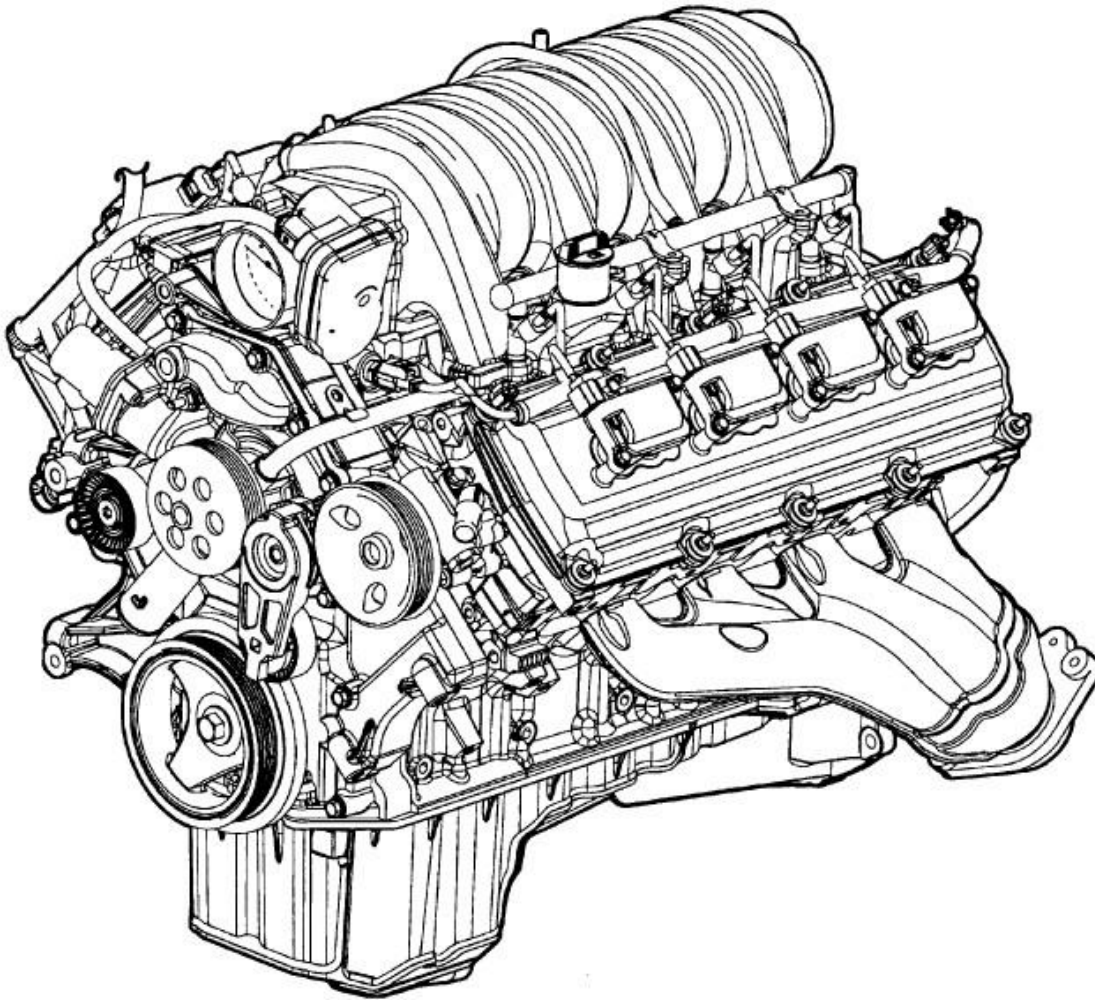


2010 ENGINE**6.1L - Service Information - Grand Cherokee****DESCRIPTION****DESCRIPTION**

©15ca8cb

Fig. 1: 6.1L ENGINE**Courtesy of CHRYSLER LLC**

The 6.1L (370 CID) eight-cylinder engine is a 90° V-Type, deep skirt, lightweight cast iron block with aluminum heads, single cam, overhead valves, and hydraulic roller tappets. 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.

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).

See **ENGINE PERFORMANCE DIAGNOSTIC TABLE** and **ENGINE MECHANICAL DIAGNOSTIC TABLE** for possible causes and corrections of malfunctions.

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

- Cylinder Compression Pressure Test. See **CYLINDER COMPRESSION PRESSURE LEAKAGE**.
- Cylinder Combustion Pressure Leakage Test. See **CYLINDER COMBUSTION PRESSURE LEAKAGE**.
- Engine Cylinder Head Gasket Failure Diagnosis. See **Engine/Cylinder Head - Diagnosis and Testing**.
- Intake Manifold Leakage Diagnosis. See **Engine/Manifolds/MANIFOLD, Intake - Diagnosis and Testing**.

ENGINE MECHANICAL DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES/TAPPETS	1. High or low oil level in crankcase. 2. Thin or diluted oil. 3. Low oil pressure. 4. Dirt in hydraulic tappets.	1. Check for correct oil level. Adjust oil level by draining or adding as needed. Refer to <u>Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications</u> . 2. Change oil and filter. See <u>Engine/Lubrication/OIL - Standard Procedure</u> . 3. Check oil pressure. See <u>Engine/Lubrication - Diagnosis and Testing</u> . Check oil pump. If OK, check rod and main bearings for excessive wear. 4. Inspect the hydraulic tappets for dirt or wear. See <u>Engine/Engine Block/LIFTER(S), Hydraulic - Diagnosis and Testing</u> . 5. Install new push rods. See

2010 Jeep Grand Cherokee SRT-8

2010 ENGINE 6.1L - Service Information - Grand Cherokee

	5. Bent push rod(s). 6. Worn rocker arms. 7. Worn tappets. 8. Worn valve guides. 9. Excessive runout of valve seats on valve faces.	<u>Engine/Cylinder Head/ROCKER ARM, Valve - Removal.</u> 6. Inspect oil supply to rocker arms and replace worn arms as necessary. See <u>Engine/Cylinder Head/ROCKER ARM, Valve - Removal.</u> 7. Install new hydraulic tappets. See <u>Engine/Engine Block/LIFTER(S), Hydraulic - Diagnosis and Testing.</u> 8. Inspect the valve guides for wear, cracks or looseness. If either condition exists, replace the cylinder head. See <u>Engine/Cylinder Head - Removal.</u> 9. Grind valves and seats. See <u>Engine/Cylinder Head/VALVES, Intake and Exhaust - Standard Procedure.</u>
CONNECTING ROD NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Excessive connecting rod bearing clearance. 5. Connecting rod journal out-of-round. 6. Misaligned connecting rods.	1. Check for correct oil level. Refer to <u>Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications</u>. 2. Check oil pressure. See <u>Engine/Lubrication - Diagnosis and Testing.</u> 3. Change oil and filter. See <u>Engine/Lubrication/OIL - Standard Procedure.</u> 4. Inspect and replace rod bearings as necessary. See <u>Engine/Engine Block/ROD, Piston and Connecting - Inspection.</u> 5. Service or replace crankshaft. See <u>Engine/Engine Block/ROD, Piston and Connecting - Inspection.</u> 6. Replace bent connecting rods. See <u>Engine/Engine Block/ROD, Piston and Connecting - Inspection.</u>
MAIN BEARING NOISE	1. Insufficient oil supply. 2. Low oil pressure.	1. Check for correct oil level. Refer to <u>Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications</u>. 2. Check oil pressure. See <u>Engine/Lubrication - Diagnosis and Testing</u> Check oil pump. If OK, check rod and main bearings for excessive wear.

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	3. Thin or diluted oil.	3. Change oil and filter. See <u>Engine/Lubrication/OIL - Standard Procedure.</u>
	4. Excessive bearing clearance.	4. Replace as necessary. See <u>Engine/Engine Block/BEARING(S), Crankshaft - Inspection.</u>
	5. Excessive end play.	5. Inspect and replace thrust washers as necessary. See <u>Engine/Engine Block/CRANKSHAFT - Removal.</u>
	6. Crankshaft journal out-of-round.	6. Service or replace crankshaft. See <u>Engine/Engine Block/CRANKSHAFT - Removal.</u>
	7. Loose flywheel or torque converter.	7. Tighten to correct torque. See <u>Engine/Engine Block/FLEXPLATE - Installation.</u>

ENGINE LUBRICATION DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings. (a) Misaligned or damaged. (b) Loose fasteners, broken or porous metal parts. 2. Crankshaft rear seal 3. Crankshaft seal flange. Scratched, nicked or grooved. 4. Oil pan flange cracked. 5. Front cover seal, damaged or misaligned. 6. Scratched or damaged vibration damper hub. 7. Crankshaft Rear Flange Microporosity	1. (a) Replace as necessary. (b) Tighten fasteners, Repair or replace metal parts. 2. Replace as necessary. 3. Polish or replace crankshaft. 4. Replace oil pan. 5. Replace seal. 6. Polish or replace damper. 7. 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	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.

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	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.

ENGINE PERFORMANCE DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery 2. Corroded or loose battery connections. 3. Faulty starter. 4. Faulty coil or control unit. 5. Incorrect spark plug gap. 6. Dirt or water in fuel system. 7. Faulty fuel pump, relay or wiring.	1. Charge or replace as necessary. 2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals. 3. Refer to <u>Electrical - Engine Systems/Starting - Diagnosis and Testing</u> . 4. Refer to <u>Electrical - Ignition Control/Ignition Control/COIL, Ignition - Removal</u> . 5. Correct as necessary. 6. Clean system and replace fuel filter. 7. Repair or replace as necessary.
ENGINE STALLS OR ROUGH IDLE	1. Dirty or incorrectly gapped spark plugs. 2. Idle mixture too lean or too rich. 3. Vacuum leak. 4. Faulty coil. 5. Incorrect engine timing.	1. Correct as necessary. 2. Refer to appropriate Powertrain Diagnosis Information. 3. Inspect intake manifold and vacuum hoses, repair or replace as necessary. 4. Refer to <u>Electrical - Ignition Control/Ignition Control/COIL, Ignition - Removal</u> . 5. Refer to <u>Engine/Valve Timing - Standard Procedure</u> .
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs. 2. Dirt or water in fuel system. 3. Faulty fuel pump.	1. Correct as necessary. 2. Clean system and replace fuel filter. 3. Refer to the Appropriate

	4. Blown cylinder head gasket. 5. Low compression. 6. Burned, warped or pitted valves. 7. Plugged or restricted exhaust system. 8. Faulty coil.	Diagnostic Information 4. Replace cylinder head gasket. 5. See <u>CYLINDER COMPRESSION PRESSURE LEAKAGE</u> . 6. Replace as necessary. 7. Inspect and replace as necessary. 8. Refer to <u>Electrical - Ignition Control/Ignition Control/COIL, Ignition - Removal</u> .
ENGINE MISSES ON ACCELERATION	1. Spark plugs dirty or incorrectly gapped. 2. Dirt in fuel system. 3. Burned, warped or pitted valves. 4. Faulty coil.	1. Correct as necessary. 2. Clean fuel system. 3. Replace as necessary. 4. Refer to <u>Electrical - Ignition Control/Ignition Control/COIL, Ignition - Removal</u> .
ENGINE MISSES AT HIGH SPEED	1. Spark plugs dirty or incorrectly gapped. 2. Faulty coil. 3. Dirt or water in fuel system.	1. Correct as necessary. 2. Refer to <u>Electrical - Ignition Control/Ignition Control/COIL, Ignition - Removal</u> . 3. Clean system and replace fuel filter.

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. Disable the fuel system and perform the fuel system pressure release procedure. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
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. See **CYLINDER COMBUSTION PRESSURE 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/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, 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.

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 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

STANDARD PROCEDURE

REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads
- Tapping the hole with a special Heli-Coil Tap, or equivalent
- Installing an insert into the tapped hole to bring the hole back to its original thread size

HYDROSTATIC LOCK

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

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

1. Perform the Fuel Pressure Release Procedure. Refer to **Fuel System/Fuel Delivery - Standard Procedure**.
2. Disconnect the negative cable(s) from the battery.
3. Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign material.
4. Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the spark plugs.
5. With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.
6. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
7. Be sure all fluid has been removed from the cylinders.
8. Repair engine or components as necessary to prevent this problem from occurring again.
9. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.
10. Install new spark plugs. Tighten the spark plugs to 41 N.m (30 ft. lbs.).
11. Drain engine oil. Remove and discard the oil filter.
12. Install the drain plug. Tighten the plug to 34 N.m (25 ft. lbs.).
13. Install a new oil filter.
14. Fill engine crankcase with the specified amount and grade of oil. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications**.
15. Connect the negative cable(s) to the battery.
16. Start the engine and check for any leaks.

REMOVAL

REMOVAL

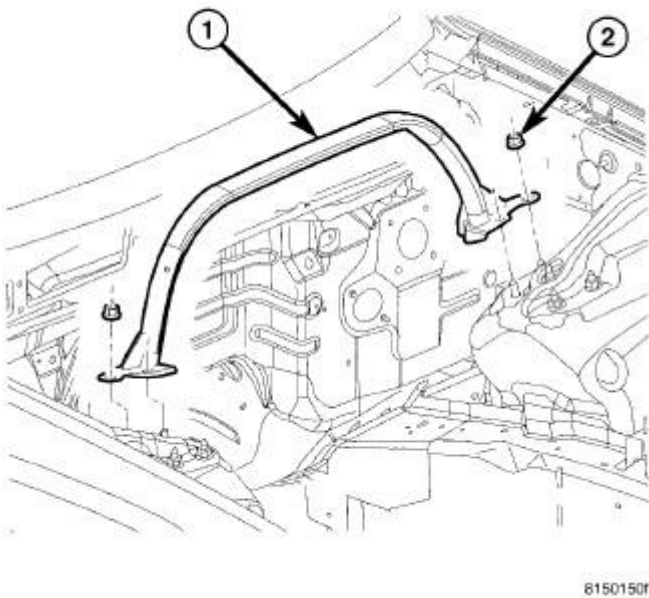


Fig. 2: STRUT TOWER SUPPORT
Courtesy of CHRYSLER LLC

1. Remove the strut tower support (1).

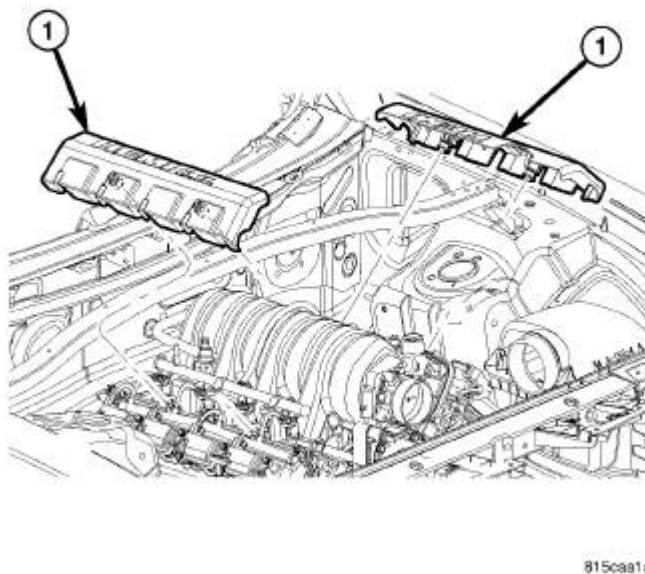


Fig. 3: ENGINE COVERS
Courtesy of CHRYSLER LLC

2. Remove the engine covers (1).

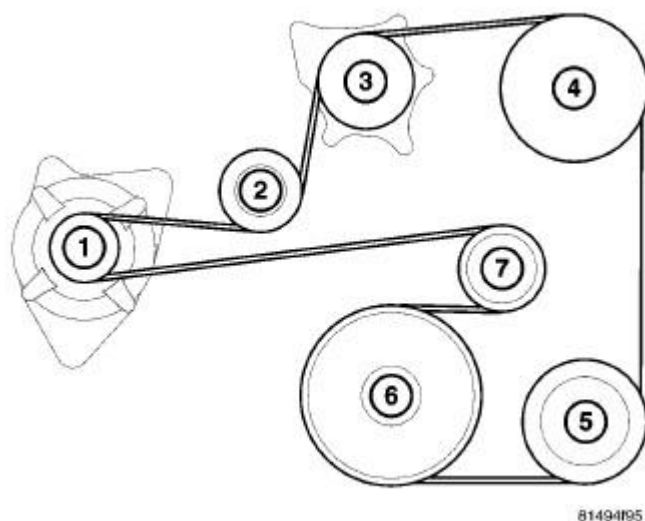


Fig. 4: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

3. Perform the Fuel System Pressure Release procedure. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
4. Disconnect the battery negative cable.
5. Remove the air cleaner resonator and duct work as an assembly.
6. Drain the cooling system. Refer to **Cooling - Standard Procedure** .
7. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
8. Remove radiator fan shroud. Refer to **Cooling/Engine/FAN, Cooling - Removal** .

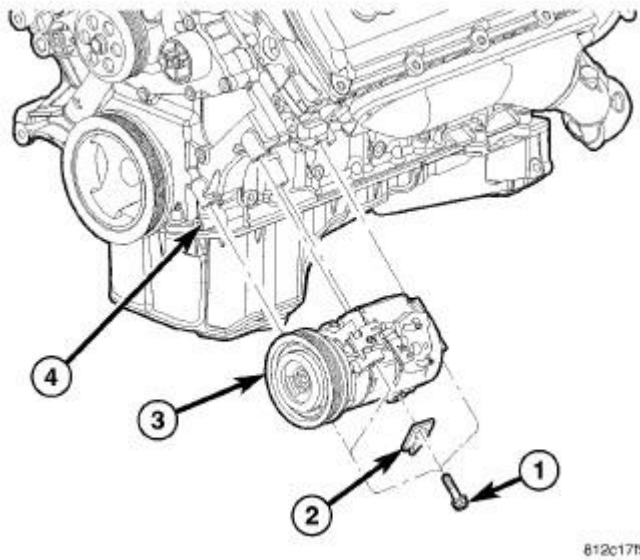


Fig. 5: A/C COMPRESSOR REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

9. Remove the A/C compressor while leaving the lines attached. Secure compressor out of the way.

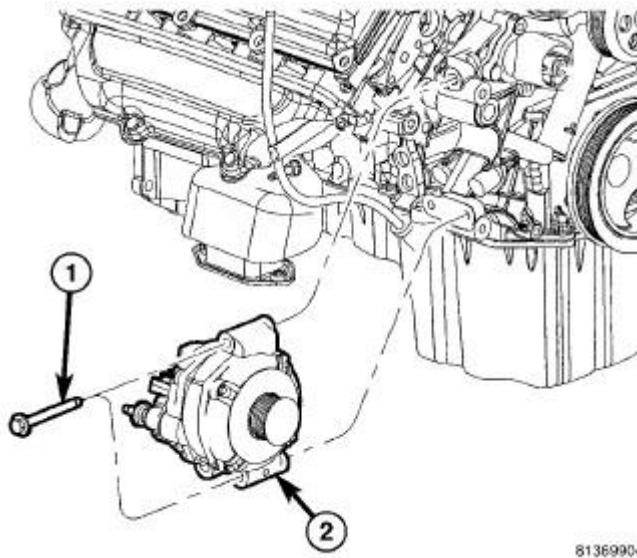


Fig. 6: GENERATOR
Courtesy of CHRYSLER LLC

10. Remove generator assembly. Refer to **Electrical - Engine Systems/Charging/GENERATOR - Removal**.
11. Remove the intake manifold and IAFM as an assembly. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.
12. Remove the ground wires from the rear of each cylinder head.

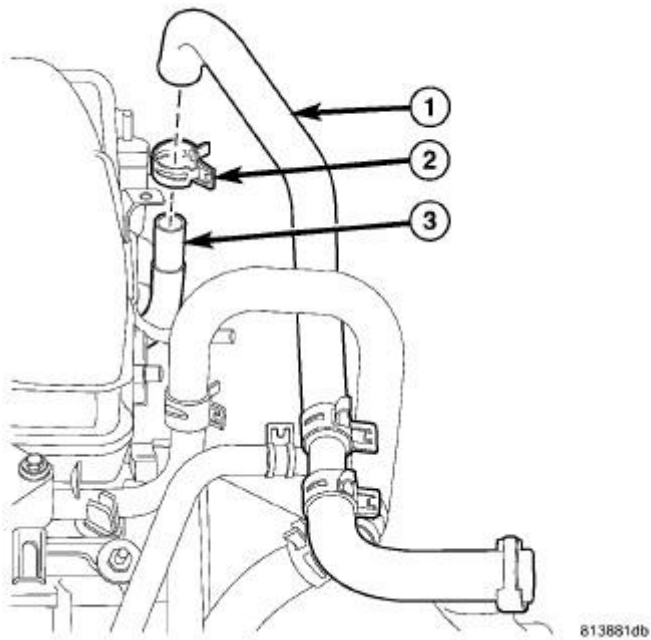


Fig. 7: HEATER HOSE SUPPLY
Courtesy of CHRYSLER LLC

- 1 - Heater Hose
- 2 - Clamp
- 3 - Tube

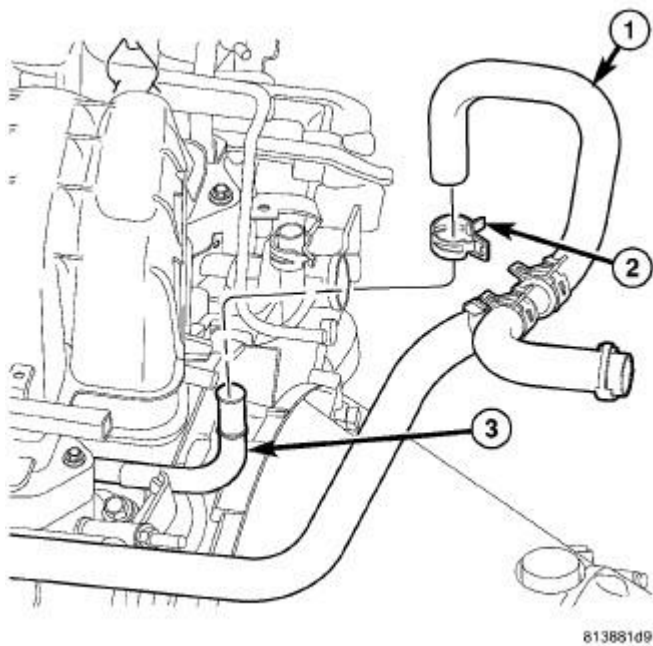


Fig. 8: HEATER HOSE RETURN

Courtesy of CHRYSLER LLC

- 1 - Heater Hose
- 2 - Clamp
- 3 - Tube

13. Disconnect the heater hoses (1).

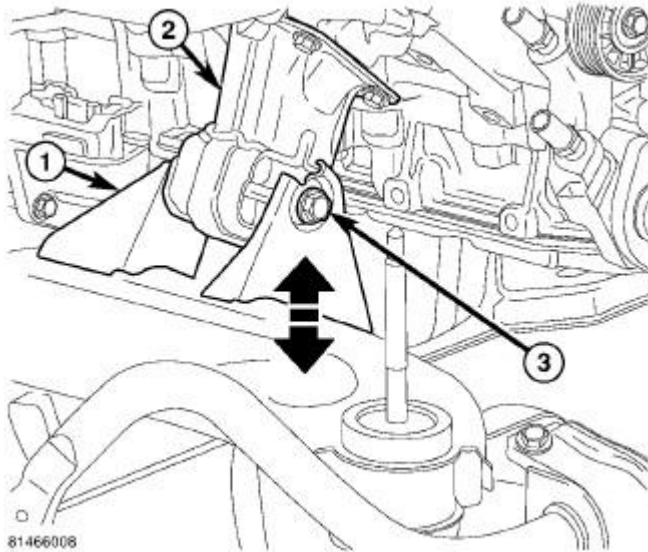


Fig. 9: ENGINE MOUNT BOLT

Courtesy of CHRYSLER LLC

NOTE: It is not necessary to disconnect P/S hoses from pump, for P/S pump removal.

14. Remove the power steering pump and set aside.
15. Disconnect the fuel supply line. Refer to Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure.
16. Raise and support the vehicle on a hoist and drain the engine oil.
17. Remove engine front mount to frame bolts (3) and nuts.
18. Disconnect the transmission oil cooler lines from their retainers at the oil pan bolts.

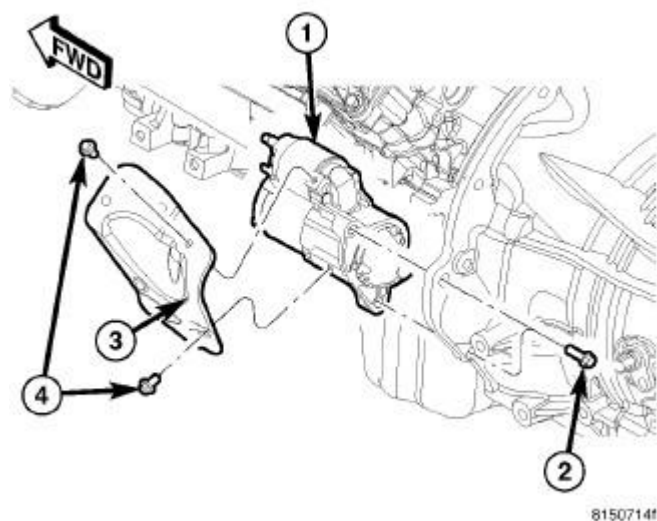


Fig. 10: STARTER

Courtesy of CHRYSLER LLC

19. Disconnect exhaust pipe at manifolds.
20. Disconnect the starter wires. Remove starter motor (1). Refer to **Electrical - Engine Systems/Starting/STARTER - Removal** .

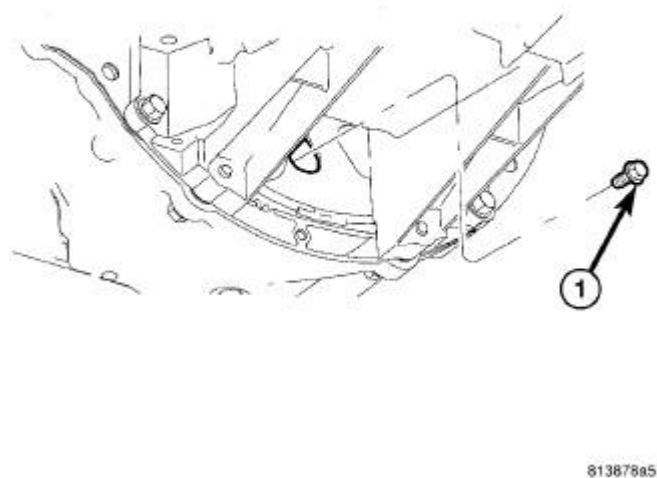
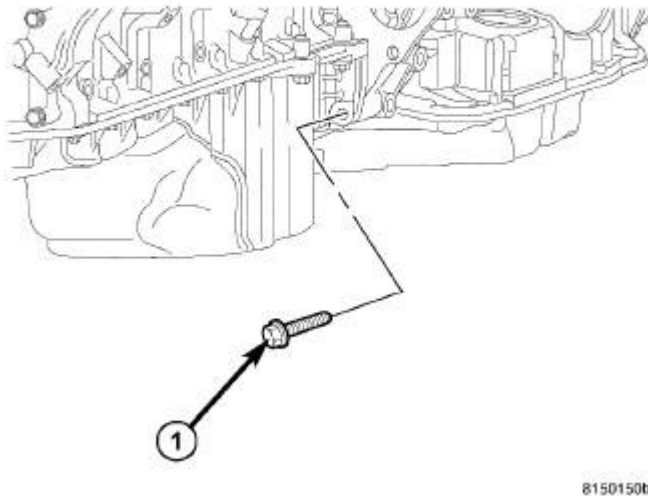


Fig. 11: TORQUE CONVERTER BOLTS

Courtesy of CHRYSLER LLC

1 - Bolts

21. Remove the structural dust cover. See Engine/Engine Block/COVER, Structural Dust - Removal.
22. Remove drive plate to converter bolts.

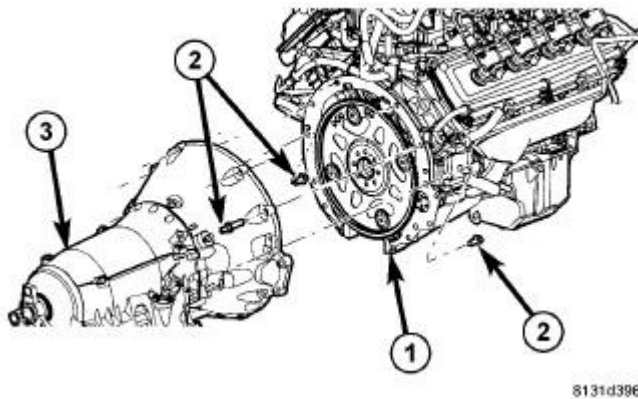


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Fig. 12: OIL PAN TO TRANSMISSION BOLTS
Courtesy of CHRYSLER LLC

1 - BOLTS

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



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Fig. 13: Remove/Install Transmission To Engine Bolts
Courtesy of CHRYSLER LLC

- 1 - ENGINE
- 2 - BOLTS
- 3 - TRANSMISSION

24. Remove transmission bell housing to engine block bolts (2).
25. Lower the vehicle.

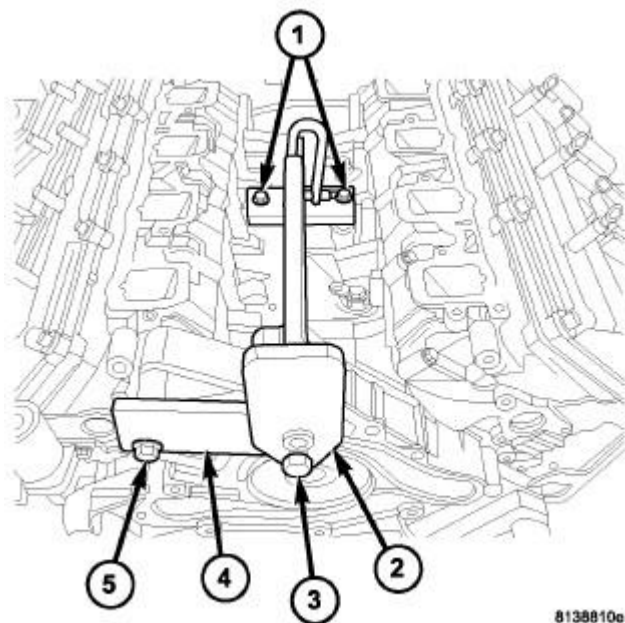


Fig. 14: ENGINE LIFT FIXTURE and ADAPTER
Courtesy of CHRYSLER LLC

- 1 - Bolts
- 2 - Engine Lift Fixture
- 3 - Adapter Bolt
- 4 - Adapter
- 5 - Adapter Nut

26. Install the Engine Lift Fixture 8984A (2), and Adapter 8984-UPD (4).
27. Separate engine from transmission, remove engine from vehicle, and install engine assembly on a repair stand.

INSTALLATION

INSTALLATION

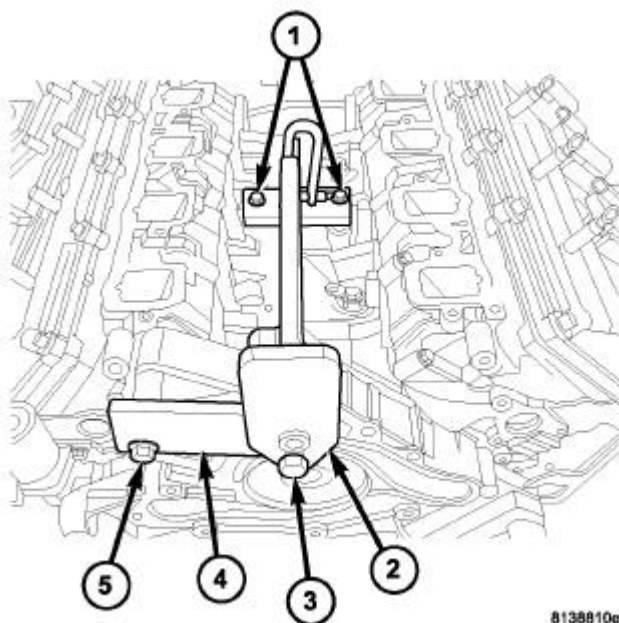


Fig. 15: ENGINE LIFT FIXTURE and ADAPTER
 Courtesy of CHRYSLER LLC

- 1 - Bolts
- 2 - Engine Lift Fixture
- 3 - Adapter Bolt
- 4 - Adapter
- 5 - Adapter Nut

1. Install Engine Lift Fixture 8984A and 8984-UPD.
2. Position the engine in the engine compartment.
3. Lower the engine into compartment and align engine with transmission.

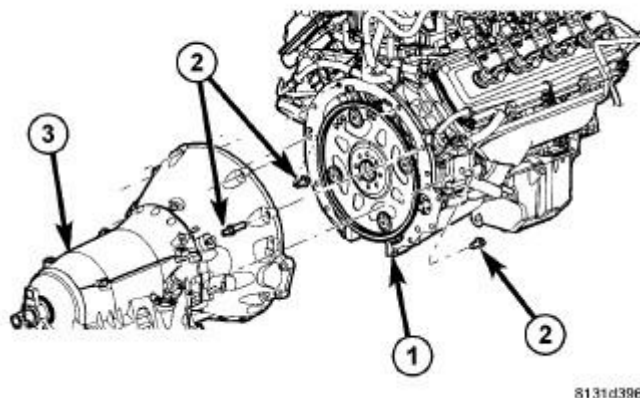


Fig. 16: Remove/Install Transmission To Engine Bolts

Courtesy of CHRYSLER LLC

- 1 - ENGINE
- 2 - BOLTS
- 3 - TRANSMISSION

4. Mate engine (1) and transmission (3) and install two transmission to engine block mounting bolts (2) finger tight.

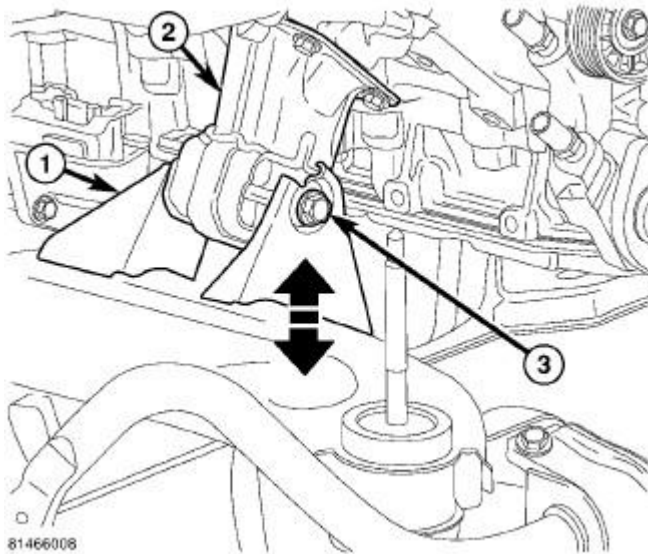


Fig. 17: ENGINE MOUNT BOLT

Courtesy of CHRYSLER LLC

5. Lower engine assembly until the engine mounts (2) rests in frame perches (1).

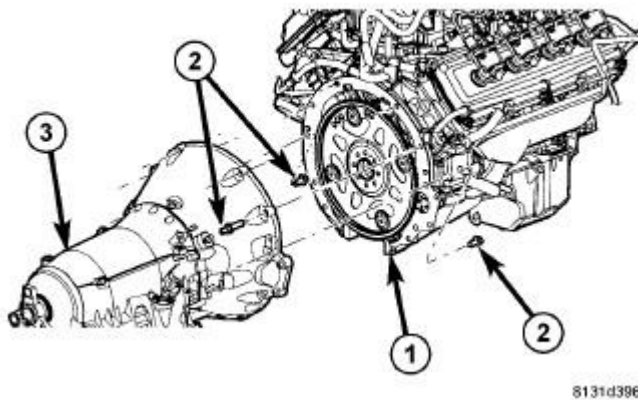


Fig. 18: Remove/Install Transmission To Engine Bolts

Courtesy of CHRYSLER LLC

1 - ENGINE
2 - BOLTS
3 - TRANSMISSION

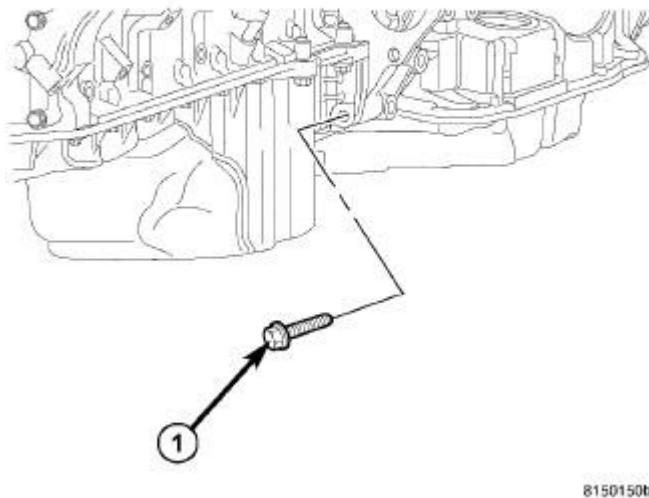


Fig. 19: OIL PAN TO TRANSMISSION BOLTS

Courtesy of CHRYSLER LLC

1 - BOLTS

6. Install remaining transmission to engine block mounting bolts (2) and the oil pan to transmission bolts (1) and tighten.

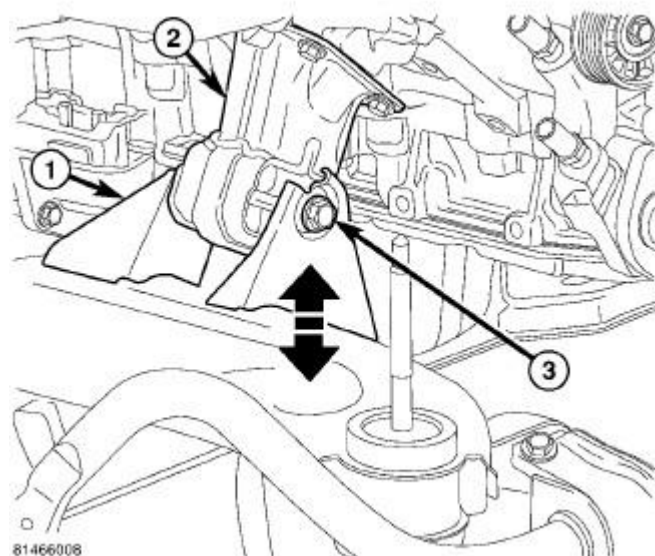


Fig. 20: ENGINE MOUNT BOLT
Courtesy of CHRYSLER LLC

7. Install and tighten engine mount to frame bolts (3) and nuts.

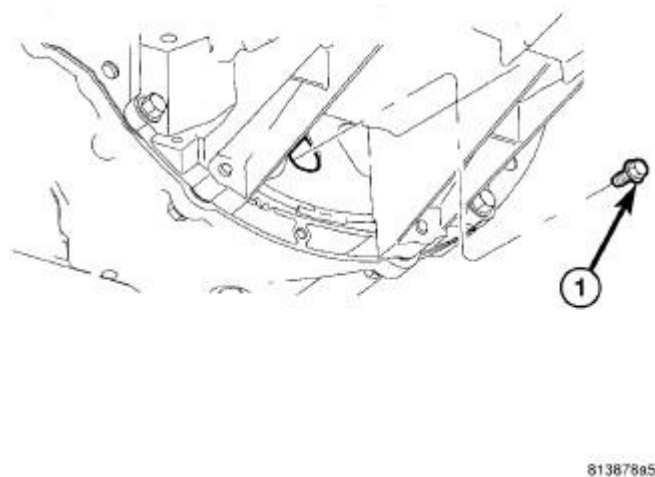


Fig. 21: TORQUE CONVERTER BOLTS
Courtesy of CHRYSLER LLC

1 - Bolts

8. Install drive plate to torque converter bolts (1).

9. Install the structural dust cover (1).

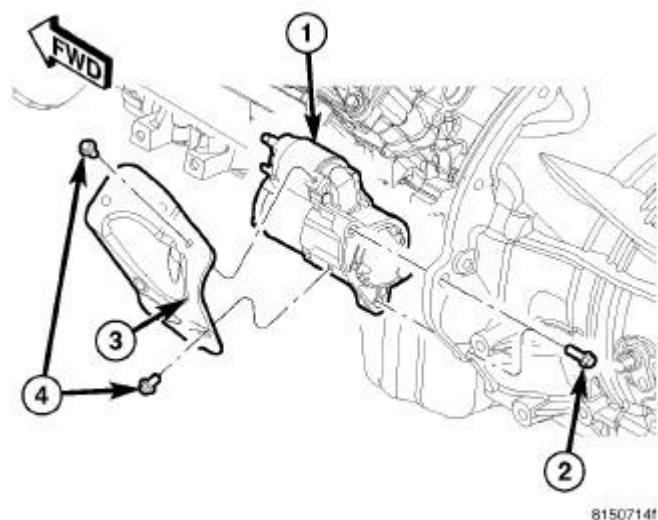


Fig. 22: STARTER
Courtesy of CHRYSLER LLC

10. Install the starter (1) and connect the starter wires. Refer to **Electrical - Engine Systems/Starting/STARTER - Installation**.
11. Install the exhaust pipe to manifold.
12. Lower the vehicle.

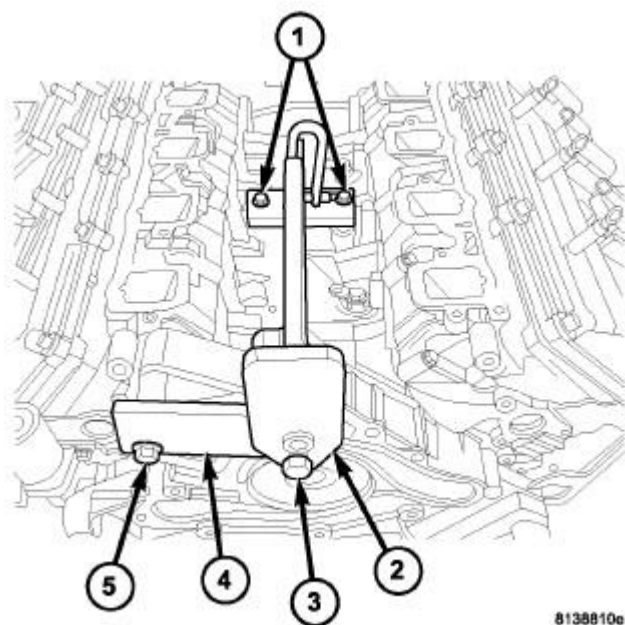


Fig. 23: ENGINE LIFT FIXTURE and ADAPTER
Courtesy of CHRYSLER LLC

- 1 - Bolts
- 2 - Engine Lift Fixture
- 3 - Adapter Bolt
- 4 - Adapter
- 5 - Adapter Nut

13. Remove Engine Lift Fixture 8984A (2), and Adapter 8984-UPD.

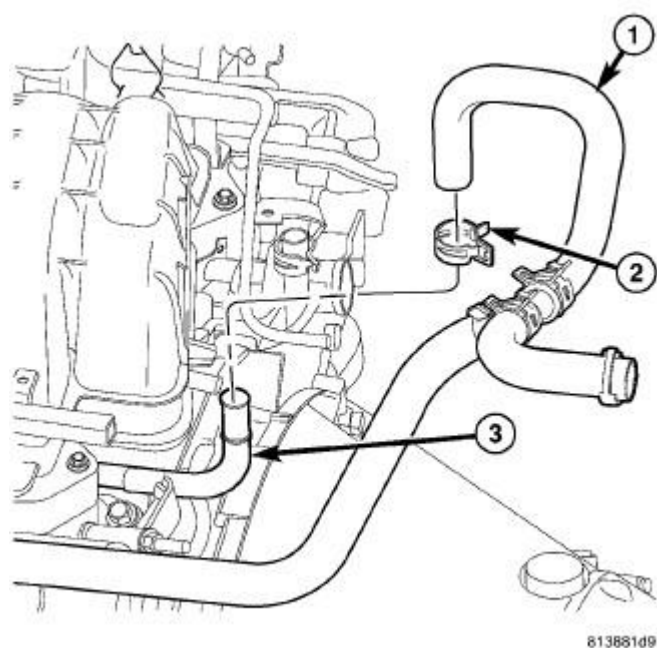


Fig. 24: HEATER HOSE RETURN
Courtesy of CHRYSLER LLC

- 1 - Heater Hose
- 2 - Clamp
- 3 - Tube

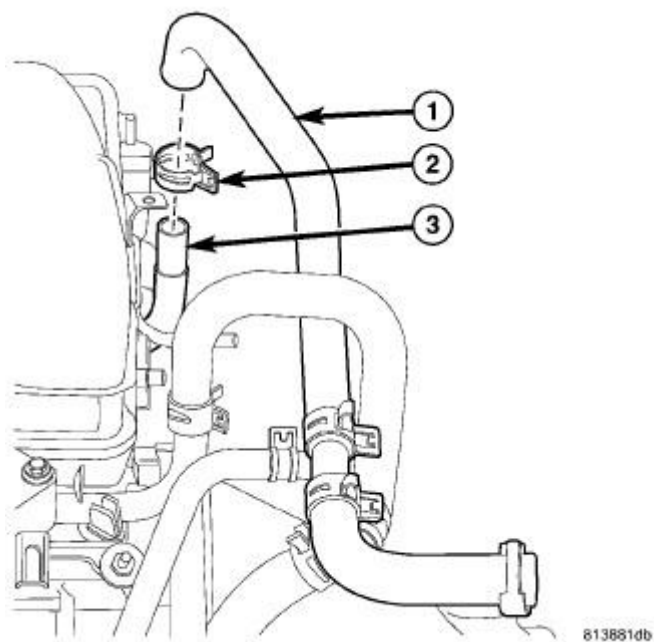


Fig. 25: HEATER HOSE SUPPLY
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - Heater Hose
2 - Clamp
3 - Tube |
|--|

14. Connect the fuel supply line. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure** .
15. Reinstall the power steering pump.
16. Connect the heater hoses (1).

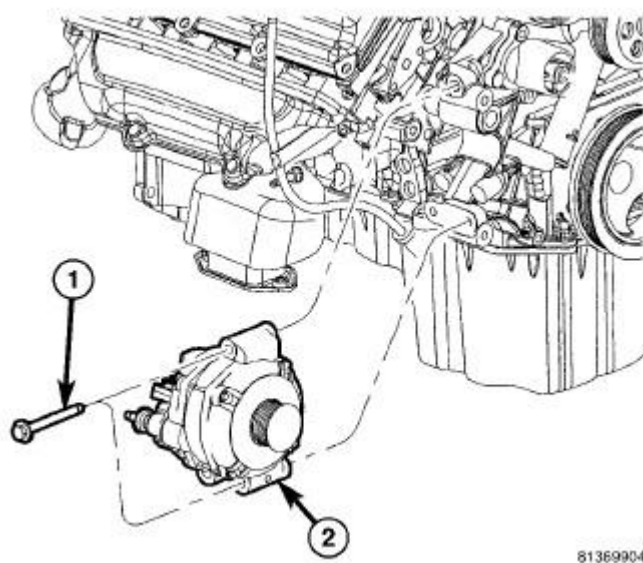


Fig. 26: GENERATOR

Courtesy of CHRYSLER LLC

17. Reconnect the ground wires to the rear of each cylinder head.
18. Install the intake manifold. See Engine/Manifolds/MANIFOLD, Intake - Installation.
19. Install the generator (2), and wire connections. Refer to Electrical - Engine Systems/Charging/GENERATOR - Installation.

