2013 ENGINE

3.6L - Service Information - C/V Tradesman, Grand Caravan, Town & Country

DESCRIPTION

DESCRIPTION

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

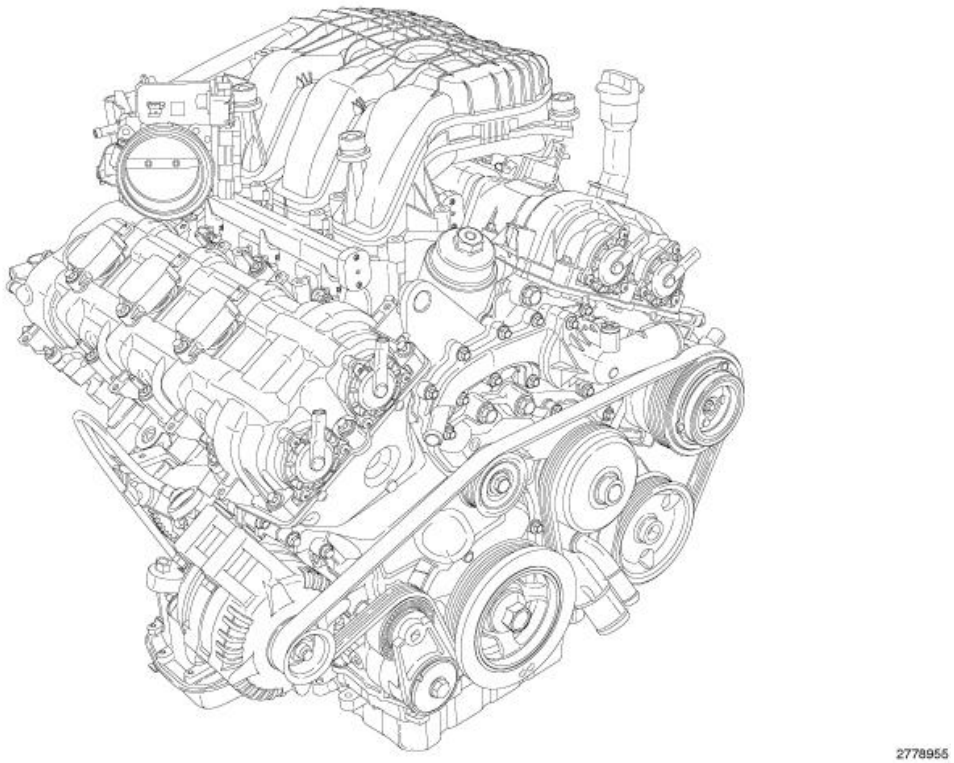


Fig. 1: 3.6L (219.7 CID) Flexible Fuel V-6 Engine
Courtesy of CHRYSLER GROUP, LLC

NOTE: RWD engine configuration shown in illustration, FWD similar.

The 3.6 liter (219.7 CID) flexible fuel V-6 engine features Variable Valve Timing (VVT), Dual Overhead Camshafts (DOHC) and a high-pressure die-cast aluminum cylinder block with steel liners in a 60° configuration. The 3.6 liter engine has a chain driven variable discharge oil pump with a two-stage pressure regulator for improved fuel economy. The exhaust manifolds are integrated into the cylinder heads for reduced weight. The cylinders are numbered from front to rear. The right bank is numbered 1, 3, 5 and the left bank is numbered 2, 4, 6. The firing order is 1-2-3-4-5-6. The engine serial number is located on the left side of the cylinder block at the transmission flange.

- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/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 attains normal operating temperature.
3. Turn the engine OFF.
4. Remove the spark plugs.
5. Remove the oil filler cap.
6. Remove the air cleaner hose.
7. **Calibrate the tester according to the manufacturer's instructions.** The shop air source for testing should maintain a regulated air pressure at 552 kPa (80 psi).
8. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set the piston of the cylinder to be tested at TDC compression.
9. During the testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

