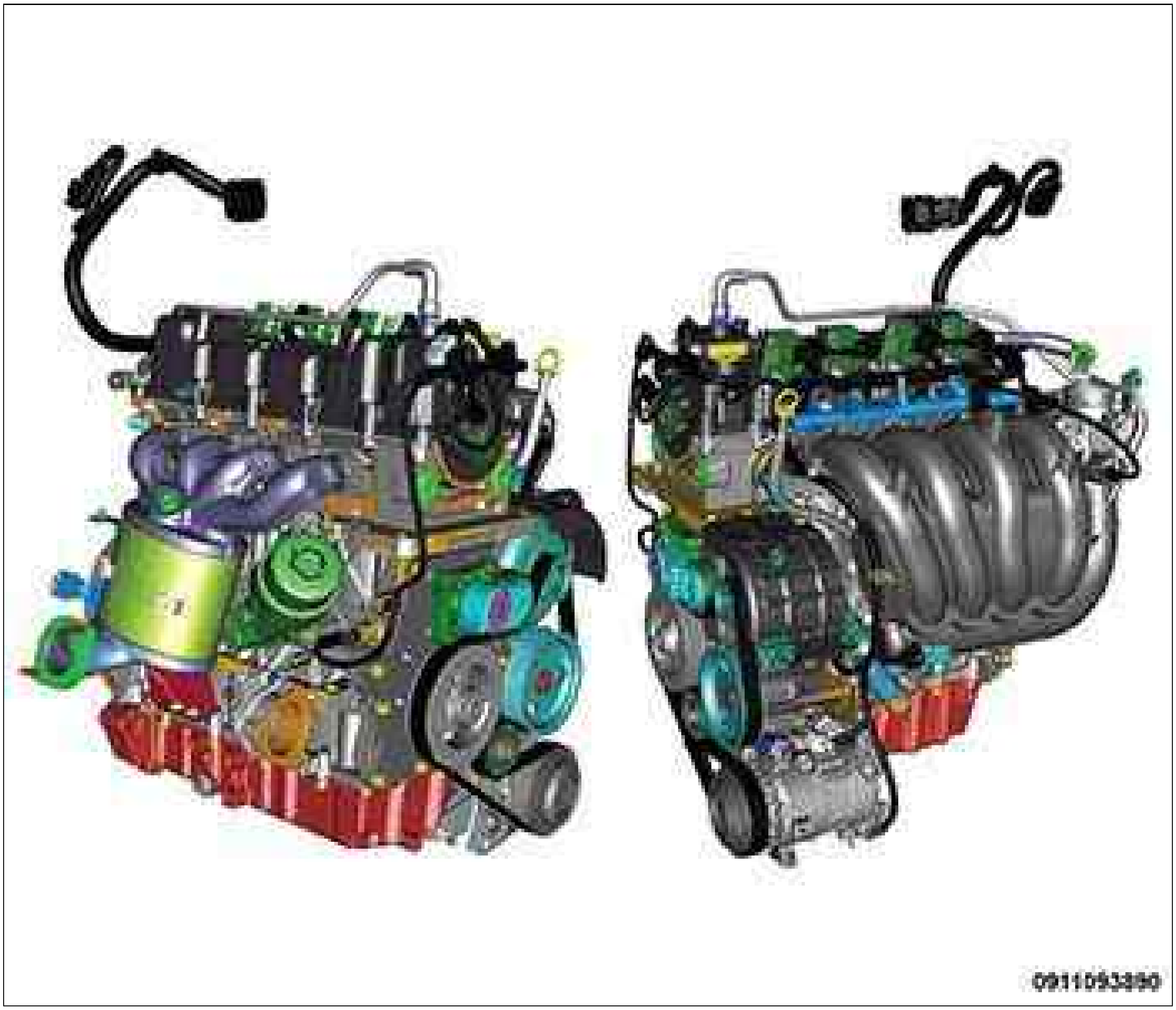
DESCRIPTION > DESCRIPTION

Fig 1: 4-Cylinder In-Line 1598 CC Engine



Courtesy of CHRYSLER GROUP, LLC

DESCRIPTION > DESCRIPTION > 1.6 TORQUE ENGINE

The 4-cylinder in-line 1598 cc engine, with 4 valves per cylinder, delivers a power of 110 HP and a toque of 15 kgm.

The engine management with integrated electronic injection-ignition system is by Magneti Marelli.

The engine features the following characteristics:

- Tappet cover made of plastic

- Aluminum alloy head
- Single overhead camshaft
- Roller rocker arms
- Cast-iron block
- Cast-iron under-block
- Oil sump made of aluminum alloys
- Timing controlled by chain
- Variable valve timing system
- Hydraulic tappets

DIAGNOSIS AND TESTING > ENGINE PERFORMANCE DIAGNOSTIC TABLE

ENGINE PERFORMANCE DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test the battery. Charge or replace as necessary. Refer to BATTERY, DIAGNOSIS AND TESTING .
	2. Corroded or loose battery connections.	2. Clean and tighten the battery connections. Apply a coat of light mineral grease to the terminals. Refer to SPECIFICATIONS .
	3. Faulty engine starting system.	3. Test the starting system. Refer to DIAGNOSIS AND TESTING .
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. Refer to DIAGNOSIS AND TESTING .
	5. Incorrect spark plug gap.	5. Set the spark plug gap. Refer to SPECIFICATIONS .
	6. Contamination in fuel system.	6. Clean the fuel system and replace the fuel filter. Refer to FILTER, FUEL, REMOVAL AND INSTALLATION .
	7. Incorrect engine oil level and oil quality.	The engine starting should not be effected if the oil level shows anywhere on the dipstick. If the oil level is off the dipstick, the oil level could be contributing to the

		startability issue. If the oil quality is questionable, change the oil and filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	8. Long Stand Still Parking - longer than 35 days.	Perform a long start procedure - Crank engine for 10 seconds, let sit for 5 seconds, crank for 10 seconds. May be necessary to continue sequence after a 30 second break.
	9. Faulty fuel pump.	7. Test the fuel pump and replace as needed. Refer to DIAGNOSIS AND TESTING .
	8. Incorrect cam timing.	8. Verify cam timing. Refer to VALVE TIMING .
	10. Faulty Camshaft Position (CMP) sensor.	Replace the Camshaft Position (CMP) sensor. Refer to SENSOR, CAMSHAFT POSITION, REMOVAL AND INSTALLATION .
	11. Faulty Crankshaft Position (CKP) sensor.	Replace the Crankshaft Position (CKP) sensor. Refer to SENSOR, CRANKSHAFT POSITION, REMOVAL AND INSTALLATION .
ENGINE STALLS OR IDLES ROUGH	1. Idle speed too low.	1. Check for Diagnostic Trouble Codes (DTC). Refer to appropriate Engine Electrical Diagnostics article.
	2. Incorrect fuel mixture.	2. Check for Diagnostic Trouble Codes (DTC). Refer to appropriate Engine Electrical Diagnostics article.
	3. Vacuum leak.	3. Inspect intake manifold, manifold gasket, and vacuum hoses.
	4. Faulty ignition coil(s).	4. Test and replace the ignition coil. Refer to COIL, IGNITION, REMOVAL AND INSTALLATION .
	5. Faulty Crankshaft Position (CKP) sensor.	5. Replace the Crankshaft Position (CKP) sensor. Refer to SENSOR, CRANKSHAFT POSITION, REMOVAL AND INSTALLATION .
	6. Incorrect cam timing.	6. Verify cam timing. Refer to VALVE TIMING .

ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. Correct as necessary. Refer to SPARK PLUG, REMOVAL AND INSTALLATION .
	2. Contamination in fuel system.	2. Clean the fuel system and replace the fuel filter. Refer to FILTER, FUEL, REMOVAL AND INSTALLATION .
	3. Faulty fuel pump.	3. Test and replace the fuel pump. Refer to MODULE, FUEL PUMP, REMOVAL AND INSTALLATION .
	4. Leaking cylinder head gasket.	4. Replace the cylinder head gasket. Refer to CYLINDER HEAD, REMOVAL AND INSTALLATION .
	5. Low compression.	5. Determine the cause and repair as necessary. Refer to ENGINE MECHANICAL DIAGNOSTIC TABLE .
	6. Burned, warped, or pitted valves.	6. Replace valves as necessary.
	7. Plugged or restricted exhaust system.	7. Perform the exhaust restriction test. Install new parts as necessary. Refer to DIAGNOSIS AND TESTING .
	8. Faulty ignition coil(s).	8. Test and replace the ignition coil. Refer to COIL, IGNITION, REMOVAL AND INSTALLATION .
	9. Incorrect valve timing.	9. Verify cam timing. Refer to VALVE TIMING .
ENGINE MISSES ON ACCELERATION	1. Dirty or incorrectly gapped spark plugs.	1. Correct as necessary. Refer to SPARK PLUG, REMOVAL AND INSTALLATION .
	2. Contamination in fuel system.	2. Clean fuel system and replace the fuel filter. Refer to FILTER, FUEL, REMOVAL AND INSTALLATION .
	3. Burned, warped, or pitted valves.	3. Replace valves as necessary.
	4. Faulty ignition coil(s).	4. Test and replace the ignition coil. Refer to COIL, IGNITION, REMOVAL AND INSTALLATION .
ENGINE MISSES AT HIGH SPEED	1. Dirty or incorrect spark plug gap.	1. Correct as necessary. Refer to SPARK PLUG, REMOVAL AND INSTALLATION .

	2. Faulty ignition coil(s).	2. Test and replace the ignition coil. Refer to COIL, IGNITION, REMOVAL AND INSTALLATION .
	3. Contamination in fuel system.	3. Clean the fuel system and replace the fuel filter. Refer to FILTER, FUEL, REMOVAL AND INSTALLATION .
	4. Dirty fuel injector(s).	4. Test and replace as necessary. Refer to DIAGNOSIS AND TESTING .

DIAGNOSIS AND TESTING > ENGINE MECHANICAL DIAGNOSTIC TABLE

ENGINE MECHANICAL DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. Adjust the engine oil level. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	2. Thin or diluted oil.	2. Change the engine oil and filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	3. Low oil pressure.	3. Check the oil pump. If OK, check the rod and main bearings for excessive wear. Refer to STANDARD PROCEDURE .
	4. Dirt in valve lash adjusters.	4. Replace as necessary. Refer to LIFTER(S), HYDRAULIC, REMOVAL AND INSTALLATION .
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn valve lash adjusters	6. Replace as necessary. Refer to LIFTER(S), HYDRAULIC, REMOVAL AND INSTALLATION .
	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, REMOVAL AND INSTALLATION .
	8. Excessive runout of valve seats or valve faces.	8. Replace as necessary.

CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check and adjust the engine oil level. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	2. Low oil pressure.	2. Check the engine oil pump. If OK, check the rod and main bearings for excessive wear. Refer to STANDARD PROCEDURE .
	3. Thin or diluted oil.	3. Change the engine oil and filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	4. Excessive bearing clearance.	4. Replace as necessary).
	5. Connecting rod journal out-of-round, rough surface or debris. Obstructed oil feed hole.	5. Service or replace the crankshaft. Check the crankshaft for plugged oil feed hole.
	6. Misaligned connecting rods.	6. Replace the bent connecting rods. Refer to ROD, PISTON AND CONNECTING, REMOVAL AND INSTALLATION .
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check and adjust the engine oil level. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	2. Low oil pressure.	2. Check the engine oil pump. If OK, check the rod and main bearings for excessive wear. Refer to STANDARD PROCEDURE .
	3. Thin or diluted oil.	3. Change the engine oil and filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check the thrust washers for wear.
	6. Crankshaft journal out-of round, rough or debris. Obstructed oil feed hole.	6. Service or replace the crankshaft. Check the engine block for plugged oil feed hole.
	7. Loose flywheel, flexplate or torque converter.	7. Tighten flexplate to the proper specification. Refer to TORQUE SPECIFICATIONS . Tighten flywheel to the proper specification. Refer to

		SPECIFICATIONS . Tighten torque converter to the proper specification. Refer to SPECIFICATIONS .

DIAGNOSIS AND TESTING > CYLINDER COMPRESSION TEST

NOTE:

To perform a compression test on a MULTI-AIR equipped engine, the ignition MUST remain in the "key on" position. If the ignition is in the "off" position, the intake valves will not actuate and the result will be no compression.

NOTE:

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

NOTE:

Be certain 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. If possible, for best results, the compression test should be performed on a warm engine.
2. Clean the spark plug recesses with compressed air.
3. Remove the spark plugs and record the cylinder number of each spark plug for future reference.
4. Inspect the spark plug electrodes for abnormal firing indicators such as fouled, hot, oily, etc.
5. Disable the fuel system and perform the fuel system pressure release procedure. Refer to FUEL DELIVERY, STANDARD PROCEDURE .
6. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
7. 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.

8. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
9. 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.

10. If one or more cylinders continue to have abnormally low compression pressures, perform the cylinder combustion pressure leakage test. Refer to CYLINDER LEAKAGE TEST .

DIAGNOSIS AND TESTING > CYLINDER LEAKAGE TEST

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

Cylinder leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion 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 a regulated air pressure at 552 kPa (80 psi).
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.
8. 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.

If leakage is greater then 25%, refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART below.

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

DIAGNOSIS AND TESTING > OIL CONSUMPTION TEST AND DIAGNOSIS

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

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

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

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

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

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

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

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

DIAGNOSIS AND TESTING > OIL CONSUMPTION TEST AND DIAGNOSIS > OIL CONSUMPTION TEST

1. Check the oil level at least 15 minutes after a hot shutdown with the vehicle on a level surface.
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 with a black light marking device (pen) or air conditioning dye applied with a small brush.

   > *NOTE:*
   >
   > *The use of a black light marking device is recommended so the marks can only be seen with a ultraviolet light.*

4. Record the vehicle mileage. Note that the oil level at 'full' mark 15 minutes after hot shut-down and date.
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 on a level surface. If the oil level is half way between the "FULL" and "ADD" mark or below, continue with the next step.
7. Using a black light, check for any external engine oil leaks, repair as necessary, if no external engine oil leaks are present, continue with oil consumption diagnosis.

DIAGNOSIS AND TESTING > OIL CONSUMPTION TEST AND DIAGNOSIS > OIL CONSUMPTION DIAGNOSIS

1. Check the Positive Crankcase Ventilation (PCV) system. Make sure the system is not restricted, (one way by blowing air through it) and the PCV valve is the correct part based on the part number. Check the hoses and connectors for damage or leaks. It must have correct vacuum source at intake manifold through the hose- vent assembly. Normal vacuum is considered to be 18-20 in. Hg at idle, below 3000 ft. above sea level.

2. Perform a cylinder compression test and cylinder leakage test using the standard cylinder leakage tester and following manufacturers suggested best practices. Refer to CYLINDER COMPRESSION TEST and CYLINDER LEAKAGE TEST .

> *NOTE:*
>
> ***Blow the spark plug sockets/bores out with compressed air to remove fluid or debris before removing the spark plugs.***
>
> *Verify the spark plugs are not oil saturated.*

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

DIAGNOSIS AND TESTING > OIL CONSUMPTION TEST AND DIAGNOSIS > TOP 18 REASONS THAT MAY LEAD TO ENGINE OIL CONSUMPTION

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

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

2. **Distorted Cylinders**

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

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

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

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

If equipped with an engine driven vacuum pump, high oil consumption can be caused by unchecked airflow into the pump. This can be caused by anything that opens the vacuum pump intake port up to the atmosphere such as a faulty vacuum pump, hose fitting, hose and brake booster. If there is not a restriction (normally caused by the pump pulling vacuum on the brake booster), then the vacuum pump will pump a high volume of air. This high volume of air will pressurize the crankcase and cause excessive oil burning and oil flow through the PCV system.

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:

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

   2. Gasoline contaminated with diesel fuel

   3. Restricted air intake

   4. 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.

DIAGNOSIS AND TESTING > ENGINE LUBRICATION DIAGNOSTIC TABLE

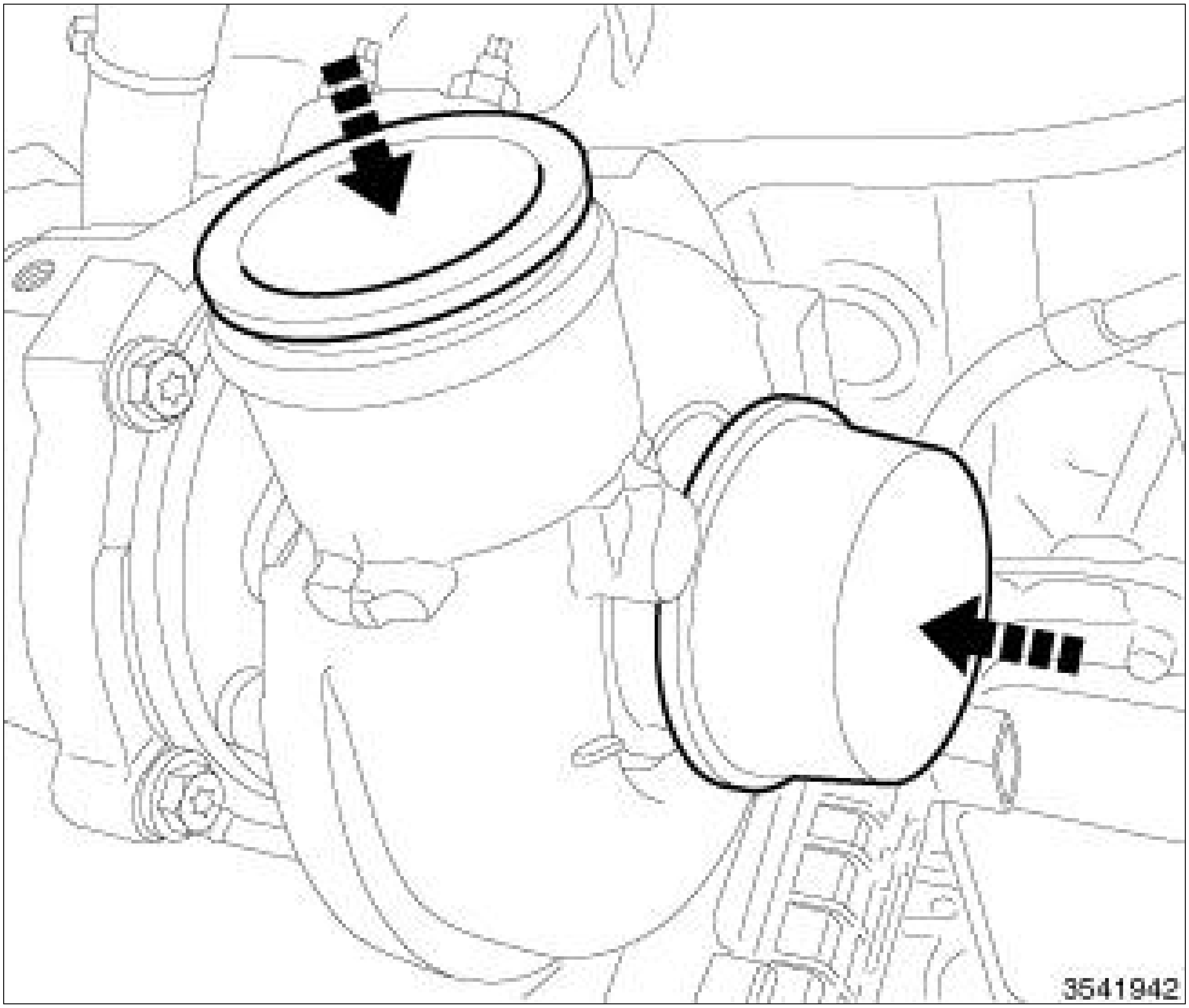
ENGINE LUBRICATION DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Misaligned or damaged gaskets and O-rings.	1. Replace as necessary.
	2. Loose fasteners, broken or porous metal parts.	2. Repair or replace metal parts. Tighten fasteners to the proper specification. Refer to TORQUE SPECIFICATIONS .
	3. Crankshaft rear oil seal.	3. Replace the rear crankshaft oil seal.
	4. Crankshaft rear oil seal surface scratched, nicked or grooved.	4. Polish or replace the crankshaft).
	5. Oil pan flange cracked.	5. Replace the oil pan. Refer to PAN, OIL, REMOVAL AND INSTALLATION .
	6. Damaged or misaligned crankshaft front oil seal.	6. Replace the front crankshaft oil seal.
	7. Scratched or damaged vibration damper hub front oil seal surface.	7. Polish or replace the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct the engine oil level.
	2. Faulty oil pressure sensor.	2. Replace the oil pressure sensor. Refer to SENSOR, OIL PRESSURE, REMOVAL AND INSTALLATION .
	3. Low oil pressure.	3. Check the main crankshaft bearing clearance. Refer to STANDARD PROCEDURE . 3. Check the rod bearing clearance. Refer to STANDARD PROCEDURE .

	4. Clogged oil filter.	4. Replace the engine oil filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
	5. Worn oil pump.	5. Replace the engine oil pump. Refer to PUMP, ENGINE OIL, REMOVAL AND INSTALLATION .
	6. Thin or diluted oil.	6. Change the engine oil and filter.
	7. Excessive bearing clearance.	7. Replace the crankshaft bearings. 7. Replace the rod bearings.
	8. Oil pump relief valve stuck.	8. Replace the engine oil pump. Refer to PUMP, ENGINE OIL, REMOVAL AND INSTALLATION .
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone the cylinder bores and replace the piston rings. Refer to STANDARD PROCEDURE . Refer to RING(S), PISTON, REMOVAL AND INSTALLATION .
	2. Carbon in oil ring slots.	2. Replace the piston rings. Refer to RING(S), PISTON, REMOVAL AND INSTALLATION .
	3. Worn valve guides.	3. Replace the cylinder head. Refer to CYLINDER HEAD, REMOVAL AND INSTALLATION .
	4. Leaking valve guide seals.	4. Replace the valve guide seals. Refer to VALVE GUIDES .
ENGINE OIL FILTER SWOLLEN OR BURST	1. Obstructed or incorrect oil filter.	1. Install new oil filter and test engine oil pressure. Refer to DIAGNOSIS AND TESTING .
	2. Engine oil viscosity incorrect.	2. Change engine oil and test engine oil pressure. Refer to DIAGNOSIS AND TESTING .
	3. Excessive engine oil pressure.	3. Replace engine oil pump. Refer to PUMP, ENGINE OIL, REMOVAL AND INSTALLATION .

STANDARD PROCEDURE > DUST COVERS AND CAPS

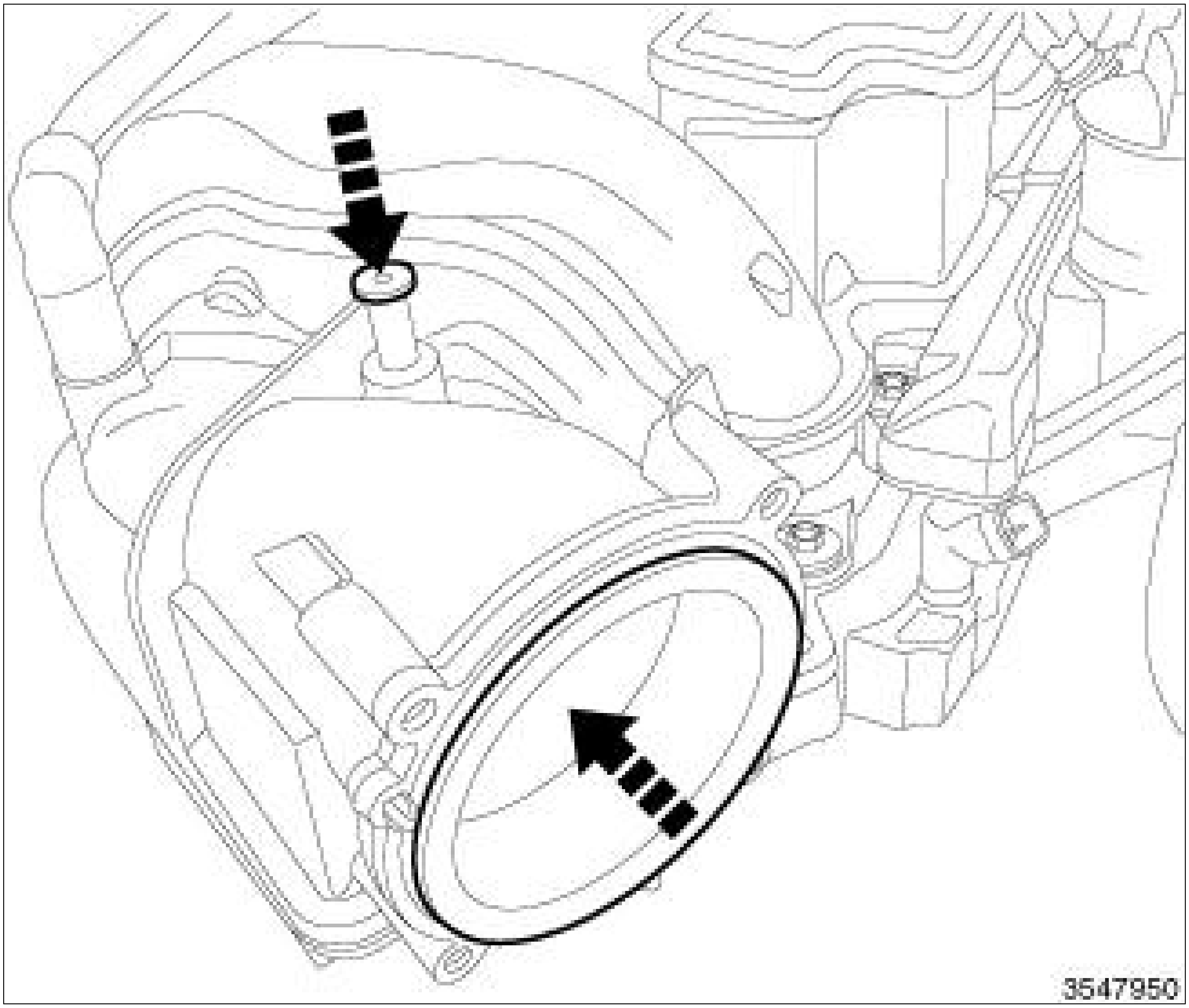
Fig 1: Covers/Caps



Courtesy of CHRYSLER GROUP, LLC

To avoid the possibility of dust, dirt, moisture and other foreign debris being introduced to the engine during service, cover or cap all openings when hoses and tubes are removed.

Fig 2: Opening Cover

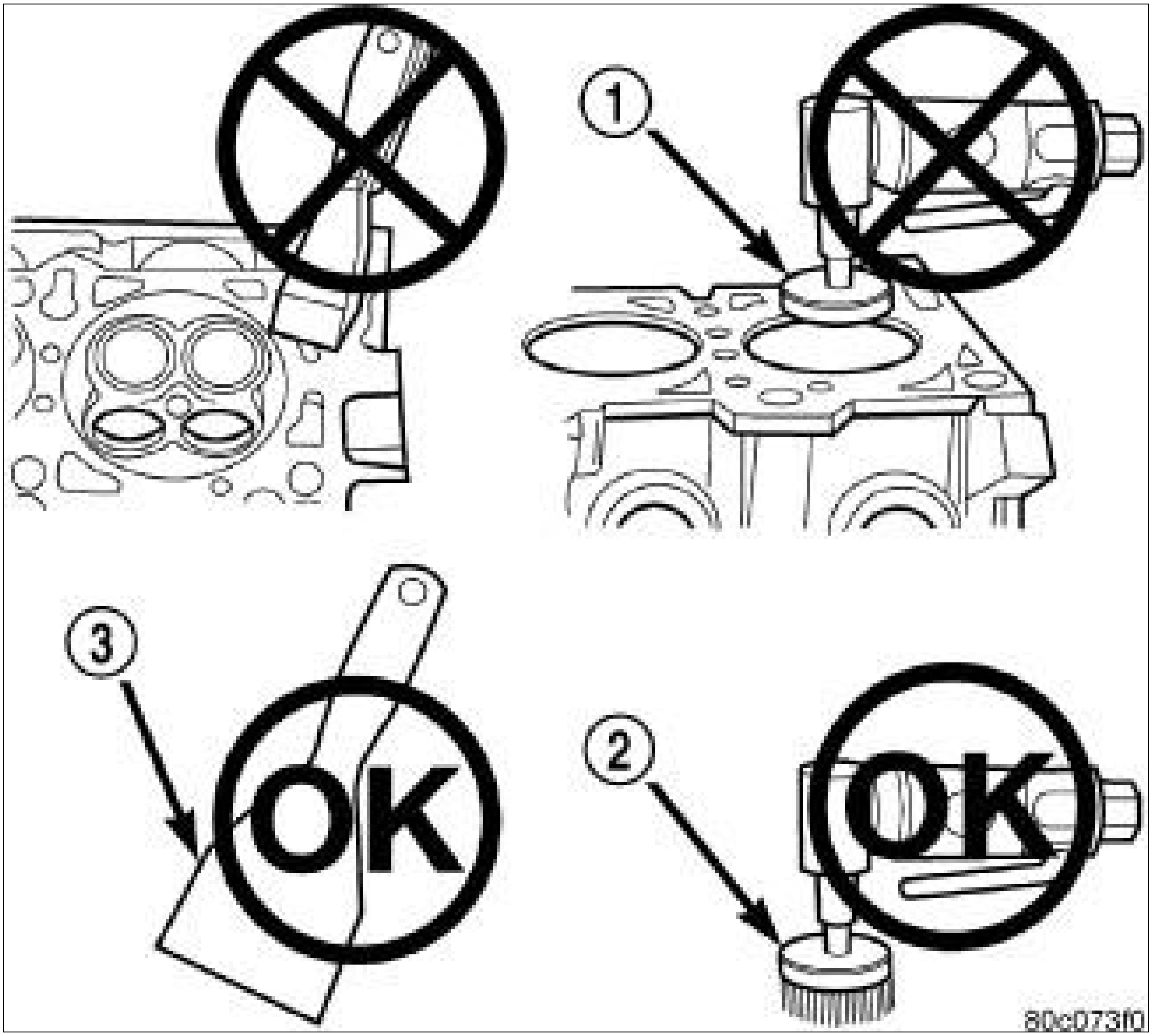


Courtesy of CHRYSLER GROUP, LLC

Covers installed over openings will reduce the possibility of foreign materials to entering the engine systems. Using miller tool Universal Protective Cap Set (special tool #10368, Set, Universal Protective Cap), select the appropriate cover needed for the procedure.

STANDARD PROCEDURE > ENGINE GASKET SURFACE PREPARATION

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

> 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 (3).
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (2).

> 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.*

STANDARD PROCEDURE > FORM-IN-PLACE GASKETS AND SEALERS

> NOTE:
>
> *All of the sealants mentioned below are not used on every engine, they are listed as a general reference guide. See service information for specific sealer usage.*

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. All sealing surfaces that use form-in-place gaskets and sealers **must** be free of grease or oil. Surfaces should be cleaned with Mopar® brake parts cleaner prior to sealer application. After the sealer is applied, the parts should be assembled within 10 minutes.

There are numerous types of form-in-place gasket materials that are used in the engine area. Each has different properties and can not be used in place of the other.

SEALANT TYPES

- **MOPAR® ENGINE SEALANT RTV SILICONE RUBBER ADHESIVE** 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** 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** 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® BED PLATE SEALANT** is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.
- **MOPAR® THREEBOND™ ENGINE RTV** is formulated as a high performance temperature vulcanized silicone with good elasticity, temperature and chemical resistance when cured. It is resistant to engine oil, transmission fluid and gear lube but not recommended for sealing engine coolant.

SEALANT APPLICATION

- 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 Sealant RTV 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 and "T" joint locations, 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® Threebond™ Engine RTV Sealant gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. The gasket surfaces should be cleaned with isopropyl alcohol wipes in preparation for sealant application. All mounting holes must be circled. For corner sealing and "T" joint locations, 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 assembled within 20 minutes and torqued in place within 45 minutes. The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

STANDARD PROCEDURE > HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

CAUTION:

DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Disconnect and isolate the negative battery cable. If equipped with an Intelligent Battery Sensor (IBS), disconnect the IBS connector first before disconnecting the negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).
6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from reoccurring.

   CAUTION:

   Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect the negative battery cable. If equipped with an Intelligent Battery Sensor (IBS), connect the IBS connector to the negative battery cable.
13. Start engine and check for any leaks.

STANDARD PROCEDURE > REPAIR DAMAGED OR WORN THREADS

CAUTION:

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

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

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

SPECIFICATIONS > ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Type	In-Line OHV, SOHC	
Number of Cylinders	4	
Firing Order	1-3-4-2	
Compression Ratio	11.0:1	
Maximum Engine Speed	5500 RPM	
Displacement	1.6 L E-Torque (1598 cc)	97.6 cu. in.
Oil Capacity	4.3 L	4.5 qt.
Coolant Capacity	5.6 L	5.9 qt.
Maximum Power	81 kw @ 5500 RPM	110 hp @ 5500 RPM
Maximum Torque	152 N.m @ 4500 RPM	112 ft. lbs. @ 4500 RPM
Maximum Torque	15.5 Kg @ 4500 RPM	112 ft. lbs. @ 4500 RPM
Bore	77 mm	3.03 in.
Stroke	85.8 mm	3.37 in.

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum	
Cylinder Bore Diameter		
Cylinder Bore Internal Diameter	76.993 - 77.007 mm	3.0312 - 3.0317 in.
Oversize inner diameter cylinder bore	0.010 mm	0.0003 in.

Cylinder Bore Out-of-Round	± 0.005 mm	± 0.0001 in.
Cylinder Bore Taper	± 0.005 mm	± 0.0001 in.
Cylinder liner inner diameter oversize	0.010 mm	0.0003 in.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Connecting Rod Journal Diameter		
Journal Grade		
A (red)	1.480 - 1.484 mm	0.0582 - 0.0584 in.
B (blue)	1.485 - 1.489 mm	0.05846 - 0.0586 in.
C (yellow)	1.490 - 1.494 mm	0.0586 - 0.0588 in.
Oversized Connecting Rod Half-Bearing Thickness	1.541 - 1.547 mm	0.0606 - 0.0609 in.
Main Bearing Journal Diameter		
Journal Grade		
1	1.980 - 1.984 mm	0.0779 - 0.0781 in.
2	1.984 - 1.988 mm	0.0781 - 0.0782 in.
3	1.989 - 1.993 mm	0.0783 - 0.0784 in.
Oversized Main Half-Bearing Thickness	2.105 - 2.111 mm	0.0828 - 0.0831 in.
Clearance Between Main Bearings - Crankshaft Main Journals	0.015 - 0.034 mm	0.0005 - 0.0013 in.
Thrust Half-Washer Thickness	2.08 - 2.18 mm	0.0818 - 0.0858 in.
Crankshaft End Float	0.033 - 0.050 mm	0.00129 - 0.00196 in.
Main Journal Seat Diameter	51.997 - 52.007 mm	2.0471 - 2.0475 in.
Crankshaft Main Journal Diameter	47.992 - 48.008 mm	1.8894 - 1.8900 in.
Crankshaft Diameter	43.992 - 44.008 mm	1.7319 - 1.7325 in.
Main Journal Diameter Undersize	0.127 mm	0.0049 in.
Crankshaft Diameter Undersize	0.127 mm	0.0049 in.

CONNECTING ROD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance Connecting Rod Bearings - Crankshaft Crankpins	0.021 - 0.037 mm	0.0008 - 0.0014 in.
Big End Inner Diameter	46.991 - 47.005 mm	1.8500 - 1.8505 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Diameter		
Piston Outer Diameter	76.965 - 76.974 mm	3.0301 - 3.0304 in.
Piston Outer Diameter Oversize	0.40 mm	0.0157 in.
Permitted Weight Difference Between Pistons	± 5 g	± 0.1763 oz.
Piston Outer Diameter Oversize	0.1 mm	0.0039 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Compression 1st Sealing Ring Gap	0.2 mm	0.0070 in.
Cylinder Compression 2nd Sealing Ring Gap	0.2 mm	0.0070 in.
Engine Piston Oil Scraper Ring Gap	0.25 mm	0.0088 in.
Cylinder Compression 1st Sealing Ring Thickness	1.170 - 1.230 mm	0.0412 - 0.0433 in.
Cylinder Compression 2nd Sealing Ring Thickness	1.172 - 1.210 mm	0.0413 - 0.0426 in.
Piston Oil Scraper Ring Thickness	2.340 - 2.480 mm	0.0825 - 0.0874 in.
Sealing Ring Seat in Piston - 1st Groove	1.220 - 1.250 mm	0.0430 - 0.0440 in.

Sealing Ring Seat in Piston - 2nd Groove	1.215 - 1.235 mm	0.0428 - 0.0435 in.
Sealing Ring Seat in Piston - 3rd Groove	2.521 - 2.541 mm	0.0889 - 0.0896 in.
Cylinder Compression 1st Sealing Ring End Float	0.010 - 0.080 mm	0.0003 - 0.0028 in.
Cylinder Compression 2nd Sealing Ring End Float	0.025 - 0.063 mm	0.0008 - 0.0022 in.
Engine Piston Oil Scraper Ring End Float	0.041 - 0.201 mm	0.0014 -0.0070 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Small End Piston Pin Housing Diameter	18.96 - 18.98 mm	0.7464 - 0.7472 in.
Piston Pin-Small End Interference	0.020 - 0.045 mm	0.0007 - 0.0017 in.
Diameter of Piston Pin Housing on the Piston	18.992 - 19.012 mm	0.7477 - 0.74850 in.
Gudgeon Pin Outer Diameter	18.995 - 19.000 mm	0.7478 - 0.7480 in.
Piston to Piston Pin Clearance	0.008 - 0.017 mm	0.0003 - 0.0006 in.

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Material	Cast Aluminum - Heat Treated	
Cylinder head height	97 mm	3.4215 in.
Combustion chamber volume (cc)	31.6 - 33.0 cc	

VALVE SEAT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Valve Seat Band Angle in Contact With Inlet Valves	44°30' - 44°	

Valve Seat Band Angle in Contact With Exhaust Valves	44°30' - 45°

VALVE GUIDE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Valve Guide Seat Diameter	11.000 - 11.020 mm	0.4330 - 0.4338 in.
Valve Guide Inner Diameter	5.975 - 6.000 mm	0.2352 - 0.2362 in.
Valve Guide Outer Diameter	11.049 - 11.064 mm	0.4349 - 0.4355 in.
Valve Guide Outer Diameter Oversizes	0.05/0.10/0.25 mm	0.0019/0.0039/0.0098 in.
Intake Valve/Valve Guide Clearance	0.023 - 0.066 mm	0.0009 - 0.0025 in.
Exhaust Valve/Valve Guide Clearance	0.051 - 0.094 mm	0.0020 - 0.0037 in
Interference Between Valve Guides and Valve Guide Seats	0.029 - 0.064 mm	0.0011 - 0.0025 in.

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Valve Outer Diameter		
Intake	30.60 - 30.86 mm	1.2047 - 1.2149 in.
Exhaust	23.13 - 23.39 mm	0.9106 -0.9208 in.
Valve Stem Diameter		
Intake	5.934 - 5.952 mm	0.2336 - 0.2343 in.
Exhaust	5.906 - 5.924 mm	0.2325 - 0.2332 in.

VALVE SPRINGS

DESCRIPTION	SPECIFICATION	
-	Metric	Standard
Valve Spring Free Length	51.3 mm	2.0196 in.
Length of Valve Springs Under a Load of 285 - 319 N	43.0 mm	1.6929 in.

Length of Valve Springs Under a Load of 759 - 833 N	34.45 mm	1.3562 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cam Journal Diameter	25.29 - 25.30 mm	0.9956 - 0.9960 in.
Cam Support Diameter	25.359 - 25.380 mm	0.9983 - 0.9992 in.
Cam Pin/Support Clearance	0.050 - 0.070 mm	0.0019 -0.0027 in.
End Play	0.013 - 0.023 mm	0.0005 - 0.0009 in.
Intake Camshaft Total Lift	35.33 mm	1.3909 in.
Exhaust Camshaft Total Lift	35.76 mm	1.4078 in.
Nominal Intake Camshaft Lift	5.1429 mm	0.2024 in.
Nominal Exhaust Camshaft Lift	5.5701 mm	0.2192 in.

OIL PRESSURE

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Engine Oil Delivery Pressure at Idle	1.0 bar	14.5 psi
Engine Oil Supply Pressure At 4000 RPM	2.8 - 3.8 bar	40.6 - 55.1 psi.

SPECIFICATIONS > TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

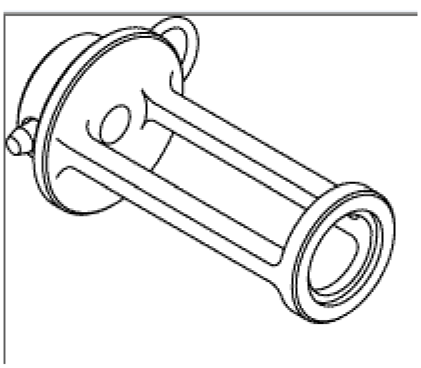
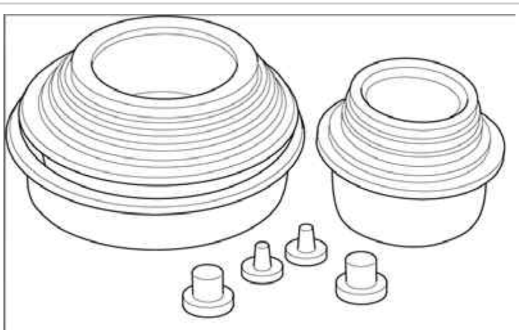
DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	NEW FASTENER*
A/C Lines to Compressor	20	15	-	-
A/C Compressor Mounting Bracket Bolts	25	18	-	-
A/C Compressor Bolts	25	18	-	-
Belt Tensioner Bolts	9	-	80	-
Camshaft Position Sensor	9	-	80	-

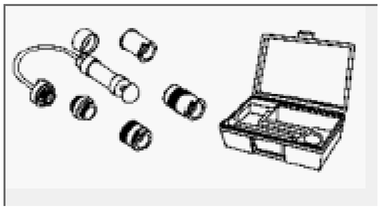
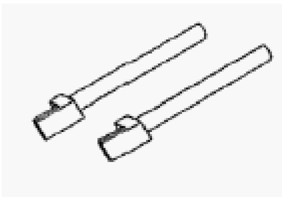
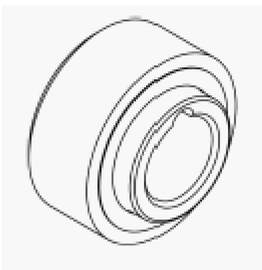
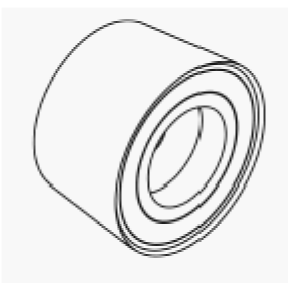
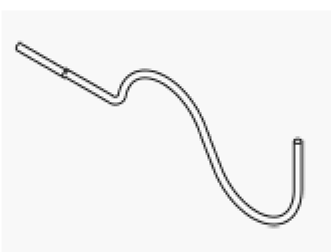
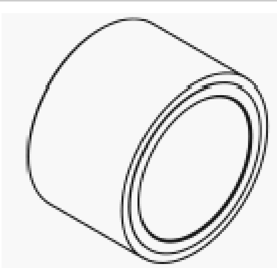
Camshaft Sprocket VVT Bolt	115	85	-	-
Coolant Connector Pipe Bolts	12	9	-	-
Coolant Chamber Cover Bolts	12	9	-	-
Connecting Rod Caps	16 + 90°	12 + 90°	-	X
Crankshaft Position Sensor Bolt	9	-	80	-
Cylinder Head Bolts	Refer to CYLINDER HEAD, REMOVAL AND INSTALLATION .			-
Cylinder Head Cover Bolts	12	9	-	-
Cylinder Head Access Caps	18	13	-	-
Engine Timing Cover Bolts	13	10	-	-
Exhaust Manifold/Catalytic Converter to Cylinder Head Bolts	25	18	-	X
Engine to Transmission Bolts	60	44	-	-
Exhaust Manifold Heat Shield Bolts	8	-	71	-
Exhaust Manifold/Catalytic Converter Lower Bracket Bolts	25	18	-	-
Exhaust Pipe to Exhaust Manifold/Catalytic Converter Bolts	20	15	-	-
Exhaust Pipe Bracket Bolts	25	18	-	-
Flywheel Bolt	40 + 40°	30 + 30°	-	-
Flywheel Lower Guide Bolts	60	44	-	-
Flywheel Upper Guide Bolts	60	44	-	-
Generator Bolts	25	18	-	-
Idler Pulley Bolt	35	26	-	-
Ignition Coils	9	-	80	-
Intake Manifold Bolts	28	21	-	X
Knock Sensor Bolt	25	18	-	-
Ladder Frame to Block Bolts	-			
M8 Bolts	26	19	-	-
M10 Bolts	61	45	-	-
Left Engine Mount	-			-
M8 Bolts	35	26	-	-
M10 Bolts	67	49	-	-

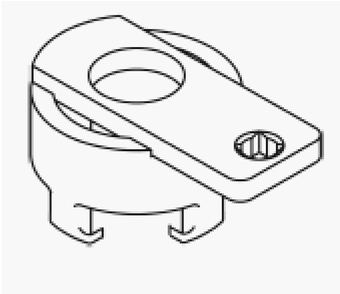
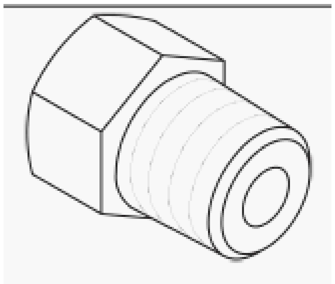
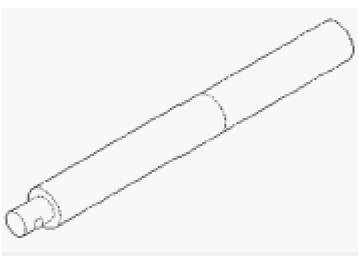
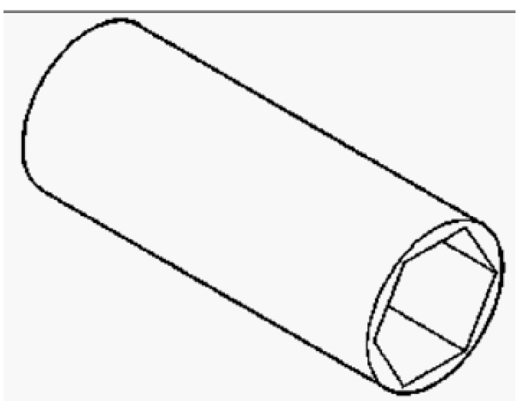
Left Engine Mount to Adapter Bracket Bolts	40 + 45°	30 + 45°	-	-
Left Engine Mount to Frame Rail Bolts	120	89	-	-
Oil Filter Cap	25	18	-	-
Oil Filter Housing	27	20	-	-
Oil Jet Bolt	12	9	-	-
Oil Pan Bolts	31	23	-	-
Oil Pan to Transmission Bolts	60	44	-	-
Oil Pan Drain Plug	20	15	-	-
Oil Pressure Sensor	32	24	-	-
Oil Pump Pick-up Tube Bolts	12	9	-	-
Oxygen Sensor	45	32	-	-
Rocker Arm Shaft Bolt	28	21	-	-
Rear Engine Mount to Transmission Bolt	90 + 45°	66 + 45°	-	X
Rear Engine Mount to Cradle Bolt	90 + 45°	66 + 45°	-	-
Rear Engine Mount to Pivot Bracket Bolt (Transmission Side)	40 + 45°	30 + 45°	-	-
Rear Engine Mount to Pivot Bracket Bolt (Cradle Side)	40 + 45°	30 + 45°	-	-
Right Engine Mount Bracket Bolts	100	74	-	-
Right Engine Mount to Frame Rail	60 + 45°	44 + 45°	-	-
Right Engine Mount to Engine Mount Bracket	90 + 45°	66 + 45°	-	-
Spark Plugs	30	22	-	-
Starter Motor Bolts	38	28	-	-
Thermostat Housing Bolts	14	10	-	-
Throttle Body Bolts	9	-	80	-
Timing Chain Tensioner	63	46	-	-
Timing Chain Guide Bolt	23	17	-	-
Transmission to Engine Bolts	60	44	-	-
Transmission to Oil Pan	60	44	-	-
Vibration Damper Bolt	40 + 55°	30 + 55°	-	-
Water Pump Bolts	28	21	-	-

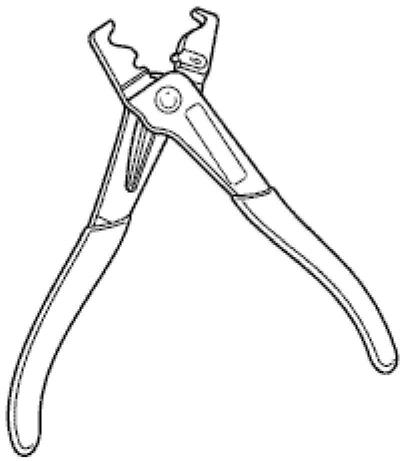
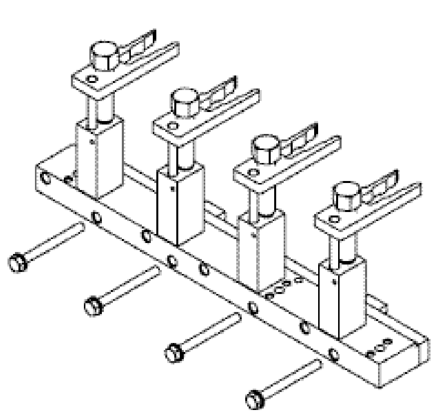
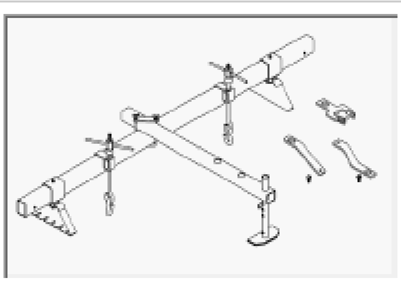
***NEW FASTENER:** Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.

SPECIAL TOOLS > SPECIAL TOOLS

	2025300090 - Alignment Pins, Multiair to Cylinder Head
	2029400090 - Tool, Engine Mount Alignment
	10224 - Adapter, Valve Spring (Originally Shipped In Kit Number(s) 10223.)
	10368 - Set, Universal Protective Cap

	7700-A - Tester, Cooling System
	8189 - Guide Pins (Originally Shipped In Kit Number(s) 8180, 8180CC, 8263, 8263CC.)
	9506 - Installer, Oil Seal (Originally Shipped In Kit Number(s) 9610, 9970.)
	9509 - Installer, Oil Seal (Originally Shipped In Kit Number(s) 9610, 9970.)
	9703 - Pin, Tensioner (Originally Shipped In Kit Number(s) 9610, 9970.)
	9706 - Installer, Crankshaft Rear Oil Seal (Originally Shipped In Kit Number(s) 9610, 9970.)

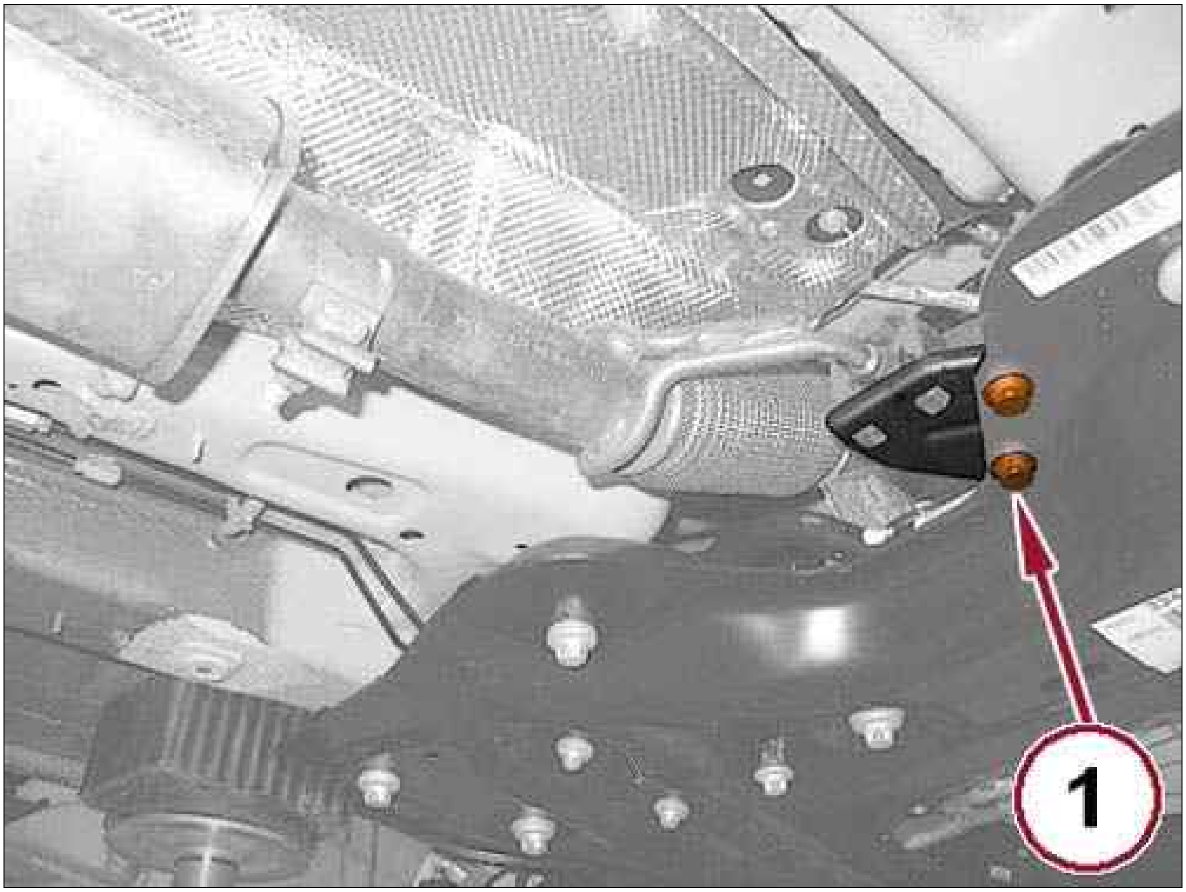
	9707 - Holder, Vibration Damper (Originally Shipped In Kit Number(s) 9610, 9970.)
	9879 - Adapter, Oil Pressure Test (Originally Shipped In Kit Number(s) 9998.)
	C-3685-A - Bloc-Chek Kit
	C-4171 - Driver Handle, Universal (Originally Shipped In Kit Number(s) 9202, 9202A-CAN, 9202CC, 9299, 9299CC, 9299CC, 9300A-CAN.)
	C-4597 - Socket, Oil Pressure

	MD998772A - Compressor, Valve Spring (Originally Shipped In Kit Number(s) 8678, 8853, 8854.)
	10288 - Pliers, Hose Clamp
	10259B - Compressor, MultiAir® Spring
	8534B - Fixture, Driveline Support (Originally Shipped In Kit Number(s) 8534, 8534B, 8849, 9565.)

REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Open the fuse box casing lid in the engine compartment and remove fuse F21 (15 Amp) from the fuel pump.
2. Start-up several times until all the pressure in the fuel distribution manifold has discharged.
3. Fit the fuse removed previously and close the fuse box casing.
4. Remove the left and right front tire and wheel. Refer to REMOVAL AND INSTALLATION .
5. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
6. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
7. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
8. Remove the battery tray. Refer to TRAY, BATTERY, REMOVAL AND INSTALLATION .
9. Drain the manual transmission gear oil. Refer to appropriate Transmission Service Information article.
10. Drain the cooling system. Refer to STANDARD PROCEDURE .
11. Recover the refrigerant from the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
12. Remove the left front half shaft. Refer to REMOVAL AND INSTALLATION .
13. Remove the right front half shaft. Refer to REMOVAL AND INSTALLATION .
14. Remove the front fascia. Refer to FASCIA, FRONT, REMOVAL AND INSTALLATION .
15. Remove the left front head lamp unit. Refer to UNIT, FRONT LAMP, REMOVAL AND INSTALLATION .
16. Remove the right front head lamp unit. Refer to UNIT, FRONT LAMP, REMOVAL AND INSTALLATION .
17. Remove the head lamp cross member. Refer to CROSSMEMBER, HEADLAMP MOUNTING, REMOVAL AND INSTALLATION .
18. Remove the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
19. Remove the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .

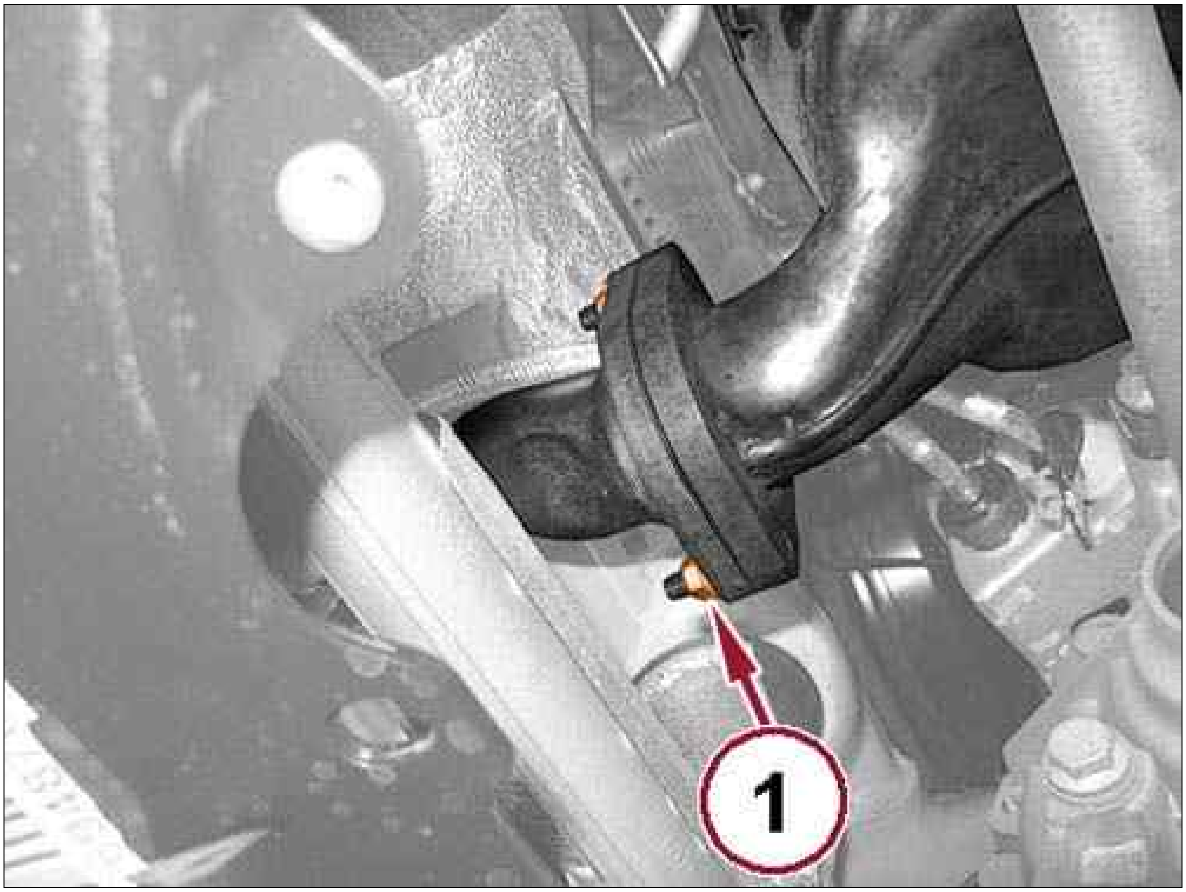
Fig 1: Exhaust Pipe Mounting Bracket Screws



Courtesy of CHRYSLER GROUP, LLC

20. Loosen the screws (1) fixing the exhaust pipe mounting bracket.

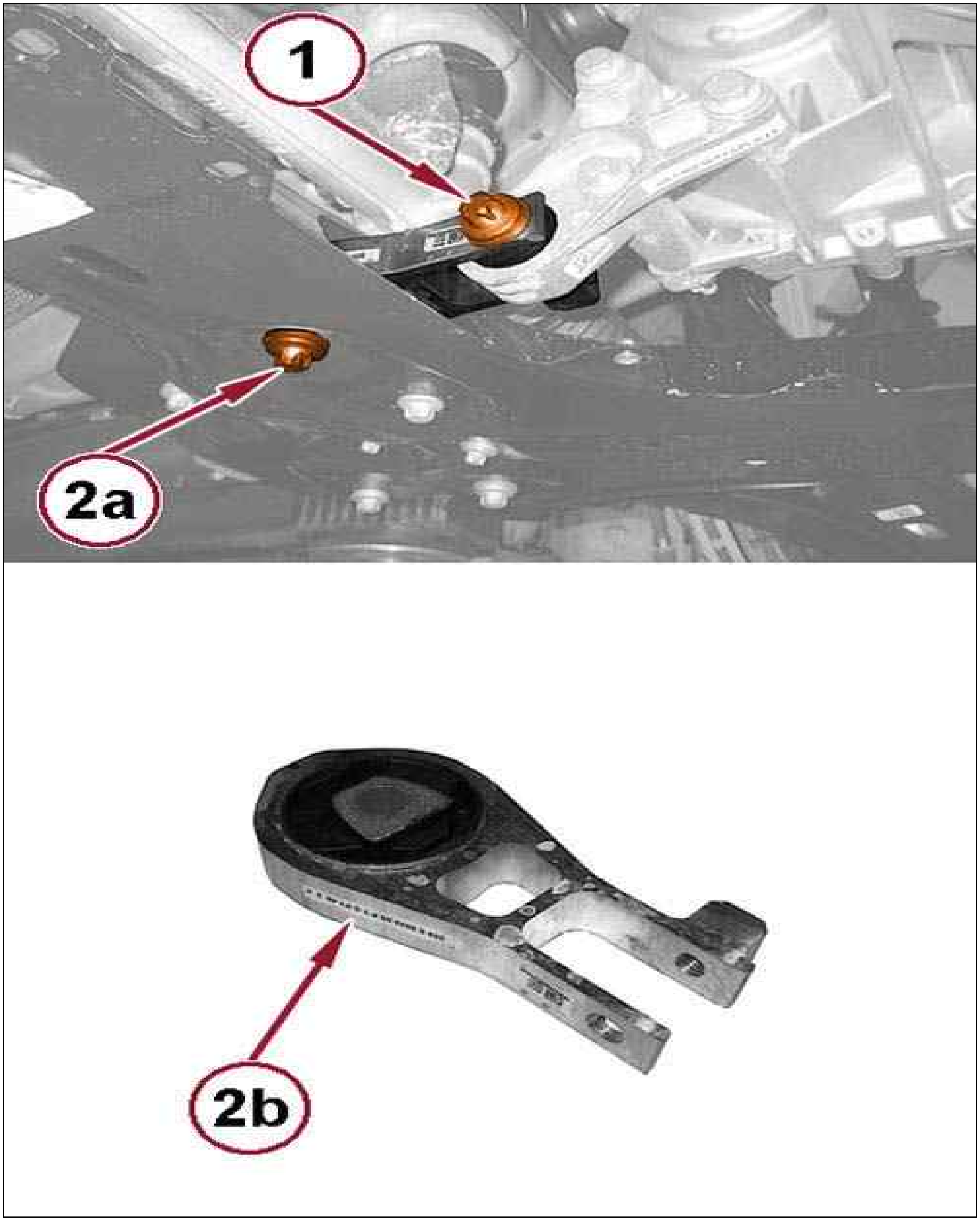
Fig 2: Exhaust Pipe To Catalytic Converter Nut



Courtesy of CHRYSLER GROUP, LLC

21. Undo the nuts and disconnect the exhaust pipe from the catalytic converter.
22. Remove the gasket.

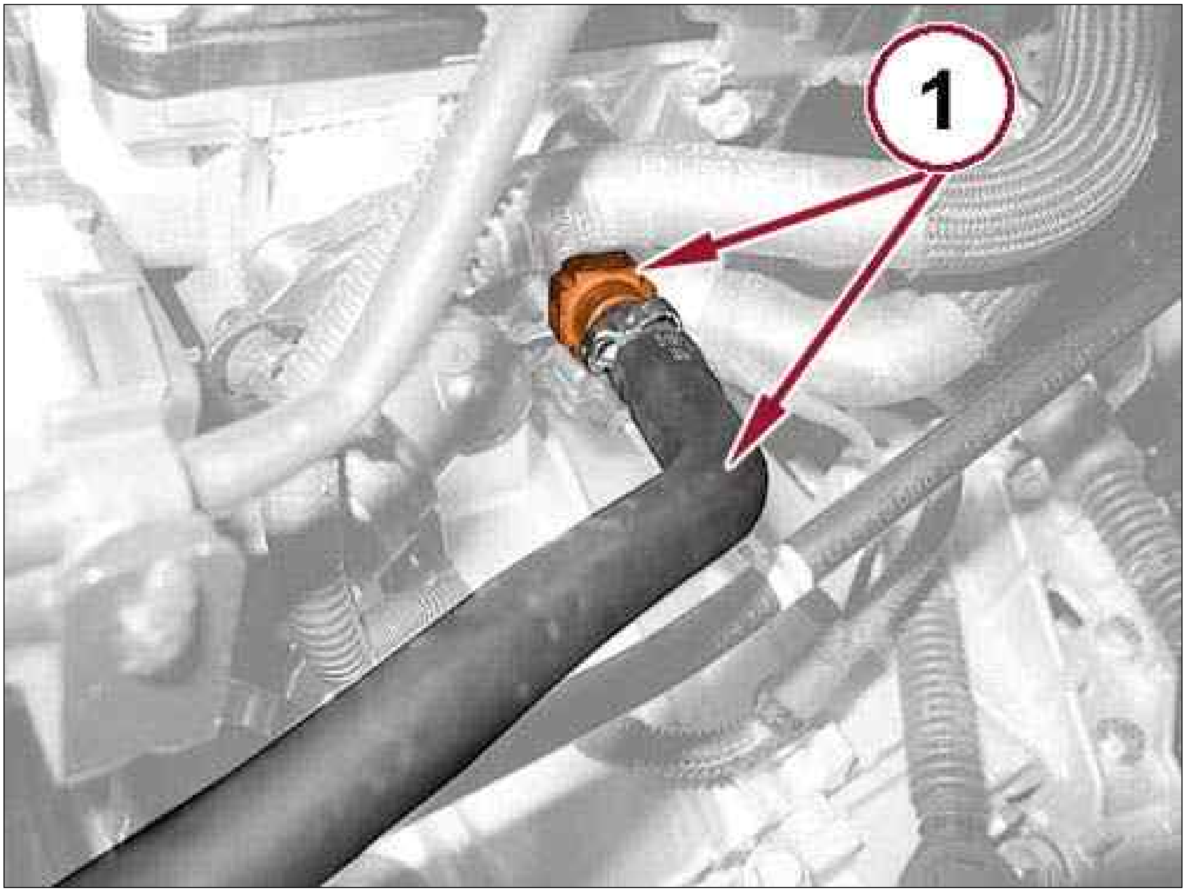
Fig 3: Lower Reaction Rod To Bracket Bolt, Lower Reaction Rod & Bolt



Courtesy of CHRYSLER GROUP, LLC

23. Position a suitable hydraulic lift underneath the gearbox.
24. Undo the bolt (1) securing the lower reaction rod to the bracket on the differential.
25. Undo the bolt (2a) and remove the lower reaction rod (2b) from the front suspension crossmember.
26. Remove the hydraulic lift.

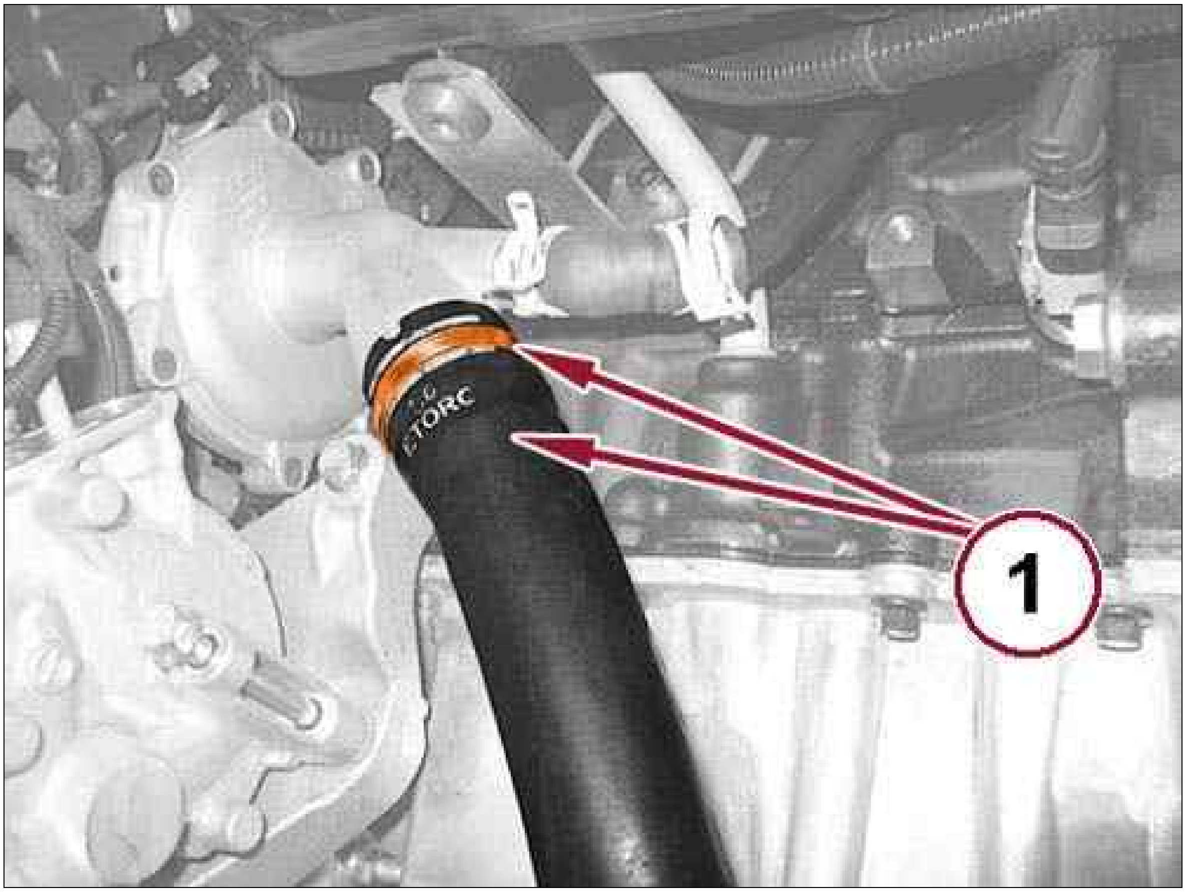
Fig 4: Quick Coupling At Degassing Pipe - Thermostat Side



Courtesy of CHRYSLER GROUP, LLC

27. Disconnect the quick coupling for the degassing pipe (1), thermostat side.

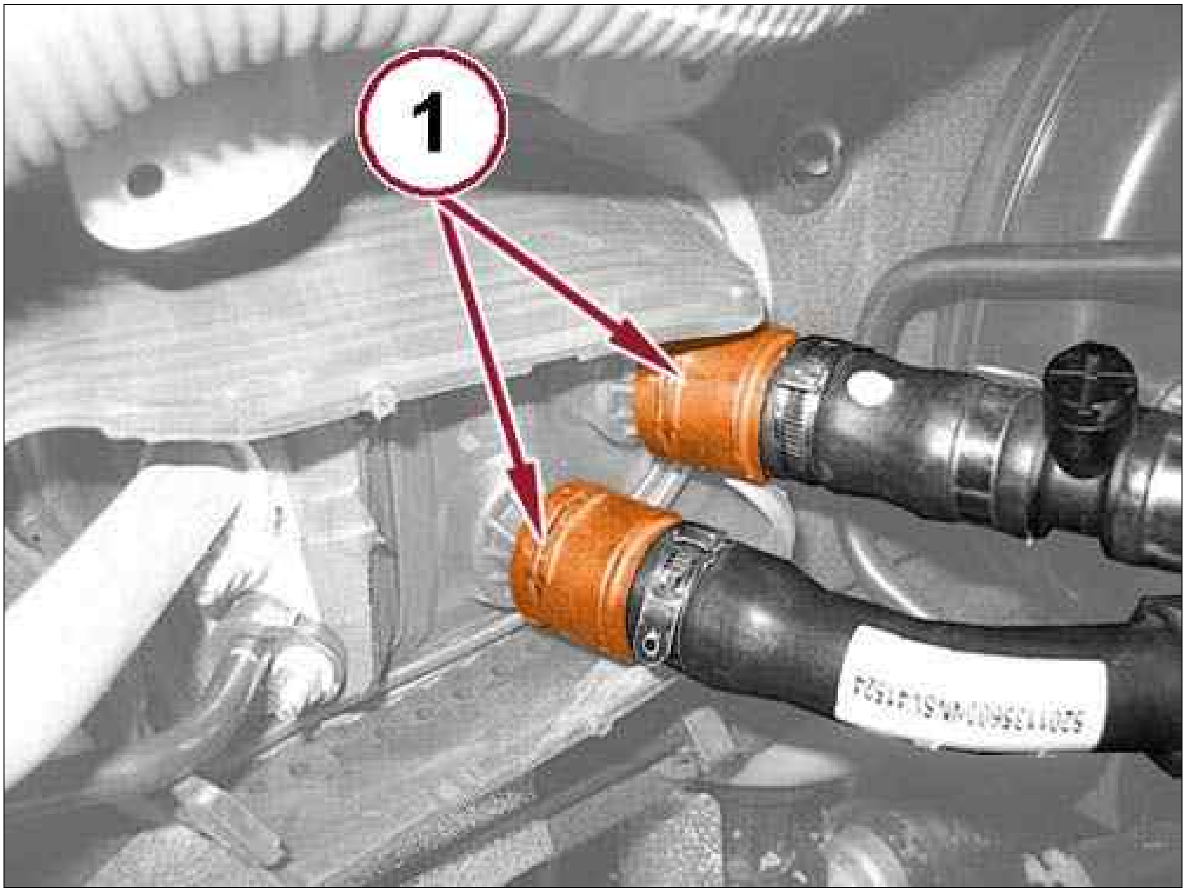
Fig 5: Return Pipe To Water Pump & Band



Courtesy of CHRYSLER GROUP, LLC

28. Loosen the band and remove the return pipe (1) to the water pump, complete with the reservoir.

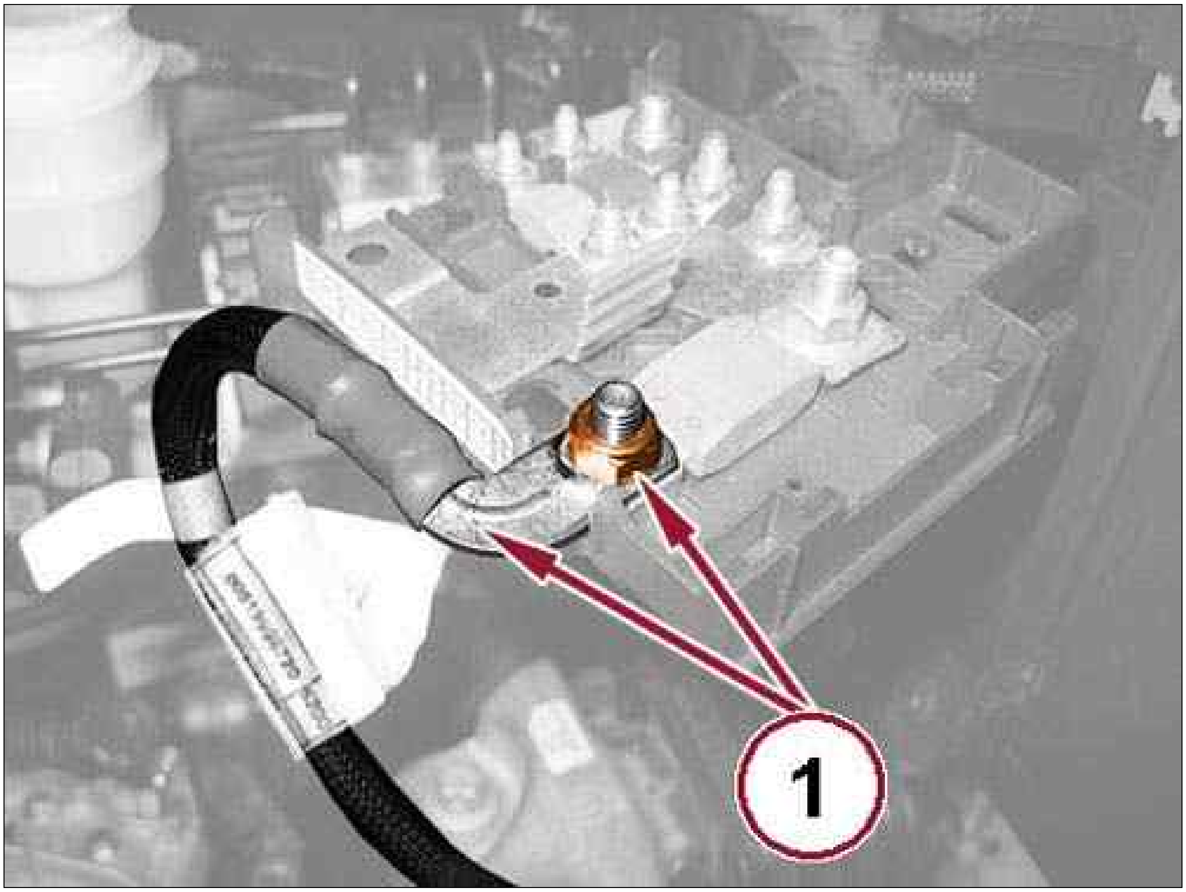
Fig 6: Quick Couplings At Heater Supply & Return Pipes



Courtesy of CHRYSLER GROUP, LLC

29. Disconnect the quick couplings for the heater supply and return pipes (1).

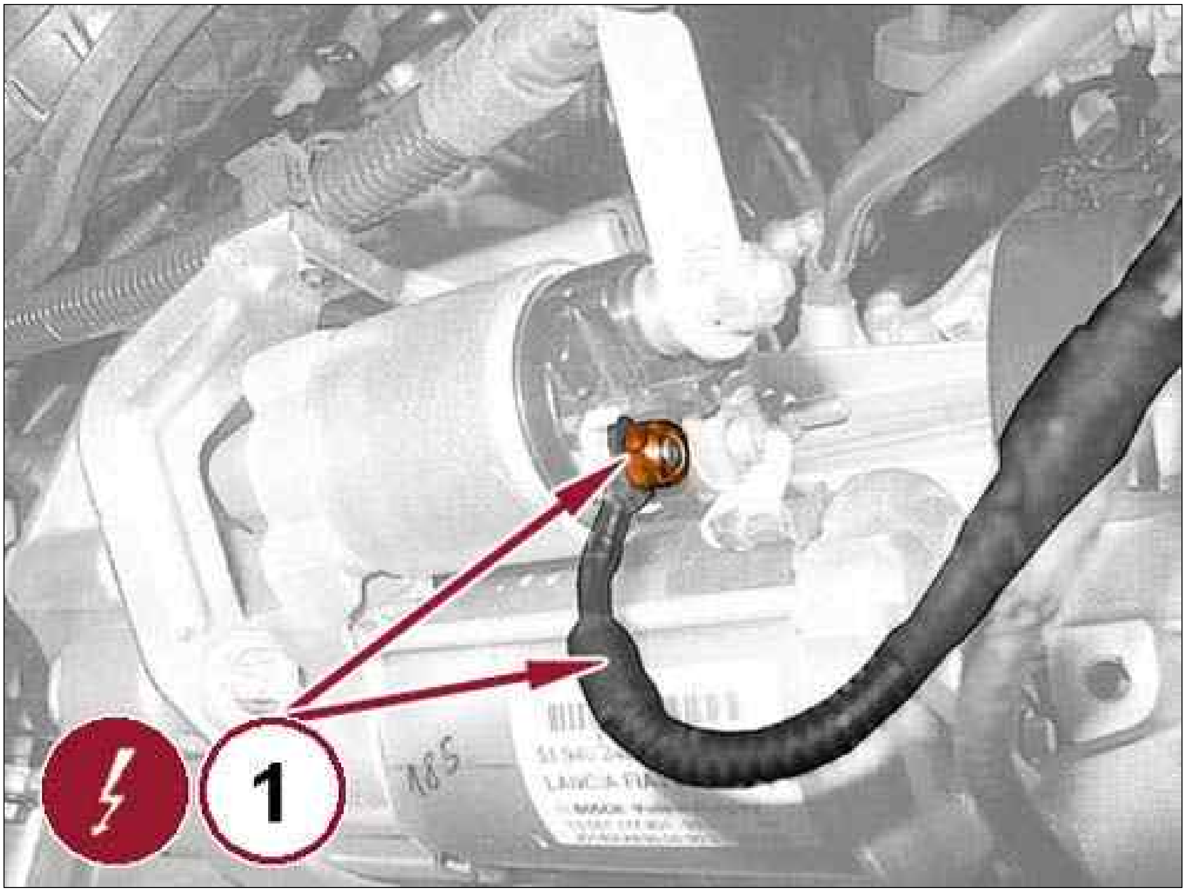
Fig 7: Starter Supply Cable & Nut



Courtesy of CHRYSLER GROUP, LLC

30. Undo the nut and disconnect the starter supply cable (1).

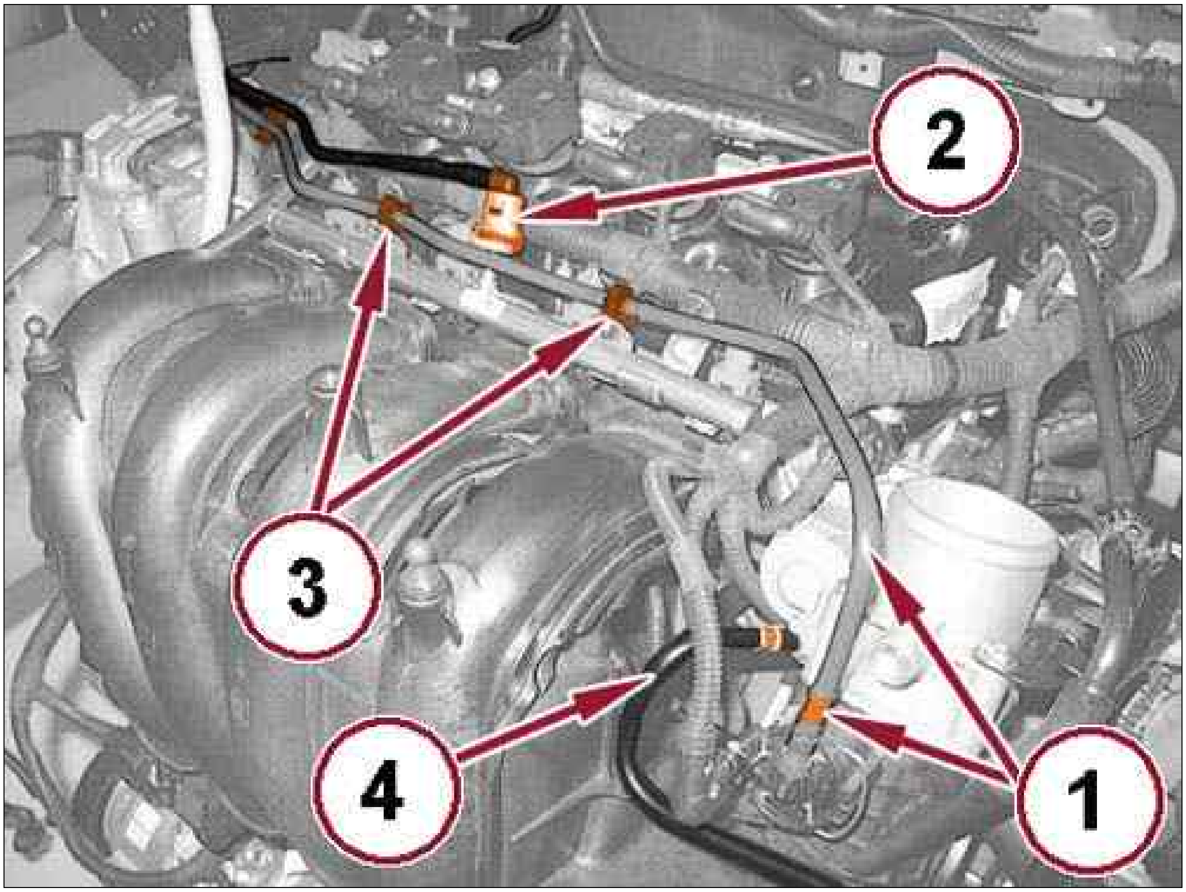
Fig 8: Starter Cable & Nut



Courtesy of CHRYSLER GROUP, LLC

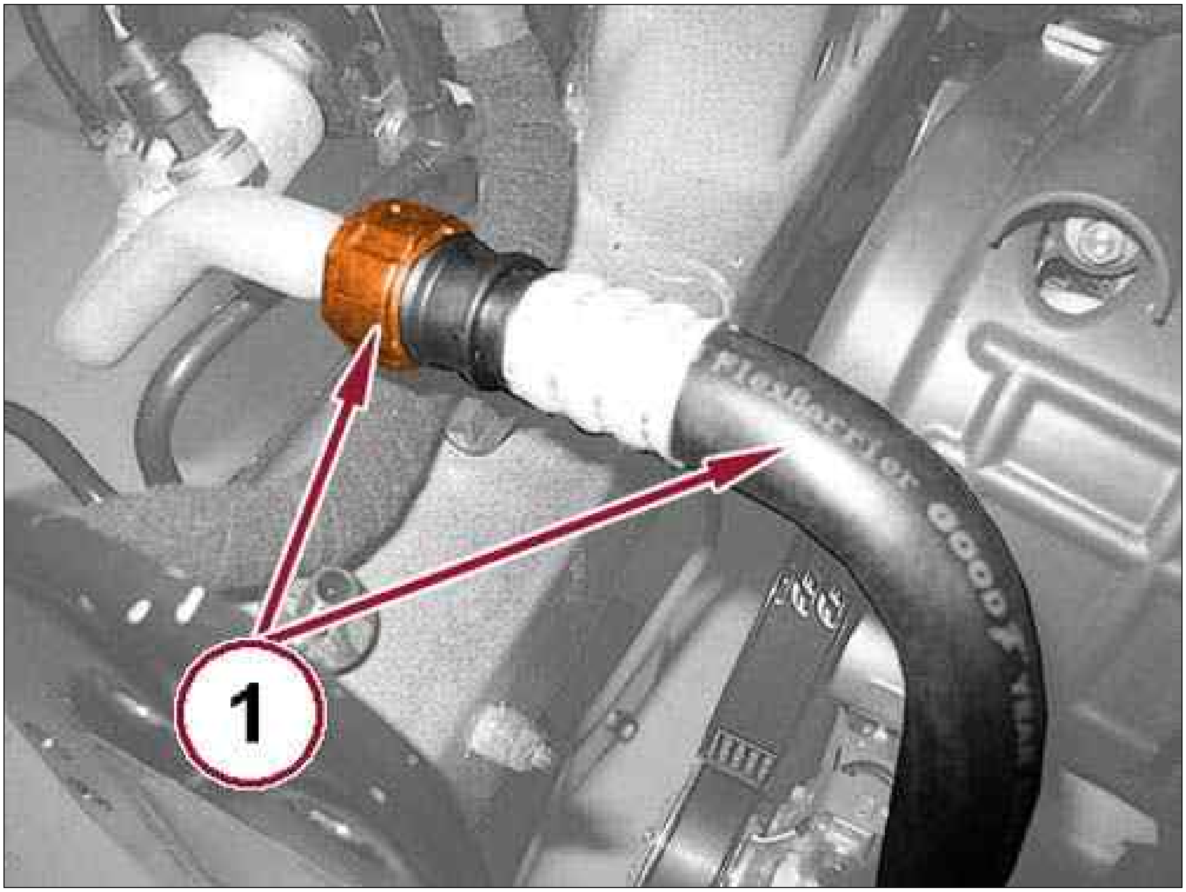
31. Undo the nut and disconnect the starter cable (1).

Fig 9: Front Fuel Vapor Pipe & Band At Solenoid Valve Side, Quick Coupling At Fuel Manifold Supply Pipe At Rail Side, Pipe Retaining Clips & Vacuum Air Pipe & Band At Throttle Body



32. Loosen the band and disconnect the front fuel vapor pipe, solenoid valve side (1).
33. Disconnect the quick coupling for the fuel manifold supply pipe, rail side (2).
34. Open the clips retaining the pipes previously disconnected (3).
35. Loosen the band and disconnect the vacuum air pipe from the throttle body (4).

