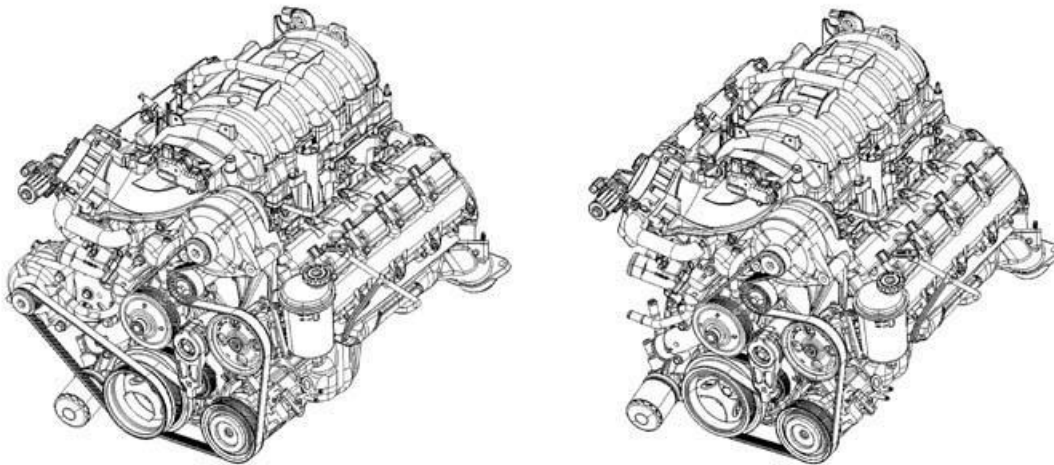


2014 ENGINE**6.4L - Service Information - Ram Pickup****DESCRIPTION****DESCRIPTION**

2506017985

Fig. 1: 6.4L Engine - With & Without Secondary Generator
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If the engine has experienced a catastrophic failure, THE INTAKE MANIFOLD MUST BE REPLACED!

The 6.4L V-8 gasoline engine incorporates a light weight, deep skirt, cast iron block with aluminum heads. The valvetrain configuration consists of a single camshaft, hydraulic roller tappets, overhead splayed valves, and two spark plugs per cylinder with a hemispherical style combustion chamber.

The cylinders are numbered from front to rear; 1, 3, 5, 7 on the left bank and 2, 4, 6, 8 on the right bank. The firing order is 1-8-4-3-6-5-7-2.

DIAGNOSIS AND TESTING**ENGINE DIAGNOSIS - INTRODUCTION**

Engine diagnosis can be helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions are classified as Performance (e.g., engine idles rough and stalls) or Mechanical (e.g., a strange noise).

Refer to **ENGINE PERFORMANCE DIAGNOSTIC TABLE** and **ENGINE MECHANICAL DIAGNOSTIC TABLE** . Refer to **FUEL SYSTEM - RAM PICKUP** for the fuel system diagnosis.

Additional diagnosis and testing procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test. Refer to **CYLINDER COMPRESSION TEST** .
- Cylinder Combustion Pressure Leakage Test. Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE** .
- Engine Cylinder Head Gasket Failure Diagnosis. Refer to **DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE** .
- Intake Manifold Leakage Diagnosis. Refer to **DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE** .

ENGINE PERFORMANCE DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. Refer to <u>DIAGNOSIS AND TESTING</u> .
	4. Incorrect spark plug gap.	4. Refer to <u>SPECIFICATIONS</u> .
	5. Dirt or water in fuel system.	5. Clean system and replace fuel filter.
	6. Faulty fuel pump, relay or wiring.	6. Refer to <u>FUEL SYSTEM - RAM PICKUP</u> .
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set to low.	1. Refer to <u>CYLINDER COMPRESSION TEST</u> .
	2. Vacuum leak.	2. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. Replace spark plugs.
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Blown cylinder head gasket.	3. Replace cylinder head gasket.
	4. Low compression.	4. Refer to <u>CYLINDER COMPRESSION TEST</u> .
	5. Burned, warped or pitted	5. Replace as necessary.

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

	valves.	
	6. Plugged or restricted exhaust system.	6. Inspect and replace as necessary.

ENGINE MECHANICAL DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. Refer to OIL - <u>STANDARD PROCEDURE</u> .
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if OK, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. Inspect the valve guides for wear, cracks or looseness. If either condition exists, replace the cylinder head. Refer to <u>CYLINDER HEAD, REMOVAL</u> .
	8. Excessive runout of valve seats on valve faces.	8. Refer to VALVES, INTAKE AND EXHAUST - <u>STANDARD PROCEDURE</u> .
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Refer to OIL - <u>STANDARD PROCEDURE</u> .
	2. Low oil pressure.	2. Check oil pump, if OK, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Refer to OIL - <u>STANDARD PROCEDURE</u> .
	2. Low oil pressure.	2. Check oil pump, if OK, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.

7. Loose flywheel or torque converter.	7. Tighten to correct torque.
--	-------------------------------

CYLINDER COMBUSTION PRESSURE LEAKAGE

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

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
 - Leaks between adjacent cylinders or into water jacket.
1. Check the coolant level and fill as required. DO NOT install the radiator cap.
 2. Start and operate the engine until it attains normal operating temperature.
 3. Turn the engine OFF.
 4. Remove the spark plugs.
 5. Remove the oil filler cap.
 6. Remove the air cleaner hose.
 7. **Calibrate the tester according to the manufacturer's instructions.** The shop air source for testing should maintain a regulated air pressure at 552 kPa (80 psi).
 8. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set the piston of the cylinder to be tested at TDC compression.
 9. During the testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with **no more** than 25% leakage.

FOR EXAMPLE: Input air at 552 kPa (80 psi), the primary gauge factory set at 207 kPa (30 psi) input pressure. The secondary gauge should have no more than 176 kPa (25.5 psi) loss, when connected to the cylinder.

Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART.**

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH	Head gasket leaking or cracked	Remove cylinder head and inspect.

RADIATOR	cylinder head or block	Replace defective part.
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary.
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary.

CYLINDER COMPRESSION TEST

NOTE: To perform a compression test on a MULTI-AIR equipped engine, the ignition **MUST** remain in the "key on" position. If the ignition is in the "off" position, the intake valves will not actuate and the result will be no compression.

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

NOTE: Be certain the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs and record the cylinder number of each spark plug for future. Reference.
3. Inspect the spark plug electrodes for abnormal firing indicators such as fouled, hot, oily, etc.
4. Disable the fuel system and perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

NOTE: The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.

7. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
8. If one or more cylinders have abnormally low compression pressures, repeat the compression test.

NOTE: If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question.

9. If one or more cylinders continue to have abnormally low compression pressures, perform the cylinder combustion pressure leakage test. Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE**.

CYLINDER LEAKAGE TEST

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

Cylinder leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
 - Leaks between adjacent cylinders or into water jacket.
 - Any causes for combustion pressure loss.
1. Check the coolant level and fill as required. DO NOT install the radiator cap.
 2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
 3. Remove the spark plugs.
 4. Remove the oil filler cap.
 5. Remove the air cleaner hose.
 6. **Calibrate the tester according to the manufacturer's instructions.** The shop air source for testing should maintain a regulated air pressure at 552 kPa (80 psi).
 7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set the piston of the cylinder to be tested at TDC on the compression stroke.
 8. As each cylinder is pressurized, listen for the air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with **no more** than 25% leakage.

If leakage is greater than 25%, refer to **CYLINDER LEAKAGE DIAGNOSIS CHART**.

CYLINDER LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part.
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary.
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH	Stuck or broken piston rings; cracked piston; worn rings	Inspect for broken rings or piston. Measure ring gap and cylinder

OIL FILLER CAP OPENING ONLY	and/or cylinder wall	diameter, taper and out-of-round. Replace defective part as necessary.
-----------------------------	----------------------	---

OIL CONSUMPTION TEST AND DIAGNOSIS

The following diagnostic procedures are used to determine the source of excessive internal oil consumption, these procedures and tests apply to vehicles with 50,000 miles or less.

NOTE: Engine oil consumption may be greater than normal during engine break-in. Repairs should be delayed until vehicle has been driven at least 7,500 miles.

Severe service (high ambient temperature, short trips, heavy loading, trailer towing, taxi, off-road, or law enforcement use) may result in greater oil consumption than normal.

Sustained high speed driving and high engine RPM operation may result in increased oil consumption.

Failure to comply with the recommended oil type and viscosity rating, as outlined in the owner's manual, may impact oil economy as well as fuel economy.

Oil consumption may increase with vehicle age and mileage due to normal engine wear.

NOTE: Because a few drops of external oil leakage per mile can quickly account for the loss of one quart of oil in a few hundred miles, be certain there is no external engine oil leaks present.

- Oil leakage is not the same as oil consumption and all external leakage must be eliminated before any action can be taken to verify and/or correct oil consumption complaints.
- Verify that the engine has the correct oil level dipstick and dipstick tube installed.
- Verify that the engine is not being run in an overfilled condition. Check the oil level 15 minutes after a hot shutdown with the vehicle parked on a level surface. In no case should the level be above MAX or the FULL mark on the dipstick.

OIL CONSUMPTION TEST

1. Check the oil level at least 15 minutes after a hot shutdown.
2. If the oil level is low, top off with the proper viscosity and API service level engine oil. Add one bottle of MOPAR® 4-In-1 Leak Detection Dye into the engine oil.
3. Tamper proof the oil pan drain plug, oil filter, dipstick and oil fill cap.
4. Record the vehicle mileage.
5. Instruct the customer to drive the vehicle as usual.
6. Ask the customer to return to the servicing dealer after accumulating 500 miles, Check the oil level at least 15 minutes after a hot shutdown. If the oil level is half way between the "FULL" and "ADD" mark continue with the next step.
7. Using a black light, re-check for any external engine oil leaks, repair as necessary, if no external engine

oil leaks are present, continue with oil consumption diagnosis.

OIL CONSUMPTION DIAGNOSIS

1. Check the Positive Crankcase Ventilation (PCV) system. Make sure the system is not restricted and the PCV valve has the correct part number and correct vacuum source (18-20 in. Hg at idle below 3000 ft. above sea level is considered normal).
2. Perform a cylinder compression test and cylinder leakage test using the standard cylinder leakage tester and following manufacturers suggested best practices. .

NOTE: **Verify the spark plugs are not oil saturated. If the spark plugs are oil saturated and compression is good it can be assumed the valve seals or valve guides are at fault.**

3. If one or more cylinders have more than 25% leak down further engine tear down and inspection will be required.

TOP 19 REASONS THAT MAY LEAD TO ENGINE OIL CONSUMPTION

1. Tapered and Out-of-Round Cylinders

The increased piston clearances permit the pistons to rock in the worn cylinders. While tilted momentarily, an abnormally large volume of oil is permitted to enter on one side of the piston. The rings, also tilted in the cylinder, permit oil to enter on one side. Upon reversal of the piston on each stroke, some of this oil is passed into the combustion chamber.

2. Distorted Cylinders

This may be caused by unequal heat distribution or unequal tightening of cylinder head bolts. This condition presents a surface which the rings may not be able to follow completely. In this case, there may be areas where the rings will not remove all of the excess oil. When combustion takes place, this oil will be burned and cause high oil consumption.

3. Improper operation of "PCV "system

The main purpose of the Positive Crankcase Ventilation (PCV) valve is to recirculate blow-by gases back from the crankcase area through the engine to consume unburned hydrocarbons. The PCV system usually has a one way check valve and a make up air source. The system uses rubber hoses that route crankcase blow by gases to the intake manifold. Vacuum within the engine intake manifold pulls the blow by gases out of the crankcase into the combustion chamber along with the regular intake air and fuel mixture.

The PCV system can become clogged with sludge and varnish deposits and trap blow by gases in the crankcase. This degrades the oil, promoting additional formation of deposit material. If left uncorrected, the result is plugged oil rings, oil consumption, rapid ring wear due to sludge buildup, ruptured gaskets and seals due to crankcase pressurization.

4. Worn Piston Ring Grooves

For piston rings to form a good seal, the sides of the ring grooves must be true and flat - not flared or shouldered. Piston rings in tapered or irregular grooves will not seal properly and, consequently, oil will pass around behind the rings into the combustion chamber.

5. Worn, Broken or Stuck Piston Rings

When piston rings are broken, worn or stuck to such an extent that the correct tension and clearances are not maintained, this will allow oil to be drawn into the combustion chamber on the intake stroke and hot gases of combustion to be blown down the cylinder past the piston on the power stroke. All of these conditions will result in burning and carbon build up of the oil on the cylinders, pistons and rings.

6. Cracked or Broken Ring Lands

Cracked or broken ring lands prevent the rings from seating completely on their sides and cause oil pumping. This condition will lead to serious damage to the cylinders as well as complete destruction of the pistons and rings. Cracked or broken ring lands cannot be corrected by any means other than piston replacement.

7. Worn Valve Stems and Guides

When wear has taken place on valve stems and valve guides, the vacuum in the intake manifold will draw oil and oil vapor between the intake valve stems and guides into the intake manifold and then into the cylinder where it will be burned.

8. Bent or Misaligned Connecting Rods

Bent or misaligned connecting rods will not allow the pistons to ride straight in the cylinders. This will prevent the pistons and rings from forming a proper seal with the cylinder walls and promote oil consumption. In addition, it is possible that a bearing in a bent connect rod will not have uniform clearance on the connecting rod wrist pin. Under these conditions, the bearing will wear rapidly and throw off an excessive amount of oil into the cylinder.

9. Fuel Dilution

If raw fuel is allowed to enter the lubrication system, the oil will become thinner and more volatile and will result in higher oil consumption. The following conditions will lead to higher oil consumption;

- Excess fuel can enter and mix with the oil via a leaking fuel injector
- Gasoline contaminated with diesel fuel
- Restricted air intake
- Excessive idling

10. Contaminated Cooling Systems

Corrosion, rust, scale, sediment or other formations in the water jacket and radiator will prevent a cooling system from extracting heat efficiently. This is likely to cause cylinder distortion thus leading to higher oil consumption.

11. Oil Viscosity

The use of oil with a viscosity that is too light may result in high oil consumption. Refer to the vehicle owner's manual for the proper oil viscosity to be used under specific driving conditions and/or ambient temperatures.

12. Dirty Engine Oil

Failure to change the oil and filter at proper intervals may cause the oil to be so dirty that it will promote accumulation of sludge and varnish and restrict oil passages in the piston rings and pistons. This will increase oil consumption; dirty oil by nature is also consumed at a higher rate than clean oil.

13. Crankcase Overfull

Due to an error in inserting the oil dip stick so that it does not come to a seat on its shoulder, a low reading may be obtained. Additional oil may be added to make the reading appear normal with the stick in this incorrect position which will actually make the oil level too high. If the oil level is so high that the lower ends of the connecting rods touch the oil in the oil pan excessive quantities of oil will be thrown on the cylinder walls and some of it will work its way up into the combustion chamber.

14. Excessively High Oil Pressure

A faulty oil pressure relief valve may cause the oil pressure to be too high. The result will be that the engine will be flooded with an abnormally large amount of oil in a manner similar to that which occurs with worn bearings. This condition may also cause the oil filter to burst.

15. Aftermarket Performance Chips and Modification

Increasing performance through the use of performance/power enhancement products to a stock or factory engine will increase the chance of excessive oil consumption.

16. Lugging Engine

Lugging is running the engine at a lower RPM in a condition where a higher RPM (more power/torque) should be implemented. Especially susceptible on vehicles equipped with a manual transmission. This driving habit causes more stress loading on the piston and can lead to increases in engine oil consumption.

17. Turbocharged Engines

There is a possibility for PCV "push-over" due to higher crankcase pressure (as compared to naturally aspirated engines) which is normal for turbocharged engines. This condition causes varying amounts of engine oil to enter the intake manifold, charge air cooler and associated plumbing to and from the charge air cooler, also a leaking turbocharger seal will draw oil into the combustion chamber where it will burn (blue smoke from tail pipe may be present) and form carbon deposits which contribute to further oil consumption as they interfere with proper engine function.

18. Restricted Air Intake

Excessive restriction in the air intake system will increase engine vacuum and can increase oil consumption, an extremely dirty air filter would be one example of this situation.

19. Intake Manifold port seals

Engines that have a "V" configuration and a "wet valley" (3.3/3.8L) could draw oil into the intake ports due to improper sealing between the intake manifold ports and cylinder head. Causes may include improper torque of intake manifold bolts, corrosion (aluminum intake manifold) and or warped sealing surface.

ENGINE LUBRICATION DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Misaligned or damaged gaskets and O-rings.	1. Replace as necessary.
	(a) Loose fasteners, broken or porous metal parts.	(a) Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear oil seal.	2. Replace rear crankshaft oil seal. Refer to <u>SEAL, CRANKSHAFT OIL, REAR, REMOVAL</u> .
	3. Crankshaft rear oil seal surface. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan. Refer to <u>PAN, OIL, REMOVAL</u> .
	5. Damaged or misaligned crankshaft front oil seal.	5. Replace front crankshaft oil seal. Refer to <u>SEAL, CRANKSHAFT OIL, FRONT, REMOVAL</u> .
OIL PRESSURE DROP	6. Scratched or damaged vibration damper hub.	6. Polish or replace vibration damper.
	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sensor.	2. Replace oil pressure sensor. Refer to <u>SENSOR, OIL PRESSURE, REMOVAL</u> .
	3. Low oil pressure.	3. Check main bearing clearance. Refer to <u>BEARING(S), CRANKSHAFT, MAIN, STANDARD PROCEDURE</u> . 3. Check rod bearing clearance. Refer to <u>BEARING(S), CONNECTING ROD, STANDARD PROCEDURE</u> .
	4. Clogged oil filter.	4. Replace oil filter. Refer to <u>FILTER, ENGINE OIL</u> .

		<u>REMOVAL</u> .
	5. Worn oil pump.	5. Replace oil pump. Refer to <u>PUMP, ENGINE OIL, REMOVAL</u> .
	6. Thin or diluted oil.	6. Change oil and filter. Refer to OIL - <u>STANDARD PROCEDURE</u> .
	7. Excessive bearing clearance.	7. Replace crankshaft bearings. Refer to <u>BEARING(S), CRANKSHAFT, MAIN, STANDARD PROCEDURE</u> . 7. Replace rod bearings. Refer to <u>BEARING(S), CONNECTING ROD, STANDARD PROCEDURE</u> .
	8. Oil pump relief valve stuck.	8. Replace oil pump. Refer to <u>PUMP, ENGINE OIL, REMOVAL</u> .
	9. Oil pump pickup tube loose, damaged or clogged.	9. Replace oil pump pick-up (Refer to <u>PUMP, ENGINE OIL - REMOVAL</u>).
OIL PUMPING AT RINGS	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings. Refer to RING(S), PISTON - <u>STANDARD PROCEDURE</u> .
	2. Carbon in oil ring slots.	2. Replace rings. Refer to <u>ROD, PISTON AND CONNECTING, REMOVAL</u> .
	3. Worn valve guides.	3. Replace cylinder heads. Refer to <u>CYLINDER HEAD, REMOVAL</u> .
	4. Leaking valve guide seals.	4. Replace valve guide seals. Refer to <u>SEAL(S), VALVE GUIDE, REMOVAL</u> .

STANDARD PROCEDURE

DUST COVERS AND CAPS

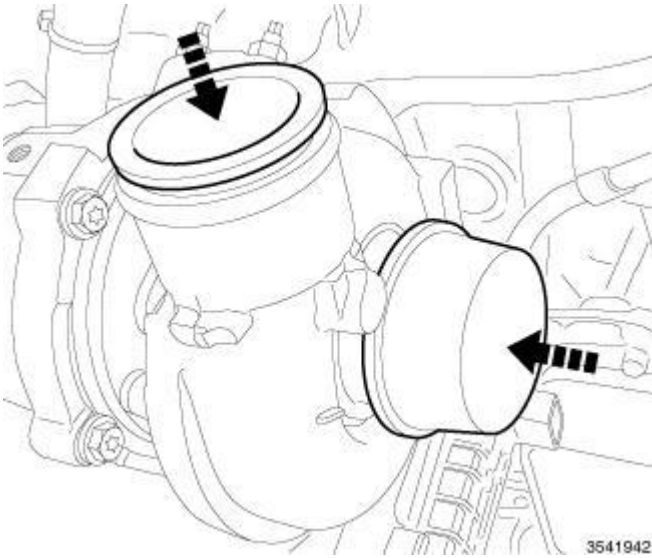


Fig. 2: Covers/Caps

Courtesy of CHRYSLER GROUP, LLC

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

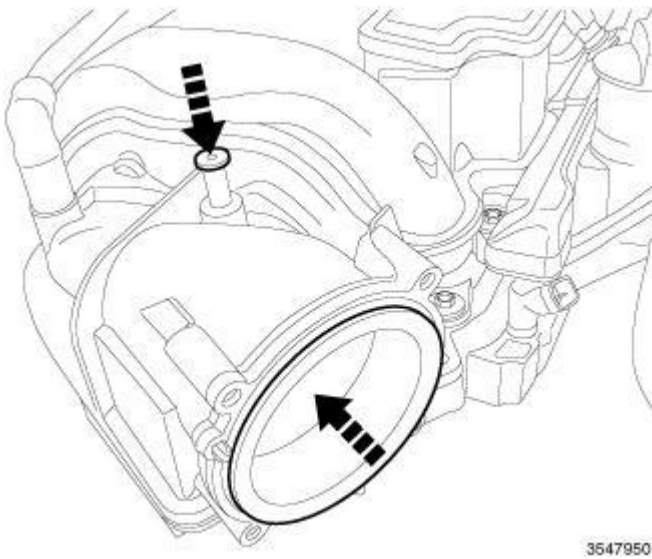


Fig. 3: Opening Cover

Courtesy of CHRYSLER GROUP, LLC

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

ENGINE GASKET SURFACE PREPARATION



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

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

Never use the following to clean gasket surfaces:

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

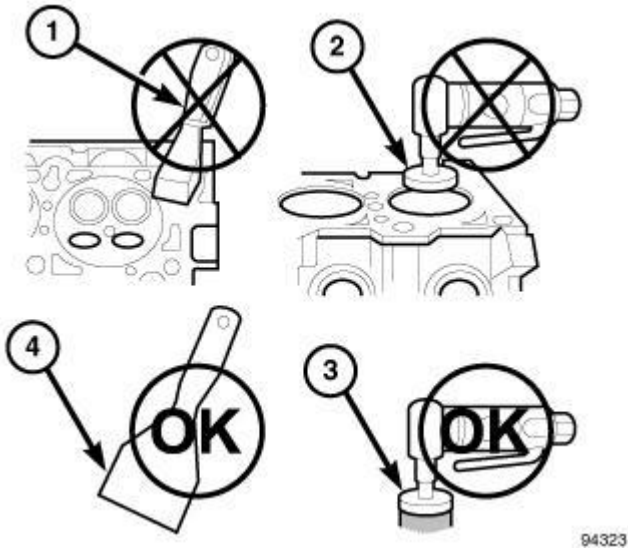


Fig. 5: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (4).
- High speed power tool with a plastic bristle brush style disc (3).

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

REPAIR DAMAGED OR WORN THREADS

CAUTION: Always maintain the original center line when drilling and/or tapping holes.

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 a Heli-Coil insert into the tapped hole to bring the hole back to its original thread size

HYDROSTATIC LOCK

CAUTION: Do not attempt to run engine. Severe damage could occur.

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

1. Disconnect and isolate the negative battery cable.
2. Lift the engine cover retaining grommets off the ball studs and remove the engine cover.
3. Place a shop towel around the fuel supply line Quick Connect Fitting to catch any fuel that may be under pressure and disconnect the fuel supply line. Refer to **FITTING, QUICK CONNECT**.
4. Loosen the air duct retaining clamp at the throttle body.
5. Disconnect the intake air temperature sensor electrical connector (2).
6. Remove the makeup air hose at the air cleaner housing.
7. Remove the air cleaner housing retaining bolt.
8. While lifting up the air cleaner housing, slide the air duct off the throttle body and remove the air cleaner housing from the vehicle.
9. Inspect the air duct, air cleaner housing and the intake manifold to make sure the system is dry and clear of any foreign material.
10. Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head.

11. Remove the spark plugs. Refer to **SPARK PLUG, REMOVAL** .
12. With the spark plugs removed, rotate the crankshaft using a breaker bar and socket.
13. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
14. Make sure all fluid has been removed from the cylinders.
15. Repair engine or components as necessary to prevent this problem from occurring again.
16. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will help prevent engine damage on restart.
17. Install new spark plugs. Refer to **SPARK PLUG, INSTALLATION** .
18. Perform the Engine Oil Service procedure. Refer to OIL - **STANDARD PROCEDURE** .
19. Connect negative battery cable and tighten nut to 5 N.m (45 in. lbs.).
20. Start the engine and check for leaks.

SPECIFICATIONS

ENGINE SPECIFICATIONS

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	90° V-8 OHV
Displacement	6.4 Liters 392 (Cubic Inches)
Bore	103.9 mm (4.09 in.)
Stroke	94.6 mm (3.72 in.)
Compression Ratio	10.9:1
Firing Order	1-8-4-3-6-5-7-2
Lubrication	Pressure Feed - Full Flow Filtration
Cooling System	Liquid Cooled - Forced Circulation
Cylinder Block	Cast Iron
Cylinder Head	Aluminum
Crankshaft	Forged Steel
Camshaft	Cast Iron
Pistons	Aluminum Alloy
Connecting Rods	Powdered Metal

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cam Bore Diameter	65.52 mm	2.5795 in.
Cylinder Bore Diameter	103.9 mm	4.09 in.
Out of Round (MAX)	0.008 mm	0.0003 in.
Taper (MAX)	0.0127 mm	0.0005 in.

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

Lifter Bore Diameter	21.45 - 21.425 mm	0.8444 - 0.8435 in.
----------------------	-------------------	---------------------

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Measured at 38.0 mm (1.5 in.) Below Deck	0.0245 - 0.0515 mm	0.00096 - 0.0020 in.
Ring Groove Diameter		
Groove #1	93.1 - 93.4 mm	3.665 - 3.677 in.
Groove #2	91.6 - 91.8 mm	3.606 - 3.614 in.
Weight	437 grams	15.41 oz.
Piston Length	54.70 - 55.30 mm	2.153 - 2.177 in.
Ring Groove Width		
No. 1	1.2 mm	0.0472 in.
No. 2	1.2 mm	0.0472 in.
No. 3	2.0 mm	0.0787 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.30 - 0.40 mm	0.0118 - 0.0157 in.
Second Compression Ring	0.35 - 0.60 mm	0.0137 - 0.0236 in.
Oil Control (Steel Rails)	0.20 - 0.71 mm	0.0079 - 0.028 in.
Side Clearance		
Top Compression Ring	0.02 - 0.068 mm	0.0007 - 0.0026 in.
Second Compression Ring	0.02 - 0.058 mm	0.0007 - 0.0022 in.
Oil Ring (Steel Ring)	0.019 - 0.229 mm	0.0007 - 0.0091 in.
Ring Width		
Top Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Second Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Oil Ring (Steel Rails)	0.447 - 0.473 mm	0.0175 - 0.0186 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Side Clearance	0.10 - 0.35 mm	0.003 - 0.0137 in.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	65 mm	2.6 in.

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

Bearing Clearance	0.023 - 0.051 mm	0.0009 - 0.002 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.
End Play	0.052 - 0.282 mm	0.002 - 0.011 in.
End Play (MAX)	0.282 mm	0.011 in.
Connecting Rod Journal Diameter	54.00 mm	2.126 in.
Bearing Clearance	0.020 - 0.074 mm	0.0007 - 0.0029 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.

CAMSHAFT

DESCRIPTION		SPECIFICATION	
		Metric	Standard
Bearing Journal Diameter			
	No. 1	67.72 mm	2.67 in.
	No. 2	57.8 mm	2.27 in.
	No. 3	57.4 mm	2.26 in.
	No. 4	57.0 mm	2.24 in.
	No. 5	43.633 mm	1.72 in.
Bearing To Journal Clearance Standard			
	No. 1	0.040 - 0.080 mm	0.0015 - 0.003 in.
	No. 2	0.050 -0.090 mm	0.0019 - 0.0035 in.
	No. 3	0.040 - 0.080 mm	0.0015 - 0.003 in.
	No. 4	0.050 - 0.090 mm	0.0019 - 0.0035 in.
	No. 5	0.040 - 0.080 mm	0.0015 - 0.003 in.
Camshaft End Play		.080 - 0.290 mm	0.0031 - 0.0114 in.
Duration		288.0°	
Valve Lift (@ Zero Lash)			
	Intake	15.0 mm	0.591 in.
	Exhaust	14.2 mm	0.559 in.

VALVE TIMING

DESCRIPTION		SPECIFICATION
Intake		
	Opens (BTDC)	36.0°
	Closes (ATDC)	250.0°
	Duration	286.0°
Exhaust		
	Opens (BTDC)	278°
	Closes (ATDC)	10°
Valve Overlap		46°

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Valve Seat Angle	44.5° - 45.0°	
Valve Seat Runout (MAX)	0.04 mm	0.0016 in.
Valve Seat Width		
Intake	0.94 - 1.04 mm	0.037 - 0.041 in.
Exhaust	1.16 - 1.26 mm	0.046 - 0.050 in.
Guide Bore Diameter		
Intake	7.975 - 7.997 mm	0.314 - 0.315 in.
Exhaust	7.975 - 7.990 mm	0.314 - 0.315 in.

HYDRAULIC TAPPETS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	21.387 - 21.405 mm	0.8420 - 0.8427 in.
Clearance (To Bore)	0.020 - 0.063 mm	0.0007 - 0.0024 in.
Dry Lash (at the valve)	3.0 mm	0.1181 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle		
Intake	45.5° - 46.0°	
Exhaust	45.0° - 45.5°	
Head Diameter		
Intake	54.3 mm	2.138
Exhaust	42.0 mm	1.654
Length (Overall From Gage Line)		
Intake	130.19	5.126
Exhaust	129.545	5.100
Stem Diameter		
Intake	7.934 - 7.954 mm	0.312 - 0.313 in.
Exhaust	7.930 - 7.950 mm	0.312 - 0.313 in.
Stem - to - Guide Clearance		
Intake	0.021 - 0.066 mm	0.0008 - 0.0025 in.
Exhaust	0.025 - 0.070 mm	0.0010 - 0.0028 in.

VALVE SPRING

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Spring Force (Valve Closed)		

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

Intake	510.0 N ± 26.0 N @ 52.1 mm	114.7 lbs. ± 5.8 lbs. @ 2.051 in.
Exhaust	571.0 N ± 26.0 N @ 51.2 mm	114.7 lbs. ± 5.8 lbs. @ 2.051 in.
Spring Force (Valve Open)		
Intake	1500.0 N ± 70.0 N @ 37.6 mm	337.2 lbs. ± 15.7 lbs. @ 1.480 in.
Exhaust	1500.0 N ± 70.0 N @ 37.6 mm	337.2 lbs. ± 15.7 lbs. @ 1.480 in.
Free Length Approx.)		
Intake	63.9 mm	2.516 in.
Exhaust	63.9 mm	2.516 in.
Number of Coils		
Intake	8.55	
Exhaust	8.55	
Wire Diameter		
Intake and Exhaust	5.65 X 4.51 mm	0.222 - 0.178 in.
Installed Height (Spring Seat to Bottom of Retainer)		
Intake	52.1 mm	2.051 in.
Exhaust	51.2 mm	2.016 in.

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Over Rotors (MAX)	0.095 mm	0.0038 in.
Outer Rotor to Pump Body Clearance (MAX)	0.235 mm	0.009 in.
Tip Clearance Between Rotors (MAX)	0.150 mm	0.006 in.

OIL PRESSURE

SPECIFICATION	SPECIFICATION
At Curb Idle Speed (min.)*	25 kPa (4 psi)
@ 3000 RPM	170 - 758 kPa (25 - 110 psi)
* CAUTION: If pressure is zero at curb idle, DO NOT run engine	

TORQUE SPECIFICATIONS**6.4L ENGINE**

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Air Cleaner Housing - Bolt	5	-	44
Block Pipe Plugs			
(1/4 NPT)	20	15	-
(3/8 NPT)	27	20	-
Water Drain Plugs	34	25	-
Camshaft Sprocket - Bolt	122	90	-

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

Camshaft Thrust Plate - Bolts	12	-	106
Lifting Stud	55	40	-
Connecting Rod Cap - Bolts	45 Plus 60° Turn	33 Plus 60° Turn	-
Main Bearing Cap - Bolts			
M-12 Bolts	28 Plus 90° Turn	21 Plus 90° Turn	-
M-8 Bolts (Crossbolts)	31	23	-
Cylinder Head - Bolts (M-12)	Specific torque and fastener pattern required; follow installation sequence. Refer to <u>CYLINDER HEAD, INSTALLATION</u> .		
Cylinder Head Cover - Bolts	11	-	97
Engine Mount Bracket to Engine Block - Bolts	61	45	-
Engine Mount Heat Shield - Nuts	25	18	-
Engine Timing Cover - Bolts	28	21	-
Exhaust Manifold - Medium Duty			
Left Side	30	22	-
Right Side	25	18	-
Exhaust Manifold - Heavy Duty	Specific torque and fastener pattern required; follow installation sequence. Refer to <u>MANIFOLD, EXHAUST, INSTALLATION</u> .		
Exhaust Manifold Heat Shields			
Forward Nuts	8	-	70
Rearward Nuts	14	10	-
Flexplate to Crankshaft - Bolts	95	70	-
Flywheel to Crankshaft - Bolts	75	55	-
Front Isolator to Engine Mount Bracket- Bolts	60	44	-
Front Isolator to Engine Cradle Crossmember - Bolts	61	45	-
Generator to Engine Block - Bolts	54	40	-
Generator Support Bracket-to-Engine Mount Nut	25	18	-
Heater Tube - Bolt	18	13	-
Intake Manifold - Bolts	Specific torque and fastener pattern required; follow installation sequence. Refer to <u>MANIFOLD, INTAKE, INSTALLATION</u> .		
Lifter Guide Holder - Bolts	12	9	-
MDS Solenoid - Bolts	11	8	-
Oil Control Valve - Bolt	11	8	-
Piston Oil Cooler Jet - Bolts	13	10	-
Power Steering Pump to Engine Block - Bolts	28	21	-
Oil Dipstick Tube - Nut	31	23	-
Oil Pan - Drain Plug	27	20	-

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

Oil Pan - Bolts	Specific torque and fastener pattern required; follow installation sequence. Refer to PAN, OIL, INSTALLATION .		
Oil Pump - Bolts	28	21	-
Oil Pump Pickup Tube			
Nut	28	21	-
Bolt	12	9	-
Rear Seal Retainer - Bolts	15	11	-
Rear Isolator Bracket to Transmission - Bolts (Automatic)	33	24	-
Rear Isolator to Bracket - Bolts (Automatic)	54	40	-
Rear Isolator to Crossmember - Bolts (Automatic)	61	45	-
Rear Isolator to Transmission - Bolts (Manual)	56	41	-
Rear Isolator to Crossmember - Bolts (Manual)	54	40	-
Rocker Arm - Bolts	22	16	-
Strut Tower Support - Bolts	32	28	-
Thermostat Housing - Bolts	28	21	-
Throttle Body - Bolts	12	9	-
Torque Converter to Flexplate - Bolts	68	50	-
Transmission to Engine Block - Bolts	68	50	-
Vibration Damper - Bolt	180	133	-
Water Pump to Engine Timing Cover - Bolts	28	21	-

REMOVAL**REMOVAL**

CAUTION: If the original engine has experienced a catastrophic failure or an individual failure with the piston, cylinder bore, engine block, valve or valve seat, the intake manifold **MUST** be replaced with a new manifold.

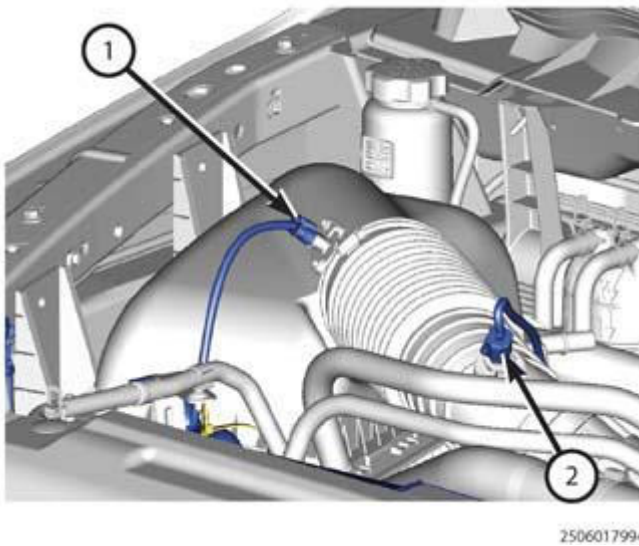


Fig. 6: Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Remove the Hood. Refer to **HOOD, REMOVAL** .
2. Remove the engine cover.
3. Disconnect the Intake Air Temperature (IAT) sensor harness connector (2).
4. Disconnect the Mass Air Flow (MAF) sensor harness connector (1).

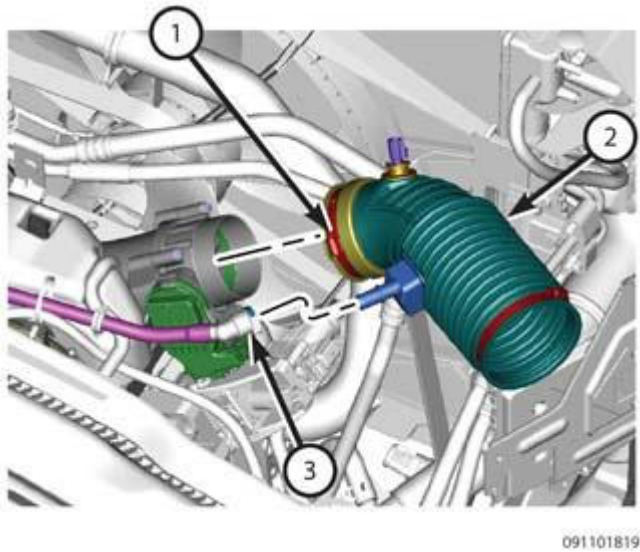


Fig. 7: Clamp, Air Intake Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

5. Remove the breather hose (3) from the intake air hose (2).
6. Loosen the clamp (1) that secure the intake air hose to the throttle body.

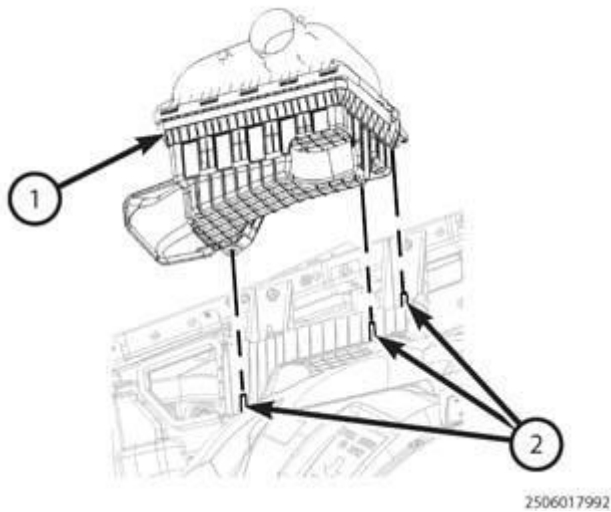


Fig. 8: Air Cleaner Housing & Tabs
Courtesy of CHRYSLER GROUP, LLC

7. Using care, lift the air cleaner housing (1) off the tabs (2).
8. Perform the Fuel System Pressure Release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.

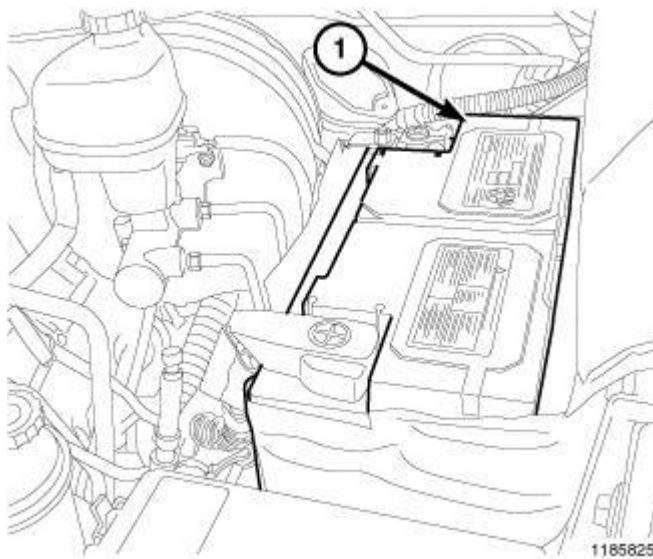


Fig. 9: Battery
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the negative battery cable.

WARNING: Do not remove or loosen the radiator draincock with system hot and under pressure. Serious burns from coolant can occur.

10. Drain the cooling system. Refer to **STANDARD PROCEDURE** .

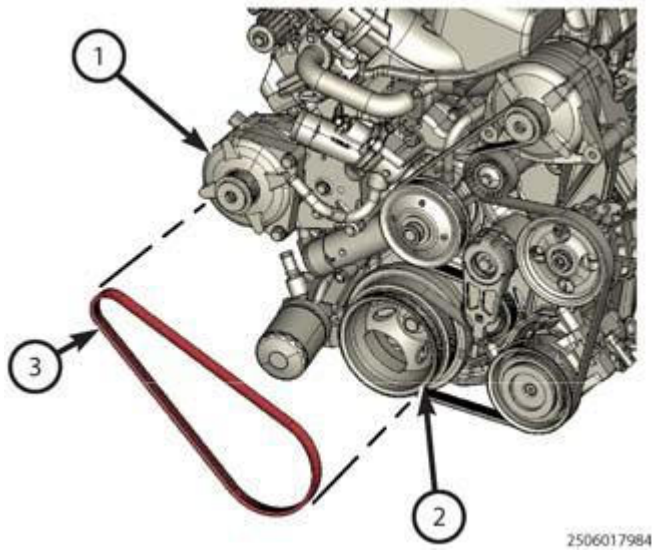


Fig. 10: Removing/Installing Belt
Courtesy of CHRYSLER GROUP, LLC

11. If equipped with dual generators (1). Remove the secondary belt (3). Refer to **BELT, SERPENTINE, REMOVAL** .

CAUTION: Do not let the tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

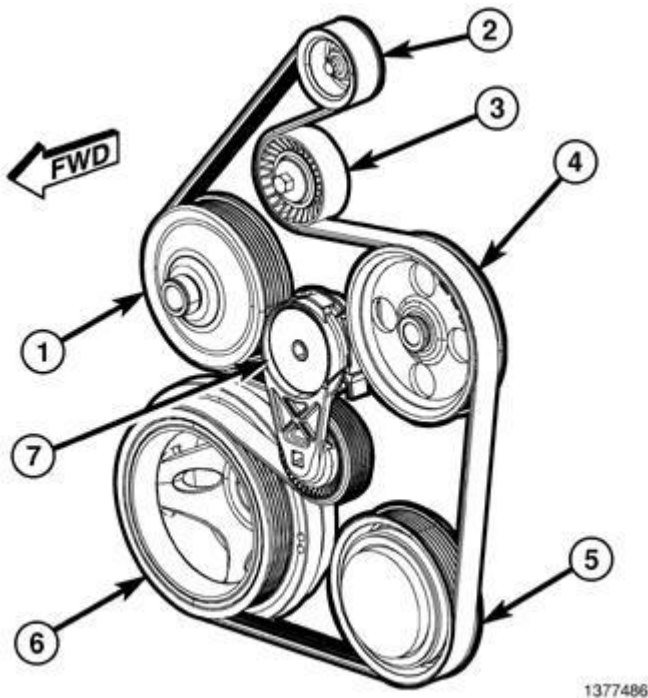


Fig. 11: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

12. Insert a suitable square drive ratchet into the square hole on the belt tensioner arm (7).
13. Release the belt tension by rotating the tensioner clockwise until the accessory drive belt can be removed from the generator pulley only (2).

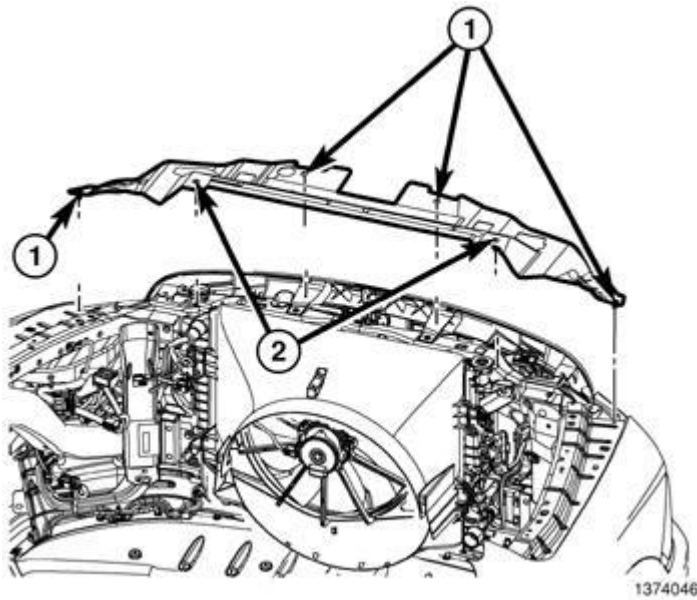


Fig. 12: Upper Radiator Seal & Plastic Rivets
Courtesy of CHRYSLER GROUP, LLC

14. Remove the upper radiator seal push pins (1).
15. Remove the plastic rivets (2) and remove the upper radiator seal.

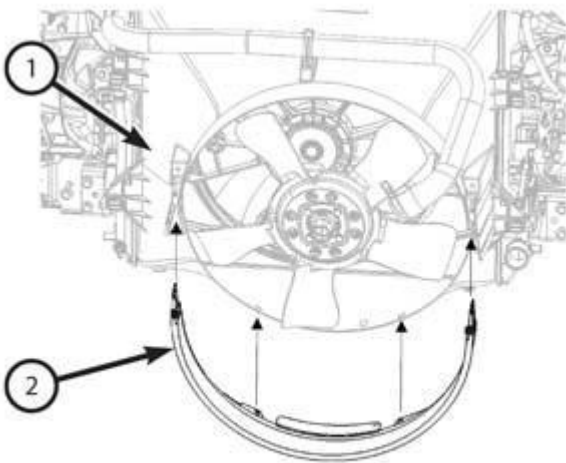


Fig. 13: Upper & Lower Shrouds
Courtesy of CHRYSLER GROUP, LLC

16. Remove the lower shroud (2).
17. Remove the upper fan shroud (1) from the radiator tank clips. Refer to FAN, COOLING, ELECTRIC, REMOVAL or FAN, COOLING, VISCOUS, REMOVAL .

CAUTION: Do not place the viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.

18. Remove the viscous fan drive assembly. Refer to FAN, COOLING, VISCOUS, REMOVAL .
19. Remove the radiator.
20. Recover the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .

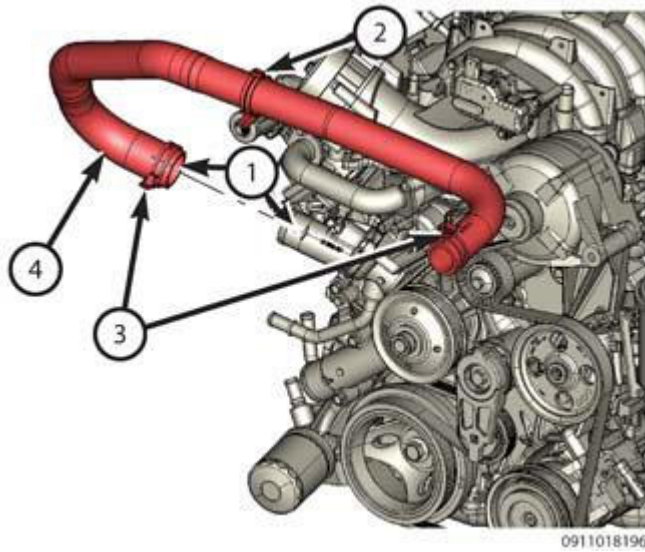


Fig. 14: Upper Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

21. Remove the upper radiator hose (4).

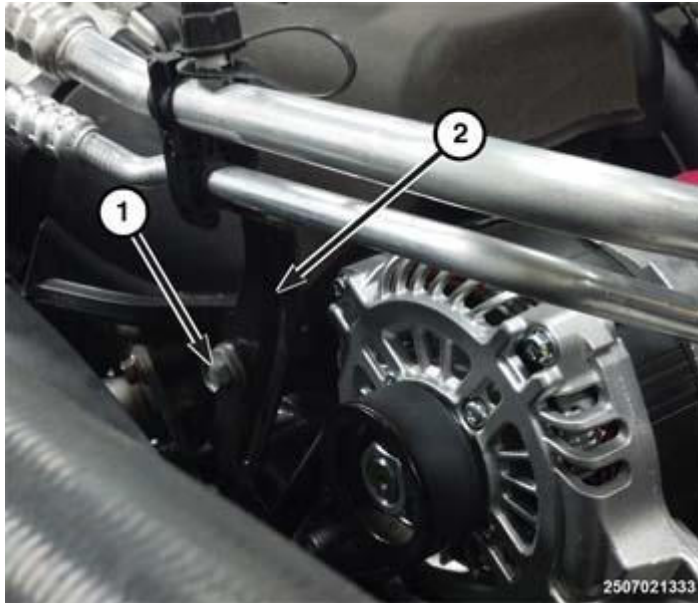


Fig. 15: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

22. Remove the A/C lines at the support bracket (2).

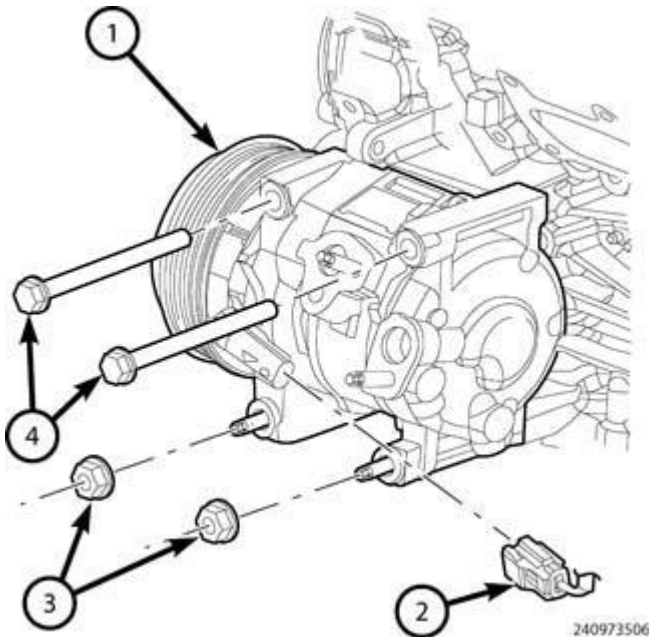


Fig. 16: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

23. Remove the A/C compressor (1). Refer to **COMPRESSOR, A/C, REMOVAL** .

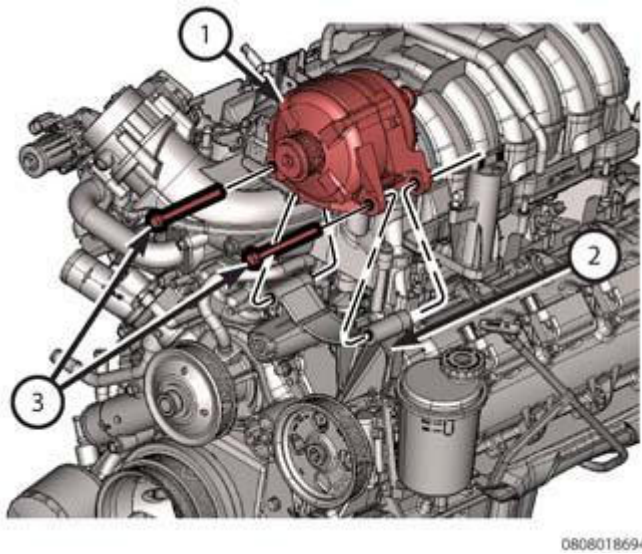


Fig. 17: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

24. Disconnect the generator electrical connectors and remove the generator assembly (1). Refer to **GENERATOR, REMOVAL**.

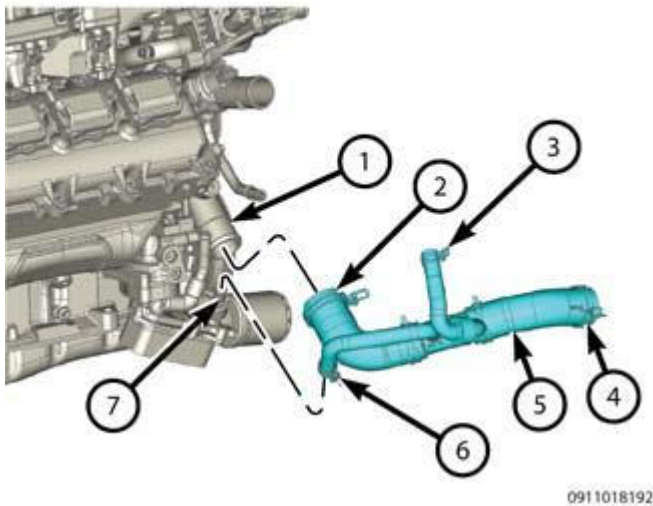


Fig. 18: Lower Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

25. Disconnect the heater hose (3) and lower radiator hose (5) at the water pump (1).
26. If equipped with an oil cooler (7). Remove the return hose (6).

NOTE: It is not necessary to disconnect the power steering hoses from the power steering pump, for power steering pump removal.

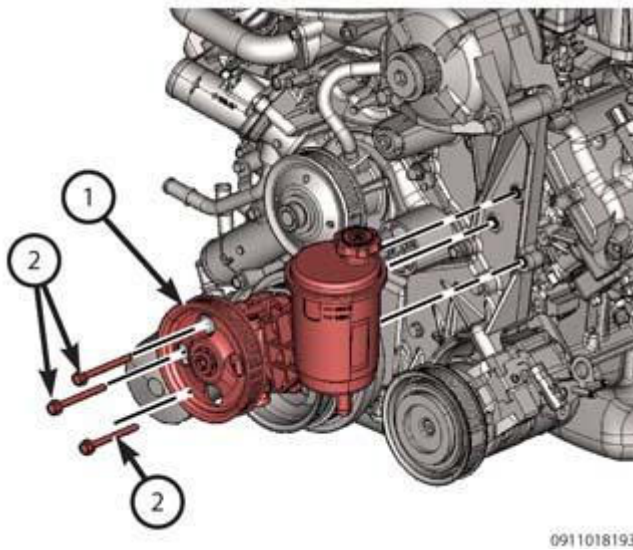


Fig. 19: Power Steering Pump Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

27. Remove the three bolts (2) securing the power steering pump through the holes in the pulley (1) and secure the power steering pump out of the way.

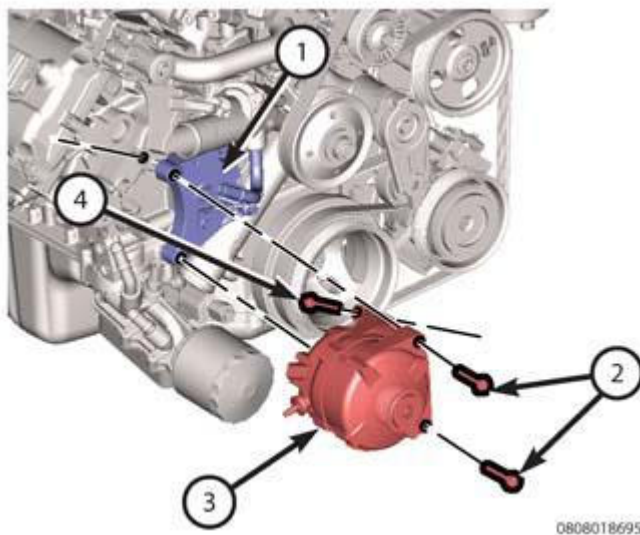


Fig. 20: Generator, Insulator Cap, B+ Output Terminal & Connector
Courtesy of CHRYSLER GROUP, LLC

28. Remove the lower generator (3). Refer to **GENERATOR, REMOVAL**.
29. Disconnect the fuel supply line. Refer to **FITTING, QUICK CONNECT**.
30. Raise and support the vehicle on a hoist and drain the engine oil.

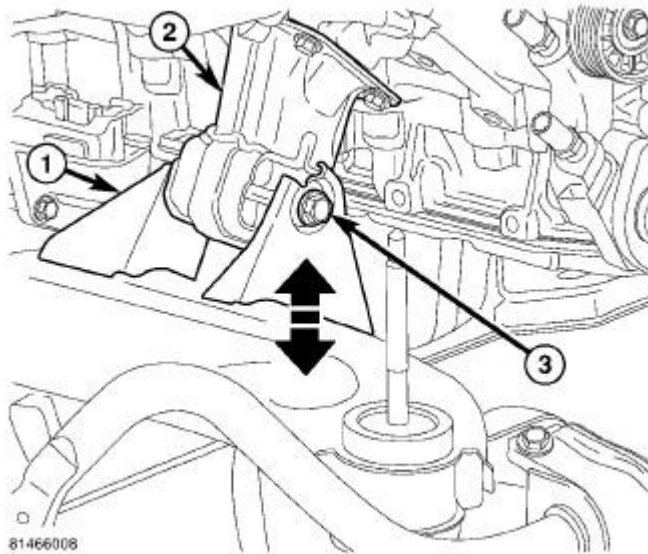


Fig. 21: Engine Mount & Bolt
Courtesy of CHRYSLER GROUP, LLC

31. Loosen both front engine mount through bolts (3).
32. Disconnect the transmission oil cooler lines from their retainers at the oil pan bolts.

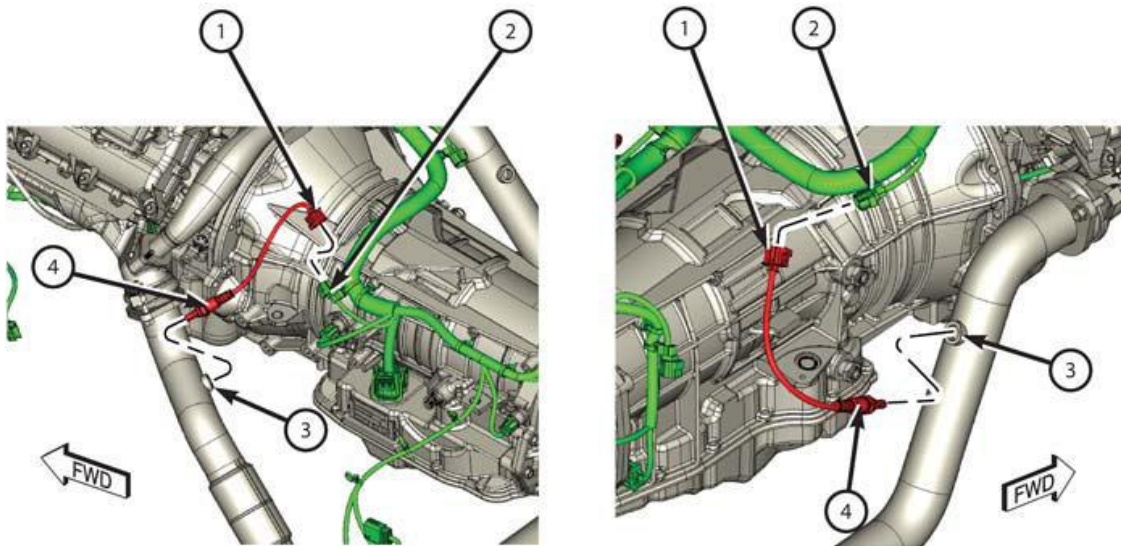
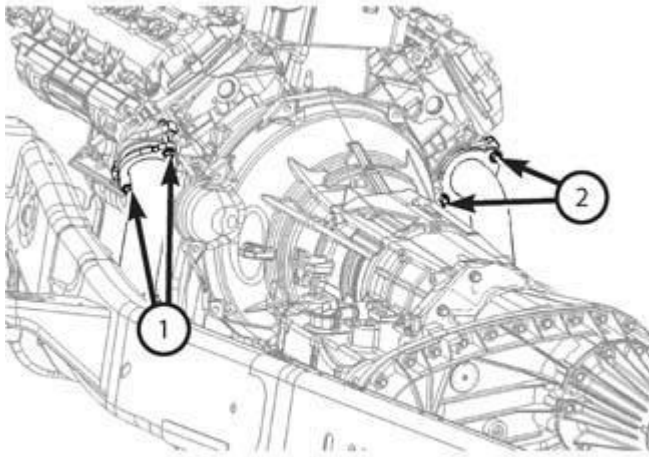


Fig. 22: Oxygen Sensors & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When servicing or replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to

hang by the oxygen sensor wires will damage the harness and/or sensor.

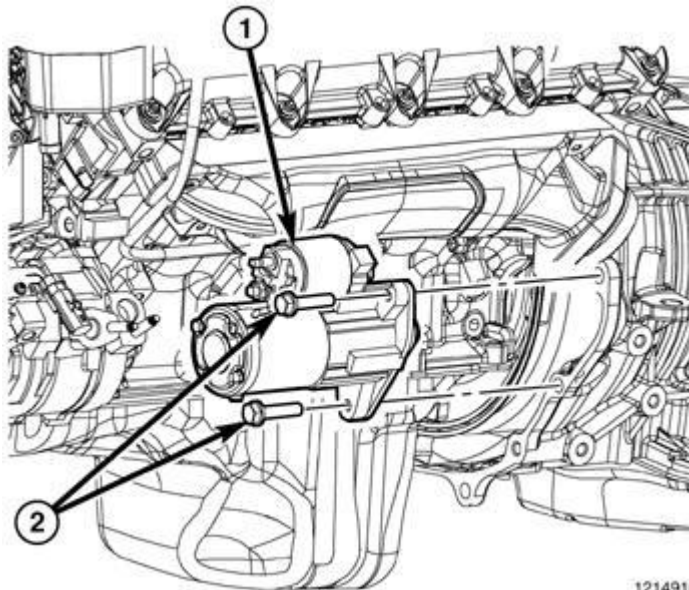
33. Disconnect the oxygen sensor electrical connectors (1, 2).
34. Saturate all exhaust bolts and nuts with Mopar® Rust Penetrant. Allow 5 minutes for penetration.



2506017995

Fig. 23: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

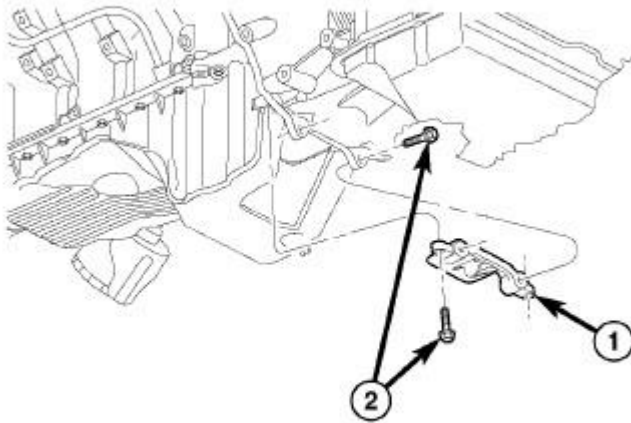
35. Remove the exhaust pipe to manifold bolts (1, 2) and disconnect the front exhaust pipe/catalytic converter assembly at the exhaust manifolds.



1214916

Fig. 24: Starter Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

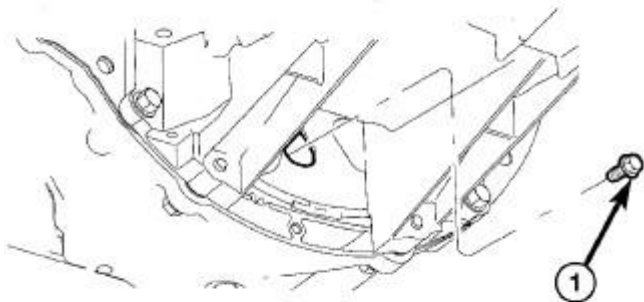
36. Disconnect the starter wires and remove the starter (1). Refer to **STARTER, REMOVAL** .



815005aa

Fig. 25: Structural Dust Cover
Courtesy of CHRYSLER GROUP, LLC

37. Remove the transmission inspection and structural dust covers (2). Refer to **COVER, STRUCTURAL DUST, REMOVAL**.

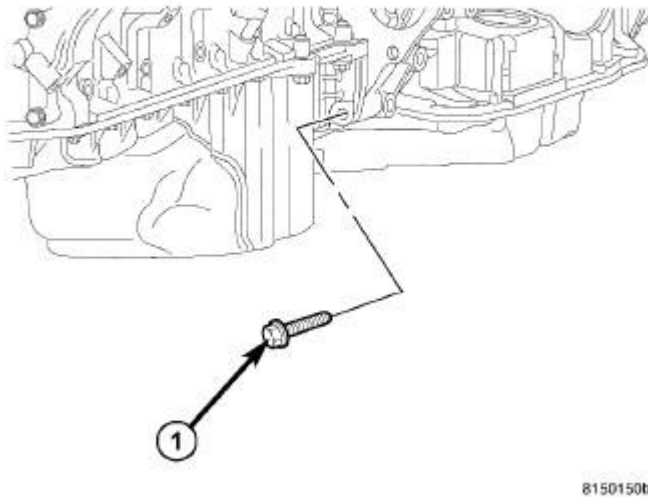


813878a5

Fig. 26: Drive Plate Torque Converter Bolts

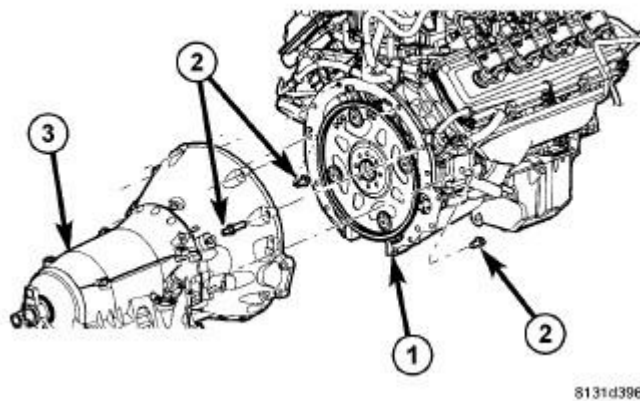
Courtesy of CHRYSLER GROUP, LLC

38. Remove the drive plate to converter bolts (Automatic transmission equipped vehicles).

**Fig. 27: Oil Pan To Transmission Bolts**

Courtesy of CHRYSLER GROUP, LLC

39. Remove both the left and right side oil pan to transmission bolts (1).

**Fig. 28: Remove/Install Transmission To Engine Bolts**

Courtesy of CHRYSLER GROUP, LLC

40. Remove the transmission bell housing to engine block bolts (2).

41. Lower the vehicle.



0909019774

Fig. 29: Intake Manifold Removal/Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

42. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL** .

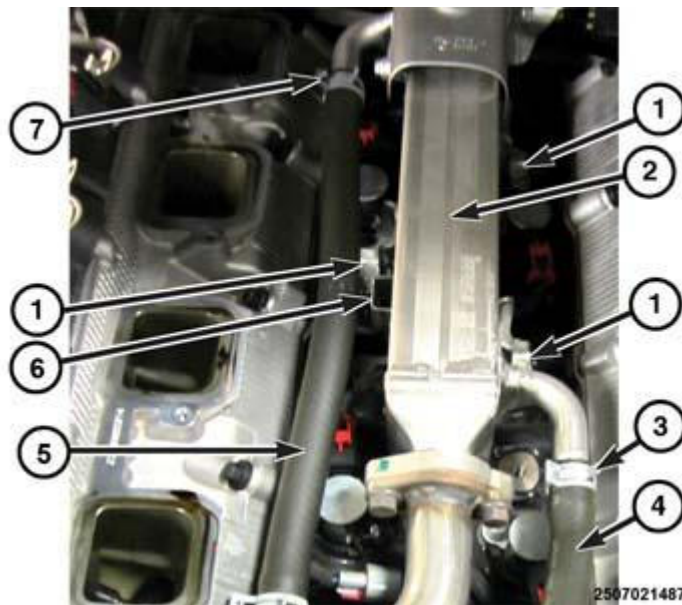


Fig. 30: Remove/Install EGR Cooler
Courtesy of CHRYSLER GROUP, LLC

43. Remove the EGR cooler (2)

Refer to **COOLER, EGR, REMOVAL** .

NOTE: To remove the VVTS, the engine must be at room temperature.

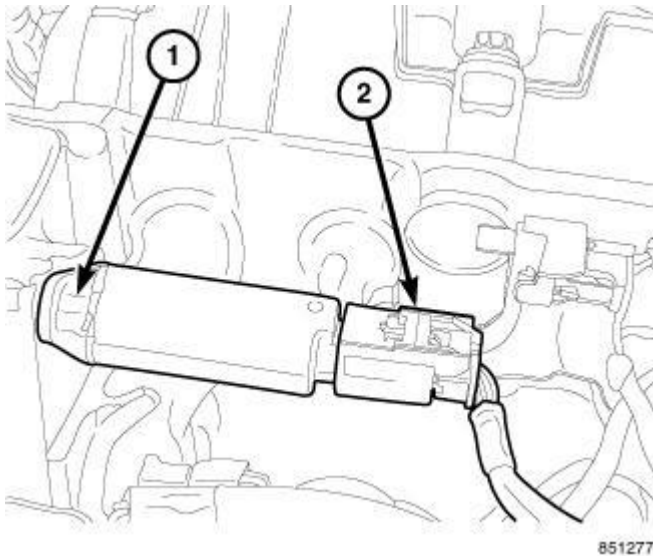


Fig. 31: Oil Control Valve
Courtesy of CHRYSLER GROUP, LLC

44. Remove the VVTS electrical connector (2).
45. Remove the VVTS retaining bolt.

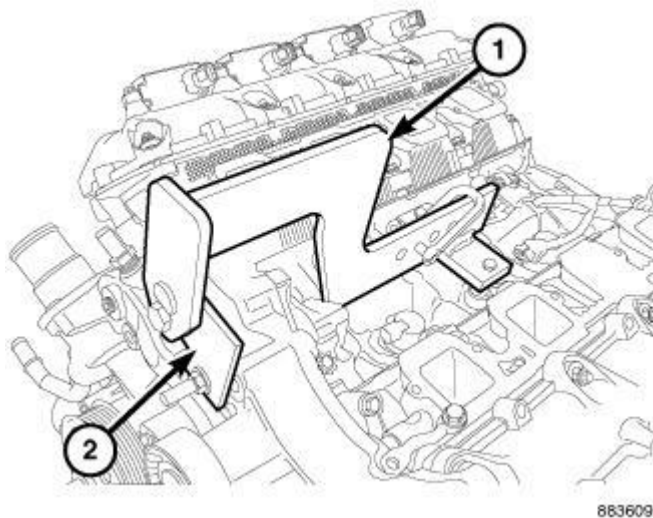


Fig. 32: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not use air tools to install the (special tool #8984B, Fixture, Engine Lifting) (1) and (special tool #2013800090, Adapter, Engine Lifting Bracket).

46. Install the engine lift fixture (1) and adapter.

47. Support the transmission with a suitable transmission jack.
48. Separate the engine from the transmission and remove engine from the vehicle.
49. If required, remove the following components for installation on the replacement engine:
 - Remove the accessory drive belt.
 - Engine wiring harness.
 - Upper and lower intake manifold and brackets.
 - Sensors.
 - Timing chain cover.
 - Crankshaft Damper.
 - Accessory drive belt tensioner.
 - Block heater (if equipped).

INSTALLATION

INSTALLATION

CAUTION: If the original engine has experienced a catastrophic failure or an individual failure with the piston, cylinder bore, engine block, valve or valve seat, the intake manifold **MUST** be replaced with a new manifold.

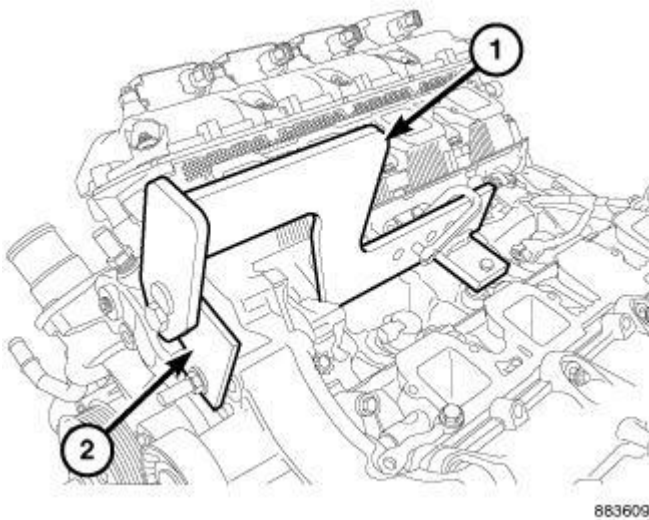


Fig. 33: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not use air tools to install the (special tool #8984B, Fixture, Engine Lifting) and (special tool #2013800090, Adapter, Engine Lifting Bracket).

1. If required, install the following components for installation on the replacement engine:
 - Engine wiring harness.

- Upper and lower intake manifold and brackets.
 - Sensors.
 - Timing chain cover.
 - Crankshaft Damper.
 - Accessory drive belt tensioner.
 - Accessory drive belt.
 - Block heater (if equipped).
2. Install the engine lift fixture (1) and adapter (2).
 3. Position the engine in the engine compartment.

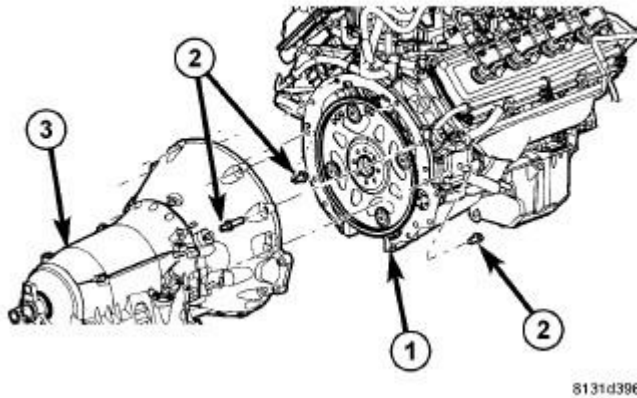


Fig. 34: Remove/Install Transmission To Engine Bolts
 Courtesy of CHRYSLER GROUP, LLC

4. Lower and align the engine (1) to the transmission (3).
5. Install two transmission bell housing to engine block mounting bolts (2) finger tight.

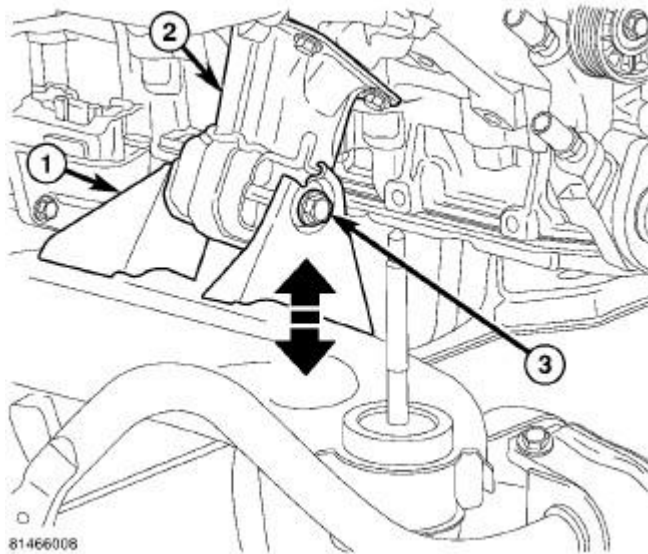


Fig. 35: Engine Mount & Bolt
Courtesy of CHRYSLER GROUP, LLC

6. Lower the engine assembly until the engine mount through bolts (3) line up in the frame brackets (1).
7. Raise and support the vehicle on a hoist.

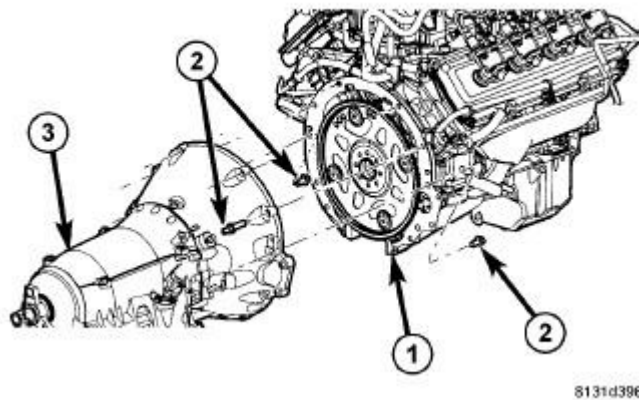


Fig. 36: Remove/Install Transmission To Engine Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Install the remaining transmission bell housing to engine block mounting bolts (2) and tighten to 68 N.m (50 ft. lbs.).

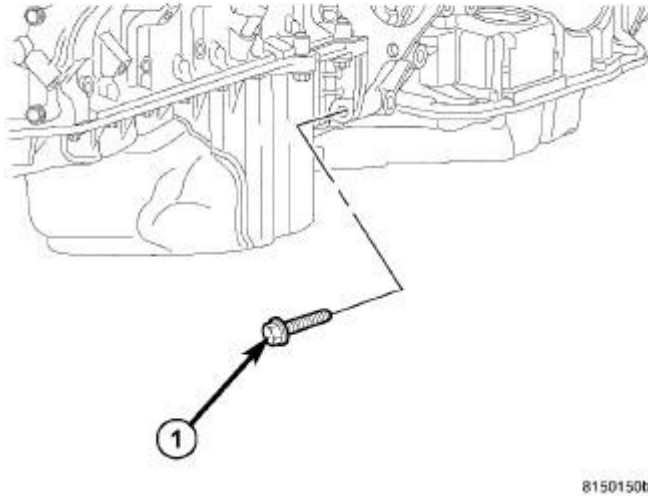


Fig. 37: Oil Pan To Transmission Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install both the left and right side oil pan to transmission bolts (1) and tighten bolts to 54 N.m (40 ft. lbs.).
10. Connect the transmission oil cooler lines at the oil pan and tighten bolts to 12 N.m (9 ft. lbs.).

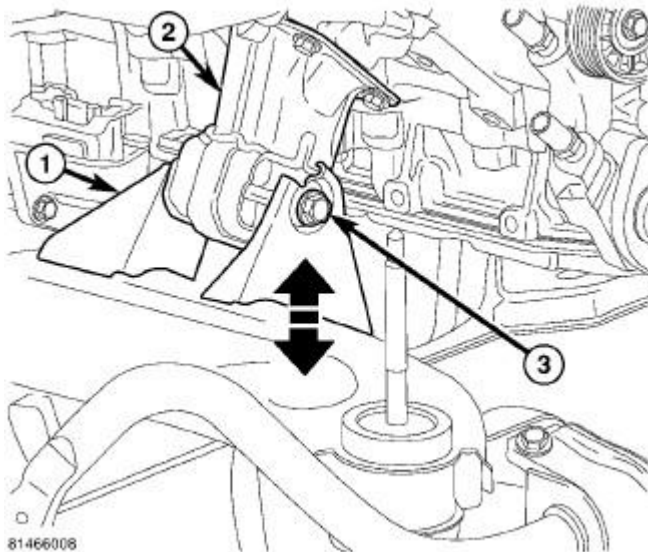
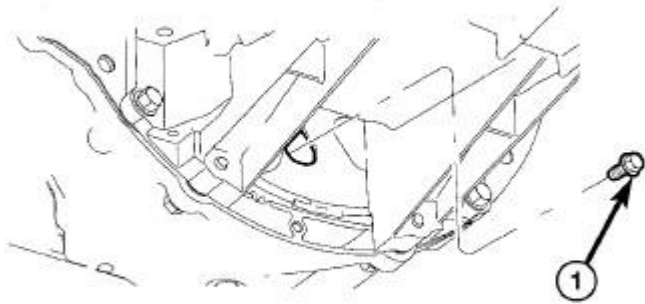


Fig. 38: Engine Mount & Bolt
Courtesy of CHRYSLER GROUP, LLC

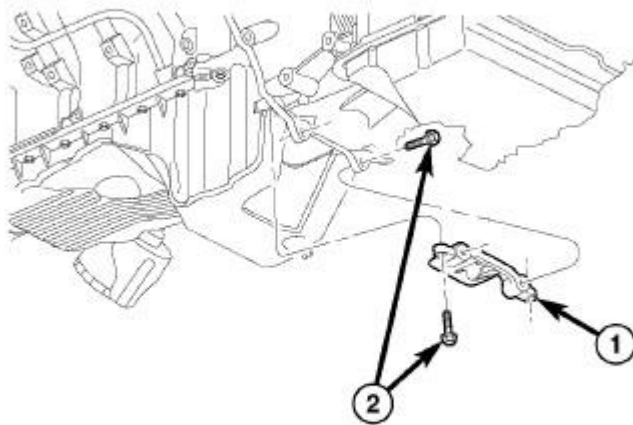
11. Install the engine mount through bolts (3) and nuts and tighten to 95 N.m (70 ft. lbs.).