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

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

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

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

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

OIL CONSUMPTION TEST AND DIAGNOSIS

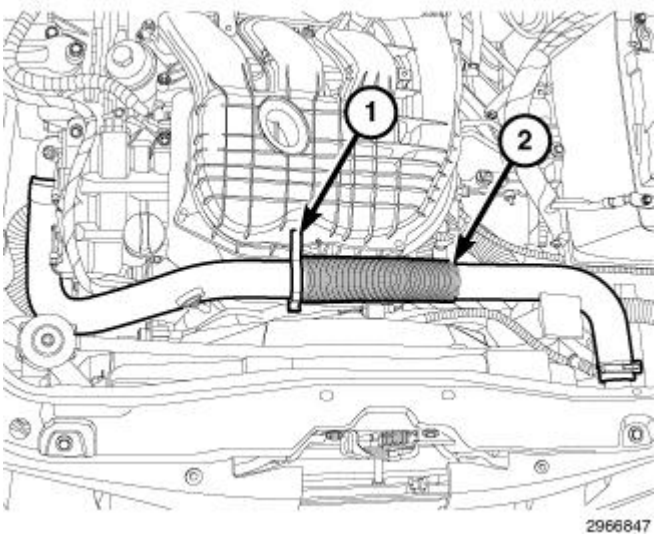


Fig. 11: Upper Radiator Hose & Hose Retainer
Courtesy of CHRYSLER GROUP, LLC

14. Disengage the hose retainer (1) from the intake manifold and remove the upper radiator hose (2).

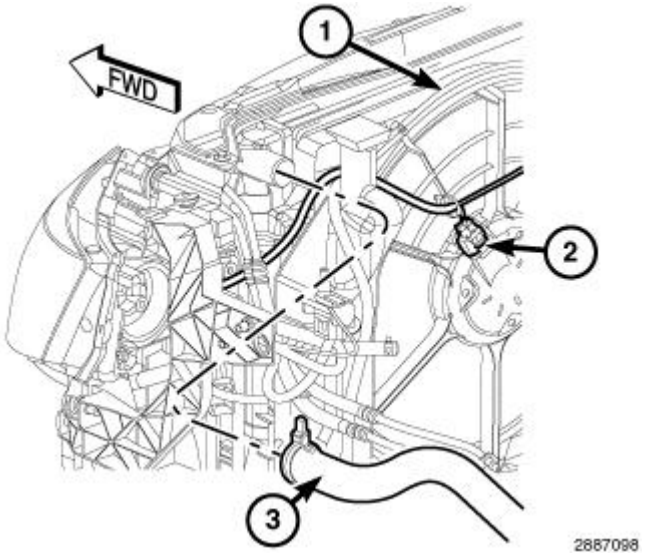


Fig. 12: Cooling Fan, Module & Upper Radiator Hose
Courtesy of CHRYSLER GROUP, LLC

15. Remove the cooling fan module (1). Refer to **FAN, COOLING, REMOVAL** .

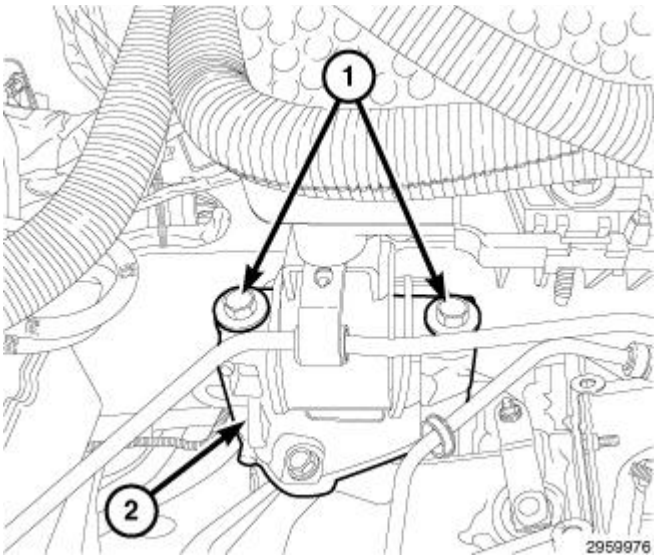


Fig. 66: LH Engine (Transmission) Mount Bracket & Bolts
Courtesy of CHRYSLER GROUP, LLC

11. Install two bolts (1) to the LH engine (transmission) mount bracket (2).
12. Position the main wire harness onto the engine.

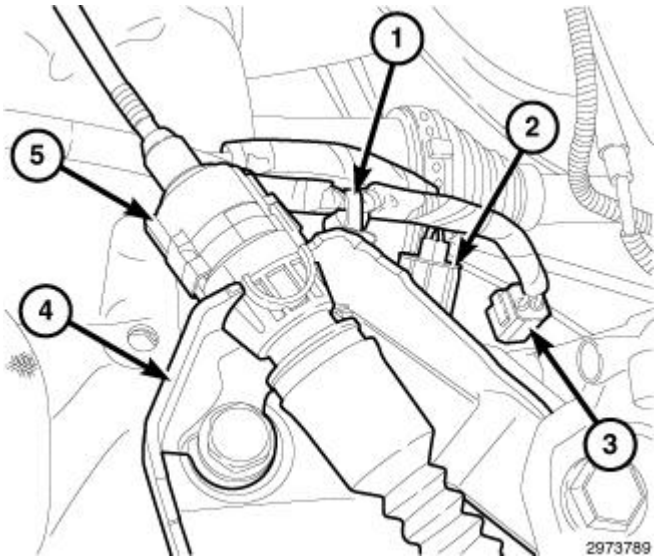


Fig. 67: Output Shaft Speed Sensors Connectors, Bracket, Gearshift Cable & Retainers
Courtesy of CHRYSLER GROUP, LLC