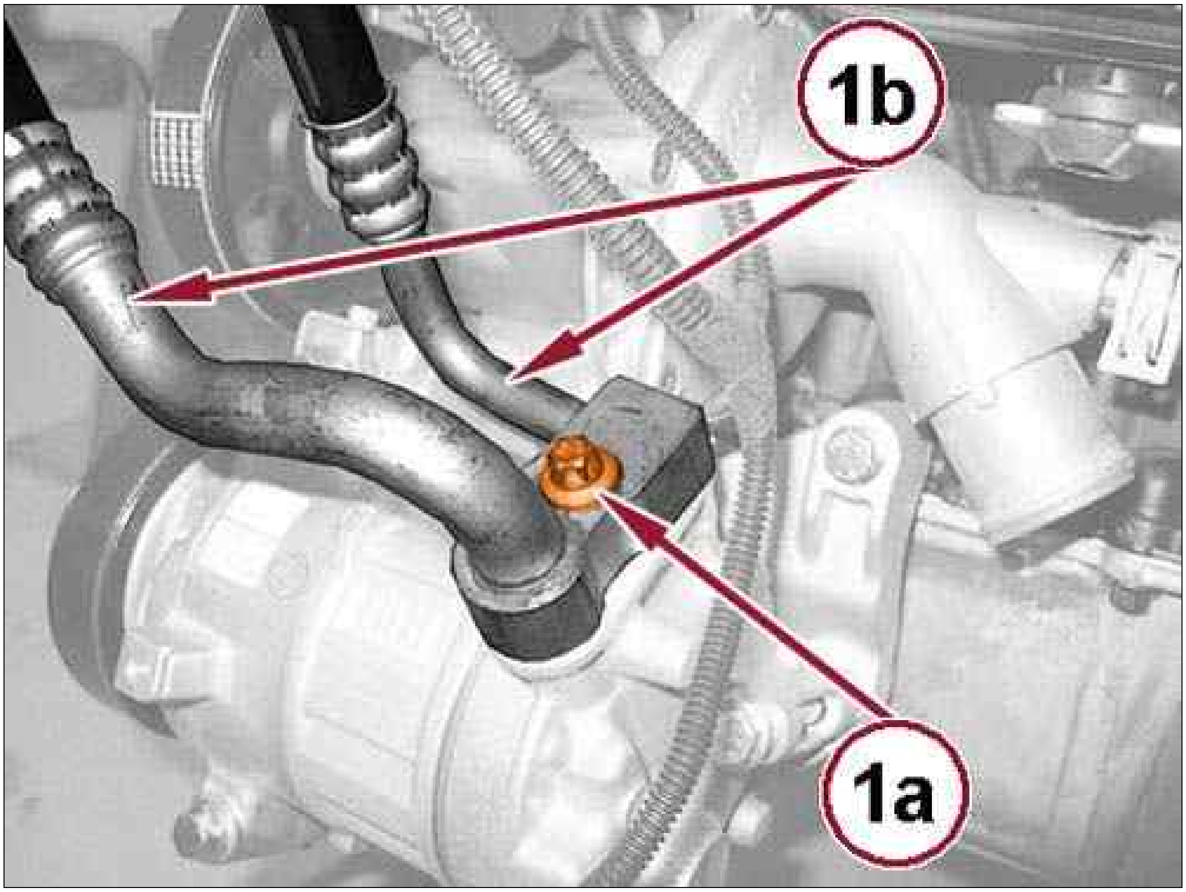
Fig 10: Quick Coupling At Front Coolant Return Pipe At Evaporator



Courtesy of CHRYSLER GROUP, LLC

36. Disconnect the quick coupling for the front coolant return pipe (1) from the evaporator.

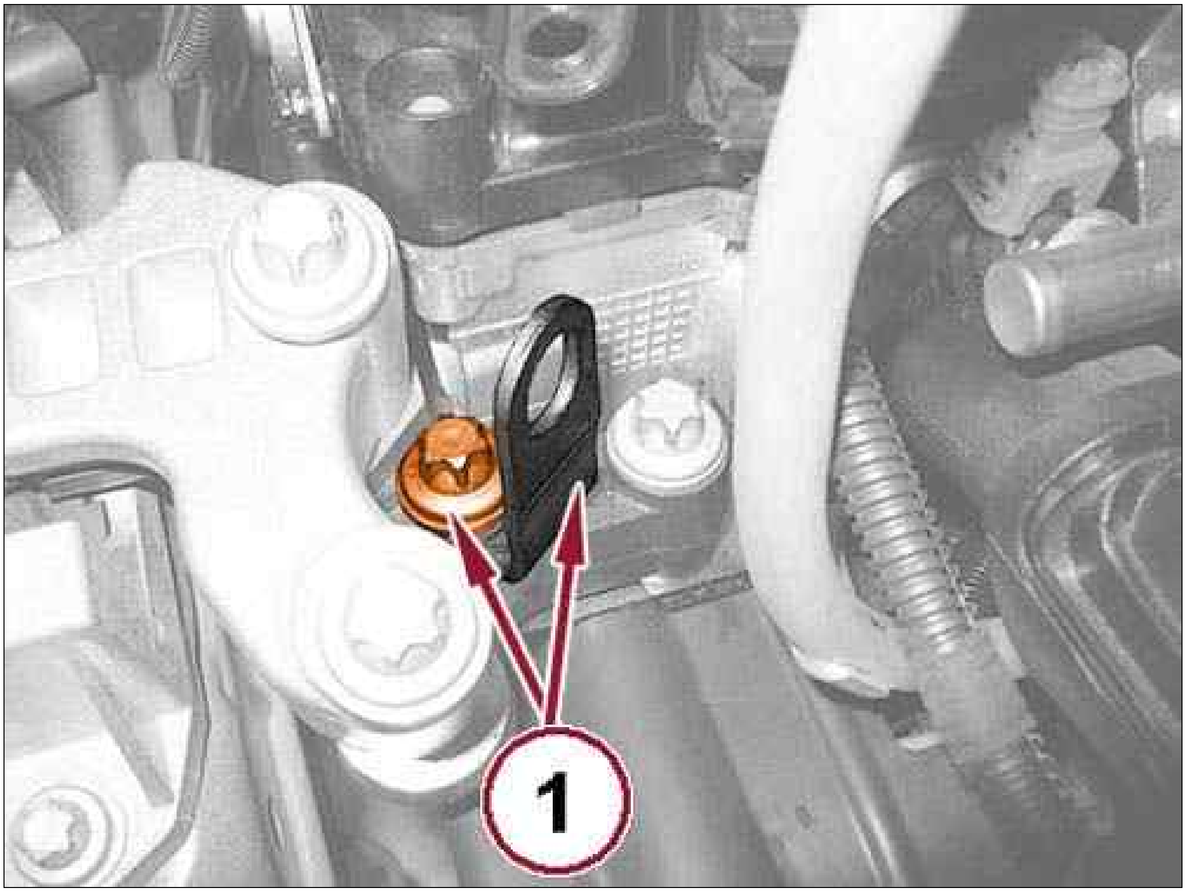
Fig 11: Coolant Pipes At Compressor & Screw



Courtesy of CHRYSLER GROUP, LLC

37. Undo the screw (1a), disconnect and remove the coolant pipes (1b) from the compressor.

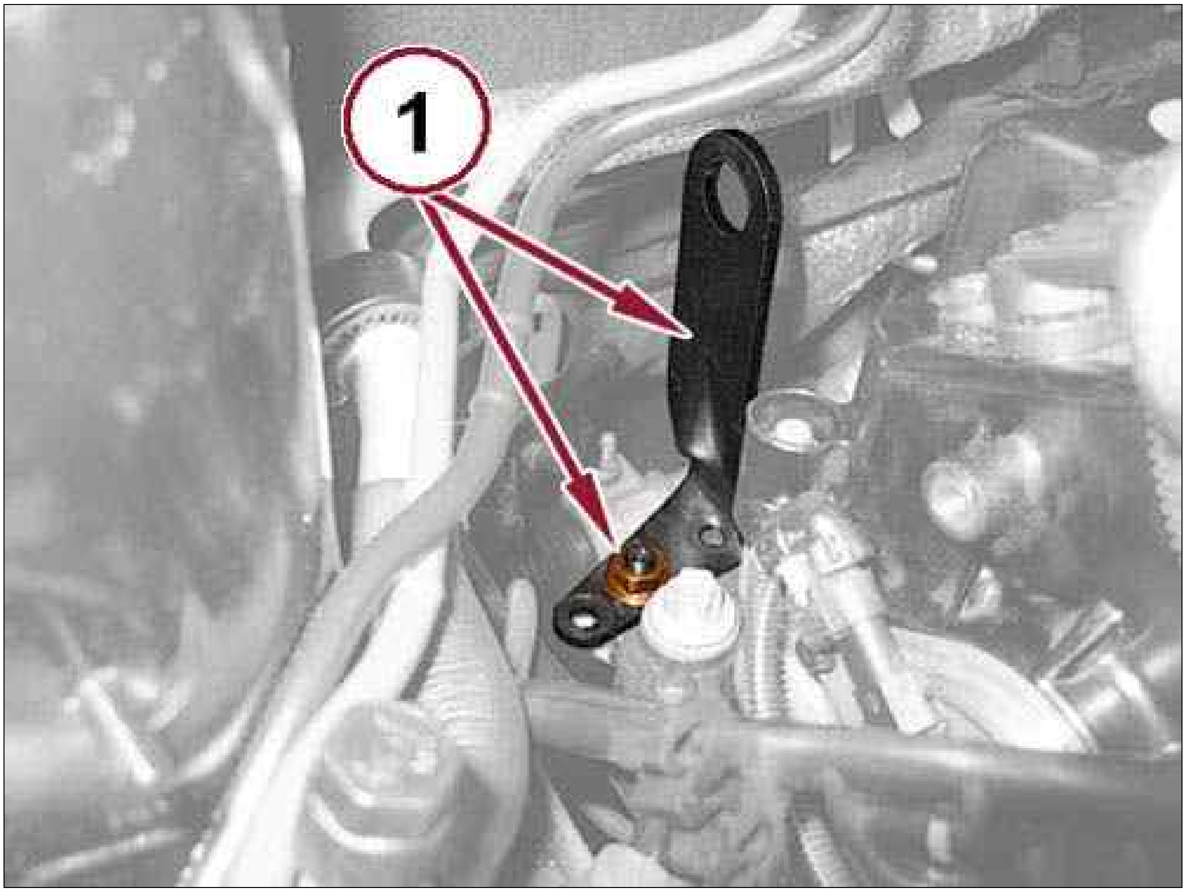
Fig 12: Lifting Bracket & Screw



Courtesy of CHRYSLER GROUP, LLC

38. Using the rigid power unit support front fixing screw, timing side, fit the lifting bracket (1).

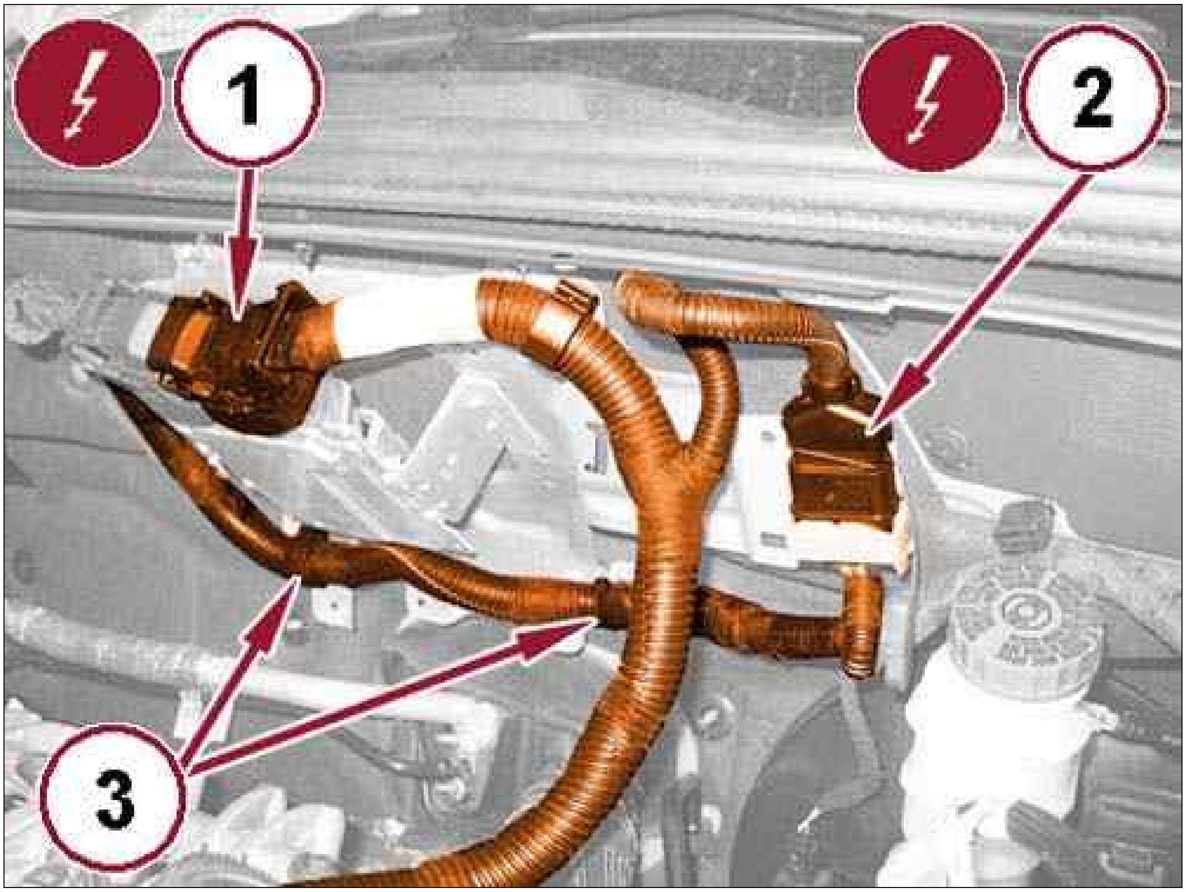
Fig 13: Lifting Bracket & Screw



Courtesy of CHRYSLER GROUP, LLC

39. Using the rigid power unit support rear opening, timing side, fit the lifting bracket (1).

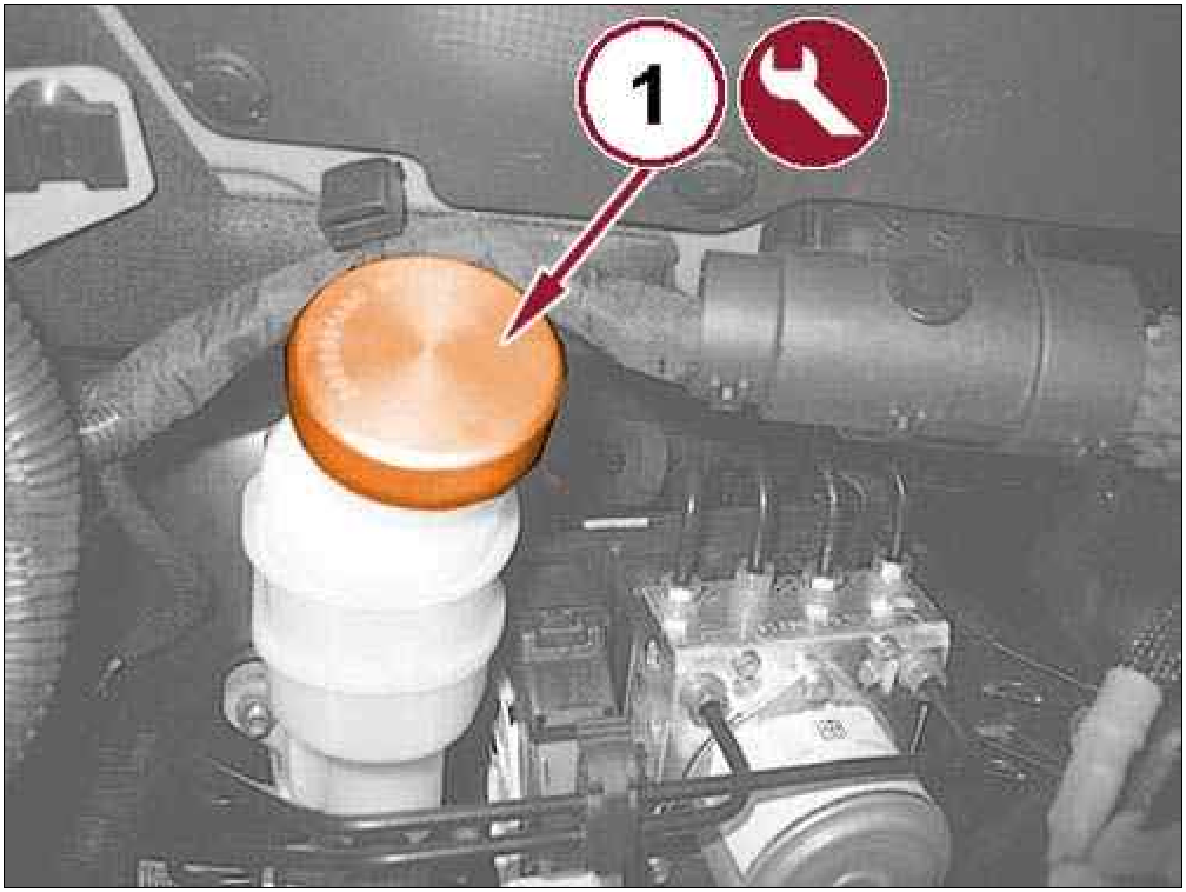
Fig 14: Injection Control Unit Wire Harness Connectors & Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

40. Disconnect the injection control unit wire harness connectors (1, 2).
41. Disconnect the engine front coupling.
42. Open the retaining clips (3) and release the wiring.

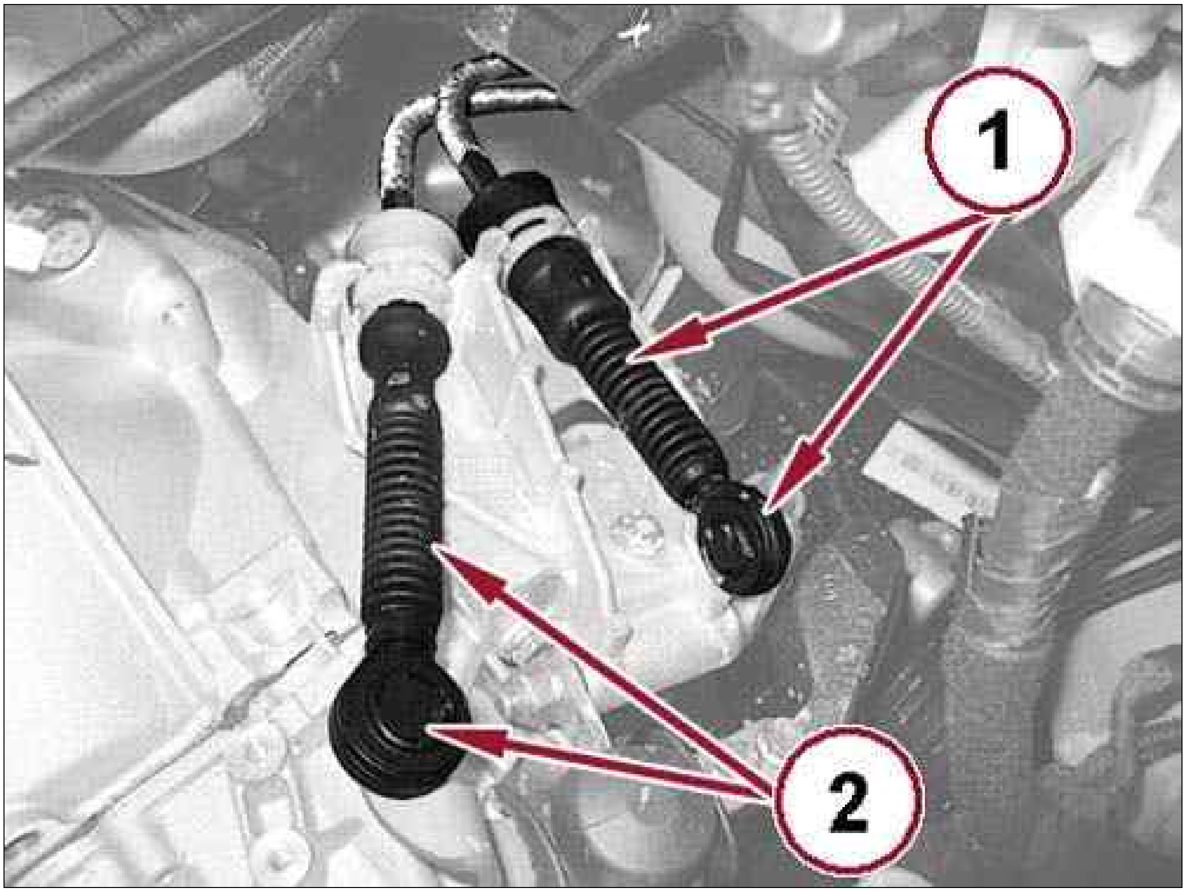
Fig 15: Special Tool On Reservoir



Courtesy of CHRYSLER GROUP, LLC

43. Unscrew the cap and fit the tool 2000001400 (1).

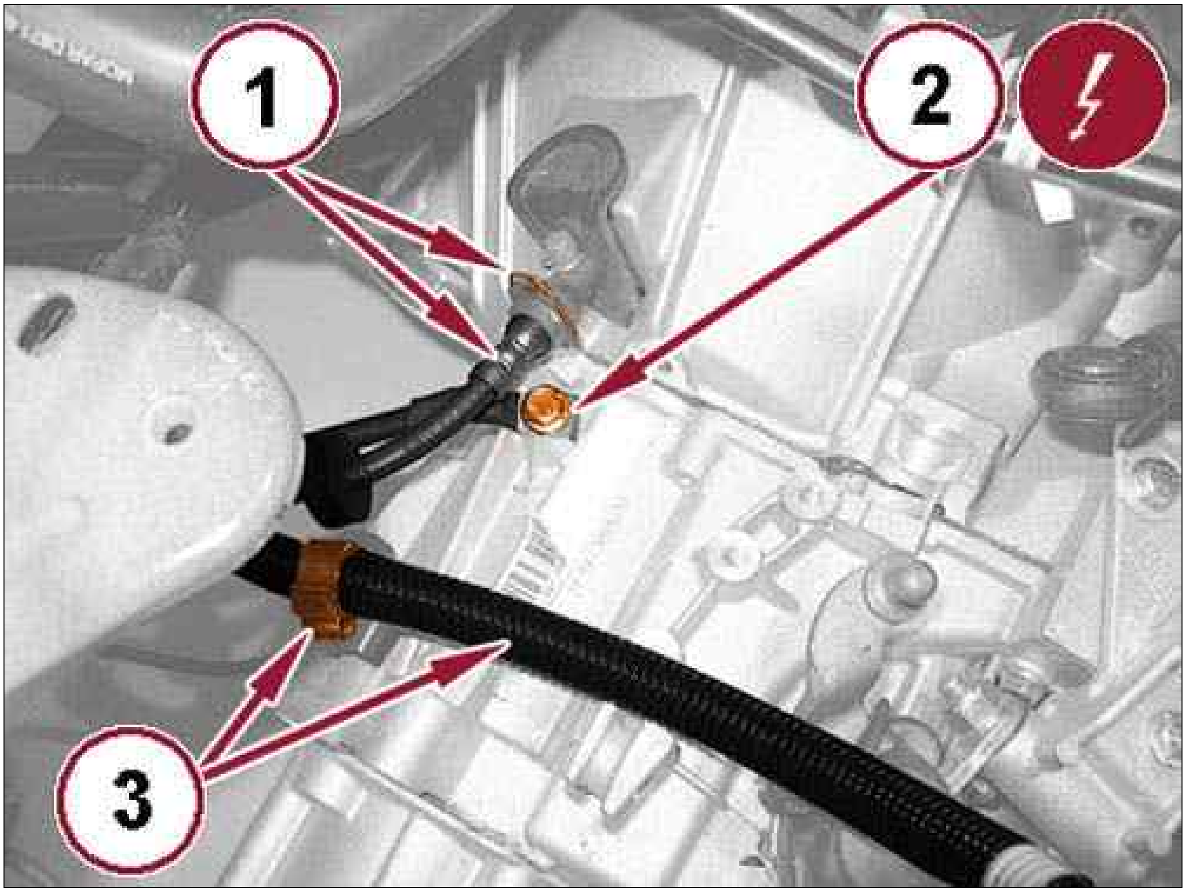
Fig 16: Gear Engagement Cable & Gear Selection Cable



Courtesy of CHRYSLER GROUP, LLC

44. Release the terminal, retract the bush and move the gear engagement cable to the side (1).
45. Release the terminal, retract the bush and move the gear selection cable to the side (2).

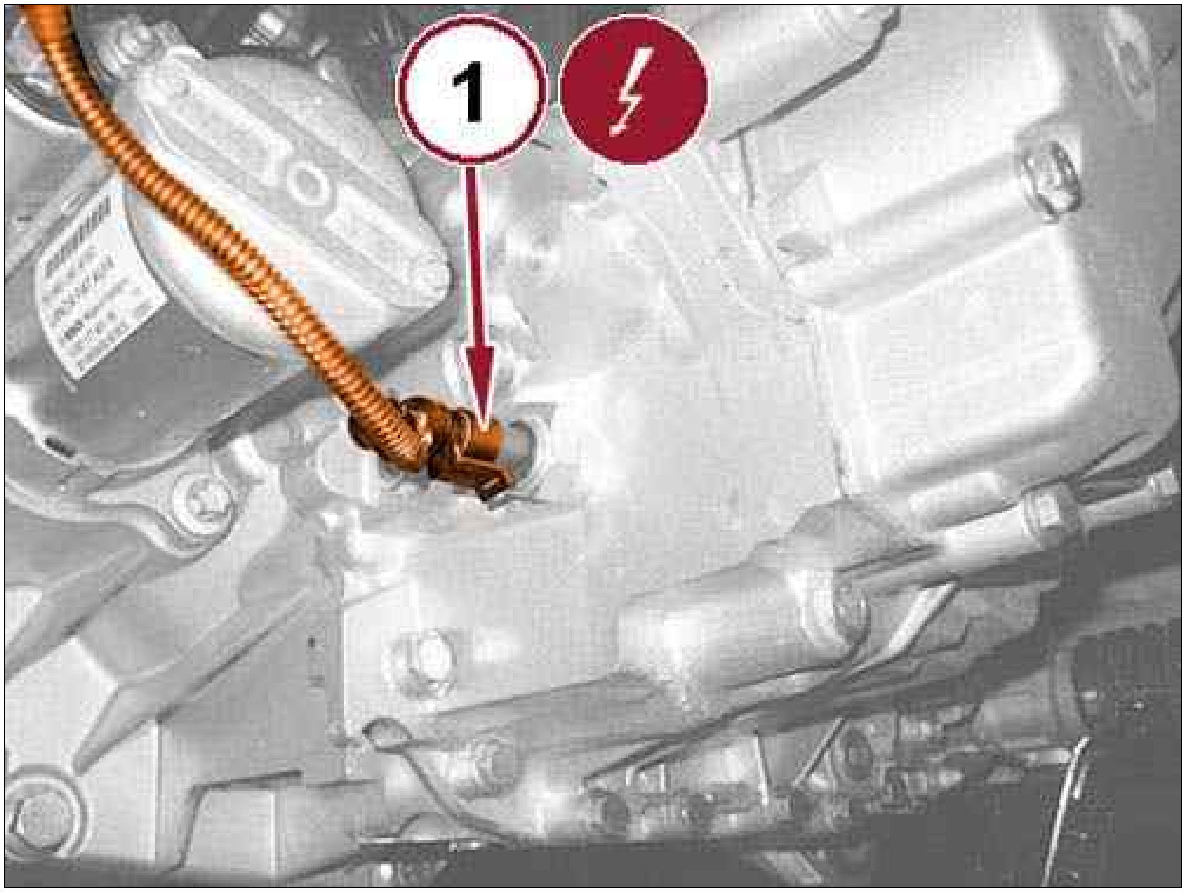
Fig 17: Oil Supply Pipe At Clutch Control Actuator, Battery Earth Cable Screw & Wiring Retaining Clip



Courtesy of CHRYSLER GROUP, LLC

46. Compress the clip and disconnect the oil supply pipe (1) to the clutch control actuator.
47. Undo the screw (2) and disconnect the battery earth cable.
48. Open the retaining clip and release the wiring (3).

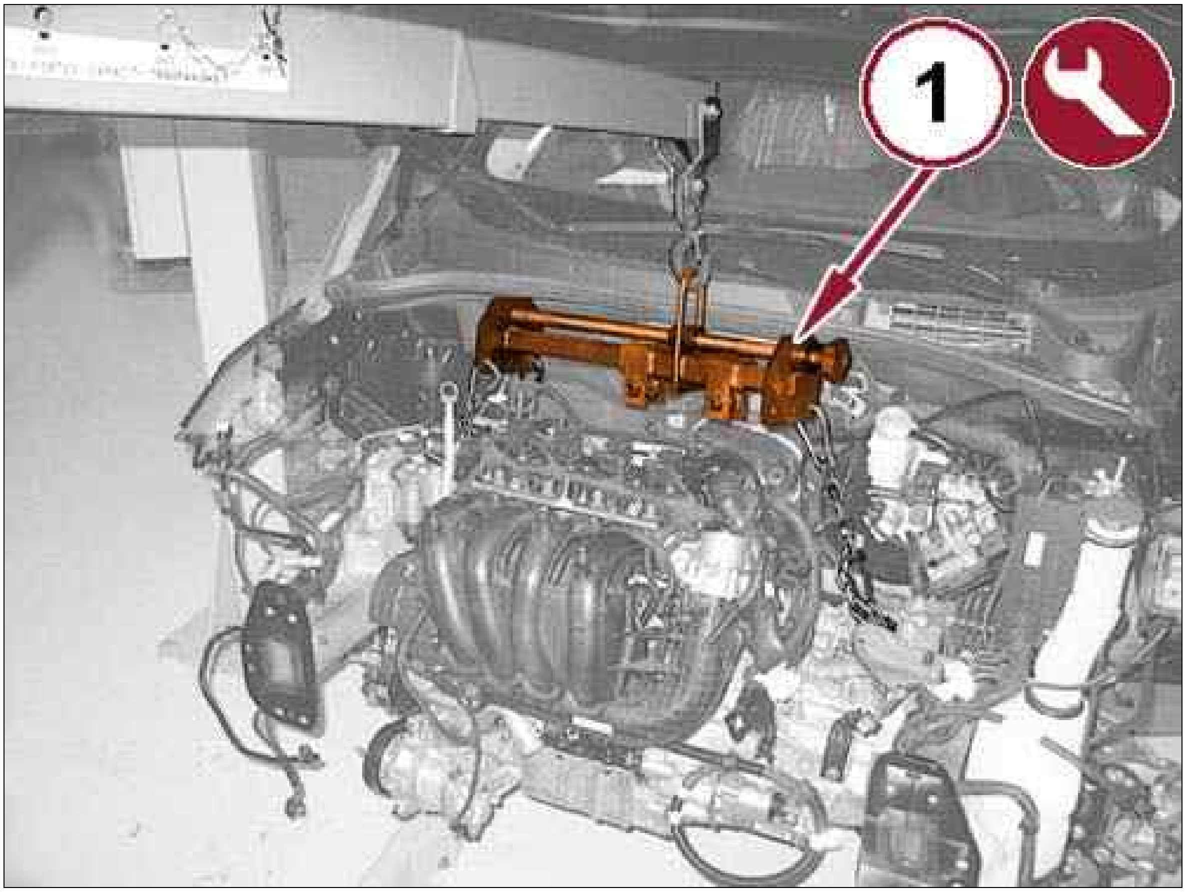
Fig 18: Reversing Light Switch Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

49. Disconnect the reversing light switch wire harness connector (1).

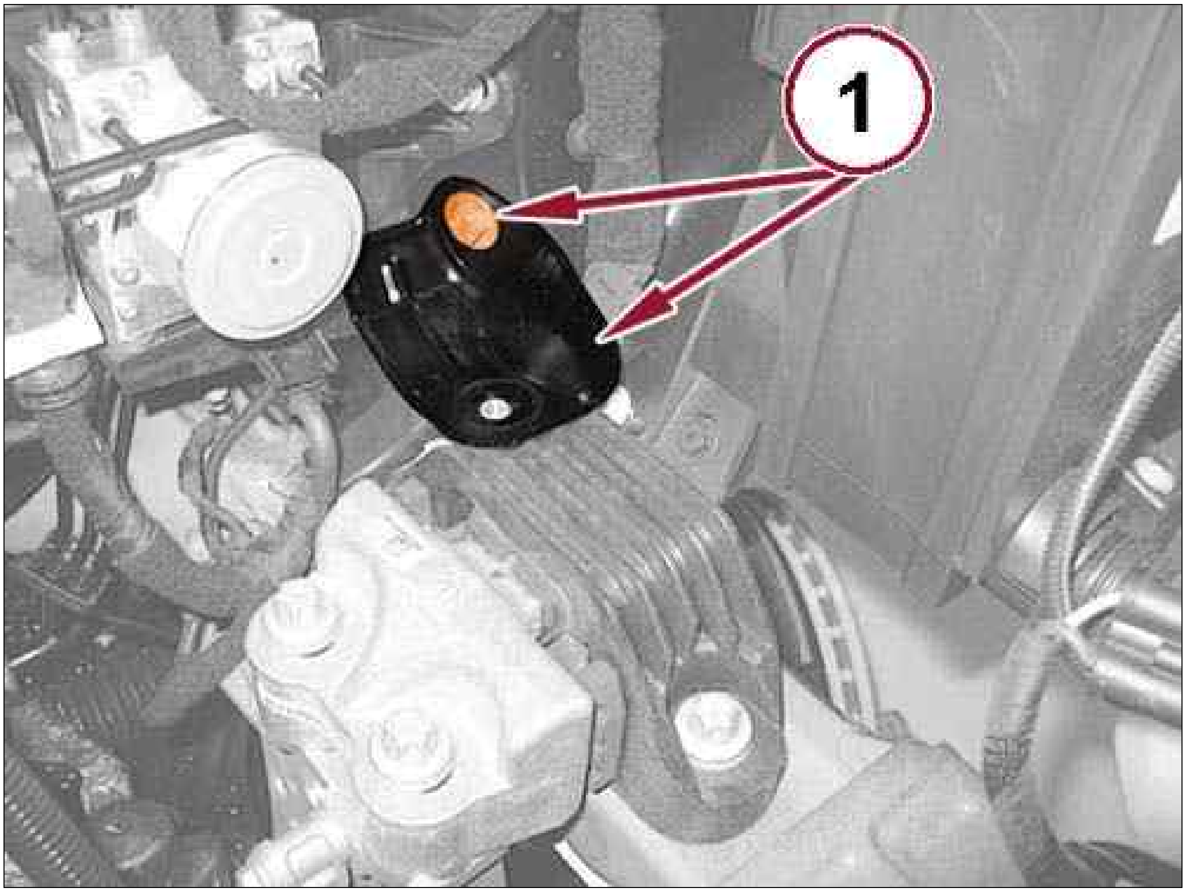
Fig 19: Special Tool Used To Secure Brackets



Courtesy of CHRYSLER GROUP, LLC

50. Use a suitable hydraulic lift and the tool 1871001700 to secure the brackets fitted previously and the gearbox side power unit rigid support.

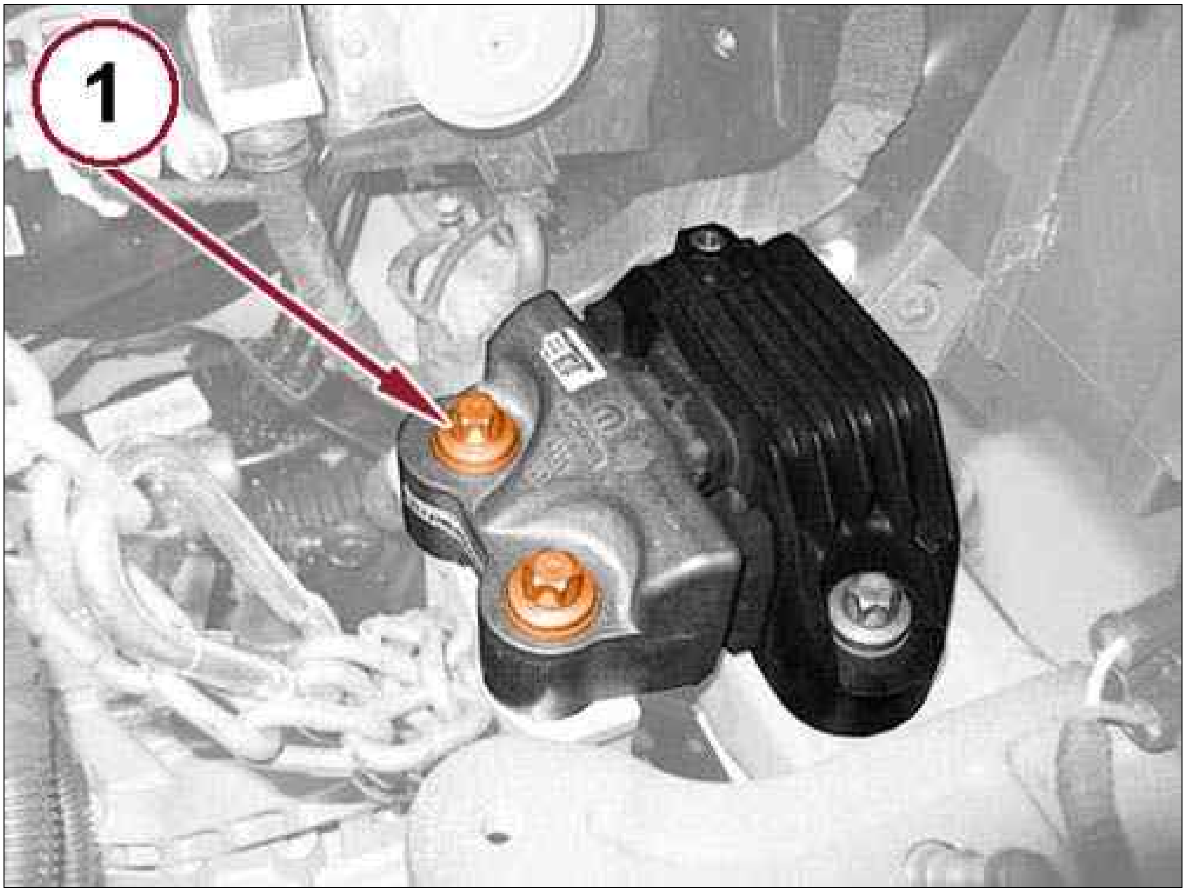
Fig 20: Heat Shield & Bolt



Courtesy of CHRYSLER GROUP, LLC

51. Undo the bolt and remove heat shield (1).

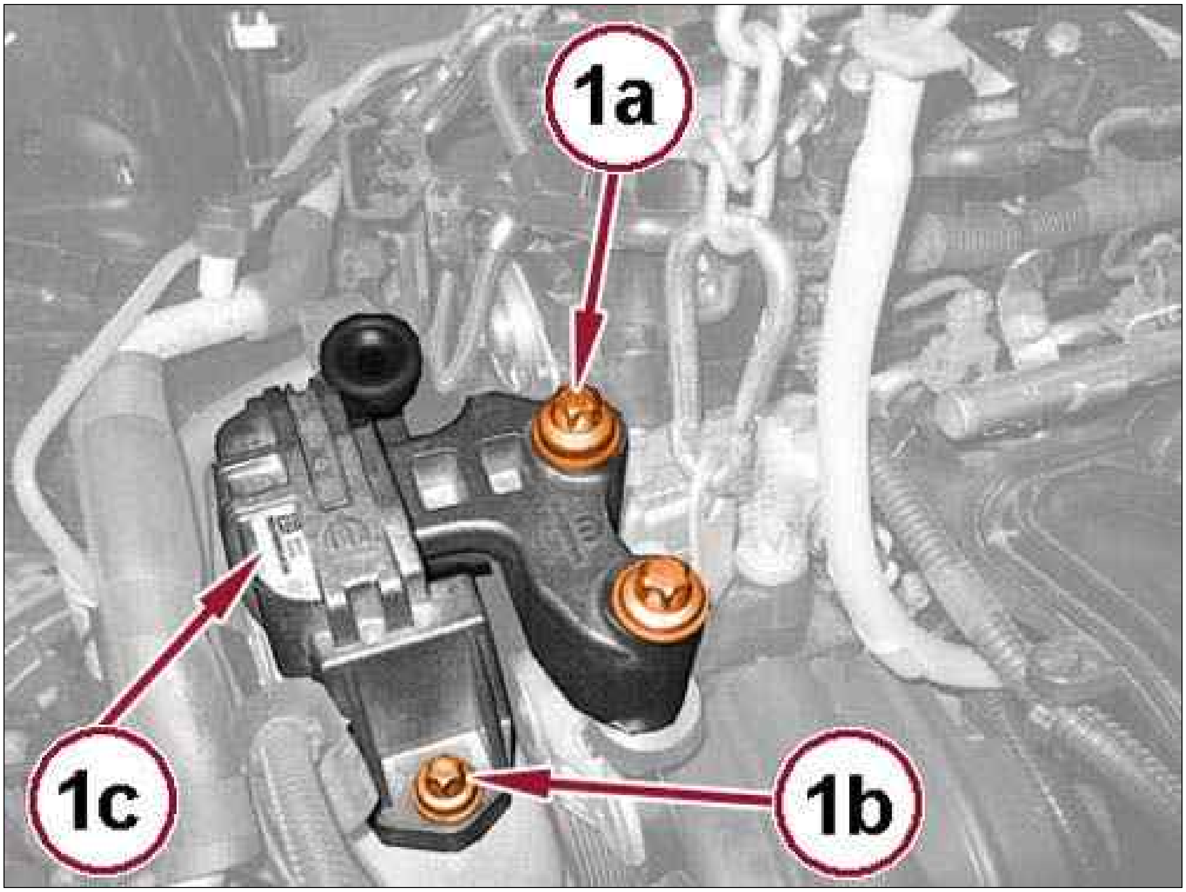
Fig 21: Power Unit Support Flexible Mounting (Gearbox Side) & Bolts



Courtesy of CHRYSLER GROUP, LLC

52. Undo the bolts (1) securing the gearbox side power unit support flexible mounting to the rigid support.

Fig 22: Power Unit Support Flexible Mounting (Timing Side) & Bolts



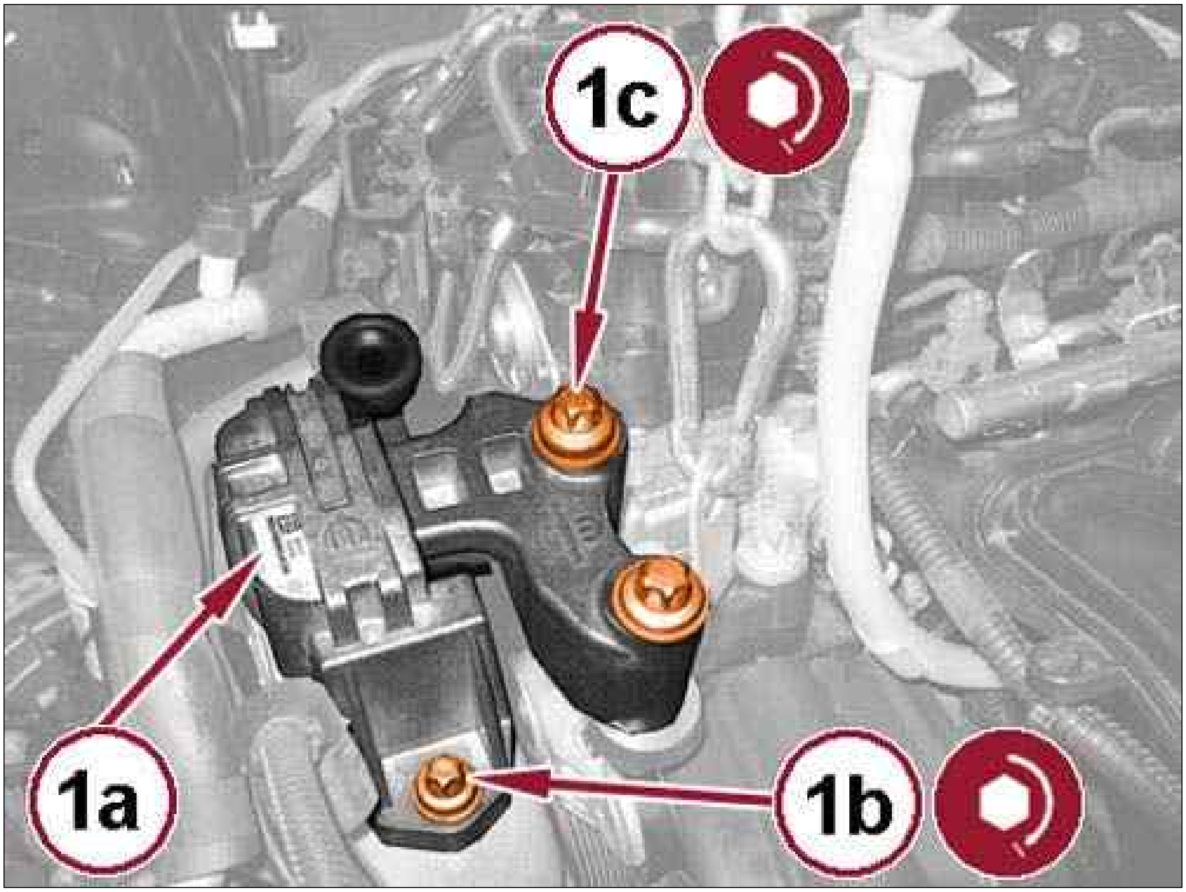
Courtesy of CHRYSLER GROUP, LLC

53. Undo the bolts (1a), (1b) and remove the timing side power unit support flexible mounting (1c).
54. Remove the power unit from the engine compartment and position it on a suitable platform.
55. Release the power unit from the support tools.

REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Fit the support tools to the power unit.
2. Place the power unit in its housing using a suitable hydraulic hoist.

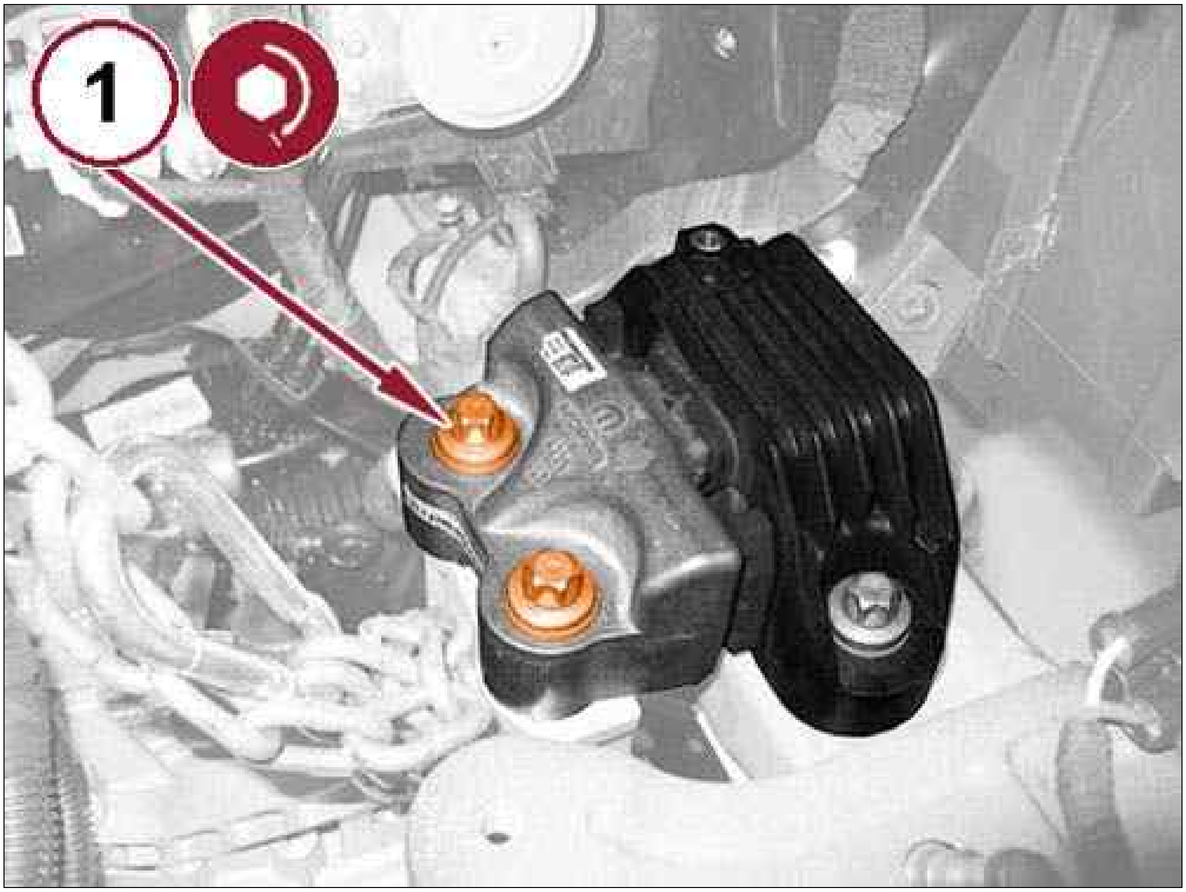
Fig 1: Power Unit Support Flexible Mounting (Timing Side) & Bolts



Courtesy of CHRYSLER GROUP, LLC

3. Place the timing side power unit support flexible mounting (1a) in its housing and tighten the screws (1b) and (1c) to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 2: Power Unit Support Flexible Mounting (Gearbox Side) & Bolts

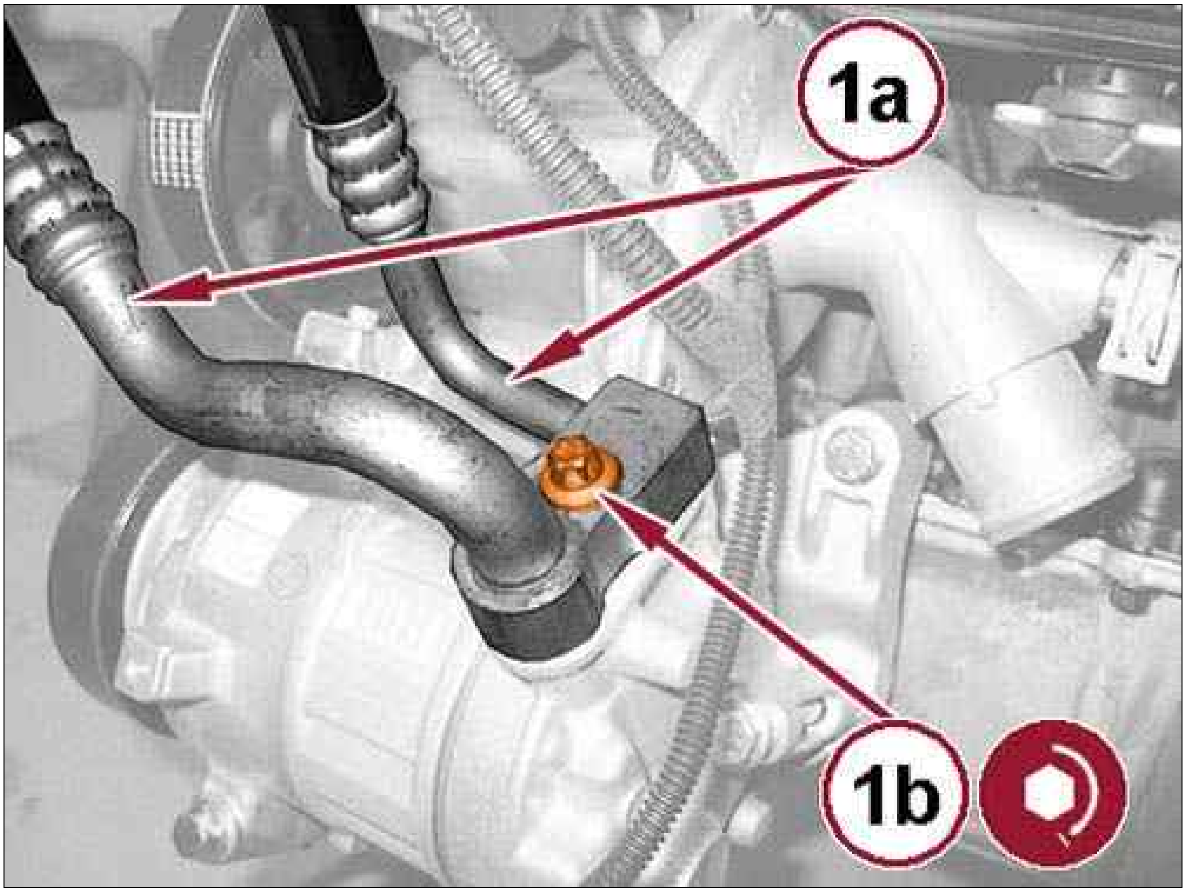


Courtesy of CHRYSLER GROUP, LLC

4. Tighten the screws securing the gearbox side power unit support flexible mounting to the rigid support to the proper specification. Refer to TORQUE SPECIFICATIONS .
5. Place the heat shield in its housing and tighten the screw.
6. Remove the hydraulic hoist and the equipment used for supporting the power unit.
7. Remove the rear lifting bracket.
8. Remove the front lifting bracket.
9. Connect the reverse light switch wire harness connector.
10. Engage the starter wiring with the intermediate retaining clip.
11. Connect the battery earth cable and tighten the screw.
12. Connect the oil delivery pipe to the clutch control actuator and engage the fixing clip.
13. Place the gear selection cable in its housing, engage the bush and the terminal.
14. Place the gear engagement cable in its housing, engage the bush and the terminal.
15. Connect the engine front coupling.
16. Connect the injection control unit wire harness connectors.

17. Engage the wiring retaining clips.

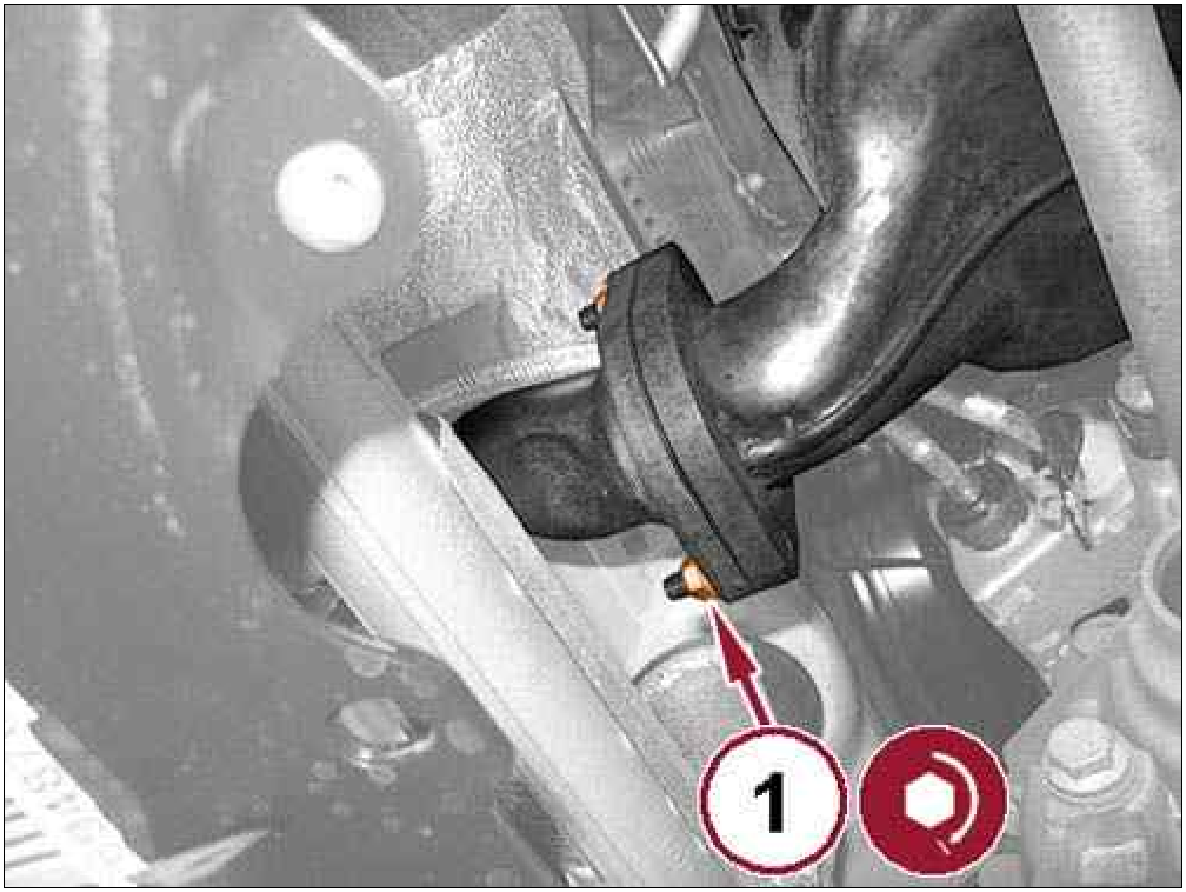
Fig 3: A/C lines & Screw



Courtesy of CHRYSLER GROUP, LLC

18. Connect the A/C lines (1a), complete with **NEW** gaskets and tighten the screw (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
19. Connect the quick coupling for the front coolant return pipe from the evaporator.
20. Connect the vacuum air pipe to the throttle body and tighten the band.
21. Connect the quick coupling for the fuel manifold supply pipe, rail side.
22. Connect the front fuel vapor pipe, solenoid valve side, and tighten the band.
23. Engage the pipes connected previously to the intermediate retaining clips.
24. Connect the starter cable and tighten the nut.
25. Connect the starter supply cable and tighten the nut.
26. Connect the quick couplings for the heater supply and return pipes.
27. Place the water pump return pipe complete with reservoir in its housing and tighten the band.
28. Connect the quick coupling for the degassing pipe, thermostat side.

Fig 4: Exhaust Pipe To Catalytic Converter Nut



Courtesy of CHRYSLER GROUP, LLC

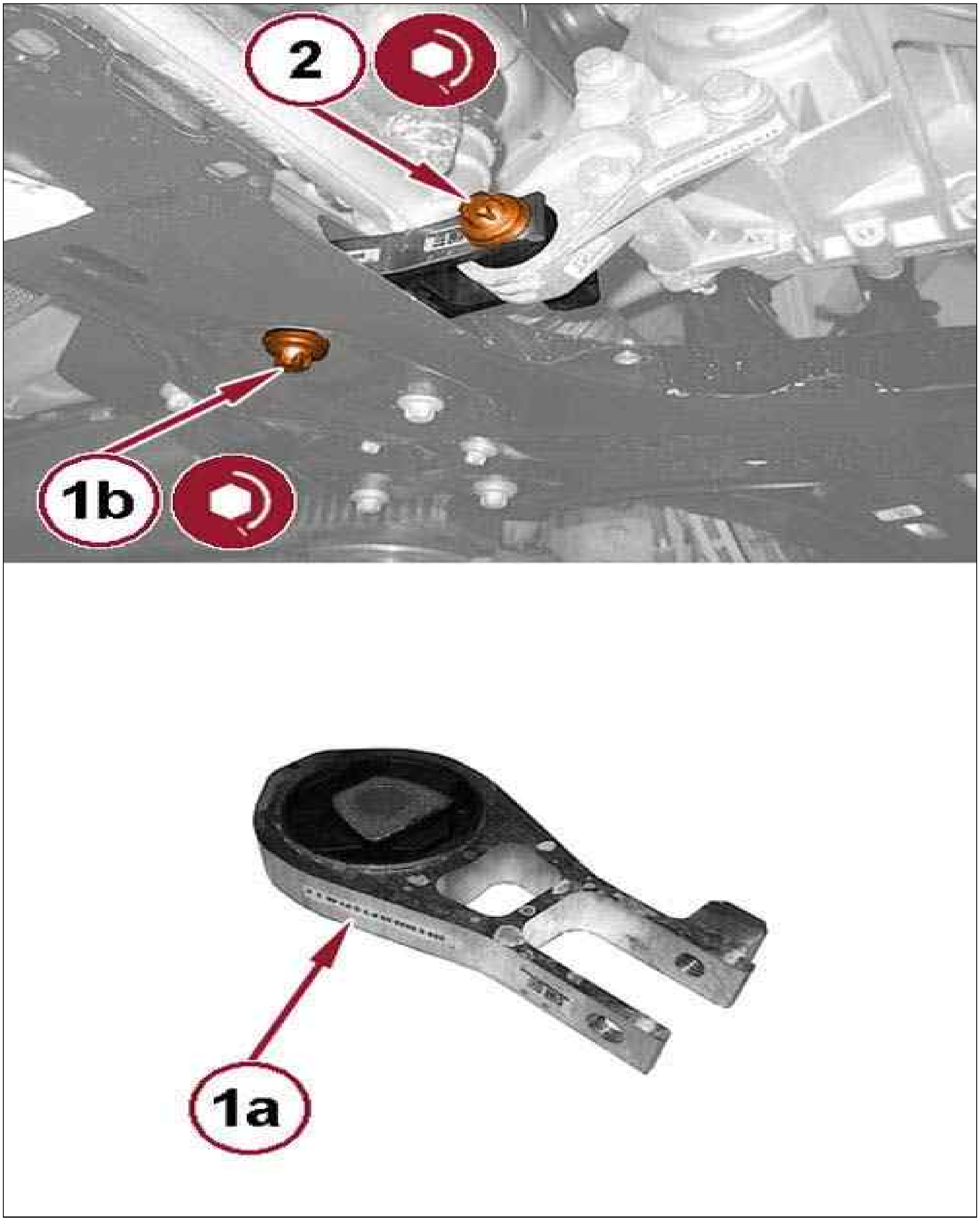
29. Place the exhaust pipe back in its housing complete with **NEW** gasket. Connect it to the catalytic converter and tighten the new nuts to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 5: Exhaust Pipe Mounting Bracket Screws

Courtesy of CHRYSLER GROUP, LLC

30. Tighten the screws securing the exhaust pipe mounting bracket to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 6: Lower Reaction Rod To Bracket Bolt, Lower Reaction Rod & Bolt



Courtesy of CHRYSLER GROUP, LLC

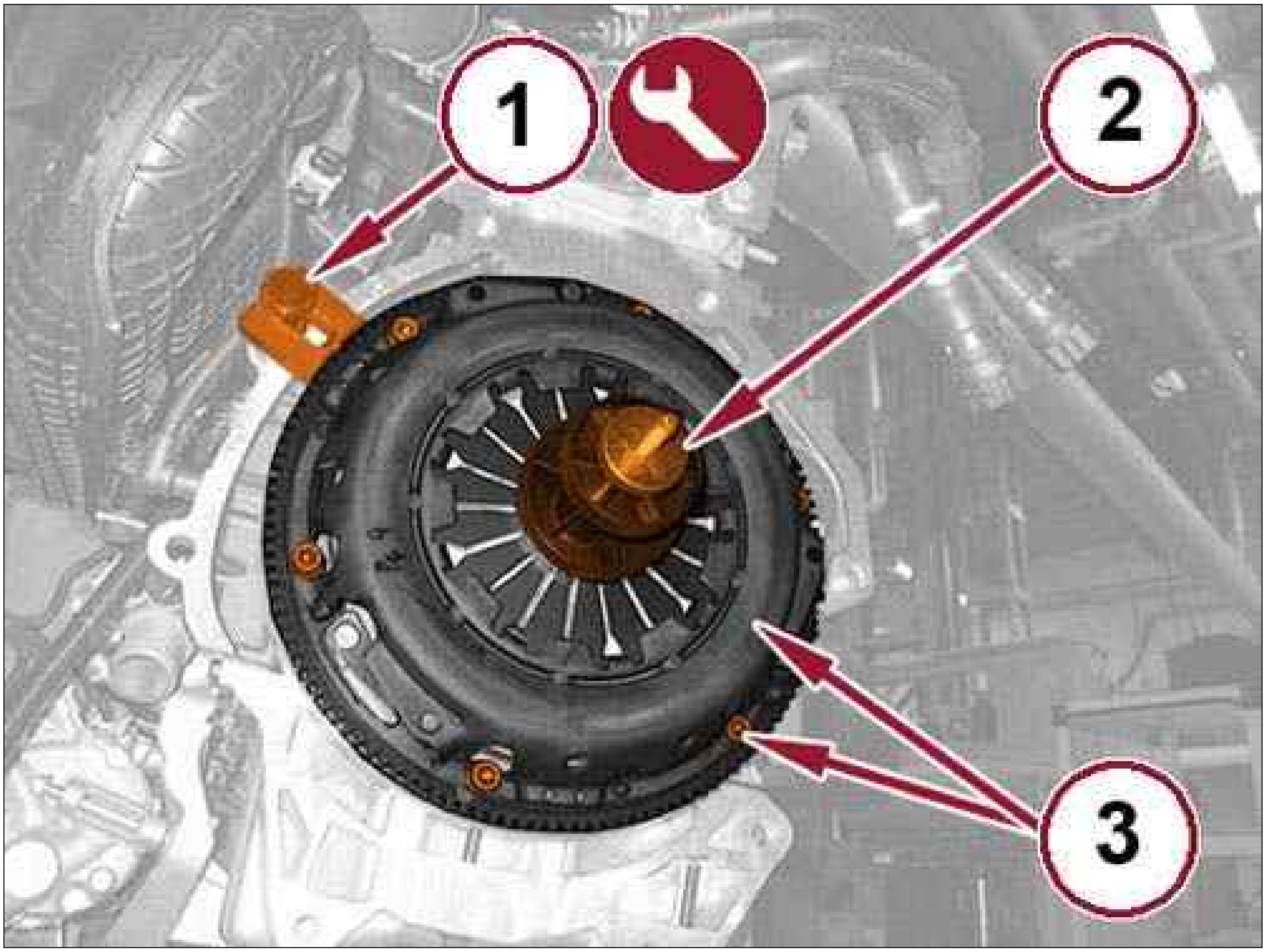
31. Place the rear mount (1a) in its housing and tighten the bolt (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
32. Tighten the rear mount to the bracket bolt (2) to the proper specification. Refer to TORQUE SPECIFICATIONS .
33. Install the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .

34. the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
35. Install the head lamp cross member. Refer to CROSSMEMBER, HEADLAMP MOUNTING, REMOVAL AND INSTALLATION .
36. Install the right front head lamp unit. Refer to UNIT, FRONT LAMP, REMOVAL AND INSTALLATION .
37. Install the left front head lamp unit. Refer to UNIT, FRONT LAMP, REMOVAL AND INSTALLATION .
38. Install the front fascia. Refer to FASCIA, FRONT, REMOVAL AND INSTALLATION .
39. Install the right front half shaft. Refer to REMOVAL AND INSTALLATION .
40. Install the left front half shaft. Refer to REMOVAL AND INSTALLATION .
41. Install the battery tray. Refer to TRAY, BATTERY, REMOVAL AND INSTALLATION .
42. Evacuate and charge the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
43. Fill the cooling system. Refer to STANDARD PROCEDURE .
44. Fill the manual transmission gear oil. Refer to appropriate Transmission Service Information article.
45. Bleed the hydraulic clutch. Refer to STANDARD PROCEDURE .
46. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
47. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
48. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
49. Install the left and right front tire and wheel. Refer to REMOVAL AND INSTALLATION .
50. Remove the vehicle from the lift.

REMOVAL AND INSTALLATION > ENGINE - POSITION ON STAND AND REMOVE

REST THE ENGINE ON THE STAND

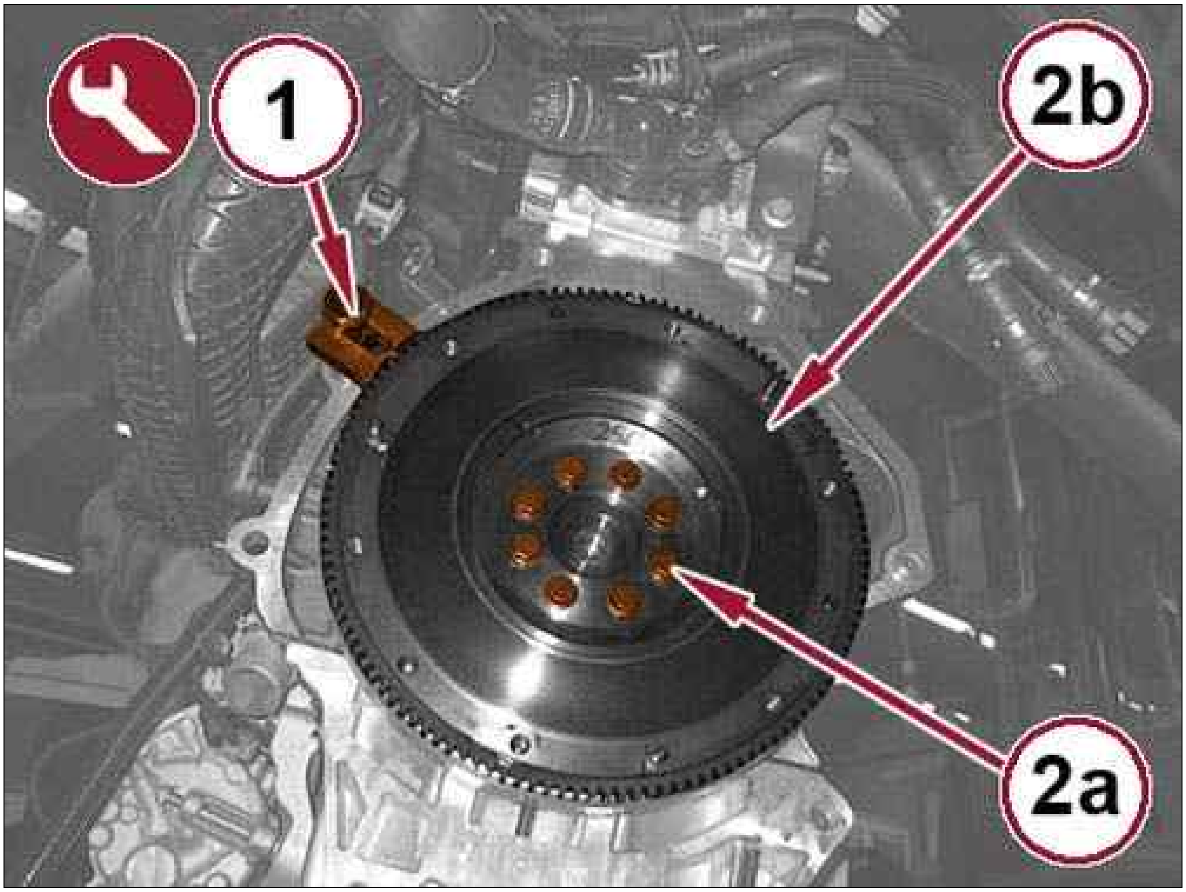
Fig 1: Flywheel Locking Tool, Clutch Centering Tool & Clutch Mechanism Assembly & Bolts



Courtesy of CHRYSLER GROUP, LLC

1. Fit the flywheel locking tool 1860846000 (1).
2. Fit a suitable clutch centering tool (2).
3. Remove the bolts and the clutch mechanism assembly (3).

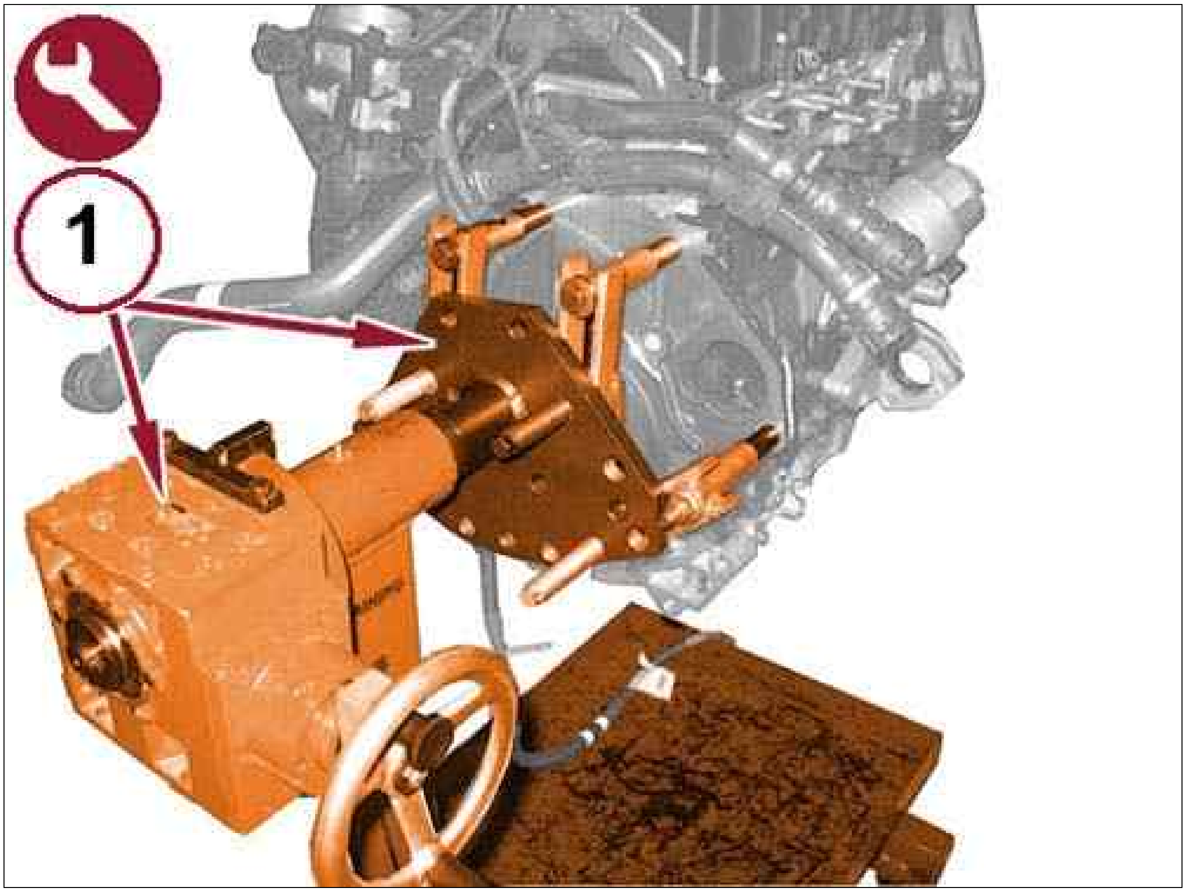
Fig 2: Flywheel Locking Tool, Flywheel & Bolts



Courtesy of CHRYSLER GROUP, LLC

4. Make sure that the flywheel locking tool 1860846000 (1) has been fitted properly.
5. Remove the bolts (2a) and remove the engine flywheel (2b).
6. Remove the flywheel locking tool 1860846000 (1).

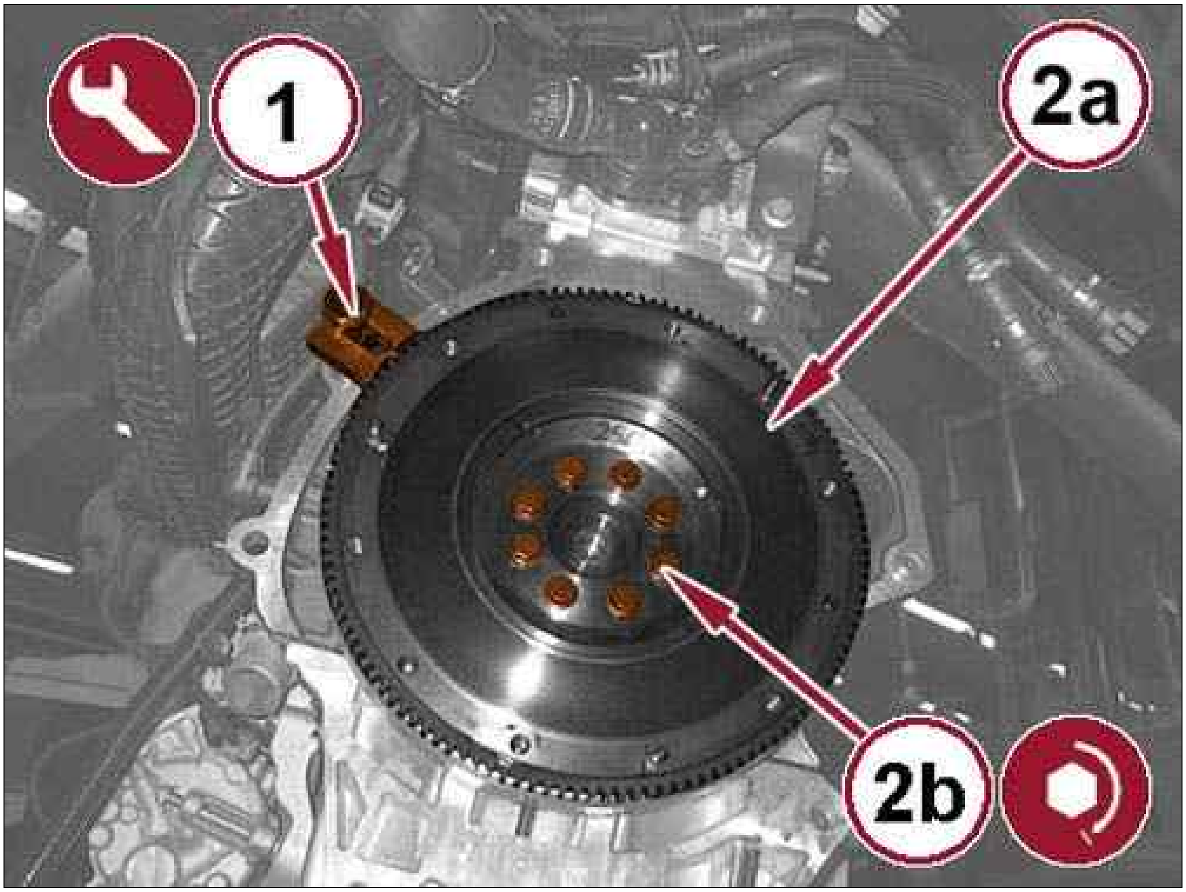
Fig 3: Positioning Engine On Overhaul Stand



Courtesy of CHRYSLER GROUP, LLC

7. With a suitable hydraulic hoist, place the engine on the overhaul stand 1871000000 (1).
8. **Removal of engine from the stand**
9. Support the engine using the mounting tools and a suitable hydraulic hoist.
10. Undo the fastenings securing the engine block to the overhaul stand bracket.
11. Place the engine on a suitable board.

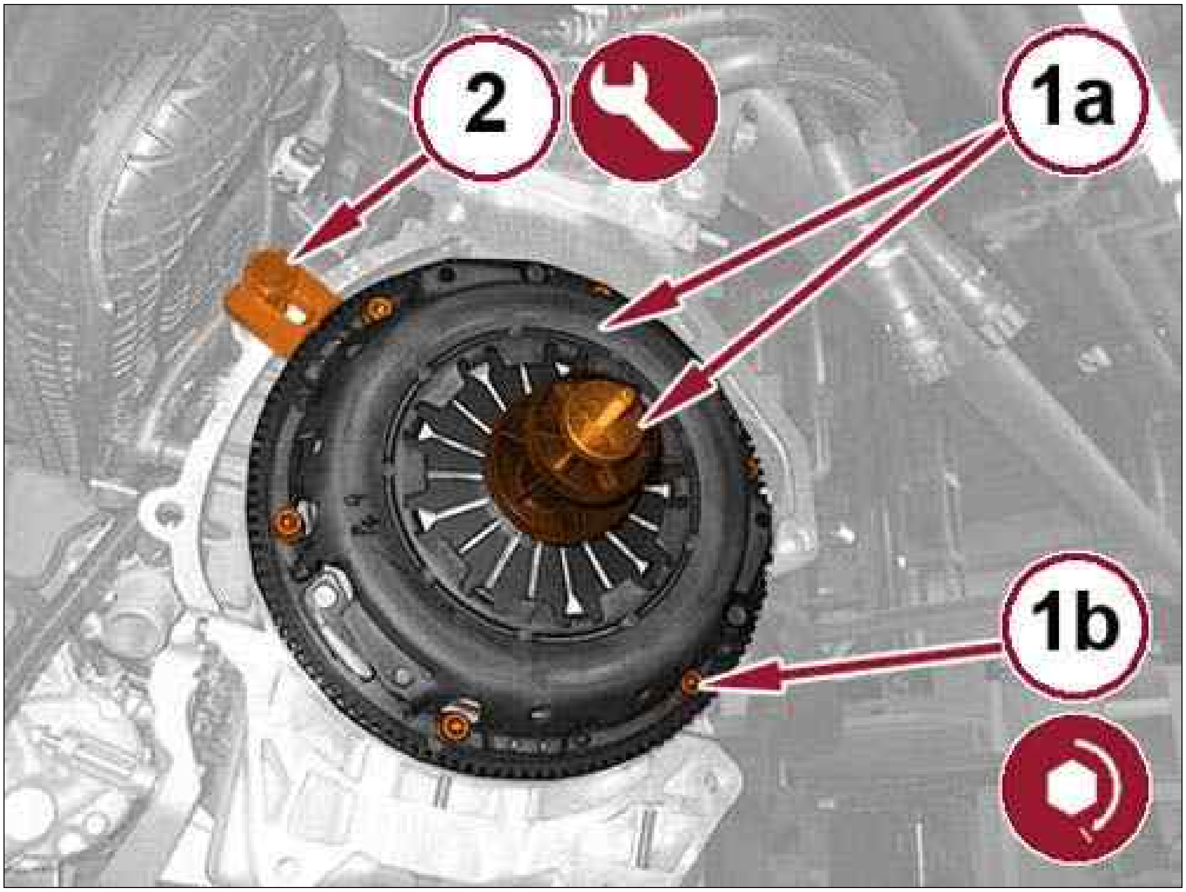
Fig 4: Flywheel Locking Tool, Flywheel & Bolts



Courtesy of CHRYSLER GROUP, LLC

12. Fit the flywheel locking tool 1860846000 (1).
13. Install the engine flywheel (2a) in its housing and tighten the **NEW** screws (2b) to the proper specification. Refer to SPECIFICATIONS .

Fig 5: Flywheel Locking Tool, Clutch Centering Tool & Clutch Mechanism Assembly & Bolts

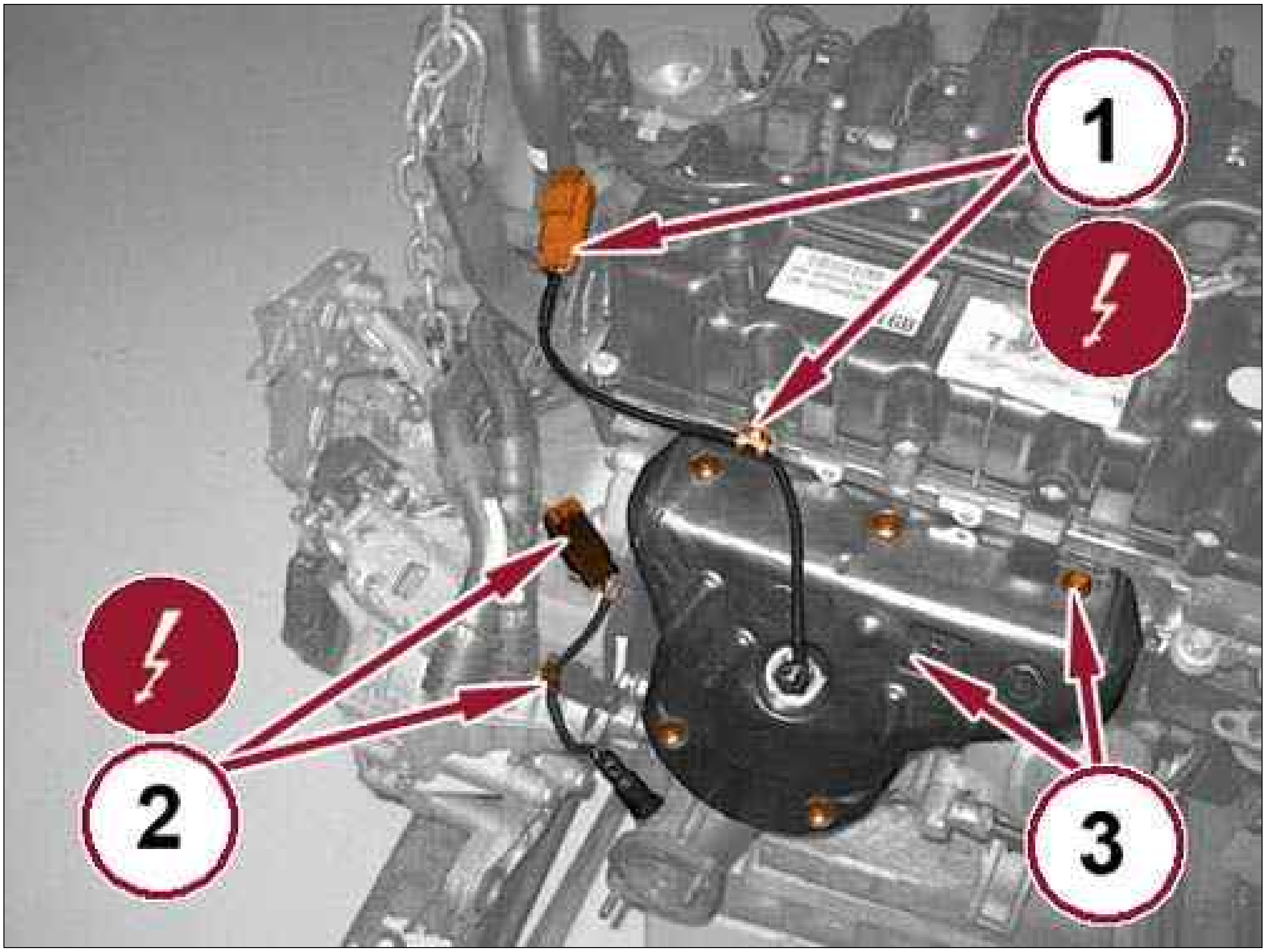


Courtesy of CHRYSLER GROUP, LLC

14. Using a suitable clutch centering tool, position the complete clutch mechanism (1a) and tighten the bolts (1b) to the proper specification. Refer to SPECIFICATIONS .
15. Remove the flywheel lock 1860846000 (2).

DISASSEMBLY AND ASSEMBLY > DISASSEMBLY AND REASSEMBLY FOLLOWING INSPECTION > DISASSEMBLY

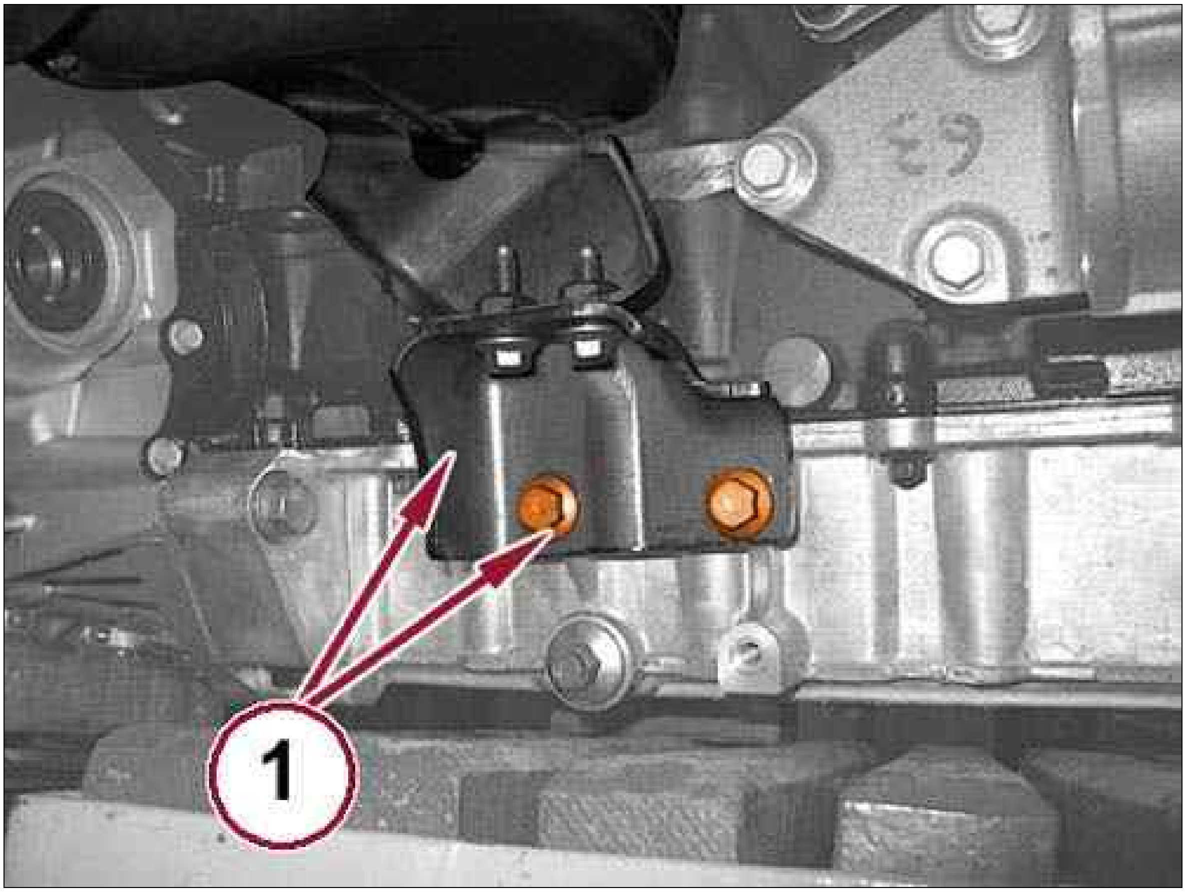
Fig 1: Front & Rear O2 Sensors Wire Harness Retaining Clips & Exhaust Manifold Heat Shield & Screws



Courtesy of CHRYSLER GROUP, LLC

1. Disconnect the front oxygen sensor wire harness connector and release the wiring from the retaining clip (1).
2. Disconnect the rear oxygen sensor wire harness connector and release the wiring from the retaining clip (2).
3. Undo the screws and remove the exhaust manifold heat shield (3).