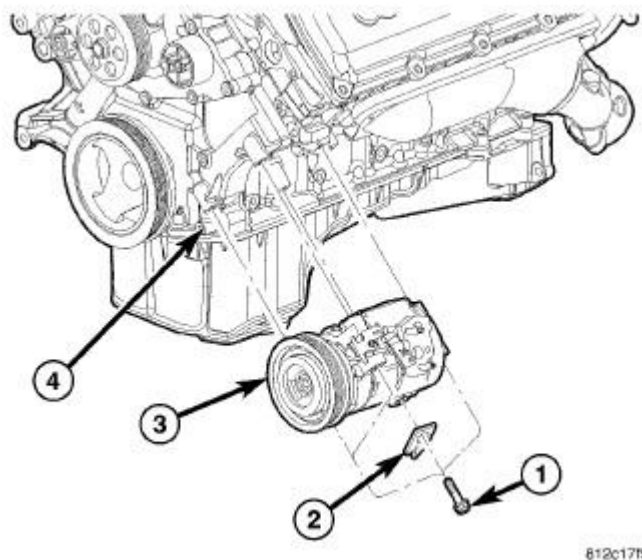


Fig. 27: A/C COMPRESSOR REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

20. Install the A/C Compressor (3). Refer to Heating and Air Conditioning/Plumbing/COMPRESSOR, A/C - Installation.

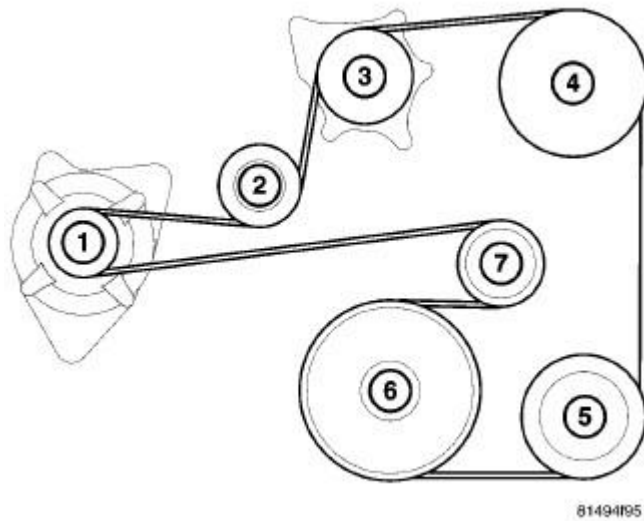
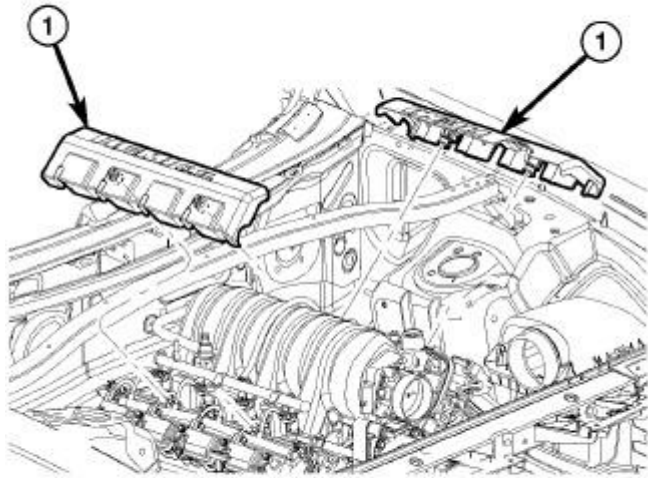


Fig. 28: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

- | |
|--|
| <p>1 - GENERATOR
 2 - IDLER PULLEY
 3 - WATER PUMP
 4 - P/S PUMP
 5 - A/C COMPRESSOR
 6 - CRANKSHAFT
 7 - BELT TENSIONER</p> |
|--|

21. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation** .
22. Install the radiator fan shroud. Refer to **Cooling/Engine/FAN, Cooling - Installation** .
23. Connect the radiator lower hose.
24. Connect the transmission oil cooler lines to the radiator.
25. Connect the radiator upper hose.



815caa1a

Fig. 29: ENGINE COVERS

Courtesy of CHRYSLER LLC

26. Install the air cleaner resonator and duct work.
27. Add engine oil to crankcase. Refer to **Vehicle Quick Reference/Capacities and Recommended Fluids - Specifications** .
28. Fill the cooling system. Refer to **Cooling - Standard Procedure** .
29. Install the engine cover (1).

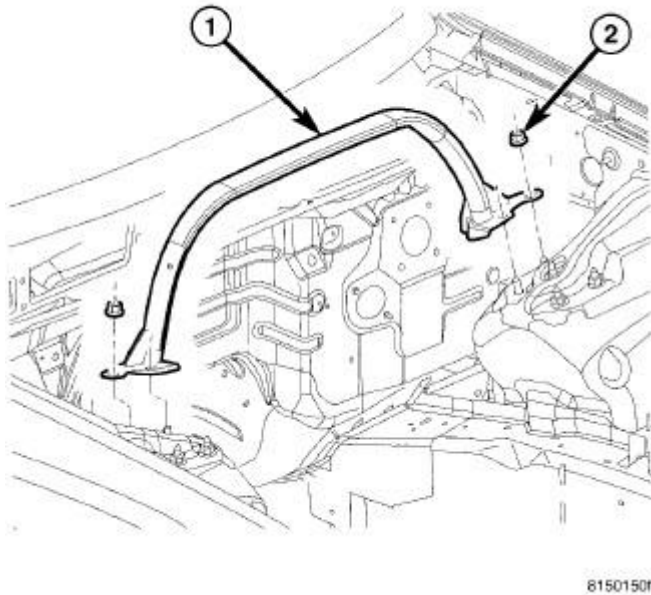


Fig. 30: STRUT TOWER SUPPORT
Courtesy of CHRYSLER LLC

30. Install the strut tower support (1).
31. Connect battery negative cable.
32. Start engine and inspect for leaks.
33. Road test vehicle.

SPECIFICATIONS

6.1L ENGINE

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	90° V-8 OHV
Displacement	6.1 Liters 370 (Cubic Inches)
Bore	103 mm (4.055 in.)
Stroke	90.9 mm (3.58 in.)
Compression Ratio	10.3:1
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

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2010 ENGINE 6.1L - Service Information - Grand Cherokee

Crankshaft	Forged Steel
Camshaft	Hollow Assembled Camshaft
Pistons	Aluminum Alloy
Connecting Rods	Powdered Metal

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
-	Metric	Standard
Cylinder Bore Diameter	103 mm	4.055 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	435 grams	15.34 oz.
Piston Length	54.70 - 55.30	2.153 - 2.177 in.
Ring Groove Width	-	-
No. 1	1.51 - 1.54 mm	0.0594 - 0.0606 in.
No. 2	1.51 - 1.53 mm	0.0594 - 0.0602 in.
No. 3	3.030 - 3.055 mm	0.1192 - 0.1202 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
-	Metric	Standard
Clearance In Piston	0.006 - 0.015 mm	0.00023 - 0.00059 in.
Diameter	25.0 - 25.003 mm	0.9843 - 0.9844 in.
Length	64.785 - 65.215 mm	2.551 - 2.568 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
-	Metric	Standard

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2010 ENGINE 6.1L - Service Information - Grand Cherokee

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

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
-		
Piston Pin Bore Diameter	23.955 - 23.975 mm	0.9431 - 0.9438 in.
Side Clearance	0.10 - 0.35 mm	0.003 - 0.0137 in.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
-		
Main Bearing Journal Diameter	64.988 - 65.012 mm	2.5585 - 2.5595 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	53.992 - 54.008 mm	2.125 - 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	58.2 mm	2.29 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.

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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 @ SAE 0.006"

DESCRIPTION	SPECIFICATION
Intake	-
Opens (BTDC)	15.0°
Closes (ATDC)	268.0°
Duration	283.0°
Exhaust	-
Opens (BTDC)	251°
Closes (ATDC)	35°
Duration	286.0°
Valve Overlap	50°

CYLINDER HEAD

DESCRIPTION	SPECIFICATION
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.05 mm (0.0019 in.)
Valve Seat Width (Finish)	-
Intake	1.18 - 1.62 mm (0.0464 - 0.0637 in.)
-	(0.0464 - 0.0637 in.)
Exhaust	1.48 - 1.92 mm (0.0582 - 0.0755 in.)
-	(0.0582 - 0.0755 in.)
Guide Bore Diameter (Std.)	7.975 - 8.00 mm (0.313 - 0.314 in.)
-	(0.313 - 0.314 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	3.0 mm (at the valve)	0.1181 in.

VALVES

DESCRIPTION	SPECIFICATION

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Face Angle	-
Intake	45.5° - 46.0°
Exhaust	45.0° - 45.5°
Head Diameter	-
Intake	52.67 - 52.93 mm (2.07 - 2.08 in.)
-	
Exhaust	40.37 - 40.63 mm (1.57 - 1.60 in.)
-	
Length (Overall From Gage Line)	-
Intake	124.38 - 124.76 mm (4.897 - 4.912 in.)
-	
Exhaust	122.47 - 122.85 mm (4.822 - 4.837 in.)
-	
Stem Diameter	-
Intake	7.734 - 7.954 mm (0.312 - 0.313 in.)
-	
Exhaust	7.930 - 7.950 mm (0.312 - 0.313 in.)
-	
Stem - to - Guide Clearance	-
Intake	0.021 - 0.066 mm (0.0008 - 0.0025 in.)
-	
Exhaust	0.025 - 0.070 mm (0.0010 - 0.0028 in.)
-	
Valve Lift (@ Zero Lash)	-
Intake	14.5 mm (0.571 in.)
Exhaust	14.0 mm (0.551 in.)

VALVE SPRING

DESCRIPTION	SPECIFICATION
Spring Force (Valve Closed)	-
Intake	445.0 N +/- 22.0 N @ 47.5 mm (99.0 lbs +/- 4.0 - 9.0 lbs. @ 1.870 in.)
Exhaust	445.0 N +/- 22.0 N @ 45 mm (99.0 lbs +/- 4.0 - 9.0 lbs. @ 1.772 in.)
Spring Force (Valve Open)	-
Intake	1450.0 N +/- 68.0 N @ 33.0 mm (325.5 lbs. +/- 15.3 lbs. @ 1.3 in.)
Exhaust	1450.0 N +/- 68.0 N @ 31.0 mm (325.5 lbs. +/- 15.3 lbs. @ 1.22 in.)
Free Length (approx)	-
Intake	54.2 mm (2.133 in.)
Exhaust	51.4 mm (2.023 in.)
Number of Coils	-

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2010 ENGINE 6.1L - Service Information - Grand Cherokee

Intake	7.35
Exhaust	7.0
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	47.5 mm (1.870 in.)
Exhaust	45.0 mm (1.772 in.)

OIL PUMP

DESCRIPTION	SPECIFICATION
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

TORQUE CHART 6.1L ENGINE

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Block Pipe Plugs (1/4 NPT)	20	15	-
(3/8 NPT)	27	20	-
Camshaft Sprocket - Bolt	122	90	-
Camshaft Tensioner Plate - Bolts	28	21	-
Timing Chain Case Cover - Bolts	28	21	-
Lifting Stud	55	40	-
Connecting Rod Cap - Bolts	45 plus 60° Turn	33 plus 60° Turn	-
Main Bearing Cap - Bolts	28 plus 90° Turn	21 plus 90° Turn	-
M-12			
Crossbolts	21.5	16	-
M-8			
Cylinder Head - Bolts	-	-	-
M-12 Bolts			
Step 1	34	25	-
Step 2	54	40	-

2010 Jeep Grand Cherokee SRT-8

2010 ENGINE 6.1L - Service Information - Grand Cherokee

	Step 3	Turn 90°	Turn 90°	-
M-8 Bolts		-	-	-
	Step 1	20	15	-
	Step 2	34	25	-
Cylinder Head Cover - Bolts		8	-	70
Exhaust Manifold to Cylinder Head - Bolts		31	23	-
Flexplate to crankshaft - Bolts		95	70	-
Flywheel to crankshaft - Bolts		75	55	-
Front Insulator - Through bolt/nut		95	70	-
Front Insulator to Block - Bolts		95	70	-
Generator - Mounting Bolt		55	40	-
Intake Manifold - Bolts	Refer to INSTALLATION Procedure.			
Lifter Guide Holder		12	9	-
Piston Oil Cooler Jet - Bolts		13	10	-
Oil Pan - Bolts		12	9	-
Oil Dipstick Tube		6	-	53
Oil Pan - Drain Plug		27	20	-
Oil Pump - Attaching Bolts		28	21	-
Oil Pump Pickup Tube - Bolt and Nut		28	21	-
Rear Seal Retainer Attaching Bolts		15	11	-
Rear Insulator to Bracket		68	50	-
Rear Insulator to Crossmember		41	30	-
Rear Insulator to Transmission		68	50	-
Rear Insulator Bracket - Bolts		68	50	-
Rocker Arm - Bolts		22	16	-
Spark Plugs		-	-	-
Thermostat Housing - Bolts		28	21	-
Throttle Body - Bolts		12	9	-
Vibration Damper - Bolt		176	129	-
Water Pump to Timing Chain Cover - Bolts		28	21	-

SPECIAL TOOLS

SPECIAL TOOLS

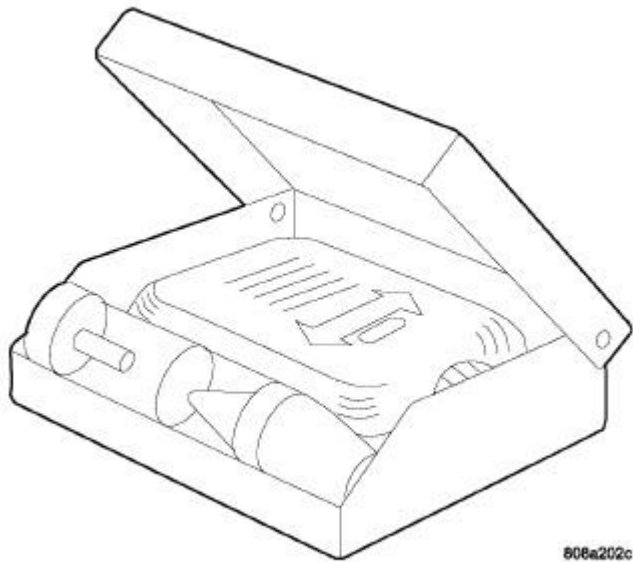


Fig. 31: BLOC-CHEK-KIT - C-3685-A
Courtesy of CHRYSLER LLC

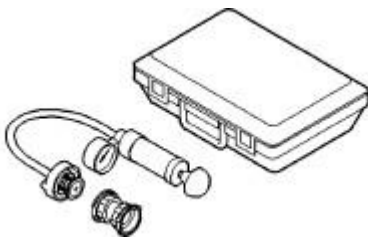


Fig. 32: TESTER, COOLING SYSTEM - 7700-A
Courtesy of CHRYSLER LLC

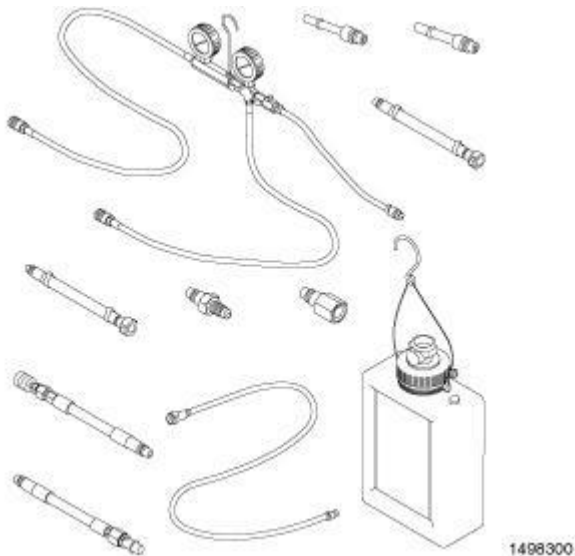


Fig. 33: DECAY TOOL, FUEL - 8978A

Courtesy of CHRYSLER LLC

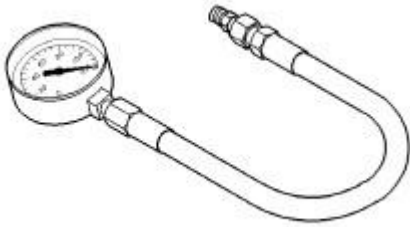


Fig. 34: GAUGE, PRESSURE - C-3292A

Courtesy of CHRYSLER LLC

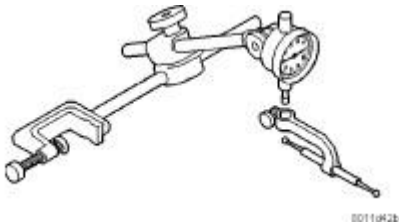


Fig. 35: SET, DIAL INDICATOR - C-3339A

Courtesy of CHRYSLER LLC

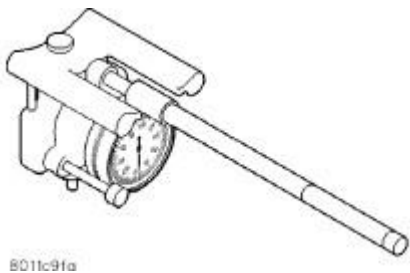


Fig. 36: CYLINDER INDICATOR - C-119

Courtesy of CHRYSLER LLC

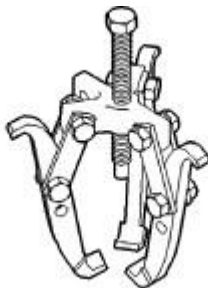


Fig. 37: PULLER - 1023

Courtesy of CHRYSLER LLC

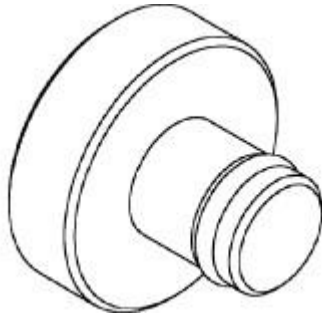


Fig. 38: INSERT, CRANKSHAFT - 8513A

Courtesy of CHRYSLER LLC



2065300

Fig. 39: INSTALLER, DAMPER - 8512A

Courtesy of CHRYSLER LLC

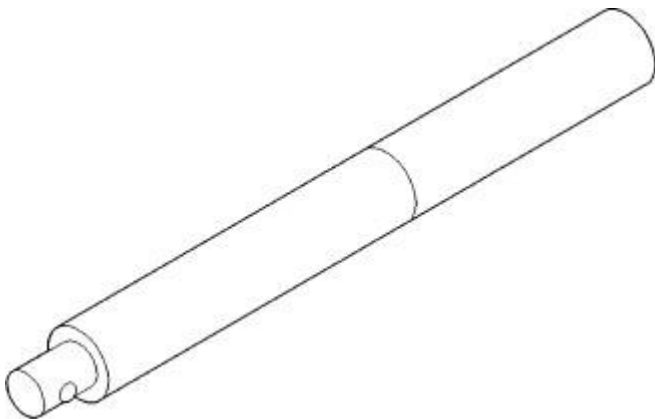


Fig. 40: DRIVER HANDLE, UNIVERSAL - C-4171

Courtesy of CHRYSLER LLC

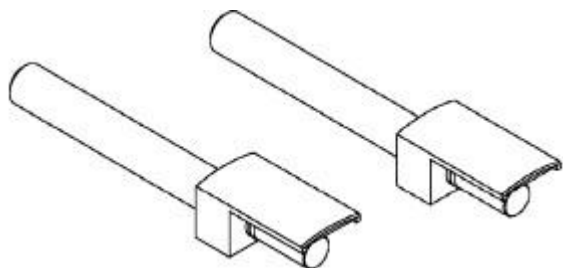


Fig. 41: GUIDES, CONNECTING ROD - 8507
Courtesy of CHRYSLER LLC

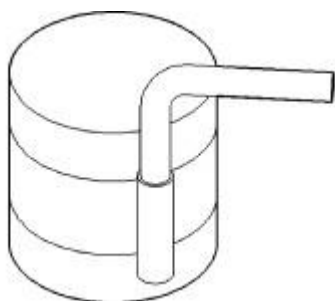


Fig. 42: COMPRESSOR, PISTON - C-385
Courtesy of CHRYSLER LLC

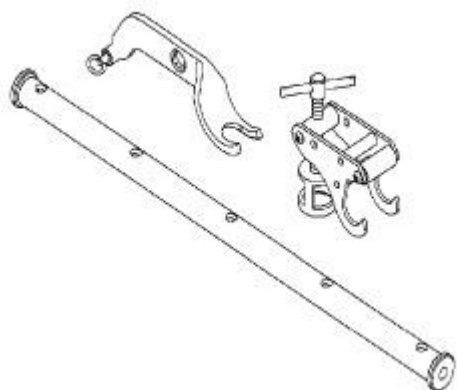


Fig. 43: COMPRESSOR, VALVE SPRING - 9065A
Courtesy of CHRYSLER LLC

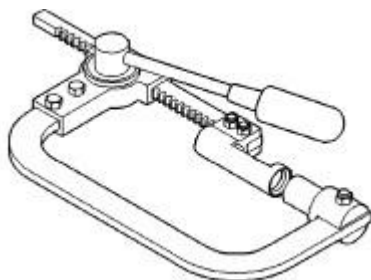


Fig. 44: COMPRESSOR, VALVE SPRING - C-3422-D
Courtesy of CHRYSLER LLC

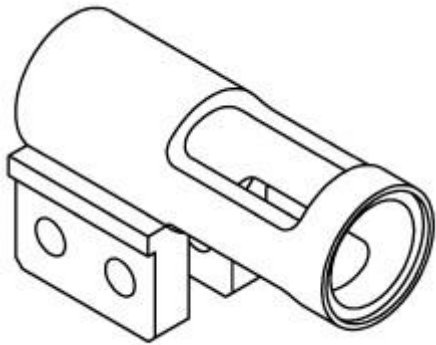


Fig. 45: ADAPTER, VALVE SPRING - 8464
Courtesy of CHRYSLER LLC

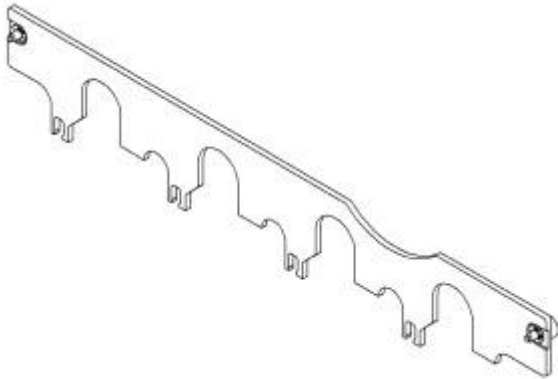


Fig. 46: RETAINER, PUSH ROD - 9070
Courtesy of CHRYSLER LLC

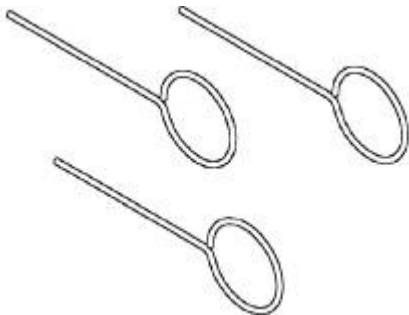


Fig. 47: PINS, TENSIONER - 8514
Courtesy of CHRYSLER LLC

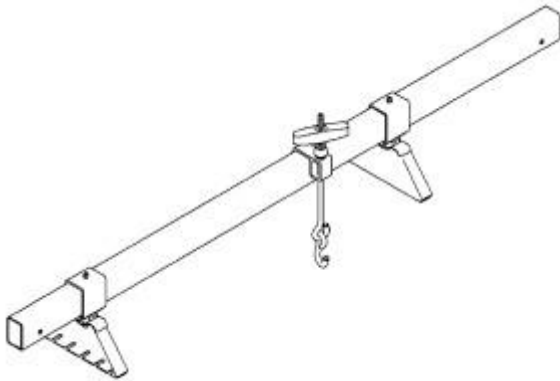


Fig. 48: SUPPORT FIXTURE, ENGINE - 8534B
Courtesy of CHRYSLER LLC

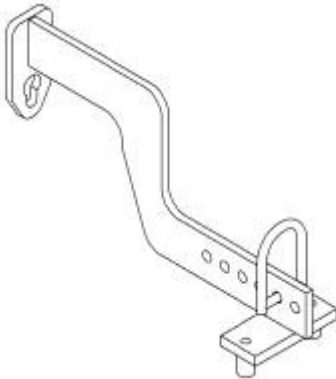


Fig. 49: ENGINE LIFT FIXTURE - 8984A
Courtesy of CHRYSLER LLC

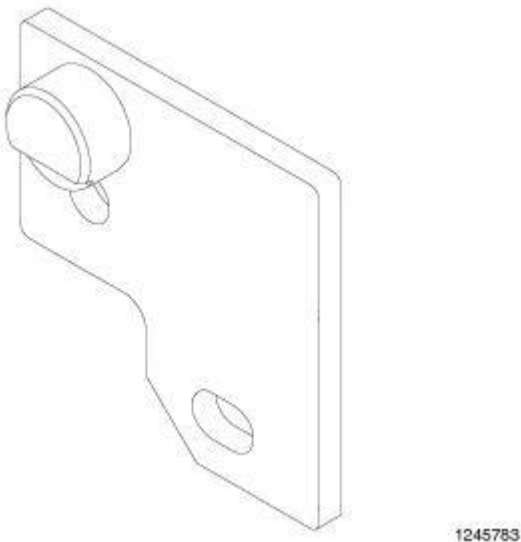


Fig. 50: Adapter, Engine Lifting - 8984-EAGLE
Courtesy of CHRYSLER LLC

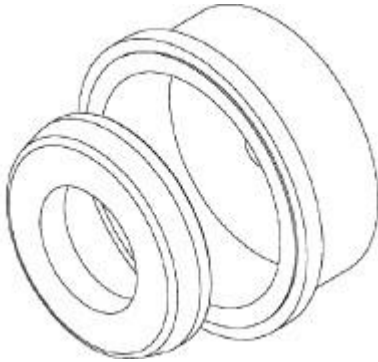


Fig. 51: INSTALLER, SEAL - 8349
Courtesy of CHRYSLER LLC

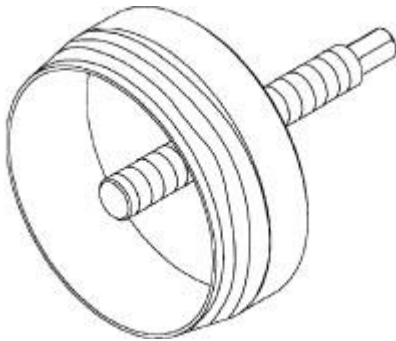


Fig. 52: REMOVER, SEAL - 8506
Courtesy of CHRYSLER LLC

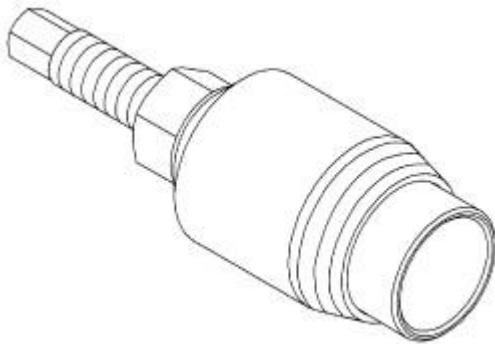


Fig. 53: REMOVER, SEAL - 9071
Courtesy of CHRYSLER LLC



Fig. 54: INSTALLER, SEAL - 9072

Courtesy of CHRYSLER LLC

AIR INTAKE SYSTEM

REMOVAL

REMOVAL

Filter Element Only

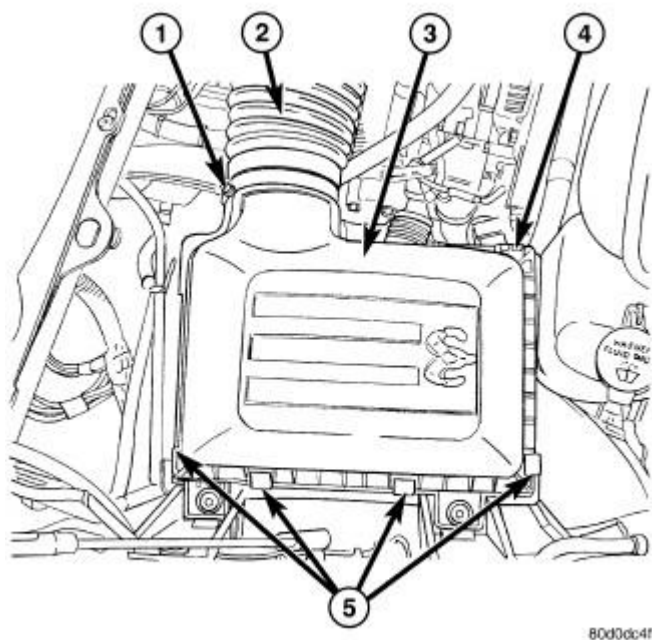


Fig. 55: AIR CLEANER COVER

Courtesy of CHRYSLER LLC

- 1 - CLAMP
- 2 - AIR DUCT

- 3 - AIR CLEANER COVER
- 4 - LOCATING TABS
- 5 - CLIPS (4)

NOTE: Always unplug the Charge/Intake Air Temperature sensor before removing the resonator.

Housing removal is not necessary for element (filter) replacement.

1. Loosen clamp (1) and disconnect air duct (2) at air cleaner cover.
2. Pry over 4 spring clips (5) from housing cover (3) (spring clips retain cover to housing).
3. Release housing cover from locating tabs on housing and remove cover.
4. Remove air cleaner element (filter) from housing.
5. Clean inside of housing before replacing element.

Housing Assembly

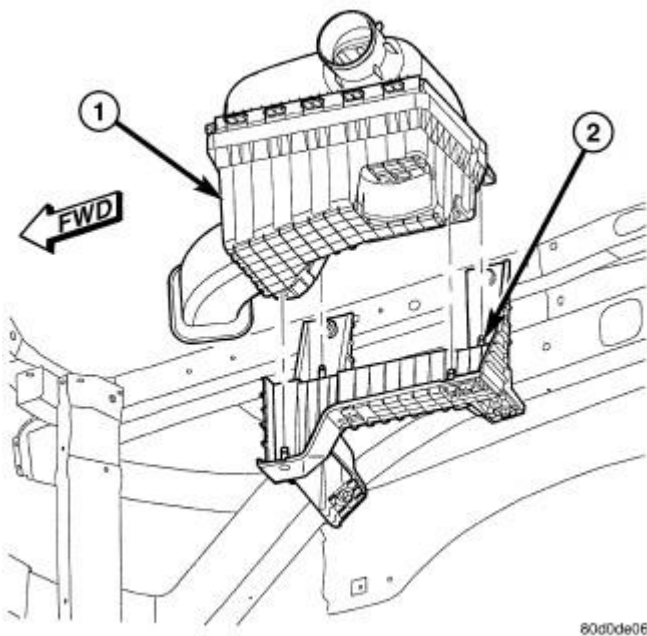


Fig. 56: AIR CLEANER HOUSING
Courtesy of CHRYSLER LLC

- 1 - AIR CLEANER HOUSING ASSEMBLY
- 2 - LOCATING PINS (4)

NOTE: Always unplug the Charge/Intake Air Temperature sensor before removing the resonator.

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Lift entire housing assembly (1) from 4 locating pins (2).

INSTALLATION

INSTALLATION

1. Install filter element into housing.
2. Position housing cover into housing locating tabs.
3. Pry up 4 spring clips and lock cover to housing.
4. Install air duct to air cleaner cover and tighten hose clamp to 5 N.m (45 in. lbs.).
5. If any other hose clamps were removed from air intake system, tighten them to 5 N.m (45 in. lbs.).
6. If any bolts were removed from air resonator housing or air intake tubing, tighten them to 5 N.m (45 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

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.

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

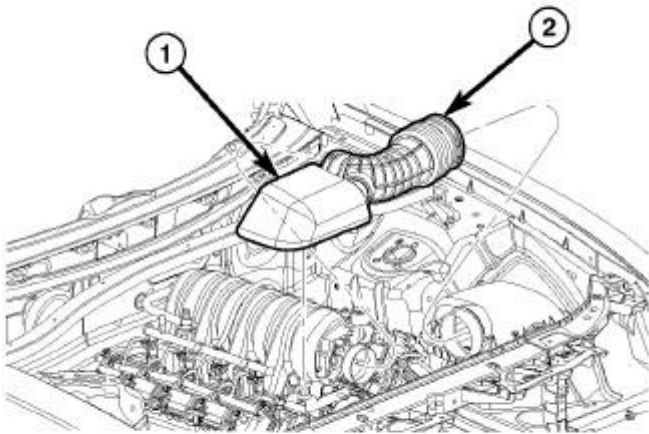
WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 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 C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL**REMOVAL**



815d014c

Fig. 57: Air Cleaner Duct

Courtesy of CHRYSLER LLC

1. Perform the Fuel System Pressure Release procedure. Refer to **Fuel System/Fuel Delivery - Standard Procedure** . Disconnect the fuel supply line. Refer to **Fuel System/Fuel Delivery/FITTING, Quick Connect - Standard Procedure** .
2. Disconnect the battery negative cable.
3. Drain the cooling system. Refer to **Cooling - Standard Procedure** .
4. Remove the air cleaner resonator and duct work. See **Engine/Air Intake System - Removal**.
5. Remove closed crankcase ventilation system.
6. Disconnect the evaporation control system.

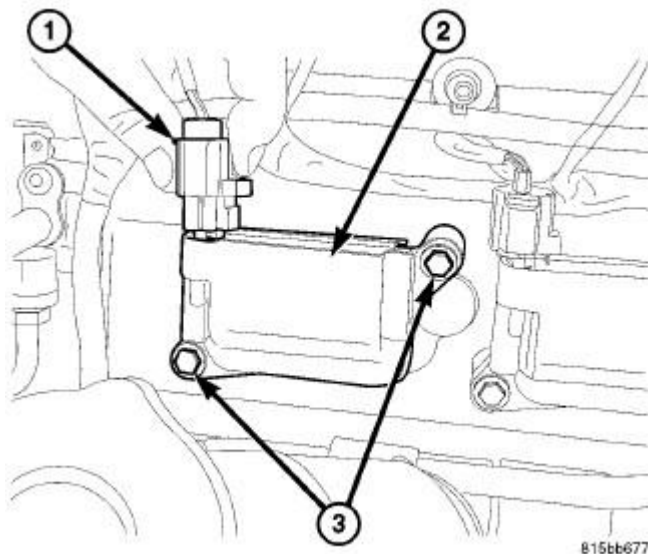


Fig. 58: Ignition Coil Mounting Bolts
Courtesy of CHRYSLER LLC

7. Unplug the ignition coil (1).
8. Remove ignition coil mounting bolts (3).
9. Disconnect heater hoses.

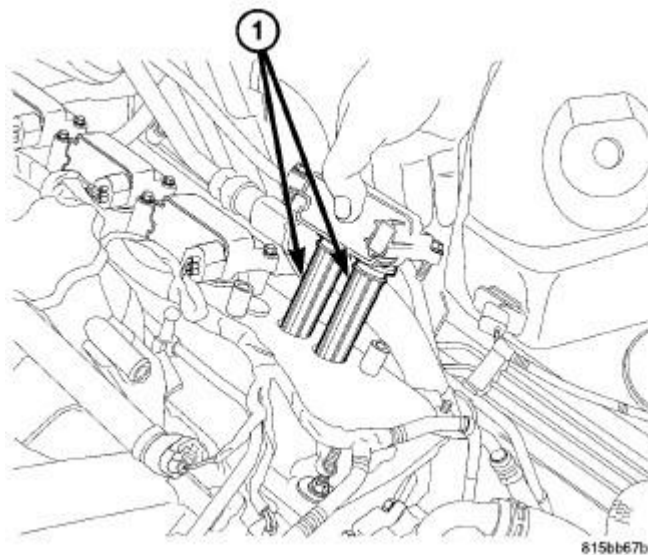


Fig. 59: Removing/Installing Ignition Coil
Courtesy of CHRYSLER LLC

10. Remove the power steering pump.
11. Disconnect the exhaust at the exhaust manifolds.
12. Remove the ignition coils (1).

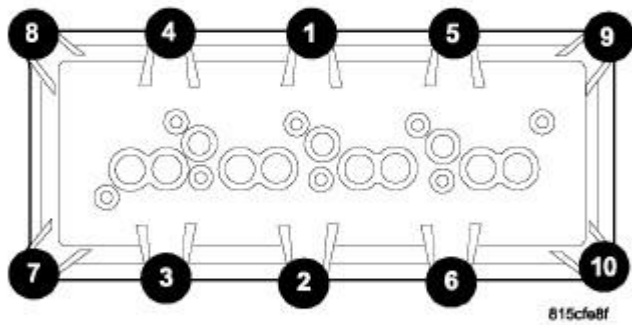


Fig. 60: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

13. Unbolt the cylinder head covers using the sequence provided.

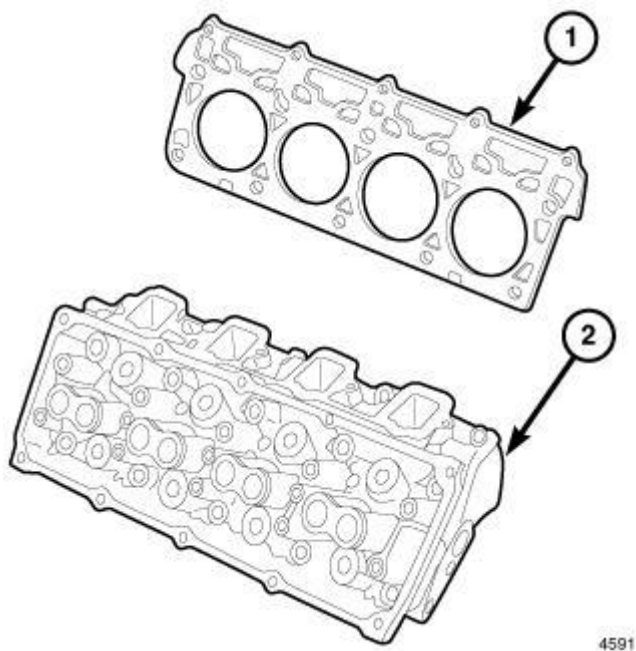


Fig. 61: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD COVER

- 2 - GASKET
- 3 - FASTENERS
- 4 - CYLINDER HEAD
- 5 - HEAD GASKET

14. Remove the cylinder head cover (1). See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.**

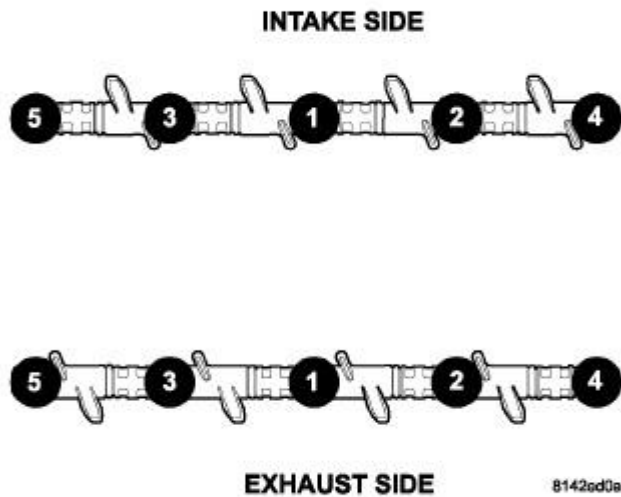
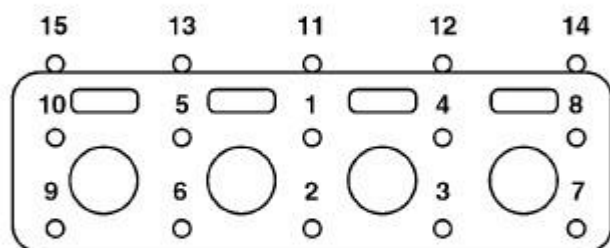


Fig. 62: ROCKER SHAFT TORQUE SEQUENCE
 Courtesy of CHRYSLER LLC

15. Remove intake manifold and throttle body as an assembly. See **Engine/Manifolds/MANIFOLD, Intake - Removal.**
16. Remove rocker arm assemblies and push rods. Identify to ensure installation in original locations. See **Engine/Cylinder Head/ROCKER ARM, Valve - Removal.**



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Fig. 63: HEAD BOLT TIGHTENING SEQUENCE

Courtesy of CHRYSLER LLC

17. Remove the head bolts from each cylinder head, using the sequence provided, and remove cylinder heads. Discard the cylinder head gasket.

CLEANING**CLEANING**

Clean all surfaces of cylinder block and cylinder heads.

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

INSPECTION**INSPECTION**

1. Inspect the cylinder head for out-of-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 either condition exist, replace the cylinder head.
4. Inspect push rods. Replace worn or bent push rods.

INSTALLATION**INSTALLATION**

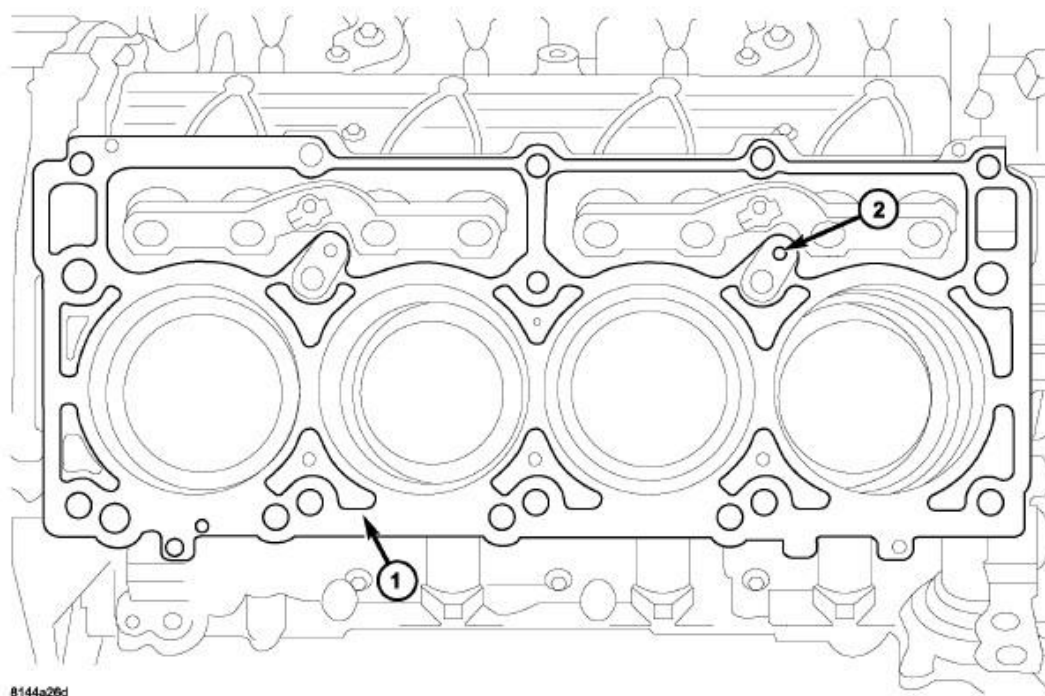


Fig. 64: HEAD GASKET INSTALLATION

Courtesy of CHRYSLER LLC

- | |
|----------------------------------|
| 1 - HEAD GASKET
2 - OIL HOLES |
|----------------------------------|

1. Clean all surfaces of cylinder block and cylinder heads.
2. Clean cylinder block front and rear gasket surfaces using a suitable solvent.

CAUTION: The head gaskets (1) are interchangeable between left and right sides. They are marked "UP" to indicate direction to face up.

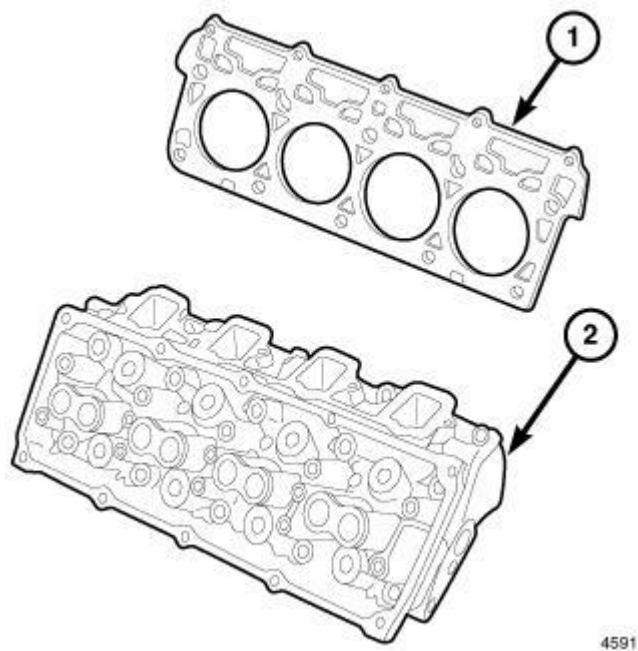
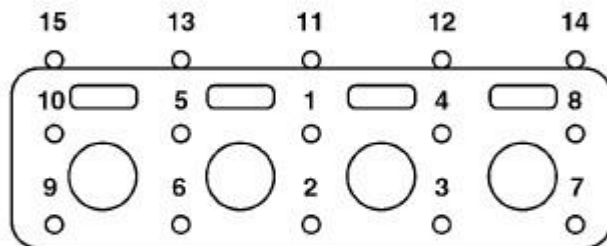


Fig. 65: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - CYLINDER HEAD COVER
2 - GASKET
3 - FASTENERS
4 - CYLINDER HEAD
5 - HEAD GASKET</p> |
|---|

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

3. Position new cylinder head gaskets (5) onto the cylinder block.
4. Position cylinder heads (4) onto head gaskets (5) and cylinder block.