813878a5

Fig. 39: Drive Plate Torque Converter Bolts
Courtesy of CHRYSLER GROUP, LLC

12. Install all torque converter-to-driveplate bolts (1) by hand, verify the torque converter is pulled flush to the driveplate and tighten bolts to 31 N.m (23 ft. lbs.).



815006aa

Fig. 40: Structural Dust Cover
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The structural dust cover must be installed as described in the **Structural Dust Cover** installation procedure. Failure to do so will cause severe damage to the cover.

13. Install the structural dust cover (1). Refer to **COVER, STRUCTURAL DUST, INSTALLATION**.

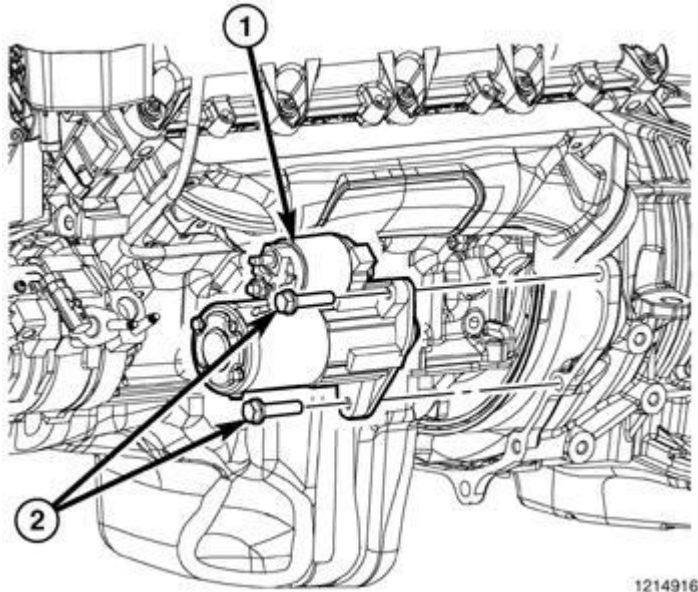


Fig. 41: Starter Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Install the starter (1) and connect the starter wires. Refer to **STARTER, INSTALLATION**.

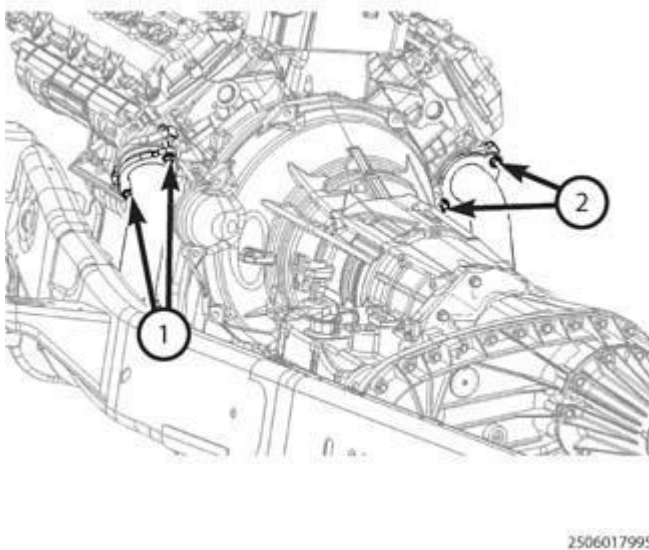
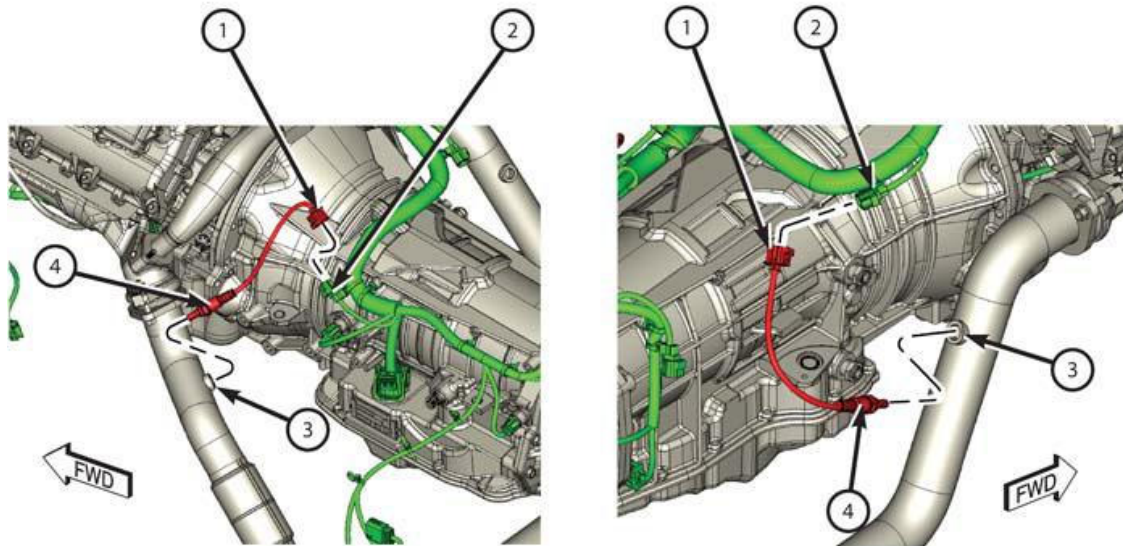


Fig. 42: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

15. Install the front exhaust pipe/catalytic converter assembly to the exhaust manifold flange and tighten the

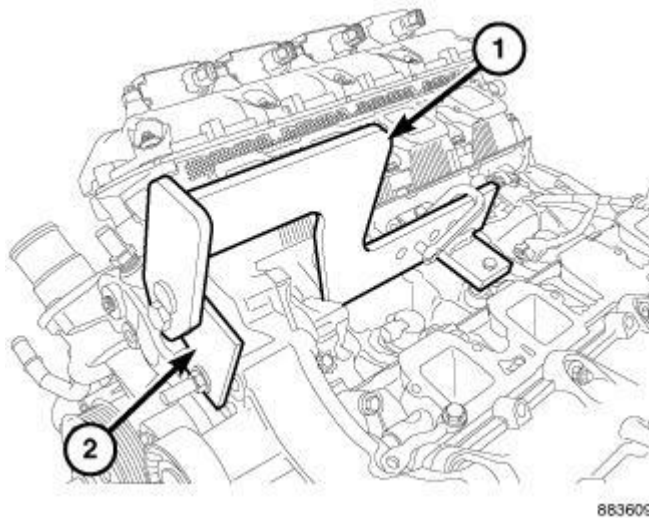
bolts and nuts (1, 2) to 26 N.m (19 ft. lbs.).



2506017977

Fig. 43: Oxygen Sensors & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

16. Connect the O2 sensors electrical connectors (1, 2).
17. Lower the vehicle.



883609

Fig. 44: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

18. Remove the engine lift fixture (1) (special tool #8984B, Fixture, Engine Lifting) and adapter (2) (special

tool #2013800090, Adapter, Engine Lifting Bracket) Eagle (1, 2).

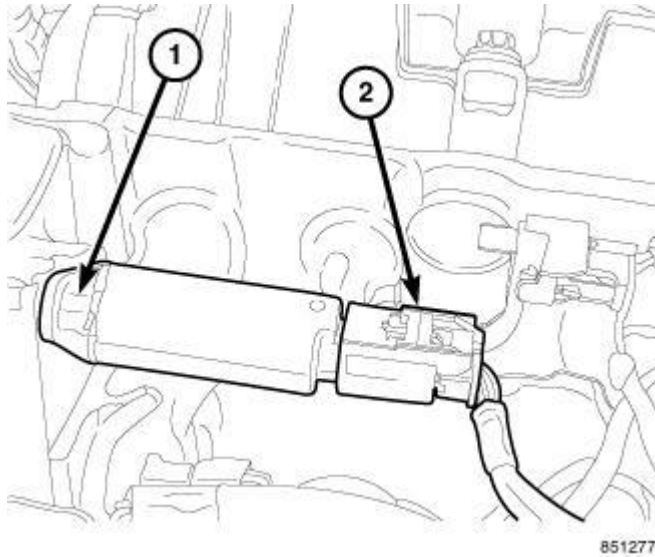


Fig. 45: Oil Control Valve

Courtesy of CHRYSLER GROUP, LLC

19. Install the VVTS (1) and securely tighten fastener.
20. Connect the VVTS electrical connector (2).

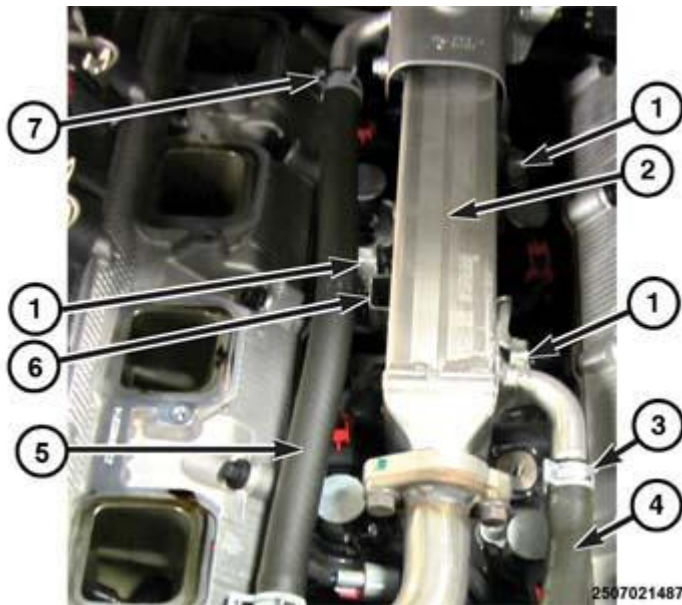


Fig. 46: Remove/Install EGR Cooler

Courtesy of CHRYSLER GROUP, LLC

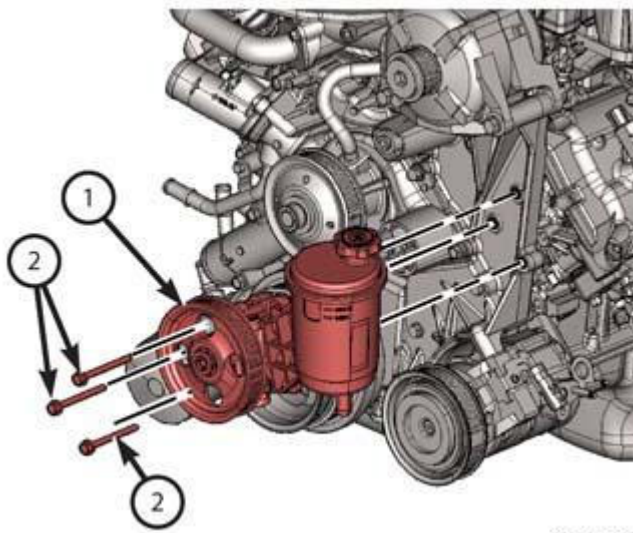
21. Install the EGR cooler (2). Refer to COOLER, EGR, INSTALLATION.



0909019774

Fig. 47: Intake Manifold Removal/Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

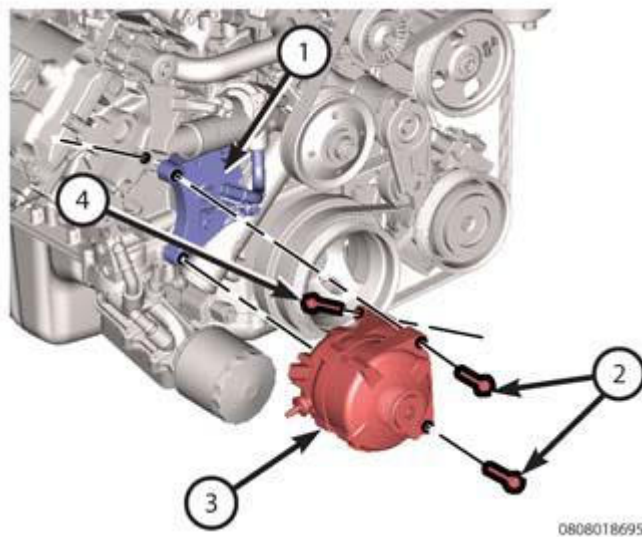
22. Install the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL** .
23. Connect the fuel supply line. Refer to **FITTING, QUICK CONNECT** .



0911018193

Fig. 48: Power Steering Pump Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

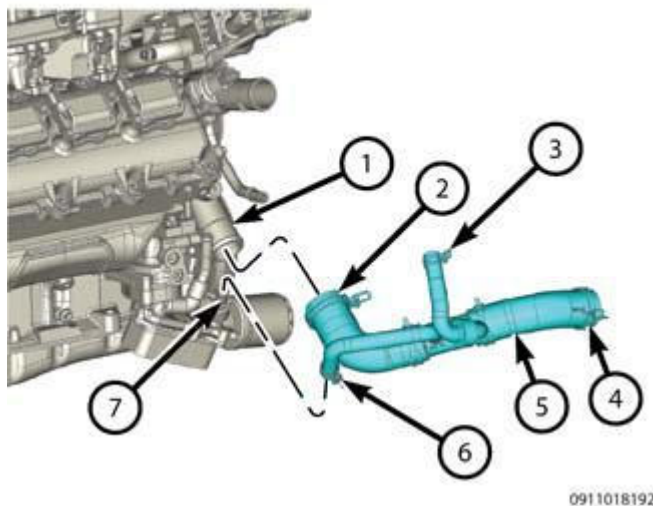
24. Install the three power steering pump mounting bolts (2) through the access holes in the pulley (1) and tighten bolts to 28 N•m (21 ft. lbs.).



0808018695

Fig. 49: Generator, Insulator Cap, B+ Output Terminal & Connector
 Courtesy of CHRYSLER GROUP, LLC

25. If equipped, install the lower generator (3) and electrical connections. Refer to **GENERATOR, INSTALLATION** .



0911018192

Fig. 50: Lower Radiator Hose
 Courtesy of CHRYSLER GROUP, LLC

26. Connect the heater hoses (3) and the lower radiator hose (5).
 27. Install the oil cooler (7) return hose (6).

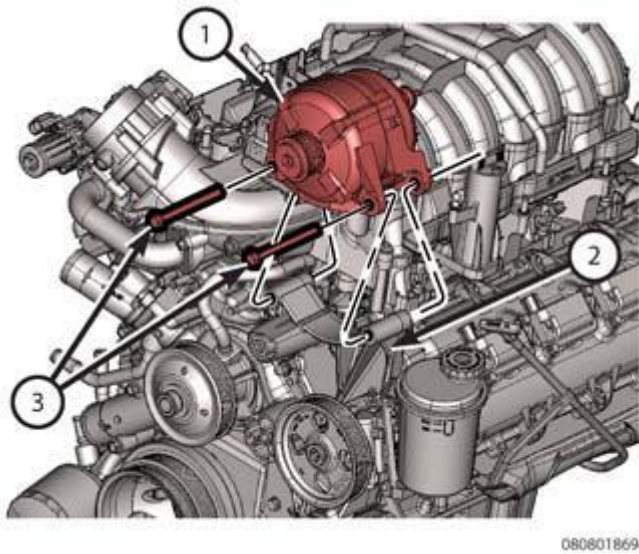


Fig. 51: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

28. Install the generator (1) and electrical connections. Refer to **GENERATOR, INSTALLATION** .

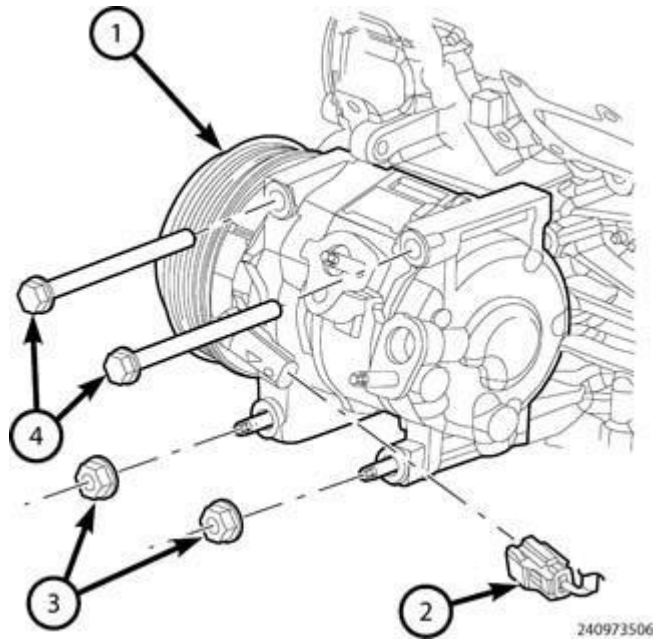


Fig. 52: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

29. Install the A/C compressor (1). Refer to **COMPRESSOR, A/C, INSTALLATION** .

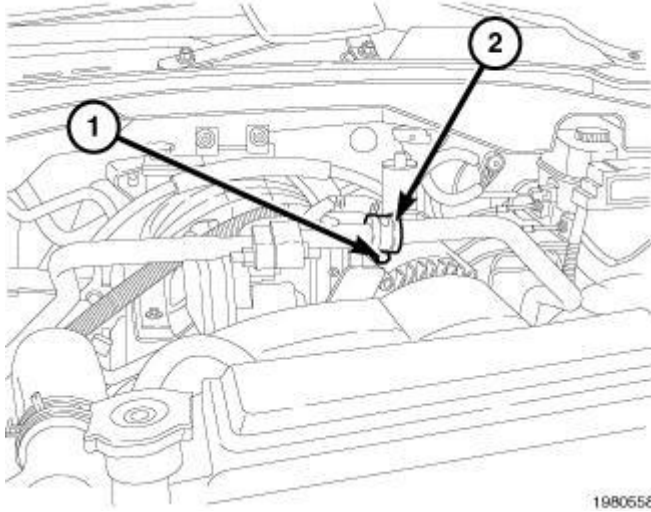


Fig. 53: A/C Line P-Clip & Retaining Bolt
 Courtesy of CHRYSLER GROUP, LLC

30. Install the refrigerant lines to the upper bracket. Tighten the bolt (1) to 12 N.m (9 ft. lbs.).

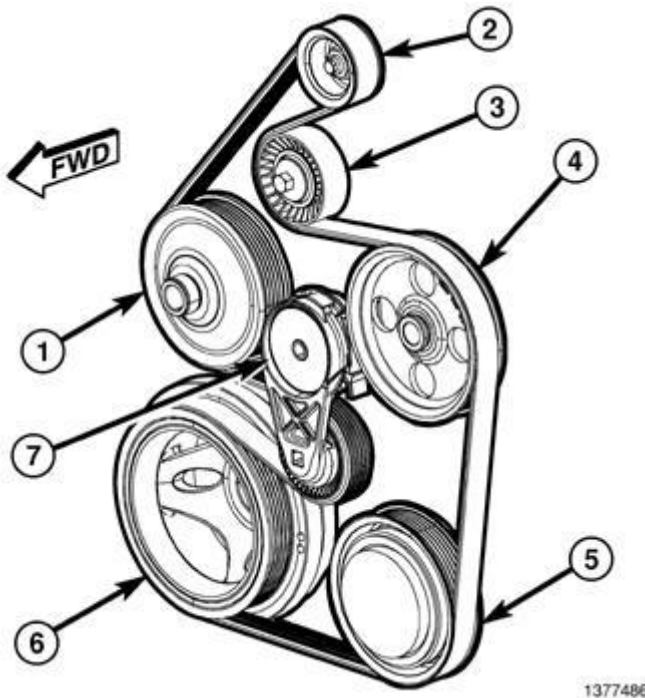


Fig. 54: Accessory Drive Belt Routing, Tensioner & Pulleys
 Courtesy of CHRYSLER GROUP, LLC

31. Insert a suitable square drive ratchet into the square hole on the belt tensioner arm (7).

CAUTION: Do not let the tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

32. Rotate the tensioner (7) counter-clockwise and install the accessory drive belt (4).

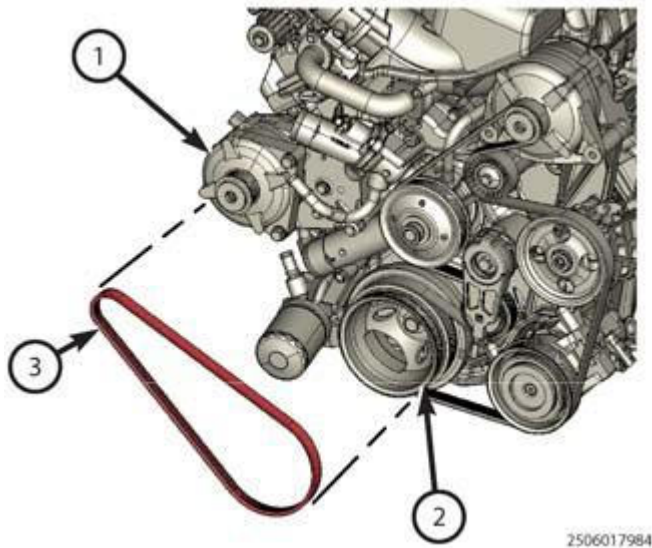


Fig. 55: Removing/Installing Belt
Courtesy of CHRYSLER GROUP, LLC

33. If equipped, install the secondary generator drive belt (3). Refer to **BELT, SERPENTINE, INSTALLATION** .
34. Install the radiator and A/C condenser as an assembly. Refer to **RADIATOR, ENGINE COOLING, INSTALLATION** and **CONDENSER, A/C, INSTALLATION** .

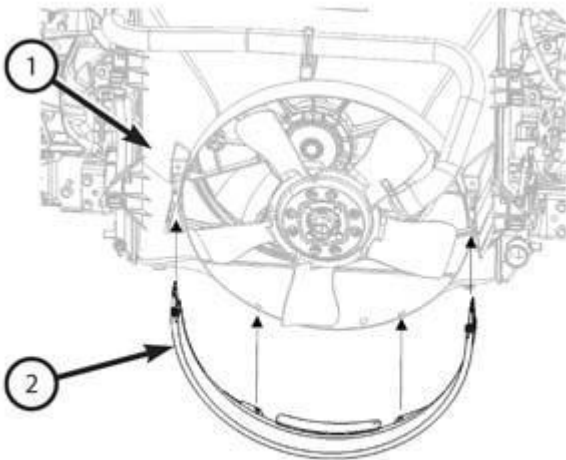


Fig. 56: Upper & Lower Shrouds
Courtesy of CHRYSLER GROUP, LLC

35. Install the viscous fan drive assembly. Refer to **FAN, COOLING, VISCOUS, REMOVAL** .
36. Position the shroud (1) on the radiator tank clips and install the fan shroud.

37. Install the lower fan shroud (2).

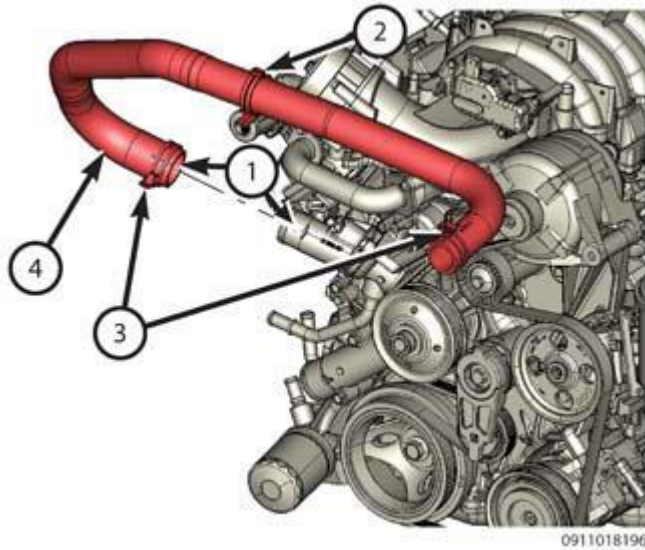


Fig. 57: Upper Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

38. Install the upper radiator hose (4).

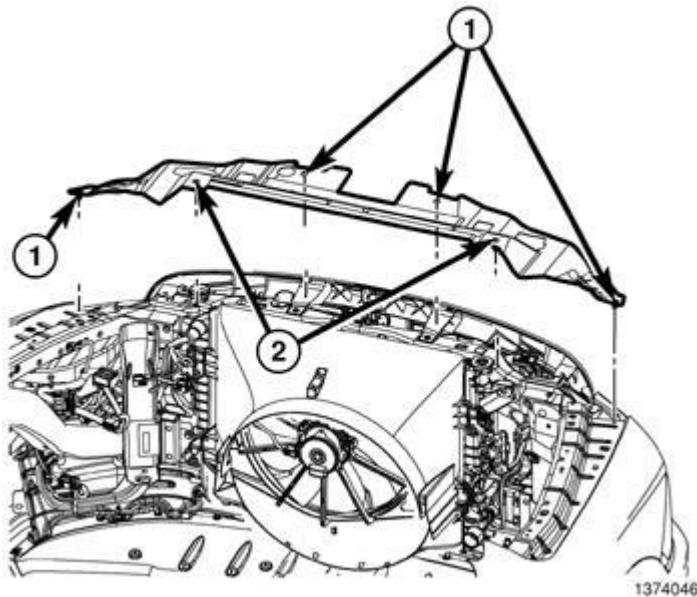


Fig. 58: Upper Radiator Seal & Plastic Rivets
Courtesy of CHRYSLER GROUP, LLC

39. Install the washer bottle.
40. Position the upper radiator seal and install the two plastic rivets (2).
41. Install the four push pins (1).
42. Install the engine cover (1).

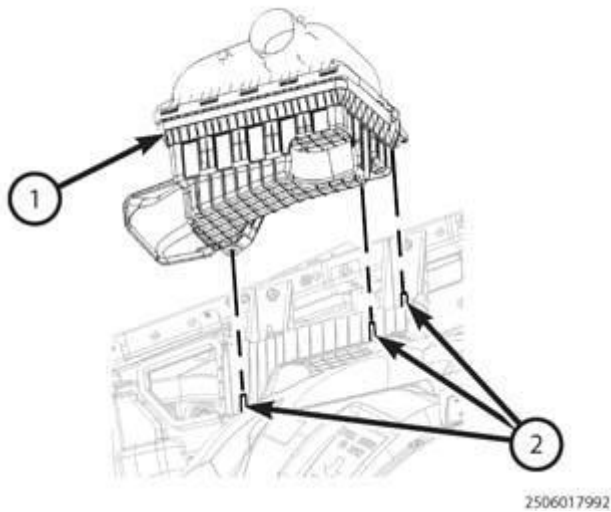


Fig. 59: Air Cleaner Housing & Tabs
 Courtesy of CHRYSLER GROUP, LLC

43. Install the air cleaner housing (1).

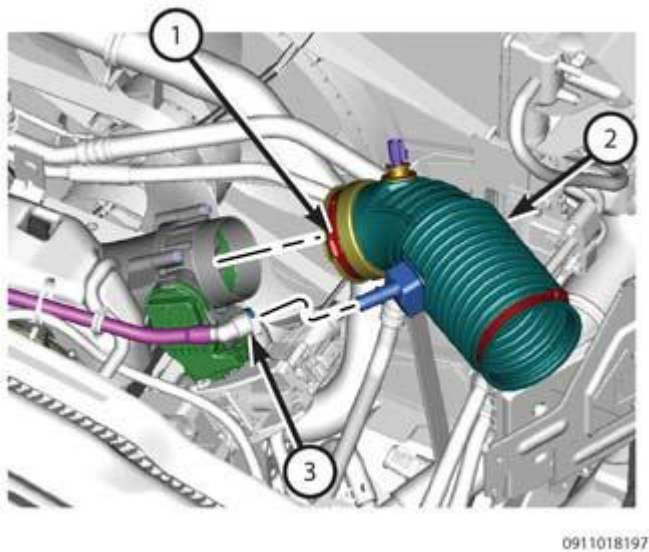


Fig. 60: Clamp, Air Intake Tube & Breather Hose
 Courtesy of CHRYSLER GROUP, LLC

44. Install the intake hose (2). Hand tighten clamp.
45. Install the breather hose (3).

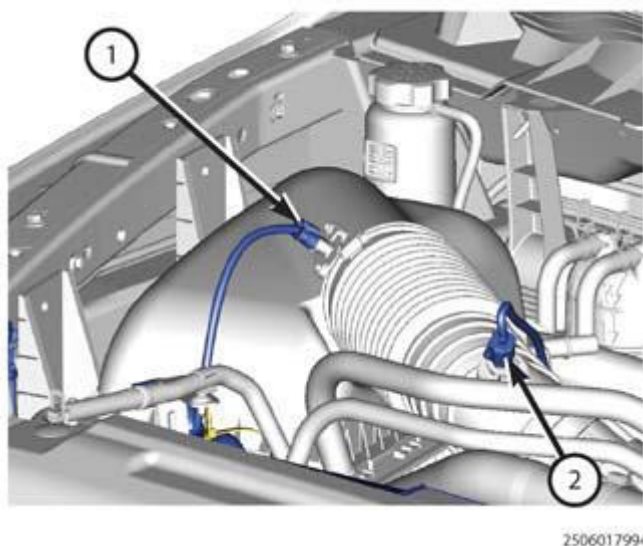


Fig. 61: Temperature Sensor

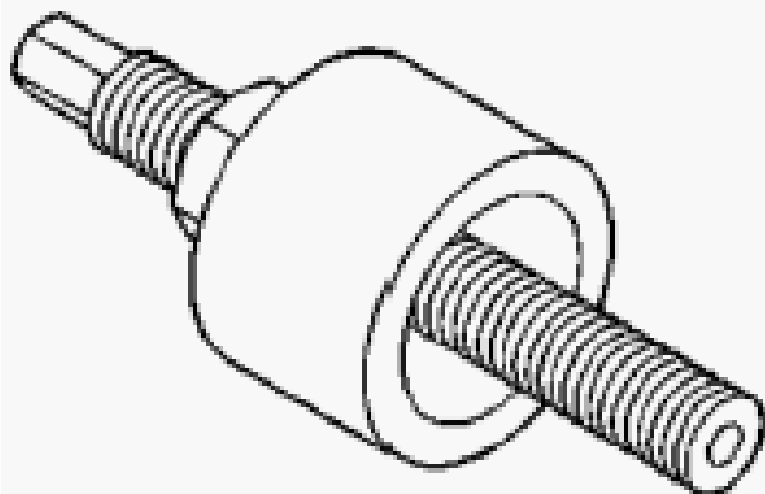
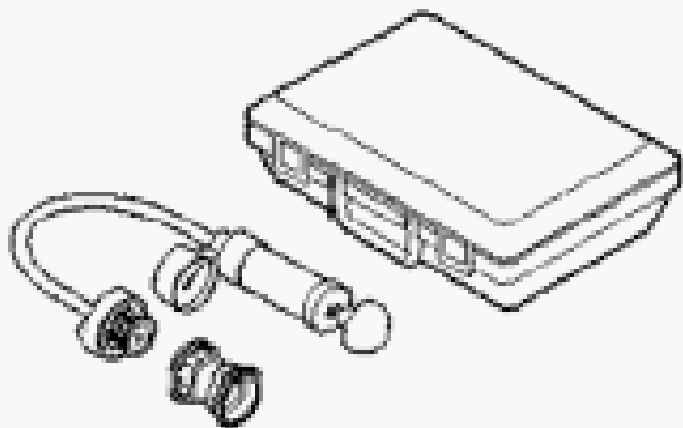
Courtesy of CHRYSLER GROUP, LLC

46. Connect the Intake Air Temperature (IAT) sensor electrical connector (2).
47. Connect the Mass Air Flow (MAF) sensor (1).
48. Fill the engine with oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS**.
49. Fill the cooling system. Refer to **STANDARD PROCEDURE**.
50. Connect the negative battery cable.
51. Start the engine and check for leaks.
52. If required, evacuate and charge the A/C system. Refer to **PLUMBING, STANDARD PROCEDURE**.
53. Install the Hood (Refer to **HOOD, INSTALLATION**).

SPECIAL TOOLS

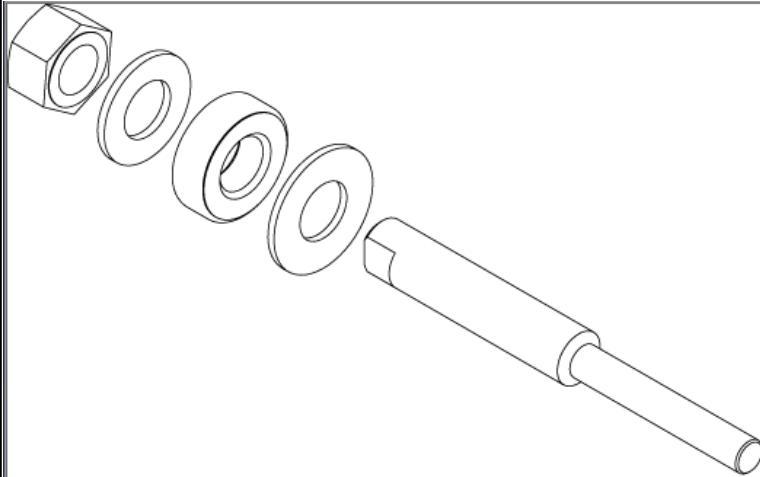
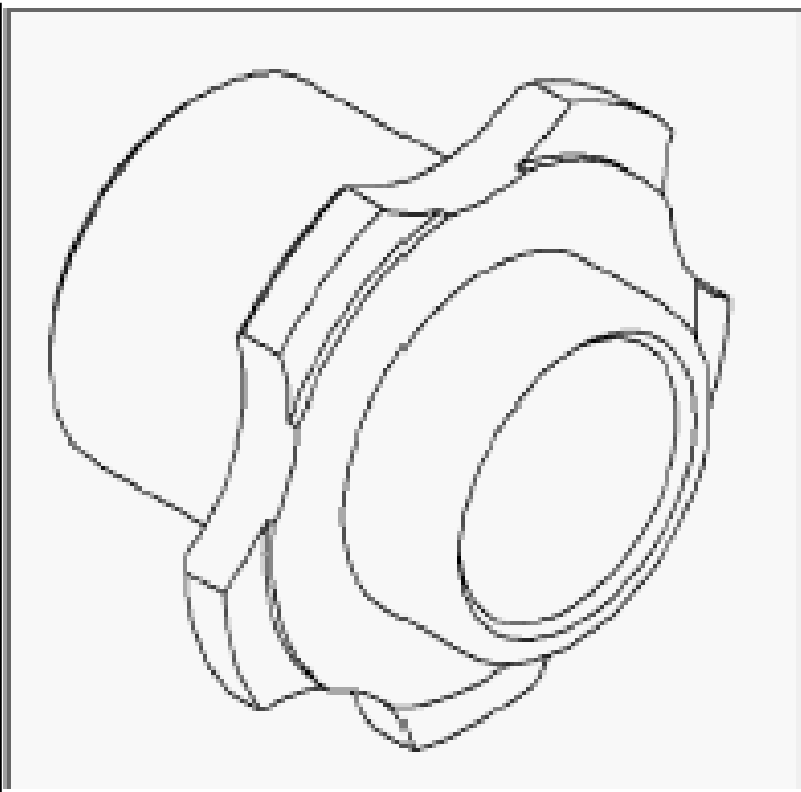
SPECIAL TOOLS

1023 - Puller
(Originally Shipped In Kit Number(s)
8678.)



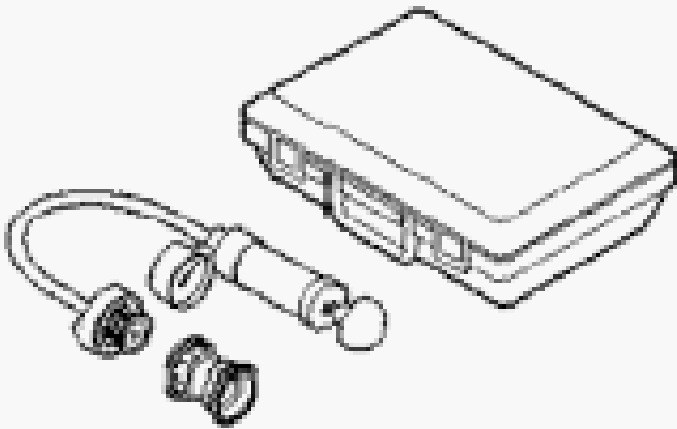
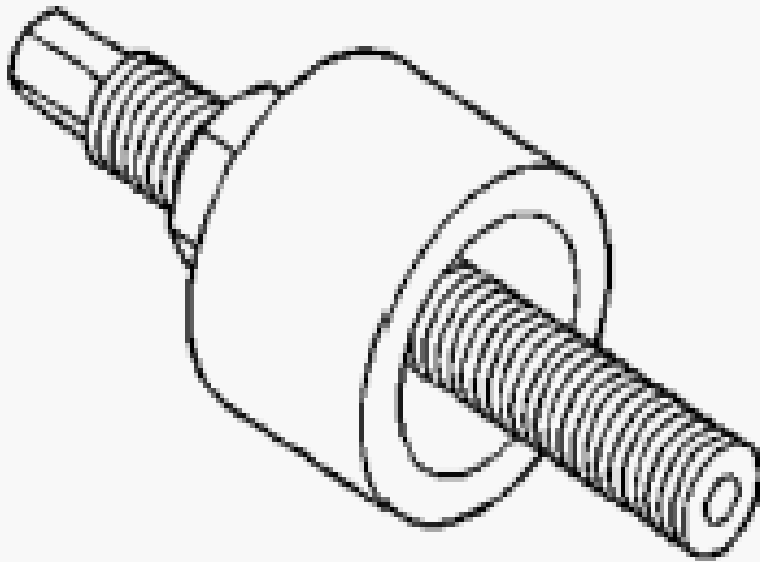
10368 - Set, Universal Protective Cap

10386 - Holder, Vibration Damper



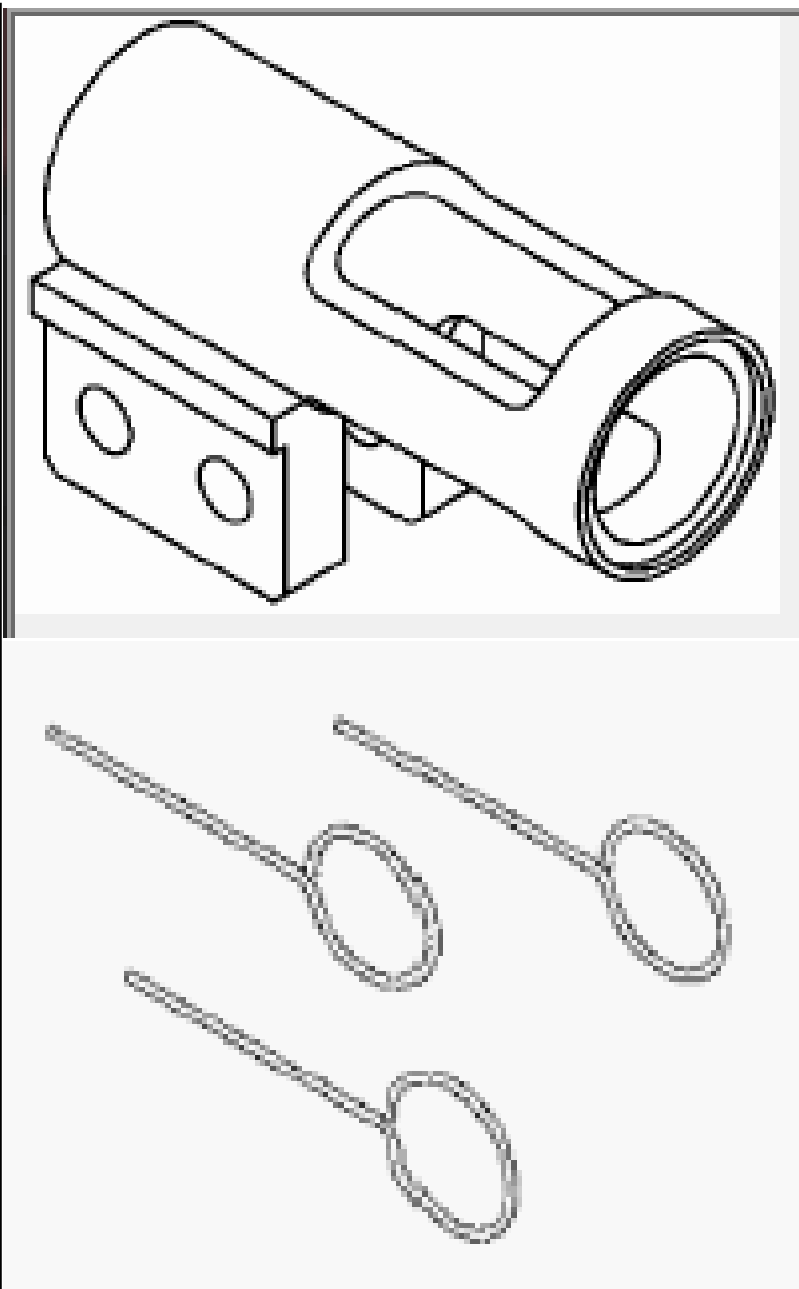
10387 - Installer, Vibration Damper

6871 - Installer, A/C Hub
(Originally Shipped In Kit Number(s)
6896.)



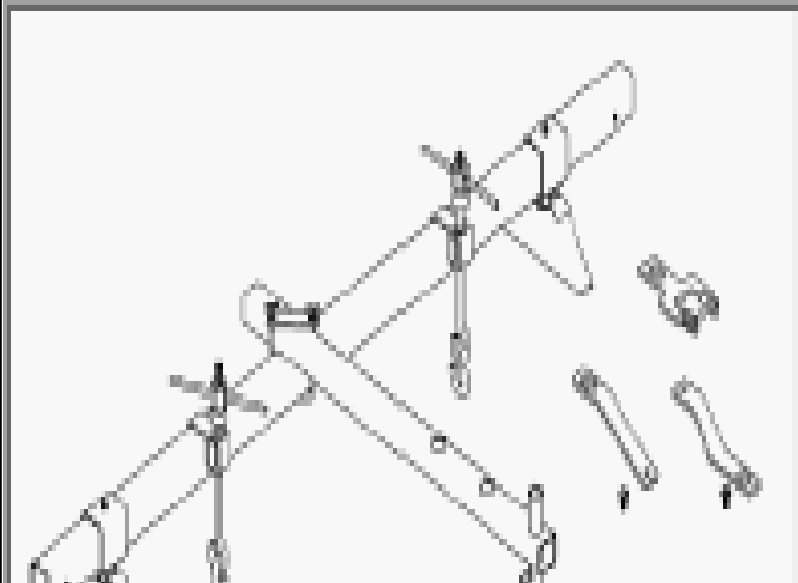
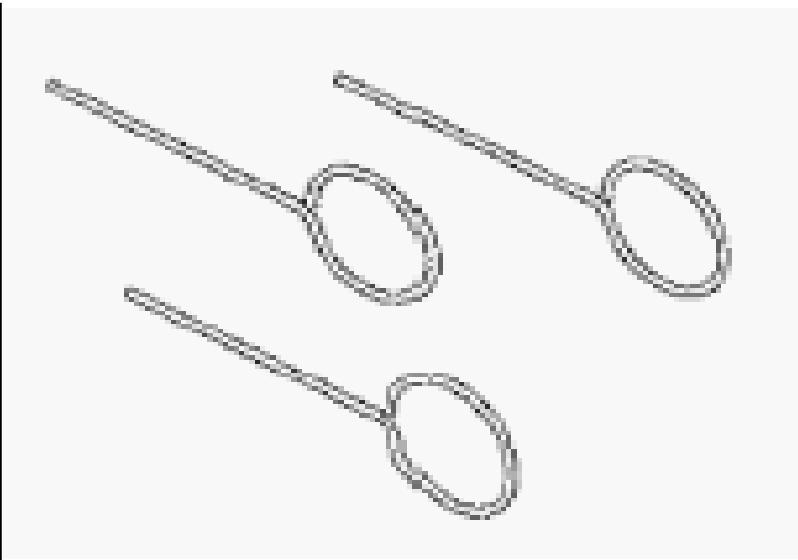
7700 - Tester, Cooling System
(Originally Shipped In Kit Number(s)
7700-A.)

8464 - Adapter, Valve Spring
(Originally Shipped In Kit Number(s)
8664, 8665, 8665CC, 8702, 9577.)



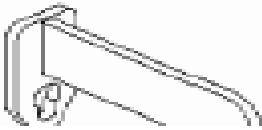
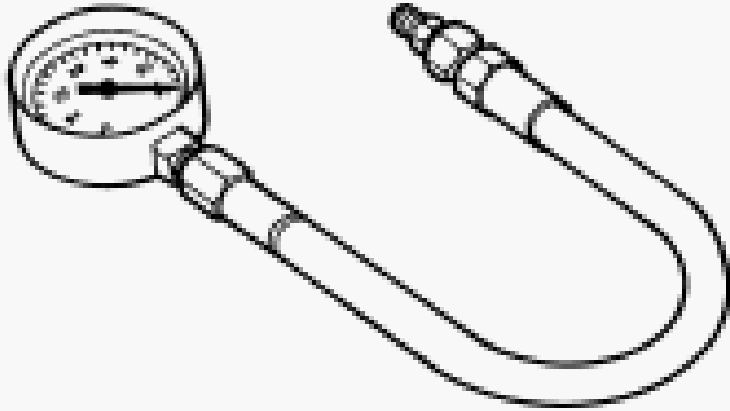
10387 - Installer, Damper
(Originally Shipped In Kit Number(s)
8283, 8527, 8575, 8575CC, 8660, 8661.)

8514 - Pins, Tensioner
(Originally Shipped In Kit Number(s)
8283, 8283CC, 8527, 8527CC, 8575,
8575CC, 9975.)



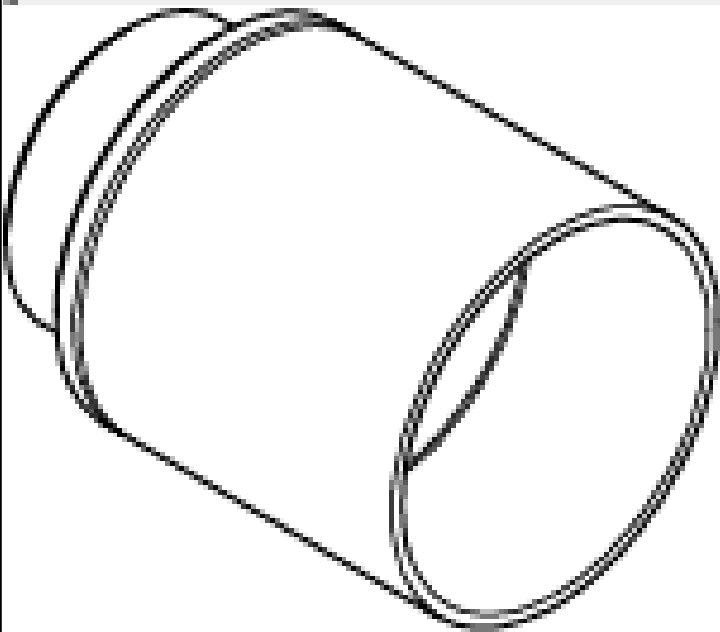
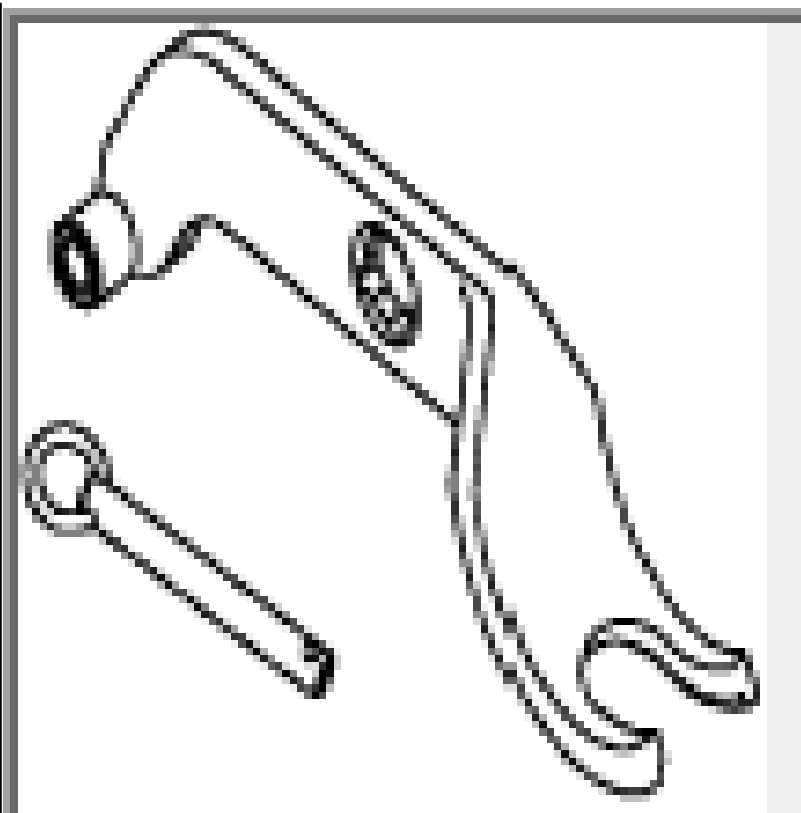
8534B - Fixture, Driveline Support
(Originally Shipped In Kit Number(s)
8534, 8534B, 8849, 9565.)

8984-UPD - Adapter, Engine Lift
(Originally Shipped In Kit Number(s)
9516, 9516-CAN, 9517, 9517-CAN, 9518,
9519.)

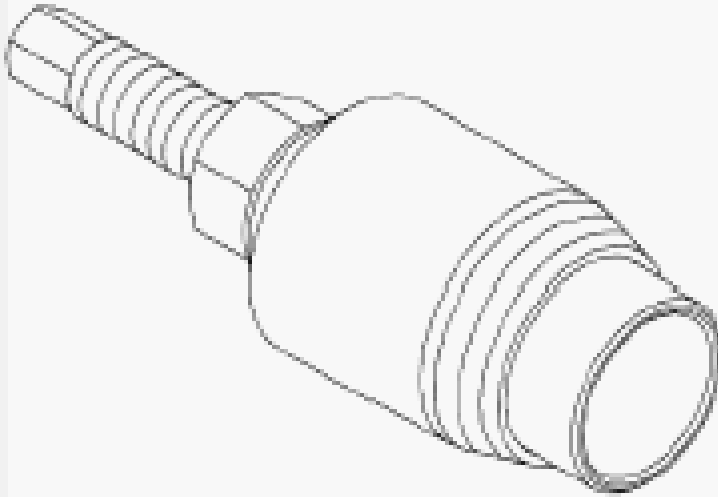


8984B - Fixture, Engine Lifting
(Originally Shipped In Kit Number(s)
8849CC, 9329, 9515, 9516, 9518, 9519,
9540, 9541, 9577.)

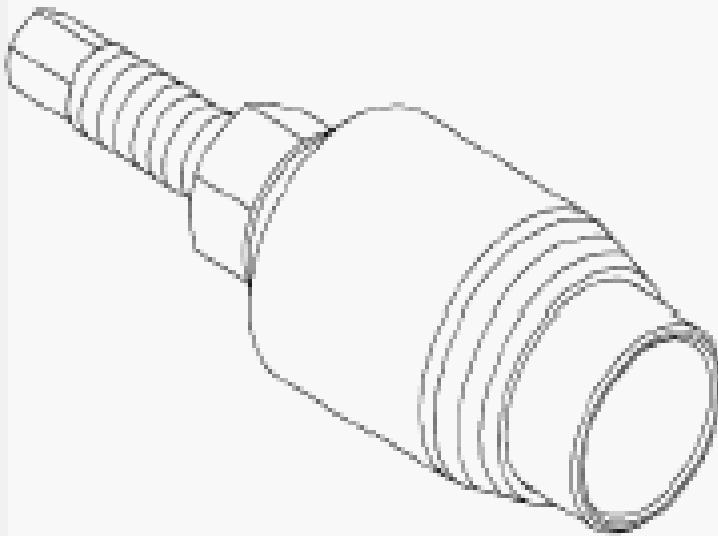
9065-3 - Adapter, Valve Spring
Compressor
(Originally Shipped In Kit Number(s)
9516-CAN, 9517-CAN.)



9065C - Compressor, Valve Spring
(Originally Shipped In Kit Number(s).)

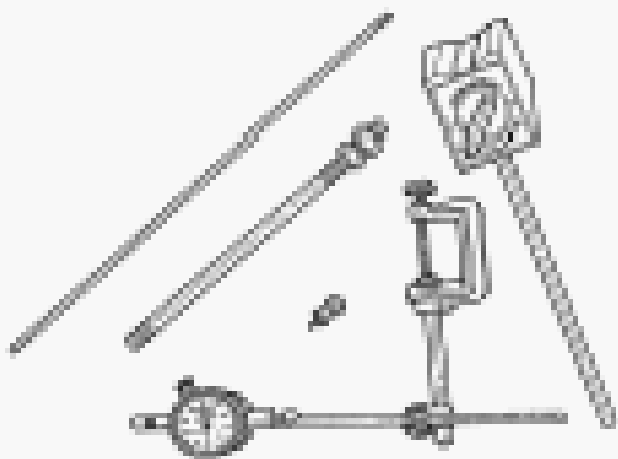
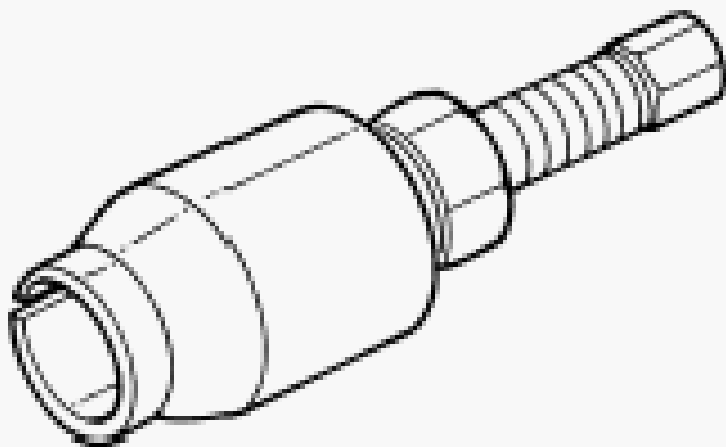


9070 - Retainer, Push Rod
(Originally Shipped In Kit Number(s)
8999, 8999CC, 9329, 9515, 9540, 9541,
9577.)



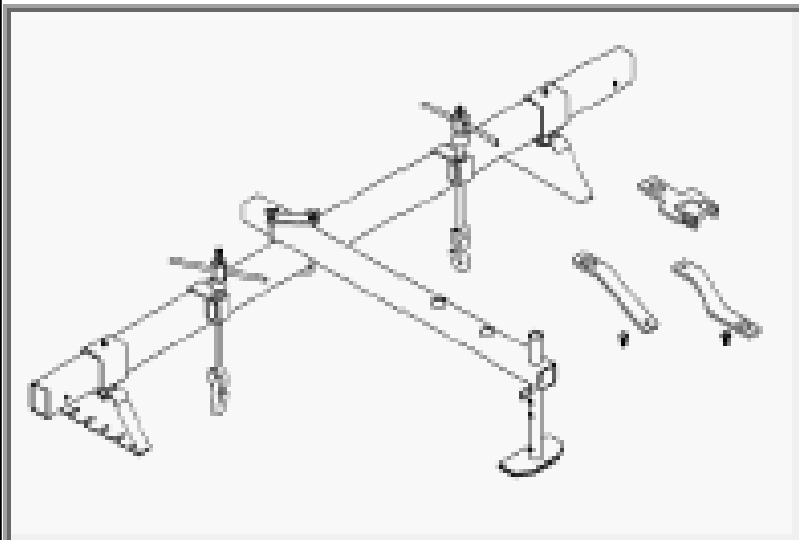
9071 - Remover, Seal
(Originally Shipped In Kit Number(s)
8999, 8999CC, 9329, 9515, 9540, 9541,
9577.)

9072 - Installer, Seal
(Originally Shipped In Kit Number(s)
8999, 8999CC, 9329, 9515, 9540, 9541,
9577, 9975, 9976.)

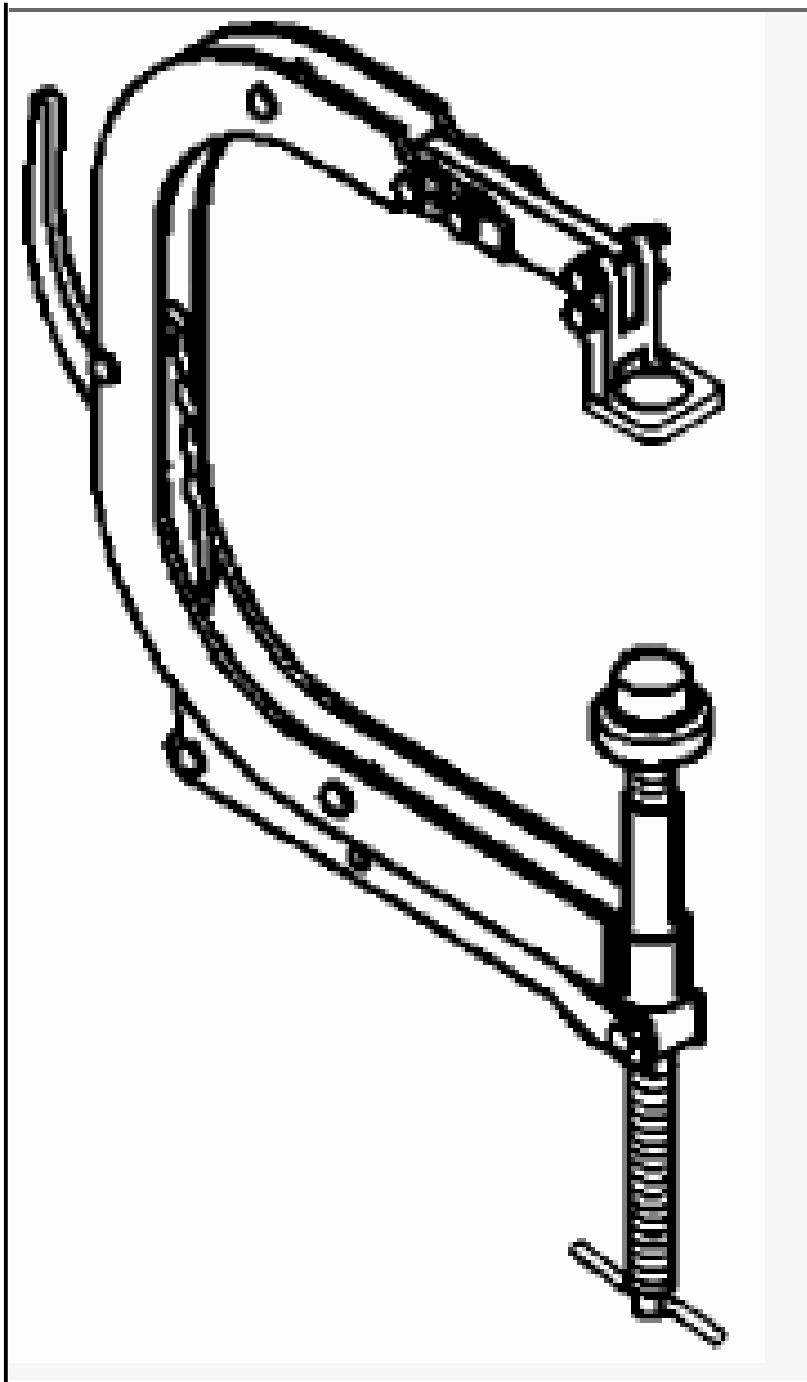


C-119 - Cylinder Indicator

C-3292A - Gauge, Pressure



C-3422-D - Compressor, Valve Spring



C-3685-A - Bloc-Chek Kit

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

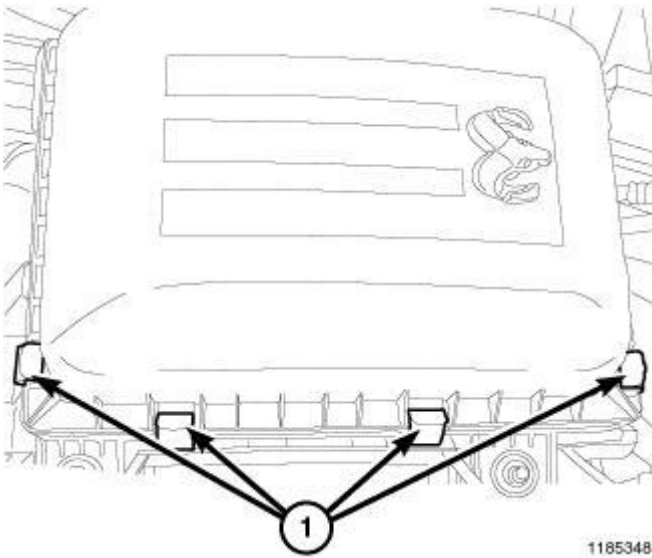


Fig. 62: Air Cleaner Body Cover Retaining Clamps
 Courtesy of CHRYSLER GROUP, LLC

1. Disengage the retaining clamps (1) that secure the air cleaner body cover to air cleaner body.
2. Lift and push the air cleaner body cover toward the engine to disengage the cover locating tabs from the air cleaner body and position the cover out of the way.

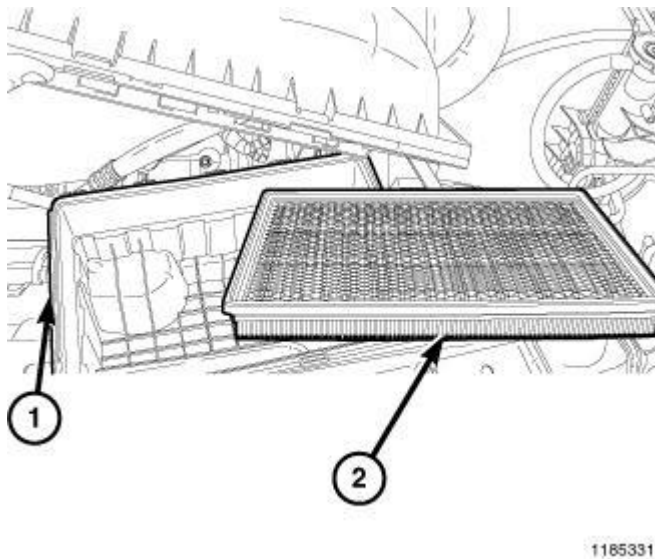
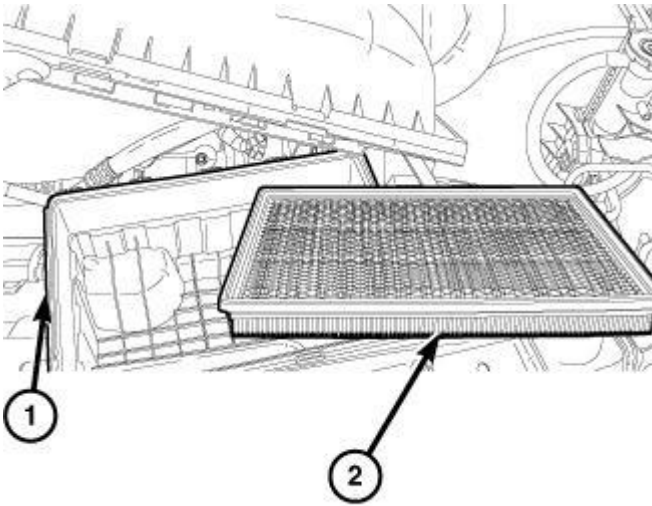


Fig. 63: Air Cleaner Body & Air Filter Element
 Courtesy of CHRYSLER GROUP, LLC

3. Remove the air cleaner element (2) from the inside of the air cleaner body (1).
4. Clean out the inside of the air cleaner body (1).

INSTALLATION

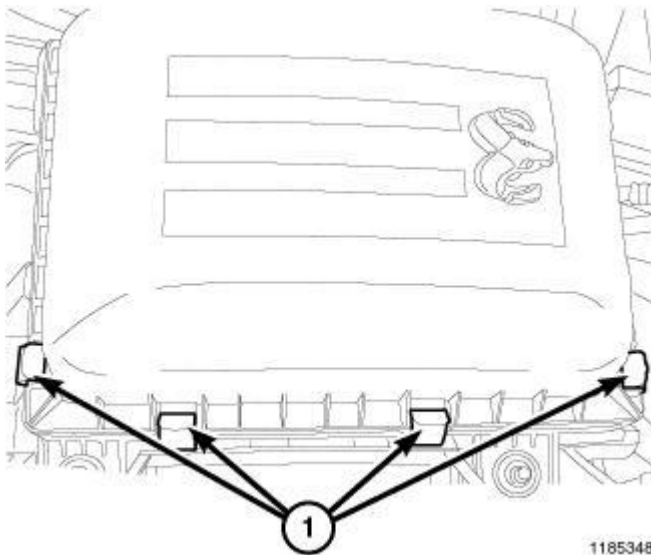
INSTALLATION



1185331

Fig. 64: Air Cleaner Body & Air Filter Element
Courtesy of CHRYSLER GROUP, LLC

1. Clean any dirt or foreign matter from the inside of the air cleaner housing (1).
2. Install the air filter element (2) into air cleaner housing. Make sure the element is properly seated in the housing.



1185348

Fig. 65: Air Cleaner Body Cover Retaining Clamps
Courtesy of CHRYSLER GROUP, LLC

3. Position the air cleaner housing cover to the air cleaner housing and engage the cover locating tabs.
4. Fully install the air cleaner housing cover to the air cleaner housing and engage the four retaining clamps (1).

BODY, AIR CLEANER

REMOVAL

REMOVAL

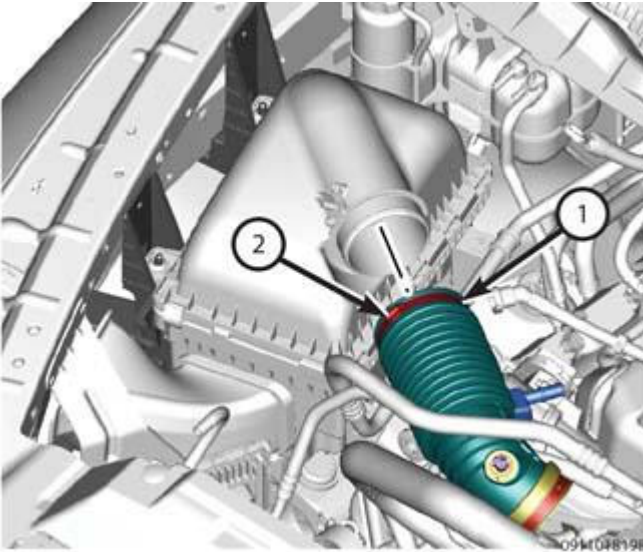


Fig. 66: Installing Air Intake Hose To Throttle Body & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

1. Separate the intake tube (1) from air cleaner body.

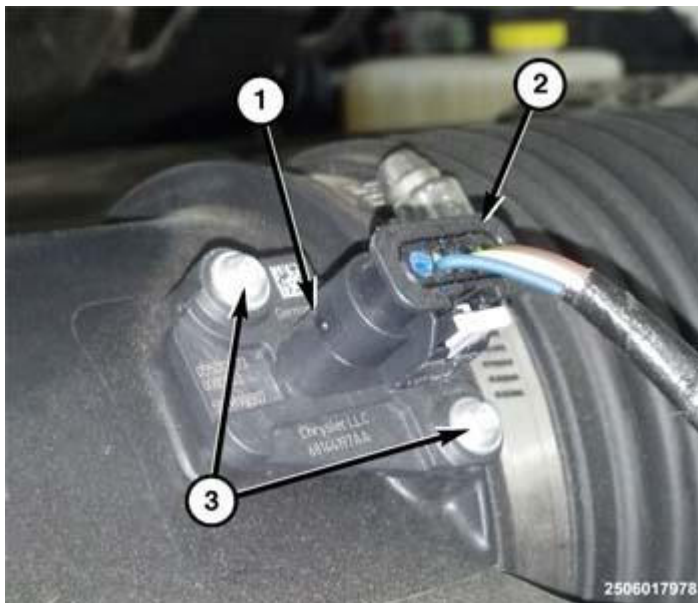


Fig. 67: Mass Air Flow Sensor & Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the Mass Air Flow sensor (MAF) (1) electrical connector (2).

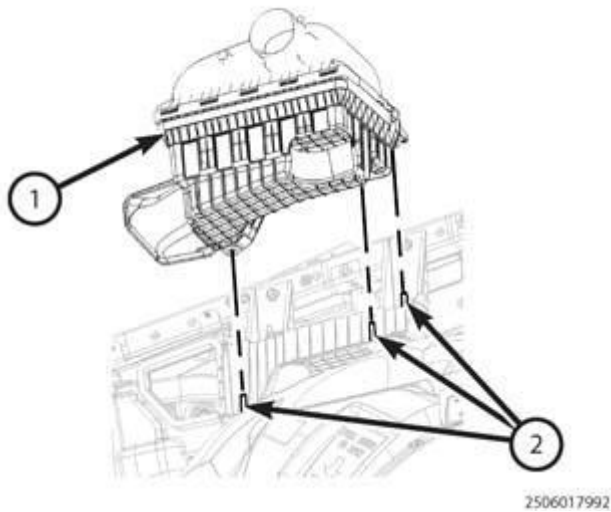


Fig. 68: Air Cleaner Housing & Tabs
Courtesy of CHRYSLER GROUP, LLC

3. Pull the air cleaner body (1) straight upward to disengage it from the grommets (2).

INSTALLATION

INSTALLATION

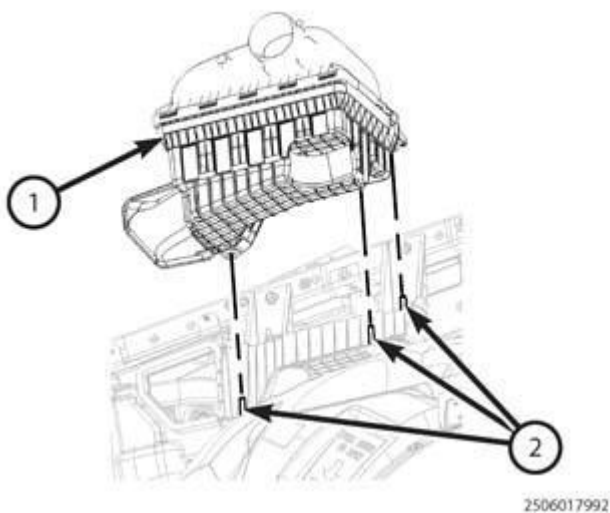


Fig. 69: Air Cleaner Housing & Tabs
Courtesy of CHRYSLER GROUP, LLC

1. Position the air cleaner body (1) onto the grommets (2) and push downward.

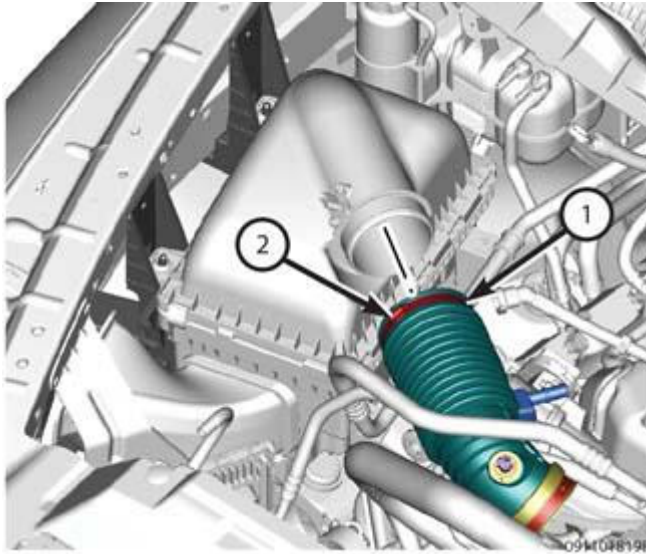


Fig. 70: Installing Air Intake Hose To Throttle Body & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

2. Connect the intake hose (1) to the air cleaner body. Tighten the band clamp (2) to 4 N.m (35 in. lbs.).

CYLINDER HEAD

OPERATION

OPERATION

The cylinder head closes the combustion chamber allowing the pistons to compress the air fuel mixture to the correct ratio for ignition. The valves located in the cylinder head open and close to either allow clean air into the combustion chamber or to allow the exhaust gases out, depending on the stroke of the engine.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- Possible indications of the cylinder head gasket leaking between adjacent cylinders are:
 -
 - Loss of engine power
 - Engine misfiring
 - Poor fuel economy
- Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:
 -

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in **CYLINDER COMPRESSION TEST**. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50-70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: Use extreme caution when the engine is operating with coolant pressure cap removed. Failure to follow this warning may result in serious or fatal injury.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

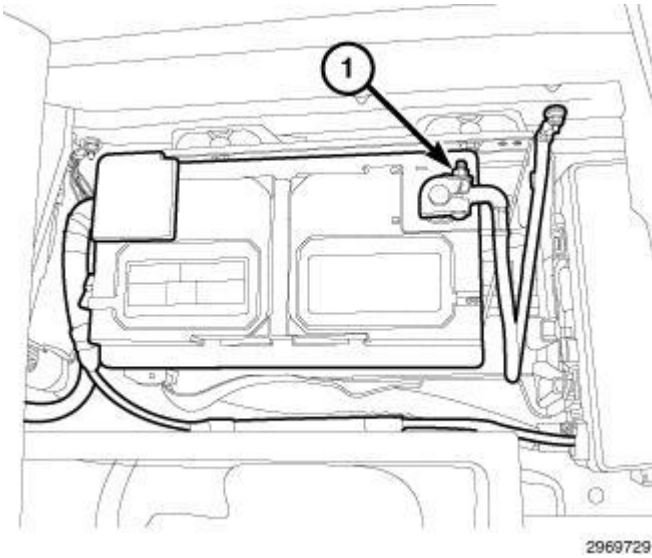
WARNING: With cooling system tester in place, pressure will build up fast. Excessive pressure built up, by continuous engine operation, must be released to a safe pressure level. Never permit pressure to exceed 138 kPa (20 psi). Failure to follow this warning may result in serious or fatal injury.

Install Cooling System Tester (special tool #7700, Tester, Cooling System) or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit (special tool #C-3685-A, Bloc-Chek Kit) or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL**REMOVAL**



2969729

Fig. 71: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .
2. Disconnect the negative battery cable (1).



0909019774

Fig. 72: Intake Manifold Removal/Installation Sequence

Courtesy of CHRYSLER GROUP, LLC

3. Remove the engine cover.
4. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL** .
5. Drain the cooling system. Refer to **STANDARD PROCEDURE** .

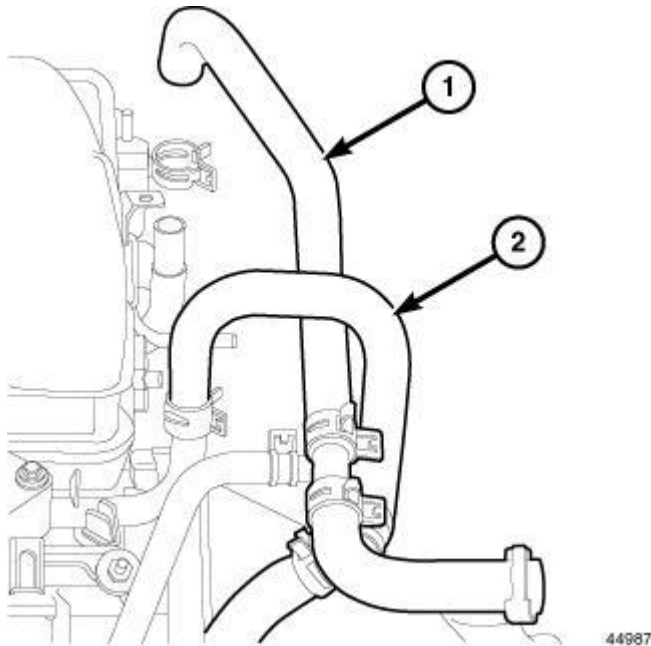


Fig. 73: Heater Hose Supply
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the heater hoses (1, 2).
7. Raise the vehicle.

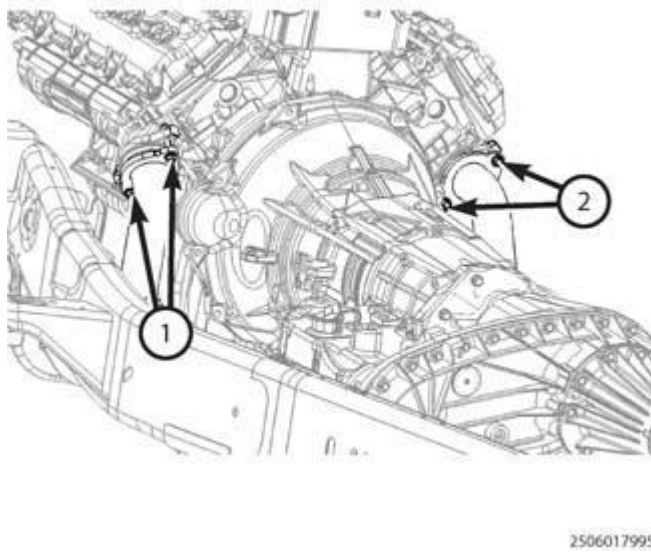


Fig. 74: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Separate the down pipes from the exhaust manifold.
9. Lower the vehicle.

CAUTION: Do not let the tensioner arm snap back to the freearm position, sever

damage may occur to the tensioner.

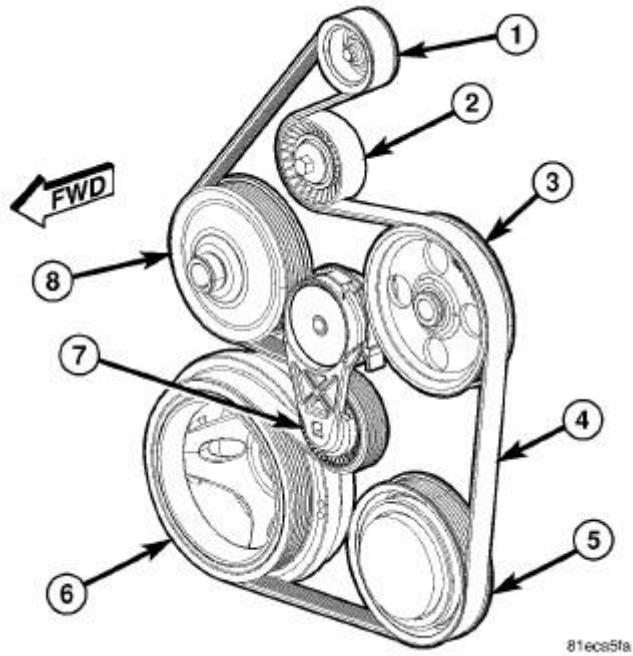


Fig. 75: Belt Routing (5.7L Engine)

Courtesy of CHRYSLER GROUP, LLC

10. Rotate the accessory drive belt tensioner (8) clockwise until it contacts its stop. Remove the accessory drive belt (4), then slowly rotate the tensioner (7) into the frearm position. Refer to **BELT, SERPENTINE, REMOVAL**.

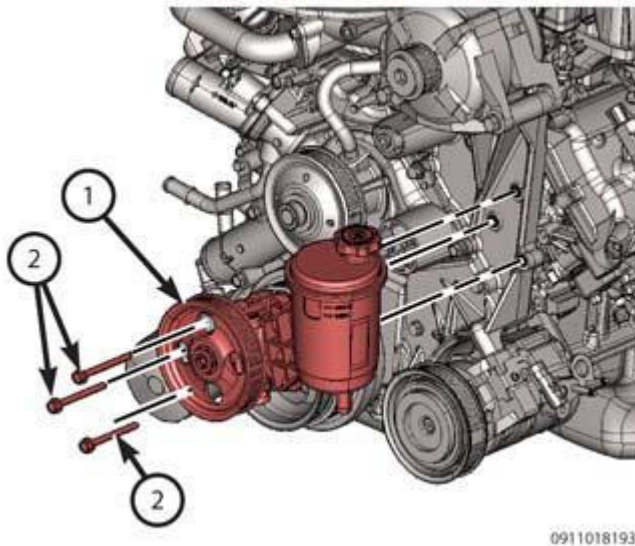


Fig. 76: Power Steering Pump Pulley & Bolts

Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to disconnect the power steering pump hoses from the pump, for power steering pump removal.