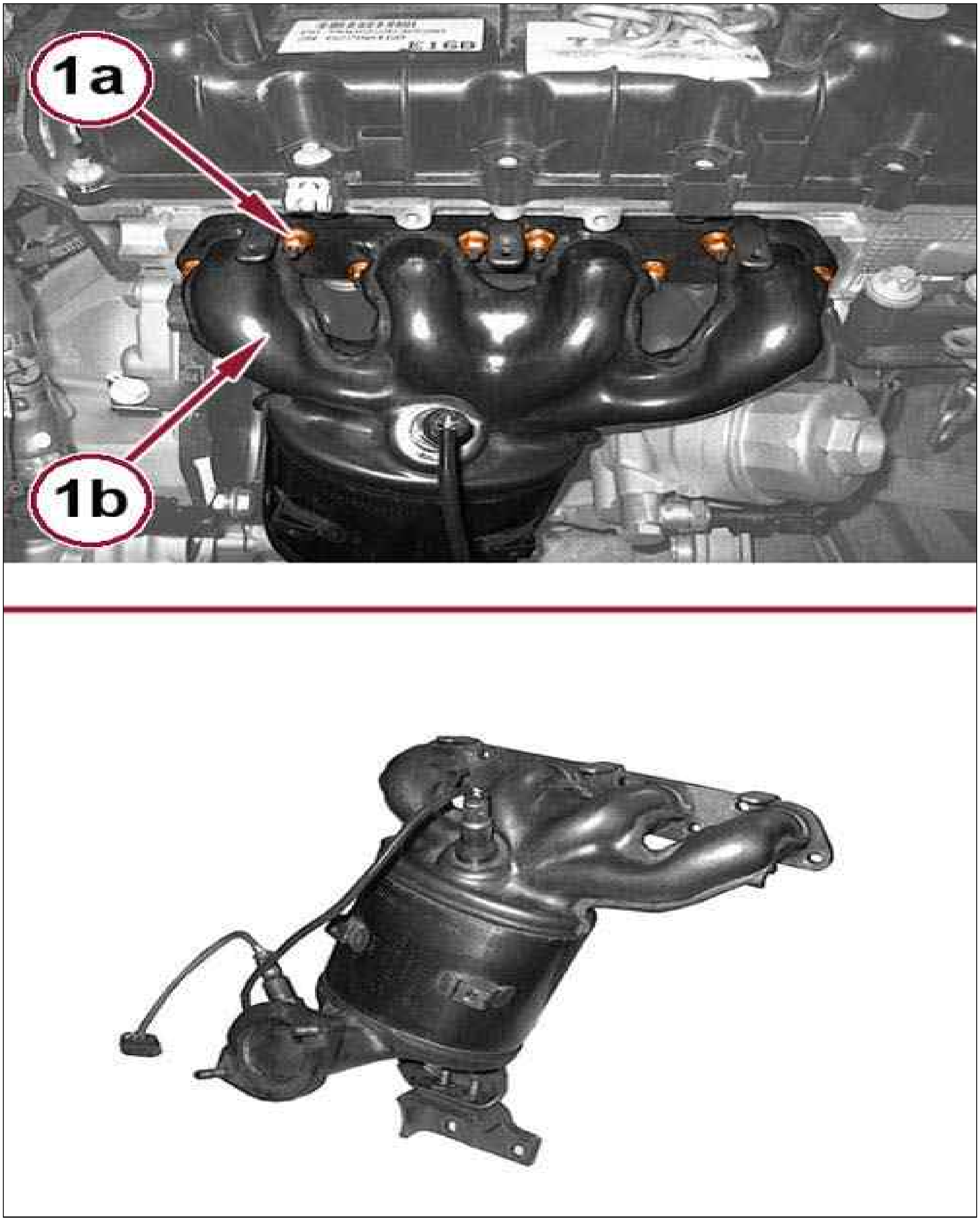
Fig 2: Catalytic Converter Mounting Bracket (At Engine Oil Sump Side) & Screws



Courtesy of CHRYSLER GROUP, LLC

4. Undo the screws securing the catalytic converter mounting bracket (1), engine oil sump side.

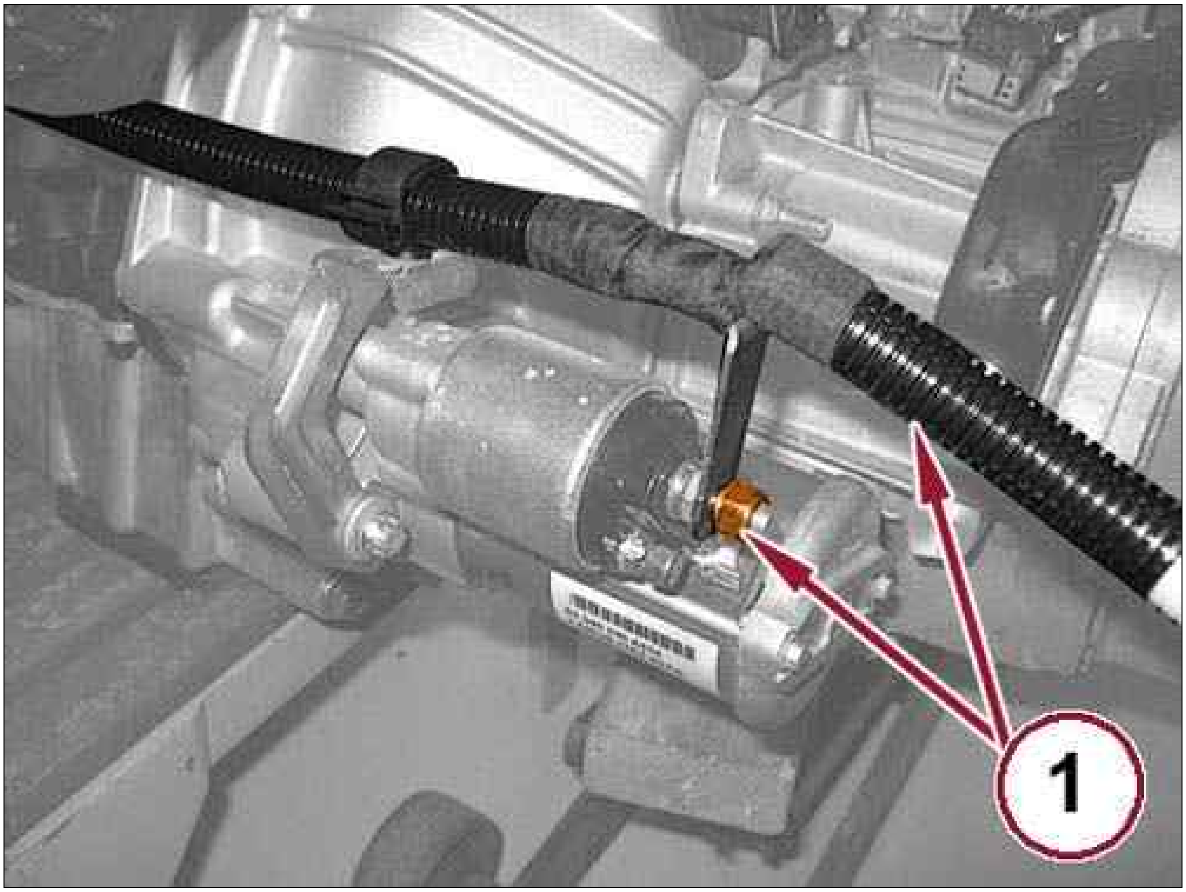
Fig 3: Exhaust Manifold And Catalytic Converter & Nuts



Courtesy of CHRYSLER GROUP, LLC

5. Undo the nuts (1a) and remove the exhaust manifold and catalytic converter (1b).

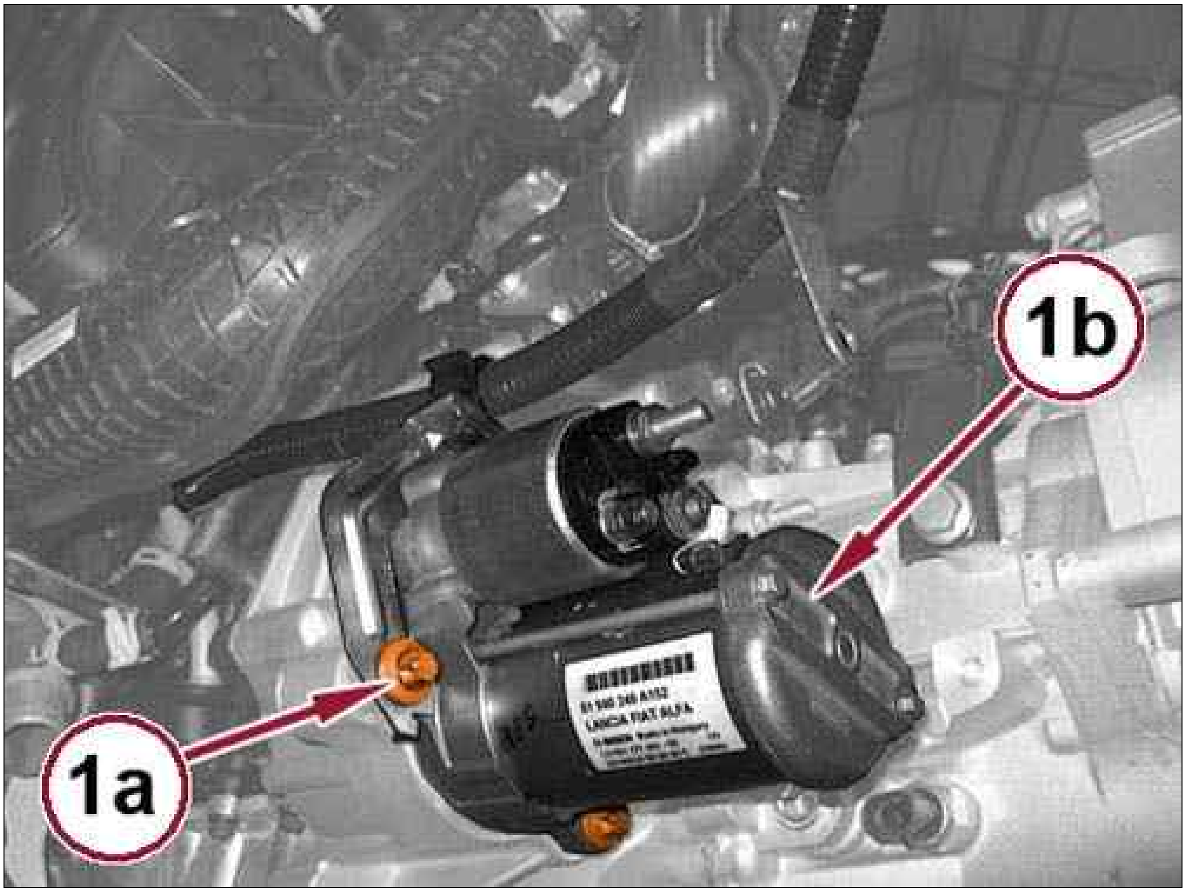
Fig 4: Starter Wiring & Nut



Courtesy of CHRYSLER GROUP, LLC

6. Undo the nut and disconnect the starter wiring (1).

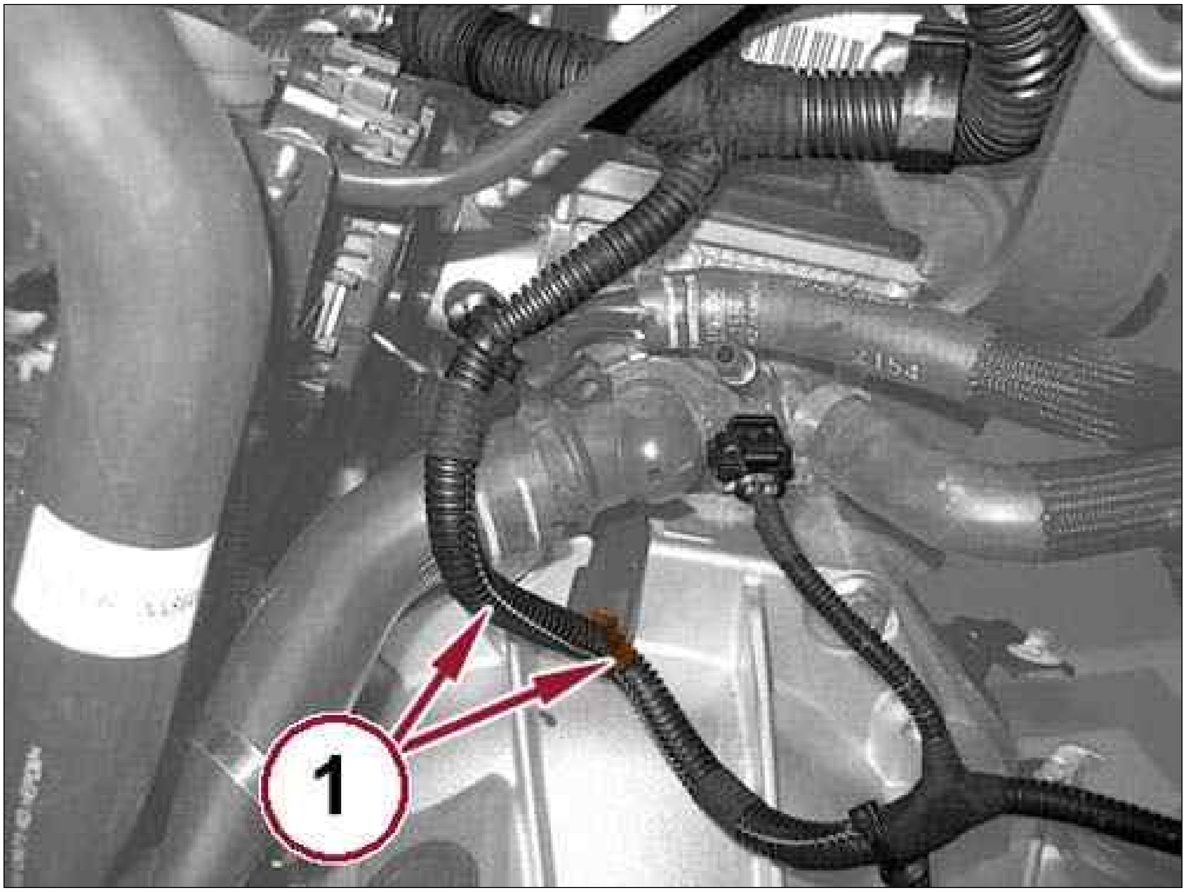
Fig 5: Starter & Screws



Courtesy of CHRYSLER GROUP, LLC

7. Undo the screws (1a) and remove the starter (1b).

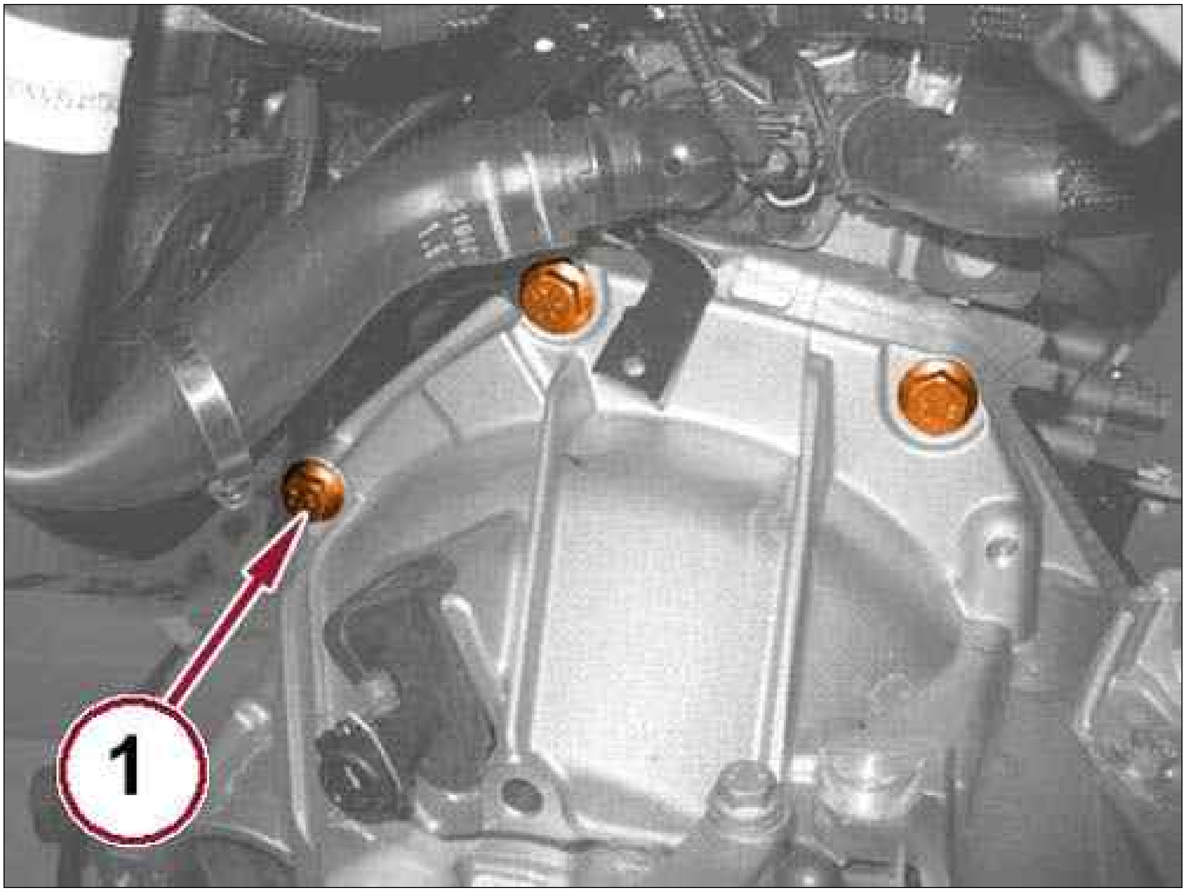
Fig 6: Wiring Attached To Bracket At Gearbox



Courtesy of CHRYSLER GROUP, LLC

8. Release the wiring from the bracket on the gearbox (1).

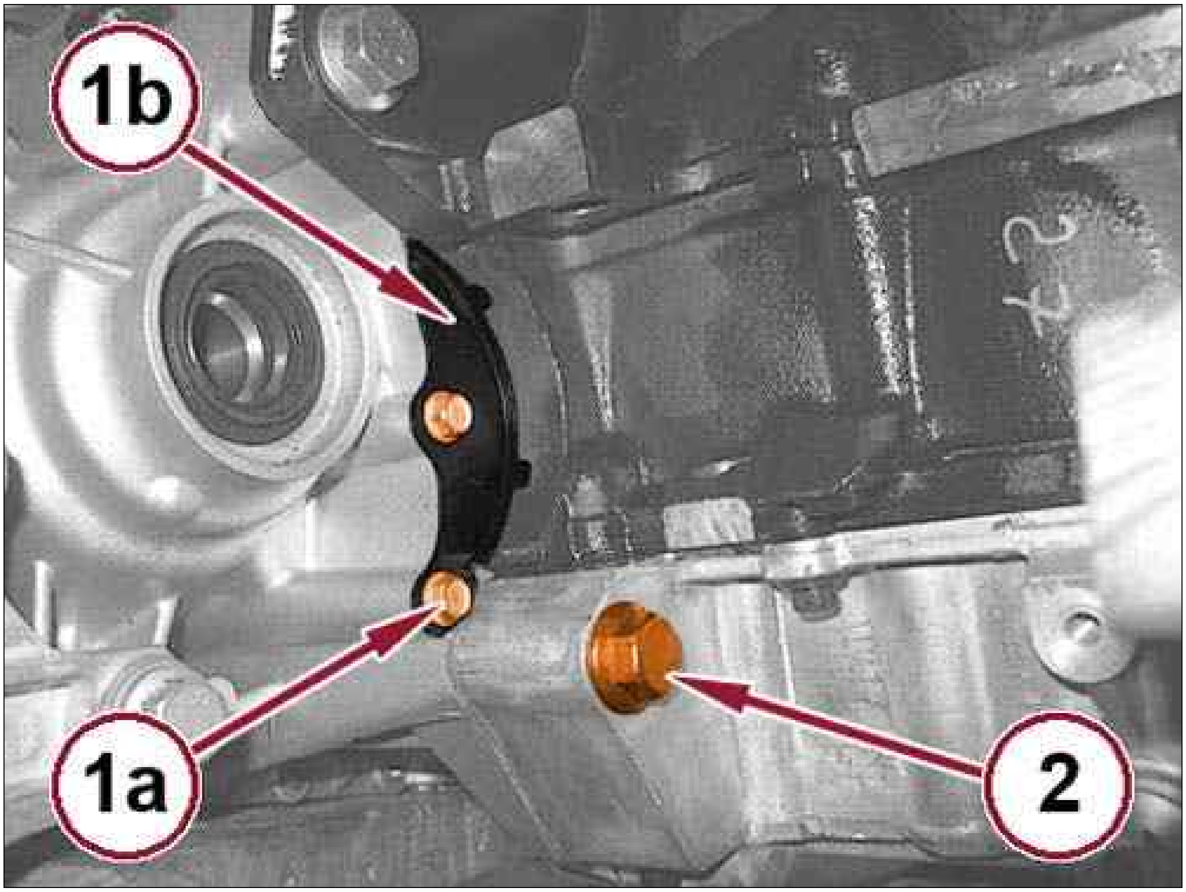
Fig 7: Gearbox To Engine Upper Bolts



Courtesy of CHRYSLER GROUP, LLC

9. Remove the upper bolts (1) securing the gearbox to the engine.

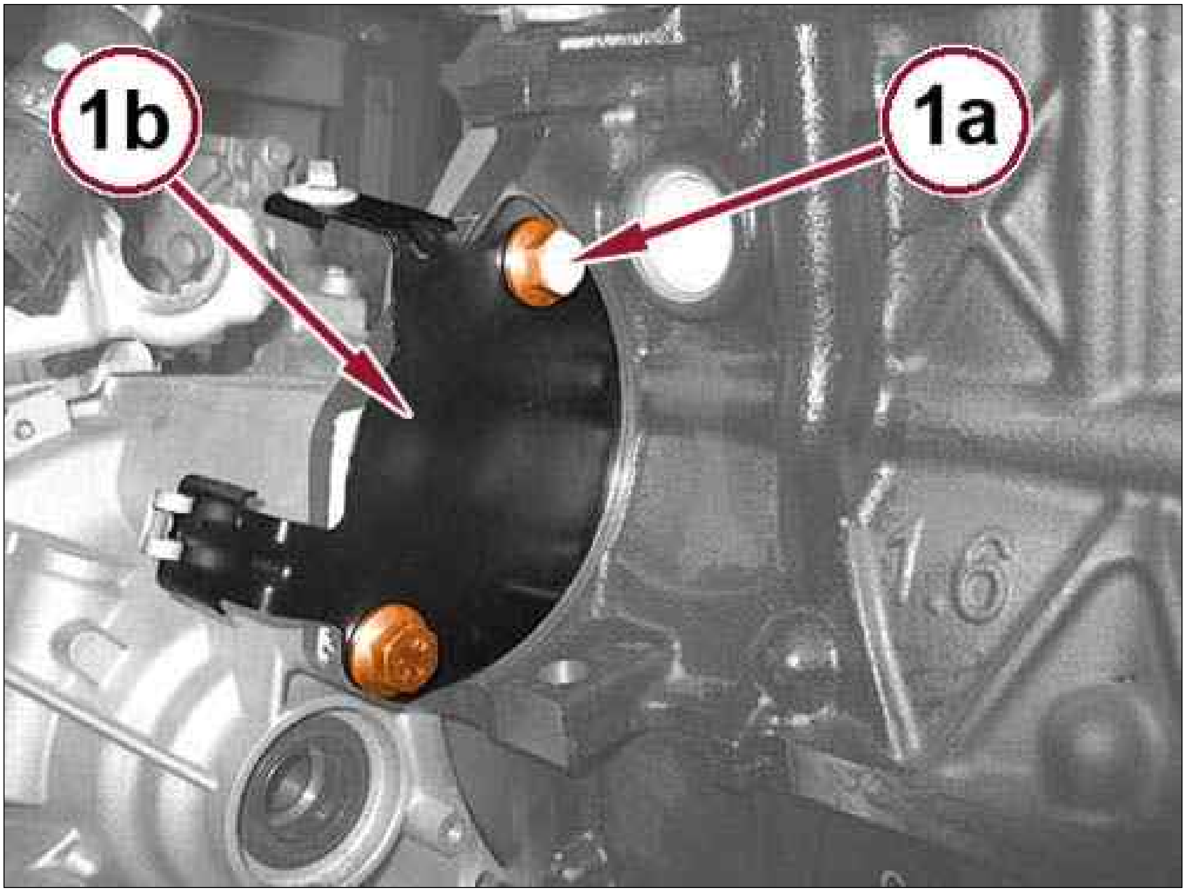
Fig 8: Flywheel Lower Guard, Bolts, Gearbox To Engine Oil Sump Bolts



Courtesy of CHRYSLER GROUP, LLC

10. Remove the bolts (1a) and remove the engine flywheel lower guard (1b).
11. Remove the front bolts (2) fixing the gearbox to the engine oil sump.

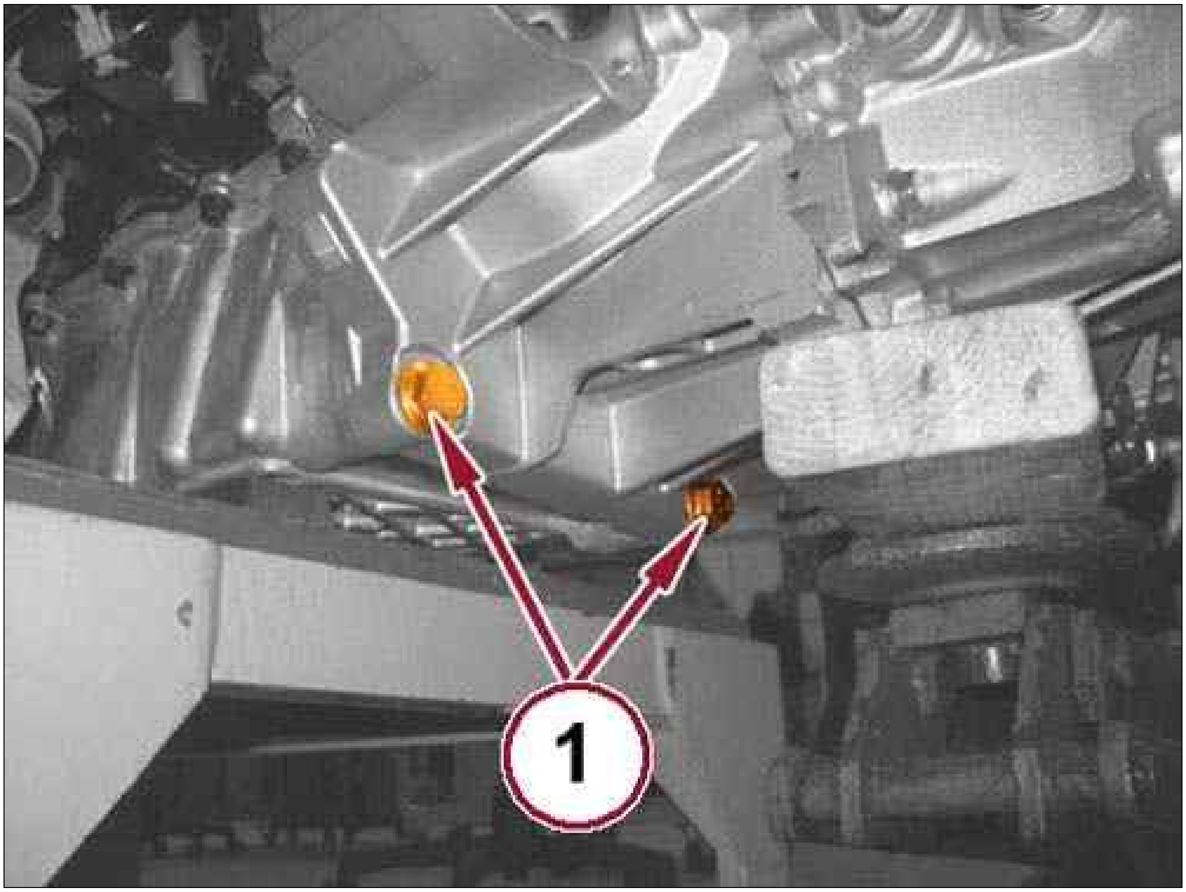
Fig 9: Gearbox To Engine Bolt & Flywheel Upper Guard



Courtesy of CHRYSLER GROUP, LLC

12. Remove the side screws bolts fixing the gearbox to the engine (1a) and the engine flywheel upper guard (1b).

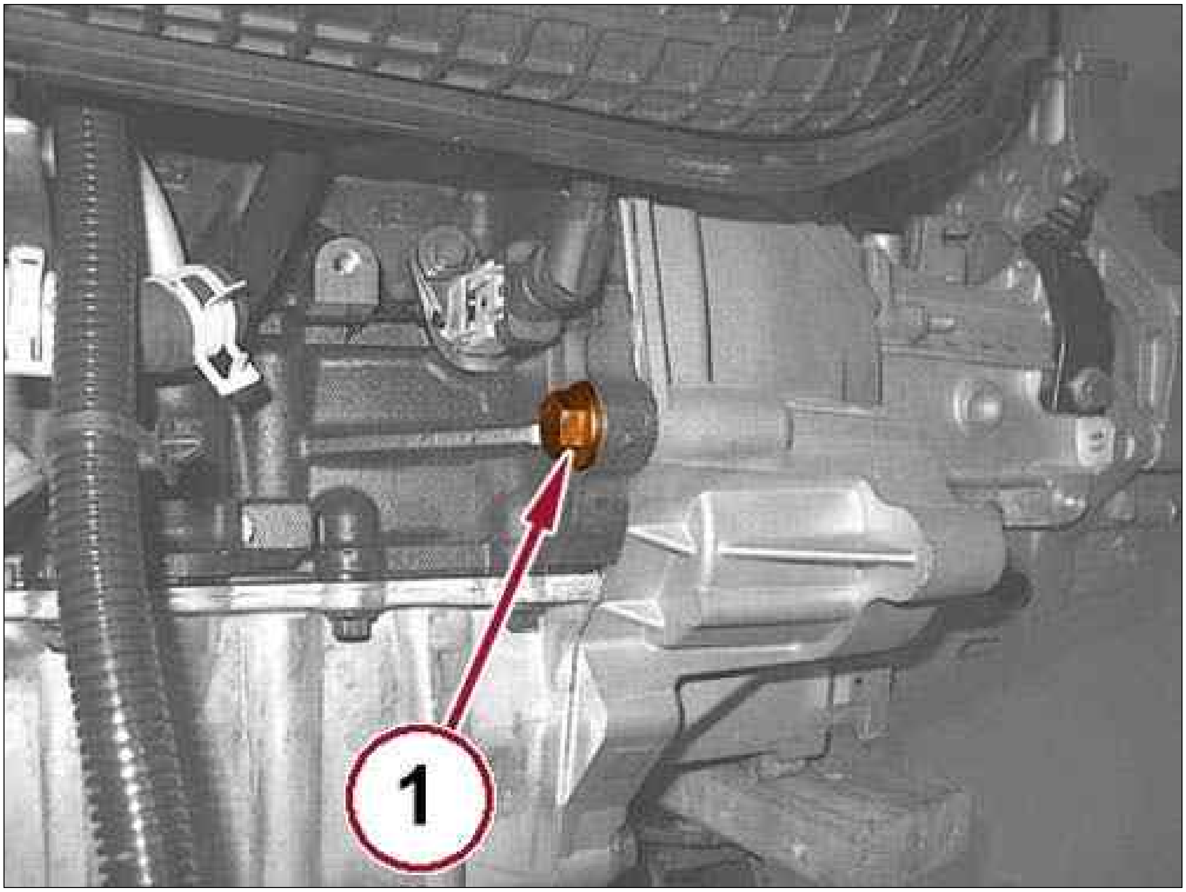
Fig 10: Gearbox To Engine Oil Sump Rear Bolts



Courtesy of CHRYSLER GROUP, LLC

13. Remove the rear bolts (1) securing the gearbox to the engine oil sump.

Fig 11: Gearbox To Engine Side Bolt



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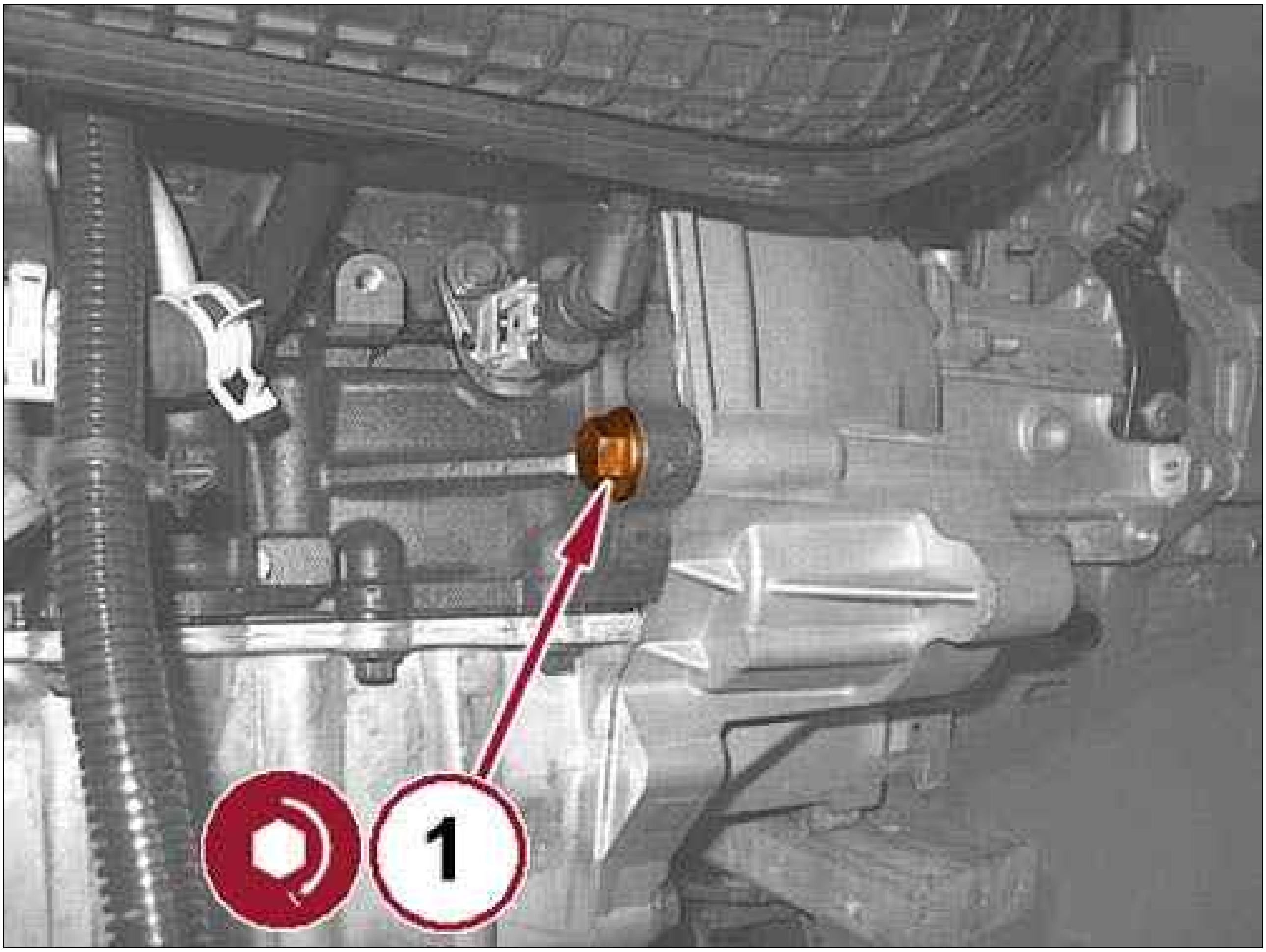
14. Remove the side bolt fixing the gearbox to the engine.
15. Remove the gearbox from the engine.

DISASSEMBLY AND ASSEMBLY > DISASSEMBLY AND REASSEMBLY FOLLOWING INSPECTION > REASSEMBLY

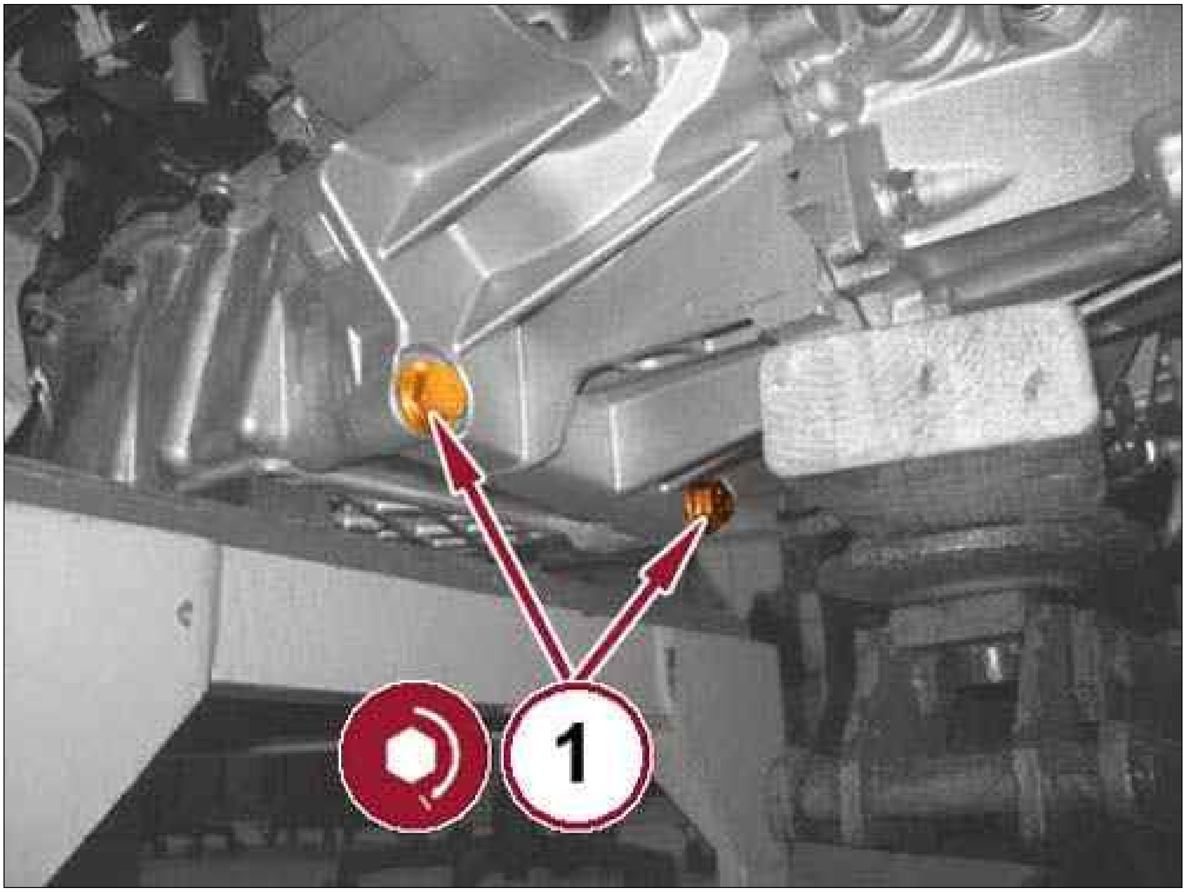
Fig 1: Gearbox To Engine Side Bolt



Courtesy of CHRYSLER GROUP, LLC

1. Fit the gearbox in its seat and tighten the side bolt fixing the gearbox to the engine to the proper specification. Refer to TORQUE SPECIFICATIONS .

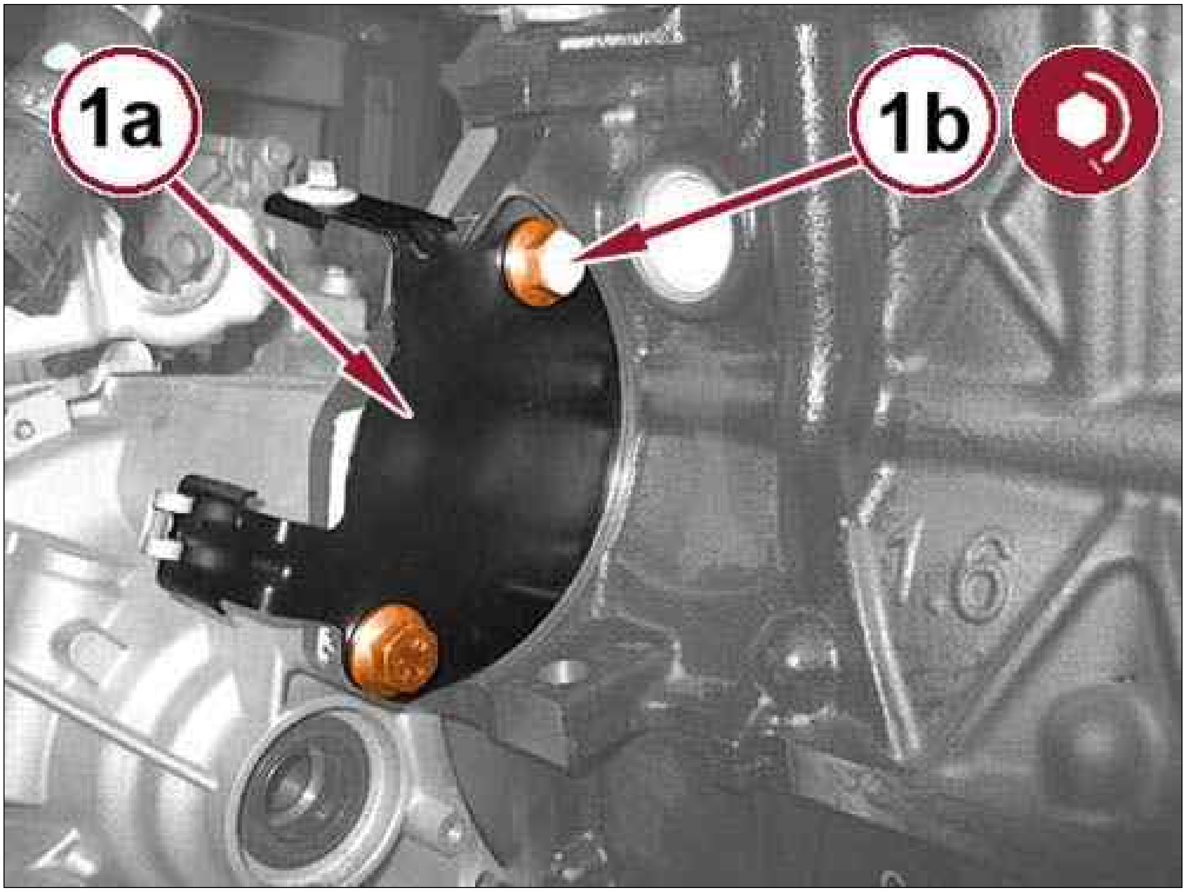
Fig 2: Gearbox To Engine Oil Sump Rear Bolts



Courtesy of CHRYSLER GROUP, LLC

2. Tighten the bolts securing the rear upper screws fixing the gearbox to the engine oil sump to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 3: Gearbox To Engine Bolt & Flywheel Upper Guard



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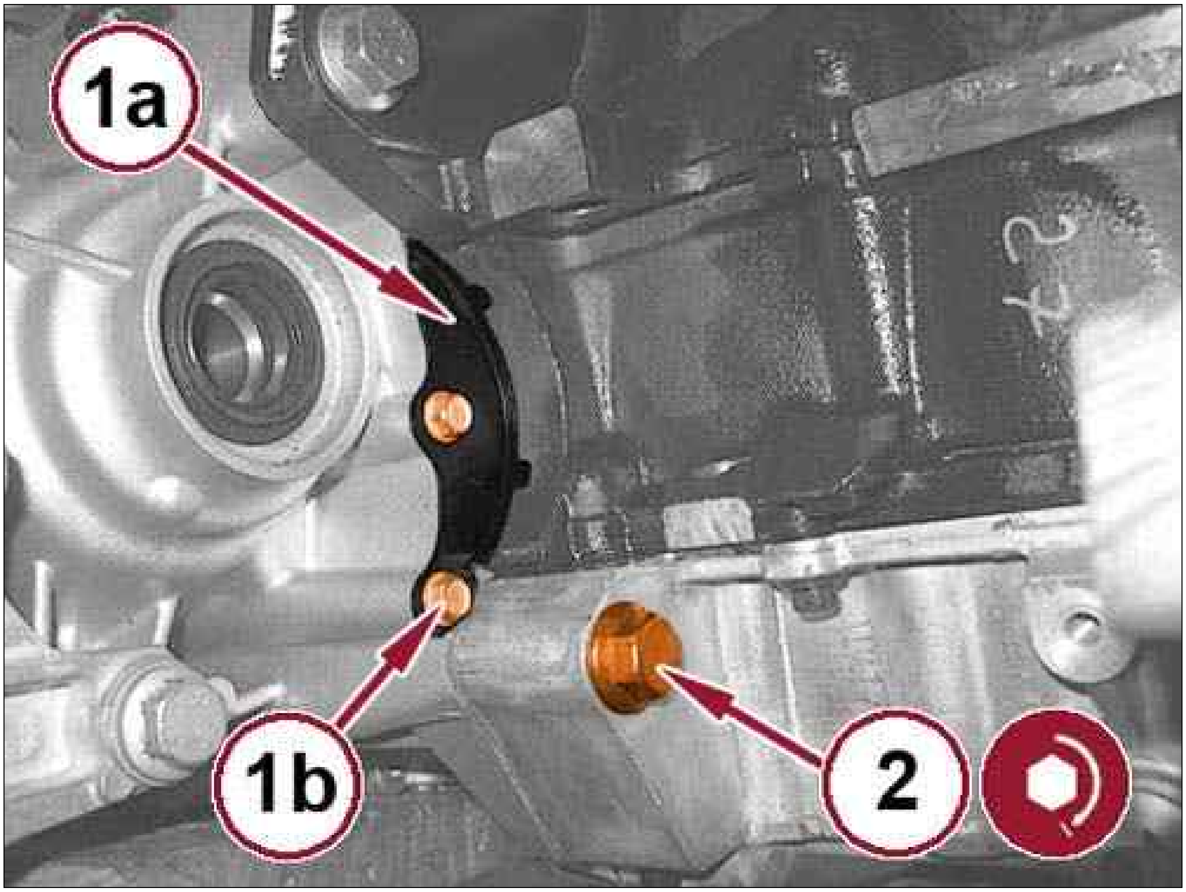
3. Place the engine flywheel upper guard (1a) back in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

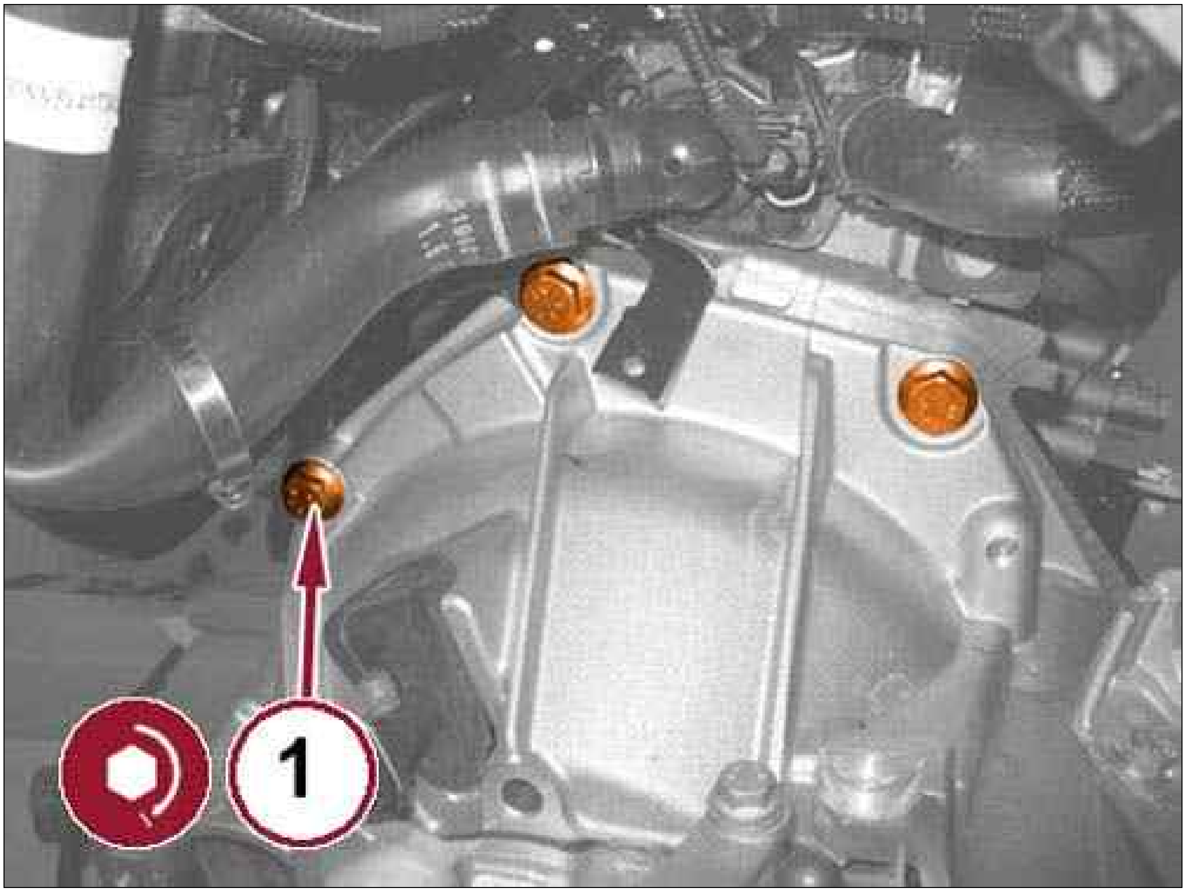
Fig 4: Flywheel Lower Guard, Bolts, Gearbox To Engine Oil Sump Bolts



Courtesy of CHRYSLER GROUP, LLC

4. Place the engine flywheel lower guard (1a) in its housing and tighten the corresponding bolts (1b).
5. Tighten the front bolt securing the gearbox to the engine oil sump to the proper specification. Refer to TORQUE SPECIFICATIONS .

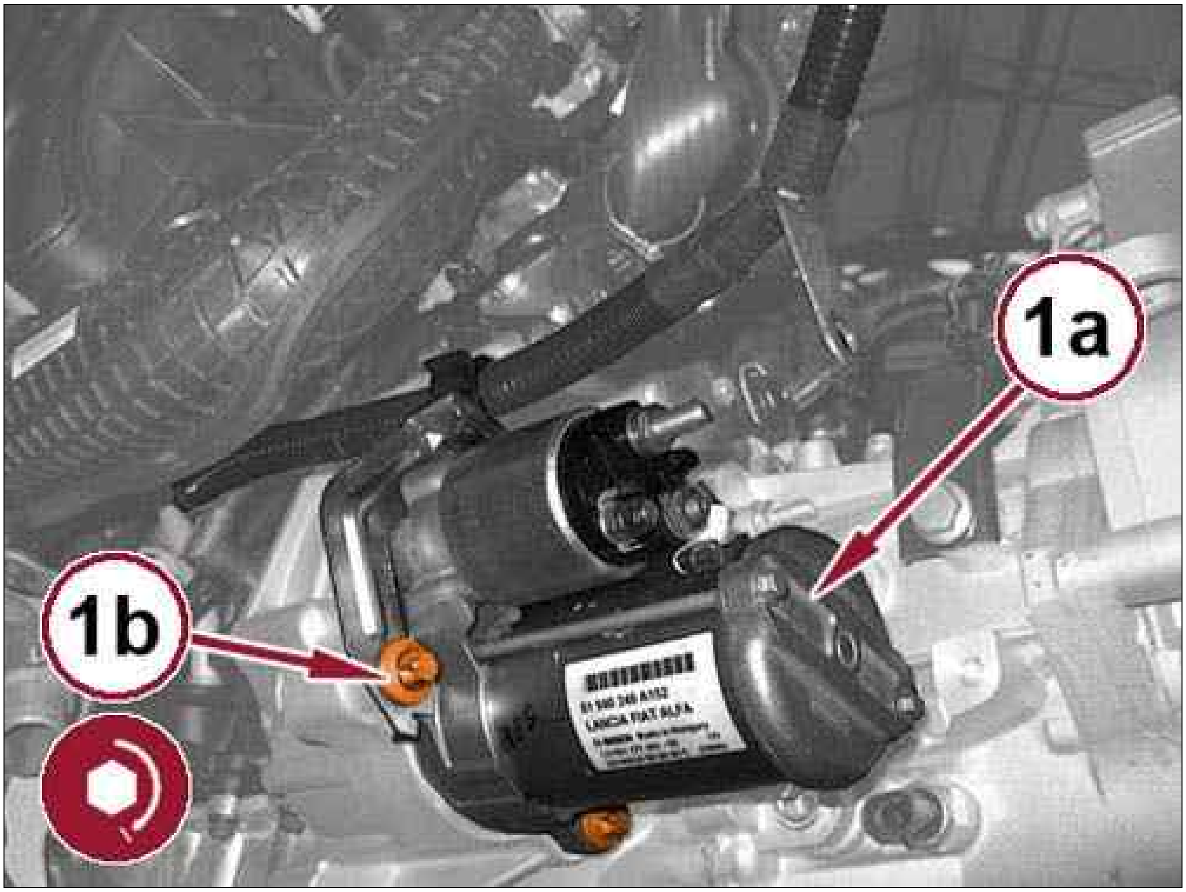
Fig 5: Gearbox To Engine Upper Bolts



Courtesy of CHRYSLER GROUP, LLC

6. Tighten the upper screws fixing the gearbox to the engine to the proper specification. Refer to TORQUE SPECIFICATIONS .
7. Engage the wiring in the bracket on the gearbox.

Fig 6: Starter & Screws



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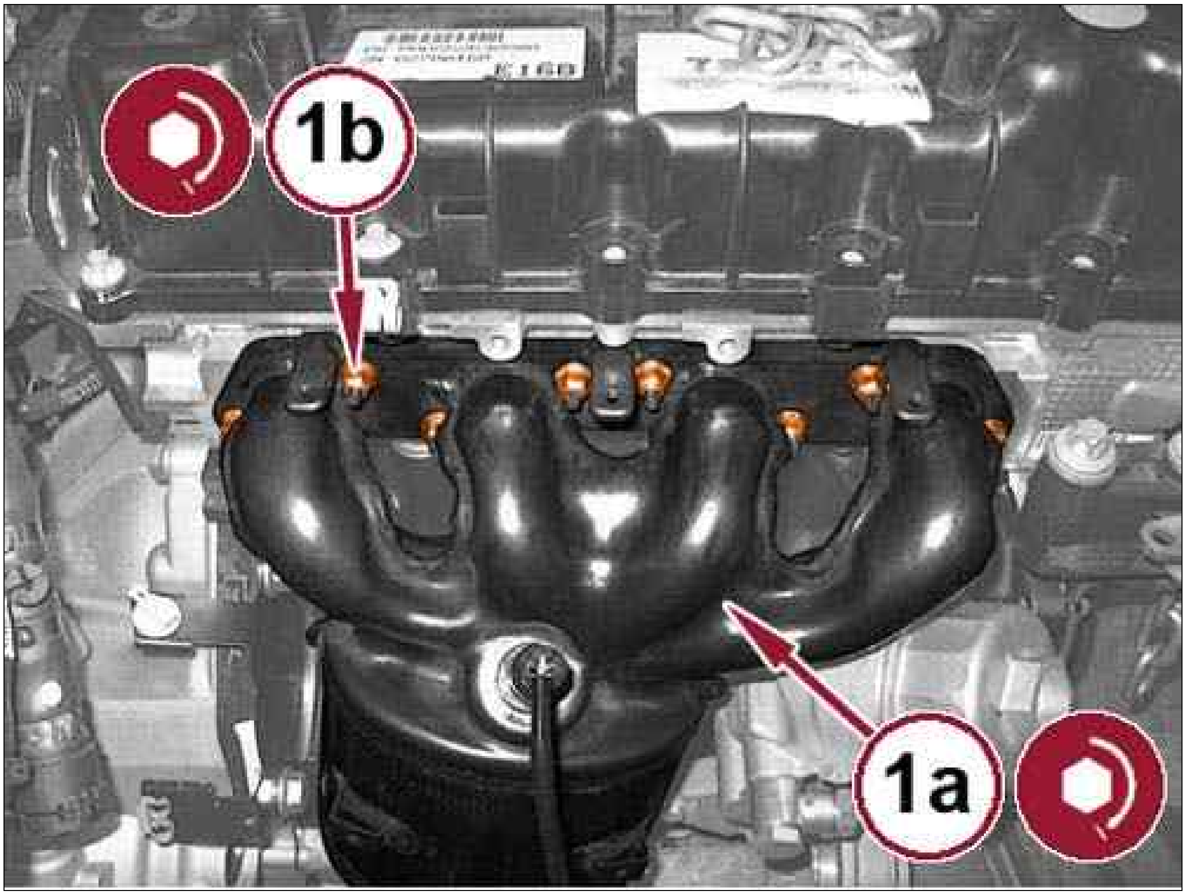
8. Place the starter (1a) in its housing and tighten the screws (1b) to the prescribed torque.
9. Connect the starter wiring and tighten the nut.

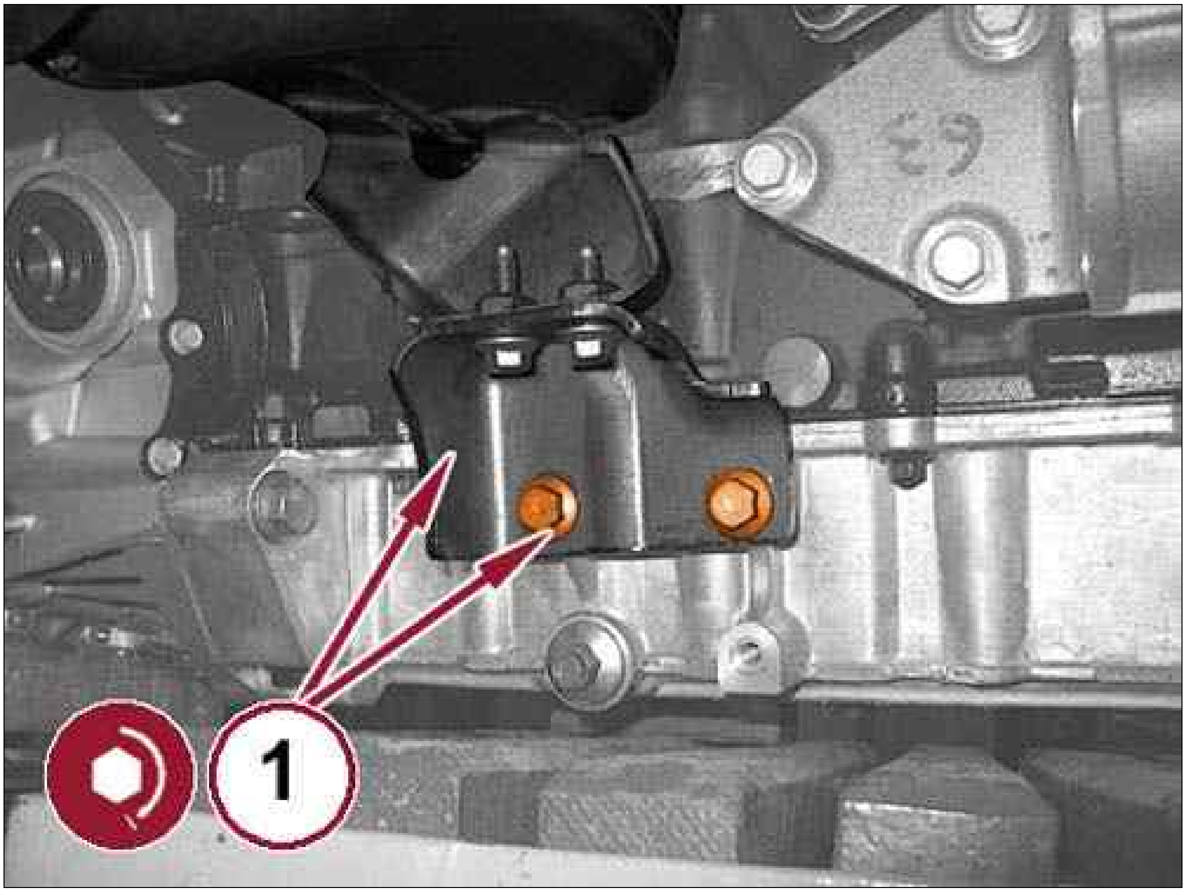
Fig 7: Exhaust Manifold With Catalytic Converter & Nuts



Courtesy of CHRYSLER GROUP, LLC

10. Place the exhaust manifold with catalytic converter (1a), complete with a **NEW** gasket, back in its housing and tighten the **NEW** nuts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 8: Catalytic Converter Mounting Bracket (At Engine Oil Sump Side) & Screws

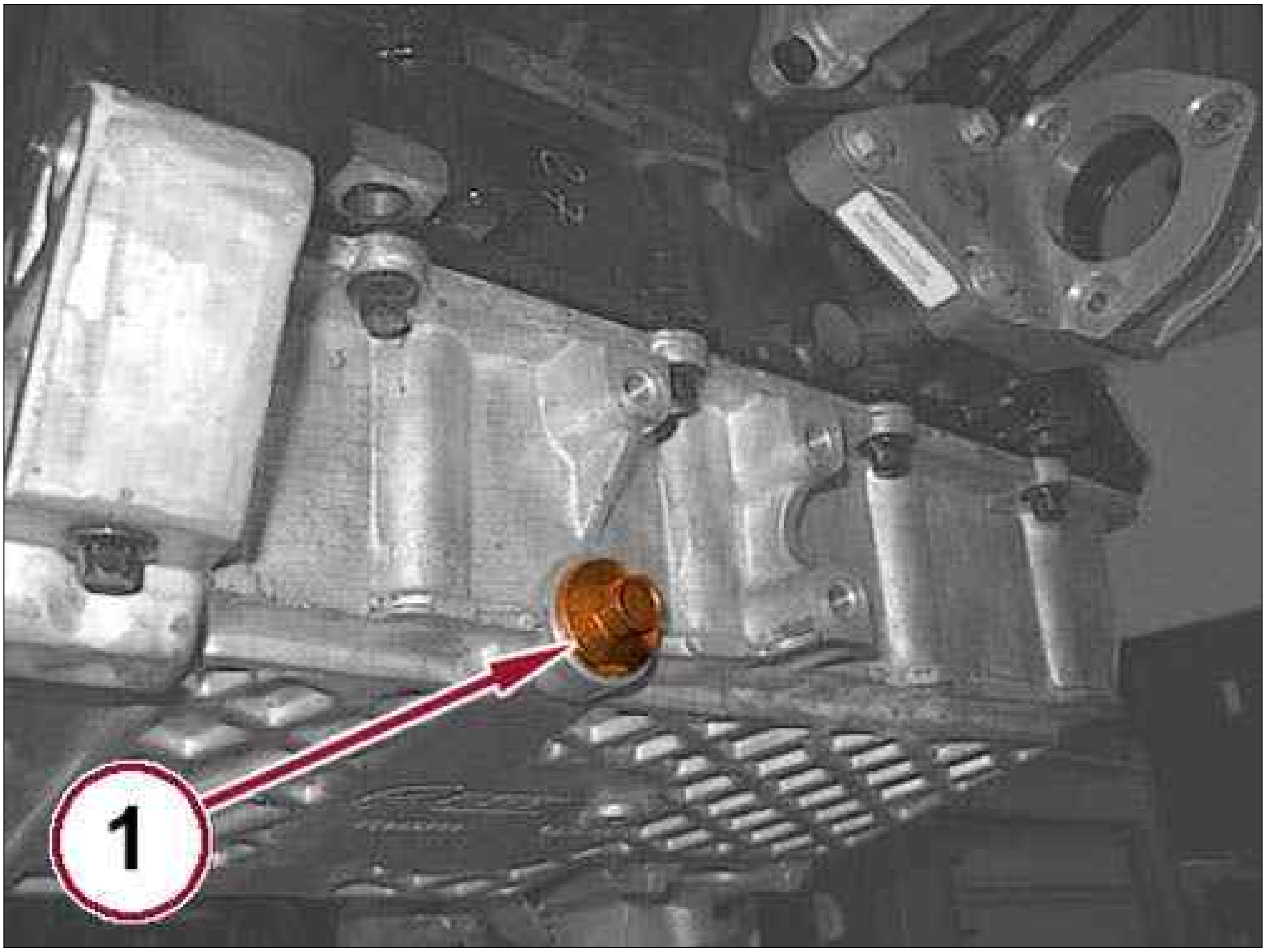


Courtesy of CHRYSLER GROUP, LLC

11. Tighten the fixing screws for the catalytic converter mounting bracket, engine sump side, to the proper specification. Refer to SPECIFICATIONS .
12. Refit the exhaust manifold heat shield back in its housing and tighten the screws.
13. Connect the rear oxygen sensor wire harness connector for the and engage the wiring with the retaining clip.
14. Connect the front oxygen sensor wire harness connector for the and engage the wiring with the retaining clip.

DISASSEMBLY AND ASSEMBLY > REMOVE CYLINDER HEAD AND OIL PAN FOR INSPECTION

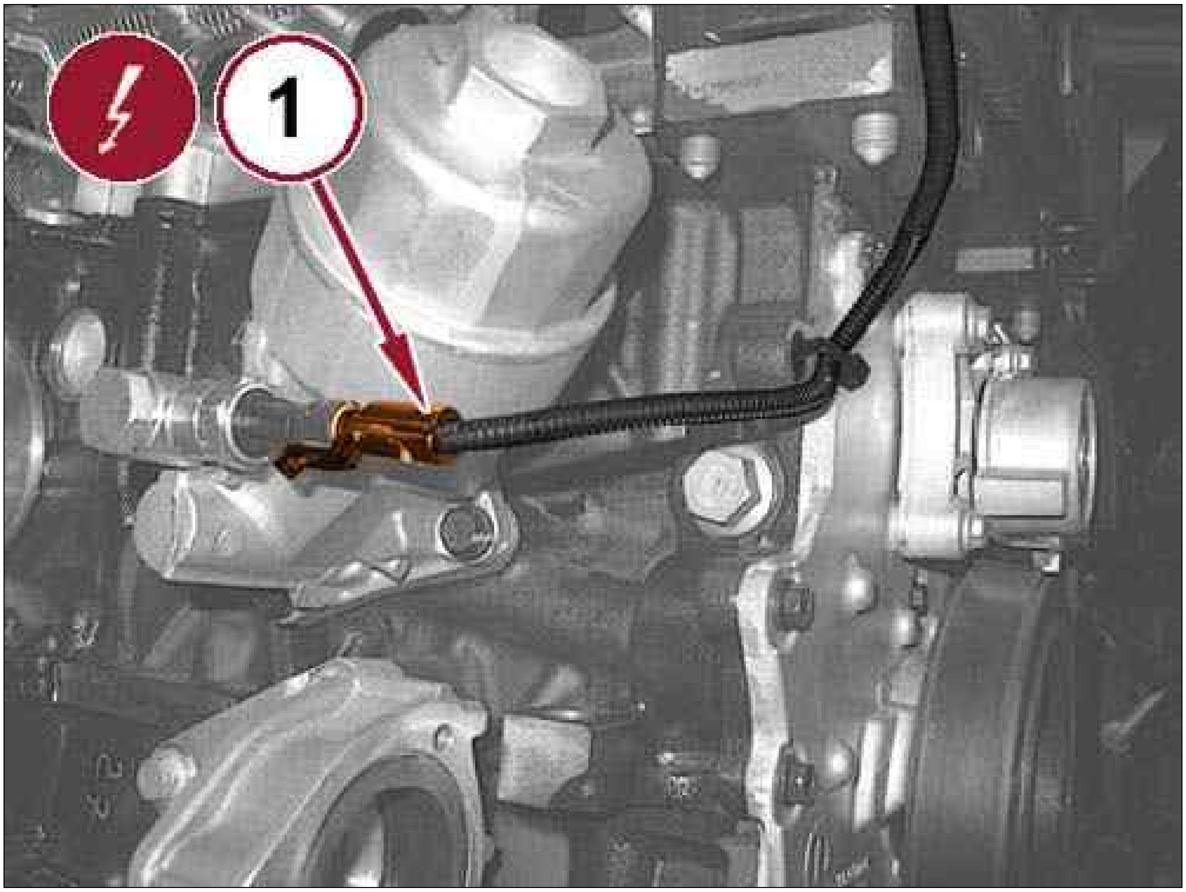
Fig 1: Engine Oil Pan Drain Plug



Courtesy of CHRYSLER GROUP, LLC

1. Remove the plug (1) and drain the engine oil into a suitable container.

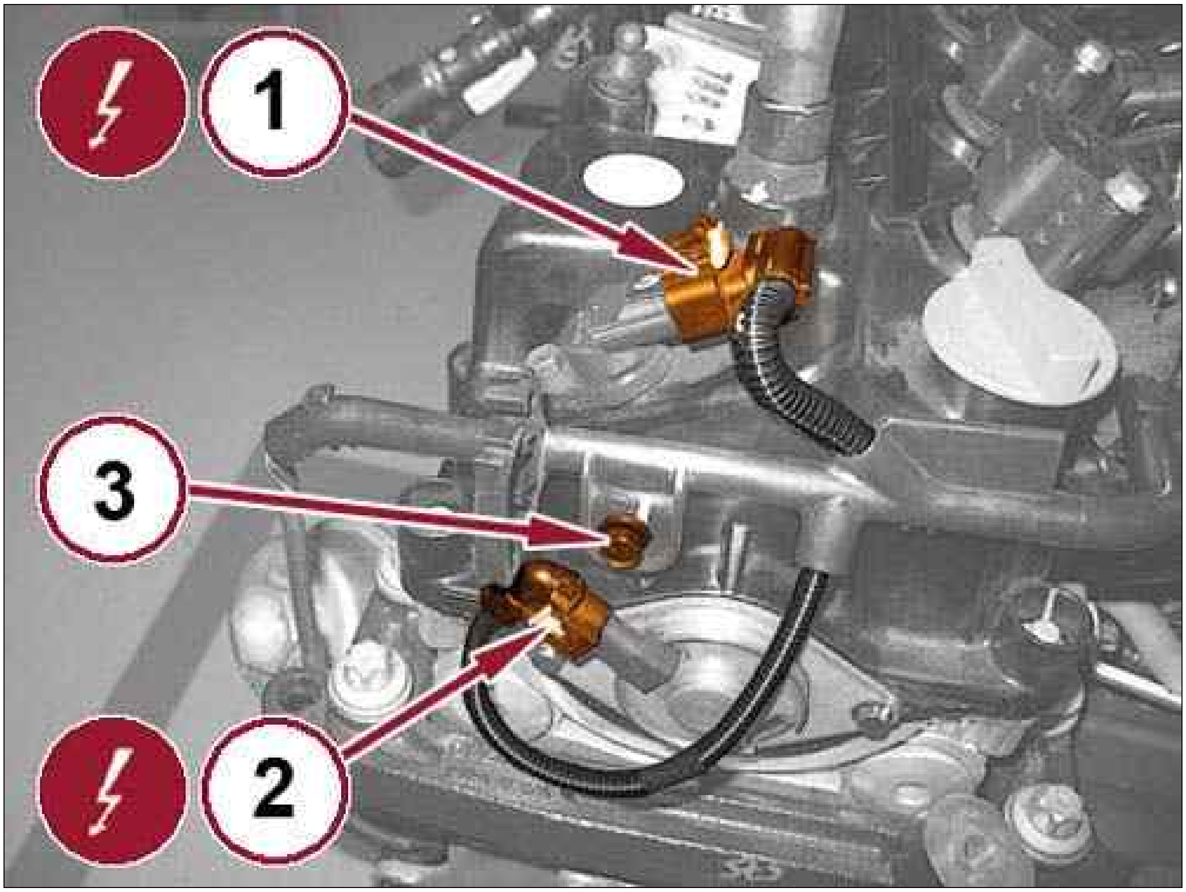
Fig 2: Oil Pressure Switch Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the minimum engine oil pressure switch wire harness connector and release the wiring.

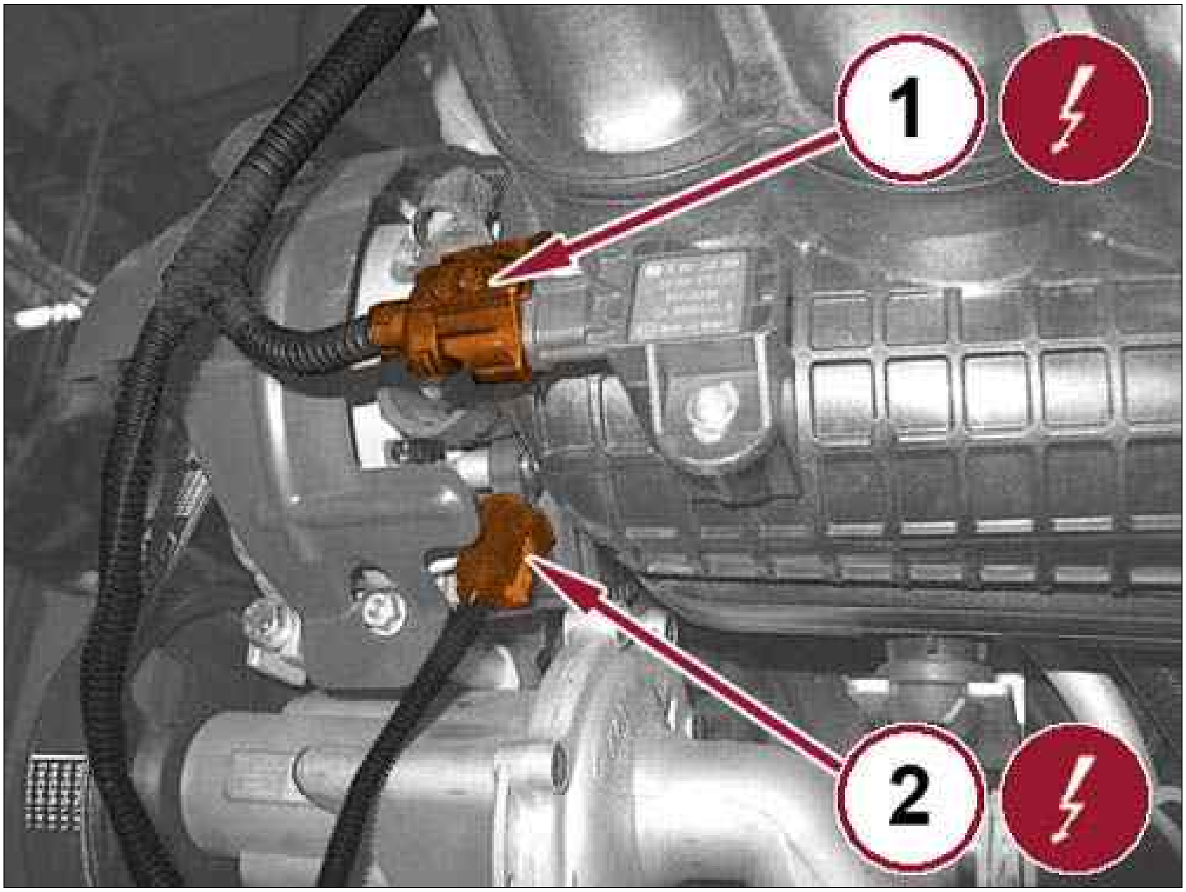
Fig 3: Camshaft Position (CMP) Sensor Wire Harness Connector, Variable Valve Timing System Electromagnet Wire Harness Connector & Wiring Duct To Tappet Cover (Timing Side) Bolt



Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the Camshaft Position (CMP) sensor wire harness connector (1).
4. Disconnect the variable valve timing system electromagnet wire harness connector (2).
5. Remove the bolt (3) securing the wiring duct to the tappet cover, on the timing side.

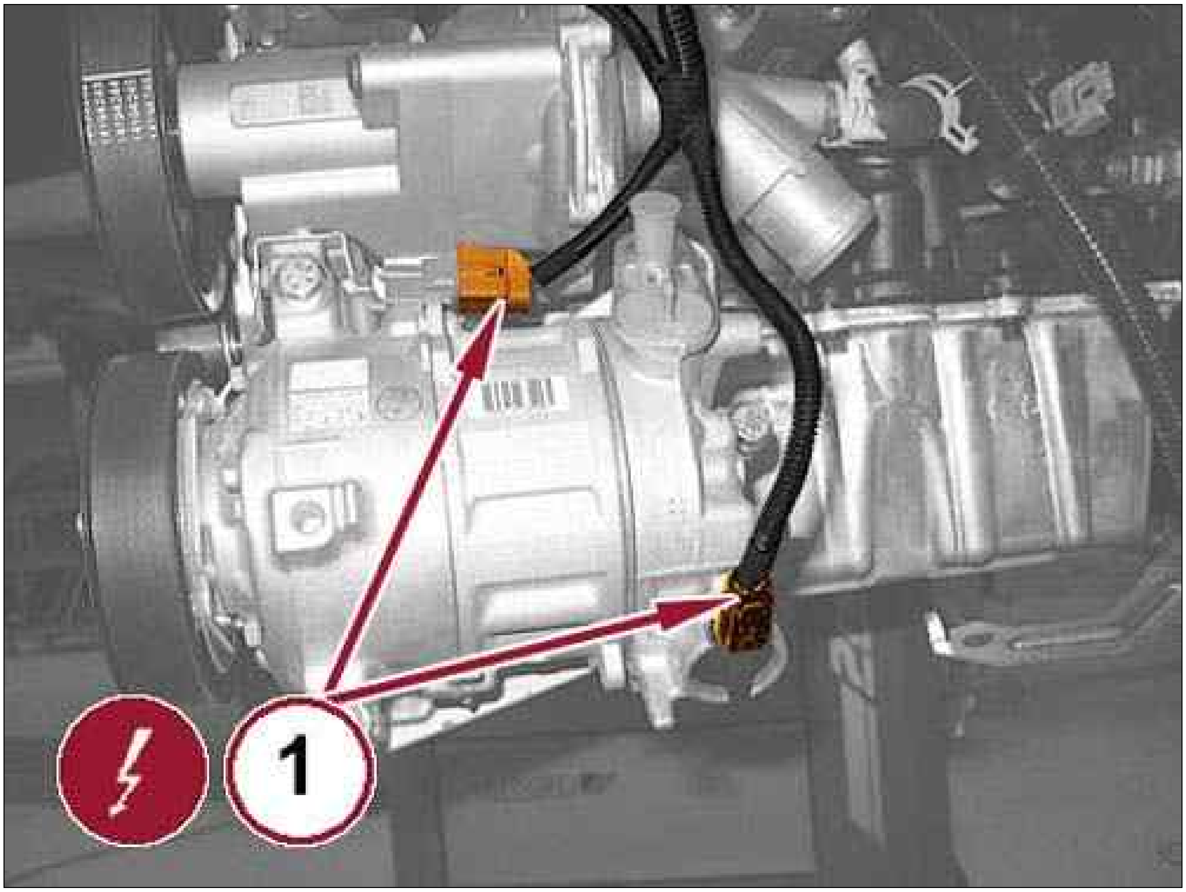
Fig 4: Intake Air Temperature And Pressure Sensor Wire Harness Connector & Generator Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

6. Disconnect the intake air temperature and pressure sensor wire harness connector (1).
7. Disconnect the generator wire harness connector (2).

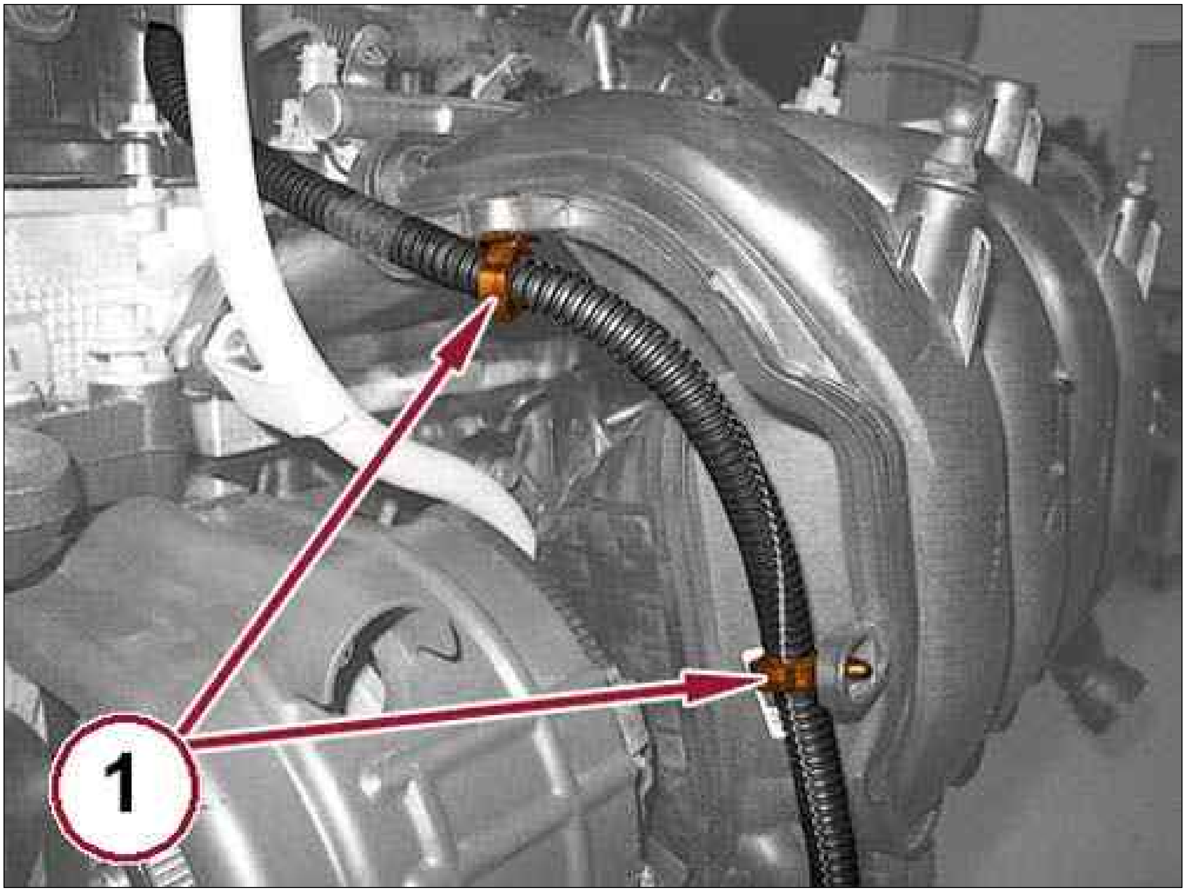
Fig 5: A/C Compressor Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the A/C compressor wire harness connector (1).

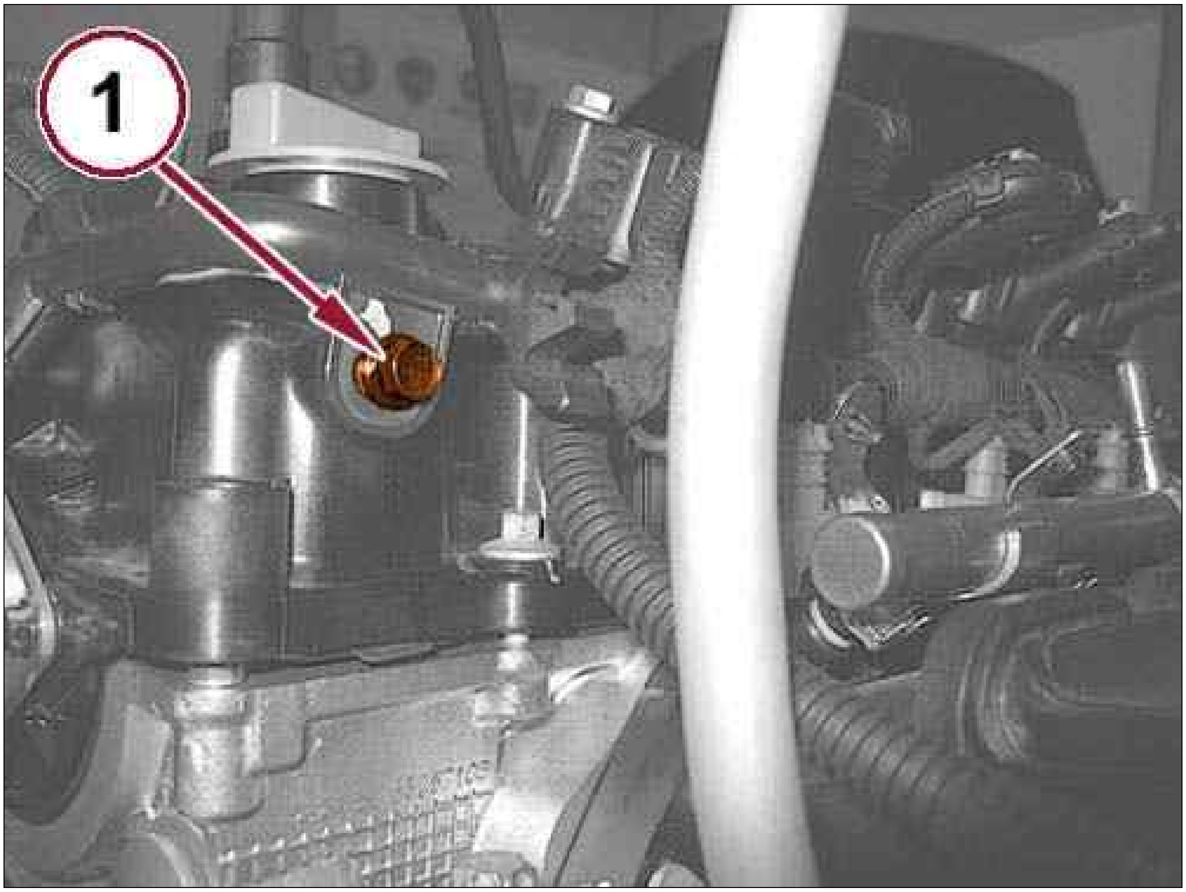
Fig 6: Wiring Retaining Clips At Air Chamber Side



Courtesy of CHRYSLER GROUP, LLC

9. Release the wiring retaining clips (1), air chamber side.

Fig 7: Wiring Duct To Tappet Cover (Intake Side) Bolt



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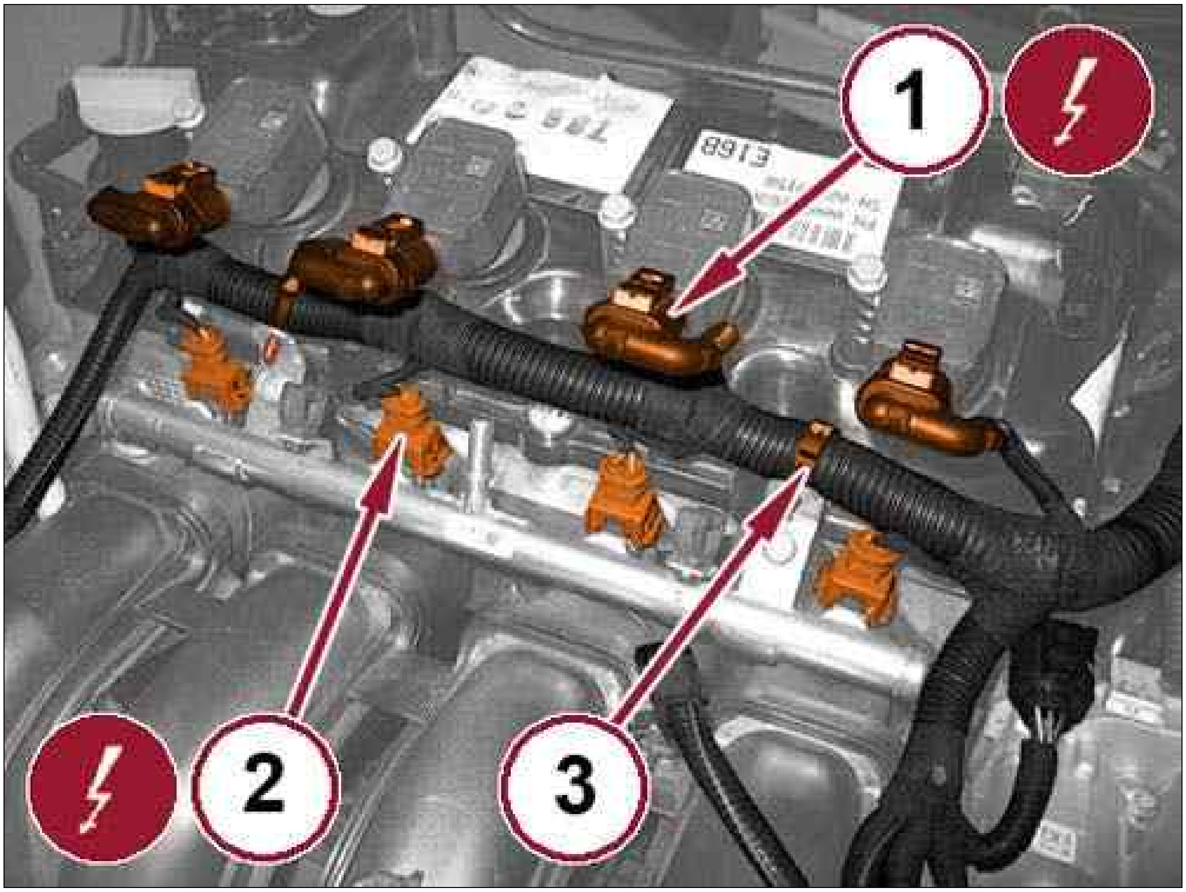
10. Remove the bolt (1) securing the wiring duct to the tappet cover, on the intake side.

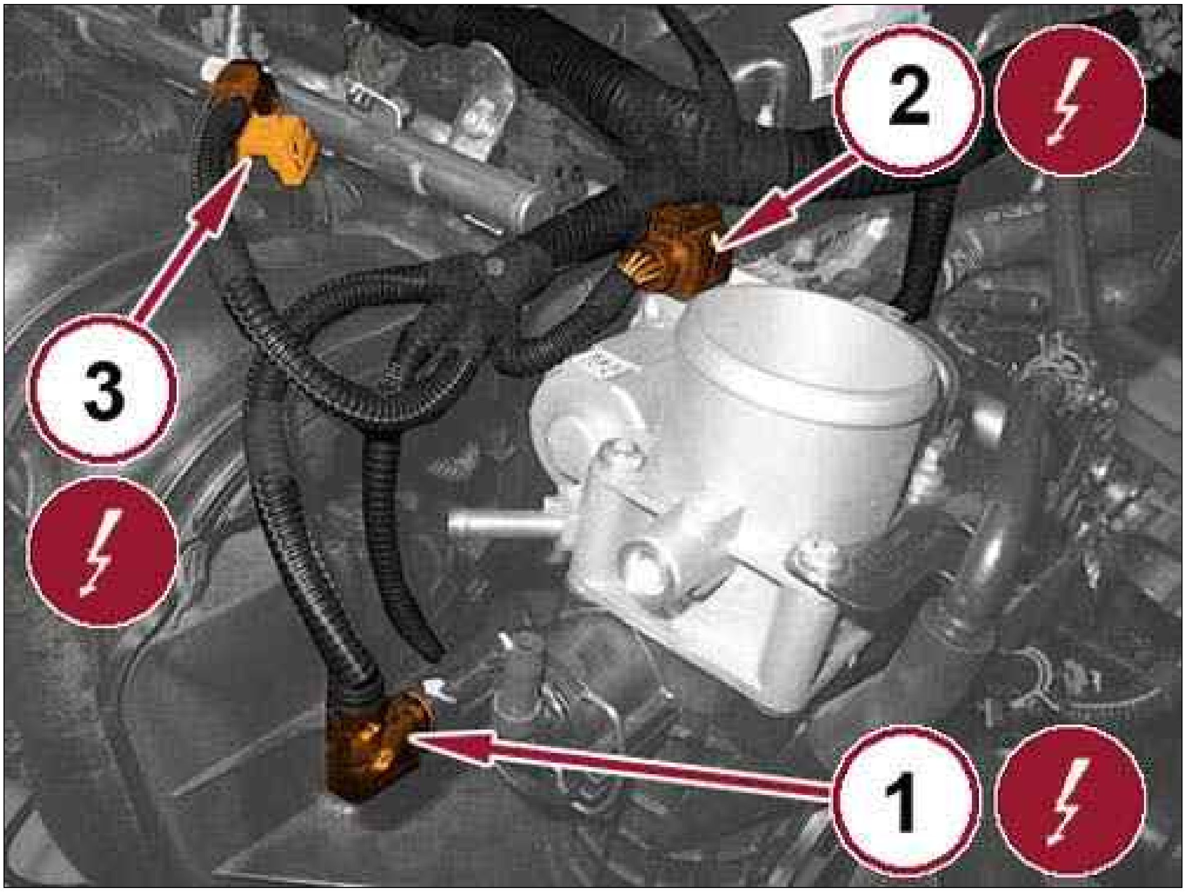
Fig 8: Ignition Coils & Fuel Injector Wire Harness Connectors & Wiring At Mounting Brackets



Courtesy of CHRYSLER GROUP, LLC

11. Disconnect the ignition coils wire harness connector (1).
12. Detach the fuel injectors wire harness connector (2).
13. Release the wiring from the mounting brackets (3).

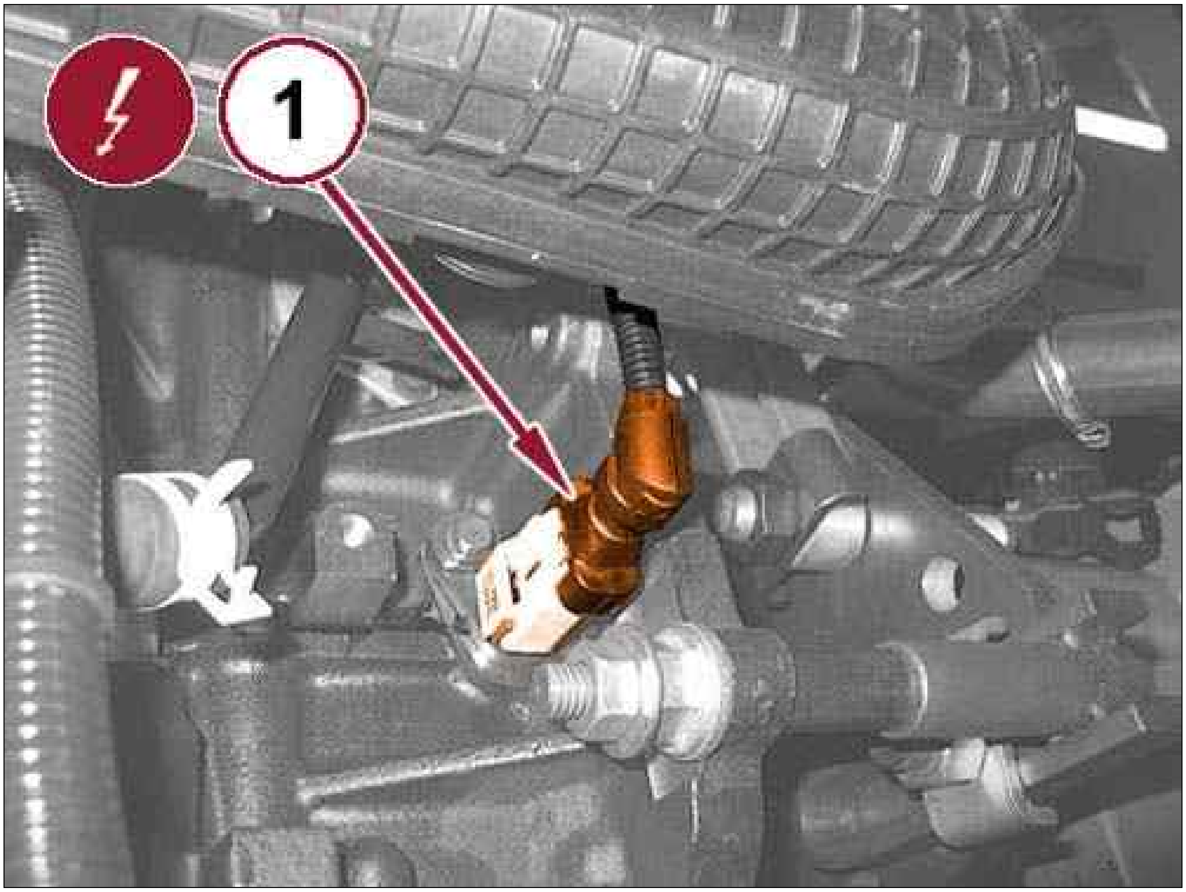
Fig 9: Fuel Vapor Recovery Solenoid, Throttle Body & Knock Sensor Wire Harness Connectors



Courtesy of CHRYSLER GROUP, LLC

14. Detach the fuel vapor recovery solenoid wire harness connector (1).
15. Detach the throttle body wire harness connector (2)
16. Disconnect the knock sensor wire harness connector.