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Fig. 66: HEAD BOLT TIGHTENING SEQUENCE

Courtesy of CHRYSLER LLC

5. Tighten the cylinder head bolts in three steps using the sequence provided :

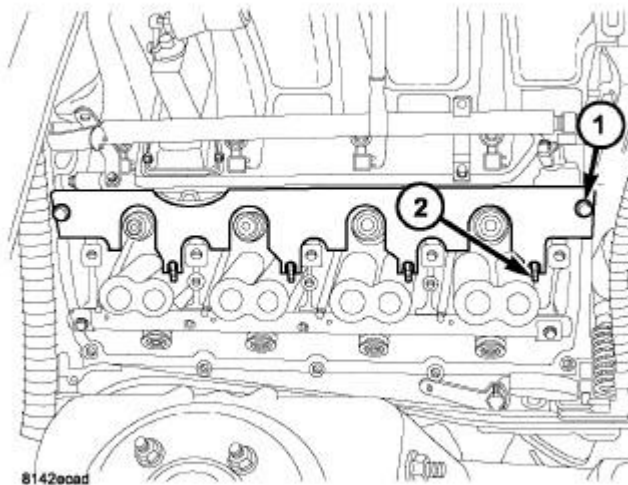
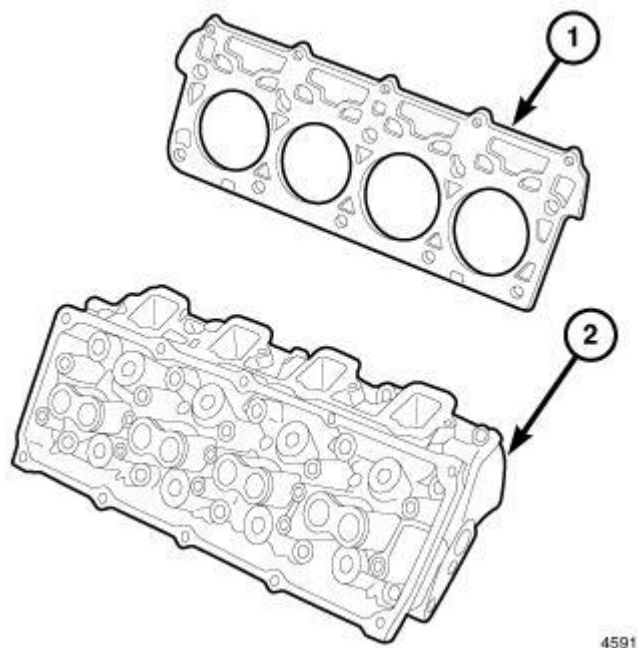


Fig. 67: PUSHROD RETAINING PLATE

Courtesy of CHRYSLER LLC

- 1 - PUSHROD RETAINING PLATE FASTENER
- 2 - PUSHROD HOLDER

- Step 1 - Tighten M12 cylinder head bolts, in sequence, to 34 N.m (25 ft. lbs.) and M8 bolts to 20 N.m (15 ft. lbs.).
 - Step 2 - Tighten M12 cylinder head bolts, in sequence, to 54 N.m (40 ft. lbs.) and verify M8 bolts to 20 N.m (15 ft. lbs.).
 - Step 3 - Turn M12 cylinder head bolts, in sequence, 90 degrees and tighten M8 bolts to 34 N.m (25 ft. lbs.).
6. Install push rods and rocker arm assemblies in their original position, using Push Rod Retaining Plate 9070 (1). See **Engine/Cylinder Head/ROCKER ARM, Valve - Installation**.
 7. Install the intake manifold and throttle body assembly. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.
 8. If required, adjust spark plug gap to specifications. Install the plugs.
 9. Connect the heater hoses.
 10. Install the fuel supply line.
 11. Install the power steering pump.
 12. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation**



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Fig. 68: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- 1 - CYLINDER HEAD COVER
- 2 - GASKET
- 3 - FASTENERS
- 4 - CYLINDER HEAD

5 - HEAD GASKET

13. Install cylinder head covers (1). See Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.

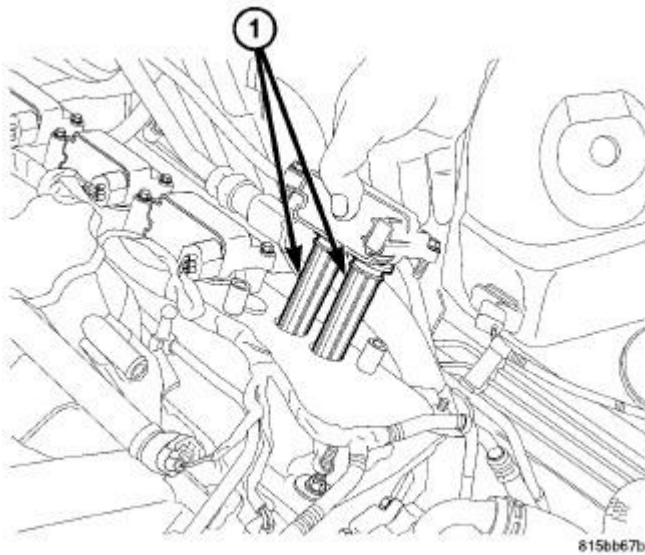


Fig. 69: Removing/Installing Ignition Coil
Courtesy of CHRYSLER LLC

14. Install the ignition coils (1). Refer to Electrical - Ignition Control/Ignition Control/COIL, Ignition - Installation

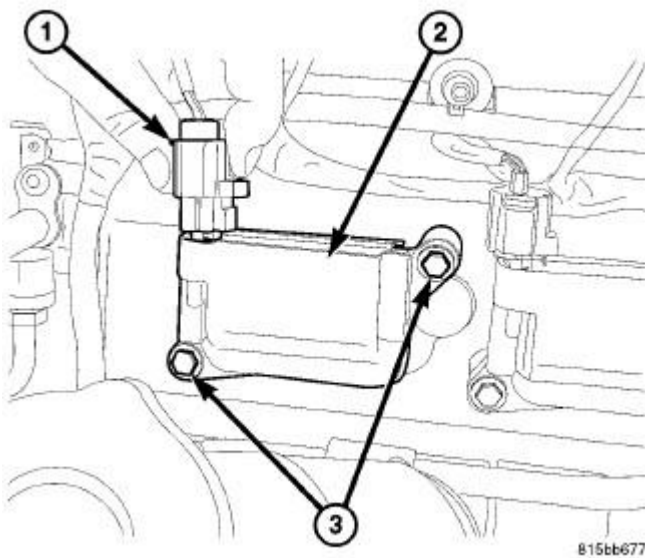
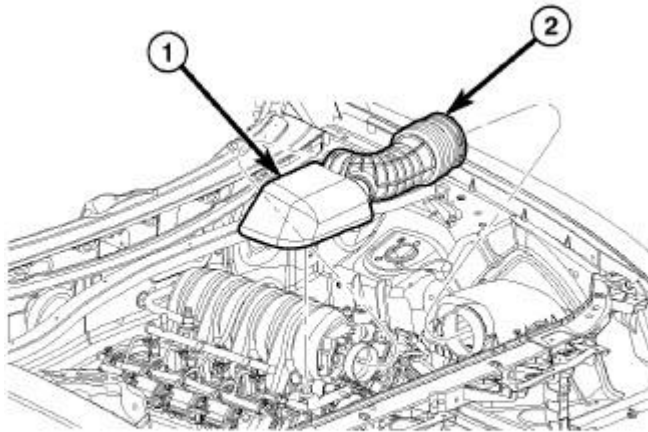


Fig. 70: Ignition Coil Mounting Bolts
Courtesy of CHRYSLER LLC

15. Reconnect the ignition coil wiring (1). Refer to **Electrical - Ignition Control/Ignition Control/COIL, Ignition - Installation**



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Fig. 71: Air Cleaner Duct
Courtesy of CHRYSLER LLC

16. Connect the evaporation control system.
17. Install the air cleaner duct (2). See **Engine/Air Intake System - Installation**.
18. Fill the cooling system. Refer to **Cooling - Standard Procedure**
19. Connect the negative cable to the battery.
20. Start the engine and check for any fluid leaks.

COVER(S), CYLINDER HEAD

Removal

REMOVAL

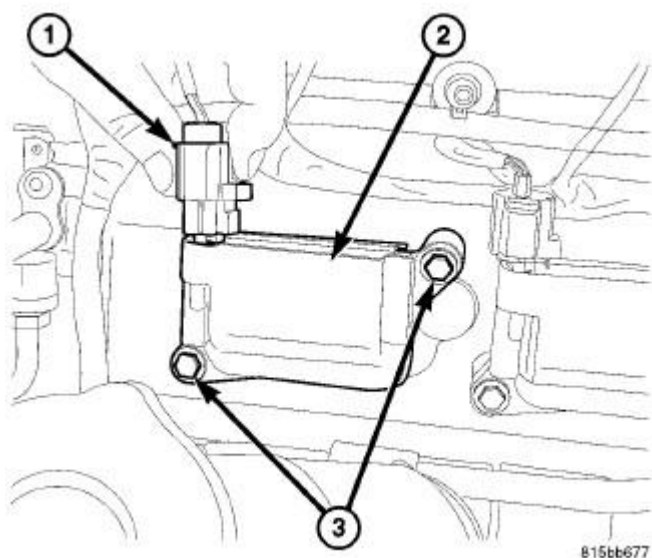


Fig. 72: Ignition Coil Mounting Bolts
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Disconnect ignition coil connector (1).
3. Remove ignition coil retaining bolts (3).

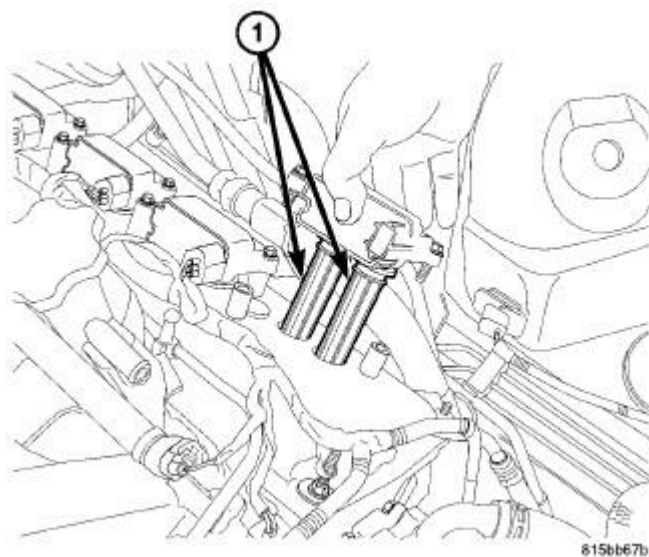


Fig. 73: Removing/Installing Ignition Coil
Courtesy of CHRYSLER LLC

4. Remove ignition coil (1).

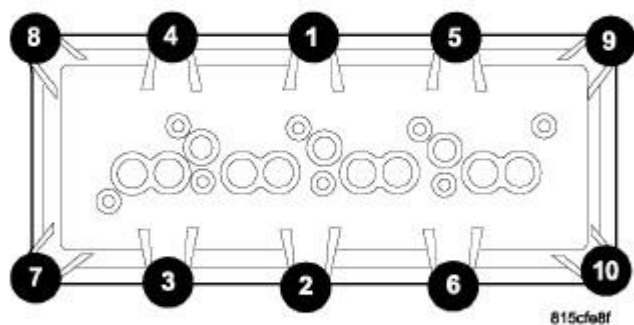


Fig. 74: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

5. Remove cylinder head cover retaining bolts.

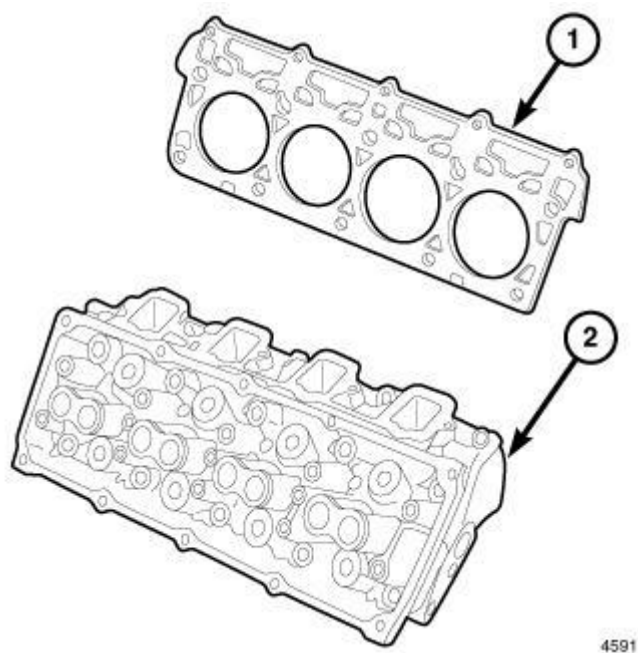


Fig. 75: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

6. Remove cylinder head cover (1).

NOTE: The gasket (2) may be used again, provided no cuts, tears, or deformation have occurred.

Installation

INSTALLATION

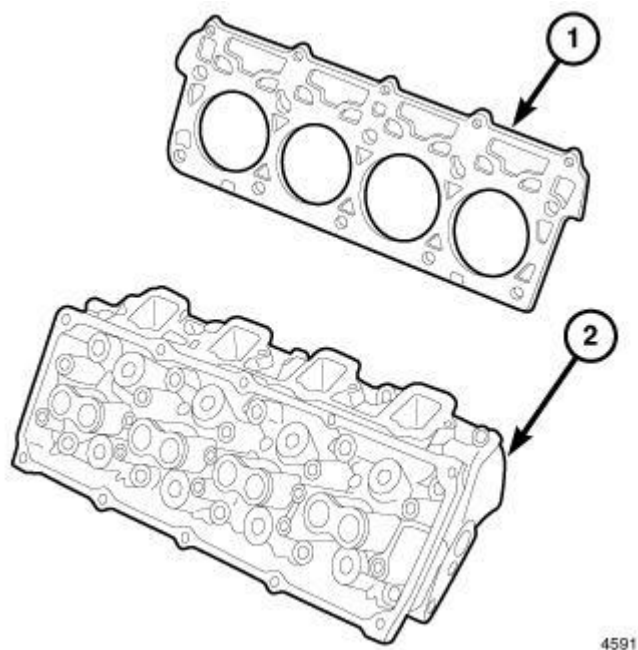


Fig. 76: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

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.

1. Clean cylinder head cover (1) and both sealing surface (4). Inspect and replace gasket (2) as necessary.
2. Install cylinder head cover and hand start all fasteners. Verify that all double ended studs (3) are in the correct location.

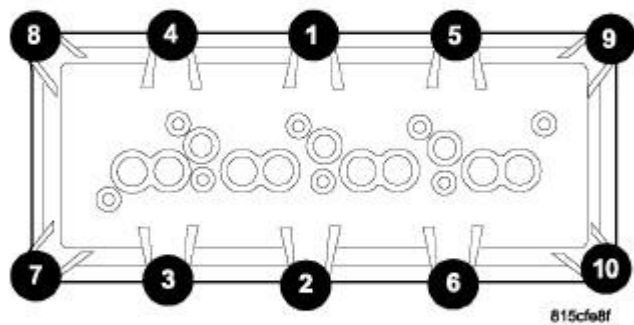


Fig. 77: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

3. Tighten cylinder head cover bolts and double ended studs to 8 N.m (70 in. lbs.) in the sequence shown in illustration.

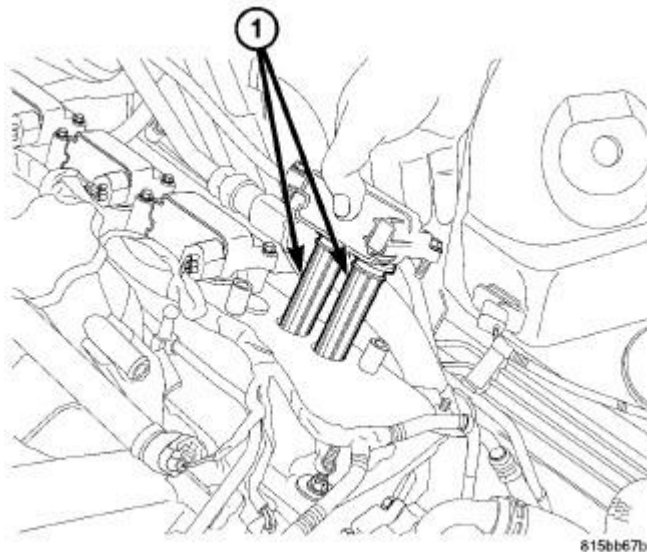


Fig. 78: Removing/Installing Ignition Coil
Courtesy of CHRYSLER LLC

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

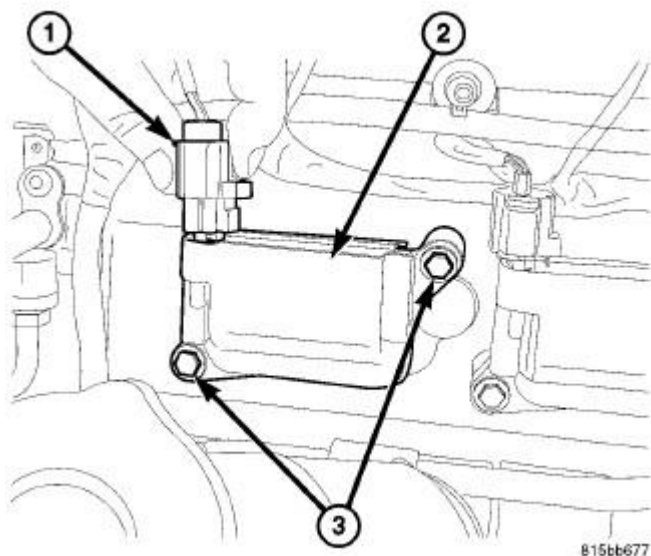


Fig. 79: Ignition Coil Mounting Bolts
Courtesy of CHRYSLER LLC

6. Tighten fasteners (3) to 7 N.m (62 in. lbs.).
7. Connect ignition coil electrical connectors (1).
8. Install PCV hose.
9. Install the engine cover.
10. Connect the negative battery cable.

ROCKER ARM, VALVE

Removal

REMOVAL

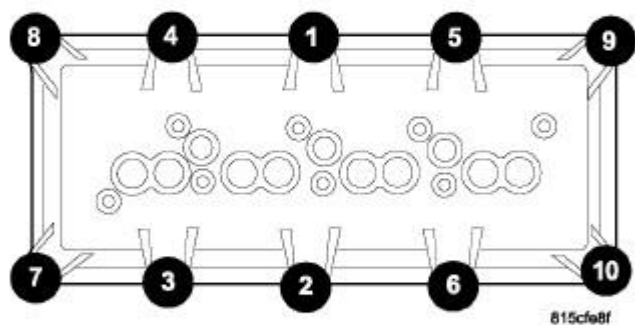


Fig. 80: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

1. Remove cylinder head cover. See [Engine/Cylinder Head/COVER\(S\), Cylinder Head - Removal](#).

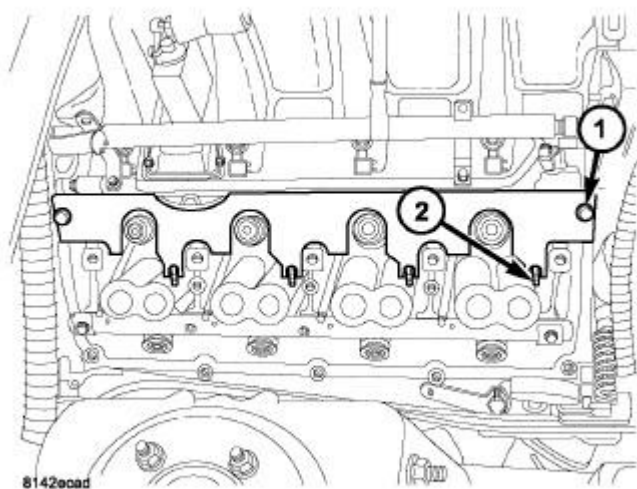


Fig. 81: PUSHROD RETAINING PLATE
Courtesy of CHRYSLER LLC

2. Install Push Rod Retaining Plate 9070 (1).

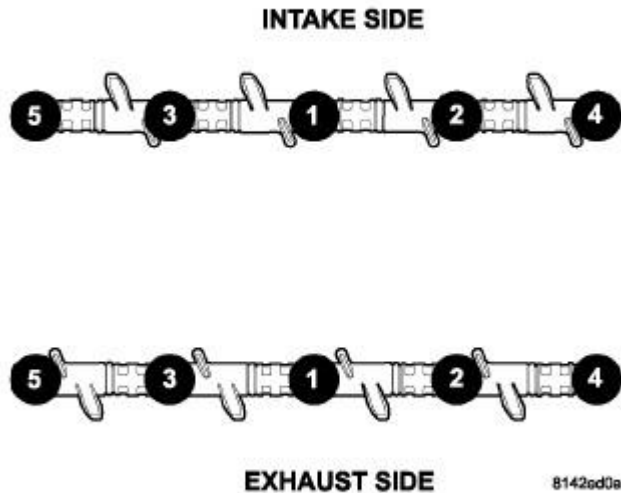


Fig. 82: ROCKER SHAFT TORQUE SEQUENCE
Courtesy of CHRYSLER LLC

3. Loosen the rocker shafts using the sequence provided.

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 shafts. Note location for reassembly.

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

5. Remove the push rods. Note push rod location for reassembly.

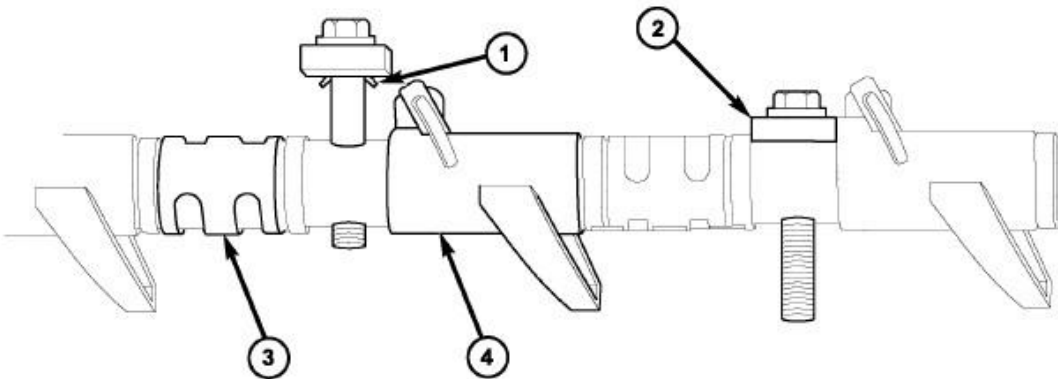


Fig. 83: ROCKER ARM RETAINER REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - ASSEMBLY TANG
2 - RETAINER (FULLY SEATED)
3 - SPACER
4 - ROCKER ARM |
|--|

CAUTION: Do not remove the retainers (1) from the rocker shaft (3).

Installation

INSTALLATION

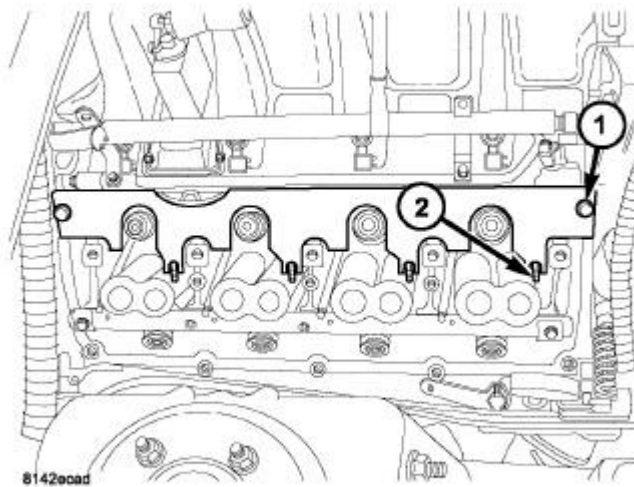


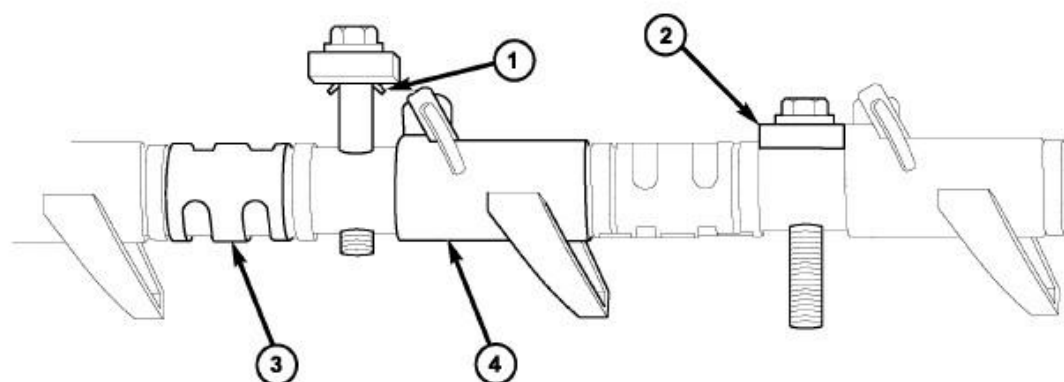
Fig. 84: PUSHROD RETAINING PLATE

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - PUSH ROD RETAINING PLATE FASTENER
2 - PUSH ROD HOLDER |
|--|

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

1. Install the push rods in the same order as removed.
2. Install the Push Rod Retaining Plate 9070 (1).



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Fig. 85: ROCKER ARM RETAINER REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

- | |
|-----------------------------|
| 1 - ASSEMBLY TANG |
| 2 - RETAINER (FULLY SEATED) |
| 3 - SPACER |
| 4 - ROCKER ARM |

CAUTION: Ensure that retainers (2) and rocker arms (4) are not overlapped when torquing bolts.

CAUTION: Verify that push rod is installed into rocker arm (4) and tappet correctly while installing rocker shaft assembly. Recheck after rocker shaft has been torqued to specification.

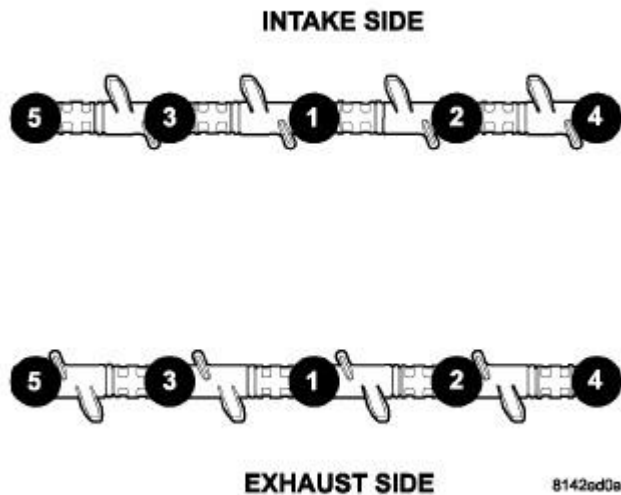


Fig. 86: ROCKER SHAFT TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

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

3. Install rocker shaft assemblies in the same order as removed.
4. Tighten the rocker shaft bolts to 22 N.m (195 in. lbs.) using the sequence provided.

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

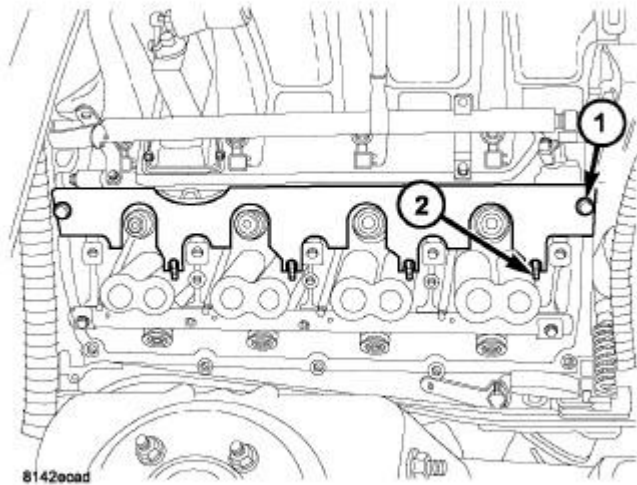


Fig. 87: PUSHROD RETAINING PLATE
Courtesy of CHRYSLER LLC

- | |
|---------------------------------------|
| 1 - PUSH ROD RETAINING PLATE FASTENER |
| 2 - PUSH ROD HOLDER |

5. Remove Push Rod Retaining Plate 9070 (1).

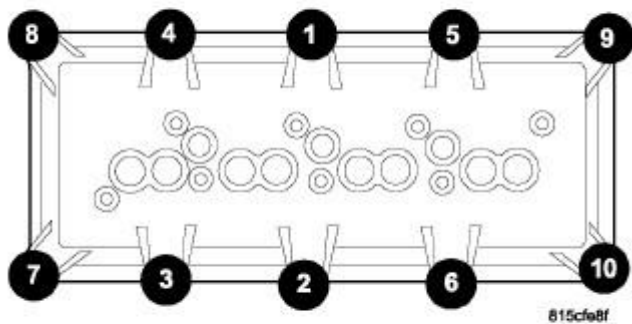


Fig. 88: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

6. Install cylinder head cover. See **Engine/Cylinder Head/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.

Removal

REMOVAL

The valve stem seal is integral with the valve spring seat. For removal, see **Engine/Cylinder Head/SPRING (S), Valve - Removal.**

Installation

INSTALLATION

The valve stem seal is integral with the valve spring seat. For installation, see **Engine/Cylinder Head/SPRING (S), Valve - Installation.**

SPRING(S), VALVE

Removal

REMOVAL

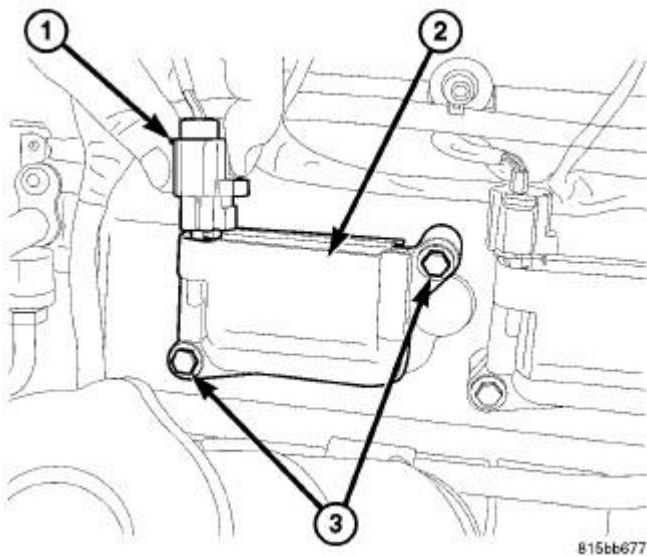


Fig. 89: IGNITION COIL MOUNTING BOLTS
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove air cleaner assembly.
3. Remove air intake resonator.
4. Remove spark plug cables.
5. Remove ignition coil connectors (1).
6. Remove ignition coils (2).
7. Remove one spark plug.

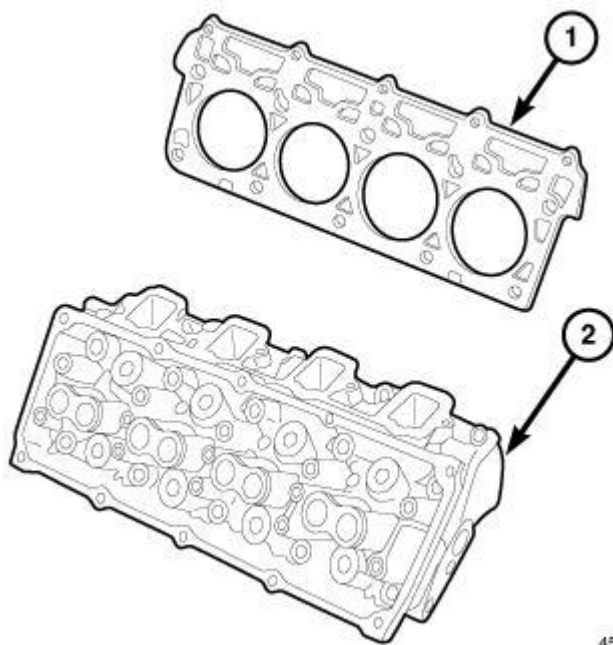


Fig. 90: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- 1 - CYLINDER HEAD COVER
- 2 - GASKET
- 3 - FASTENERS
- 4 - CYLINDER HEAD
- 5 - HEAD GASKET

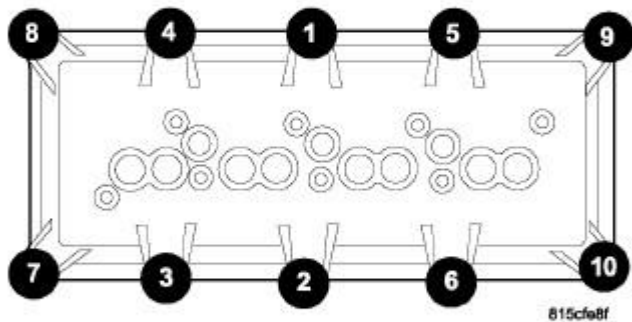


Fig. 91: Cylinder Head Cover Torque Sequence
Courtesy of CHRYSLER LLC

8. Remove cylinder head cover (1) using the sequence shown in illustration. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.**

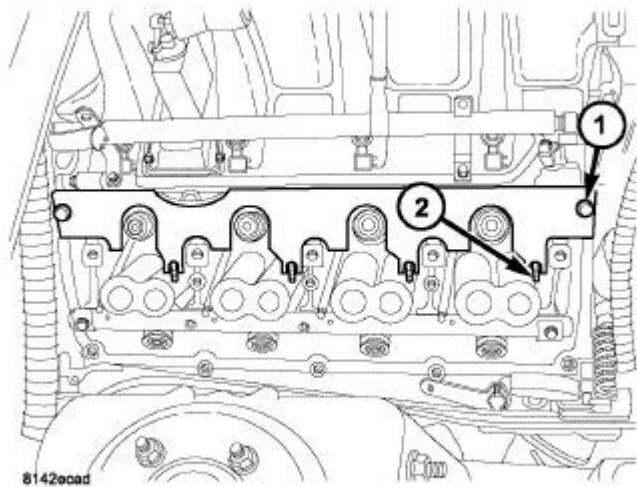


Fig. 92: PUSHROD RETAINING PLATE

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - PUSH ROD RETAINING PLATE FASTENER
2 - PUSH ROD HOLDER |
|--|

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

NOTE: If removing intake valve spring, install Push Rod Retaining Plate 9070 (1), to retain the intake push rods (2).

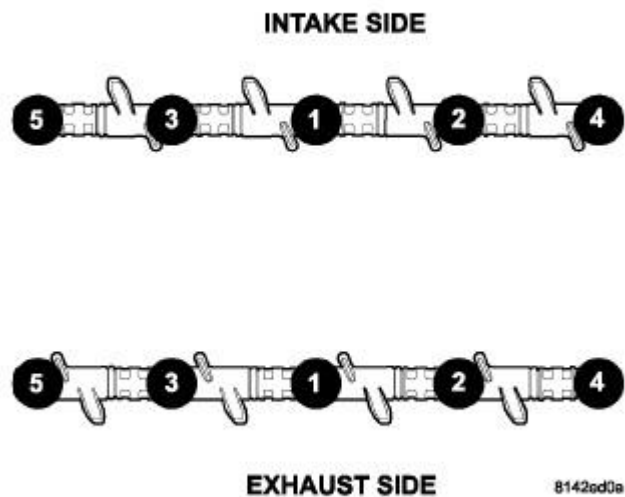


Fig. 93: ROCKER SHAFT TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

9. Remove exhaust/intake rocker arm shafts using the sequence shown in illustration.

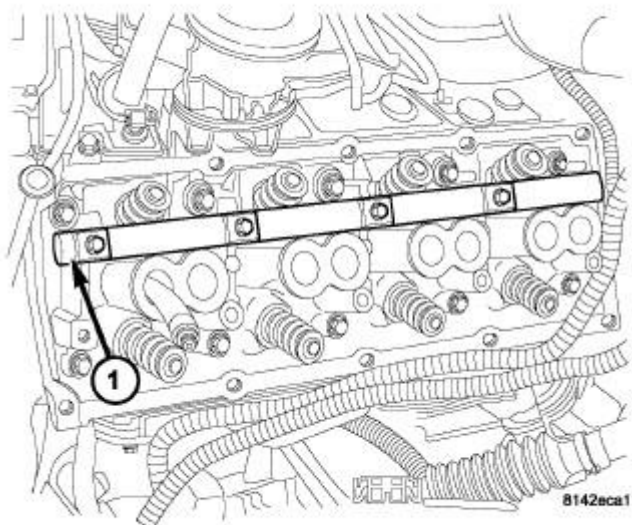


Fig. 94: ROCKER SHAFT

Courtesy of CHRYSLER LLC

1 - ROCKER ARM SHAFT 9065A

10. Install Rocker Arm Shaft 9065A (1).

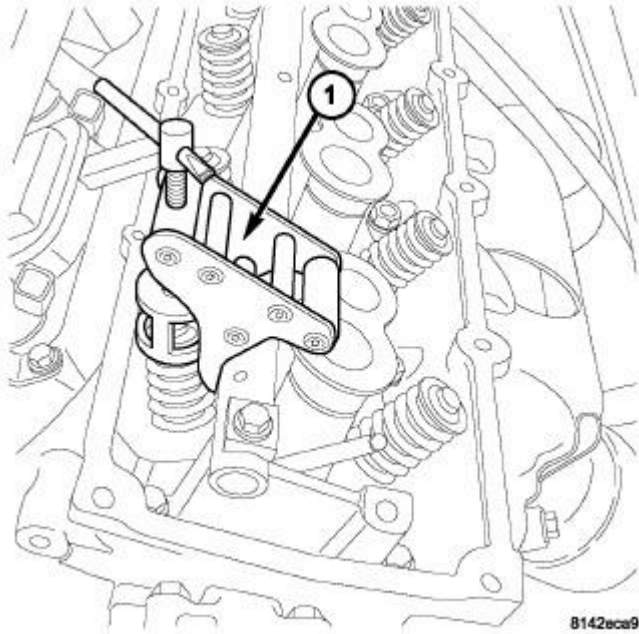


Fig. 95: VALVE SPRING REMOVAL/INSTALLATION INTAKE
Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR TOOL 9065A

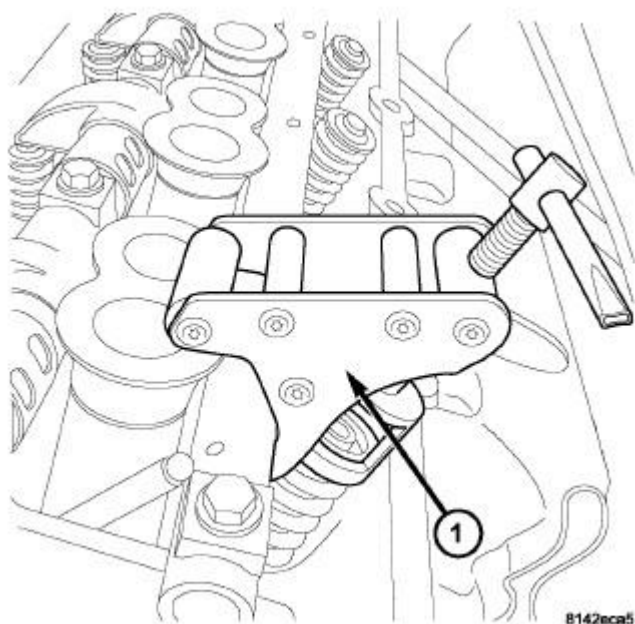


Fig. 96: VALVE SPRING REMOVAL/INSTALLATION EXHAUST
Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR TOOL 9065A

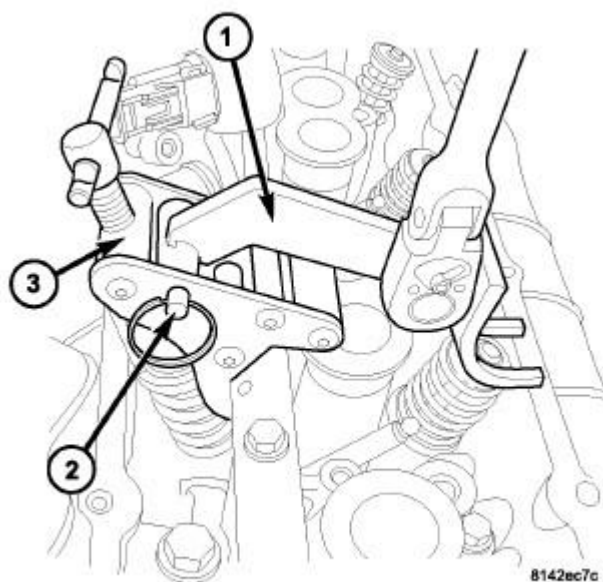
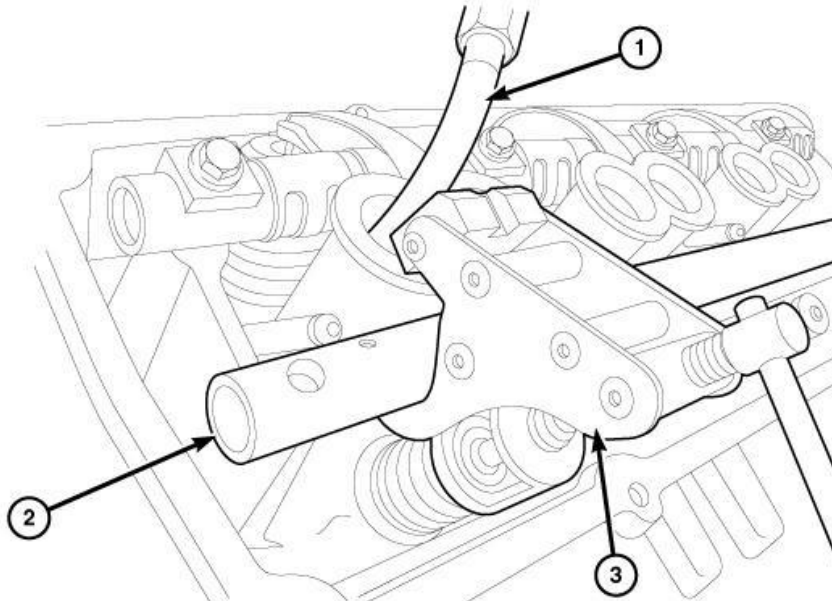


Fig. 97: VALVE SPRING TOOL ADAPTER
Courtesy of CHRYSLER LLC

- 1 - EXHAUST ADAPTER 9065A
- 2 - ADAPTER PIN
- 3 - VALVE SPRING COMPRESSOR 9065A

11. Install spring compressor (1,3), special tool 9065A, and exhaust adapter arm (1) tool 9065A if needed.

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



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Fig. 98: SPECIAL TOOL 9065A COMPONENTS

Courtesy of CHRYSLER LLC

- 1 - AIR HOSE
- 2 - DUMMY SHAFT
- 3 - VALVE SPRING COMPRESSOR 9065A

12. Insert air hose (1) into spark plug hole and charge cylinder with air.

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

13. Compress valve spring with valve spring compressor (3) tool 9065A and remove valve retainer locks.
14. Release spring compressor (3) and remove valve spring.

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

15. Remove valve seal.

Installation

INSTALLATION

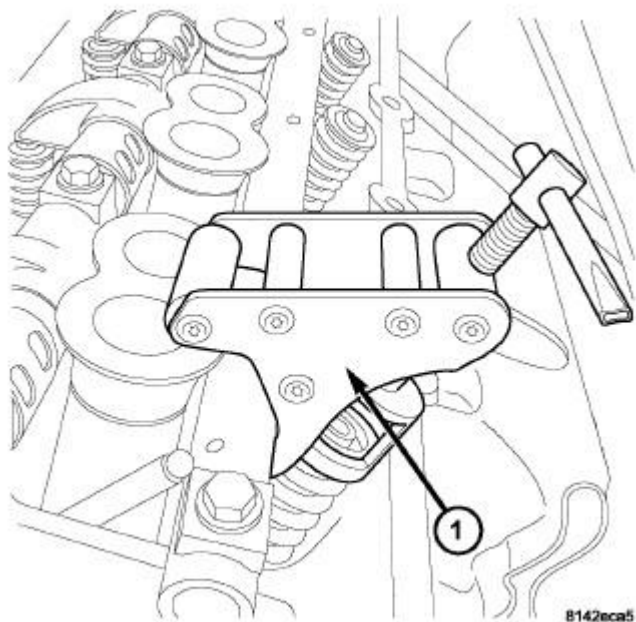


Fig. 99: VALVE SPRING REMOVAL/INSTALLATION EXHAUST
Courtesy of CHRYSLER LLC

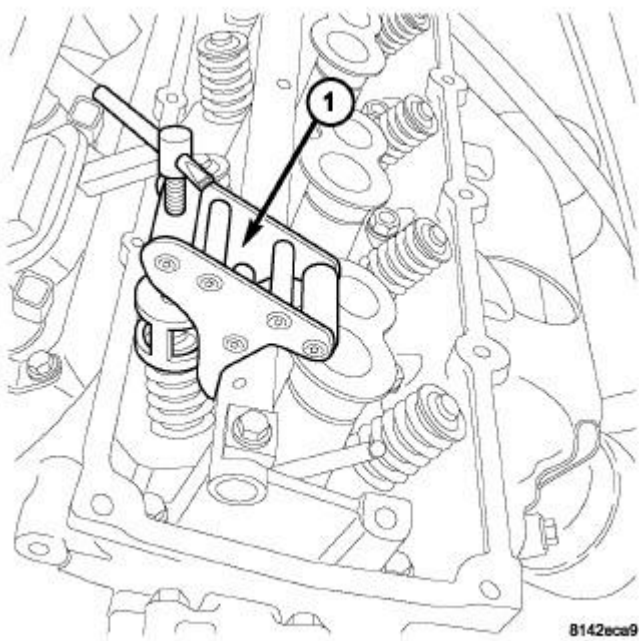
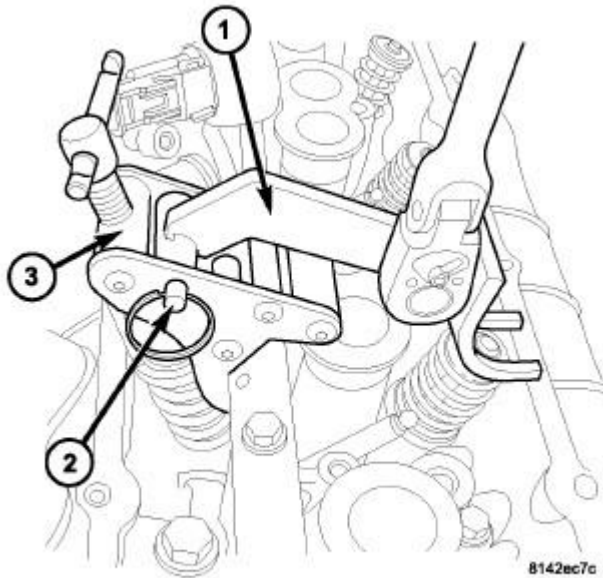


Fig. 100: VALVE SPRING REMOVAL/INSTALLATION INTAKE
Courtesy of CHRYSLER LLC

1 - VALVE SPRING COMPRESSOR TOOL 9065A**Fig. 101: VALVE SPRING TOOL ADAPTER**

Courtesy of CHRYSLER LLC

- 1 - EXHAUST ADAPTER 9065A
- 2 - ADAPTER PIN
- 3 - VALVE SPRING COMPRESSOR 9065A

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

1. Install valve seal.

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

2. Install valve spring.
3. Using Valve Spring Compressor 9065A (1,3), compress valve spring and install valve spring retainer and locks.

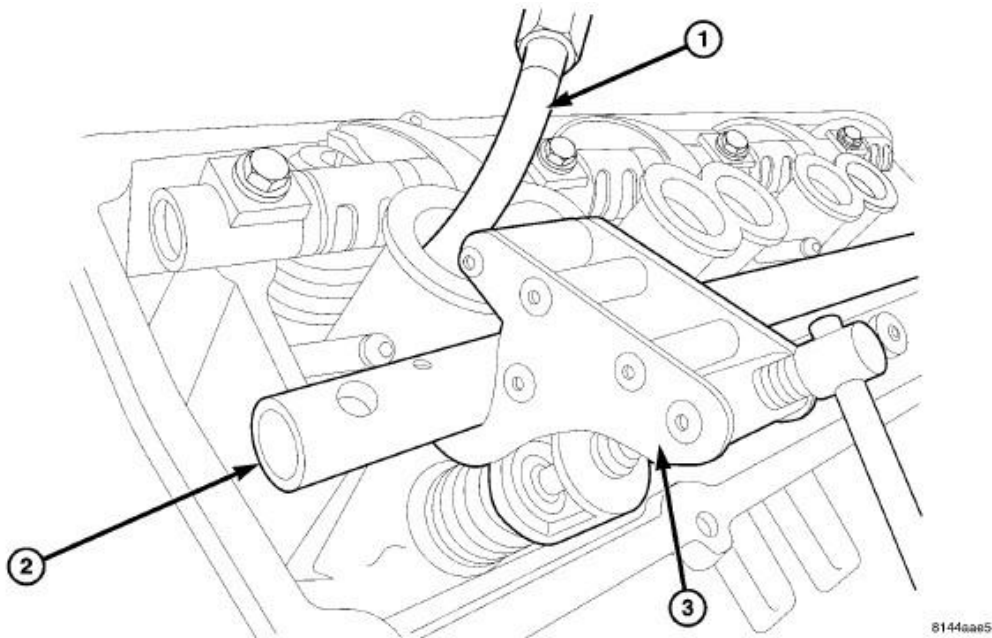


Fig. 102: SPECIAL TOOL 9065A COMPONENTS
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - AIR HOSE
2 - DUMMY SHAFT
3 - VALVE SPRING COMPRESSOR 9065A |
|--|

4. Release air charge in cylinder (1).
5. Remove Valve Spring Compressor 9065A (3).

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

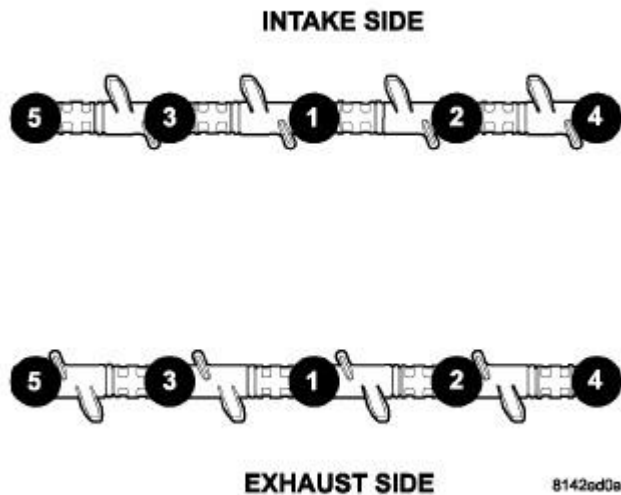


Fig. 103: ROCKER SHAFT TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

6. Install rocker arm shaft and push rods. See Engine/Cylinder Head/ROCKER ARM, Valve - Installation.
7. Tighten the rocker shaft bolts to 22 N.m (195 in. lbs.) using the rocker shaft torque sequence.

