2014 ENGINE

2.4L - Service Information - Dart

DESCRIPTION

DESCRIPTION

The 2.4 Liter (146 cu. in.) in-line four cylinder engine is a single over head camshaft with mechanical lash adjusters and four valves per cylinder design. This engine is NOT free-wheeling; meaning that the pistons will contact the valves in the event of a timing chain failure.

The cylinders are numbered from front of the engine to the rear. The firing order is 1-3-4-2.

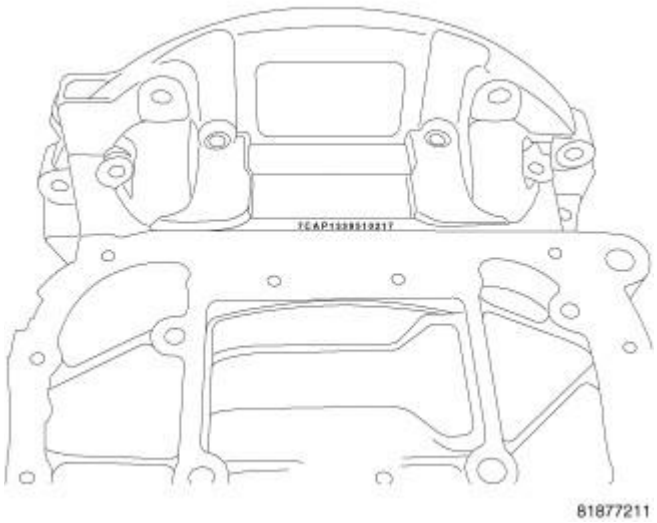

Fig. 1: Serial Number Location
Courtesy of CHRYSLER GROUP, LLC

The engine serial number is located on the rear of the cylinder block. The serial number contains engine build date information.

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).

Refer to **PERFORMANCE DIAGNOSTIC TABLE** and **ENGINE MECHANICAL DIAGNOSTIC**

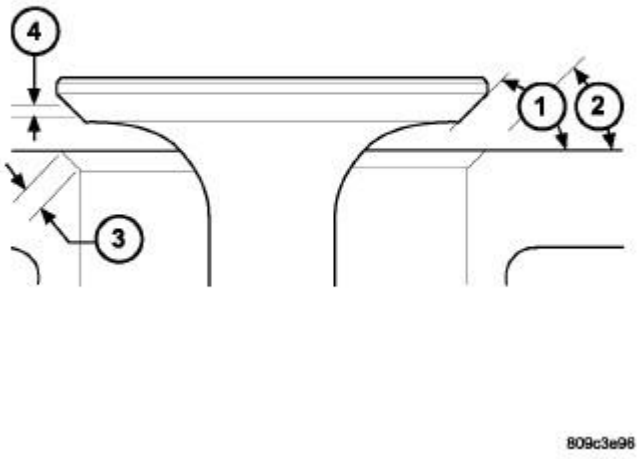

Fig. 136: Valve Face & Seat
Courtesy of CHRYSLER GROUP, LLC

1 - SEAT WIDTH
2 - FACE ANGLE
3 - SEAT ANGLE
4 - SEAT CONTACT AREA

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

1. Measure the concentricity of the valve seat using a dial indicator. Refer to **ENGINE SPECIFICATIONS** .
2. Inspect the valve seat (3) with Prussian blue to determine where the valve contacts the seat. To do this, coat the valve seat (3) **LIGHTLY** with Prussian blue then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face (4), contact is satisfactory. If the blue is transferred to the top edge of the valve face, then lower the valve seat with a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, then raise the valve seat with a 65 degree stone.

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

3. When the seat is properly positioned the width of the intake and exhaust seats should be within specification. Refer to **ENGINE SPECIFICATIONS** .

VALVE AND SPRING INSTALLED HEIGHT

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

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

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

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

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

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

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

OIL CONSUMPTION TEST

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

OIL CONSUMPTION DIAGNOSIS

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

pass around behind the rings into the combustion chamber.

