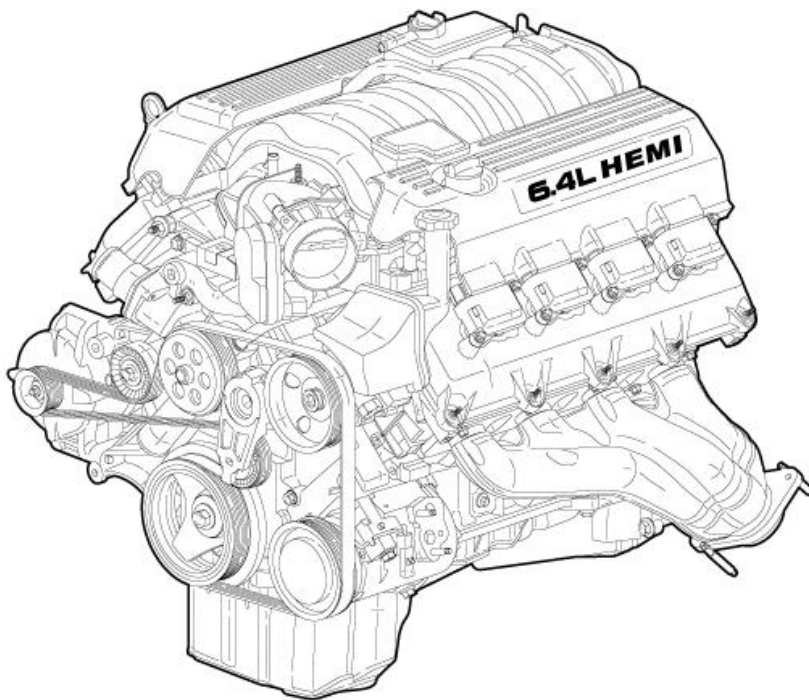


2013 ENGINE**6.4L - Service Information - Chrysler 300****DESCRIPTION****DESCRIPTION**

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



3667207

Fig. 1: 6.4L HEMI V-8 Engine

Courtesy of CHRYSLER GROUP, LLC

The 6.4L HEMI eight-cylinder SRT high performance engine is a 90° V-Type, deep skirt, lightweight cast iron block with aluminum heads, single cam, overhead valves, and hydraulic roller lifters. The heads incorporate splayed valves with a hemispherical style combustion chamber and dual spark plugs. 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. The 6.4L HEMI engine is a bored and stroked version of the 5.7L HEMI engine developed for SRT high performance vehicles. This engine shares the same architecture as the 2009 5.7L HEMI with the following Performance Upgrades:

- Increased Bore
- Increased Stroke

- Increased Valve Sizing

The 6.4L HEMI engine also has improved horsepower, torque and fuel economy as compared with the 6.1L HEMI engine. This is achieved with the larger displacement and the following Technical Improvements:

- Variable Cam Timing (VCT) Cam Phasing System
- Multi-Displacement System (MDS)
- High Flow Ports
- Increased Maximum RPM
- Combustion Chamber Shape
- Higher Compression Ratio

DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - INTRODUCTION

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

These malfunctions may be classified as either performance e.g., (engine idles rough and stalls) or mechanical e.g., (a strange noise). For possible causes and corrections of malfunctions, refer to **ENGINE MECHANICAL DIAGNOSIS CHART** .

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. For additional Information on diagnosis and testing refer to the following tests:

- Cylinder Compression Pressure Leakage. Refer to **CYLINDER COMPRESSION PRESSURE LEAKAGE** .
- Cylinder Combustion Pressure Leakage. Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE** .
- Checking Engine Oil Pressure. Refer to **CHECKING ENGINE OIL PRESSURE** .
- Cylinder Head Gasket Failure. Refer to **DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE** .
- Intake Manifold Leakage. Refer to **DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE** .

CYLINDER COMBUSTION PRESSURE LEAKAGE

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

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating)

- Leaks between adjacent cylinders or into water jacket
 - Any causes for combustion and/or compression 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 reaches 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 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
 7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Position the piston of cylinder to be tested at TDC compression. While 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 between cylinders.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

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

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Air escapes through the 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 the 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 the radiator	Cylinder head gasket leaking or cracked in cylinder head or engine block.	Remove cylinder head and inspect. Replace cylinder head gasket, cylinder head or engine block as necessary.
More than 50% leakage from adjacent cylinders	Cylinder head gasket leaking or crack in cylinder head or engine block between adjacent cylinders.	Remove cylinder head and inspect. Replace cylinder head gasket, cylinder head or engine block as necessary.
More than 25% leakage and air escapes through the oil filler cap opening only	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall.	Remove cylinder head and inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary.

CYLINDER COMPRESSION PRESSURE LEAKAGE

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

NOTE: Ensure 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. 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**.

ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE NOISE	1. Worn accessory drive belt	1. Check for damage and/or alignment. Refer to <u>BELT, SERPENTINE, DIAGNOSIS AND TESTING</u> .
	2. Worn coolant pump	2. Check for possible coolant leak. If OK, Check the pulley and input shaft for wear. Replace as necessary.
	3. Worn generator	3. Check the pulley for wear. Spin the armature. Replace as necessary.
	4. Idler/Tensioner pulley	4. Check pulleys. Verify bearing noise. Replace as necessary.

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NOISY VALVES/LIFTERS	5. Power steering pump	5. Check the pulley and input shaft for wear. Replace as necessary.
	6. Flywheel/Flexplate	6. Check for wear or possible cracking. Check bolts. repair as necessary.
	1. High or low oil level in crankcase.	1. Check for correct oil level. Adjust oil level by draining or adding as needed.
	2. Thin or diluted oil.	2. Change oil. Refer to Engine/Lubrication/OIL - <u>STANDARD PROCEDURE</u> .
	3. Low oil pressure.	3. Check engine oil level. If OK, perform oil pressure test. Refer to Engine/Lubrication - <u>DIAGNOSIS AND TESTING</u> .
	4. Dirt in hydraulic lifters.	4. Clean/replace hydraulic lifters.
	5. Bent push rod(s).	5. Install new push rods.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms and replace worn arms as needed.
	7. Worn hydraulic lifters.	7. Install new hydraulic lifters.
CONNECTING ROD NOISE	8. Worn valve guides.	8. Inspect all valve guides and replace as necessary.
	9. Excessive runout of valve seats or valve faces.	9. Grind valves and seats.
	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. If OK, perform oil pressure test. Refer to Engine/Lubrication - <u>DIAGNOSIS AND TESTING</u> .
	3. Thin or diluted oil.	3. Change oil to correct viscosity. Refer to Engine/Lubrication/OIL - <u>STANDARD PROCEDURE</u> .
	4. Excessive connecting rod bearing clearance.	4. Measure bearings for correct clearance with plasti-gage. Repair as necessary.
	5. Connecting rod journal out of round.	5. Replace crankshaft or grind journals.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level.
	2. Low oil pressure.	2. Check engine oil level. If OK, perform oil pressure test. Refer to Engine/Lubrication - <u>DIAGNOSIS AND TESTING</u> .
	3. Thin or diluted oil.	3. Change oil to correct viscosity. Refer to Engine/Lubrication/OIL - <u>STANDARD PROCEDURE</u> .

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	4. Excessive main bearing clearance.	4. Measure bearings for correct clearance. Repair as necessary.
	5. Excessive end play.	5. Check crankshaft thrust bearing for excessive wear on flanges.
	6. Crankshaft main journal out of round or worn.	6. Grind journals or replace crankshaft.
	7. Loose flexplate, flywheel or torque converter.	7. Inspect crankshaft, flexplate, flywheel and bolts for damage. Tighten to correct torque.
LOW OIL PRESSURE	1. Low oil level.	1. Check oil level and fill if necessary.
	2. Faulty oil pressure sending unit.	2. Install new sending unit.
	3. Clogged oil filter.	3. Install new oil filter.
	4. Worn oil pump.	4. Replace oil pump assembly.
	5. Thin or diluted oil.	5. Change oil to correct viscosity. Refer to Engine/Lubrication/OIL - <u>STANDARD PROCEDURE</u> .
	6. Excessive bearing clearance.	6. Measure bearings for correct clearance.
	7. Oil pump relief valve stuck.	7. Remove valve to inspect, clean and reinstall.
	8. Oil pickup tube loose, broken, bent or clogged.	8. Inspect oil pickup tube and pump, and clean or replace if necessary.
	9. Oil pump cover warped or cracked.	9. Install new oil pump.
	10. Faulty or missing piston cooling jets.	10. Replace piston cooling jets.
OIL LEAKS	1. Misaligned or deteriorated gaskets.	1. Replace gasket.
	2. Loose fastener or broken or porous metal part.	2. Tighten, repair or replace the part.
	3. Front or rear crankshaft oil seal leaking.	3. Replace seal.
	4. Leaking oil gallery plug or cup plug.	4. Remove and reseal threaded plug. Replace cup style plug.
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. PCV System malfunction.	1. Refer to <u>VALVE, POSITIVE CRANKCASE VENTILATION (PCV), REMOVAL</u> .
	2. Defective valve stem seal(s).	2. Repair or replace seal(s).
	3. Worn or broken piston rings.	3. Hone cylinder bores. Install new rings.
	4. Scuffed pistons/cylinder walls.	4. Hone cylinder bores and replace pistons as required.
	5. Carbon in oil control ring	5. Remove rings and de-carbon piston.

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	groove.	
	6. Worn valve guides.	6. Inspect/replace valve guides as necessary.
	7. Piston rings fitted too tightly in grooves.	7. Remove rings and check ring end gap and side clearance. Replace if necessary.

Lifter Purge Guideline

1. Warm engine to standard idle conditions.

NOTE: Engine noise may be in the form of a clicking, chatter, or clattering noise.

2. Listen to the engine for 30 to 60 seconds with the hood up and the engine cover removed.
3. If noise is present, de-aeration of the lifters is required.
4. Run the engine between 2000 and 3000 RPM for three to five minutes.
5. Return the engine to standard idle speed for 30 to 60 seconds.
6. Evaluate noise. If noise is present, repeat the run an additional 4 cycles.

NOTE: The standard drive cycle will be about 10 - 15 miles of non- stop, combined highway and city driving.

7. If noise is present, take the vehicle on a standard drive cycle.

NOTE: Use a feeler gauge to verify clearance is present between the lifter and cam base circle.

8. Evaluate the noise. If noise present, follow standard service procedure for lifter repairs or noise conditions.
9. Evaluate lifters for sponginess, check valve defects, and clearance.

ENGINE LUBRICATION DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-rings 2. • Misaligned or damaged • Loose fasteners, broken or porous metal parts 3. Crankshaft rear seal 4. Crankshaft seal flange damaged 5. Oil pan flange cracked	1. Verify condition 2. • Replace as necessary • Tighten fasteners, repair or replace metal parts 3. Replace as necessary 4. Polish or replace crankshaft

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	6. Front cover seal damaged/misaligned 7. Damaged vibration damper 8. Crankshaft rear flange microporosity	5. Replace oil pan 6. Replace seal 7. Polish or replace damper 8. Replace crankshaft
OIL PRESSURE DROP	1. Low oil level 2. Faulty oil pressure sending unit 3. Low oil pressure 4. Clogged oil filter 5. Worn oil pump 6. Thin or diluted oil 7. Excessive bearing clearance 8. Oil pump relief valve stuck 9. Oil pickup tube loose or damaged 10. Faulty or missing piston cooling jets	1. Check and correct oil level 2. Replace sending unit 3. Check pump and bearing clearance 4. Replace oil filter 5. Replace as necessary 6. Change oil and filter 7. Replace as necessary 8. Replace oil pump 9. Replace as necessary 10. Replace piston cooling jets
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings 2. Carbon in oil ring slots 3. Incorrect ring size installed 4. Worn valve guides 5. Leaking intake gasket 6. Leaking valve guide seals	1. Hone cylinder bores and replace rings 2. Replace rings 3. Replace rings 4. Ream guides and replace valves 5. Replace intake gaskets 6. Replace valve guide seals

LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-rings.	1. Replace as necessary.
	a. Misaligned or damaged.	a. Replace as necessary.
	b. Loose fasteners, broken or porous metal parts.	b. Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear seal.	2. Replace as necessary.
	3. Crankshaft seal flange. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan.
	5. Front cover seal, damaged or misaligned.	5. Replace seal.
	6. Scratched or damaged vibration damper hub.	6. Polish or replace damper.

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	7. Crankshaft Rear Flange Microporosity.	7. Replace Crankshaft.
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sending unit.	2. Replace sending unit.
	3. Low oil pressure.	3. Check pump and bearing clearance.
	4. Clogged oil filter.	4. Replace oil filter.
	5. Worn oil pump.	5. Replace as necessary.
	6. Thin or diluted oil.	6. Change oil and filter.
	7. Excessive bearing clearance.	7. Replace as necessary.
	8. Oil pump relief valve stuck.	8. Replace oil pump.
	9. Oil pickup tube loose or damaged.	9. Replace as necessary.
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings.
	3. Incorrect ring size installed.	3. Replace rings.
	4. Worn valve guides.	4. Ream guides and replace valves.
	5. Leaking intake gasket(s).	5. Replace intake gasket(s).
	6. Leaking valve guide seals.	6. Replace valve guide seals.

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, ensure no external engine oil leaks are 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 leak down test using the standard leak down gauge 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 15% leak down further engine tear down and inspection will be required.

TOP 18 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.

STANDARD PROCEDURE

ENGINE GASKET SURFACE PREPARATION

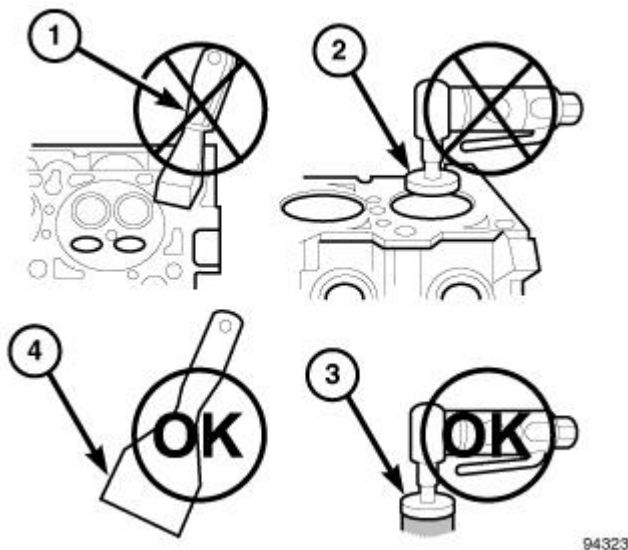


Fig. 2: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

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).

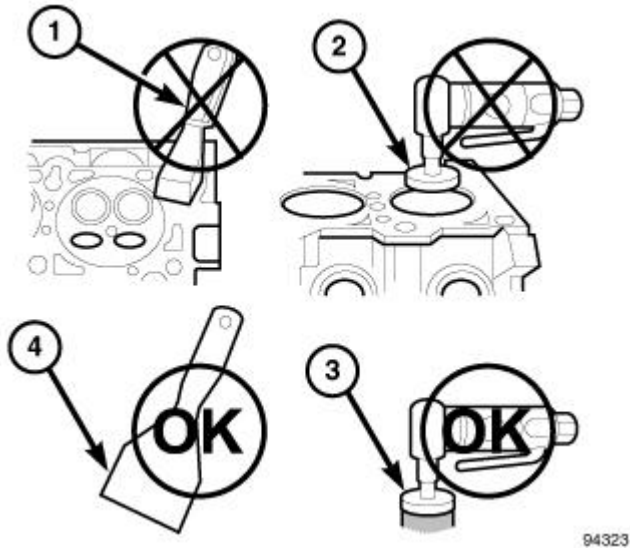


Fig. 3: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

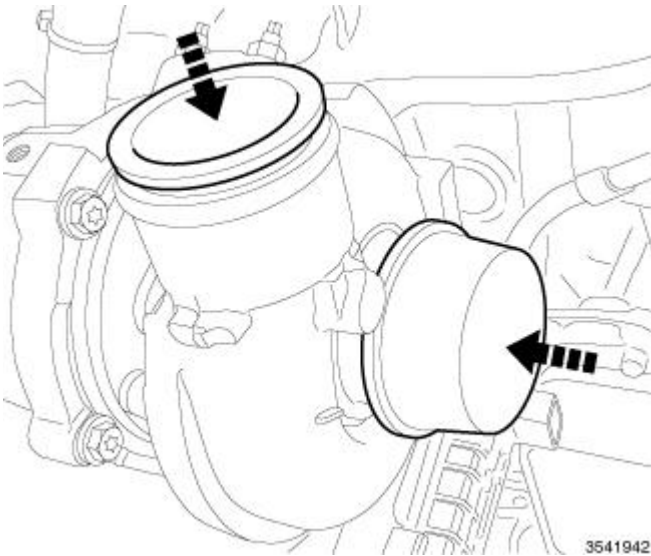
NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

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).

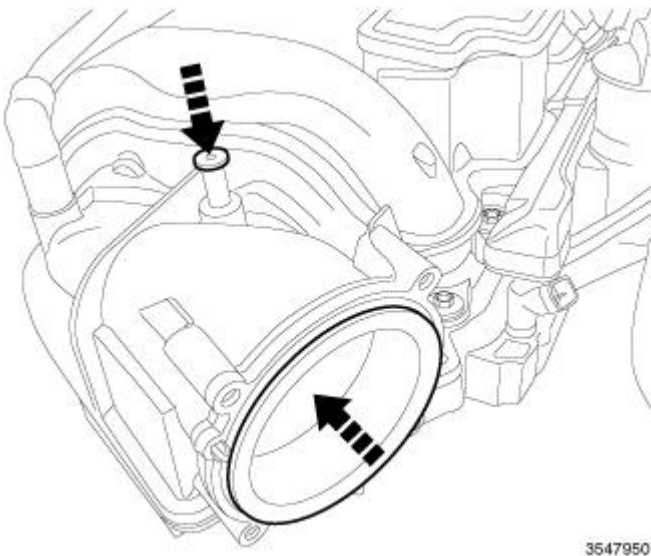
Sealing surfaces must be free of grease or oil residue. Clean surfaces with Mopar® brake parts cleaner (or equivalent).

DUST COVERS AND CAPS

**Fig. 4: 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. 5: 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.

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.

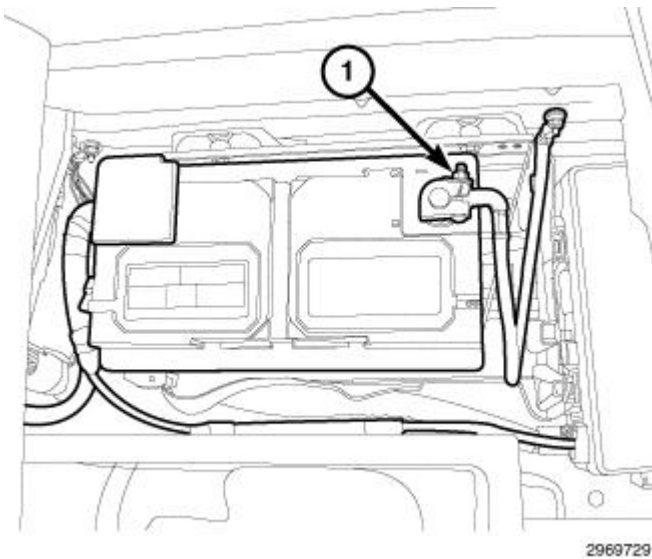


Fig. 6: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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

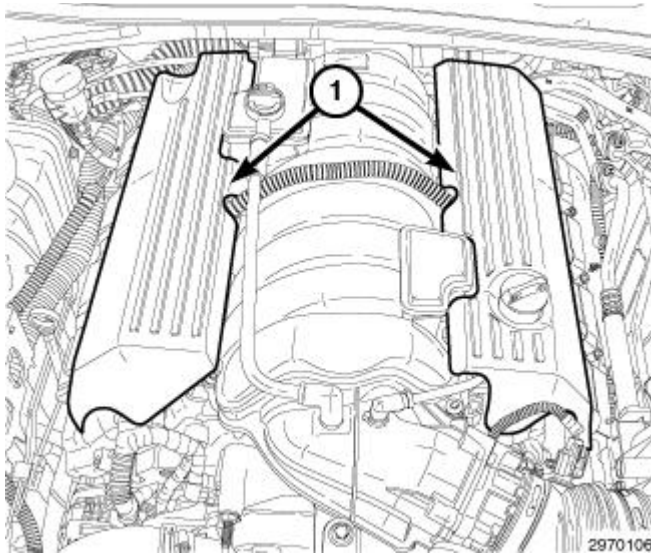


Fig. 7: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

2. Lift the engine cover retaining grommets off the ball studs and remove the engine cover (2).
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 - **STANDARD PROCEDURE**.

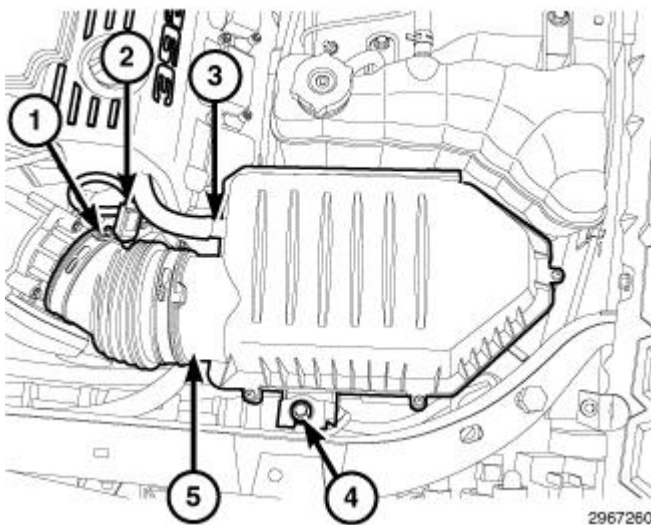


Fig. 8: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing

Courtesy of CHRYSLER GROUP, LLC

4. Loosen the air duct retaining clamp (1) at the throttle body.
5. Disconnect the intake air temperature sensor electrical connector (2).
6. Remove the makeup air hose (3) at the air cleaner housing.

7. Remove the air cleaner housing retaining bolt (4).
8. While lifting up the air cleaner housing (5), 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 Engine/Lubrication/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

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

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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.
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

SPECIFICATION	
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DESCRIPTION	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.
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.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	36.0°
Closes (ATDC)	250.0°
Duration	286.0°
Exhaust	

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Opens (BTDC)	278°
Closes (ATDC)	10°
Duration	288.0°
Valve Overlap	46°

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.

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Exhaust	0.025 - 0.070 mm	0.0010 - 0.0028 in.
Valve Lift (@ Zero Lash)		
Intake	15.0 mm	0.591 in.
Exhaust	14.2 mm	0.559 in.

VALVE SPRING

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Spring Force (Valve Closed)		
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

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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	-
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	8	-	70
Engine Mount Bracket to Engine Block - Bolts	61	45	-
Engine Mount Heat Shield - Nuts	25	18	-
Engine Timing Cover - Bolts	28	21	-
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	-

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Oil Pan - Drain Plug	27	20	-
Oil Pan - Bolts	Specific torque and fastener pattern required; follow installation sequence. Refer to PAN, OIL - <u>INSTALLATION</u> .		
Oil Pump - Bolts	28	21	-
Oil Pump Pickup Tube - Bolt and Nut	28	21	-
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	330	243	-
Water Pump to Engine Timing Cover - Bolts	28	21	-

REMOVAL**REMOVAL**

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

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.

1. Remove the hood. Refer to HOOD - **REMOVAL** .

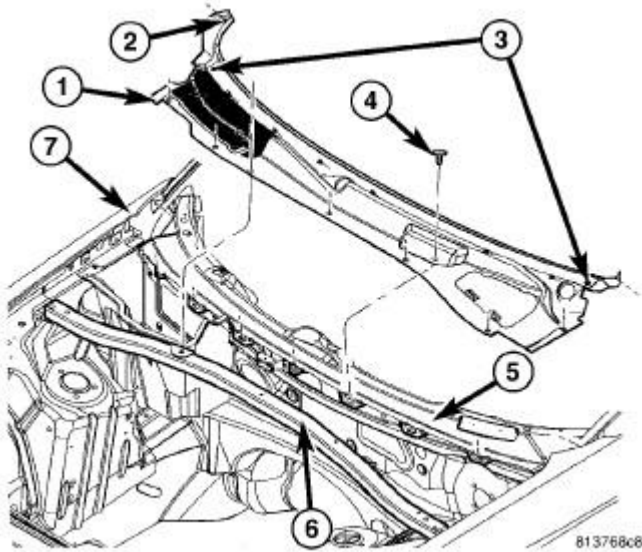


Fig. 9: Removing/Installing Cowl Panel
 Courtesy of CHRYSLER GROUP, LLC

2. Remove the cowl panel cover (1). Refer to **COVER, COWL PANEL, REMOVAL** .
3. Remove the strut tower support (6).

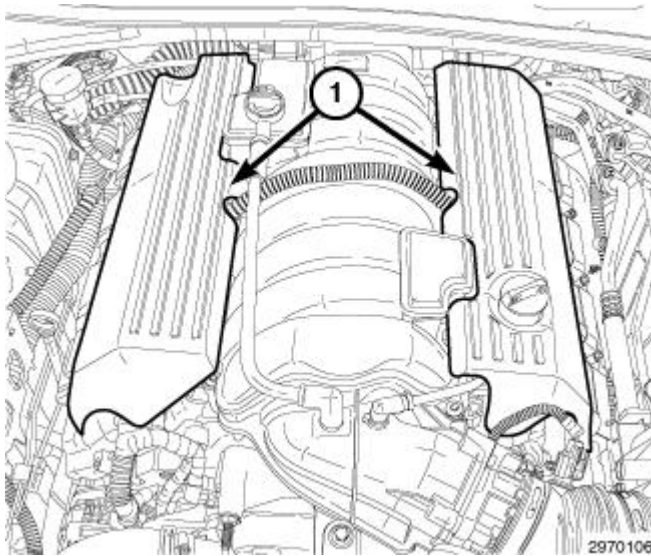


Fig. 10: Engine Covers
 Courtesy of CHRYSLER GROUP, LLC

4. Lift the engine cover retaining grommets off the ball studs and remove the engine covers (1).
5. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

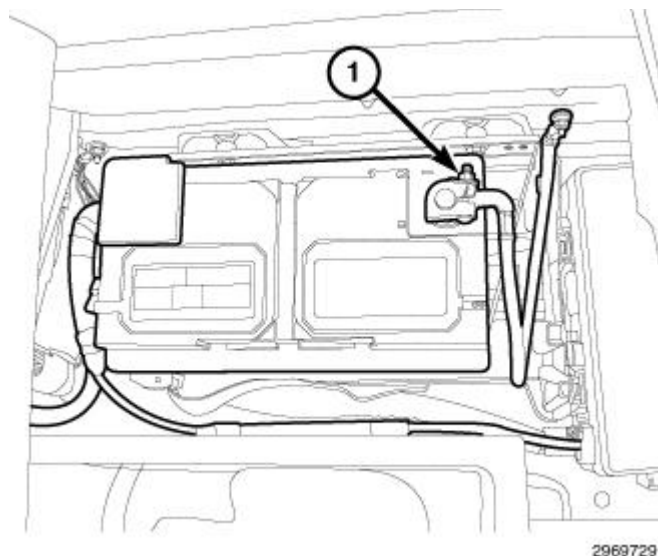


Fig. 11: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

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

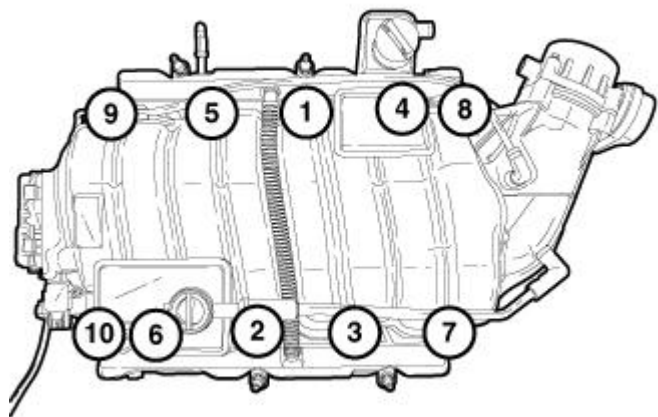


Fig. 12: Intake Manifold Removal/Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Remove the intake manifold and throttle body as an assembly.

7. Remove the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL.

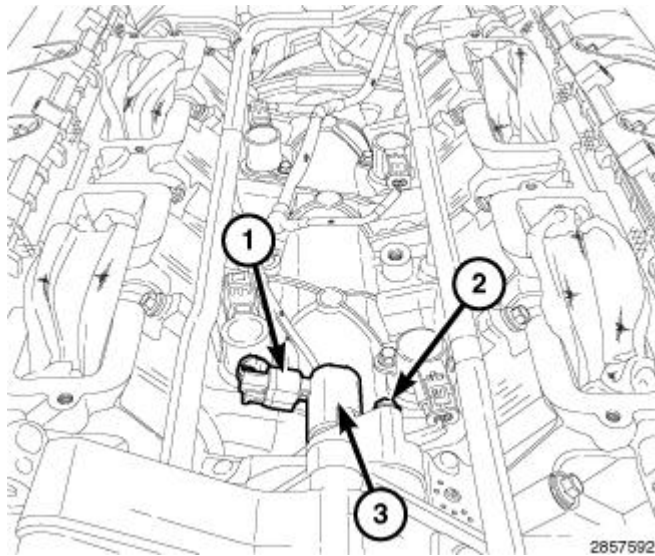


Fig. 13: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: The engine must be at room temperature before removing the oil control valve.

8. Disconnect the oil control valve electrical connector (1).
9. Remove the oil control valve retaining bolt (2).
10. Rotate the oil control valve (3) to break the seal then pull the oil control valve straight out.

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

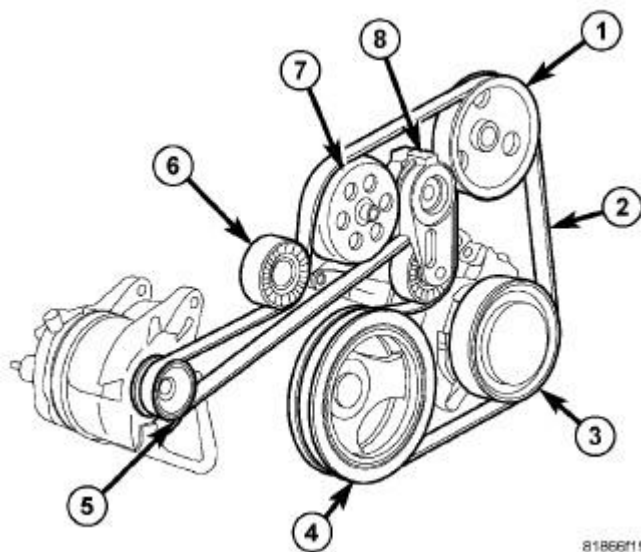


Fig. 14: Accessory Drive Belt Routing, Tensioner & Pulleys

Courtesy of CHRYSLER GROUP, LLC

11. Rotate the accessory drive belt tensioner (8) clockwise until it contacts the stop and remove the accessory drive belt (2), then slowly rotate the tensioner into the freearm position.

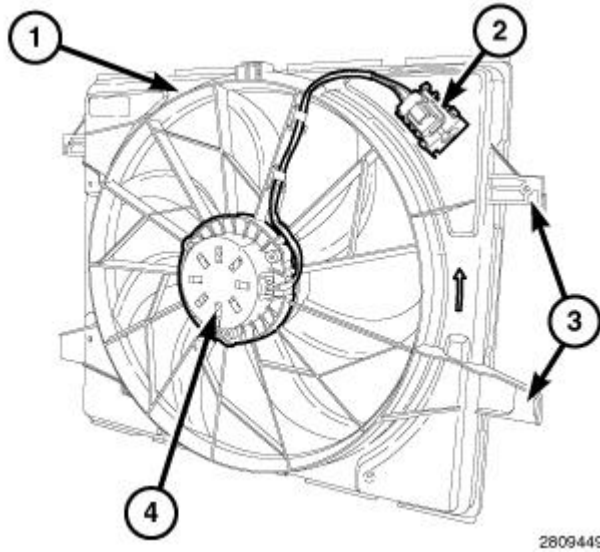


Fig. 15: Cooling Fan Module Components

Courtesy of CHRYSLER GROUP, LLC

12. Remove the cooling fan (1). Refer to **FAN, COOLING, REMOVAL**.
13. Raise and support the vehicle.

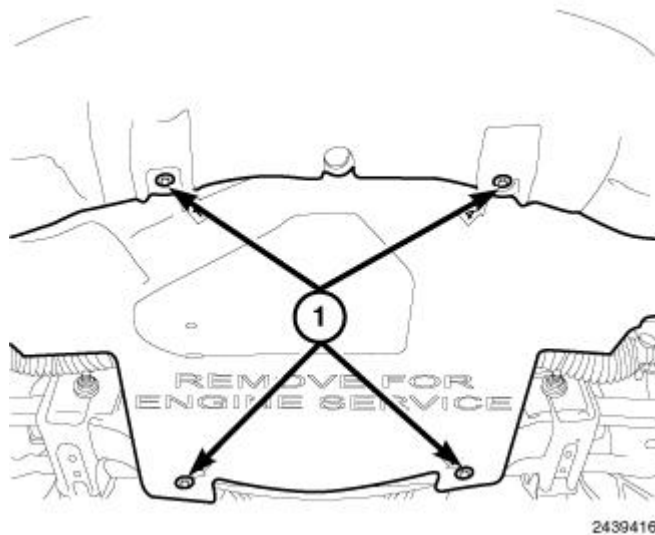


Fig. 16: Lower Splash Shield & Fasteners

Courtesy of CHRYSLER GROUP, LLC

14. Remove the belly pan retainers (1) and remove the belly pan.
15. Drain the cooling system. Refer to **STANDARD PROCEDURE**.

16. Drain the engine oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE** .

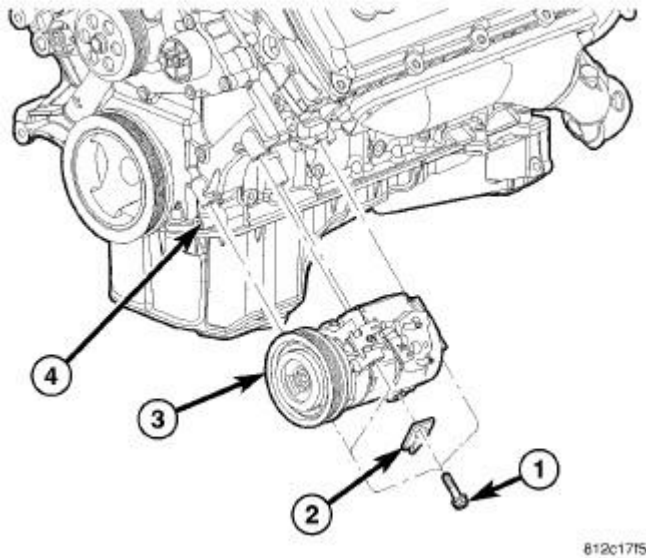


Fig. 17: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

17. Remove the A/C compressor (3). Refer to **COMPRESSOR, A/C, REMOVAL** .

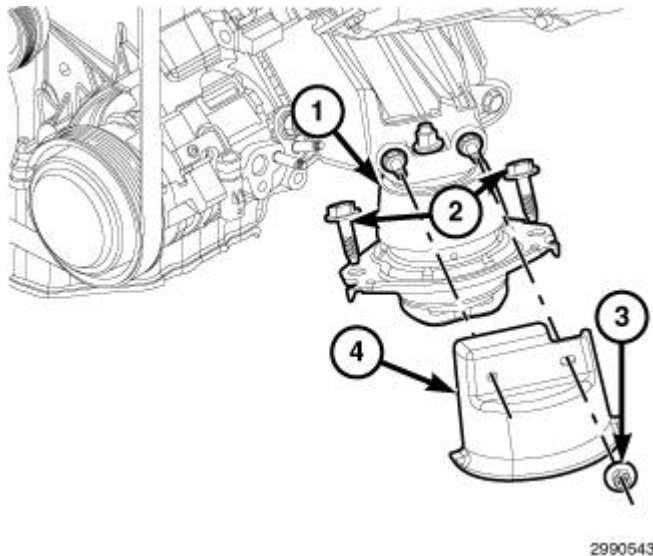


Fig. 18: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

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

18. Remove both left/right engine mount heat shield (4) retaining nuts (3) and remove the heat shields.
19. Remove both left/right engine mount to frame retaining bolts (2).

20. Disconnect the transmission oil cooler lines from their retainers at the oil pan.

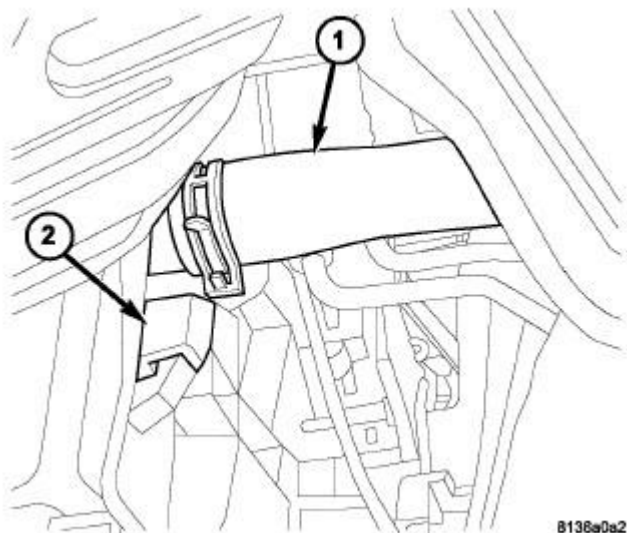


Fig. 19: Lower Radiator Hose

Courtesy of CHRYSLER GROUP, LLC

1 - LOWER
RADIATOR
HOSE
2 -
RADIATOR
FAN
ASSEMBLY

21. Remove the lower radiator hose (1).

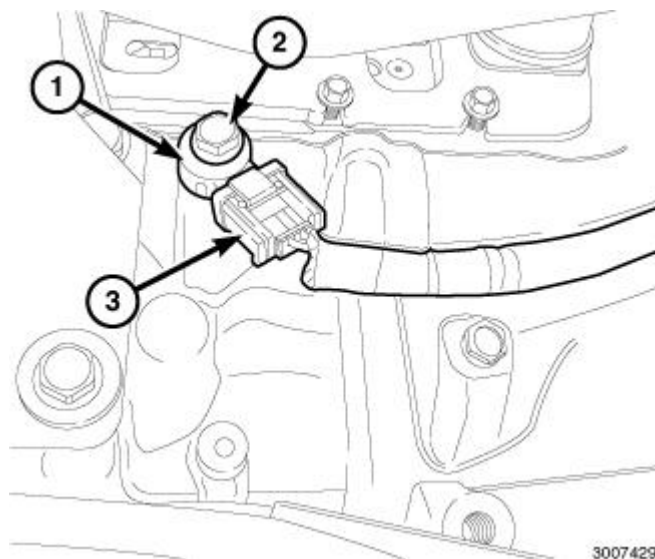


Fig. 20: Knock Sensor, Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: Two knock sensors are used. Each sensor is bolted to the outside of the engine block below the exhaust manifold.

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

22. Remove the heat shields from both knock sensors (shield snaps on/off sensor).
23. Disconnect the knock sensor electrical connectors (3).

CAUTION: When separating the catalytic converters from the manifolds, disconnect the oxygen sensor connectors. Allowing the catalytic converters hanging from the oxygen sensor wires damages the harness and/or sensors.

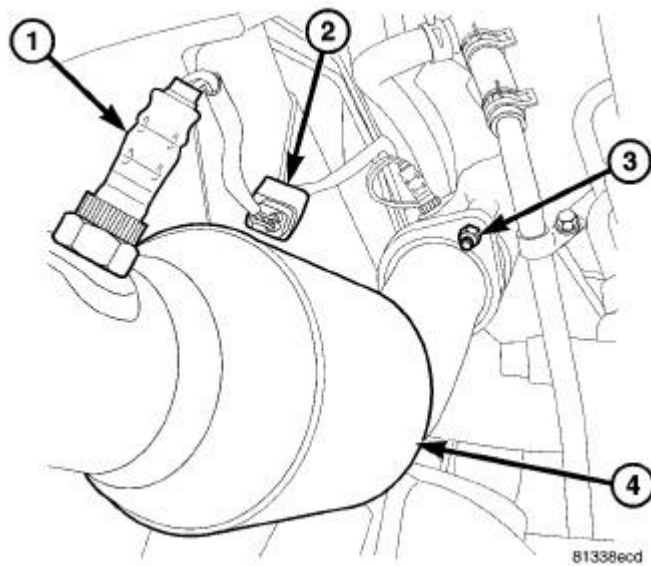


Fig. 21: Oxygen Sensor, Oxygen Sensor Connector, Ball Flange Nut & LH Catalytic Converter
Courtesy of CHRYSLER GROUP, LLC

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

24. Disconnect all oxygen sensor electrical connectors (2).
25. Saturate all exhaust bolts and nuts (3) with Mopar® Rust Penetrant. Allow five minutes for penetration.
26. Remove the both catalytic converter to manifold flange nuts (3) and separate the catalytic converters (4) from the exhaust manifolds.

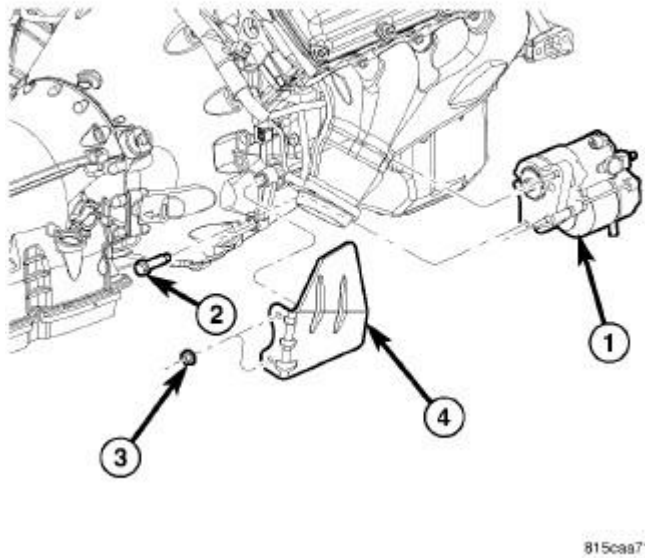


Fig. 22: Removing/Installing Starter
Courtesy of CHRYSLER GROUP, LLC

27. Remove the starter motor (1) heat shield (4).
28. Disconnect the starter wires, remove the starter motor retaining bolts (2) and remove the starter (1). Refer to **STARTER, REMOVAL** .

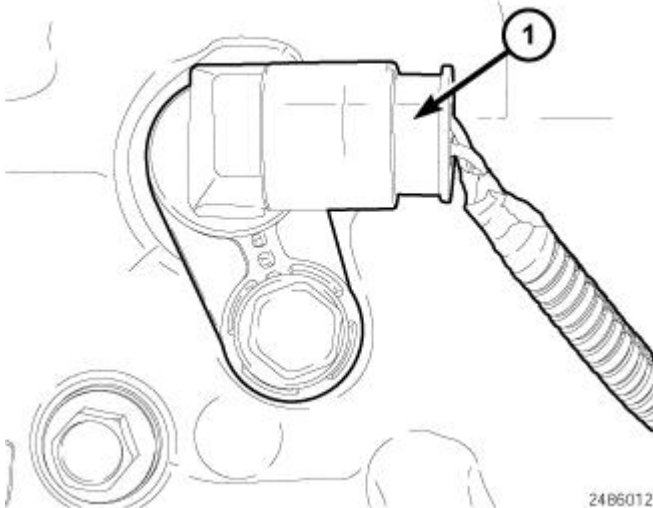
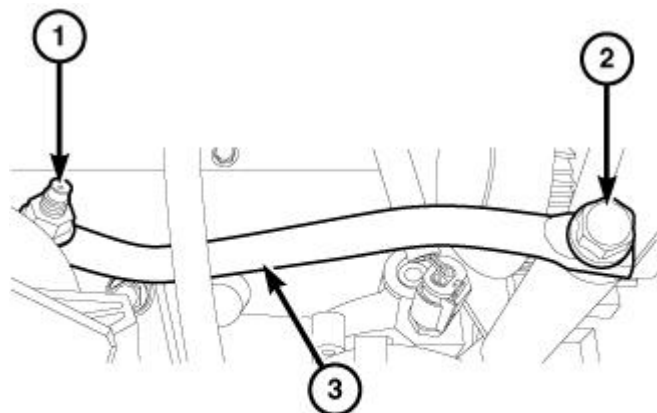


Fig. 23: Crankshaft Position Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

NOTE: The Crankshaft Position (CKP) sensor is located at the right-rear side of the engine block.

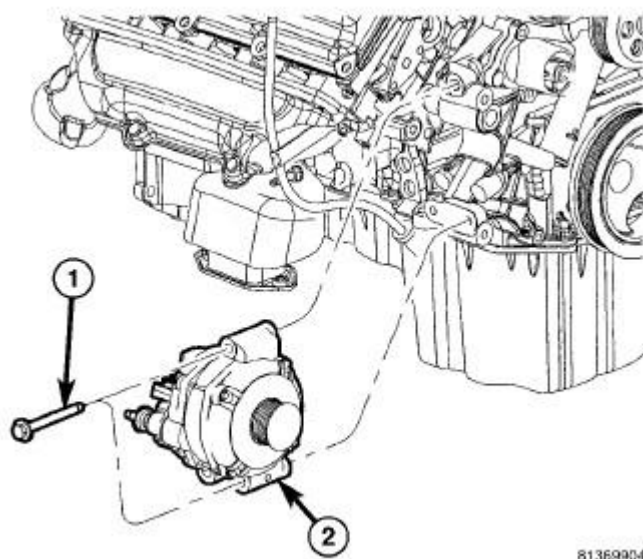
29. Remove the CKP sensor electrical connector (1).



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Fig. 24: Support Bracket, Bolt & Nut
Courtesy of CHRYSLER GROUP, LLC

30. Remove the generator support bracket to engine mount retaining nut (1).
31. Remove the generator support bracket retaining bolt (2) and remove the support bracket (3).
32. Lower the vehicle.
33. Unsnap the plastic insulator cap from the B+ output terminal.
34. Remove the B+ terminal mounting nut at the rear of the generator and remove the B+ terminal.
35. Depress the field wire connector tab at the rear of the generator and disconnect the field wire connector.



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Fig. 25: Generator & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

36. Remove the two generator retaining bolts (1) and remove the generator (2).

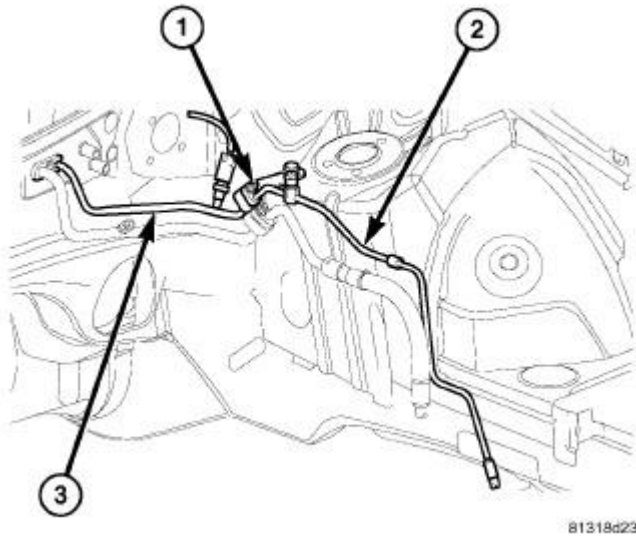


Fig. 26: Removing/Installing A/C Liquid Front Line
Courtesy of CHRYSLER GROUP, LLC

37. Remove the nut (1) from the front section of the A/C liquid line (2) to the rear section of the liquid line (3), separate the lines, remove and discard the dual plane seal.
38. Install plugs or tape over the opened liquid line fittings.
39. Remove the front section of the A/C liquid line (2) from the engine compartment.

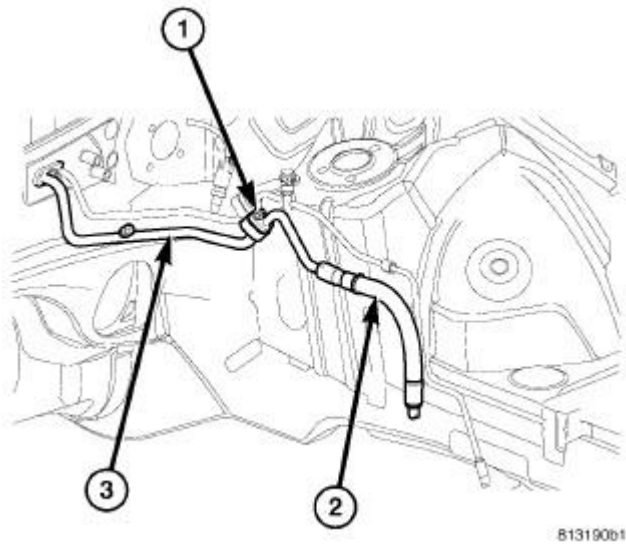
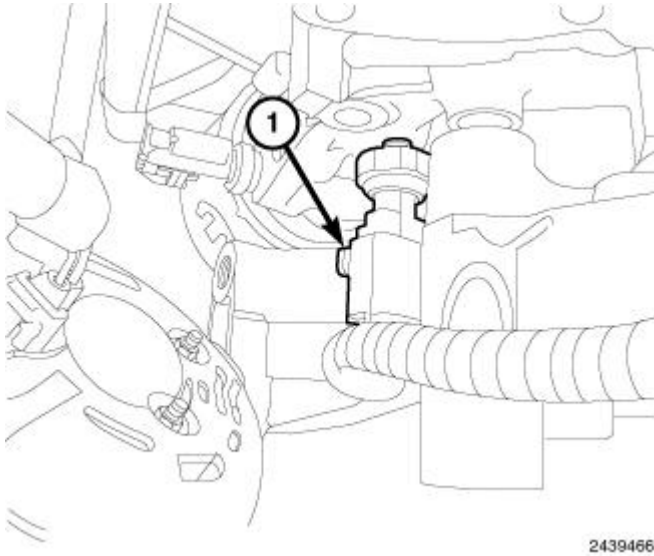


Fig. 27: Removing/Installing A/C Suction Front Line
Courtesy of CHRYSLER GROUP, LLC

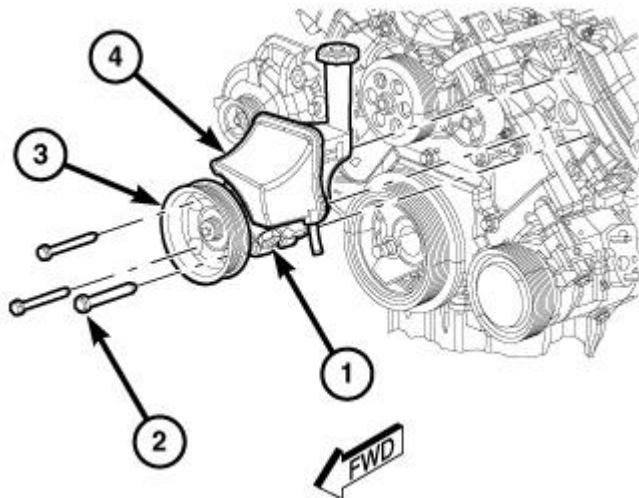
40. Remove the nut (1) from the front section of the A/C suction line (2) to the rear section of the suction line (3), separate the lines, remove and discard the dual plane seal.
41. Install plugs or tape over the opened suction line fittings.
42. Remove the front section of the A/C suction line (2) from the engine compartment.



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Fig. 28: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

43. Remove the oil pressure sensor electrical connector (1).
44. Remove the oil temperature sensor electrical connector.



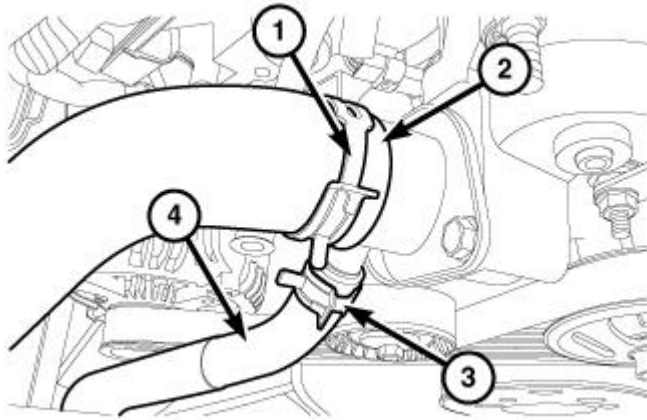
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Fig. 29: Power Steering Reservoir, Pump, Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to disconnect power steering pump hoses from power

steering pump for power steering pump removal.

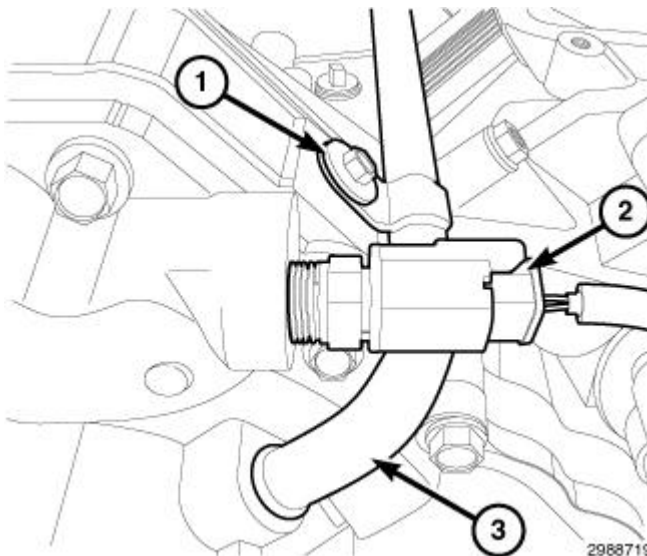
45. Remove the three power steering pump (4) mounting bolts (2) through the access holes in the pulley (3) and position the pump aside.



2988475

Fig. 30: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

46. Remove the upper radiator hose clamp (1) and remove the upper radiator hose (2).
47. Remove the oil cooler hose clamp (3) and remove the oil cooler hose (4).



2988719

Fig. 31: Coolant Temperature (ECT) Sensor Electrical Connector, Heater Tube & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

48. Remove the heater tube retaining bolt (1).
49. Remove the coolant temperature sensor electrical connector (2).

50. Lift the heater tube (3) out of the water pump.

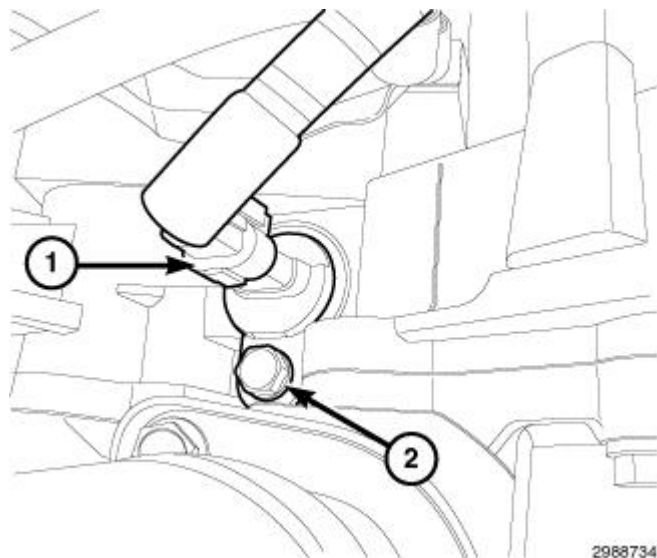


Fig. 32: Camshaft Position Sensor Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

51. Disconnect the camshaft position sensor electrical connector (1).

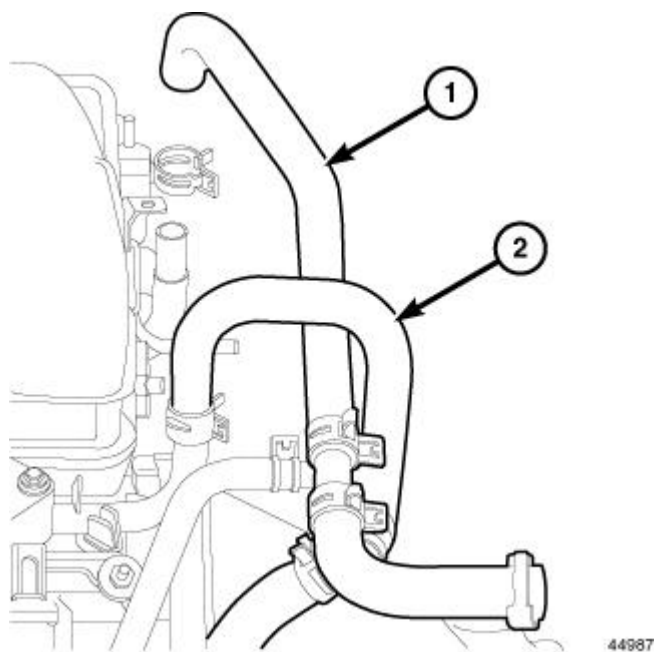
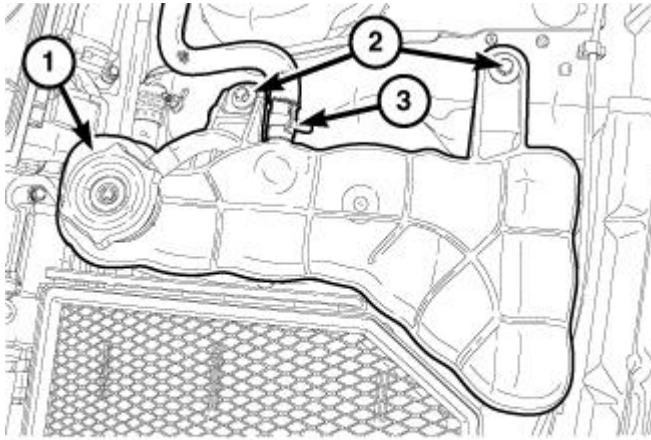


Fig. 33: Heater Hose Supply
Courtesy of CHRYSLER GROUP, LLC

52. Remove the heater hoses (1, 2).

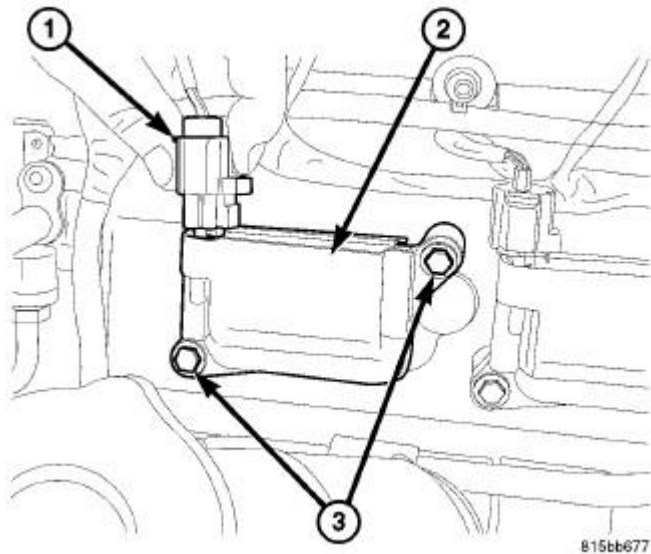


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Fig. 34: Coolant Recovery Container Pressure Cap, Tube & Screws
 Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove the hoses from the coolant bottle for coolant bottle removal.

53. Remove the coolant bottle retaining bolts (2) and position the coolant bottle (1) aside.



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Fig. 35: Ignition Coil Mounting Bolts
 Courtesy of CHRYSLER GROUP, LLC

54. Remove all ignition coil electrical connectors (1) and position the harness aside.

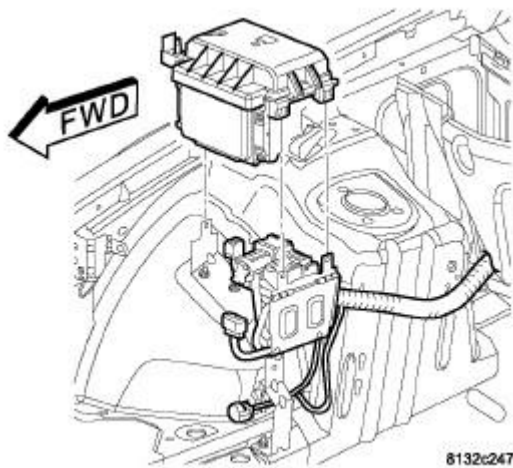


Fig. 36: TIPM/PDC Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

55. Remove the Power Distribution Center (PDC) and mounting bracket.
56. Unfasten the wire harness mounted on the right hand inner fender panel and position aside.

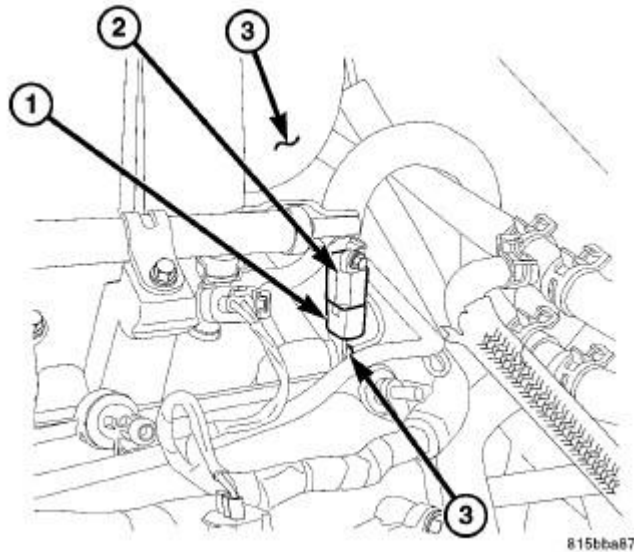


Fig. 37: Ignition Capacitor, Electrical Connector & Intake Manifold
Courtesy of CHRYSLER GROUP, LLC

NOTE: The ignition capacitor (2) is located near the left rear corner of the intake manifold (3).

57. Remove the ignition capacitor (1) electrical connector (2).
58. Remove the ground wires from the rear of each cylinder head.
59. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE**.

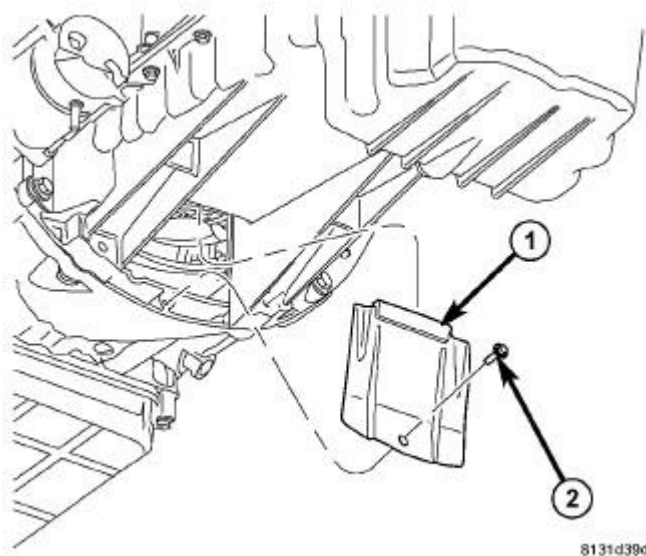


Fig. 38: Remove/Install Torque Converter Access Cover
Courtesy of CHRYSLER GROUP, LLC

60. Remove the transmission inspection cover retaining bolt (2) and remove the inspection cover (1).

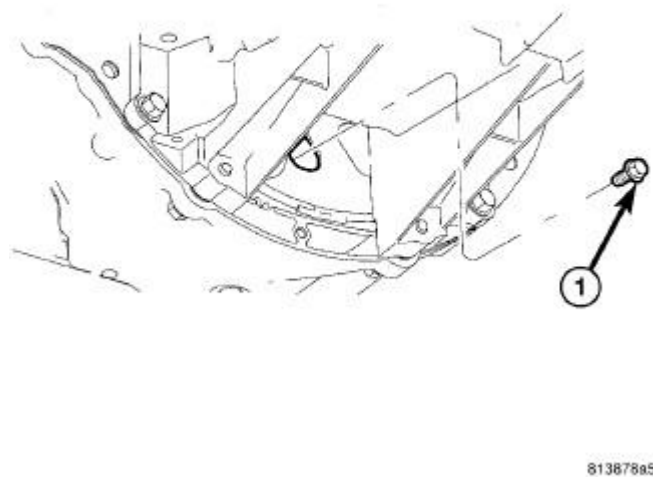


Fig. 39: Torque Converter Bolts
Courtesy of CHRYSLER GROUP, LLC

61. Automatic transmission equipped vehicles, rotate the crankshaft in clockwise direction until the torque converter bolts (1) are accessible and remove the flexplate to torque converter bolts (1).

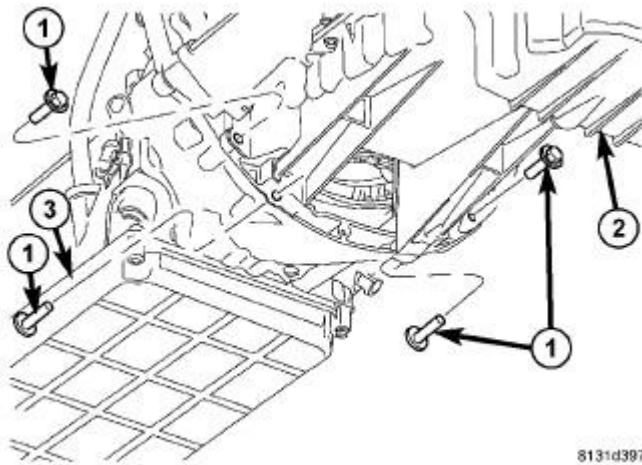


Fig. 40: Remove/Install Transmission To Oil Pan Bolts
Courtesy of CHRYSLER GROUP, LLC

62. Remove the oil pan to transmission bolts (1).

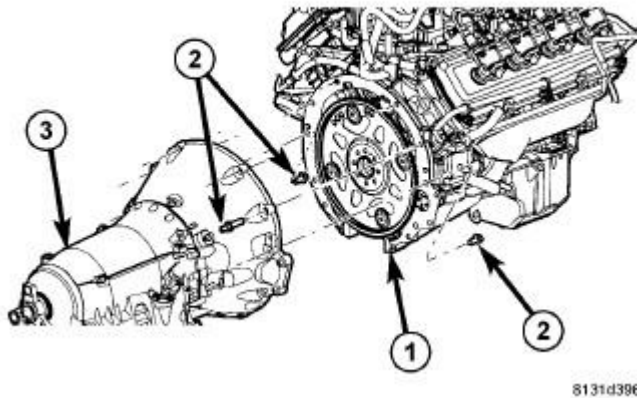


Fig. 41: Remove/Install Transmission To Engine Bolts
Courtesy of CHRYSLER GROUP, LLC

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

CAUTION: While carefully separating the engine from the transmission and removing the engine from the vehicle, constant checks must be made to ensure no damage to other components or wiring harnesses occur throughout the removal procedure.

64. Lower the vehicle.
65. Using a suitable jack, support the transmission.

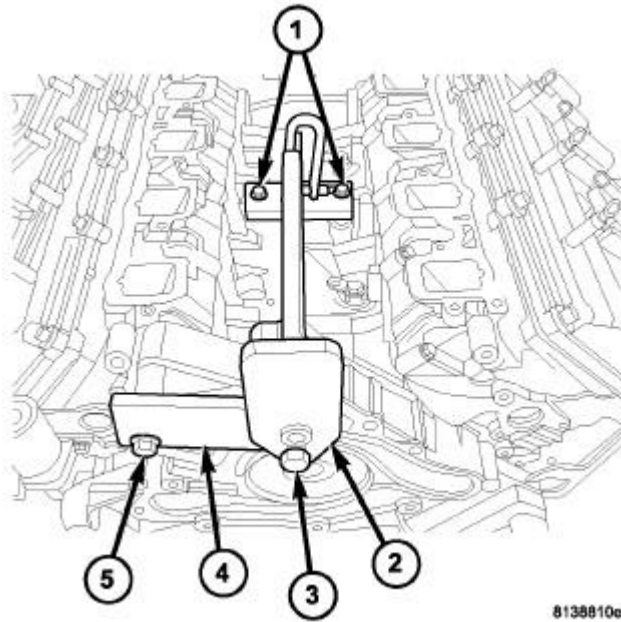


Fig. 42: Engine Lift Fixture And Adapter
Courtesy of CHRYSLER GROUP, LLC

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

66. Install the (special tool #8984B, Fixture, Engine Lifting) (2) and (special tool #8984-UPD, Adapter, Engine Lift) (4).
67. Using a suitable engine hoist, separate the engine from the transmission and remove the engine from the engine compartment.
68. Secure the engine onto a suitable engine stand.

INSTALLATION

INSTALLATION

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

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.

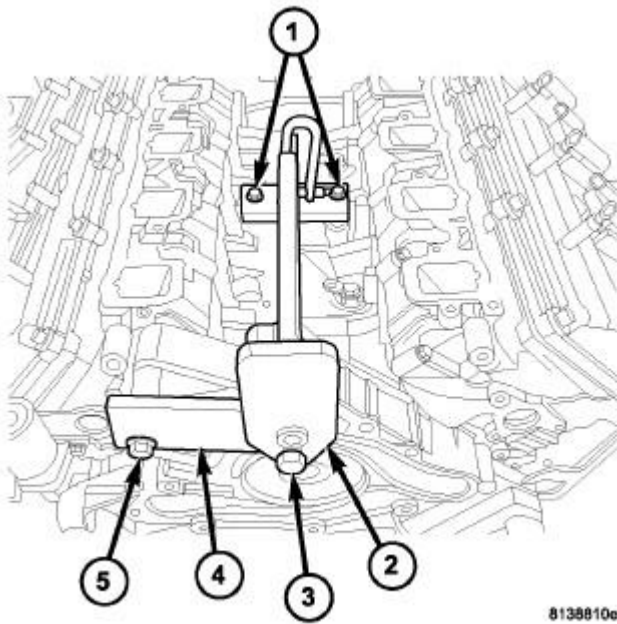


Fig. 43: Engine Lift Fixture And Adapter
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not use air tools to install (special tool #8984B, Fixture, Engine Lifting) (2, 3).

1. Install the engine lift fixture (2) (special tool #8984B, Fixture, Engine Lifting) and adapter (special tool #8984-UPD, Adapter, Engine Lift) (4).
2. Using a suitable engine hoist, lower the engine into the engine compartment.
3. Automatic transmission equipped vehicles, align the engine with the transmission.
4. Install two transmission bell housing to engine block bolts finger tight.
5. Lower the engine assembly until the engine mounts rest in the engine cradle crossmember.

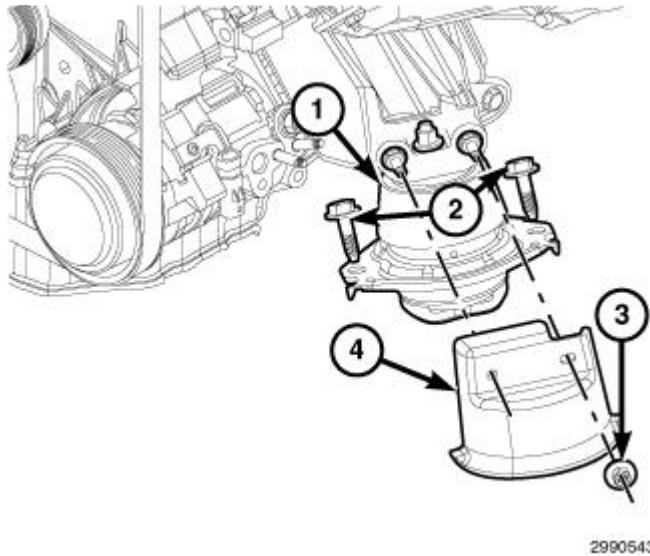


Fig. 44: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

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

6. Align the engine mounts, install both left/right engine mount to frame retaining bolts (2) and tighten to 68 N.m (50 ft. lbs.).
7. Position both left and right engine mount heat shields (4), install the retaining nuts (3) and tighten to 27 N.m (20 ft. lbs.).
8. Remove the engine hoist and the jack supporting the transmission.
9. Raise and support the vehicle.

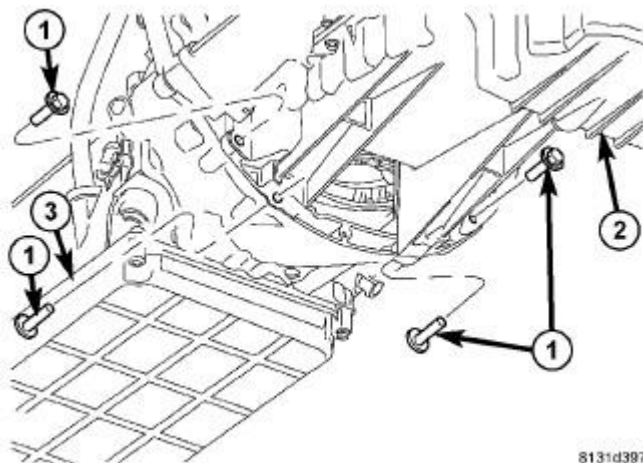


Fig. 45: Remove/Install Transmission To Oil Pan Bolts
Courtesy of CHRYSLER GROUP, LLC

10. Automatic transmission equipped vehicles, install the oil pan to transmission bolts (1) and tighten to 54 N.m (40 ft. lbs.).

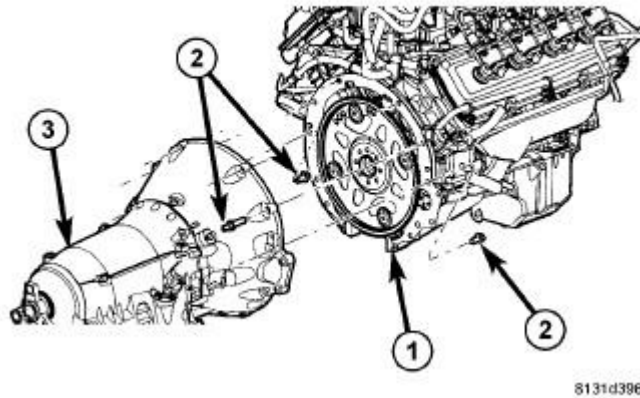


Fig. 46: Remove/Install Transmission To Engine Bolts
Courtesy of CHRYSLER GROUP, LLC

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

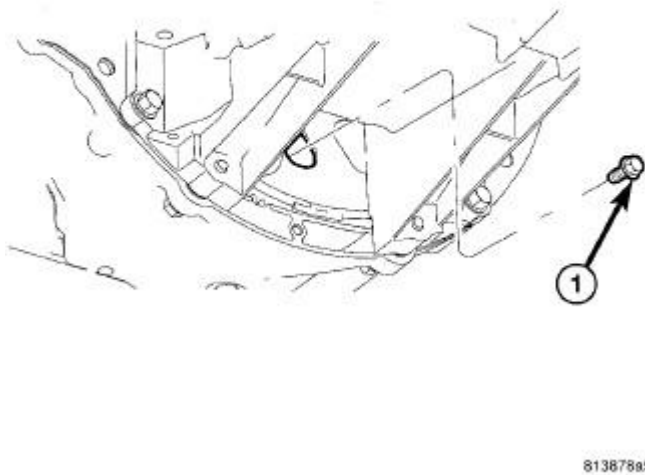


Fig. 47: Torque Converter Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: It is essential that the correct length bolts are used to attach the converter to the flexplate. Bolts that are too long will damage the clutch surface inside the torque converter.

12. Rotate the crankshaft in clockwise direction and install all torque converter to flexplate bolts (1) finger

tight.

13. Verify that the torque converter is pulled flush to the flexplate and tighten bolts to 88 N.m (65 ft. lbs.).

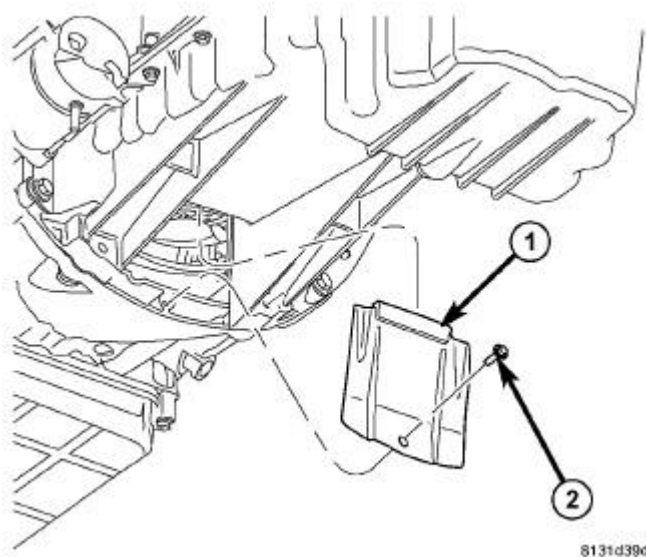


Fig. 48: Remove/Install Torque Converter Access Cover
Courtesy of CHRYSLER GROUP, LLC

14. Install the inspection cover (1) and tighten the retaining bolt (2) to 11 N.m (8 ft. lbs.).

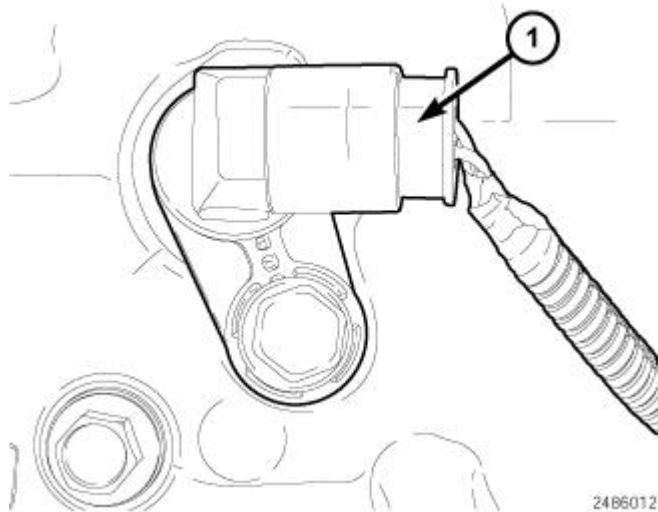
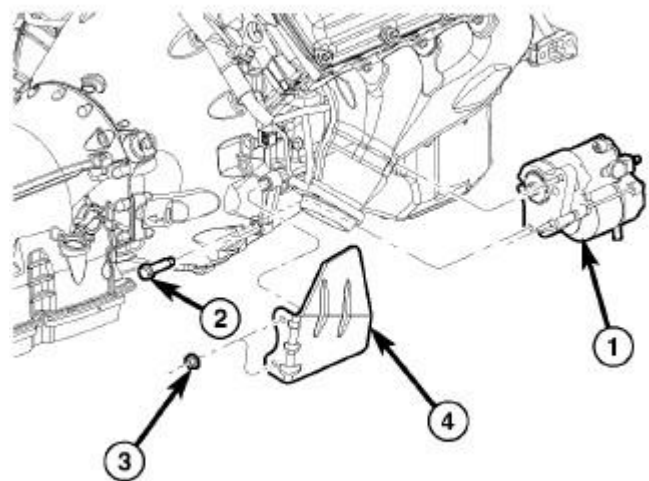


Fig. 49: Crankshaft Position Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

NOTE: The Crankshaft Position (CKP) sensor is located at the right rear side of the engine block.