Fig 10: Crankshaft Position (CKP) Sensor Wire Harness Connector



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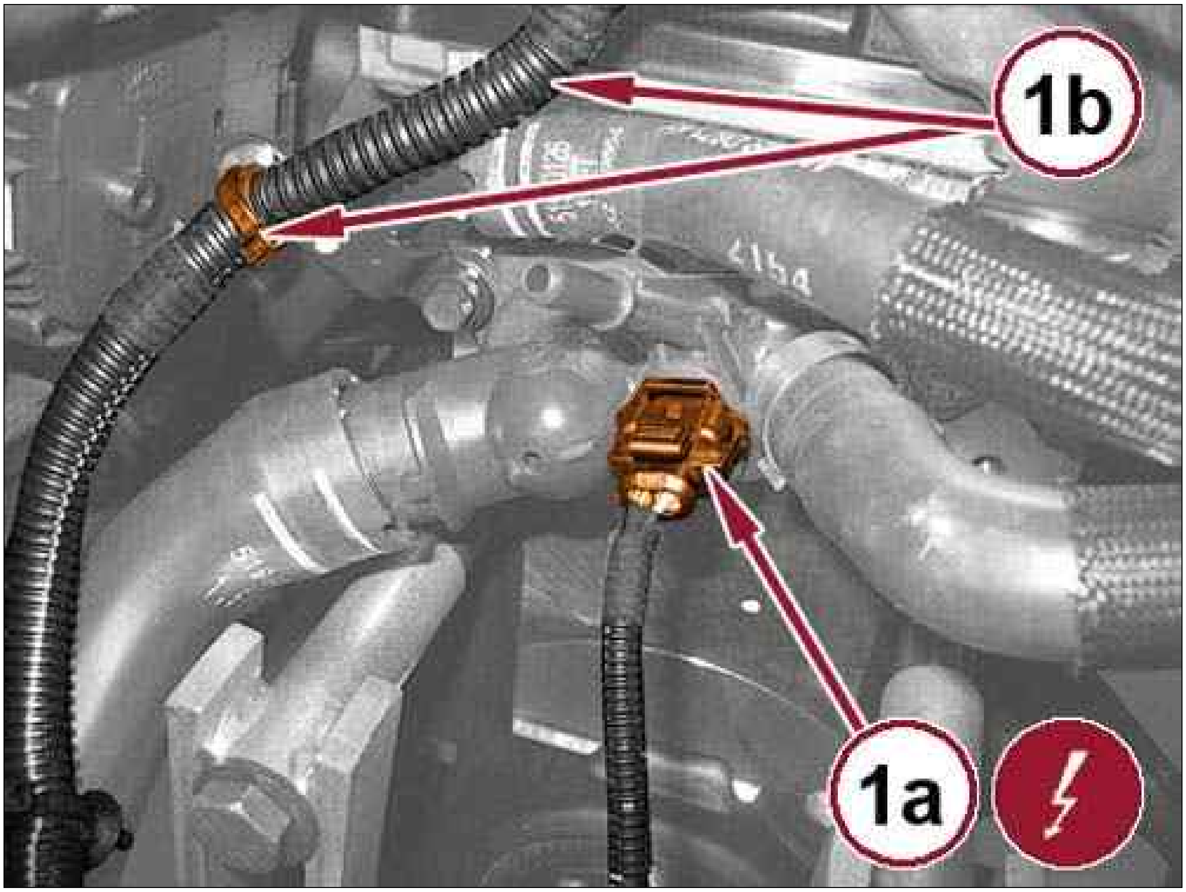
17. Disconnect the Crankshaft Position (CKP) sensor wire harness connector (1).

Fig 11: Engine Water Temperature Sensor Wire Harness Connector & Wiring At Bracket



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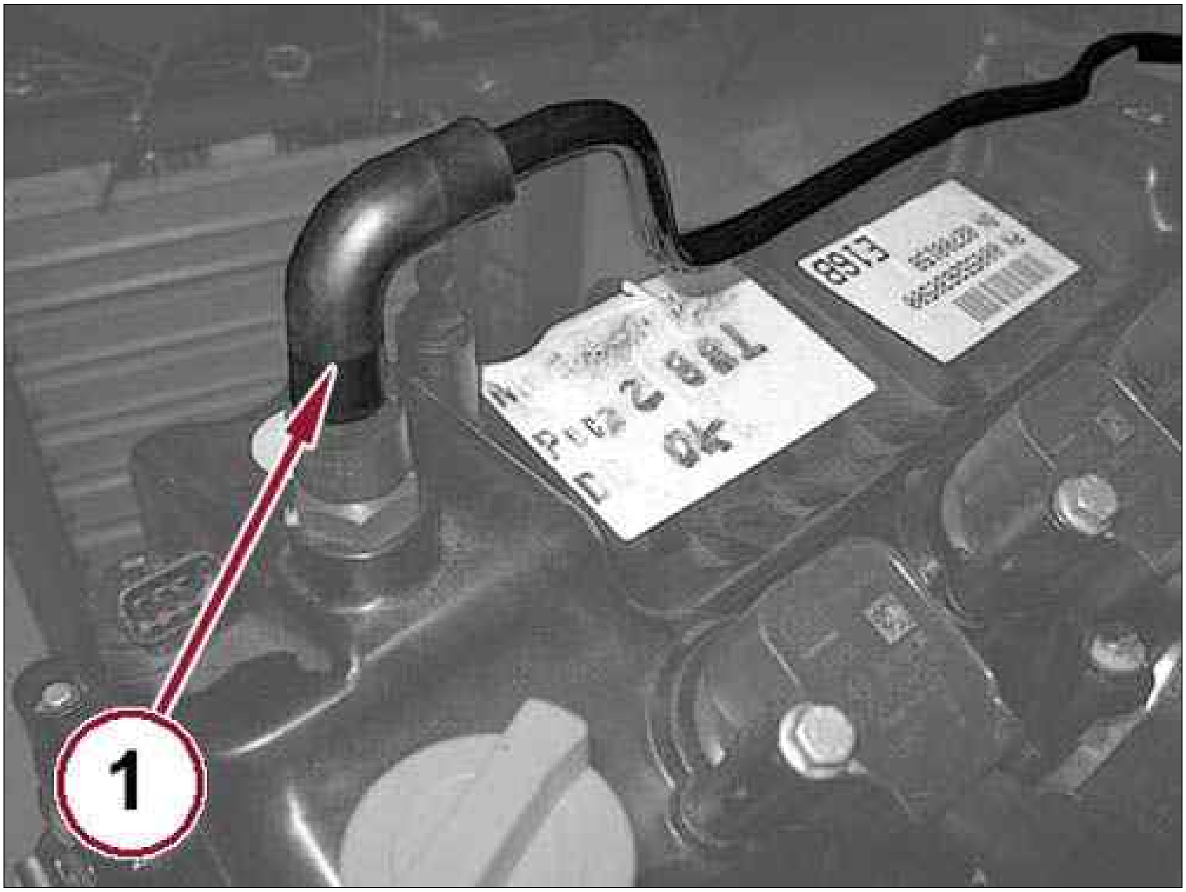
18. Disconnect the engine water temperature sensor wire harness connector (1a) and release the wiring from the bracket (1b).
19. Remove the engine wiring.

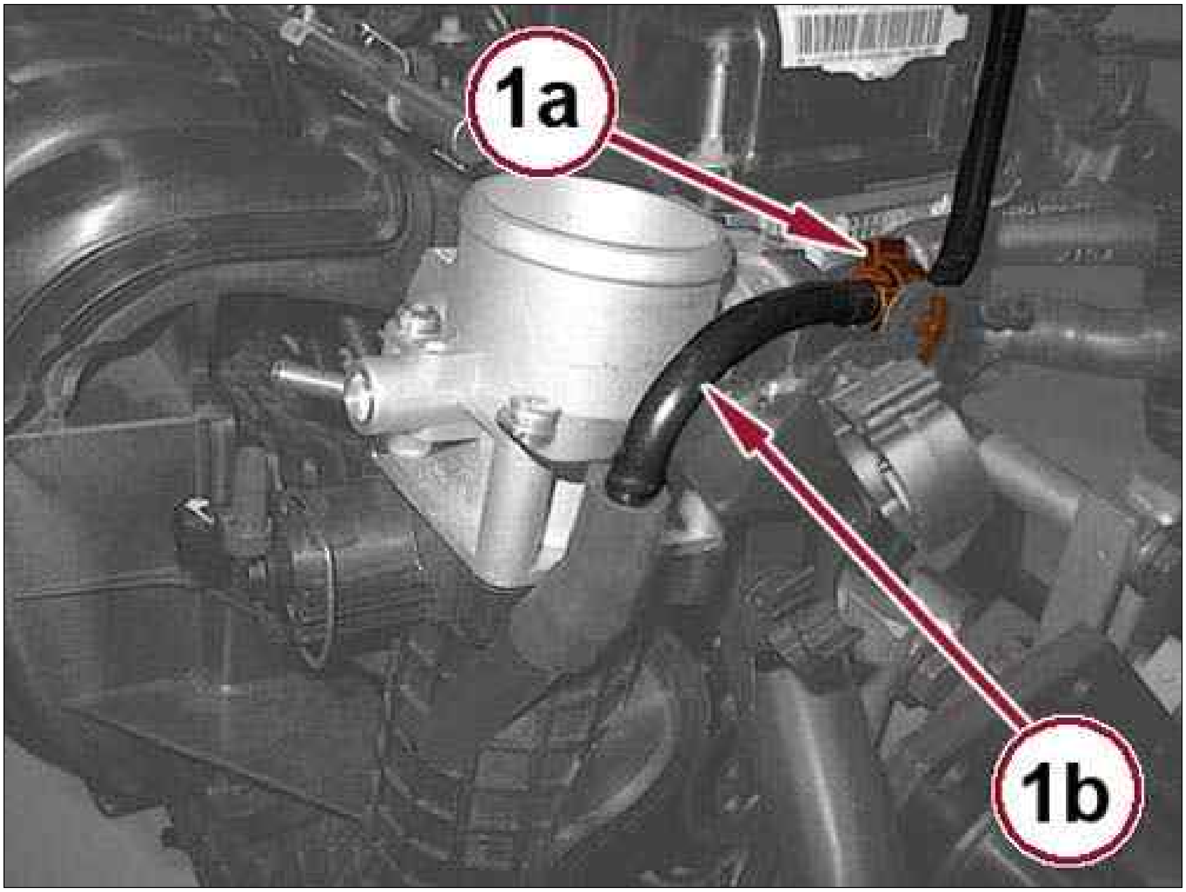
Fig 12: Positive Crankcase Valve (PCV)



Courtesy of CHRYSLER GROUP, LLC

20. Disconnect the Positive Crankcase Valve (PCV) (1), single-acting valve side.

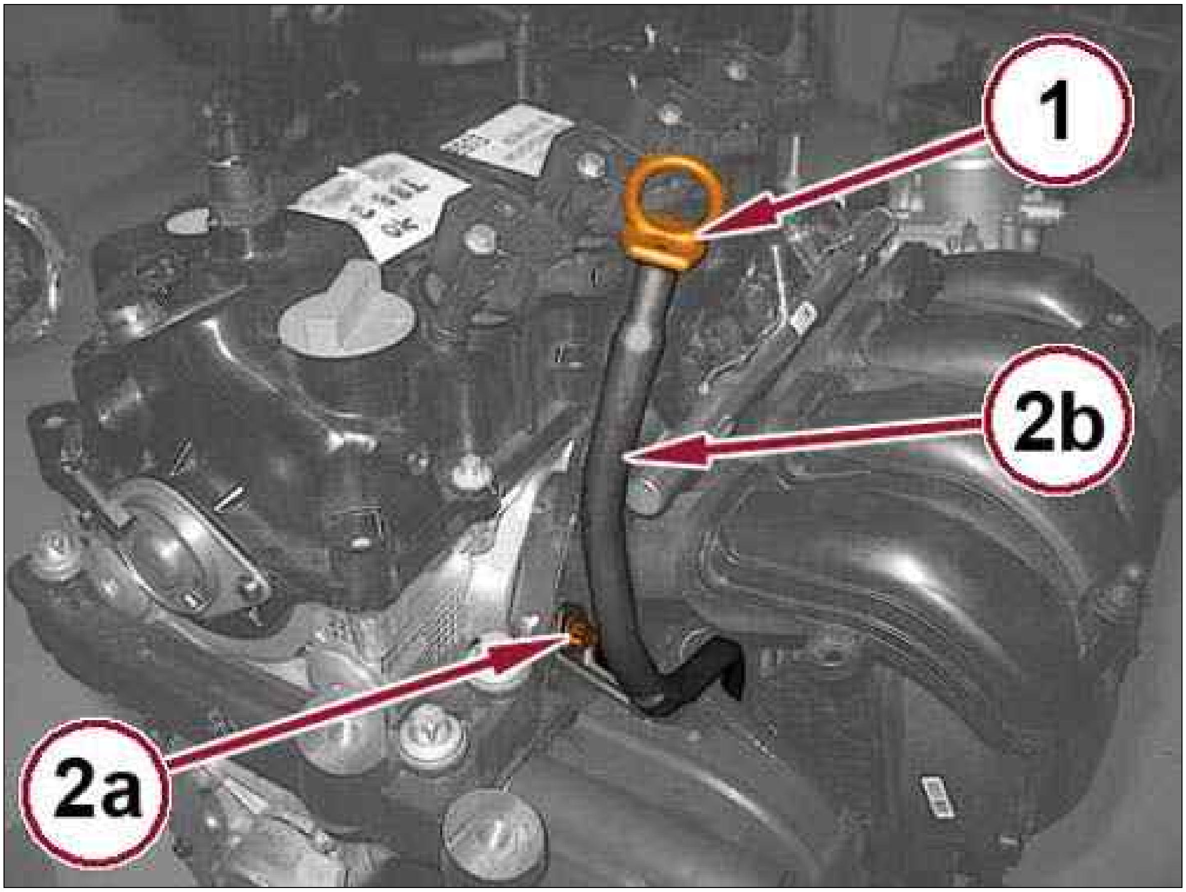
Fig 13: Engine Oil Vapor Inlet Pipe & Retaining Clip



Courtesy of CHRYSLER GROUP, LLC

21. Open the retaining clip (1a), disconnect the idling engine oil vapor inlet pipe (1b) from the air chamber and remove it.

Fig 14: Engine Oil Dipstick, Tube & Bolt



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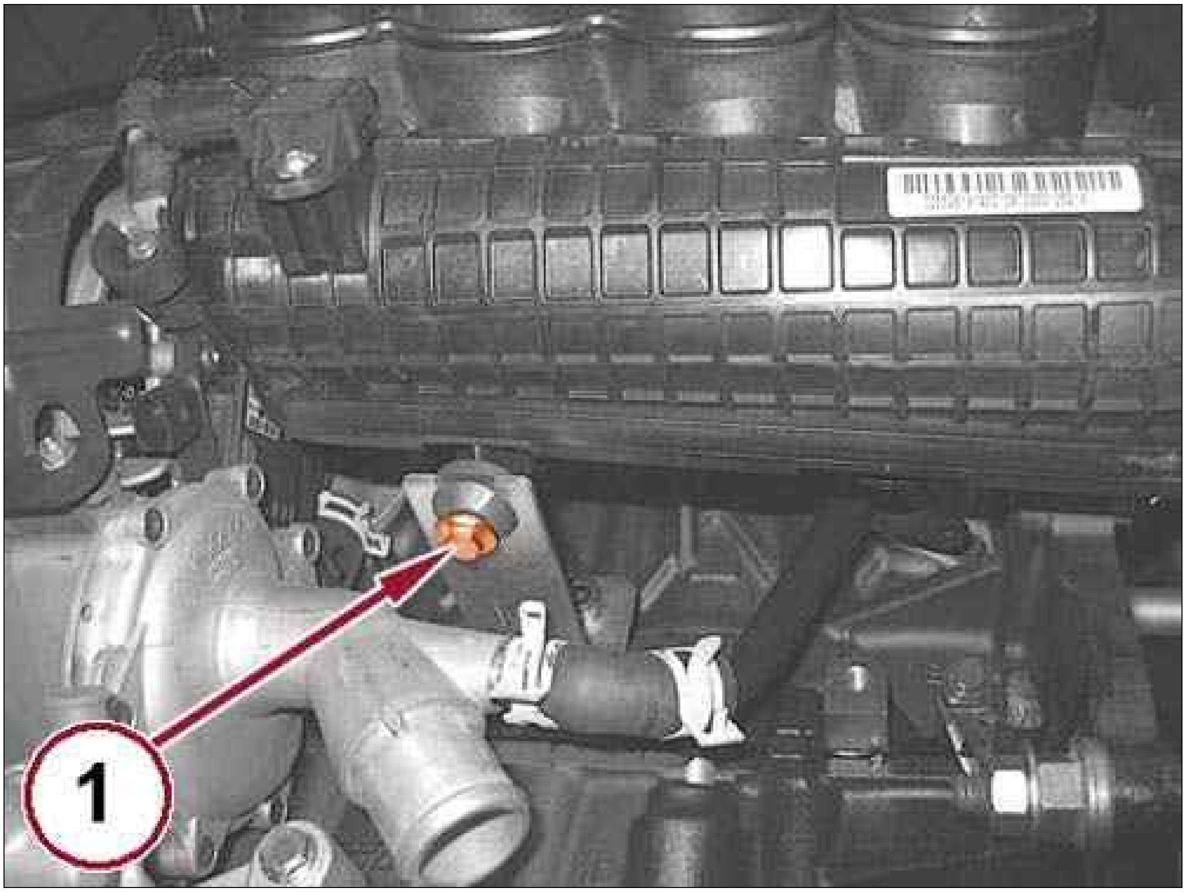
22. Remove the engine oil dipstick (1).
23. Remove the bolt (2a) and the engine oil dipstick tube (2b).

Fig 15: Air Chamber To Mounting Bracket Bolt



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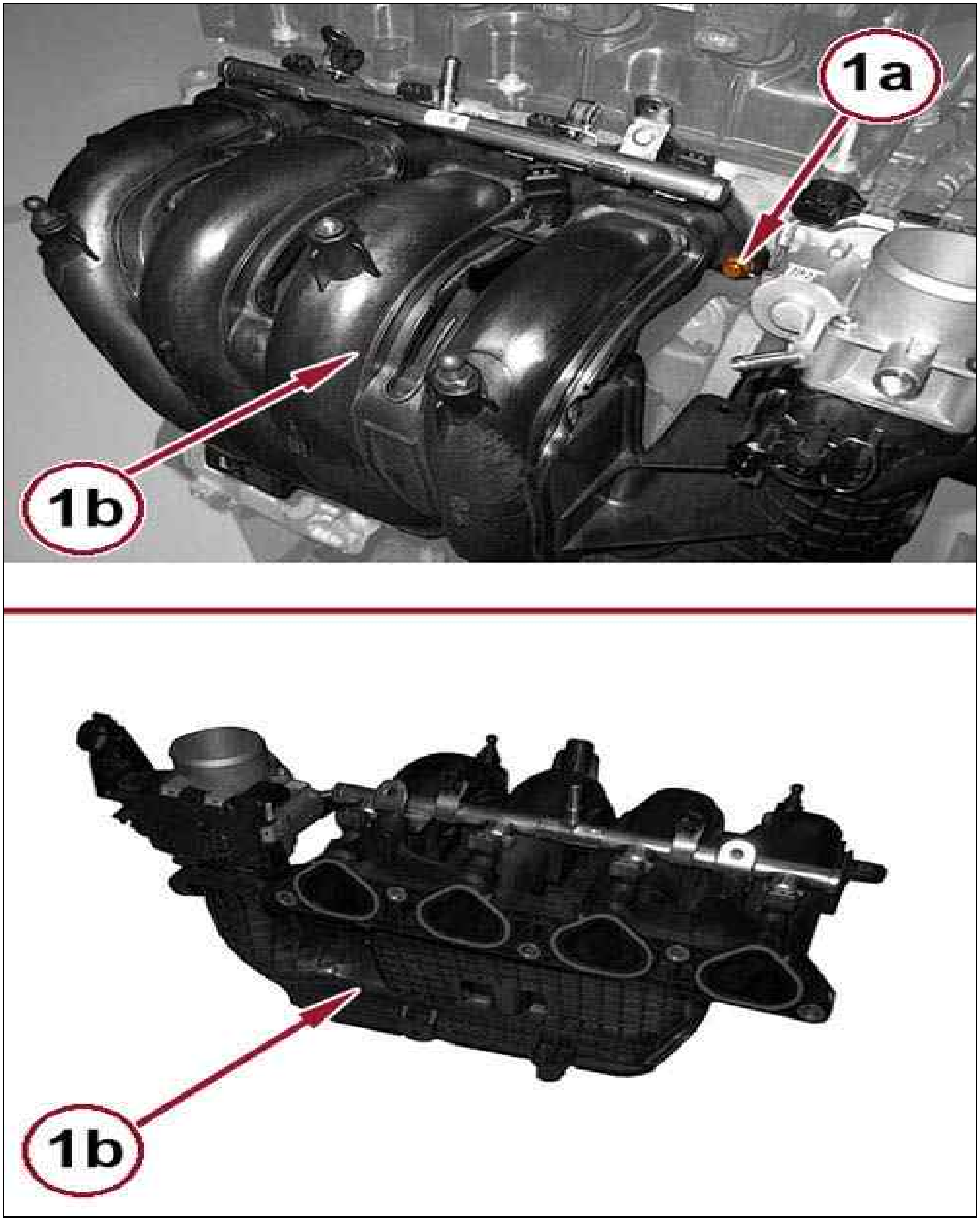
24. Remove the bolt (1) securing the air chamber to the mounting bracket.

Fig 16: Air Intake Chamber With Throttle Body And Fuel Distribution Manifold & Bolts



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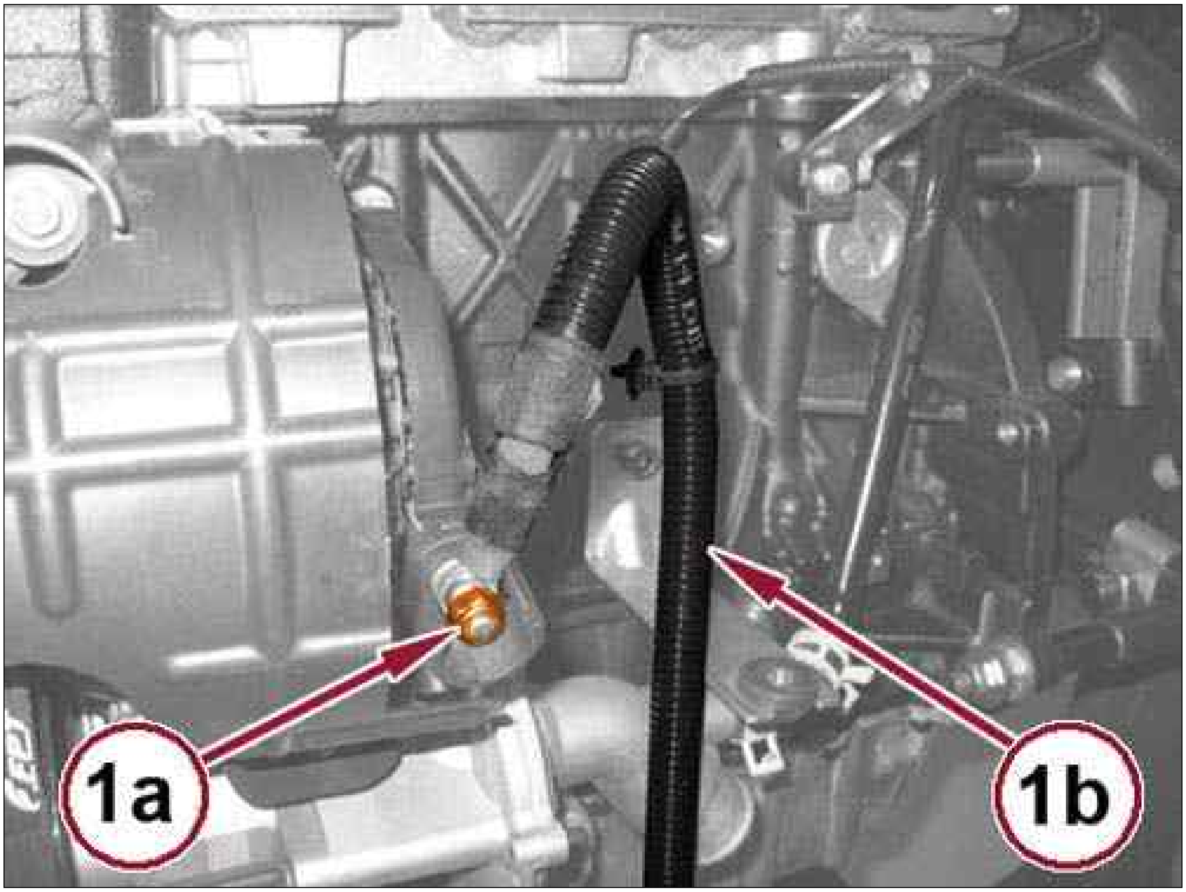
25. Remove the bolts (1a) and remove the air intake chamber (1b) complete with throttle body and fuel distribution manifold.

Fig 17: Engine Wiring & Nut



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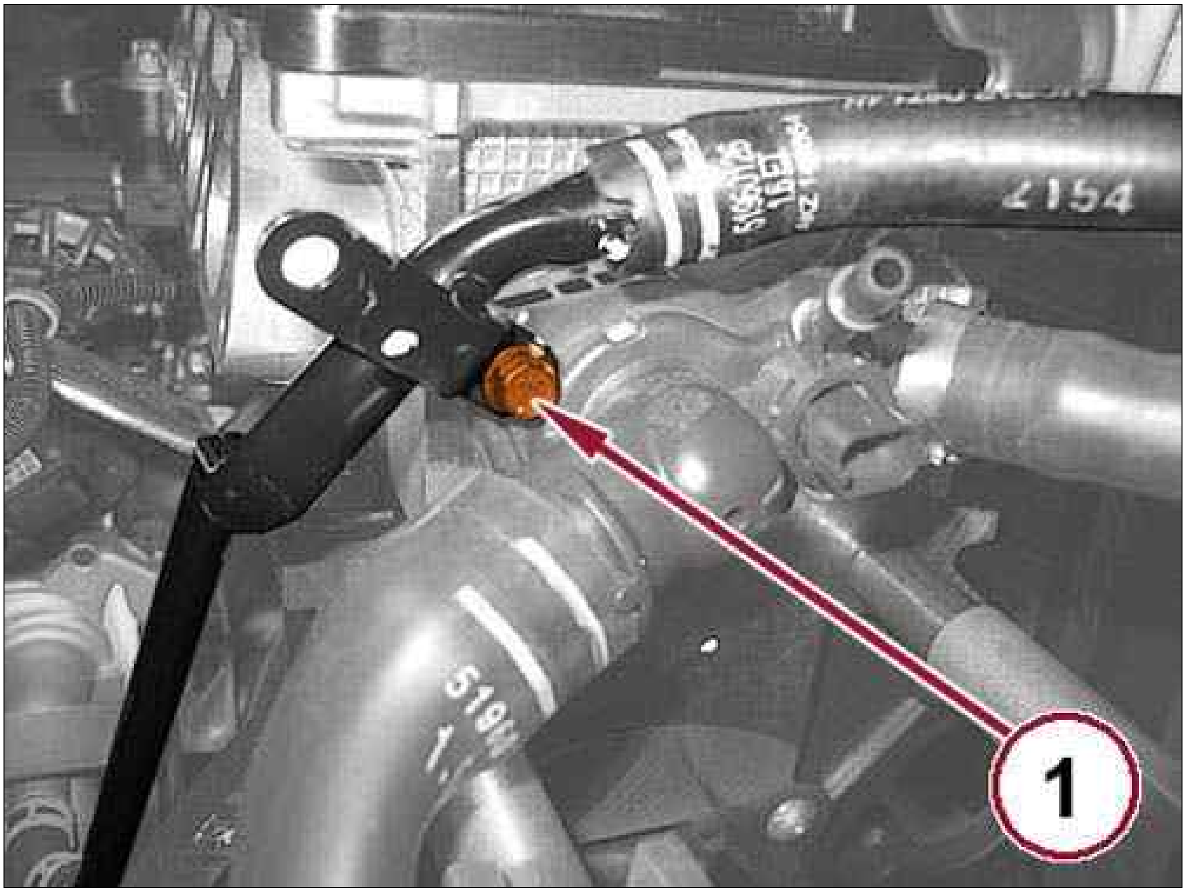
26. Remove the nut (1a) and remove the engine wiring (1b).

Fig 18: Heater To Thermostat Return Pipe & Bolt



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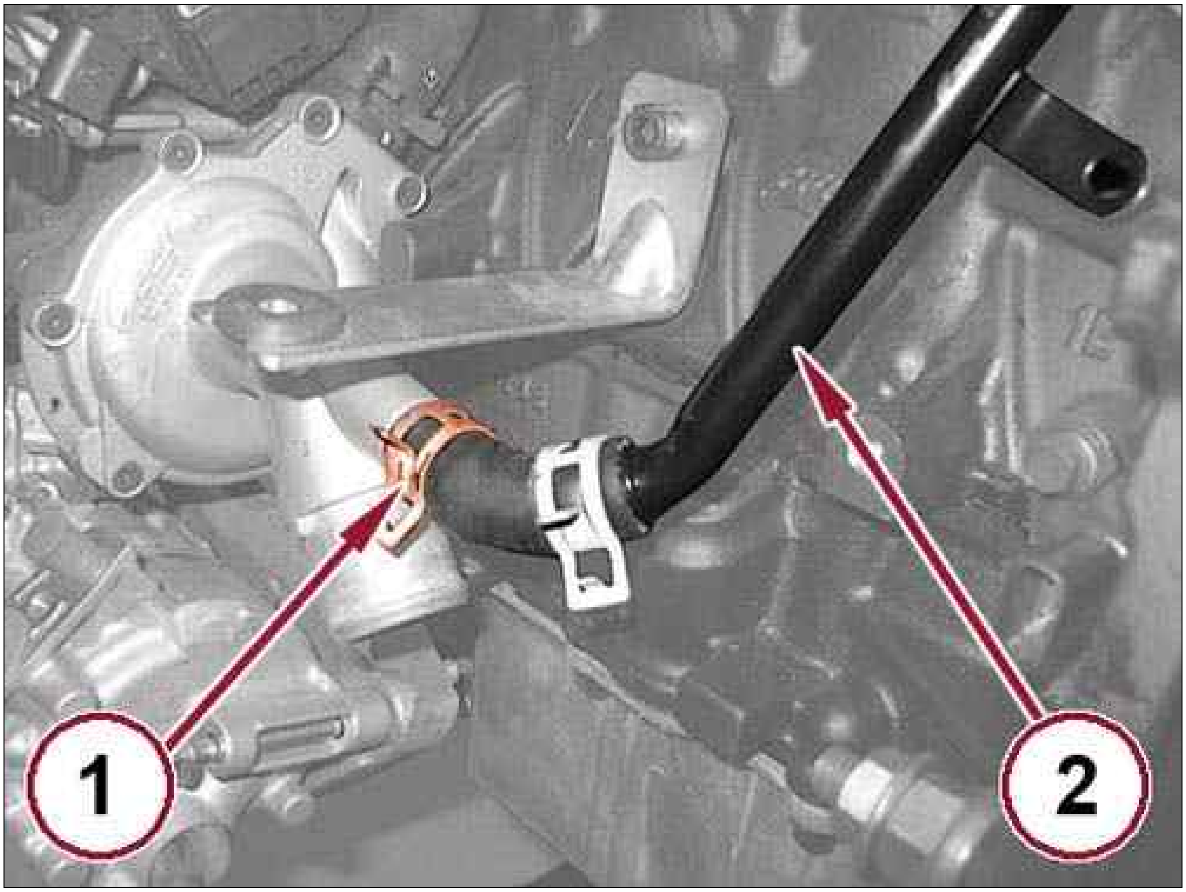
27. Remove the fixing bolt (1) for the return pipe from the heater to the thermostat.

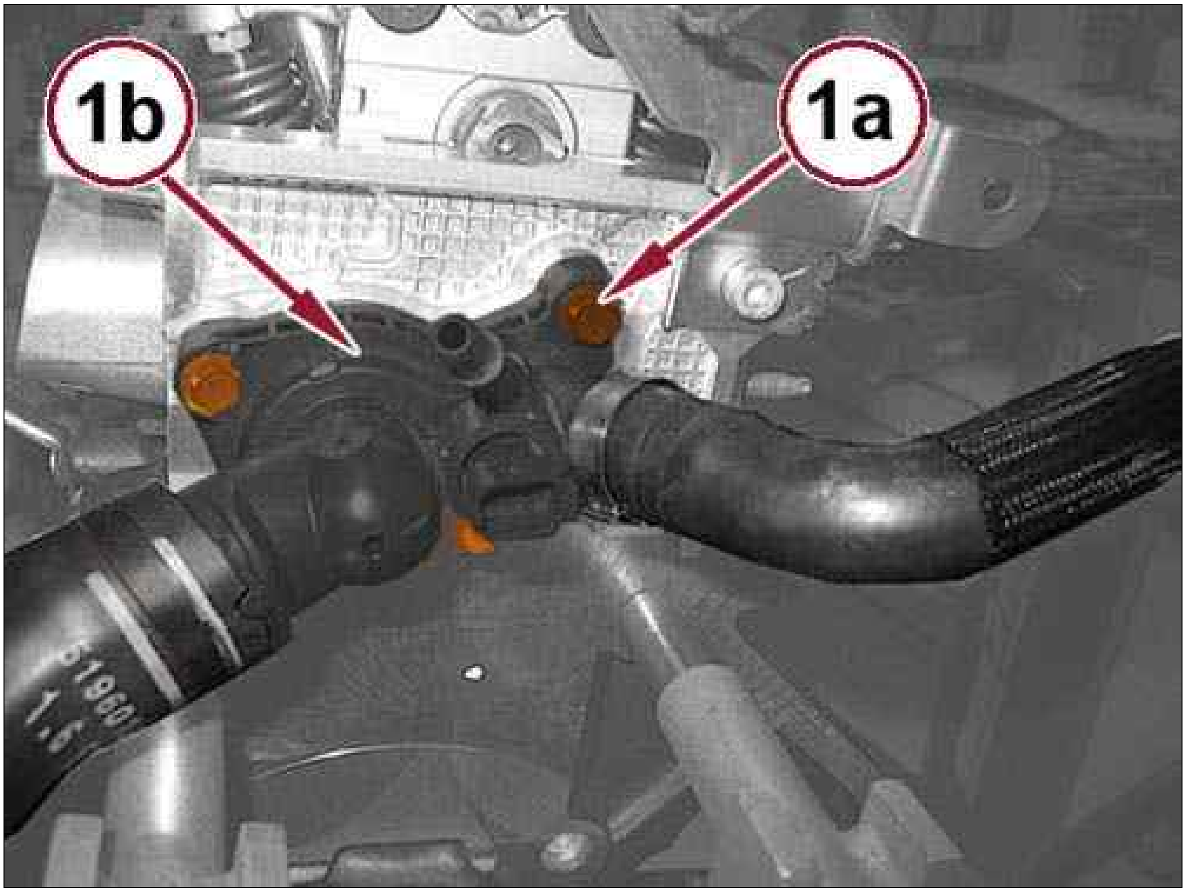
Fig 19: Return Pipe & Retaining Band



Courtesy of CHRYSLER GROUP, LLC

28. Use the tool 1881138000 to release the retaining band (1) for the return pipe (2) from the heater, water pump side.
29. Disconnect the return pipe (2) from the heater from the water pump and remove it.

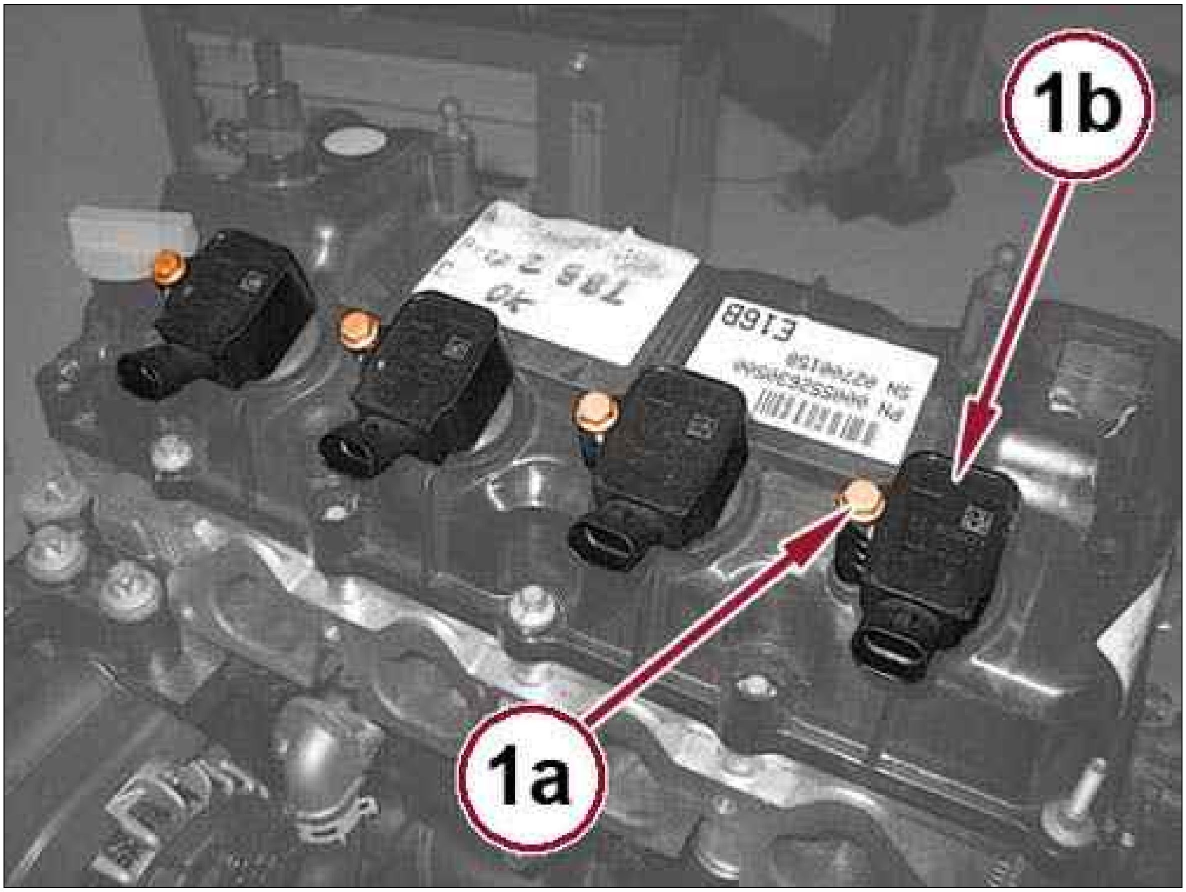
Fig 20: Thermostat Complete With Pipes & Bolts



Courtesy of CHRYSLER GROUP, LLC

30. Remove the bolts (1a) and the thermostat (1b) complete with pipes.

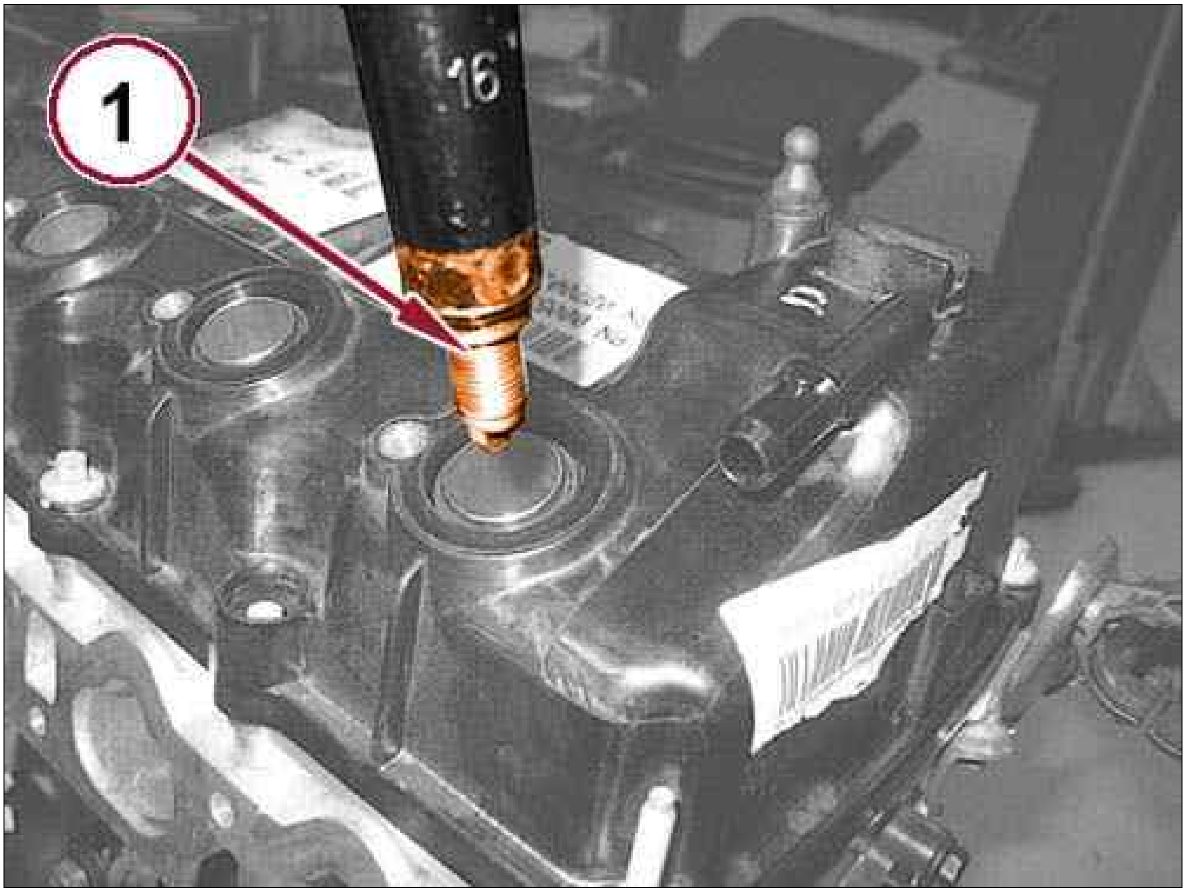
Fig 21: Ignition Coils & Bolts



Courtesy of CHRYSLER GROUP, LLC

31. Remove the bolts (1a) and the ignition coils (1b).

Fig 22: Removing/Installing Spark Plugs



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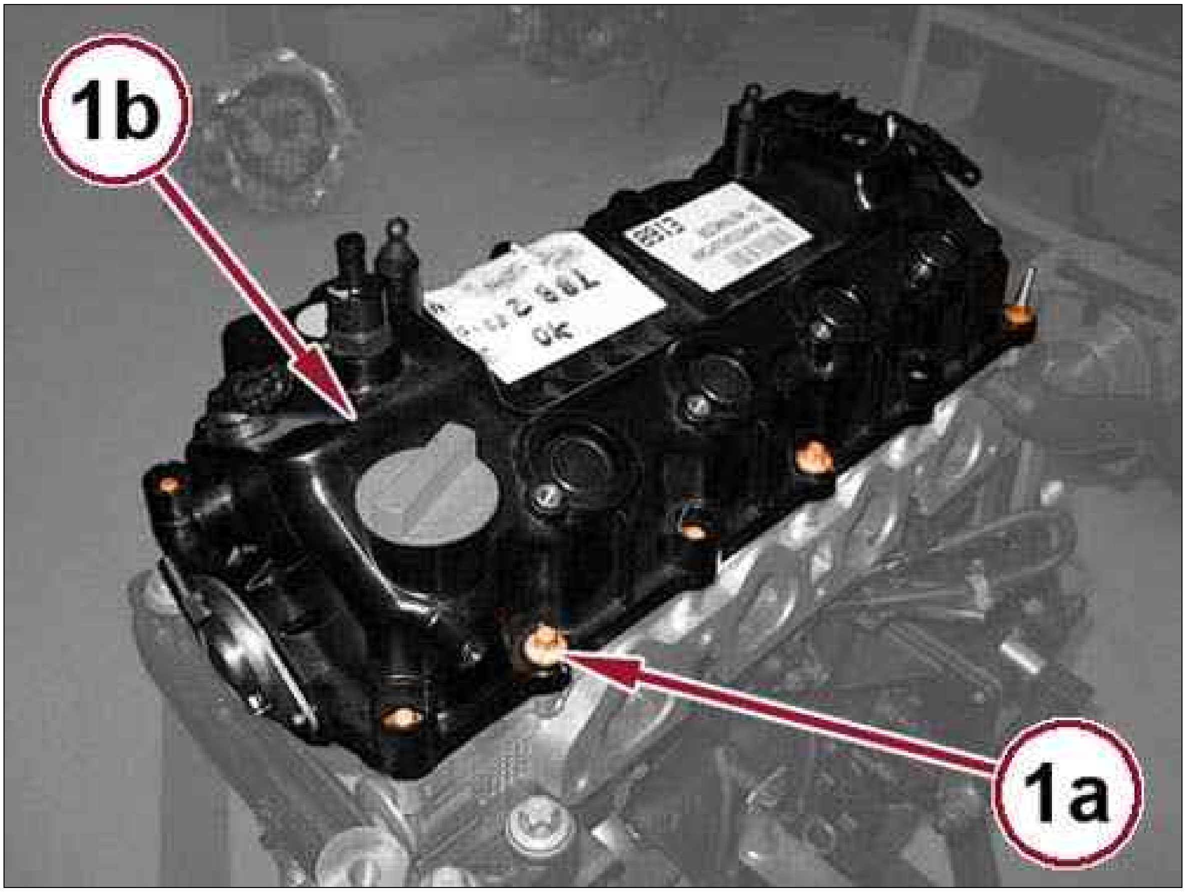
32. Remove the spark plugs (1) using a suitable tool.

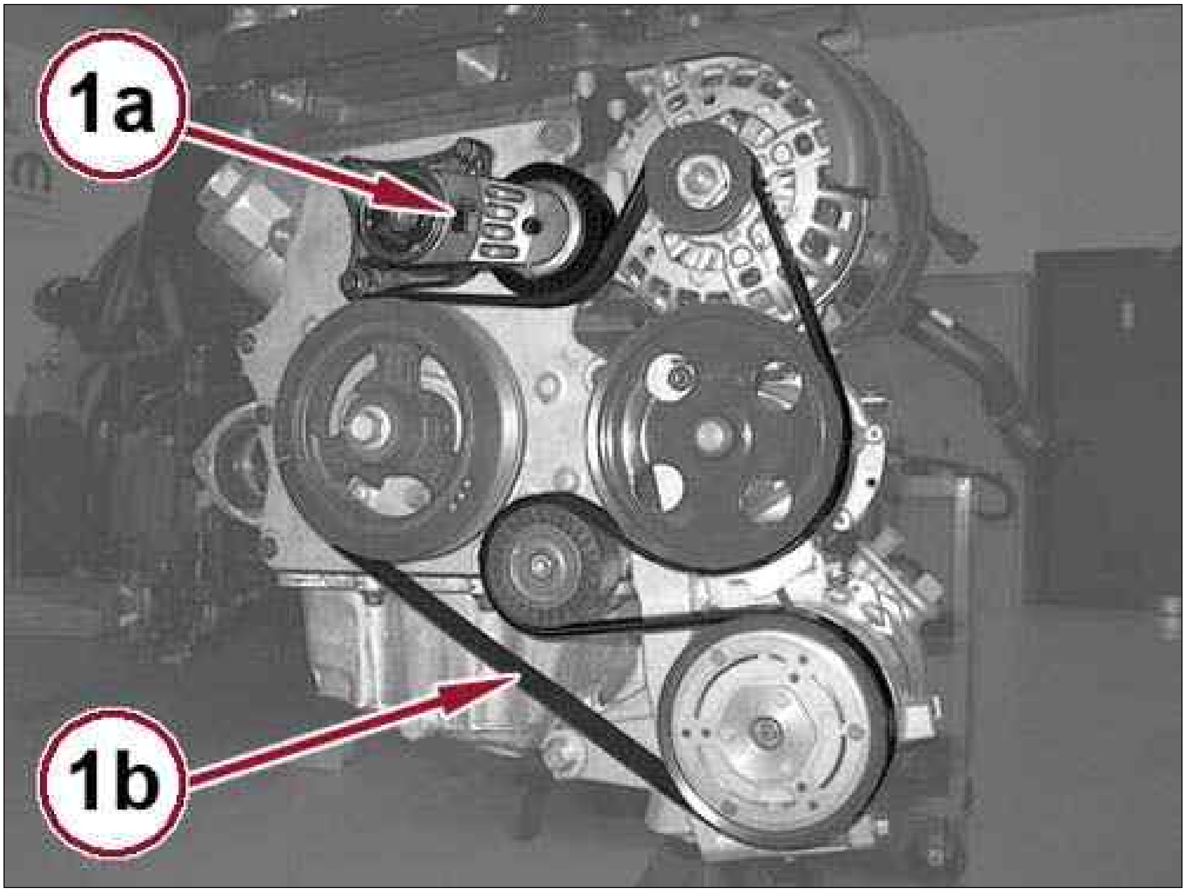
Fig 23: Tappet Cover & Bolts



Courtesy of CHRYSLER GROUP, LLC

33. Remove the bolts (1a) and remove the tappet cover (1b) complete with variable valve timing electromagnet.

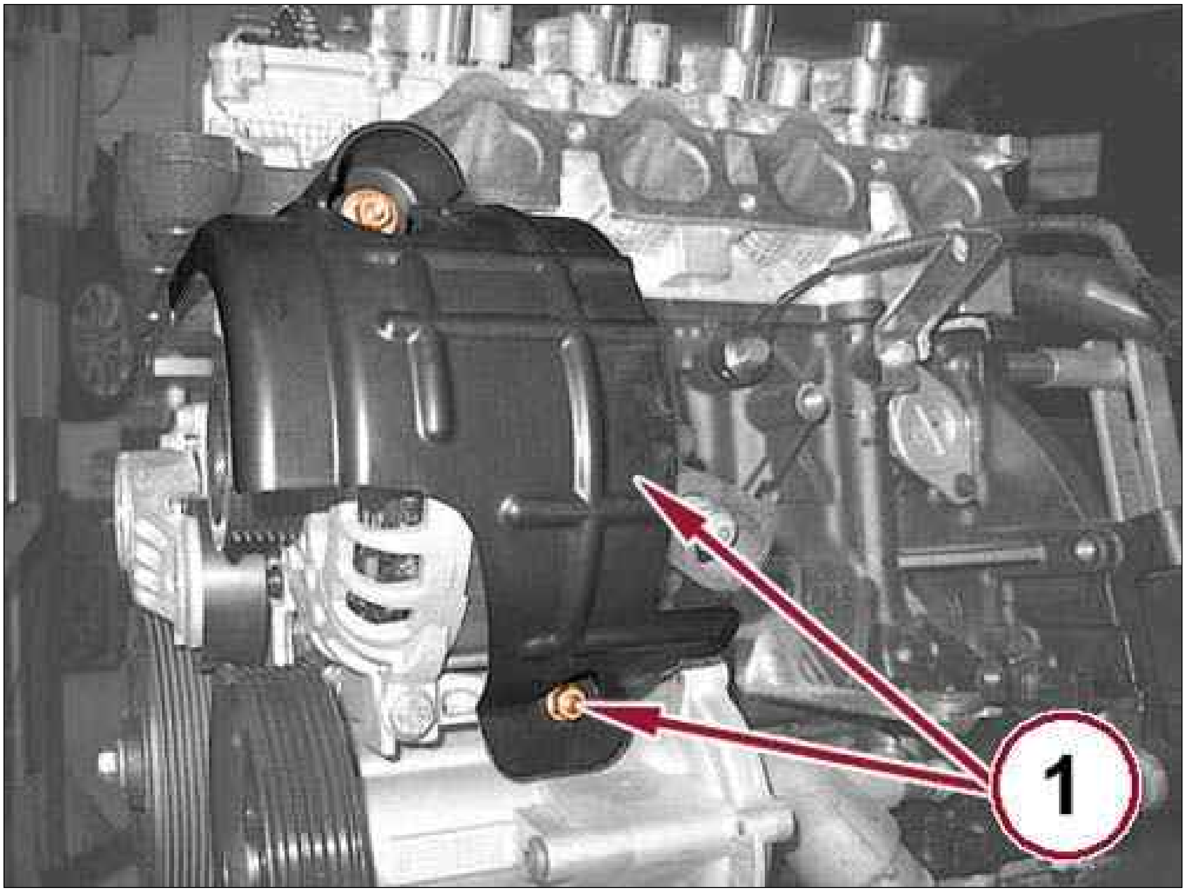
Fig 24: Tensioner & Serpentine Belt Routing



Courtesy of CHRYSLER GROUP, LLC

34. Use the moving tensioner (1a) and remove the serpentine belt (1b).

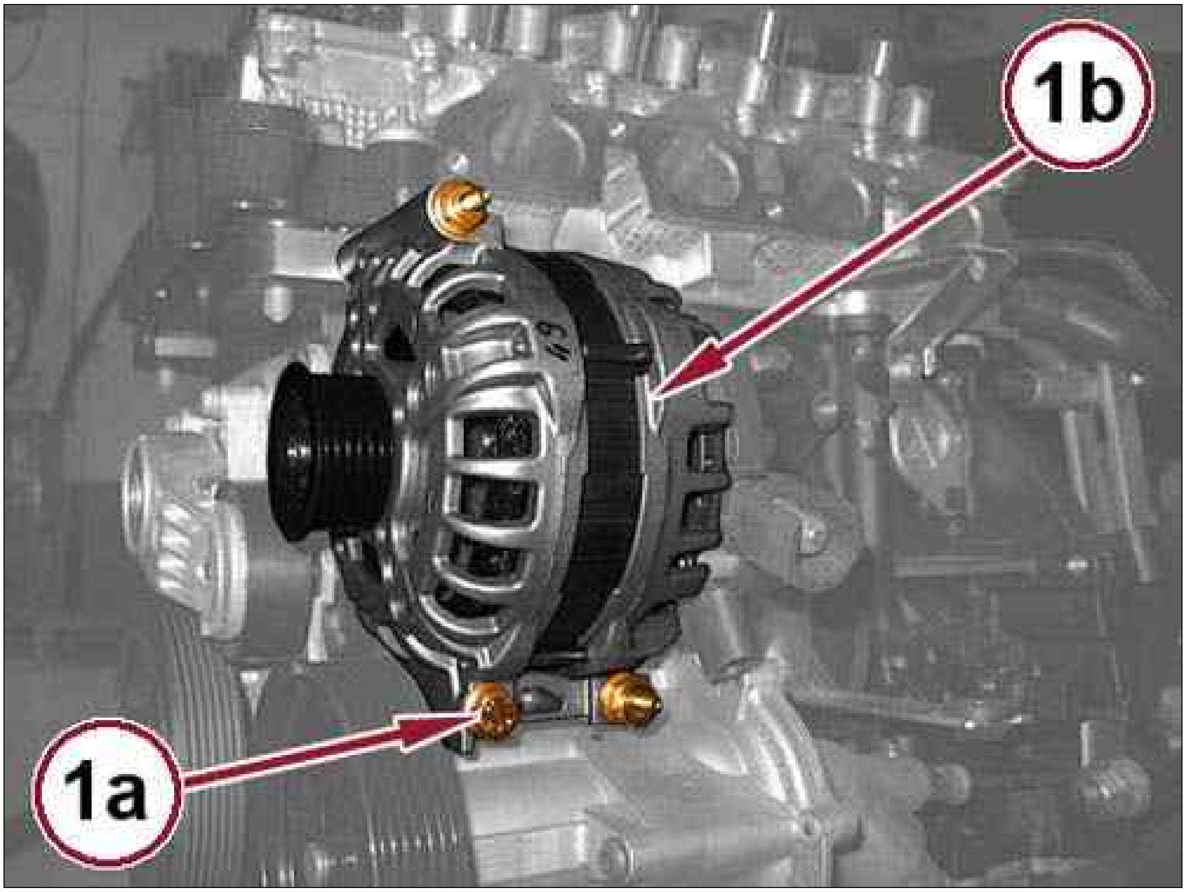
Fig 25: Generator Guard & Nuts



Courtesy of CHRYSLER GROUP, LLC

35. Remove the nuts and the generator guard (1).

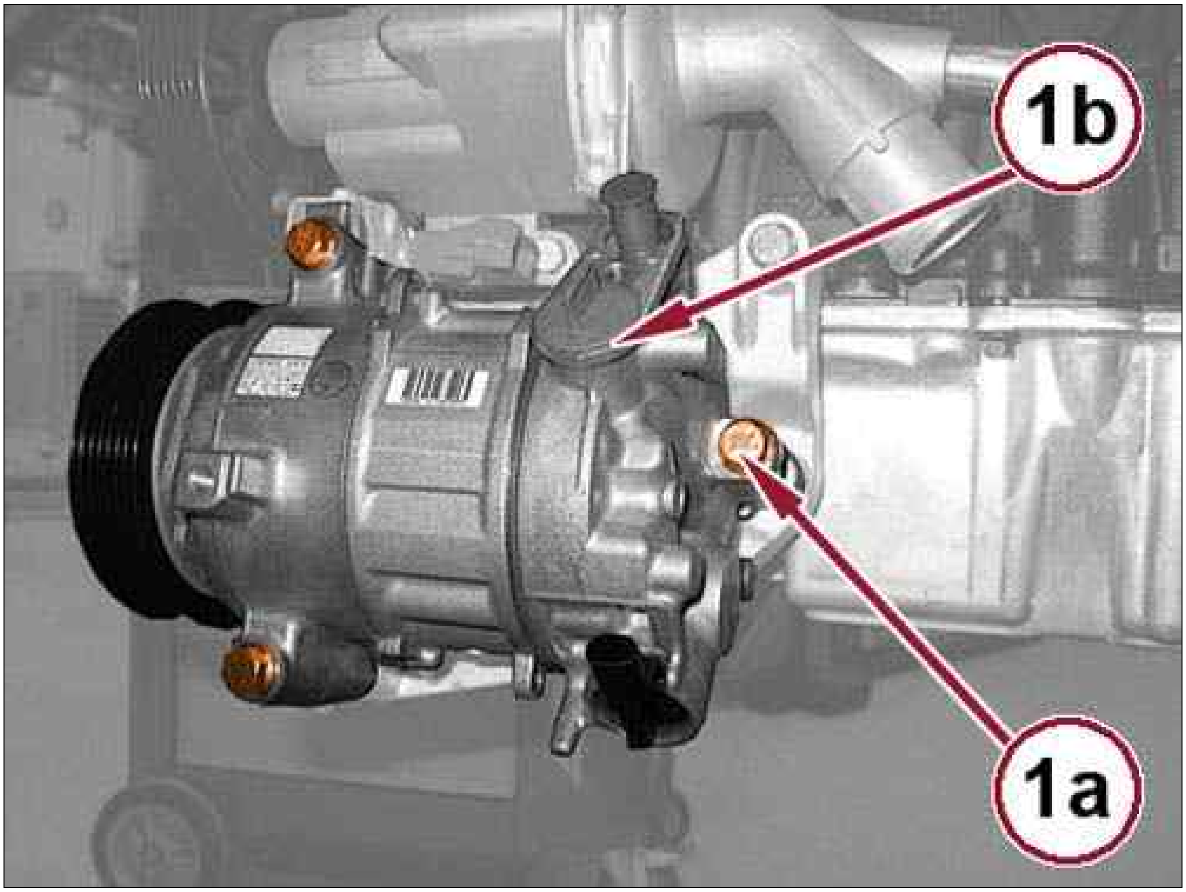
Fig 26: Generator & Bolts



Courtesy of CHRYSLER GROUP, LLC

36. Remove the bolts (1a) and the generator (1b).

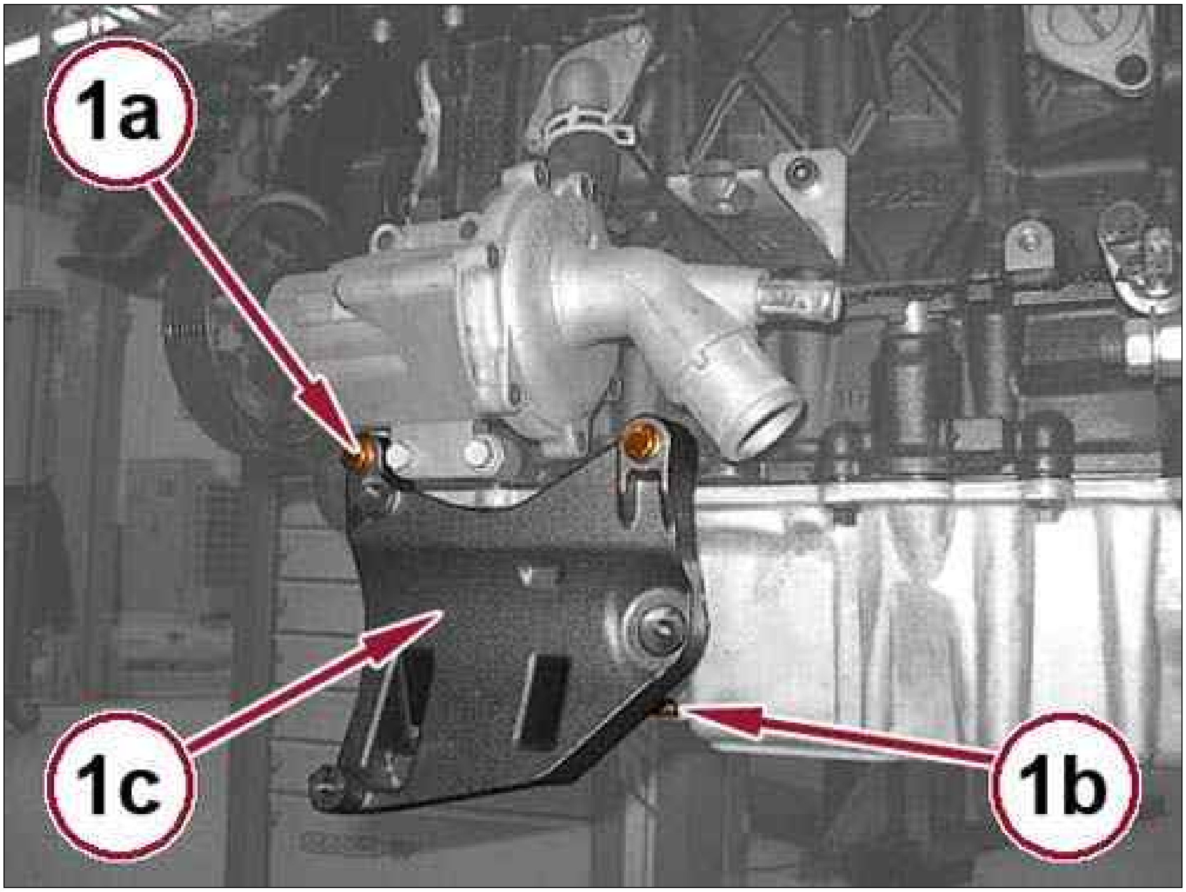
Fig 27: A/C Compressor & Bolts



Courtesy of CHRYSLER GROUP, LLC

37. Remove the bolts (1a) and the A/C compressor (1b).

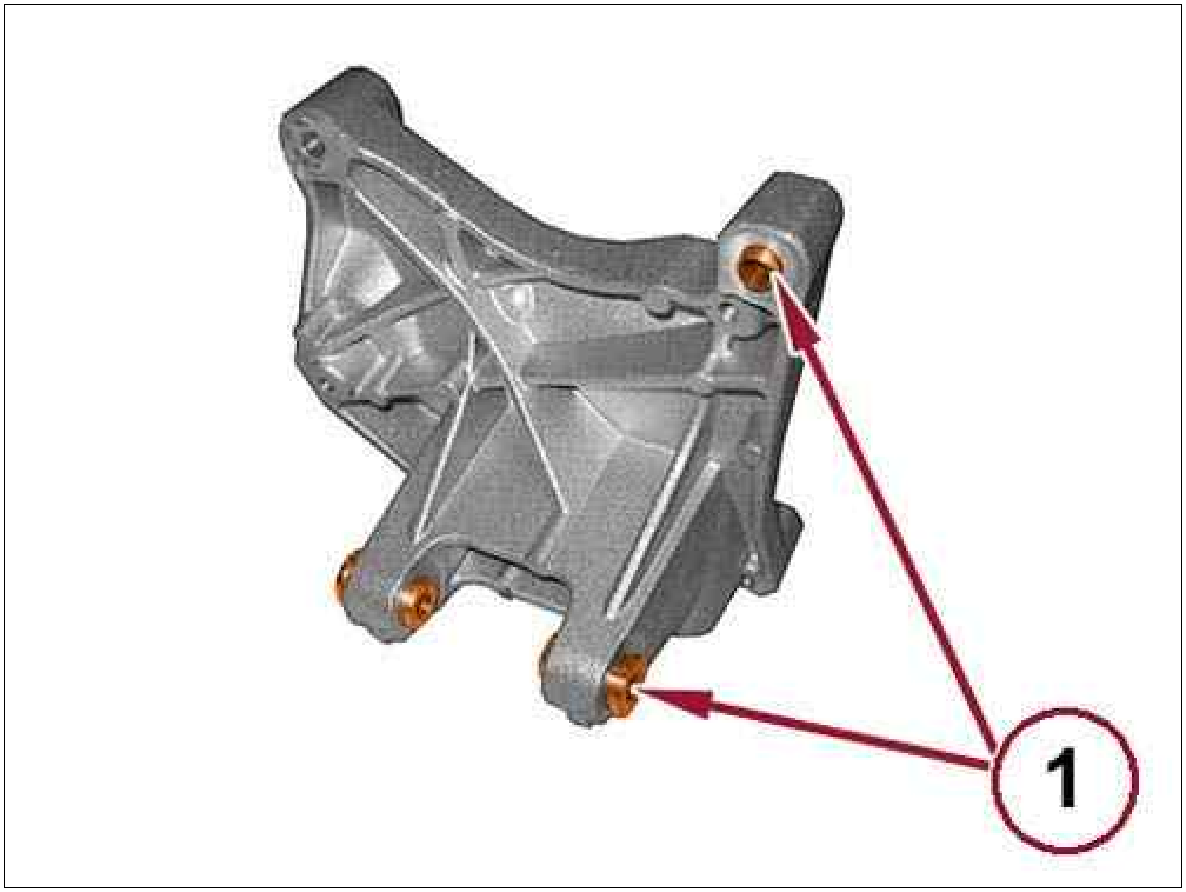
Fig 28: A/C Compressor Mounting & Bolts



Courtesy of CHRYSLER GROUP, LLC

38. Remove the bolts (1a), the bolt (1b) and the A/C compressor mounting (1c).

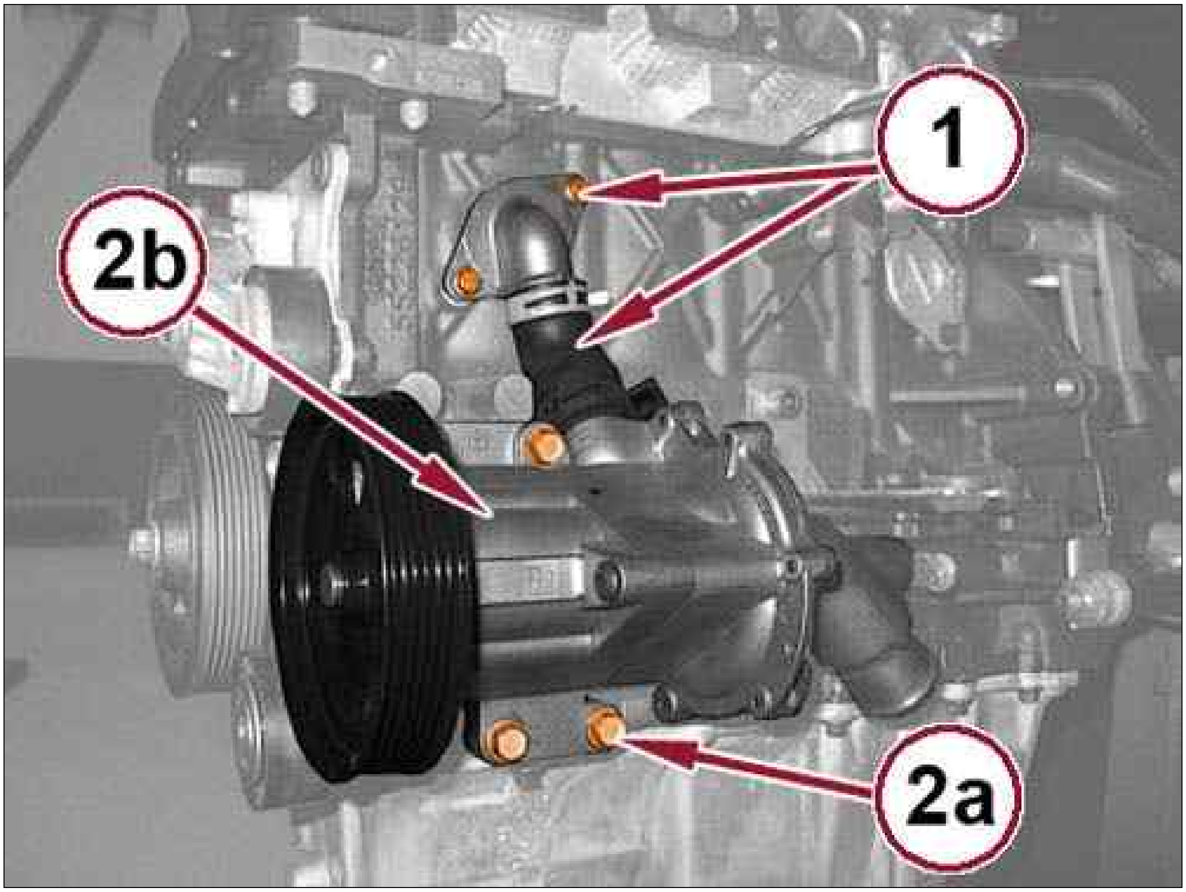
Fig 29: Compressor Mounting Bushes



Courtesy of CHRYSLER GROUP, LLC

39. Check that the compressor mounting bushes (1) are intact.

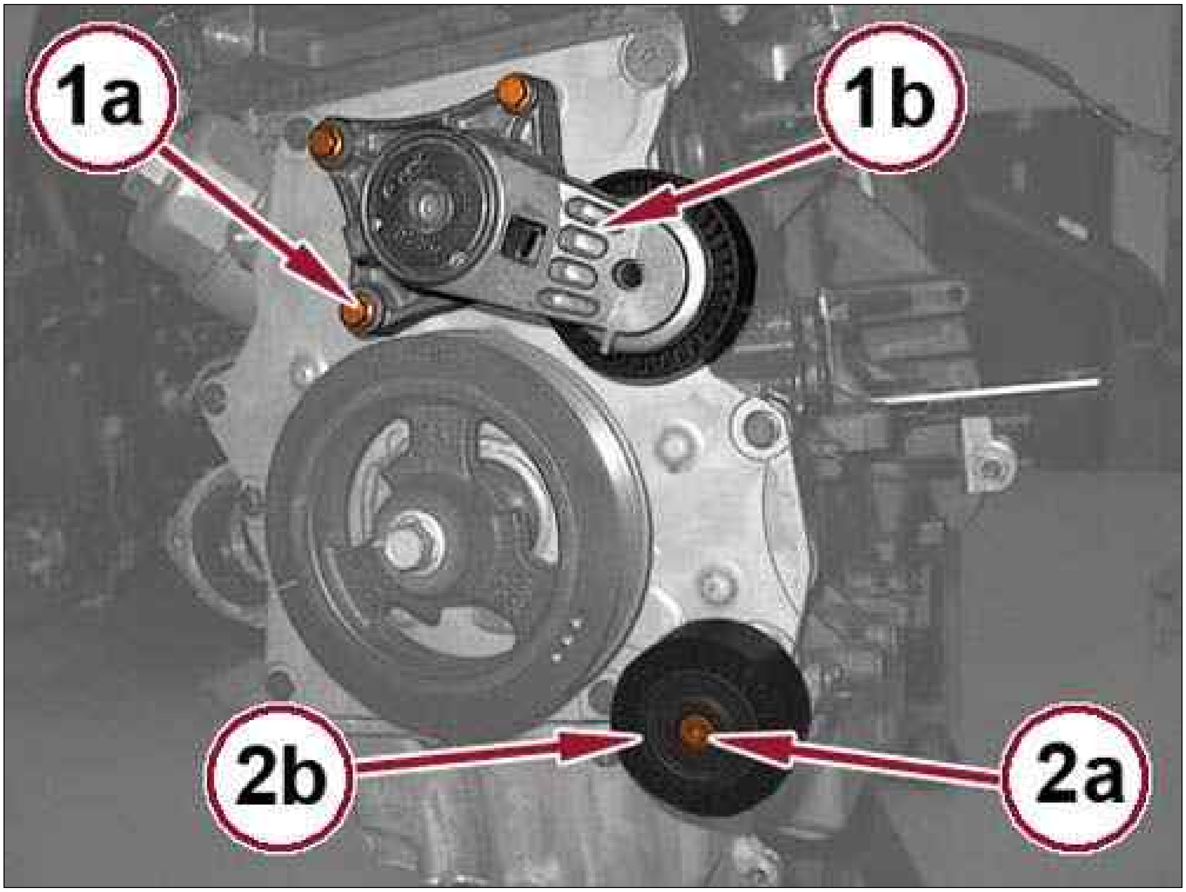
Fig 30: Water Delivery Pipe To Engine Block, Water Pump Assembly & Bolts



Courtesy of CHRYSLER GROUP, LLC

40. Remove the bolts (1) securing the water delivery pipe to the engine block.
41. Remove the bolts (2a) and the water pump assembly (2b).

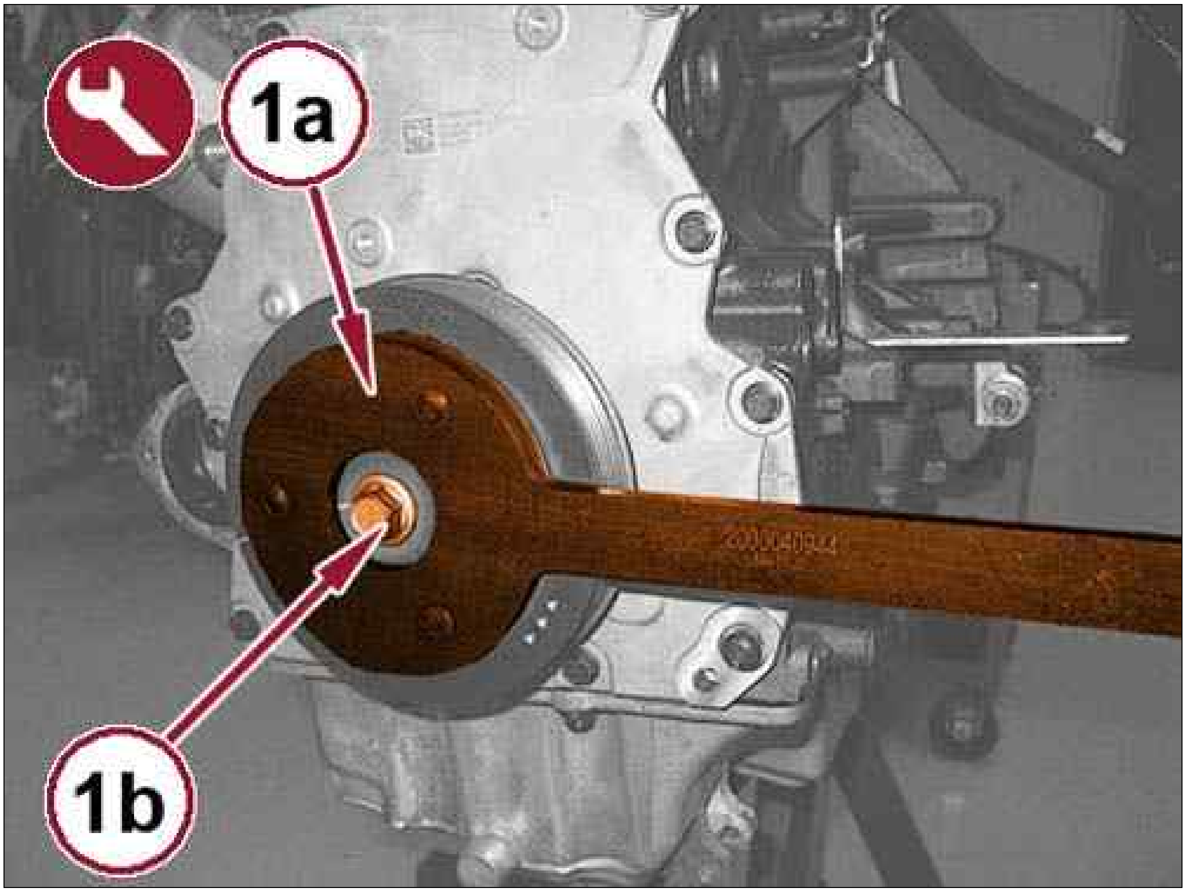
Fig 31: Accessory Drive Belt Automatic Tensioner, Accessory Drive Belt Fixed Tensioner & Bolts



Courtesy of CHRYSLER GROUP, LLC

42. Remove the bolts (1a) and the accessory drive belt automatic tensioner (1b).
43. Remove the bolts (2a) and the engine accessory drive belt fixed tensioner (2b).

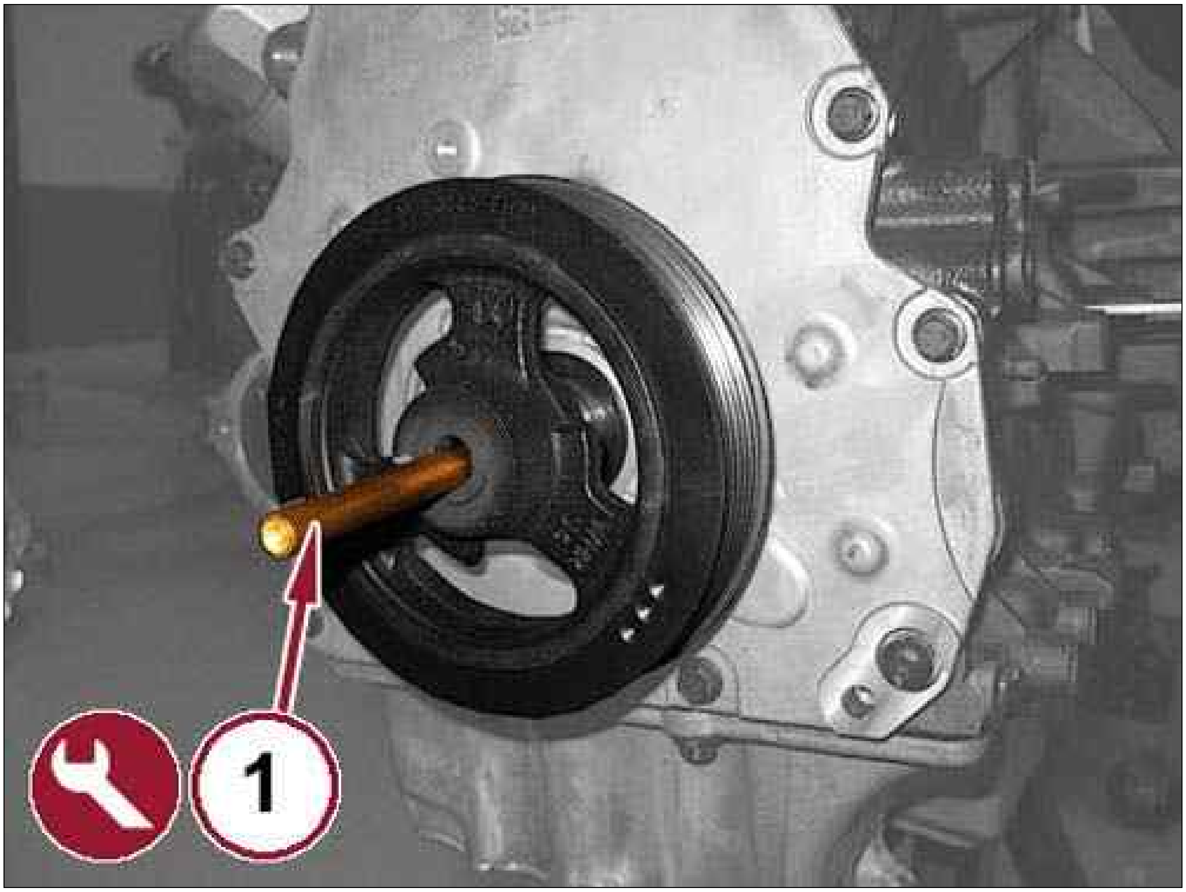
Fig 32: Using Special Tool At Crankshaft Pulley & Bolt



Courtesy of CHRYSLER GROUP, LLC

44. Use the tool 2000040944 (1a) to remove the bolt securing the crankshaft pulley (1b).

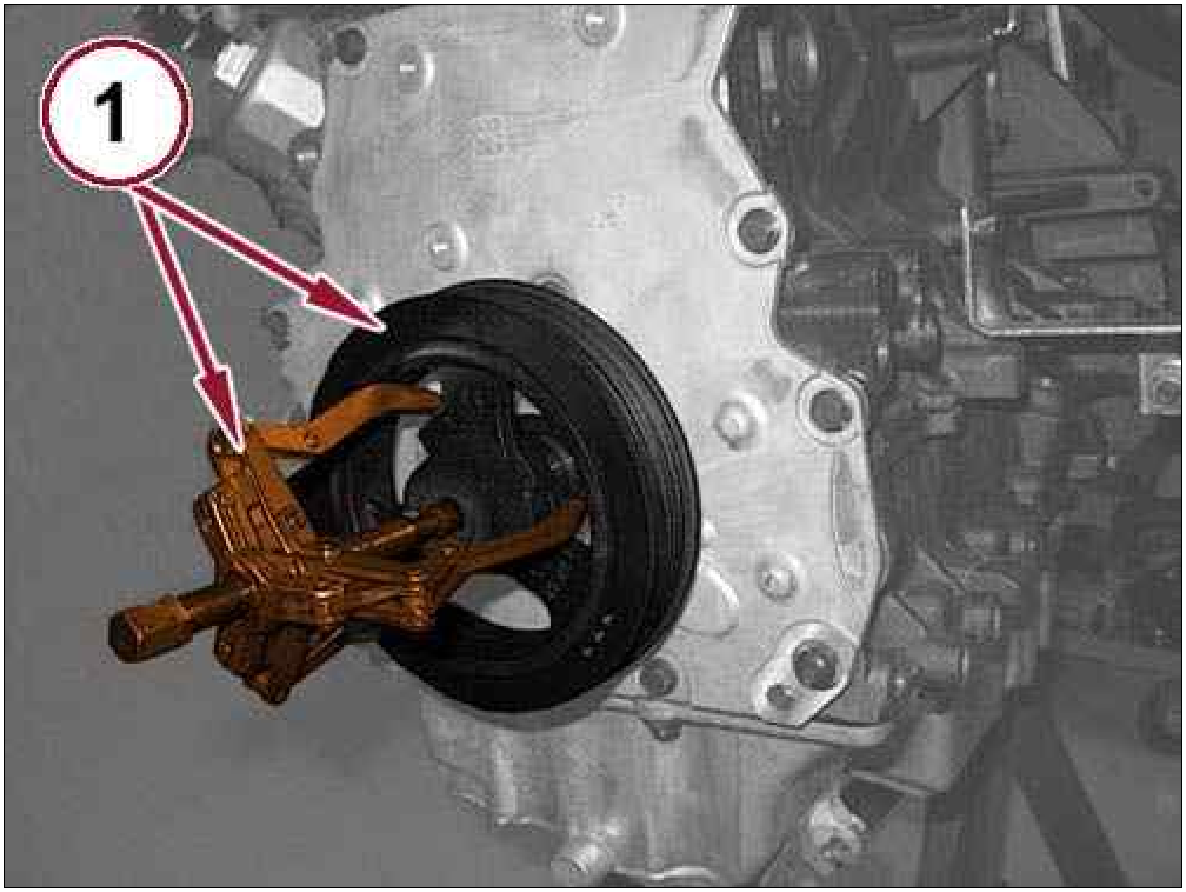
Fig 33: Inserting Special Tool In Crankshaft Pulley Hub



Courtesy of CHRYSLER GROUP, LLC

45. Insert the tool 2000040942 (1) in the crankshaft pulley hub as shown in the figure.

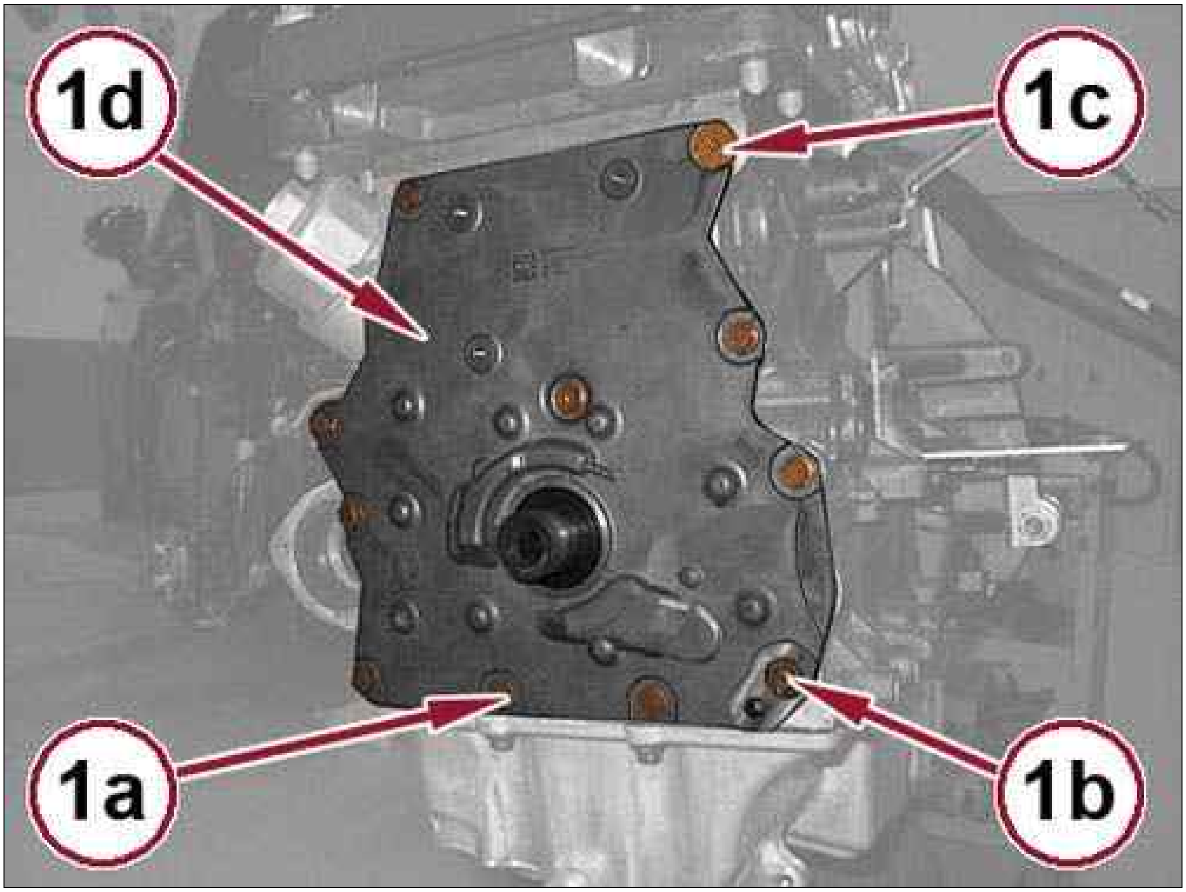
Fig 34: Removing Crankshaft Pulley Using Extractor



Courtesy of CHRYSLER GROUP, LLC

46. Apply a suitable extractor (1) as shown in the figure and proceed with the removal of the crankshaft pulley.
47. Remove the crankshaft oil seal and the gaskets from the timing drive chain cover.

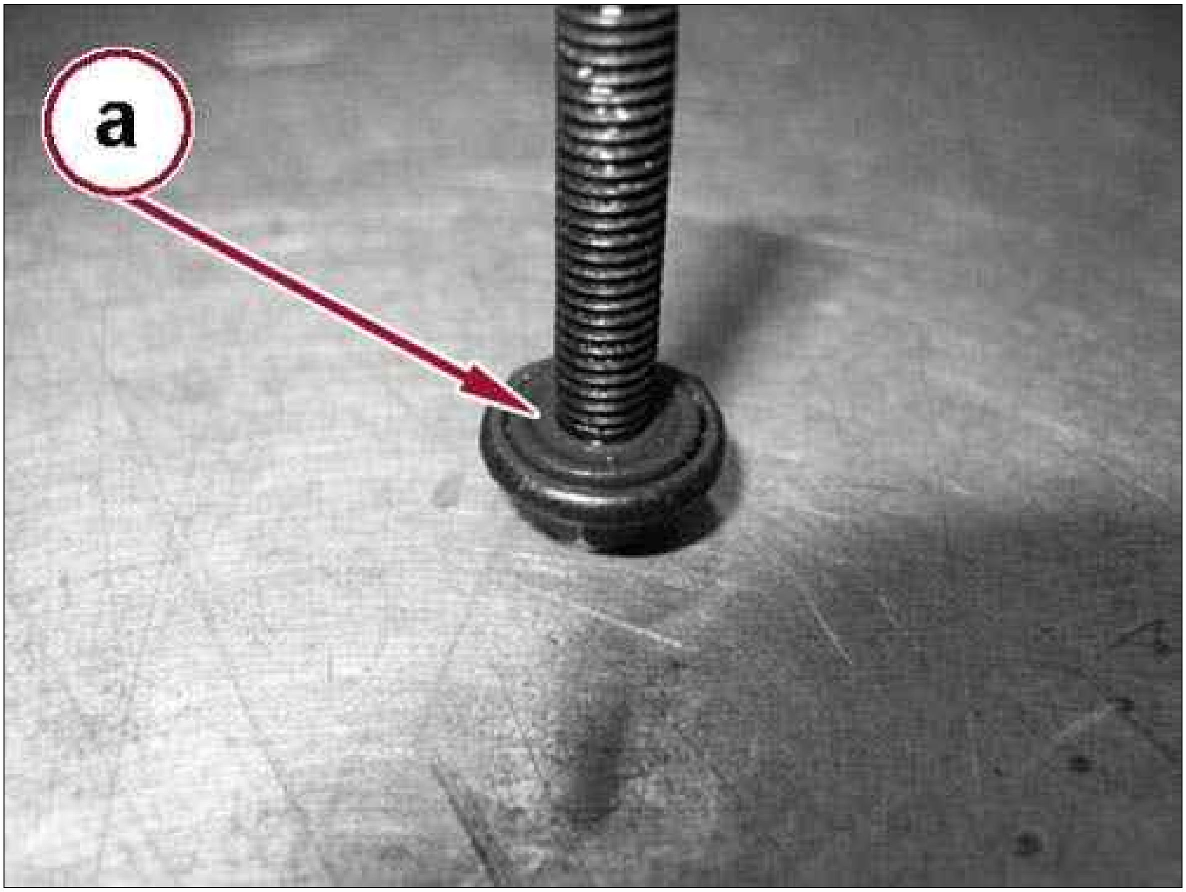
Fig 35: Timing Drive Chain Cover & Bolts



Courtesy of CHRYSLER GROUP, LLC

48. Remove the bolts (1a), (1b), (1c) and the timing drive chain cover (1d) complete with gasket and engine oil pump.

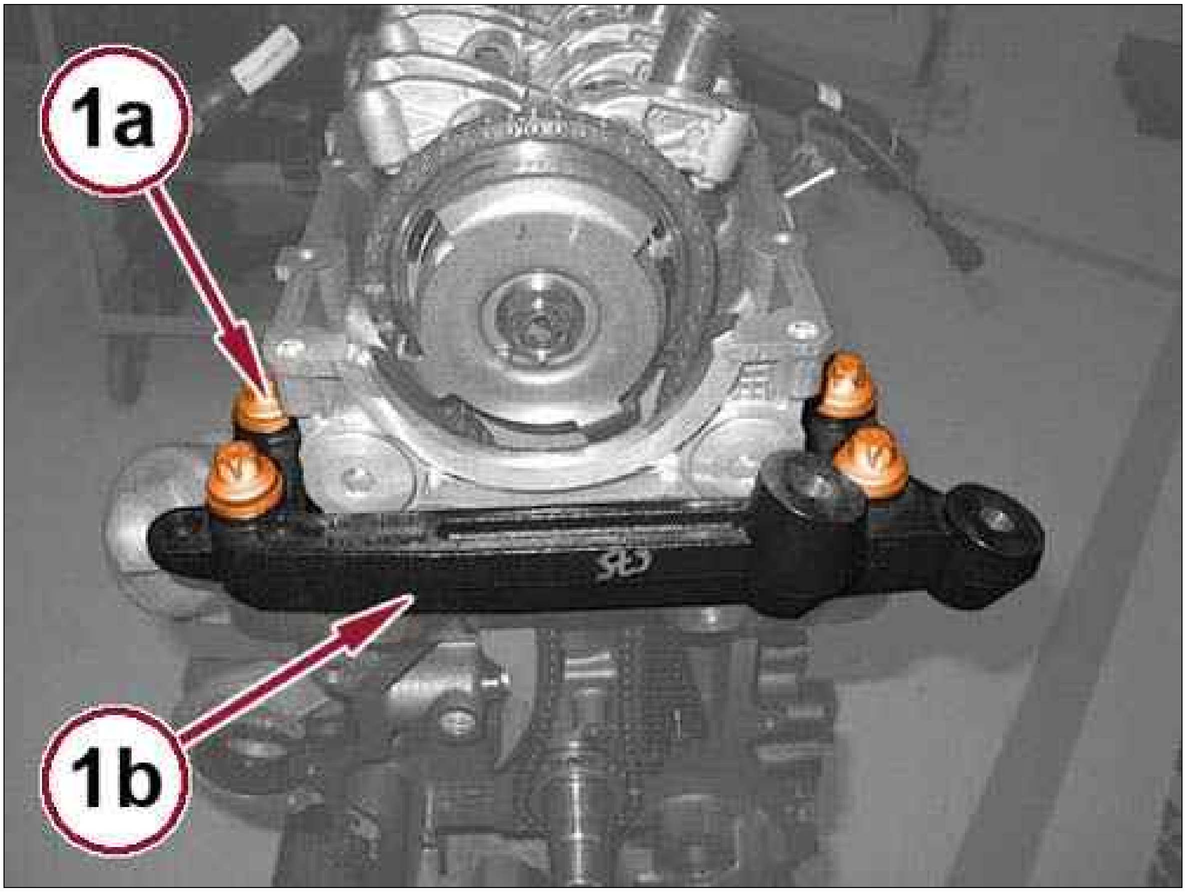
Fig 36: Centre Fixing Screw For Timing Drive Chain Cover & Gasket



Courtesy of CHRYSLER GROUP, LLC

49. The centre fixing screw for the timing drive chain cover must be replaced at every removal, since it includes a gasket (a) in the position shown in the figure.