5. **Worn, Broken or Stuck Piston Rings**

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

6. **Cracked or Broken Ring Lands**

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

7. **Worn Valve Stems and Guides**

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

8. **Bent or Misaligned Connecting Rods**

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

9. **Fuel Dilution**

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

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

10. **Contaminated Cooling Systems**

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

11. **Oil Viscosity**

Journal Out-of-Round (Max.)	0.005 mm	0.0001 in.
Journal Taper (Max.)	0.006 mm	0.0002 in.
End Play	0.05 - 0.25 mm	0.0019 - 0.0098 in.
Wear Limit	0.30 mm	0.0118 in.
Main Bearing Diametrical Clearance	0.028 - 0.048 mm	0.0011 - 0.0018 in.
Main Bearing Diametrical Clearance (Max)	0.058 mm	0.0022 in.

CYLINDER HEAD CAMSHAFT BEARING BORE DIAMETER

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cam Bearing Bore		
Cam Bearing Bore	24.000 - 24.021 mm	0.9448 - 0.9457 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cam Journal Diameter		
Cam Journal Diameter	23.954 - 23.970 mm	0.943 - 0.944 in.
Bearing Clearance - Diametrical		
Cam Journal Clearance	0.020 - 0.067 mm	0.0008 - 0.0026 in.
End Play	0.11 - 0.25 mm	0.004 - 0.009 in.
Max Lift @ 0.2mm (0.007 in.) lash		
Intake	9.2 mm	0.362 in.
Max Lift @ 0.28mm (0.011 in.) lash		
Exhaust	8.42 mm	0.331 in.
Intake Valve Timing		
Closes (ABDC)	Control By VVAA	
Opens (ATDC)	Control By VVAA	
Duration	Control By VVAA	
Exhaust Valve Timing		
Closes (BTDC)	8.45°	
Opens (BBDC)	45°	
Duration	216.55°	
Valve Overlap @ 0.5mm (0.019 in.) w/VVT in lock-pin position	18.75°	
* All reading in crankshaft degrees at 0.5 mm (0.019 in.) valve lift.		

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum - Heat treated	

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

1. Attach the transmission to the engine. Refer to **INSTALLATION** .
2. With the engine and the transmission bolted together and on the engine cradle, slowly and carefully lower the vehicle down to a point that the engine assembly can be verified that it is in the proper alignment with the engine bay.

NOTE: An assistant may be needed to help align the assembly.

3. Slowly lower engine assembly in to position.
4. Install the right engine mount. Refer to **INSULATOR, ENGINE MOUNT, RIGHT, INSTALLATION**.
5. Install the left engine mount. Refer to **INSULATOR, ENGINE MOUNT, RIGHT, INSTALLATION**.
6. Remove the Engine Support Cradle straps and remove the cradle from below the engine/transmission assembly.
7. Connect the shifter cables to the transmission. Refer to **CABLE, GEARSHIFT CONTROL, INSTALLATION** .
8. Connect the AC lines at the compressor. Refer to **LINE, A/C DISCHARGE, INSTALLATION** .
9. Connect the heater hose quick connects at the heater core inlet and outlet tubes.
10. Install the exhaust manifold assembly. Refer to **MANIFOLD, EXHAUST, INSTALLATION**.

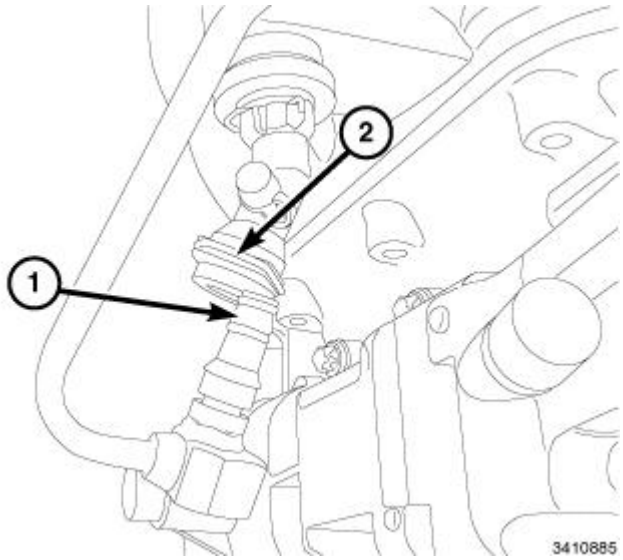

Fig. 20: Hydraulic Supply Pipe & Concentric Slave Cylinder
Courtesy of CHRYSLER GROUP, LLC

11. Connect the hydraulic supply pipe (1) for the concentric slave cylinder (2). Refer to **CYLINDER, CLUTCH SLAVE, INSTALLATION** .