11. Remove the three power steering pump retaining bolts (2) through the access holes in the pulley (1).
12. Remove the power steering pump and secure out of the way.

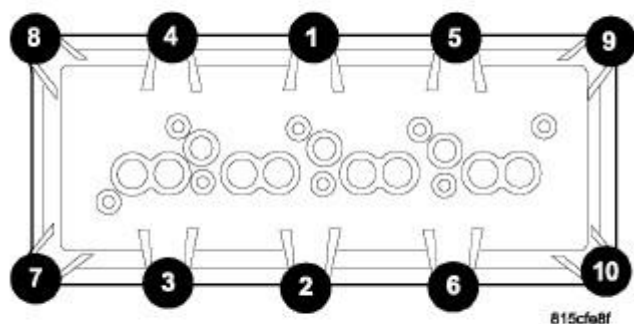
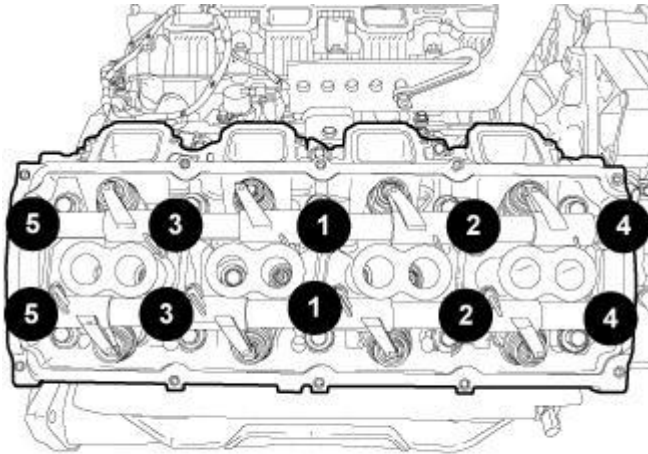


Fig. 77: Cylinder Head Cover Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

13. Using the sequence shown in illustration, remove the cylinder head cover retaining bolts and remove cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.
14. If removing the right cylinder head, remove the engine oil dip stick tube retaining nut at the exhaust manifold and remove the oil dip stick tube.



921225

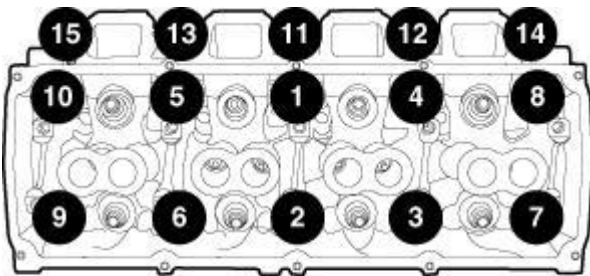
Fig. 78: Rocker Shafts Retaining Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Pushrods and rocker arm assemblies must be installed in their original locations or engine damage could result.

NOTE: Make sure to identify the original location of the rocker arms and push rods for correct assembly.

15. Remove the rocker arms and pushrods. Refer to L **ROCKER ARM, VALVE, REMOVAL** .



88745

Fig. 79: Cylinder Head Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar.

NOTE: It is not necessary to remove the exhaust manifolds to remove the cylinder heads.

16. Using the sequence shown in illustration, remove the cylinder head bolts and remove the cylinder head(s).

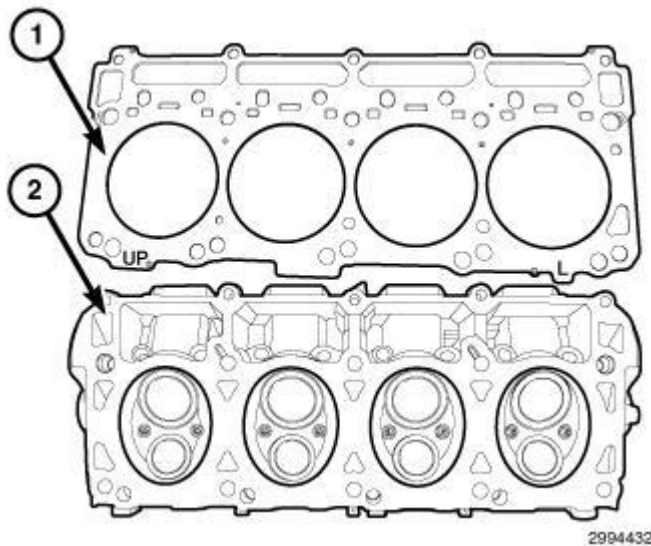
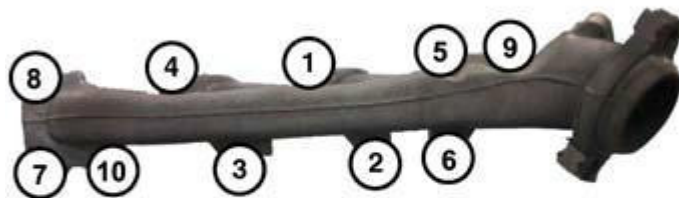


Fig. 80: Cylinder Head Gasket & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar.

17. Discard the cylinder head gasket (1).
18. Inspect and clean the cylinder head (2) mating surface.



0911023295

Fig. 81: Exhaust Manifold Stud Bolt & Washer Locations
Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar.

19. If necessary, using the sequence shown in illustration, remove the exhaust manifold bolts and remove the manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.

CLEANING

CLEANING

Clean all surfaces of the cylinder block and cylinder heads.

Clean the cylinder block front and rear gasket surfaces using a suitable solvent.

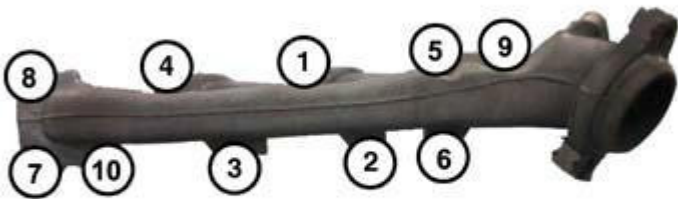
INSPECTION

INSPECTION

1. Inspect the cylinder head for flatness using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If any of these conditions exist, replace the cylinder head.
4. Inspect push rods. Replace worn or bent push rods.

INSTALLATION

INSTALLATION



0911023295

Fig. 82: Exhaust Manifold Stud Bolt & Washer Locations
Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar.

1. If removed, using a new exhaust manifold gasket, position the exhaust manifold and install the retaining bolts finger tight. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
2. Using the sequence shown in illustration, tighten the retaining bolts to 25 N.m (18 ft. lbs.).

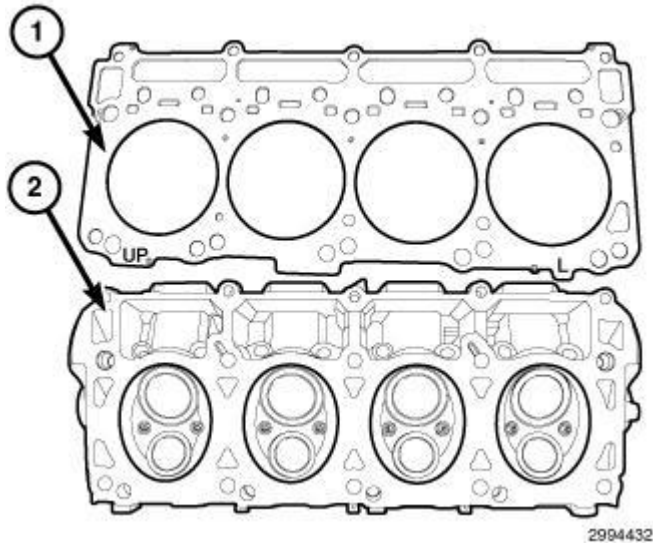


Fig. 83: Cylinder Head Gasket & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The cylinder head gaskets (1) are not interchangeable between left and right sides. They are marked "UP" to indicate direction to face up and "L" or "R" to indicate left side or right side of engine block.

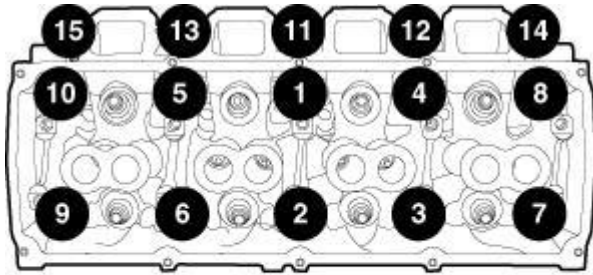
NOTE: Left side shown in illustration, right side similar.

3. Clean all sealing surfaces of the engine block and the cylinder head(s) (2).

NOTE: Rotate crankshaft 45° so that all pistons are 1/2 the way down the cylinder bore to avoid piston to valve contact.

4. Position the new cylinder head gasket(s) (1) onto the engine block.
5. Position the cylinder head(s) (2) onto the engine block.
6. Install the cylinder head bolts finger tight.

CAUTION: The 6.4L engine uses a unique 4 layer steel head gasket that must be compressed evenly and completely across the deck surface for proper sealing. The tightening sequence must be followed to ensure all layers are compressed before applying the additional 90 degree turn.

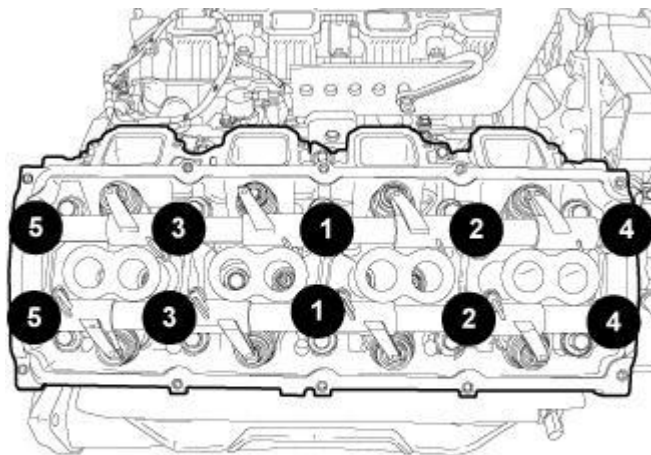


88745

Fig. 84: Cylinder Head Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

7. Using the sequence below, tighten the retaining bolts.
 - a. Using the sequence shown in illustration, tighten bolts 1-10 to 34 N.m (25 ft. lbs.).
 - b. Using the sequence shown in illustration, tighten bolts 11-15 to 20 N.m (15 ft. lbs.).
 - c. Using the sequence shown in illustration, tighten bolts 1-10 to 54 N.m (40 ft. lbs.).
 - d. Using the sequence shown in illustration, verify bolts 11-15 are 20 N.m (15 ft. lbs.).
 - e. Using the sequence shown in illustration, tighten bolts 1-10 to 61 N.m (45 ft. lbs.).
 - f. Using the sequence shown in illustration, rotate bolts 1-10 an additional 90 degrees.
 - g. Using the sequence shown in illustration, tighten bolts 11-15 to 34 N.m (25 ft. lbs.).



921225

Fig. 85: Rocker Shafts Retaining Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Pushrods and rocker arm assemblies must be installed in their original locations or engine damage could result.

8. Install the pushrods and rocker arms. Refer to **ROCKER ARM, VALVE, INSTALLATION** .
9. If removed, install the oil dip stick tube and tighten the retaining nut at the exhaust manifold.

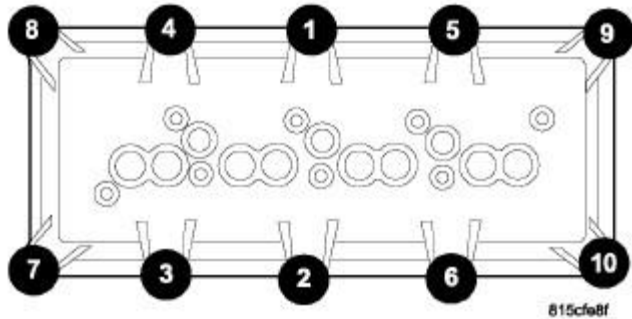


Fig. 86: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

10. Position the cylinder head covers, using the sequence shown in illustration, tighten the cylinder head cover bolts to 8 N.m (70 lbs in.). Refer to **COVER(S), CYLINDER HEAD, INSTALLATION** .

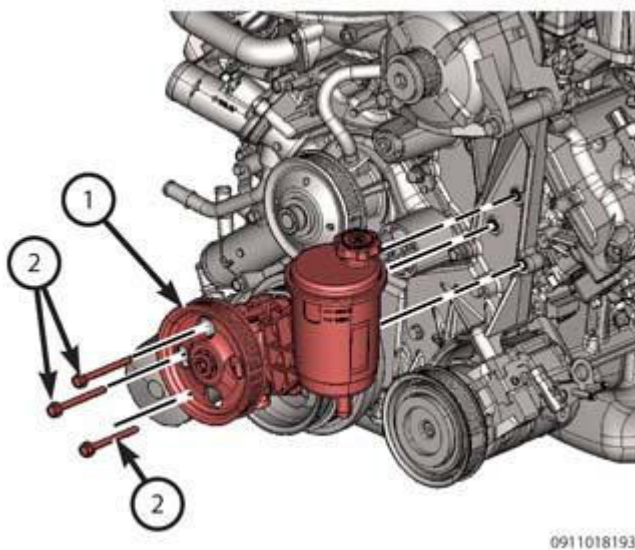


Fig. 87: Power Steering Pump Pulley & Bolts
 Courtesy of CHRYSLER GROUP, LLC

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

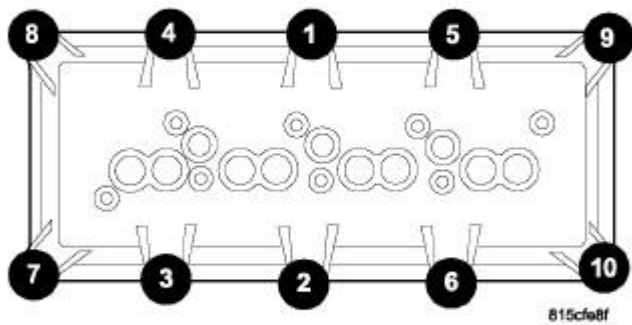
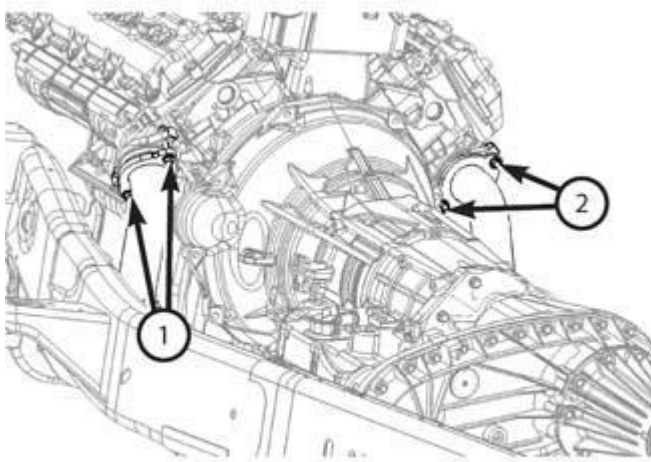


Fig. 88: Cylinder Head Cover Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not let the tensioner arm snap back to the freearm position, sever damage may occur to the tensioner.

12. Rotate the accessory drive belt tensioner (8) clockwise until it contacts it's stop, install the accessory drive belt (2), then slowly release the tensioner into position. Refer to **BELT, SERPENTINE, INSTALLATION** .



2506017995

Fig. 89: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

13. Raise and support the vehicle.
14. Install the down pipes to the exhaust manifolds.

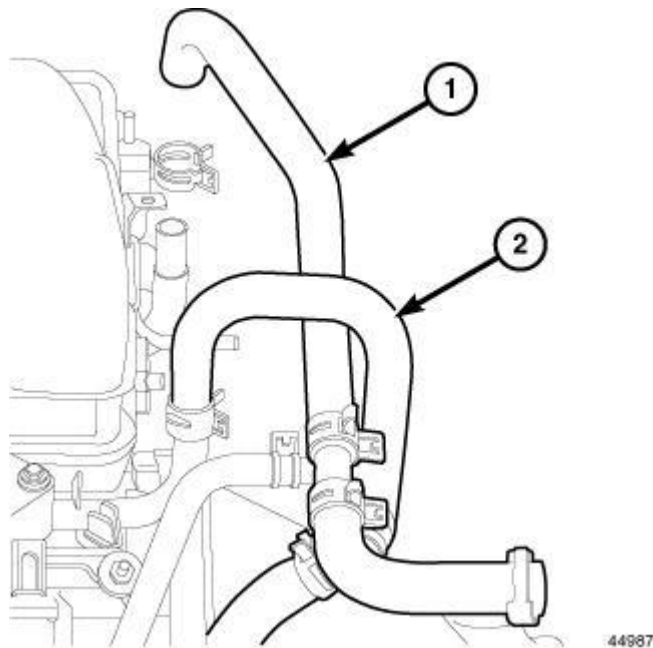


Fig. 90: Heater Hose Supply
Courtesy of CHRYSLER GROUP, LLC

15. Lower the vehicle.
16. Connect the heater hoses (1, 2).



Fig. 91: Intake Manifold Removal/Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

17. Install the intake manifold and throttle body as an assembly. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
18. Connect the fuel supply line.
19. Install the engine covers.

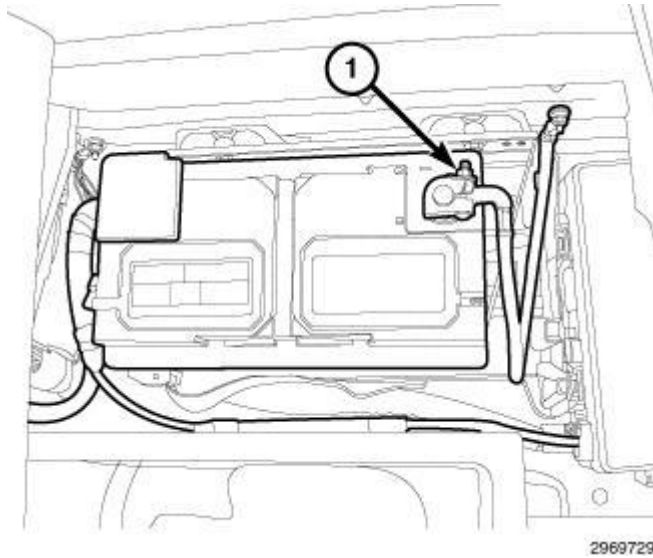


Fig. 92: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

20. Fill cooling system. Refer to **STANDARD PROCEDURE**.
21. Connect the negative battery cable (1).
22. Start engine check for leaks.

COVER(S), CYLINDER HEAD

REMOVAL

LEFT

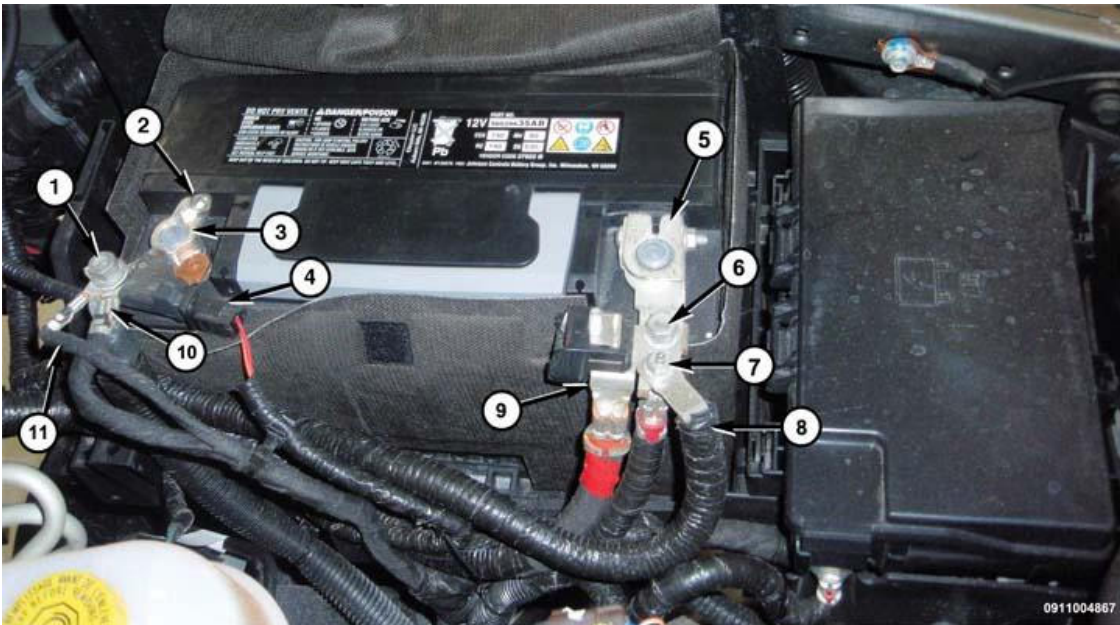


Fig. 93: Battery Cables & Components
Courtesy of CHRYSLER GROUP, LLC

1. Remove the nut (1) and the negative battery cables (10, 11).
2. Remove the engine cover.

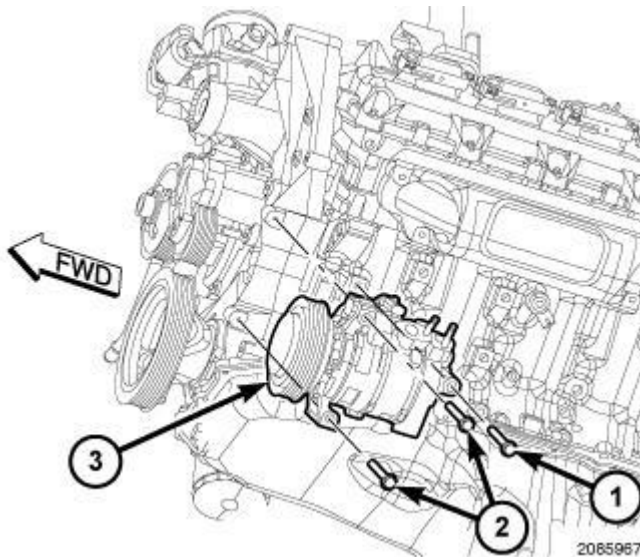


Fig. 94: A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

3. Remove the oil indicator bolt.
4. Remove the accessory drive belt.
5. Disconnect the A/C compressor harness connector.
6. Remove the A/C compressor (3) from the engine block.

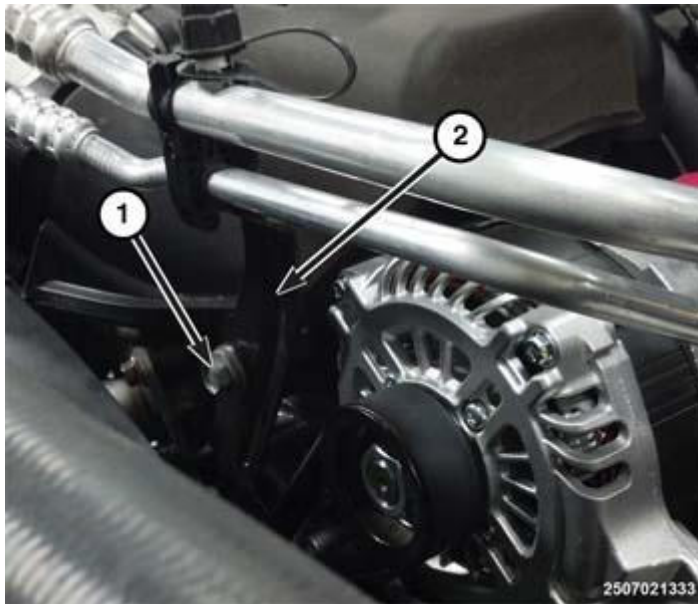


Fig. 95: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

7. Separate the A/C line support bracket (2).
8. Position the A/C compressor aside.

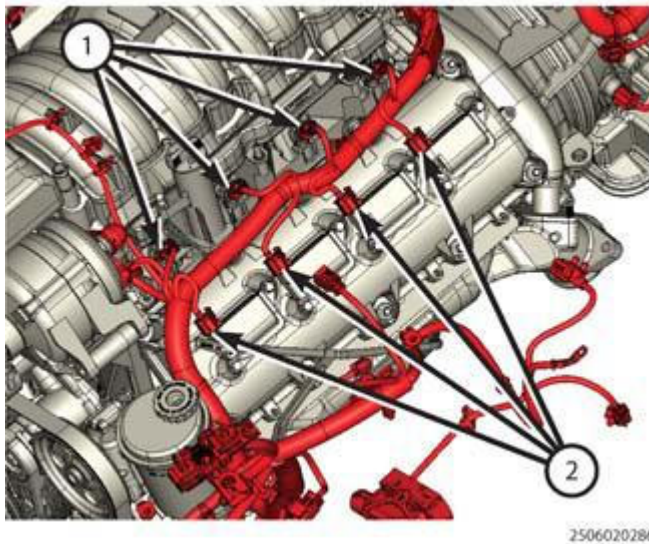


Fig. 96: Injectors Harness Connectors & Ignition Coil Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the ignition coil harness connectors (2).
10. Disconnect the fuel injector harness connectors (1).
11. Position the engine harness aside.

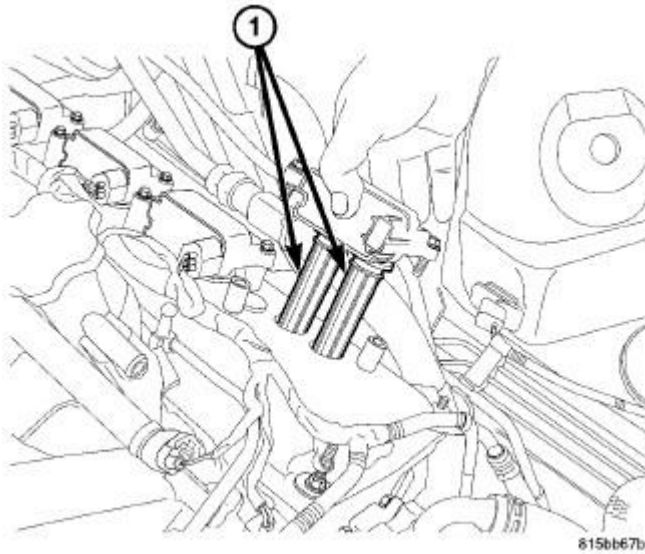


Fig. 97: Removing/Installing Ignition Coil
Courtesy of CHRYSLER GROUP, LLC

12. Remove the ignition coil retaining bolts.
13. Remove the ignition coils (1).

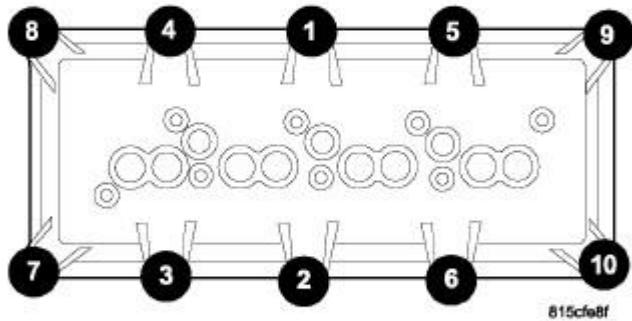


Fig. 98: Cylinder Head Cover Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

14. Using the sequence shown in illustration, remove the cylinder head cover retaining bolts.

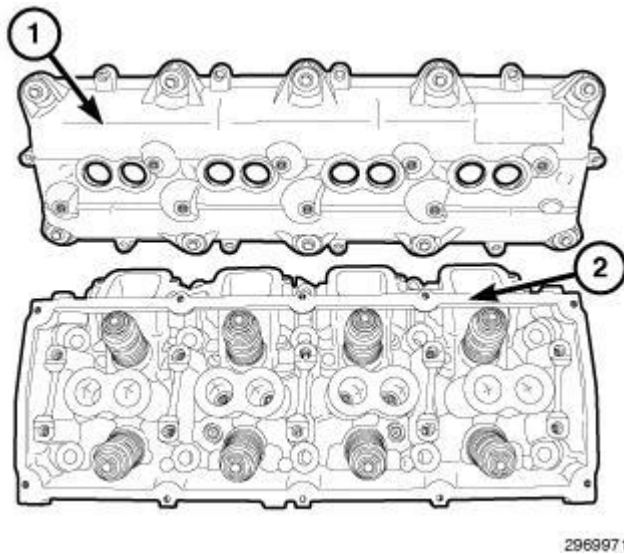


Fig. 99: Cylinder Head & Cover
Courtesy of CHRYSLER GROUP, LLC

15. Remove the cylinder head cover (1).
16. Clean the sealing surface of the cylinder head (2).

NOTE: The cylinder head cover gasket may be used again, provided no cuts, tears, or deformation have occurred.

RIGHT

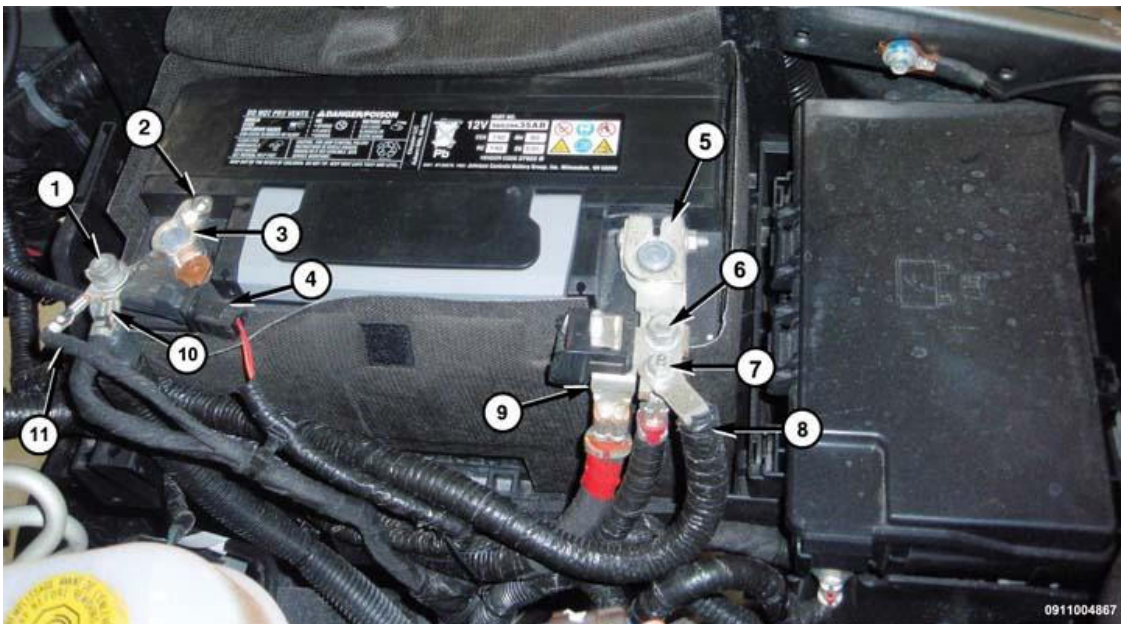


Fig. 100: Battery Cables & Components
Courtesy of CHRYSLER GROUP, LLC

1. Remove nut (1) and the negative battery cables (10, 11).
2. Remove the engine cover.
3. Remove the air cleaner body. Refer to **BODY, AIR CLEANER, REMOVAL** .

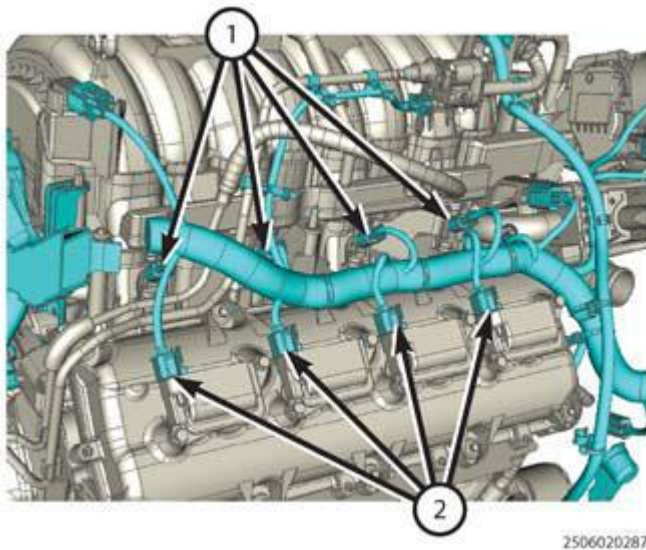


Fig. 101: Fuel Injector Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the ignition coil harness connectors (2).
5. Disconnect the fuel injector harness connectors (1).
6. Position the engine harness aside.
7. Remove the coolant lines from the cylinder head cover and position aside.

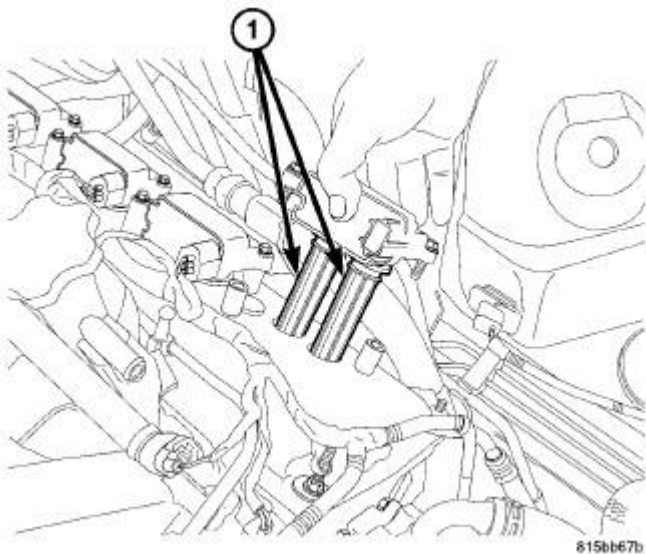


Fig. 102: Removing/Installing Ignition Coil
Courtesy of CHRYSLER GROUP, LLC

8. Remove the ignition coil retaining bolts.
9. Remove the ignition coils (1).

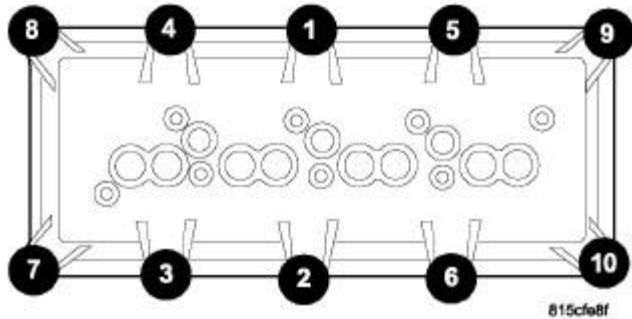


Fig. 103: Cylinder Head Cover Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

10. Using the sequence shown in illustration, remove the cylinder head cover retaining bolts.

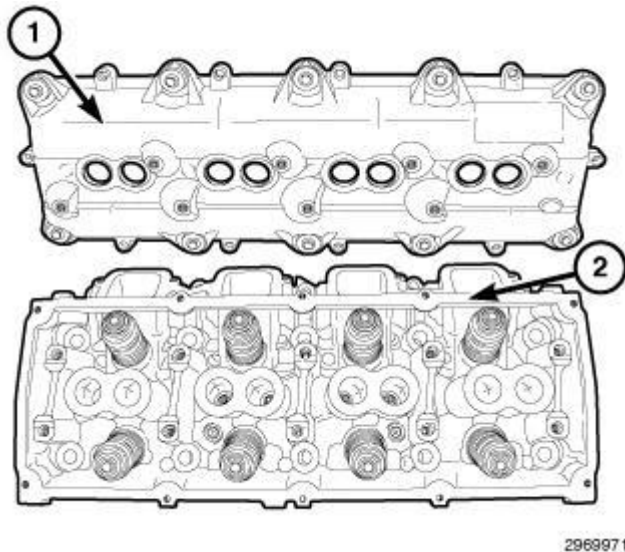


Fig. 104: Cylinder Head & Cover
Courtesy of CHRYSLER GROUP, LLC

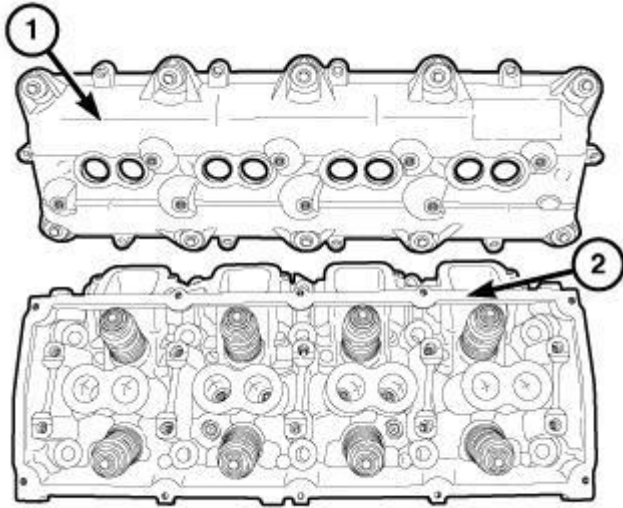
11. Remove the cylinder head cover (1).

12. Clean the sealing surface of the cylinder head (2).

NOTE: The cylinder head cover gasket may be used again, provided no cuts, tears, or deformation have occurred.

INSTALLATION

LEFT



2969971

Fig. 105: Cylinder Head & Cover

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: Do not allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

NOTE: The cylinder head cover gasket may be used again, provided no cuts, tears, or deformation have occurred.

1. Clean the cylinder head cover (1) and the sealing surface of the cylinder head (2). Inspect and replace gasket if necessary.
2. Install the cylinder head cover and hand start all fasteners.

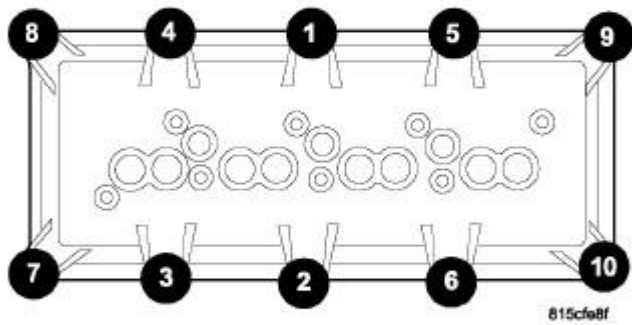


Fig. 106: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

3. Using the sequence shown in illustration, tighten the cylinder head cover bolts to the proper specification. Refer to **TORQUE SPECIFICATIONS** .

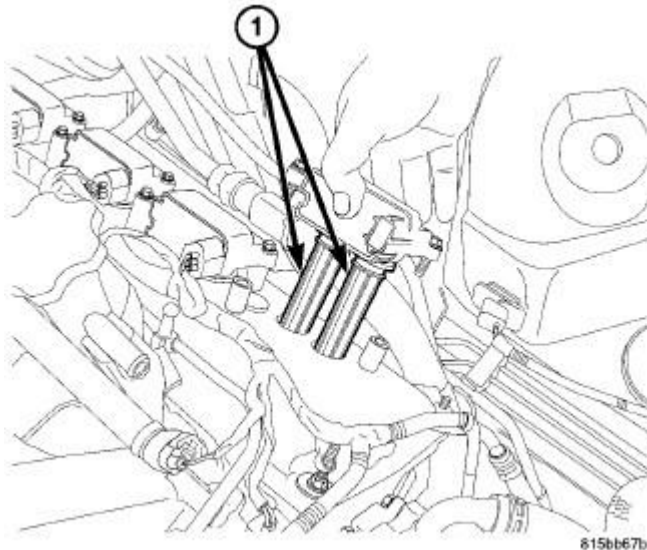


Fig. 107: Removing/Installing Ignition Coil
 Courtesy of CHRYSLER GROUP, LLC

4. Before installing the ignition coils, apply dielectric grease to the inside of the spark plug boots (1).
5. Install the ignition coils.

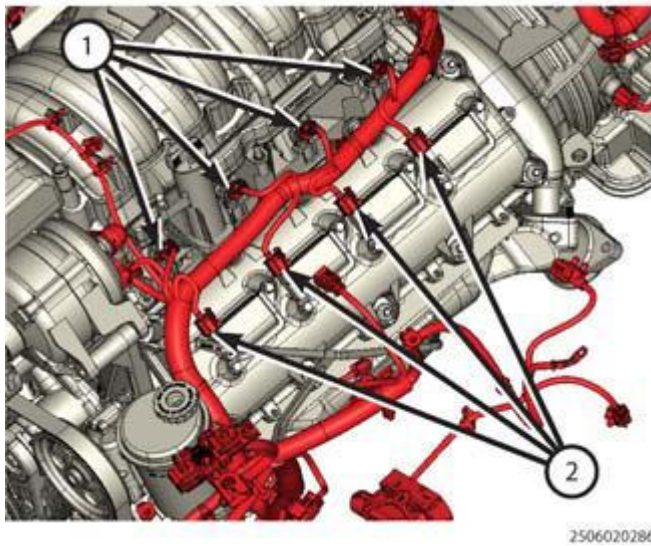


Fig. 108: Injectors Harness Connectors & Ignition Coil Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

6. Tighten the ignition coil retaining bolts to the proper specification. Refer to **SPECIFICATIONS** .
7. Connect the fuel injector harness connectors (1).
8. Connect the ignition coil harness connectors (2).

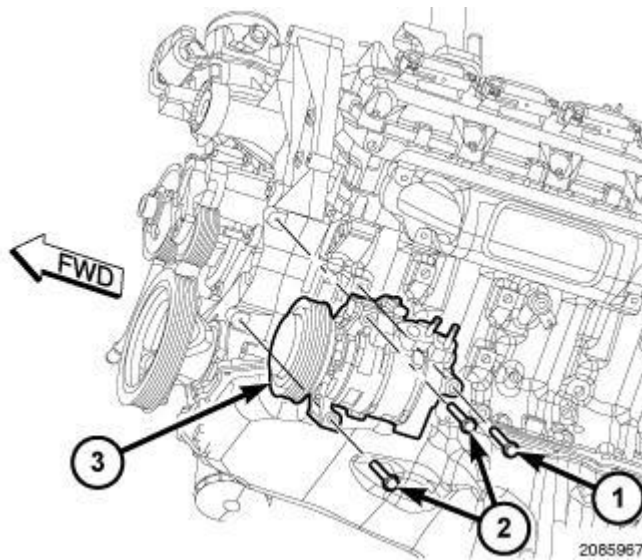


Fig. 109: A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

9. If removed, install studs that secure the A/C compressor to the engine.
10. Loosely install the bolts that secure the A/C compressor to the engine.
11. Tighten the bolt to 28 N.m (21 ft. lbs.) using the following sequence:
 - Upper and lower fasteners (2) at front of compressor.
 - Fastener (1) at rear of compressor.

12. Connect the A/C compressor harness connector.

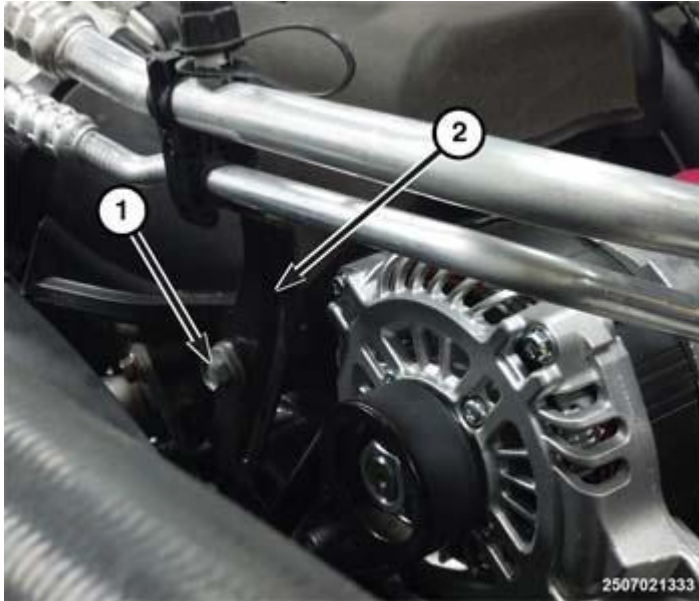


Fig. 110: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

13. Install the A/C support bracket (2) to the intake manifold. Torque the bolt (1) to the proper specification. Refer to **TORQUE SPECIFICATIONS** .
14. Install the oil indicator tube bolt. Tighten the bolt to the proper specification. Refer to **TORQUE SPECIFICATIONS** .
15. Install the engine cover.

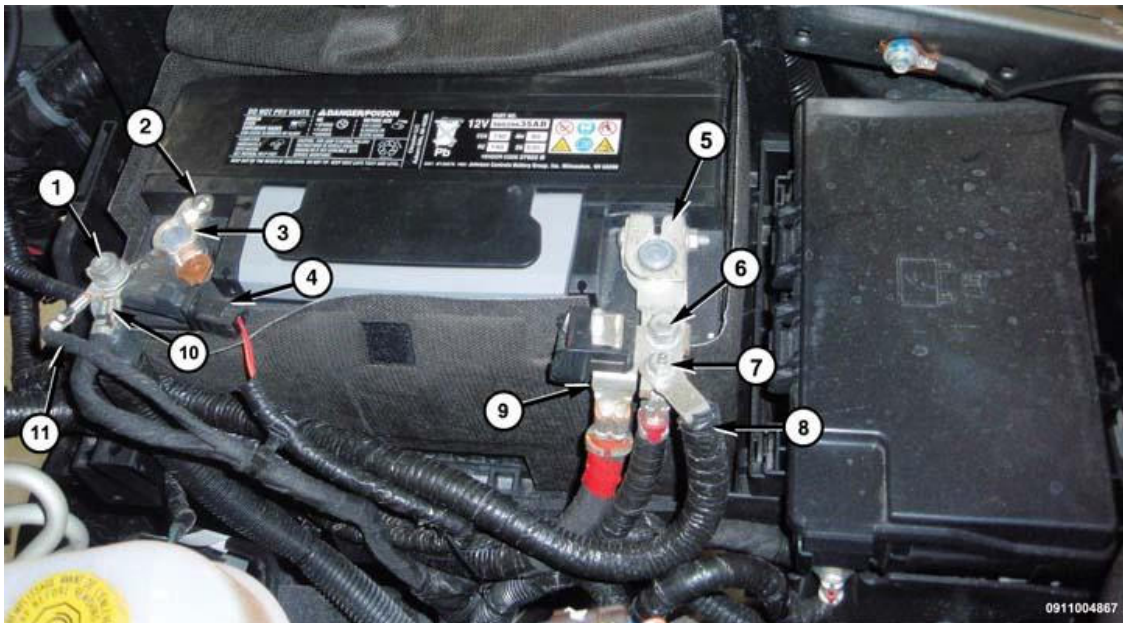


Fig. 111: Battery Cables & Components

Courtesy of CHRYSLER GROUP, LLC

16. Connect the battery negative cables (10, 11). Tighten the nut (1) to the proper specification. Refer to **SPECIFICATIONS**.

RIGHT

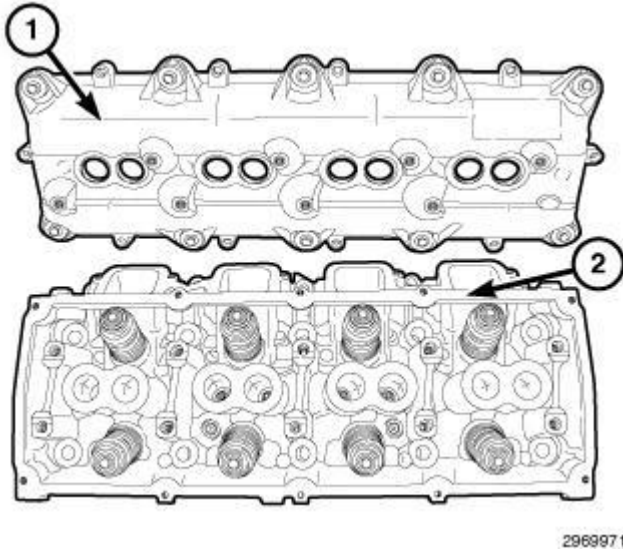


Fig. 112: Cylinder Head & Cover

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: Do not allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

NOTE: The cylinder head cover gasket may be used again, provided no cuts, tears, or deformation have occurred.

1. Clean the cylinder head cover (1) and the sealing surface of the cylinder head (2). Inspect and replace gasket if necessary.
2. Install the cylinder head cover and hand start all fasteners.

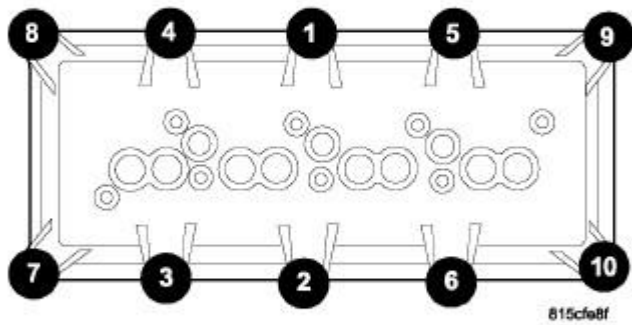


Fig. 113: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

3. Using the sequence shown in illustration, tighten the cylinder head cover bolts to the proper specification. Refer to **TORQUE SPECIFICATIONS** .

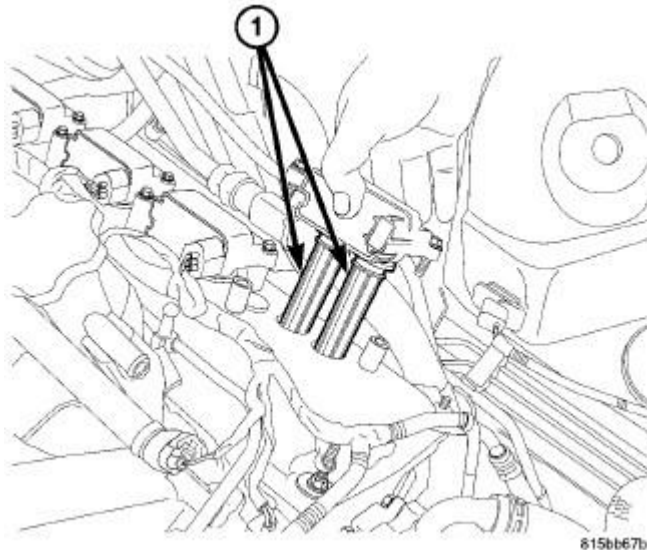


Fig. 114: Removing/Installing Ignition Coil
 Courtesy of CHRYSLER GROUP, LLC

4. Before installing the ignition coils, apply dielectric grease to the inside of the spark plug boots (1).
5. Install the ignition coils.

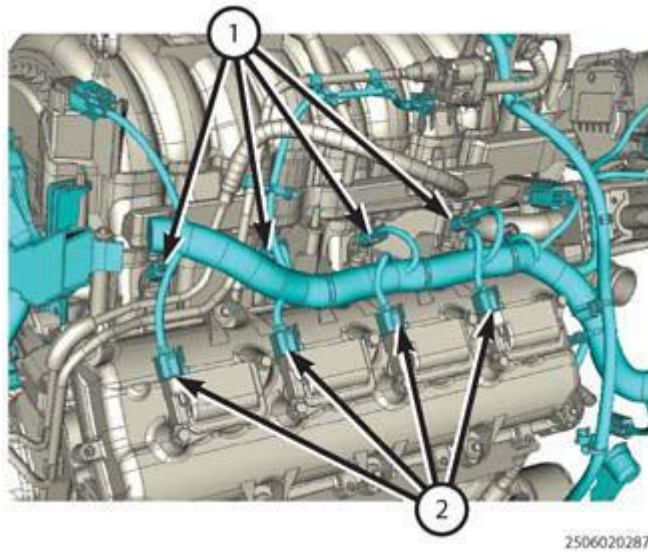


Fig. 115: Fuel Injector Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

6. Tighten the ignition coil retaining bolts to the proper specification. Refer to **SPECIFICATIONS** .
7. Connect the ignition coil harness connectors (2).
8. Install the coolant lines to the cylinder head cover.
9. Install the air cleaner body. Refer to **BODY, AIR CLEANER, INSTALLATION** .
10. Install the engine covers.

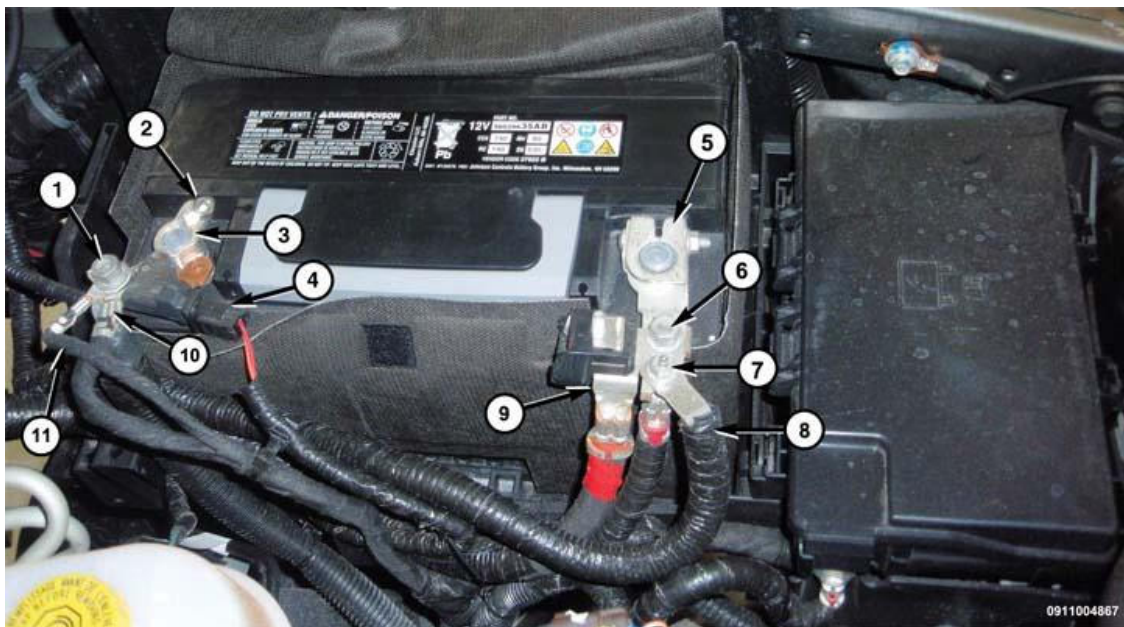
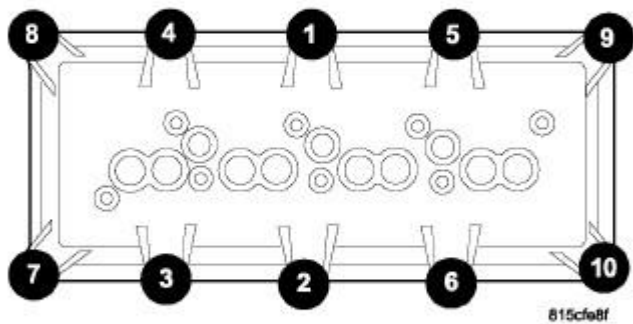


Fig. 116: Battery Cables & Components
Courtesy of CHRYSLER GROUP, LLC

11. Connect the battery negative cables (10, 11). Tighten the nut (1) to the proper specification. Refer to

SPECIFICATIONS .**ROCKER ARM, VALVE****REMOVAL****REMOVAL****Fig. 117: Cylinder Head Cover Removal/Tightening Sequence****Courtesy of CHRYSLER GROUP, LLC**

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

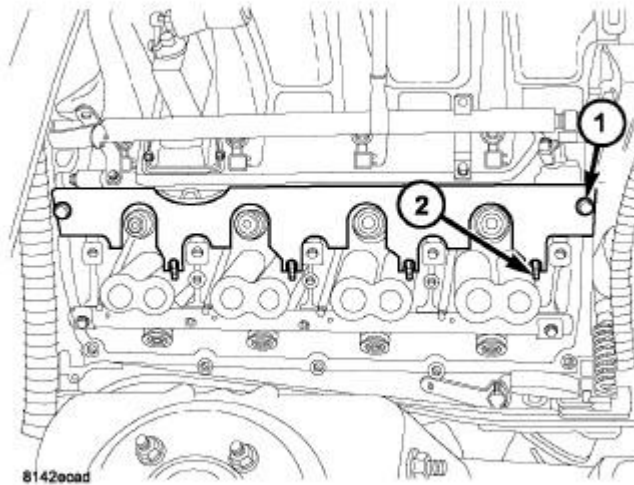


Fig. 118: Pushrod Retaining Plate
 Courtesy of CHRYSLER GROUP, LLC

2. Install Push Rod Retainer (special tool #9070, Retainer, Push Rod) (1).

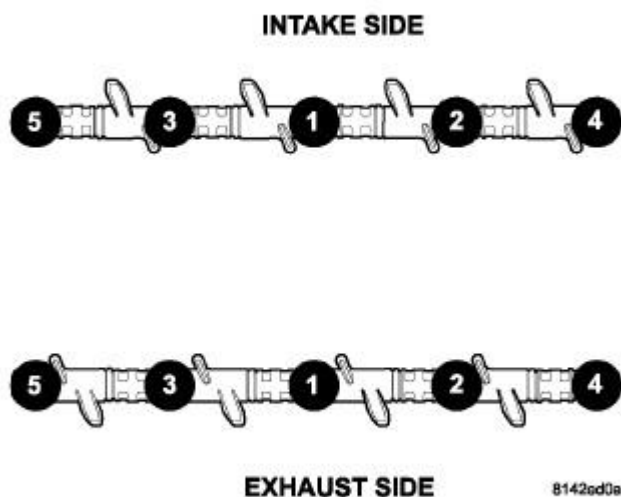


Fig. 119: Rocker Shaft Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

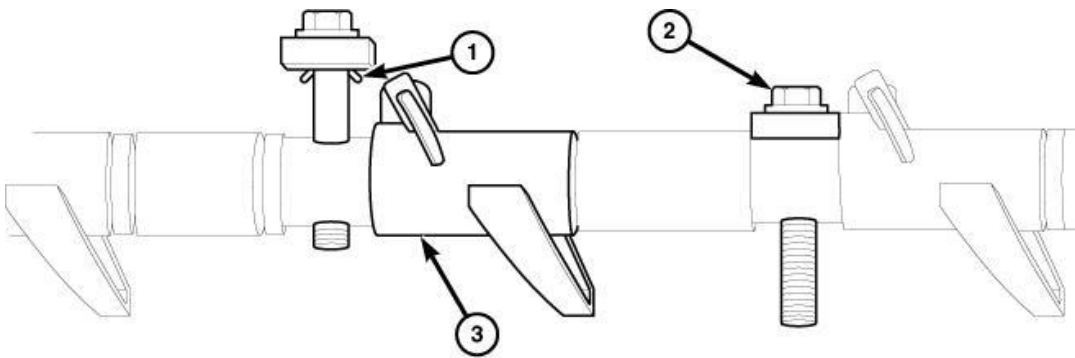
- Using the sequence shown in illustration, loosen the rocker shaft assemblies.

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with an "I".

- Remove the rocker shaft assemblies. Note the location for reassembly.

CAUTION: The longer pushrods are for the exhaust side, and the shorter pushrods are for intake side.

- Remove the pushrods. Note the pushrod location for reassembly.



4637

Fig. 120: Rocker Arm Retainers
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not remove the retainers from the rocker shaft assemblies. The assembly tangs (1) at the bottom of the retainers can be damaged, causing the assembly tangs to break off and get into the engine.

INSTALLATION

INSTALLATION

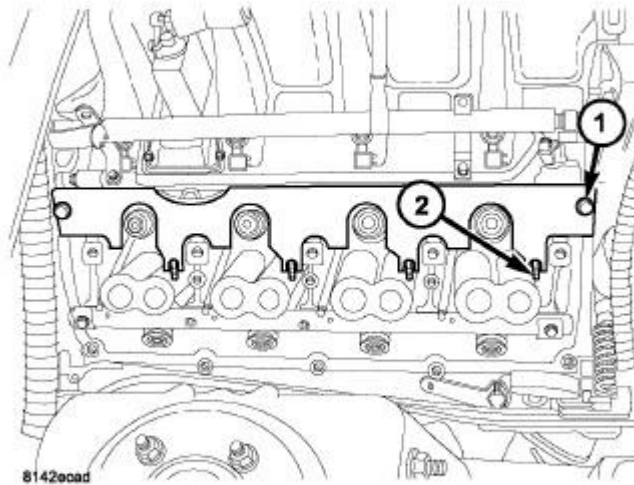
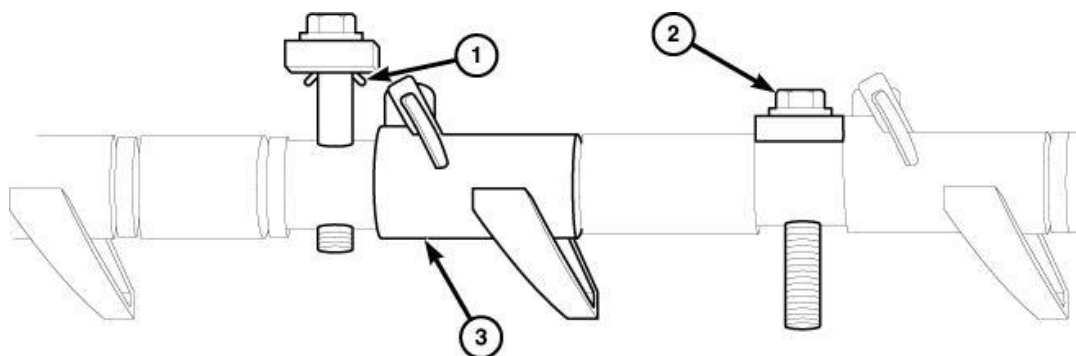


Fig. 121: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The longer pushrods are for the exhaust side, and the shorter pushrods are for intake side.

1. Install the pushrods in the same order as removed.
2. Install the Push Rod Retainer (special tool #9070, Retainer, Push Rod) (1).



45077

Fig. 122: Rocker Arm Retainers
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Ensure the retainers (1) and rocker arms (3) are not overlapped when torquing bolts.

CAUTION: Verify the push rods are installed into the rocker arms (3) and lifters correctly while installing the rocker shaft assembly. Recheck after the rocker shaft assembly has been torqued to specification.

3. Install the rocker shaft assemblies in the same order as removed.

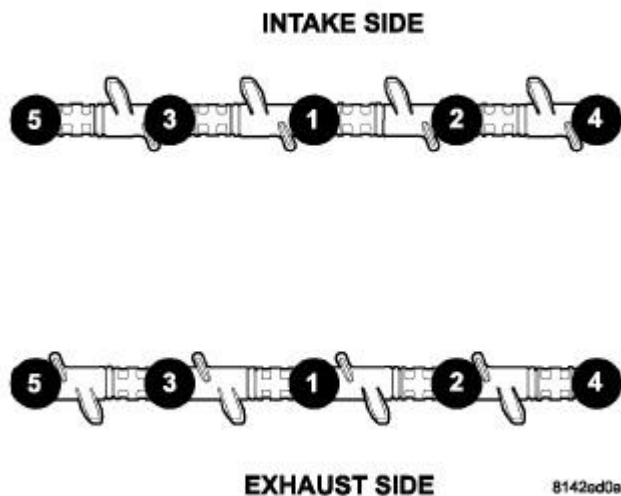


Fig. 123: Rocker Shaft Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with the letter "I".

4. Verify the rocker arms are installed in the correct location.

NOTE: Repeat torque sequence several times to ensure rocker shaft assembly is firmly seated.

5. Using the sequence shown in illustration, tighten the rocker shaft bolts to 22 N.m (16 ft. lbs.).

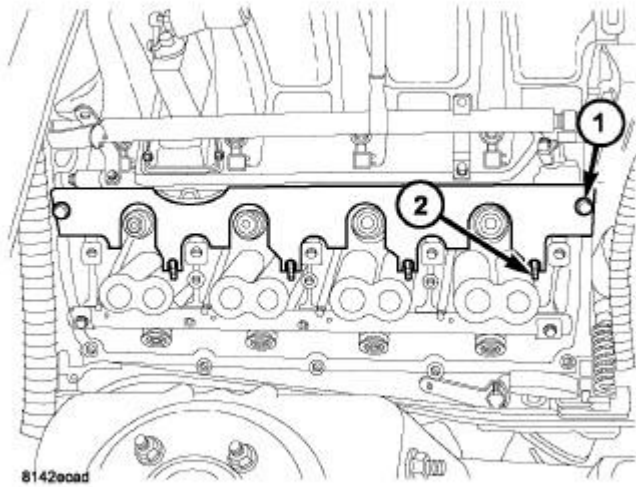


Fig. 124: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not rotate or crank the engine during or immediately after rocker arm installation. Allow the hydraulic roller lifters adequate time to bleed down (about 5 minutes).

6. Remove the Push Rod Retainer (special tool #9070, Retainer, Push Rod) (1).

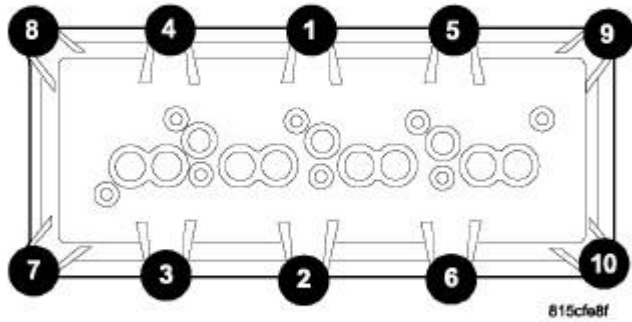


Fig. 125: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

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

SEAL(S), VALVE GUIDE

DESCRIPTION

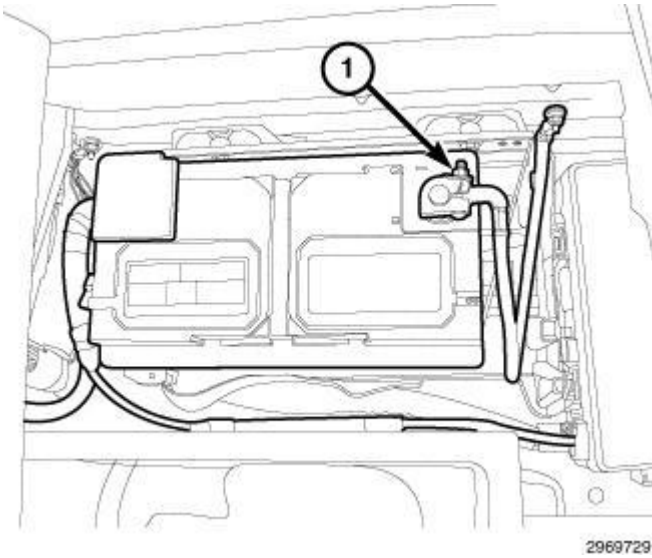
DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems. The intake valve stem seal has a smaller valve spring seat compared to the exhaust valve stem seal. The intake and exhaust valve stem seals are identified by different colors.

SPRING(S), VALVE

REMOVAL

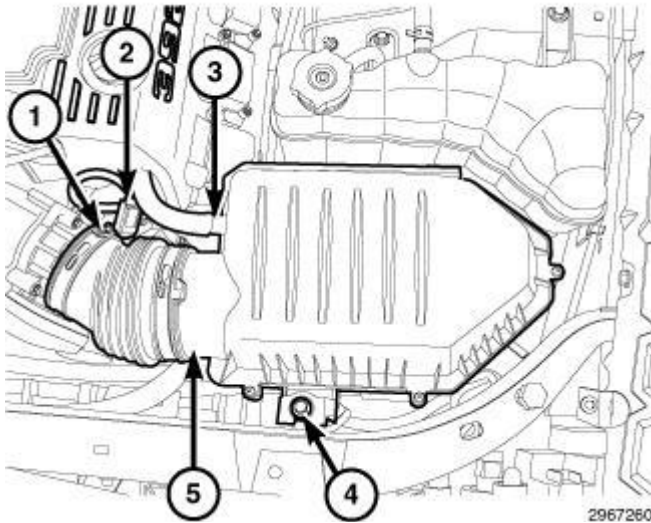
REMOVAL



2969729

Fig. 126: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable (1).



2967260

Fig. 127: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

2. Remove the air cleaner housing (5) and clean air tube (1). Refer to **BODY, AIR CLEANER, INSTALLATION**.

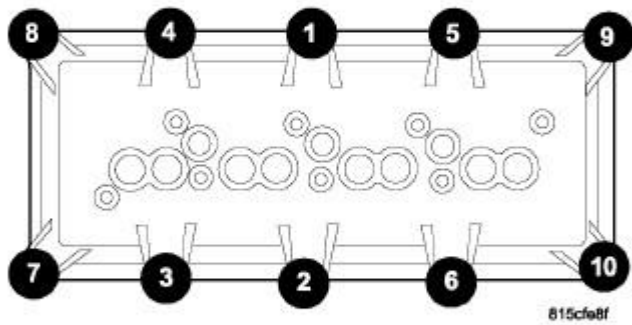


Fig. 128: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

3. Remove the cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, REMOVAL** .

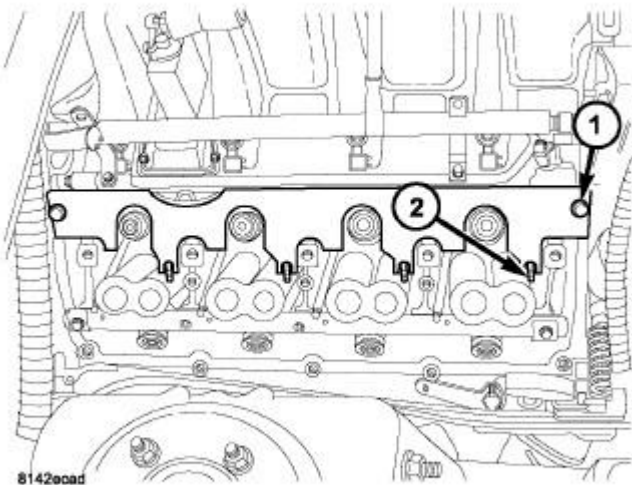
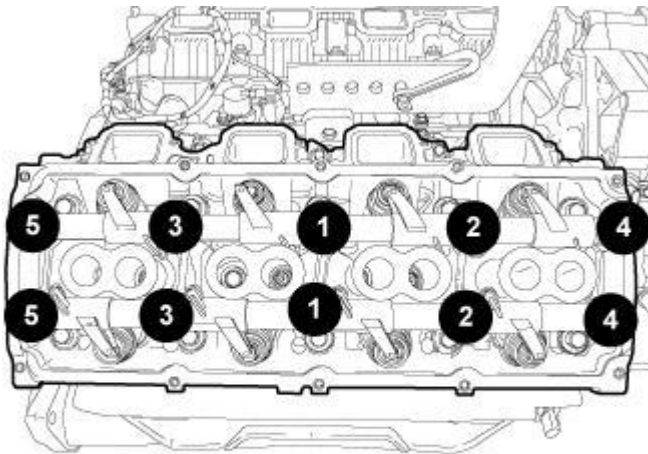


Fig. 129: Pushrod Retaining Plate
 Courtesy of CHRYSLER GROUP, LLC

CAUTION: The piston must be at TDC, and both valves closed on the cylinder to be serviced.

NOTE: The intake push rods can fall into the engine and become lodged in the oil pan, if removing intake rocker arm shaft, install the pushrod retainer (special tool #9070, Retainer, Push Rod) (1) to retain the intake push rods (2).

4. Install the pushrod retainer (special tool #9070, Retainer, Push Rod) (1) onto the cylinder head.
5. Clip the pushrods (2) into the pushrod retainer (1).



921225

Fig. 130: Rocker Shafts Retaining Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with an "I".

6. Using the sequence shown in illustration, remove the rocker arm shaft bolts and remove the rocker arm shaft.

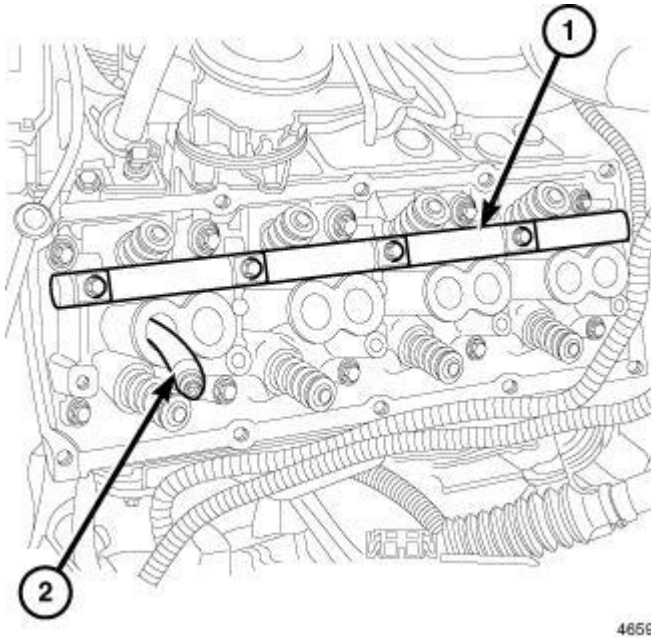


Fig. 131: Rocker Arm Shaft Adapter & Air Hose
Courtesy of CHRYSLER GROUP, LLC

7. Install the rocker arm shaft adapter (special tool #9065C, Compressor, Valve Spring) (1).
8. Insert an air hose (2) into the spark plug hole and charge the cylinder with air.

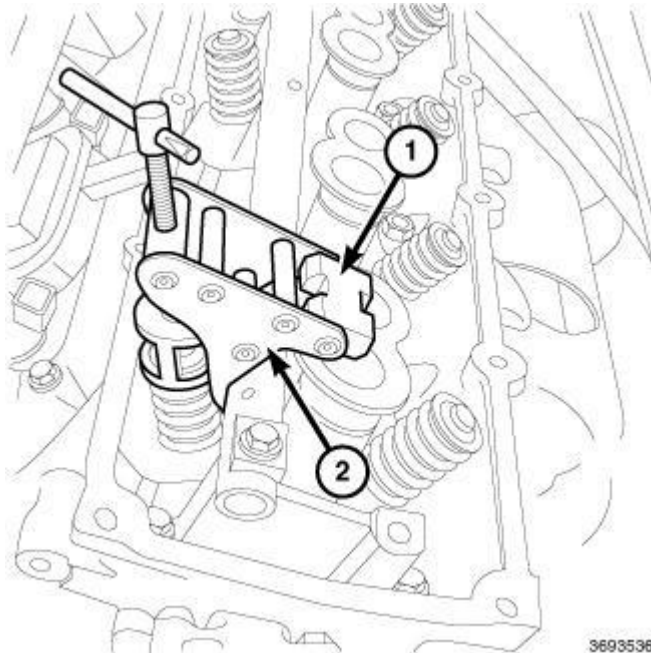


Fig. 132: Intake Valve Spring Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: A fulcrum assembly (1) must be rotated to the appropriate setting as marked on the tool for proper valve spring alignment.

NOTE: All valve springs and seals are removed in the same manner.

NOTE: Tap the top of the valve spring retainer to loosen the spring retainer locks.

9. Install the valve spring compressor (special tool #9065C, Compressor, Valve Spring) (1) and remove the intake valve retainer locks.
10. Release the valve spring compressor and remove the valve springs.

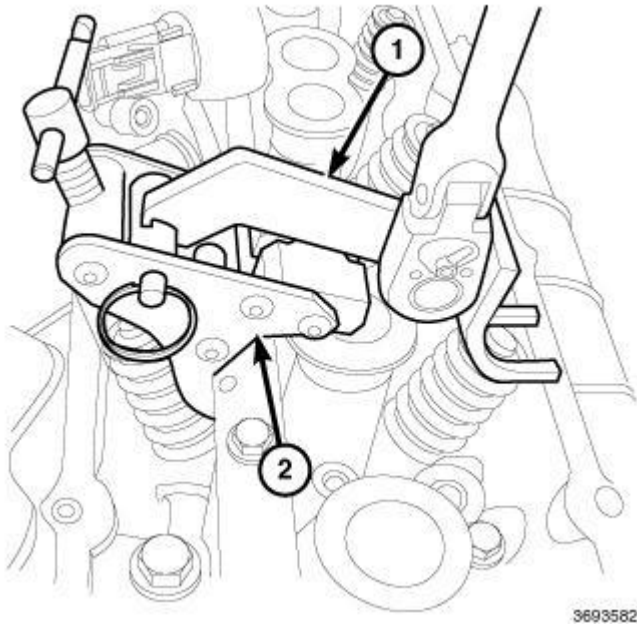


Fig. 133: Valve Spring Compressor & Adapter
Courtesy of CHRYSLER GROUP, LLC

11. Install the valve spring compressor (special tool #9065C, Compressor, Valve Spring) (2) and the rocker arm adapter (special tool #9065-3, Adapter, Valve Spring Compressor) (1) and remove the exhaust valve retainer locks.
12. Release the valve spring compressor and remove the valve spring.

NOTE: The valve springs are interchangeable between intake and exhaust.

13. Remove and discard the valve guide seal.

INSTALLATION

INSTALLATION

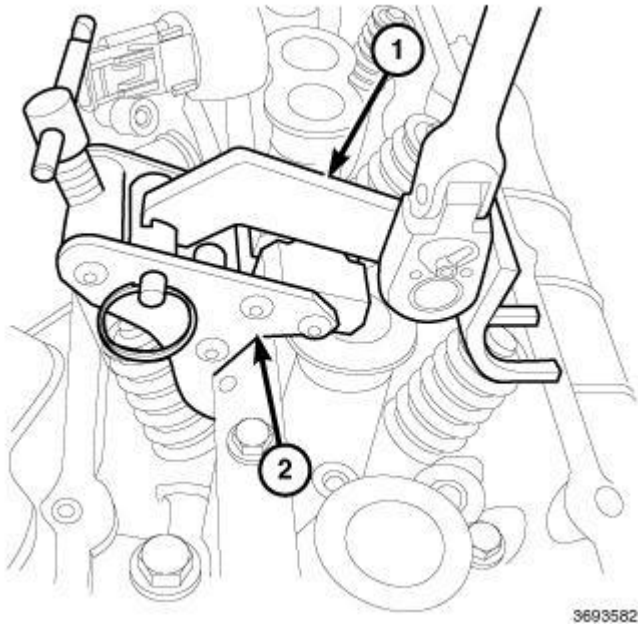


Fig. 134: Valve Spring Compressor & Adapter
Courtesy of CHRYSLER GROUP, LLC

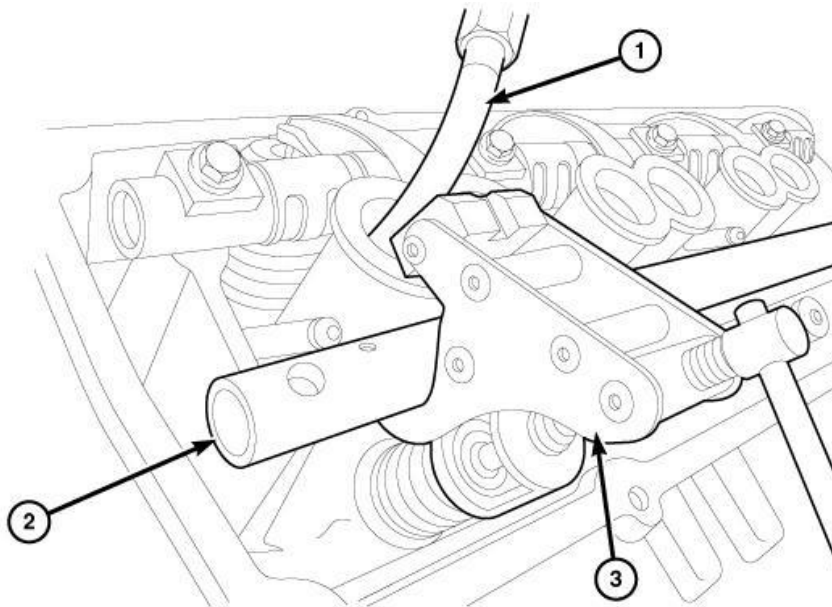
NOTE: All valve springs and seals are installed in the same manner.

NOTE: The intake seal has a smaller spring seat diameter compared to the exhaust seal.

