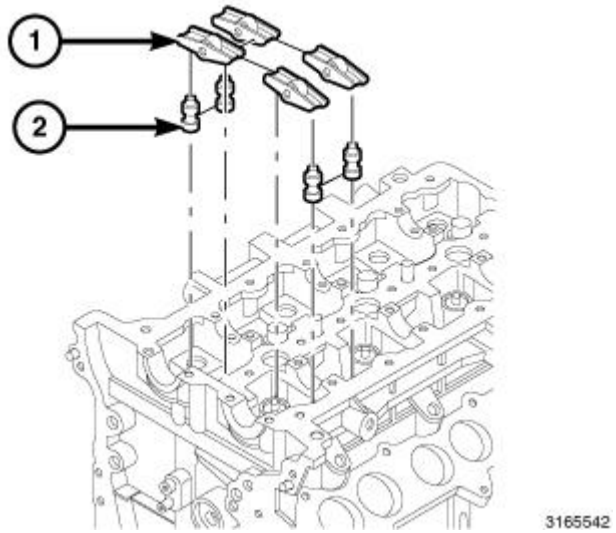


Fig. 154: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

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

NOTE: Rocker arms and lifters must be installed in the same location as when removed and stored in the up right position.

2. Remove the rocker arm (1) and lifter (2) assembly.

INSTALLATION

INSTALLATION

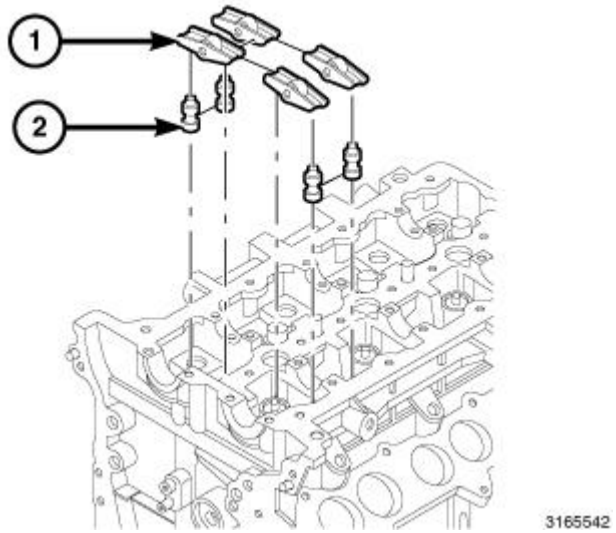


Fig. 155: Rocker Arms & Hydraulic Lifters
Courtesy of CHRYSLER GROUP, LLC

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NOTE: Rocker arms and lifters must be installed in the same location as when removed.

1. Install the rocker arm (1) and lifter (2) assembly in the same location as noted during removal.
2. Install the camshaft. Refer to **CAMSHAFT, ENGINE, INSTALLATION**.

SEAL(S), CAMSHAFT

REMOVAL

REMOVAL

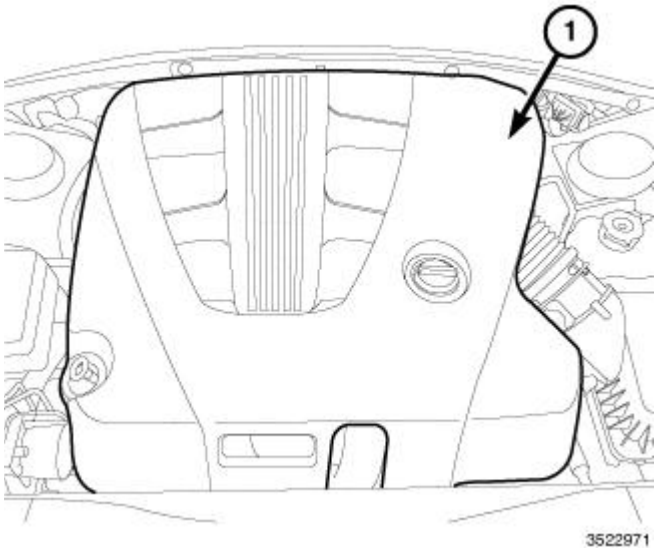


Fig. 156: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Remove the engine cover (1).

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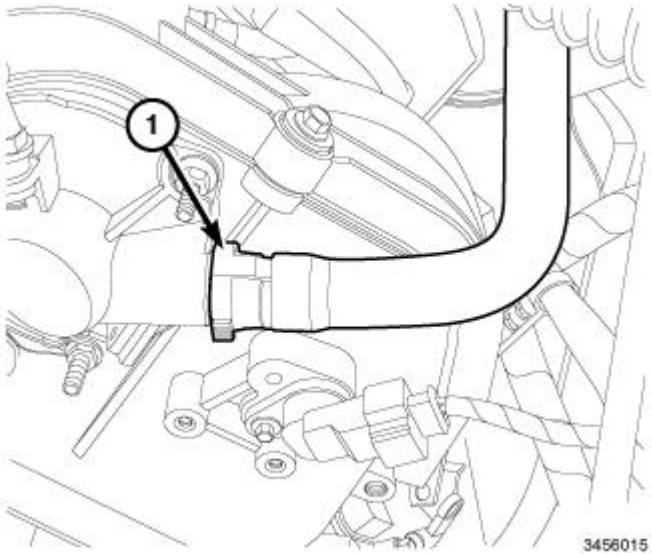


Fig. 157: CCV Hose
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the CCV hose (1) from oil breather/camshaft seal housing.

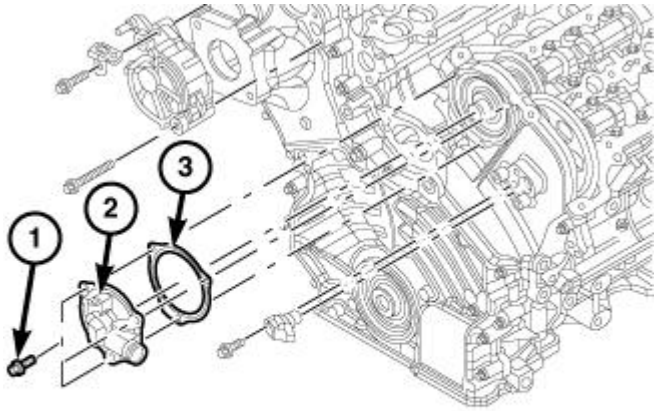


Fig. 158: Oil Breather/Camshaft Seal Housing, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the oil breather/camshaft seal housing (2).
4. Remove and discard gasket (3).

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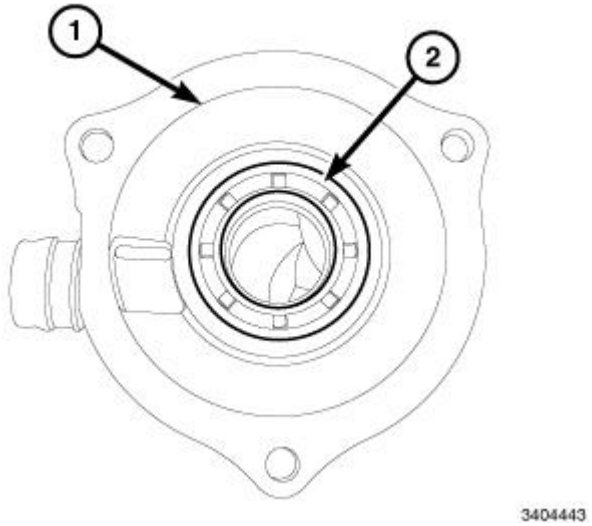


Fig. 159: Oil Breather/Camshaft Seal Housing & Camshaft Seals
Courtesy of CHRYSLER GROUP, LLC

5. Using a suitable tool remove the camshaft oil seal (2).

INSTALLATION

INSTALLATION

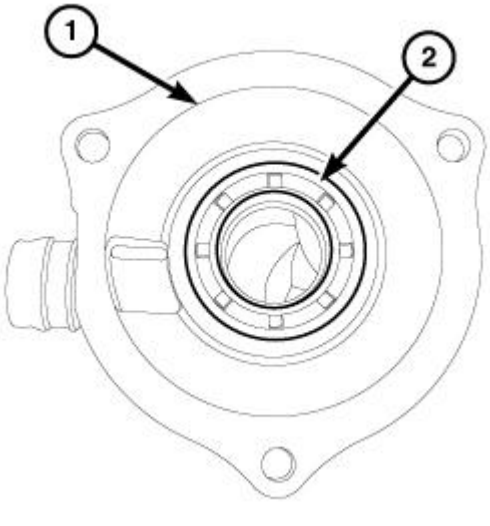


Fig. 160: Oil Breather/Camshaft Seal Housing & Camshaft Seals
Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket sealing mating surfaces.
2. Install the camshaft seals (2) into oil breather/camshaft seal housing (1).

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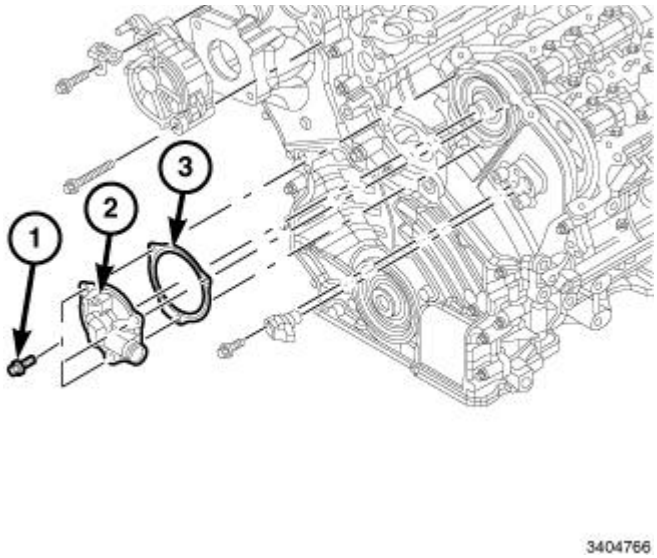


Fig. 161: Oil Breather/Camshaft Seal Housing, Gasket & Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Using a new gasket (3), install the oil breather/camshaft seal housing (2). Tighten bolts (1) to 14 N.m (124 in. lbs.).

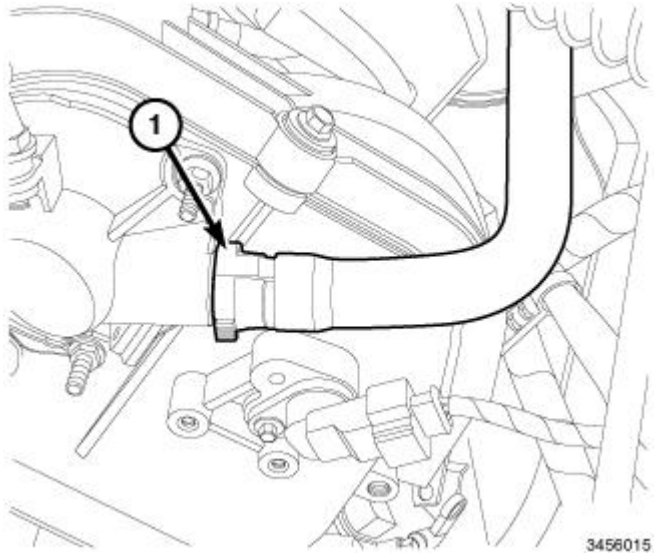


Fig. 162: CCV Hose
Courtesy of CHRYSLER GROUP, LLC

4. Connect the CCV hose (1) to the oil breather/camshaft seal housing.

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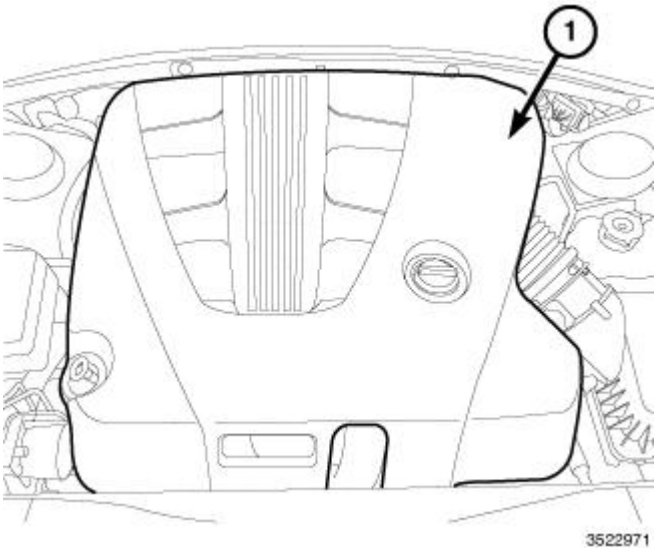


Fig. 163: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

5. Install the engine cover (1).

VALVES, INTAKE AND EXHAUST

STANDARD PROCEDURE

VALVE SEALS

1. Disconnect the negative battery cable.
2. Remove the cylinder head and place on work bench. Refer to **CYLINDER HEAD, REMOVAL**.

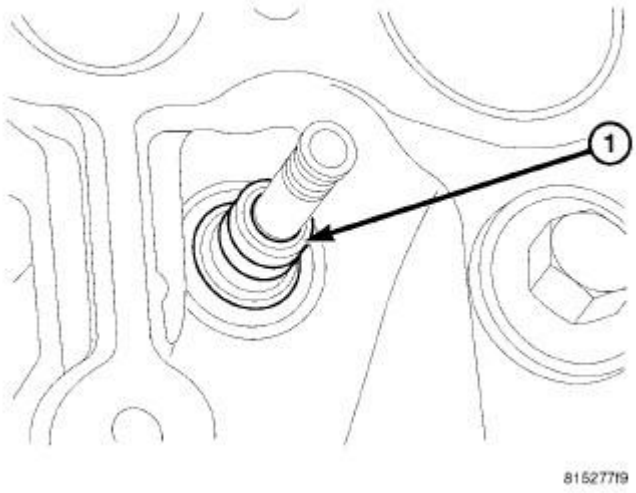


Fig. 164: Valve Seal

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Courtesy of CHRYSLER GROUP, LLC

3. Use (special tool #C-3422-D, Compressor, Valve Spring) and (special tool #10224, Adapter, Valve Spring) and compress each valve spring.
4. Remove the valve locks, retainers, and springs.
5. Remove the valve seal (1).
6. Repeat this procedure for all cylinders.

VALVE SERVICE

This procedure is done with the engine cylinder head removed from the block.

DISASSEMBLY

1. Remove the engine cylinder head from the cylinder block. Refer to **CYLINDER HEAD, REMOVAL**.
2. Use (special tool #C-3422-D, Compressor, Valve Spring) and (special tool #10224, Adapter, Valve Spring) and compress each valve spring.
3. Remove the valve locks, retainers, and springs.
4. Use a smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.
5. Remove the valves, and place them in a rack in the same order as removed.

VALVE CLEANING

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

INSPECTION

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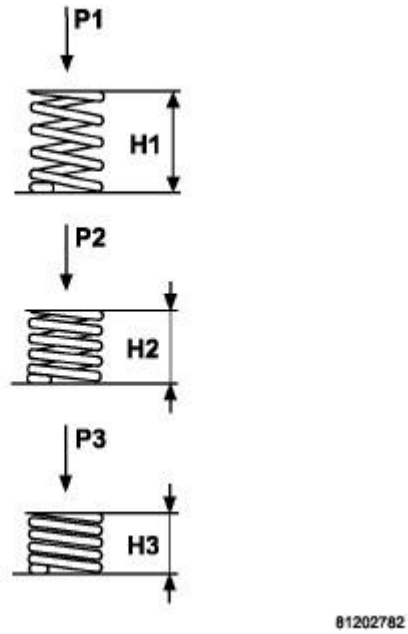


Fig. 165: Valve Spring Chart
Courtesy of CHRYSLER GROUP, LLC

1. Inspect for cracks in the combustion chambers and valve ports.
2. Inspect for cracks on the exhaust seat.
3. Inspect for cracks in the gasket surface at each coolant passage.
4. Inspect valves for burned, cracked or warped heads.
5. Inspect for scuffed or bent valve stems.
6. Replace valves displaying any damage.
7. Check valve spring height. Free length: 44.1 mm (1.736 in.); Closed valve: 34 mm (1.338 in.); Valve open 25.5 mm (1.003 in.).

VALVE SEAT REFACING

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

VALVE GUIDES

Valve Guides Stem Clearance	Min	Max
Intake Valve Guide Stem Clearance	0.382 mm (0.150 in.)	0.6 mm (0.023 in.)
Exhaust Valve Guide Stem Clearance	0.382 mm (0.150 in.)	0.6 mm (0.023 in.)

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

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1. Measure and record internal diameter of valve guides. Valve guide internal diameter is 6.0 to 6.012 mm (0.2362 to 0.2366 in.).
2. Measure valve stems and record diameters. Intake valve stem diameter 5 mm (0.1968 in.). Exhaust valve stem diameter 5 mm (0.1968 in.).
3. Subtract diameter of valve stem from internal diameter of its respective valve guide to obtain valve stem clearance in valve guide. Clearance of inlet valve stem in valve guide is 0.03 to 0.06 mm (.0011 to.0023 in). Clearance of exhaust valve stem in valve guide is 0.04 to 0.07 mm (.0015 to.0027 in).
4. If valve stem clearance in valve guide exceeds tolerances, new valve guides must be installed.

ENGINE BLOCK

DESCRIPTION

DESCRIPTION

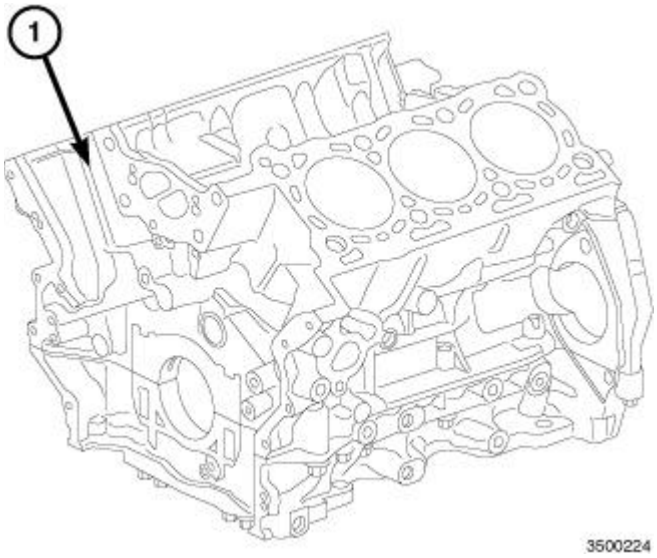


Fig. 166: 3.0L Engine Block
Courtesy of CHRYSLER GROUP, LLC

The 3.0L engine utilizes a cast Iron cylinder block (1) with a bedplate design. The cylinder angle is 60 degrees V block design. The cylinder block has increased rigidity that reduces structural flexing, plus a fractured connecting rod cap design that can not distort connecting rod cap fit.

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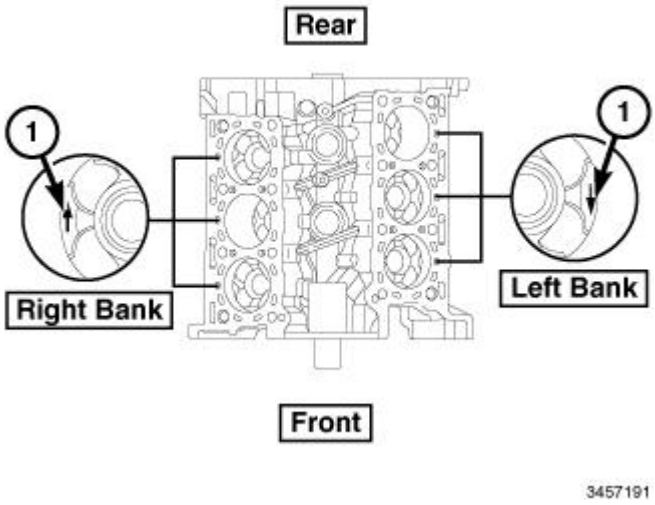


Fig. 167: Arrow Stamped On Piston Crown
Courtesy of CHRYSLER GROUP, LLC

Cylinders are numbered front to back, beginning with the right bank. The right bank cylinders are numbered 1, 2, 3. The left bank cylinders 4, 5, 6. The injection order of the engine is 1-4-2-5-3-6.

STANDARD PROCEDURE

STANDARD PROCEDURE - BEARING SELECTION CHARTS

CONNECTING ROD BEARINGS - LARGE END

Connecting Rod Journal Diameter - Connecting Rod Large End	Bearing Half	Connecting Rod Journal Diameter - Crankshaft		
		A	B	C
		67.500 - 67.494	67.494 - 67.488	67.488 - 67.482
A 71.000 - 71.006	Upper Bearing Shell	Red	Red	Blue
	Lower Bearing Shell	Red	Blue	Blue
B 71.006 - 71.012	Upper Bearing Shell	Red	Blue	Blue
	Lower Bearing Shell	Blue	Blue	Yellow
C 71.012 - 71.018	Upper Bearing Shell	Blue	Blue	Yellow
	Lower Bearing Shell	Blue	Yellow	Yellow

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CRANKSHAFT BEARINGS

Cylinder Block Seat Diameter (Bed Plate)	Bearing Half	Crankshaft Main Journal Diameter		
		A	B	C
		73.958 - 73.952	73.952 - 73.946	73.946 - 73.940
A 78.000 - 78.006	Upper Bearing Shell	Red	Red	Blue
	Lower Bearing Shell	Red	Blue	Blue
B 78.006 - 78.012	Upper Bearing Shell	Red	Blue	Blue
	Lower Bearing Shell	Blue	Blue	Yellow
C 78.012 - 78.018	Upper Bearing Shell	Blue	Blue	Yellow
	Lower Bearing Shell	Blue	Yellow	Yellow

BEARING(S), CONNECTING ROD

REMOVAL

REMOVAL

1. Disconnect negative battery cable.
2. Remove the engine from vehicle and mount on suitable engine stand. Refer to **REMOVAL**.
3. Remove the oil pump pickup tube. Refer to **PICK-UP, OIL PUMP, REMOVAL**.

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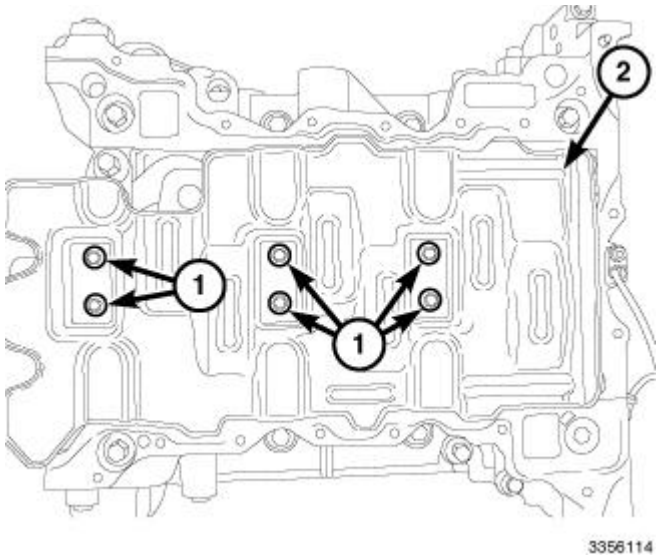


Fig. 168: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (1) and the windage tray (2).

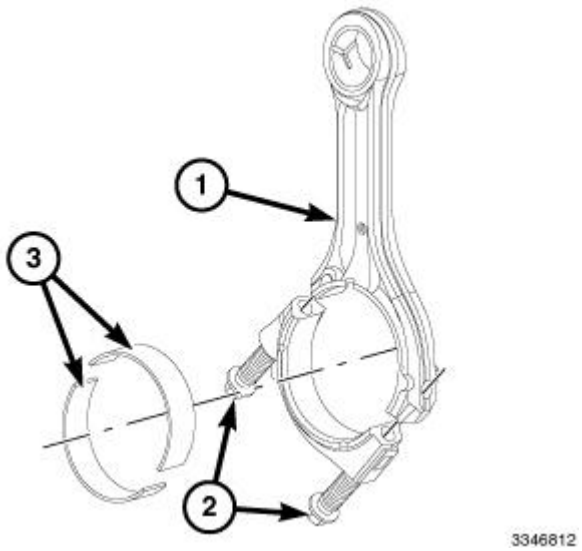


Fig. 169: Connecting Rod, Bearings & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the connecting rod bearing caps one at a time and discard bolts (2).
6. Carefully remove the upper half and lower bearing half (3) from the connecting rod.

INSTALLATION

INSTALLATION

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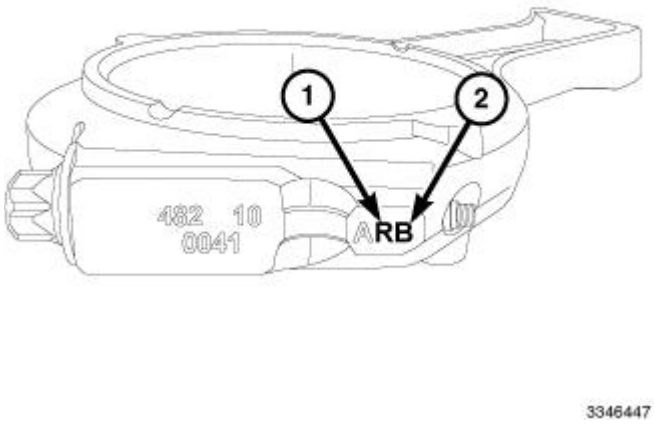


Fig. 170: Connecting Rod Shaft & Class Identification Mark
Courtesy of CHRYSLER GROUP, LLC

NOTE: If the connecting rod has to be replaced only use connecting rod of the same weight, recognizable by a letter stamped on connecting rod shaft (1).

1. Each connecting rod has its own letter class identification mark (2) on connecting rod for bearing selection.

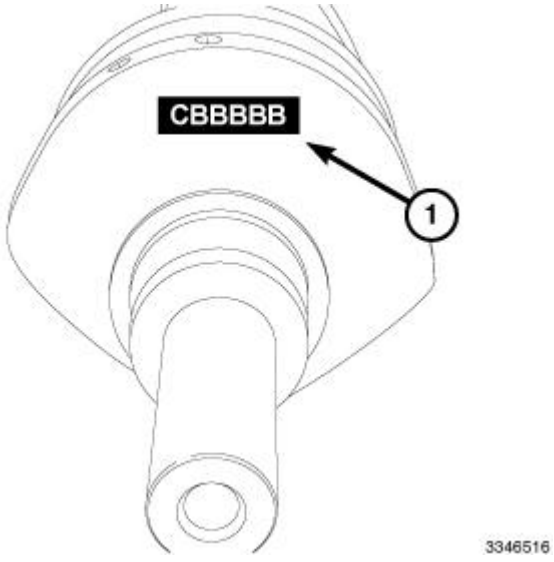


Fig. 171: Letters Stamped Into Crankshaft
Courtesy of CHRYSLER GROUP, LLC

2. Letter class identification mark on crankshaft (1).

Cylinder No.	1	2	3	4	5	6

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Crankshaft Letter	C	B	B	B	B	B
Connecting Rod Letter	B	B	A	A	A	A

3. Choose the correct connecting rod bearings size from the above table. To determine the correct bearing size for each cylinder, each connecting rod "letter class", (letter stamped on each connecting rod), must be matched with crankshaft "letter class" (6 digits letters stamped on the first crankshaft counter weight). The letters stamped on the crankshaft are in the same orders as the cylinders. The first letter correspond to the first cylinder (timing system side), the second letter to the second one, etc. See bearing selection chart. Refer to **Engine/Engine Block - Standard Procedure**.

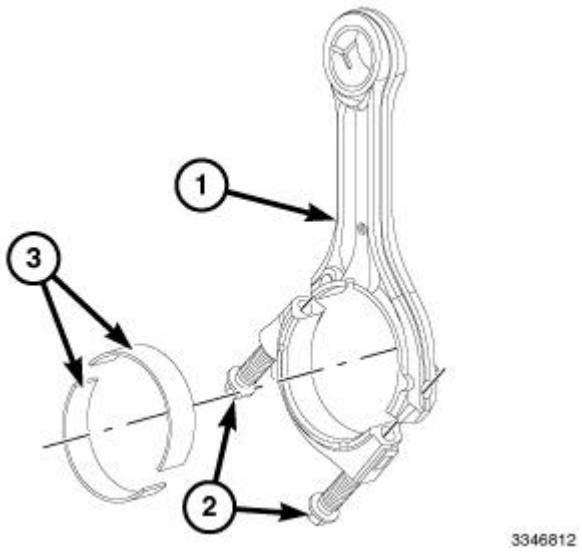


Fig. 172: Connecting Rod, Bearings & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Assemble connecting rod bearings (3) and bearing caps to their respective connecting rods (2) ensuring that the serrations on the cap and reference marks are aligned.
5. Using new bolts, tighten the connecting rod cap bolts to:
   - Step 1: Tighten to 10 N.m (88 in. lbs.).
   - Step 2: Tighten each bolt to 25 N.m (18 ft. lbs.).
   - Step 3: Tighten each bolt an additional 75 degrees turn.
   - Step 4: With the torque wrench set at 50 N.m (37 ft. lbs.) to check the tightening of each bolt.

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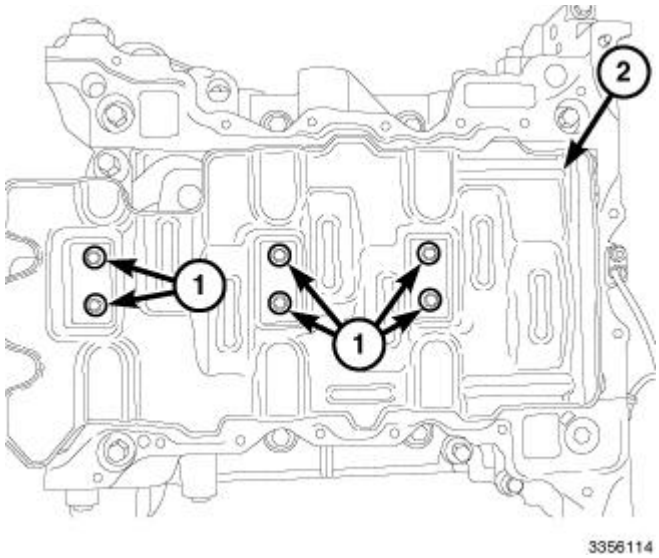


Fig. 173: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the windage tray (2). Tighten bolts (1) to 11 N.m (97 in. lbs.).
7. Install the oil pump pickup tube. Refer to **PICK-UP, OIL PUMP, INSTALLATION**.
8. Install the engine into vehicle. Refer to **INSTALLATION**.
9. Connect the negative battery cable.

BEARING(S), CRANKSHAFT, MAIN

DESCRIPTION

DESCRIPTION

The bottom of the cylinder block has provisions for mounting the bedplate and the oil jets. The bedplate houses the other half of the main bearing shell. The bedplate is made of cast iron and bolts to the cylinder block. There is twenty six M12 mounting bolts, and three M8 mounting bolts.

The number four main bearing serves as the thrust washer location.

The upper main bearings have a oil supply holes and center grooves for lubrication of the main journals. The lower main bearings provide strength where it is needed.

The upper main bearings are available in three different thicknesses bearings. A color coded mark on the side of the bearing is used to identify it's thickness. Each color coded bearing is matched to it's respective journal. The select fit is obtained by matching the color coded bearings to grade identification marks on the cylinder block and crankshaft. Letters marked on the cylinder block identify the color of each upper-half main bearing, while letters marked on the front end of the crankshaft indicate the color of each lower half main bearing.

REMOVAL

REMOVAL

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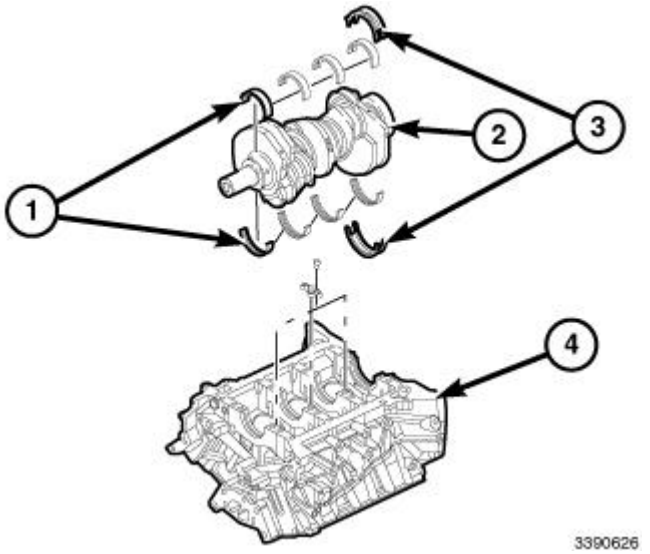


Fig. 174: Crankshaft, Bearings, Thrust Bearing & Engine Block
Courtesy of CHRYSLER GROUP, LLC

1. Remove the crankshaft (2). Refer to **CRANKSHAFT, REMOVAL**.

INSTALLATION

INSTALLATION

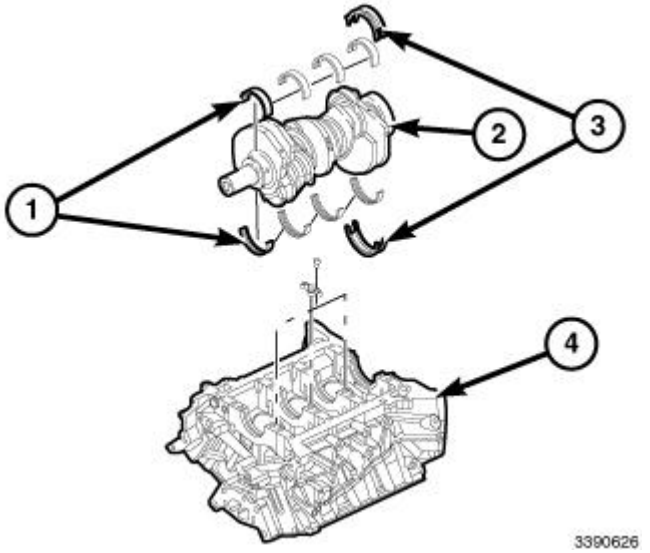


Fig. 175: Crankshaft, Bearings, Thrust Bearing & Engine Block
Courtesy of CHRYSLER GROUP, LLC

1. Install the crankshaft (2). Refer to **CRANKSHAFT, INSTALLATION**.

CRANKSHAFT

DESCRIPTION

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DESCRIPTION

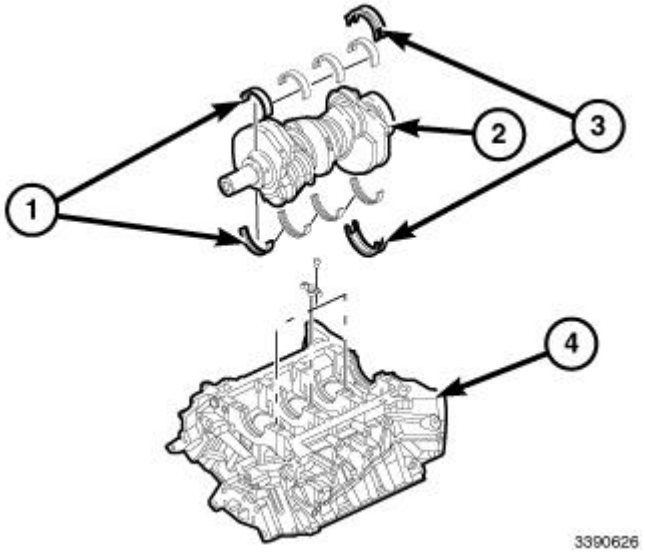


Fig. 176: Crankshaft, Bearings, Thrust Bearing & Engine Block
Courtesy of CHRYSLER GROUP, LLC

The crankshaft (1) for the 3.0L is a forged steel type design with four main bearing journals. The fourth crankshaft support controls crankshaft thrust.

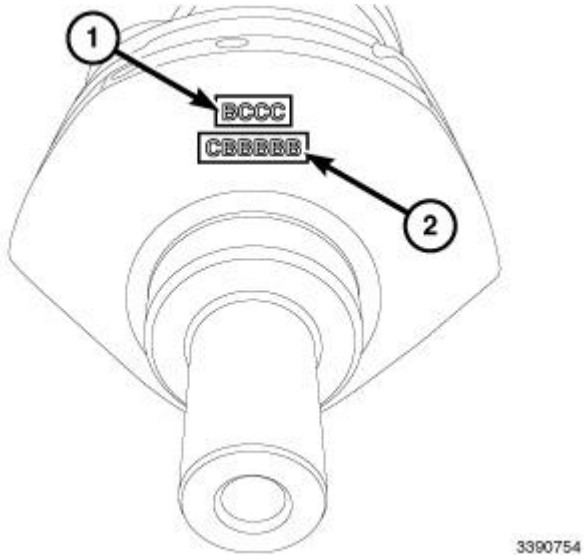


Fig. 177: Bearing Identification & Letters Stamped Into Crankshaft
Courtesy of CHRYSLER GROUP, LLC

The bearing identification for the upper crankshaft main journals is etched into the lower right side of engine block and the proper lower bearing selection can be found etched in the front of the crankshaft (1).

OPERATION

OPERATION

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The crankshaft transfers force generated by combustion within the cylinder bores to the flexibility. The crankshaft has six separate throws arranged at different angles (splayed) to reduce second order free movements of inertia. Following the injection order 1-4-2-5-3-6, the crankshaft throw angles alternate between 46°.

STANDARD PROCEDURE

MEASURE CRANKSHAFT AND BLOCK JOURNALS

NOTE: After any bearing damage occurred, remove all debris which is present in the main oil gallery, connecting rod bores, and in the crankshaft and oil galleries.

1. Remove the crankshaft.
2. Clean all engine parts thoroughly.
3. Inspect the crankshaft, replace as necessary.
4. Inspect the crankcase for damage.
5. Inspect the crankshaft main bearing bedplate for damage.
6. Install the crankshaft main bearing caps and check for out of round. Replace as necessary.
7. Remove the main bearing caps and install the crankshaft with the correct selected bearings.

NOTE: Radial mounting of the main bearings of standard size crankshaft is possible by assigning the color-coded bearing shells. The upper main bearings can be identified by the four digit mark etched on the engine block below the high pressure pump. The lower main bearings can be identified by the code etched on the front of the crankshaft hub.

ASSIGNING CRANKSHAFT MAIN BEARING SHELLS

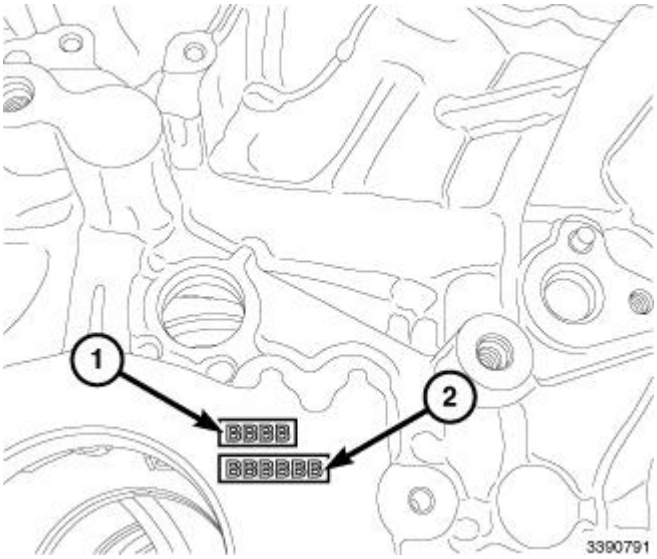


Fig. 178: Upper Main Bearing Identification
Courtesy of CHRYSLER GROUP, LLC

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The upper main bearings can be identified by the four digit mark etched in the block (1) next to the oil pump.

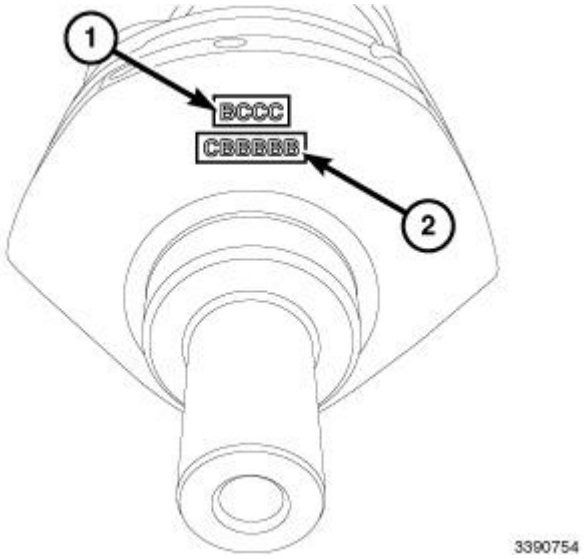


Fig. 179: Bearing Identification & Letters Stamped Into Crankshaft
Courtesy of CHRYSLER GROUP, LLC

The lower main bearings can be identified by the code etched on the front of the crankshaft counter weight (1). This color code indicates which bearing shell halves are to be used.

8. Select the correct bearing shells based upon the crankcase and crankshaft identification marks.
9. Mount the crankshaft axially using the thinnest thrust washer.
10. Inspect the crankshaft end play. If the crankshaft end play is out of specification, remove the crankshaft and install the larger thrust shim. repeat the procedure until crankshaft end play is within specification.
11. Mount the crankshaft axially again and check each main bearing oil clearance with plasti-gauge. For bearing clearance specifications. Refer to **Engine - Specifications**.

CHECKING CRANKSHAFT END PLAY

1. Mount the (special tool #C-3339A, Set, Dial Indicator) to a stationary point at rear of engine. Locate the probe perpendicular against the rear of the crankshaft.
2. Move the crankshaft all the way to the front of its travel.
3. Zero the dial indicator.
4. Move the crankshaft all the way to the rear of it's travel and record the reading on the dial indicator. For crankshaft end play clearances, refer to the **Engine - Specifications**.

REMOVAL

REMOVAL

1. Remove the engine from the vehicle and mount engine on a suitable engine stand. Refer to **REMOVAL**.
2. Mount the engine onto a suitable engine stand.

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3. Remove both cylinder heads. Refer to **CYLINDER HEAD, REMOVAL**.

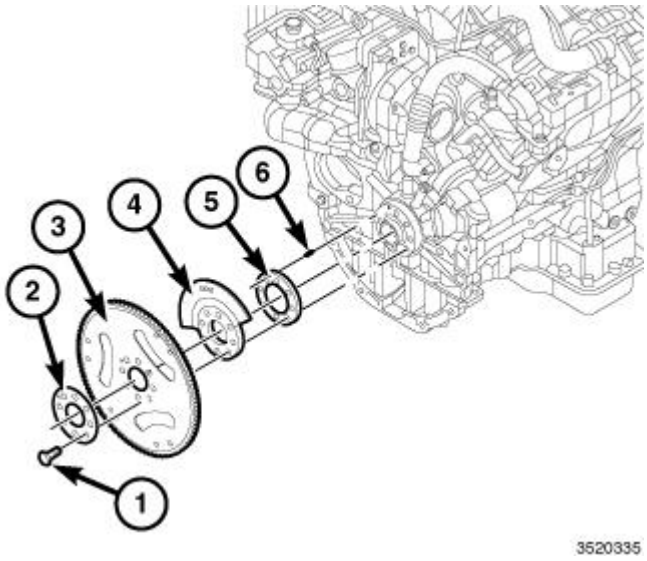


Fig. 180: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove bolts (1) and flex plate (3).
5. Remove the counter weight (4) and tone wheel (5).
6. Check the crankshaft end play. Refer to **Engine/Engine Block/CRANKSHAFT - Standard Procedure**.

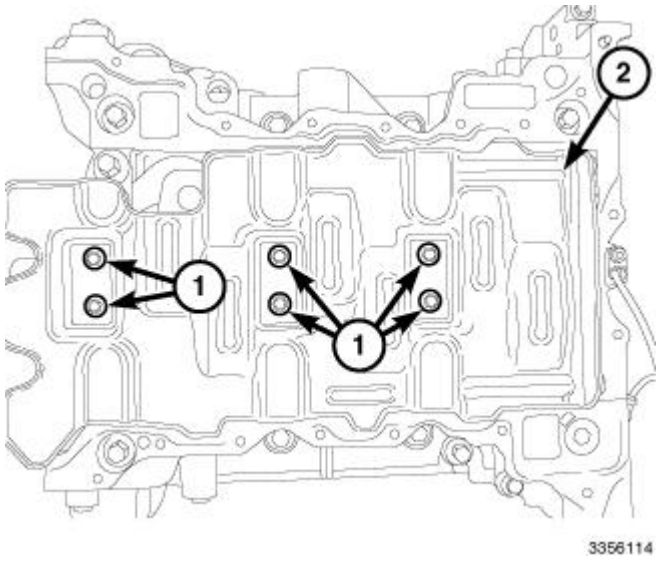


Fig. 181: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove the oil pump. Refer to **PUMP, ENGINE OIL, REMOVAL**.
8. Remove bolts (1) and the windage tray (2).

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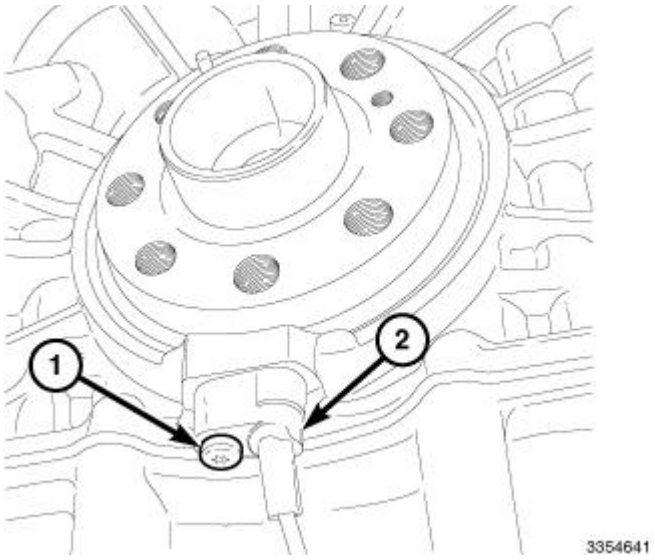


Fig. 182: Crankshaft Position Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolt (1) and the Crankshaft Position Sensor (CKP) (2).

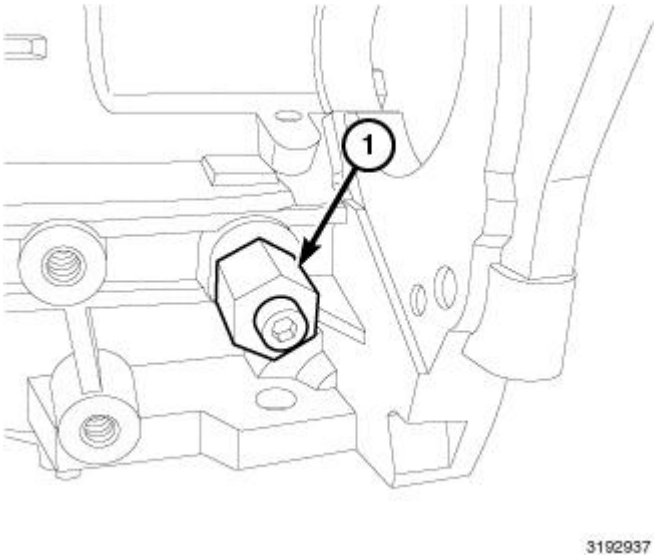


Fig. 183: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

10. Remove the (special tool #VM.10339, Tool, Crankshaft Timing) (1).

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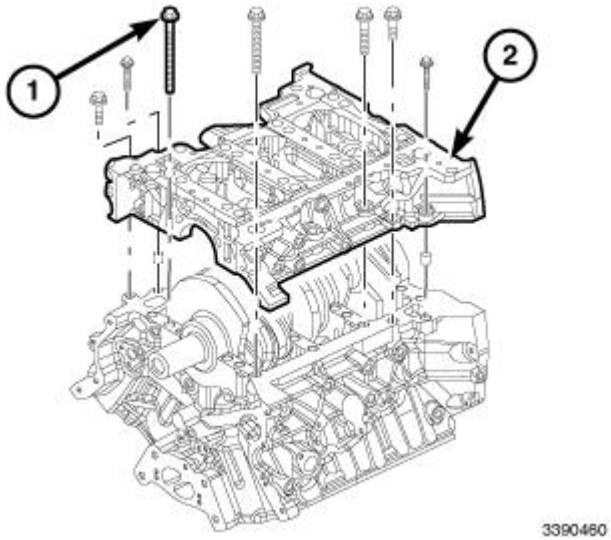


Fig. 184: Bed Plate & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Remove bolts (1) securing the bed plate (2) to engine block.

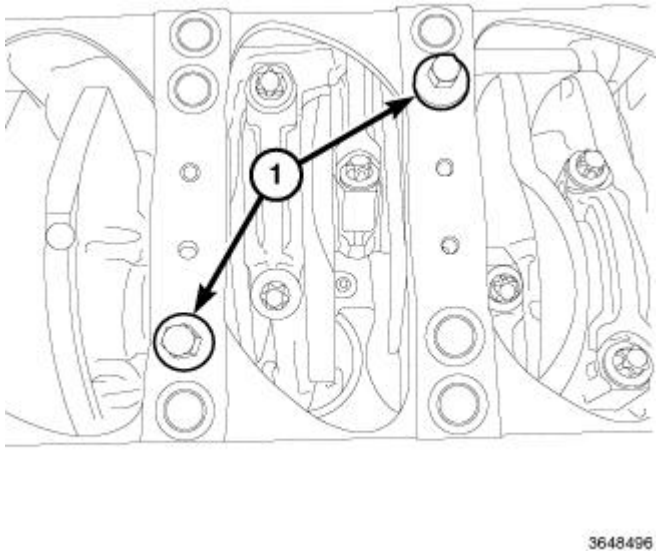


Fig. 185: Bed Plate Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Install two bed plate bolts (1) finger tight.

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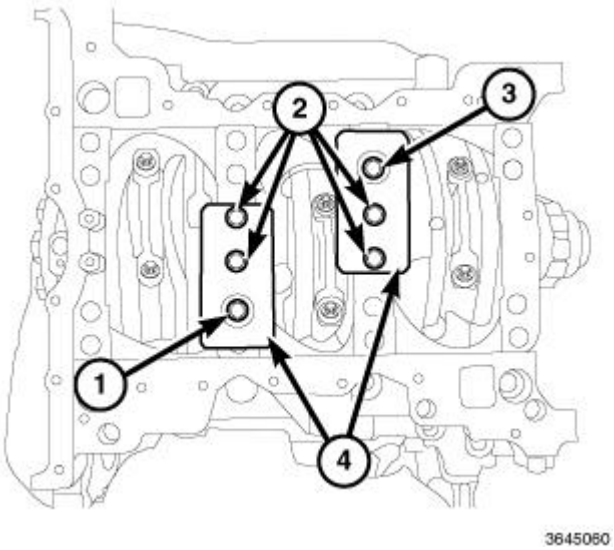


Fig. 186: Bedplate Removal Tools & Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Install the (special tool #VM.10362, Tool, Bedplate Removal) (4) and securely tighten bolts (2).
14. Loosen bolts (1 and 3) in half turn increments until seal is broken.
15. Removal bolts (2) and the (special tool #VM.10362, Tool, Bedplate Removal) (4).
16. Remove bolts (1 and 3) and the bed plate.

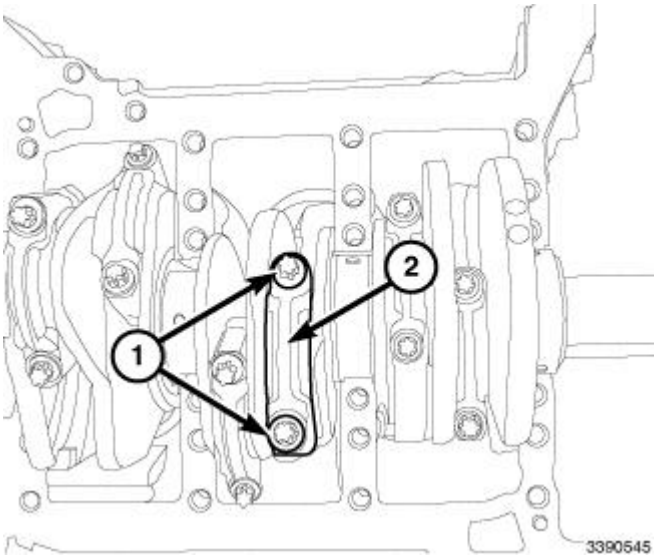


Fig. 187: Connecting Rods Bearing Cap & Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not allow the connecting rods to nick or score the crankshaft during assembly or disassembly.

CAUTION: Do not allow the connecting rod to bend or dent the oil jet. Serious

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engine damage may result from a misaligned oil jet.

17. Remove bolts (1) and the connecting rods bearing cap (2).

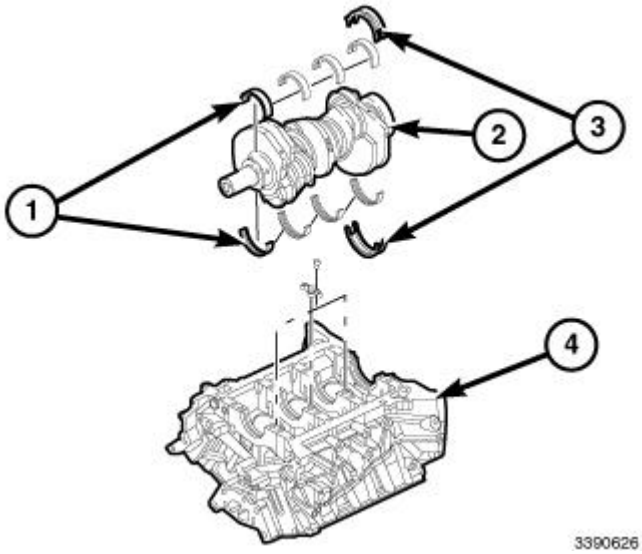


Fig. 188: Crankshaft, Bearings, Thrust Bearing & Engine Block
Courtesy of CHRYSLER GROUP, LLC

18. Remove the crankshaft (2).
19. Remove the thrust washer (3).
20. Remove the crankshaft bearings (1).

INSTALLATION

INSTALLATION

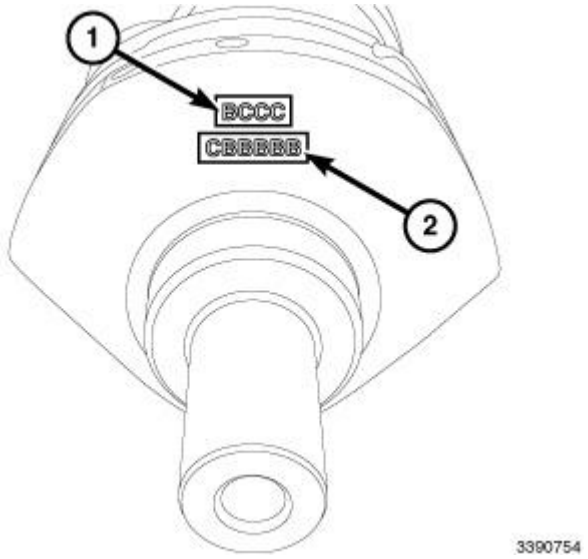


Fig. 189: Bearing Identification & Letters Stamped Into Crankshaft

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Courtesy of CHRYSLER GROUP, LLC

1. Clean all sealing and mating surfaces. Be sure that the sealing and mating surfaces are free of oil and debris. Refer to **Engine - Standard Procedure**.

NOTE: If any bearing damage has occurred, remove all debris from the connecting rod bores, crankshaft, and oil galleries. Remove the steel ball from the main oil gallery before cleaning.

2. Clean and inspect the crankshaft and bearings journals. Replace the bearings as necessary.
3. Locate the crankshaft bearing journal letter class (1) stamp on the crankshaft weight.

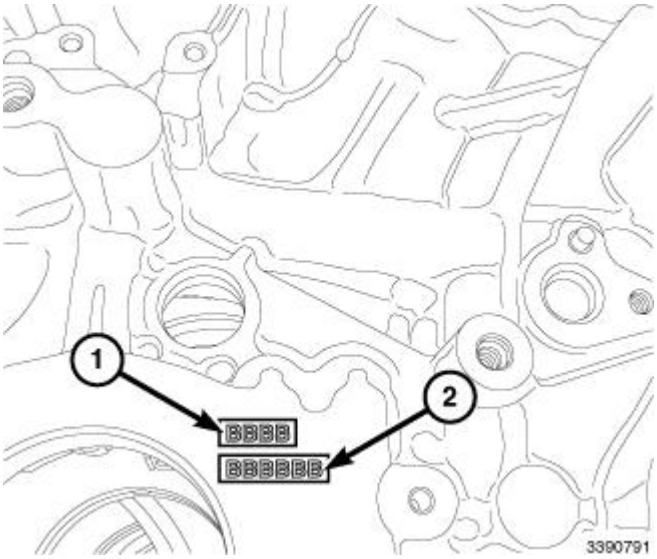


Fig. 190: Upper Main Bearing Identification
Courtesy of CHRYSLER GROUP, LLC

4. Locate the engine block crankshaft journal letter class stamp on the engine block (1).

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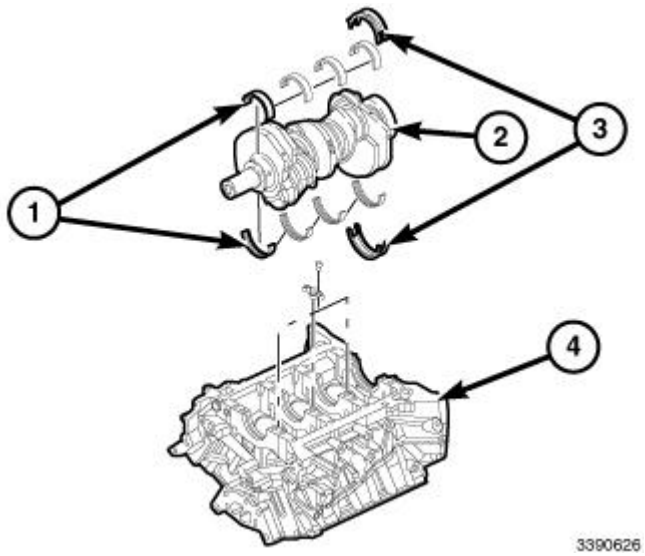


Fig. 191: Crankshaft, Bearings, Thrust Bearing & Engine Block
Courtesy of CHRYSLER GROUP, LLC

5. To determine the correct crankshaft journal letter class, each cylinder block seat diameter letter class must be matched with the crankshaft main journal diameter letter class. Both letter classes stamped on the cylinder block as well as on the crankshaft weight are in a progressive order starting from the front of the engine. The first letter corresponds to the first cylinder, the second to the second, etc. Use the crankshaft bearing selection chart to determine the half shell color. Refer to **Engine/Engine Block/CRANKSHAFT - Standard Procedure**.
6. Select the correct and install top half of the crankshaft bearings (1) and the top half of the crankshaft thrust bearing (3) into engine block (4).
7. Using the bearing selection chart from step five, select the correct bearing and install lower half of the crankshaft bearings (1) and the lower half of the crankshaft thrust bearing (3) into bed plate.

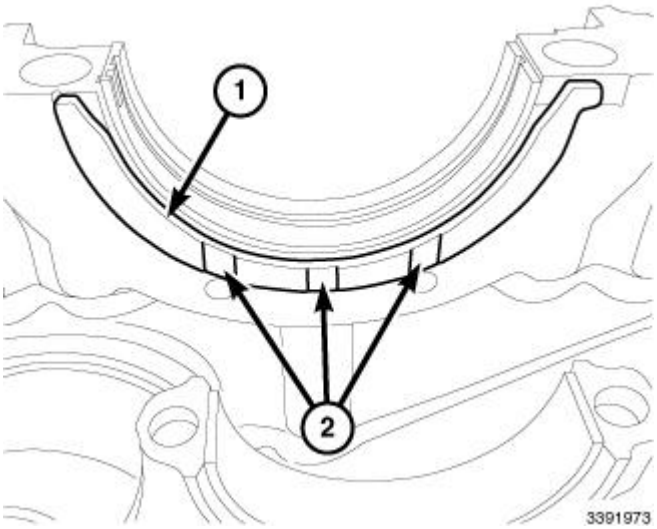


Fig. 192: Thrust Bearings & Oil Discharge Groves
Courtesy of CHRYSLER GROUP, LLC

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8. When installing the thrust bearings (1) in the engine block and bed plate, make sure the oil discharge groves (2) face towards the crankshaft.

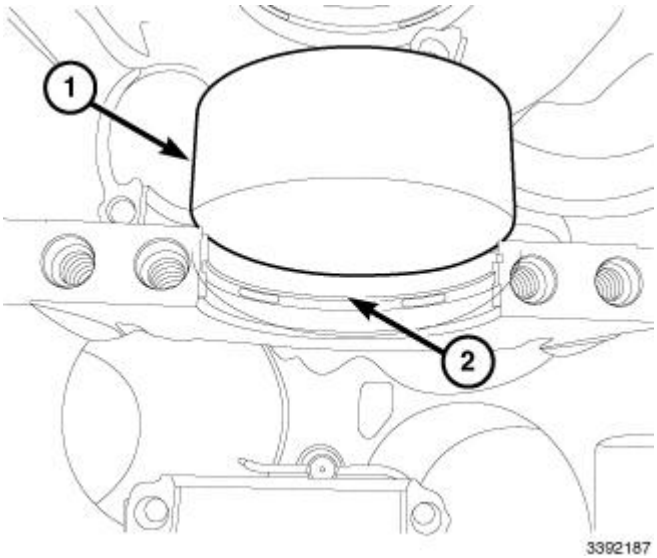


Fig. 193: Crankshaft Bearing Positioning Tool & Main Bearing
Courtesy of CHRYSLER GROUP, LLC

9. Using the (special tool #VM.10342, Tool, Crankshaft Bearing Positioning) (1) check the alignment of the first three main bearings (2) in engine block and bed plate.

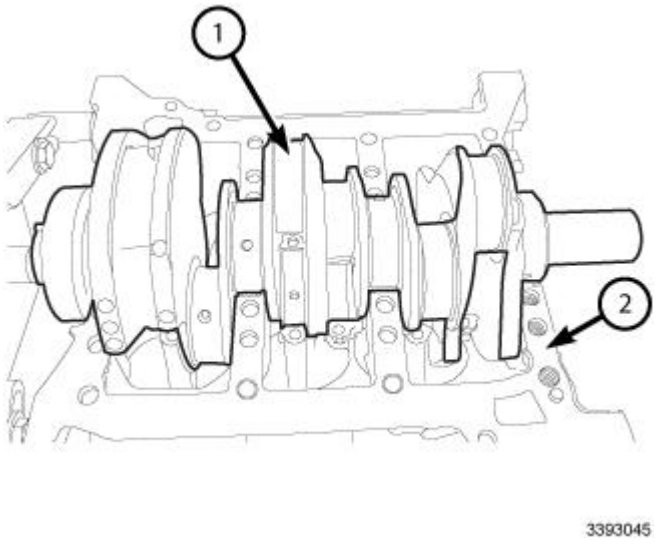


Fig. 194: Crankshaft & Engine Block
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not allow the connecting rods to nick or score the crankshaft during assembly or disassembly.

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10. Set the crankshaft (2) into the engine block.

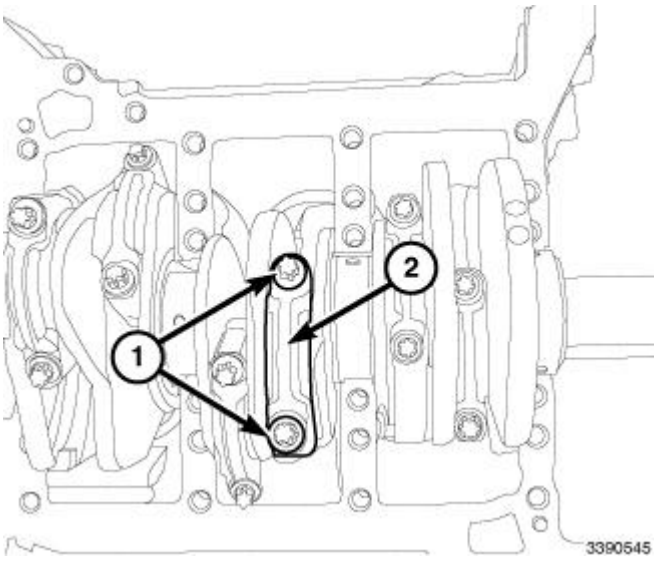


Fig. 195: Connecting Rods Bearing Cap & Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not allow the connecting rod to bend or dent the oil jet. Serious engine damage may result from a misaligned oil jet.

11. Using new bearings and bolts (1), install the connecting rod bearing caps (2). Refer to **BEARING(S), CONNECTING ROD, INSTALLATION**.
12. Install the lower half of the crankshaft bearings and the lower half of the crankshaft thrust bearing into bed plate.

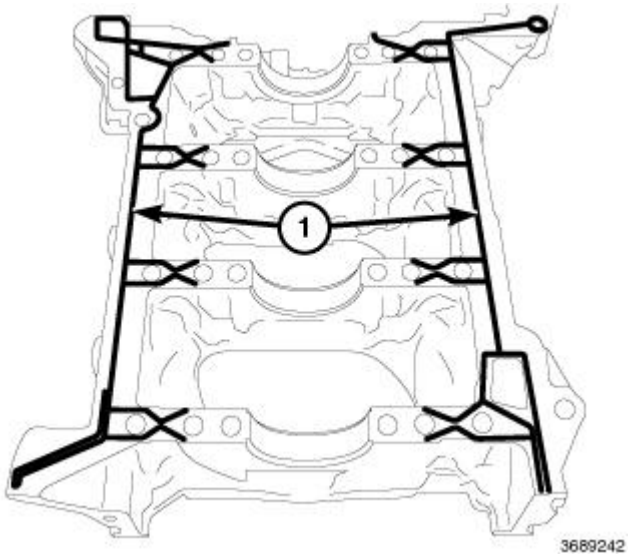


Fig. 196: RTV Sealant Compound On Bed Plate
Courtesy of CHRYSLER GROUP, LLC

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13. Clean the gasket sealing surfaces. Refer to **Engine - Standard Procedure**.
14. Using Mopar® Threebond Engine RTV Sealant, apply a 1.5 mm thick bead of sealing compound to bedplate as illustrated (1) and **DO NOT** spread the sealing bead.

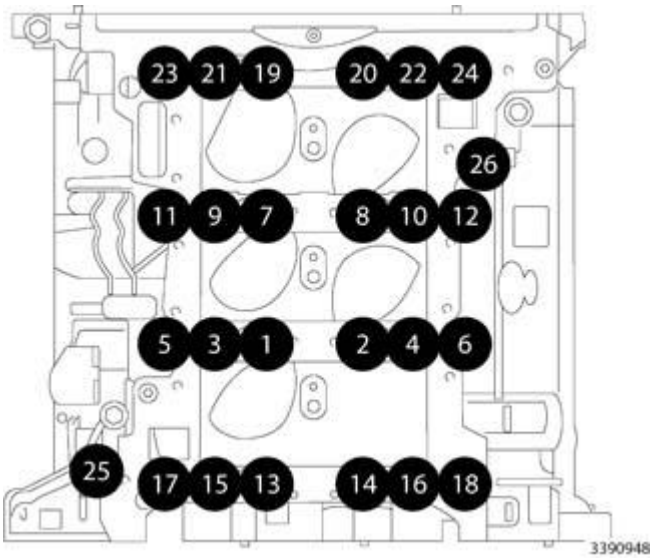


Fig. 197: Bed Plate Onto Engine Block Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

15. Install the bed plate onto the engine block.
16. Using new bolts, install the twenty six M12 bolts (1 - 26) and the three M8 bolts finger tight.
17. Using the tightening shown in illustration, tighten all M12 bolts to 45 N.m (33 ft. lbs.).

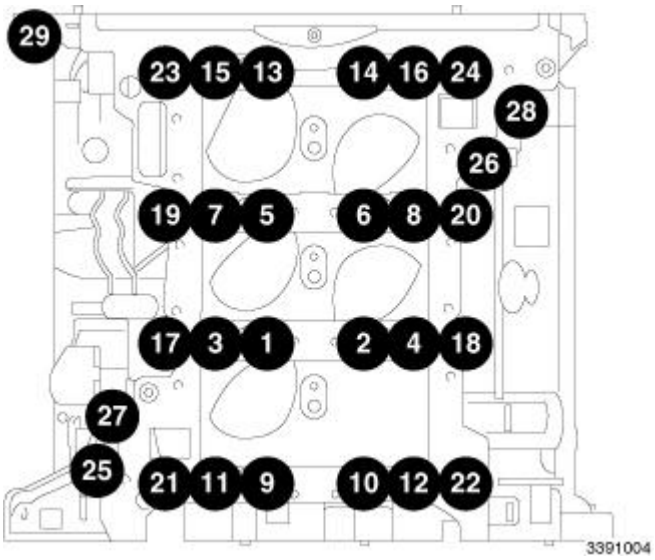


Fig. 198: Bed Plate Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

18. Using the tighten sequence shown in illustration to the following torque values:

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- Step 1: Using a torque angle gauge, tight the internal bed plate bolts (1 - 16) an additional 110 degrees turn.
- Step 2: Tight the external bed plate bolts (17 - 26) to 120 N.m (89 ft. lbs.).
- Step 3: Tighten the three M8 bolts (27 - 29) to 30 N.m 22 ft. lbs.).
- Step 4: Check the torque of the M12 bolts (1 - 26) in a counterclockwise direction with the torque wrench set at 115 N.m (85 ft. lbs.).

19. The crankshaft should turn freely. If the crankshaft does not turn freely loosen and re-torque the bearing caps.

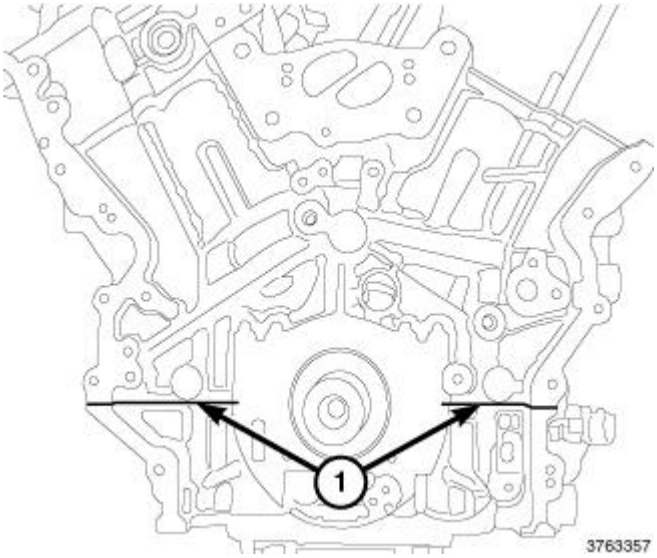
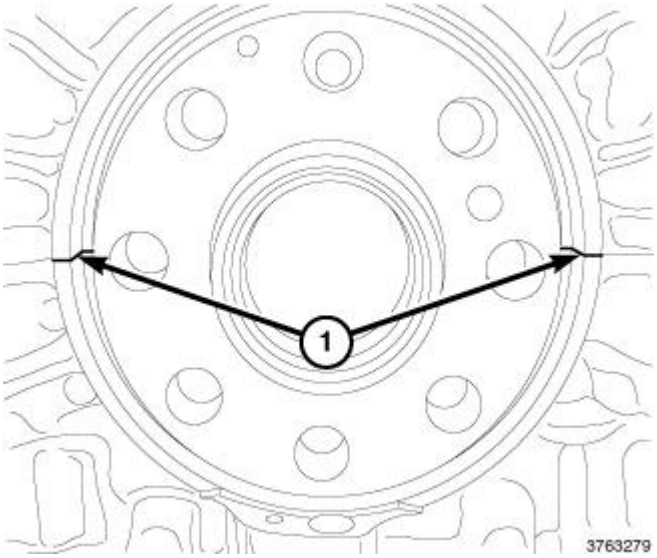


Fig. 199: RTV Sealant Excess Locations
Courtesy of CHRYSLER GROUP, LLC

20. Remove any excess Mopar® Threebond Engine RTV Sealant (1) that may have squeezed out in the front of engine.



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Fig. 200: Rear Oil Seal Excess RTV Sealant Locations
Courtesy of CHRYSLER GROUP, LLC

21. Remove any excess Mopar® Threebond Engine RTV Sealant (1) that may have squeezed out in rear oil seal bay.
22. Check the crankshaft end play. Refer to **Engine/Engine Block/CRANKSHAFT - Standard Procedure**.

