2012 ENGINE3.7L -

Service Information - Dakota

DESCRIPTION

DESCRIPTION

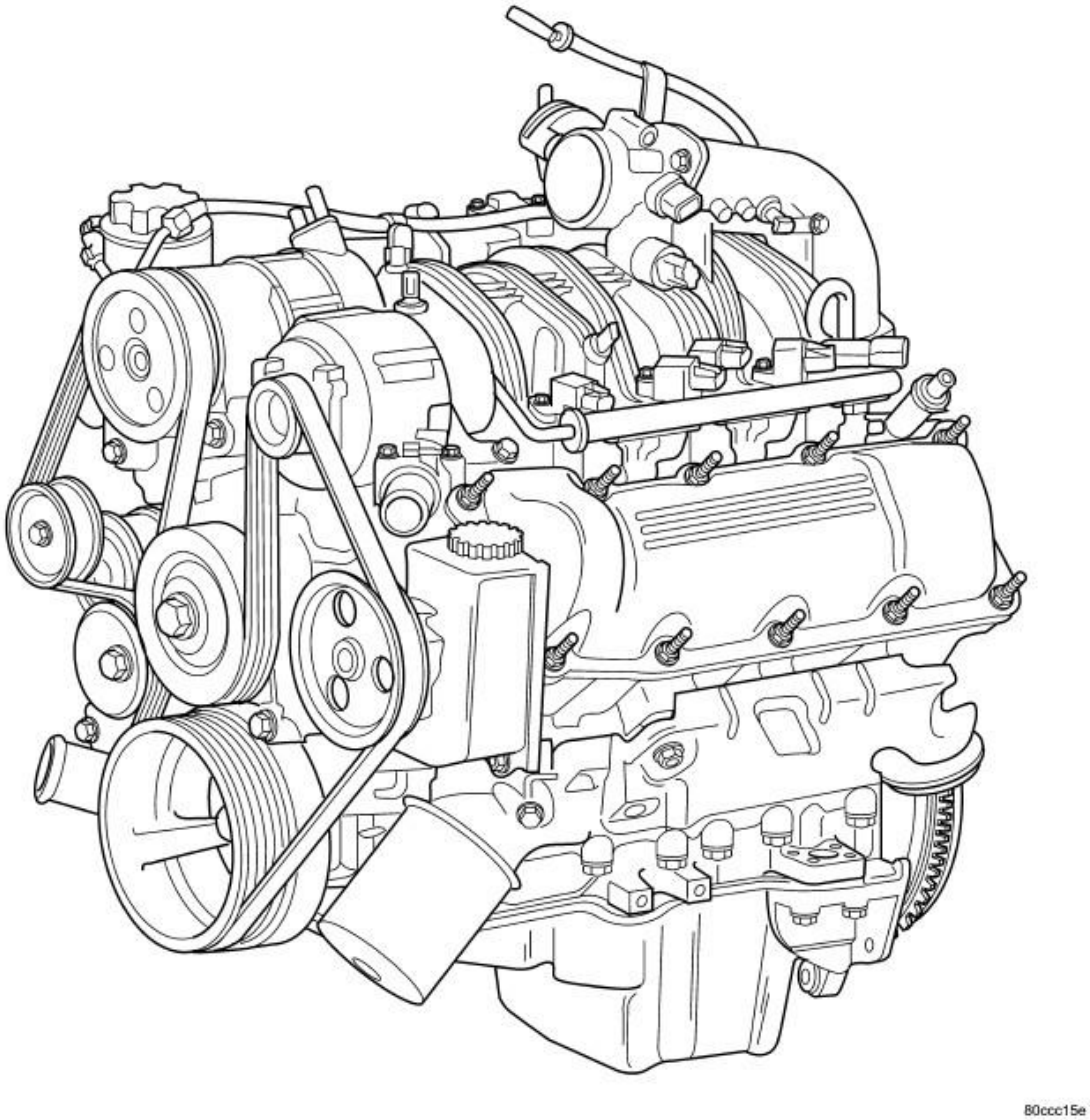

Fig. 1: 3.7L Engine
Courtesy of CHRYSLER GROUP, LLC

The 3.7 liter (226 CID) six-cylinder engine is an 90° single overhead camshaft engine. Refer to **Fig. 1**. The cast iron cylinder block is made up of two different components; the first component is the cylinder bore and upper block, the second component is the bedplate that comprises the lower portion of the cylinder block and houses the lower half of the crankshaft main bearings. The cylinders are numbered from front to rear with the left bank being numbered 1, 3, and 5 and the right bank being numbered 2, 4, and 6. The firing order is 1-6-5-4-3-2. The

engine serial number is located at the right front side of the engine block.

DIAGNOSIS AND TESTING

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 **ENGINE DIAGNOSIS - PERFORMANCE** and **MECHANICAL** 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. Refer to **CYLINDER COMPRESSION PRESSURE LEAKAGE**.
- Cylinder Combustion Pressure Leakage Test. Refer to **CYLINDER COMBUSTION PRESSURE LEAKAGE**.
- Engine Cylinder Head Gasket Failure Diagnosis. Refer to **DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET**.
- Intake Manifold Leakage Diagnosis. Refer to **DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS**.

ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. Refer to **DIAGNOSIS AND TESTING** .
	4. Faulty coil or control unit.	4. Refer to **COIL, IGNITION, REMOVAL** .
	5. Incorrect spark plug gap.	5. Correct as necessary.
	6. Incorrect right bank cam timing.	6. Refer to **VALVE TIMING**.
	7. Dirt or water in fuel system.	7. Clean system and replace fuel filter.
	8. Faulty fuel pump, relay or wiring.	8. Repair or replace as necessary.

	9. Faulty cam or crank sensor	9. Refer to **IGNITION SYSTEM - SERVICE INFORMATION** article.
ENGINE STALLS OR ROUGH IDLE	1. Vacuum leak. 2. Faulty crank position sensor 3. Faulty coil. 4. Incorrect cam timing.	1. Inspect intake manifold and vacuum hoses, repair or replace as necessary. 2. Replace crank position sensor. 3. Refer to **COIL, IGNITION, REMOVAL** . 4. Refer to **Engine/Valve Timing - Standard Procedure**.
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs. 2. Dirt or water in fuel system. 3. Faulty fuel pump. 4. Blown cylinder head gasket. 5. Low compression. 6. Burned, warped or pitted valves. 7. Plugged or restricted exhaust system. 8. Faulty coil. 9. Incorrect cam timing.	1. Correct as necessary. 2. Clean system and replace fuel filter. 3. Refer to **FUEL SYSTEM** article. 4. Replace cylinder head gasket. 5. Repair as necessary. Refer to **CYLINDER COMPRESSION PRESSURE LEAKAGE**. 6. Replace as necessary. 7. Inspect and replace as necessary. 8. Refer to **COIL, IGNITION, REMOVAL** . 9. Refer to **VALVE TIMING**.
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 **COIL, IGNITION, REMOVAL** .
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 **COIL, IGNITION, REMOVAL** . 3. Clean system and replace fuel filter.

MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if OK, check rod and main bearings for excessive

		wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. Inspect the valve guides for wear, cracks or looseness. If either condition exists, replace the cylinder head. Refer to **CYLINDER HEAD, LEFT, REMOVAL, 3.7L** and **CYLINDER HEAD, RIGHT, REMOVAL, 3.7L**.
	8. Excessive runout of valve seats on valve faces.	8. Refer to **Engine/Cylinder Head/VALVES, Intake and Exhaust - Standard Procedure**.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
	2. Low oil pressure.	2. Check oil pump, if OK, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .
	2. Low oil pressure.	2. Check oil pump, if OK, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings. Misaligned or damaged.	1. Replace as necessary.

	2. Loose fasteners, broken or porous metal parts.	2. Tighten fasteners, repair or replace metal parts.
	3. Crankshaft rear seal	3. Replace as necessary. Refer to **SEAL, CRANKSHAFT OIL, REAR, REMOVAL, 3.7L**.
	4. Crankshaft seal flange. Scratched, nicked or grooved.	4. Polish or replace crankshaft.
	5. Oil pan flange cracked.	5. Replace oil pan. Refer to **PAN, OIL, REMOVAL, 3.7L**.
	6. Timing chain cover seal, damaged or misaligned.	6. Replace seal. Refer to **SEAL, CRANKSHAFT OIL, FRONT, REMOVAL, 3.7L**.
	7. Scratched or damaged vibration damper hub.	7. Polish or replace damper. Refer to **DAMPER, VIBRATION, REMOVAL, 3.7L**.
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level. Refer to **Engine/Lubrication/OIL - Standard Procedure**.
	2. Faulty oil pressure sending unit.	2. Replace sending unit. Refer to **SWITCH, OIL PRESSURE, REMOVAL, 3.7L**.
	3. Low oil pressure.	3. Check oil pump and bearing clearance. Refer to **Engine/Lubrication/PUMP, Engine Oil - Inspection**.
	4. Clogged oil filter.	4. Replace oil filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 3.7L**.
	5. Worn oil pump.	5. Replace oil pump. Refer to **PUMP, ENGINE OIL, REMOVAL, 3.7L**.
	6. Thin or diluted oil.	6. Change oil and filter. Refer to **FILTER, ENGINE OIL, REMOVAL, 3.7L**.
	7. Excessive bearing clearance.	7. Replace as necessary. Refer to **Engine/Engine Block/ROD, Piston and Connecting - Standard Procedure**.
	8. Oil pump relief valve stuck.	8. Replace oil pump. Refer to **PUMP, ENGINE OIL, REMOVAL, 3.7L**.
	9. Oil pick up tube loose, damaged or clogged.	9. Replace as necessary. Refer to **PAN, OIL, REMOVAL, 3.7L**.
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings. Refer to **Engine/Engine Block/RING(S), Piston - Standard Procedure**.
	2. Carbon in oil ring slots.	2. Replace rings. Refer to **Engine/Engine Block/RING(S), Piston - Standard Procedure**.
	3. Incorrect ring size installed.	3. Replace rings. Refer to **Engine/Engine**

		Block/RING(S), Piston - Standard Procedure.
	4. Worn valve guides.	4. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head (left) and (right). Refer to **CYLINDER HEAD, LEFT, REMOVAL, 3.7L** and **CYLINDER HEAD, RIGHT, REMOVAL, 3.7L**.
	5. Leaking valve guide seals.	5. Replace valve guide seals **(Left Cylinder Head)** and **(Right Cylinder Head)** . Refer to **VALVES, INTAKE AND EXHAUST, REMOVAL, 3.7L**.

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 PRESSURE RELEASE** .
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

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

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

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

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

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. Set 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

OIL CONSUMPTION TEST AND DIAGNOSIS

Diagnostic Procedure

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

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

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

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

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

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

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

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

OIL CONSUMPTION TEST

1. Check the oil level at least 15 minutes after a hot shutdown.
2. If the oil level is low, top off with the proper viscosity and API service level engine oil. Add one bottle of MOPAR® 4-In-1 Leak Detection Dye into the engine oil.
3. Tamper proof the oil pan drain plug, oil filter, dipstick and oil fill cap.

4. Record the vehicle mileage.
5. Instruct the customer to drive the vehicle as usual.
6. Ask the customer to return to the servicing dealer after accumulating 500 miles, Check the oil level at least 15 minutes after a hot shutdown. If the oil level is half way between the "FULL" and "ADD" mark continue with the next step.
7. Using a black light, re-check for any external engine oil leaks, repair as necessary, if no external engine oil leaks are present, continue with oil consumption diagnosis.

OIL CONSUMPTION DIAGNOSIS

1. Check the Positive Crankcase Ventilation (PCV) system. Make sure the system is not restricted and the PCV valve has the correct part number and correct vacuum source (18-20 in. Hg at idle below 3000 ft. above sea level is considered normal).
2. Perform a **CYLINDER COMPRESSION PRESSURE LEAKAGE** test and **CYLINDER-TO-CYLINDER LEAKAGE TEST** using the standard leak down gauge following manufacturers suggested best practices.

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

3. If one or more cylinders have more than 15% leak down further engine tear down and inspection will be required.

TOP 19 REASONS THAT MAY LEAD TO ENGINE OIL CONSUMPTION

1. **Tapered and Out-of-Round Cylinders**

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

2. **Distorted Cylinders**

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

3. **Improper operation of "PCV "system**

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

out of the crankcase into the combustion chamber along with the regular intake air and fuel mixture.

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

4. **Worn Piston Ring Grooves**

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

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

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

6. **Cracked or Broken Ring Lands**

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

7. **Worn Valve Stems and Guides**

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

8. **Bent or Misaligned Connecting Rods**

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

9. **Fuel Dilution**

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

   - Excess fuel can enter and mix with the oil via a leaking fuel injector

- Gasoline contaminated with diesel fuel
- Restricted air intake
- Excessive idling

10. **Contaminated Cooling Systems**

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

11. **Oil Viscosity**

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

12. **Dirty Engine Oil**

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

13. **Crankcase Overfull**

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

14. **Excessively High Oil Pressure**

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

15. **Aftermarket Performance Chips and Modification**

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

16. **Lugging Engine**

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

17. **Turbocharged Engines**

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

18. **Restricted Air Intake**

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

19. **Intake Manifold port seals**

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

STANDARD PROCEDURE

DUST COVERS AND CAPS

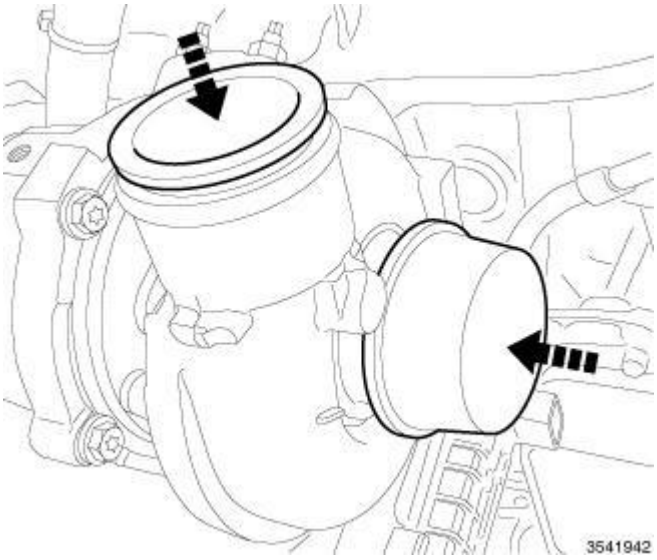

Fig. 2: Covers/Caps
Courtesy of CHRYSLER GROUP, LLC

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

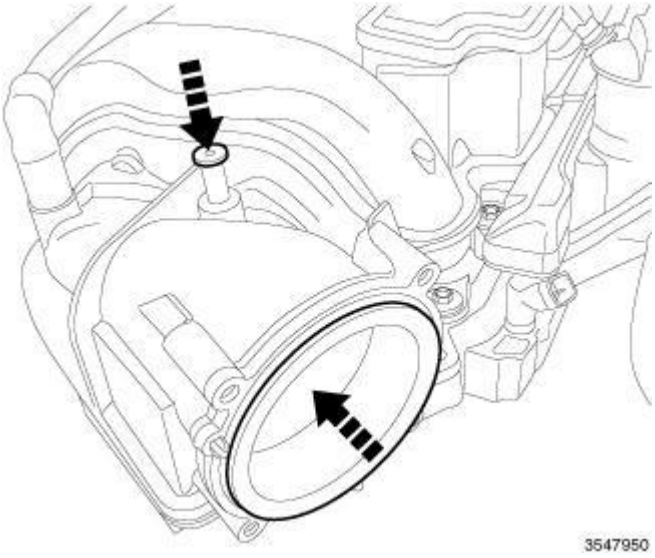

Fig. 3: Opening Cover
Courtesy of CHRYSLER GROUP, LLC

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

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.

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results.**Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4 oz. / 16 oz. can w/applicator.

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier than using precut gaskets.

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

ENGINE GASKET SURFACE PREPARATION

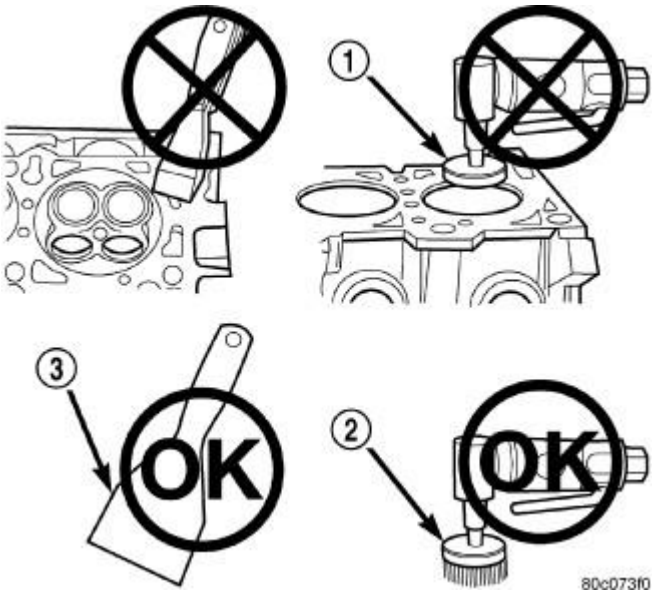

Fig. 4: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD 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.

Never use the following to clean gasket surfaces:

- Metal scraper (3).
- Abrasive pad (1) or paper to clean cylinder block and head.
- High speed power tool (1) with an abrasive pad or a wire brush.

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

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper.
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow).

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may

be used on cast iron surfaces with care.

SPECIFICATIONS

3.7L ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
Type	90° SOHC V6 12 Valve	
Number of Cylinders	6	
Firing Order	1-6-5-4-3-2	
Lead Cylinder	No. 1 Left Bank	
Compression Ratio	9.6:1	
Max. Variation Between Cylinders	25%	
	Metric	**Standard**
Displacement	3.7 Liters	226 Cubic Inches
Bore	93.0 mm	3.66 in.
Stroke	90.8 mm	3.40 in.
Horsepower	211 @ 5200 RPM	
Torque	236 ft.lbs.@ 4000 RPM	
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Bore Diameter	93.013 ± 0.0075 mm	3.6619 ± 0.0003 in.
Out of Round (MAX)	0.076 mm	0.003 in.
Taper (MAX)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Diameter	92.975 mm	3.6605 in.
Weight	365.0 grams	12.87 oz.
Ring Groove Diameter		
No. 1	85.37 - 83.13 mm	3.282 - 3.273 in
No. 2	82.833 - 83.033 mm	3.261 - 3.310 in.
No. 3	83.88 - 84.08 mm	3.302 - 3.310 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**

Clearance In Piston	0.006 - 0.015 mm	0.0002 - 0.0005 in.
Diameter	24.017 - 24.020 mm	0.9455 - 0.9456 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.20 - 0.36 mm	0.0079 - 0.0142 in.
Second Compression Ring	0.37 - 0.63 mm	0.0146 - 0.0249 in.
Oil Control (Steel Rails)	0.25 - 0.76 mm	0.0099 - 0.30 in.
Side Clearance		
Top Compression Ring	0.051 - 0.094 mm	0.0020 - 0.0037 in.
Second Compression Ring	0.040 - 0.080 mm	0.0016 - 0.0031 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	0.057 - 0.058 in.
Second Compression Ring	1.472 - 1.490 mm	0.057 - 0.058 in.
Oil Ring (Steel Rails)	0.445 - 0.470 mm	0.017 - 0.018 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.006 - 0.044 mm	0.0002 - 0.0017 in.
Side Clearance	0.10 - 0.35 mm	0.004 - 0.0138 in.
Piston Pin Clearance	0.015 - 0.028 mm	0.0006 - 0.0011 in.
Bearing Bore Out of Round (MAX)	0.004 mm	0.0002 in.
Total Weight (Less Bearing)	612 grams	21.588 ounces

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	63.488 - 63.512 mm	2.4996 - 2.5005 in.
Bearing Clearance	0.002 - 0.046 mm	0.00008 - 0.0018 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.006 mm	0.0004 in.
End Play	0.052 - 0.282 mm	0.0021 - 0.0112 in.
End Play (MAX)	0.282 mm	0.0112 in.
Connecting Rod Journal Diameter	57.908 - 57.892 mm	2.2798 - 2.2792 in.
Bearing Clearance	0.006 - 0.044	0.0002 - 0.0011 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.006 mm	0.0002 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Bore Diameter	26.02 - 26.04 mm	1.0245 - 1.0252 in.
Bearing Journal Diameter	25.975 - 25.995 mm	1.0227 - 1.0235 in.
Bearing Clearance	0.025 - 0.065 mm	0.001 - 0.0026 in.
Bearing Clearance (MAX)	0.065 mm	0.0026 in.
End Play	0.075 -0.200 mm	0.003 - 0.0079 in.
End Play (MAX)	0.200 mm	0.0079 in.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	5.6°
Closes (ATDC)	240.1°
Duration	245.7°
Exhaust	
Opens (BTDC)	241.5°
Closes (ATDC)	20.1°
Duration	261.6°
Valve Overlap	25.7°

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Face Angle	45° - 45.5°	
Head Diameter		
Intake	48.52 - 48.78 mm	1.9103 - 1.9205 in.
Exhaust	36.87 - 37.13 mm	1.4516 - 1.4618 in.
Length (Overall)		
Intake	113.45 - 114.21 mm	4.4666 - 4.4965 in.
Exhaust	114.92 - 115.68 mm	4.5244 - 4.5543 in.
Stem Diameter		
Intake	6.931 - 6.957 mm	0.2729 - 0.2739 in.
Exhaust	6.902 - 6.928 mm	0.2717 - 0.2728 in.
Stem-to-Guide Clearance		
Intake	0.018 - 0.069 mm	0.0008 - 0.0028 in.
Exhaust	0.047 - 0.098 mm	0.0019 - 0.0039 in.
Max. Allowable Stem-to-Guide Clearance (Rocking Method)		
Intake	0.069 mm	0.0028 in.
Exhaust	0.098 mm	0.0039 in.

Valve Lift (Zero Lash)		
Intake	12.00 mm	0.472 in.
Exhaust	12.00 mm	0.472 in.

VALVE SPRING

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Free Length (Approx)		
Intake	48.18 mm	1.896 in.
Exhaust - w/damper	49.2 mm	1.973 in.
Spring Force (Valve Closed)		
Intake	332.0 - 368.0 N @ 40.12 mm	74.63 - 82.72 lbs. @ 1.5795 in.
Exhaust - (without damper)	356 - 394 N @ 39.12 mm	80.031 - 88.57 lbs. @ 1.54 in.
Spring Force (Valve Open)		
Intake	948.0 - 1038.0 N @ 28.12 mm	213.2 - 233.8 lbs. @ 1.107 in.
Exhaust - without damper	874 - 956 N @ 27.12 mm	196.5 - 214.9 lbs. @ 1.067 in.
Number of Coils		
Intake	7.30	
Exhaust	7.15	
Wire Diameter		
Intake	4.77 X 3.80 mm	0.1878 X 0.1496 in.
Exhaust	4.66 X 3.72 mm	0.1843 X 0.1464 in.
Installed Height (Spring Seat to Bottom of Retainer) Nominal		
Intake	40.12 mm	1.579 in.
Exhaust - w/damper	40.12 mm	1.579 in.

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Gasket Thickness (Compressed)	0.7 mm	(0.0276 in.)
Valve Seat Angle	44.5° - 45.0°	
Valve Seat Runout (MAX)	0.051 mm	0.002 in.
Valve Seat Width		
Intake	1.75 - 2.36 mm	0.0698 - 0.0928 in.
Exhaust	1.71 - 2.32 mm	0.0673 - 0.0911 in.
Guide Bore Diameter (Std.)	6.975 - 7.00 mm	0.2747 - 0.2756 in.
Cylinder Head Warpage (Flatness)	0.0508 mm	0.002 in.

OIL PUMP

DESCRIPTION	SPECIFICATION	

	Metric	Standard
Clearance Over Rotors/End Face (MAX)	0.095 mm	0.0038 in.
Cover Out - of -Flat (MAX)	0.025 mm	0.001 in.
Inner and Outer Rotor Thickness	12.02 mm	0.4731 in.
Outer Rotor to pocket (Diametral) clearance (MAX)	.235 mm	0.0093 in.
Outer Rotor Diameter (MIN)	85.925 mm	0.400 in.
Tip Clearance Between Rotors (MAX)	0.150 mm	0.006 in.

OIL PRESSURE

SPECIFICATION	SPECIFICATION	
	Metric	**Standard**
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 at 3000 rpm.**		

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
BOLT - CAMSHAFT			
Non - Oiled Sprocket Bolt	122	90	-
Bearing Cap Bolts	11		100
Bolt - Counterbalance shaft retaining	28	-	250
Bolts - Timing Chain Cover	58	43	-
Bolts - Connecting Rod Cap	27	20	-
	Plus 90° Turn		
Bolts - Bed Plate	Refer to **INSTALLATION** Procedure.		
Bolt - Crankshaft Damper	175	130	-
BOLTS - CYLINDER HEAD			
M11 Bolts	Refer to **INSTALLATION** (Left) and **INSTALLATION** (Right) Procedure.		
M8 Bolts	Refer to **INSTALLATION** (Left) and **INSTALLATION** (Right) Procedure.		
Bolts - Cylinder Head Cover	12	-	105
Bolts - Exhaust Manifold	25	18	-
Nuts- Exhaust Manifold Heat Shield	8	-	72
	Then loosen 45°		
Bolts - Flexplate	95	70	-
Bolts - Engine Mount Bracket to Block	61	45	-

Bolts - Rear Mount to Transmission	46	34	-
BOLTS - GENERATOR MOUNTING			
M10 Bolts	54	40	-
M8 Bolts	28	-	250
Bolts - Intake Manifold	12	-	105
	Refer to **Fig. 17** Procedure for Tightening Sequence		
Bolts - Oil Pan	15	-	130
Plug - Oil Pan-Drain	34	25	-
Bolts - Oil Pump	28	-	250
Bolts - Oil Pump Cover	12	-	105
Bolt and Nut - Oil Pickup Tube	28	-	250
Bolt - Oil Dipstick Tube to Engine Block	15	-	130
Bolts - Oil Fill Tube	12	-	105
Bolts - Timing Chain Guide	28	-	250
Timing Chain Tensioner Arm	28	-	250
Bolts - Hydraulic Tensioner	28	-	250
Bolts - Timing Chain Primary Tensioner	28	-	250
Bolt - Timing Drive Idler Sprocket	34	25	-
Bolts - Thermostat Housing	12	-	105
Bolts - Water Pump	58	43	-

REMOVAL

REMOVAL

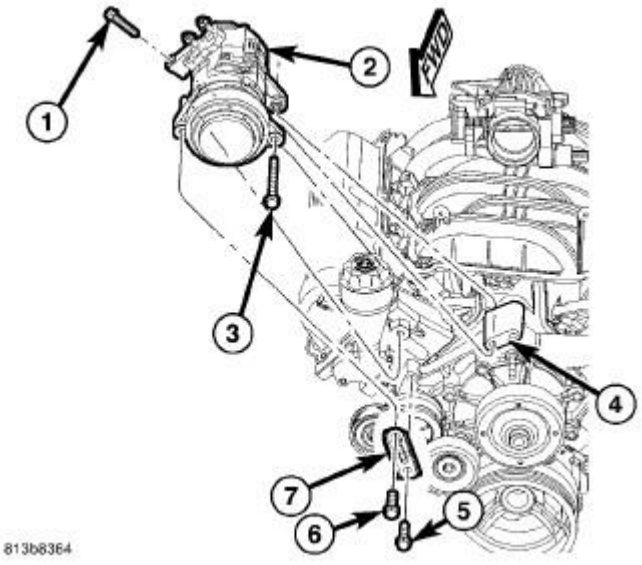

Fig. 5: A/C Compressor Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the battery negative cable.
2. Remove air cleaner assembly.
3. Remove radiator core support bracket.
4. Remove fan shroud with viscous fan assembly.
5. Remove drive belt.
6. Remove A/C compressor (2) and secure away from engine. Refer to **Fig. 5**.

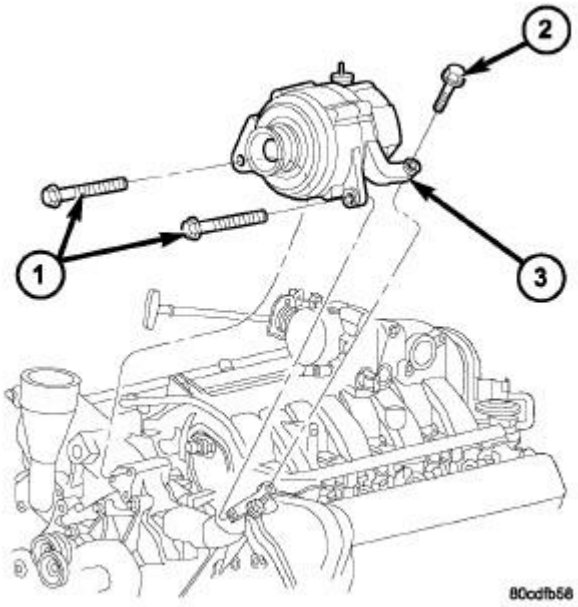

Fig. 6: Generator Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

7. Remove generator (3) and secure away from engine. Refer to **Fig. 6**.

NOTE: Do NOT remove the phenolic pulley from the P/S pump. It is not required for P/S pump removal.

8. Remove power steering pump with lines attached and secure away from engine.
9. Drain cooling system.
10. Disconnect the heater hoses from the engine.
11. Disconnect heater hoses from heater core and remove hose assembly.
12. Disconnect throttle and speed control cables.
13. Remove upper radiator hose from engine.
14. Remove lower radiator hose from engine.

15. Remove radiator/cooling module assembly.
16. Disconnect the engine to body ground straps at the left side of cowl.

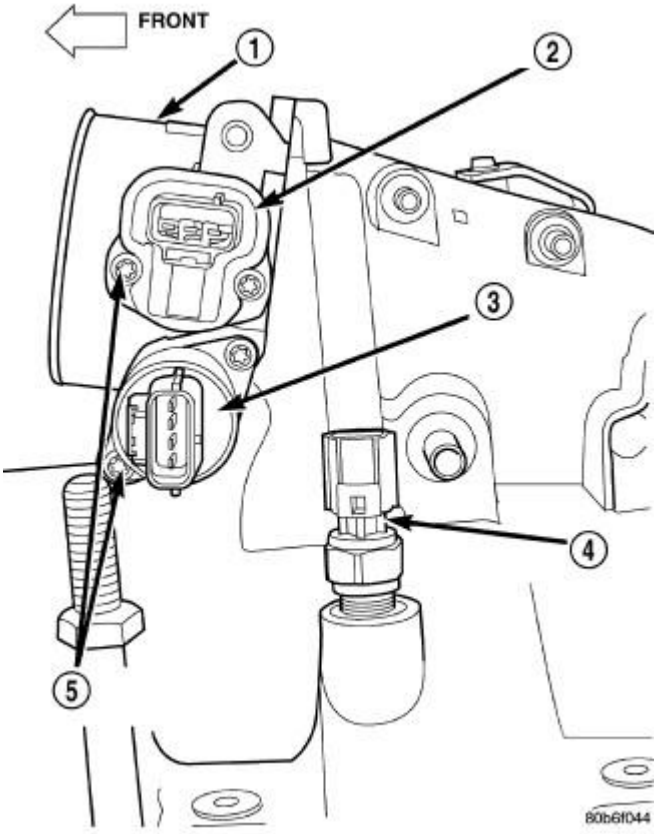

Fig. 7: Throttle Body Connection Points
Courtesy of CHRYSLER GROUP, LLC

17. Disconnect the engine wiring harness at the following points : Refer to **Fig. 7**.
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure (MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor
18. Remove coil over plugs.

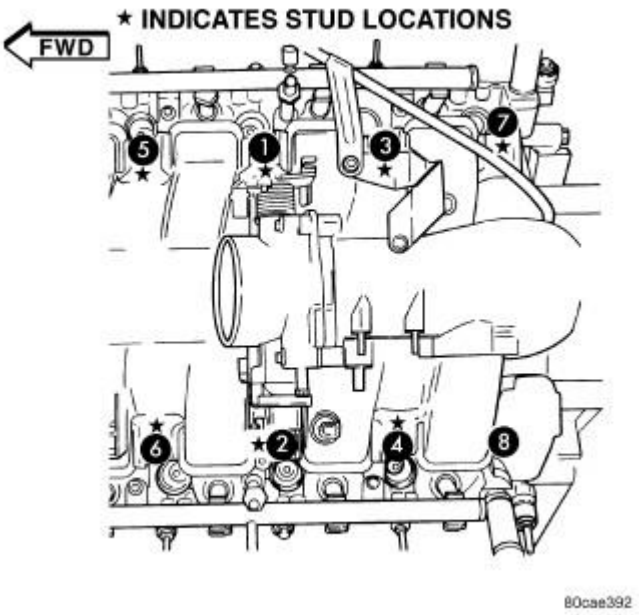

Fig. 8: Intake Manifold Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

19. Release fuel rail pressure.
20. Remove fuel rail and secure away from engine.

NOTE: It is not necessary to release the quick connect fitting from the fuel supply line for engine removal.

21. Remove the PCV hose.
22. Remove the breather hoses.
23. Remove the vacuum hose for the power brake booster.
24. Disconnect knock sensors.
25. Remove engine oil dipstick tube.
26. Remove intake manifold. Refer to **Fig. 8**.
27. Install engine lifting fixture, special tool # (special tool #8427, Fixture, Engine Lifting), using original fasteners from the removed intake manifold, and fuel rail. Torque to factory specifications.

NOTE: Recheck bolt torque for engine lift plate before removing engine.

28. Secure the left and right engine wiring harnesses away from engine.
29. Raise vehicle.
30. Disconnect oxygen sensor wiring.
31. Disconnect crankshaft position sensor.

32. Disconnect the engine block heater power cable, if equipped.

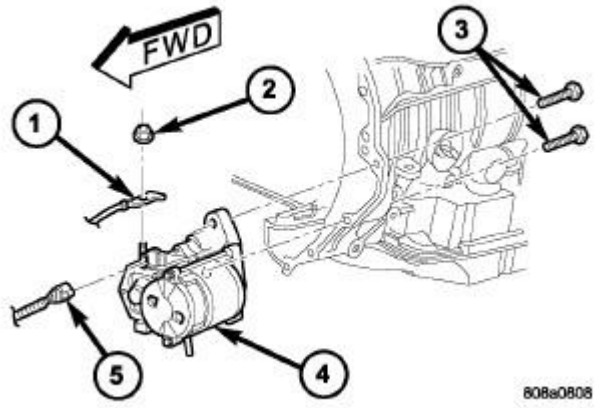

Fig. 9: Remove/Install Starter Motor
Courtesy of CHRYSLER GROUP, LLC

33. Disconnect the front propshaft at the front differential and secure out of way.

NOTE: It is necessary to disconnect the front propshaft for access to the starter and left side exhaust flange.

34. Remove the starter (4). Refer to **Fig. 9**.

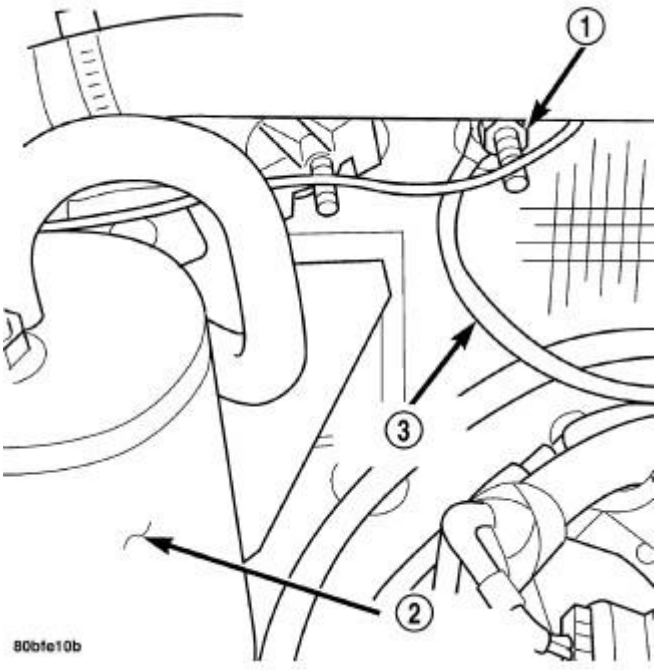

Fig. 10: Removal/Installation Body Ground Strap-Right Side

Courtesy of CHRYSLER GROUP, LLC

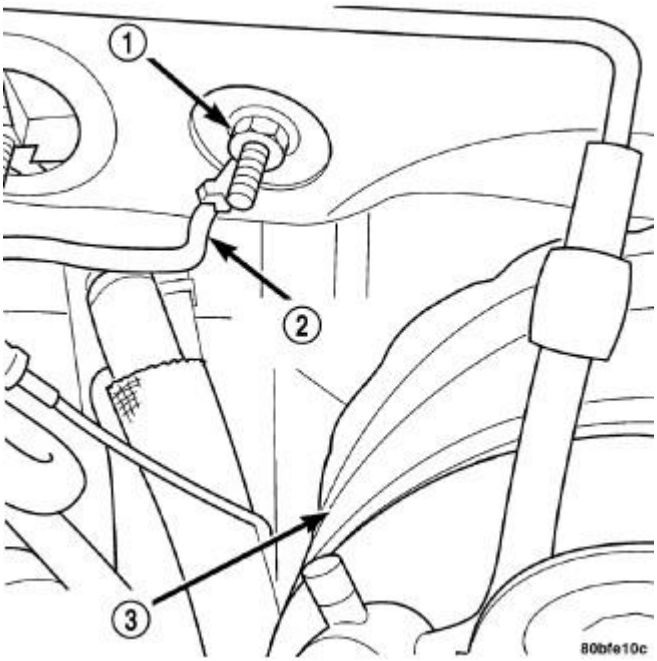

Fig. 11: Removal/Installation Body Ground Strap-Left Side
Courtesy of CHRYSLER GROUP, LLC

35. Remove the ground straps from the left (2) and right. Refer to **Fig. 11**. (3) side of the block. Refer to **Fig. 10**.
36. Disconnect the right and left exhaust pipes at the manifolds and from the crossover, and remove from the vehicle.

NOTE: The exhaust clamps at the manifolds cannot be reused. New clamps must be used or leaks may occur.

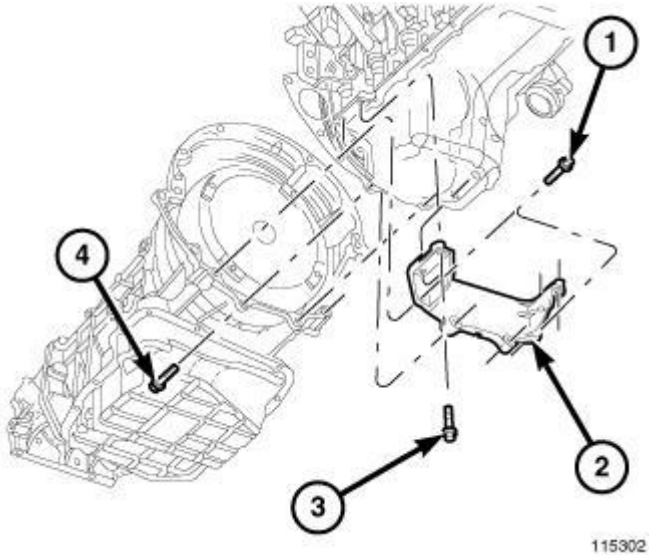

Fig. 12: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

37. Remove the structural cover. Refer to **Fig. 12**.
38. Remove torque convertor bolts, and mark location for reassembly.
39. Remove transmission bellhousing to engine bolts.
40. Remove left and right engine mount thru bolts.
41. Lower the vehicle.
42. Support the transmission with a suitable jack.
43. Connect a suitable engine hoist to the engine lift plate.
44. Remove engine from vehicle.

INSTALLATION

INSTALLATION

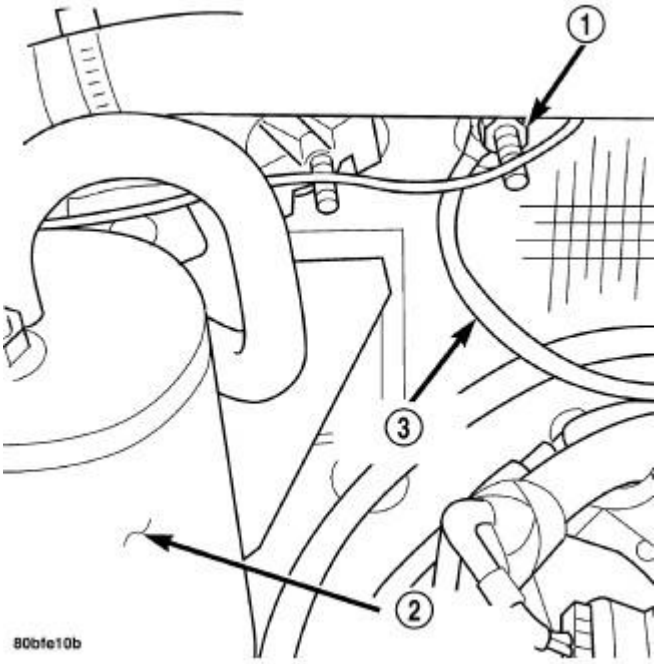

Fig. 13: Removal/Installation Body Ground Strap-Right Side
Courtesy of CHRYSLER GROUP, LLC

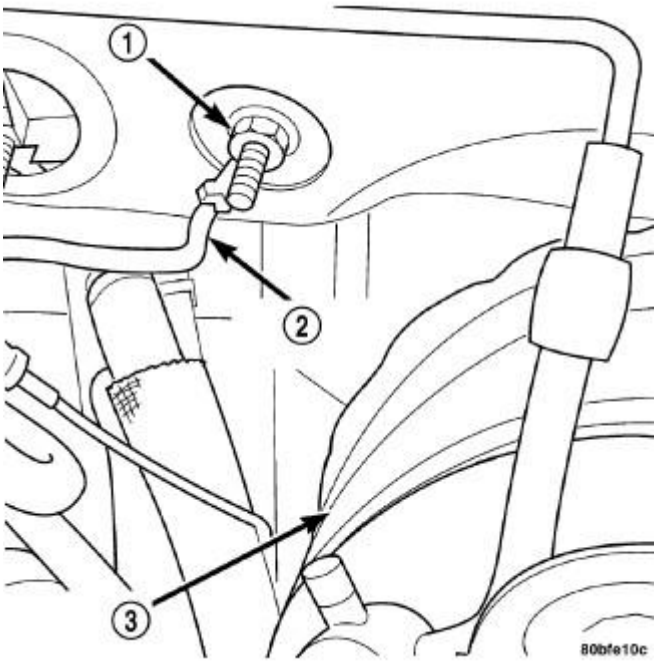

Fig. 14: Removal/Installation Body Ground Strap-Left Side
Courtesy of CHRYSLER GROUP, LLC

1. Position the engine in the vehicle.
2. Install both left and right side engine mounts onto engine.

3. Raise the vehicle.
4. Install the transmission bellhousing to engine mounting bolts. Tighten the bolts to 41 N.m (30 ft. lbs.).
5. Tighten the engine mount thru bolts.
6. Install the torque convertor bolts.
7. Connect the ground straps on the left (2) and right (3) side of the engine. Refer to **Fig. 14**. Refer to **Fig. 13**.

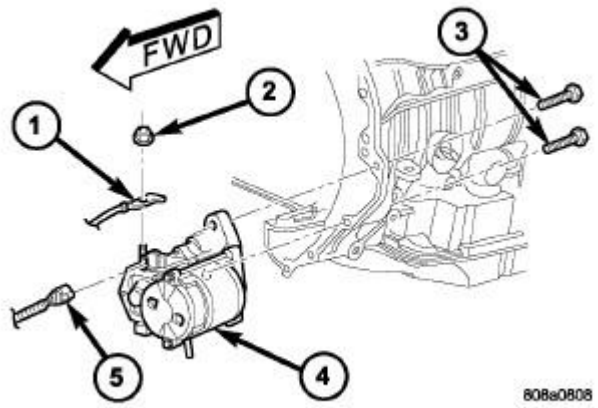

Fig. 15: Remove/Install Starter Motor
Courtesy of CHRYSLER GROUP, LLC

8. Install the starter (4). Refer to **Fig. 15**.
9. Connect the crankshaft position sensor.
10. Install the engine block heater power cable, if equipped.

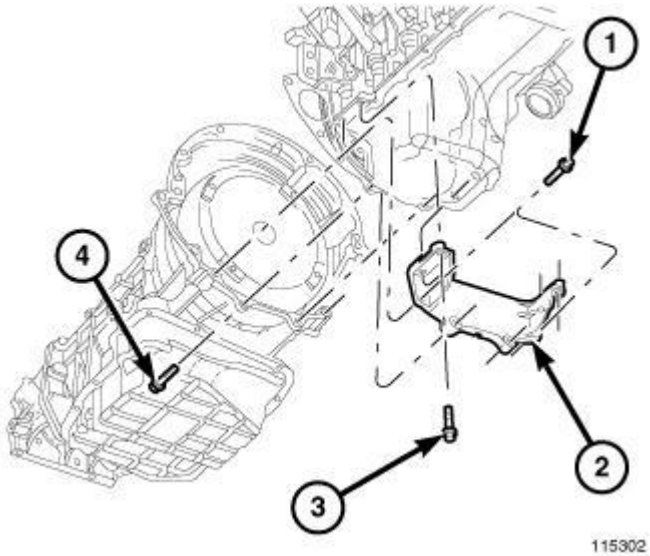

Fig. 16: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

11. Install the structural cover. Refer to **Fig. 16**.

NOTE: New clamps must be used on exhaust manifold flanges. Failure to use new clamps may result in exhaust leaks.

12. Install the left and right exhaust pipes.
13. Connect the left and right oxygen sensors.
14. Lower vehicle.
15. Remove the engine lift plate.
16. Connect the knock sensors.
17. Connect the engine to body ground straps at the left side of the cowl.

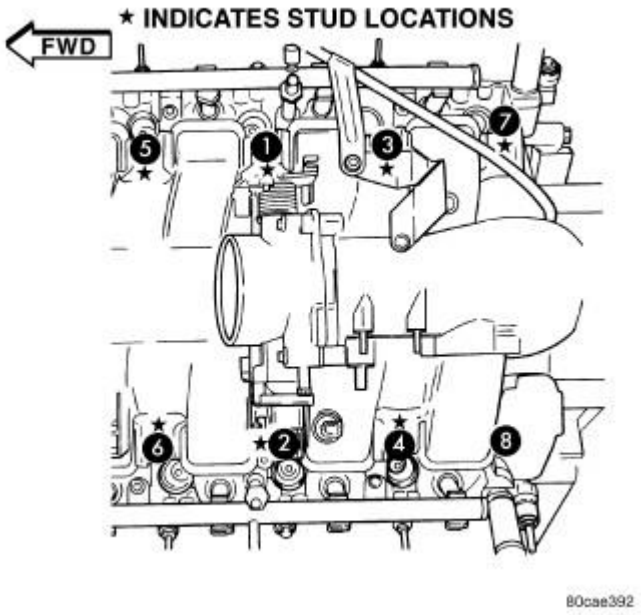

Fig. 17: Intake Manifold Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

18. Install the intake manifold. Refer to **Fig. 17**.
19. Install the engine oil dipstick tube.
20. Install the power brake booster vacuum hose.
21. Install the breather hoses.
22. Install the PCV hose.
23. Install the fuel rail.