13. Engage the wire harness retainer (1) to the gearshift cable bracket (4).
14. Connect two output shaft speed sensors connectors (2 and 3).
15. Connect the gearshift cable (5) from the bracket (4).

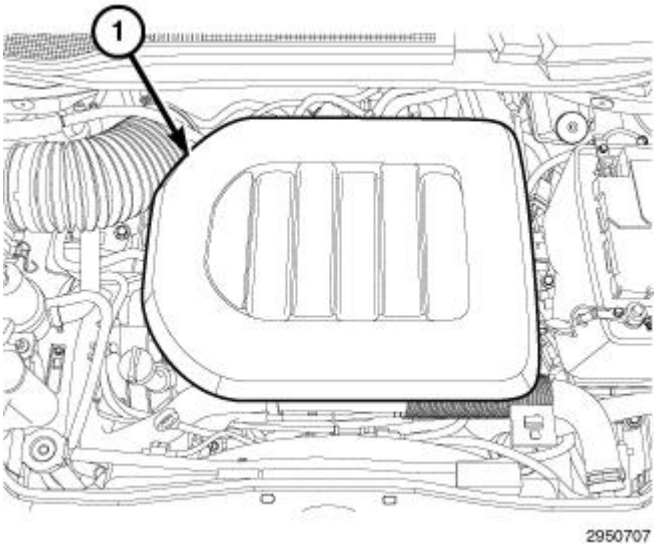


Fig. 134: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

8. Install engine cover (1).
9. Connect the negative battery cable and tighten nut to 5 N.m (44 in. lbs.).

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

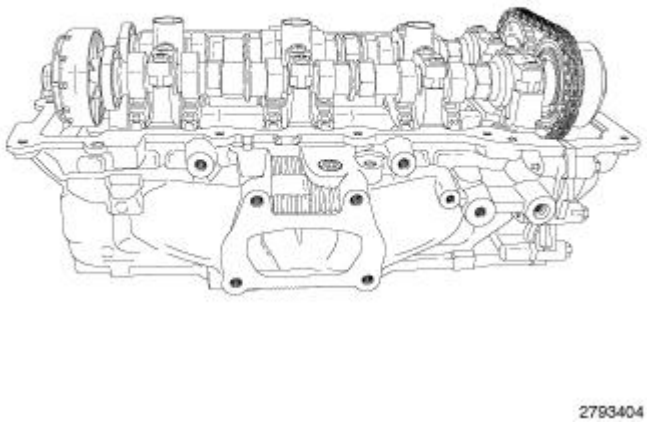


Fig. 135: Aluminum Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

The 3.6L aluminum cylinder heads are a unique design with left and right castings. The exhaust manifolds are