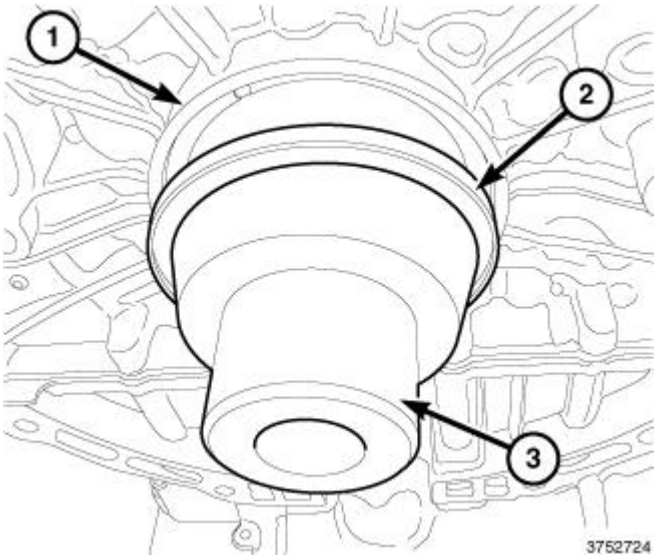


Fig. 201: Rear Seal Guide, Rear Oil Seal & Crankshaft
Courtesy of CHRYSLER GROUP, LLC

23. Install the (special tool #VM.10341-1, Guide, Rear Seal) (3) and slide the rear oil seal (2) onto the crankshaft.
24. Remove the (special tool #VM.10341-1, Guide, Rear Seal) (3).

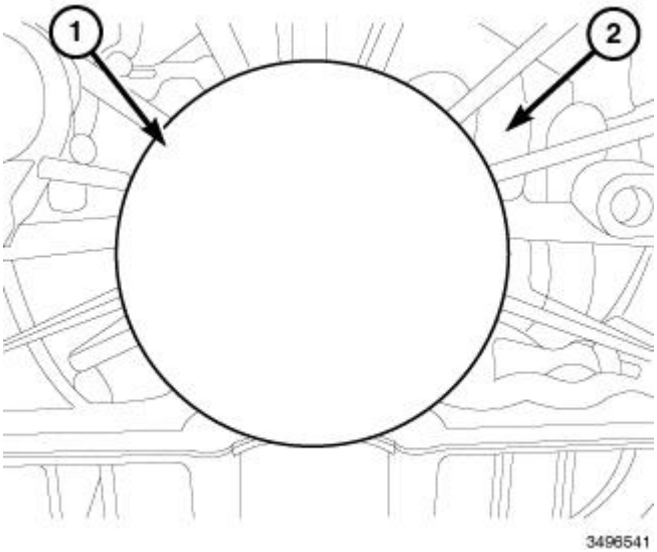


Fig. 202: Rear Seal Installer & Crankshaft Position Sensor (CKP) Boss
Courtesy of CHRYSLER GROUP, LLC

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NOTE: Position the flat portion of the Rear Seal Installer should be facing down giving you clearance by the Crankshaft Position Sensor (CKP) boss.

25. Using the (special tool #VM.10341-2, Installer Tool, Rear Seal) (1) install the rear main oil seal into the engine block.

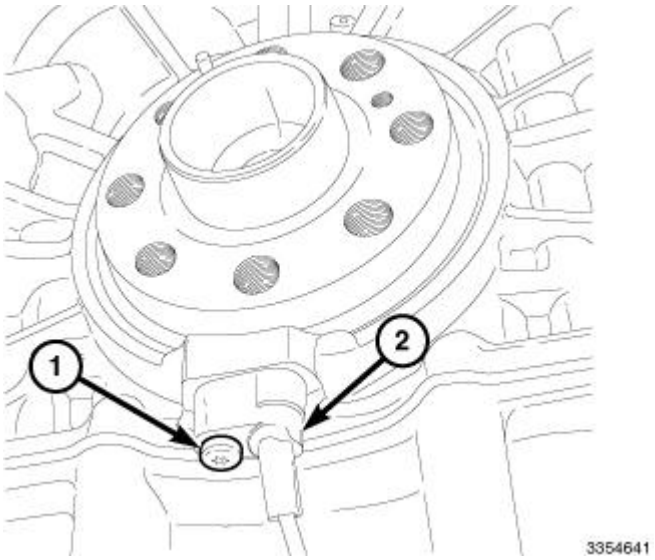


Fig. 203: Crankshaft Position Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

26. Install the Crankshaft Position Sensor (CKP) (2). Tighten bolt (1) to 6 N.m (53 in. lbs.).

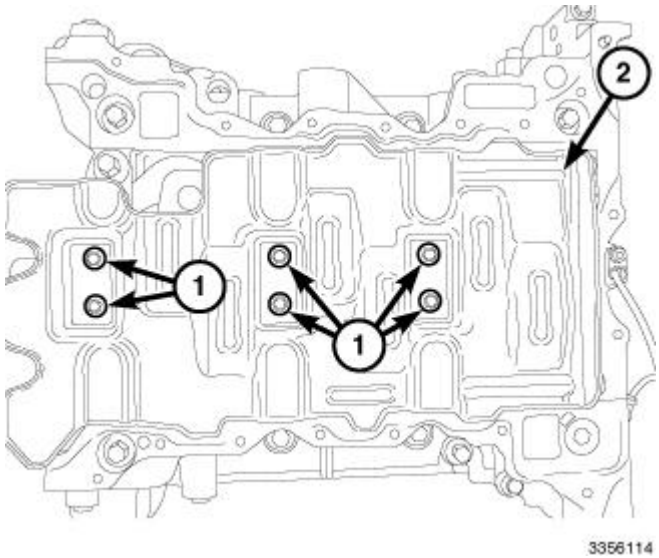


Fig. 204: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

27. Install the windage tray (2). Tighten bolts (1) to 11 N.m (97 in. lbs.).
28. Install the oil pump. Refer to **PUMP, ENGINE OIL, INSTALLATION**.

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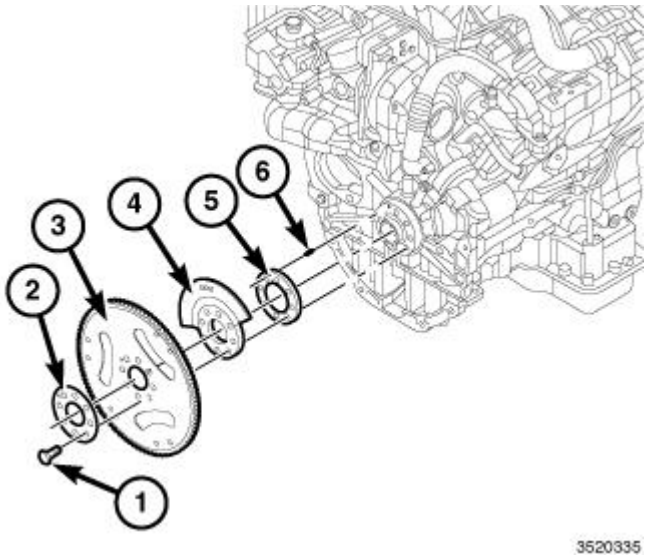


Fig. 205: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

29. Install the tone wheel (5), counter weight (4), and the flex plate (3). Refer to **FLEXPLATE, INSTALLATION**.
30. Install both cylinder heads. Refer to **CYLINDER HEAD, INSTALLATION**.
31. Install the engine into vehicle. Refer to **INSTALLATION**.

DAMPER, VIBRATION

REMOVAL

REMOVAL

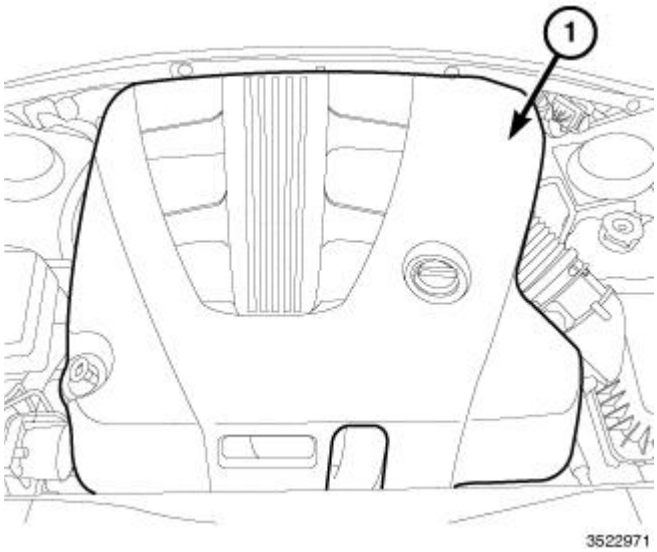


Fig. 206: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

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1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

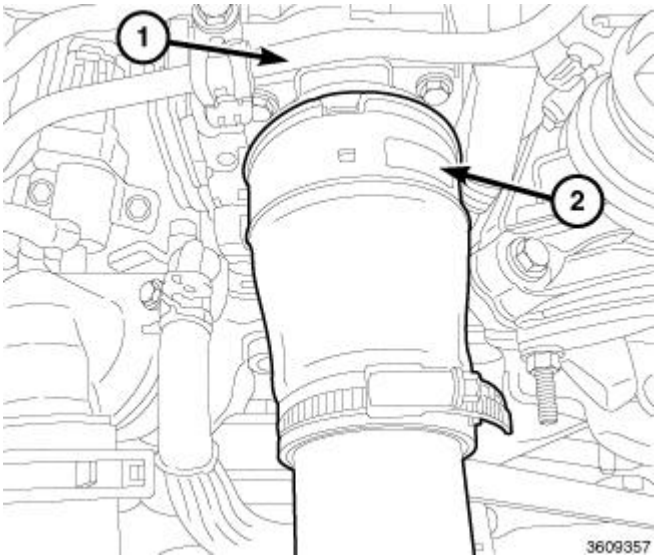


Fig. 207: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the Charge Air Cooler (CAC) hose (2) from the EGR air flow control valve and position aside.
4. Remove bolt and position aside the CAC hose assembly.

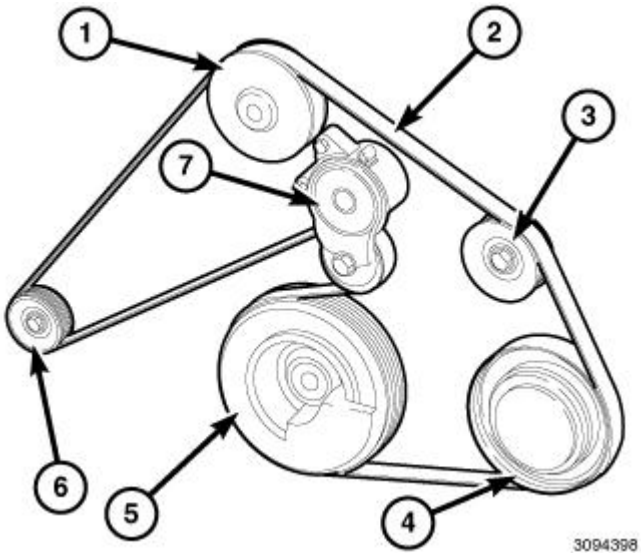


Fig. 208: Pulleys, Tensioner & Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

5. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
6. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

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7. Lock the engine 30 degrees ATDC. Refer to **Engine/Valve Timing - Standard Procedure**.

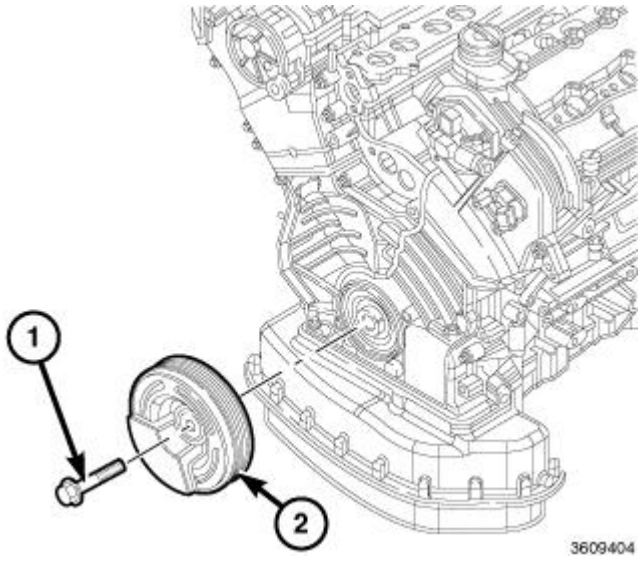


Fig. 209: Vibration Damper & Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Lower the vehicle.

NOTE: The crankshaft damper bolt is a left hand thread.

9. Remove bolt (1) and the vibration damper (2).

INSTALLATION

INSTALLATION

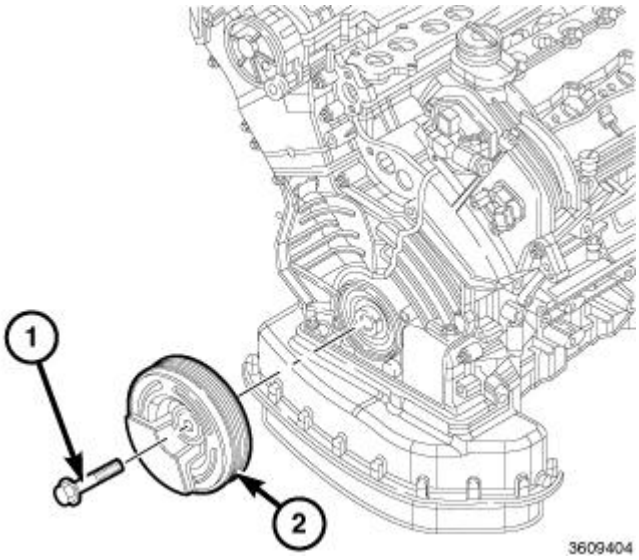


Fig. 210: Vibration Damper & Bolt

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Courtesy of CHRYSLER GROUP, LLC

NOTE: The crankshaft damper bolt is a left hand thread.

1. Install the vibration damper (2). Tighten bolt (1) to 100 N.m (74 ft. lbs.) plus an additional 125 degrees turn.

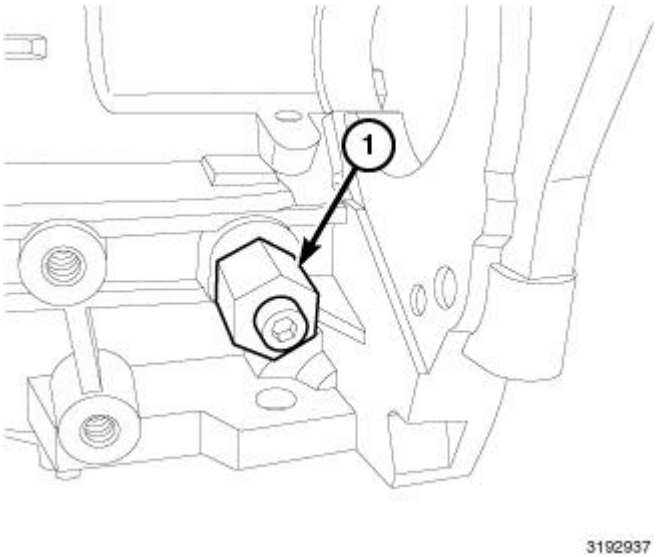


Fig. 211: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Remove the (special tool #VM.10339, Tool, Crankshaft Timing) (1).

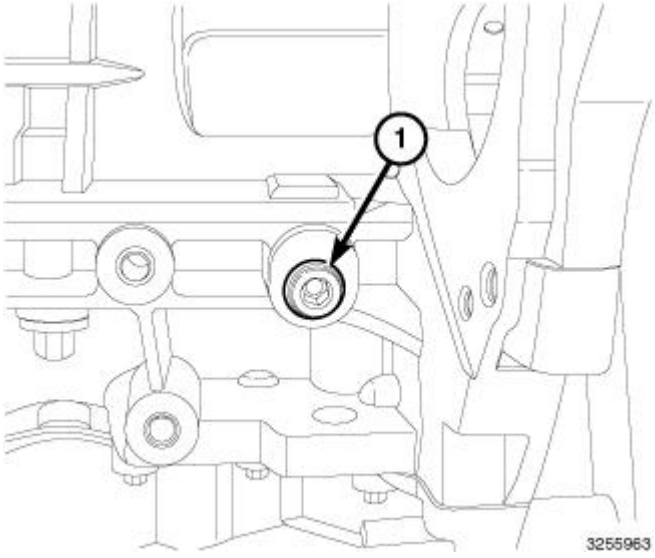


Fig. 212: Engine Block Plug
Courtesy of CHRYSLER GROUP, LLC

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4. Install engine block plug (1). Tighten 30 N.m (22 ft. lbs.).
5. Lower the vehicle.

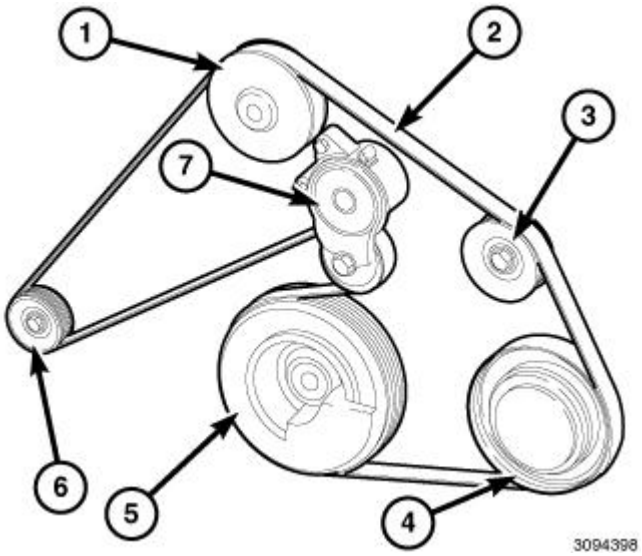


Fig. 213: Pulleys, Tensioner & Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

6. Installed the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

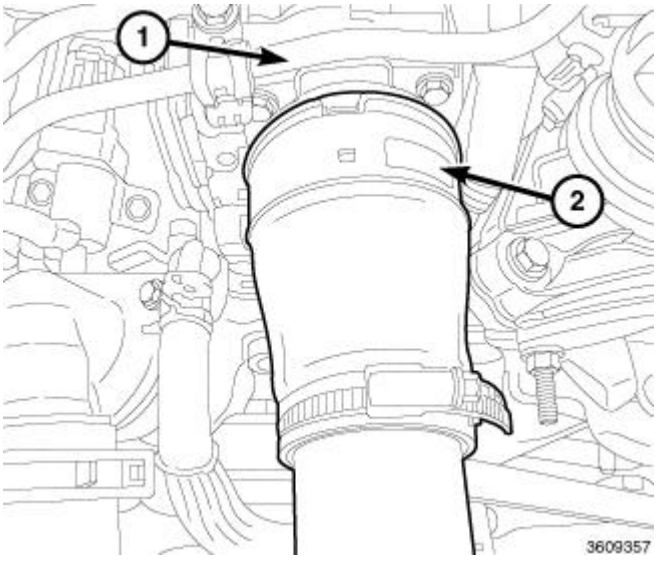


Fig. 214: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

7. Position the Charge Air Cooler (CAC) hose assembly and tighten bolts (1) to 11 N.m (97 in. lbs.).
8. Connect the CAC hose (2) to the EGR air flow control valve.

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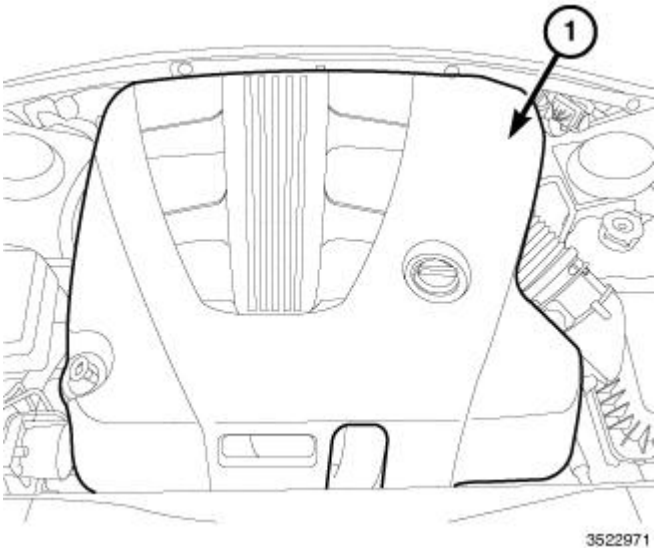


Fig. 215: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

9. Install the engine cover (1).
10. Connect the negative battery cable.

FLEXPLATE

DESCRIPTION

DESCRIPTION

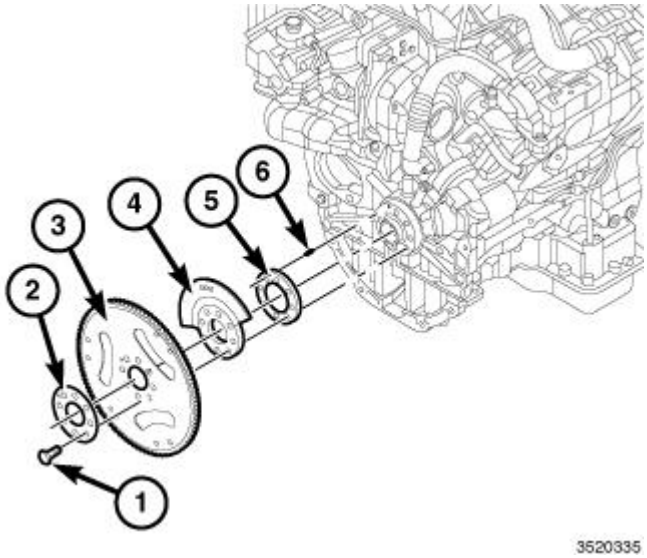


Fig. 216: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

The flex plate is fastened to the crankshaft and can only be installed one way. The crankshaft has a dowel

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locating pin that is used to align the magnetic tone wheel and the counter weight. The stamped-steel flex plate has a segment ring to provide engine speed and crankshaft position information to the Power Control Module (PCM). The crankshaft position sensor is mounted next to the segment ring and sends electrical pulses to the PCM.

REMOVAL

REMOVAL

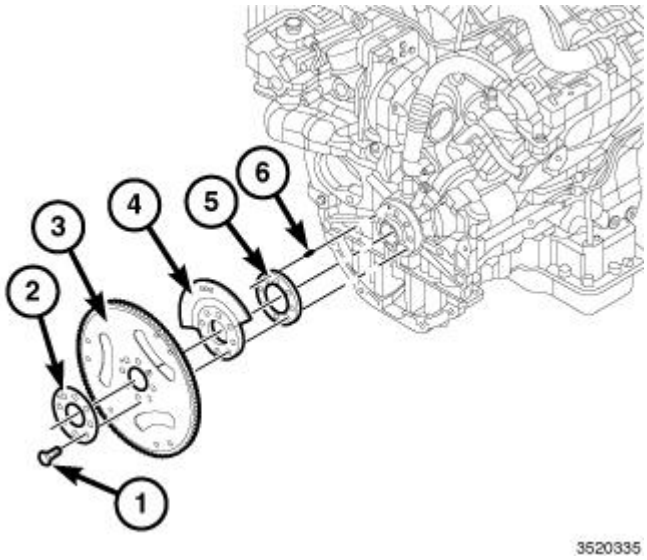


Fig. 217: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Remove the transmission. Refer to **REMOVAL** .
2. Paint mark the flex plate hub to flex plate relation.
3. Remove bolts (1) and flex plate (3).
4. If necessary, remove the counter weight (4) and tone wheel (5).
5. Inspect flex plate for damage.

INSTALLATION

INSTALLATION

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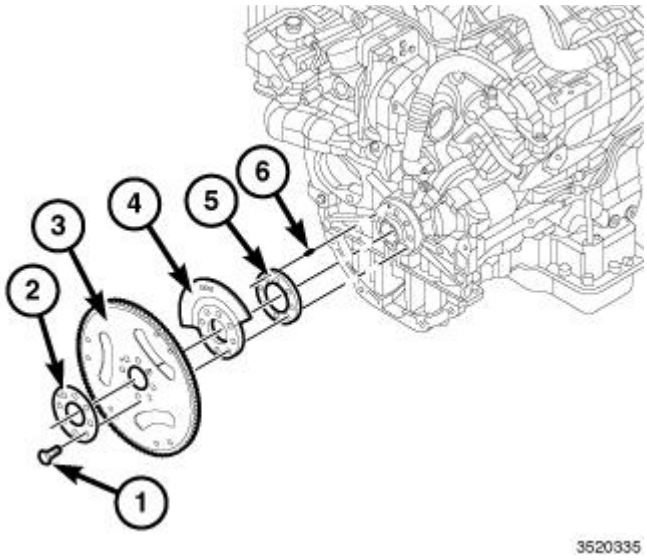


Fig. 218: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do Not lubricate new bolts as they are already coated with an anti-scuff treatment. Align the flex plate to hub paint marks, where applicable.

NOTE: Always use new flex plate bolts when ever the existing bolts have been removed

1. If removed, install the tone wheel (5) and counter weight (4).
2. Install the flex plate (3).

NOTE: With clean engine oil, lubricate the bolt side of backing plate (2).

3. Lubricate and install the backing plate (2) and tighten bolts (1) finger tight.

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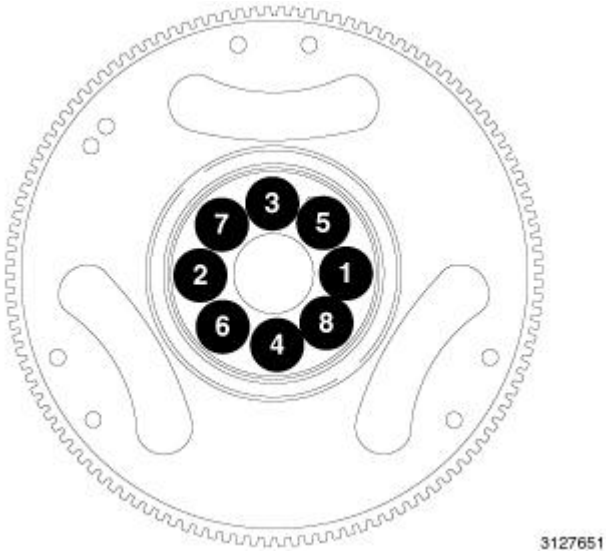


Fig. 219: Flex Plate Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the tightening sequence shown in illustration, Tighten bolts to:
   - Tighten bolts 50 N.m (37 ft. lbs.).
   - Loosen one bolt at a time and retighten bolt in a clockwise cross pattern to 125 N.m (92 ft. lbs.).
   - Using a torque angle gauge, tighten each bolt an additional 30 degrees in a clockwise cross pattern.
5. Install the transmission. Refer to **INSTALLATION** .

PUMP, VACUUM

DESCRIPTION

DESCRIPTION

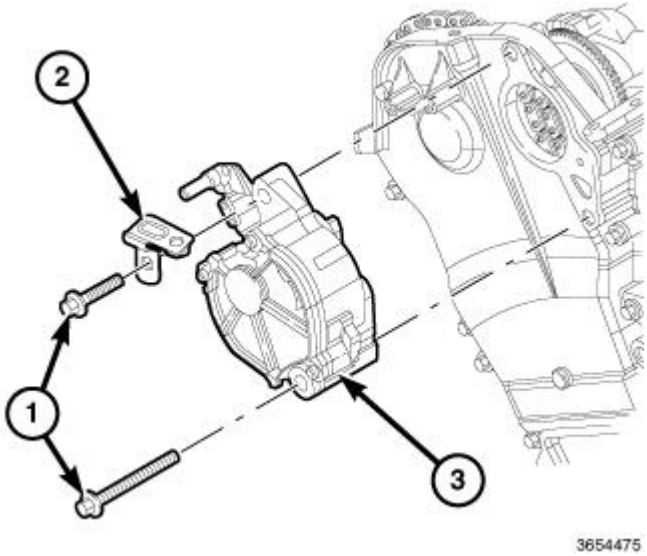


Fig. 220: Vacuum Pump & Bolts

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Courtesy of CHRYSLER GROUP, LLC

The vacuum pump is a constant displacement, vane-type pump. Vacuum is generated by vanes mounted in the pump rotor. The rotor is located in the pump housing and is pressed onto the pump shaft.

The vacuum pump operates by a slotted extension attached to the vacuum pump shaft. The vacuum pump shaft slotted extension fits into, and is driven by, the intake camshaft gear.

The vacuum pump rotating components are internally lubricated and the vacuum pump has no serviceable parts. Do not disassemble or attempt to repair the pump.

OPERATION

OPERATION

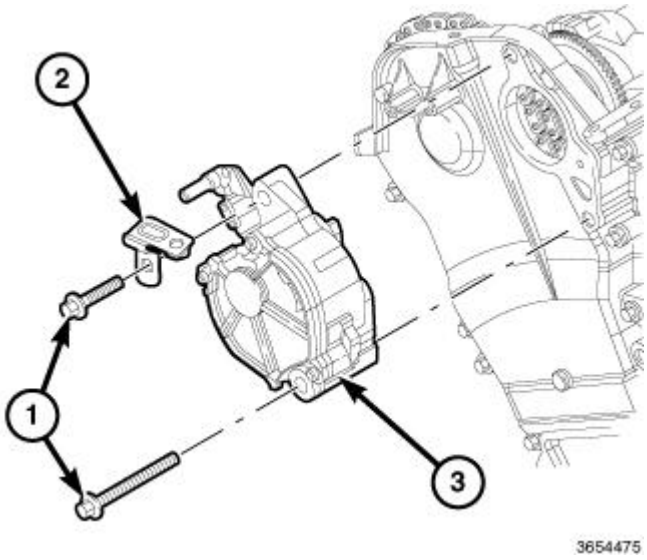


Fig. 221: Vacuum Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

Vacuum pump output is transmitted to the EGR vacuum bypass solenoid and brake vacuum booster, systems through a supply hose. The hose is connected to an outlet port on the pump housing and uses an in-line check valve to retain system vacuum when vehicle is not running.

Pump output ranges from a minimum of 8.5 to 25 inches vacuum.

The pump rotor and vanes are rotated by the slotted pump drive gear which fits into the camshaft drive gear.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING

1. Connect a vacuum gauge to the booster check valve with a short length of hose and T-fitting.
2. Start the engine allowing the engine to run for 30 seconds. Vacuum should be 18 inches HG (609

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millibars). Verify the vacuum line is not leaking. If no leak is present replace vacuum pump. Refer to **PUMP, VACUUM, REMOVAL** and **PUMP, VACUUM, INSTALLATION**.

REMOVAL

REMOVAL

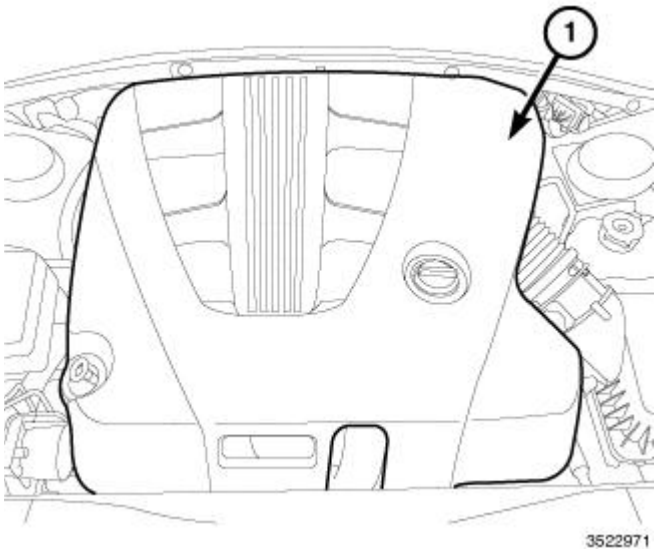


Fig. 222: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Remove the engine cover (1).

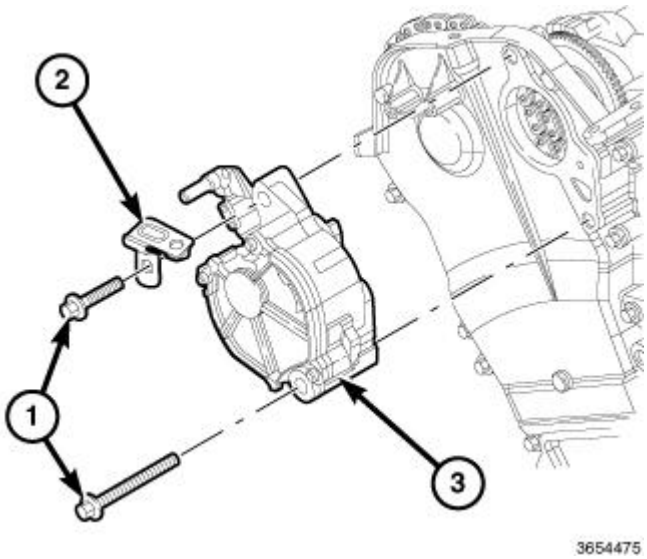


Fig. 223: Vacuum Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

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3. Remove the vacuum line from vacuum pump.

NOTE: Observe position of driver on rear of pump upon removal.

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

INSTALLATION

INSTALLATION

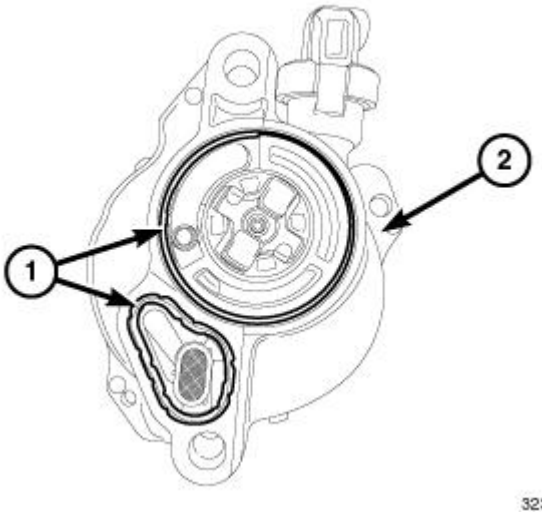
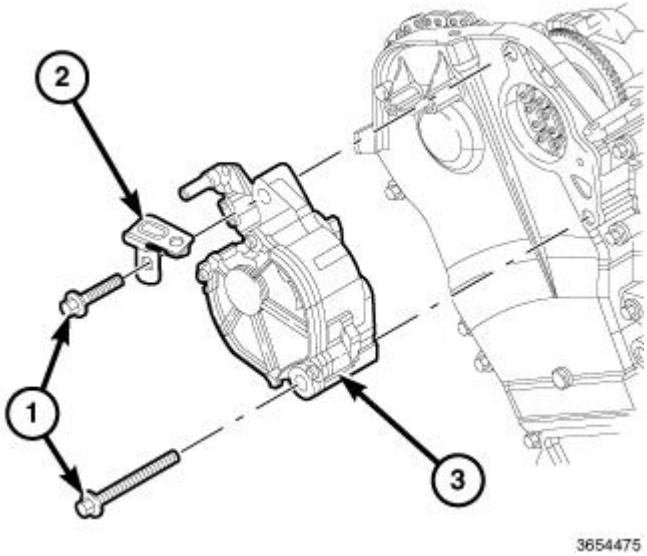


Fig. 224: Vacuum Pump & O-Ring Seals
Courtesy of CHRYSLER GROUP, LLC

1. Clean all sealing surfaces.
2. Install new O-ring seals (1) onto the vacuum pump (2).



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Fig. 225: Vacuum Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Position the slotted drive gear on rear of pump with the slot on the camshaft drive gear.
4. Install vacuum pump (2). Tighten bolts (1) to 30 N.m (22 ft. lbs.).
5. Install vacuum line onto the vacuum pump.

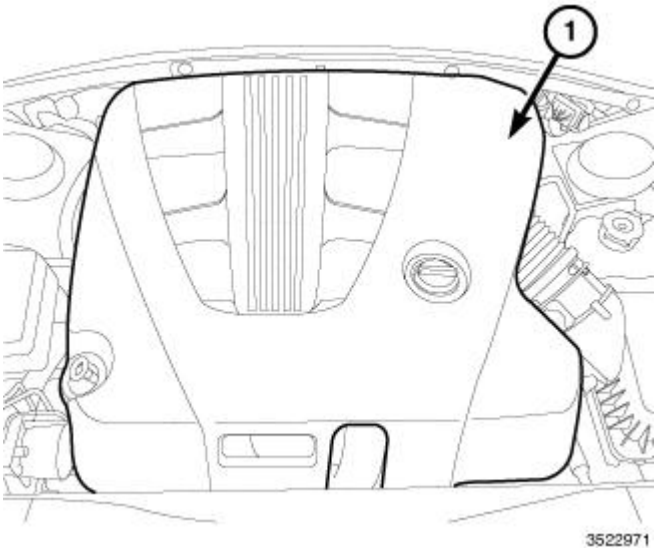


Fig. 226: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

6. Connect the negative battery cable.
7. Start the engine and inspect for leaks.
8. Install the engine cover (1).

ROD, PISTON AND CONNECTING

DESCRIPTION

DESCRIPTION

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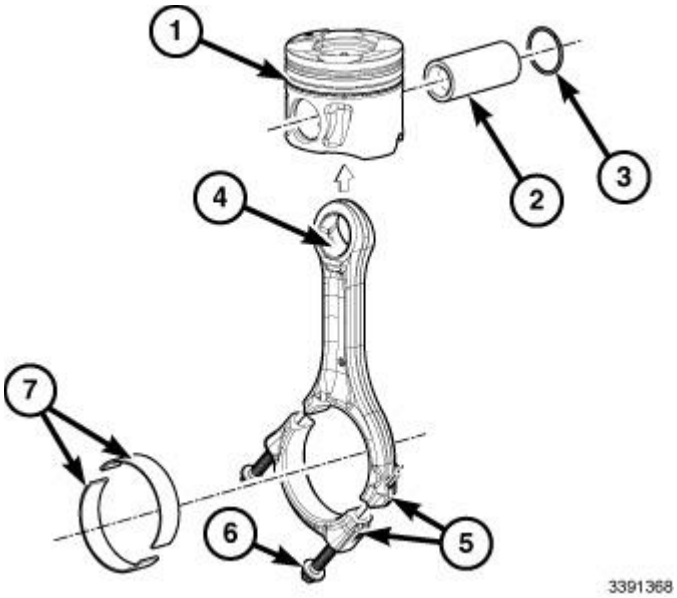


Fig. 227: Piston & Connecting Rod Components
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If the connecting rod bolts are ever loosened, replace all of the connecting rods.

The pistons (1) are made of a high strength Aluminum Alloy B2+Phosphate and Graphite Coating. Conventional Cooling Gallery. Insert Ring + Parallel Type Groove. The piston crown consists of a combustion bowl and four recesses machined for the valves. Circlips (3) secure a full floating piston pin (2). The pistons have a phosphate surface treatment and the piston skirts have a graphite treatment for scuff resistance. The piston skirts have notches to provide the necessary clearance for the oil jets when the pistons are at BDC. The connecting rod (5) that are forged steel I-shaped with a diagonal slit and a tapered faced small end. The connecting rod (5) is a fracture split type rod.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the engine from the vehicle and mount on suitable engine stand. Refer to **REMOVAL**.
3. Remove both cylinder heads. Refer to **CYLINDER HEAD, REMOVAL**.

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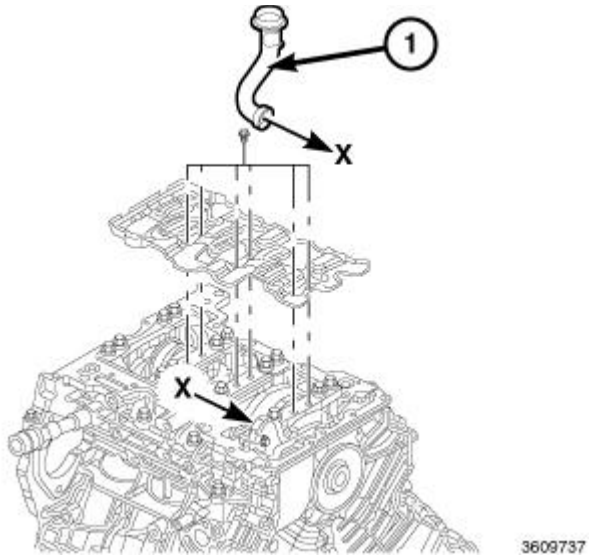


Fig. 228: Oil Pump Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

4. Remove the oil pump and pickup tube (1). Refer to **PUMP, ENGINE OIL, REMOVAL**.

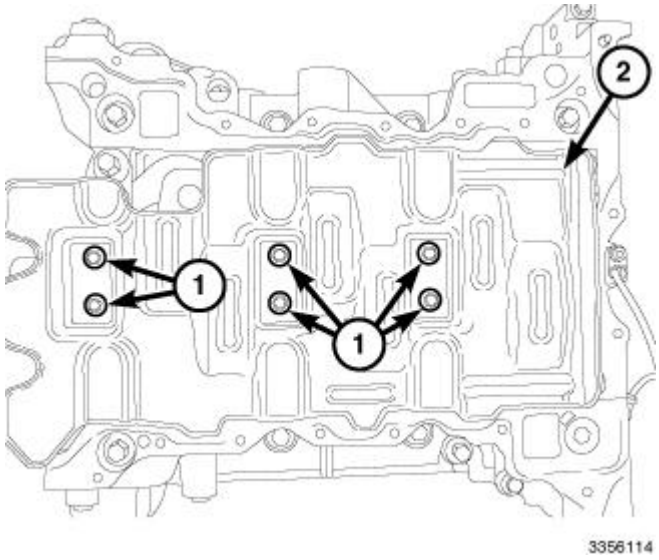


Fig. 229: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolts (1) and the windage tray (2).

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

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage. Care must be taken not to

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damage the crankshaft tone ring when removing cylinder number four oil jet.

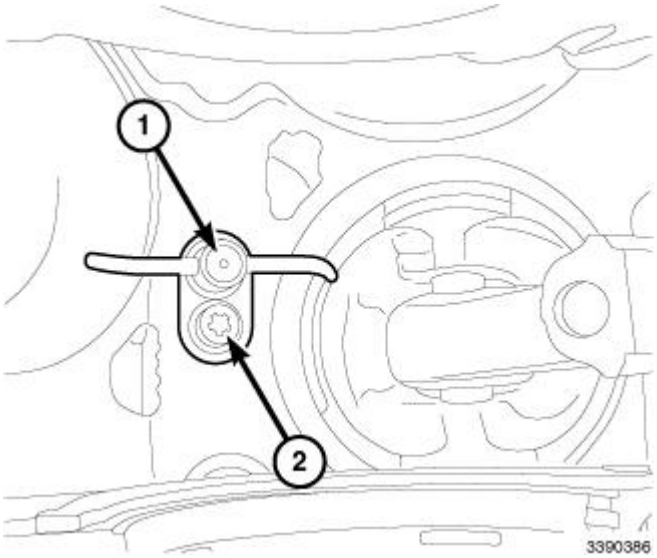


Fig. 230: Oil Jet & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Remove the appropriate oil jet retaining bolt (2) and remove oil jet (1) from the engine block.

NOTE: The piston and connecting rod assembly must be removed through the top of cylinder block.

7. Remove the ridge from the top of the cylinder bores with a ridge reamer before removing pistons from cylinder block. **Be sure to keep the top of pistons covered during this operation.**
8. Rotate the crankshaft so the connecting rod is centered in the cylinder bore.
9. Remove the connecting rod cap bolts and remove the fracture-split rod cap.

NOTE: Use care not to nick or scratch the crankshaft journal or cylinder bore during removal.

10. Carefully remove the piston and connecting rod assembly out through the top of the cylinder block.
11. Mark the pistons with the matching cylinder number after removal.
12. Repeat this procedure for the remaining pistons and connecting rod assemblies.

PISTON PIN

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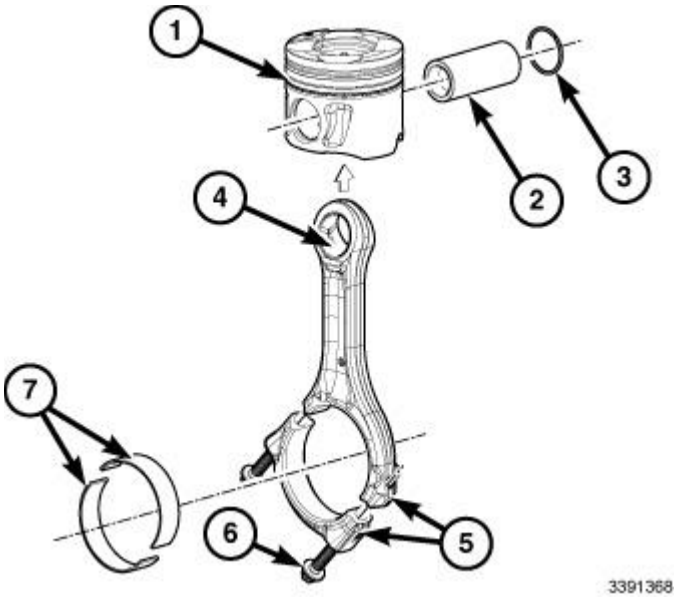


Fig. 231: Piston & Connecting Rod Components
Courtesy of CHRYSLER GROUP, LLC

1. Secure the connecting rod (5) in a soft jawed vice.
2. Remove the two snap rings (3) securing the piston pin (2).
3. Push the piston pin (2) out of the piston (1) and the connecting rod (5).
4. Remove the piston (1) from the connecting rod (5).
5. Measure the diameter of the piston pin in the center and on both ends. Refer to **Engine - Specifications**.
6. Repeat this procedure for the remaining pistons and connecting rod assemblies.

PISTON RING

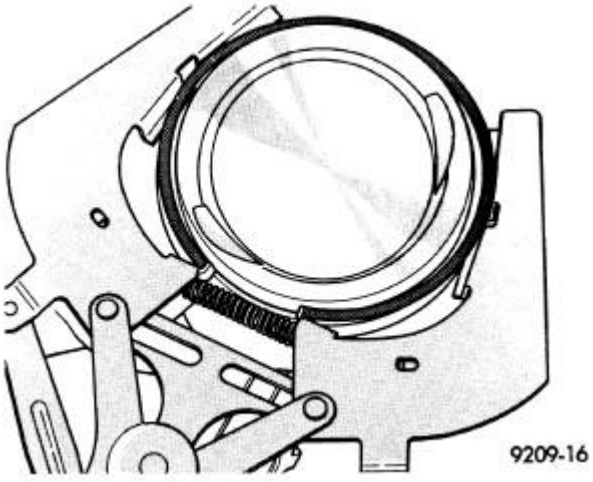


Fig. 232: Piston Rings - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1. The ID mark on the face of the top and second piston rings must point toward the piston crown.

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2. Using a suitable ring expander, remove the top and second piston rings.
3. Remove the upper oil ring side rail, lower oil ring side rail and then the oil expander from the piston.
4. Carefully clean carbon from the piston crowns, skirts and ring grooves ensuring the 4 oil holes in the oil control ring groove are clear.
5. Repeat this procedure for the remaining pistons and connecting rod assemblies.

INSPECTION

INSPECTION

PISTONS

1. Check the piston pin bores in piston for roundness. Make 3 checks at 120° intervals. Maximum out of roundness.020 mm (.0008 in.).
2. The piston diameter should be measured approximately 10 mm (.394 in.) up from the base.
3. Skirt wear should not exceed 0.1 mm (.00039 in.).

PISTON PINS

1. Measure the diameter of piston pin in the center and both ends. Refer to **Engine - Specifications**.

CONNECTING RODS

CAUTION: Connecting rods must be replaced once the end caps are loosened. All six must have the same weight and the same number. Replacement connecting rods will only be supplied in sets of six. When assembling the connecting rod, be sure to paint mark or scribe mark each of the connecting rods and caps before installation, for alignment purposes later.

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

Connecting rods are supplied in sets of six since they all must be of the same weight category.

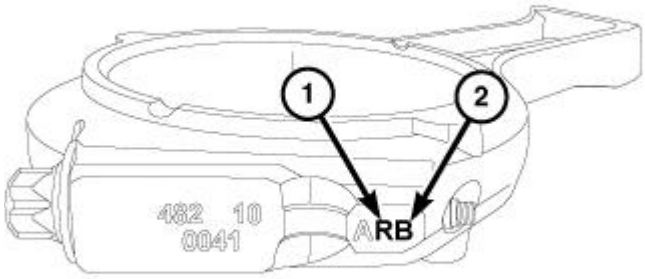
1. Assemble bearing shells and bearing caps to their respective connecting rods ensuring that the serrations on the cap and reference marks are aligned.
2. Using new bolts, tighten the connecting rod cap bolts to:
   - Step 1: Tighten to 10 N.m (88 in. lbs.).
   - Step 2: Tighten each bolt to 25 N.m (18 ft. lbs.).
   - Step 3: Tighten each bolt an additional 75 degrees turn.
   - Step 4: With the torque wrench set at 50 N.m (37 ft. lbs.) to check the tightening of each bolt.

INSTALLATION

INSTALLATION

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WARNING: All six connecting rods must have the same weight and letter classification. The connecting rod bolts are a one time use, and must be replaced every time they are loosened or removed.

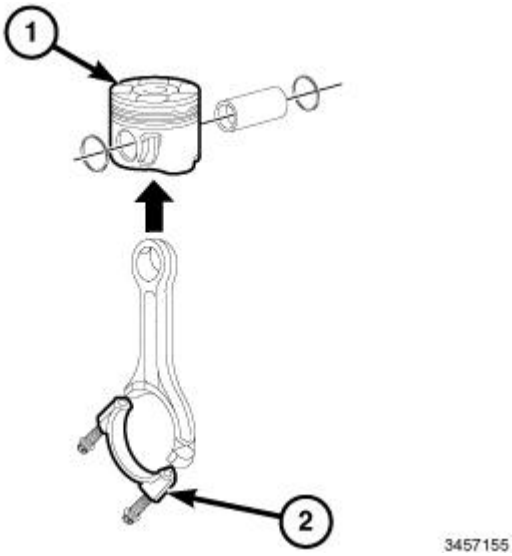


3346447

Fig. 233: Connecting Rod Shaft & Class Identification Mark
Courtesy of CHRYSLER GROUP, LLC

Each connecting rod has its own letter weight class identification mark (1) on connecting rod. Only use connecting rods that are of the same weight class. (R = Rosso, V = Verde)

PISTON PIN



3457155

Fig. 234: Piston Crown & Connecting Rod Cap
Courtesy of CHRYSLER GROUP, LLC

NOTE: During piston assembly with the connecting rod, pay attention concerning the

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arrow position on the piston crown (1) and the stamping on the connecting rod cap (2): the arrow and the stamping must oppose one another and cannot be on the same side.

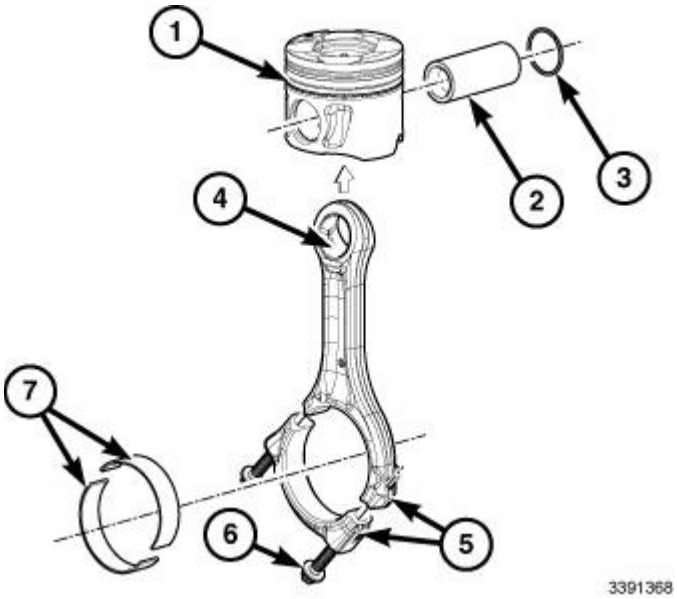
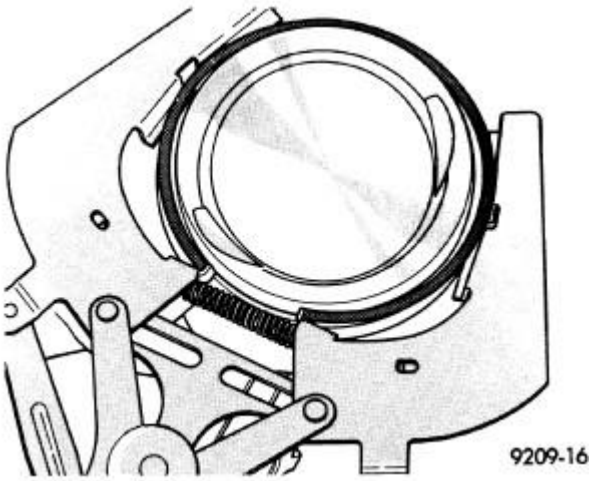


Fig. 235: Piston & Connecting Rod Components
Courtesy of CHRYSLER GROUP, LLC

1. Secure connecting rod (5) in soft jawed vice.
2. Lubricate piston pin (2) and piston (1) with clean engine oil.
3. Position piston (1) on connecting rod (5).
4. Install piston pin (2).
5. Install snap ring (3) in piston (1) to retain piston pin (2).
6. Remove connecting rod (5) from vice.

PISTON RINGS



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Fig. 236: Piston Rings - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

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

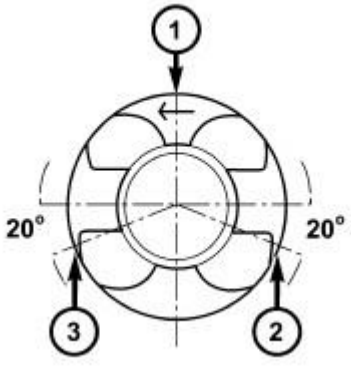


Fig. 237: Piston Ring Gap Location
Courtesy of CHRYSLER GROUP, LLC

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

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

PISTON

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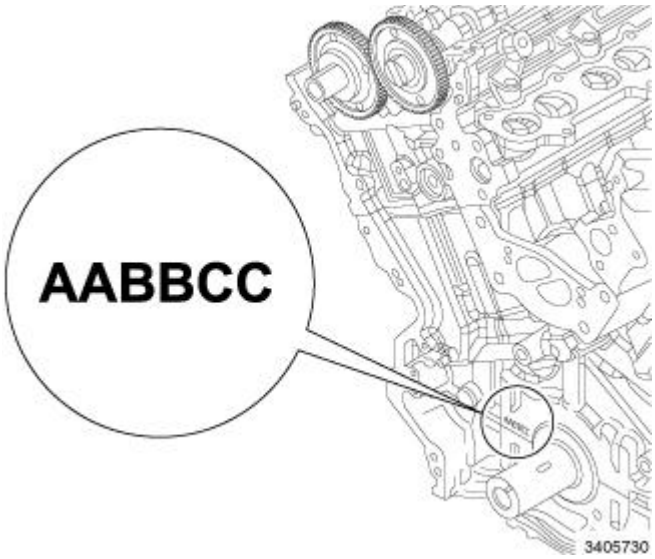


Fig. 238: Cylinder Identification Location
Courtesy of CHRYSLER GROUP, LLC

1. Identify the correct piston to cylinder location on left front of engine block.

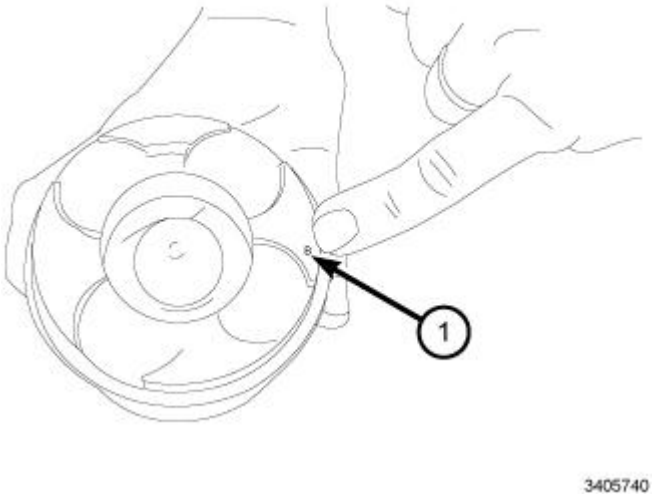


Fig. 239: Piston Lettering Identification
Courtesy of CHRYSLER GROUP, LLC

2. Identify the piston by the lettering shown in illustration on piston crown.
3. Using the reference table below select the correct piston to location.

NOTE: The first letter correspond to the first cylinder, the second letter to the second one etc.

Piston Letter On Crown	A	A	B	B	C	C

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Cylinder Piston Location	1	2	3	4	5	6

4. Before installing the Piston Installer, make sure the oil ring expander ends are butted together.
5. Immerse the piston head and rings in clean engine oil, slide the piston installer over the piston and tighten. **Ensure position of rings does not change during this operation** .

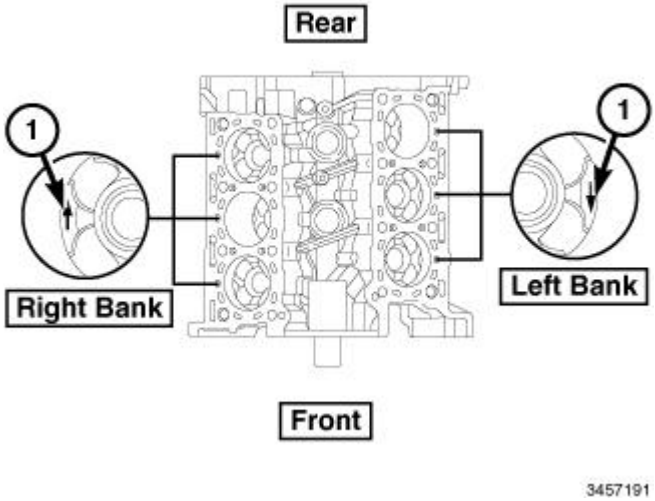


Fig. 240: Arrow Stamped On Piston Crown
Courtesy of CHRYSLER GROUP, LLC

6. When installing the pistons and connecting rod assembly, making sure that the arrow stamped on the piston crown (1) is turned toward the back side of the engine (flywheel side) for the right bank pistons 1 2 3 and toward the front side of the engine (timing chain side) for the left bank pistons 4 5 6.

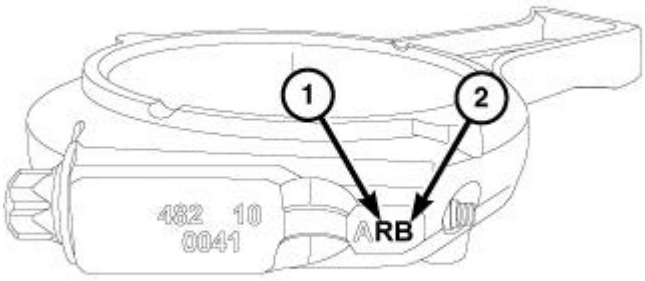


Fig. 241: Connecting Rod Shaft & Class Identification Mark
Courtesy of CHRYSLER GROUP, LLC

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7. Each connecting rod has its own letter class identification mark (2) on connecting rod for bearing selection.

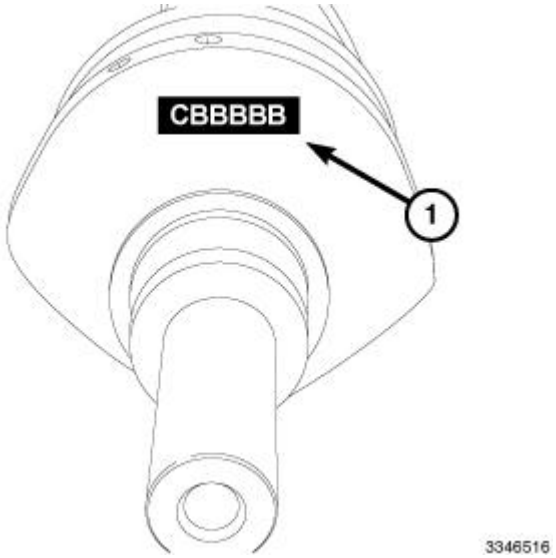


Fig. 242: Letters Stamped Into Crankshaft
Courtesy of CHRYSLER GROUP, LLC

8. To determine the correct bearing size for each cylinder. Each connecting rod letter class must be matched with the crankshaft letter class (1) with the bearing selection chart to determine the correct bearing color for each cylinder. The letters stamped into the crankshaft (1) are in the same order as the cylinders. The first letter corresponds to the first cylinder, the second to the second, etc. See bearing selection chart. Refer to **Engine/Engine Block - Standard Procedure**.

CAUTION: Care must be taken not to nick the crankshaft journal or cylinder bore when installing the pistons.

9. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal.
10. Guide the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

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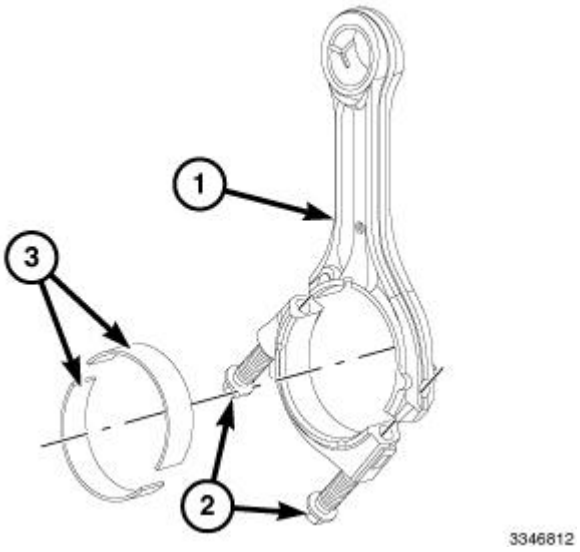
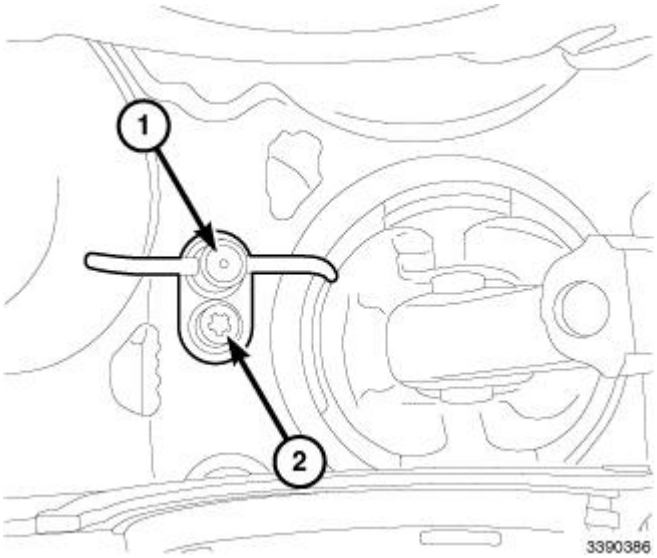


Fig. 243: Connecting Rod, Bearings & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Assemble connecting rod bearings (3) and bearing caps to their respective connecting rods (2) ensuring that the serrations on the cap and reference marks are aligned.

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

12. Using new bolts, tighten the connecting rod cap bolts to:
    - Step 1: Tighten to 10 N.m (88 in. lbs.).
    - Step 2: Tighten each bolt to 25 N.m (18 ft. lbs.).
    - Step 3: Tighten each bolt an additional 75 degrees turn.
    - Step 4: With the torque wrench set at 50 N.m (37 ft. lbs.) to check the tightening of each bolt.



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Fig. 244: Oil Jet & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

13. Install the oil jets. Refer to **JET, PISTON OIL COOLER, INSTALLATION**.

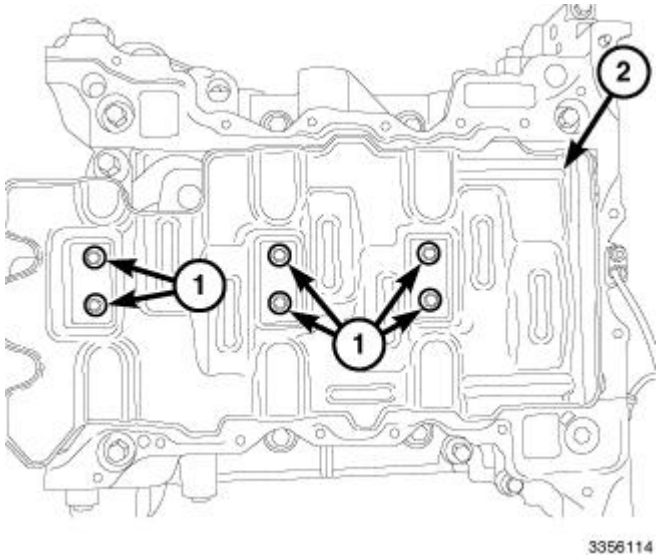


Fig. 245: Windage Tray & Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Install the windage tray (2). Tighten bolts (1) to 11 N.m (97 in. lbs.).

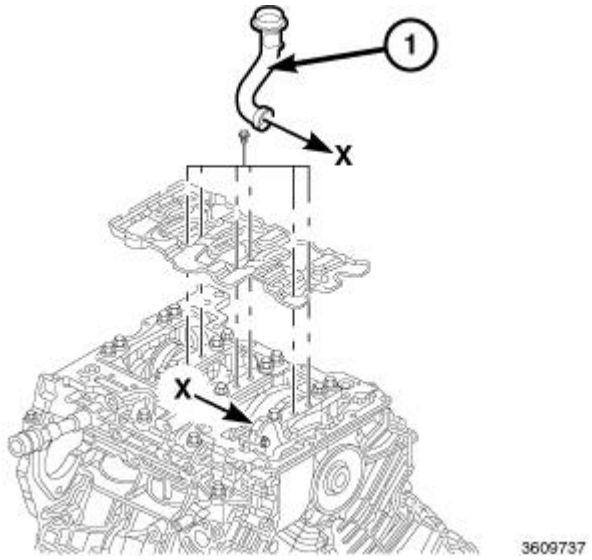


Fig. 246: Oil Pump Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

15. Install the oil pump pickup tube (1). Refer to **PICK-UP, OIL PUMP, INSTALLATION**.
16. Install both cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.
17. Connect negative battery cable.

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SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

REMOVAL

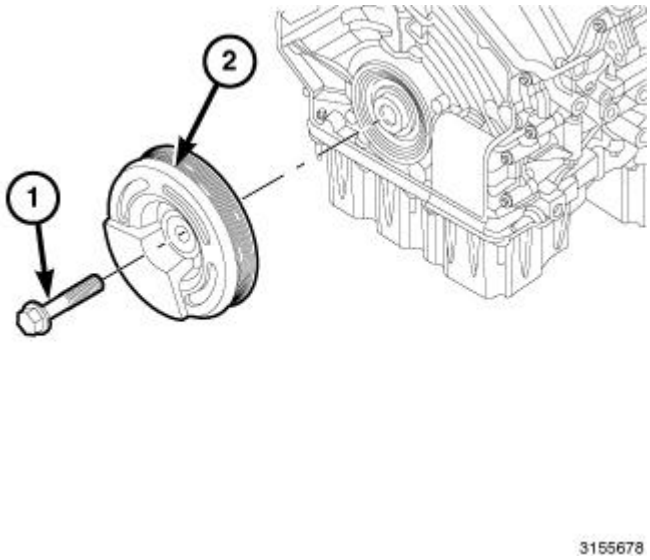


Fig. 247: Vibration Damper & Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Remove the vibration damper. Refer to **DAMPER, VIBRATION, REMOVAL**.

CAUTION: Care must be taken when removing the crankshaft seal. DO NOT damage or gouge the timing chain cover.

3. Using suitable seal puller, remove the front crankshaft seal.

INSTALLATION

INSTALLATION

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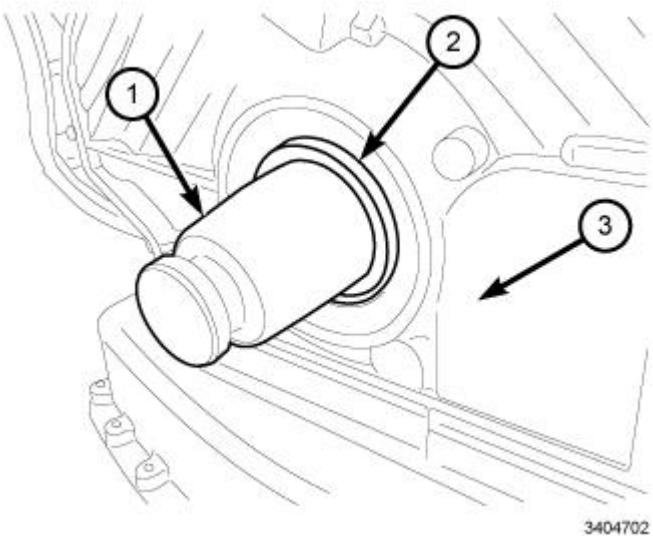


Fig. 248: Front Seal Guide & Oil Seal
Courtesy of CHRYSLER GROUP, LLC

1. Clean timing chain cover seal surface.

NOTE: The lip of the front oil seal faces away from the engine on installation.

2. Install the (special tool #VM.10340-1, Guide, Front Seal) (1) and position the front seal (2) in place.
3. Remove the (special tool #VM.10340-1, Guide, Front Seal) (1).

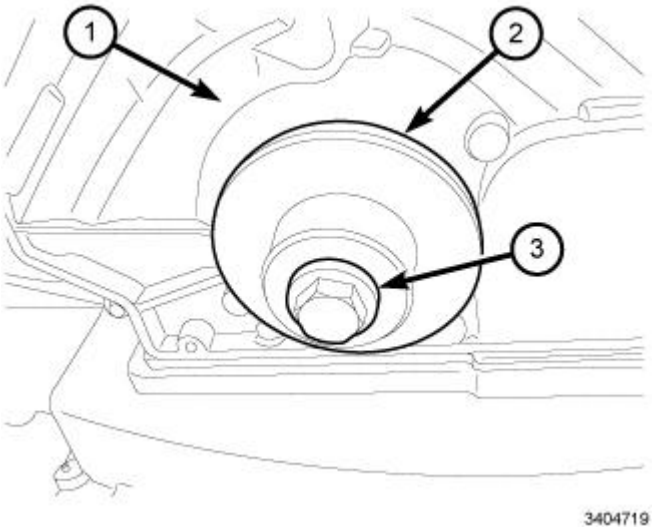


Fig. 249: Front Seal Installer Tool & Vibration Damper Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Using the (special tool #VM.10340-2, Installer Tool, Front Seal) (2), install the front crankshaft oil seal using the vibration damper bolt to draw the seal in place.
5. Remove bolt (3) and the (special tool #VM.10340-2, Installer Tool, Front Seal) (2).

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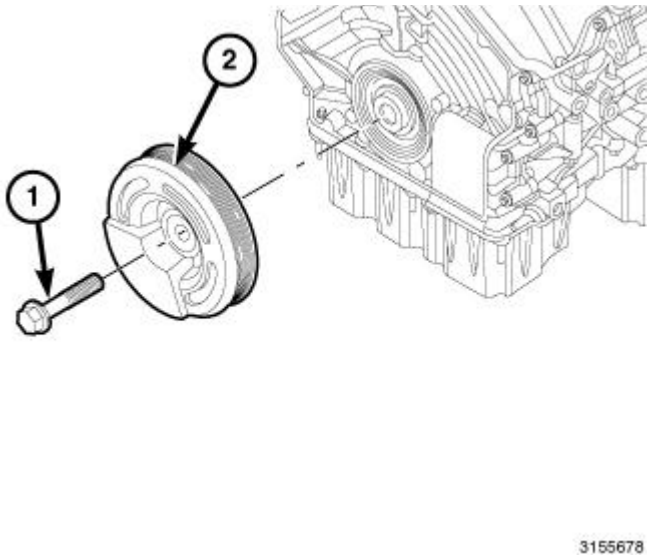


Fig. 250: Vibration Damper & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Install the vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION**.
7. Connect negative battery cable.

SEAL, CRANKSHAFT OIL, REAR

REMOVAL

REMOVAL

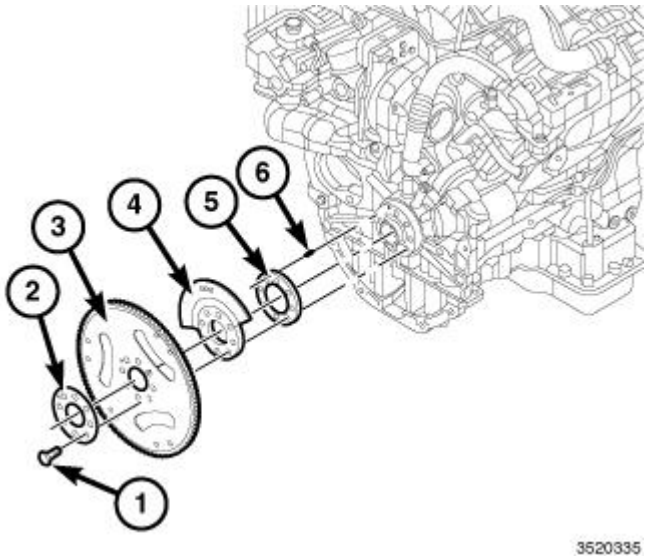


Fig. 251: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Remove the flex plate (3), counter weight (4), and tone wheel (5). Refer to **FLEXPLATE, REMOVAL**.