24. Install the coil over plugs.

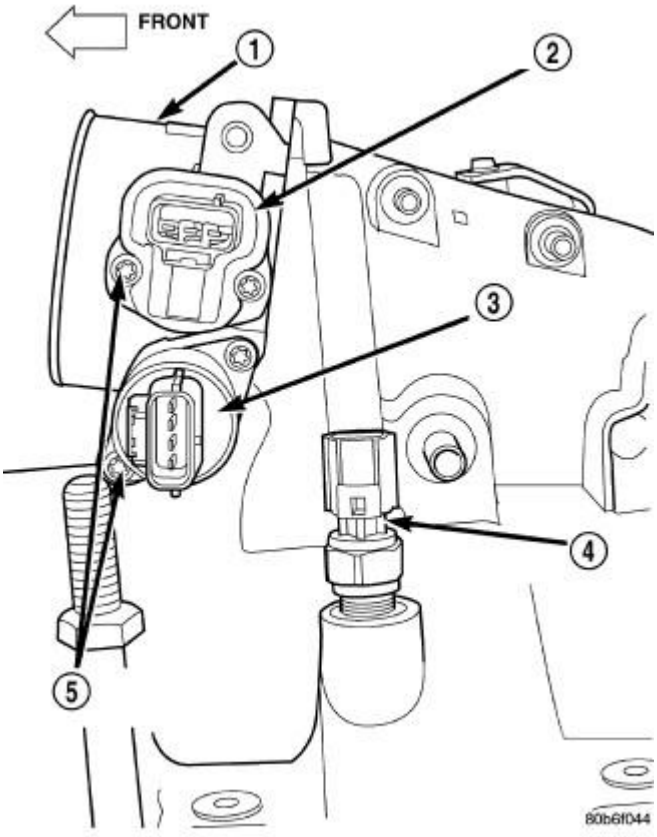

Fig. 18: Throttle Body Connection Points
Courtesy of CHRYSLER GROUP, LLC

25. Connect the engine wiring harness at the following points : Refer to **Fig. 18**.
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor

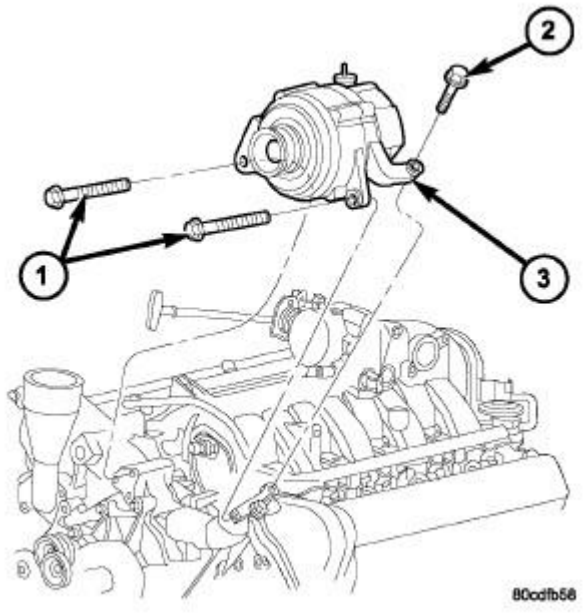

Fig. 19: Generator Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

26. Reinstall the radiator/cooling module assembly.
27. Connect lower radiator hose.
28. Connect upper radiator hose.
29. Connect throttle and speed control cables.
30. Install the heater hose assembly.
31. Install coolant recovery bottle.
32. Install the power steering pump.
33. Install the generator (3). Refer to **Fig. 19**.

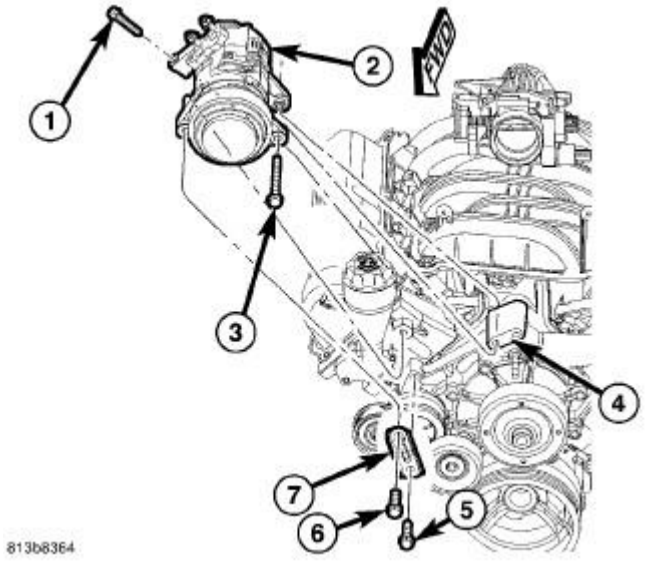

Fig. 20: A/C Compressor Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

34. Install the A/C compressor (2). Refer to **Fig. 20**.
35. Install the drive belt.
36. Install the fan shroud with the viscous fan assembly.
37. Install the radiator core support bracket.
38. Install the air cleaner assembly.
39. Refill the engine cooling system.
40. Recharge the air conditioning.
41. Check and fill engine oil.
42. Connect the battery negative cable.
43. Start the engine and check for leaks.

SPECIAL TOOLS

SPECIAL TOOLS

1023 - Puller (Originally Shipped In Kit Number(s) 8678.)
10368 - Set, Universal Protective Cap
6871 - Installer, A/C Hub (Originally Shipped In Kit Number(s) 6896.)
6958 - Wrench, Spanner (Originally Shipped In Kit Number(s) 6947, 6949, 6966, 8204, 8204CC, 8667.)
7700 - Tester, Cooling System (Originally Shipped In Kit Number(s) 7700-A.)

8346 - Pins, Adapter
(Originally Shipped In Kit Number(s) 8503, 8510, 8520, 8520CC.)
8348 - Installer, Seal
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC, 9975.)
8349 - Installer, Crankshaft Rear Oil Seal
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC.)
8349-2 - Guide Crank Seal
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC.)
8379 - Locking Tool, Wedge
(Originally Shipped In Kit Number(s) 8703, 8703CC.)
8387 - Compressor, Valve Spring
(Originally Shipped In Kit Number(s) 8653, 8700, 8700CC.)
8427 - Fixture, Engine Lifting
(Originally Shipped In Kit Number(s) 8703, 8703CC, 8712, 9975.)
8428A - Holder, Camshaft
(Originally Shipped In Kit Number(s) 10134, 10134, 9975.)
8429 - Holder, Secondary Camshaft Chain
(Originally Shipped In Kit Number(s) 8703, 8703CC, 8712, 9975.)
8454 - 3-Jaw Puller
(Originally Shipped In Kit Number(s) 8673, 8675, 8676, 8709, 8709CC.)
8506 - Remover, Seal
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC.)
8507 - Guides, Connecting Rod
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC.)
8511 - Remover, Seal
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC, 9975.)
8512A - Installer, Damper
(Originally Shipped In Kit Number(s) 8283, 8527, 8575, 8575CC, 8660, 8661.)
8513A - Insert, Crankshaft
(Originally Shipped In Kit Number(s) 8283, 8527, 8575, 8999, 8999CC.)
8514 - Pins, Tensioner
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC, 9975.)
8516A - Remover/Installer
(Originally Shipped In Kit Number(s) 8283, 8527, 8534B, 8575, 9090, 9300, 9975.)
8517 - Remover
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC, 9975.)
8519 - Adapters, Valve Spring
(Originally Shipped In Kit Number(s) 8283, 8283CC, 8527, 8527CC, 8575, 8575CC, 9975.)
8534B - Fixture, Driveline Support
(Originally Shipped In Kit Number(s) 8534, 8534B, 8849, 9565.)
8641 - Remover/Installer
(Originally Shipped In Kit Number(s) 8703, 8703CC, 8712, 9975.)
9867 - Wedge, Locking
(Originally Shipped In Kit Number(s) 9998, 9999.)
C-119 - Cylinder Indicator

	C-3292A - Gauge, Pressure C-3422-D - Compressor, Valve Spring C-3501 - Hone W/Oil, AMMCO Cylinder C-3501-3810 - Stones, 220 Grit Honing C-3501-3880 - Oil, Honing C-3685-A - Bloc-Chek Kit C-4171 - Driver Handle, Universal (Originally Shipped In Kit Number(s) 9202, 9202A-CAN, 9202CC, 9299, 9299CC, 9299CC, 9300A-CAN.) C-823 - Hone, Cylinder

AIR INTAKE SYSTEM

AIR CLEANER

REMOVAL

REMOVAL

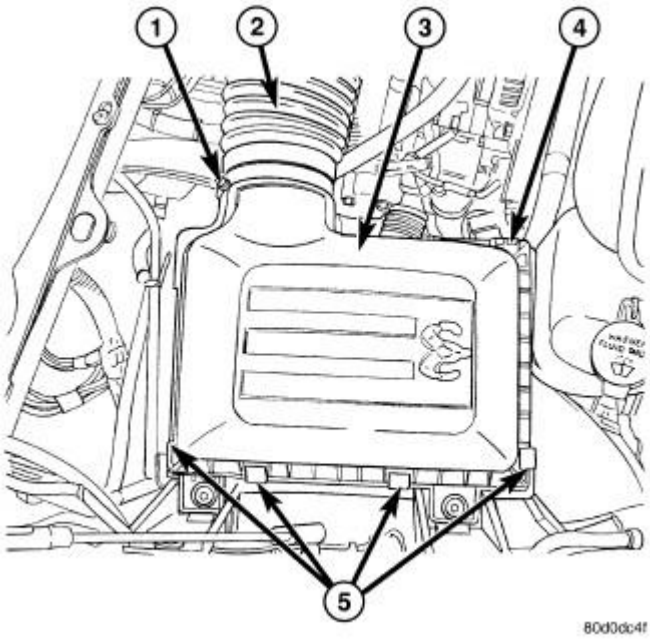

Fig. 21: Air Cleaner Housing Cover, Air Duct & Fasteners
Courtesy of CHRYSLER GROUP, LLC

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

5. Clean inside of housing before replacing element.

INSTALLATION

INSTALLATION

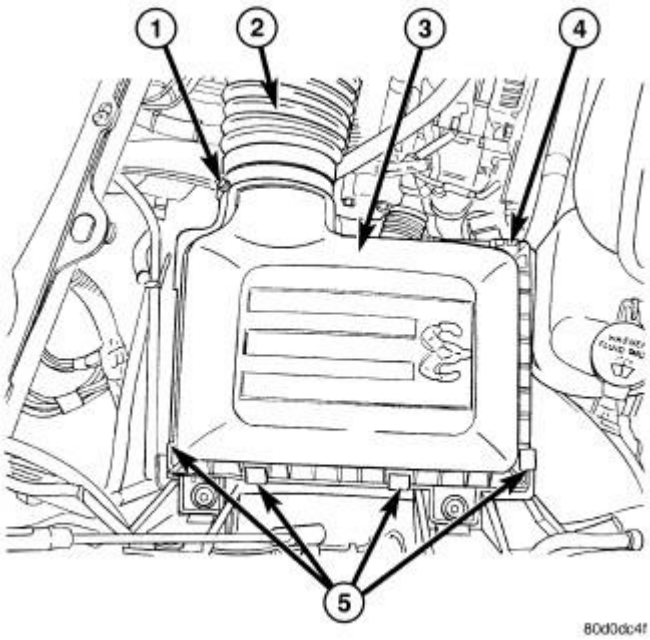

Fig. 22: Air Cleaner Housing Cover, Air Duct & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Install filter element into housing.
2. Position housing cover (3) into housing locating tabs.
3. Pry up 4 spring clips (5) and lock cover to housing.
4. Install air duct (2) to air cleaner cover (3) and tighten hose clamp (1) to 3 N.m (30 in. lbs.).

BODY, AIR CLEANER

REMOVAL

REMOVAL

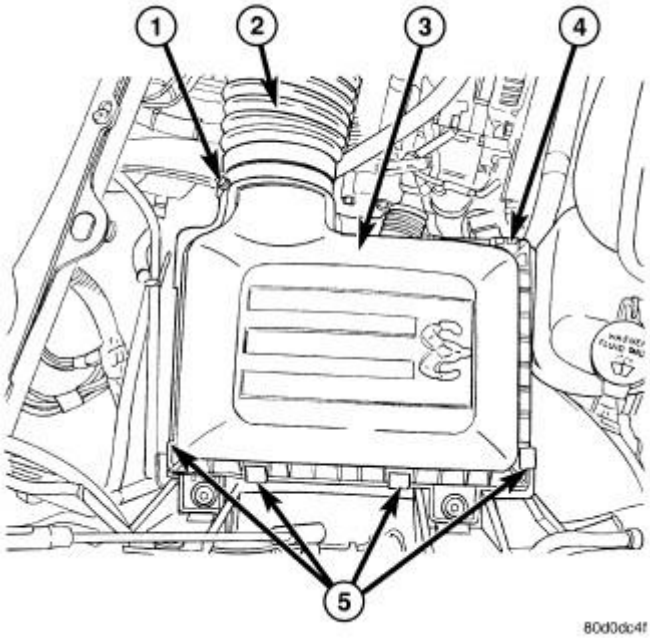

Fig. 23: Air Cleaner Housing Cover, Air Duct & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1. Loosen clamp (1) and disconnect air duct (2) at air cleaner cover (3).

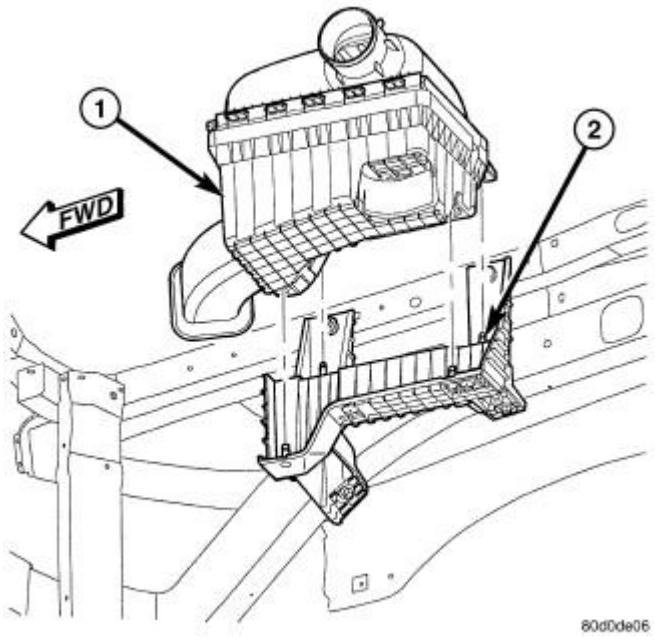

Fig. 24: Air Cleaner Housing Assembly
Courtesy of CHRYSLER GROUP, LLC

2. Lift entire housing (1) assembly from 4 locating pins (2).

INSTALLATION

INSTALLATION

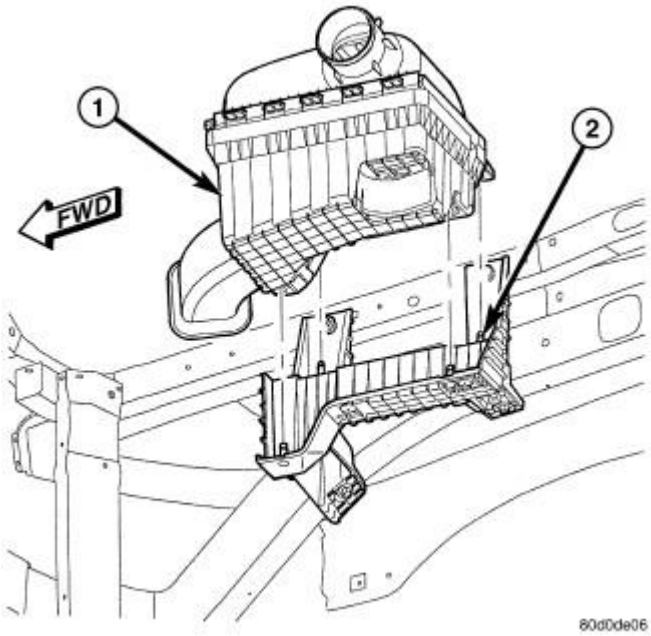

Fig. 25: Air Cleaner Housing Assembly
Courtesy of CHRYSLER GROUP, LLC

1. Position housing assembly (1) into 4 locating pins (2).

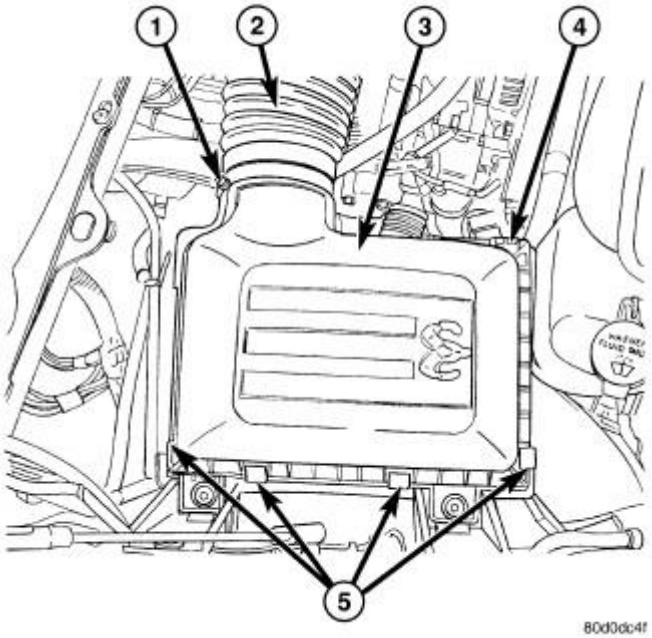

Fig. 26: Air Cleaner Housing Cover, Air Duct & Fasteners
Courtesy of CHRYSLER GROUP, LLC

2. Connect air duct (2) at air cleaner cover (3) and tighten clamp (1).

CYLINDER HEAD, LEFT

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET

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

CHEMICAL TEST METHOD

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

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Disconnect the exhaust pipe at the left side exhaust manifold.
4. Drain the engine coolant. Refer to **STANDARD PROCEDURE** .
5. Lower the vehicle.
6. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL, 3.7L**.
7. Remove the master cylinder and booster assembly. Refer to **BOOSTER, POWER BRAKE,**

REMOVAL and **BOOSTER, POWER BRAKE, HYDRO-BOOST, REMOVAL** .

8. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).

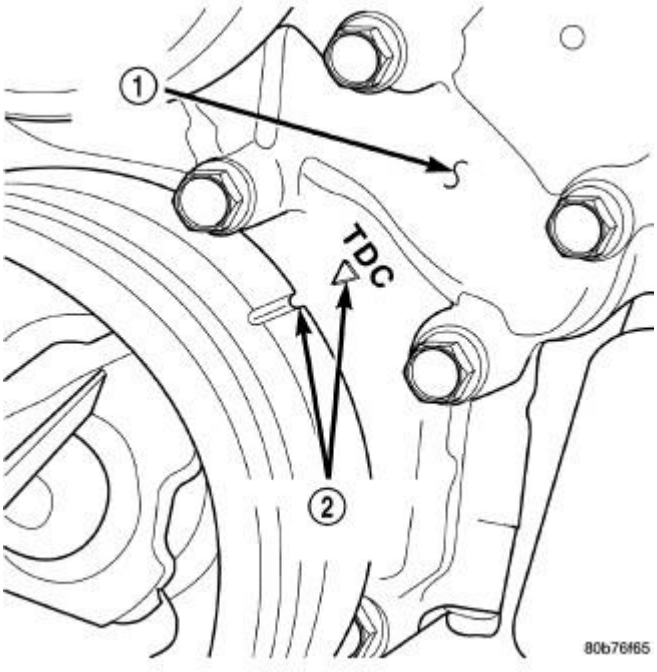

Fig. 27: TDC Indicator Marks
Courtesy of CHRYSLER GROUP, LLC

9. Remove the fan shroud and fan blade assembly. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
10. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
11. Remove the power steering pump and set aside.
12. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (2).

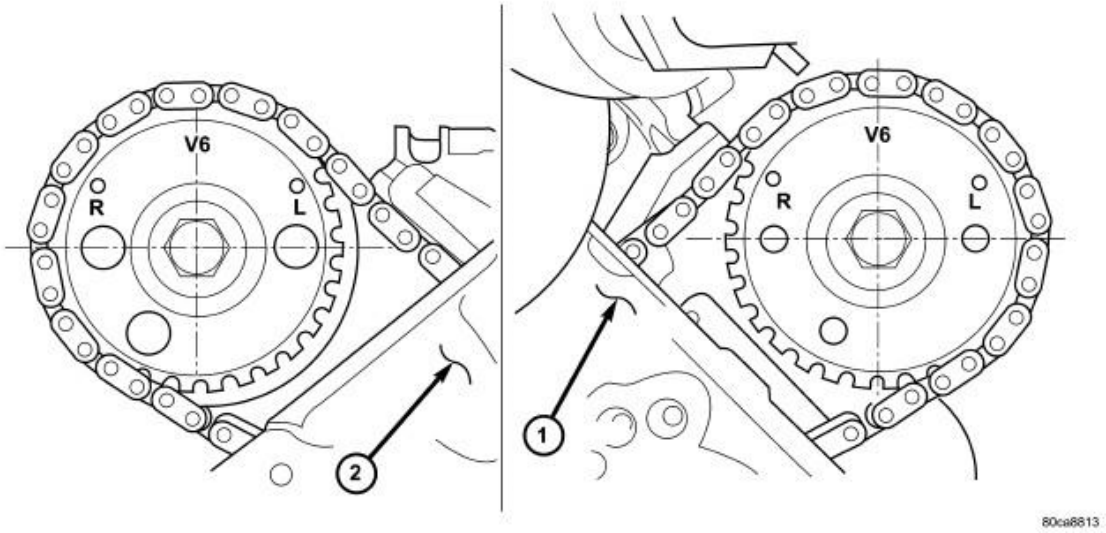

Fig. 28: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

13. Verify the V6 mark on the camshaft sprocket is at the 12 o'clock position. Rotate the crankshaft one turn if necessary.
14. Remove the crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 3.7L**.
15. Remove the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.

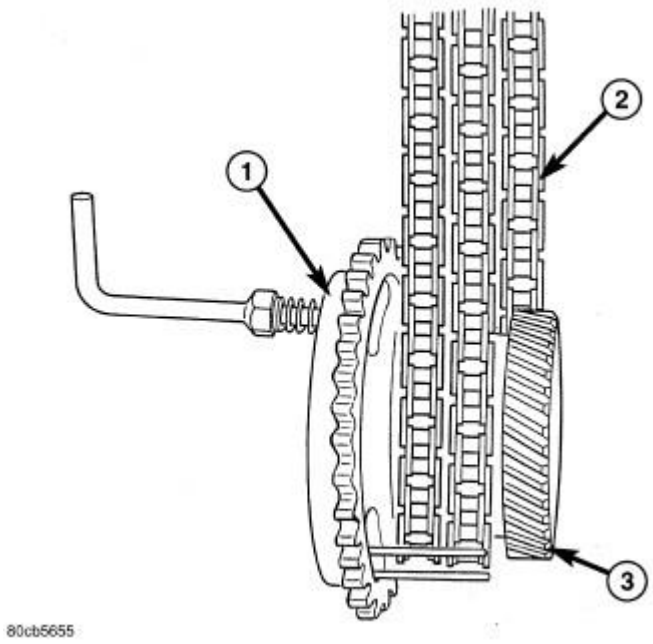

Fig. 29: Locking Secondary Timing Chains
Courtesy of CHRYSLER GROUP, LLC

16. Lock the secondary timing chains to the idler sprocket using special tool (special tool #8429, Holder,

Secondary Camshaft Chain) timing chain holding fixture.

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

17. Mark the secondary timing chain, one link on each side of the V6 mark on the camshaft drive gear.
18. Remove the left side secondary chain tensioner. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

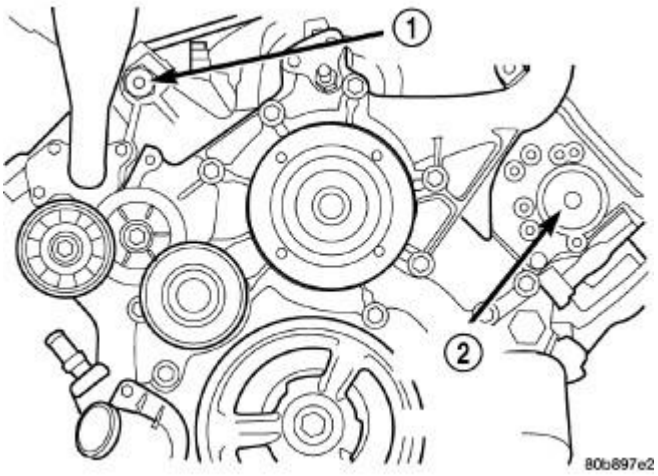

Fig. 30: Access Plugs From Left And Right Cylinder Heads
Courtesy of CHRYSLER GROUP, LLC

19. Remove the cylinder head access plug (2).
20. Remove the left side secondary chain guide. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.
21. Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. Severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

22. Remove the cylinder head retaining bolts.
23. Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, due to the design of the cylinder head gasket any distortion to the cylinder head

sealing surface may prevent the gasket from properly sealing resulting in leaks.

INSTALLATION

INSTALLATION

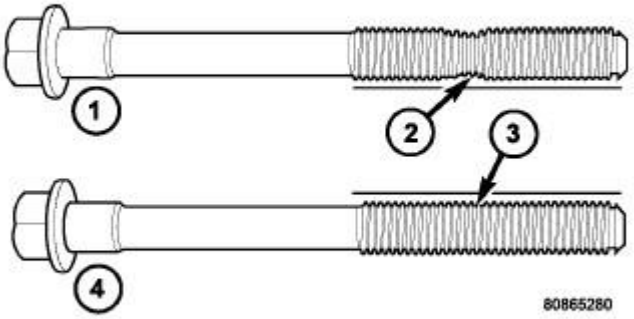

Fig. 31: Checking Cylinder Head Bolts For Stretching (Necking)
Courtesy of CHRYSLER GROUP, LLC

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down (2) the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced. Refer to **Fig. 31**.

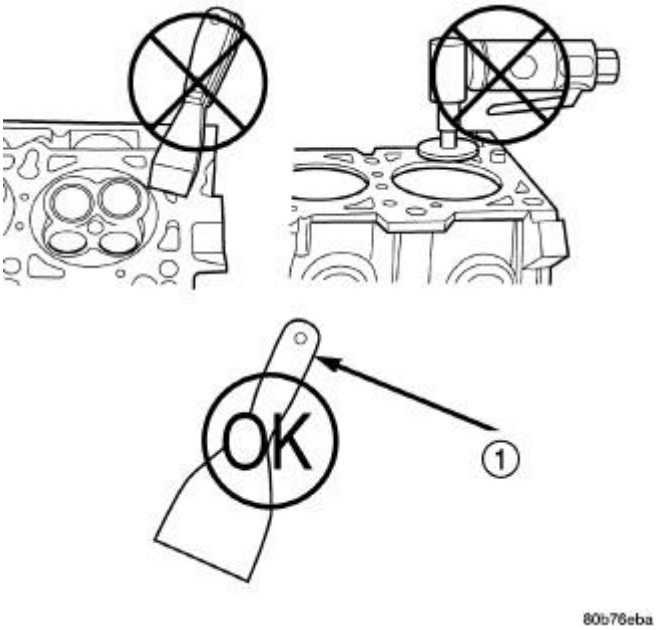

Fig. 32: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

1 - PLASTIC/WOOD SCRAPER

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper (1) because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

1. Clean the cylinder head and cylinder block mating surfaces. Refer to **Fig. 32**.

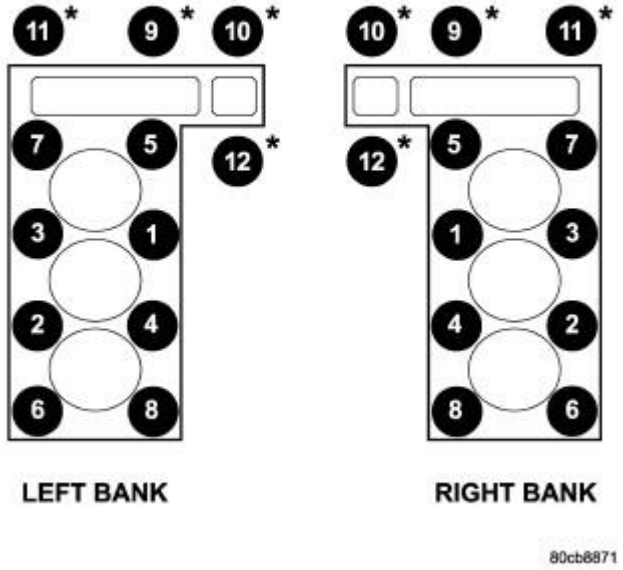

Fig. 33: Cylinder Head Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

* - INDICATES SEALANT ON THREADS

2. Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the eight M11 bolts.
5. Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

6. Tighten the bolts in sequence using the following steps and torque values : Refer to **Fig. 33**.
   - Step 1: Tighten bolts 1-8, 27 N.m (20 ft. lbs.).
   - Step 2: Verify that bolts 1-8, all reached 27 N.m (20 ft. lbs.), by repeating step 1 without loosening

the bolts.

- Tighten bolts 9 thru 12 to 14 N.m (10 ft. lbs.).
- Step 3: Tighten bolts 1-8, 90 degrees.
- Step 4: Tighten bolts 1-8, 90 degrees, again. Tighten bolts 9-12, 26 N.m (19 ft. lbs.)

7. Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark on the gear then using Special Tool (special tool #8428A, Holder, Camshaft) Camshaft Wrench, position the gear onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

8. Install the camshaft drive gear retaining bolt.
9. Install the left side secondary chain guide. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.
10. Install the cylinder head access plug.
11. Re-set and install the left side secondary chain tensioner. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.
12. Remove Special Tool (special tool #8429, Holder, Secondary Camshaft Chain).
13. Install the timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 3.7L**.
14. Install the crankshaft damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 3.7L**. Tighten damper bolt 175 N.m (130 Ft. Lbs.).
15. Install the power steering pump.
16. Install the fan blade assembly and fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
17. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).
18. Install the master cylinder and booster assembly. Refer to **BOOSTER, POWER BRAKE, INSTALLATION** and **BOOSTER, POWER BRAKE, HYDRO-BOOST, INSTALLATION** .
19. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION, 3.7L**.
20. Refill the cooling system. Refer to **STANDARD PROCEDURE** .
21. Raise the vehicle.
22. Install the exhaust pipe onto the left exhaust manifold.
23. Lower the vehicle.
24. Connect the negative cable to the battery.
25. Start the engine and check for leaks.

CAMSHAFT, ENGINE

DESCRIPTION

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. Four bearing journals are machined into the camshaft. Camshaft end play is controlled by two thrust walls that border the nose piece journal.

REMOVAL

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, Do not forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use the Wedge Locking Tool (special tool #8379, Locking Tool, Wedge) will result in hydraulic tensioner ratchet over extension, requiring timing chain cover removal to reset the tensioner ratchet.

1. Remove cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. Set engine cylinder #1 to TDC, camshaft sprocket V6 marks at the 12 o'clock position.
3. Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel (Located on the right side camshaft sprocket) for any reason, Severe damage will occur to the target wheel resulting in a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave the bolt snug against the sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

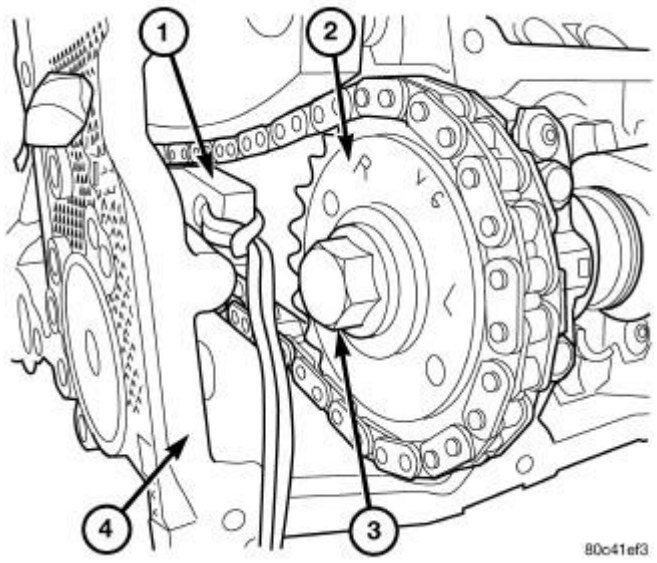

Fig. 34: Timing Chain Tensioners Secured With Timing Chain Wedge
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Do not force Locking Wedge (special tool #9867, Wedge, Locking) past the narrowest point between the chain strands. Damage to the tensioners may occur.

5. Position the Wedge Locking Tool (special tool #8379, Locking Tool, Wedge) (1) between the timing chain strands, tap the tool to securely wedge the timing chain against the tensioner arm and guide.

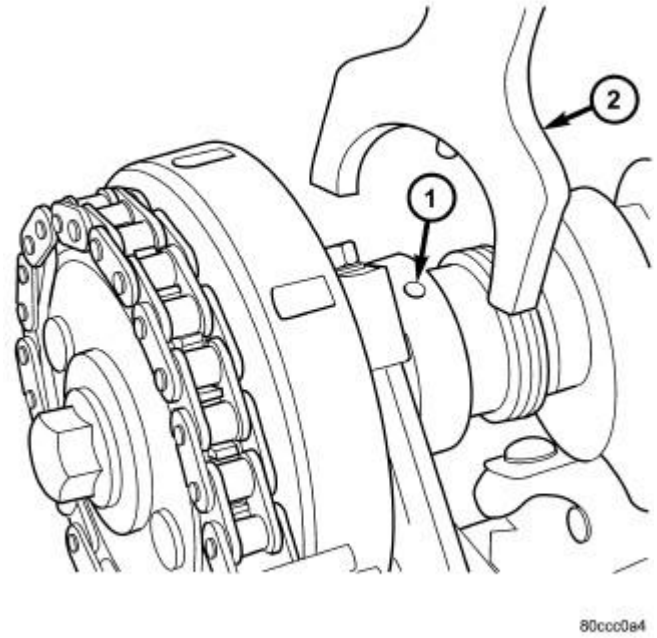

Fig. 35: Camshaft & Camshaft Holder

Courtesy of CHRYSLER GROUP, LLC

6. Hold the camshaft with the Camshaft Holder (special tool #8428A, Holder, Camshaft), while removing the camshaft sprocket bolt and sprocket. Refer to **Fig. 35**.
7. Using the Camshaft Holder (special tool #8428A, Holder, Camshaft), gently allow the camshaft to rotate 5° clockwise until the camshaft is in the neutral position (no valve load).
8. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

9. Remove the camshaft bearing caps and the camshaft.

INSTALLATION

INSTALLATION

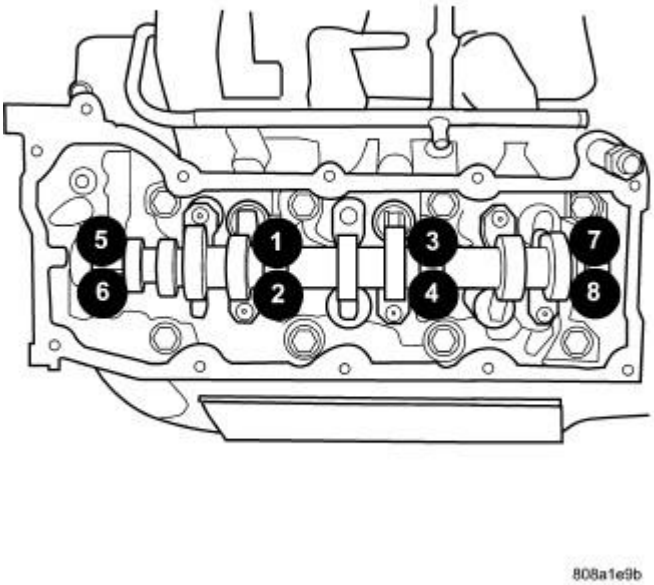

Fig. 36: Camshaft Bearing Caps Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the left side camshaft so that the camshaft sprocket dowel is near the 1 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.
3. Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 through 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.

4. Working in 1/2 turn increments, tighten the bearing cap retaining bolts in the sequence shown in illustration.
5. Tighten the camshaft bearing cap retaining bolts to 11 N.m (100 in. lbs.). Refer to **Fig. 36**.
6. Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal).

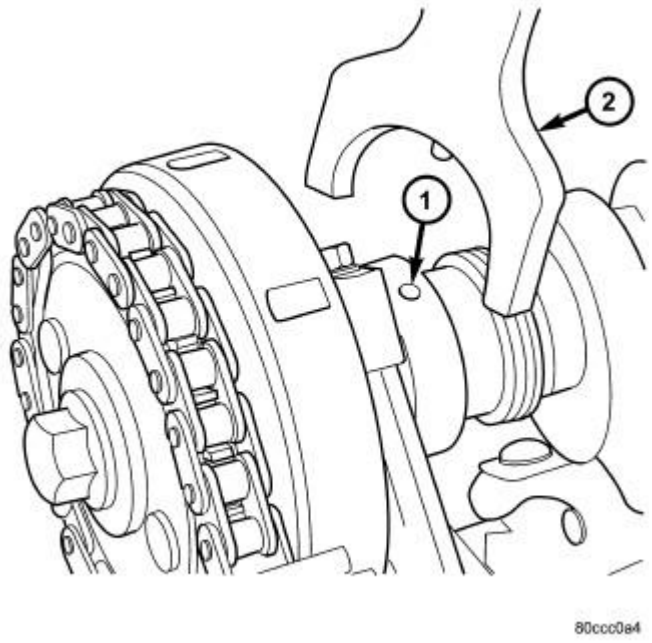

Fig. 37: Camshaft & Camshaft Holder
Courtesy of CHRYSLER GROUP, LLC

7. Using the Camshaft Holder (special tool #8428A, Holder, Camshaft) (2), rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.

CAUTION: Remove excess oil from the camshaft sprocket retaining bolt, failure

to do so can cause bolt over-torque resulting in bolt failure.

8. Remove excess oil from bolt, then install the camshaft sprocket retaining bolt and hand tighten.
9. Remove Wedge Locking Tool (special tool #8379, Locking Tool, Wedge).

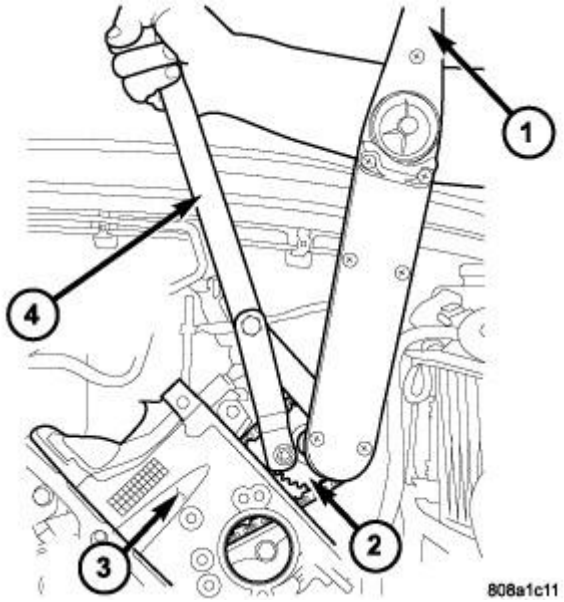

Fig. 38: Tightening Left Side Camshaft Sprocket Bolt
Courtesy of CHRYSLER GROUP, LLC

10. Using the Spanner Wrench (special tool #6958, Wrench, Spanner) (4) with adapter pins (special tool #8346, Pins, Adapter), tighten the camshaft sprocket retaining bolt to 122 N.m (90 ft. lbs.).
11. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

COVER(S), CYLINDER HEAD

DESCRIPTION

DESCRIPTION

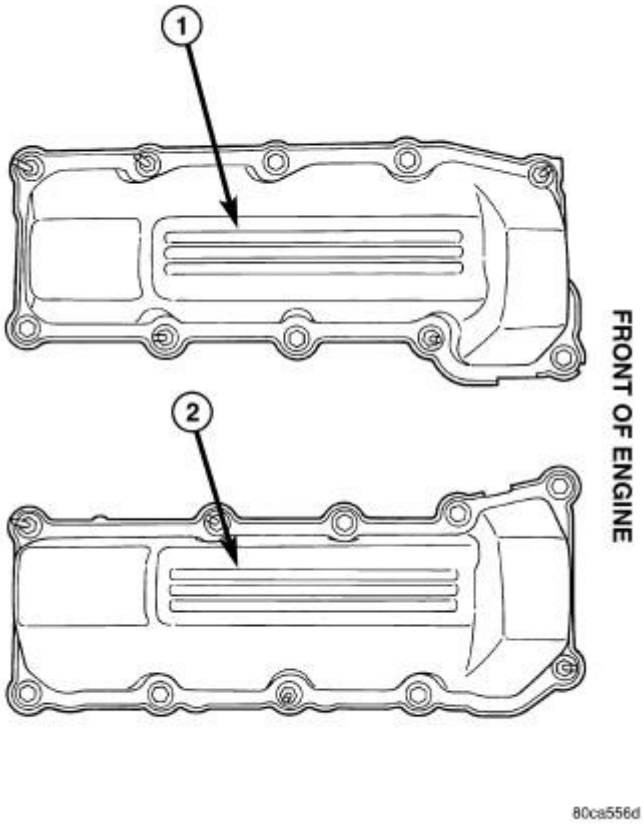

Fig. 39: Cylinder Head Covers
Courtesy of CHRYSLER GROUP, LLC

1 - LEFT SIDE CYLINDER HEAD COVER
2 - RIGHT SIDE CYLINDER HEAD COVER

The cylinder head covers (1, 2) are made of glass re-enforced thermoset plastic, and are not interchangeable from side-to-side. Refer to **Fig. 39**.

REMOVAL

REMOVAL

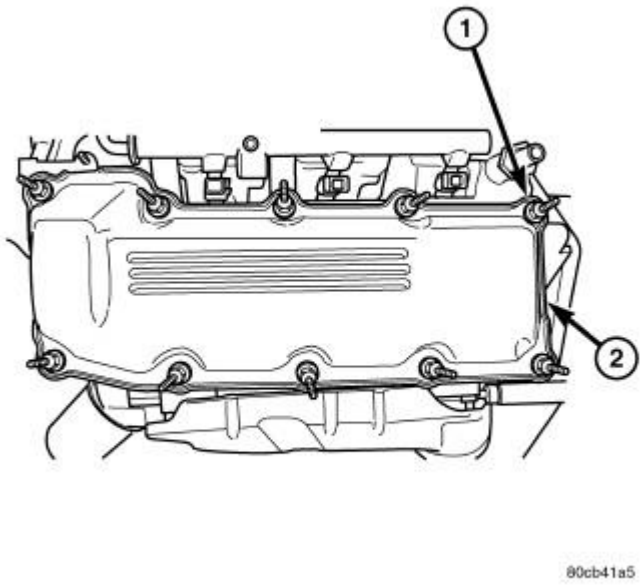

Fig. 40: Cylinder Head Cover & Screws
Courtesy of CHRYSLER GROUP, LLC

1 - SCREWS
2 - CYLINDER HEAD COVER

1. Disconnect negative cable from battery.
2. Remove the resonator assemble and air inlet hose.
3. Disconnect injector connectors and un-clip the injector harness.
4. Route injector harness in front of cylinder head cover.
5. Disconnect the left side breather tube and remove the breather tube.
6. Remove the cylinder head cover mounting bolts (1).
7. Remove cylinder head cover (1) and gasket. Refer to **Fig. 40**.

NOTE: The gasket may be used again, providing no cuts, tears, or deformation has occurred.

INSTALLATION

INSTALLATION

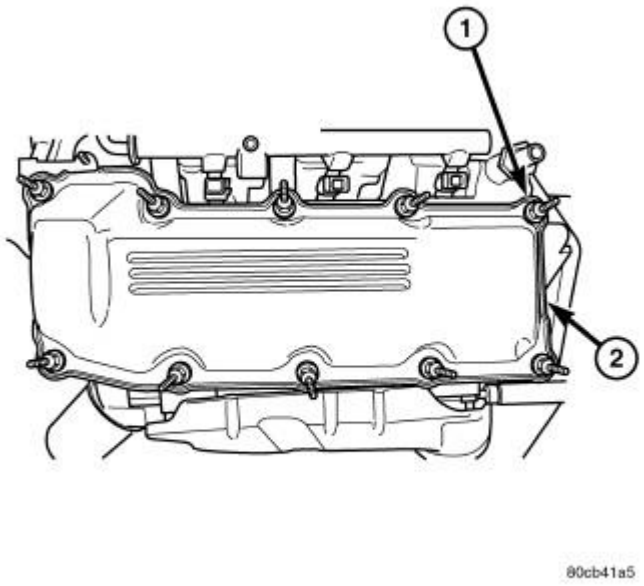

Fig. 41: Cylinder Head Cover & Screws
Courtesy of CHRYSLER GROUP, LLC

1 - SCREWS
2 - CYLINDER HEAD COVER

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

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Install cylinder head cover (2). Refer to **Fig. 41**.
3. Tighten cylinder head cover bolts (1) and double ended studs to 12 N.m (105 in. lbs.).
4. Install left side breather and connect breather tube.
5. Connect injector electrical connectors and injector harness retaining clips.
6. Install the resonator and air inlet hose.
7. Connect negative cable to battery.