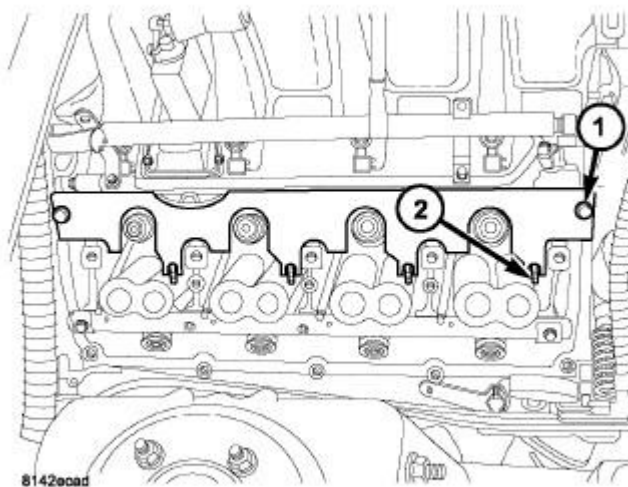


Fig. 104: PUSHROD RETAINING PLATE

Courtesy of CHRYSLER LLC

- 1 - PUSH ROD RETAINING PLATE FASTENER
- 2 - PUSH ROD HOLDER

8. Remove Push Rod Retainer 9070 (1), if used.

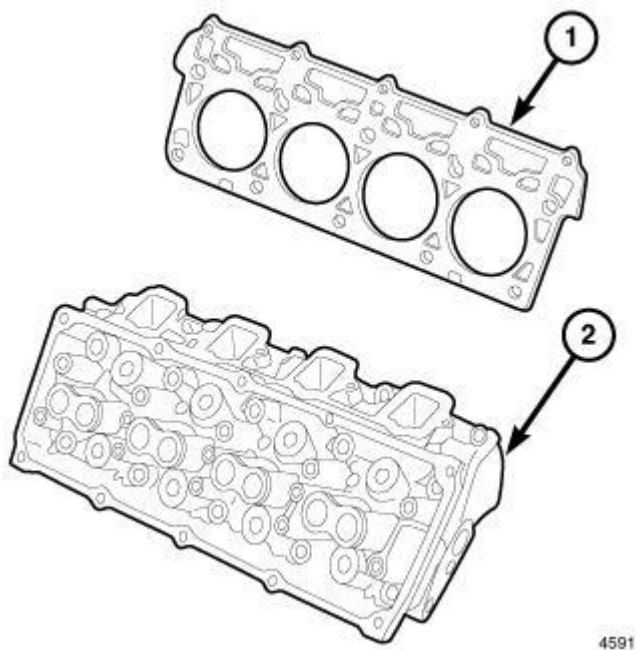


Fig. 105: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- 1 - CYLINDER HEAD COVER
- 2 - GASKET
- 3 - FASTENERS
- 4 - CYLINDER HEAD
- 5 - HEAD GASKET

9. Install cylinder head cover (1).

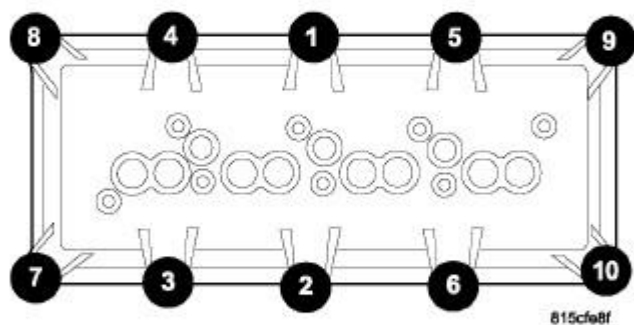


Fig. 106: Cylinder Head Cover Torque Sequence

Courtesy of CHRYSLER LLC

10. Tighten cylinder head cover bolts and double ended studs. See [Engine/Cylinder Head/COVER\(S\), Cylinder Head - Installation.](#)
11. Install spark plugs.

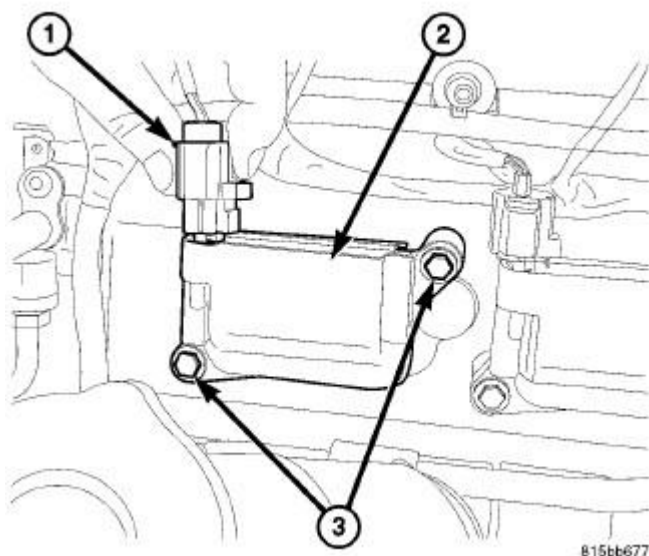


Fig. 107: IGNITION COIL MOUNTING BOLTS

Courtesy of CHRYSLER LLC

12. Install ignition coil on plug (2), and tighten fasteners (3) to 12 N.m (105 in. lbs.)

13. Install ignition coil connectors (1).
14. Install spark plug cables.
15. Install air intake resonator.
16. Install air cleaner assembly.
17. Connect negative battery cable.

VALVES, INTAKE AND EXHAUST

Description

VALVES

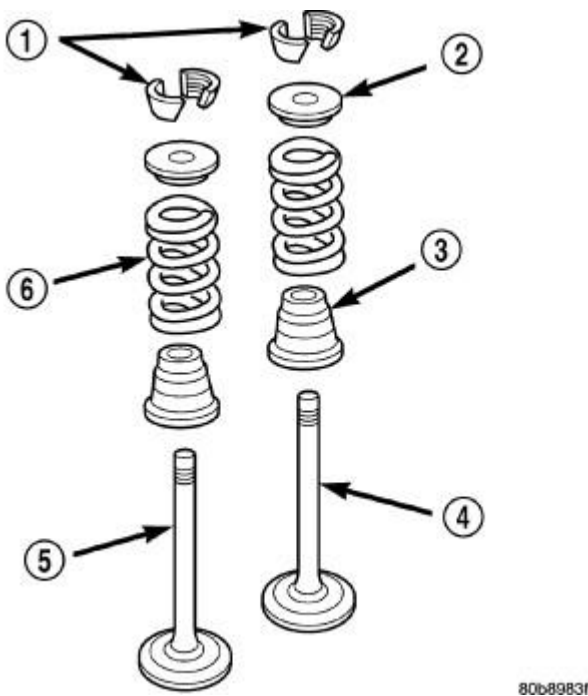


Fig. 108: Valve Assembly Configuration
Courtesy of CHRYSLER LLC

Both the intake (4) and exhaust (5) valves are made of steel. The intake valve is 52.8 mm (2.08 inches) in diameter and the exhaust valve is 40.5 mm (1.59 inches) 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

REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that 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. Using a suitable dial indicator measure the center of the valve seat, total run out must not exceed 0.051 mm (0.002 in).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
3. When the seat is properly positioned the width of the intake seat must be 1.018 - 1.62 mm (0.0464 - 0.0637 in.) and the exhaust seat must be 1.48 - 1.92 mm (0.058 - 0.075 in.).
4. Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 46.0 mm (1.81 in.).

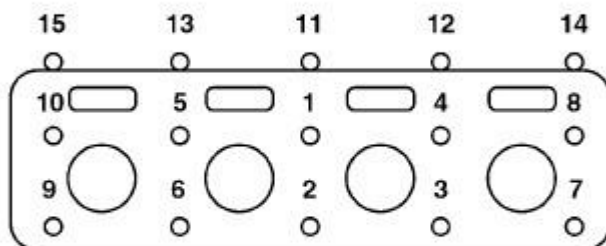
VALVE FACE AND VALVE SEAT ANGLE CHART

DESCRIPTION	SPECIFICATION
Seat Width	-
Intake	1.018 - 1.62 mm (0.0464 - 0.0637 in.)
Exhaust	1.48 - 1.92 mm (0.058 - 0.075 in.)
Face Angle	-
Intake	45 $\frac{1}{2}$ ° - 46°
Exhaust	45° - 45 $\frac{1}{2}$ °
Seat Angle	-
Intake	44 $\frac{1}{2}$ ° - 45°
Exhaust	44 $\frac{1}{2}$ ° - 45°

5. The valve seat must maintain a seat angle of 44 $\frac{1}{2}$ ° - 45°.
6. The valve face must maintain a face angle of 45 $\frac{1}{2}$ ° - 46° for the Intake, and 45° - 45 $\frac{1}{2}$ ° face angle for the exhaust.

Removal

REMOVAL



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Fig. 109: HEAD BOLT TIGHTENING SEQUENCE

Courtesy of CHRYSLER LLC

1. Remove the cylinder head. See [Engine/Cylinder Head - Removal](#).

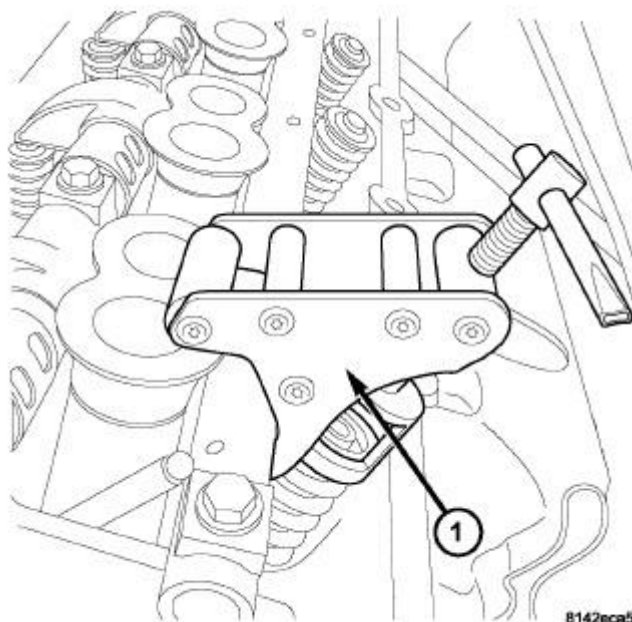


Fig. 110: VALVE SPRING REMOVAL/INSTALLATION EXHAUST

Courtesy of CHRYSLER LLC

2. Compress valve springs using Valve Spring Compressor C-3422-D (1) and adapter 8464.

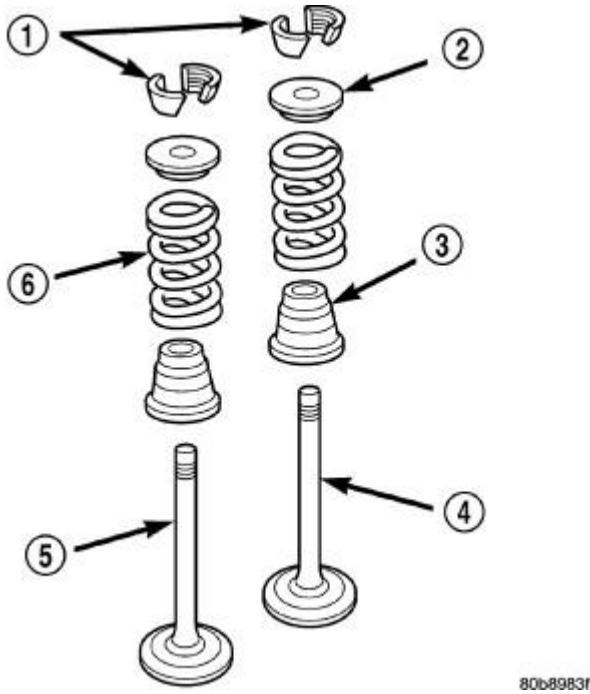


Fig. 111: Valve Assembly Configuration
 Courtesy of CHRYSLER LLC

3. Remove valve retaining locks (1), valve spring retainers (2), valve stem seals (3) and valve springs (6).
4. Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guides. Identify valves to ensure installation in original location.

Installation

INSTALLATION

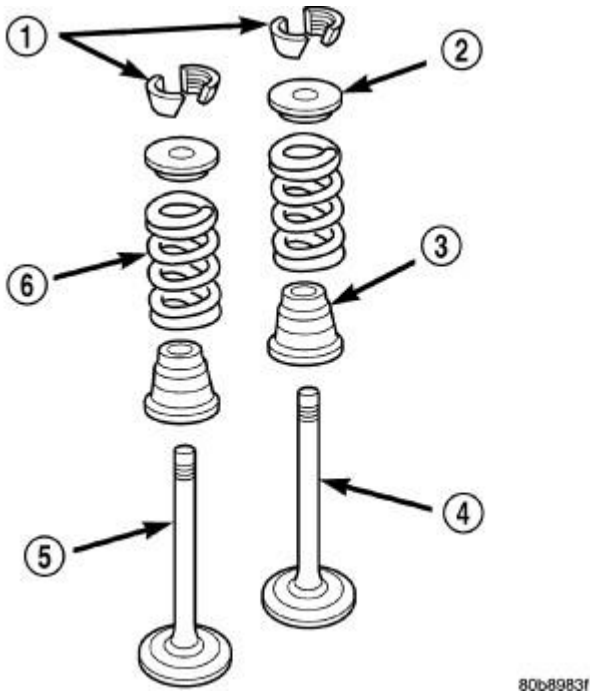


Fig. 112: Valve Assembly Configuration
Courtesy of CHRYSLER LLC

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

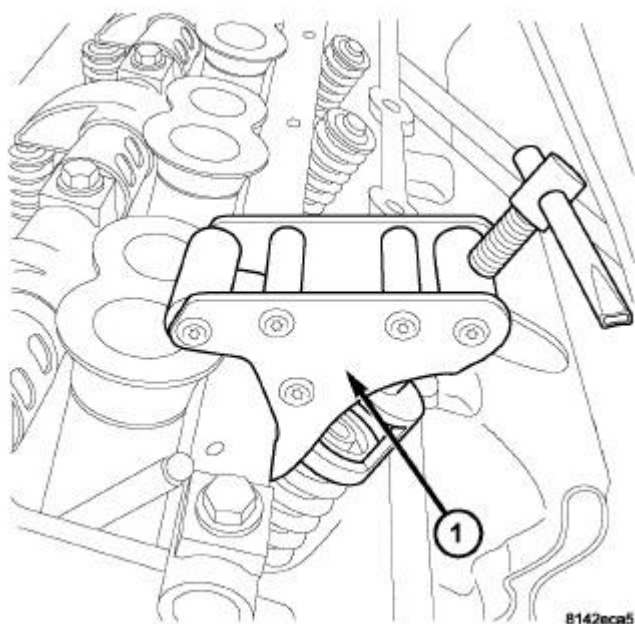


Fig. 113: VALVE SPRING REMOVAL/INSTALLATION EXHAUST
 Courtesy of CHRYSLER LLC

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

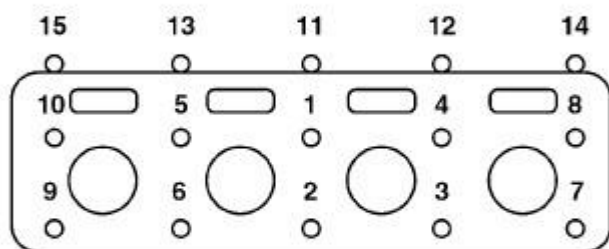


Fig. 114: HEAD BOLT TIGHTENING SEQUENCE

Courtesy of CHRYSLER LLC

8. Install the cylinder head. See **Engine/Cylinder Head - Installation.**

ENGINE BLOCK

CLEANING

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- the galley at the oil filter adaptor hole.
- the front and rear oil galley holes.
- the 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 galley plugs. Tighten the 1/4 inch NPT plugs to 20 N.m (177 in. lbs.). Tighten the 3/8 inch NPT plugs to 27 N.m (240 in. lbs.).

INSPECTION

INSPECTION

ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking. Repair as necessary.
2. Examine block and cylinder bores for cracks or fractures.
3. Check block deck surfaces for flatness.

CYLINDER BORE

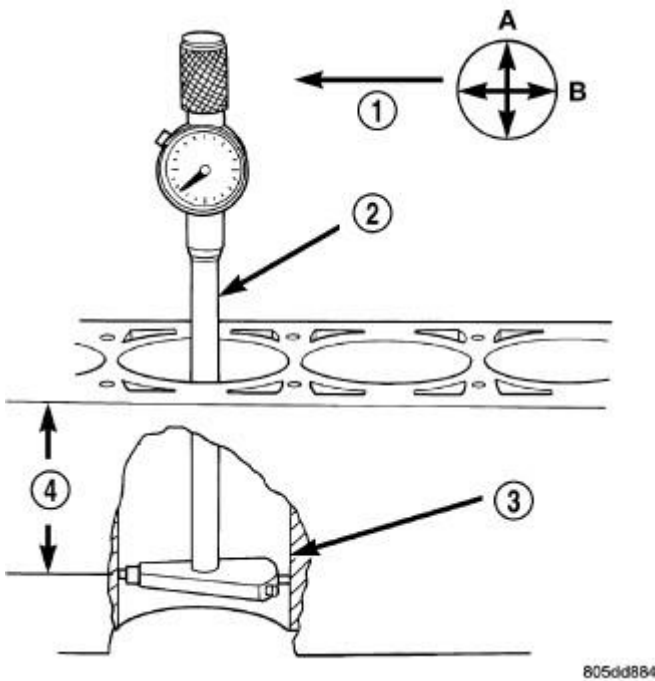


Fig. 115: Using Bore Gauge To Measure Cylinder Bore Diameter
 Courtesy of CHRYSLER LLC

- 1 - FRONT
- 2 - BORE GAUGE
- 3 - CYLINDER BORE
- 4 - 38 MM (1.5 in)

1. It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.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 top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.
3. Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.
4. Determine taper by subtracting the smaller diameter from the larger diameter.
5. Rotate measuring device 90° and repeat steps above.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder block must be replaced. 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), CRANKSHAFT, MAIN

Standard Procedure

CRANKSHAFT MAIN BEARING - FITTING**MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)**

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.) and 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

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

Inspection**INSPECTION**

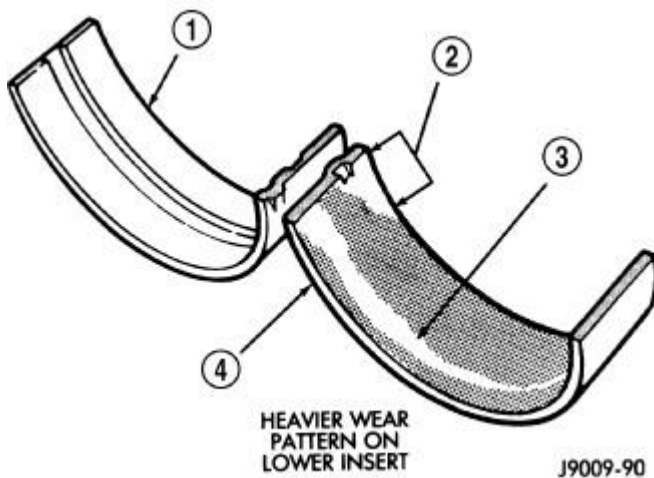


Fig. 116: Main Bearing Wear Patterns

Courtesy of CHRYSLER 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, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

CAMSHAFT, ENGINE

Removal

CAMSHAFT CORE HOLE PLUG

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

1. Remove the rear cam bearing core plug.

CAMSHAFT

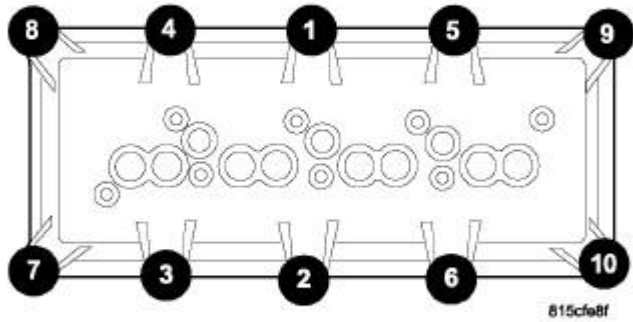
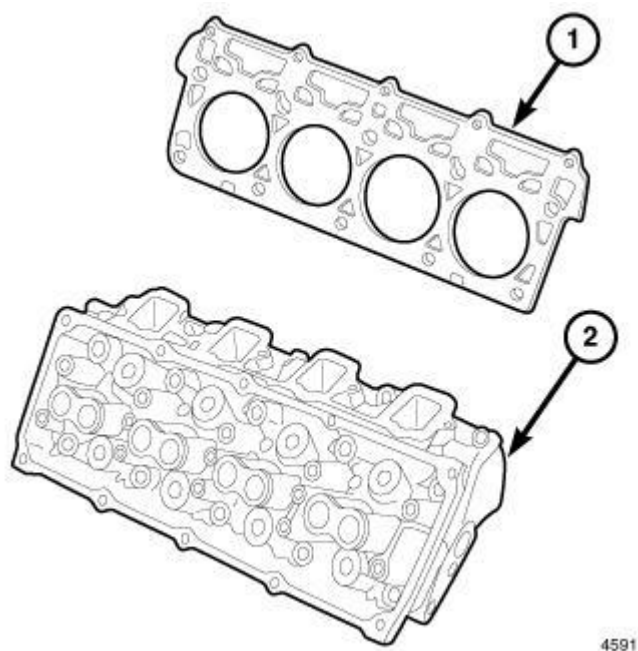


Fig. 117: Cylinder Head Cover Torque Sequence
 Courtesy of CHRYSLER LLC

1. Remove the battery negative cable.
2. Remove the air cleaner assembly. See **Engine/Air Intake System - Removal**.
3. Drain coolant. Refer to **Cooling - Standard Procedure** .
4. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal** .
5. Remove the generator.
6. Remove the A/C compressor, and set aside.
7. Remove the radiator. Refer to **Cooling/Engine/RADIATOR, Engine Cooling - Removal**
8. Remove intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Removal**.
9. Remove cylinder head covers. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Removal**.

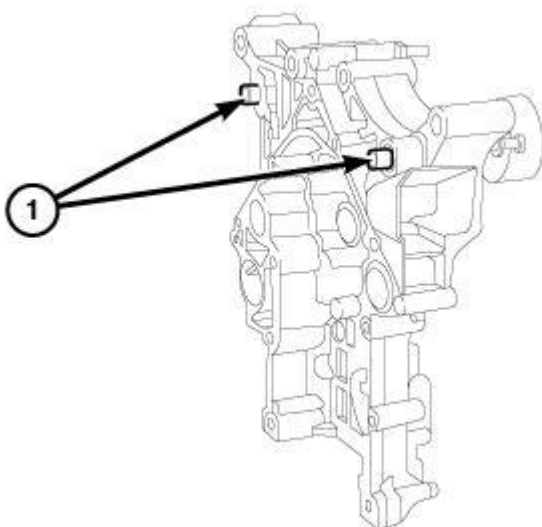


4591

Fig. 118: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - CYLINDER HEAD COVER
 2 - GASKET
 3 - FASTENERS
 4 - CYLINDER HEAD
 5 - HEAD GASKET</p> |
|---|

10. Remove both left and right cylinder heads (4). See **Engine/Cylinder Head - Removal**.
11. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal**.

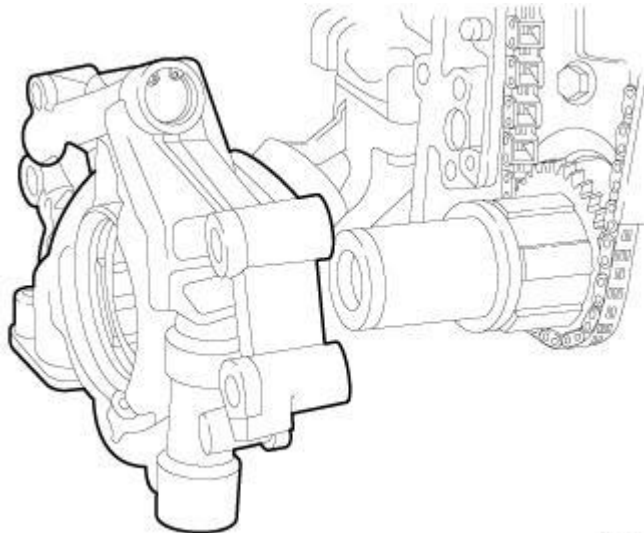


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Fig. 119: FRONT COVER SLIDE BUSHINGS

Courtesy of CHRYSLER LLC

12. Remove timing case cover (1). See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
13. Remove the oil pick up tube.

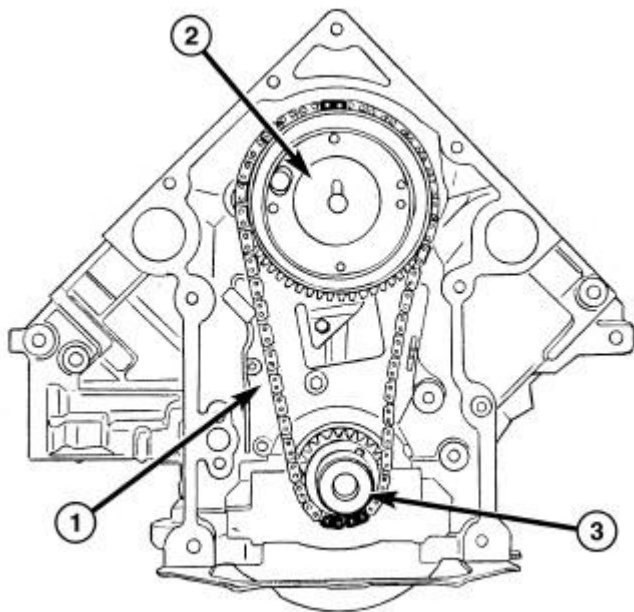


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Fig. 120: OIL PUMP REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

14. Remove the oil pump. See Engine/Lubrication/PUMP, Engine Oil - Removal.



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Fig. 121: TIMING MARK ALIGNMENT

Courtesy of CHRYSLER LLC

15. Remove the timing chain (2). See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal**.
16. Remove camshaft tensioner/thrust plate assembly.

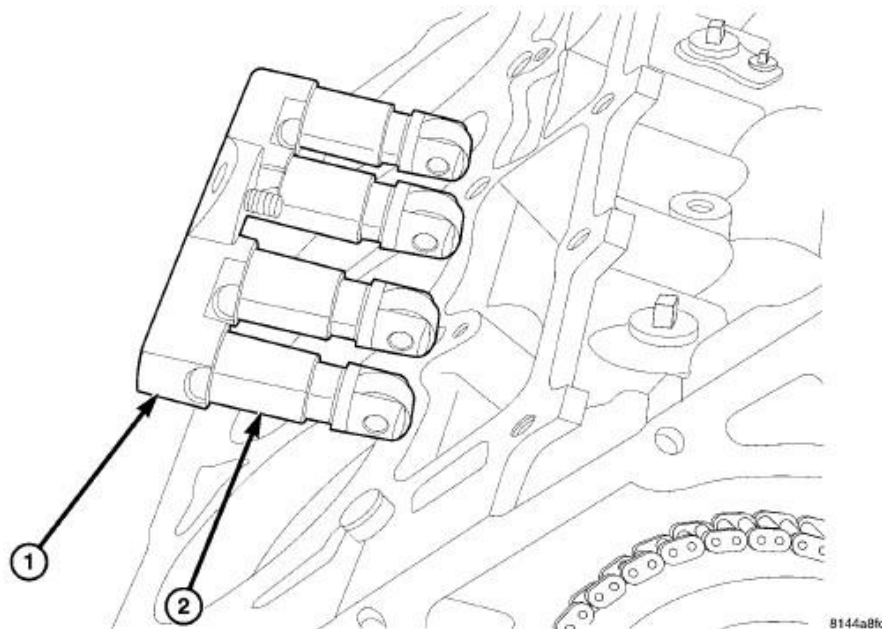


Fig. 122: HYDRAULIC ROLLER TAPPET REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

NOTE: Identify lifters to ensure installation in original location.

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

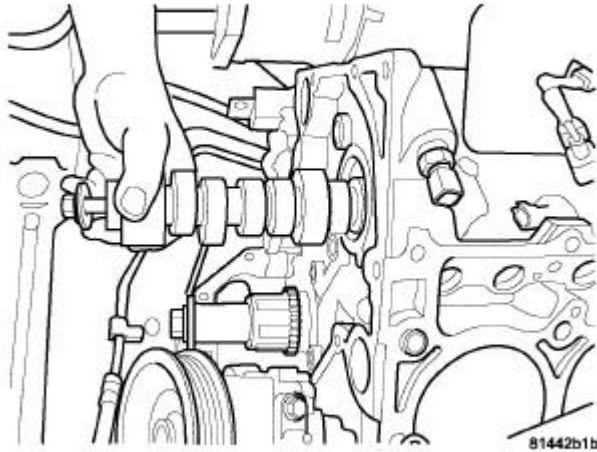


Fig. 123: CAMSHAFT REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

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

Inspection

INSPECTION

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

Installation

CAMSHAFT CORE HOLE PLUG

1. Clean core hole in block.

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

2. Install a new core hole plug at the rear of camshaft, using suitable flat faced tool. The plug must be fully seated on the cylinder block shoulder.

CAMSHAFT

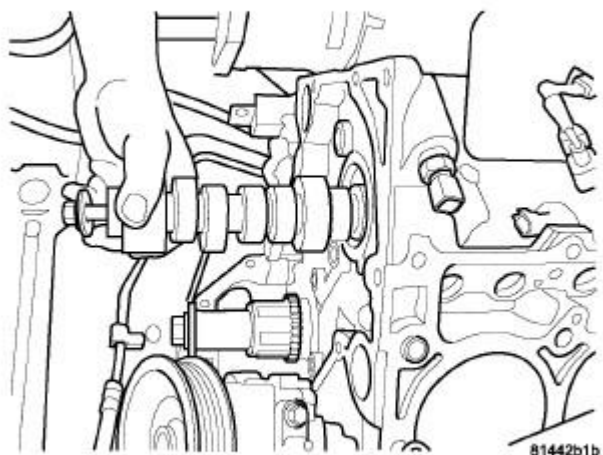


Fig. 124: CAMSHAFT REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

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

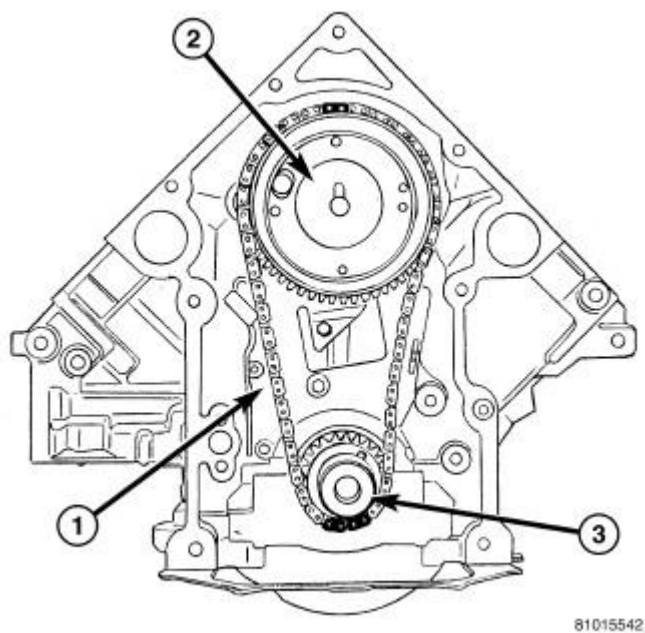


Fig. 125: TIMING MARK ALIGNMENT
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Chain Tensioner
2 - Camshaft Sprocket
3 - Crankshaft Sprocket |
|---|

2. Install camshaft Tensioner plate assembly. Tighten bolts to 28 N.m (250 in. lbs.).
3. Install timing chain and sprockets. See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.**
4. Measure camshaft end play. See **Engine - Specifications** If not within limits install a new thrust plate.

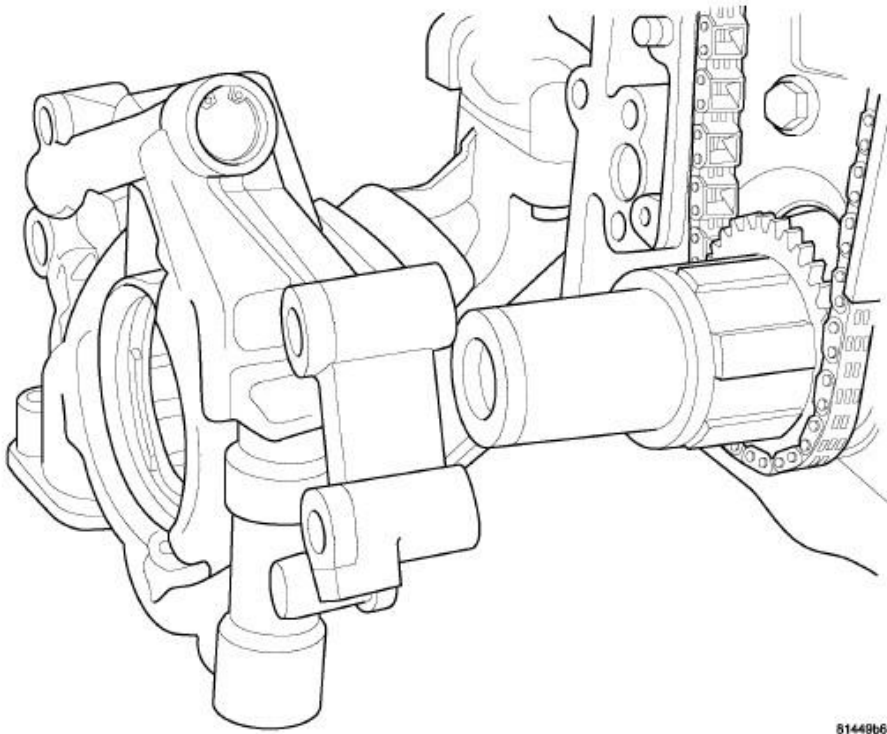


Fig. 126: OIL PUMP REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

5. Install the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Installation.**
6. Install the oil pick up tube.

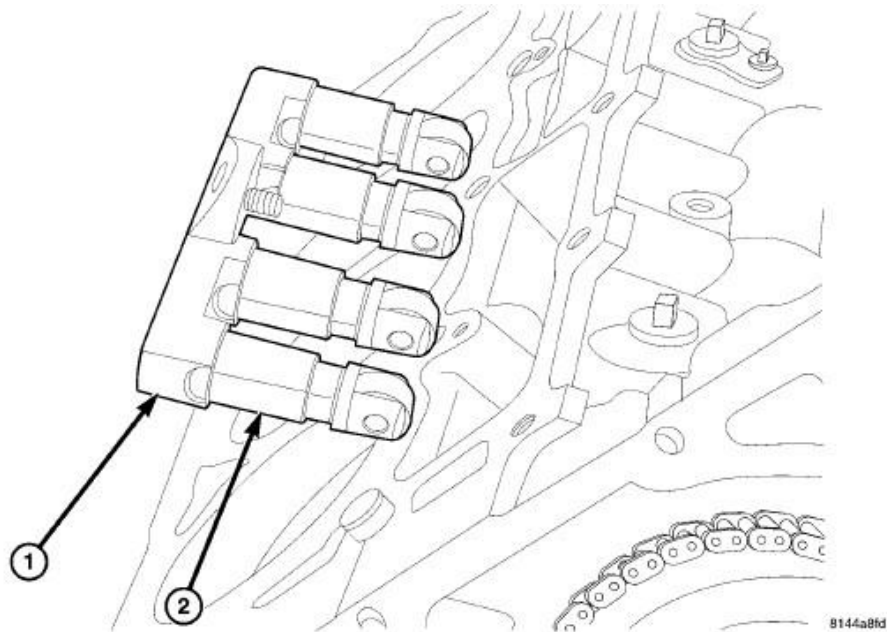
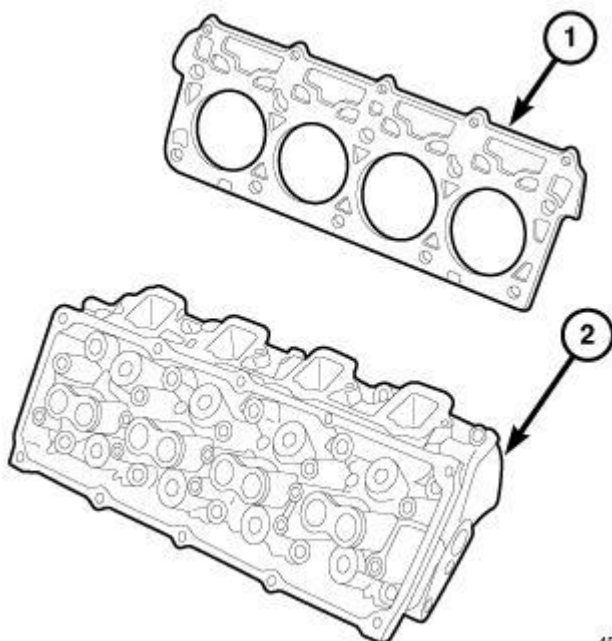


Fig. 127: HYDRAULIC ROLLER TAPPET REMOVAL/INSTALLATION
 Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - TAPPET RETAINER
2 - HYDRAULIC ROLLER TAPPET |
|--|

7. Each tappet reused must be installed in the same position from which it was removed. **When camshaft is replaced, all of the tappets must be replaced.**
8. Install tappets (2) and retaining yoke assembly (1). See Engine/Engine Block/LIFTER(S), Hydraulic - Installation.



4591

Fig. 128: Cylinder Head & Gasket
Courtesy of CHRYSLER LLC

- 1 - CYLINDER HEAD COVER
- 2 - GASKET
- 3 - FASTENERS
- 4 - CYLINDER HEAD
- 5 - HEAD GASKET

9. Install both left and right cylinder heads (4). See [Engine/Cylinder Head - Installation](#).
10. Install pushrods.

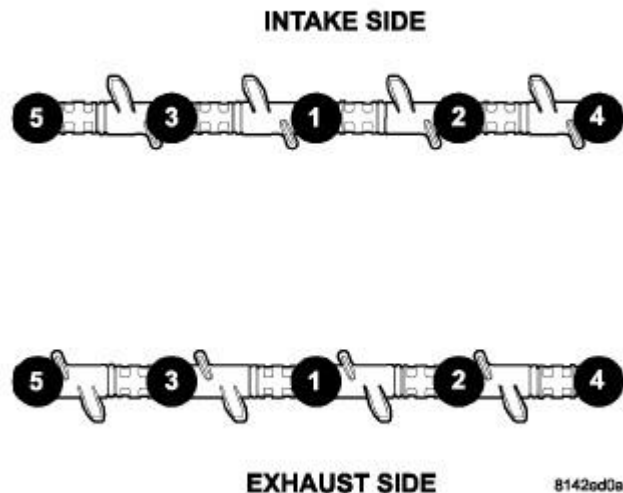


Fig. 129: ROCKER SHAFT TORQUE SEQUENCE
Courtesy of CHRYSLER LLC

11. Install rocker arms. See [Engine/Cylinder Head/ROCKER ARM, Valve - Installation](#).

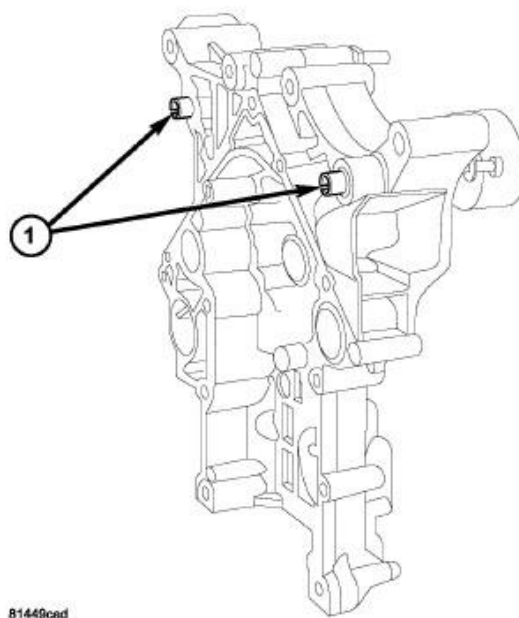


Fig. 130: FRONT COVER SLIDE BUSHINGS

Courtesy of CHRYSLER LLC

12. Install timing case cover. See Engine/Valve Timing/COVER(S), Engine Timing - Installation.
13. Install the oil pan. See Engine/Lubrication/PAN, Oil - Installation.

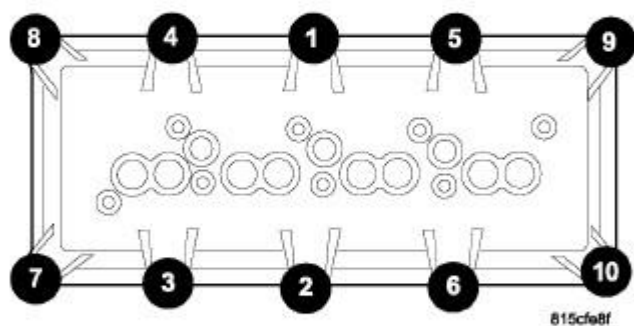


Fig. 131: Cylinder Head Cover Torque Sequence

Courtesy of CHRYSLER LLC

14. Install cylinder head covers. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation**.
15. Install intake manifold. See **Engine/Manifolds/MANIFOLD, Intake - Installation**.
16. Install the A/C compressor. See **Engine/Lubrication/PAN, Oil - Installation**.
17. Install the generator.
18. Install the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation**
19. Install the radiator. Refer to **Cooling/Engine/RADIATOR, Engine Cooling - Installation**
20. Install the air cleaner assembly.
21. Install the battery negative cable.
22. Refill coolant. Refer to **Cooling - Standard Procedure**
23. Refill engine oil.
24. Start engine and check for leaks.

COVER, STRUCTURAL DUST

Description

DESCRIPTION

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine.

Operation

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

Removal

REMOVAL

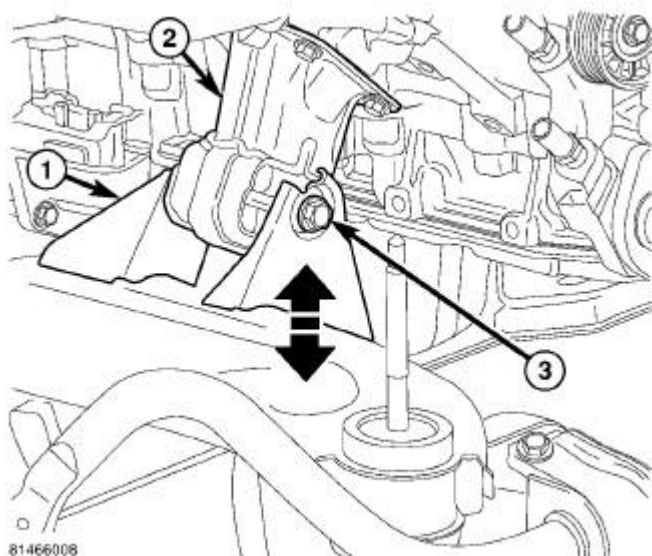


Fig. 132: ENGINE MOUNT BOLT
Courtesy of CHRYSLER LLC

1. Loosen both the right and left engine mount bolts (3).

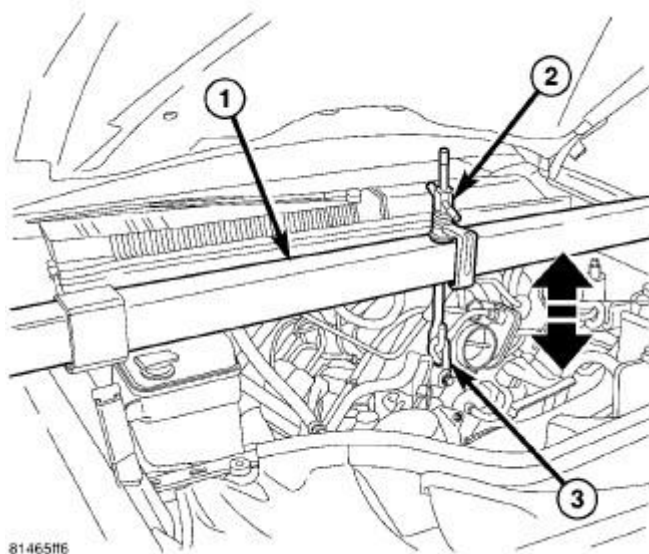
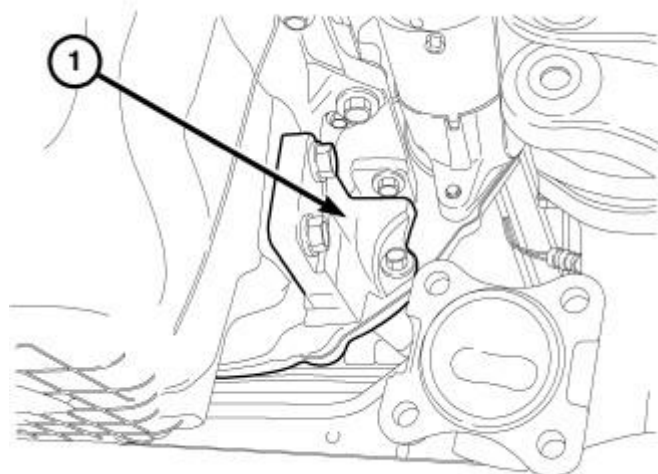


Fig. 133: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

2. Install the Engine Support Fixture 8534B (1) and connect the lifting adapter (2) to the water pump bolt stud (3). **Do not use the third leg.**
3. Raise the engine to gain clearance for dust cover removal.



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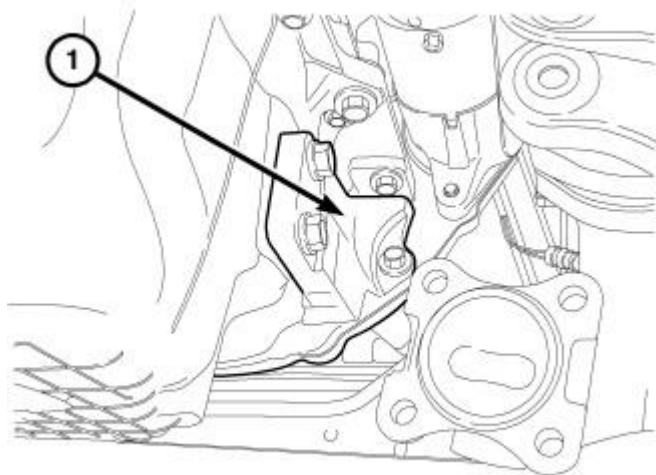
Fig. 134: STRUCTURAL DUST COVER

Courtesy of CHRYSLER LLC

4. Remove the bolts attaching the structural dust cover to the transmission and the oil pan.
5. Remove the structural dust cover from the vehicle.

Installation

INSTALLATION



81e46e80

Fig. 135: STRUCTURAL DUST COVER

Courtesy of CHRYSLER LLC

1. Loosely install the 4 fasteners.
2. Ensure the dust cover is flush to the oil pan and transmission.
3. Tighten the bottom fastener to the transmission to 54 N.m (39 ft. lbs.).

4. Tighten the top bolt to the Oil Pan to 54 N.m (39 ft. lbs.).
5. Tighten the top bolt to the transmission to 54 N.m (39 ft. lbs.).
6. Tighten the bottom bolt to the Oil Pan to 54 N.m (39 ft. lbs.).

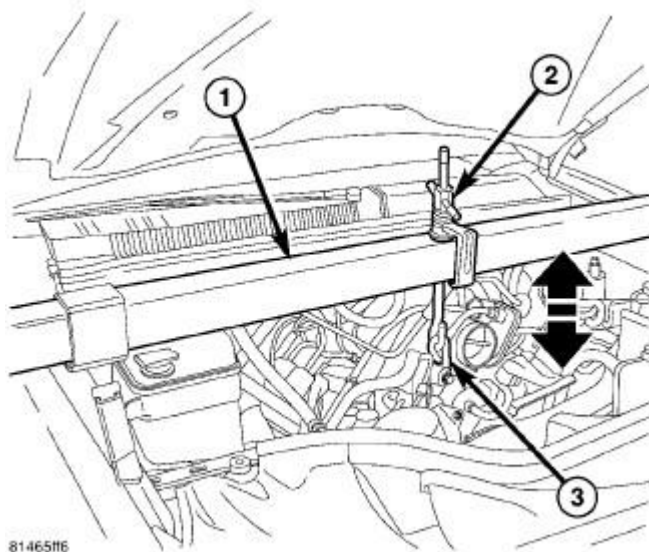


Fig. 136: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

7. Lower the vehicle.
8. Lower engine into the mounts using Engine Support Fixture 8534B (1).
9. Remove the Engine Support Fixture 8534B (1).