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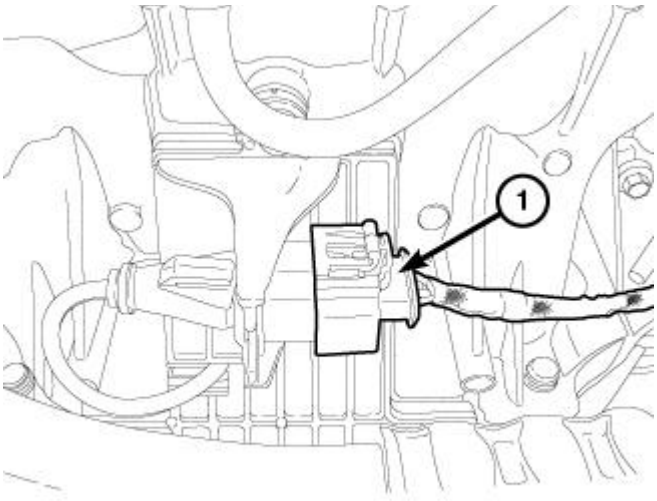


Fig. 252: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the Crankshaft Position Sensor (CKP) wire harness connector (1).

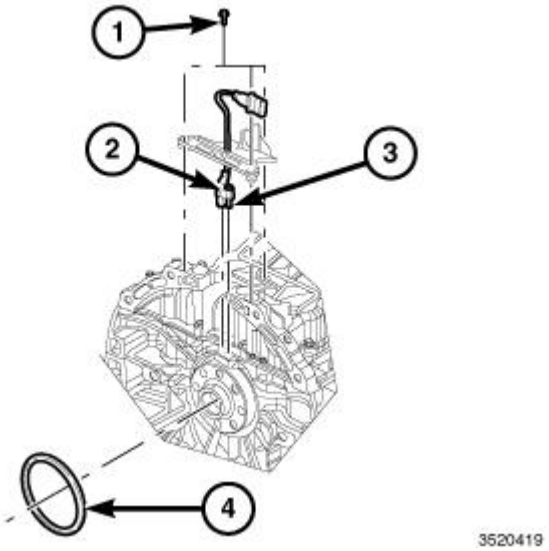


Fig. 253: CKP Sensor, Seal & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the CKP cover.
4. Remove bolt (3) CKP sensor (2).

NOTE: Use care not to damage the rear main oil seal sealing surface.

5. Using suitable seal puller, remove the rear main oil seal (4).

INSTALLATION

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INSTALLATION

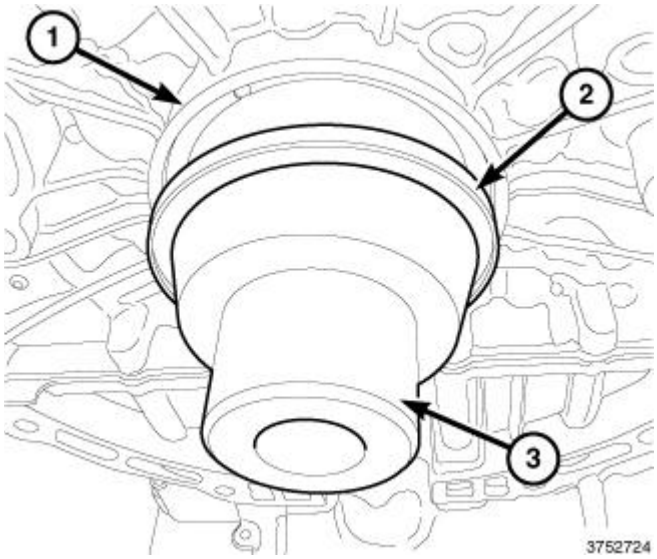


Fig. 254: Rear Seal Guide, Rear Oil Seal & Crankshaft
Courtesy of CHRYSLER GROUP, LLC

1. Clean around seal surface area.

NOTE: The lip of the front oil seal faces away from the engine on installation.

2. Install the (special tool #VM.10341-1, Guide, Rear Seal) (3) and slide the rear oil seal (2) onto the crankshaft.
3. Remove the (special tool #VM.10341-1, Guide, Rear Seal) (3).

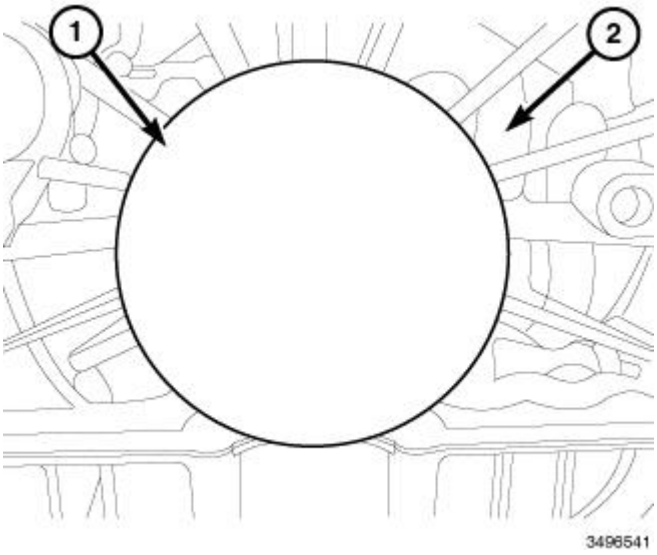


Fig. 255: Rear Seal Installer & Crankshaft Position Sensor (CKP) Boss
Courtesy of CHRYSLER GROUP, LLC

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NOTE: Position the flat portion of the Rear Seal Installer should be facing down giving you clearance by the Crankshaft Position Sensor (CKP) boss.

4. Using the (special tool #VM.10341-2, Installer Tool, Rear Seal) (1) install the rear main oil seal into the engine block.

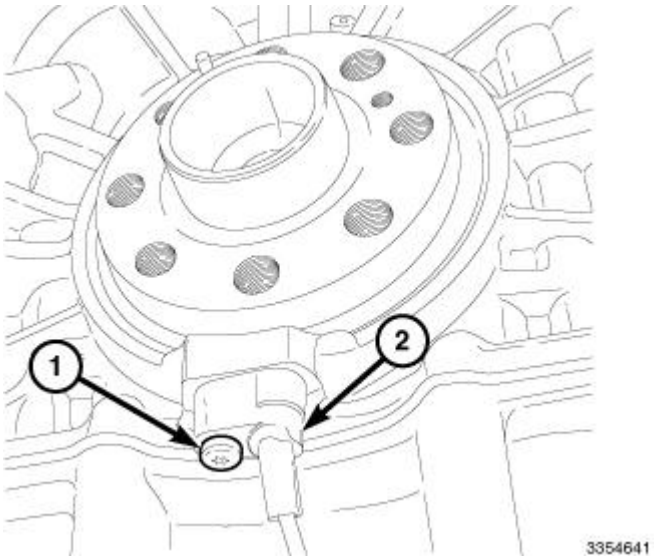


Fig. 256: Crankshaft Position Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Clean the area and bore around CKP.
6. Install the Crankshaft Position Sensor (CKP) (2). Tighten bolt (1) to 6 N.m (53 in. lbs.).

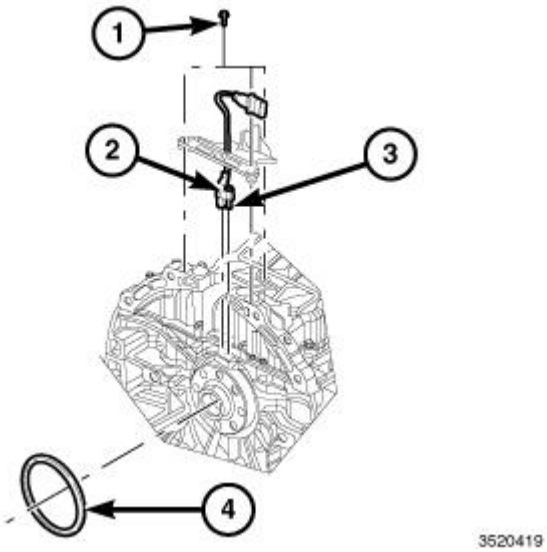


Fig. 257: CKP Sensor, Seal & Fasteners
Courtesy of CHRYSLER GROUP, LLC

7. Install the CKP sensor cover. Tighten bolts (1) to 8 N.m (71 in. lbs.).

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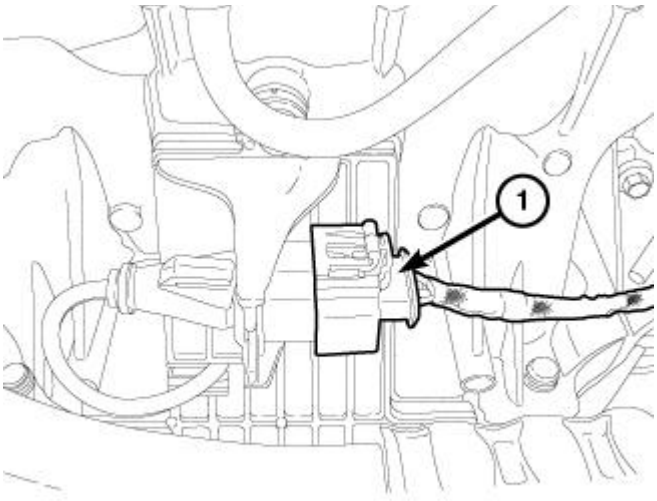


Fig. 258: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

8. Connect the CKP wire harness connector (1).

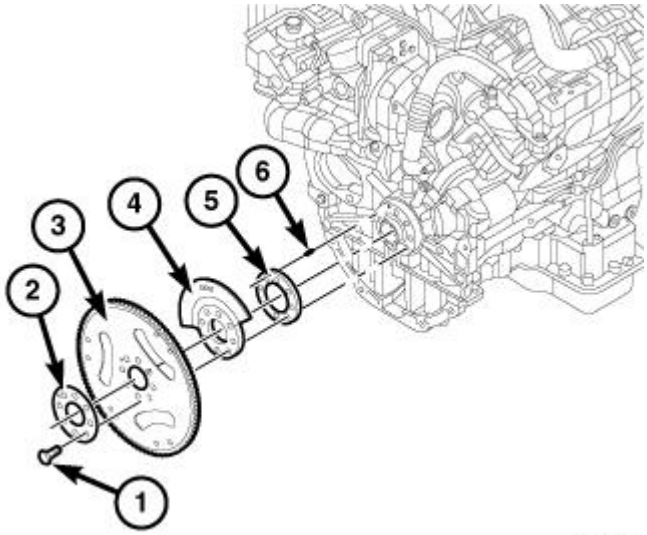


Fig. 259: Backing Plate, Flex Plate, Counter Weight, Tone Wheel & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the tone wheel (5), counter weight (4), and flex plate (3). Refer to **FLEXPLATE, INSTALLATION**.

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, REAR MOUNT

REMOVAL

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REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the transmission belly pan.

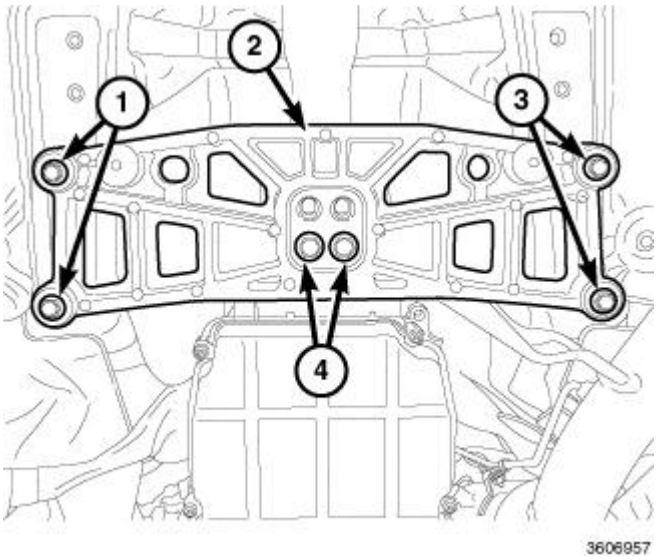


Fig. 260: Rear Crossmember & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove the two bolts (4) from the rear engine mount isolator.
4. Using a suitable transmission jack, positioned under the transmission oil pan, raise the transmission until the weight is off of the isolator.
5. Remove bolts (1, 3) and the rear crossmember (2).

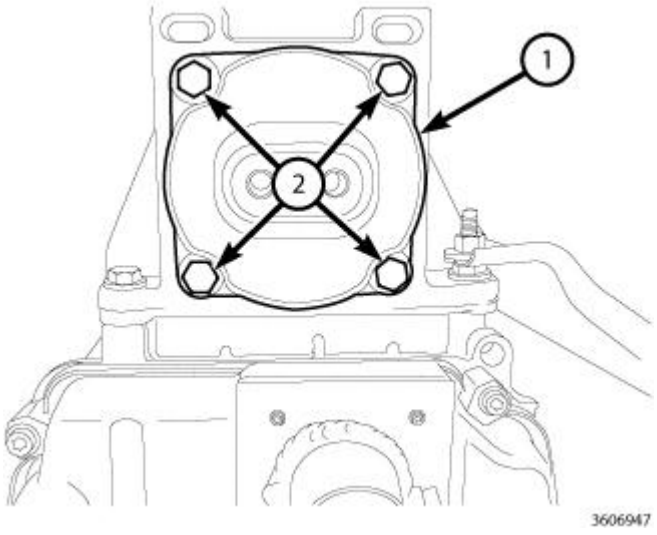


Fig. 261: Rear Engine Mount Isolator & Bolts
Courtesy of CHRYSLER GROUP, LLC

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6. Remove bolts (2) and the rear engine mount isolator (1).

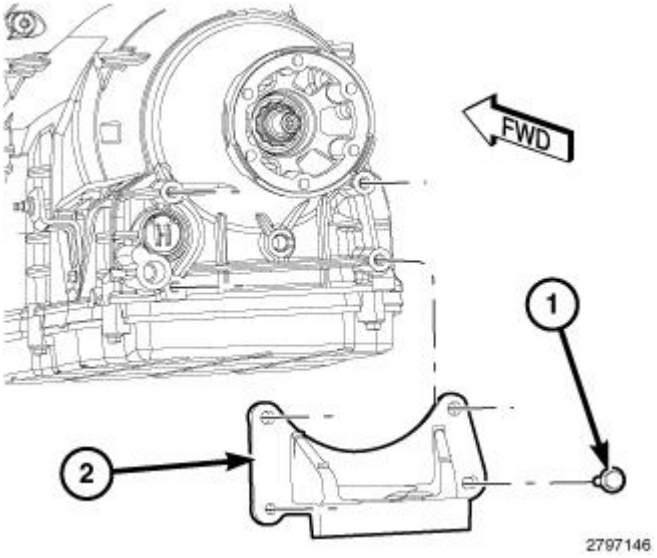


Fig. 262: Rear Engine Mount Bracket & Bolts (4x2)
Courtesy of CHRYSLER GROUP, LLC

7. If required, remove four bolts (1) and the rear engine mount bracket (2).

INSTALLATION

INSTALLATION

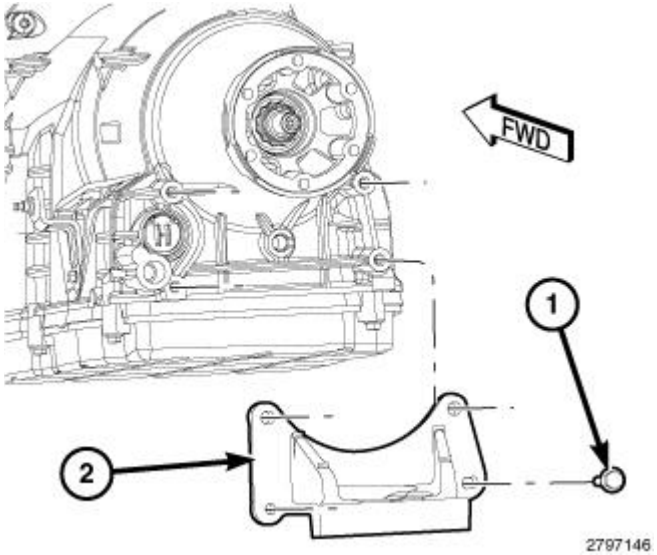


Fig. 263: Rear Engine Mount Bracket & Bolts (4x2)
Courtesy of CHRYSLER GROUP, LLC

1. If removed, install the rear engine mount bracket (2). Tighten bolts (1) to 33 N.m (24 ft. lbs.).

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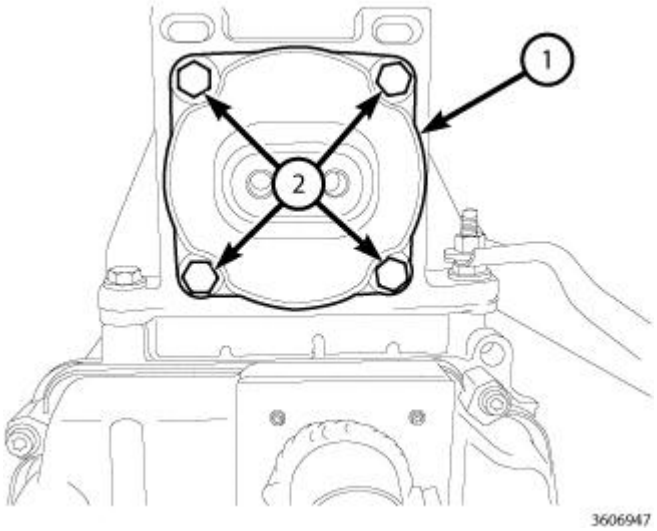


Fig. 264: Rear Engine Mount Isolator & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Install the rear engine mount isolator (1) Tighten bolts (2) to 61 N.m (45 ft. lbs.).

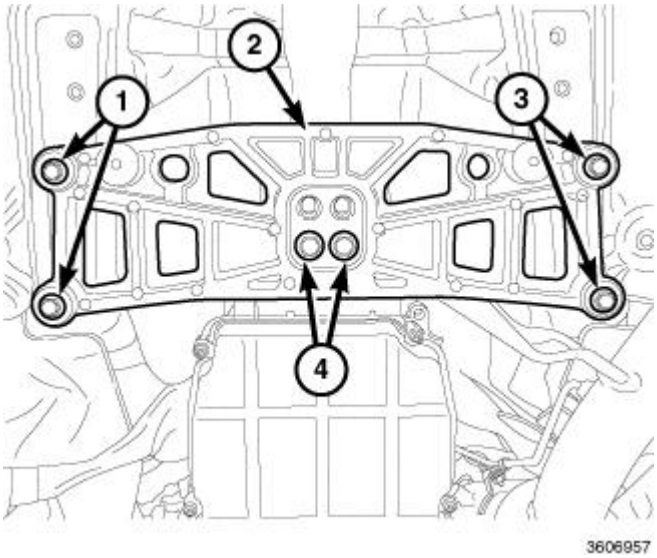


Fig. 265: Rear Crossmember & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the crossmember (2). Tightened bolts (1 and 3) to 55 N.m (41 ft. lbs.).
4. Lower the transmission so the weight is resting on the isolator.
5. Install the rear engine mount isolator bolts (4) and tighten to 61 N.m (45 ft. lbs.).
6. Install the transmission belly pan.
7. Lower the vehicle.

INSULATOR, ENGINE MOUNT, LEFT

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REMOVAL

REMOVAL

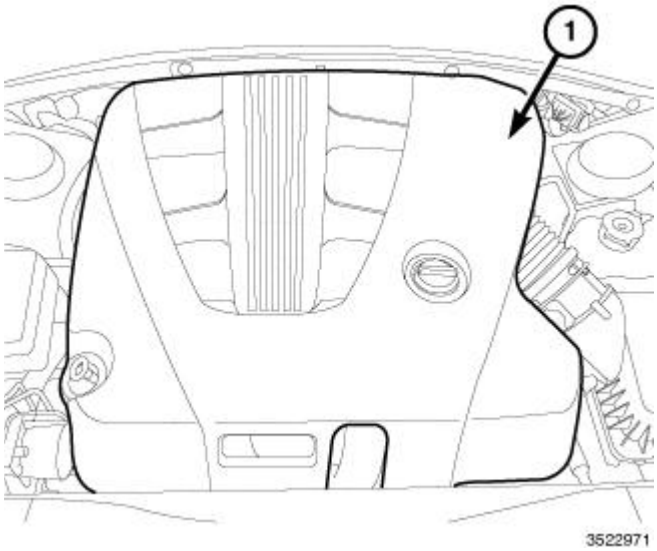


Fig. 266: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).
3. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL**.

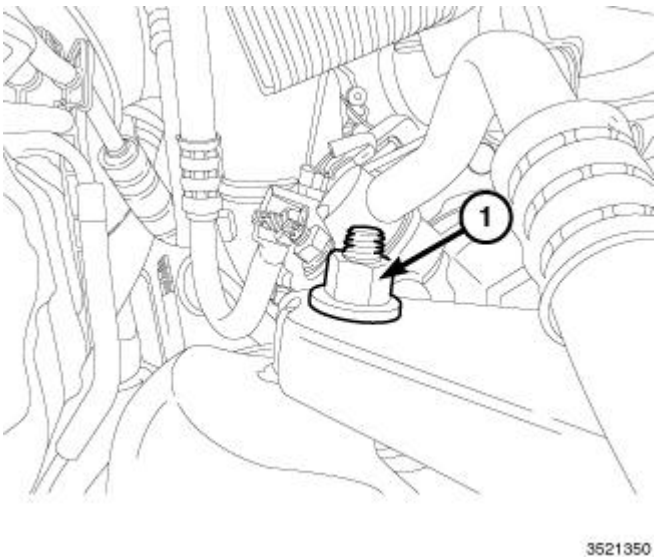


Fig. 267: Engine Mount Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

4. Remove the left and right engine mount retaining nut (1).
5. Using (special tool #8534B, Fixture, Driveline Support) lift engine enough to gain access to the engine

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mount without damaging the turbocharger.

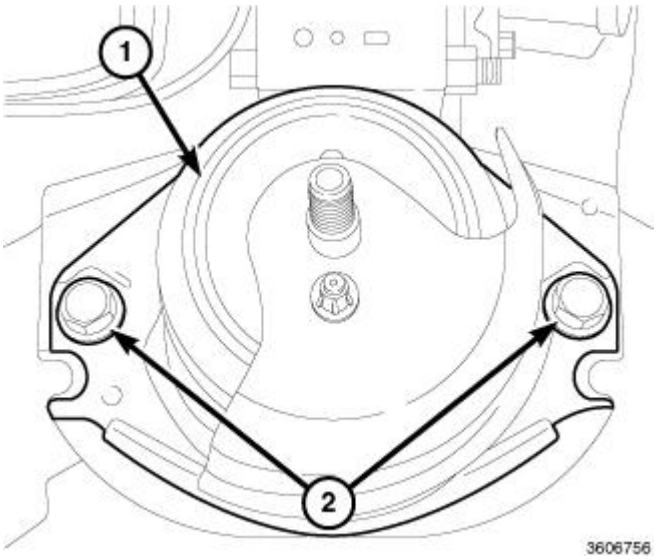


Fig. 268: Left Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
7. Removed the belly pan. Refer to **BELLY PAN, REMOVAL** .
8. Remove bolts (2) and the left engine mount (1).

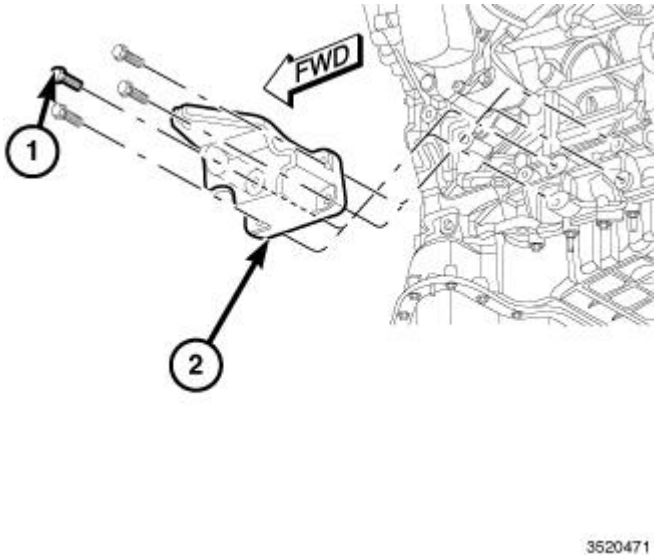


Fig. 269: Left Engine Mount Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. If necessary, remove bolts (1) and the left engine mount bracket (2).

INSTALLATION

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INSTALLATION

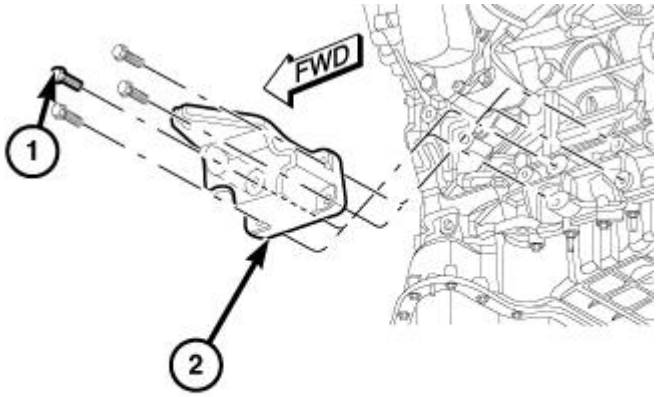


Fig. 270: Left Engine Mount Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. If necessary, Install the left engine mount bracket (2). Tighten Bolts (1) to 61 N.m (45 ft. lbs).

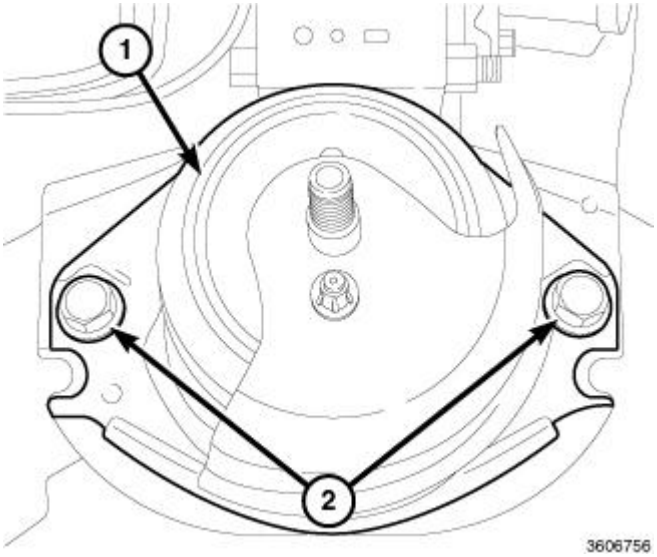


Fig. 271: Left Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Install the left engine mount (1). Tighten bolts (2) to 61 N.m (45 ft. lbs.).
3. Install the belly pan. Refer to **BELLY PAN, INSTALLATION** .
4. Lower the vehicle.
5. Lower the engine into position and remove (special tool #8534B, Fixture, Driveline Support).

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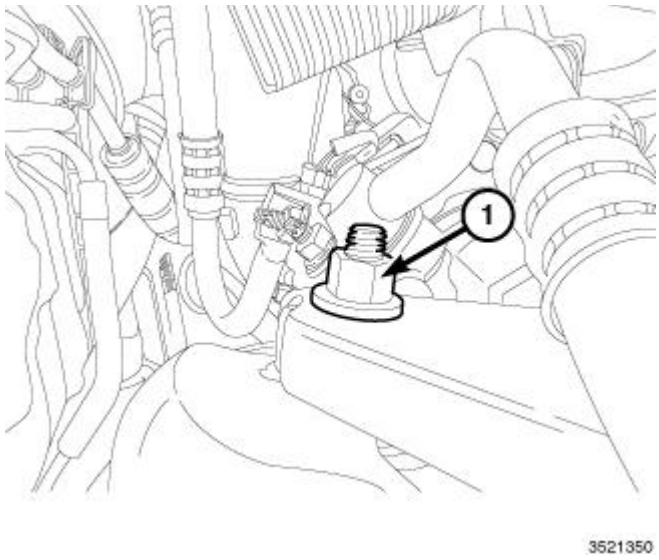


Fig. 272: Engine Mount Retaining Nut
Courtesy of CHRYSLER GROUP, LLC

6. Install the left and right engine mount retaining nuts (1) and tighten to 61 N.m (45 ft. lbs.).
7. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.

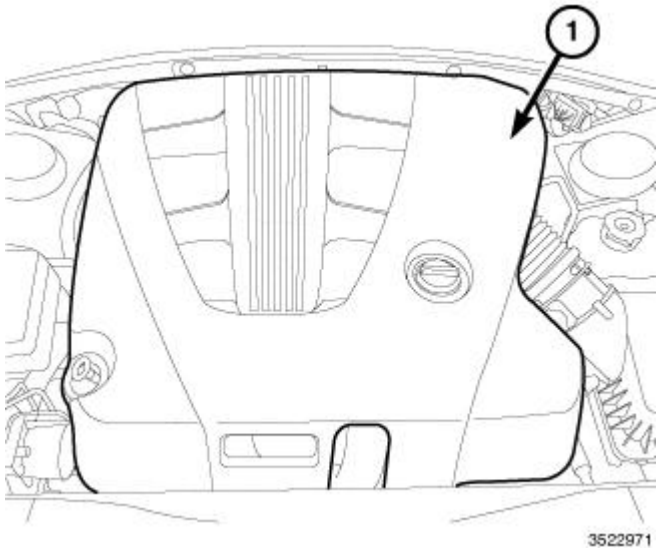


Fig. 273: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

8. Install the engine cover (1).
9. Connect the negative battery cable.

INSULATOR, ENGINE MOUNT, RIGHT

REMOVAL

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REMOVAL

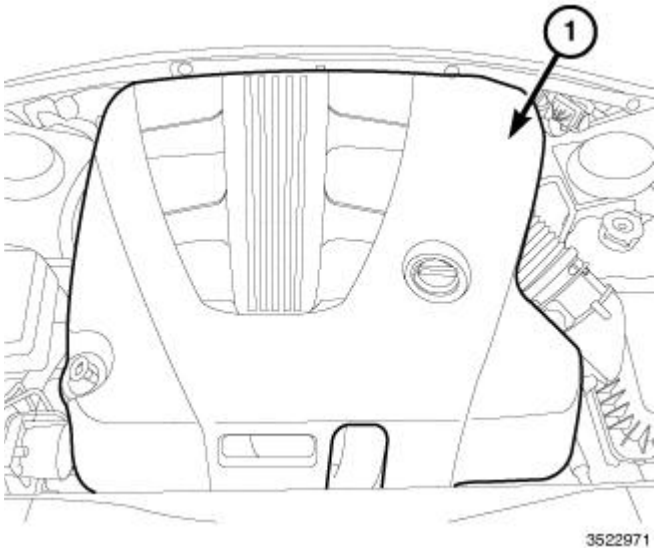


Fig. 274: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).
3. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL**.
4. Remove the generator. Refer to **GENERATOR, REMOVAL** .

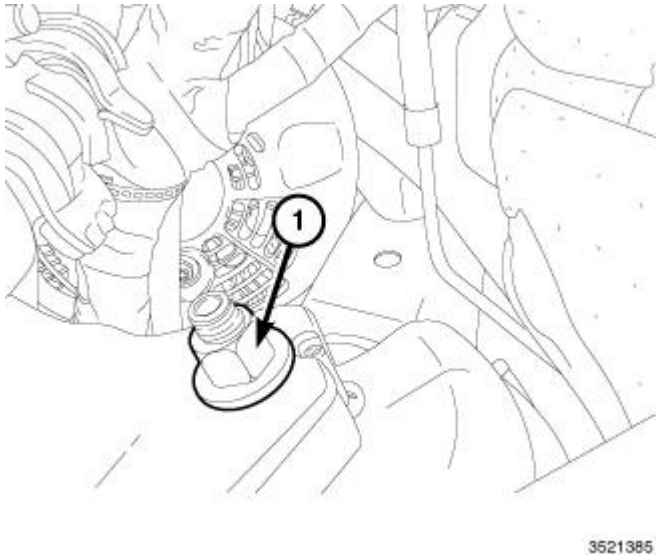


Fig. 275: Engine Mount Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the right and left engine mount retaining nut (1).
6. Using (special tool #8534B, Fixture, Driveline Support) lift engine enough to gain access to the engine mount.

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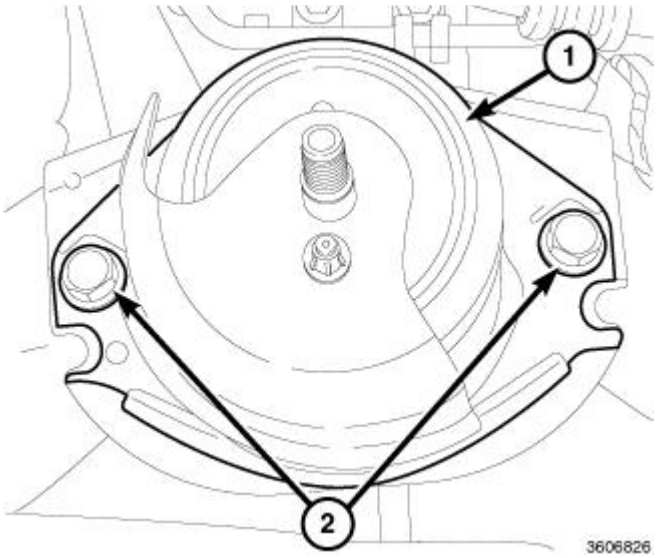


Fig. 276: Right Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
8. Removed the belly pan. Refer to **BELLY PAN, REMOVAL** .
9. Remove bolts (2) and the right engine mount (1).

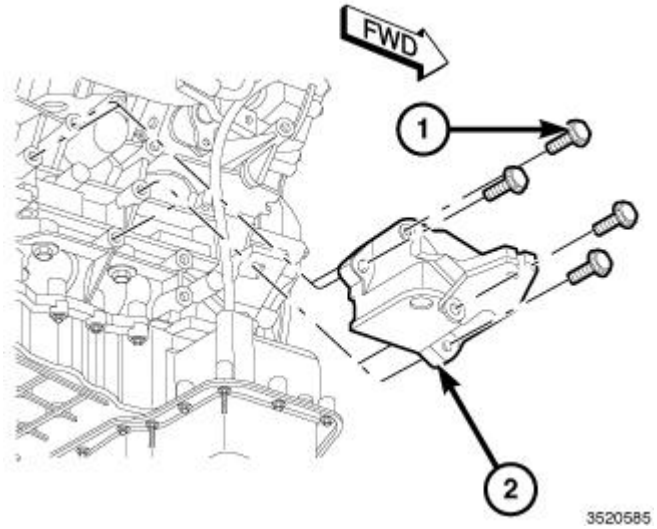


Fig. 277: Engine Mount Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. If necessary, remove bolts (1) and the engine mount bracket (2).

INSTALLATION

INSTALLATION

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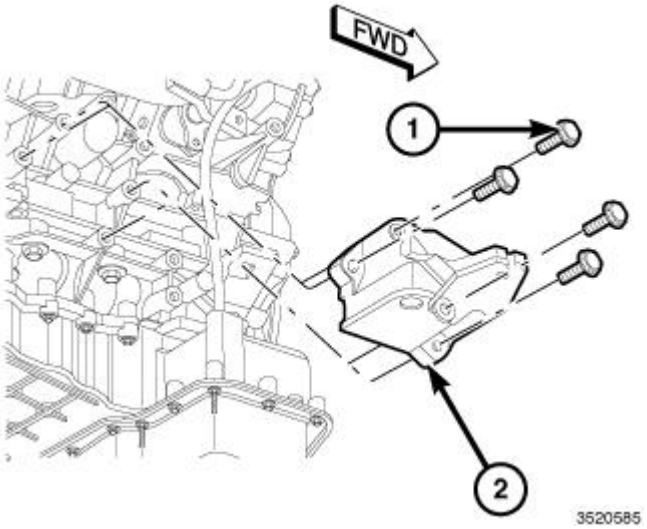


Fig. 278: Engine Mount Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. If necessary, Install the engine mount bracket (2). Tighten bolts (1) to 61 N.m (45 ft. lbs.).

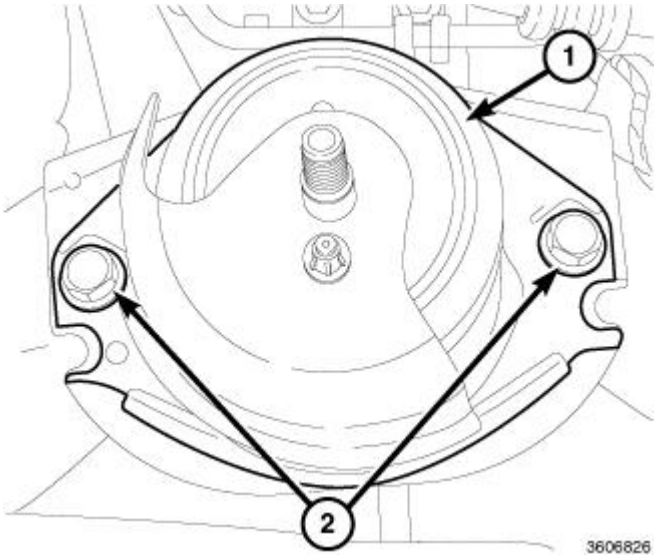


Fig. 279: Right Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Install the right engine mount (1). Tighten bolts (2) to 61 N.m (45 ft. lbs.).
3. Install the belly pan. Refer to **BELLY PAN, INSTALLATION** .
4. Lower the vehicle.
5. Lower the engine into position and remove (special tool #8534B, Fixture, Driveline Support).

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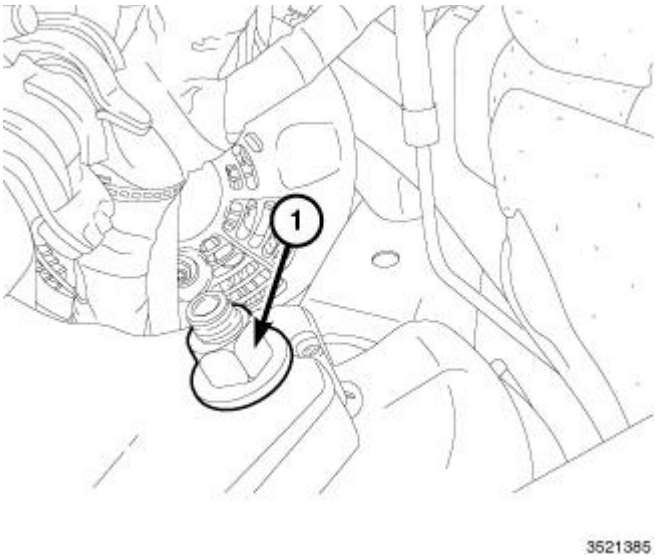


Fig. 280: Engine Mount Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

6. Install the right and left engine mount retaining nuts (1) and tighten to 61 N.m (45 ft. lbs.).
7. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.
8. Install the generator. Refer to **GENERATOR, INSTALLATION** .

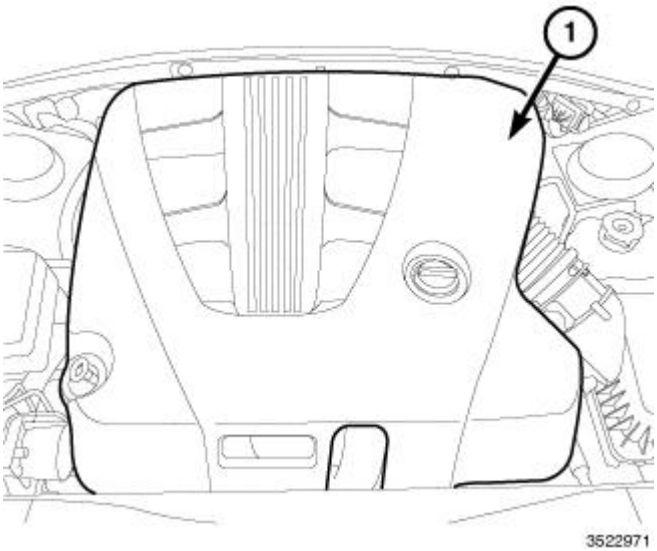


Fig. 281: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

9. Install the engine cover (1).
10. Connect the negative battery cable.

LUBRICATION

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ADAPTER, OIL COOLER

REMOVAL

REMOVAL

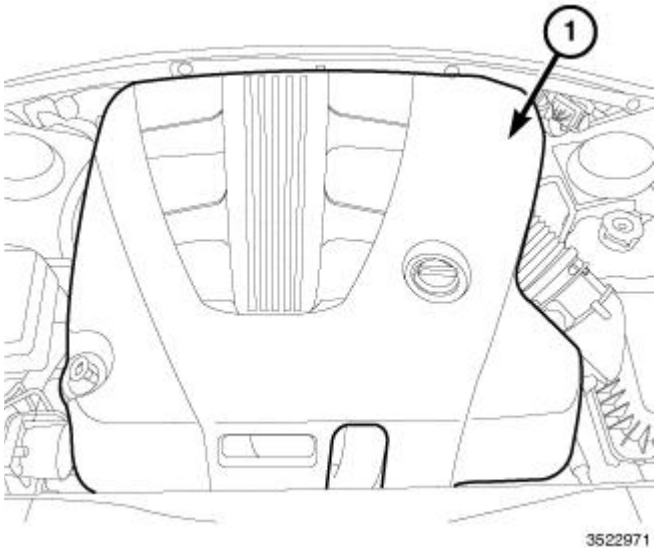


Fig. 282: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove engine cover (1).
3. Remove the air cleaner body and air tube. Refer to **BODY, AIR CLEANER, REMOVAL**.
4. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
5. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
6. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
7. Drain the engine oil. Using a new sealing washer, install and tighten drain plug to 45 N.m (33 ft. lbs.).

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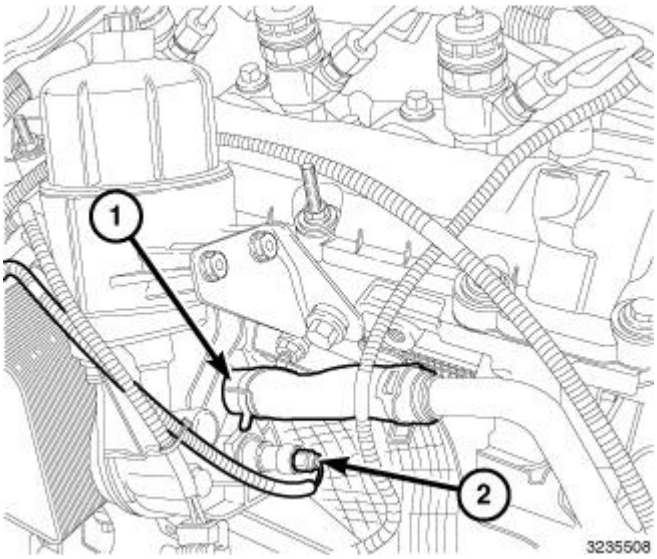


Fig. 283: Coolant Hose & Oil Pressure Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

8. Lower the vehicle.
9. Disconnect the coolant hose (1) from oil cooler adapter.
10. Disconnect the oil pressure sensor harness connector (2).

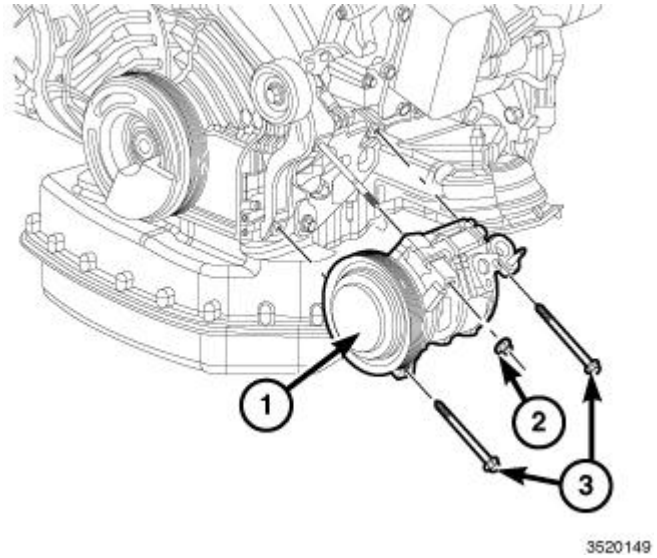


Fig. 284: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Removal of the A/C compressor does not require the refrigerant to be evacuated.

11. Remove the A/C compressor and position aside. Refer to **COMPRESSOR, A/C, REMOVAL** .

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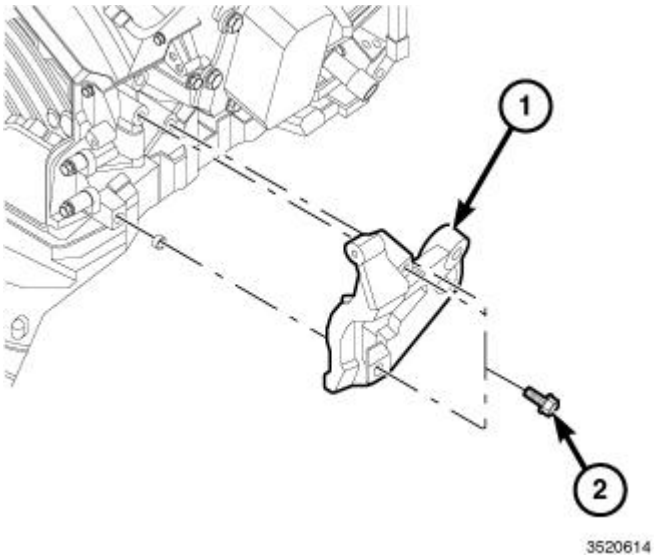


Fig. 285: A/C Compressor Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolts (2), and the A/C compressor bracket (1).

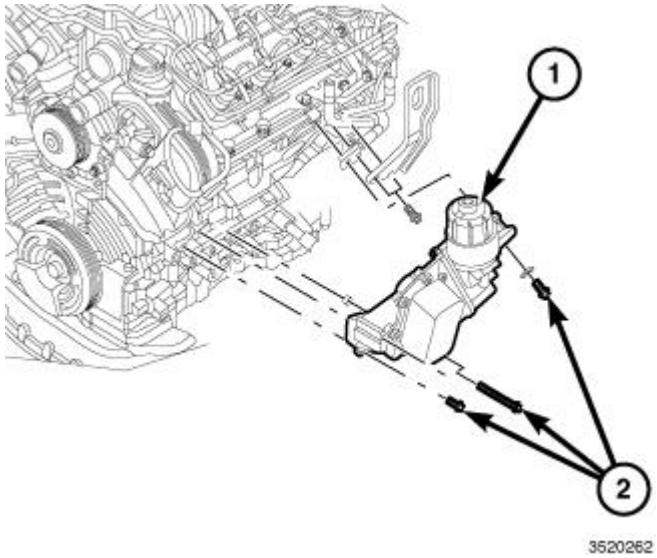


Fig. 286: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

13. Remove bolts (2) and the oil cooler adapter (1).

INSTALLATION

INSTALLATION

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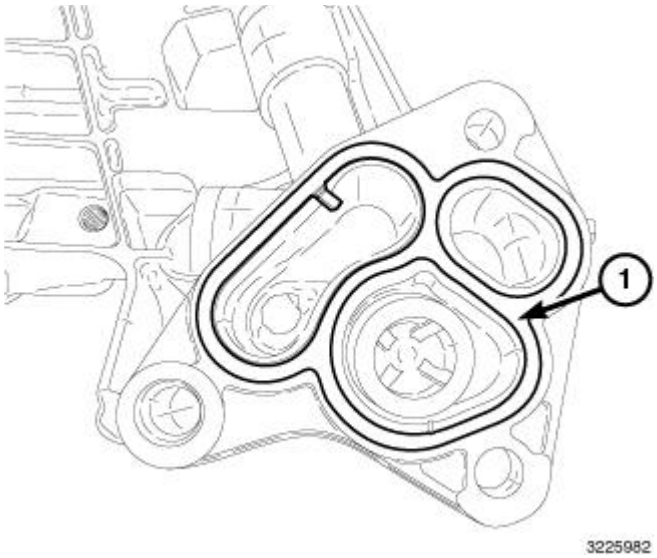


Fig. 287: Oil Cooler Adapter O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket sealing surfaces.
2. Install a new O-ring seal (1).

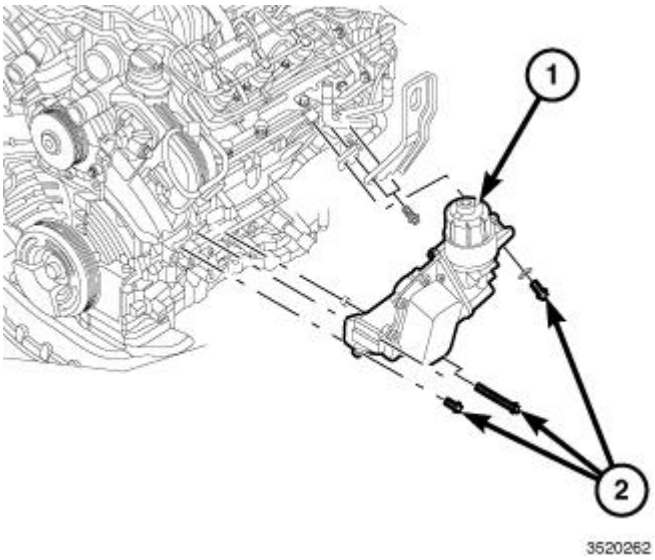


Fig. 288: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

3. Install the oil cooler adapter (1). Tighten bolts (2) 30 N.m (22 ft. lbs.).

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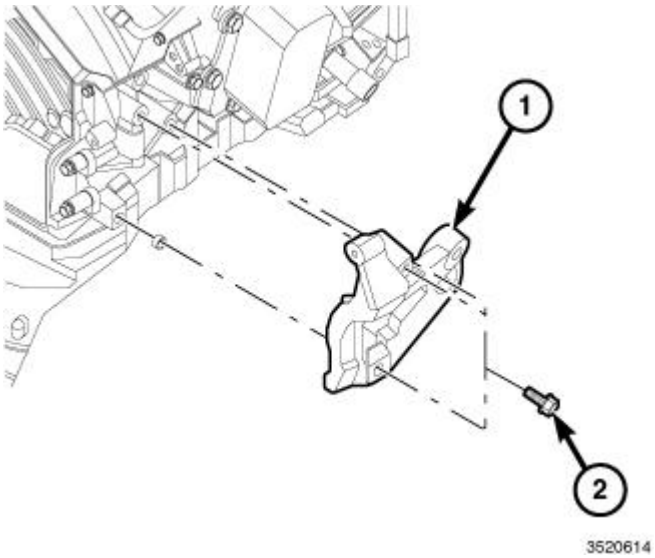


Fig. 289: A/C Compressor Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the A/C compressor bracket (1). Tighten bolts (2) 45 N.m (33 ft. lbs.).

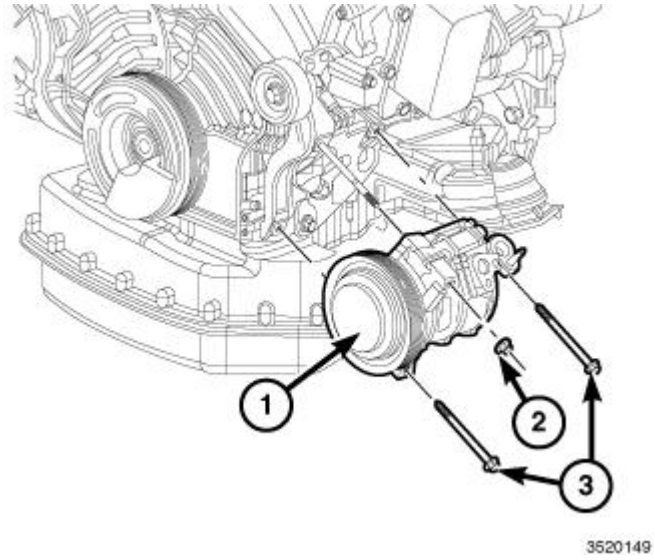


Fig. 290: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Install the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION** .

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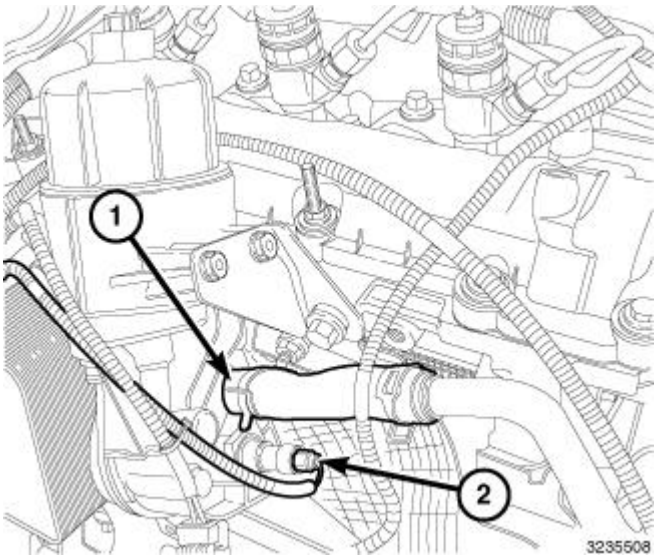


Fig. 291: Coolant Hose & Oil Pressure Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

6. Connect the oil pressure sensor harness connector (2).
7. Connect the coolant hose (1) from oil cooler adapter.
8. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
9. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
10. Lower the vehicle.
11. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
12. Change the oil filter and fill the engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
13. Install the air tube and air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.
14. Connect the negative battery cable.
15. Start the engine and check for leaks.

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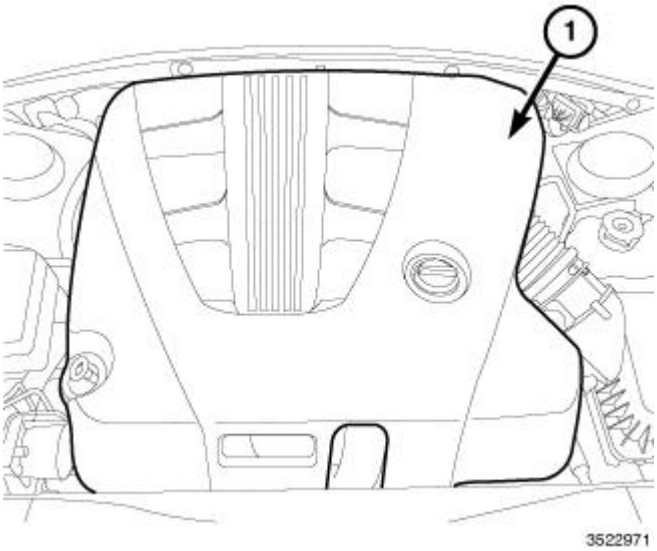


Fig. 292: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

16. Install the engine cover (1).

COOLER, OIL

DESCRIPTION

DESCRIPTION

Engine coolant is used to cool the oil. A plate-style external heat exchanger is located on the left side of the engine block. A single O-ring style gaskets seal the oil cooler to the oil cooler adapter. Replace the O-ring style gaskets whenever the oil cooler is removed or replaced. The oil is fed to the oil cooler through the oil filter. After the oil cooler, the oil is fed back to the main oil gallery of the cylinder block. The oil cooler and adapter is located on the left side of the engine block.

REMOVAL

REMOVAL

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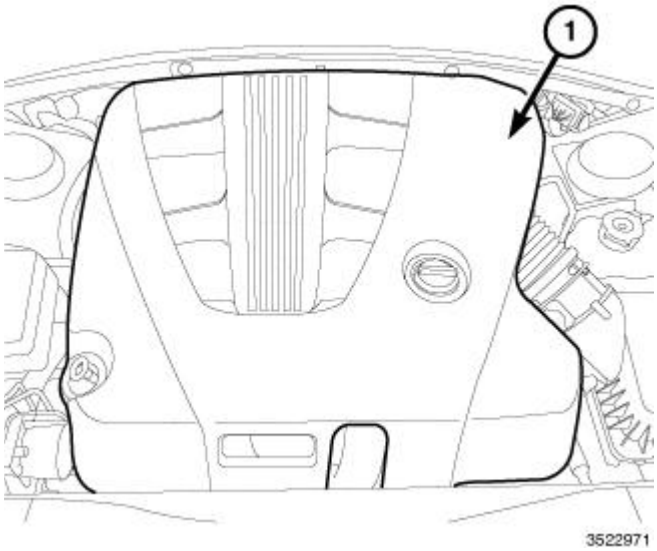


Fig. 293: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).
3. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
4. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
5. Drain the cooling system. Refer to **STANDARD PROCEDURE** .

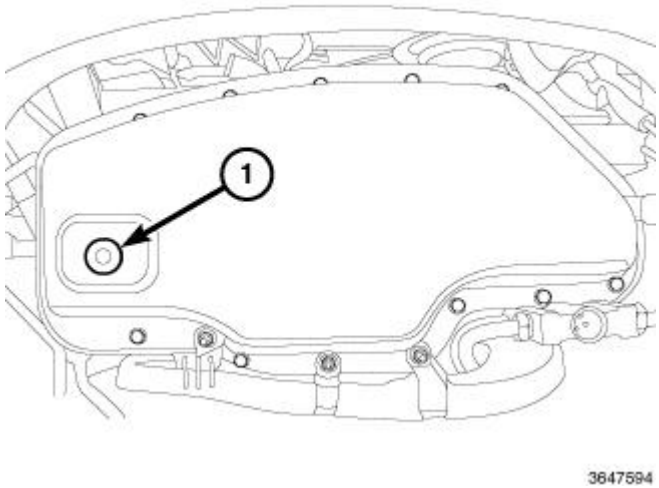


Fig. 294: Oil Pan Drain Plug
Courtesy of CHRYSLER GROUP, LLC

6. Drain the engine oil. Using a new sealing washer, install and tighten drain plug (1) to 45 N.m (33 ft. lbs.).
7. Lower the vehicle.

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8. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL**.
9. Remove the serpentine drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .

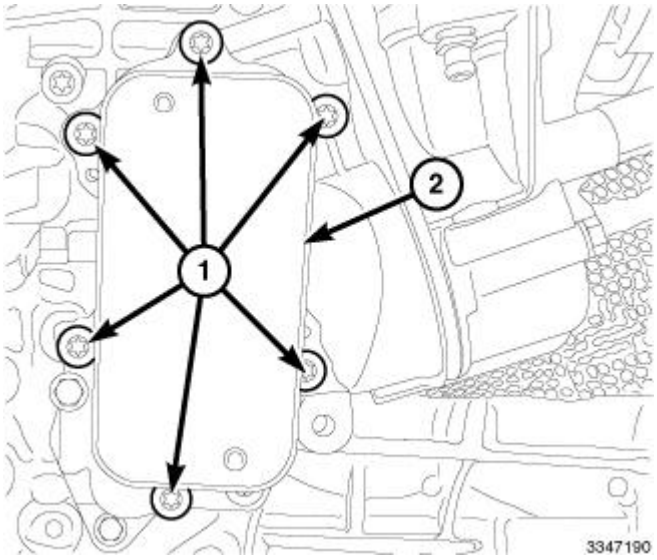


Fig. 295: Oil Cooler & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Remove bolts (1) and the engine oil cooler (2).

INSTALLATION

INSTALLATION

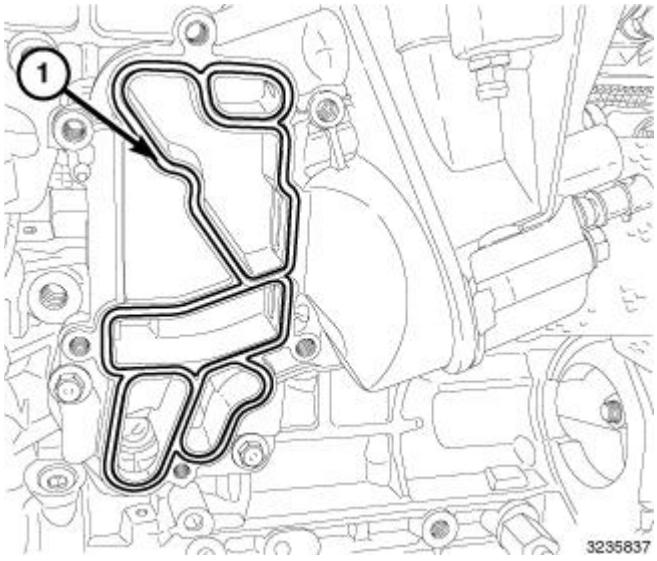


Fig. 296: Oil Cooler Adapter O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1. Clean all gasket mating surfaces. Refer to **Engine - Standard Procedure**.

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2. Install a new O-ring seal onto the oil cooler adapter.

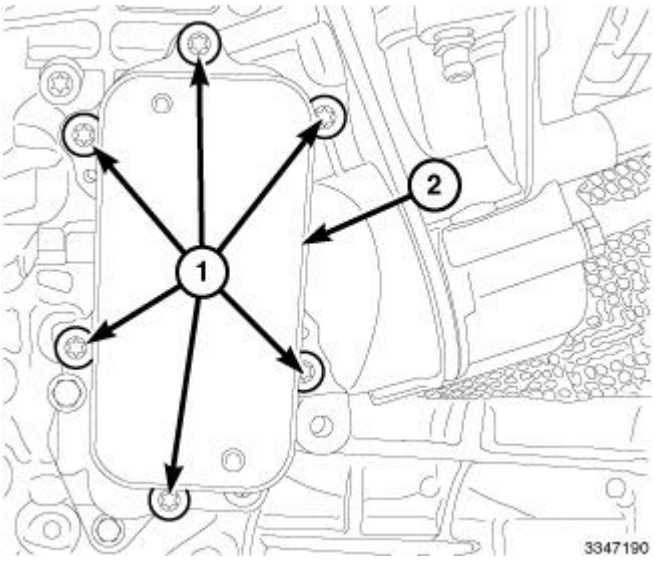


Fig. 297: Oil Cooler & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the engine oil cooler. Tighten bolts to 30 N.m (22 ft. lbs.).
4. Install the serpentine drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
5. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.
6. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
7. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
8. Lower the vehicle.
9. Change the oil filter and fill the engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
10. Fill the cooling system. Refer to **STANDARD PROCEDURE** .

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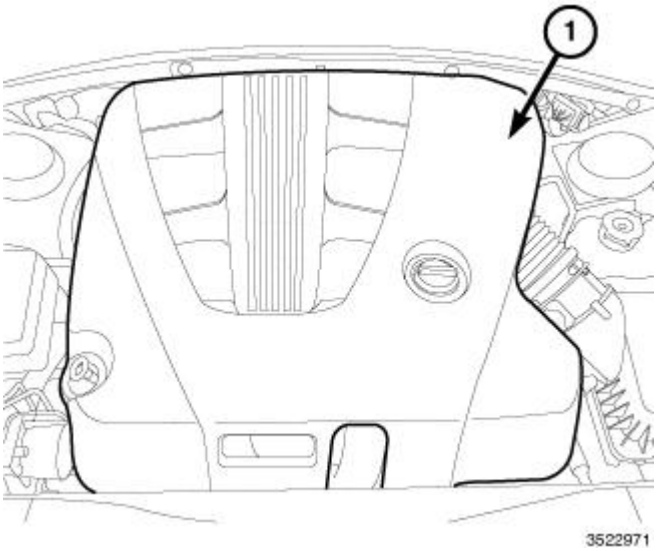


Fig. 298: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

11. Install the engine cover (1).
12. Connect the negative battery cable.

FILTER, ENGINE OIL

REMOVAL

REMOVAL

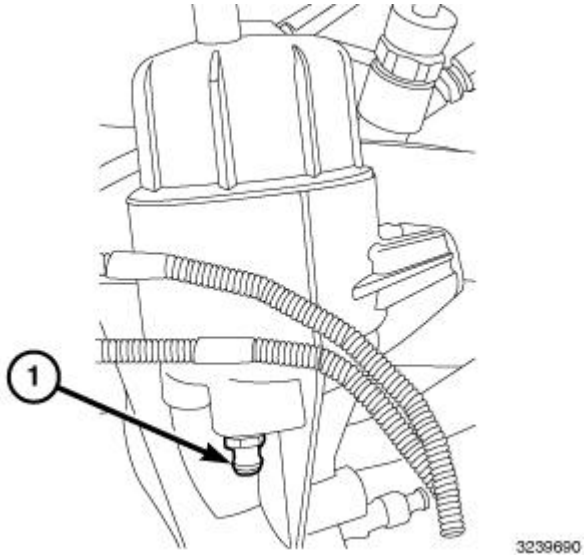


Fig. 299: Oil Filter Housing Bleeder Screw
Courtesy of CHRYSLER GROUP, LLC

1. Open the vent screw on top of oil cap.

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2. Open the bleeder screw (1) and drain the oil filter housing and securely tighten bleeder screw.
3. Remove the oil filter cap.

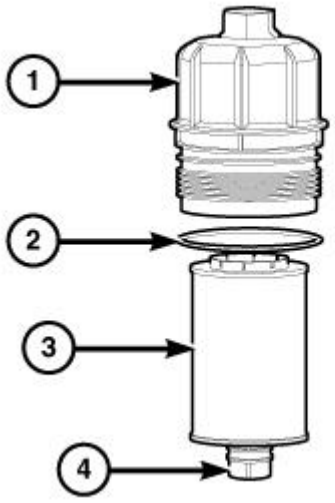


Fig. 300: Oil Filter Cover, O-Ring Gasket, Oil Filter & Base Oil Filter
Courtesy of CHRYSLER GROUP, LLC

4. While holding the oil filter cover (1), pushdown on base oil filter (4) to separate from cover and remove the oil filter (3).
5. Remove and discard O-ring gasket (2). Clean and inspect cap.

INSTALLATION

INSTALLATION

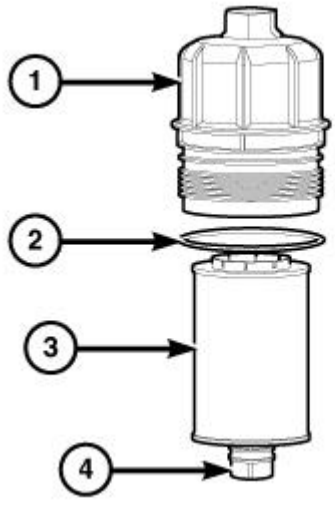


Fig. 301: Oil Filter Cover, O-Ring Gasket, Oil Filter & Base Oil Filter
Courtesy of CHRYSLER GROUP, LLC

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1. Lubricate and install the new oil filter cap O-ring gasket (2). Make sure the oil filter cap O-ring is in the correct location.
2. Install the oil filter (3) into oil filter cap (1).
3. Install oil filter cap (1) and tighten to 25 N.m (18 ft. lbs.).
4. Securely tighten the vent screw on top of the oil filter cap.

HOUSING, OIL FILTER

REMOVAL

REMOVAL

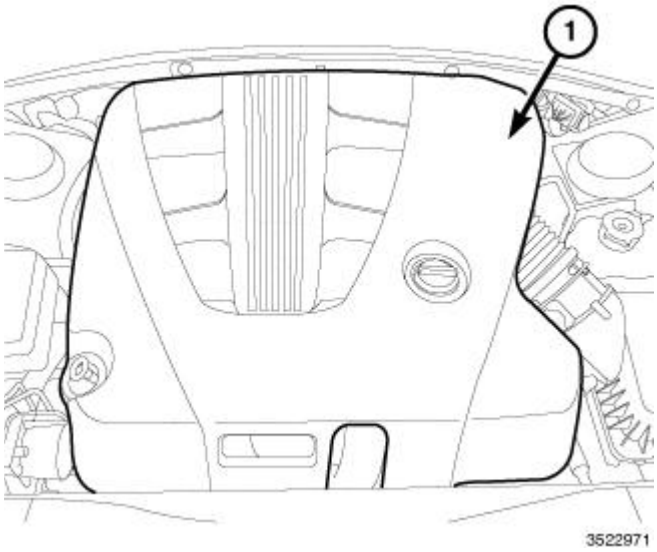


Fig. 302: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).
3. Remove the oil cooler adapter. Refer to **ADAPTER, OIL COOLER, REMOVAL**.

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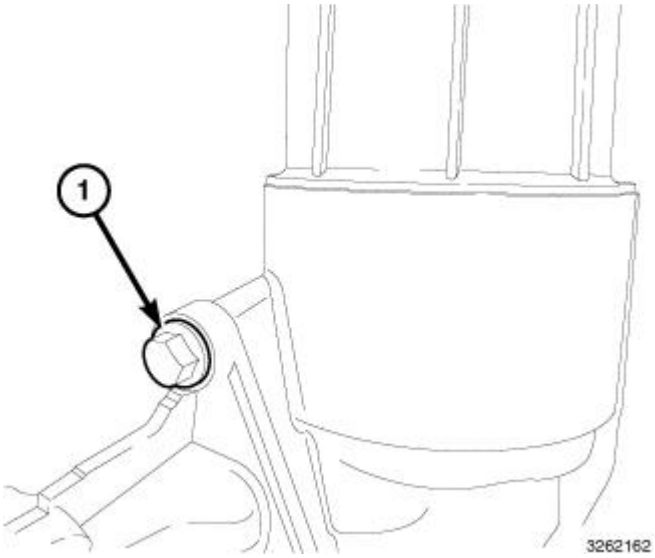


Fig. 303: Upper Oil Filter Housing Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Remove the upper oil filter housing bolt (1).

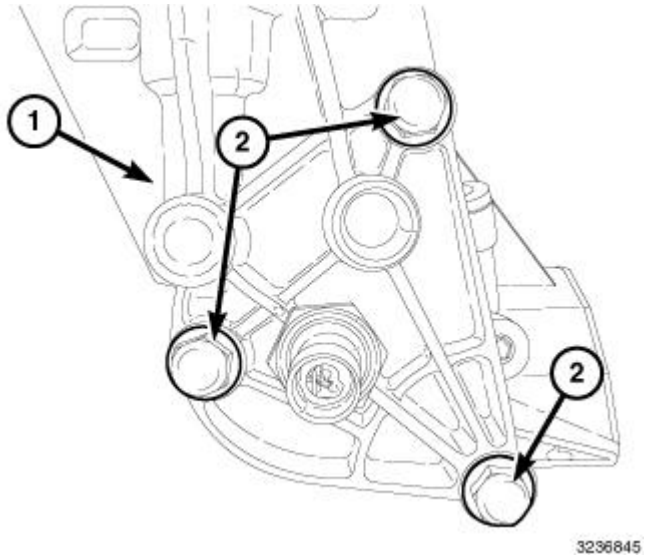


Fig. 304: Oil Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove bolts (2) and the oil filter housing (1).

INSTALLATION

INSTALLATION

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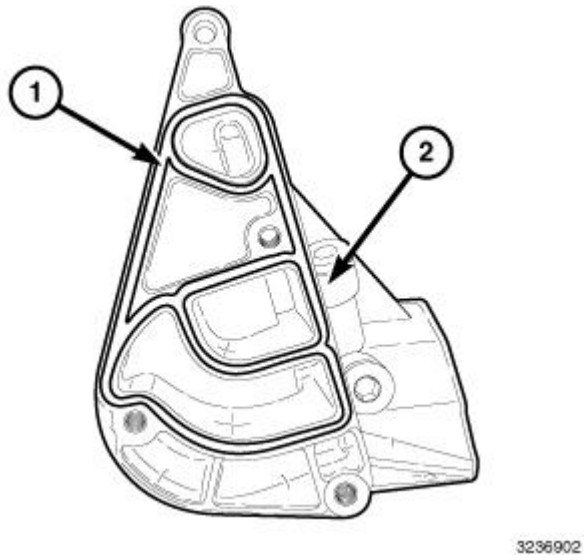


Fig. 305: Oil Filter Housing & O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket sealing surfaces.
2. Install new O-ring seal (1) onto the oil filter housing (2).

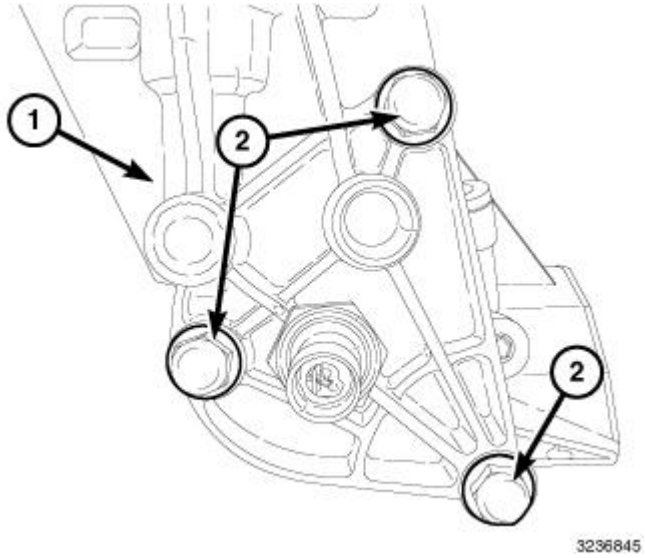


Fig. 306: Oil Filter Housing & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install oil filter housing (1). Tighten bolts (2) to 30 N.m (22 ft. lbs.).