1. Install a new valve guide seal.

NOTE: The intake spring retainer has a longer free length compared to the exhaust spring retainer.

2. Install the valve spring.
3. Install the valve spring retainer.
4. Using the valve spring compressor (special tool #9065C, Compressor, Valve Spring) (3) and the rocker arm adapter (special tool #9065-3, Adapter, Valve Spring Compressor) (1), compress the valve spring and install the valve spring retainer locks.



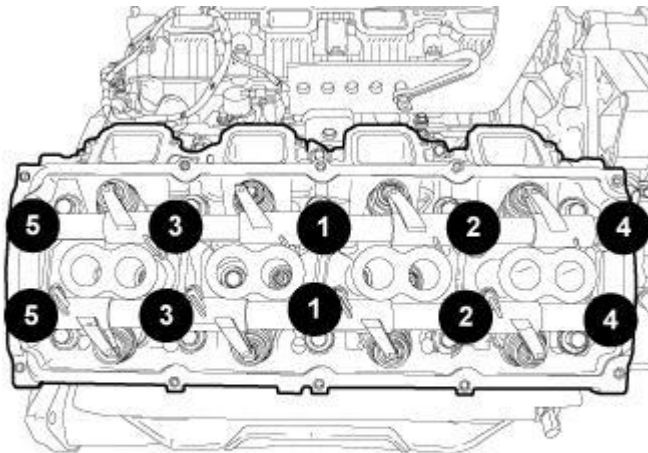
45107

Fig. 135: Valve Spring Removal Tools
 Courtesy of CHRYSLER GROUP, LLC

5. Remove the valve spring compressor (special tool #9065C, Compressor, Valve Spring) (3) and the rocker arm adapter (special tool #9065-3, Adapter, Valve Spring Compressor).
6. Release the air charge (1) in the cylinder.

CAUTION: Verify that the pushrods are fully seated into the lifters and the rocker arms. Recheck after rocker arm shaft has been torqued to specification.

7. Install the rocker arm shaft and push rods. Refer to ROCKER ARM, VALVE, INSTALLATION .



921225

Fig. 136: Rocker Shafts Retaining Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

NOTE: Repeat torque sequence several times to ensure rocker shaft assembly is firmly seated.

8. Using the sequence shown in illustration, tighten the rocker arm shaft bolts to 22 N.m (16 ft. lbs.).

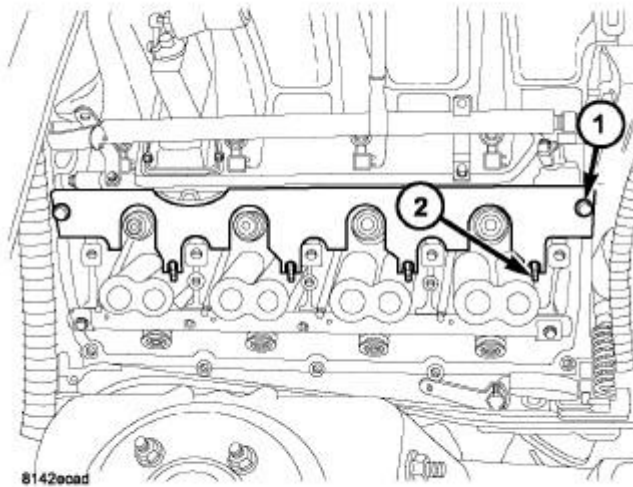


Fig. 137: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

9. Remove the pushrod retainer (special tool #9070, Retainer, Push Rod) (1).

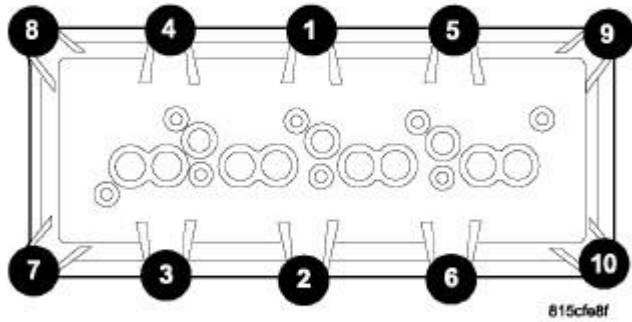


Fig. 138: Cylinder Head Cover Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

10. Position the cylinder head cover onto the cylinder head.
11. Using the sequence shown in illustration, tighten the cylinder head cover bolts to 8 N.m (6 ft. lbs.). Refer to **COVER(S), CYLINDER HEAD, INSTALLATION**.

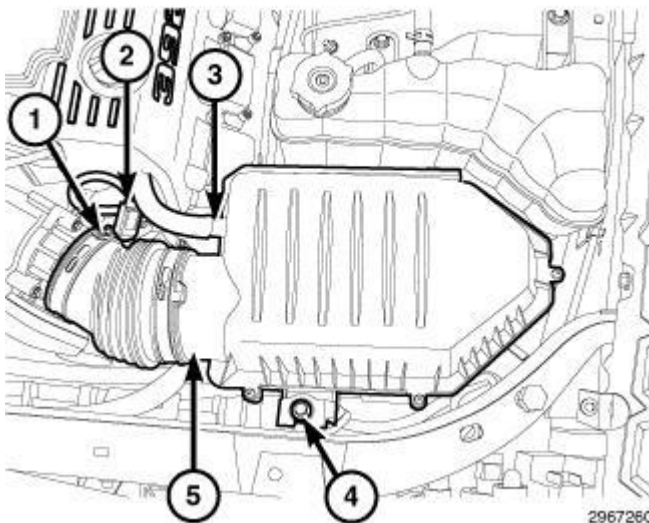
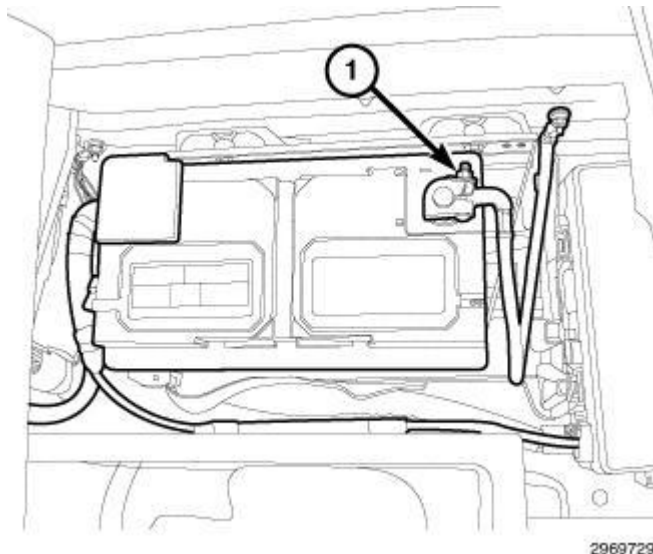


Fig. 139: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

12. Install the air cleaner housing (5) and clean air tube (1). Refer to **BODY, AIR CLEANER,**

INSTALLATION .



2969729

Fig. 140: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

13. Connect the negative battery cable.
14. Road test the vehicle.

VALVES, INTAKE AND EXHAUST

DESCRIPTION

VALVES

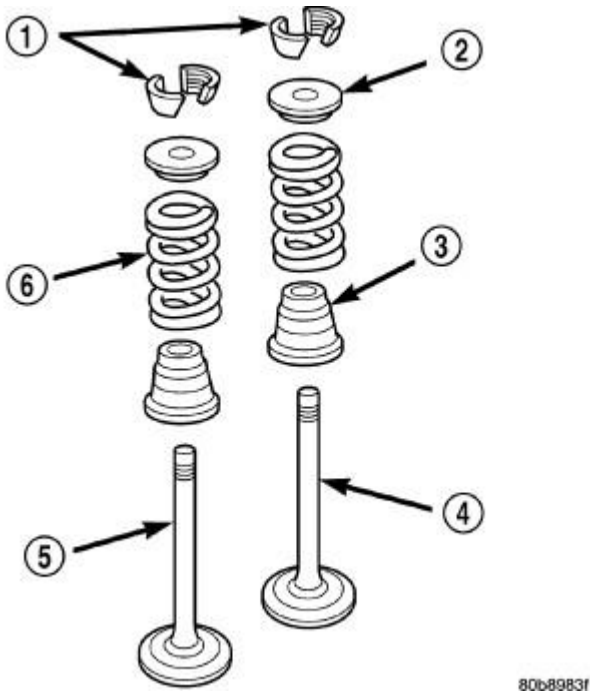


Fig. 141: Valve Assembly Configuration
 Courtesy of CHRYSLER GROUP, LLC

Both the intake (4) and exhaust (5) valves are made of steel with full chrome plate on valve stems. The intake valve is 54.3 mm (2.14 in.) diameter and the exhaust valve is 42.0 mm (1.65 in.) diameter. All valves use three bead lock keepers (1) and retainers (2) to retain the springs (6) and promote valve rotation.

VALVE GUIDES

The valve guides are made of powdered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

STANDARD PROCEDURE

STANDARD PROCEDURE - REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that the correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

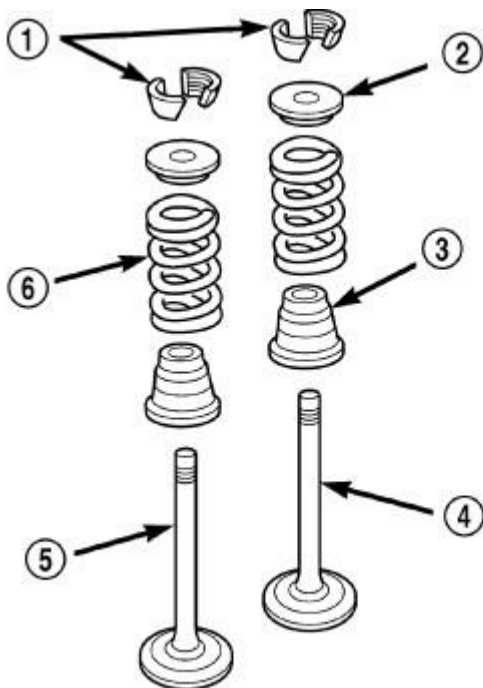
1. Measure the concentricity of the valve seat using a dial indicator. Total runout should not exceed 0.051 mm (0.002 inch.) total indicator reading.
2. Inspect the valve seat with Prussian blue to determine where the valve contacts the seat. To do this, coat

the valve seat with Prussian blue then set the valve in place. Rotate the valve using light pressure. If the blue is transferred to the center of the valve face, contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat with a 65 degree stone.

3. Refer to the below chart for the proper valve seat width, valve seat angle, valve face angle and valve spring height.

VALVE SEAT, VALVE FACE AND SPRING HEIGHT CHART

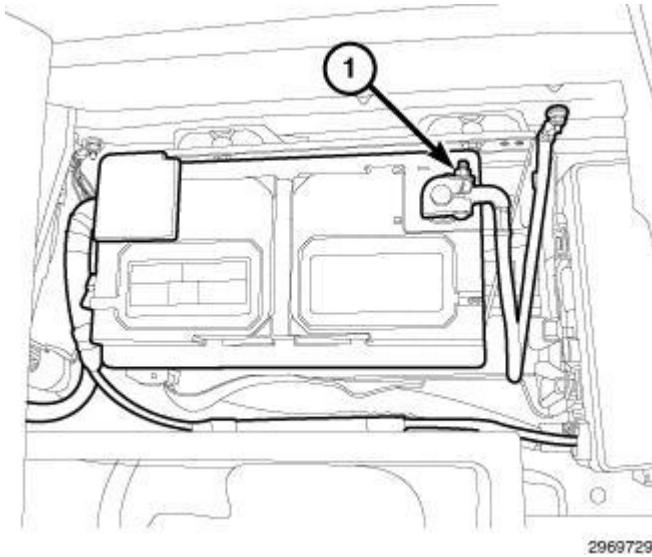
DESCRIPTION	SPECIFICATION	
SEAT WIDTH		
INTAKE	0.94 - 1.04 mm	0.037 - 0.041 in.
EXHAUST	1.16 - 1.26 mm	0.046 - 0.050 in.
SEAT ANGLE		
(INT. AND EXT.)	44.5° - 45°	
FACE ANGLE		
INTAKE	45.5° - 46°	
EXHAUST	45° - 45.5°	
SPRING HEIGHT		
INTAKE	52.1 mm	2.051 in.
EXHAUST	51.2 mm	2.016 in.



80b8983f

Fig. 142: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

4. The valve seat must maintain an angle of 44.5° - 45.0°.
5. The valve face must maintain an angle of 45.5° - 46.0° for the Intake and 45° - 45.5° for the exhaust.

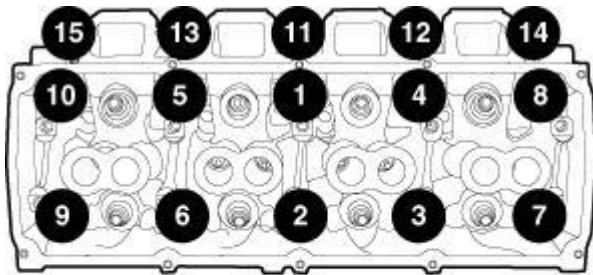
REMOVAL**REMOVAL**

2969729

Fig. 143: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable (1).



68745

Fig. 144: Cylinder Head Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL** .

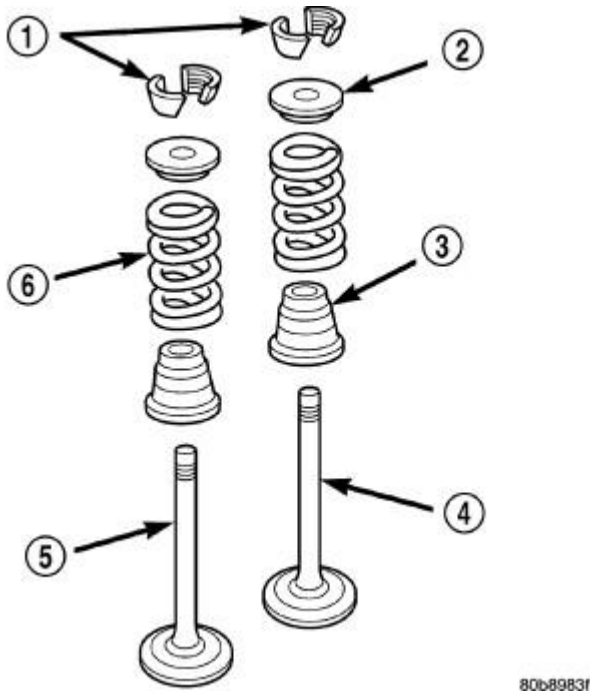


Fig. 145: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

3. Compress the valve springs using the valve spring compressor (special tool #C-3422-D, Compressor, Valve Spring) and adapter (special tool #8464, Adapter, Valve Spring).
4. Remove the valve spring retainer locks (1), valve spring retainers (2), valve stem seals (3) and valve springs (6).
5. Before removing the valves, remove any burrs from the valve spring retainer lock grooves in the valve stems (4) to prevent damage to the valve guides. Identify the valves to ensure installation in their original location.
6. Remove the valves (4, 5).

INSTALLATION

INSTALLATION

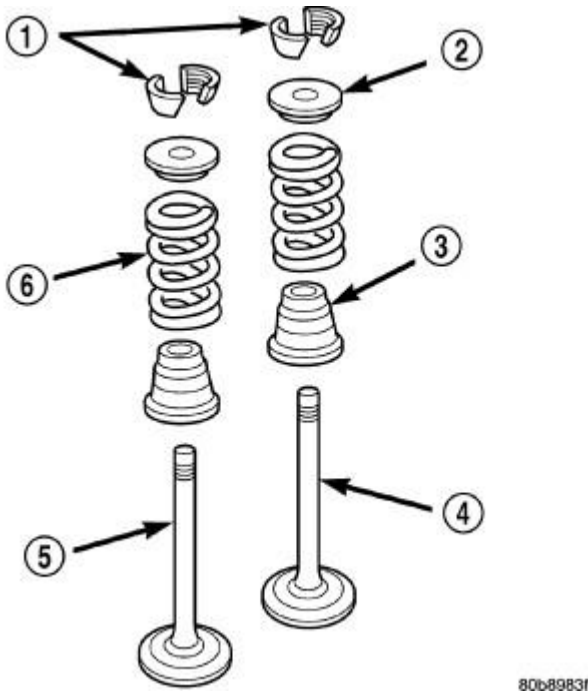


Fig. 146: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

1. Clean the valves thoroughly. Discard burned, warped, and cracked valves.
2. Remove carbon and varnish deposits from inside the valve guides with a reliable guide cleaner.
3. Measure the valve stems for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.
4. Coat the valve stems (4, 5) with clean engine oil and insert them into the cylinder head.
5. If the valves or seats have been reground, check valve stem height. If the valve is too long, replace the cylinder head.
6. Install new seals (3) on all valve guides. Install the valve springs (6) and valve spring retainers (2).

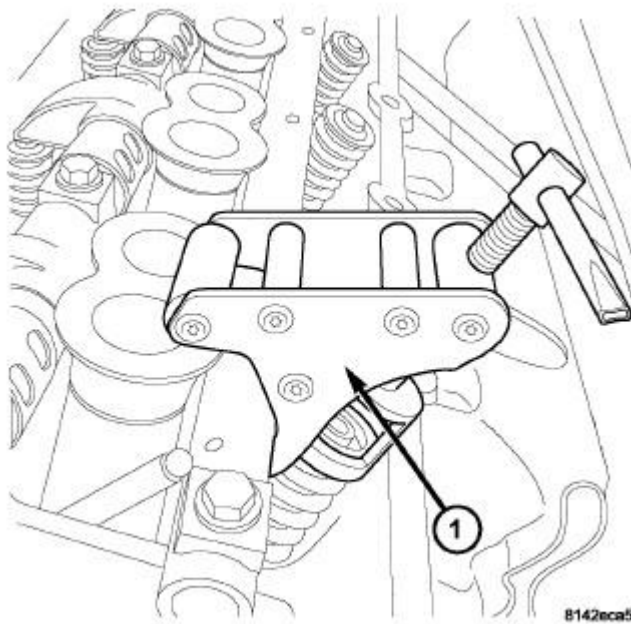
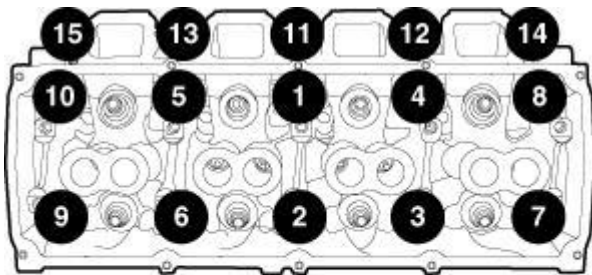


Fig. 147: Exhaust Valve Spring Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

7. Compress the valve springs with the valve spring compressor (special tool #C-3422-D, Compressor, Valve Spring) (1) and adapter (special tool #8464, Adapter, Valve Spring), install the valve spring retainer locks and release the tool. If the valves and/or seats have been ground, measure the installed height of the springs. Make sure the measurement is taken from the bottom of spring seat in the cylinder head to the bottom surface of valve spring retainer.



88745

Fig. 148: Cylinder Head Bolt Removal & Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

8. Install the cylinder head (2). Refer to CYLINDER HEAD, INSTALLATION.

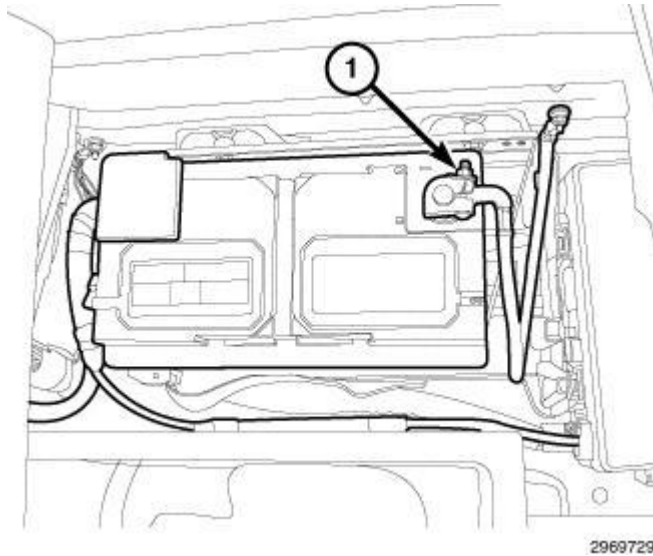


Fig. 149: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

9. Connect the negative battery cable (1).

ENGINE BLOCK

CLEANING

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean:

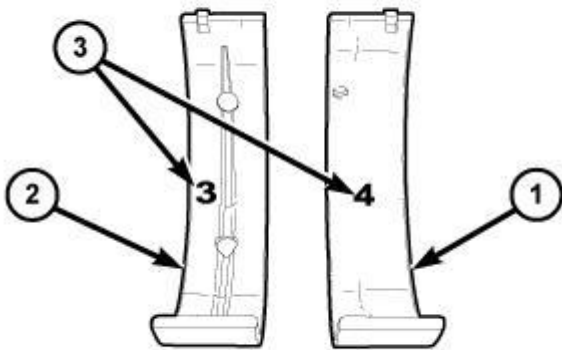
- Gallery at the oil filter adaptor hole
- Front and rear oil gallery holes
- Multiple Displacement System (MDS) oil gallery holes in the valley
- Oil feed holes for the crankshaft main bearings

Drilled and tapped holes should be free of debris upon assembly.

Once the block has been completely cleaned, apply Loctite® PST pipe sealant with Teflon 592 to the threads of the front and rear oil gallery plugs and coolant drain plugs. Tighten the oil gallery 1/4 inch x 18 NPT plugs to 20 N.m (15 ft. lbs.). Tighten the coolant drain 1/4 inch x 18 NPT plugs to 34 N.m (25 ft. lbs.). Tighten the 3/8 inch x 18 NPT plugs to 27 N.m (20 ft. lbs.).

INSPECTION

INSPECTION



2767936

Fig. 150: Main Bearing Inserts

Courtesy of CHRYSLER GROUP, LLC

1. Wipe the main bearing inserts (1, 2) clean.
2. Inspect the inserts for abnormal wear patterns, scoring, grooving, fatigue, pitting and for metal or other foreign material imbedded in the lining.
3. Inspect the back of the inserts for fractures, scrapes or irregular wear patterns.
4. Inspect the insert locking tabs for damage.
5. Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing.
6. Replace any bearing that shows abnormal wear.
7. Inspect the main bearing bores for signs of scoring, nicks and burrs.
8. If the cylinder block main bearing bores show damage, replace the engine block.

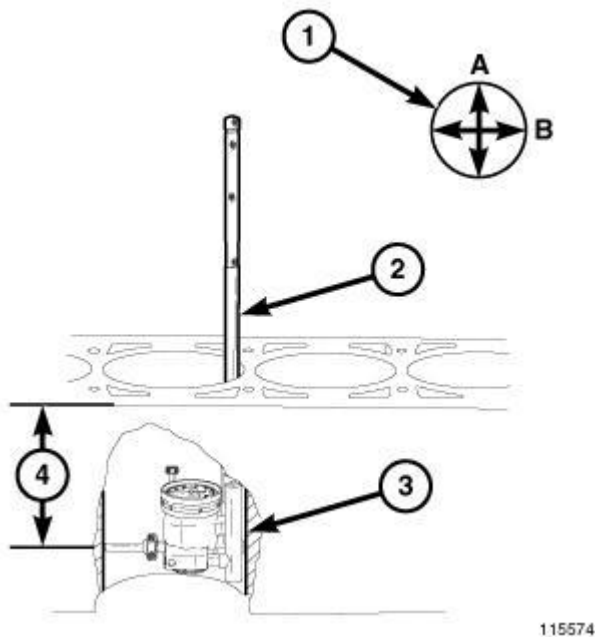


Fig. 151: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

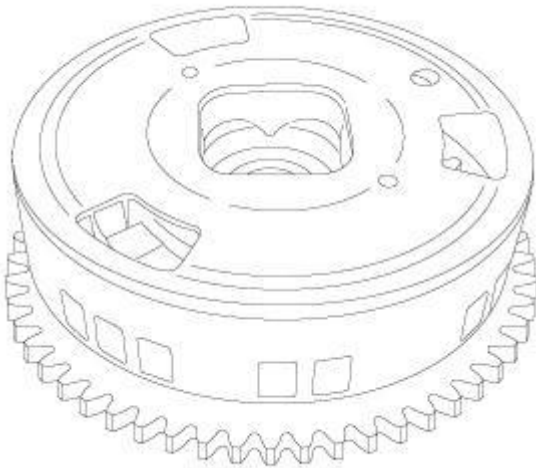
9. Use Cylinder Indicator (special tool #C-119, Cylinder Indicator) (2) to correctly measure the inside diameter of the cylinder bore (3). A cylinder bore gauge capable of reading in 0.003 mm (0.0001 in.) Increments is required. If a bore gauge is not available, do not use an inside micrometer.
10. Measure the inside diameter of the cylinder bore at three levels below the top of the bore (4). Start at the top of the bore, perpendicular (across or at 90°) to the axis of the crankshaft at point A (1).
11. Repeat the measurement near the middle of the bore then repeat the measurement near the bottom of the bore.
12. Determine the taper by subtracting the smaller diameter from the larger diameter.
13. Rotate the measuring device 90° to point B (1) and repeat the three measurements. Verify that the maximum taper is within specifications.
14. Determine out-of-roundness by comparing the difference between each measurement.
15. If the cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.015 mm (0.0006 inch) then the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds the maximum limits, replace the cylinder block.

NOTE: A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

ASSEMBLY, VARIABLE VALVE TIMING

DESCRIPTION

DESCRIPTION



1225995

Fig. 152: Variable Cam Timing (VCT) Assembly
Courtesy of CHRYSLER GROUP, LLC

The 5.7L Eagle engine is equipped with Variable Cam Timing (VCT). This system advances and/or retards the camshaft timing to improve engine performance, mid-range torque, idle quality, fuel economy, and reduce emissions. The VCT assembly is sometimes referred to as a camshaft phaser.

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

The VCT assembly consists of the camshaft sprocket and a timing phaser. The VCT phaser assembly bolts to the camshaft and is serviced as an assembly.

OPERATION

OPERATION

The Variable Cam Timing (VCT) assembly is actuated with engine oil pressure. The oil flow to the VCT assemblies is controlled by an Oil Control Valve (OCV). The OCV consists of a Pulse Width Modulated (PWM) solenoid and a spool valve. The PCM actuates the OCV to control oil flow through the spool valve into the VCT assemblies. The VCT assembly consists of a rotor, stator, and sprocket. The stator is connected to the timing chain through the sprocket. The rotor is connected to the camshaft. Oil flow into the VCT assembly rotates the rotor with respect to the stator, thus rotating the exhaust camshaft with respect to the timing chain and intake camshaft. An infinitely variable cam timing position can be achieved within the limits of the hardware. The CMP monitors the position of the camshaft with respect to the crankshaft and provides feedback to the PCM.

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

REMOVAL

REMOVAL

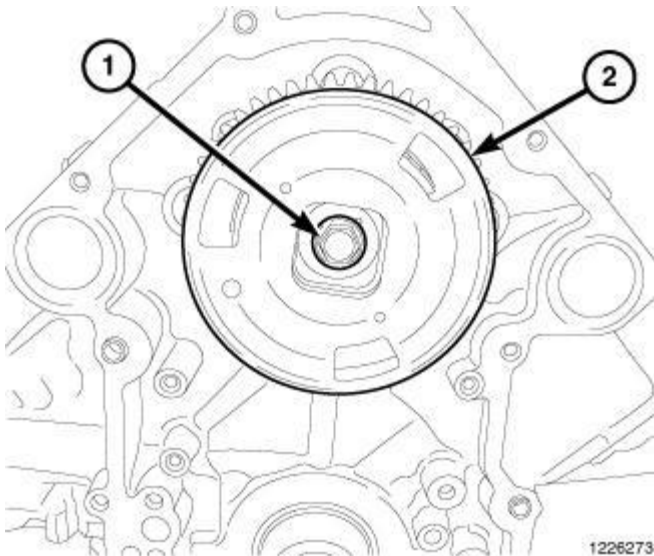


Fig. 153: Camshaft Phaser & Bolt
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

1. Remove the timing chain and sprockets. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL.
2. Remove the camshaft phaser bolt (1).
3. Remove camshaft phaser (2).

INSTALLATION

INSTALLATION

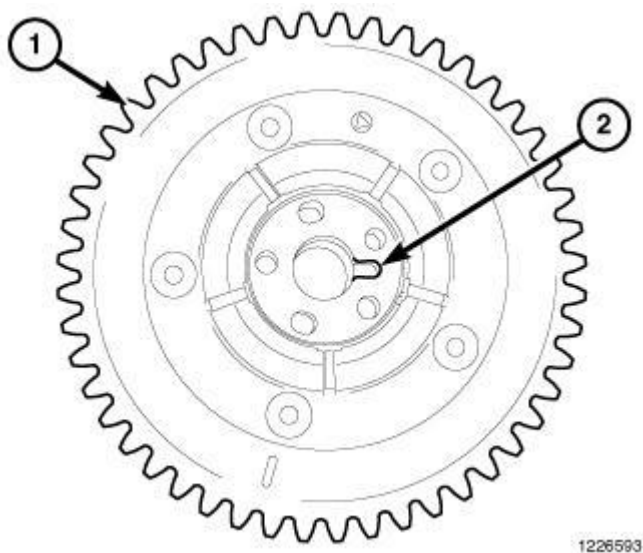
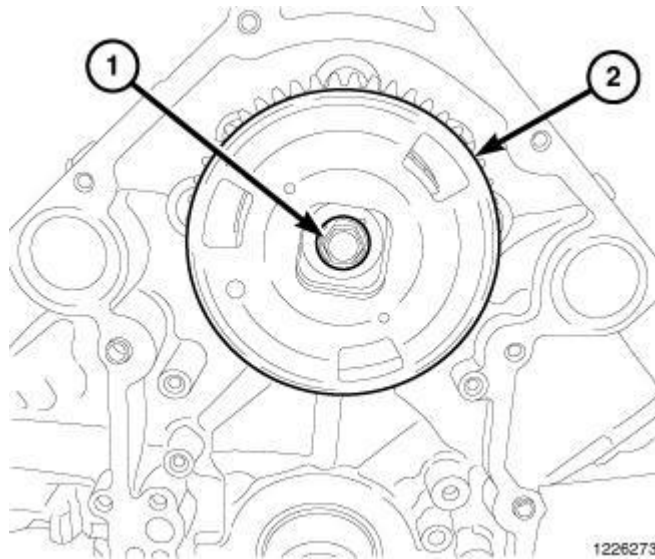


Fig. 154: Phaser Alignment Slot

Courtesy of CHRYSLER GROUP, LLC

1. Align the slot (2) in the phaser (1) with the dowel on the camshaft.

**Fig. 155: Camshaft Phaser & Bolt**

Courtesy of CHRYSLER GROUP, LLC

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

2. Position the phaser (2) in place and install phaser retaining bolt (1) and tighten to 122 N.m (90 ft. lbs.).
3. Install the timing chain and sprockets. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.

BEARING(S), CRANKSHAFT, MAIN

STANDARD PROCEDURE

STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

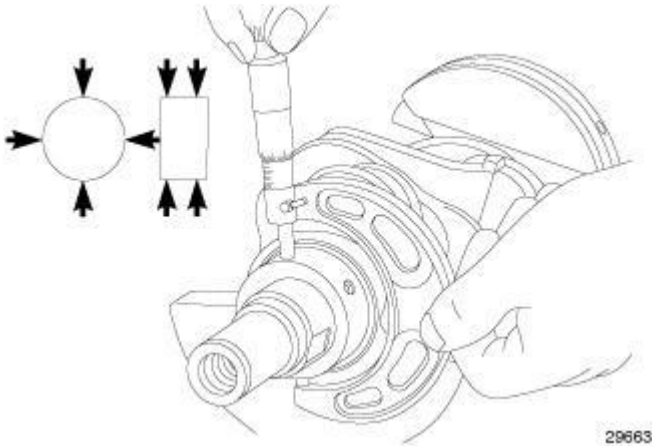


Fig. 156: Measuring Main Bearing Journal Diameter
 Courtesy of CHRYSLER GROUP, LLC

With the crankshaft removed from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.0002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select the inserts required to obtain the specified bearing-to-journal clearance.

CRANKSHAFT MAIN BEARING SELECTION

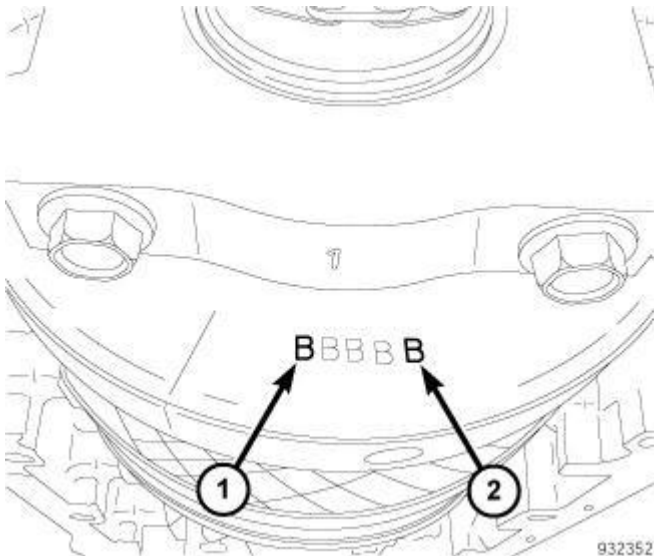


Fig. 157: Crankshaft Counterweight Stamped Grade Identification Marks
 Courtesy of CHRYSLER GROUP, LLC

The main bearings are "select fit" to achieve proper oil clearances. For main bearing selection, the crankshaft

counterweight has grade identification marks stamped into it. These marks are read from left to right. The left letter (1). Refers to the number one main journal and the right letter (2). Refers to the number 5 journal.

NOTE: Service main bearings are coded. These codes identify what size or grade of the bearing.

MAIN BEARING SELECTION CHART

GRADE MARKING	BEARING SIZE		FOR USE WITH JOURNAL SIZE	
	METRIC	STANDARD	METRIC	STANDARD
A	0.008 mm U/S	0.0004 in. U/S	64.988 - 64.995 mm	2.5585 - 2.5588 in.
B	NOMINAL		64.996 - 65.004 mm	2.5588 - 2.5592 in.
C	0.008 mm O/S	0.0004 in. O/S	65.005 - 65.012 mm	2.5592 - 2.5595 in.

INSPECTION

INSPECTION

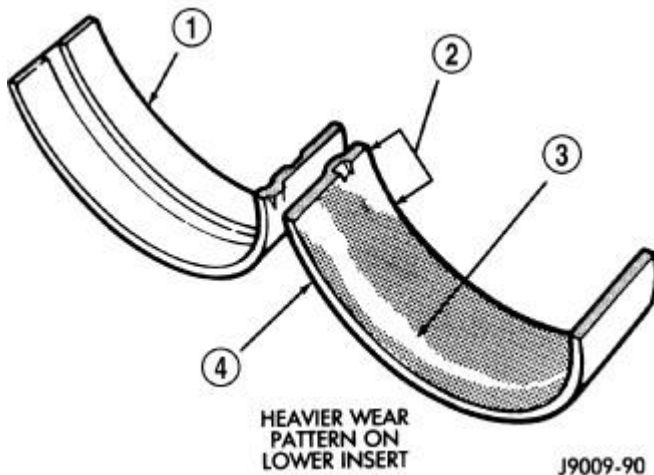


Fig. 158: Main Bearing Wear Patterns
Courtesy of CHRYSLER GROUP, LLC

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

NOTE: If any crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

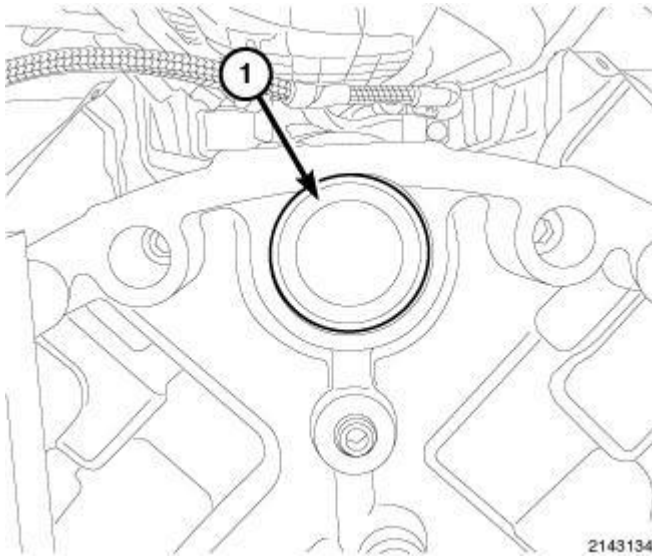
CAMSHAFT, ENGINE**REMOVAL****CAMSHAFT CORE HOLE PLUG**

Fig. 159: Camshaft Core Hole Plug

Courtesy of CHRYSLER GROUP, LLC

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .
2. Remove the engine from the vehicle. Refer to **L REMOVAL** .
3. Remove the flexplate. Refer to **FLEXPLATE, REMOVAL** .

CAUTION: Do not damage the rear surface of the camshaft or the core plug sealing surface, when removing the core plug.

4. Using a suitable sharp punch, punch a small hole in the camshaft core hole plug (1).
5. Insert a short sheet metal screw into the small hole in the camshaft core hole plug.
6. Using a suitable slide hammer puller, remove the rear camshaft core hole plug.

CAMSHAFT

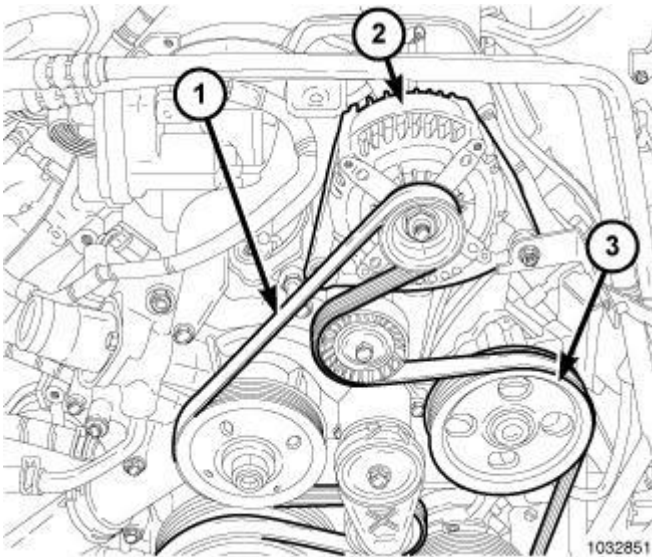


Fig. 160: Accessory Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

1. Remove the battery negative cable.
2. Remove the air cleaner assembly. Refer to **BODY, AIR CLEANER, REMOVAL** .
3. Drain coolant. Refer to **STANDARD PROCEDURE** .
4. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
5. Remove the left and right cylinder heads. Refer to **CYLINDER HEAD, REMOVAL** .
6. Remove the radiator. Refer to **RADIATOR, ENGINE COOLING, REMOVAL** .
7. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .
8. Remove timing case cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL** .

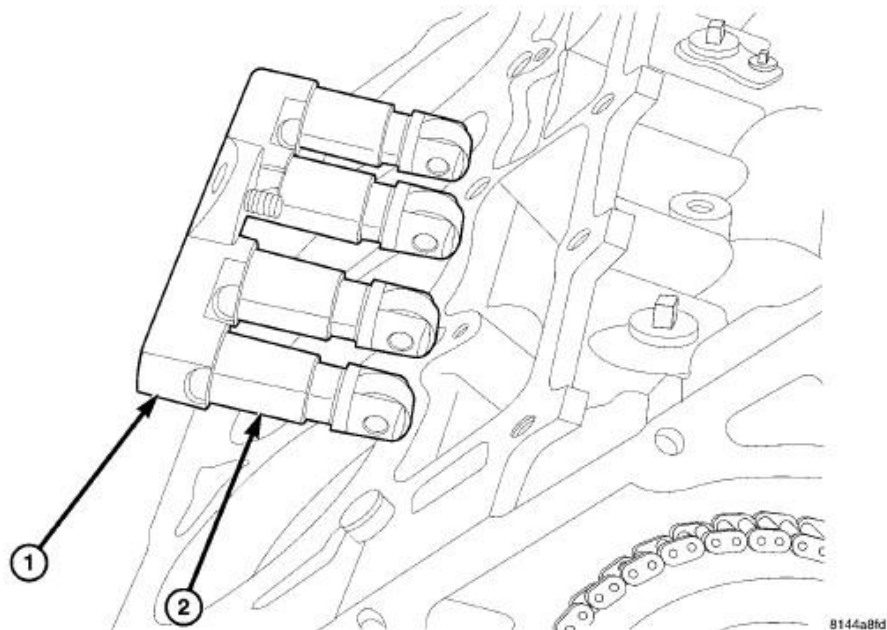


Fig. 161: Removing/Installing Hydraulic Roller Tappet
Courtesy of CHRYSLER GROUP, LLC

NOTE: Identify lifters to ensure installation in original location.

9. Remove the tappets (2) and retainer (1) assembly.

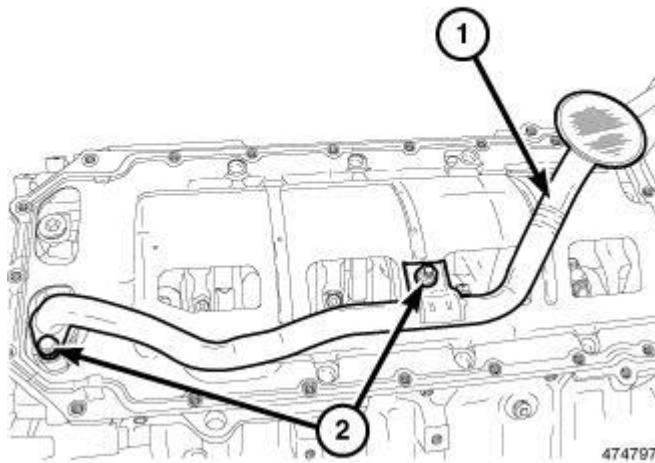


Fig. 162: Oil Pick Up Tube
Courtesy of CHRYSLER GROUP, LLC

10. Remove the oil pick up tube (1).

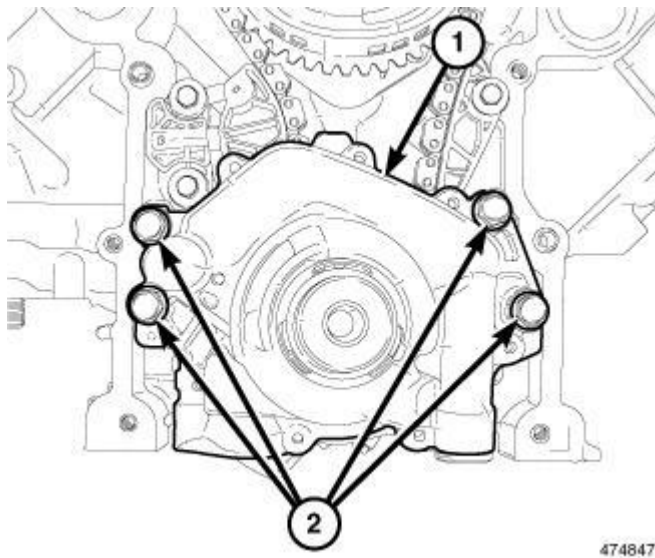


Fig. 163: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Remove the oil pump retaining bolts (2) and remove the oil pump (1).

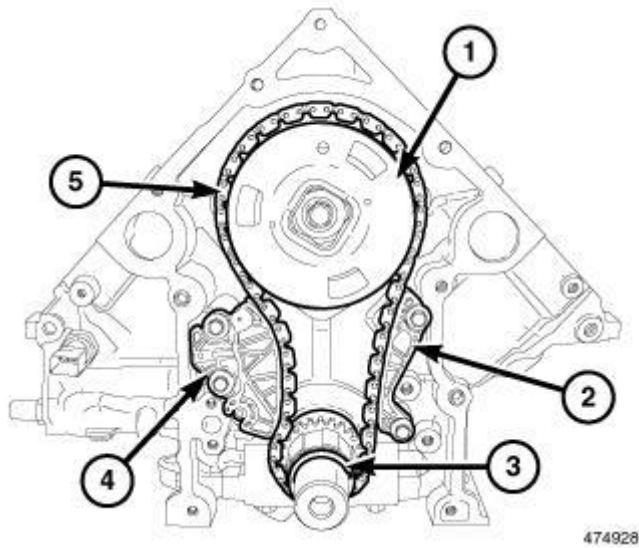


Fig. 164: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
 Courtesy of CHRYSLER GROUP, LLC

12. Remove timing chain (5). Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL.

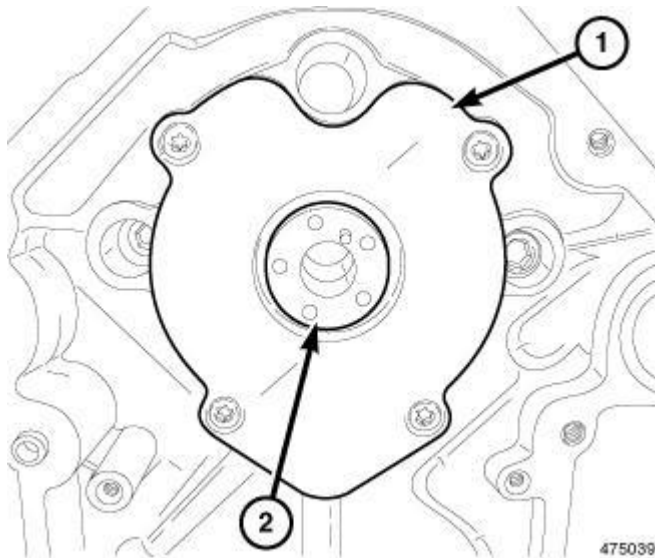


Fig. 165: Camshaft Thrust Plate
 Courtesy of CHRYSLER GROUP, LLC

13. Remove camshaft thrust plate (1).

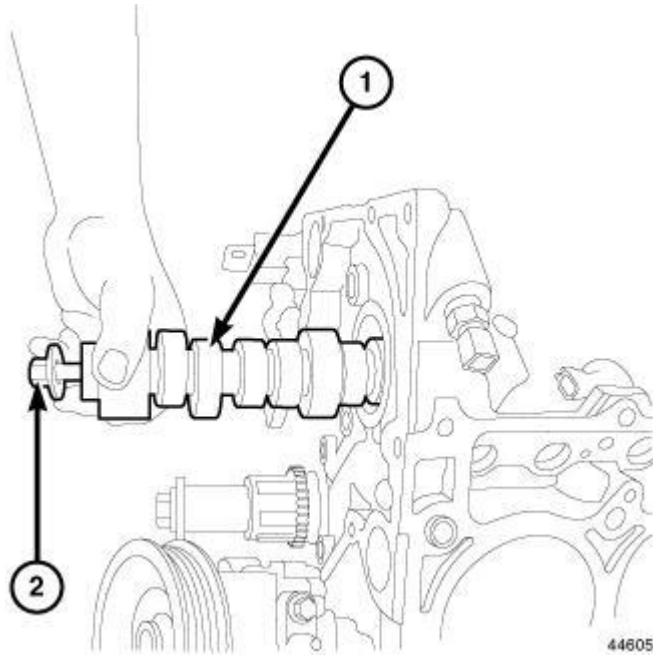


Fig. 166: Removing/Installing Camshaft
Courtesy of CHRYSLER GROUP, LLC

NOTE: **Slowly rotate the camshaft while pulling camshaft out.**

14. Install a long bolt (2) into front of camshaft (1) to aid in removal of the camshaft. Remove camshaft, being careful not to damage cam bearings with the cam lobes.

INSPECTION

INSPECTION

The cam bearings are not serviceable. Do not attempt to replace cam bearings for any reason. If the cam bearings are damaged, the cylinder block must be replaced.

INSTALLATION

CAMSHAFT CORE HOLE PLUG

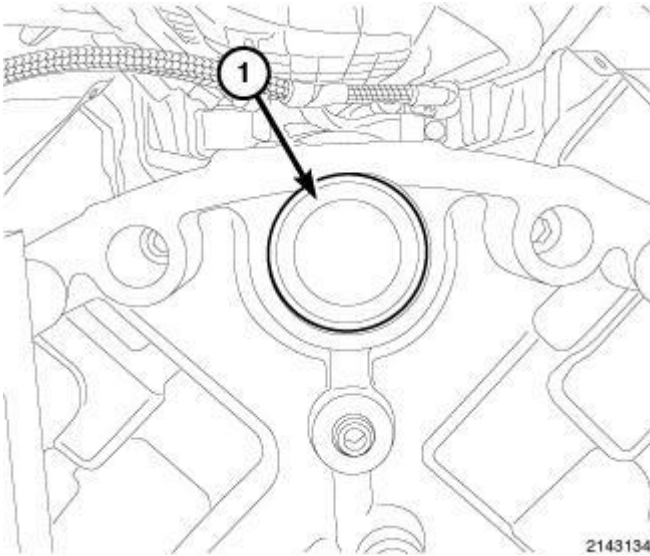


Fig. 167: Camshaft Core Hole Plug

Courtesy of CHRYSLER GROUP, LLC

1. Clean the core hole in the cylinder block.

NOTE: Do not apply adhesive to the new camshaft core hole plug. A new plug has adhesive pre-applied.

2. Install a new camshaft core hole plug (1) located at the rear of cylinder block, using a suitable flat faced tool. The plug must be fully seated on the cylinder block shoulder.
3. Install the flexplate. Refer to **FLEXPLATE, INSTALLATION** .
4. Install the engine. Refer to **INSTALLATION** .

CAMSHAFT

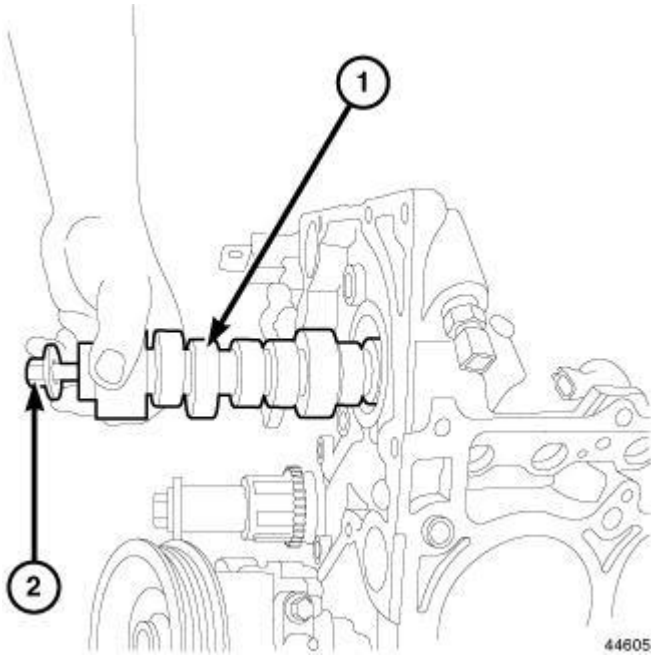


Fig. 168: Removing/Installing Camshaft
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the camshaft lobes and camshaft bearing journals and insert the camshaft (1).

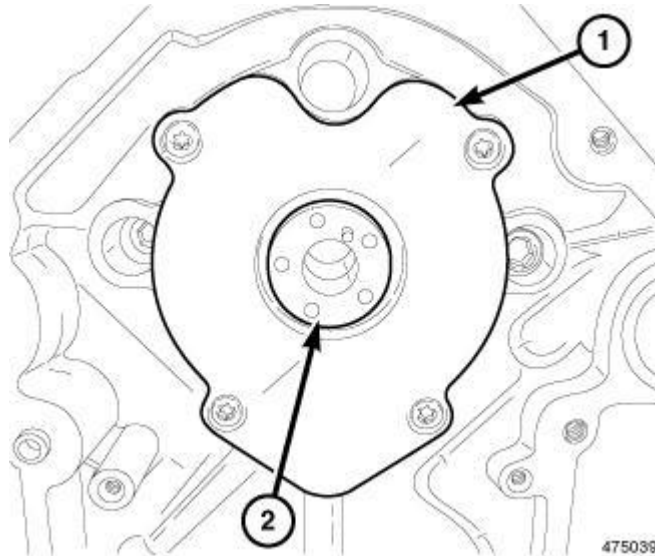


Fig. 169: Camshaft Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

NOTE: Ensure that the plate is installed on the correct side. The fasteners are flat head fasteners so the top of the head of the fastener should not stick above the front face of the plate after they are torqued. The plate has chamfered fastener holes and the chamfered side should be facing forward to ensure the fasteners are flush or below the front surface.

2. Install the camshaft thrust plate (1).

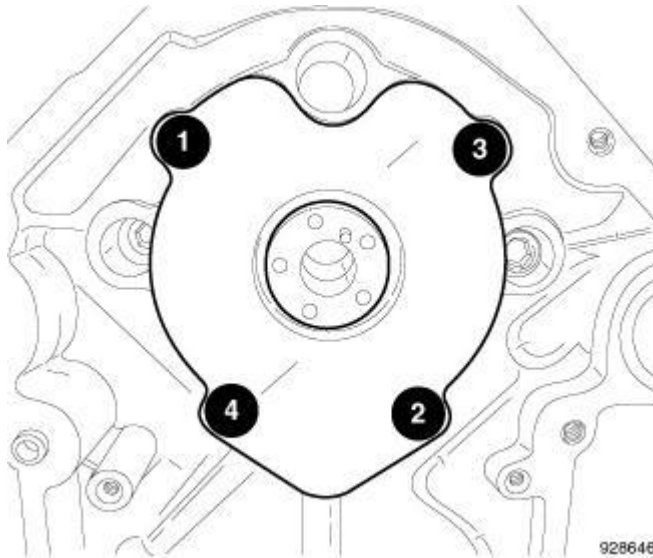


Fig. 170: Camshaft Thrust Plate Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

3. Using the sequence shown in illustration, tighten the bolts to 12 N.m (9 ft. lbs.).

NOTE: The camshaft phaser must be installed before the camshaft end play can be measured.

4. Measure camshaft end play. Refer to **ENGINE SPECIFICATIONS**.
5. If not within limits, disassemble, clean, and inspect for burrs or debris. Reassemble and measure end play again. If the end play is still out, then install a new thrust plate.

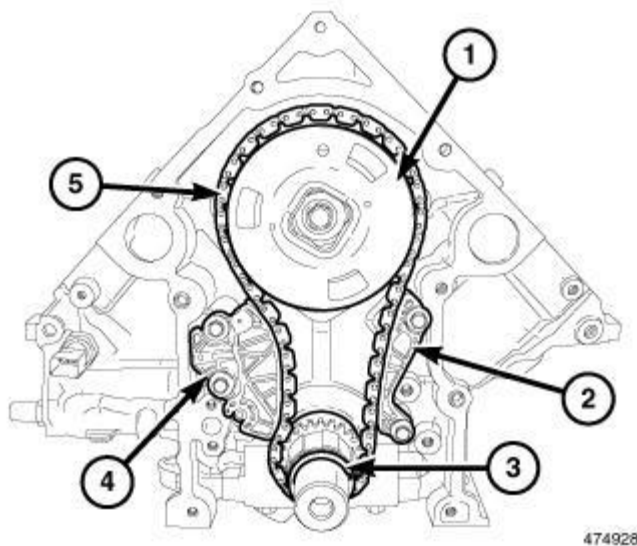


Fig. 171: Timing Chain, Sprockets, Timing Chain Tensioner & Guide

Courtesy of CHRYSLER GROUP, LLC

6. Install the timing chain (5) and sprockets (1, 3). Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
7. Install the timing chain tensioner arm (4) and guide (2).

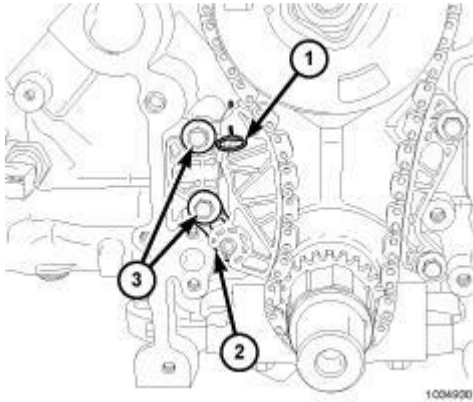


Fig. 172: Timing Chain Tensioner Pin
Courtesy of CHRYSLER GROUP, LLC

8. Remove the tensioner pin (special tool #8514, Pins, Tensioner) (1).

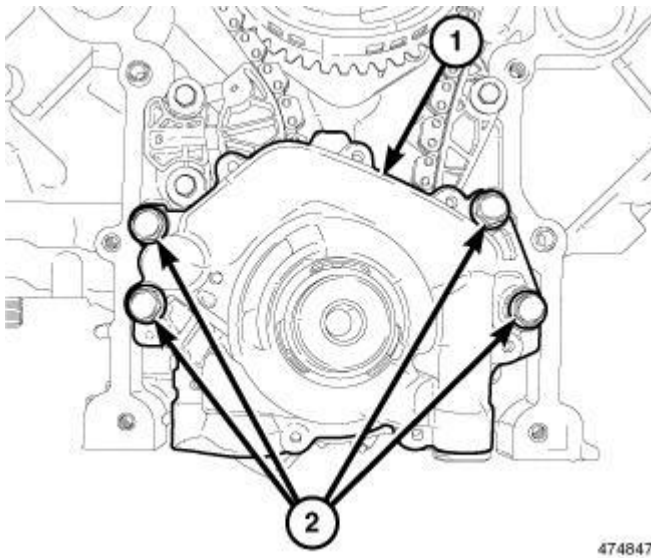


Fig. 173: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the oil pump (1) and tighten bolts to 28 N.m (21 ft. lbs.). Refer to **PUMP, ENGINE OIL, INSTALLATION**.

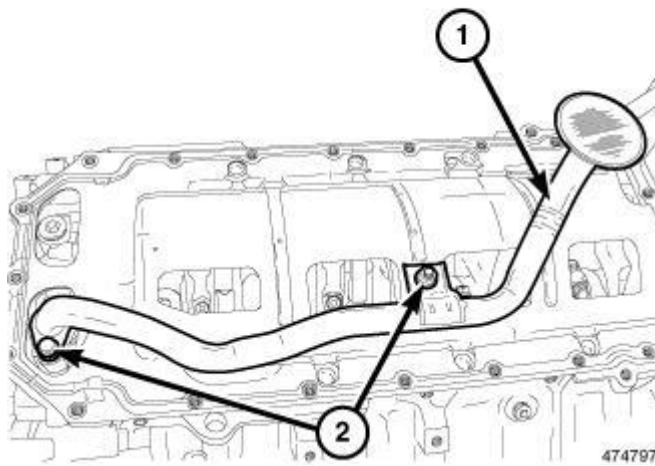


Fig. 174: Oil Pick Up Tube

Courtesy of CHRYSLER GROUP, LLC

10. Inspect the oil pick up tube O-rings and replace as necessary.
11. Install the oil pick up tube (1) and tighten fasteners (2) to 28 N.m (21 ft. lbs.).
12. Install the timing chain cover. Refer to L COVER(S), ENGINE TIMING, INSTALLATION .
13. Install the oil pan. Refer to PAN, OIL, INSTALLATION .

CAUTION: Engines equipped with MDS use both standard roller lifters (2) and deactivating roller lifters (1). The deactivating roller lifters must be used in cylinders 1, 4, 6, 7. The deactivating lifters can be identified by the two holes in the side of the lifter body (3), for the latching pins.

NOTE: Each tappet reused must be installed in the same position from which it was removed. When camshaft is replaced, all of the tappets must be replaced.

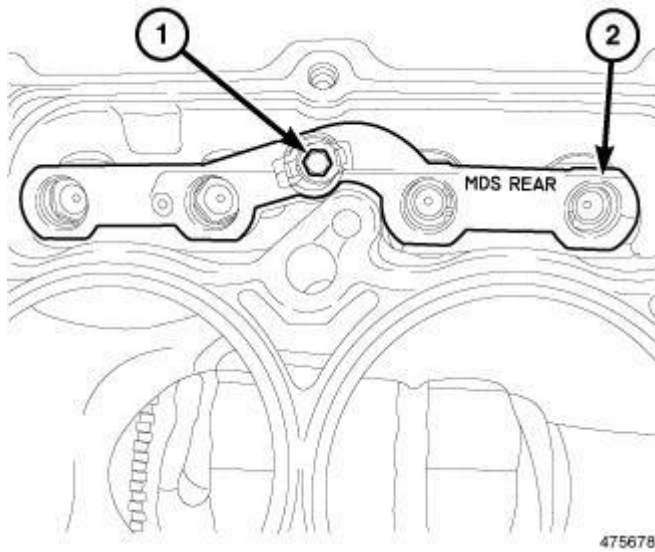


Fig. 175: Rear MDS Lifter Assembly
Courtesy of CHRYSLER GROUP, LLC

14. Install the rear MDS lifter assembly (2) and tighten bolt (1) to 12 N.m (106 in. lbs.)

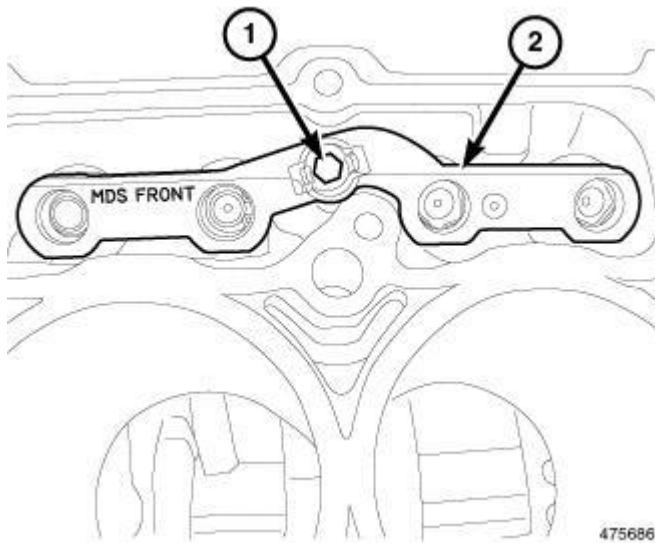
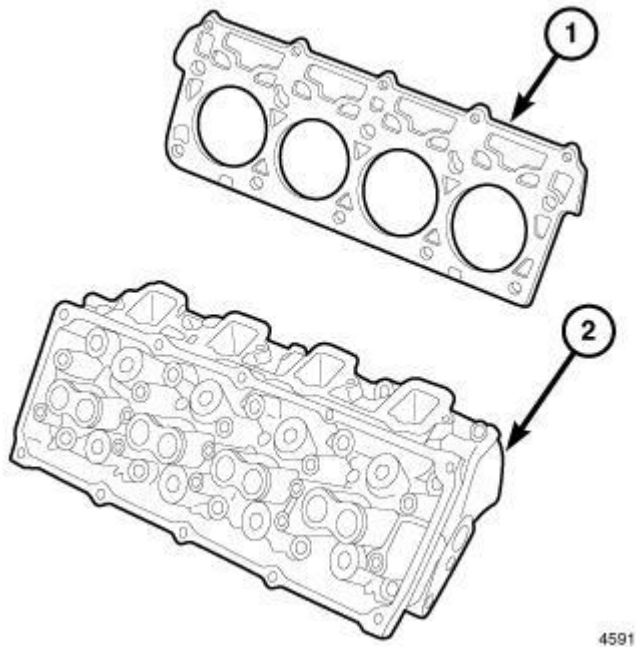


Fig. 176: Front MDS Lifter Assembly
Courtesy of CHRYSLER GROUP, LLC

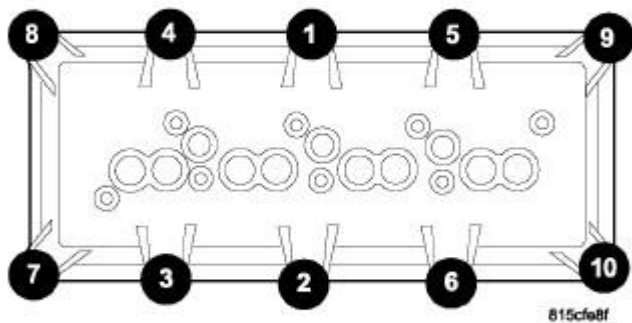
15. Install the front MDS lifter assembly (2) and tighten bolt (1) to 12 N.m (106 in. lbs.).



4591

Fig. 177: Cylinder Head & Gasket
 Courtesy of CHRYSLER GROUP, LLC

16. Install both the left and right cylinder heads (4). Refer to CYLINDER HEAD, INSTALLATION .
17. Install pushrods.
18. Install rocker arms. Refer to ROCKER ARM, VALVE, INSTALLATION .



815c98f

Fig. 178: Cylinder Head Cover Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

19. Install cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION** .

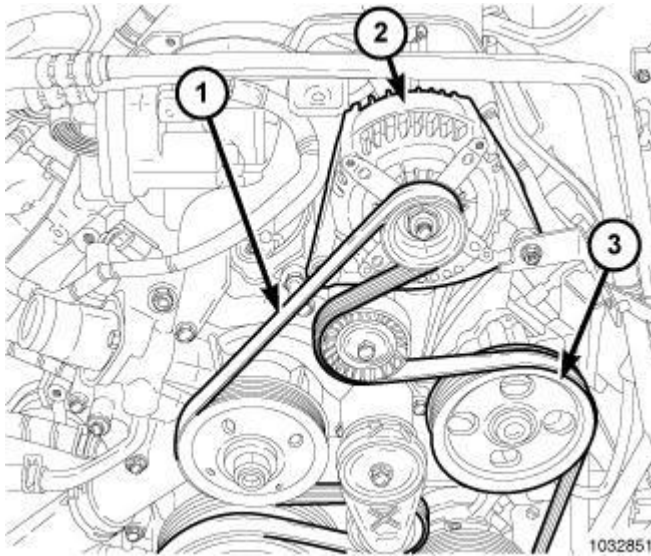


Fig. 179: Accessory Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

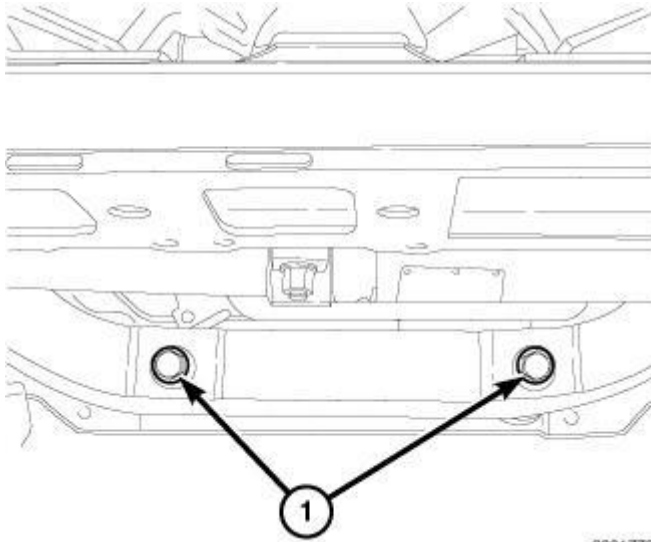
20. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION** .
21. Install the generator (2).
22. Install the power steering pump (3).
23. Install the accessory drive belt (1). Refer to **BELT, SERPENTINE, INSTALLATION** .
24. Install the radiator. Refer to **RADIATOR, ENGINE COOLING, INSTALLATION** .
25. Install the air cleaner assembly. Refer to **BODY, AIR CLEANER, INSTALLATION** .
26. Install the negative battery cable.
27. Fill the radiator with coolant. Refer to **STANDARD PROCEDURE** .
28. Fill the engine with oil. Refer to **FILTER, ENGINE OIL, INSTALLATION** .
29. Start the engine and check for leaks.

COVER, STRUCTURAL DUST

REMOVAL

REMOVAL

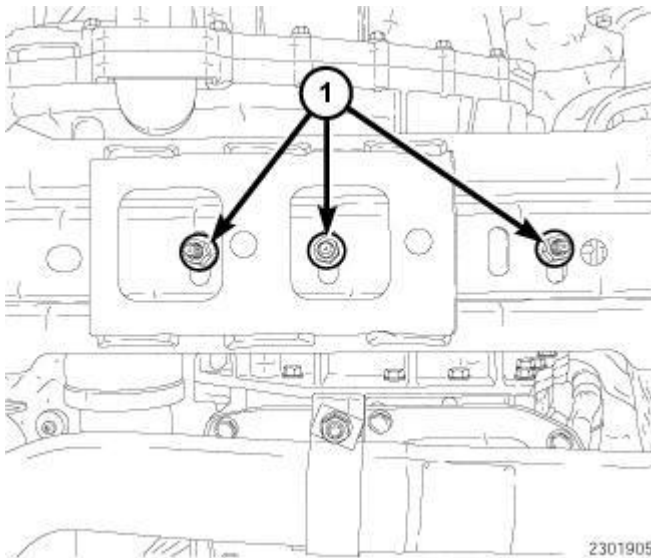
1. Raise and support the vehicle.



2301773

Fig. 180: Steering Rack To Frame Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

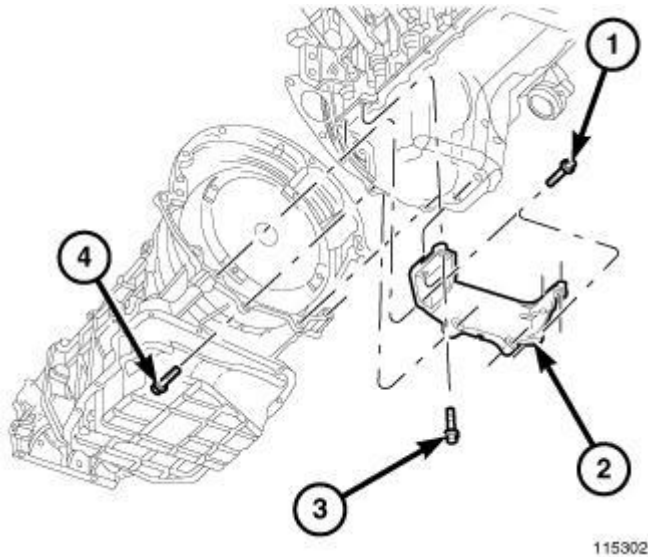
2. Remove the steering rack to frame mounting bolts (1) and lower the steering rack enough to gain clearance for the structural dust cover removal.



2301905

Fig. 181: Transmission Mount To Crossmember Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

3. Remove the transmission mount to crossmember retaining nuts (1).
4. Using a suitable jack, lift the transmission enough to gain clearance for the structural dust cover removal.

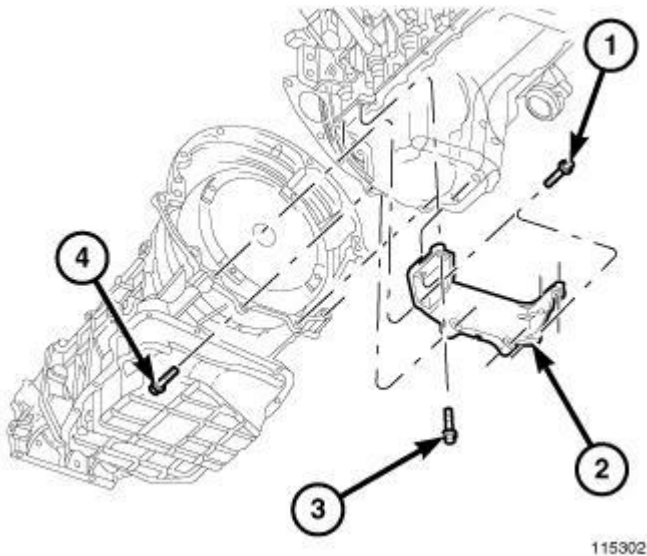
**Fig. 182: Structural Cover**

Courtesy of CHRYSLER GROUP, LLC

5. Remove the structural dust cover retaining bolts (1, 3 & 4).
6. Remove the structural dust cover (2).

INSTALLATION**INSTALLATION**

CAUTION: The structural dust cover must be installed as described in the following steps. Failure to do so may cause severe damage to the cover.

**Fig. 183: Structural Cover**

Courtesy of CHRYSLER GROUP, LLC

1. Position the structural dust cover in the vehicle
2. Install all four bolts retaining the structural dust cover to the engine (3) hand tight.
3. Install the four cover to transmission bolts (1, 2 & 4) hand tight.

CAUTION: The structural dust cover must be held tightly against both the engine and the transmission bell housing during the tightening sequence. Failure to do so may cause severe damage to the cover.

4. Tighten the structural dust cover-to-transmission bolts (1, 2 & 4) to 9 N.m (80 in. lbs.).
5. Tighten the structural dust cover-to-engine block bolts (3) to 9 N.m (80 in. lbs.).
6. Retighten the structural dust cover-to-transmission bolts to 54 N.m (40 ft. lbs.).
7. Retighten the structural dust cover-to-engine block bolts to 54 N.m (40 ft. lbs.).

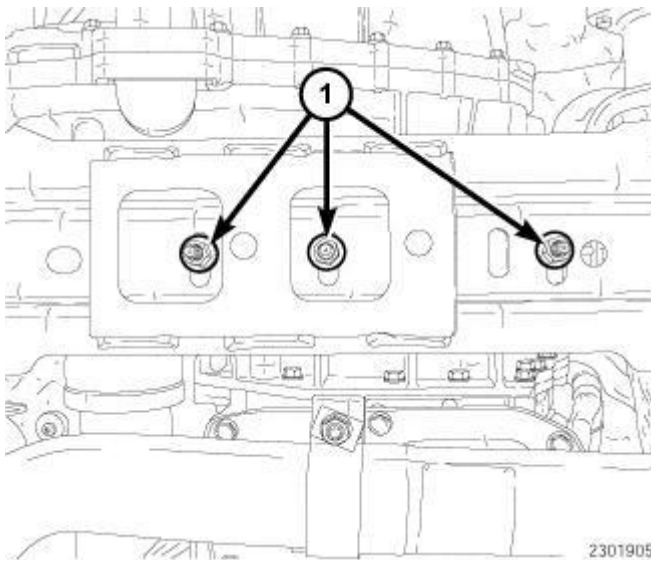
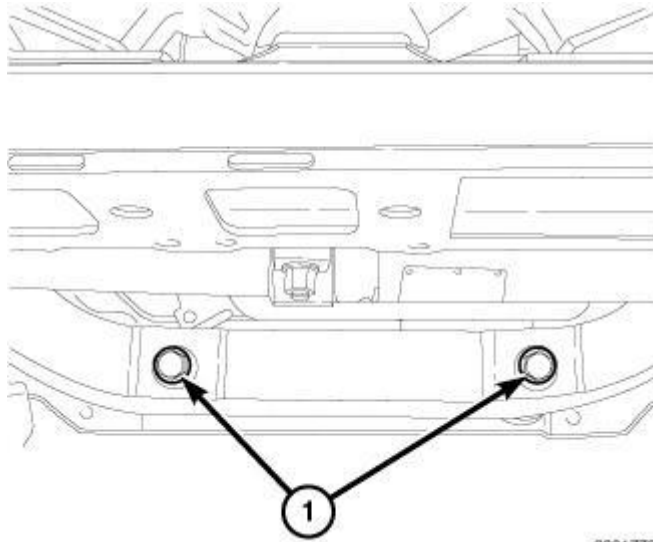


Fig. 184: Transmission Mount To Crossmember Retaining Nuts
Courtesy of CHRYSLER GROUP, LLC

8. Lower the transmission onto the crossmember and remove the jack.
9. Install the transmission mount to crossmember retaining nuts (1) and tighten to 54 N.m (40 ft. lbs.).



2301773

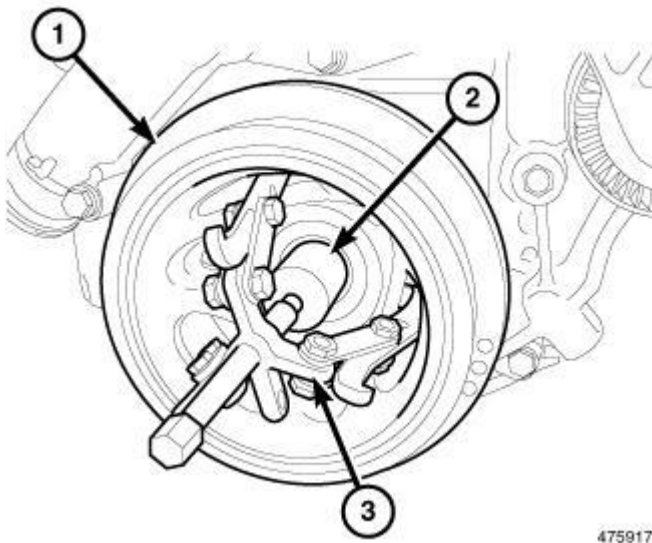
Fig. 185: Steering Rack To Frame Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Position the steering rack to the frame, install the bolts (1) and tighten bolts/nuts to 258 N.m (190 ft. lbs.).
11. Lower the vehicle.

CRANKSHAFT

REMOVAL

REMOVAL



475917

Fig. 186: Removing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

1. Remove engine. Refer to **REMOVAL**.

2. Remove the vibration damper (1) using Crankshaft Insert (special tool #8513A, Insert, Crankshaft) (2) and Puller (special tool #1023, Puller) (3). Refer to **DAMPER, VIBRATION, REMOVAL** .

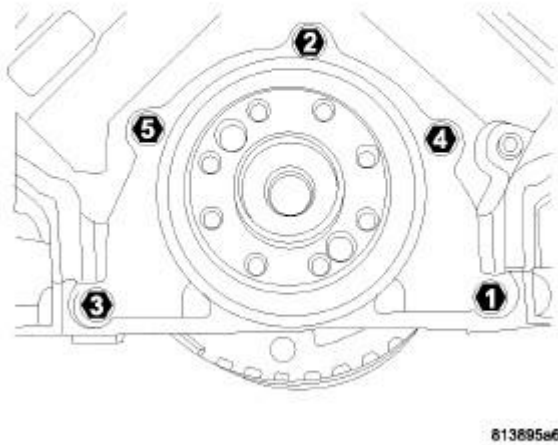


Fig. 187: Rear Seal Retainer Torque Sequence
 Courtesy of CHRYSLER GROUP, LLC

3. Remove the rear oil seal retainer. Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, REMOVAL** .
4. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .

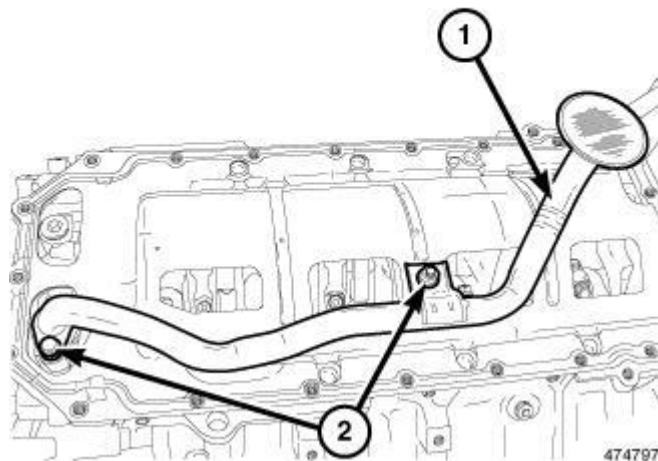


Fig. 188: Oil Pick Up Tube
 Courtesy of CHRYSLER GROUP, LLC

5. Remove the oil pump pickup (1).
6. Remove the windage tray/oil pan gasket.
7. Remove the timing chain cover . Refer to **COVER(S), ENGINE TIMING, REMOVAL** .

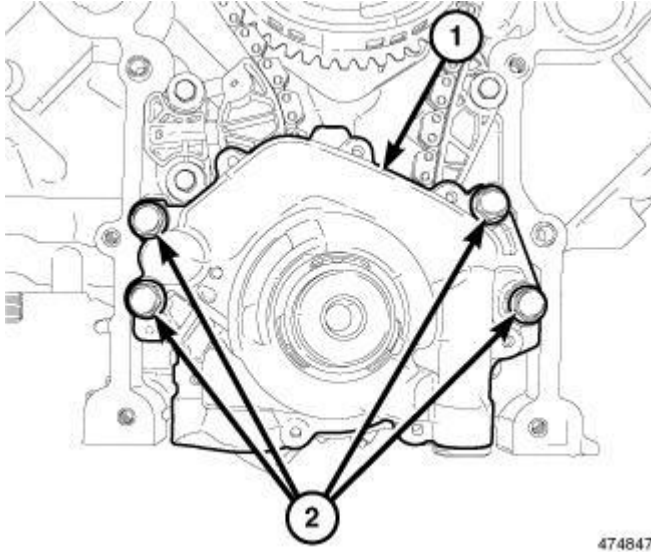


Fig. 189: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove the oil pump (1). Refer to **PUMP, ENGINE OIL, REMOVAL** .