15. Connect the CKP sensor electrical connector (1).



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Fig. 50: Removing/Installing Starter
Courtesy of CHRYSLER GROUP, LLC

16. Position the starter motor (1) into the transmission.
17. Install the three starter motor retaining bolts (2) and tighten to 54 N.m (40 ft. lbs.).
18. Connect the solenoid wire to the starter motor (snaps in place).
19. Position the battery cable to the solenoid stud, install the battery cable eyelet nut and tighten to 11 N.m (8 ft. lbs.).
20. Position the starter heat shield (4) and install the retaining nuts (3).

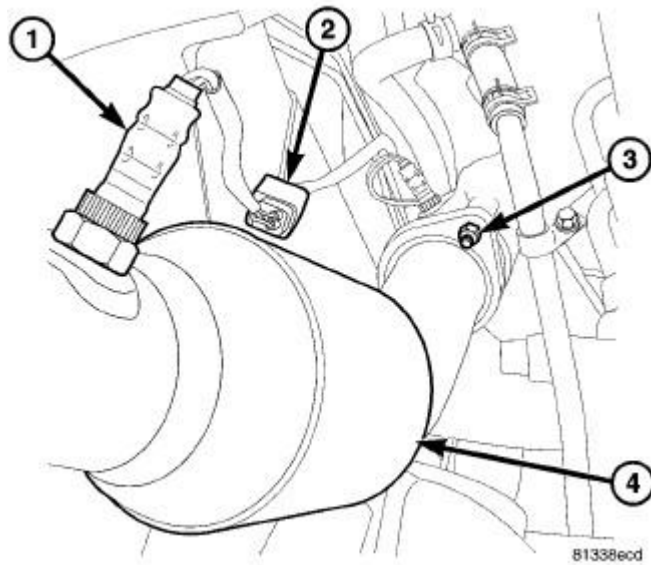


Fig. 51: Oxygen Sensor, Oxygen Sensor Connector, Ball Flange Nut & LH Catalytic Converter
Courtesy of CHRYSLER GROUP, LLC

21. Position the catalytic converters (4) onto the exhaust manifold flanges, install the flange nuts (3) and tighten to 41 N.m (30 ft. lbs.).
22. Connect the oxygen sensor electrical connectors (2).

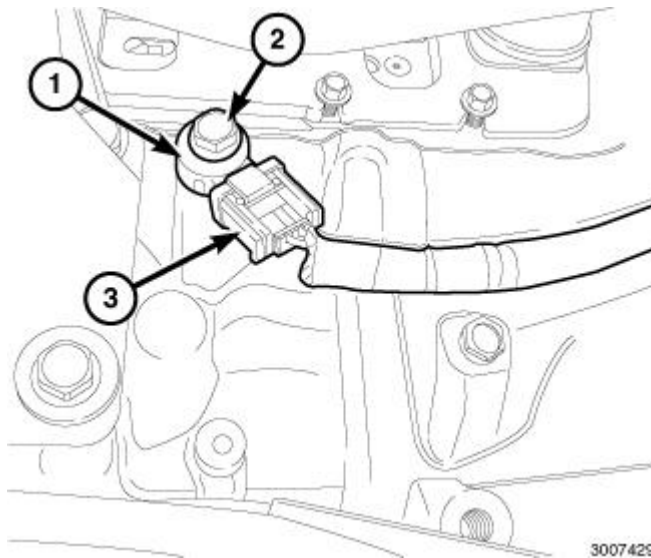


Fig. 52: Knock Sensor, Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

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

23. Connect the right and left knock sensor (1) electrical connectors (5).
24. Install the heat shields onto both knock sensors (shield snaps on/off sensor).

25. Connect the transmission oil cooler lines to their retainers at the oil pan.

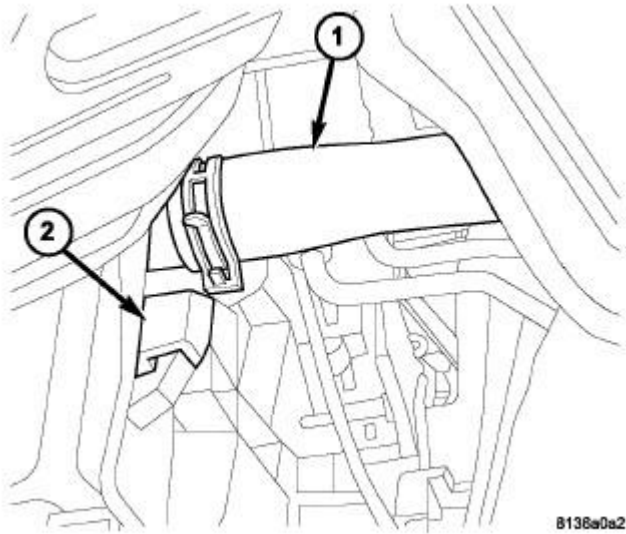


Fig. 53: Lower Radiator Hose

Courtesy of CHRYSLER GROUP, LLC

1 - LOWER RADIATOR HOSE
2 - RADIATOR FAN ASSEMBLY

26. Install the lower radiator hose (1).
27. Lower the vehicle.

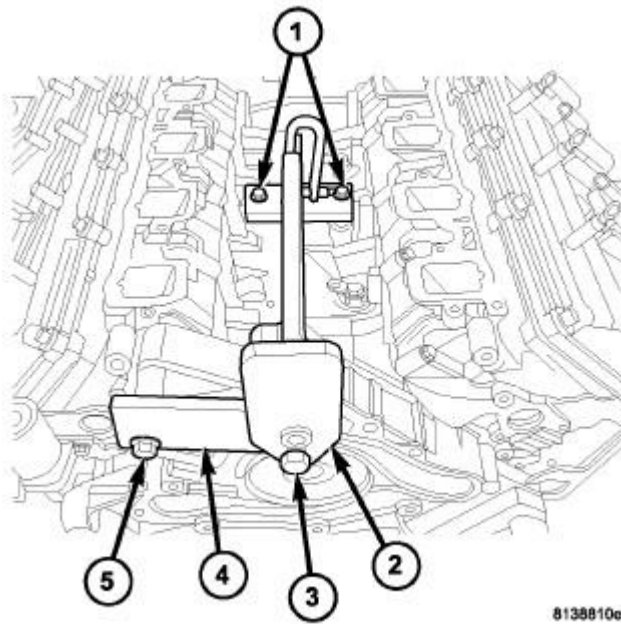


Fig. 54: Engine Lift Fixture And Adapter
Courtesy of CHRYSLER GROUP, LLC

28. Remove the engine lift fixture (special tool #8984B, Fixture, Engine Lifting) (2) and adapter (special tool #8984-UPD, Adapter, Engine Lift) (4).
29. Position the left and right side wiring harness.
30. Lubricate the oil control valve (OCV) rubber O-ring seal with clean engine oil.

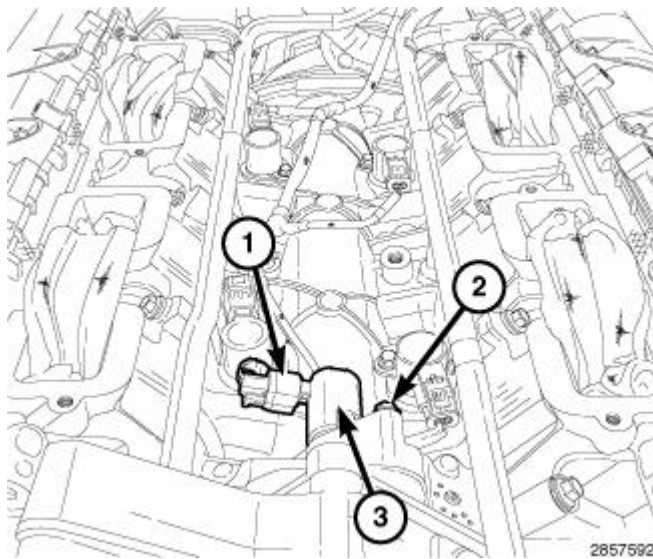


Fig. 55: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

31. Install the OCV (3) and rotate into position.

32. Install the OCV retaining bolt (2) and tighten to 11 N.m (8 ft. lbs.).
33. Connect the OCV electrical connector (1).

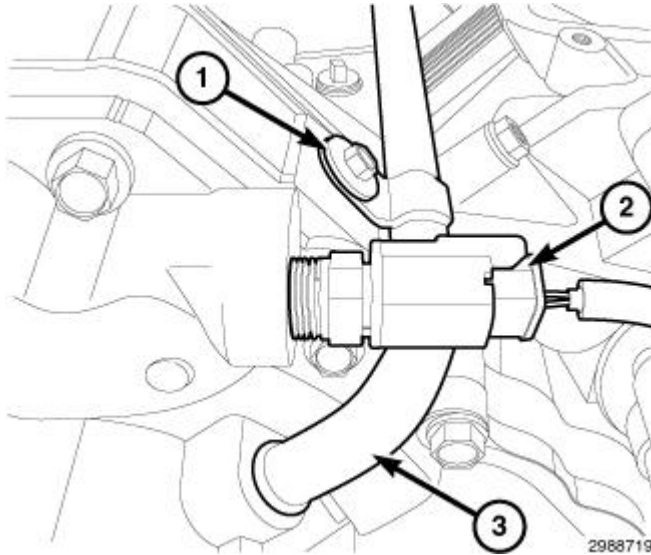


Fig. 56: Coolant Temperature (ECT) Sensor Electrical Connector, Heater Tube & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

34. Position the heater core tube (3) into the water pump.
35. Install the heater core tube retaining bolt (1) and tighten to 11 N.m (8 ft. lbs.).
36. Connect the electrical connector to the coolant temperature (ECT) sensor (2).

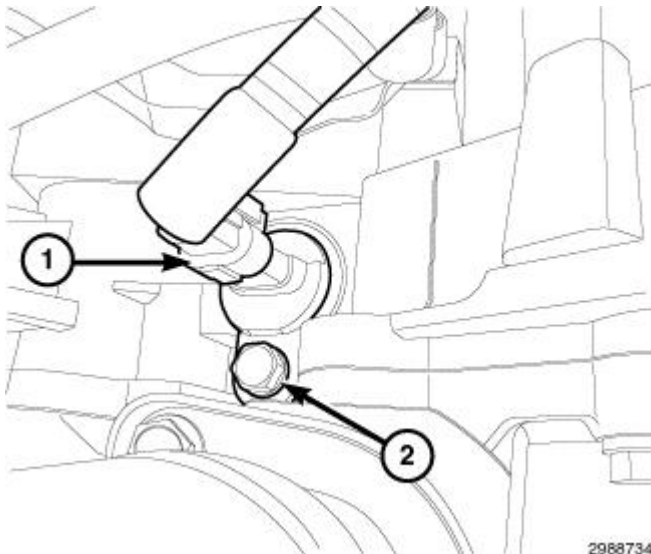
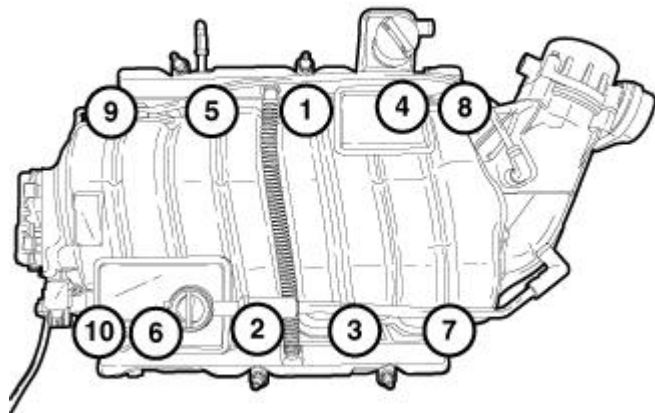


Fig. 57: Camshaft Position Sensor Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

37. Connect the camshaft position sensor electrical connector (1).

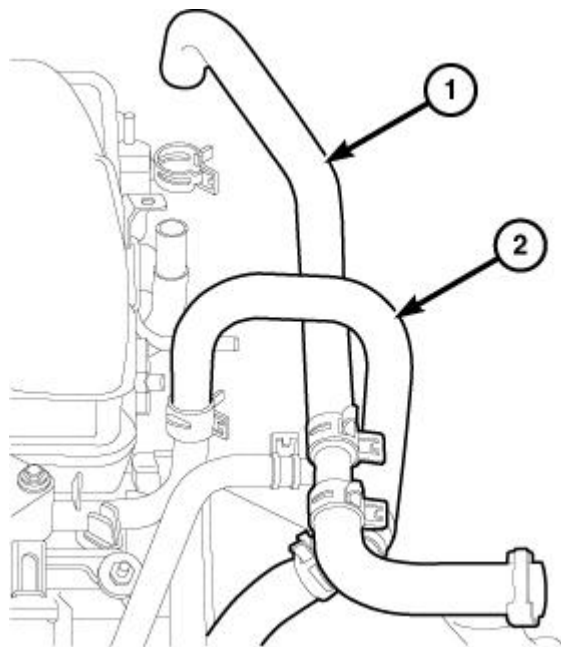


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Fig. 58: Intake Manifold Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: Install the intake manifold and throttle body as an assembly.

38. Install the intake manifold. Refer to MANIFOLD, INTAKE, INSTALLATION.



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Fig. 59: Heater Hose Supply
Courtesy of CHRYSLER GROUP, LLC

39. Connect the heater hoses (1, 2).
40. Connect the ground wires to the rear of each cylinder head.

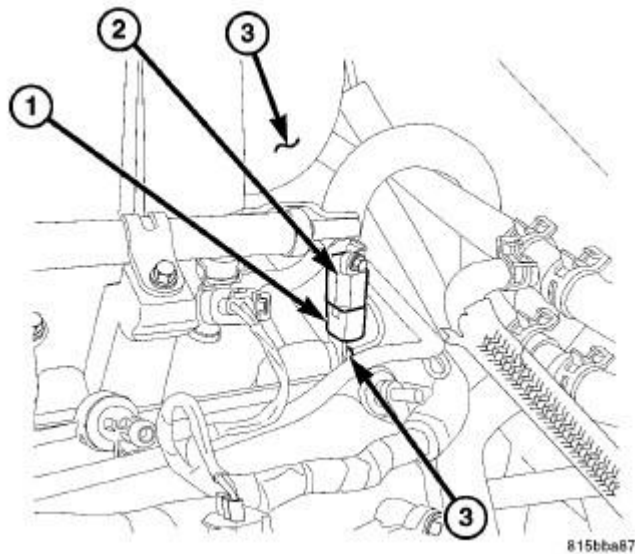


Fig. 60: Ignition Capacitor, Electrical Connector & Intake Manifold
Courtesy of CHRYSLER GROUP, LLC

NOTE: The ignition capacitor (2) is attached to the rear of the left cylinder head.

41. Connect the ignition capacitor (2) electrical connector (1).

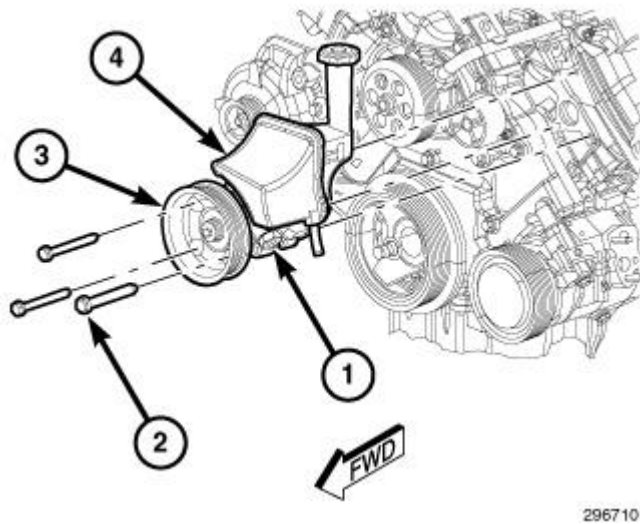
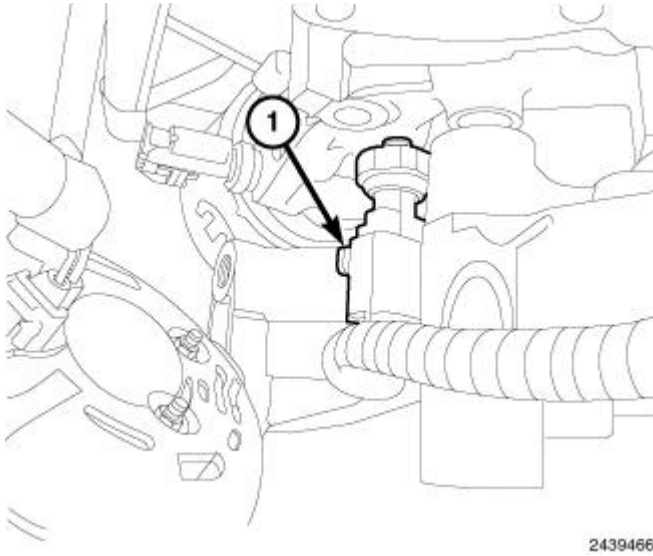


Fig. 61: Power Steering Reservoir, Pump, Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

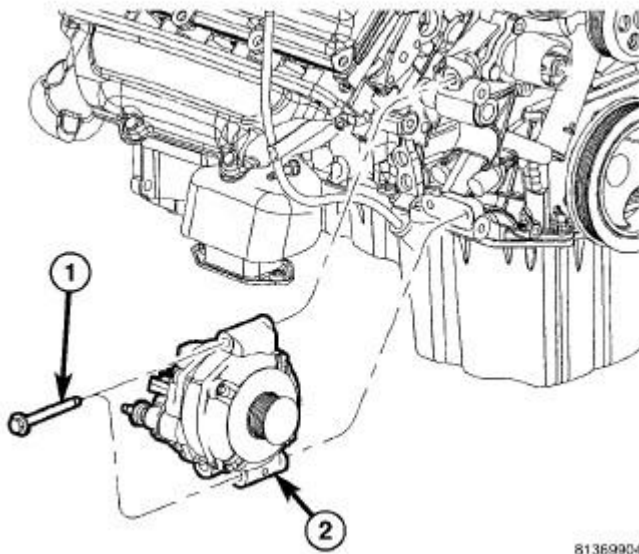
42. Position the power steering pump (4).
43. Install the three power steering pump (4) mounting bolts (2) through the access holes in the pulley and tighten the bolts to 28 N.m (21 ft. lbs.).



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Fig. 62: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

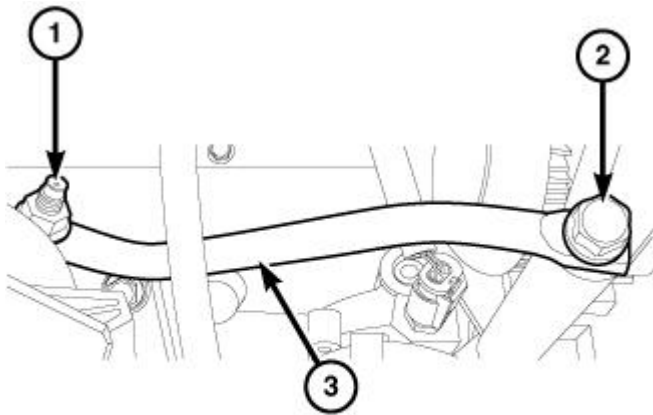
44. Connect the oil pressure sensor electrical connector (1).
45. Connect the oil temperature sensor electrical connector.



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Fig. 63: Generator & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

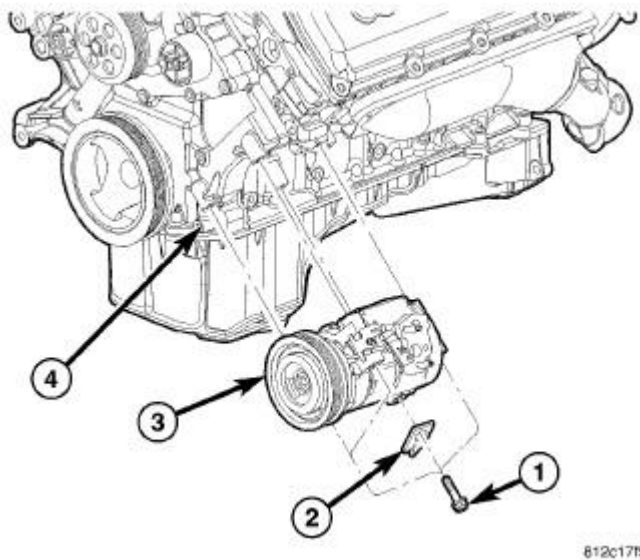
46. Position the generator (2) and install two generator mounting bolts (1) finger tight.
47. Raise and support the vehicle.



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Fig. 64: Support Bracket, Bolt & Nut
Courtesy of CHRYSLER GROUP, LLC

48. Position the generator support bracket (3) to the engine mount, install the retaining nut (1) finger tight.
49. Position the generator support bracket (3) to the generator, install the retaining bolt (2) and tighten to 65 N.m (48 ft. lbs.).
50. Tighten the generator support bracket (3) to engine mount retaining nut (1) to 28 N.m (21 ft. lbs.).



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Fig. 65: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

51. Install the A/C compressor (3). Refer to **COMPRESSOR, A/C, REMOVAL** .

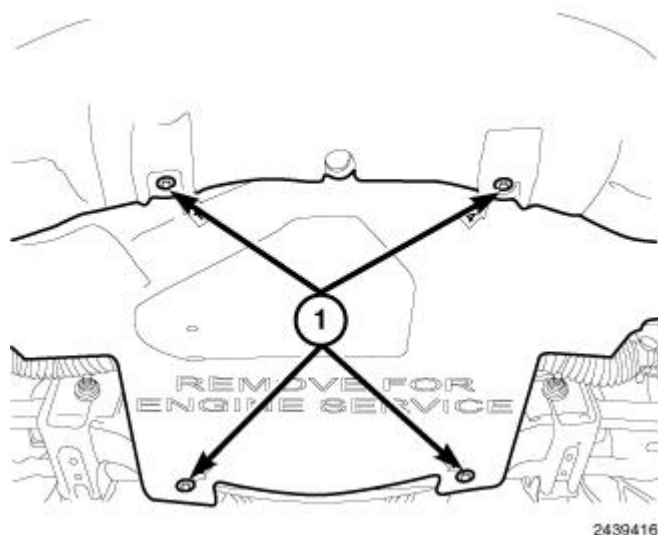


Fig. 66: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

52. Position the belly pan and install the belly pan retainers (1).
53. Lower the vehicle.

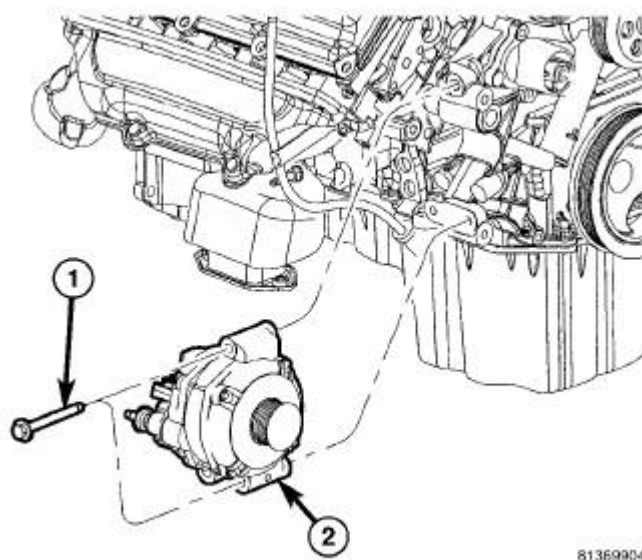


Fig. 67: Generator & Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

54. Tighten two generator mounting bolts (1) to 65 N.m (48 ft. lbs.).
55. Snap the field wire connector into the rear of the generator.
56. Position the generator B+ terminal eyelet to the generator output stud, install the retaining nut and tighten to 13 N.m (10 ft. lbs.).
57. Snap the plastic insulator cap onto the B+ output terminal.

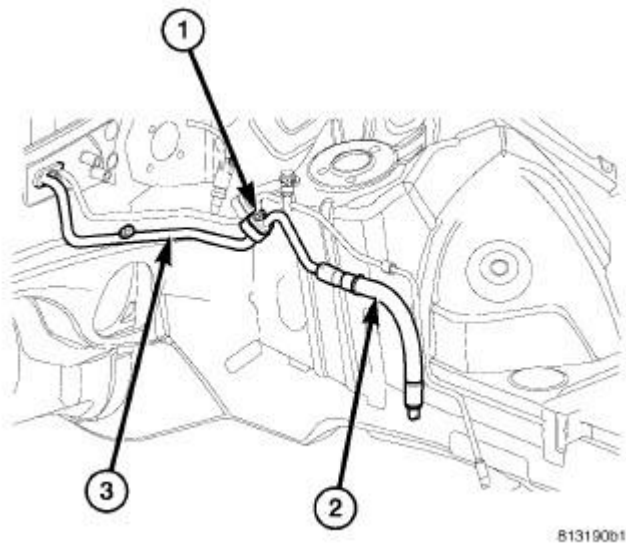


Fig. 68: Removing/Installing A/C Suction Front Line
 Courtesy of CHRYSLER GROUP, LLC

58. Position the front section of the A/C suction line (2) into the engine compartment.
59. Remove the tape or plugs from the fittings that connect the front section of the A/C suction line to the rear section of the A/C suction line (3).

NOTE: Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

60. Lubricate the new dual plane seal with clean refrigerant oil and position the seal onto the suction line fitting.
61. Connect the front section of the A/C suction line to the rear section of the A/C suction line.
62. Install the nut (1) that secures the front section of the A/C suction line to the rear section of the A/C suction line and tighten the nut to 22 N.m (16 ft. lbs.).

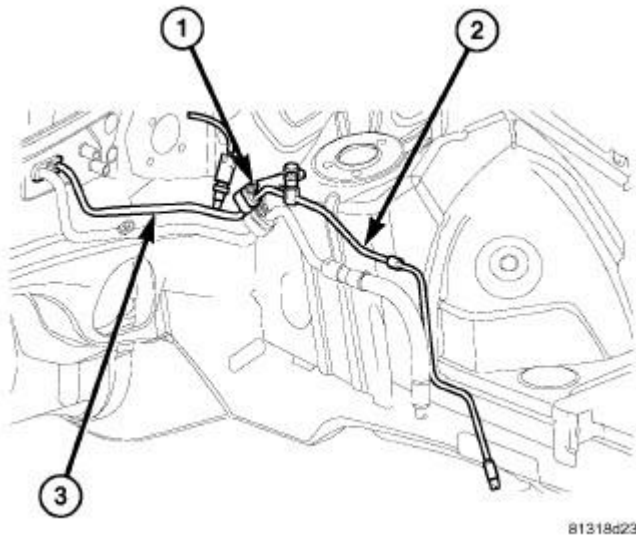


Fig. 69: Removing/Installing A/C Liquid Front Line
 Courtesy of CHRYSLER GROUP, LLC

63. Position the front section of the A/C liquid line into the engine compartment.
64. Remove the tape or plugs from the fittings that connect the front section of the A/C liquid line to the rear section of the A/C liquid line (3).

NOTE: Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

65. Lubricate the new dual plane seal with clean refrigerant oil and position the seal onto the liquid line fitting.
66. Connect the front section of the A/C liquid line to the rear section of the A/C liquid line.
67. Install the nut (1) that secures the front section of the A/C liquid line to the rear section of the A/C liquid line and tighten the nut to 22 N.m (16 ft. lbs.).

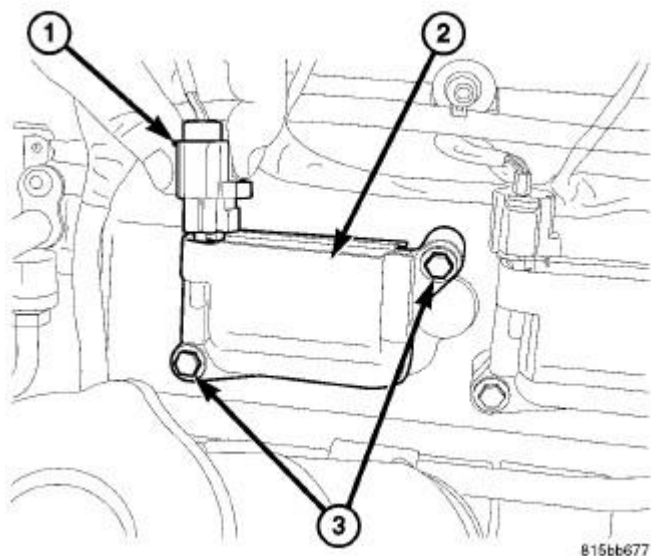


Fig. 70: Ignition Coil Mounting Bolts
 Courtesy of CHRYSLER GROUP, LLC

68. Position the ignition coil electrical harness and connect all ignition coil electrical connectors (1).

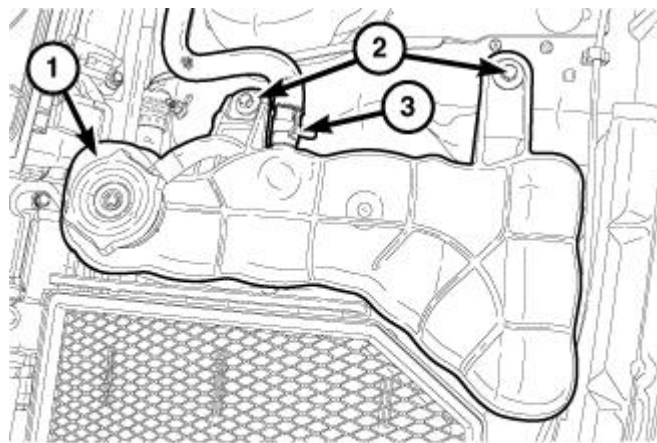


Fig. 71: Coolant Recovery Container Pressure Cap, Tube & Screws
 Courtesy of CHRYSLER GROUP, LLC

69. Position the coolant bottle (1) and install the coolant bottle retaining bolts (2).

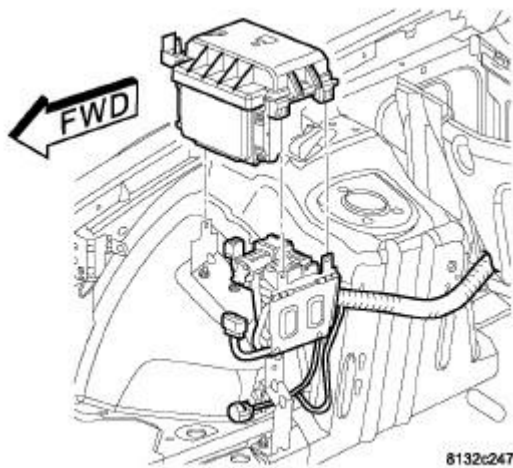


Fig. 72: TIPM/PDC Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

70. Install the Totally Integrated Power Module (TIPM) mounting bracket.
71. Install the PDC bracket.
72. Position the wire harness and secure to the right hand inner fender panel.
73. Secure the PDC to the bracket.

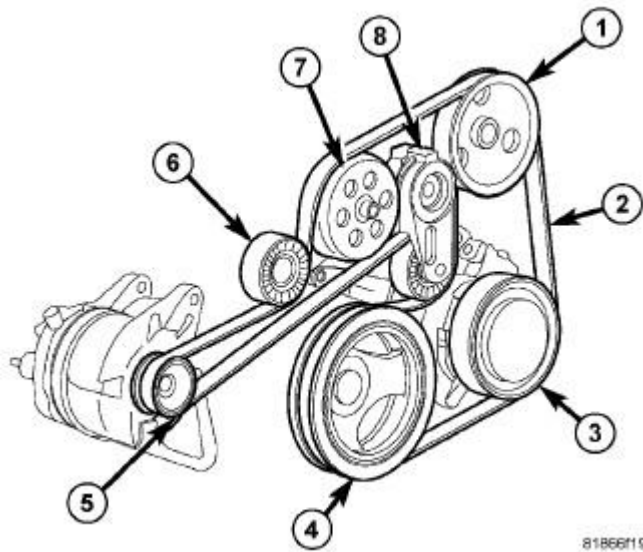


Fig. 73: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

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

74. Rotate the accessory drive belt tensioner (8) clockwise until it contacts the stop and install the accessory

drive belt (2) onto the pulleys, then slowly release the tensioner.

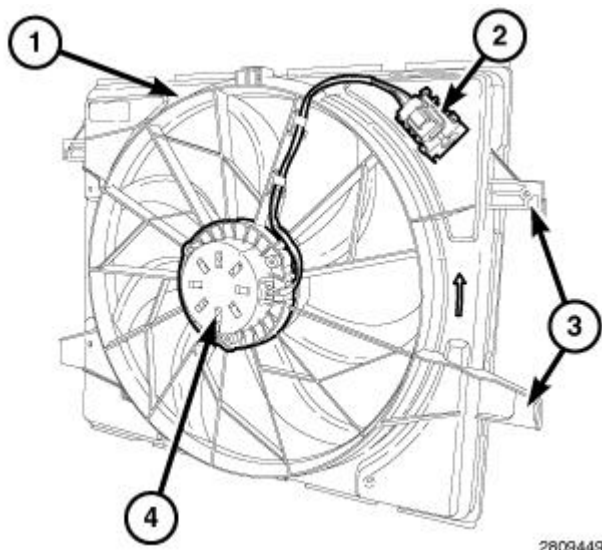


Fig. 74: Cooling Fan Module Components
Courtesy of CHRYSLER GROUP, LLC

75. Install the cooling fan. Refer to **FAN, COOLING, INSTALLATION** .

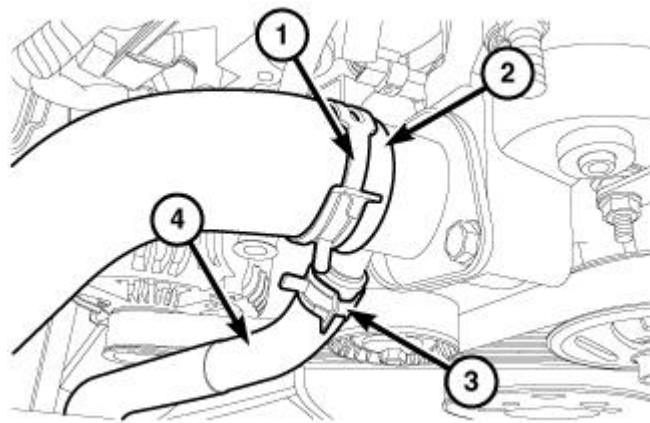


Fig. 75: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

76. Position the oil cooler hose (4) and Install oil cooler hose clamp (3).
77. Position the upper radiator hose (2) and Install the upper radiator hose clamp (1).

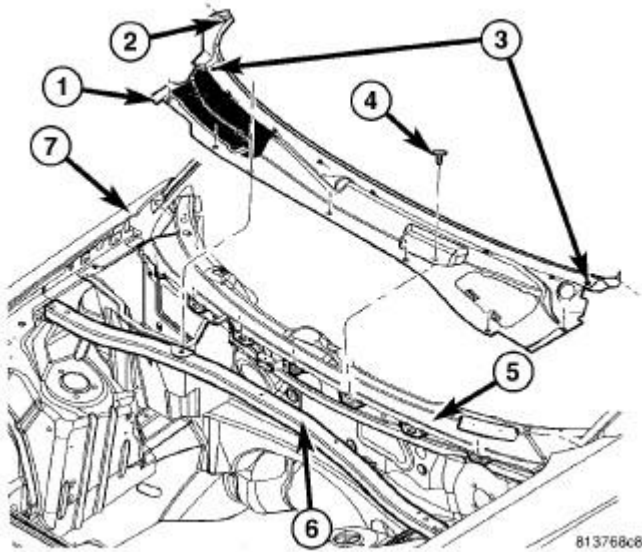


Fig. 76: Removing/Installing Cowl Panel
Courtesy of CHRYSLER GROUP, LLC

78. Install the strut tower support (6) and tighten bolts to 38 N.m (28 ft. lbs.).
79. Install the cowl panel cover (1). Refer to **COVER, COWL PANEL, INSTALLATION** .
80. Fill the crankcase with the specified type and amount of engine oil. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
81. Fill the cooling system with the specified type and amount of engine coolant. Refer to **STANDARD PROCEDURE** .

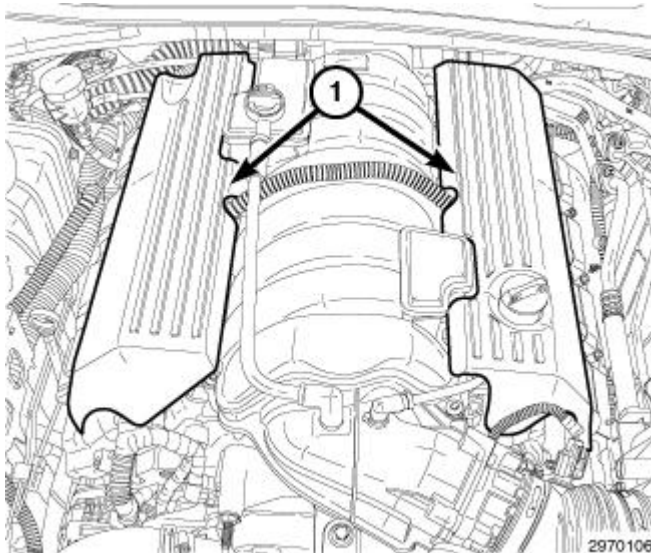


Fig. 77: Engine Covers
Courtesy of CHRYSLER GROUP, LLC

82. Install the engine covers (1) onto the ball studs.

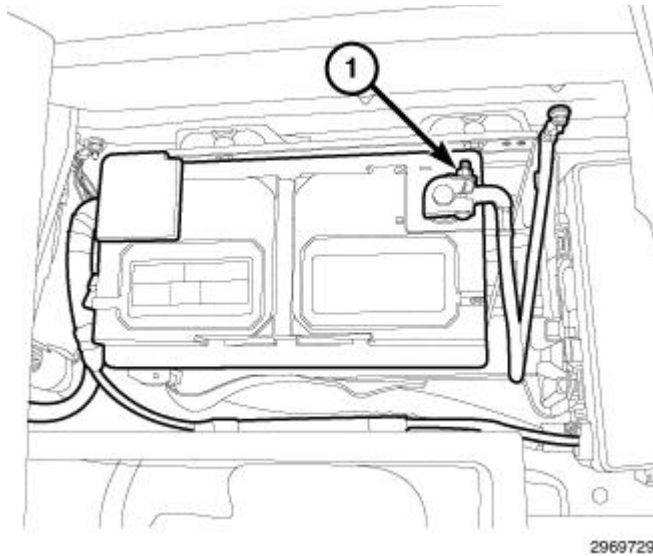


Fig. 78: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

83. Connect the negative battery cable (3).
84. Perform the Refrigerant System Charge procedure. Refer to **PLUMBING, STANDARD PROCEDURE**.
85. Start the engine and inspect for leaks.

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.)

8512A - 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.)

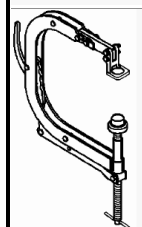
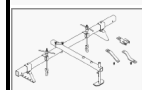
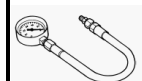
8984-UPD - Adapter, Engine Lift
(Originally Shipped In Kit Number(s) 9516, 9516-CAN, 9517, 9517-CAN, 9518, 9519.)

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.)

9065B - Compressor, Valve Spring

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

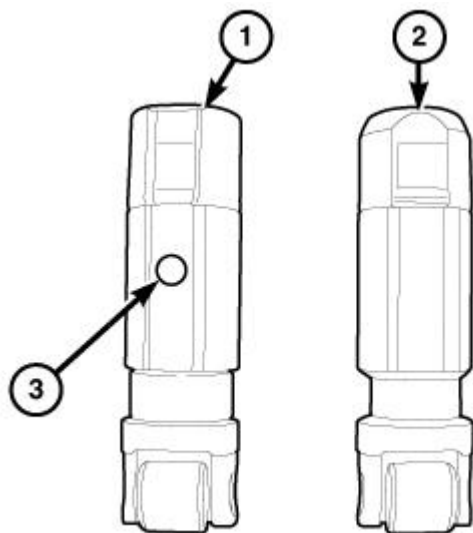
C-3422-D - Compressor, Valve Spring

C-3685-A - Bloc-Chek Kit

MDS SYSTEM

DESCRIPTION

DESCRIPTION



479259

Fig. 79: 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

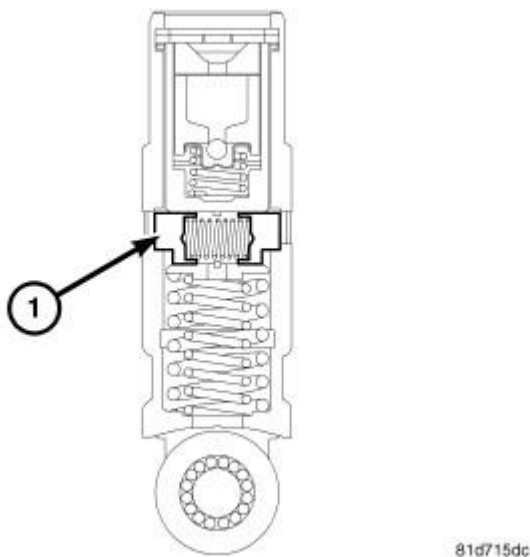
OPERATION**OPERATION**

Fig. 80: 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.

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

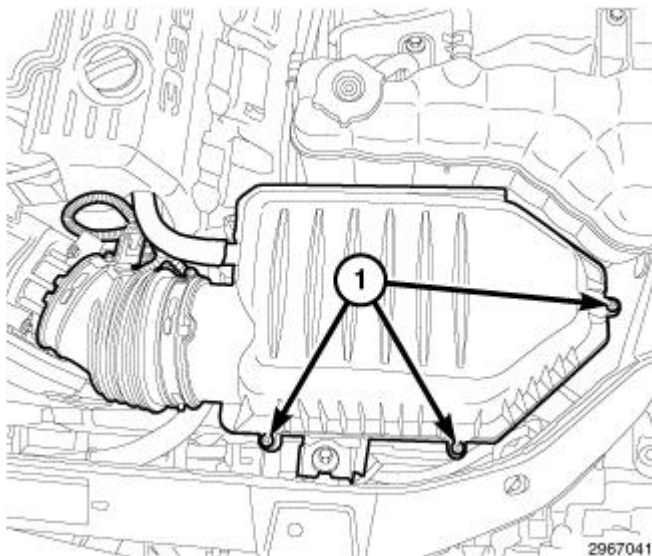


Fig. 81: Air Cleaner Housing Cover Retaining Screws
Courtesy of CHRYSLER GROUP, LLC

1. Remove the air cleaner housing cover retaining screws (1).

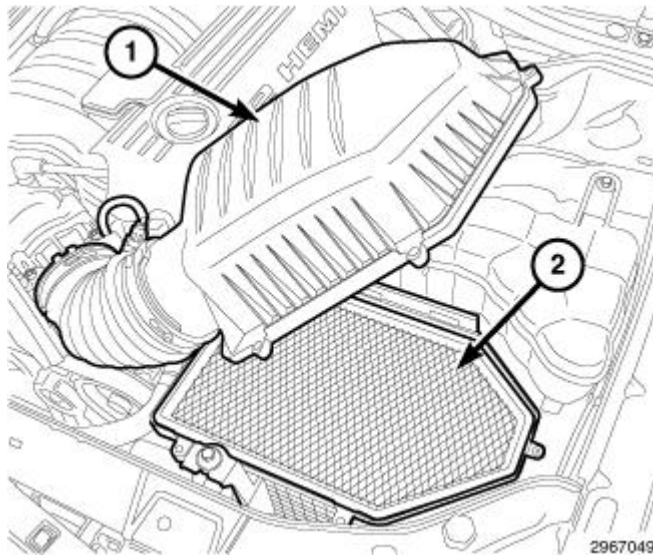


Fig. 82: Air Cleaner Housing Cover & Air Cleaner Element
Courtesy of CHRYSLER GROUP, LLC

2. Lift the air cleaner housing cover (1) while separating the locating tabs from the housing.
3. Remove air cleaner element (2) from the housing.
4. Clean the inside of air cleaner housing before replacing element.

INSTALLATION

INSTALLATION

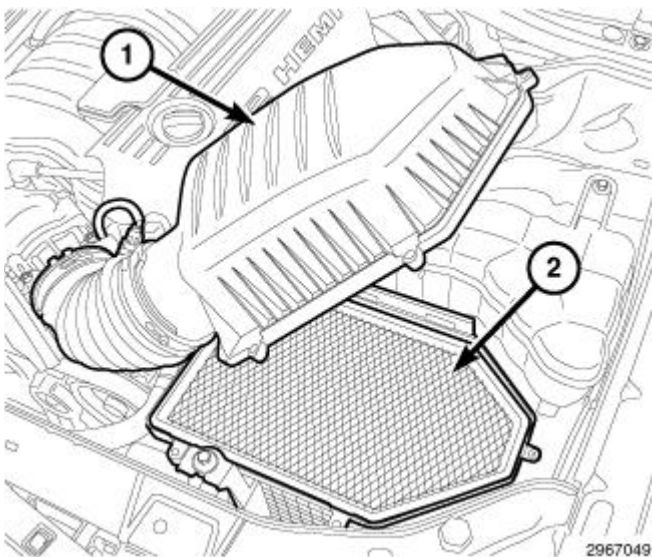


Fig. 83: Air Cleaner Housing Cover & Air Cleaner Element
Courtesy of CHRYSLER GROUP, LLC

1. Install the air cleaner element (2) into the housing.
2. Align the air cleaner housing cover (1) locating tabs into the housing while lowering the cover into

position.

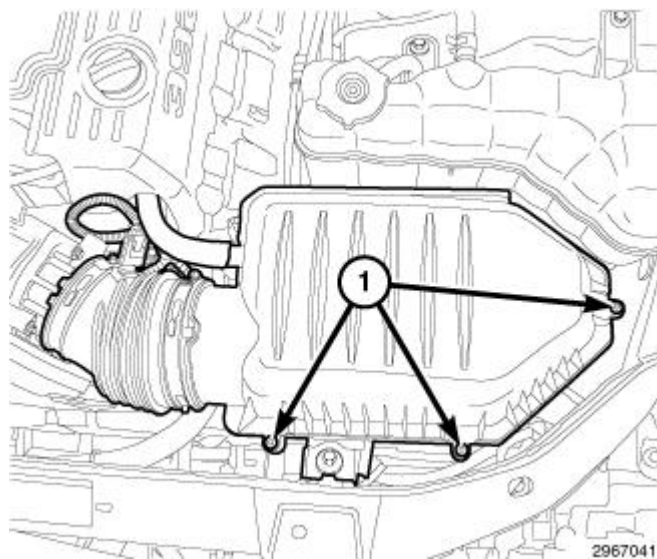


Fig. 84: Air Cleaner Housing Cover Retaining Screws
Courtesy of CHRYSLER GROUP, LLC

3. Install the air cleaner housing cover retaining screws (1) and tighten to 3 N.m (30 in. lbs.).

BODY, AIR CLEANER

REMOVAL

REMOVAL

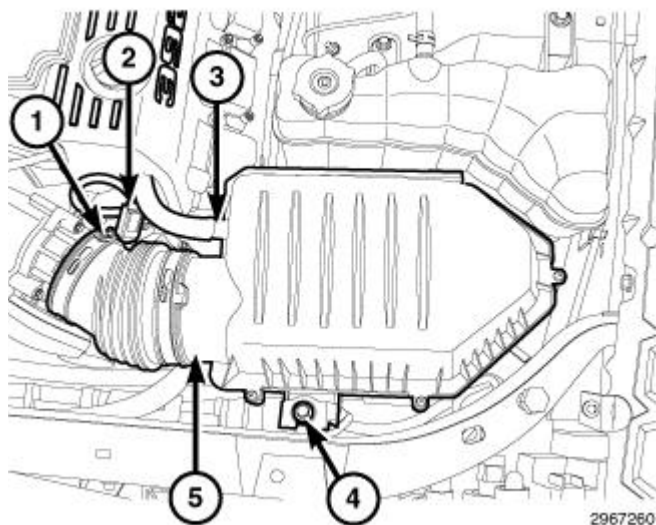


Fig. 85: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

1. Loosen the air duct retaining clamp (1) at the throttle body.
2. Disconnect the intake air temperature sensor electrical connector (2).
3. Remove the makeup air hose (3) at the air cleaner housing.
4. Remove the air cleaner housing retaining bolt (4).
5. While lifting up the air cleaner housing (5), slide the air duct off the throttle body and remove the air cleaner housing from the vehicle.

INSTALLATION

INSTALLATION

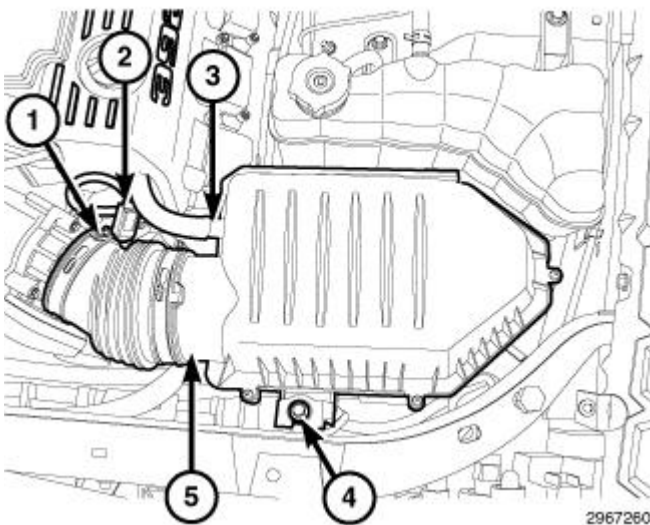


Fig. 86: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

1. While sliding the air duct onto the throttle body, lower the air cleaner housing (5) into position and align the locating pin on the bottom of the housing.
2. Install the air cleaner housing retaining bolt (4) and tighten to 5 N.m (44 in. lbs.).
3. Install the makeup air hose (3) at the air cleaner housing.
4. Connect the intake air temperature sensor electrical connector (2).
5. Position the air duct retaining clamp (1) at the throttle body and tighten to 3 N.m (30 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 PRESSURE LEAKAGE**. 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

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

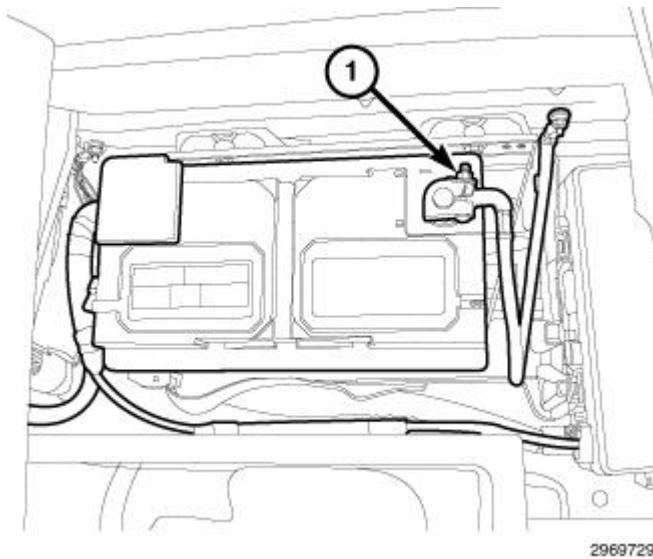


Fig. 87: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the negative battery cable (1).

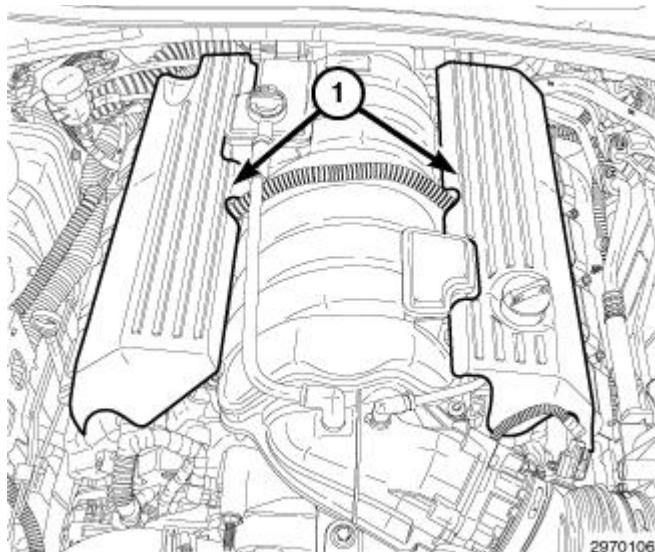


Fig. 88: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

3. Remove the engine covers (1).
4. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
5. Drain the cooling system. Refer to **STANDARD PROCEDURE**.

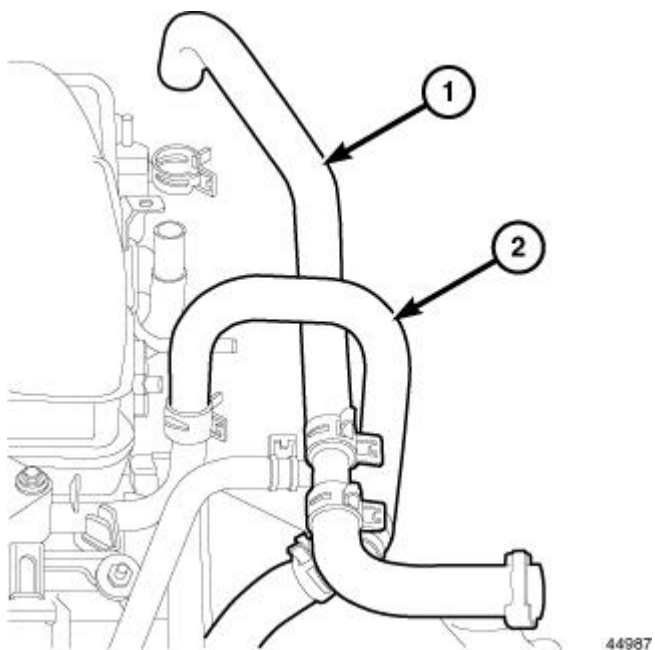


Fig. 89: Heater Hose Supply

Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the heater hoses (1, 2).

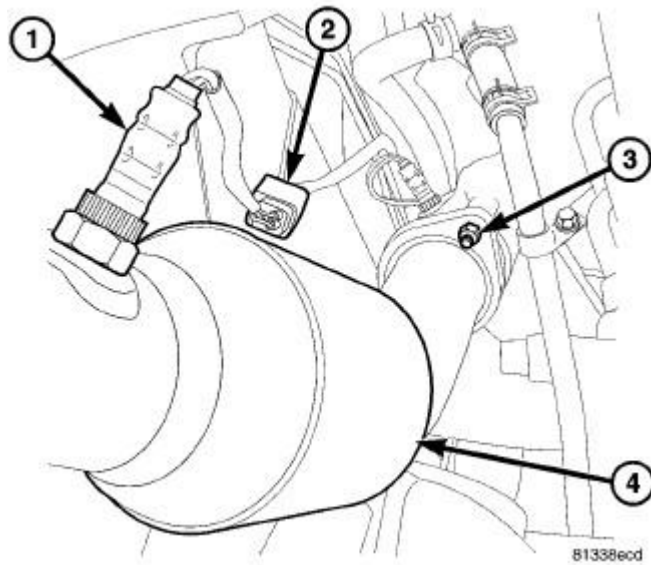


Fig. 90: Oxygen Sensor, Oxygen Sensor Connector, Ball Flange Nut & LH Catalytic Converter
Courtesy of CHRYSLER GROUP, LLC

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

7. Remove the catalytic converters. Refer to CONVERTER, CATALYTIC, REMOVAL .
8. Lower the vehicle.

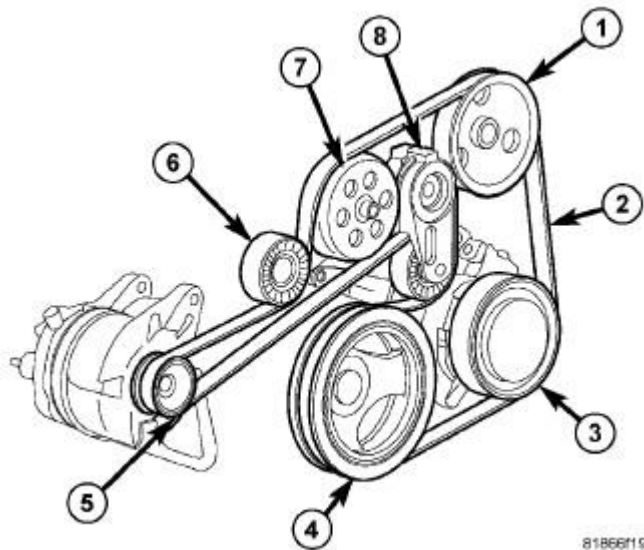


Fig. 91: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

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

9. Rotate the accessory drive belt tensioner (8) clockwise until it contacts its stop. Remove the accessory drive belt (2), then slowly rotate the tensioner into the freearm position. Refer to **BELT, SERPENTINE, REMOVAL**.

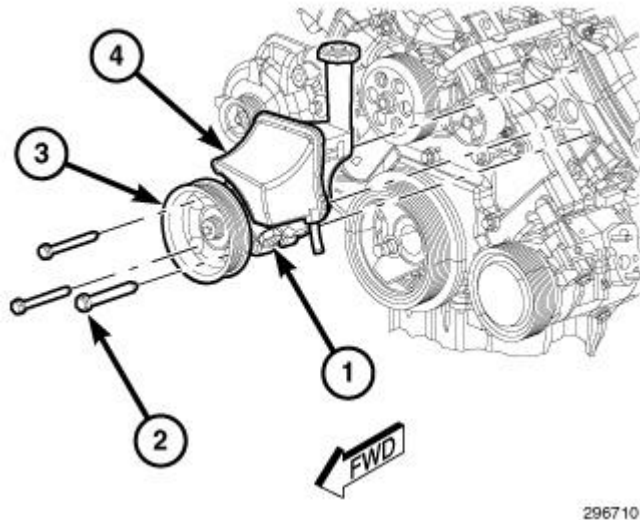


Fig. 92: Power Steering Reservoir, Pump, Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

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

10. Remove the three power steering pump (1) retaining bolts (2) through the access holes in the pulley (3).
11. Remove the power steering pump (1) and secure out of the way.

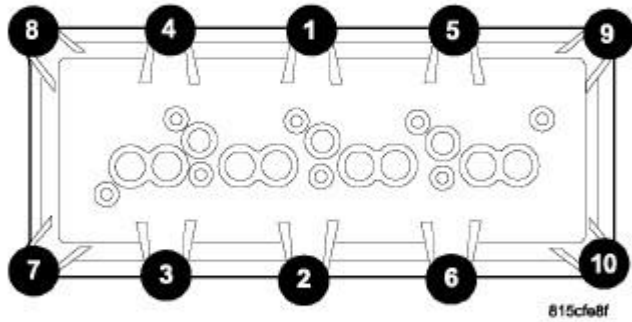


Fig. 93: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

12. Using the sequence shown in illustration, remove the cylinder head cover retaining bolts and remove cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL**.
13. 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.

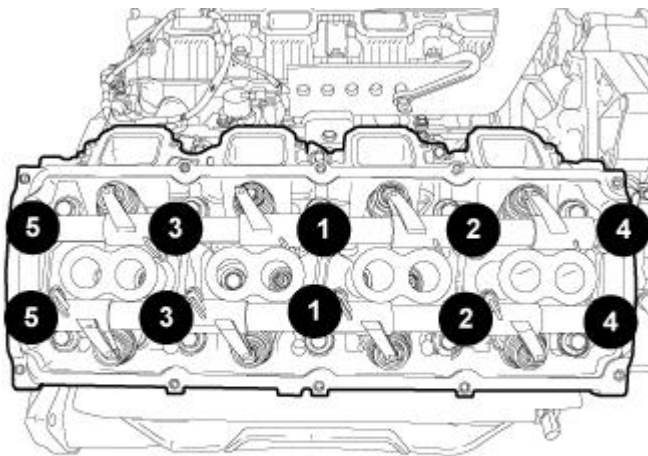


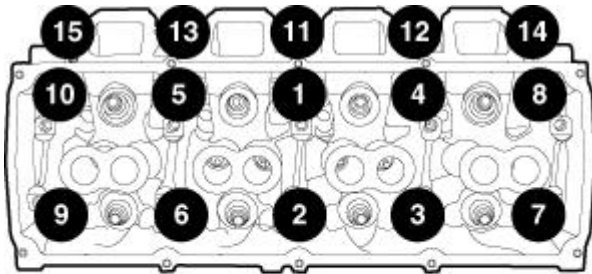
Fig. 94: Rocker Shafts Retaining Bolt Removal & Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

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.

14. Remove the rocker arms and pushrods. Refer to ROCKER ARM, VALVE, REMOVAL.



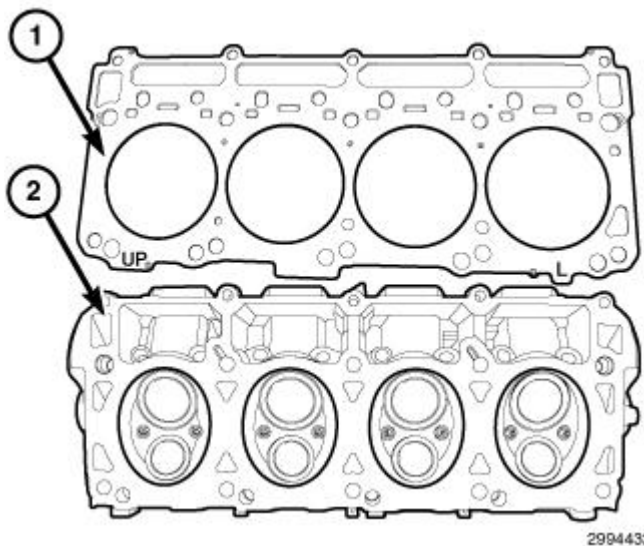
88745

Fig. 95: 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.

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

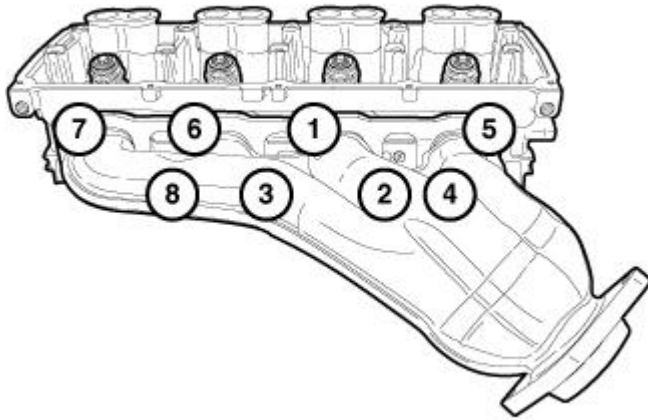


2994432

Fig. 96: Cylinder Head Gasket & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

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

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



2997620

Fig. 97: Exhaust Manifold Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

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

18. If necessary, using the sequence shown in illustration, remove the exhaust manifold bolts and remove the manifold.

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

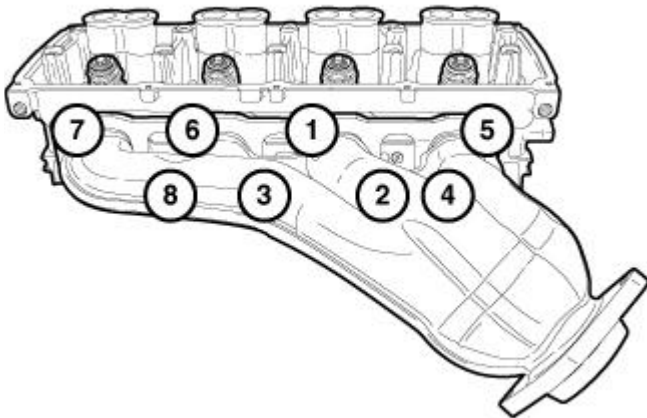
INSPECTION

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

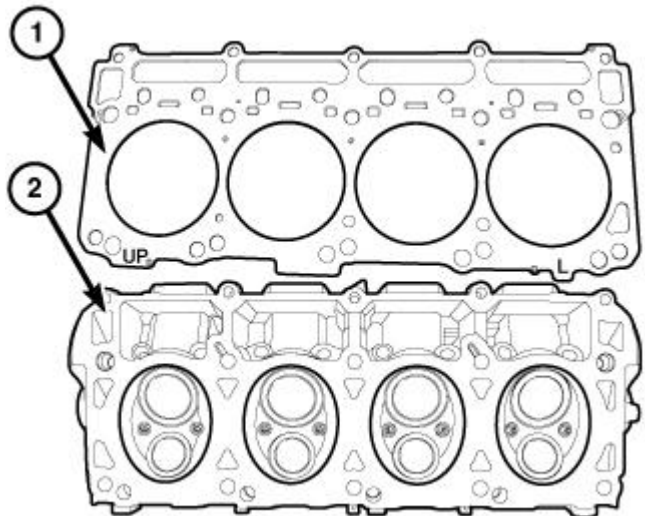


2997620

Fig. 98: Exhaust Manifold Removal/Tightening Sequence
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.
2. Using the sequence shown in illustration, tighten the retaining bolts to 31 N.m (23 ft. lbs.).



2994432

Fig. 99: 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.

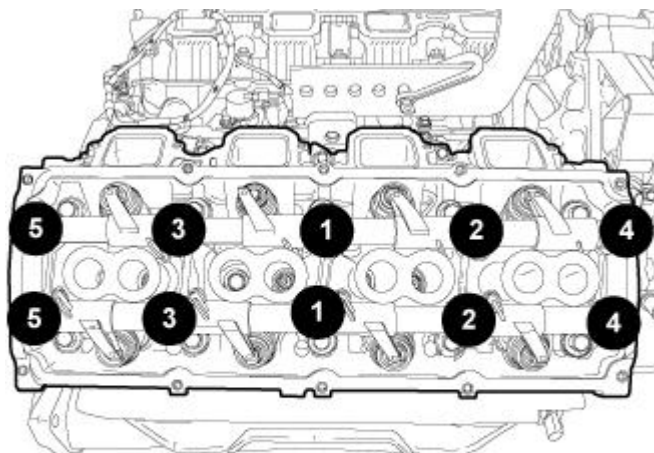


88745

Fig. 100: 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.).

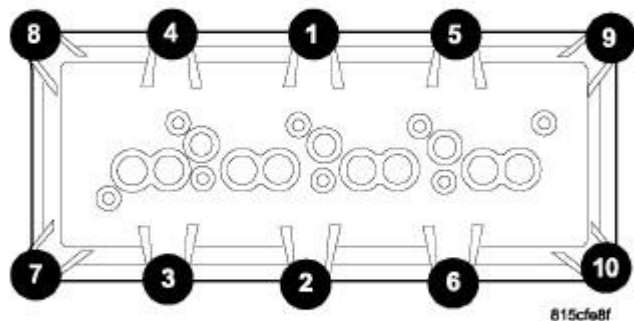


921225

Fig. 101: 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.

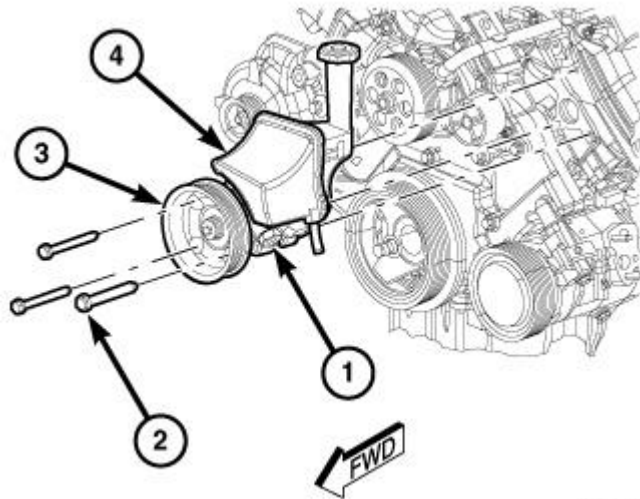


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Fig. 102: Cylinder Head Cover Torque Sequence

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**.

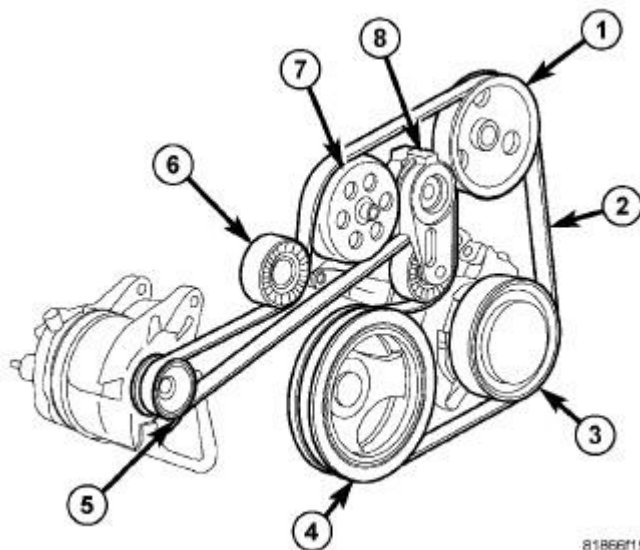


2967101

Fig. 103: Power Steering Reservoir, Pump, Pulley & Bolts

Courtesy of CHRYSLER GROUP, LLC

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



81866119

Fig. 104: Accessory Drive Belt Routing, Tensioner & Pulleys

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 its stop, install the accessory drive belt (2), then slowly release the tensioner into position. Refer to **BELT, SERPENTINE, INSTALLATION**.

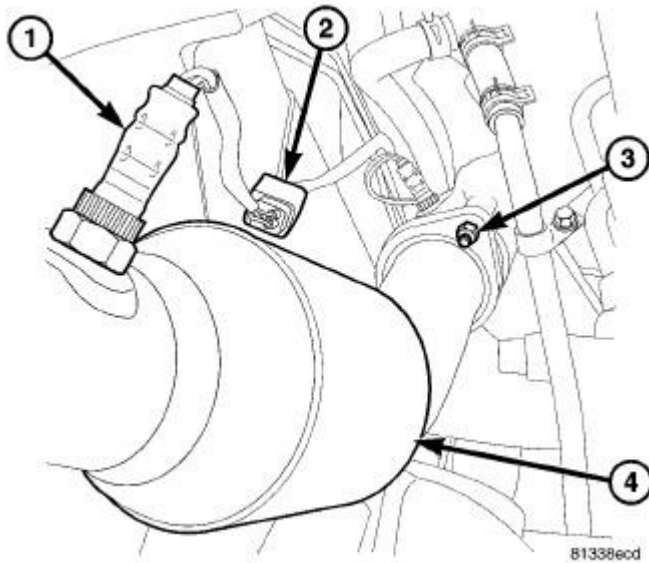


Fig. 105: Oxygen Sensor, Oxygen Sensor Connector, Ball Flange Nut & LH Catalytic Converter
Courtesy of CHRYSLER GROUP, LLC

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

13. Raise and support the vehicle.
14. Install the catalytic converters. Refer to **CONVERTER, CATALYTIC, INSTALLATION**.
15. Lower the vehicle.

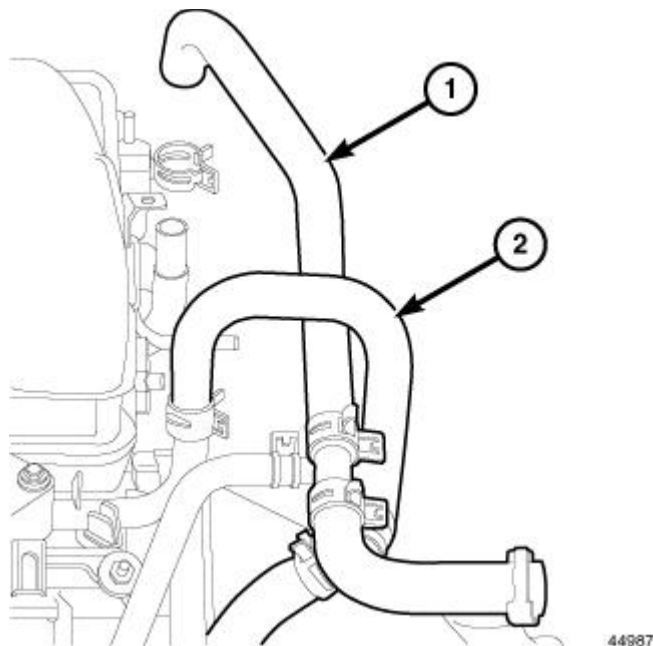


Fig. 106: Heater Hose Supply
Courtesy of CHRYSLER GROUP, LLC

16. Connect the heater hoses (1, 2).
17. Install the intake manifold and throttle body as an assembly. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
18. Connect the fuel supply line.

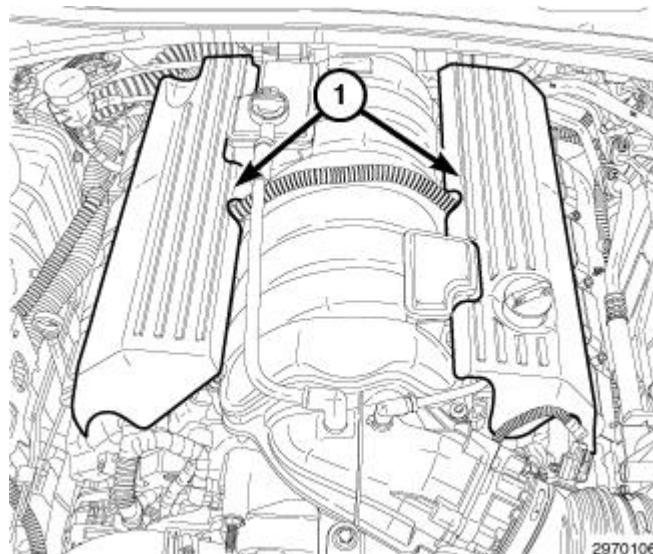


Fig. 107: Engine Covers
Courtesy of CHRYSLER GROUP, LLC

19. Install the engine covers (1).
20. Fill cooling system. Refer to Cooling System - **STANDARD PROCEDURE**.

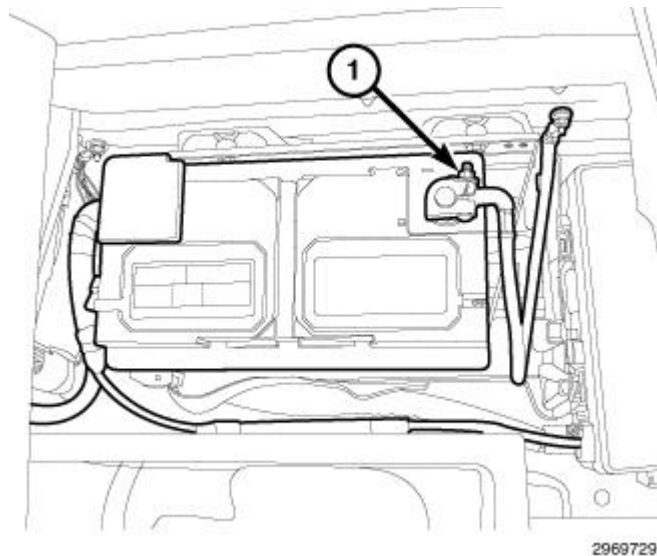


Fig. 108: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

21. Connect the negative battery cable (1).
22. Start engine check for leaks.

COVER(S), CYLINDER HEAD

REMOVAL

REMOVAL

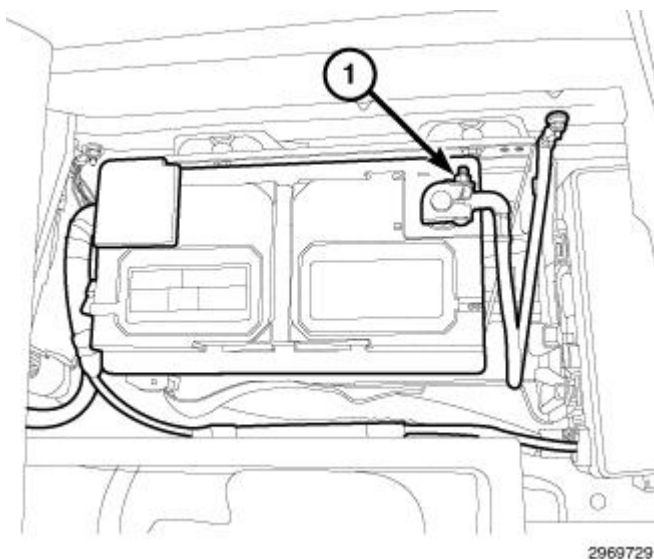


Fig. 109: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).