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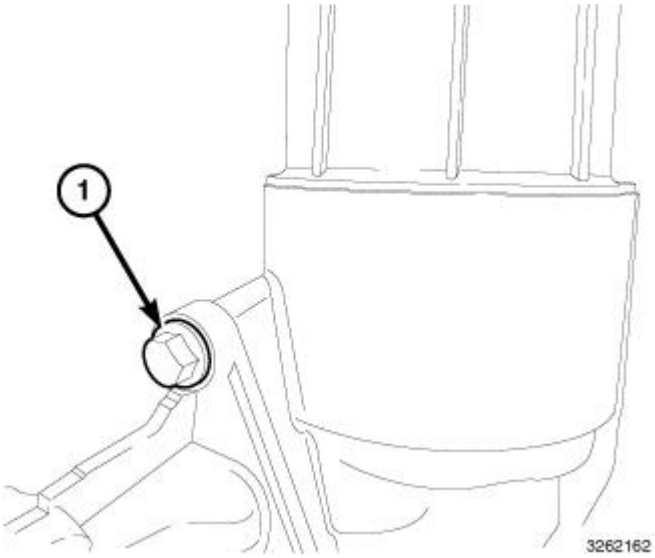


Fig. 307: Upper Oil Filter Housing Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Install the front oil filter housing bolt and tighten to 15 N.m (133 in. lbs.).

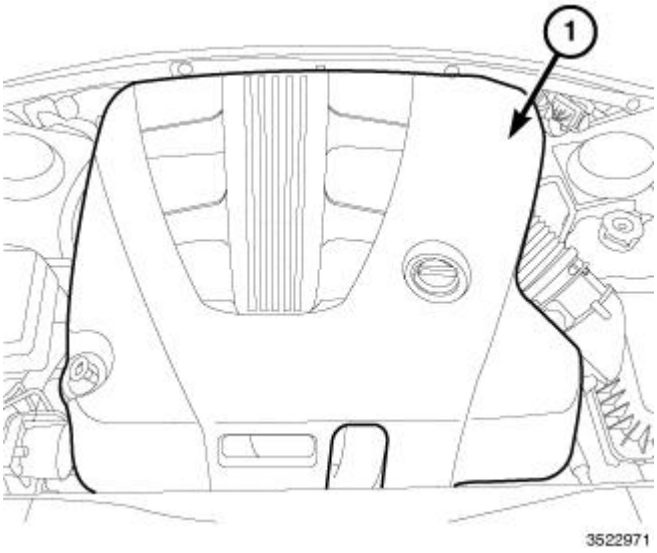


Fig. 308: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

5. Install the oil cooler adapter. Refer to **ADAPTER, OIL COOLER, INSTALLATION**.
6. Connect the negative battery cable.
7. Start the engine and check for leaks.
8. Install the engine cover (1).

JET, PISTON OIL COOLER

DESCRIPTION

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DESCRIPTION

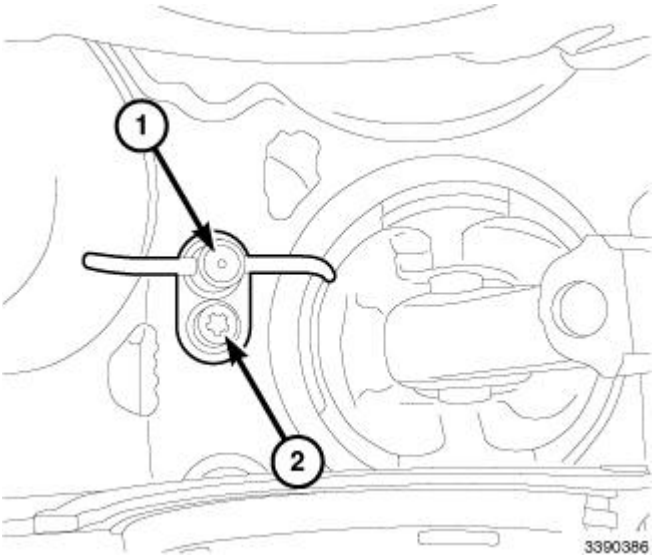


Fig. 309: Oil Jet & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

Three dual-nozzle oil jets (1) are bolted to the cylinder block underneath the main oil gallery. The jets connect with an oil-tight fit to the main gallery through lubrication passages. Each oil jet helps cool two opposite pistons. Proper oil jet alignment is important. Each nozzle is designed to alternatively spray oil through both cooling galleries within the piston. The oil spray is aimed at one of the cooling galleries as the piston approaches TDC. As the piston approaches BDC, the oil spray is aimed at the adjacent cooling gallery.

REMOVAL

REMOVAL

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage.

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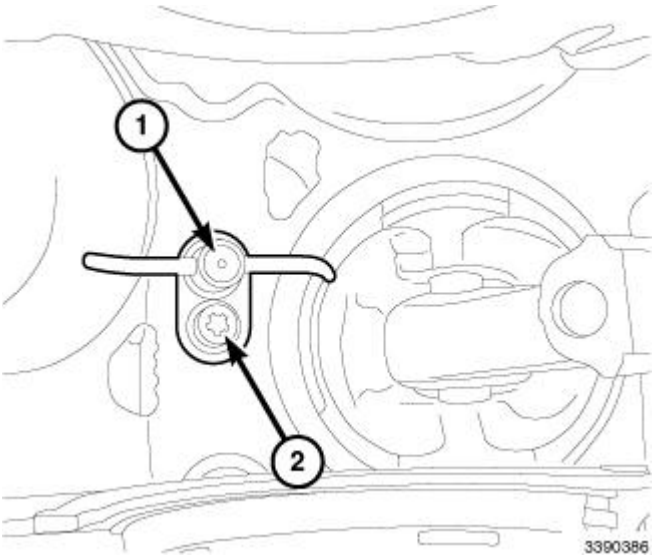


Fig. 310: Oil Jet & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the crankshaft. Refer to **CRANKSHAFT, REMOVAL**.
3. Remove bolt (2) and oil jet (1) from engine block.

INSTALLATION

INSTALLATION

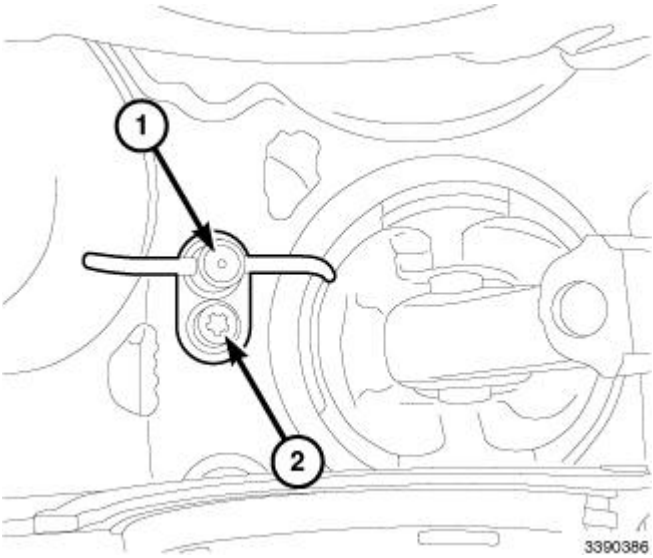


Fig. 311: Oil Jet & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Use caution when removing and installing oil jets. Damage to oil jet nozzle could cause severe engine damage.

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1. Install oil jet (1) in engine block. Tighten bolt (2) to 11 N.m (97 in. lbs.).
2. Install the crankshaft. Refer to **CRANKSHAFT, INSTALLATION**.
3. Connect the negative battery cable.

JET, TIMING CHAIN OIL

REMOVAL

REMOVAL

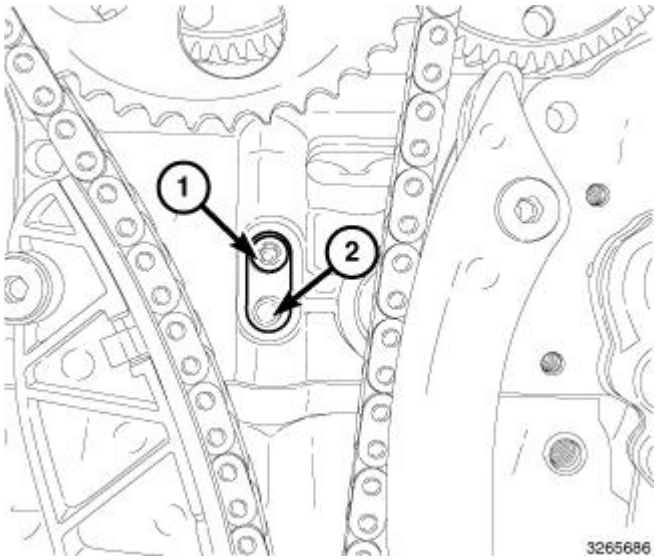


Fig. 312: Timing Chain Oil Jet & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: Right side shown in illustration, left side similar.

1. Disconnect the negative battery cable.
2. Remove the upper timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.
3. Remove bolt (1) and the timing chain oil jet (2).
4. Remove and discard O-ring seal.

INSTALLATION

INSTALLATION

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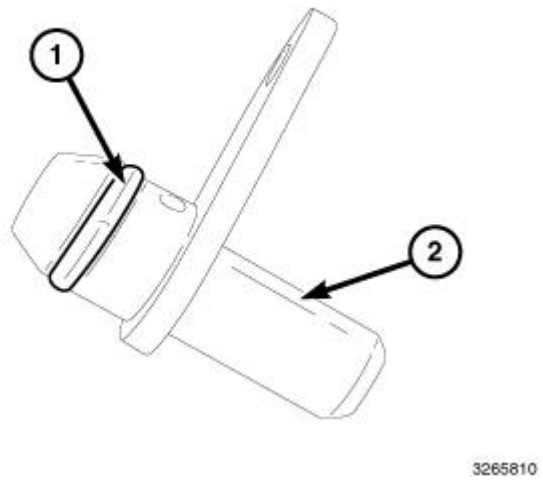


Fig. 313: Timing Chain Oil Jet & O-Ring Seal
Courtesy of CHRYSLER GROUP, LLC

1. Install a new O-ring seal (1) onto the timing chain oil jet (2).

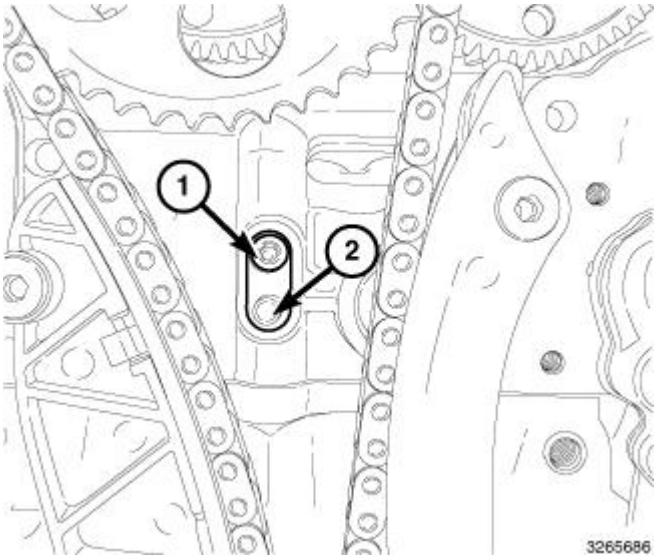


Fig. 314: Timing Chain Oil Jet & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: Right side shown in illustration, left side similar.

2. Install the timing chain oil jet (2). Tighten bolt (1) to 11 N.m (97 in. lbs.).
3. Install the upper timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
4. Fill engine oil to proper level.
5. Connect the negative battery cable.

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OIL

DESCRIPTION

DESCRIPTION

Refer to the Lube and Maintenance information for oil specifications. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, DESCRIPTION** .

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE OIL AND FILTER CHANGE

WARNING: New or used engine oil can be irritating to the skin. Avoid prolonged or repeated skin contact with engine oil. Contaminants in used engine oil, caused by internal combustion, can be hazardous to your health. Thoroughly wash exposed skin with soap and water. Do not wash skin with gasoline, diesel fuel, thinner, or solvents, health problems can result. Do not pollute, dispose of used engine oil properly. Contact your dealer or government agency for location of collection center in your area.

Change the engine oil and filter at mileage and time intervals described in the Maintenance Schedule. Refer to **MAINTENANCE SCHEDULES, DESCRIPTION** .

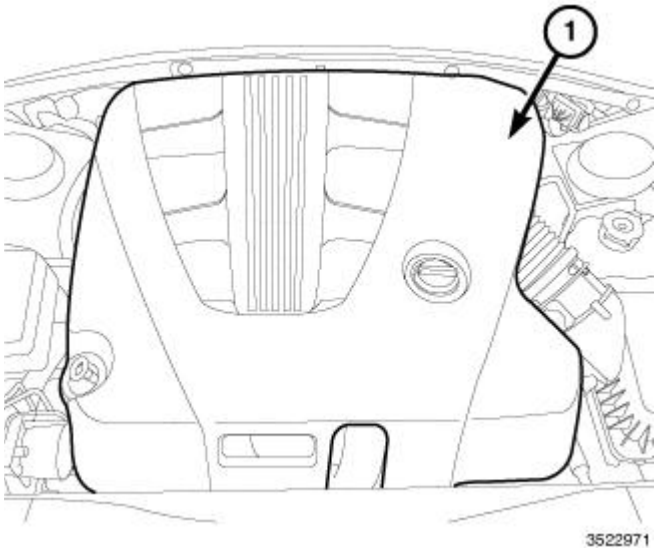


Fig. 315: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Run the engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn the engine off.
3. Remove the engine cover (1).

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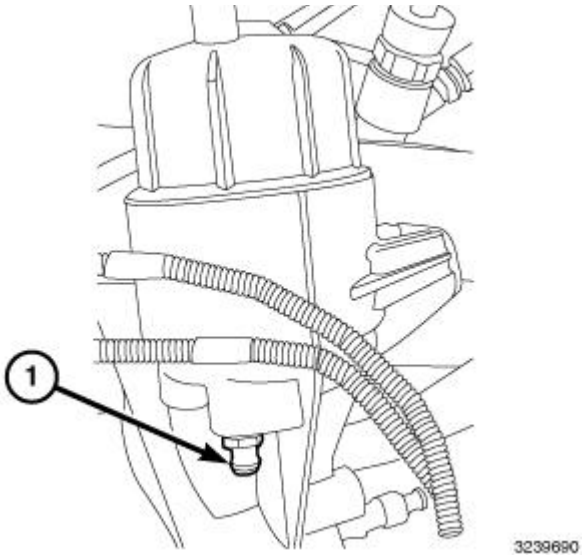


Fig. 316: Oil Filter Housing Bleeder Screw
Courtesy of CHRYSLER GROUP, LLC

4. Open the vent screw on top of oil cap.
5. Place an oil absorbent cloth around the oil filter housing at the base.
6. Open the bleeder screw (1) and drain the oil filter housing and securely tighten bleeder screw.
7. Rotate the oil filter cap (1) counterclockwise and remove the oil filter and cap.

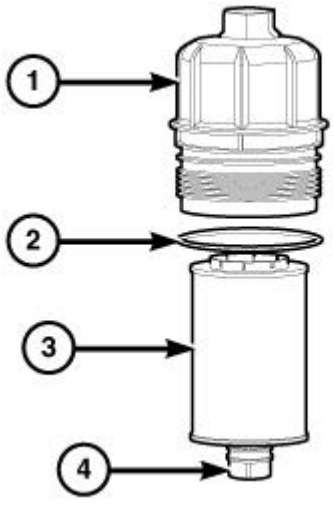


Fig. 317: Oil Filter Cover, O-Ring Gasket, Oil Filter & Base Oil Filter
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When performing an engine oil change, the oil filter cap must be removed. Removing the oil filter cap releases oil held within the oil filter cavity and allows it to drain into the sump. Failure to remove the cap prior to reinstallation of the drain plug will not allow complete

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draining of the used engine oil.

NOTE: The oil filter (3) is attached to the oil filter cap (1).

8. While holding the oil filter cover (1), pushdown on base oil filter (4) to separate from cover and remove the oil filter (3).
9. Remove and discard O-ring gasket (2). Clean and inspect cap.

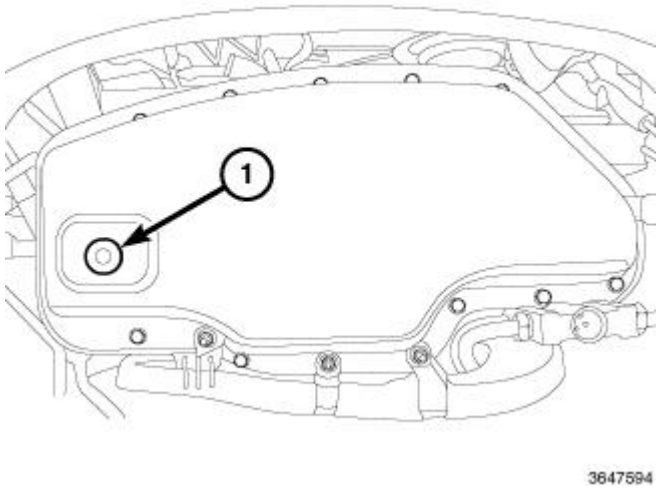


Fig. 318: Oil Pan Drain Plug
Courtesy of CHRYSLER GROUP, LLC

10. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
11. Place a suitable drain pan under the crankcase drain plug (1).
12. Drain the engine oil. Inspect the drain plug threads for stretching or other damage. Replace the drain plug (1) if damaged.
13. Using a new sealing washer, install and tighten the drain plug (1) to 45 N.m (33 ft. lbs.).

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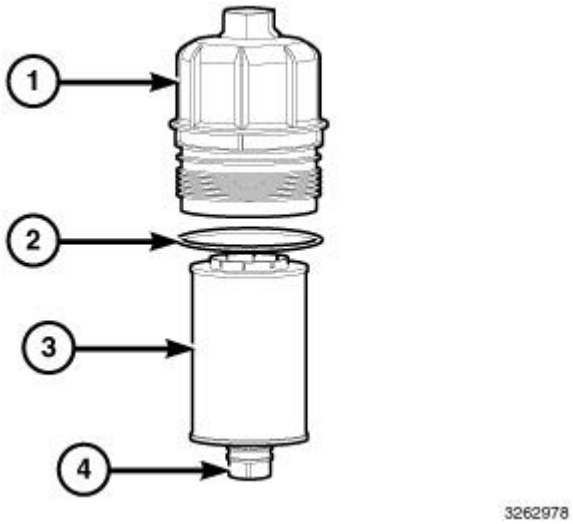
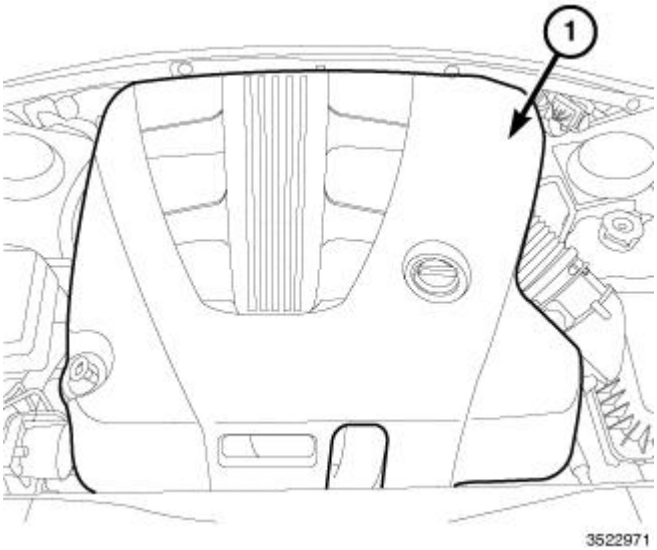


Fig. 319: Oil Filter Cover, O-Ring Gasket, Oil Filter & Base Oil Filter
Courtesy of CHRYSLER GROUP, LLC

14. Lower the vehicle.

NOTE: It is not necessary to pre-oil the oil filter or fill the oil filter housing.

15. Lubricate and install the new oil filter cap O-ring gasket (2). Make sure the oil filter cap O-ring is in the correct location.
16. Install the oil filter (3) into oil filter cap (1).
17. Install oil filter cap (1) and tighten to 25 N.m (18 ft. lbs.).
18. Securely tighten the vent screw on top of the oil filter cap.
19. Fill the crankcase with the specified type and amount of engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .



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Fig. 320: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

20. Start the engine and inspect for leaks.
21. Stop the engine and check the oil level.
22. Install the engine cover (1).

OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. When replacing oil filter, use a Mopar® filter or equivalent.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing of used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

PAN, OIL

REMOVAL

UPPER OIL PAN

1. Disconnect the negative battery cable.
2. Center and lock the steering wheel.
3. Remove bolts and the oil level indicator tube.

NOTE: The lower oil pan must be removed to access all of the upper oil pan retaining bolts.

4. Remove the lower oil pan. Refer to **PAN, OIL, REMOVAL**.

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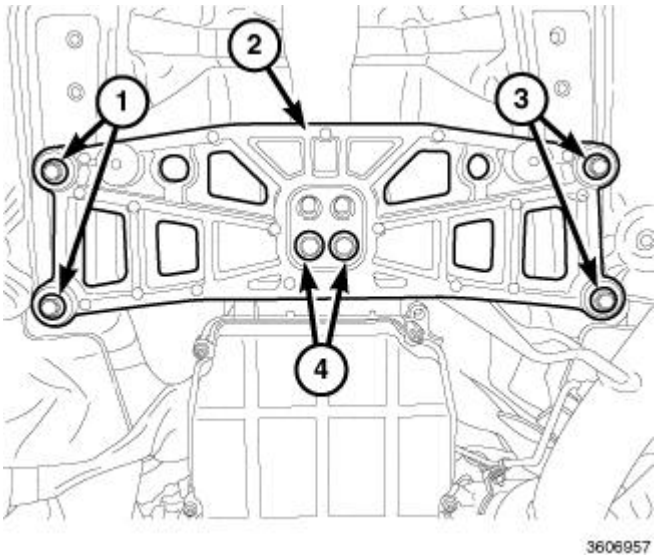


Fig. 321: Rear Crossmember & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the transmission belly pan.
6. Remove the two bolts (4) from the rear engine mount isolator.
7. Using a suitable transmission jack, positioned under the transmission oil pan, raise the transmission to gain enough clearance to remove the CKP sensor cover.

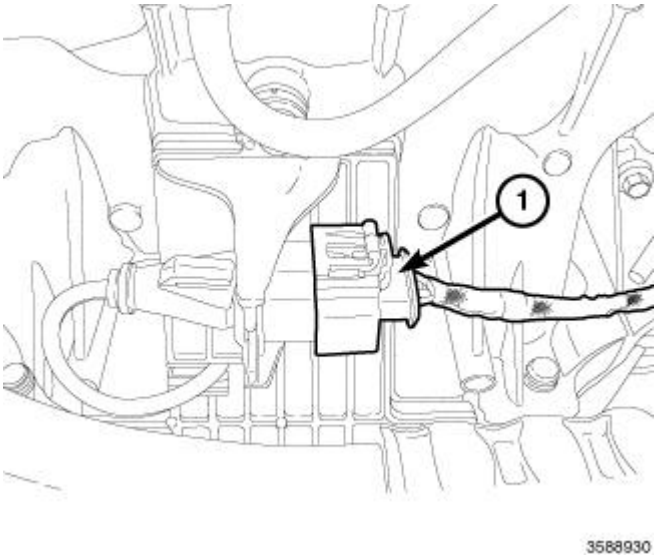


Fig. 322: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the Crankshaft Position Sensor (CKP) sensor wiring harness connector (1).

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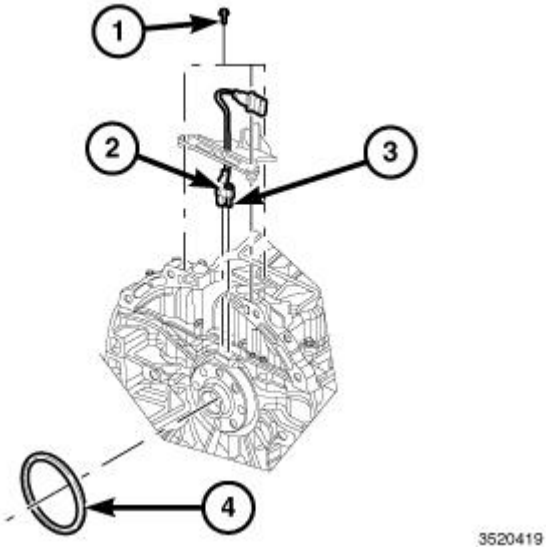


Fig. 323: CKP Sensor, Seal & Fasteners
Courtesy of CHRYSLER GROUP, LLC

9. Remove bolts (1) and the CKP sensor cover.

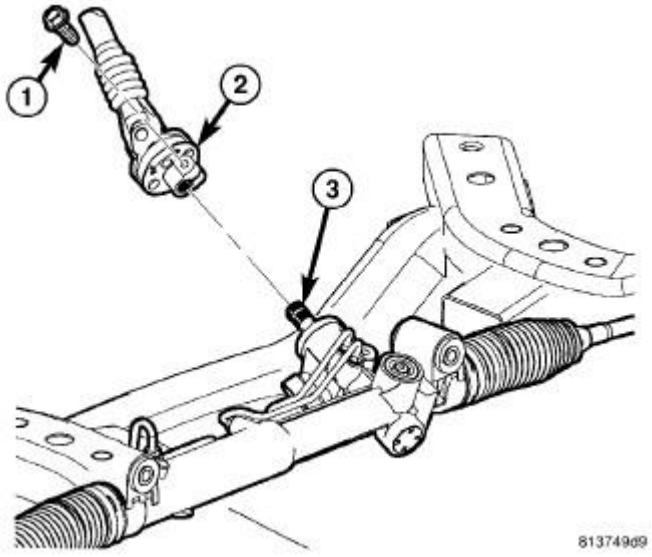


Fig. 324: Lower Intermediate Coupling Pinch Bolt, Lower Intermediate Shaft & Steering Gear
Courtesy of CHRYSLER GROUP, LLC

10. Remove lower intermediate coupling pinch bolt (1) at steering gear (3). Separate lower intermediate shaft (2) from steering gear shaft (3).

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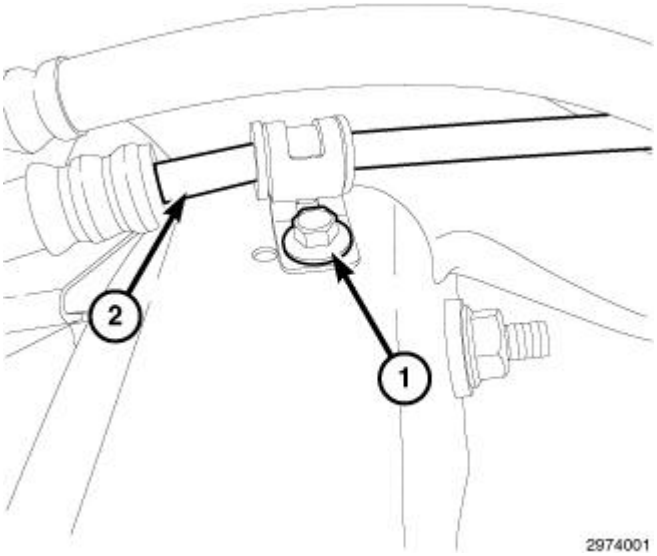


Fig. 325: Retaining Bolt & Return Line
Courtesy of CHRYSLER GROUP, LLC

11. Remove bolt (1) securing the return hose (2) to engine cradle.

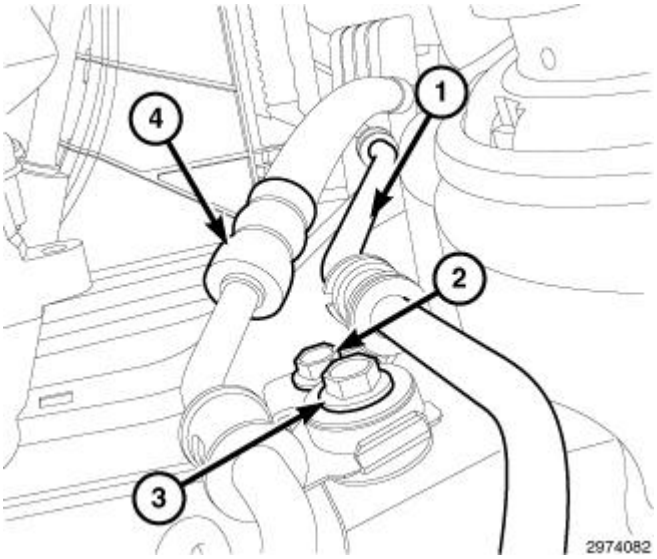


Fig. 326: Pressure Line, Return Line & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove bolt (3) securing pressure line (4) to right side of cradle.

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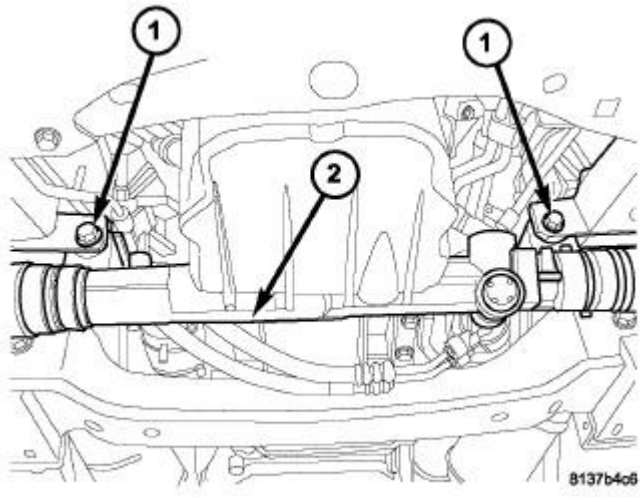


Fig. 327: Steering Gear & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Remove bolts (1) and allow the steering gear (2) to drop down out of mounts.

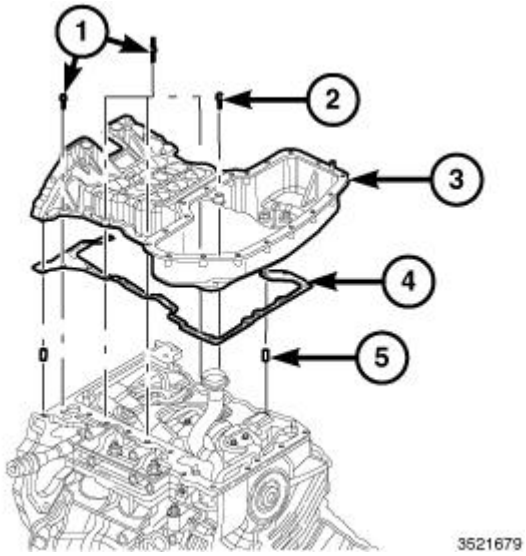


Fig. 328: Upper Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

14. Remove bolt (2) and the oil pump pick-up tube.
15. Remove the four upper oil pan-to-transmission bolts.
16. Remove bolts (1) and the upper oil pan (3).
17. Remove and discard gasket (4).

LOWER OIL PAN

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1. Remove the belly pan. Refer to **BELLY PAN, REMOVAL** .
2. Drain the engine oil. Using a new sealing washer, install and tighten drain plug to 45 N.m (33 ft. lbs.).

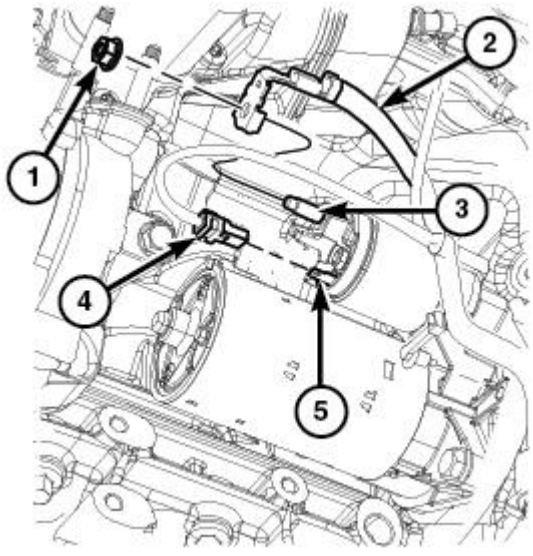


Fig. 329: Starter Cables, Connector & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove nut (1) and the B+ cable (2) from the stud (3) and position aside.
4. Disconnect the solenoid wire harness connector (4) from the terminal (5).

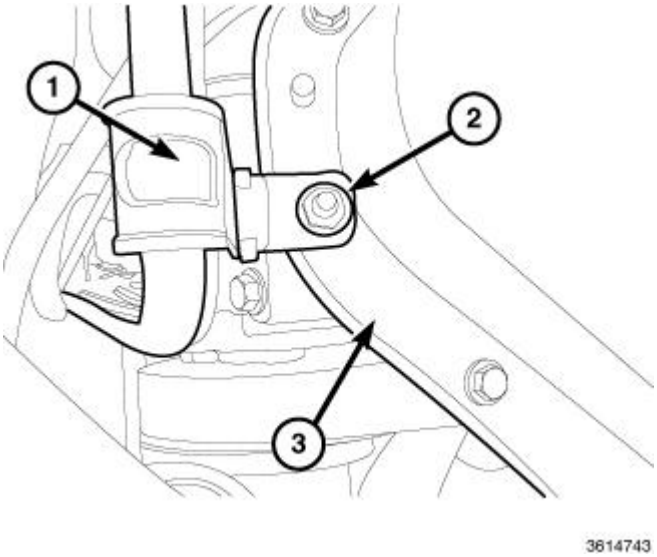


Fig. 330: Transmission Cooler Line Bracket, Nut & Oil Pan
Courtesy of CHRYSLER GROUP, LLC

5. Remove nut (2) securing the transmission cooler line bracket (1) to oil pan (3).

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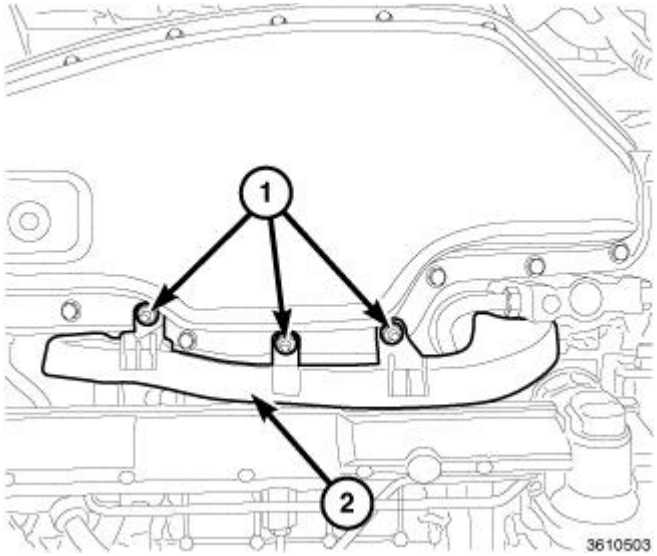


Fig. 331: Lower Engine Wire Harness & Nuts
Courtesy of CHRYSLER GROUP, LLC

6. Remove nuts (1) and allow wire harness (2) to drop down for clearance.

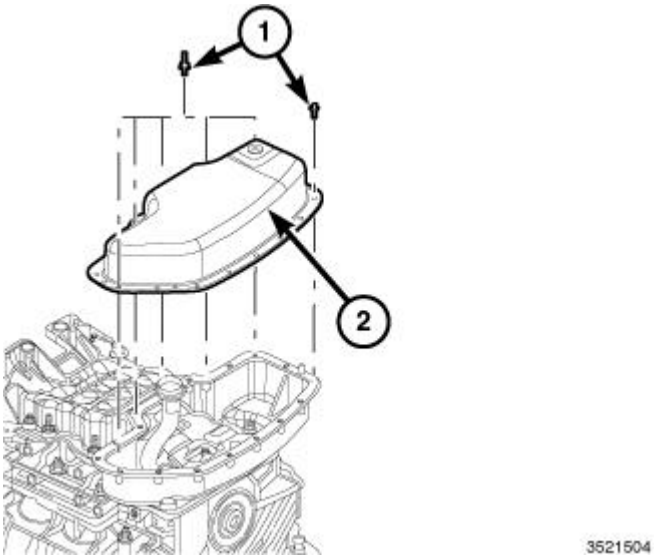


Fig. 332: Oil Pan & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Remove bolts (1) and the oil pan (2).

CLEANING

CLEANING - OIL PAN

CAUTION: Do not use oil based liquids, wire brushes, abrasive wheels or metal scrapers to clean the engine gasket surfaces. Use only isopropyl (rubbing)

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alcohol, along with plastic or wooden scrapers. Improper gasket surface preparation may result in engine fluid leakage.

1. Clean the oil pan in solvent and wipe dry with a clean cloth.
2. Remove all residual sealant (1) from the upper and lower oil pans. Refer to **Engine - Standard Procedure**.

INSTALLATION

UPPER OIL PAN

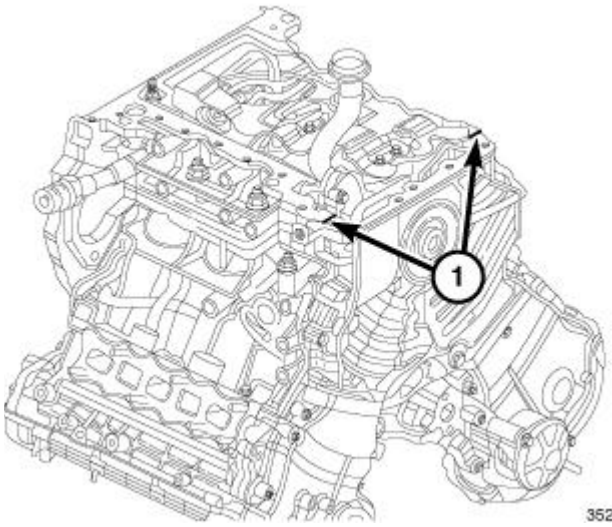


Fig. 333: RTV Sealant To Timing Cover To Engine Block T-Joints
Courtesy of CHRYSLER GROUP, LLC

1. Clean and gasket sealing surfaces. Refer to **Engine - Standard Procedure**.

NOTE: Clean the oil pan sealing surfaces with isopropyl alcohol in preparation for sealant application.

2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant to the timing cover to engine block T-joints (1).

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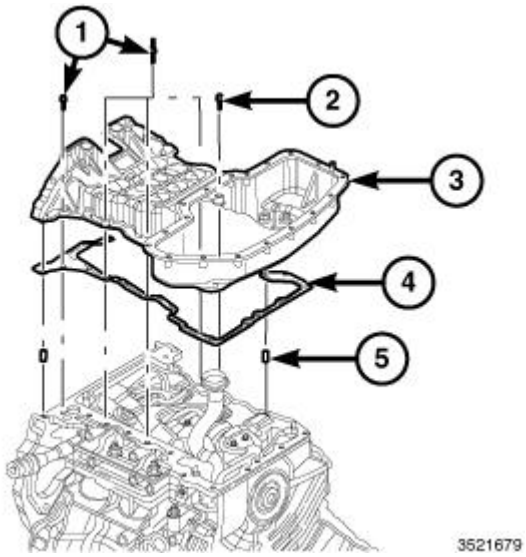


Fig. 334: Upper Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Install a new oil pan gasket (4).

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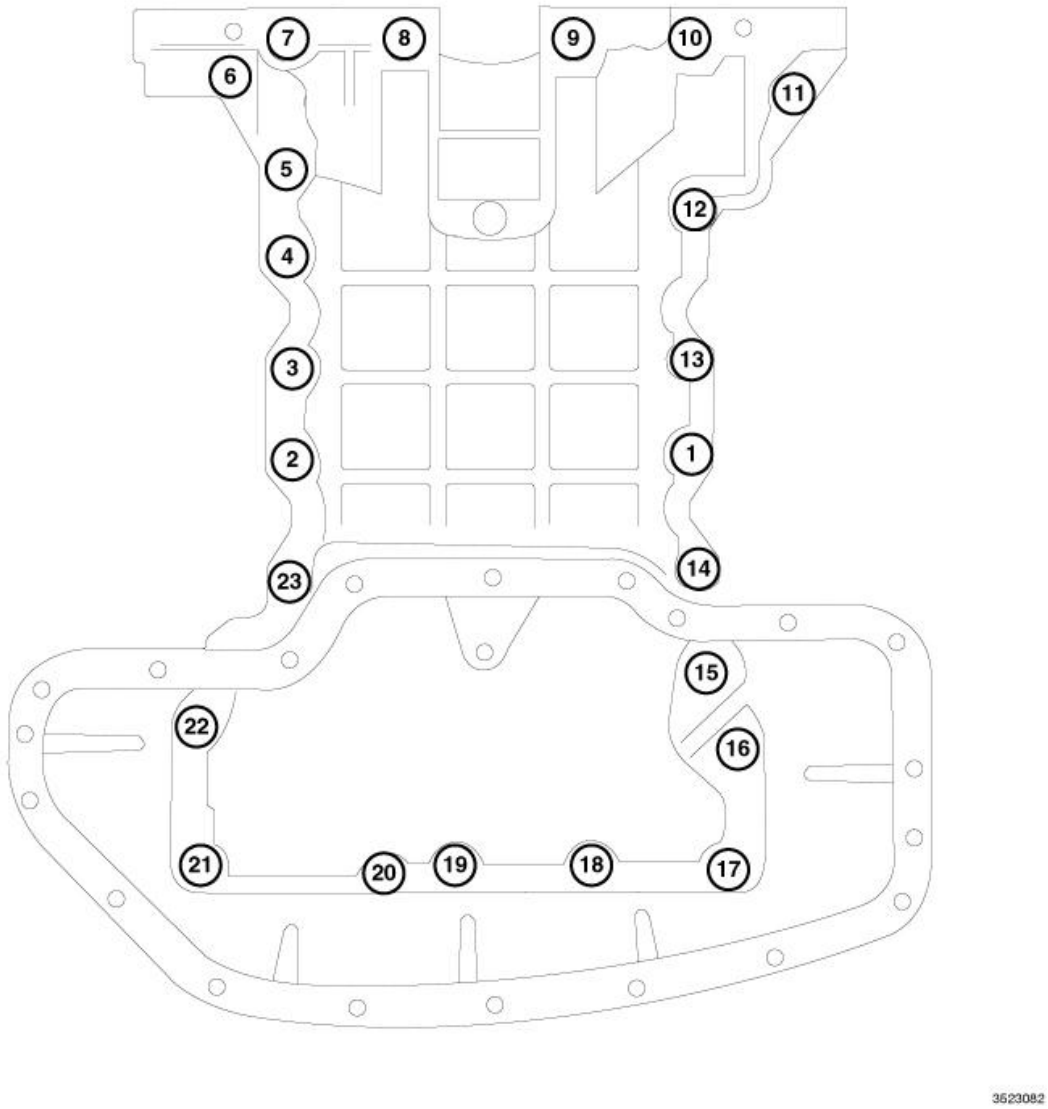


Fig. 335: Upper Oil Pan Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: Bolts in the following positions are stud bolts (4, 14, 17, 19, 21, and 23).

4. Install the upper oil pan and tighten bolts finger tight:
   - Using the tightening sequence shown in illustration, tighten bolts to 15 N.m (133 in. lbs.).
   - Loosen each bolt one at a time 90 degrees, then using the tightening sequence shown in illustration tighten bolts to 15 N.m (133 in. lbs.).

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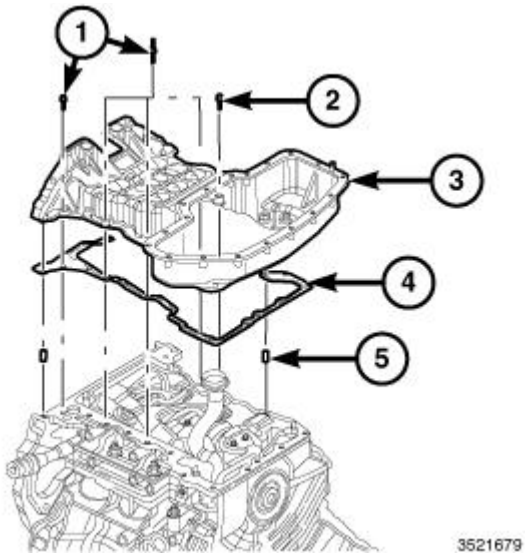


Fig. 336: Upper Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Install the four upper oil pan-to transmission to bolts and tighten to 39 N.m (29 ft. lbs.).
6. Install the oil pump pick-up tube. Tighten bolt (2) to 11 N.m (97 in. lbs.).

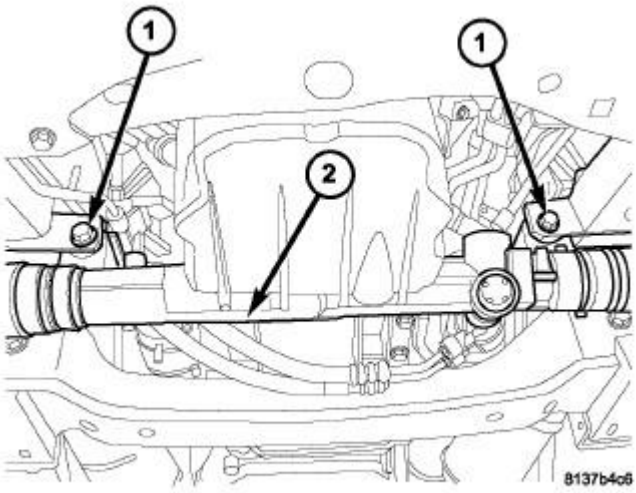


Fig. 337: Steering Gear & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Lift steering gear (2) into mounted position and install steering gear mounting bolts (1). Tighten bolts to 95 N.m (70 ft. lbs.).

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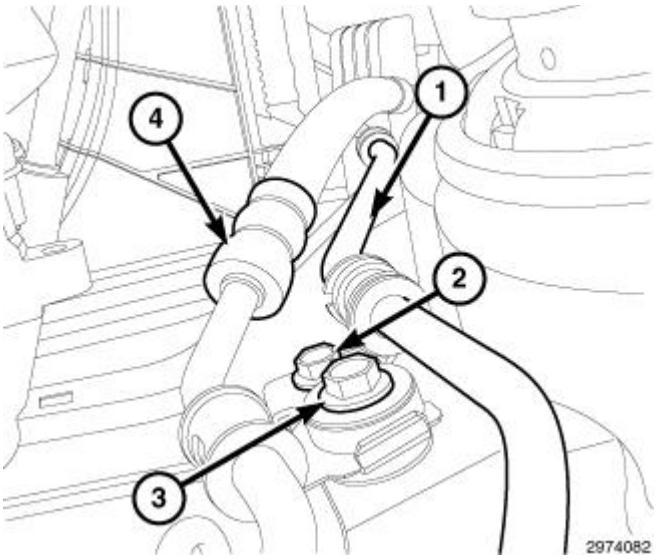


Fig. 338: Pressure Line, Return Line & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install bolt (2) securing return line (1) to right side of cradle and tighten to 19 N.m (168 in. lbs.).
9. Install bolt (3) securing pressure line (4) to right side of cradle and tighten to 19 N.m (168 in. lbs.).

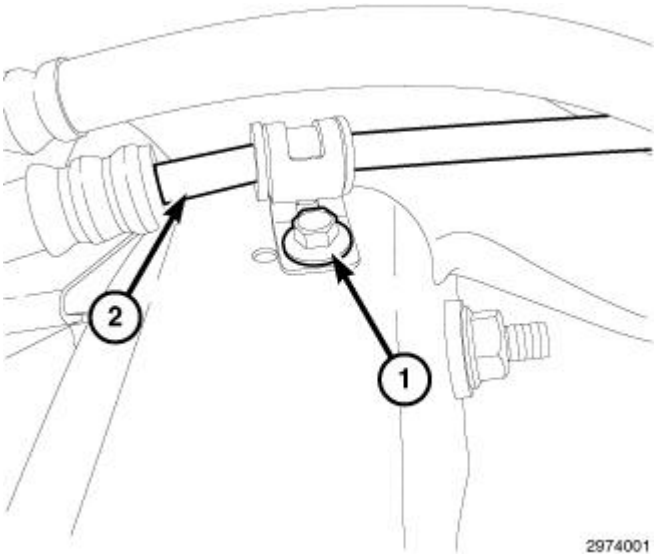


Fig. 339: Retaining Bolt & Return Line
Courtesy of CHRYSLER GROUP, LLC

10. Install bolt (1) securing the return hose (2) to engine cradle. Tighten bolt to 19 N.m (168 in. lbs.).

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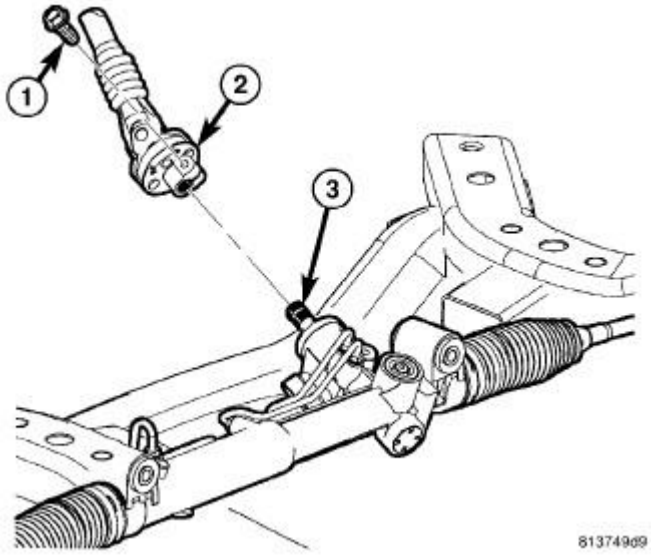


Fig. 340: Lower Intermediate Coupling Pinch Bolt, Lower Intermediate Shaft & Steering Gear
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Prior to coupling installation, make sure gear is centered in its travel to match clockspring centering in steering column.

11. Align lower intermediate shaft (2) with input shaft (3) and install steering coupling. Install NEW pinch bolt and tighten to 45 N.m (33 ft. lbs.).

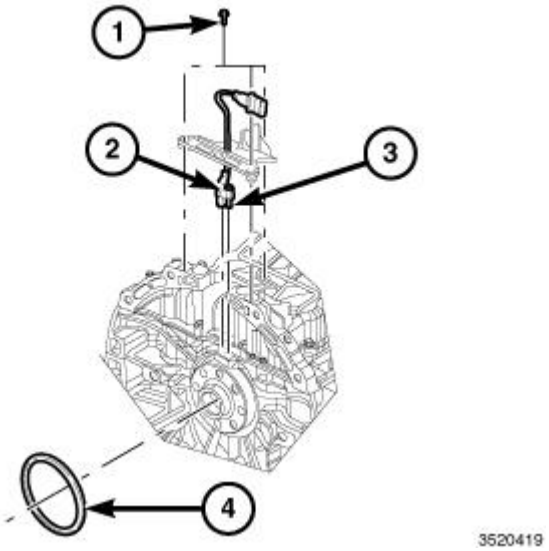


Fig. 341: CKP Sensor, Seal & Fasteners
Courtesy of CHRYSLER GROUP, LLC

12. Install the Crankshaft Position Sensor (CKP) sensor cover. Tighten bolts (1) to 8 N.m (71 in. lbs.).

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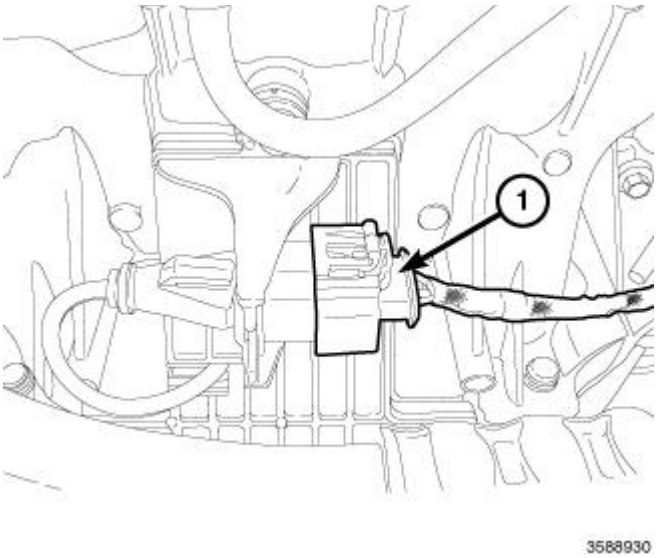


Fig. 342: Crankshaft Position Sensor (CKP) Wiring Harness Connector
Courtesy of CHRYSLER GROUP, LLC

13. Connect the CKP wire harness connector (1).

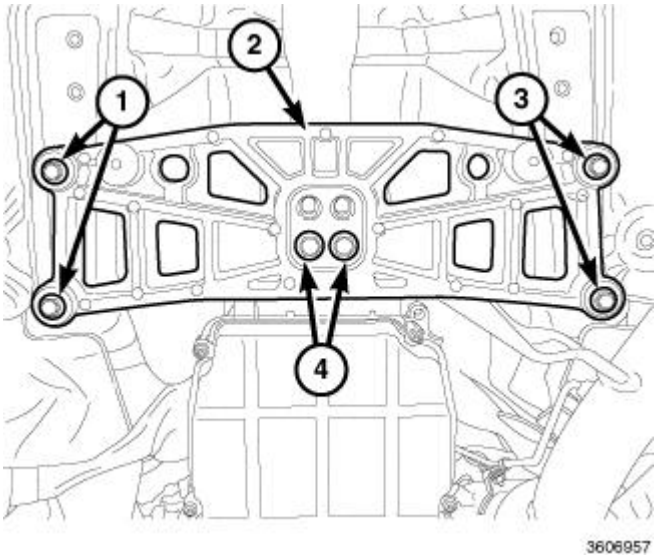


Fig. 343: Rear Crossmember & Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Lower the transmission so the weight is resting on the isolator.
15. Install the rear engine mount isolator bolts (4) and tighten to 61 N.m (45 ft. lbs.).
16. Install the transmission belly pan.
17. Install the lower oil pan. Refer to **PAN, OIL, INSTALLATION**.
18. Install the oil level indicator tube. Tighten bolts to 11 N.m (97 in. lbs.).
19. Replace the oil filter and fill the engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .

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20. Remove the steering wheel lock.
21. Connect the negative battery cable.

LOWER OIL PAN

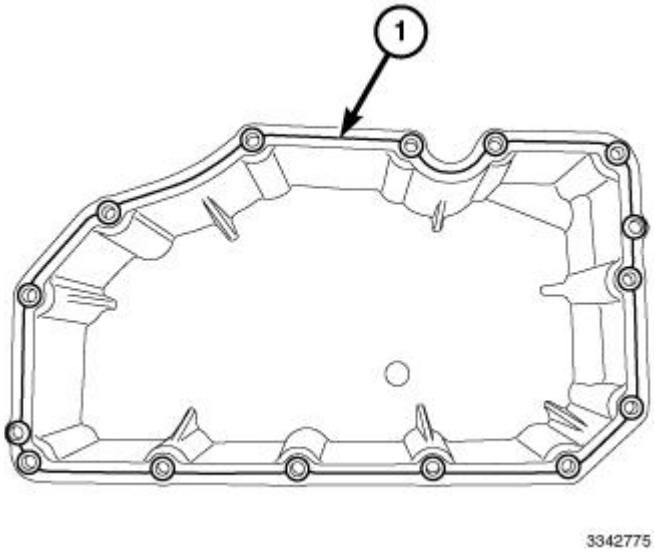


Fig. 344: Lower Oil Pan Gasket Sealing Surfaces
Courtesy of CHRYSLER GROUP, LLC

1. Clean and gasket sealing surfaces. Refer to **Engine - Standard Procedure**.

CAUTION: Engine assembly requires the use of a unique sealant that is compatible with engine oil. Using a sealant other than Mopar® Threebond Engine RTV Sealant may result in engine fluid leakage.

CAUTION: Following the application of Mopar® Threebond Engine RTV Sealant to the gasket surfaces, the components must be assembled within 20 minutes and the attaching fasteners must be tightened to specification within 45 minutes. Prolonged exposure to the air prior to assembly may result in engine fluid leakage.

NOTE: Sealing surfaces must be free of a gasket material and oil residue. Clean the oil pan sealing surfaces with isopropyl alcohol in preparation for sealant application.

2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant to the lower oil pan as shown in illustration (1).

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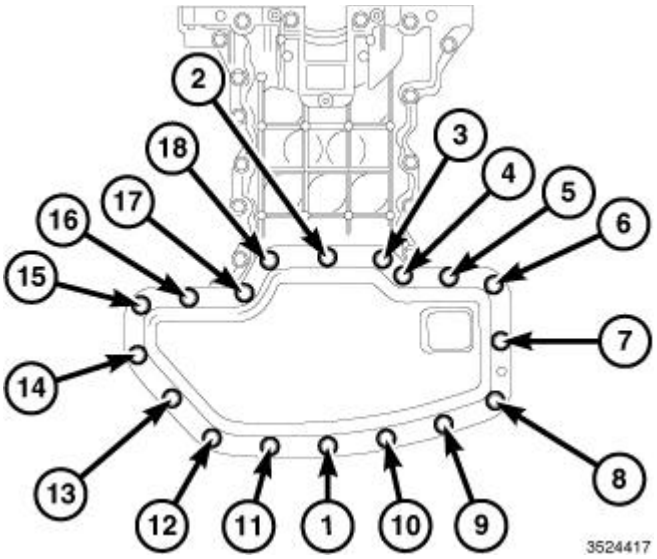


Fig. 345: Oil Pan To Engine Block Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: Stud bolts go in the following locations: 2, 4, 6, 14, and 18.

3. Position the oil pan to engine block and install the oil pan bolts finger tight.
   - Using the tightening sequence shown in illustration, tighten the oil pan bolts to 15 N.m (133 in. lbs.).
   - Loosen each bolt one at a time 90 degrees, then using the tightening sequence shown in illustration tighten bolts to 15 N.m (133 in. lbs.).

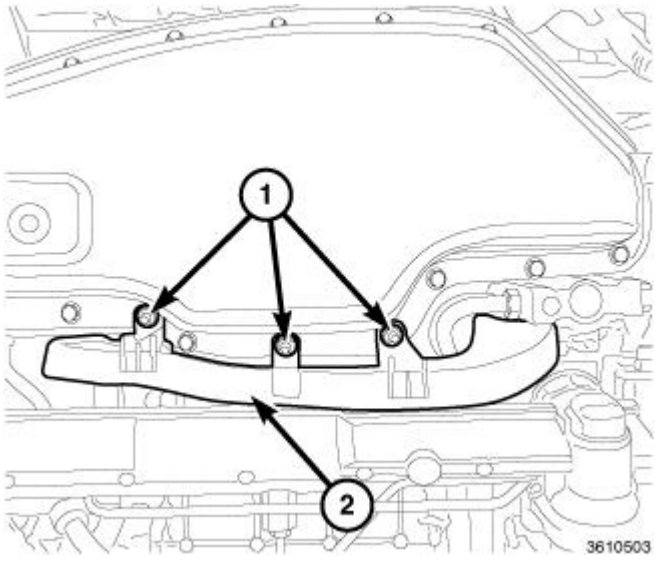


Fig. 346: Lower Engine Wire Harness & Nuts
Courtesy of CHRYSLER GROUP, LLC

4. Install the wire harness (2). Tighten nuts (1) to 11 N.m (97 in. lbs.).

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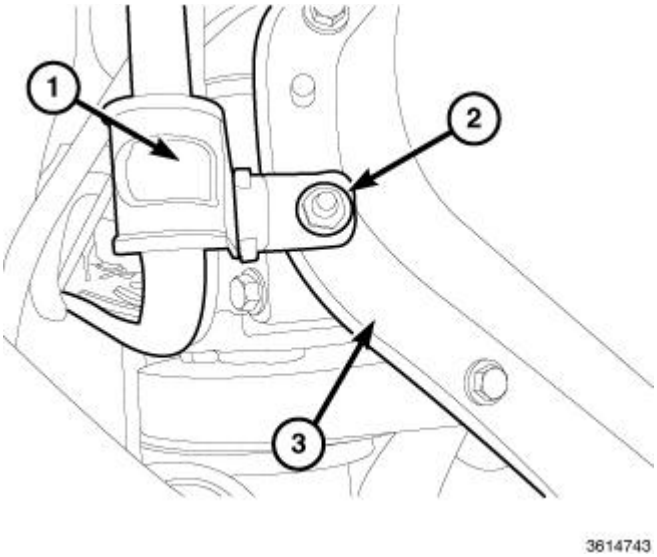


Fig. 347: Transmission Cooler Line Bracket, Nut & Oil Pan
Courtesy of CHRYSLER GROUP, LLC

5. Install the transmission cooler line bracket (1) and tighten nuts (2) to 11 N.m (97 in. lbs.).

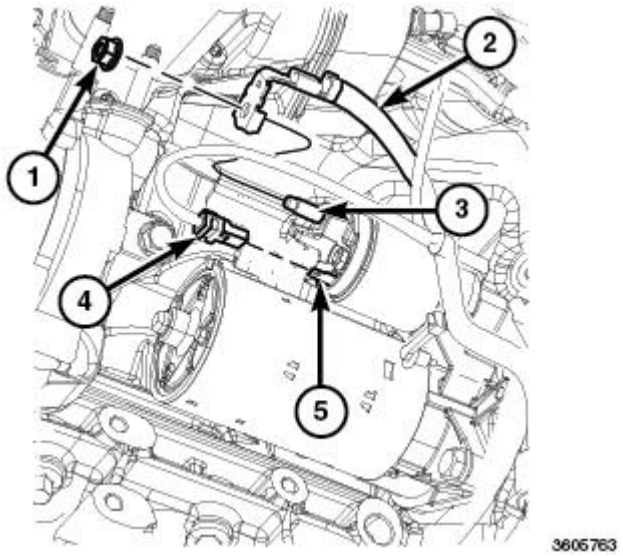


Fig. 348: Starter Cables, Connector & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Connect the solenoid wire harness connector (4) to the solenoid terminal (5).
7. Install the B+ cable (2) to the solenoid stud (3). Tighten nut (1) to 11 N.m (97 in. lbs.).
8. Install the belly pan. Refer to **BELLY PAN, INSTALLATION** .
9. Fill the engine with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .

PICK-UP, OIL PUMP

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REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the lower oil pan. Refer to **PAN, OIL, REMOVAL**.

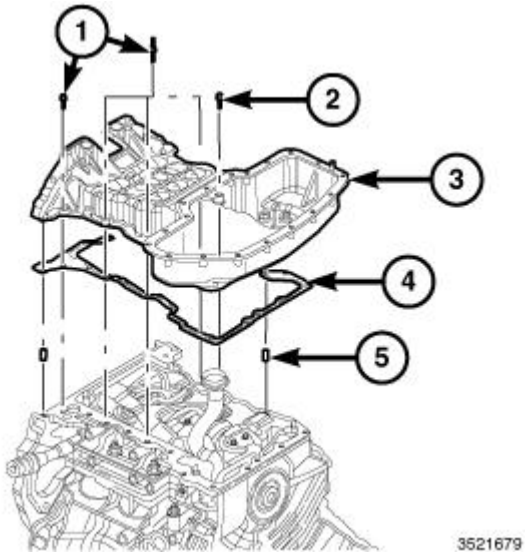


Fig. 349: Upper Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove the oil pump pickup tube bolt (2).

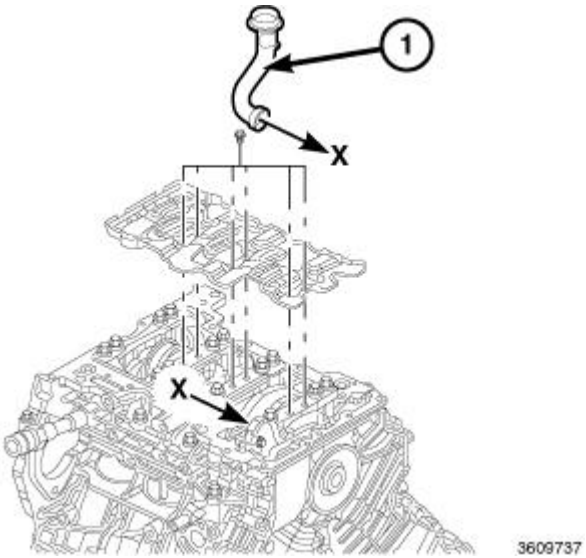


Fig. 350: Oil Pump Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

4. Remove the oil pump pickup tube (1) from oil pump.

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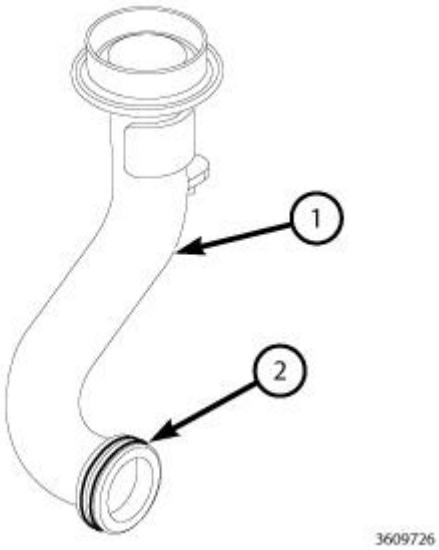


Fig. 351: Oil Pump Pickup Tube & O-Ring
Courtesy of CHRYSLER GROUP, LLC

5. Remove and discard O-ring (2).

INSTALLATION

INSTALLATION

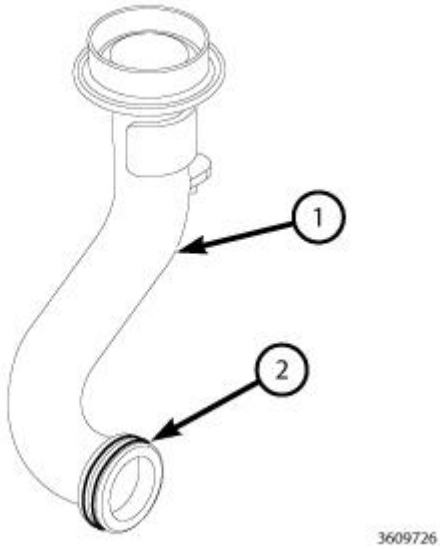


Fig. 352: Oil Pump Pickup Tube & O-Ring
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate and install a new O-ring (2) on oil pump pickup tube (1).

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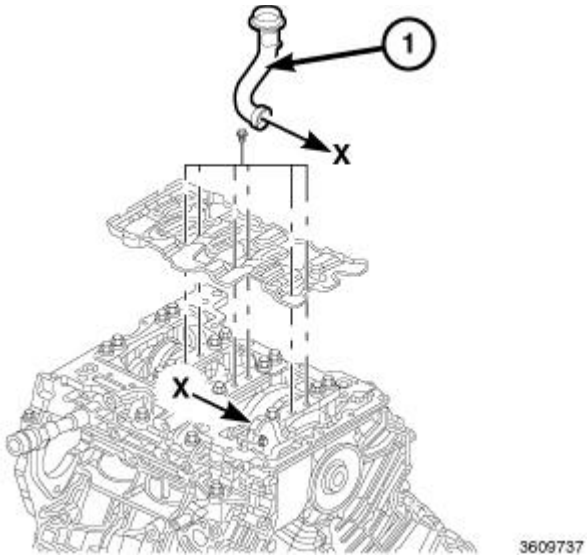


Fig. 353: Oil Pump Pickup Tube
Courtesy of CHRYSLER GROUP, LLC

2. Install pickup tube (2) into oil pump.

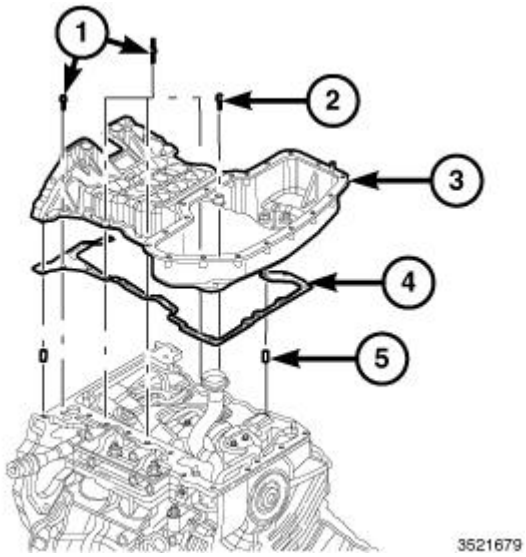


Fig. 354: Upper Oil Pan, Gasket & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Tighten the oil pump pickup tube bolts (1) to 11 N.m (97 in. lbs.).
4. Install the lower oil pan. Refer to **PAN, OIL, INSTALLATION**.
5. Fill the engine to proper level with recommended engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
6. Connect the negative battery cable.

PUMP, ENGINE OIL

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REMOVAL

REMOVAL

1. Remove the oil pump pick-up tube. Refer to **PICK-UP, OIL PUMP, REMOVAL**.
2. Remove the lower timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

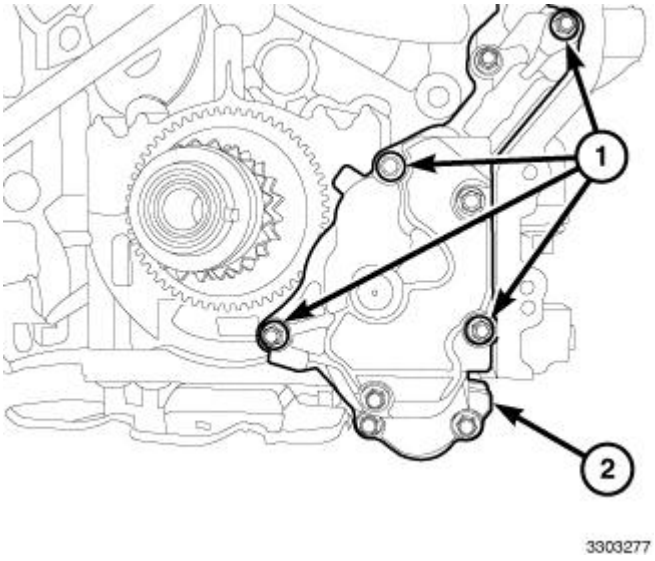


Fig. 355: Engine Oil Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts and the engine oil pump (1).

INSTALLATION

INSTALLATION

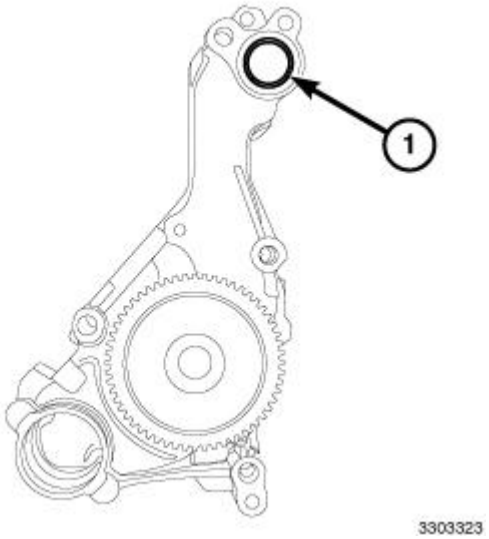


Fig. 356: Engine Oil Pump O-Ring Gasket

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Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket sealing surfaces. Refer to **Engine - Standard Procedure**.
2. Install a new O-ring gasket (1) onto the oil pump.

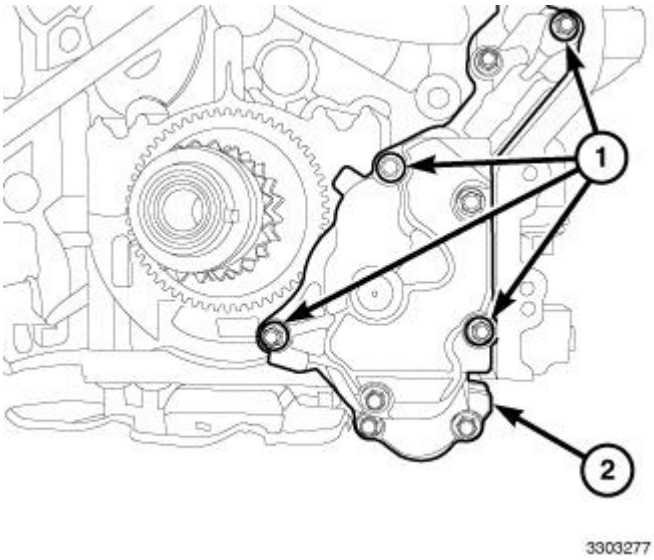


Fig. 357: Engine Oil Pump & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the oil pump. Tighten bolts to 14 N.m (124 in. lbs.).
4. Install the lower timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
5. Install oil pump pick-up tube. Refer to **PICK-UP, OIL PUMP, INSTALLATION**.