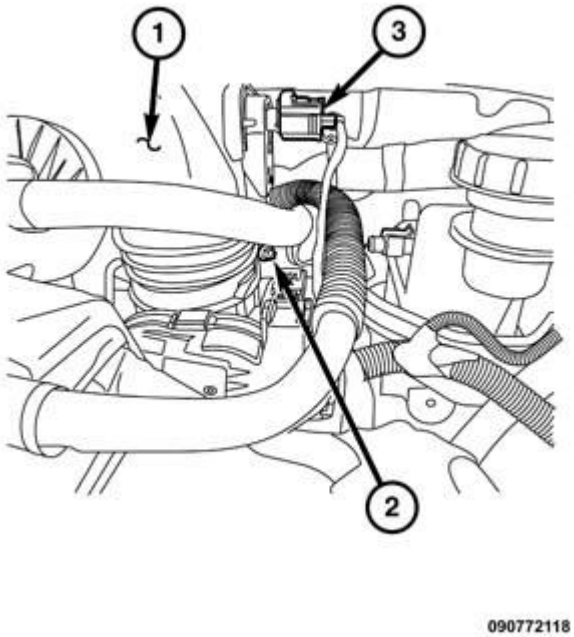

Fig. 43: Resonator, Clamp & Connector
Courtesy of CHRYSLER GROUP, LLC

4. Tighten the clamp (2) at the resonator outlet (1).
5. Connect the IAT connector (3).
6. Install the engine cover. Push downward to make sure all four rubber mounts are secure.

CYLINDER HEAD

DESCRIPTION

DESCRIPTION

Fig. 61: MAP Sensor Connector & Fittings
Courtesy of CHRYSLER GROUP, LLC

36. Remove wiring harness retainer from the intake manifold eyelets (1)
37. Unplug the MAP sensor connector (2).

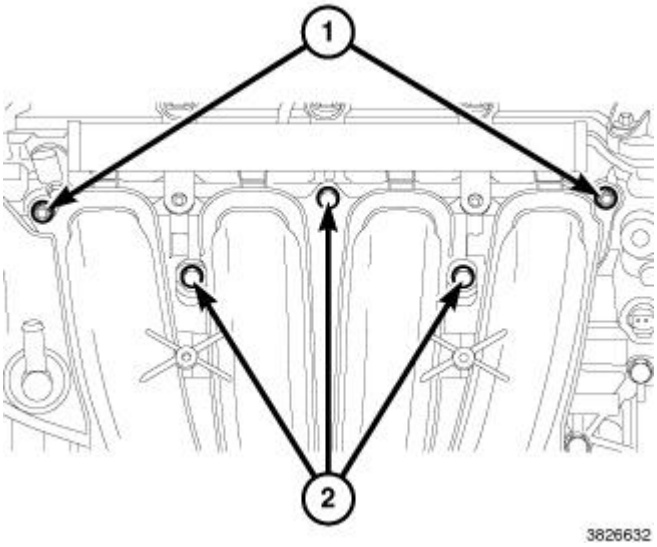

Fig. 62: Intake Manifold Retaining Bolts & Nuts
Courtesy of CHRYSLER GROUP, LLC

38. Remove intake manifold retaining bolts (2) and nuts (1).
39. Remove the intake manifold from the cylinder head.
40. Inspect the cylinder head and cylinder head components. Refer to **CYLINDER HEAD - INSPECTION** .

NOTE: Ensure cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.