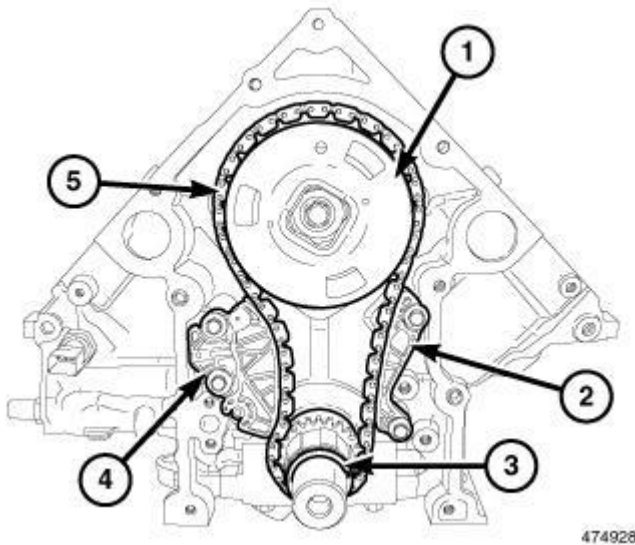


Fig. 190: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
Courtesy of CHRYSLER GROUP, LLC

9. Remove the timing chain (5) and sprockets (1, 3). Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL**.

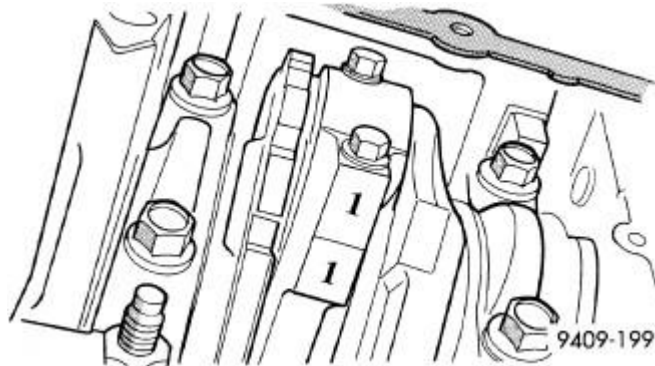


Fig. 191: Identifying Mark On Connecting Rod And Bearing Cap
Courtesy of CHRYSLER GROUP, LLC

10. Identify rod bearing caps before removal. Remove rod bearing caps with bearings.

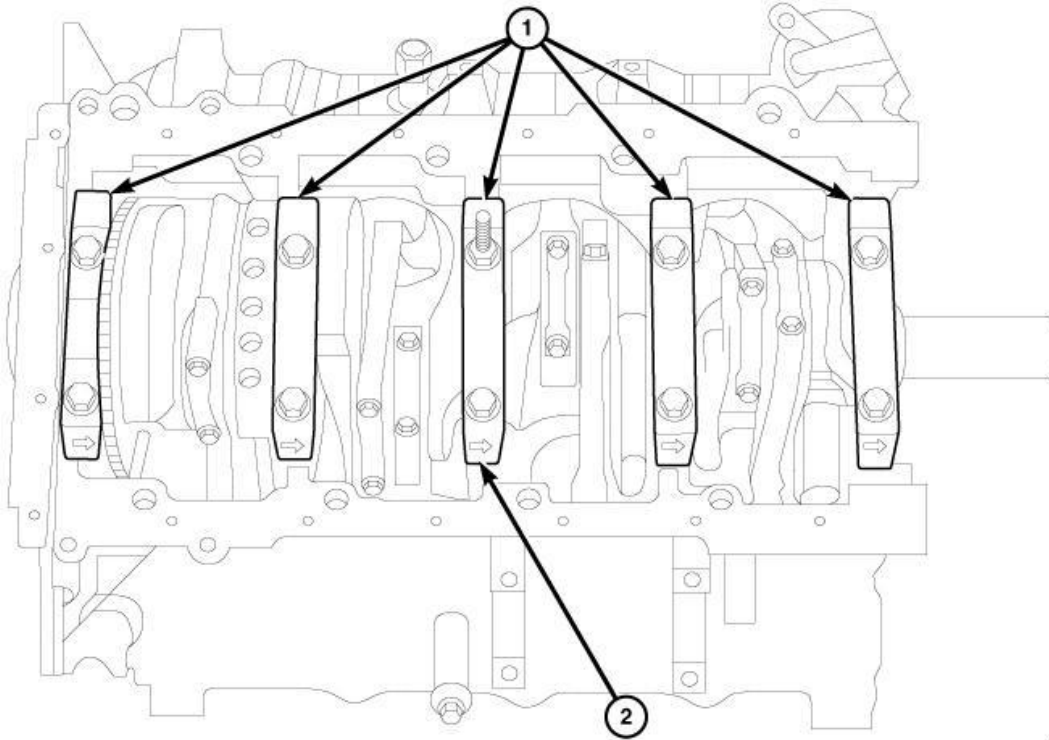


Fig. 192: Main Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

11. Identify main bearing caps (1) before removal.

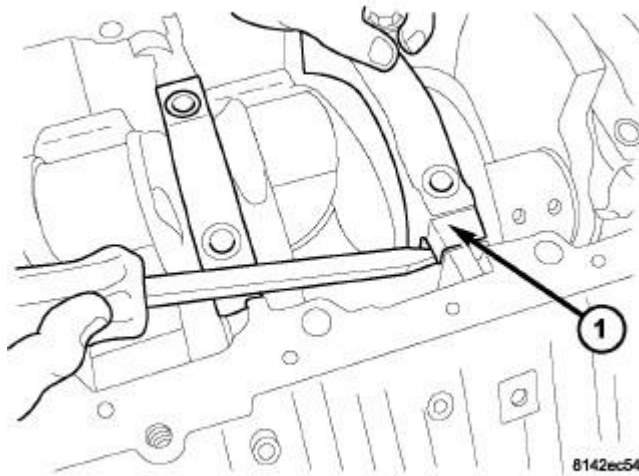


Fig. 193: Main Bearing Cap Removal
Courtesy of CHRYSLER GROUP, LLC

12. Remove main bearing cap bolts.
13. Remove main bearing caps (1) and bearings one at a time.

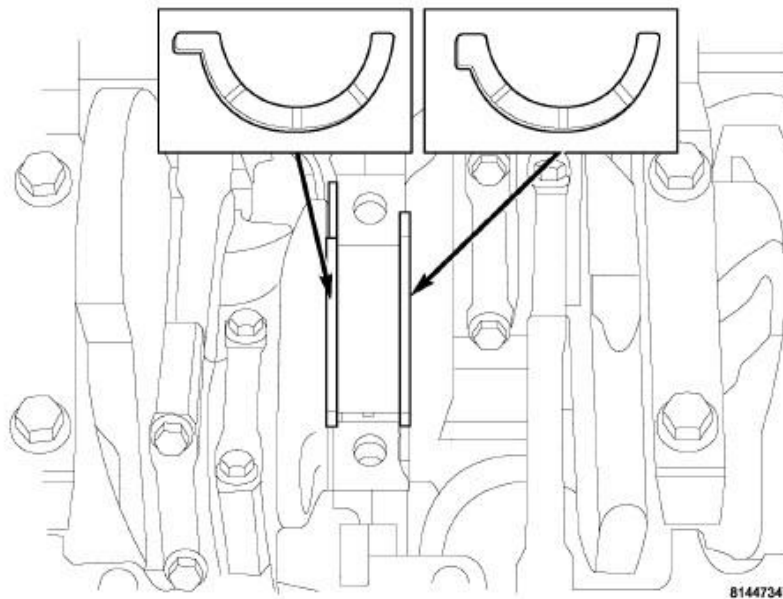
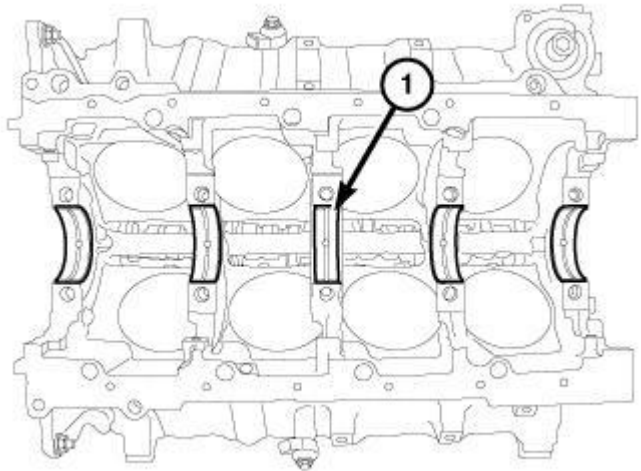


Fig. 194: Identifying Thrust Washer Locations
Courtesy of CHRYSLER GROUP, LLC

14. Remove the thrust washers.
15. Remove the crankshaft out of the block.

INSTALLATION

INSTALLATION

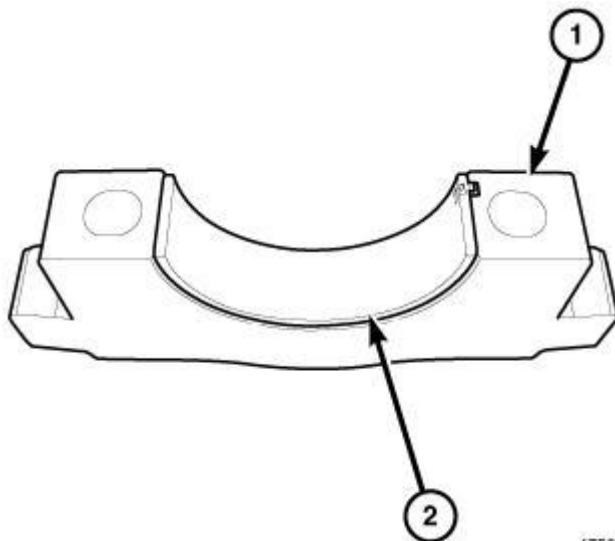


475697

Fig. 195: Main Bearings

Courtesy of CHRYSLER GROUP, LLC

1. Select the proper main bearings. Refer to **BEARING(S), CRANKSHAFT, MAIN**.
2. Install main bearings in block (1).

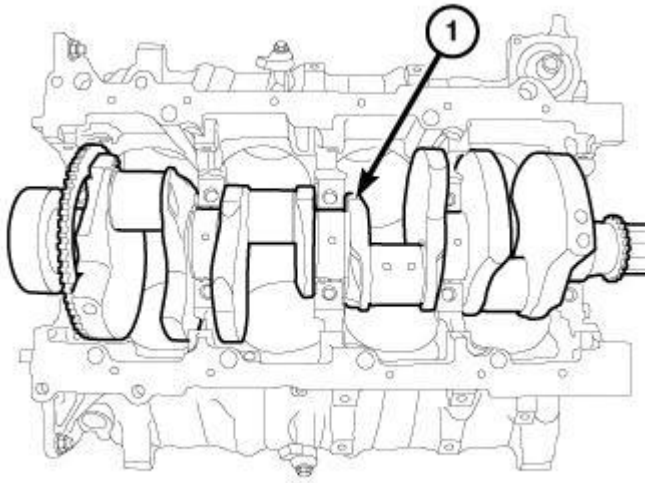


475850

Fig. 196: Main Bearing Shells In The Bearing Caps

Courtesy of CHRYSLER GROUP, LLC

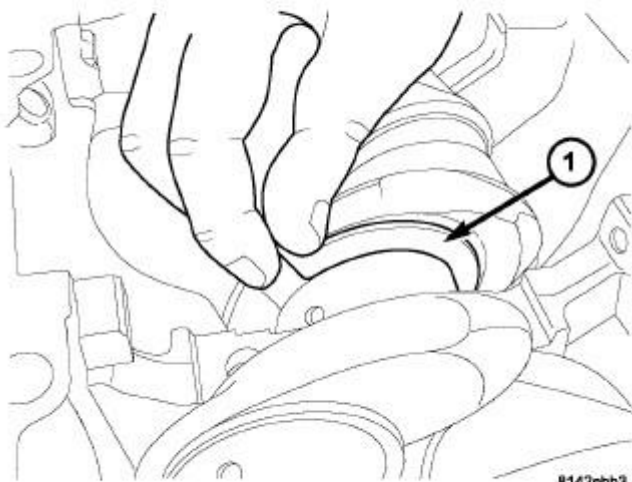
3. Install main bearing shells (2) in the bearing caps (1).



475840

Fig. 197: Crankshaft**Courtesy of CHRYSLER GROUP, LLC**

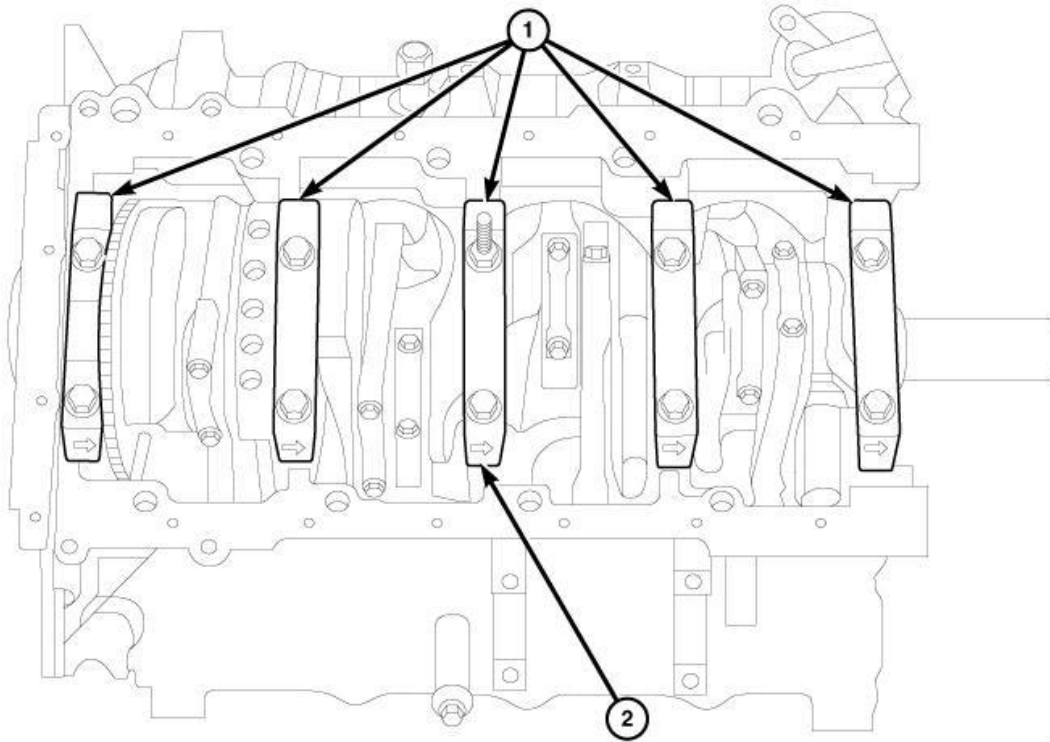
4. Lubricate the main bearing shells with clean engine oil.
5. Position the crankshaft (1) into the cylinder block.



8142ebb3

Fig. 198: Removing/Installing Thrust Washer**Courtesy of CHRYSLER GROUP, LLC**

6. Lubricate and install the thrust bearings (1).

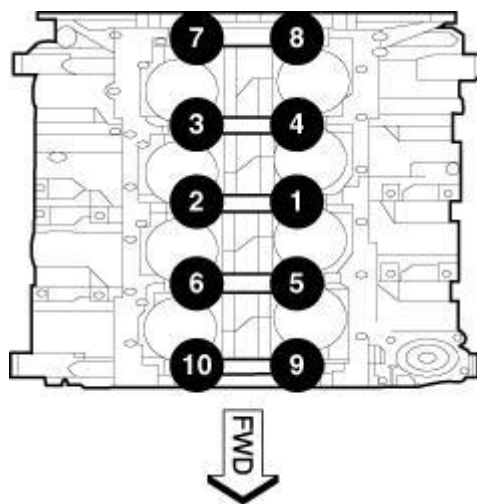


44625

Fig. 199: Main Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

NOTE: The main cap crossbolts are torqued after final torque of the main cap bolts. Always use a new washer/seal on crossbolts.

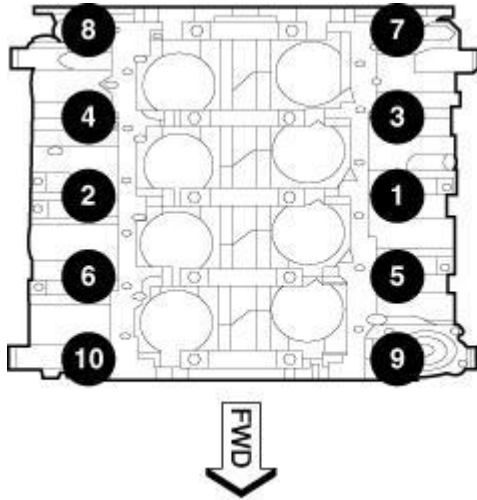
7. Clean and oil all cap bolts. Install all main bearing caps (1) making sure the arrow (2) faces forward.



4715

Fig. 200: Main Bearing Cap Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

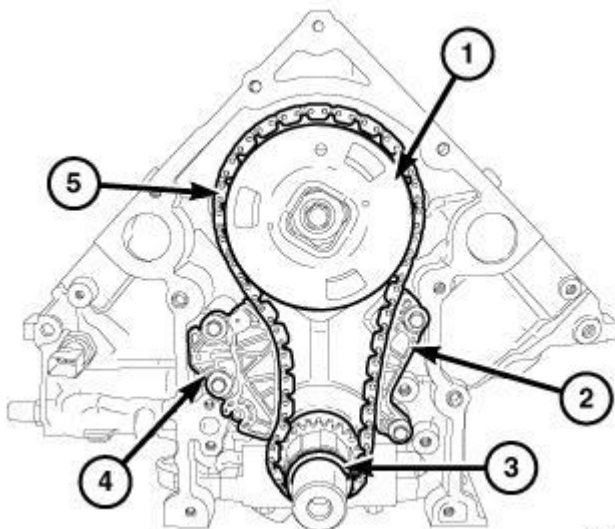
8. Tighten main bearing cap bolts to 13 N.m (10 ft. lbs.) in the sequence shown in illustration.
9. Tighten main bearing cap bolts to 27 N.m (20 ft. lbs.) in the sequence shown in illustration.
10. Rotate main cap bolts an additional 90° in the sequence shown in illustration.



161728

Fig. 201: Crossbolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

11. Install the crossbolts with new seal washer. Starting with crossbolt A,
12. Tighten crossbolt to 28 N.m (21 ft. lbs.).
13. Repeat crossbolt tightening procedure.
14. Measure crankshaft end play. Refer to **BEARING(S), CRANKSHAFT, MAIN** .
15. Position the connecting rods onto the crankshaft and install the rod bearing caps. Refer to **ROD, PISTON AND CONNECTING, INSTALLATION** .



474928

Fig. 202: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
Courtesy of CHRYSLER GROUP, LLC

16. Install timing chain (5) and sprockets (1, 3). Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
17. Install the timing chain tensioner (4) and guide (2).

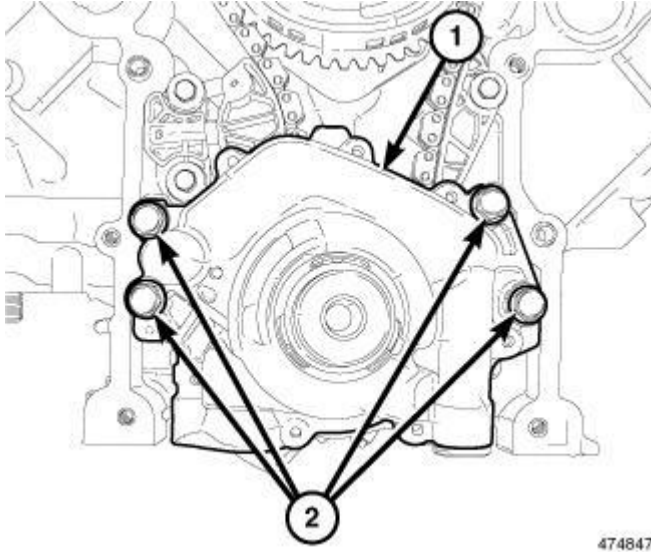


Fig. 203: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

18. Install the oil pump (1). Refer to **PUMP, ENGINE OIL, INSTALLATION**.
19. Install the timing chain case cover (1). Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.

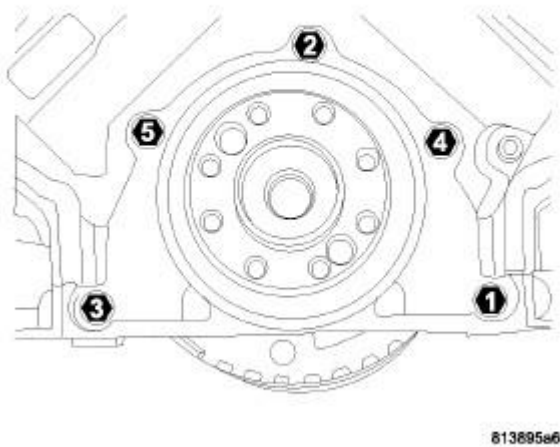


Fig. 204: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

20. Install the rear main seal and retainer. Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, INSTALLATION** .

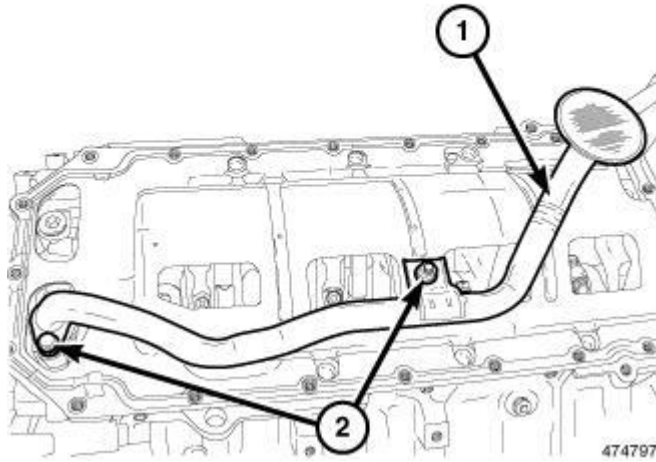


Fig. 205: Oil Pick Up Tube

Courtesy of CHRYSLER GROUP, LLC

21. Install the windage tray/oil pan gasket.
22. Inspect oil pick up tube O-rings, replace as necessary.
23. Install the oil pick up tube (1) and tighten fasteners (2) to 28 Nm (248 in. lbs.).
24. Install the oil pan. Refer to **PAN, OIL, INSTALLATION** .
25. Install the vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION** .
26. Install the engine. Refer to **INSTALLATION** .

DAMPER, VIBRATION

REMOVAL

REMOVAL

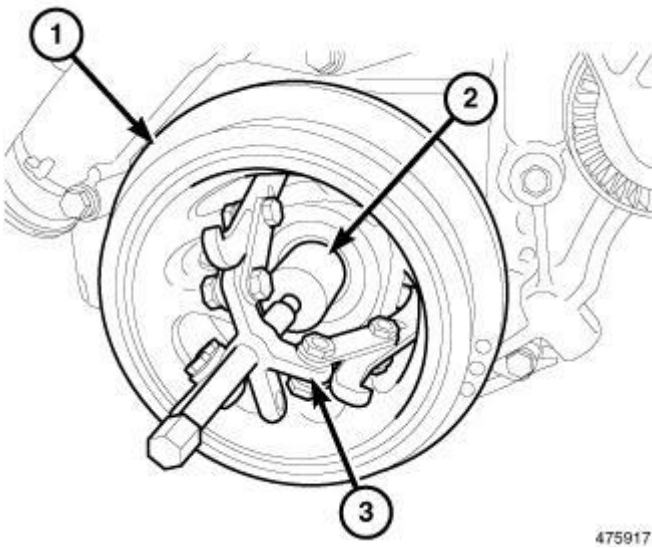


Fig. 206: Removing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

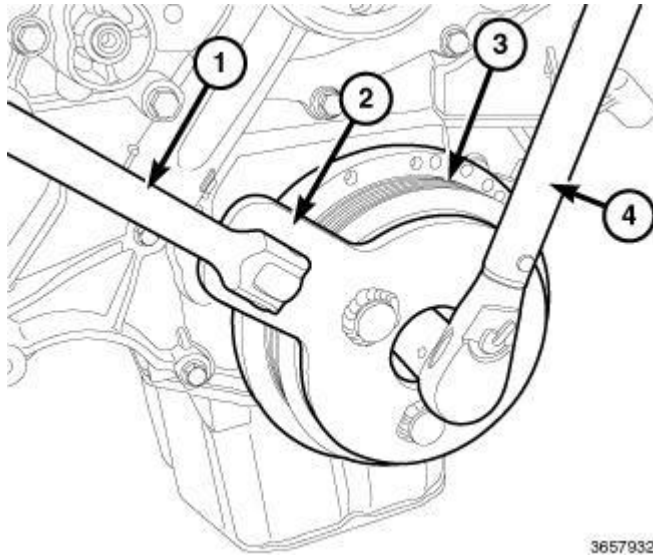
1. Disconnect negative cable from battery.
2. If equipped, remove the secondary generator belt. Refer to **BELT, SERPENTINE, REMOVAL** .
3. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
4. Raise the vehicle.
5. Remove the lower fan shroud.
6. Remove crankshaft damper bolt.
7. Remove damper (1) using Crankshaft Insert (special tool #8513A, Insert, Crankshaft) (2) and Three Jaw Puller (special tool #1023, Puller) (3).

INSTALLATION

INSTALLATION

CAUTION: To prevent severe damage to the crankshaft, damper, and damper installer, thoroughly clean the damper bore and the crankshaft nose before installing damper.

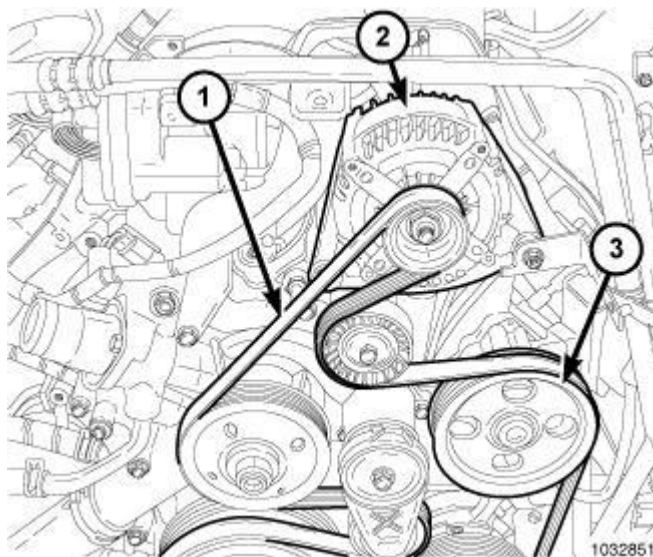
1. Position the damper onto crankshaft.
2. Assemble the damper installer (special tool #10387, Installer, Vibration Damper) (2), and the pressing cup (1) from A/C hub installer (special tool #6871, Installer, A/C Hub).
3. Using the damper installer (special tool #10387, Installer, Vibration Damper) (2), and the pressing cup (1) from the A/C hub installer (special tool #6871, Installer, A/C Hub), press the damper onto crankshaft.



3657932

Fig. 207: Installing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

4. Install the crankshaft damper bolt.
5. Position the (special tool #10386, Holder, Vibration Damper) (2), onto the vibration damper (3).
6. Tighten the bolt to 185 N.m (136 ft. lbs.).
7. Install the lower fan shroud.
8. Lower the vehicle.



1032851

Fig. 208: Accessory Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

9. Install the accessory drive belt (1). Refer to **BELT, SERPENTINE, INSTALLATION**.
10. If removed, install the secondary generator belt.
11. Connect the negative cable to battery.

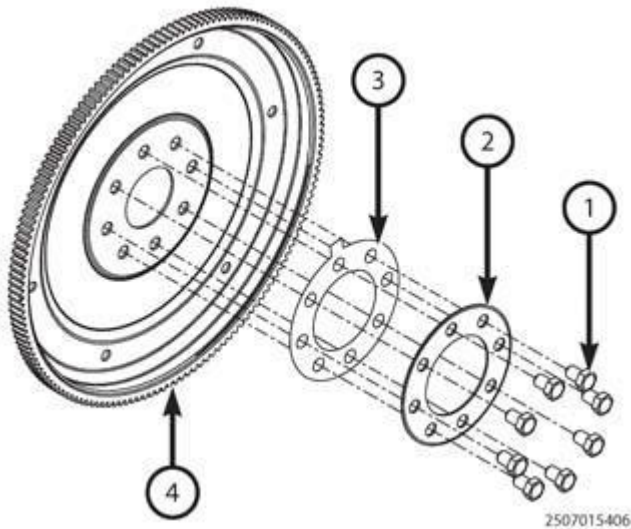
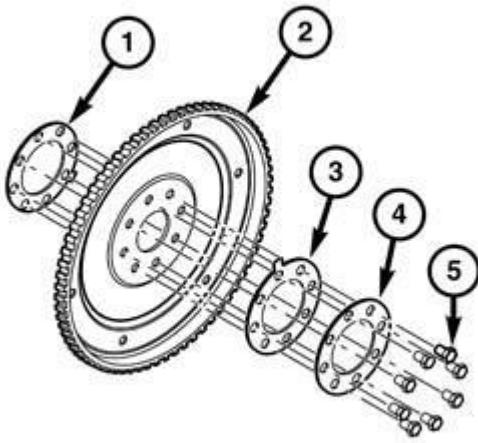
FLEXPLATE**REMOVAL****REMOVAL****NON-HIGH OUTPUT ENGINE**

Fig. 209: Bolts, Clamp Ring, Shim & Flex Plate
Courtesy of CHRYSLER GROUP, LLC

1. Remove the transmission (Refer to appropriate AUTOMATIC TRANSMISSION - SERVICE INFORMATION article).
2. Paint mark the flex plate hub to flex plate relation.
3. Remove bolts (1), clamp ring (2), Shim (3) and the flex plate (4).
4. Inspect flex plate for damage.

HIGH OUTPUT ENGINE



0913002106

Fig. 210: Bolts, Clamping Ring, Friction Shim & Flex Plate
 Courtesy of CHRYSLER GROUP, LLC

1. Remove the transmission (Refer to appropriate AUTOMATIC TRANSMISSION - SERVICE INFORMATION article).
2. Paint mark the flex plate hub to flex plate relation.
3. Remove bolts (5), clamping ring (4), large friction shim (3), flex plate (2) and the small friction shim (1).
4. Inspect flex plate for damage.

INSTALLATION

INSTALLATION

NON-HIGH OUTPUT ENGINE

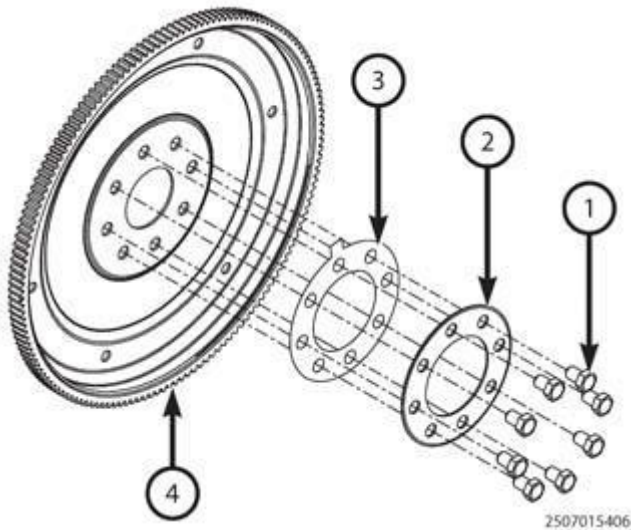


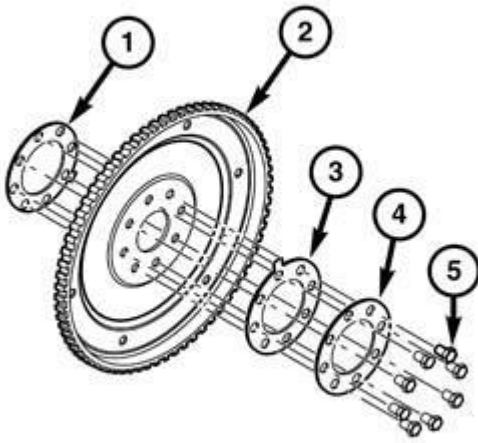
Fig. 211: Bolts, Clamp Ring, Shim & Flex Plate
Courtesy of CHRYSLER GROUP, LLC

NOTE: A new bolts (1), clamp ring (2) must be used anytime the flex plate has been removed. Do not lubricate new bolts as they are already coated with an anti-scuff treatment.

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

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

HIGH OUTPUT ENGINE



0913002106

Fig. 212: Bolts, Clamping Ring, Friction Shim & Flex Plate
Courtesy of CHRYSLER GROUP, LLC

NOTE: New bolts (5), clamp ring (4), and shims (1, 3) anytime the flex plate has been removed. Do not lubricate new bolts as they are already coated with an anti-scuff treatment.

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

1. Install the small friction shim (1), flex plate (2), large friction shim (3), clamping ring (4) and tighten bolts (5) finger tight.
2. Use a crisscross pattern to tighten bolts to 137 N.m (100 ft. lbs.).
3. Install the transmission (Refer to appropriate AUTOMATIC TRANSMISSION - SERVICE INFORMATION article).

LIFTER(S), HYDRAULIC, ROLLER

DESCRIPTION

DESCRIPTION

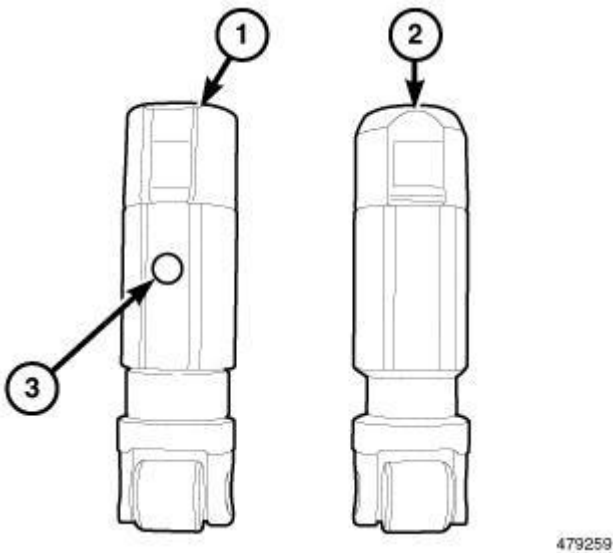


Fig. 213: MDS Lifter

Courtesy of CHRYSLER GROUP, LLC

The Multiple Displacement System (MDS) selectively deactivates cylinders 1, 4, 6 and 7 during steady speed, low acceleration and shallow grade climbing conditions to increase fuel economy.

The MDS can provide a 5 to 20% fuel economy benefit when operating in four-cylinder mode. Depending on driving habits and vehicle usage. For EPA rating purposes the fuel economy is 8 to 15% higher than if the engine was operating on eight-cylinders at all times.

The MDS deactivating lifter (1) can be distinguished from the non-MDS lifter (2) by the disconnecting pin (3) on the side of the MDS lifter.

MDS is integrated into the basic engine architecture requiring these additional components:

- Unique MDS camshaft
- 8 deactivating roller lifters
- 4 MDS control valve solenoids
- MDS control valve solenoid wiring harness
- Oil temperature sensor

OPERATION

OPERATION

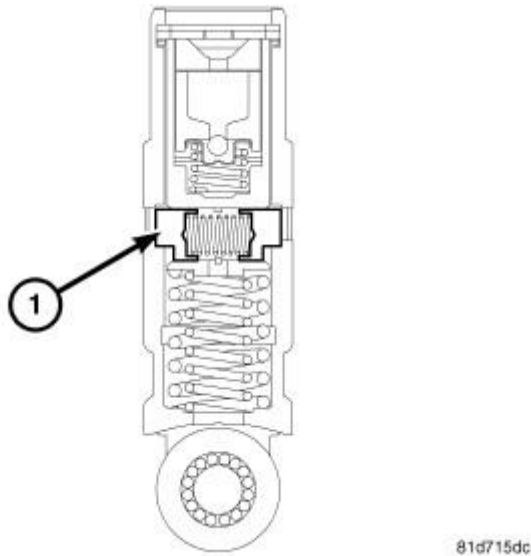


Fig. 214: MDS Lifter Cross-Section
 Courtesy of CHRYSLER GROUP, LLC

The Multiple Displacement System (MDS) provides cylinder deactivation during steady speed, low acceleration and shallow grade climbing conditions to increase fuel economy. Both four and eight cylinder configurations have even firing intervals to provide smooth operation. The MDS selectively deactivates cylinders 1, 4, 6, and 7, to improve fuel economy. All deactivated cylinders have unique hydraulic lifters that collapse when deactivated to prevent the valves from opening. Engine oil pressure is used to activate and deactivate the valves. Oil is delivered through special oil passages drilled into the cylinder block. The MDS solenoid valves control the flow. When activated, pressurized oil pushes a latching pin on each MDS lifter which becomes a lost motion link. The base of the MDS lifter follows the camshaft while the top remains stationary. The MDS lifter is held in place against the pushrod by light spring pressure but unable to move because of the much higher force of the valve spring.

NOTE: It is critical to use the recommended oil viscosity in engines that use MDS.

Deactivation occurs during the compression stroke of each cylinder, after air and fuel enter the cylinder. Ignition occurs, but the combustion products remain trapped in the cylinder under high pressure, because the valves no longer open. No fuel/air enters or leaves during subsequent piston strokes, this high pressure gas is repeatedly compressed and expanded like an air spring.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC TAPPETS

Check the oil pressure before disassembling any part of the engine to correct tappet noise. If vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-80 psi) at 3, 000 RPM.

Check the oil level after the engine reaches normal operating temperature. Allow five minutes for the oil level to stabilize before checking the oil level. The oil level in the pan should never be above the FULL mark or below the ADD OIL mark on the dipstick. Either of these two conditions could be responsible for noisy tappets.

HIGH

If the oil level is above the FULL mark, it is possible for the connecting rods to dip into the oil. With the engine running, this condition could create foam in the oil pan. Foam in the oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow the valves to seat noisily.

LOW

Low oil level may allow the oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on the intake side of the oil pump through which air can be drawn creates the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When the oil level and leaks have been corrected, operate the engine at fast idle. Run the engine for a sufficient amount of time to allow all of the air inside the tappets to be bleed out.

TAPPET NOISE DIAGNOSIS

1. To determine the source of tappet noise, crank the engine over with the cylinder head covers removed.
2. Feel each valve spring or rocker arm to detect the noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

NOTE: **Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm pushrod sockets and pushrod ends for wear.**

3. Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leak-down around the unit plunger, or by the plunger partially sticking in the tappet body cylinder. The tappet should be replaced. A heavy click is caused by a tappet check valve not seating, or by foreign particles wedged between the plunger and the tappet body. This will cause the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.
4. The valve train generates a noise very much like a light tappet noise during normal operation. Care must be taken to ensure that tappets are making the noise. If more than one tappet seems to be noisy, it's probably not the tappets.

REMOVAL**REMOVAL**

1. Disconnect and isolate the negative battery cable.
2. Remove the cylinder head. Refer to **CYLINDER HEAD, REMOVAL** .

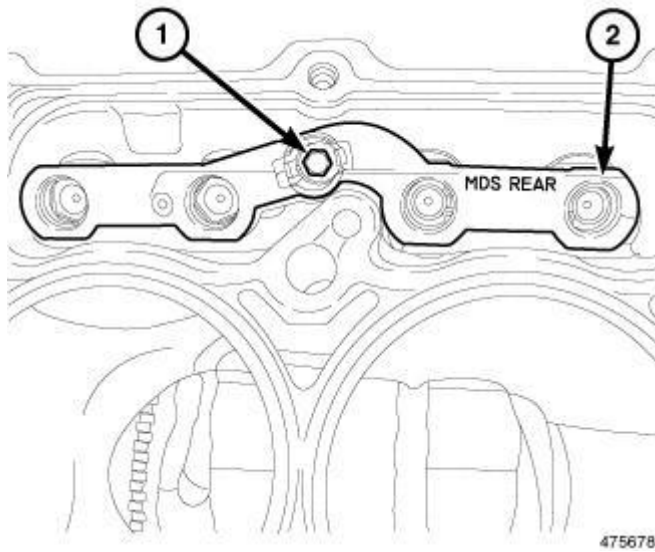


Fig. 215: Rear MDS Lifter Assembly
Courtesy of CHRYSLER GROUP, LLC

3. Remove the tappet guide holder retaining bolt (1) from the tappet guide holder assembly (2).

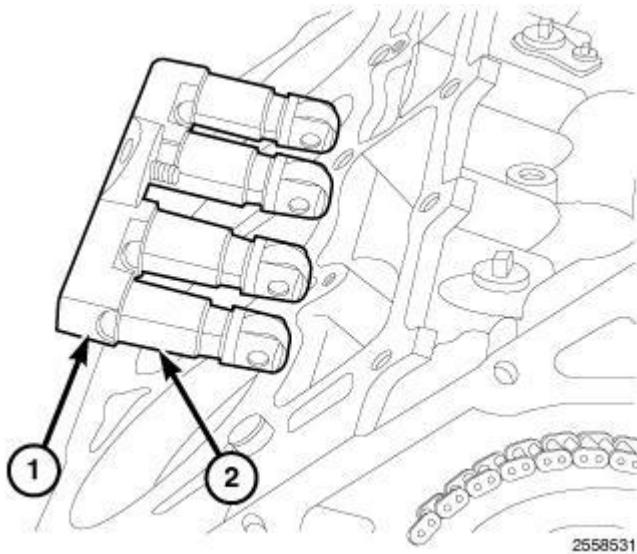


Fig. 216: Tappet Guide Holder Assembly
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The lifter and retainer assembly must be installed as a unit.

CAUTION: If the lifter and retainer assembly are to be reused, identify the lifters to ensure installation in their original location or engine damage could result.

4. Remove the tappet guide holder (1) and tappets (2) as an assembly.
5. Check the camshaft lobes for abnormal wear.

INSTALLATION

INSTALLATION

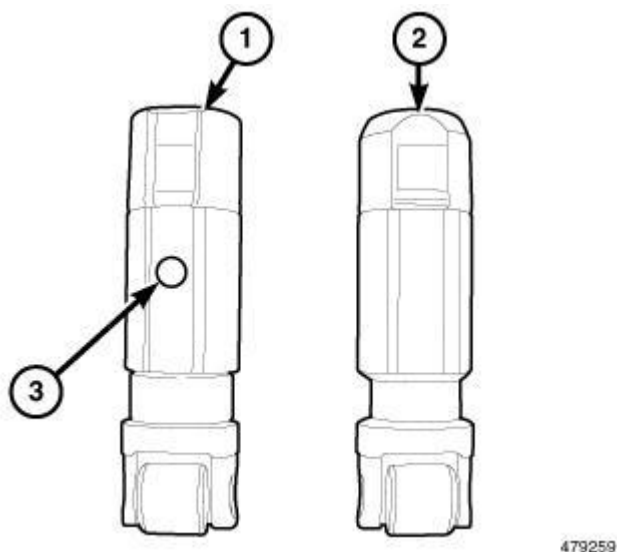


Fig. 217: MDS Lifter

Courtesy of CHRYSLER GROUP, LLC

The Multiple Displacement System (MDS) provides cylinder deactivation during steady speed, low acceleration and shallow grade climbing conditions to increase fuel economy.

CAUTION: Engines equipped with MDS use both standard roller lifters (2) and deactivating roller lifters (1). The deactivating roller lifters must be used in cylinders 1, 4, 6, 7. The deactivating lifters can be identified by the two holes in the side of the lifter body (3), for the latching pins.

CAUTION: The lifter and retainer assembly must be installed as a unit.

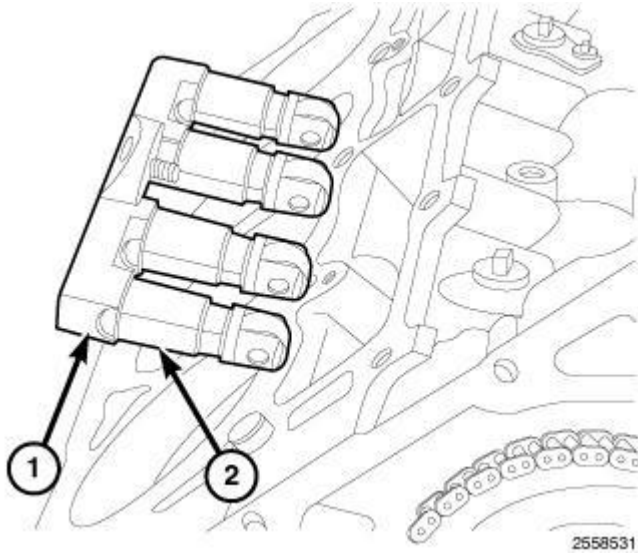


Fig. 218: Tappet Guide Holder Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the tappet guide holder (1) and tappets (2).

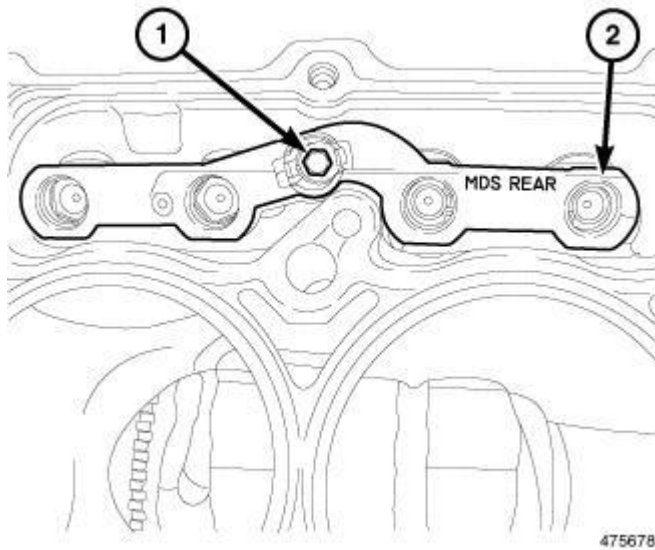


Fig. 219: Rear MDS Lifter Assembly
Courtesy of CHRYSLER GROUP, LLC

CAUTION: If the lifters and guide holder assembly are to be reused, they must be installed in their original location.

2. Install the tappet guide holder (2) and tappets.
3. Tighten the tappet retainer bolt (1) to 12 N.m (9 ft. lbs.).
4. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.
5. Connect the negative battery cable.

CAUTION: To prevent damage to valve assemblies, do not run the engine above fast idle until all hydraulic lifters have filled with oil and have become quiet.

6. Start the engine and check for leaks.
7. Road test the vehicle.

RETAINER, CRANKSHAFT REAR OIL SEAL

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

The crankshaft rear oil seal is integral to the crankshaft rear oil seal retainer and cannot be serviced separately.

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Raise and support the vehicle.
2. Remove the transmission inspection/torque converter access cover.
3. Inspect the rear of the cylinder block for evidence of oil leakage, note the following:
 - Circular spray pattern generally indicates seal leakage or crankshaft damage.
 - Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See appropriate Engine Service Information for proper repair procedures of these items.
4. If no leaks are detected, pressurize the crankcase as outlined in **AIR LEAK DETECTION TEST METHOD**.

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out using an emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done. Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, REMOVAL**.

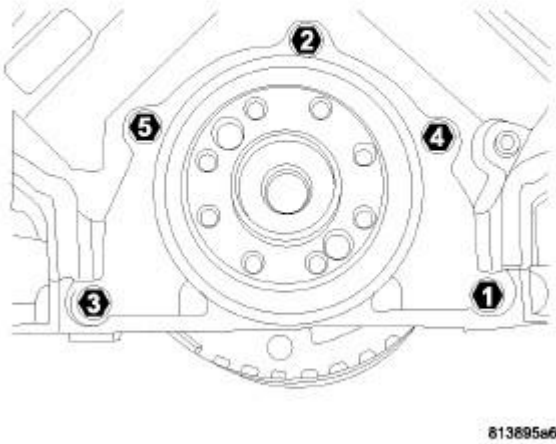
REMOVAL**REMOVAL**

Fig. 220: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

- NOTE:** The crankshaft rear oil seal is integral to the crankshaft rear oil seal retainer and must be replaced as an assembly.
- NOTE:** The crankshaft rear oil seal retainer can not be reused after removal.
- NOTE:** This procedure can be performed in vehicle.

1. Disconnect the negative battery cable.
2. Remove the transmission (Refer to appropriate AUTOMATIC TRANSMISSION - SERVICE INFORMATION article).
3. Remove the flexplate. Refer to **FLEXPLATE, REMOVAL** .
4. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .
5. Using the sequence shown in illustration, remove the rear oil seal retainer mounting bolts.
6. Carefully remove the retainer from the engine block.

INSTALLATION**INSTALLATION**

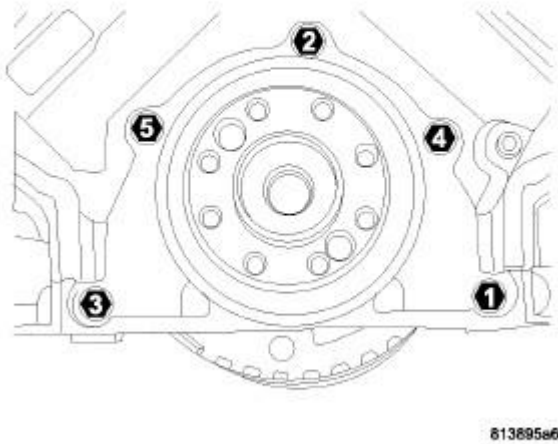


Fig. 221: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: The crankshaft rear oil seal is integral to the crankshaft rear oil seal retainer and must be replaced as an assembly.

NOTE: The crankshaft rear oil seal retainer can not be reused after removal.

1. Thoroughly clean all gasket residue from the engine block.
2. Position the gasket onto the new crankshaft rear oil seal retainer.
3. Position the crankshaft rear oil seal retainer onto the engine block.
4. Using the sequence shown in illustration, install the crankshaft rear oil seal retainer mounting bolts and tighten to 13 N.m (10 ft. lbs.).
5. Install the oil pan. Refer to **PAN, OIL, INSTALLATION** .
6. Install the flexplate. Refer to **FLEXPLATE, INSTALLATION** .
7. Install the transmission (Refer to appropriate AUTOMATIC TRANSMISSION - SERVICE INFORMATION article).
8. Fill the engine with oil.
9. Start the engine and check for leaks.

RING(S), PISTON

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON RING FITTING

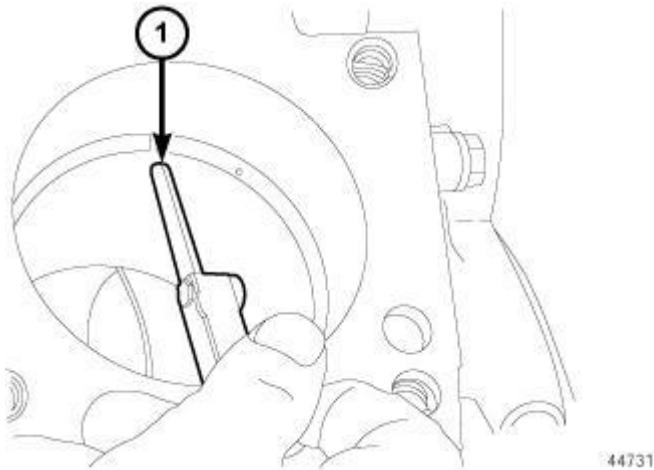
PISTON RING END GAP

Fig. 222: Checking Piston Ring End Gap Using Feeler Gauge
Courtesy of CHRYSLER GROUP, LLC

NOTE: Before reinstalling used rings or installing new rings, the ring clearances must be checked.

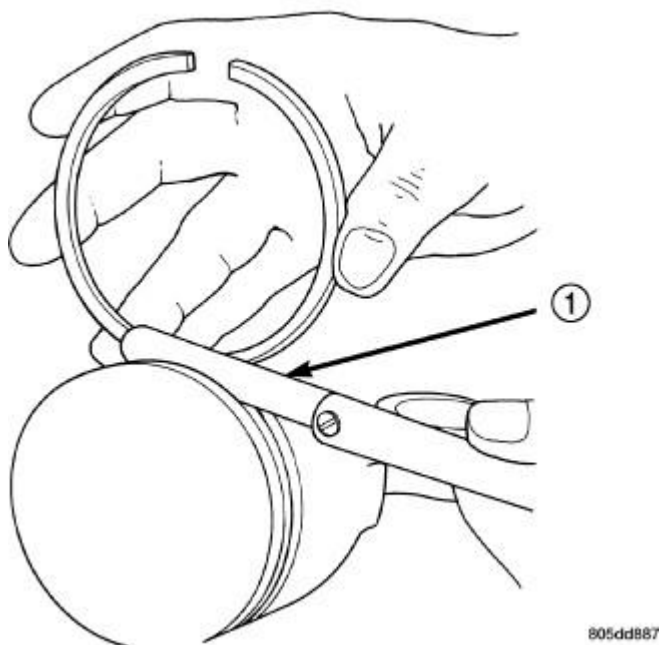
1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

NOTE: The ring gap measurement must be made with the ring positioned at least 12 mm (0.50 inch.) from bottom of cylinder bore.

3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge check the ring end gap. Replace any rings not within specification.

PISTON RING SIDE CLEARANCE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

**Fig. 223: Measuring Piston Ring Side Clearance**

Courtesy of CHRYSLER GROUP, LLC

1. Measure the ring side clearance as shown in illustration make sure the feeler gauge (1) fits snugly between the ring land and the ring. Replace any ring not within specification.
2. Rotate the ring around the piston, the ring must rotate in the groove with out binding.

PISTON RING SPECIFICATION CHART

Piston Ring Position		Piston Ring Side Clearance	Maximum Clearance
Upper Ring	Metric	0.04 - 0.09 mm	0.11 mm
	Standard	0.0015 - 0.0035 in.	0.004 in.
Intermediate Ring	Metric	0.04 - 0.08 mm	0.10 mm
	Standard	0.0015 - 0.0031 in.	0.004 in.
Piston Ring Position		Piston Ring End Gap	Wear Limit
Upper Ring	Metric	0.40 - 0.55 mm	0.43 mm
	Standard	0.0157 - 0.0216 in.	0.017 in.
Intermediate Ring	Metric	0.24 - 0.51 mm	0.74 mm
	Standard	0.0094 - 0.0200 in.	0.029 in.
Oil Control Ring (Steel Rail)	Metric	0.015 - 0.66 mm	0.76 mm
	Standard	0.0059 - 0.0259 in.	0.030 in.

PISTON RING INSTALLATION



Fig. 224: Installing Piston Ring Side Rail
Courtesy of CHRYSLER GROUP, LLC

NOTE: The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

NOTE: Piston rings are installed in the following order:

- Oil ring expander.
- Lower oil ring side rail.
- Upper oil ring side rail.
- No. 2 Intermediate piston ring.
- No. 1 Upper piston ring.

1. Install the oil ring expander.
2. Install upper side rail by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

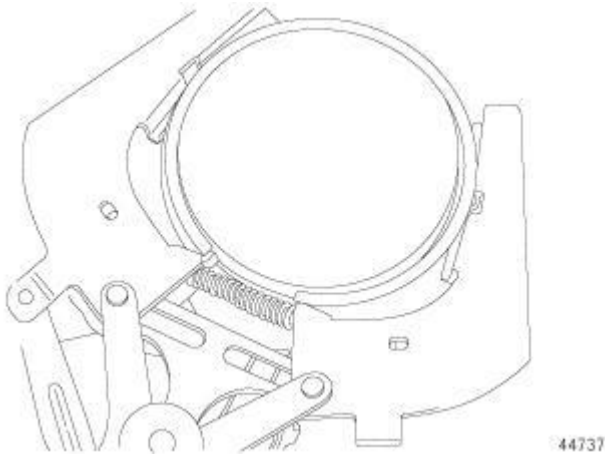
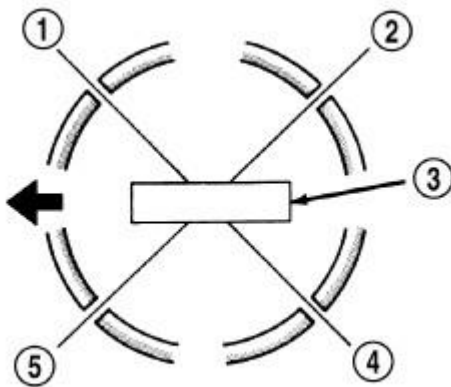


Fig. 225: Installing Upper & Intermediate Rings
Courtesy of CHRYSLER GROUP, LLC

3. Install No. 2 intermediate piston ring using a piston ring installer.
4. Install No. 1 upper piston ring using a piston ring installer.



RR09B48

Fig. 226: Piston Ring End Gap Position
Courtesy of CHRYSLER GROUP, LLC

NOTE: Install the piston rings so the gaps positioned as indicated with the piston viewed from the top.

NOTE: Staggering ring gap is important for oil control.

5. Install the oil expander so the ring gap is located in the (1) position.
6. Install the oil ring rails so the ring gap is located in the (2, 4) position.
7. Install the second compression ring so the ring gap is located in the (3) position.
8. Install the top compression so the ring gap is located in the (1) position.

ROD, PISTON AND CONNECTING**DESCRIPTION****DESCRIPTION**

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons are made of a high strength aluminum alloy. Piston skirts are coated with a solid lubricant (Molykote®) to reduce friction and provide scuff resistance. The piston top ring groove and land is anodized. The connecting rods are made of forged powdered metal, with a fractured cap design.

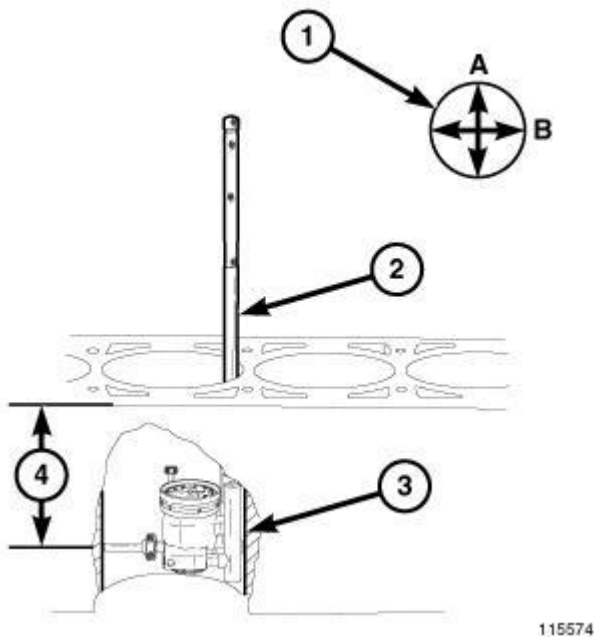
STANDARD PROCEDURE**STANDARD PROCEDURE - PISTON FITTING**

Fig. 227: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

1. To correctly select the proper size piston, use Cylinder Indicator (special tool #C-119, Cylinder Indicator) (2) to measure the inside diameter of the cylinder bore (3). A cylinder bore gauge capable of reading in 0.003 mm (0.0001 in.) Increments is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below the top of bore (4). Start perpendicular (across or at 90°) to the axis of the crankshaft at point A (1) and then take an additional bore reading 90° at point B (1).
3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. The piston-rod assembly is specific for the left cylinder bank (odd numbered) and the right cylinder bank (even

numbered) and must not be interchanged.

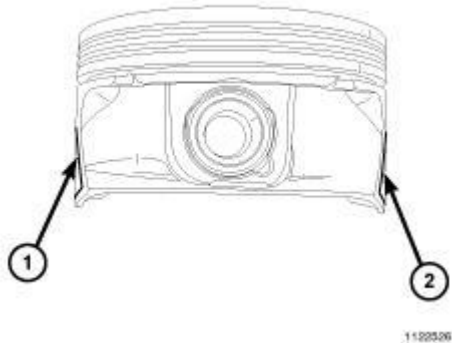


Fig. 228: Piston Diameter Measuring Points
Courtesy of CHRYSLER GROUP, LLC

4. Measure the piston diameter with a micrometer at points (1, 2).

REMOVAL

REMOVAL

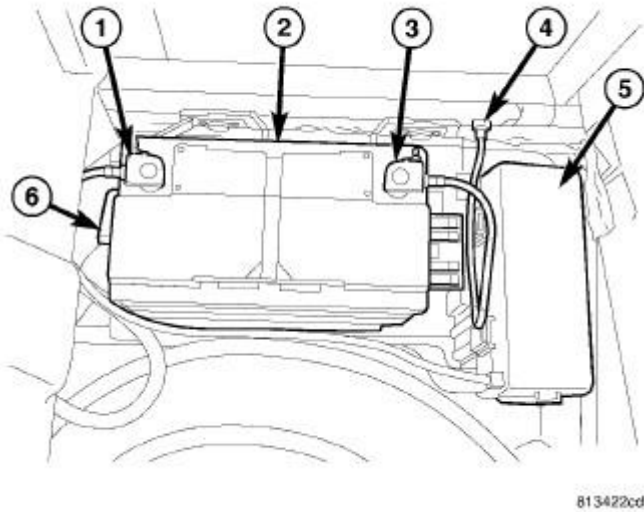
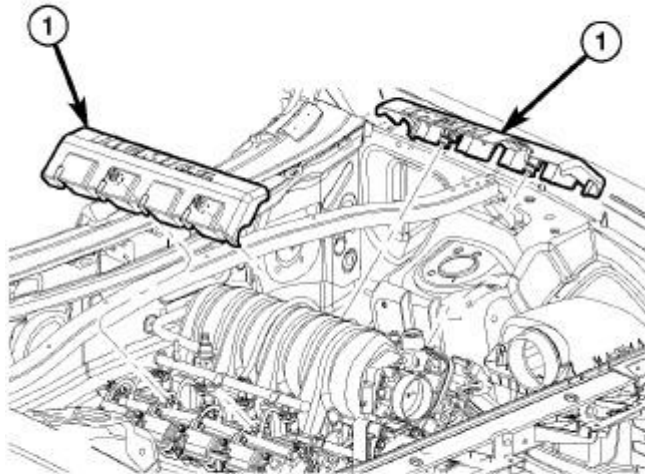


Fig. 229: Battery System Components & PDC Cover
Courtesy of CHRYSLER GROUP, LLC

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.
2. Disconnect and isolate the negative battery cable (3).

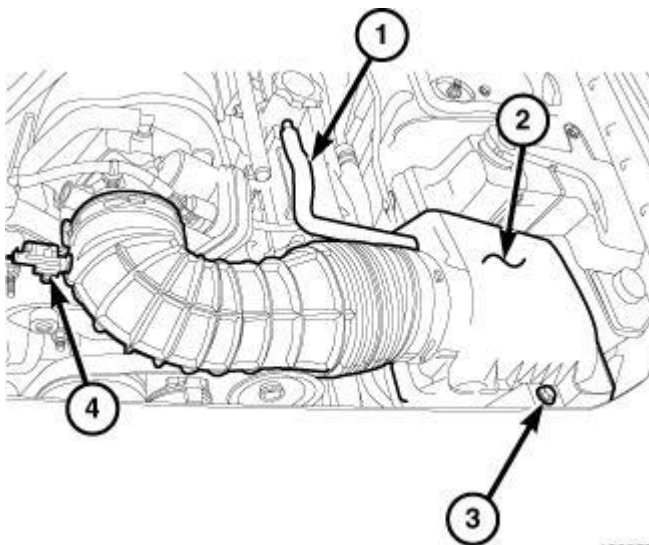


815caa1a

Fig. 230: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

3. Remove the engine covers (1).



163967

Fig. 231: Makeup Air Hose, Air Cleaner Housing, Retaining Bolt & Intake Air Temperature Sensor

Courtesy of CHRYSLER GROUP, LLC

4. Loosen clamp and disconnect the air duct at throttle body.
5. Disconnect the intake air temperature sensor (4) electrical connector.
6. Remove the makeup air hose (1).

7. Remove the air cleaner housing retaining bolt (3) and remove the air cleaner housing (2).
8. Remove the cylinder head(s). Refer to **CYLINDER HEAD, REMOVAL**.
9. Raise and support the vehicle.

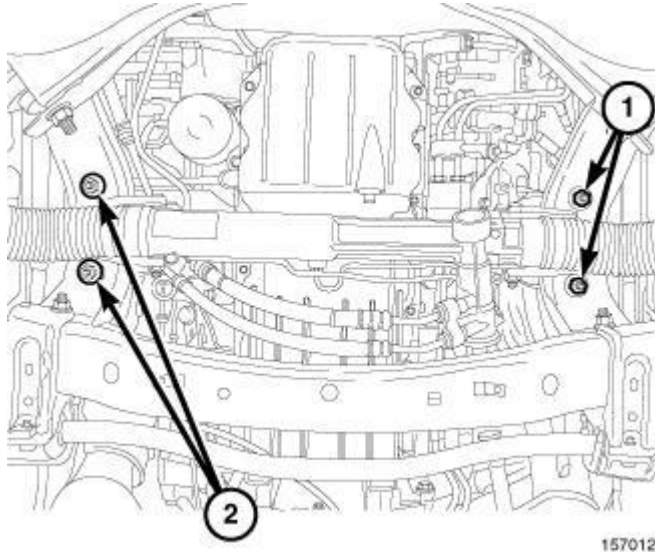


Fig. 232: Engine Mount Nuts
Courtesy of CHRYSLER GROUP, LLC

10. Remove the engine mount nuts (1, 2).

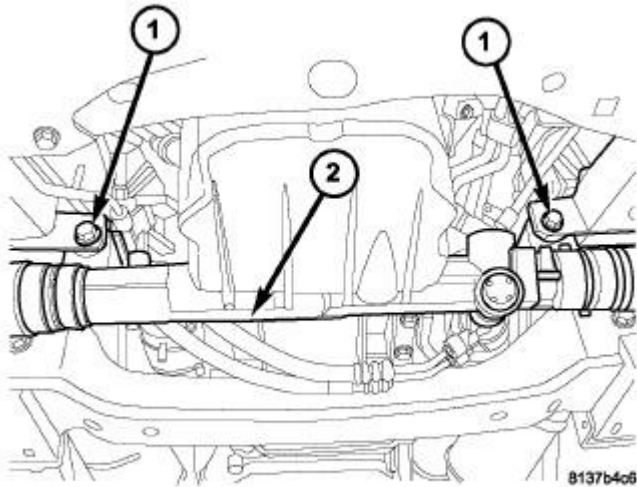


Fig. 233: Gear Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Remove the steering gear mounting bolts (1) and position the steering gear (2) aside.
12. Remove the engine oil dipstick and tube from the oil pan.

13. Lower the vehicle.

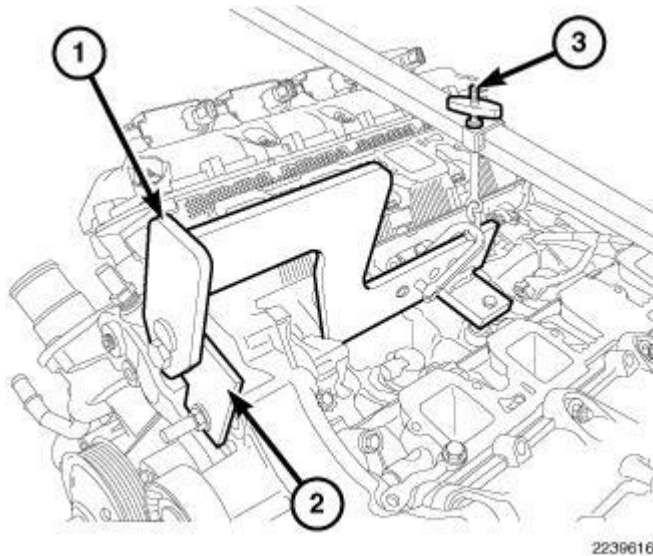


Fig. 234: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not use air tools to install engine lift fixture.

14. Install the Engine Lift Fixture (special tool #8984B, Fixture, Engine Lifting) (1), Engine Lift Adapter (special tool #8984-UPD, Adapter, Engine Lift) (2) and the Engine Support Fixture (special tool #8534B, Fixture, Driveline Support) (3).
15. Raise the engine to provide clearance to remove the oil pan.
16. Raise and support the vehicle.
17. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .
18. Lower the vehicle.
19. Remove the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL** .
20. If necessary, remove the ridge on top of the cylinder bores with a reliable ridge reamer before removing the pistons from the cylinder block. **Be sure to keep the tops of the pistons covered during this operation.**

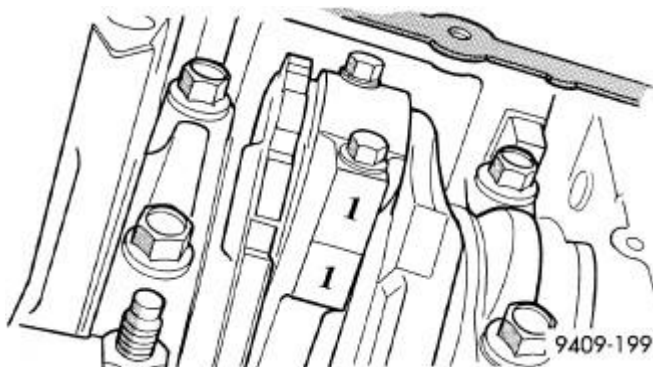


Fig. 235: Identifying Mark On Connecting Rod And Bearing Cap
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur.

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removal to ensure correct reassembly.

21. Raise and support the vehicle.
22. Mark the connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

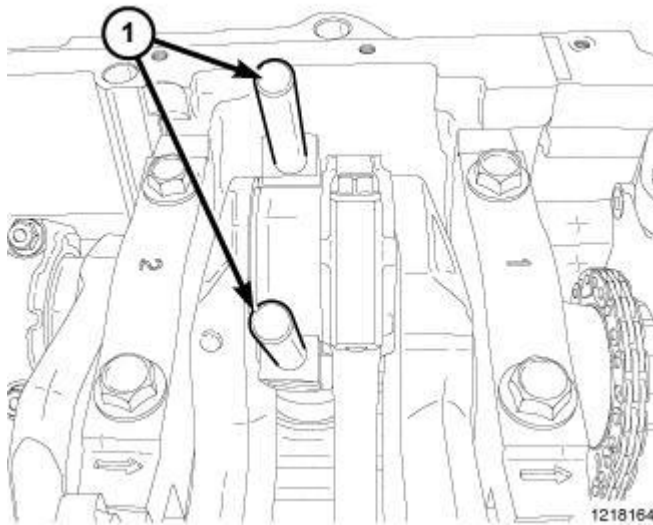


Fig. 236: Connecting Rod Guides
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur.

NOTE: Pistons and connecting rods assemblies must be removed from the top of cylinder block. When removing the piston and connecting rod assemblies from the engine, rotate the crankshaft so each connecting rod is centered in the cylinder bore.

23. Remove the connecting rod cap, install the Connecting Rod Guides (special tool #8507, Guides, Connecting Rod) (1) and carefully remove the piston from the cylinder bore, repeat this procedure for each piston being removed.

24. Immediately after removing the piston and connecting rod, install the bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.
25. Carefully remove the piston rings from the piston(s), starting from the top ring down.

CLEANING**CLEANING**

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

1. Using a suitable cleaning solvent, clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: Do not remove the piston pin from the piston and connecting rod assembly.

INSPECTION**INSPECTION**

Check the connecting rod journal for excessive wear, taper and scoring. Refer to **ROD, PISTON AND CONNECTING - STANDARD PROCEDURE** .

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore. Refer to **ROD, PISTON AND CONNECTING - STANDARD PROCEDURE** .

Check the piston for scoring or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION**INSTALLATION**

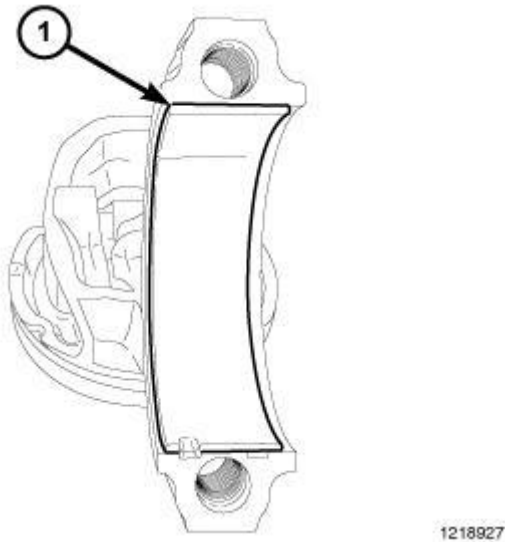


Fig. 237: Rod Bearing

Courtesy of CHRYSLER GROUP, LLC

NOTE: Before reinstalling used rings or installing new rings, the ring clearances must be checked.

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

1. Check piston ring clearance. Refer to **RING(S), PISTON - STANDARD PROCEDURE** .
2. Before installing piston and connecting rod assemblies into the bore, install the piston rings. Refer to **RING(S), PISTON - STANDARD PROCEDURE** .
3. Immerse the piston head and rings in clean engine oil and position a ring compressor over the piston and rings and tighten the ring compressor. **Ensure the position of rings do not change during this operation.**
4. Position the rod bearing (1) onto the connecting rod and lubricate bearing surface with clean engine oil.

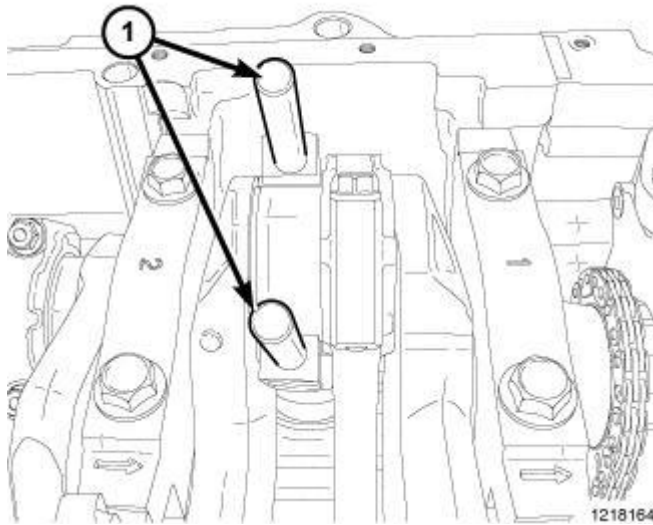


Fig. 238: Connecting Rod Guides
Courtesy of CHRYSLER GROUP, LLC

5. Install Connecting Rod Guides (special tool #8507, Guides, Connecting Rod) (1) into the connecting rod bolt threads.

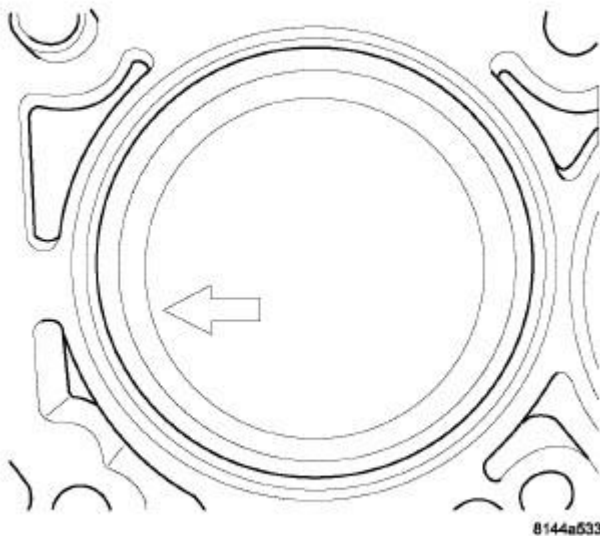
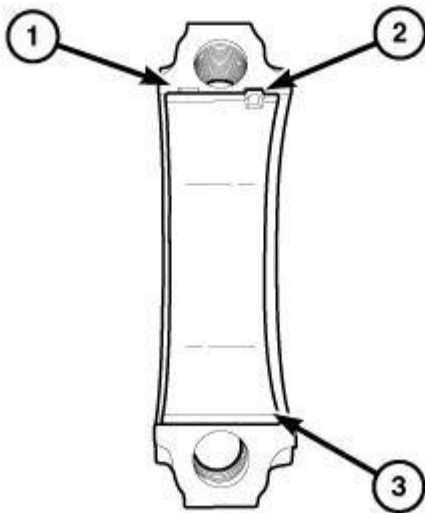


Fig. 239: Piston Direction Arrow
Courtesy of CHRYSLER GROUP, LLC

6. The pistons are marked on the piston pin bore surface with an raised "F" or arrow on top of piston indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks.

7. Wipe cylinder bore clean and lubricate with clean engine oil.
8. Rotate the crankshaft until the connecting rod journal is centered with the cylinder bore.
9. Insert the piston and rod assembly into the cylinder bore and carefully position the connecting rod over the crankshaft journal.
10. Tap the piston down into the cylinder bore using a hammer handle while guiding the connecting rod into position on the rod journal.



1219213

Fig. 240: Connecting Rod Cap
Courtesy of CHRYSLER GROUP, LLC

11. Remove the Connecting Rod Guides (special tool #8507, Guides, Connecting Rod).
12. Wipe the connecting rod cap (1) clean and lubricate with clean engine oil and install the bearing (3).

NOTE: The connecting rods and bearing caps are not interchangeable, line up the previously marked bearing caps and connecting rods to ensure assembly to their original location.

13. Lubricate the bearing surfaces with clean engine oil and position the rod cap in place.

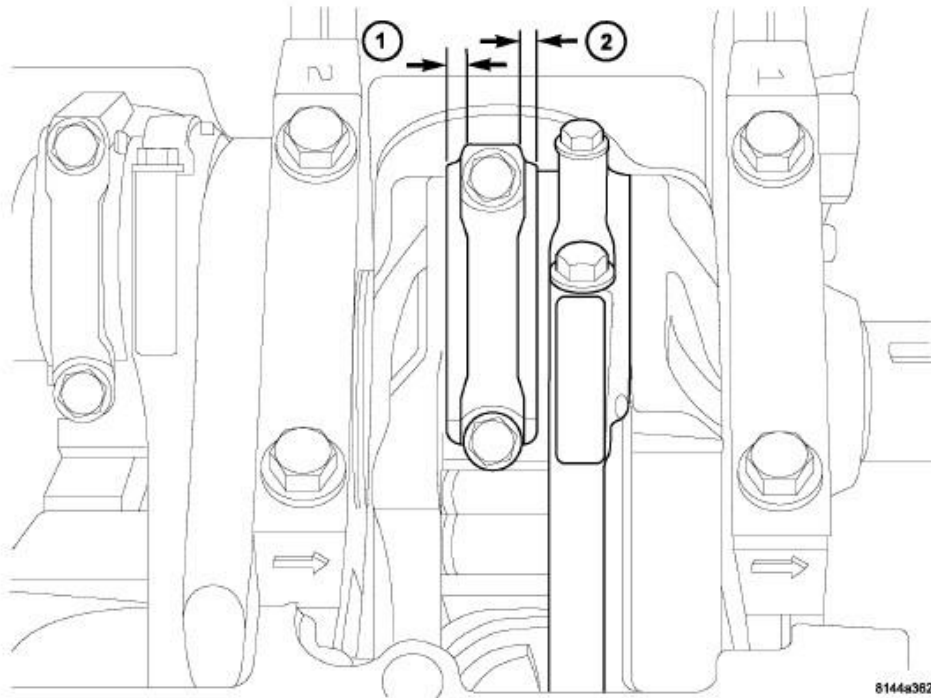


Fig. 241: Identifying Connecting Rod Proper Installation
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When installing the connecting rods, make sure the wide side of the connecting rod faces the crankshaft and the narrow sides face each other.