SENSOR, OIL PRESSURE

DESCRIPTION

DESCRIPTION

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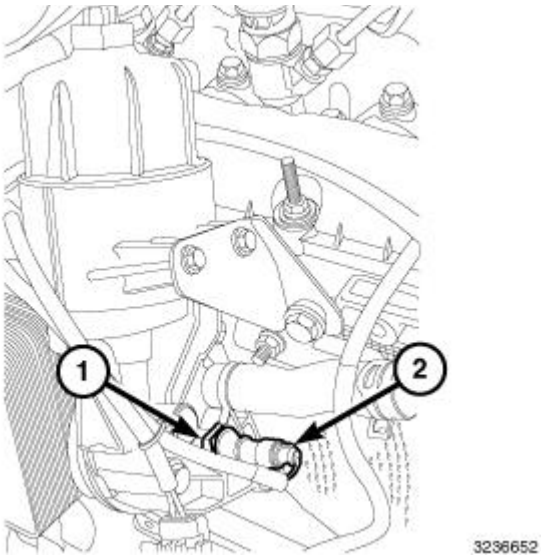


Fig. 358: Engine Oil Pressure Sensor & Connector
Courtesy of CHRYSLER GROUP, LLC

The engine oil pressure sensor (1) is mounted on the oil cooler adapter housing. The sensor provides an output voltage to the PCM that corresponds to the engine oil pressure. Under certain operating conditions, for example low oil pressure, it may be necessary for the PCM to increase the engine idle speed to ensue adequate engine lubrication.

The engine oil pressure sensor (1) is a single wire sensor with a threaded pressure port. The pressure port is mounted to the oil cooler adapter housing through an access hole. An aluminum seal ring seals the engine oil pressure sensor to the oil cooler adapter housing.

OPERATION

OPERATION

The engine oil pressure sensor receives a 5- volt reference from the PCM. The sensor ground is also provided by the PCM. The sensor output voltage varies from 0.5 to 4.5 volts depending on engine oil pressure.

REMOVAL

REMOVAL

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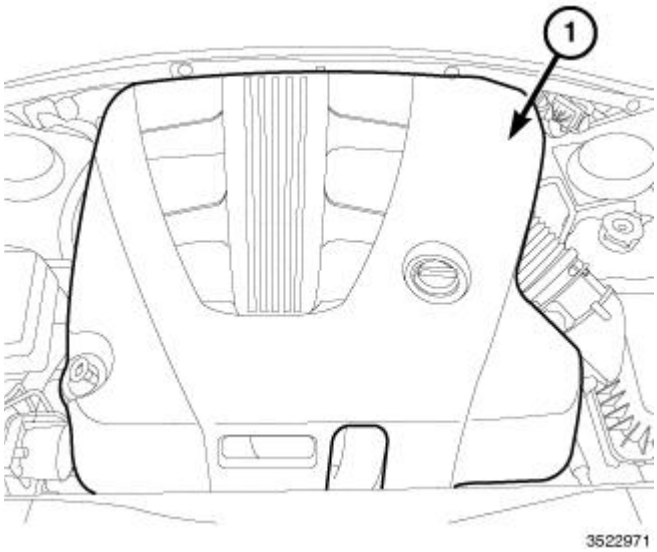


Fig. 359: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

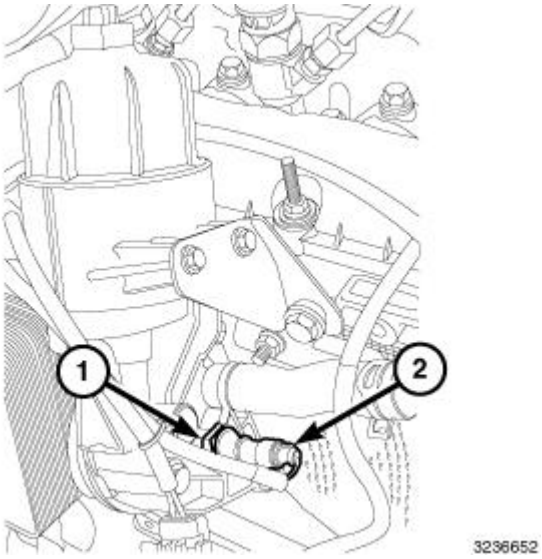


Fig. 360: Engine Oil Pressure Sensor & Connector
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect engine oil pressure sensor harness connector (2).
4. Remove engine oil pressure sensor (1).

INSTALLATION

INSTALLATION

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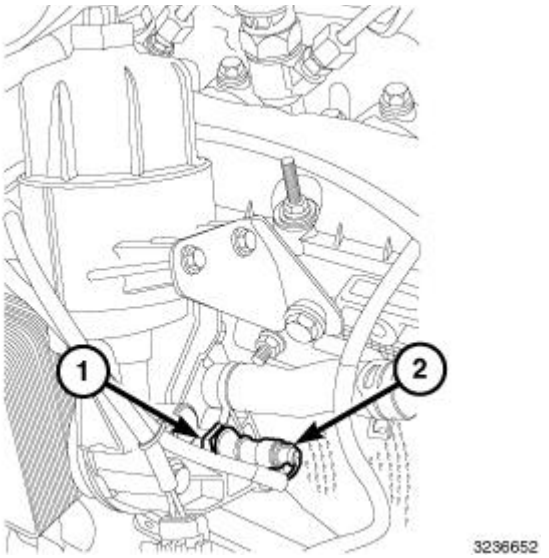


Fig. 361: Engine Oil Pressure Sensor & Connector
Courtesy of CHRYSLER GROUP, LLC

1. Install the engine oil pressure sensor (1). Tighten sensor (1) to 33 N.m (24 ft. lbs.).
2. Connect engine oil pressure sensor harness connector (2).

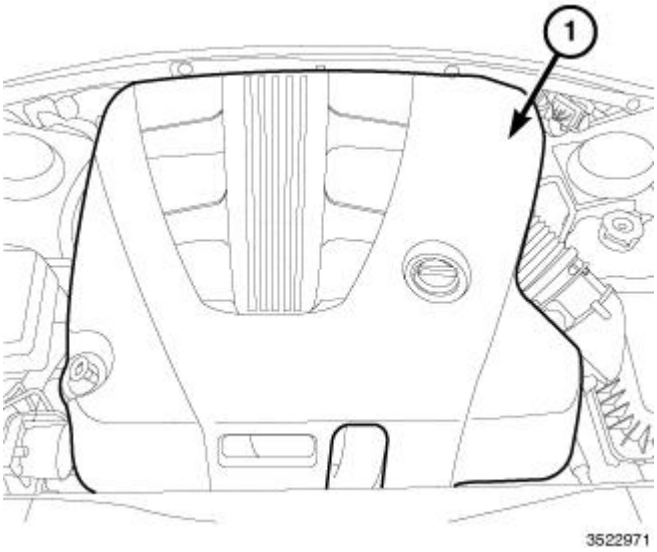


Fig. 362: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

3. Install the engine cover (1).
4. Connect the negative battery cable.
5. Start vehicle and inspect for leaks.

MANIFOLDS

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ACTUATOR, SWIRL VALVE

DESCRIPTION

DESCRIPTION

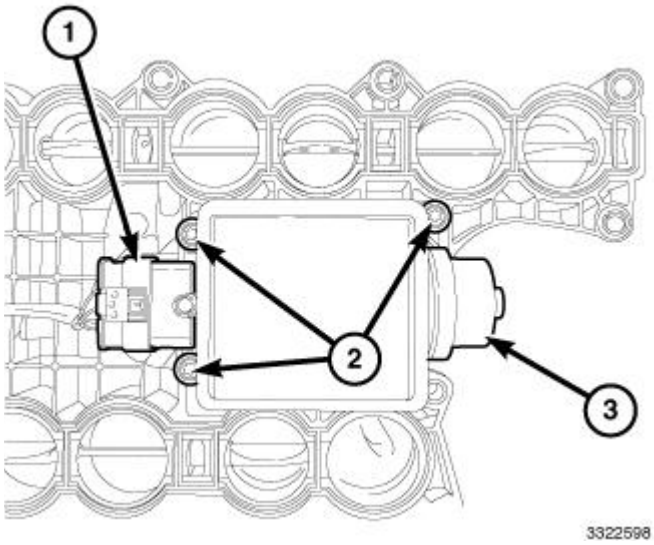


Fig. 363: Swirl Valve Actuator, Connector & Fasteners
Courtesy of CHRYSLER GROUP, LLC

The intake manifolds feature swirl intake ports to reduce particulates at low engine speeds. Each cylinder incorporates one swirl port and one charge port. The swirl ports can be closed by the swirl valves. The valves are connected together via a linkage which is operated by the swirl valve actuator (3). The swirl valves are normally open by spring tension. The spring is integral with the swirl valve actuator. In the lower engine speed and load range, the swirl valves are closed by the swirl valve actuator (3). The entire air mass flows through the charge ports only, which results in greater swirling. The increased swirling produces uniform combustion for better engine performance and reduction of particulates. As rotational speed and load increases, the swirl valves open, so that optimal swirling and the required air mass are provided for the current operating conditions.

REMOVAL

REMOVAL

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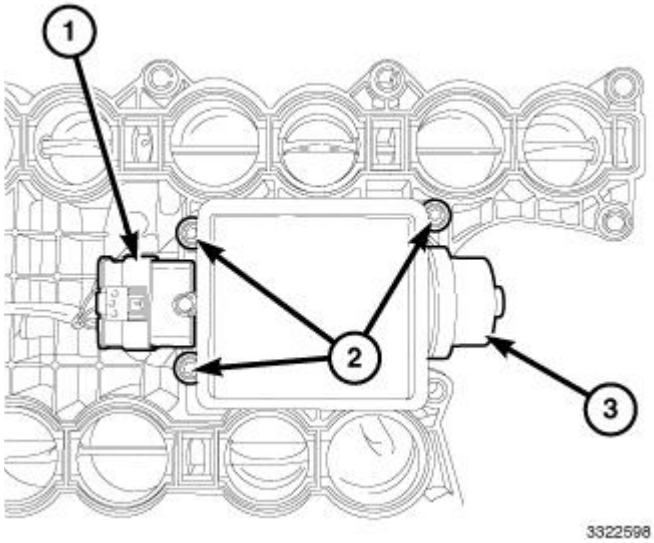


Fig. 364: Swirl Valve Actuator, Connector & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
3. Disconnect the swirl valve actuator harness connector (1).
4. Remove fasteners (2) and the swirl valve actuator (3).

INSTALLATION

INSTALLATION

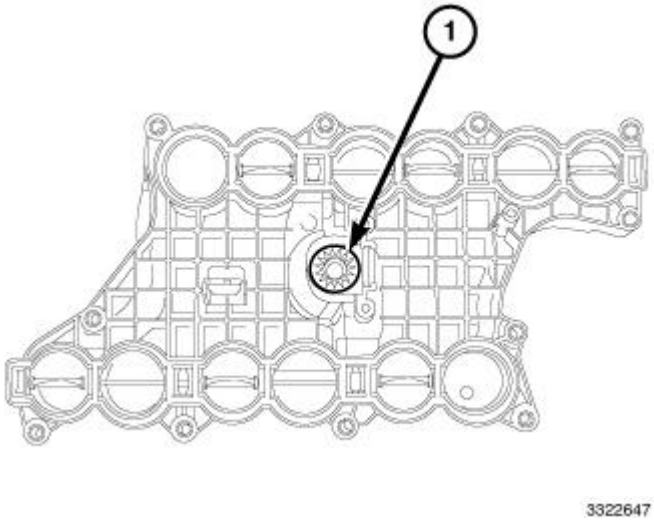


Fig. 365: Swirl Valve Gear
Courtesy of CHRYSLER GROUP, LLC

1. Inspect the swirl valve gear (1) for damage.

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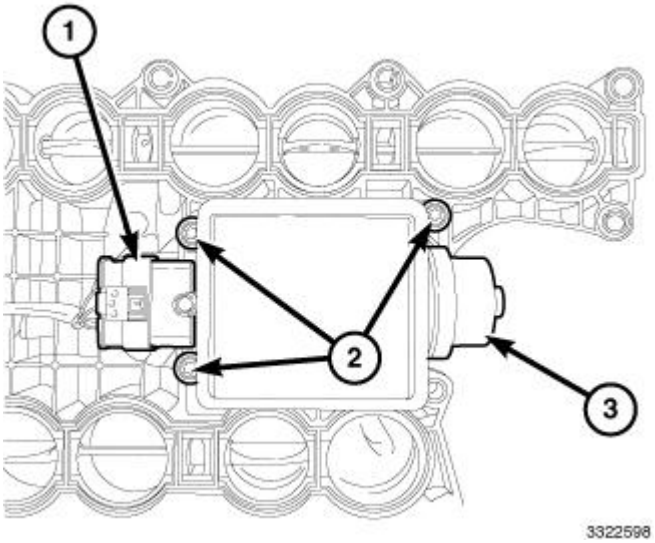


Fig. 366: Swirl Valve Actuator, Connector & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Install the swirl valve actuator (3) and securely tighten fasteners (2).
3. Connect the swirl valve harness connector (1).
4. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
5. Connect the negative battery cable.

MANIFOLD, EXHAUST

REMOVAL

RIGHT BANK

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it has cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

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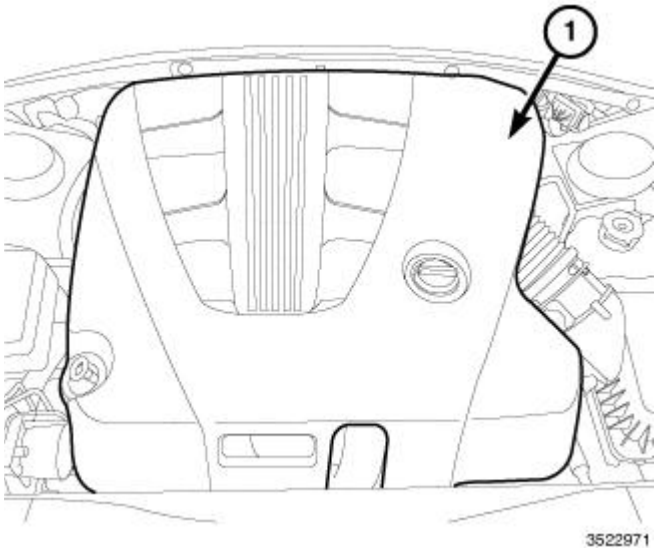


Fig. 367: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

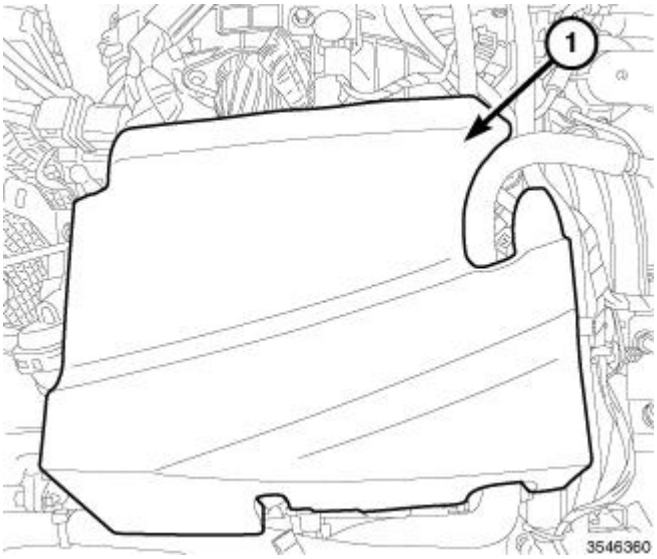


Fig. 368: Right Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

3. Remove the right side fuel injector silencer (1).

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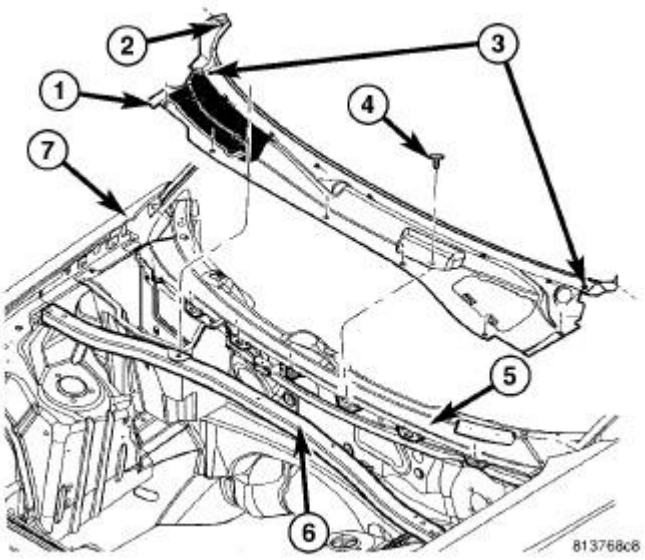
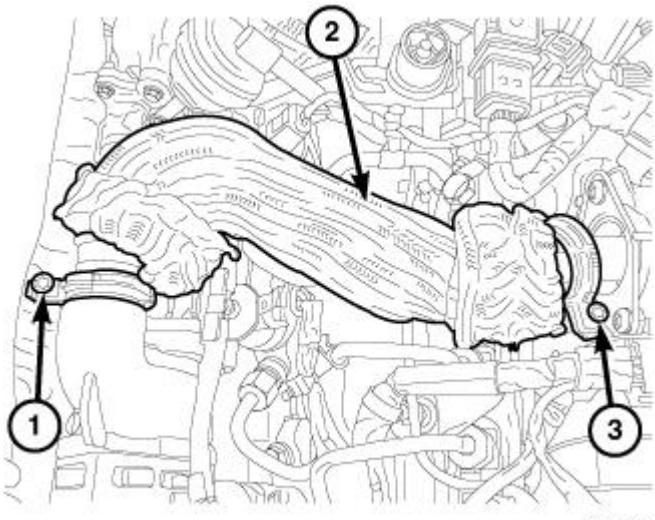


Fig. 369: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

4. Remove the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, REMOVAL** .
5. Remove bolts and the strut support brace (6).
6. Remove fasteners and the rear engine compartment heat shield.
7. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
8. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
9. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
10. Remove the lower oil dipstick tube bolt.
11. Remove the generator. Refer to **GENERATOR, REMOVAL** .



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Fig. 370: EGR Tube & Clamps
Courtesy of CHRYSLER GROUP, LLC

12. Remove the EGR tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), REMOVAL** .

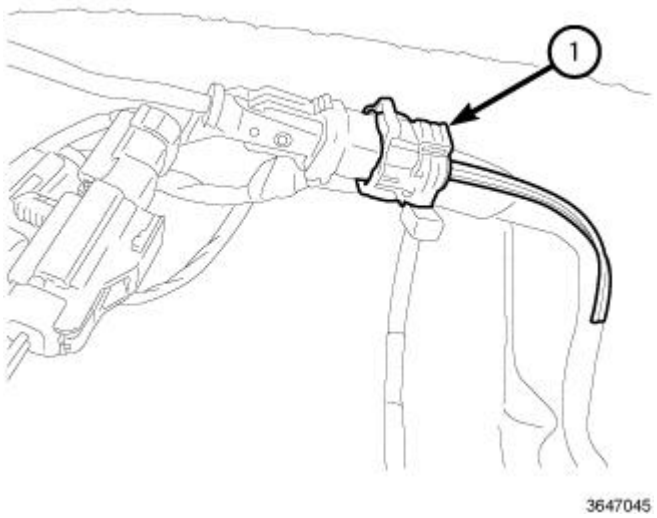


Fig. 371: Exhaust Temperature Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

13. Disconnect the exhaust temperature sensor wire harness connector (1).
14. Remove nut and the engine oil dip stick.

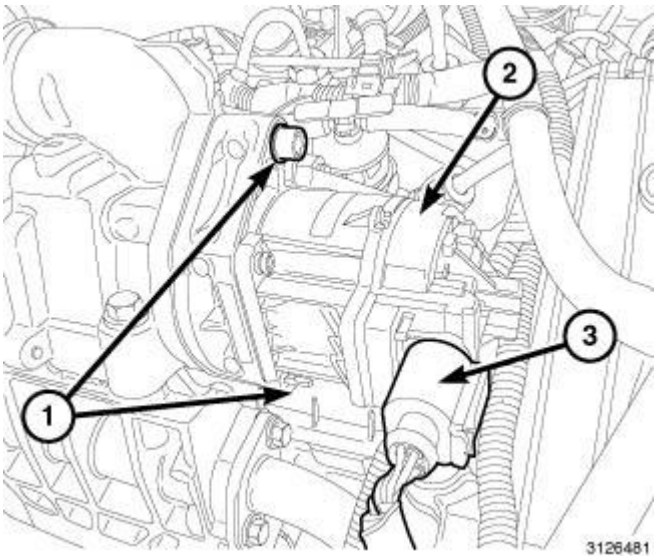


Fig. 372: EGR Valve, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

15. Disconnect the EGR valve wire harness connector (2).

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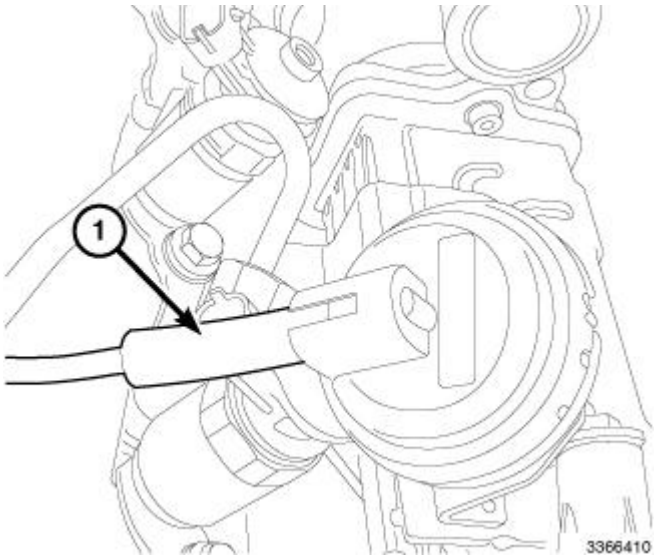


Fig. 373: EGR Cooler Vacuum Bypass Hose
Courtesy of CHRYSLER GROUP, LLC

16. Disconnect the EGR cooler vacuum bypass hose (1).

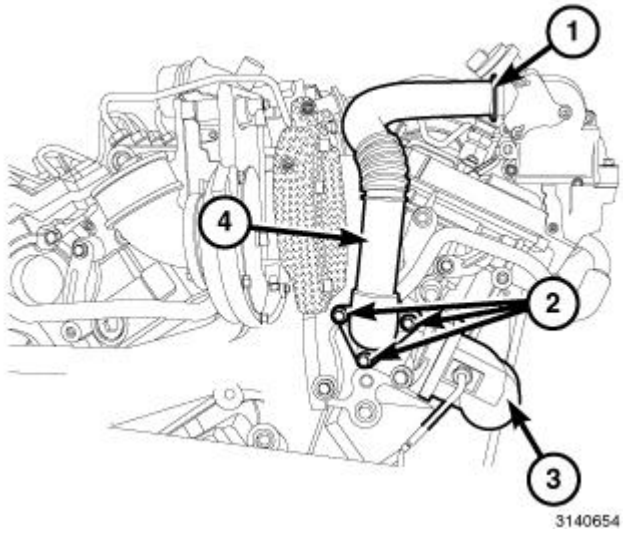


Fig. 374: Turbocharger-To-EGR Cooler Tube Clamp
Courtesy of CHRYSLER GROUP, LLC

17. Remove the turbocharger-to-EGR cooler tube clamp (1).

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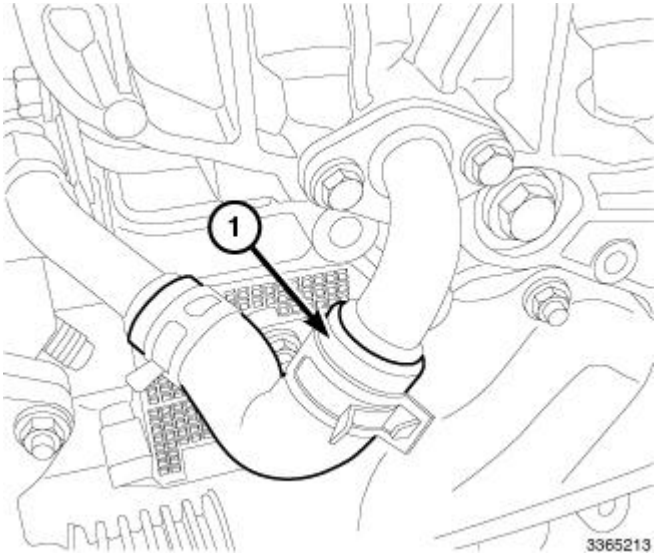


Fig. 375: EGR Cooler Supply Hose
Courtesy of CHRYSLER GROUP, LLC

18. Disconnect the EGR cooler supply hose (1).

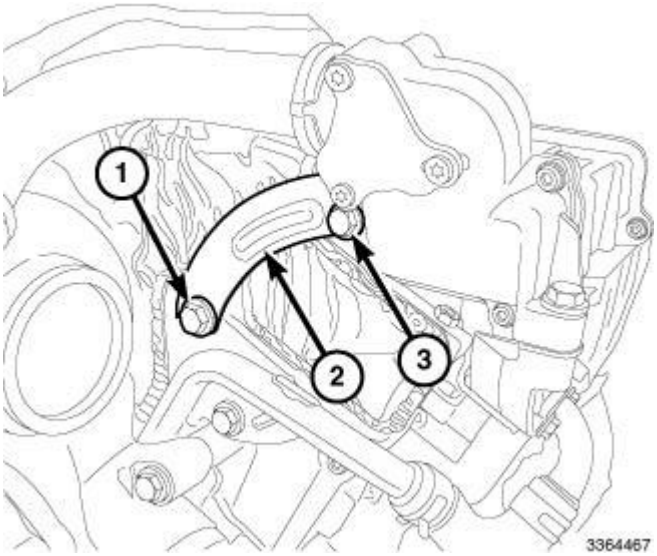


Fig. 376: EGR Cooler Bypass Valve Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

19. Remove bolt (3) at the rear EGR cooler bypass valve support bracket (2).

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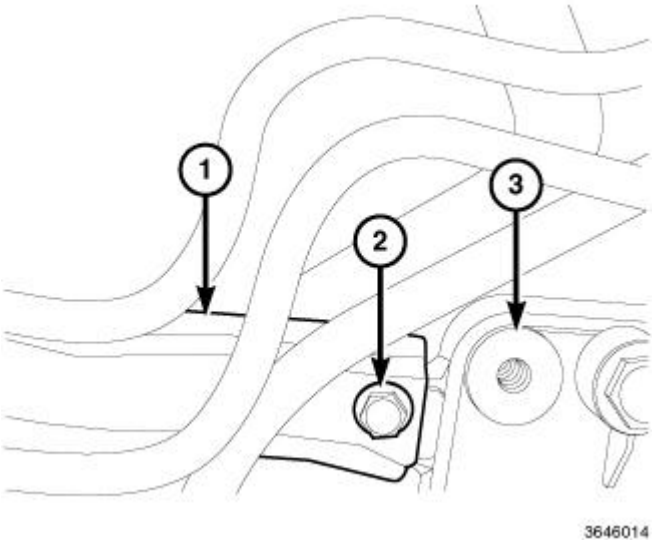


Fig. 377: Fuel Line Support Bracket, Generator Mounting Bracket & Bolt
Courtesy of CHRYSLER GROUP, LLC

20. Remove bolt (2) securing the fuel line support bracket (1) to generator mounting bracket (3).

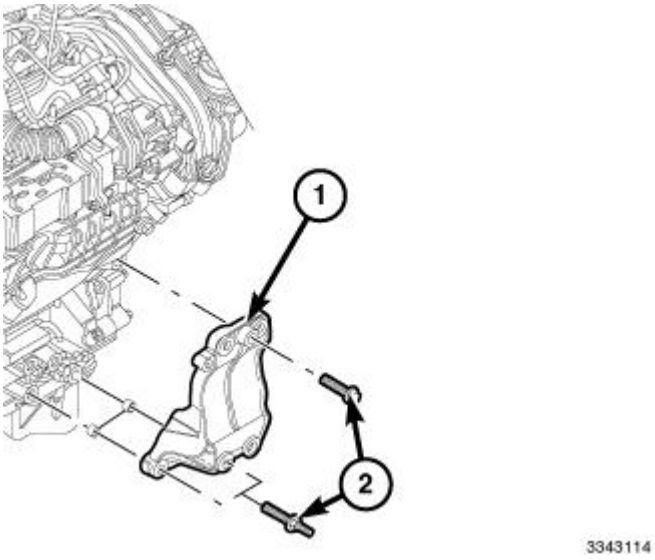


Fig. 378: Generator Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (2) and the generator mounting bracket (1).

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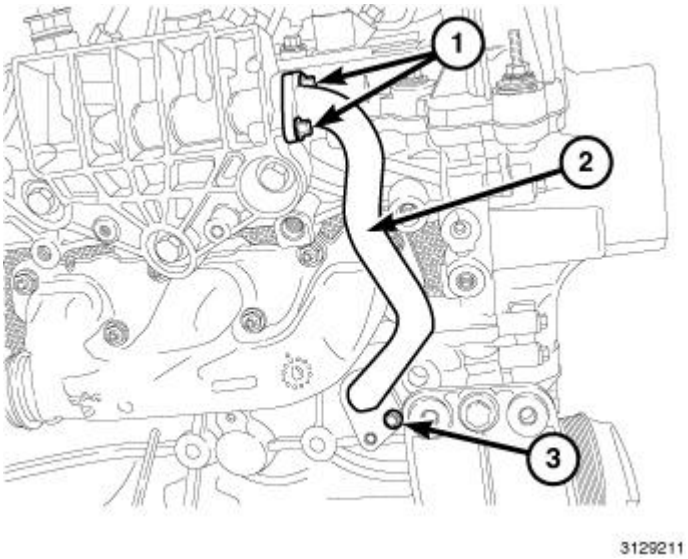


Fig. 379: EGR Cooler Coolant Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

22. Remove bolts (1 and 3) and the EGR cooler coolant tube (2).

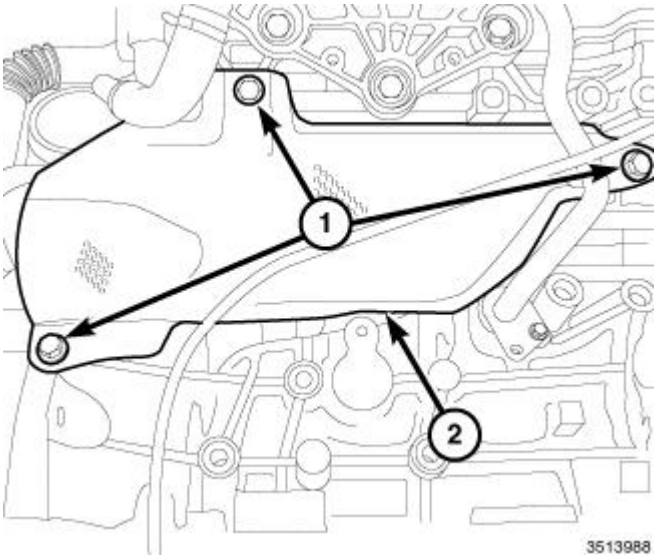


Fig. 380: Right Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

23. Remove bolts (1) and the right exhaust manifold heat shield (2).

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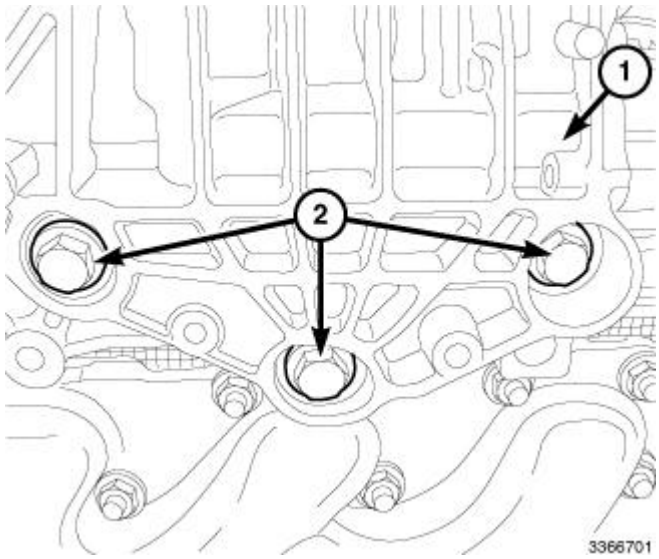


Fig. 381: Cooler Assembly Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

24. Remove bolts (2) and the EGR and cooler assembly bracket (1).

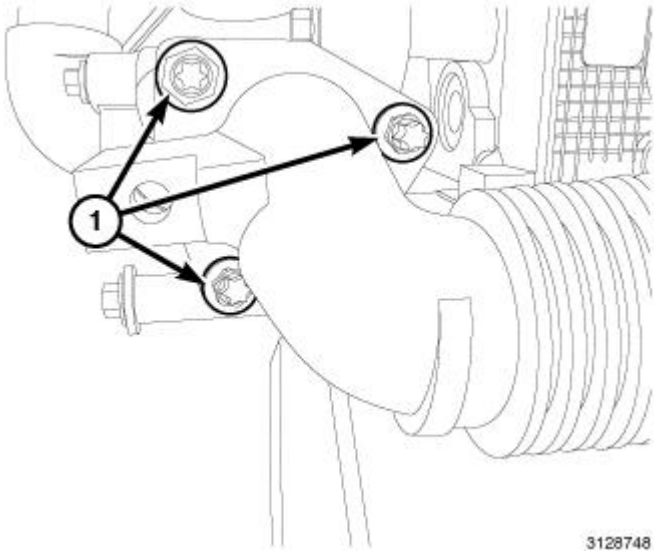


Fig. 382: Right Exhaust Manifold To Turbocharger Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

25. Raise the vehicle.
26. Remove the right exhaust manifold to turbocharger retaining nuts (1).

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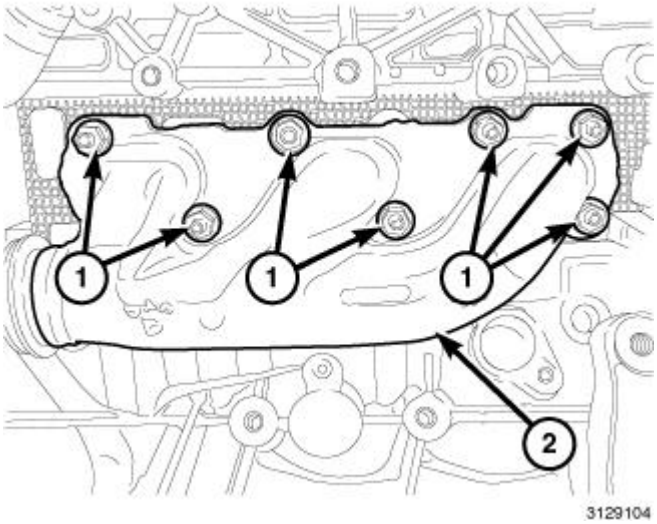


Fig. 383: Right Exhaust Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

27. Remove the nuts (1) and right exhaust manifold (2).

LEFT BANK

WARNING: The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it has cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

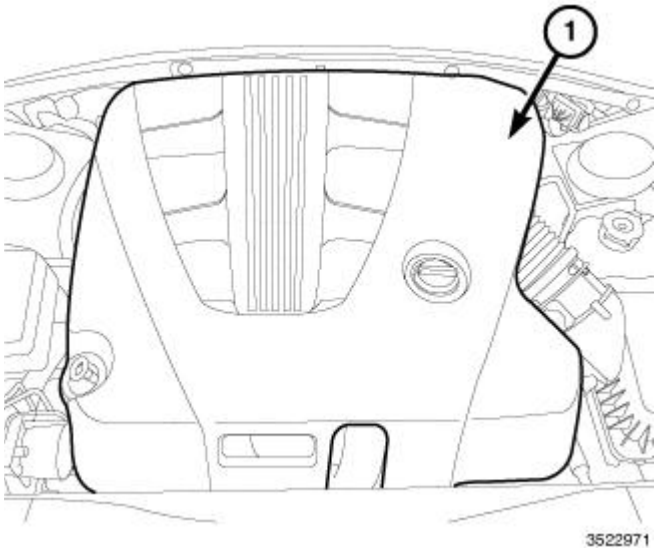


Fig. 384: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

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1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

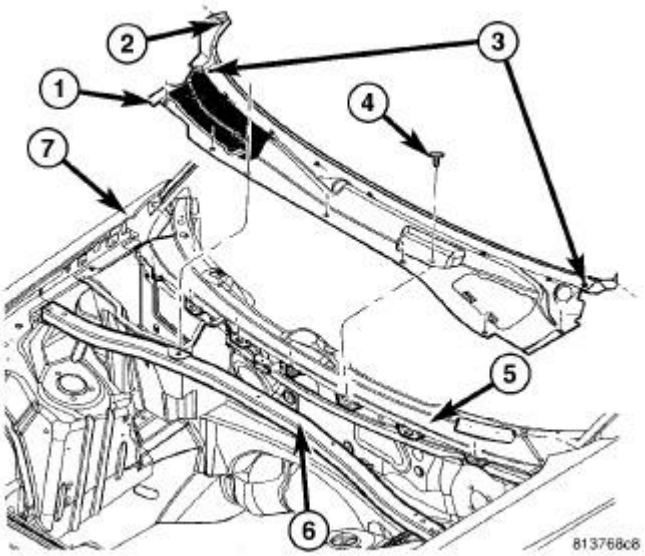


Fig. 385: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, REMOVAL** .
4. Remove bolts and the strut support brace (6).
5. Remove fasteners and the rear engine compartment heat shield.
6. Remove the air cleaner body and intake air tube. Refer to **BODY, AIR CLEANER, REMOVAL**.
7. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
8. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
9. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
10. Lower the vehicle.

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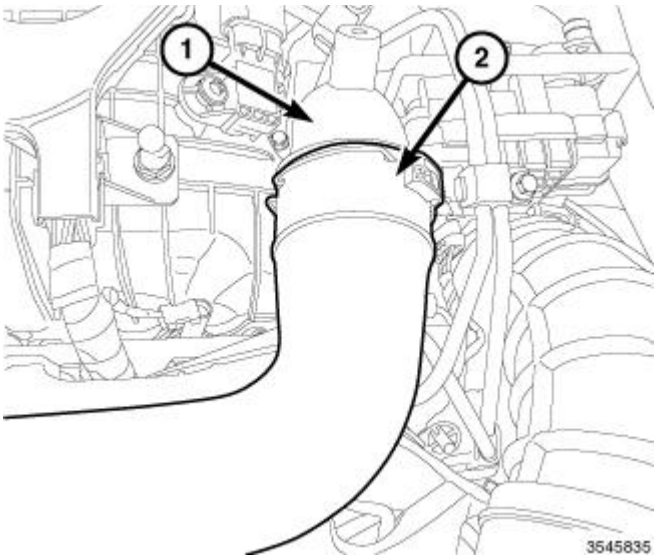


Fig. 386: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

11. Disconnect the Charge Air Cooler (CAC) hose (2) from turbocharger (1).

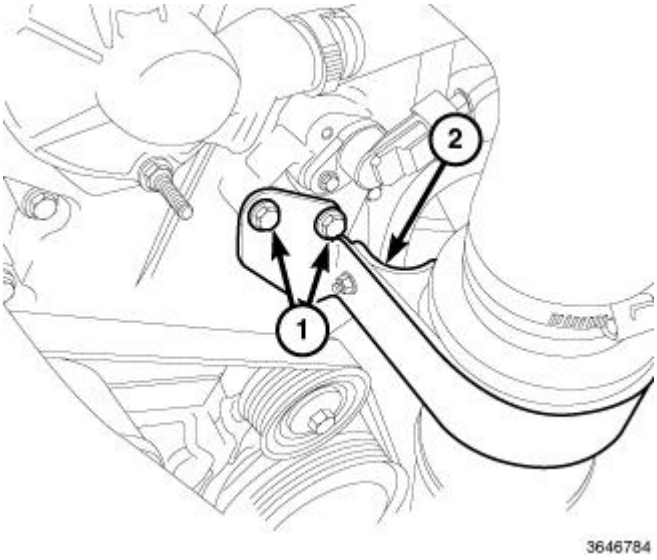


Fig. 387: CAC Hose Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Remove the two (1) bolts securing the CAC hose and bracket (2) to timing cover and position aside.

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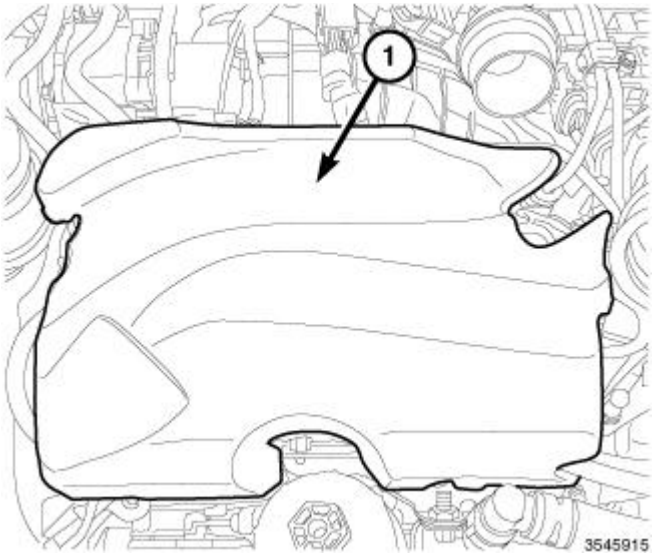


Fig. 388: Left Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

13. Remove the left side fuel injector silencer (1).

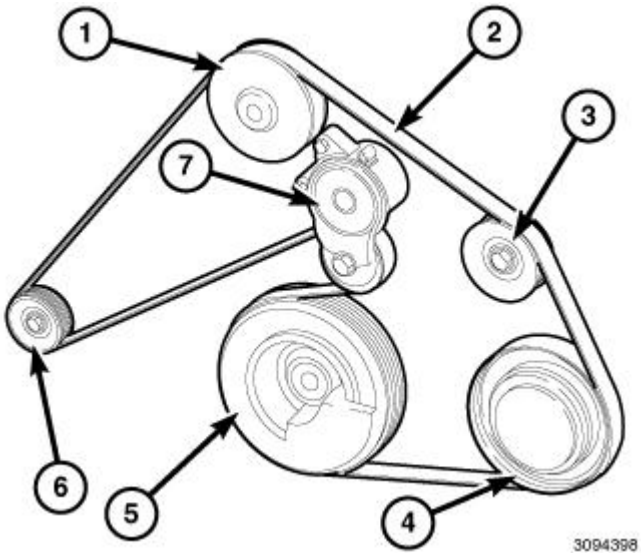


Fig. 389: Pulleys, Tensioner & Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

14. Partially remove the accessory drive belt (2).

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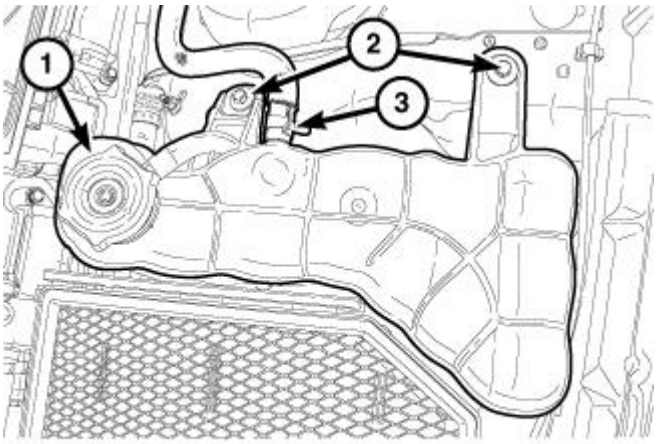


Fig. 390: Coolant Recovery Container Pressure Cap, Tube & Screws
Courtesy of CHRYSLER GROUP, LLC

15. Remove the coolant recovery bottle. Refer to **BOTTLE, COOLANT RECOVERY, REMOVAL** .

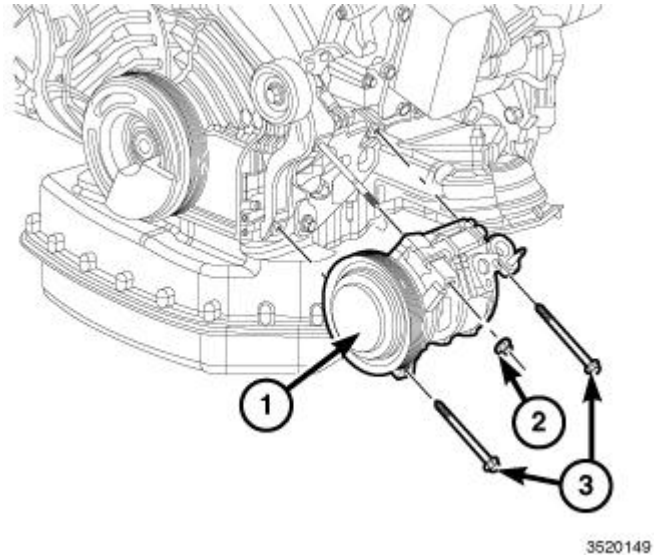


Fig. 391: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

16. Disconnect the A/C compressor wire harness connector.
17. Remove the nut (2) and stud securing the A/C compressor (1).
18. Remove bolts (3) securing the A/C compressor and position the A/C compressor aside.

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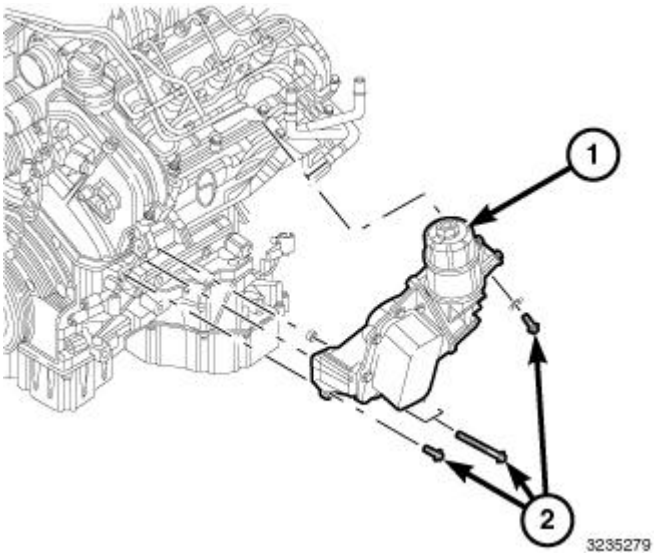


Fig. 392: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

19. Remove the oil cooler adapter. Refer to **ADAPTER, OIL COOLER, REMOVAL**.
20. Remove the fuel injection pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, REMOVAL** .

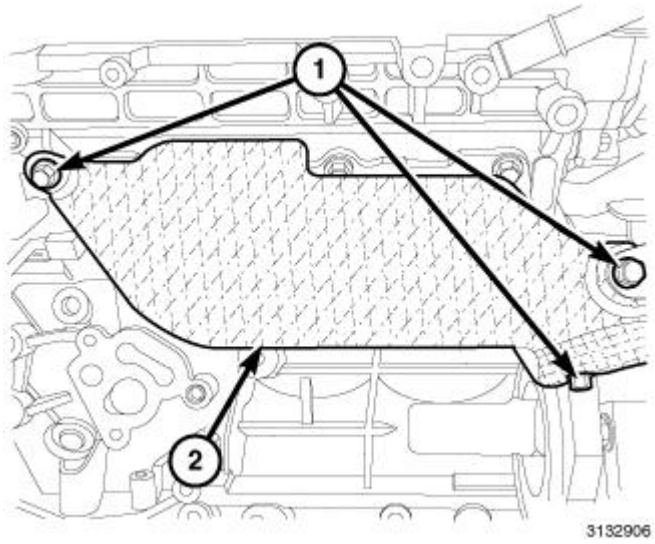


Fig. 393: Left Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Remove bolts (1) and the left exhaust manifold heat shield (2).

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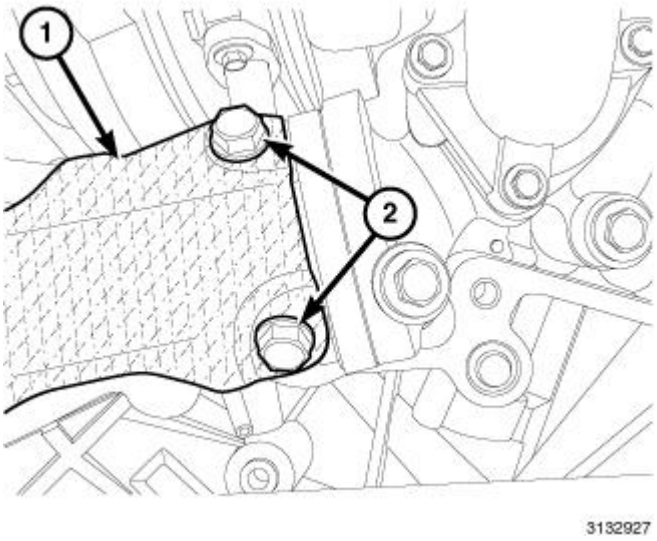


Fig. 394: Exhaust Manifold Pipe To Turbocharger Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

22. Remove bolts (2) and the exhaust manifold pipe to turbocharger heat shield (1).
23. Remove the turbocharger-to-cowl extension heat shield.

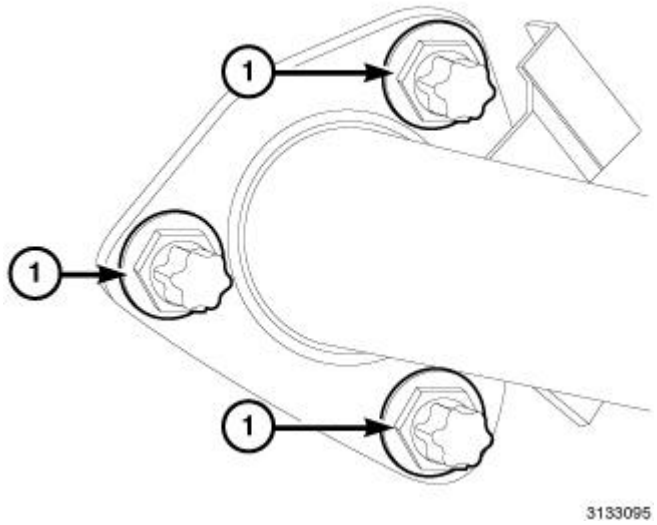


Fig. 395: Exhaust Manifold Pipe To Turbocharger Nuts
Courtesy of CHRYSLER GROUP, LLC

24. Remove the three nuts (1) from exhaust manifold pipe to turbocharger.

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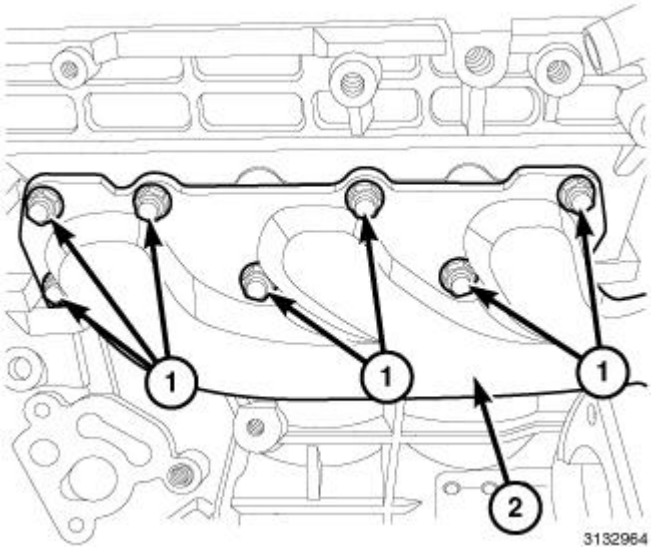


Fig. 396: Left Exhausts Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

25. Remove nuts (1) and the left exhausts manifold (2).
26. Remove and discard gaskets.

INSTALLATION

RIGHT BANK

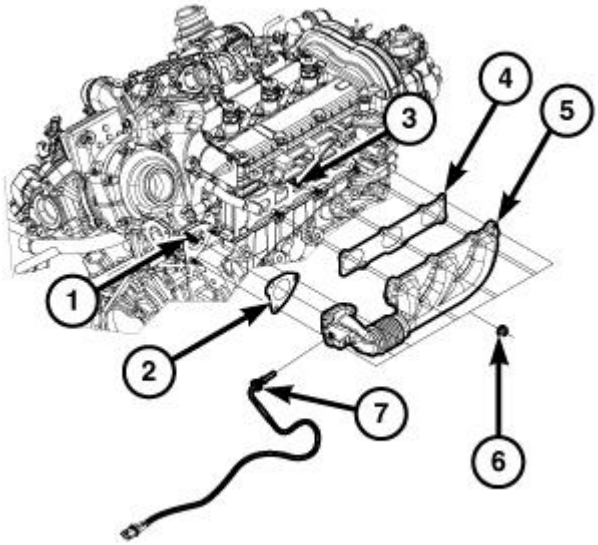


Fig. 397: Exhaust Manifold, Gaskets, Turbocharger, Cylinder Head & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Clean the cylinder head, exhaust manifold and turbocharger sealing surfaces. Refer to **Engine - Standard Procedure**.
2. Install new exhaust manifold gaskets (2 and 4) to turbocharger (1) and the cylinder head (3).

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3. Install the exhaust manifold (5) and the retaining nuts (6) finger tight.

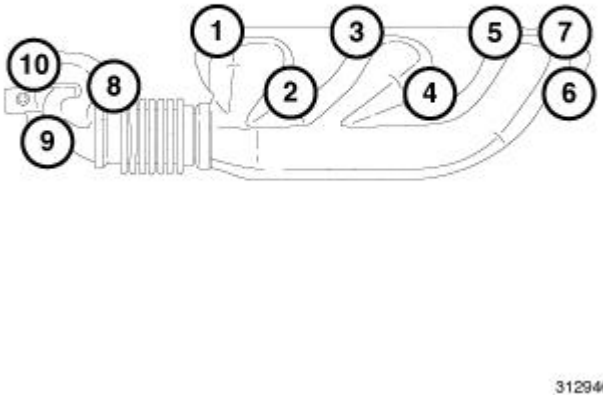


Fig. 398: Right Bank Exhaust Manifold Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the tightening sequence shown in illustration tighten nuts to:
   - Tighten nuts to 15 N.m (133 in. lbs.).
   - Tighten nuts to 40 N.m (30 ft. lbs.).

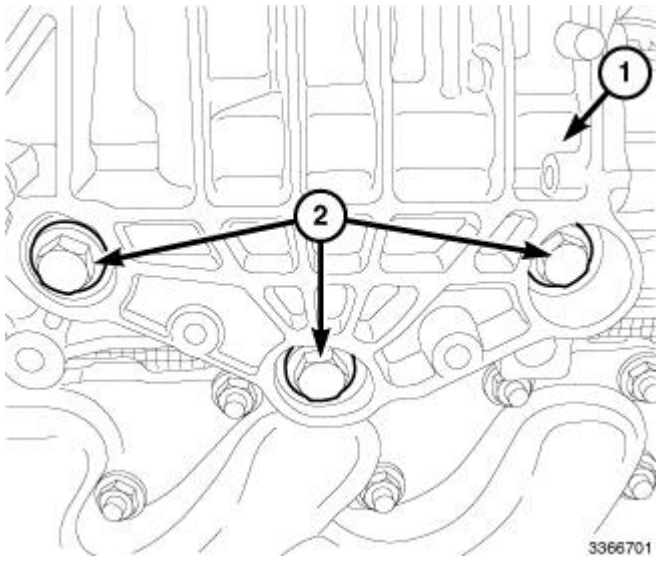


Fig. 399: Cooler Assembly Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Install the EGR and cooler assembly bracket (2). Tighten bolts to 45 N.m (33 ft. lbs.).

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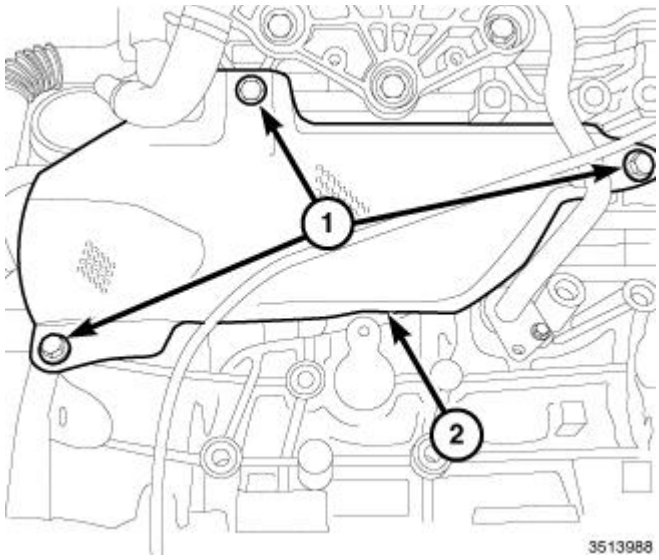


Fig. 400: Right Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the right exhaust manifold heat shield (2). Tighten bolts (1) to 15 N.m (133 in. lbs.).

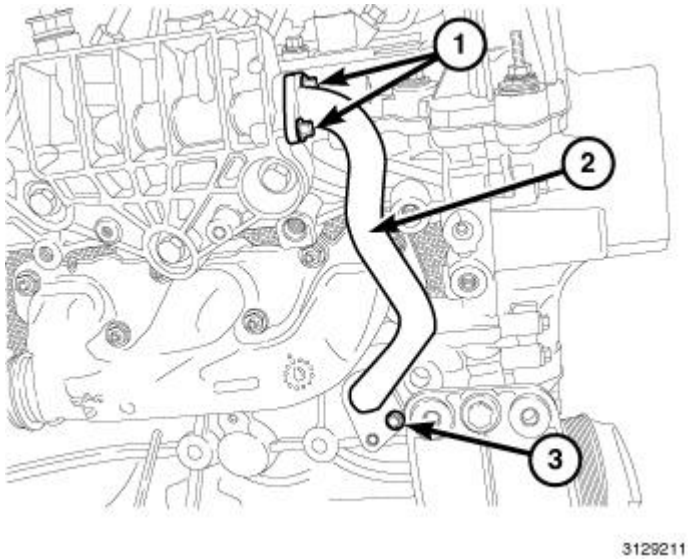


Fig. 401: EGR Cooler Coolant Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Using a new O-ring seal and gasket install the EGR cooler coolant tube (2). Tighten bolts (1 and 3) to 18 N.m (159 in. lbs.).

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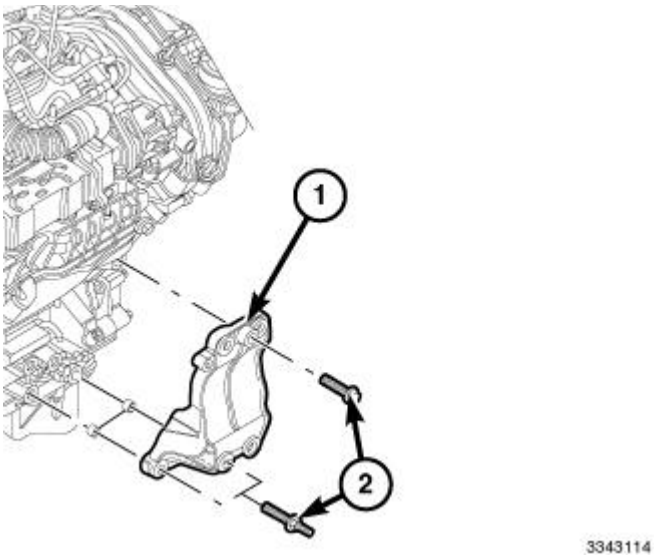


Fig. 402: Generator Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install the generator mounting bracket (1). Tighten bolts (2) to 45 N.m (33 ft. lbs.).

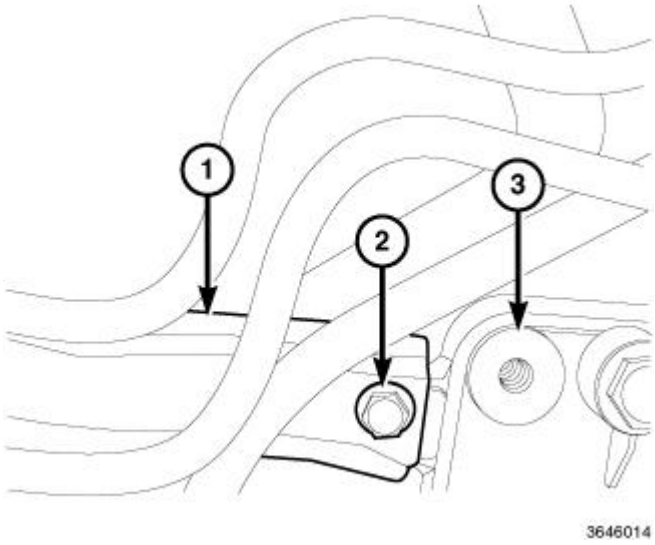


Fig. 403: Fuel Line Support Bracket, Generator Mounting Bracket & Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Install bolt (2) securing the fuel line support bracket (1) to generator mounting bracket (3) and tighten to 11 N.m (97 in. lbs.).

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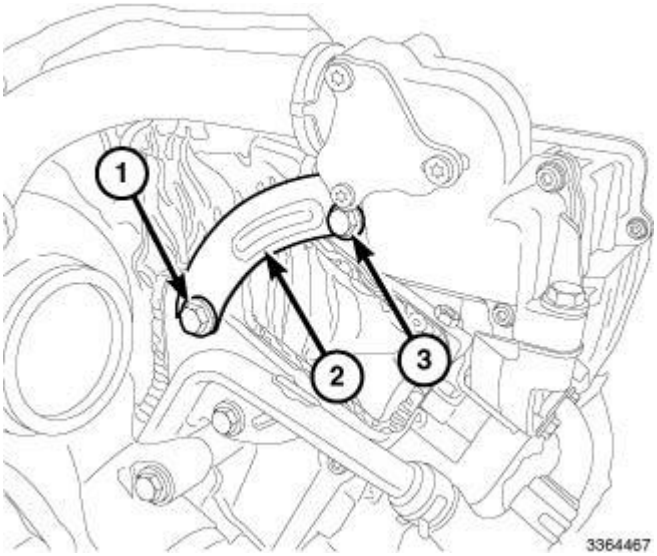


Fig. 404: EGR Cooler Bypass Valve Support Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Install bolt (3) at the rear EGR cooler bypass valve support bracket (2) and tighten to 25 N.m (18 ft. lbs.).

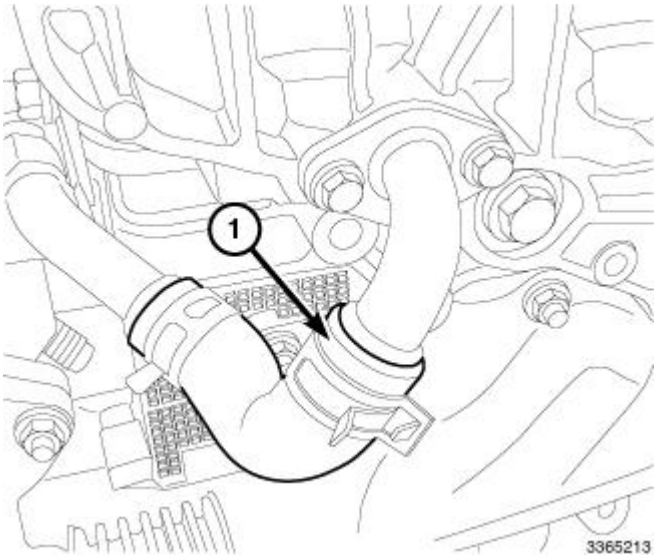


Fig. 405: EGR Cooler Supply Hose
Courtesy of CHRYSLER GROUP, LLC

11. Connect the EGR cooler supply hose (1).

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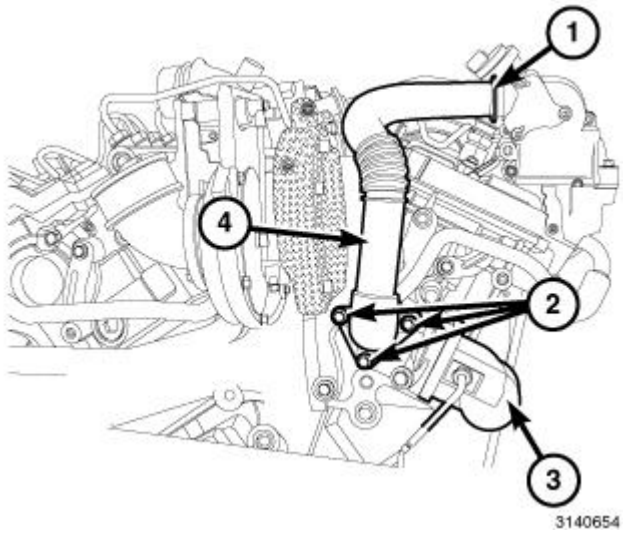


Fig. 406: Turbocharger-To-EGR Cooler Tube Clamp
Courtesy of CHRYSLER GROUP, LLC

12. Using a new gasket the turbocharger-to-EGR cooler tube and securely tighten clamp (1).

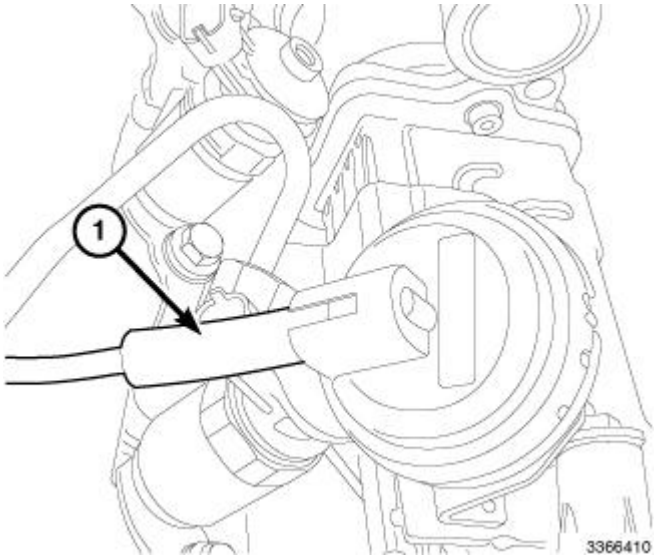


Fig. 407: EGR Cooler Vacuum Bypass Hose
Courtesy of CHRYSLER GROUP, LLC

13. Connect the EGR cooler vacuum bypass hose (1).

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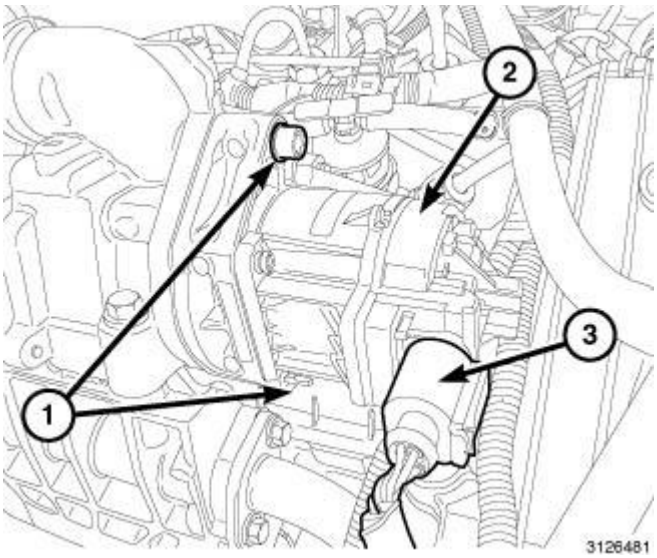


Fig. 408: EGR Valve, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

14. Connect the EGR valve wire harness connector (2).

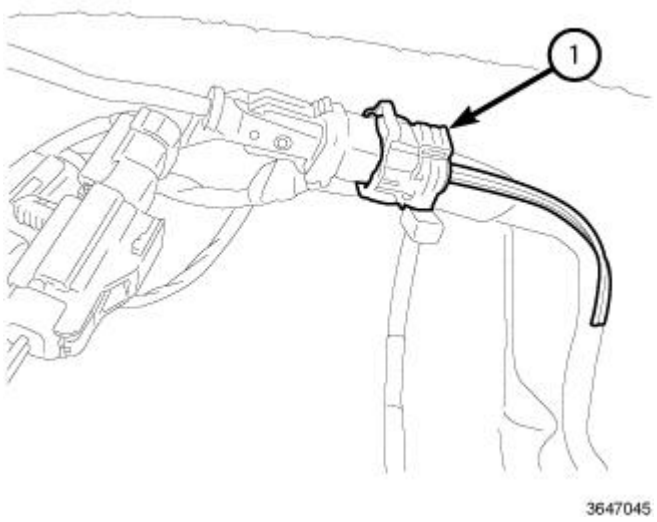


Fig. 409: Exhaust Temperature Sensor Wire Harness Connector
Courtesy of CHRYSLER GROUP, LLC

15. Using a new O-ring seal, install the oil dipstick tube. Tighten upper nut to 11 N.m (97 in. lbs.).
16. Connect the exhaust temperature sensor wire harness connector (1).

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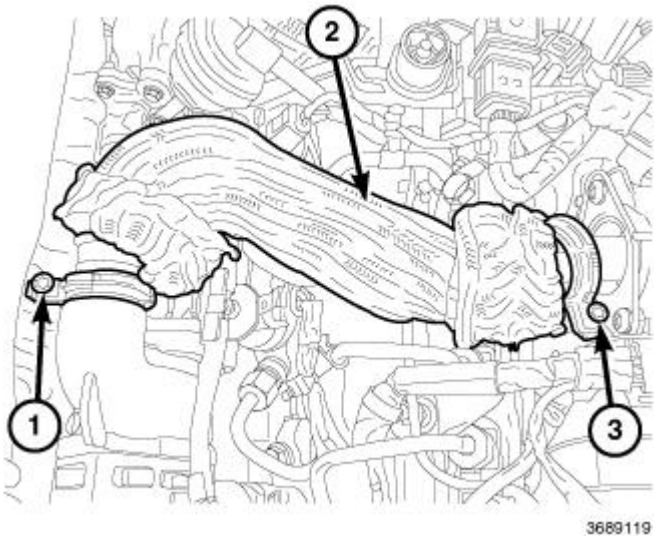


Fig. 410: EGR Tube & Clamps
Courtesy of CHRYSLER GROUP, LLC

17. Install the EGR tube. Refer to **TUBE, EXHAUST GAS RECIRCULATION (EGR), INSTALLATION** .
18. Install the generator. Refer to **GENERATOR, INSTALLATION** .
19. Install the lower oil dipstick tube bolt. Tighten bolt to 11 N.m (97 in. lbs.).
20. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
21. Lower the vehicle.

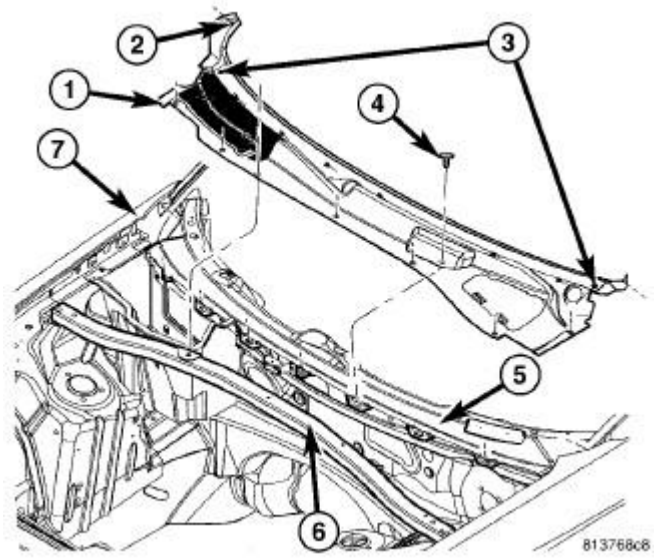


Fig. 411: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

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22. Install the rear engine compartment heat shield and securely tighten the fasteners.
23. Install the strut support brace (6). Tighten bolts to 38 N.m (28 ft. lbs.).
24. Install the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, INSTALLATION** .