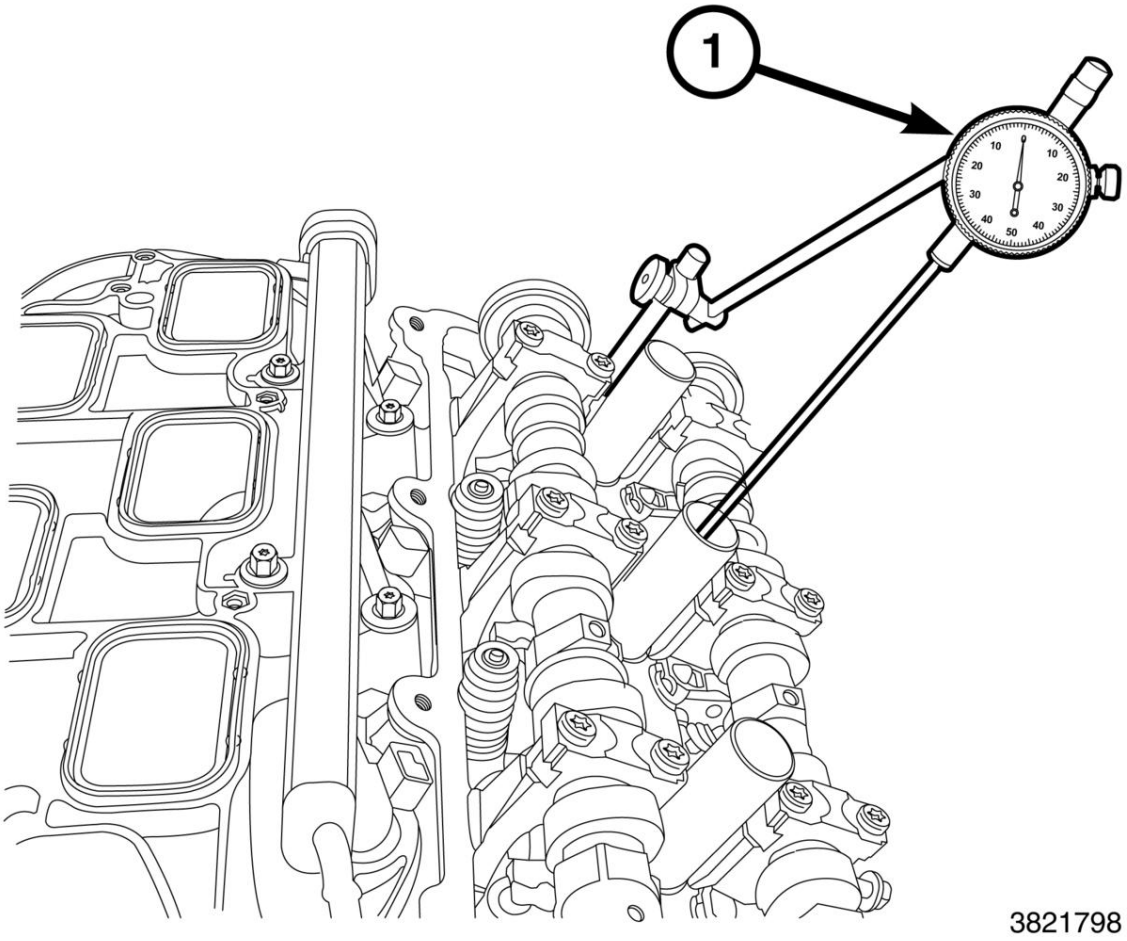


Fig. 245: Positioning Dial Indicator & Setting #4 Cylinder At Top-Dead-Center Compression Stroke
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not rotate the crankshaft more than a few degrees independently of the camshafts. Piston to valve contact could occur resulting in possible valve damage. If the crankshaft needs to be rotated more than a few degrees, first remove the camshafts.

1. Verify that the indicator dial (1) is set to zero when the left side number four cylinder piston is positioned at top-dead-center on the compression stroke.

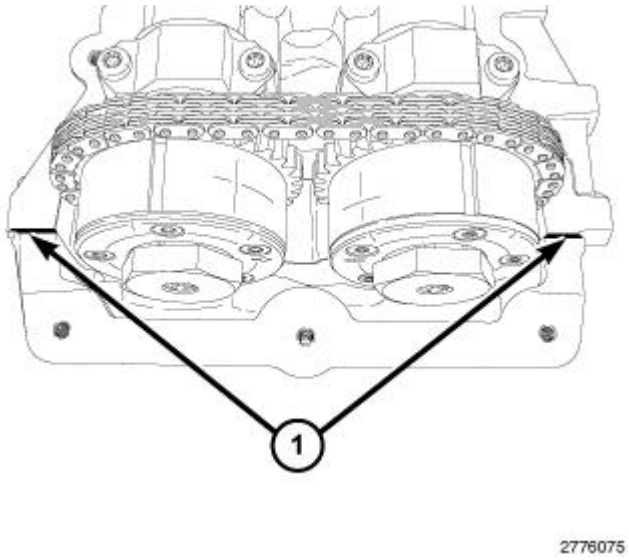


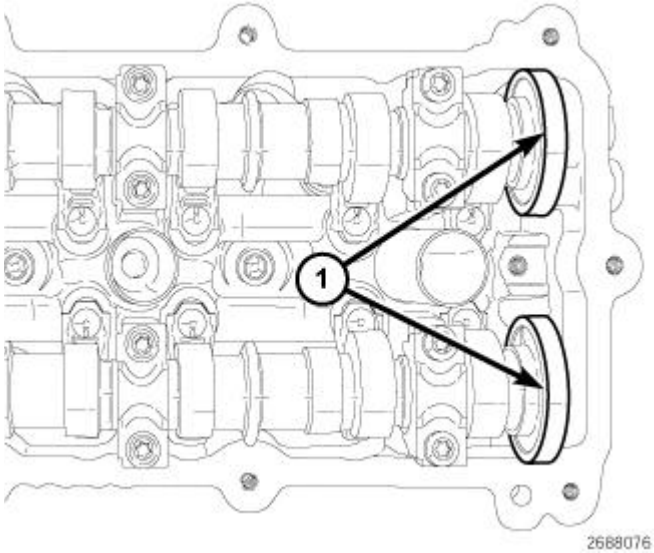
Fig. 299: Residual Sealant
Courtesy of CHRYSLER GROUP, LLC

NOTE: The LH cylinder head cover T-joints are shown in illustration, the RH cylinder head cover T-joints are similar.