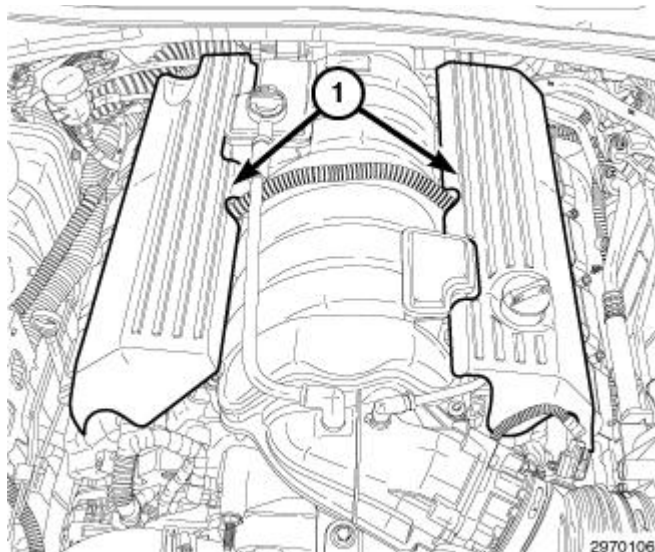


Fig. 110: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

2. Remove the engine covers (1).

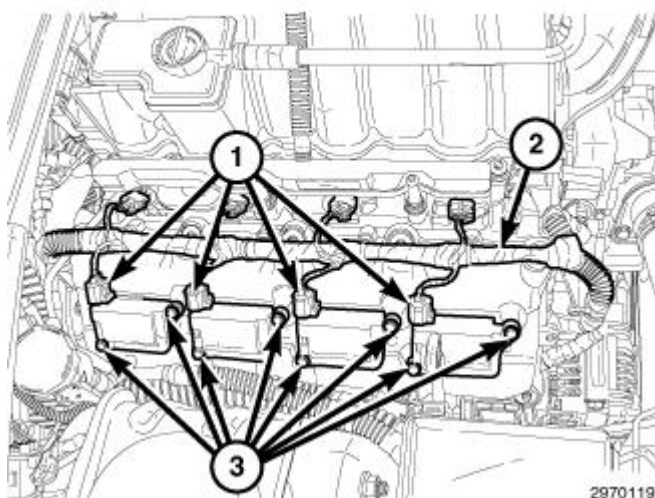


Fig. 111: Ignition Coil Electrical Connectors, Harness & Bolts

Courtesy of CHRYSLER GROUP, LLC

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

3. Disconnect the ignition coil electrical connectors (1).
4. Position the electrical harness (2) aside.
5. Remove the ignition coil retaining bolts (3).

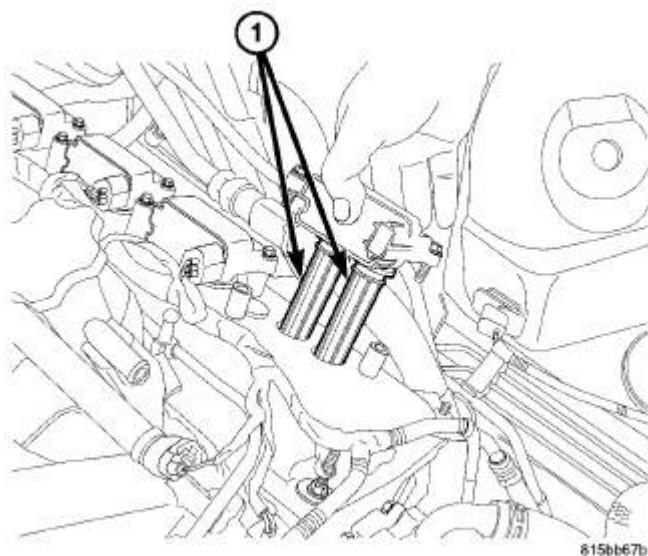


Fig. 112: Removing/Installing Ignition Coil
Courtesy of CHRYSLER GROUP, LLC

6. Remove the ignition coils (1).

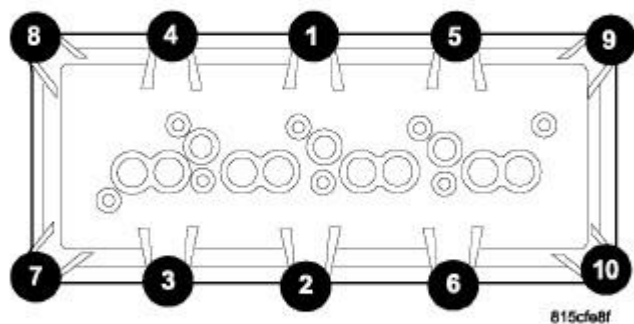
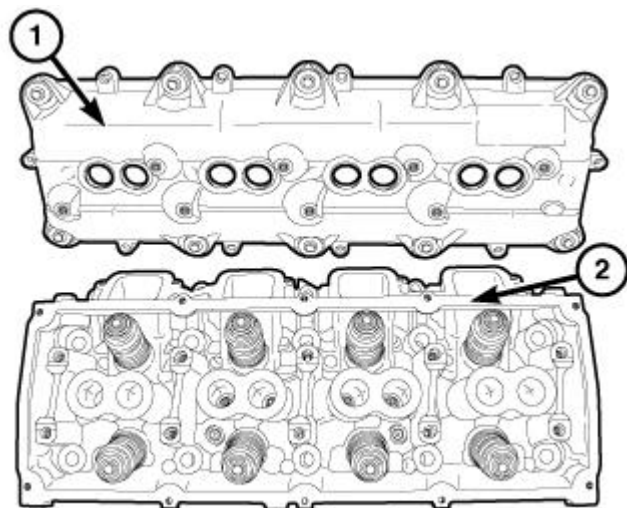


Fig. 113: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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



2969971

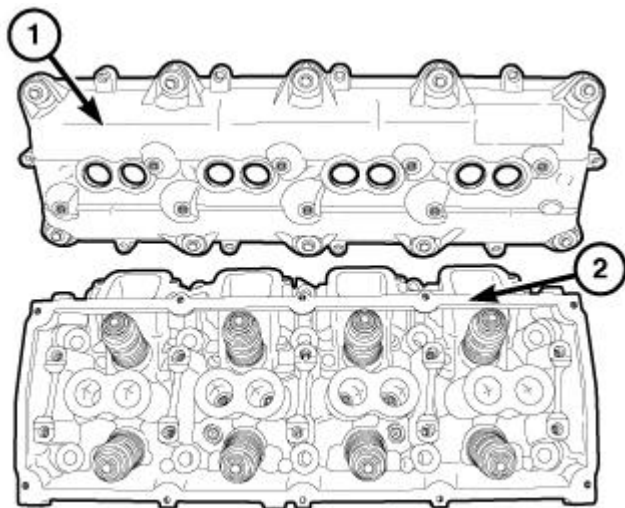
Fig. 114: Cylinder Head & Cover
Courtesy of CHRYSLER GROUP, LLC

8. Remove the cylinder head cover (1).
9. 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

INSTALLATION



2969971

Fig. 115: 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.

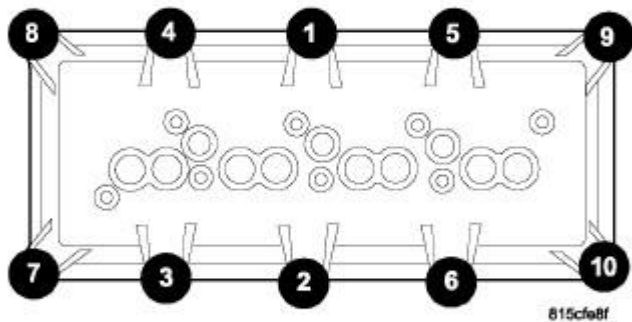


Fig. 116: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

3. Using the sequence shown in illustration, tighten the cylinder head cover bolts to 8 N.m (70 lbs in.).

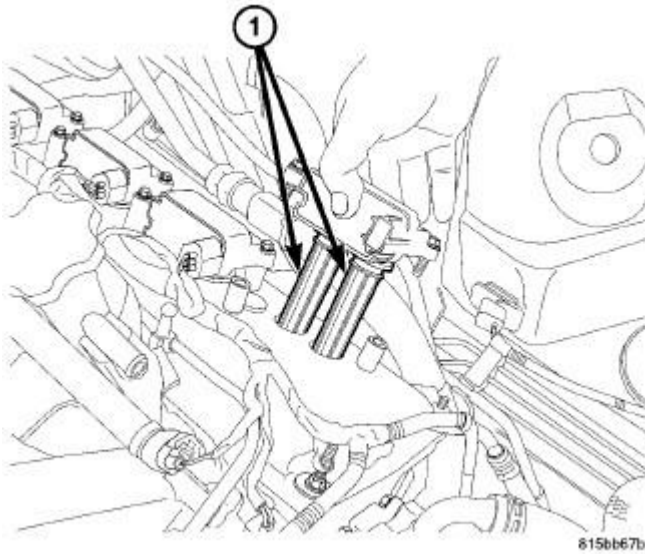


Fig. 117: Removing/Installing Ignition Coil
Courtesy of CHRYSLER GROUP, LLC

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

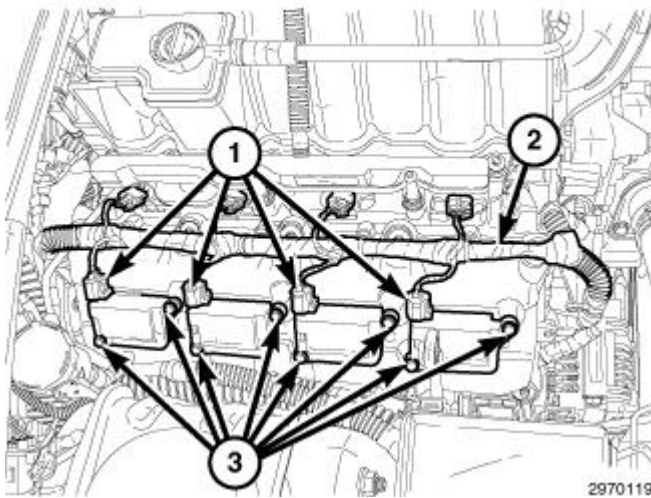
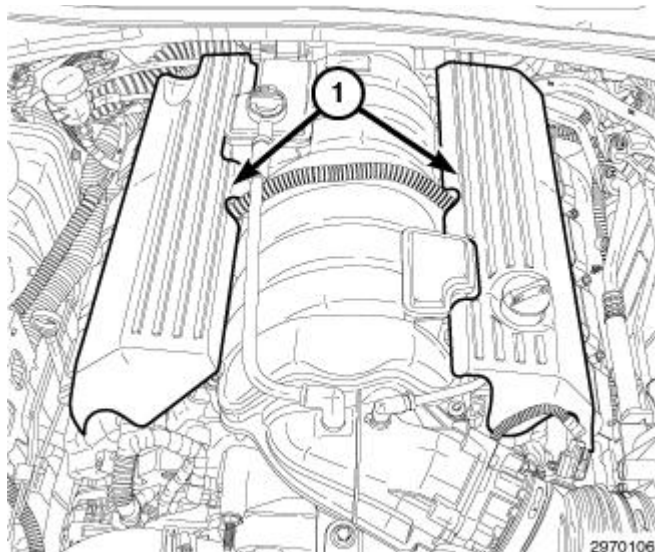


Fig. 118: Ignition Coil Electrical Connectors, Harness & Bolts
Courtesy of CHRYSLER GROUP, LLC

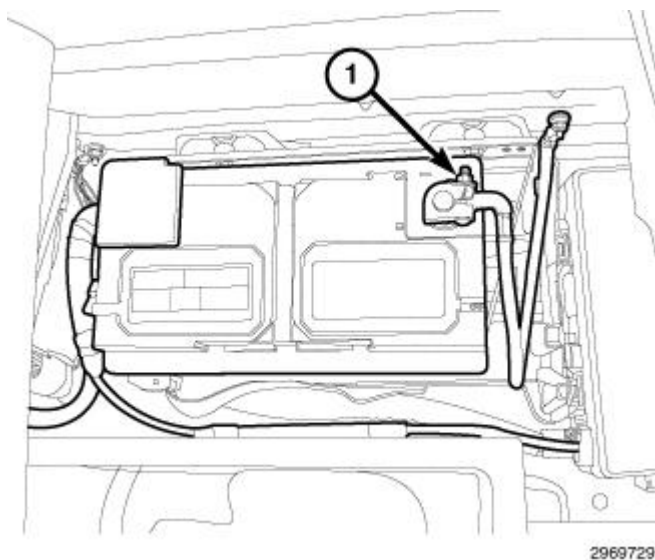
NOTE: Right side shown in illustration, left side similar.

6. Tighten the ignition coil retaining bolts (3) to 7 N.m (62 in. lbs.).
7. Position the electrical harness (2).
8. Connect the ignition coil electrical connectors (1).

**Fig. 119: Engine Covers**

Courtesy of CHRYSLER GROUP, LLC

9. Install the engine covers (1).

**Fig. 120: Negative Battery Cable**

Courtesy of CHRYSLER GROUP, LLC

10. Connect the negative battery cable.

ROCKER ARM, VALVE

REMOVAL

REMOVAL

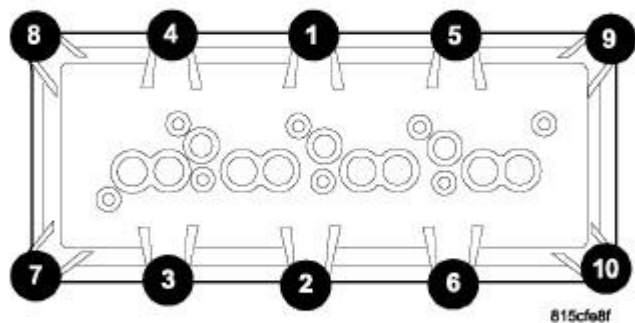


Fig. 121: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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

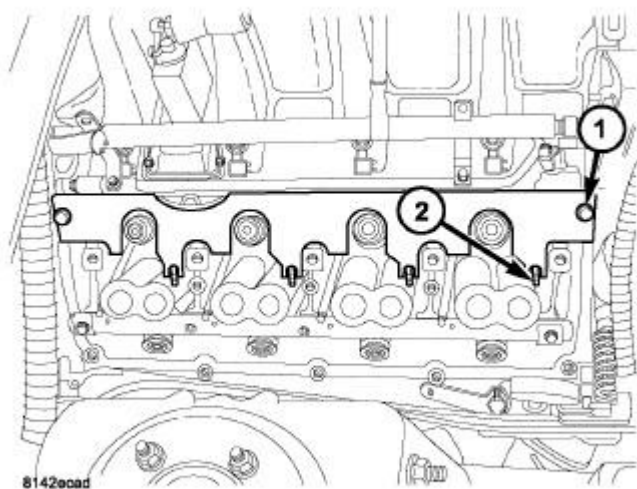


Fig. 122: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

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

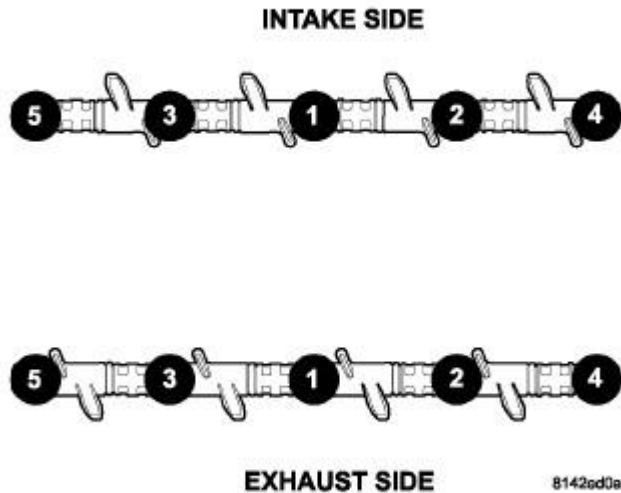


Fig. 123: Rocker Shaft Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

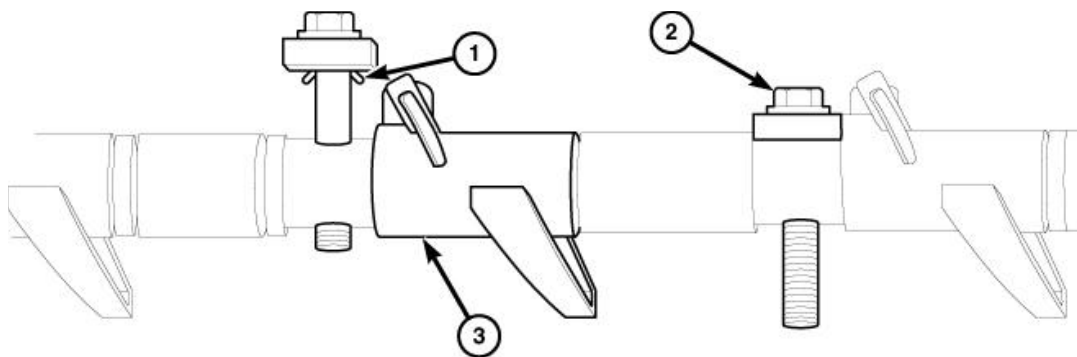
3. Using the sequence shown in illustration, loosen the rocker shaft assemblies.

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

4. 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.

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



4637

Fig. 124: 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**

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.

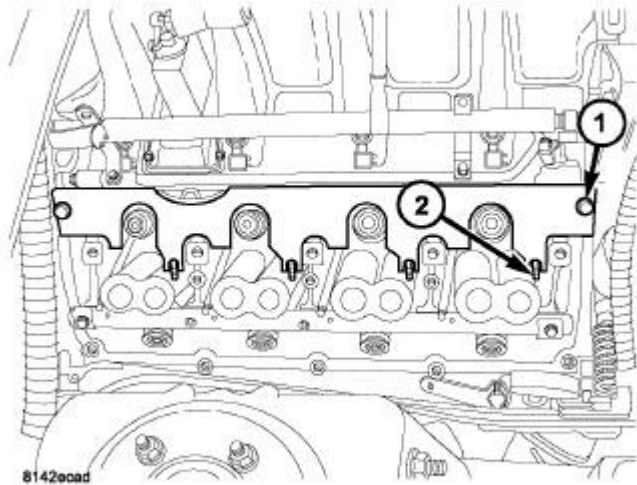
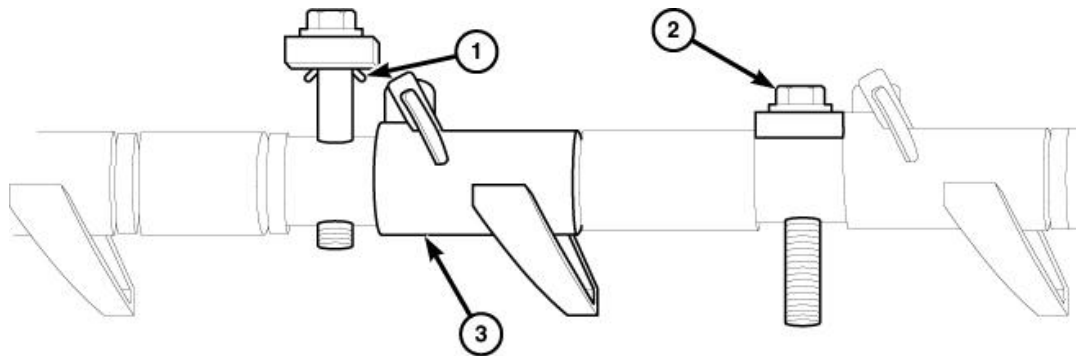


Fig. 125: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

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



45077

Fig. 126: 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.

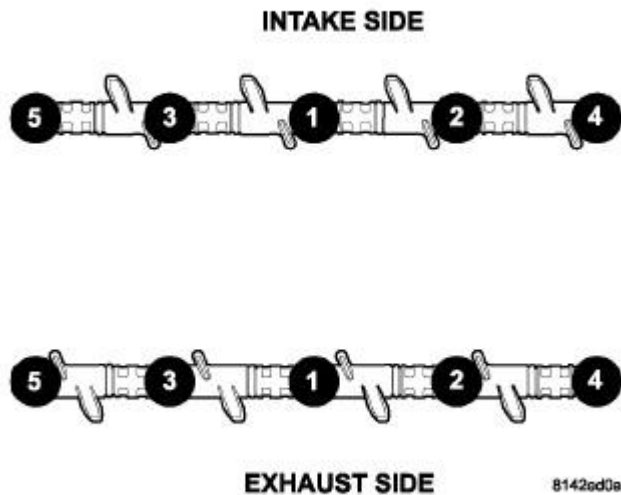


Fig. 127: Rocker Shaft Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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.).

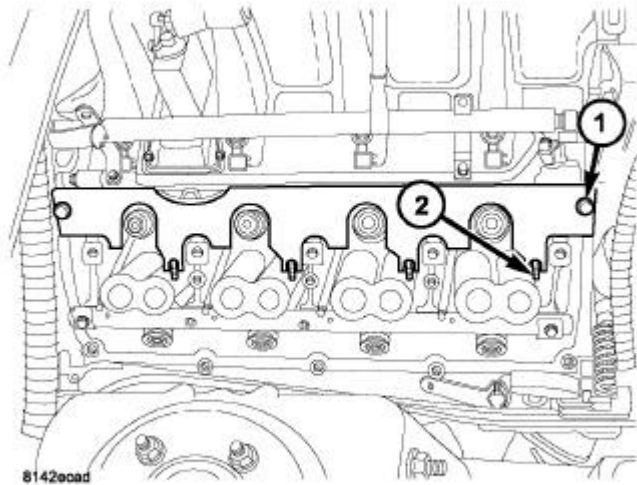


Fig. 128: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

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).

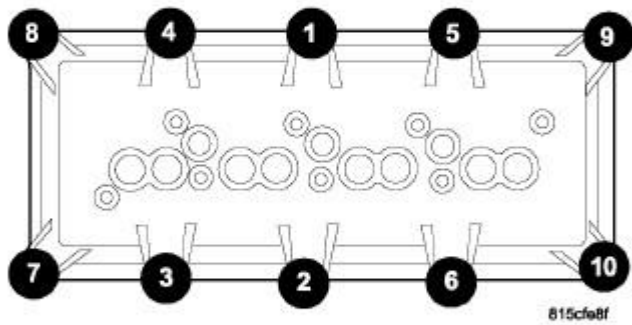


Fig. 129: Cylinder Head Cover Torque Sequence
 Courtesy of CHRYSLER GROUP, LLC

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

SEAL(S), VALVE GUIDE

DESCRIPTION

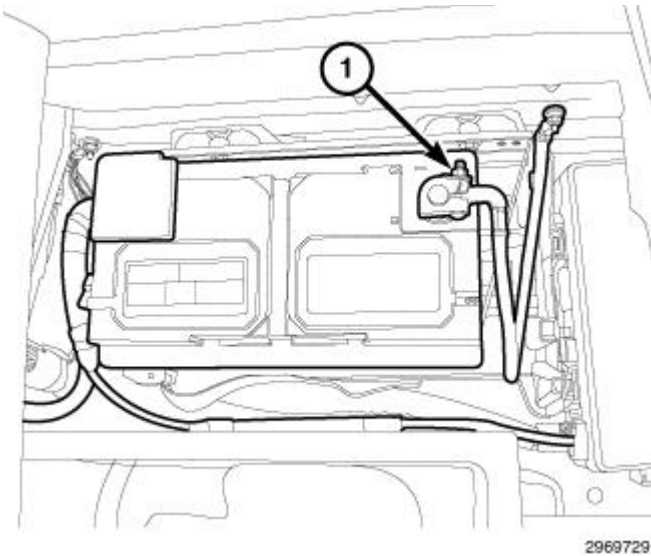
DESCRIPTION

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

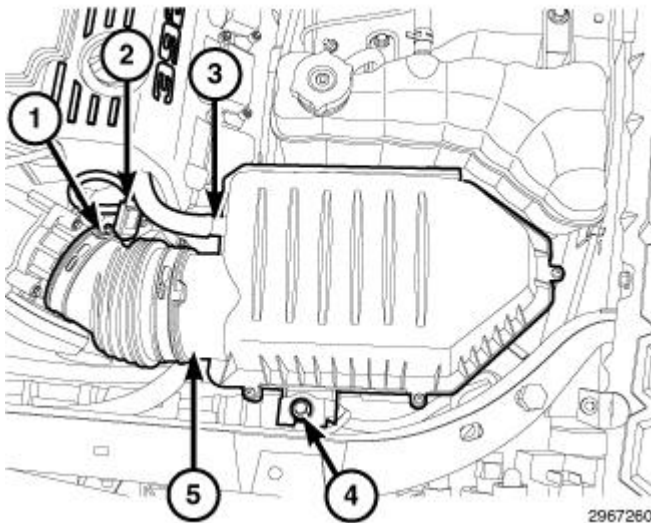


2969729

Fig. 130: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

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



2967260

Fig. 131: 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.**

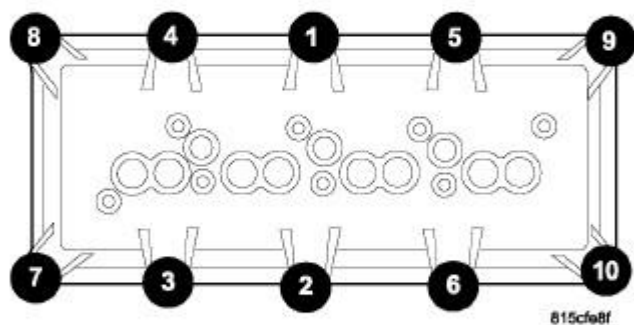


Fig. 132: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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

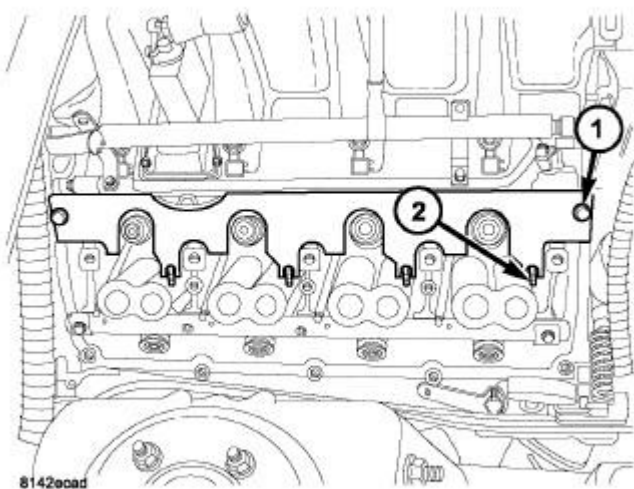
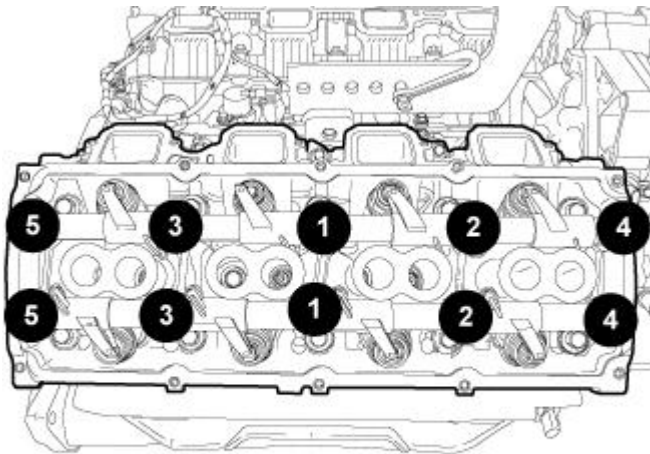


Fig. 133: Pushrod Retaining Plate
Courtesy of CHRYSLER GROUP, LLC

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).

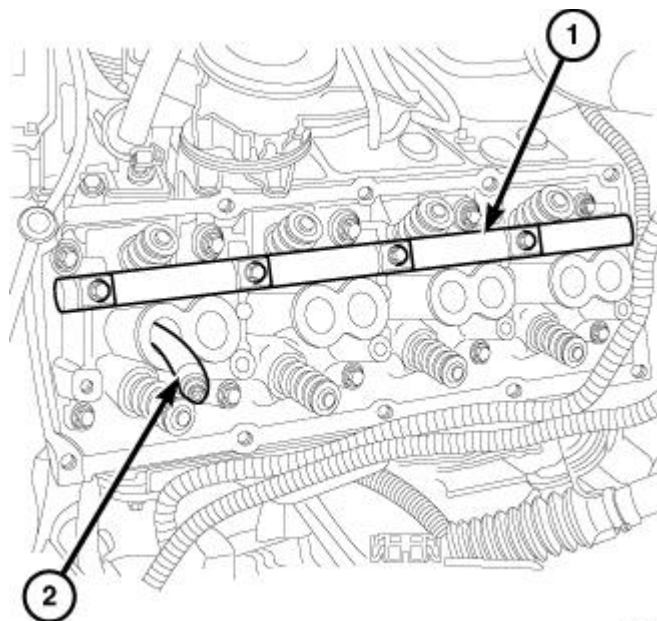


921225

Fig. 134: 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.

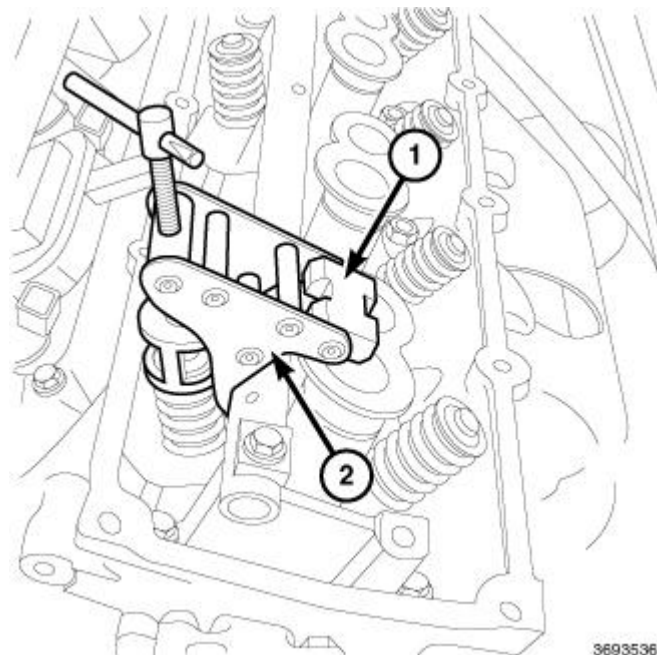


4659

Fig. 135: Rocker Shaft

Courtesy of CHRYSLER GROUP, LLC

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



3693536

Fig. 136: 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 #9065B, Compressor, Valve Spring) (1) and remove the intake valve retainer locks.
10. Release the valve spring compressor and remove the valve springs.

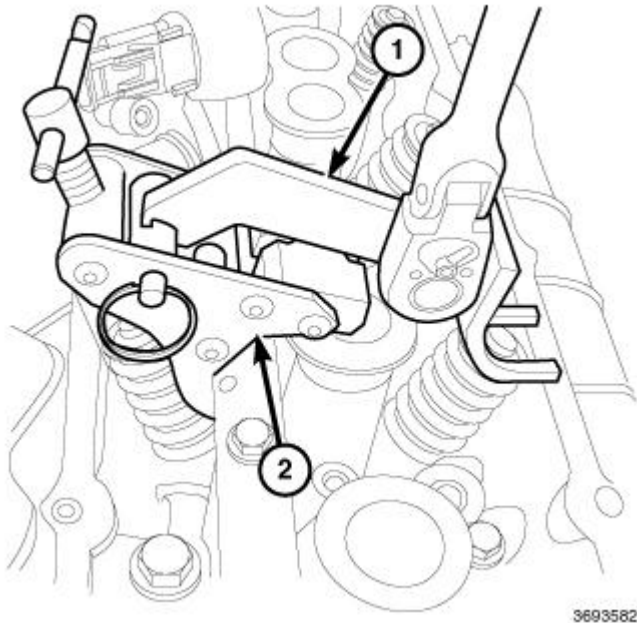


Fig. 137: Valve Spring Compressor & Adapter
Courtesy of CHRYSLER GROUP, LLC

11. Install the valve spring compressor (special tool #9065B, 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

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.

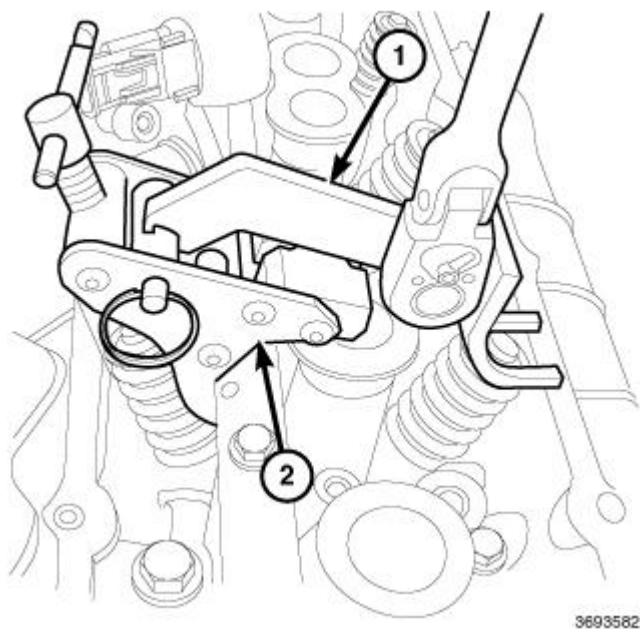
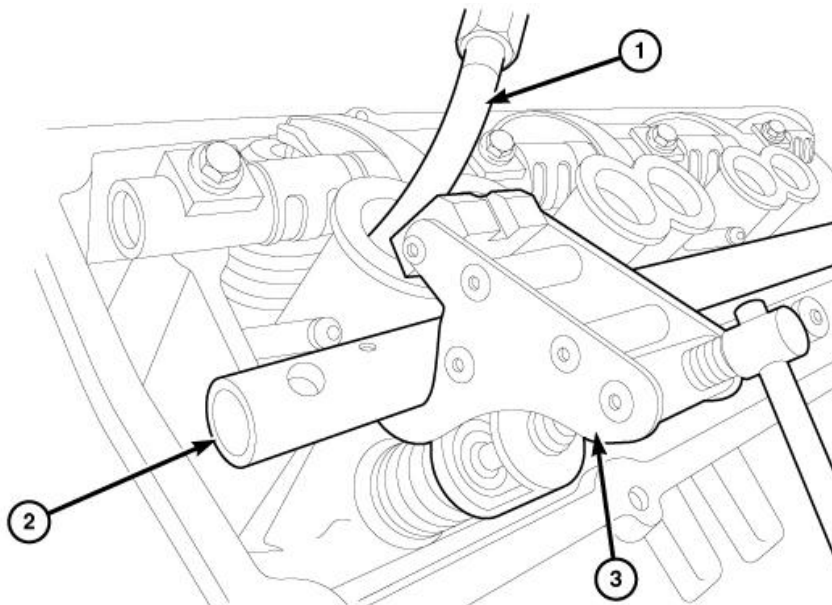


Fig. 138: Valve Spring Compressor & Adapter
Courtesy of CHRYSLER GROUP, LLC

4. Using the valve spring compressor (special tool #9065B, 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.



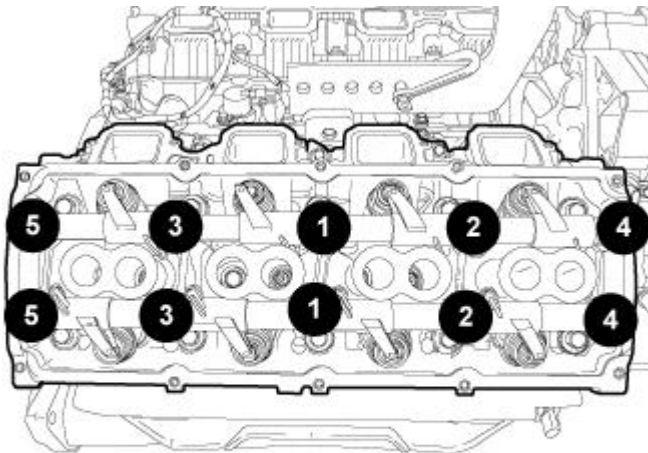
45107

Fig. 139: Valve Spring Removal Tools
 Courtesy of CHRYSLER GROUP, LLC

5. Remove the valve spring compressor (special tool #9065B, 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. 140: 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.).

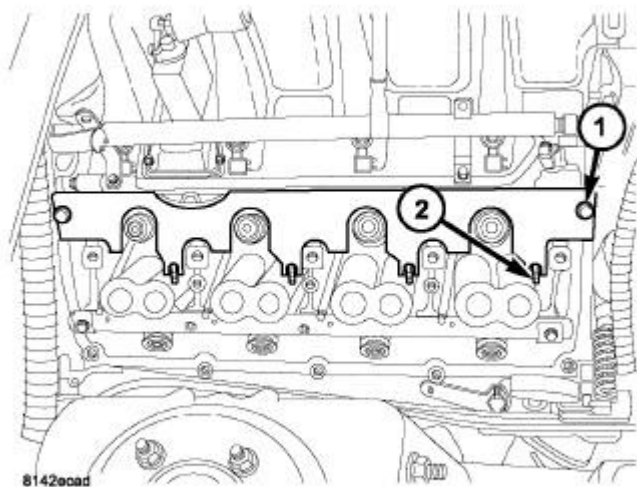


Fig. 141: Pushrod Retaining Plate

Courtesy of CHRYSLER GROUP, LLC

9. Remove the pushrod retainer (special tool #9070, Retainer, Push Rod) (1).
10. Position the cylinder head cover onto the cylinder head.

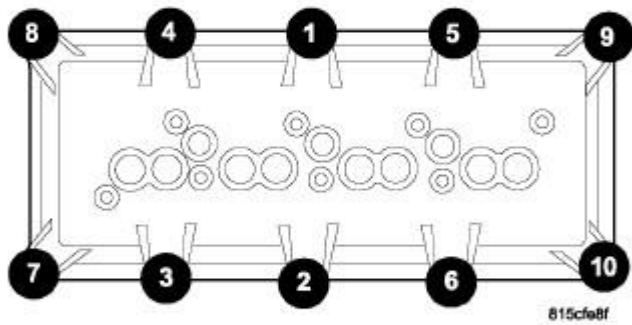


Fig. 142: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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**.

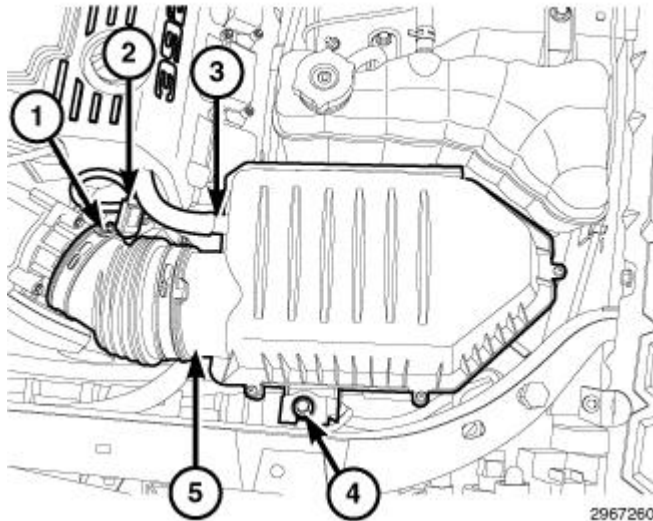


Fig. 143: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

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

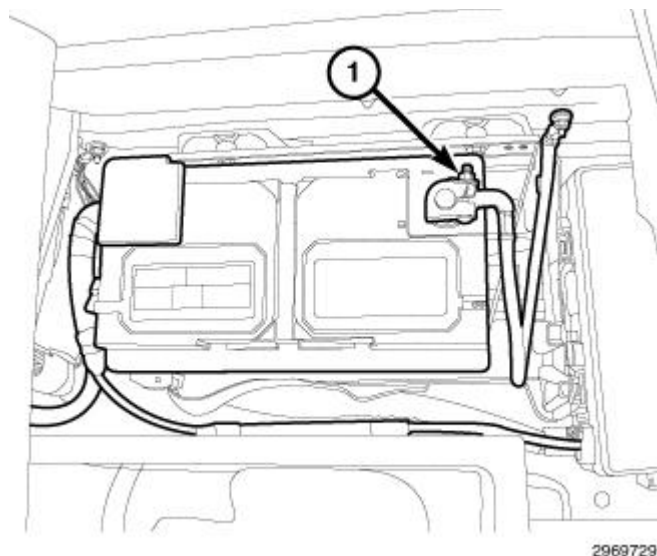


Fig. 144: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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

VALVES, INTAKE AND EXHAUST

DESCRIPTION

VALVES

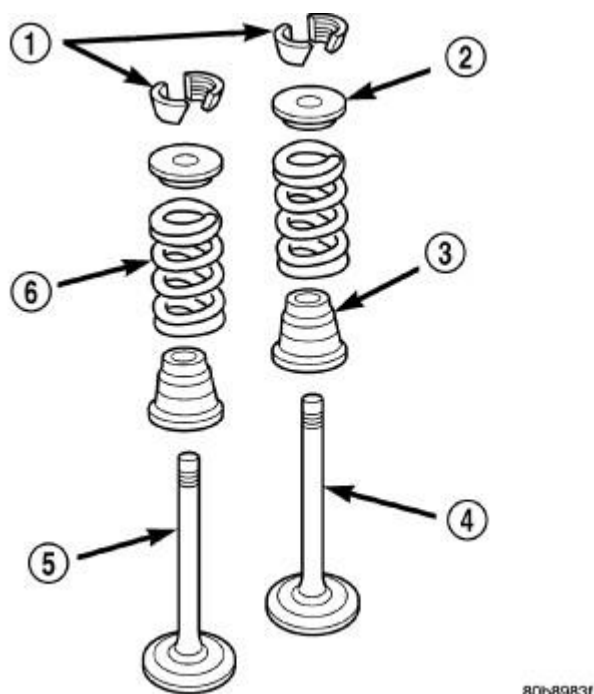


Fig. 145: Identifying Intake/Exhaust Valves

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.

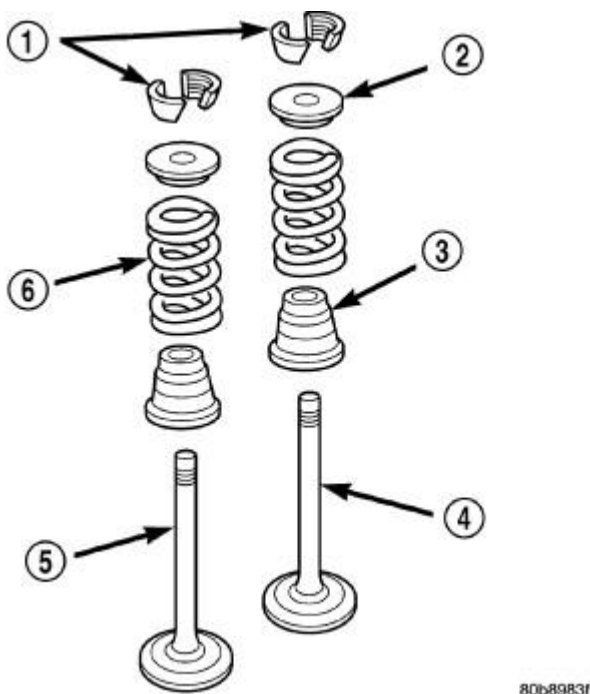
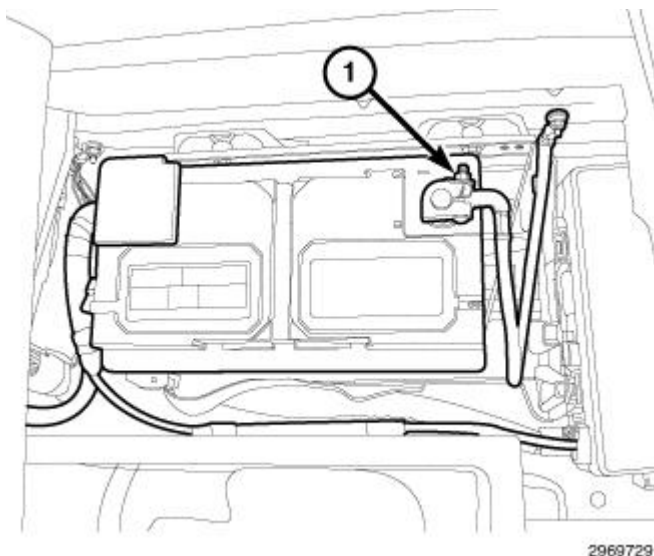


Fig. 146: Identifying Intake/Exhaust Valves
Courtesy of CHRYSLER GROUP, LLC

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. 147: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

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



88745

Fig. 148: Cylinder Head Bolt Removal & Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

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

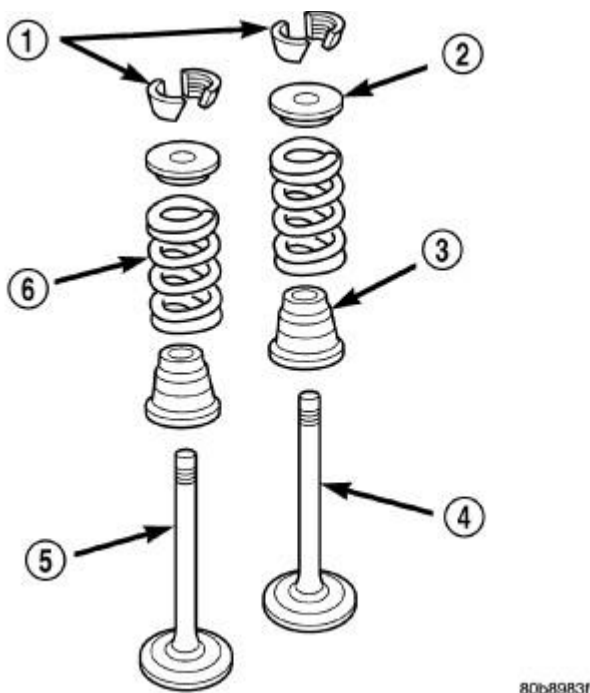


Fig. 149: Identifying Intake/Exhaust Valves
 Courtesy of CHRYSLER GROUP, LLC

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

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.

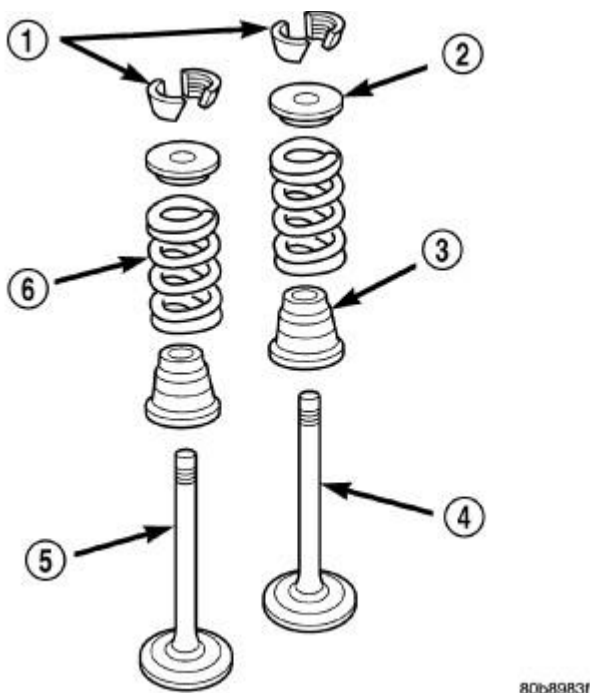


Fig. 150: Identifying Intake/Exhaust Valves
 Courtesy of CHRYSLER GROUP, LLC

3. Measure the valve stems (4, 5) for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.
4. Coat the valve stems 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).

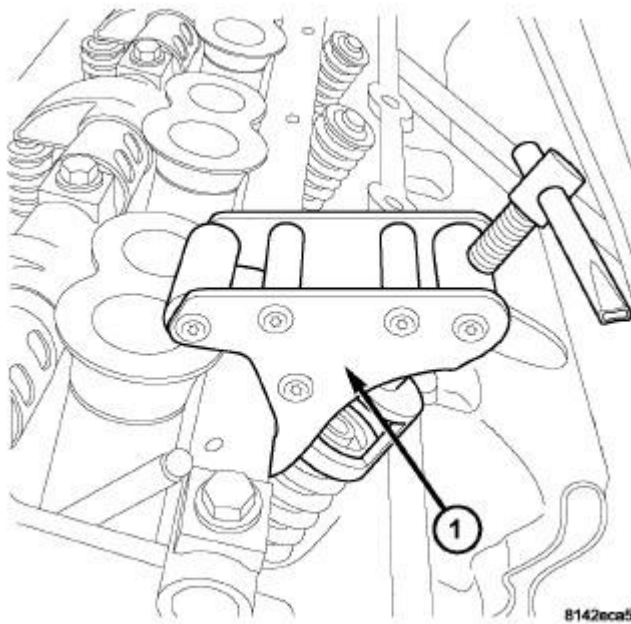


Fig. 151: Valve Spring Remove/Install - Exhaust
Courtesy of CHRYSLER GROUP, LLC

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.



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Fig. 152: Cylinder Head Bolt Removal & Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

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

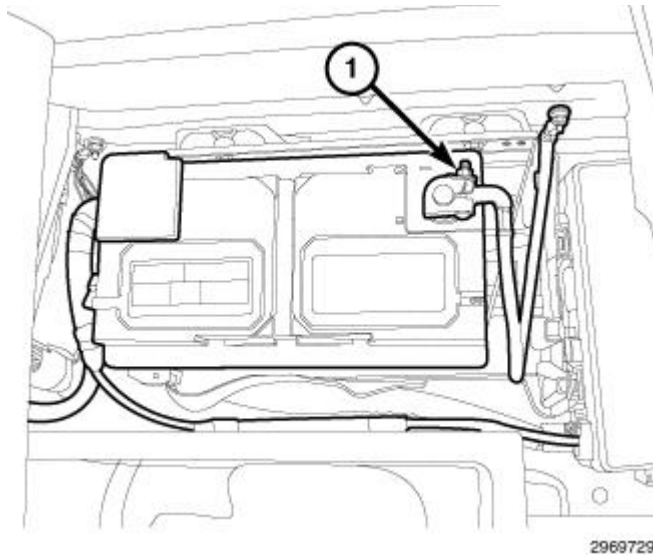


Fig. 153: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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 the following:

- Gallery at the oil filter adaptor hole.
- Front and rear oil gallery holes.
- Feed holes for the crankshaft main bearings.

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. Tighten the 1/4 inch NPT plugs to 20 N.m (15 ft. lbs.). Tighten the 3/8 inch NPT plugs to 27 N.m (20 ft. lbs.) and the coolant drain plugs to 34 N.m (25 ft. lbs.).

INSPECTION

INSPECTION

ENGINE BLOCK

1. Clean the engine block thoroughly and check all core hole plugs for evidence of leaking and repair if necessary.

2. Examine the engine block and cylinder bores for cracks or fractures.

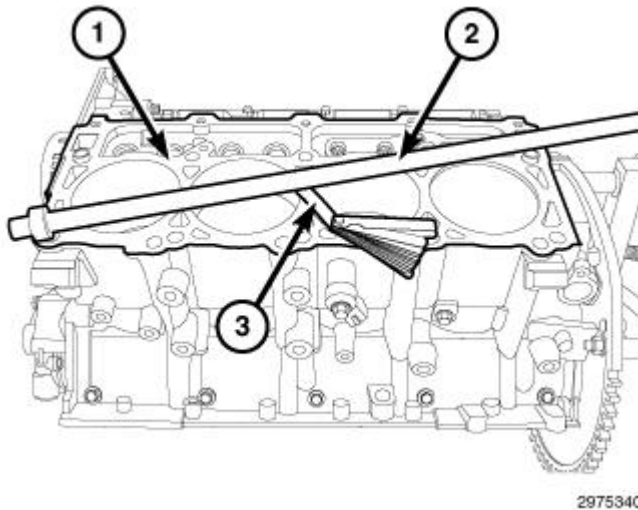


Fig. 154: Checking Engine Block Deck Surface With Precision Straightedge & Feeler Gauge
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Check the engine block deck surface with a precision straightedge and feeler gauge. The surface irregularities should not exceed 0.09 mm (0.0035 in.). Check the deck surface from one end to the other with the precision straightedge positioned across corners and parallel to the block centerline up and down the deck.

3. Check the engine block deck (1) surfaces for flatness using a precision straightedge (2) and feeler gauge (3).

CYLINDER BORE

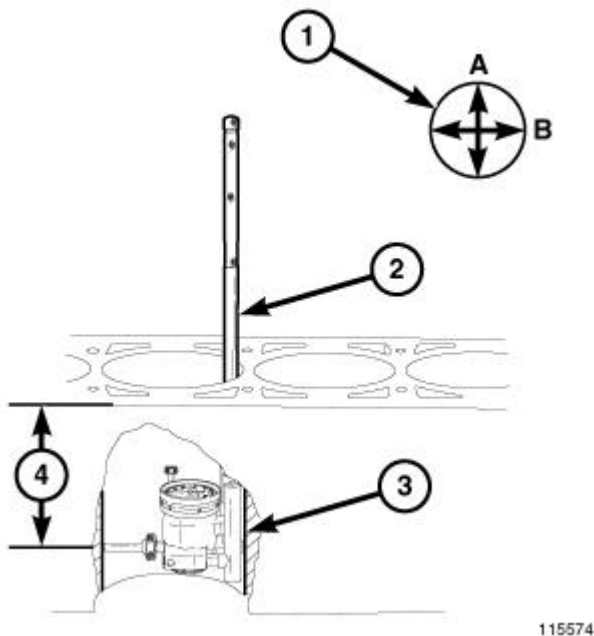
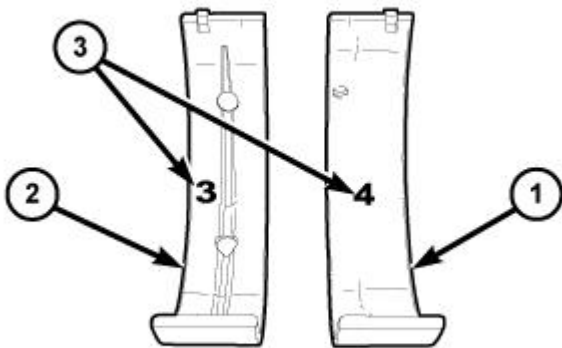


Fig. 155: Measuring Cylinder Bore Diameter
 Courtesy of CHRYSLER GROUP, LLC

1. 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.
2. 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).
3. Repeat the measurement near the middle of the bore then repeat the measurement near the bottom of the bore.
4. Determine the taper by subtracting the smaller diameter from the larger diameter.
5. Rotate the measuring device 90° to point B (1) and repeat the three measurements. Verify that the maximum taper is within specifications.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If the cylinder bore taper does not exceed 0.0127 mm (0.0005 inch) and out-of-roundness does not exceed 0.008 mm (0.0003 inch) then the cylinder bore can be honed. If the cylinder bore taper or out-of-round condition exceeds the maximum limits, replace the engine 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.

MAIN BEARINGS



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Fig. 156: 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 engine block main bearing bores show damage, replace the engine block.

BEARING(S), CRANKSHAFT, MAIN

STANDARD PROCEDURE

STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

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

CRANKSHAFT MAIN BEARING SELECTION

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, corresponding with journal number 1, 2, 3, 4 and 5.

NOTE: Service main bearings are coded. These codes identify what size (color) the bearing is.

MAIN BEARING SELECTION CHART - 6.4L

GRADE	COLOR	mm	In	FOR USE WITH JOURNAL SIZE
	LOWER			64.988-64.995 mm
A	ORANGE	0.008 mm U/S	(0.0004 in.) U/S	(2.5585- 2.5588 in.)
	LOWER			64.996-65.004 mm
B	BLACK	NOMINAL	NOMINAL	(2.5588-2.5592 in.)
	LOWER			65.005-65.012 mm
C	GREEN	0.008 mm O/S	(0.0004 in.) O/S	(2.5592-2.5595 in.)

INSPECTION

INSPECTION

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

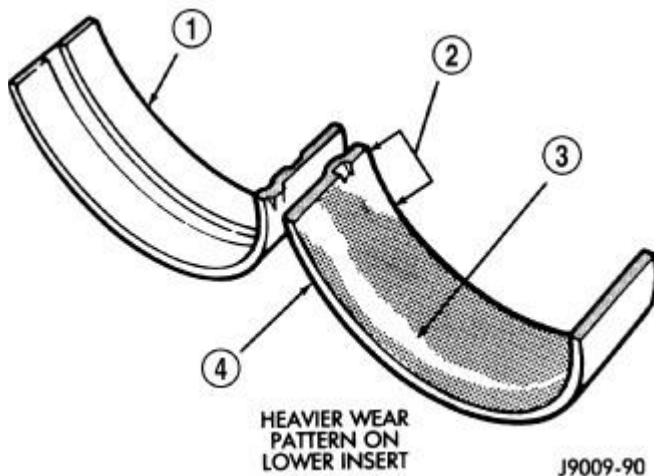


Fig. 157: Main Bearing Wear Patterns
Courtesy of CHRYSLER GROUP, LLC

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 of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

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

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

CAMSHAFT, ENGINE

REMOVAL

5.7L / 6.4L - CAMSHAFT CORE HOLE PLUG

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

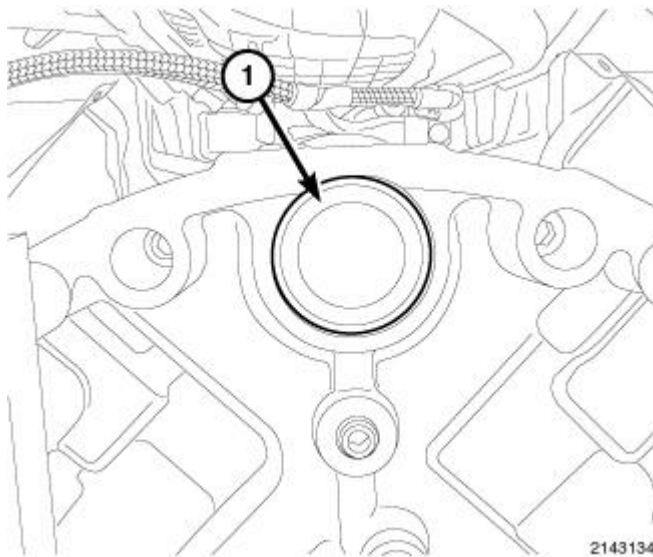


Fig. 158: Camshaft Core Hole Plug
Courtesy of CHRYSLER GROUP, LLC

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.

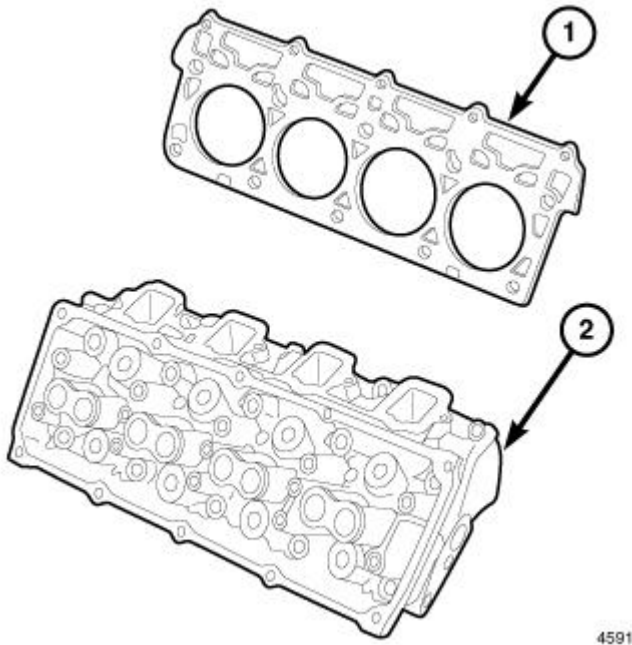
CAMSHAFT

Fig. 159: Cylinder Head Components
Courtesy of CHRYSLER GROUP, LLC

1. Remove both cylinder heads (2). Refer to **CYLINDER HEAD, REMOVAL**.

CAUTION: The 6.4L Multi Displacement System (MDS) engine uses both standard roller lifters and deactivating roller lifters. 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, for the latching pins.

CAUTION: Whenever the camshaft is replaced, all lifters must be replaced. If the lifter and retainer assemblies are to be reused, identify the lifters to ensure installation in their original location or engine damage could result.

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

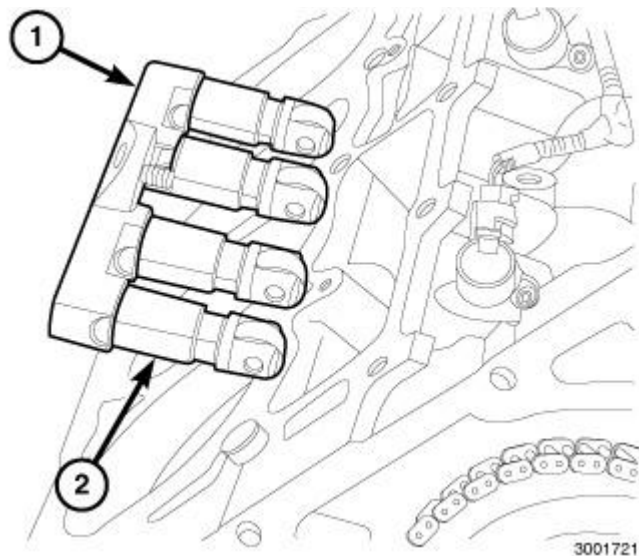


Fig. 160: Identifying Lifters & Retainers

Courtesy of CHRYSLER GROUP, LLC

2. Remove the lifters (2) and retainer (1) as an assembly. Refer to **LIFTER(S), HYDRAULIC, ROLLER, REMOVAL**.

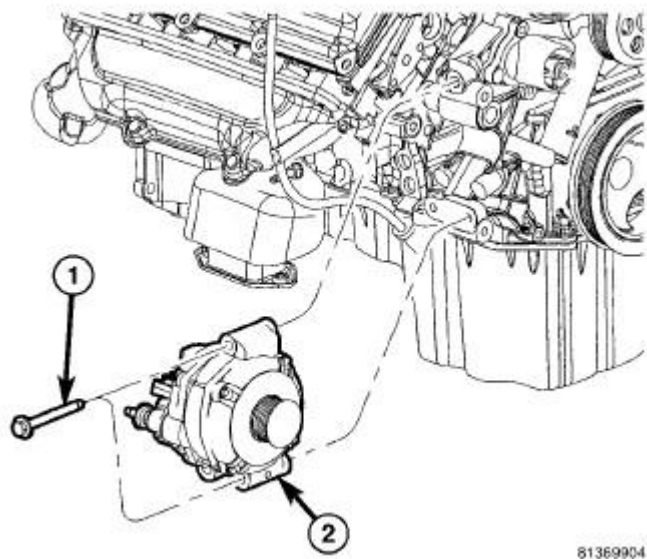


Fig. 161: Generator & Retaining Bolt

Courtesy of CHRYSLER GROUP, LLC

3. Remove the generator. Refer to **GENERATOR, REMOVAL**.
4. Remove the A/C compressor. Refer to **COMPRESSOR, A/C, REMOVAL**.

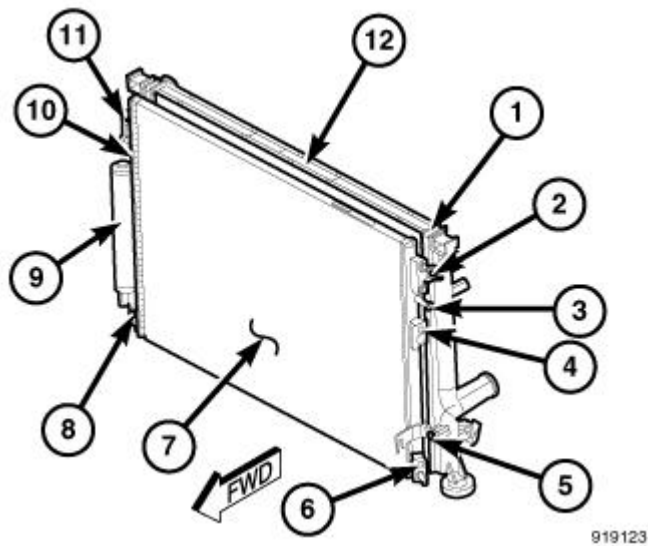


Fig. 162: A/C Condenser & Radiator
Courtesy of CHRYSLER GROUP, LLC

5. Remove the radiator (12). Refer to **RADIATOR, ENGINE COOLING, REMOVAL**.
6. Remove the A/C condenser (7). Refer to **CONDENSER, A/C, REMOVAL**.
7. Raise and support vehicle.

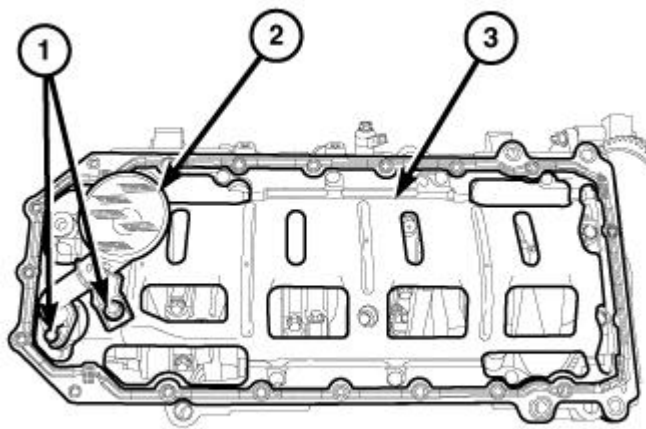
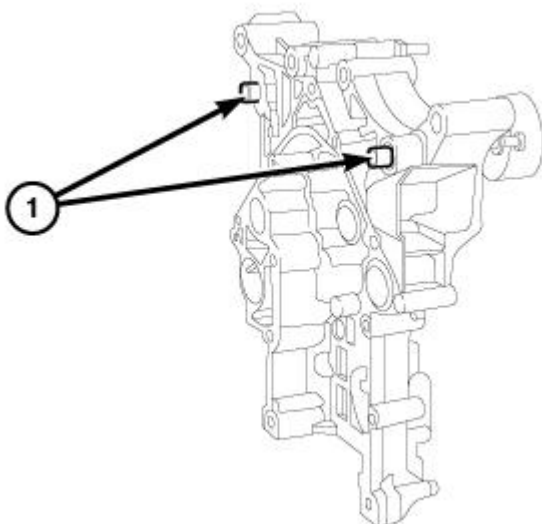


Fig. 163: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

8. Remove the oil pan and oil pump pickup tube (2). Refer to **PAN, OIL, REMOVAL**.

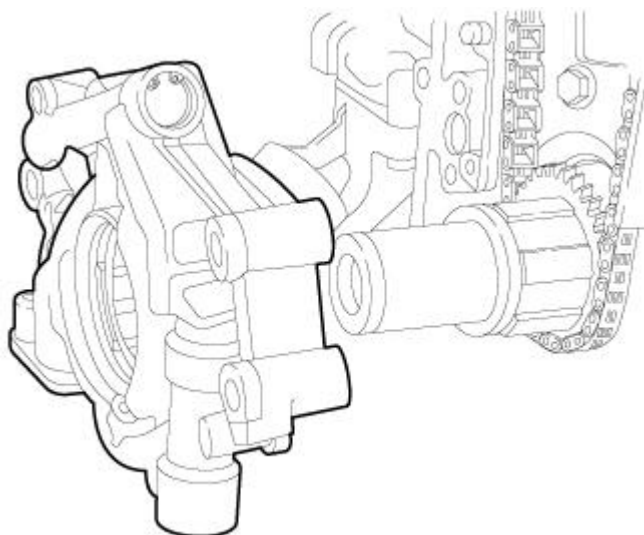


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Fig. 164: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove the water pump for timing cover removal.

9. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL.



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Fig. 165: Remove/Install Oil Pump
Courtesy of CHRYSLER GROUP, LLC

10. Remove the oil pump. Refer to PUMP, ENGINE OIL, REMOVAL.

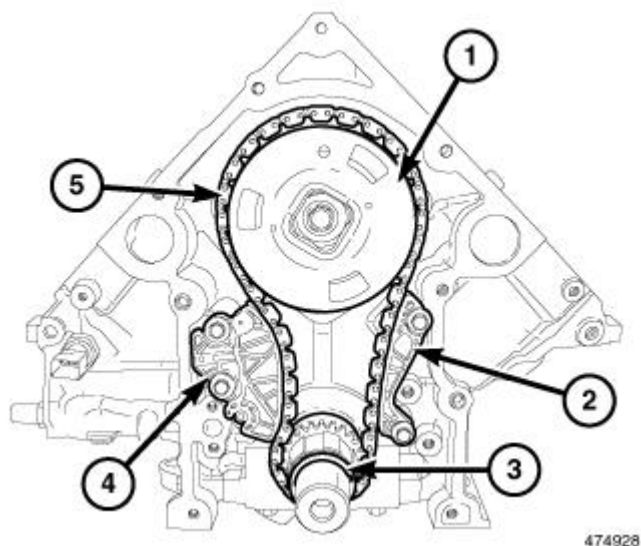


Fig. 166: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
Courtesy of CHRYSLER GROUP, LLC

11. Remove the timing chain (5) and camshaft phaser (1). Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL**.

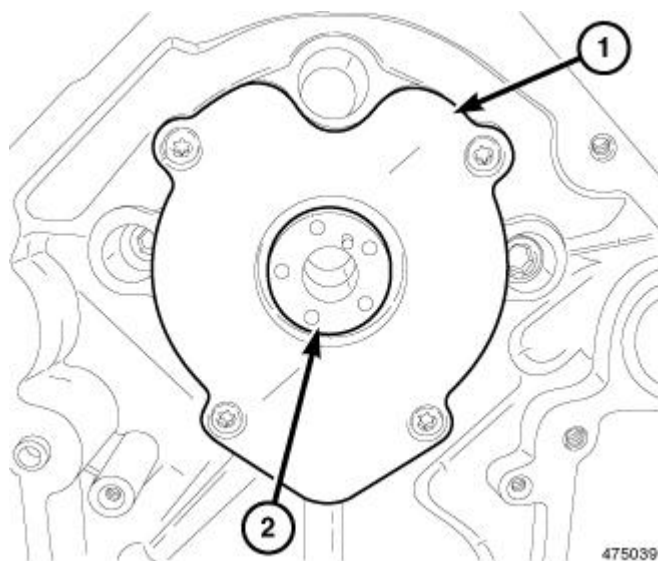


Fig. 167: Camshaft Thrust Plate
Courtesy of CHRYSLER GROUP, LLC

12. Remove the camshaft thrust plate (1).

CAUTION: Use care when removing the camshaft, do not damage the camshaft bearings with the camshaft lobes.

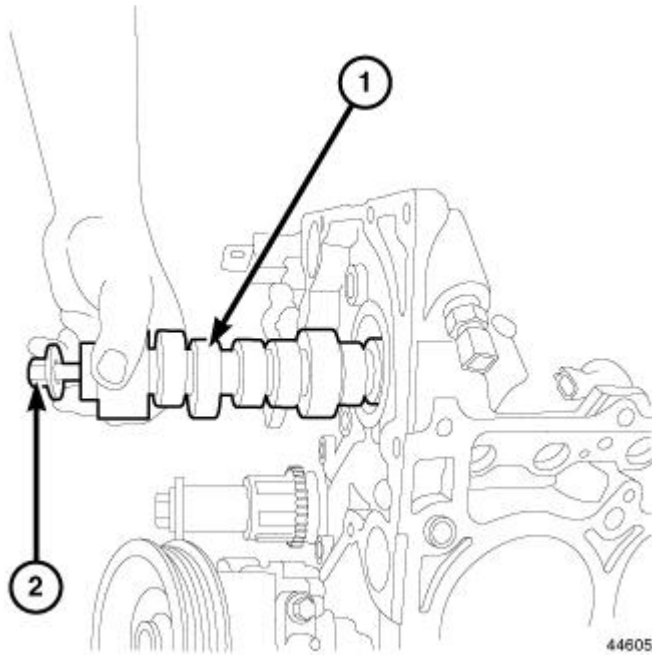


Fig. 168: Removing/Installing Camshaft
Courtesy of CHRYSLER GROUP, LLC

13. Install a long bolt (2) into the front of the camshaft to aid in removal.
14. Remove the camshaft using care not to damage the camshaft bearings with the camshaft lobes (1).

INSPECTION

INSPECTION

1. The cam bearings are not serviceable. Do not attempt to replace cam bearings for any reason.

INSTALLATION

5.7L / 6.4L - CAMSHAFT CORE HOLE PLUG

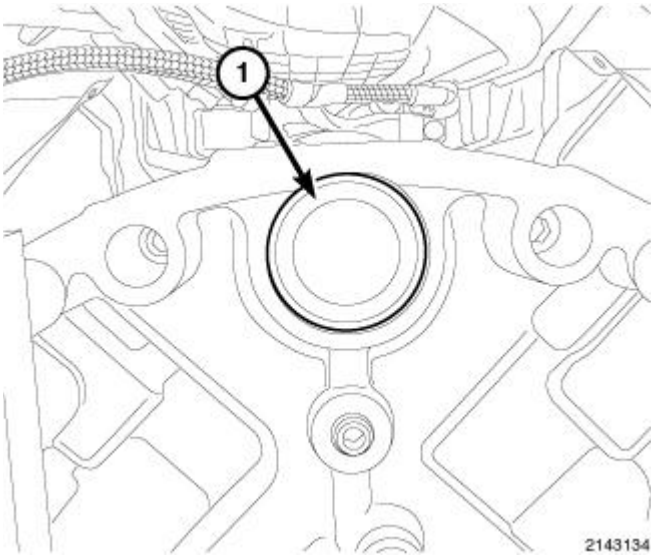


Fig. 169: Camshaft Core Hole Plug

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 Engine **INSTALLATION**.

CAMSHAFT

CAUTION: The 6.4L engine uses a unique camshaft for use with the Multi Displacement System (MDS). When installing a new camshaft, the replacement camshaft must be compatible with MDS.

CAUTION: Use care when installing the camshaft into the engine block, do not damage the camshaft bearings with the camshaft lobes.

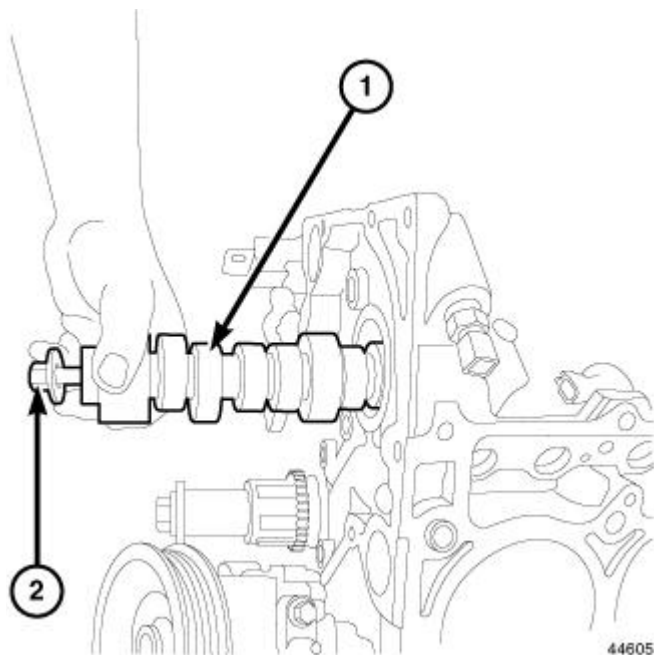


Fig. 170: Removing/Installing Camshaft
 Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the camshaft lobes (1) and the camshaft bearing journals with clean engine oil.
2. Install a long bolt (2) into the front of the camshaft to aid in the installation, carefully install the camshaft into the engine block.

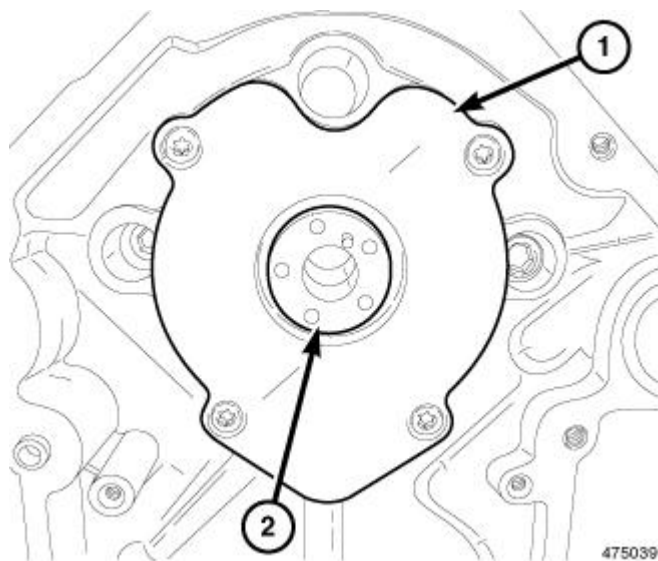


Fig. 171: Camshaft Thrust Plate
 Courtesy of CHRYSLER GROUP, LLC

3. Install the camshaft thrust plate (1) and tighten retaining bolts to 12 N.m (106 in. lbs.).

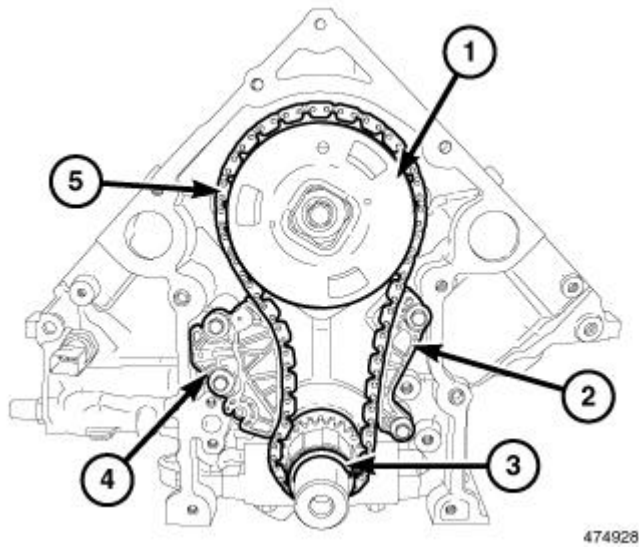


Fig. 172: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
Courtesy of CHRYSLER GROUP, LLC

4. Install the timing chain and camshaft phaser. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
5. Using a suitable dial indicator, measure the camshaft end play. Refer to Engine - **SPECIFICATIONS** . If not within specification, install a new thrust plate.