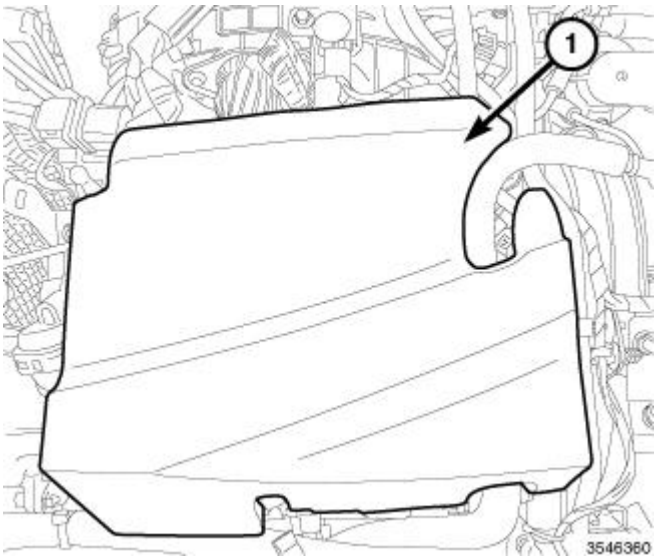


Fig. 412: Right Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

25. Install the right side fuel injector silencer (1).

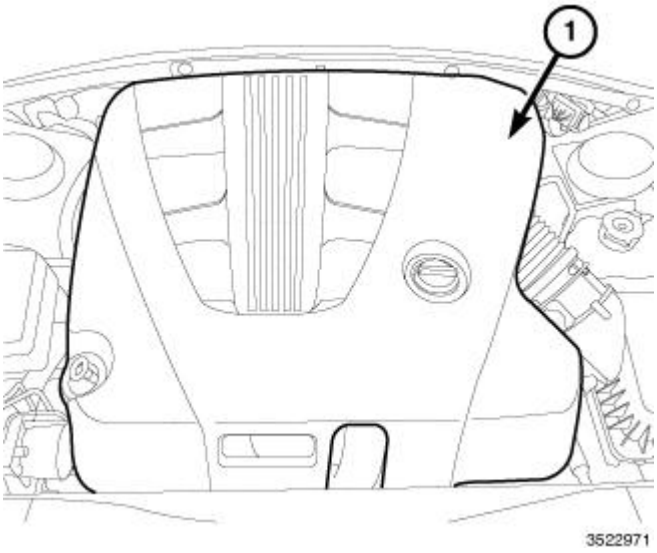


Fig. 413: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

26. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
27. Connect the negative battery cable.
28. Start the engine and check for leaks.

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29. Install the engine cover (1).

LEFT BANK

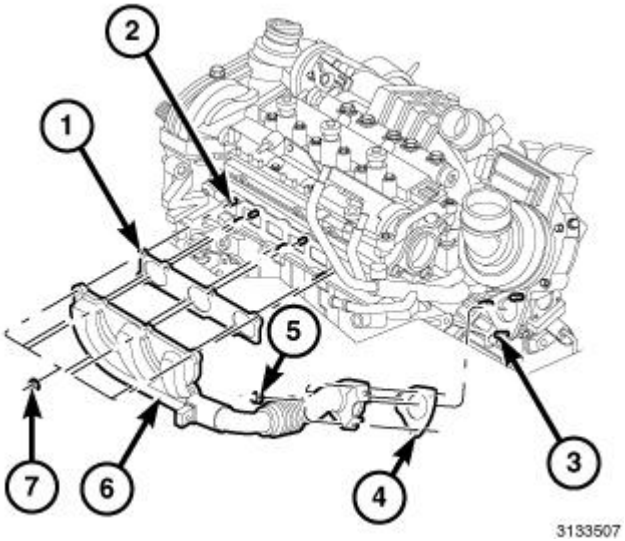


Fig. 414: Exhaust Manifold, Gaskets, Turbocharger, Cylinder Head & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Clean the cylinder head and exhaust manifold sealing surfaces. Refer to **Engine - Standard Procedure**.
2. Install new exhaust manifold gaskets (1 and 4), to the cylinder head (2) and the turbocharger (3).
3. Install the exhaust manifold (6) and the retaining nuts (5 and 7) finger tight.

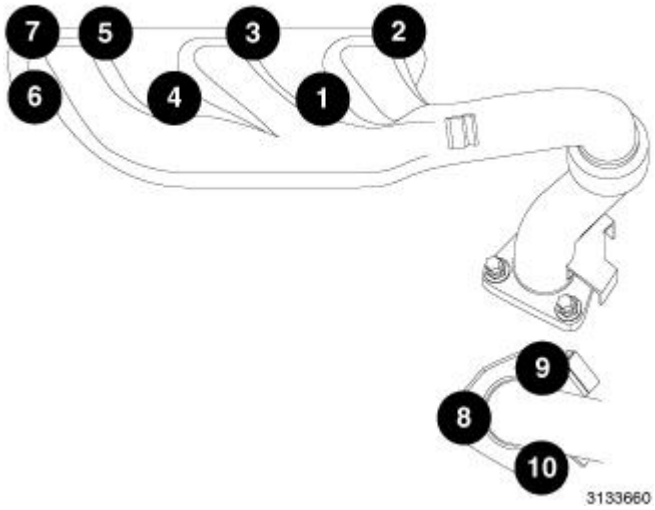


Fig. 415: Left Bank Exhaust Manifold Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the tightening sequence shown in illustration tighten nuts to:
   - Step 1: tighten nuts to 15 N.m (133 in. lbs.).

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- Step 2: Tighten nuts to 40 N.m (30 ft. lbs.).

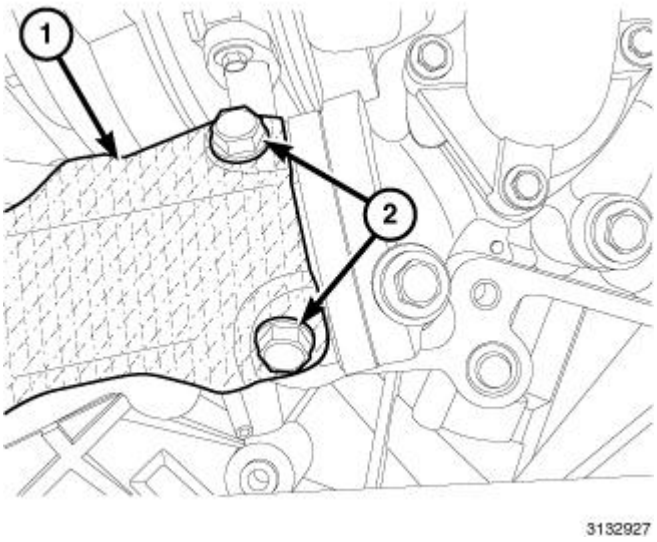


Fig. 416: Exhaust Manifold Pipe To Turbocharger Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Install the turbocharger-to-cowl extension heat shield.
6. Install the exhaust heat shield (1). Tighten bolt (2) to 15 N.m (133 in. lbs.).

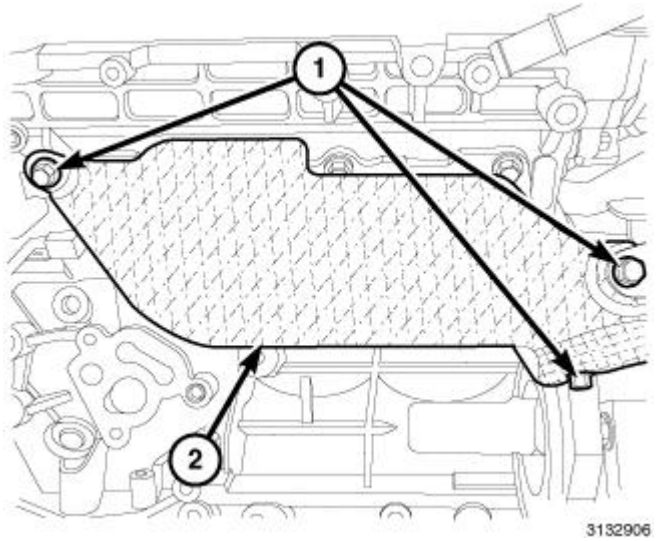


Fig. 417: Left Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Install the left exhaust manifold heat shield (2). Tighten bolts (1) to 15 N.m (133 in. lbs.).
8. Install the fuel injection pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, INSTALLATION** .

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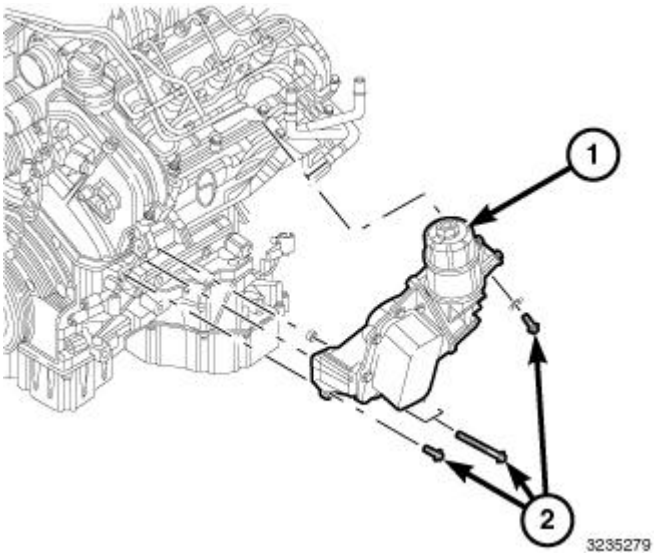


Fig. 418: Oil Cooler Adapter Assembly
Courtesy of CHRYSLER GROUP, LLC

9. Install the oil cooler adapter. Refer to **ADAPTER, OIL COOLER, INSTALLATION**.

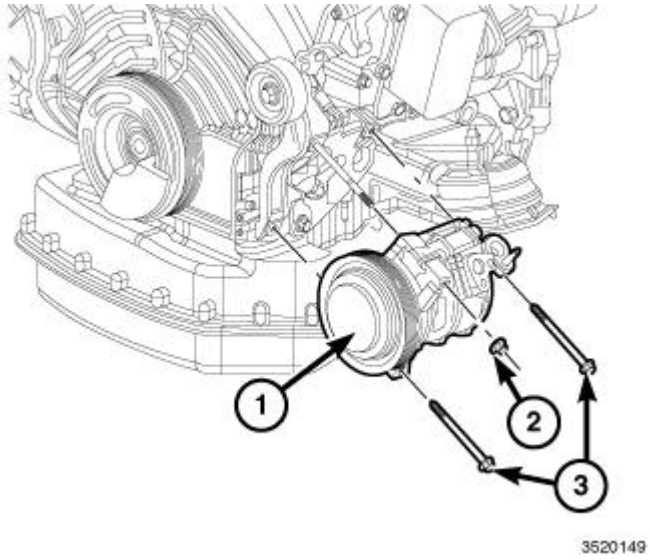


Fig. 419: A/C Compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

10. Install the A/C compressor (1). Tighten bolts (3) to 30 N.m (22 ft. lbs.).
11. Install the A/C compressor mounting stud and tighten to 11 N.m (97 in. lbs.).
12. Install the A/C compressor mounting nut (2) and tighten to 30 N.m (22 ft. lbs.).
13. Connect the A/C compressor wire harness connector.

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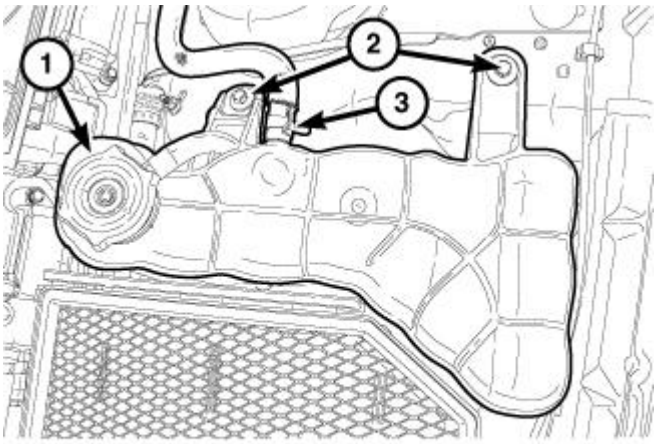


Fig. 420: Coolant Recovery Container Pressure Cap, Tube & Screws
Courtesy of CHRYSLER GROUP, LLC

14. Install the coolant recovery bottle. Refer to **BOTTLE, COOLANT RECOVERY, INSTALLATION** .

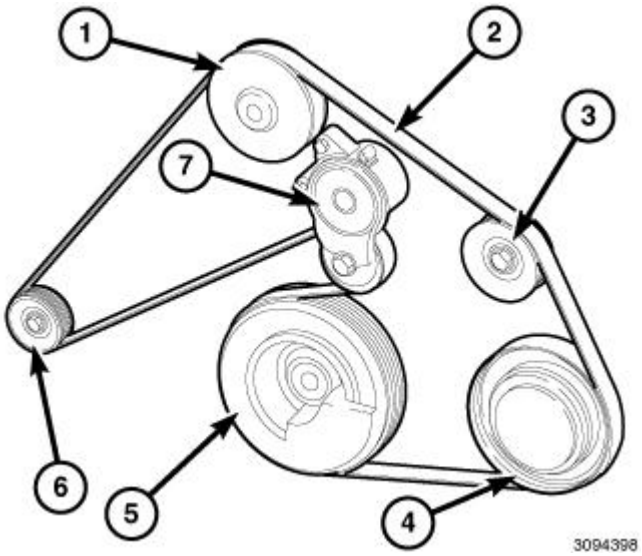


Fig. 421: Pulleys, Tensioner & Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

15. Install the accessory drive belt (2).

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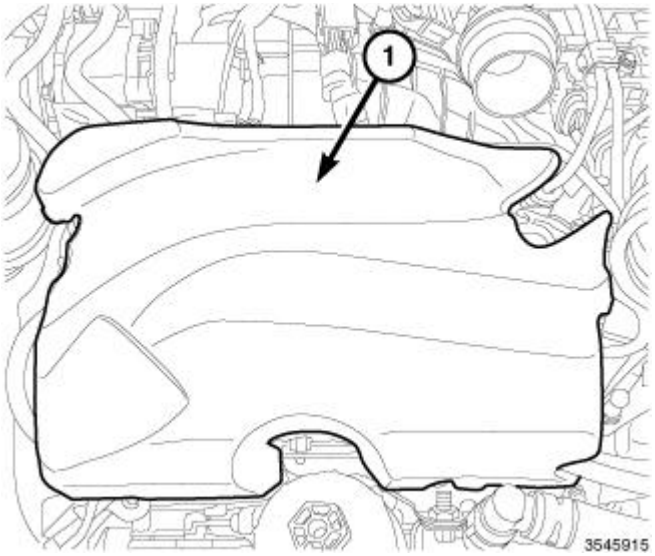


Fig. 422: Left Side Fuel Injector Silencer
Courtesy of CHRYSLER GROUP, LLC

16. Install the left side fuel injector silencer (1).

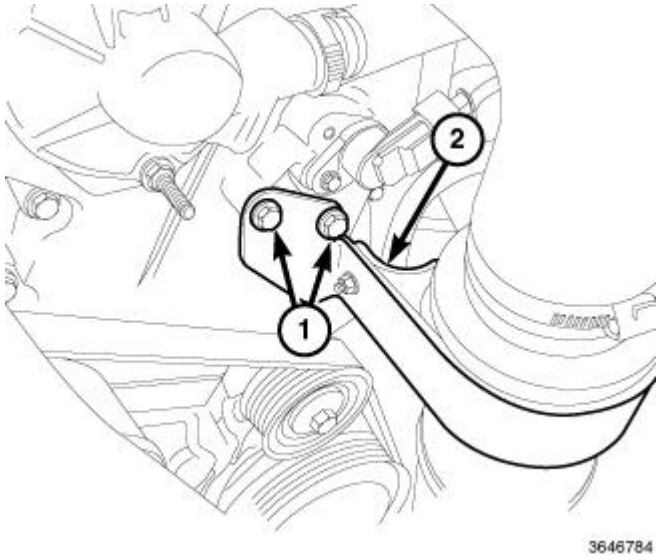


Fig. 423: CAC Hose Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Position the CAC hose and bracket (2) to timing cover. Tighten bolts (1) to 11 N.m (97 in. lbs.).

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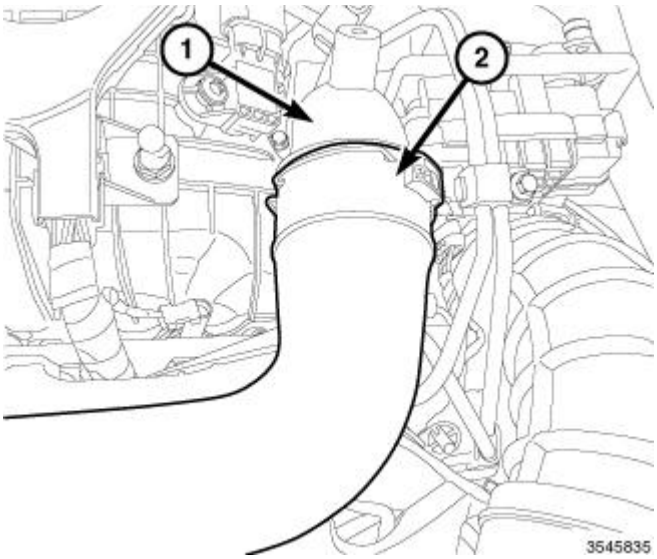


Fig. 424: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

18. Connect the Charge Air Cooler (CAC) hose (2) from turbocharger (1).
19. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
20. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
21. Lower the vehicle.
22. Install the air cleaner body and intake air tube. Refer to **BODY, AIR CLEANER, INSTALLATION**.

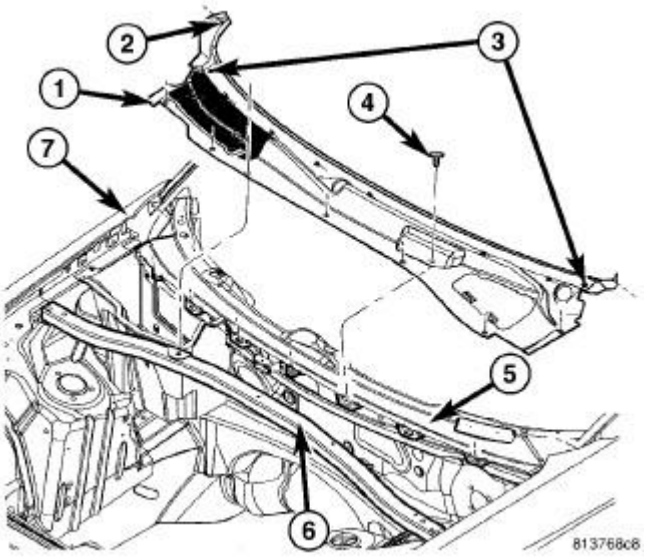


Fig. 425: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

23. Install the rear engine compartment heat shield and securely tighten the fasteners.

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24. Install the strut support brace (6). Tighten bolts to 38 N.m (28 ft. lbs.).
25. Install the wiper arm linkage. Refer to **LINKAGE, WIPER ARM, INSTALLATION** .

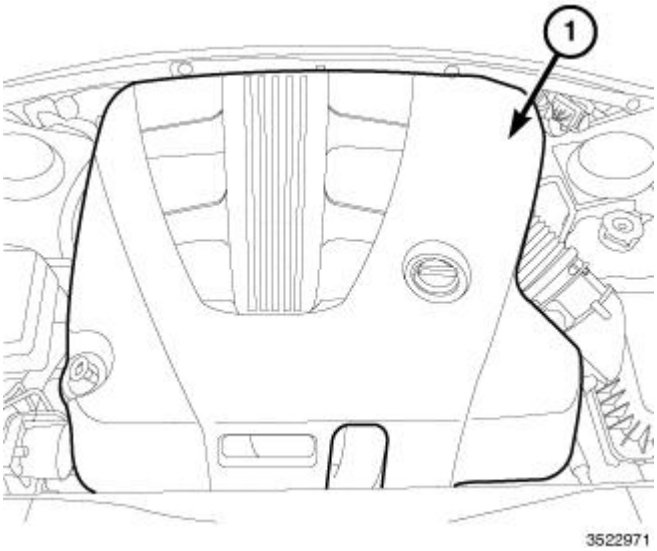


Fig. 426: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

26. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
27. Connect the negative battery cable.
28. Start the engine and check for leaks.
29. Install the engine cover (1).

MANIFOLD, INTAKE

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the turbocharger. Refer to **TURBOCHARGER, REMOVAL**.

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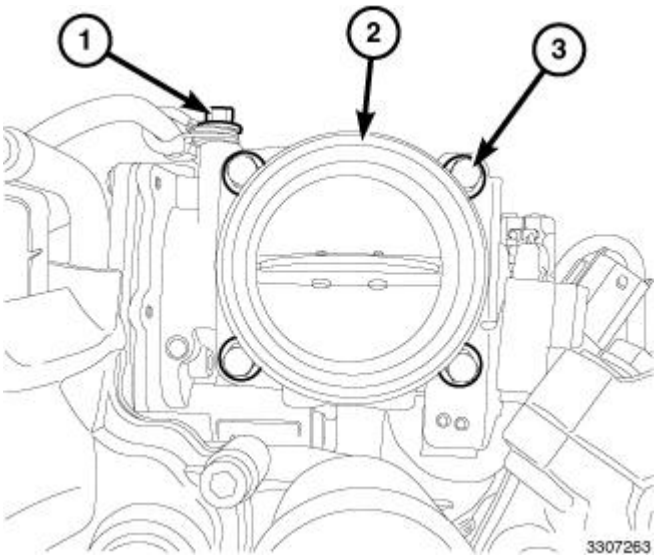


Fig. 427: (EGR) Air Flow Control Valve
Courtesy of CHRYSLER GROUP, LLC

3. Remove the EGR air flow control valve (2). Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR) AIRFLOW CONTROL, REMOVAL** .
4. Remove the fuel tubes. Refer to **TUBE(S), FUEL, REMOVAL** .
5. Disconnect the engine wire harness connectors.
6. Remove the ball stud fastener, bolts and position aside engine wiring harness.

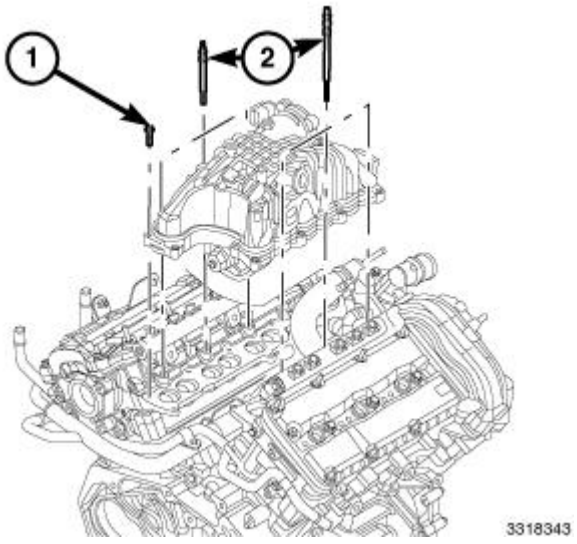


Fig. 428: Glow Plugs & Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do Not rest the intake manifold on the swirl valve actuator. Care must be taken when handling the swirl valve assembly.

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7. Remove bolts (1) and the intake manifold.
8. Remove and discard gasket.

INSTALLATION

INSTALLATION

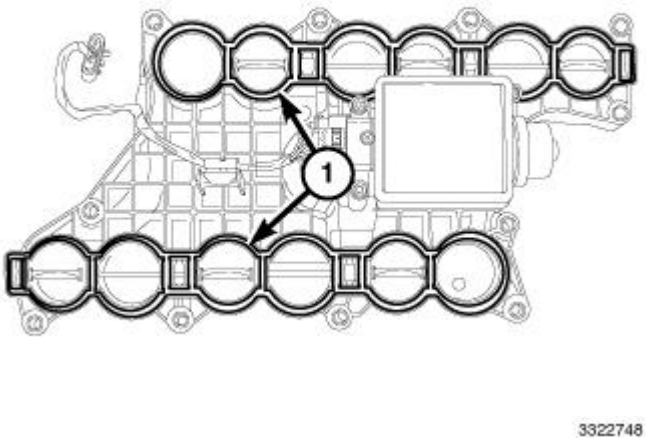


Fig. 429: Intake Manifold Gasket
Courtesy of CHRYSLER GROUP, LLC

1. Clean the gasket sealing surfaces. Refer to **Engine - Standard Procedure**.
2. Install a new intake manifold gasket (1).

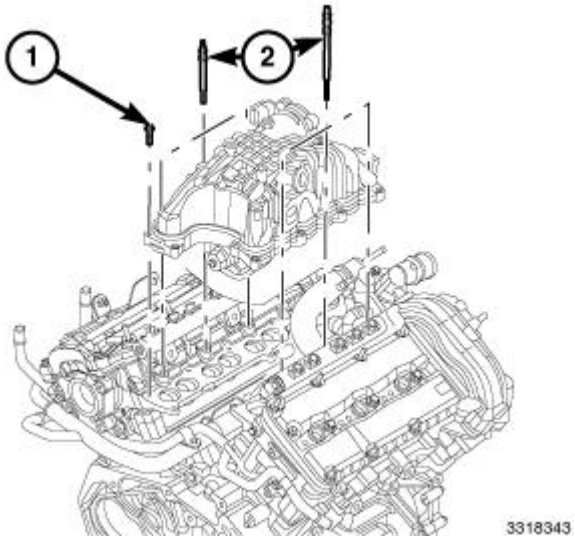


Fig. 430: Glow Plugs & Bolts
Courtesy of CHRYSLER GROUP, LLC

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3. Install the intake manifold and tighten bolts finger tight.

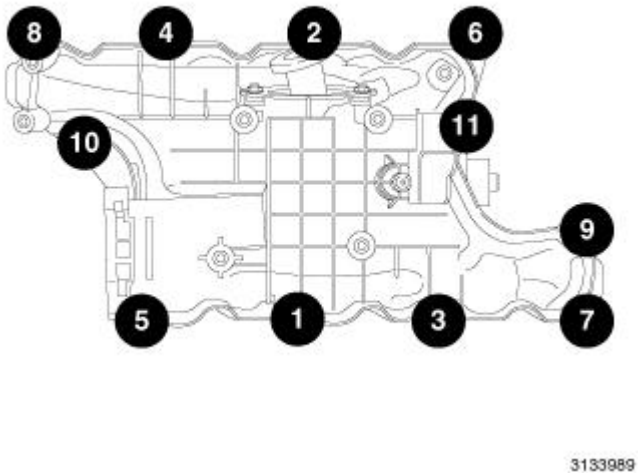


Fig. 431: Intake Manifold Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the tightening sequence shown in illustration, tighten bolts to 12 N.m (106 in. lbs.).

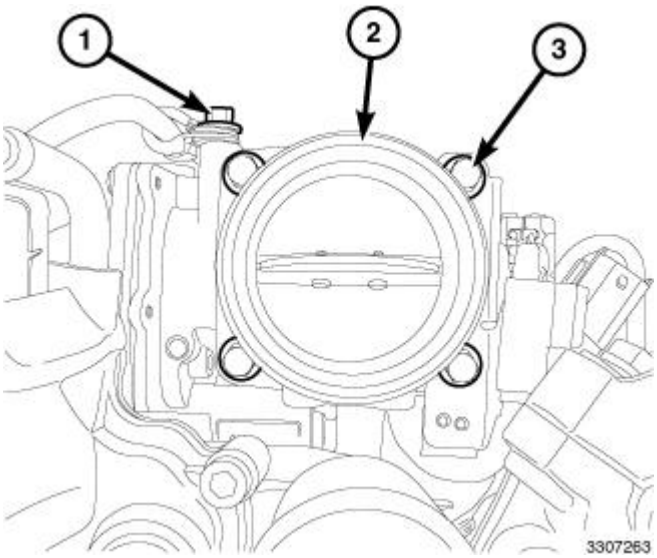


Fig. 432: (EGR) Air Flow Control Valve
Courtesy of CHRYSLER GROUP, LLC

5. Position and properly route and install the engine wiring harness.
6. Install the ball stud fastener and bolts and securely tighten.

NOTE: Fuel tubes are a one time only use and must be replaced anytime they have been removed.

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7. Install the fuel tubes. Refer to **TUBE(S), FUEL, INSTALLATION** .
8. Install the EGR air flow control valve (2). Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR) AIRFLOW CONTROL, INSTALLATION** .
9. Install the turbocharger. Refer to **TURBOCHARGER, INSTALLATION**.
10. Connect the negative battery cable.
11. Start the engine, allow to warm, turn the engine off and inspect for leaks.

TURBOCHARGER SYSTEM

ACTUATOR, TURBOCHARGER

DESCRIPTION

DESCRIPTION

The turbocharger boost pressure servomotor is bolted to the side of the turbocharger housing and is responsible for controlling turbocharger boost pressure. It controls the boost pressure by varying the position of the guide vanes. The servomotor operates in response to a PWM signal from the Powertrain Control Module (PCM).

The turbocharger boost pressure servomotor is serviced with the turbocharger and **is not** serviceable separately. To replace the servomotor, replace the turbocharger. Refer to **TURBOCHARGER, REMOVAL**.

COOLER AND HOSES, CHARGE AIR

DESCRIPTION

DESCRIPTION

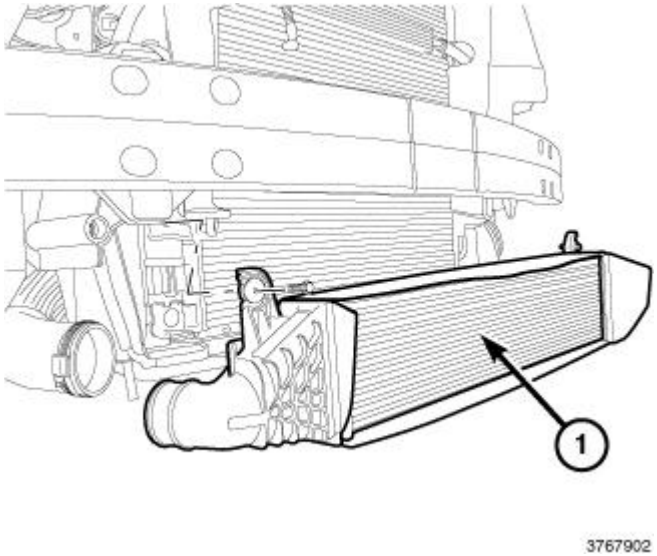


Fig. 433: Charge Air Cooler
Courtesy of CHRYSLER GROUP, LLC

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The charge air system consists of a inlet air compressor which is part of the turbocharger housing, charge air cooler (1) located in front of the radiator, and charge air cooler plumbing.

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.

REMOVAL

REMOVAL

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

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

1. Disconnect the battery negative cable.
2. Raise and support the vehicle.

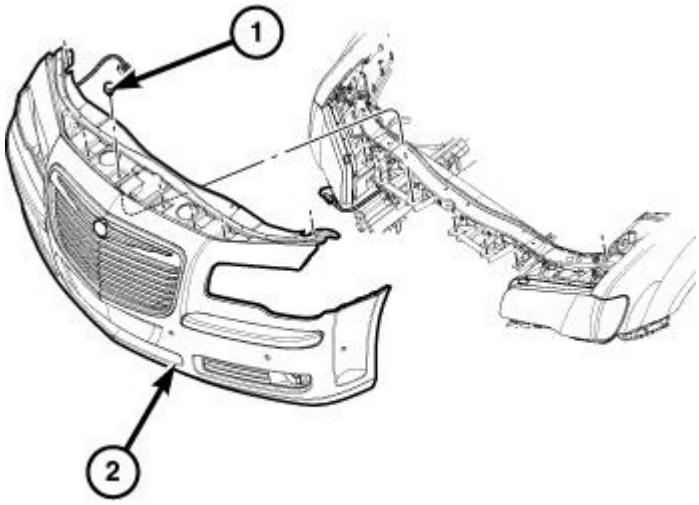


Fig. 434: Front Bumper Fascia & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove the front bumper fascia hardware (1) and the fascia (2). Refer to **FASCIA, FRONT, REMOVAL** .

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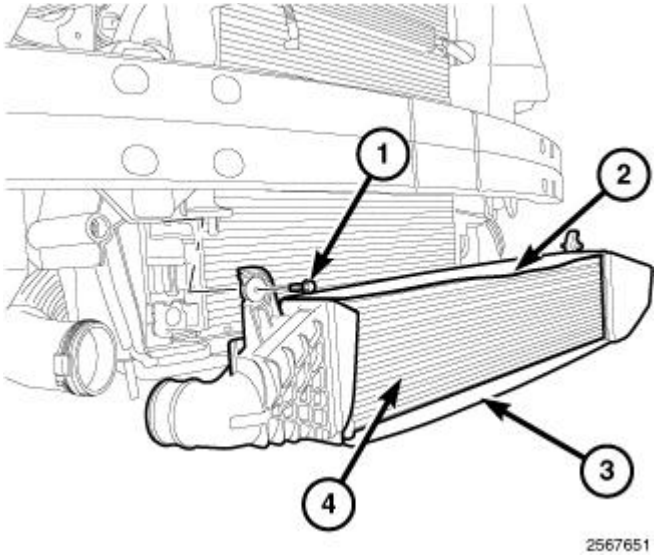


Fig. 435: Charge Air Cooler & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove the hoses from the charge air cooler (4).

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

5. Remove the two mount bolts (1).
6. Lift the cooler up and then forward to allow the lower locators to clear the mount bushings.

CHARGE AIR COOLER HOSES

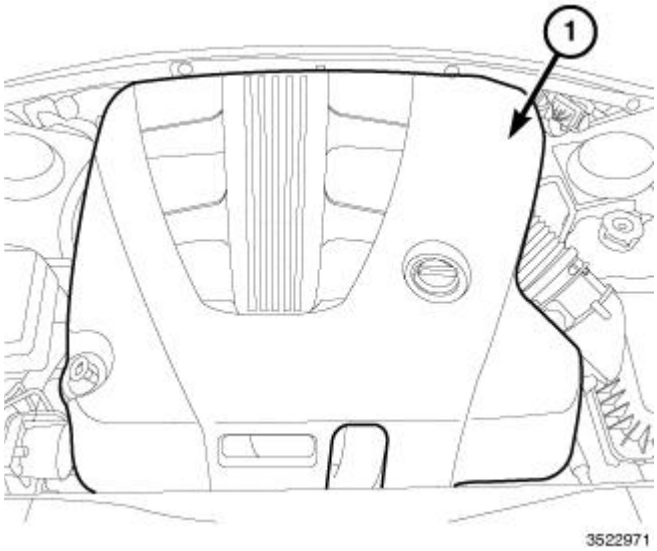


Fig. 436: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

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1. Remove the engine cover (1).

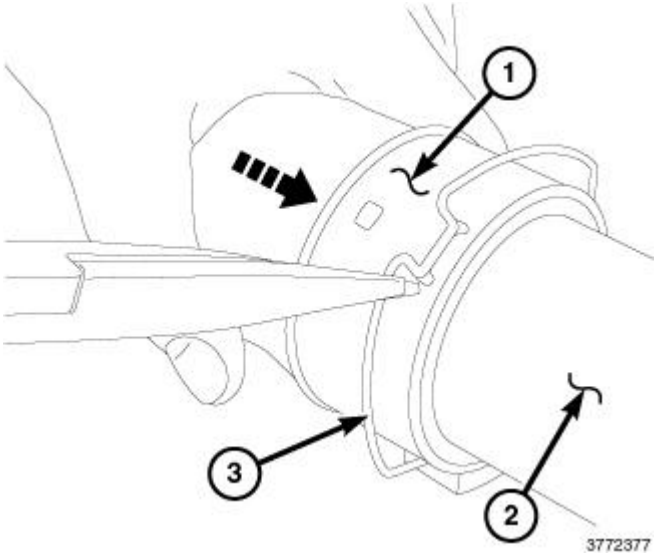


Fig. 437: Charge Air Cooler (CAC) Hose, Flange & Retainer
Courtesy of CHRYSLER GROUP, LLC

2. Remove the Charge Air Cooler (CAC) hose (1) by pushing the hose into the cooler flange (2) while pulling the retainer (3) to the unseated position.

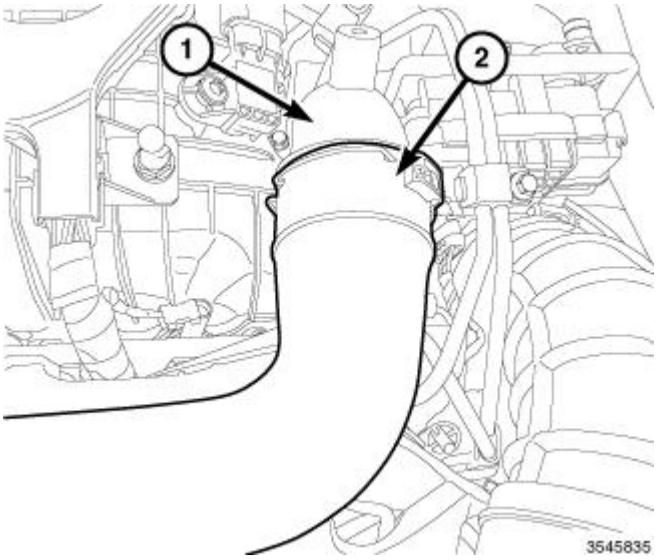


Fig. 438: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the CAC hose (2) from turbocharger (1).

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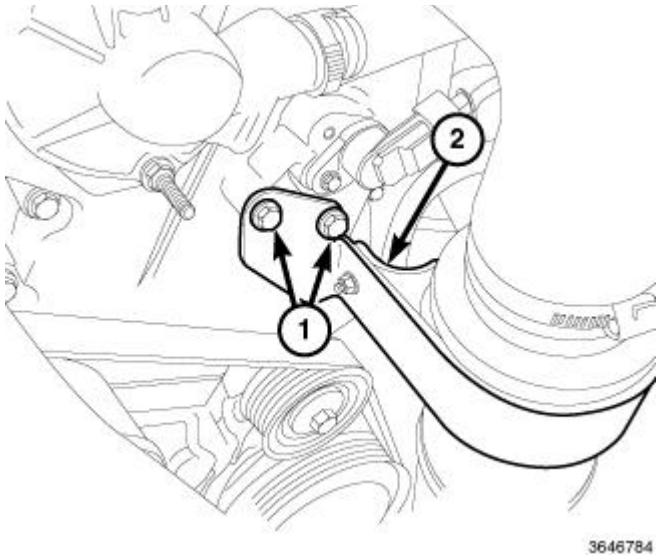


Fig. 439: CAC Hose Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove the two CAC bracket to timing cover bolts (1) and set the CAC hose assemble aside.
5. Disconnect and remove the left Charge Air Cooler (CAC) hose as an assembly.

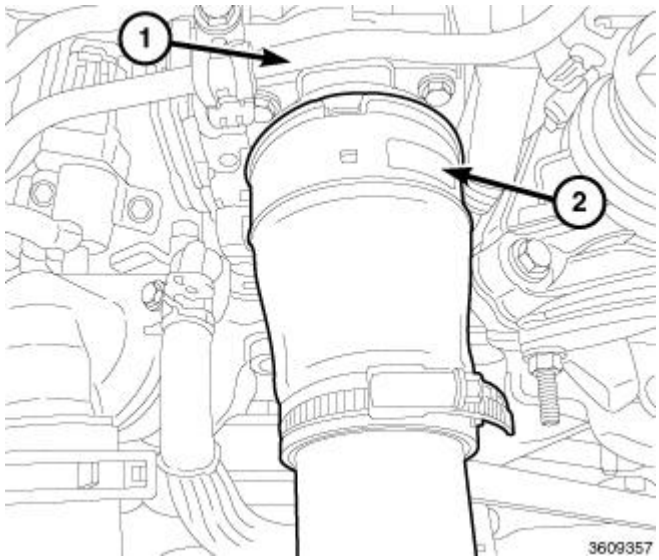


Fig. 440: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the right CAC hose (2) from the EGR air flow control valve.
7. Remove bolt securing the right CAC hose to lower timing cover.
8. Disconnect and remove the right CAC hose from the cooler.

INSPECTION

INSPECTION

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Visually inspect the charge air cooler and plumbing for cracks, holes, loose clamps, or damage. Inspect the tubes, fins, and welds for tears, breaks, or other damage. Replace the charge air cooler if damage is found.

INSTALLATION

INSTALLATION

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

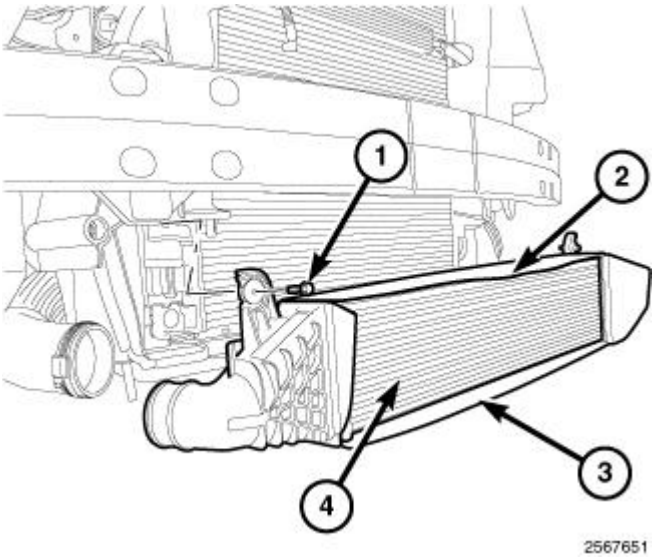


Fig. 441: Charge Air Cooler & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Position the charge air cooler (2) into the vehicle.
2. Press the charge air cooler to the radiator support till it clicks into place.
3. Install the two cooler bolts (1). Tighten the bolts to 14 N.m (124 in. lbs.)
4. Install the outlet hose to the charge air cooler with the clamp in position. Tighten the outlet clamp to 11 N.m (95 in. lbs.)

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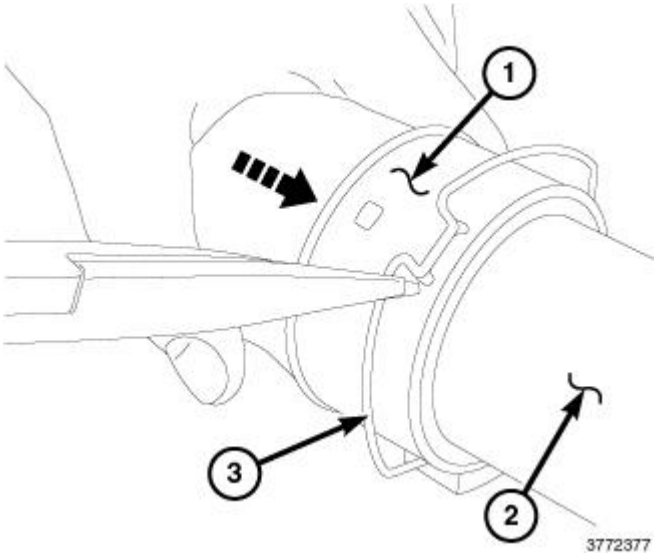


Fig. 442: Charge Air Cooler (CAC) Hose, Flange & Retainer
Courtesy of CHRYSLER GROUP, LLC

NOTE: Make sure the hose is fully seated before locking the hose retainer.

5. Install the inlet hose (1) onto the cooler inlet (2) and lock the hose retainer (3) into position.

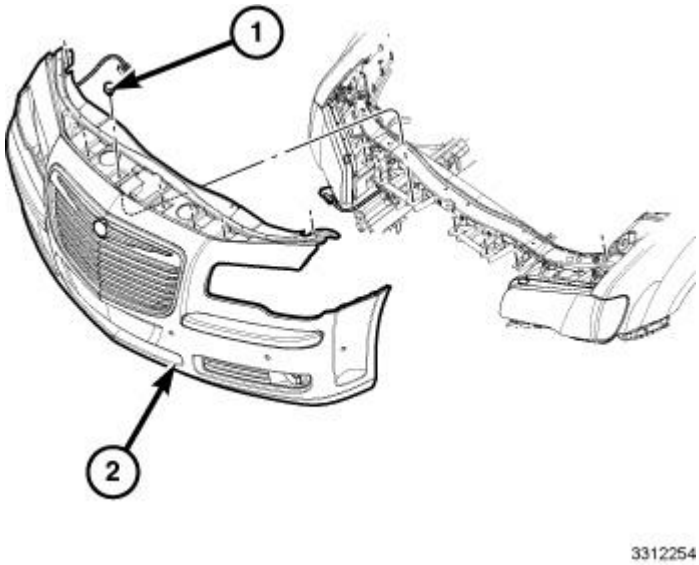


Fig. 443: Front Bumper Fascia & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Install the front bumper fascia. Refer to **FASCIA, FRONT, INSTALLATION** .
7. Lower the vehicle.
8. Connect the battery negative cable.
9. Start engine and check for leaks.

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CHARGE AIR COOLER HOSES

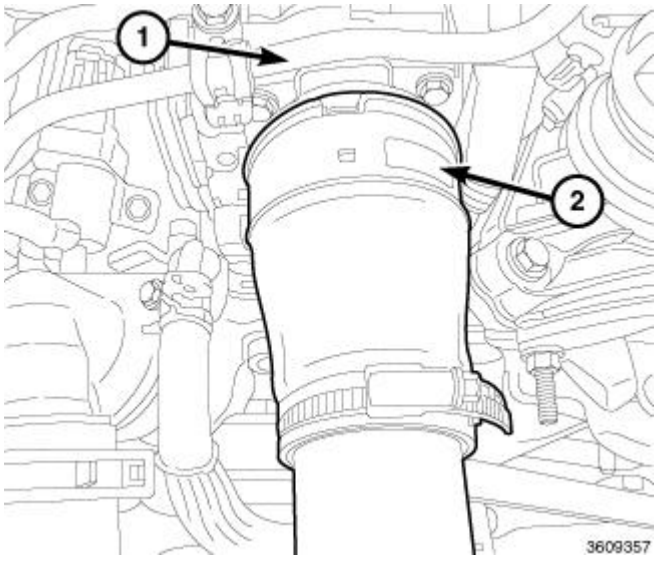


Fig. 444: EGR Air Flow Control Valve & CAC Hose
Courtesy of CHRYSLER GROUP, LLC

1. Install and connect the right Charge Air Cooler (CAC) hose to the cooler.
2. Install the bolt that secures the CAC hose to the timing cover and tighten to 10 N.m (88.5 in. lbs.).
3. Connect the right CAC hose (2) to the EGR air flow control valve.

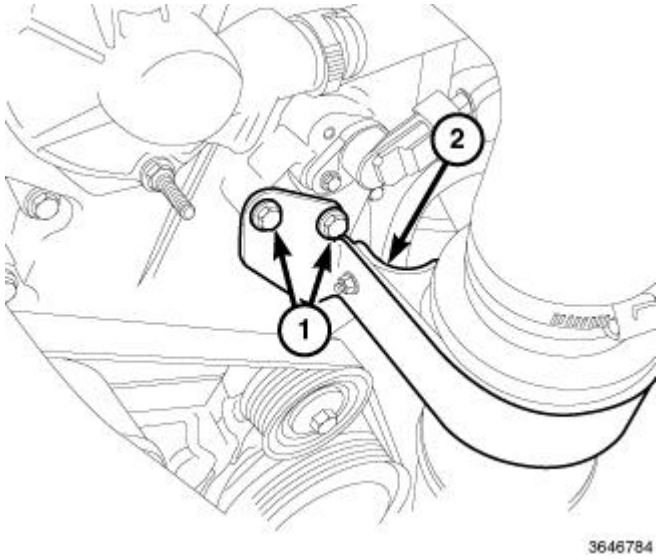


Fig. 445: CAC Hose Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install and connect the left CAC hose as an assembly.
5. Install the two bolts (1) securing the CAC hose and bracket (2) to timing cover and tighten to 10 N.m (88.5 in. lbs.).

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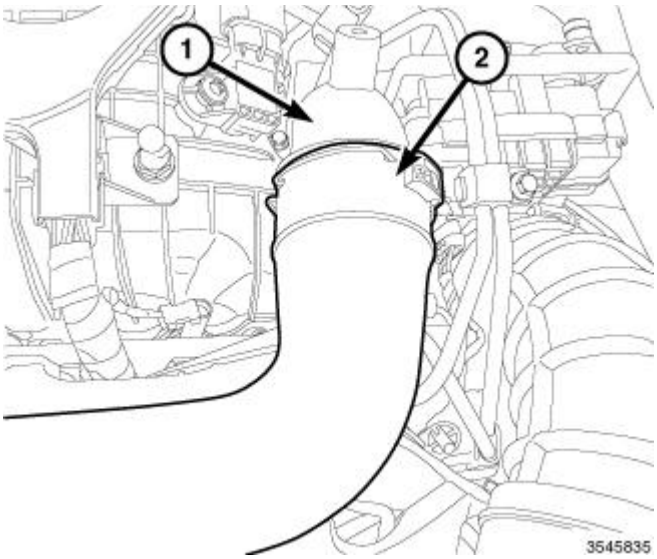


Fig. 446: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

6. Connect the CAC hose (2) to the turbocharger (1).

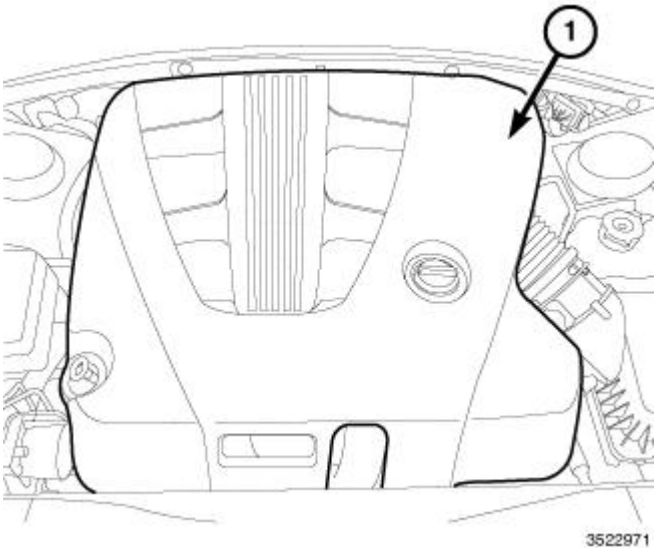


Fig. 447: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

7. Install the engine cover (1).

TURBOCHARGER

DESCRIPTION

DESCRIPTION

CAUTION: The turbocharger is a performance part and must not be tampered with. The actuator bracket is an integral part of the turbocharger. Tampering with the actuator or other components can reduce durability by increasing cylinder pressure and thermal loading due to incorrect inlet and exhaust manifold pressure. Poor fuel economy and failure to meet regulatory emissions laws may result. Increasing the turbocharger boost WILL NOT increase engine power.

The turbocharger used on this vehicle is of the variable turbine type. These turbochargers use the entire exhaust energy to boost efficiency of the turbocharger and the engine.

The advantages of a turbocharger with variable turbine geometry are:

- Higher charge pressure already in the lower and in upper engine speed ranges.
- Higher torque as a result of improved cylinder charge.
- Reduction in exhaust emissions as a result of an improvement in the air supply of the engine.
- Increased power output as a result of the higher charge pressure combined with a reduced exhaust back pressure and thus improved charge cycle.

OPERATION

OPERATION

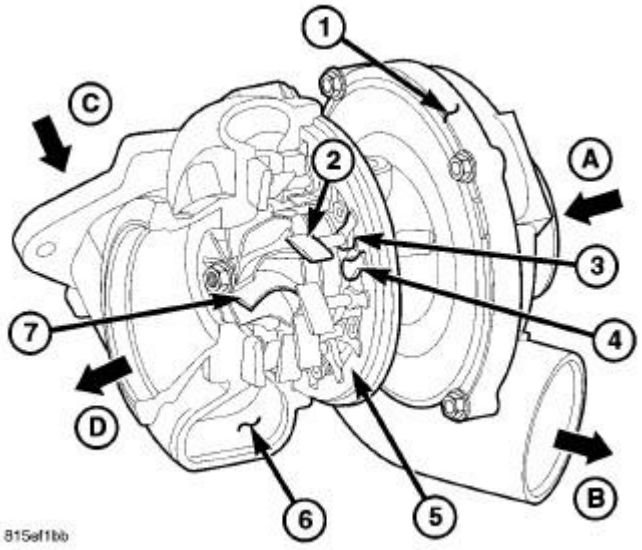


Fig. 448: Turbocharger Components
Courtesy of CHRYSLER GROUP, LLC

1 - COMPRESSOR HOUSING
2 - GUIDE VANE
3 - GUIDE STUD OF GUIDE VANE

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4 - GUIDE STUD OF CONTROL LINKAGE
5- ADJUSTING RING
6 - TURBINE HOUSING
7 - TURBINE WHEEL
A - TURBO INLET (FRESH AIR)
B - TURBO OUTLET (COMPRESSED AIR)
C - EXHAUST GASES TO TURBINE WHEEL
D - EXHAUST OUTLET

The exhaust gases of the engine are directed through the exhaust manifold into the turbine housing (6) onto the turbine wheel (7). The flow energy of the exhaust gases cause the turbine wheel (7) to rotate. Consequently, the compressor wheel, which is connected through the turbine shaft with the turbine wheel (7), is driven at the same speed. The fresh air (A) inducted by the compressor wheel is compressed and passed to the engine.

The charge pressure is controlled by varying the position of the guide vanes (2). The guide stud (3) of the control linkage of the boost pressure actuator turns the adjusting ring (5) in the turbine housing (6). As a result, all the guide vanes (3) whose guide studs (4) likewise mesh into the adjusting ring (5), are also turned.

At low speeds, the flow cross-section is reduced by closing the guide vanes (2). Consequently the speed at which the exhaust gas impacts on the turbine wheel (7) is increased, as a result of which the speed of the turbocharger and thus the charge pressure rises.

At high engine speeds the guide vanes (2) are increasingly opened and the flow cross-section is thus enlarged, as a result of which the speed of the turbocharger reduces and the charge pressure drops.

The turbocharger guide vanes are controlled by the electronic actuator. The Powertrain Control Module (PCM) monitors the boost and charge air changes to the turbocharger system during operation. The PCM sends a PWM signal to the actuator. The actuator will then respond to the signal adjusting the guide vanes.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TURBOCHARGER

The turbocharger, charge air cooler and exhaust gas recirculation systems operate with one another and must be tested as a complete system. It is important that all components of the air intake system be thoroughly tested any time a symptom is present for one of these components.

It is typical to notice a small amount of engine oil in the air intake system. This comes from the crankcase ventilation and may weep out of hose connections that are not clamped properly. This does not mean that the turbocharger requires replacement.

If DTC's or the performance of the vehicle lead to the determination that the boost pressure and/or mass air flow values are out of range, the systems listed below should be inspected. If a DTC for the inlet or intake air temperature has been stored, refer to the appropriate diagnostics.

NOTE: Also a continuous air leak may result in an intermittent symptom. The

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Powertrain Control Module (PCM) monitors the sensor readings continuously but only sets a DTC or reduces the engine torque when these readings are outside of the tolerances, which may occur under certain driving conditions.

Inspect the following:

- Air intake system plumbing: Loose or broken hoses or fittings may create an air leak resulting in a loss of pressure and mass air flow. (A smoke machine does not create enough pressure to find a leak in the air intake system).
- Turbo Resonator: Inspect the resonator (muffler, connected to the turbocharger) for air leaks at the seam between the two shells.
- Charge Air Cooler: A charge air cooler damaged by tools or external debris may leak air.
- Exhaust Gas Recirculation (EGR) valve: A sticking EGR valve influences the mass air flow causing implausibility with MAF, which displays one or more DTC's. Don't replace the EGR valve if no DTC's are present. Use the actuator test in the scan tool to move the EGR valve at idle speed. The MAF value should alternate between 500 to 600 mg/strk at 5% ratio (almost closed) and 200 to 300 mg/strk at 95% ratio (almost opened) when the "EGR Positioner" is being actuated by the scan tool.
- Mass Air Flow Sensor (MAF): The mass air flow, measured and provided by the MAF is critical for calculations performed by the PCM and may result in several DTC's related to the air intake system if not accurate.
- Boost Pressure Sensor: Make sure that the correct part number, or superseding part number, is installed. Refer to MOPAR® for the correct part number information.
- Turbocharger: Refer to **TURBOCHARGER DIAGNOSTIC PROCEDURE**. Consider that an operating turbocharger creates a flow sound, which is normal and does not require replacement. Other sounds like whistling are potentially caused by the resonator or improper line connections.

TURBOCHARGER DIAGNOSTIC PROCEDURE

1. Visually inspect all the blades of the turbocharger compressor and turbine wheel for damage which may have been caused by foreign particles. For example if the air filter was improperly installed or an incorrect air filter was installed.

CAUTION: Do NOT try to move the actuator mechanism by pushing or pulling the connecting rod. There is a worm gear attached to the actuator mechanism, which doesn't allow any movement from its output side.

2. If the actuator mechanism doesn't move at all check power and ground supply of the actuator.
3. If the actuator mechanism doesn't move even though the electrical connection has been verified or moves erratically the turbocharger assembly is defective and must be replaced.

REMOVAL

REMOVAL

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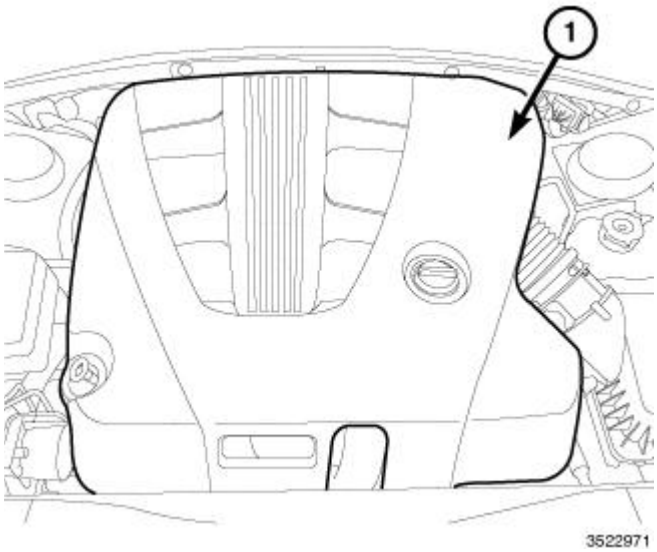


Fig. 449: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery.
2. Remove the engine cover (1).

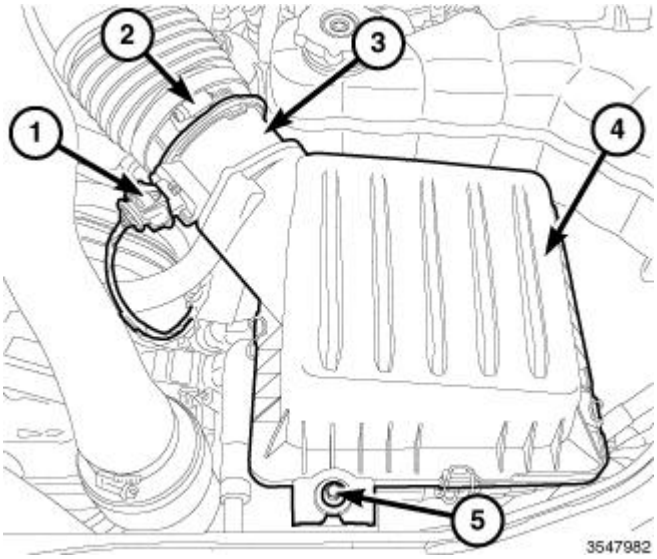


Fig. 450: Mass Air Flow (MAF) Sensor, Connector, Clamp, Air Cleaner Body & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Remove the air cleaner body and air tube. Refer to **BODY, AIR CLEANER, REMOVAL**.

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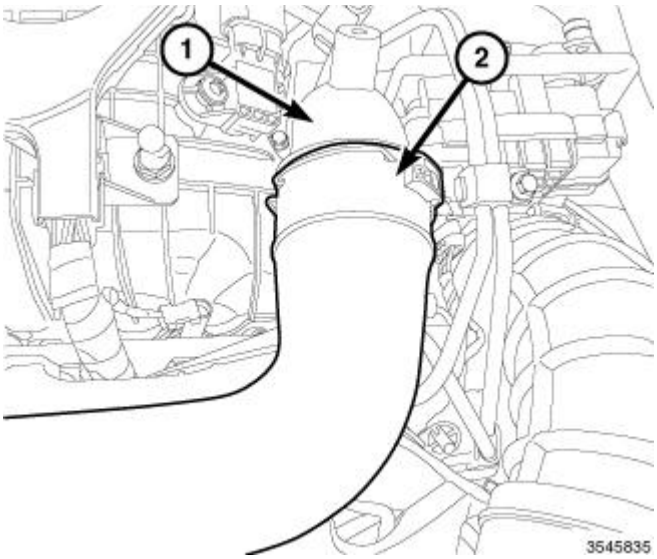


Fig. 451: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the Charge Air Cooler (CAC) hose (2) from turbocharger (1).
5. Remove the CAC hose at the resonator.
6. Raise and support vehicle.

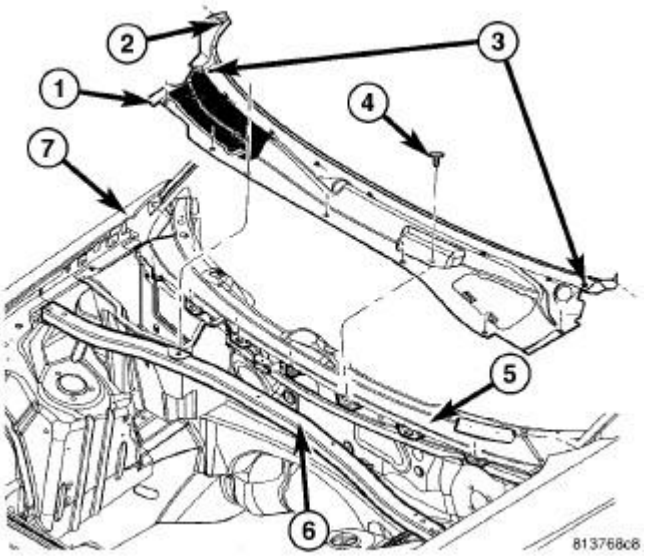


Fig. 452: Cowl Panel, Push-Pins & Fasteners
Courtesy of CHRYSLER GROUP, LLC

7. Remove the cowl. Refer to **COVER, COWL PANEL, REMOVAL** .

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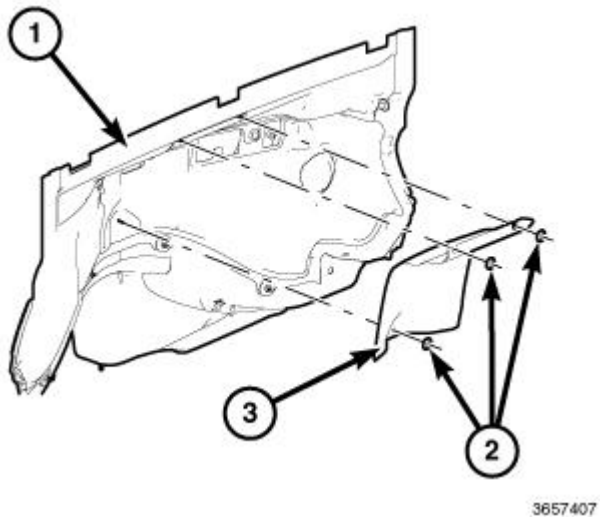


Fig. 453: Dash Extension, Heatshield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

8. Remove the heatshield (3) from the dash extension (1).

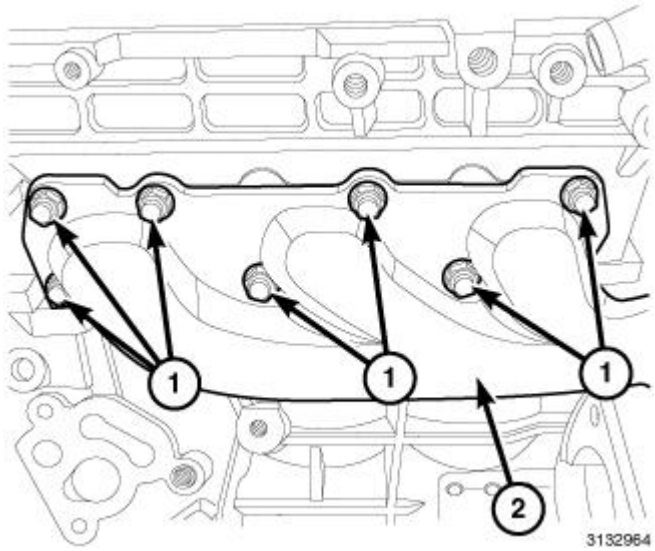


Fig. 454: Left Exhausts Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

9. Remove the left side exhaust manifold. Refer to **MANIFOLD, EXHAUST, REMOVAL**.

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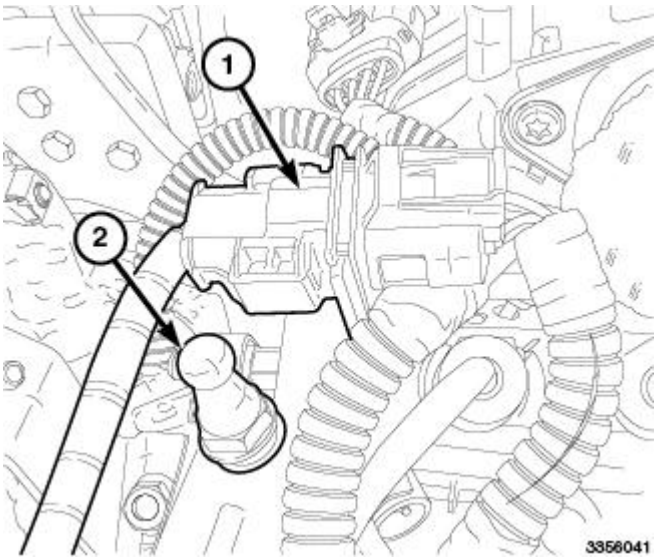


Fig. 455: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the O2 sensor wiring harness connector (1).
11. Remove the upper transmission indicator tube ball stud fastener (2).
12. Remove the transmission oil indicator tube mounting bracket.

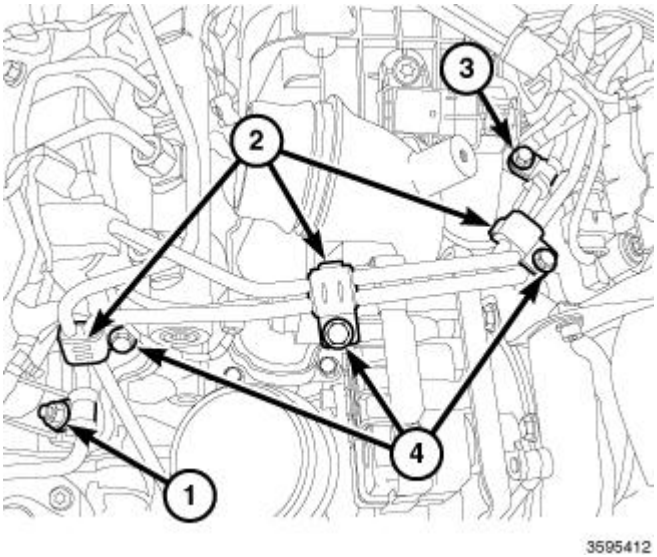


Fig. 456: Fuel Tube Securing Bolts & Bracket
Courtesy of CHRYSLER GROUP, LLC

13. Remove nut (1) securing the fuel tube.
14. Remove bolt (3) securing the fuel tube.
15. Remove bolts (4) and the bracket (2) securing the fuel tubes.

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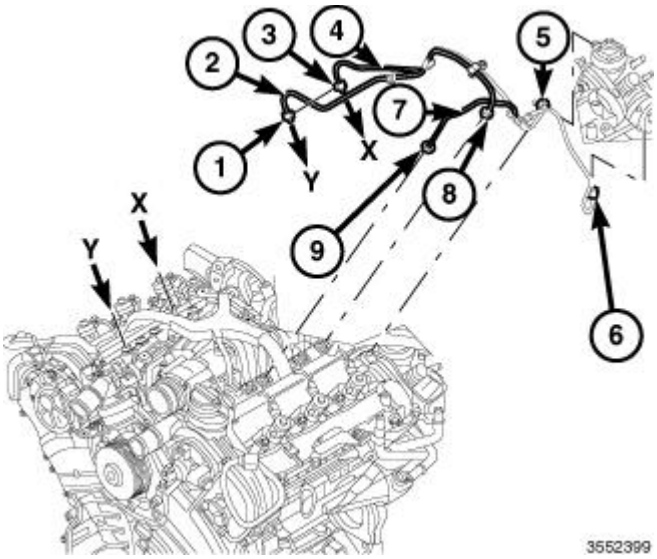


Fig. 457: High Pressure Fuel Crossover Tube, Left High Pressure Fuel Tube & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: The fuel lines are a one time use only. The fuel lines must be discarded and a new line must be installed.

16. Loosen union nuts (3, 8) and remove the high pressure fuel crossover tube (4) and discard fuel tube.
17. Loosen union nuts (6, 9) and remove the left high pressure fuel tube (7) and discard fuel tube.

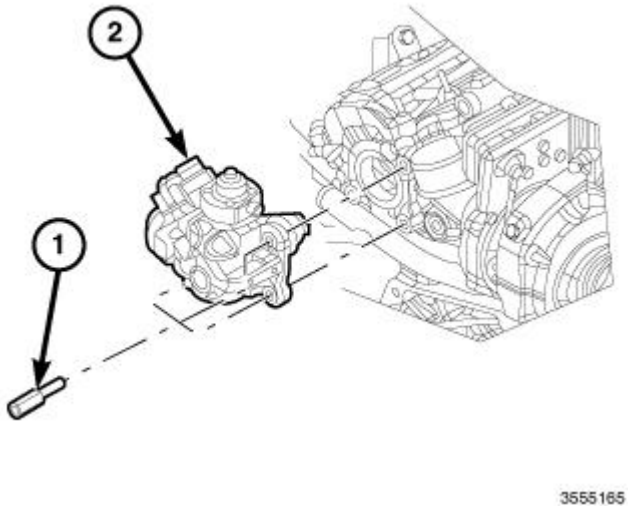


Fig. 458: Fuel Injection Pump
Courtesy of CHRYSLER GROUP, LLC

18. Remove the fuel injection pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, REMOVAL** .

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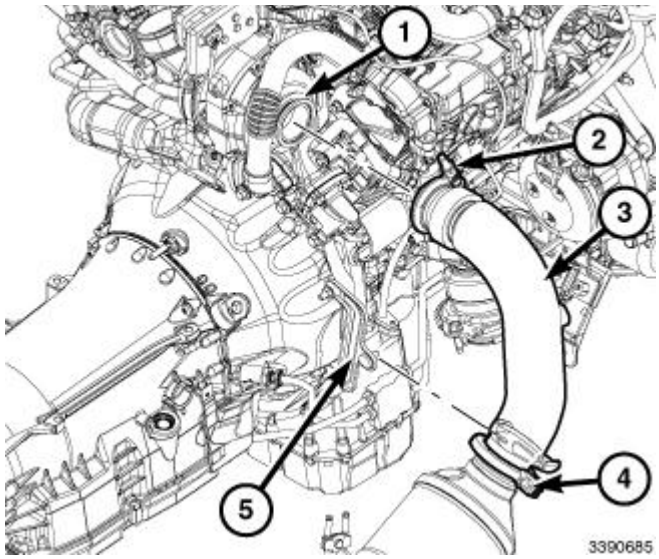


Fig. 459: Turbocharger Outlet, Exhaust Down Pipe & Clamps
Courtesy of CHRYSLER GROUP, LLC

19. Disconnect the turbocharger actuator electrical connector.
20. Loosen the clamp (2) for the exhaust down pipe (4) from the turbocharger outlet (1) and separate the downpipe from the outlet flange.
21. Raise and support the vehicle.
22. Loosen the nut that mounts the downpipe (3) to the transmission mount bracket (5).
23. Loosen the upper Diesel Particulate Filter (DPF) clamp (4) from the down pipe (3).
24. Lower the vehicle.
25. Remove the down pipe from the engine compartment.

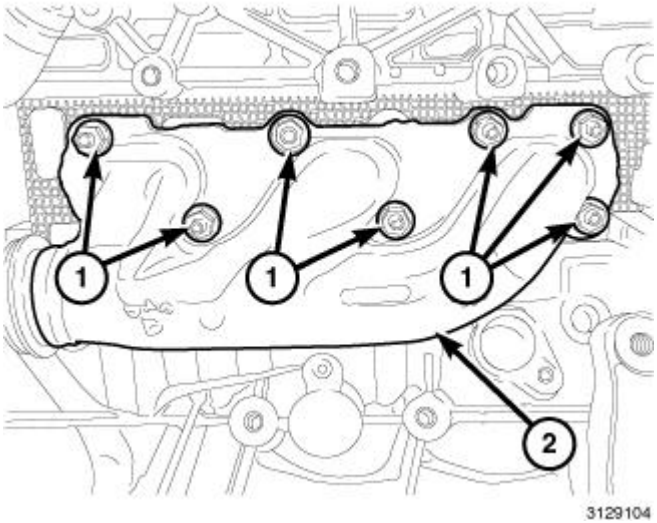


Fig. 460: Right Exhaust Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

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26. Remove the right side exhaust manifold (2). Refer to **MANIFOLD, EXHAUST, REMOVAL**.