CLEANING

CLEANING

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use ONLY a wooden or plastic scraper.

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

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

1. Remove all gasket material from cylinder head and block. Refer to **ENGINE - STANDARD**

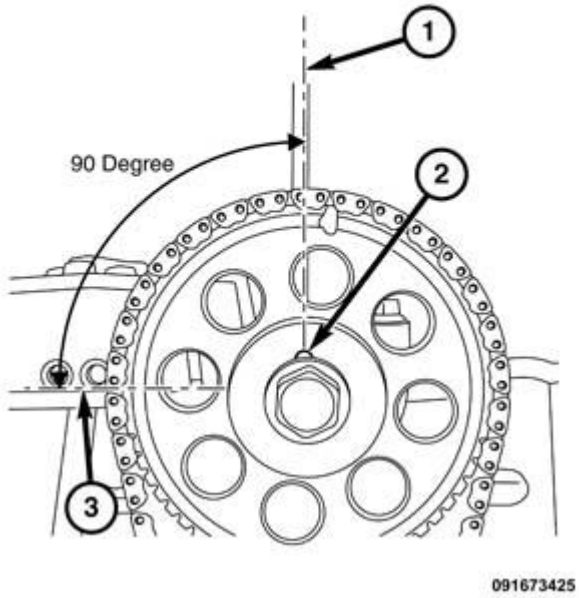

Fig. 81: Vertical Center Line Of Camshaft, Dowel & Cylinder Head
Courtesy of CHRYSLER GROUP, LLC

5. Remove the frame cover portion of the right splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL** .

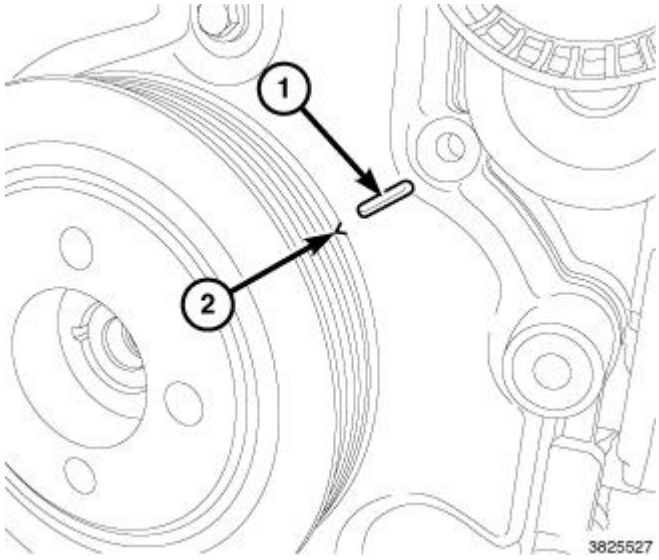

Fig. 82: Timing Cover Mark & Notch
Courtesy of CHRYSLER GROUP, LLC

6. Rotate the crankshaft clockwise (as viewed from the front) to align the timing cover mark (1) with the damper notch (2) to place the number one cylinder piston at top-dead-center on the compression stroke.

Courtesy of CHRYSLER GROUP, LLC

5. Install the VVAA. Refer to **ASSEMBLY, VARIABLE VALVE ACTUATION, INSTALLATION**.
6. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION**.
7. Connect the battery negative cable and tighten nut to 5 N.m (45 in. lbs.).

ROCKER ARM, VALVE

DESCRIPTION

DESCRIPTION

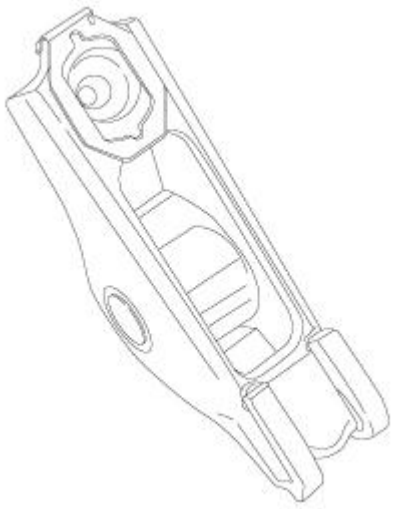

Fig. 102: Valve Rocker Arm
Courtesy of CHRYSLER GROUP, LLC

The valve rocker arms are steel stampings with an integral roller bearing. A spring clip helps to hold the rocker arm in position on the ball socket when removing or installing the variable valve actuation assembly. The rocker arm ball socket also incorporates a 0.5 mm oil hole for roller and camshaft lubrication.