ROCKER ARM, VALVE

DESCRIPTION

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.5 inch) oil jet hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

REMOVAL

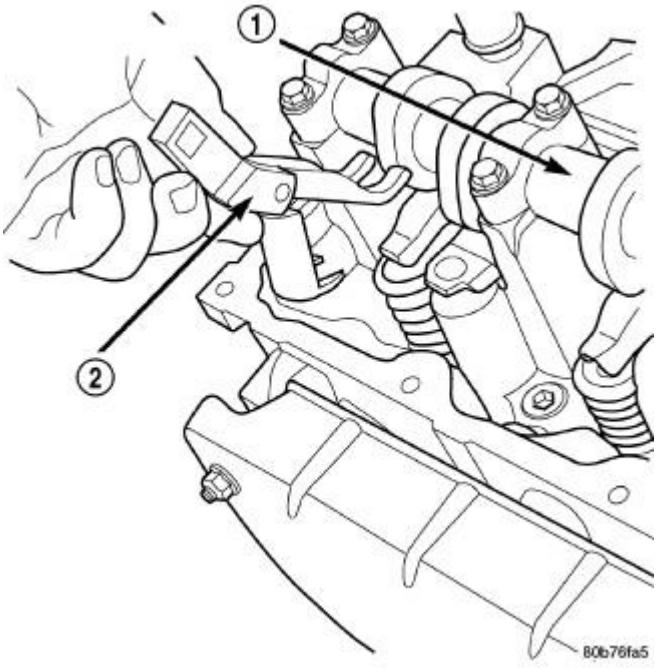

Fig. 42: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. For rocker arm removal on cylinder No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
3. For rocker arm removal on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
4. For rocker arm removal on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.
5. For rocker arm removal on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at TDC ignition stroke.
6. Using the Rocker Arm Remover/Installer (special tool #8516A, Remover/Installer) (2), press downward

on the valve spring, remove rocker arm. Refer to **Fig. 42**.

INSTALLATION

INSTALLATION

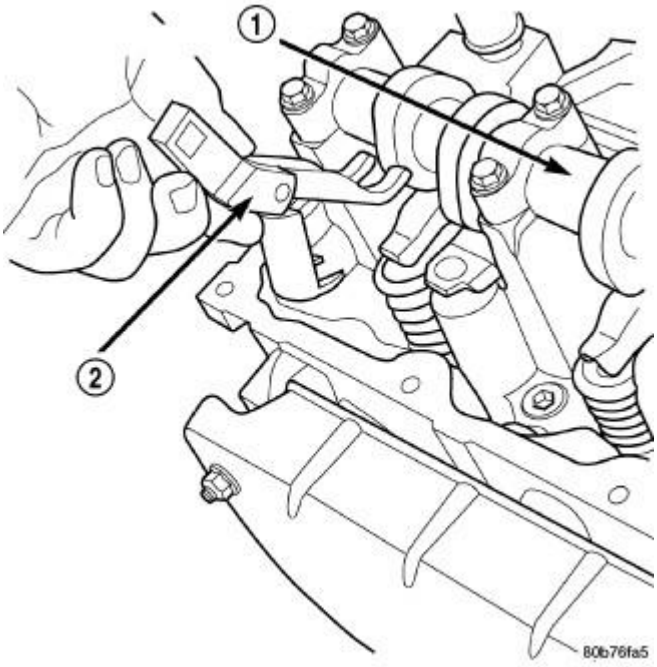

Fig. 43: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

1. For rocker arm installation on cylinders No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
2. For rocker arm installation on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
3. For rocker arm installation on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.
4. For rocker arm installation on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at TDC ignition stroke.

5. Using the Rocker Arm Remover/Installer (special tool #8516A, Remover/Installer) (2) press downward on the valve spring, install rocker arm. Refer to **Fig. 43**.
6. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

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.

REMOVAL

REMOVAL

The valve stem seal is integral with the valve spring seat, for removal. Refer to **SPRING(S), VALVE, REMOVAL, 3.7L** (Left) and **SPRING(S), VALVE, REMOVAL, 3.7L** (Right).

INSTALLATION

INSTALLATION

The valve stem seal is integral with the valve spring seat, for installation. Refer to **SPRING(S), VALVE, INSTALLATION, 3.7L** (Left) and **SPRING(S), VALVE, INSTALLATION, 3.7L** (Right).

SPRING(S), VALVE

DESCRIPTION

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are NOT common for intake and exhaust applications. The exhaust spring has an external damper. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

REMOVAL

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. Using the Valve Spring Remover/Installer (special tool #8516A, Remover/Installer), remove the rocker arms and the hydraulic lash adjusters.
3. Remove the spark plug for the cylinder the valve spring and seal are to be removed from.
4. Apply shop air to the cylinder to hold the valves in place when the spring is removed.

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

5. Using the Valve Spring Compressor (special tool #8387, Compressor, Valve Spring), compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

6. Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

7. Remove the valve spring compressor.

NOTE: The valve springs are NOT common between intake and exhaust.

8. Remove the spring retainer, and the spring.

NOTE: The valve stem seals are common between intake and exhaust.

9. Remove the valve stem seal.

INSTALLATION

INSTALLATION

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

1. Apply shop air to the cylinder to hold the valves in place while the spring is installed.

NOTE: The valve stem seals are common between intake and exhaust.

2. Install the valve stem seal.

NOTE: The valve springs are NOT common between intake and exhaust.

3. Install the spring retainer, and the spring.
4. Using the Valve Spring Compressor (special tool #8387, Compressor, Valve Spring), compress the valve spring.
5. Install the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

6. Remove the valve spring compressor.
7. Disconnect the shop air to the cylinder.
8. Install the spark plug for the cylinder the valve spring and seal was installed on.
9. Using Valve Spring Remover/Installer (special tool #8516A, Remover/Installer), install the rocker arms and the hydraulic lash adjusters.
10. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

VALVES, INTAKE AND EXHAUST

DESCRIPTION

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE

STANDARD PROCEDURE - REFACING

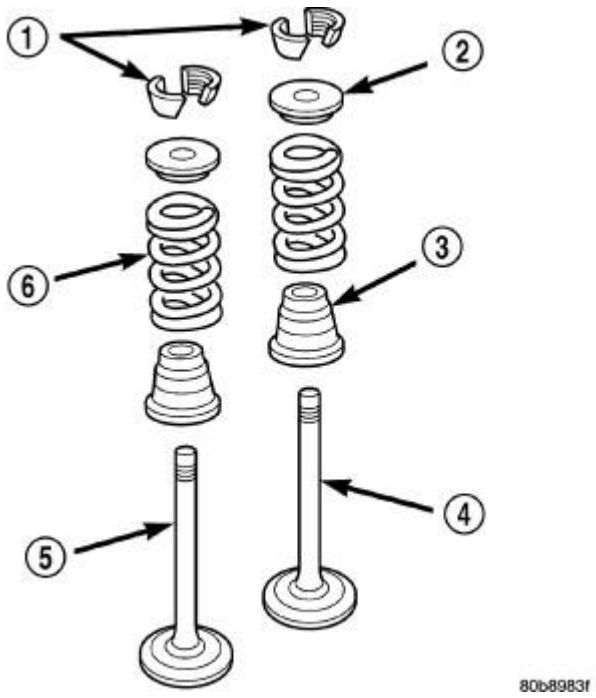

Fig. 44: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

1 - VALVE LOCKS (3-BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

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 (4) 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 1.75 - 2.36 mm (0.0689 - 0.0928 in.) and the exhaust seat must be 1.71 - 2.32 mm (0.0673 - 0.0911 in.).
4. Check the valve spring (6) installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 40.74 mm (1.6039 in.)
5. The valve seat and valve face must maintain a face angle of 44.5 - 45 ° angle.

REMOVAL

REMOVAL

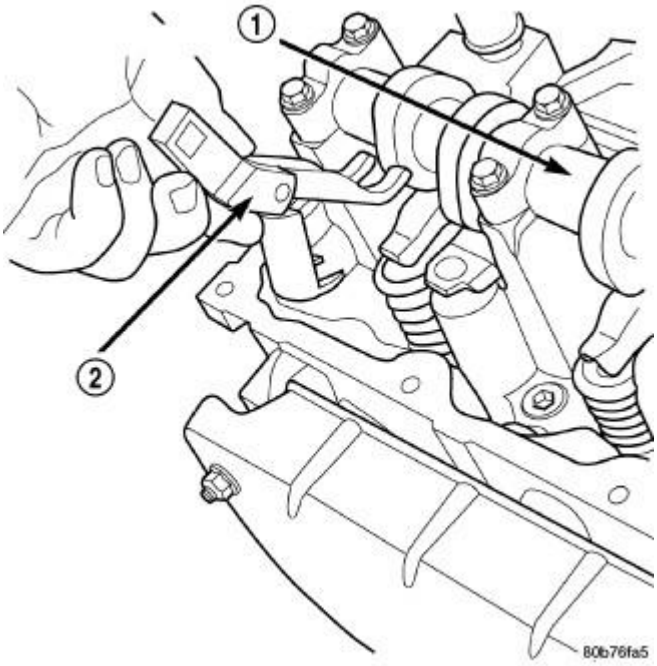

Fig. 45: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

NOTE: The cylinder head(s) must be removed in order to perform this procedure.

1. Remove and isolate the negative battery cable.
2. Remove the cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
3. Remove the rocker arms and lash adjusters. Refer to **ROCKER ARM, VALVE, REMOVAL, 3.7L** (Left) and **ROCKER ARM, VALVE, REMOVAL, 3.7L** (Right).
4. Remove the camshaft bearing caps and the camshaft. Refer to **CAMSHAFT, ENGINE, REMOVAL, 3.7L** (Left) and **CAMSHAFT, ENGINE, REMOVAL, 3.7L** (Right).
5. Remove the cylinder head(s). Refer to **CYLINDER HEAD, LEFT, REMOVAL, 3.7L** and **CYLINDER HEAD, RIGHT, REMOVAL, 3.7L**.

   NOTE: All valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

6. Using Valve Spring Compressor (special tool #C-3422-D, Compressor, Valve Spring) and Adapter (special tool #8519, Adapters, Valve Spring), compress the valve spring.

   NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

7. Remove the two spring retainer lock halves.

NOTE: The valve spring is under tension, use care when releasing the valve spring compressor.

8. Remove the valve spring compressor.
9. Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

10. Remove the valve from the cylinder head.

NOTE: The valve stem seals are common between intake and exhaust.

11. Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

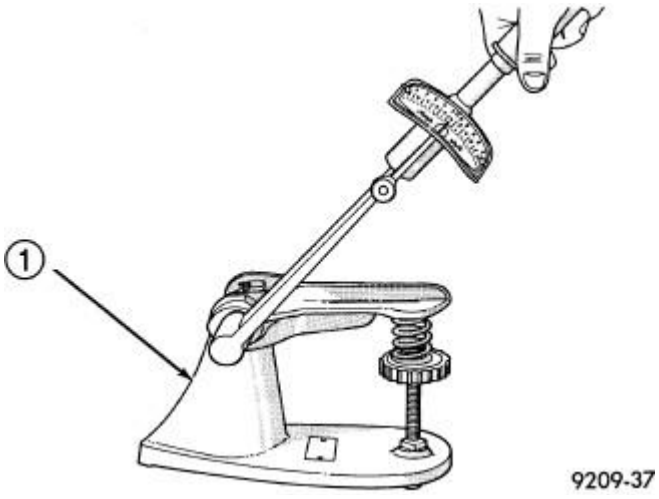

Fig. 46: Testing Valve Springs
Courtesy of CHRYSLER GROUP, LLC

Inspect the valve springs for physical signs of wear or damage. Using a suitable valve spring tester (1), test the following;

- Specified Spring Height
- Specified Spring Force (Valve Open)
- Specified Spring Force (Valve Closed)

Replace any springs that do not meet specifications. Refer to **Engine - Specifications**.

INSTALLATION

INSTALLATION

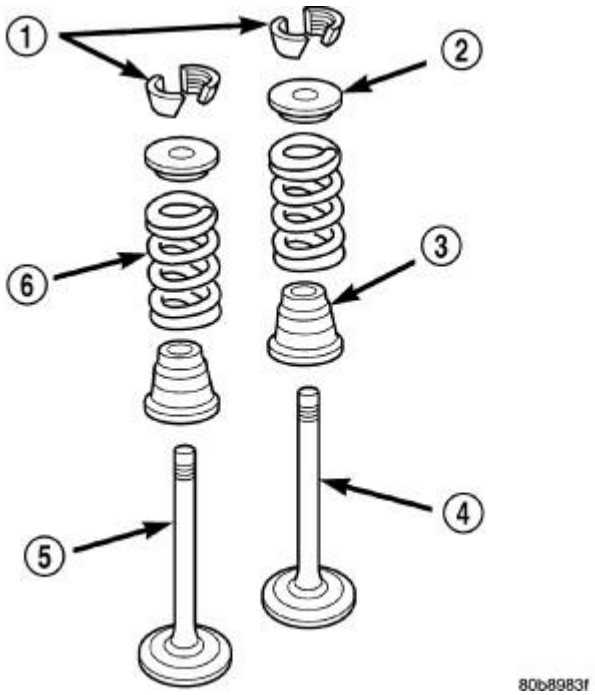

Fig. 47: Valve Assembly Configuration
Courtesy of CHRYSLER GROUP, LLC

1 - VALVE LOCKS (3-BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

1. coat the valve stem with clean engine oil and insert it into the cylinder head.
2. Install the valve stem seal. make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
3. Install the spring and the spring retainer.
4. Using the valve spring compressor, compress the spring and install the two valve spring retainer halves.
5. Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated. Refer to **Fig. 47**.

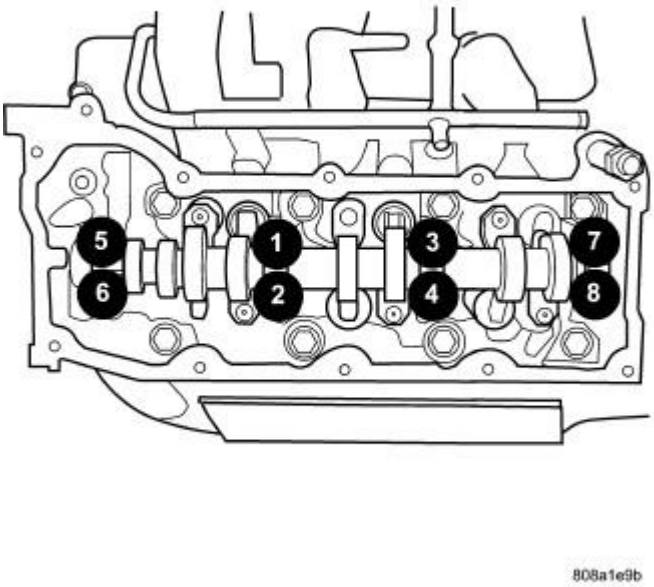

Fig. 48: Camshaft Bearing Caps Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

6. Lubricate the camshaft journal with clean engine oil then Position the camshaft (with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock), then position the camshaft bearing caps.
7. Install the camshaft bearing cap retaining bolts. Tighten the bolts 9-13 N.m (100 in. lbs.) in 1/2 turn increments in the sequence shown in illustration. Refer to **Fig. 48**.
8. Position the hydraulic lash adjusters and rocker arms. Refer to **ROCKER ARM, VALVE, INSTALLATION, 3.7L** (Left) and **ROCKER ARM, VALVE, INSTALLATION, 3.7L** (Right).

CYLINDER HEAD, RIGHT

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

1. Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.
2. Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.
3. Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
4. Low oil pressure.
5. The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

6. Air ingested into oil due to broken or cracked oil pump pick up.
7. Worn valve guides.
8. Rocker arm ears contacting valve spring retainer.
9. Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.
10. Oil leak or excessive cam bore wear in cylinder head.
11. Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel firm when pressed quickly. When pressed very slowly, lash adjusters should collapse.
b. Remove suspected lash adjusters, and replace.
c. Before installation, make sure adjusters are full of oil. This can be verified by little plunger travel when lash adjuster is depressed quickly.

REMOVAL

RIGHT

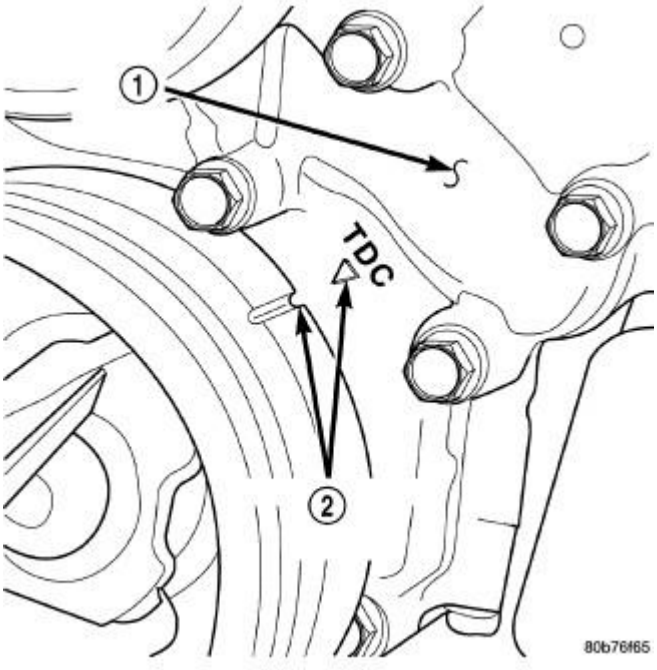

Fig. 49: TDC Indicator Marks
Courtesy of CHRYSLER GROUP, LLC

1 - TIMING CHAIN COVER 2 - CRANKSHAFT TIMING MARKS

1. Disconnect battery negative cable.

2. Raise the vehicle on a hoist.
3. Disconnect the exhaust pipe at the right side exhaust manifold.
4. Drain the engine coolant. Refer to **STANDARD PROCEDURE** .
5. Lower the vehicle.
6. Remove the intake manifold. Refer to **MANIFOLD, INTAKE, REMOVAL, 3.7L**.
7. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
8. Remove the fan shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
9. Remove oil fill housing from cylinder head.
10. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
11. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark. (2). Refer to **Fig. 49**.

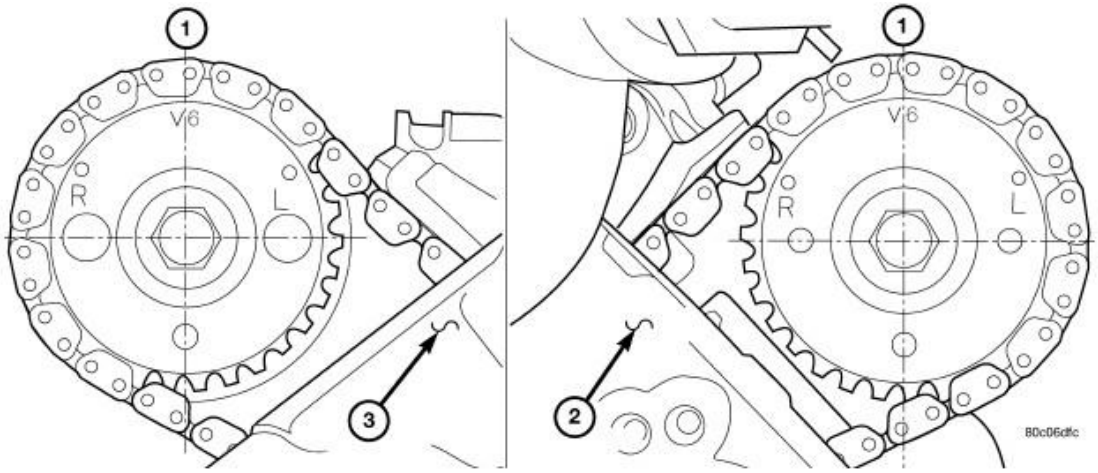

Fig. 50: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

12. Verify the V6 mark on the camshaft sprocket is at the 12 o'clock position. Refer to **Fig. 50**. Rotate the crankshaft one turn if necessary.
13. Remove the crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 3.7L**.
14. Remove the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.

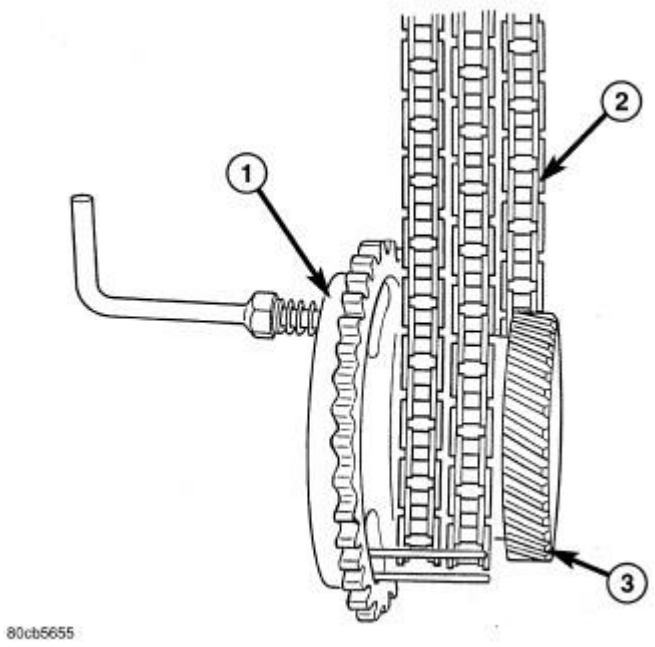

Fig. 51: Locking Secondary Timing Chains
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8429
2 - CAMSHAFT CHAIN
3 - CRANKSHAFT TIMING GEAR

15. Lock the secondary timing chains to the idler sprocket using the Secondary Camshaft Chain Holder (special tool #8429, Holder, Secondary Camshaft Chain) (1). Refer to **Fig. 51**.

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

16. Mark the secondary timing chain, one link on each side of the V6 mark on the camshaft drive gear.
17. Remove the right side secondary chain tensioner. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

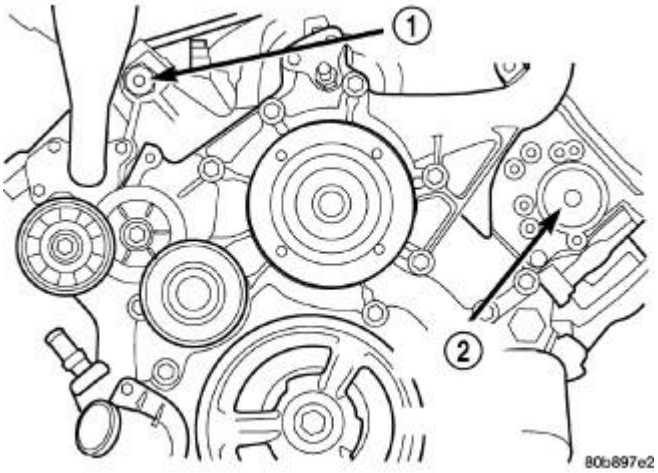

Fig. 52: Access Plugs From Left And Right Cylinder Heads
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

18. Remove the cylinder head access plug (1, 2). Refer to **Fig. 52**.
19. Remove the right side secondary chain guide. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

CAUTION: The nut on the right side camshaft sprocket should not be removed for any reason, as the sprocket and camshaft sensor target wheel is serviced as an assembly. If the nut was removed, tighten nut to 5 N.m (44 in. lbs.).

20. Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

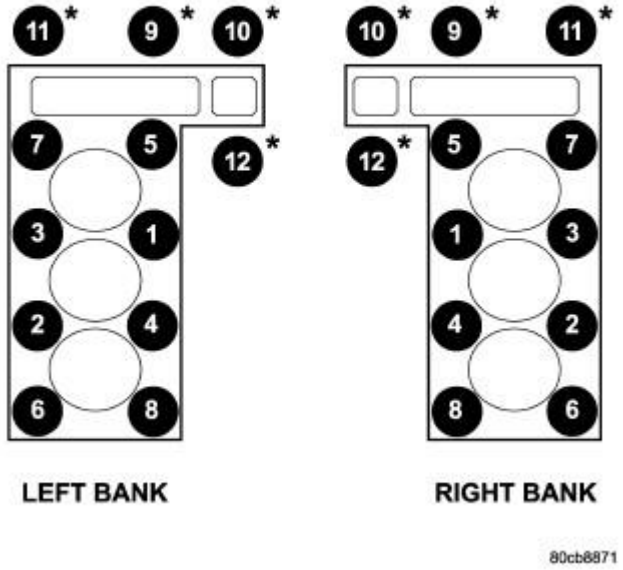

Fig. 53: Cylinder Head Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

* - INDICATES SEALANT ON THREADS

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

21. Remove the cylinder head retaining bolts. Refer to **Fig. 53**.
22. Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

INSTALLATION

INSTALLATION

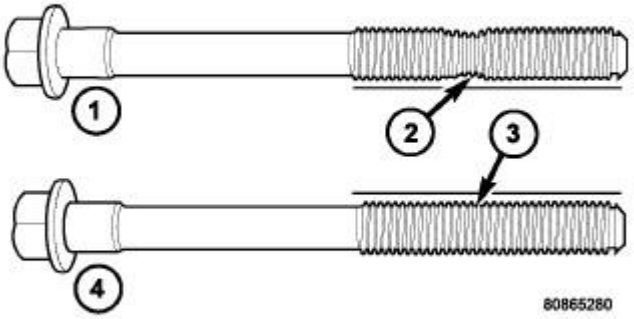

Fig. 54: Checking Cylinder Head Bolts For Stretching (Necking)
Courtesy of CHRYSLER GROUP, LLC

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down (2) the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced. Refer to **Fig. 54**.

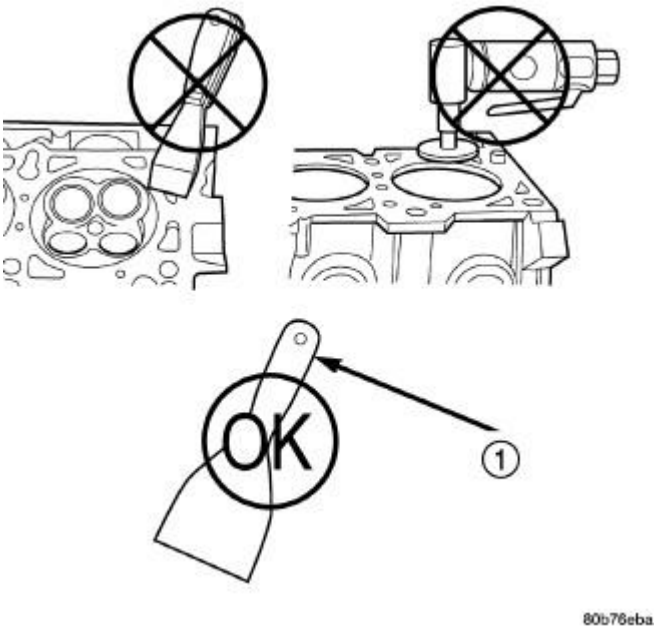

Fig. 55: Proper Tool Usage For Surface Preparation
Courtesy of CHRYSLER GROUP, LLC

1 - PLASTIC/WOOD SCRAPER

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper (1), high speed scotch brite (2) or rolock tool (3) because the surfaces could be cut or ground. Use only a wooden or plastic scraper (4).

1. Clean the cylinder head and cylinder block mating surfaces. Refer to **Fig. 55**.

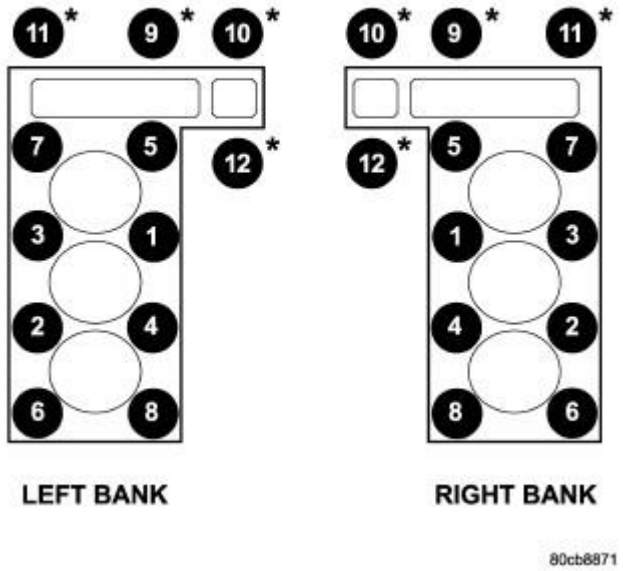

Fig. 56: Cylinder Head Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

* - INDICATES SEALANT ON THREADS

2. Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four M8 cylinder head mounting bolts (1) require sealant to be added to them before installing. Failure to do so may cause leaks.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the eight M10 bolts.

5. Coat the four M8 cylinder head bolts with **Mopar Lock and Seal Adhesive** then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

6. Tighten the bolts in sequence using the following steps and torque values : Refer to **Fig. 56**.
   - Step 1: Tighten bolts 1-8, 27 N.m (20 ft. lbs.).
   - Step 2: Verify that bolts 1-8, all reached 27 N.m (20 ft. lbs.), by repeating step 1 without loosening the bolts. Tighten bolts 9 thru 12 to 14 N.m (10 ft. lbs.).
   - Step 3: Tighten bolts 1-8, 90 °.
   - Step 4: Tighten bolts 1-8, 90 °, again. Tighten bolts 9-12, 26 N.m (19 ft. lbs.)

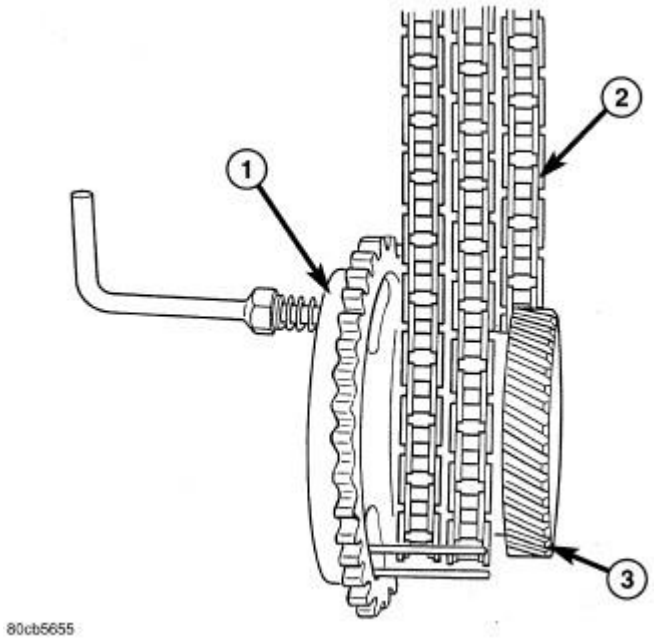

Fig. 57: Locking Secondary Timing Chains
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8429
2 - CAMSHAFT CHAIN
3 - CRANKSHAFT TIMING GEAR

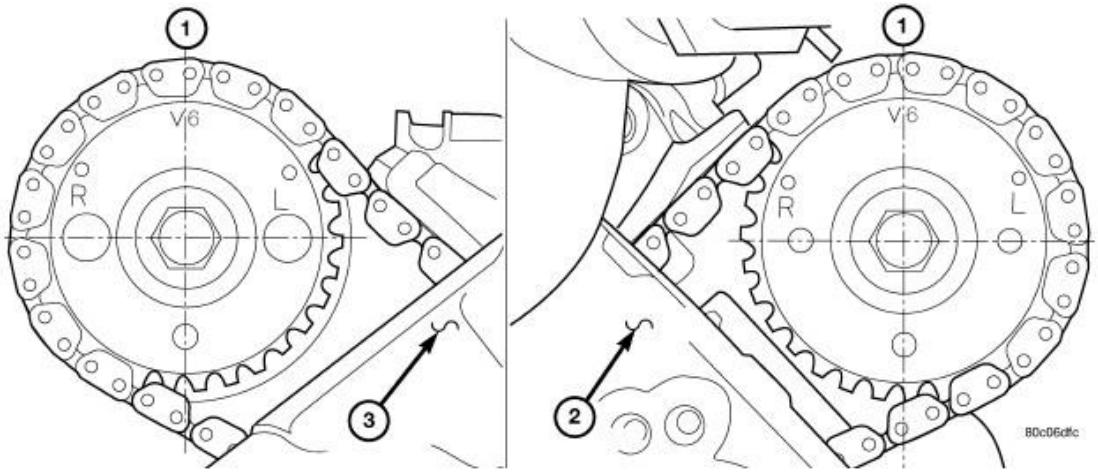

Fig. 58: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

7. Position the secondary chain (2) onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark. Refer to **Fig. 57**. (1) on the gear then using Special Tool (special tool #8428A, Holder, Camshaft) Camshaft Wrench, position the gear onto the camshaft. Refer to **Fig. 58**.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torquing of bolt resulting in bolt failure.

8. Install the camshaft drive gear retaining bolt.
9. Install the right side secondary chain guide. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.

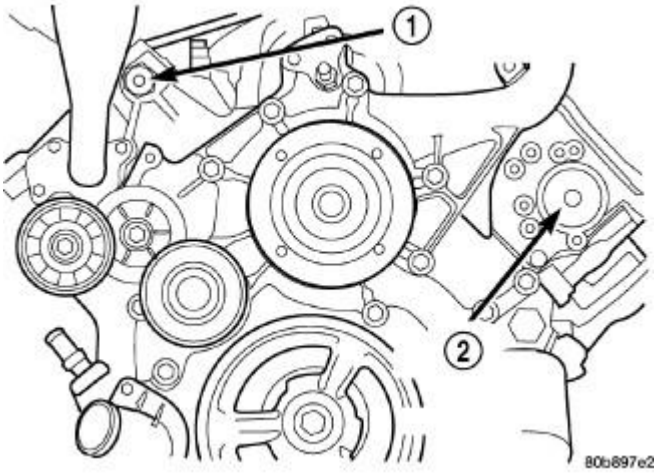

Fig. 59: Access Plugs From Left And Right Cylinder Heads
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT CYLINDER HEAD ACCESS PLUG

2 - LEFT CYLINDER HEAD ACCESS PLUG

10. Install the cylinder head access plug (1, 2). Refer to **Fig. 59**.
11. Re-set and install the right side secondary chain tensioner. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.

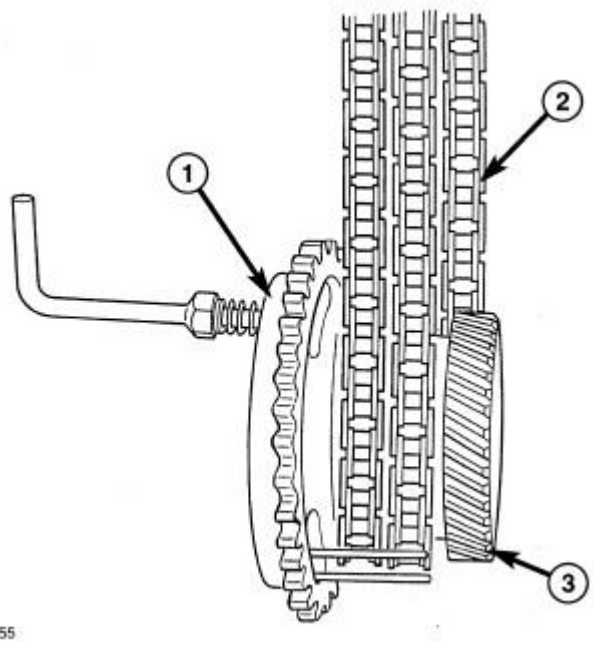

Fig. 60: Locking Secondary Timing Chains
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8429
2 - CAMSHAFT CHAIN
3 - CRANKSHAFT TIMING GEAR

12. Remove Special Tool (special tool #8429, Holder, Secondary Camshaft Chain) (1). Refer to **Fig. 60**.
13. Install the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.
14. Install the crankshaft damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 3.7L**. Tighten damper bolt 175 N.m (130 Ft. Lbs.).
15. Install accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
16. Install the fan shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
17. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).
18. Install the intake manifold. Refer to **MANIFOLD, INTAKE, INSTALLATION, 3.7L**.
19. Install oil fill housing onto cylinder head.

20. Refill the cooling system. Refer to **STANDARD PROCEDURE** .
21. Raise the vehicle.
22. Install the exhaust pipe onto the right exhaust manifold.
23. Lower the vehicle.
24. Reconnect battery negative cable.
25. Start the engine and check for leaks.

CAMSHAFT, ENGINE

DESCRIPTION

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. Four bearing journals are machined into the camshaft. Camshaft end play is controlled by two thrust walls that border the nose piece journal.

REMOVAL

REMOVAL

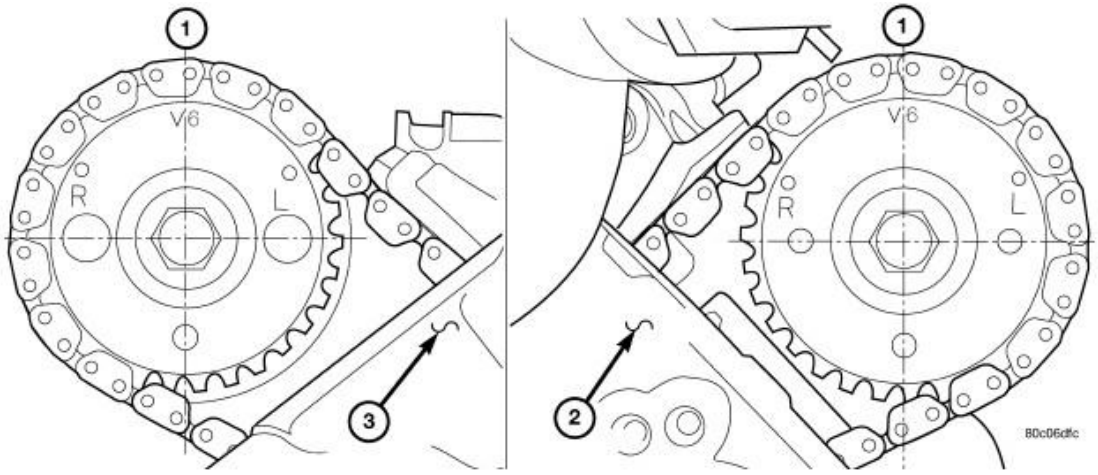

Fig. 61: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

CAUTION: When the timing chain is removed and the cylinder heads are still installed, Do not forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use Wedge Locking Tool (special tool #8379, Locking Tool, Wedge) will result in hydraulic tensioner ratchet over extension, Requiring timing chain cover removal to re-set the tensioner ratchet.

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. Set engine to TDC cylinder No. 1, camshaft sprocket V6 marks at the 12 o'clock position (1). Refer to **Fig. 61**.
3. Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

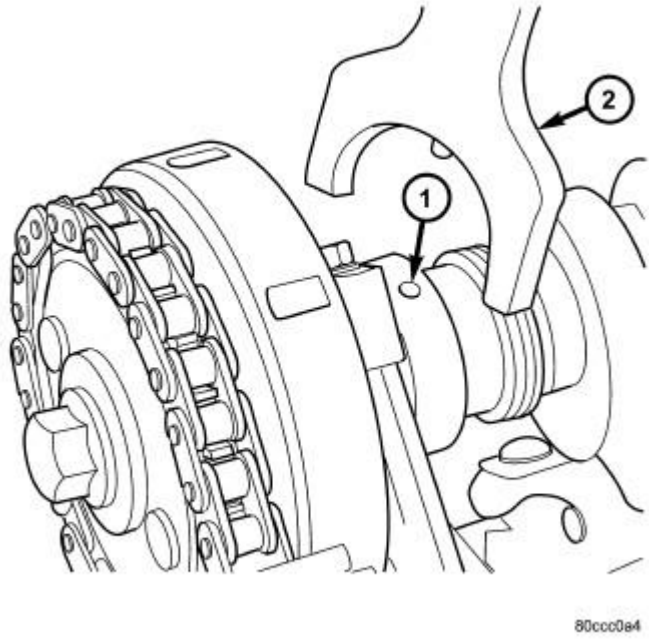

Fig. 62: Camshaft & Camshaft Holder
Courtesy of CHRYSLER GROUP, LLC

1 - Camshaft hole
2 - Special Tool 8428

CAUTION: Do not hold or pry on the camshaft target wheel for any reason, severe damage will occur to the target wheel resulting in a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Refer to **Fig. 63**. Leave bolt snug against sprocket.

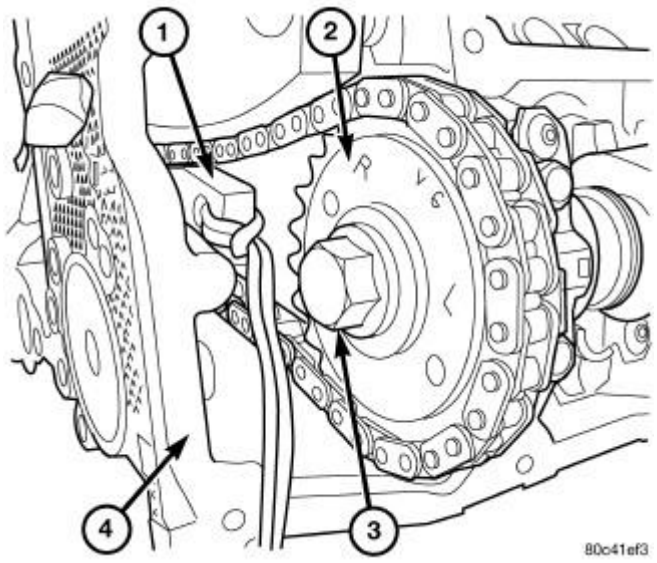

Fig. 63: Timing Chain Tensioners Secured With Timing Chain Wedge
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8379
2 - CAMSHAFT SPROCKET
3 - CAMSHAFT SPROCKET BOLT
4 - CYLINDER HEAD

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force Locking Wedge (special tool #9867, Wedge, Locking) past the narrowest point between the chain strands. Damage to the tensioners may occur.

5. Position the Wedge Locking Tool (special tool #8379, Locking Tool, Wedge) (1) between the timing chain strands. Refer to **Fig. 63**. Tap the tool to securely wedge the timing chain against the tensioner arm and guide.

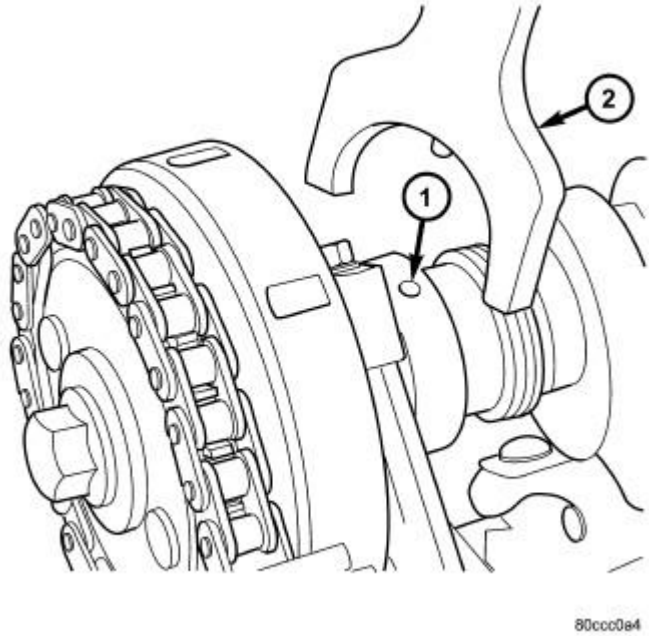

Fig. 64: Camshaft & Camshaft Holder
Courtesy of CHRYSLER GROUP, LLC

1 - Camshaft hole
2 - Special Tool 8428

6. Remove the camshaft position sensor.
7. Hold the camshaft with Camshaft Holder (special tool #8428A, Holder, Camshaft) (2), while removing the camshaft sprocket bolt and sprocket. Refer to **Fig. 64**.

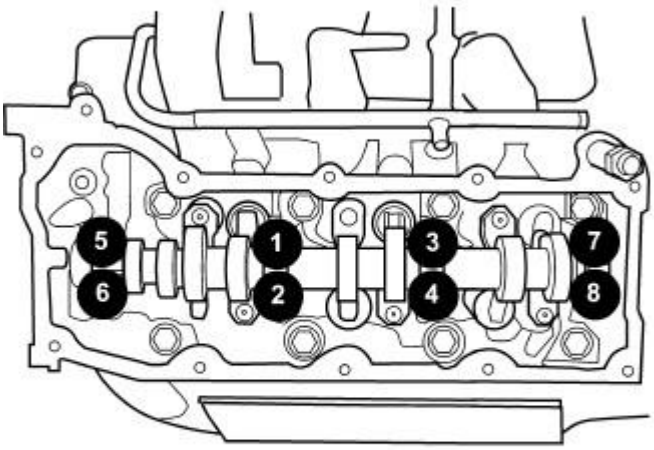

Fig. 65: Camshaft Bearing Caps Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

8. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Refer to **Fig. 65**. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

9. Remove the camshaft bearing caps and the camshaft.

INSTALLATION

INSTALLATION

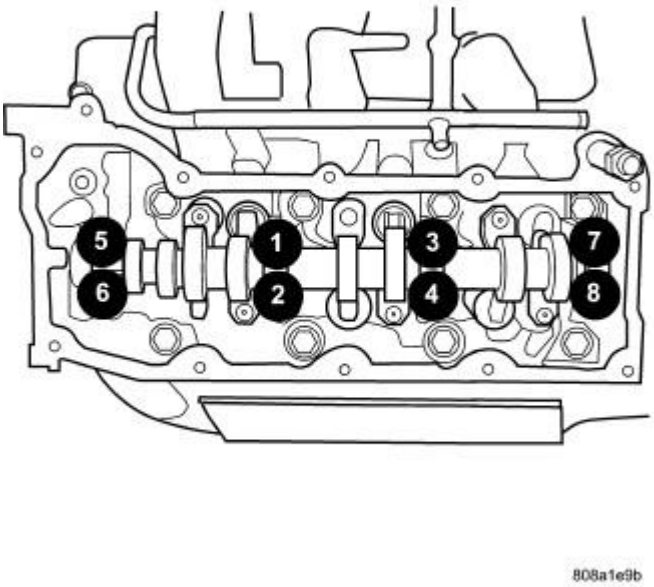

Fig. 66: Camshaft Bearing Caps Bolt Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the right side camshaft so that the camshaft sprocket dowel is near the 10 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.
3. Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 through 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.

4. Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward.
5. Tighten the camshaft bearing cap retaining bolts to 11 N.m (100 in. lbs.). Refer to **Fig. 66**.

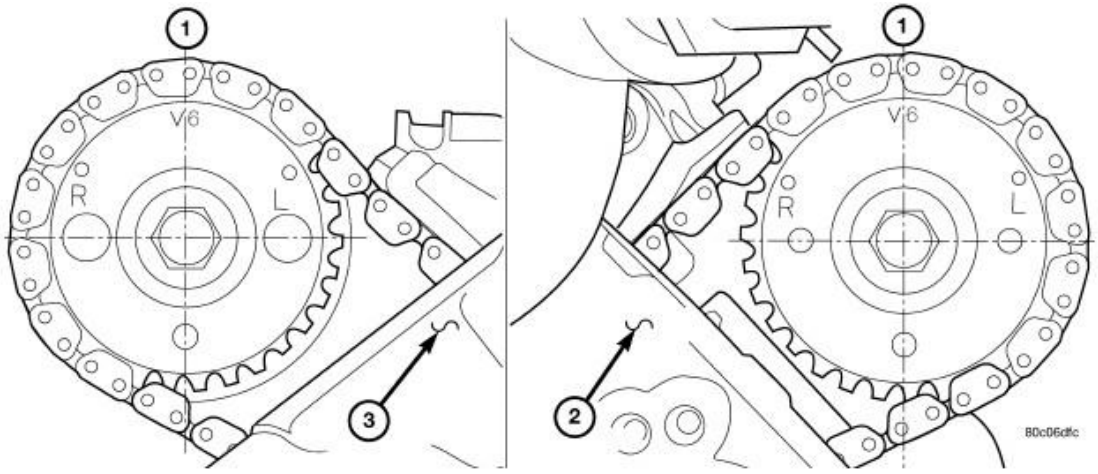

Fig. 67: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

6. Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal). Refer to **Fig. 67**.