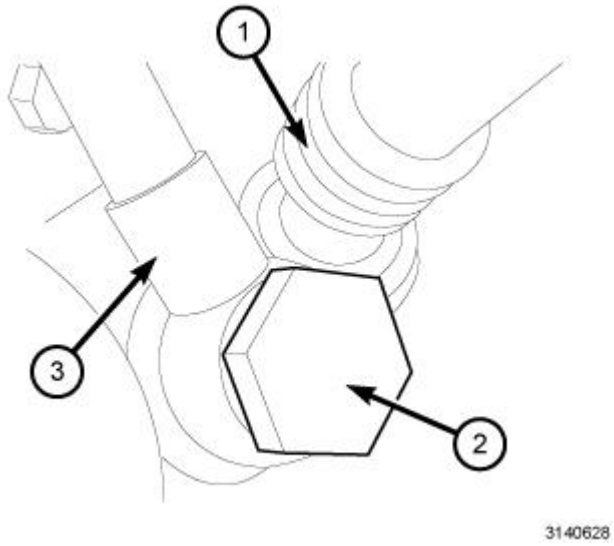


Fig. 461: Upper Banjo Bolt & Turbocharger Supply Lines
Courtesy of CHRYSLER GROUP, LLC

27. Remove the banjo bolt (2) at the engine block for the turbocharger supply line (3).

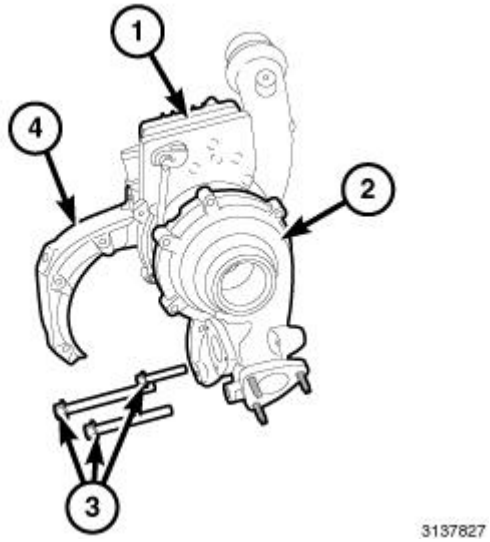


Fig. 462: Actuator, Turbo, Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

28. Remove the turbo mounting bolts (3).

NOTE: The turbocharger oil return line is fitted into a rubber grommet on the engine block. Care must be used when removing the turbocharger, that the return line is not damaged.

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29. With care, lift the turbo upwards and away from the engine block, to remove the turbocharger oil return tube from the engine block.
30. If needed, remove the heat shield (4).
31. If needed, remove the actuator (1).

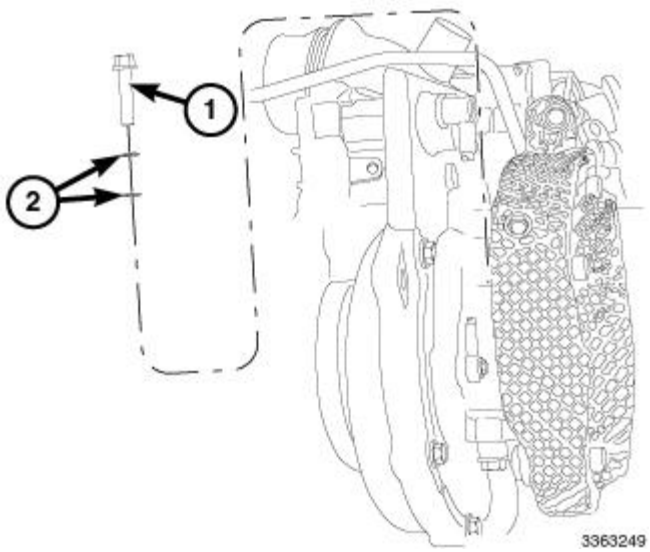


Fig. 463: Upper Turbocharger Supply Line Banjo Bolt & Copper Washers
Courtesy of CHRYSLER GROUP, LLC

32. Remove the upper turbocharger supply line banjo bolt (1).
33. Remove the supply line from the turbocharger.

INSPECTION

INSPECTION

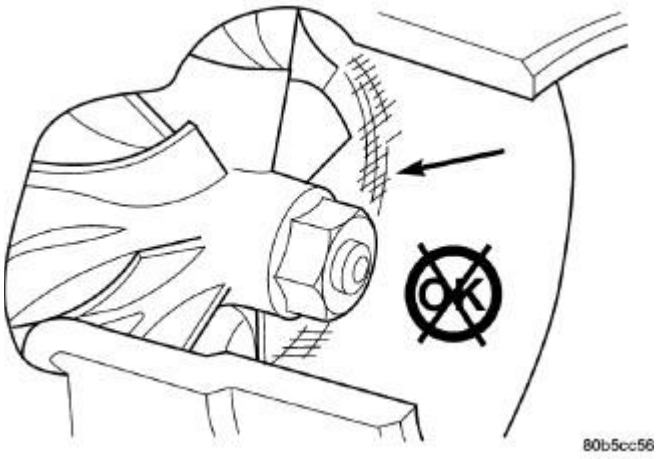


Fig. 464: Inspect Compressor Housing For Impeller Rubbing Condition
Courtesy of CHRYSLER GROUP, LLC

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Visually inspect the turbocharger and exhaust manifold gasket surfaces. Replace stripped or eroded mounting studs.

1. Visually inspect the turbocharger for cracks. The following cracks are NOT acceptable:
   - Cracks in the turbine and compressor housing that go completely through.
   - Cracks in the mounting flange that are longer than 15 mm (0.6 in.).
   - Cracks in the mounting flange that intersect bolt through-holes.
   - Two (2) Cracks in the mounting flange that are closer than 6.4 mm (0.25 in.) together.
2. Visually inspect the impeller and compressor wheel fins for nicks, cracks, or chips. 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.
3. Visually inspect the turbocharger compressor housing for an impeller rubbing condition. Replace the turbocharger if the condition exists.

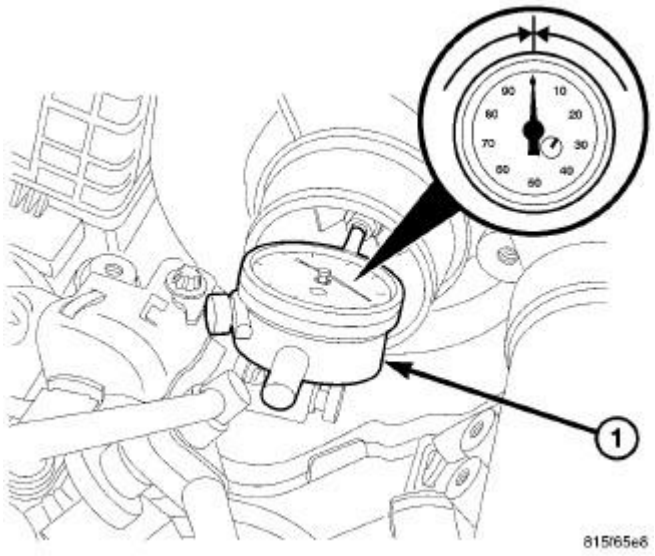


Fig. 465: Measuring Turbocharger End Play
Courtesy of CHRYSLER GROUP, LLC

1 - DIAL INDICATOR

4. Measure the turbocharger end play:
   1. Install a dial indicator (1) 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 0.026 mm (0.0001 in.) MIN. and 0.127 mm (0.005 in.) MAX. If the recorded measurement falls outside these parameters, replace the turbocharger assembly.

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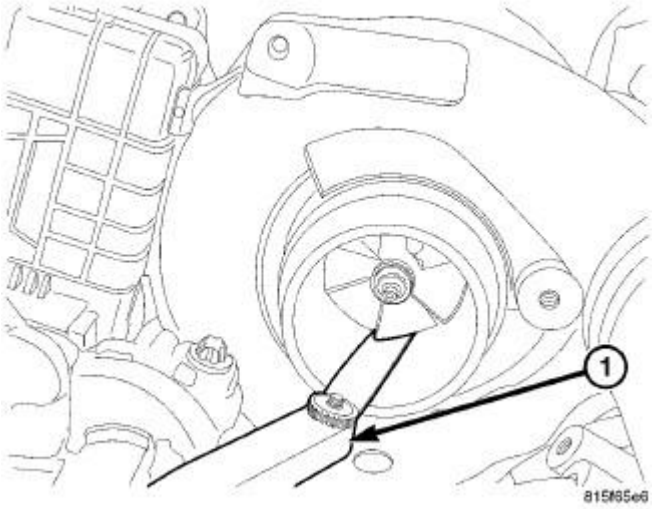


Fig. 466: Measuring Turbocharger Radial Bearing Clearance
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAGE

5. Measure the turbocharger bearing radial clearance:
    1. Insert a narrow blade or wire style feeler gauge (1) 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 0.076 mm (0.003 in.) MIN. and 0.102 mm (0.040 in.) MAX. If the recorded measurement falls outside these specifications, replace the turbocharger assembly.

INSTALLATION

INSTALLATION

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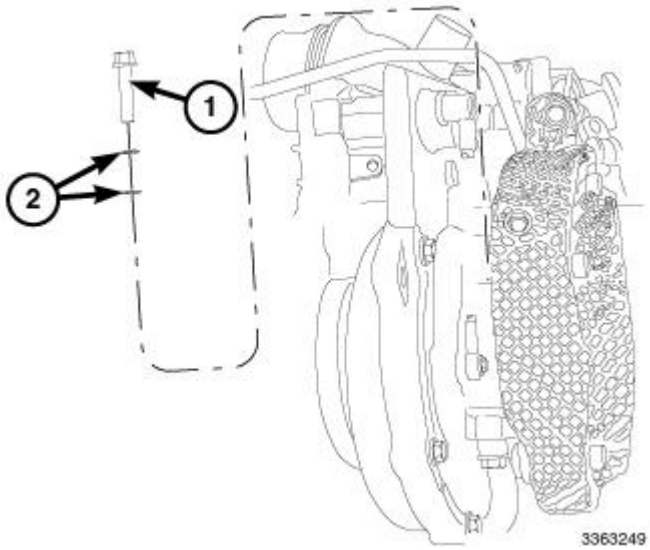


Fig. 467: Upper Turbocharger Supply Line Banjo Bolt & Copper Washers
Courtesy of CHRYSLER GROUP, LLC

1. Install new copper washers (2) for the oil supply line at the turbocharger. **Loosely** install the banjo bolt.

NOTE: Do to tight clearances. To aid in installation. Use a petroleum based gel to hold a new copper washer to the engine block to allow installation of the oil supply line banjo bolt when the turbocharger is positioned into place.

2. Using a new copper washer for the oil supply line. Apply a petroleum base gel to one side of the washer and press it into the engine block side of the turbocharger supply port.

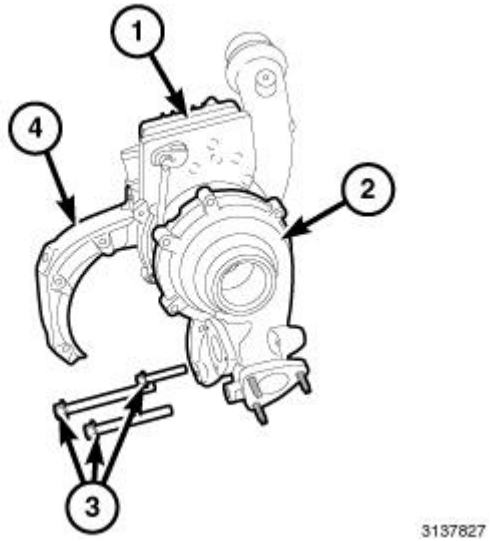


Fig. 468: Actuator, Turbo, Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install new oil return line grommet into the engine block.

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4. Using care, position the turbo on to the engine block while guiding the oil return tube into the grommet.
5. Install the M10 mounting bolts to the engine block. Tighten M10 bolts to 55 N.m (41 ft. lbs.).
6. Install the M8 mounting bolt to the cylinder head. Tighten M8 bolts to 25 N.m (18 ft. lbs.).

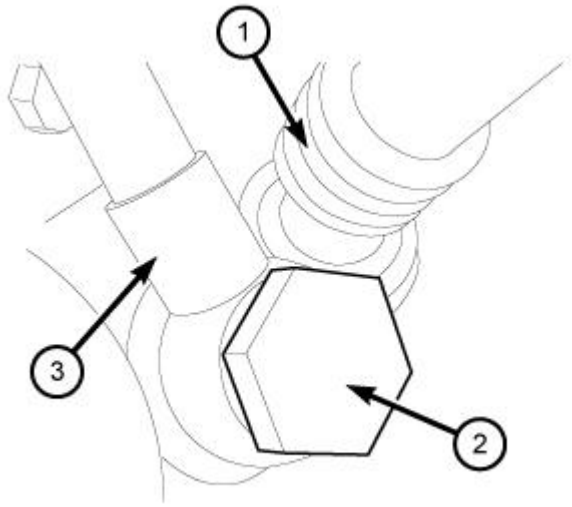


Fig. 469: Upper Banjo Bolt & Turbocharger Supply Lines
Courtesy of CHRYSLER GROUP, LLC

7. Install a new copper washer onto the supply line banjo bolt (2).
8. Tighten the oil supply line banjo bolt (2) at the engine block to 35 N.m (26 ft. lbs.).
9. Tighten the upper banjo bolt (1) to 25 N.m (18 ft. lbs.).

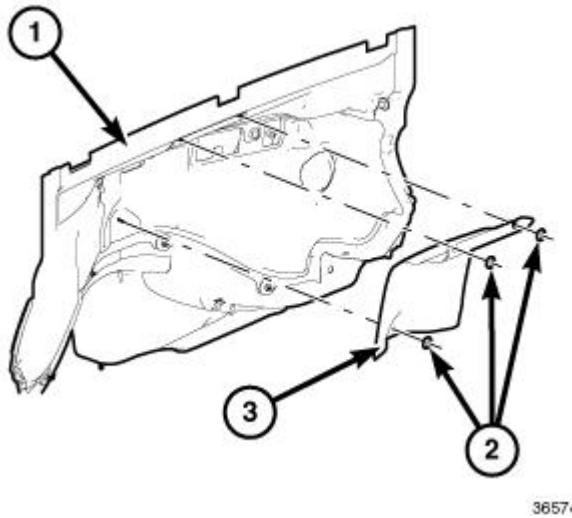


Fig. 470: Dash Extension, Heatshield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

10. Install the dash extension heat shield (3). Tighten the nuts (2) to 3 N.m (27 in. lbs.).

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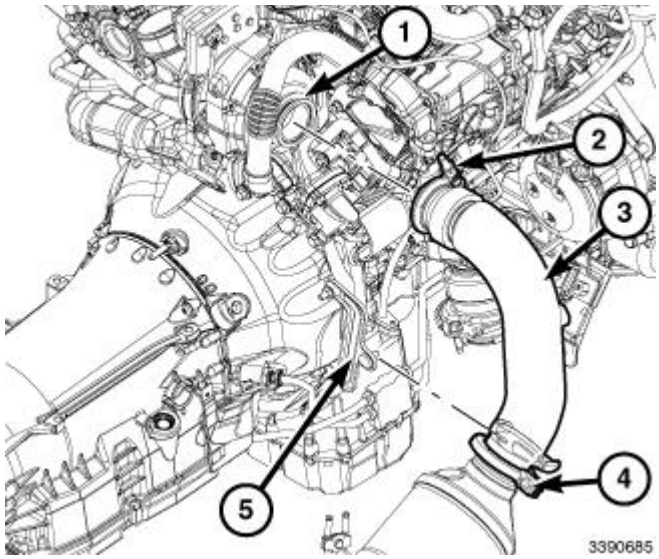


Fig. 471: Turbocharger Outlet, Exhaust Down Pipe & Clamps
Courtesy of CHRYSLER GROUP, LLC

11. Position the exhaust downpipe (3) onto the turbocharger outlet nozzle (1) and tighten the clamp (2) to 25 N.m (18 ft. lbs.).
12. Raise and support the vehicle.
13. Align the downpipe (3) to the Diesel Particulate Filter (DPF).
14. Mount the exhaust to the transmission mounting bracket (5). Tighten the nut to 26 N.m (19 ft. lbs.).
15. Lower the vehicle.

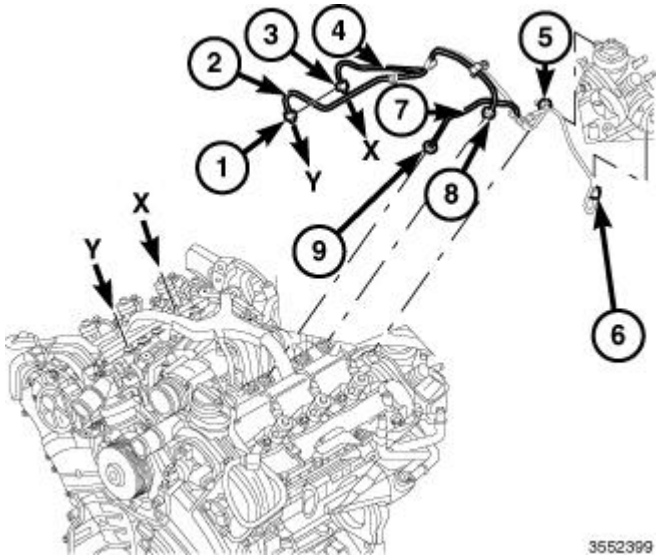


Fig. 472: High Pressure Fuel Crossover Tube, Left High Pressure Fuel Tube & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: The fuel lines are a one time use only. The fuel lines must be discarded and a new line must be installed.

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16. Install a new fuel cross over line (4). Tighten the union nuts (3 and 8) to 5 N.m (44 in. lbs.) plus an additional 75 degrees turn.
17. Install a new left high pressure fuel tube (7). Tighten union nut (6 and 9) to 5 N.m (44 in. lbs.) plus an additional 75 degrees turn.

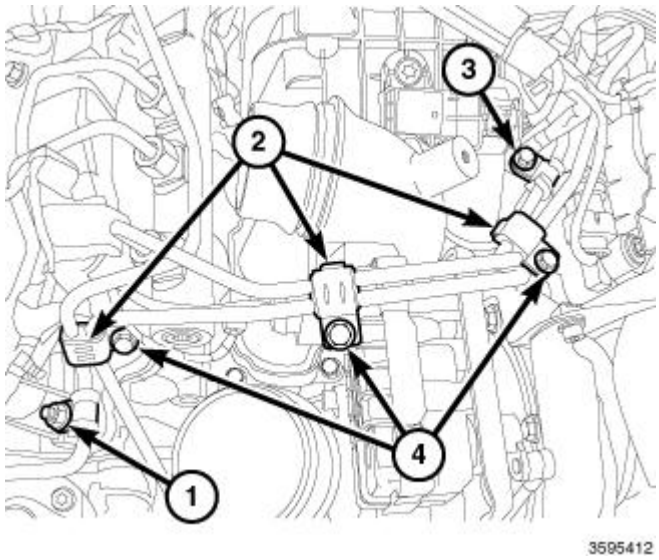


Fig. 473: Fuel Tube Securing Bolts & Bracket
Courtesy of CHRYSLER GROUP, LLC

18. Install the bolts (4) to the brackets (2) that secure the fuel tubes. Tighten to 11 N.m (97 in. lbs.).
19. Install the bolt securing the fuel line to the intake manifold (3). Tighten to 11 N.m (97 in. lbs.).
20. Install the nut (1) that secures the fuel line to the valve cover stud. Tighten to 11 N.m (97 in. lbs.).

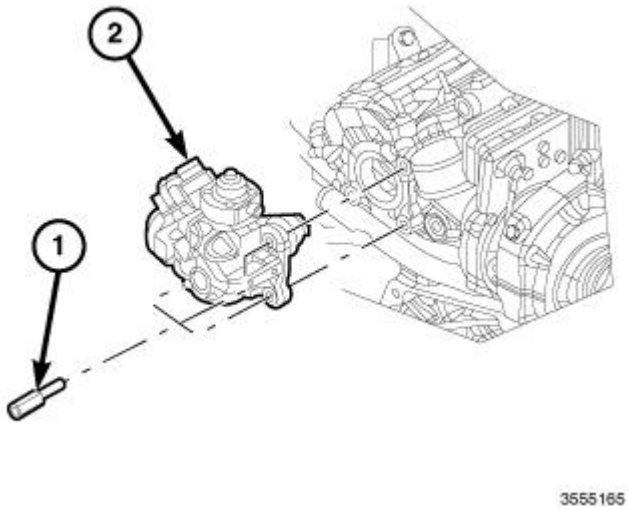


Fig. 474: Fuel Injection Pump
Courtesy of CHRYSLER GROUP, LLC

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21. Install the fuel injection pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, INSTALLATION** .

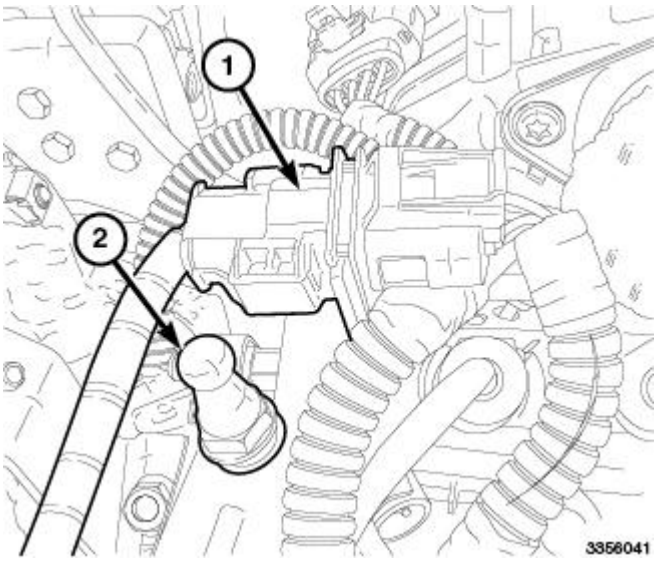


Fig. 475: Oxygen Sensor Connector & Ball Stud Fastener
Courtesy of CHRYSLER GROUP, LLC

22. Install the upper transmission indicator tube bracket. Tighten the stud (2) to 15 N.m (11 ft. lbs.).
23. Connect the O2 sensor wiring harness connector (1) and install it into the bracket.

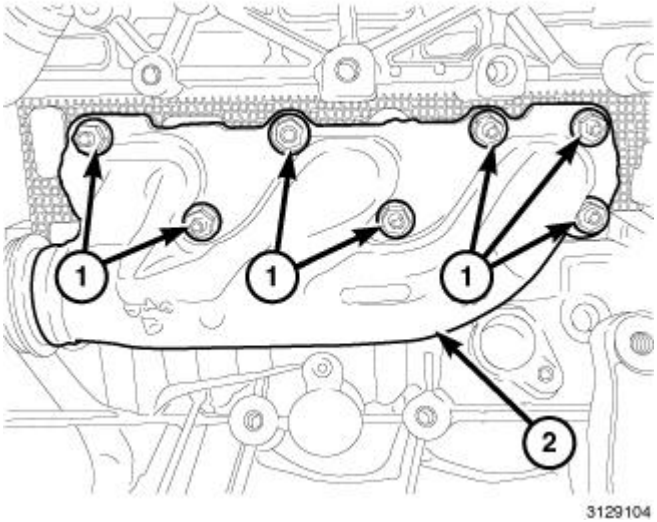


Fig. 476: Right Exhaust Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

24. Install the right side exhaust manifold. Refer to **MANIFOLD, EXHAUST, INSTALLATION**.

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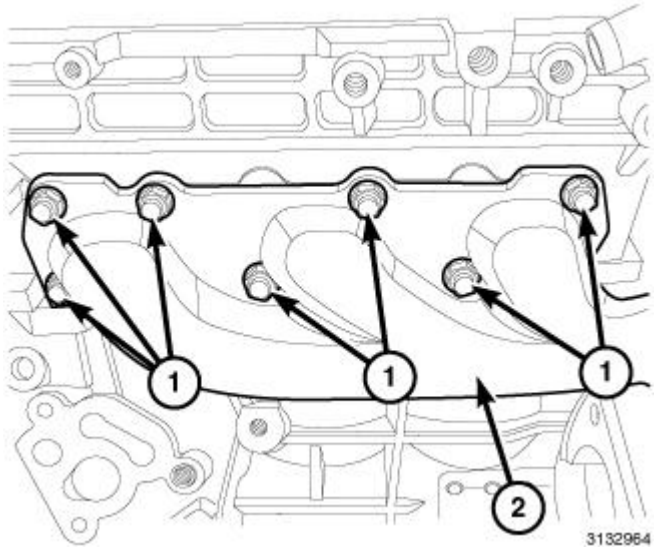


Fig. 477: Left Exhausts Manifold & Nuts
Courtesy of CHRYSLER GROUP, LLC

25. Install the left side exhaust manifold. Refer to **MANIFOLD, EXHAUST, INSTALLATION**.

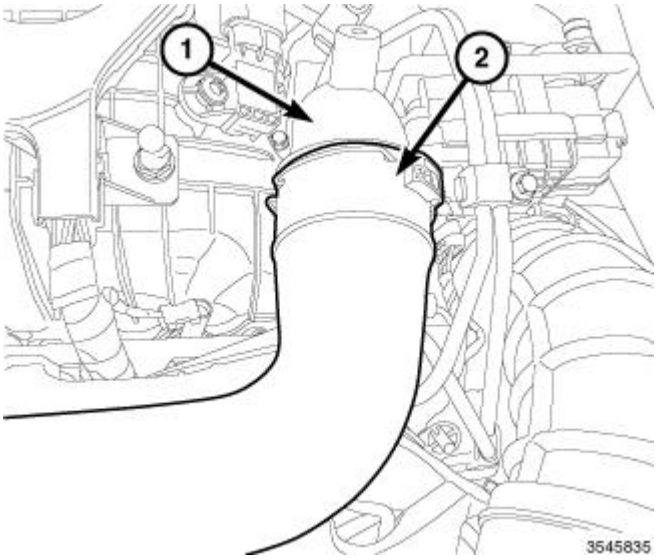


Fig. 478: Turbocharger & Charge Air Cooler (CAC) Hose
Courtesy of CHRYSLER GROUP, LLC

26. Install the CAC to the resonator.
27. Install the CAC hose (2) to the turbocharger (1).

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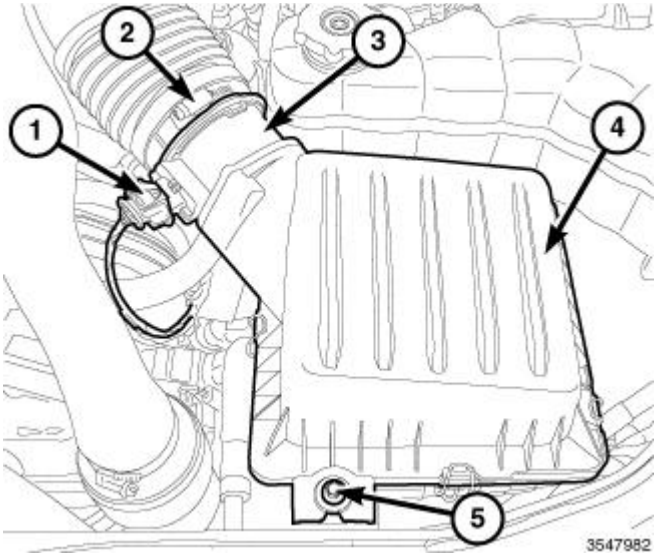


Fig. 479: Mass Air Flow (MAF) Sensor, Connector, Clamp, Air Cleaner Body & Fasteners
Courtesy of CHRYSLER GROUP, LLC

28. Install the air cleaner and air tube assembly. Refer to **BODY, AIR CLEANER, INSTALLATION**.
29. Connect the negative battery cable.

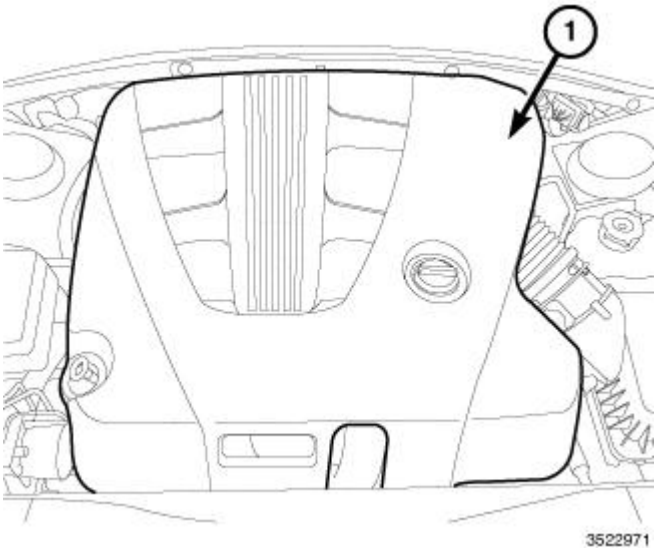


Fig. 480: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

30. Install the engine cover.

VALVE TIMING

STANDARD PROCEDURE

CAMSHAFT TIMING PROCEDURE

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LEFT CAMSHAFT

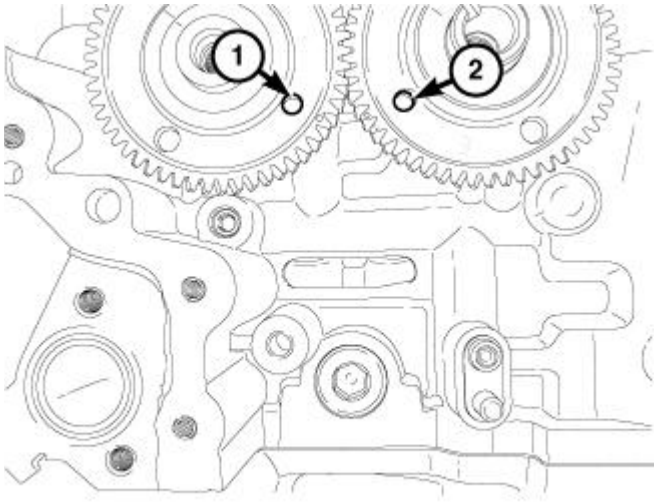


Fig. 481: Intake Camshaft Gear Timing Mark & Exhaust Camshaft Timing Gear Mark
Courtesy of CHRYSLER GROUP, LLC

1. The intake camshaft gear timing mark (1) should be at the four O'clock position and the exhaust camshaft timing gear mark (2) should be at the seven O'clock position.

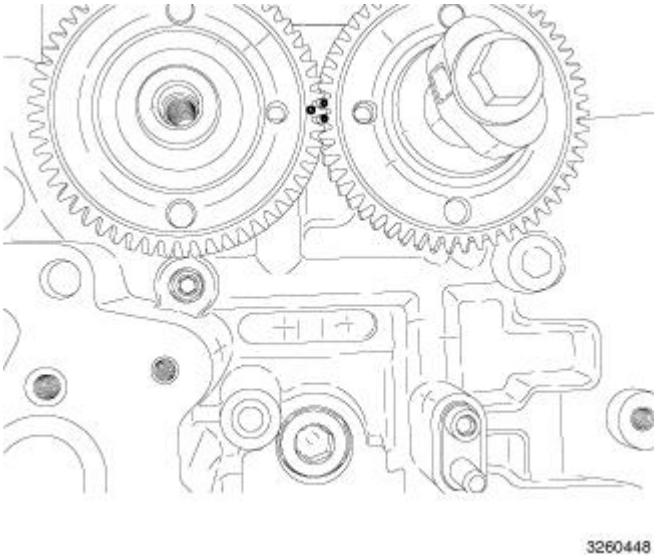


Fig. 482: Left Camshaft Gear Dots
Courtesy of CHRYSLER GROUP, LLC

2. Rotate the camshafts to line up the three camshaft gear dots and install the left (special tool #VM.10338-2, Timing Tool, Camshaft (Left)) (1).

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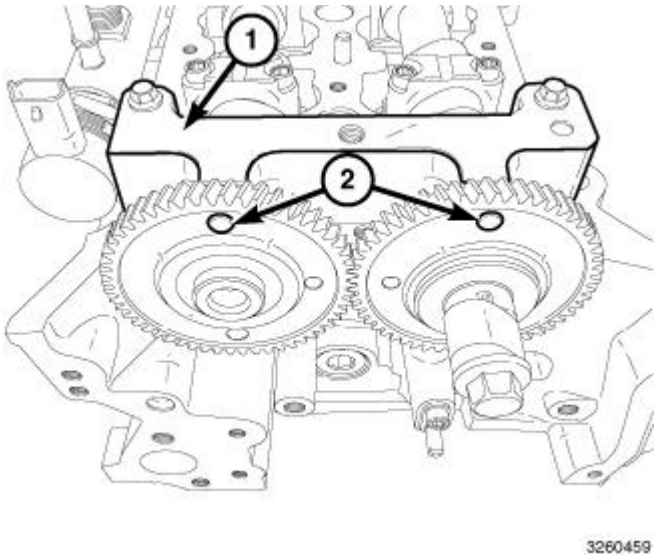


Fig. 483: Camshaft Timing Tool & Sprockets Holes - Left
Courtesy of CHRYSLER GROUP, LLC

3. If the (special tool #VM.10338-2, Timing Tool, Camshaft (Left)) (1) locking pins don't align up and fit into the holes (2) on the camshaft gears then the camshafts are not timed properly.

RIGHT CAMSHAFT

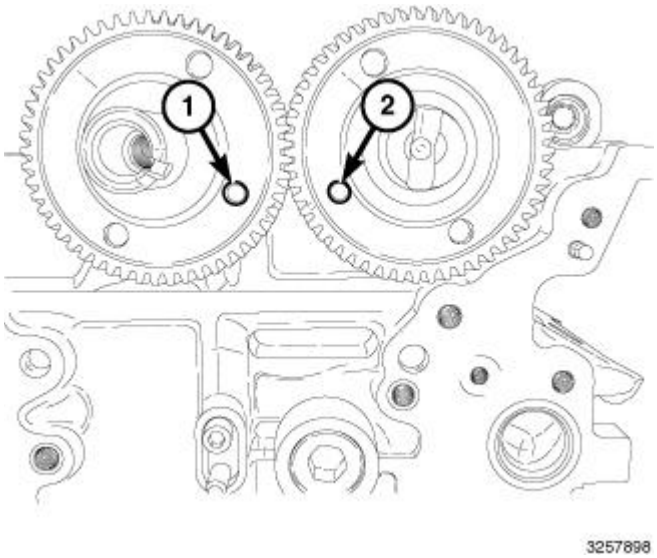


Fig. 484: Exhaust Camshaft Gear Timing Mark & Intake Camshaft Timing Gear Mark
Courtesy of CHRYSLER GROUP, LLC

1. The exhaust camshaft gear timing mark (1) should be at the four O'clock position and the intake camshaft timing gear mark (2) should be at the seven O'clock position.

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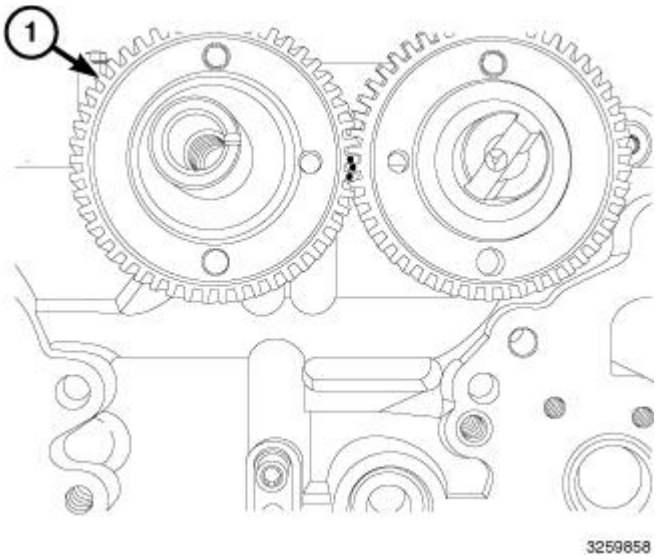


Fig. 485: Right Camshaft Gear Dots
Courtesy of CHRYSLER GROUP, LLC

2. Rotate the camshafts to line up the three camshaft gear dots and install the right (special tool #VM.10338-1, Timing Tool, Camshaft (Right)) (1).

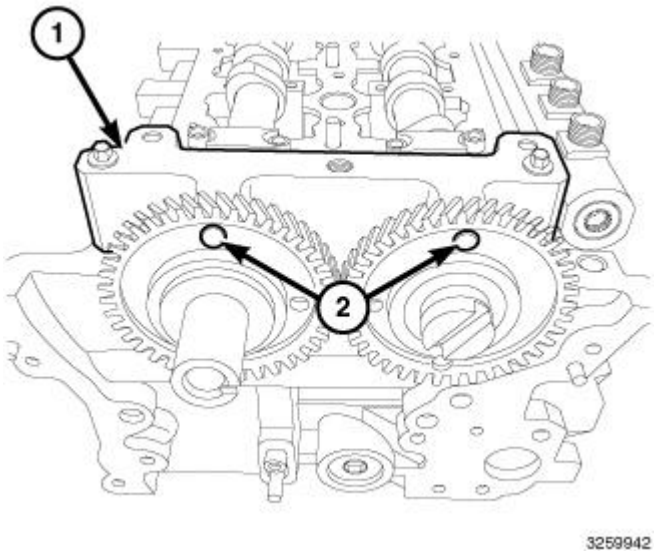


Fig. 486: Camshaft Timing Tool & Sprockets Holes - Right
Courtesy of CHRYSLER GROUP, LLC

3. If the (special tool #VM.10338-1, Timing Tool, Camshaft (Right)) (1) locking pins don't align up and fit into the holes (2) on the camshaft gears then the camshafts are not timed properly.

LOCKING ENGINE 30 DEGREES AFTER TDC

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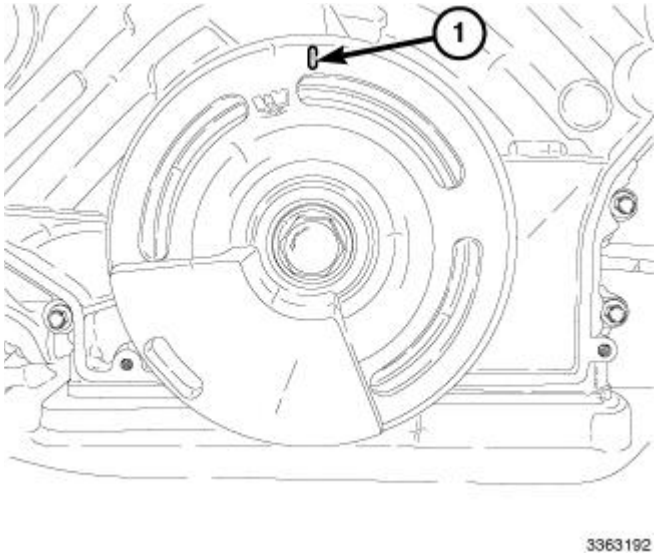


Fig. 487: Crankshaft At 12 O'clock Position
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Rotate the engine until timing mark (1) on the crankshaft is at the 12 O'clock position, (this is 30° ATDC).

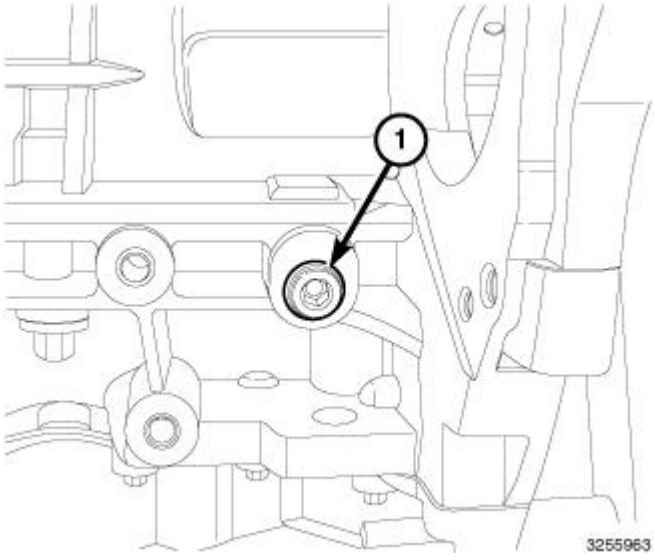


Fig. 488: Engine Block Plug
Courtesy of CHRYSLER GROUP, LLC

3. Remove the engine block plug (1).

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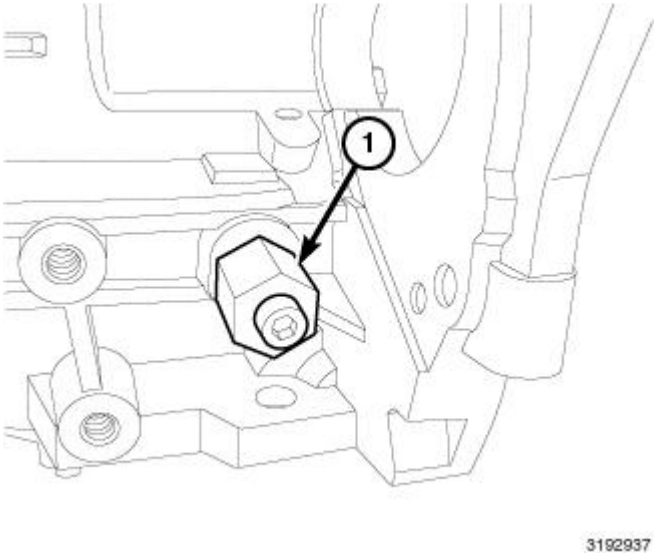


Fig. 489: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

4. Install the (special tool #VM.10339, Tool, Crankshaft Timing) (1) into the starter side of the engine block. If the (special tool #VM.10339, Tool, Crankshaft Timing) does not fully go into the engine block and stops short, the engine is not properly set to 30° ATDC. Rotate the engine so the (special tool #VM.10339, Tool, Crankshaft Timing) fully engages into engine block and crankshaft. Once full engaged thread tool into engine block and install the bolt. The crankshaft is now set at 30° ATDC.

CHAIN AND SPROCKETS, TIMING

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the lower timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.
3. Lock the engine to 30 degrees ATDC. Refer to **Engine/Valve Timing - Standard Procedure**.

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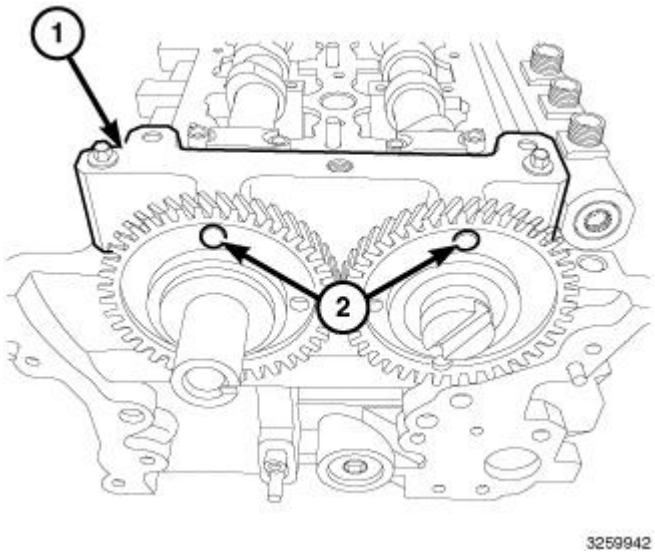


Fig. 490: Camshaft Timing Tool & Sprockets Holes - Right
Courtesy of CHRYSLER GROUP, LLC

4. Install the right (special tool #VM.10338-1, Timing Tool, Camshaft (Right)) (1) and securely tighten bolts.

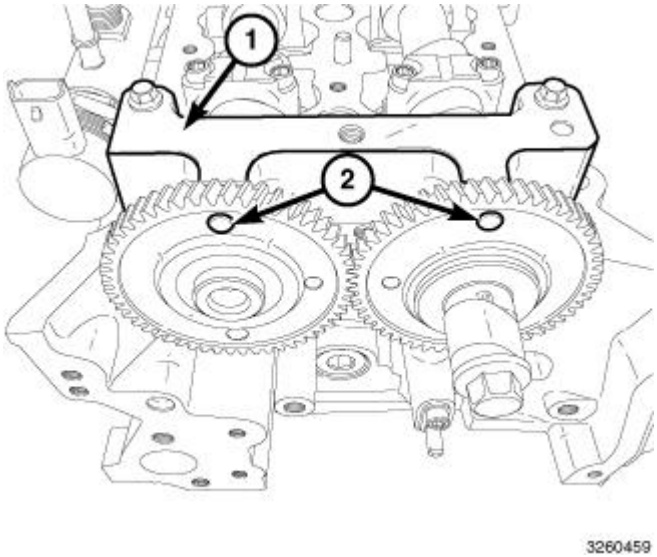


Fig. 491: Camshaft Timing Tool & Sprockets Holes - Left
Courtesy of CHRYSLER GROUP, LLC

5. Install the left (special tool #VM.10338-2, Timing Tool, Camshaft (Left)) (1) and securely tighten bolts.

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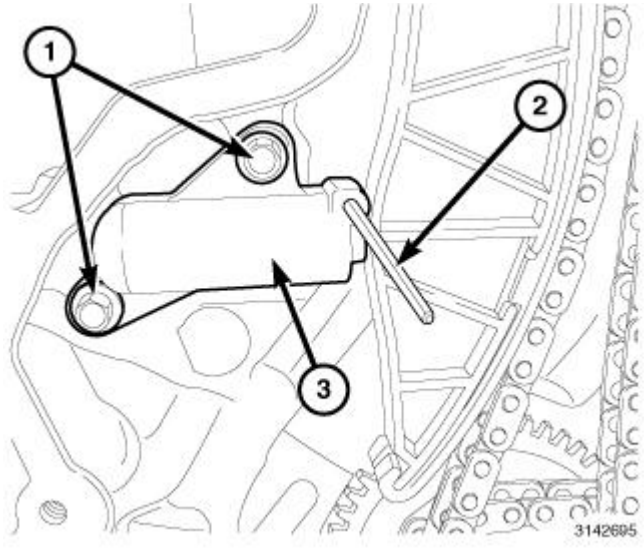


Fig. 492: Pin, Right Timing Chain Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the (special tool #VM.10359, Pin, Tensioner) (2) into timing chain tensioner (3).
7. Remove bolts (1) and the right timing chain tensioner (3).

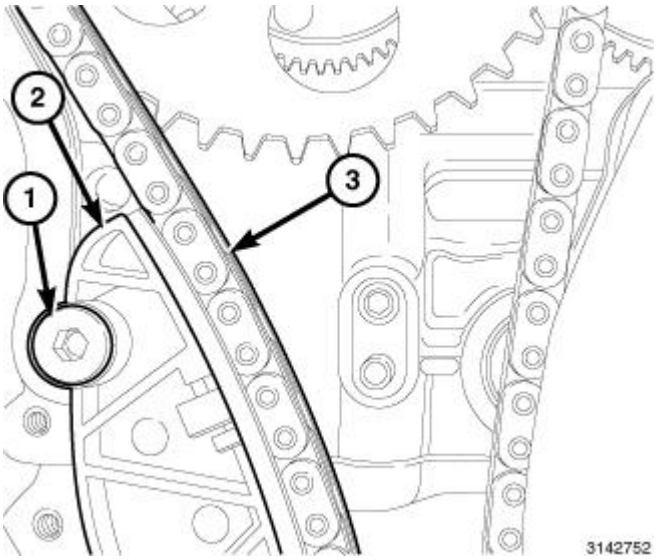


Fig. 493: Right Outer Timing Chain Guide & Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Remove bolt (1) and the right outer timing chain guide (2).

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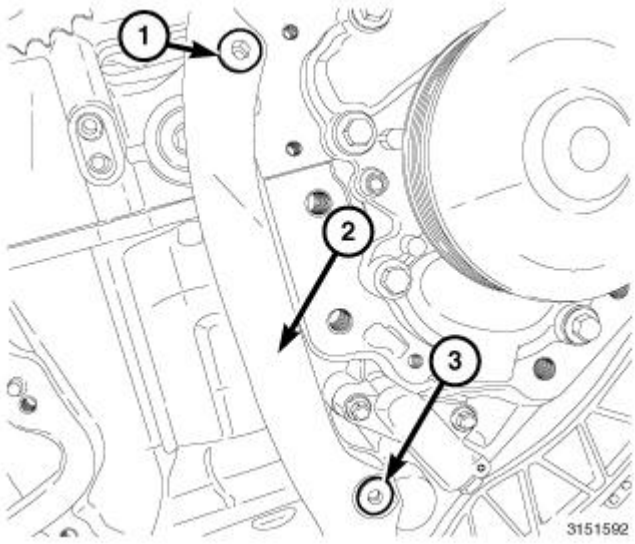


Fig. 494: Right Inner Timing Chain Guide & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. If necessary, remove bolt (1 and 3) and the right inner timing chain guide (2).

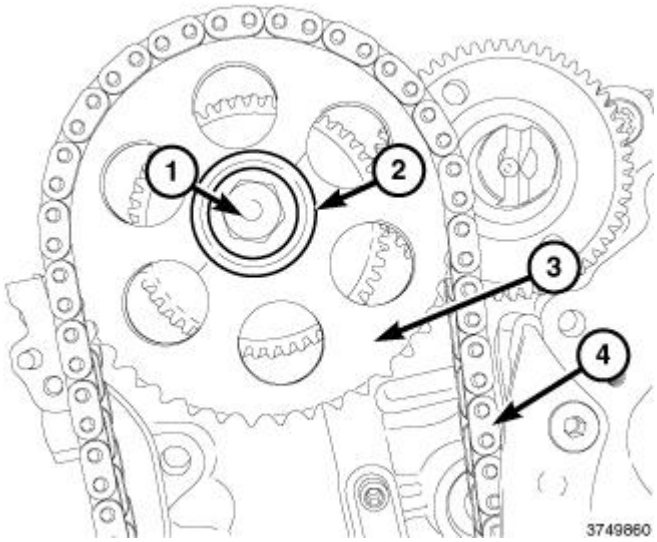


Fig. 495: Bolt, Washer, Timing Chain & Right Timing Chain Sprocket
Courtesy of CHRYSLER GROUP, LLC

10. Remove bolt (1) and washer (2).
11. Remove the right timing chain sprocket (4) and timing chain (3).

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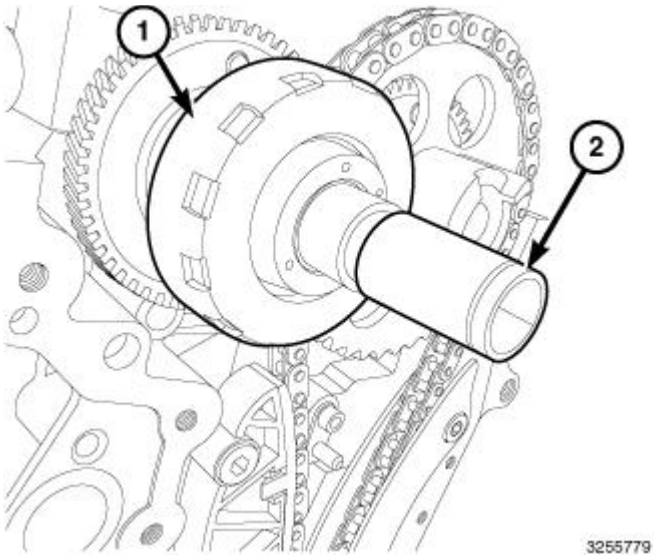


Fig. 496: Oil Separator & Oil Separator Remover/Installer Tool
Courtesy of CHRYSLER GROUP, LLC

12. Using the (special tool #VM.10344, Tool, Oil Separator Remover/Installer) (2), remove the oil separator (1) from the left intake camshaft.

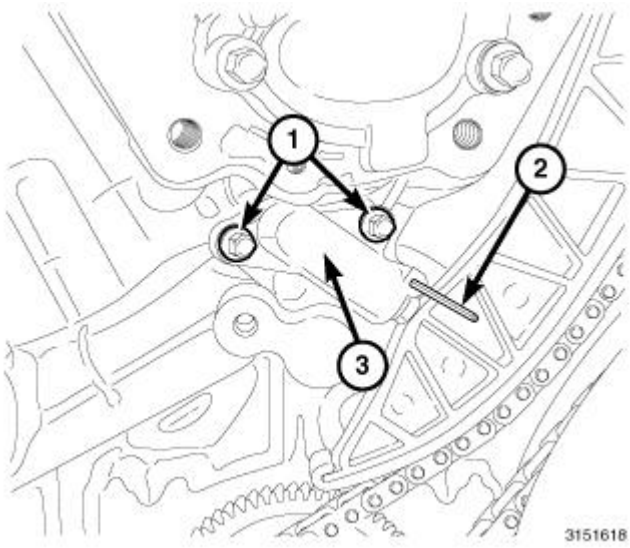


Fig. 497: Left Timing Chain Tensioner, Pin & Bolt
Courtesy of CHRYSLER GROUP, LLC

13. Install the (special tool #VM.10359, Pin, Tensioner) (2) into the timing chain tensioner (3).
14. Remove bolts (1) and the left timing chain tensioner (3).

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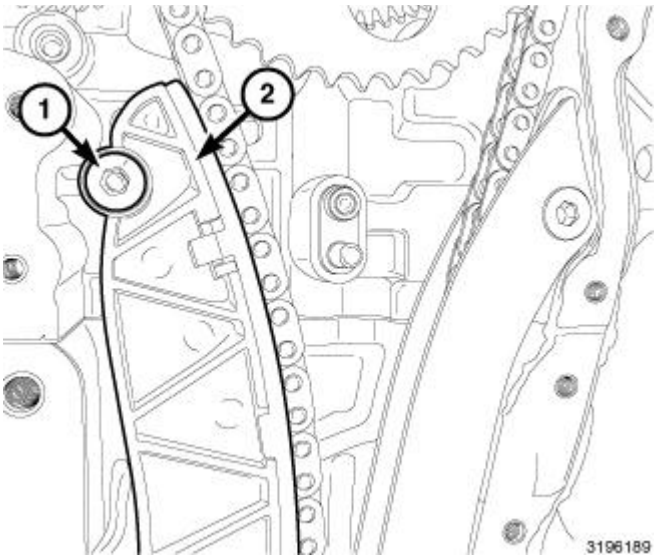


Fig. 498: Left Inner Timing Chain Guide & Bolt
Courtesy of CHRYSLER GROUP, LLC

15. Remove bolt (1), and the left inner timing chain guide (2).

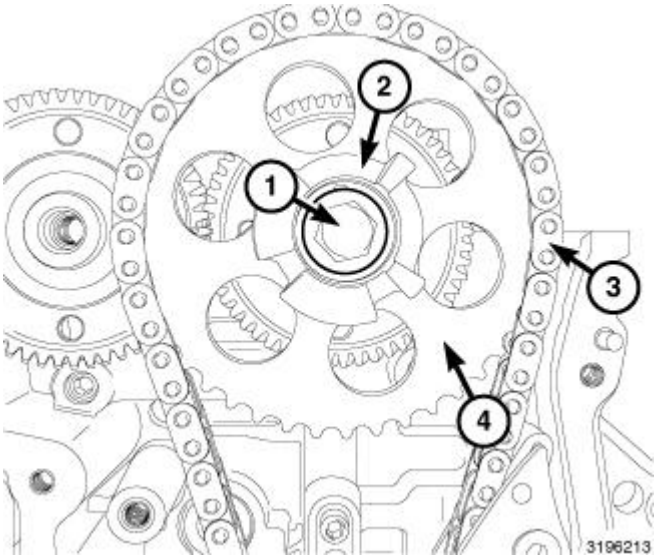


Fig. 499: Camshaft Position Sensor (CMP) Reluctor Wheel, Left Camshaft Timing Chain Sprocket, Timing Chain & Bolt
Courtesy of CHRYSLER GROUP, LLC

16. Remove bolt (1) and the Camshaft Position Sensor (CMP) reluctor wheel (2).
17. Remove the left camshaft timing chain sprocket (3) and timing chain (4).

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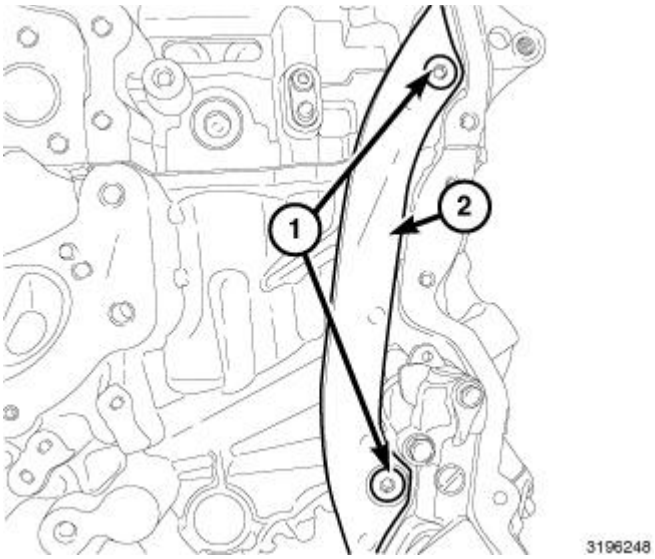


Fig. 500: Left Outer Timing Chain Guide & Bolts
Courtesy of CHRYSLER GROUP, LLC

18. If necessary, remove bolts (1) and the left outer timing chain guide (2).
19. If necessary, remove the crankshaft timing chain sprocket.
20. If necessary, remove the oil pump drive gear.

INSPECTION

INSPECTION

Inspect the following valve timing components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.
- Idler sprocket assembly bushing and shaft for excessive wear.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep.
- Secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner arm and chain should be replaced.
- Primary chain tensioner plastic faces. Replace as required.

INSTALLATION

INSTALLATION

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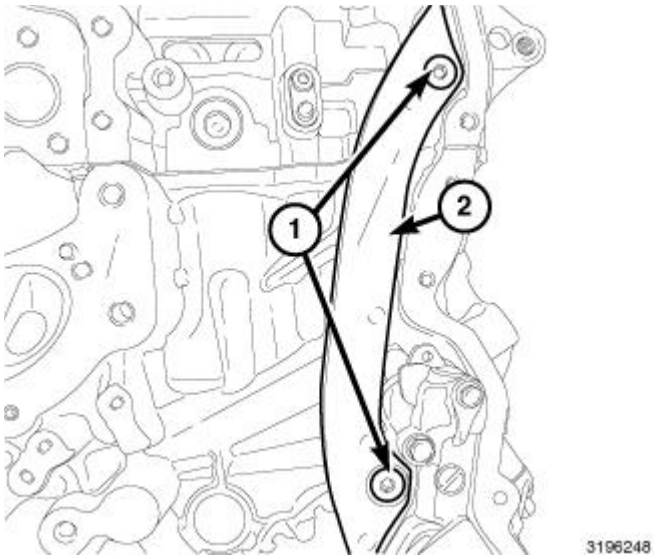


Fig. 501: Left Outer Timing Chain Guide & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Camshafts should already be timed with dots facing each other and the (special tool #VM.10338, Tool, Camshaft Timing) installed.

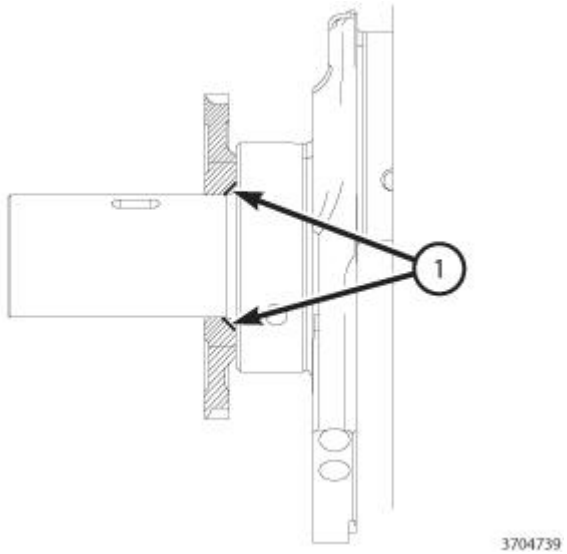


Fig. 502: Crankshaft Timing Chain Sprocket With Beveled Edge
Courtesy of CHRYSLER GROUP, LLC

NOTE: The oil pump drive gear bevel edge (1) should be facing the engine.

1. If removed, install the oil pump drive gear with beveled edge (1) facing the engine.
2. If removed, install the crankshaft timing chain sprocket.
3. If removed, install the left outer timing chain guide (2). Tighten bolts (1) to 30 N.m (22 ft. lbs.).

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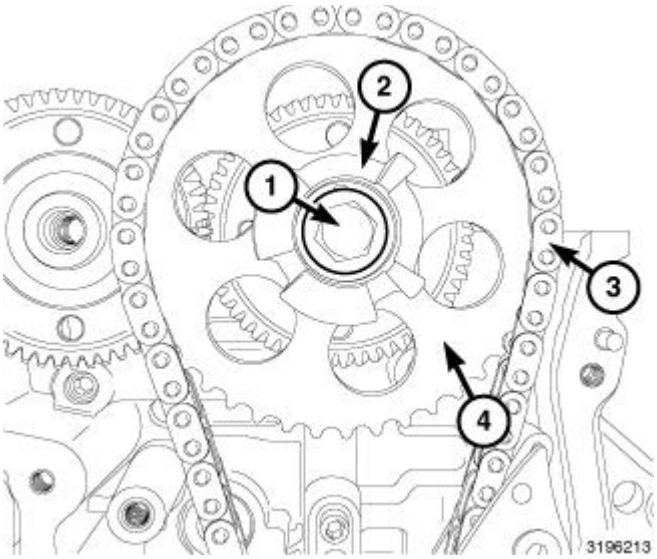


Fig. 503: Camshaft Position Sensor (CMP) Reluctor Wheel, Left Camshaft Timing Chain Sprocket, Timing Chain & Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Install the left timing chain (3) and camshaft timing chain sprocket (4).
5. Install the reluctor wheel (2). Tighten bolt (1) finger tight.

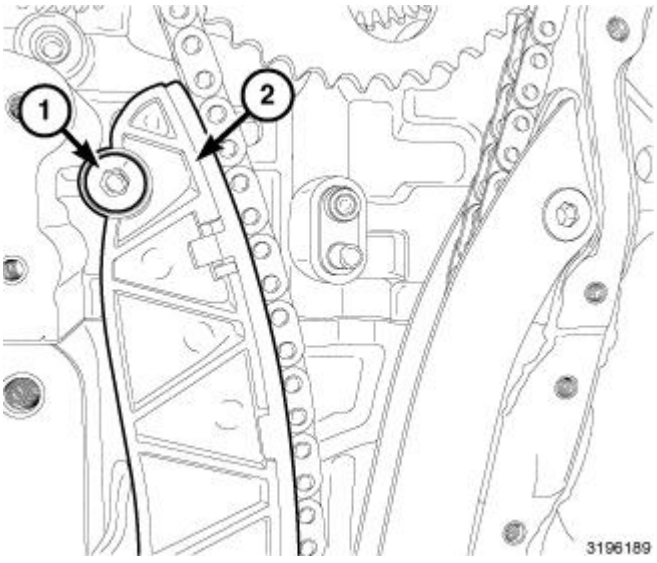


Fig. 504: Left Inner Timing Chain Guide & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Install the left inner timing chain guide (2). Tighten bolt (1) to 30 N.m (22 ft. lbs.).

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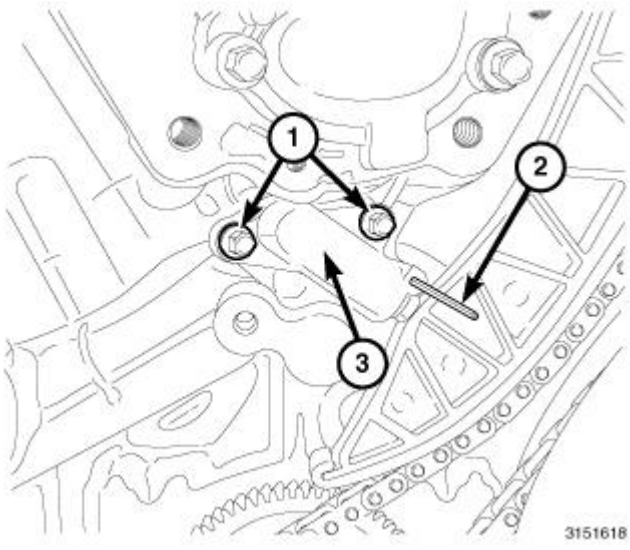


Fig. 505: Left Timing Chain Tensioner, Pin & Bolt
Courtesy of CHRYSLER GROUP, LLC

7. Install the left timing chain tensioner (3). Tighten bolts (1) to 14 N.m (124 in. lbs.).
8. Remove the (special tool #VM.10359, Pin, Tensioner) (2) from timing chain tensioner (3).

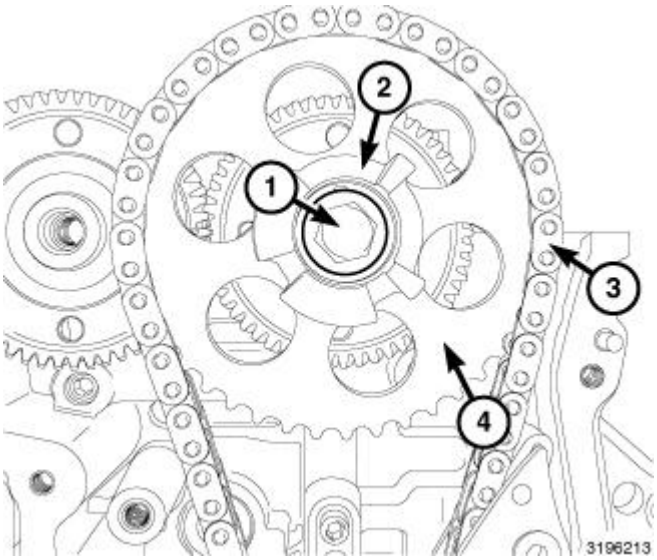


Fig. 506: Camshaft Position Sensor (CMP) Reluctor Wheel, Left Camshaft Timing Chain Sprocket, Timing Chain & Bolt
Courtesy of CHRYSLER GROUP, LLC

9. Tighten the reluctor wheel (2) bolt (1) to 100 N.m (74 ft. lbs.).

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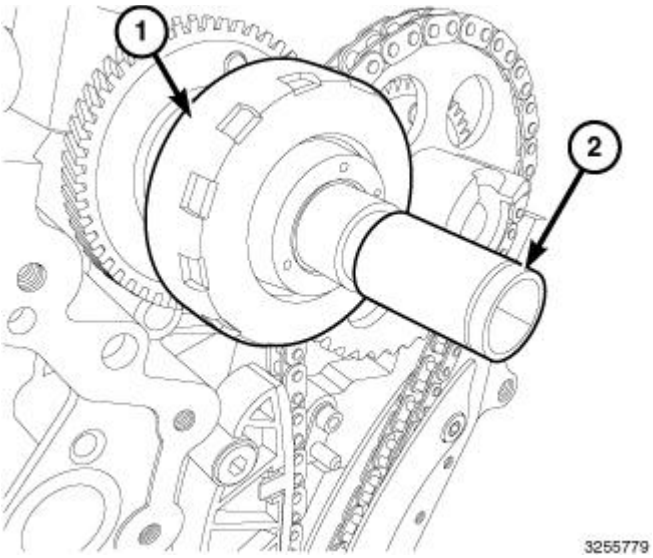


Fig. 507: Oil Separator & Oil Separator Remover/Installer Tool
Courtesy of CHRYSLER GROUP, LLC

10. Using the (special tool #VM.10344, Tool, Oil Separator Remover/Installer) (2), install the oil separator (1) and tighten to 30 N.m (22 ft. lbs.).

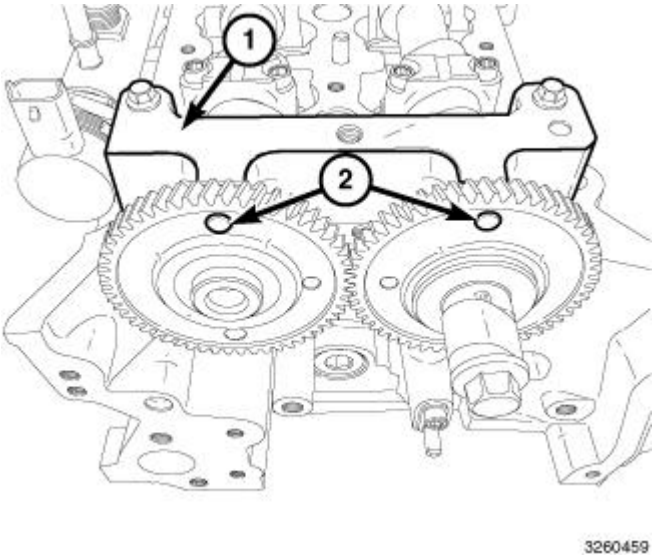


Fig. 508: Camshaft Timing Tool & Sprockets Holes - Left
Courtesy of CHRYSLER GROUP, LLC

11. Remove the (special tool #VM.10338-2, Timing Tool, Camshaft (Left)) (1).

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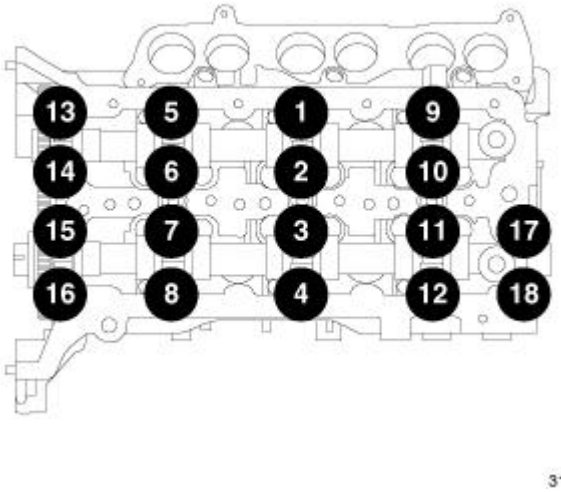


Fig. 509: Camshaft Bearing Cap Tightening Sequence - Left
Courtesy of CHRYSLER GROUP, LLC

12. Install the left camshaft bearing caps 13 through 16 and tighten bolts to 11 N.m (97 in. lbs.).

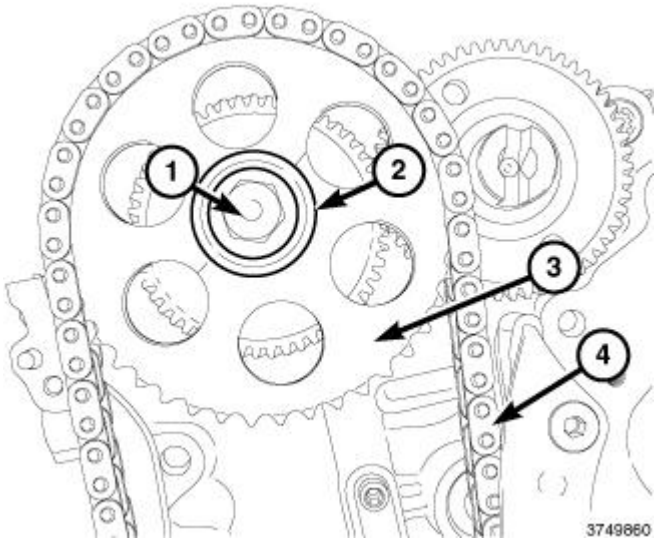


Fig. 510: Bolt, Washer, Timing Chain & Right Timing Chain Sprocket
Courtesy of CHRYSLER GROUP, LLC

13. Install the right timing chain (4) and timing chain sprocket (3).
14. Install the bolt (1) and washer (2) and tighten bolt (1) finger tight.