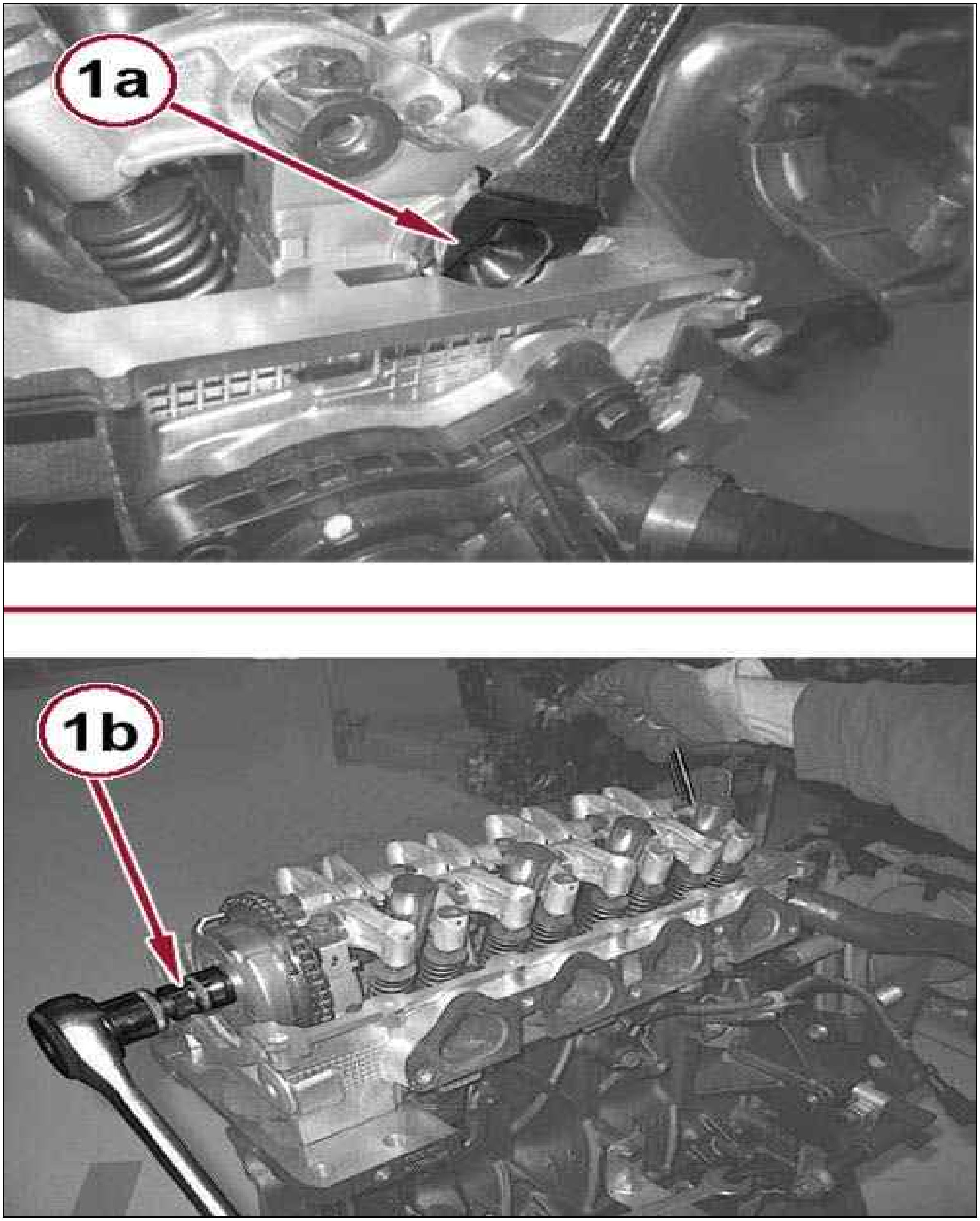
Fig 37: Timing Side Power Unit Rigid Support & Bolts



Courtesy of CHRYSLER GROUP, LLC

50. Remove the bolts (1a) and the timing side power unit rigid support (1b).

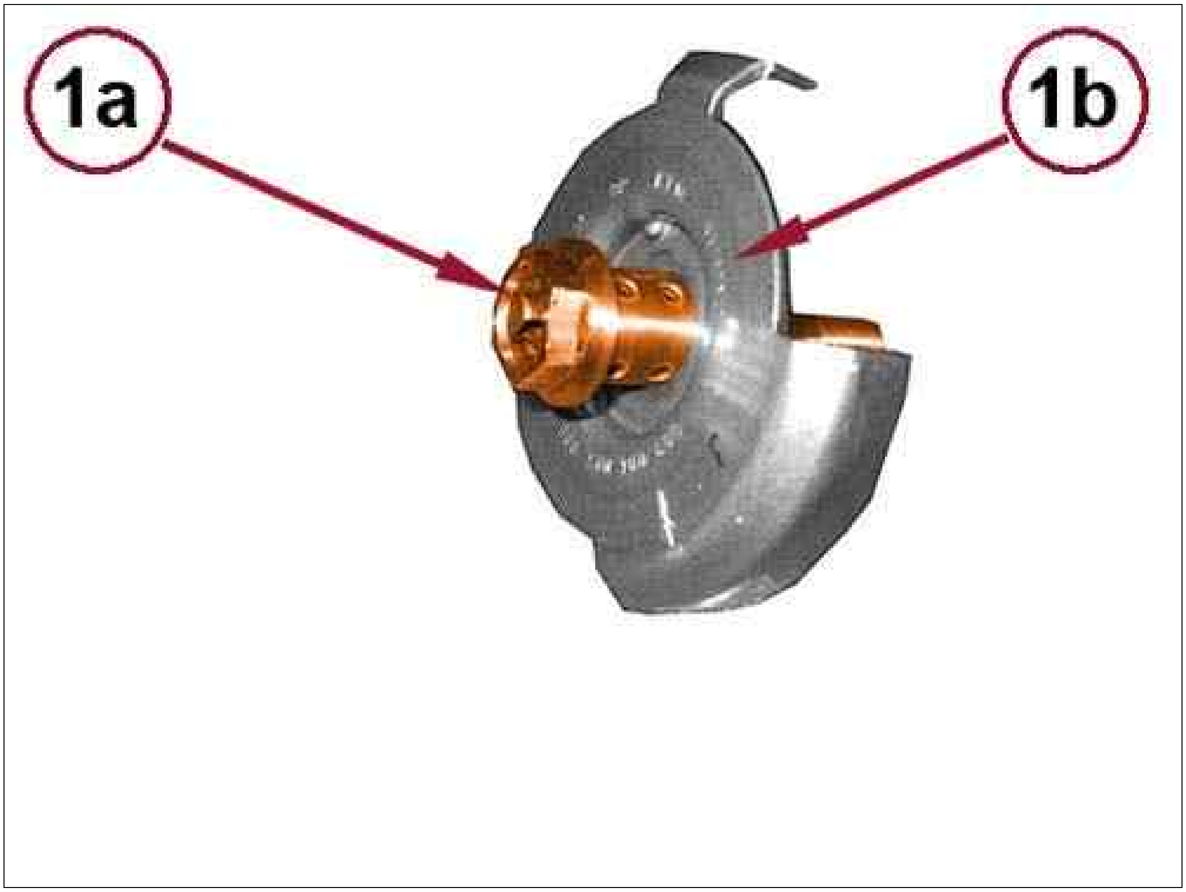
Fig 38: Applying Counter-Torque On Rear Stem Of Camshaft To Remove Bolt Securing Variable Valve Timing System



Courtesy of CHRYSLER GROUP, LLC

51. Applying a counter-torque on the rear stem of the camshaft (1a) remove the bolt securing the variable valve timing system (1b).

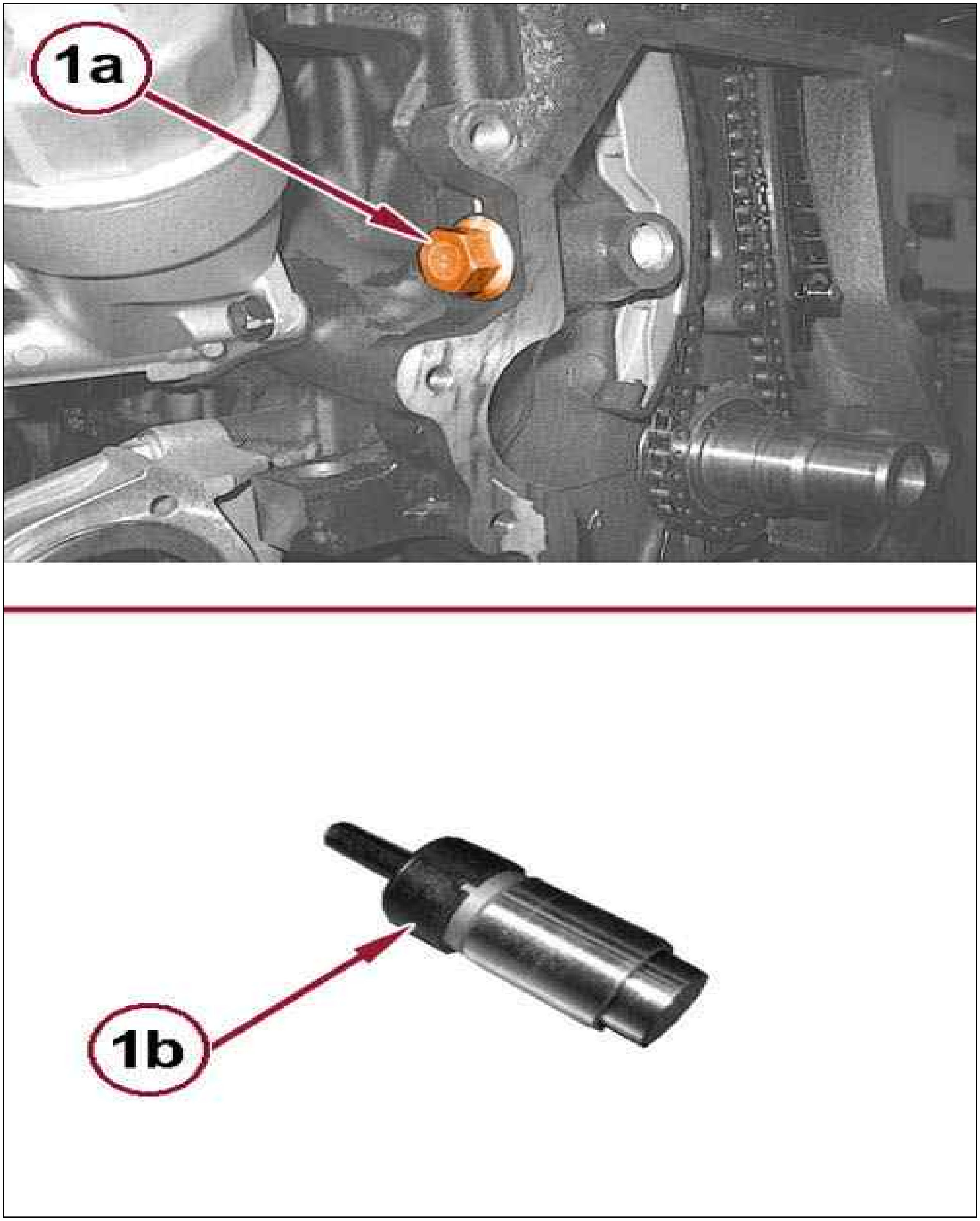
Fig 39: Variable Valve Timing System And Toothed Wheel For Timing Sensor & Bolt



Courtesy of CHRYSLER GROUP, LLC

52. Remove the bolt (1a) securing the variable valve timing system and the toothed wheel for the timing sensor (1b).

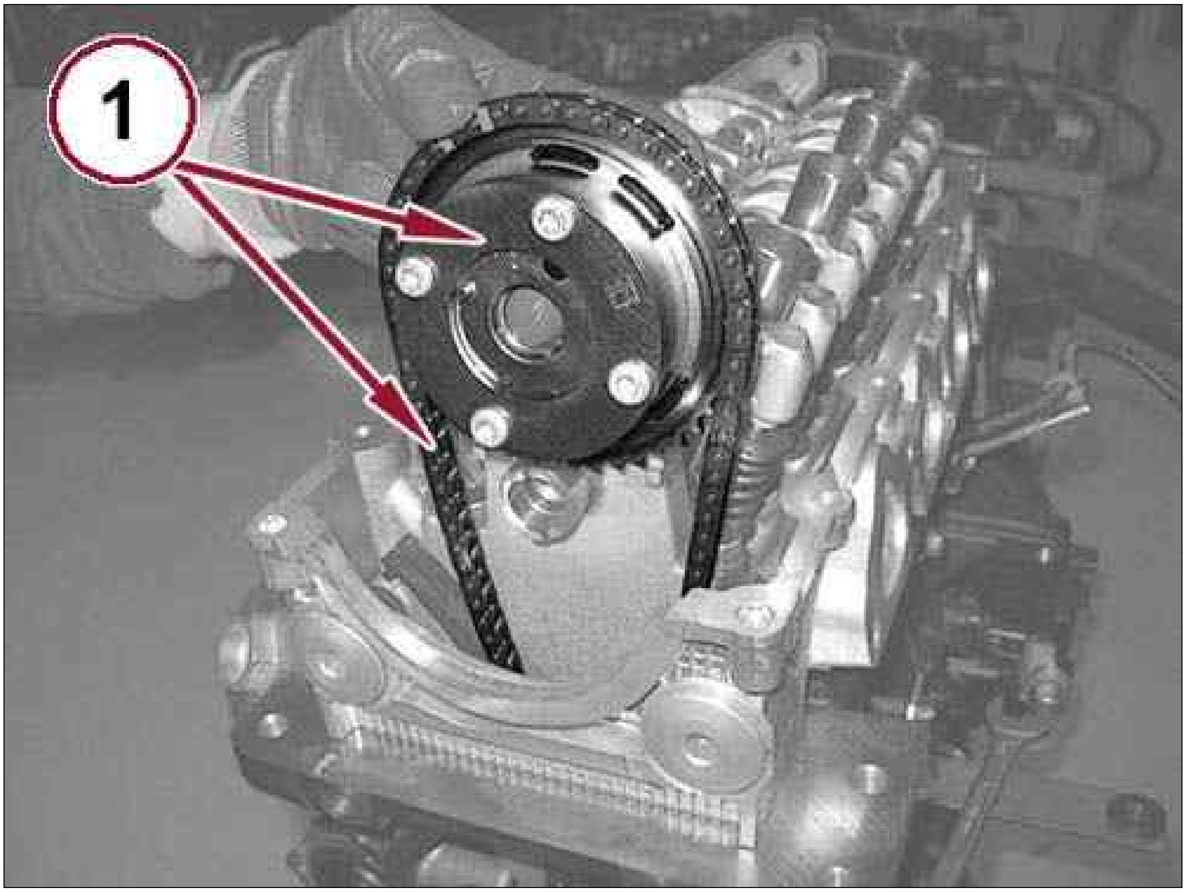
Fig 40: Timing Drive Chain Moving Tensioner & Bolt



Courtesy of CHRYSLER GROUP, LLC

53. Remove the bolt (1a) complete with gasket and the timing drive chain moving tensioner (1b).

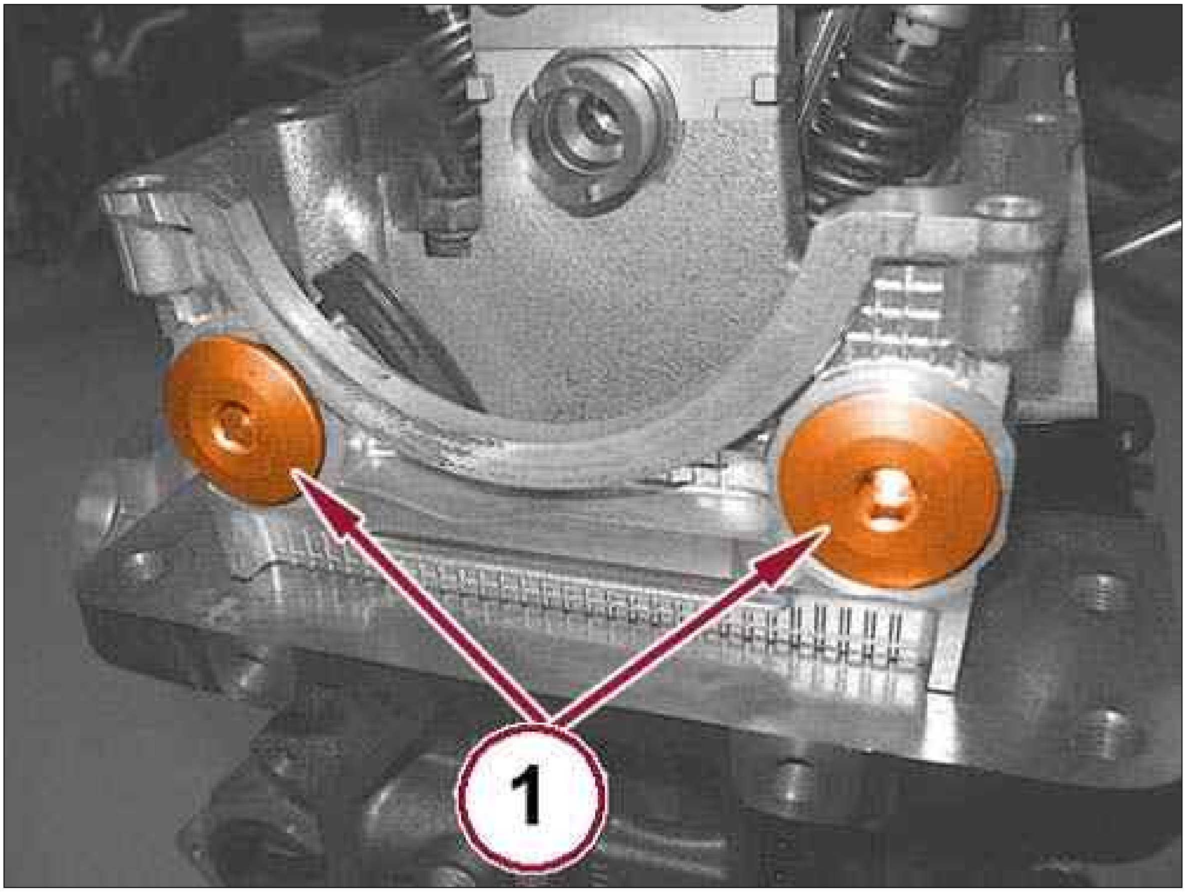
Fig 41: Variable Valve Timing System With Timing Control Chain



Courtesy of CHRYSLER GROUP, LLC

54. Remove the variable valve timing system along with the timing control chain (1).

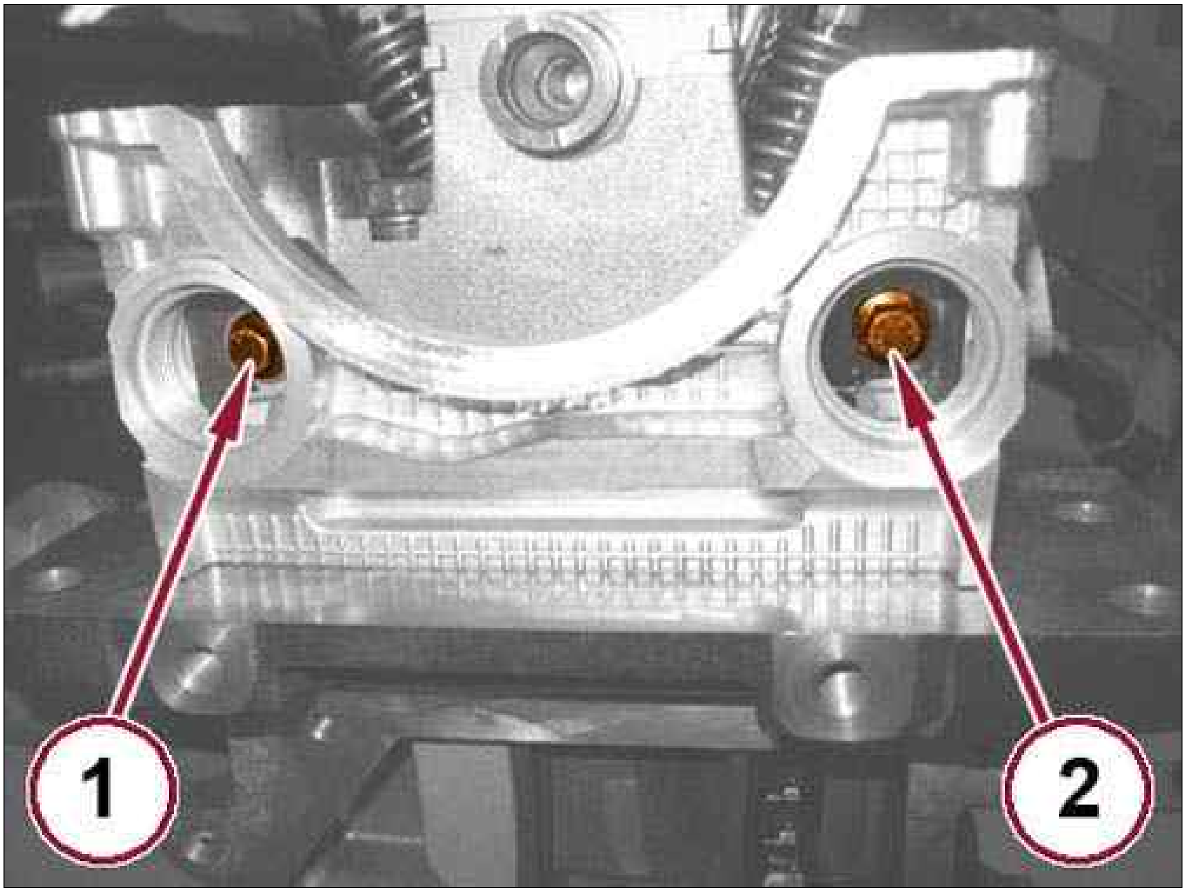
Fig 42: Access Caps For Timing Drive Chain Pad Fixing Screws



Courtesy of CHRYSLER GROUP, LLC

55. Remove the access caps (1) for the timing drive chain pad fixing screws, complete with O-rings.

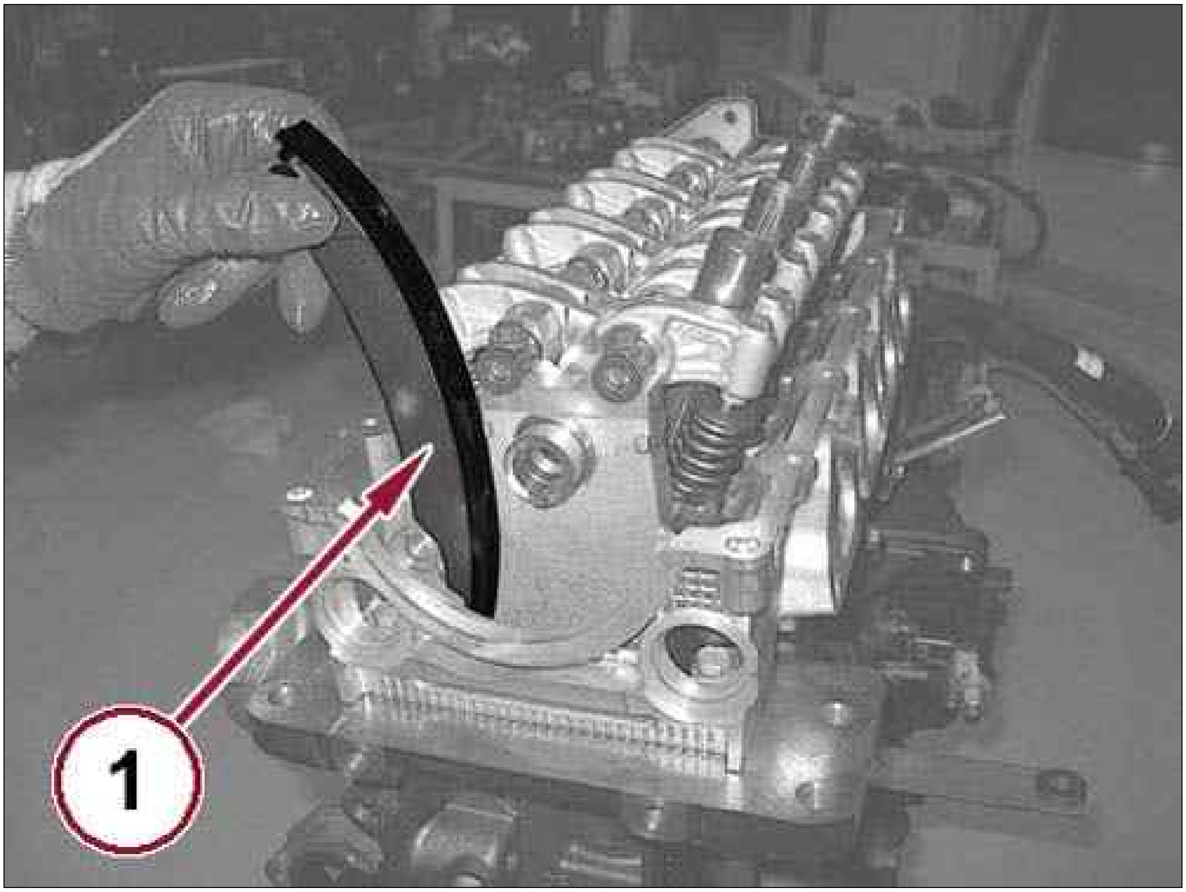
Fig 43: Timing Drive Chain Moving Pad & Fixed Pad Fixing Bolts



Courtesy of CHRYSLER GROUP, LLC

56. Remove the timing drive chain moving pad fixing bolt (1).
57. Remove the timing drive chain fixed pad fixing bolt (1).

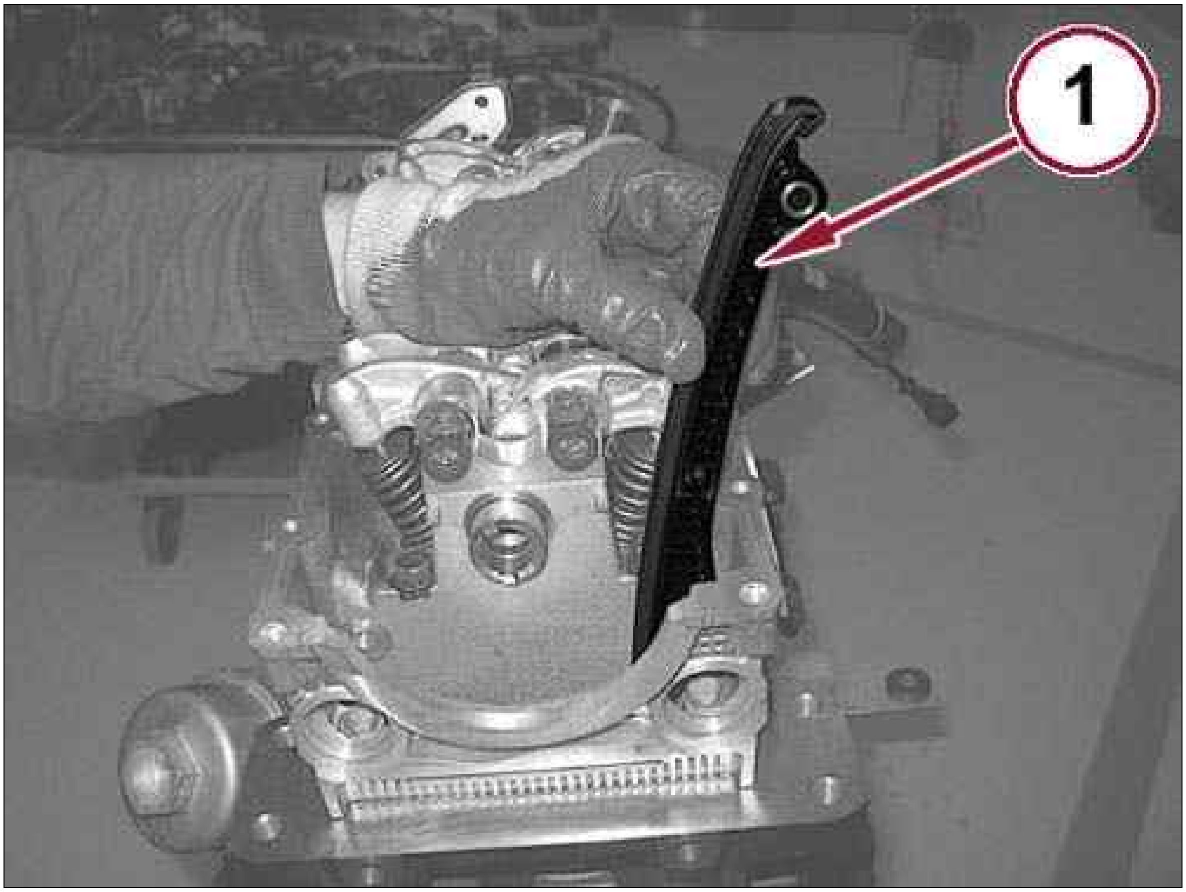
Fig 44: Timing Drive Chain Moving Pad



Courtesy of CHRYSLER GROUP, LLC

58. Remove the timing drive chain moving pad (1).

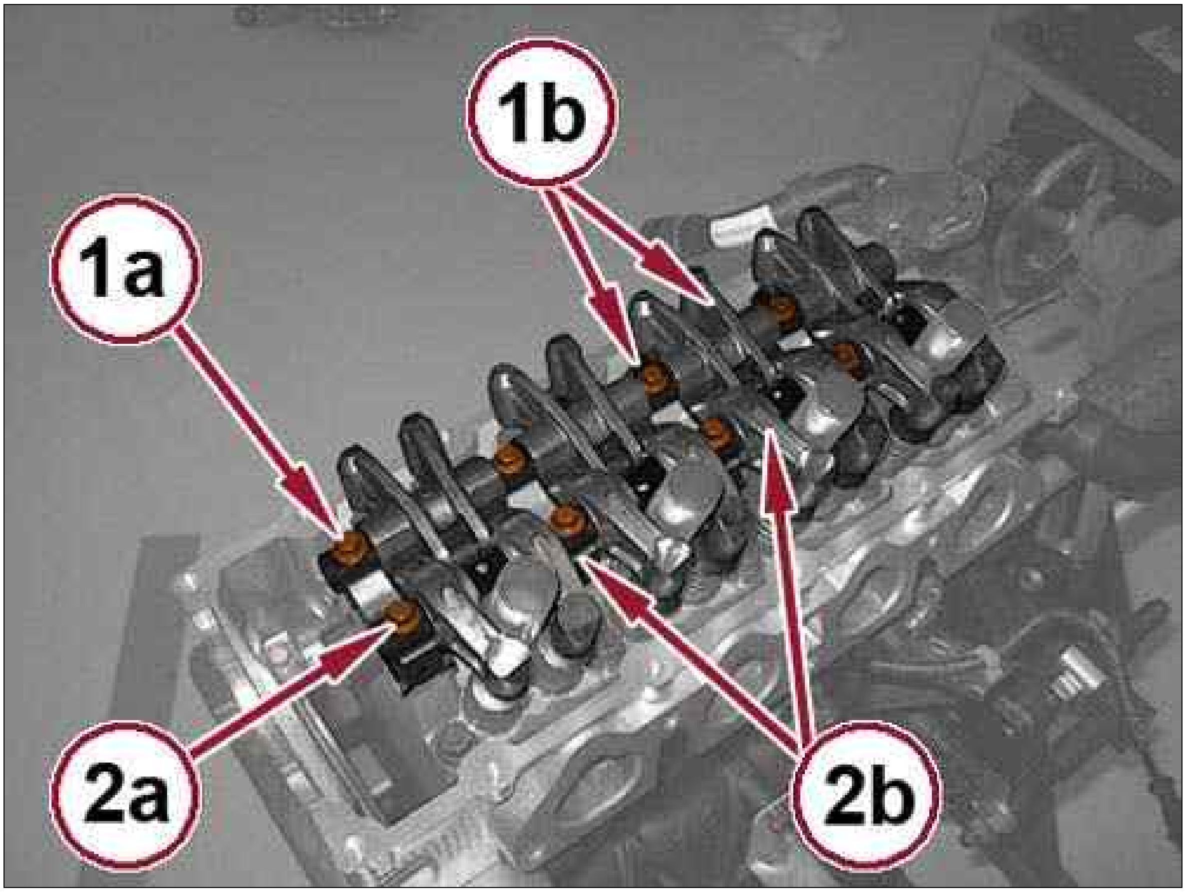
Fig 45: Timing Drive Chain Fixed Pad



Courtesy of CHRYSLER GROUP, LLC

59. Remove the timing drive chain fixed pad (1).

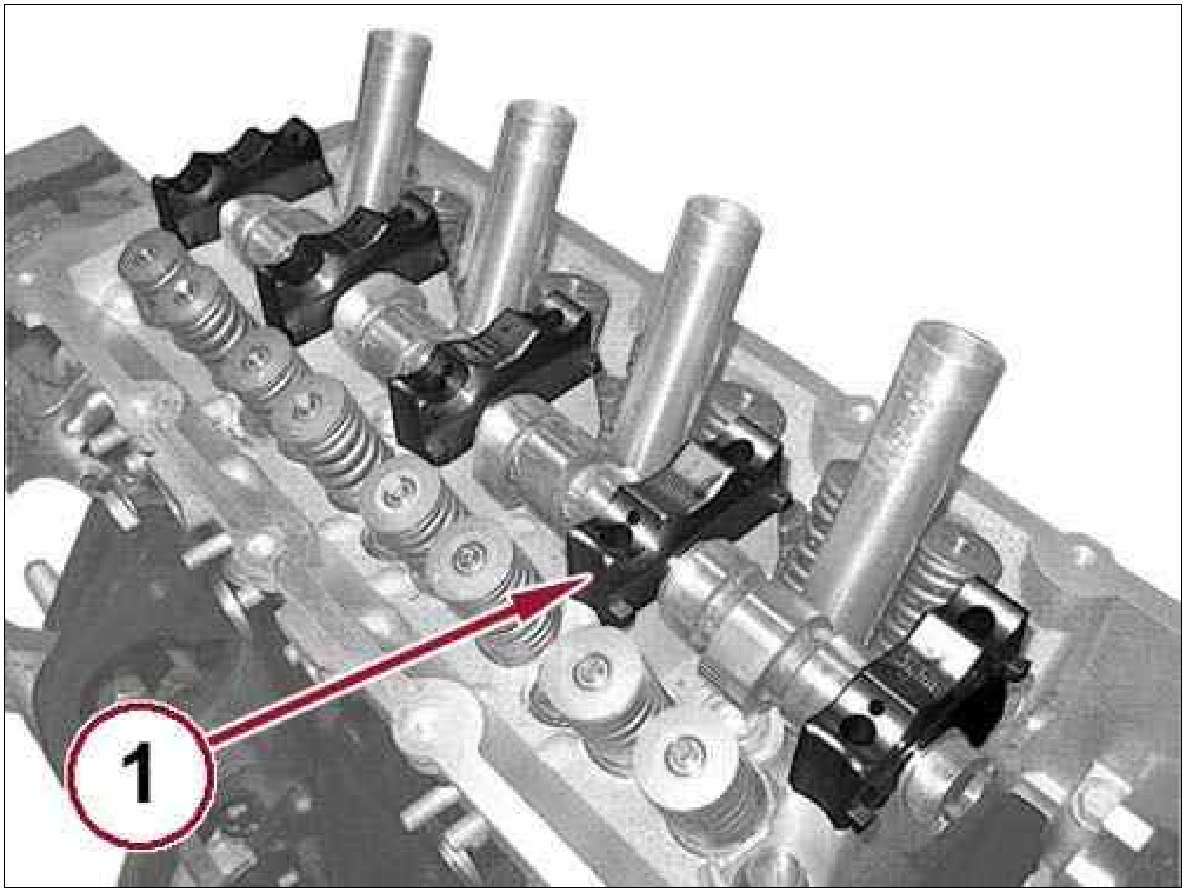
Fig 46: Intake & Exhaust Rocker Arms & Bolts



Courtesy of CHRYSLER GROUP, LLC

60. Remove the bolts (1a) and the rocker arms on exhaust side (1b).
61. Remove the bolts (2a) and the rocker arms on intake side (2b).

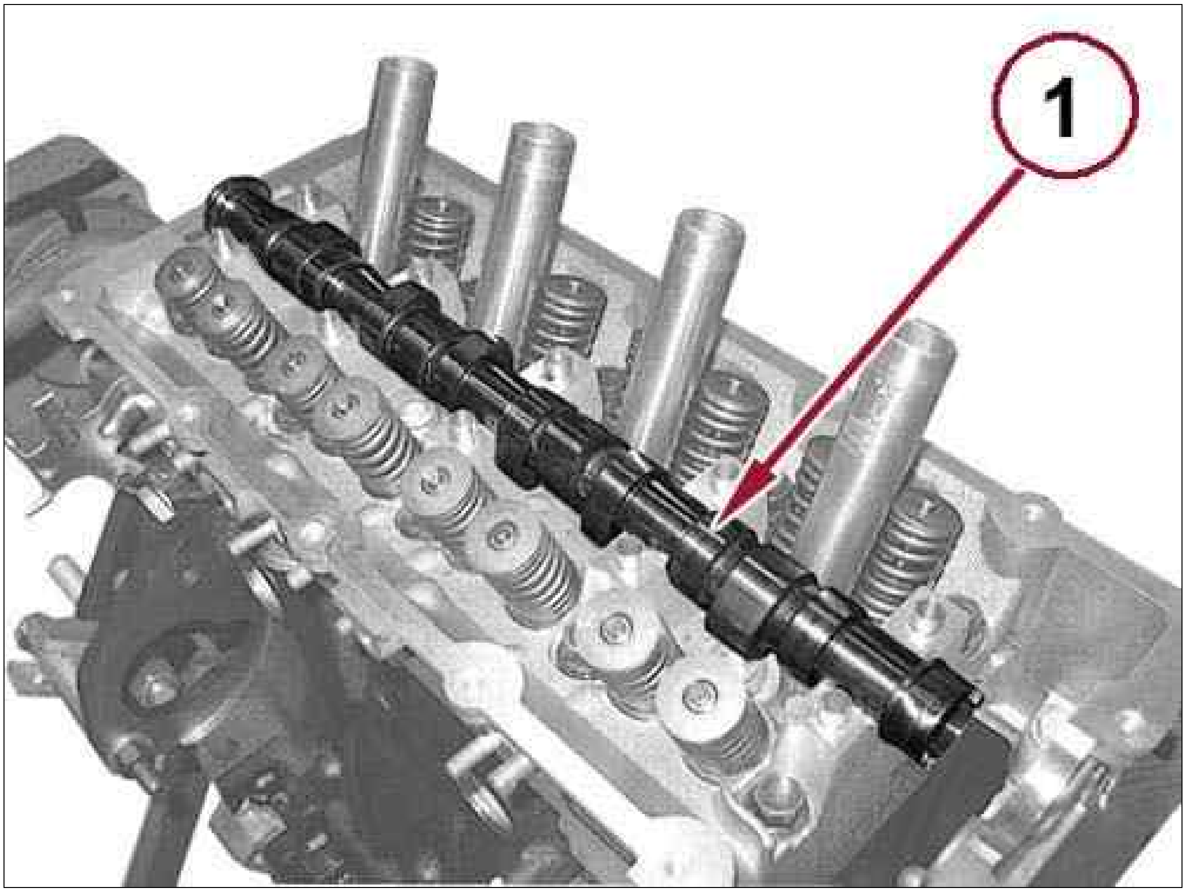
Fig 47: Camshaft Caps



Courtesy of CHRYSLER GROUP, LLC

62. Remove the camshaft caps (1).

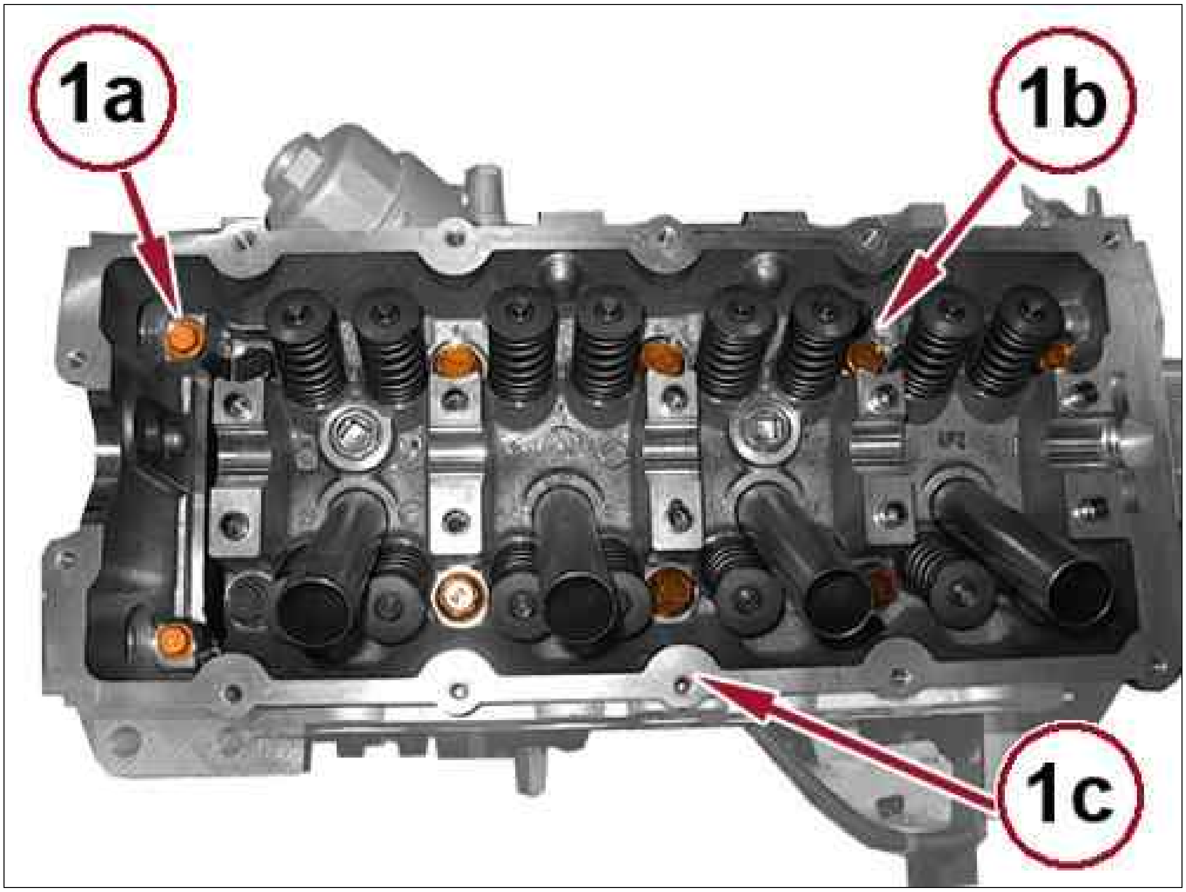
Fig 48: Camshaft



Courtesy of CHRYSLER GROUP, LLC

63. Remove the camshaft.

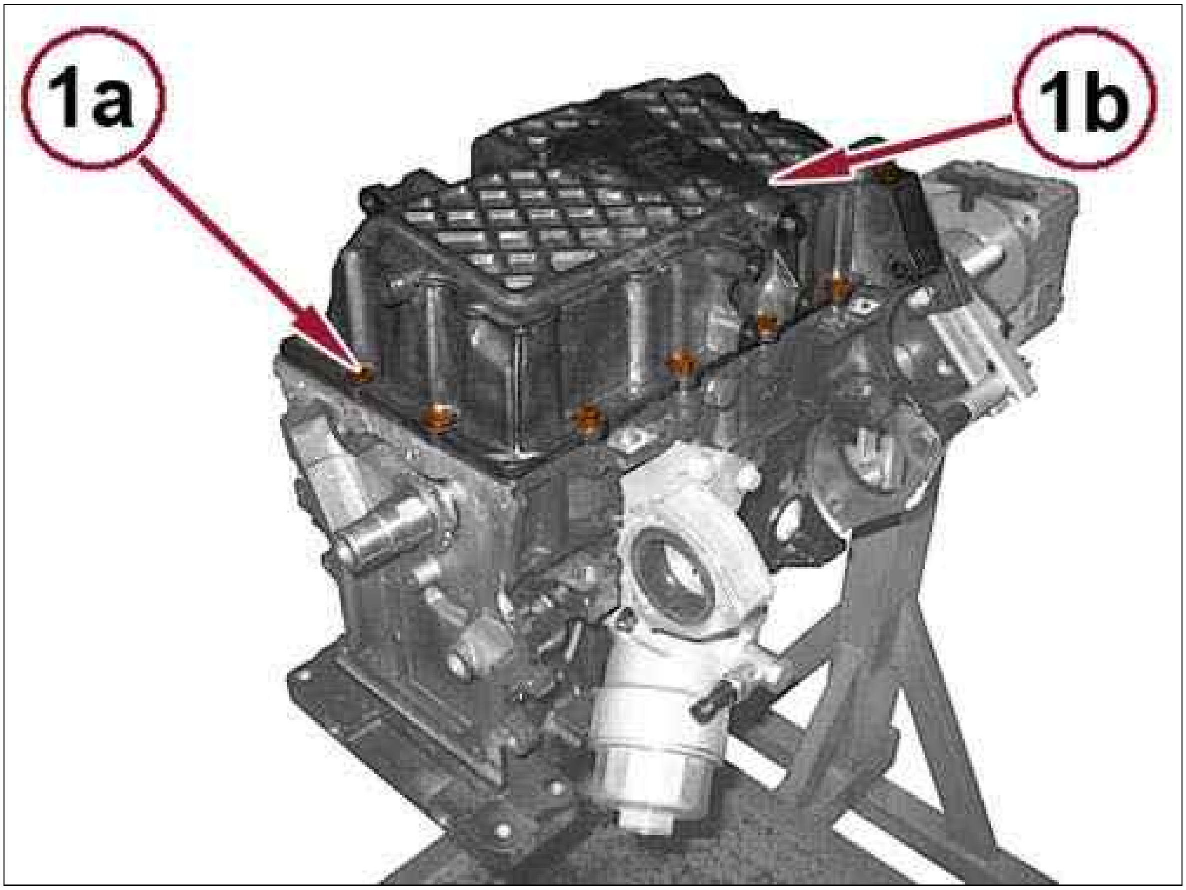
Fig 49: Cylinder Head & Bolts



Courtesy of CHRYSLER GROUP, LLC

64. Remove the bolts (1a), (1b) and cylinder head (1c).
65. Remove the gasket.

Fig 50: Engine Oil Sump & Bolts

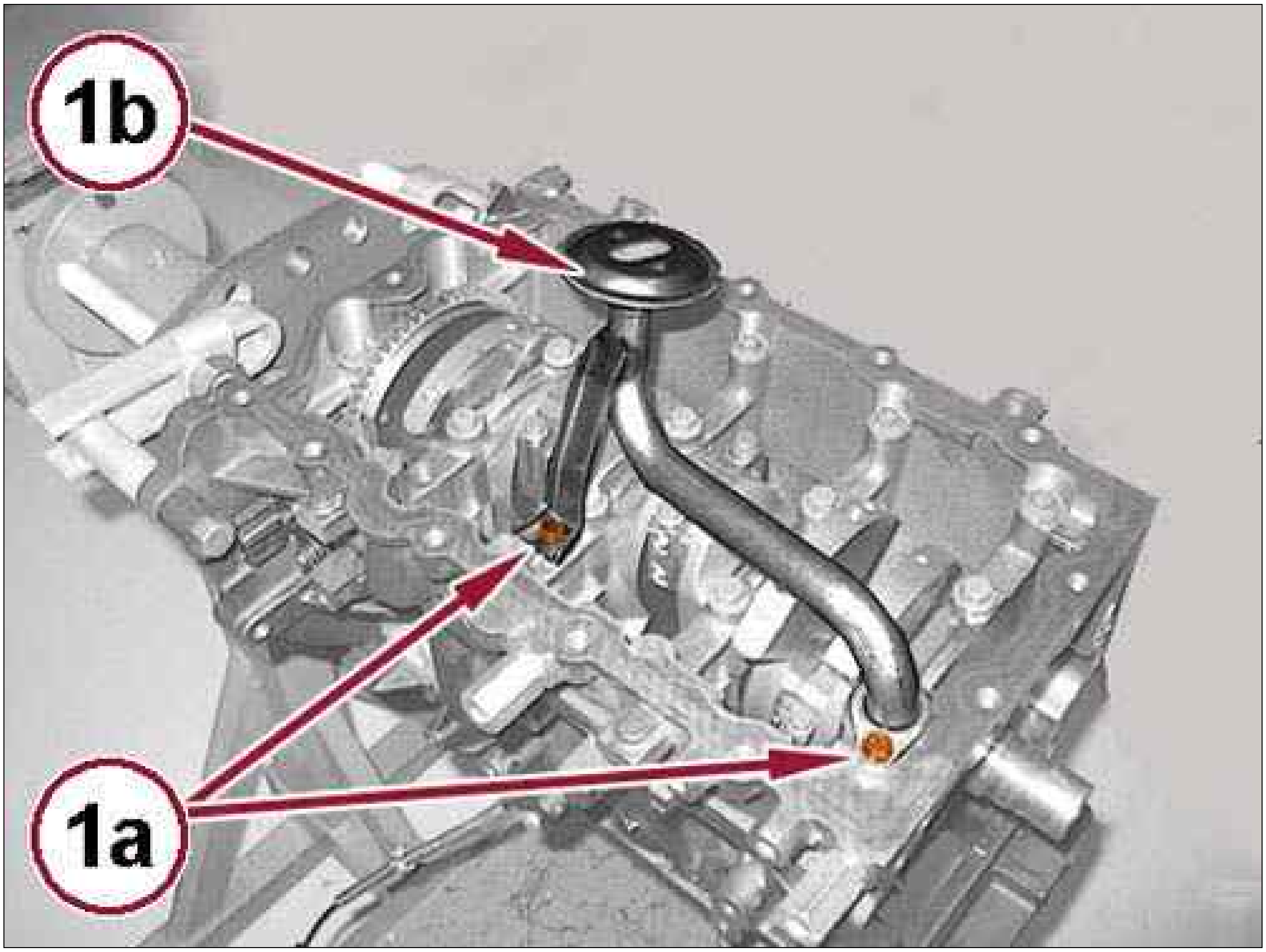


Courtesy of CHRYSLER GROUP, LLC

66. Remove the bolts (1a) and the engine oil sump (1b).
67. Remove the gasket.

DISASSEMBLY AND ASSEMBLY > DISASSEMBLE-REASSEMBLE-FOLLOWING-INSPECTION

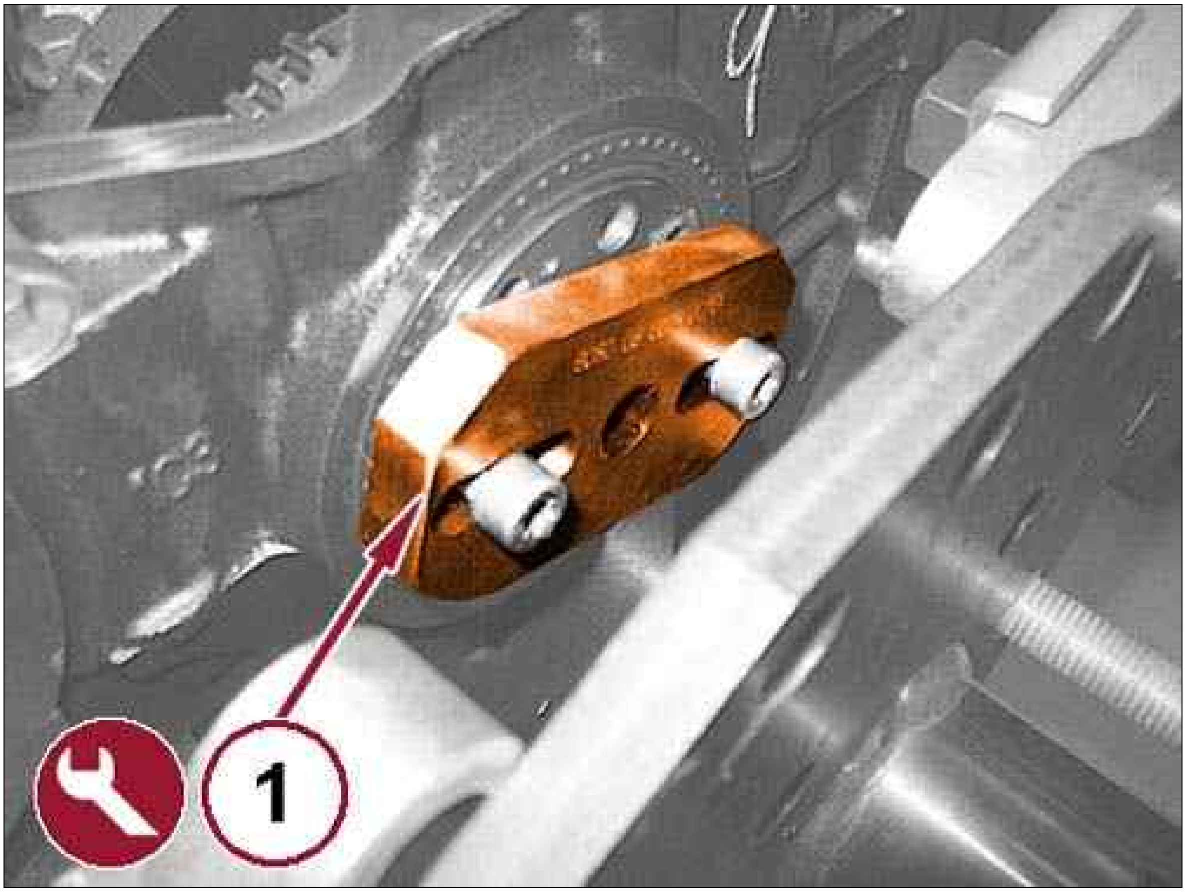
Fig 1: Engine Oil Pick-Up Tube With O-Ring & Screws



Courtesy of CHRYSLER GROUP, LLC

1. Undo the screws (1a) and remove the engine oil pick-up tube (1b) complete with O-ring.

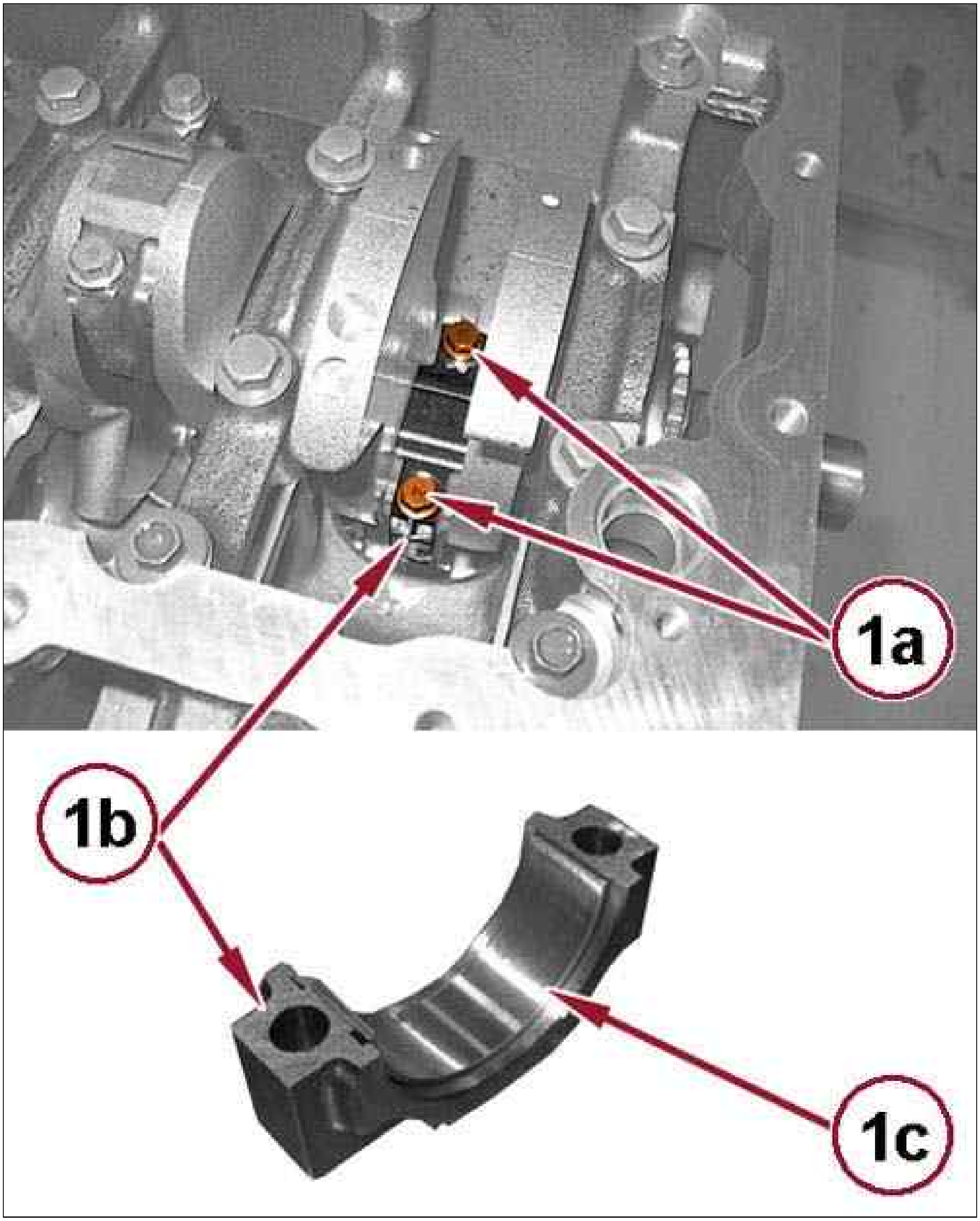
Fig 2: Special Tool Installed To Rotate Crankshaft



Courtesy of CHRYSLER GROUP, LLC

2. Fit the tool 1860815000 (1) for rotating the crankshaft.

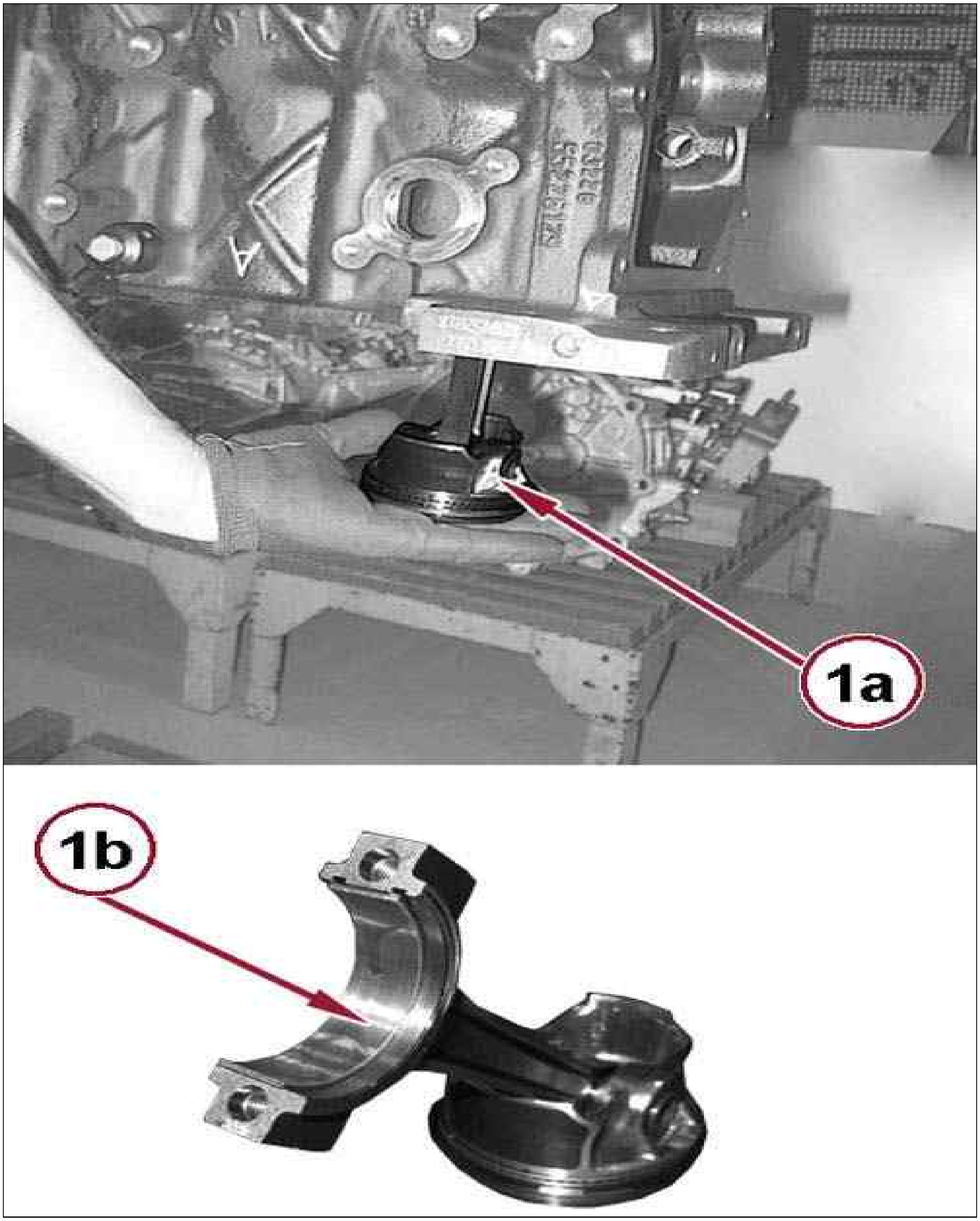
Fig 3: Connecting Rod Cap With Half-Bearing & Bolts



Courtesy of CHRYSLER GROUP, LLC

3. Remove the bolts (1a) and the connecting rod cap (1b) complete with half-bearing (1c).

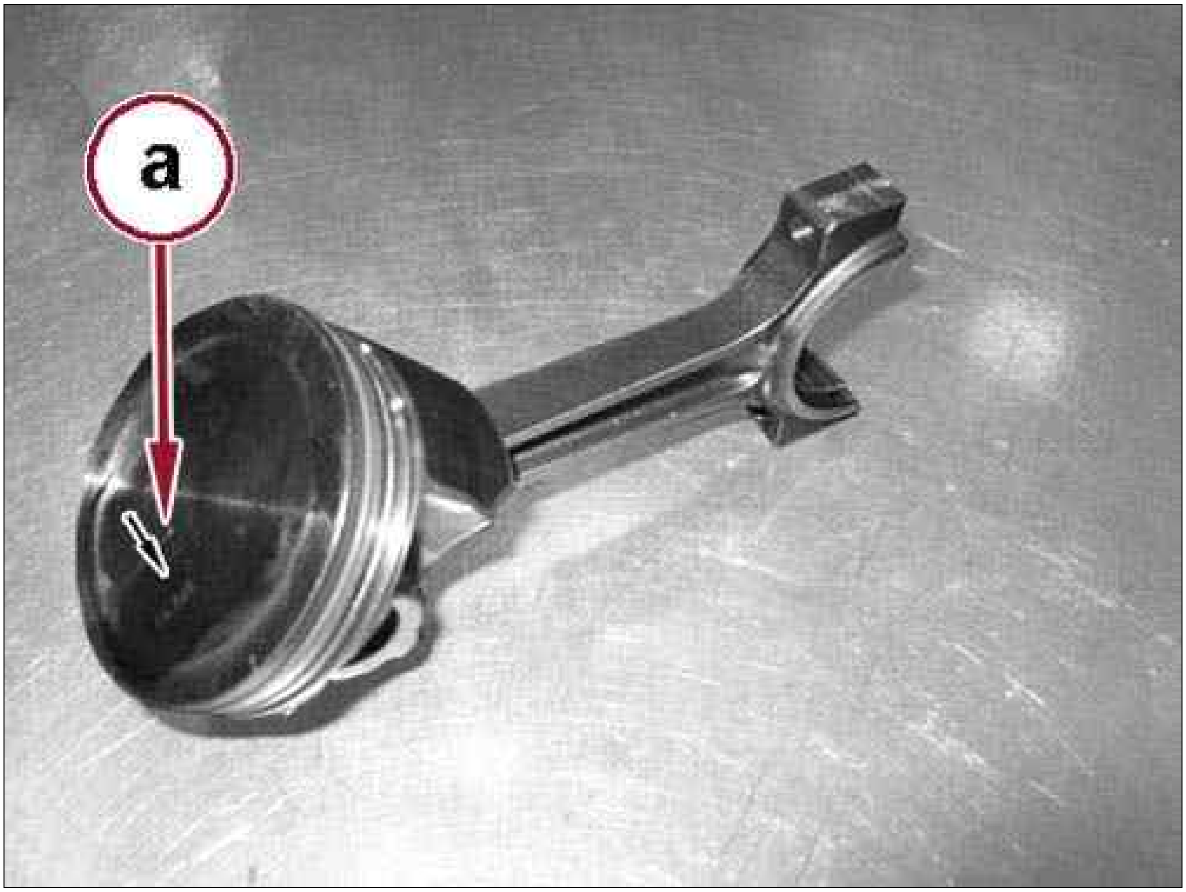
Fig 4: Piston-Connecting Rod Assembly With Half-Bearing



Courtesy of CHRYSLER GROUP, LLC

4. Remove the piston-connecting rod assembly (1a) complete with half-bearing (1b).
5. Proceed in the same way for the removal of the remaining pistons.

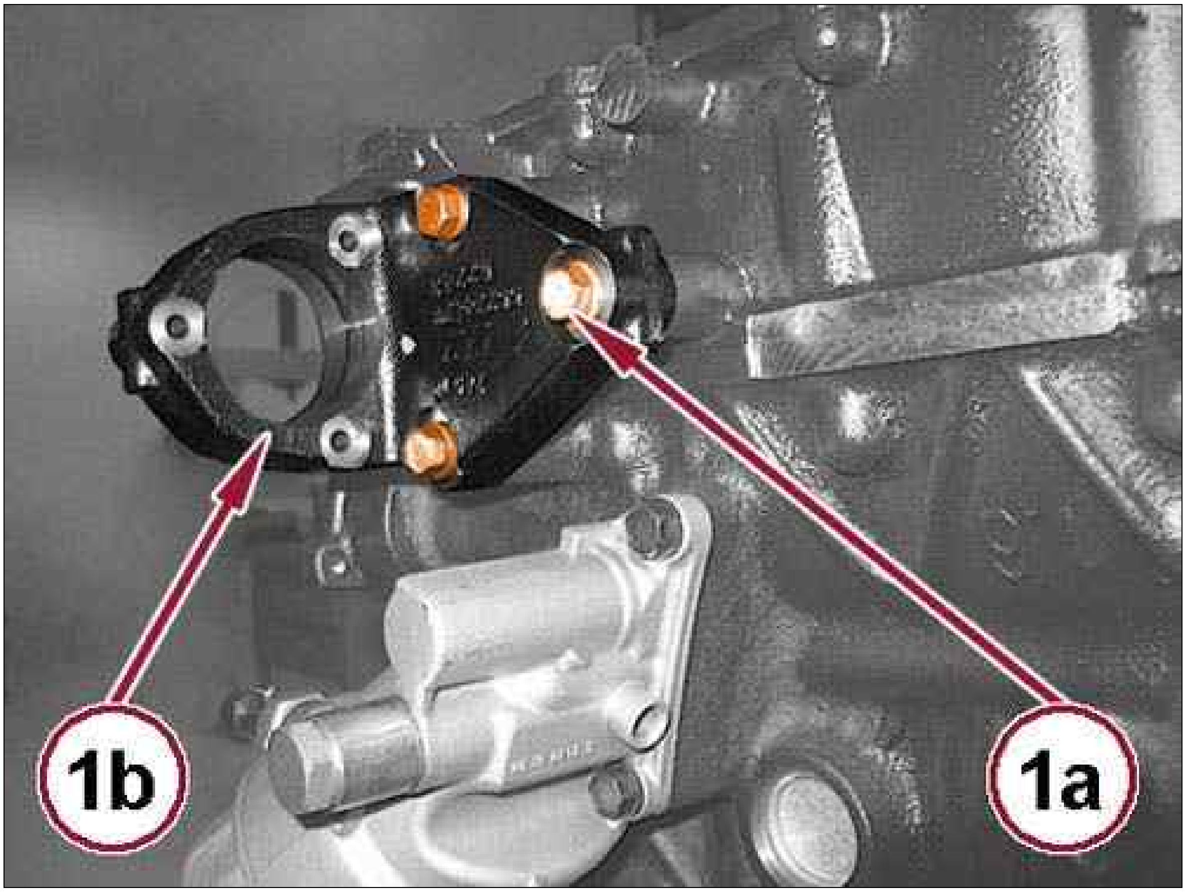
Fig 5: Arrow On Piston Crown Facing Timing Side Indicates Piston Fitting Direction



Courtesy of CHRYSLER GROUP, LLC

6. The arrow (a) on the piston crown facing the timing side indicates the fitting direction. The connecting rod-cap matching is "BREAK" type and can only be fitted in one position.
7. Remove the piston pin, connecting rod, and rings. Refer to ROD, PISTON AND CONNECTING, REMOVAL AND INSTALLATION .

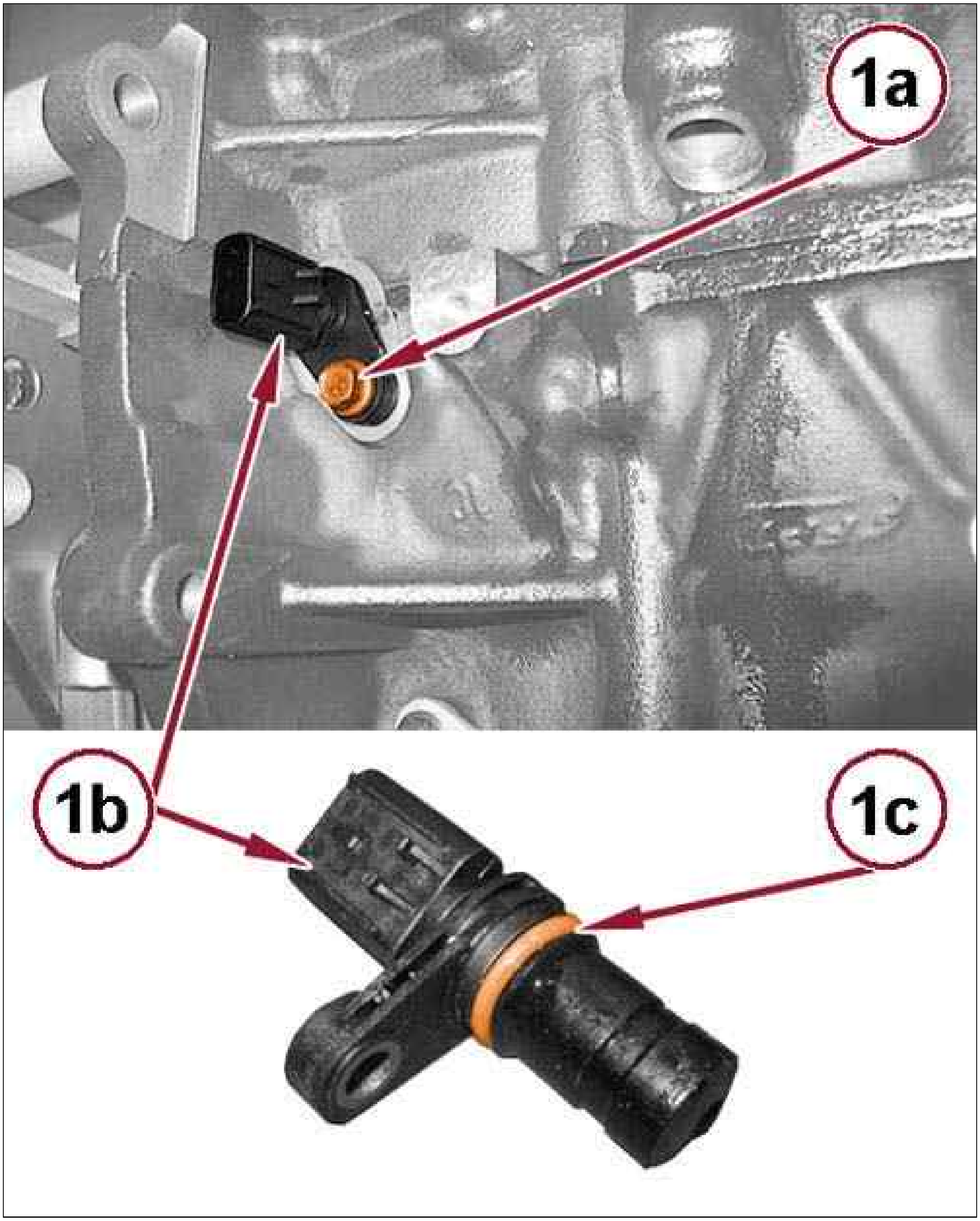
Fig 6: Intermediate Shaft Mounting Bracket & Bolts



Courtesy of CHRYSLER GROUP, LLC

8. Remove the bolts (1a) and remove the intermediate shaft mounting bracket (1b).

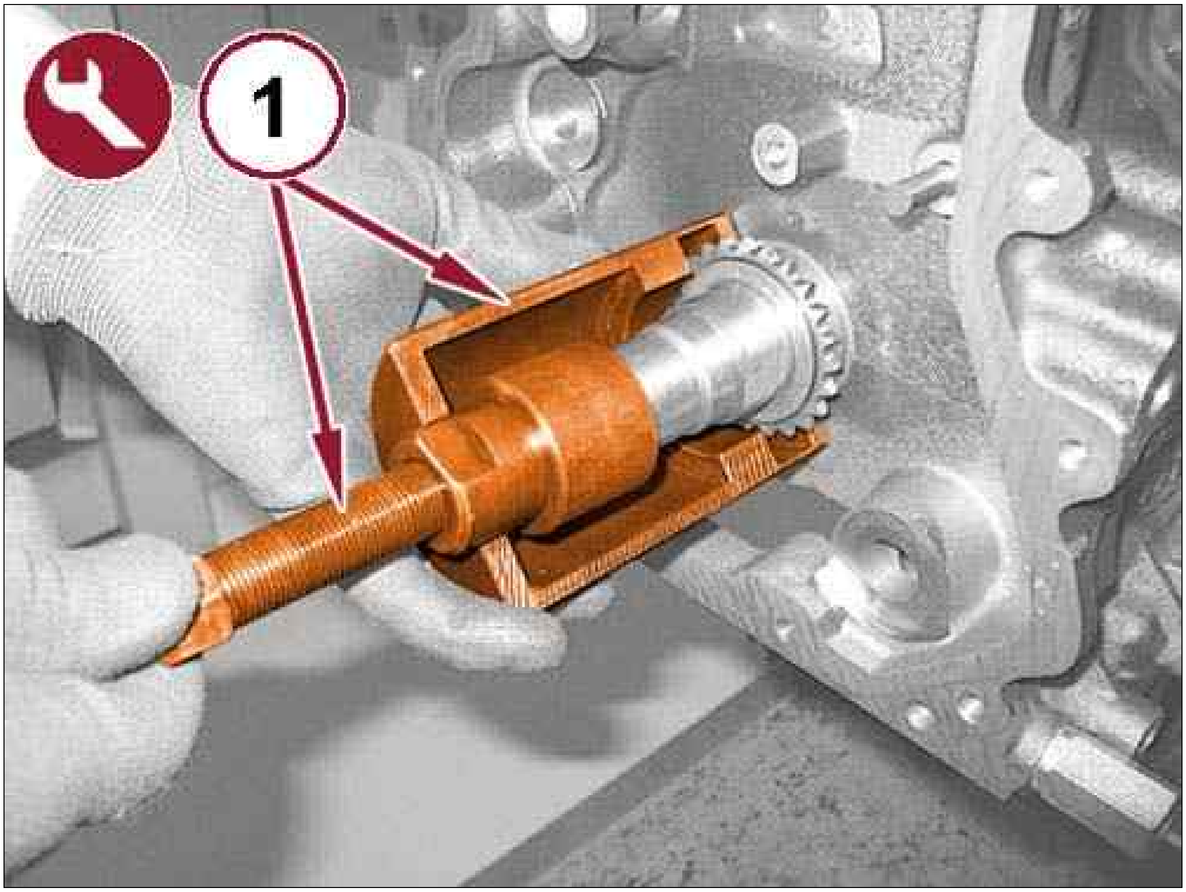
Fig 7: Crankshaft Position (CMP) Sensor With O-Ring & Bolt



Courtesy of CHRYSLER GROUP, LLC

9. Remove the bolt (1a) and the Crankshaft Position (CMP) sensor (1b) complete with O-ring (1c).

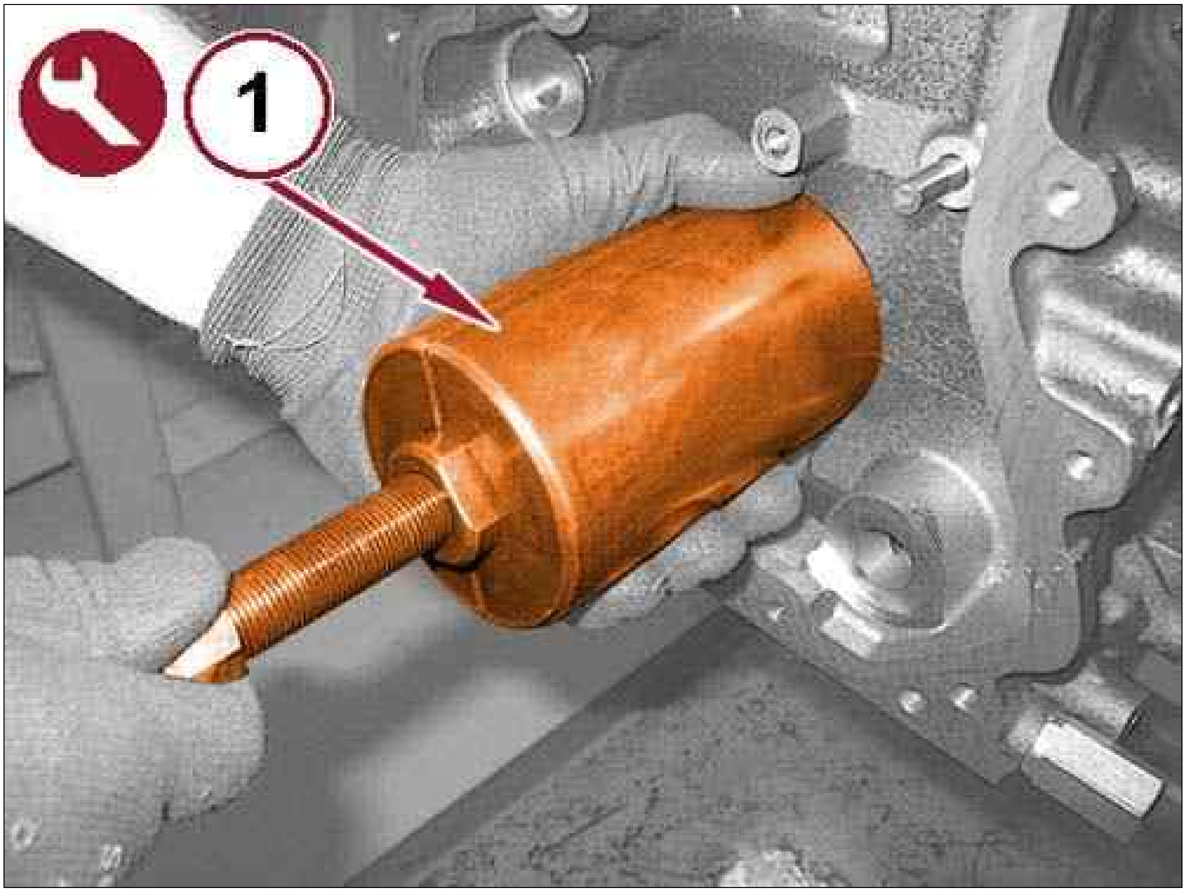
Fig 8: Fitting Central Pin And Half-Casing Of Special Tool To Remove Timing Chain Drive Gear



Courtesy of CHRYSLER GROUP, LLC

10. Remove the timing chain drive gear using the tool 2000040946 (1).
11. Fit the central pin and the half-casing as shown in the figure (1).

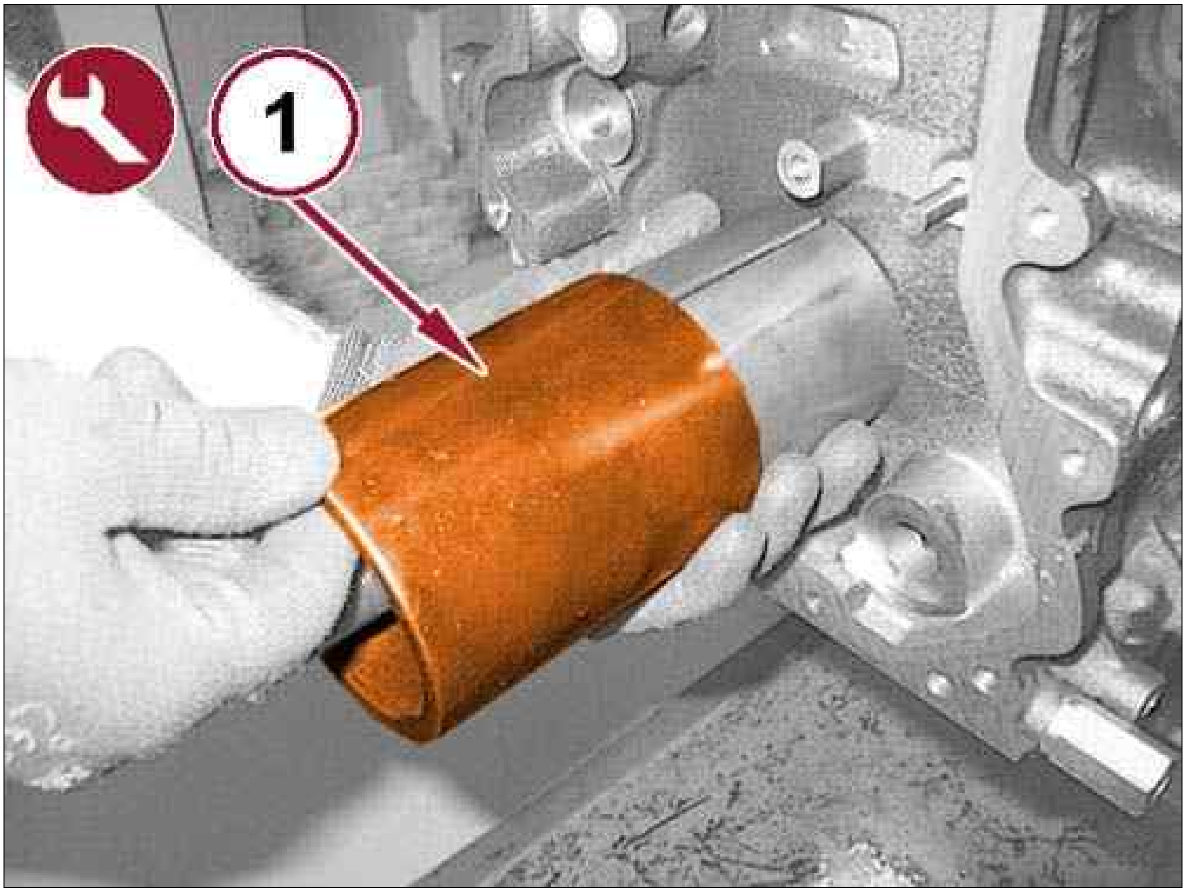
Fig 9: Fitting Half-Casing Of Special Tool



Courtesy of CHRYSLER GROUP, LLC

12. Fit the half-casing as shown in the figure (1).

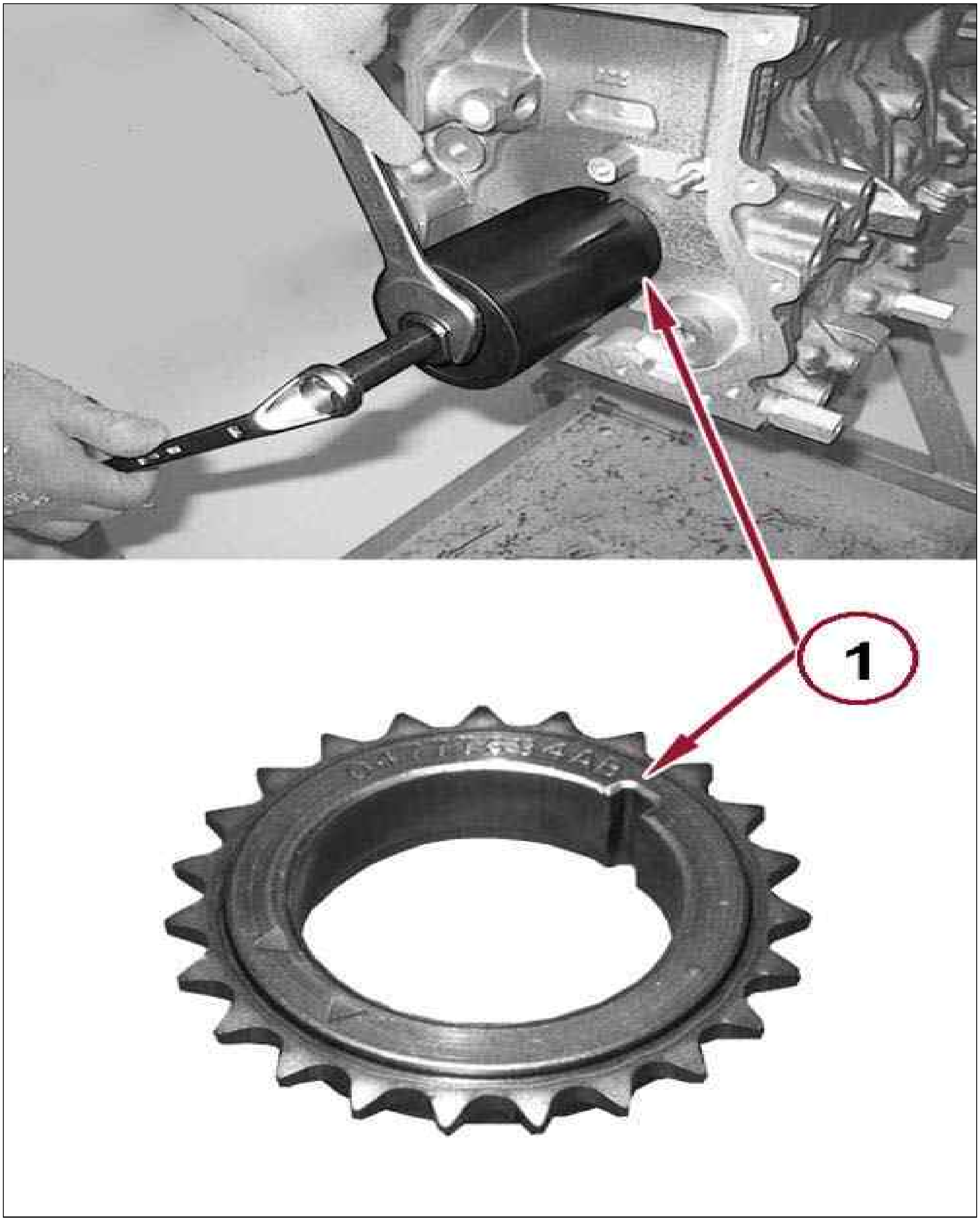
Fig 10: Fitting Retaining Cylinder Of Special Tool



Courtesy of CHRYSLER GROUP, LLC

13. Fit the retaining cylinder as shown in the figure.

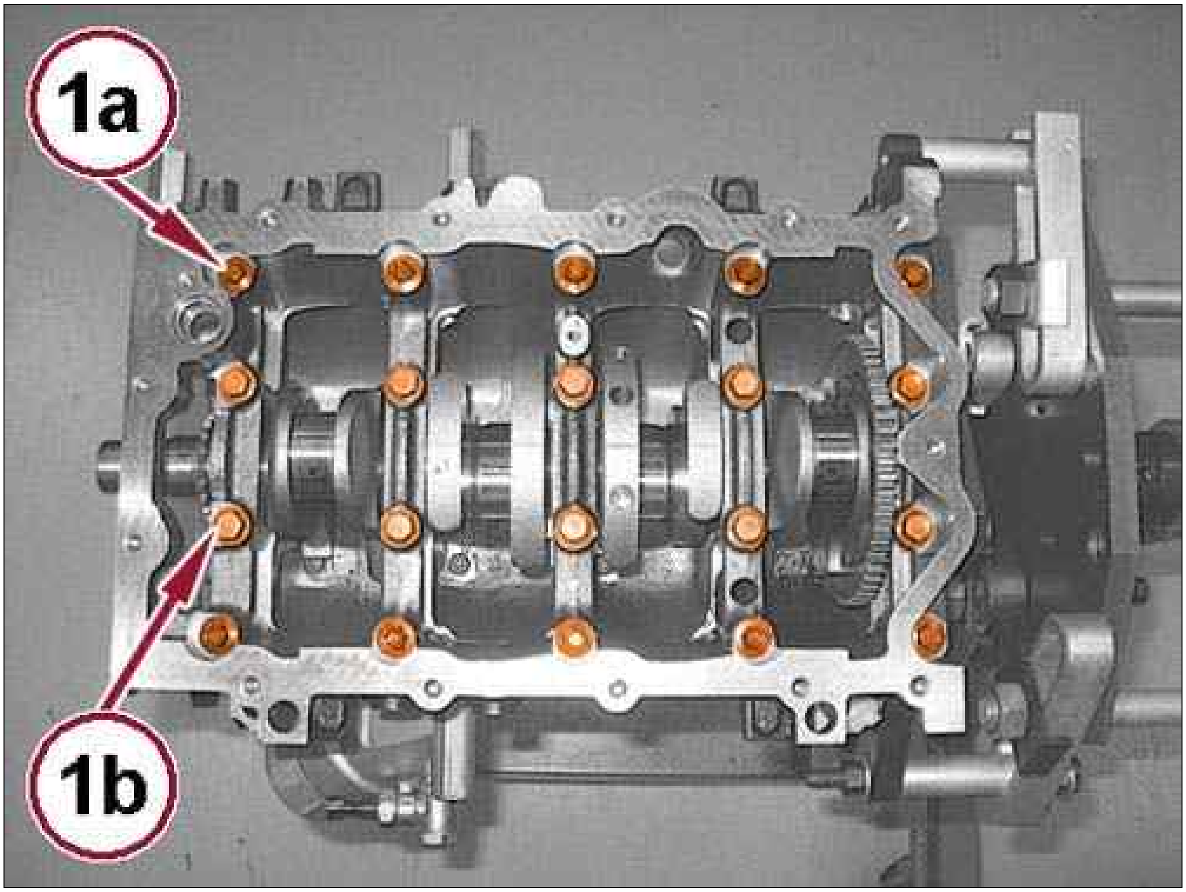
Fig 11: Removing Timing Chain Drive Gear



Courtesy of CHRYSLER GROUP, LLC

14. Proceed with the removal of the timing chain drive gear.

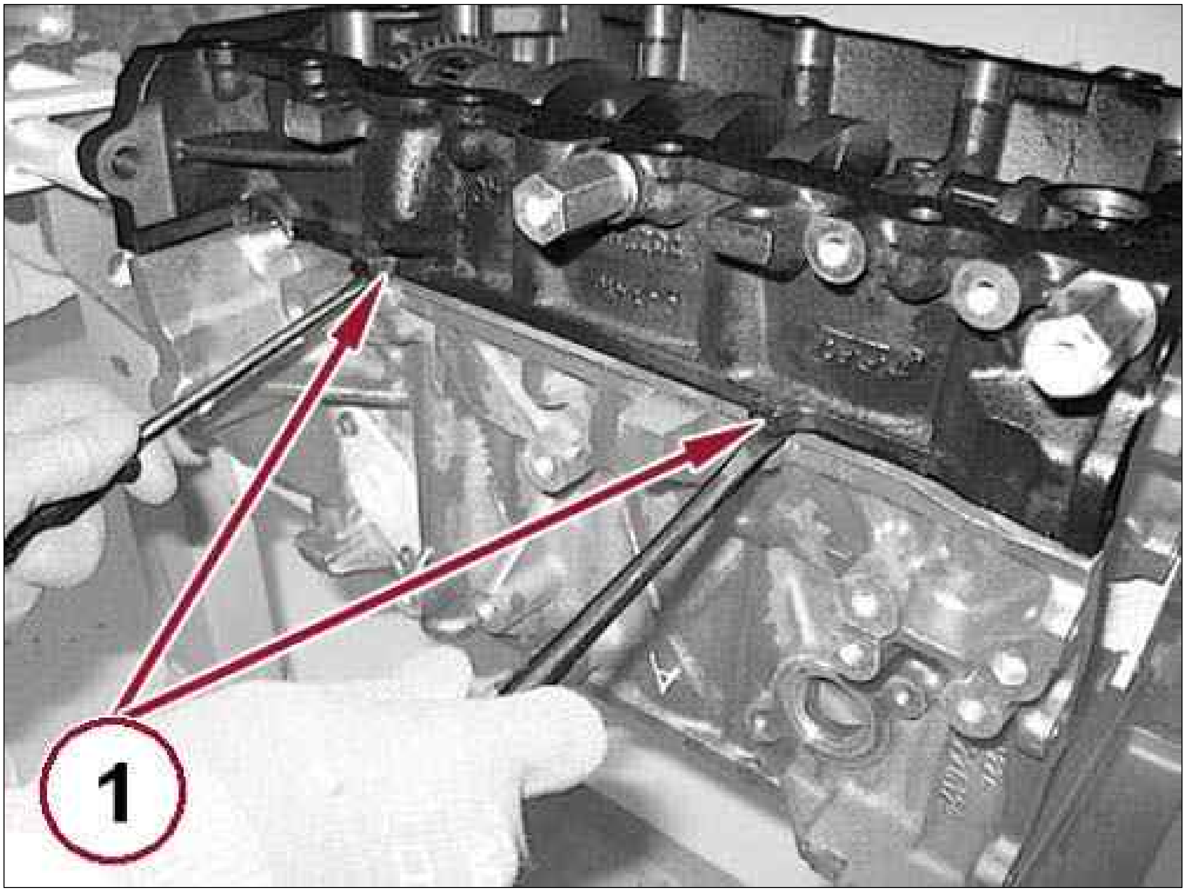
Fig 12: Internal & External Bolts Securing Lower Block



Courtesy of CHRYSLER GROUP, LLC

15. Remove the external bolts (1a) and the internal bolts (1b) securing the lower block.

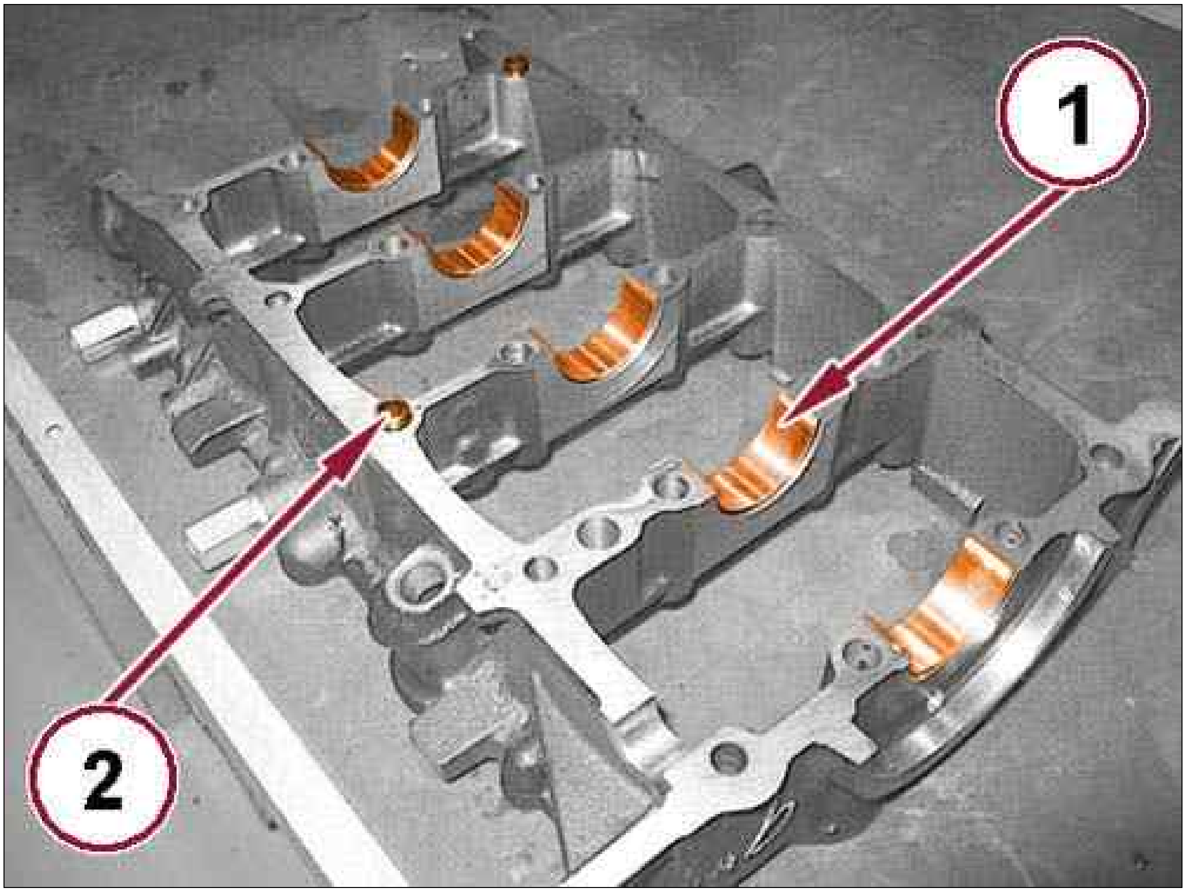
Fig 13: Releasing Lower Block Using Suitable Tool In Designated Areas



Courtesy of CHRYSLER GROUP, LLC

16. Use a suitable tool (1) to release the lower block, operating in the areas shown in the figure, intake side and exhaust side.
17. Remove the lower block complete with main half-bearings.