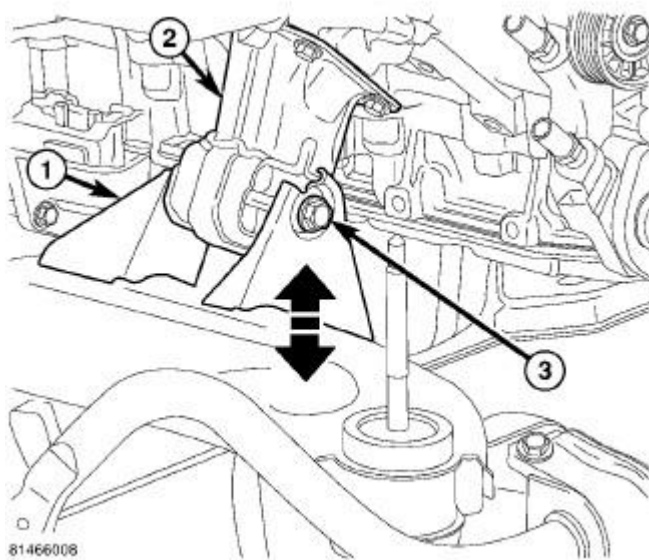


Fig. 137: ENGINE MOUNT BOLT

Courtesy of CHRYSLER LLC

10. Raise the vehicle.
11. Tighten the motor mount bolts (3).

CRANKSHAFT

Removal

REMOVAL

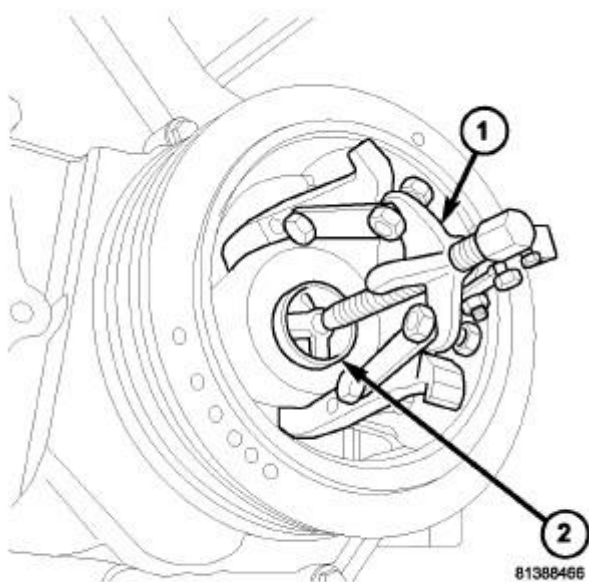


Fig. 138: CRANKSHAFT DAMPER REMOVAL

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Special Tool 1023 Puller
2 - Special Tool 8513A Insert |
|---|

1. Remove the vibration damper (1). See Engine/Engine Block/DAMPER, Vibration - Removal.

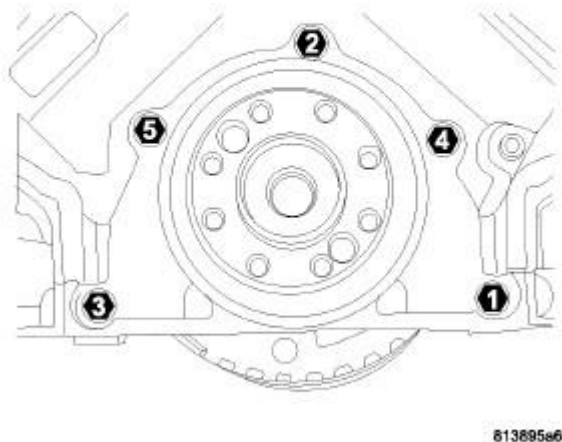


Fig. 139: REAR SEAL RETAINER TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

2. Remove the rear oil seal retainer. See **Engine/Engine Block/RETAINER, Crankshaft Rear Oil Seal - Removal.**
3. Remove the oil pan. See **Engine/Lubrication/PAN, Oil - Removal.**
4. Remove the oil pump pickup.
5. Remove the windage tray/oil pan gasket.

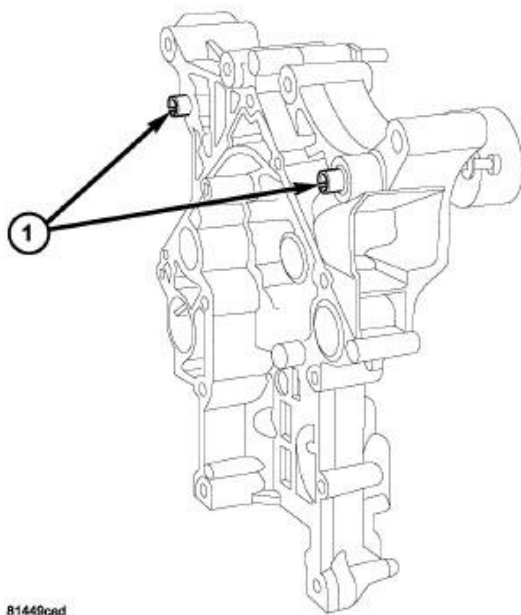
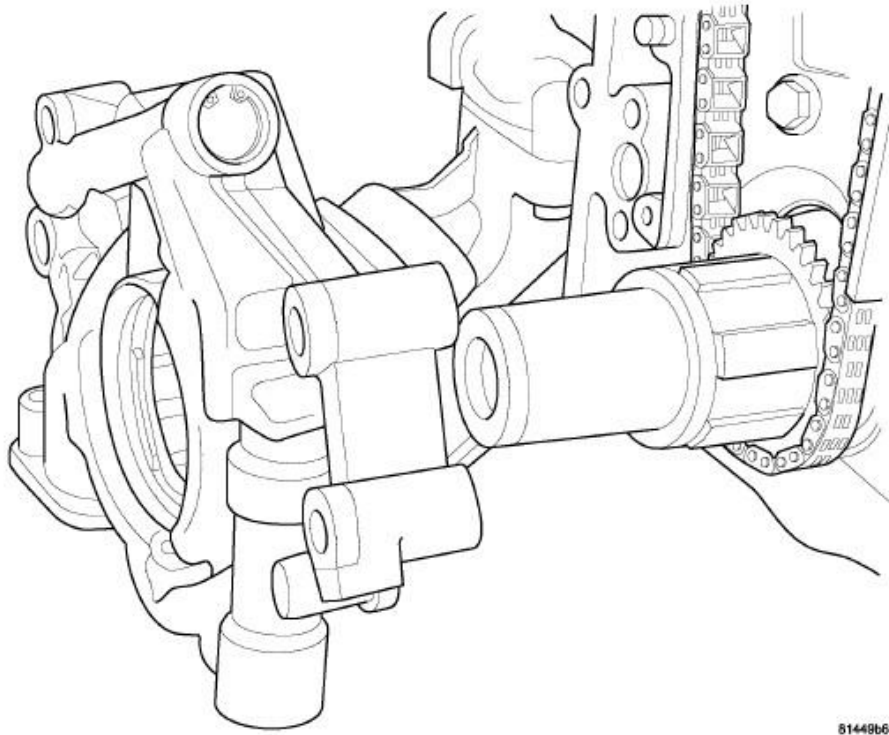


Fig. 140: FRONT COVER SLIDE BUSHINGS

Courtesy of CHRYSLER LLC

6. Remove the timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.

**Fig. 141: OIL PUMP REMOVAL/INSTALLATION**

Courtesy of CHRYSLER LLC

7. Remove the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Removal**.

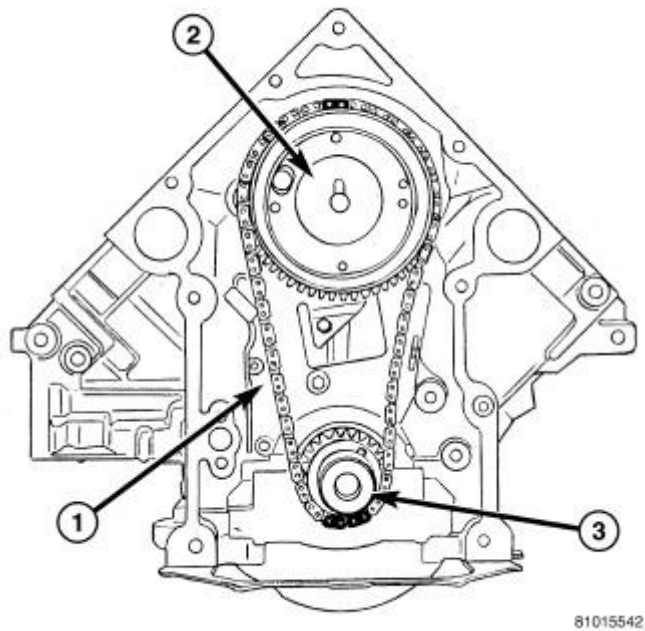
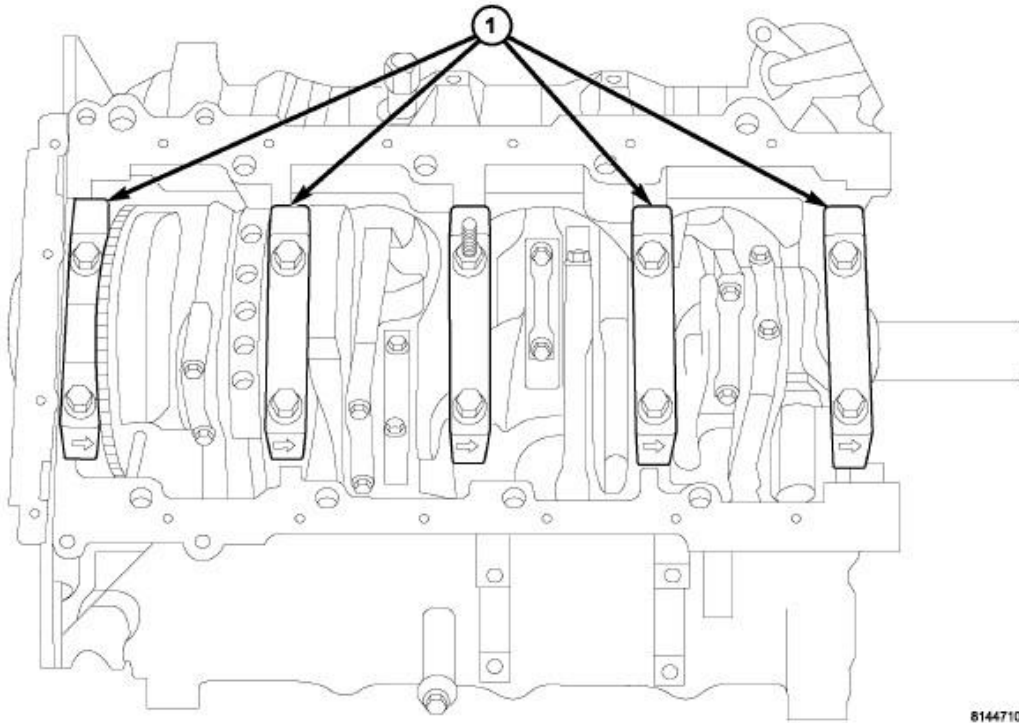


Fig. 142: TIMING MARK ALIGNMENT
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Chain Tensioner
2 - Camshaft Sprocket
3 - Crankshaft Sprocket |
|---|

8. Remove the timing drive (2). See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Removal**.



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Fig. 143: MAIN BEARING CAPS
Courtesy of CHRYSLER LLC

1 - MAIN BEARING CAPS

9. Identify rod bearing caps before removal. Remove rod bearing caps with bearings.
10. Identify main bearing caps (1) before removal.

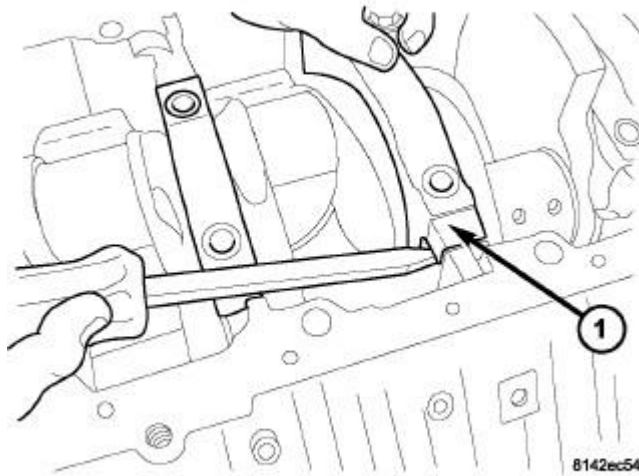


Fig. 144: MAIN CAP REMOVAL
 Courtesy of CHRYSLER LLC

1 - MAIN CAP

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

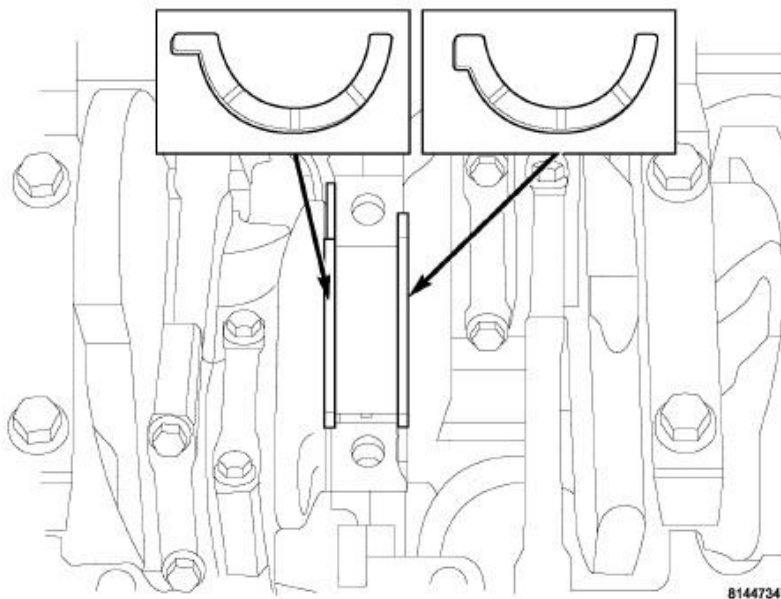


Fig. 145: THRUST WASHER LOCATION
 Courtesy of CHRYSLER LLC

12. Remove the thrust washers.
13. Remove the crankshaft out of the block.

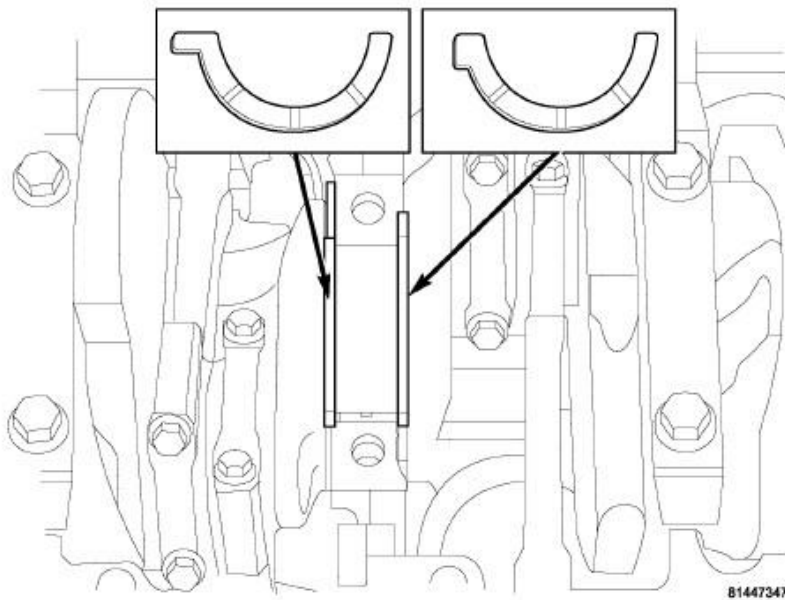
Installation**INSTALLATION**

Fig. 146: THRUST WASHER LOCATION
Courtesy of CHRYSLER LLC

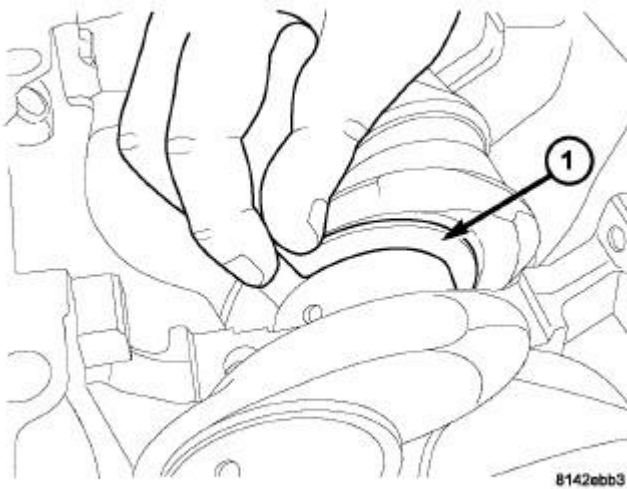
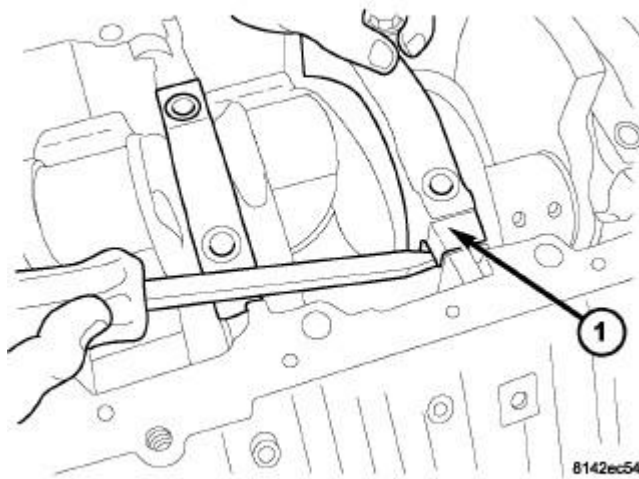


Fig. 147: THRUST WASHER REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

1. Select the proper main bearings. See **Engine/Engine Block/BEARING(S), Crankshaft - Standard Procedure**.
2. Install main bearings in block and caps, and lubricate bearings.
3. Position the crankshaft into the cylinder block.
4. Install the thrust washers (1).

**Fig. 148: MAIN CAP REMOVAL**

Courtesy of CHRYSLER LLC

1 - MAIN CAP

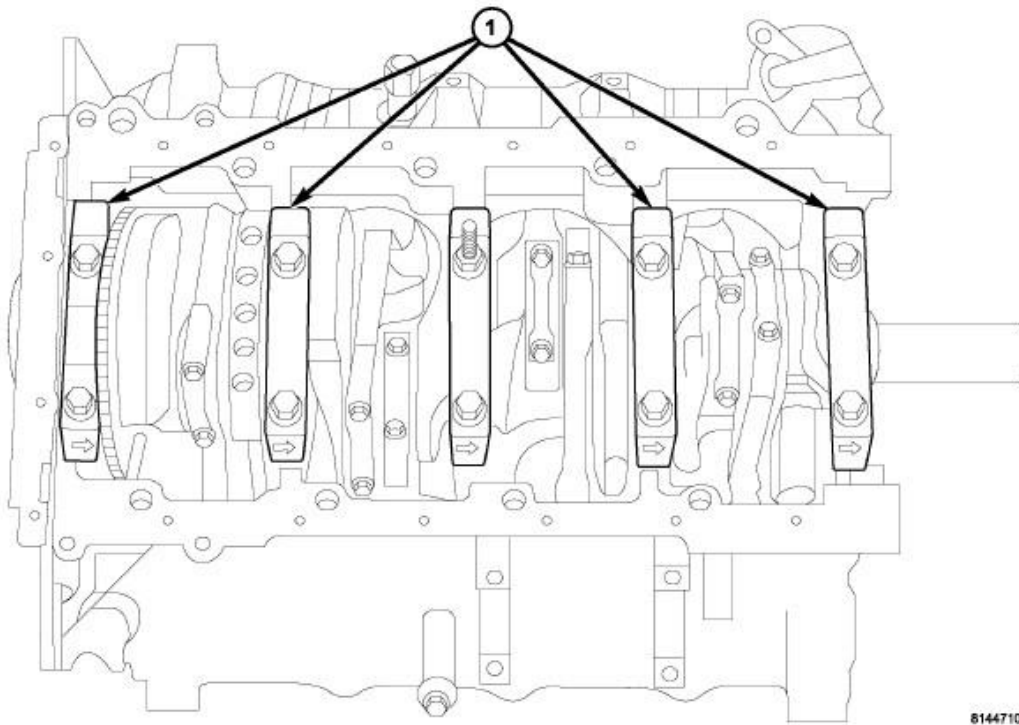


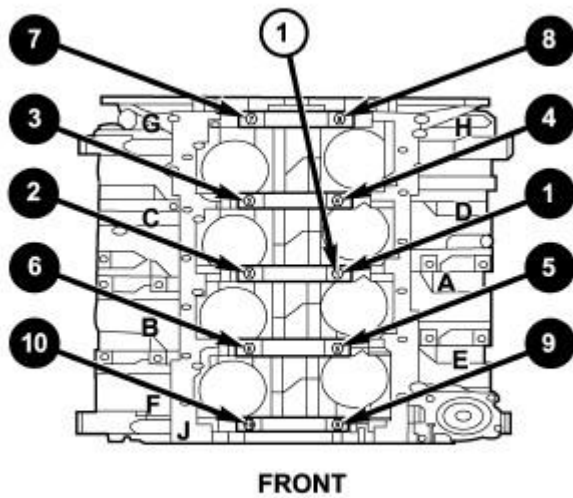
Fig. 149: MAIN BEARING CAPS

Courtesy of CHRYSLER LLC

1 - MAIN BEARING CAPS

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

5. Clean and oil all cap bolts. Install all main bearing caps (1). Install all cap bolts and alternately tighten in two steps using the following sequence.



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Fig. 150: MAIN CAP TORQUE

Courtesy of CHRYSLER LLC

6. Step 1 - 27 N.m (20 ft. lbs.).
7. Step 2 - Turn main cap bolts an additional 90°.
8. Install the crossbolts with new washer/gasket. Starting with crossbolt A torque each crossbolt to 28 N.m (21 ft. lbs.).
9. Repeat crossbolt torque procedure.
10. Measure crankshaft end play. See Engine/Engine Block/BEARING(S), Crankshaft - Standard Procedure.

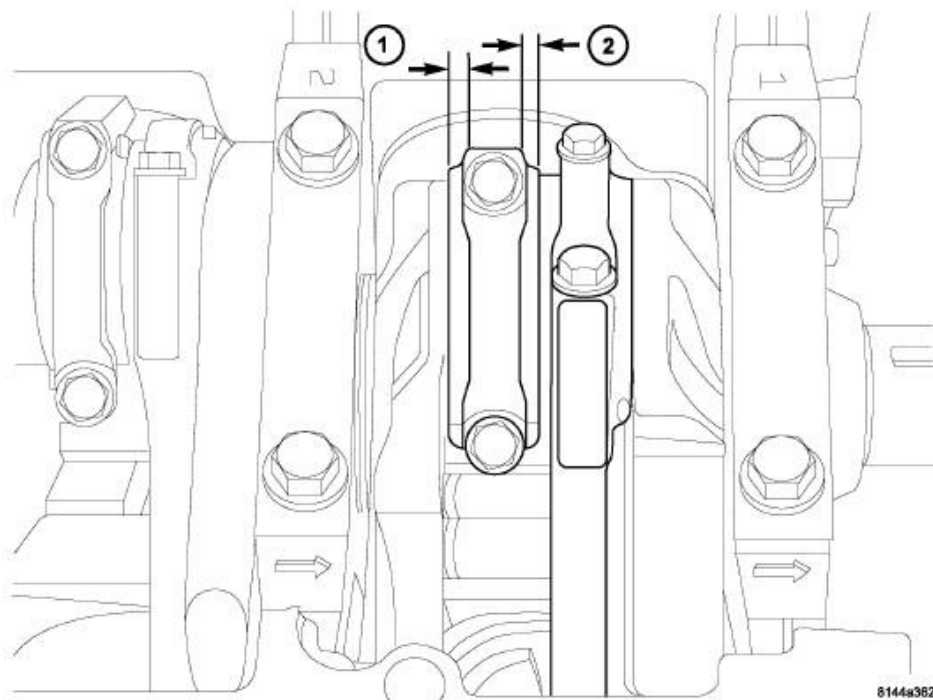


Fig. 151: CONNECTING ROD REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

11. Position the connecting rods onto the crankshaft and install the rod bearing caps. See **Engine/Engine Block/ROD, Piston and Connecting - Installation.**

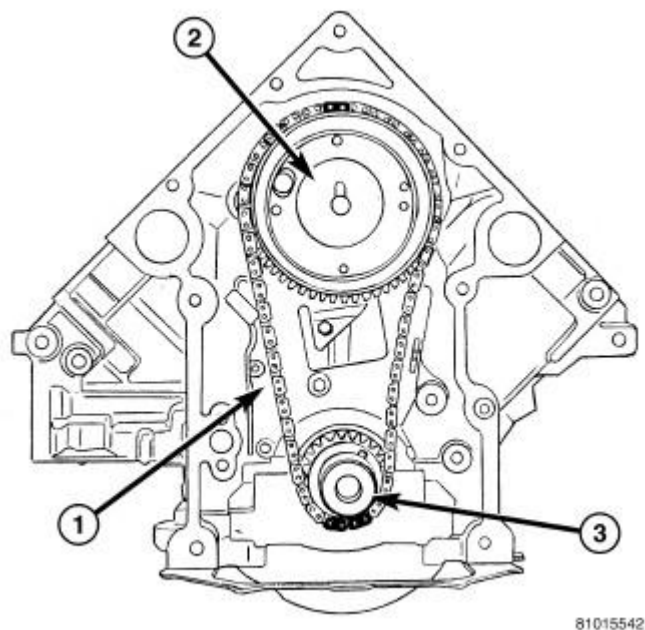
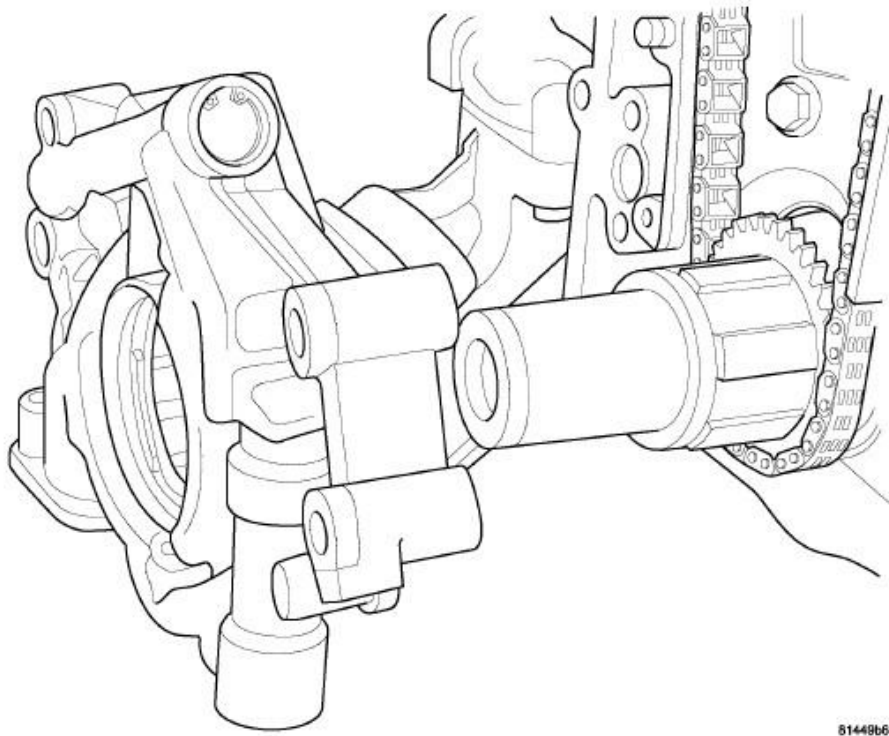


Fig. 152: TIMING MARK ALIGNMENT

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Chain Tensioner
2 - Camshaft Sprocket
3 - Crankshaft Sprocket |
|---|

12. Install timing drive (2). See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation.**

**Fig. 153: OIL PUMP REMOVAL/INSTALLATION**

Courtesy of CHRYSLER LLC

13. Install oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Installation.**

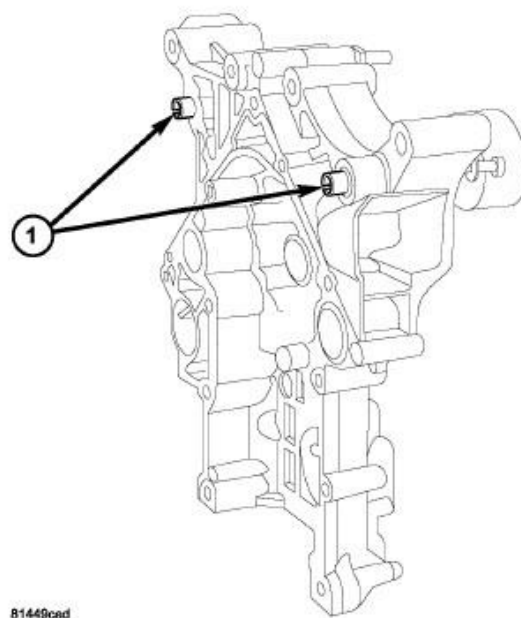


Fig. 154: FRONT COVER SLIDE BUSHINGS
Courtesy of CHRYSLER LLC

14. Install the timing chain cover (1). See **Engine/Valve Timing/CHAIN and SPROCKETS, Timing - Installation**.

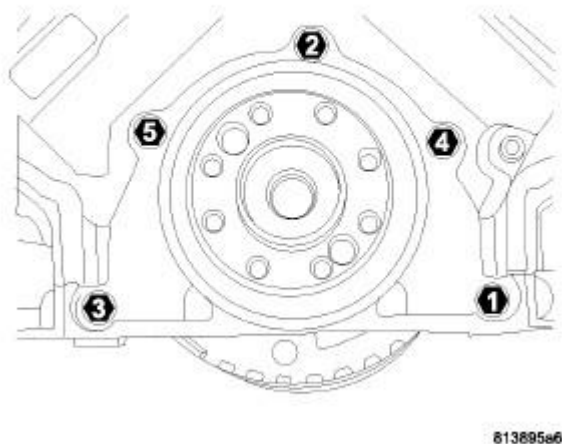


Fig. 155: REAR SEAL RETAINER TORQUE SEQUENCE
Courtesy of CHRYSLER LLC

15. Install the rear main seal and retainer. See **Engine/Engine Block/RETAINER, Crankshaft Rear Oil**

Seal - Installation.

16. Install the windage tray/oil pan gasket.
17. Install the oil pick up tube.
18. Install the oil pan. See **Engine/Lubrication/PAN, Oil - Installation.**
19. Install the vibration damper. See **Engine/Engine Block/DAMPER, Vibration - Installation.**
20. Install the engine. See **Engine - Installation.**

DAMPER, VIBRATION**Removal****REMOVAL**

1. Disconnect negative cable from battery.
2. Remove accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal .**
3. Drain cooling system. Refer to **Cooling - Standard Procedure .**
4. Remove radiator upper hose.
5. Remove fan shroud. Refer to **Cooling/Engine/FAN, Cooling - Removal .**
6. Remove vibration damper bolt.

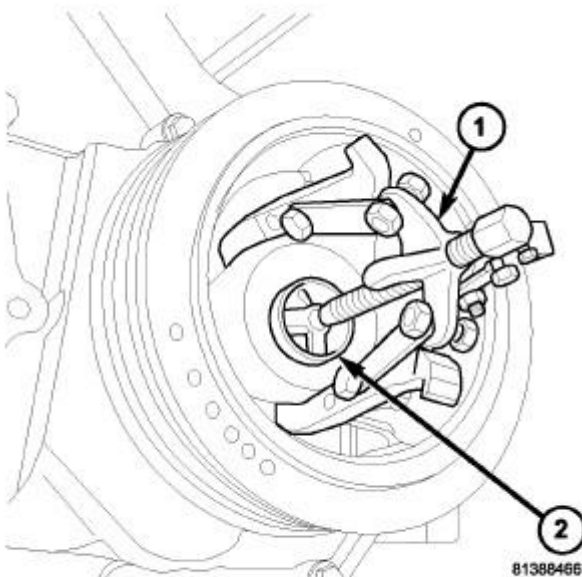


Fig. 156: VIBRATION DAMPER REMOVAL
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Special Tool 1023 Puller
2 - Special Tool 8513A Insert |
|---|

7. Remove damper using Special Tools 8513A Insert and 1023 Three Jaw Puller.

Installation

INSTALLATION

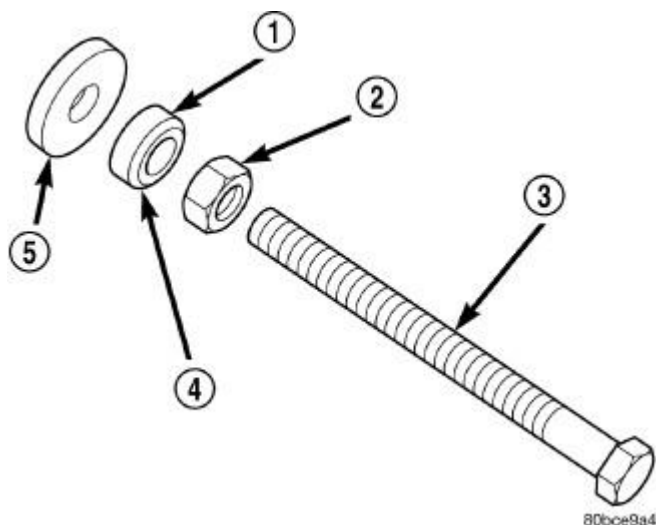


Fig. 157: Proper Assembly Method for Special Tool 8512A
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - BEARING |
| 2 - NUT |
| 3 - THREADED ROD |
| 4 - BEARING HARDENED SURFACE (FACING NUT) |
| 5 - HARDENED WASHER |

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Slide damper onto crankshaft slightly.

CAUTION: Damper Installer 8512A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

2. Assemble Damper Installer 8512A as follows, The nut is threaded onto the shaft first (2). Then the roller bearing (1) is placed onto the threaded rod (3) The hardened bearing surface of the bearing (1) **MUST** face the nut (2). Then the hardened washer (5) slides onto the threaded rod (3) . Once assembled coat the threaded rod's threads with MOPAR® Nickel Anti-Seize or (Loctite No. 771).
3. Using Damper Installer 8512A, press damper onto crankshaft.
4. Install then tighten vibration damper bolt to 176 N.m (129 ft. lbs.).

5. Install radiator upper hose.
6. Install accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Installation**
7. Refill cooling system. Refer to **Cooling - Standard Procedure**
8. Connect negative cable to battery.

FLEXPLATE

Removal

REMOVAL

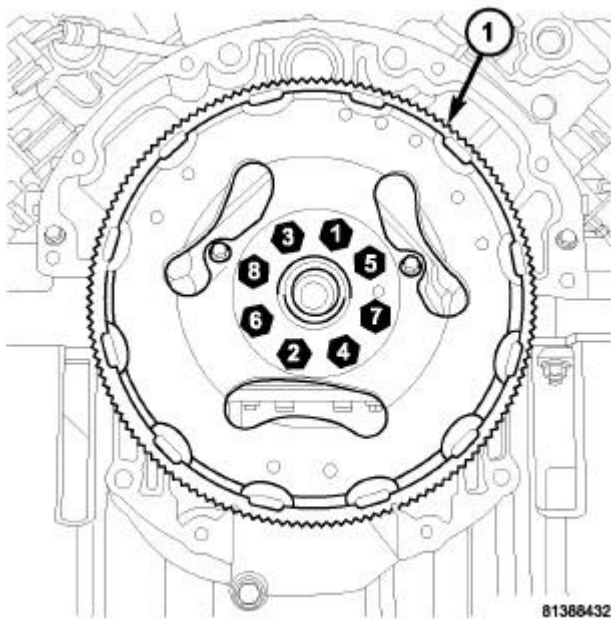


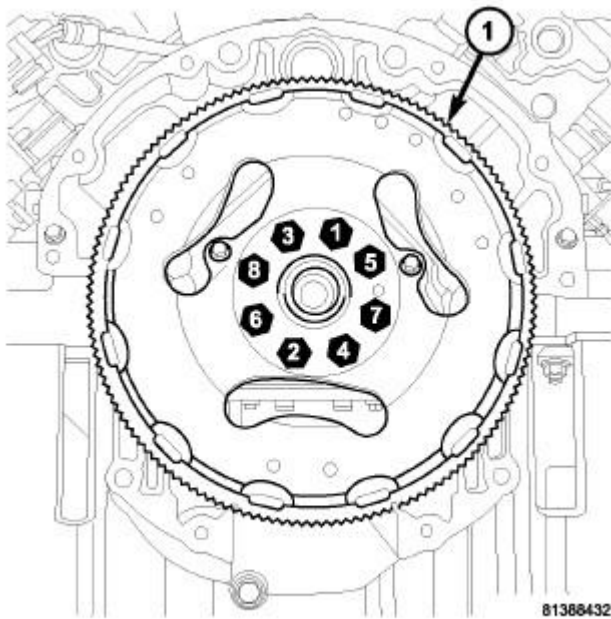
Fig. 158: FLEX PLATE TIGHTENING SEQUENCE
 Courtesy of CHRYSLER LLC

1 - Flexplate

1. Remove the transmission. Refer to **Transmission and Transfer Case/Automatic - NAG1 - Removal**.
2. Remove the bolts and flexplate (1).

Installation

INSTALLATION

**Fig. 159: FLEX PLATE TIGHTENING SEQUENCE**

Courtesy of CHRYSLER LLC

1 - Flexplate

1. Position the flexplate or flywheel onto the crankshaft and install the bolts hand tight.
2. **For automatic transmissions:** Tighten the flexplate retaining bolts to 95 N.m (70 ft. lbs.).
3. Install the transmission. Refer to **Transmission and Transfer Case/Automatic - NAG1 - Installation**

LIFTER(S), HYDRAULIC, ROLLER**Diagnosis and Testing****HYDRAULIC ROLLER TAPPETS**

Before disassembling any part of the engine to correct tappet noise, check the oil pressure. If vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-70 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 dipstick. Either of these two conditions could be responsible for noisy tappets.

OIL LEVEL 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 tappets

by the oil pump causing them to lose length and allow valves to seat noisily.

OIL LEVEL LOW

Low oil level may allow oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on intake side of oil pump through which air can be drawn will create the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When 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 tappets to be bled out.

TAPPET NOISE DIAGNOSIS

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

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

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

Removal

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the cylinder head. See **Engine/Cylinder Head - Removal**.

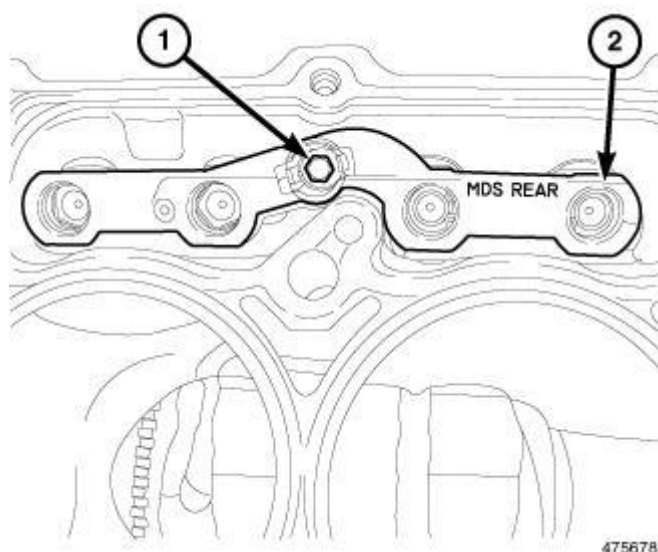


Fig. 160: Rear MDS Lifter Assembly
Courtesy of CHRYSLER LLC

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

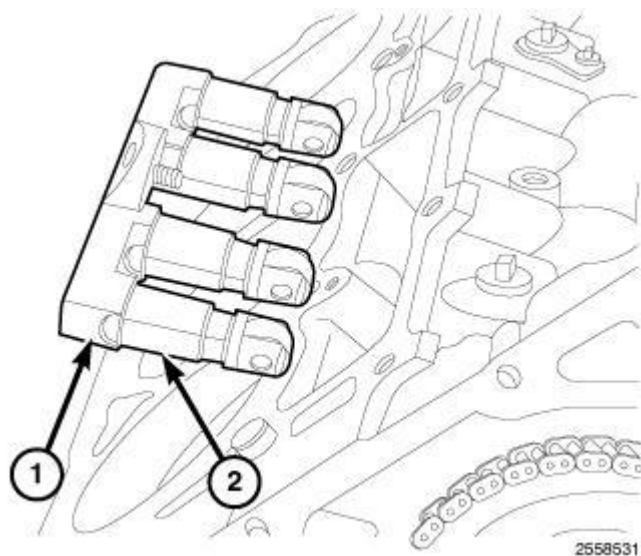


Fig. 161: Tappet Guide Holder Assembly
Courtesy of CHRYSLER LLC

CAUTION: The lifter and guide holder assembly must be installed as an assembly and in their original locations or engine damage could result.

CAUTION: If the lifter and guide holder assembly are to be reused, identify lifters to ensure installation in their original location.

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

Installation

INSTALLATION

CAUTION: The lifter and guide holder assembly must be installed as an assembly and in their original locations or engine damage could result.

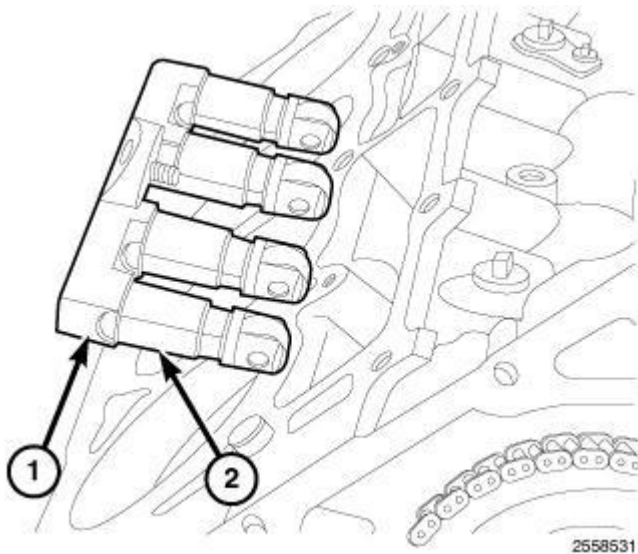


Fig. 162: Tappet Guide Holder Assembly
Courtesy of CHRYSLER LLC

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

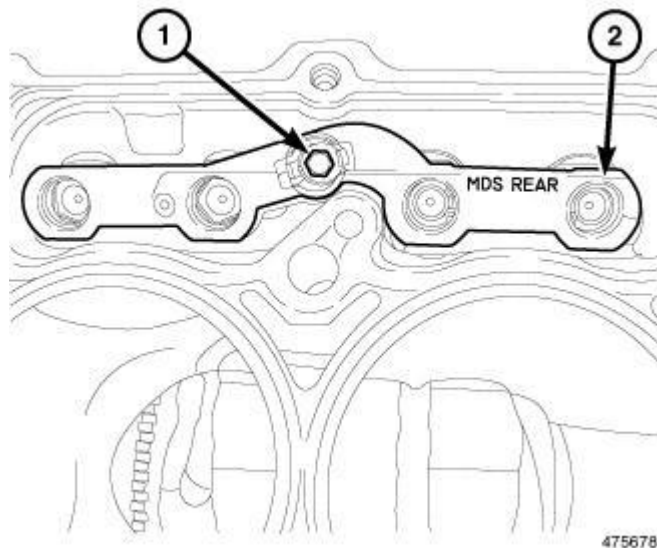


Fig. 163: Rear MDS Lifter Assembly
Courtesy of CHRYSLER LLC

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

2. Install the tappet guide holder (2) and tappets.
3. Tighten the tappet retainer bolt (1) to 12 N.m (106 in. lbs.).
4. Install the cylinder head. See Engine/Cylinder Head - Installation.
5. Connect the negative battery.

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

REAR SEAL AREA LEAKS

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

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

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

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

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

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

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

6. For bubbles that remain steady with shaft rotation, no further inspection can be done. See Engine/Engine Block/RETAINER, Crankshaft Rear Oil Seal - Removal.

Removal

REMOVAL

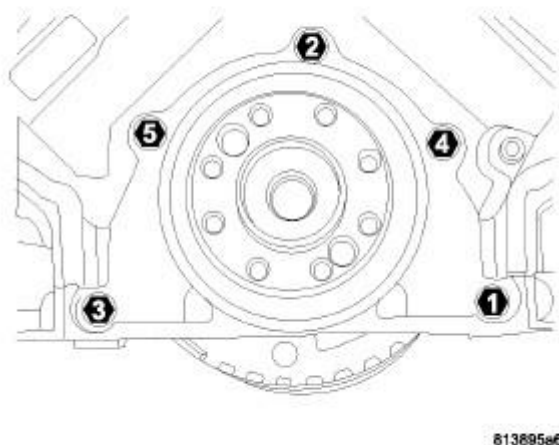


Fig. 164: REAR SEAL RETAINER TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

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

1. Disconnect the negative battery cable.
2. Remove the transmission. Refer to appropriate Transmission SERVICE INFORMATION article.
3. Remove the flexplate. See Engine/Engine Block/FLEXPLATE - Removal.
4. Remove the oil pan. See Engine/Lubrication/PAN, Oil - Removal.
5. Using the sequence shown in illustration, remove the rear oil seal retainer mounting bolts.
6. Carefully remove the retainer from the engine block.

Installation

INSTALLATION

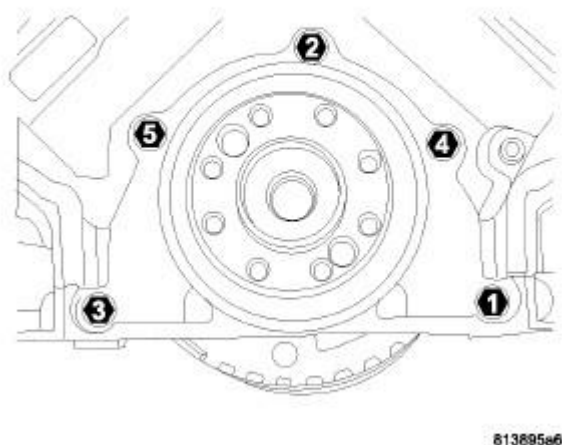


Fig. 165: REAR SEAL RETAINER TORQUE SEQUENCE

Courtesy of CHRYSLER LLC

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

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

1. Thoroughly clean all gasket residue from the engine block.
2. Position the gasket onto the new crankshaft rear oil seal retainer.
3. Position the crankshaft rear oil seal retainer onto the engine block.
4. Using the sequence shown in illustration, install the crankshaft rear oil seal retainer mounting bolts and tighten to 15 N.m (11 ft. lbs.).
5. Install the oil pan. See Engine/Lubrication/PAN, Oil - Installation.

6. Install the flexplate. See **Engine/Engine Block/FLEXPLATE - Installation**.
7. Install the transmission. Refer to appropriate Transmission SERVICE INFORMATION article.
8. Fill the engine with oil.
9. Start the engine and check for leaks.

RING(S), PISTON

Standard Procedure

PISTON RING FITTING

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

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

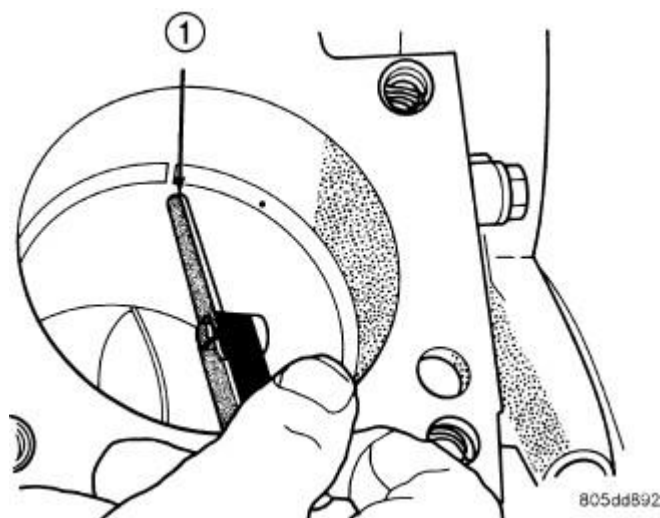


Fig. 166: Ring Gap Measurement
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE

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

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

PISTON RING SIDE CLEARANCE

5. Measure the ring side clearance as shown in illustration. Make sure the feeler gauge fits snugly between

the ring land and the ring. Replace any ring not within specification.