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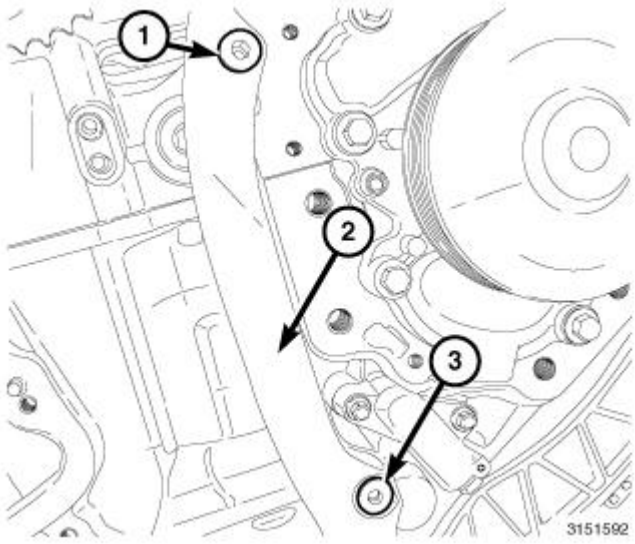


Fig. 511: Right Inner Timing Chain Guide & Bolts
Courtesy of CHRYSLER GROUP, LLC

15. If removed install the right inner timing chain guide (2). Tighten bolts (1 and 3) to 30 N.m (22 ft. lbs.).

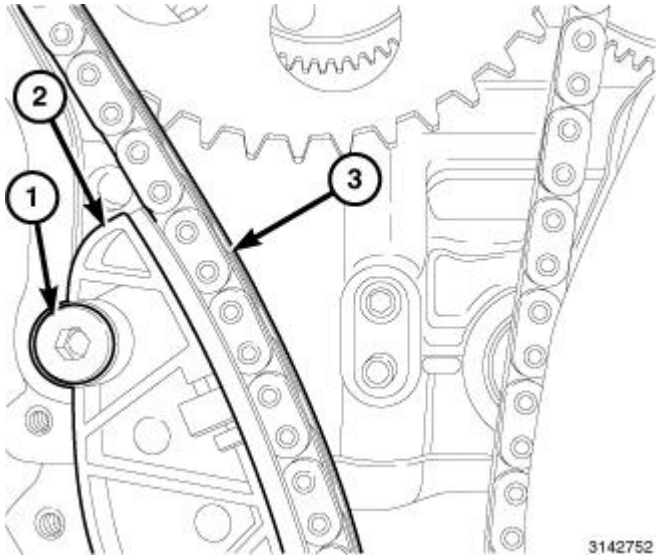


Fig. 512: Right Outer Timing Chain Guide & Bolt
Courtesy of CHRYSLER GROUP, LLC

16. Install the right outer timing chain guide (2). Tighten bolt (1) to 30 N.m (22 ft. lbs.).

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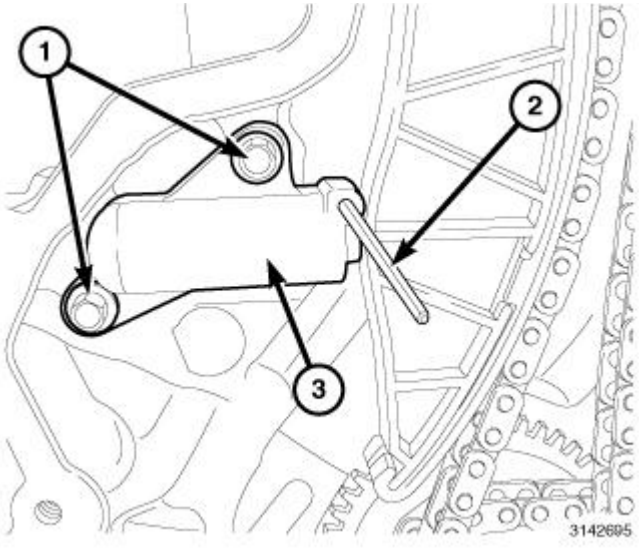


Fig. 513: Pin, Right Timing Chain Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Install the right timing chain tensioner (3). Tighten bolts (1) to 14 N.m (124 in. lbs.).
18. Remove (special tool #VM.10359, Pin, Tensioner) (2) from timing chain tensioner (3).

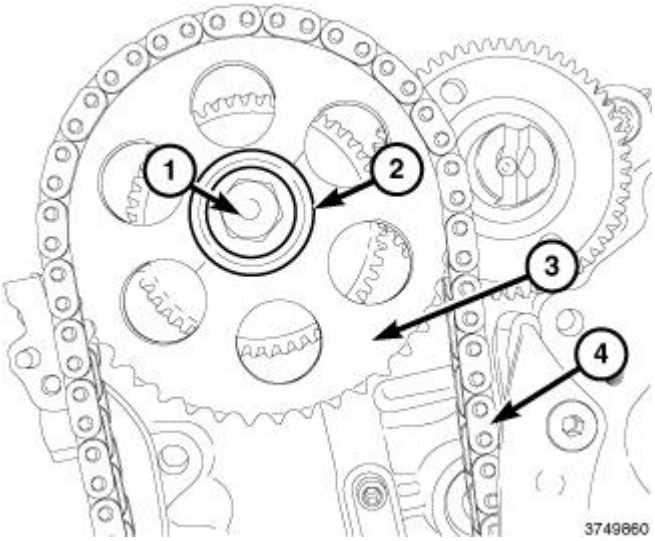


Fig. 514: Bolt, Washer, Timing Chain & Right Timing Chain Sprocket
Courtesy of CHRYSLER GROUP, LLC

19. Tighten the timing chain sprocket bolt (1) to 100 N.m (74 ft. lbs.).

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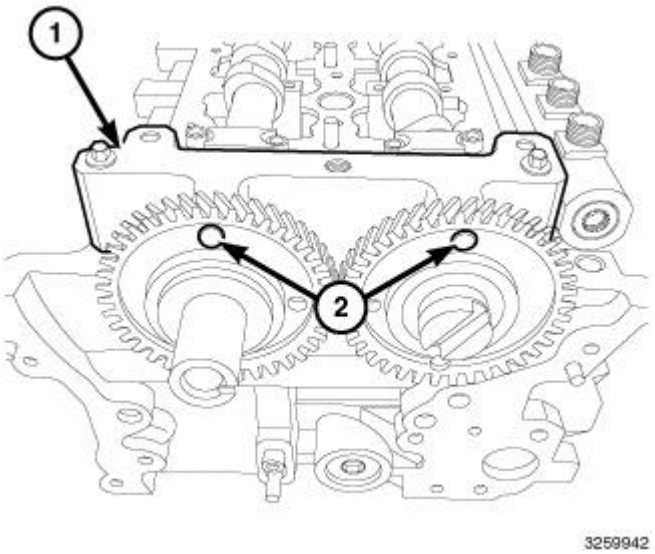


Fig. 515: Camshaft Timing Tool & Sprockets Holes - Right
Courtesy of CHRYSLER GROUP, LLC

20. Remove the (special tool #VM.10338-1, Timing Tool, Camshaft (Right)) (1).

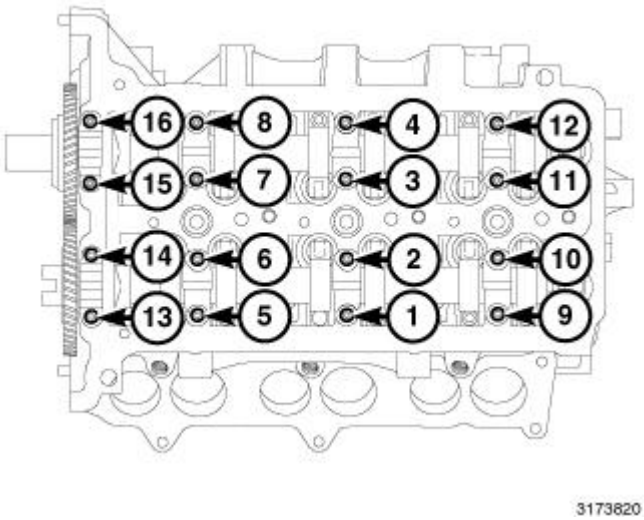


Fig. 516: Camshaft Bearing Cap Tightening Sequence - Right
Courtesy of CHRYSLER GROUP, LLC

21. Install the right camshaft bearing caps 13 through 16 and tighten bolts to 11 N.m (97 in. lbs.).

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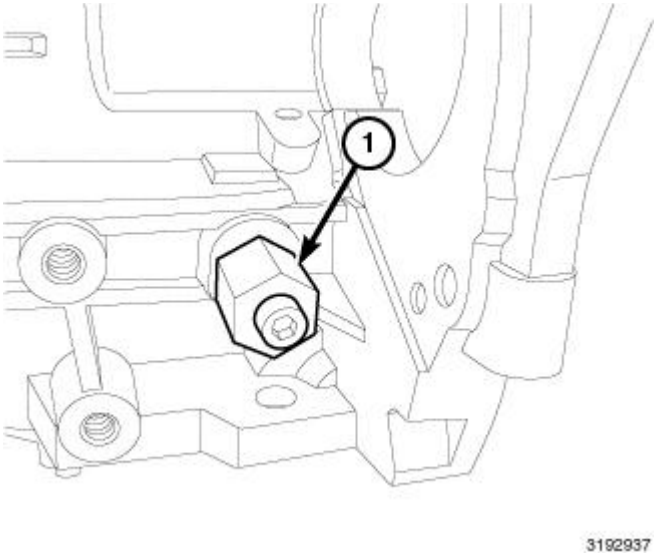


Fig. 517: Crankshaft Timing Tool
Courtesy of CHRYSLER GROUP, LLC

22. Remove the (special tool #VM.10339, Tool, Crankshaft Timing) (1).

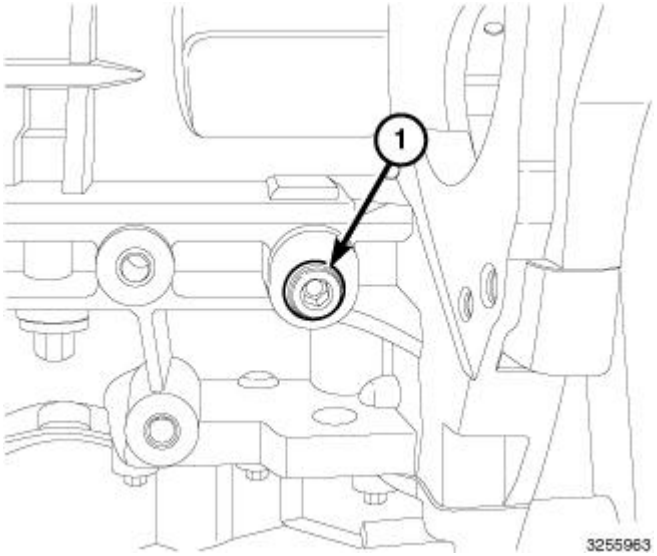


Fig. 518: Engine Block Plug
Courtesy of CHRYSLER GROUP, LLC

23. Install engine block plug (1). Tighten 30 N.m (22 ft. lbs.).
24. Install the lower timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
25. Install the right upper timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
26. Install the left upper timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
27. Install the right and left cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION**.
28. Connect negative battery cable.

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29. Start engine and inspect for leaks. Care must be taken to observe the fuel system warnings.

COVER(S), ENGINE TIMING

REMOVAL

UPPER TIMING COVER

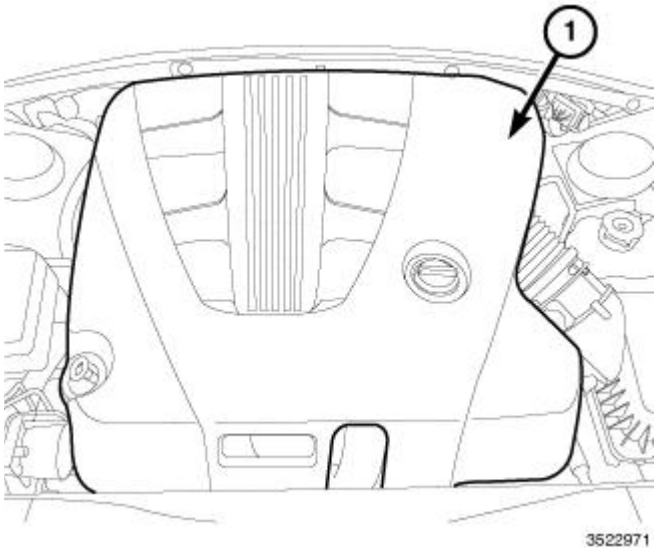


Fig. 519: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).
3. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
4. Remove the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, REMOVAL** .
5. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
6. Lower the vehicle.
7. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL**.
8. Remove the charge air outlet tube.
9. Remove the upper and lower radiator hoses.
10. Remove the high pressure fuel injection pump. Refer to **PUMP, FUEL INJECTION, HIGH PRESSURE, REMOVAL** .
11. Remove the vacuum pump. Refer to **PUMP, VACUUM, REMOVAL**.
12. Remove the right and left cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.

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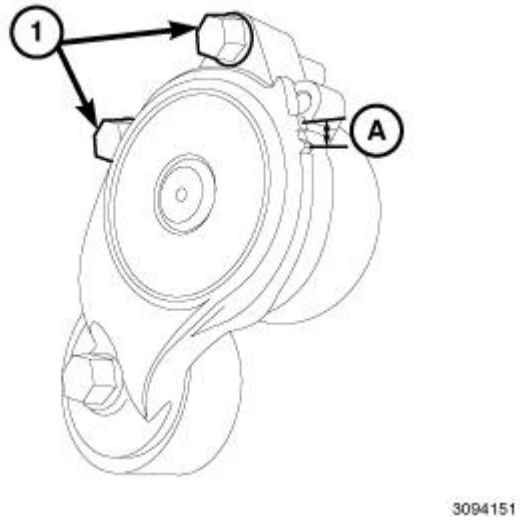


Fig. 520: Belt Wear Indicator (Measurement A)
Courtesy of CHRYSLER GROUP, LLC

13. Remove the serpentine belt tensioner. Refer to **TENSIONER, BELT, REMOVAL** .

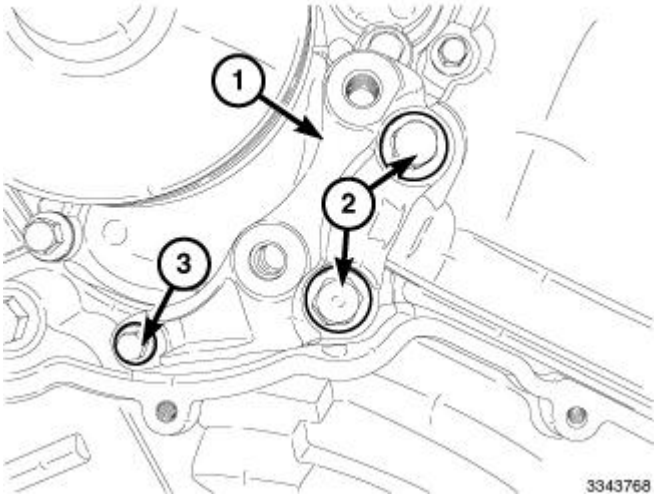


Fig. 521: Serpentine Belt Tensioner Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Remove bolts (2 and 3) and the serpentine belt tensioner bracket (1).

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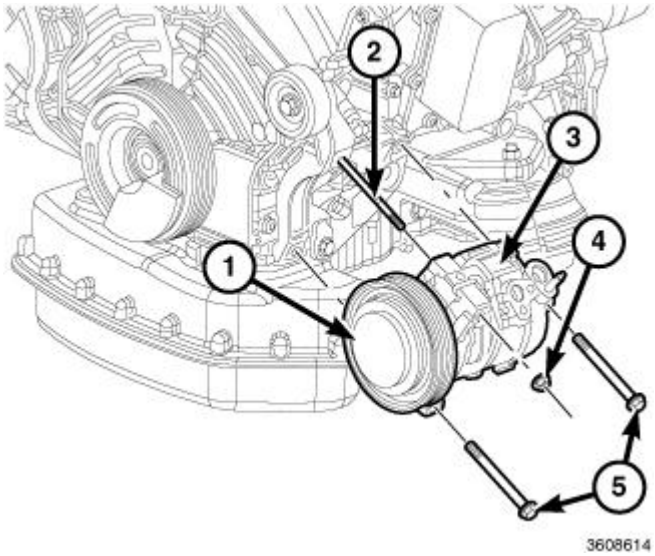


Fig. 522: A/C compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Removal of the A/C compressor does not require the refrigerant to be evacuated.

15. Disconnect the A/C compressor wire harness connector (3).
16. Remove nut (4), bolts (5) and position the aside A/C compressor (1).

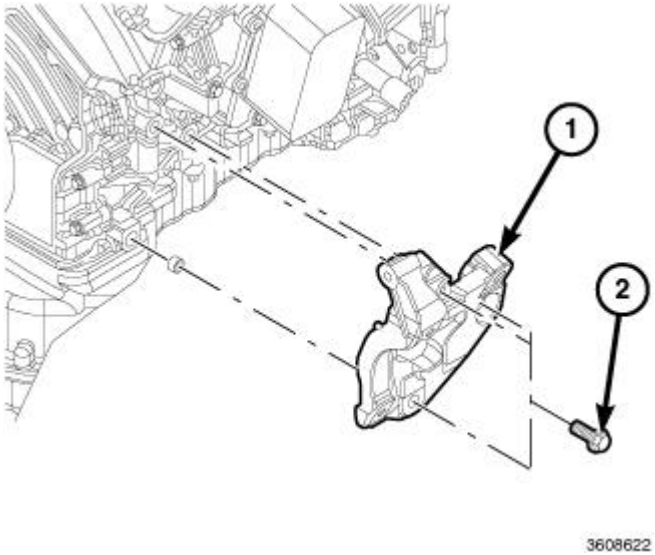


Fig. 523: A/C Compressor Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

17. Remove bolts (2) and the A/C compressor mounting bracket (1).

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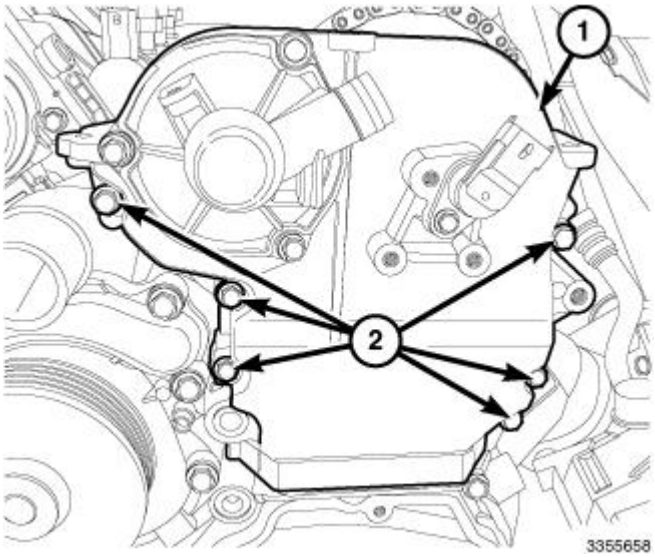


Fig. 524: Left Timing Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Disconnect the breather hose from left timing cover (1).
19. Remove bolts (2) and the left timing cover (1).

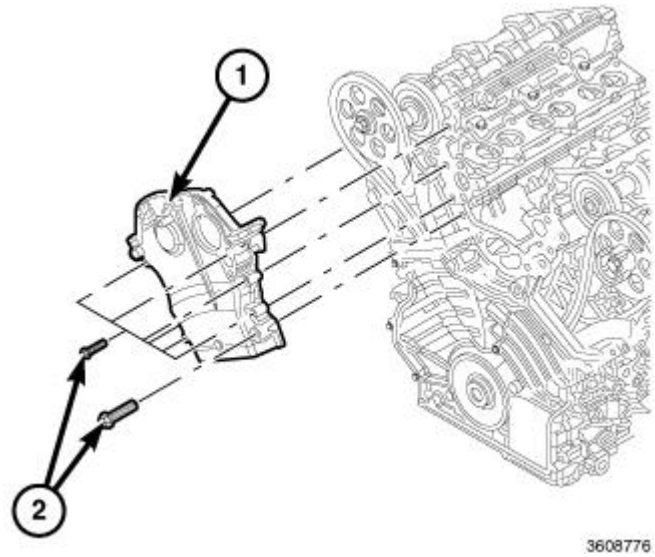


Fig. 525: Right Upper Timing Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

20. Remove bolts (2) and the right upper timing cover (1).

LOWER TIMING COVER

1. Disconnect the negative battery cable.
2. Remove the right and left upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.

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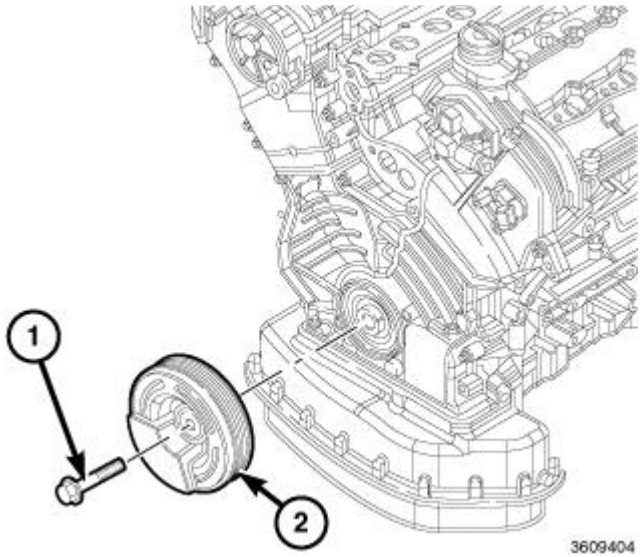


Fig. 526: Vibration Damper & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: The crankshaft damper bolt is a left hand thread.

3. Remove the vibration damper (2). Refer to **DAMPER, VIBRATION, REMOVAL**.

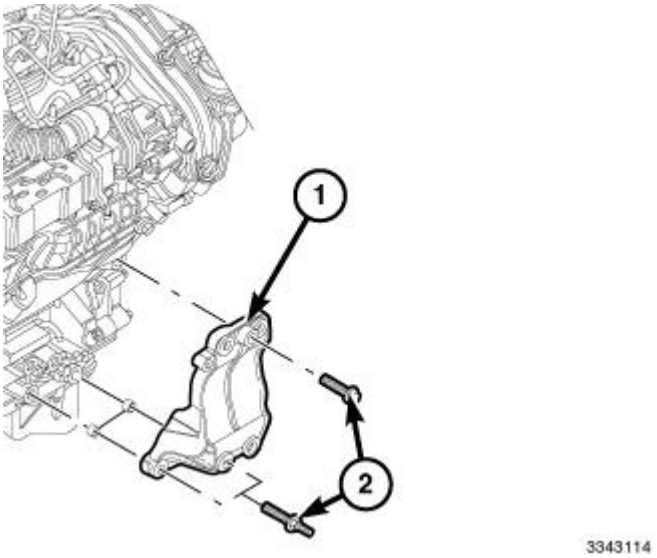


Fig. 527: Generator Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove the generator. Refer to **GENERATOR, REMOVAL** .
5. Remove bolts (2) and the generator mounting bracket (1).

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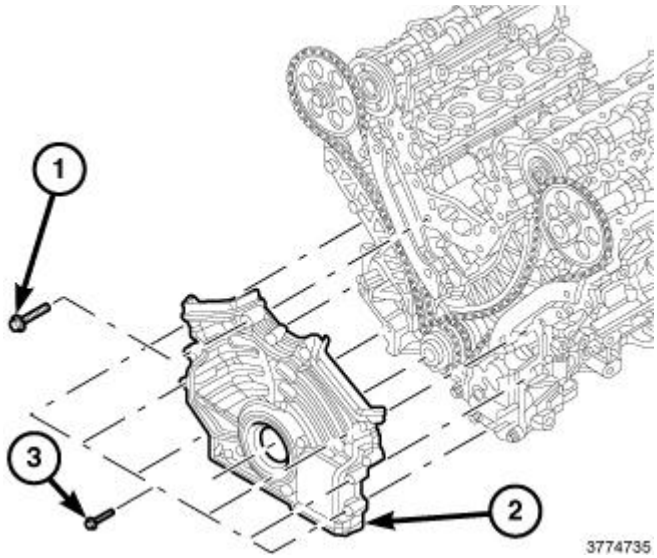


Fig. 528: Lower Timing Chain Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove the lower oil pan. Refer to **PAN, OIL, REMOVAL**.
7. Remove bolts (1 and 3) and the lower timing chain cover (2).

INSTALLATION

UPPER TIMING COVER

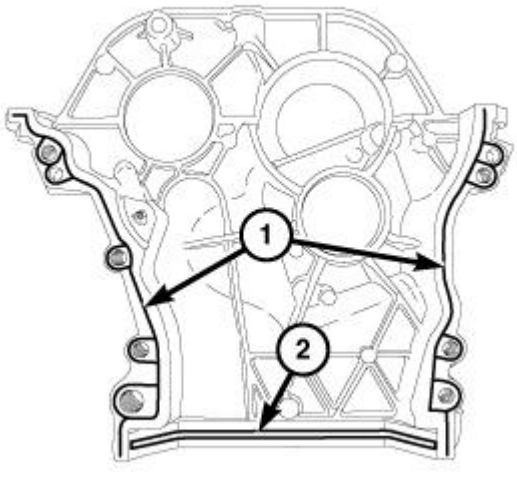


Fig. 529: RTV Sealant Locations To Right Upper Timing Cover
Courtesy of CHRYSLER GROUP, LLC

1. Clean and gasket sealing surfaces. Refer to **Engine - Standard Procedure**.

CAUTION: Engine assembly requires the use of a unique sealant that is

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compatible with engine oil. Using a sealant other than Mopar® Threebond Engine RTV Sealant may result in engine fluid leakage.

CAUTION: Following the application of Mopar® Threebond Engine RTV Sealant to the gasket surfaces, the components must be assembled within 20 minutes and the attaching fasteners must be tightened to specification within 45 minutes. Prolonged exposure to the air prior to assembly may result in engine fluid leakage.

NOTE: Sealing surfaces must be free of a gasket material and oil residue. Clean the oil pan sealing surfaces with isopropyl alcohol in preparation for sealant application.

2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant to locations 1 and 2 of the right upper timing cover.
3. Install the right upper timing cover and tighten bolts finger tight.

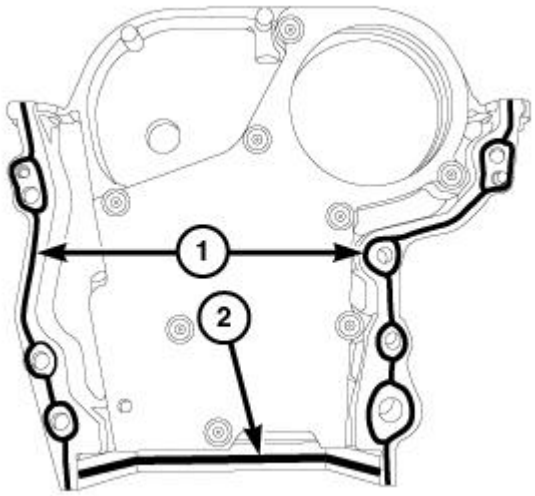


Fig. 530: RTV Sealant Locations To Left Upper Timing Cover
Courtesy of CHRYSLER GROUP, LLC

NOTE: Sealing surfaces must be free of a gasket material and oil residue. Clean the oil pan sealing surfaces with isopropyl alcohol in preparation for sealant application.

4. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant to locations 1 and 2 of the left upper timing cover.
5. Install the left upper timing cover and tighten bolts finger tight.

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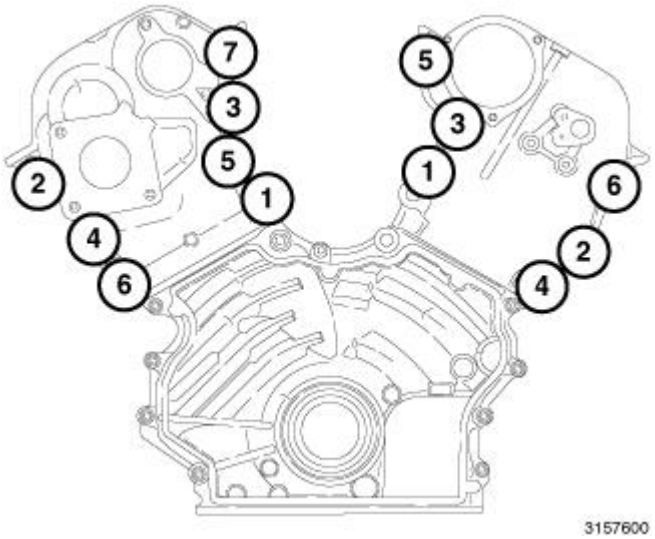


Fig. 531: Left & Right Upper Timing Cover Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

6. Using the sequence shown in illustration, tighten right and left side bolts to:
   - M10 to 25 N.m (18 ft. lbs.).
   - M6 to 9 N.m (80 in. lbs.).
   - Loosen M10 bolt 60 degrees and retighten to 45 N.m (33 ft. lbs.).
   - Loosen M6 bolts 60 degrees and retighten to 15 N.m (133 in. lbs.).

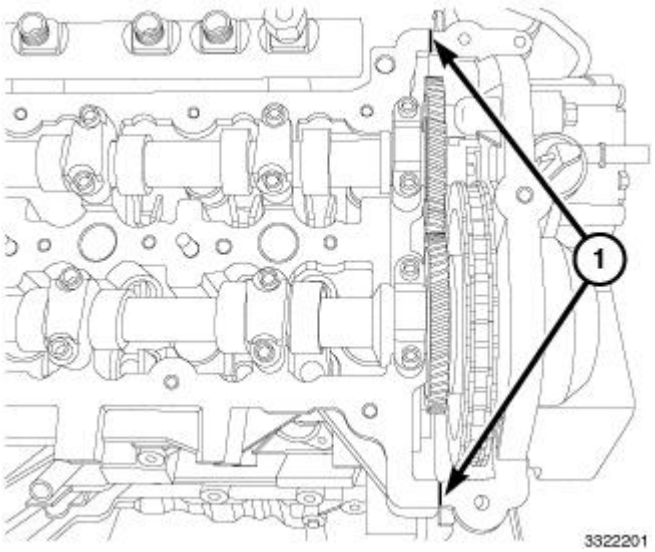


Fig. 532: RTV Sealant At The T-Joints
Courtesy of CHRYSLER GROUP, LLC

7. Remove any of Mopar® Threebond Engine RTV Sealant that may have squeezed out of the right upper timing cover T-joint (1).

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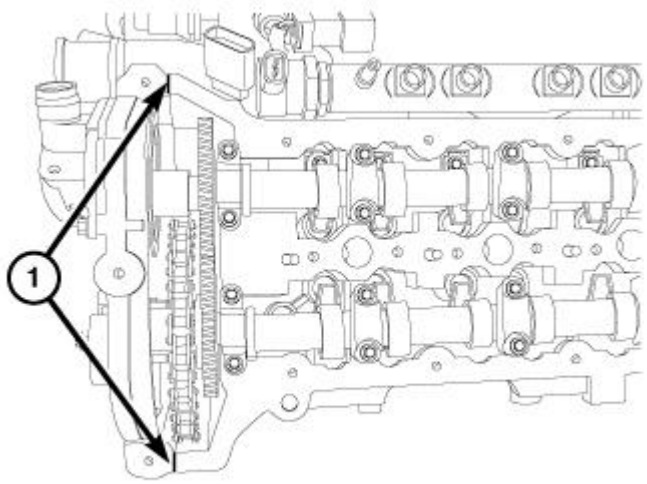


Fig. 533: Left Upper Timing Cover Excess RTV Sealant Locations
Courtesy of CHRYSLER GROUP, LLC

8. Remove any of Mopar® Threebond Engine RTV Sealant that may have squeezed out of the left upper timing cover T-joint (1).

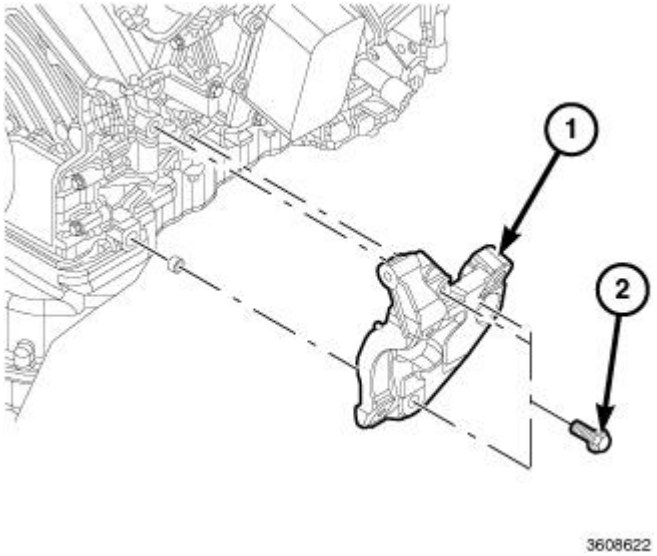


Fig. 534: A/C Compressor Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the A/C compressor mounting bracket (1). Tighten bolts (2) to 45 N.m (33 ft. lbs.).

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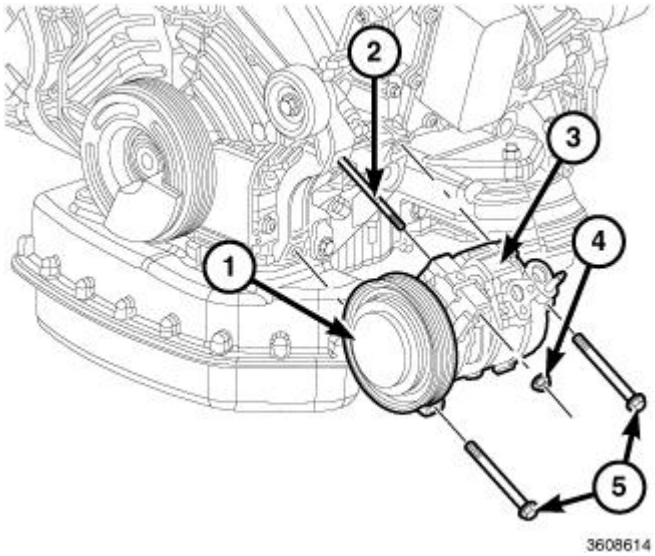


Fig. 535: A/C compressor & Fasteners
Courtesy of CHRYSLER GROUP, LLC

10. Install the A/C compressor and tighten fasteners using the following sequence to:
    - Bolt at the rear of compressor to 28 N.m (21 ft. lbs.).
    - Bolt at the front of compressor to 28 N.m (21 ft. lbs.).
    - Nut at the front of the compressor to 28 N.m (21 ft. lbs.).

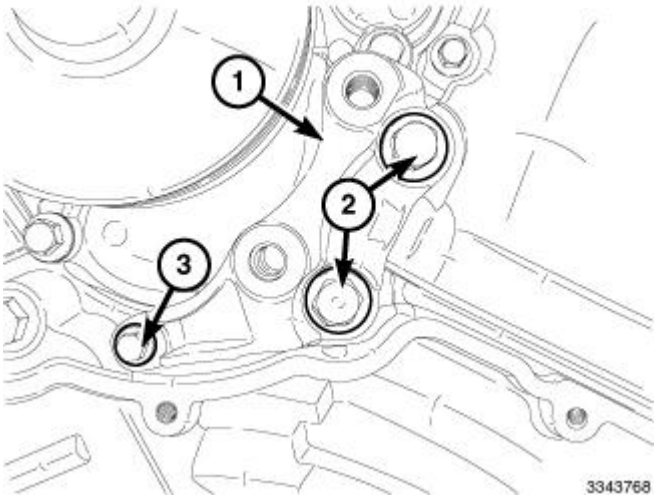


Fig. 536: Serpentine Belt Tensioner Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Install the serpentine belt tensioner bracket (1) and tighten bolts to:
    - M10 bolts to 45 N.m (33 ft. lbs.).
    - M6 bolt to 11 N.m (97 in. lbs.).

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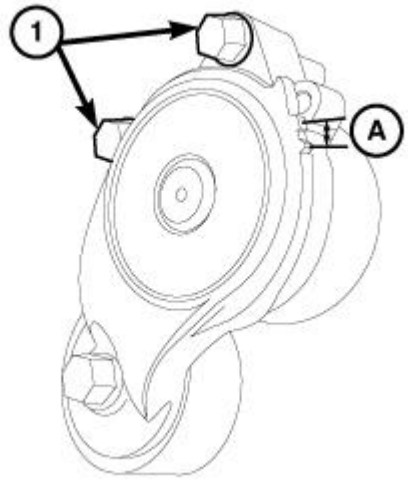
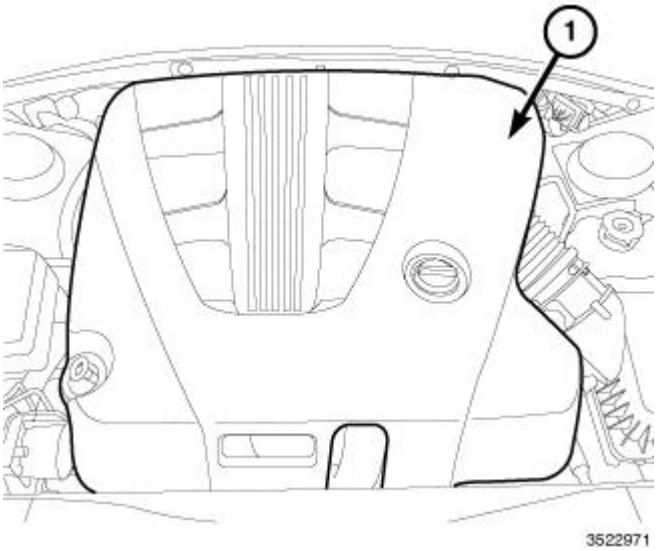


Fig. 537: Belt Wear Indicator (Measurement A)
Courtesy of CHRYSLER GROUP, LLC

12. Install the serpentine belt tensioner. Refer to **TENSIONER, BELT, INSTALLATION** .
13. Install the right and left cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION**.
14. Install the vacuum pump. Refer to **PUMP, VACUUM, INSTALLATION**.
15. Install the lower and upper radiator hoses.
16. Install the charge air outlet tube.
17. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION**.
18. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
19. Install the belly pan and lower fascia to suspension cradle close out panel. Refer to **BELLY PAN, INSTALLATION** .
20. Lower the vehicle.



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Fig. 538: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

21. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
22. Install the engine cover (1).
23. Connect the negative battery cable.
24. Start the engine and check for leaks.

LOWER TIMING COVER

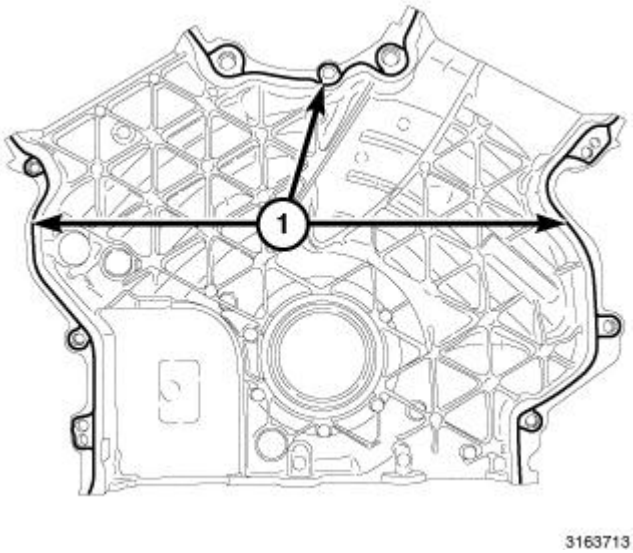


Fig. 539: Lower Timing Chain Cover RTV Sealant Locations
Courtesy of CHRYSLER GROUP, LLC

1. Clean the oil pan sealing surfaces with isopropyl alcohol in preparation for sealant application. Refer to **Engine - Standard Procedure**.

CAUTION: Engine assembly requires the use of a unique sealant that is compatible with engine oil. Using a sealant other than Mopar® Threebond Engine RTV Sealant may result in engine fluid leakage.

CAUTION: Following the application of Mopar® Threebond Engine RTV Sealant to the gasket surfaces, the components must be assembled within 20 minutes and the attaching fasteners must be tightened to specification within 45 minutes. Prolonged exposure to the air prior to assembly may result in engine fluid leakage.

2. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant to the following locations (1).

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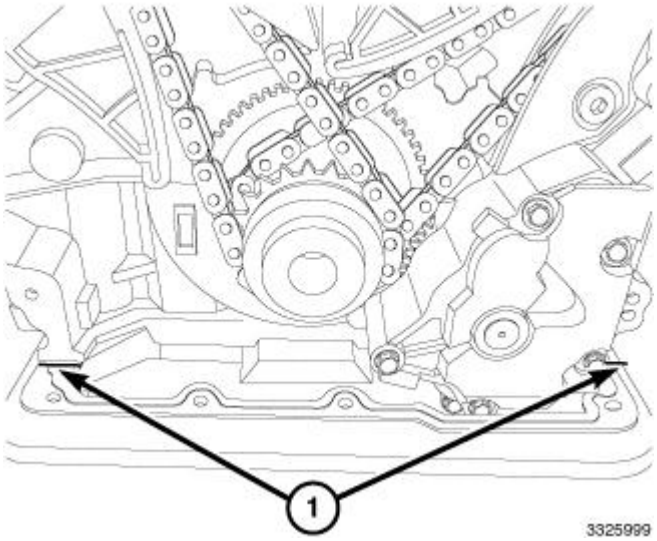


Fig. 540: Lower Timing Chain Cover RTV Sealant T-Joint Locations
Courtesy of CHRYSLER GROUP, LLC

3. Apply a 3 mm wide bead of Mopar® Threebond Engine RTV Sealant at the T-joint (1).

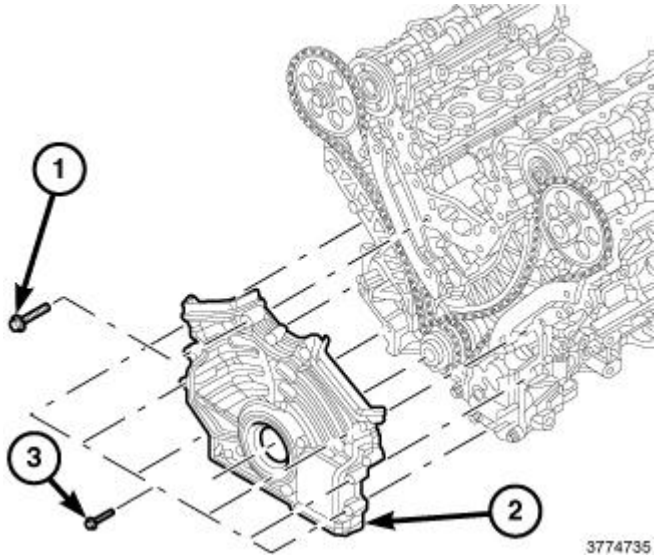


Fig. 541: Lower Timing Chain Cover & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Install the timing chain cover (2) and tighten bolts (1 and 3) finger tight.

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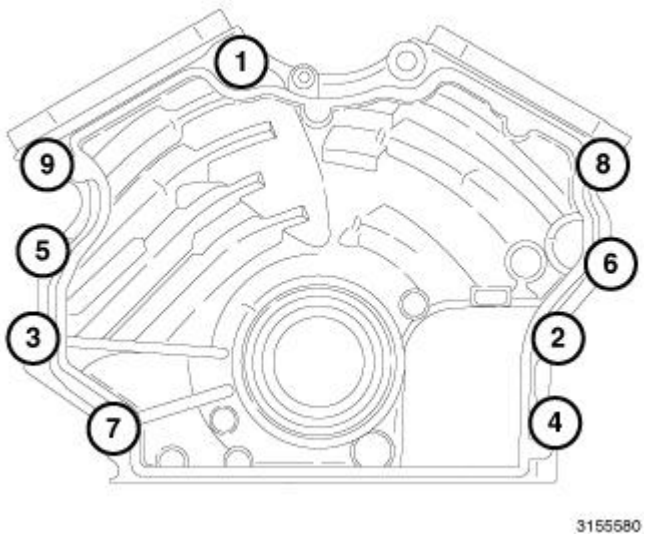


Fig. 542: Lower Timing Chain Cover Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

5. Using the sequence shown in illustration, tighten bolts to:
   - M10 bolts (1) 25 N.m (18 ft. lbs.).
   - M6 to 9 N.m (80 in. lbs.).
   - Loosen M10 bolt 60 degrees and retighten to 45 N.m (33 ft. lbs.).
   - Loosen M6 bolts 60 degrees and retighten to 15 N.m (133 in. lbs.).

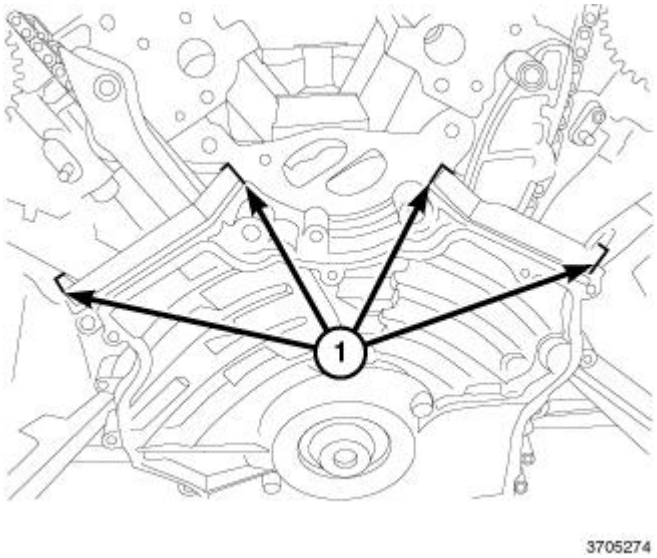


Fig. 543: Lower Timing Cover Excess RTV Sealant Locations
Courtesy of CHRYSLER GROUP, LLC

6. Remove any of Mopar® Threebond Engine RTV Sealant that may have squeezed out of the lower timing cover joints (1).
7. Install the lower oil pan. Refer to **PAN, OIL, INSTALLATION**.

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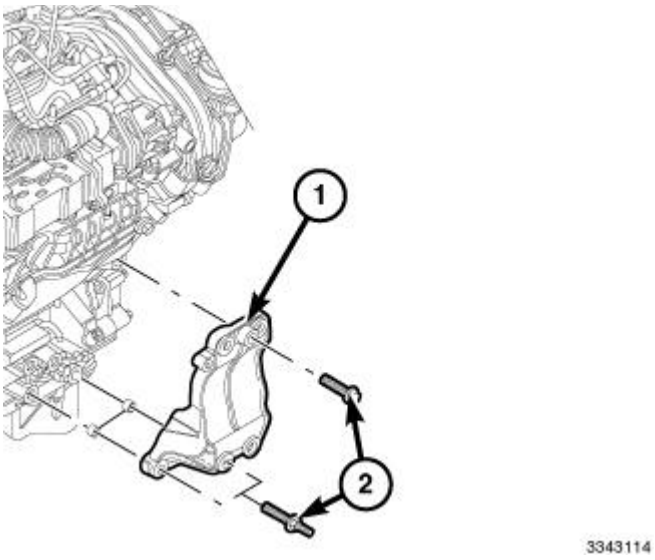


Fig. 544: Generator Mounting Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install the generator mounting bracket (1). Tighten bolts (2) to 45 N.m (33 ft. lbs.).
9. Install the generator. Refer to **GENERATOR, INSTALLATION** .

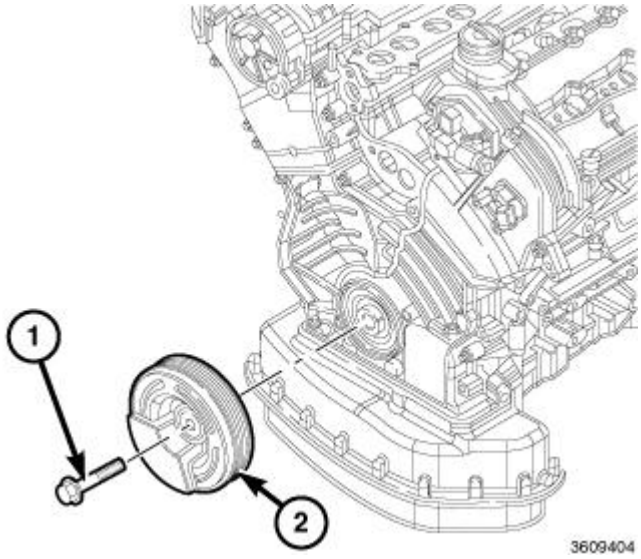


Fig. 545: Vibration Damper & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: The crankshaft damper bolt is a left hand thread.

10. Install the vibration damper (2). Refer to **DAMPER, VIBRATION, INSTALLATION**.
11. Install the left and right upper timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
12. Connect the negative battery cable.

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TENSIONER, ENGINE TIMING

DESCRIPTION

DESCRIPTION

Both timing chain tensioner is located on the engine block. The tensioner is hydraulically operated with the adjusting portion riding on the right timing chain guide. Hydraulic support for the tensioner is supplied by forward oil passages in the engine block.

REMOVAL

REMOVAL

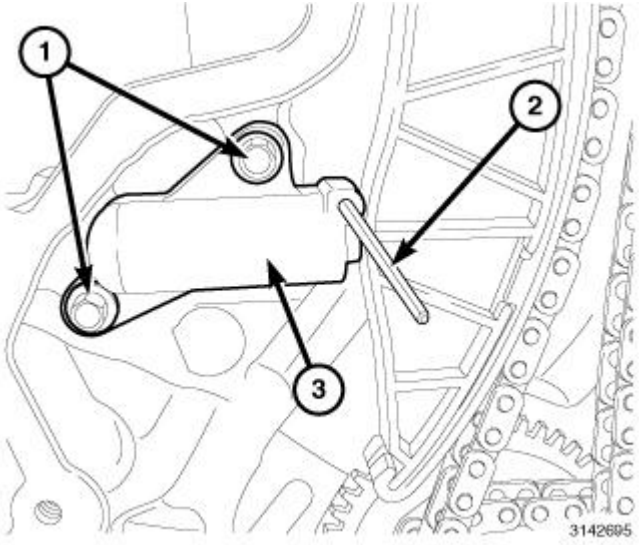


Fig. 546: Pin, Right Timing Chain Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the lower timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.
3. Pushing back the tensioner piston, and install (special tool #VM.10359, Pin, Tensioner) (2).
4. Remove bolts (1) and the right timing chain tensioner (3).

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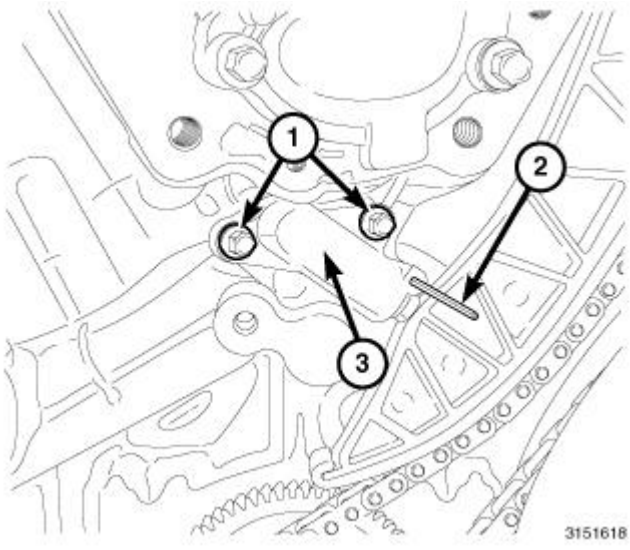


Fig. 547: Left Timing Chain Tensioner, Pin & Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Pushing back the piston, and install (special tool #VM.10359, Pin, Tensioner) (2).
6. Remove bolts (1) and the left timing chain tensioner (3).

INSTALLATION

INSTALLATION

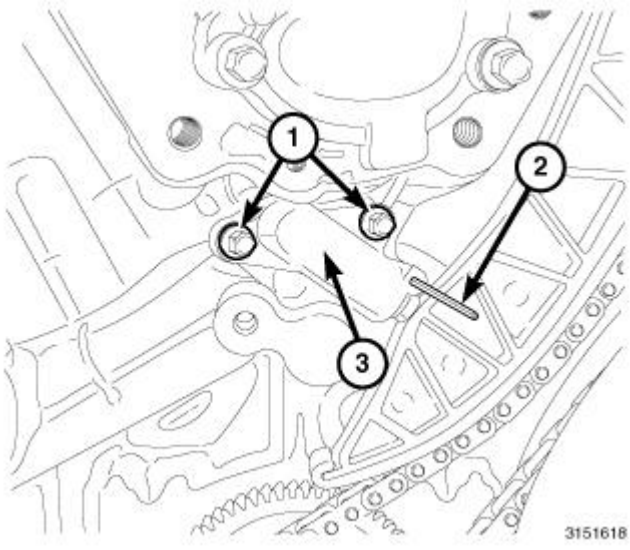


Fig. 548: Left Timing Chain Tensioner, Pin & Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Install the left timing chain tensioner (3). Tighten bolts (1) to 11 N.m (97 in. lbs.).

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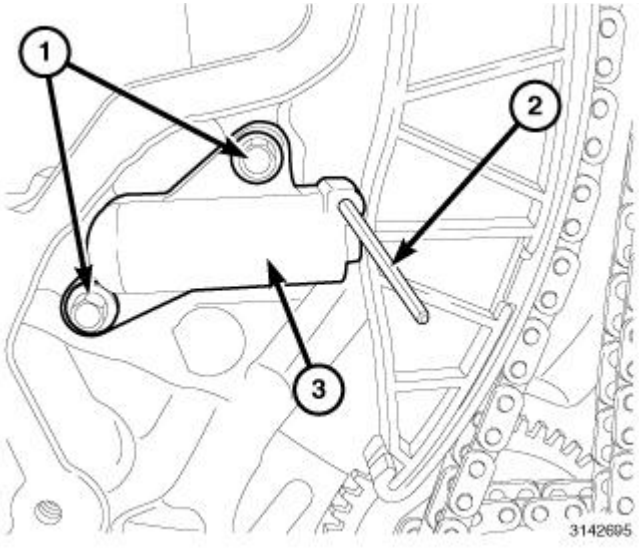


Fig. 549: Pin, Right Timing Chain Tensioner & Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Install the right timing chain tensioner (3). Tighten bolts (1) to 11 N.m (97 in. lbs.).
3. Remove both (special tool #VM.10359, Pin, Tensioner) (2).
4. Install the lower timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
5. Connect the negative battery cable.
6. Start the engine and inspect for leaks.

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

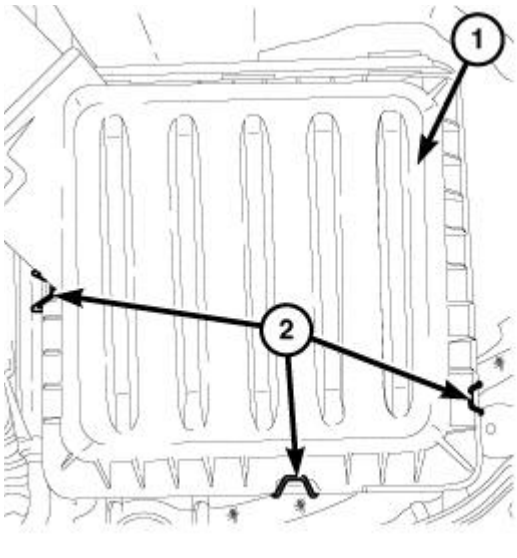


Fig. 550: Air Housing Cover & Spring Clips
Courtesy of CHRYSLER GROUP, LLC

NOTE: Housing removal is not necessary for element (filter) replacement.

1. Release the three spring clips (2) and remove the housing cover (1).

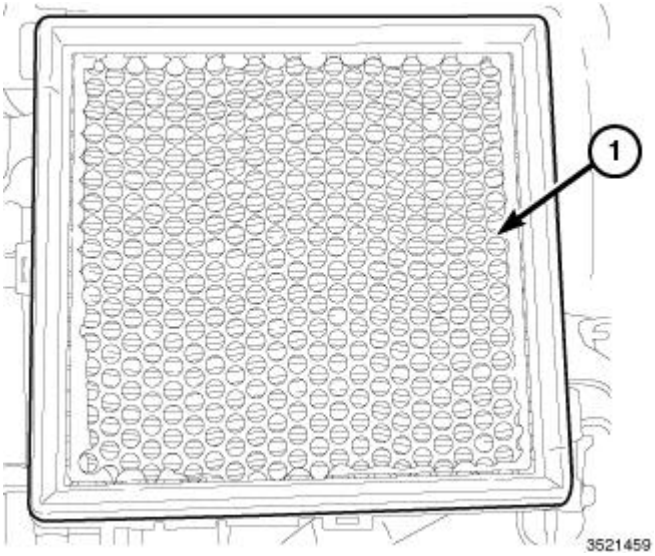


Fig. 551: Air Cleaner Element
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

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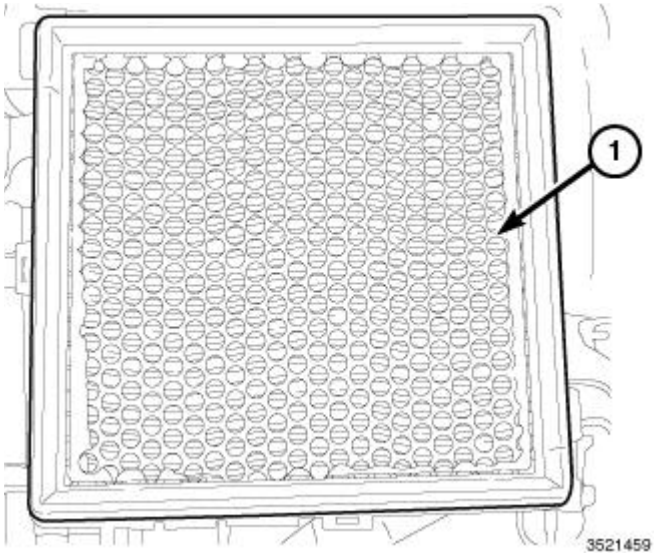


Fig. 552: Air Cleaner Element
Courtesy of CHRYSLER GROUP, LLC

1. If necessary, clean out the air cleaner body.
2. Install the air cleaner element (1) into housing.

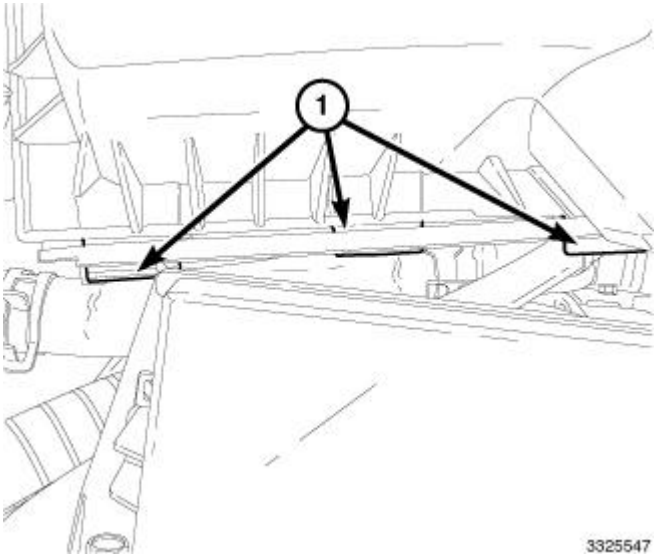


Fig. 553: Housing Cover Locating Tabs
Courtesy of CHRYSLER GROUP, LLC

3. Position housing cover locating tabs (1) into rear housing and seat cover onto housing.

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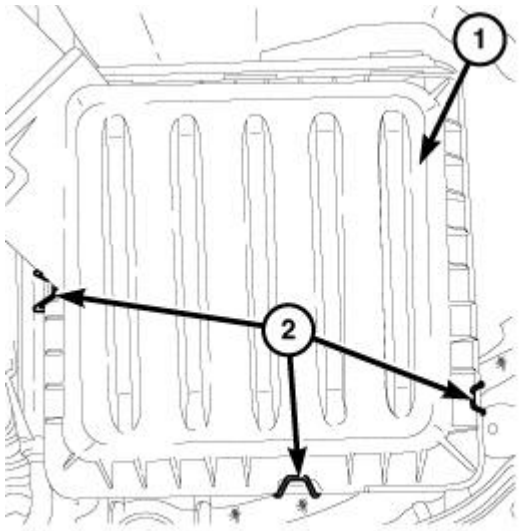


Fig. 554: Air Housing Cover & Spring Clips
Courtesy of CHRYSLER GROUP, LLC

4. Lock the spring clips (2) onto housing cover (1).

BODY, AIR CLEANER

REMOVAL

REMOVAL

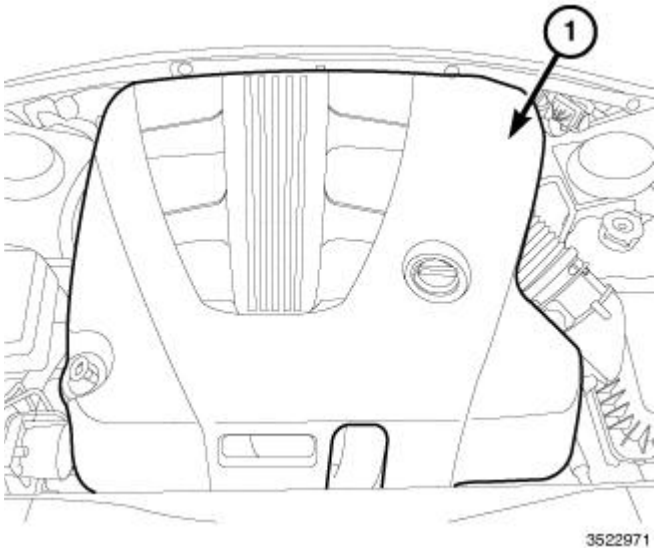


Fig. 555: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

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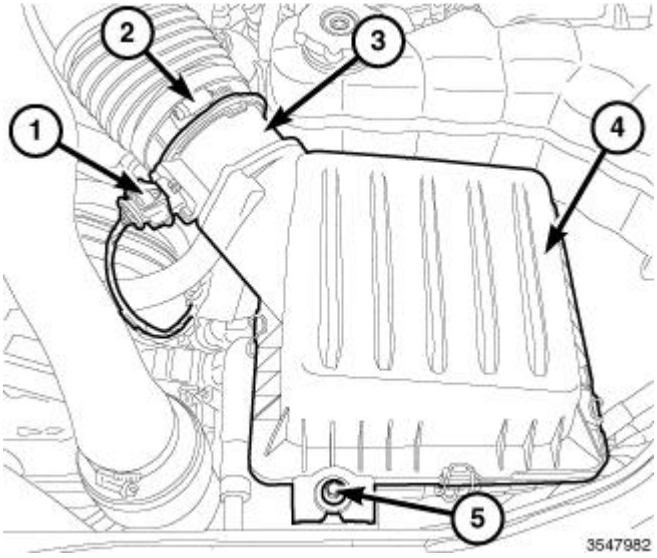


Fig. 556: Mass Air Flow (MAF) Sensor, Connector, Clamp, Air Cleaner Body & Fasteners
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the Mass Air Flow (MAF) sensor harness connectors (2).
4. Loosen screw clamp (1) and remove the air outlet tube from the MAF sensor.
5. Remove the bolt (4) securing the air cleaner body.
6. Pulling upward, remove the air cleaner body (3).

INTAKE AIR TUBE

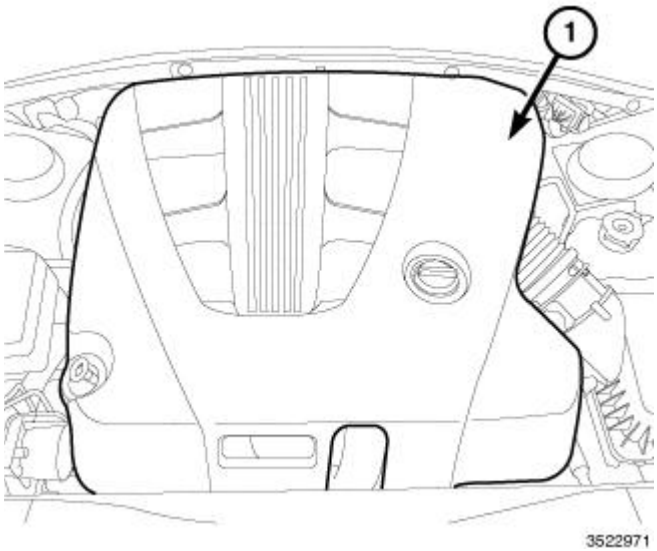


Fig. 557: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Remove the engine cover (1).

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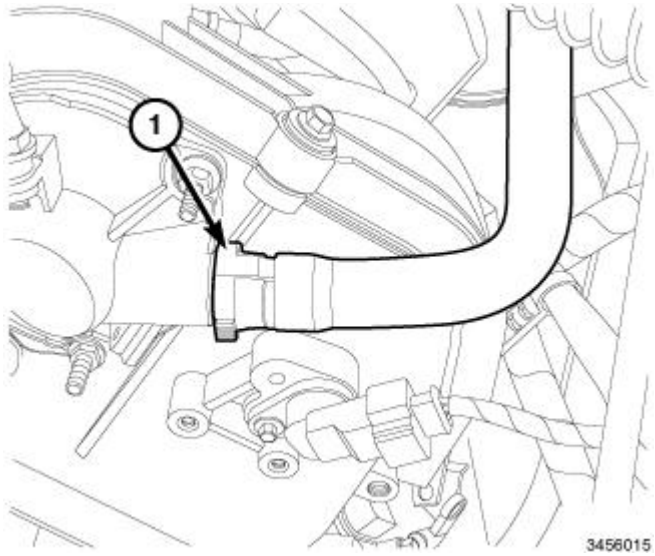


Fig. 558: CCV Hose
Courtesy of CHRYSLER GROUP, LLC

3. Remove the CCV hose (1) from upper timing cover. (During removal of the CCV hose do NOT disconnect CCV hose at the Air Tube.)

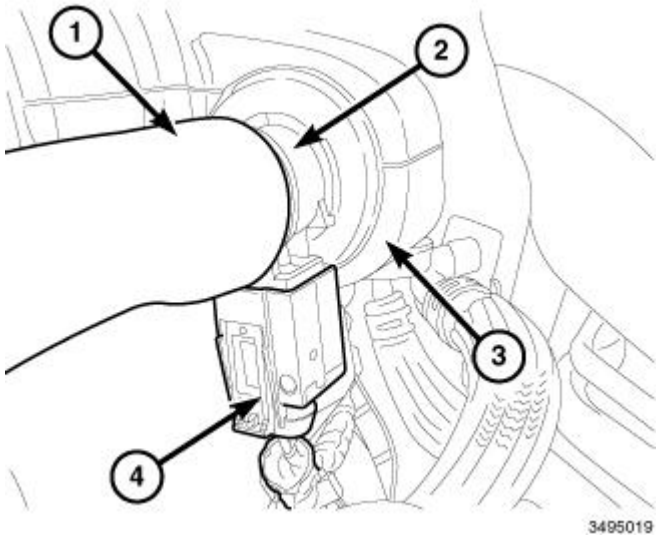


Fig. 559: Crankcase Vent Heater, Air Inlet Hose, Breather Hose & Connector
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the CCV hose heater wire harness connector (4).
5. Loosen clamp and remove intake air tube from air cleaner body.
6. Loosen clamp and remove intake air tube from turbocharger.

INSTALLATION

INSTALLATION

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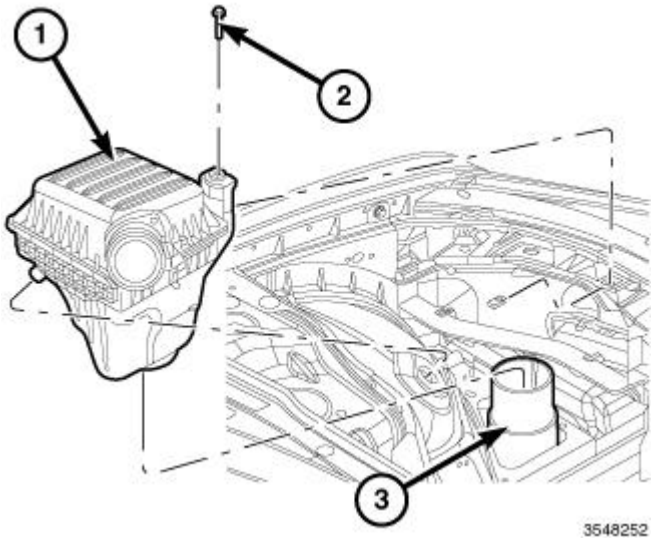


Fig. 560: Air Cleaner Body
Courtesy of CHRYSLER GROUP, LLC

1. Position the air cleaner body (3) onto the air inlet duct and push down to lock in place.

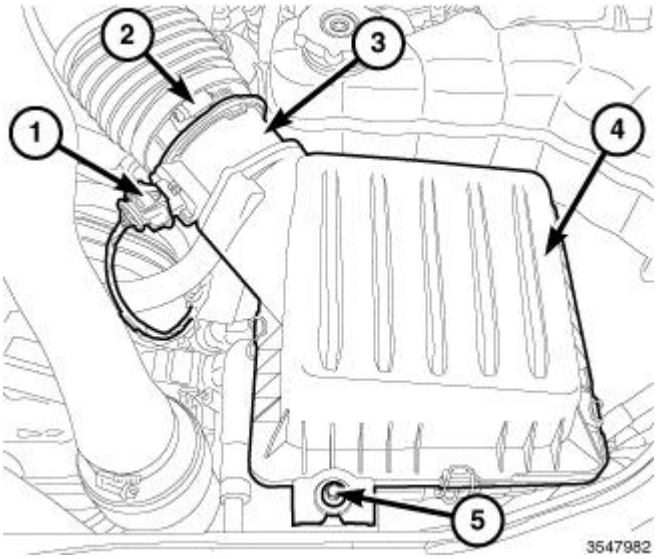


Fig. 561: Mass Air Flow (MAF) Sensor, Connector, Clamp, Air Cleaner Body & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Install the bolt and securely tighten. (4)
3. Install the air outlet tube (1) onto Mass Air Flow (MAF) sensor and securely tighten screw clamp.
4. Connect the MAF sensor harness connectors (2).

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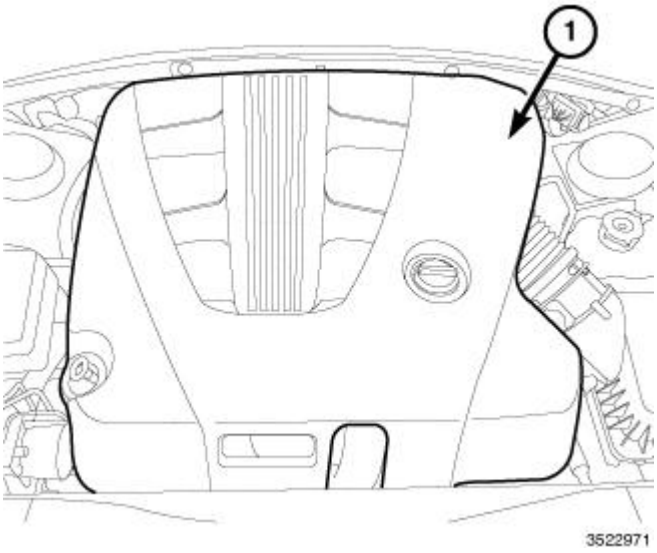


Fig. 562: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

5. Install the engine cover (1).
6. Connect the negative battery cable.

INTAKE AIR TUBE

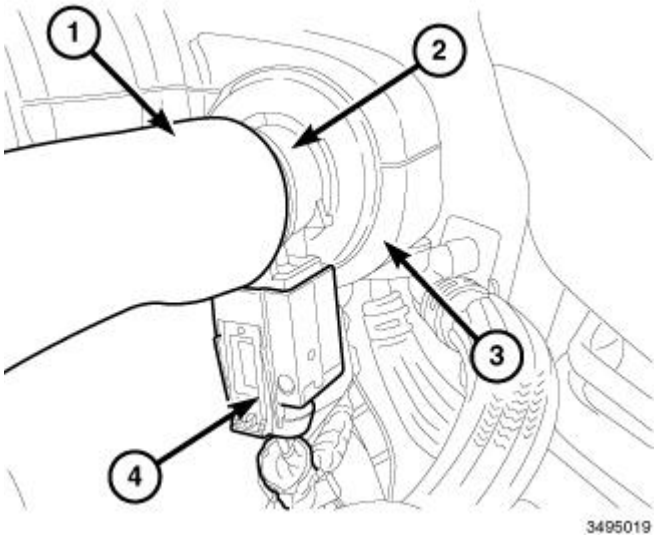


Fig. 563: Crankcase Vent Heater, Air Inlet Hose, Breather Hose & Connector
Courtesy of CHRYSLER GROUP, LLC

1. Install the intake air tube to turbocharger and securely tighten clamp.
2. Install the intake air tube to air cleaner body and securely tighten clamp.
3. Connect the CCV hose heater wire harness connector (4).

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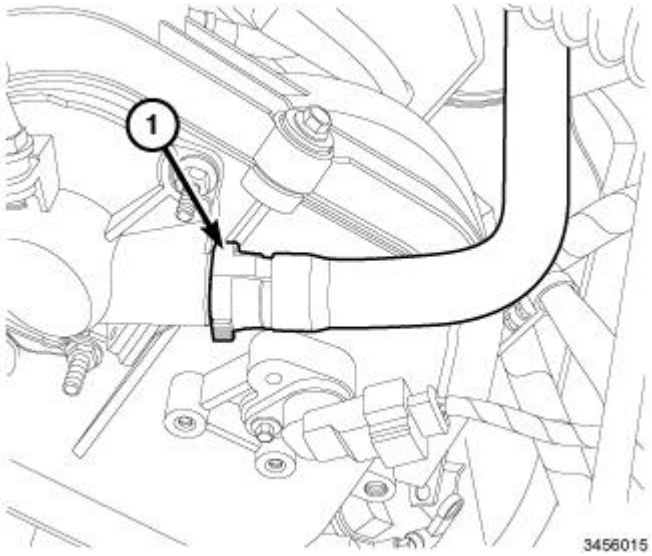


Fig. 564: CCV Hose
Courtesy of CHRYSLER GROUP, LLC

4. Install the CCV hose (1) to upper timing cover.
5. Connect the negative battery cable.

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