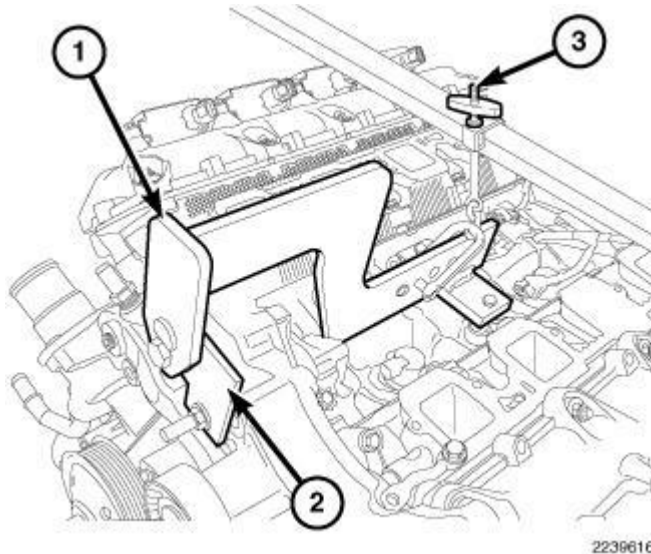


Fig. 242: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Always replace the connecting rod bolts whenever they are loosened or removed.

14. Lubricate the new rod cap bolts with clean engine oil, install and tighten to 21 N.m (15 ft. lbs.) plus 90°.
15. Install the timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
16. Install the new oil pan gasket/windage tray and oil pan. Refer to **PAN, OIL, INSTALLATION**.
17. Install the engine oil dipstick tube and dipstick.
18. Lower the vehicle.
19. Using the Engine Lift Fixture (special tool #8984B, Fixture, Engine Lifting) (1), Engine Lift Adapter (special tool #8984-UPD, Adapter, Engine Lift) (2) and the Engine Support Fixture (special tool #8534B, Fixture, Driveline Support) (3) lower the engine into position and remove.
20. Raise and support the vehicle.

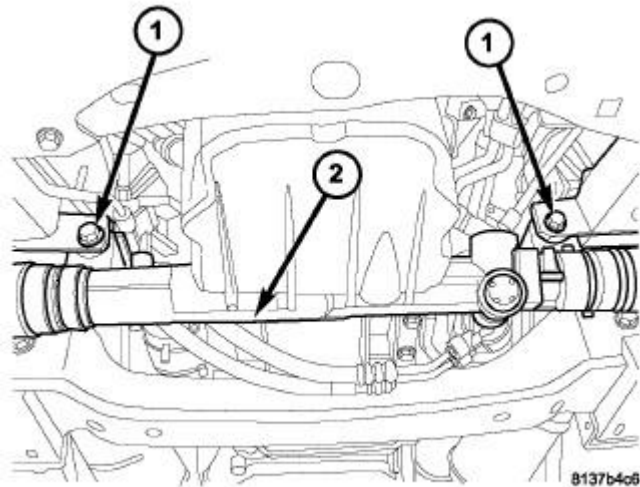
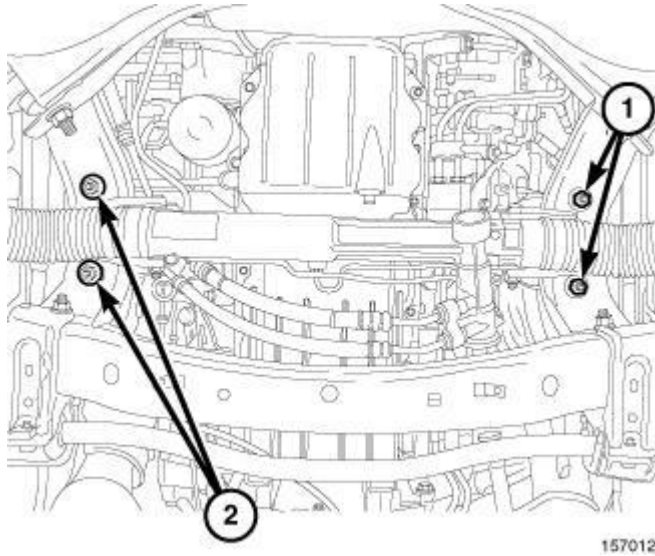


Fig. 243: Gear Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

21. Position the steering gear (2), install mounting bolts (1) and tighten to 95 N.m (70 ft. lbs.).

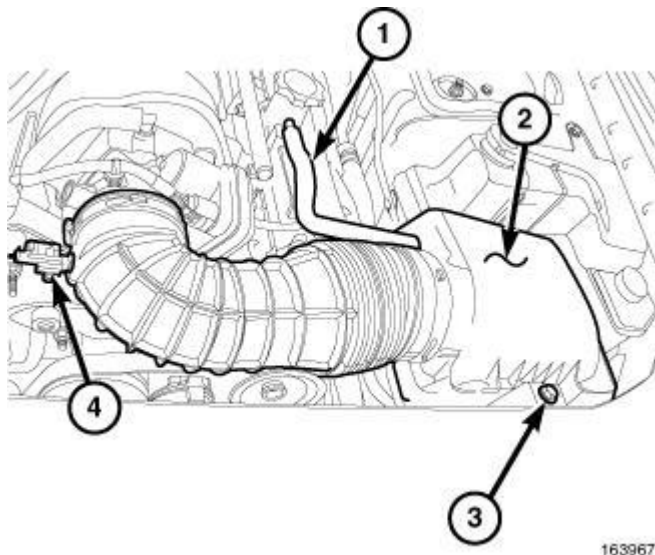


157012

Fig. 244: Engine Mount Nuts

Courtesy of CHRYSLER GROUP, LLC

22. Install the engine mount nuts (1, 2) and tighten to 95 N.m (70 ft. lbs.).
23. Lower the vehicle.
24. Install the cylinder head(s). Refer to **CYLINDER HEAD, INSTALLATION** .



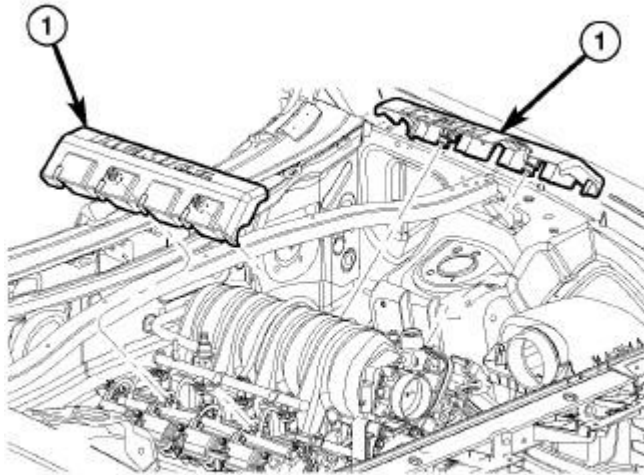
163967

Fig. 245: Makeup Air Hose, Air Cleaner Housing, Retaining Bolt & Intake Air Temperature Sensor

Courtesy of CHRYSLER GROUP, LLC

25. Position the air cleaner housing (2), install the air cleaner housing retaining bolt (3) and securely tighten.
26. Connect the makeup air hose (1).
27. Connect the intake air temperature sensor (4) electrical connector.
28. Connect the air duct to the throttle body and tighten clamp to 3 N.m (30 in. lbs.).

29. Fill the engine with oil. Refer to OIL - **STANDARD PROCEDURE** .

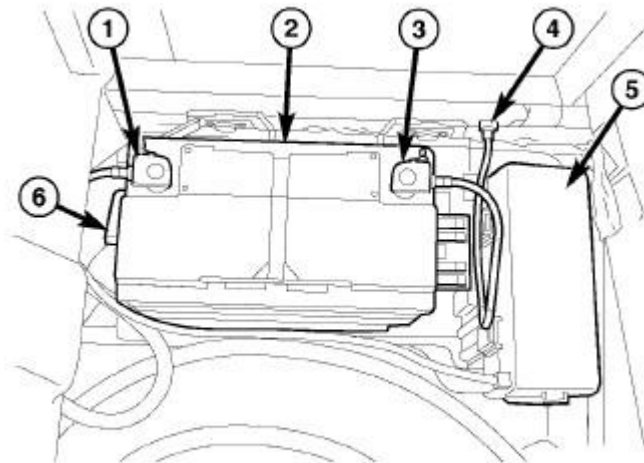


815caa1a

Fig. 246: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

30. Install the engine covers (1).



813422cd

Fig. 247: Battery System Components & PDC Cover

Courtesy of CHRYSLER GROUP, LLC

31. Connect the negative battery cable (3).

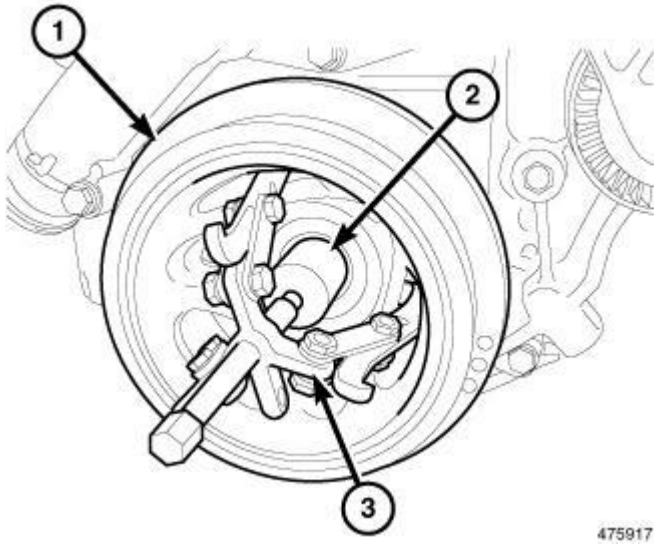
SEAL, CRANKSHAFT OIL, FRONT**REMOVAL****REMOVAL**

Fig. 248: Removing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative cable from battery.
2. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
3. Drain cooling system. Refer to **STANDARD PROCEDURE** .
4. Remove upper radiator hose.
5. Remove radiator shroud attaching fasteners.
6. Remove radiator cooling fan and shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** or **FAN, COOLING, VISCOUS, REMOVAL** .
7. Remove crankshaft damper bolt.
8. Remove damper using Crankshaft Insert (special tool #8513A, Insert, Crankshaft) (2) and Three Jaw Puller (special tool #1023, Puller) (1). Refer to **DAMPER, VIBRATION, REMOVAL** .

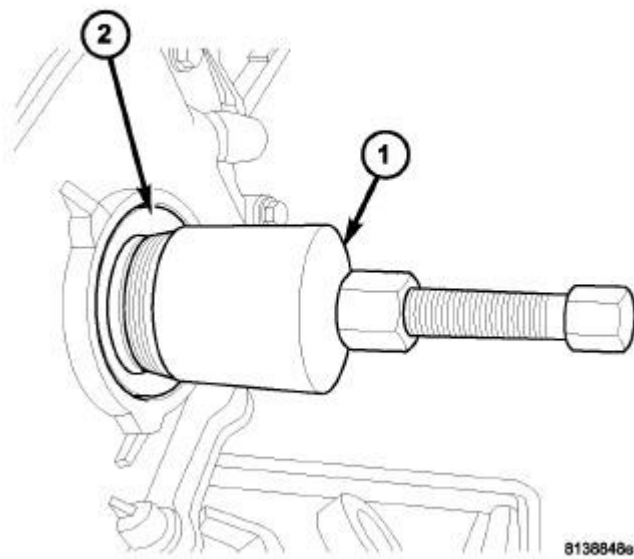


Fig. 249: Front Crankshaft Seal Removal
Courtesy of CHRYSLER GROUP, LLC

9. Using Seal Remover (special tool #9071, Remover, Seal) (1), remove crankshaft front seal (2).

INSTALLATION

INSTALLATION

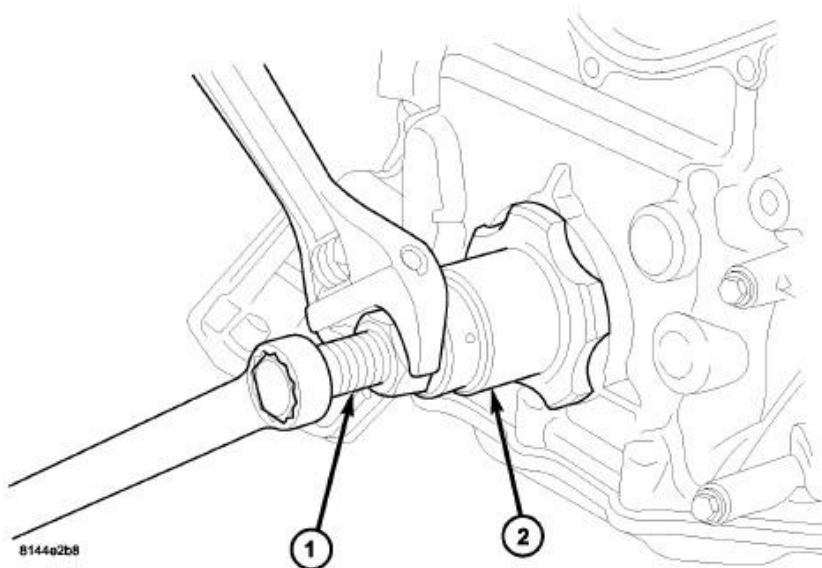


Fig. 250: Front Seal Installation

Courtesy of CHRYSLER GROUP, LLC

CAUTION: The front crankshaft seal must be installed dry. Do not apply lubricant to the sealing lip or the outer edge.

1. Using Crankshaft Front Oil Seal Installer (special tool #9072, Installer, Seal) (2) and Damper Installer (special tool #10387, Installer, Vibration Damper) (1), install crankshaft front seal.

CAUTION: To prevent severe damage to the crankshaft or damper, thoroughly clean the damper bore and the crankshaft nose before installing damper.

2. Install vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION** .
3. Install radiator cooling fan and shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** or **FAN, COOLING, VISCOUS, INSTALLATION** .
4. Install upper radiator hose.
5. Install accessory drive belt. Refer. Refer to **BELT, SERPENTINE, INSTALLATION** .
6. Refill cooling system. Refer to **STANDARD PROCEDURE** .
7. Connect negative cable to battery.

SEAL, CRANKSHAFT OIL, REAR

DESCRIPTION

DESCRIPTION

The crankshaft rear oil seal is integral to the crankshaft rear oil seal retainer, for more information. Refer to the following:

- **Diagnosis and Testing** . Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL - DIAGNOSIS AND TESTING** .
- **Removal** . Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, REMOVAL** .
- **Installation** . Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, INSTALLATION** .

SOLENOID, MULTIPLE DISPLACEMENT

DESCRIPTION

DESCRIPTION

The Multi Displacement System selectively deactivates cylinders 1, 4, 6, and 7, to improve fuel economy. It has two modes of operation:

- 8 cylinders for acceleration and heavy loads.
- 4 cylinders for cruising and city traffic.

The main components of the Multi Displacement System are:

- Unique MDS camshaft.
- Deactivating roller tappets.
- 4 control valves/solenoids.
- control valve/solenoid wiring harness.
- oil temp sensor.

OPERATION

OPERATION

Cylinder Deactivation

- Trap an exhaust charge from a normal combustion event
- Normal combustion event
- Don't open the exhaust valve
- Don't open the intake valve
- Piston is an air spring
- Cylinders deactivated in firing sequence

Cylinder Reactivation

- Open the exhaust valve
- Empty the cylinder
- Open the intake valve
- Normal combustion event
- Cylinders reactivated in firing sequence

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - MDS SOLENOID

The Multi-Displacement System (MDS) has the following detectable issues:

- solenoid circuit
- fail to deactivate a cylinder(s)
- fail to reactivate a cylinder(s)
- low oil pressure

CONDITION	POSSIBLE CAUSES	CORRECTION
MDS does not activate	1. Low oil pressure.	1. Check for proper oil pressure.
	2. Bad oil temperature sensor.	2. Replace the oil temperature

2014 RAM 2500 HD Laramie

2014 ENGINE 6.4L - Service Information - Ram Pickup

		sensor.
	3. Malfunctioning MDS solenoid.	3. Replace the solenoid.
	4. Malfunctioning MDS tappet.	4. Replace tappet (s).
MDS does not deactivate	1. Low oil pressure.	1. Check or proper oil pressure.
	2. Bad oil temperature sensor.	2. Replace the oil temp sensor.
	3. Malfunctioning MDS solenoid.	3. Replace the solenoid.
	4. Malfunctioning MDS tappet.	4. Replace tappet(s).

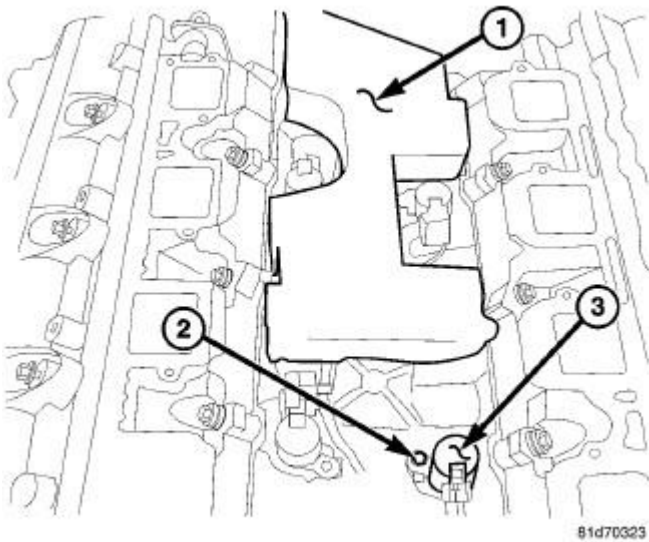
REMOVAL**REMOVAL**

Fig. 251: Intake Manifold Foam Insulator Pad, MDS Solenoids & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL** .
3. Remove foam insulator pad (1).

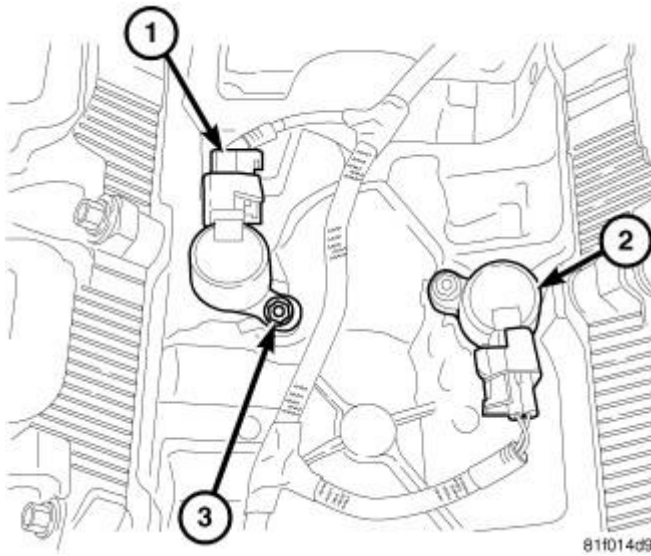


Fig. 252: MDS Solenoid Connector
Courtesy of CHRYSLER GROUP, LLC

4. Remove the Multiple Displacement Solenoid (MDS) (2) electrical connector(s) (1).
5. Remove the MDS solenoid (2) retaining bolt(s) (3).

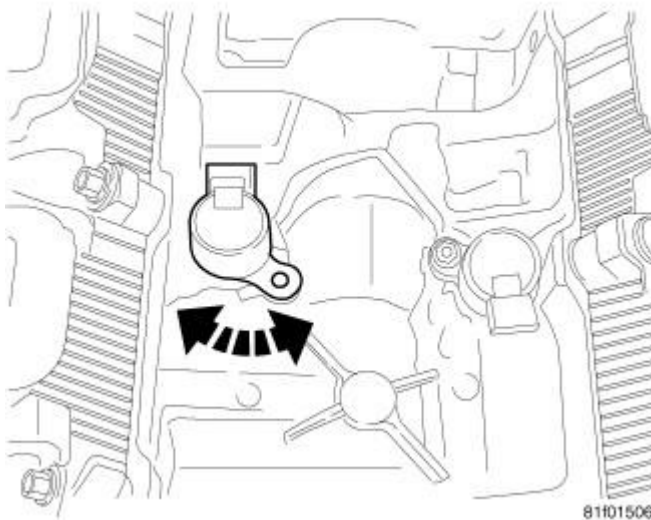


Fig. 253: Removing/Installing MDS Solenoid
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not try to pry the solenoid out. This could lead to breakage and contamination of the lubrication system.

6. Lightly tap on the MDS solenoid(s) with a rubber mallet. Rotate the MDS solenoid(s) from side to side to break the seal.
7. Remove the MDS solenoid(s).

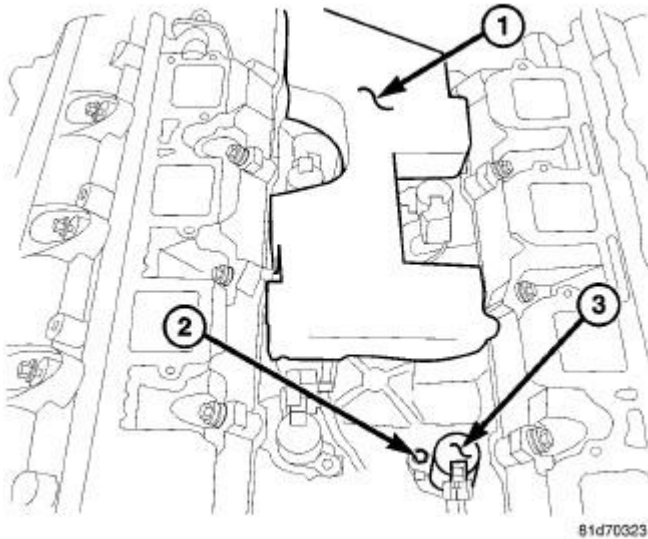
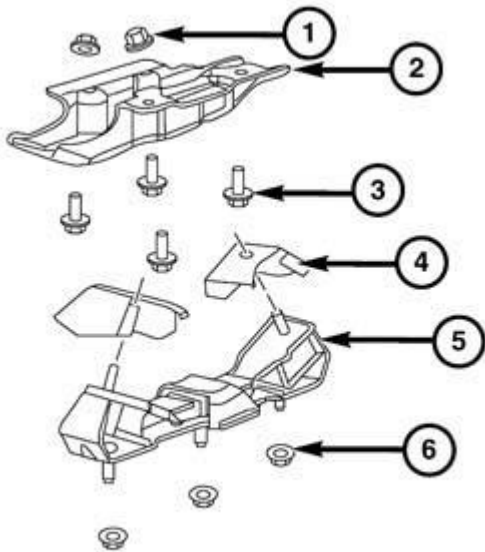
INSTALLATION**INSTALLATION**

Fig. 254: Intake Manifold Foam Insulator Pad, MDS Solenoids & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Verify the MDS solenoid bores are free of debris before installing the MDS solenoid into the engine block.
2. Install the MDS solenoid(s) (3), ensure the seal is fully seated into the engine block.
3. Install the retaining bolt(s) (2) and tighten to 11 N.m (8 ft. lbs.).
4. Connect the MDS electrical connector to the solenoid(s) (3).
5. Install the foam insulator pad (1).
6. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION** .

ENGINE MOUNTING**INSULATOR, ENGINE MOUNT, REAR (TRANSMISSION)****REMOVAL****REMOVAL****REMOVAL**



0912002986

Fig. 255: Transmission Mount Nuts, Upper Mount Bracket, Bolts, Heat Shields, Mount & Lower Nuts
 Courtesy of CHRYSLER GROUP, LLC

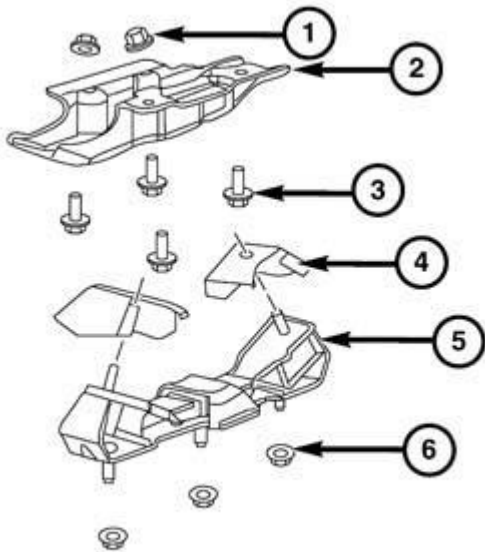
NOTE: 4WD mount shown in illustration. 2WD mount similar.

1. Raise the vehicle on a hoist.
2. Remove the lower nuts (6) from the transmission mount (5).
3. Using a suitable jack. Raise the transmission off the crossmember.
4. Remove the bolts (3) that secure the upper transmission mount bracket (2) to the transmission.
5. Remove the rear mount assembly from vehicle.
6. Remove the transmission mount nuts (1) from the upper transmission mount bracket.
7. Separate the insulator from the transmission mounting bracket.
8. Remove the transmission mount heat shields (4).

INSTALLATION

INSTALLATION

INSTALLATION



0912002986

Fig. 256: Transmission Mount Nuts, Upper Mount Bracket, Bolts, Heat Shields, Mount & Lower Nuts
 Courtesy of CHRYSLER GROUP, LLC

NOTE: 4WD mount shown. 2WD mount similar.

NOTE: Threadlocking compound must be applied to the bolts before installation.

1. If removed, position the heat shields (4) onto the insulator (5).
2. Position the insulator to the upper transmission mount bracket (2). Tighten the nuts (1) to 61 N.m (45 ft. lbs.).
3. Align the transmission mount to the transmission.
4. Install the bolts (3) that attach the transmission bracket to the transmission. Tighten the bolts to 64 N.m (47 ft. lbs.).
5. Lower the transmission so the transmission mount rest on the crossmember and the studs of the transmission mount are aligned in the slots in the crossmember.
6. Install the nuts (6) onto the transmission mount studs through the crossmember access slot.
7. Tighten the nuts to 61 N.m (45 ft. lbs.).
8. Lower the vehicle.

INSULATOR, ENGINE MOUNT, FRONT

REMOVAL

INSULATOR, LEFT

LEFT

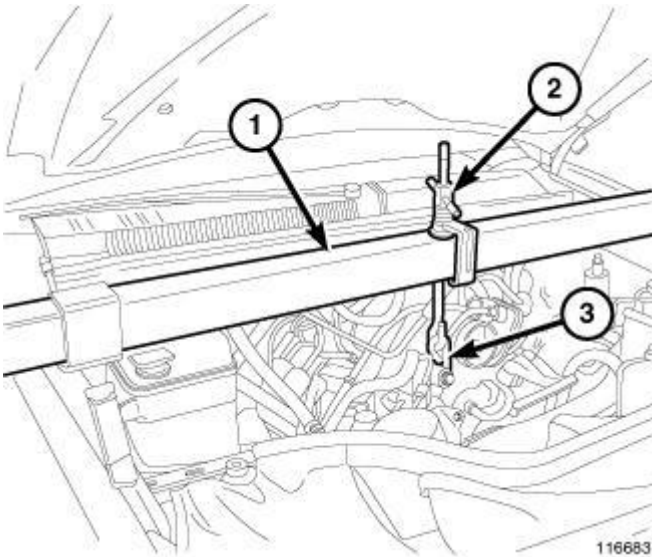


Fig. 257: Engine Support Tool
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Install the (special tool #8534B, Fixture, Driveline Support) (1).
3. Using the handle (2), tighten the lift rod (3) so that the engine will be supported.
4. Raise the vehicle.

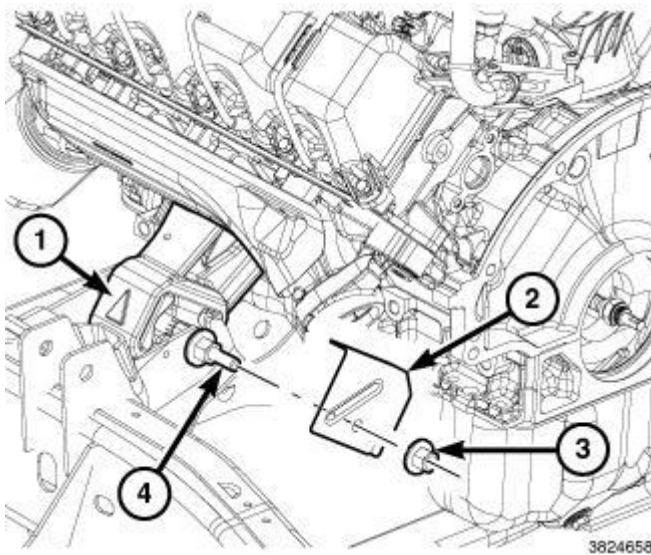


Fig. 258: Engine Mount, Heat Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Loosening of both front engine mount through bolts will be required for lifting of the engine.

5. Remove the engine mount heat shield nuts (3).

6. Remove the heat shield (2) from the engine mount through bolts (4).
7. Loosen the nut from engine mount through bolts.
8. Lower the vehicle.
9. Tighten the handle for the engine lift so that the engine clears the engine mount to frame bracket.
10. Raise the vehicle.

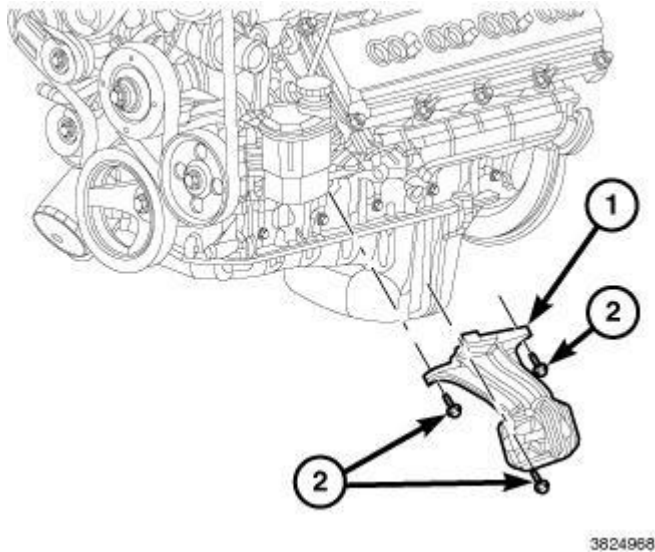


Fig. 259: Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Remove the bolts (2) that secure the engine mount (1) to the engine block.
12. Remove insulator from engine.

INSULATOR, RIGHT

RIGHT

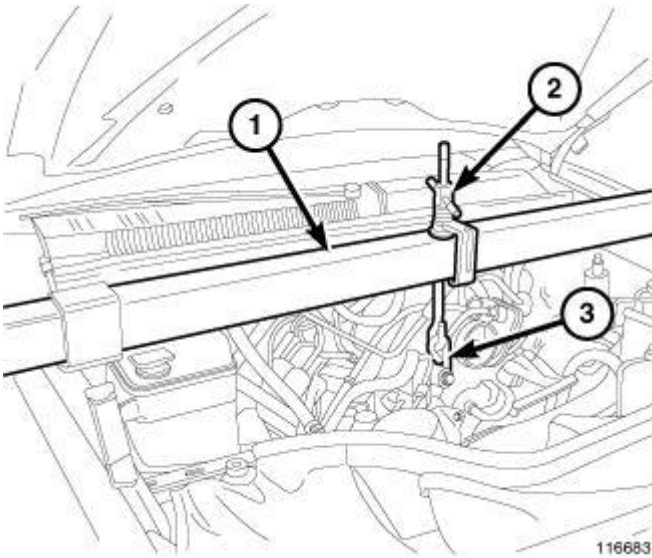


Fig. 260: Engine Support Tool
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Install the (special tool #8534B, Fixture, Driveline Support) (1).
3. Using the handle (2), tighten the lift rod (3) so that the engine will be supported.
4. Raise the vehicle.

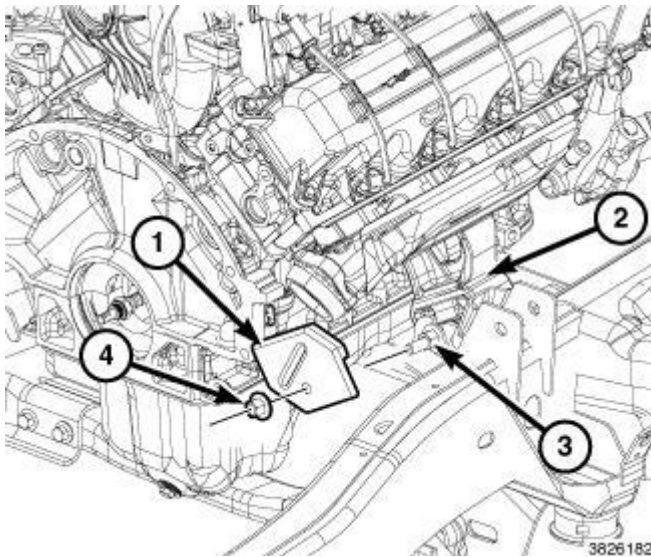


Fig. 261: Engine Mount, Heat Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

NOTE: Loosening of both front engine mount through bolts will be required for lifting of the engine.

5. Remove the engine mount heat shield nuts (4).

6. Remove the heat shields (1) from the engine mounts through bolts.
7. Loosen the nut (3) from engine mount through bolts.
8. Lower the vehicle.
9. Tighten the handle for the engine lift so that the engine clears the engine mount to frame bracket.
10. Raise the vehicle.

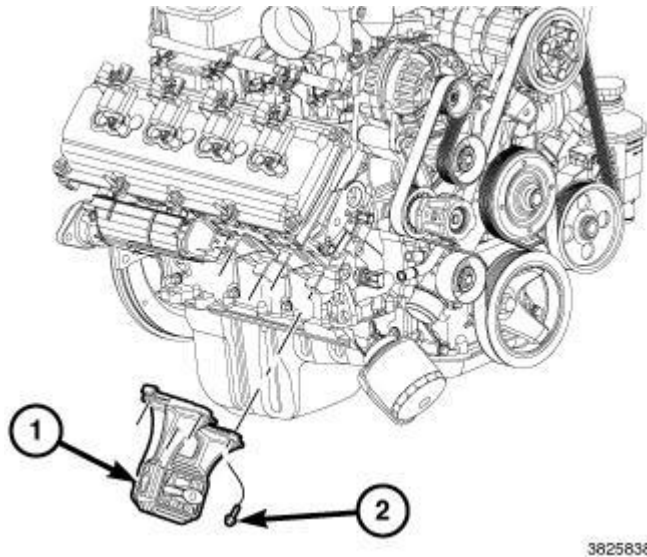


Fig. 262: Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Remove the bolts (2) that secure the engine mount (1) to the engine block.
12. Remove insulator from below the vehicle.

INSTALLATION

INSULATOR, LEFT

LEFT

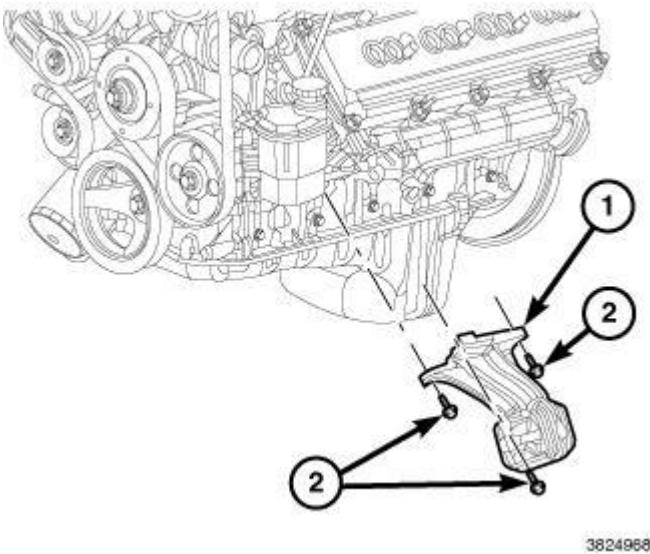


Fig. 263: Engine Mount & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. With the vehicle raised. Position the engine mount (1) on the engine.
2. Install upper and lower mount mounting bolts (2). Tighten bolts to 64 N.m (47 ft. lbs.).
3. Center the engine mount through bolt.
4. Lower the vehicle.

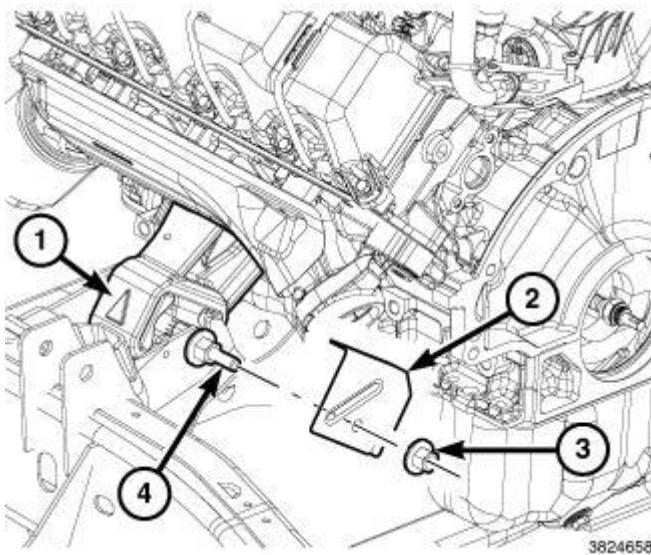


Fig. 264: Engine Mount, Heat Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Lower the engine into position onto the frame.
6. Raise vehicle.
7. Install the nut to the engine mount through bolt (4). Tighten the bolt to 130 N.m (96 ft. lbs.).
8. Install the engine mount heat shield (2). Tighten the nut (3) to 55 N.m (41 ft. lbs.).

9. Lower the vehicle.

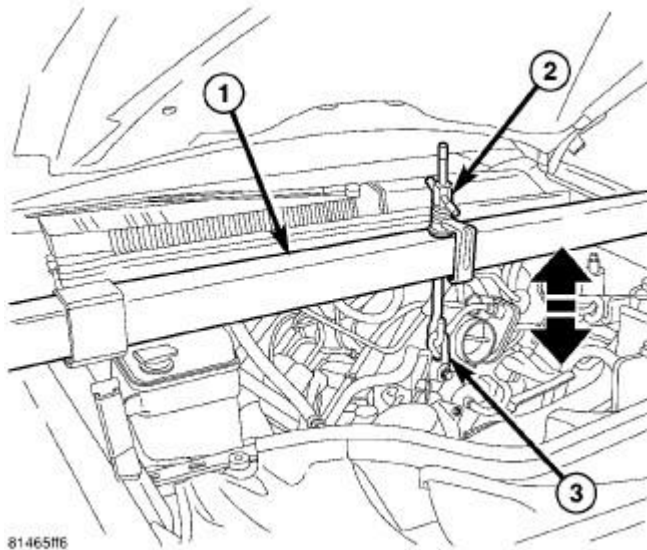


Fig. 265: Engine Support Tool
 Courtesy of CHRYSLER GROUP, LLC

10. Remove the (special tool #8534B, Fixture, Driveline Support).
11. Connect negative battery cable.

INSULATOR, RIGHT

RIGHT

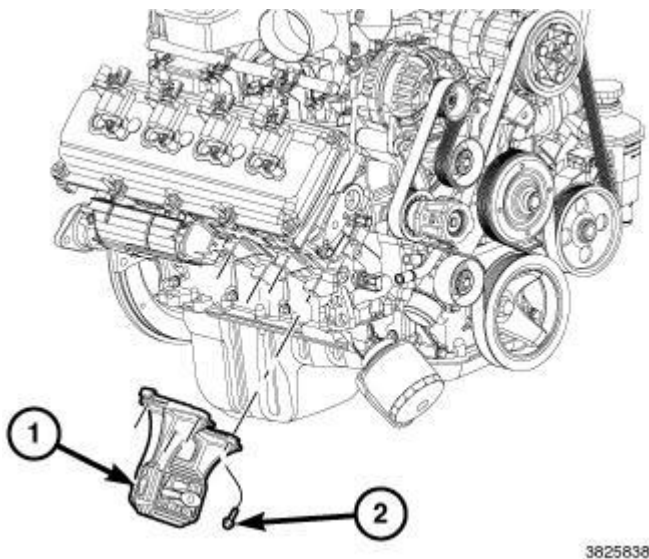


Fig. 266: Engine Mount & Bolts
 Courtesy of CHRYSLER GROUP, LLC

1. With the vehicle raised. Position the engine mount (1) on the engine.
2. Install upper and lower mount mounting bolts (2). Tighten bolts to 64 N.m (47 ft. lbs.).
3. Center the engine mount through bolt.
4. Lower the vehicle.

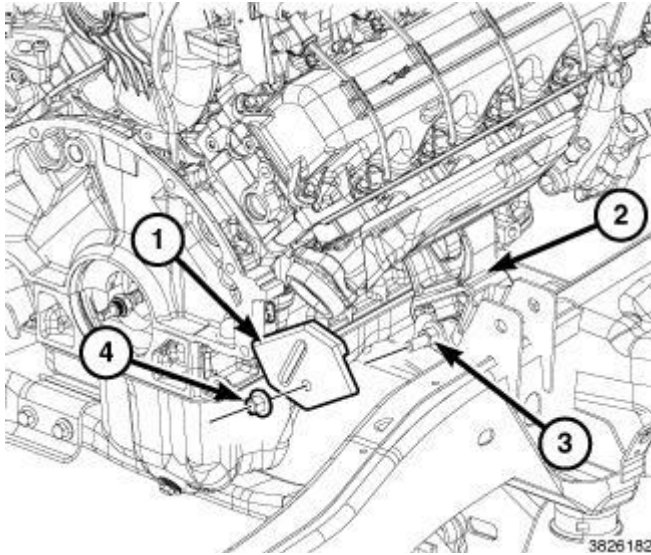


Fig. 267: Engine Mount, Heat Shield & Fasteners
 Courtesy of CHRYSLER GROUP, LLC

5. Lower the engine into position onto the frame.
6. Raise vehicle.
7. Install the nut to the engine mount through bolt (3). Tighten the bolt to 130 N.m (96 ft. lbs.).
8. Install the engine mount heat shield (1). Tighten the nut (4) to 55 N.m (41 ft. lbs.).
9. Lower the vehicle.

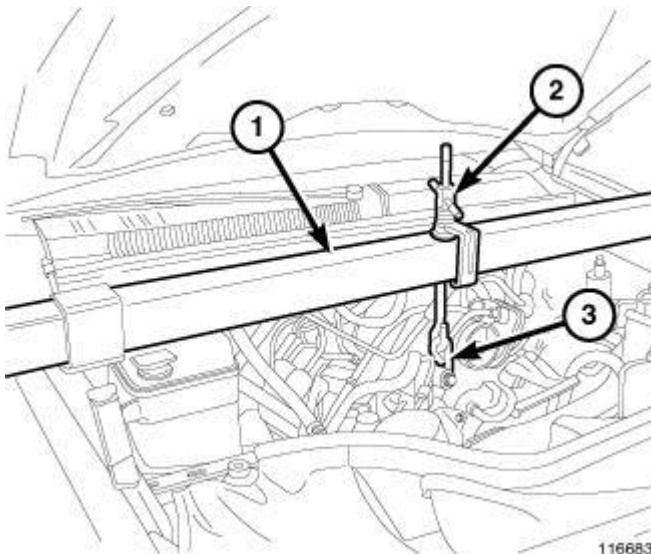
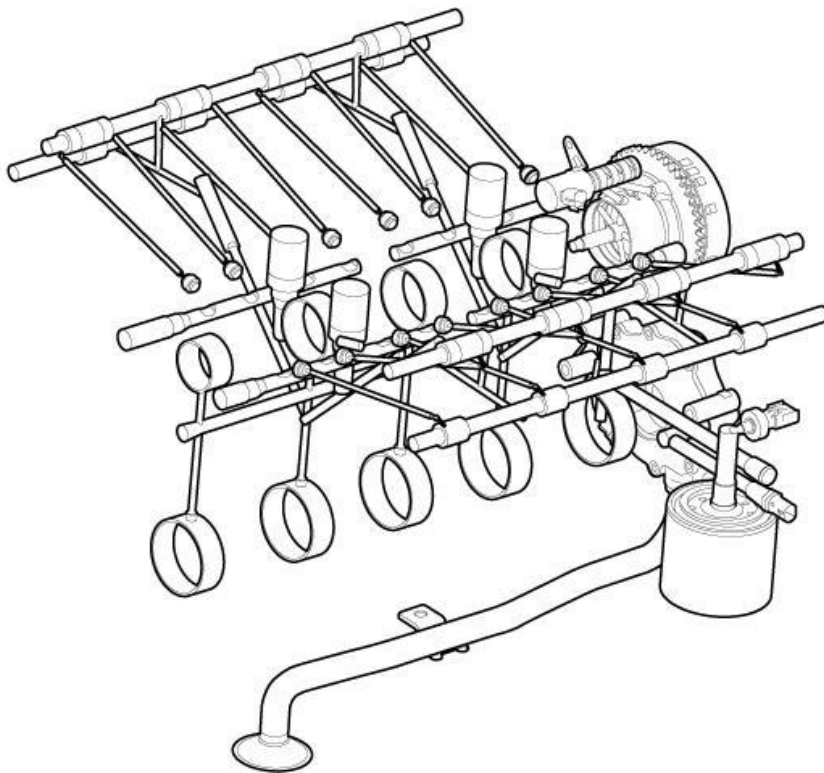


Fig. 268: Engine Support Tool**Courtesy of CHRYSLER GROUP, LLC**

10. Remove the (special tool #8534B, Fixture, Driveline Support).
11. Connect negative battery cable.

LUBRICATION**DESCRIPTION****DESCRIPTION**

2390268

Fig. 269: MDS Lubrication System**Courtesy of CHRYSLER GROUP, LLC**

The MDS lubrication system is a full flow filtration pressure feed type.

DIAGNOSIS AND TESTING**CHECKING ENGINE OIL PRESSURE**

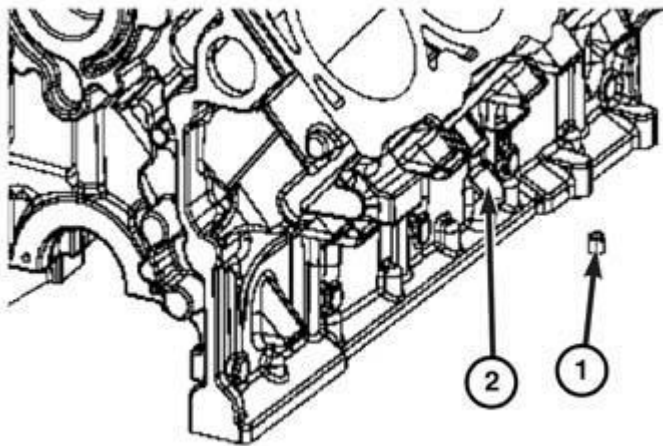
1. Remove the oil pressure sending unit and install gauge assembly (special tool #C-3292A, Gauge, Pressure).
2. Run the engine until thermostat opens.
3. Oil Pressure:

- Curb Idle-25 kPa (4 psi) minimum
 - 3000 RPM-170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of the oil leak. If the oil leak is found and identified, repair per Service Information instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.



0911030971

Fig. 270: Engine Oil Pan Plug
Courtesy of CHRYSLER GROUP, LLC

NOTE: If the oil indicator tube is located in the engine oil pan. A plug (1) is inserted into the hole on the engine block (2). Validation of the plug is required when the engine block has been replaced.

AIR LEAK DETECTION TEST METHOD

1. Remove the PCV valve from the IAFM. Cap or plug the PCV valve grommet.
2. Attach an air hose with a pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

3. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per Service Information procedures.
4. If the leakage occurs at the rear oil seal area, refer to **INSPECTION FOR REAR SEAL AREA LEAKS**.
5. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve.
6. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
 - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
 - b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil gallery pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in **AIR LEAK DETECTION TEST METHOD**

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to

remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

COOLER AND LINES, OIL

DESCRIPTION

DESCRIPTION

An engine oil cooler is used on the 6.4L engine. The cooler is a coolant-to-oil type and mounted on the oil filter adapter housing.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Raise vehicle on hoist.
3. If equipped, remove the secondary generator. Refer to **GENERATOR, REMOVAL** .
4. Drain cooling system. Refer to **STANDARD PROCEDURE** .
5. Remove the oil filter funnel.

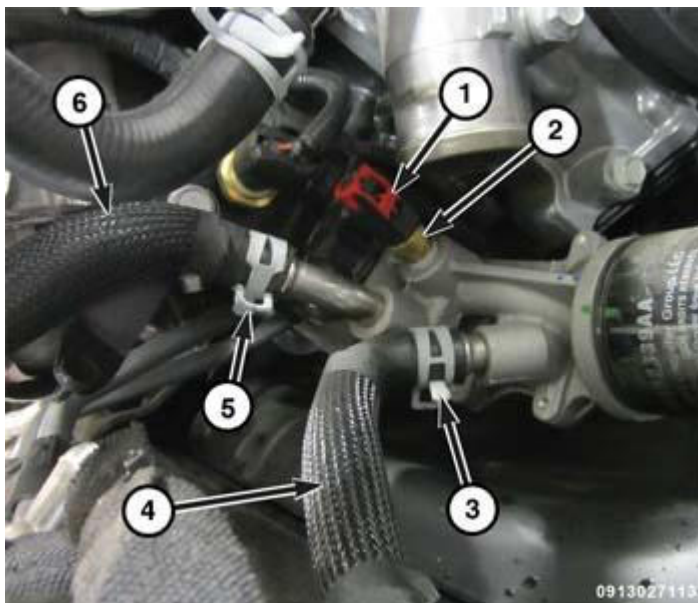
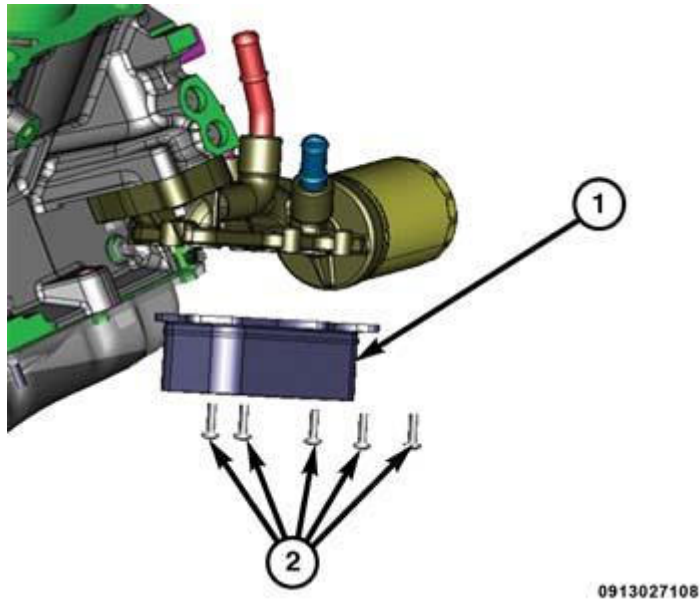


Fig. 271: Oil Temperature Sensor, Electrical Connector, Oil Cooler Coolant Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

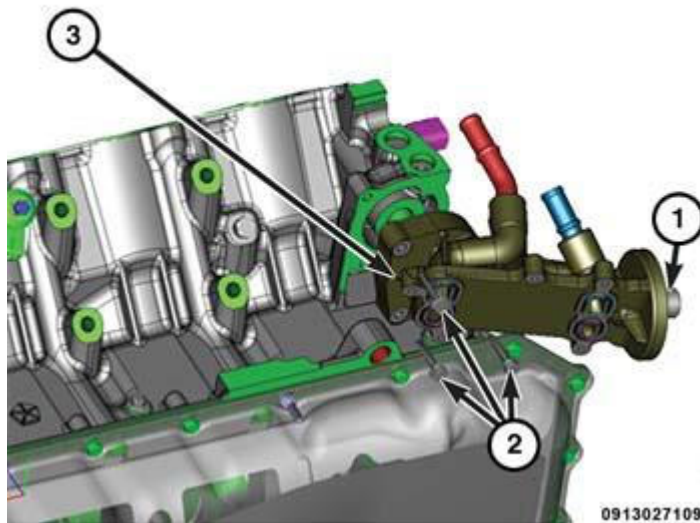
6. Disconnect the oil temperature sensor (2) electrical connector (1).
7. Disconnect the oil cooler coolant hoses (4, 6).



0913027108

Fig. 272: Remove/Install Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

8. Remove oil filter.
9. Remove the oil cooler (1) from the adapter.



0913027109

Fig. 273: Remove/Install Adapter
Courtesy of CHRYSLER GROUP, LLC

10. Remove the adapter (3) from the engine.

INSTALLATION

INSTALLATION

NOTE: Inspect seal conditions. Seals can be re-used, if not damaged. Position seal in the seal channel and press lightly into place. Repeat procedure for each seal position.

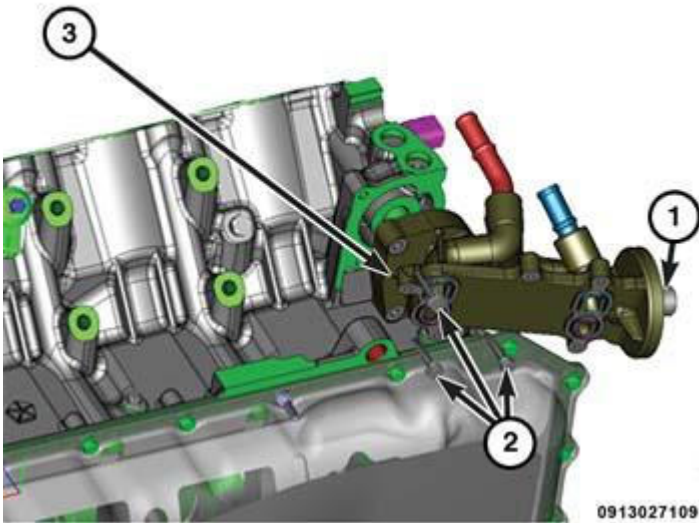


Fig. 274: Remove/Install Adapter

Courtesy of CHRYSLER GROUP, LLC

1. Lubricate seal and position oil filter adapter to the engine block. Tighten the bolts (2) to 12 N.m (9 ft. lbs.).
2. If removed, install the oil filter connector (1). Tighten the bolts to 25 N.m (18 ft. lbs.).

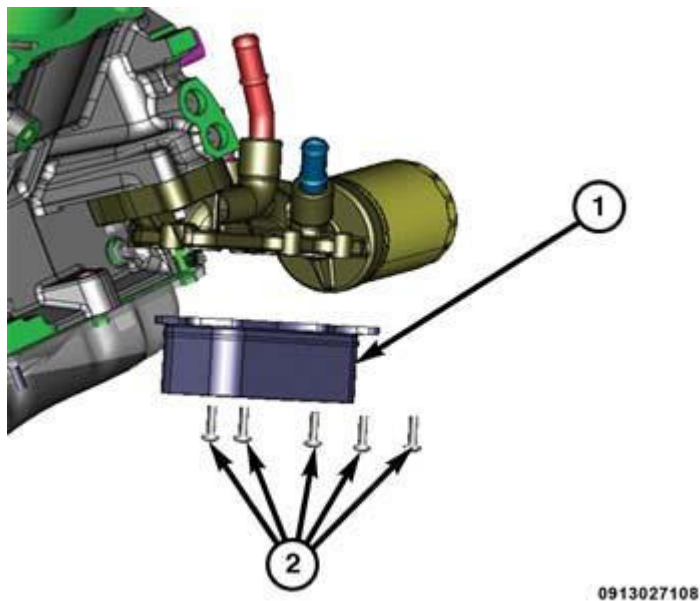


Fig. 275: Remove/Install Oil Cooler

Courtesy of CHRYSLER GROUP, LLC

3. Install oil cooler (1). Tighten the bolts (2) to 12 N.m (9 ft. lbs.).

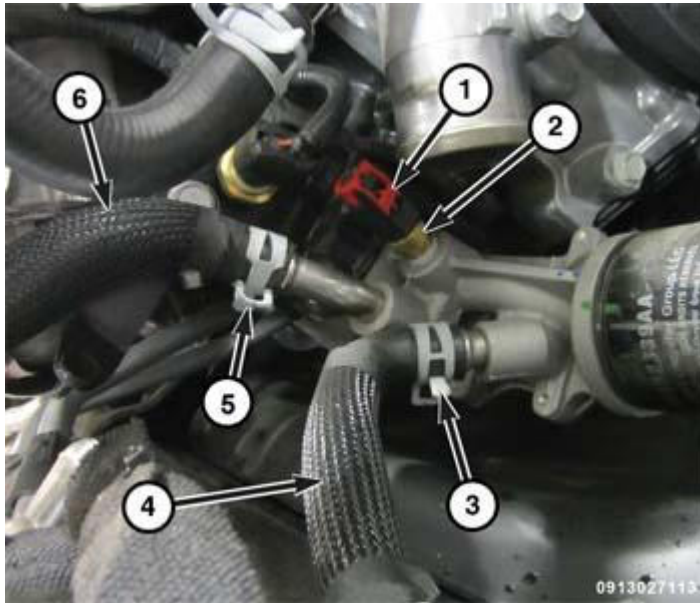


Fig. 276: Oil Temperature Sensor, Electrical Connector, Oil Cooler Coolant Hoses & Clamps
Courtesy of CHRYSLER GROUP, LLC

4. Install the oil temperature sensor (1). Tighten the bolts (2) to 27 N.m (9 ft. lbs.).
5. Connect the oil temperature sensor electrical connector (1).
6. Connect oil cooler coolant hoses (4, 6).
7. Install oil filter.
8. Install the oil filter funnel.
9. If removed, install the secondary generator. Refer to **GENERATOR, INSTALLATION**.
10. Lower vehicle.
11. Fill cooling system. Refer to **STANDARD PROCEDURE**.
12. Connect the battery negative cable.

FILTER, ENGINE OIL

REMOVAL

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. Chrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.
4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill.

Remove filter from vehicle.

NOTE: Make sure filter gasket was removed with filter.

5. With a wiping cloth, clean the gasket sealing surface of oil and grime.

INSTALLATION

INSTALLATION

1. Lightly lubricate the oil filter gasket (2) with engine oil.

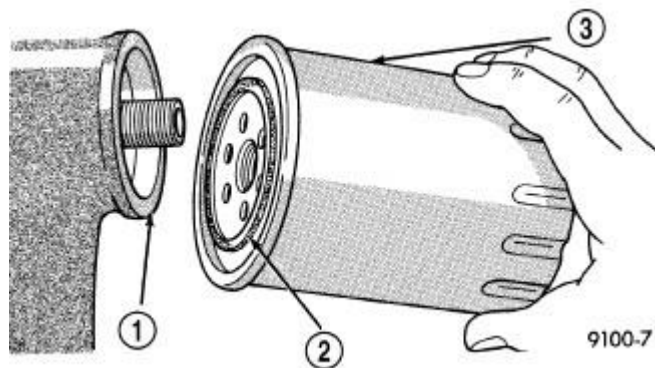


Fig. 277: Installing Engine Oil Filter
Courtesy of CHRYSLER GROUP, LLC

2. Thread the oil filter (3) onto adapter nipple and when the gasket makes contact with sealing surface (1), rotate the filter 360° or one full turn, do not over tighten.
3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

OIL

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE OIL SERVICE

The engine oil level indicator is located at the left hand of the engine on the 5.7L engines.

CRANKCASE OIL LEVEL INSPECTION

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

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about ten minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

It is recommended that the engine oil level should be checked when the engine is at operating temperature.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately five minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Verify the oil level to be at the top of the "SAFE" range +/- 1/4 of the total distance of the range.
7. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules. Refer to **MAINTENANCE SCHEDULES, DESCRIPTION** .

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.
5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase. Torque to 34 N.m (25 ft. lbs.).
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this Service Information.
8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to applicable disposal laws.

PAN, OIL

REMOVAL

REMOVAL

4X2

1. Disconnect the negative battery cable.
2. Raise the vehicle.

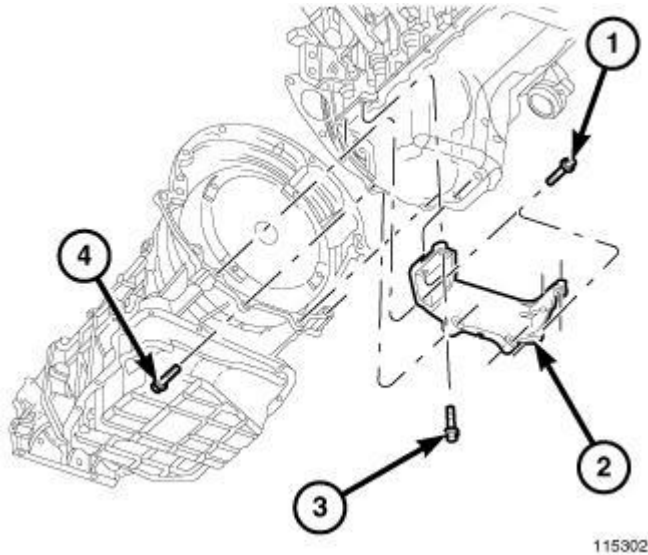


Fig. 278: Structural Cover
 Courtesy of CHRYSLER GROUP, LLC

3. Drain engine oil.
4. Remove the structural dust cover (2). Refer to COVER, STRUCTURAL DUST, REMOVAL.

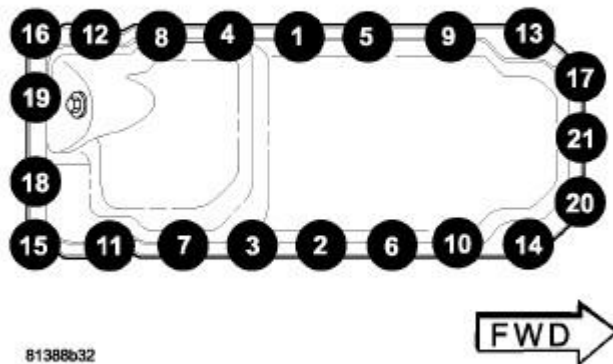


Fig. 279: Oil Pan Torque Sequence
 Courtesy of CHRYSLER GROUP, LLC

NOTE: The oil pump pick-up tube can be removed with the oil pan positioned aside.

5. Remove the oil pan mounting bolts using the sequence provided.

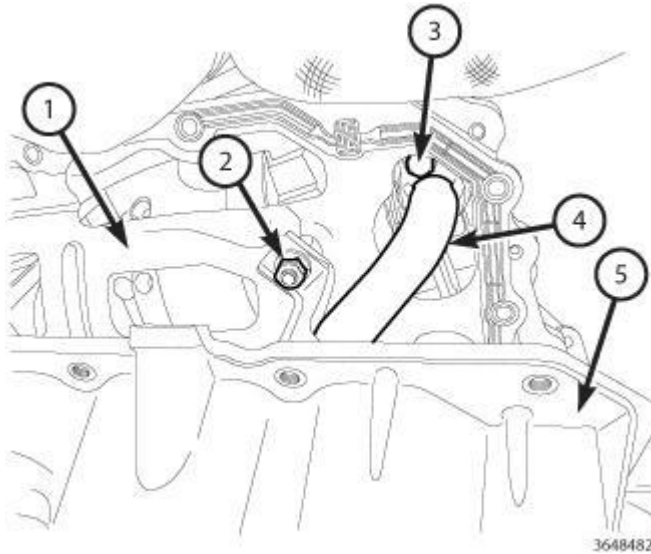


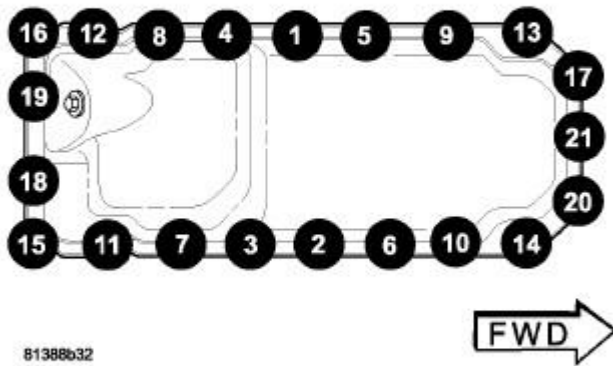
Fig. 280: Oil Pan Gasket/Windage Tray, Oil Pump Pickup Tube, Oil Pan & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Unbolt the front oil pump pickup tube bolt (3) and remove the nut (2) and remove the tube and oil pan from the engine.

NOTE: When the oil pan is removed, a new integral windage tray (1) and gasket assembly must be installed. The old gasket cannot be reused.

7. Discard the integral windage tray and gasket and replace.

4X4

**Fig. 281: Oil Pan Torque Sequence**

Courtesy of CHRYSLER GROUP, LLC

1. Follow all steps for 4X2 removal.
2. Unbolt and lower the steering rack, without disconnecting the lines.

NOTE: The front axle must be lowered to remove the oil pan on 4X4 vehicles.

3. Remove the front driveshaft at the axle. Mark for reassembly.
4. Support the front axle.
5. Remove the right and left axle to mount bolts.
6. Lower axle.
7. Remove the oil pan mounting bolts and oil pan.
8. Unbolt oil pump pickup tube and remove tube.

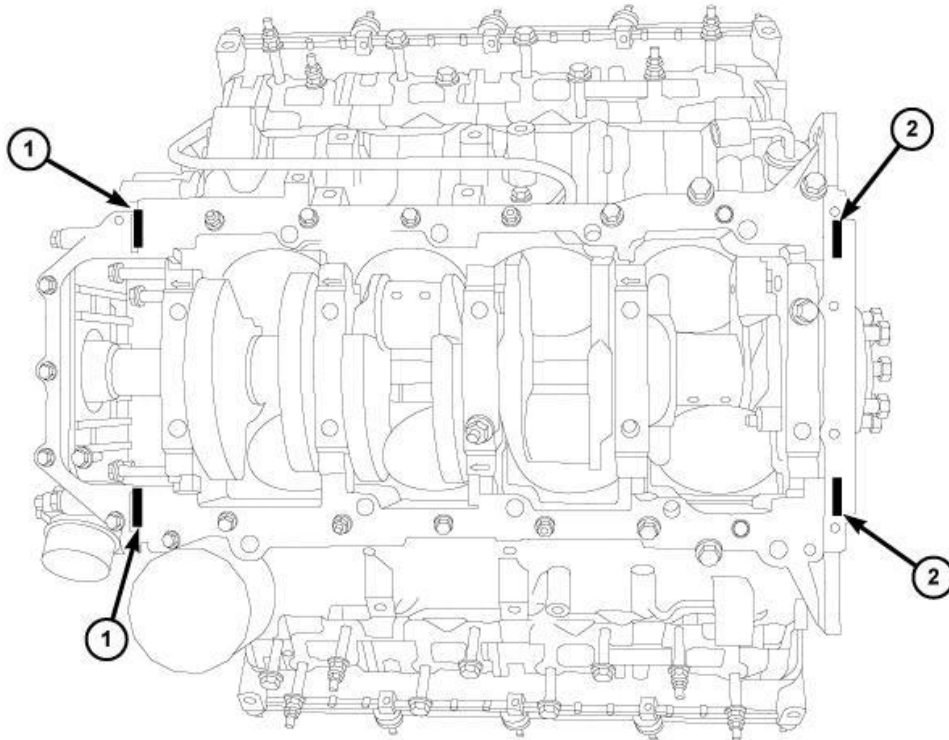
NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

9. Discard the integral windage tray and gasket and replace.

INSTALLATION**INSTALLATION****4X2**

NOTE: For the engine torque specifications

Refer to **ENGINE SPECIFICATIONS** .



44843

Fig. 282: T-Joint RTV Application

Courtesy of CHRYSLER GROUP, LLC

1. Clean the oil pan gasket mating surface of the block and oil pan.

NOTE: Mopar® Engine RTV must be applied to the four T-joints (1, 2). The bead of RTV should cover the bottom of the gasket. This area is approximately 4.5 mm x 25 mm in each of the four T-joint locations.

2. Apply Mopar® Engine RTV at the T- joints (1, 2).

NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

3. Install a new integral windage tray.

NOTE: The oil pump pick-up tube can be installed with the oil pan in position.

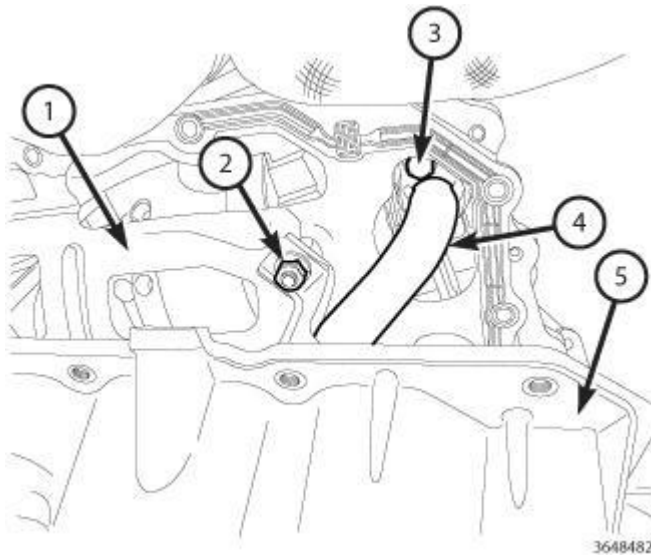


Fig. 283: Oil Pan Gasket/Windage Tray, Oil Pump Pickup Tube, Oil Pan & Fasteners
Courtesy of CHRYSLER GROUP, LLC

4. Reinstall the oil pump pickup tube (4) with new O-rings.
5. Install the oil pick-up tube brace nut (2).

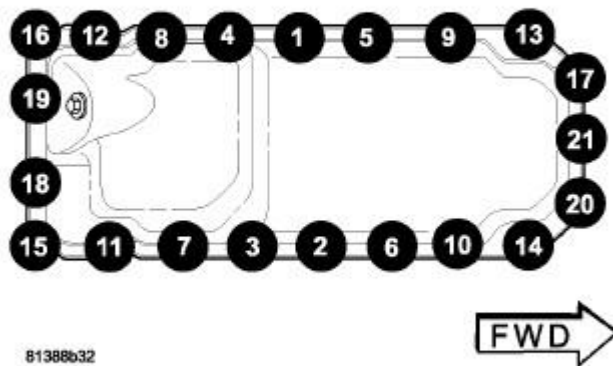


Fig. 284: Oil Pan Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: The double ended oil pan studs must be installed in the same location that they were removed from.

6. Position the oil pan and install the mounting bolts and studs. Tighten the mounting bolts in sequential to 14 N.m (10 ft. lbs.).

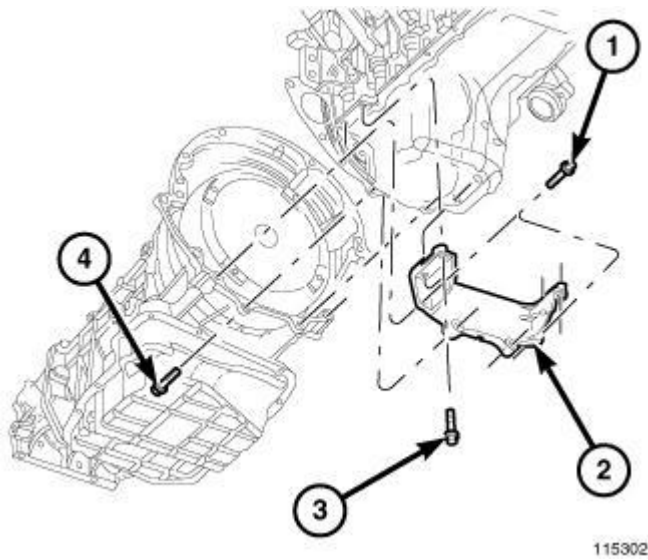
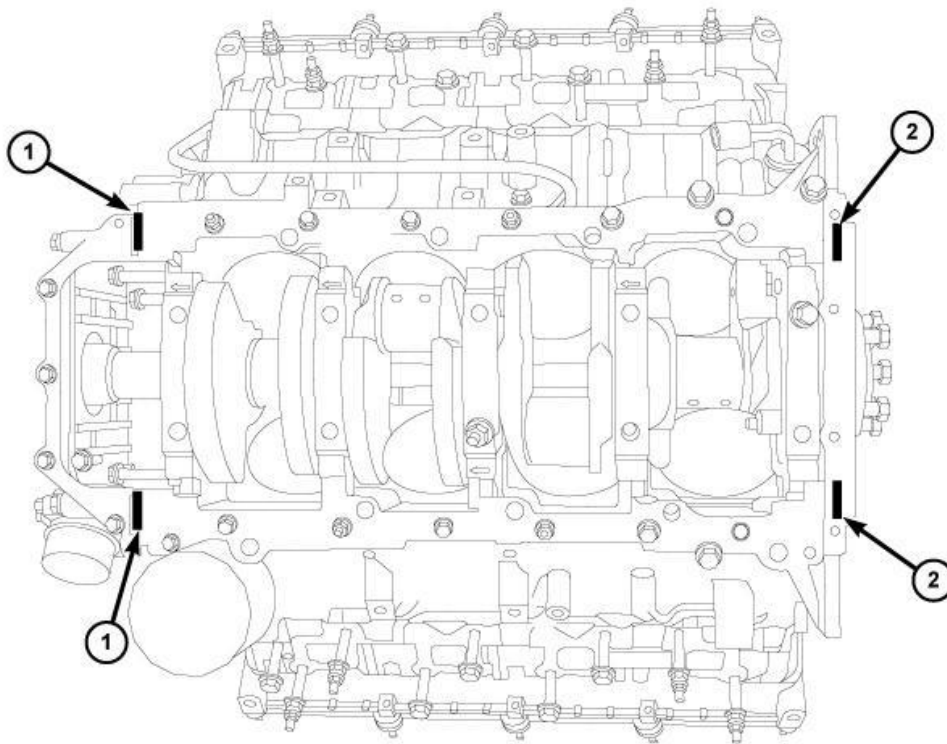


Fig. 285: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

7. Install the structural cover (2). Refer to **COVER, STRUCTURAL DUST, INSTALLATION.**
8. Lower the vehicle.
9. Fill engine oil.
10. Connect the negative battery cable.
11. Start engine and check for leaks.

4X4



44843

Fig. 286: T-Joint RTV Application

Courtesy of CHRYSLER GROUP, LLC

1. Clean the oil pan gasket mating surface of the block and oil pan.

NOTE: Mopar® Engine RTV must be applied to the four T-joints (1, 2). The bead of RTV should cover the bottom of the gasket. This area is approximately 4.5 mm x 25 mm in each of the four T-joint locations.

2. Apply Mopar® Engine RTV at the T- joints (1, 2).

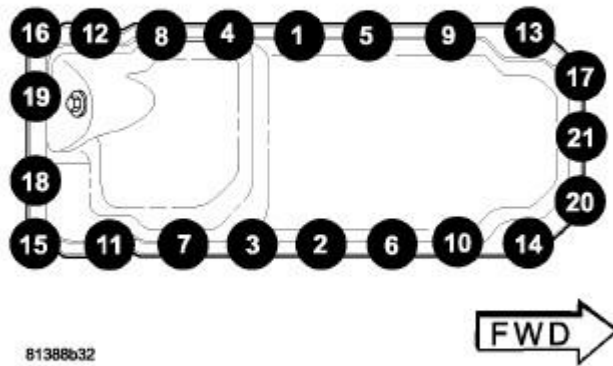


Fig. 287: Oil Pan Torque Sequence

Courtesy of CHRYSLER GROUP, LLC

NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

3. Install a new integral windage tray and gasket.
4. Reinstall the oil pump pickup tube with new O-rings. Tighten tube to pump fasteners to 28 N.m (21 ft.lbs.).

NOTE: The double ended oil pan studs must be installed in the same location that they were removed from.

5. Position the oil pan and install the mounting bolts and studs. Tighten the mounting bolts to 12 N.m (105 in.lbs.).

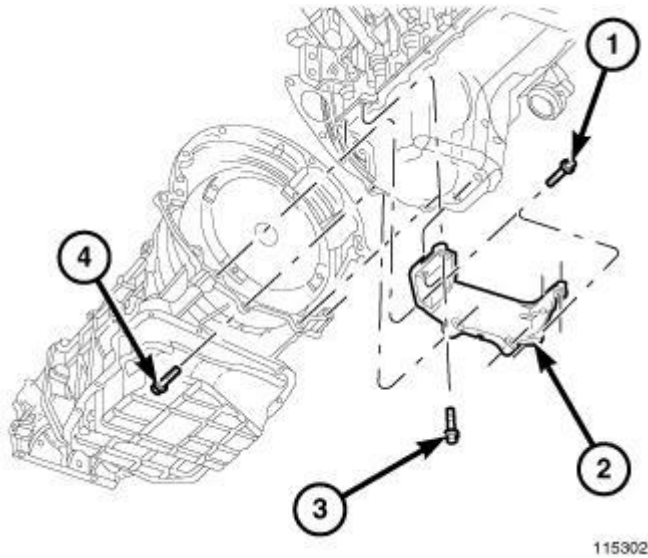


Fig. 288: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

6. Connect cooler lines to radiator, transmission and clips.

NOTE: When connecting the transmission oil cooler lines, it is necessary to replace the line clip that is located on the oil pan stud. The retention force of the clip is severely degraded upon removal.

7. Install the structural cover (2). Refer to COVER, STRUCTURAL DUST, INSTALLATION.

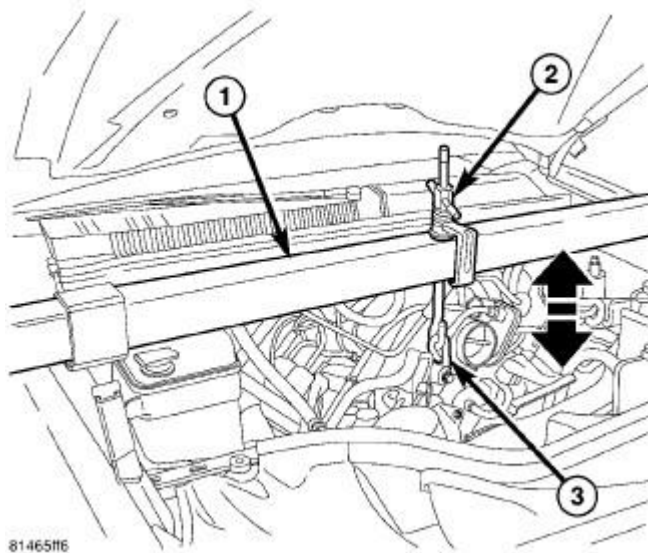


Fig. 289: Engine Support Tool
Courtesy of CHRYSLER GROUP, LLC

8. Lower the engine into mounts using Engine Support Fixture (special tool #8534B, Fixture, Driveline

Support) (1).

9. Install both the left and right side engine mount through bolts. Tighten the nuts to 68 N.m (50 ft. lbs.).
10. Reinstall the front axle, if removed.
11. Install the steering rack, if removed.
12. Install the rear transmission mount, if removed.
13. Remove Engine Support Fixture (special tool #8534B, Fixture, Driveline Support) (1).
14. Install the front crossmember. Refer to **CROSSMEMBER, LOWER CONTROL ARM, INSTALLATION** and/or **CROSSMEMBER, TRANSMISSION, INSTALLATION** .
15. Install the fan shroud and fan.
16. Fill engine oil.
17. Connect the negative battery cable.
18. Start engine and check for leaks.

PUMP, ENGINE OIL

REMOVAL

REMOVAL

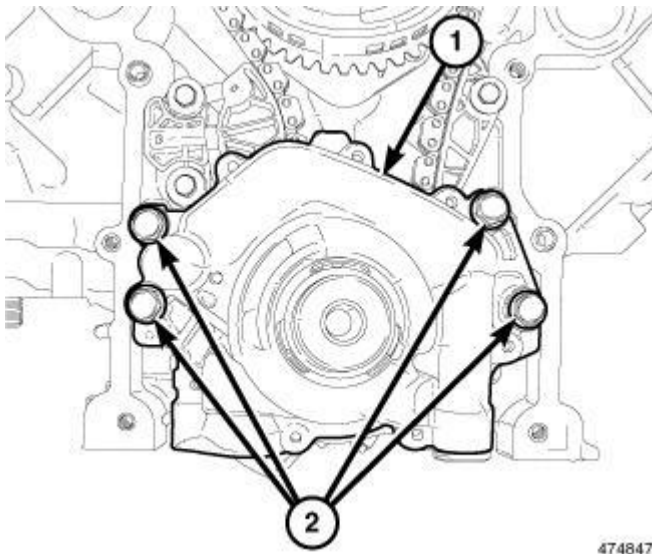


Fig. 290: Oil Pump Retaining Bolts

Courtesy of CHRYSLER GROUP, LLC

1. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .
2. Remove the timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL** .
3. Remove the four bolts (2) and the oil pump (1).