CAUTION: Do not use oil based liquids, wire brushes, abrasive wheels or metal scrapers to clean the engine gasket surfaces. Use only isopropyl (rubbing) alcohol, along with plastic or wooden scrapers. Improper gasket surface preparation may result in engine fluid leakage.

18. Remove all residual sealant (1) from the cylinder head, timing chain cover and cylinder head cover mating surfaces. Refer to **ENGINE GASKET SURFACE PREPARATION** .

LEFT



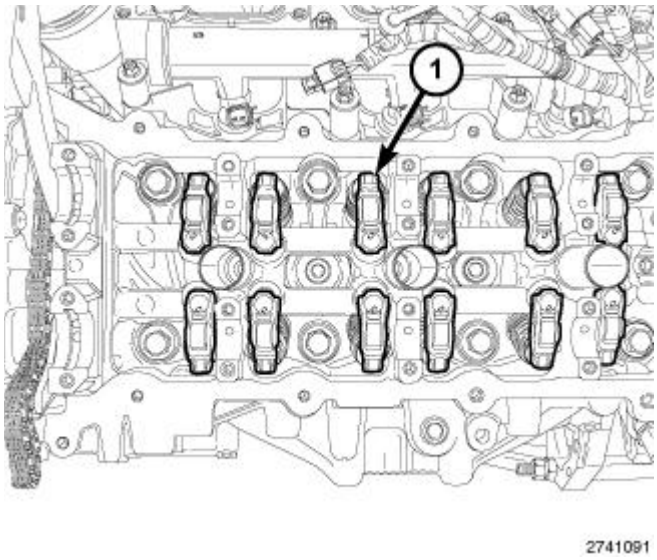


Fig. 346: Locating Rocker Arms
Courtesy of CHRYSLER GROUP, LLC

NOTE: The LH cylinder head rocker arms are shown in illustration, the RH cylinder head rocker arms are similar. If the rocker arms are being reused, reassemble them into their original locations.

1. Lubricate the rocker arms with clean engine oil before installation.

NOTE: When placing the rocker arms. The valve stem should fit securely into the rocker arm guides.

2. Position the rocker arm(s) (1) onto the lifter(s) and valve stem(s).

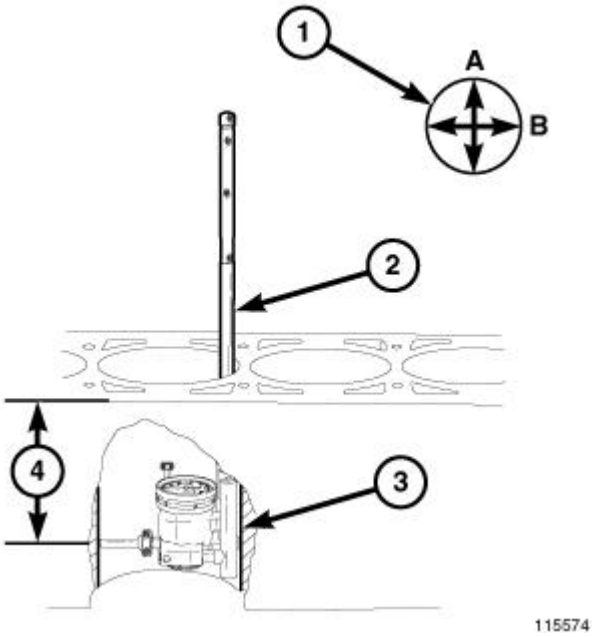


Fig. 406: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

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

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

BEARING(S), CONNECTING ROD

STANDARD PROCEDURE

CONNECTING ROD BEARING FITTING

NOTE: Typical V6 engine configuration shown in illustration.