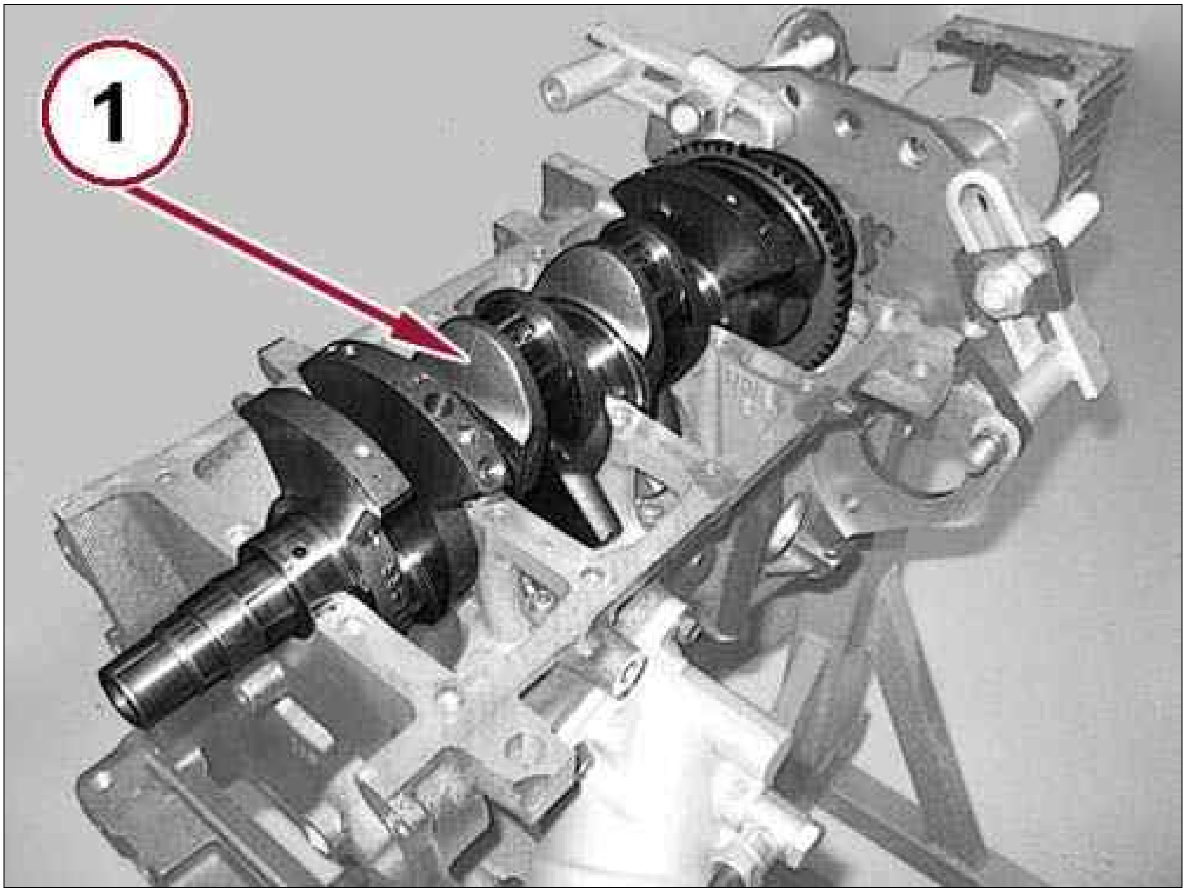
Fig 14: Lower Main Half-Bearings & Locating Bushes



Courtesy of CHRYSLER GROUP, LLC

18. Remove the lower main half-bearings (1).
19. Remove the locating bushes (2).
20. Remove all sealant residues.

Fig 15: Crankshaft



Courtesy of CHRYSLER GROUP, LLC

21. Check that the crankshaft end float corresponds to the prescribed figures using a magnetic base and dial gauge.

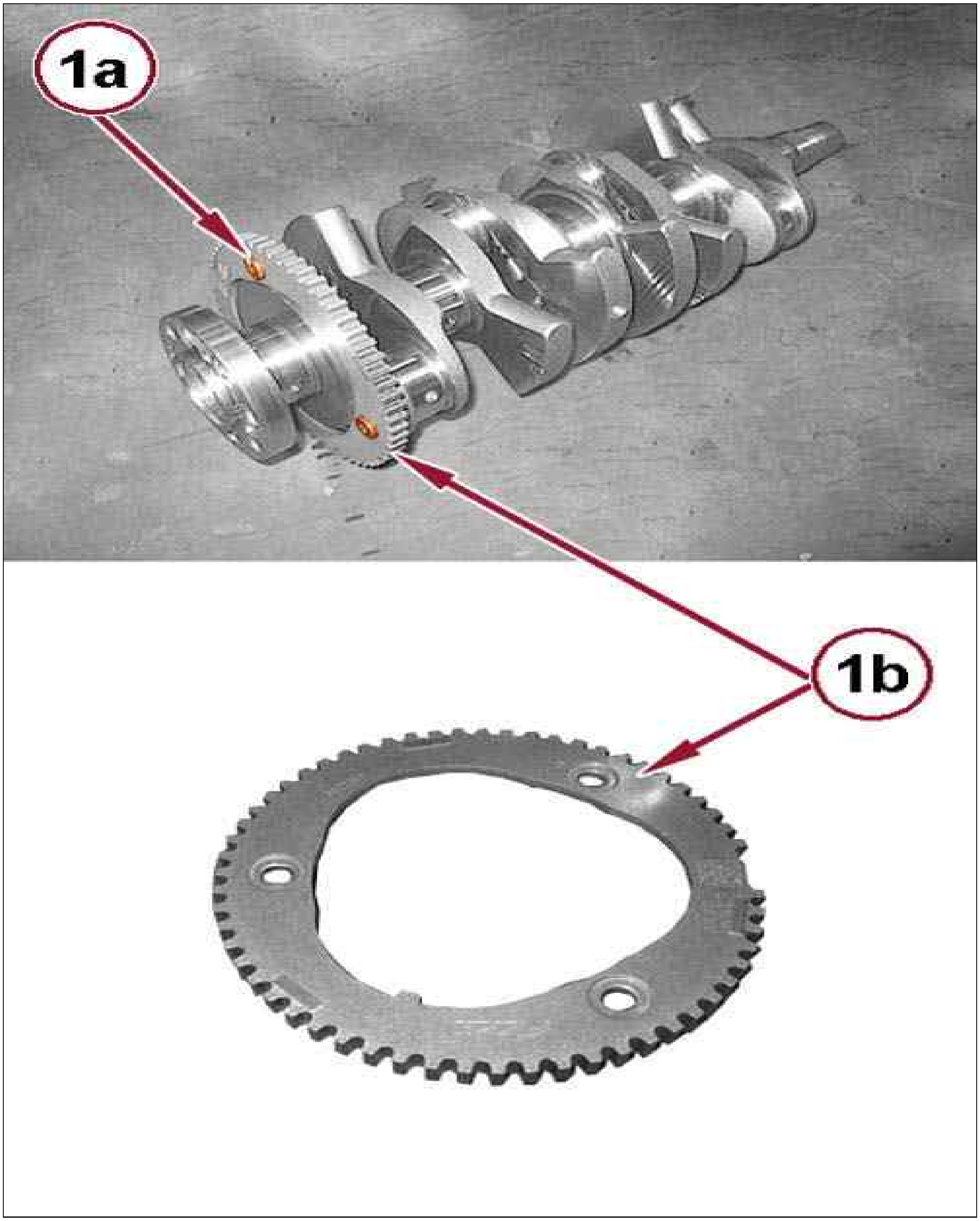
    0.050 ÷ 0.033 (mm)

22. If the value for the crankshaft end float is not within the prescribed limits, when refitting use suitable oversize thrust half-washers.

23. Remove the crankshaft (1).

24. Remove the crankshaft oil seal, flywheel side.

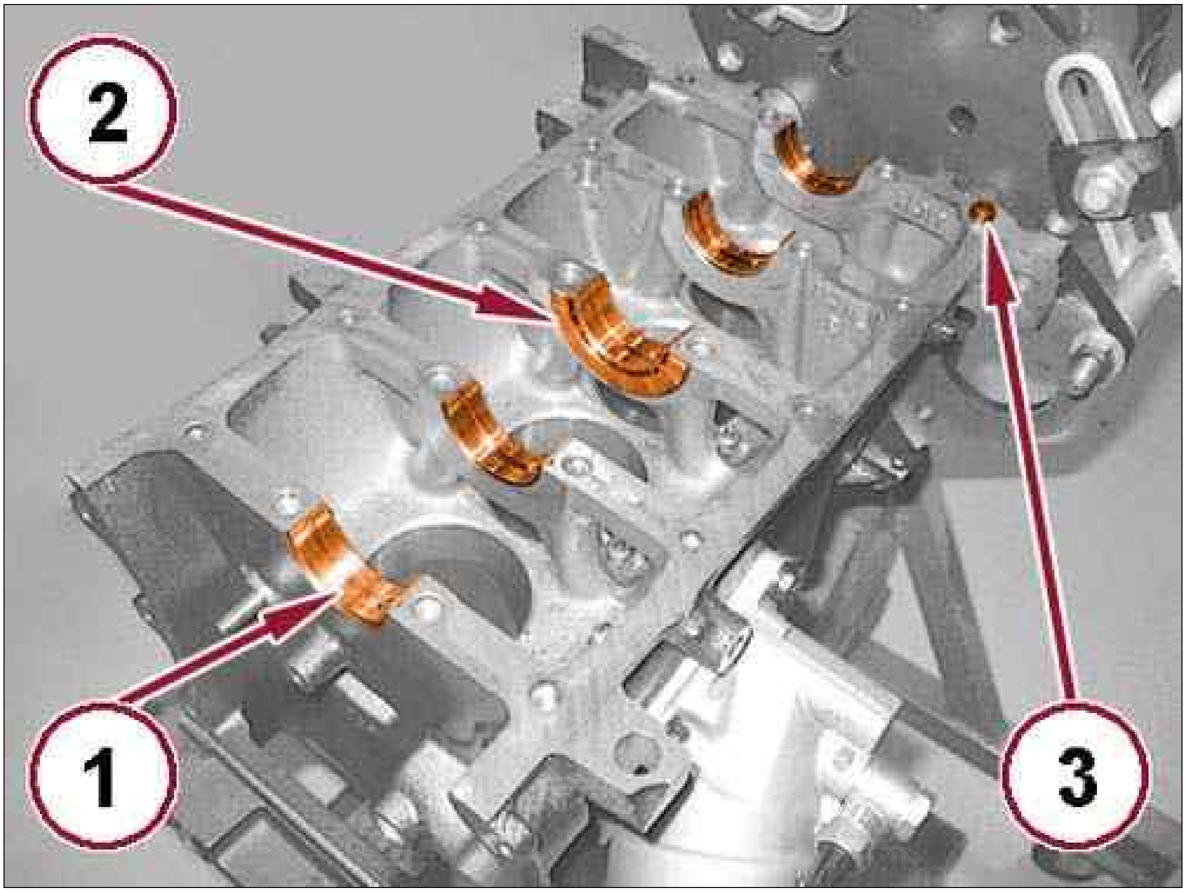
Fig 16: Tone Wheel & Bolts



Courtesy of CHRYSLER GROUP, LLC

25. Remove the bolts (1a) and tone wheel (1b).

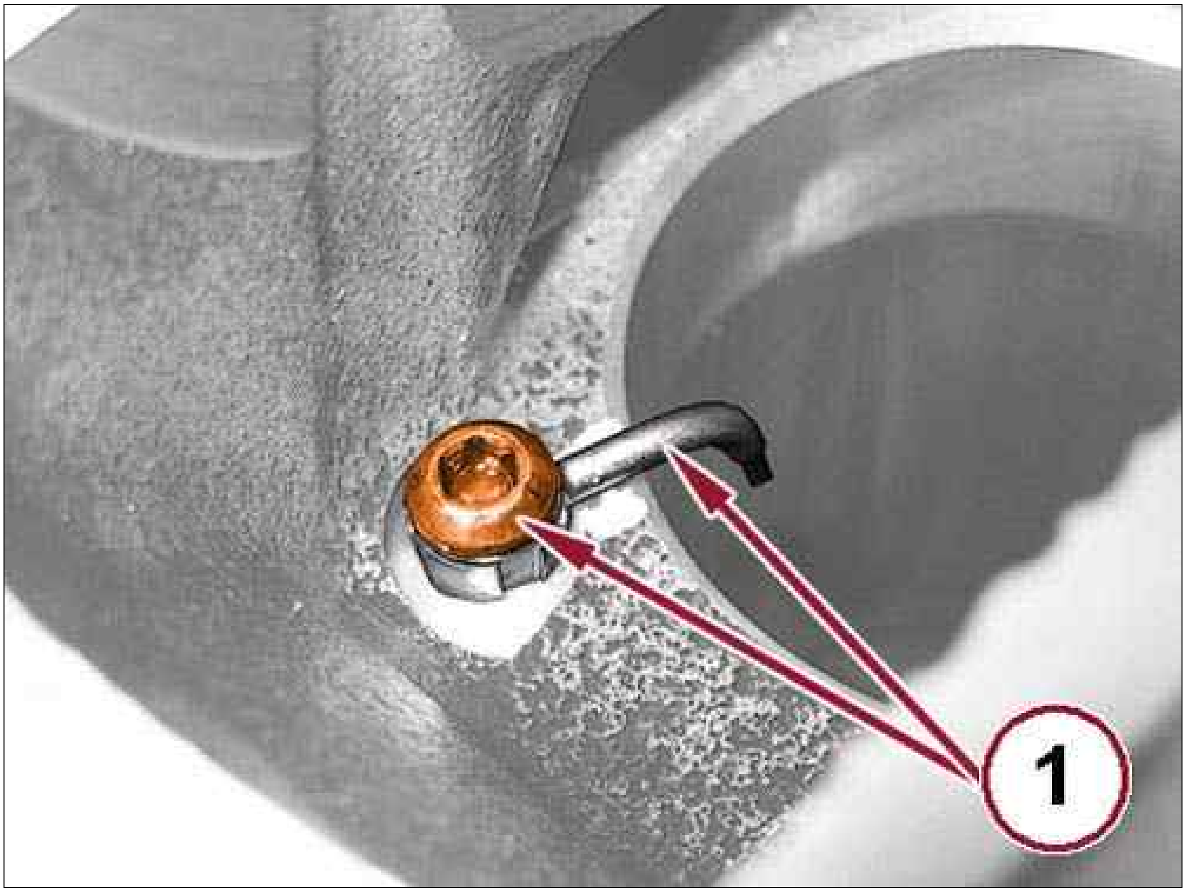
Fig 17: Upper Main Half-Bearings, Thrust Washers & Locating Bushing



Courtesy of CHRYSLER GROUP, LLC

26. Remove the upper main half-bearings (1).
27. Remove the thrust washers (2).
28. Remove the locating bush (3).
29. Remove all sealant residues.

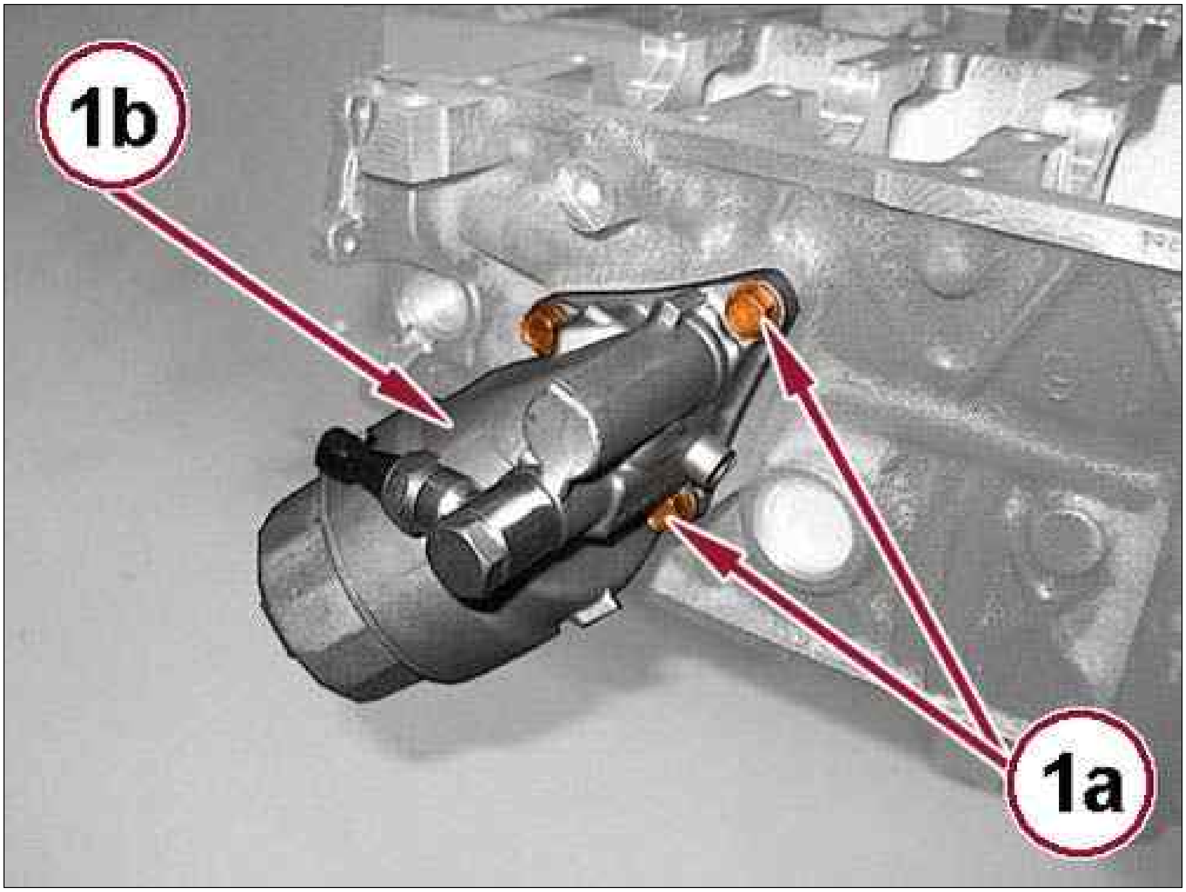
Fig 18: Engine Oil Jets & Bolts



Courtesy of CHRYSLER GROUP, LLC

30. Remove the bolt and the engine oil jets (1).

Fig 19: Oil Filter Mounting & Bolts



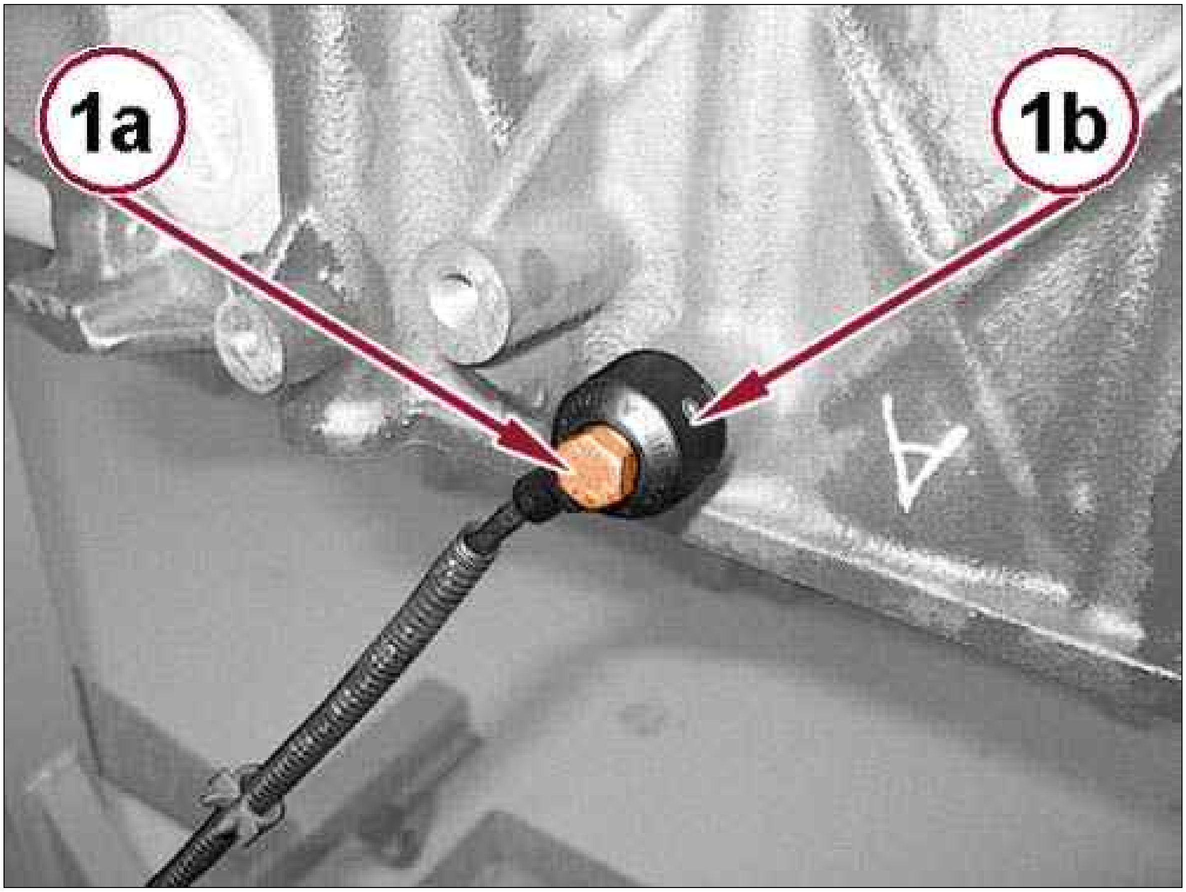
Courtesy of CHRYSLER GROUP, LLC

NOTE:

Place the engine oil filter mounting in a vice, undo the cover and remove the filter element.

31. Remove the bolts (1a) and the engine oil filter mounting (1b) complete with gasket.

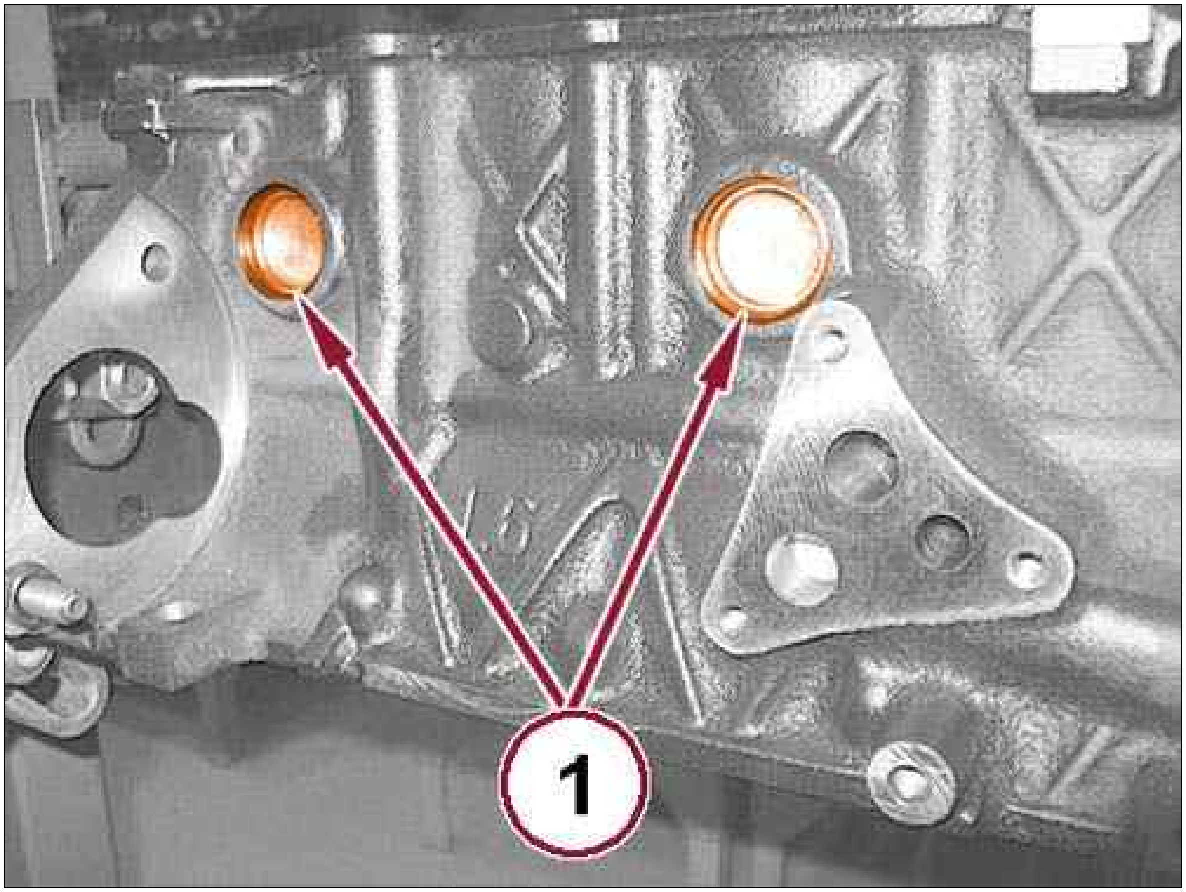
Fig 20: Knock Sensor & Bolt



Courtesy of CHRYSLER GROUP, LLC

32. Remove the bolt (1a) and the knock sensor (1b).

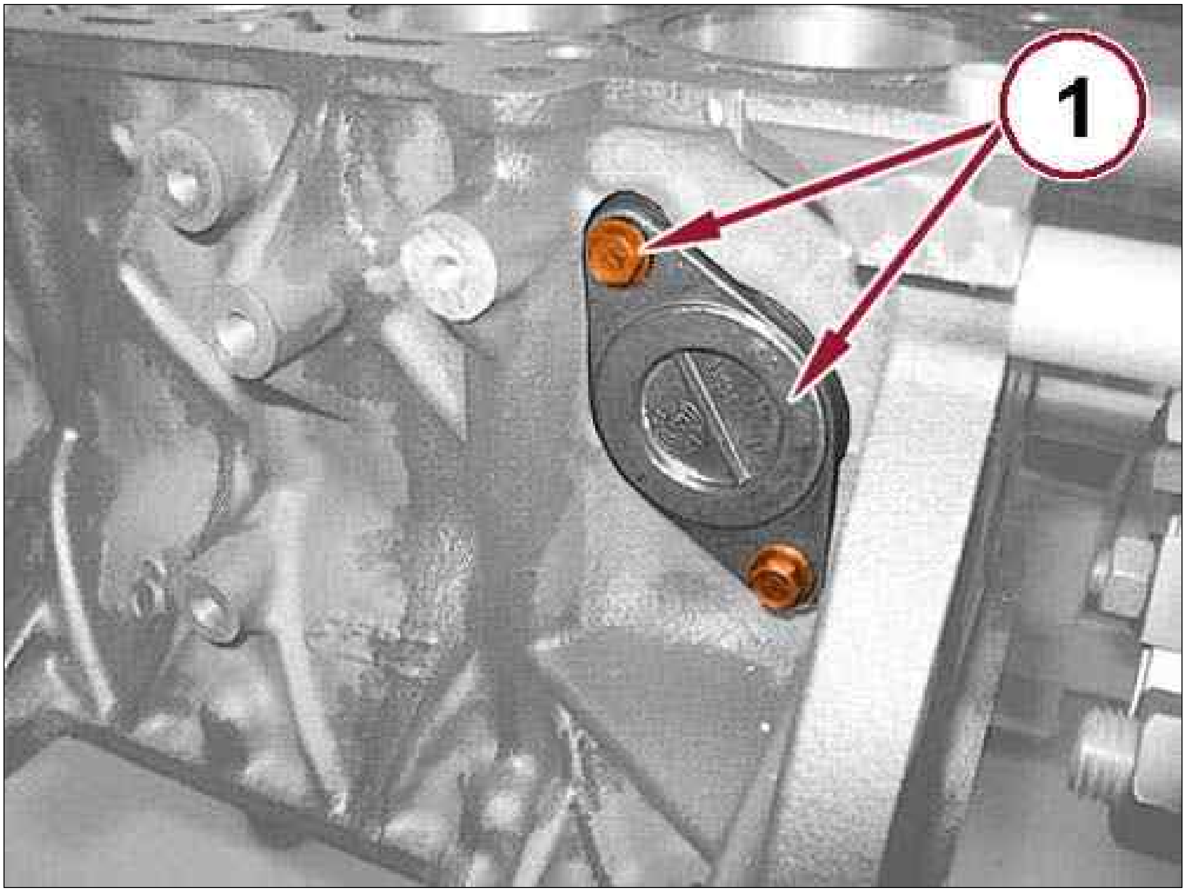
Fig 21: Locating Coolant Plugs



Courtesy of CHRYSLER GROUP, LLC

33. Use a suitable tool to remove the plugs from the engine coolant chambers.

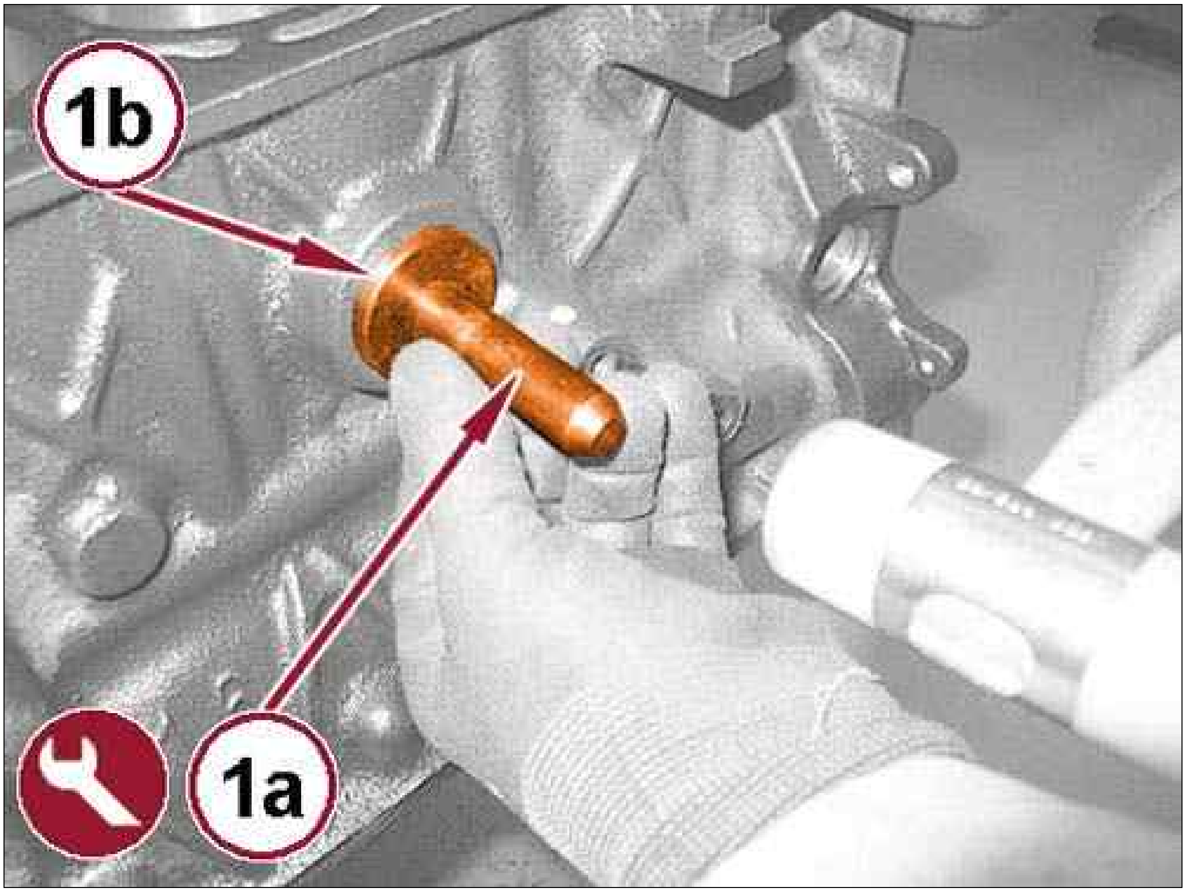
Fig 22: Closing Flange & Bolts



Courtesy of CHRYSLER GROUP, LLC

34. Remove the bolts and the closing flange (1) for the engine coolant chambers complete with gasket.
35. Wash and check the appearance of all components removed.
36. Place the engine block on the overhaul stand.

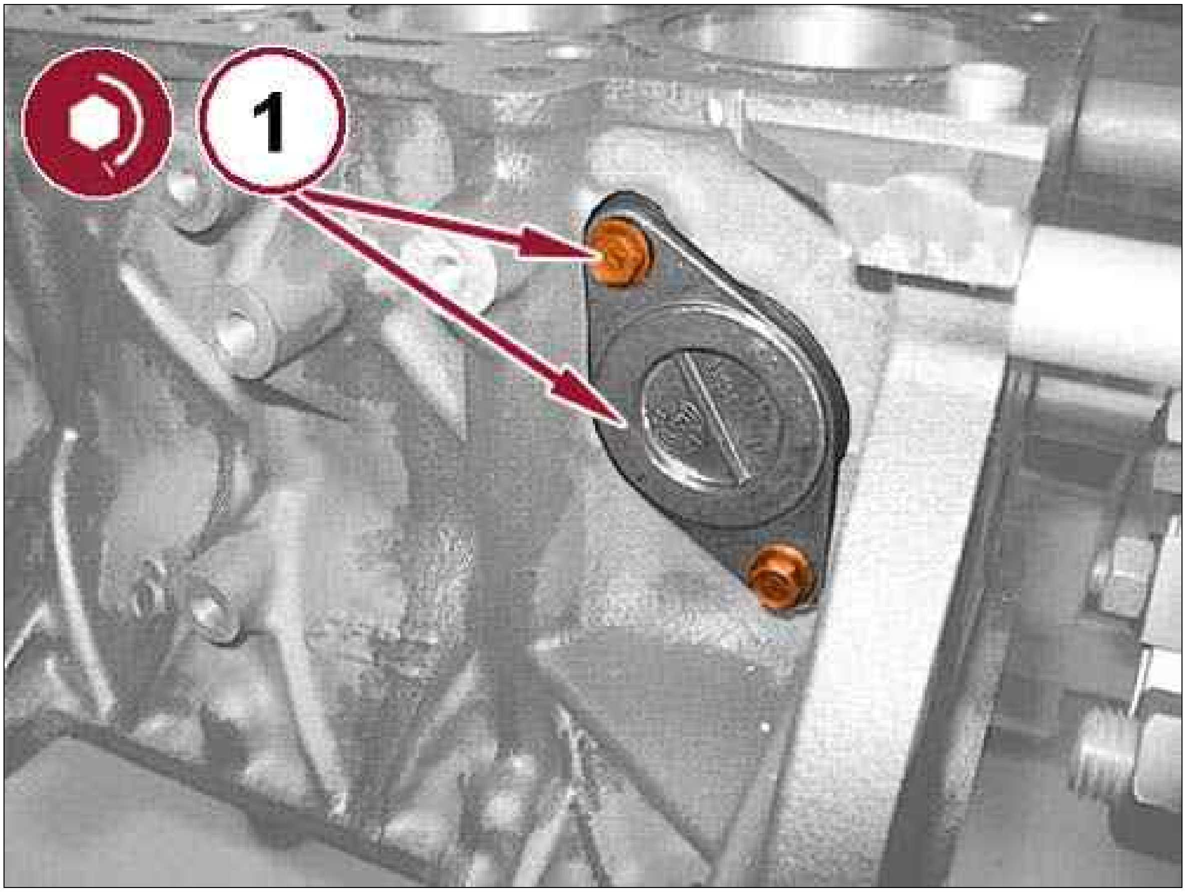
Fig 23: Installing Coolant Plugs Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

37. Use the tool 2000040940 (1a) to fit the **NEW** plugs of the engine coolant chambers (1b).

Fig 24: Closing Flange & Bolts

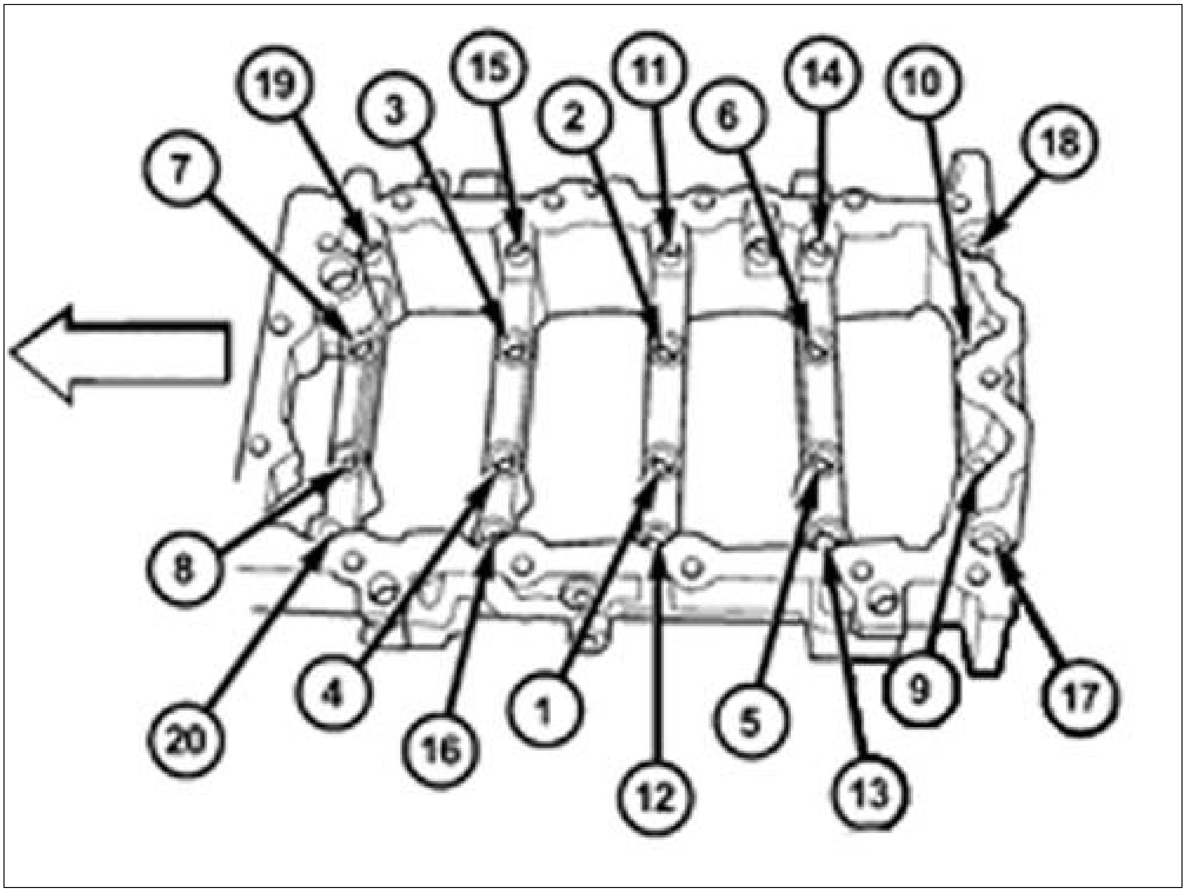


Courtesy of CHRYSLER GROUP, LLC

38. Place the engine coolant chambers closing flange in its housing, complete with a **NEW** gasket, and tighten the bolts (1) to the proper specification. Refer to TORQUE SPECIFICATIONS .
39. Use a calibrated metal rule and a feeler gauge to check the planarity of the cylinder head - engine block support surface. Refer to ENGINE SPECIFICATIONS .
40. If the measurement does not correspond to the prescribed values, regrind the cylinder head support surface.
41. Measure the diameter of the cylinder liners and check that they correspond to the prescribed values. Refer to ENGINE SPECIFICATIONS .
42. Check that the roundness of the cylinder liners is within the prescribed limit. Refer to ENGINE SPECIFICATIONS .
43. Check that the taper of the cylinder liners is within the prescribed limits. Refer to ENGINE SPECIFICATIONS .
44. If the cylinder liner taper or roundness measurements are not within the prescribed values, ream the cylinder liners following the prescribed oversizes. Refer to ENGINE SPECIFICATIONS .
45. If reaming, ensure all the liners have the same oversize. Refer to ENGINE SPECIFICATIONS .
46. Fit the locating bushes for the lower/upper block.

47. Provisionally fit the lower block to measure the main journal seats and then remove it.

Fig 25: Lower Block Bolt Tightening Sequence



Courtesy of CHRYSLER GROUP, LLC

48. Using the tightening sequence shown in illustration, tighten the lower block fixing bolts to:

    1. M8 bolts 26 N.m (19 ft. lbs.).
    2. M10 bolts 61 N.m (45 ft. lbs.).

49. Check that the diameter of the main journal seats is within the prescribed limits (without fitting the half-bearings).

    51.997 ÷ 52.007 (mm)

50. Check that the diameter of the main journals is within the prescribed limits.

    47.992 ÷ 48.008 (mm)

51. Check that the diameter of the crankpins is within the prescribed limits.

    43.992 ÷ 44.008 (mm)

52. Check the crankshaft and connecting rod bearings, keeping in mind that no adjustment operations should be carried out on the half-bearings.
53. Replace them if scoring or signs of binding are noted.
54. The size of the main half-bearings is given.

-	mm	in.
Class 1	1.980 ÷ 1.984	0.0779 ÷ 0.0781
Class 2	1.984 ÷ 1.988	0.0781 ÷ 0.0782
Class 3	1.989 ÷ 1.993	0.0783 ÷ 0.0784
Bearing shells thickness of counter increased	2.105 ÷ 2.111	0.0828 ÷ 0.0831

55. The size of the connecting rod half-bearings is given.

-	(mm)	in.
Class A (Red)	1.480 ÷ 1.484	0.05826 ÷ 0.05842
Class B (Blue)	1.485 ÷ 1.489	0.05846 ÷ 0.05862
Class C (Yellow)	1.490 ÷ 1.494	0.05866 ÷ 0.05881

56. The thrust half-washer thickness is given.

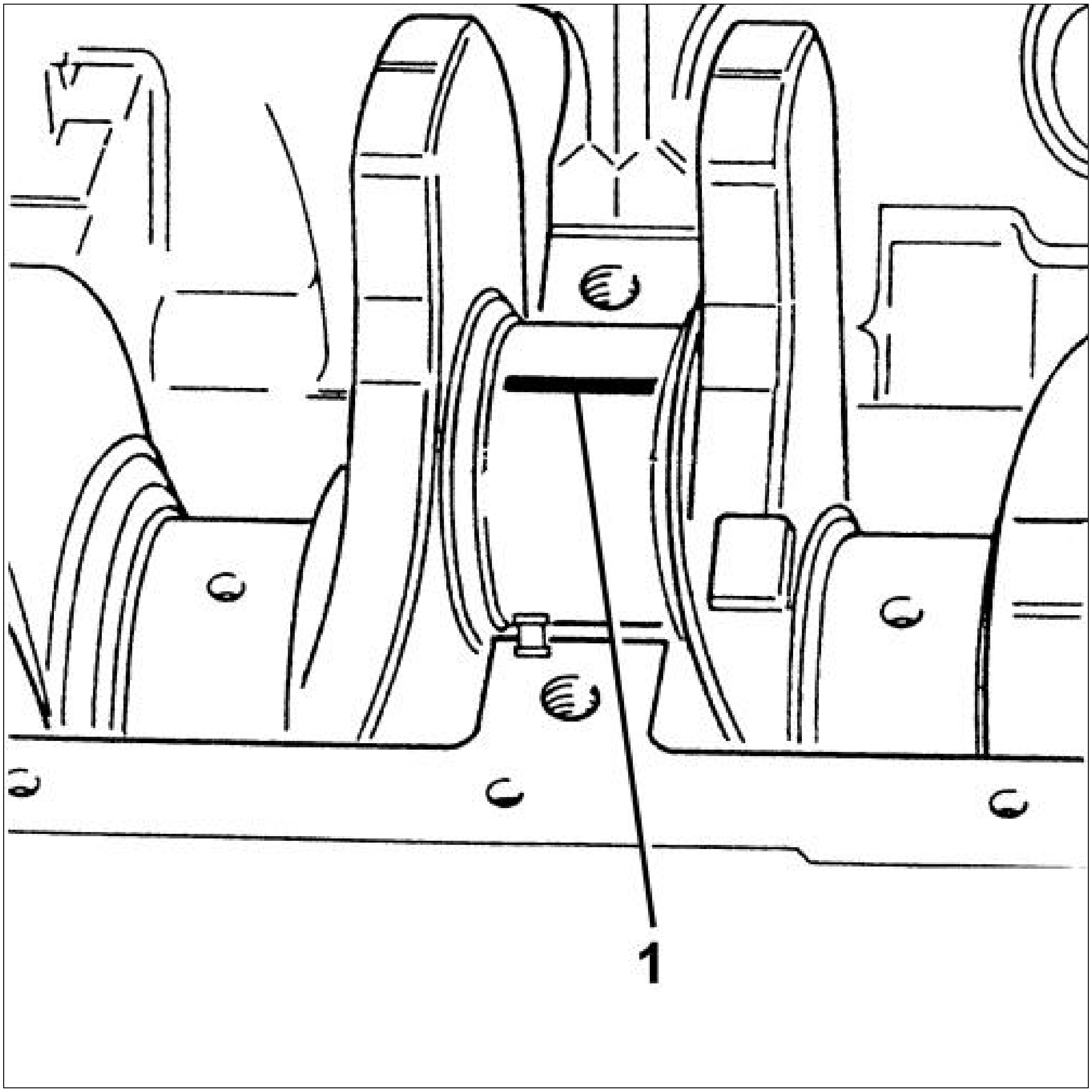
-	(mm)	in.
Thickness big end bearings plus	2.08 ÷ 2.18	0.0818 ÷ 0.0858

57. Place the upper and lower main half-bearings in their seats taking great care over cleanliness.

58. Position the tone wheel in its housing and securely tighten the **NEW** screws, pre-treated type.

59. Fit the crankshaft into its housing on the upper block.

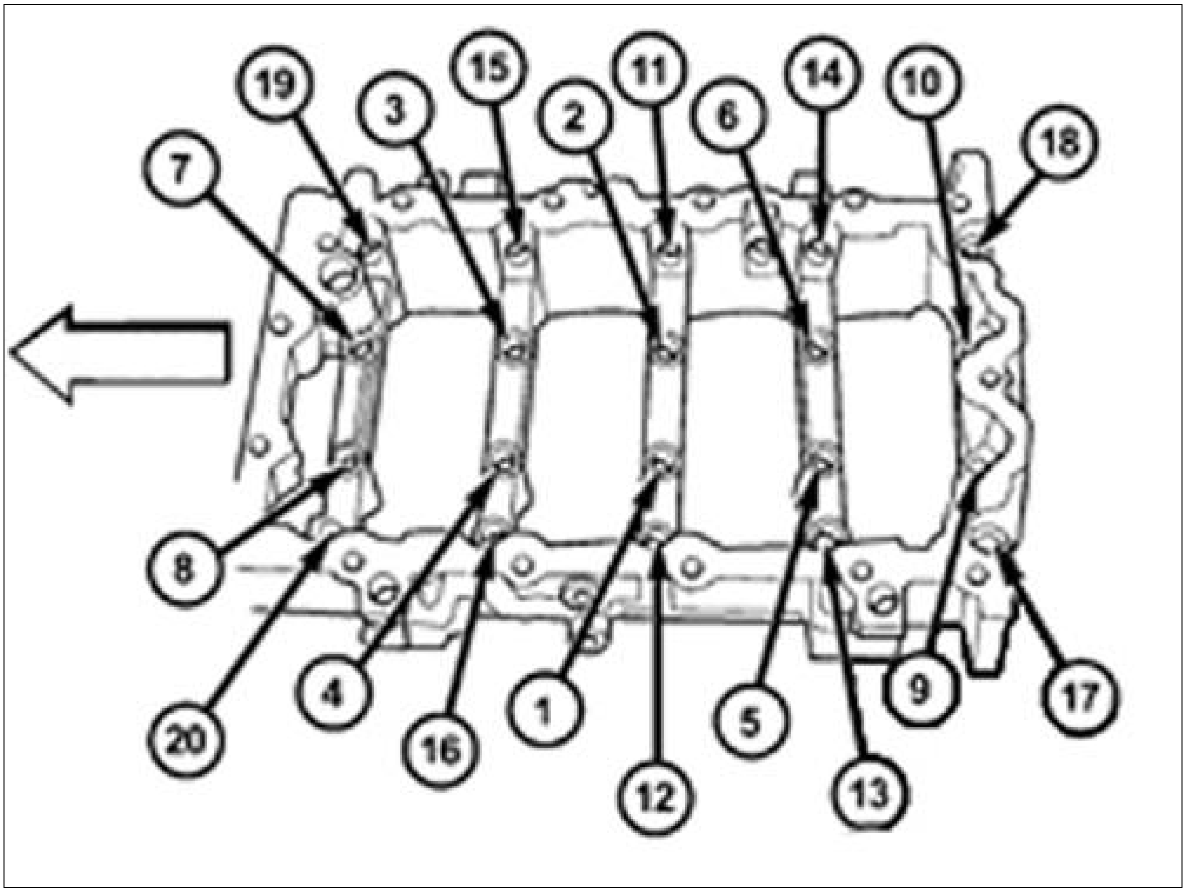
Fig 26: Using Plastigage To Measure Main Journal Clearance



Courtesy of CHRYSLER GROUP, LLC

60. Fit the calibrated wire (Plastigage) (1) for measuring the main journal clearance.
61. Provisionally fit the lower block to measure the main journal clearance and then remove it.

Fig 27: Lower Block Bolt Tightening Sequence



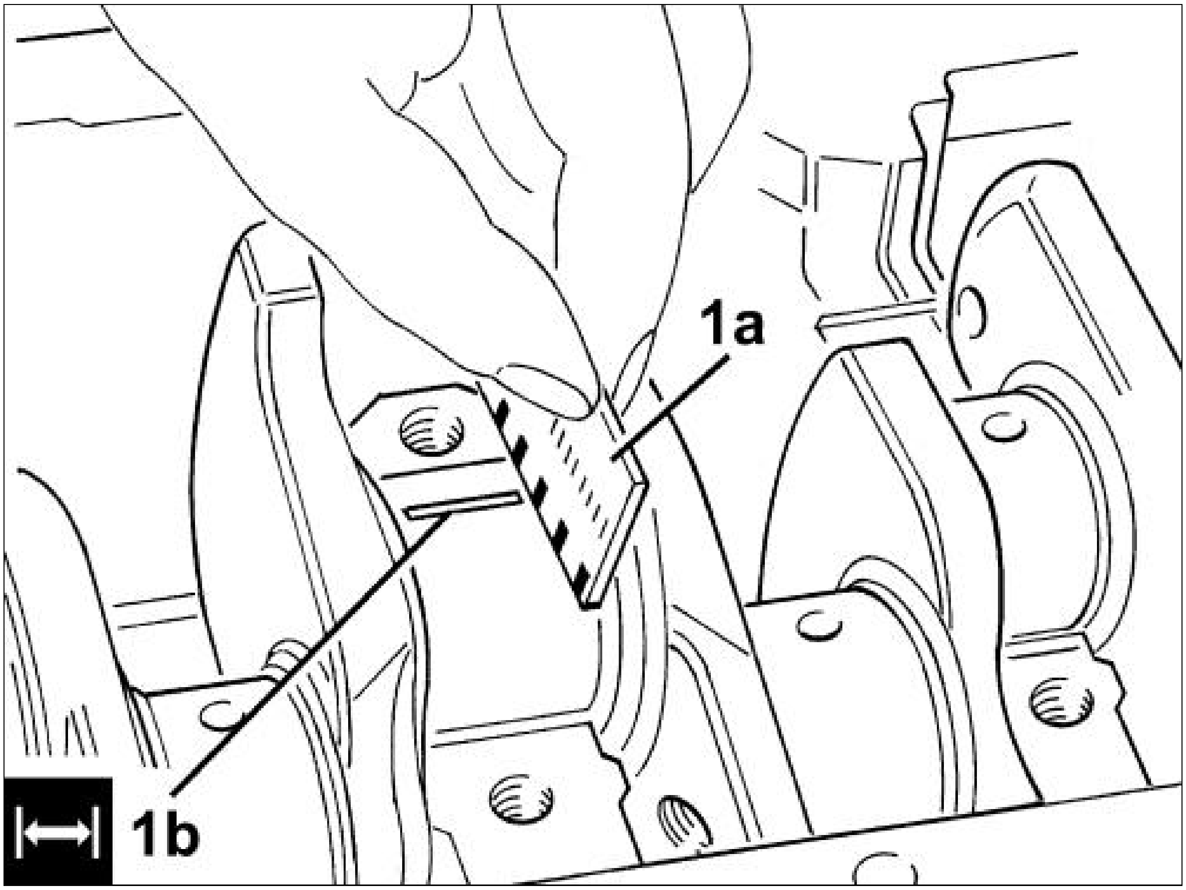
Courtesy of CHRYSLER GROUP, LLC

62. Using the tightening sequence shown in illustration, tighten the lower block fixing bolts to:

    1. M8 bolts 26 N.m (19 ft. lbs.).

    2. M10 bolts 61 N.m (45 ft. lbs.).

Fig 28: Measuring Journal Clearance



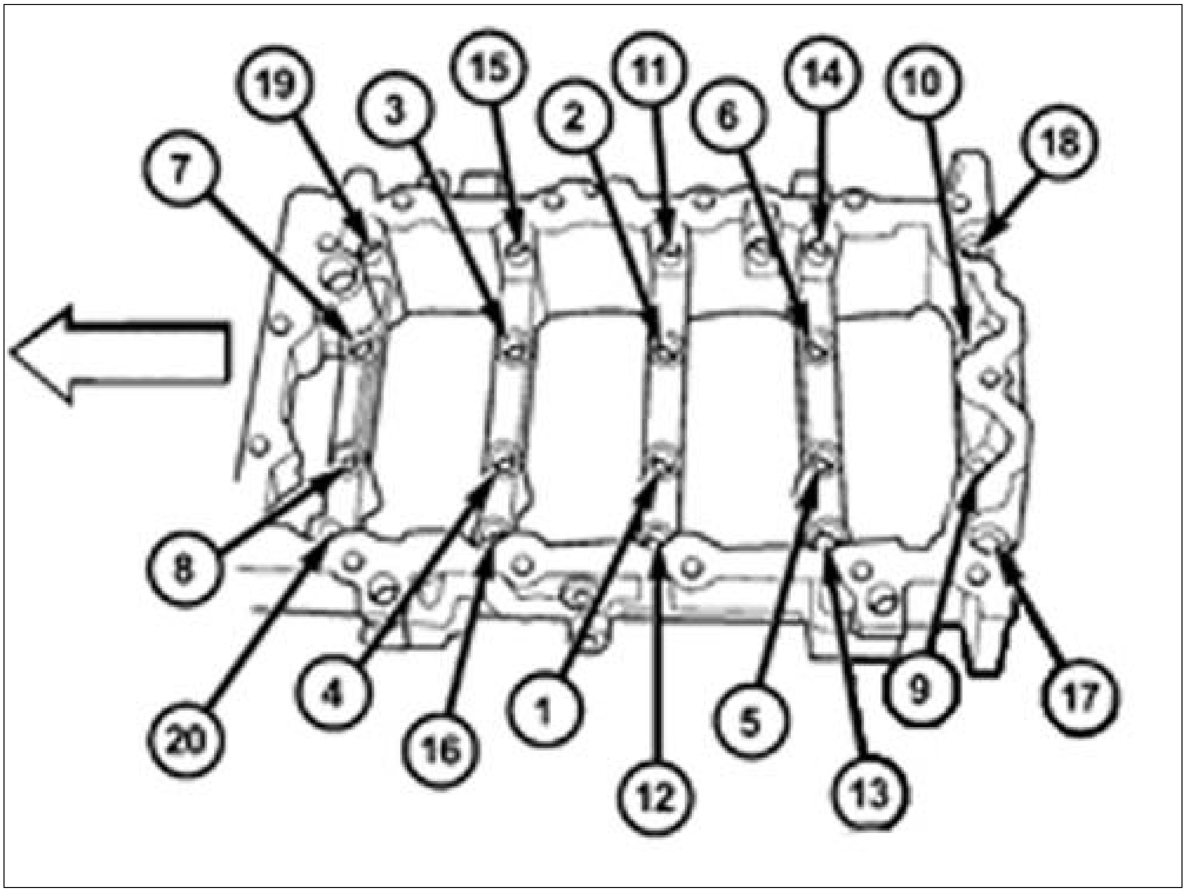
Courtesy of CHRYSLER GROUP, LLC

63. Remove the ladder frame complete with main half-bearings and, using a graduated measuring instrument (1a), measure the clearance shown in illustration by the calibrated wire (1b).
64. Check one journal at a time, without rotating the crankshaft.

    bearings - journals crankshaft (mm) 0.015 ÷ 0.034

65. If the figure measured is outside of the tolerance, replace the main half-bearings with ones of the correct size and category.
66. Apply a 1.5-2.0 mm thick continuous bead of sealant (LOCTITE 5205) to the lower block surface.

Fig 29: Lower Block Bolt Tightening Sequence



Courtesy of CHRYSLER GROUP, LLC

67. Using the tightening sequence shown in illustration, tighten the ladder frame bolts to:

    1. M8 bolts the proper specification. Refer to TORQUE SPECIFICATIONS .
    2. M10 bolts the proper specification. Refer to TORQUE SPECIFICATIONS .

68. Check the piston pin housing diameter on the small end.

-	(mm)	in.
Connecting rod	18.96 ÷ 18.98	0.7464 ÷ 0.7472
Pin	0.045 ÷ 0.020	0.00177 ÷ 0.0007
Based on the piston pin diameter	18.992 ÷ 19.012	0.7477 ÷ 0.7485

69. Check that the diameter of the piston pin housing in the piston is within the prescribed values.
70. If the piston pin housing diameter is not within prescribed values, replace the piston complete with its piston pin.
71. Check that the outer diameter of the piston pin is within the prescribed limits; if not, replace the worn piston pin.

-	(mm)	in.
Pin outer diameter	18.995 ÷ 19.000	0.7478 ÷ 0.7480
piston pin	0.008 ÷ 0.017	0.0003 ÷ 0.0006

72. Fit the piston rings in the cylinder bore and check that the opening between the ends is within the recommended values; if this is not the case, replace the circlips.

-	(mm)	in.
Ring 1 seal ring compression cylinders	0.2	0.007
Ring 2 seal ring compression cylinders	0.2	0.007
Light scraper ring piston (mm)	0.25	0.009

73. Check that the thickness of the sealing rings is within the prescribed limits.

-	(mm)	in.
Thickness 1 ^ seal ring compression cylinders	1.170 ÷ 1.230	0.046 ÷ 0.048
Thickness 2 ^ seal ring compression cylinders (mm)	1.172 ÷ 1.210	0.046 ÷ 0.047
Scraper piston ring thickness (mm)	2.340 ÷ 2.480	.0.092 ÷ 0.097

74. Check that the housing of the sealing rings on the pistons is within the prescribed limits.

-	(mm)	in.
Ring seats on the piston - 1st	1.220 ÷ 1.250	1.963 ÷ 2.011
Ring seats on the piston - 2nd	1.215 ÷ 1.235	1.955 ÷ 1.987
Ring seats on the piston - 3rd	2.521 ÷ 2.541	4.057 ÷ 4.089

75. Check that the outer diameter of the pistons corresponds to the prescribed figures; if not, replace the piston complete with piston rings and piston pin.

-	(mm)	in.
Outside diameter pistons	76.956 ÷ 76.974	123.849 ÷ 123.878
Increase outside diameter pistons	0.40	0.643

76. Measure perpendicular to the gudgeon pin axis, 10 mm from the lower edge of the skirt.

77. Check that the axial clearance between the pistons rings and the seats on the piston corresponds to the prescribed values.

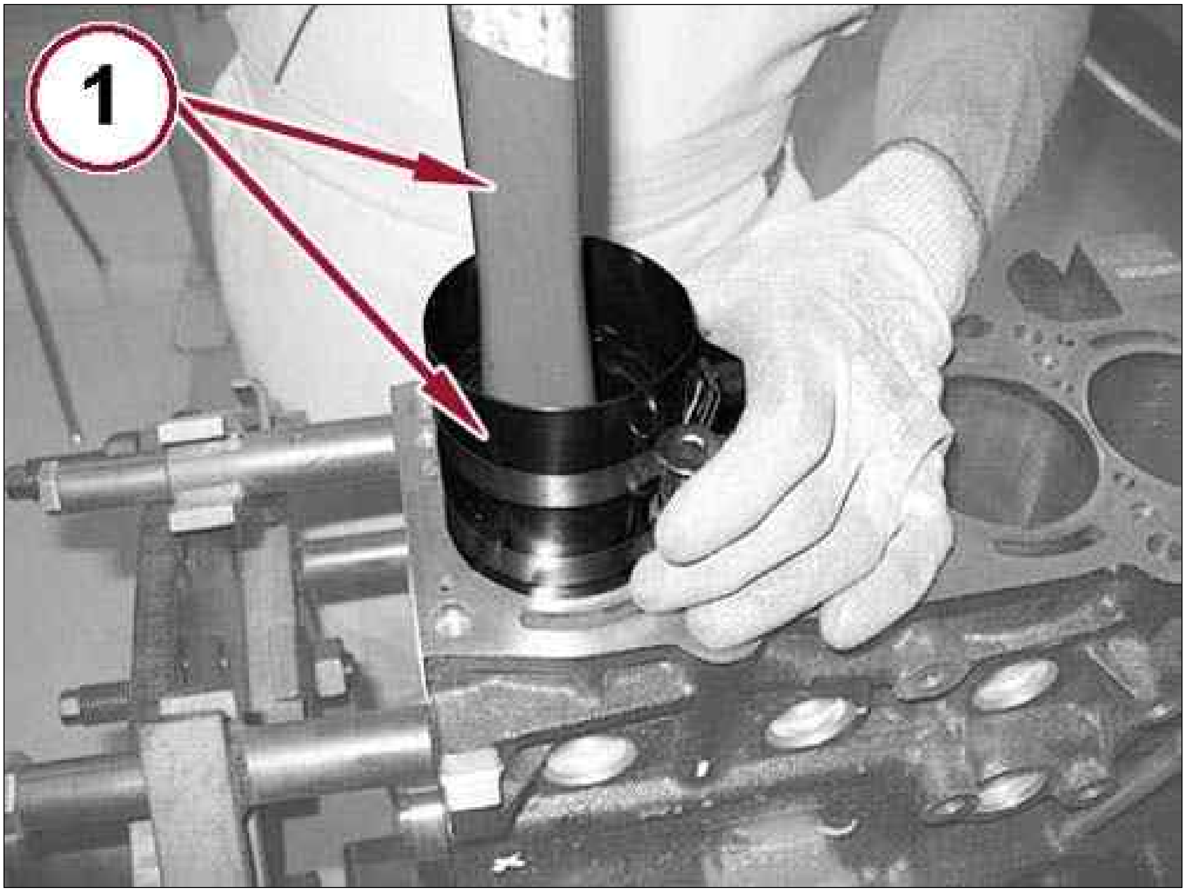
-	(mm)	in.
Axial play 1st ring compression cylinder	0.010 ÷ 0.080	0.0160 ÷ 0.1287
Axial clearance 2nd ring compression cylinder (mm)	0.025 ÷ 0.063	0.0402 ÷ 0.1013
Axial piston motor scraper ring	0.041 ÷ 0.201	0.0659 ÷ 0.3234

78. Fit the caps on the connecting rods and secure them by tightening the screws to the proper specification. Refer to TORQUE SPECIFICATIONS .
79. The connecting rods are preset fracture rods and are supplied already fractured by parts together with the cap screws. The connecting rod caps are not interchangeable because the fracture profile differs from part to part.
80. Check that the big end diameter (without fitting the half-bearings) is within the prescribed limits; if not, replace the connecting rods.

-	(mm)	in.
Big end inside diameter	46.991 ÷ 47.005	75.624 ÷ 75.647

81. Assemble the piston pin, connecting rod, and rings. Refer to ROD, PISTON AND CONNECTING, REMOVAL AND INSTALLATION .
82. Install the tool 1860815000 for crankshaft rotation.

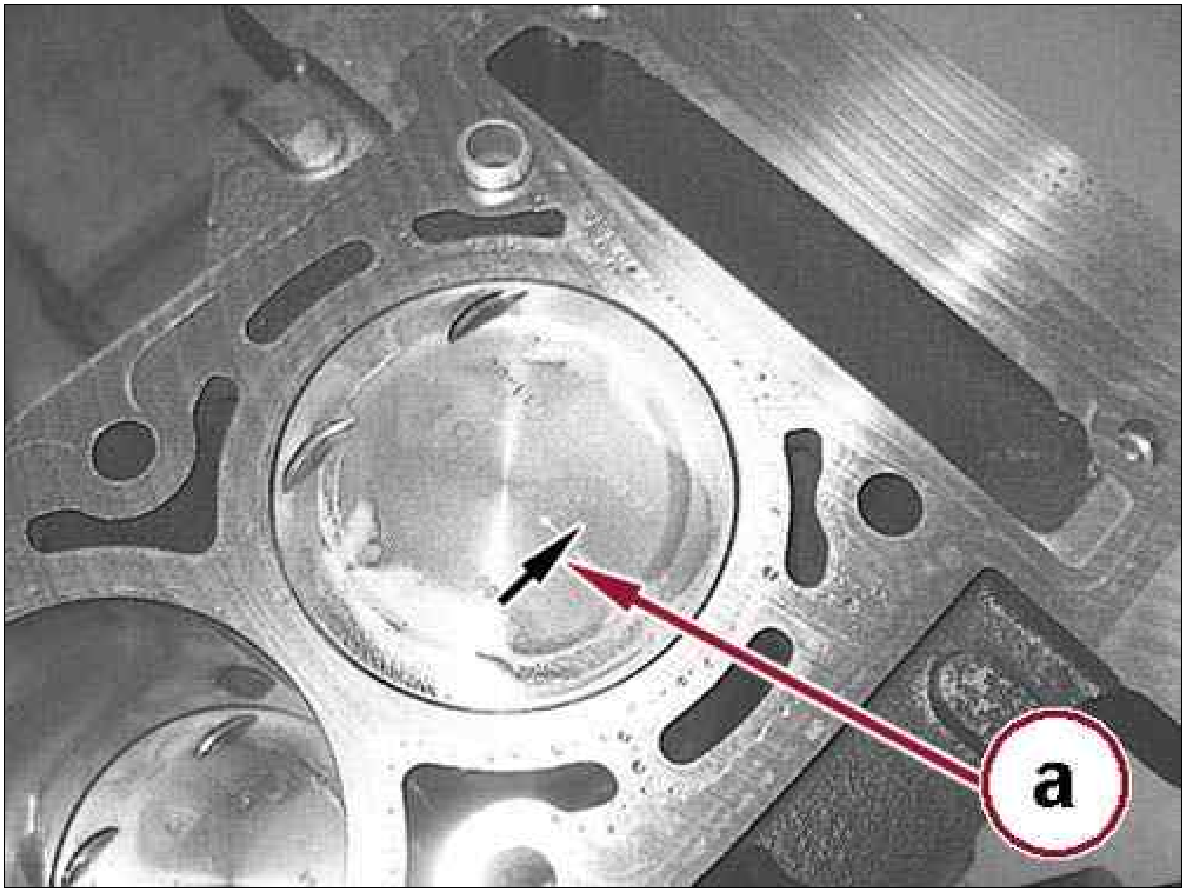
Fig 30: Compressing Sealing Rings To Install Piston Assemblies



Courtesy of CHRYSLER GROUP, LLC

83. Fit the connecting rod-piston assemblies with half-bearings using a suitable tool (1) to compress the sealing rings and then fit the piston into the cylinder liner.

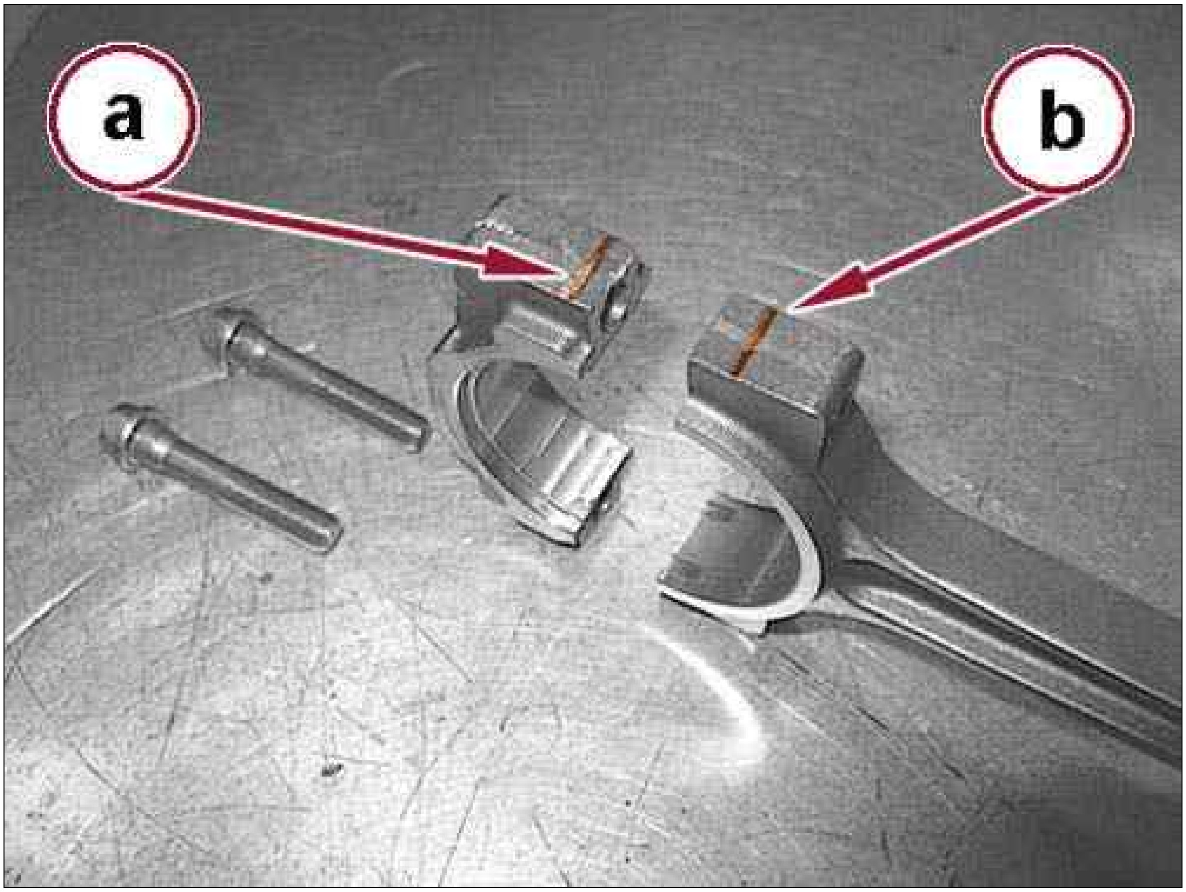
Fig 31: Installing Piston With Arrow On Piston Crown Facing Timing Side



Courtesy of CHRYSLER GROUP, LLC

84. The arrow (a) on the piston crown facing the timing side indicates the fitting direction.
85. Apply the calibrated wire (plastigage) for measuring the crankpin clearance.
86. Refit the caps complete with half-bearings on the connecting rods and secure them by tightening the screws to the proper specification. Refer to TORQUE SPECIFICATIONS .
87. The connecting rods are preset fracture rods and are supplied already fractured by Parts together with the cap screws. The connecting rod caps are not interchangeable because the fracture profile differs from part to part.

Fig 32: Locating Notches On Connecting Rod Cap & Connecting Rod



Courtesy of CHRYSLER GROUP, LLC

88. A notch (a) is present on the connecting rod caps, which should be aligned with the notch (b) on the connecting rod.

    These reference notches should be facing the intake side.

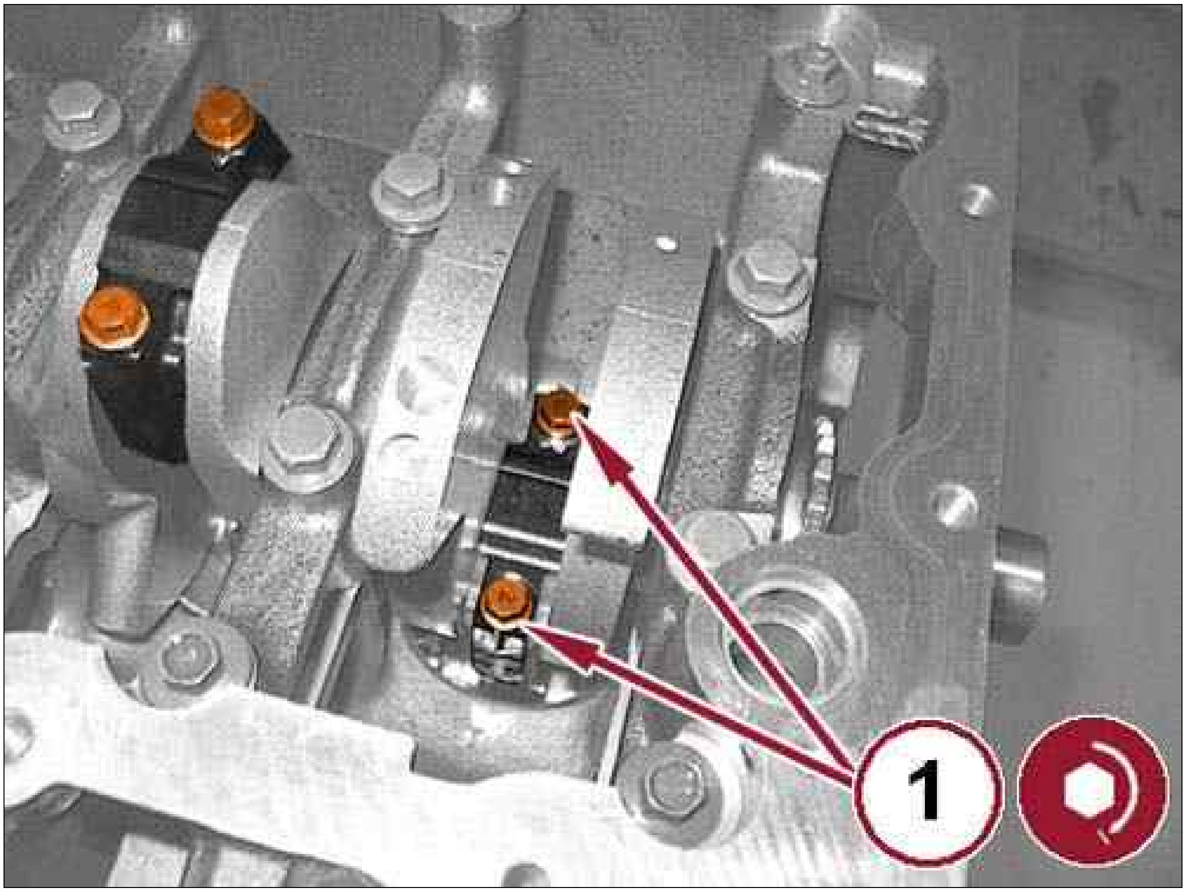
89. Remove the connecting rod caps and check the crankshaft backlash. Use an appropriate gauge to measure the width of the plastigage.

90. Check one crankshaft at a time, without rotating the crankshaft.

-	(mm)	in.
rod bearings - crankpins crankshaft	0.021 ÷ 0.037	0.0337 ÷ 0.0595

91. If the measured value is outside of the prescribed limits, replace the connecting rod half-bearings with appropriately sized half-bearings.

Fig 33: Connecting Rod Caps Bolts



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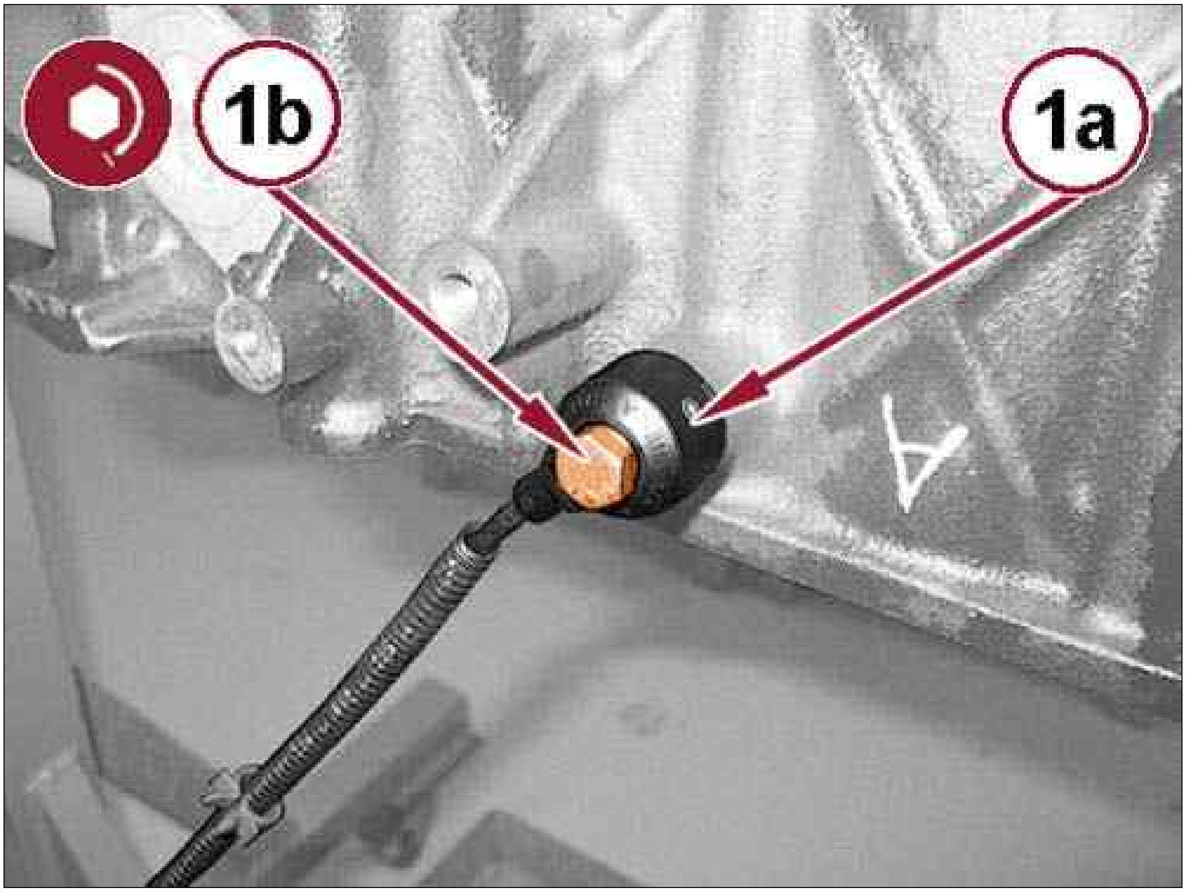
92. Proceed with final fitting of the connecting rod caps complete with half-bearings, tightening the fixing bolts (1) to the proper specification. Refer to TORQUE SPECIFICATIONS .

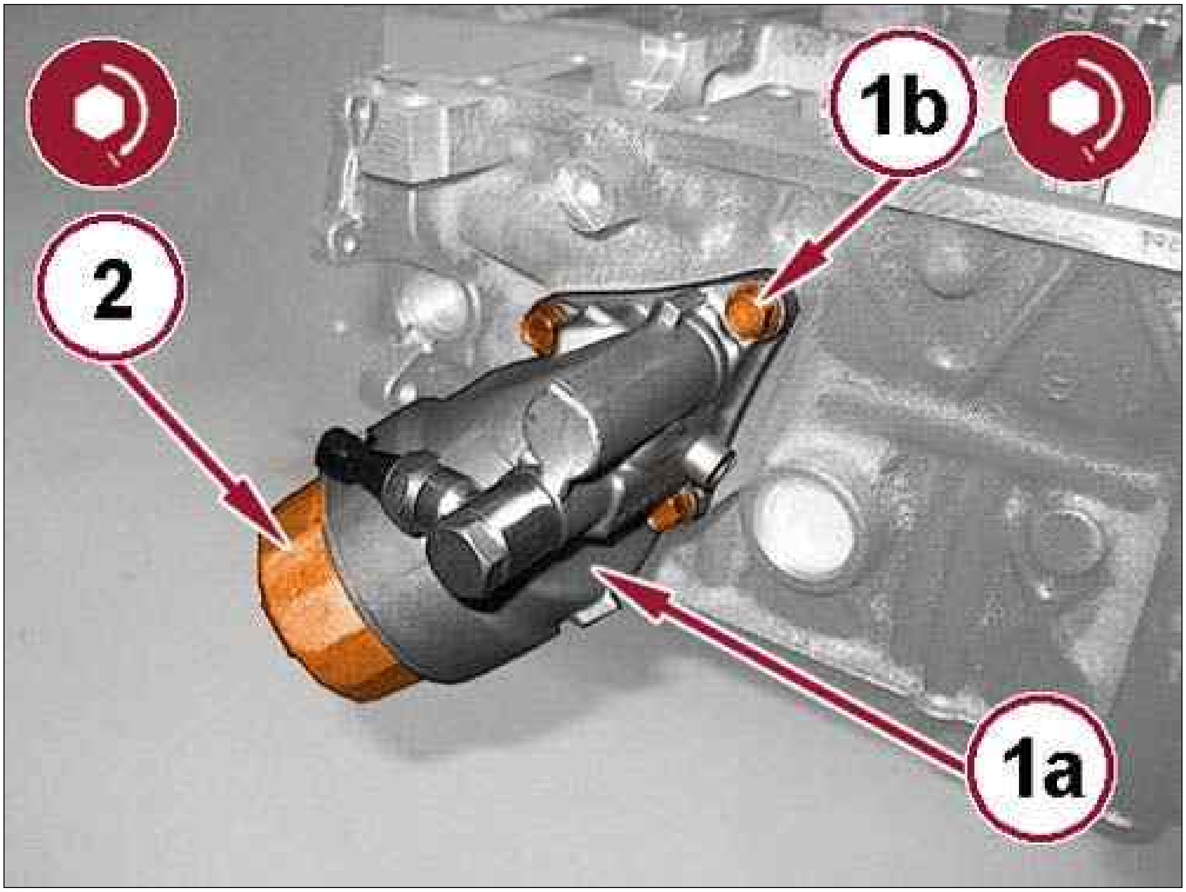
Fig 34: Knock Sensor & Bolt



Courtesy of CHRYSLER GROUP, LLC

93. Install the knock sensor (1a) in its housing and tighten the bolt (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

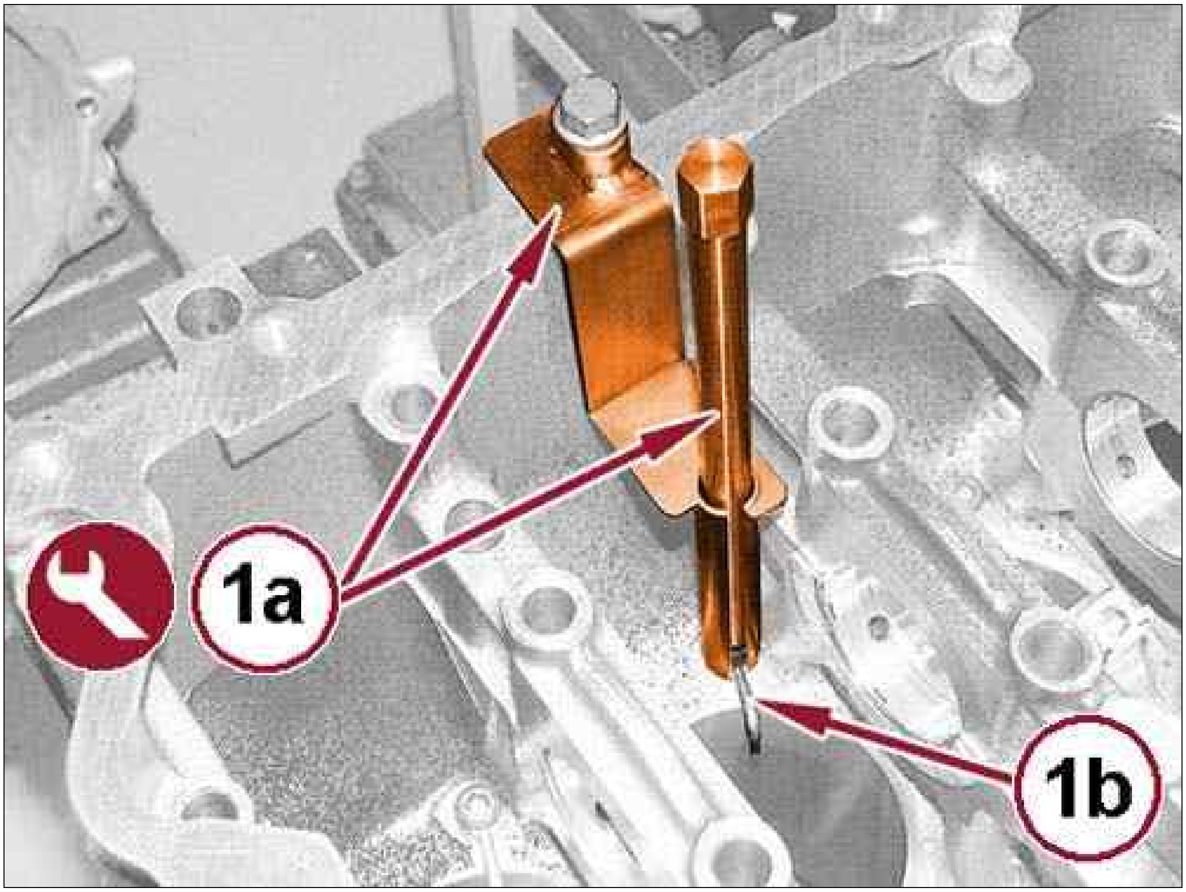
Fig 35: Oil Filter Mounting & Bolts



Courtesy of CHRYSLER GROUP, LLC

94. Place the engine oil filter mounting (1a) complete with new gasket back in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
95. Install a **NEW** filter element and tighten the cover (2) complete with a **NEW** gasket to the proper specification. Refer to TORQUE SPECIFICATIONS .