CLEANING

CLEANING

1. Wash all parts in a suitable solvent.

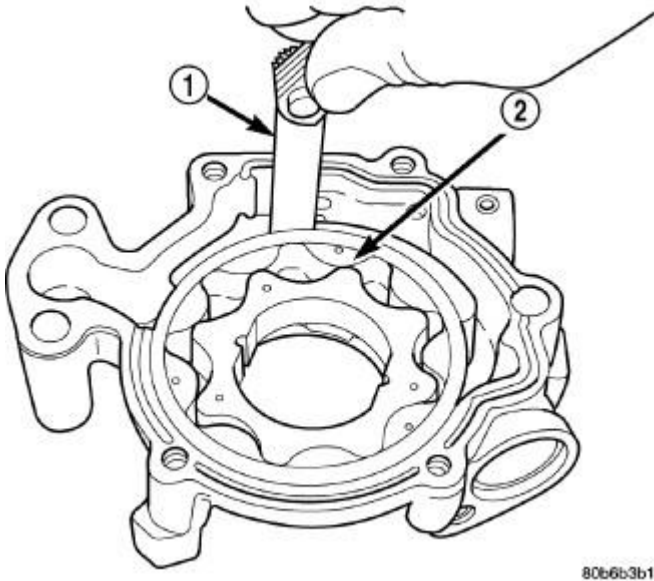
INSPECTION**INSPECTION**

Fig. 291: Measuring Outer Rotor Clearance in Housing
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

1. Remove the pump cover.
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
3. Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor (2) and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.

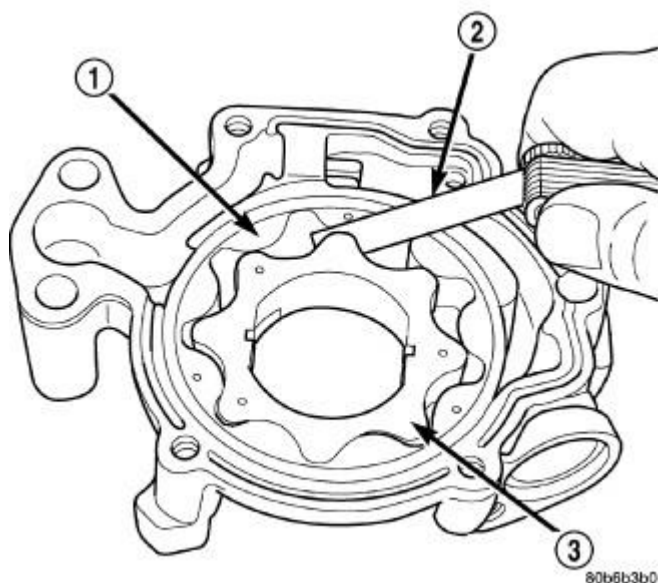


Fig. 292: Measuring Clearance Between Rotors
Courtesy of CHRYSLER GROUP, LLC

4. Install the inner rotor into the oil pump body. Measure the clearance between the inner (3) and outer rotors (1). If the clearance between the rotors is 0.150 mm (0.006 in.) or more the oil pump assembly must be replaced.

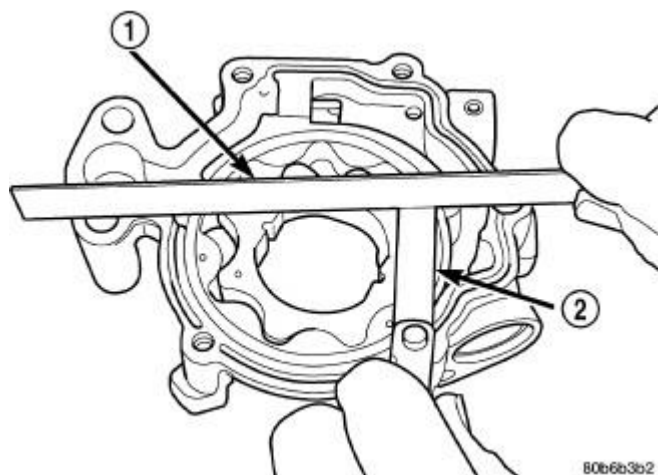


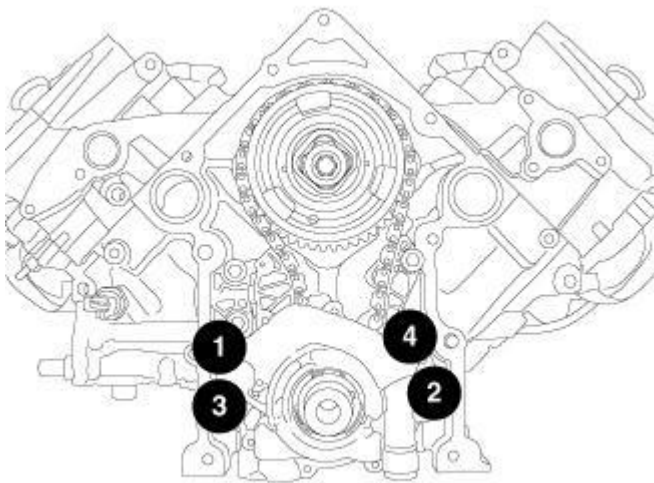
Fig. 293: Measuring Clearance Over Rotors
Courtesy of CHRYSLER GROUP, LLC

5. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of 0.095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.
6. Reinstall the pump cover. Tighten fasteners to 15 N.m (132 in. lbs.).

NOTE: The 5.7 Oil pump is serviced as an assembly. In the event the oil pump is not functioning or out of specification, it must be replaced as an assembly.

INSTALLATION

INSTALLATION



439119

Fig. 294: Oil Pump Retaining Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Position the oil pump on the crankshaft and install the oil pump retaining bolts finger tight.
2. Using the sequence shown, tighten the oil pump retaining bolts to 28 N.m (21 ft. lbs.).
3. Install the timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION** .
4. Install the oil pan. Refer to **PAN, OIL, INSTALLATION** .

SENSOR, OIL PRESSURE

DESCRIPTION

DESCRIPTION

The oil pressure sensor uses the following three circuits:

- Signal circuit to the PCM
- Sensor ground circuit from the PCM
- 5 volt. Reference circuit from the PCM

The oil pressure sensor returns a voltage signal back to the PCM with. Reference to oil pressure. Ground for the sensor is supplied by the PCM.

The oil pressure sensor is located on the right side of the engine block. The sensor screws into the engines main

oil gallery.

REMOVAL

REMOVAL

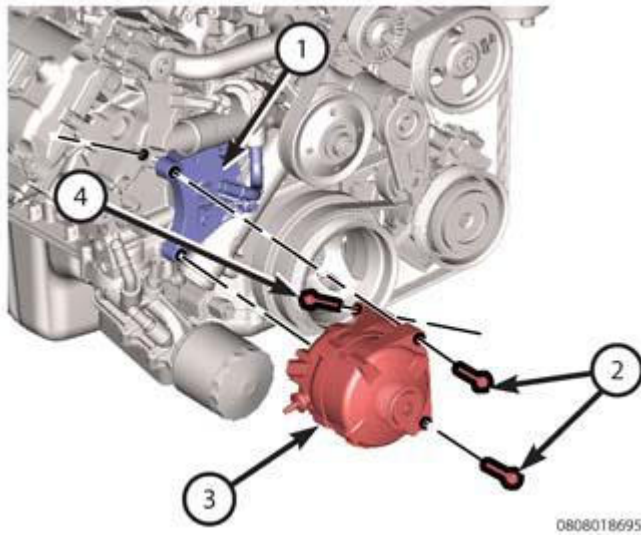


Fig. 295: Generator, Insulator Cap, B+ Output Terminal & Connector
Courtesy of CHRYSLER GROUP, LLC

1. If equipped, remove the secondary generator. Refer to **GENERATOR, REMOVAL** .

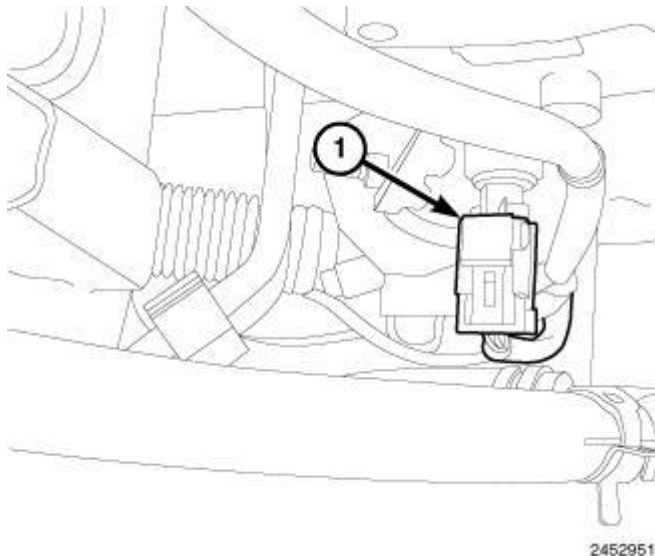


Fig. 296: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect and isolate the negative battery cable.
3. Disconnect the oil pressure sensor electrical connector (1).

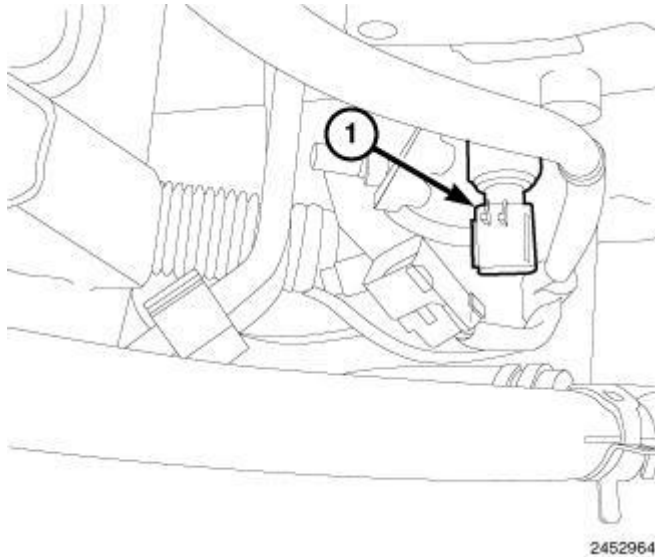


Fig. 297: Oil Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

4. Remove the oil pressure sensor (1).

INSTALLATION

INSTALLATION

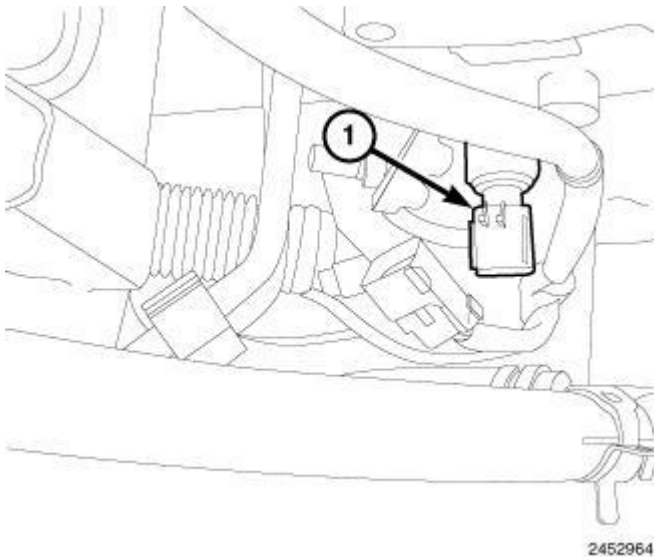


Fig. 298: Oil Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

NOTE: Apply Mopar® Thread Sealant with PTFE to the sensor threads with before installing into the engine block.

1. Install the oil pressure sensor (1).

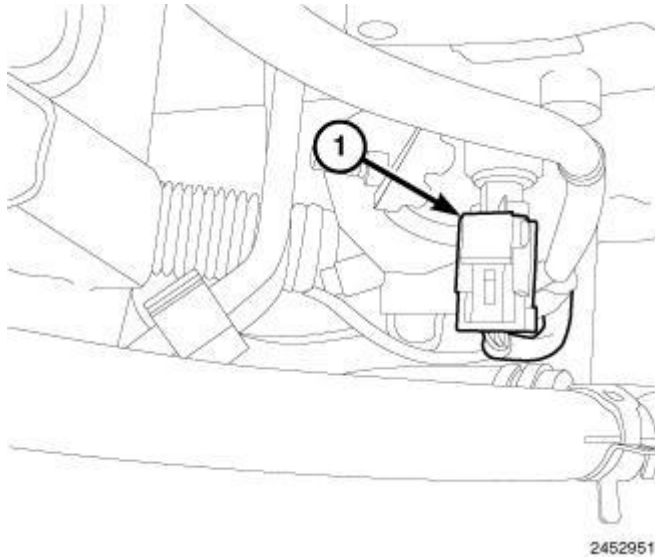


Fig. 299: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

2. Connect the oil pressure sensor electrical connector (1).

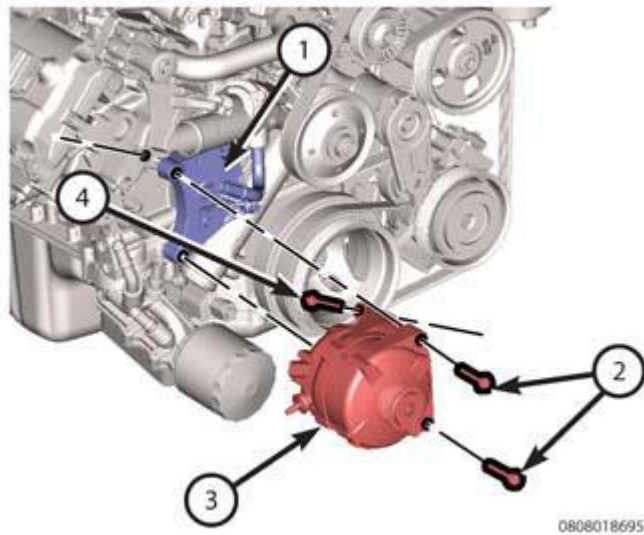


Fig. 300: Generator, Insulator Cap, B+ Output Terminal & Connector
Courtesy of CHRYSLER GROUP, LLC

3. If removed, install the secondary generator. Refer to **GENERATOR, INSTALLATION**.
4. Connect the negative battery cable.

SENSOR, OIL TEMPERATURE

DESCRIPTION

DESCRIPTION

The oil temperature sensor uses the following two circuits:

- Signal circuit to the PCM
- Ground circuit from the PCM

The oil temperature sensor is a Negative Thermal Coefficient sensor. The resistance of the sensor changes as oil temperature changes. This results in different output voltages back to the PCM.

The oil temperature sensor is located on the right side of the engine block.

REMOVAL

REMOVAL

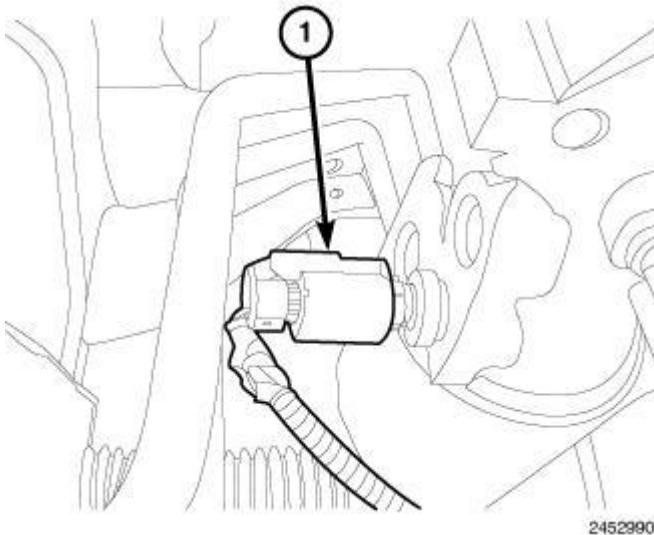


Fig. 301: Oil Temperature Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable.
2. Disconnect the oil temperature sensor electrical connector (1).

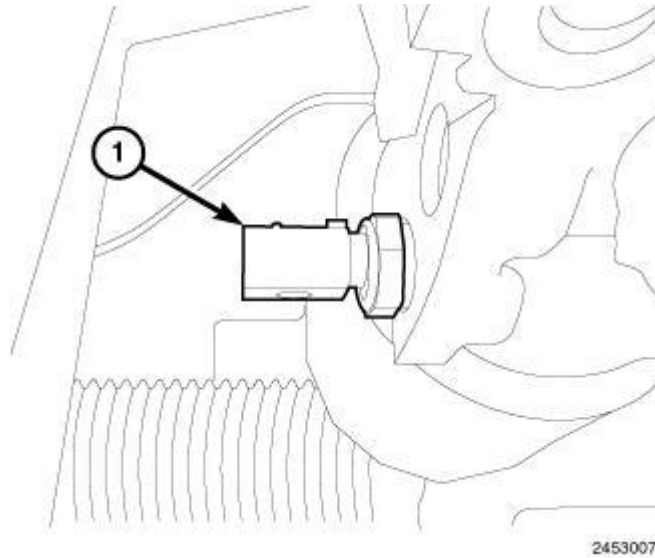


Fig. 302: Oil Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

3. Remove the oil temperature sensor (1).

INSTALLATION

INSTALLATION

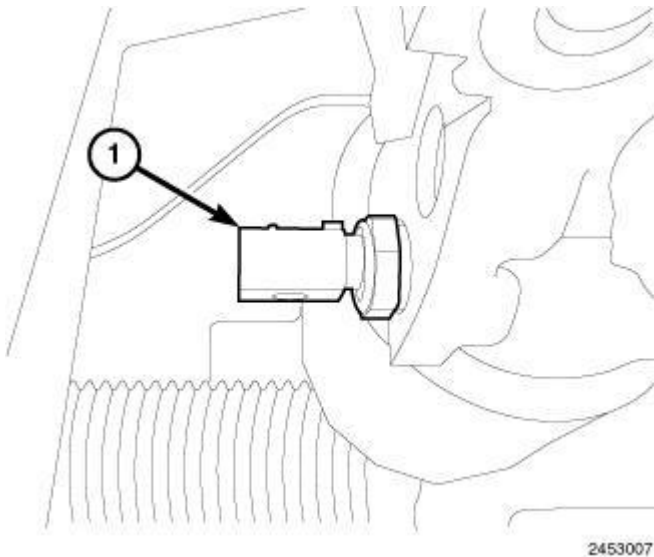


Fig. 303: Oil Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

NOTE: Apply Mopar® Thread Sealant with PTFE to the sensor threads before installing into the engine block.

1. Install the oil temperature sensor (1).

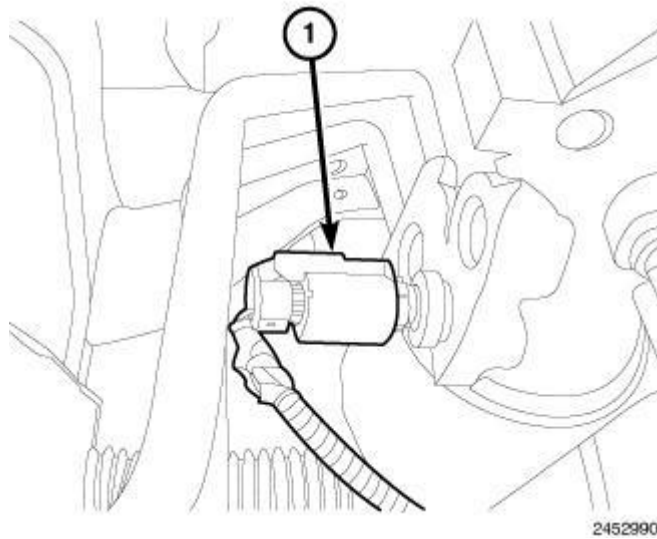


Fig. 304: Oil Temperature Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

2. Connect the oil temperature sensor electrical connector (1).
3. Connect the negative battery cable.

SOLENOID, VARIABLE VALVE TIMING (VVTS), EXHAUST

DESCRIPTION

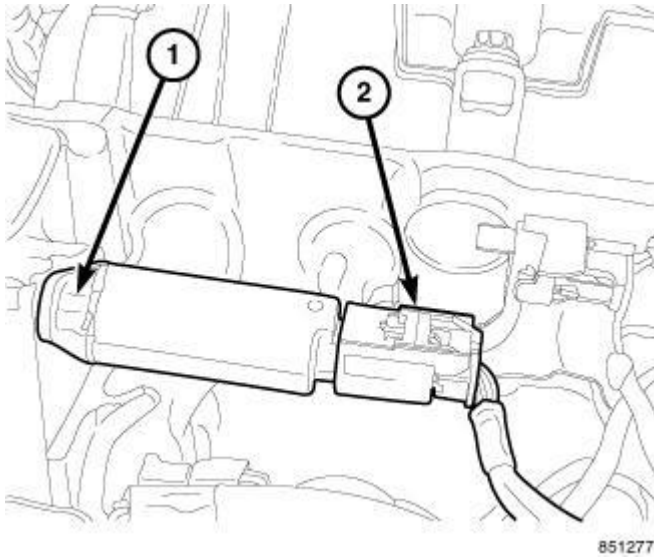
DESCRIPTION

The 5.7L engine is equipped with Variable Cam Timing (VCT). This system uses an variable valve timing solenoid to direct oil pressure into the camshaft phaser assembly. The camshaft phaser assembly advances and/or retards camshaft timing to improve engine performance, mid-range torque, idle quality, fuel economy, and reduce emissions. The VVTS is located under the intake manifold.

OPERATION

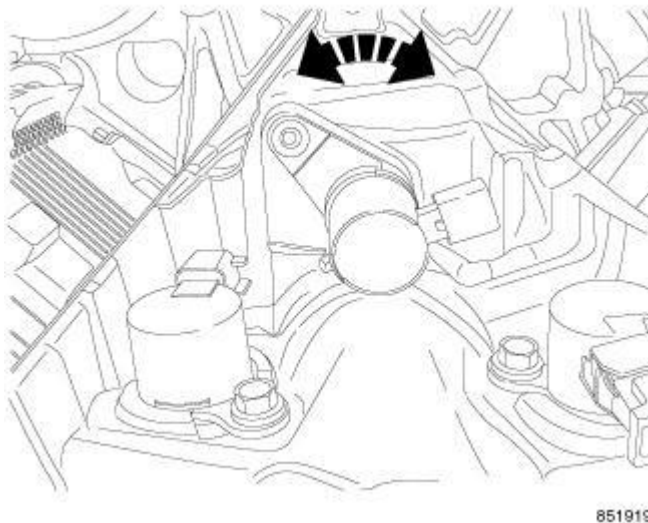
OPERATION

The Variable Cam Timing (VCT) assembly is actuated with engine oil pressure. The oil flow to the VCT assembly is controlled by an Variable Valve Timing Solenoid (VVTS). The VVTS consists of a Pulse Width Modulated (PWM) solenoid and a spool valve. The PCM actuates the VVTS to control oil flow through the spool valve into the VCT assembly. The VCT assembly consists of a rotor and a stator/sprocket. The stator/sprocket is connected to the timing chain. The rotor is connected to the camshaft. Oil flow into the VCT assembly rotates the rotor with respect to the stator, thus rotating the camshaft with respect to the stator/sprocket. This will rotate both the intake and exhaust lobes on the camshaft by the same amount. The intake and exhaust lobes can not be individually controlled with this VCT system. An infinitely variable valve timing position can be achieved within the limits of the hardware. The camshaft position sensor monitors the position of the camshaft with respect to the crankshaft and provides feedback to the PCM.

REMOVAL**REMOVAL****Fig. 305: Oil Control Valve**

Courtesy of CHRYSLER GROUP, LLC

1. Remove intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL** .
2. Disconnect VVTS electrical connector (2).
3. Remove VVTS fastener (1).

**Fig. 306: Removing/Installing OCV**

Courtesy of CHRYSLER GROUP, LLC

NOTE: To remove the VVTS, the engine must be at room temperature.

4. Rotate and pull the VVTS out.

INSTALLATION

INSTALLATION

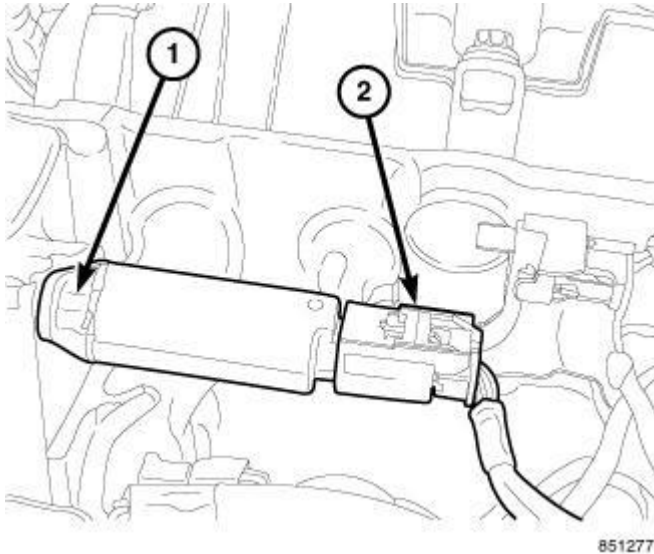


Fig. 307: Oil Control Valve

Courtesy of CHRYSLER GROUP, LLC

1. Install the VVTS.
2. Ensure that the O-ring is fully seated into the cylinder block.
3. Securely tighten the VVTS fastener (1).
4. Connect the VVTS electrical connector (2).
5. Install the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL .

MANIFOLDS

MANIFOLD, EXHAUST

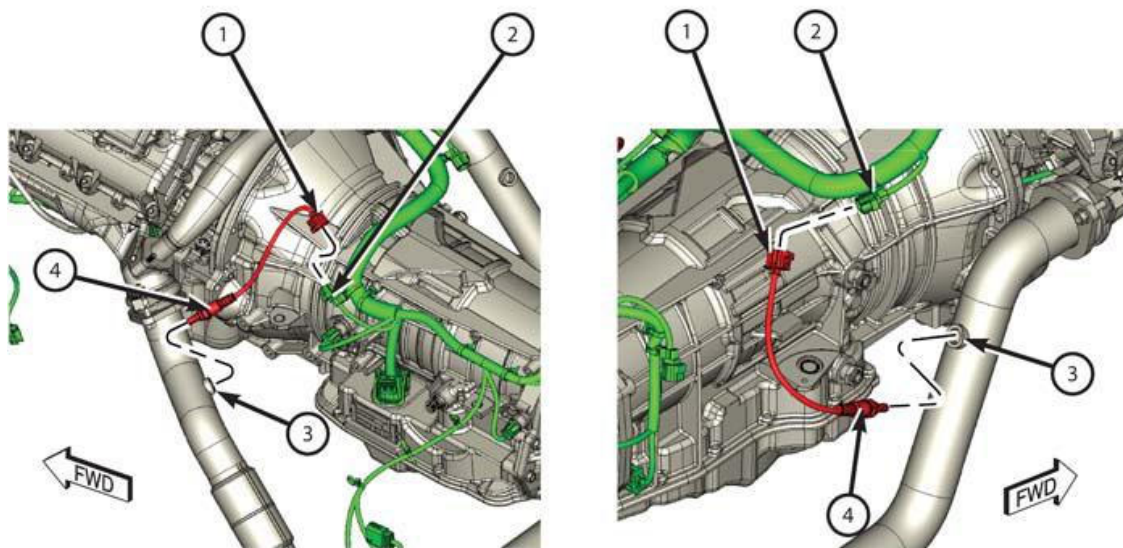
REMOVAL

REMOVAL

1. Remove the engine cover (1).
2. Disconnect the negative battery cable (1).
3. Raise and support the vehicle.

CAUTION: When servicing or replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or

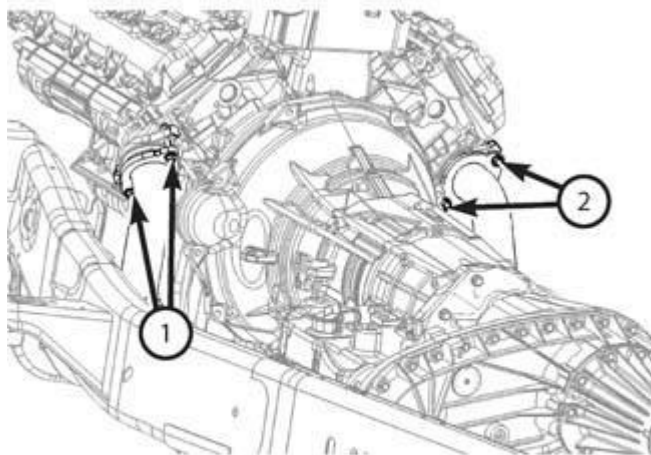
sensor.



2506017977

Fig. 308: Oxygen Sensors & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the oxygen sensor electrical connectors (1).



2506017995

Fig. 309: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Saturate the front exhaust pipe/catalytic converter retaining bolts and nuts with Mopar® Rust Penetrant or equivalent and allow 5 minutes for penetration.

6. Separate the right and left exhaust pipe/catalytic converter assembly.

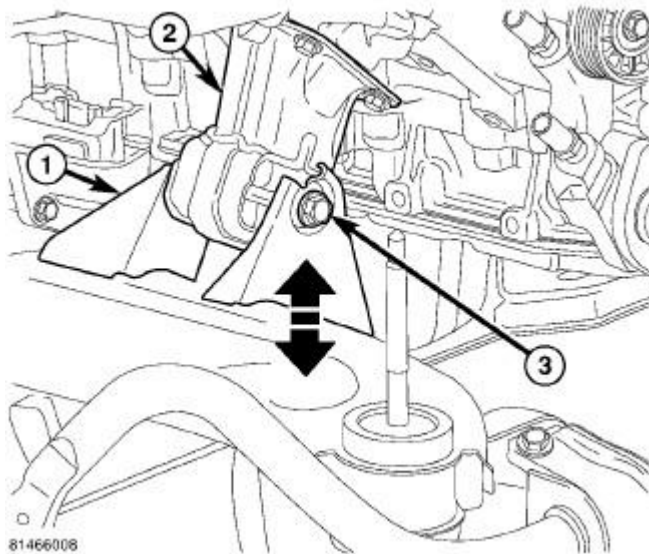


Fig. 310: Engine Mount & Bolt
Courtesy of CHRYSLER GROUP, LLC

Right side shown, left side similar.

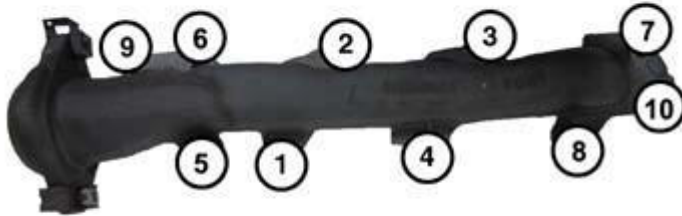
7. Loosen the right and left engine mount through bolts (3).

Partially lower the vehicle.

8. Using a suitable jack stand. Raise the engine.

CAUTION: Do not damage engine harness while raising the engine.

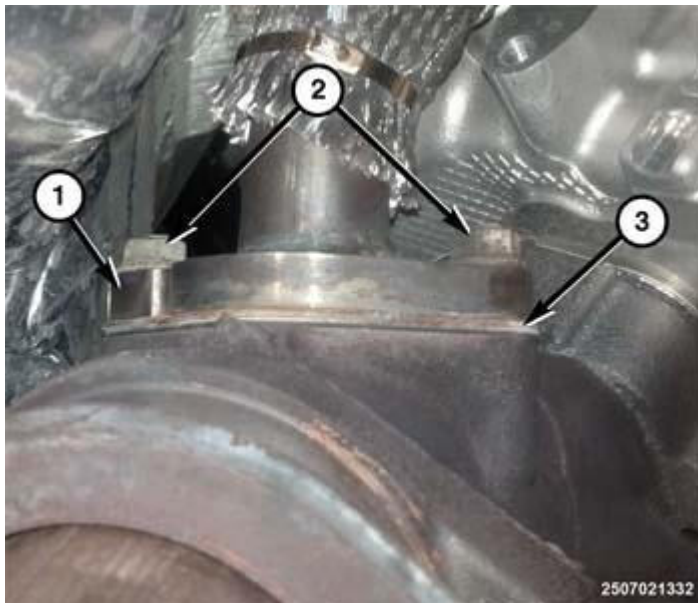
9. Remove the front wheels.
10. Remove the inner wheel splash shields.
11. Remove the exhaust manifold heat shield.



0911023296

Fig. 311: Exhaust Manifold Stud Bolt Locations
 Courtesy of CHRYSLER GROUP, LLC

NOTE: The stud-bolts used to secure the exhaust manifold are at locations 5, 9, 7 and 8. All bolts removed must be installed in the same location were they were removed from.



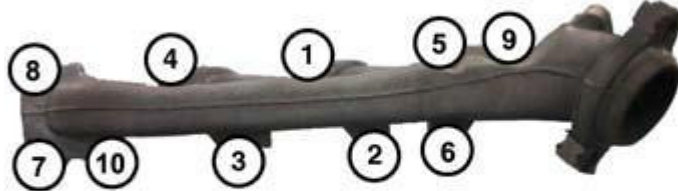
2507021332

Fig. 312: Remove/Install Inlet Tube
 Courtesy of CHRYSLER GROUP, LLC

12. Right Side:

Using the sequence shown, remove the exhaust manifold retaining bolts.

13. Remove the EGR intake tube nuts (2) at the Left side exhaust manifold.



0911023295

Fig. 313: Exhaust Manifold Stud Bolt & Washer Locations
Courtesy of CHRYSLER GROUP, LLC

NOTE: The stud-bolts and washers used to secure the exhaust manifold are at locations 6, 9, 8 and 10. All bolts removed must be installed in the same location were they were removed from.

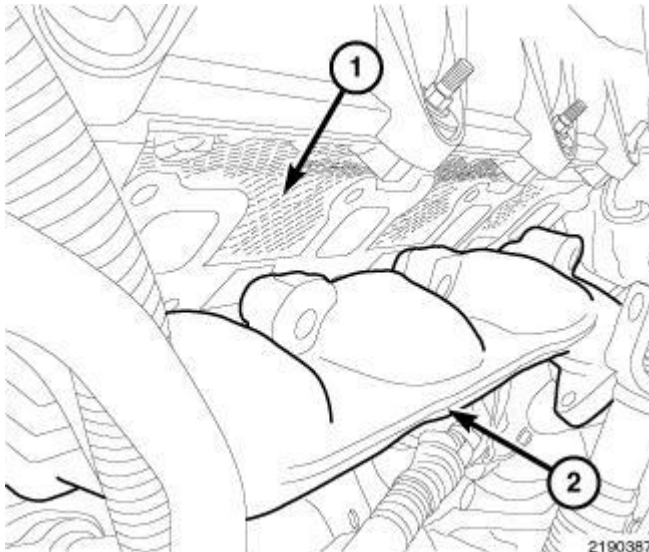


Fig. 314: Locating Exhaust Manifold & Gasket
Courtesy of CHRYSLER GROUP, LLC

14. Left Side:

- Disconnect the knock sensor electrical connector.

- Remove the oil indicator tube.
- Using the sequence shown, remove the exhaust manifold retaining bolts.

Left side shown, right similar.

15. Remove the exhaust manifold (2) and gasket.
16. Inspect the exhaust manifold for any damage. Refer to **MANIFOLD, EXHAUST - INSPECTION**.
17. Clean the mating surfaces.

CLEANING

CLEANING

Clean mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

INSPECTION

INSPECTION

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straight edge. Gasket surfaces must be flat within 0.2 mm per 300 mm (0.008 inch per foot).

INSTALLATION

INSTALLATION - MEDIUM DUTY

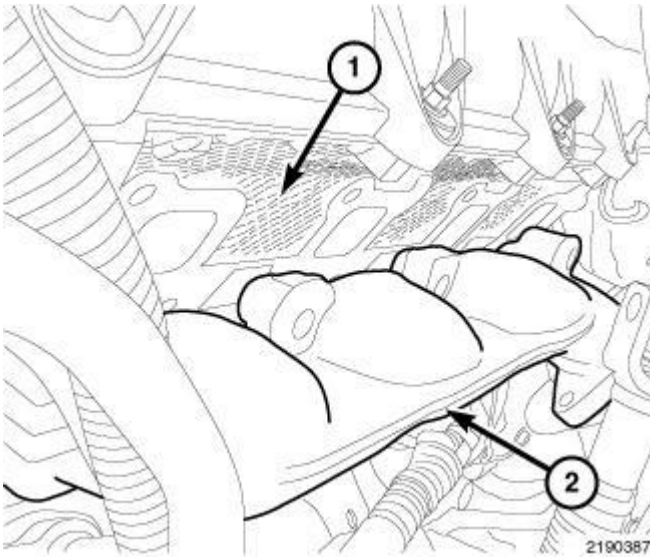
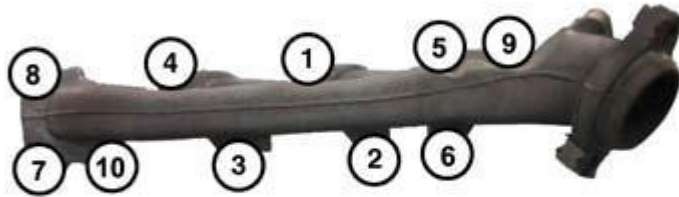


Fig. 315: Locating Exhaust Manifold & Gasket
Courtesy of CHRYSLER GROUP, LLC

Left side shown, right similar.

1. Prior to installation, make sure all gasket mating surfaces (1, 2) are clean and free of any debris.
2. Position the exhaust manifold gasket and manifold.



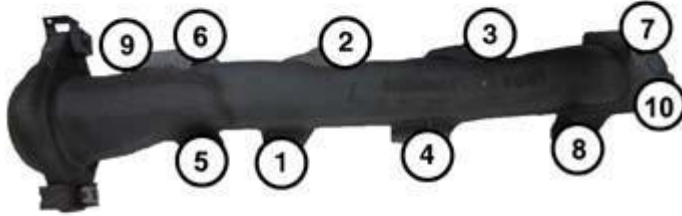
0911023295

Fig. 316: Exhaust Manifold Stud Bolt & Washer Locations
Courtesy of CHRYSLER GROUP, LLC

3. Left Side:

- Install a new EGR cooler intake pipe gasket onto the exhaust manifold.
 - Align the exhaust manifold to the EGR cooler intake pipe.
 - Using the sequence shown, Install the exhaust manifold retaining bolts and pre-tighten to 16 N.m (12 ft. lbs.) allowing the gasket to seat to the exhaust manifold and cylinder head.
 - Install the oil indicator tube.
 - Connect the knock sensor electrical connector.
4. Re-check the torque at 30 N.m (22 ft. lbs.) using the sequence shown.
 5. Install the heat shield. Refer to **ENGINE SPECIFICATIONS**.

NOTE: The bolts used to secure the exhaust manifold are stainless steel at locations 7 and 8. All bolts removed must be installed in the same location were they were removed from.



0911023296

Fig. 317: Exhaust Manifold Stud Bolt Locations
Courtesy of CHRYSLER GROUP, LLC

6. **Right Side:** Using the sequence shown, install the exhaust manifold retaining bolts and tighten to 16 N.m (12 ft. lbs.) allowing the gasket to seat to the exhaust manifold and cylinder head.
7. Re-check the torque at 25 N.m (18 ft. lbs.) using the sequence shown.
8. Install the heat shield. Refer to **ENGINE SPECIFICATIONS** .
9. Install the inner wheel well splash shield.
10. Install the front wheels.

CAUTION: Do not damage engine harness while lowering the engine.

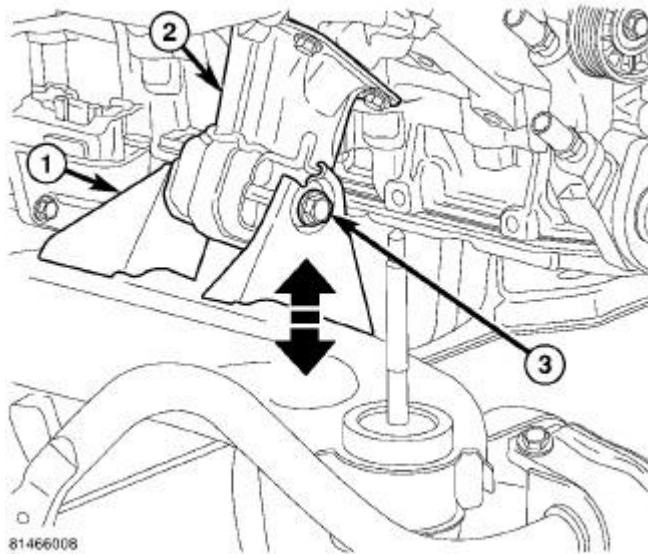


Fig. 318: Engine Mount & Bolt
 Courtesy of CHRYSLER GROUP, LLC

11. Lower the engine onto the frame and remove the jack stand.
12. Raise the vehicle.

Right side shown, left side similar.

13. Install the right and left engine mount through bolts (3) and tighten to 100 N.m (74 ft. lbs.).

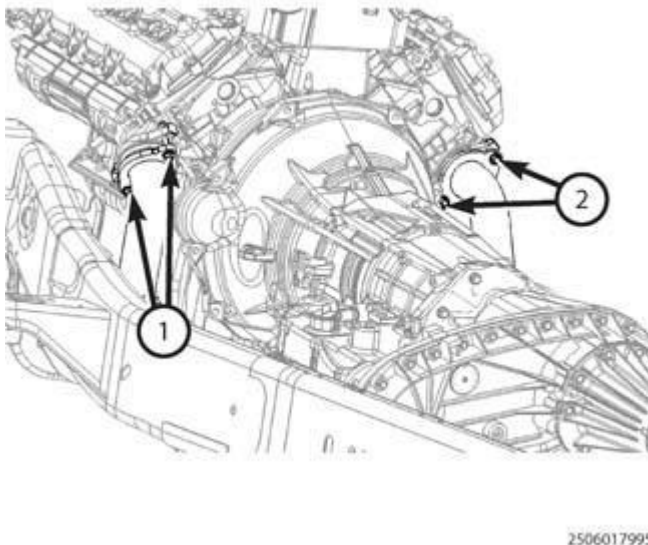
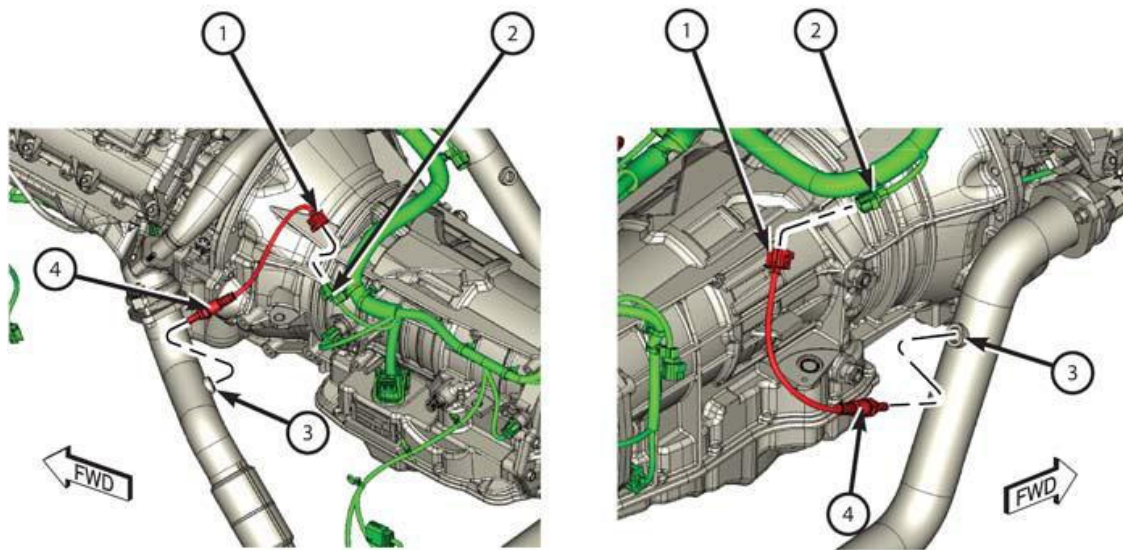


Fig. 319: Exhaust Pipe To Manifold Bolts
 Courtesy of CHRYSLER GROUP, LLC

14. Install the right (2) and left (1) exhaust pipe/catalytic converter assembly. Tighten the bolts to 100 N.m (74 ft. lbs.).



2506017977

Fig. 320: Oxygen Sensors & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

15. Connect the oxygen sensor electrical connectors (1).

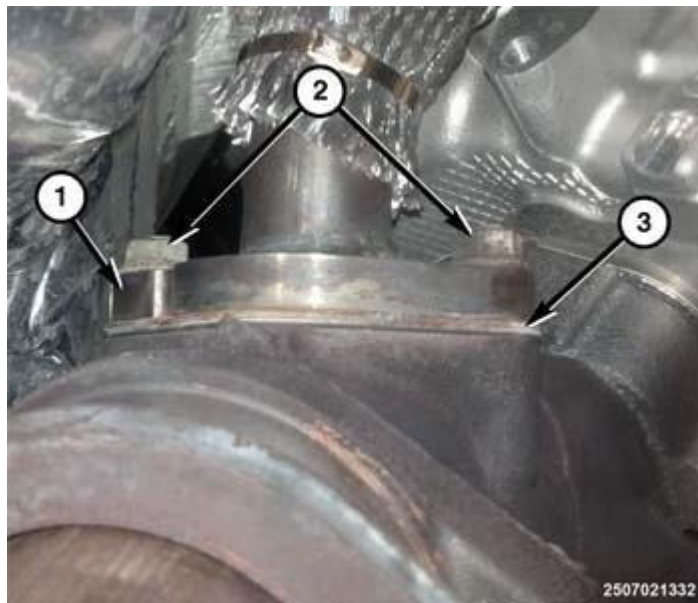


Fig. 321: Remove/Install Inlet Tube
Courtesy of CHRYSLER GROUP, LLC

16. Install the EGR intake tube nuts (2). Tighten the to 23 N.m (17 ft. lbs.).
17. Lower the vehicle.
18. Install the engine cover (1).

19. Connect the negative battery cable (1).
20. Start the engine and check for leaks.

INSTALLATION - LIGHT DUTY

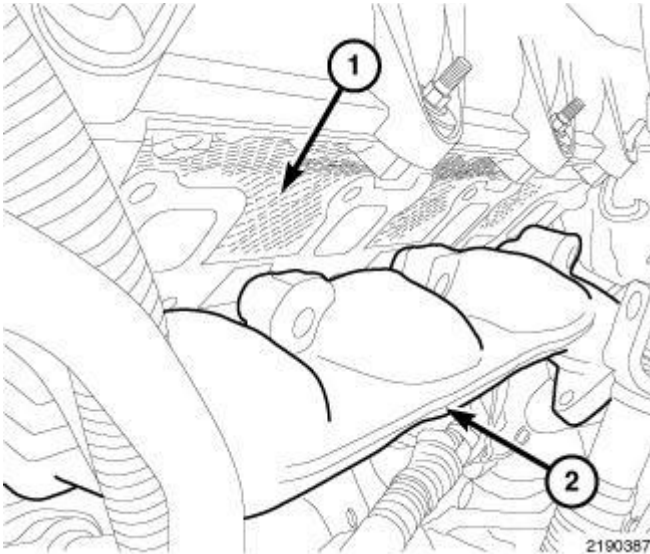
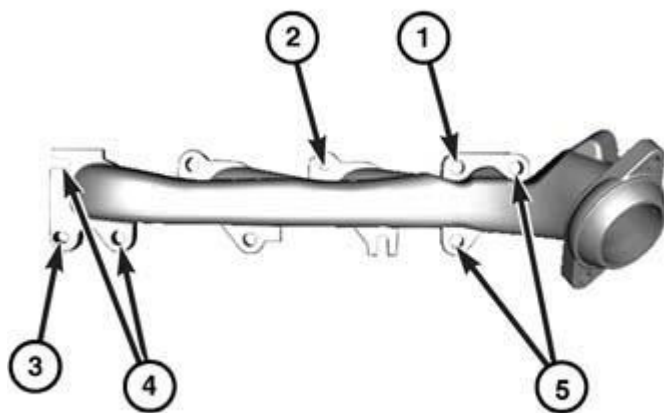


Fig. 322: Locating Exhaust Manifold & Gasket
Courtesy of CHRYSLER GROUP, LLC

Left side shown, right similar.

1. Prior to installation, make sure all gasket mating surfaces (1, 2) are clean and free of any debris.
2. Position the exhaust manifold gasket and manifold to the engine.



0914026674

Fig. 323: Locating Exhaust Manifold Bolts & Washers Placement Locations

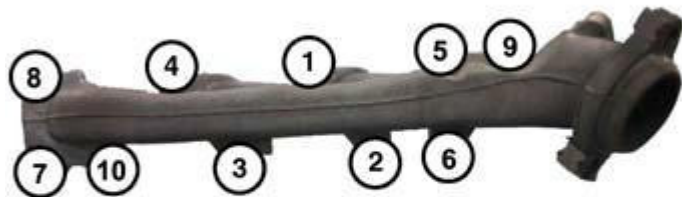
Courtesy of CHRYSLER GROUP, LLC

NOTE: A special coating is used on the bolts and washers for extreme heat. Placement of the bolts and washers are crucial for expansion and contraction due to extreme heat.

3. Left Side:

NOTE: Initial torque of all the bolts are 16 N.m (12 ft. lbs.) allowing the gasket to seat to the exhaust manifold and cylinder head.

- Install a new EGR cooler intake pipe gasket onto the exhaust manifold.
- Align the exhaust manifold to the EGR cooler intake pipe.
- Install the non-coated standard stud bolts with coated washers into position #4.
- Install the coated stud bolts with coated washers into position #5.
- Install a coated bolt with a coated washer in position #1.
- Install a coated bolt only in position #2.
- Install a non-coated standard bolt with a coated washer in position #3.



0911023295

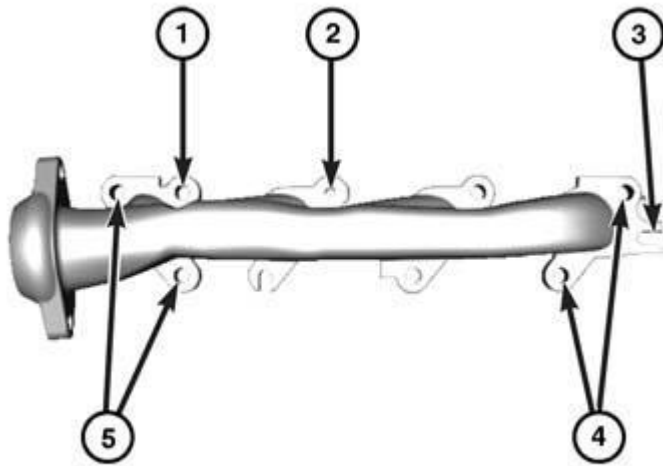
Fig. 324: Exhaust Manifold Stud Bolt & Washer Locations
Courtesy of CHRYSLER GROUP, LLC

4. Torque the bolts to specifications in sequential order:

1	19	14
2, 3, 4	25	18
5, 6	16	12

7, 8,	25	18
9	16	12
10	25	18

5. Install the oil indicator tube.
6. Connect the knock sensor electrical connector.
7. Install the heat shield. Refer to **ENGINE SPECIFICATIONS**.



0914026673

Fig. 325: Locating Exhaust Manifold Bolts & Washers Placement Locations
 Courtesy of CHRYSLER GROUP, LLC

NOTE: A special coating is used on the bolts and washers for extreme heat. Placement of the bolts and washers are crucial for expansion and contraction due to extreme heat.

8. Right Side:

NOTE: Initial torque of all the bolts are 16 N.m (12 ft. lbs.) allowing the gasket to seat to the exhaust manifold and cylinder head.

- Install a new EGR cooler intake pipe gasket onto the exhaust manifold.
- Align the exhaust manifold to the EGR cooler intake pipe.
- Install the non-coated standard stud bolts with coated washers into position #4.
- Install the coated stud bolts with coated washers into position #5.
- Install a coated bolt with a coated washer in position #1.
- Install a coated bolt only in position #2.
- Install a non-coated standard bolt with a coated washer in position #3.



0911023296

Fig. 326: Exhaust Manifold Stud Bolt Locations
 Courtesy of CHRYSLER GROUP, LLC

9. Torque the bolts to specifications in sequential order: :

1	19	14
2, 3, 4	25	18
5, 6	16	12
7, 8,	25	18
9	16	12
10	25	18

10. Install the heat shield. Refer to **ENGINE SPECIFICATIONS** .
 11. Install the inner wheel well splash shield.
 12. Install the front wheels.

CAUTION: Do not damage engine harness while lowering the engine.

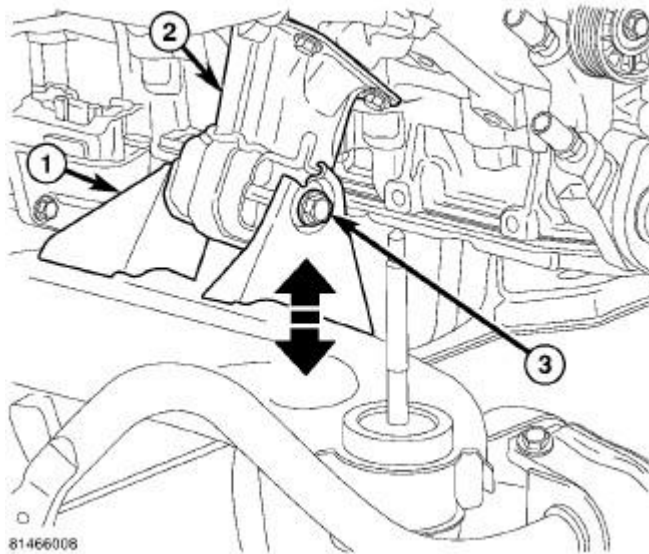


Fig. 327: Engine Mount & Bolt
Courtesy of CHRYSLER GROUP, LLC

13. Lower the engine onto the frame and remove the jack stand.
14. Raise the vehicle.

Right side shown, left side similar.

15. Install the right and left engine mount through bolts (3) and tighten to 100 N.m (74 ft. lbs.).

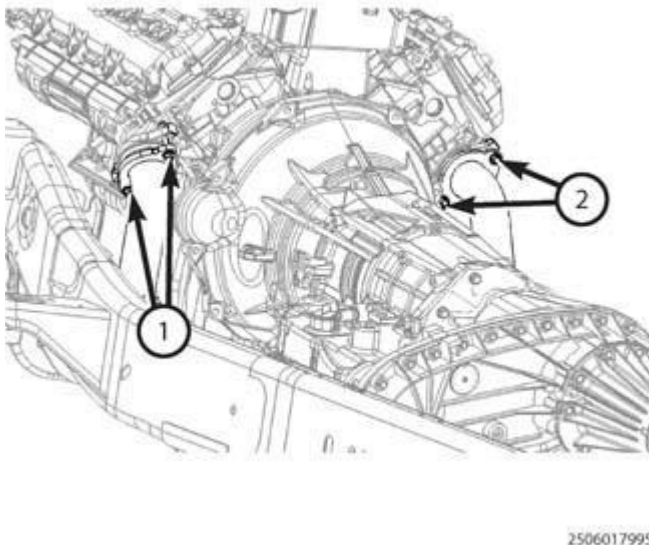
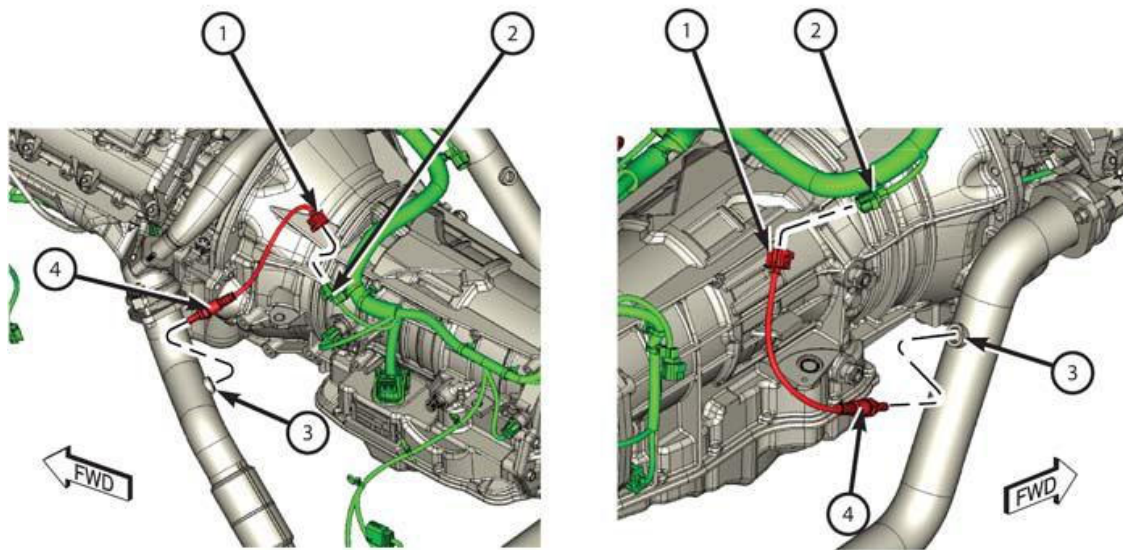


Fig. 328: Exhaust Pipe To Manifold Bolts
Courtesy of CHRYSLER GROUP, LLC

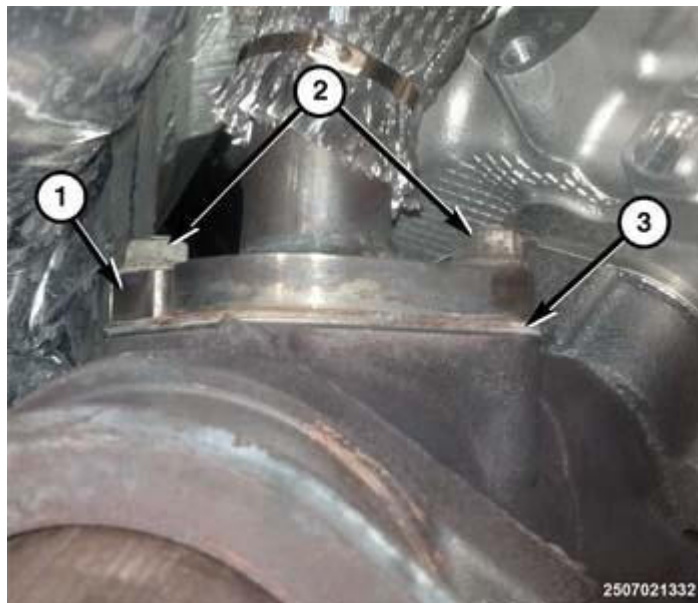
16. Install the right (2) and left (1) exhaust pipe/catalytic converter assembly. Tighten the bolts to 100 N.m (74 ft. lbs.).



2506017977

Fig. 329: Oxygen Sensors & Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

17. Connect the oxygen sensor electrical connectors (1).



2507021332

Fig. 330: Remove/Install Inlet Tube
Courtesy of CHRYSLER GROUP, LLC

18. Install the EGR intake tube nuts (2). Tighten the to 23 N.m (17 ft. lbs.).
19. Lower the vehicle.
20. Install the engine cover (1).

21. Connect the negative battery cable (1).
22. Start the engine and check for leaks.

MANIFOLD, INTAKE

DESCRIPTION

DESCRIPTION

CAUTION: If the engine has experienced a catastrophic failure, THE INTAKE MANIFOLD MUST BE REPLACED!

The intake manifold is made of a composite material and features a dual shaft Short Runner Valve (SRV) system to maximize both low end torque and peak power. The SRV is bolted to the front of the intake manifold and can be service separately from the manifold. The manifold uses a single plane sealing system with individual port seals and a separate PCV port seal to prevent leaks.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: Use extreme caution when the engine is operating. Do not stand in a direct line with the fan. Do not put your hands near the pulleys, belts or the fan. Do not wear loose clothing. Failure to follow these instructions may result in possible serious or fatal injury.

1. Start the engine.
2. Spray a small stream of water at the suspected leak area.
3. If a change in RPM is observed the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

REMOVAL

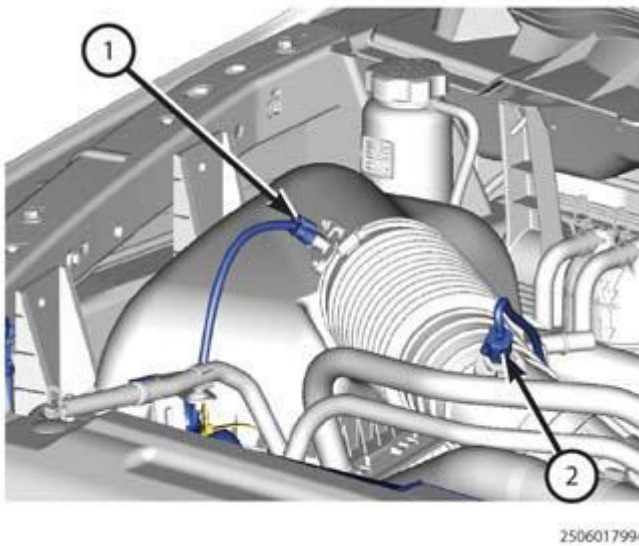


Fig. 331: Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the intake air temperature (IAT) sensor electrical connector (2).

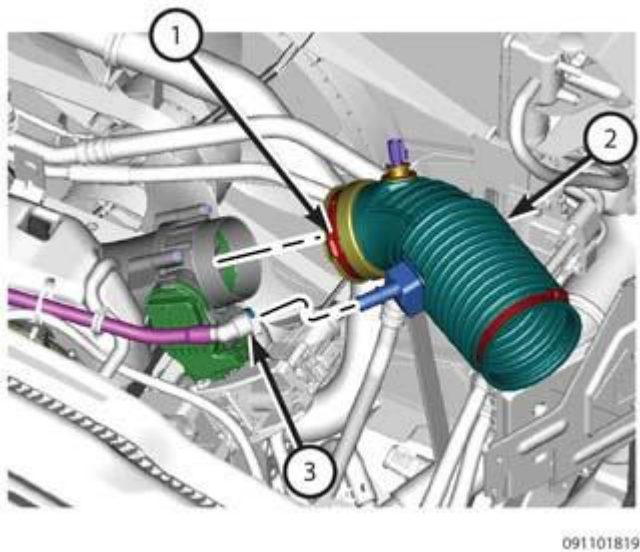


Fig. 332: Clamp, Air Intake Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

2. Remove the breather hose (3).
3. Remove the intake air tube (2) from the air cleaner housing and the throttle body.

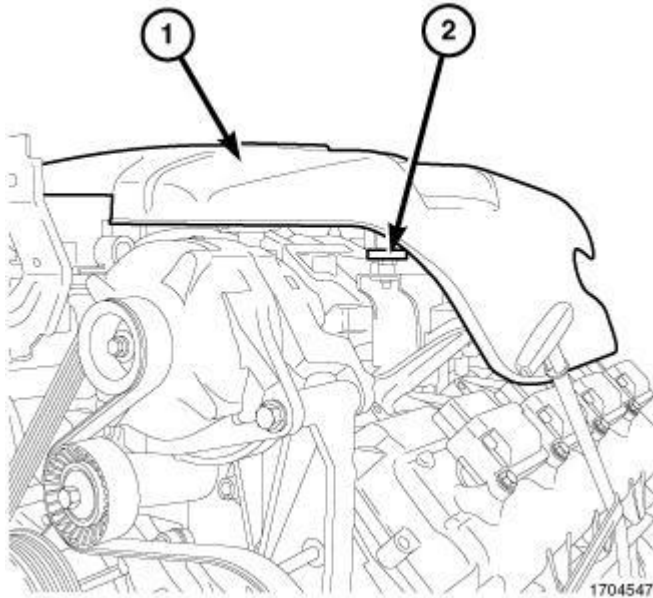


Fig. 333: Engine Cover & Grommets
Courtesy of CHRYSLER GROUP, LLC

4. Lift up the front of the engine cover (1) and separate the engine cover front grommets (2) from the ball studs on the intake manifold.
5. Perform the fuel pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

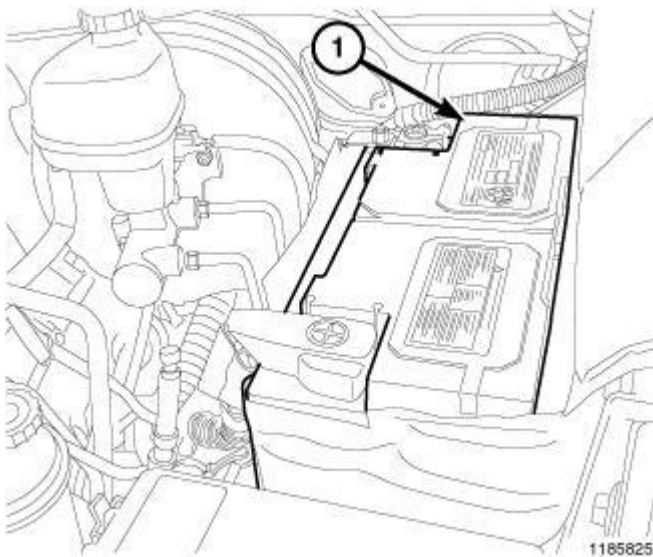


Fig. 334: Battery
Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the negative battery cable (1).

NOTE: Excessive fuel spillage onto the gaskets can cause gaskets to expand and

dislodge from the gasket groove.

7. Disconnect the fuel supply line quick connect fitting at the fuel rail (1) and plug the fuel supply line with a shipping cap to prevent spillage. Refer to **FITTING, QUICK CONNECT**.

NOTE: The factory fuel injection electrical harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If the harness was not tagged, note the electrical connector's location during removal.

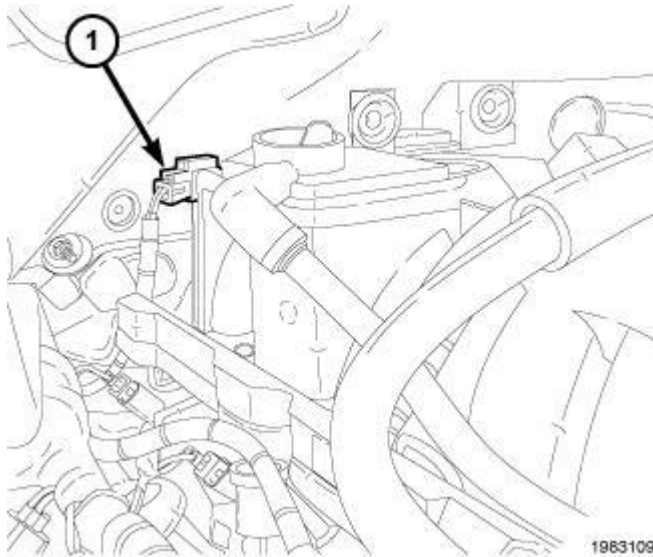


Fig. 335: MAP Sensor

Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the MAP sensor electrical connector (1).

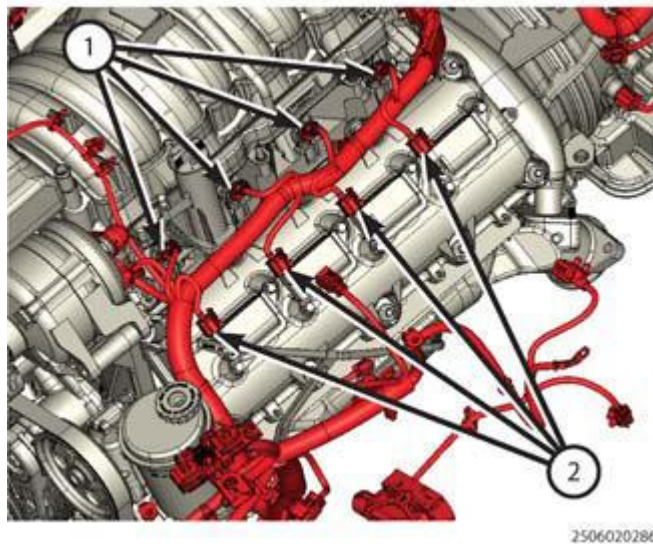


Fig. 336: Injectors Harness Connectors & Ignition Coil Harness Connectors

Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the electrical connectors to all fuel injectors (1) and position the fuel injector electrical harness aside.
10. Remove the main engine electrical harness gromm at the rear of the intake manifold and position harness aside.

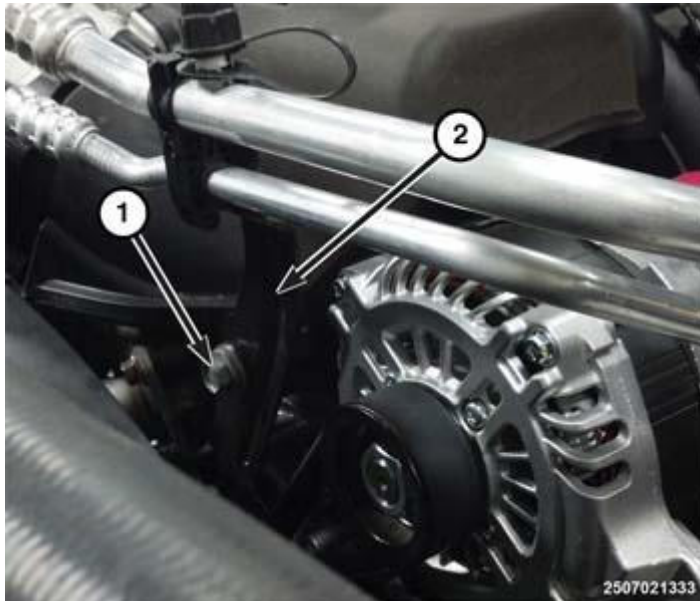


Fig. 337: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

11. Remove the bolt at the A/C line support bracket.

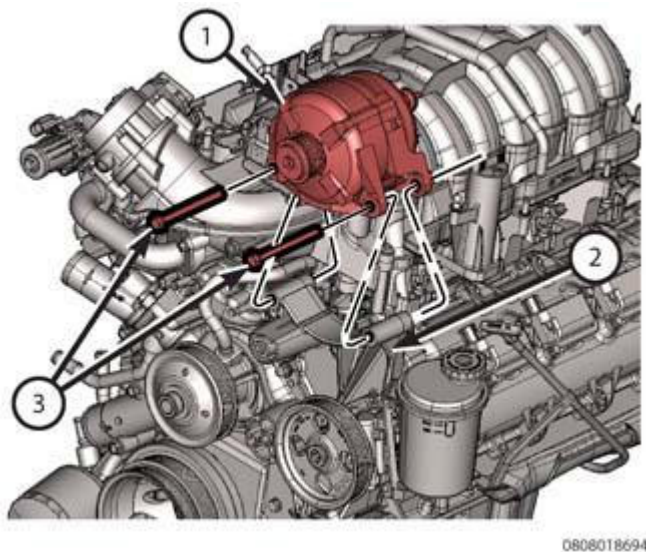


Fig. 338: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

12. If equipped with a secondary generator. Remove the wiring harness from the intake manifold.

13. Remove the primary generator (1) and position aside.

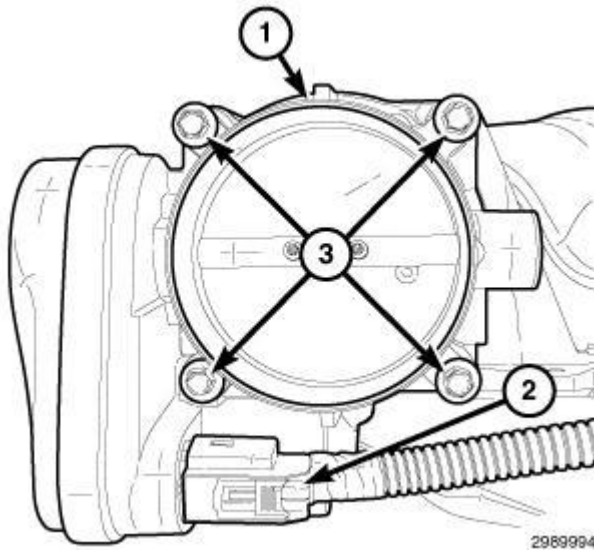


Fig. 339: Throttle Body, Connector & Bolts
Courtesy of CHRYSLER GROUP, LLC

14. Disconnect the electrical connectors (2) at the throttle body (1) and reposition the harness.

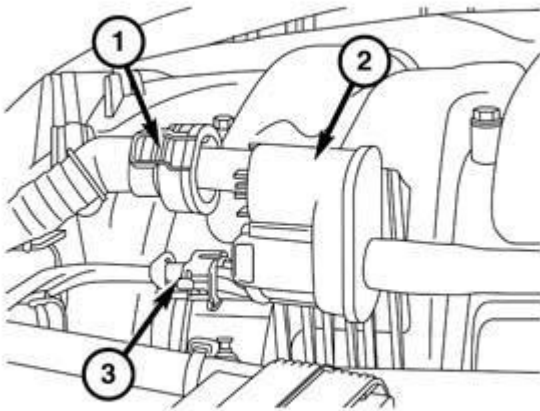


Fig. 340: Purge Solenoid, Electrical Connector & Vapor Line Quick-Connect Fitting
Courtesy of CHRYSLER GROUP, LLC

15. Remove the purge solenoid (2).

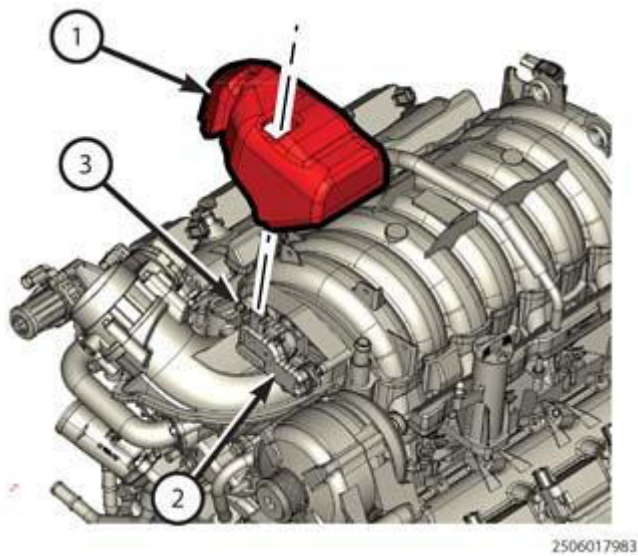


Fig. 341: Short Runner Valve Components
Courtesy of CHRYSLER GROUP, LLC

16. Remove the short runner valve (SRV) cover (1).
17. Disconnect the short runner valve (SRV) electrical connector (3).



Fig. 342: Removing/Installing EGR Crossover Tube
Courtesy of CHRYSLER GROUP, LLC

18. Remove the EGR crossover tube (2).



0909019774

Fig. 343: Intake Manifold Removal/Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

Using the sequence shown, loosen the intake manifold retaining bolts.

19. Remove the intake manifold and throttle body as an assembly.

CLEANING

CLEANING

NOTE: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

INSPECTION

INSPECTION

1. Inspect the intake manifold sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.

INSTALLATION

INSTALLATION

NOTE: Inspect seal conditions. Seals can be re-used, if not damaged. Position seal in the seal channel and press lightly into place. Repeat procedure for each seal

position.

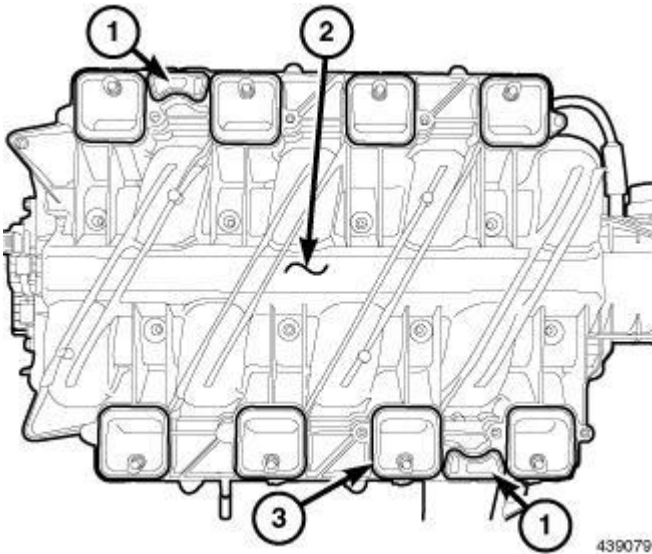


Fig. 344: Intake Manifold & PCV Seals
Courtesy of CHRYSLER GROUP, LLC

NOTE: If reinstalling the original manifold apply Mopar® Lock & Seal Adhesive to the intake manifold bolts. Not required when installing a new manifold.

1. Apply Mopar® Lock & Seal Adhesive to the intake manifold bolts.
2. Install the intake manifold seals (3) and positive crankcase ventilation (PCV) seals (1).



Fig. 345: Intake Manifold Removal/Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

3. Using the sequence shown, tighten the intake manifold bolts to 12 N.m (9 ft. lbs.).
4. Position the main engine electrical harness at the rear of the intake manifold and install the support strap.
5. Connect the fuel supply line quick connect fitting at the fuel rail (1).

NOTE: The factory fuel injection electrical harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If the harness was not tagged, use the noted the electrical connector's location during removal.

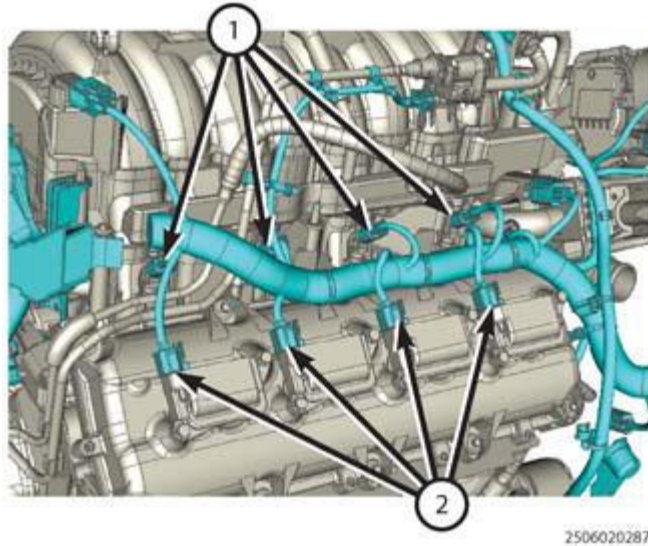


Fig. 346: Fuel Injector Electrical Connectors
Courtesy of CHRYSLER GROUP, LLC

6. Position the fuel injector electrical harness and connect the electrical connectors (1) to all fuel injectors.

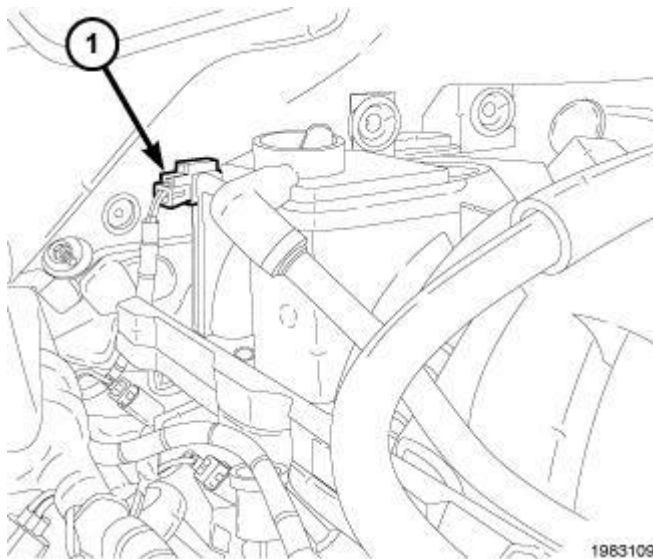


Fig. 347: MAP Sensor
Courtesy of CHRYSLER GROUP, LLC

7. Connect the map sensor electrical connector (1).



Fig. 348: Removing/Installing EGR Crossover Tube
Courtesy of CHRYSLER GROUP, LLC

8. Install the EGR crossover tube (2). Tighten bolts (1) to 24 N.m (18 ft. lbs.).

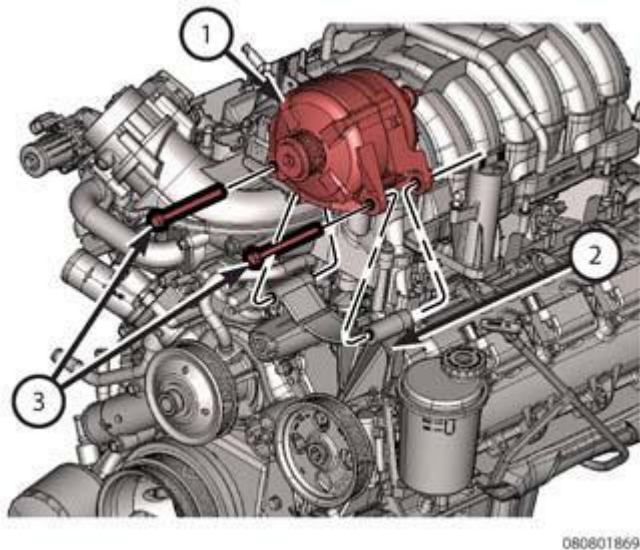


Fig. 349: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

9. Install the generator (1). Torque the bolts to 50 N.m (37 ft. lbs.).

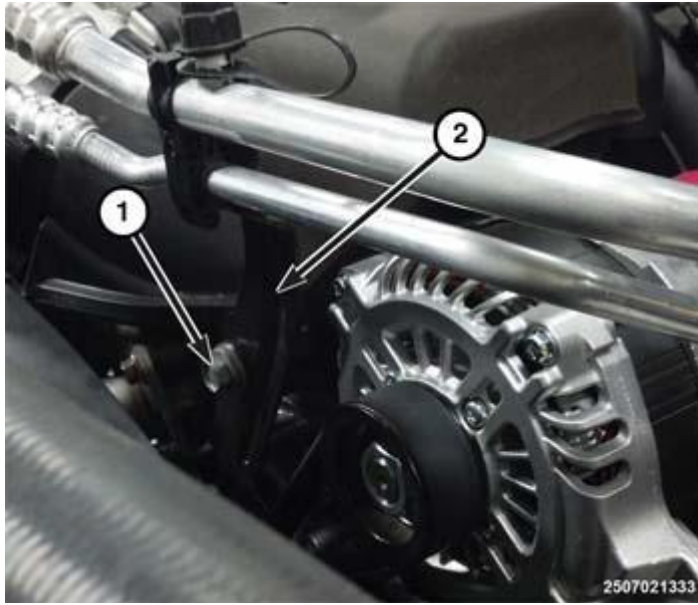


Fig. 350: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

10. Position the A/C line Bracket (2) to the manifold. Torque the bolt (1) to 50 N.m (37 ft. lbs.).

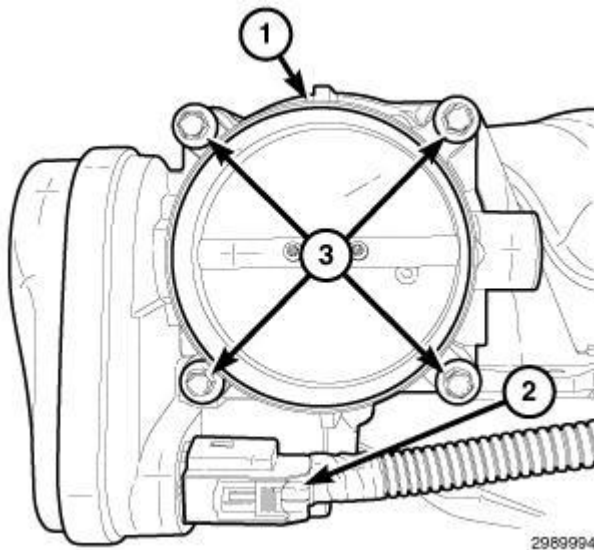


Fig. 351: Throttle Body, Connector & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Position the wiring harness (2) and connect the electrical connector at the throttle body (1).