REMOVAL

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. If the exhaust rockers are to be serviced, remove the exhaust camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL**.

NOTE: If the rocker arms are to be reused, identify their positions so that they can be reassembled into their original locations.

3. If the intake rockers are to be serviced, remove the Variable Valve Actuator Assembly (VVAA). Refer to

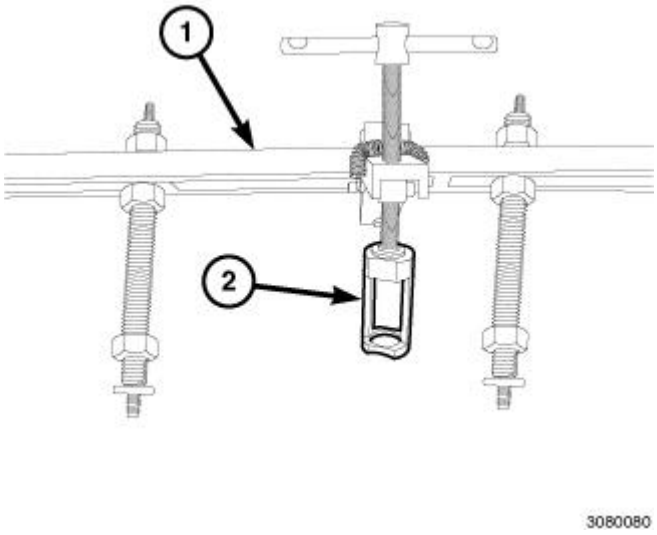

Fig. 116: Valve Spring Compressor & Adapter
Courtesy of CHRYSLER GROUP, LLC

1. Install the (special tool #10224, Adapter, Valve Spring) (2) on the (special tool #MD998772A, Compressor, Valve Spring) (1).

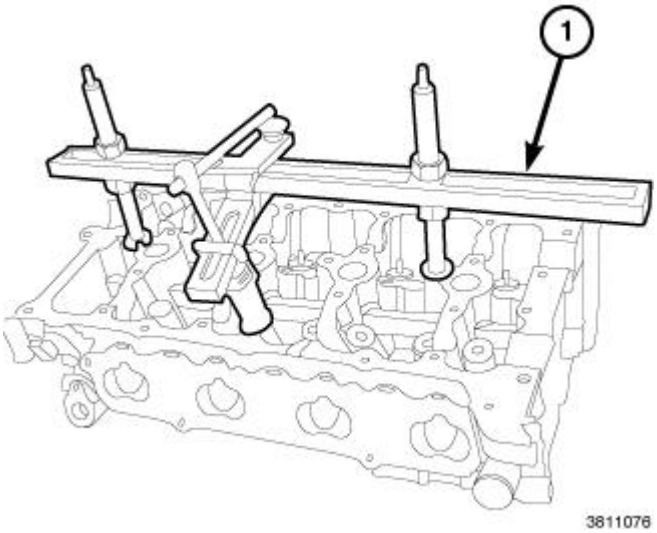

Fig. 117: Valve Spring Compressor
Courtesy of CHRYSLER GROUP, LLC

NOTE: Number 3 intake valve spring compression shown in illustration, all other valves similar.

2. Install the (special tool #MD998772A, Compressor, Valve Spring) (1) onto the cylinder head.
3. Place a ball of rags in the combustion chamber to hold the valves in place.

Courtesy of CHRYSLER GROUP, LLC

1. Clean and inspect the valves thoroughly. Replace burned, warped and cracked valves.
2. Inspect the retainer lock grooves for wear or damage (2).
3. Inspect the valve face (4) for wear and pitting.
4. Measure the valve stems (3) and margins (5) for wear. Refer to **ENGINE SPECIFICATIONS** .