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

PISTON RING SPECIFICATION CHART

Piston Ring Position	Piston Ring Side Clearance	Maximum Clearance
Upper Ring	Metric	-
	Standard	-
Intermediate Ring	Metric	-
	Standard	-
Piston Ring Position	Piston Ring End Gap	Wear Limit
Upper Ring	Metric	-
	Standard	-
Intermediate Ring	Metric	-
	Standard	-
Oil Control Ring (Steel Rail)	Metric	-
	Standard	-

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

NOTE: Piston rings are installed in the following order:

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



Fig. 167: SIDE RAIL - INSTALLATION
Courtesy of CHRYSLER LLC

1 - SIDE RAIL END

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

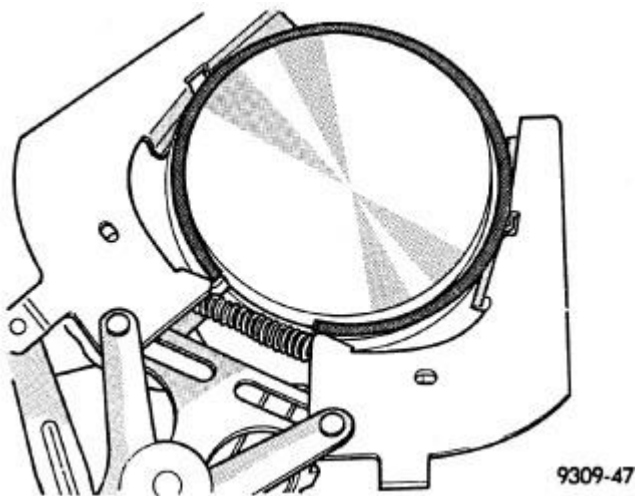
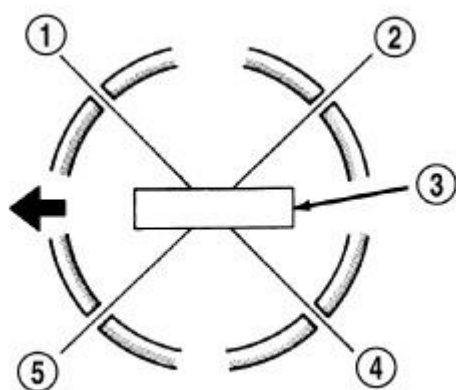


Fig. 168: UPPER AND INTERMEDIATE RINGS
Courtesy of CHRYSLER LLC

10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



RR09B48

Fig. 169: PISTON RING END GAP POSITION

Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - SIDE RAIL UPPER
2 - NO. 1 RING GAP
3 - PISTON PIN
4 - SIDE RAIL LOWER
5 - NO. 2 RING GAP AND SPACER EXPANDER GAP |
|--|

- Position piston ring end gaps as shown in illustration. It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.

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

PISTON FITTING

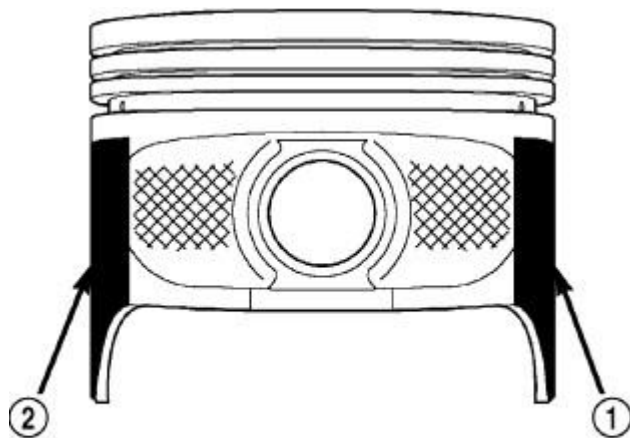
- To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (0.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
- Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start

perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B .

NOTE: Always install new retaining clips for the piston pin. Never reuse the old clips.

NOTE: Use care not to distort the clip while installing.

3. Once assembled, the piston-rod assembly is specific for the left cylinder bank (odd numbered) and the right cylinder bank (even numbered) and must not be interchanged.



80sac2ao

Fig. 170: MOLY COATED PISTON
Courtesy of CHRYSLER LLC

1 - MOLY COATED
2 - MOLY COATED

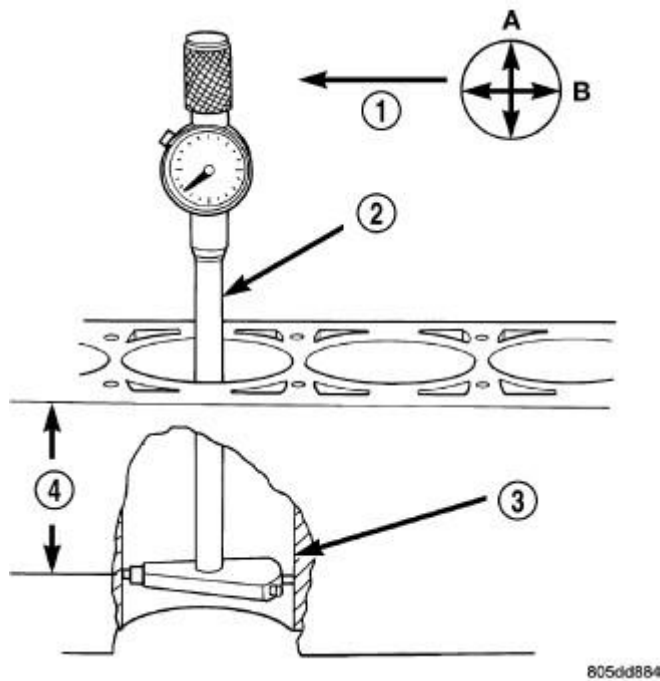


Fig. 171: BORE GAUGE TYPICAL
 Courtesy of CHRYSLER LLC

1 - FRONT
 2 - BORE GAUGE
 3 - CYLINDER BORE
 4 - 38 MM
 (1.5 in)

4. The coating material 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 dial Bore Gauge is **MANDATORY** . To correctly select the proper size piston, a cylinder bore gauge 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

1. Disconnect negative cable from battery.
2. Remove the following components:
 - Oil pan and gasket/windage tray. See Engine/Lubrication/PAN, Oil - Removal.
 - Cylinder head covers. See Engine/Cylinder Head/COVER(S), Cylinder Head - Removal.
 - Timing chain cover. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.

- Cylinder head(s). See Engine/Cylinder Head - Removal and Engine/Cylinder Head - Removal.
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

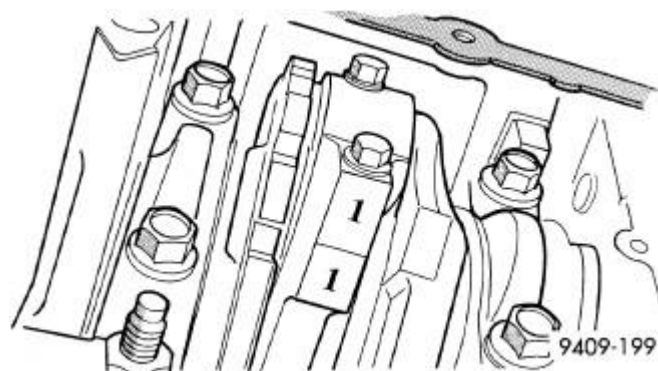


Fig. 172: IDENTIFY CONNECTION ROD TO CYLINDER

Courtesy of CHRYSLER LLC

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

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool .

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

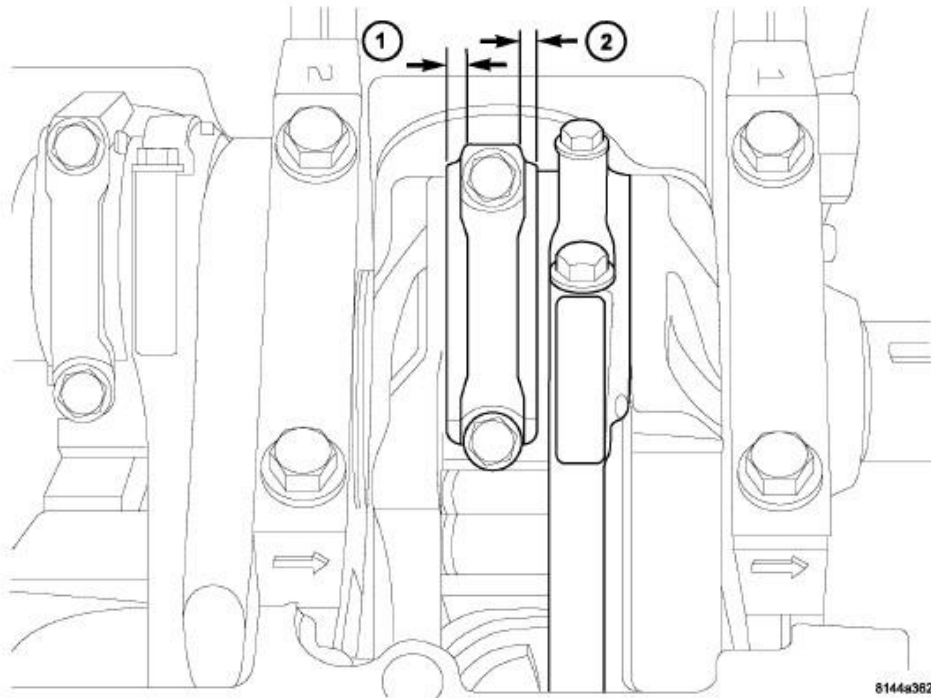


Fig. 173: CONNECTING ROD REMOVAL/INSTALLATION

Courtesy of CHRYSLER LLC

- | |
|----------------------------------|
| 1 - WIDE SIDE
2 - NARROW SIDE |
|----------------------------------|

5. Remove connecting rod cap. Install Connecting Rod Guides 8507 onto the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

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

CAUTION: When removing and installing the piston and connecting rod assembly, Do not damage the piston cooling jets. If the jets are bent, engine damage may occur.

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

Cleaning

CLEANING

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

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

Inspection

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring. See **Engine/Engine Block/BEARING (S), Crankshaft - Standard Procedure.**

Check the connecting rod for signs of twist or bending.

Use the proper tool when removing the piston clip. If the clip is pried out, a burr may form on the groove that will inhibit pin removal and installation.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore. See **Engine/Engine Block/ROD, Piston and Connecting - Standard Procedure.**

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

Installation

INSTALLATION

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings. See **Engine/Engine Block/RING(S), Piston - Standard Procedure.**
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Connecting Rod Guides 8507 onto the connecting rod bolt threads.

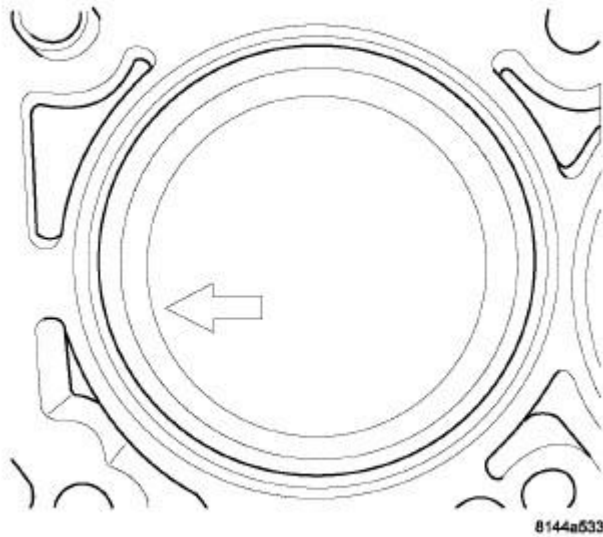


Fig. 174: PISTON DIRECTION ARROW

Courtesy of CHRYSLER LLC

5. The pistons are marked on the piston pin bore surface with an raised "F" or arrow on top of piston indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks.
6. Wipe cylinder bore clean and lubricate with engine oil.
7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

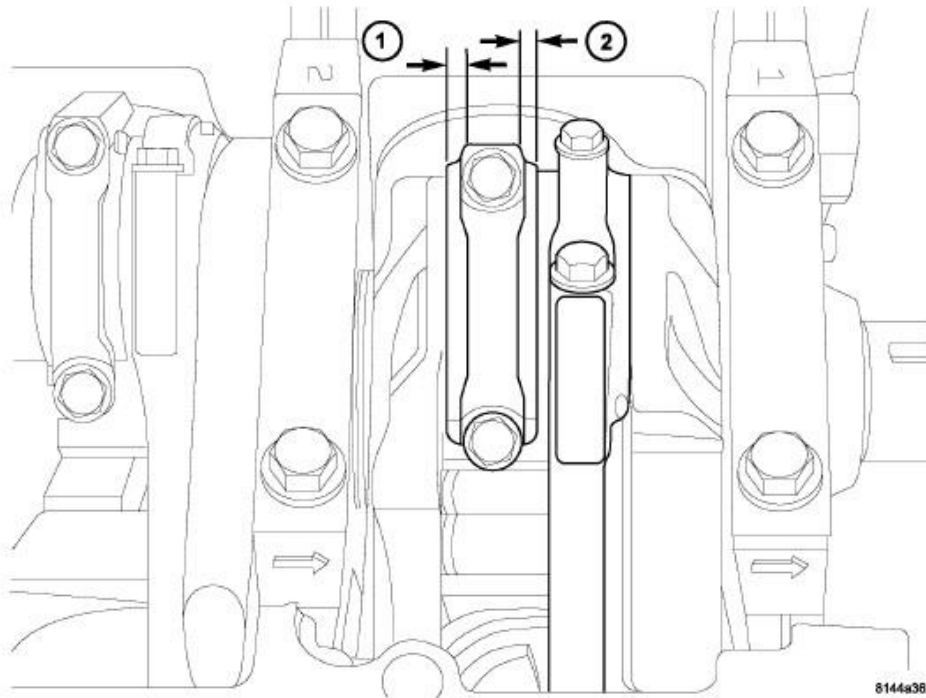


Fig. 175: Removing/Installing Connecting Rod
Courtesy of CHRYSLER LLC

1 - WIDE SIDE 2 - NARROW SIDE

CAUTION: Always replace the Rod Bolts whenever they are loosened or removed.

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 45 N.m (33 ft. lbs.) plus a 60° turn.
10. Install the following components:
 - Cylinder head(s). See **Engine/Cylinder Head - Installation.**
 - Cylinder head covers. See **Engine/Cylinder Head/COVER(S), Cylinder Head - Installation.**
 - Install the intake manifold.
 - Oil pan and gasket/windage tray. See **Engine/Lubrication/PAN, Oil - Installation.**
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

SEAL, CRANKSHAFT OIL, FRONT

Removal

REMOVAL

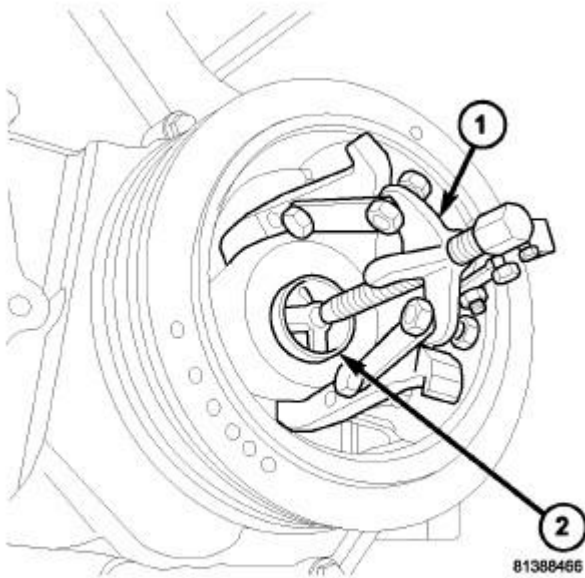


Fig. 176: CRANKSHAFT DAMPER REMOVAL
Courtesy of CHRYSLER LLC

- | |
|---|
| <p>1 - Special Tool 1023 Puller
2 - Special Tool 8513A Insert</p> |
|---|

1. Disconnect negative cable from battery.
2. Remove accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal**
3. Drain cooling system. Refer to **Cooling - Standard Procedure**
4. Remove upper radiator hose.
5. Remove radiator shroud attaching fasteners.
6. Remove radiator cooling fan and shroud. Refer to **Cooling/Engine/FAN, Cooling - Removal**
7. Remove crankshaft damper bolt.
8. Remove damper using the Crankshaft Insert 8513A (2) and Three Jaw Puller 1023 (1). See **Engine/Engine Block/DAMPER, Vibration - Removal**.

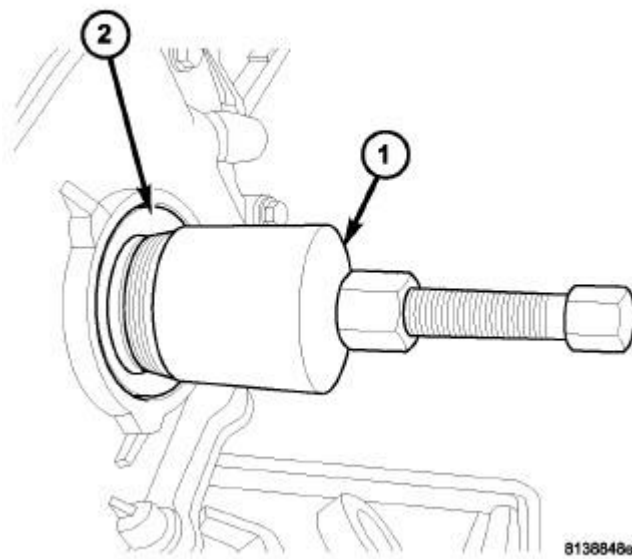


Fig. 177: FRONT CRANKSHAFT SEAL REMOVAL
Courtesy of CHRYSLER LLC

1 - Special Tool 9071
2 - Seal

9. Use Seal Remover 9071 (1) to remove the crankshaft front seal (2).

Installation

INSTALLATION

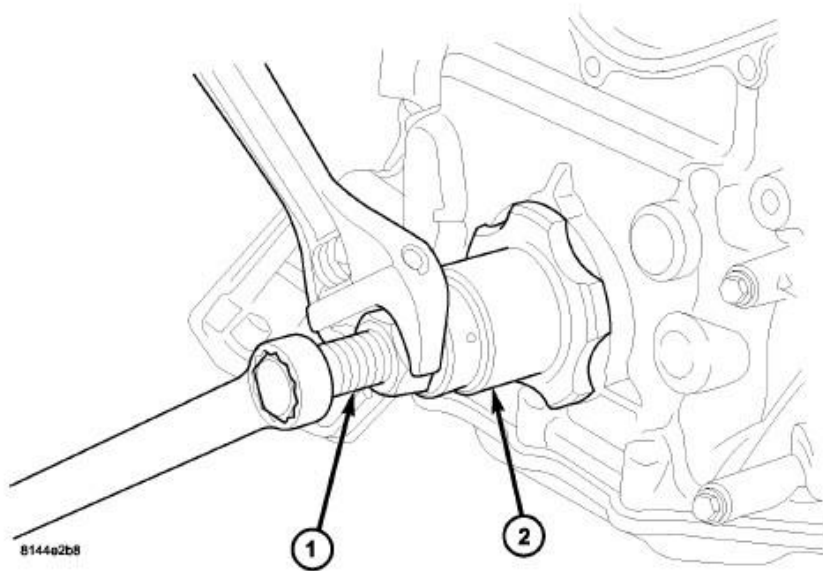


Fig. 178: FRONT SEAL INSTALLATION
Courtesy of CHRYSLER LLC

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

1. Use Seal Installer 8348 and Damper Installer 8512A to install the crankshaft front oil seal.

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

2. Install vibration damper. See Engine/Engine Block/DAMPER, Vibration - Installation.
3. Install radiator cooling fan and shroud. Refer to Cooling/Engine/FAN, Cooling - Installation.
4. Install upper radiator hose.
5. Install accessory drive belt refer. Refer to Cooling/Accessory Drive/BELT, Serpentine - Installation.
6. Refill cooling system. Refer to Cooling - Standard Procedure
7. Connect negative cable to battery.

SEAL, CRANKSHAFT OIL, REAR

Description

DESCRIPTION

The crankshaft rear oil seal is integral to the crankshaft rear oil seal retainer, for more information refer to the following;

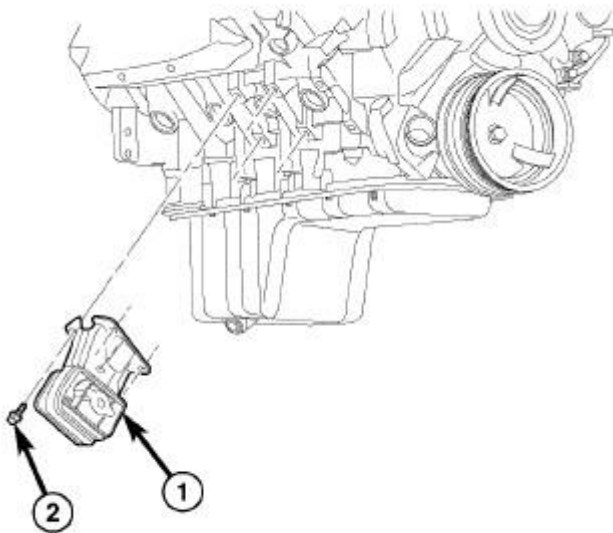
- **Diagnosis and Testing** . See Engine/Engine Block/RETAINER, Crankshaft Rear Oil Seal - Diagnosis and Testing.
- **Removal** . See Engine/Engine Block/RETAINER, Crankshaft Rear Oil Seal - Removal.
- **Installation** . See Engine/Engine Block/RETAINER, Crankshaft Rear Oil Seal - Installation.

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, FRONT

Removal

REMOVAL



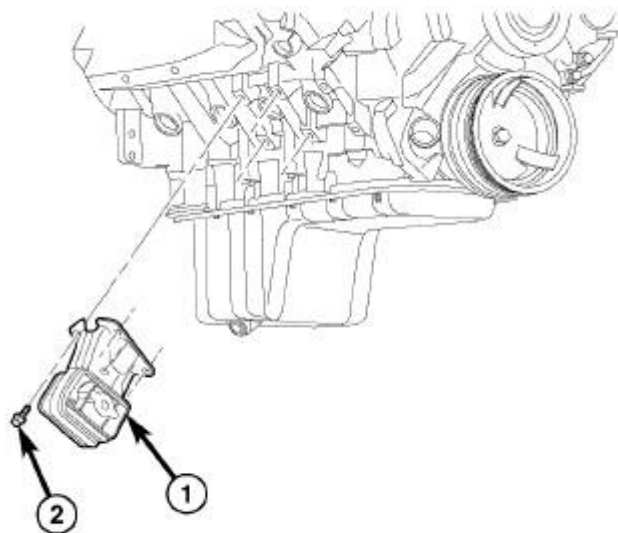
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Fig. 179: Removing/Installing Engine Mount
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Raise vehicle.
3. Remove engine mount thru bolts.
4. Raise engine using suitable jack.
5. Remove engine mount bolts (2).
6. Remove mount (1) from engine.

Installation

INSTALLATION



81501652

Fig. 180: Removing/Installing Engine Mount
Courtesy of CHRYSLER LLC

1. Install the engine mount (1).
2. Lower the engine.
3. Install the thru bolts and nuts
4. Lower vehicle.
5. Connect negative battery cable.

INSULATOR, ENGINE MOUNT, REAR

Removal

REMOVAL

4X2

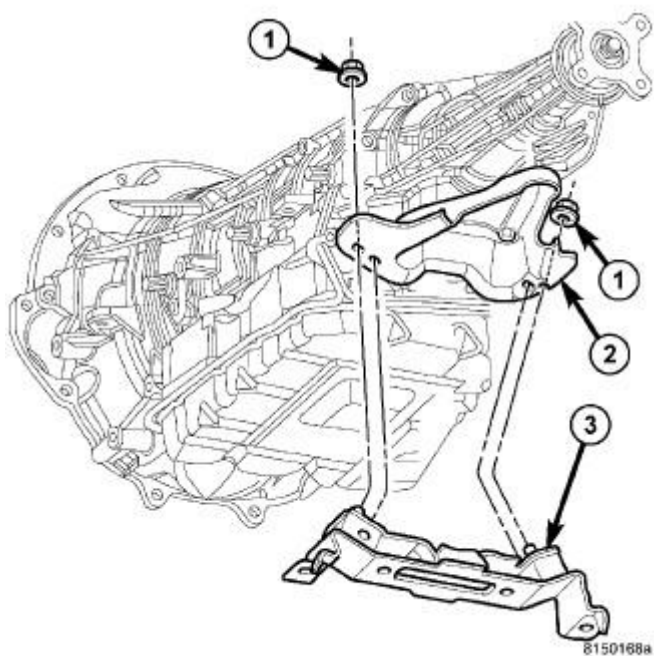
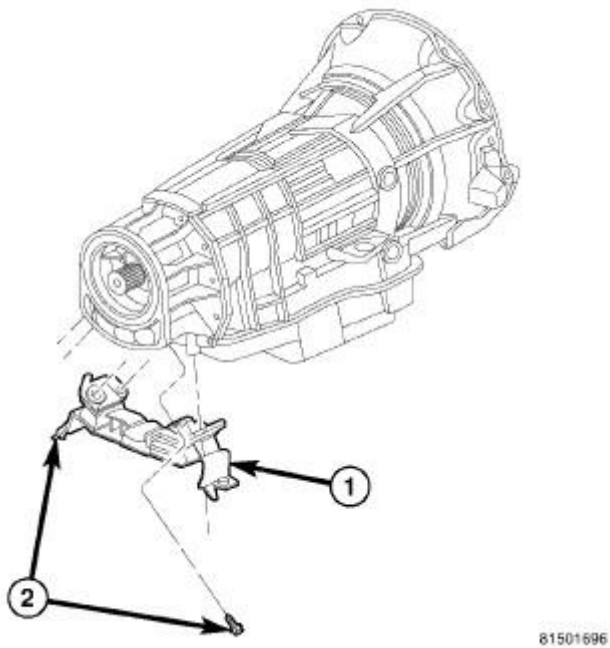


Fig. 181: 4X2 TRANSMISSION MOUNT

Courtesy of CHRYSLER LLC

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the crossmember.
4. Remove the fasteners (1) from the transmission mount to transmission.
5. Remove the mount (3).
6. Remove the transmission mount bracket (2), if required.

4X4

**Fig. 182: 4X4 TRANSMISSION MOUNT****Courtesy of CHRYSLER LLC**

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the crossmember.
4. Remove the fasteners (2) from the transmission mount (1) to transmission.
5. Remove the mount.

Installation**INSTALLATION****4X2**

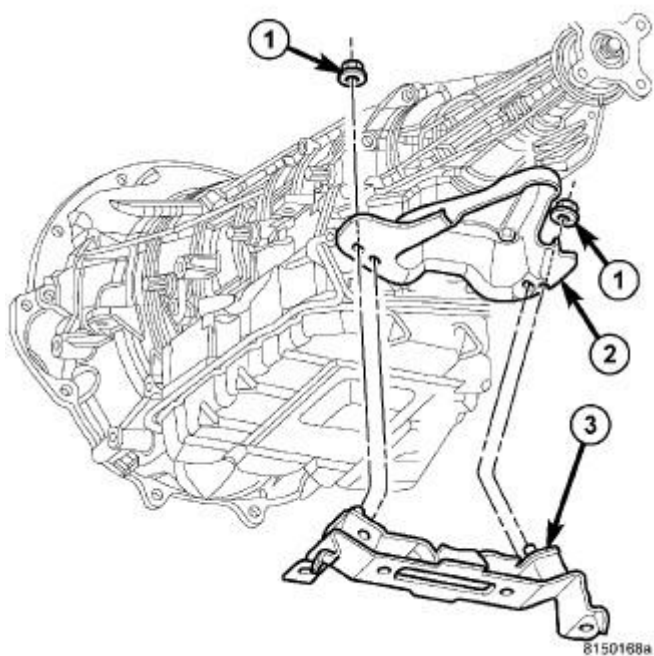
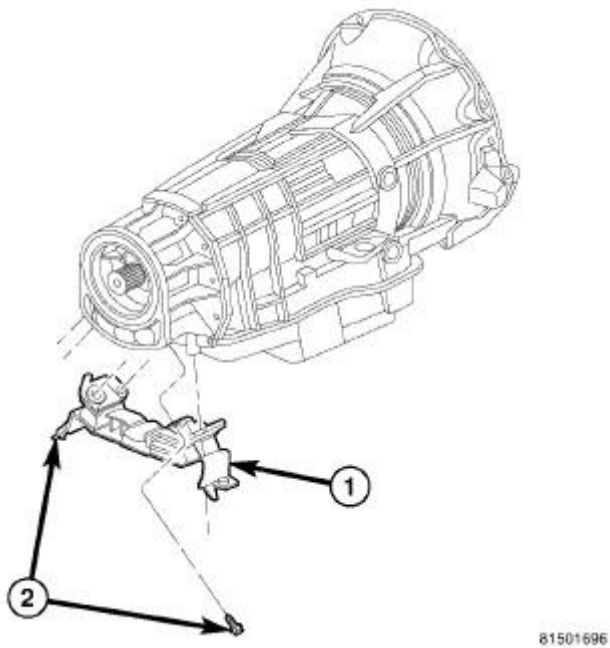


Fig. 183: 4X2 TRANSMISSION MOUNT

Courtesy of CHRYSLER LLC

1. Install the transmission mount bracket (2), if removed.
2. Position the transmission mount (3) on the transmission mount bracket (2). Install the fasteners (1) that attach the transmission mount to the bracket.
3. Tighten the bolts to 30 N.m (22 ft. lbs.).
4. Install the crossmember.

4X4

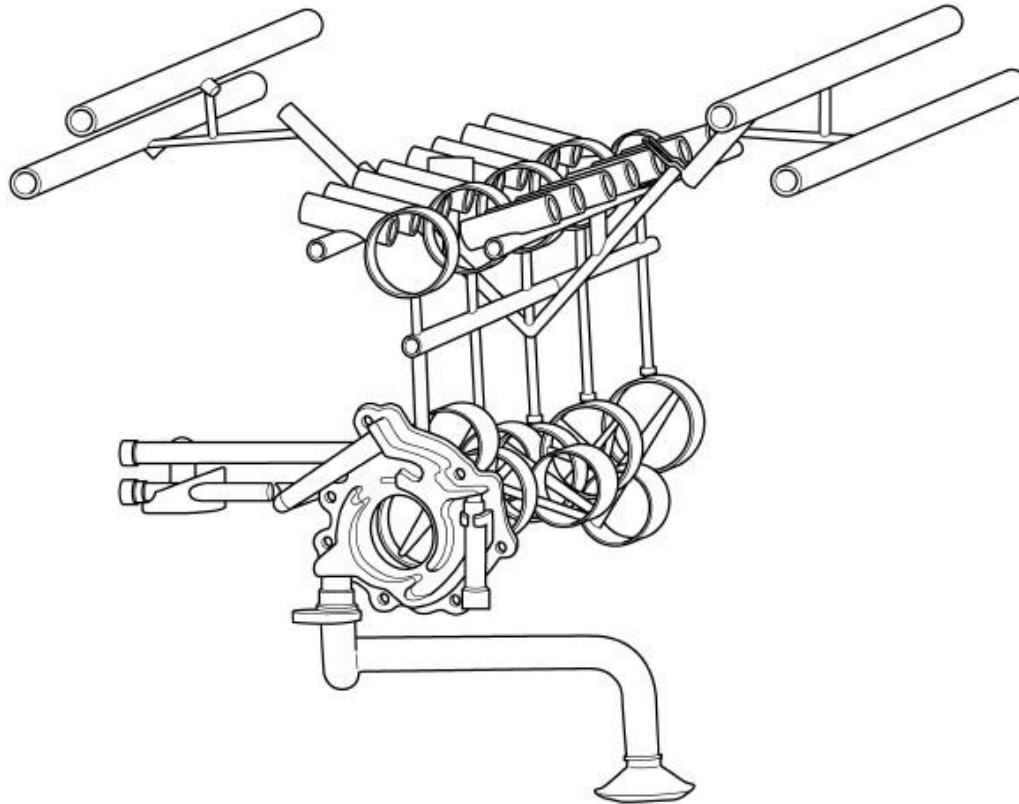
**Fig. 184: 4X4 TRANSMISSION MOUNT****Courtesy of CHRYSLER LLC**

1. Position the transmission mount (1) on the transmission. Install the bolts (2) that attach the transmission mount to the transmission.
2. Tighten the bolts to 30 N.m (22 ft. lbs.).
3. Install the crossmember.

LUBRICATION

DESCRIPTION

DESCRIPTION



810115ad

Fig. 185: Engine Oil Lubrication System
Courtesy of CHRYSLER LLC

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

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

1. Remove oil pressure sending unit and install gauge assembly C-3292A.
2. Run engine until thermostat opens.
3. Oil Pressure:
 - Curb Idle - 25 kPa (4 psi) minimum
 - 3000 RPM - 170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil

leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service information instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.

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 from the IAFM. Cap or plug the PCV valve grommet.
2. Attach an air hose with pressure gauge and regulator to the dipstick tube.

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

3. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service information procedures.
4. If the leakage occurs at the rear oil seal area, refer to **INSPECTION FOR REAR SEAL AREA LEAKS**.
5. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve.
6. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

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

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

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
 - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.

- b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in **AIR LEAK DETECTION TEST METHOD**.

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

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

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

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

FILTER, ENGINE OIL

Removal

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. Chrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.
4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

NOTE: Make sure filter gasket was removed with filter.

5. With a clean wiping cloth, clean the gasket sealing surface of oil and grime.

Installation

INSTALLATION

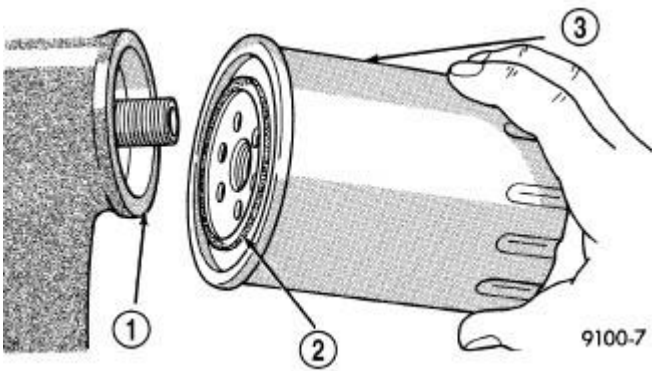


Fig. 186: Oil Filter Sealing Surface - Typical
Courtesy of CHRYSLER LLC

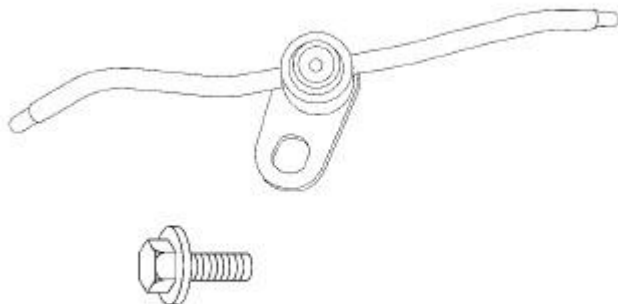
- 1 - SEALING SURFACE
- 2 - RUBBER GASKET
- 3 - OIL FILTER

1. Lightly lubricate oil filter gasket (2) with engine oil.
2. Thread filter onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one half turn, or 180°, do not over tighten.
3. Add oil, verify crankcase oil level, and start engine. Inspect for oil leaks.

JET, PISTON OIL COOLER

Description

DESCRIPTION



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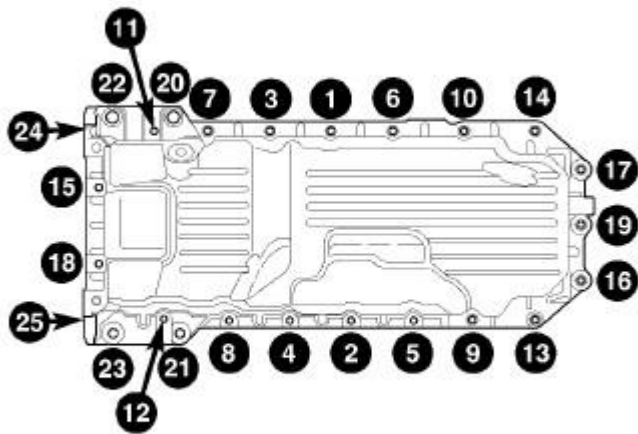
Fig. 187: ENGINE OIL JET

Courtesy of CHRYSLER 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



8150068b

Fig. 188: Oil Pan Torque Sequence

Courtesy of CHRYSLER LLC

1. Remove the oil pan and oil pick-up tube. See Engine/Lubrication/PAN, Oil - Removal.

NOTE: When the oil pan is removed, a new oil pan gasket/windage tray assembly must be installed. The old gasket cannot be reused.

2. Discard the integral windage tray and gasket.

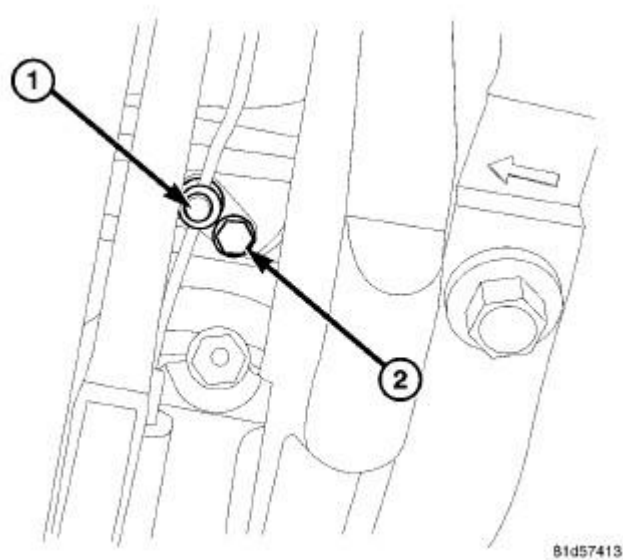


Fig. 189: OIL JET REMOVE/INSTALL

Courtesy of CHRYSLER LLC

NOTE: It may be necessary to rotate the engine crankshaft to access the Piston Oil Cooler Jet retaining bolts.

3. Remove the Piston Oil Cooler Jet retaining bolt (2).
4. Remove the Piston Oil Cooler Jet (1).

Installation

INSTALLATION

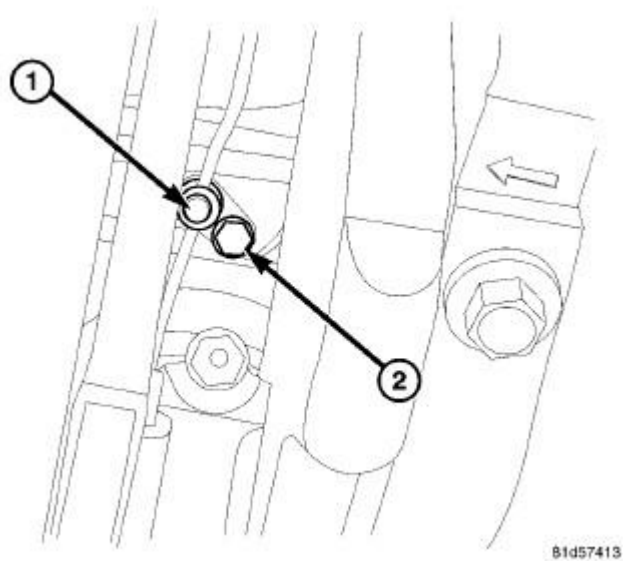
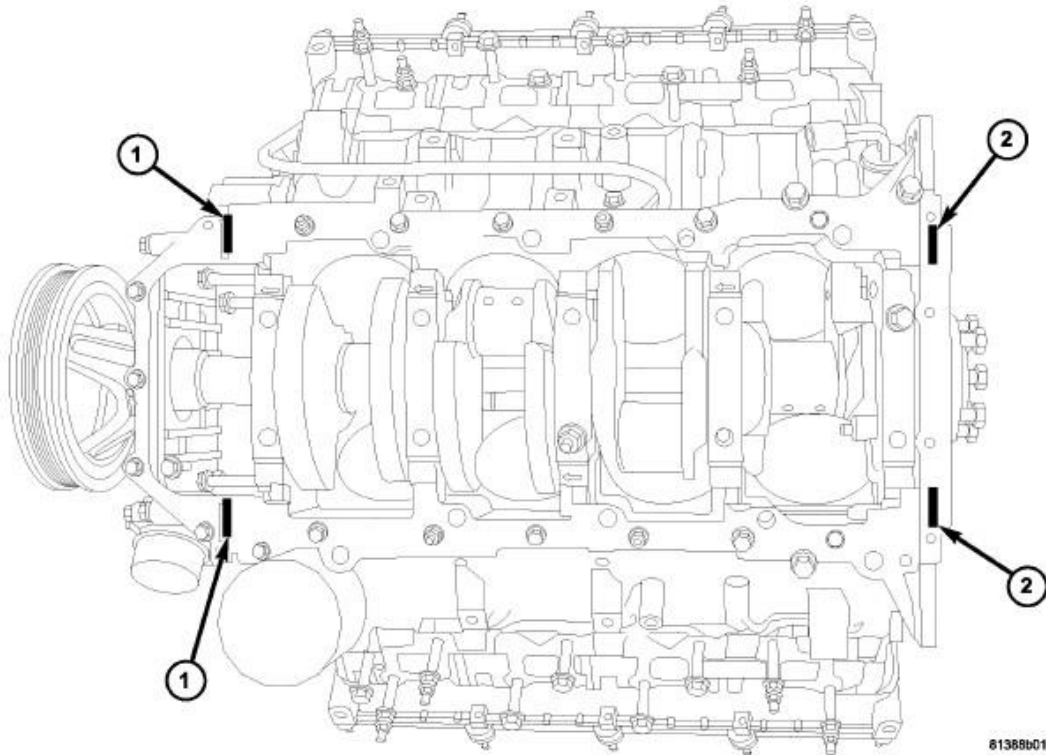


Fig. 190: OIL JET REMOVE/INSTALL

Courtesy of CHRYSLER LLC

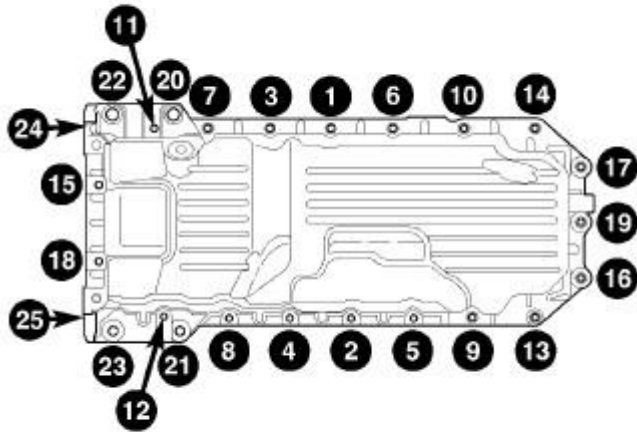
1. Install the Piston Oil Cooler Jet. (1)
2. Tighten the bolt to 13 Nm (115 in. lbs.) (2)

**Fig. 191: T-JOINT RTV APPLICATION**

Courtesy of CHRYSLER LLC

NOTE: Mopar® Engine RTV must be applied to the 4 T-joints, (area where front cover, rear retainer, block, 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.

3. Clean the oil pan mating surfaces of the engine block and oil pan.
4. Apply Mopar ® Engine RTV at the 4 T- joints. (1,2)
5. Install a new oil pan gasket/windage tray assembly.



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Fig. 192: Oil Pan Torque Sequence
 Courtesy of CHRYSLER LLC

6. Install the engine oil pan. See Engine/Lubrication/PAN, Oil - Installation.

OIL

Standard Procedure

ENGINE OIL SERVICE

The engine oil level indicator is located at the right hand of the engine on the 6.1L engines.

CRANKCASE OIL LEVEL INSPECTION

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

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about ten minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately five minutes for oil to settle to bottom of crankcase, remove

engine oil dipstick.

3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules. Refer to **Vehicle Quick Reference/Maintenance Schedules - Description** .

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Remove oil fill cap.
3. Hoist and support vehicle on safety stands.
4. Remove the belly pan.
5. Place a suitable drain pan under crankcase drain.
6. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
7. Install drain plug in crankcase. Tighten to 27 N.m (20 ft. lbs.)
8. Lower vehicle and fill crankcase with specified type and amount of engine oil.
9. Install oil fill cap.
10. Start engine and inspect for leaks.
11. Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the **WARNING** at beginning of this section.

PAN, OIL

Removal

REMOVAL

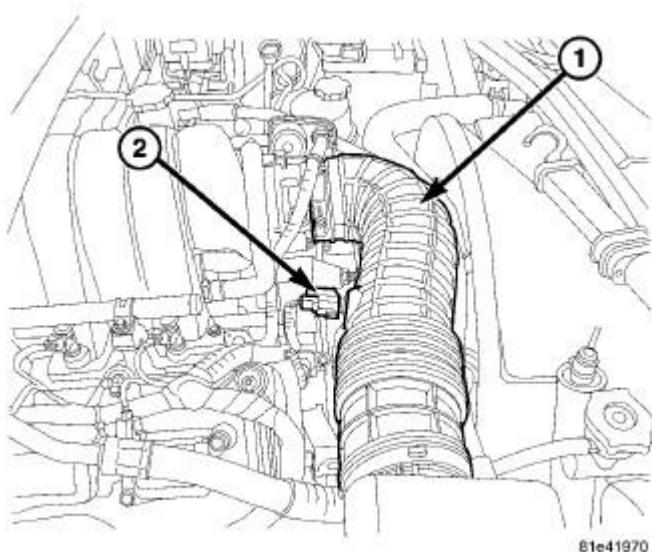


Fig. 193: INLET AIR HOSE
Courtesy of CHRYSLER LLC

1. Disconnect the Negative Battery cable from the batter.
2. Remove the engine oil dipstick.
3. Disconnect the Intake Air Temperature Sensor harness connector (2).
4. Remove the Inlet Air hose (1).
5. Raise the vehicle on a hoist and drain the engine oil.
6. Remove the front tires.
7. Remove the front axle assembly. Refer to **Differential and Driveline/Front Axle - C200FE - Removal** .

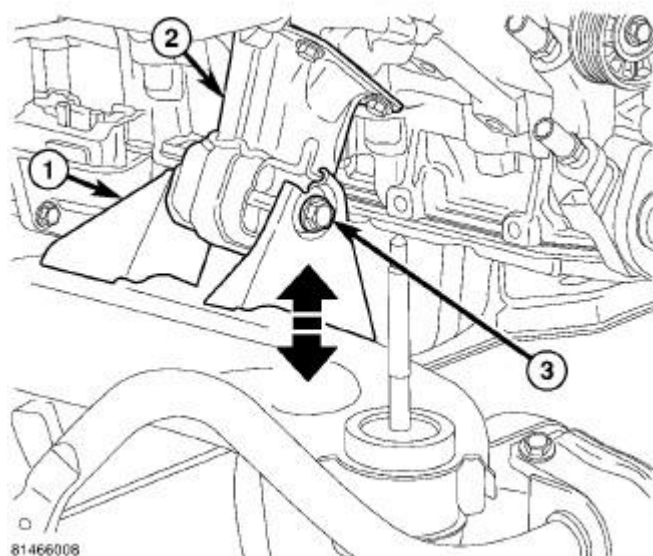


Fig. 194: ENGINE MOUNT BOLT

Courtesy of CHRYSLER LLC

8. Loosen the left and right side engine mount to frame bolts (3).

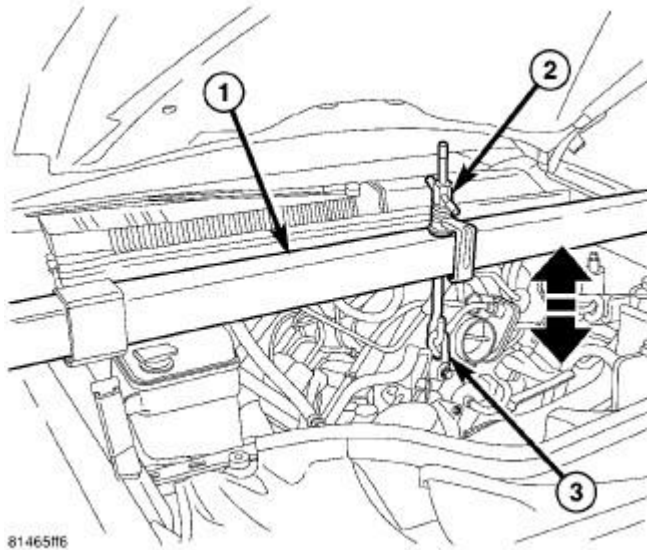


Fig. 195: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

9. Lower the vehicle.
10. Install the Engine Support Fixture 8534B (1) and connect the lifting adapter (2) to the water pump bolt stud (3). **Do not use the third leg.**
11. Raise engine using Engine Support Fixture 8534B (1) to provide clearance to remove engine oil pan.
12. Raise the vehicle.