NOTE: While installing the engine cover the front ball studs will make a popping or suction sound as the ball studs are inserted into the front grommets.

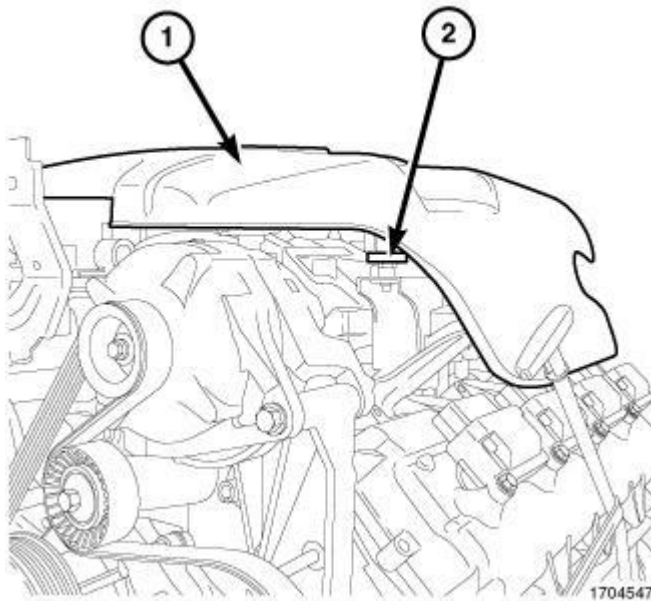


Fig. 352: Engine Cover & Grommets
Courtesy of CHRYSLER GROUP, LLC

12. Lower the front of the engine cover (1) and line up the front grommets (2) with the ball studs on the front of the intake manifold and with a downward motion push the engine cover front grommets onto the ball studs.

NOTE: Lightly lift the front of the engine cover to insure the front ball studs are seated into the front grommets correctly.

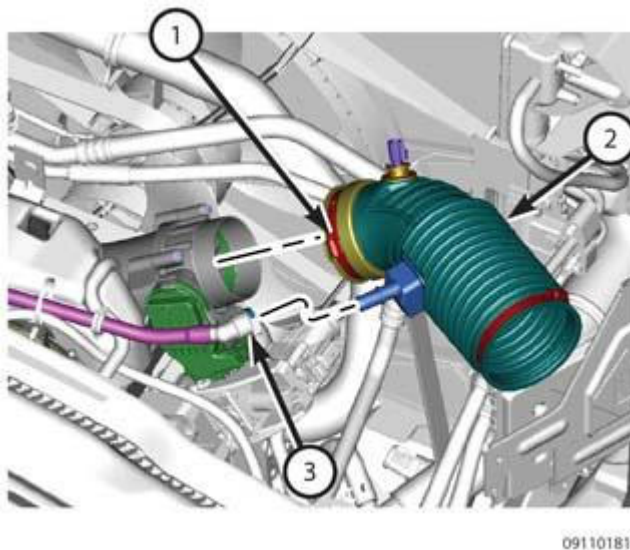


Fig. 353: Clamp, Air Intake Tube & Breather Hose
Courtesy of CHRYSLER GROUP, LLC

13. Connect the intake air tube to the air cleaner assembly and the throttle body.
14. Connect the breather air hose (3).

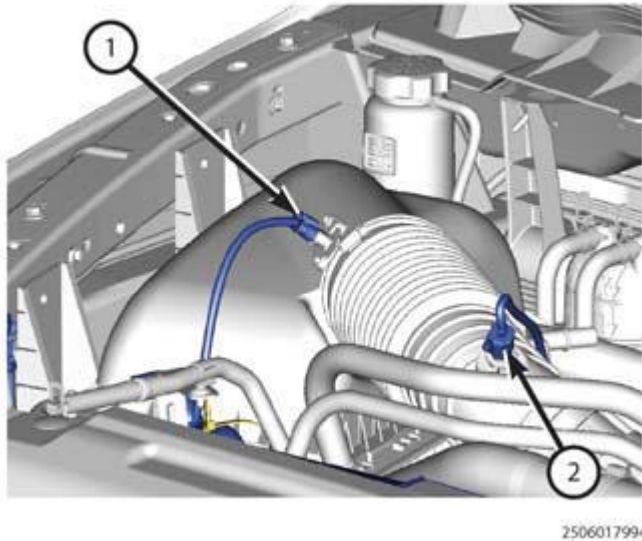


Fig. 354: Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

15. Connect the temperature sensor (2).

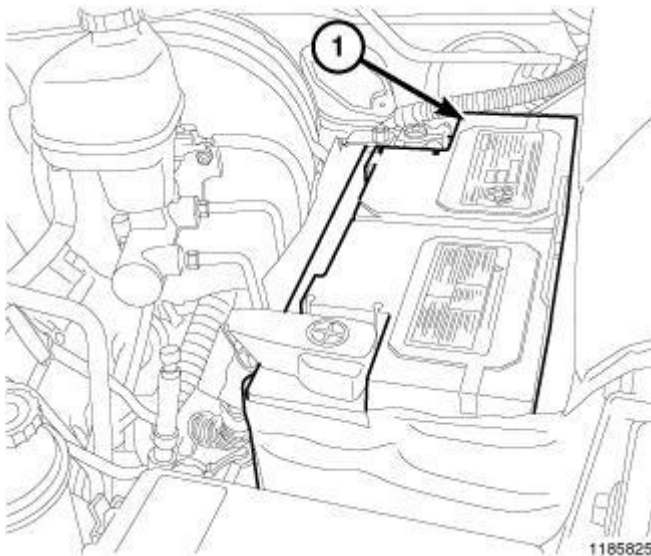


Fig. 355: Battery
Courtesy of CHRYSLER GROUP, LLC

16. Connect the negative battery cable (1).

VALVE TIMING

CHAIN AND SPROCKETS, TIMING

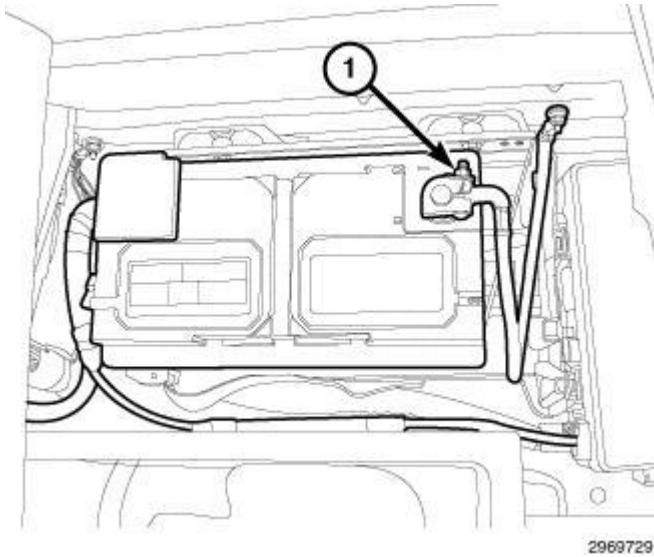
REMOVAL**REMOVAL**

Fig. 356: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Drain the cooling system.

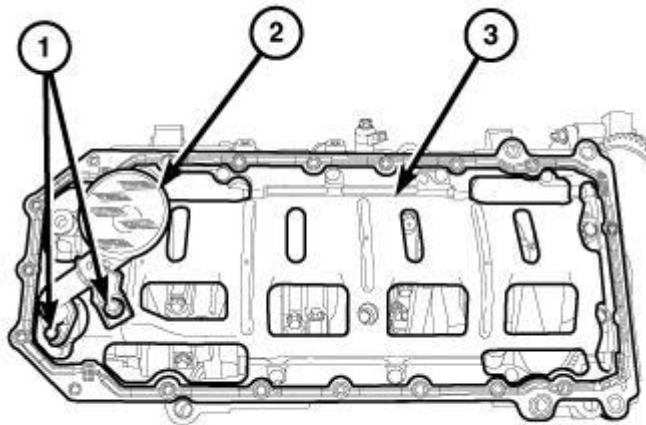
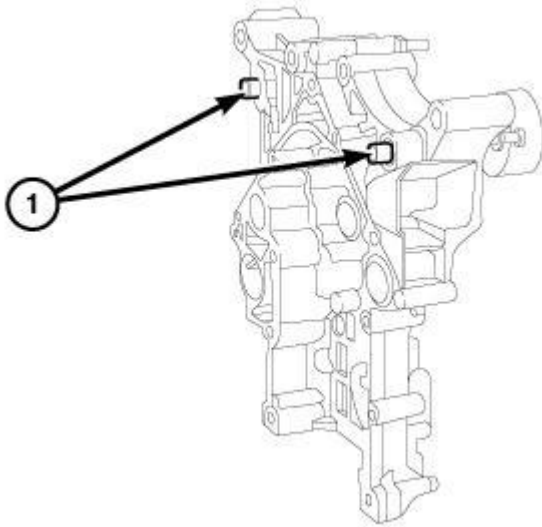


Fig. 357: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

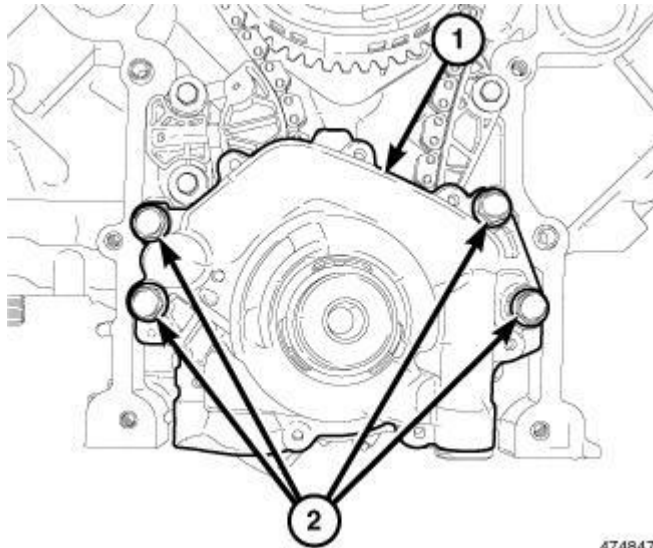
4. Remove the oil pan and oil pump pick up tube (2). Refer to **PAN, OIL, REMOVAL** .



45131

Fig. 358: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

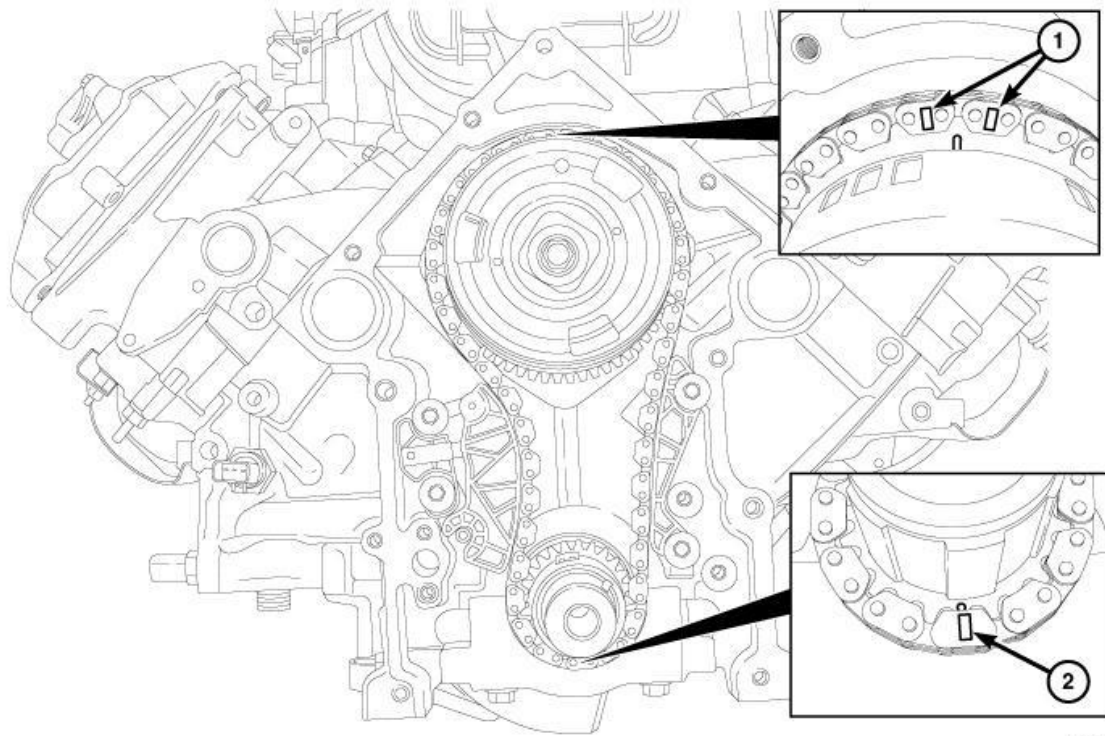
5. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL .
6. Verify the slide bushings (1) remain located in the engine timing cover during removal.



474847

Fig. 359: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

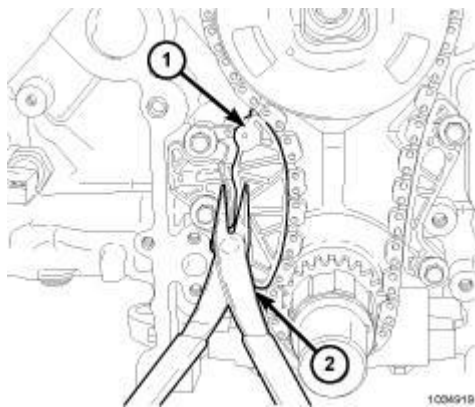
7. Remove the oil pump retaining bolts (2) and remove the oil pump (1).



487402

Fig. 360: Aligning Timing Marks With Timing Chain Sprockets
Courtesy of CHRYSLER GROUP, LLC

8. Install the vibration damper bolt finger tight. Using a suitable socket and breaker bar, rotate the crankshaft to align the timing marks with the timing chain sprockets (1, 2).



1036919

Fig. 361: Chain Tensioner Arm
Courtesy of CHRYSLER GROUP, LLC

9. Retract the chain tensioner arm (1) until the hole in the arm lines up with the hole in the bracket.

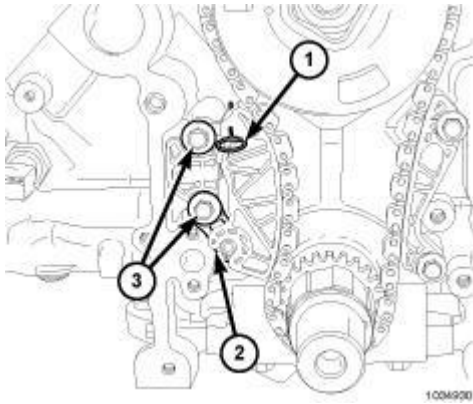


Fig. 362: Timing Chain Tensioner Pin
 Courtesy of CHRYSLER GROUP, LLC

10. Install the Tensioner Pin (special tool #8514, Pins, Tensioner) (1) into the chain tensioner holes.

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

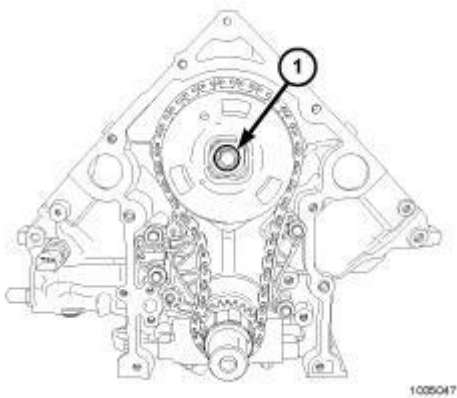


Fig. 363: Camshaft Phaser Retaining Bolt
 Courtesy of CHRYSLER GROUP, LLC

11. Remove the camshaft phaser retaining bolt (1) and remove the timing chain with the camshaft phaser and crankshaft sprocket.

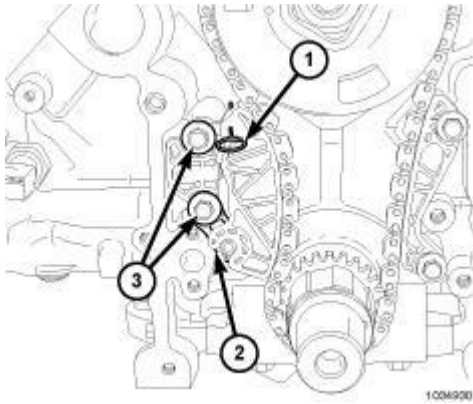


Fig. 364: Timing Chain Tensioner Pin
Courtesy of CHRYSLER GROUP, LLC

NOTE: Inspect the timing chain tensioner and timing chain guide shoes for wear and replace as necessary.

12. If the timing chain tensioner is to be replaced, remove the retaining bolts (3) and remove the timing chain tensioner (2).

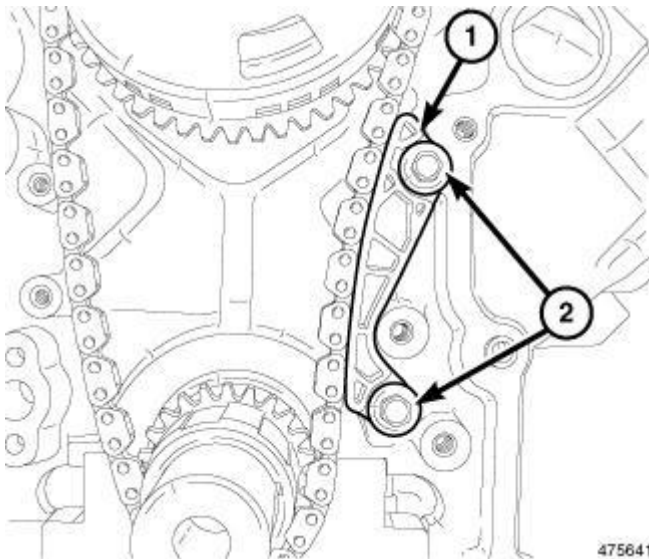
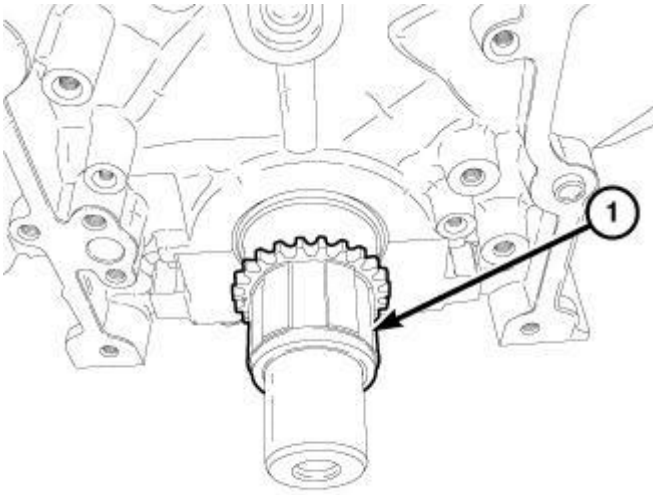


Fig. 365: Timing Chain Guide
Courtesy of CHRYSLER GROUP, LLC

13. If the timing chain guide (1) is to be replaced, remove the retaining bolts (2) and remove the timing chain guide (1).

INSTALLATION

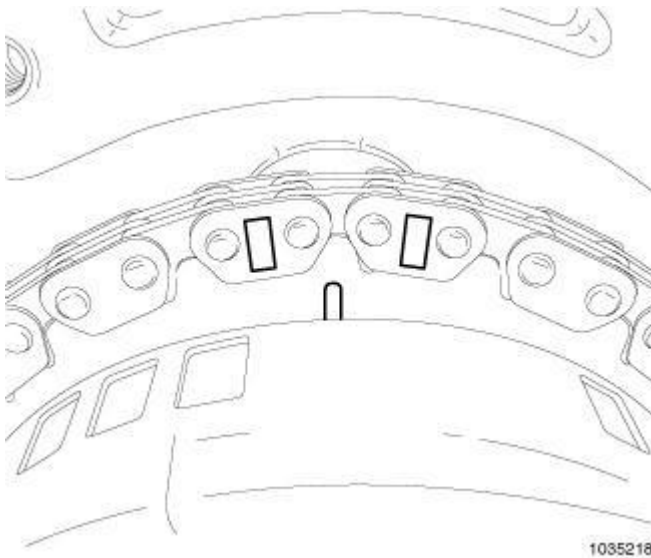
INSTALLATION



475580

Fig. 366: Crankshaft Sprocket
Courtesy of CHRYSLER GROUP, LLC

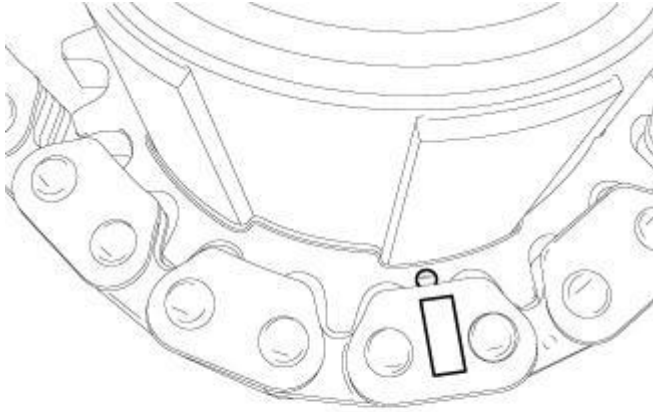
1. Install the crankshaft sprocket (1) and position halfway onto the crankshaft.



1035218

Fig. 367: Aligning Timing Chain & Camshaft Phaser Marks
Courtesy of CHRYSLER GROUP, LLC

2. While holding the camshaft phaser in hand, position the timing chain on the camshaft phaser and align the timing marks as shown.



475628

Fig. 368: Aligning Timing Chain & Crankshaft Sprocket Marks
Courtesy of CHRYSLER GROUP, LLC

3. While holding the camshaft phaser and timing chain in hand, position the timing chain on the crankshaft sprocket and align the timing mark as shown.

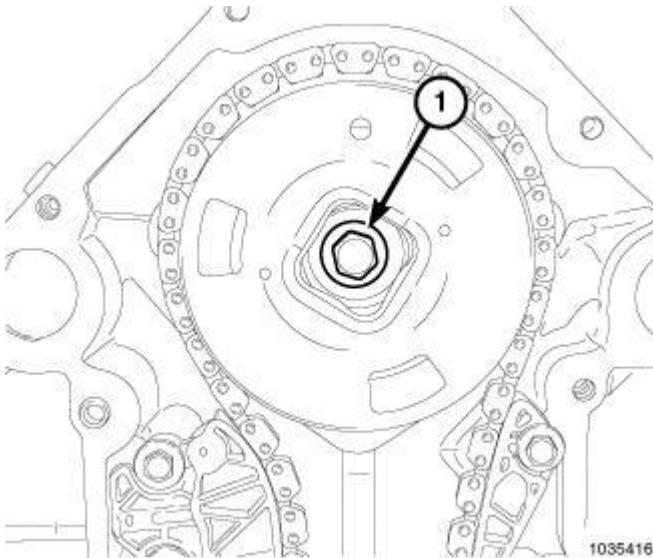
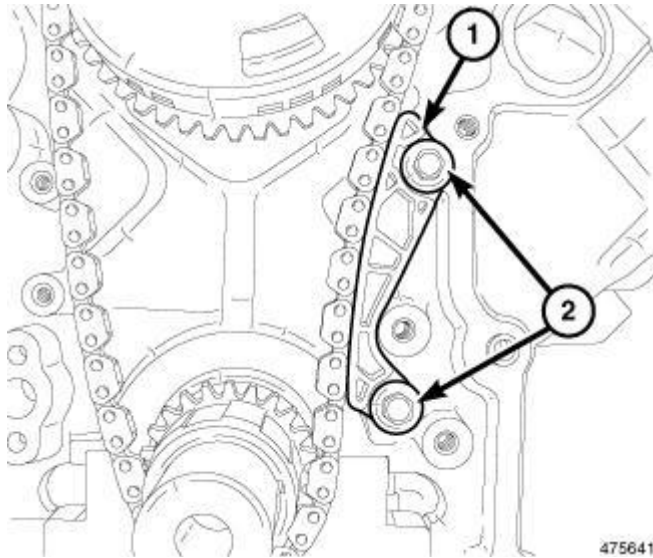


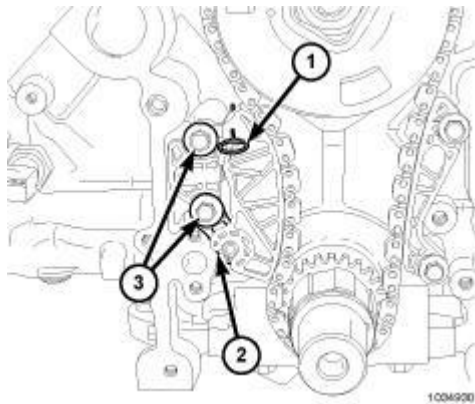
Fig. 369: Camshaft Phaser Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

4. Align the slot in the camshaft phaser with the dowel on the camshaft and position the camshaft phaser on the camshaft while sliding the crankshaft sprocket into position.
5. Install the camshaft phaser retaining bolt (1) finger tight.

**Fig. 370: Timing Chain Guide**

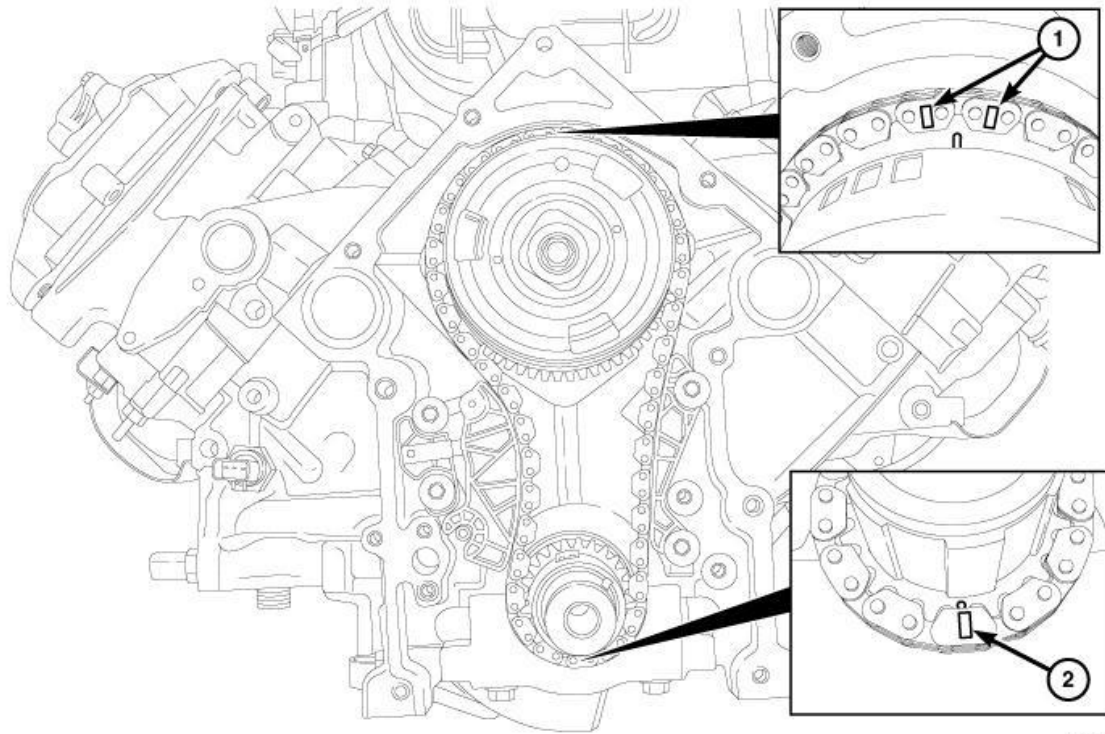
Courtesy of CHRYSLER GROUP, LLC

6. If removed, install the timing chain guide (1) and tighten the bolts (2) to 11 N.m (8 ft. lbs.).

**Fig. 371: Timing Chain Tensioner Pin**

Courtesy of CHRYSLER GROUP, LLC

7. If removed, install the timing chain tensioner (2) and tighten the bolts (3) to 11 N.m (8 ft. lbs.).
8. If required, retract the chain tensioner arm and install the Tensioner Pin (special tool #8514, Pins, Tensioner) (1) into the holes of the chain tensioner arm.



487402

Fig. 372: Aligning Timing Marks With Timing Chain Sprockets
Courtesy of CHRYSLER GROUP, LLC

9. Using care, rotate the crankshaft to verify the alignment of the timing marks (1, 2). If the timing marks do not line up, remove the camshaft sprocket and realign.

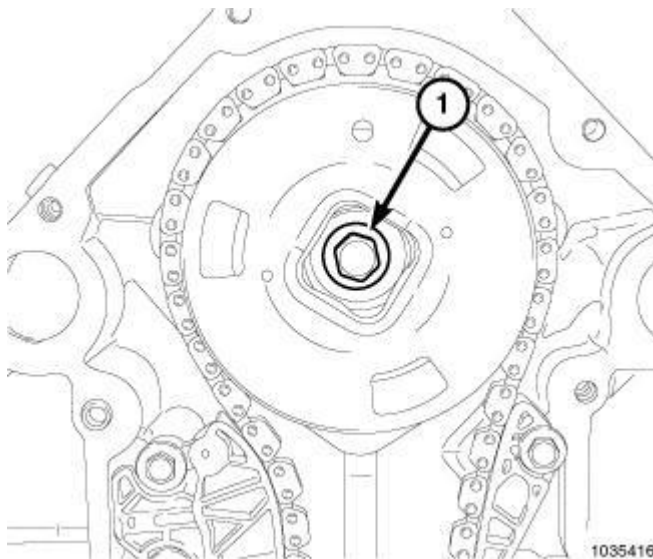
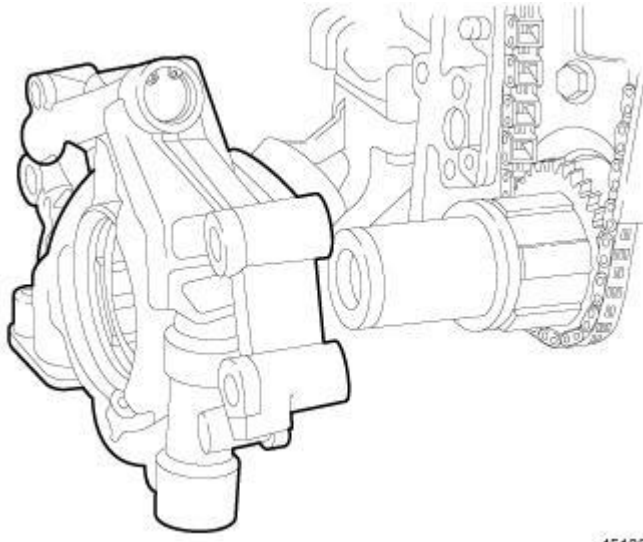


Fig. 373: Camshaft Phaser Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

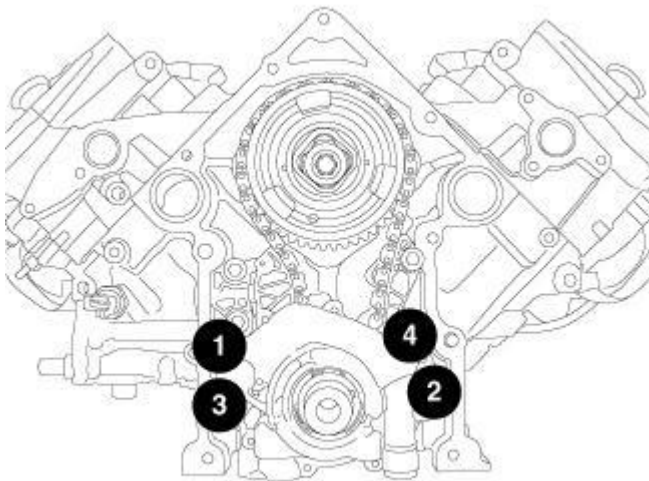
10. Tighten the camshaft phaser bolt (1) to 85 N.m (63 ft. lbs.).



45133

Fig. 374: Remove/Install Oil Pump
Courtesy of CHRYSLER GROUP, LLC

11. Position the oil pump onto the crankshaft and install the oil pump retaining bolts finger tight.



439119

Fig. 375: Oil Pump Retaining Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

12. Using the sequence shown, tighten the oil pump retaining bolts to 28 N.m (21 ft. lbs.).

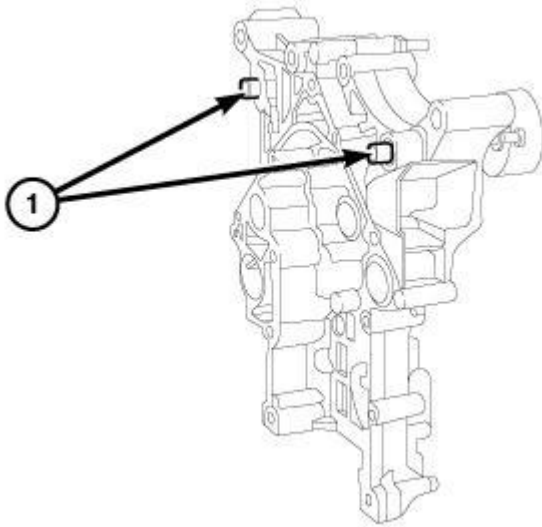


Fig. 376: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

13. Verify the slide bushings (1) remain located in the engine timing cover.

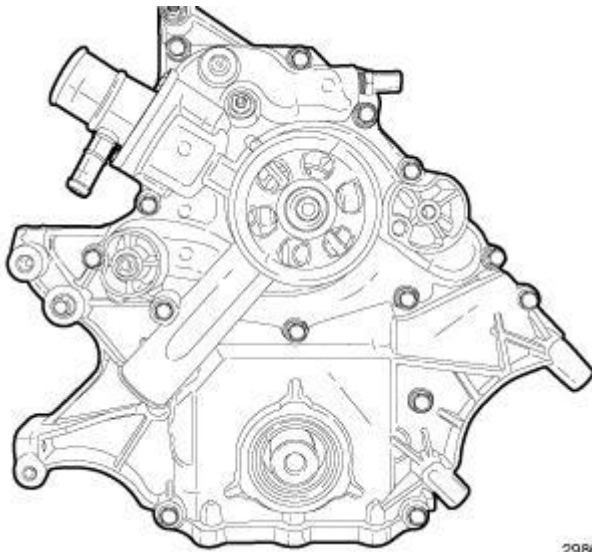
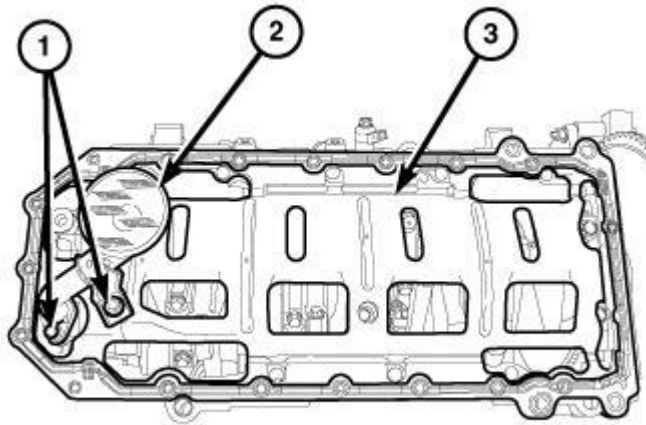


Fig. 377: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

14. Using a new gasket, install the engine timing cover and tighten the retaining bolts to 28 N.m (21 ft. lbs.).

NOTE: The large lifting stud is torqued to 55 N.m (40 ft. lbs.).

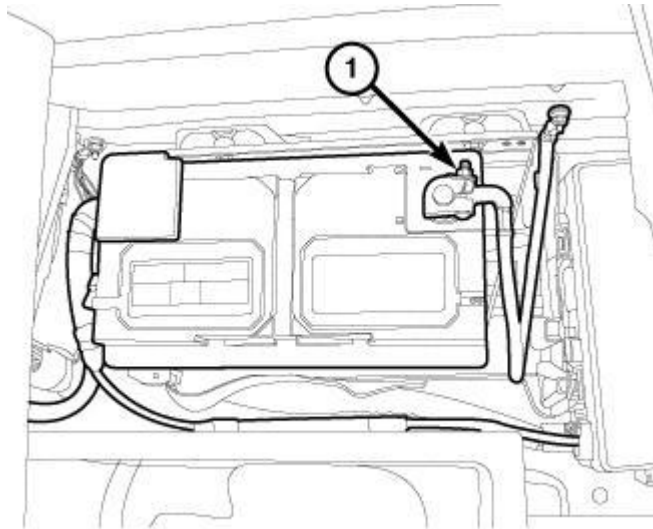
15. Tighten the large lifting stud to 55 N.m (40 ft. lbs.).



2970744

Fig. 378: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

16. Raise and support the vehicle.
17. Install the oil pump pickup tube (2) and the oil pan. Refer to **PAN, OIL, INSTALLATION** .



2969729

Fig. 379: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

18. Install the negative battery cable.
19. Fill the cooling system with the specified type and amount of engine coolant. Refer to **STANDARD PROCEDURE** .

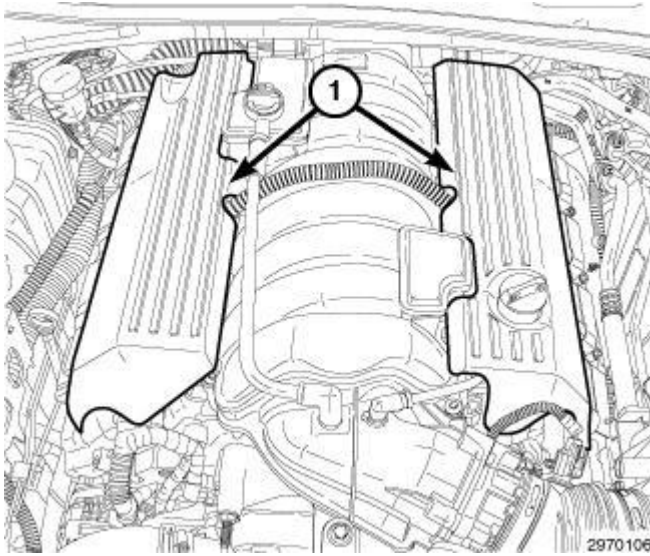


Fig. 380: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

20. Fill the crankcase with the specified type and amount of engine oil. Refer to OIL - **STANDARD PROCEDURE** .
21. Install the engine covers (1).
22. Start the engine and check for leaks.

COVER(S), ENGINE TIMING

REMOVAL

REMOVAL

1. Remove the engine covers.
2. Perform the fuel pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

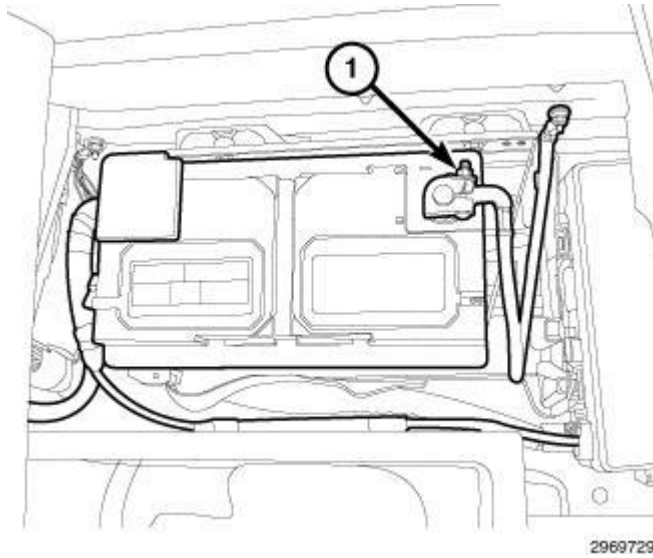


Fig. 381: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the negative battery cable (1).

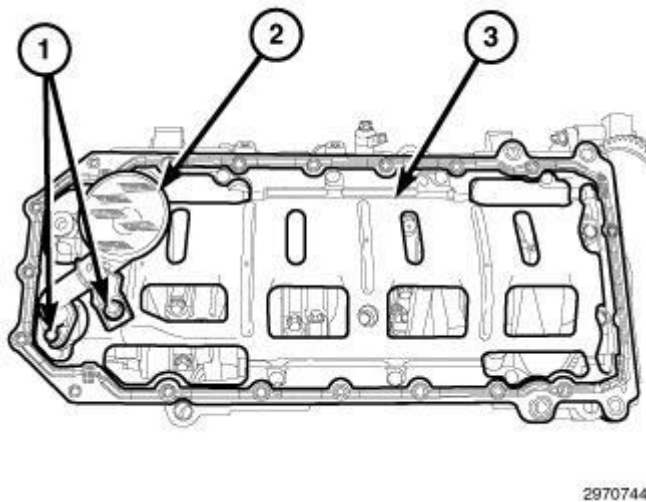
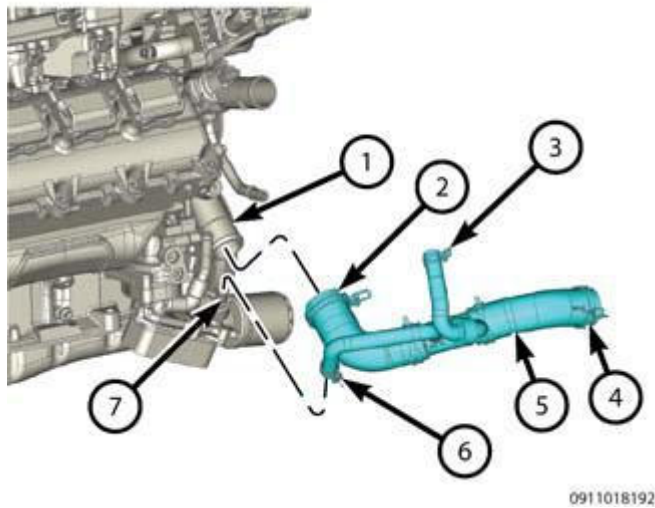


Fig. 382: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

NOTE: When the oil pan is removed, a new oil pan gasket and the integral windage tray assembly must be installed, the old gasket cannot be reused.

4. Remove the oil pan. Refer to **PAN, OIL, REMOVAL** .
5. Remove the oil pump pickup tube retaining bolt and nut (1).
6. Remove the oil pump pickup tube (2).
7. Remove and discard the oil pan gasket/windage tray (3).

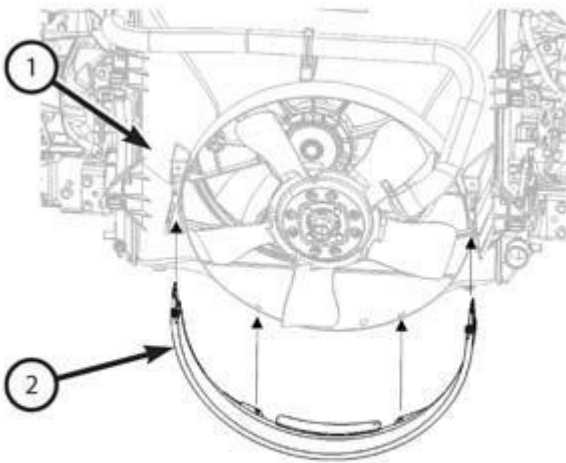


0911018192

Fig. 383: Lower Radiator Hose

Courtesy of CHRYSLER GROUP, LLC

8. Drain the engine coolant into a clean pan.
9. Remove the lower radiator hose (2) at the water pump and position aside.
10. Remove the heater hose at the water pump.



0911018191

Fig. 384: Upper & Lower Shrouds

Courtesy of CHRYSLER GROUP, LLC

11. Remove the lower fan shroud (2).
12. Lower the vehicle.

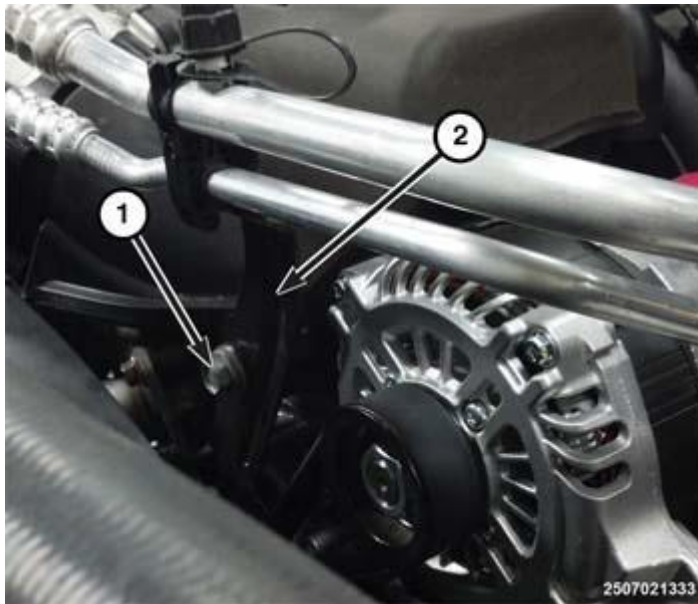


Fig. 385: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

13. Remove the A/C line support bracket.

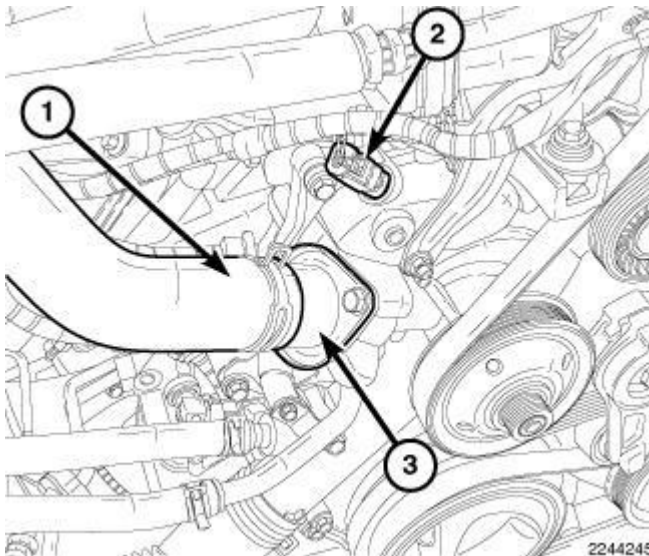


Fig. 386: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

14. Separate the upper radiator hose (1) from the thermostat housing (3) and position aside.
15. Remove the coolant temperature sensor electrical connector (2).

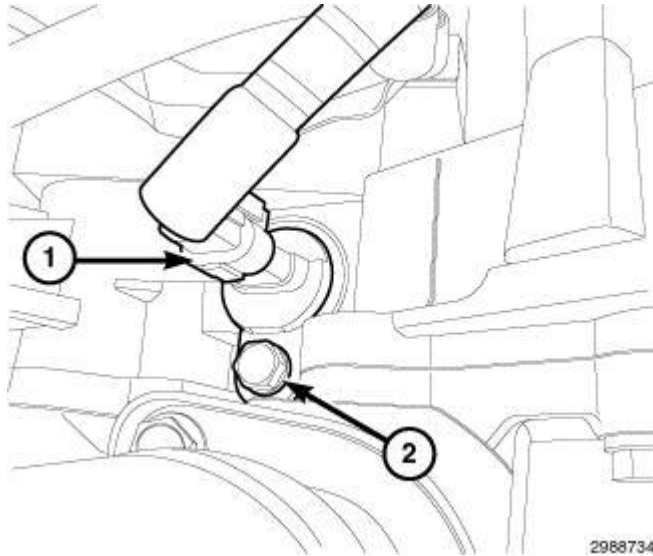


Fig. 387: Camshaft Position Sensor Electrical Connector & Bolt
 Courtesy of CHRYSLER GROUP, LLC

16. Disconnect the camshaft position sensor electrical connector (1).
17. Remove the cooling fan. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** or **FAN, COOLING, VISCOUS, REMOVAL**.

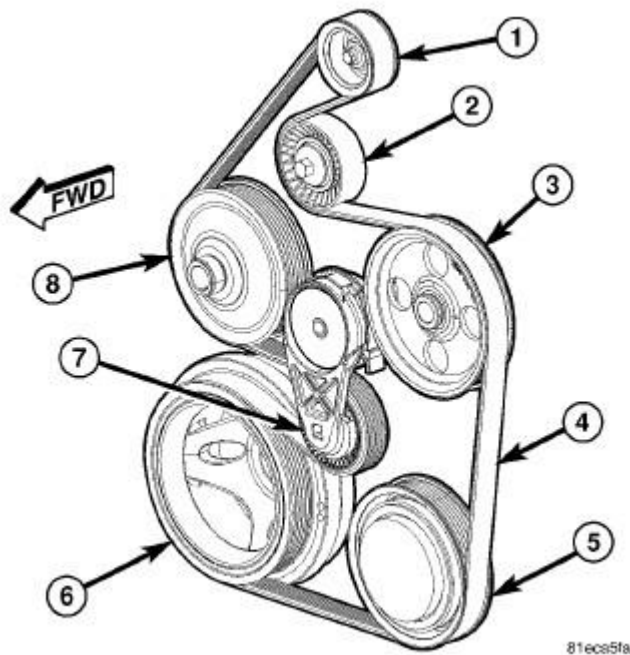


Fig. 388: Belt Routing (5.7L Engine)
 Courtesy of CHRYSLER GROUP, LLC

18. Remove the accessory drive belt (4). Refer to **BELT, SERPENTINE, REMOVAL**.
19. Remove the idler pulley (2).

20. Remove the belt tensioner (7).

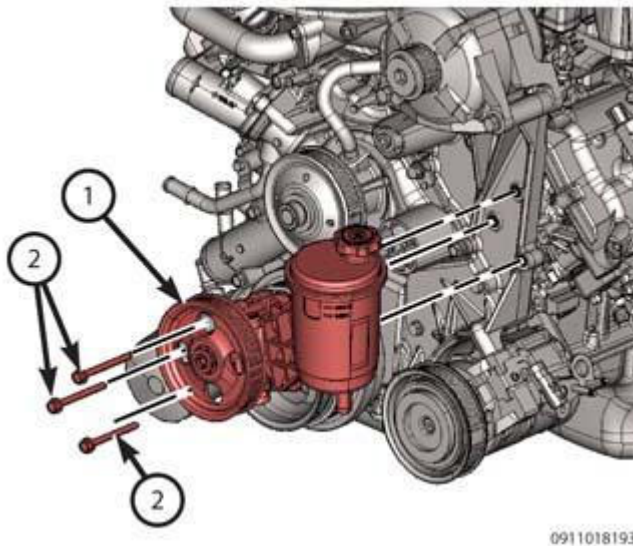


Fig. 389: Power Steering Pump Pulley & Bolts
 Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove the power steering pump hoses for power steering pump removal.

21. Remove the three power steering pump mounting bolts (2) through the access holes in the pulley (1).
 22. Remove the power steering pump from the engine and position aside.

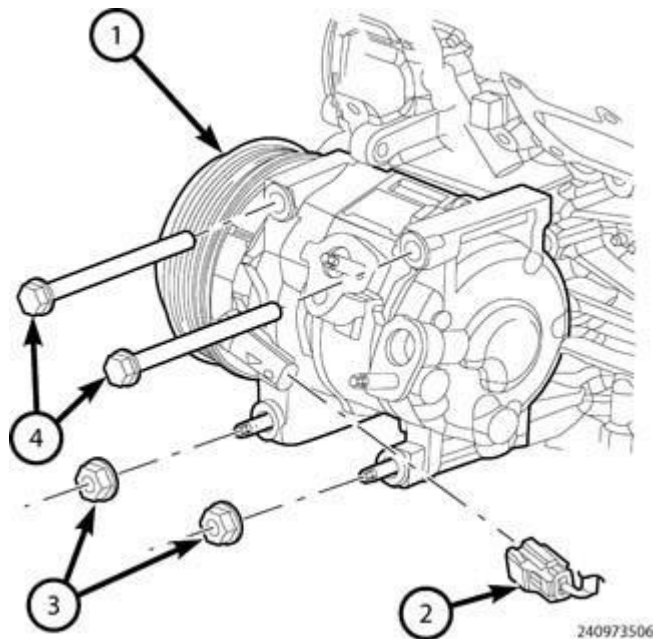
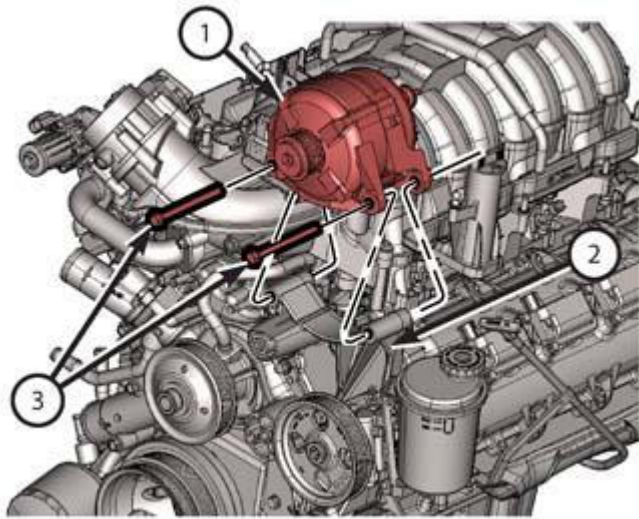


Fig. 390: Removing/Installing A/C Compressor
 Courtesy of CHRYSLER GROUP, LLC

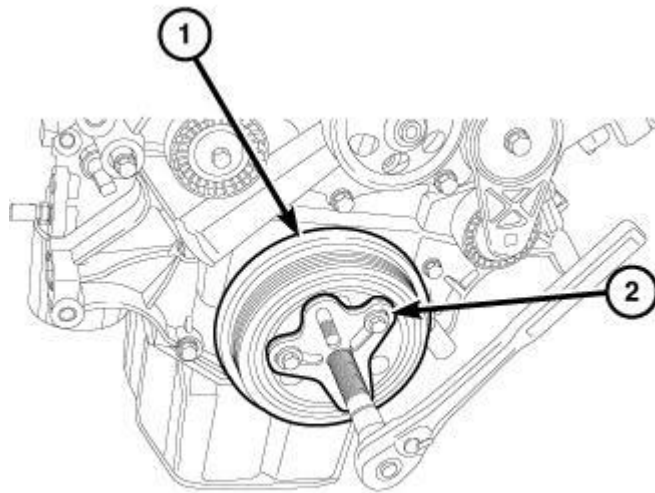
23. Remove the A/C compressor and position aside. Refer to COMPRESSOR, A/C, REMOVAL .



0808018694

Fig. 391: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

24. Remove the generator (1) from the front timing chain cover and position aside. Refer to GENERATOR, REMOVAL .



1184557

Fig. 392: Vibration Damper & Bolt Grip Puller
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the puller tool, ensure the bolts are fully threaded through the entire crankshaft damper.

25. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL .

26. Install the puller tool (2) making sure the bolts are fully threaded through the entire crankshaft damper and remove the crankshaft damper (1).

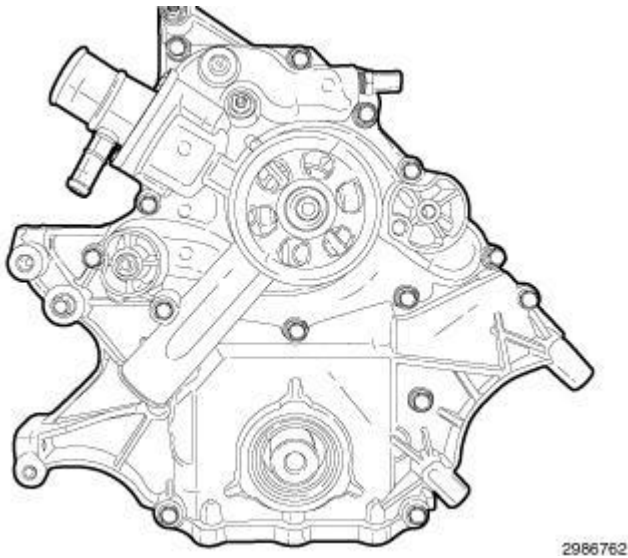


Fig. 393: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove water pump for timing cover removal.

27. Remove the engine timing cover retaining bolts and remove the engine timing cover.

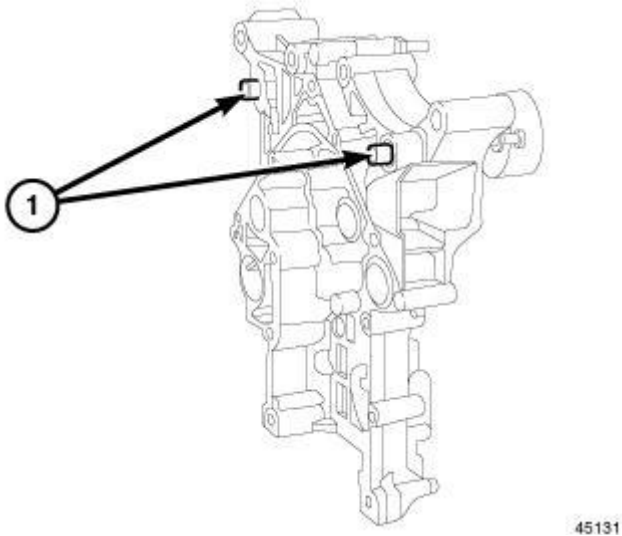


Fig. 394: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

28. Verify that the engine timing cover slide bushings (1) remain located in the engine timing cover.

INSTALLATION

INSTALLATION

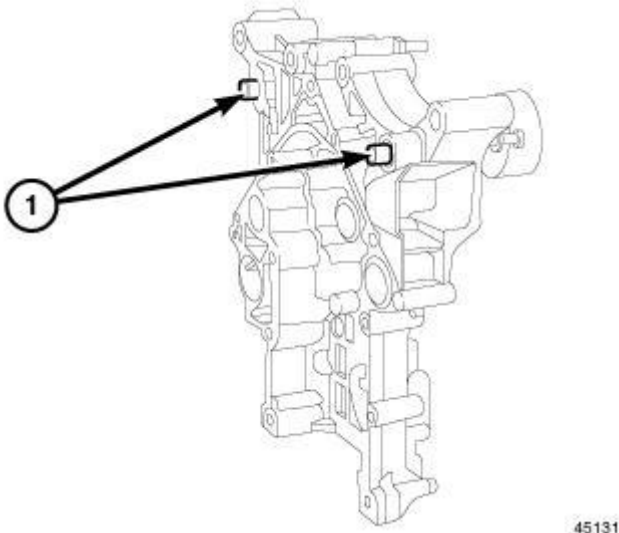


Fig. 395: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

1. Clean the engine timing cover and engine block surface.

NOTE: Always install a new gasket when servicing the engine timing cover.

2. Verify that the engine timing cover slide bushings (1) remain located in the engine timing cover.

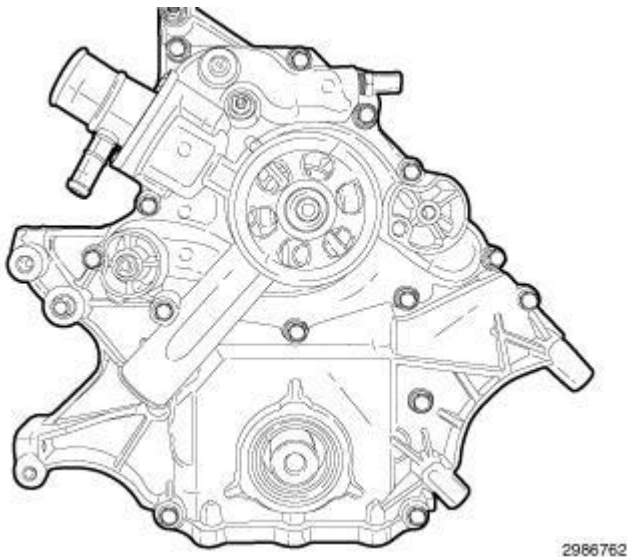
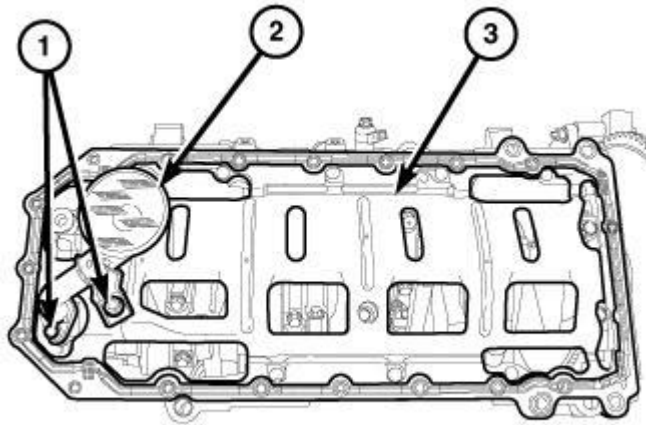


Fig. 396: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

3. Using a new gasket, install the engine timing cover and tighten the retaining bolts to 28 N.m (21 ft. lbs.).

NOTE: The large lifting stud is torqued to 55 N.m (40 ft. lbs.).

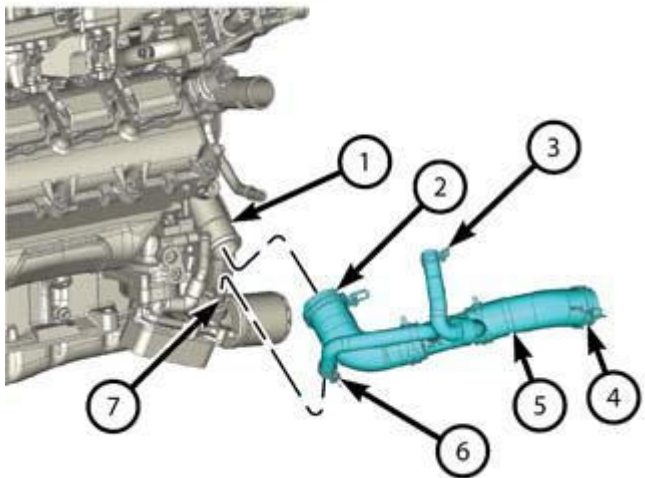
4. Tighten the large lifting stud to 55 N.m (40 ft. lbs.).



2970744

Fig. 397: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Raise and support the vehicle.
6. Install the oil pump pickup tube (2) and the oil pan. Refer to **PAN, OIL, INSTALLATION**.



0911018192

Fig. 398: Lower Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

7. Install the heater hose onto the water pump.
8. Install the lower radiator hose (2) onto the water pump (1).

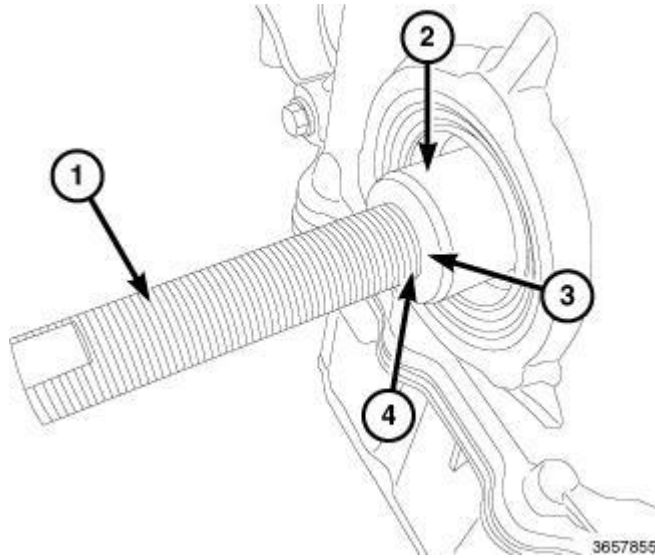


Fig. 399: Installing Vibration Damper Onto Crankshaft Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

9. Assemble the (special tool #10387, Installer, Vibration Damper) as follows:
 1. Install the threaded shaft (1) onto the crankshaft (3) till its seated.
 2. Position the crankshaft damper onto the crankshaft.
 3. Install the thrust washer.
 4. Install the roller bearing onto the threaded shaft making sure the hardened bearing surface is facing away from the crankshaft.
 5. Install the washer.
 6. Install the nut onto the threaded shaft.

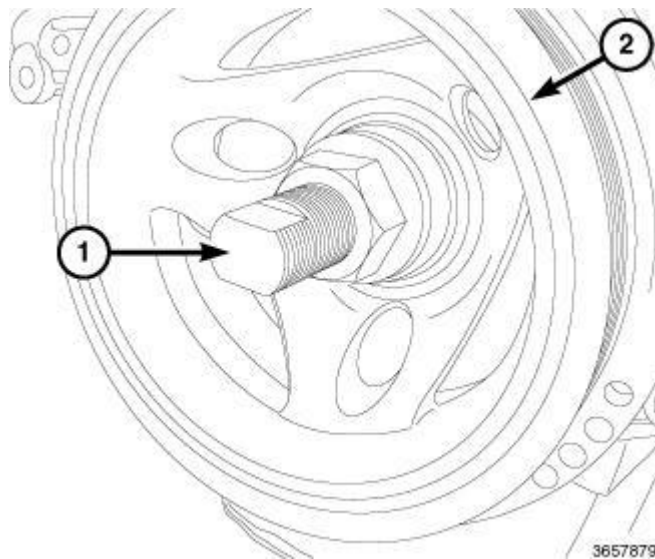
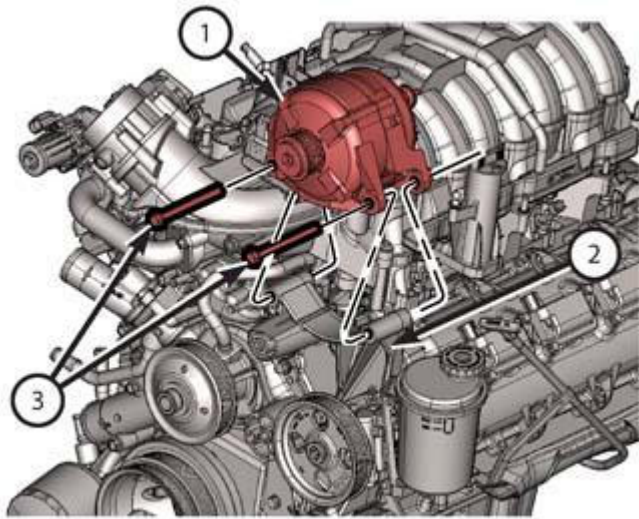


Fig. 400: Installing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

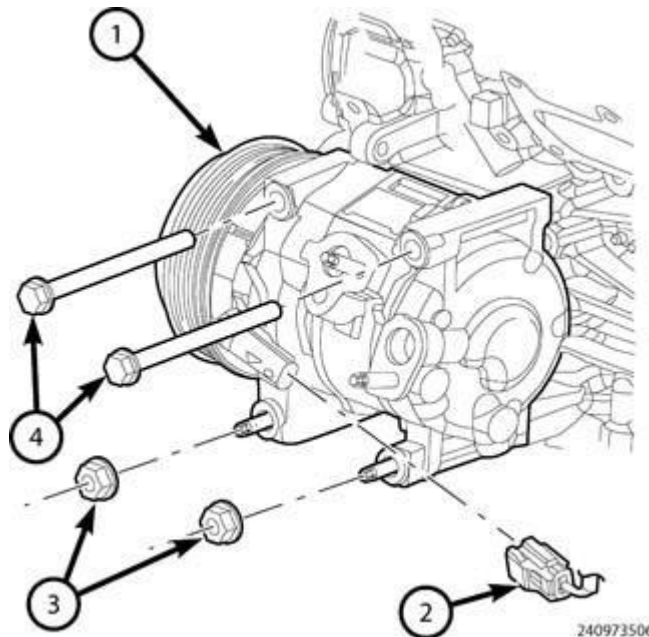
10. Install the vibration damper (2). Refer to **DAMPER, VIBRATION, INSTALLATION** .



0808018694

Fig. 401: Generator, Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

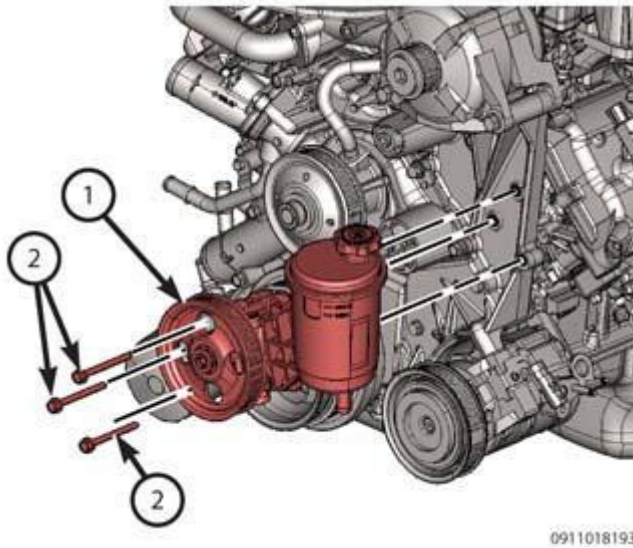
11. Install the generator (1). Refer to **GENERATOR, INSTALLATION** .



240973506

Fig. 402: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

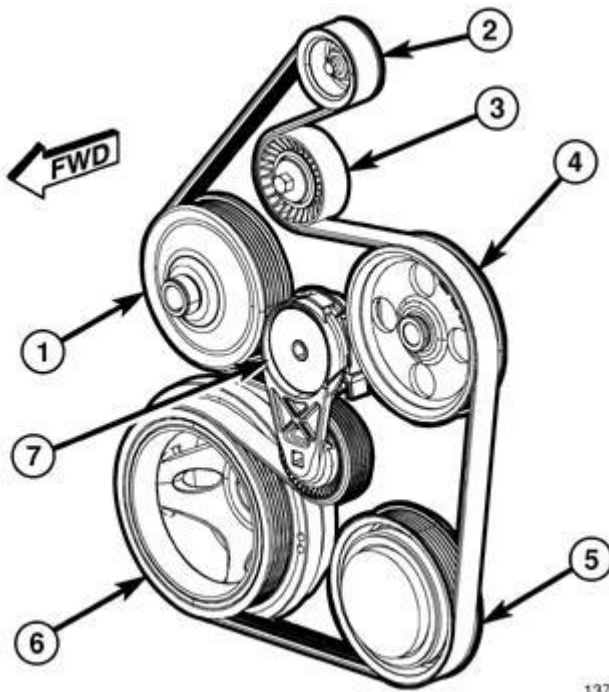
12. Install the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION** .



0911018193

Fig. 403: Power Steering Pump Pulley & Bolts
 Courtesy of CHRYSLER GROUP, LLC

13. Position the power steering pump, align the pump (1) with the mounting holes on the engine.
14. Install the three power steering pump mounting bolts (2) through access holes in the pulley and tighten to 28 N.m (21 ft. lbs.).



1377486

Fig. 404: Accessory Drive Belt Routing, Tensioner & Pulleys
 Courtesy of CHRYSLER GROUP, LLC

15. Install the accessory drive belt tensioner assembly (7) and idler pulley (3).
16. Install the accessory drive belt (2). Refer to **BELT, SERPENTINE, INSTALLATION**.

17. Install the cooling fan. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** or **FAN, COOLING, VISCOUS, INSTALLATION**.

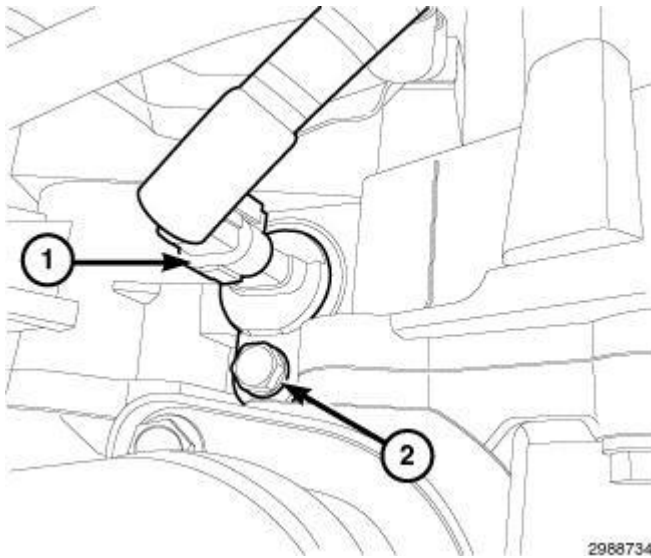


Fig. 405: Camshaft Position Sensor Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

18. Connect the camshaft position sensor electrical connector (1).

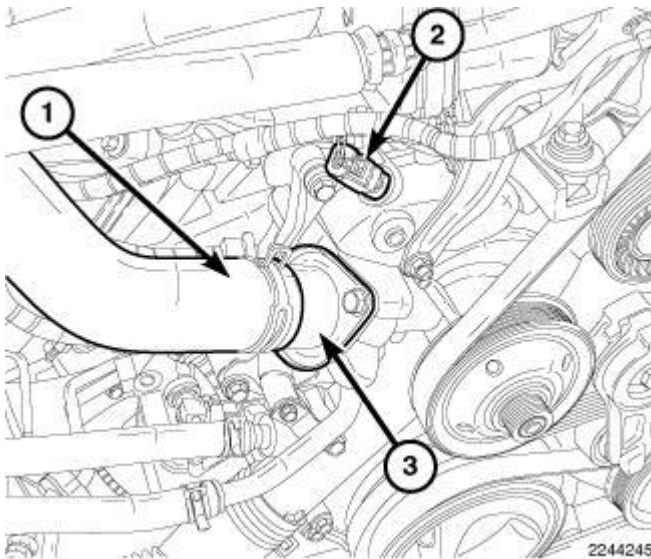


Fig. 406: Engine Coolant Temperature (ECT) Sensor & Thermostat
Courtesy of CHRYSLER GROUP, LLC

19. Connect the coolant temperature sensor electrical connector (2).
20. Install the upper radiator hose (1).

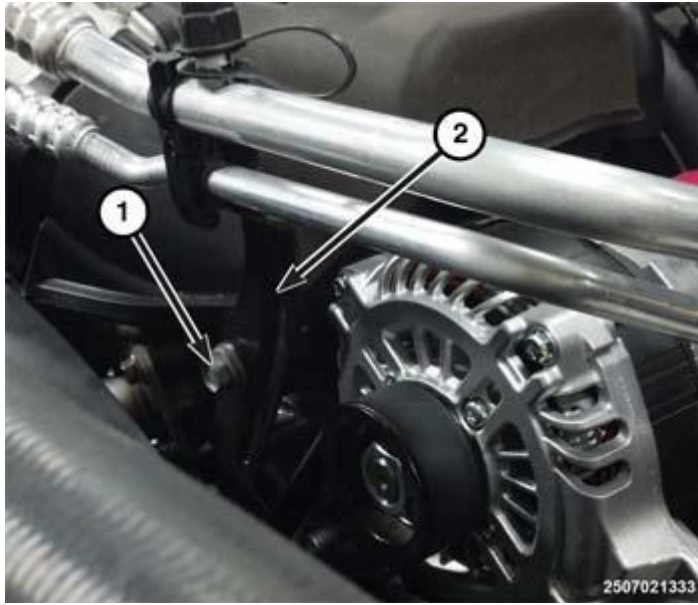


Fig. 407: A/C Line Support Bracket
Courtesy of CHRYSLER GROUP, LLC

21. Install the A/C line support bracket (2). Tighten the bolt (1) to 20 N.m (15 ft. lbs.).
22. Fill the cooling system with the specified type and amount of engine coolant. Refer to **STANDARD PROCEDURE**.
23. Fill the crankcase with the specified type and amount of engine oil. Refer to OIL - **STANDARD PROCEDURE**.

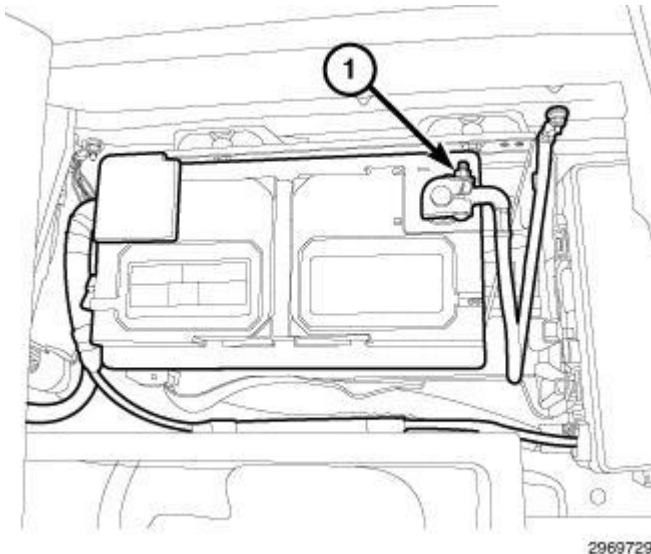


Fig. 408: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

24. Connect the negative battery cable (1).
25. Install the engine covers.

26. Start the engine and check for leaks.

TENSIONER, ENGINE TIMING

DESCRIPTION

DESCRIPTION



Fig. 409: Timing Chain Tensioner Arm
Courtesy of CHRYSLER GROUP, LLC

The timing chain tensioner is a spring loaded design. It consists of two chain guide shoes. One shoe is fixed in place and the other is spring loaded to keep tension on the chain.

OPERATION

OPERATION



Fig. 410: Timing Chain Tensioner Arm
Courtesy of CHRYSLER GROUP, LLC

The timing chain tension is maintained by routing the timing chain through the tensioner assembly. The tensioner assembly consists of two chain guide shoes. One shoe is fixed in place and the other is spring loaded to maintain the correct timing chain tension.