VALVE GUIDES

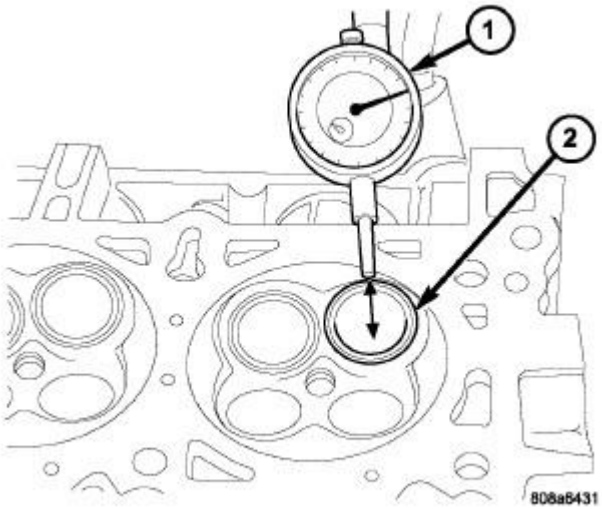

Fig. 146: Measuring Valve Guide Wear
Courtesy of CHRYSLER GROUP, LLC

NOTE: Typical cylinder head shown in illustration.

1. Remove carbon and varnish deposits from inside of the valve guides with a reliable guide cleaner.
2. Measure valve stem-to-guide clearance as follows:
3. Install the valve (2) into the cylinder head so that it is 15 mm (0.590 inch.) off of the valve seat. A small piece of hose may be used to hold the valve in place.
4. Attach the Dial Indicator Set (special tool #C-3339A, Set, Dial Indicator) (1) to the cylinder head and set it at a right angle to the valve stem being measured.
5. Move the valve to and from the indicator. Compare this reading to the specification. Refer to **ENGINE SPECIFICATIONS** .

NOTE: If stem-to-guide clearance exceeds specifications, you must measure the valve stem. If the valve stem is within specification or if the valve guide is loose in the cylinder head, replace the cylinder head.

INSTALLATION

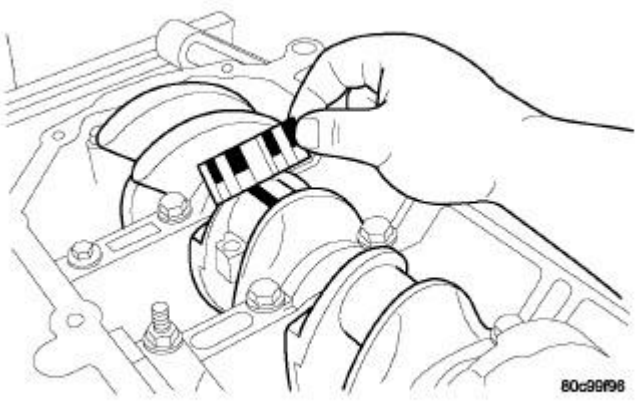

Fig. 198: Connecting Rod Bearing Clearance - Typical
Courtesy of CHRYSLER GROUP, LLC

1. For measuring connecting rod bearing clearance procedure and use of Plastigage. Refer to **ENGINE - STANDARD PROCEDURE** . For bearing clearance. Refer to **ENGINE SPECIFICATIONS** .

   NOTE: The rod bolts should not be reused.

2. Before installing the **NEW** rod bolts the threads and under the bolt head should be oiled with clean engine oil.
3. Install each bolt finger tight then alternately tighten each bolt to assemble the cap properly.
4. Tighten the connecting rod bolts using the 2 step torque-turn method. Tighten according to the following values:

   CAUTION: Do not use a torque wrench for the second step.

   - Tighten the bolts to 20 N.m (15 ft. lbs.).
   - Tighten the connecting rod bolts an additional 90°.