20. Install the eight main bearing tie bolts. Tighten the bolts in the sequence shown in illustration to 28 N.m (21 ft. lbs.).
21. Install the engine oil pump and oil pump pick-up. Refer to **PUMP, ENGINE OIL, INSTALLATION**.
22. Install the rear crankshaft oil seal and flexplate. Refer to **SEAL, CRANKSHAFT OIL, REAR, INSTALLATION**.
23. Install the timing chain and sprockets, engine timing cover, oil pans, spark plugs and cylinder head covers. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION**.
24. Install the engine. Refer to **INSTALLATION**.
25. If removed, install the oil filter and fill the engine crankcase with the proper oil to the correct level. Refer to **STANDARD PROCEDURE** .
26. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).
27. Fill the cooling system. Refer to **STANDARD PROCEDURE** .
28. Operate the engine until it reaches normal operating temperature. Check cooling system for correct fluid level. Refer to **STANDARD PROCEDURE** .

NOTE: The Cam/Crank Variation Relearn procedure must be performed using the scan tool anytime there has been a repair/replacement made to a powertrain system, for example: flywheel, valvetrain, camshaft and/or crankshaft sensors or components.

DAMPER, VIBRATION

REMOVAL

REMOVAL

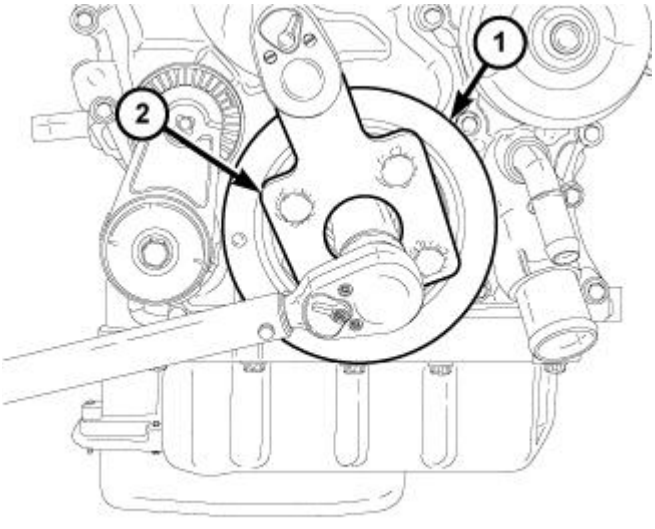


Fig. 445: Crankshaft Vibration Damper & Vibration Damper Holder

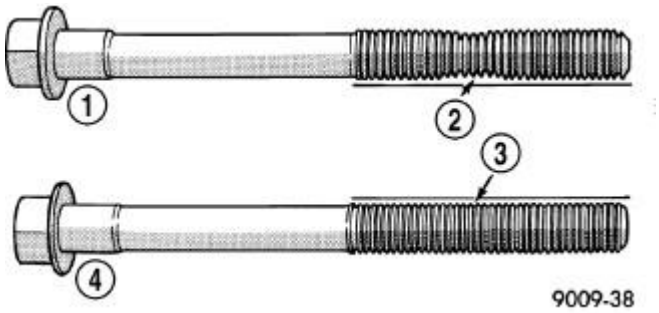


Fig. 477: Identifying Cylinder Head Bolts
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The main bearing cap bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts must be replaced.

18. Check the main bearing cap bolts for necking by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2) the bolt must be replaced.

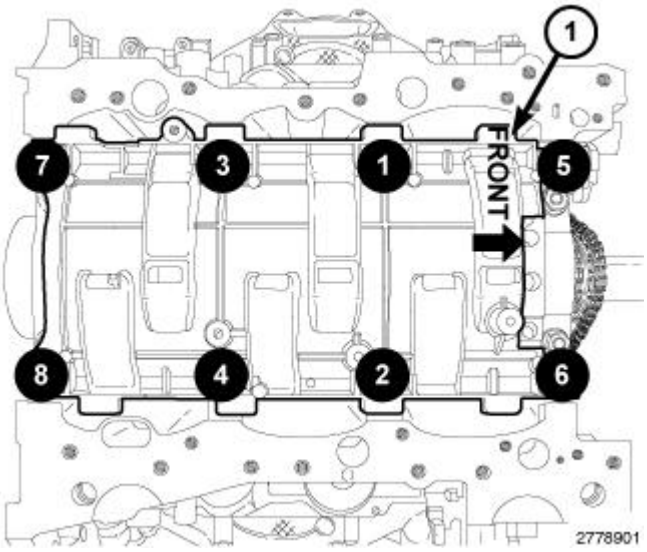


Fig. 478: Windage Tray With Main Bearing Cap Bolts Installation Sequence
Courtesy of CHRYSLER GROUP, LLC

19. Install the windage tray with eight main bearing cap bolts. Tighten the bolts in the sequence shown in illustration to 21 N.m (16 ft. lbs.) plus 90°.
20. Install the engine oil pump and oil pump pick-up. Refer to **PUMP, ENGINE OIL, INSTALLATION**.
21. Install the cylinder heads, engine timing cover and oil pans. Refer to **CYLINDER HEAD, INSTALLATION**.
22. If removed, install the oil filter and fill the engine crankcase with the proper oil to the correct level. Refer to **STANDARD PROCEDURE** .
23. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).