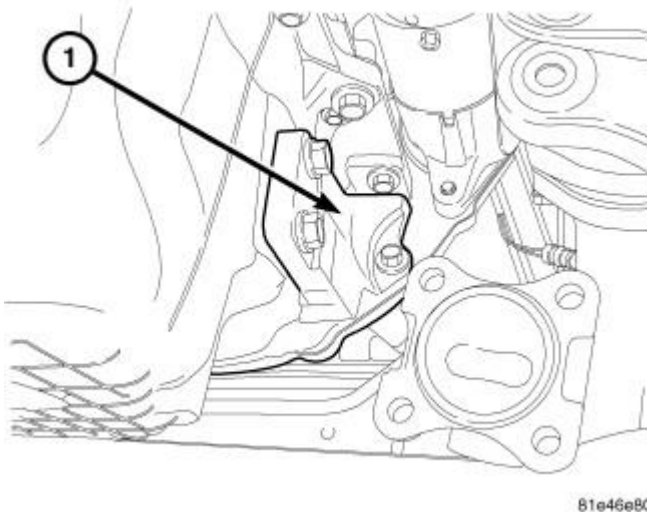


Fig. 196: STRUCTURAL DUST COVER

Courtesy of CHRYSLER LLC

13. Remove the structural dust cover. See Engine/Engine Block/COVER, Structural Dust - Removal.

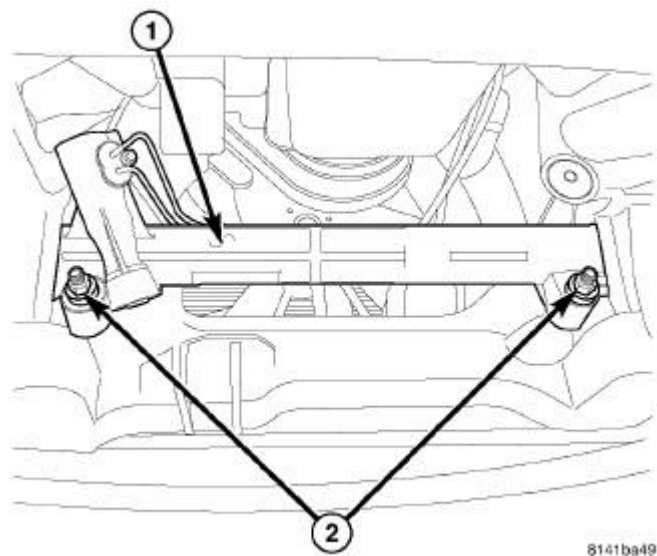


Fig. 197: GEAR MOUNTING BOLT

Courtesy of CHRYSLER LLC

14. Remove the steering gear to frame mounting bolts, and lower the gear. **Do not remove from vehicle, or disconnect hoses.**

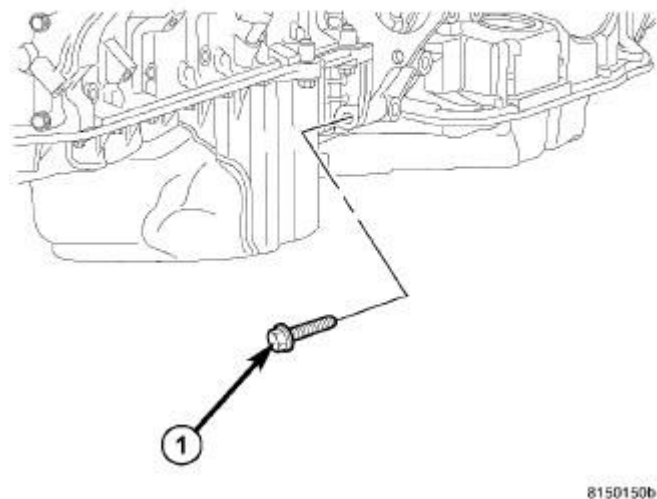


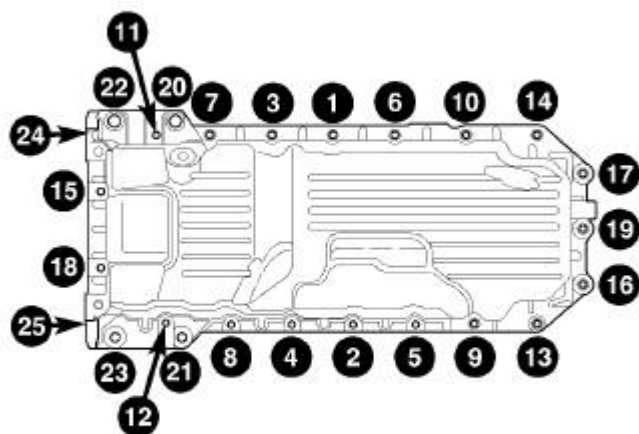
Fig. 198: OIL PAN TO TRANSMISSION BOLT

Courtesy of CHRYSLER LLC

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

NOTE: The horizontal M10 fasteners are 5 mm longer in length, and must be reinstalled in original locations.

15. Lower the engine wire harness and retainers from the oil pan bolts.
16. Lower the transmission cooler line retainers from the oil pan bolts.
17. Remove the M10 fasteners (1) (vertical and horizontal) from the rear of the oil pan to the transmission and engine.



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Fig. 199: Oil Pan Torque Sequence

Courtesy of CHRYSLER LLC

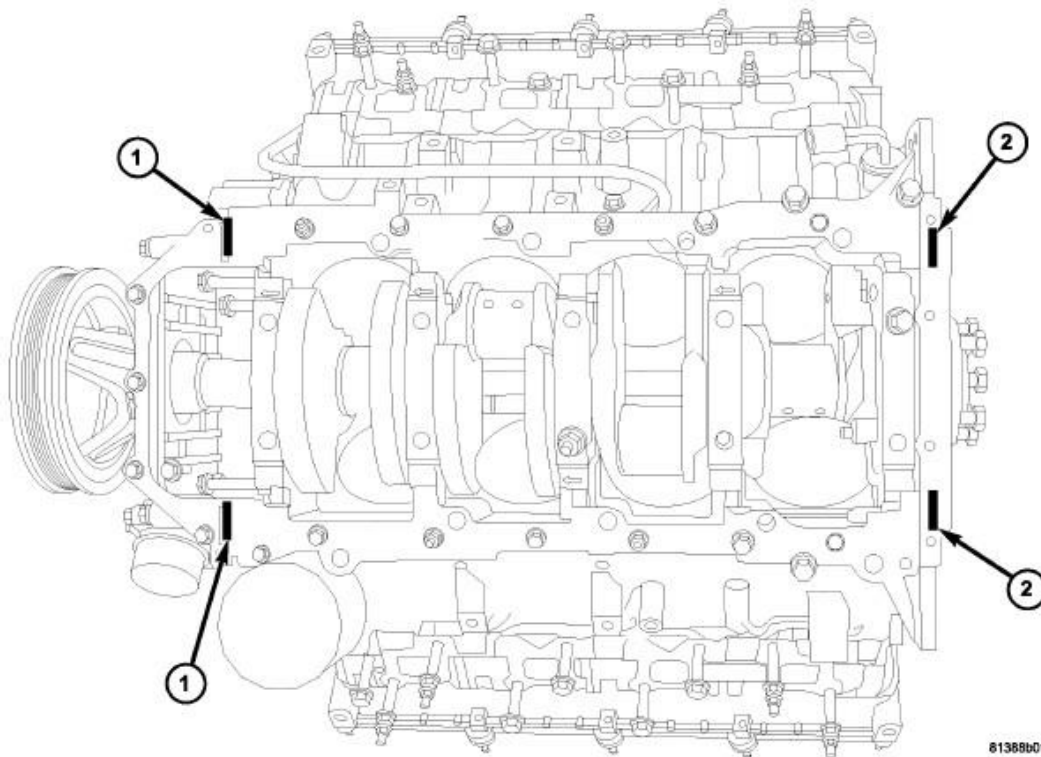
18. Remove the oil pan mounting bolts using the sequence provided, and oil pan.

NOTE: When the oil pan is removed, a new oil pan gasket/windage tray assembly must be installed. The old gasket cannot be reused.

19. Remove the engine oil pickup tube.
20. Discard the integral windage tray and gasket and replace.

Installation

INSTALLATION

**Fig. 200: T-JOINT RTV APPLICATION**

Courtesy of CHRYSLER LLC

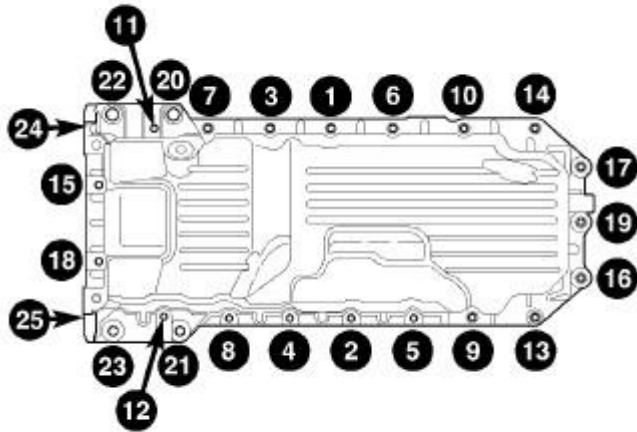
1. Clean the oil pan gasket mating surface of the block and oil pan.

NOTE: Mopar® Engine RTV must be applied to the 4 T-joints, (area where front cover, rear retainer, block, 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.

2. Apply Mopar® Engine RTV at the 4 T- joints.

NOTE: When the oil pan is removed, a new oil pan gasket/windage tray assembly must be installed. The old gasket cannot be reused.

3. Install a new oil pan gasket/windage tray assembly.
4. If removed, reinstall the oil pump pickup tube with new o-ring. Tighten tube to pump fasteners to 28 N.m (250 in. lbs).



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Fig. 201: Oil Pan Torque Sequence

Courtesy of CHRYSLER LLC

NOTE: The horizontal M10 fasteners are 5 mm longer in length, and must be reinstalled in original locations.

NOTE: New M6 fasteners must be used when reinstalling the oil pan. Do not reuse the old M6 fasteners.

5. Align the rear of the oil pan with the rear face of the engine block, and install the M10 and M6 oil pan fasteners finger tight. Using the following torque sequence, tighten the M6 mounting bolts to 5 N.m (44 in. lbs.).
6. Using the following torque sequence, tighten the M10 oil pan fasteners to 54 N.m (39 ft. lbs.).
7. Using the following torque sequence, tighten the M6 oil pan fasteners to 12 N.m (106 in. lbs.).

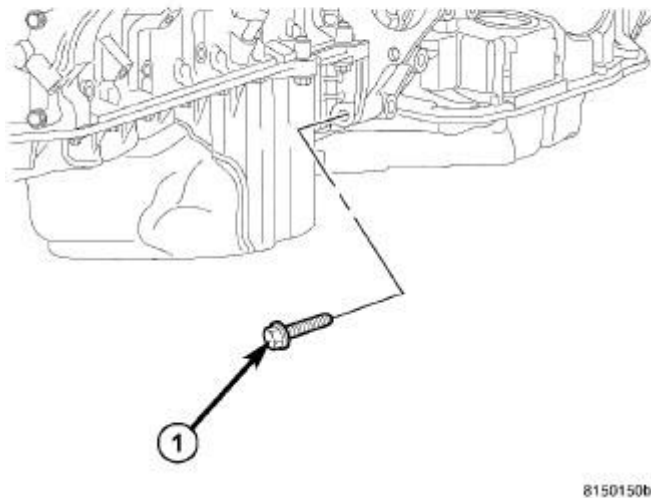


Fig. 202: OIL PAN TO TRANSMISSION BOLT
Courtesy of CHRYSLER LLC

8. Install both the left and right side oil pan to transmission bolts (1). Tighten the bolts to 54 N.m (39 ft. lbs.).

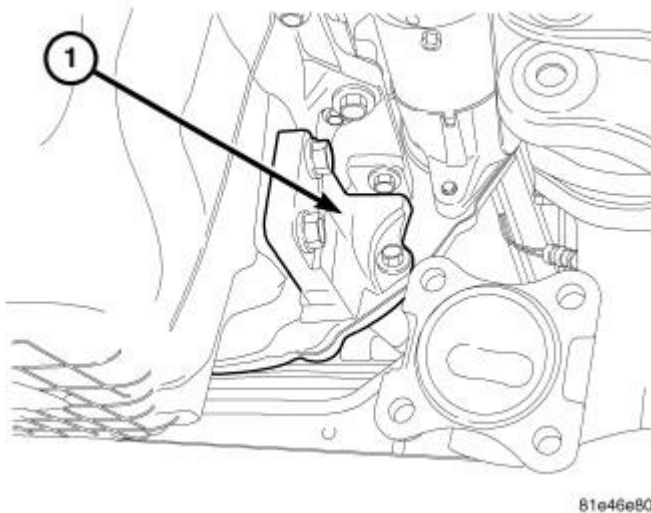


Fig. 203: STRUCTURAL DUST COVER
Courtesy of CHRYSLER LLC

9. Install the structural dust cover (1). See **Engine/Engine Block/COVER, Structural Dust - Installation.**
10. Install the engine oil filter, if removed.

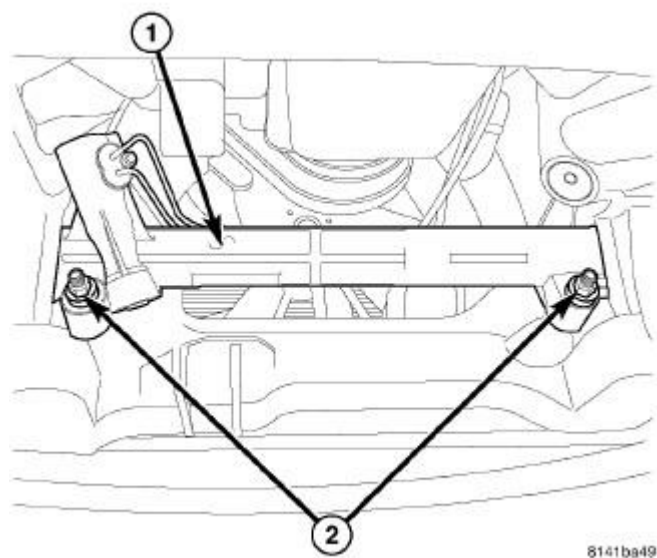


Fig. 204: GEAR MOUNTING BOLT
Courtesy of CHRYSLER LLC

11. Position the steering gear and install the Steering gear mounting nuts (2). Tighten to 244 N.m (180 ft. lbs.).

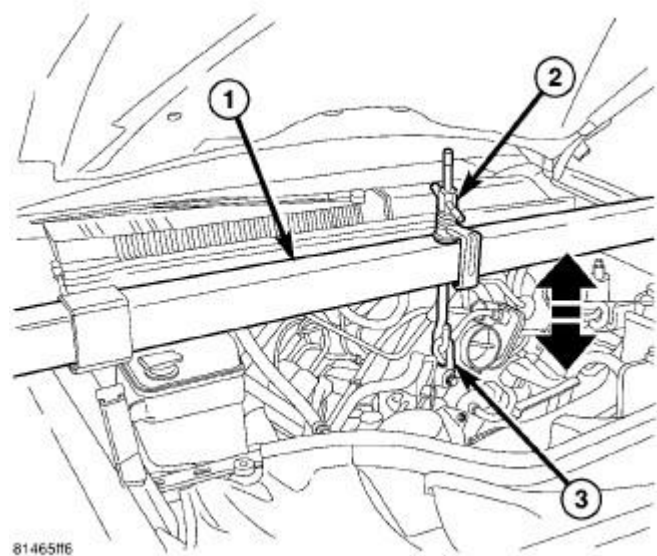


Fig. 205: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

12. Lower the vehicle.
13. Lower the engine into the mounts using the Engine Support Fixture 8534B (1).
14. Remove the Engine Support Fixture 8534B (1).

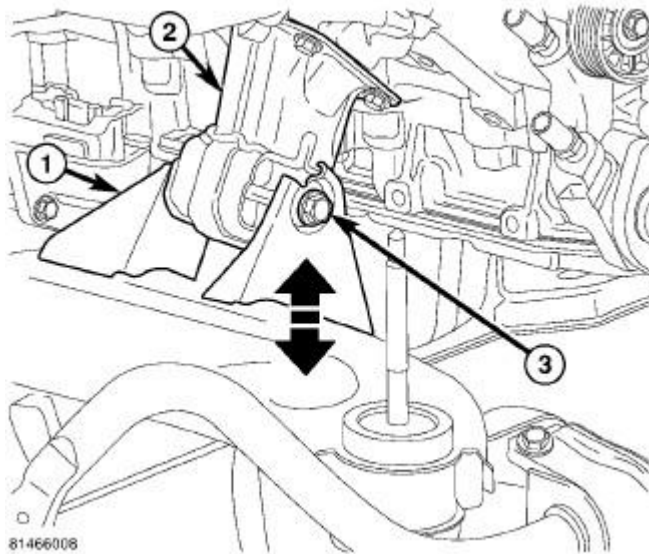


Fig. 206: ENGINE MOUNT BOLT
Courtesy of CHRYSLER LLC

15. Raise the vehicle.
16. Tighten both the left and right side engine mount bolts (3) and nuts. Tighten the bolts and nuts to 54 N.m (39 ft. lbs.).
17. Install the front axle. Refer to **Differential and Driveline/Front Axle - C200FE - Installation** .
18. Install the front tires.

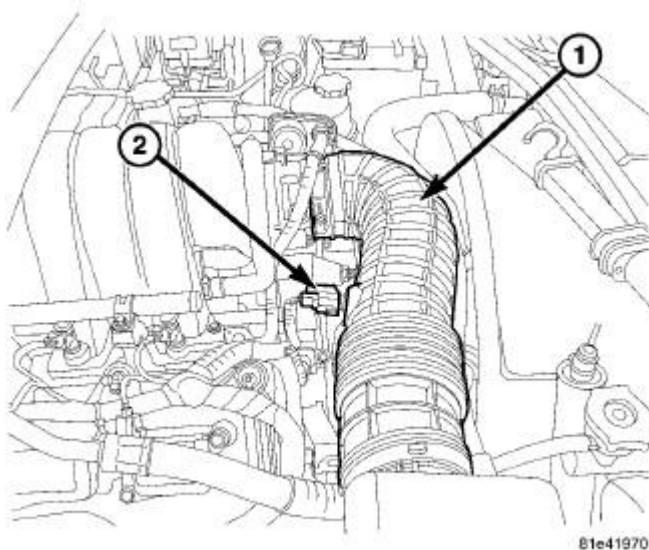


Fig. 207: INLET AIR HOSE
Courtesy of CHRYSLER LLC

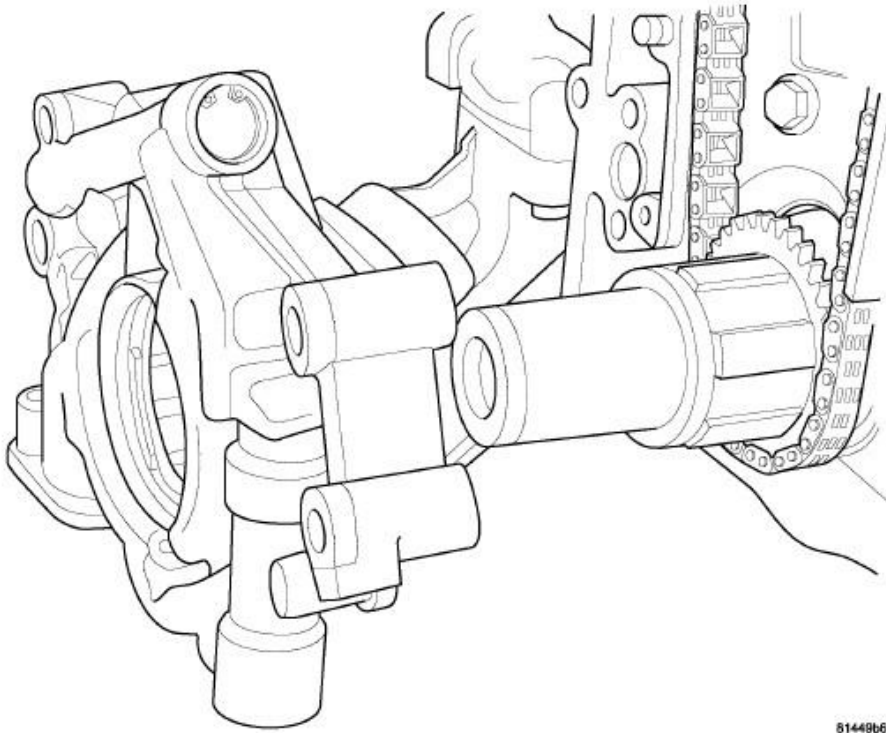
19. Lower the vehicle

20. Fill the engine oil.
21. Install the engine oil dipstick.
22. Install the Inlet Air hose (1).
23. Connect the Intake Air Temperature Sensor harness connector (2).
24. Reconnect the negative battery cable.
25. Start engine and check for leaks.
26. Turn the Ignition off and check the engine oil level.

PUMP, ENGINE OIL

Removal

REMOVAL



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Fig. 208: OIL PUMP REMOVAL/INSTALLATION
Courtesy of CHRYSLER LLC

1. Remove the oil pan and pick-up tube. See **Engine/Lubrication/PAN, Oil - Removal**.
2. Remove the timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Removal**.
3. Remove the four bolts, and the oil pump.

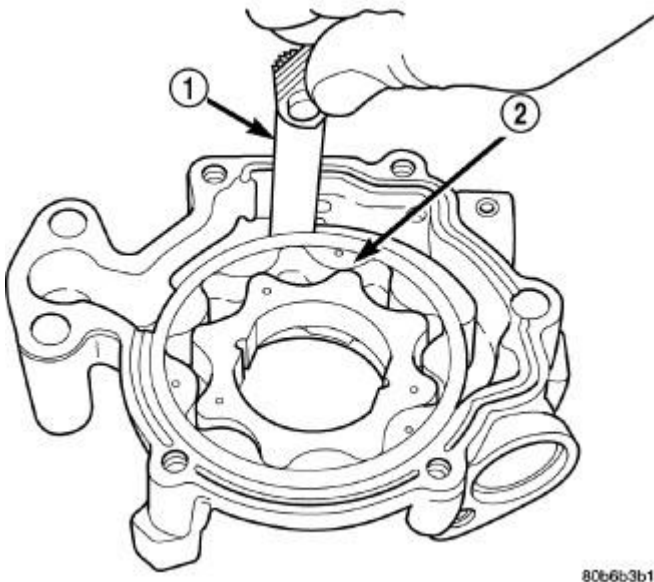
Cleaning

CLEANING

1. Wash all parts in a suitable solvent.

Inspection

INSPECTION



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Fig. 209: Measuring Outer Rotor Clearance in Housing
Courtesy of CHRYSLER LLC

1 - FEELER GAUGE
2 - OUTER ROTOR

CAUTION: The oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

1. Remove the pump cover.
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
3. Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor (2) and the body . If the measurement is 0.235 mm (0.009 in.) or more the oil pump assembly must be replaced.

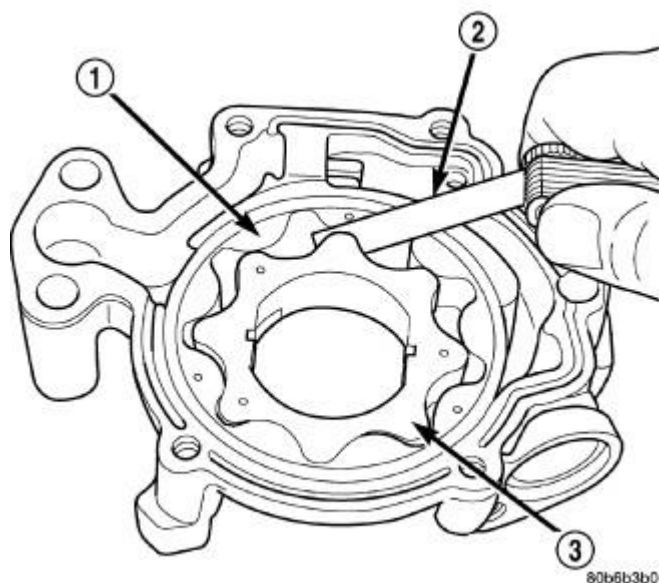


Fig. 210: Measuring Clearance Between Rotors
Courtesy of CHRYSLER LLC

1 -
OUTER
ROTOR
2 -
FEELER
GAUGE
3 -
INNER
ROTOR

4. Install the inner rotor in the into the oil pump body. Measure the clearance between the inner (3) and outer rotors (1) . If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.

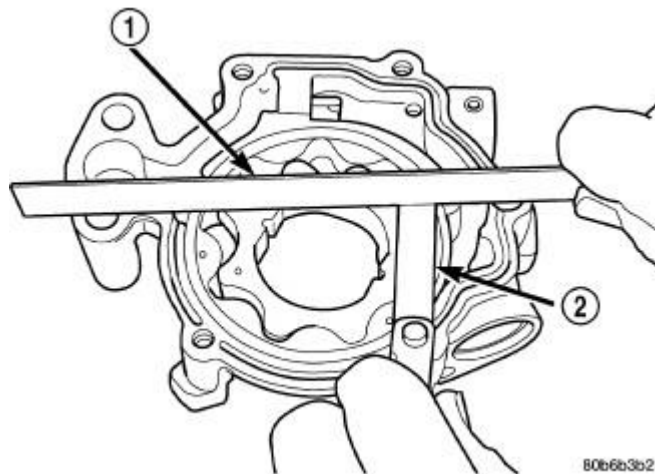


Fig. 211: Measuring Clearance Over Rotors

Courtesy of CHRYSLER LLC

1 - STRAIGHT EDGE
2 - FEELER GAUGE

5. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced .
6. Reinstall the pump cover. Tighten fasteners to 15 N.m (132 in. lbs.)

NOTE: The 6.1L Oil pump is released 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

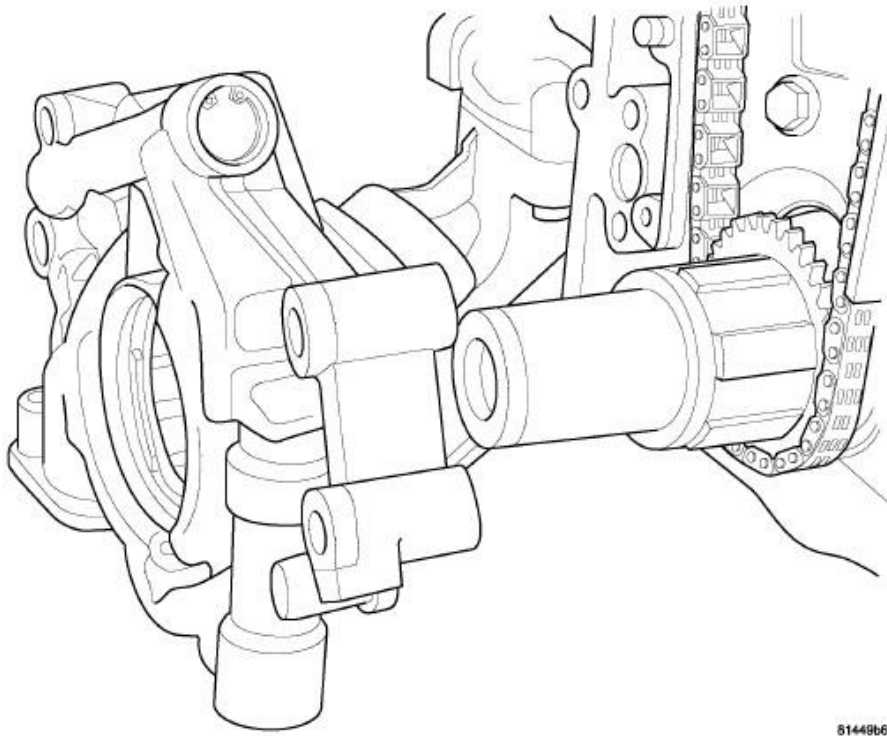


Fig. 212: OIL PUMP REMOVAL/INSTALLATION
 Courtesy of CHRYSLER LLC

1. Position the oil pump onto the crankshaft and install the 4 oil pump retaining bolts.
2. Tighten the oil pump retaining bolts to 28 N.m (250 in. lbs.).
3. Install the timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
4. Install the pick-up tube and oil pan. See **Engine/Lubrication/PAN, Oil - Installation.**

SENSOR, OIL PRESSURE

Description

DESCRIPTION

The oil pressure sensor uses the following three circuits:

- Signal circuit to the PCM
- Sensor ground circuit from the PCM
- 5 volt reference circuit from the PCM

The oil pressure sending unit 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.

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.

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

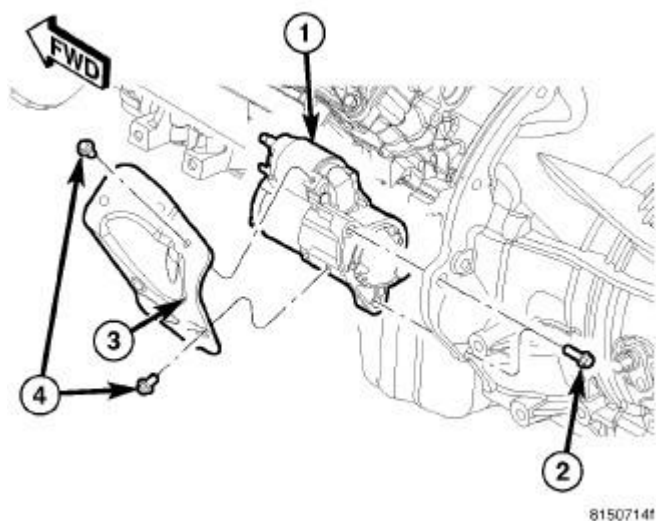
OPERATION

The exhaust manifolds collect the engine exhaust exiting the combustion chambers, then channels the exhaust gases to the exhaust pipes attached to the manifolds.

Removal

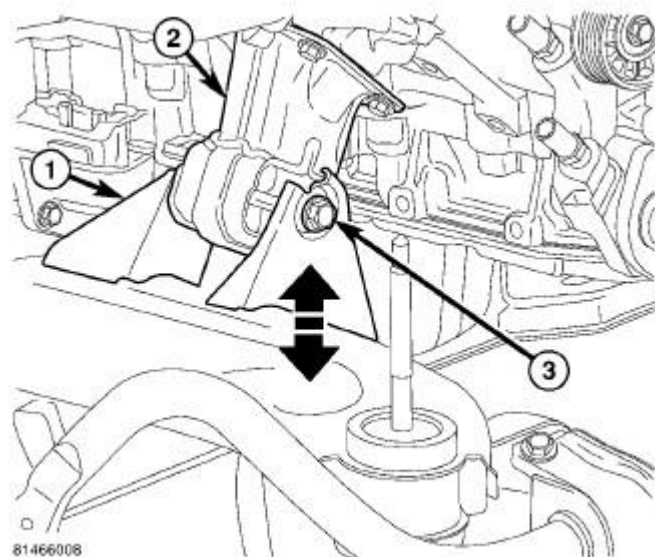
REMOVAL

EXHAUST MANIFOLD - LEFT SIDE

**Fig. 213: STARTER**

Courtesy of CHRYSLER LLC

1. Remove air cleaner housing.
2. Disconnect negative battery cable.
3. Remove exhaust pipe to manifold bolts, remove pipe.
4. Remove starter (1) and heat shield (3).
5. Remove knock sensor.

**Fig. 214: ENGINE MOUNT BOLT**

Courtesy of CHRYSLER LLC

6. Remove the front propeller shaft at the front axle, and position out of the way. Refer to **Differential and**

Driveline/Propeller Shaft/SHAFT, Drive - Removal .

7. Remove both left and right side engine mount to frame bolts (3).

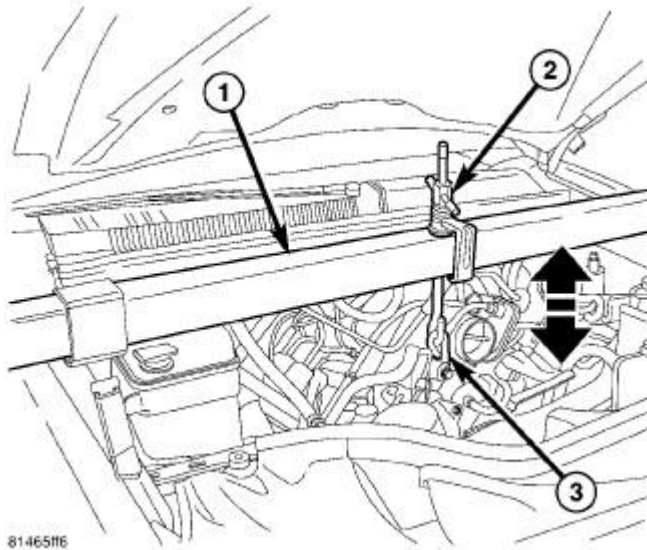


Fig. 215: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

8. Install engine support fixture special tool 8534B (1). **Do not use the third leg.**
9. Raise engine using special tool 8534B to provide clearance to remove the exhaust manifold.

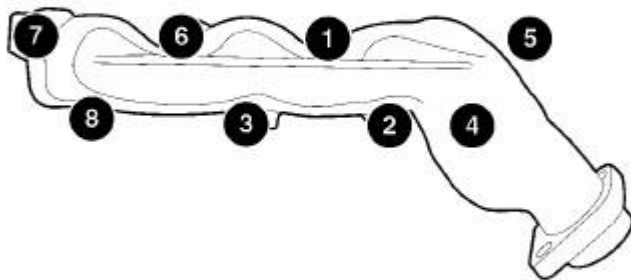
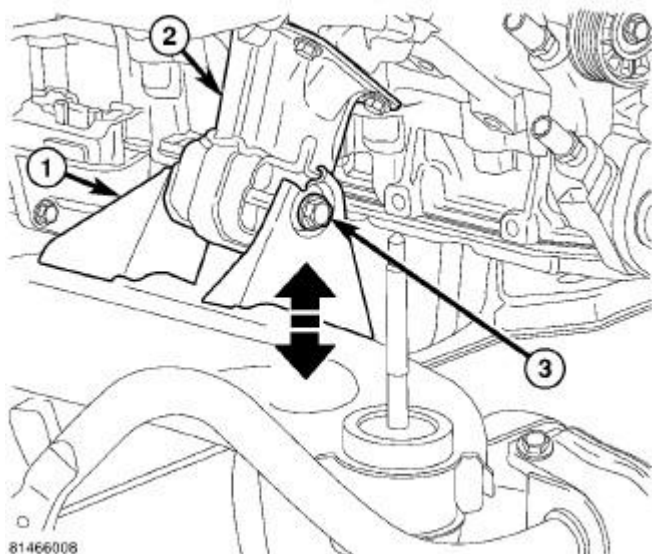


Fig. 216: EXHAUST MANIFOLD TORQUE LEFT
Courtesy of CHRYSLER LLC

10. Remove the top row of bolts from manifold from under the hood.
11. Remove the bottom row of bolts from manifold from under vehicle.
12. Remove manifold from under vehicle.

EXHAUST MANIFOLD - RIGHT SIDE**Fig. 217: ENGINE MOUNT BOLT****Courtesy of CHRYSLER LLC**

1. Disconnect negative battery cable.
2. Remove exhaust pipe to manifold bolts, remove pipe.
3. Remove knock sensor.
4. Remove both left and right side engine mount to frame bolts (3).

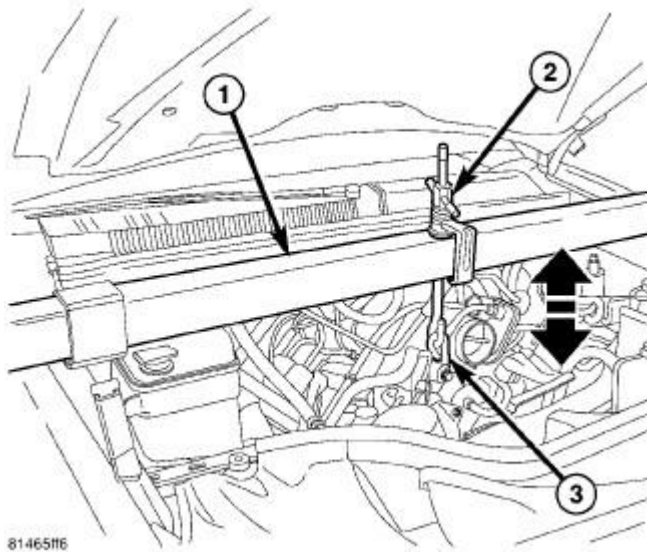


Fig. 218: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

5. Install engine support fixture special tool 8534B (1). **Do not use the third leg.**
6. Raise engine using special tool 8534B to provide clearance to remove the exhaust manifold.

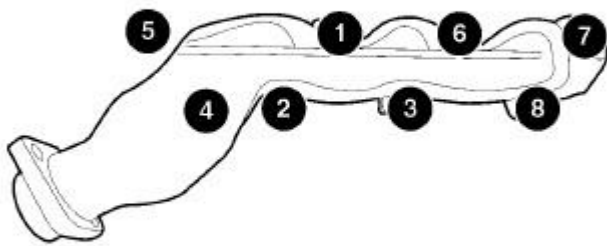


Fig. 219: EXHAUST MANIFOLD TORQUE RIGHT
Courtesy of CHRYSLER LLC

7. Remove the top row of bolts from manifold from under the hood.
8. Remove the bottom row of bolts from manifold from under vehicle.

9. Remove the manifold from under vehicle.

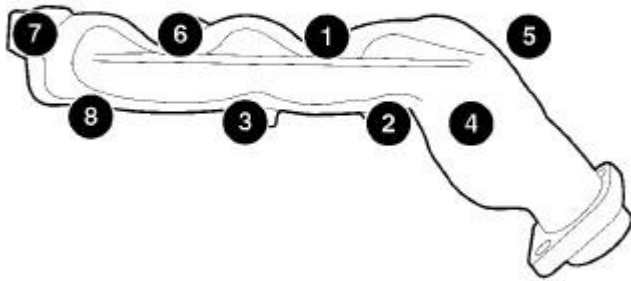
Cleaning**CLEANING**

Clean mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

Inspection**INSPECTION**

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straight edge. Gasket surfaces must be flat within 0.375 mm (0.0147 in.) around each port opening, and 0.75 mm (0.0295 in.) overall.

Installation**INSTALLATION****EXHAUST MANIFOLD - LEFT SIDE**

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Fig. 220: EXHAUST MANIFOLD TORQUE LEFT
Courtesy of CHRYSLER LLC

1. Install manifold gasket and manifold.
2. Install manifold bolts and tighten to 31 N.m (23 ft. lbs.) using the sequence provided.

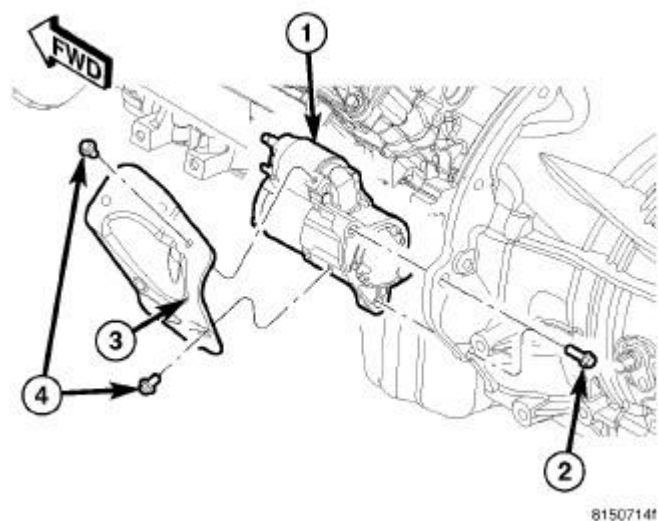


Fig. 221: STARTER

Courtesy of CHRYSLER LLC

3. Install the knock sensor.
4. Install starter (1) and heat shield (3).

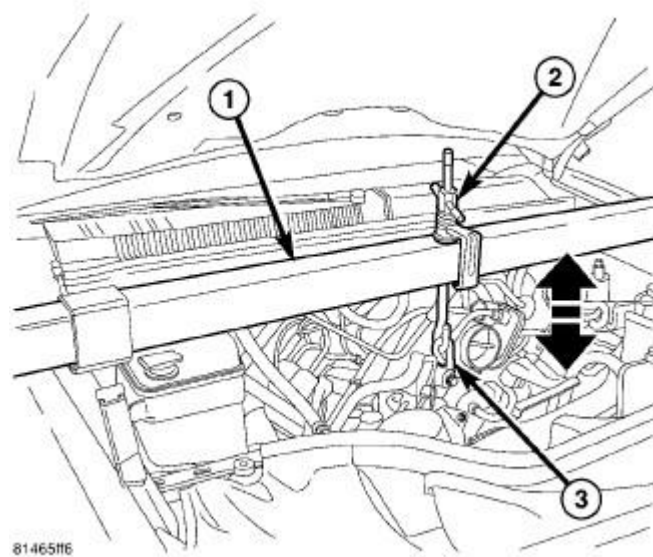


Fig. 222: ENGINE SUPPORT TOOL

Courtesy of CHRYSLER LLC

5. Lower the engine using Engine Support 8534B (1).

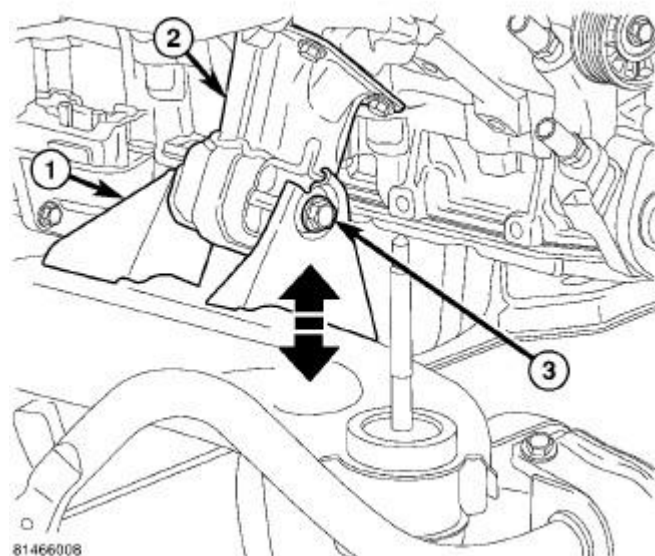


Fig. 223: ENGINE MOUNT BOLT
Courtesy of CHRYSLER LLC

6. Install both left and right side engine mount to frame bolts (3).

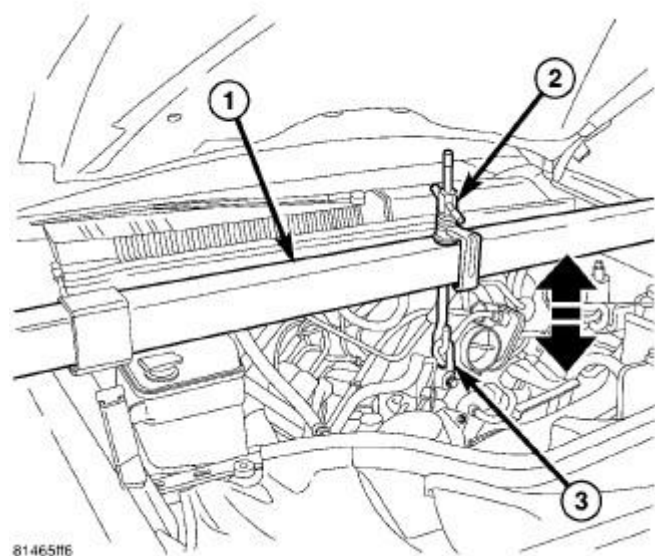
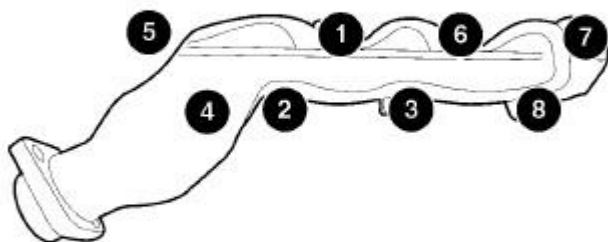


Fig. 224: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

7. Remove Engine Support fixture 8534B (1).
8. Install the front propeller shaft. Refer to **Differential and Driveline/Propeller Shaft/SHAFT, Drive - Installation**
9. Install the exhaust pipe to manifold bolts.
10. Reconnect negative battery cable.

EXHAUST MANIFOLD - RIGHT SIDE



815d0278

Fig. 225: EXHAUST MANIFOLD TORQUE RIGHT
Courtesy of CHRYSLER LLC

1. Install manifold gasket and manifold.
2. Install manifold bolts and tighten to 31 N.m (23 ft. lbs.) using the sequence provided.

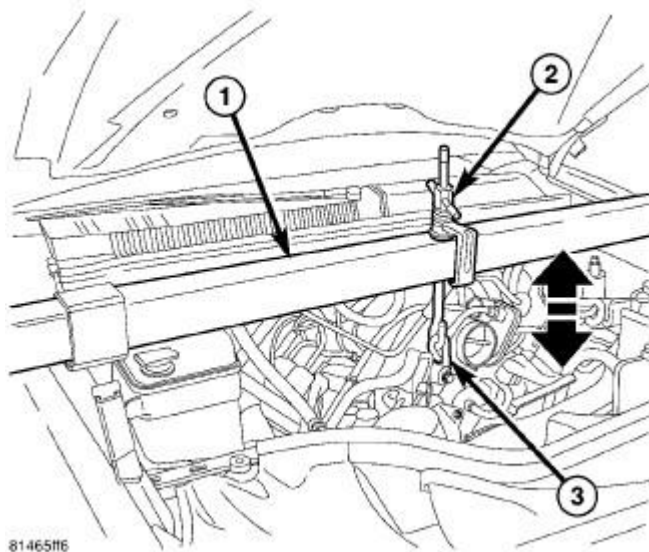


Fig. 226: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

3. Lower the engine using Engine Support Fixture 8534B (1).

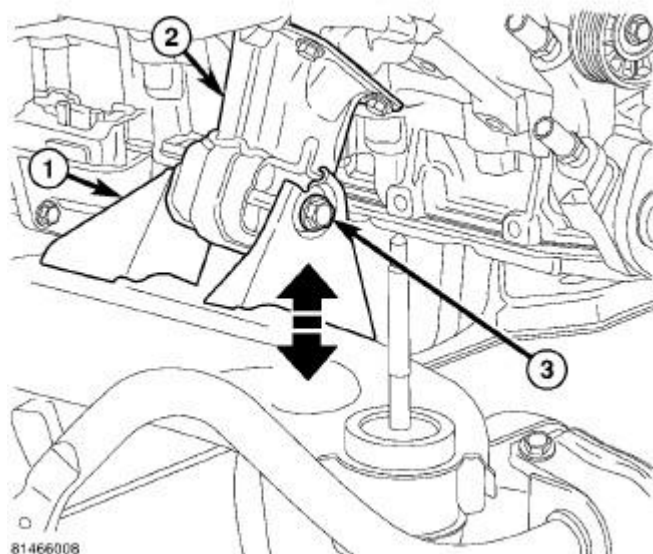


Fig. 227: ENGINE MOUNT BOLT
Courtesy of CHRYSLER LLC

4. Install both left and right side engine mount to frame bolts (3).

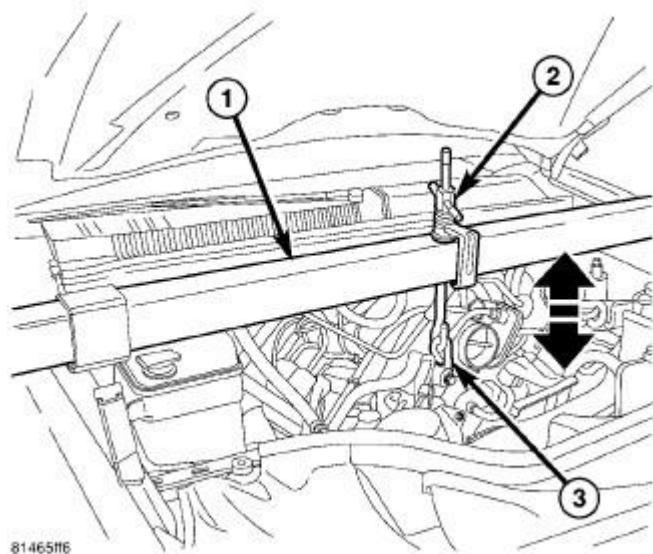


Fig. 228: ENGINE SUPPORT TOOL
Courtesy of CHRYSLER LLC

5. Remove Engine Support Fixture 8534B (1).
6. Install the air cleaner housing.
7. Install the knock sensor.

8. Install the exhaust pipe to manifold bolts.
9. Reconnect negative battery cable.

MANIFOLD, INTAKE

Description

DESCRIPTION

The intake manifold is made of aluminum, and features runners to maximize power. The intake manifold uses single plane sealing which consist of two edge molded gaskets to prevent leaks.