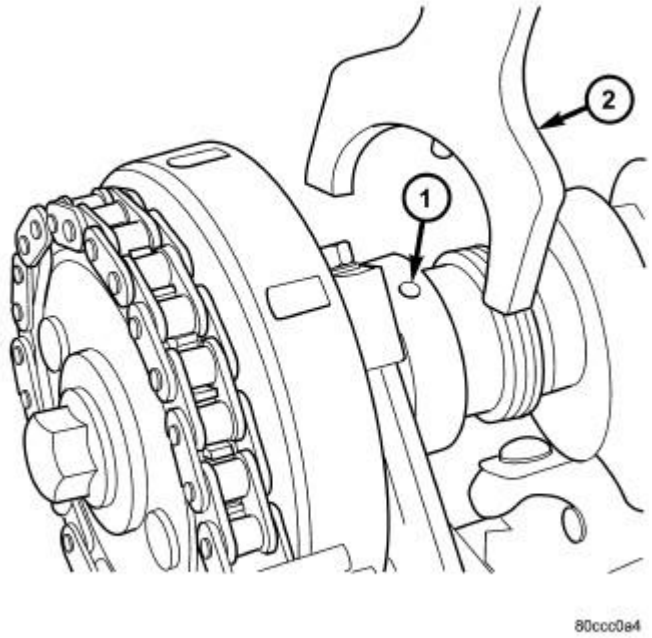

Fig. 68: Camshaft & Camshaft Holder
Courtesy of CHRYSLER GROUP, LLC

1 - Camshaft hole
2 - Special Tool 8428

7. Using the Camshaft Holder (special tool #8428A, Holder, Camshaft) (2), rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Refer to **Fig. 68**. Install the

sprocket onto the camshaft.

CAUTION: Remove excess oil from the camshaft sprocket retaining bolt, failure to do so can cause bolt over-torque resulting in bolt failure.

8. Remove excess oil from camshaft sprocket bolt, then install the camshaft sprocket retaining bolt and hand tighten.

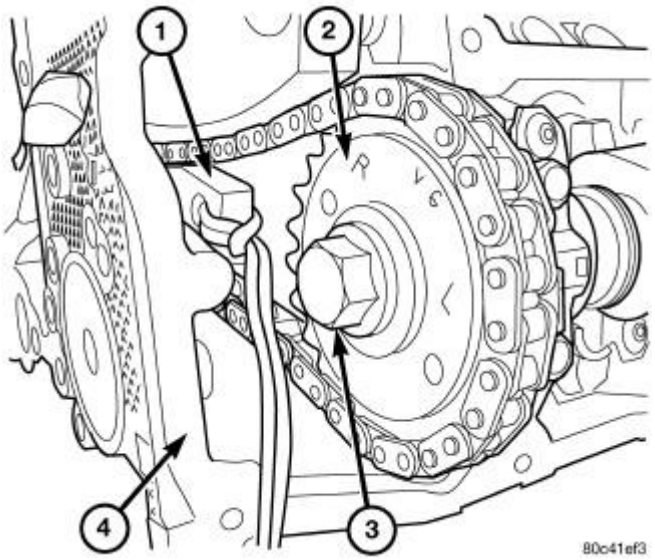

Fig. 69: Timing Chain Tensioners Secured With Timing Chain Wedge
Courtesy of CHRYSLER GROUP, LLC

1 - SPECIAL TOOL 8379
2 - CAMSHAFT SPROCKET
3 - CAMSHAFT SPROCKET BOLT
4 - CYLINDER HEAD

9. Remove timing chain wedge special tool (special tool #8379, Locking Tool, Wedge) (1). Refer to **Fig. 69**.
10. Using Spanner Wrench (special tool #6958, Wrench, Spanner) with adapter pins (special tool #8346, Pins, Adapter), tighten the camshaft sprocket retaining bolt to 122 N.m (90 ft. lbs.)
11. Install the camshaft position sensor.
12. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

COVER(S), CYLINDER HEAD

REMOVAL

REMOVAL

1. Disconnect battery negative cable.
2. Remove air cleaner assembly, resonator assembly and air inlet hose.
3. Drain cooling system, below the level of the heater hoses. Refer to **STANDARD PROCEDURE** .
4. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
5. Remove air conditioning compressor retaining bolts and move compressor to the left.
6. Remove heater hoses.
7. Disconnect injector and ignition coil connectors.
8. Disconnect and remove positive crankcase ventilation (PCV) hose.
9. Remove oil fill tube.
10. Un-clip injector and ignition coil harness and move away from cylinder head cover.
11. Remove right rear breather tube and filter assembly.
12. Remove cylinder head cover retaining bolts.
13. Remove cylinder head cover.

INSTALLATION

INSTALLATION

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

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Tighten cylinder head cover bolts and double ended studs to 12 N.m (105 in. lbs).
3. Install right rear breather tube and filter assembly.
4. Connect injector, ignition coil electrical connectors and harness retaining clips.
5. Install the oil fill tube.
6. Install PCV hose.
7. Install heater hoses.
8. Install air conditioning compressor retaining bolts.
9. Install accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
10. Fill Cooling system. Refer to **STANDARD PROCEDURE** .
11. Install air cleaner assembly, resonator assembly and air inlet hose.
12. Connect battery negative cable.

ROCKER ARM, VALVE

DESCRIPTION

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 0.5 mm oil jet hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

REMOVAL

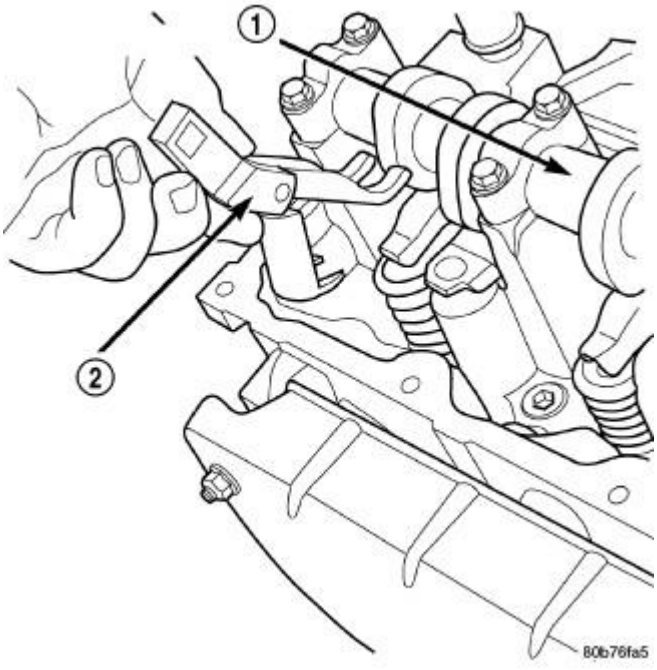

Fig. 70: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. For rocker arm removal on cylinder No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
3. For rocker arm removal on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
4. For rocker arm removal on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.
5. For rocker arm removal on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at

TDC ignition stroke.

6. Using the Rocker Arm Remover/Installer (special tool #8516A, Remover/Installer) (2), press downward on the valve spring, remove rocker arm. Refer to **Fig. 70**.

INSTALLATION

INSTALLATION

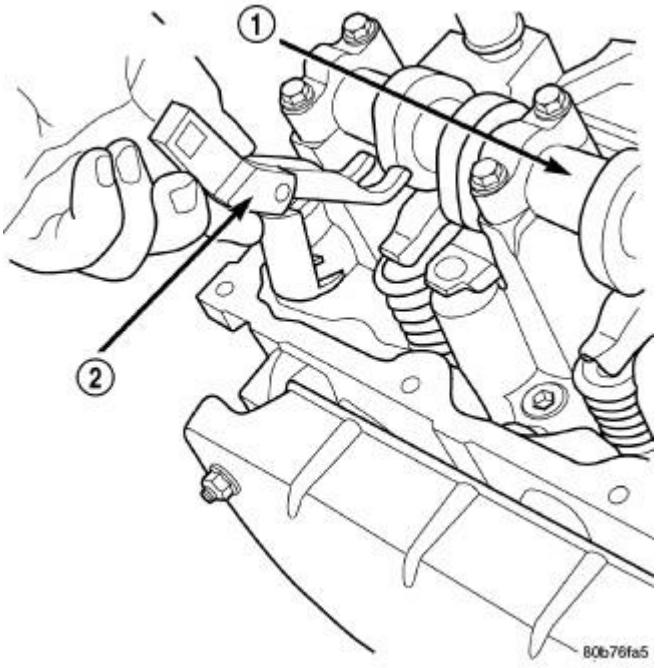

Fig. 71: Rocker Arm - Removal/Installation
Courtesy of CHRYSLER GROUP, LLC

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

1. For rocker arm installation on cylinders No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
2. For rocker arm installation on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
3. For rocker arm installation on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.

4. For rocker arm installation on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at TDC ignition stroke.
5. Using the Rocker Arm Remover/Installer (special tool #8516A, Remover/Installer) (2) press downward on the valve spring, install rocker arm. Refer to **Fig. 71**.
6. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

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.

REMOVAL

REMOVAL

The valve stem seal is integral with the valve spring seat, for removal. Refer to **SPRING(S), VALVE, REMOVAL, 3.7L** (Left) and **SPRING(S), VALVE, REMOVAL, 3.7L** (Right).

INSTALLATION

INSTALLATION

The valve stem seal is integral with the valve spring seat, for installation. Refer to **SPRING(S), VALVE, INSTALLATION, 3.7L** (Left) and **SPRING(S), VALVE, INSTALLATION, 3.7L** (Right).

SPRING(S), VALVE

DESCRIPTION

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. There are different springs for intake and exhaust applications. The exhaust spring has an external damper. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

REMOVAL

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. Using the Valve Spring Remover/Installer (special tool #8516A, Remover/Installer), remove the rocker arms and the hydraulic lash adjusters.

3. Remove the spark plug for the cylinder the valve spring and seal are to be removed from.
4. Apply shop air to the cylinder to hold the valves in place when the spring is removed.

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

5. Using the Valve Spring Compressor (special tool #8387, Compressor, Valve Spring), compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

6. Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

7. Remove the valve spring compressor.

NOTE: The valve springs are NOT common between intake and exhaust.

8. Remove the spring retainer, and the spring.
9. Remove the valve stem seal.

NOTE: The valve stem seals are common between intake and exhaust.

INSTALLATION

INSTALLATION

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

1. Apply shop air to the cylinder to hold the valves in place while the spring is installed.

NOTE: The valve stem seals are common between intake and exhaust.

2. Install the valve stem seal.

NOTE: The valve springs are NOT common between intake and exhaust.

3. Install the spring retainer, and the spring.
4. Using Valve Spring Compressor (special tool #8387, Compressor, Valve Spring), compress the valve spring.

5. Install the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

6. Remove the valve spring compressor.
7. Disconnect the shop air to the cylinder.
8. Install the spark plug for the cylinder the valve spring and seal was installed on.
9. Using the Valve Spring Remover/Installer Special Tool (special tool #8516A, Remover/Installer), install the rocker arms and the hydraulic lash adjusters.
10. Install the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

ENGINE BLOCK

DESCRIPTION

DESCRIPTION

The cylinder block is made of cast iron. The block is a closed deck design with the left bank forward. To provide high rigidity and improved NVH an enhanced compacted graphite bedplate is bolted to the block. The block design allows coolant flow between the cylinders bores, and an internal coolant bypass to a single poppet inlet thermostat is included in the cast aluminum front cover.

STANDARD PROCEDURE

STANDARD PROCEDURE - CYLINDER BORE HONING

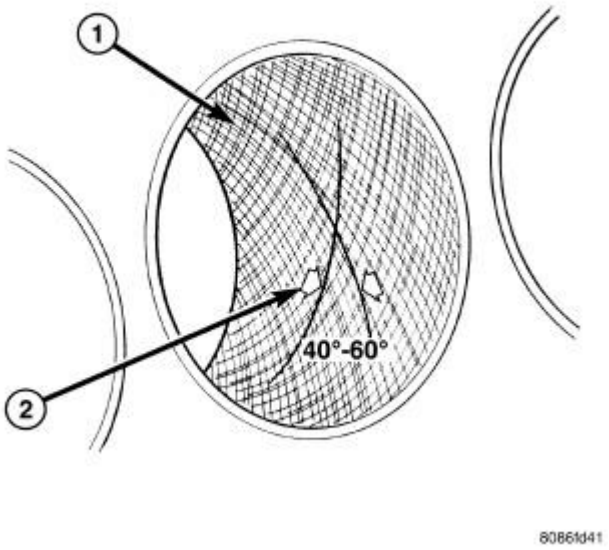

Fig. 72: Cylinder Bore Crosshatch Pattern
Courtesy of CHRYSLER GROUP, LLC

1 - CROSSHATCH PATTERN
2 - INTERSECT ANGLE

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

1. Used carefully, the Cylinder Bore Sizing Hone (special tool #C-823, Hone, Cylinder), equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

2. Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool (special tool #C-3501, Hone W/Oil, AMMCO Cylinder), equipped with 280 grit stones (special tool #C-3501-3810, Stones, 220 Grit Honing). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil (special tool #C-3501-3880, Oil, Honing), or a light honing oil, available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

3. Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern (1). The hone marks should INTERSECT at 50° to 60° for proper seating of rings (2).
4. A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.
5. After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

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.) torque. Tighten the 3/8 inch NPT plugs to 27 N.m (240 in. lbs.) torque.

INSPECTION

INSPECTION

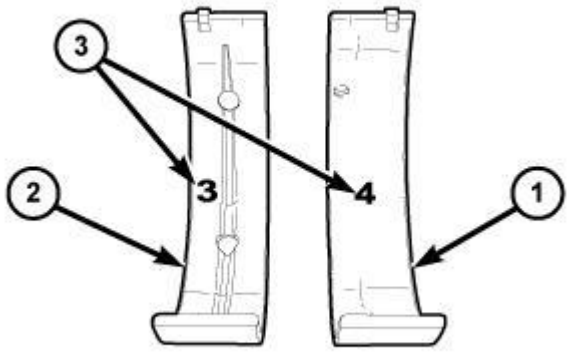

Fig. 73: Main Bearing Inserts
Courtesy of CHRYSLER GROUP, LLC

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

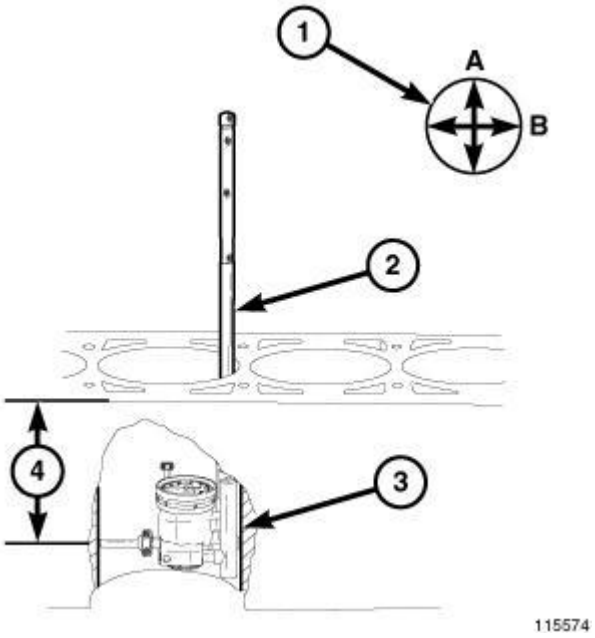

Fig. 74: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

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

condition exceeds the maximum limits, replace the cylinder block.

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

BEARING(S), CRANKSHAFT, MAIN

STANDARD PROCEDURE

STANDARD PROCEDURE - MAIN BEARING FITTING

SELECT FIT IDENTIFICATION

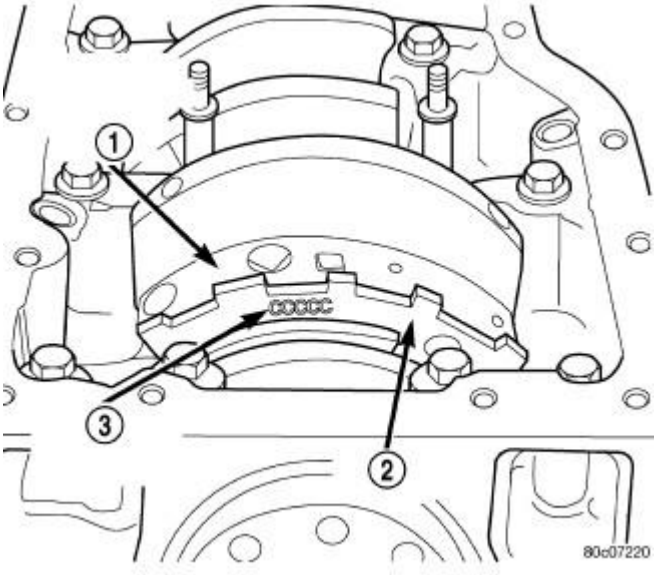

Fig. 75: Markings On Target Wheel
Courtesy of CHRYSLER GROUP, LLC

The main bearings are "select fit" to achieve proper oil clearances. For main bearing selection, the crankshaft position sensor target wheel (2) has grade identification marks stamped into it. These marks are read from left to right, corresponding with journal number 1, 2, 3, 4. The crankshaft position sensor target wheel is mounted to the number 6 counter weight (1) on the crankshaft.

INSPECTION

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.

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.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block. Refer to **CRANKSHAFT, REMOVAL, 3.7L**.

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 (0.002 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.

Install the crankshaft into the cylinder block. Refer to **Engine/Engine Block/CRANKSHAFT - Inspection**.

Check crankshaft end play.

CRANKSHAFT MAIN BEARING SELECTION

CRANKSHAFT MARKING	JOURNAL SIZE	
	Metric	Standard
"R" Size	63.488 - 63.496 mm	2.4995 - 2.4998 in.
"S" Size	63.496 - 63.500 mm	2.4998 - 2.4999 in.
"T" Size	63.500 - 63.504 mm	2.4999 - 2.501 in.
"U" Size	63.504 - 63.512 mm	2.5001 - 2.5004 in.

BEARING SIZE		
Bearing Code	Size	Application
Upper Bearing		
A	.2.443 - 2.447 mm (.0961 -.0963 in.)	Use with crankshaft size "R"
B	2.439 - 2.443 mm (0.960 -.0961 in.)	Use with crankshaft "S, T"
C	2.435 - 2.439 mm (.0958 -.0960 in.)	Use with crankshaft "U"
Lower Bearing Main "1" and "4"		
"1"	2.441 - 2.447 mm (.0961 -.0963 in.)	Use with crankshaft "R, S"
"2"	2.435 - 2.441 mm (.0958 -.0962 in.)	Use with crankshaft "T, U"
Lower Main Bearing "2" and "3"		
"3"	2.429 - 2.435 mm (.0956 -.0958 in.)	Use with crankshaft "R, S"
"4"	2.423 - 2.429 mm	Use with crankshaft "T, U"

	(.0953 -.0956 in.)
Bearing Clearances	
Main "1, 4"	
Crankshaft "R"	.004 -.034 mm (.00015 -.0013 in.)
Crankshaft "S"	.004 -.030 mm (.00015 -.0011 in.)
Crankshaft "T"	.006 -.032 mm (.0002 -.0012 in.)
Crankshaft "U"	.002 -.032 mm (.00007 -. 0012 in.)
Main "2, 3"	
Crankshaft "R"	.016 -.046 mm (.0006 -.0018 in.)
Crankshaft "S"	.016 -.042 mm (.00062 -.016 in.)
Crankshaft "T"	.018 -.044 mm (.0007 -.0017 in.)
Crankshaft "U"	.014 -.044 mm (.0005 -.0017 in.)

1. Service main bearings are available in four grades. The chart identifies the four service grades available.

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 bedplate.

OPERATION

OPERATION

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

REMOVAL

REMOVAL

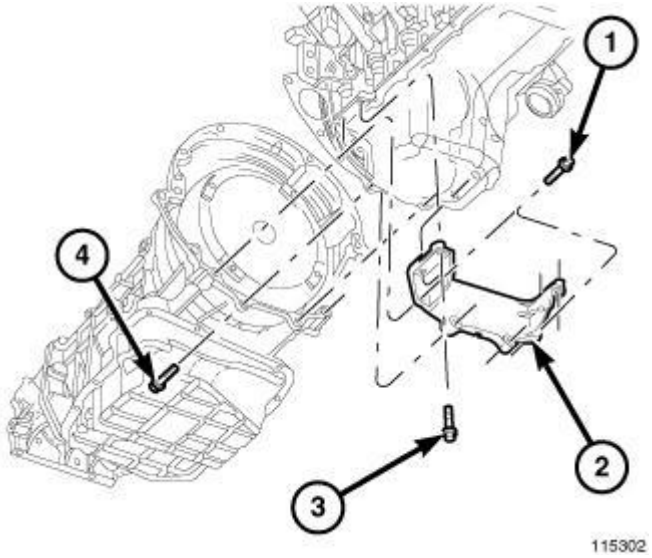

Fig. 76: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

1. Raise vehicle on hoist.
2. Remove the left hand exhaust pipe from exhaust manifold.
3. Loosen the right hand exhaust manifold-to-exhaust pipe retaining bolts.
4. Remove the eight bolts (1, 2, 3) retaining structural cover in the sequence shown in illustration.
5. Pivot the exhaust pipe downward and remove the structural cover.

INSTALLATION

INSTALLATION

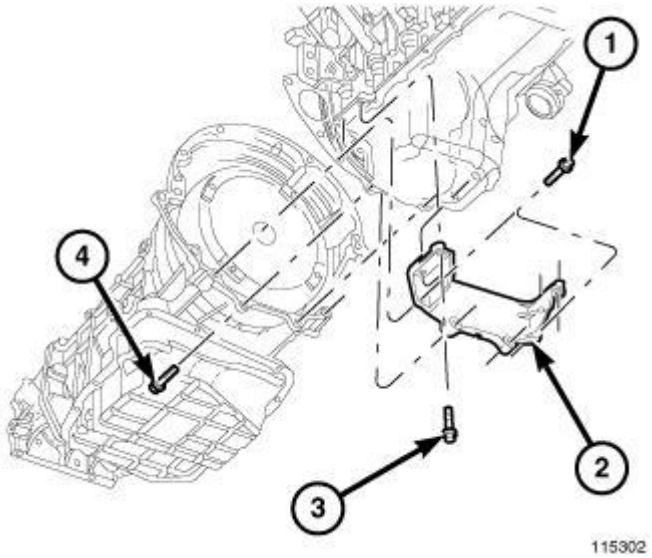

Fig. 77: Structural Cover
Courtesy of CHRYSLER GROUP, LLC

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

1. Position the structural cover in the vehicle.
2. Install all four bolts (1, 2, 3) retaining the cover-to-engine. Refer to **Fig. 77**. DO NOT tighten the bolts at this time.
3. Install the four cover-to-transmission bolts (1, 2, 3). Do NOT tighten at this time.

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

4. Starting with the two rear cover-to-engine bolts, tighten bolts (1) to 54 N.m (40 ft. lbs.), then tighten bolts (2) and (3) to 54 N.m (40 ft. lbs.) in the sequence shown in illustration.
5. Install the exhaust pipe on left hand exhaust manifold.
6. Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20-26 N.m (15-20 ft. lbs.).

CRANKSHAFT

DESCRIPTION

DESCRIPTION

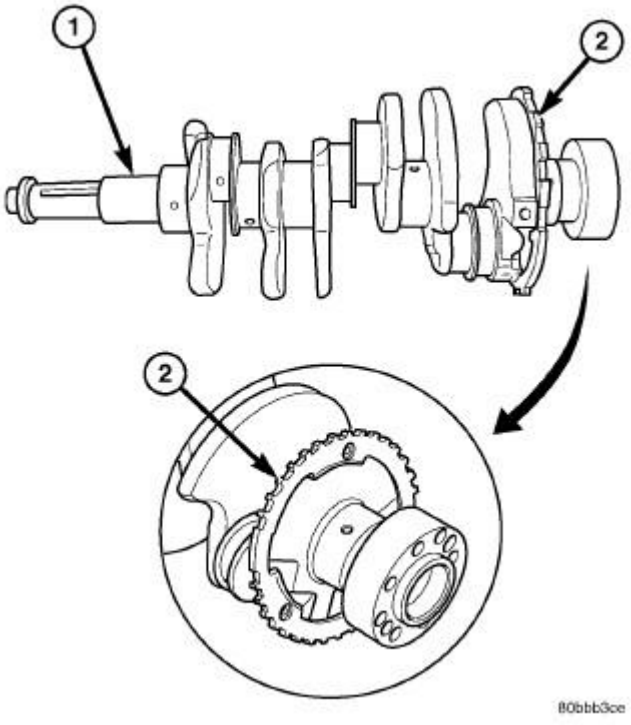

Fig. 78: Crankshaft & Target Ring
Courtesy of CHRYSLER GROUP, LLC

1 - CRANKSHAFT
2 - CRANKSHAFT POSITION SENSOR TARGET RING

The crankshaft (1) is constructed of nodular cast iron. Refer to **Fig. 78**. The crankshaft is a three throw split pin design with six counterweights for balancing purposes. The crankshaft is supported by four select fit main bearings with the No. 2 serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The No. 6 counterweight has provisions for crankshaft position sensor target wheel (2) mounting. The select fit main bearing markings are located on the rear side of the target wheel. The crankshaft oil seals are one piece design. The front oil seal is retained in the timing chain cover, and the rear seal is pressed in to a bore formed by the cylinder block and the bedplate assembly.

REMOVAL

REMOVAL

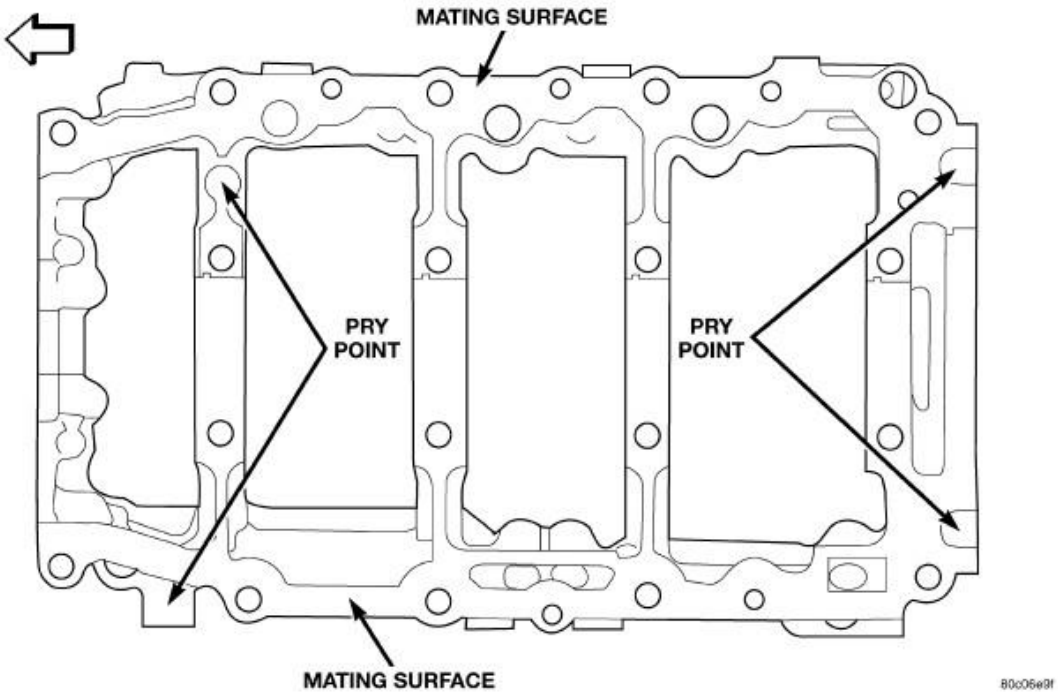

Fig. 79: Pry Points On Bedplate
Courtesy of CHRYSLER GROUP, LLC

NOTE: To remove the crankshaft from the engine, the engine must be removed from the vehicle.

1. Remove the engine. Refer to **REMOVAL, 3.7L**.
2. Remove the engine oil pump. Refer to **PUMP, ENGINE OIL, REMOVAL, 3.7L**.

CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when removing oil pan. Gasket can not be removed with oil pan.

3. Remove the bedplate mounting bolts. Note the location of the two stud bolts for installation.
4. Remove the connecting rods from the crankshaft.

CAUTION: The bedplate to cylinder block mating surface is a critical sealing surface. Do not pry on or damage this surface in anyway.

NOTE: The bedplate contains the lower main bearing halves. Use care when handling bedplate as not to drop or damage bearing halves. Installing main bearing halves in the wrong position will cause severe damage to the crankshaft.

NOTE: The bedplate has pry points cast into it. Use these points only. The pry points are shown in illustration below.

5. Carefully pry on the pry points to loosen the bedplate then remove the bedplate. Refer to **Fig. 79**.

CAUTION: When removing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

6. Remove the crankshaft.
7. Remove the crankshaft tone wheel.

INSPECTION

INSPECTION

NOTE: Thoroughly inspect the connecting rod bearing bores and main bearing bores for scoring, blueing or severe scratches. Further disassembly may be required.

If connecting rod bearing bores show damage, the cylinder heads must be removed to service the piston and rod assemblies. If the bedplate or the cylinder block main bearing bores show damage the engine must be replaced.

1. If required, remove the main bearing halves from the cylinder block and bedplate.
2. Thoroughly clean the bedplate to cylinder block sealing surfaces and main bearing bores. Remove all oil and sealant residue.
3. Inspect the bedplate main bearing bores for cracks, scoring or severe blueing. If either condition exists the engine must be replaced.
4. Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing. If either condition exist replace the thrust washers.

5. Inspect the oil pan gasket/windage tray for splits, tears or cracks in the gasket sealing surfaces. Replace gasket as necessary.

INSTALLATION

INSTALLATION

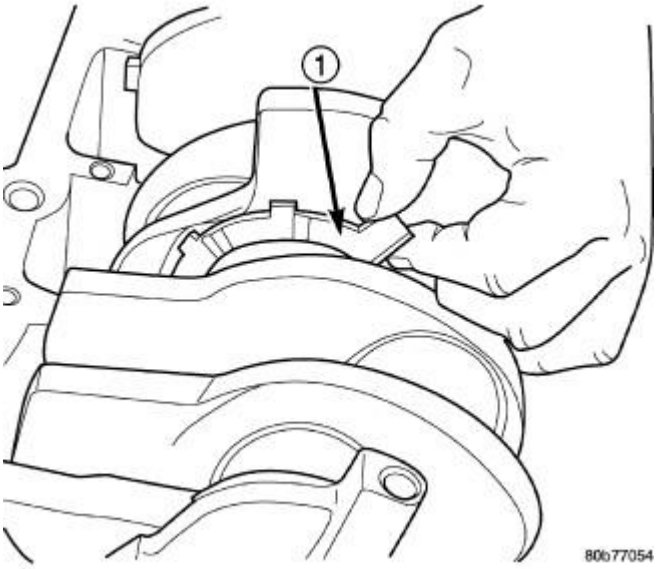

Fig. 80: Crankshaft Thrust Washer Installation
Courtesy of CHRYSLER GROUP, LLC

1 - CRANKSHAFT THRUST WASHER

CAUTION: Main bearings are select fit. Refer to BEARING(S), CRANKSHAFT, MAIN in this service information for proper bearing selections.

CAUTION: When installing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

NOTE: Apply sealant to the tone wheel retaining screws prior to installation.

1. Lubricate upper main bearing halves with clean engine oil.
2. Install the crankshaft tone wheel. Tighten the mounting screws to 15 N.m (11 ft. lbs.)
3. Position crankshaft in cylinder block.
4. Install the thrust washers (1).

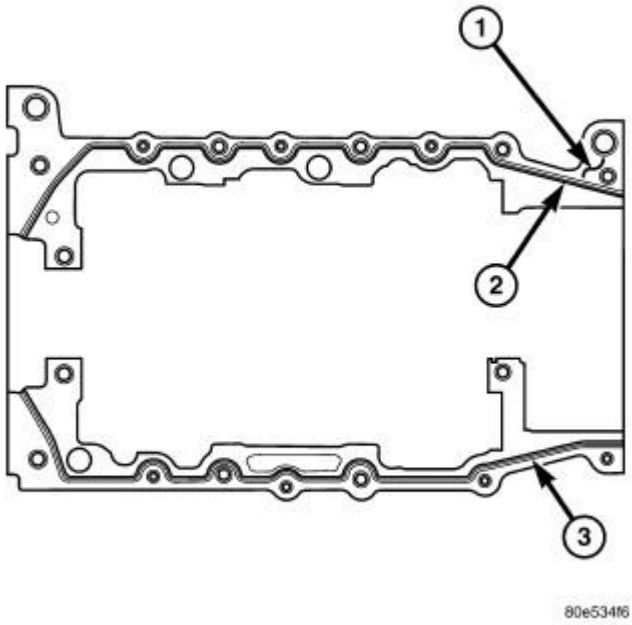

Fig. 81: Bedplate Sealant
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER BLOCK
2 - SEALANT
3 - SEALANT

CAUTION: The bedplate to cylinder block mating surface must be coated with Mopar® Engine RTV sealant prior to installation. Failure to do so will cause severe oil leaks.

NOTE: Make sure that the bedplate and cylinder block sealing surfaces are clean and free of oil or other contaminants. Contaminants on the sealing surfaces may cause main bearing distortion and/or oil leaks.

5. Apply a 2.5 mm (0.100 inch) bead of Mopar® Engine RTV sealant to the cylinder block-to-bedplate mating surface (2, 3) as shown in illustration.

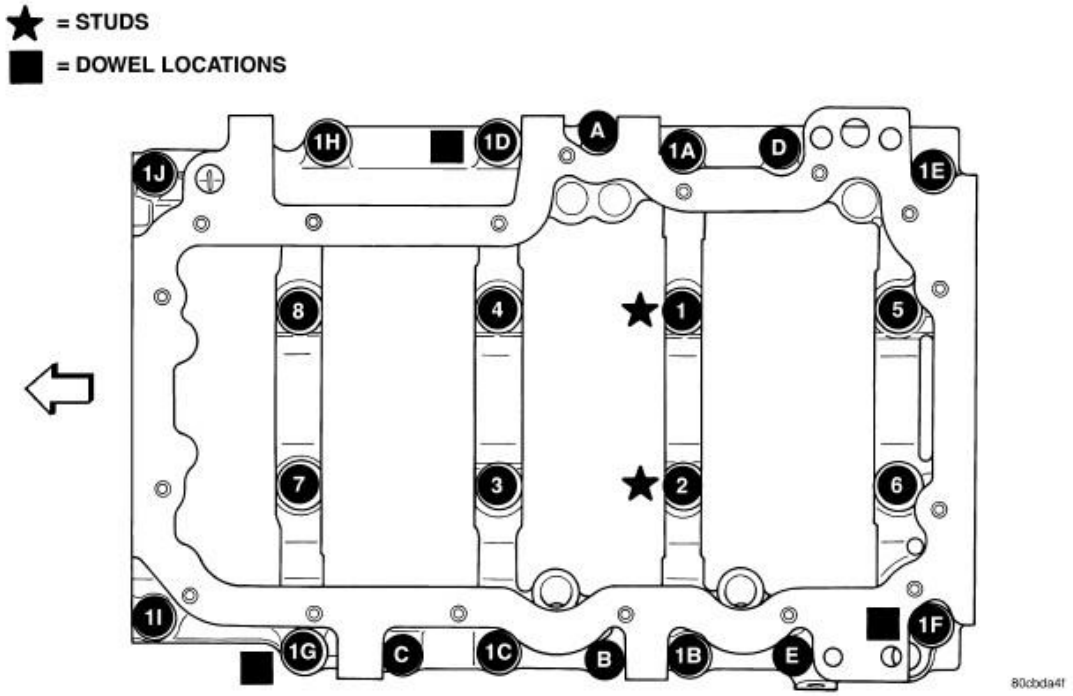

Fig. 82: Bedplate Tightening Sequence With Stud & Dowel Location
Courtesy of CHRYSLER GROUP, LLC

6. Coat the crankshaft main bearing journals with clean engine oil and position the bedplate onto the cylinder block.

NOTE: Lubricate the bedplate retaining bolts with clean engine oil prior to installation.

7. Install the bedplate retaining bolts, making sure to place the stud bolts in the correct location, Tighten the bolts in the sequence shown in illustration.
   - Hand tighten bolts **1D, 1G and 1F** until the bedplate contacts the block.
   - Tighten bolts **1A - 1J** to 54 N.m (40 ft. lbs.)
   - Tighten bolts **1 - 8** to 7 N.m (5 ft. lbs.)
   - Turn bolts **1 - 8** an additional 90°.
   - Tighten bolts **A - E** 27 N.m (20 ft. lbs.).
8. Measure crankshaft end play.
9. Install the connecting rods and measure side clearance. Refer to **Engine/Engine Block/ROD, Piston and Connecting - Standard Procedure**.
10. Install oil pump. Refer to **PUMP, ENGINE OIL, INSTALLATION, 3.7L**.
11. Install the engine. Refer to **INSTALLATION, 3.7L**.

DAMPER, VIBRATION

REMOVAL

REMOVAL

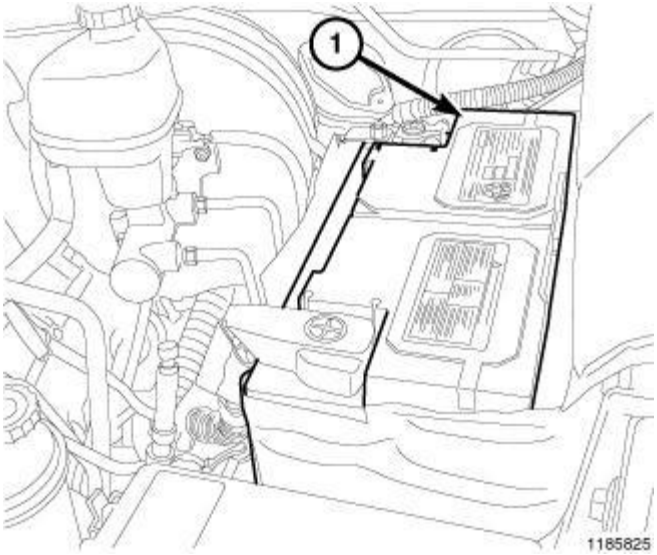

Fig. 83: Negative Battery Cable
Courtesy of CHRYSLER GROUP, LLC

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

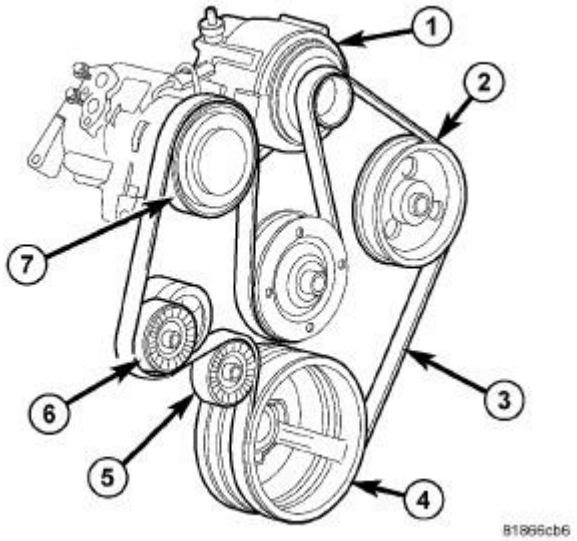

Fig. 84: Accessory Drive Belt Routing, Tensioner & Pulleys
Courtesy of CHRYSLER GROUP, LLC

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

2. Rotate the belt tensioner (6) until it contacts its stop and remove the belt (3), then slowly rotate the tensioner (6) into the freearm position.

3. Raise and support the vehicle.

WARNING: Do not remove the radiator pressure cap, cylinder block drain plugs or loosen the radiator draincock with the system hot and under pressure. Serious burns from coolant can occur.

4. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
5. Lower the vehicle.
6. Remove the upper radiator hose.

NOTE: The thermal viscous fan drive/fan blade assembly is attached (threaded) to the water pump hub shaft.

NOTE: The transmission cooler line snaps onto the lower right hand corner of the fan shroud.

CAUTION: After removing fan blade/viscous fan drive assembly, do not place viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into the bearing assembly and contaminate the bearing lubricant.

7. Remove the fan shroud and fan blade/viscous fan drive assembly as a complete unit from the vehicle. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .

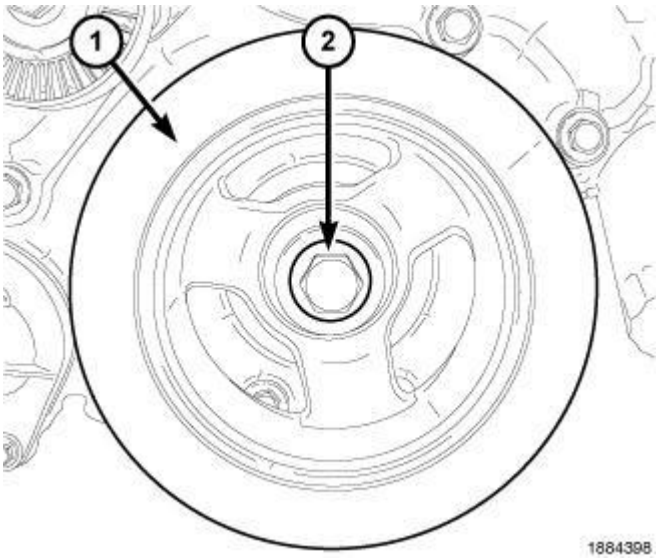

Fig. 85: Vibration Damper & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

8. Remove the vibration damper (1) retaining bolt (2).

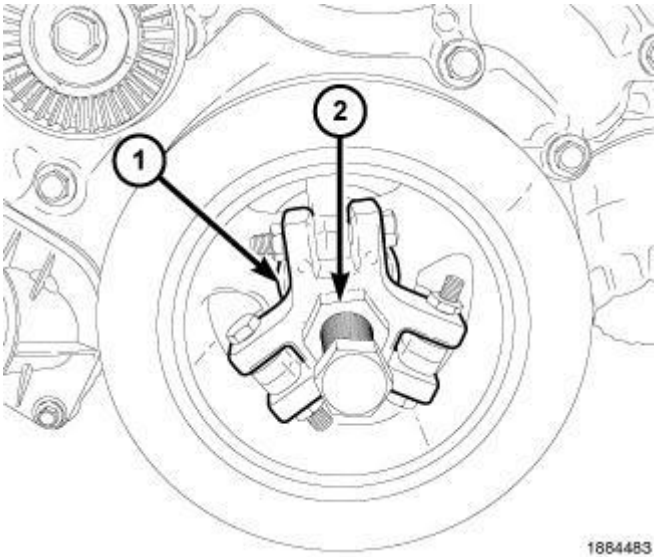

Fig. 86: Removing Crankshaft Damper
Courtesy of CHRYSLER GROUP, LLC

9. Using the crankshaft insert (special tool #8513A, Insert, Crankshaft) (1) and the three jaw puller (special tool #8454, 3-Jaw Puller) (2) remove the crankshaft damper.

INSTALLATION

INSTALLATION

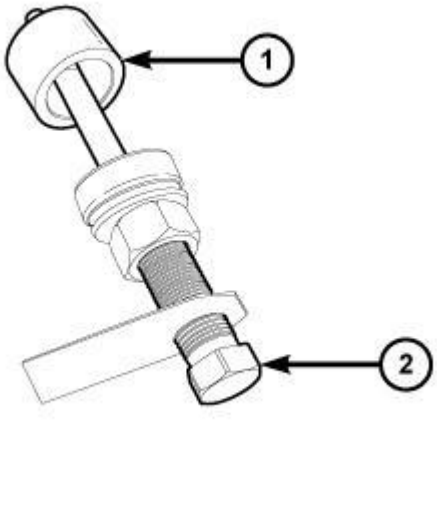

Fig. 87: Damper Installer & A/C Hub Installer Cup
Courtesy of CHRYSLER GROUP, LLC

CAUTION: To prevent severe damage to the crankshaft, damper, and damper installer (special tool #8512A, Installer, Damper), thoroughly clean the damper bore and the crankshaft nose before installing damper.

1. Position the damper onto the crankshaft.
2. Assemble the damper installer (special tool #8512A, Installer, Damper) (2) and the A/C hub installer cup (special tool #6871, Installer, A/C Hub) (1).

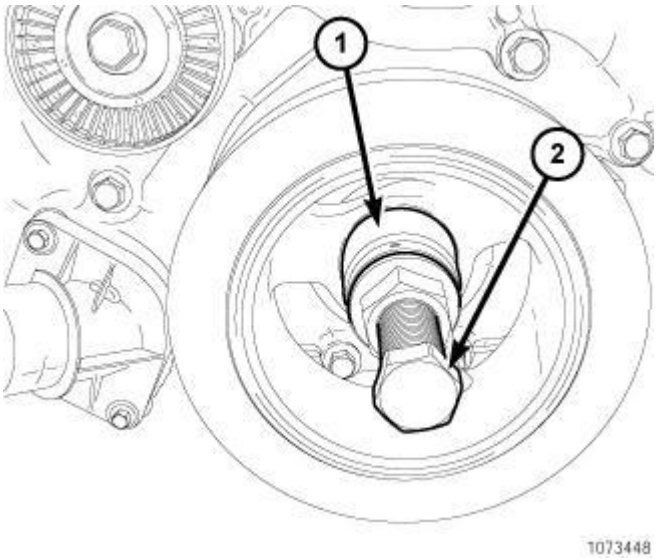

Fig. 88: Pressing Damper Onto Crankshaft
Courtesy of CHRYSLER GROUP, LLC

3. Using the damper installer (special tool #8512A, Installer, Damper) (2) and the A/C hub installer cup (special tool #6871, Installer, A/C Hub) (1), press the damper onto the crankshaft.
4. Coat the vibration damper bolt threads with Mopar ® Nickel Anti-Seize or equivalent, install and tighten the bolt to 175 N.m (130 ft. lbs.).
5. Install the cooling fan assembly. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
6. Install the radiator upper shroud and tighten fasteners to 11 N.m (95 in. lbs.).
7. Install the radiator upper hose.
8. Install the accessory drive belt. Refer to **BELT, SERPENTINE, INSTALLATION** .
9. Refill the cooling system. Refer to **STANDARD PROCEDURE** .
10. Connect the negative battery cable.