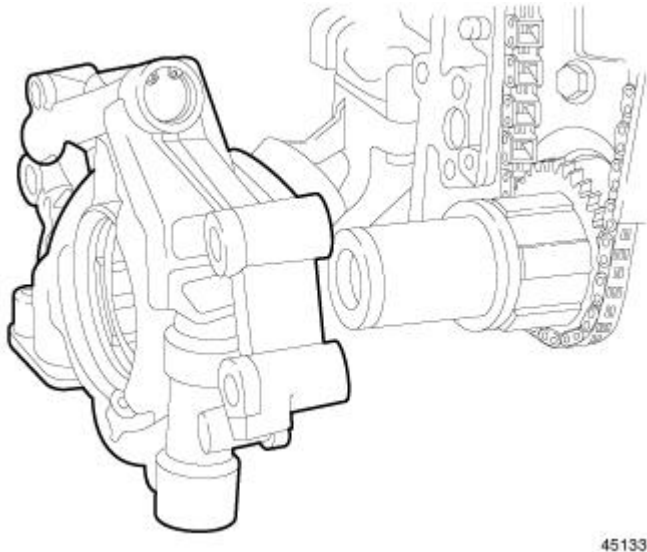
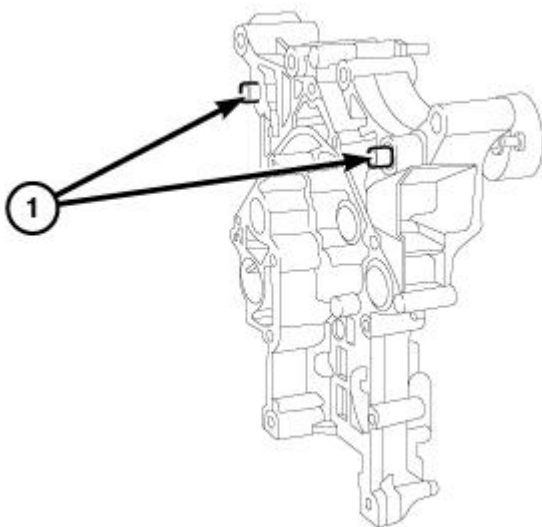


Fig. 173: Remove/Install Oil Pump
Courtesy of CHRYSLER GROUP, LLC

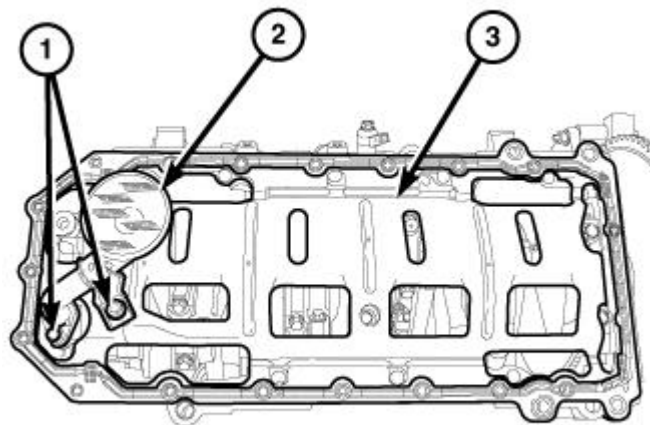
6. Install the oil pump. Refer to **PUMP, ENGINE OIL, INSTALLATION**.



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Fig. 174: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

7. Install the engine timing cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.
8. Raise and support vehicle.



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Fig. 175: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

9. Install the oil pump pickup tube (2) and oil pan. Refer to **PAN, OIL, INSTALLATION**.

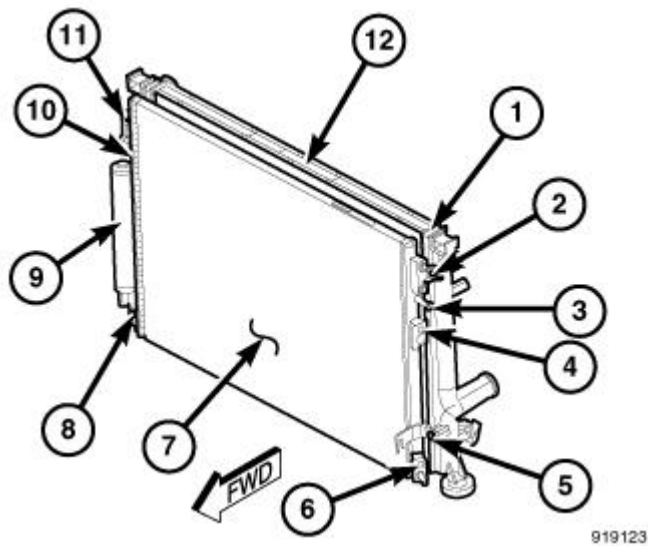


Fig. 176: A/C Condenser & Radiator
Courtesy of CHRYSLER GROUP, LLC

10. Install the A/C condenser (7). Refer to CONDENSER, A/C, INSTALLATION .
11. Install the radiator (12). Refer to RADIATOR, ENGINE COOLING, INSTALLATION .
12. Install the A/C compressor. Refer to COMPRESSOR, A/C, INSTALLATION .

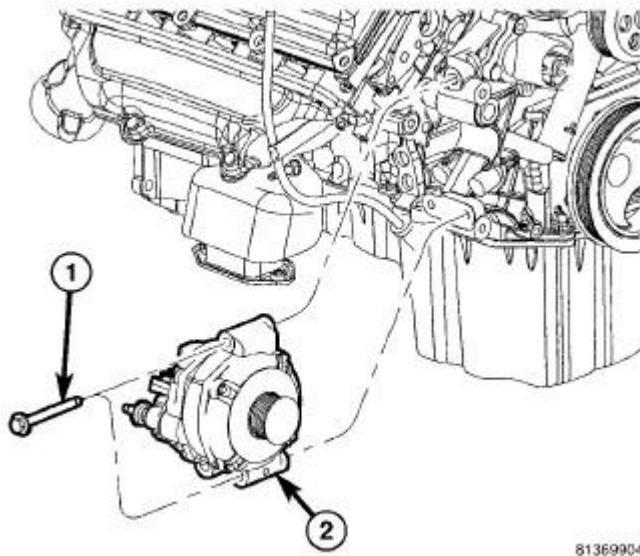


Fig. 177: Generator & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

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

CAUTION: The 6.4L Multi Displacement System (MDS) engine uses both standard roller lifters and deactivating roller lifters. 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, for the latching pins.

CAUTION: Whenever the camshaft is replaced, all lifters must be replaced. If the lifter and retainer assemblies are to be reused, identify the lifters to ensure installation in their original location or engine damage could result.

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

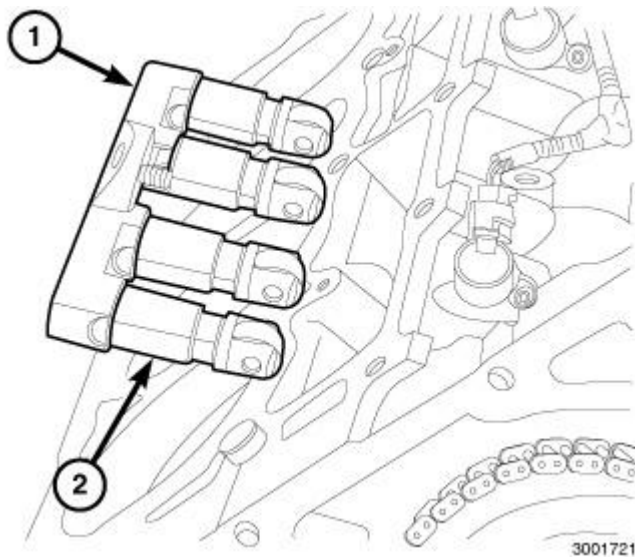


Fig. 178: Identifying Lifters & Retainers
Courtesy of CHRYSLER GROUP, LLC

14. Install the lifters (2) and retainer (1) as an assembly into their original location. Refer to **LIFTER(S), HYDRAULIC, ROLLER, INSTALLATION.**

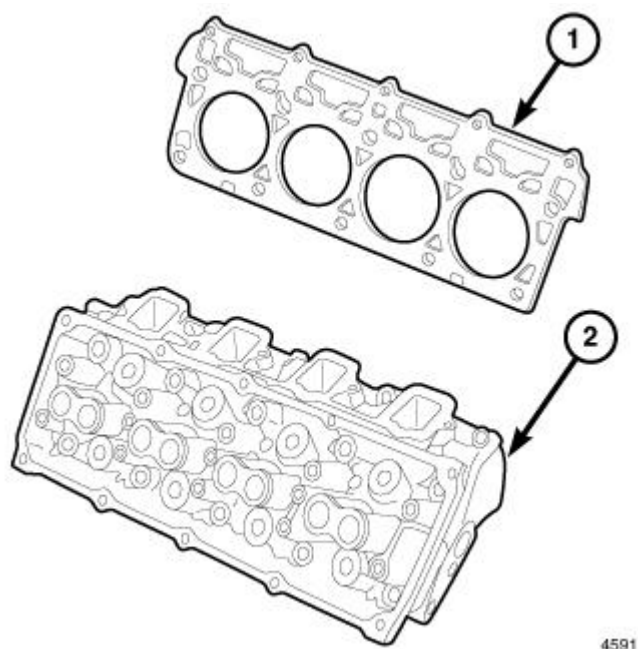


Fig. 179: Cylinder Head Components
Courtesy of CHRYSLER GROUP, LLC

15. Install both cylinder heads (2). Refer to **CYLINDER HEAD, INSTALLATION**.
16. Install the pushrods in the same location as removed.
17. Install the rocker arms Refer to **ROCKER ARM, VALVE, INSTALLATION**.

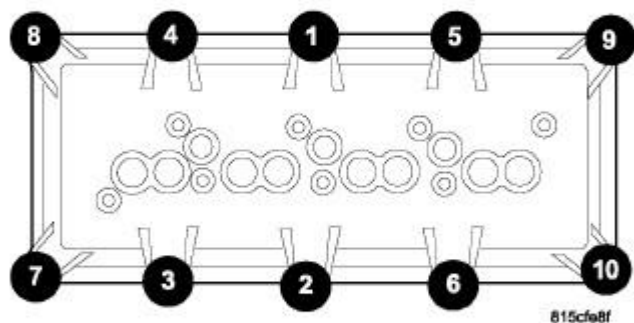


Fig. 180: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

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

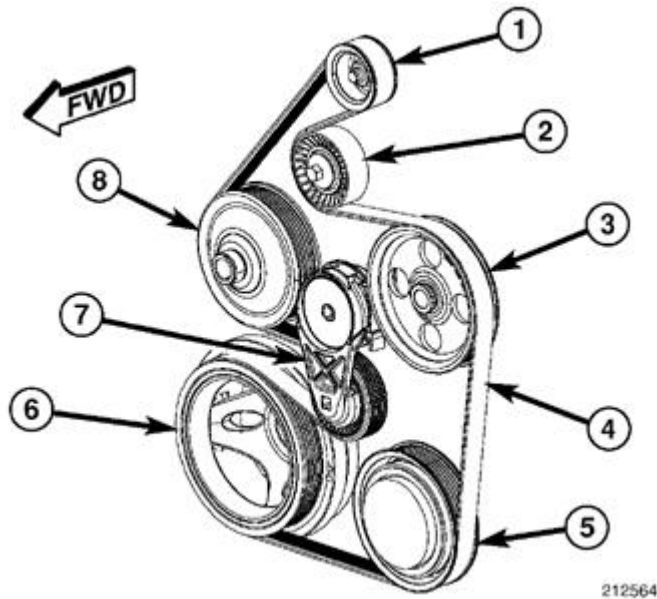


Fig. 181: Drive Belt Tensioners & Assembly With Drive Belt Routing
Courtesy of CHRYSLER GROUP, LLC

19. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.

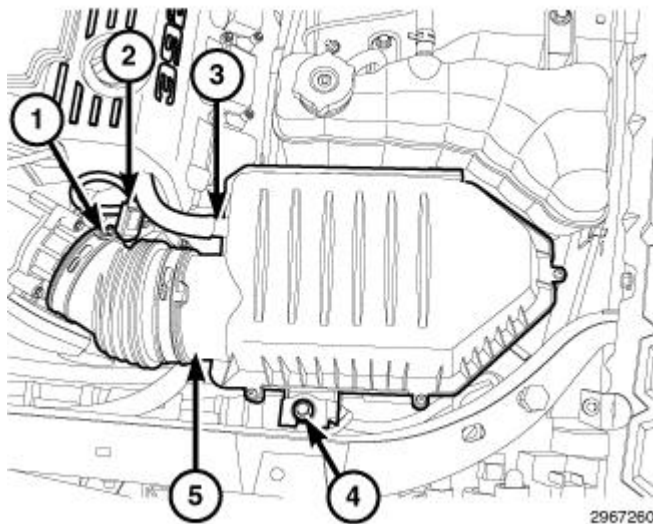


Fig. 182: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing
Courtesy of CHRYSLER GROUP, LLC

20. Install the air cleaner housing (5) and clean air tube (1).

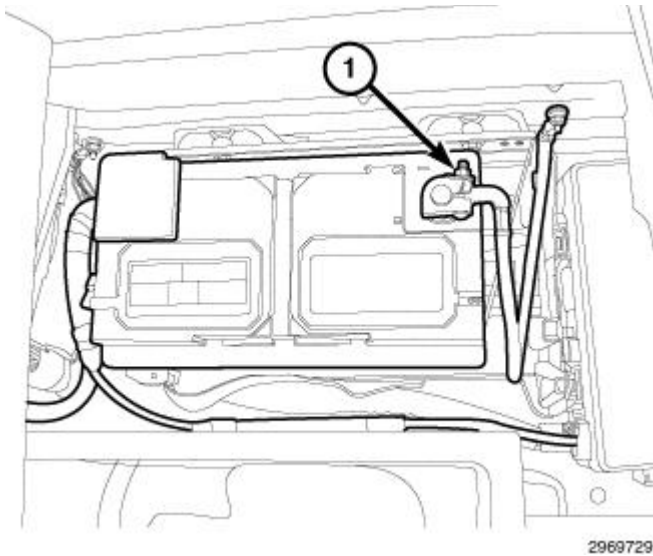


Fig. 183: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

21. Install the negative battery cable.
22. Fill the cooling system with the specified type and amount of engine coolant. Refer to Engine Cooling System **STANDARD PROCEDURE** .
23. Fill the crankcase with the specified type and amount of engine oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE** .

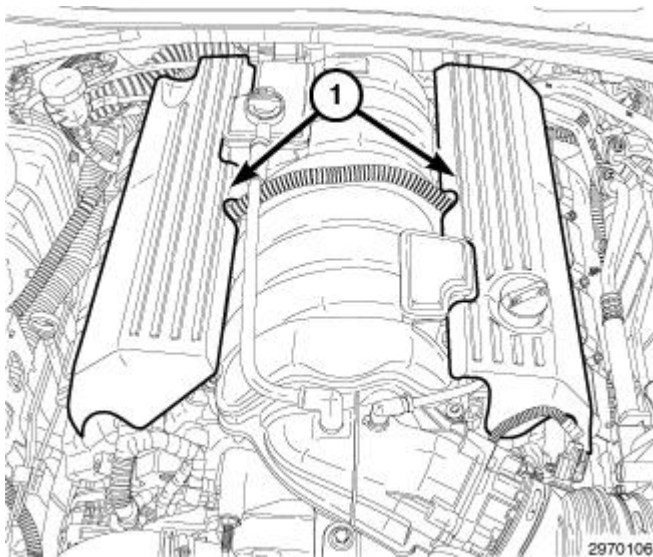


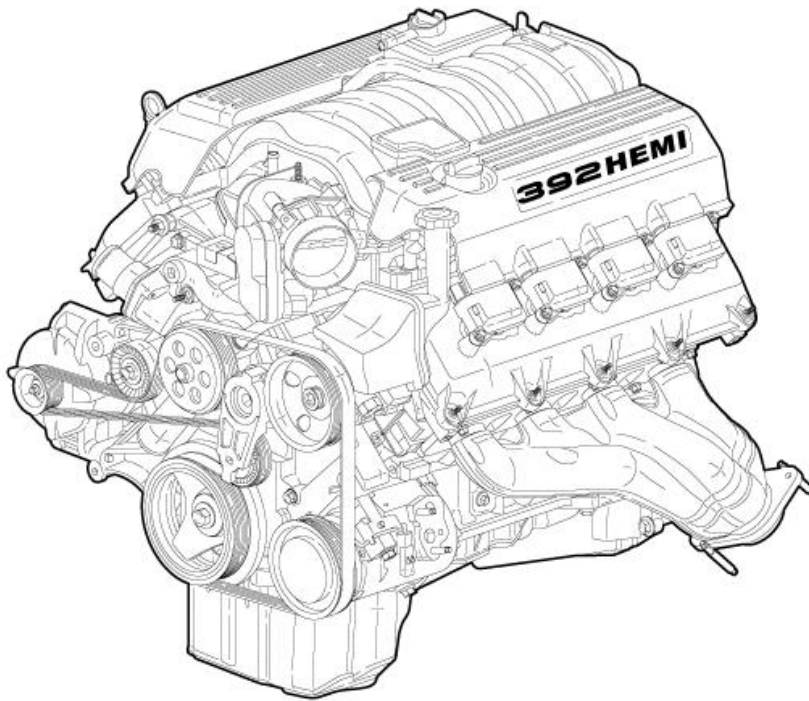
Fig. 184: Engine Covers
Courtesy of CHRYSLER GROUP, LLC

24. Install engine covers (1).
25. Start the engine and check for leaks.

CRANKSHAFT

REMOVAL**REMOVAL**

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

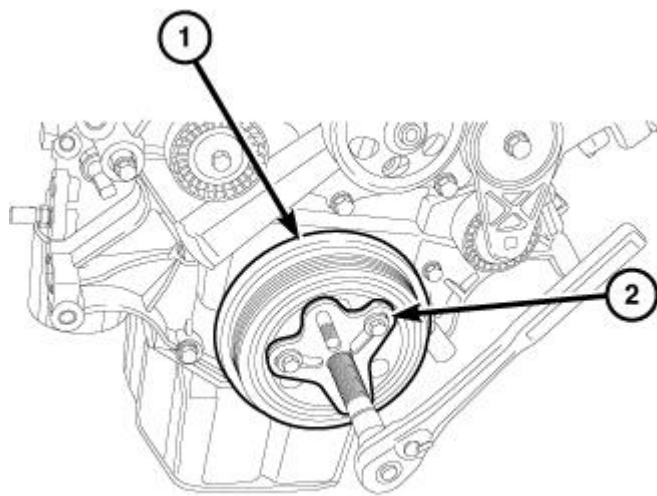


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Fig. 185: 6.4L HEMI V-8 Engine

Courtesy of CHRYSLER GROUP, LLC

1. Remove the engine. Refer to Engine **REMOVAL**.
2. Secure the engine onto a suitable engine stand.

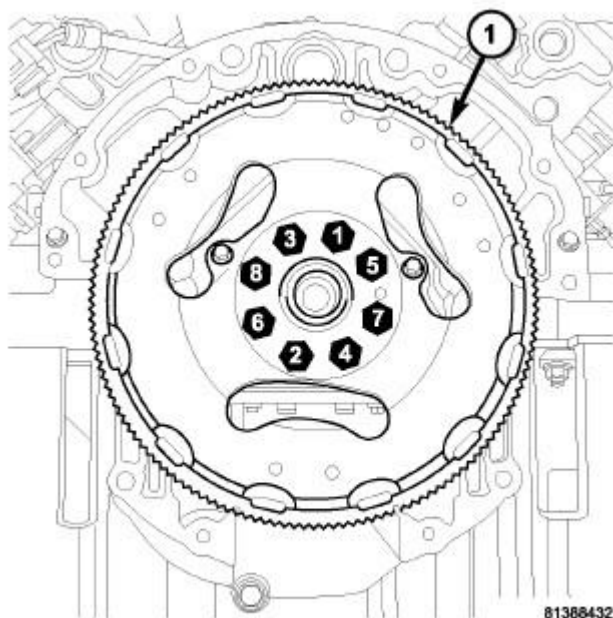


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Fig. 186: Vibration Damper & Bolt Grip Puller
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the puller tool, ensure the bolts are fully threaded through the entire crankshaft damper.

3. Remove the crankshaft damper retaining bolt.
4. Install the puller tool (2) making sure the bolts are fully threaded through the entire crankshaft damper.
5. Remove the crankshaft damper (1).

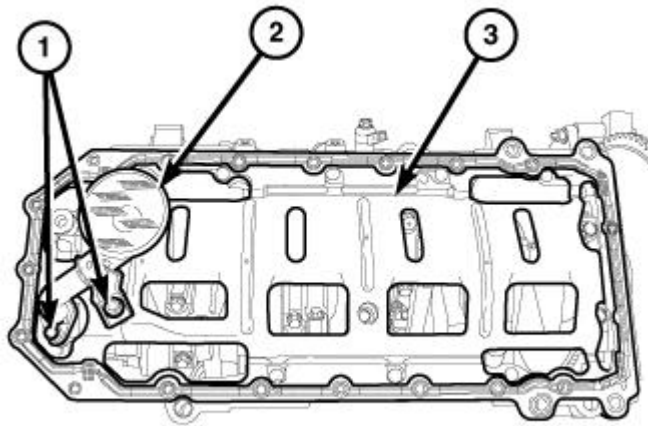


81388432

Fig. 187: Flex Plate Bolt Removal/Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

6. Remove the flexplate (1). Refer to **FLEXPLATE, REMOVAL**.



2970744

Fig. 188: 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.

7. Remove the oil pan and the oil pump pickup tube (2). Refer to **PAN, OIL, REMOVAL**.
8. Remove and discard the oil pan gasket/windage tray (3).

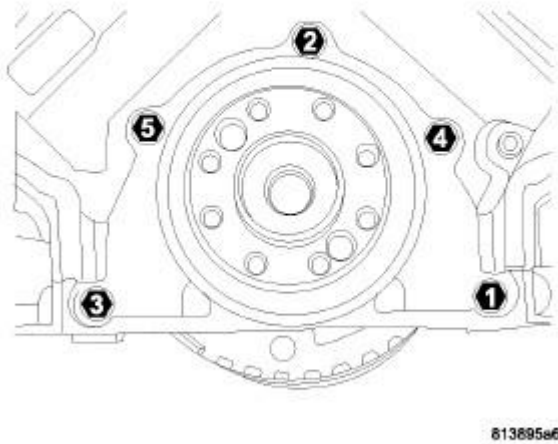


Fig. 189: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

9. Remove the crankshaft rear oil seal retainer. Refer to **RETAINER, CRANKSHAFT REAR OIL SEAL, REMOVAL.**

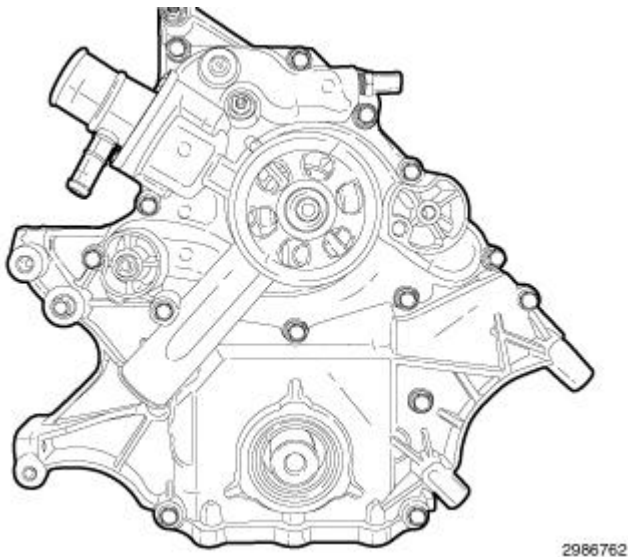
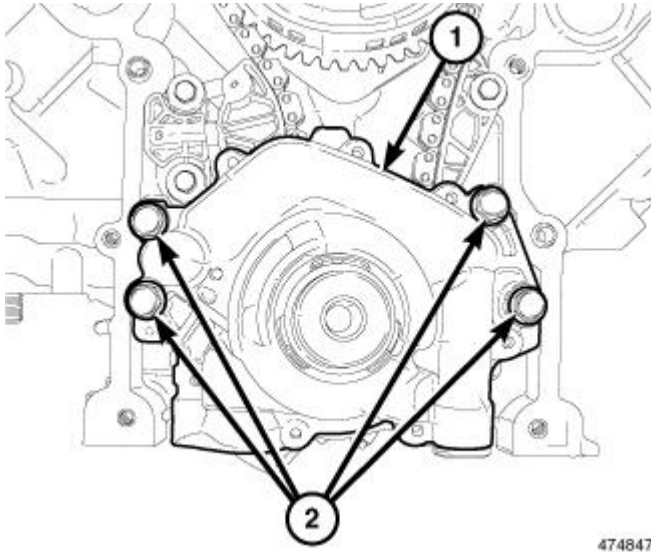


Fig. 190: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

10. Remove the engine timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL.**

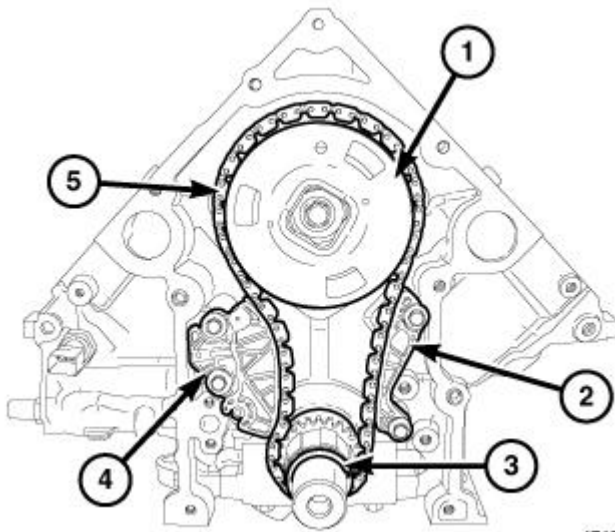


474847

Fig. 191: Oil Pump Retaining Bolts

Courtesy of CHRYSLER GROUP, LLC

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



474928

Fig. 192: Timing Chain, Sprockets, Timing Chain Tensioner & Guide

Courtesy of CHRYSLER GROUP, LLC

12. Remove the timing chain (5), camshaft phaser (1) and crankshaft sprocket (3). Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL**.

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

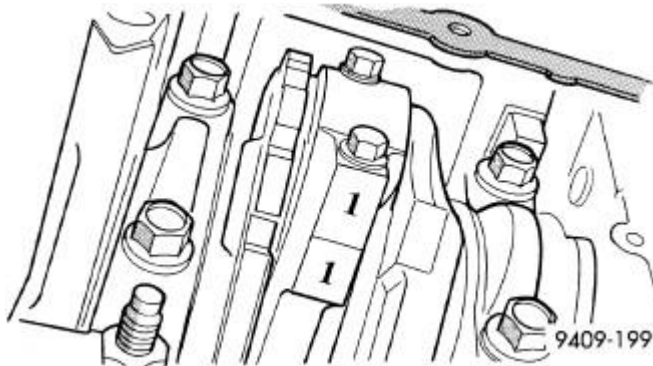
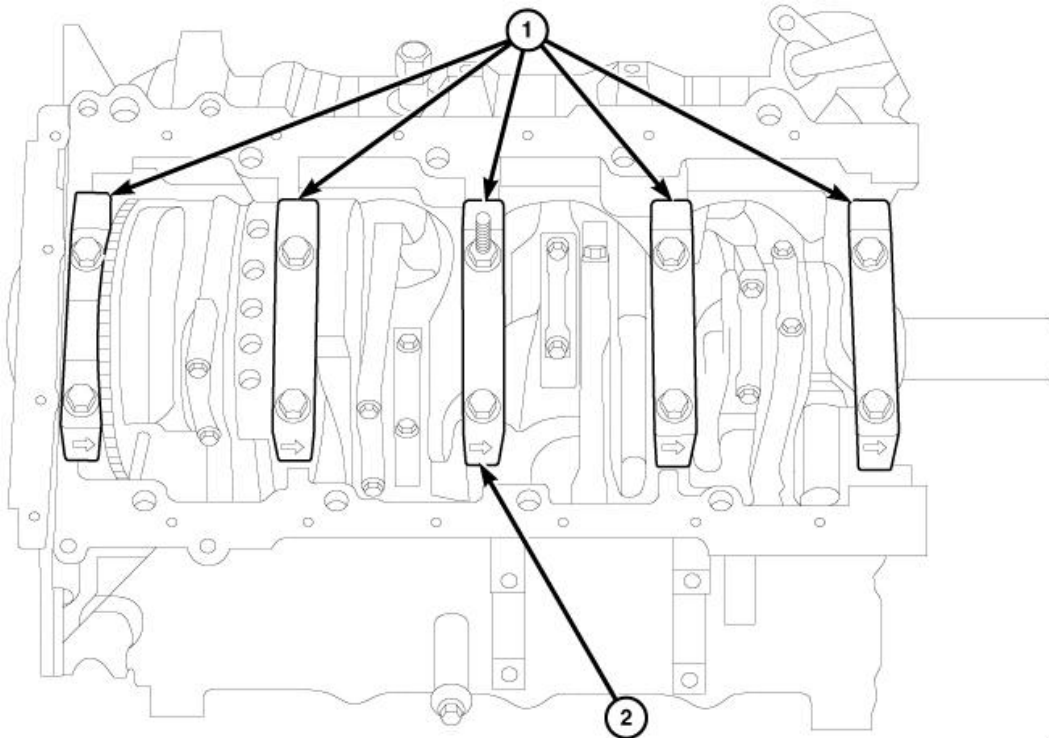


Fig. 193: Identifying Mark On Connecting Rod And Bearing Cap
Courtesy of CHRYSLER GROUP, LLC

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

13. Mark the connecting rod and bearing cap location using a permanent ink marker or scribe tool.
14. Remove the rod bearing caps and bearings.

CAUTION: Do not use a number stamp or a punch to mark main bearing caps as damage to bearing caps and/or bearings could occur.



44625

Fig. 194: Main Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

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

15. Mark the main bearing caps (1) using a permanent ink marker or scribe tool.
16. Remove the main bearing cap bolts.
17. Remove the main bearing cap crossbolts.

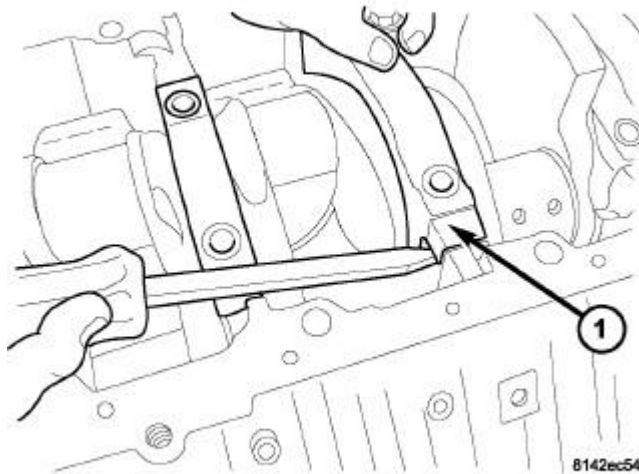


Fig. 195: Main Bearing Cap Removal
Courtesy of CHRYSLER GROUP, LLC

18. Remove main bearing caps (1) and bearings one at a time.

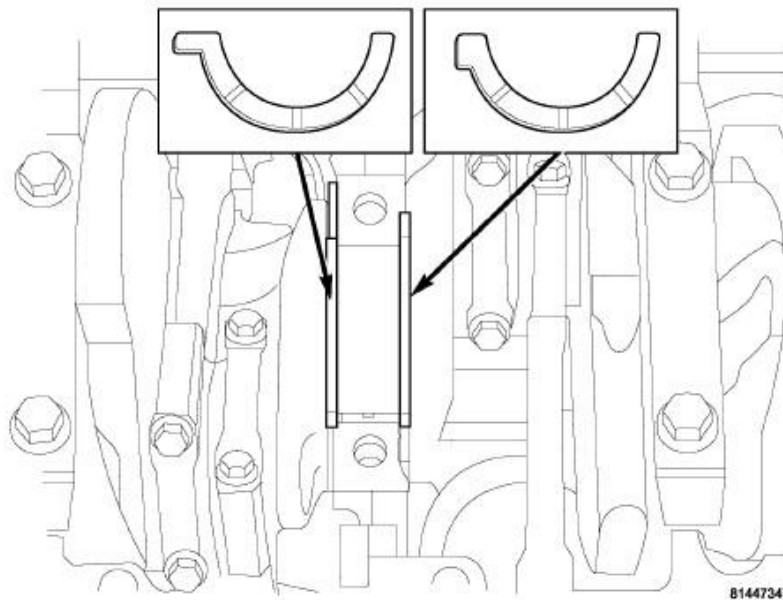


Fig. 196: Identifying Thrust Washer Locations
Courtesy of CHRYSLER GROUP, LLC

19. Remove the thrust bearings.

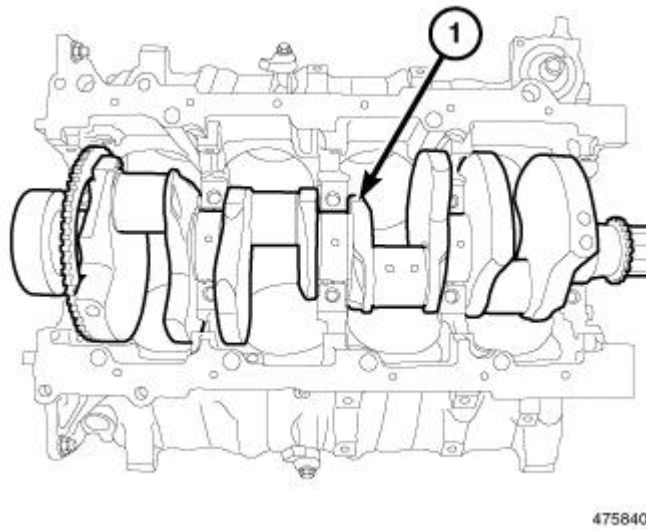


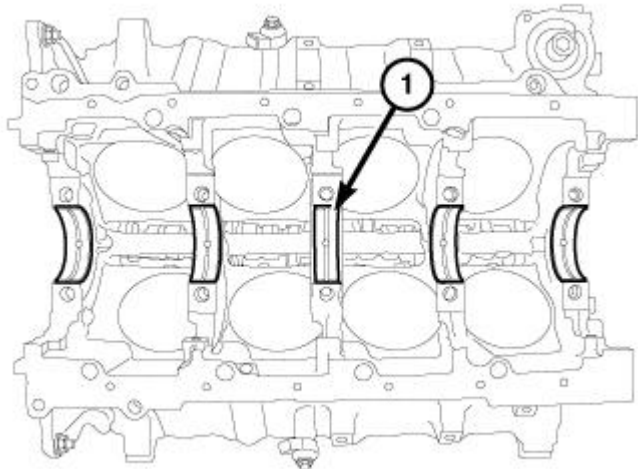
Fig. 197: Crankshaft
Courtesy of CHRYSLER GROUP, LLC

20. Remove the crankshaft (1) out of the engine block.

INSTALLATION

INSTALLATION

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

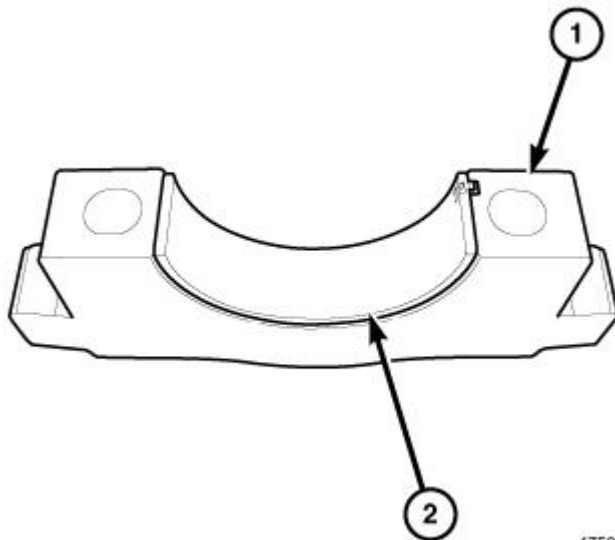


475697

Fig. 198: Main Bearings

Courtesy of CHRYSLER GROUP, LLC

1. Select the proper main bearings (1). Refer to Engine/Engine Block/BEARING(S), Crankshaft, Main - **STANDARD PROCEDURE**.
2. Lubricate the main bearing shells with clean engine oil.
3. Install the main bearings into the engine block.

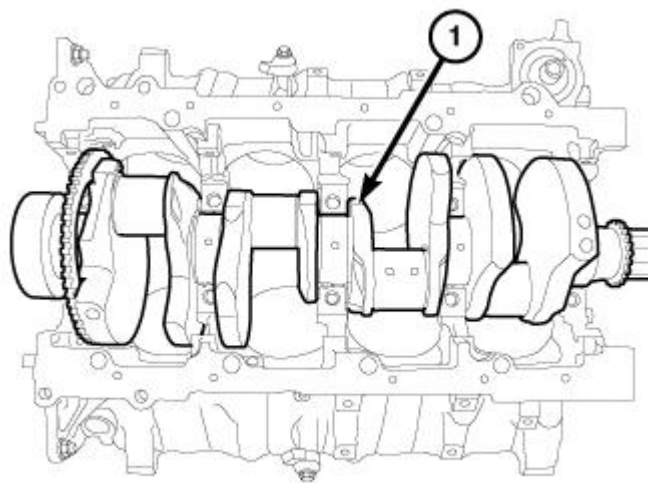


475850

Fig. 199: Main Bearing Shells In The Bearing Caps

Courtesy of CHRYSLER GROUP, LLC

4. Install the main bearing shells (2) into the bearing caps (1).

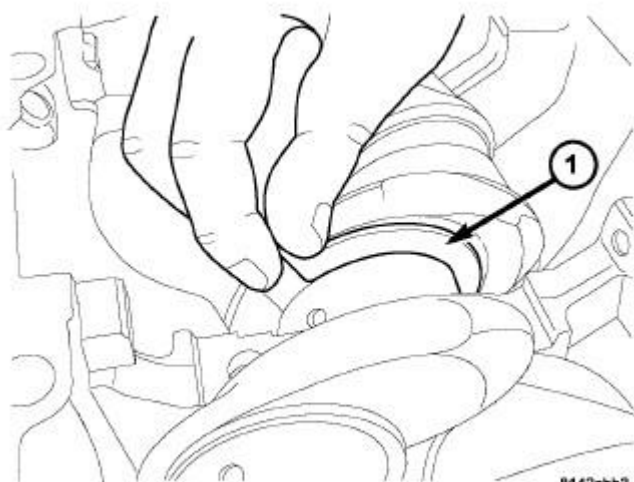


475840

Fig. 200: Crankshaft

Courtesy of CHRYSLER GROUP, LLC

5. Position the crankshaft (1) into the engine block.

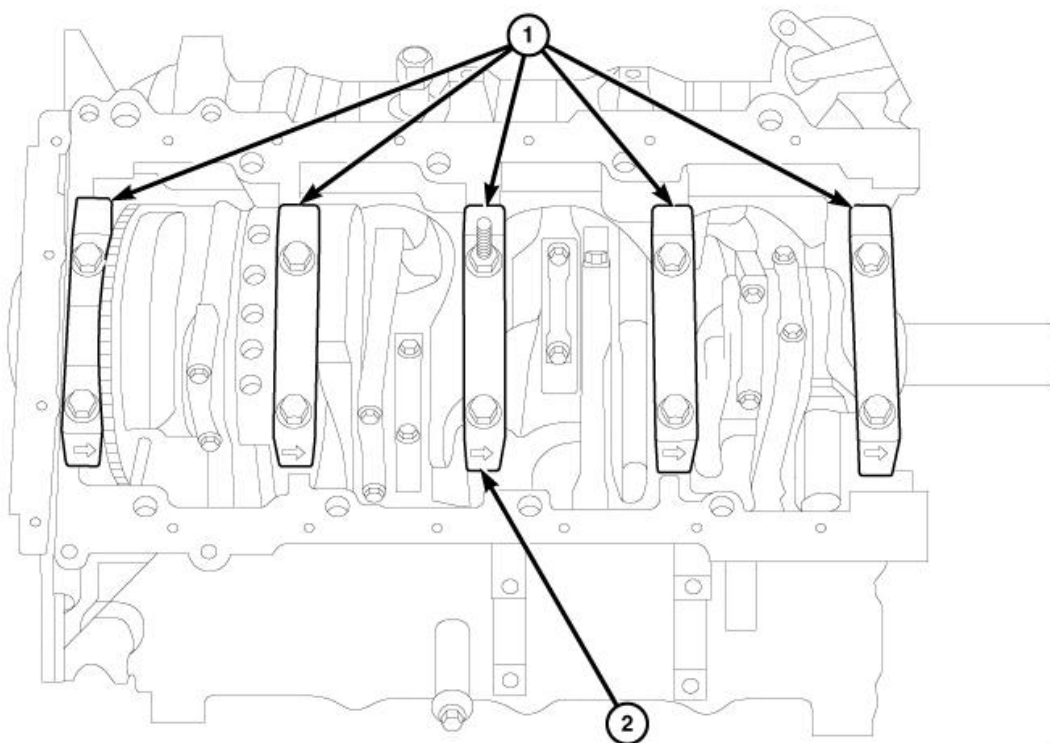


8142ebb3

Fig. 201: Thrust Washer Installation

Courtesy of CHRYSLER GROUP, LLC

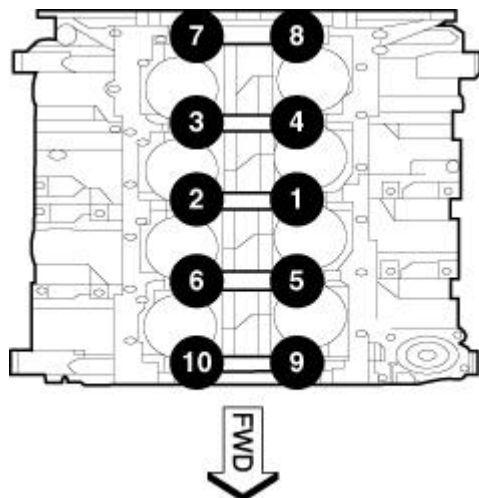
6. Lubricate and install the thrust bearings (1).



44625

Fig. 202: Main Bearing Caps
Courtesy of CHRYSLER GROUP, LLC

7. Install all main bearing caps (1) in the location as noted during removal making sure the arrow (2) faces forward.
8. Clean and oil all main cap bolts and install finger tight.

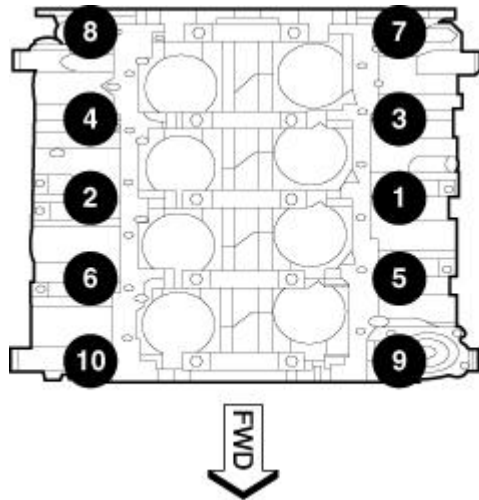


4715

Fig. 203: Main Bearing Cap Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

9. Using the sequence shown in illustration, tighten the main bearing cap bolts to 13 N.m (10 ft. lbs.).

10. Again, using the sequence shown in illustration, tighten the main bearing cap bolts to 28 N.m (21 ft. lbs.).
11. Using the sequence shown in illustration, rotate the main bearing cap bolts an additional 90°.



161728

Fig. 204: Crossbolt Tightening Sequence
 Courtesy of CHRYSLER GROUP, LLC

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

12. Install the crossbolts with new seal washers finger tight.
13. Using the sequence shown in illustration, tighten the crossbolts to 31 N.m (23 ft. lbs.).
14. Again, using the sequence shown in illustration, repeat the crossbolt tightening procedure.
15. Measure the crankshaft end play. Refer to Engine/Engine Block/BEARING(S), Crankshaft, Main - **STANDARD PROCEDURE**.

CAUTION: The connecting rod bolts must not be reused. Always replace the connecting rod bolts whenever they are loosened or removed.

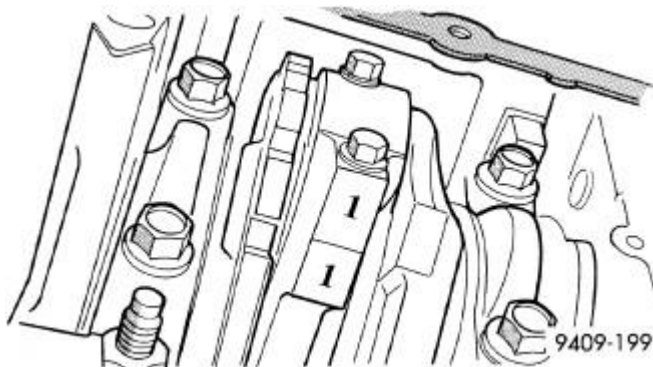


Fig. 205: Identifying Mark On Connecting Rod And Bearing Cap
 Courtesy of CHRYSLER GROUP, LLC

16. Wipe the connecting rod caps clean and install the rod bearings.
17. Lubricate the bearing surfaces with clean engine oil and install the bearings and connecting rod caps onto the connecting rod journals in the same location as noted during removal.
18. Lubricate the new connecting rod bolts with clean engine oil and install the bolts finger tight.
19. Tighten the connecting rod bolts to 21 N.m (15 ft. lbs.) plus an additional 90° turn.

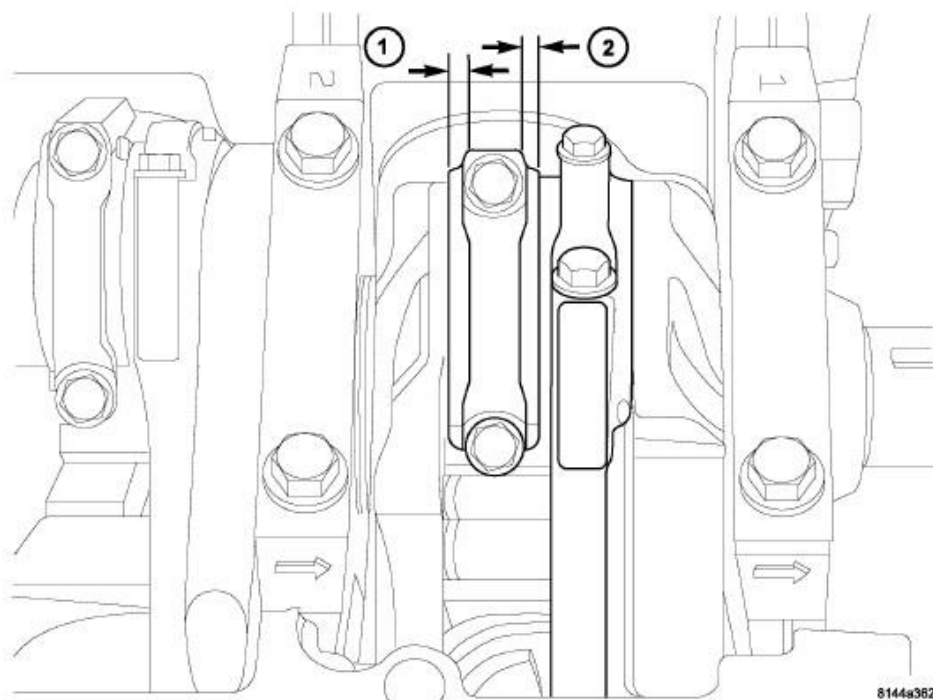


Fig. 206: Identifying Connecting Rod Proper Installation
Courtesy of CHRYSLER GROUP, LLC

20. If required, measure the connecting rod side clearance (1, 2). Refer to Engine - **SPECIFICATIONS** .

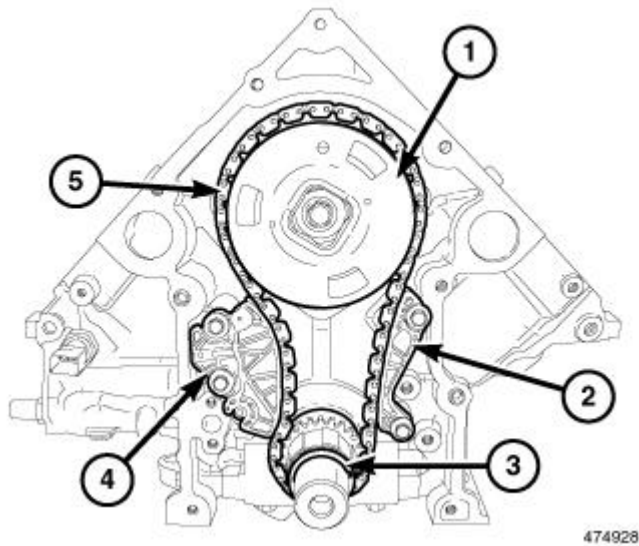


Fig. 207: Timing Chain, Sprockets, Timing Chain Tensioner & Guide
Courtesy of CHRYSLER GROUP, LLC

21. Install the timing chain (5), camshaft phaser (1) and crankshaft sprocket (3). Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
22. Position the oil pump on the crankshaft and install the oil pump retaining bolts finger tight.

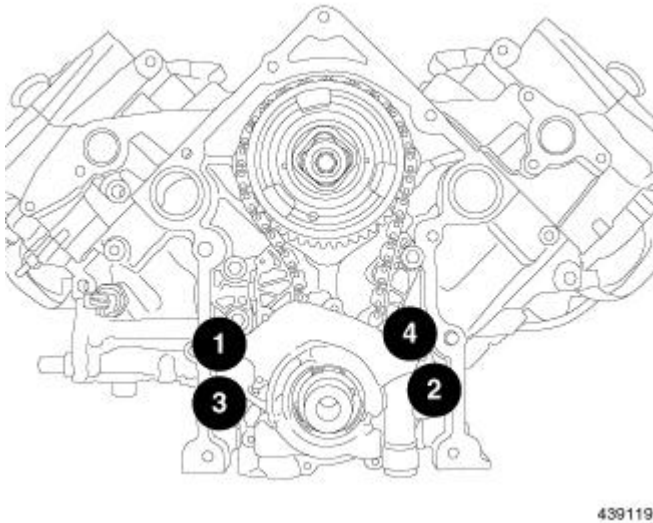
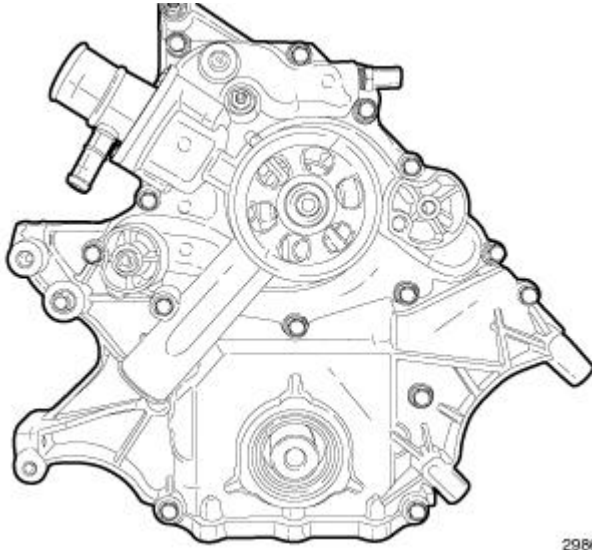


Fig. 208: Oil Pump Retaining Bolt Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

23. Using the sequence shown in illustration, tighten the oil pump retaining bolts to 28 N.m (21 ft. lbs.).



2966762

Fig. 209: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

24. Install the engine timing cover (1). Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.

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.

25. Thoroughly clean all gasket residue from the engine block.
26. Position the gasket onto the new crankshaft rear oil seal retainer.
27. Position the crankshaft rear oil seal retainer onto the engine block.

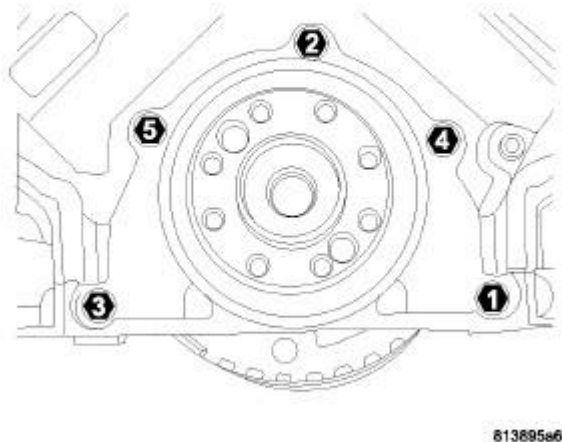


Fig. 210: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

28. Using the sequence shown in illustration, install the crankshaft rear oil seal retainer mounting bolts and tighten to 15 N.m (11 ft. lbs.).

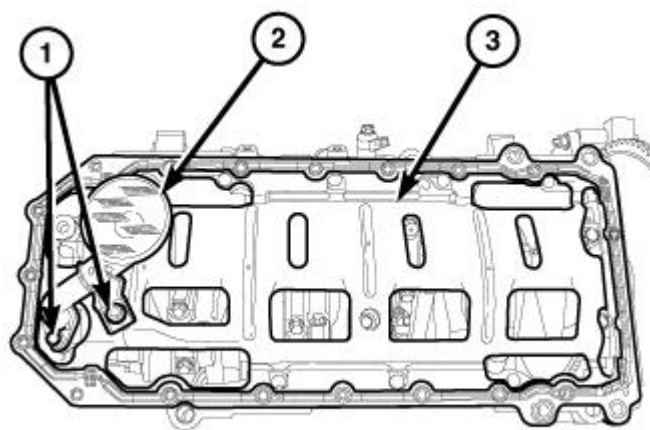


Fig. 211: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

29. Install the oil pump pickup tube (2) and oil pan. Refer to **PAN, OIL, INSTALLATION**.

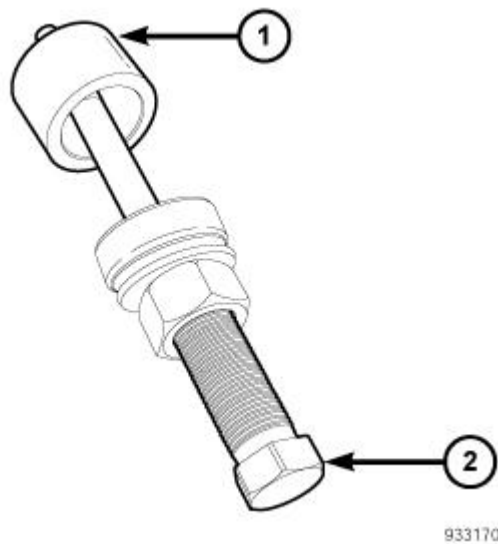


Fig. 212: Removing/Installing Crankshaft Damper Bolt
Courtesy of CHRYSLER GROUP, LLC

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

30. Position the damper on the crankshaft.

CAUTION: The Damper Installer is assembled in a specific sequence. Failure to assemble this tool in this sequence may result in tool failure and severe damage to either the tool or the crankshaft.

31. Assemble the Damper Installer (special tool #8512A, Installer, Damper) (2) as follows:
1. Install the nut onto the threaded shaft.
 2. Install the roller bearing onto the threaded shaft making sure the hardened bearing surface is facing the nut.
 3. Install the pressing cup (2) from the A/C Hub Installer (special tool #6871, Installer, A/C Hub) onto the threaded shaft.
 4. Coat the threaded shaft with MOPAR® Nickel Anti-Seize or equivalent.

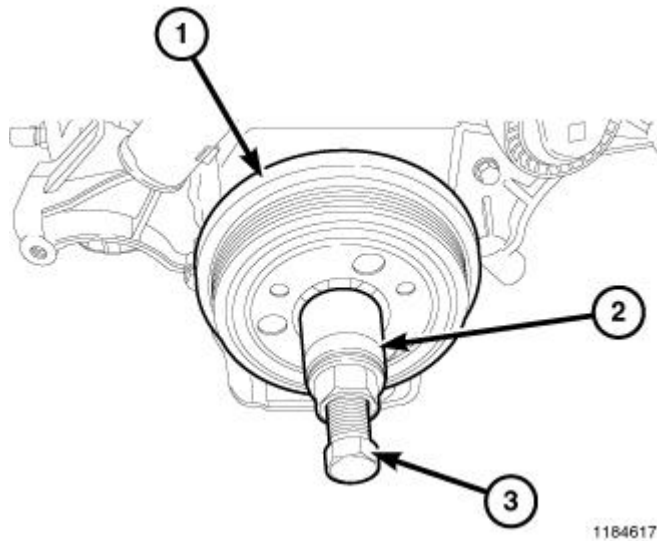


Fig. 213: Pressing Damper Onto Crankshaft
Courtesy of CHRYSLER GROUP, LLC

32. Using the Damper Installer (special tool #8512A, Installer, Damper) (3) and the pressing cup (2) from A/C Hub Installer (special tool #6871, Installer, A/C Hub), press the crankshaft damper (1) onto the crankshaft.
33. Install the crankshaft damper bolt and tighten to 176 N.m (129 ft. lbs.).

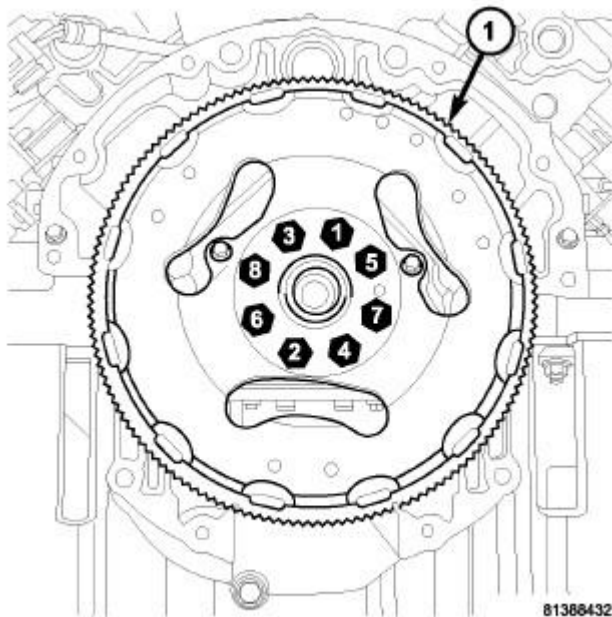
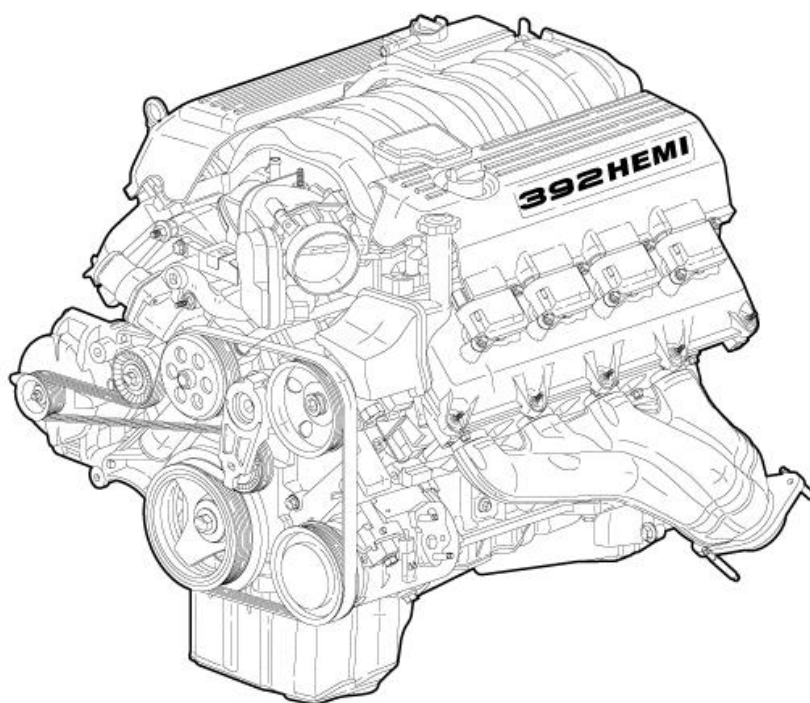


Fig. 214: Flex Plate Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

34. Install the flexplate (1). Refer to **FLEXPLATE, INSTALLATION**.



2981007

Fig. 215: 6.4L HEMI V-8 Engine
Courtesy of CHRYSLER GROUP, LLC

35. Install the engine. Refer to Engine **INSTALLATION**.
36. Start the engine and check for leaks.

DAMPER, VIBRATION

DESCRIPTION

DESCRIPTION

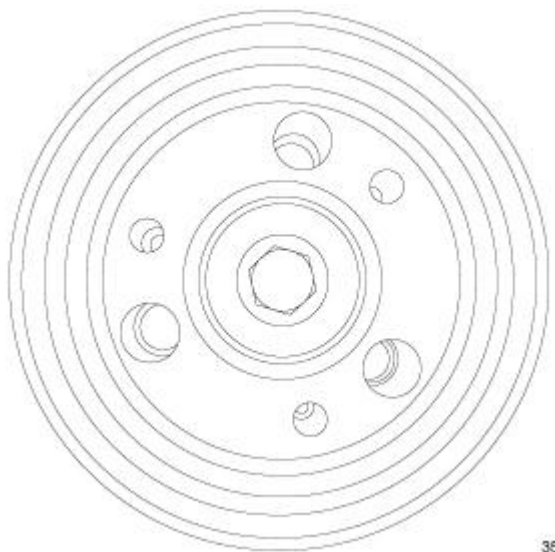
The crankshaft damper is used to control the resonance that is produced by the engine. The Noise, Vibration, and Harshness (NVH) created from the crankshaft can be controlled by dissipating the torque energy through the damper.



3548067

Fig. 216: Crankshaft Damper & Harden Steel Bolt
Courtesy of CHRYSLER GROUP, LLC

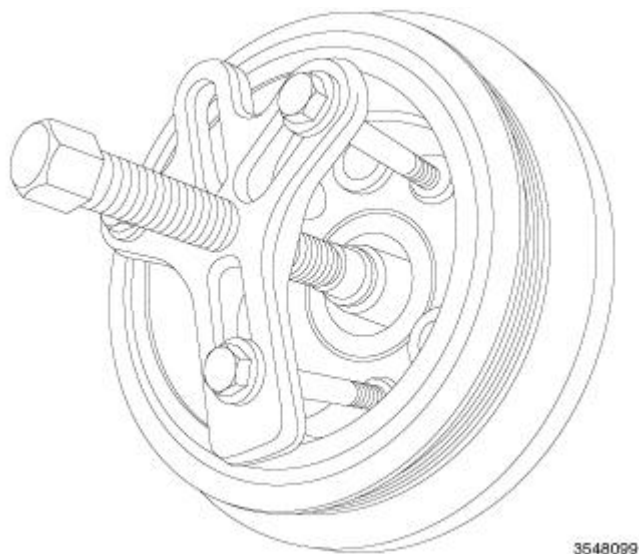
The crankshaft damper on the engines is held to the crankshaft by means of a harden steel bolt. The damper is pressed onto a specific machined surface of the crankshaft.



3548080

Fig. 217: HEMI® Engine Crankshaft Damper
Courtesy of CHRYSLER GROUP, LLC

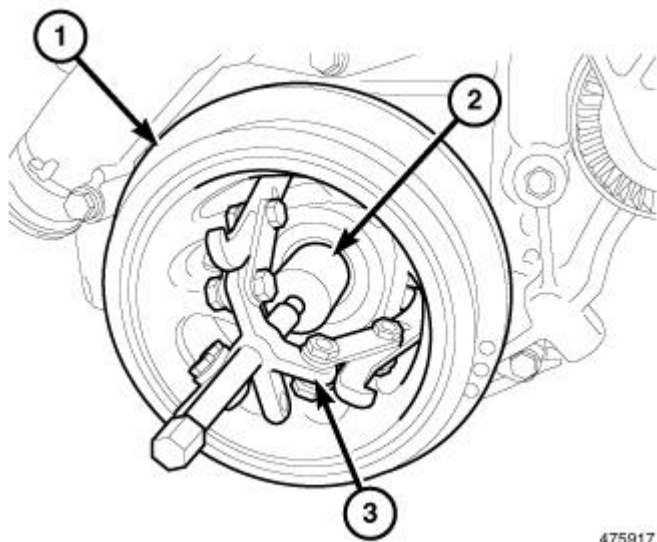
The HEMI® Engines incorporate various crankshaft vibration dampers depending on the engine application. And can be removed depending on the application used.



3548099

Fig. 218: Removing Vibration Damper
 Courtesy of CHRYSLER GROUP, LLC

Finding the proper puller for the application will ensure no damage will come to the damper. The flange puller is used by installing 3 bolts into the pre-tapped holes in the damper.



475917

Fig. 219: Removing Vibration Damper
 Courtesy of CHRYSLER GROUP, LLC

Some pulleys that do not have bolt holes can be removed with a three jaw style (special tool #1023, Puller).

REMOVAL

REMOVAL

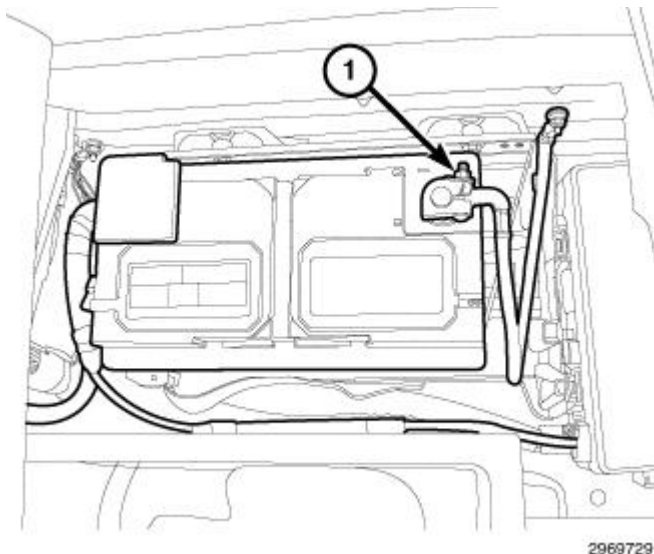


Fig. 220: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).
2. Drain the cooling system. Refer to Engine Cooling System **STANDARD PROCEDURE** .

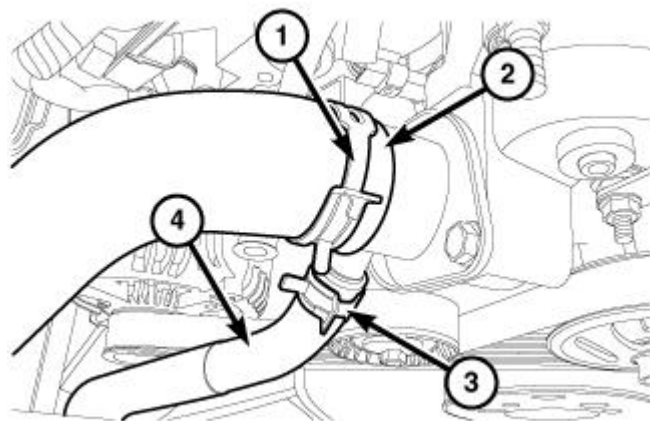


Fig. 221: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp

Courtesy of CHRYSLER GROUP, LLC

3. Remove the upper radiator hose clamps (1) and remove the upper radiator hose (2).
4. Remove the oil cooler hose clamp (3) and remove oil cooler hose (4) and position aside.

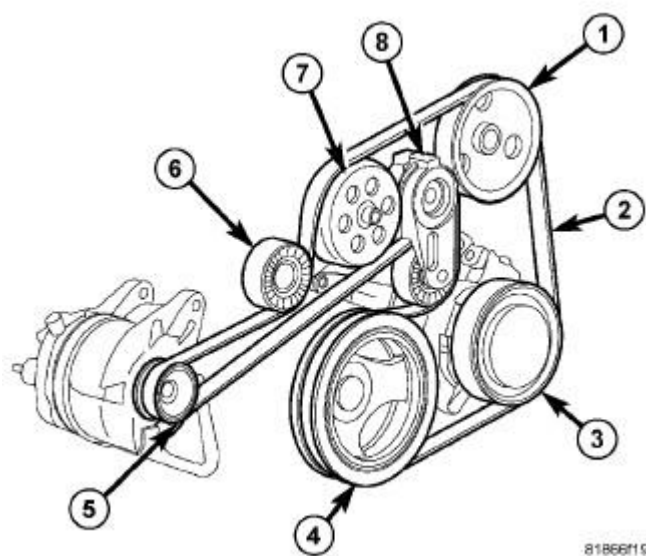


Fig. 222: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

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

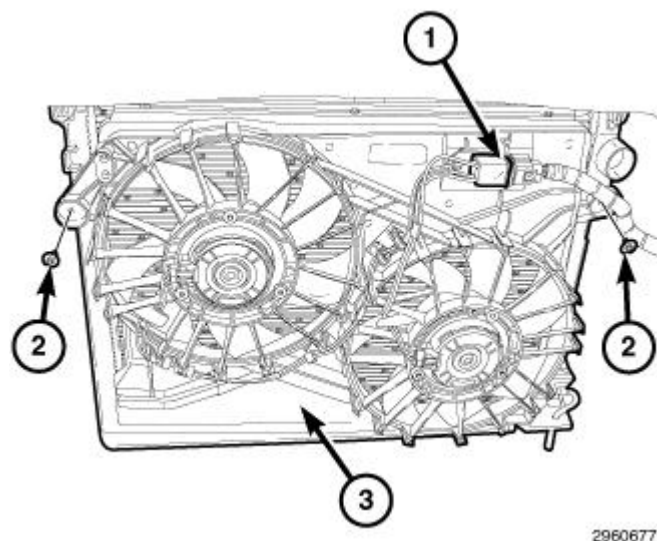


Fig. 223: Cooling Fan Electrical Connector, Cooling Fan Mounting Bolts & Radiator Cooling Fan Assembly
Courtesy of CHRYSLER GROUP, LLC

6. Remove the cooling fan assembly. Refer to **FAN, COOLING, REMOVAL** .

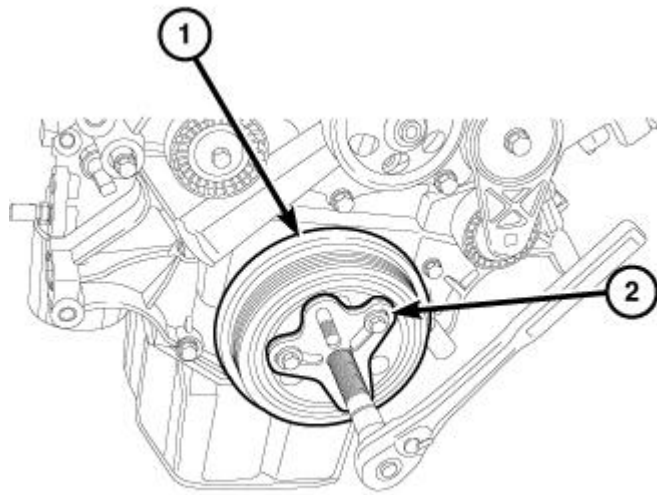


Fig. 224: Vibration Damper & Bolt Grip Puller
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the puller tool, ensure the bolts are fully threaded through the entire crankshaft damper.

7. Remove the vibration damper bolt.
8. Install the puller tool (2) making sure the bolts are fully threaded through the entire crankshaft damper.
9. Remove the crankshaft damper (1).

INSTALLATION

INSTALLATION

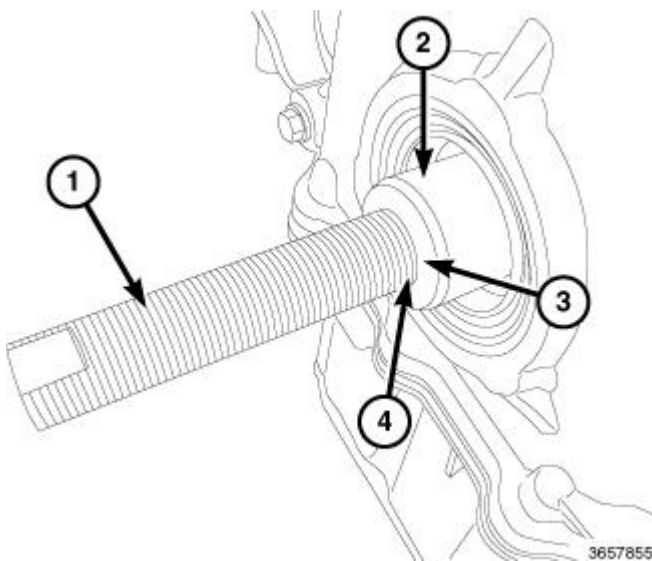


Fig. 225: Installing Vibration Damper Onto Crankshaft Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

1. Using (special tool #10387, Installer, Vibration Damper), install the threaded rod (1) onto the crankshaft (2).
2. Tighten the threaded rod (4) until it is seated to the face (3) of the crankshaft.

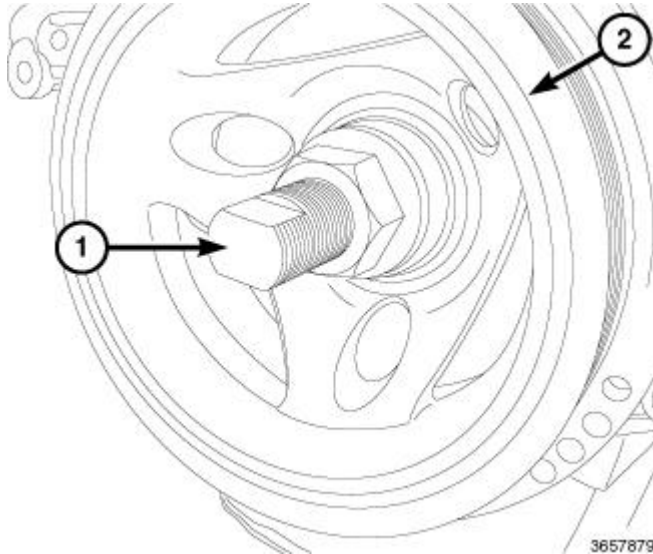


Fig. 226: Installing Vibration Damper
 Courtesy of CHRYSLER GROUP, LLC

3. Position the damper (2) on the crankshaft.
4. Install the press washer, bearing, washer, and the press nut onto the threaded rod.
5. Using Damper Installer (1) and a deep well socket, press the damper onto the crankshaft till seated.

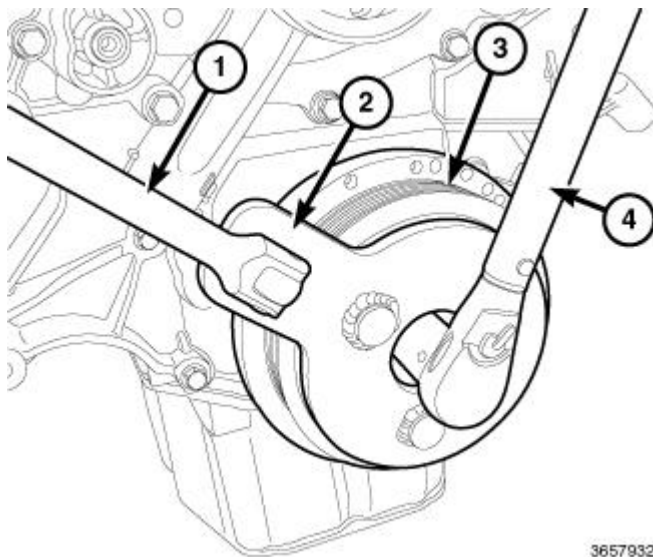


Fig. 227: Installing Vibration Damper
 Courtesy of CHRYSLER GROUP, LLC

6. Install the vibration damper bolt.

7. Position the (special tool #10386, Holder, Vibration Damper) (2), onto the vibration pulley (3).
8. Tighten the bolt to 250 N.m (184 ft. lbs.).

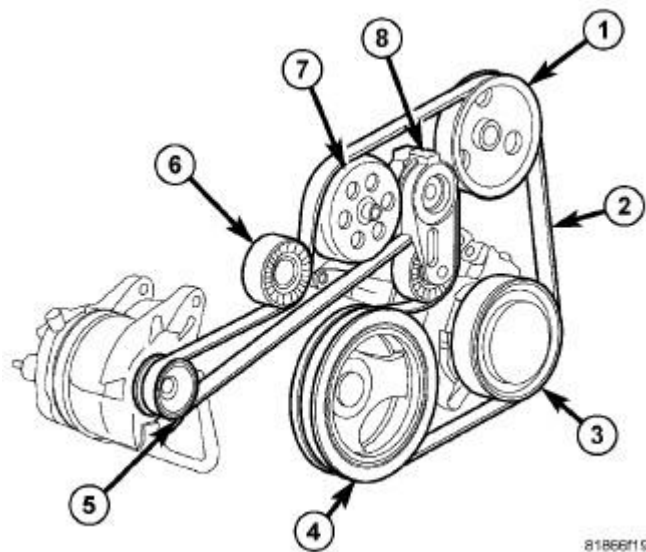


Fig. 228: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

9. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .

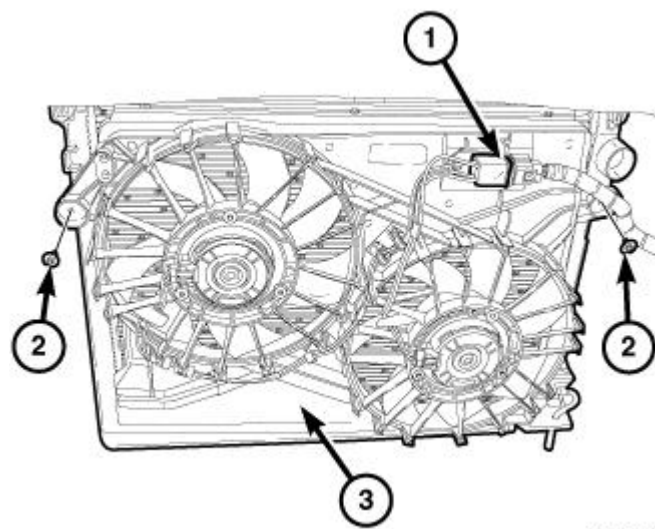
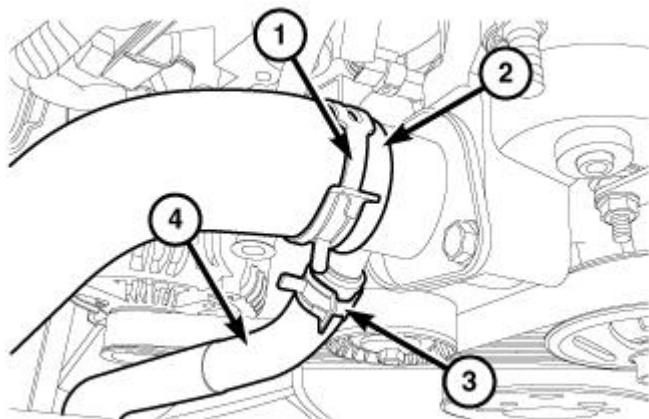


Fig. 229: Cooling Fan Electrical Connector, Cooling Fan Mounting Bolts & Radiator Cooling Fan Assembly
Courtesy of CHRYSLER GROUP, LLC

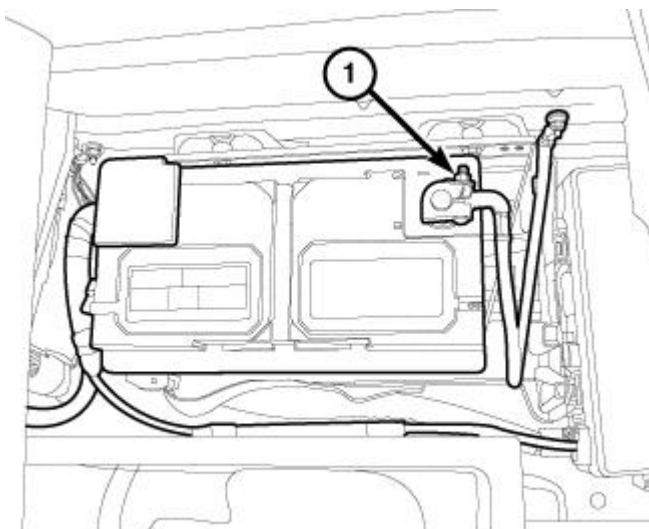
10. Install the cooling fan. Refer to **FAN, COOLING, INSTALLATION** .



2968475

Fig. 230: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
 Courtesy of CHRYSLER GROUP, LLC

11. Install the oil cooler hose (4) and clamp (3).
12. Install the upper radiator hose (2) and clamp (1).
13. Refill the cooling system. Refer to Engine Cooling System **STANDARD PROCEDURE** .



2969729

Fig. 231: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

14. Connect the negative battery cable (1).

FLEXPLATE

REMOVAL

REMOVAL

1. Remove the transmission. Refer to NAG1 - **REMOVAL** .

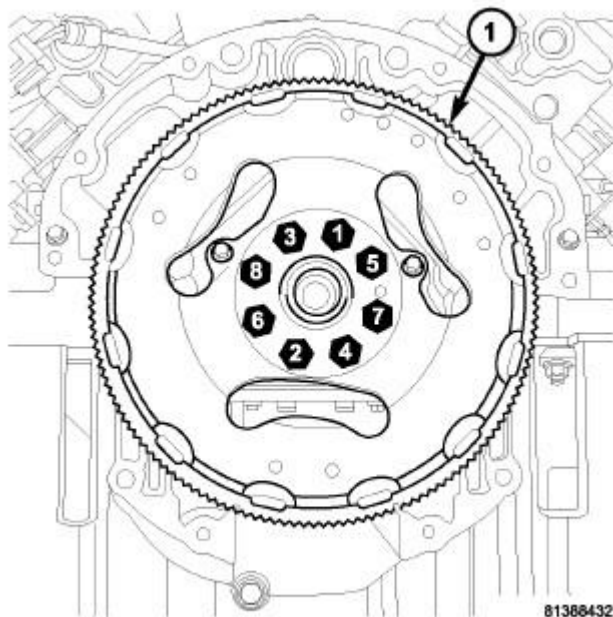


Fig. 232: Flex Plate Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

2. Using the sequence shown in illustration, remove the flexplate (1) retaining bolts.
3. Remove the flexplate.

INSTALLATION**INSTALLATION**

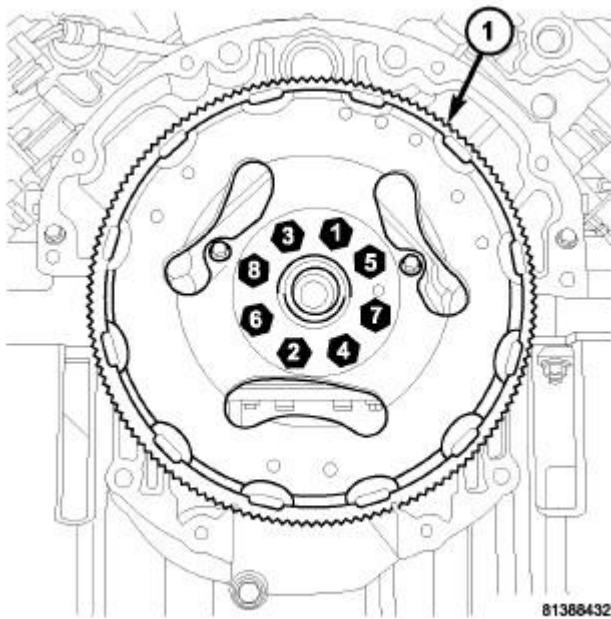


Fig. 233: Flex Plate Bolt Removal/Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

1. Position the flexplate (1) onto the crankshaft and install the bolts finger tight.
2. Using the sequence shown in illustration, tighten the flexplate retaining bolts to 95 N.m (70 ft. lbs.).
3. Install the transmission. Refer to NAG1 - **INSTALLATION** .

LIFTER(S), HYDRAULIC, ROLLER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC ROLLER LIFTERS

Before disassembling any part of the engine to correct lifter noise, check the oil pressure. If the vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-70 psi) at 3,000 RPM.

Check the oil level after the engine reaches normal operating temperature. Allow 5 minutes to stabilize oil level, check dipstick. 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 lifters.

HIGH

If 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 oil pan would be fed to the hydraulic lifters by the oil pump causing them to lose length and allow valves to seat noisily.

LOW

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

LIFTER NOISE DIAGNOSIS

1. To determine source of lifter noise, crank the engine with cylinder head covers removed.
2. Feel each valve spring or rocker arm to detect noisy lifter. The noisy lifter 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 lifters. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not noticeably reduced, it can be assumed the noise is in the lifter. Inspect the rocker arm push rod sockets and push rod ends for wear.**

3. Valve lifter 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 lifter body cylinder. The lifter should be replaced. A heavy click is caused by a lifter check valve not seating or by foreign particles wedged between the plunger and the lifter 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 the valve closes. In either case, lifter assembly should be removed for inspection and cleaning.
4. The valve train generates a noise very much like a light lifter noise during normal operation. Care must be taken to ensure that lifters are making the noise. If more than one lifter seems to be noisy, it's probably not the lifters.

REMOVAL**REMOVAL**

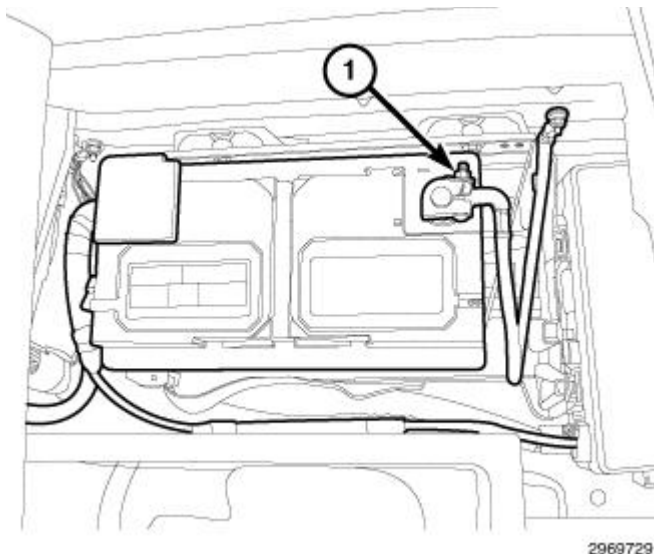


Fig. 234: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

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

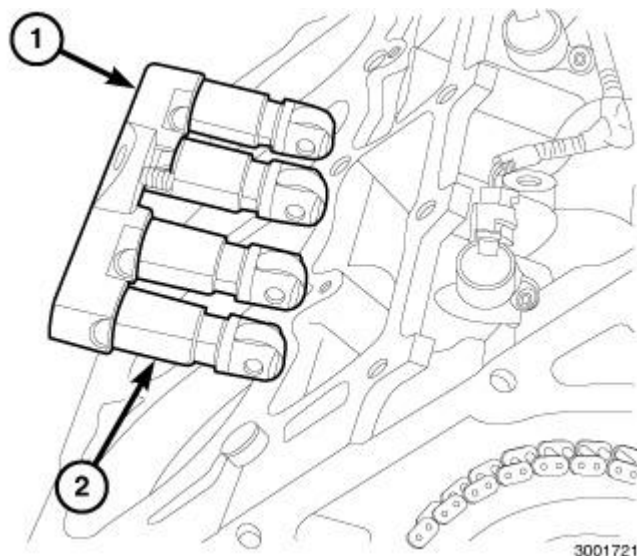


Fig. 235: Identifying Lifters & Retainers

Courtesy of CHRYSLER GROUP, LLC

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.

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

3. Remove the lifters (2) and retainer (1) as an assembly.
4. Check the camshaft lobes for abnormal wear.

INSTALLATION

INSTALLATION

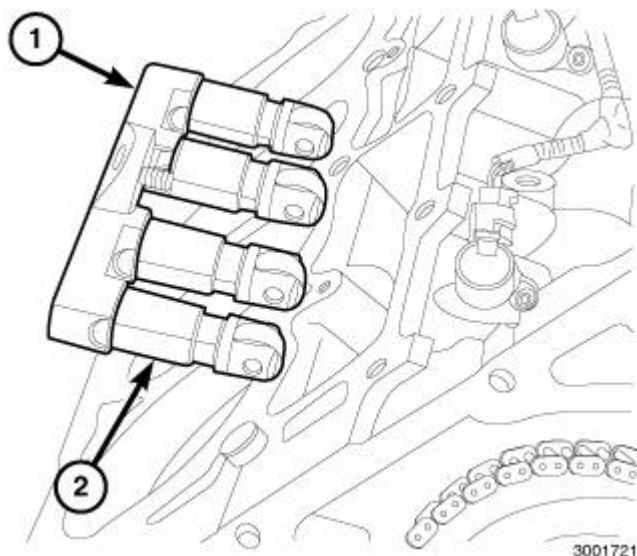


Fig. 236: Identifying Lifters & Retainers
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate the lifters (2) and retainer (1) assembly with clean engine oil.

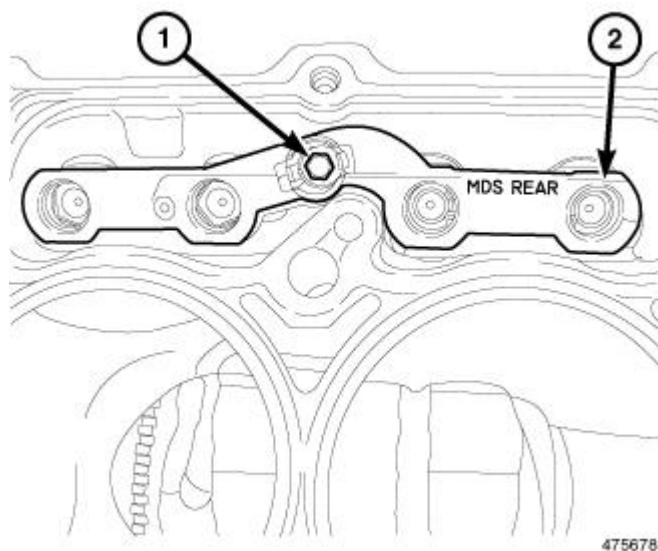


Fig. 237: Rear MDS Lifter Assembly
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The 6.4L Multi Displacement System (MDS) engine uses both

standard roller lifters and deactivating roller lifters. 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, for the latching pins.

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.

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

2. Install the lifters (2) and retainer (1) as an assembly into their original location.
3. Tighten the lifter retainer bolt (1) to 12 N.m (9 ft. lbs.).
4. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.

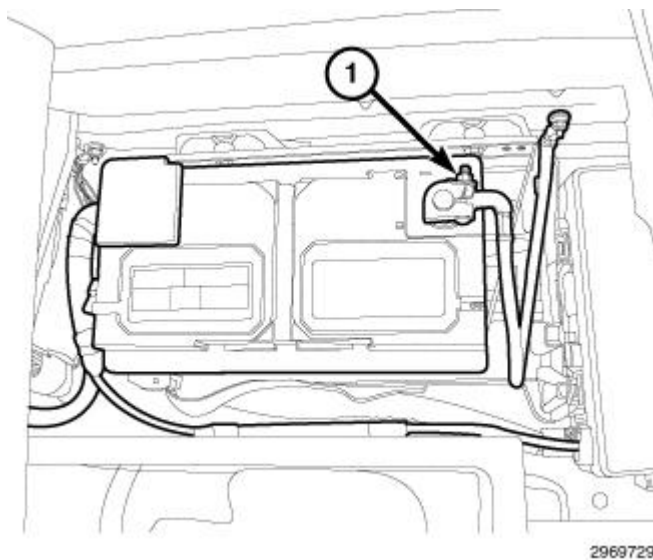


Fig. 238: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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 is serviced as an assembly.

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 and 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 gallery pipe plugs, oil filter runoff and main bearing cap to cylinder block mating surfaces. See appropriate Engine information, for proper repair procedures of these components.
4. If no leaks are detected, pressurize the crankcase . Refer to Engine/Lubrication/Diagnosis and Testing - **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**

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.

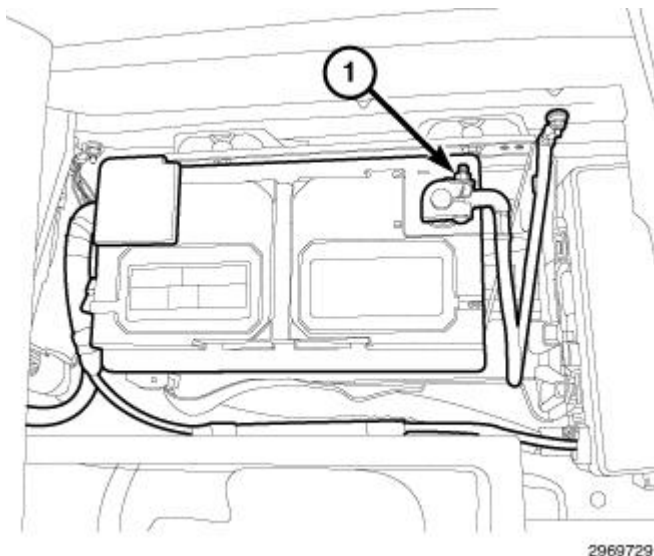


Fig. 239: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).
2. Remove the transmission. Refer to NAG1 - **REMOVAL**.

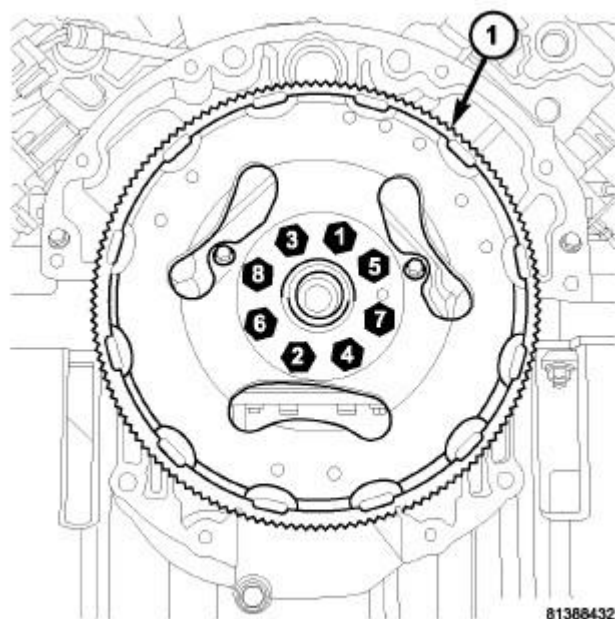


Fig. 240: Flex Plate Bolt Removal/Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

3. Remove the flexplate (1). Refer to **FLEXPLATE, REMOVAL**.

4. Remove the oil pan. Refer to **PAN, OIL, REMOVAL**.

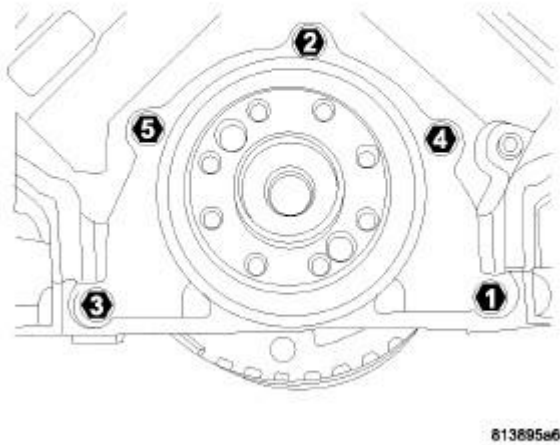


Fig. 241: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

5. Using the sequence shown in illustration, remove the rear oil seal retainer mounting bolts.
6. Remove and discard the rear oil seal retainer.

INSTALLATION

INSTALLATION

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.

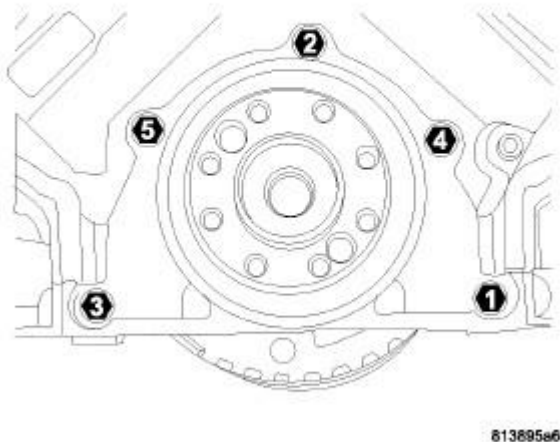


Fig. 242: Rear Seal Retainer Torque Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the sequence shown in illustration, install the crankshaft rear oil seal retainer mounting bolts and tighten to 15 N.m (11 ft. lbs.).
5. Install the oil pan. Refer to **PAN, OIL, INSTALLATION.**

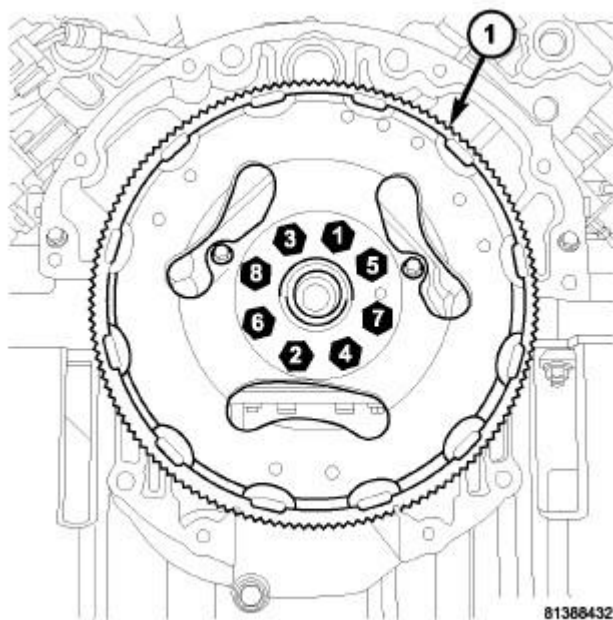


Fig. 243: Flex Plate Bolt Removal/Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

6. Install the flexplate (1). Refer to **FLEXPLATE, INSTALLATION**.
7. Install the transmission. Refer to NAG1 - **INSTALLATION**.
8. Fill the crankcase with the specified type and amount of engine oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE**.

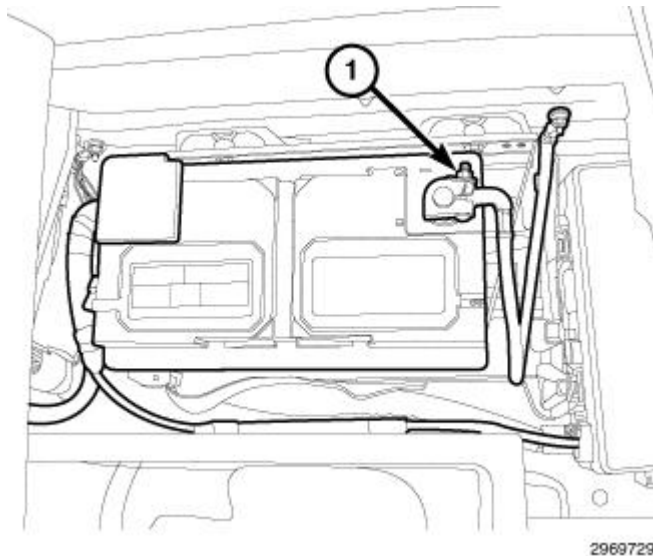


Fig. 244: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

9. Connect the negative battery cable (1).
10. Start the engine and check for leaks.

RING(S), PISTON

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON RING FITTING

CAUTION: Before reinstalling used piston rings or installing new piston rings, the piston ring clearances must be checked or engine damage may result.

1. Wipe the cylinder bore clean.
2. Insert the piston ring into the cylinder bore.

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

3. Using a piston, make sure that the piston ring is squared in the cylinder bore. Slide the piston ring downward into the cylinder.

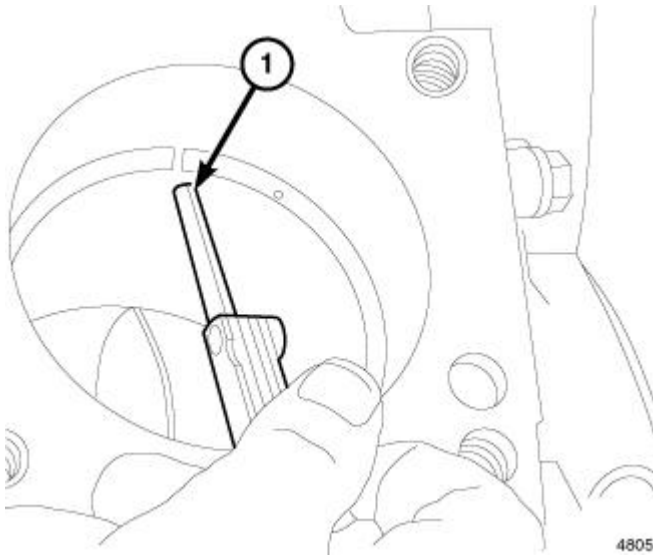


Fig. 245: Using Feeler Gauge To Check Ring End Gap
Courtesy of CHRYSLER GROUP, LLC

4. Using a feeler gauge (1), check the piston ring end gap, replace any rings not within specification.

PISTON RING SIDE CLEARANCE

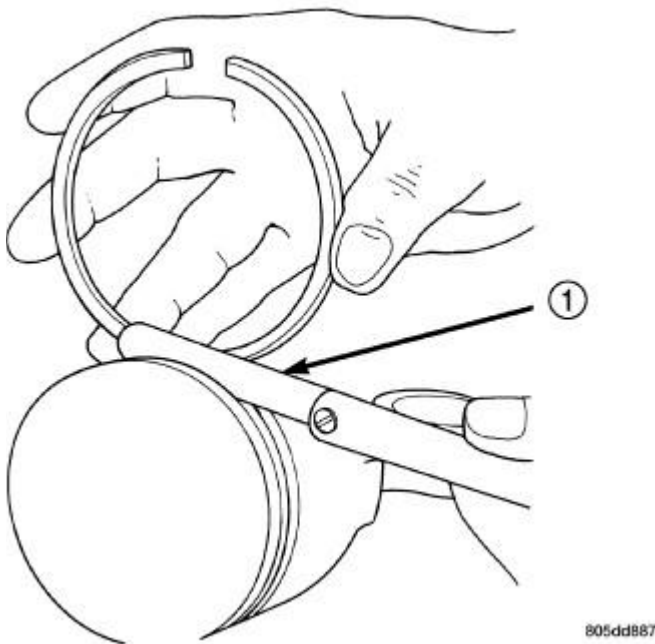


Fig. 246: Measuring Piston Ring Side Clearance
Courtesy of CHRYSLER GROUP, LLC

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

1. Measure the piston ring side clearance with a feeler gauge (1) as shown in illustration. Make sure the feeler gauge fits snugly between the piston ring land and the piston ring, replace any ring not within specification.

NOTE: Make sure the marks on the compression rings face upward.

2. Rotate the ring around the piston. The ring must rotate in the groove with out binding.

PISTON RING INSTALLATION

1. Install the oil ring expander.



Fig. 247: Installing Piston Ring Side Rail
Courtesy of CHRYSLER GROUP, LLC

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

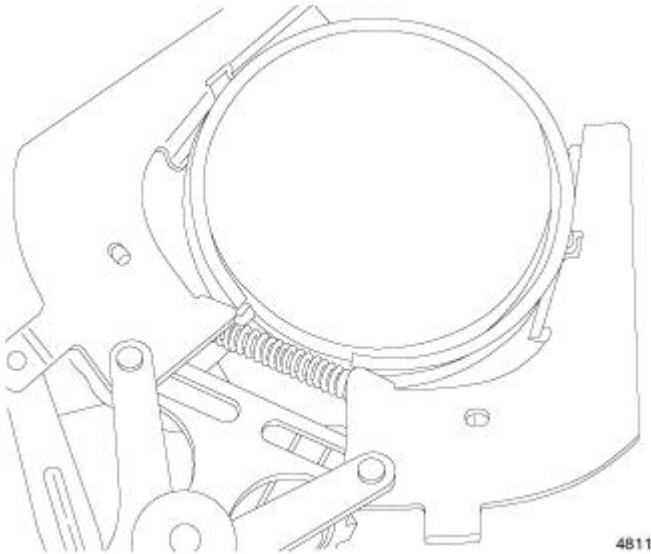
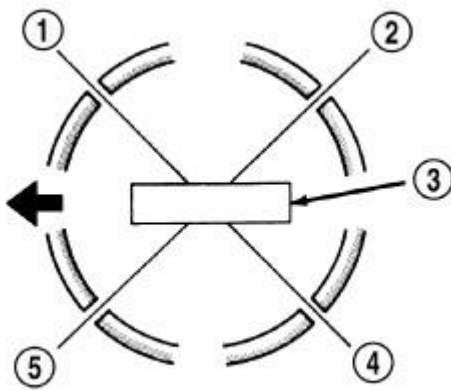


Fig. 248: Installing Upper & Intermediate Rings
Courtesy of CHRYSLER GROUP, LLC

3. Using a piston ring installer, install the No. 2 intermediate piston ring.
4. Using a piston ring installer, install the No. 1 upper piston ring.



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Fig. 249: Piston Ring End Gap Position
Courtesy of CHRYSLER GROUP, LLC

5. Install the oil ring expander gap at the (5) position.
6. Install the oil ring lower side rail gap at the (4) position.
7. Install the oil ring upper side rail gap at the (1) position.
8. Install the second compression ring gap at the (5) position.
9. Install the top compression ring gap at the (2) 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. A floating piston pin is used to attach the piston and connecting rod.

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON FITTING

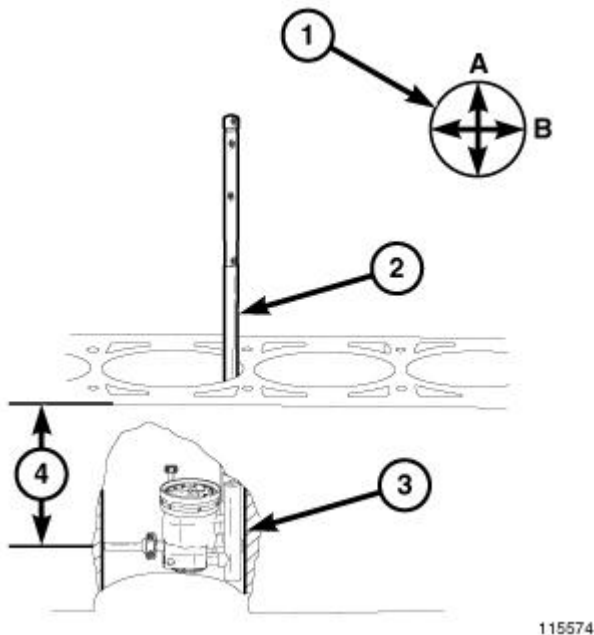


Fig. 250: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

1. Use Cylinder Indicator (special tool #C-119, Cylinder Indicator) (2) to correctly measure the inside diameter of the cylinder bore (3). A cylinder indicator capable of reading in 0.003 mm (0.0001 in.) increments is required. If a cylinder indicator 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 top of bore (4). Start perpendicular (across or at 90°) to the axis of the crankshaft at point A and then take an additional bore reading 90° to that at point B.

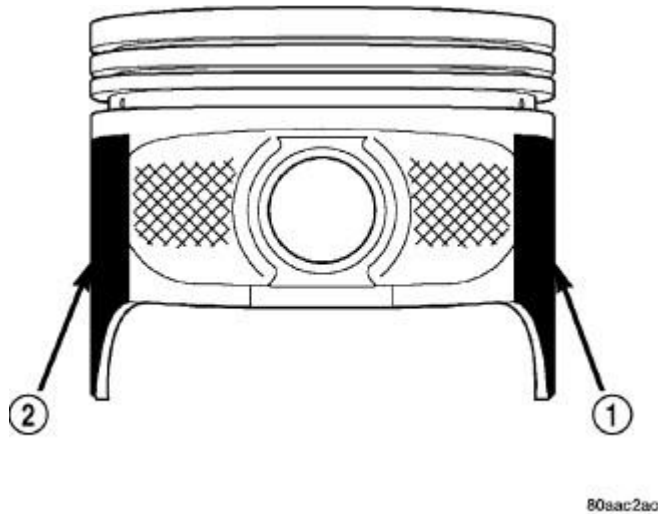


Fig. 251: Moly Coated Piston
Courtesy of CHRYSLER GROUP, LLC

NOTE: The coated pistons, piston pins and connecting rods are pre-assembled and serviced as an assembly.

3. The piston and rod assembly is specific for the left cylinder bank (odd numbered) and the right cylinder bank (even numbered) and must not be interchanged.
4. The coating material (1, 2) is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a cylinder indicator is **MANDATORY**. To correctly select the proper size piston, a cylinder indicator capable of reading in 0.003 mm (0.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

REMOVAL

REMOVAL

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE**.

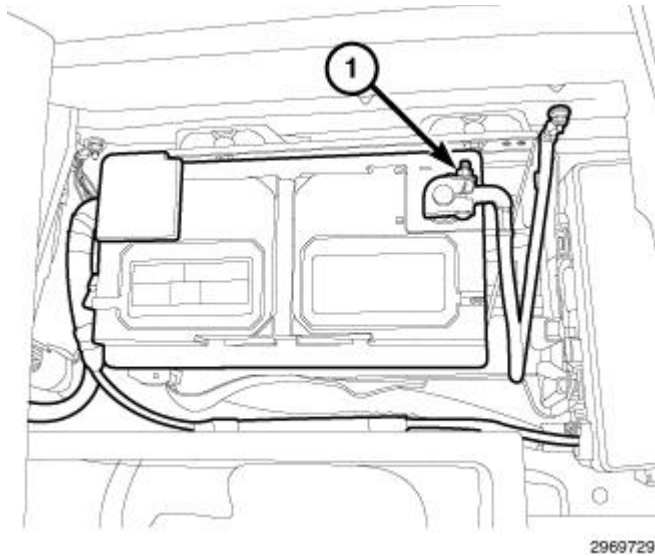


Fig. 252: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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

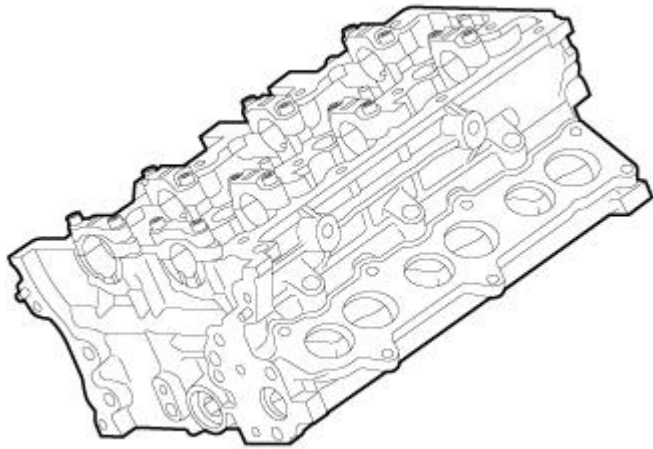
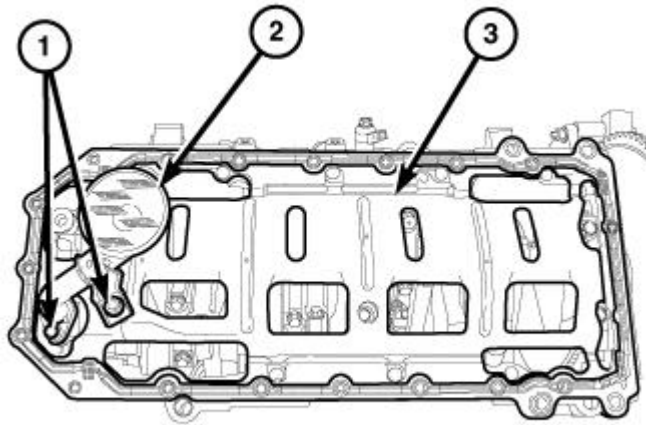


Fig. 253: Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

3. Remove the cylinder head(s). Refer to **CYLINDER HEAD, REMOVAL**.

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**.

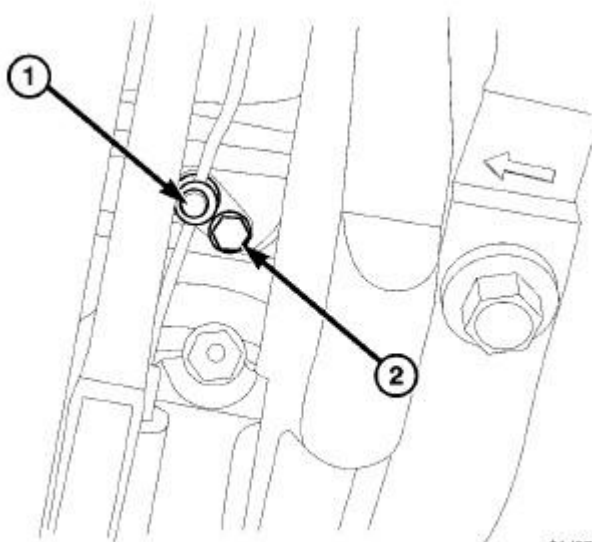


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Fig. 254: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

5. Remove and discard the oil pan gasket/windage tray (3).
6. If necessary, remove the ridge on top of the cylinder bores with a reliable ridge reamer before removing pistons from engine block. **Be sure to keep the tops of the pistons covered during this operation.**

CAUTION: When removing and installing the pistons and connecting rods, do not damage the piston oil cooler jets. If the jets are bent, engine damage may occur.



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Fig. 255: Piston Oil Jet & Bolt
 Courtesy of CHRYSLER GROUP, LLC

7. Remove the piston oil cooler jet(s) retaining bolt(s) (2) and remove the piston oil cooler jet(s) (1).

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

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.

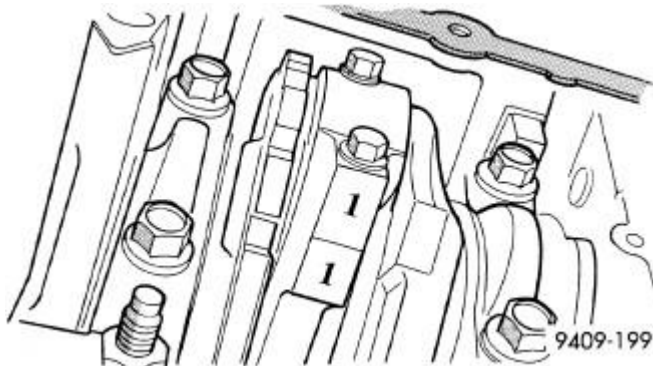


Fig. 256: Identifying Mark On Connecting Rod And Bearing Cap
Courtesy of CHRYSLER GROUP, LLC

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

8. Mark the connecting rod and bearing cap position using a permanent ink marker or scribe tool.

NOTE: Pistons and connecting rod assemblies must be removed from the top of the engine 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.

9. Remove the connecting rod cap and carefully remove the piston from the cylinder bore, repeat this procedure for each piston being removed.
10. 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.
11. 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 device 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.

INSPECTION

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring.

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 Engine/Engine Block/ROD, Piston and Connecting - **STANDARD PROCEDURE** .

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

INSTALLATION

INSTALLATION

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

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 Engine/Engine Block/RING(S), Piston - **STANDARD PROCEDURE** .
2. Before installing piston and connecting rod assemblies into the bore, install the piston rings. Refer to Engine/Engine Block/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. **Make sure the position of rings do not change during this operation.**

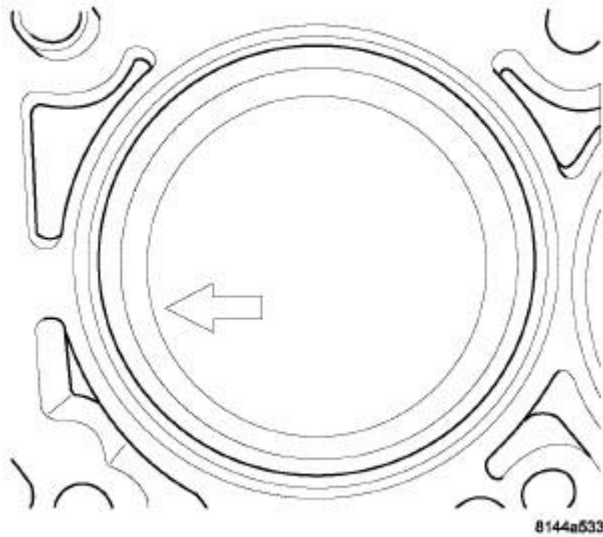
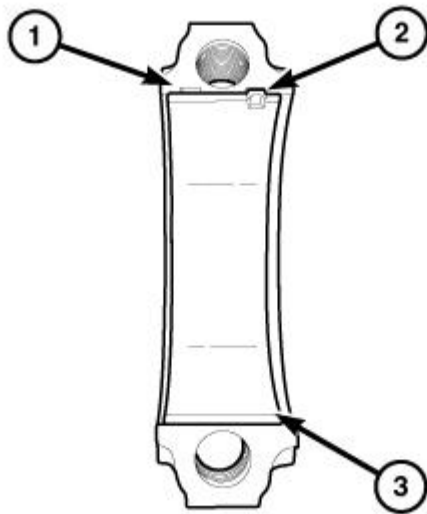


Fig. 257: Piston Direction Arrow

Courtesy of CHRYSLER GROUP, LLC

4. 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 the engine on both cylinder banks.
5. Wipe the cylinder bore clean and lubricate with clean engine oil.
6. Rotate the crankshaft until the connecting rod journal is centered with the cylinder bore.
7. Insert the piston and rod assembly into the cylinder bore and carefully position the connecting rod over the crankshaft journal.
8. Tap the piston down in cylinder bore using a hammer handle. While at the same time, guide the connecting rod into position on crankshaft rod journal.
9. Perform the measure bearing clearance procedure. Refer to **ENGINE BLOCK** .



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Fig. 258: Connecting Rod Cap
Courtesy of CHRYSLER GROUP, LLC

10. 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.

11. Lubricate the bearing surfaces with clean engine oil and position the rod cap onto the connecting rod.

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.

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

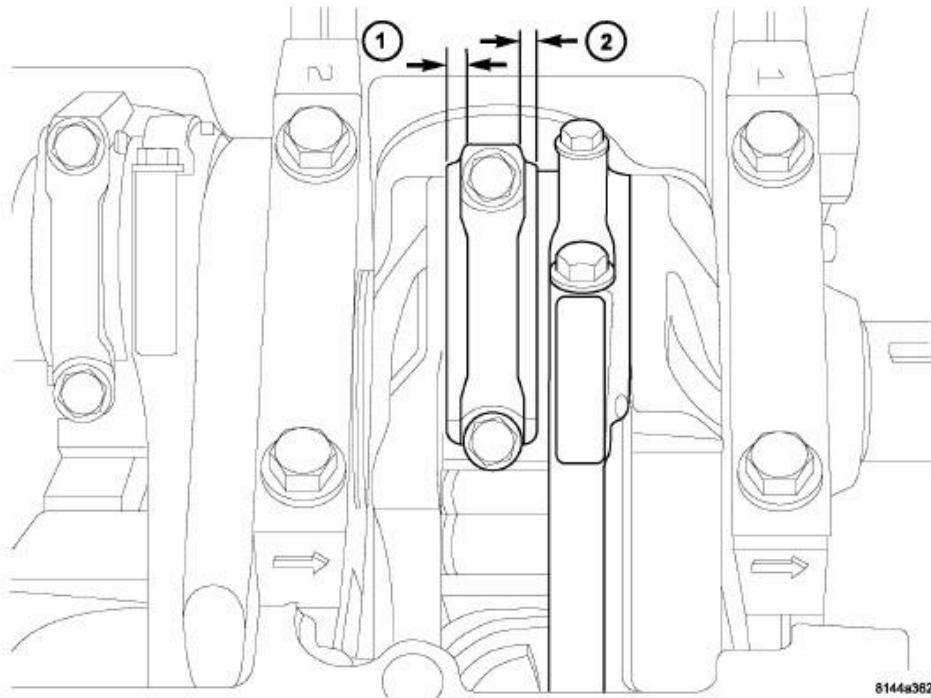


Fig. 259: Identifying Connecting Rod Proper Installation
Courtesy of CHRYSLER GROUP, LLC

12. Verify the connecting rods are properly installed, the wide side (1) of the connecting rod is facing towards the crankshaft and the narrow sides (2) of the connecting rods face each other.
13. Lubricate the new rod cap bolts with clean engine oil, install and tighten to 45 N.m (33 ft. lbs.) plus an additional 60° turn.

CAUTION: When removing and installing the pistons and connecting rods, do not damage the piston oil cooler jets. If the jets are bent, engine damage may occur.

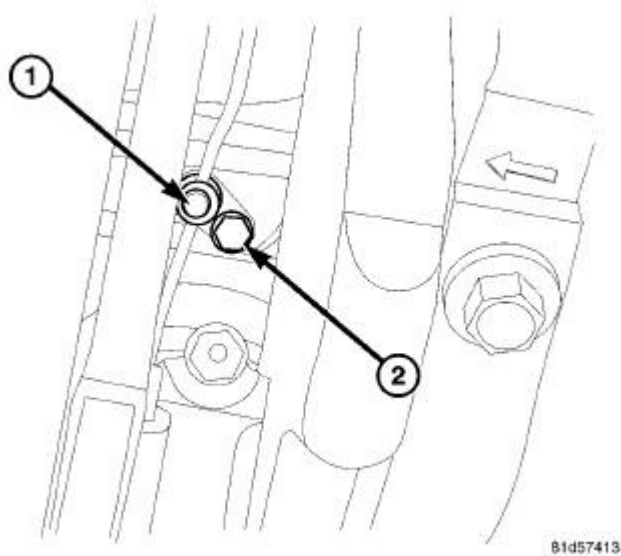


Fig. 260: Piston Oil Jet & Bolt
Courtesy of CHRYSLER GROUP, LLC

14. Position the piston oil cooler jet(s) (1).
15. Install the piston oil cooler jet retaining bolt(s) (2) and tighten to 13 N.m (10 ft. lbs.).

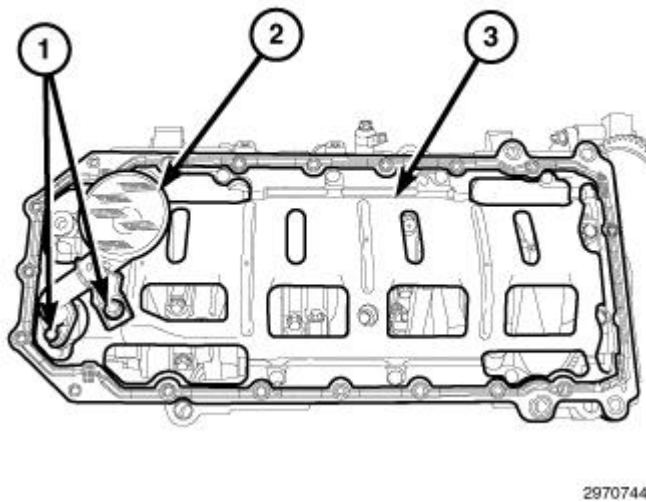
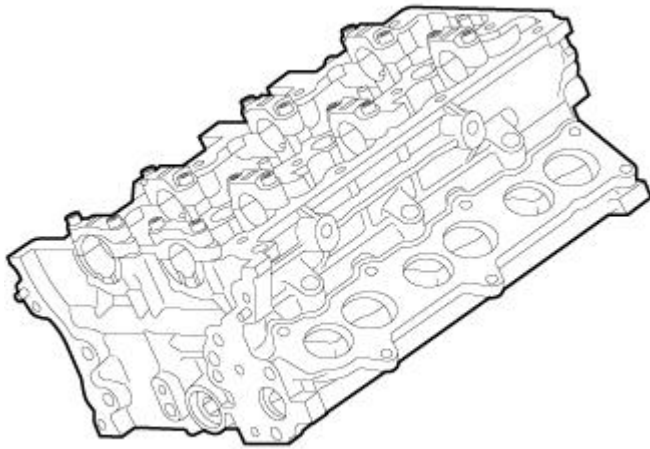


Fig. 261: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

16. Install the new oil pan gasket/windage tray (3), oil pump pickup tube (2) and oil pan. Refer to **PAN, OIL, INSTALLATION**.
17. Install the engine oil dipstick tube and dipstick.
18. Lower the vehicle.

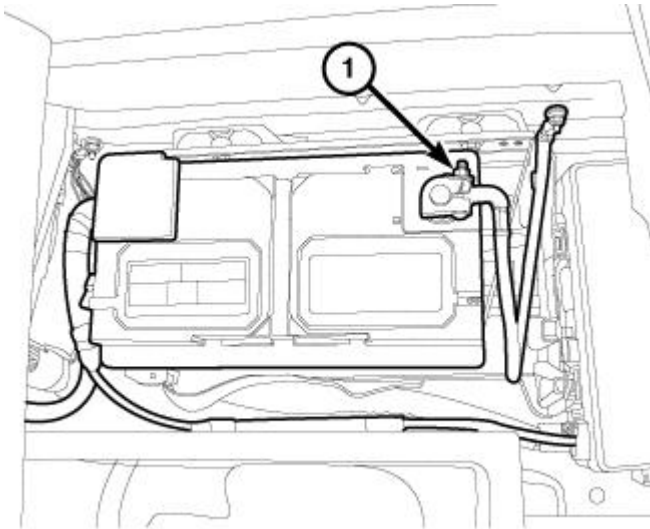


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Fig. 262: Cylinder Head

Courtesy of CHRYSLER GROUP, LLC

19. Install the cylinder head(s). Refer to **CYLINDER HEAD, INSTALLATION**.



2969729

Fig. 263: Negative Battery Cable

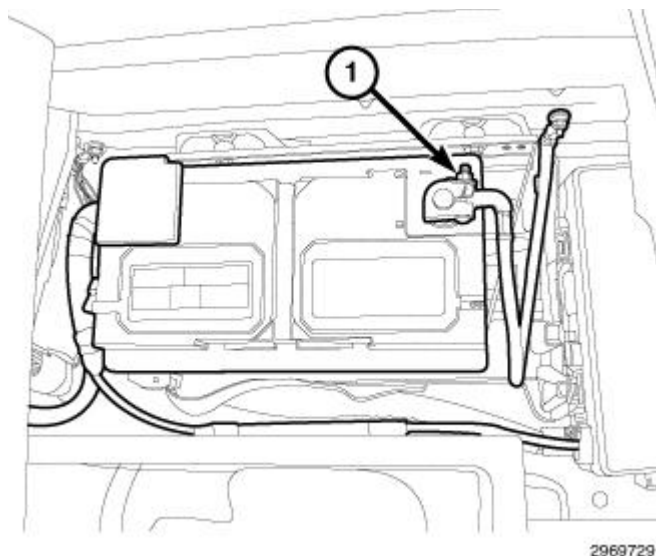
Courtesy of CHRYSLER GROUP, LLC

20. Connect the negative battery cable (3).
21. Start the engine and check for leaks.

SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

REMOVAL

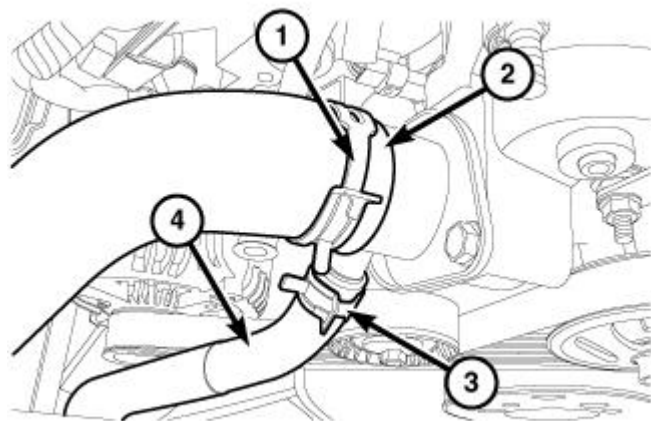


2969729

Fig. 264: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).
2. Drain the cooling system. Refer to Engine Cooling System - **STANDARD PROCEDURE** .



2968475

Fig. 265: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp

Courtesy of CHRYSLER GROUP, LLC

3. Remove the upper radiator hose clamp (1) and remove the upper radiator hose (2).
4. Remove the oil cooler hose clamp (3) and remove oil cooler hose (4).

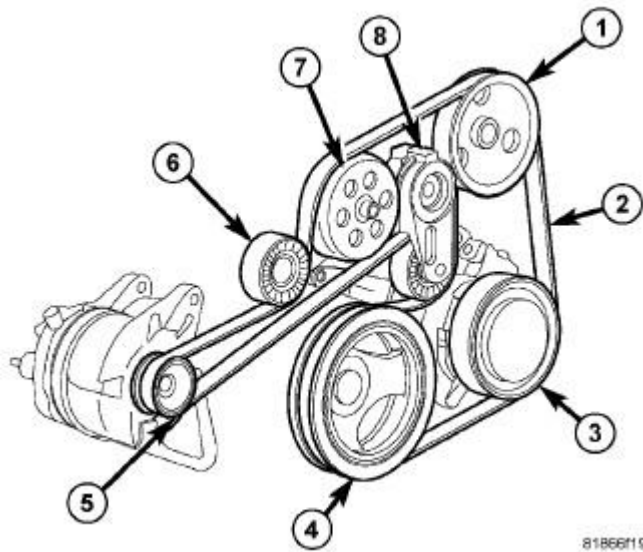


Fig. 266: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

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

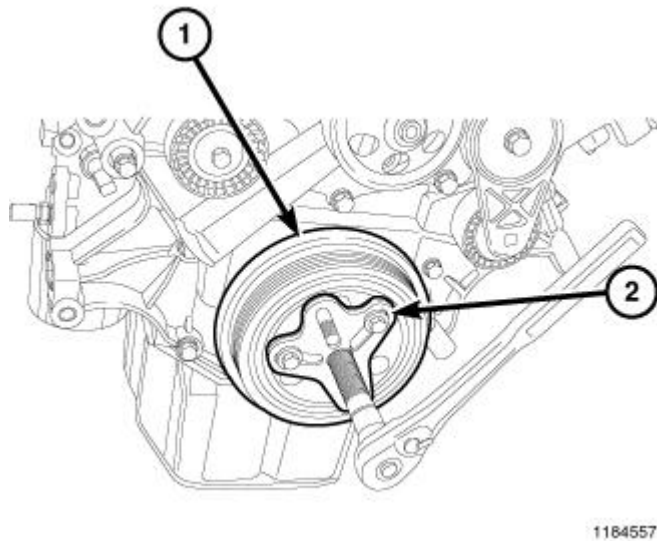


Fig. 267: Vibration Damper & Bolt Grip Puller
Courtesy of CHRYSLER GROUP, LLC

NOTE: When installing the puller tool, ensure the bolts are fully threaded through the entire crankshaft damper.

6. Remove the crankshaft damper retaining bolt.
7. Install the puller tool (2) making sure the bolts are fully threaded through the entire crankshaft damper.
8. Remove the crankshaft damper (1).

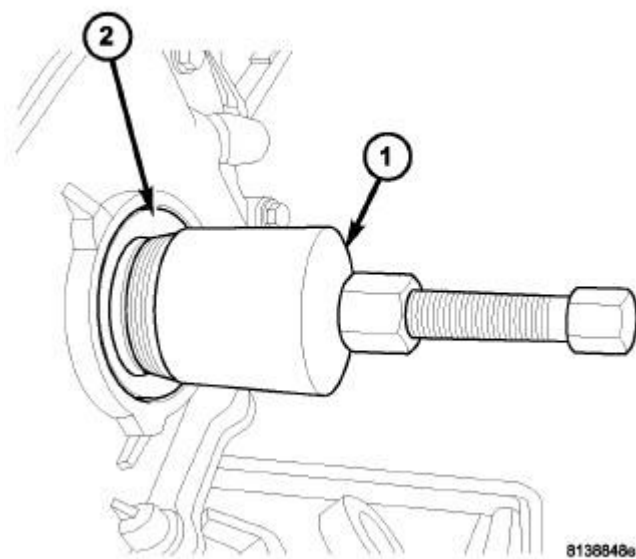


Fig. 268: Front Crankshaft Seal Removal
Courtesy of CHRYSLER GROUP, LLC

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

INSTALLATION

INSTALLATION

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

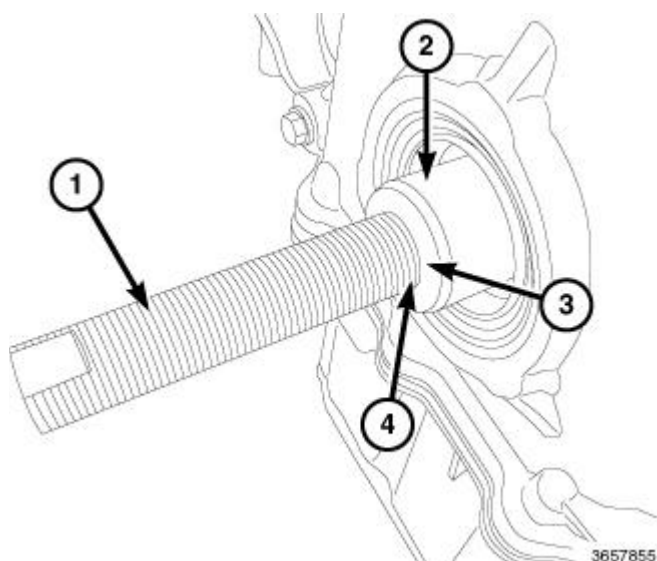


Fig. 269: Installing Vibration Damper Onto Crankshaft Using Special Tool
 Courtesy of CHRYSLER GROUP, LLC

1. Install the threaded rod (1) from the (special tool #10387, Installer, Vibration Damper) into the crankshaft (2) till seated.

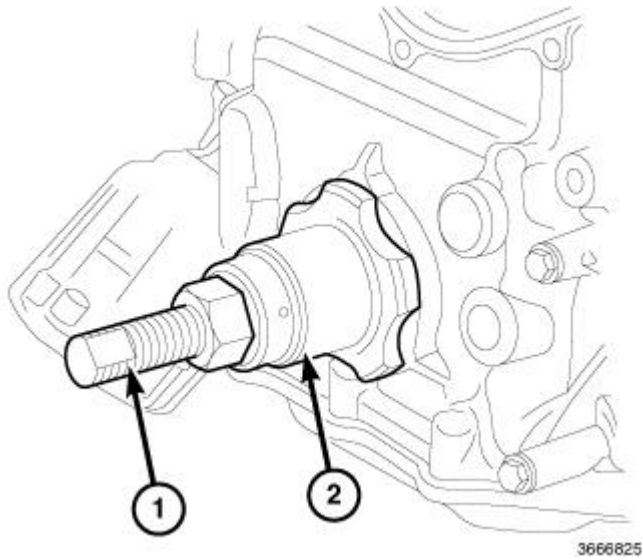


Fig. 270: Front Seal Installation
 Courtesy of CHRYSLER GROUP, LLC

2. Using Seal Installer (special tool #9072, Installer, Seal) and (special tool #10387, Installer, Vibration Damper) (2), install the crankshaft front oil seal.

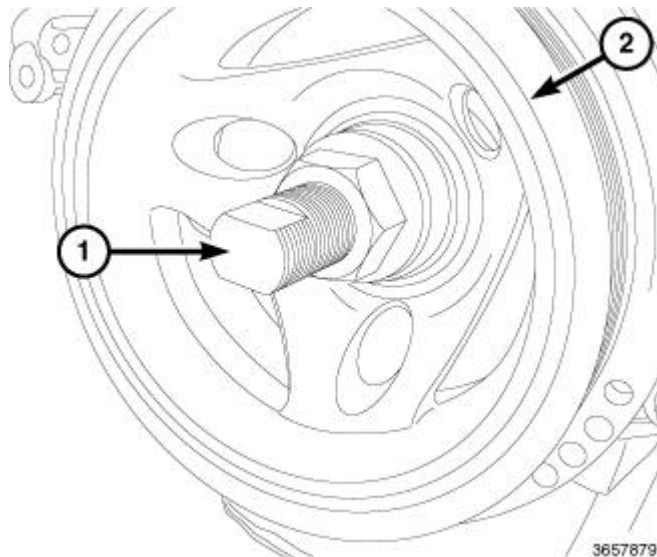


Fig. 271: Installing Vibration Damper
 Courtesy of CHRYSLER GROUP, LLC

3. Position the damper (2) on the crankshaft.

4. Install the press washer, bearing, washer, and the press nut onto the threaded rod.
5. Using Damper Installer (1) and a deep well socket, press the damper onto the crankshaft till seated.

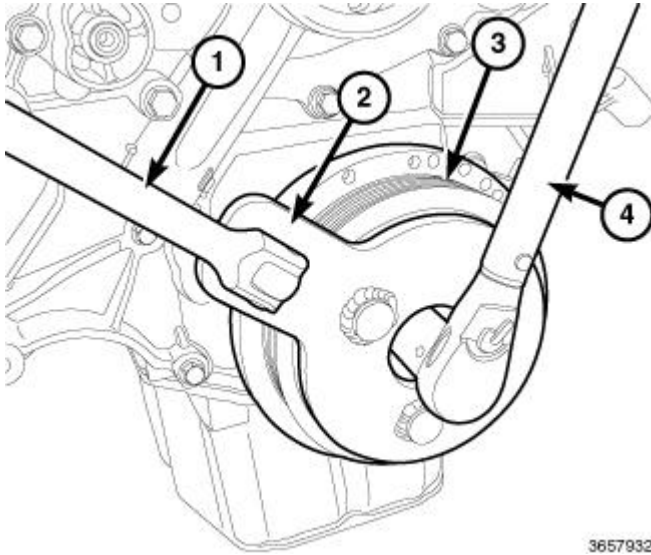


Fig. 272: Installing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

6. Install the vibration damper bolt.
7. Position the (special tool #10386, Holder, Vibration Damper) (2), onto the vibration pulley (3).
8. Tighten the bolt to 250 N.m (184 ft. lbs.).

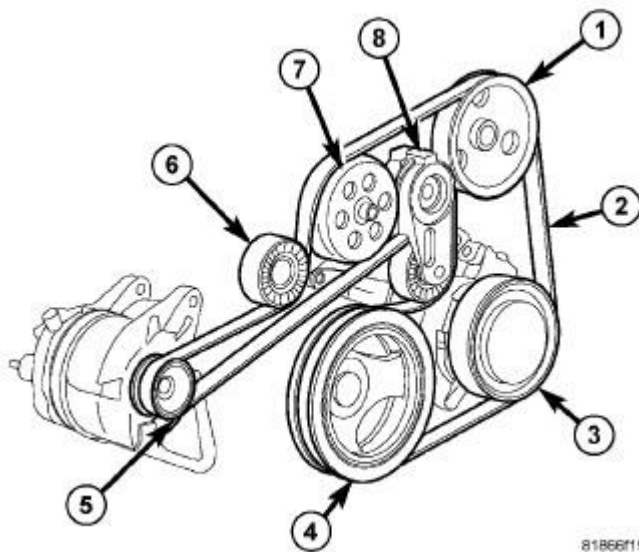
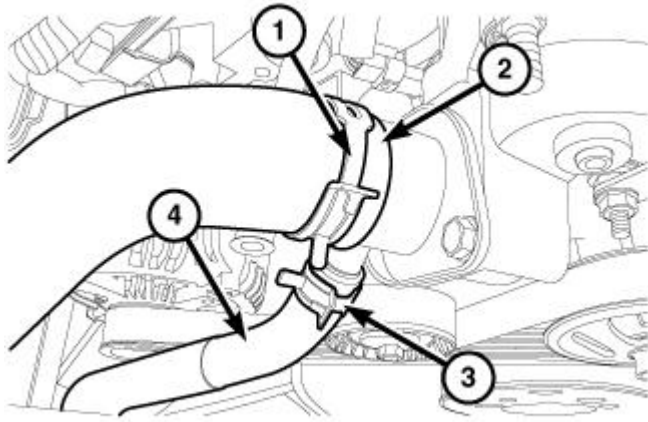


Fig. 273: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

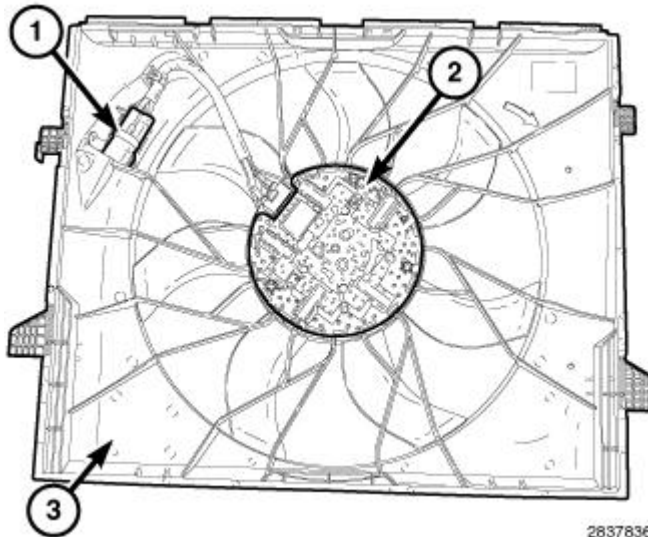
9. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .



2988475

Fig. 274: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
 Courtesy of CHRYSLER GROUP, LLC

10. Install the upper radiator hose (2) and clamp (1).
11. Install the oil cooler hose (4) and clamp (3).



2837836

Fig. 275: Cooling Fan Motor Assembly
 Courtesy of CHRYSLER GROUP, LLC

12. Install the cooling fan. Refer to **FAN, COOLING, INSTALLATION** .
13. Refill the cooling system. Refer to Engine Cooling System - **STANDARD PROCEDURE** .

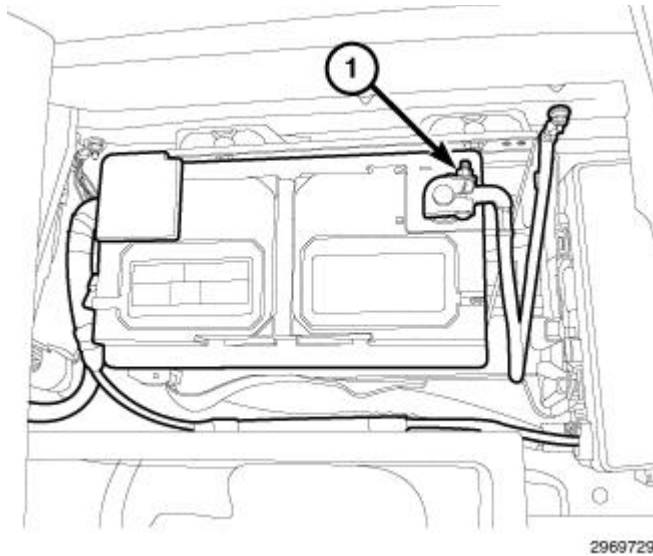


Fig. 276: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

14. Connect the negative battery cable (1).

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 Engine/Engine Block/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 (MDS) 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 lifters
- 4 control valve solenoids
- Control valve solenoid wiring harness
- Oil temperature sensor

OPERATION

OPERATION

Cylinder Deactivation

- Trap an exhaust charge from a normal combustion event
- Normal combustion event
- Deactivate the exhaust valve
- Deactivate the intake valve
- Piston is an air spring
- Cylinders deactivated in firing sequence

Cylinder Reactivation

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

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - 6.4L - MDS SOLENOID

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

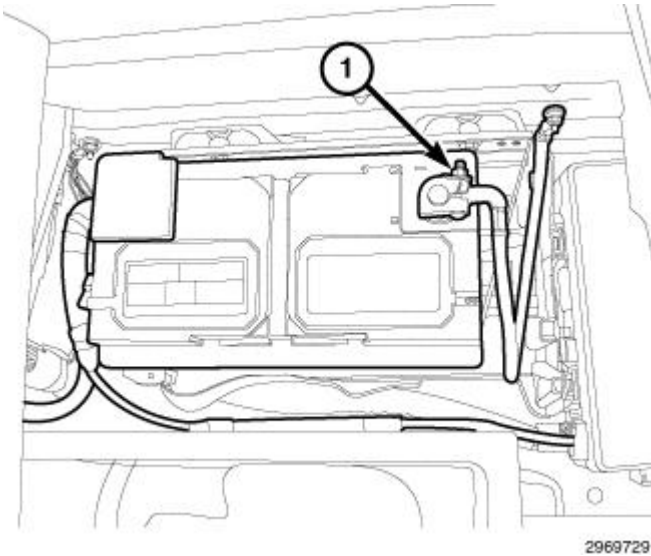
- Solenoid circuit
- Fail to deactivate a cylinder(s)
- Fail to reactivate a cylinder(s)
- Low oil pressure

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 sensor
	3. Malfunctioning MDS solenoid	3. Replace the MDS solenoid
	4. Malfunctioning MDS lifter	4. Replace lifter(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 MDS solenoid
	4. Malfunctioning MDS lifter(s)	4. Replace lifter(s)

REMOVAL

REMOVAL

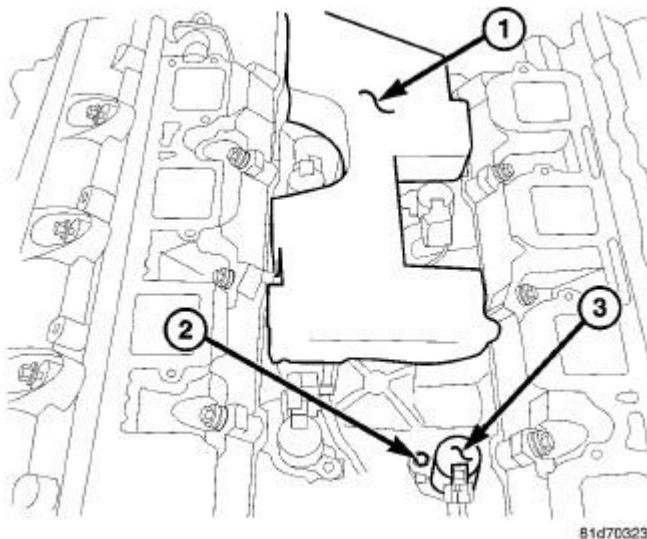


2969729

Fig. 277: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

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

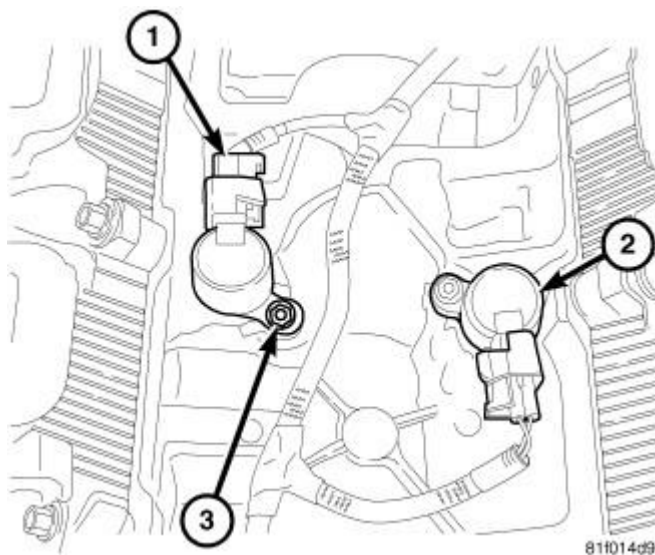


81d70323

Fig. 278: MDS Solenoids

Courtesy of CHRYSLER GROUP, LLC

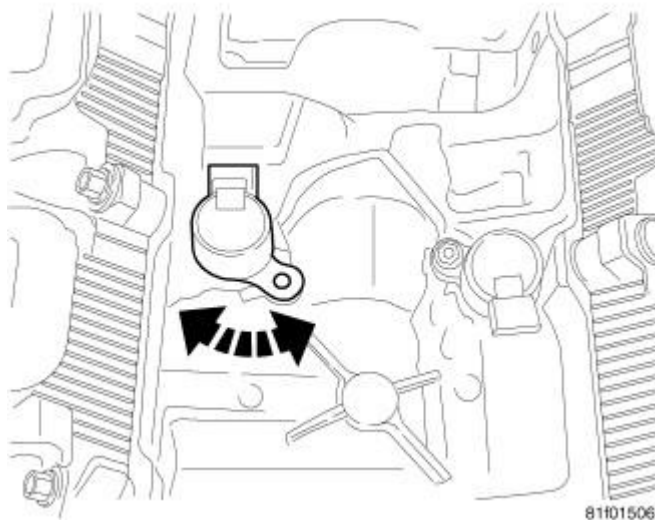
3. Remove foam insulator pad (1).

**Fig. 279: 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).

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

**Fig. 280: Removing/Installing MDS Solenoid**

Courtesy of CHRYSLER GROUP, LLC

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**

1. Verify the MDS solenoid bores are free of debris before installing the MDS solenoid into the engine block.

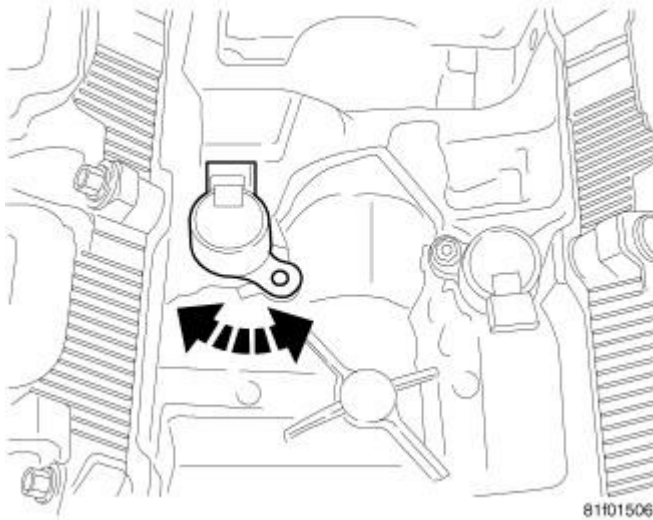


Fig. 281: Removing/Installing MDS Solenoid
Courtesy of CHRYSLER GROUP, LLC

2. Install the MDS solenoid(s) (3), ensure the seal is fully seated into the engine block.
3. Install the retaining bolt(s) (3) and tighten to 11 N.m (8 ft. lbs.).

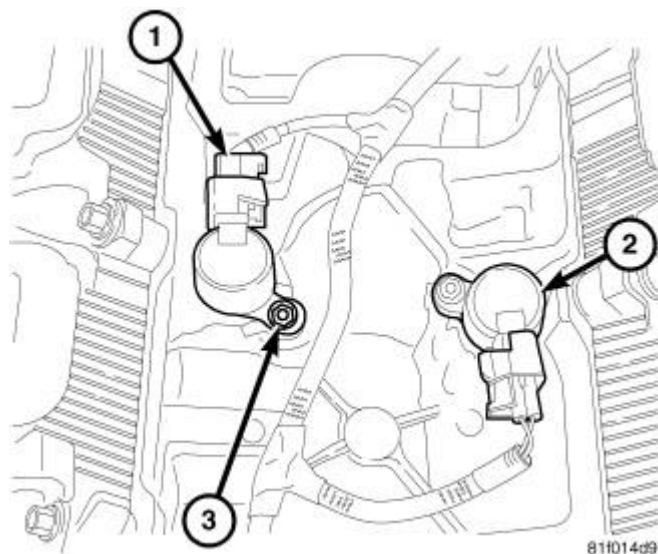


Fig. 282: MDS Solenoid Connector
Courtesy of CHRYSLER GROUP, LLC

4. Connect the MDS electrical connector to the solenoid(s) (1).

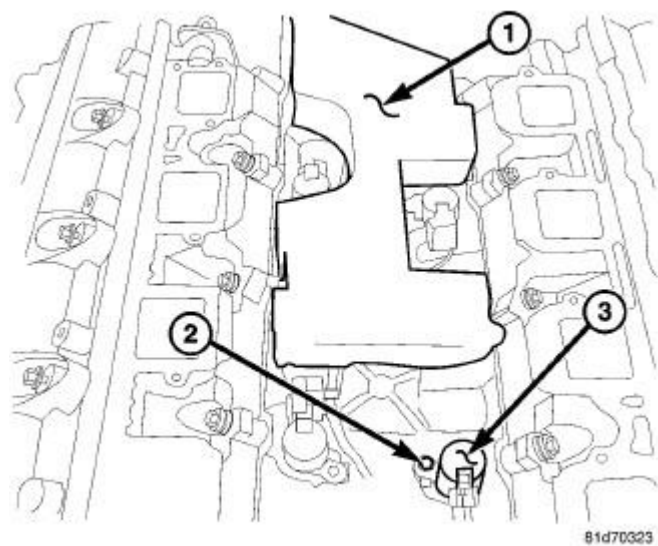


Fig. 283: MDS Solenoids
Courtesy of CHRYSLER GROUP, LLC

5. Install the foam insulator pad (1).
6. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION.**

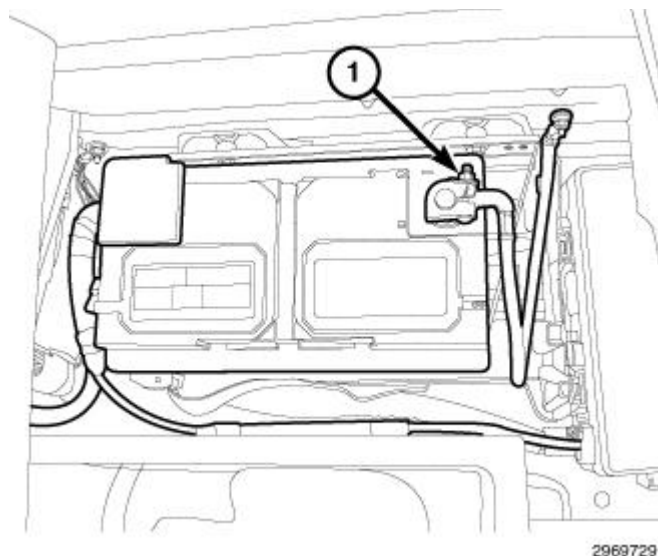


Fig. 284: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

7. Connect the negative battery cable (1).

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, REAR

REMOVAL

REMOVAL

AUTOMATIC TRANSMISSION

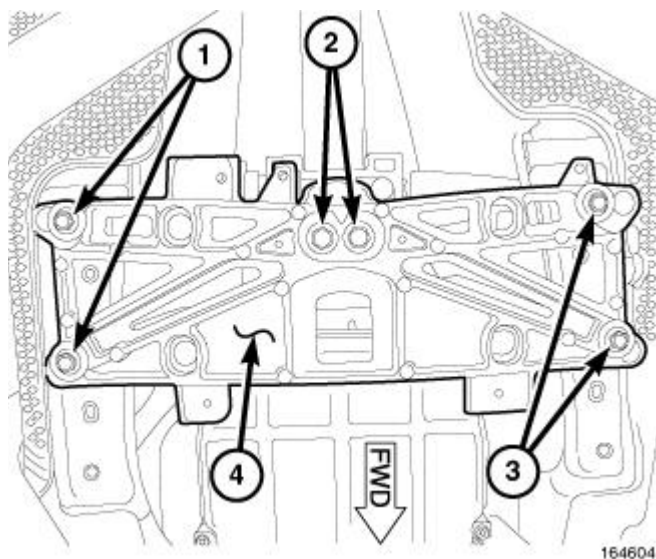


Fig. 285: Rear Cross Member Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Raise and support the vehicle.
2. Using a suitable jack, support the transmission.
3. Remove the rear transmission mount isolator bolts (2).
4. Remove the rear cross member retaining bolts (1, 3) and remove the cross member (4).