Diagnosis and Testing

INTAKE MANIFOLD LEAKAGE

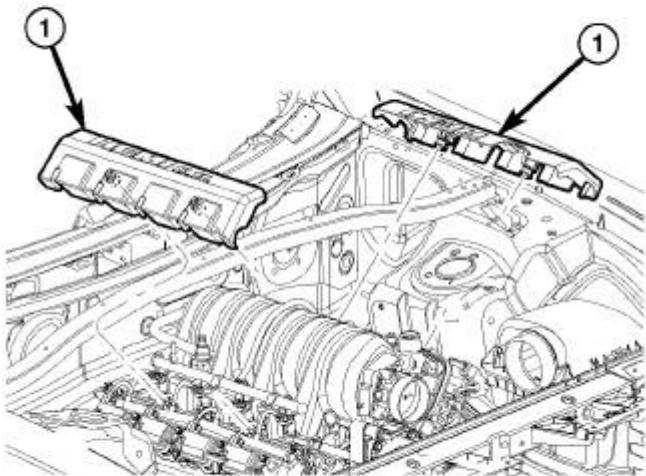
An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

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



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Fig. 229: Engine Covers

Courtesy of CHRYSLER LLC

1. Remove the engine covers (1), they snap off of the fuel rail ball studs.

WARNING: The fuel system is under constant pressure even with engine off.
Before servicing the fuel rail, fuel system pressure must be released.

2. Perform the fuel pressure release procedure. Refer to Fuel System/Fuel Delivery - Standard Procedure.
3. Disconnect and isolate the negative battery cable.

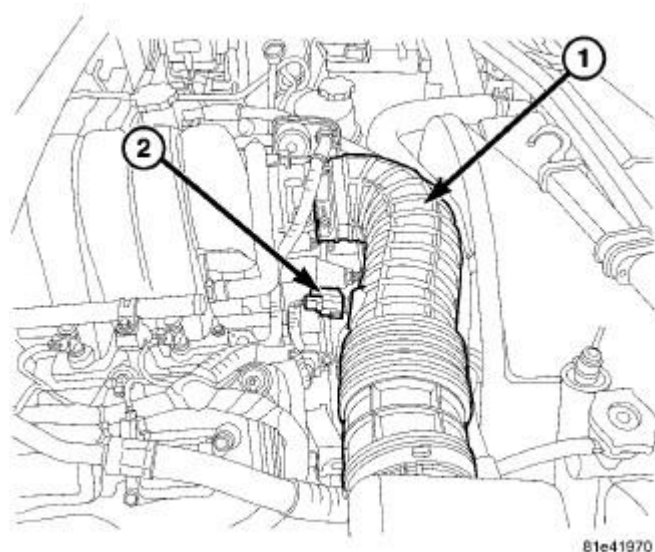


Fig. 230: INLET AIR HOSE
Courtesy of CHRYSLER LLC

4. Disconnect the intake air temperature (IAT) sensor connector (2).
5. Remove the clean air tube (1).

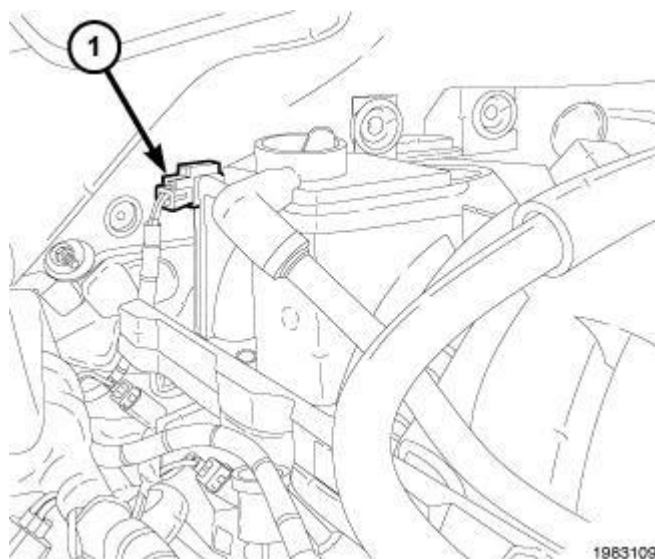


Fig. 231: MAP Sensor
Courtesy of CHRYSLER LLC

6. Disconnect the manifold air pressure (MAP) sensor connector (1) located at the back of the intake manifold.
7. Disconnect the throttle body electrical connector.

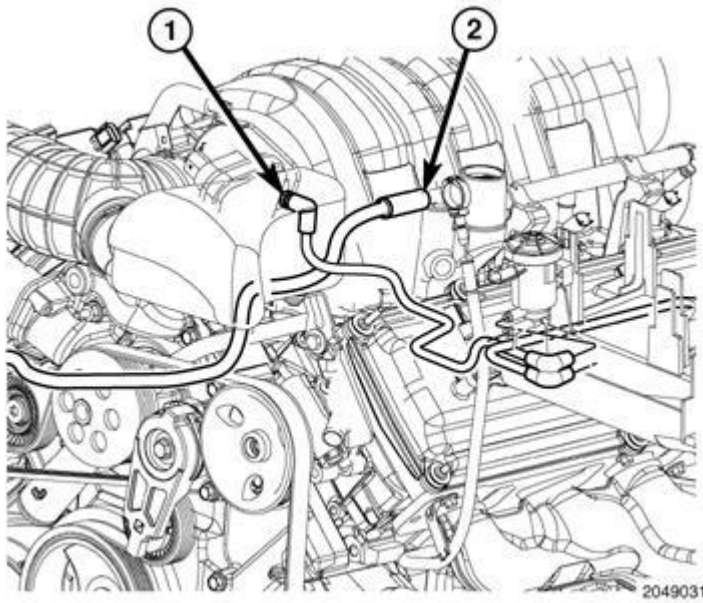


Fig. 232: Vapor Purge Vacuum Hose
Courtesy of CHRYSLER LLC

8. Disconnect the brake booster vacuum hose, vapor purge vacuum hose (2), and the Make Up Air (MUA) hose (1) to the Intake manifold.

NOTE: The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If the harness is not tagged, note wiring location before removal.

9. Disconnect the fuel injector electrical connectors.

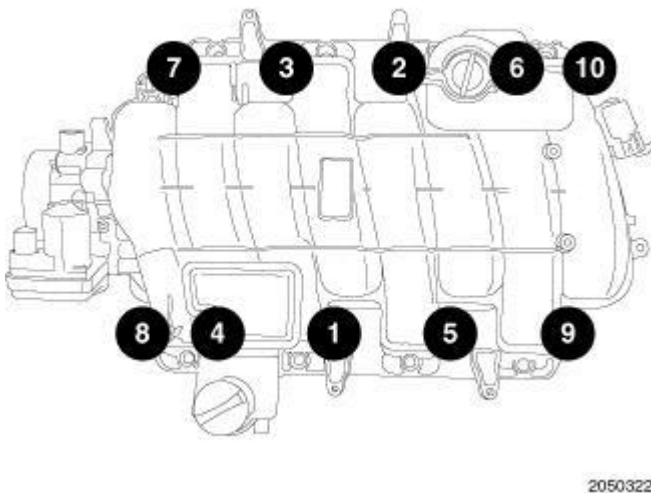


Fig. 233: Intake Manifold Retaining Fasteners Sequence
Courtesy of CHRYSLER LLC

10. Using the sequence shown in illustration, remove the intake manifold retaining fasteners.
11. Remove the intake manifold and throttle body as an assembly.

Cleaning

CLEANING

NOTE: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

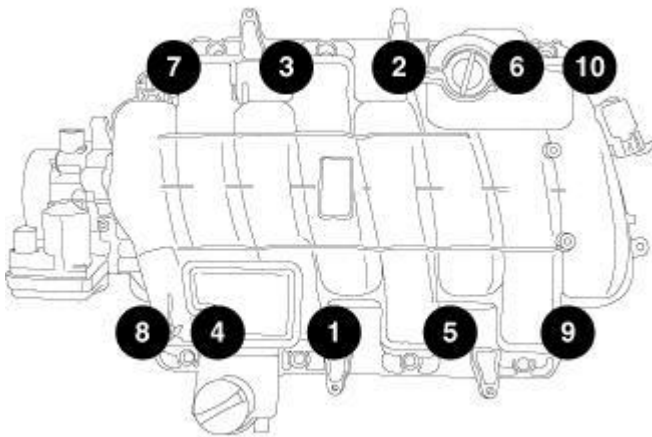
Inspection

INSPECTION

1. Inspect the intake sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.

Installation

INSTALLATION



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Fig. 234: Intake Manifold Retaining Fasteners Sequence
Courtesy of CHRYSLER LLC

1. Install the intake manifold seals.
2. Carefully position the intake manifold without disturbing the seals.
3. Apply Mopar® Lock & Seal Adhesive to the intake manifold retaining bolts.
4. Using the sequence shown in illustration, install the intake manifold retaining bolts and tighten to 12 N.m

(9 ft. lbs).

NOTE: The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If the harness was not tagged, note the wiring location previously marked before removal.

5. Connect the fuel injector electrical connectors.

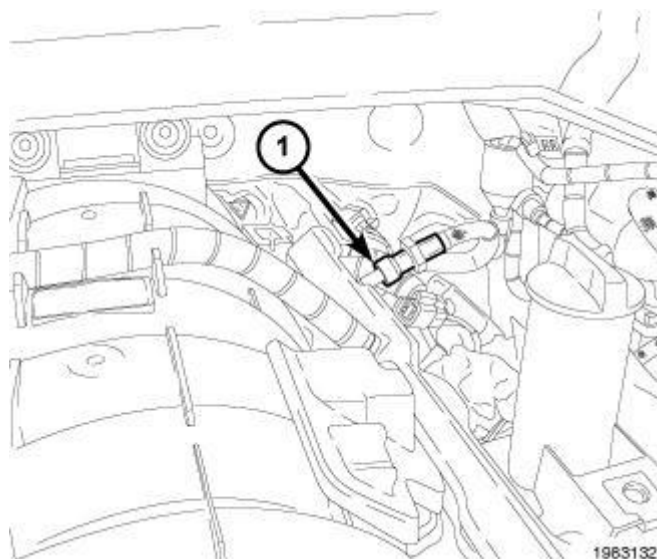


Fig. 235: Fuel Supply Line Quick Connect Fitting At Fuel Rail
Courtesy of CHRYSLER LLC

6. Connect the fuel supply line quick connect fitting (1) at the fuel rail and install the safety retainer clip.

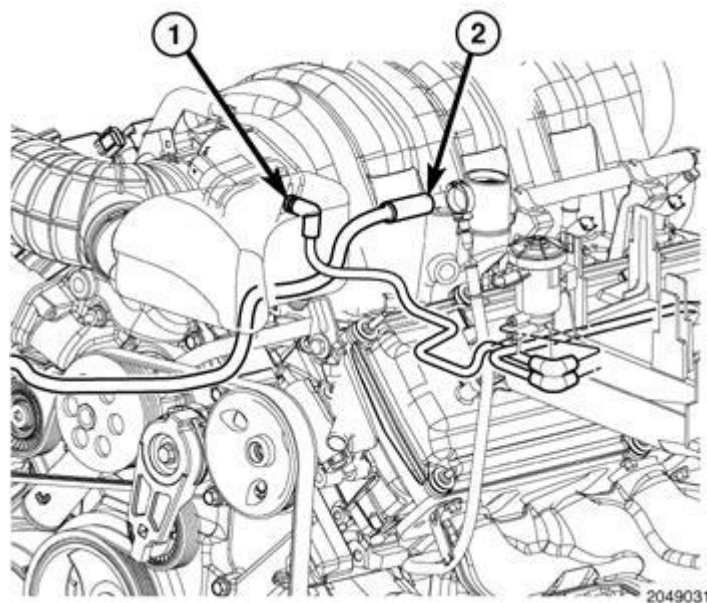


Fig. 236: Vapor Purge Vacuum Hose
Courtesy of CHRYSLER LLC

7. Connect the brake booster vacuum hose, vapor purge vacuum hose (2), and the Make Up Air (MUA) hose (1).

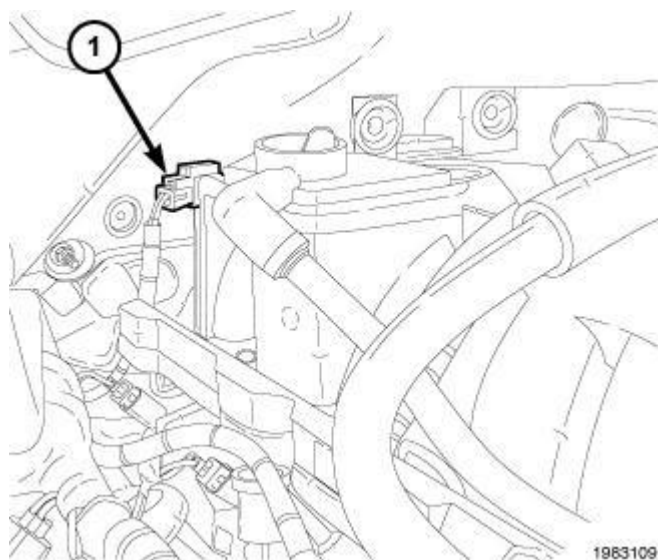


Fig. 237: MAP Sensor
Courtesy of CHRYSLER LLC

8. Connect the manifold air pressure (MAP) sensor connector (1) located at the back of the intake manifold.
9. Connect the throttle body electrical connector.

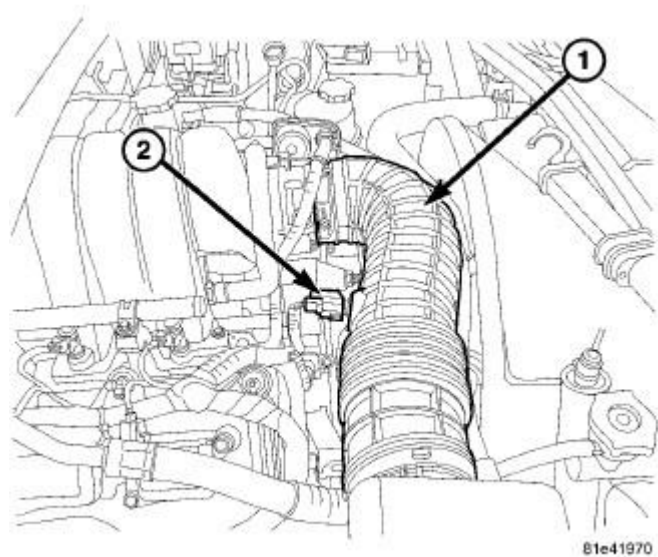
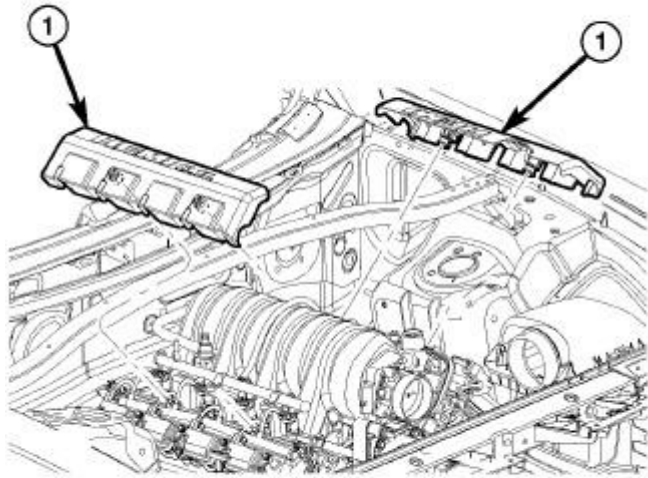


Fig. 238: INLET AIR HOSE
Courtesy of CHRYSLER LLC

10. Install the clean air tube (1).
11. Connect the intake air temperature (IAT) sensor connector (2).



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Fig. 239: Engine Covers
Courtesy of CHRYSLER LLC

12. Install the engine covers (1), they snap on the fuel rail ball studs (2).
13. Connect the negative battery cable.

VALVE TIMING

CHAIN AND SPROCKETS, TIMING

Removal

REMOVAL

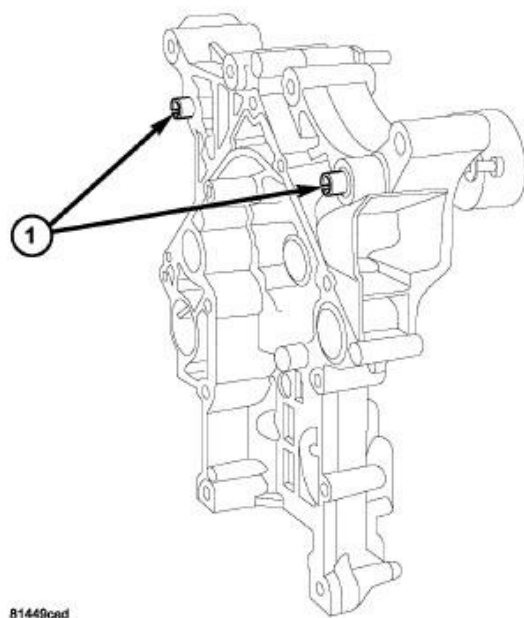


Fig. 240: FRONT COVER SLIDE BUSHINGS
Courtesy of CHRYSLER LLC

1. Disconnect the negative battery cable.
2. Drain the cooling system.
3. Remove the timing chain cover. See Engine/Valve Timing/COVER(S), Engine Timing - Removal.
4. Verify the slide bushings (1) remain installed in the timing chain cover during removal.

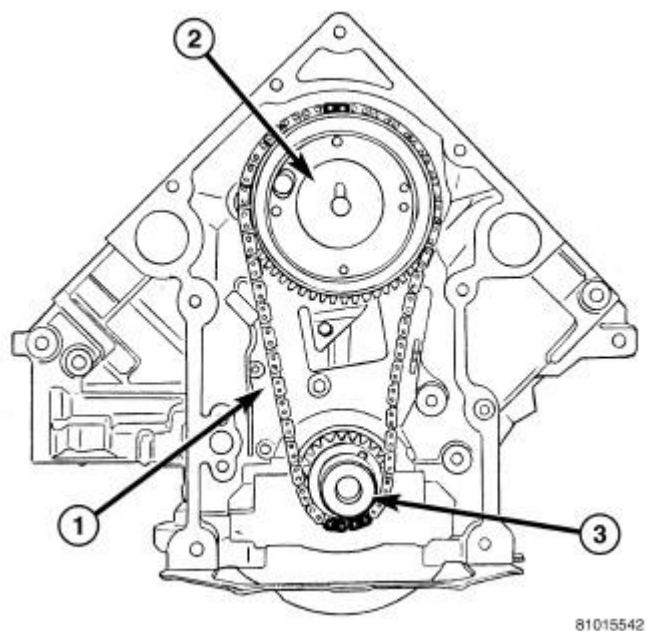


Fig. 241: Timing Mark Alignment

Courtesy of CHRYSLER LLC

5. Install the vibration damper bolt finger tight. Using a suitable socket and breaker bar, rotate the crankshaft to align the timing chain plated links with the timing marks on the sprockets as shown in illustration.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00 (2). The crankshaft keyway must be clocked at 2:00 (3). The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

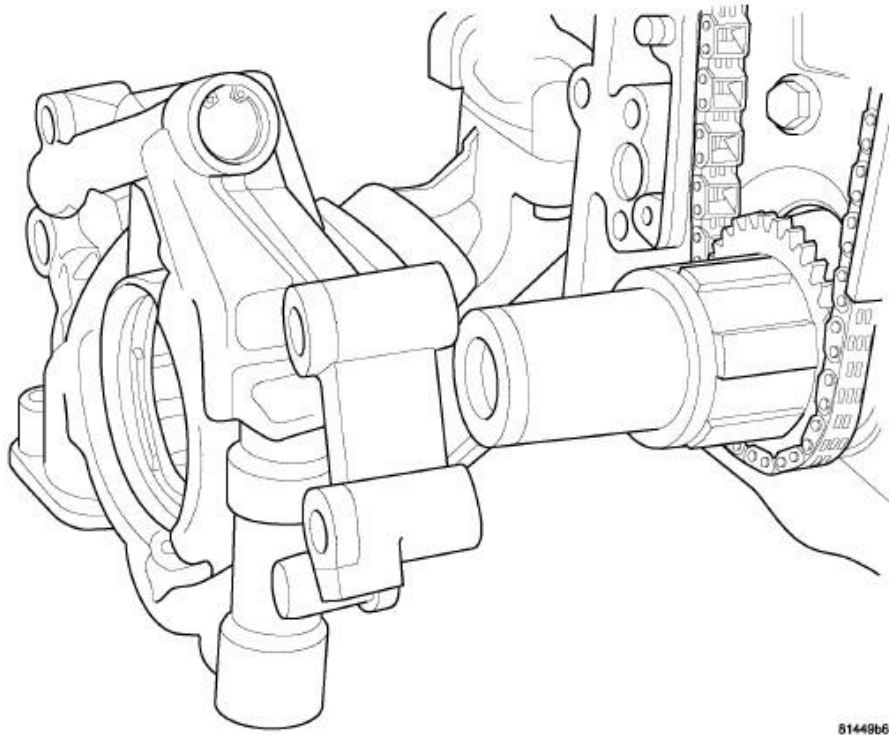


Fig. 242: Removing/Installing Oil Pump
Courtesy of CHRYSLER LLC

6. Remove the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Removal.**

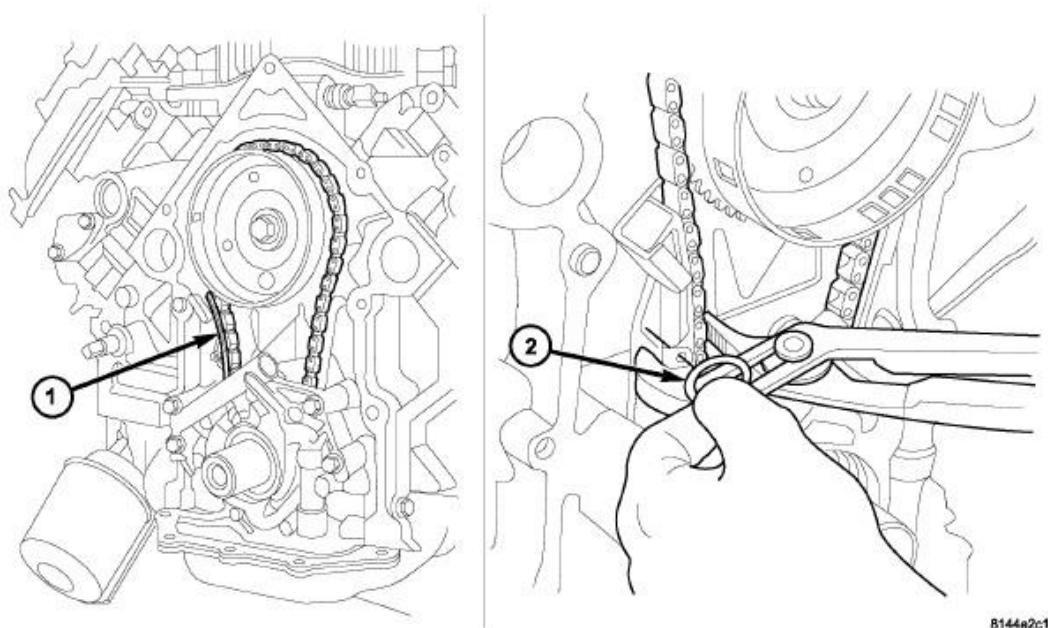


Fig. 243: RETRACTING TENSIONER
Courtesy of CHRYSLER LLC

7. Retract the chain tensioner arm (1) until the hole in the arm lines up with the hole in the bracket (2).

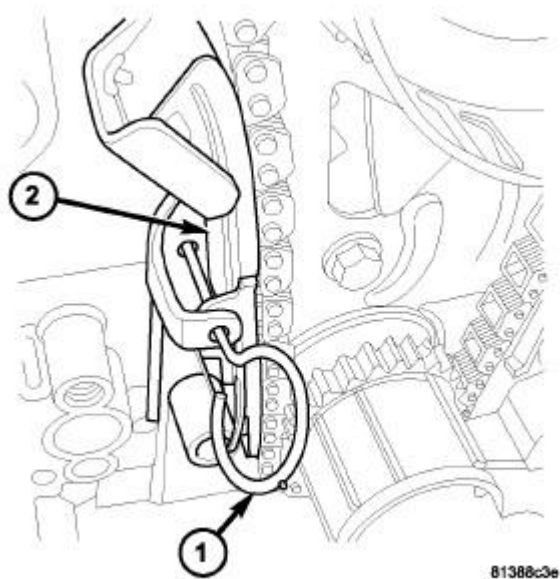


Fig. 244: TENSIONER PIN
Courtesy of CHRYSLER LLC

8. Install the Tensioner Pin 8514 (1) into the holes in the chain tensioner (2).

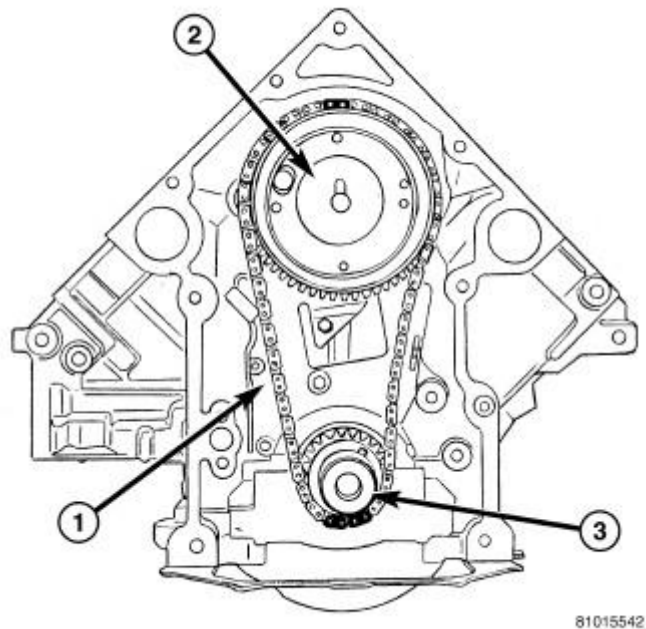


Fig. 245: Timing Mark Alignment
Courtesy of CHRYSLER LLC

9. Remove the camshaft sprocket retaining bolt and remove the timing chain with the camshaft and crankshaft sprockets (2, 3).

NOTE: **Inspect the timing chain tensioner and timing chain guide shoes for wear and replace as necessary.**

10. If the timing chain tensioner (1) is being replaced, remove the retaining bolts and remove the chain tensioner.
11. If the timing chain guide is being replaced, remove the retaining bolts and remove the timing chain guide.

Installation

INSTALLATION

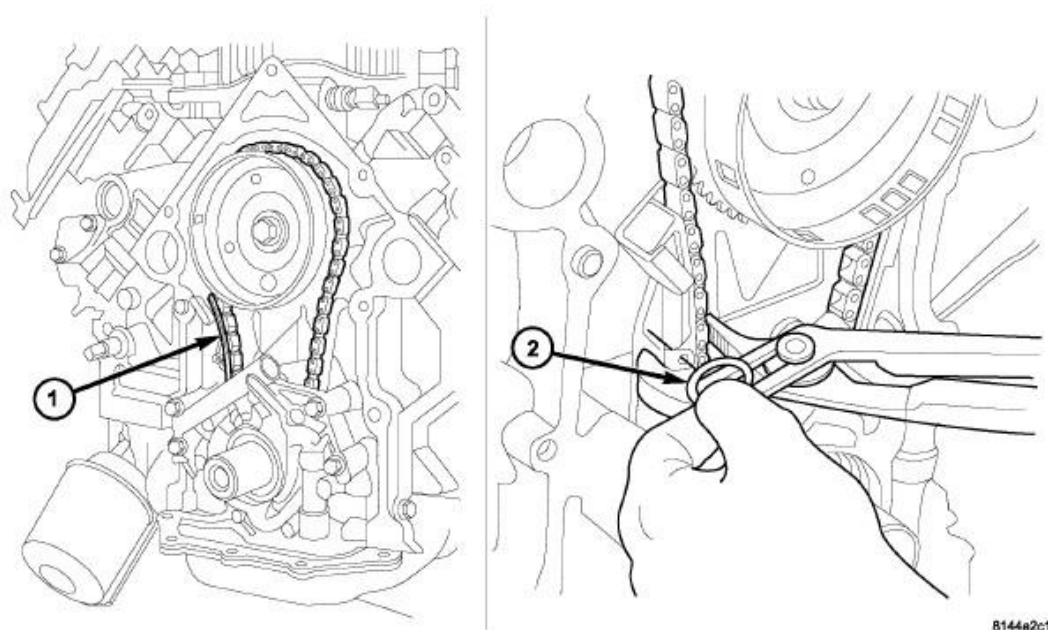


Fig. 246: RETRACTING TENSIONER
Courtesy of CHRYSLER LLC

1. If removed, install the timing chain guide and tighten bolts to 28 N.m (21 ft. lbs.).
2. If removed, install the timing chain tensioner (1) and tighten bolts to 28 N.m (21 ft. lbs.).
3. If required, retract the chain tensioner arm and install the Tensioner Pin 8514 (2) into the holes of the chain tensioner.

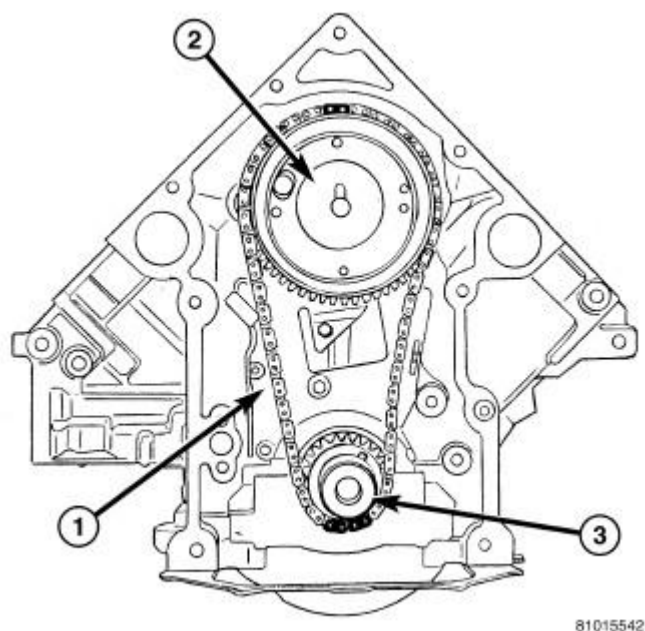


Fig. 247: TIMING MARK ALIGNMENT

Courtesy of CHRYSLER LLC

CAUTION: The timing chain must be installed with the single plated link aligned with the dot and or paint marking on the camshaft sprocket. The crankshaft sprocket is aligned with the dot and or paint marking on the sprocket between two plated timing chain links.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

4. Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft bores.
5. Place timing chain around both sprockets with timing marks aligned with the plated links.
6. Lift the sprockets and chain keeping sprockets tight against the chain in the position as shown in illustration).
7. Position both sprockets (2, 3) onto their respective shafts and verify alignment of timing marks.
8. Install the camshaft sprocket retaining bolt and tighten to 122 N.m (90 ft. lbs.).

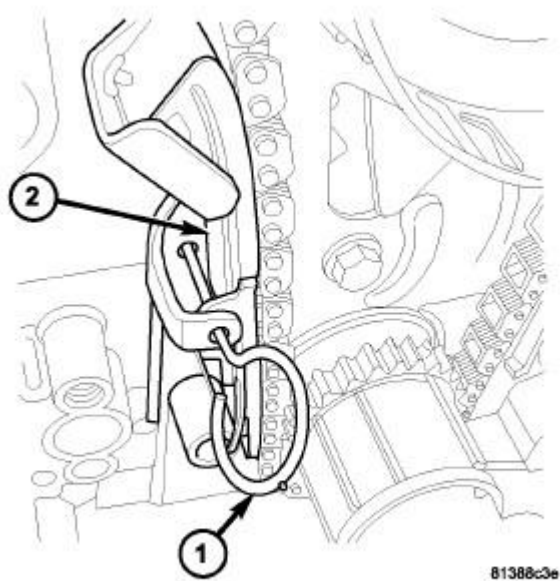
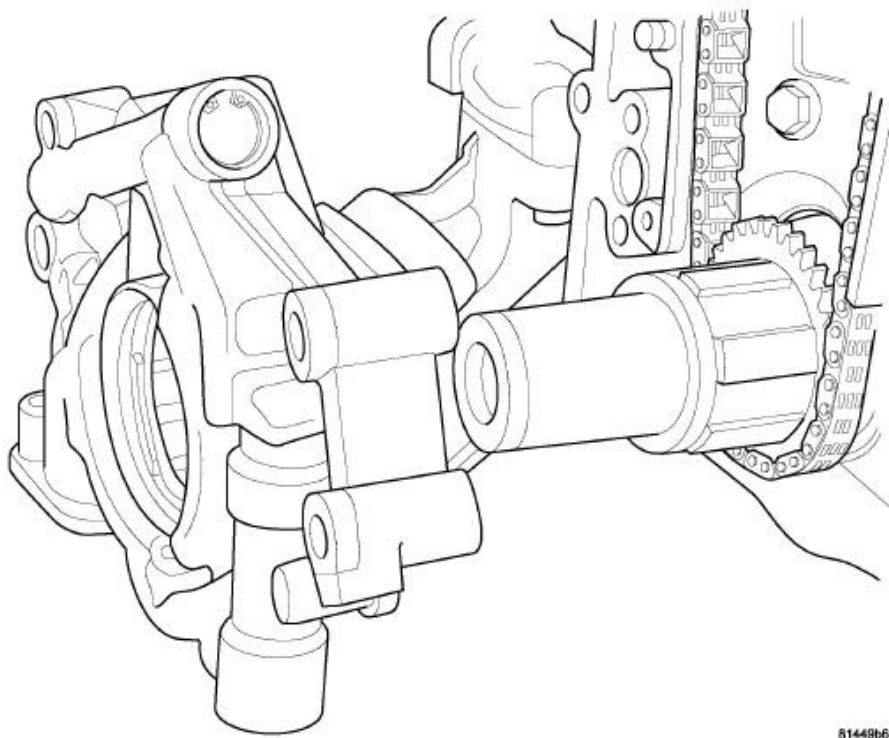


Fig. 248: TENSIONER PIN
Courtesy of CHRYSLER LLC

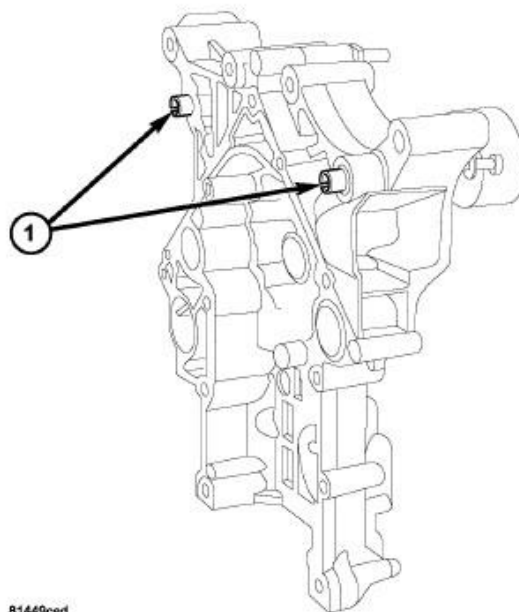
9. Remove the Tensioner Pin 8514 (1).
10. Rotate the crankshaft two revolutions and verify the alignment of the timing marks. If the timing marks do not line up, remove the camshaft sprocket and realign.



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Fig. 249: Removing/Installing Oil Pump
Courtesy of CHRYSLER LLC

11. Install the oil pump. See **Engine/Lubrication/PUMP, Engine Oil - Installation**.



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Fig. 250: FRONT COVER SLIDE BUSHINGS
Courtesy of CHRYSLER LLC

12. Verify the slide bushings (1) are installed in the timing chain cover.
13. Install the timing chain cover. See **Engine/Valve Timing/COVER(S), Engine Timing - Installation.**
14. Fill the engine with oil.
15. Fill the cooling system. Refer to **Cooling - Standard Procedure**
16. Connect the negative battery cable.
17. Start the engine and check for leaks.

COVER(S), ENGINE TIMING

Removal

REMOVAL

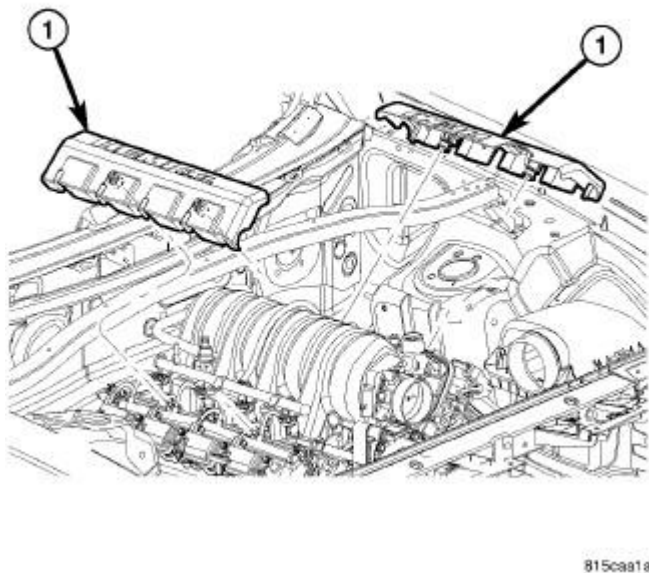
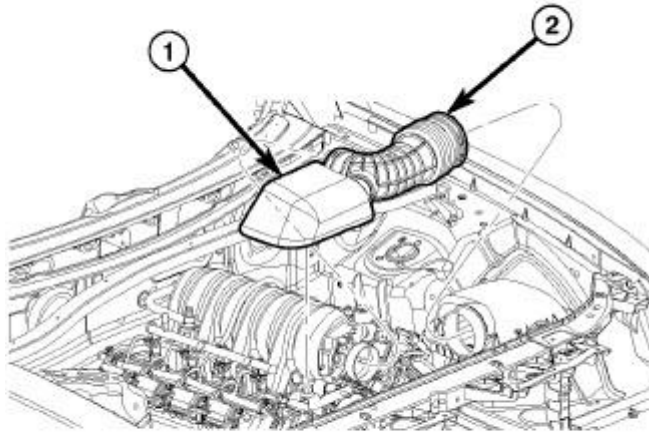


Fig. 251: Engine Covers

Courtesy of CHRYSLER LLC

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



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Fig. 252: Air Cleaner Duct
Courtesy of CHRYSLER LLC

3. Remove the air cleaner assembly.
4. Drain the cooling system.
5. Remove the accessory drive belt. Refer to **Cooling/Accessory Drive/BELT, Serpentine - Removal**
6. Remove the cooling fan.
7. Remove the coolant bottle and washer bottle.
8. Remove the fan shroud.

NOTE: It is not necessary to disconnect A/C lines or discharge freon.

9. Remove A/C compressor and set aside. Refer to **Heating and Air Conditioning/Plumbing/COMPRESSOR, A/C - Removal**

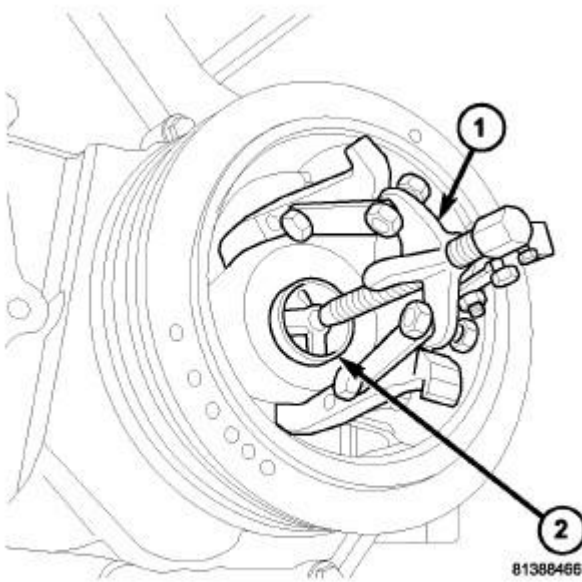


Fig. 253: CRANKSHAFT DAMPER REMOVAL

Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - Special Tool 1023 Puller
2 - Special Tool 8513A Insert |
|---|

10. Remove the generator.
11. Remove the upper radiator hose.
12. Disconnect both heater hoses at the timing cover.
13. Disconnect the lower radiator hose at engine.
14. Remove accessory drive belt tensioner and both idler pulleys.
15. Remove the crankshaft damper (2). See **Engine/Engine Block/DAMPER, Vibration - Removal**.

NOTE: Do not remove the hoses from the power steering pump.

16. Remove power steering pump and set aside.

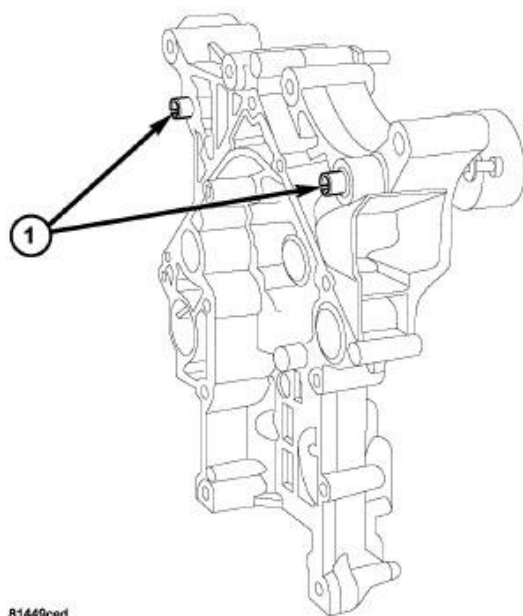


Fig. 254: FRONT COVER SLIDE BUSHINGS
Courtesy of CHRYSLER LLC

17. Remove the dipstick support bolt.
18. Drain the engine oil.
19. Remove the oil pan and pick up tube. See Engine/Lubrication/PAN, Oil - Removal.

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

20. Remove the timing cover bolts and remove cover.
21. Verify that the timing cover slide bushings (1) are located in timing cover.

Installation

INSTALLATION

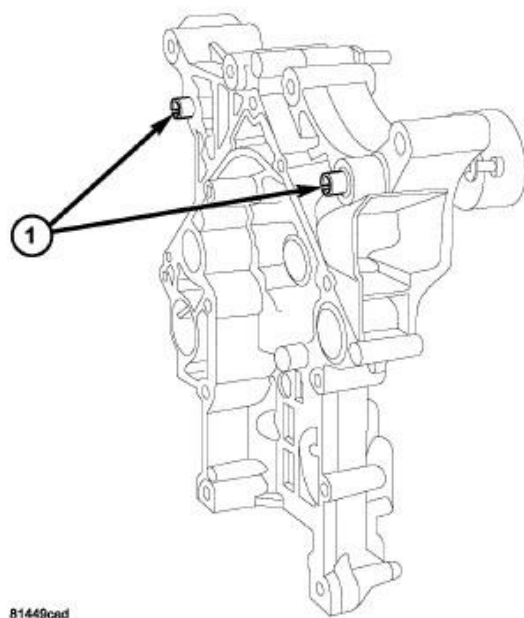


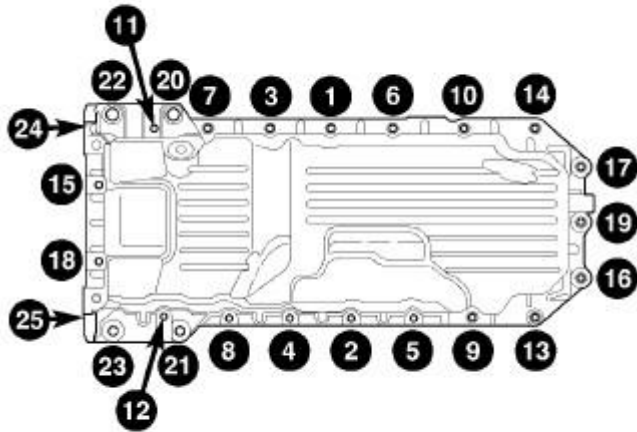
Fig. 255: FRONT COVER SLIDE BUSHINGS
Courtesy of CHRYSLER LLC

1. Clean timing chain cover and block surface.

NOTE: Always install a new gasket on timing cover.

2. Verify that the slide bushings (1) are installed in timing cover.
3. Install cover and new gasket. Tighten fasteners to 28 N.m (250 in. lbs.).

NOTE: The large lifting stud is torqued to 55 N.m (40 ft. lbs.).



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Fig. 256: Oil Pan Torque Sequence

Courtesy of CHRYSLER LLC

4. Install the oil pan and pick up tube. See [Engine/Lubrication/PAN, Oil - Installation](#).
5. Install the A/C compressor. Refer to [Heating and Air Conditioning/Plumbing/COMPRESSOR, A/C - Installation](#)
6. Install the generator. Refer to [Electrical/Charging/GENERATOR - Installation](#)
7. Install power steering pump. Refer to [Steering/Pump - Installation](#)
8. Install the dipstick support bolt.
9. Install the thermostat housing.
10. Install crankshaft damper. See [Engine/Engine Block/DAMPER, Vibration - Installation](#).

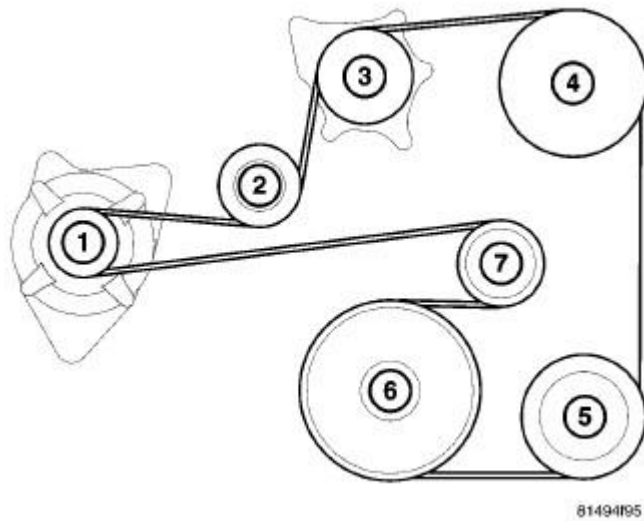


Fig. 257: Accessory Drive Belt Routing
Courtesy of CHRYSLER LLC

11. Install accessory drive belt tensioner assembly and both idler pulleys.

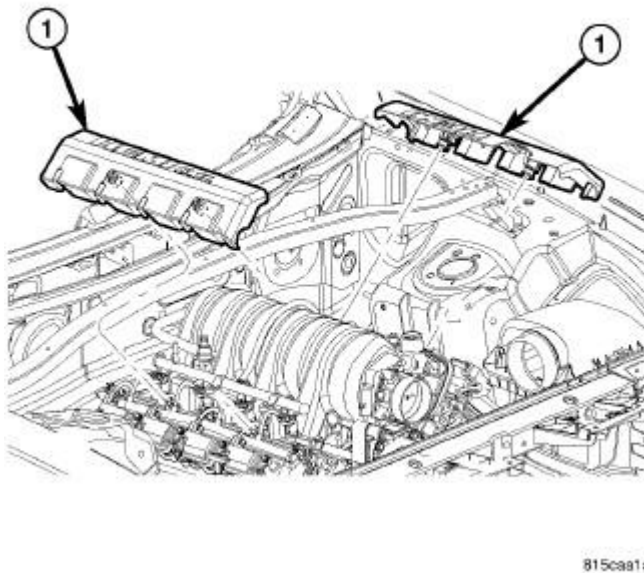


Fig. 258: Engine Covers
Courtesy of CHRYSLER LLC

12. Install the radiator lower hose.
13. Install both heater hoses at the timing cover.
14. Install radiator fan shroud.

15. Install the cooling fan.
16. Install the accessory drive belt.
17. Install the coolant bottle and washer bottle.
18. Install the upper radiator hose.
19. Install the air cleaner assembly.
20. Fill cooling system.
21. Refill engine oil.
22. Connect the battery negative cable.
23. Install the engine covers (1).

TENSIONER, ENGINE TIMING

Description

DESCRIPTION

The timing chain tensioner is a stamped steel constant tension mechanical design. It is mounted to the front of the engine, behind the timing chain drive.

Operation

OPERATION

The timing chain tension is maintained by routing the timing chain through the tensioner assembly. A nylon covered spring steel arm presses on the timing chain maintaining the correct chain tension.