FLEXPLATE

REMOVAL

REMOVAL

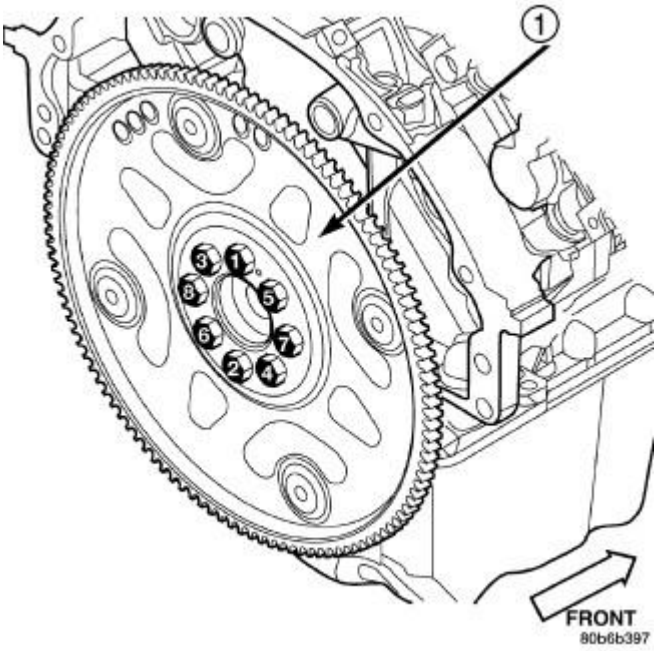

Fig. 89: Flexplate Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1 - FLEXPLATE

1. Remove the transmission. Refer to **REMOVAL** .
2. Remove the bolts and flexplate (1).

INSTALLATION

INSTALLATION

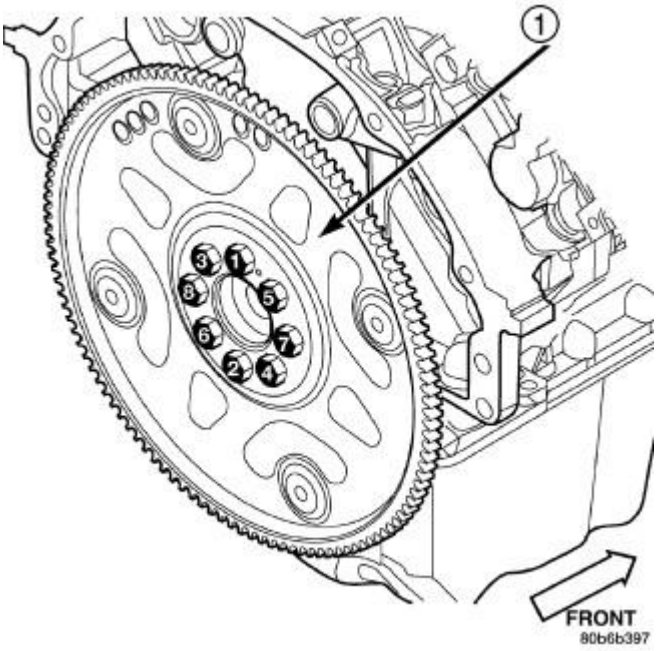

Fig. 90: Flexplate Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1 - FLEXPLATE

1. Position the flexplate onto the crankshaft and install the bolts hand tight.
2. Tighten the flexplate (1) retaining bolts to 95 N.m (70 ft. lbs.) in the sequence shown in illustration. Refer to **Fig. 90**.
3. Install the transmission.

MODULE, BALANCE SHAFT

REMOVAL

REMOVAL

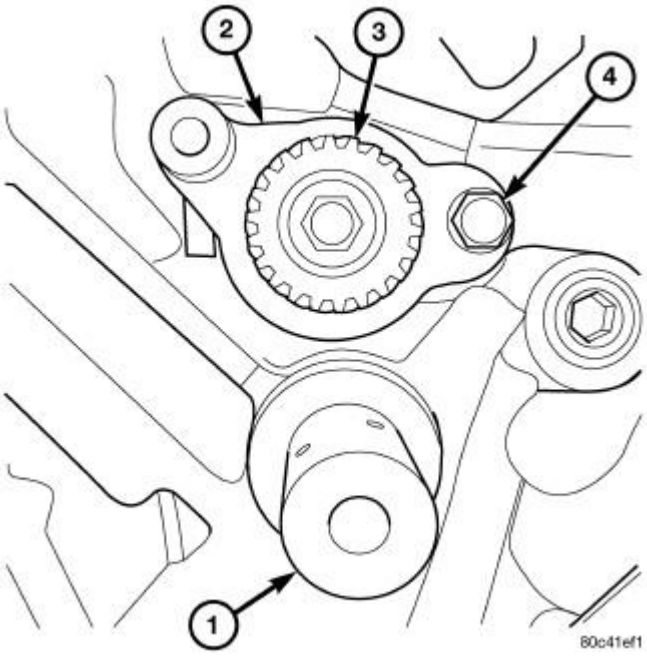

Fig. 91: Idler Shaft, Counterbalance Shaft Thrust Plate And Drive Gear & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

1. Remove the primary and secondary timing chains. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.

Remove the retaining bolt (4) from the counterbalance shaft thrust plate (2).

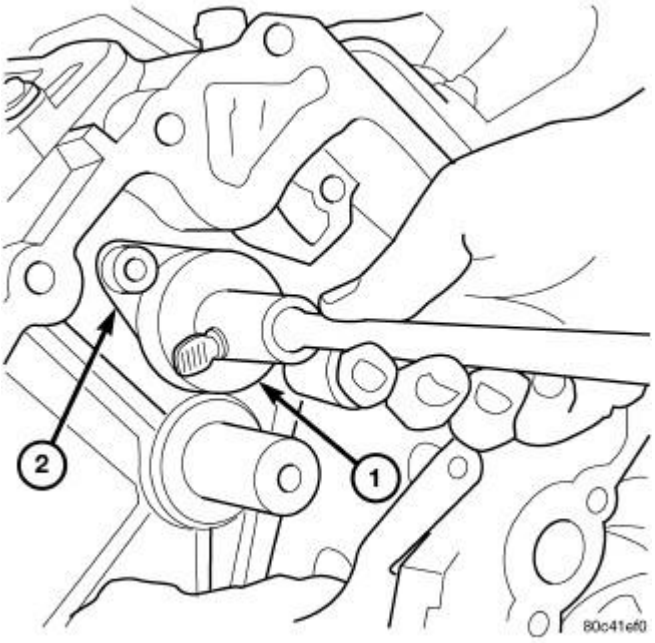

Fig. 92: Removing/Installing Counterbalance Shaft From Engine
Courtesy of CHRYSLER GROUP, LLC

2. Using the Counterbalance Shaft Remover/Installer (special tool #8641, Remover/Installer) (1), remove the counterbalance shaft from the engine.

INSTALLATION

INSTALLATION

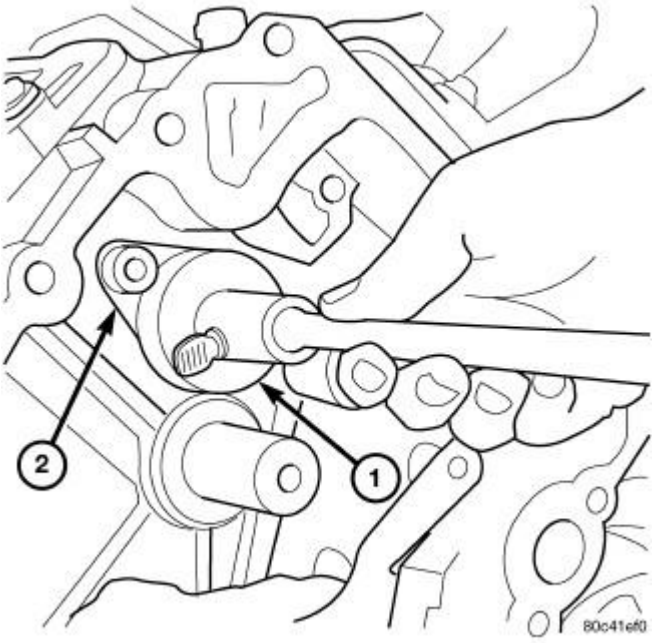

Fig. 93: Removing/Installing Counterbalance Shaft From Engine
Courtesy of CHRYSLER GROUP, LLC

1 - COUNTERBALANCE SHAFT REMOVAL AND INSTALLATION TOOL
2 - COUNTERBALANCE SHAFT THRUST PLATE

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.

1. Coat counterbalance shaft bearing journals with clean engine oil.

   NOTE: The balance shaft is heavy, and care should be used when installing shaft, so bearings are not damaged.

2. Using the Counterbalance Shaft Remover/Installer (special tool #8641, Remover/Installer) (1), carefully install counterbalance shaft into engine. Refer to **Fig. 93**.

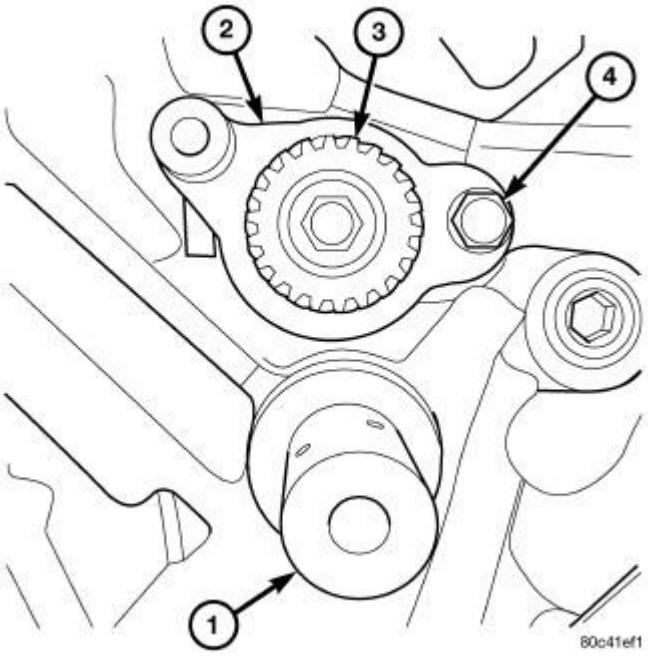

Fig. 94: Idler Shaft, Counterbalance Shaft Thrust Plate And Drive Gear & Retaining Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - IDLER SHAFT
2 - COUNTERBALANCE SHAFT THRUST PLATE
3 - COUNTERBALANCE SHAFT DRIVE GEAR
4 - RETAINING BOLT

3. Install Counterbalance shaft thrust plate retaining bolt (4) finger tight. Do not tighten bolt at this time.
4. Position the right side of the thrust plate with the right chain guide bolt, install bolt finger tight.
5. Tighten the thrust plate retaining bolt (4) to 28 N.m (250 in. lbs.). Refer to **Fig. 94**.
6. Remove the chain guide bolt so that guide can be installed.

RING(S), PISTON

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON RING FITTING

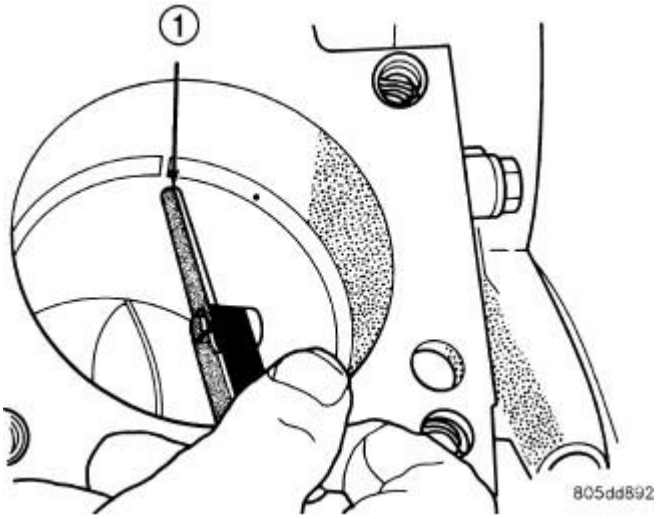

Fig. 95: Ring End Gap Measurement
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAUGE

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

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

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

3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge (1) check the ring end gap. Replace any rings not within specification.

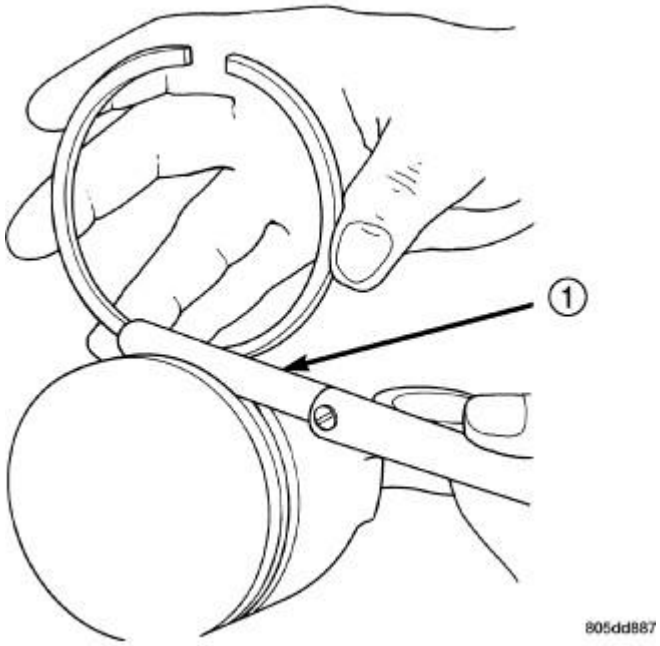

Fig. 96: Measuring Piston Ring Side Clearance
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAUGE

PISTON RING SIDE CLEARANCE

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

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

PISTON RING SPECIFICATION CHART

Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	0.051 - 0.094 mm (0.0020 - 0.0037 in.)	0.11 mm (0.004 in.)
Intermediate Ring	0.04 - 0.08 mm (0.0016 - 0.0031 in.)	0.10 mm (0.004 in.)
Oil Control Ring (Steel Rails)	0.019 - 0.229 mm (0.0007-.0090 in.)	0.25 mm (0.010 in.)

Ring Position	Ring Gap	Wear Limit

Upper Ring	0.20 - 0.36 mm (0.0079 - 0.0142 in.)	0.43 mm (0.0017 in.)
Intermediate Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)	0.74 mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.025 - 0.76 mm (0.0099 - 0.03 in.)	1.55 mm (0.061 in.)

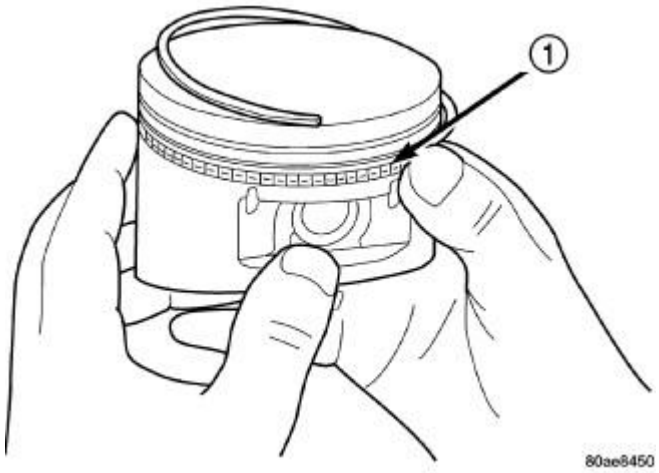

Fig. 97: Removing/Installing Piston Ring Side Rail
Courtesy of CHRYSLER GROUP, LLC

1 - SIDE RAIL END

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

NOTE: Piston rings are installed in the following order:

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

8. Install the oil ring expander.
9. Install upper side rail (1) 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.

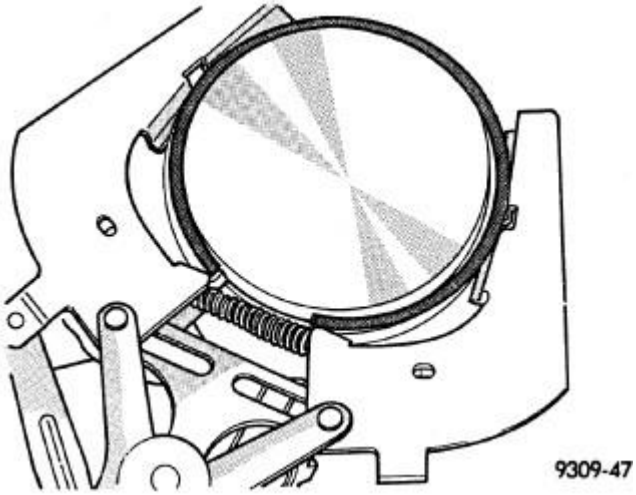

Fig. 98: Removing/Installing Upper & Intermediate Rings
Courtesy of CHRYSLER GROUP, LLC

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

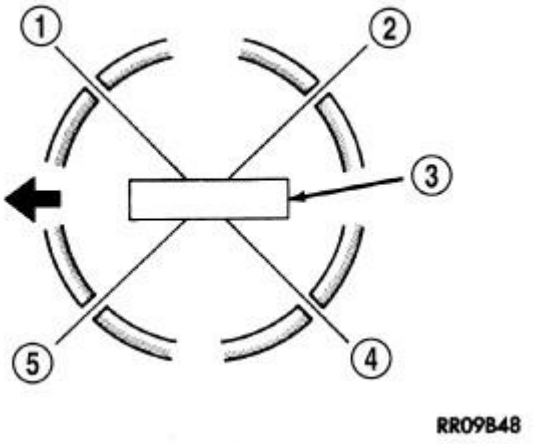

Fig. 99: Piston Ring End Gap Position
Courtesy of CHRYSLER GROUP, LLC

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

12. Position piston ring end gaps as shown in illustration. It is important that expander ring gap (5) 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

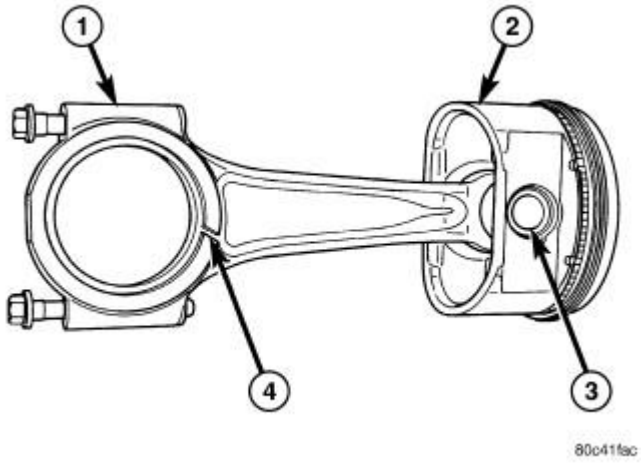

Fig. 100: Piston & Connecting Rod Assembly
Courtesy of CHRYSLER GROUP, LLC

1 - CONNECTING ROD
2 - PISTON
3 - PISTON PIN
4 - OIL SLINGER SLOT

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

The pistons (2) are made of a high strength aluminum alloy. Refer to **Fig. 100**. The connecting rods (1) are made of forged powdered metal, with a "fractured cap" design. A full floating piston pin is used to attach the piston to the connecting rod.

STANDARD PROCEDURE

CONNECTING ROD BEARING FITTING

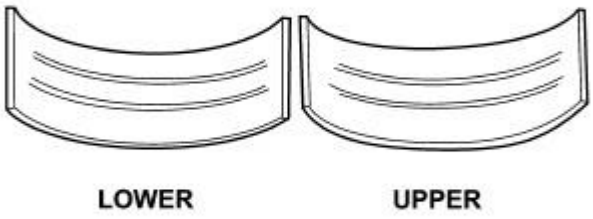

Fig. 101: Inspecting Connecting Rod Bearings
Courtesy of CHRYSLER GROUP, LLC

Inspect the connecting rod bearings for scoring. Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting. Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

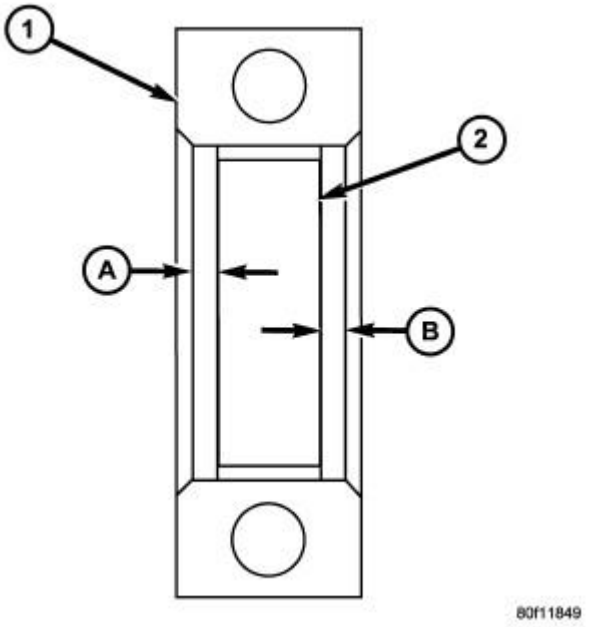

Fig. 102: Bearing Insert Location
Courtesy of CHRYSLER GROUP, LLC

1. Wipe the oil from the connecting rod journal.
2. Lubricate the upper bearing insert and position in connecting rod. **Center bearing insert (2) in connecting rod (1)**

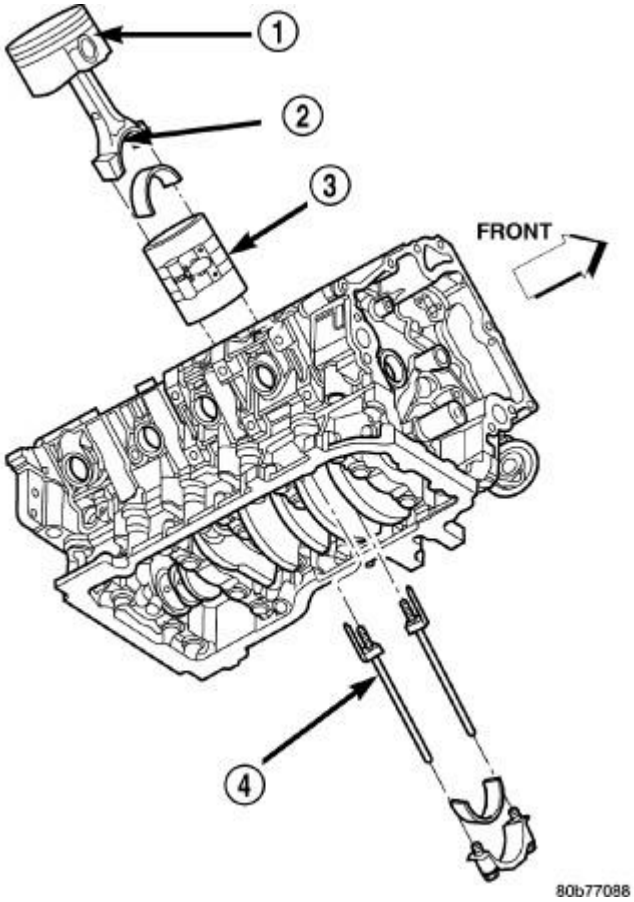

Fig. 103: Piston, Oil Slinger Slot, Ring Compressor & Special Tool
Courtesy of CHRYSLER GROUP, LLC

3. Use piston ring compressor (3) and Connecting Rod Guides (special tool #8507, Guides, Connecting Rod) to install the rod and piston assemblies. The oil slinger slots in the rods must face front of the engine. The "F"'s near the piston wrist pin bore (1) should point to the front of the engine.

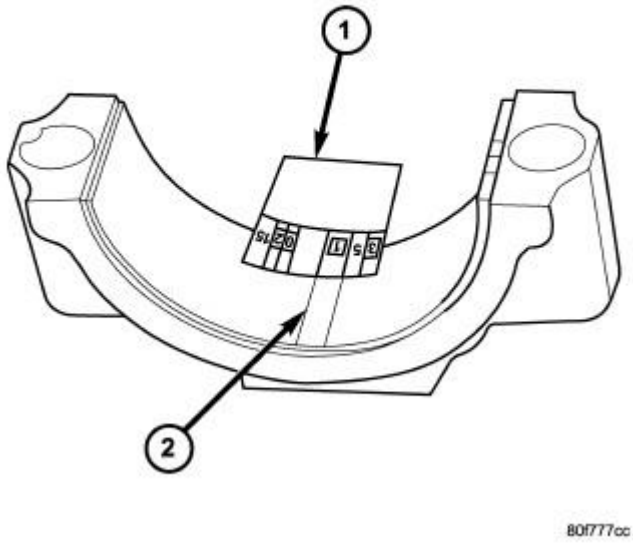

Fig. 104: Measuring Bearing Clearance With Plastigage
Courtesy of CHRYSLER GROUP, LLC

4. Install the lower bearing insert in the bearing cap. **Center bearing insert in connecting rod.** . The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.
5. Install bearing cap and connecting rod on the journal and tighten bolts to 27 N.m (20 ft. lbs.) plus a 90° turn. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.
6. Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (2). Refer to **Engine - Specifications** for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**
7. If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

Bearing Mark	SIZE		USED WITH JOURNAL SIZE	
0.025 OS	0.025 mm	0.001 in.	57.883 - 57.867 mm	2.2788 - 2.2783 in.
STD	STANDARD	STANDARD	57.908 - 57.892 mm	2.2798 - 2.2792 in.
0.250 US	0.250 mm	0.010 in.	57.658 - 57.646 mm	2.2700 - 2.2695 in.

8. If bearing-to-journal clearance exceeds the specification, determine which services bearing set to use the bearing sizes are as follows:

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or

removed.

9. Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.
10. Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 27 N.m (20 ft. lbs.) plus a 90° turn.

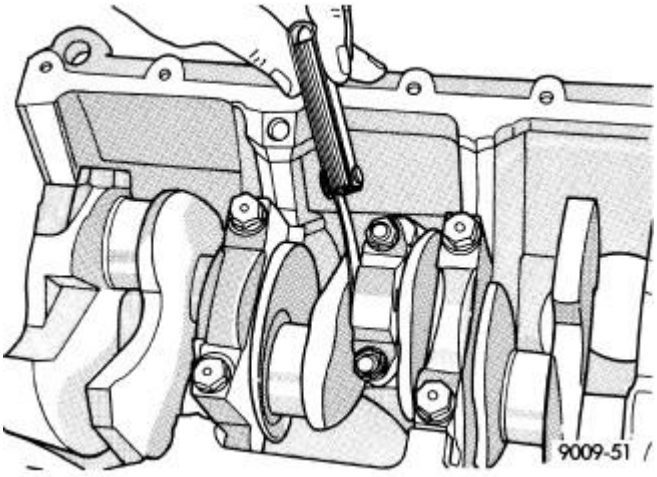

Fig. 105: Checking Connecting Rod To Crankshaft Journal Flange Clearance
Courtesy of CHRYSLER GROUP, LLC

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange. Refer to **Engine - Specifications** for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

PISTON FITTING

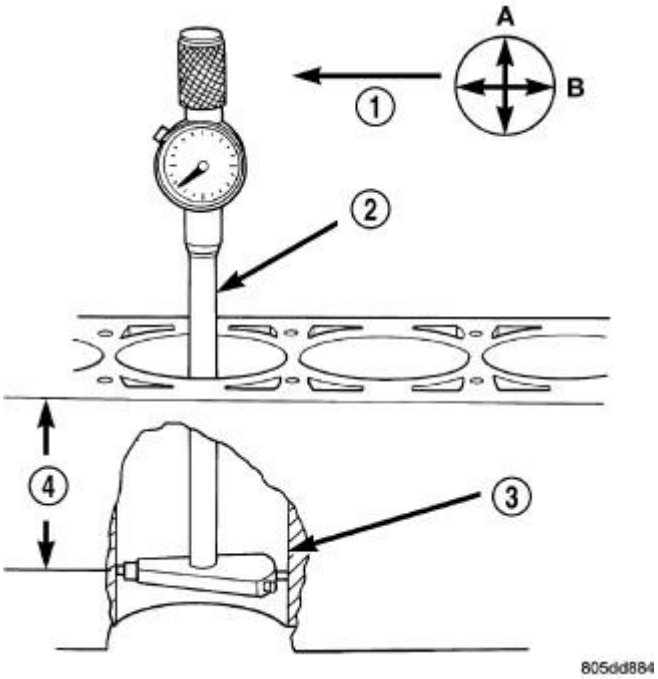

Fig. 106: Measuring Cylinder Bore Diameter
Courtesy of CHRYSLER GROUP, LLC

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

1. To correctly select the proper size piston, a cylinder bore gauge (2), capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. Refer to **Fig. 106**. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore (3) 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.

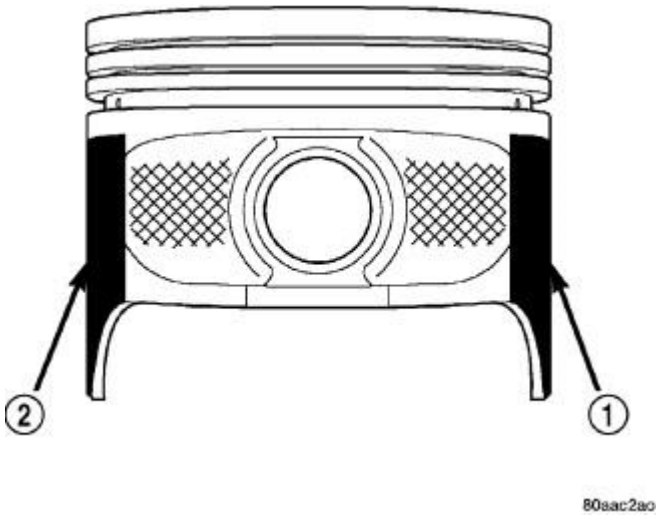

Fig. 107: Moly Coated Piston
Courtesy of CHRYSLER GROUP, LLC

1 - MOLY COATED
2 - MOLY COATED

3. The coated pistons (1, 2) will be serviced with the piston pin and connecting rod pre-assembled. Refer to **Fig. 107**.
4. The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston (1, 2) 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 (.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. Refer to **PAN, OIL, REMOVAL, 3.7L**.
   - Cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
   - Timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.
   - Cylinder head(s). Refer to **CYLINDER HEAD, LEFT, REMOVAL, 3.7L** and **CYLINDER HEAD, RIGHT, REMOVAL, 3.7L**.
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

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.

5. Remove connecting rod cap. Install the Connecting Rod Guides (special tool #8507, Guides, Connecting Rod) into 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.

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.

CLEANING

CLEANING

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

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

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

INSPECTION

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring. Refer to **Engine/Engine Block/ROD, Piston and Connecting - Standard Procedure**.

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore. Refer to **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

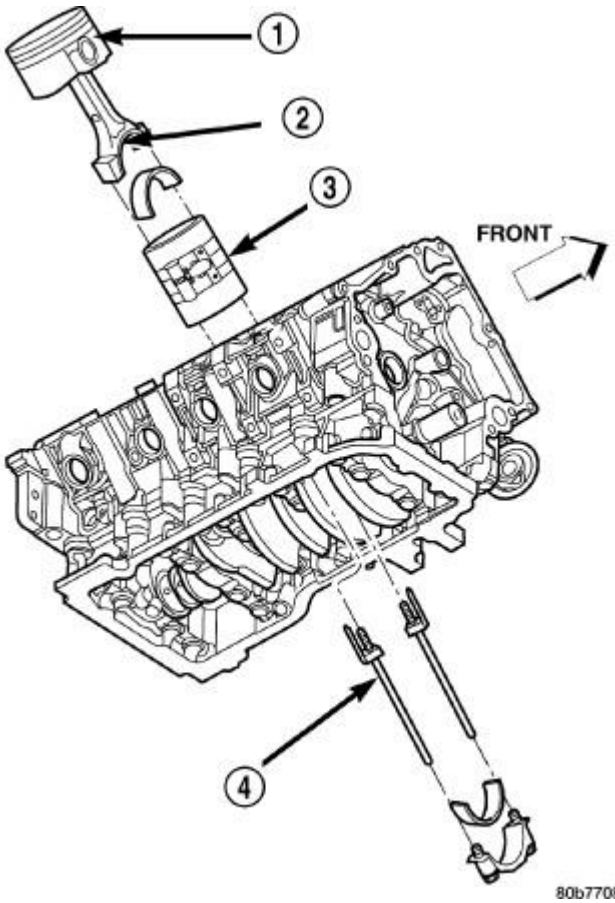

Fig. 108: Piston, Oil Slinger Slot, Ring Compressor & Special Tool
Courtesy of CHRYSLER GROUP, LLC

1 - "F" TOWARD FRONT OF ENGINE
2 - OIL SLINGER SLOT
3 - RING COMPRESSOR
4 - SPECIAL TOOL 8507

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings.
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor (3) over the piston and

rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**

3. Position bearing onto connecting rod. Ensure that hole in bearing shell aligns with hole in connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool (special tool #8507, Guides, Connecting Rod) Connecting Rod Guides (4) into connecting rod bolt threads.

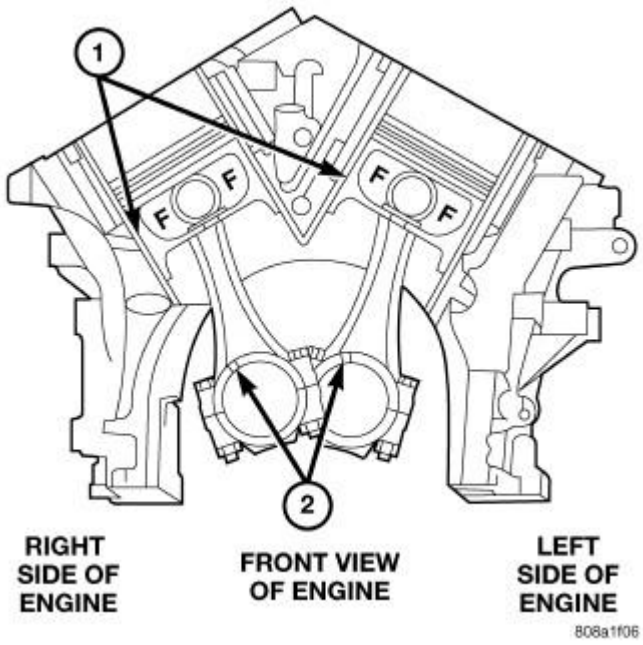

Fig. 109: Proper Connecting Rod Installation
Courtesy of CHRYSLER GROUP, LLC

1 - MAJOR THRUST SIDE OF PISTON
2 - OIL SLINGER SLOT

5. The pistons are marked on the piston pin bore surface with an raised "F" indicating installation position (1). This mark must be pointing toward the front of engine on both cylinder banks. The connecting rod oil slinger slot faces the front of the engine.
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.

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. 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 27 N.m (20 ft. lbs.) plus 90°.

10. Install the following components:
    - Cylinder head(s). Refer to **CYLINDER HEAD, LEFT, INSTALLATION, 3.7L** and **CYLINDER HEAD, RIGHT, INSTALLATION, 3.7L**.
    - Timing chain and cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 3.7L**.
    - Cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).
    - Oil pan and gasket/windage tray. Refer to **PAN, OIL, INSTALLATION, 3.7L**.
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

SEAL, CRANKSHAFT OIL, FRONT

REMOVAL

REMOVAL

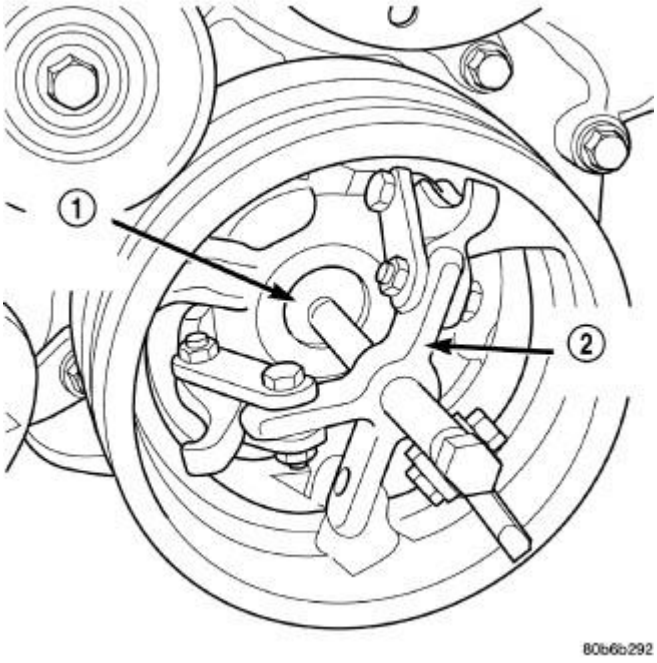

Fig. 110: Removing Crankshaft Damper
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative cable from battery.
2. Remove accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL** .
3. Remove A/C compressor mounting fasteners and set compressor aside.
4. Drain cooling system. Refer to **STANDARD PROCEDURE** .
5. Remove upper radiator hose.

6. Disconnect electrical connector for fan mounted inside radiator shroud.
7. Remove radiator shroud attaching fasteners.

NOTE: Transmission cooler line snaps into shroud lower right hand corner.

8. Remove radiator cooling fan and shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
9. Remove crankshaft damper bolt.
10. Remove damper using Crankshaft Insert (special tool #8513A, Insert, Crankshaft) (1) and (special tool #1023, Puller) Three Jaw Puller (2).

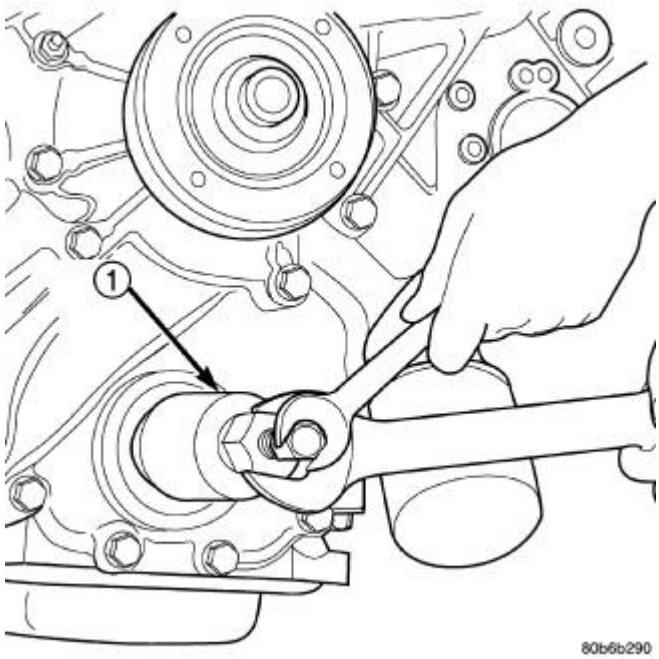

Fig. 111: Removing Crankshaft Front Oil Seal
Courtesy of CHRYSLER GROUP, LLC

11. Using Crankshaft Front Seal Remover (special tool #8511, Remover, Seal) (1), remove crankshaft front seal.

INSTALLATION

INSTALLATION

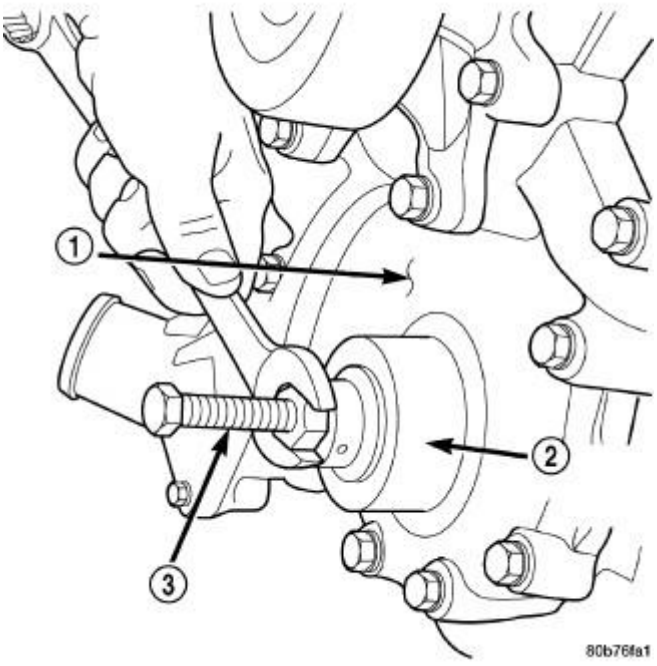

Fig. 112: Installing Crankshaft Front Oil Seal
Courtesy of CHRYSLER GROUP, LLC

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

1. Using Seal Installer (special tool #8348, Installer, Seal) and Damper Installer (special tool #8512A, Installer, Damper) (2, 3), install crankshaft front seal.
2. Install vibration damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 3.7L**.
3. Install radiator cooling fan and shroud. Refer to **FAN, COOLING, ELECTRIC, INSTALLATION** and **FAN, COOLING, VISCOUS, INSTALLATION** .
4. Install upper radiator hose.
5. Install A/C compressor and tighten fasteners to 54 N.m (40 ft. lbs.).
6. Install accessory drive belt refer. Refer to **BELT, SERPENTINE, INSTALLATION** .
7. Refill cooling system. Refer to **STANDARD PROCEDURE** .
8. Connect negative cable to battery.

SEAL, CRANKSHAFT OIL, REAR

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - 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:
    1. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    2. Where leakage tends to run straight down, possible causes are a porous block, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See appropriate Engine information, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in **OIL CONSUMPTION TEST AND DIAGNOSIS**.

    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 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 until disassembled, under the OIL LEAK row, for components inspections on possible causes and corrections. Refer to **LUBRICATION** chart.
7. After the oil leak root cause and appropriate corrective action have been identified. Refer to **SEAL, CRANKSHAFT OIL, REAR, REMOVAL, 3.7L**.

REMOVAL

REMOVAL

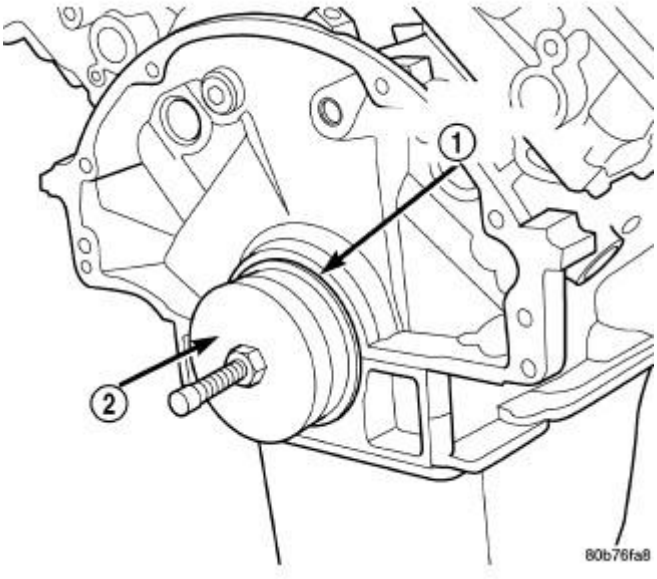

Fig. 113: Removing Crankshaft Rear Oil Seal Using Special Tool
Courtesy of CHRYSLER GROUP, LLC

NOTE: This procedure can be performed in vehicle.

1. If being performed in vehicle, remove the transmission.
2. Remove the flexplate. Refer to **FLEXPLATE, REMOVAL, 3.7L**.

NOTE: The crankshaft oil seal CAN NOT be reused after removal.

NOTE: The crankshaft rear oil seal remover (special tool #8506, Remover, Seal) must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.

3. Using Seal Remover (special tool #8506, Remover, Seal) (2), remove the crankshaft rear oil seal (1).

INSTALLATION

INSTALLATION

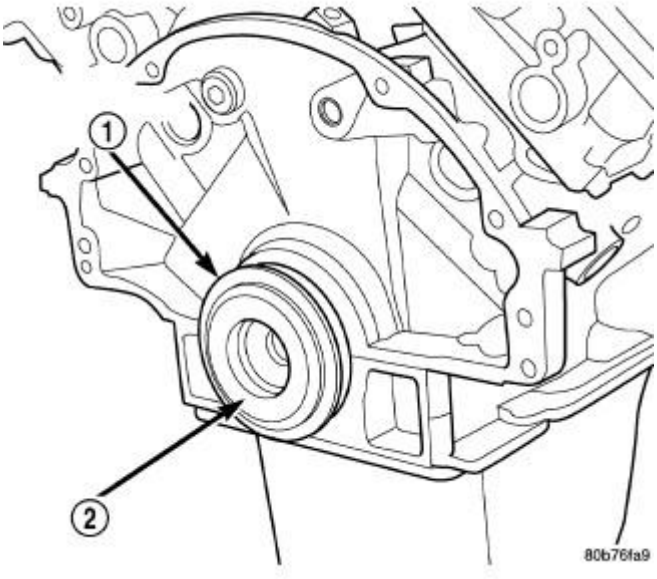

Fig. 114: Crankshaft Rear Oil Seal Guide Special Tool 8349-2 & Oil Seal
Courtesy of CHRYSLER GROUP, LLC

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349-2 GUIDE

1. Lubricate the crankshaft flange with engine oil.
2. Position the magnetic seal guide (special tool #8349-2, Guide Crank Seal) onto the crankshaft rear face. Then position the crankshaft rear oil seal (1) onto the guide (2).

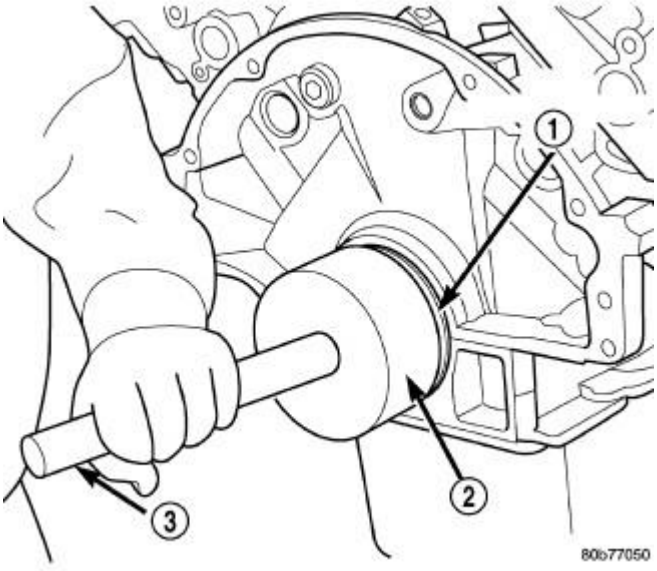

Fig. 115: Installing Crankshaft Rear Oil Seal
Courtesy of CHRYSLER GROUP, LLC

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349-1 INSTALLER
3 - SPECIAL TOOL C-4171 HANDLE

3. Using Crankshaft Rear Oil Seal Installer (special tool #8349, Installer, Crankshaft Rear Oil Seal) (2) and Driver Handle (special tool #C-4171, Driver Handle, Universal) (3), with a hammer, tap the seal (1) into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.
4. Install the flexplate.
5. Install the transmission.