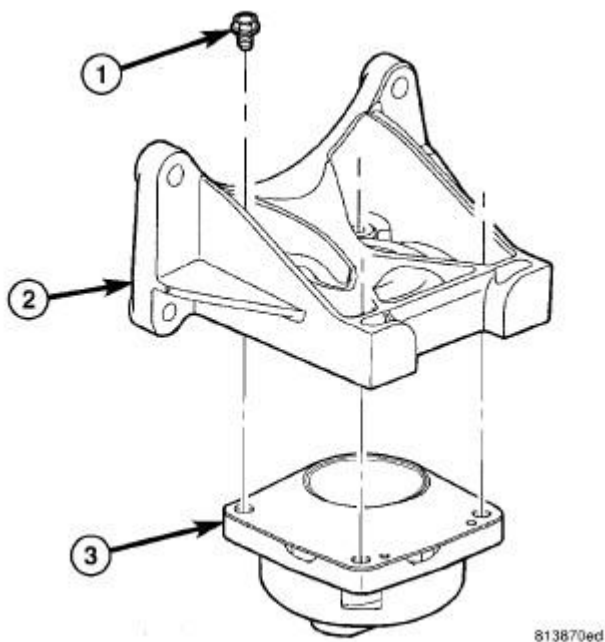


Fig. 286: Transmission Mount
Courtesy of CHRYSLER GROUP, LLC

5. Remove the rear transmission mount isolator (3) retaining bolts (1) and remove the isolator.

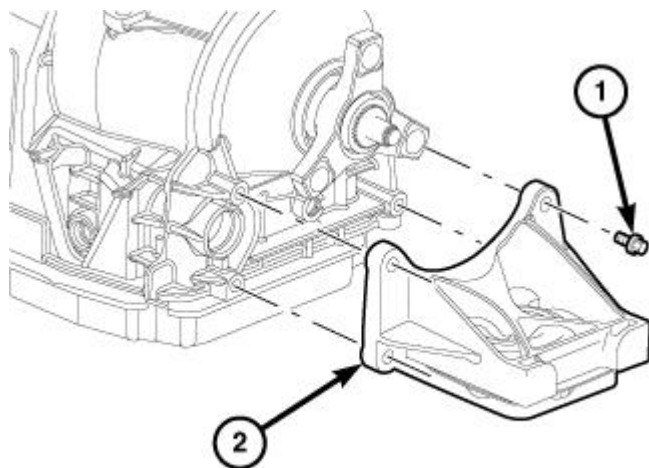
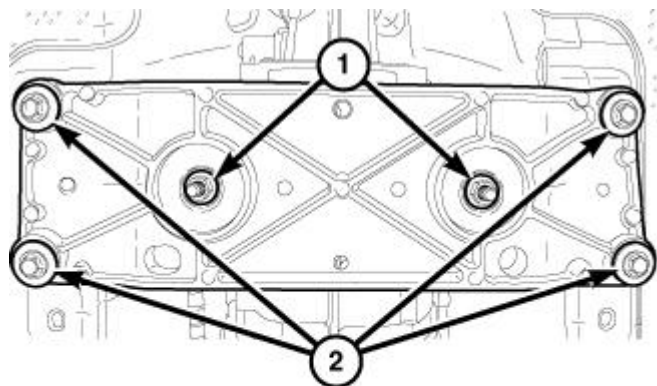


Fig. 287: Rear Transmission Mount Bracket
Courtesy of CHRYSLER GROUP, LLC

6. If required, remove the rear transmission mount bracket (2) retaining bolts (1) and remove the bracket.

MANUAL TRANSMISSION

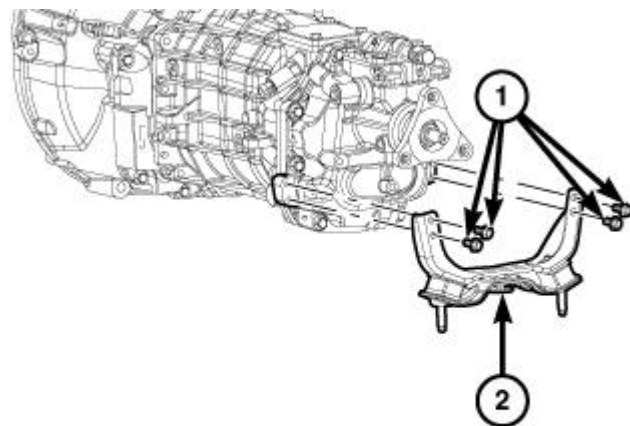
1. Raise and support the vehicle.
2. Using a suitable jack, support the transmission.



2991684

Fig. 288: Rear Cross Member & Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

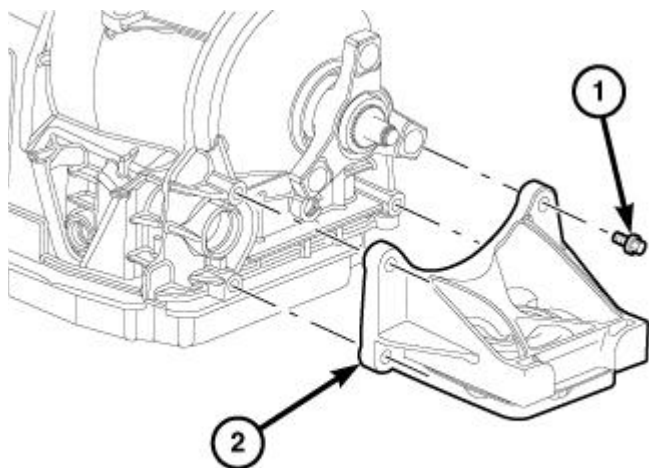
3. Remove the rear transmission mount isolator nuts (1).
4. Remove the rear cross member retaining bolts (2) and remove the cross member.



2992304

Fig. 289: Rear Transmission Mount Isolator & Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Remove the rear transmission mount isolator (2) retaining bolts (1) and remove the isolator.

INSTALLATION**INSTALLATION****AUTOMATIC TRANSMISSION**

4847

Fig. 290: Rear Transmission Mount Bracket
Courtesy of CHRYSLER GROUP, LLC

1. If removed, position the rear transmission mount bracket (2), install the retaining bolts (1) and tighten to 68 N.m (50 ft. lbs.).

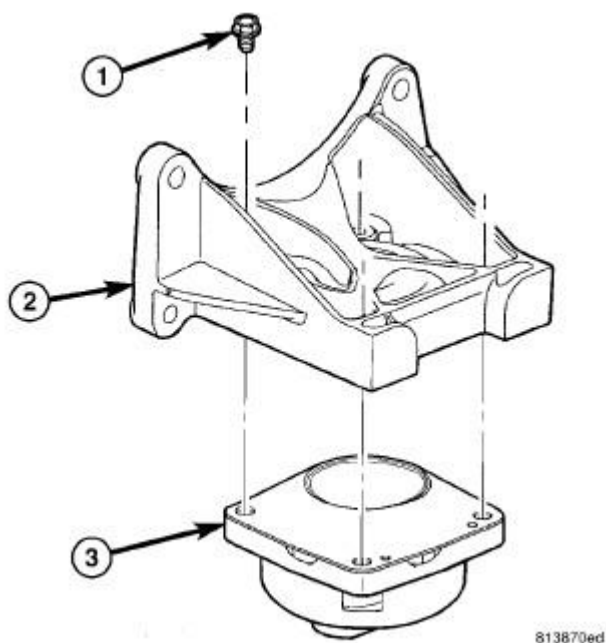


Fig. 291: Transmission Mount

Courtesy of CHRYSLER GROUP, LLC

2. Position the rear transmission mount isolator (3) to the rear transmission mount bracket (2), install the retaining bolts (1) and tighten to 33 N.m (24 ft. lbs.).

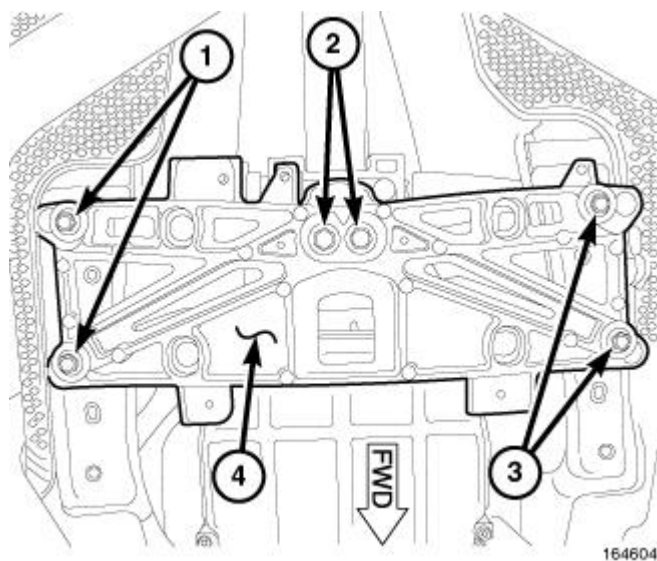
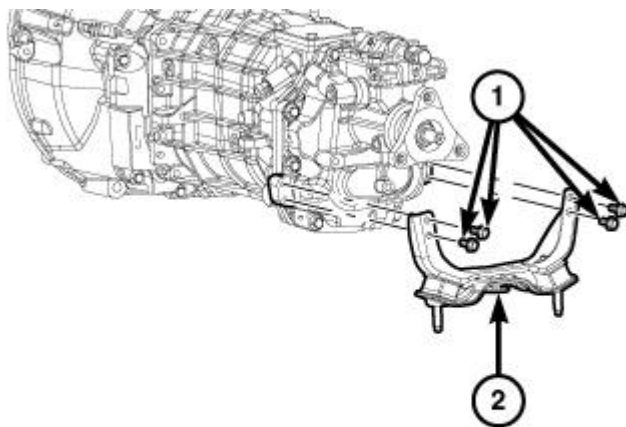


Fig. 292: Rear Cross Member Bolts

Courtesy of CHRYSLER GROUP, LLC

3. Position the transmission crossmember (4), install the retaining bolts (1, 3) finger tight.
4. Install the rear transmission mount isolator retaining bolts (2) finger tight.
5. Tighten the transmission crossmember retaining bolts (1, 3) to 68 N.m (50 ft. lbs.).

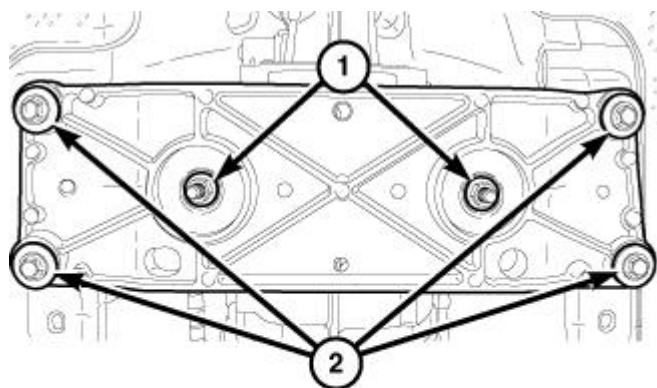
6. Lower the transmission and remove the jack.
7. Tighten the rear transmission mount isolator retaining bolts (2) to 47 N.m (35 ft. lbs.).

MANUAL TRANSMISSION

2992304

Fig. 293: Rear Transmission Mount Isolator & Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Position the rear transmission mount isolator (2), install the retaining bolts (1) and tighten to 68 N.m (50 ft. lbs.).



2991684

Fig. 294: Rear Cross Member & Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

2. Position the rear cross member, install the retaining bolts (2) finger tight.
3. Install the rear transmission mount isolator nuts (1) finger tight.

4. Tighten the transmission crossmember retaining bolts (2) to 68 N.m (50 ft. lbs.).
5. Lower the transmission and remove the jack.
6. Tighten the rear transmission mount isolator retaining nuts (1) to 47 N.m (35 ft. lbs.).

INSULATOR, ENGINE MOUNT, FRONT

REMOVAL

REMOVAL

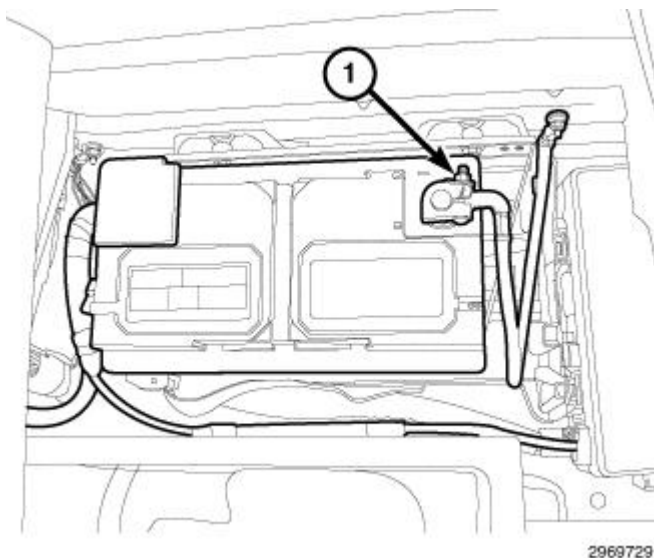


Fig. 295: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).
2. Remove the engine oil dipstick tube retaining nut at the right exhaust manifold.
3. Raise and support the vehicle.

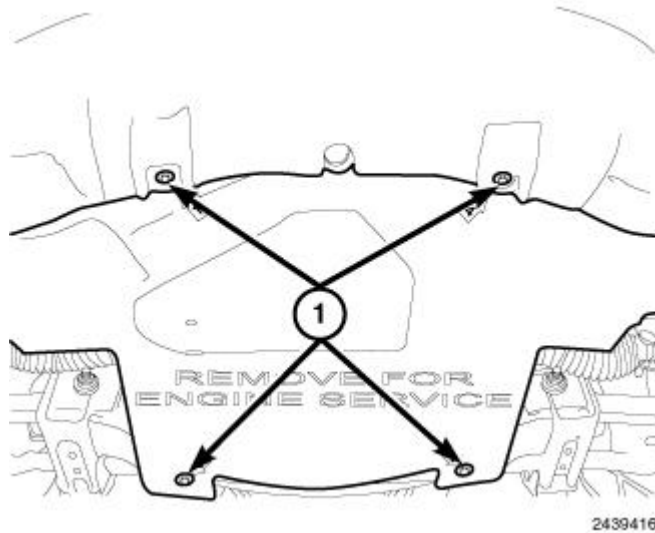


Fig. 296: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

4. Remove the belly pan retainers (1) and remove the belly pan.

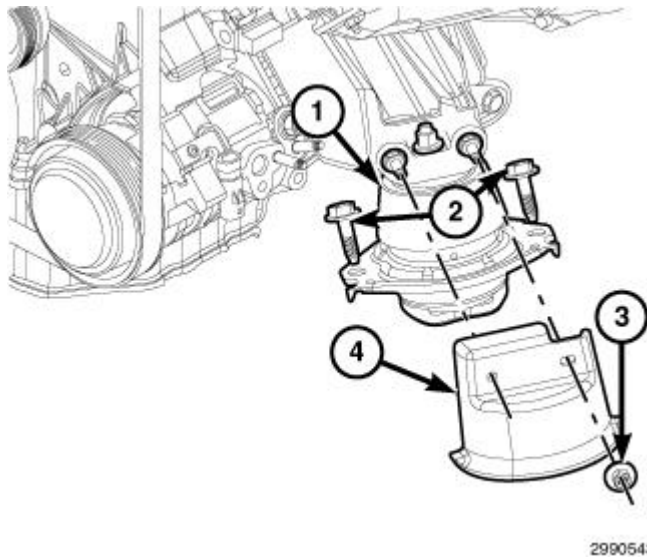
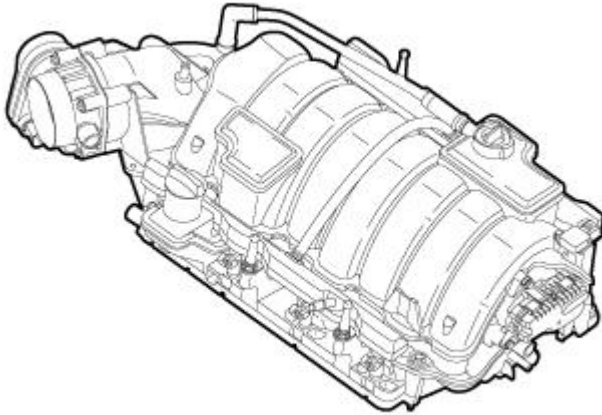


Fig. 297: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

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

5. Remove both left/right engine mount heat shield (4) retaining nuts (3) and remove the heat shields.
6. Remove both left/right engine mount lower retaining bolts (2).
7. Lower the vehicle.

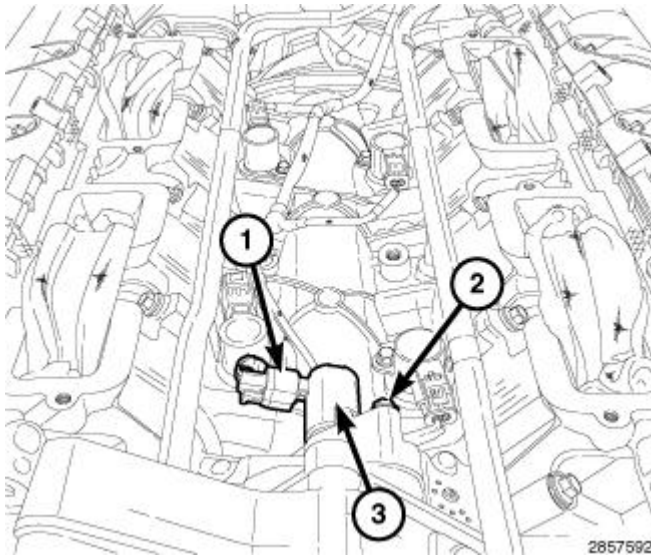


3060720

Fig. 298: Intake Manifold

Courtesy of CHRYSLER GROUP, LLC

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



2857592

Fig. 299: Oil Control Valve, Electrical Connector & Retaining Bolt

Courtesy of CHRYSLER GROUP, LLC

9. Remove the Variable Valve Control Solenoid (VVCS). Refer to **SOLENOID, VARIABLE VALVE TIMING (VVT), EXHAUST, REMOVAL**.

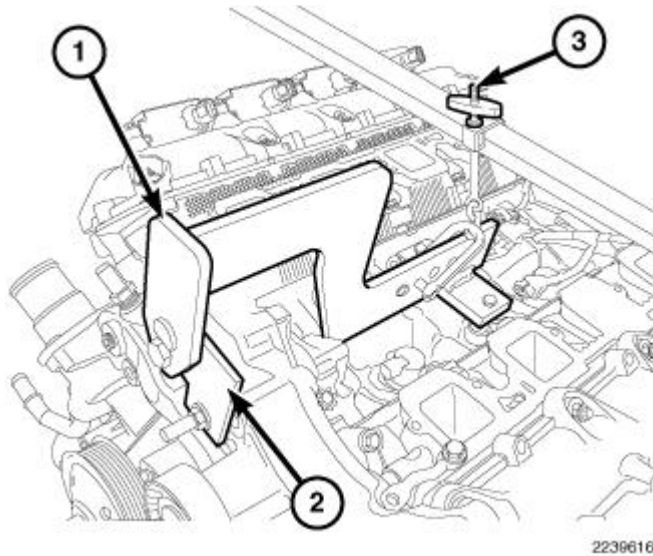


Fig. 300: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

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

10. 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).
11. Raise the engine to provide clearance to remove the engine mounts.
12. Raise and support the vehicle.

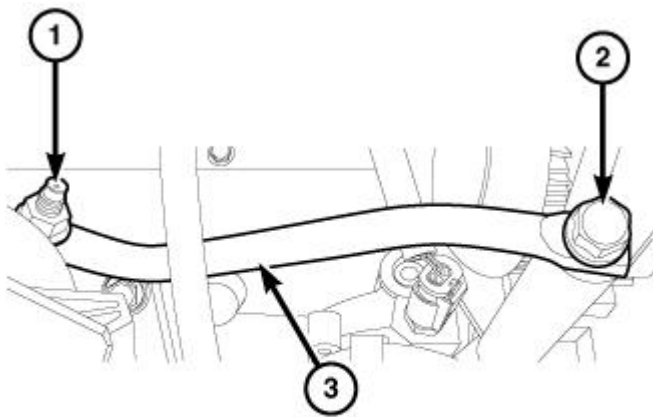


Fig. 301: Support Bracket, Bolt & Nut
Courtesy of CHRYSLER GROUP, LLC

13. Remove the generator support bracket to engine mount retaining nut (1).

14. Remove the generator support bracket retaining bolt (2) and remove the support bracket (3).

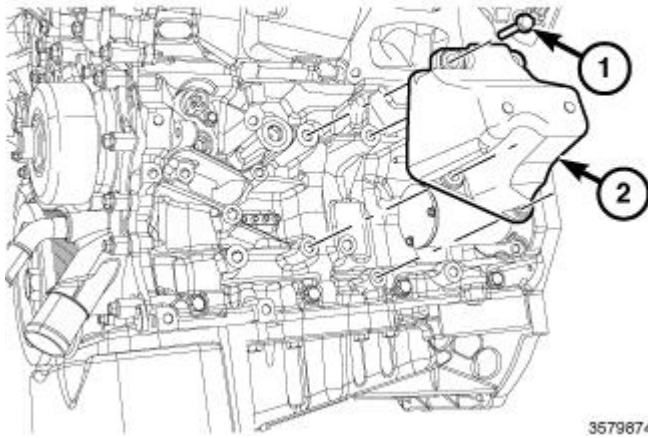


Fig. 302: Engine Mounting Bracket & Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar. Mounting brackets shown in illustration without the engine mounts.

15. Remove engine mount to engine block mounting bracket retaining bolts (1) and remove the mounting brackets (2).

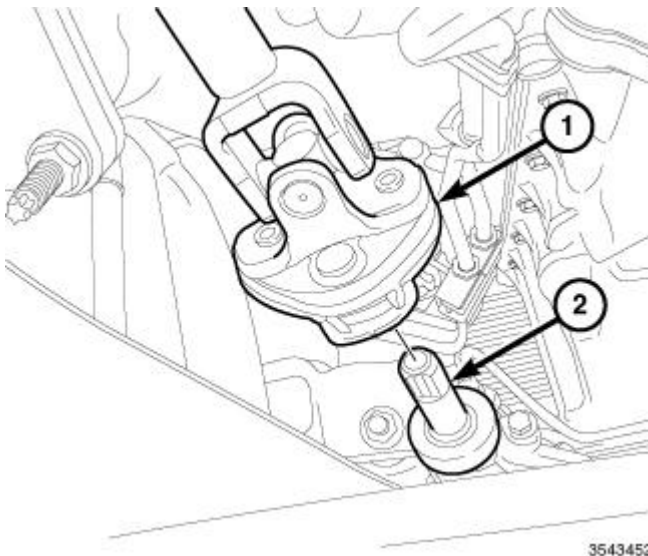
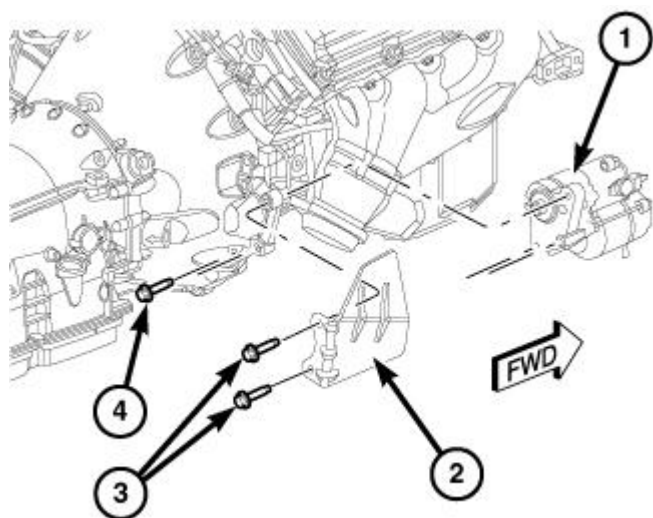


Fig. 303: Intermediate Steering Coupler & Rack And Pinion
 Courtesy of CHRYSLER GROUP, LLC

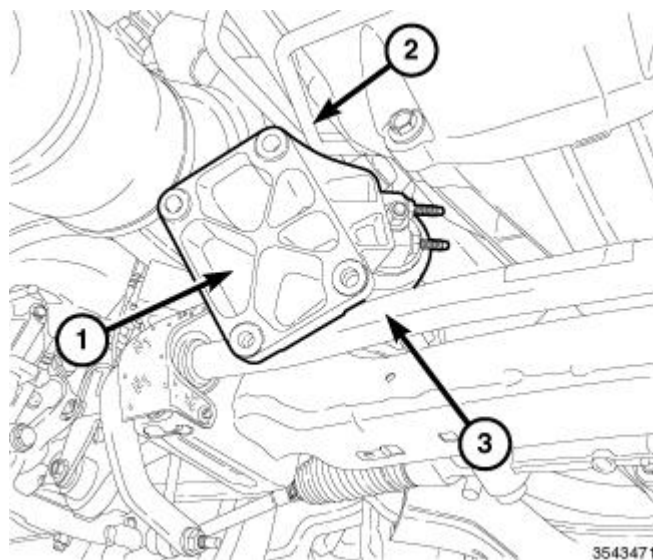
16. For removing the left side engine mount. Disconnect the intermediate steering coupler (1) from the rack and pinion (2).



3543705

Fig. 304: Starter & Right Side Engine Mount
Courtesy of CHRYSLER GROUP, LLC

17. For removing the right side engine mount. Remove the starter (1).



3543471

Fig. 305: Engine Mount
Courtesy of CHRYSLER GROUP, LLC

18. Remove the engine mount (1) assembly through the rear side of the engine.

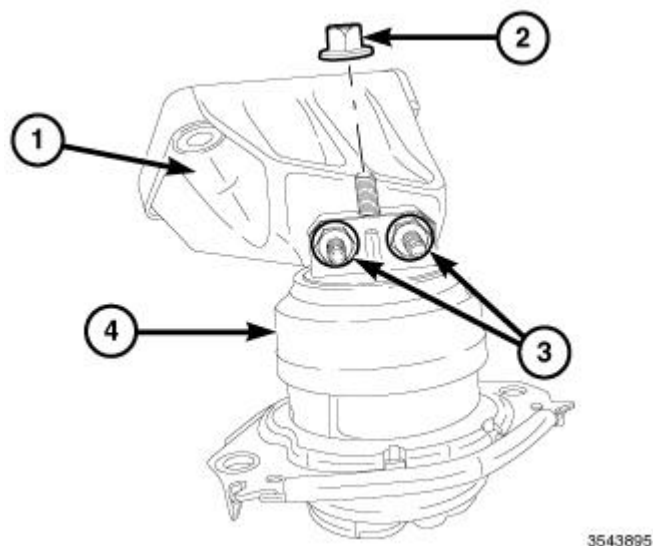


Fig. 306: Engine Mounting Bracket, Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

19. Separate the engine mount (4) from the engine mounting bracket (1).

INSTALLATION

INSTALLATION

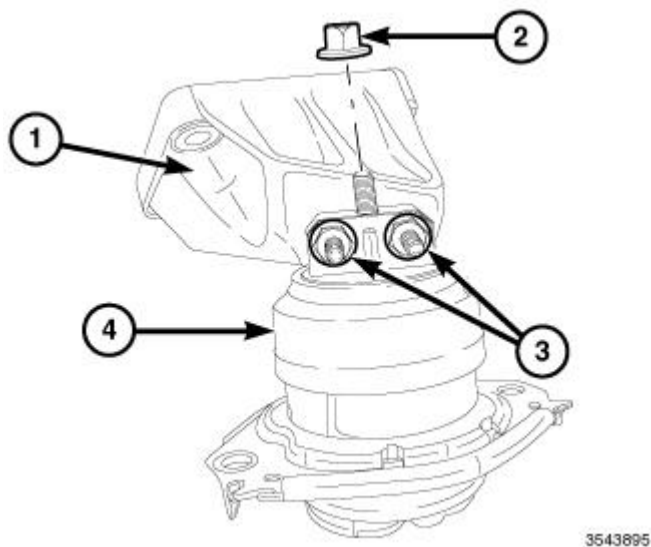


Fig. 307: Engine Mounting Bracket, Engine Mount & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Install the engine mount to the engine bracket. Tighten the nut (2) and studs (3) to 60 N.M (44 ft. lbs.)

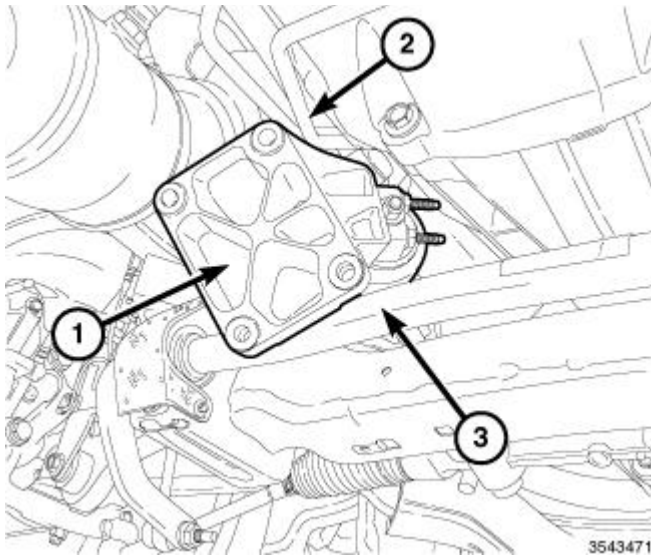


Fig. 308: Engine Mount
Courtesy of CHRYSLER GROUP, LLC

2. Position the engine mount assembly into the vehicle through the rear side of the engine.

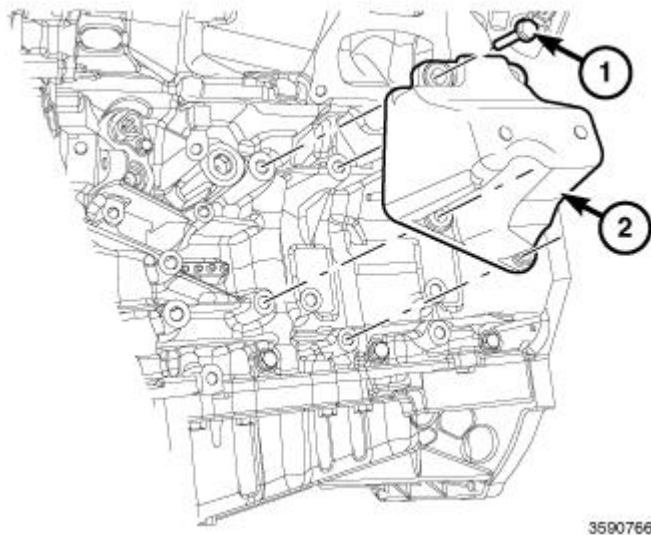
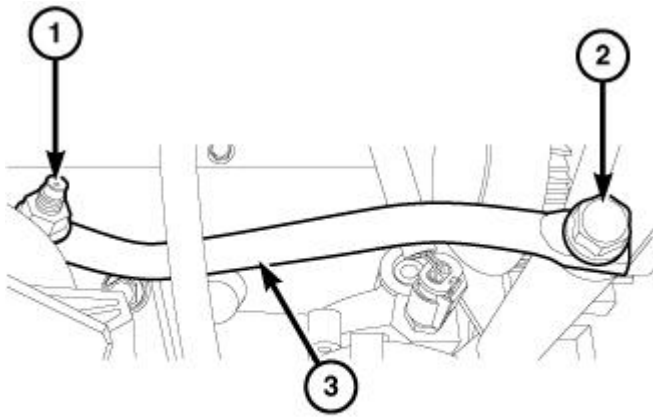


Fig. 309: Left Side Mounting Bracket
Courtesy of CHRYSLER GROUP, LLC

NOTE: Left side shown in illustration, right side similar. Mounting brackets shown in illustration without the engine mounts.

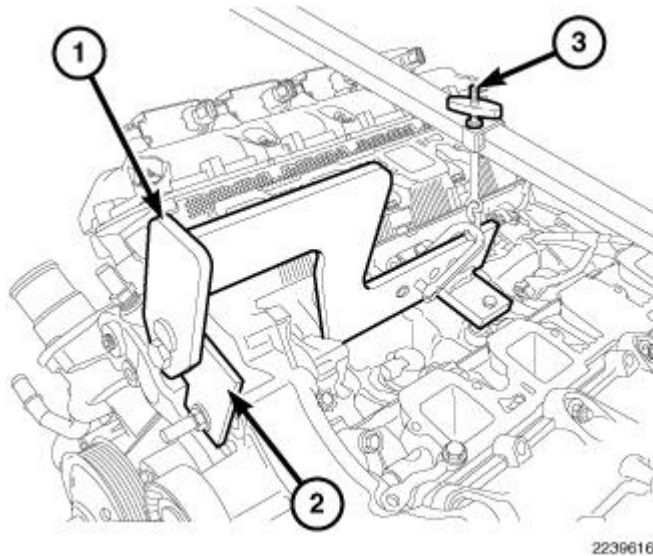
3. Position the engine mount to engine block. Install the retaining bolts and tighten to 61 N.m (45 ft. lbs.).



3002113

Fig. 310: Support Bracket, Bolt & Nut
Courtesy of CHRYSLER GROUP, LLC

4. Position the generator support bracket (3) to the engine mount, install the retaining nut (1) and tighten finger tight.
5. Position the generator support bracket (3) to the generator, install the retaining bolt (2) and tighten to 65 N.m (48 ft. lbs.).
6. Tighten the generator support bracket (3) to engine mount retaining nut (1) to 28 N.m (21 ft. lbs.).
7. Lower the vehicle.



2239616

Fig. 311: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

8. Lower the Engine Support Fixture (special tool #8534B, Fixture, Driveline Support) (3) until the engine mounts are seated in the engine cradle.

9. Remove 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).

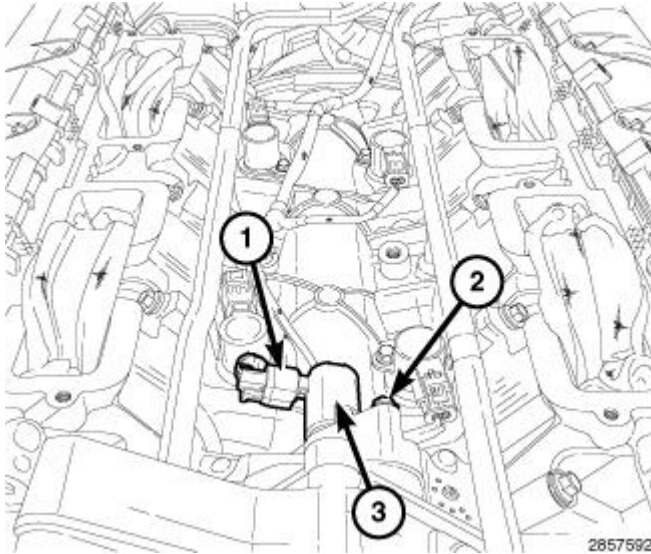


Fig. 312: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

10. Install the VVCS. Refer to **SOLENOID, VARIABLE VALVE TIMING (VVTS), EXHAUST, INSTALLATION**.
11. Raise and support the vehicle.

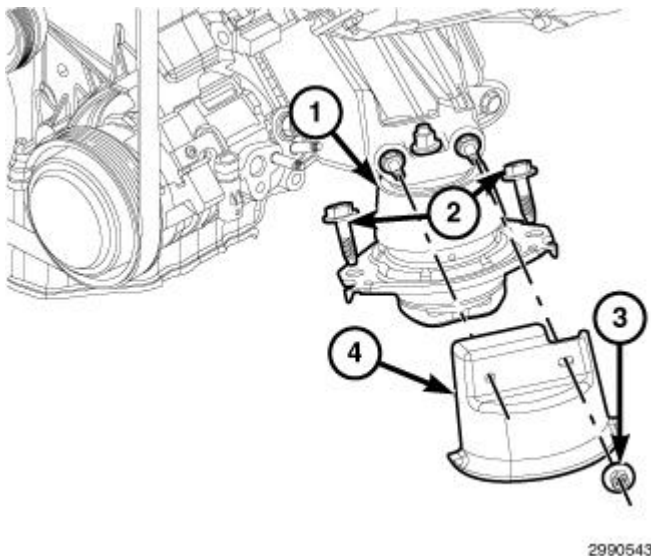


Fig. 313: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

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

12. Install both left/right engine mount lower retaining bolts (2) and tighten to 61 N.m (45 ft. lbs.).
13. Position both left/right engine mount heat shields (4), install the retaining nuts (3) and tighten to 27 N.m (20 ft. lbs.).

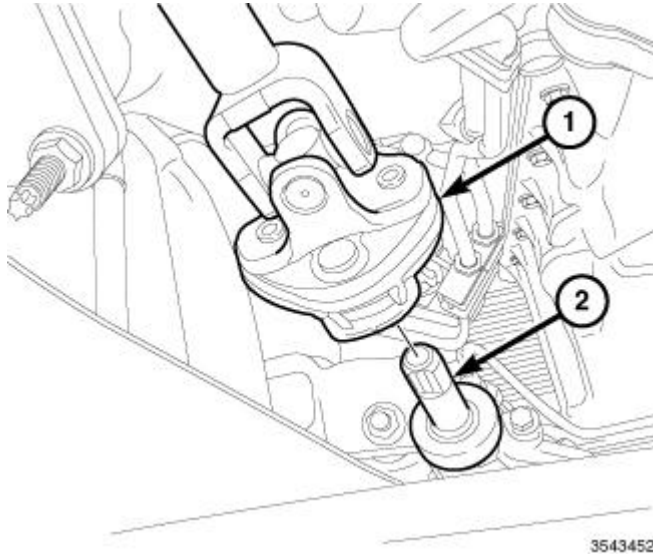


Fig. 314: Intermediate Steering Coupler & Rack And Pinion
 Courtesy of CHRYSLER GROUP, LLC

14. If disconnected. Install the intermediate steering coupler to the rack and pinion. Tighten the bolt to 45 N.m (33 ft. lbs.).

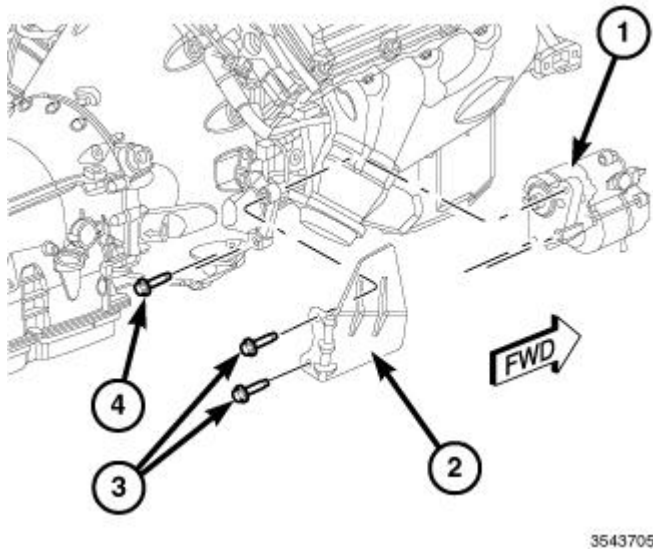


Fig. 315: Starter & Right Side Engine Mount
 Courtesy of CHRYSLER GROUP, LLC

15. If removed. Install the starter. Tighten the bolts to 27 N.m (20 ft. lbs.).

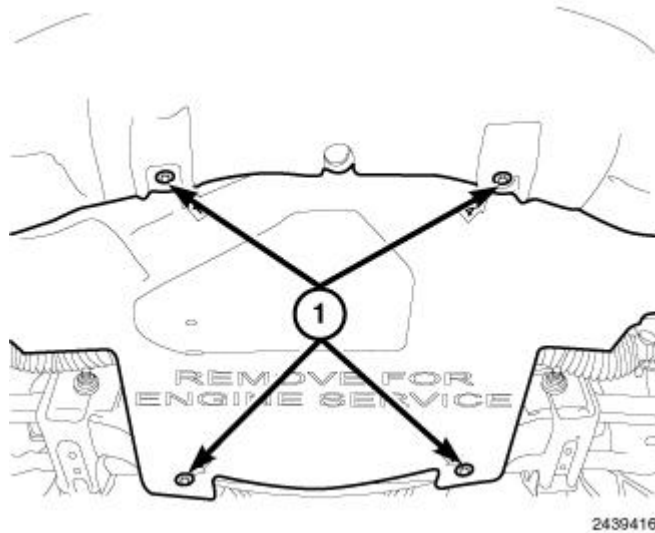


Fig. 316: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

16. Position the belly pan and install the belly pan retainers (1).
17. Lower the vehicle.
18. Position the engine oil dipstick tube, install the retaining nut at the right exhaust manifold.

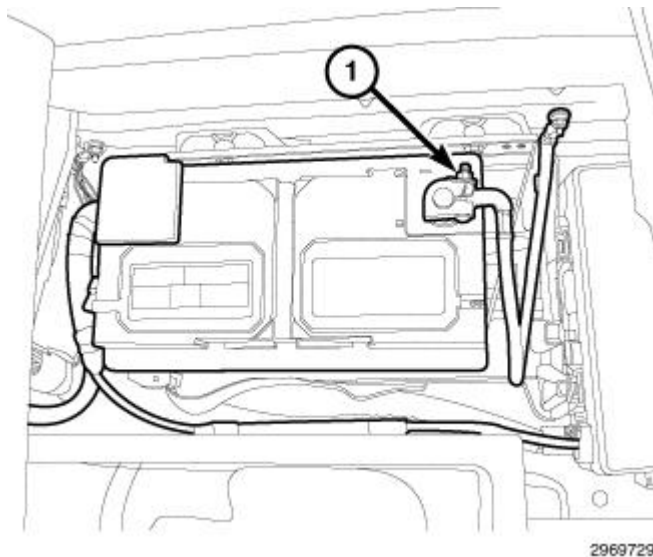
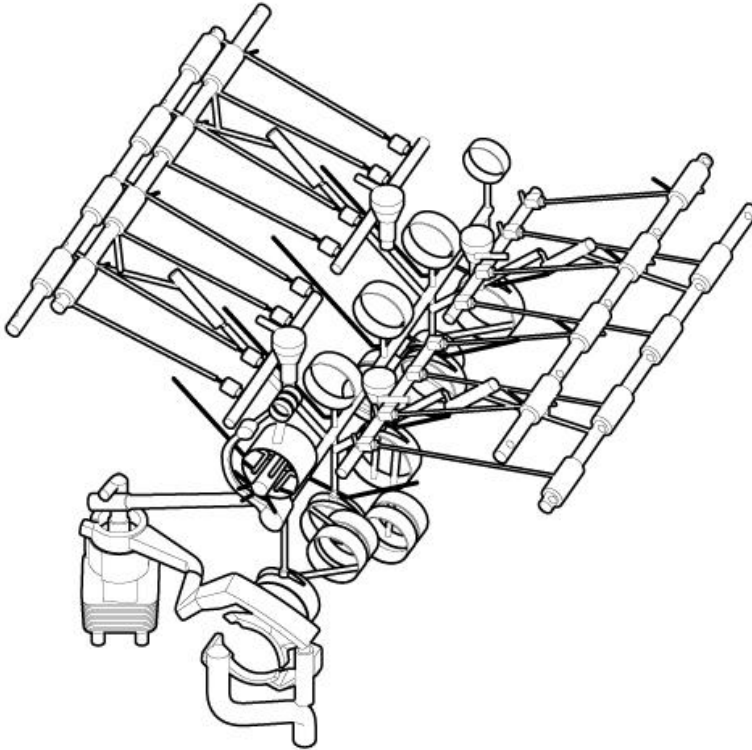


Fig. 317: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

19. Connect the negative battery cable (1).

LUBRICATION

DESCRIPTION

DESCRIPTION

3128800

Fig. 318: 6.4L Lubrication System
Courtesy of CHRYSLER GROUP, LLC

The lubrication system is a full flow filtration pressure feed type system.

DIAGNOSIS AND TESTING**CHECKING ENGINE OIL PRESSURE**

1. Remove oil pressure sending unit and install gauge assembly (special tool #C-3292A, Gauge, Pressure).
2. Run engine until thermostat opens.
3. Check oil pressure gauge:
 - 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 thus

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 oil leak. If the oil leak is found and identified, repair per service information procedures.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.

If the oil leak source is not positively identified at this time, proceed with the **AIR LEAK DETECTION TEST METHOD**.

AIR LEAK DETECTION TEST METHOD

1. Remove the PCV valve, cap or plug the PCV valve port at the intake manifold.
2. Attach an air hose with a pressure gauge and regulator onto 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, proceed with the **INSPECTION FOR REAR SEAL AREA LEAKS**.
5. If no leaks are detected, turn off the air supply and remove the air hose from the dipstick tube.
6. Remove the PCV port plug or cap at the intake manifold and install the PCV valve.
7. 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. If the oil leak is found and identified, repair per service information procedures.

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 and support the vehicle.
3. Remove torque converter or clutch housing inspection cover.
4. Using a black light and inspect the rear of the engine block for evidence of oil.

Circular spray pattern on the rear of the engine block generally indicates:

- Rear crankshaft oil seal
- Damaged crankshaft

Oil running straight down the back of the engine block generally indicates:

- Porous engine block
 - Camshaft core hole plug
 - Oil gallery pipe plug
 - Oil pan gasket
5. If no leaks are detected, pressurize the crankcase as outlined in the **AIR LEAK DETECTION TEST METHOD**.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

6. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and crankshaft oil 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 machined specifically to complement the function of the rear oil seal.

7. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

SOLENOID, VARIABLE VALVE TIMING (VVTs), EXHAUST

DESCRIPTION

DESCRIPTION

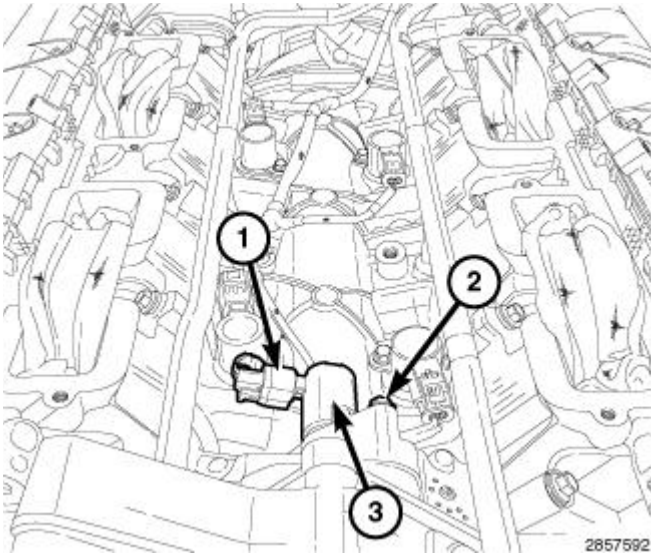


Fig. 319: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

The 6.4L engine is equipped with Variable Valve Timing (VVT). This system uses a Variable Valve Timing Solenoid (VVTs) to control the oil pressure to direct oil pressure to 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 (3) is located under the intake manifold.

OPERATION

OPERATION

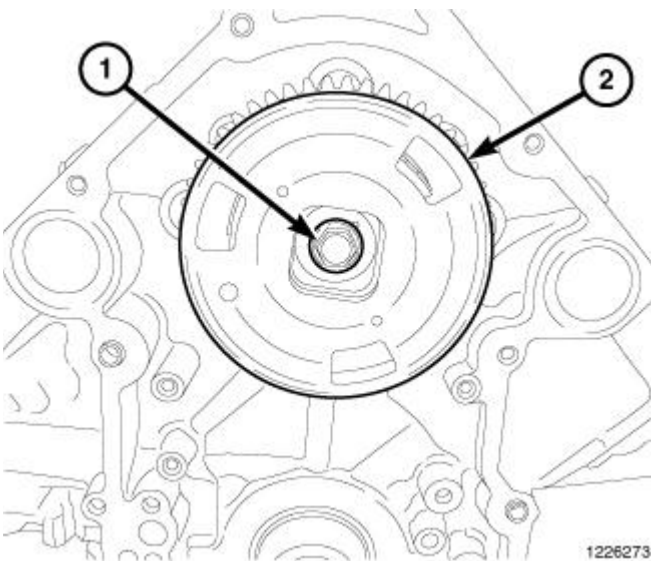


Fig. 320: Camshaft Phaser & Bolt
Courtesy of CHRYSLER GROUP, LLC

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

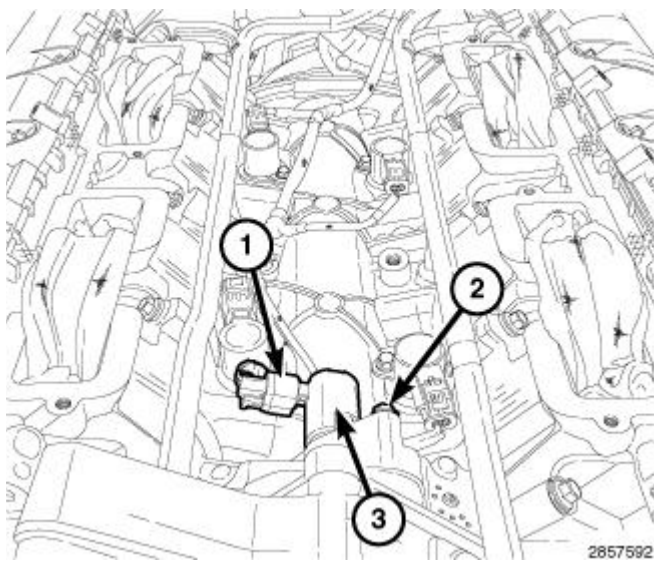


Fig. 321: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

NOTE: The Variable Valve Timing Solenoid (VVTS) (3) is located under the intake manifold.

1. Remove intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
2. Disconnect VVTS electrical connector (1).
3. Remove VVTS retaining bolt (2).

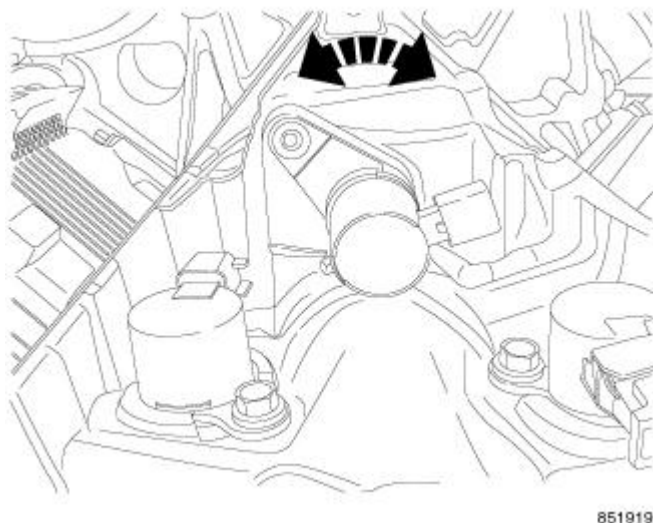


Fig. 322: Removing/Installing OCV
Courtesy of CHRYSLER GROUP, LLC

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

4. Rotate the VVTS to break the seal and remove.

INSTALLATION

INSTALLATION

1. Lubricate the Variable Valve Timing Solenoid (VVTS) rubber O-ring seal with clean engine oil.

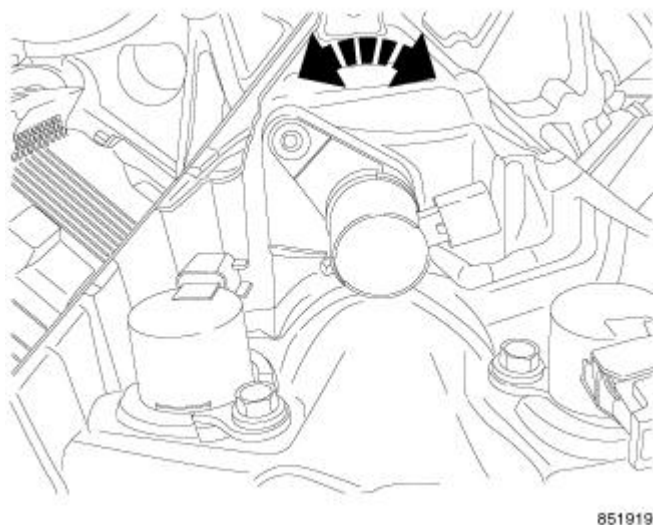


Fig. 323: Removing/Installing OCV
Courtesy of CHRYSLER GROUP, LLC

2. Install the VVTS and rotate into position.

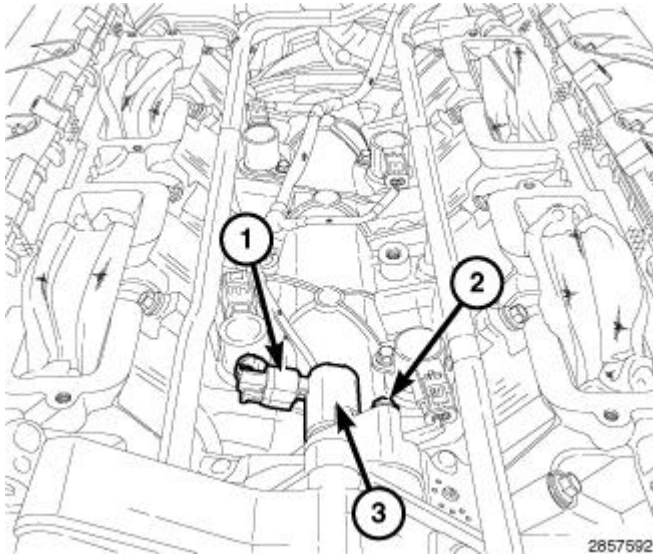


Fig. 324: Oil Control Valve, Electrical Connector & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Install the VVTS (3) retaining bolt (2) and tighten to 11 N.m (8 ft. lbs.).
4. Connect VVTS electrical connector (1).
5. Install intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.

COOLER, OIL

DESCRIPTION

DESCRIPTION

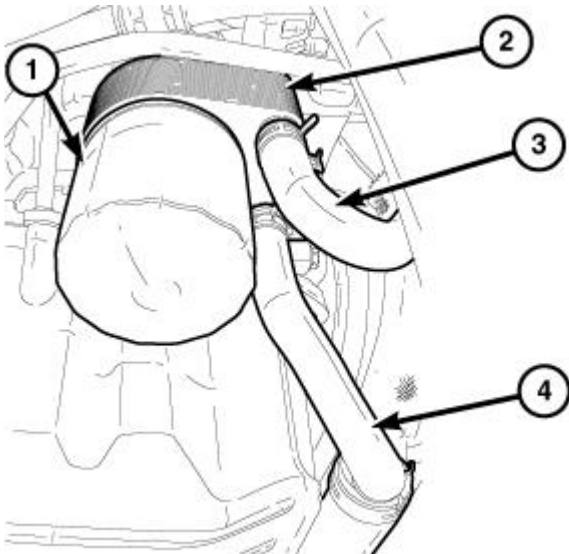


Fig. 325: Oil Filter, Oil Cooler & Hoses

Courtesy of CHRYSLER GROUP, LLC

The engine oil cooler (2) is engineered for maximum cooling efficiency with no restriction in oil flow. The oil cooler is a stack plate design coolant-to-oil heat exchanger.

The oil cooler (2) is mounted between the oil filter (1) and the engine block. The oil cooler uses the radiator coolant system; coolant is circulated through two coolant hoses to maintain a consistent engine oil temperature.

REMOVAL**REMOVAL**

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.

1. Raise and support the vehicle.

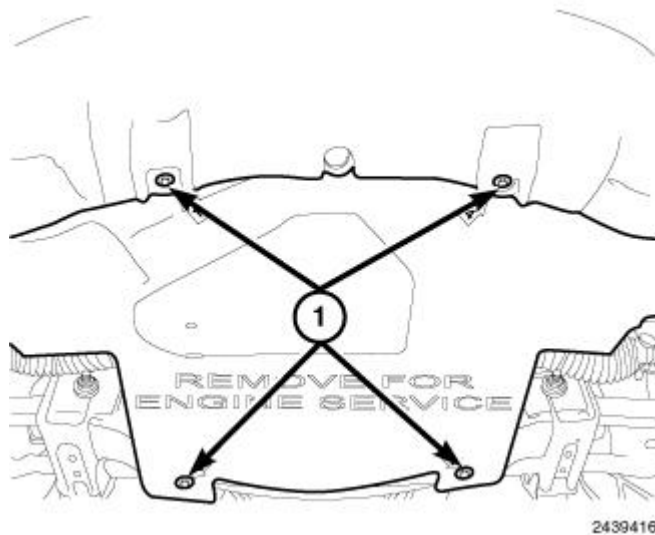


Fig. 326: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Remove the belly pan retainers (1) and remove the belly pan.
3. Drain the cooling system. Refer to Engine Cooling System - **STANDARD PROCEDURE** .

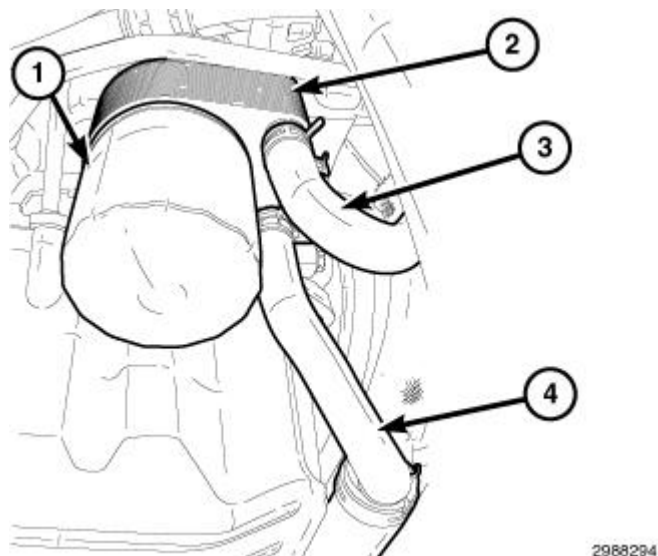


Fig. 327: Oil Filter, Oil Cooler & Hoses
Courtesy of CHRYSLER GROUP, LLC

4. Remove the oil filter (1) from the oil cooler (2).

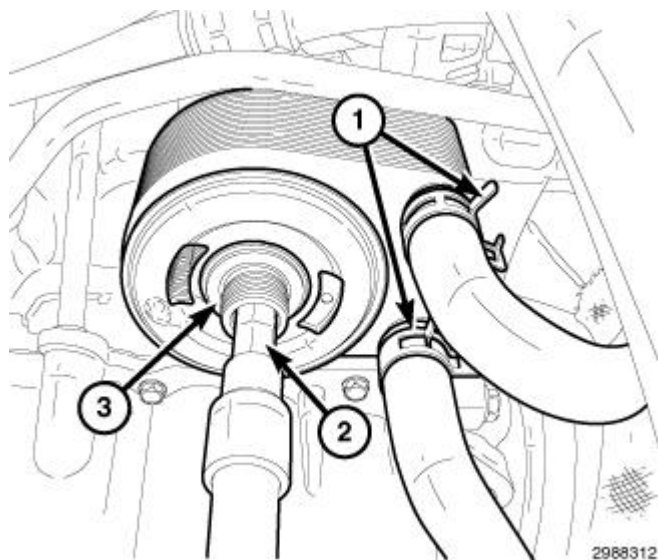
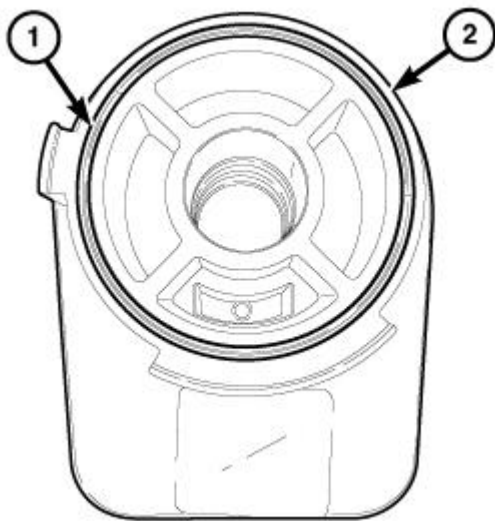


Fig. 328: Clamps, Allen Wrench Socket & Oil Cooler Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Remove the clamps (1) from the cooling hoses at the oil cooler and remove hoses.
6. Using a 12 mm Allen Wrench socket (2), remove the oil cooler retaining bolt (3).



2988394

Fig. 329: O-Ring Seal & Oil Cooler
Courtesy of CHRYSLER GROUP, LLC

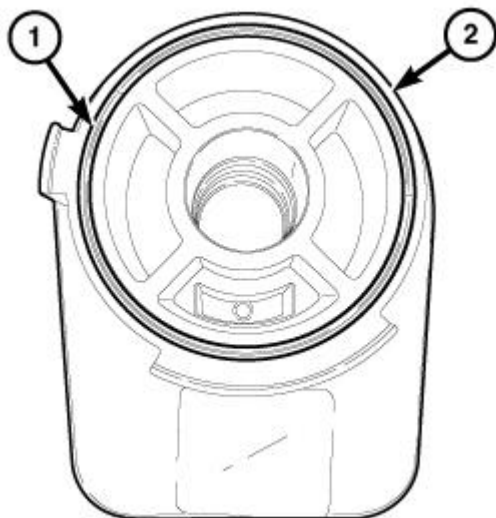
NOTE: Whenever the oil cooler is serviced, the rubber O-ring seal must be replaced.

7. Remove and discard the oil cooler (2) rubber O-ring seal (1).

INSTALLATION

INSTALLATION

CAUTION: If the engine encounters a catastrophic failure, the engine oil cooler must be replaced or damage to the new engine and/or components could result.



2988394

Fig. 330: O-Ring Seal & Oil Cooler

Courtesy of CHRYSLER GROUP, LLC

NOTE: Whenever the oil cooler is serviced, the rubber O-ring seal must be replaced.

1. Clean the sealing surface of the oil cooler (2) and install a new rubber O-ring seal (1).
2. Lightly lubricate the oil cooler rubber O-ring seal (1) with clean engine oil.

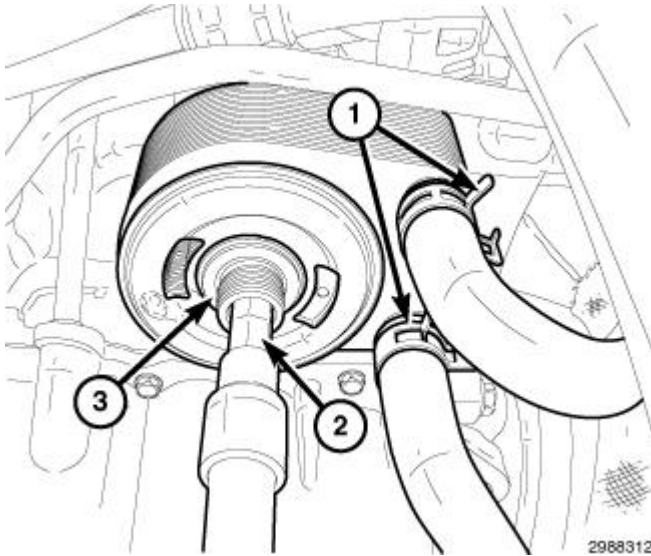


Fig. 331: Clamps, Allen Wrench Socket & Oil Cooler Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

3. Using a 12 mm Allen Wrench socket (2), install the oil cooler retaining bolt (3) and tighten to 28 N.m (21 ft. lbs.).
4. Position the cooling hoses and install the clamps (1).
5. Lightly lubricate the oil filter gasket with clean engine oil.

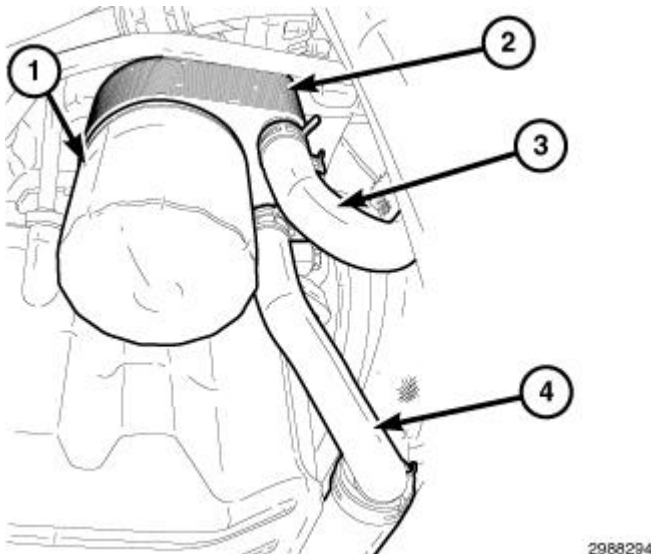


Fig. 332: Oil Filter, Oil Cooler & Hoses
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not over tighten the oil filter.

6. Thread the oil filter (1) onto the oil cooler (2) oil filter boss.
7. When the oil filter gasket makes contact with the oil cooler sealing surface, hand tighten the oil filter one half turn, or 180°.

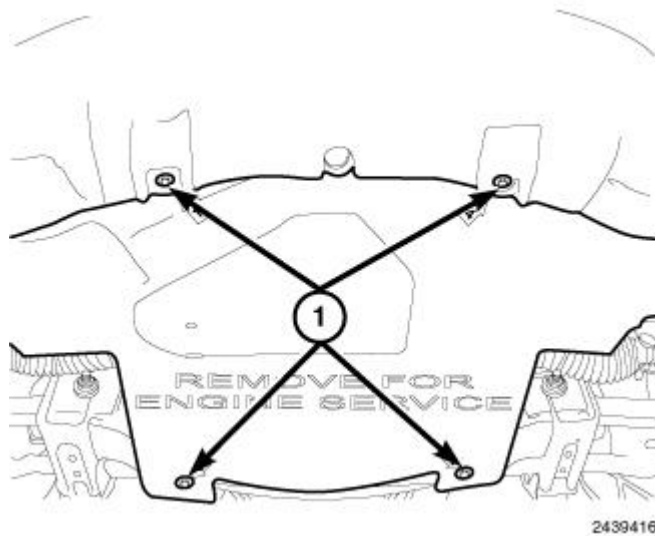


Fig. 333: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

8. Position the belly pan to the under side of the vehicle and install the retainers (1).
9. Lower the vehicle.
10. Fill the cooling system. Refer to Engine Cooling System - **STANDARD PROCEDURE** .
11. Start the engine and check for leaks.
12. Turn the engine off and check the oil level.

FILTER, ENGINE OIL

REMOVAL

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter.

1. Raise and support the vehicle.

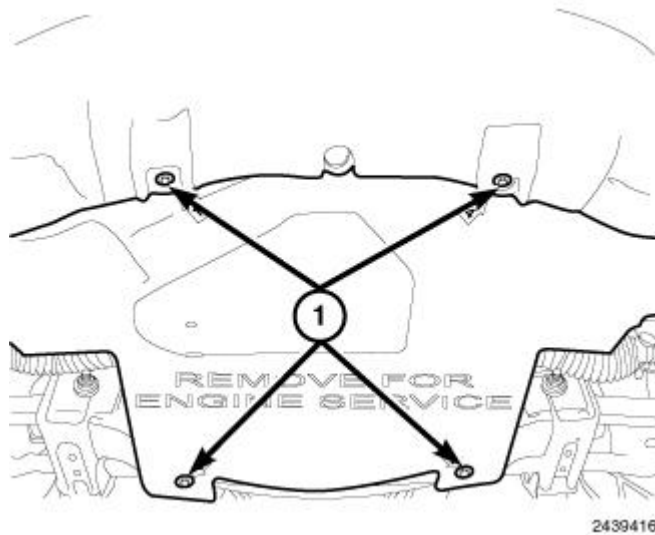


Fig. 334: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Remove the belly pan retainers (1) and remove the belly pan.
3. Position a drain pan under the oil filter.

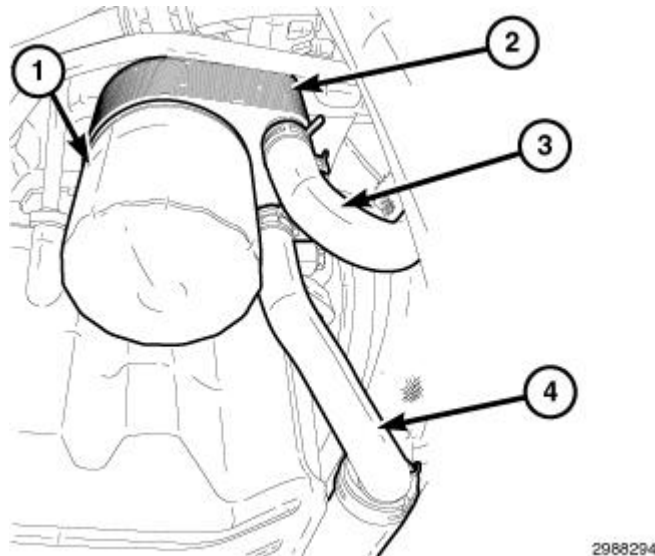


Fig. 335: Oil Filter, Oil Cooler & Hoses
Courtesy of CHRYSLER GROUP, LLC

4. Using a suitable oil filter wrench, rotate the oil filter (1) counterclockwise to remove it from the oil cooler (2).
5. When the oil filter separates from the oil cooler, keep the gasket end upward to minimize oil spill and remove the oil filter from vehicle.

NOTE: Make sure the oil filter gasket was removed with the oil filter.

6. Using a wiping cloth, clean the oil cooler gasket sealing surface of oil and grime.

INSTALLATION

INSTALLATION

1. Lightly lubricate the oil filter gasket with clean engine oil.

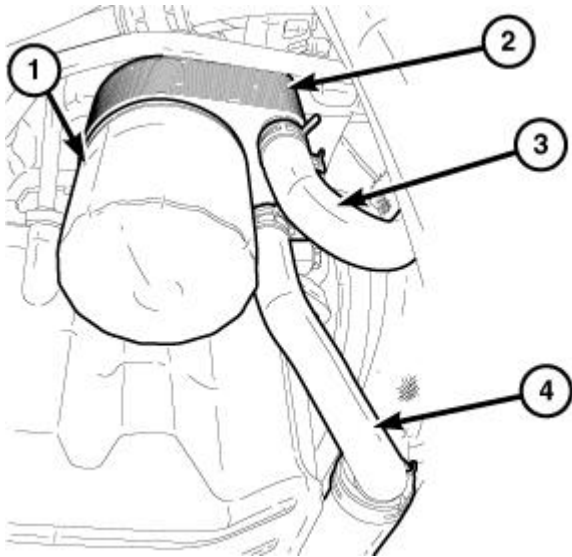


Fig. 336: Oil Filter, Oil Cooler & Hoses
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not over tighten the oil filter.

2. Thread the oil filter (1) onto the oil cooler (2) oil filter boss.
3. When the oil filter gasket makes contact with the oil cooler sealing surface, hand tighten the oil filter one half turn, or 180°.

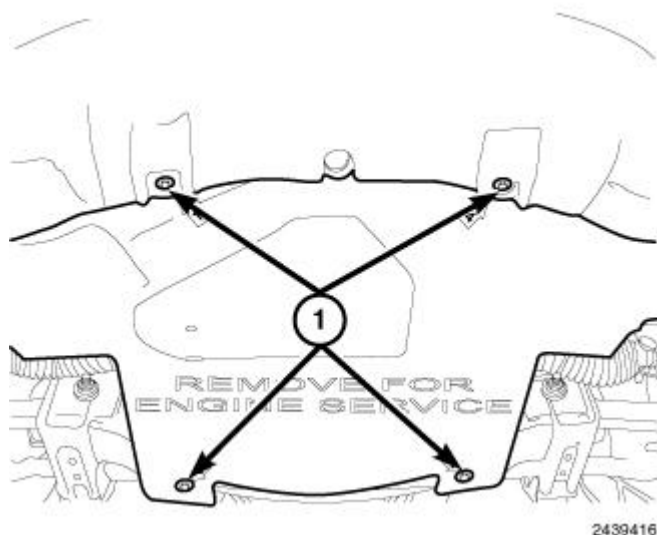


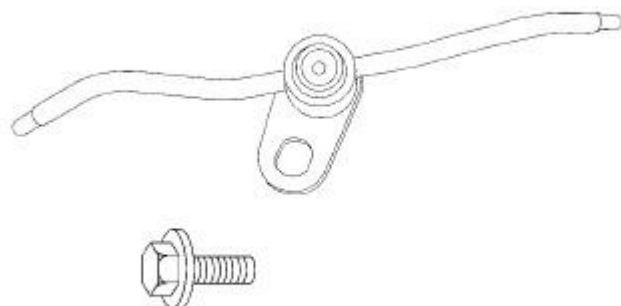
Fig. 337: Lower Splash Shield & Fasteners
 Courtesy of CHRYSLER GROUP, LLC

4. Position the belly pan to the under side of the vehicle and install the retainers (1).
5. Lower the vehicle.
6. Fill the crankcase with the specified type and amount of engine oil as described in this Service Information.
7. Install the oil fill cap.
8. Start the engine and check for leaks.
9. Turn the engine off and check the oil level.

JET, PISTON OIL COOLER

DESCRIPTION

DESCRIPTION

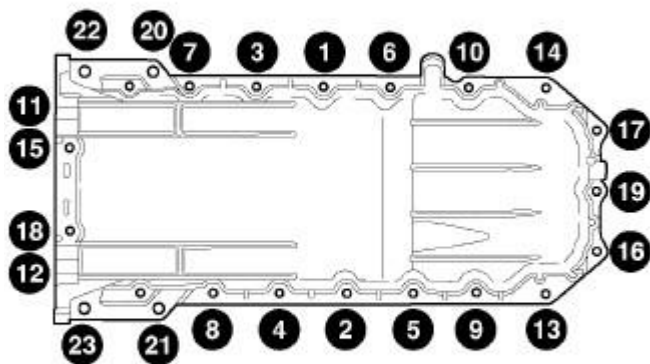


81d0111b

Fig. 338: Engine Oil Jet & Bolt

Courtesy of CHRYSLER GROUP, LLC

Four dual-nozzle oil jets are bolted to the cylinder block underneath the main oil gallery. The jets connect with an oil-tight fit to the main gallery through lubrication passages. Each oil jet helps cool the two opposing pistons.

REMOVAL**REMOVAL**

81387997

Fig. 339: Oil Pan Bolt Removal/Installation Sequence

Courtesy of CHRYSLER GROUP, LLC

1. Remove the oil pan and oil pump pickup tube. Refer to PAN, OIL, REMOVAL.

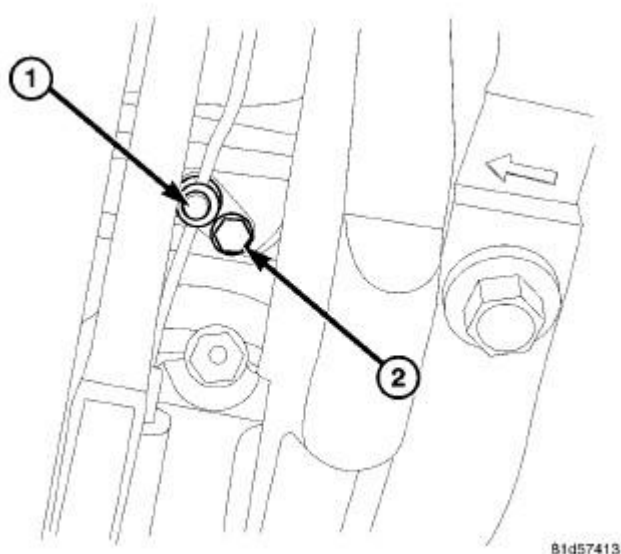


Fig. 340: Piston Oil Jet & Bolt

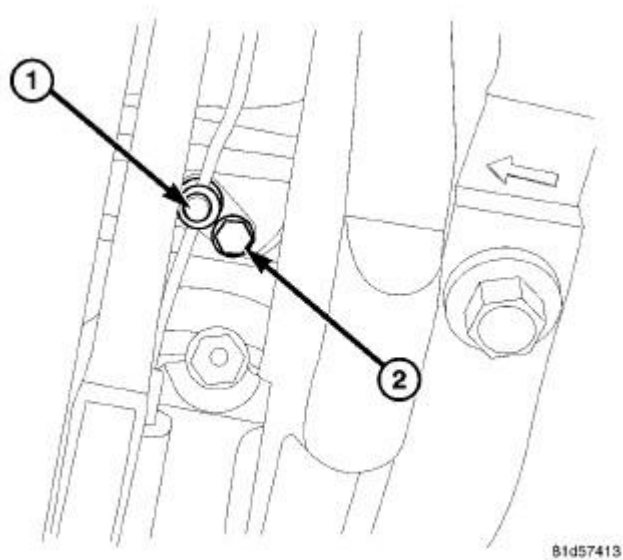
Courtesy of CHRYSLER GROUP, LLC

NOTE: It may be necessary to rotate the engine crankshaft to access the piston oil cooler jet retaining bolts.