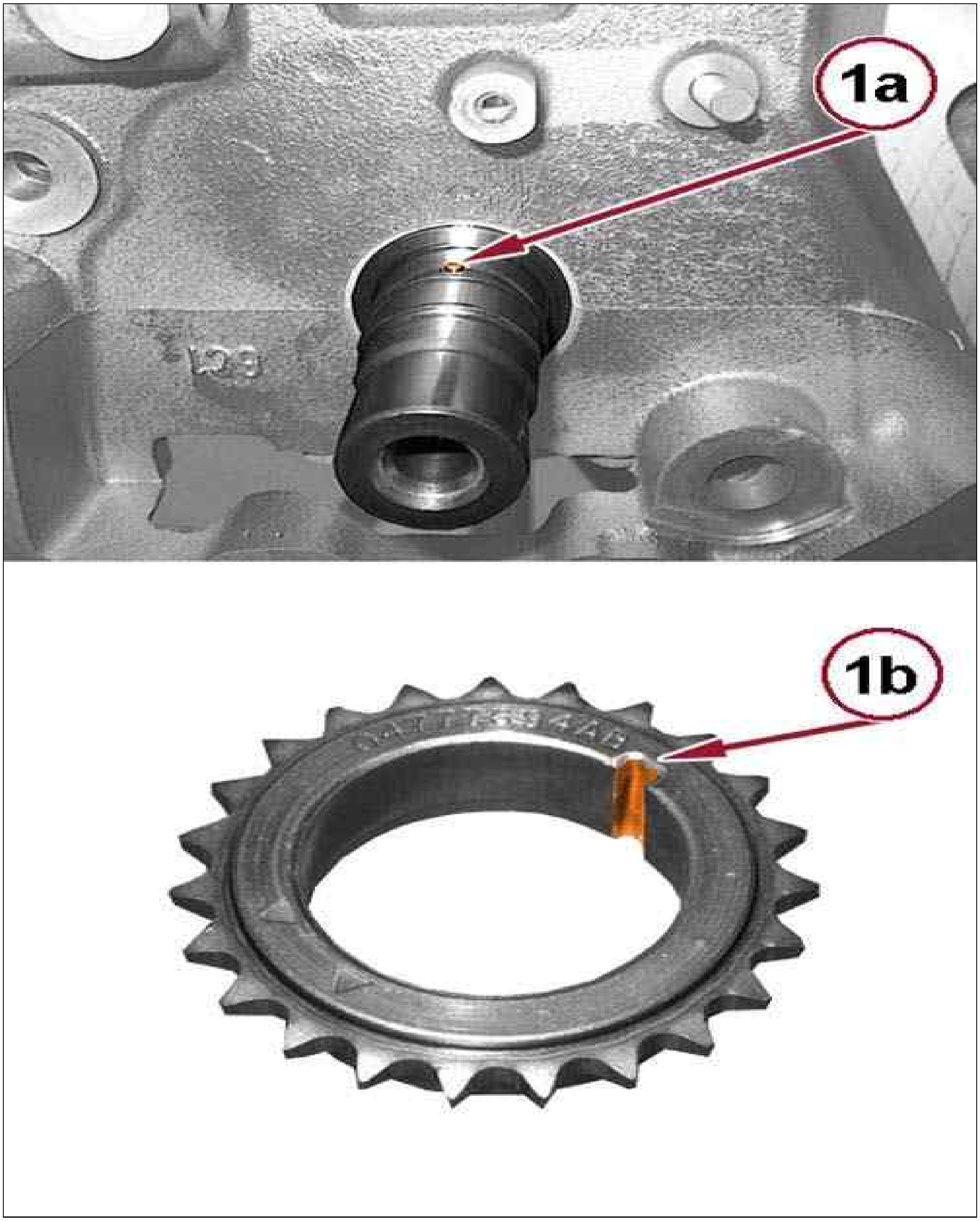
Fig 36: Installing Engine Oil Jets Back In Their Housings Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

96. Using the tool 2000040951 (1a) to place the engine oil jets (1b) back in their housings, and tighten the screws to the proper specification. Refer to TORQUE SPECIFICATIONS .

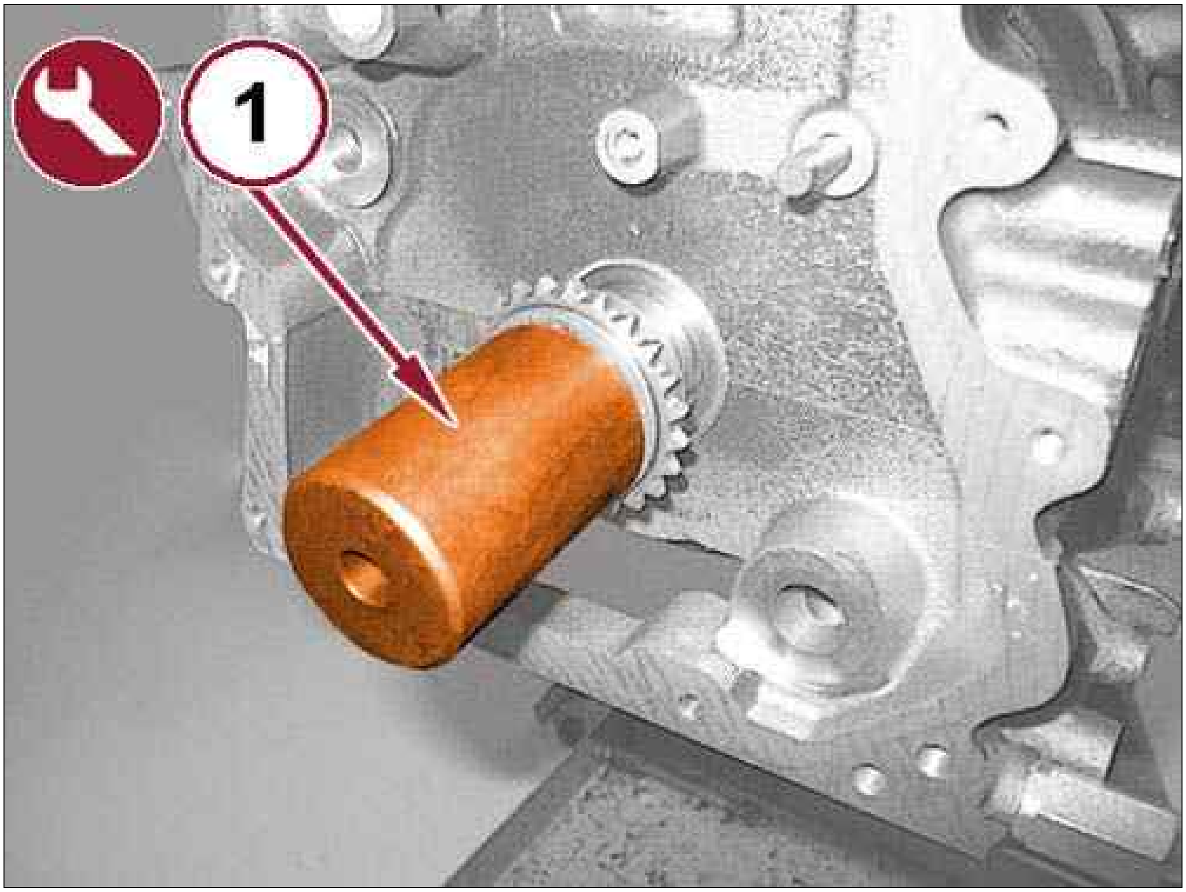
Fig 37: Installing Timing Chain Drive Gear Ensuring Pin Is Aligned With Groove



Courtesy of CHRYSLER GROUP, LLC

97. Place the timing chain drive gear back in its housing, making sure the pin (1a) is aligned with the groove (1b).

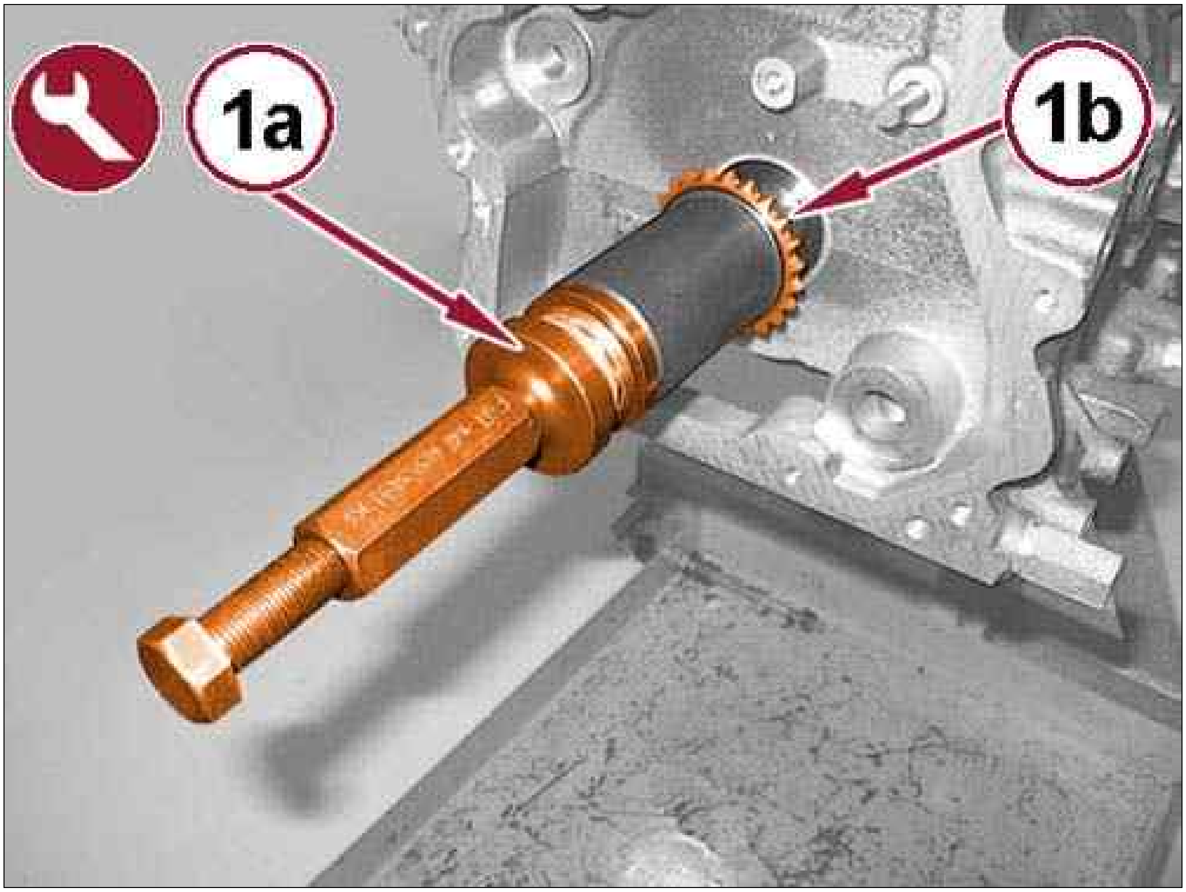
Fig 38: Fitting Retaining Cylinder Of Special Tool



Courtesy of CHRYSLER GROUP, LLC

98. Install the tool 2000040941 as shown in illustration.

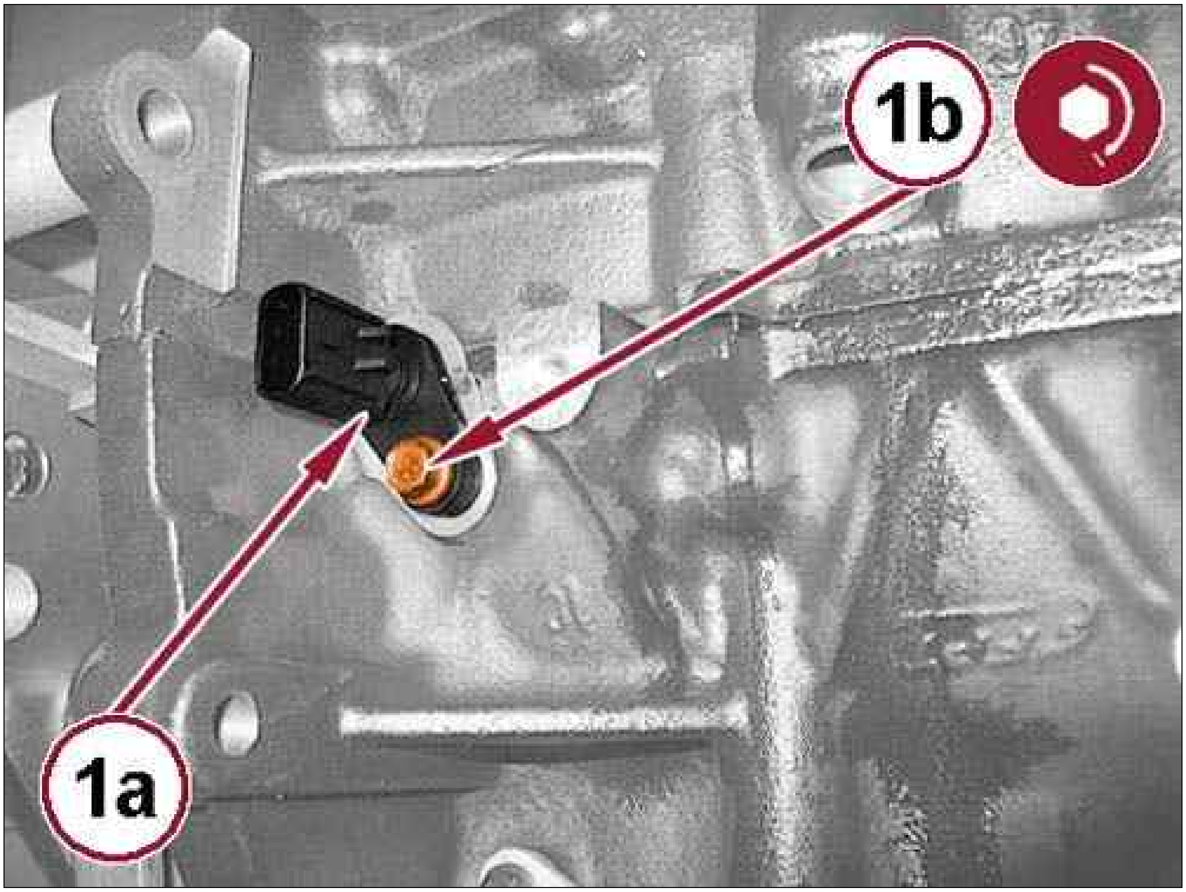
Fig 39: Using Special Tool To Complete Fitting Of Timing Chain Drive Gear



Courtesy of CHRYSLER GROUP, LLC

99. Use the tool 2000040941 (1a) to complete fitting of the timing chain drive gear (1b).

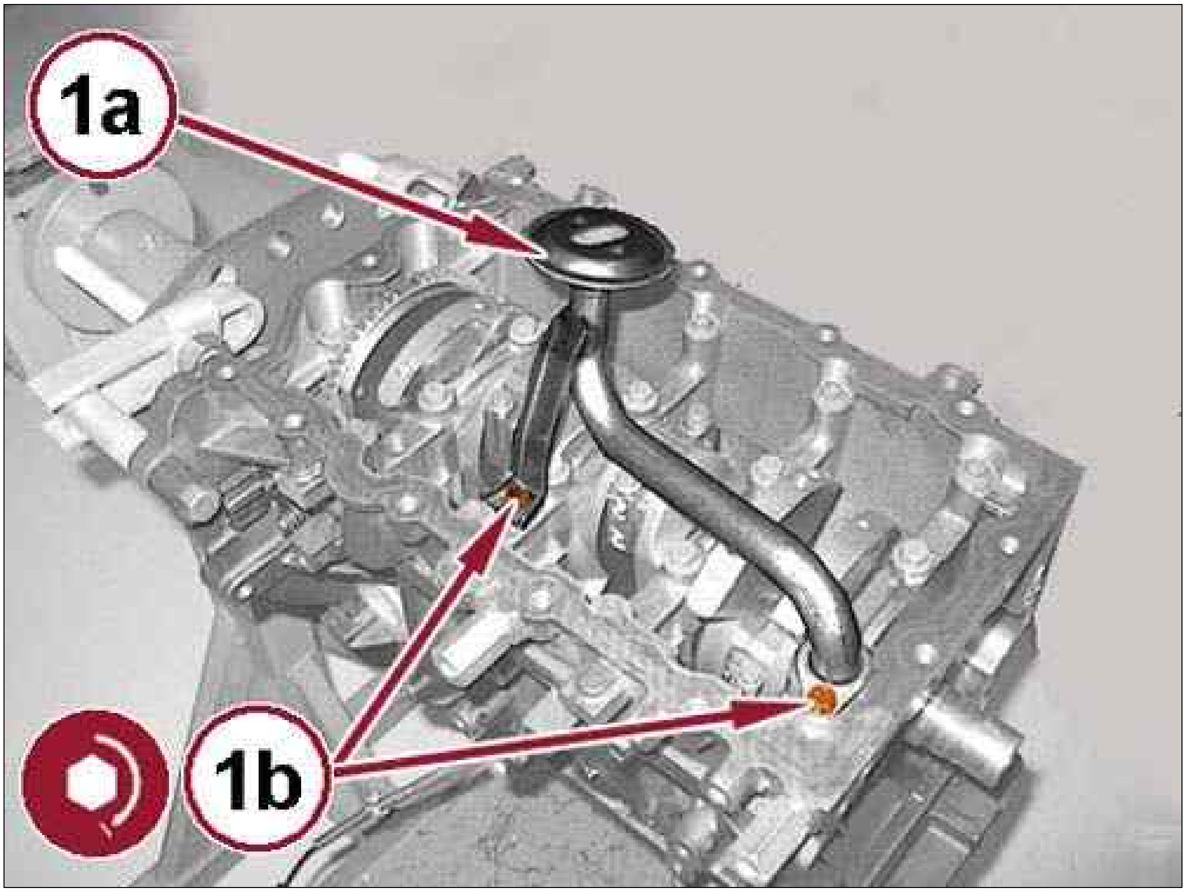
Fig 40: RPM Sensor & Bolt



Courtesy of CHRYSLER GROUP, LLC

100. Install the RPM sensor (1a) back in its housing complete with **NEW** O-ring and tighten the screw (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
101. Place the intermediate shaft mounting in its housing and securely tighten the bolts.

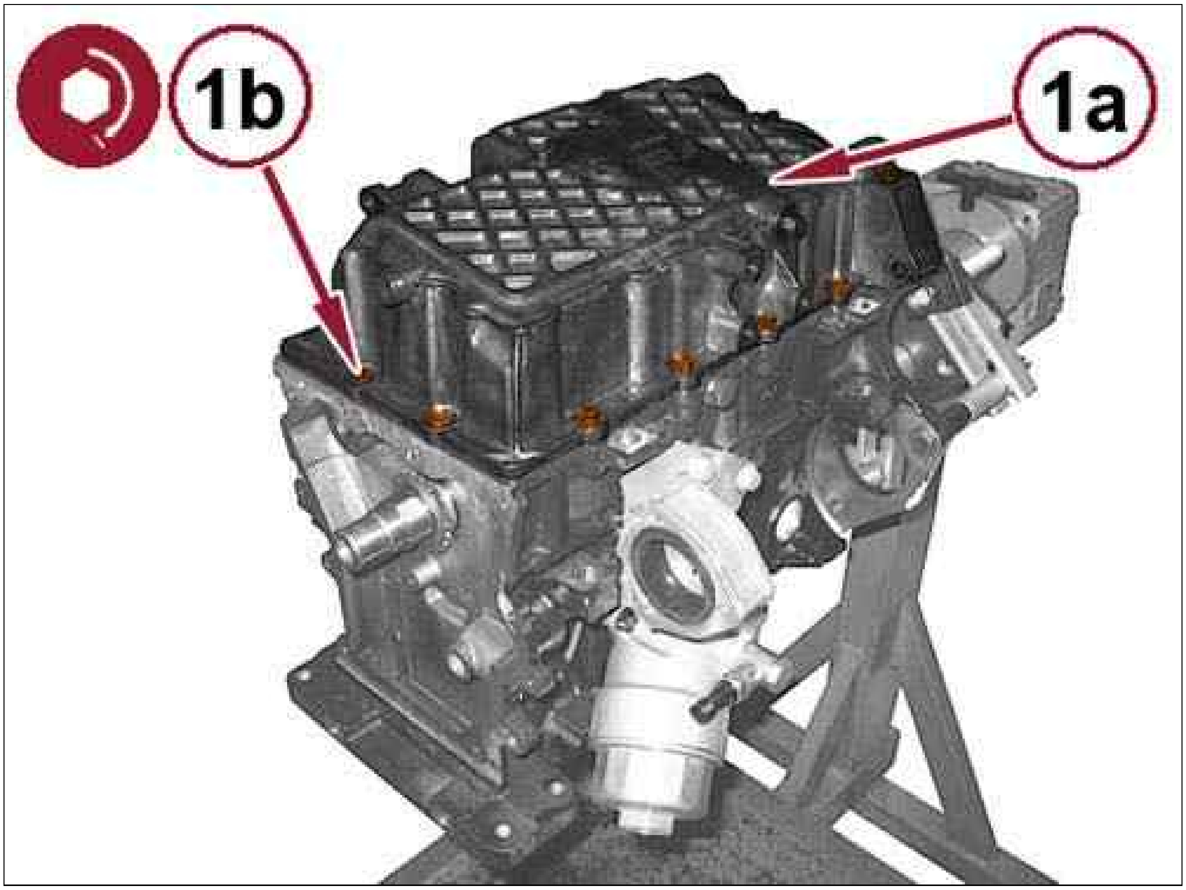
Fig 41: Engine Oil Pick-Up Tube With O-Ring & Screws



Courtesy of CHRYSLER GROUP, LLC

102. Using a **NEW** O-ring seal, install the oil pick-up tube (1a). Tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

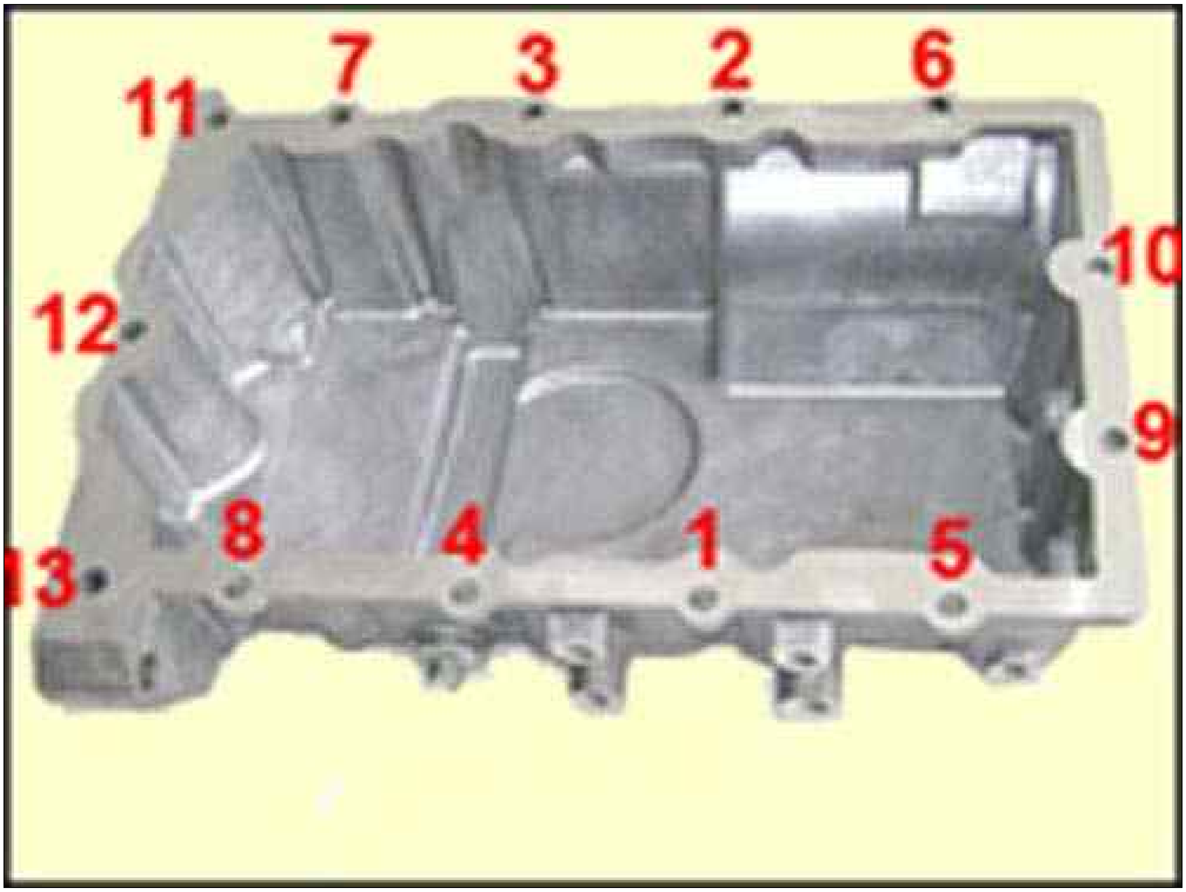
Fig 42: Engine Oil Sump & Bolts



Courtesy of CHRYSLER GROUP, LLC

103. Using a **NEW** gasket, install the engine oil pan and tighten the bolts (1b) finger tight.

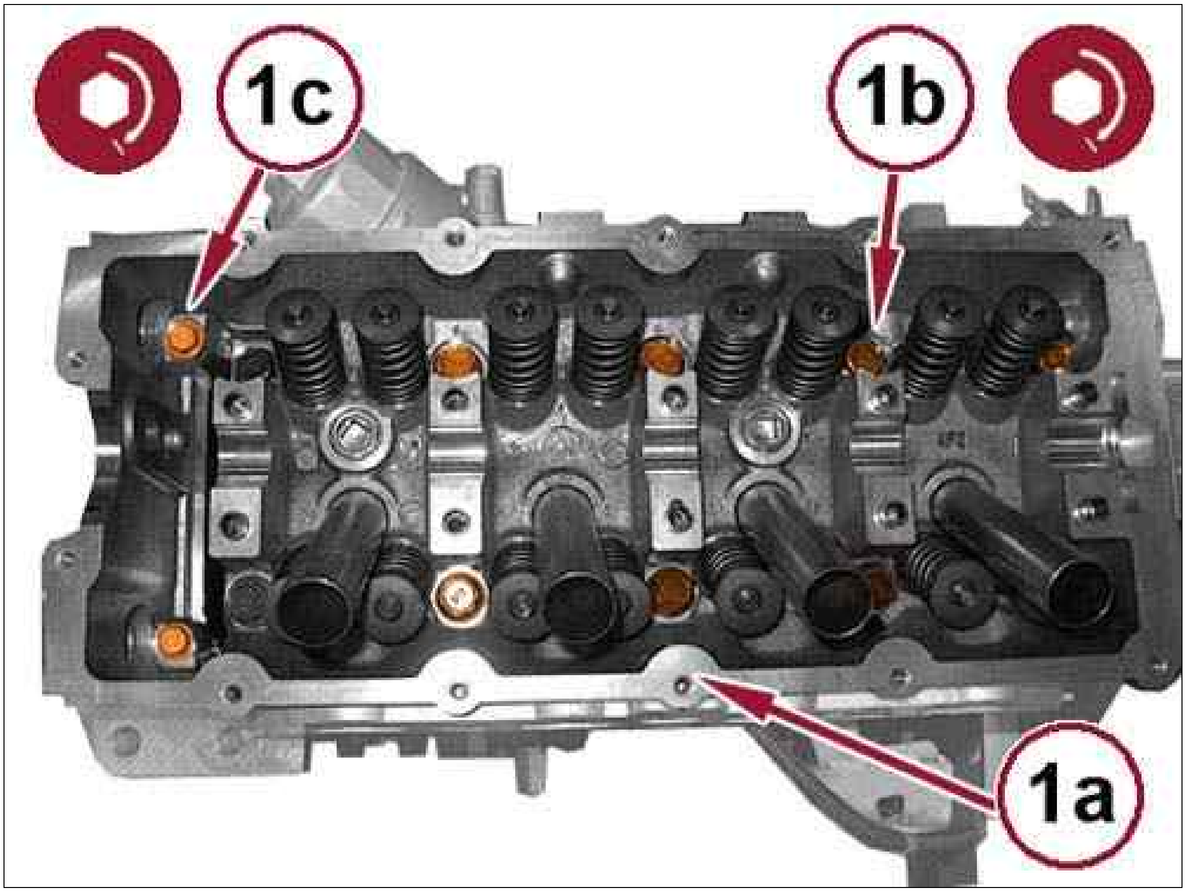
Fig 43: Oil Pan Bolt Tightening Sequence



Courtesy of CHRYSLER GROUP, LLC

104. Using the tighten sequence shown in illustration, tighten the oil pan bolts to the to the proper specification. Refer to TORQUE SPECIFICATIONS .
105. Using a **NEW** O-ring seal, Install the dipstick tube and securely tighten the bolt.
106. Install a **NEW** cylinder head gasket in position engaging the locating bushes on the engine block.

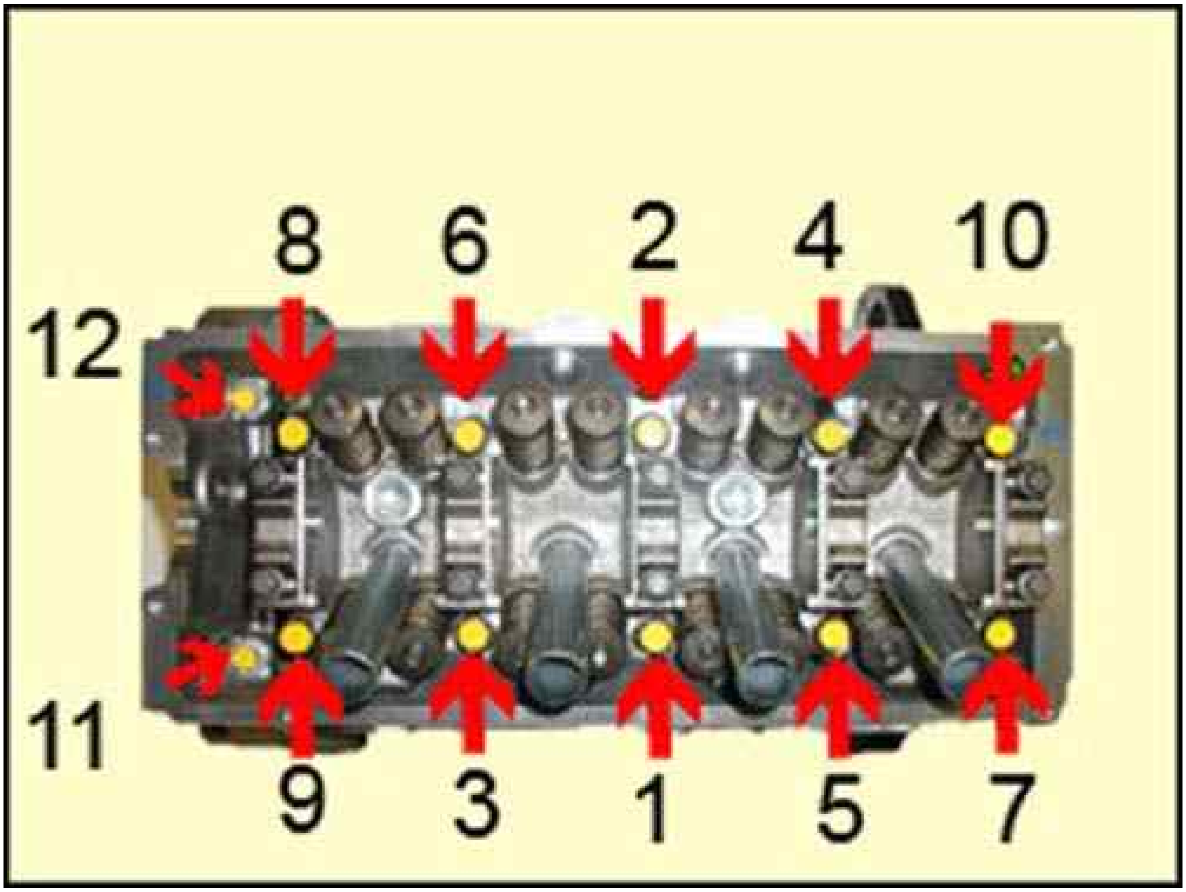
Fig 44: Cylinder Head & Bolts



Courtesy of CHRYSLER GROUP, LLC

107. Install the cylinder head (1a) back in its housing, engaging the locating bushes, then tighten the **NEW** bolts (1b) and (1c) finger tight.

Fig 45: Cylinder Head Bolt Tightening Sequence

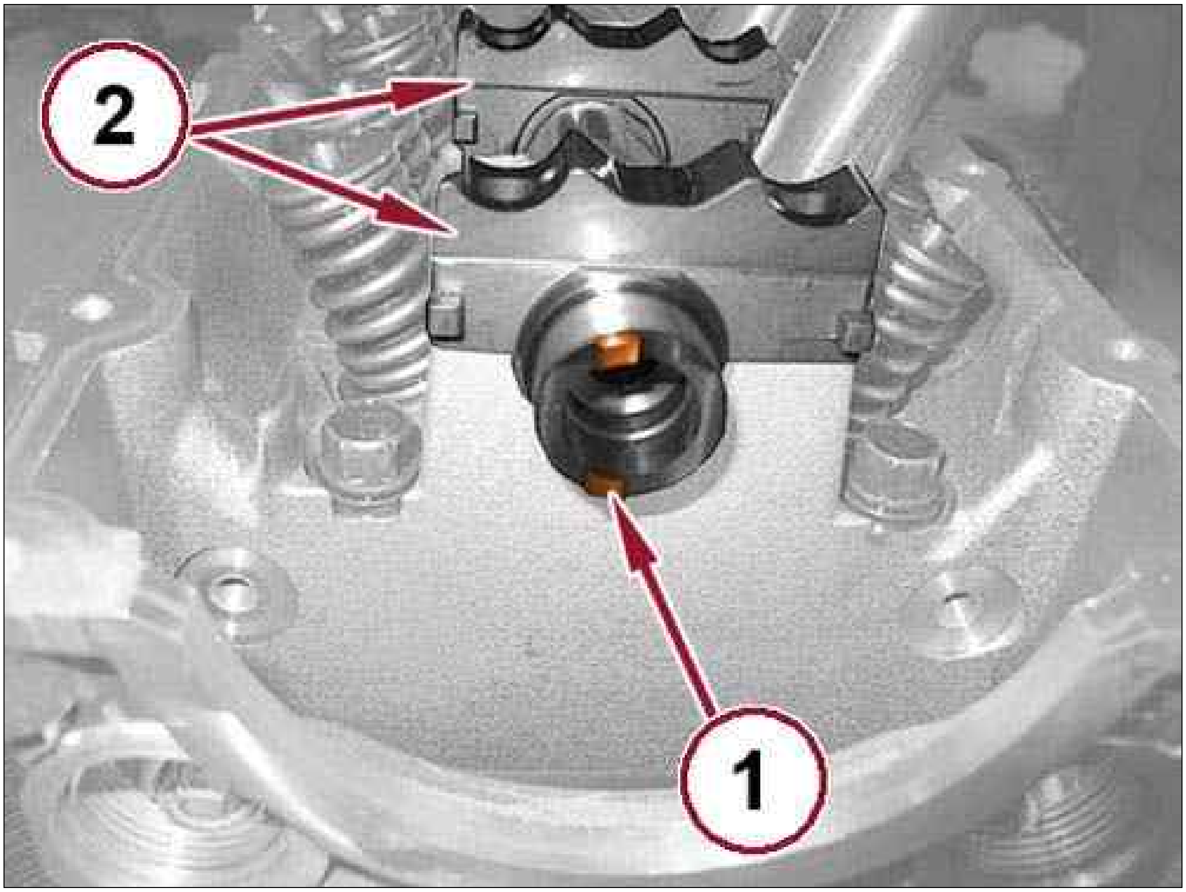


Courtesy of CHRYSLER GROUP, LLC

108. Using the tightening sequence shown in illustration, tighten the bolts:

    1. Tighten bolts 1 - 10 to 20 N.m (15 ft. lbs.)
    2. Tighten bolts 1 - 10 to 40 N.m (30 ft. lbs.)
    3. Tighten bolts 11 - 12 to 15 N.m (11 ft. lbs.)
    4. Tighten bolts 1 - 10 an additional 90° turn
    5. Tighten bolts 1 - 10 an additional 90° turn
    6. Tighten bolts 11 - 12 to 30 N.m (22 ft. lbs.).

Fig 46: Placing Camshaft Caps & Camshaft In Housing And Positioning Camshaft So That 2 Pins Of Timing Side Stem Are Vertical And Face Exhaust Side

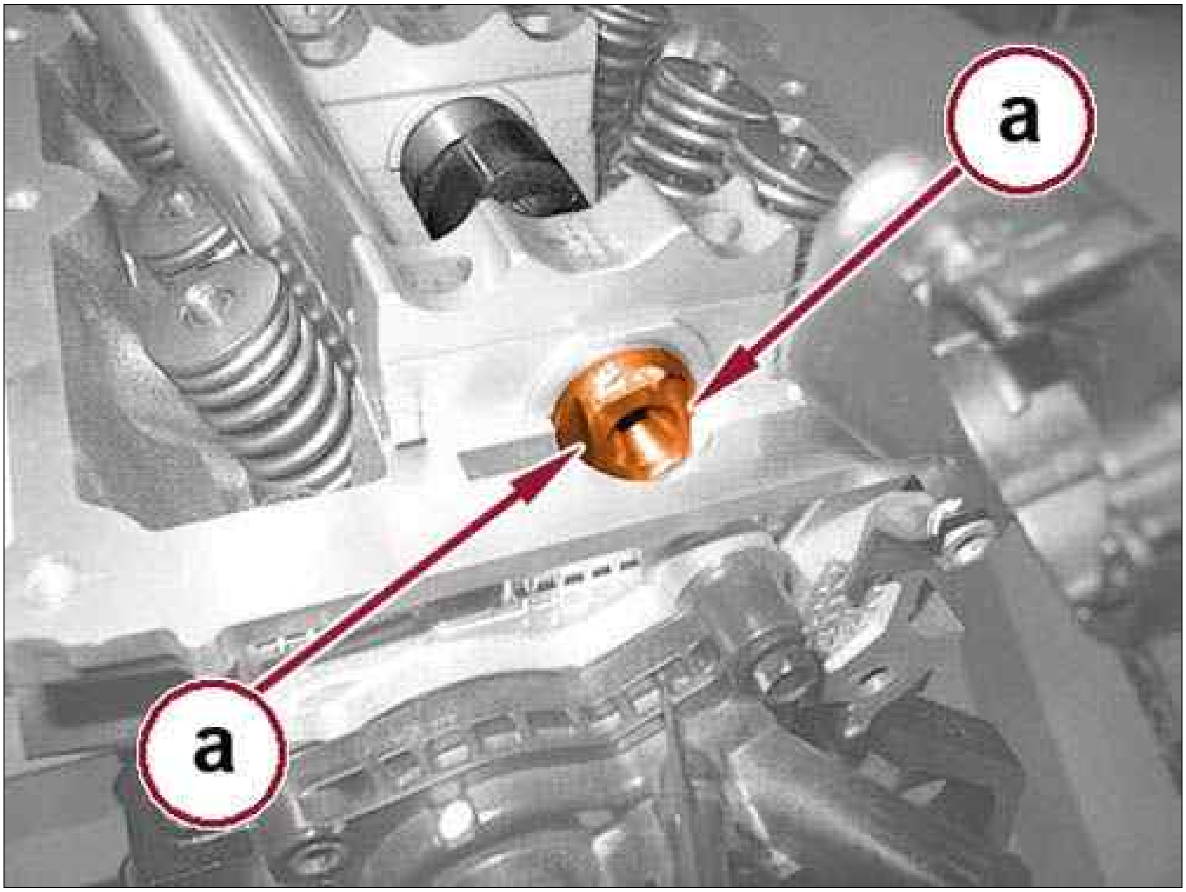


Courtesy of CHRYSLER GROUP, LLC

109. Place the camshaft in its housing and position it so that the two pins of the timing side stem are vertical and face the exhaust side, as shown in illustration.
110. Place the camshaft caps in their housings engaging the locating bushings and complying with the numbers printed on the top, from 1 to 5. The assembly direction goes from number 1, timing side, to number 5, flywheel side.

> *NOTE:*
>
> *Each camshaft cap has two teeth (1) that must be facing towards the timing drive chain side, so that the lubrication hole is facing towards the exhaust side.*

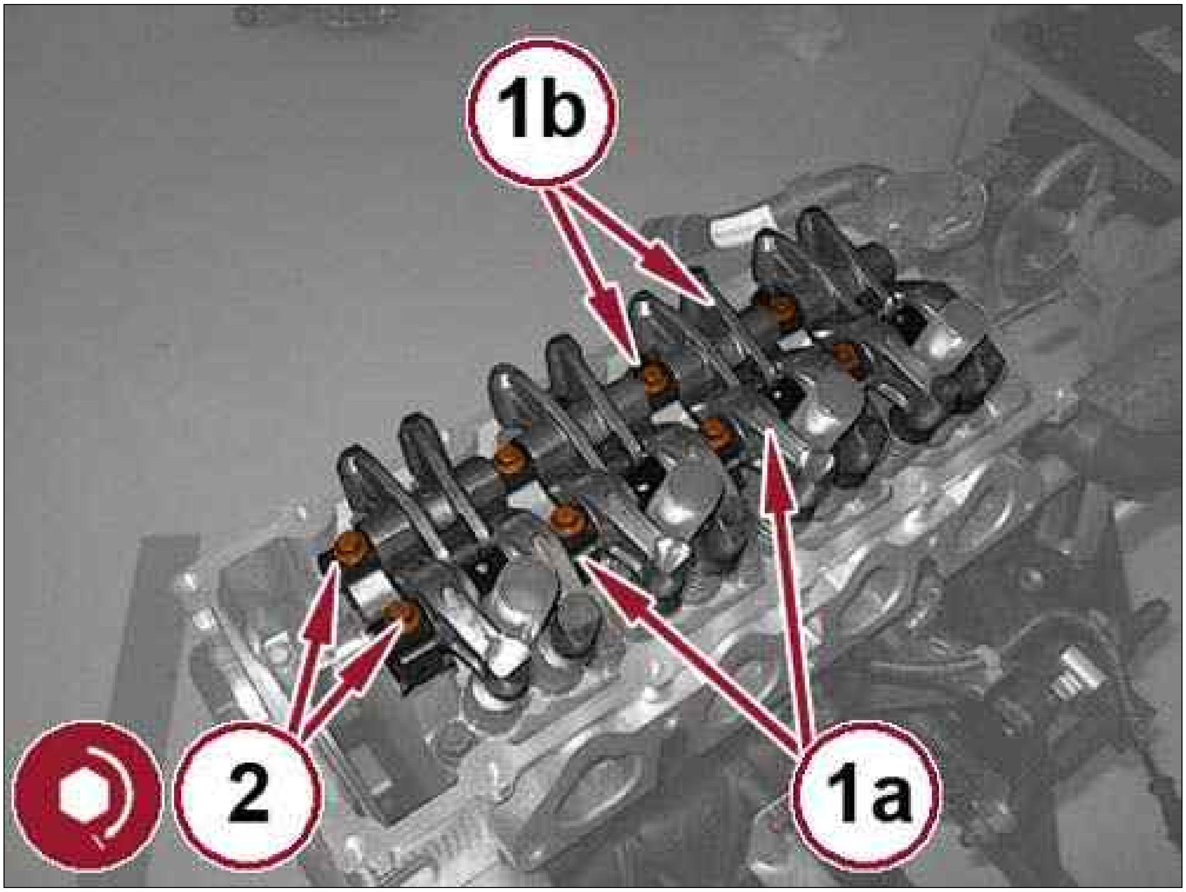
Fig 47: Positioning Two Bevels Of Flywheel Side Stem Of Camshaft



Courtesy of CHRYSLER GROUP, LLC

111. Position the camshaft as described, then make sure that the two bevels (a) of the flywheel side stem are in the position shown in figure, for an easier fitting of a spanner to use as counter-torque in the following tightening of the variable valve timing system.

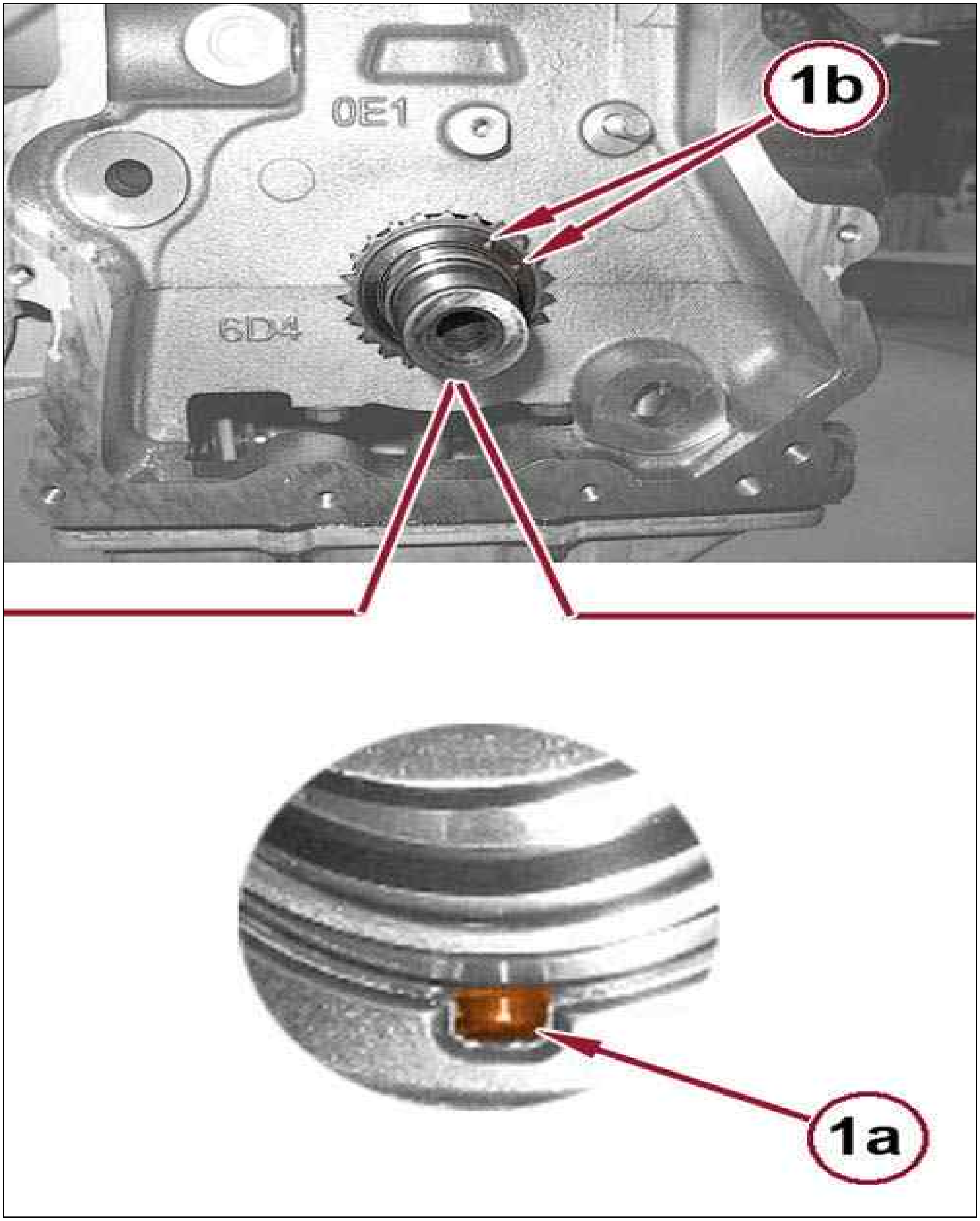
Fig 48: Intake & Exhaust Rocker Arms & Bolts



Courtesy of CHRYSLER GROUP, LLC

112. Install the rocker arms in their housings on the intake side (1a), exhaust side (1b) and the bolts (2).
113. Check that matching of each hydraulic tappet with the relevant valve is correct.
114. Tighten the intake and exhaust rocker arm shaft bolts (2) to the proper specification. Refer to TORQUE SPECIFICATIONS .
115. Install the timing drive chain fixed guide in its housing.
116. Install the timing drive chain moving guide in its housing.

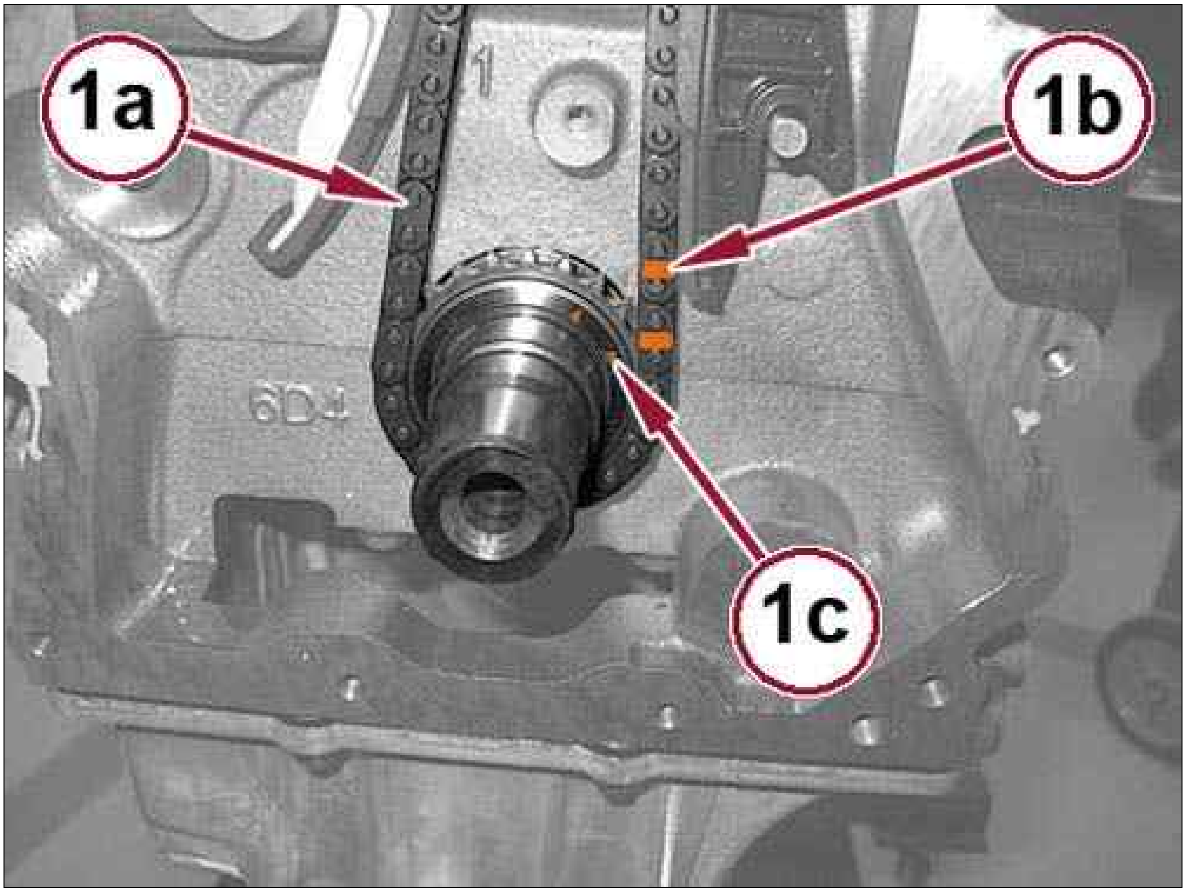
Fig 49: Rotating Crankshaft To Position Pin At Bottom To Ensure Triangles On Timing Chain Control Gear Are In Correct Position



Courtesy of CHRYSLER GROUP, LLC

117. Rotate the crankshaft to position the pin (1a) at the bottom, so that the two triangles (1b) on the timing chain control gear are in the position shown in the figure.

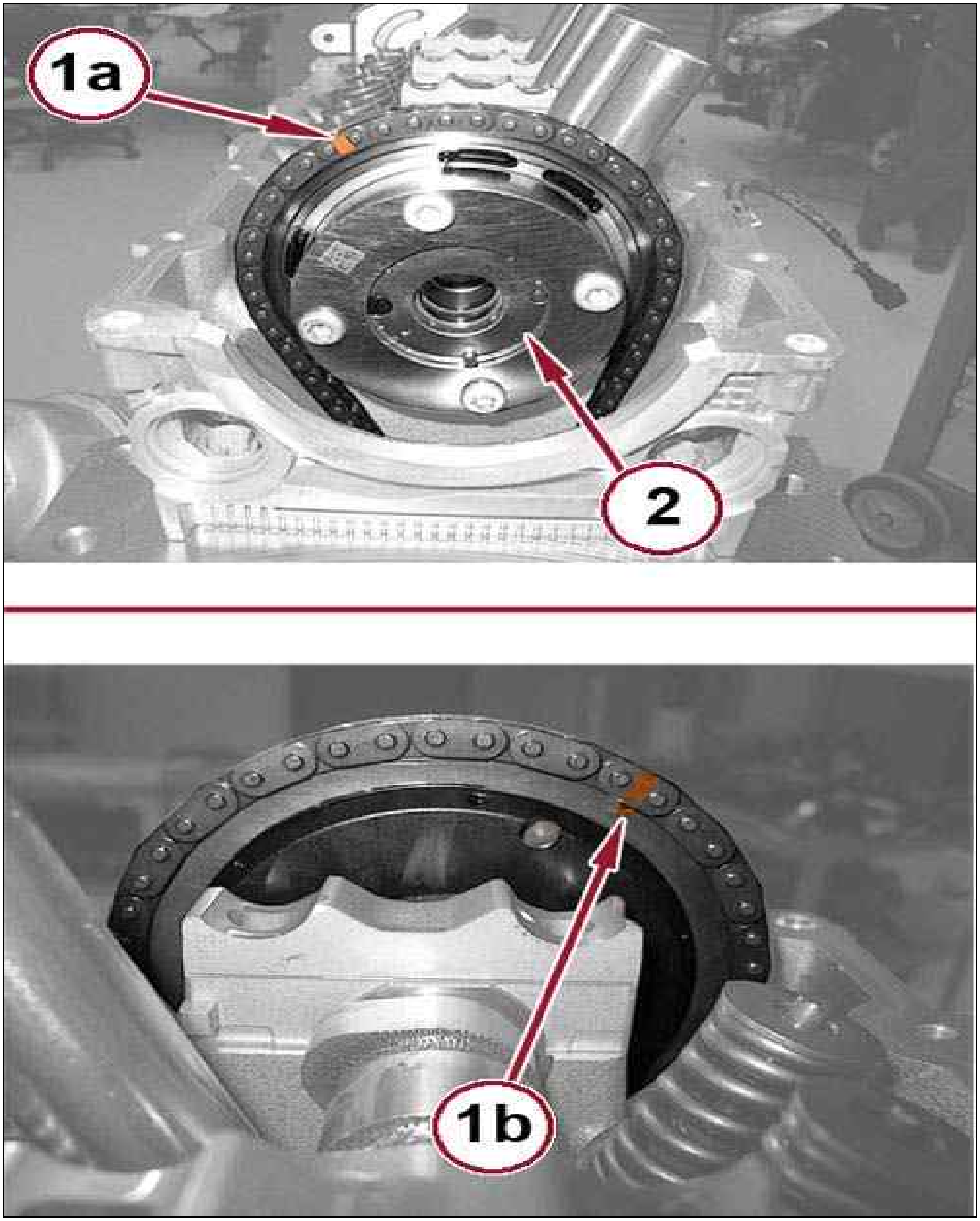
Fig 50: Placing Timing Chain In Position & Engaging Teeth Of Drive Gear To Ensure Yellow References Correspond To Triangles



Courtesy of CHRYSLER GROUP, LLC

118. Place the timing chain (1a) in position, engaging the teeth of the drive gear, so that the two yellow references (1b) correspond to the two triangles (1c).

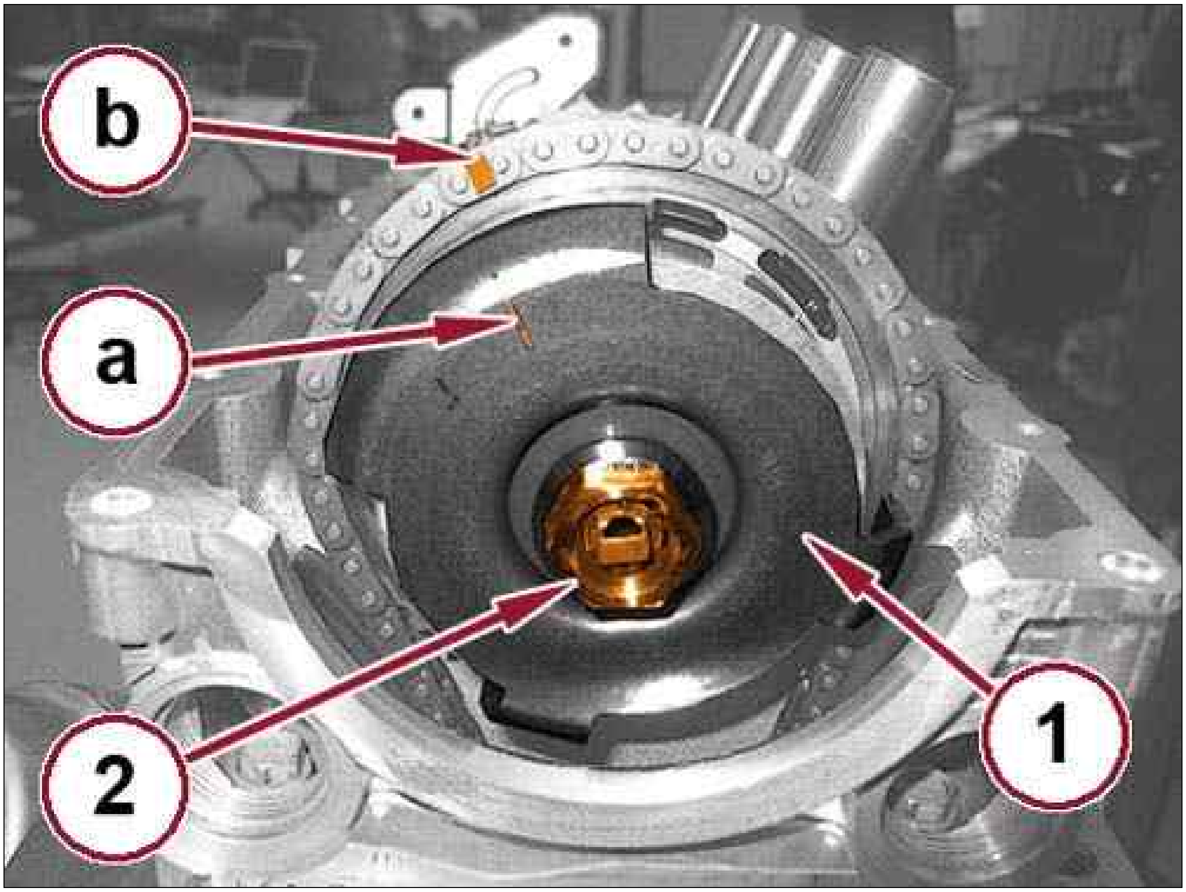
Fig 51: Engaging Upper Branch Of Timing Drive Chain With Variable Valve Timing System Teeth To Ensure Yellow Reference On Chain Corresponds To Reference Cut Into Back Of Variable Valve Timing System



Courtesy of CHRYSLER GROUP, LLC

119. Engage the upper branch of the timing drive chain with the variable valve timing system teeth, so that the yellow reference (1a) on the chain corresponds to the reference (1b) cut into the back of the variable valve timing system.

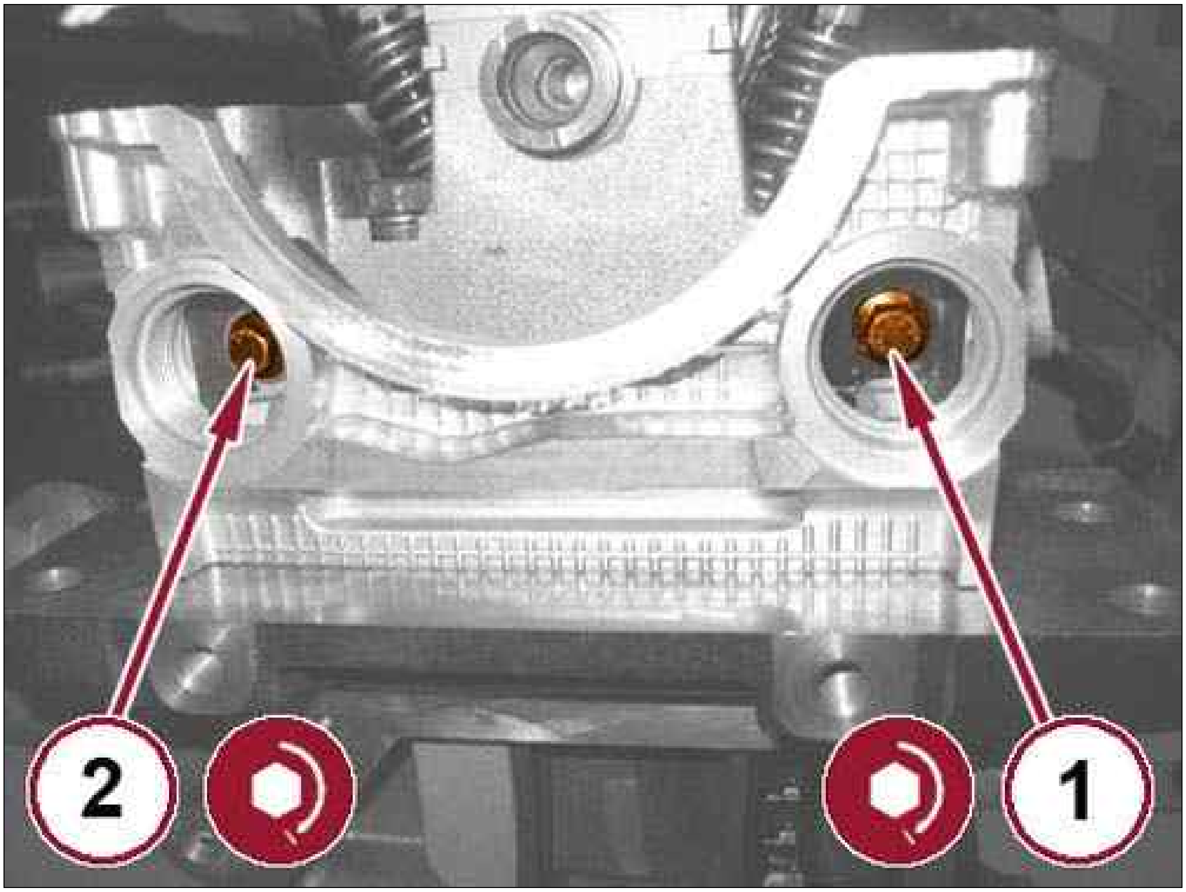
Fig 52: Ensuring Notch Cut Into Toothed Wheel Corresponds To Yellow Notch Of Timing Drive Chain



Courtesy of CHRYSLER GROUP, LLC

120. Place the variable valve timing system with chain in its housing, engaging the two pins of the camshaft stem.
121. Place the timing sensor toothed wheel in its housing, engaging the variable valve timing system pin.
122. Check that the notch (a) cut into the toothed wheel corresponds to the yellow notch (b) of the timing drive chain.
123. Install the variable valve timing system fixing screw, without tightening it.

Fig 53: Timing Drive Chain Moving Pad & Fixed Pad Fixing Bolts

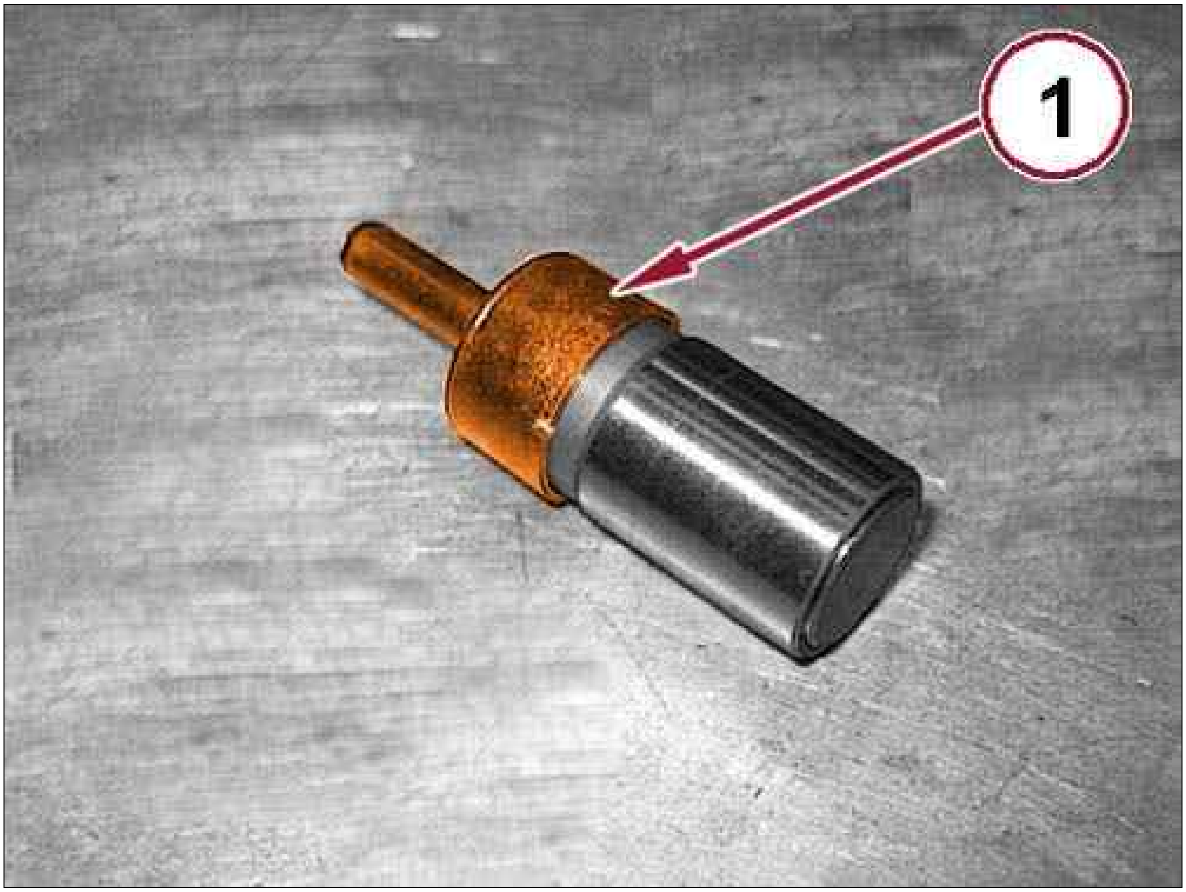


Courtesy of CHRYSLER GROUP, LLC

124. Tighten the bolt (2) securing the timing chain fixed guide to the proper specification. Refer to TORQUE SPECIFICATIONS .

125. Tighten the bolt (1) securing the timing chain moving guide to the proper specification. Refer to TORQUE SPECIFICATIONS .

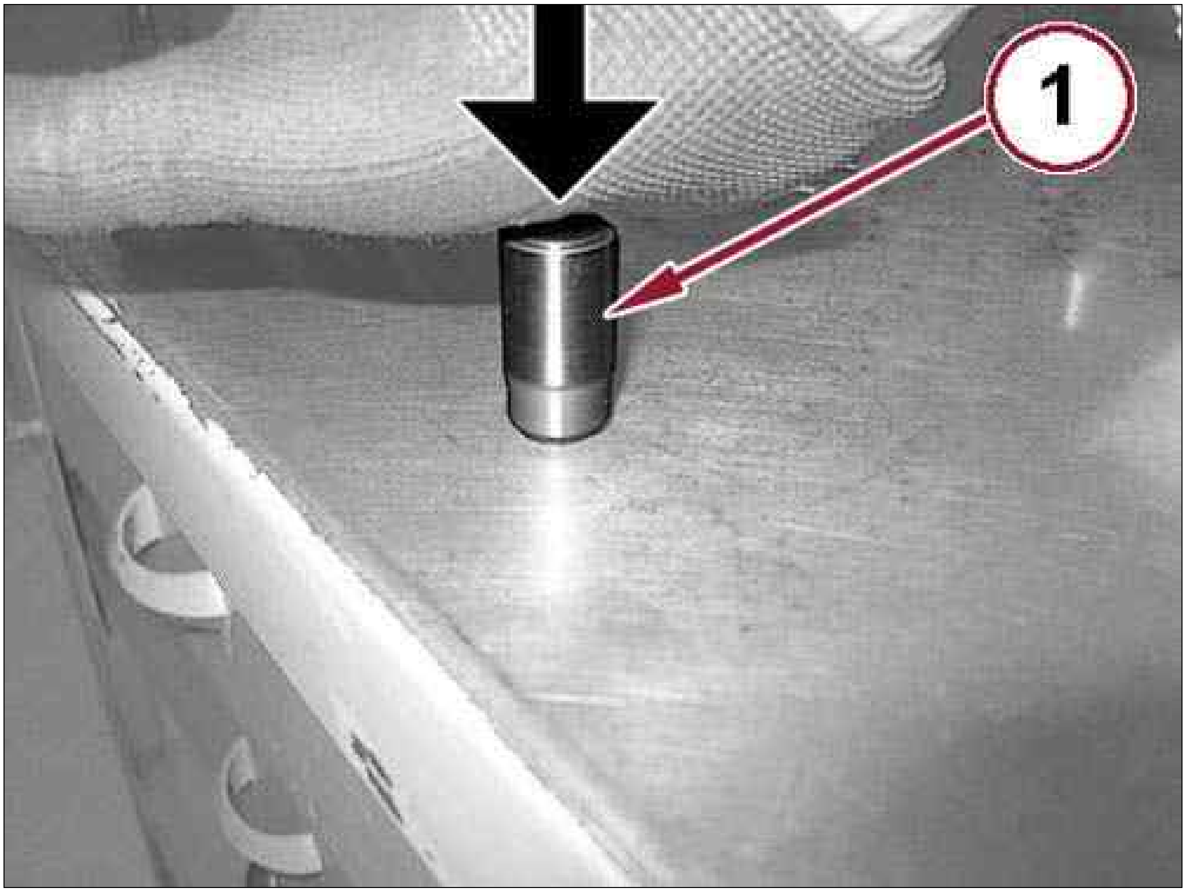
Fig 54: Moving Tensioner For Timing Drive Chain Cover



Courtesy of CHRYSLER GROUP, LLC

126. Remove the cover (1) of the moving tensioner for the timing drive chain.

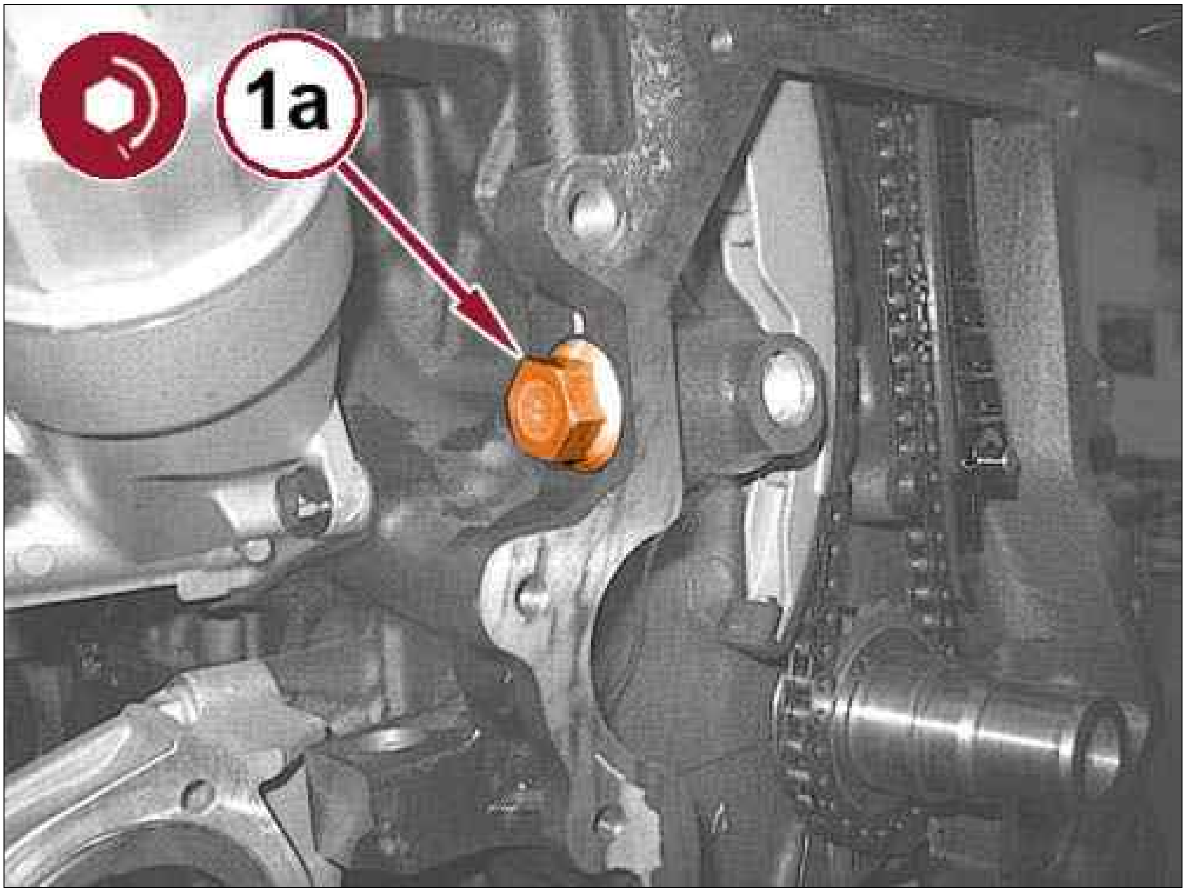
Fig 55: Engaging Moving Tensioner For Timing Drive Chain



Courtesy of CHRYSLER GROUP, LLC

127. Engage the moving tensioner for the timing drive chain as shown in the figure.
128. Fit the cover on the moving tensioner for the timing drive chain.

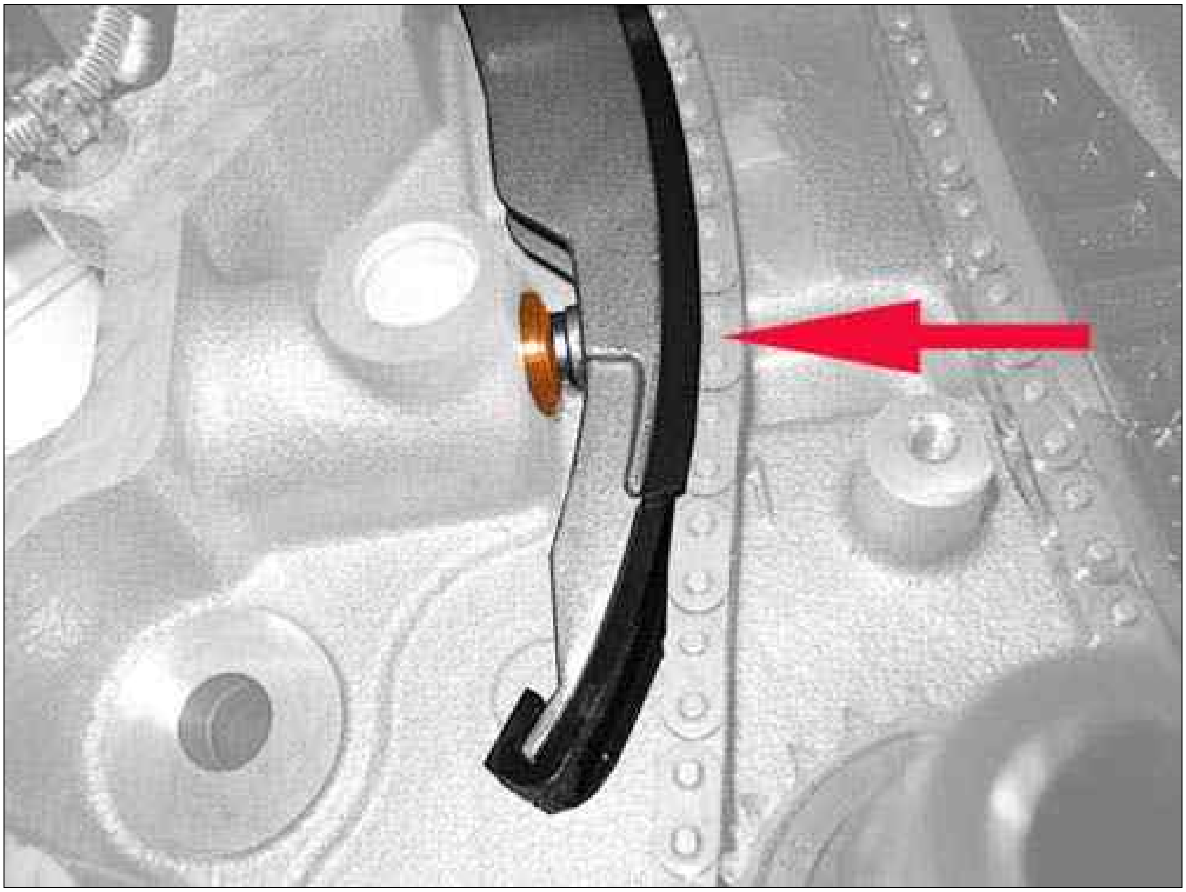
Fig 56: Timing Drive Chain Moving Tensioner & Bolt



Courtesy of CHRYSLER GROUP, LLC

129. Using a **NEW** gasket, install the timing chain tensioner and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .

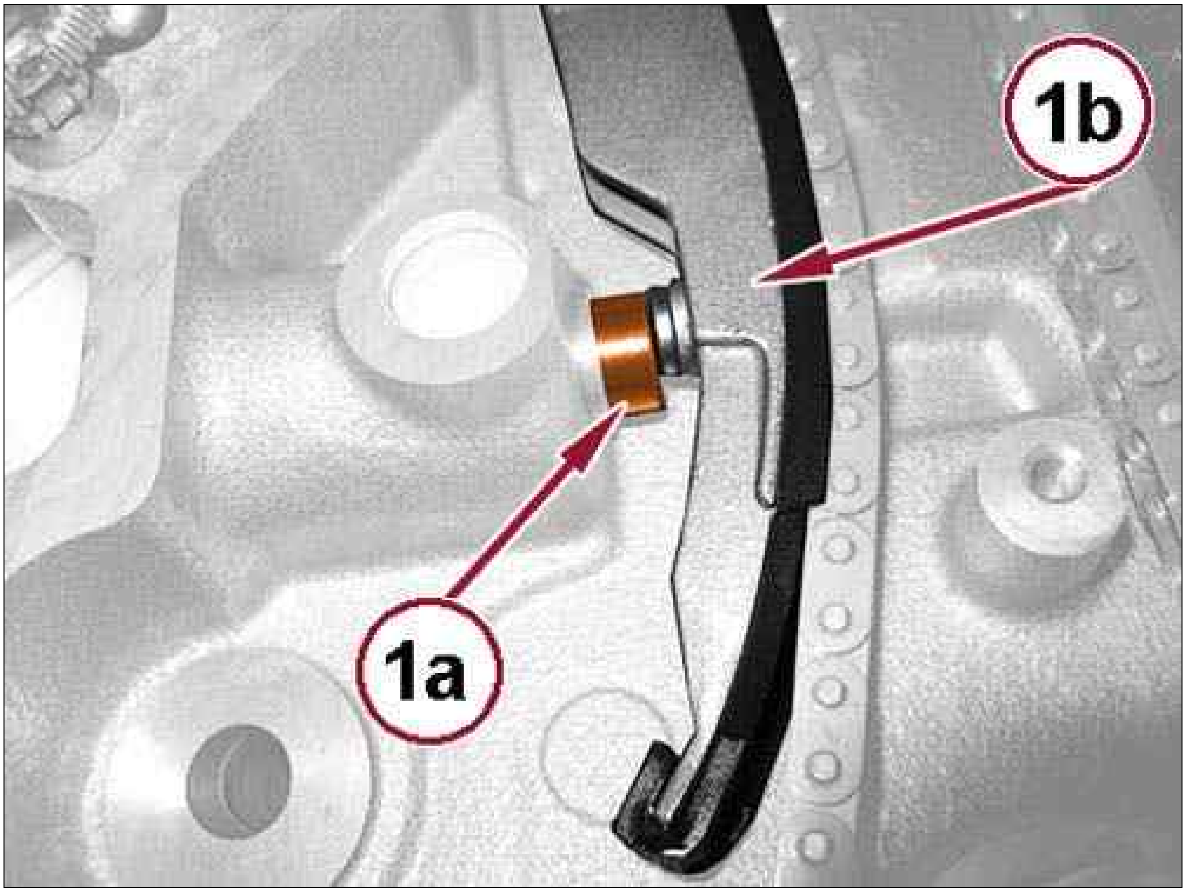
Fig 57: Releasing Piston Of Timing Drive Chain Mobile Tensioner



Courtesy of CHRYSLER GROUP, LLC

130. Work on the mobile pad to release the piston of the timing drive chain mobile tensioner.

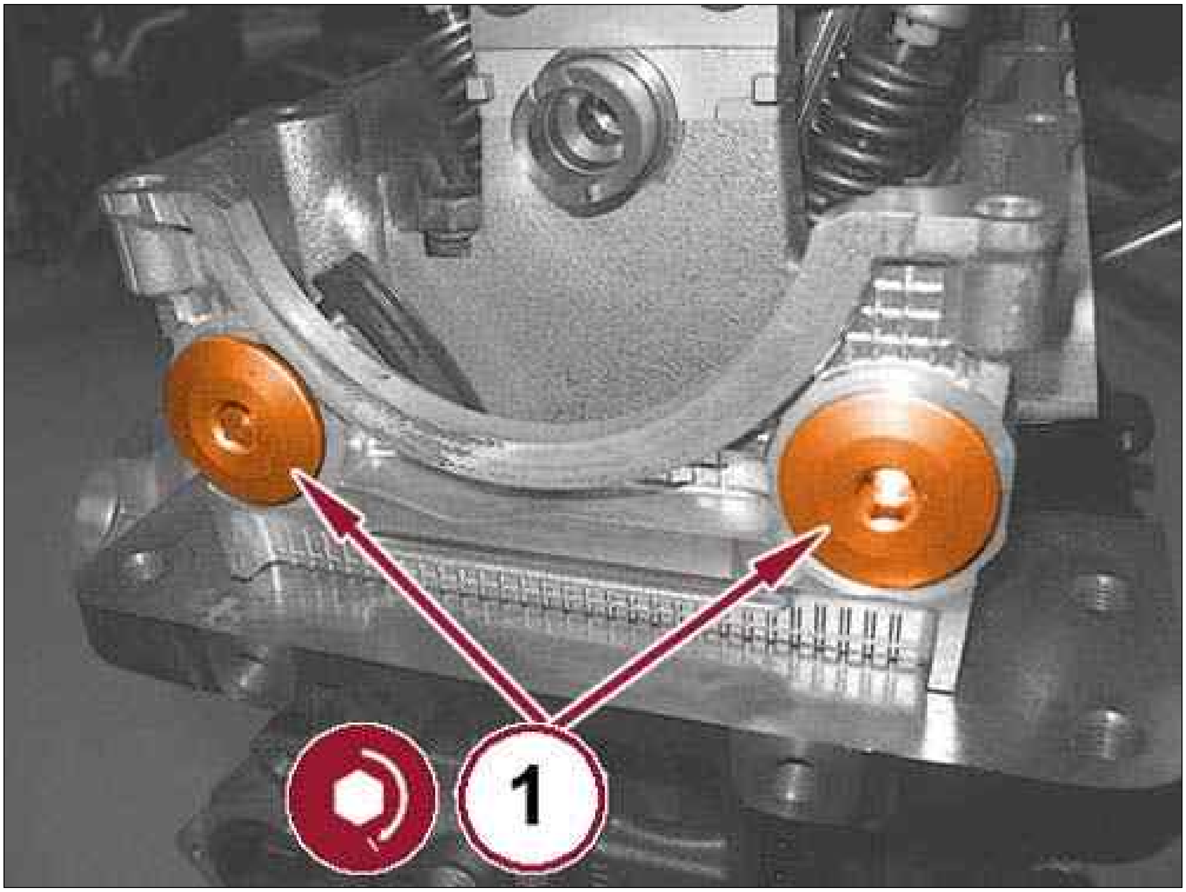
Fig 58: Ensuring Piston Of Mobile Tensioner Touches Mobile Pad



Courtesy of CHRYSLER GROUP, LLC

131. Check that the piston of the mobile tensioner (1a) touches the mobile pad (1b).

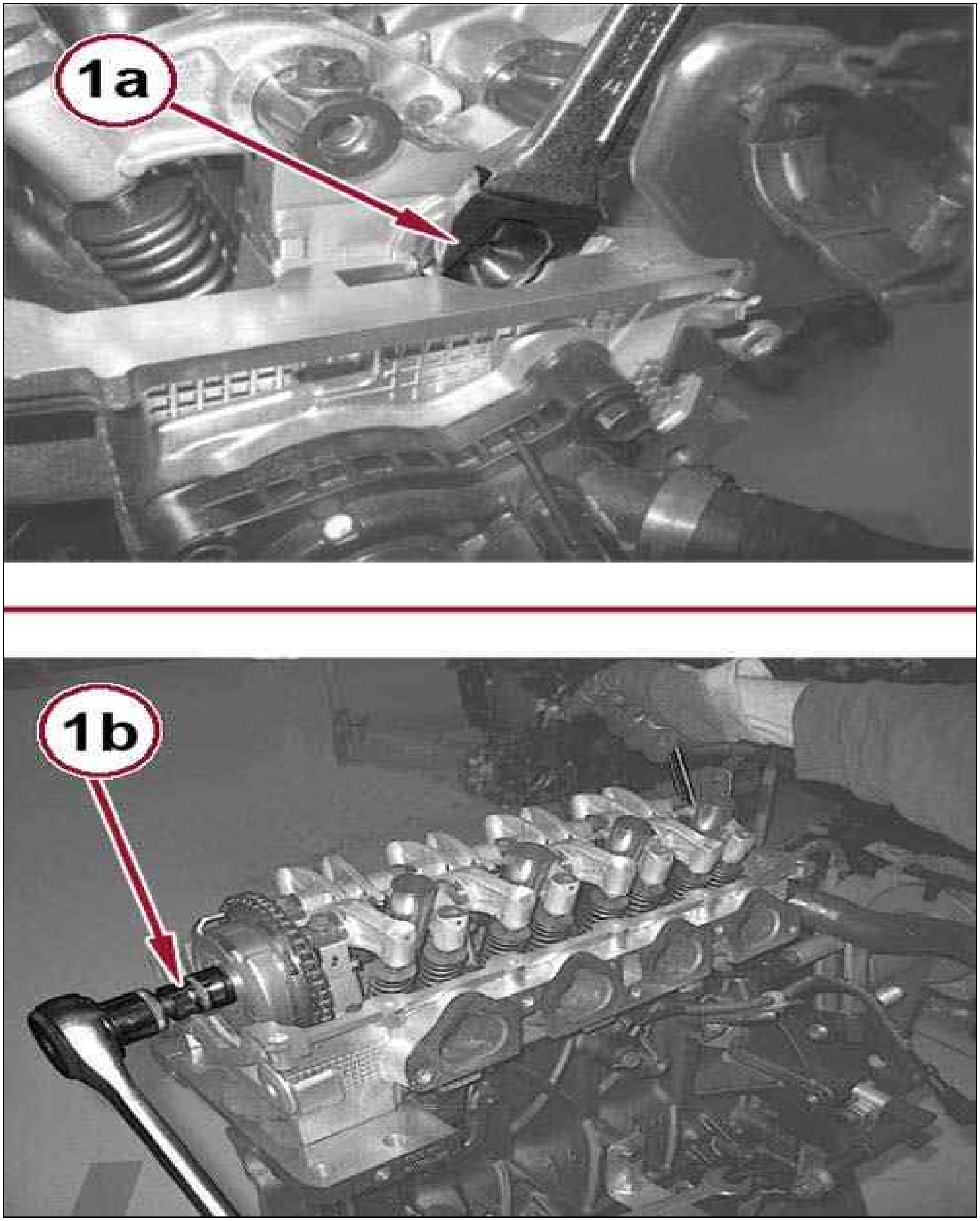
Fig 59: Access Caps For Timing Drive Chain Pad Fixing Screws



Courtesy of CHRYSLER GROUP, LLC

132. Using **NEW** O-rings, Install the access caps and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .

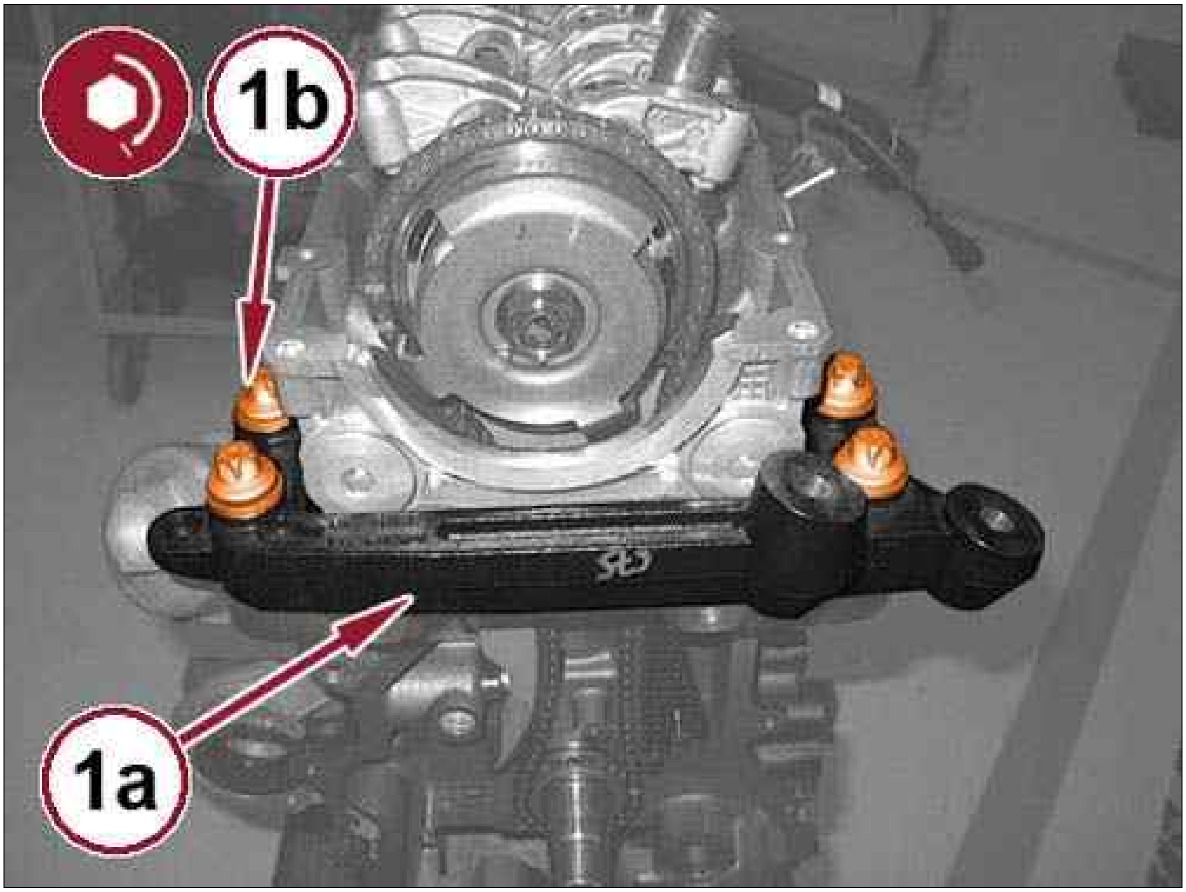
Fig 60: Applying A Counter-Torque On Rear Stem Of Camshaft & Tightening Screw Securing Variable Valve Timing System



Courtesy of CHRYSLER GROUP, LLC

133. Applying a counter-torque on the rear stem of the camshaft (1a) tighten the screw securing the variable valve timing system (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

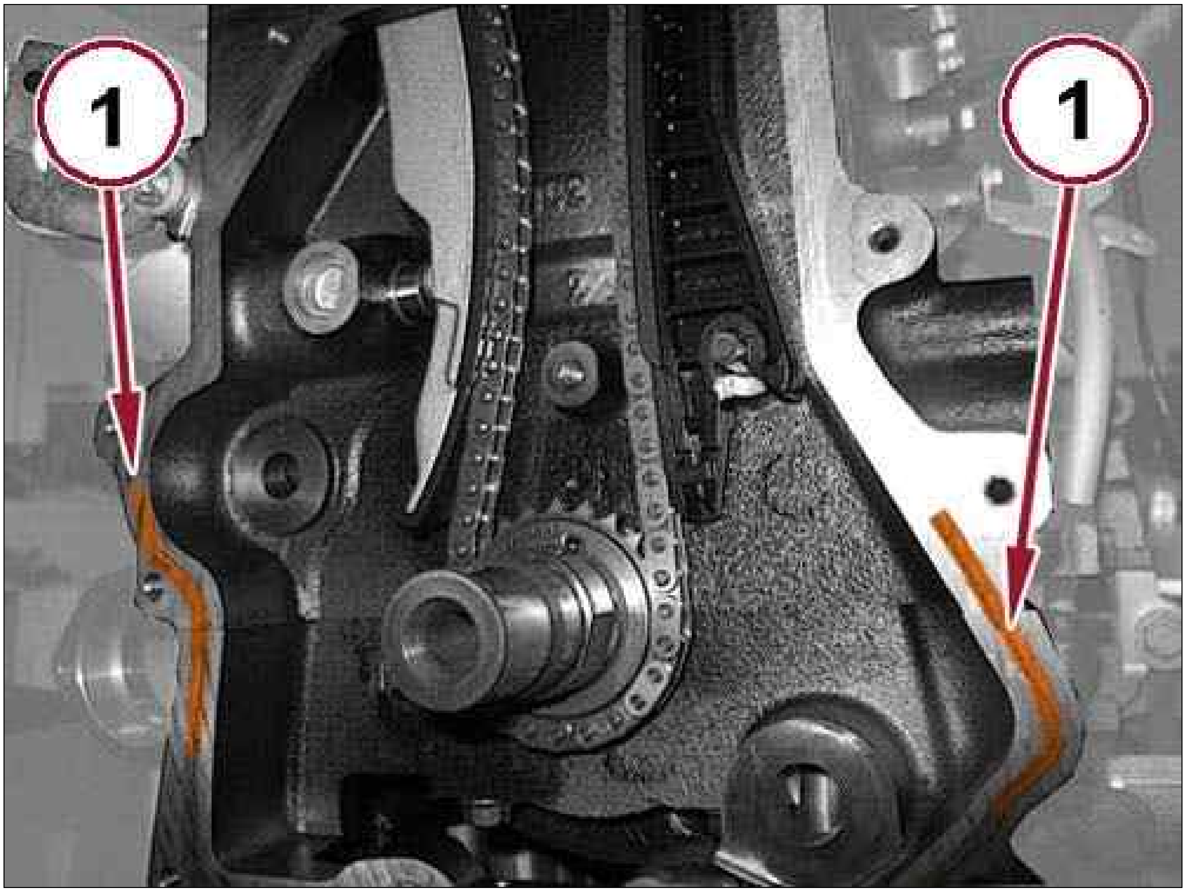
Fig 61: Timing Side Power Unit Rigid Support & Bolts



Courtesy of CHRYSLER GROUP, LLC

134. Install the engine mount bracket (1a) complete with **NEW** gasket in its housing and tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

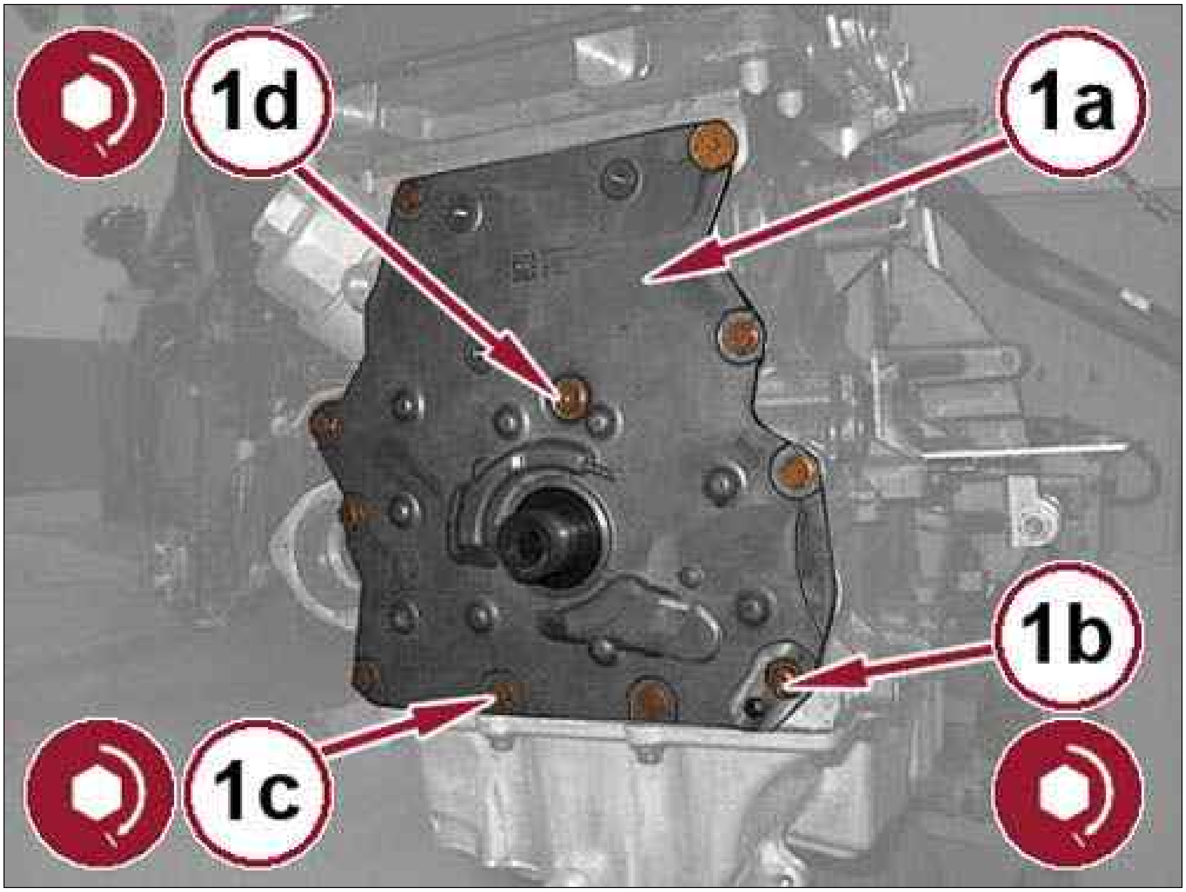
Fig 62: Applying Bead Of Sealant In Upper Block/Lower Block Joining Area Of Engine



Courtesy of CHRYSLER GROUP, LLC

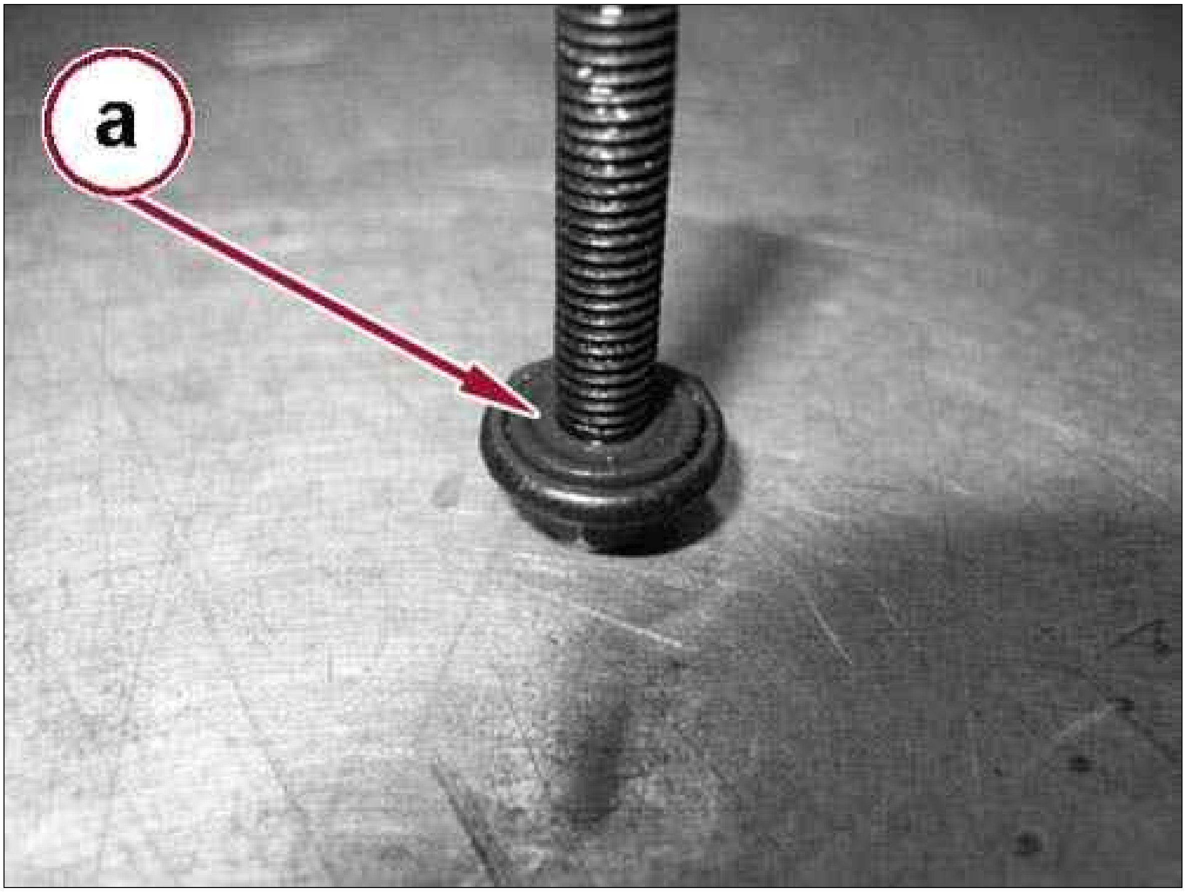
135. Lay a bead of sealant (Loctite ultra-black) (1) in the upper block/lower block joining area of the engine, as shown in the figure.