ENGINE MOUNTING

INSULATOR, ENGINE MOUNT, REAR (TRANSMISSION)

REMOVAL

REMOVAL

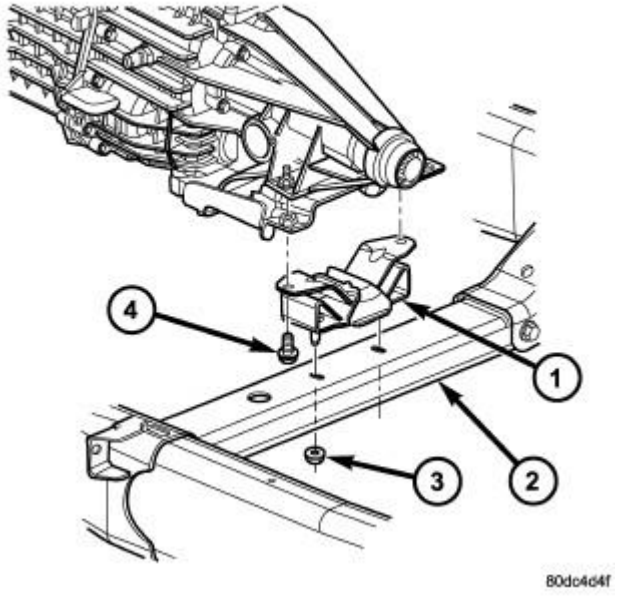

Fig. 116: Transmission Mount, Crossmember & Fasteners
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNT
2 - CROSSMEMBER
3 - NUT
4 - BOLT

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the nuts from the transmission mount (1).
4. Remove the two bolts that attach the transmission mount to the engine bracket.
5. Raise the transmission enough to remove the mount from the crossmember (2). Refer to **Fig. 116**.
6. Remove the mount (1).

INSTALLATION

INSTALLATION

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

1. Install the two bolts that attach the transmission mount to the transmission bracket.
2. Torque the bolts to 61 N.m (45 ft.lbs.) torque.
3. Lower the transmission so the transmission mount rests on the crossmember, and the studs of the transmission mount are aligned in the slots in the crossmember.
4. Install the nuts onto the transmission mount studs through the crossmember access slot.
5. Torque the nuts to 54 N.m (40 ft. lbs.).

INSULATOR, ENGINE MOUNT, FRONT

REMOVAL

REMOVAL

2WD

1. Disconnect the negative cable from the battery.

CAUTION: Remove the viscous fan before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

2. Remove the cooling fan.
3. Raise the vehicle.
4. Remove the engine oil filter.
5. Remove the oil drain trough.
6. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
7. Support the front axle with a suitable jack.
8. Remove the (4) bolts that attach the engine mounts to the front axle.
9. Remove the (3) bolts that attach the front axle to the left engine bracket.
10. Lower the front axle.

11. Remove the through bolts
12. Raise the engine far enough to be able to remove the left and right engine mounts.
13. Remove the (8) mount to engine attaching bolts
14. Remove the engine mounts.

4WD

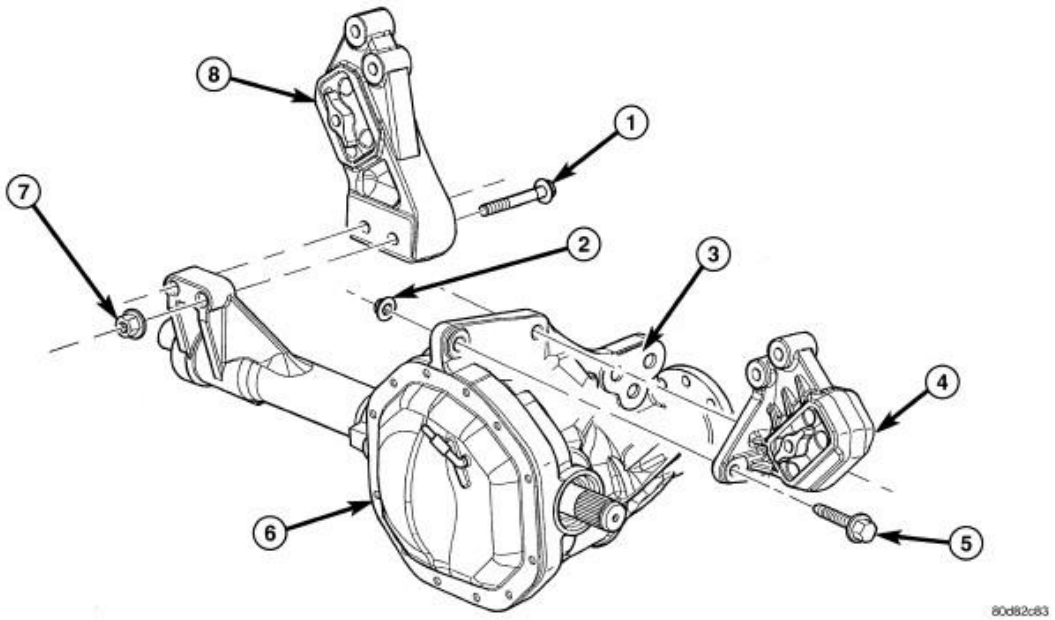

Fig. 117: Engine Insulator Mounts - 4x4
Courtesy of CHRYSLER GROUP, LLC

1 - RH INSULATOR TO AXLE BOLT
2 - NUT
3 - PINION SUPPORT MOUNT
4 - LH INSULATOR MOUNT
5 - LH INSULATOR TO AXLE BOLT
6 - FRONT AXLE
7 - NUT
8 - RH INSULATOR MOUNT

1. Disconnect the negative cable from the battery.

CAUTION: Remove the viscous fan before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

2. Remove the cooling fan.
3. Raise the vehicle.

4. Remove the skid plate.
5. Remove the front crossmember.
6. Remove the engine oil filter.
7. Remove the oil drain trough.
8. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
9. Support the front axle with a suitable jack.
10. Remove the 4 bolts that attach the engine mounts to the front axle.
11. Remove the 3 bolts that attach the front axle to the left engine bracket.
12. Lower the front axle.
13. Remove the 6 through bolts
14. Raise the engine far enough to be able to remove the left (4) and right (8) engine mounts.
15. Remove the mounts.

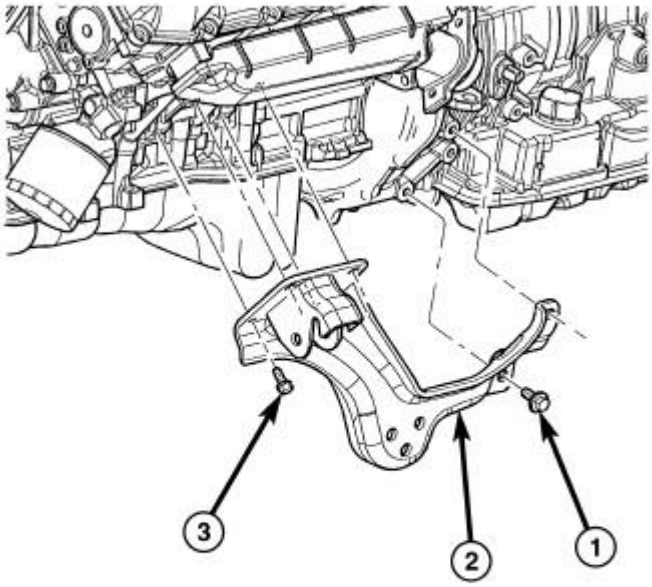

Fig. 118: Engine Mount Support Bracket
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - ENGINE MOUNT SUPPORT BRACKET
3 - BOLT

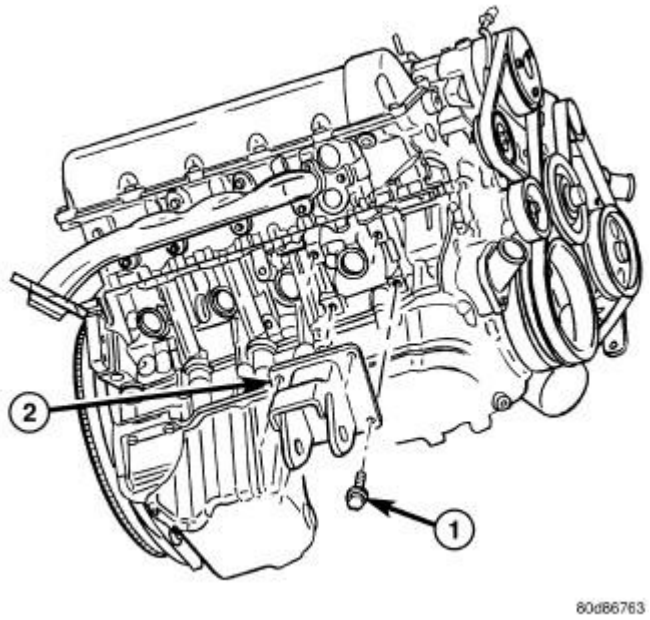

Fig. 119: Engine Mount Support Bracket
Courtesy of CHRYSLER GROUP, LLC

1 - BOLT
2 - ENGINE MOUNT SUPPORT BRACKET

16. Remove the engine mount brackets (2).

INSTALLATION

INSTALLATION

2WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts to the engine block with (8) bolts. Torque bolts to 54 N.m (40 ft. lbs.).
2. Insert the (2) through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
3. Lower the engine until the through bolts rest onto the slots in the frame brackets.
4. Tighten the through bolt nuts to 94 N.m (70 ft. lbs.).
5. Install the oil drain trough.
6. Install the engine oil filter.
7. Lower the vehicle.

8. Install the cooling fan.
9. Reconnect the negative battery cable.

4WD

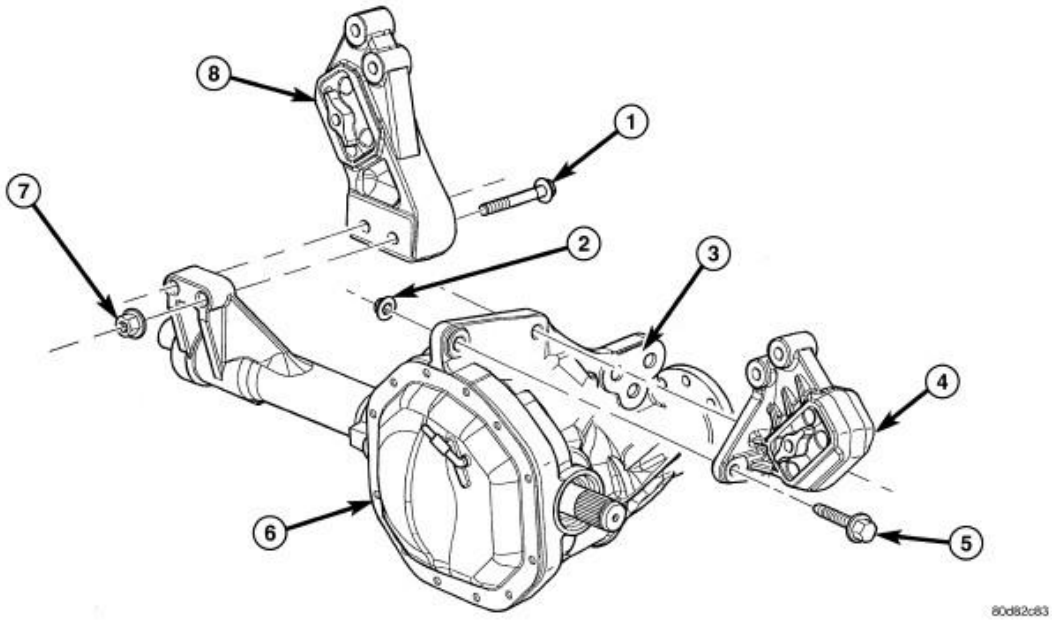

Fig. 120: Engine Insulator Mounts - 4x4
Courtesy of CHRYSLER GROUP, LLC

1 - RH INSULATOR TO AXLE BOLT
2 - NUT
3 - PINION SUPPORT MOUNT
4 - LH INSULATOR MOUNT
5 - LH INSULATOR TO AXLE BOLT
6 - FRONT AXLE
7 - NUT
8 - RH INSULATOR MOUNT

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts (4, 8) to the front axle. Torque nuts to 94 N.m (70 ft. lbs.).
2. Raise the front axle into the frame and install the left and right side through bolts. Torque nuts to 94 N.m (70 ft. lbs.).
3. Insert the two upper through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
4. Lower the engine until the left and right side engine brackets rest on the through bolts, and the lower engine bracket through holes align with the engine mounts, and the left engine bracket holes align with

the front axle slots.

5. Loose assemble the 3 bolts that attach the front axle to the left engine bracket.
6. Loose assemble the lower through bolts.
7. Torque the nuts for the 4 through bolts to 101 N.m (75 ft. lbs.).
8. Torque the 3 bolts that attach the front axle to the left engine bracket to 101 N.m (75 ft. lbs.).
9. Install the oil drain trough.
10. Install the engine oil filter.
11. Install the front crossmember.
12. Install the skid plate.
13. Lower the vehicle.
14. Install the cooling fan.
15. Reconnect the negative battery cable.

LUBRICATION

DESCRIPTION

DESCRIPTION

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

OPERATION

OPERATION

ENGINE LUBRICATION FLOW CHART - BLOCK: TABLE 1

FROM	TO
Oil Pickup Tube	Oil Pump
Oil Pump	Oil Filter
Oil Filter	Block Main Oil Gallery
Block Main Oil Gallery	1. Crankshaft Main Journal 2. Left Cylinder Head* 3. Right Cylinder Head* 4. Counterbalance Shaft Rear Journal
Crankshaft Main Journals	Crankshaft Rod Journals
Crankshaft Number One Main Journal	1. Front Timing Chain Idler Shaft 2. Counterbalance Shaft - Front Journal 3. Both Secondary Chain Tensioners
Left Cylinder Head	Refer to ENGINE LUBRICATION FLOW CHART - CYLINDER HEADS: TABLE 2 below
Right Cylinder Head	Refer to ENGINE LUBRICATION FLOW CHART - CYLINDER HEADS: TABLE 2 below

* The cylinder head gaskets have an oil restrictor to control oil flow to the cylinder heads

ENGINE LUBRICATION FLOW CHART - CYLINDER HEADS: TABLE 2

FROM	TO
Cylinder Head Oil Port (in bolt hole)	Diagonal Cross Drilling to Main Oil Gallery
Main Oil Gallery (drilled through head from rear to front)	1. Base of Camshaft Towers 2. Lash Adjuster Towers
Base of Camshaft Towers	Vertical Drilling Through Tower to Camshaft Bearings**
Lash Adjuster Towers	Diagonal Drillings to Hydraulic Lash Adjuster Pockets
** The number three camshaft bearing journal feeds oil into the hollow camshaft tubes. Oil is routed to the intake lobes, which have oil passages drilled into them to lubricate the rocker arms.	

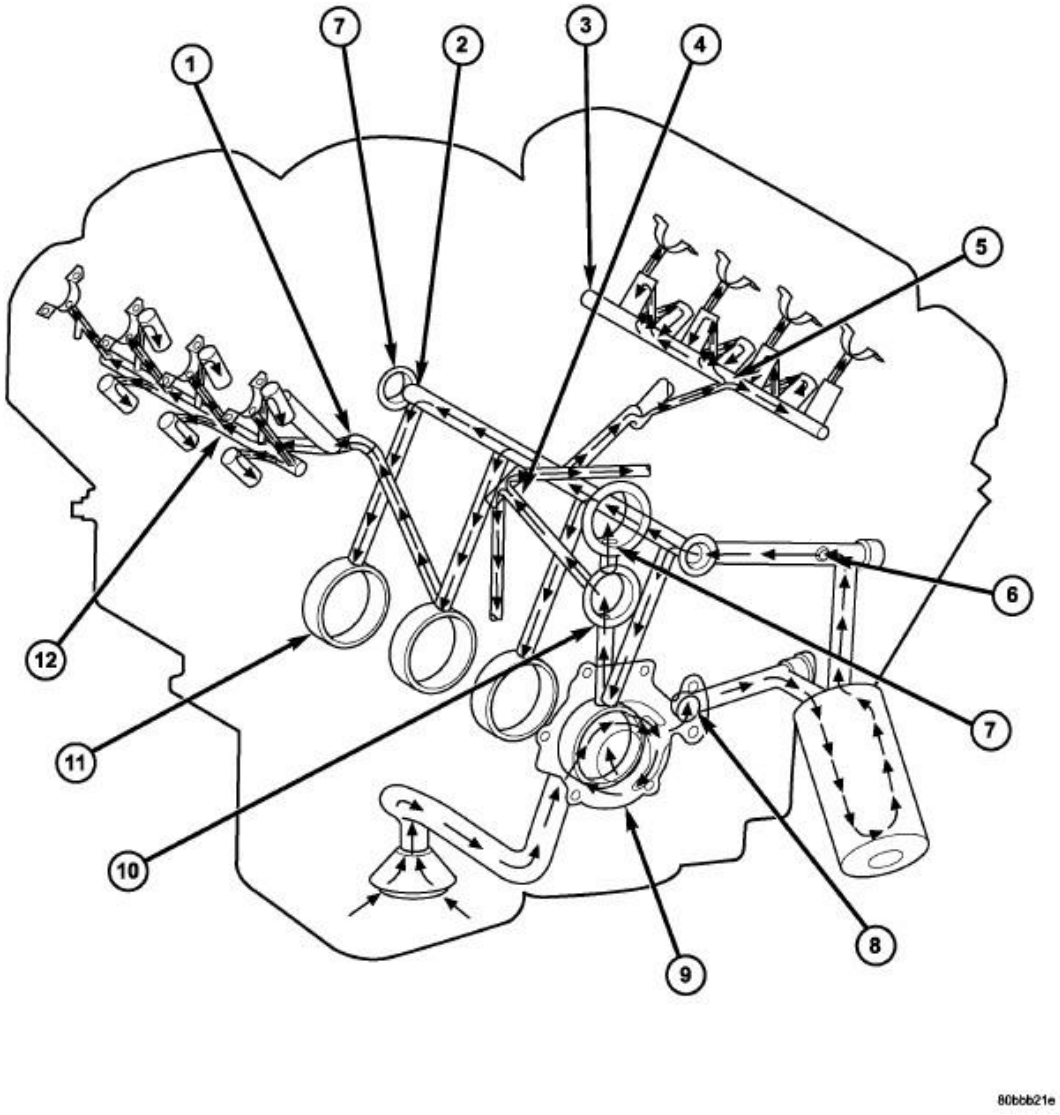

Fig. 121: Lubrication Oil Flow
Courtesy of CHRYSLER GROUP, LLC

1 - OIL FLOW TO RIGHT CYLINDER HEAD
2 - CYLINDER BLOCK MAIN OIL GALLERY
3 - LEFT CYLINDER HEAD OIL GALLERY
4 - OIL FLOW TO BOTH SECONDARY TENSIONERS
5 - OIL FLOW TO LEFT CYLINDER HEAD
6 - OIL PRESSURE SENSOR LOCATION
7 - OIL FLOW TO COUNTER BALANCE SHAFT
8 - OIL PUMP OUTLET TO CYLINDER BLOCK
9 - OIL PUMP
10 - OIL FLOW TO CRANKSHAFT MAIN JOURNALS

11 - CRANKSHAFT MAIN BEARING JOURNALS
12 - RIGHT CYLINDER HEAD OIL GALLERY

Oil from the oil pan is pumped by a gerotor type oil pump (9) directly mounted to the crankshaft nose. Oil pressure is controlled by a relief valve mounted inside the oil pump housing.

The camshaft exhaust valve lobes and rocker arms are lubricated through a small hole in the rocker arm; oil flows through the lash adjuster then through the rocker arm and onto the camshaft lobe. Due to the orientation of the rocker arm, the camshaft intake lobes are not lubed in the same manner as the exhaust lobes. The intake lobes are lubed through internal passages in the camshaft. Oil flows through a bore in the No. 3 camshaft bearing bore, and as the camshaft turns, a hole in the camshaft aligns with the hole in the camshaft bore allowing engine oil to enter the camshaft tube. Refer to **Fig. 121**. The oil then exits through 1.6 mm (0.063 in.) holes drilled into the intake lobes, lubricating the lobes and the rocker arms.

DIAGNOSIS AND TESTING

ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or 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 below.

AIR LEAK DETECTION TEST METHOD

1. Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.
2. Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.
3. 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.

4. 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.

5. If the leakage occurs at the rear oil seal area, refer to the information, INSPECTION FOR REAR SEAL AREA LEAK below.
6. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

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:
    1. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    2. Where leakage tends to run straight down, possible causes are a porous block, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurized the crankcase as outlined in **OIL CONSUMPTION TEST AND DIAGNOSIS**.

    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.

CHECKING ENGINE OIL PRESSURE

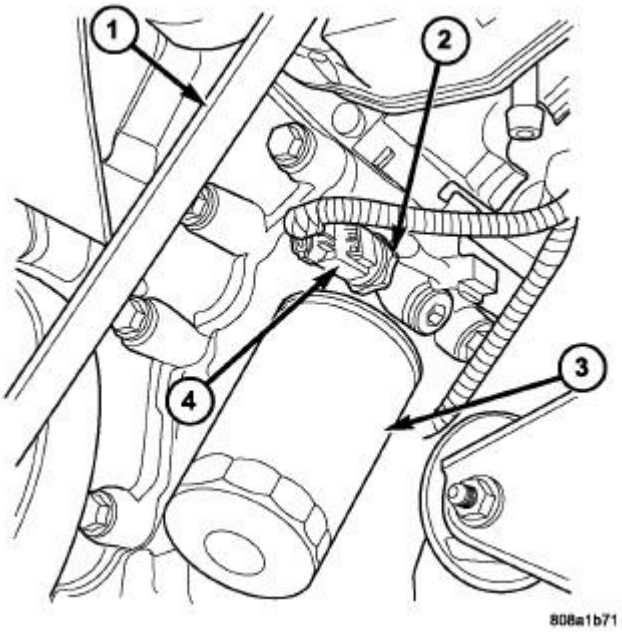

Fig. 122: Belt, Oil Pressure Sensor, Oil Filter & Connector
Courtesy of CHRYSLER GROUP, LLC

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

1. Remove oil pressure sending unit (2) and install gauge assembly (special tool #C-3292A, Gauge, Pressure). Refer to **Fig. 122**.
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.

DIAGNOSIS AND TESTING - 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:
    1. Circular spray pattern generally indicates seal leakage or crankshaft damage.
    2. Where leakage tends to run straight down, possible causes are a porous block, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See appropriate Engine information, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in **OIL CONSUMPTION TEST AND DIAGNOSIS**.

    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 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 until disassembled, under the OIL LEAK row, for components inspections on possible causes and corrections. Refer to **LUBRICATION** chart.
7. After the oil leak root cause and appropriate corrective action have been identified. Refer to **SEAL, CRANKSHAFT OIL, REAR, REMOVAL, 3.7L**.

FILTER, ENGINE OIL

REMOVAL

REMOVAL

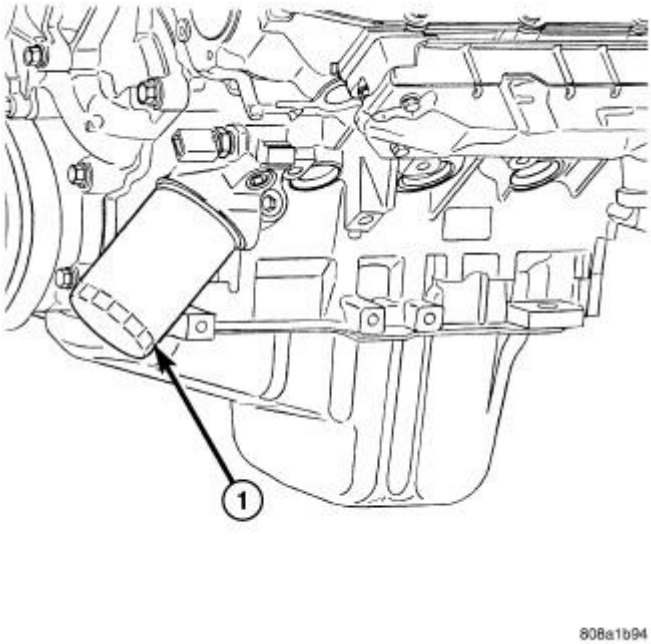

Fig. 123: Oil Filter
Courtesy of CHRYSLER GROUP, LLC

1 - ENGINE OIL FILTER

All engines are equipped with a high quality full-flow, disposable type oil filter (1). Refer to **Fig. 123**. Chrysler Corporation recommends a Mopar® or equivalent oil filter be used.

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

NOTE: Make sure filter gasket was removed with filter.

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

INSTALLATION

INSTALLATION

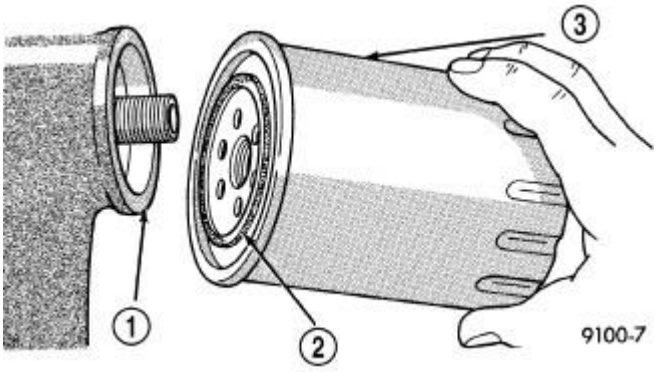

Fig. 124: Installing Engine Oil Filter
Courtesy of CHRYSLER GROUP, LLC

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

1. Lightly lubricate oil filter gasket (2) with engine oil. Refer to **Fig. 124**.
2. Thread filter (3) onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one full turn, do not over tighten.
3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

OIL

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE OIL SERVICE

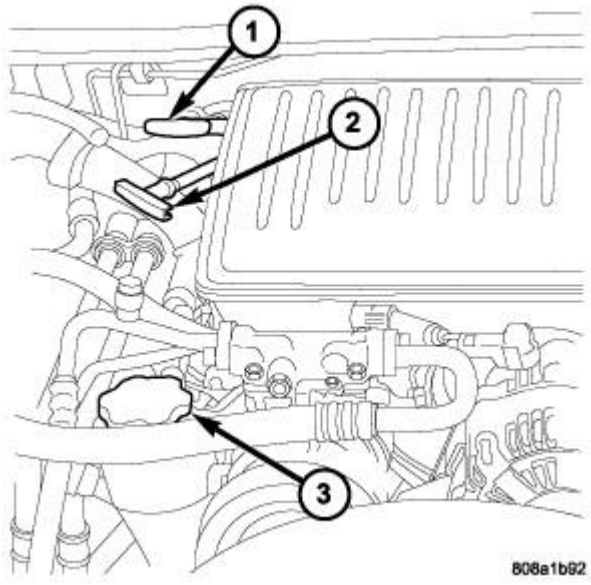

Fig. 125: Transmission And Engine Oil Dipsticks & Engine Oil Fill Cap

Courtesy of CHRYSLER GROUP, LLC

1 - TRANSMISSION DIPSTICK
2 - ENGINE OIL DIPSTICK
3 - ENGINE OIL FILL CAP

The engine oil level indicator (1) is located at the right rear of the engine on the 3.7L/4.7L engines. Refer to **Fig. 125**.

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 five 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 ten 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.

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.
5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase.
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this information.

8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

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

PAN, OIL

DESCRIPTION

DESCRIPTION

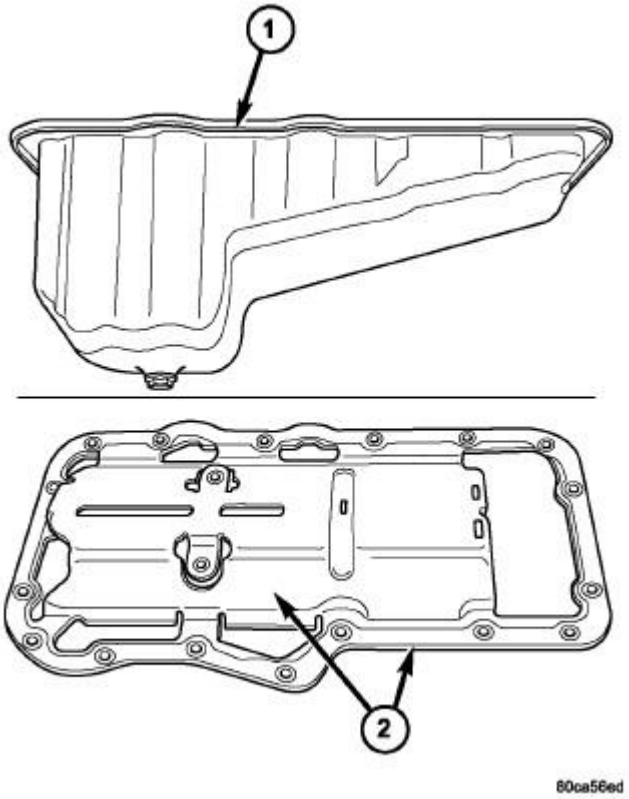

Fig. 126: Oil Pan & Gasket
Courtesy of CHRYSLER GROUP, LLC

1 - OIL PAN
2 - WINDAGE TRAY AND INTEGRATED OIL PAN GASKET

The engine oil pan (1) is made of laminated steel and has a single plane sealing surface. Refer to **Fig. 126**. The

sandwich style oil pan gasket has an integrated windage tray (2) and steel carrier. The sealing area of the gasket is molded with rubber and is designed to be reused as long as the gasket is not cut, torn or ripped.

REMOVAL

REMOVAL

1. Disconnect the negative battery cable.
2. Install engine support fixture special tool (special tool #8534B, Fixture, Driveline Support). **Do not raise engine at this time.**
3. Loosen both left and right side engine mount through bolts. Do not remove bolts.
4. Remove the structural dust cover, if equipped.
5. Drain engine oil.
6. Disconnect transmission fluid cooler lines at radiator, transmission fittings and clips.

NOTE: When disconnecting the transmission oil cooler lines, it is necessary to replace the line clip that is located on the oil pan stud. The retention force of the clip is severely degraded upon removal.

7. Remove the front crossmember. Refer to **CROSSMEMBER, LOWER CONTROL ARM, REMOVAL** and **CROSSMEMBER, TRANSMISSION, REMOVAL** .

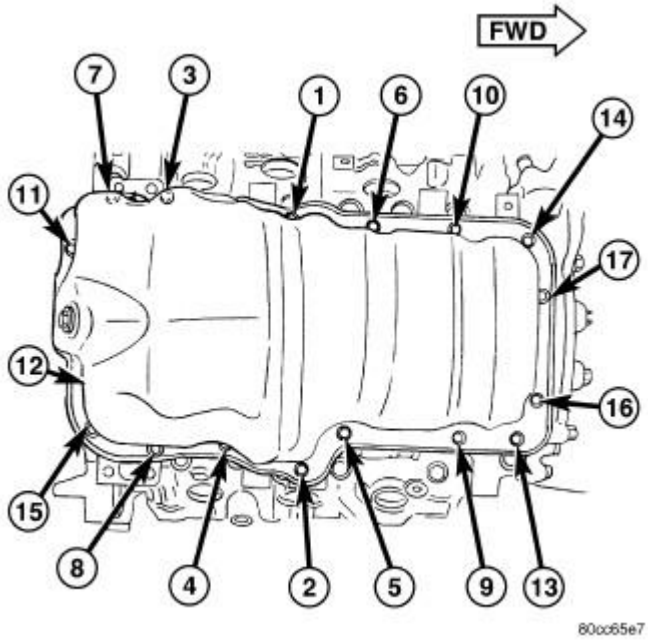

Fig. 127: Oil Pan Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Only raise the engine enough to provide clearance for oil pan

removal. Check for proper clearance at fan shroud to fan and cowl to intake manifold.

8. Raise engine using special tool (special tool #8534B, Fixture, Driveline Support) to provide clearance to remove oil pan.
9. Remove the oil pan mounting bolts (1 -17) and oil pan.

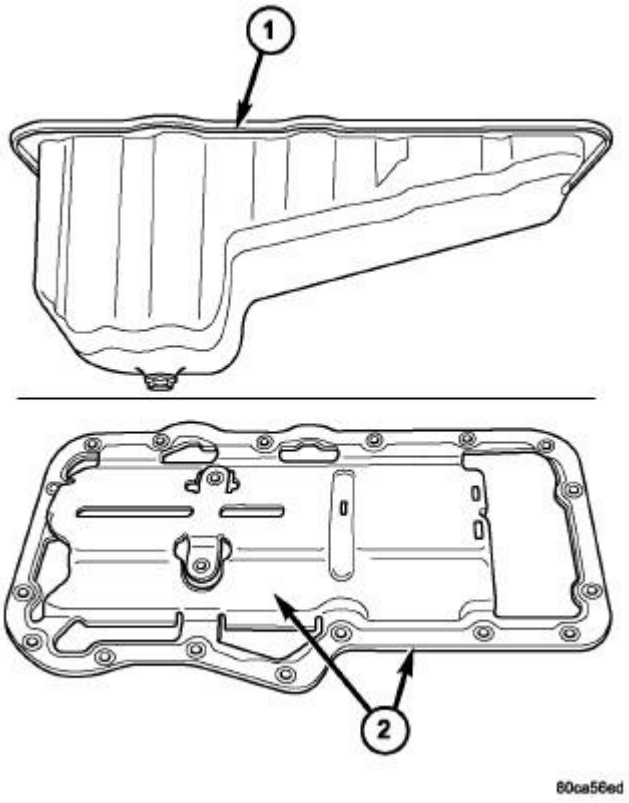

Fig. 128: Oil Pan & Gasket
Courtesy of CHRYSLER GROUP, LLC

1 - OIL PAN
2 - WINDAGE TRAY AND INTEGRATED OIL PAN GASKET

NOTE: Do not pry on oil pan (1) or oil pan gasket (2). Gasket is integral to engine windage tray and does not come out with oil pan.

10. Unbolt oil pump pickup tube and remove tube.
11. Inspect the integral windage tray and gasket (2) and replace as needed.

CLEANING

CLEANING

1. Clean oil pan in solvent and wipe dry with a clean cloth.
2. Clean the oil pan gasket surface. **DO NOT** use a grinder wheel or other abrasive tool to clean sealing surface.
3. Clean oil screen and tube thoroughly in clean solvent.

INSPECTION

INSPECTION

1. Inspect oil drain plug and plug hole for stripped or damaged threads. Repair as necessary.
2. Inspect the oil pan mounting flange for bends or distortion. Straighten flange, if necessary.

INSTALLATION

INSTALLATION

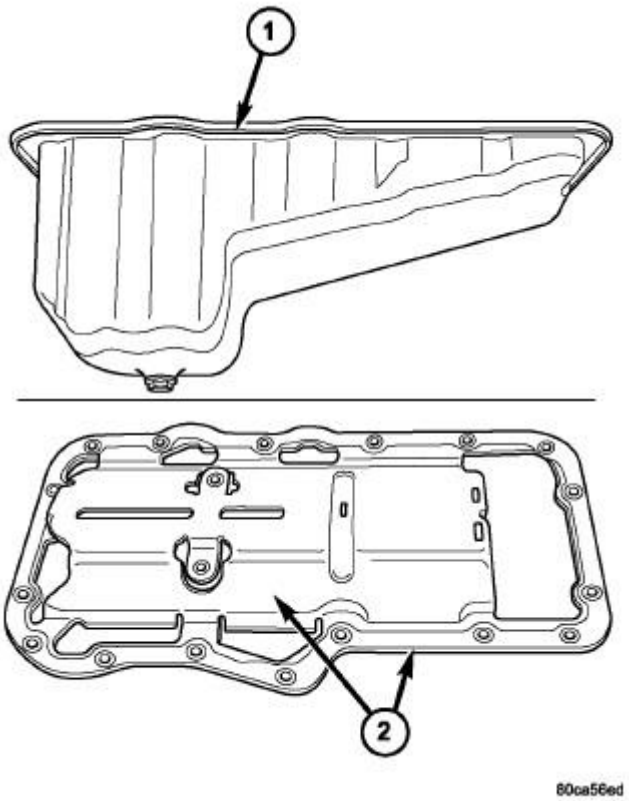

Fig. 129: Oil Pan & Gasket
Courtesy of CHRYSLER GROUP, LLC

1 - OIL PAN

2 - WINDAGE TRAY AND INTEGRATED OIL PAN GASKET

1. Clean the oil pan gasket mating surface of the bedplate and oil pan. Refer to **Fig. 129**.
2. Inspect integrated oil pan gasket (2), and replace as necessary.
3. Position the integrated oil pan gasket/windage tray assembly (2).
4. Install the oil pickup tube to the engine. Tighten nuts to 28 N.m (20 ft. lbs.).

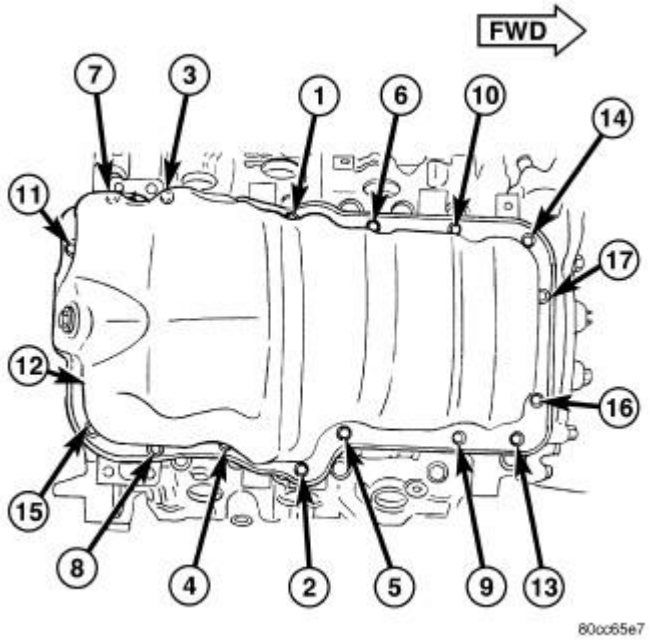

Fig. 130: Oil Pan Bolt Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

5. If removed, install stud at position No. 9.
6. Position the oil pan and install the mounting bolts and nut (1-17). Tighten the mounting bolts and nut to 15 N.m (11 ft. lbs.) in the sequence shown in illustration. Refer to **Fig. 130**.
7. Lower the engine into mounts using special tool (special tool #8534B, Fixture, Driveline Support).
8. Install both the left and right side engine mount through bolts. Tighten the nuts to 68 N.m (50 ft. lbs.).
9. Remove special tool (special tool #8534B, Fixture, Driveline Support).
10. Connect cooler lines to radiator, transmission and clips.

NOTE: When connecting the transmission oil cooler lines, it is necessary to replace the line clip that is located on the oil pan stud. The retention force of the clip is severely degraded upon removal.

11. Install structural dust cover, if equipped.
12. Install the front crossmember. Refer to **CROSSMEMBER, LOWER CONTROL ARM, INSTALLATION** and **CROSSMEMBER, TRANSMISSION, INSTALLATION** .

13. Fill engine oil.
14. Reconnect the negative battery cable.
15. Start engine and check for leaks.

PUMP, ENGINE OIL

REMOVAL

REMOVAL

1. Remove the oil pan and pick-up tube. Refer to **PAN, OIL, REMOVAL, 3.7L**.
2. Remove the timing chain cover. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.
3. Remove the timing chains and tensioners. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.
4. Remove the four bolts, primary timing chain tensioner and the oil pump.

DISASSEMBLY

DISASSEMBLY

1. Remove oil pump cover screws and lift off cover plate.
2. Remove pump inner and outer rotors.

NOTE: Once the oil pressure relief valve, cup plug, and pin are removed, the pump assembly must be replaced.

3. If it is necessary to remove the pressure relief valve, drive the roll pin from pump housing and remove cup plug, spring and valve.

INSPECTION

INSPECTION

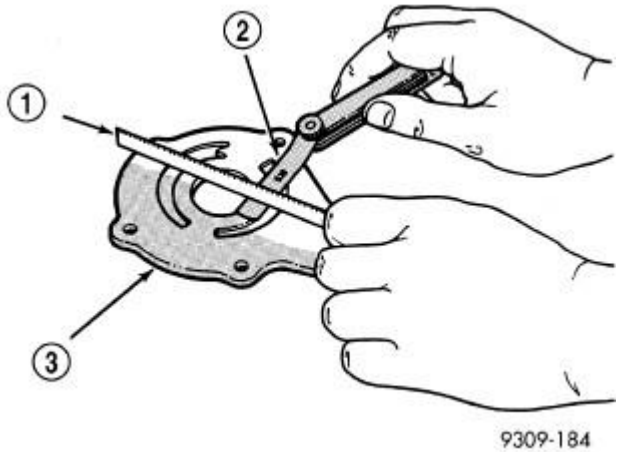

Fig. 131: Checking Cover Surface
Courtesy of CHRYSLER GROUP, LLC

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

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. 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.
2. Lay a straight edge across the pump cover surface (3). If a 0.025 mm (0.001 in.) feeler gauge (2) can be inserted between the cover and the straight edge the oil pump assembly should be replaced.

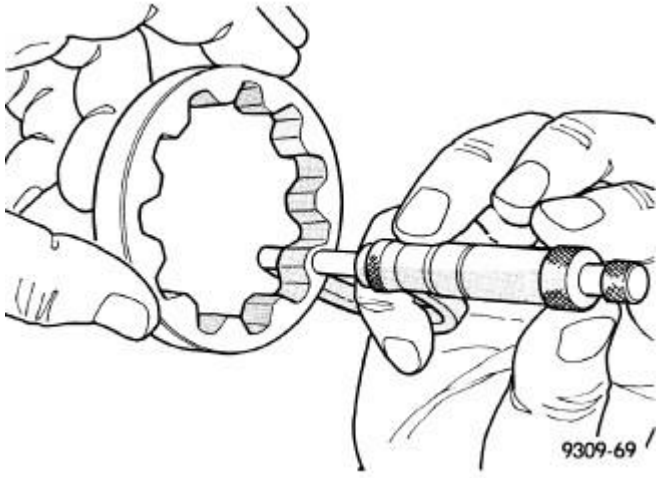

Fig. 132: Measuring Thickness Of Outer Rotor
Courtesy of CHRYSLER GROUP, LLC

3. Measure the thickness of the outer rotor. If the outer rotor thickness measures at 12.005 mm (0.472 in.) or less the oil pump assembly must be replaced.
4. Measure the diameter of the outer rotor. If the outer rotor diameter measures at 85.925 mm (3.382 in.) or less the oil pump assembly must be replaced.

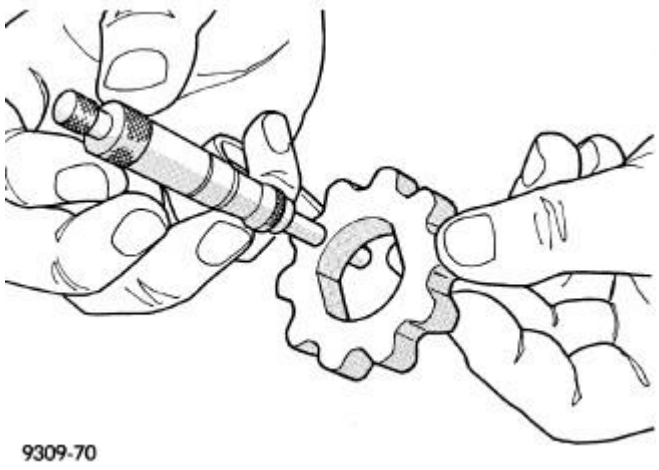

Fig. 133: Measuring Inner Rotor Thickness
Courtesy of CHRYSLER GROUP, LLC

5. Measure the thickness of the inner rotor. If the inner rotor thickness measures at 12.005 mm (0.472 in.) or less then the oil pump assembly must be replaced.

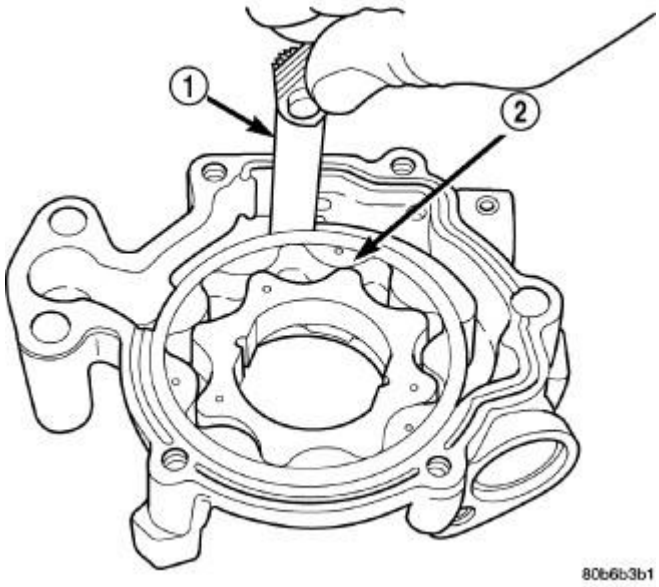

Fig. 134: Measuring Clearance Between Outer Rotor & Body
Courtesy of CHRYSLER GROUP, LLC

1 - FEELER GAUGE
2 - OUTER ROTOR

6. Slide outer rotor (2) 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 and the body. If the measurement is 0.235 mm (0.009 in.) or more the oil pump assembly must be replaced.

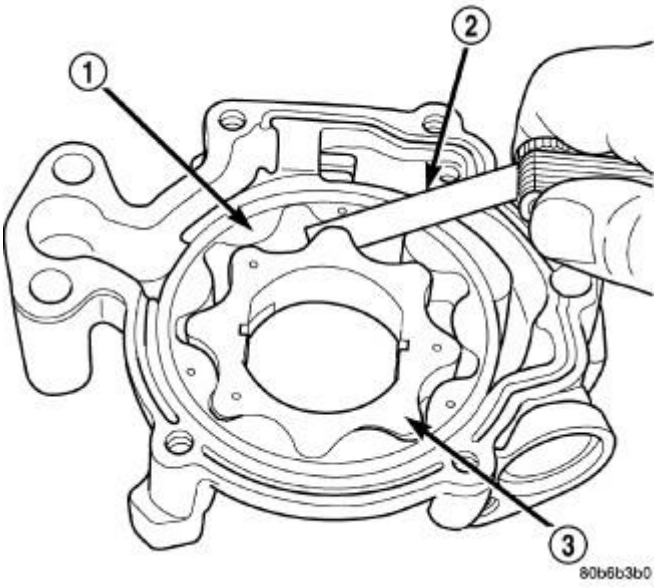

Fig. 135: Measuring Clearance Between Rotors
Courtesy of CHRYSLER GROUP, LLC

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

7. Install the inner rotor into the oil pump body. Measure the clearance between the inner (3) and outer (1) rotors. If the clearance between the rotors is 0.150 mm (0.006 in.) or more the oil pump assembly must be replaced.