	3. Right Cylinder Head 4. Piston Cooling Jets
Crankshaft Number One Main Journal	1. Primary Chain Idler Shaft 2. Right Secondary Chain Tensioner 3. Oil Pump Feedback
Crankshaft Main Journals	Crankshaft Rod Journals
Left Cylinder Head	1. Left Secondary Chain Tensioner 2. Hydraulic Lash Adjusters 3. Camshaft Journals 4. Phaser Oil Control Valves
Right Cylinder Head	1. Hydraulic Lash Adjusters 2. Camshaft Journals 3. Phaser Oil Control Valves
Hydraulic Lash Adjusters	1. Rocker Arms 2. Cam Lobes

DIAGNOSIS AND TESTING

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 de-grease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of the oil leak. If the oil leak is found and identified, repair per service information instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat the 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. Disconnect the make-up air hose from the cylinder head cover. Cap or plug the make-up air hose nipple.
2. Remove the PCV hose from the PCV valve. Cap or plug the PCV valve nipple.
3. Attach an air hose with a pressure gauge and regulator to the dipstick tube.

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

1. Run the engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn the engine off.
3. Remove the engine cover (1).

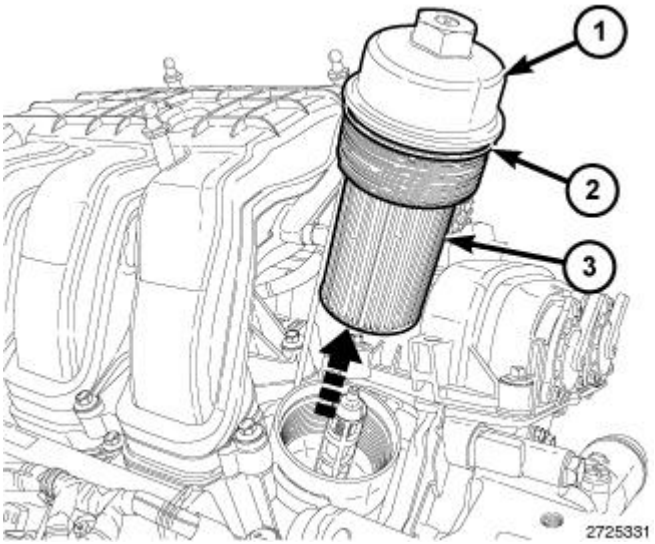


Fig. 544: Oil Filter Cap, O-Ring Seal & Oil Filter
Courtesy of CHRYSLER GROUP, LLC

NOTE: Graphic shows engine cover removed for clarity.

CAUTION: When performing an engine oil change, the oil filter cap must be removed. Removing the oil filter cap releases oil held within the oil filter cavity and allows it to drain into the sump. Failure to remove the cap prior to reinstallation of the drain plug will not allow complete draining of the used engine oil.

4. Place an oil absorbent cloth around the oil filter housing at the base of the oil filter cap.

NOTE: The oil filter (3) is attached to the oil filter cap (2).

5. Rotate the oil filter cap (1) counterclockwise and remove the cap (1) and filter (3) from the oil filter housing.

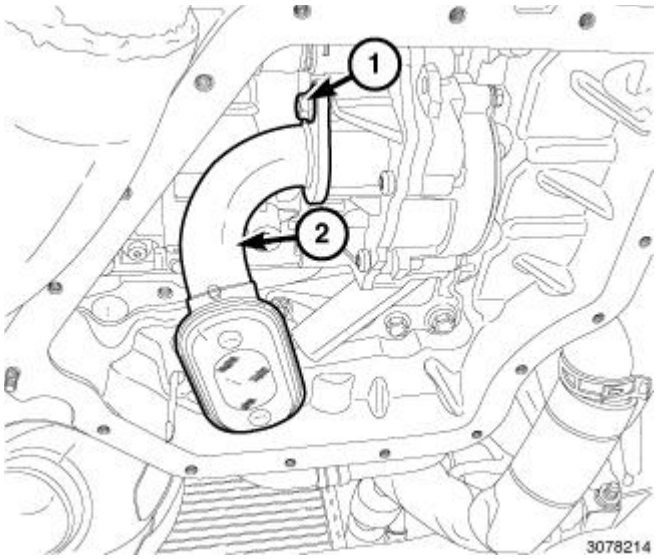


Fig. 588: Oil Pump Pick-Up Tube & Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the negative battery cable.
2. Remove the upper oil pan. Refer to **PAN, OIL, REMOVAL**.
3. Remove the oil pump pick-up (2). Refer to **PICK-UP, OIL PUMP, REMOVAL**.