9. Install the piston and connecting rod(s). Refer to **ROD, PISTON AND CONNECTING, INSTALLATION**.

ROD, PISTON AND CONNECTING

DESCRIPTION

DESCRIPTION

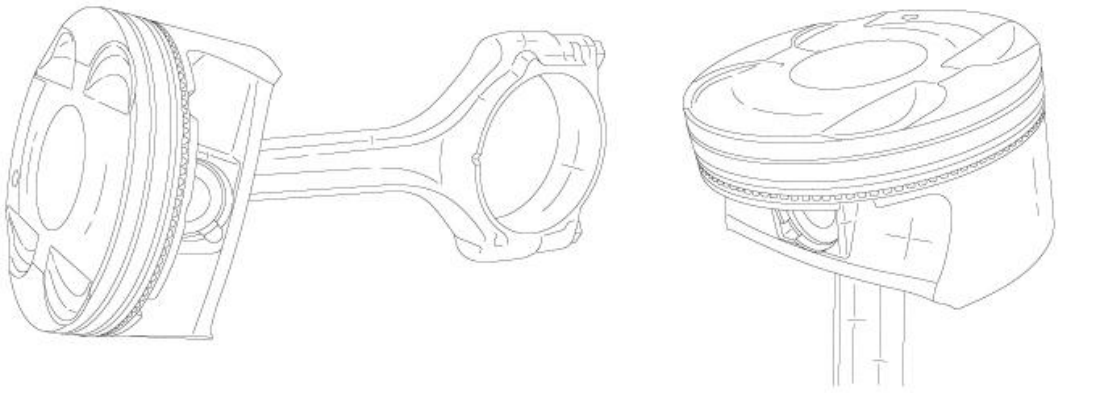

Fig. 244: Piston & Connecting Rod
Courtesy of CHRYSLER GROUP, LLC

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 a lightweight design with ultra low tension piston rings for improved fuel economy. The pistons are made of a high strength aluminum alloy and the piston skirt has a Moly® coating. The top piston ring land has an anodized coating for improved wear. The piston is connected to the rod using a full floating pin with two locking clips. The connecting rod is forged steel with a bolted cracked cap design. The connecting rod bolts are not reusable. Pistons are available in two different diameters with grade markings for each bore indicated on the side of the cylinder block. The upper compression ring is a 1.2 mm steel ring with a spray coating. The intermediate compression ring is 1.2 mm micro napier design. Both compression rings have a dot or a mark on the piston ring. The marked side of the ring must face the top of the piston. The 2 mm three piece oil control ring is very thin. These are chrome plated rings and have a stainless steel expander.

3. Install the resonator (3), bolt (2) and clamp (1). Tighten the bolt to 5 N.m (81 in. lbs.). Tighten the clamp.
4. Connect electrical connector.

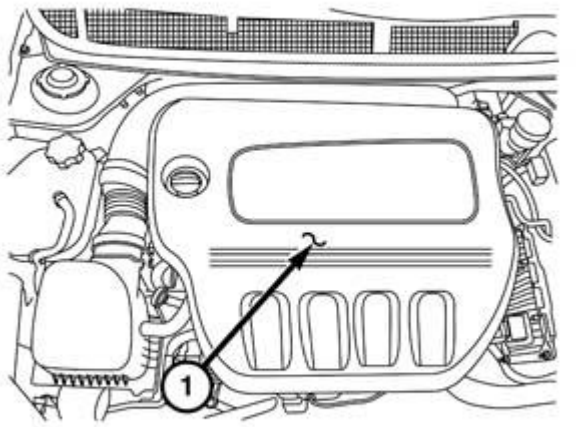

Fig. 355: Engine Cover
Courtesy of CHRYSLER GROUP, LLC

5. Install the engine cover (1).

SENSOR, OIL PRESSURE

DESCRIPTION

DESCRIPTION

The oil pressure sensor is located on the right front side of the engine block. The oil pressure sensor is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil galley). The sensor is a three terminal device.

OPERATION

OPERATION

The oil pressure sending unit returns a voltage signal back to the PCM relating oil pressure. Ground for the sensor is supplied by the PCM.

REMOVAL

REMOVAL