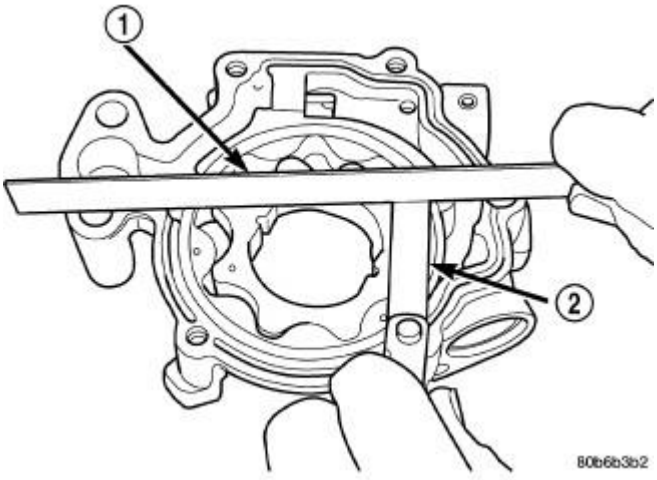

Fig. 136: Measuring Clearance Over Rotors
Courtesy of CHRYSLER GROUP, LLC

1 - STRAIGHT EDGE
2 - FEELER GAUGE

8. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of 0.095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.

NOTE: The 3.7L/4.7L 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.

ASSEMBLY

ASSEMBLY

1. Wash all parts in a suitable solvent and inspect carefully for damage or wear.
2. Install inner and outer rotors
3. Install oil pump cover plate and install cover bolts and tighten them to 12 N.m (105 in. lbs.).
4. Prime oil pump before installation by filling rotor cavity with engine oil.
5. If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other causes for oil pressure loss.

INSTALLATION

INSTALLATION

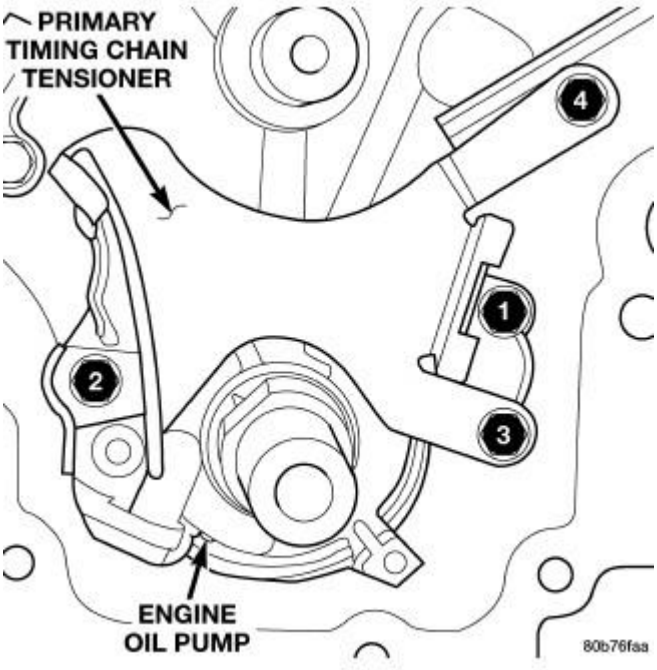

Fig. 137: Oil Pump & Primary Timing Chain Tensioner Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Position the oil pump onto the crankshaft and install one oil pump retaining bolt.
2. Position the primary timing chain tensioner and install three retaining bolts.
3. Tighten the oil pump and primary timing chain tensioner retaining bolts to 28 N.m (250 in. lbs.) in the sequence shown in illustration.
4. Install the secondary timing chain tensioners and timing chains. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.

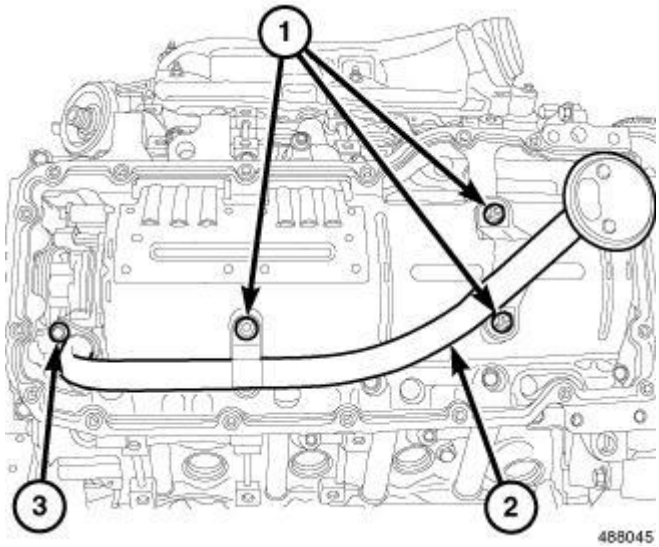

Fig. 138: Oil Pickup Tube & Fasteners
Courtesy of CHRYSLER GROUP, LLC

5. Install the timing chain cover. Refer to **COVER(S), ENGINE TIMING, INSTALLATION, 3.7L**.
6. Install the pick-up tube and oil pan. Refer to **PAN, OIL, INSTALLATION, 3.7L**.

SWITCH, OIL PRESSURE

DESCRIPTION

DESCRIPTION

The oil pressure switch is a pressure sensitive switch that is activated by the engine's oil pressure (in the main oil gallery). The switch is a two terminal device (one terminal is provided to the wiring harness and the other terminal is the switch's metal housing that screws into the engine block).

OPERATION

OPERATION

The oil pressure switch is normally "Closed." The switch changes from a "Closed" circuit to an "Open" circuit, on increasing pressure of 7 psig. The oil pressure switch changes from an "Open" circuit to a "Closed" circuit, on decreasing pressure, between 2 psig and 4 psig.

REMOVAL

REMOVAL

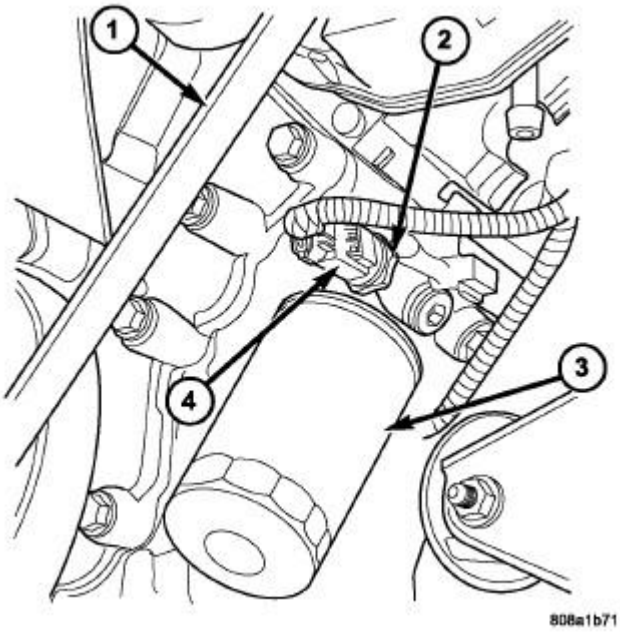

Fig. 139: Belt, Oil Pressure Sensor, Oil Filter & Connector
Courtesy of CHRYSLER GROUP, LLC

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

1. Disconnect the negative cable from the battery.
2. Raise vehicle on hoist.
3. Remove front splash shield.
4. Disconnect oil pressure sender wire (4).
5. Remove the pressure sender (2). Refer to **Fig. 139**.

INSTALLATION

INSTALLATION

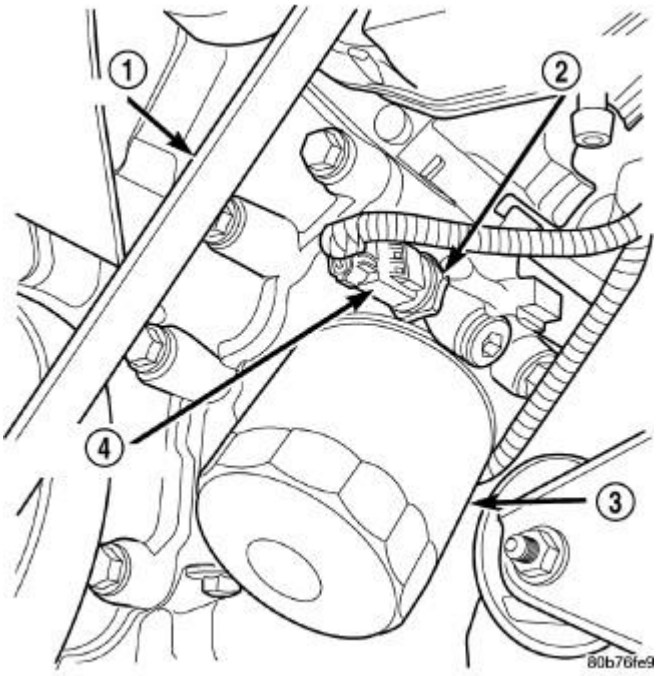

Fig. 140: Belt, Oil Pressure Sensor, Oil Filter & Connector
Courtesy of CHRYSLER GROUP, LLC

1. Install oil pressure sender (2).
2. Connect oil pressure sender wire (4).
3. Install front splash shield.
4. Lower vehicle.
5. Connect the negative battery cable.

MANIFOLDS

MANIFOLD, EXHAUST

DESCRIPTION

DESCRIPTION

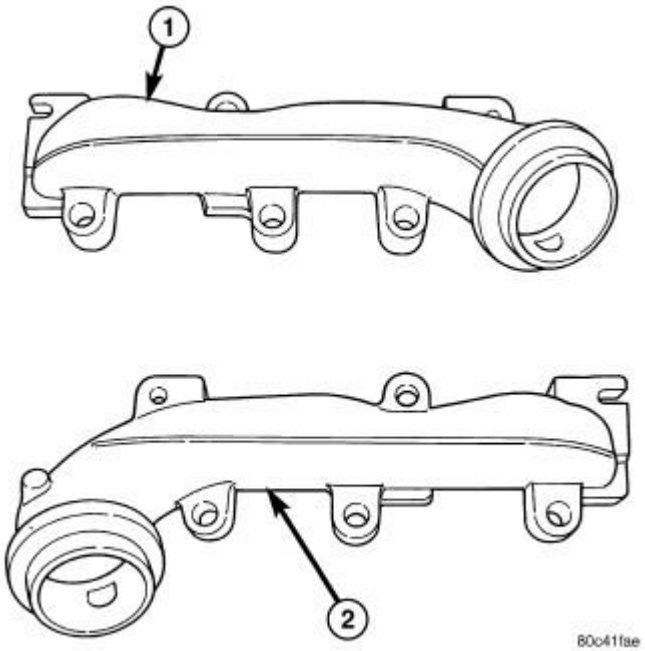

Fig. 141: Exhaust Manifolds
Courtesy of CHRYSLER GROUP, LLC

1 - LEFT SIDE EXHAUST MANIFOLD
2 - RIGHT SIDE EXHAUST MANIFOLD

The exhaust manifolds (1, 2) are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head.

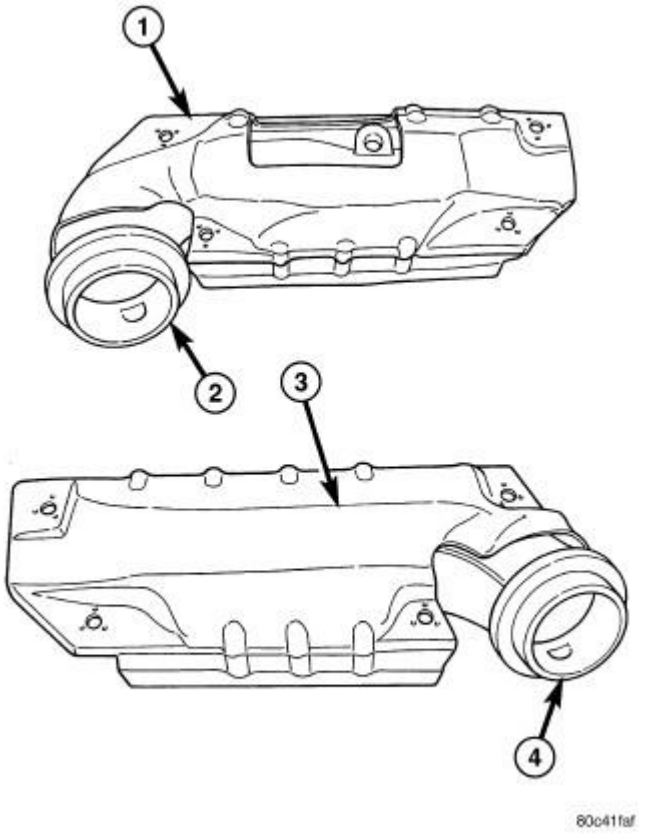

Fig. 142: Exhaust Manifold Heat Shields & Flanges
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT SIDE EXHAUST MANIFOLD HEAT SHIELD
2 - RIGHT SIDE EXHAUST MANIFOLD FLANGE
3 - LEFT SIDE EXHAUST MANIFOLD HEAT SHIELD
4 - LEFT SIDE EXHAUST MANIFOLD FLANGE

The exhaust manifolds are covered by a three layer laminated heat shield (3) for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

REMOVAL

REMOVAL

RIGHT EXHAUST MANIFOLD

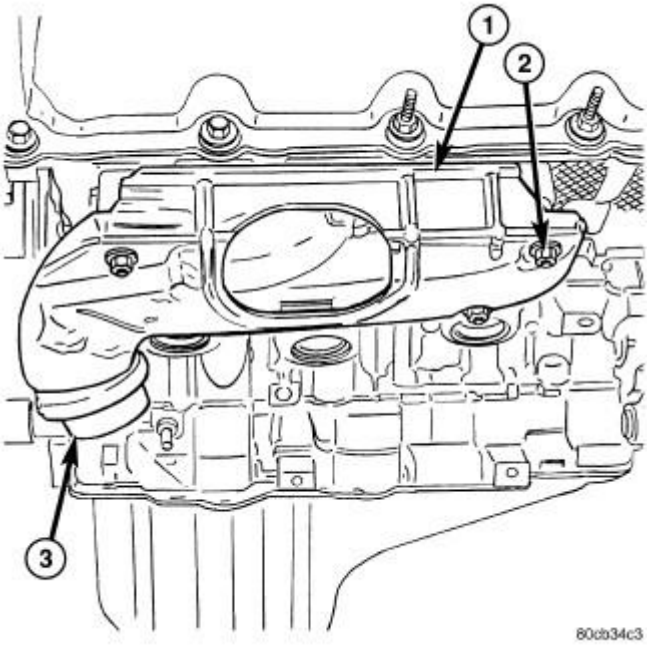

Fig. 143: Exhaust Manifold - Right
Courtesy of CHRYSLER GROUP, LLC

1 - HEAT SHIELD
2 - NUTS
3 - MANIFOLD FLANGE

1. Disconnect the negative cable from the battery.
2. Raise and support the vehicle.
3. Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.
4. Lower the vehicle.
5. Remove the exhaust heat shield (1).
6. Remove bolts, nuts and washers attaching manifold to cylinder head.
7. Remove manifold and gasket from the cylinder head. Refer to **Fig. 143**.

LEFT EXHAUST MANIFOLD

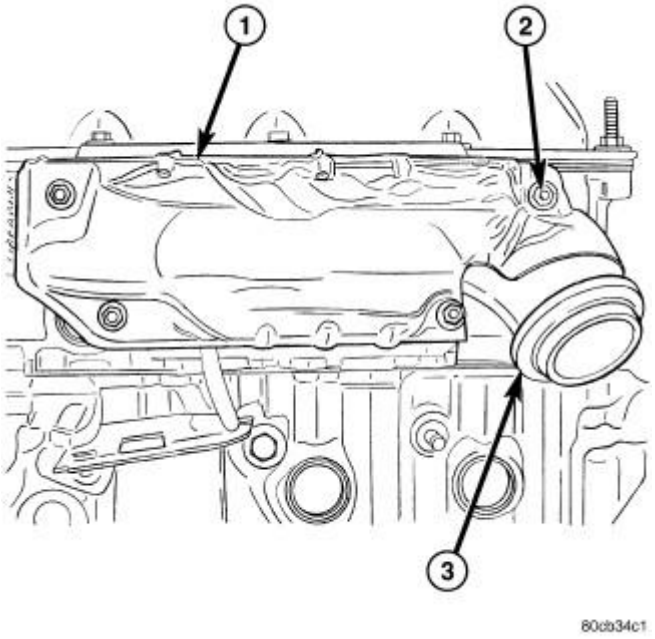

Fig. 144: Exhaust Manifold - Left
Courtesy of CHRYSLER GROUP, LLC

1 - HEAT SHIELD
2 - NUTS
3 - MANIFOLD FLANGE

1. Disconnect the negative cable from the battery.
2. Raise and support the vehicle.
3. Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.
4. Lower the vehicle.
5. Remove the exhaust heat shields (1).
6. Remove bolts, nuts and washers attaching manifold to cylinder head.
7. Remove manifold and gasket from the cylinder head. Refer to **Fig. 144**.

INSTALLATION

INSTALLATION

RIGHT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

1. Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install

conical washers and nuts on these studs.

2. Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N.m (18 ft. lbs.)
3. Install the exhaust heat shields.
4. Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

5. Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N.m (25 ft. lbs.)

LEFT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

1. Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install conical washers and nuts on these studs.
2. Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N.m (18 ft. lbs.)
3. Install the exhaust heat shields.
4. Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

5. Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N.m (25 ft. lbs.)

MANIFOLD, INTAKE

DESCRIPTION

DESCRIPTION

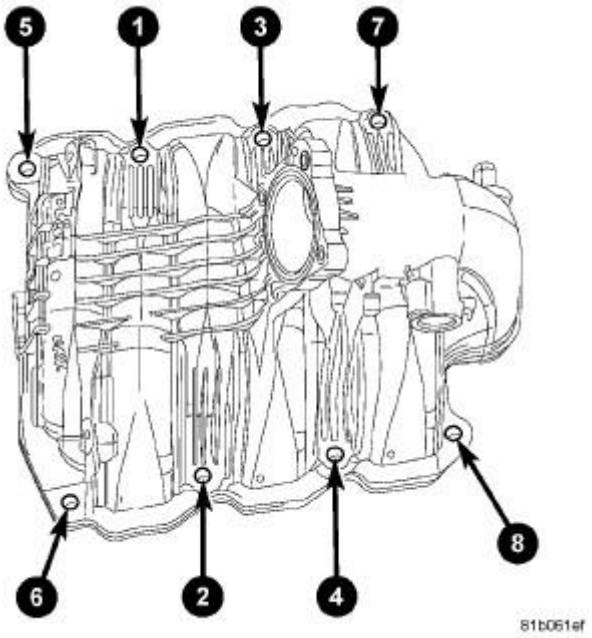

Fig. 145: 3.7L Intake Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

The intake manifold is made of a composite material and features 300 mm (11.811 in.) long runners which maximizes low end torque. Refer to **Fig. 145**.

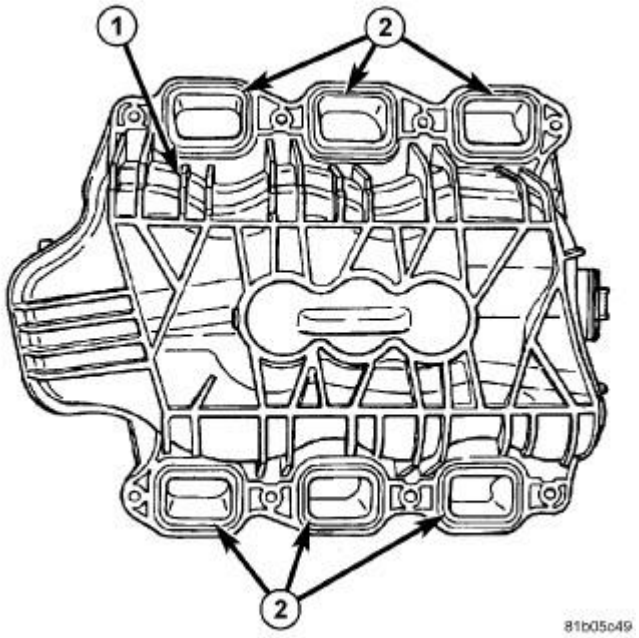

Fig. 146: Intake Manifold Seals
Courtesy of CHRYSLER GROUP, LLC

The intake manifold uses single plane sealing which consist of six individual press in place port gaskets (2) to prevent leaks. The throttle body attaches directly to the intake manifold.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKS

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.

1. Start the engine.
2. Spray a small stream of water (spray bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

REMOVAL

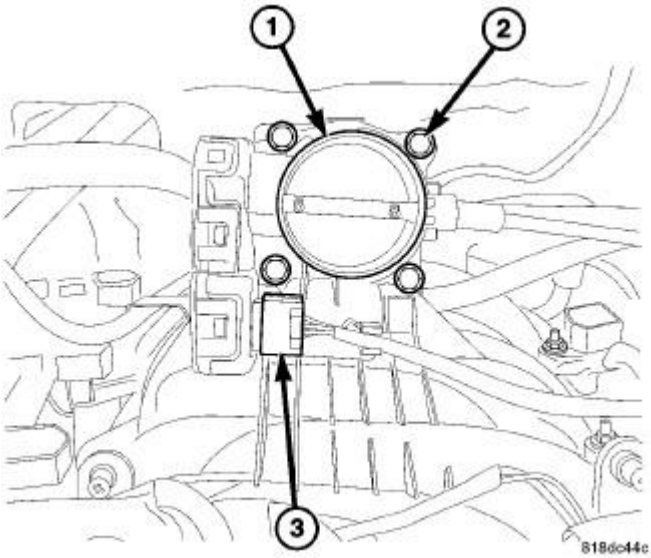

Fig. 147: Throttle Body 3.7L, Mounting Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

1 - THROTTLE BODY
2 - MOUNTING BOLTS
3 - ELEC. CONNECTOR

1. Bleed the fuel system. Refer to **Fuel System/Fuel Delivery - Standard Procedure** .
2. Disconnect the negative cable from battery.
3. Remove the resonator assembly and air inlet hose.
4. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
5. If equipped with the heater return and supply cross over lines. Remove the lines and position aside.
6. Disconnect the electronic throttle control (ETC) connector (3).

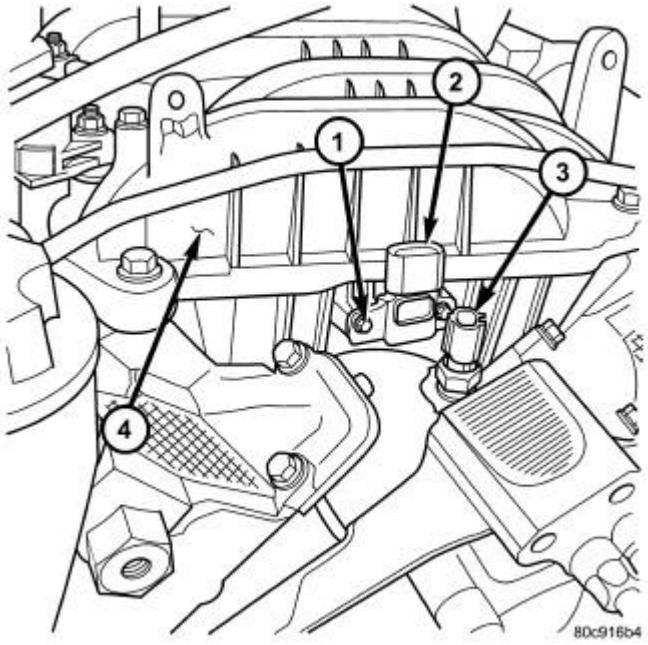

Fig. 148: MAP Sensor, ECT Sensor, Intake Manifold & Screw
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

7. Disconnect electrical connectors for the following components:
   - Coolant Temperature Sensor
   - Manifold Absolute Pressure (MAP) Sensor (2)

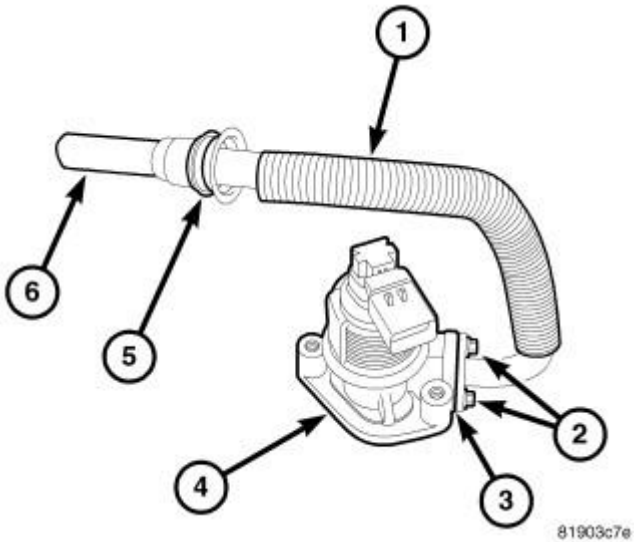

Fig. 149: EGR Solenoid/Tube Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Disconnect vapor purge hose, brake booster hose, and positive crankcase ventilation (PCV) hose.
9. Disconnect and remove ignition coil towers.
10. Remove the top oil dipstick tube retaining bolt.
11. Remove the EGR tube (1). Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR), 3.7L, REMOVAL** .
12. Remove fuel rail. Refer to **RAIL, FUEL, REMOVAL** .

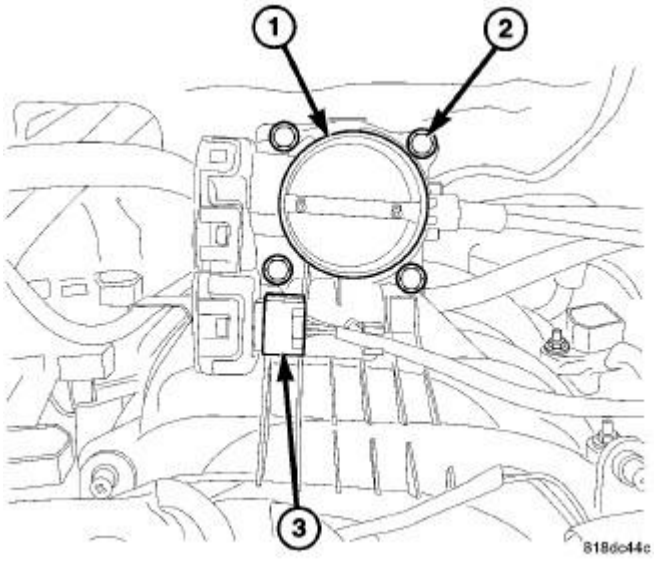

Fig. 150: Throttle Body 3.7L, Mounting Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

13. Remove throttle body assembly (1).

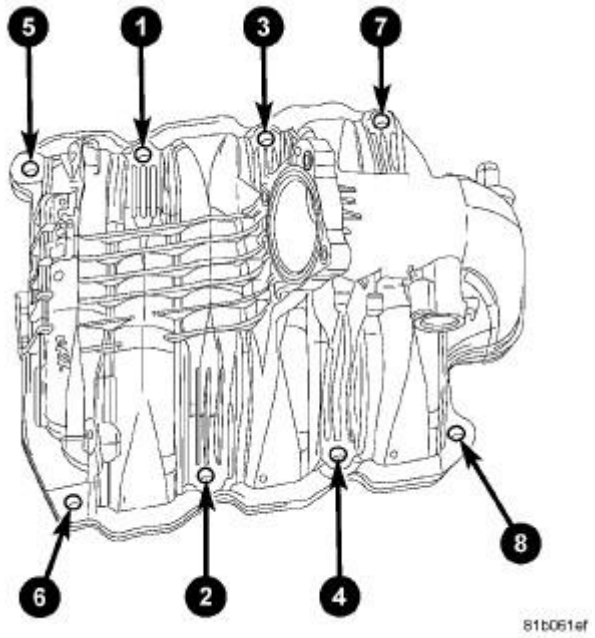

Fig. 151: 3.7L Intake Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

14. Remove the intake manifold retaining fasteners in reverse order of tightening sequence.
15. Remove the intake manifold.

INSTALLATION

INSTALLATION

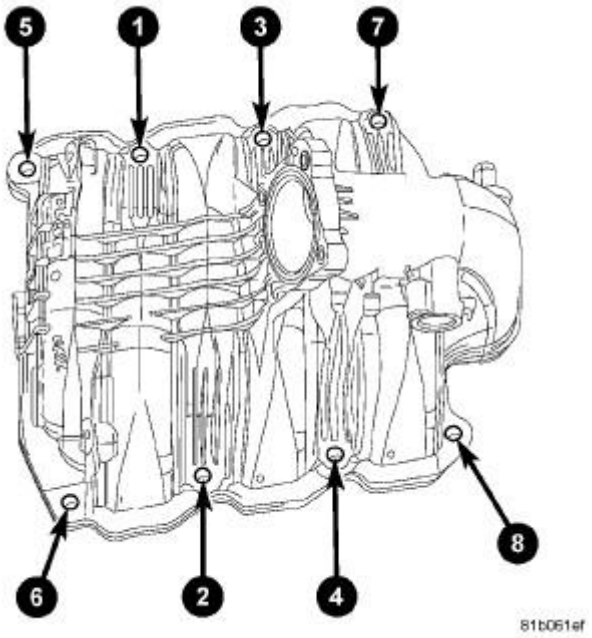

Fig. 152: 3.7L Intake Loosening/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

1. Install the intake manifold seals.
2. Install the intake manifold.
3. Install the intake manifold retaining bolts and tighten in sequence shown in illustration to 12 N.m (105 in. lbs.).

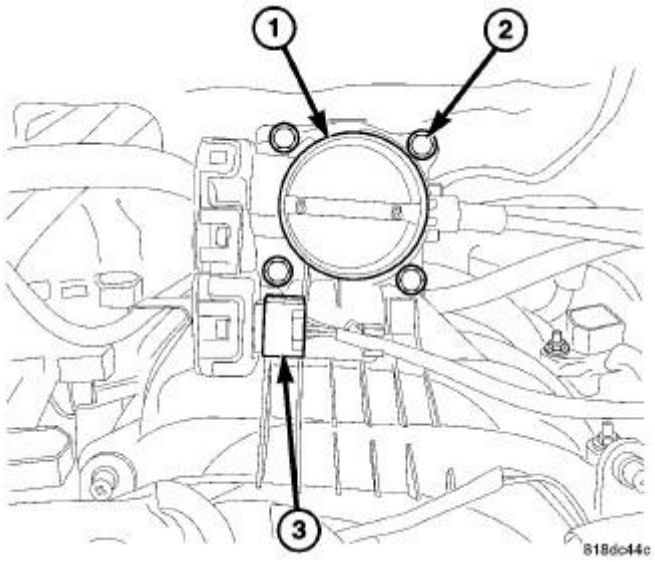

Fig. 153: Throttle Body 3.7L, Mounting Bolts & Connector
Courtesy of CHRYSLER GROUP, LLC

1 - THROTTLE BODY
2 - MOUNTING BOLTS
3 - ELEC. CONNECTOR

CAUTION: Proper torque of the throttle body is critical to normal operation. If the throttle body is over-torqued, damage to the throttle body can occur resulting in throttle plate malfunction.

4. Install the throttle body-to-intake manifold O-ring.
5. Install the throttle body (1) to intake manifold.
6. Install the four mounting bolts (2). Tighten bolts to 7 N.m (60 in. lbs.).
7. Install electrical connector (3).

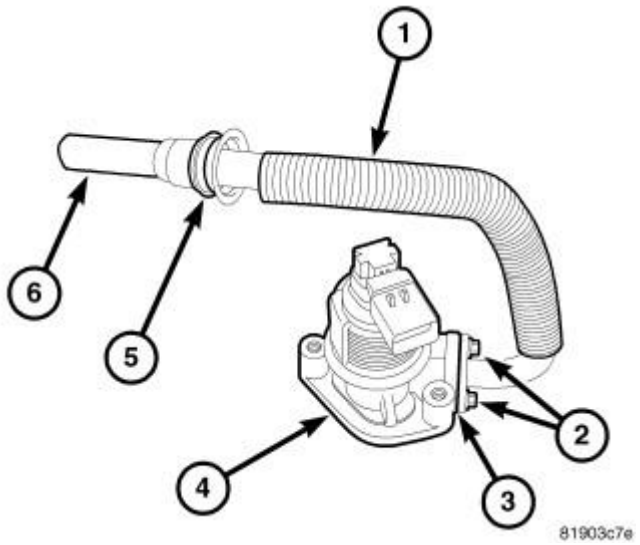

Fig. 154: EGR Solenoid/Tube Assembly
Courtesy of CHRYSLER GROUP, LLC

8. Install the fuel rail.
9. Install the EGR tube (1). Refer to **VALVE, EXHAUST GAS RECIRCULATION (EGR), 3.7L, INSTALLATION** .
10. Install ignition coil towers.

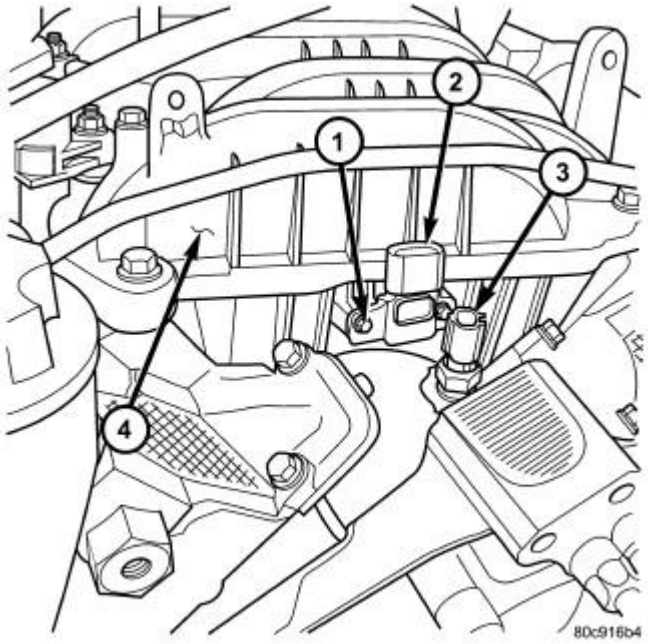

Fig. 155: MAP Sensor, ECT Sensor, Intake Manifold & Screw
Courtesy of CHRYSLER GROUP, LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

11. Connect electrical connectors for the following components:
    - Manifold Absolute Pressure (MAP) Sensor (2)
    - Coolant Temperature (CTS) Sensor
    - Ignition coil towers
12. Install top oil dipstick tube retaining bolt.
13. Connect Vapor purge hose, Brake booster hose, Positive crankcase ventilation (PCV) hose.
14. If equipped, install the heater return and supply cross over lines.
15. Fill the cooling system.
16. Install the resonator assembly and air inlet hose.
17. Connect the negative cable to battery.
18. Using the scan tool, perform the ETC Relearn function.

VALVE TIMING

DESCRIPTION

DESCRIPTION

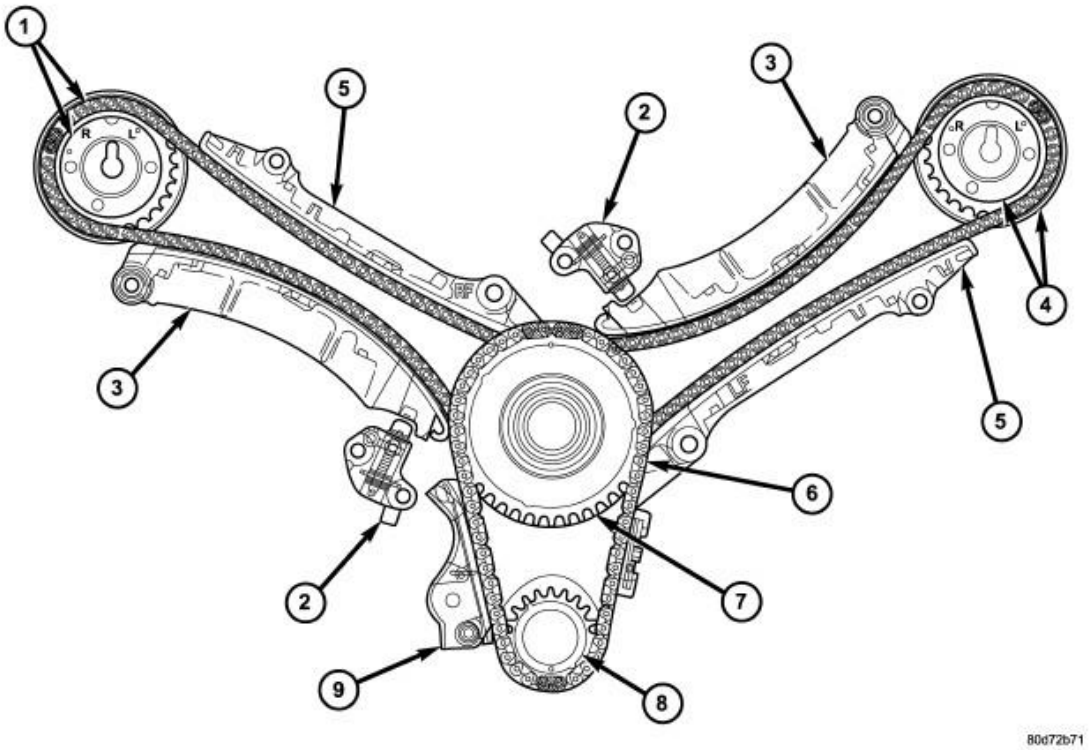

Fig. 156: Timing Drive System
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT CAMSHAFT SPROCKET AND SECONDARY CHAIN
2 - SECONDARY TIMING CHAIN TENSIONER (LEFT AND RIGHT SIDE NOT INTERCHANGEABLE)
3 - SECONDARY TENSIONER ARM
4 - LEFT CAMSHAFT SPROCKET AND SECONDARY CHAIN
5 - CHAIN GUIDE (LEFT AND RIGHT SIDE ARE NOT INTERCHANGEABLE)
6 - PRIMARY CHAIN
7 - IDLER SPROCKET
8 - CRANKSHAFT SPROCKET
9 - PRIMARY CHAIN TENSIONER

The timing drive system has been designed to provide quiet performance and reliability to support a **non-free wheeling** engine. Refer to **Fig. 156**. Specifically the intake valves are non-free wheeling and can be easily damaged with forceful engine rotation if camshaft-to-crankshaft timing is incorrect. The timing drive system consists of a primary chain (6), two secondary timing chain drives (1, 4) and a counterbalance shaft drive.

OPERATION

OPERATION

The primary timing chain is a single inverted tooth chain type. The primary chain drives the large 50 tooth idler sprocket directly from a 25 tooth crankshaft sprocket. Primary chain motion is controlled by a pivoting leaf spring tensioner arm and a fixed guide. The arm and the guide both use nylon plastic wear faces for low friction and long wear. The primary chain receives oil splash lubrication from the secondary chain drive and designed oil pump leakage. The idler sprocket assembly connects the primary chain drive, secondary chain drives, and the counterbalance shaft. The idler sprocket assembly consists of two integral 26 tooth sprockets a 50 tooth sprocket and a helical gear that is press-fit to the assembly. The spline joint for the 50 tooth sprocket is a non serviceable press fit anti rattle type. The idler sprocket assembly spins on a stationary idler shaft. The idler shaft is a light press-fit into the cylinder block. A large washer on the idler shaft bolt and the rear flange of the idler shaft are used to control sprocket thrust movement. Pressurized oil is routed through the center of the idler shaft to provide lubrication for the two bushings used in the idler sprocket assembly.

There are two secondary drive chains, both are roller type, one to drive the camshaft in each SOHC cylinder head. There are no shaft speed changes in the secondary chain drive system. Each secondary chain drives a 26 tooth cam sprocket directly from the 26 tooth sprocket on the idler sprocket assembly. A fixed chain guide and a hydraulic oil damped tensioner are used to maintain tension in each secondary chain system. The hydraulic tensioners for the secondary chain systems are fed pressurized oil from oil reservoir pockets in the block. Each tensioner incorporates a controlled leak path through a device known as a vent disc located in the nose of the piston to manage chain loads. Each tensioner also has a mechanical ratchet system that limits chain slack if the tensioner piston bleeds down after engine shut down. The tensioner arms and guides also utilize nylon wear faces for low friction and long wear. The secondary timing chains receive lubrication from a small orifice in the tensioners. This orifice is protected from clogging by a fine mesh screen which is located on the back of the hydraulic tensioners.

STANDARD PROCEDURE

MEASURING TIMING CHAIN WEAR

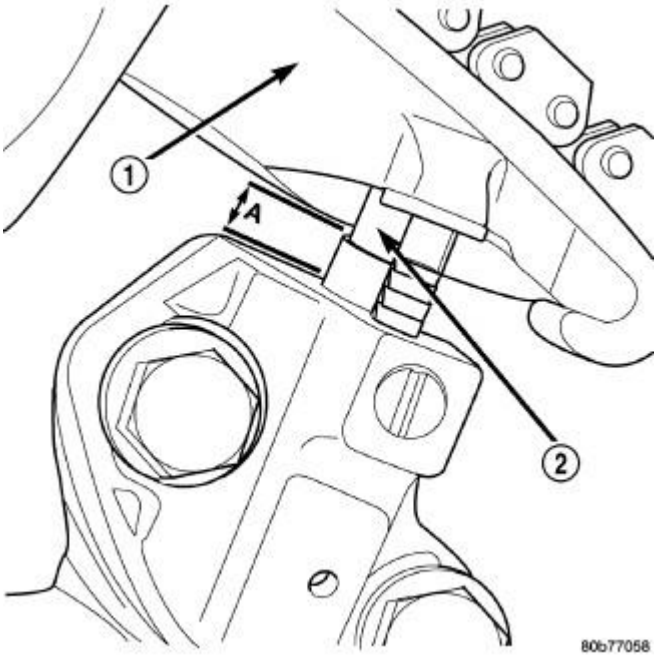

Fig. 157: Measuring Timing Chain Wear
Courtesy of CHRYSLER GROUP, LLC

1 - SECONDARY TENSIONER ARM
2 - SECONDARY CHAIN TENSIONER PISTON

NOTE: This procedure must be performed with the timing chain cover removed.

1. Remove the timing chain cover. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.
2. To determine if the secondary timing chains are worn, rotate the engine clockwise until maximum tensioner piston (2) extension is obtained. Measure the distance between the secondary timing chain tensioner housing and the step ledge on the piston. Refer to **Fig. 157**. The measurement at point (A) must be less than 15 mm (.5906 inches).
3. If the measurement exceeds the specification the secondary timing chains are worn and require replacement. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

TIMING VERIFICATION

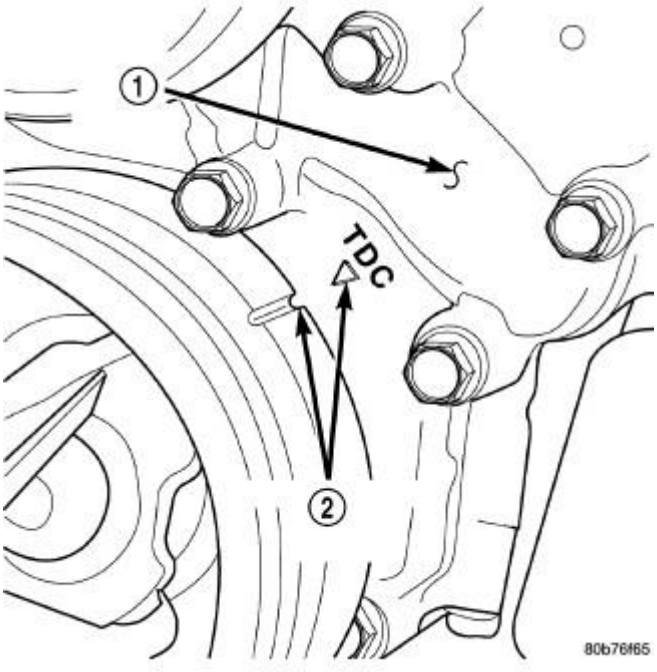

Fig. 158: TDC Indicator Marks
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The 3.7L is a non free-wheeling design engine. Therefore, correct engine timing is critical.

NOTE: Components referred to as left hand or right hand are as viewed from the drivers position inside the vehicle.

NOTE: The blue link plates on the chains and the dots on the camshaft drive sprockets may not line up during the timing verification procedure. The blue link plates are lined up with the sprocket dots only when re-timing the complete timing drive. Once the timing drive is rotated blue link-to-dot alignment is no longer valid.

Engine base timing can be verified by the following procedure:

1. Remove the cylinder head cover. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
2. Using a mirror, locate the TDC arrow on the front cover. Rotate the crankshaft until the mark on the crankshaft damper (2) is aligned with the TDC arrow on the front cover (2). The engine is now at TDC.

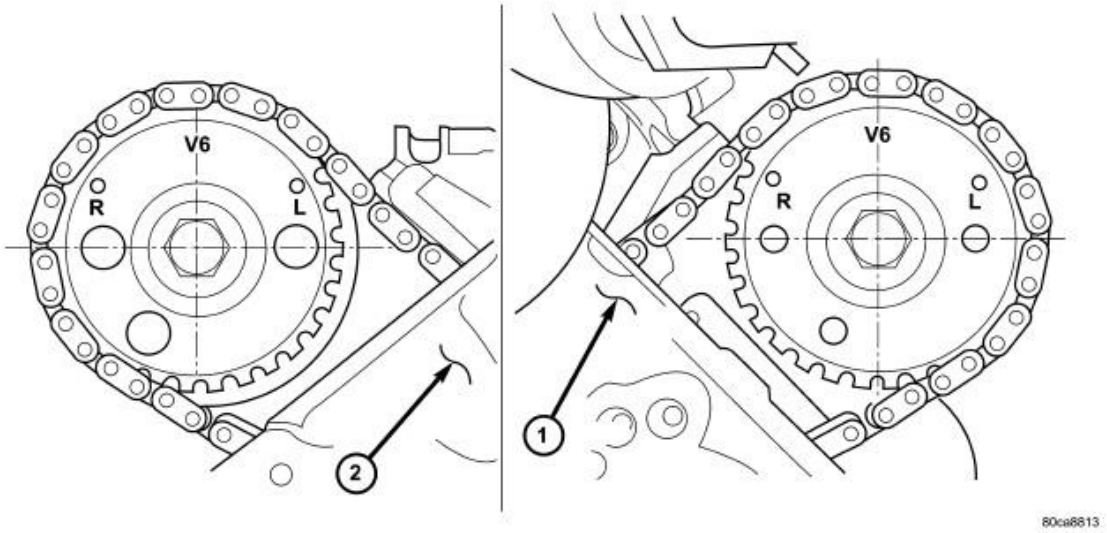

Fig. 159: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

3. Note the location of the V6 mark stamped into the camshaft drive gears (1, 2). If the V6 mark on each camshaft drive gear is at the twelve o'clock position, the engine is at TDC on the exhaust stroke. If the V6 mark on each gear is at the six o'clock position, the engine is at TDC on the compression stroke.
4. If both of the camshaft drive gears are off in the same or opposite directions, the primary chain or both secondary chains are at fault. See **CHAIN AND SPROCKETS, TIMING** procedure in this service information.
5. If only one of the camshaft drive gears is off and the other is correct, the problem is confined to one secondary chain. See **TIMING - SINGLE CAMSHAFT**, in this procedure.
6. If both camshaft drive gear V6 marks are at the twelve o'clock or the six o'clock position the engine base timing is correct. Reinstall the cylinder head covers.