2. Remove the piston oil cooler jet retaining bolt (2).
3. Remove the piston oil cooler jet (1).

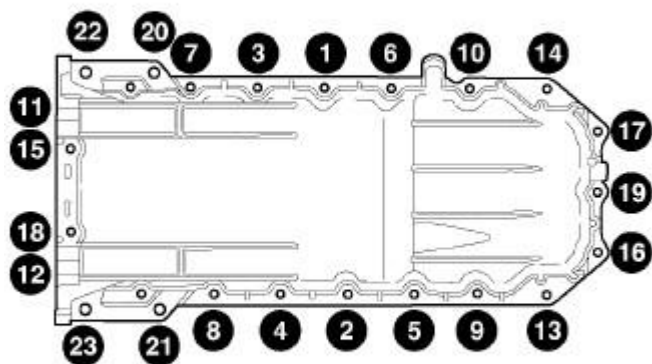
INSTALLATION

INSTALLATION

**Fig. 341: Piston Oil Jet & Bolt**

Courtesy of CHRYSLER GROUP, LLC

1. Position the piston oil cooler jet (1).
2. Install the piston oil cooler jet retaining bolt and tighten to 13 N.m (10 ft. lbs.) (2).



81387997

Fig. 342: Oil Pan Bolt Removal/Installation Sequence

Courtesy of CHRYSLER GROUP, LLC

3. Install the engine oil pump pickup tube and oil pan. Refer to **PAN, OIL, INSTALLATION**.

OIL**STANDARD PROCEDURE****STANDARD PROCEDURE - ENGINE OIL SERVICE****CRANKCASE OIL LEVEL INSPECTION**

On the 6.4L engine, the oil level indicator is located on the right side of the engine.

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

Inspect the 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 the oil level. Checking the 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 level indicator.

1. Position the vehicle on the level surface.
2. With the engine off, allow approximately five minutes for the oil to settle to the bottom of the crankcase and then remove the engine oil level indicator.
3. Wipe the oil level indicator clean.
4. Install the oil level indicator and verify it is seated in the tube.
5. Remove the oil level indicator, with the handle held above the tip, observe the oil level reading.
6. Add oil only if the level is below the ADD mark on the oil level indicator.

ENGINE OIL CHANGE

Change the engine oil at the mileage and time intervals described in the Maintenance Schedules. Refer to **MAINTENANCE SCHEDULES, DESCRIPTION**.

Run the engine until it reaches normal operating temperature.

1. Remove the oil fill cap.
2. Raise and support the vehicle.
3. Remove the belly pan. Refer to **BELLY PAN, REMOVAL**.
4. Place a suitable drain pan under the oil pan drain.
5. Remove the drain plug from the oil pan and allow the oil to drain.
6. Inspect the drain plug threads for stretching or other damage and replace if necessary.
7. Install the drain plug and tighten to 27 N.m (20 ft. lbs.).
8. Install the belly pan. Refer to **BELLY PAN, INSTALLATION**.
9. Lower the vehicle and fill the crankcase with the specified type and amount of engine oil described in this

Service Information.

10. Install the oil fill cap.
11. Start the engine and check for leaks.
12. Stop the engine and check the oil level.

NOTE: Care should be exercised when disposing of used engine oil.

PAN, OIL

REMOVAL

REMOVAL

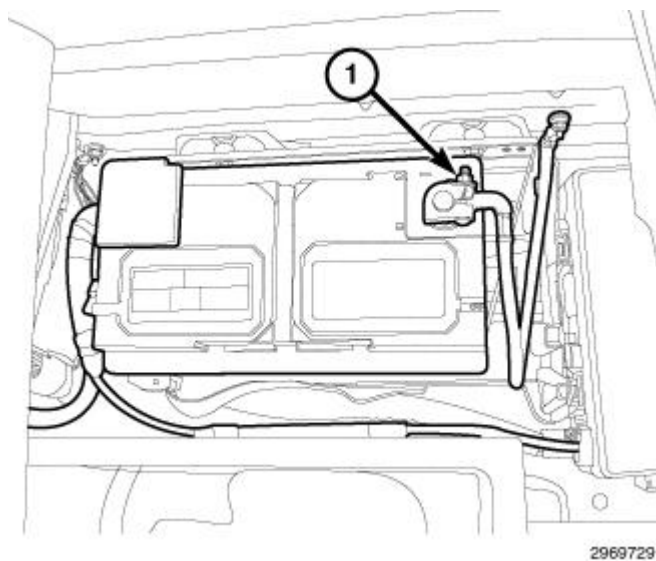


Fig. 343: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).
2. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL**.
3. Remove the engine oil dipstick and tube from the oil pan.
4. Raise and support the vehicle.

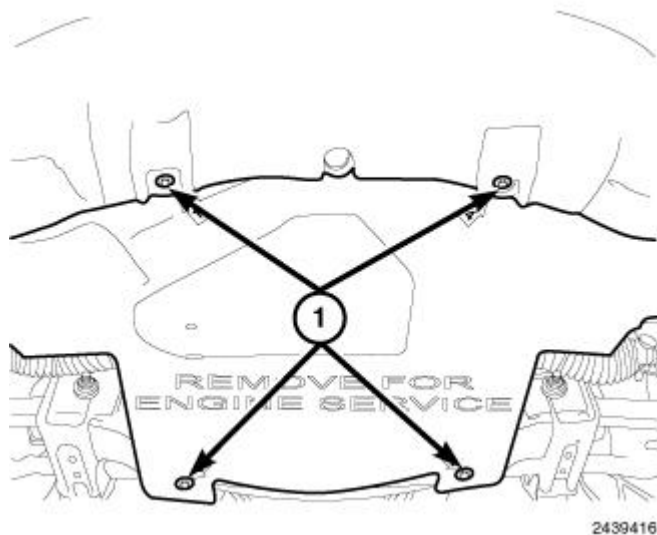


Fig. 344: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Remove the belly pan retainers (1) and remove the belly pan.
6. Drain the engine oil and remove the oil filter.

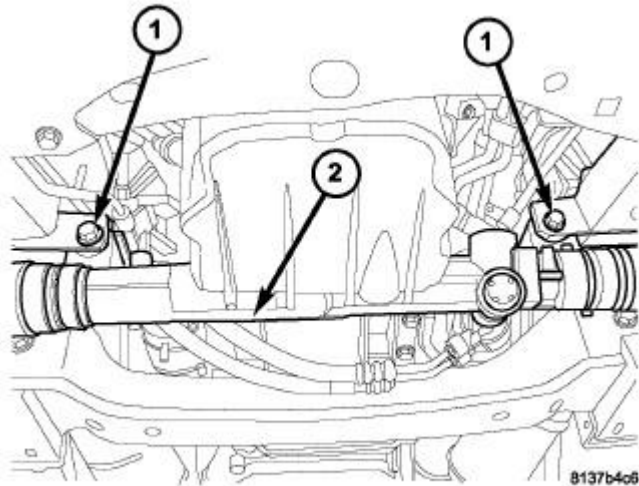


Fig. 345: Gear Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not remove P/S hoses, tie rod ends or disconnect the steering column coupler.

7. Remove the steering gear mounting bolts (1) and lower the steering gear (2) to provide clearance to remove the oil pan.

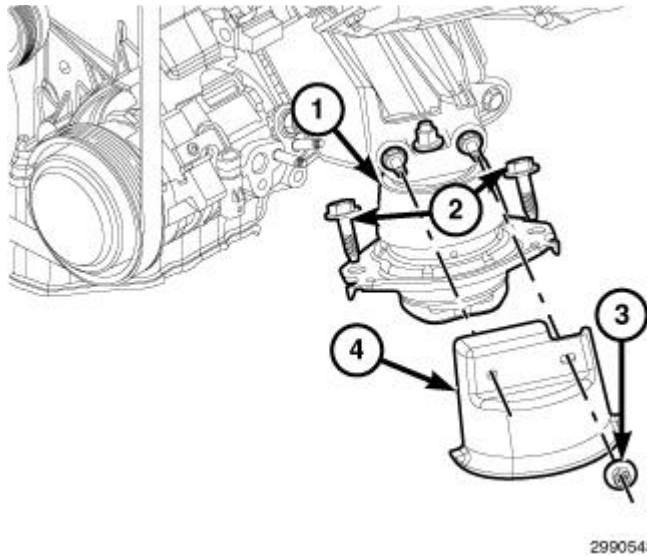


Fig. 346: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
 Courtesy of CHRYSLER GROUP, LLC

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

8. Remove both left/right front engine mount heat shield retaining nuts (3) and remove the heat shields (4).
9. Remove both left/right front engine mount lower retaining bolts (2).
10. Lower the vehicle.

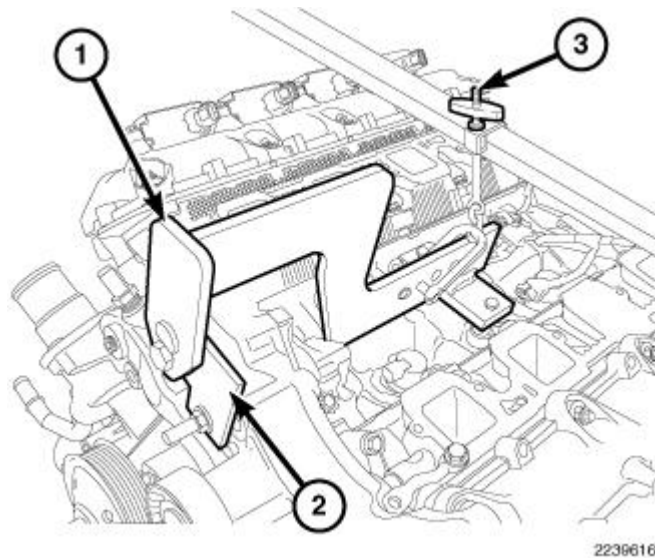


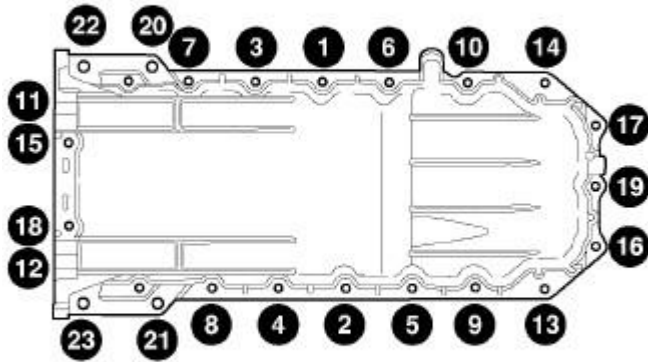
Fig. 347: Engine Lift Fixture & Adapter
 Courtesy of CHRYSLER GROUP, LLC

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

11. 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).

12. Raise the engine to provide clearance to remove the oil pan.



81387997

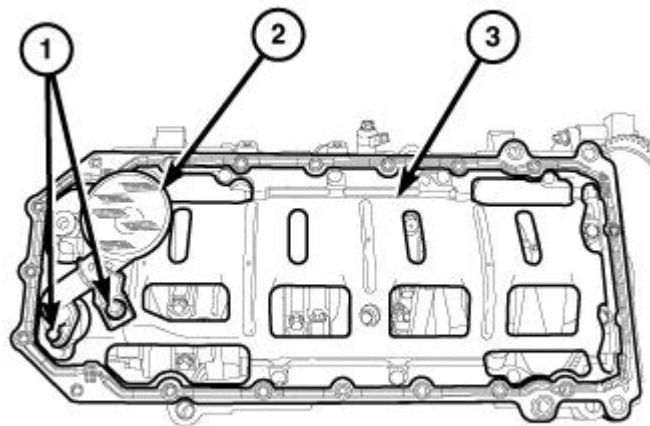
Fig. 348: Oil Pan Bolt Removal/Installation Sequence

Courtesy of CHRYSLER GROUP, LLC

NOTE: Do not pry on the oil pan or oil pan gasket. The oil pan gasket is integral to the engine windage tray and does not come out with the oil pan.

NOTE: The horizontal M10 retaining bolts (11, 12, 15, 18) are 5 mm longer in length than the vertical M10 retaining bolts (20, 21, 22, 23) and must be reinstalled in their original locations.

13. Raise and support the vehicle.
14. Remove the M10 retaining bolts (horizontal 11, 12, 15, 18 and vertical 20, 21, 22, 23) from the rear of the oil pan to the transmission.
15. Remove the M6 retaining bolts and remove the oil pan.



2970744

Fig. 349: 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.

16. Remove the oil pump pickup tube retaining bolt and nut (1).
17. Remove the oil pump pickup tube (2).
18. Remove and discard the oil pan gasket/windage tray (3).

INSTALLATION

INSTALLATION

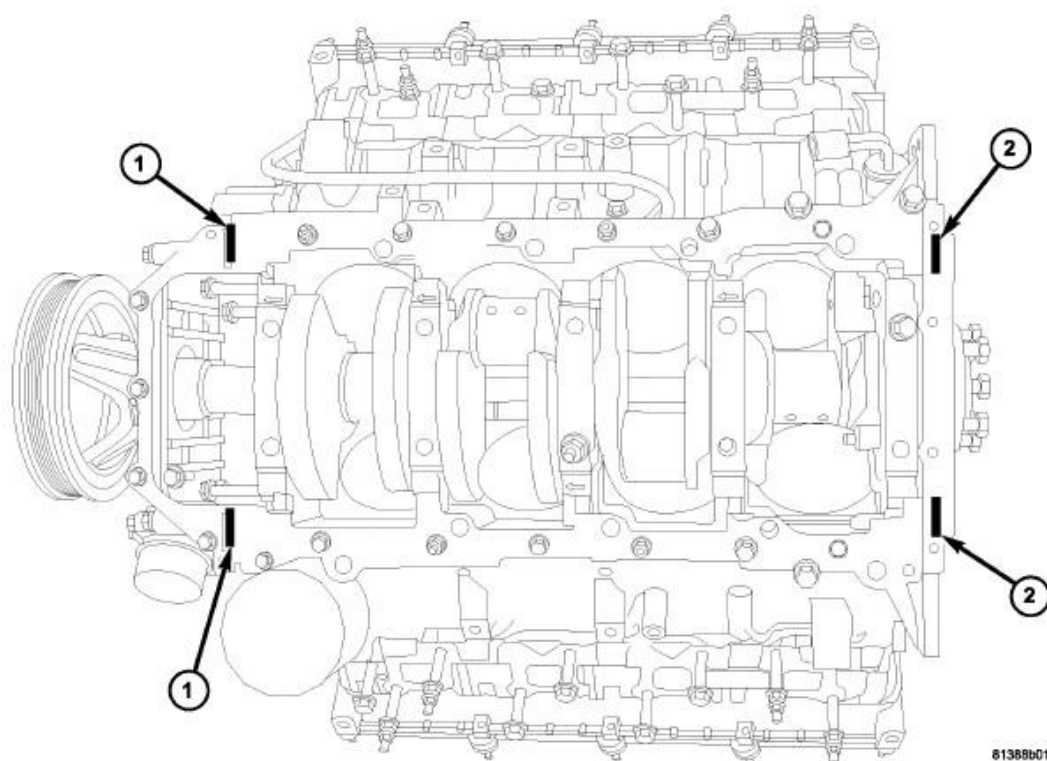


Fig. 350: T-Joint RTV Sealant Application Locations

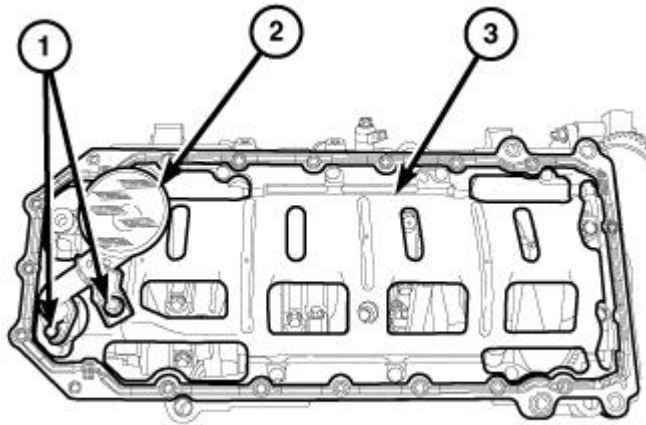
Courtesy of CHRYSLER GROUP, LLC

1 - Front Cover T-Joints

2 - Rear Oil Retainer T-Joints

NOTE: Mopar® Engine RTV must be applied to the 4 T-joints, the area where the front cover, rear retainer and oil pan gasket meet. 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 4 T-joint locations.

1. Clean the oil pan gasket mating surface of the engine block and oil pan.
2. Apply Mopar® Engine RTV at the 4 T- joints (1, 2).

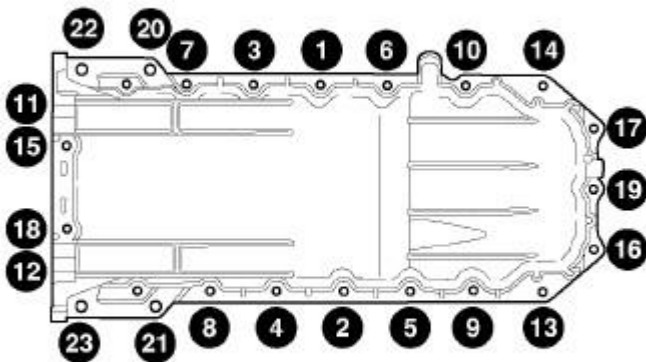


2970744

Fig. 351: 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.

3. Install a new oil pan gasket/windage tray (3).
4. Using a new O-ring, position the oil pump pickup tube (2) into the oil pump.
5. Install the oil pump pickup tube retaining bolt and nut (1) and tighten to 28 N.m (21 ft. lbs.).



81387997

Fig. 352: Oil Pan Bolt Removal/Installation Sequence
 Courtesy of CHRYSLER GROUP, LLC

NOTE: The horizontal M10 retaining bolts (11, 12, 15, 18) are 5 mm longer in length than the vertical M10 retaining bolts (20, 21, 22, 23) and must be reinstalled in their original locations.

NOTE: New M6 retaining bolts must be used when reinstalling the oil pan. Do not reuse the old M6 retaining bolts.

6. Align the rear of the oil pan with the rear face of the engine block and install the M10 and M6 retaining bolts finger tight.
7. Using the sequence shown in illustration, tighten the M6 retaining bolts to 5 N.m (44 in. lbs.).
8. Using the sequence shown in illustration, tighten the M10 retaining bolts to 54 N.m (40 ft. lbs.).
9. Using the sequence shown in illustration, tighten the M6 retaining bolts to 12 N.m (9 ft. lbs.).
10. Lower the vehicle.

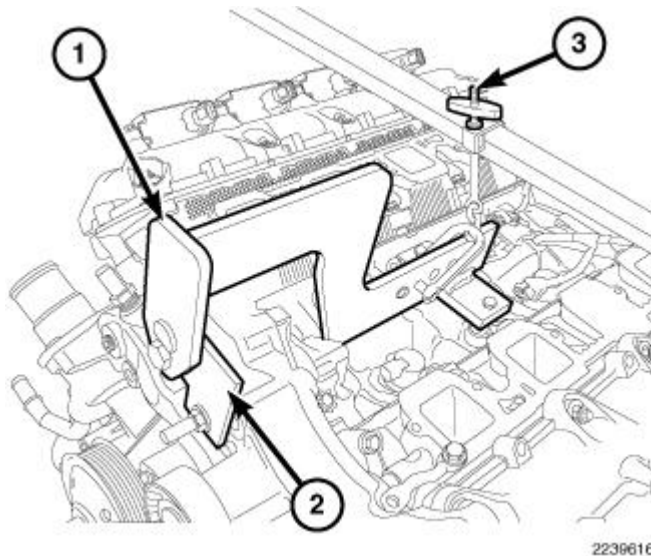


Fig. 353: Engine Lift Fixture & Adapter
Courtesy of CHRYSLER GROUP, LLC

11. 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.
12. Install the engine oil dipstick tube and dipstick.
13. Raise and support the vehicle.

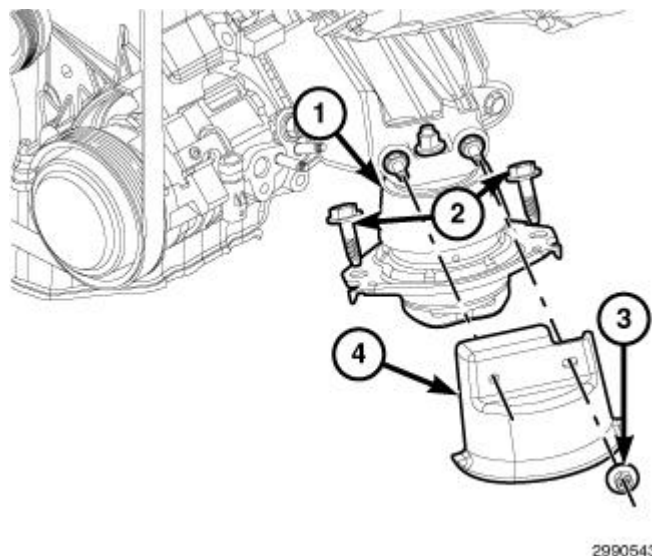


Fig. 354: Engine Mount Heat Shield Retaining Nuts, Lower Mount Retaining Bolts & Heat Shields
Courtesy of CHRYSLER GROUP, LLC

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

14. Install both engine mount lower retaining bolts (2) and tighten to 61 N.m (45 ft. lbs.).
15. Position both engine mount heat shields (4) and install retaining nuts (3).

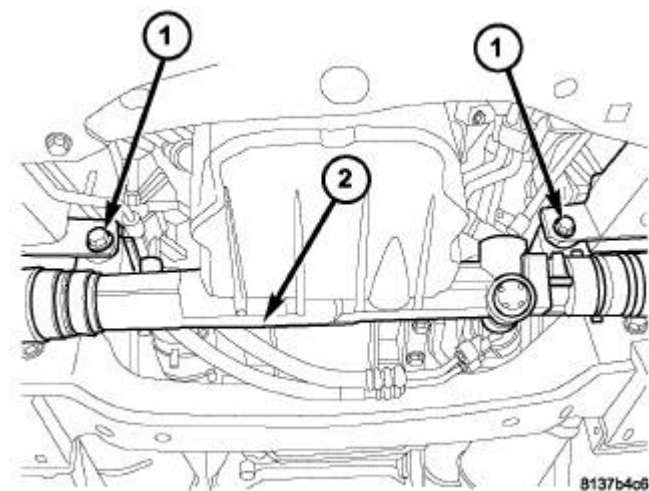


Fig. 355: Gear Mounting Bolts
Courtesy of CHRYSLER GROUP, LLC

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

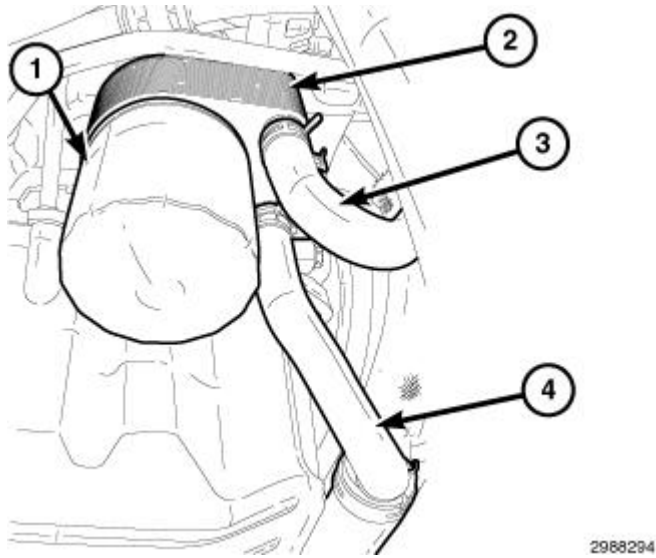


Fig. 356: Oil Filter, Oil Cooler & Hoses
Courtesy of CHRYSLER GROUP, LLC

17. Lightly lubricate the oil filter gasket with clean engine oil.

NOTE: Do not over tighten the oil filter.

18. Thread the oil filter (1) onto the oil cooler (2) oil filter boss.
19. When the oil filter gasket makes contact with the oil cooler sealing surface, hand tighten the oil filter one half turn, or 180°.

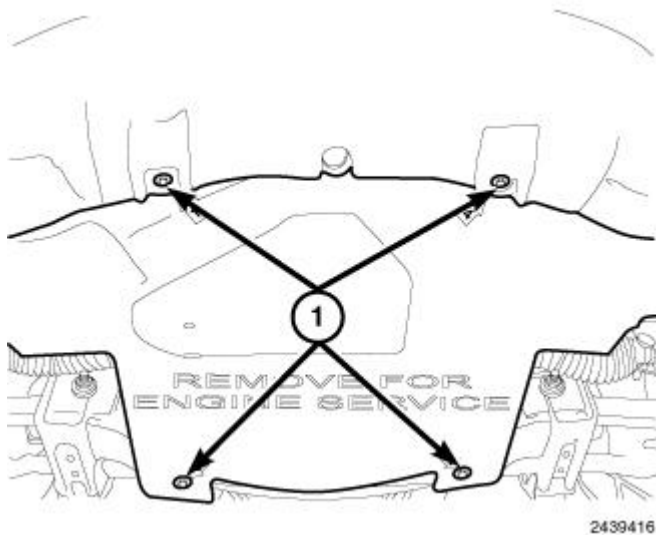


Fig. 357: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

20. Position the belly pan to the under side of vehicle and install belly pan retainers (1).
21. Lower the vehicle.

22. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
23. Fill the engine with oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE** .

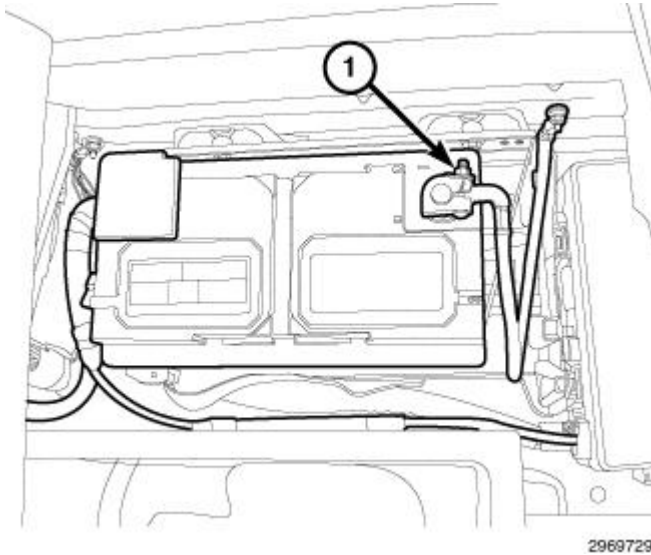


Fig. 358: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

24. Connect the negative battery cable (1).
25. Start the engine and check for leaks.

PUMP, ENGINE OIL

REMOVAL

REMOVAL

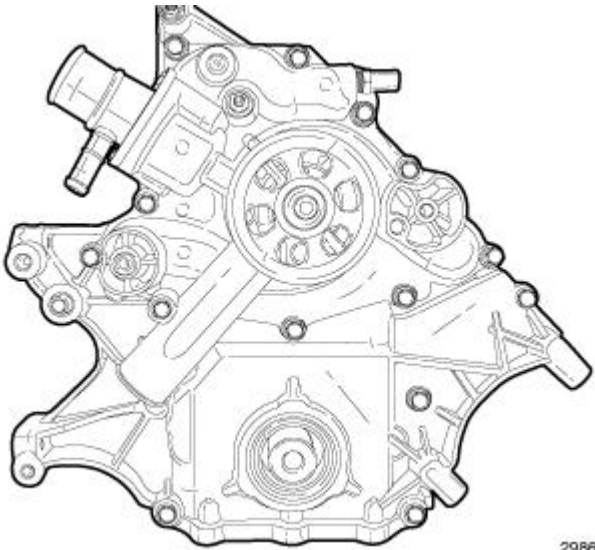
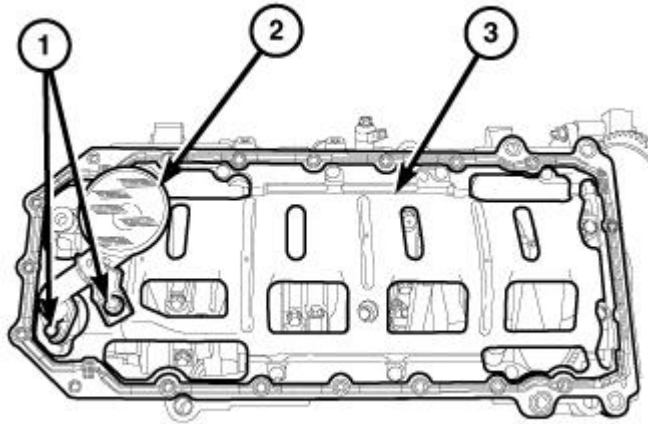


Fig. 359: Engine Timing Cover

Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove water pump for timing cover removal.

1. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL.

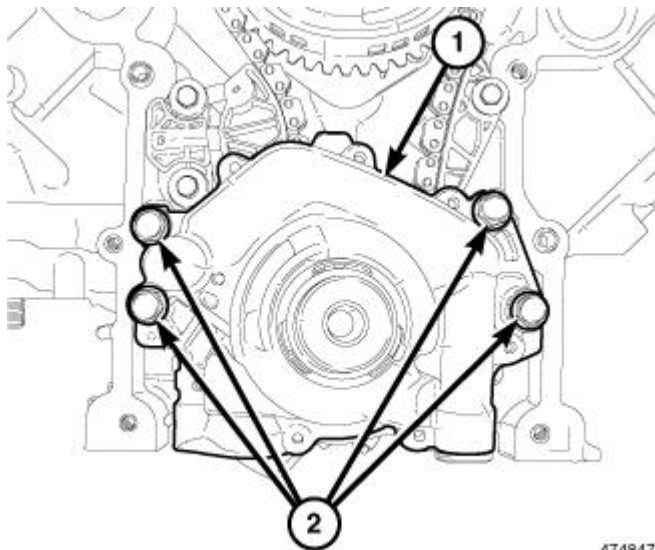


2970744

Fig. 360: 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 (3) assembly must be installed, the old gasket cannot be reused.

2. Remove the oil pan and oil pump pickup tube (2). Refer to PAN, OIL, REMOVAL.



474847

Fig. 361: Oil Pump Retaining Bolts

Courtesy of CHRYSLER GROUP, LLC

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

CLEANING

CLEANING

1. Wash all parts in a suitable solvent.
2. Using compressed air, carefully dry parts.

INSPECTION

INSPECTION

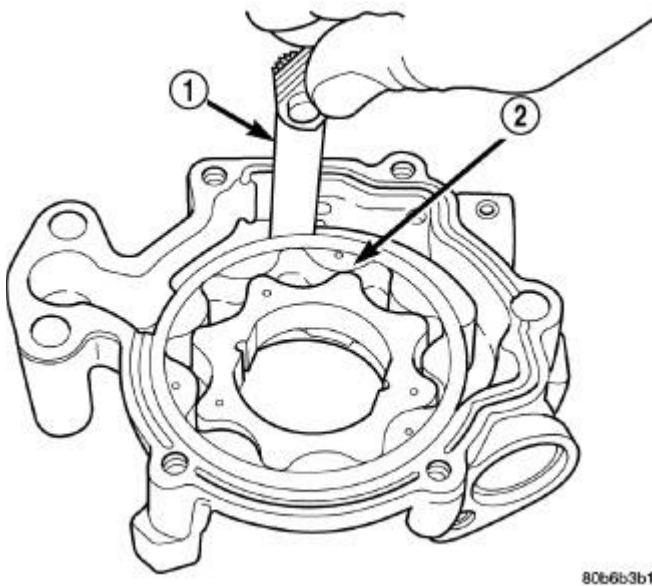


Fig. 362: Measuring Outer Rotor Clearance in Housing
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAUGE

2 - OUTER ROTOR

CAUTION: 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. The mating surface of the oil pump housing should be smooth. If the oil pump cover is scratched or grooved the oil pump assembly should be replaced.
3. Slide the outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure the clearance between the outer rotor (2) and the body. If the measurement is 0.235 mm

(0.009 in.) or greater the oil pump assembly must be replaced.

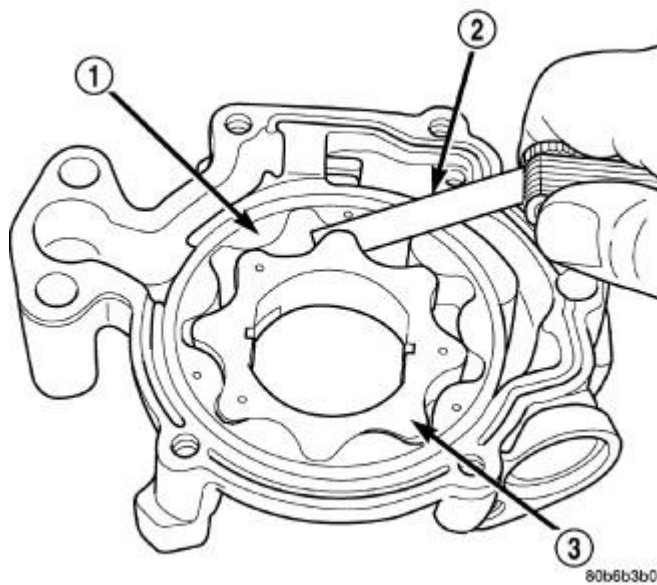


Fig. 363: Measuring Clearance Between Inner & Outer Rotors

Courtesy of CHRYSLER GROUP, LLC

1 - OUTER
ROTOR
2 - FEELER
GAUGE
3 - INNER
ROTOR

4. Install the inner rotor into the oil pump body. Measure the clearance between the inner (3) and outer (1) rotors. If the clearance between the rotors is .150 mm (0.006 in.) or greater the oil pump assembly must be replaced.

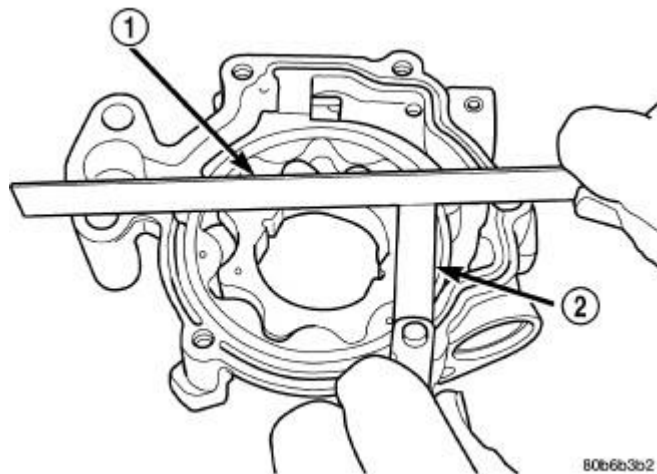


Fig. 364: Measuring Clearance Over Rotors

Courtesy of CHRYSLER GROUP, LLC

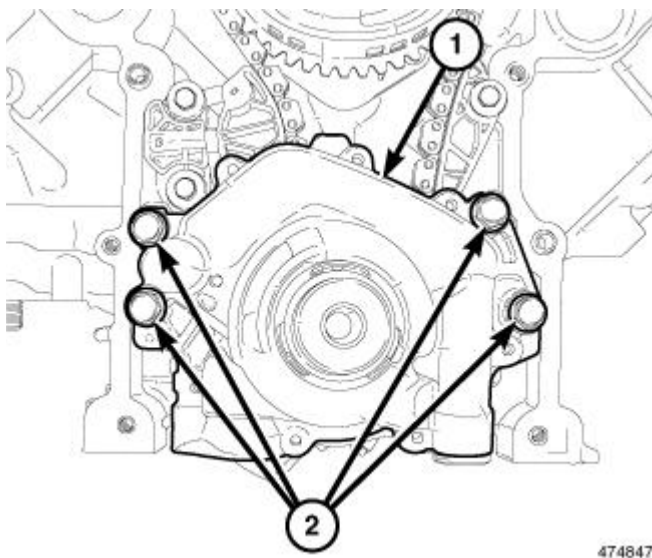
1 -
STRAIGHT
EDGE
2 - FEELER
GAUGE

5. Place a straight edge (1) across the body of the oil pump (between the bolt holes), using a feeler gauge (2), measure the clearance between the straightedge and the rotors. If the clearance is .095 mm (0.0038 in.) or greater the oil pump must be replaced.
6. Install the pump cover and tighten retainers to 15 N.m (11 ft. lbs.)

NOTE: The 6.4L oil pump is serviced as an assembly. There are no Chrysler part numbers for sub-assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

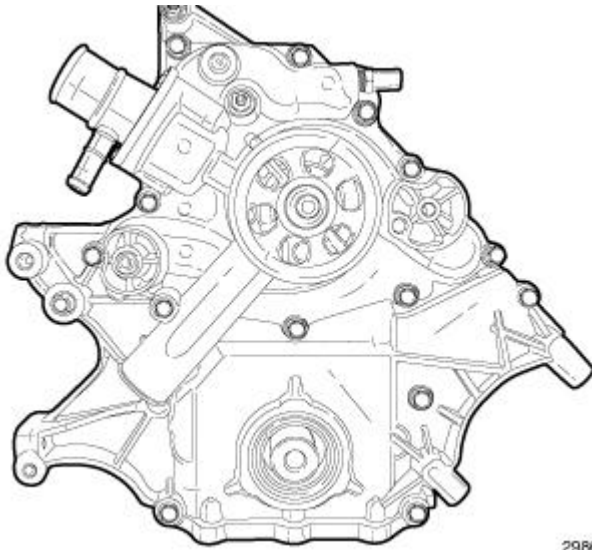
INSTALLATION

INSTALLATION

**Fig. 365: Oil Pump Retaining Bolts**

Courtesy of CHRYSLER GROUP, LLC

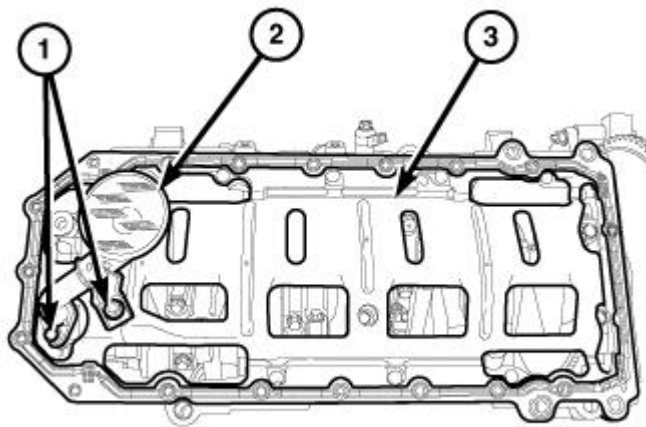
1. Position the oil pump (1) onto the crankshaft, install the retaining bolts (2) and tighten to 28 N.m (21 ft. lbs.).



2966762

Fig. 366: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

2. Install the timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION**.



2970744

Fig. 367: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Install the oil pump pickup tube (2) and 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 through 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

1. Disconnect and isolate the negative battery cable.
2. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
3. Remove the upper generator mounting bolt.
4. Raise and support the vehicle.

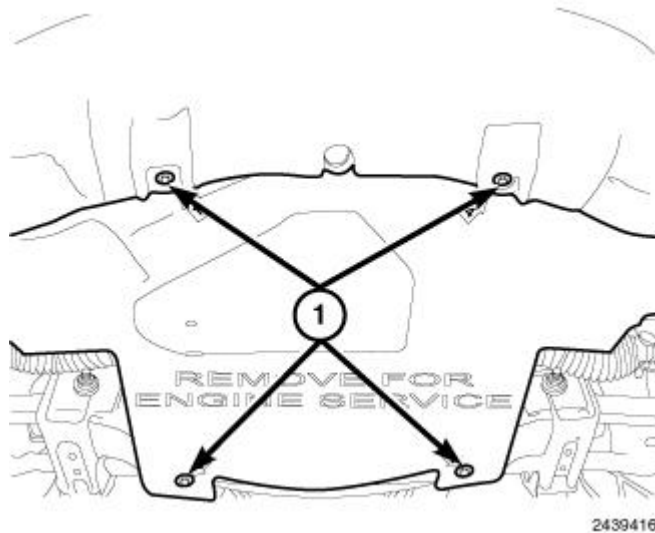
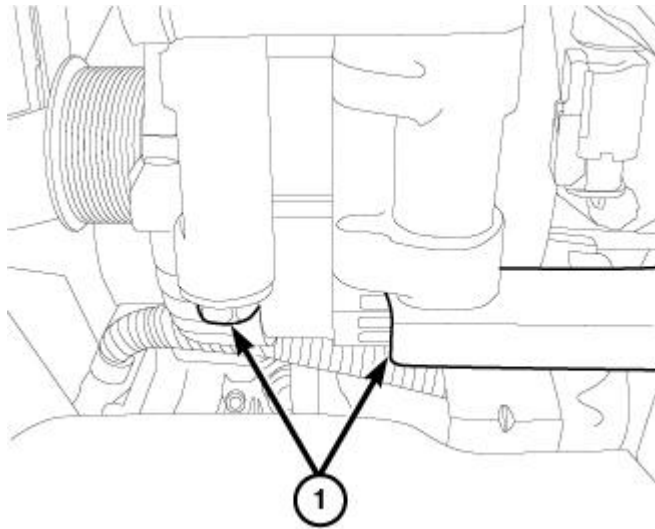


Fig. 368: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

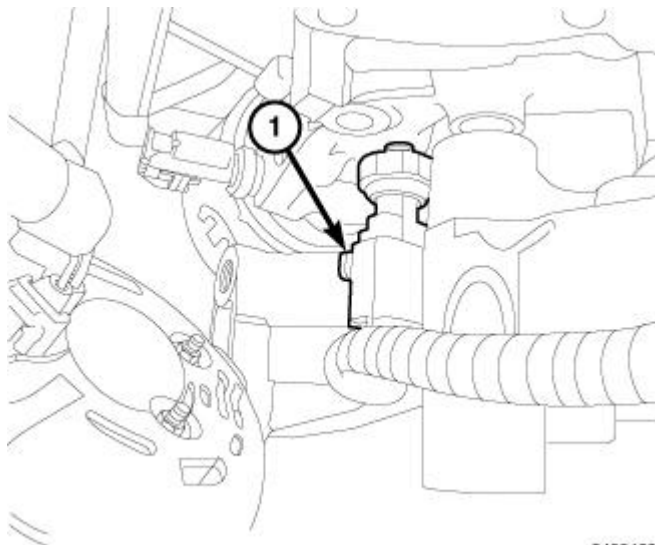
5. Remove the belly pan retainers (1) and remove the belly pan.



2439251

Fig. 369: Lower Generator Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Remove the lower generator retaining bolts (1).
7. Lower the vehicle.
8. Position the generator aside to gain access to the oil pressure sensor.



2439466

Fig. 370: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the oil pressure sensor electrical connector (1).

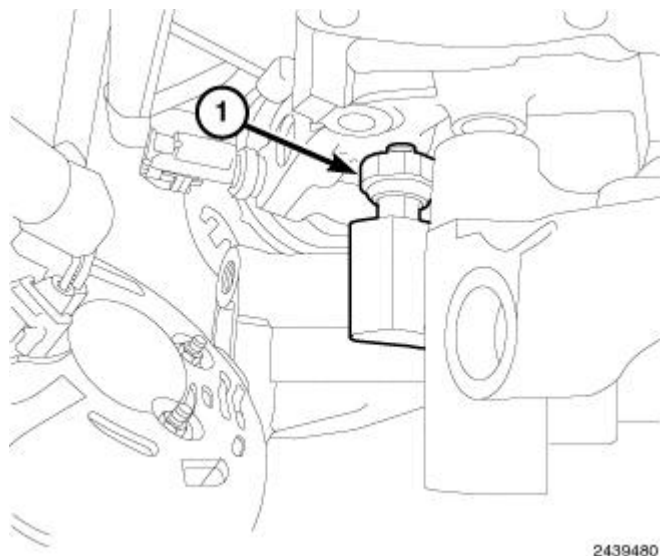


Fig. 371: Oil Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

10. Remove the oil pressure sensor (1).

INSTALLATION

INSTALLATION

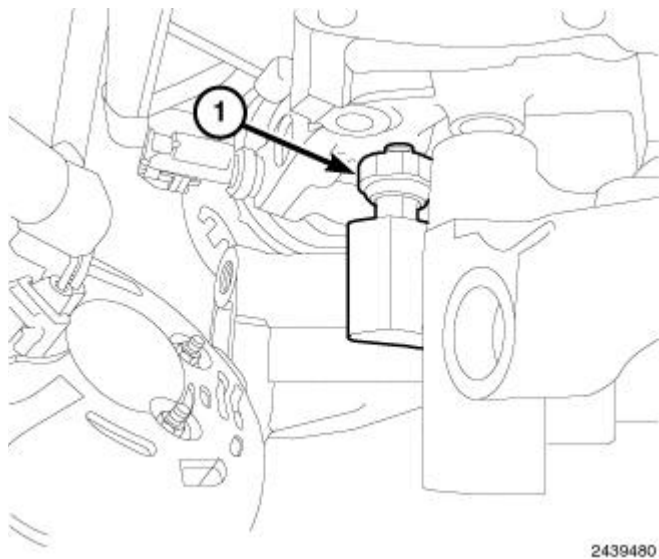
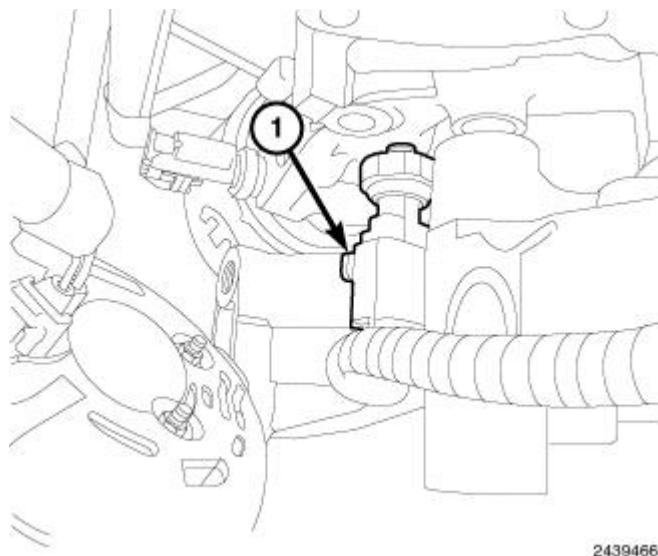


Fig. 372: Oil Pressure Sensor
Courtesy of CHRYSLER GROUP, LLC

NOTE: Apply Mopar® Thread Sealant with PTFE to the sensor threads before installing into the engine block.

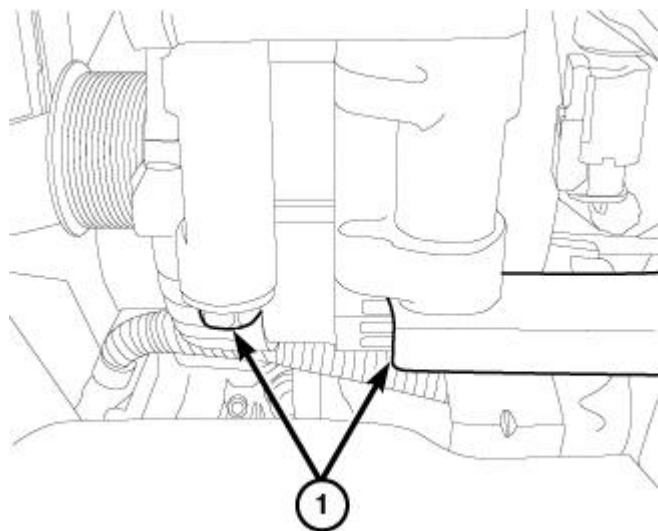
1. Install the oil pressure sensor (1).



2439466

Fig. 373: Oil Pressure Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

2. Connect the oil pressure sensor electrical connector (1).
3. Position the generator and install the upper mounting bolt finger tight.
4. Raise and support the vehicle.



2439251

Fig. 374: Lower Generator Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

5. Install the lower mounting bolts (1) and tighten to 55 N.m (41 ft. lbs).

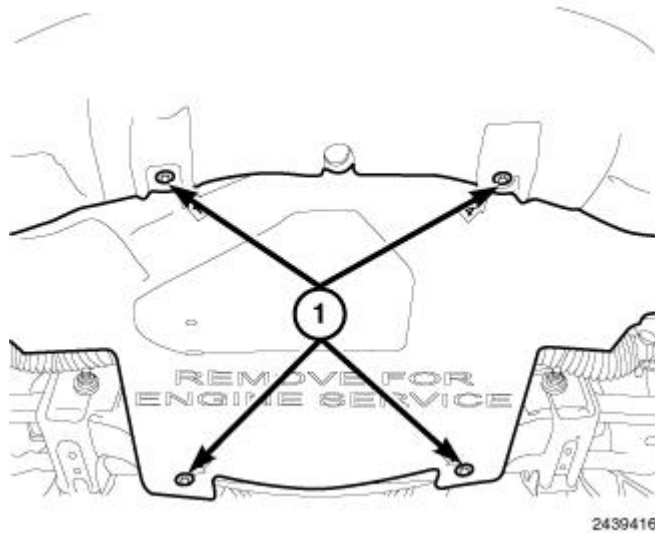


Fig. 375: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

6. Position the lower splash shield and install the retainers (1).
7. Lower the vehicle
8. Tighten the upper generator mounting bolt to 55 N.m (41 ft. lbs).

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump may be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat.

9. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION**.
10. 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**

1. Disconnect and isolate the negative battery cable.
2. Remove the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
3. Remove the generator upper mounting bolt.
4. Raise and support the vehicle.

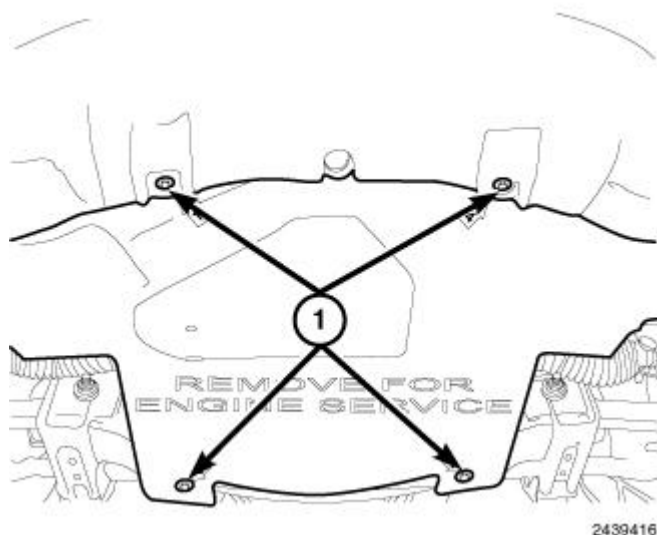


Fig. 376: Lower Splash Shield & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Remove the belly pan retainers (1) and remove the belly pan.

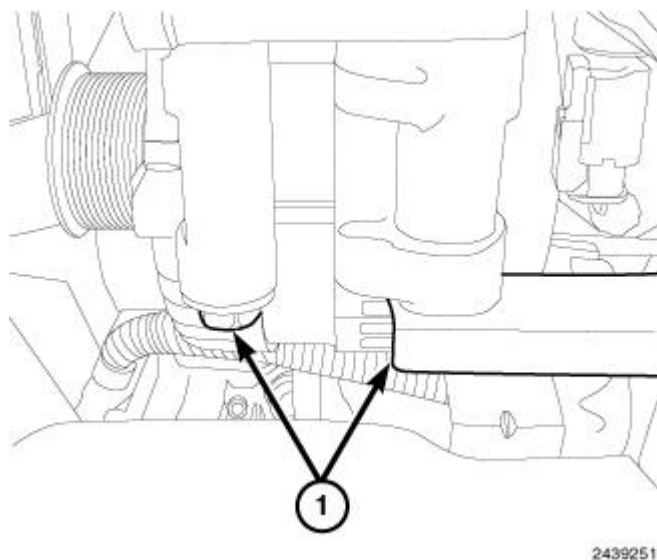
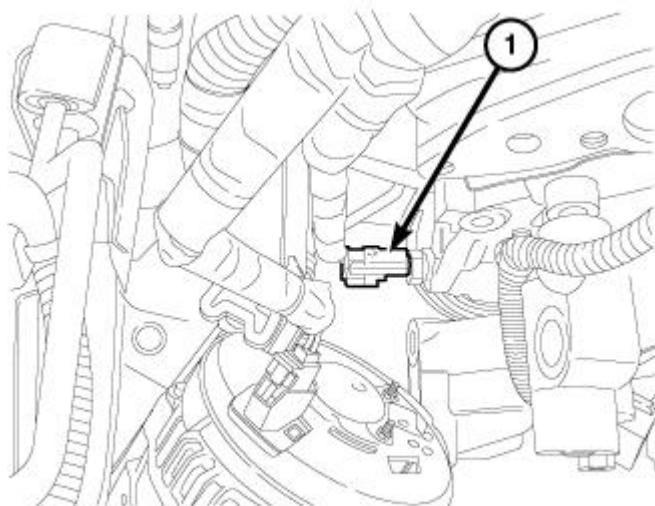


Fig. 377: Lower Generator Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

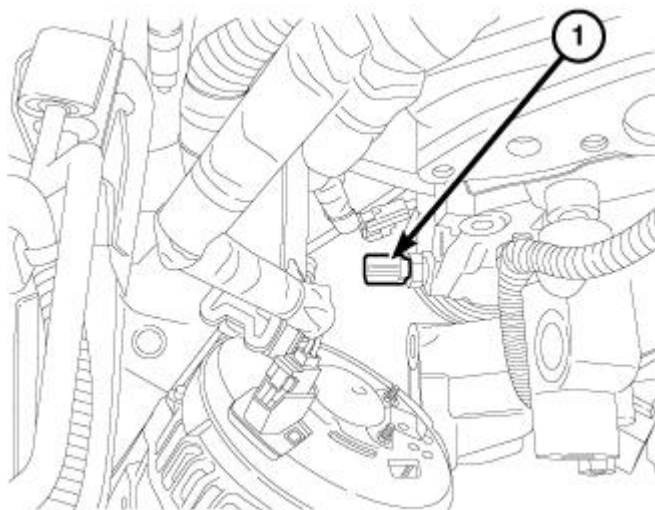
6. Remove the generator lower mounting bolts (1).
7. Lower the vehicle.
8. Position the generator aside to gain access to the oil temperature sensor.



2439543

Fig. 378: Oil Temperature Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the oil temperature sensor electrical connector (1).



2439611

Fig. 379: Oil Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

10. Remove the oil temperature sensor (1).

INSTALLATION

INSTALLATION

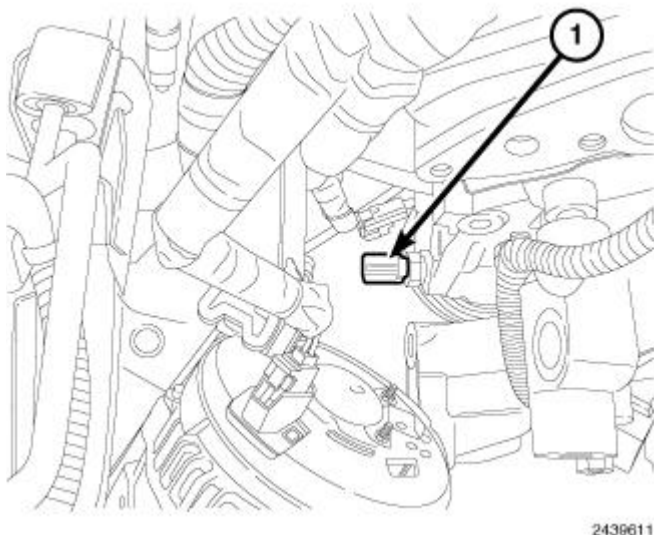


Fig. 380: Oil Temperature Sensor
Courtesy of CHRYSLER GROUP, LLC

NOTE: Apply Mopar® Thread Sealant with PTFE to the sensor threads before installing into the engine block.

1. Install the oil temperature sensor (1).

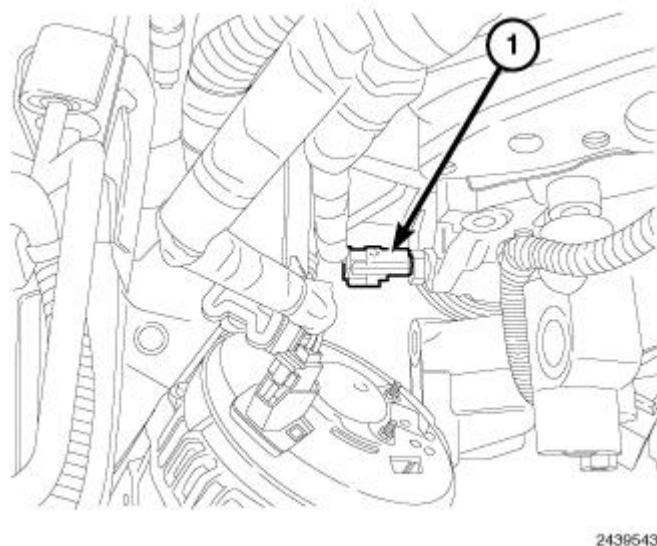
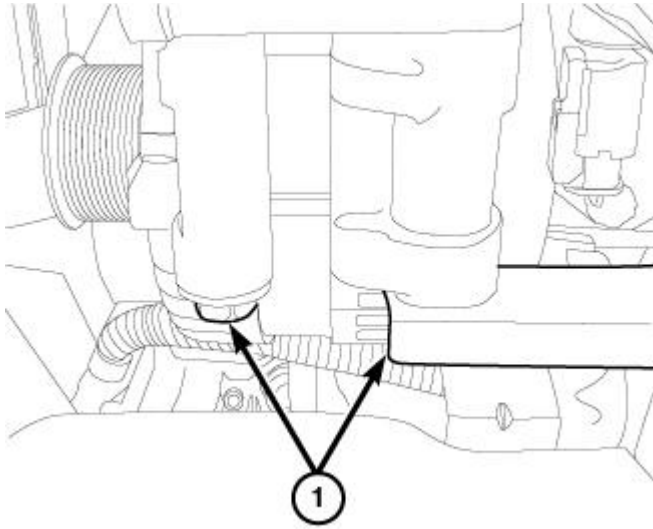


Fig. 381: Oil Temperature Sensor Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

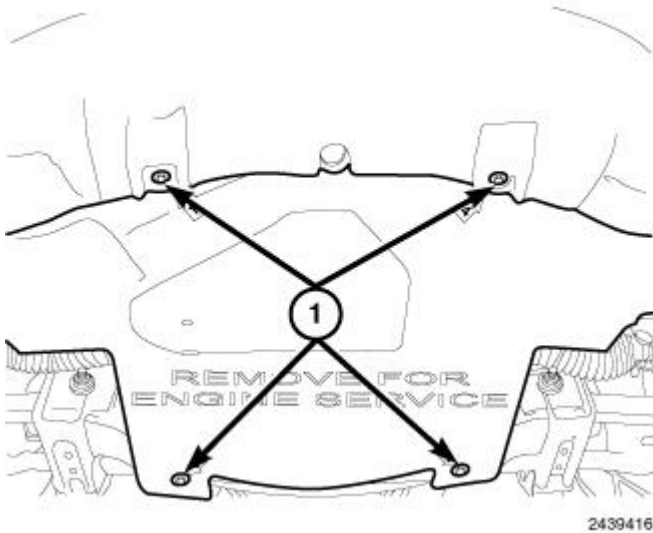
2. Connect the oil temperature sensor electrical connector (1).
3. Position the generator and install the upper mounting bolt finger tight.
4. Raise and support the vehicle.



2439251

Fig. 382: Lower Generator Retaining Bolts
 Courtesy of CHRYSLER GROUP, LLC

5. Install the generator lower mounting bolts (1) and tighten to 55 N.m (41 ft. lbs.).



2439416

Fig. 383: Lower Splash Shield & Fasteners
 Courtesy of CHRYSLER GROUP, LLC

6. Position the belly pan to the under side of the vehicle and install the retainers (1).
7. Lower the vehicle.
8. Tighten the generator upper mounting bolt to 55 N.m (41 ft. lbs.).

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump may be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat.

9. Install the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
10. Connect the negative battery cable.

MANIFOLDS

MANIFOLD, EXHAUST

DESCRIPTION

DESCRIPTION

The exhaust manifolds are tube in shell air gap design to maximize durability and performance. The exhaust manifolds are made of stainless steel stamped shells and stainless steel tubes with a powdered metal outlet. A layered graphite over perforated steel manifold gasket is used to provide sealing to the cylinder head.

OPERATION

OPERATION

The exhaust manifolds collect the engine exhaust gases exiting the combustion chambers and then channels the exhaust gases to the exhaust pipes/catalytic converters.

REMOVAL

REMOVAL

EXHAUST MANIFOLDS

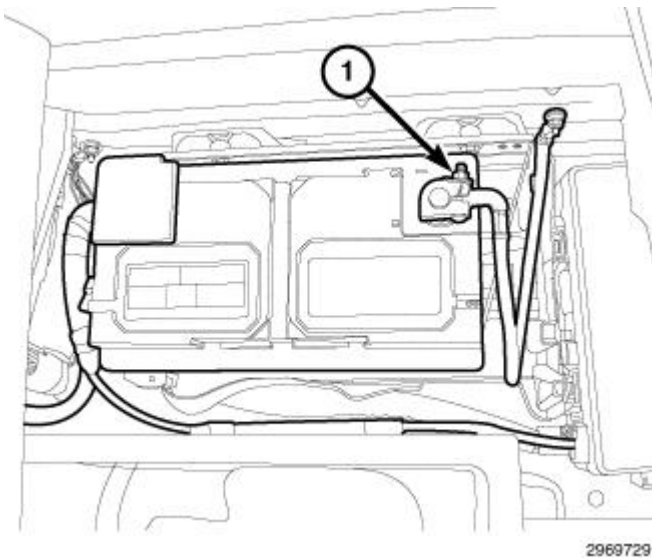
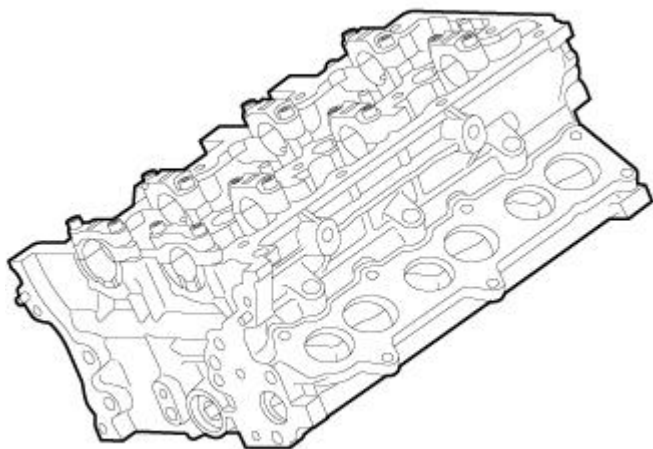


Fig. 384: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the negative battery cable (1).

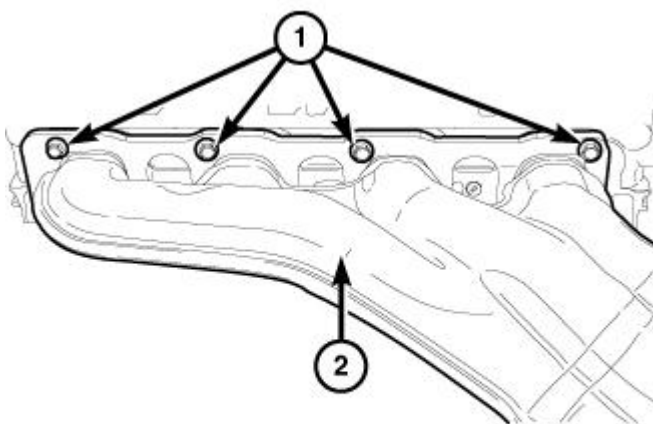
NOTE: The left side shown in illustration. Right side similar.



3501715

Fig. 385: Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

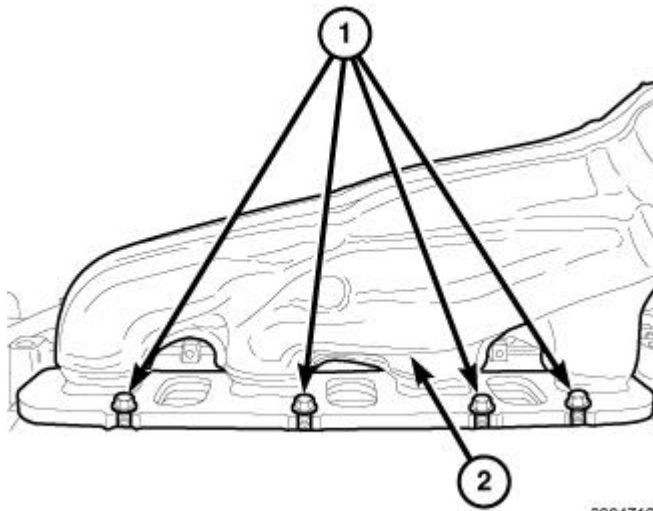
2. Remove cylinder head. Refer to **CYLINDER HEAD, REMOVAL**.



3005118

Fig. 386: Exhaust Manifold & Bolts
Courtesy of CHRYSLER GROUP, LLC

3. Remove the exhaust manifold (2) top row of bolts (1).



3004712

Fig. 387: Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Remove the exhaust manifold heat shield.
5. Remove the exhaust manifold bottom row of bolts (1).

CLEANING

CLEANING

Clean the mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

INSPECTION

INSPECTION

Inspect the exhaust manifold for cracks.

Inspect the mating surface of the exhaust manifold for flatness with a straight edge. The exhaust manifold gasket surface must be flat and within 0.67 mm (0.0264 in.) overall.

INSTALLATION

INSTALLATION

EXHAUST MANIFOLDS

NOTE: Left side shown in illustration. Right side similar.

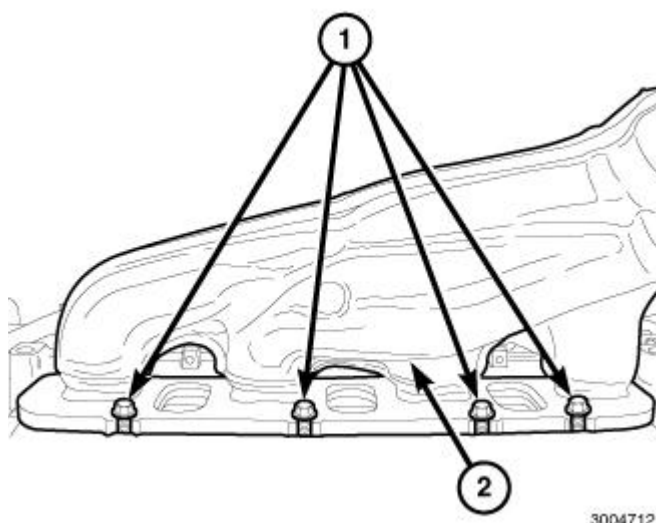


Fig. 388: Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Clean the sealing surfaces of the exhaust manifold and cylinder head.
2. Using a new exhaust manifold gasket, position the exhaust manifold (2).
3. Install the exhaust manifold bottom row of bolts (1) finger tight.

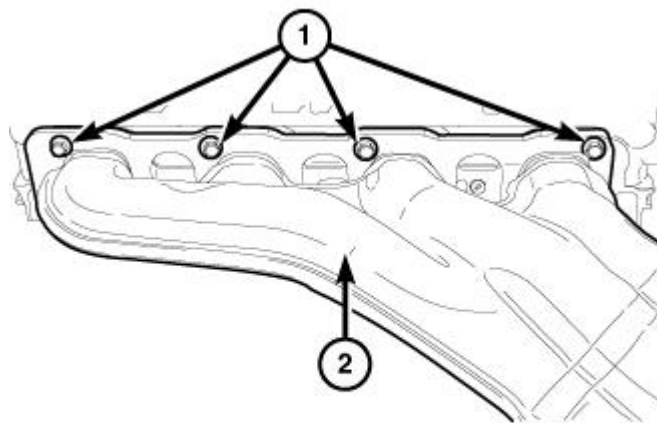
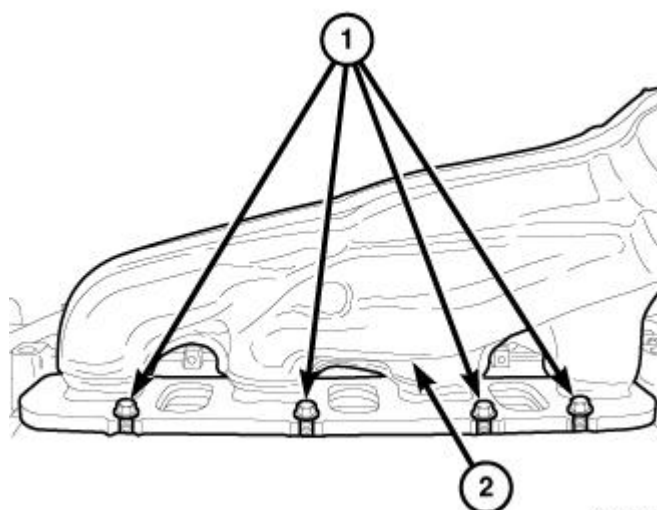


Fig. 389: Exhaust Manifold & Bolts
Courtesy of CHRYSLER GROUP, LLC

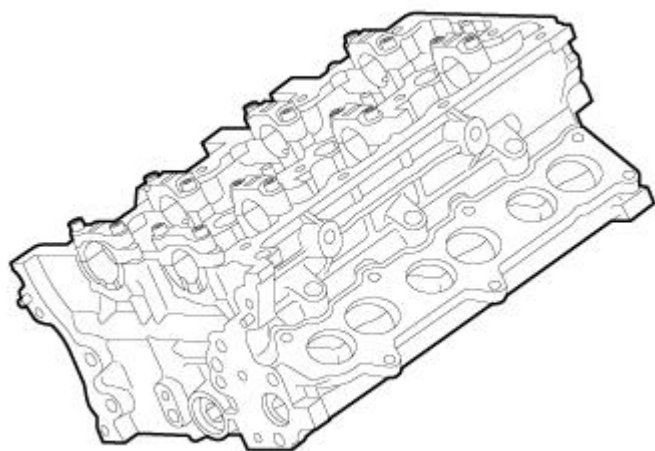
4. Install the exhaust manifold (2) top row of bolts (1) and tighten to 31 N.m (23 ft. lbs.).
5. Position the coolant bottle (1) and install the retaining bolts (2).
6. Raise and support the vehicle.



3004712

Fig. 390: Exhaust Manifold Heat Shield & Bolts
Courtesy of CHRYSLER GROUP, LLC

7. Tighten the exhaust manifold bottom row of bolts to 31 N.m (23 ft. lbs.).
8. Install the exhaust manifold heat shield.



3501715

Fig. 391: Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

9. Install the cylinder head. Refer to **CYLINDER HEAD, INSTALLATION**.

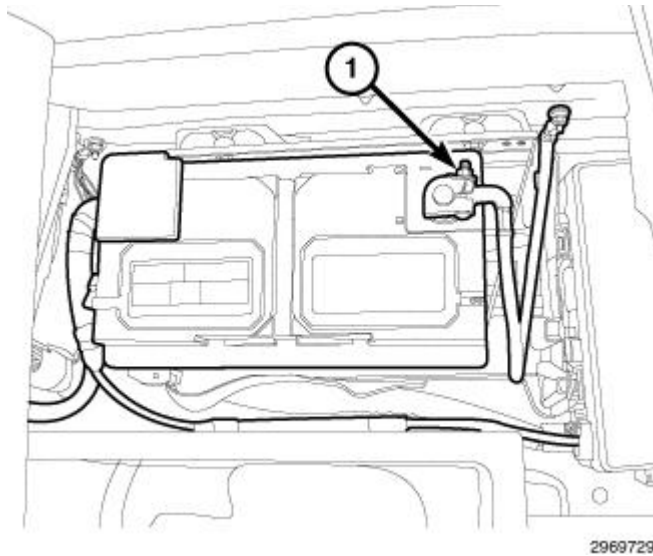


Fig. 392: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

10. Connect the negative battery cable (1).
11. 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!

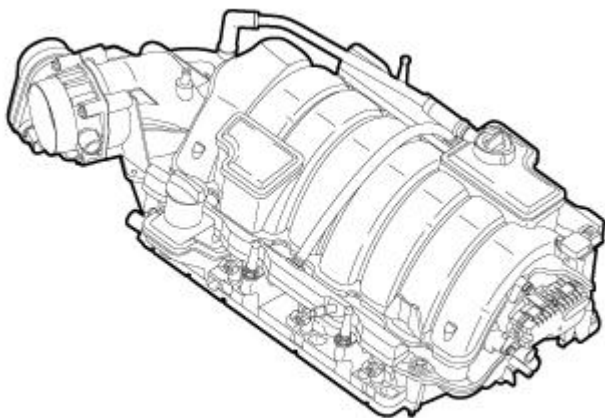


Fig. 393: Intake Manifold

Courtesy of CHRYSLER GROUP, LLC

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 rear 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 this warning may result in 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**

1. Perform the fuel system pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

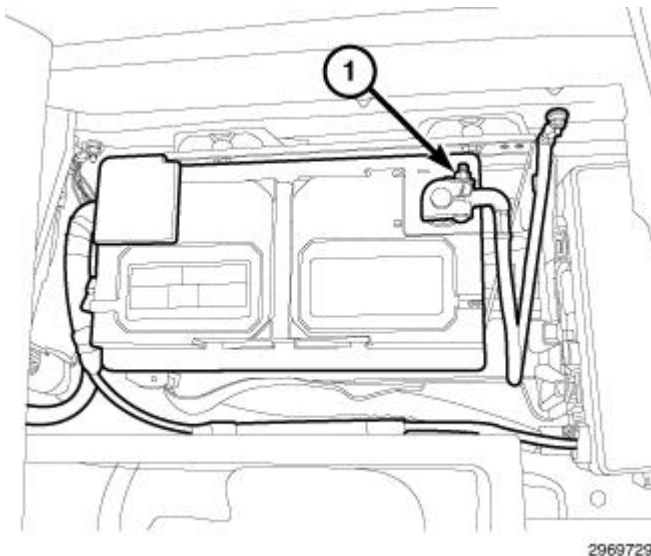


Fig. 394: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the negative battery cable (1).

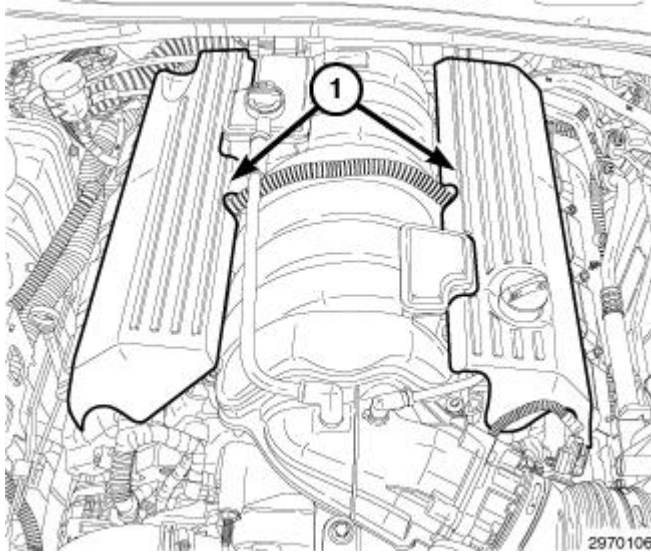


Fig. 395: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

3. Remove the engine covers (1).
4. Disconnect the fuel supply line. Refer to FITTING, Quick Connect - **STANDARD PROCEDURE** .

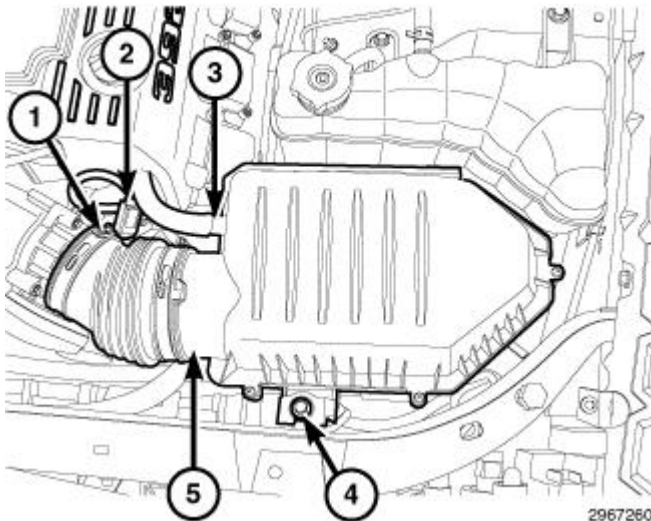


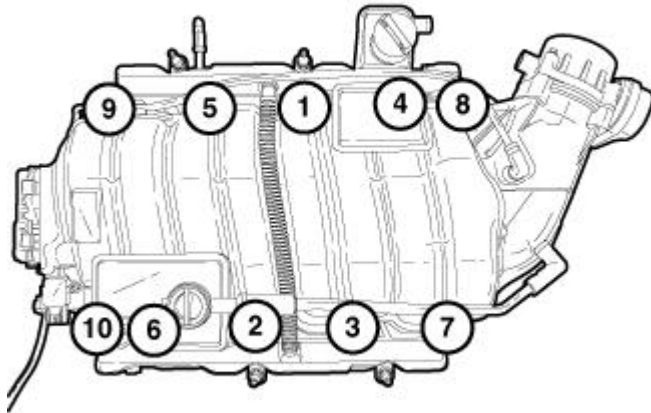
Fig. 396: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing

Courtesy of CHRYSLER GROUP, LLC

5. Remove the air cleaner housing (5). Refer to **BODY, AIR CLEANER, REMOVAL**.
6. Disconnect the brake booster hose and the EVAP purge hose.

7. Disconnect the electrical connectors from the following components:

- Manifold Absolute Pressure (MAP) Sensor
- Short Runner Valve (SRV)
- Fuel Injectors
- Electronic Throttle Control (ETC)



2979852

Fig. 397: Intake Manifold Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

NOTE: Remove the intake manifold and throttle body as an assembly.

8. Using the sequence shown in illustration, remove the intake manifold retaining bolts.
9. Remove the intake manifold and throttle body as an assembly from the vehicle.