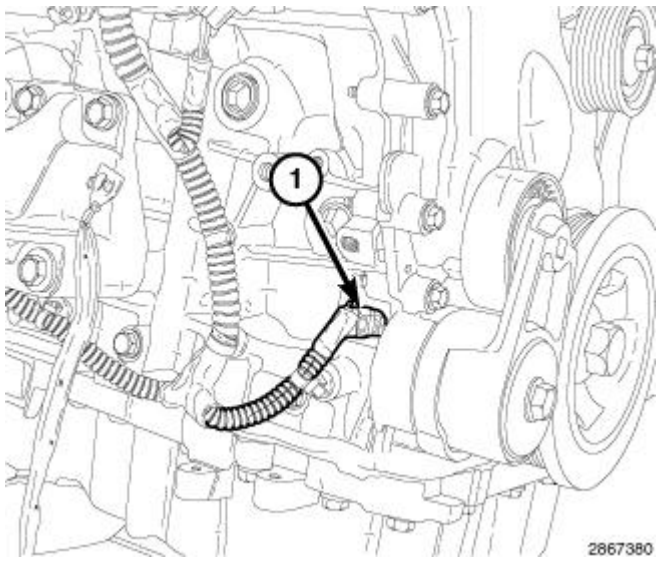


Fig. 589: Oil Pump Solenoid Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the engine wire harness from the oil pump solenoid electrical connector (1).

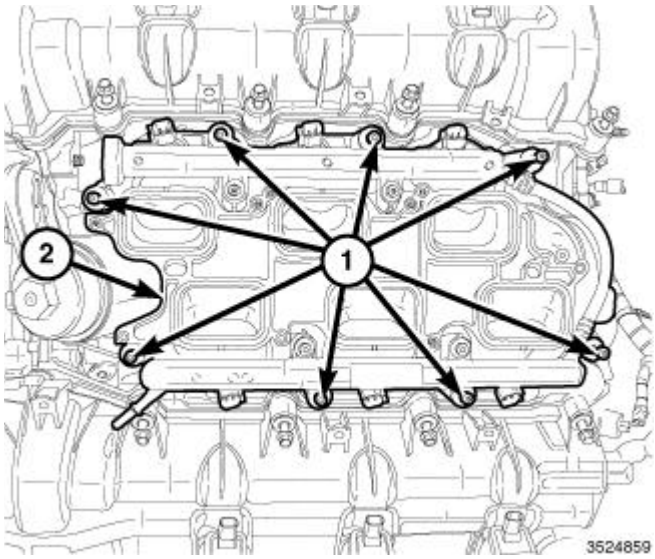


Fig. 615: Lower Intake Manifold & Bolts
Courtesy of CHRYSLER GROUP, LLC

1. Release fuel system pressure. Refer to **FUEL SYSTEM PRESSURE RELEASE PROCEDURE** .
2. Disconnect and isolate the negative battery cable.
3. Remove the air inlet hose, upper intake manifold and lower intake manifold with the fuel injectors and fuel rail (2). Refer to **MANIFOLD, INTAKE, REMOVAL**.

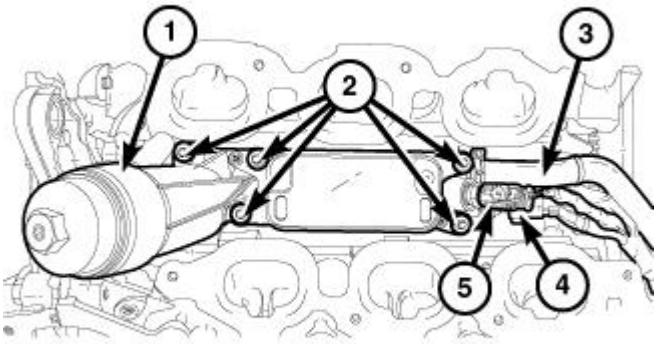


Fig. 616: Oil Temperature Sensor Electrical Connector, Oil Pressure Sensor Electrical Connector, Oil Filter Housing, Heater Hose & Bolts
Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the oil temperature sensor electrical connector (5).