COUNTER BALANCE SHAFT TIMING

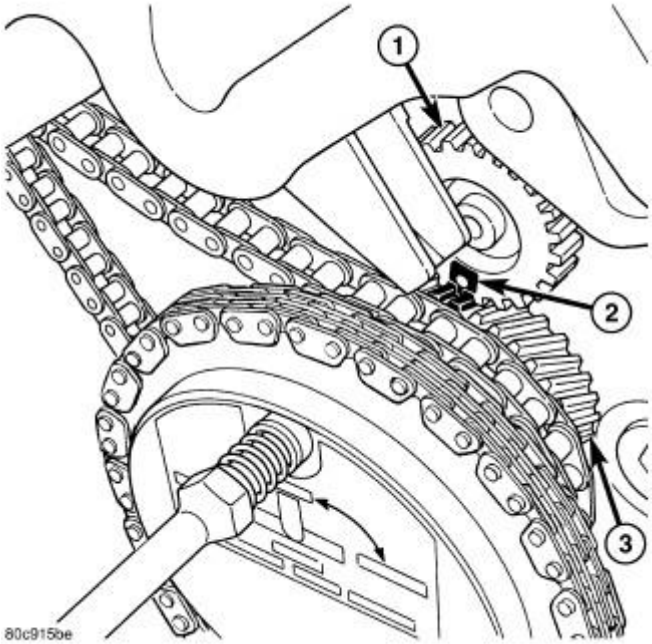

Fig. 160: Counterbalance Shaft Alignment Marks
Courtesy of CHRYSLER GROUP, LLC

1. Ensure that the engine is at TDC with both camshaft sprocket V6 marks in the 12 o'clock position.
2. Look down the left cylinder head chain cavity. The timing dot (2) on the counter balance shaft drive gear should be in the 6 o'clock position.

TIMING - SINGLE CAMSHAFT

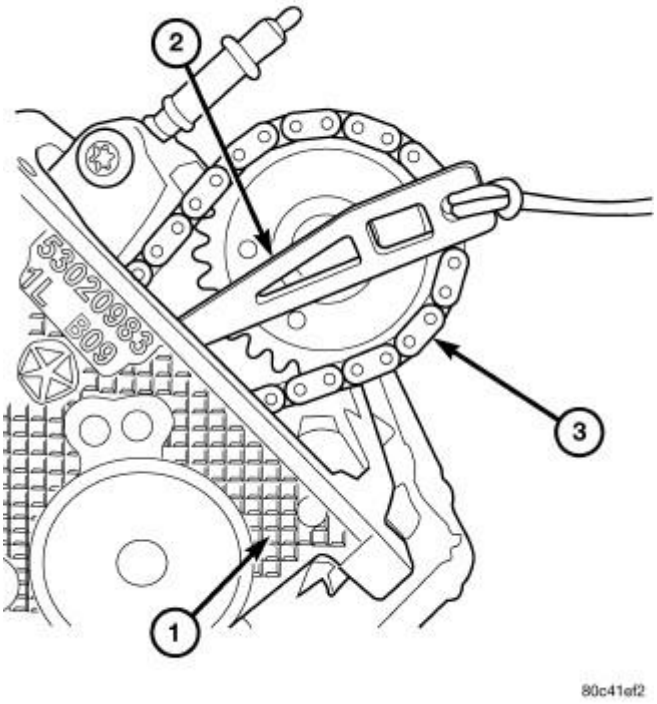

Fig. 161: Securing Timing Chain Tensioner Using Timing Chain Wedge
Courtesy of CHRYSLER GROUP, LLC

NOTE: To adjust the timing on one camshaft, perform the following procedure.

1. Using the Wedge Locking Tool (special tool #8379, Locking Tool, Wedge) (2), stabilize the secondary chain drive. For reference purposes, mark the chain-to-sprocket position.

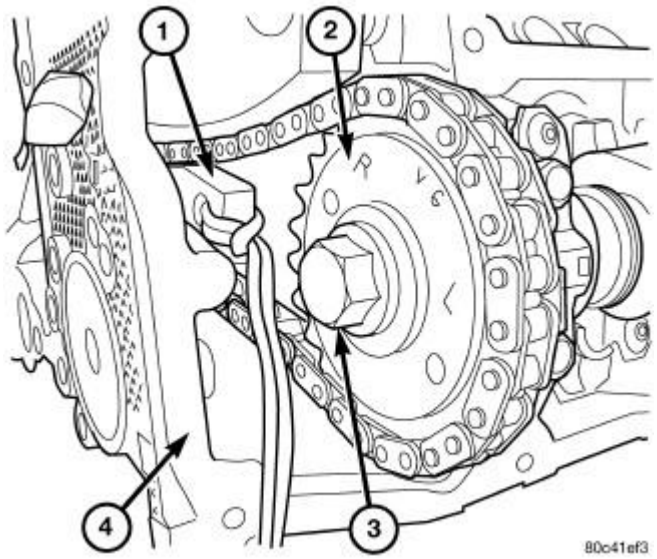

Fig. 162: Timing Chain Tensioners Secured With Timing Chain Wedge
Courtesy of CHRYSLER GROUP, LLC

2. Remove the camshaft drive gear retaining bolt (3).
3. Carefully remove the camshaft drive gear from the camshaft.

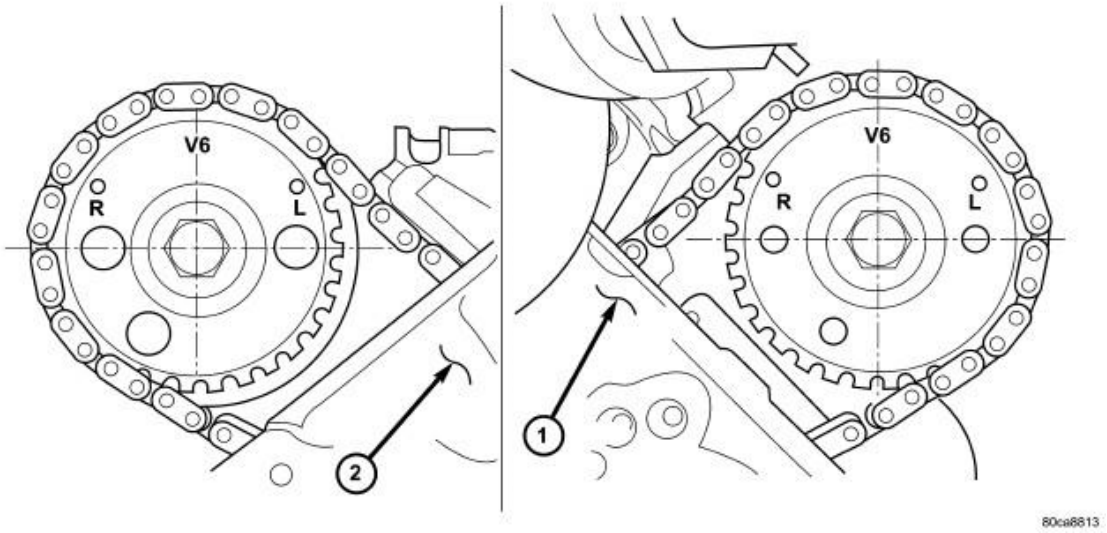

Fig. 163: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

4. Re-index the camshaft drive gear in the chain until the V6 mark is at the same position as the V6 mark on the opposite camshaft drive gear (1, 2).
5. Using the Camshaft Holder (special tool #8428A, Holder, Camshaft), rotate the camshaft until the alignment dowel on the camshaft is aligned with the slot in the camshaft drive gear.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

6. Position the camshaft drive gear onto the camshaft, remove oil from bolt then install the retaining bolt. Using Special Tools, Spanner Wrench (special tool #6958, Wrench, Spanner) with Adapter Pins (special tool #8346, Pins, Adapter) and a suitable torque wrench, tighten the retaining bolt to 122 N.m (90 ft. lbs.)
7. Remove the Wedge Locking Tool (special tool #8379, Locking Tool, Wedge).
8. Rotate the crankshaft two full revolutions, then verify that the camshaft drive gear V6 marks are in fact aligned.
9. Install the cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

CHAIN AND SPROCKETS, TIMING

REMOVAL

REMOVAL

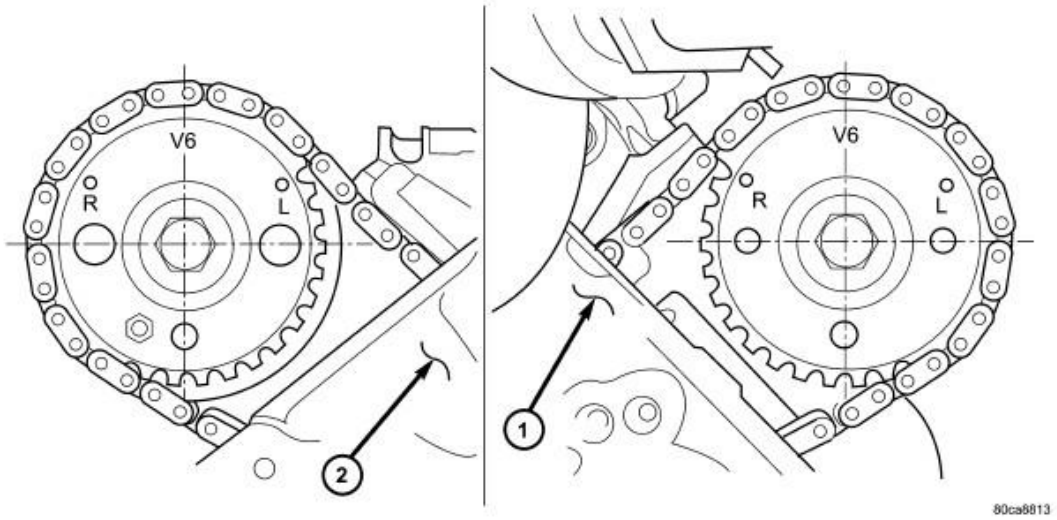

Fig. 164: Camshaft Sprocket V6 Timing Marks
Courtesy of CHRYSLER GROUP, LLC

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

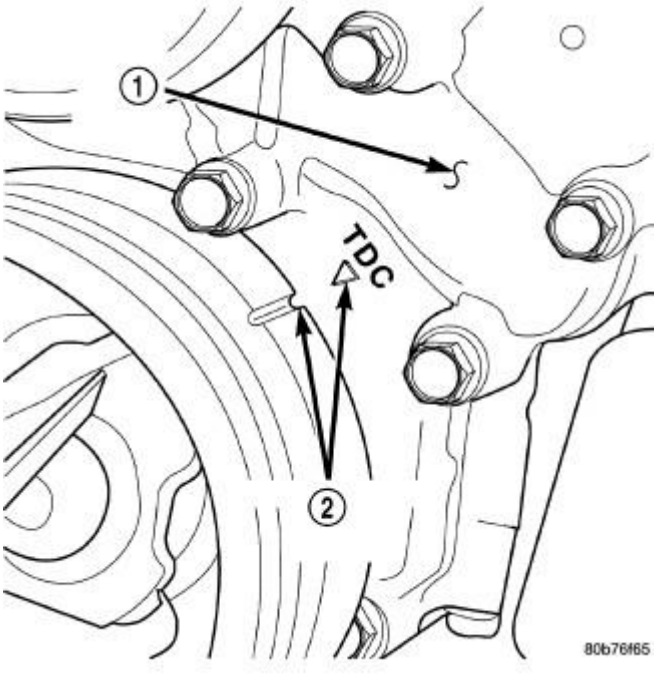

Fig. 165: TDC Indicator Marks
Courtesy of CHRYSLER GROUP, LLC

1 - TIMING CHAIN COVER

2 - CRANKSHAFT TIMING MARKS

1. Disconnect the negative battery cable.
2. Drain the cooling system. Refer to **STANDARD PROCEDURE** .
3. Remove right and left cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, REMOVAL, 3.7L** (Right).
4. Remove the radiator fan shroud. Refer to **FAN, COOLING, ELECTRIC, REMOVAL** and **FAN, COOLING, VISCOUS, REMOVAL** .
5. Rotate engine until the timing mark on crankshaft damper (2) aligns with TDC mark on timing chain cover (2) and the camshaft sprocket "V6" marks are at the 12 o'clock position (No. 1 TDC exhaust stroke). Refer to **Fig. 164**. Refer to**Fig. 165**.

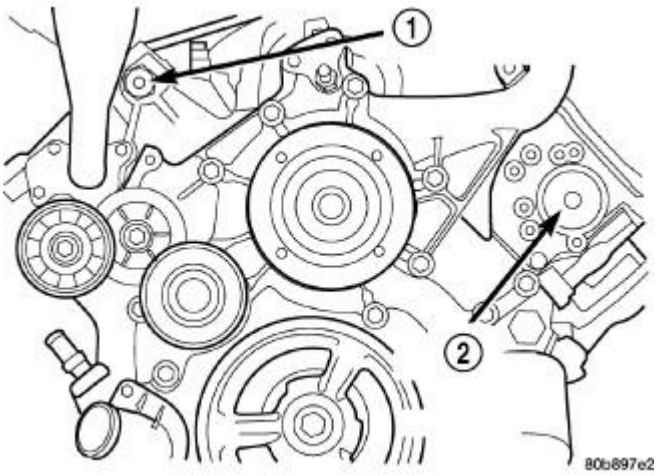

Fig. 166: Access Plugs From Left And Right Cylinder Heads
Courtesy of CHRYSLER GROUP, LLC

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

6. Remove the power steering pump. Refer to **PUMP, REMOVAL** .
7. Remove the access plugs from the left (2) and right (1) cylinder heads for access to the chain guide fasteners. Refer to **Fig. 166**.
8. Remove the oil fill housing to gain access to the right side tensioner arm fastener.
9. Remove crankshaft damper and the timing chain cover. Refer to **DAMPER, VIBRATION, REMOVAL, 3.7L**. Refer to **COVER(S), ENGINE TIMING, REMOVAL, 3.7L**.

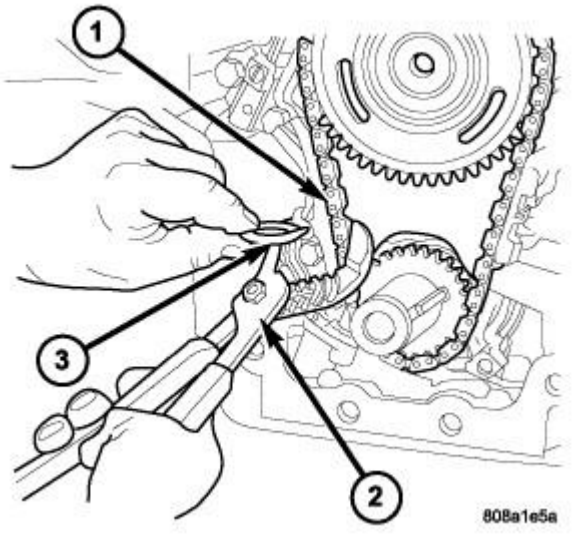

Fig. 167: Collapsing & Pinning Primary Chain Tensioner
Courtesy of CHRYSLER GROUP, LLC

1 - PRIMARY CHAIN TENSIONER
2 - ADJUSTABLE PLIERS
3 - SPECIAL TOOL 8514

10. Collapse and pin primary chain tensioner (1).

CAUTION: Plate behind left secondary chain tensioner could fall into oil pan. Therefore, cover pan opening.

11. Remove secondary chain tensioners.

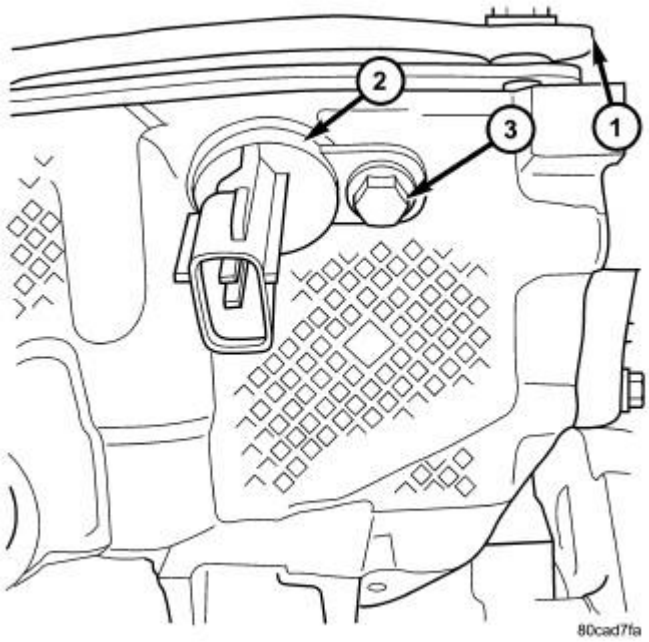

Fig. 168: Cylinder Head, Camshaft Position Sensor & Bolt
Courtesy of CHRYSLER GROUP, LLC

1 - CYLINDER HEAD
2 - CAMSHAFT POSITION SENSOR
3 - BOLT

12. Remove camshaft position sensor bolt (3) and remove sensor (2). Refer to**Fig. 168**.

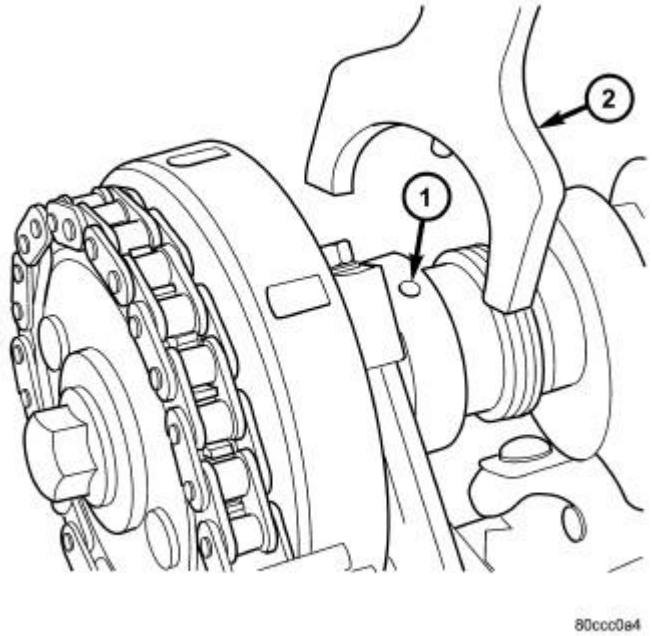

Fig. 169: Camshaft & Camshaft Holder
Courtesy of CHRYSLER GROUP, LLC

1 - Camshaft hole
2 - Special Tool 8428A

CAUTION: Care should be taken not to damage the camshaft target wheel. Do not hold the target wheel while loosening or tightening the camshaft sprocket. Do not place the target wheel near a magnetic source of any kind. A damaged or magnetized target wheel could cause a vehicle no start condition.

CAUTION: Do not forcefully rotate the camshafts or crankshaft independently of each other. Damaging intake valve to piston contact will occur. Ensure the negative battery cable is disconnected and isolated to guard against accidental starter engagement.

13. Remove left and right camshaft sprocket bolts.
14. While holding the left camshaft steel tube with Camshaft Holder (special tool #8428A, Holder, Camshaft) (2), remove the left camshaft sprocket. Slowly rotate the camshaft approximately 15 degrees clockwise to a neutral position.
15. While holding the right camshaft steel tube with Camshaft Holder (special tool #8428A, Holder, Camshaft) (2), remove the left camshaft sprocket. Slowly rotate the camshaft approximately 45 degrees counterclockwise to a neutral position.
16. Remove idler sprocket assembly bolt.
17. Slide the idler sprocket assembly and crank sprocket forward simultaneously to remove the primary and

secondary chains.

18. Remove both pivoting tensioner arms and chain guides.
19. Remove primary chain tensioner.

INSPECTION

INSPECTION

Inspect the following components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.
- Idler sprocket assembly bushing and shaft for excessive wear.
- Idler sprocket assembly spline joint. The joint should be tight with no backlash or axial movement.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep. If plastic face is severely grooved or melted, the tensioner lube jet may be clogged. The tensioner should be replaced.
- Secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner arm and chain should be replaced.
- Primary chain tensioner plastic faces. Replace as required.

INSTALLATION

INSTALLATION

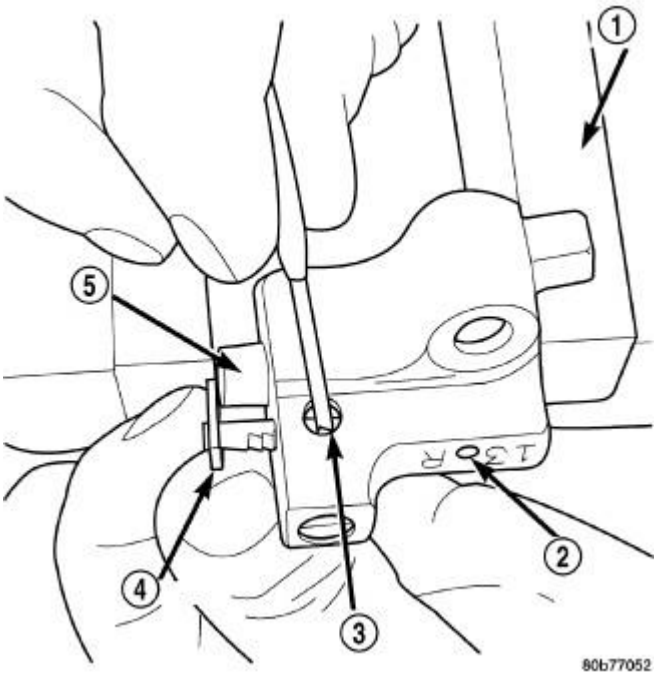

Fig. 170: Resetting Secondary Chain Tensioners

Courtesy of CHRYSLER GROUP, LLC

1. Using a vise, lightly compress the secondary chain tensioner piston (5) until the piston step is flush with the tensioner body. Using a pin or suitable tool, release ratchet pawl by pulling pawl back against spring force through access hole on side of tensioner. While continuing to hold pawl back, Push ratchet device to approximately 2 mm from the tensioner body. Install Tensioner pin (special tool #8514, Pins, Tensioner) (3) into hole on front of tensioner. Slowly open vise (1) to transfer piston spring force to lock pin.
2. Position primary chain tensioner over oil pump and insert bolts into lower two holes on tensioner bracket. Tighten bolts to 28 N.m (250 in. lbs.).

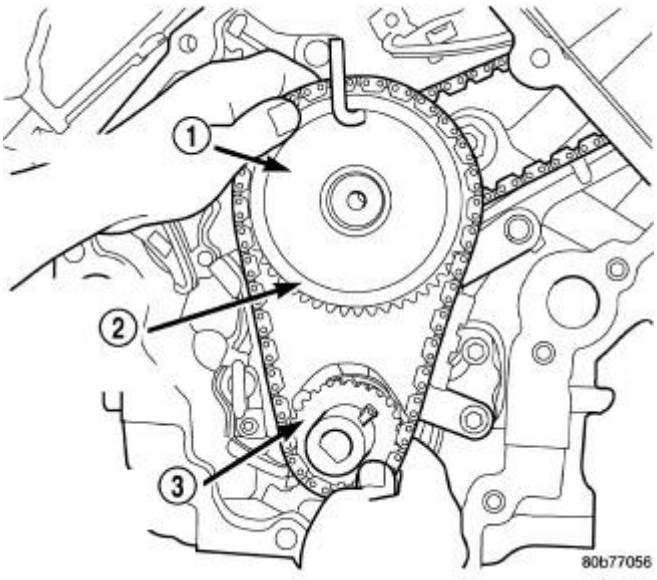

Fig. 171: Installing Idler Gear, Primary & Secondary Timing Chains
Courtesy of CHRYSLER GROUP, LLC

3. Install right side chain tensioner arm. Install Torx® bolt. Tighten Torx® bolt to 28 N.m (250 in. lbs.).

CAUTION: The silver bolts retain the guides to the cylinder heads and the black bolts retain the guides to the engine block.

4. Install the left side chain guide. Tighten the bolts to 28 N.m (250 in. lbs.).
5. Install left side chain tensioner arm, and Torx® bolt. Tighten Torx® bolt to 28 N.m (250 in. lbs.).
6. Install the right side chain guide. Tighten the bolts to 28 N.m (250 in. lbs.).
7. Install both secondary chains onto the idler sprocket. Align two plated links on the secondary chains to be visible through the two lower openings on the idler sprocket (4 o'clock and 8 o'clock). Once the secondary timing chains are installed, position the Secondary Camshaft Chain Holder (special tool #8429, Holder, Secondary Camshaft Chain) (1) to hold chains in place for installation.
8. Align primary chain double plated links with the timing mark at 12 o'clock on the idler sprocket. Align the primary chain single plated link with the timing mark at 6 o'clock on the crankshaft sprocket.
9. Lubricate idler shaft and bushings with clean engine oil.

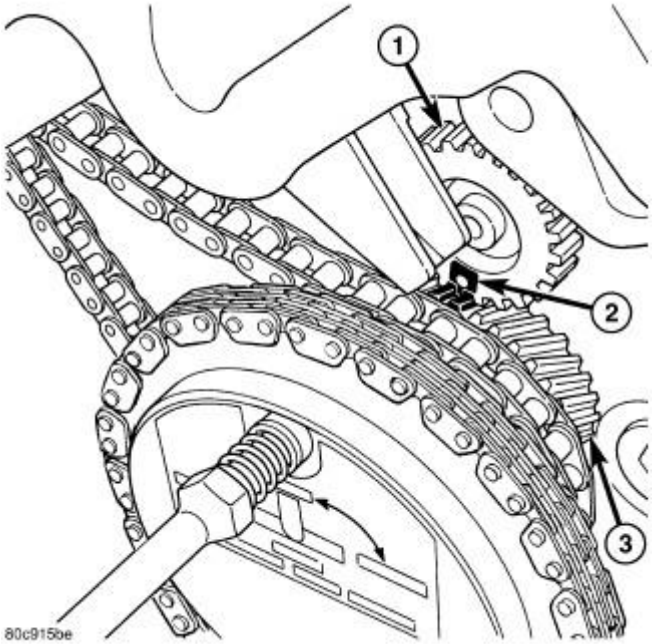

Fig. 172: Counterbalance Shaft Alignment Marks
Courtesy of CHRYSLER GROUP, LLC

NOTE: The idler sprocket must be timed to the counterbalance shaft drive gear before the idler sprocket is fully seated.

10. Install all chains, crankshaft sprocket, and idler sprocket as an assembly. After guiding both secondary chains through the block and cylinder head openings, affix chains with a elastic strap or equivalent. This will maintain tension on chains to aid in installation. Align the timing mark (2) on the idler sprocket gear (3) to the timing mark on the counterbalance shaft drive gear (1), then seat idler sprocket fully. Before installing idler sprocket bolt, lubricate washer with oil, and tighten idler sprocket assembly retaining bolt to 34 N.m (25 ft. lbs.).

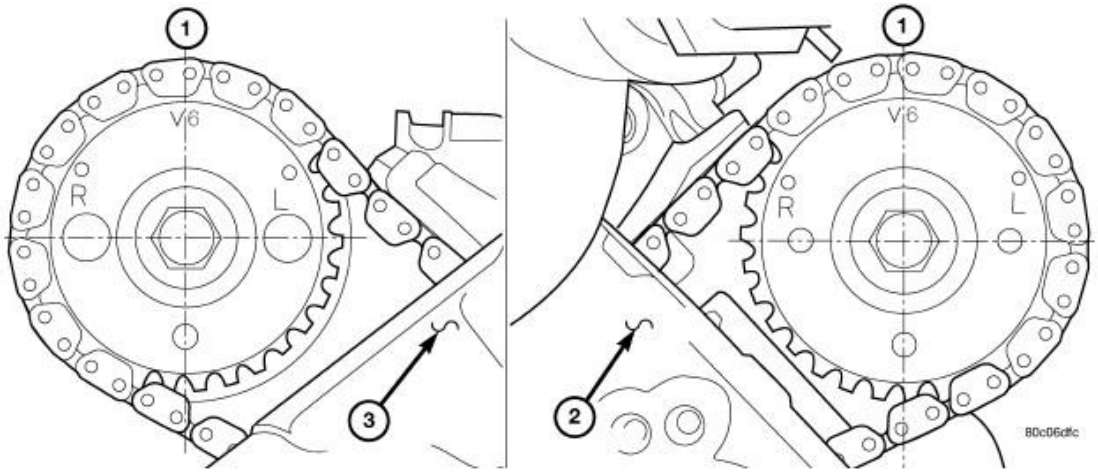

Fig. 173: Camshaft Sprocket V6 Timing Marks

Courtesy of CHRYSLER GROUP, LLC

NOTE: It will be necessary to slightly rotate camshafts for sprocket installation.

11. Align left camshaft sprocket "L" dot to plated link on chain.
12. Align right camshaft sprocket "R" dot to plated link on chain.

CAUTION: Remove excess oil from the camshaft sprocket bolt. Failure to do so can result in over-torque of bolt resulting in bolt failure.

13. Remove Secondary Camshaft Chain Holder (special tool #8429, Holder, Secondary Camshaft Chain), then attach both sprockets to camshafts. Remove excess oil from bolts, then Install sprocket bolts, but do not tighten at this time.
14. Verify that all plated links are aligned with the marks on all sprockets and the "V6" marks on camshaft sprockets are at the 12 o'clock position.

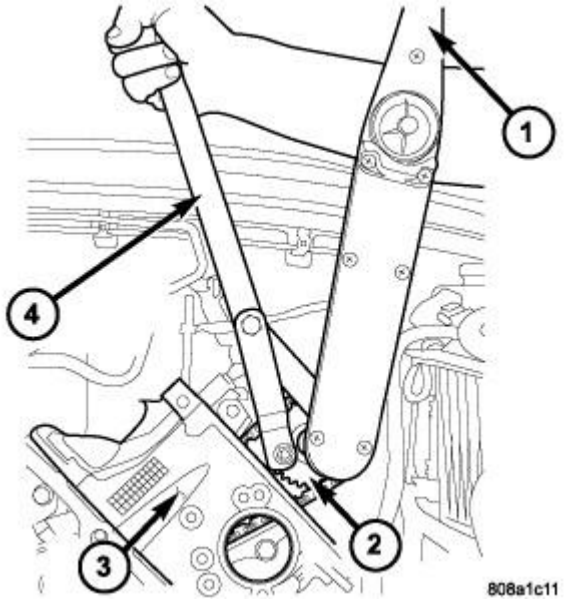

Fig. 174: Tightening Left Side Camshaft Sprocket Bolt
Courtesy of CHRYSLER GROUP, LLC

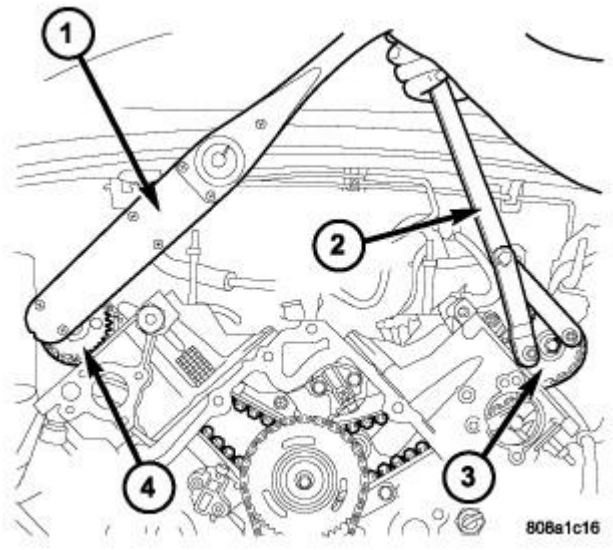

Fig. 175: Tightening Right Side Camshaft Sprocket Bolt
Courtesy of CHRYSLER GROUP, LLC

CAUTION: Ensure the plate between the left secondary chain tensioner and block is correctly installed.

15. Install both secondary chain tensioners. Tighten bolts to 28 N.m (250 in. lbs.).

NOTE: Left and right secondary chain tensioners are not common.

16. Remove all 3 locking pins from tensioners.

CAUTION: After pulling locking pins out of each tensioner, DO NOT manually extend the tensioner(s) ratchet. Doing so will over tension the chains, resulting in noise and/or high timing chain loads.

17. Using Spanner Wrench (special tool #6958, Wrench, Spanner) with Adaptor Pins (special tool #8346, Pins, Adapter), (4) tighten left and right camshaft sprocket bolts to 122 N.m (90 ft. lbs.).
18. Rotate engine two full revolutions. Verify timing marks are at the follow locations:
    - primary chain idler sprocket dot is at 12 o'clock
    - primary chain crankshaft sprocket dot is at 6 o'clock
    - secondary chain camshaft sprockets "V6" marks are at 12 o'clock
    - counterbalancer shaft drive gear dot is aligned to the idler sprocket gear dot
19. Lubricate all three chains with engine oil.

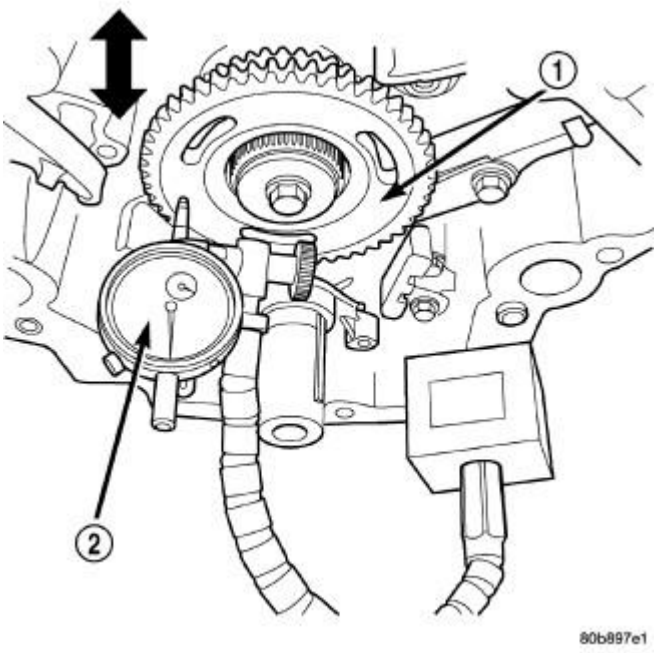

Fig. 176: Measuring Idler Gear End Play
Courtesy of CHRYSLER GROUP, LLC

20. After installing all chains, it is recommended that the idler gear end play be checked. The end play must be within 0.10 - 0.25 mm (0.004 - 0.010 in.). If not within specification, the idler gear must be replaced.
21. Install timing chain cover. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.
22. Install the crankshaft damper
23. Install cylinder head covers. Refer to **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Left) and **COVER(S), CYLINDER HEAD, INSTALLATION, 3.7L** (Right).

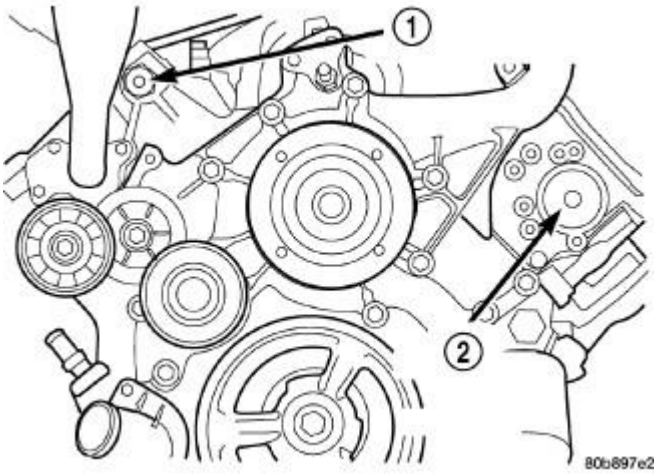

Fig. 177: Access Plugs From Left And Right Cylinder Heads
Courtesy of CHRYSLER GROUP, LLC

NOTE: Before installing threaded plug in right cylinder head, the plug must be coated with sealant to prevent leaks.

24. Coat the large threaded access plug with **Mopar® Thread Sealant with Teflon** , then install into the right cylinder head (1) and tighten to 81 N.m (60 ft. lbs.).
25. Install the oil fill housing.
26. Install access plug in left cylinder head (2).
27. Install power steering pump. Refer to **PUMP, INSTALLATION** .
28. Fill cooling system. Refer to **STANDARD PROCEDURE** .
29. Connect negative cable to battery.

COVER(S), ENGINE TIMING

REMOVAL

REMOVAL

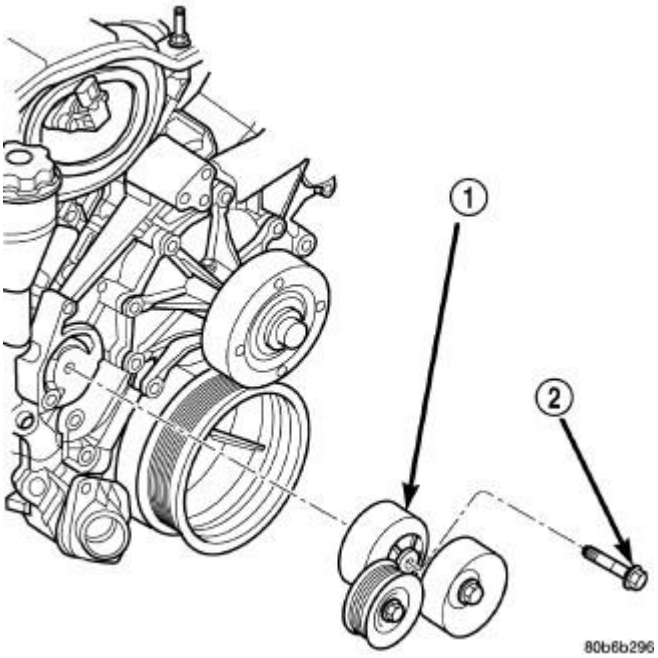

Fig. 178: Tensioner Assembly & Fastener
Courtesy of CHRYSLER GROUP, LLC

1 - TENSIONER ASSEMBLY
2 - FASTENER TENSIONER TO FRONT COVER

1. Disconnect the battery negative cable.
2. Drain cooling system. Refer to **STANDARD PROCEDURE** .
3. Remove electric cooling fan and fan shroud assembly.

4. Remove fan and fan drive assembly.
5. Disconnect both heater hoses at timing cover.
6. Disconnect lower radiator hose at engine.
7. Remove accessory drive belt tensioner assembly (1). Refer to **Fig. 178**.

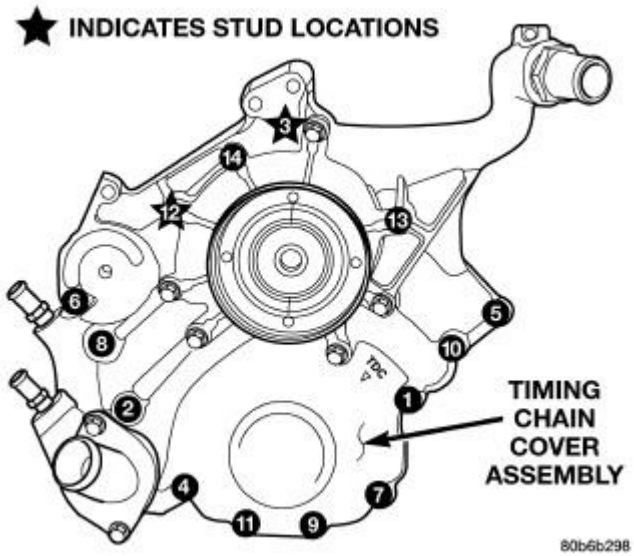

Fig. 179: Timing Chain Cover Assembly Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

8. Remove crankshaft damper. Refer to **DAMPER, VIBRATION, REMOVAL, 3.7L**.
9. Remove the generator. Refer to **GENERATOR, REMOVAL** .
10. Remove A/C compressor. Refer to **COMPRESSOR, A/C, REMOVAL** .

CAUTION: The 3.7L engine uses an anerobic sealer instead of a gasket to seal the front cover to the engine block, from the factory. For service, Mopar® Grey Engine RTV sealant must be substituted.

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

11. Remove the bolts holding the timing cover to engine block. Refer to **Fig. 179**.
12. Remove the timing cover.

INSTALLATION

INSTALLATION

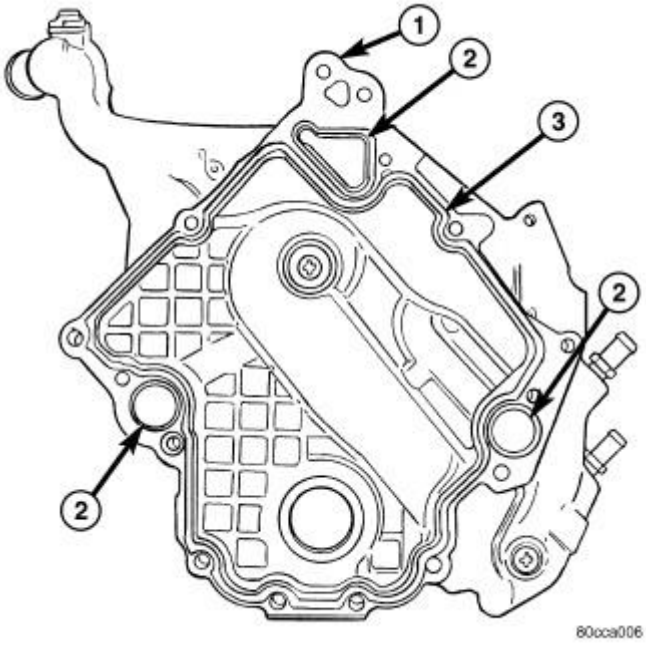

Fig. 180: Timing Chain Cover, O-Rings & Sealant Location
Courtesy of CHRYSLER GROUP, LLC

1 - TIMING CHAIN COVER
2 - WATER PASSAGE O-RING
3 - MOPAR® ENGINE RTV SEALER

CAUTION: Do not use oil based liquids to clean timing cover or block surfaces. Use only rubbing alcohol, along with plastic or wooden scrapers. Use no wire brushes or abrasive wheels or metal scrapers, or damage to surfaces could result.

1. Clean timing chain cover and block surface using rubbing alcohol.

CAUTION: The 3.7L uses a special anerobic sealer instead of a gasket to seal the timing cover to the engine block, from the factory. For service repairs, Mopar® Engine Grey RTV must be used as a substitute.

2. Inspect the water passage o-rings for any damage, and replace as necessary.
3. Apply Mopar® Grey Engine RTV sealer (3) to front cover (1) following the path provided using a 3 to 4 mm thick bead (3). Refer to **Fig. 180**.

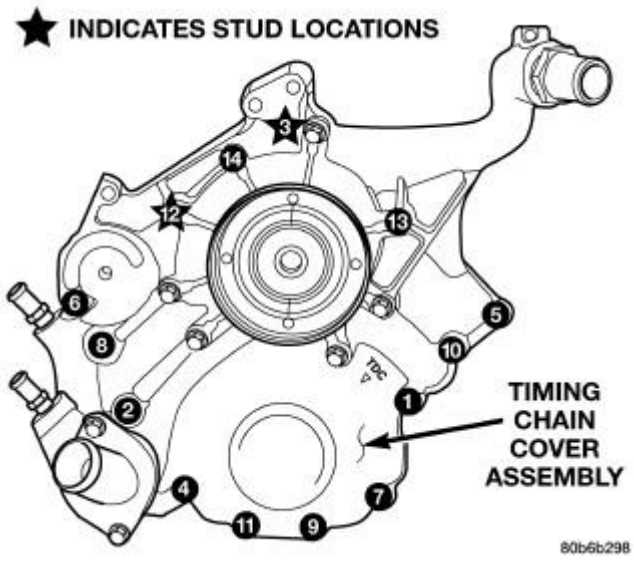

Fig. 181: Timing Chain Cover Assembly Removal/Tightening Sequence
Courtesy of CHRYSLER GROUP, LLC

4. Install cover. Tighten fasteners in sequence as shown in illustration in to 58 N.m (43 ft. lbs.). Refer to **Fig. 181**.
5. Install crankshaft damper. Refer to **DAMPER, VIBRATION, INSTALLATION, 3.7L**.
6. Install the A/C compressor. Refer to **COMPRESSOR, A/C, INSTALLATION** .
7. Install the generator. Refer to **GENERATOR, INSTALLATION** .
8. Install accessory drive belt tensioner assembly. Refer to **TENSIONER, BELT, INSTALLATION** .
9. Install radiator upper and lower hoses.
10. Install both heater hoses.
11. Install electric fan shroud and viscous fan drive assembly.
12. Fill cooling system. Refer to **STANDARD PROCEDURE** .
13. Connect the battery negative cable.

SHAFT, IDLER

REMOVAL

REMOVAL

1. Remove the primary and secondary timing chains and sprockets. Refer to **CHAIN AND SPROCKETS, TIMING, REMOVAL, 3.7L**.

NOTE: To remove the idler shaft, it is necessary to tap threads into the shaft, to install the removal tool.

2. Using a 12 mm X 1.75 tap, cut threads in the idler shaft center bore.

3. Cover the radiator core with a suitable cover.

CAUTION: Use care when removing the idler shaft, Do not strike the radiator cooling fins with the slide hammer.

4. Using Slide Hammer (special tool #8517, Remover) remove the idler shaft.

INSTALLATION

INSTALLATION

1. Thoroughly clean the idler shaft bore.
2. Position the idler shaft in the bore.

NOTE: The two lubrication holes in the idler shaft do not require any special alignment.

NOTE: Before using the retaining bolt to install the idler shaft, coat the threads and the pilot on the idler shaft, with clean engine oil.

3. Using the primary idler sprocket retaining bolt and washer, carefully draw the idler shaft into the bore until fully seated.
4. Coat the idler shaft with clean engine oil.
5. Install the timing chains and sprockets. Refer to **CHAIN AND SPROCKETS, TIMING, INSTALLATION, 3.7L**.