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

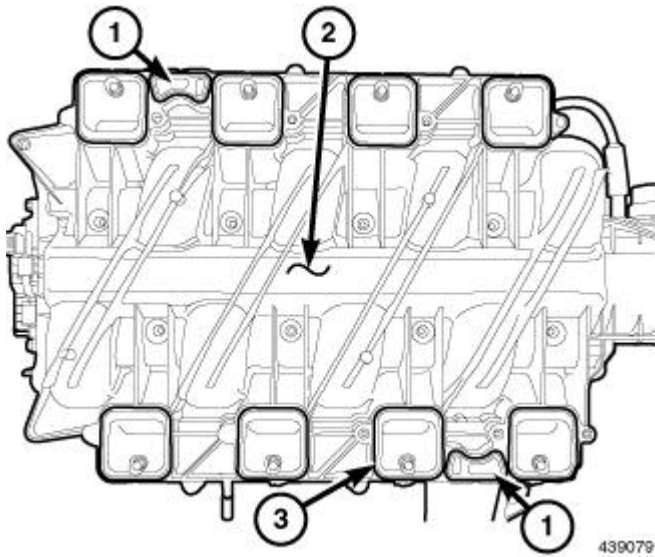


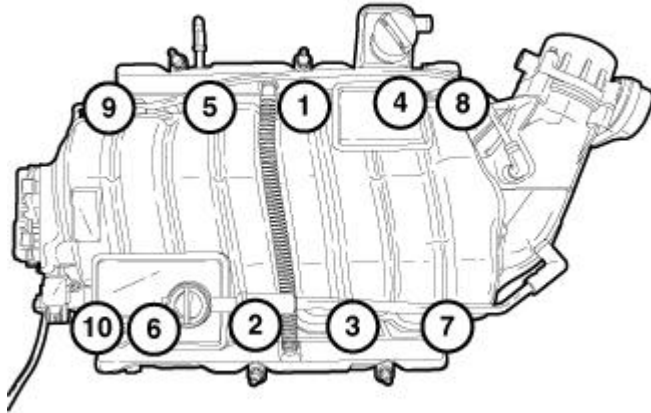
Fig. 398: Intake Manifold & PCV Seals
Courtesy of CHRYSLER GROUP, LLC

NOTE: The intake manifold seals (1, 3) may be used again, provided no cuts, tears, or deformation have occurred.

1. Inspect the intake manifold seals and replace if necessary.

NOTE: If reinstalling the original manifold, apply Mopar® Lock & Seal Adhesive to the intake manifold bolts. Not required when installing a new manifold.

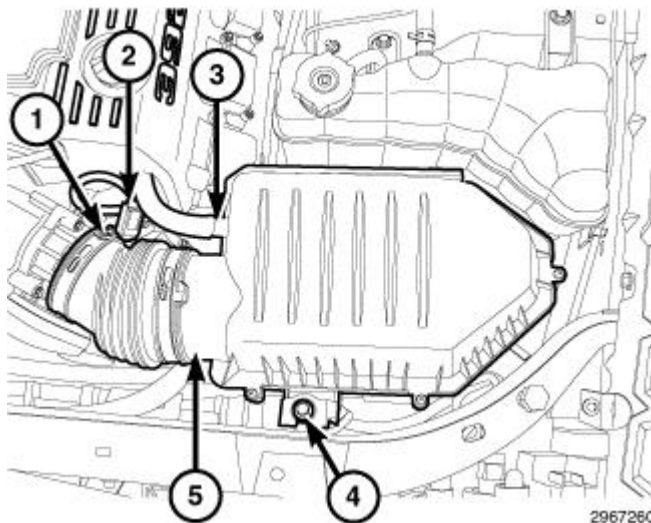
2. If required, apply Mopar® Lock & Seal Adhesive to the intake manifold bolts.
3. Position the intake manifold (2).



2979652

Fig. 399: Intake Manifold Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Using the sequence shown in illustration, install the intake manifold retaining bolts and tighten to 12 N.m (9 ft. lbs.).
5. Connect the fuel supply line. Refer to FITTING, Quick Connect - **STANDARD PROCEDURE** .
6. Connect the brake booster hose and the EVAP purge hose.
7. Connect the electrical connectors to the following components:
 - Manifold Absolute Pressure (MAP) Sensor
 - Short Runner Valve (SRV)
 - Fuel Injectors
 - Electronic Throttle Control (ETC)

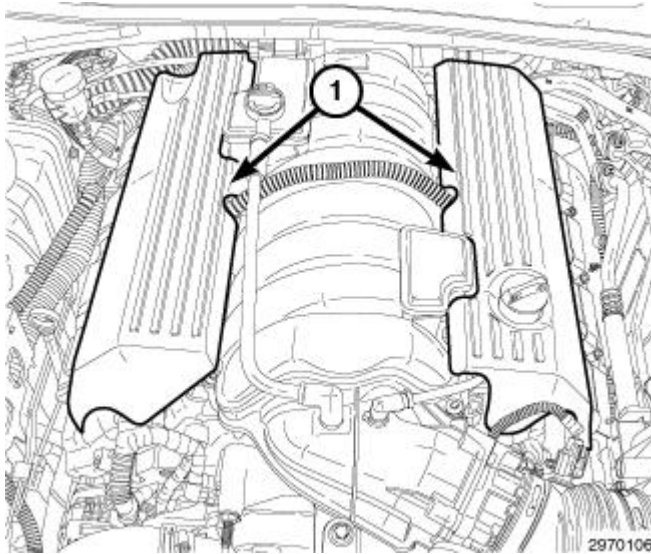


2967260

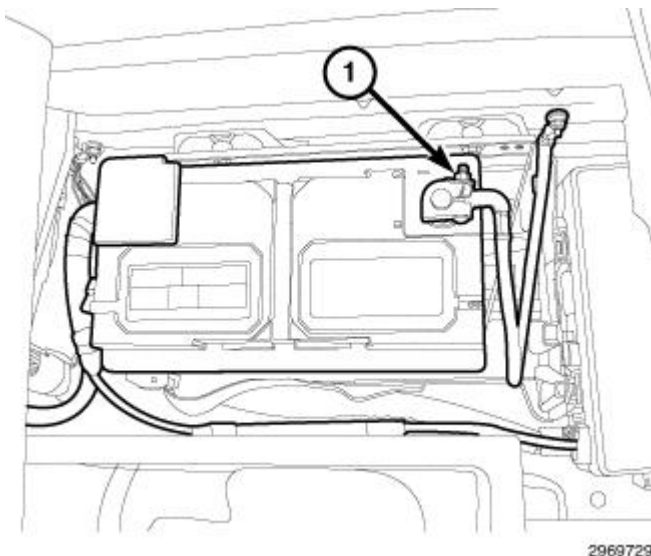
Fig. 400: Air Duct Retaining Clamp, Intake Air Temperature Sensor Electrical Connector, Makeup Air Hose, Bolt & Air Cleaner Housing

Courtesy of CHRYSLER GROUP, LLC

8. While sliding the air duct onto the throttle body, lower the air cleaner housing (5) into position and align the locating pin on the bottom of the housing.
9. Install the air cleaner housing retaining bolt (4) and tighten to 5 N.m (44 in. lbs.).
10. Install the makeup air hose (3) at the air cleaner housing.
11. Connect the intake air temperature sensor electrical connector (2).
12. Position the air duct retaining clamp (1) at the throttle body and tighten to 3 N.m (30 in. lbs.).

**Fig. 401: Engine Covers****Courtesy of CHRYSLER GROUP, LLC**

13. Install the engine covers (1) on to the ball studs.

**Fig. 402: Negative Battery Cable**

Courtesy of CHRYSLER GROUP, LLC

14. Connect the negative battery cable (1).

VALVE TIMING

CHAIN AND SPROCKETS, TIMING

REMOVAL

REMOVAL

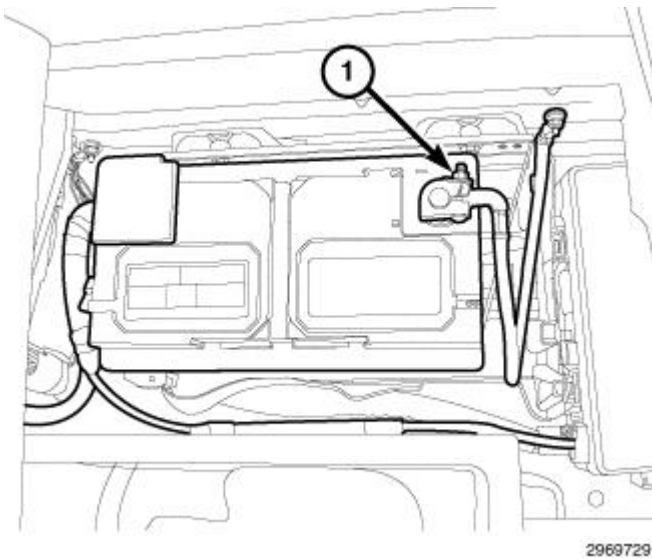
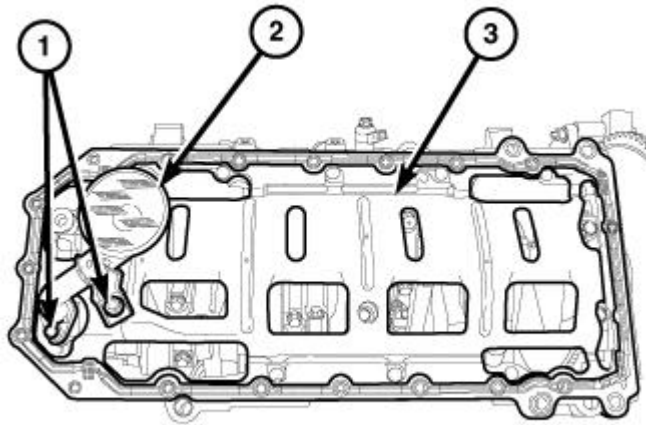


Fig. 403: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

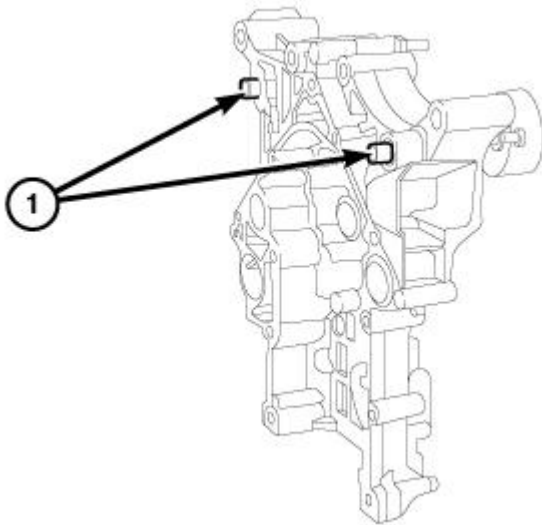
1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Drain the cooling system.



2970744

Fig. 404: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

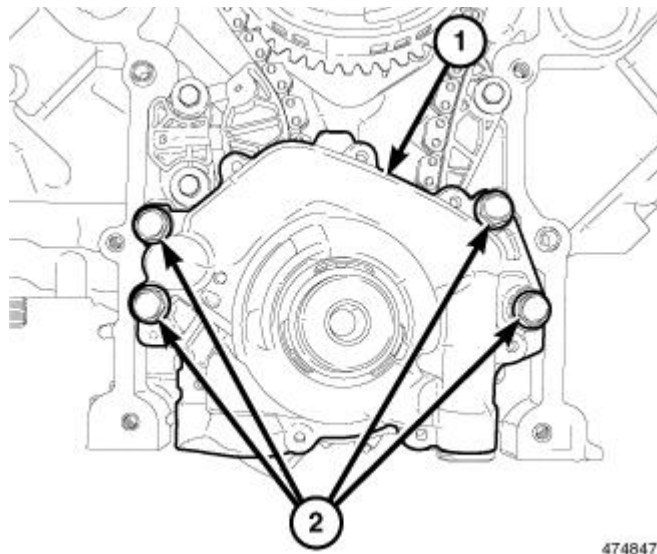
4. Remove the oil pan and oil pump pick up tube (2). Refer to **PAN, OIL, REMOVAL**.



45131

Fig. 405: Front Cover Slide Bushings
 Courtesy of CHRYSLER GROUP, LLC

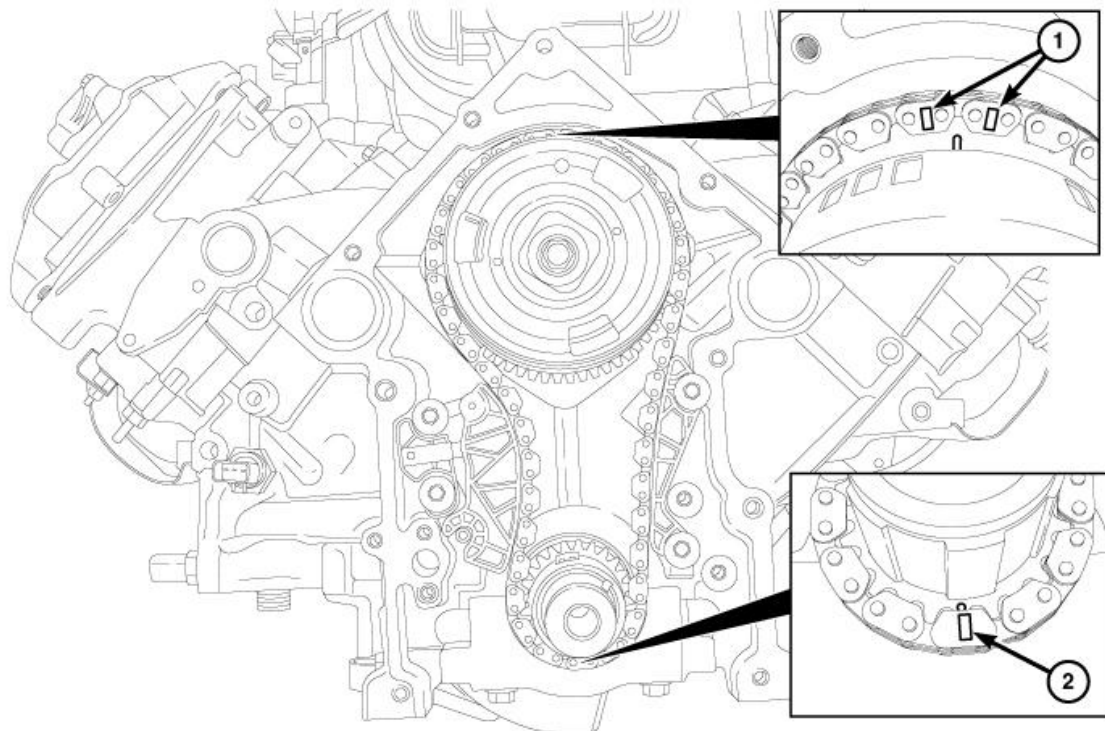
5. Remove the engine timing cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL**.
6. Verify the slide bushings (1) remain located in the engine timing cover during removal.



474847

Fig. 406: Oil Pump Retaining Bolts
Courtesy of CHRYSLER GROUP, LLC

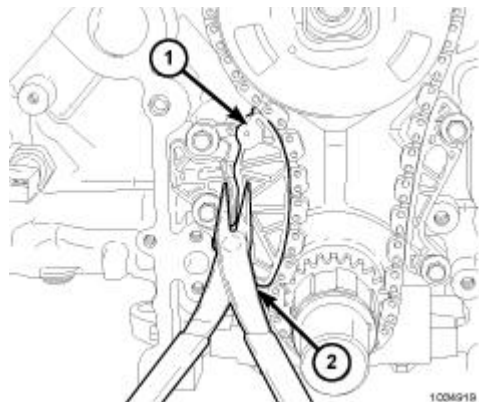
7. Remove the oil pump retaining bolts (2) and remove the oil pump (1).



487402

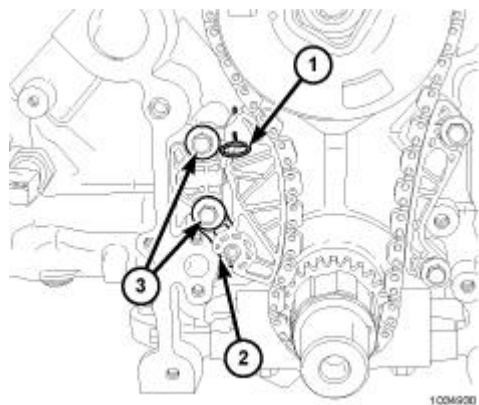
Fig. 407: Aligning Timing Marks With Timing Chain Sprockets
Courtesy of CHRYSLER GROUP, LLC

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).

**Fig. 408: 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. 409: 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.

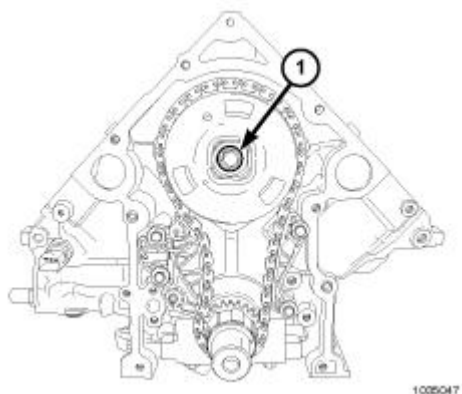


Fig. 410: Camshaft Phaser Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

11. Remove the camshaft phaser retaining bolt (1) and remove the timing chain with the camshaft phaser and crankshaft sprocket.

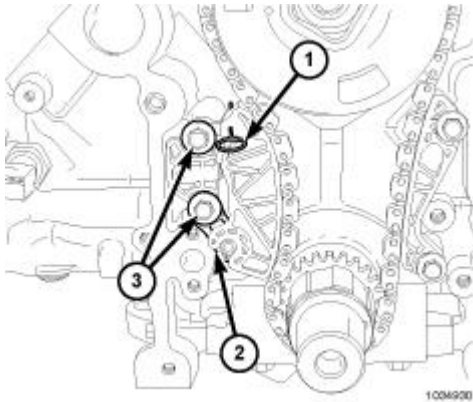


Fig. 411: Timing Chain Tensioner Pin
Courtesy of CHRYSLER GROUP, LLC

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).

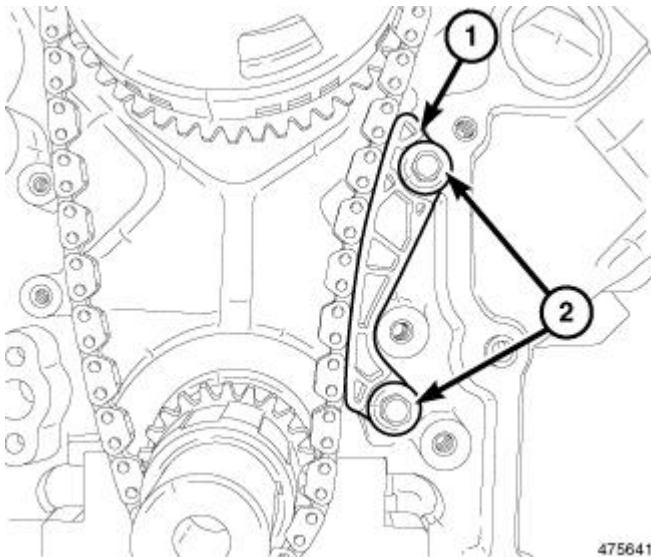
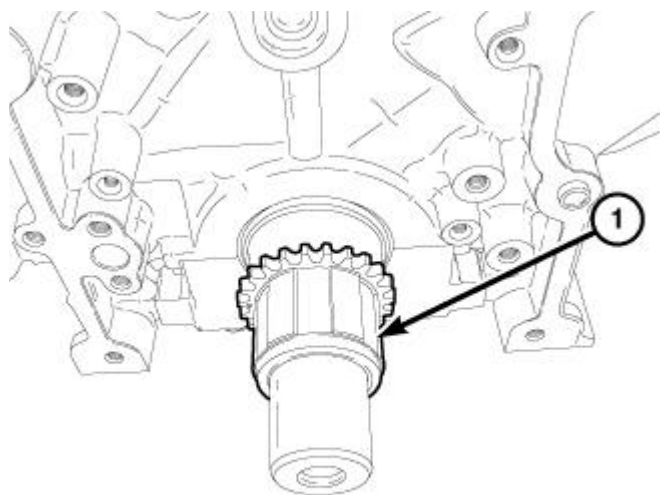


Fig. 412: Timing Chain Guide
Courtesy of CHRYSLER GROUP, LLC

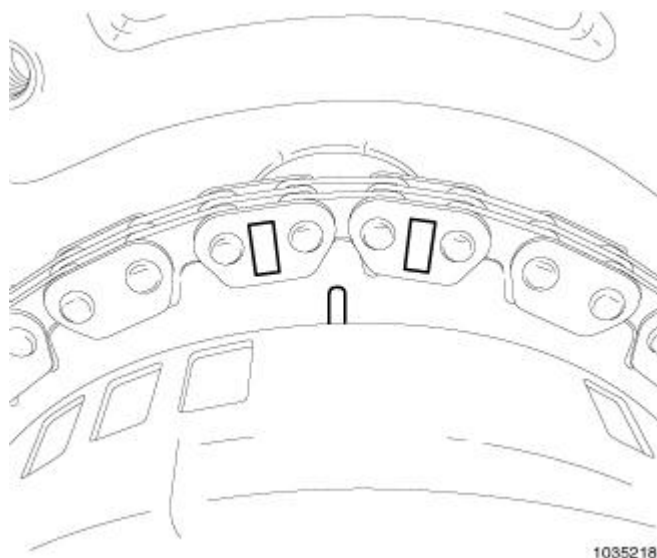
13. If the timing chain guide (1) is to be replaced, remove the retaining bolts (2) and remove the timing chain guide (1).

INSTALLATION**INSTALLATION**

475580

Fig. 413: Crankshaft Sprocket
Courtesy of CHRYSLER GROUP, LLC

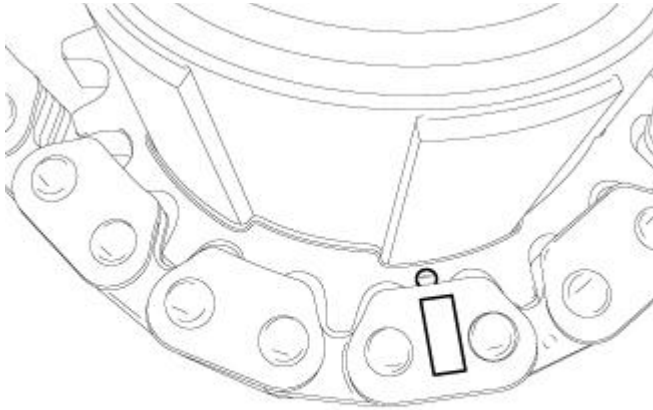
1. Install the crankshaft sprocket (1) and position halfway onto the crankshaft.



1035218

Fig. 414: Aligning Timing Chain & Camshaft Phaser Marks
Courtesy of CHRYSLER GROUP, LLC

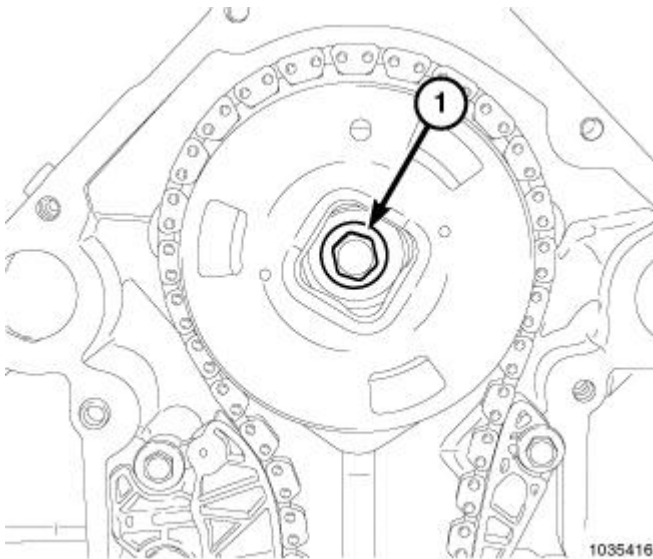
2. While holding the camshaft phaser in hand, position the timing chain on the camshaft phaser and align the timing marks as shown in illustration.



475628

Fig. 415: 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 in illustration.
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.



1035416

Fig. 416: Camshaft Phaser Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

5. Install the camshaft phaser retaining bolt (1) finger tight.

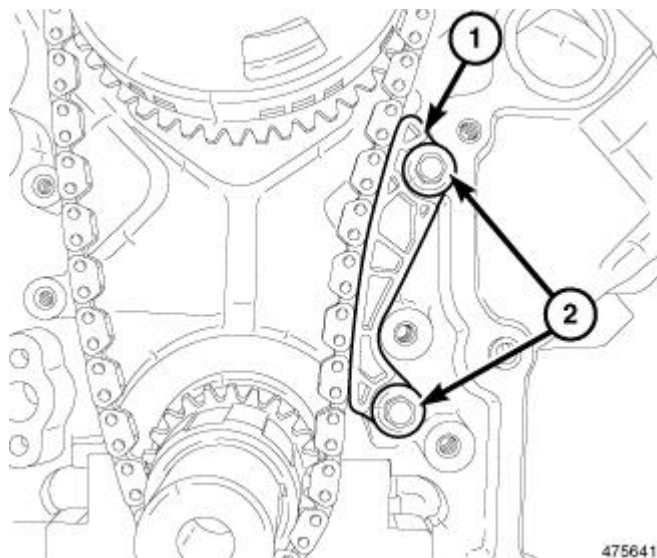


Fig. 417: Timing Chain Guide

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.).

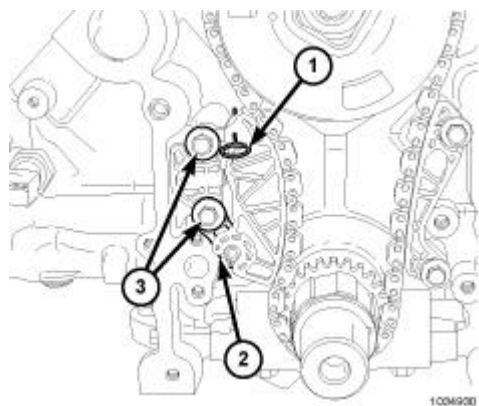


Fig. 418: Timing Chain Tensioner Pin

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.

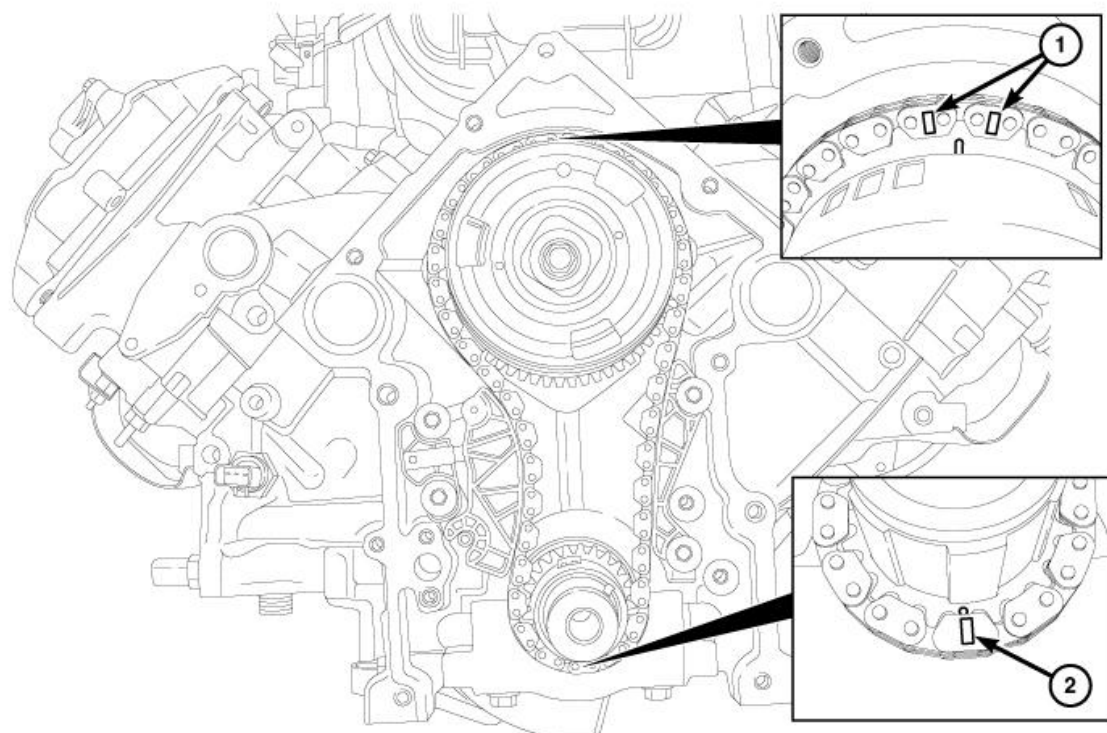


Fig. 419: Aligning Timing Marks With Timing Chain Sprockets
Courtesy of CHRYSLER GROUP, LLC

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.

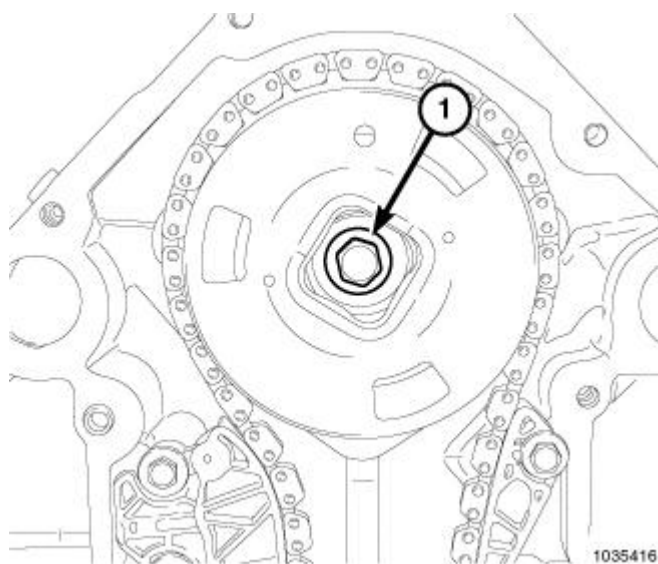
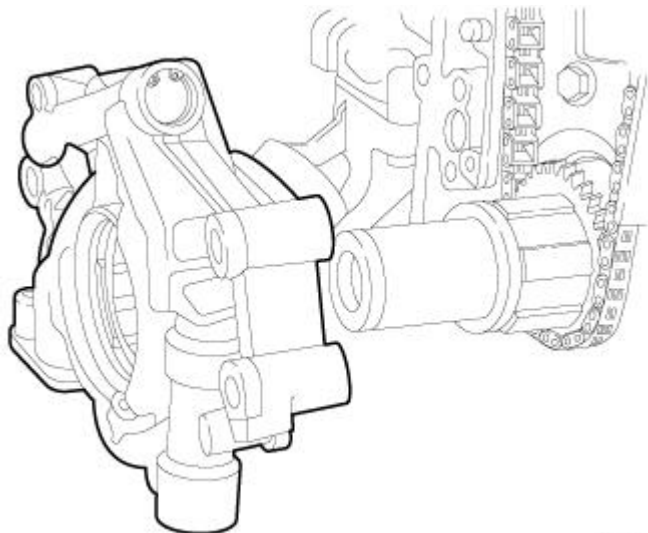


Fig. 420: Camshaft Phaser Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

10. Tighten the camshaft phaser bolt (1) to 85 N.m (63 ft. lbs.).

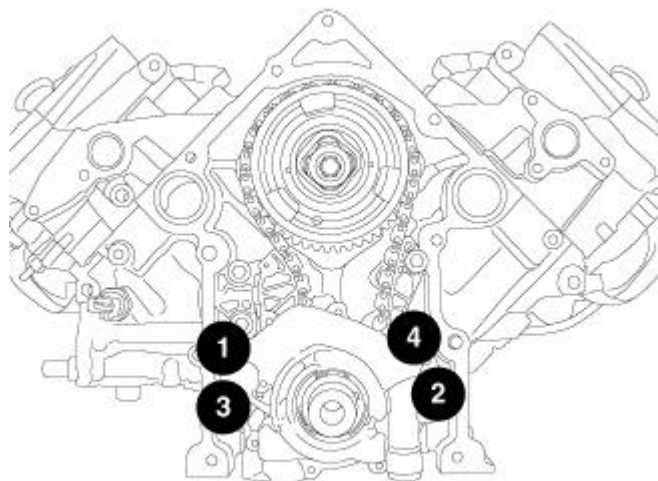


45133

Fig. 421: 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.

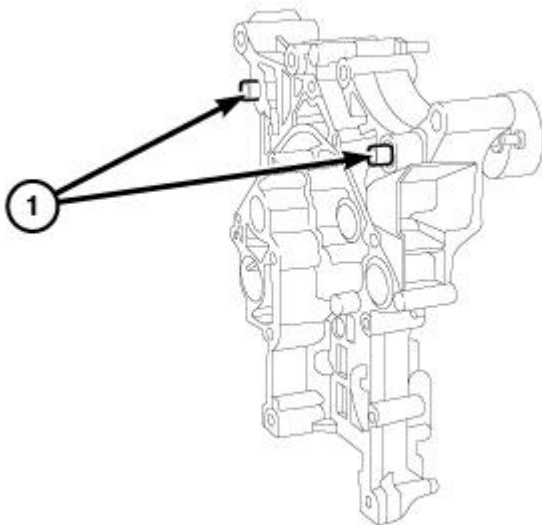


439119

Fig. 422: Oil Pump Retaining Bolt Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

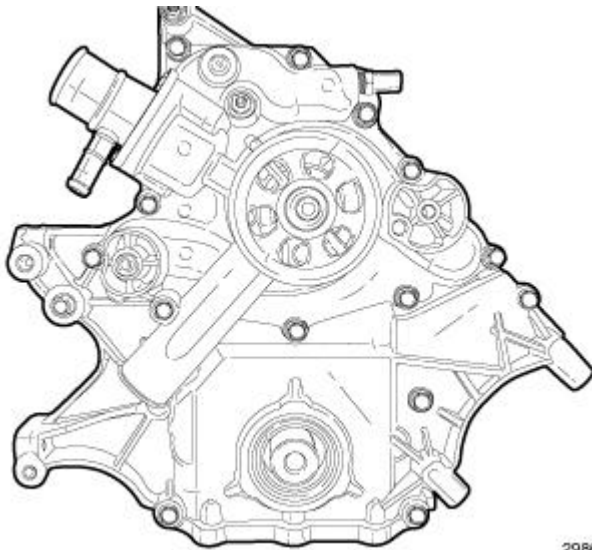
12. Using the sequence shown in illustration, tighten the oil pump retaining bolts to 28 N.m (21 ft. lbs.).



45131

Fig. 423: Front Cover Slide Bushings
Courtesy of CHRYSLER GROUP, LLC

13. Verify the slide bushings (1) remain located in the engine timing cover.



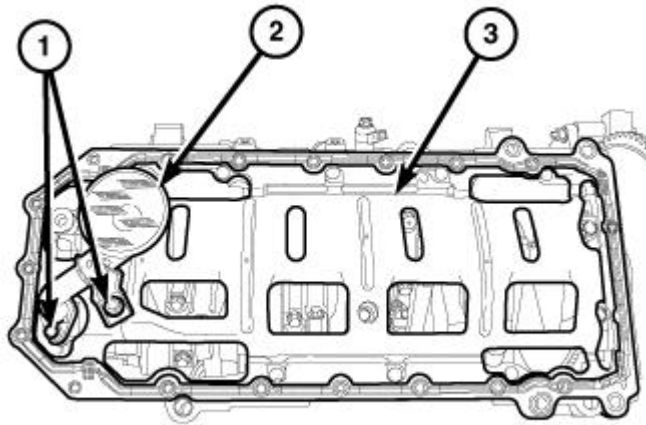
2966762

Fig. 424: 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.).

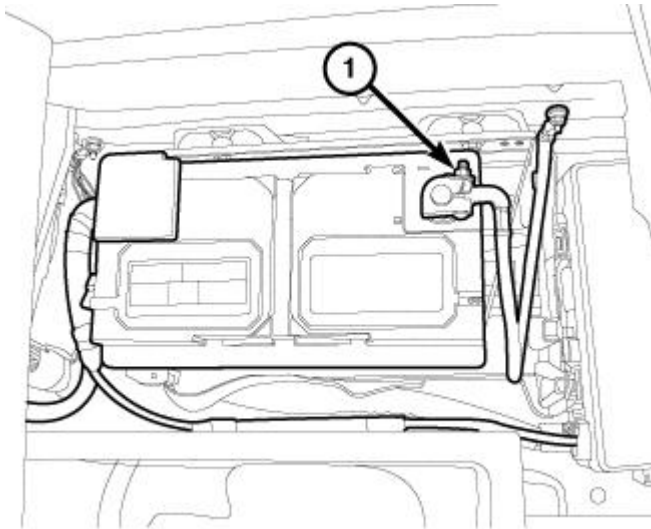
15. Tighten the large lifting stud to 55 N.m (40 ft. lbs.).
16. Raise and support the vehicle.



2970744

Fig. 425: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

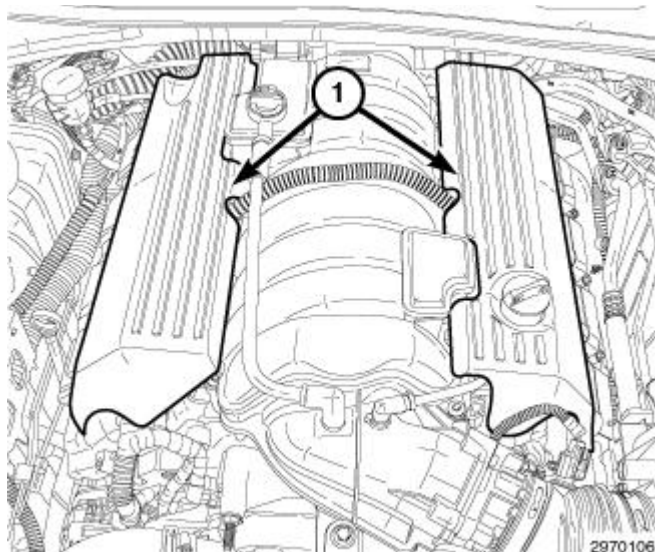
17. Install the oil pump pickup tube (2) and the oil pan. Refer to **PAN, OIL, INSTALLATION**.



2969729

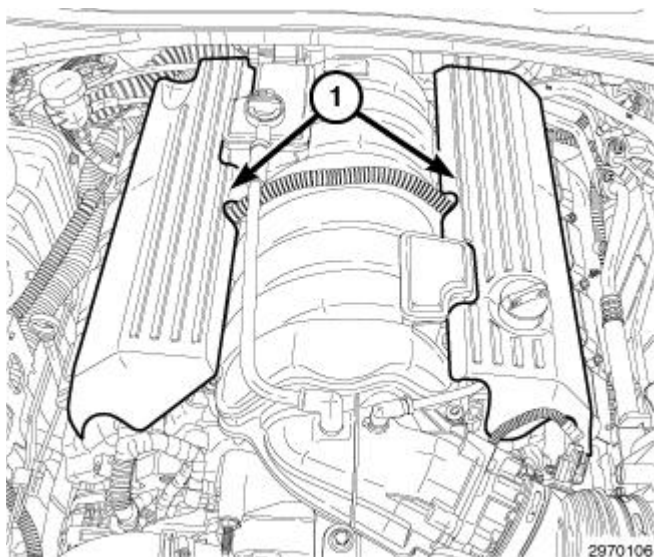
Fig. 426: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

18. Install the negative battery cable.
19. Fill the cooling system with the specified type and amount of engine coolant. Refer to Engin Cooling System - **STANDARD PROCEDURE** .
20. Fill the crankcase with the specified type and amount of engine oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE** .

**Fig. 427: Engine Covers**

Courtesy of CHRYSLER GROUP, LLC

21. Install the engine covers (1).
22. Start the engine and check for leaks.

COVER(S), ENGINE TIMING**REMOVAL****REMOVAL****Fig. 428: Engine Covers**

Courtesy of CHRYSLER GROUP, LLC

1. Remove the engine covers (1).

2. Perform the fuel pressure release procedure. Refer to **FUEL SYSTEM PRESSURE RELEASE** .

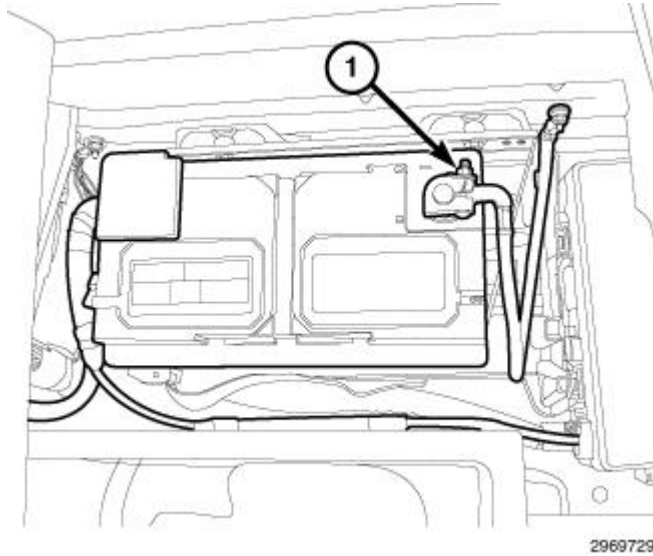


Fig. 429: Negative Battery Cable
 Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the negative battery cable (1).

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**.

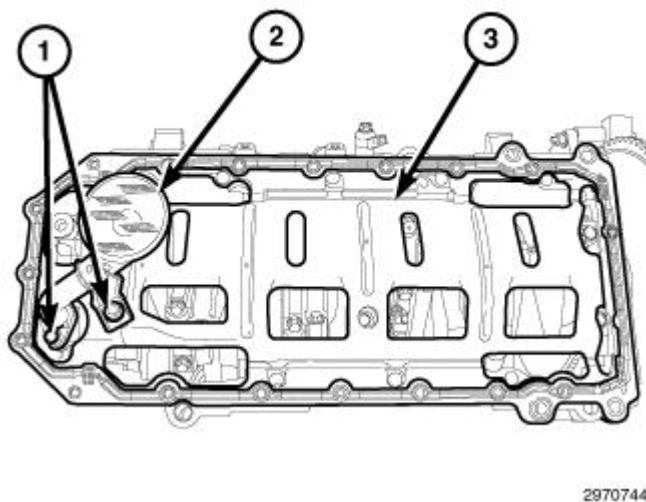


Fig. 430: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
 Courtesy of CHRYSLER GROUP, LLC

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).
8. Lower the vehicle.

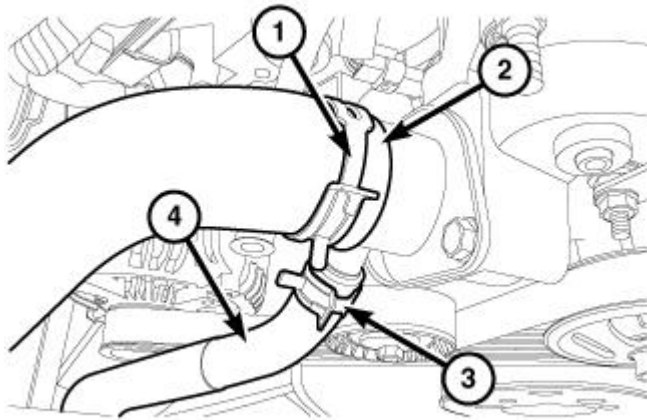


Fig. 431: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

9. Remove the upper radiator hose clamp (1) and remove the upper radiator hose (2).
10. Remove the oil cooler hose clamp (3) and remove oil cooler hose (4).

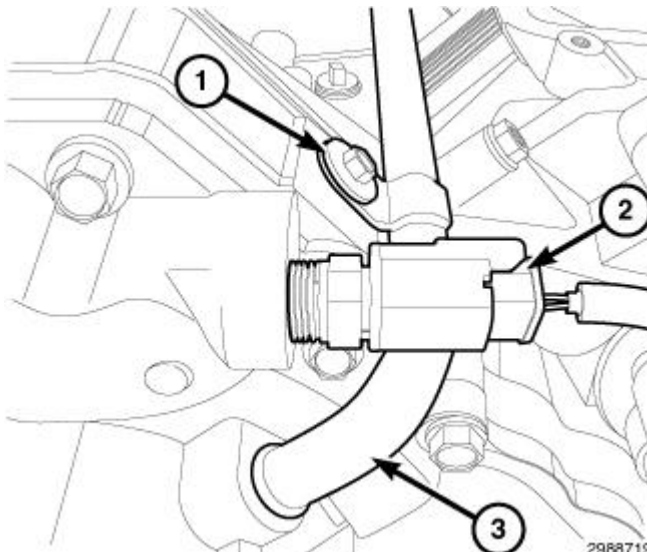


Fig. 432: Coolant Temperature (ECT) Sensor Electrical Connector, Heater Tube & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

11. Remove the coolant temperature sensor electrical connector (2).
12. Remove the heater tube retaining bolt (1).

13. Lift the heater tube (3) out of the water pump.

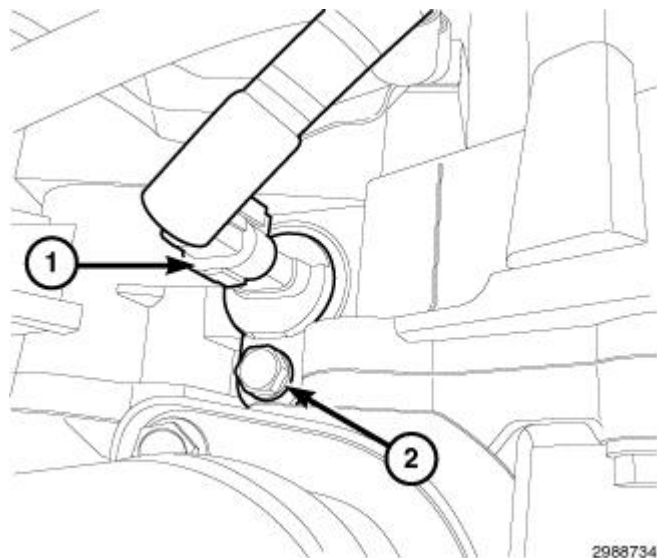


Fig. 433: Camshaft Position Sensor Electrical Connector & Bolt
Courtesy of CHRYSLER GROUP, LLC

14. Disconnect the camshaft position sensor electrical connector (1).

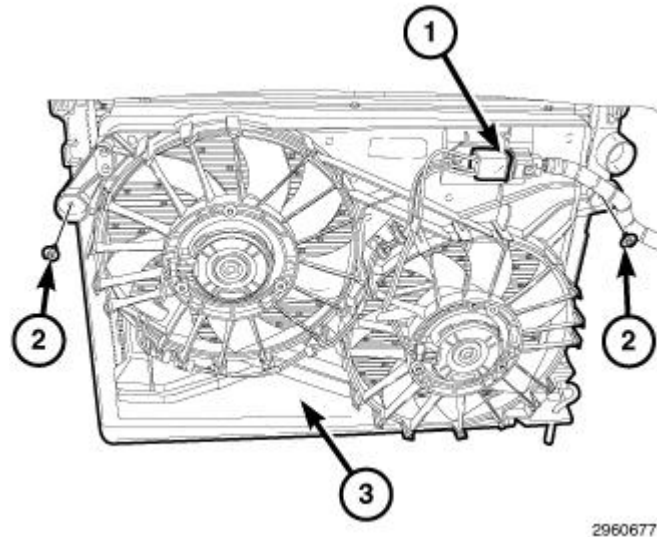


Fig. 434: Cooling Fan Electrical Connector, Cooling Fan Mounting Bolts & Radiator Cooling Fan Assembly
Courtesy of CHRYSLER GROUP, LLC

15. Remove the cooling fan. Refer to **FAN, COOLING, REMOVAL** .

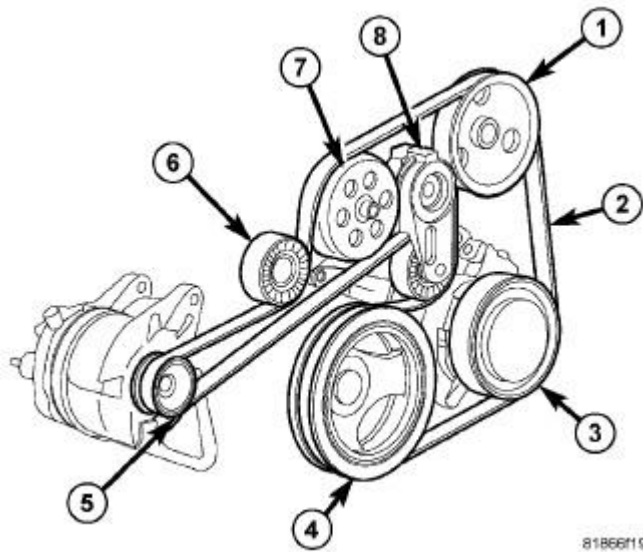


Fig. 435: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

16. Remove the accessory drive belt (2). Refer to **BELT, SERPENTINE, REMOVAL**.
17. Remove the lower radiator hose clamp and remove the lower radiator hose.
18. Remove the idler pulley (6).
19. Remove the belt tensioner (8).

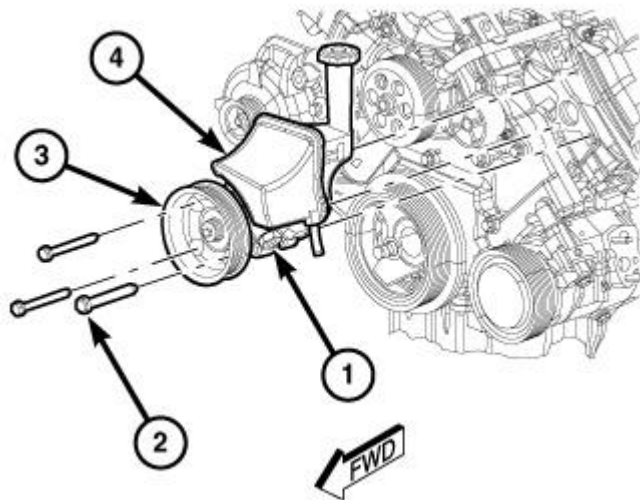


Fig. 436: Power Steering Reservoir, Pump, Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove the power steering pump hoses for power steering pump removal.

20. Remove the three power steering pump mounting bolts (2) through the access holes in the pulley (3).
21. Remove the power steering pump (1) from the engine and position aside.

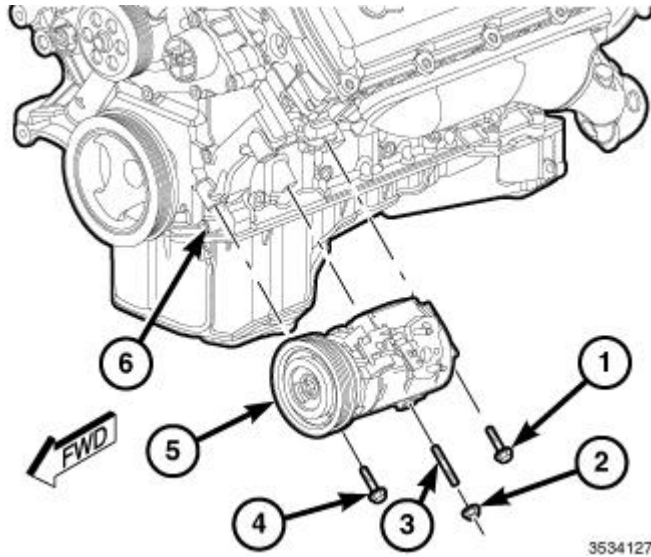


Fig. 437: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

22. Remove A/C compressor from the front timing chain cover and position aside. Refer to **COMPRESSOR, A/C, REMOVAL**.

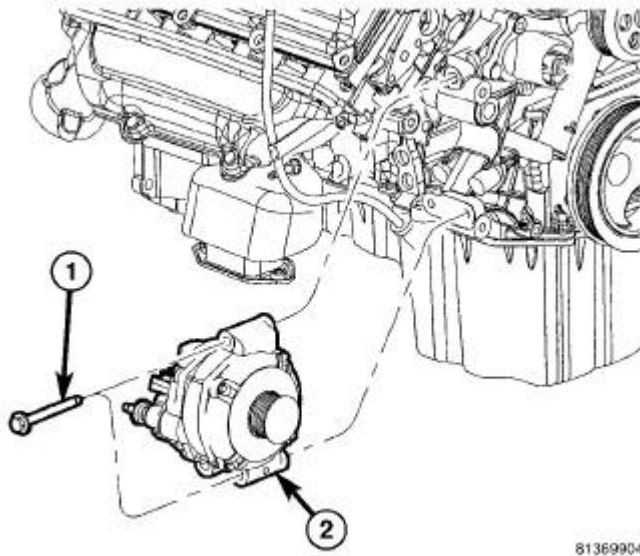
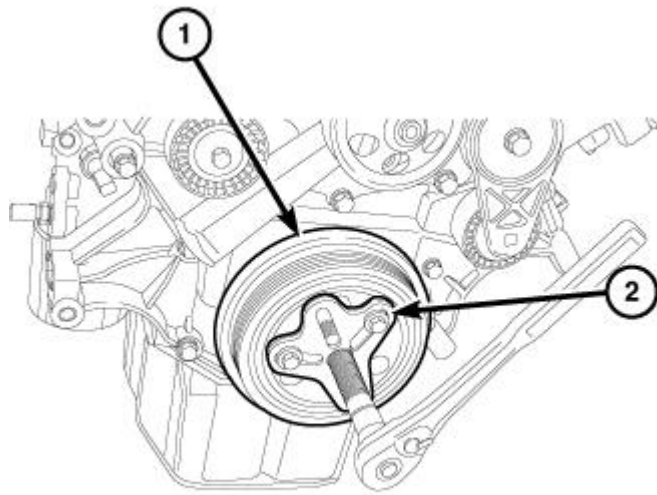


Fig. 438: Generator & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

23. Remove the generator from the front timing chain cover and position aside. Refer to **GENERATOR, REMOVAL**.

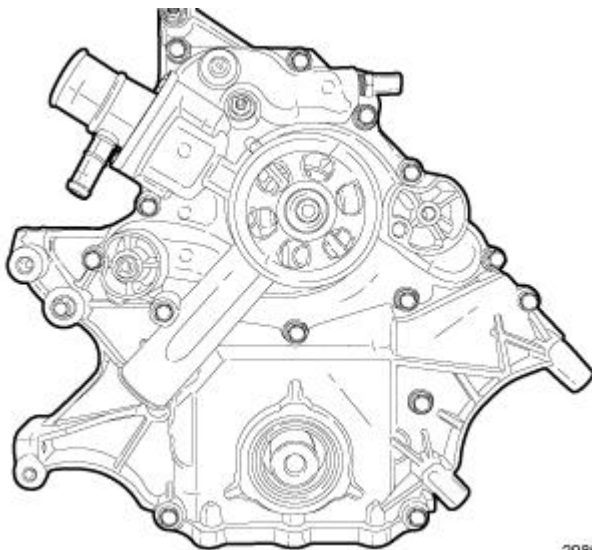


1184557

Fig. 439: 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.

24. Remove the vibration damper. Refer to **DAMPER, VIBRATION, REMOVAL**.
25. Install the puller tool (2) making sure the bolts are fully threaded through the entire crankshaft damper and remove the crankshaft damper (1).

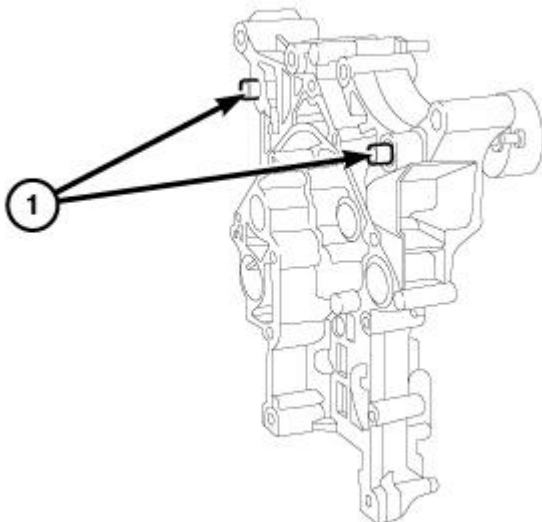


2986762

Fig. 440: Engine Timing Cover
 Courtesy of CHRYSLER GROUP, LLC

NOTE: It is not necessary to remove water pump for timing cover removal.

26. Remove the engine timing cover retaining bolts and remove the engine timing cover.



45131

Fig. 441: Front Cover Slide Bushings
 Courtesy of CHRYSLER GROUP, LLC

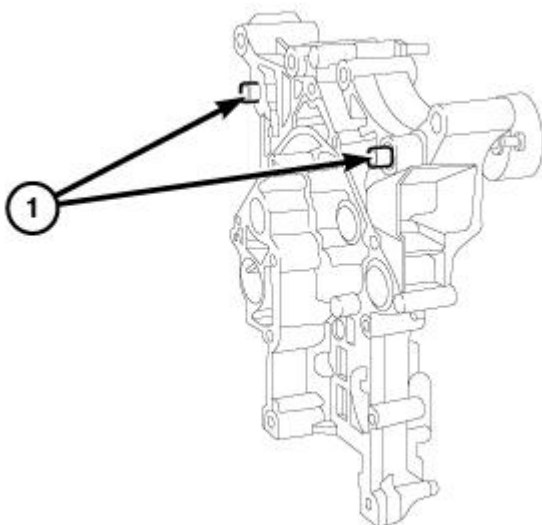
27. Verify that the engine timing cover slide bushings (1) remain located in the engine timing cover.

INSTALLATION

INSTALLATION

1. Clean the engine timing cover and engine block surface.

NOTE: Always install a new gasket when servicing the engine timing cover.



45131

Fig. 442: Front Cover Slide Bushings

Courtesy of CHRYSLER GROUP, LLC

2. Verify that the engine timing cover slide bushings (1) remain located in the engine timing cover.

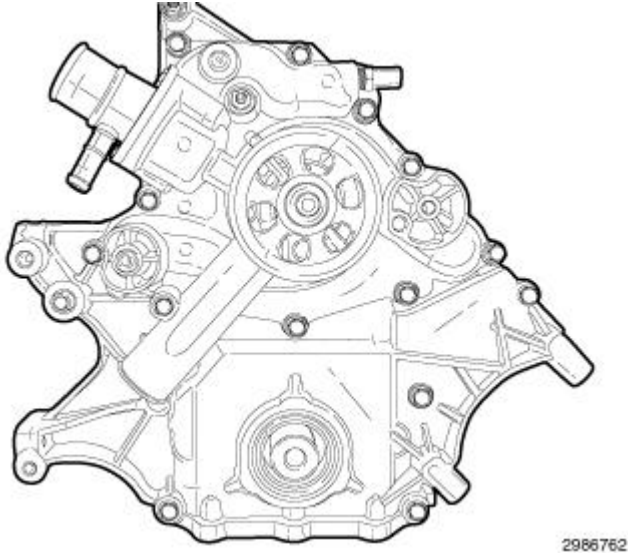


Fig. 443: Engine Timing Cover
Courtesy of CHRYSLER GROUP, LLC

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.).
5. Raise and support the vehicle.

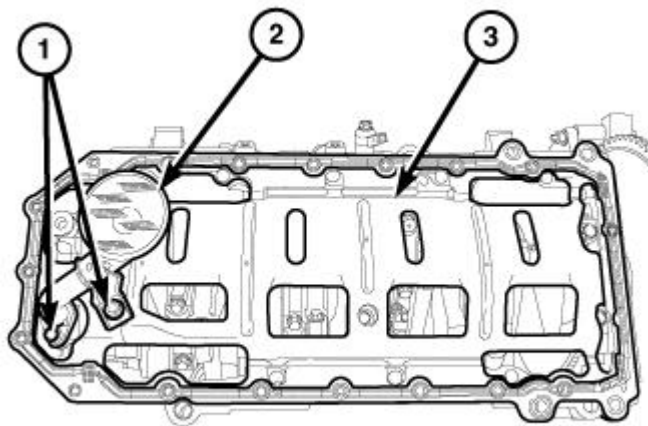


Fig. 444: Integral Windage Tray, Oil Pump Pickup Tube & Bolts
Courtesy of CHRYSLER GROUP, LLC

6. Install the oil pump pickup tube (2) and the oil pan. Refer to **PAN, OIL, INSTALLATION**.
7. Install the lower radiator hose and clamp.

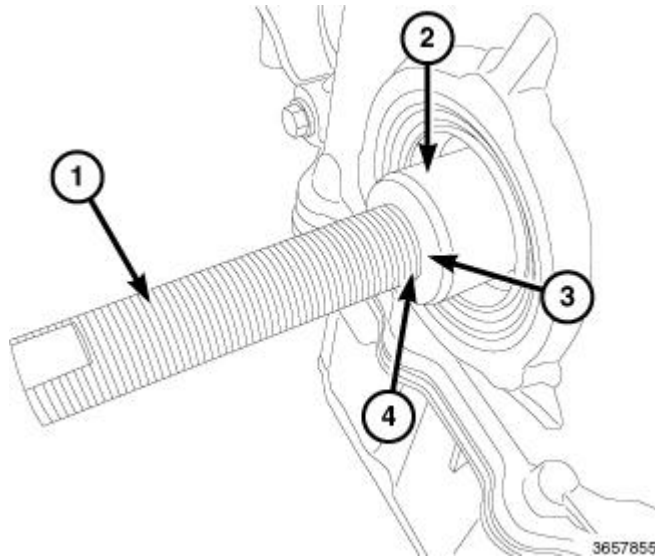


Fig. 445: Installing Vibration Damper Onto Crankshaft Using Special Tool
 Courtesy of CHRYSLER GROUP, LLC

8. 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.

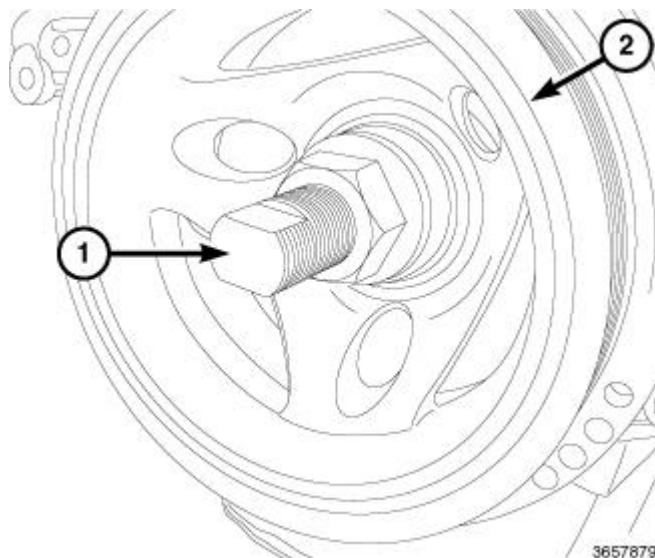


Fig. 446: Installing Vibration Damper
Courtesy of CHRYSLER GROUP, LLC

9. Using the crankshaft Damper Installer (1) press the vibration damper (2) onto the crankshaft. Refer to **DAMPER, VIBRATION, INSTALLATION**.
10. Install the crankshaft damper bolt and tighten to 176 N.m (129 ft. lbs.).

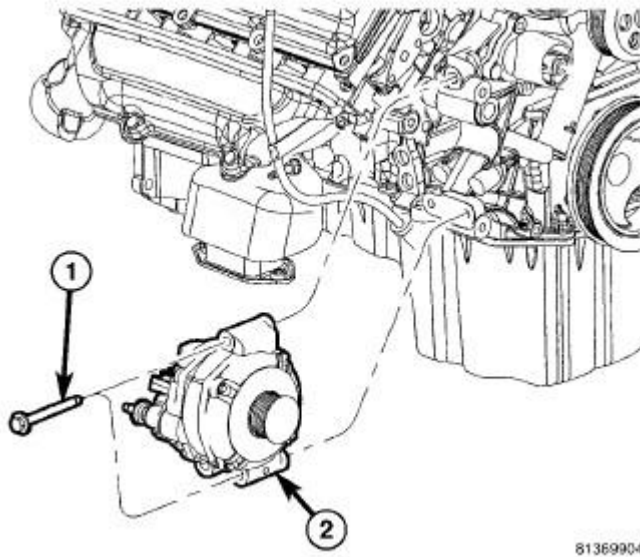


Fig. 447: Generator & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

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

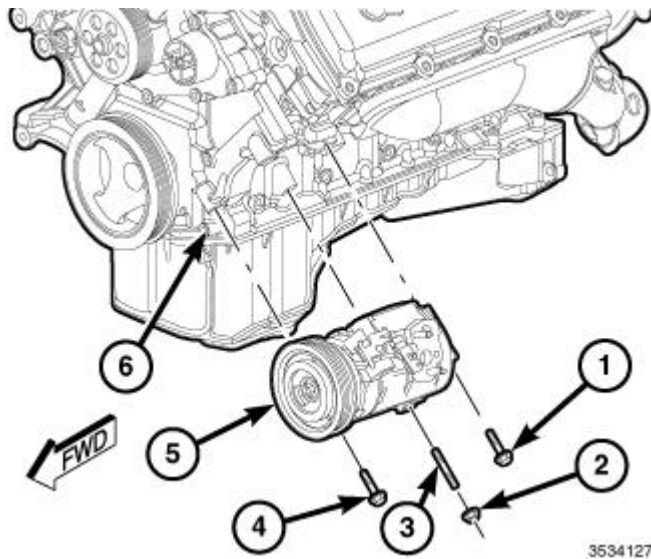


Fig. 448: Removing/Installing A/C Compressor
Courtesy of CHRYSLER GROUP, LLC

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

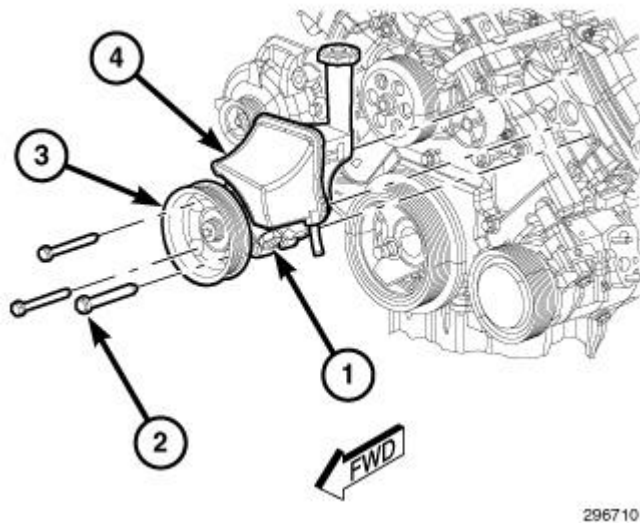


Fig. 449: Power Steering Reservoir, Pump, Pulley & Bolts
Courtesy of CHRYSLER GROUP, LLC

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 (3) and tighten to 28 N.m (21 ft. lbs.).

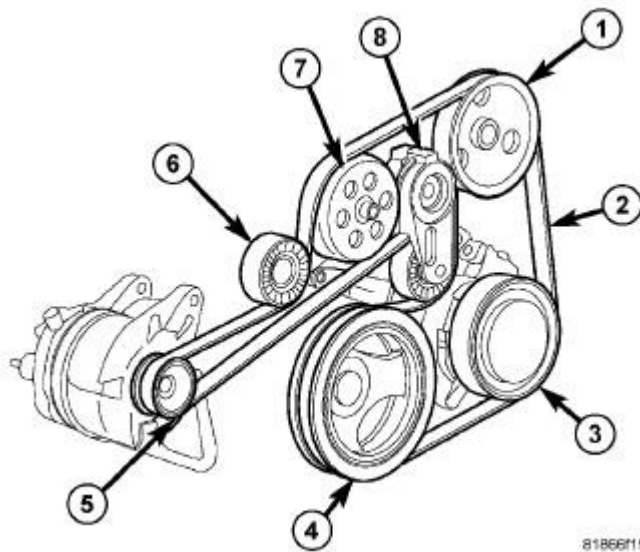
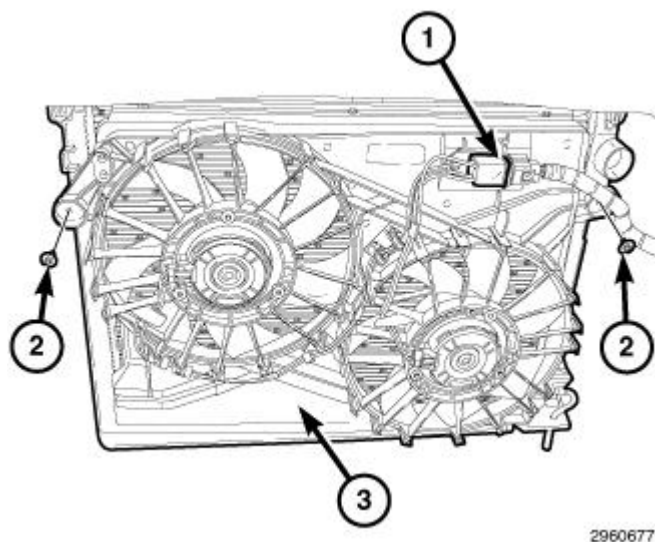


Fig. 450: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

15. Install the accessory drive belt tensioner assembly (8) and idler pulley (6).
16. Install the accessory drive belt (2). Refer to **BELT, SERPENTINE, INSTALLATION** .

17. Install the oil dipstick tube and retaining nut.

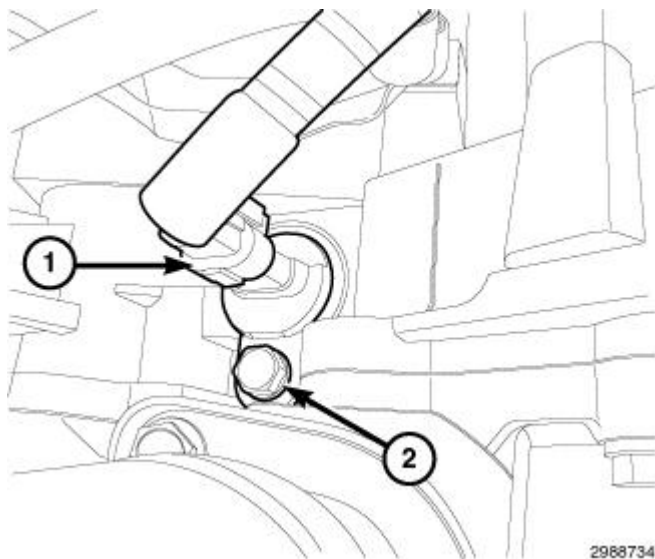


2960677

Fig. 451: Cooling Fan Electrical Connector, Cooling Fan Mounting Bolts & Radiator Cooling Fan Assembly

Courtesy of CHRYSLER GROUP, LLC

18. Install the cooling fan. Refer to **FAN, COOLING, INSTALLATION**.



2968734

Fig. 452: Camshaft Position Sensor Electrical Connector & Bolt

Courtesy of CHRYSLER GROUP, LLC

19. Connect the camshaft position sensor electrical connector (1).

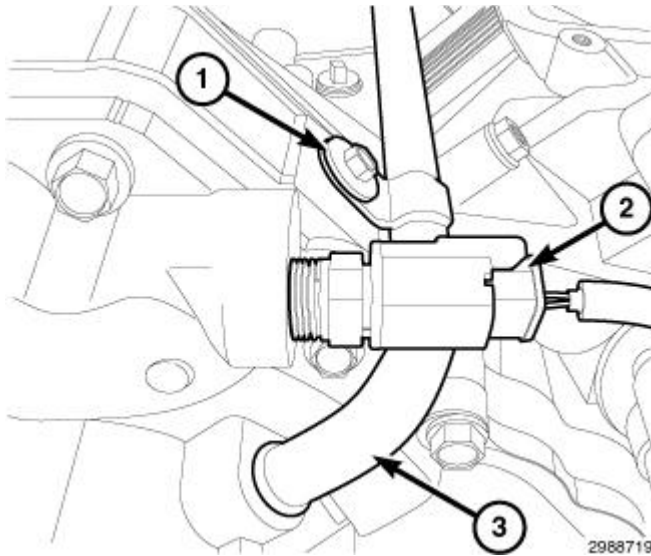


Fig. 453: Coolant Temperature (ECT) Sensor Electrical Connector, Heater Tube & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

20. Install the heater tube (3) into of the water pump.
21. Install the heater tube retaining bolt (1) and tighten to 12 N.m (9 ft. lbs.).
22. Connect the coolant temperature sensor electrical connector (2).

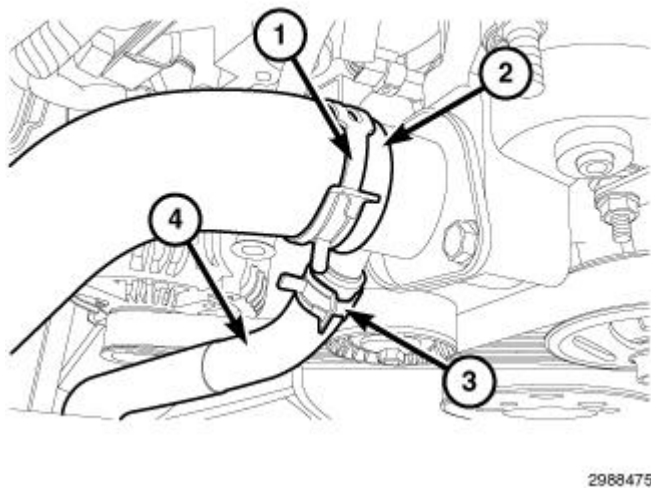
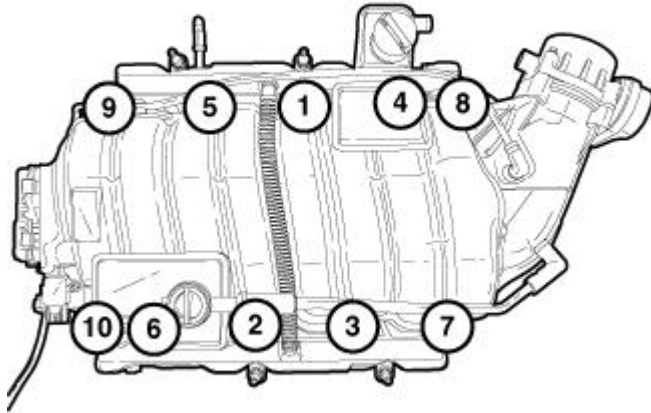


Fig. 454: Upper Radiator Hose, Clamp, Oil Cooler Return Line Hose & Clamp
Courtesy of CHRYSLER GROUP, LLC

23. Install the oil cooler hose (4) and clamp (3).
24. Install the upper radiator hose (2) and clamp (1).

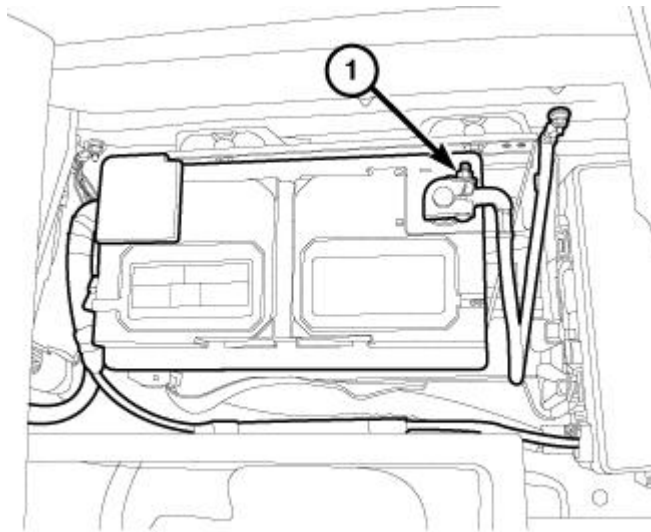


2979652

Fig. 455: Intake Manifold Removal/Tightening Sequence

Courtesy of CHRYSLER GROUP, LLC

25. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION**.
26. Fill the cooling system with the specified type and amount of engine coolant. Refer to Engine Cooling System - **STANDARD PROCEDURE**.
27. Fill the crankcase with the specified type and amount of engine oil. Refer to Engine/Lubrication/OIL - **STANDARD PROCEDURE**.



2969729

Fig. 456: Negative Battery Cable

Courtesy of CHRYSLER GROUP, LLC

28. Connect the negative battery cable (1).

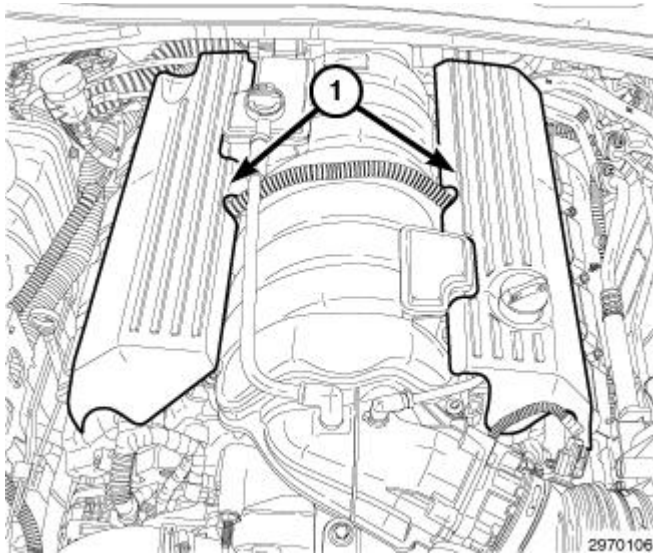


Fig. 457: Engine Covers

Courtesy of CHRYSLER GROUP, LLC

29. Install the engine covers (1).
30. Perform the Refrigerant System Charge procedure. Refer to **PLUMBING, STANDARD PROCEDURE**.
31. Start the engine and check for leaks.

TENSIONER, ENGINE TIMING

DESCRIPTION

DESCRIPTION



Fig. 458: 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. 459: 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.