Fig 63: Timing Drive Chain Cover & Bolts



Courtesy of CHRYSLER GROUP, LLC

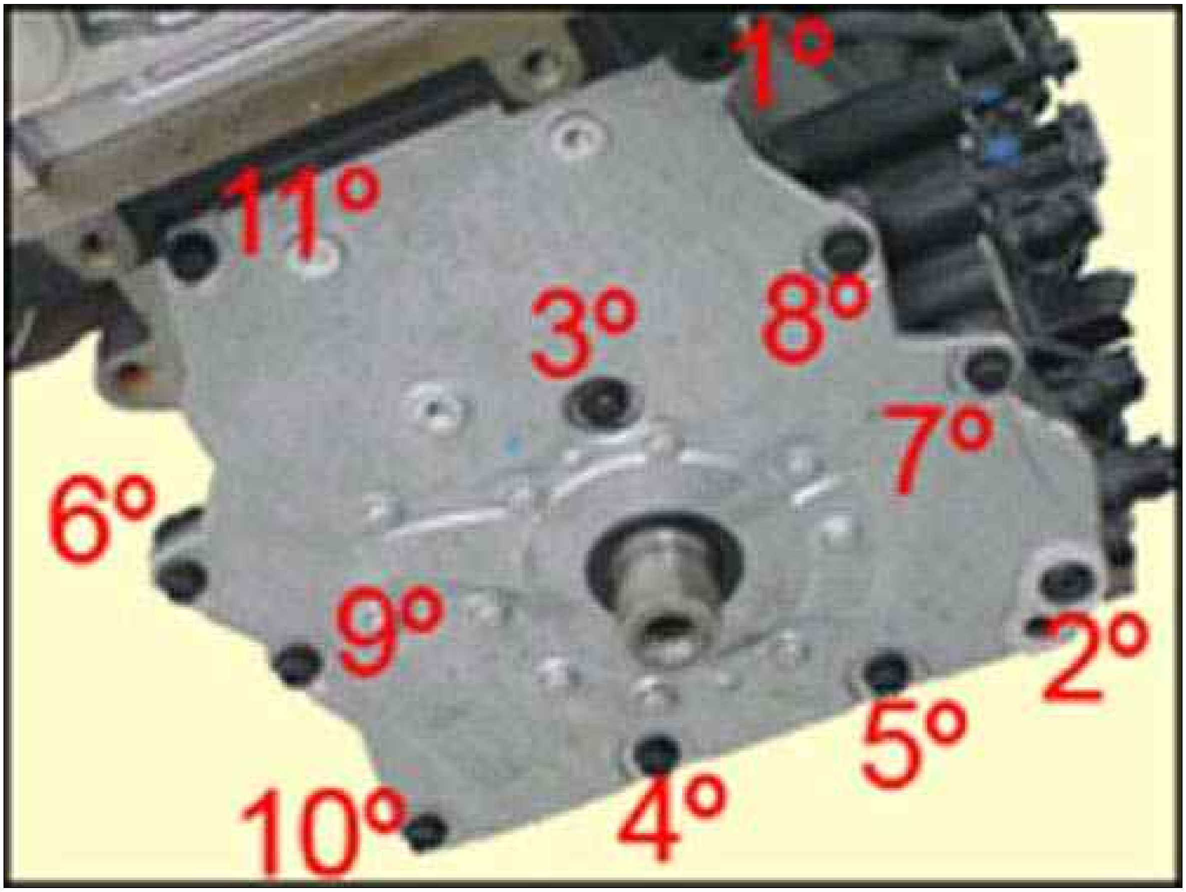
Fig 64: Centre Fixing Screw For Timing Drive Chain Cover & Gasket



Courtesy of CHRYSLER GROUP, LLC

136. Using a **NEW** gaskets, install the timing chain cover (1a) and tighten the bolts (1b), (1c) finger tight.
137. Using a **NEW** bolt in location (1d) gasket (a) with gasket tighten finger tight.

Fig 65: Timing Drive Chain Cover Bolt Tightening Sequence



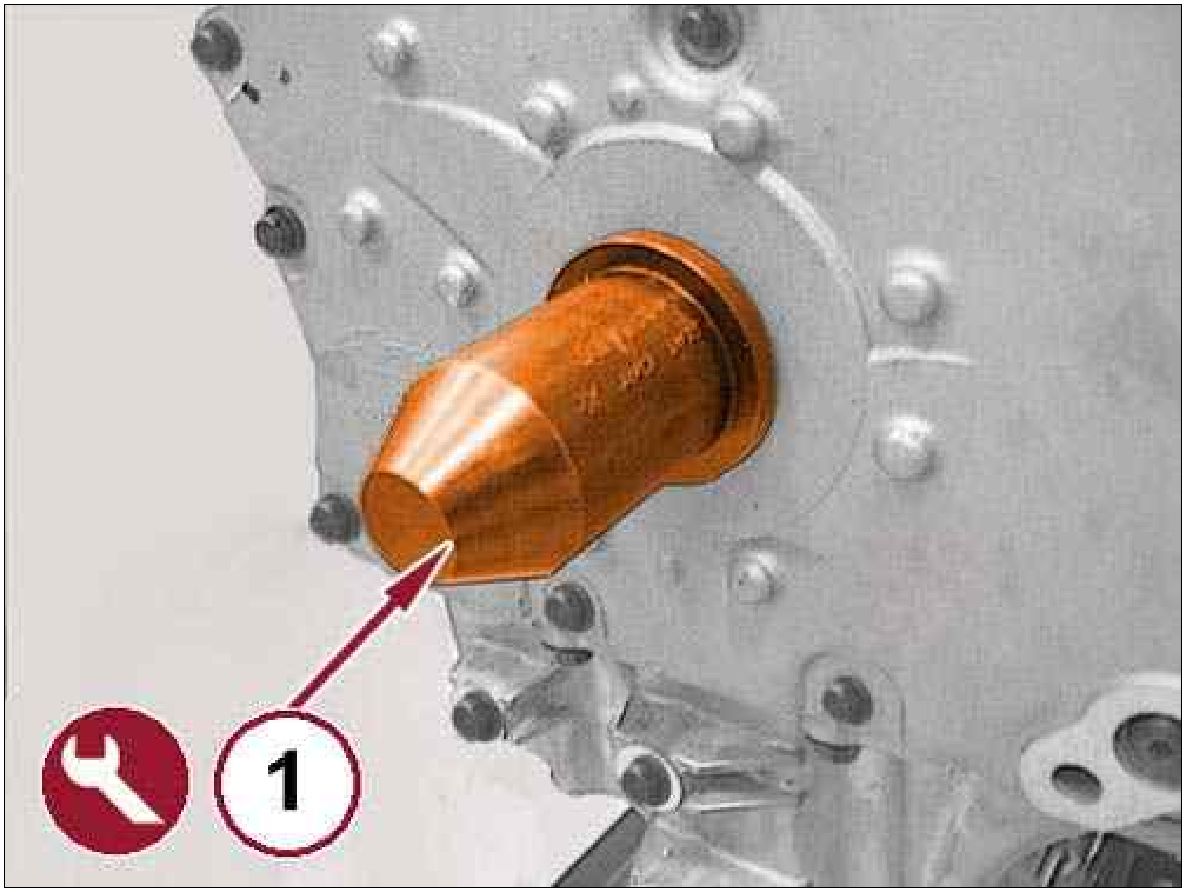
Courtesy of CHRYSLER GROUP, LLC

138. Using the tightening sequence shown in illustration, tighten the bolts:

    1. M6 bolts 13 N.m (10 ft. lbs.).

    2. M8 bolts 13 N.m (10 ft. lbs.).

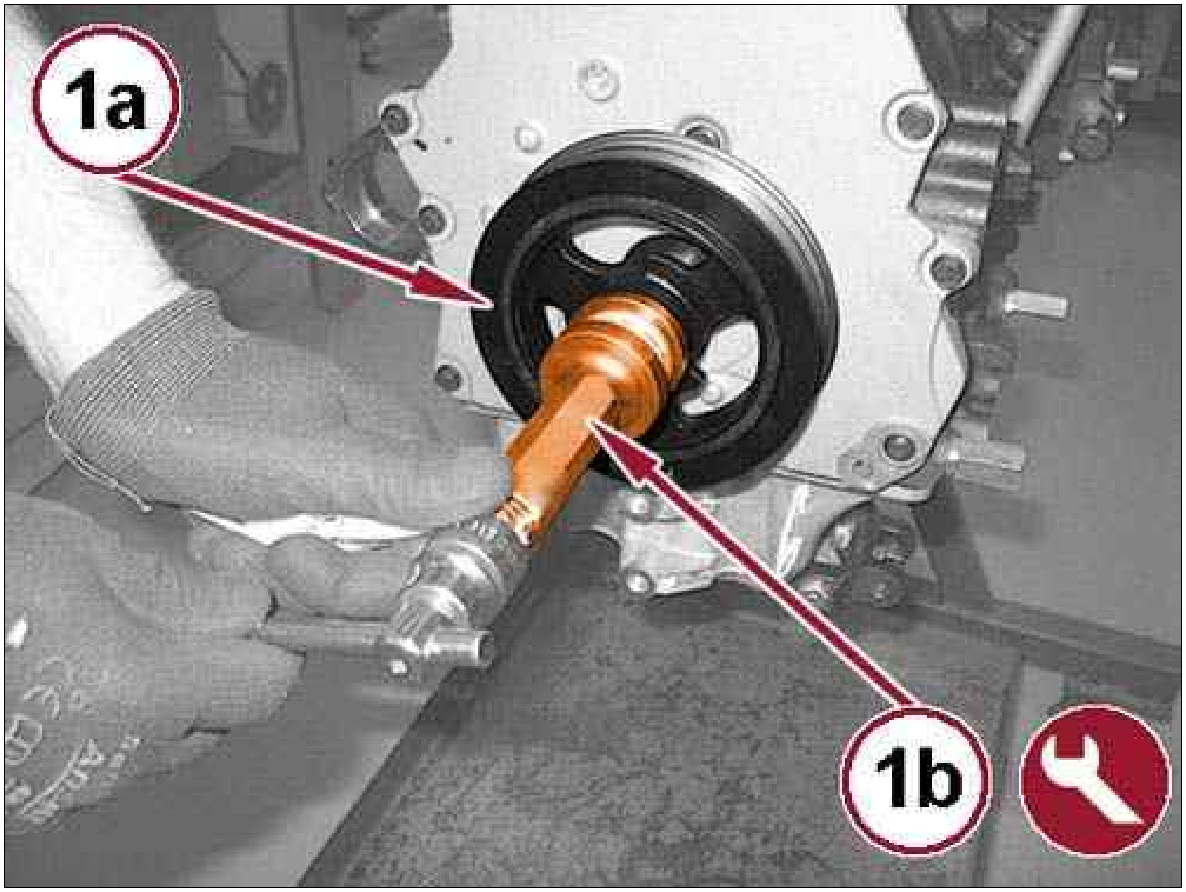
Fig 66: Using Special Tool To Install Crankshaft Oil Seal



Courtesy of CHRYSLER GROUP, LLC

139. Using the 2000040939 tool, install a **NEW** crankshaft oil seal.

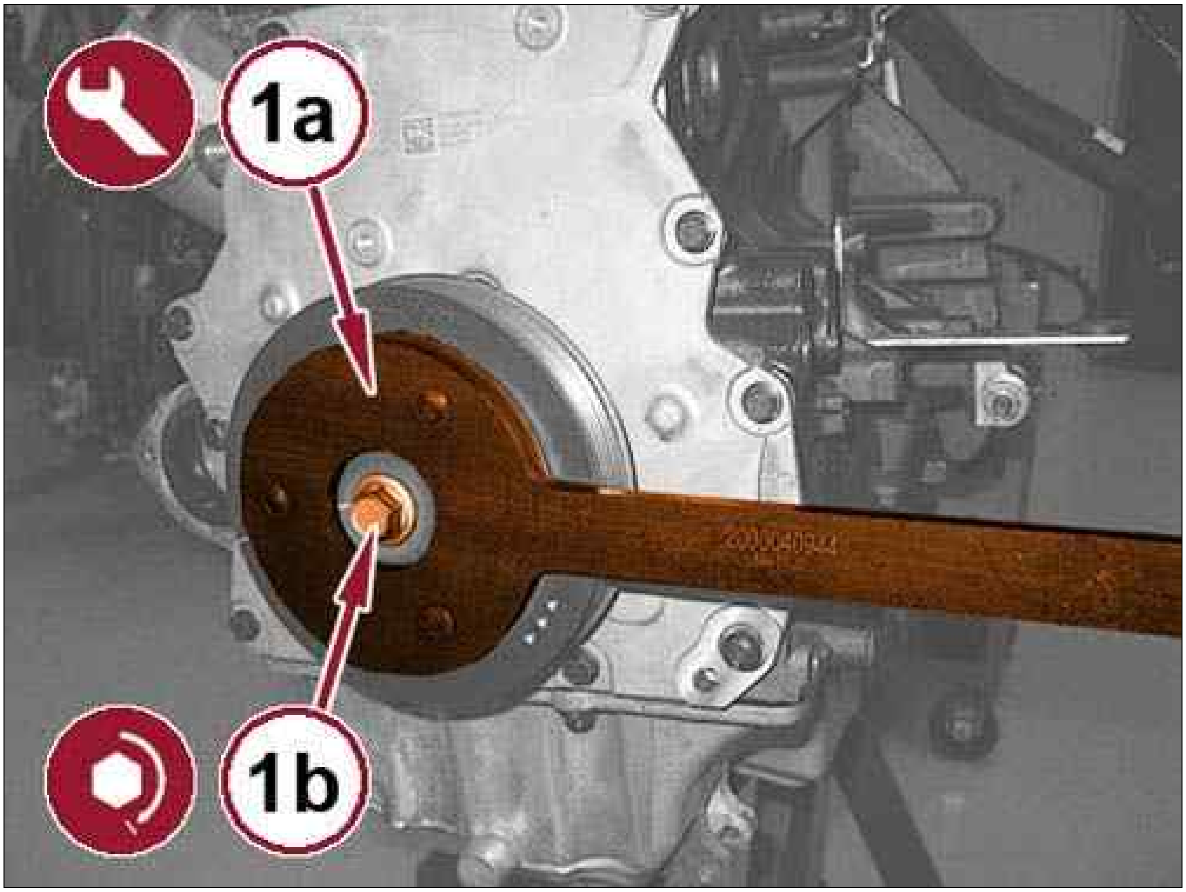
Fig 67: Using Special Tool To Install Crankshaft Pulley Into Housing



Courtesy of CHRYSLER GROUP, LLC

140. Install the crankshaft pulley (1a) in its housing and use the 2000040941 tool (1b).

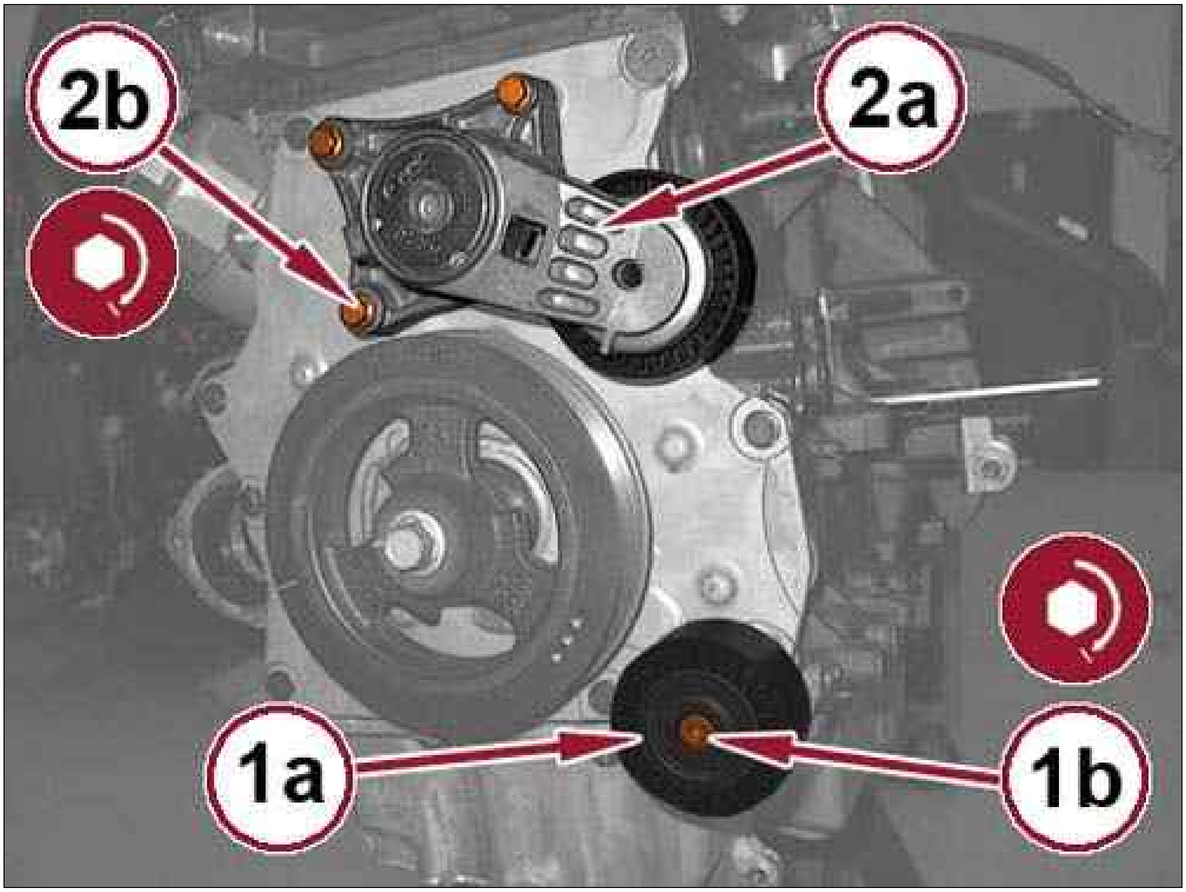
Fig 68: Using Special Tool At Crankshaft Pulley & Bolt



Courtesy of CHRYSLER GROUP, LLC

141. Using the 2000040944 tool (1a) tighten the vibration damper bolt (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

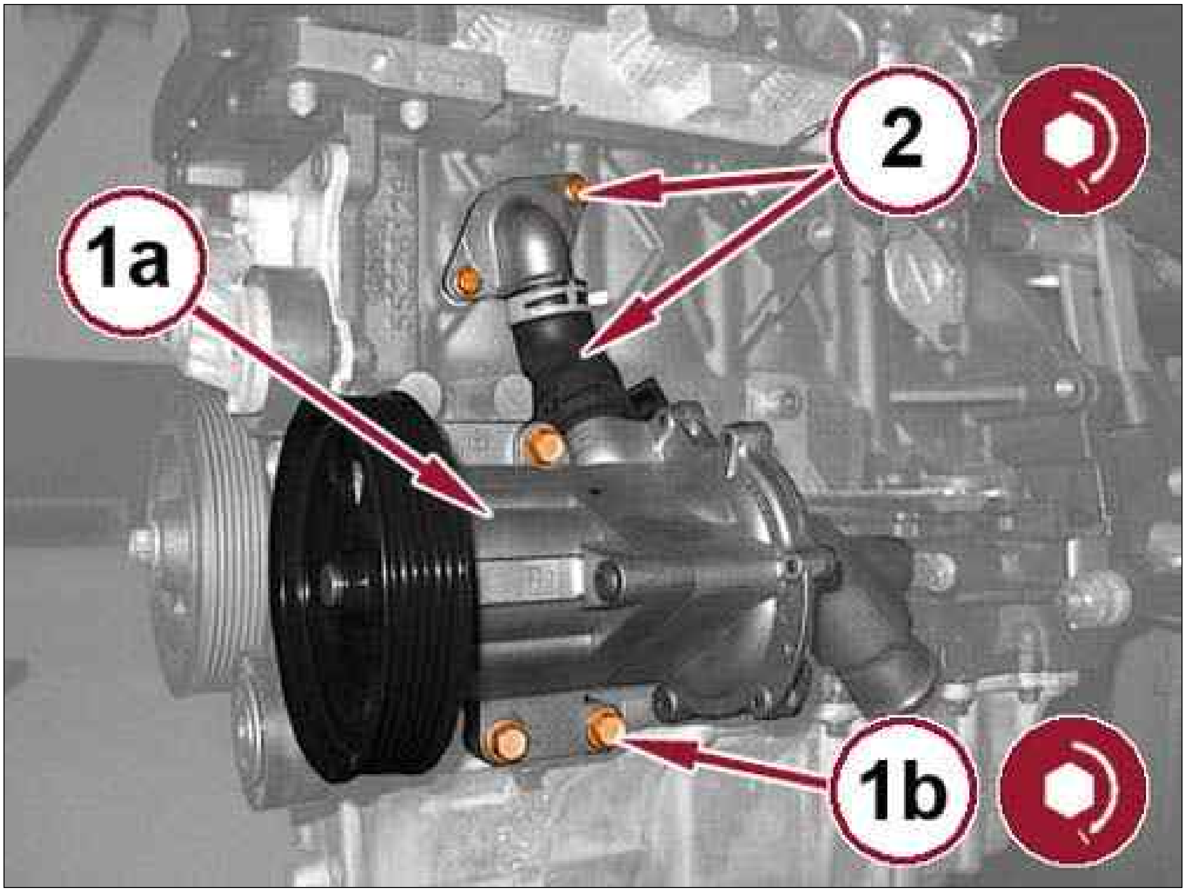
Fig 69: Accessory Drive Belt Automatic Tensioner, Accessory Drive Belt Fixed Tensioner & Bolts



Courtesy of CHRYSLER GROUP, LLC

142. Install the idler pulley (1a) and tighten the bolt (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
143. Install the serpentine belt tensioner (2a) and tighten the bolts (2b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

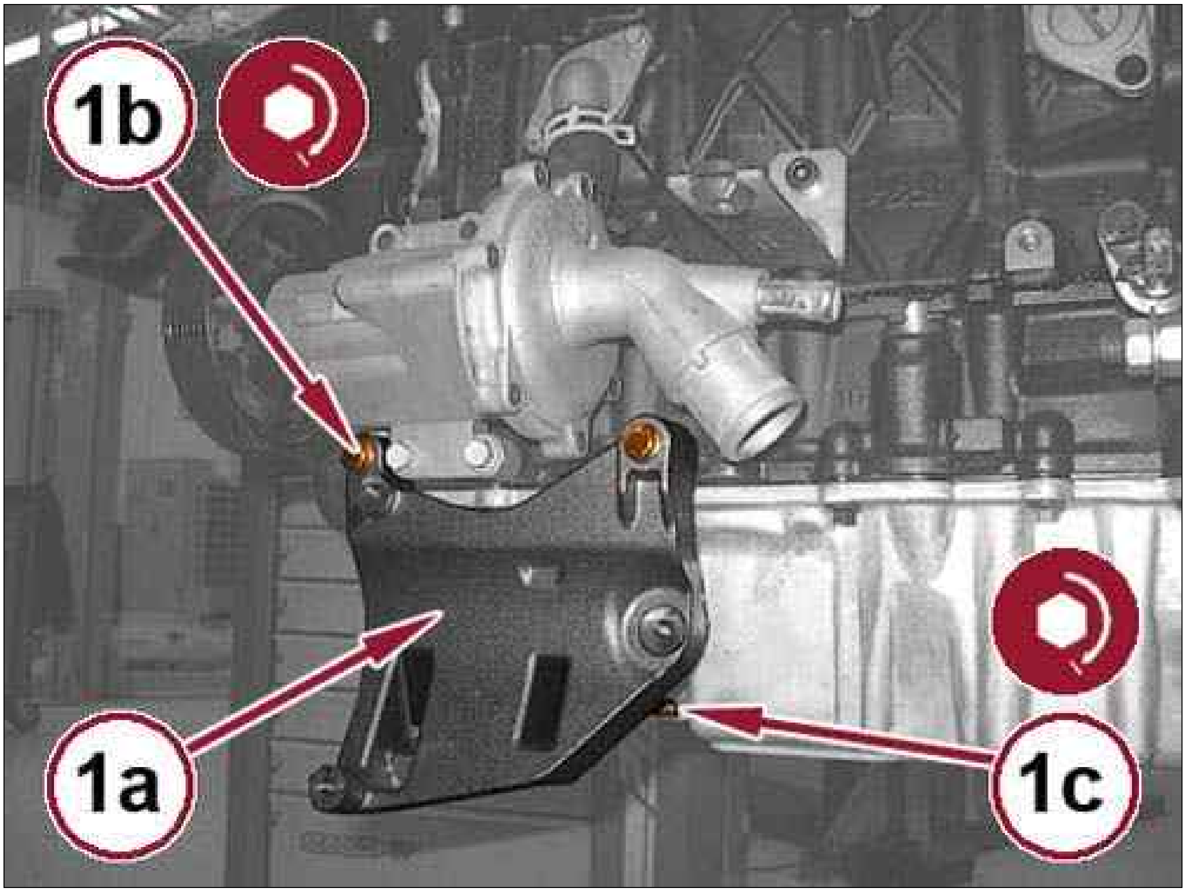
Fig 70: Water Delivery Pipe To Engine Block, Water Pump Assembly & Bolts



Courtesy of CHRYSLER GROUP, LLC

144. Replace the gasket on the connector of the water delivery pipe to the engine block.
145. Install the water pump (1a) and tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
146. Tighten the bolts (2) securing the water delivery pipe connector to the engine block to the proper specification. Refer to TORQUE SPECIFICATIONS .

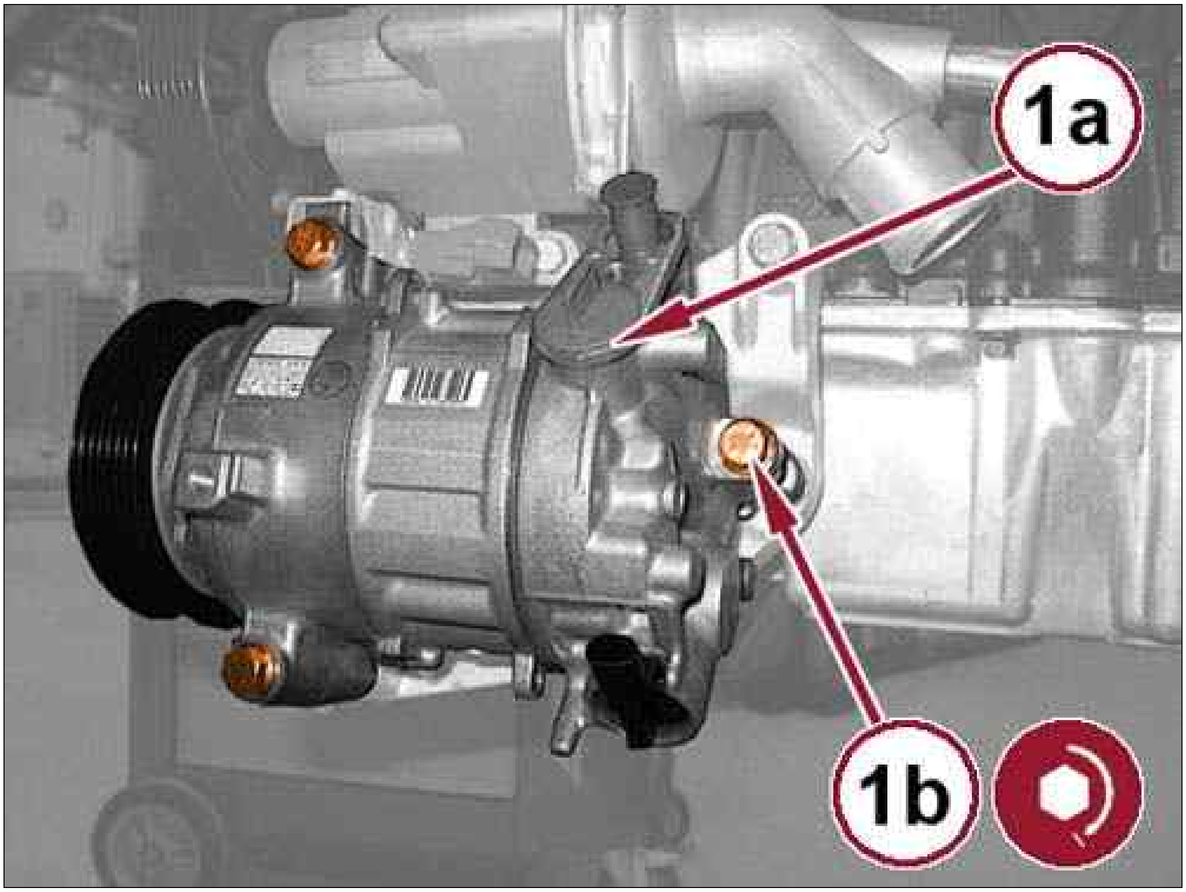
Fig 71: A/C Compressor Mounting & Bolts



Courtesy of CHRYSLER GROUP, LLC

147. Install the A/C compressor mounting bracket (1a). Tighten the bolts (1b) and the bolt (1c) to the proper specification. Refer to TORQUE SPECIFICATIONS .

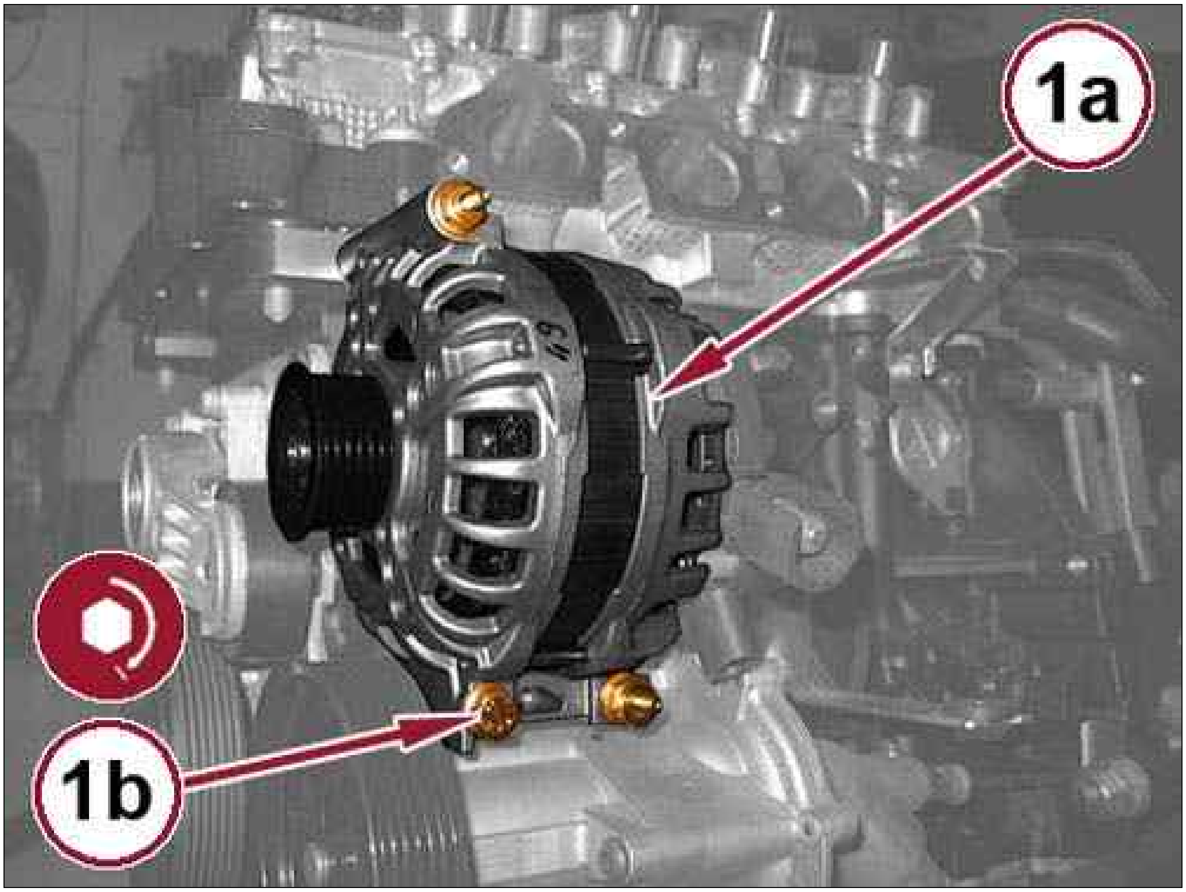
Fig 72: A/C Compressor & Bolts



Courtesy of CHRYSLER GROUP, LLC

148. Install the A/C compressor (1a) in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

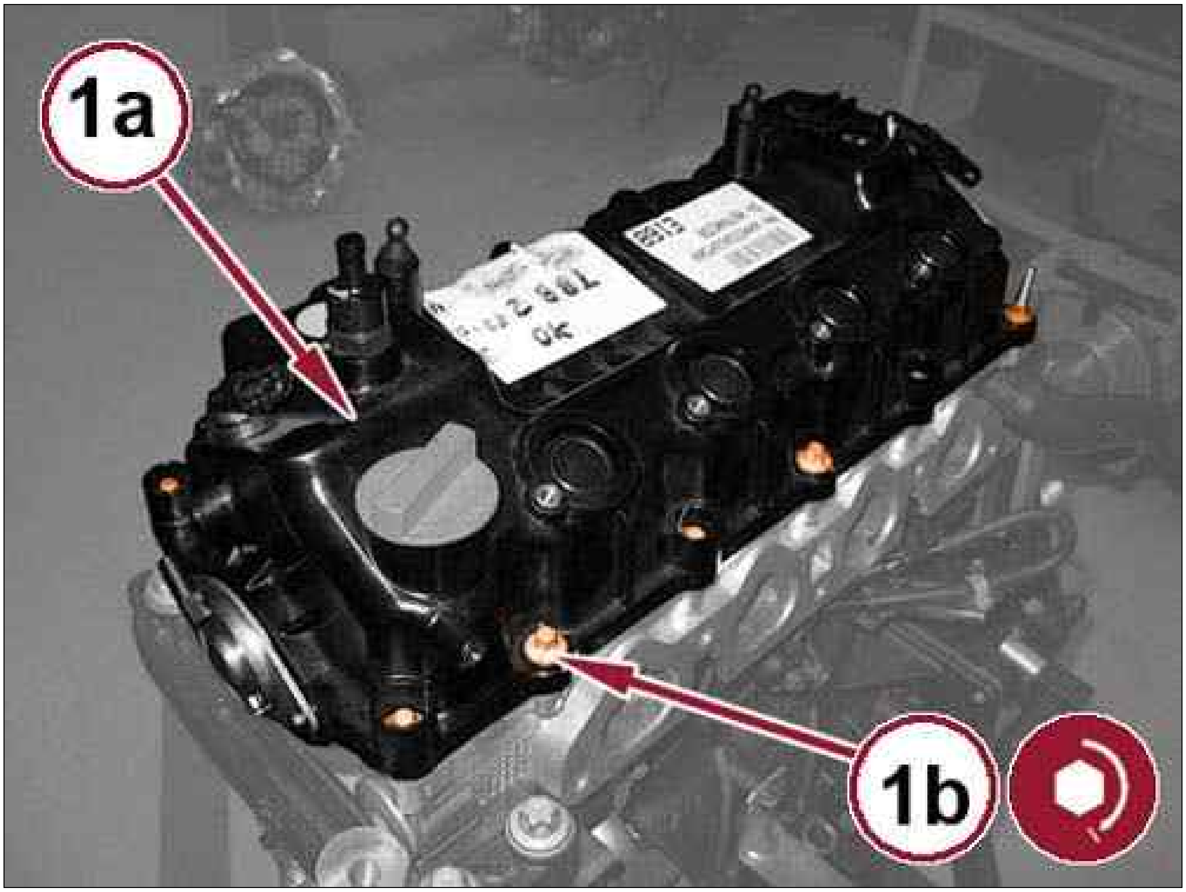
Fig 73: Generator & Bolts



Courtesy of CHRYSLER GROUP, LLC

149. Install the generator (1a) in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
150. Fit the alternator guard in its housing and tighten the nuts.
151. Adjust the moving tensioner and fit the accessory drive belt.

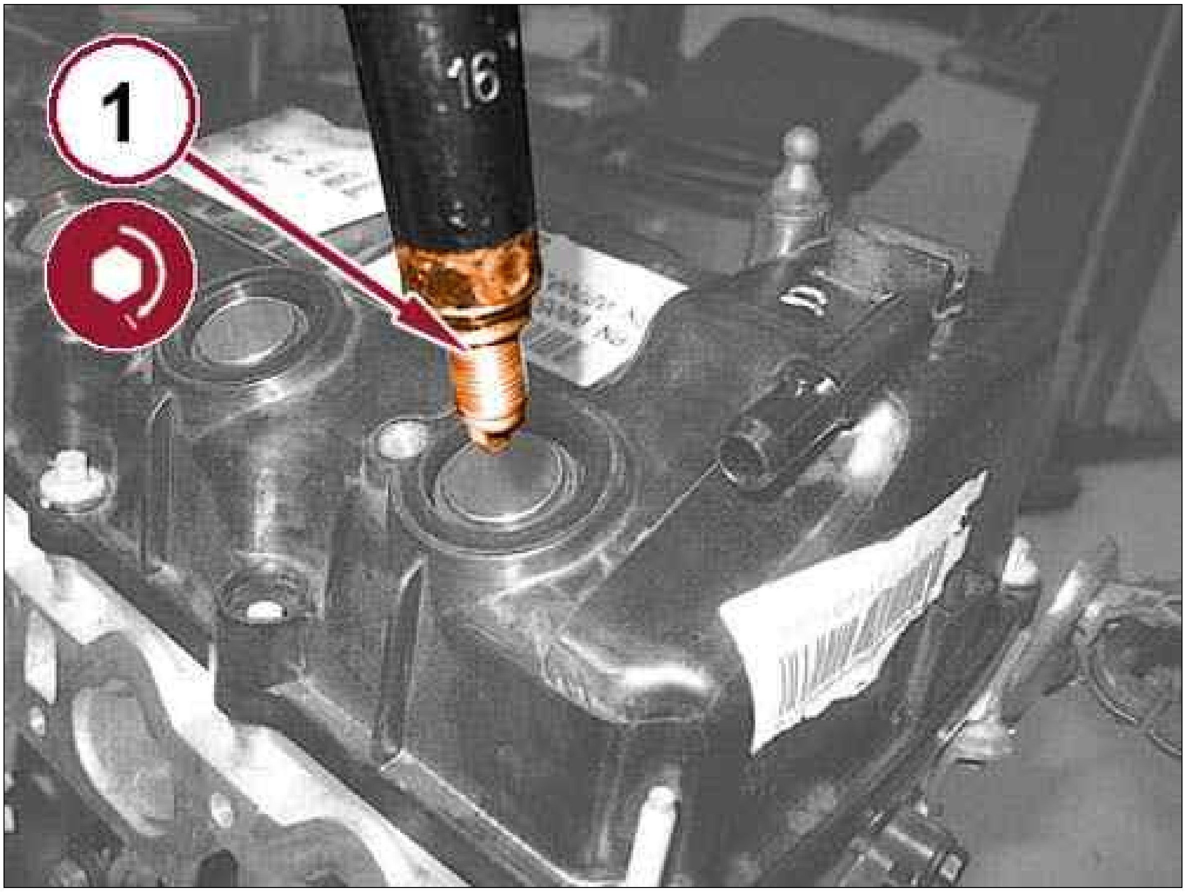
Fig 74: Tappet Cover & Bolts



Courtesy of CHRYSLER GROUP, LLC

152. Install the cylinder head cover (1a) complete with **NEW** gasket and variable valve timing electromagnet in its housing and tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

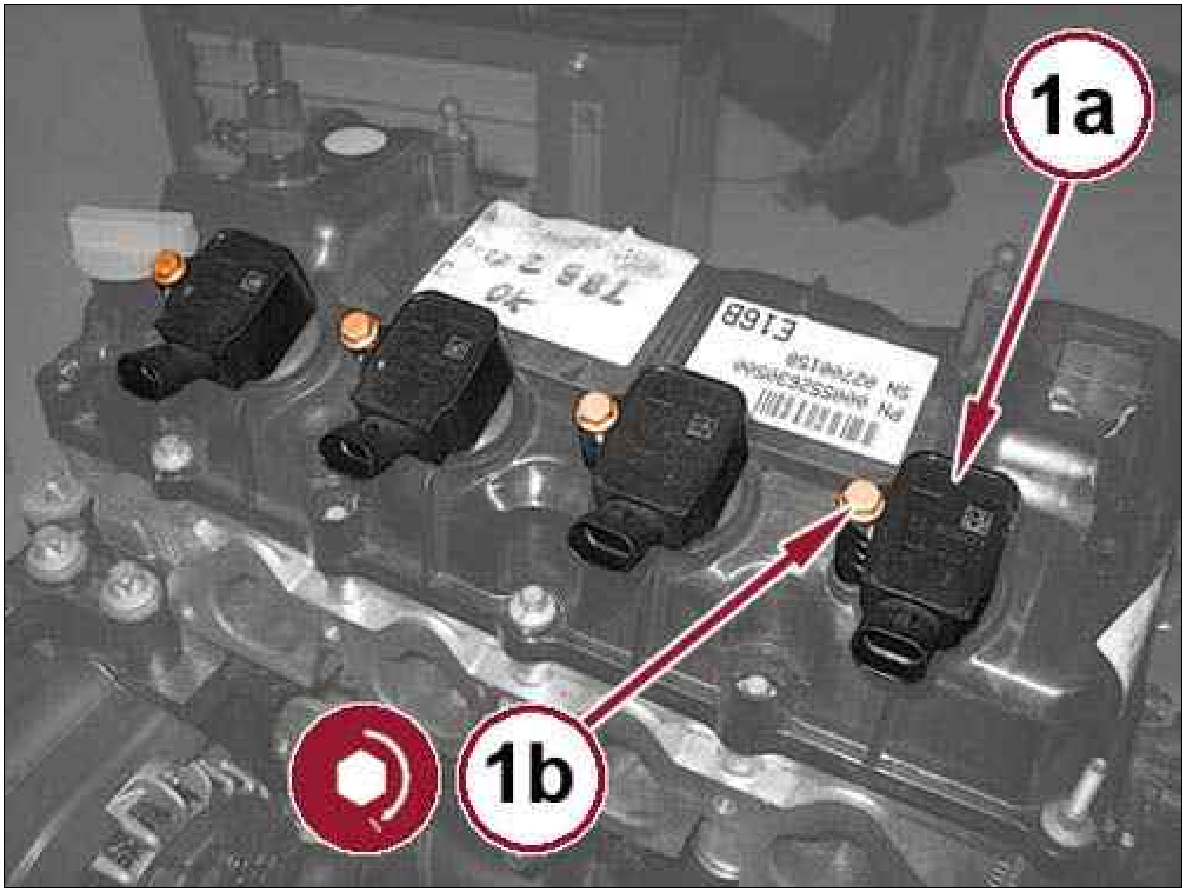
Fig 75: Removing/Installing Spark Plugs



Courtesy of CHRYSLER GROUP, LLC

153. Install the spark plugs (1) and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .

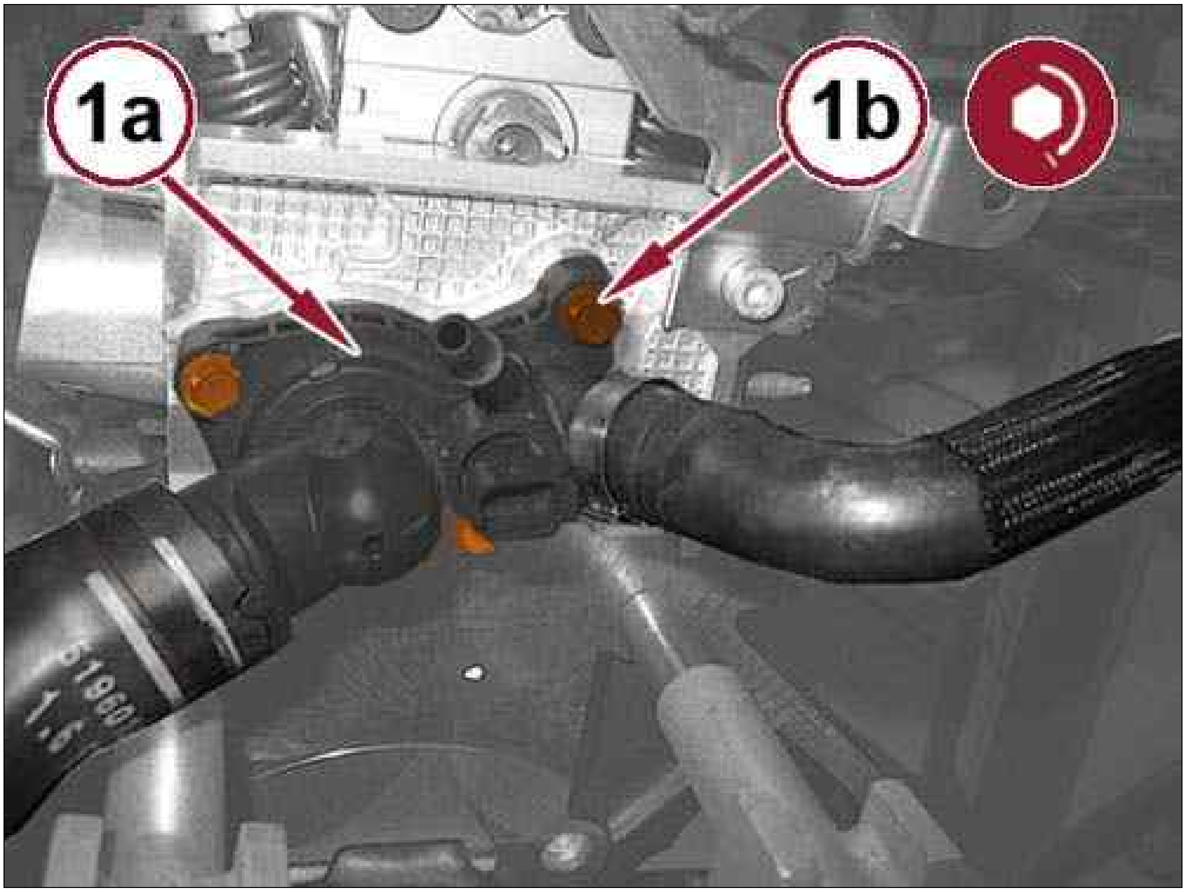
Fig 76: Ignition Coils & Bolts



Courtesy of CHRYSLER GROUP, LLC

154. Install the ignition coils (1a) in place and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

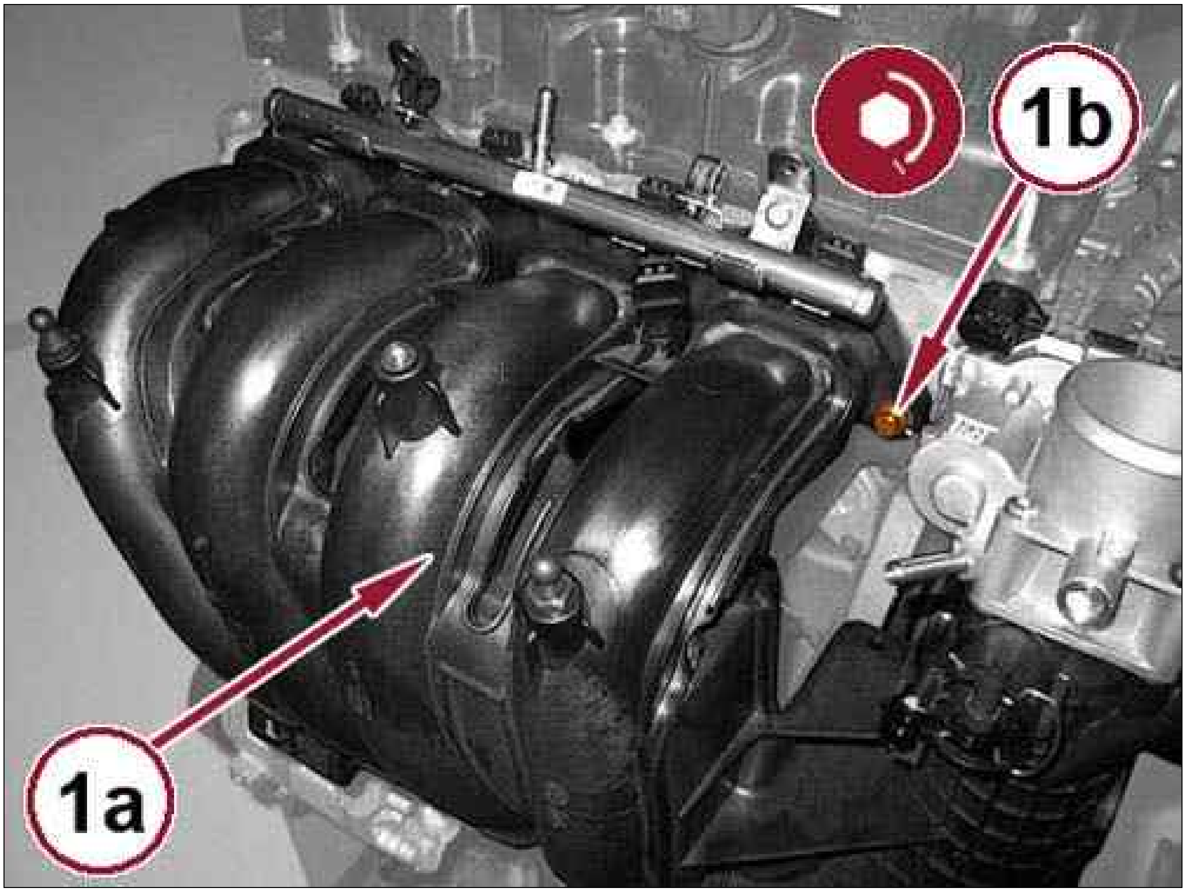
Fig 77: Thermostat Complete With Pipes & Bolts



Courtesy of CHRYSLER GROUP, LLC

155. Install the thermostat housing (1a) and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
156. Place the return pipe from the heater to the water pipe in its housing and tighten the fixing screw to the thermostat.
157. Connect the return pipe from the heater to the water pump and engage the retaining clip using the 1881138000 tool.

Fig 78: Air Intake Chamber With Throttle Body And Fuel Distribution Manifold & Bolts



Courtesy of CHRYSLER GROUP, LLC

158. Install the intake manifold (1a) complete with throttle body and fuel rail and tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
159. Tighten the screw securing the air chamber to the mounting bracket.
160. Place the engine oil dipstick tube in its housing and tighten the fixing bolt.
161. Place the idling engine oil vapor intake pipe in its housing and press-fit it, air chamber and single-acting valve side.
162. Place the engine wiring in its housing and engage the retaining clips.
163. Connect the engine temperature sensor wire harness connector and engage the wiring retainer with the bracket.
164. Connect the Crankshaft Position (CKP) sensor wire harness connector.
165. Connect the knock sensor wire harness connector.
166. Connect the throttle body wire harness connector.
167. Connect and secure the fuel vapor recovery solenoid wire harness connector.
168. Connect the fuel injectors wire harness connector.
169. Connect the ignition coils wire harness connector.

170. Tighten the screw securing the wiring duct to the tappet cover, intake side.
171. Engage the wire harness retaining clips on the intake manifold side.
172. Connect the A/C compressor wire harness connector.
173. Connect the generator wire harness connector.
174. Connect the intake air temperature and pressure sensor wire harness connector.
175. Tighten the screw securing the wiring duct to the cylinder head cover, timing side.
176. Connect the variable valve timing system electromagnet wire harness connector.
177. Connect the Camshaft Position (CMP) sensor wire harness connector.
178. Connect the minimum engine oil pressure switch wire harness connector.
179. Install the engine oil plug and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .
180. Remove the engine from the overhaul stand and place it on a suitable platform.

COVER, ENGINE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

Fig 1: Engine Cover

Courtesy of CHRYSLER GROUP, LLC

1. Raise and remove the sound insulation cover (1a) releasing it from the four inner retainers.

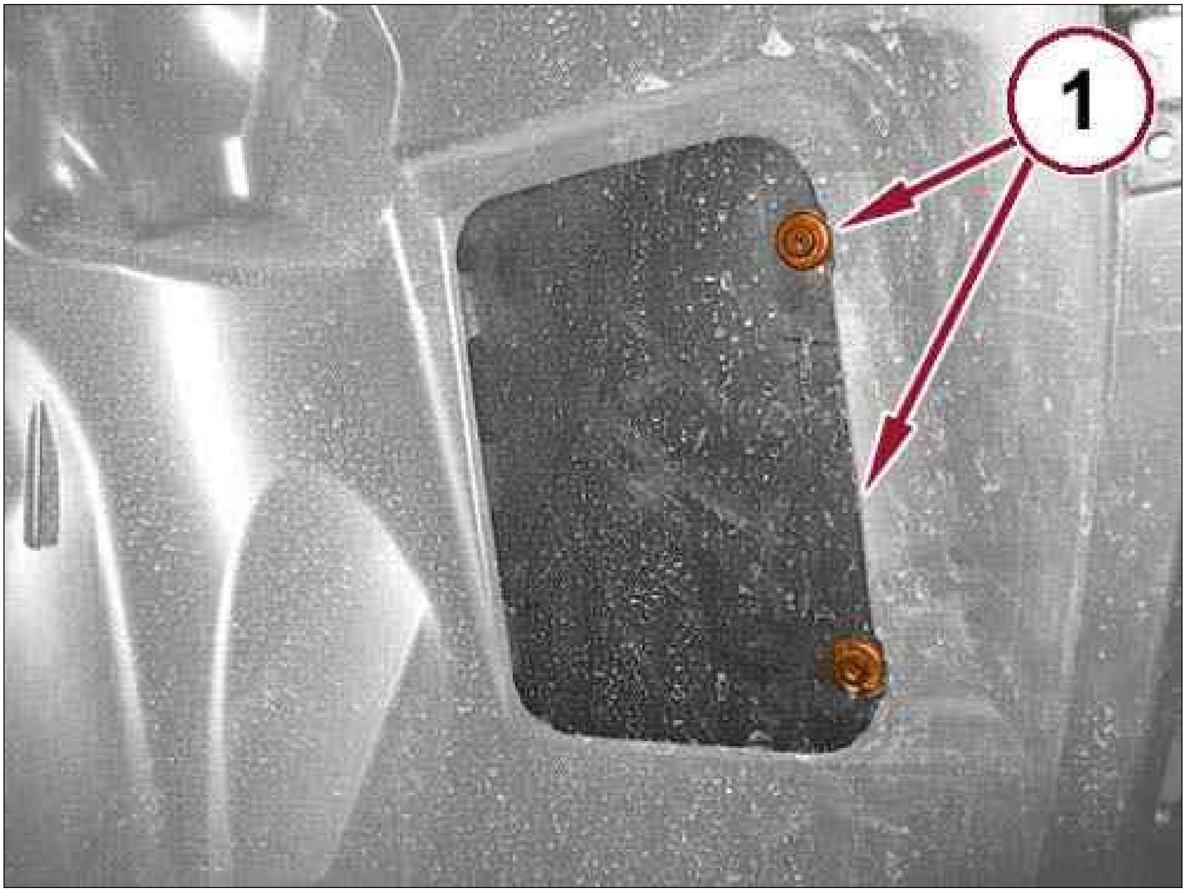
COVER, ENGINE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Check that the sound insulation cover is not damaged.
2. Position the sound insulation cover and secure it engaging the four inner retainers.

AIR INTAKE SYSTEM > BODY, AIR CLEANER > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

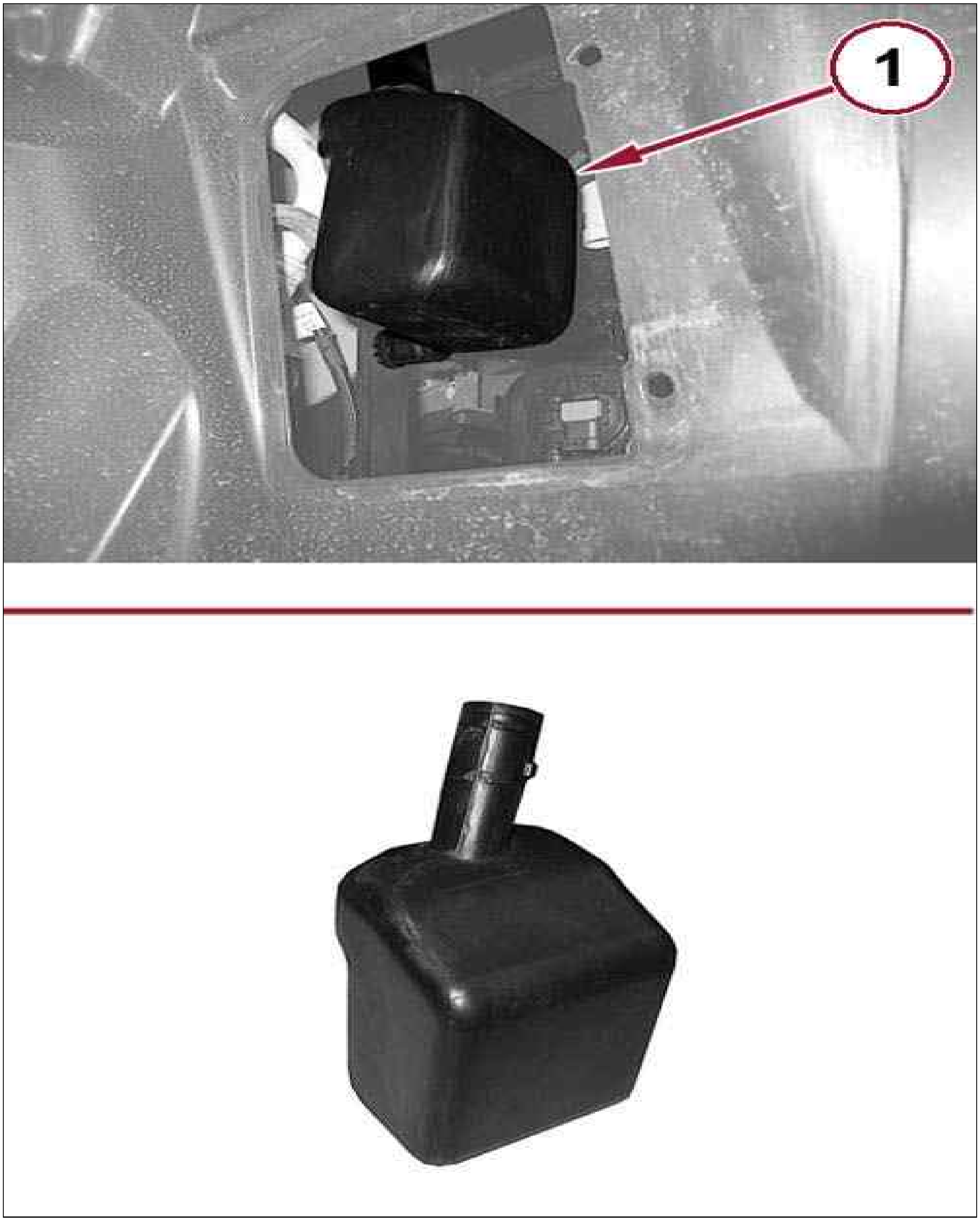
Fig 1: Cover At Wheel Arch & Screws



Courtesy of CHRYSLER GROUP, LLC

2. Remove the screws and the cover from the wheel arch.

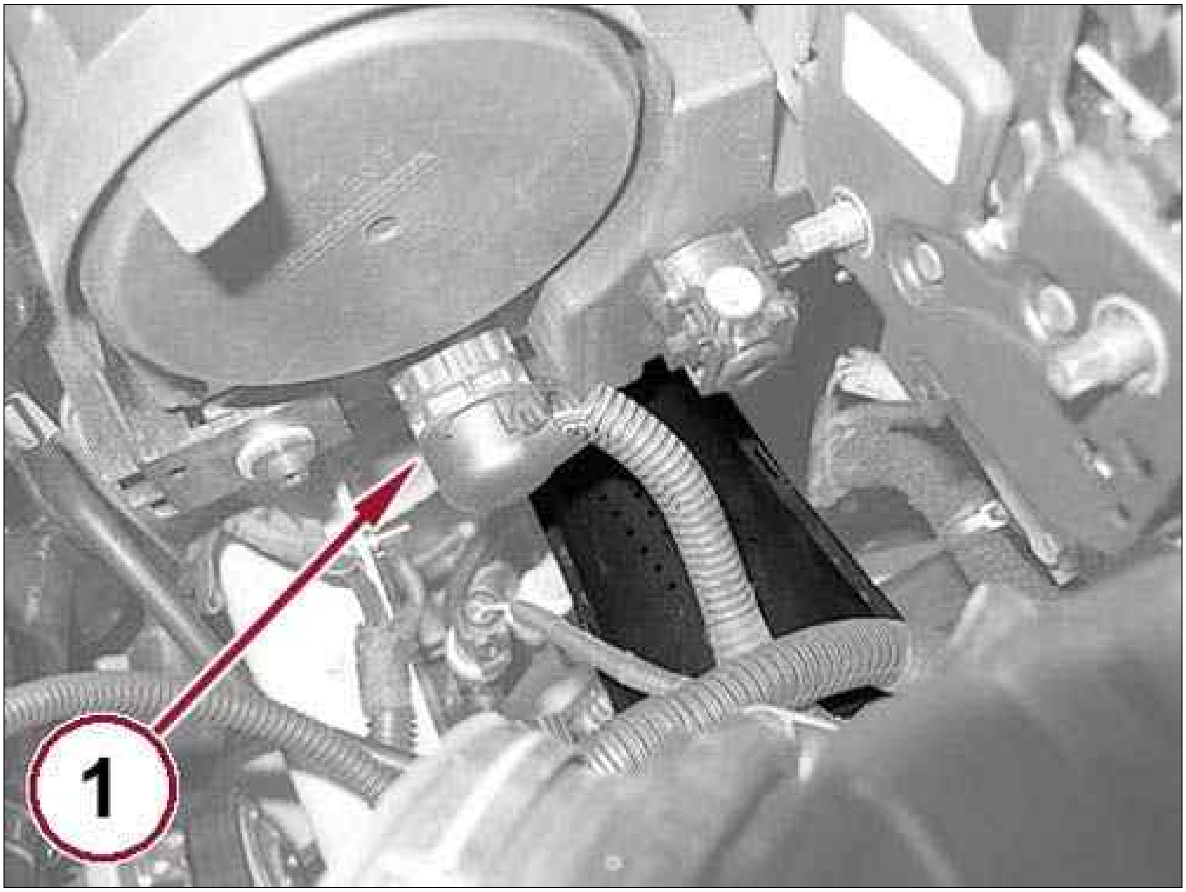
Fig 2: Resonator



Courtesy of CHRYSLER GROUP, LLC

3. Remove the resonator (1).

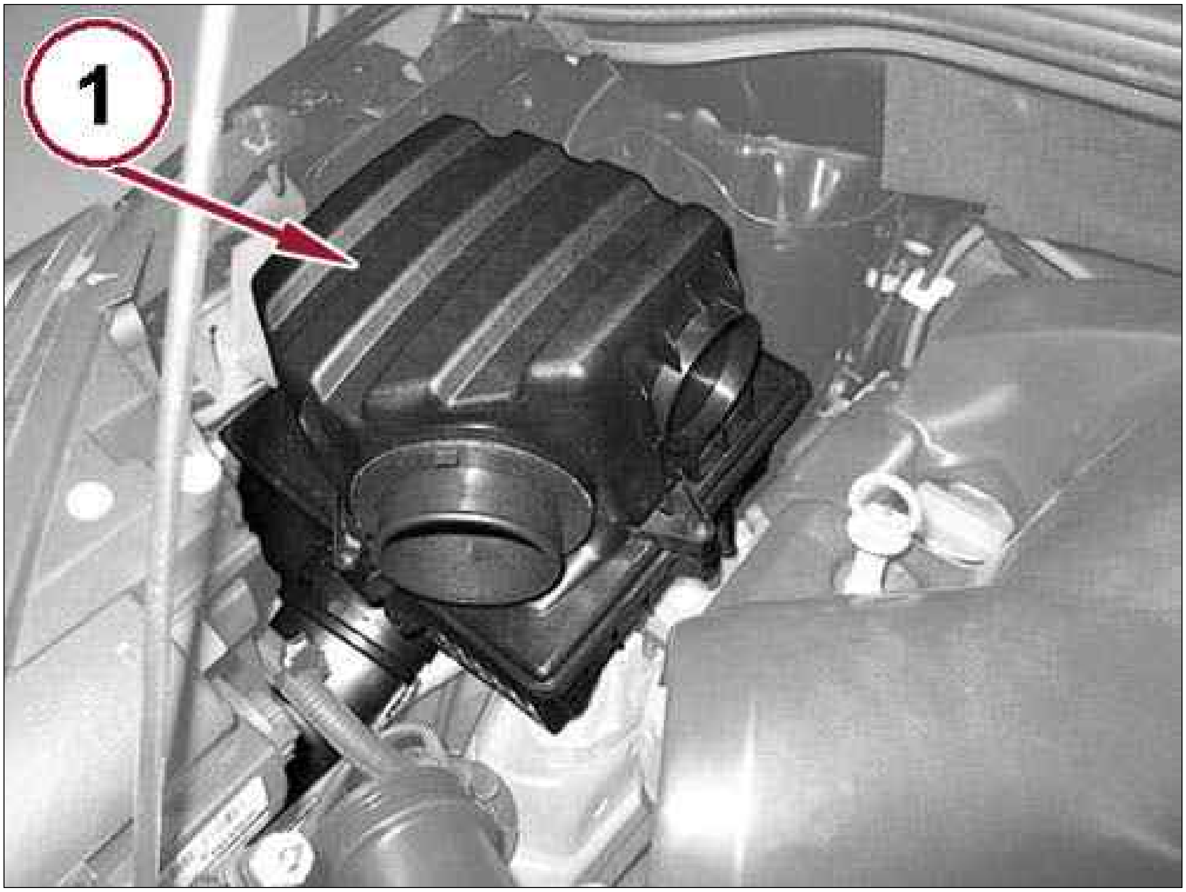
Fig 3: Cold Air Intake Nut



Courtesy of CHRYSLER GROUP, LLC

4. Remove the nut (1) fixing the cold air intake to the front end.

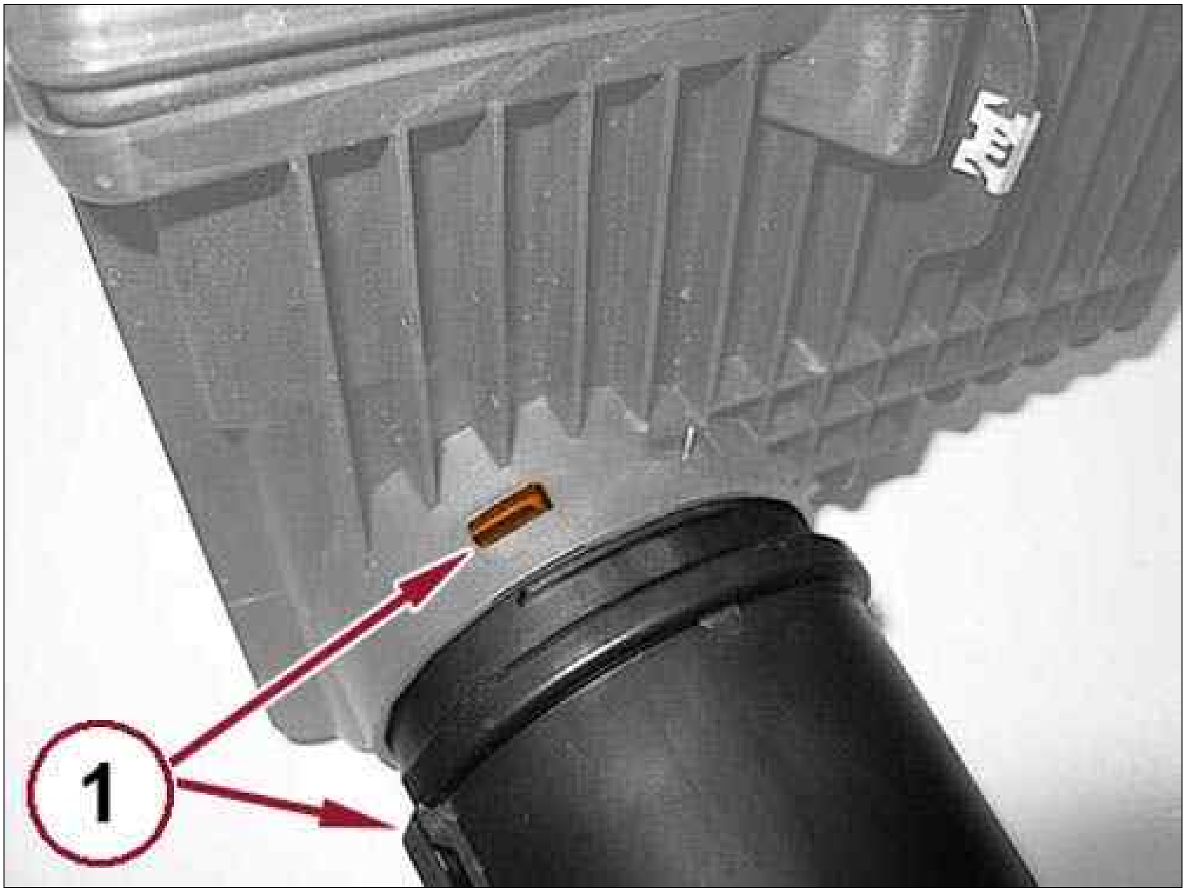
Fig 4: Air Cleaner Body



Courtesy of CHRYSLER GROUP, LLC

5. Remove the air cleaner body (1) from the flexible mountings.

Fig 5: Clips At Cold Air Intake



Courtesy of CHRYSLER GROUP, LLC

6. Release the clips to disconnect the cold air intake (1).

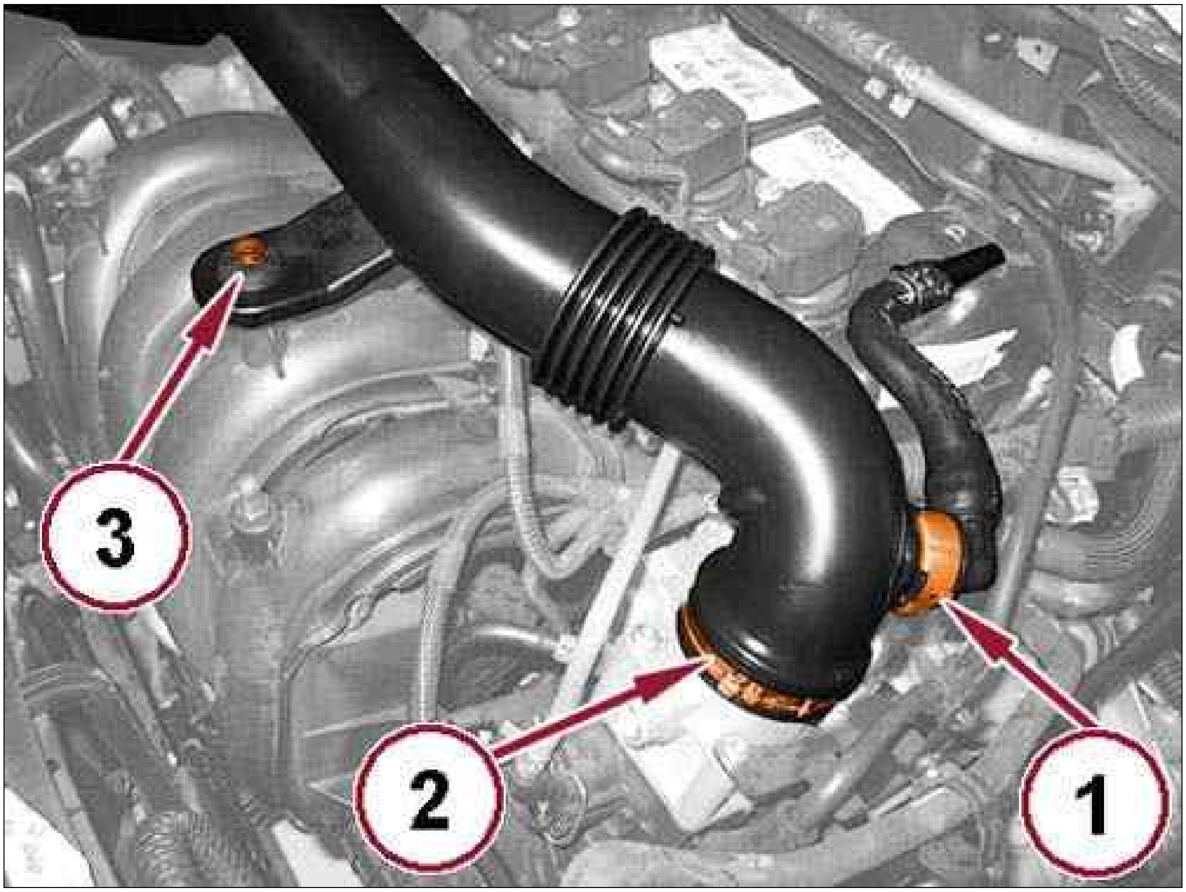
AIR INTAKE SYSTEM > BODY, AIR CLEANER > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Install the cold air intake to the air cleaner and engage the clips.
2. Place the air cleaner assembly back in its housing and engage the flexible mountings.
3. Tighten the nut fixing the cold air intake to the front end.
4. Tighten the resonator to the cold air intake.
5. Install the cover from the wheel arch and securely tighten the screws.
6. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

AIR INTAKE SYSTEM > HOSE, CLEAN AIR > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

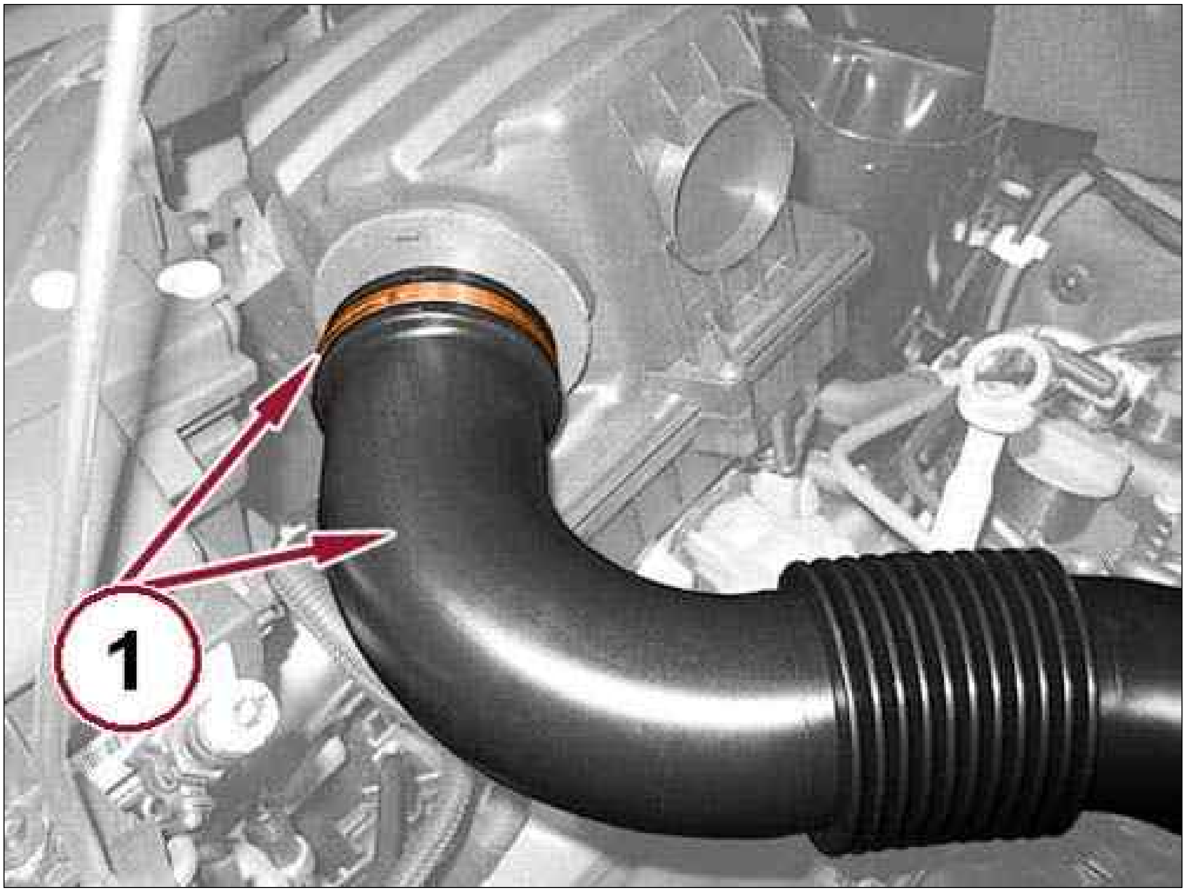
   Fig 1: Oil Vapor Pipe Quick Coupling, Air Tube To Throttle Body Band & Air Tube Bolt



Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the oil vapor pipe quick coupling (1).
3. Loosen the band securing the air tube to the throttle body (2).
4. Remove the bolt securing the air tube (3).

Fig 2: Air Tube Band At Air Cleaner Body



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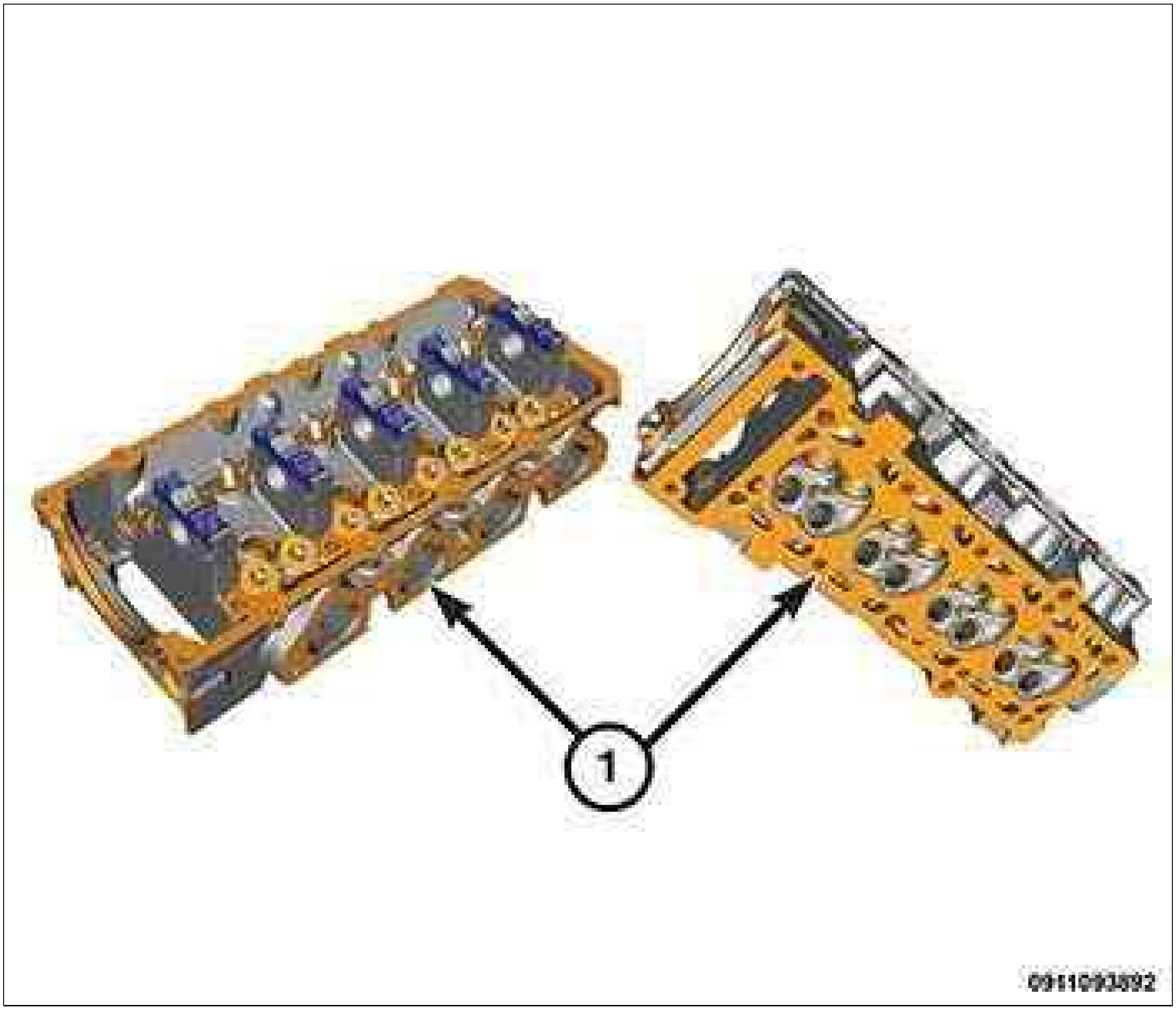
5. Loosen the band and remove the air tube from air cleaner body.

AIR INTAKE SYSTEM > HOSE, CLEAN AIR > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Install the air tube to the air cleaner body and tighten the band clamp.
2. Tighten the fixing screw of the sleeve intermediate bracket.
3. Install the air tube to the throttle body and securely tighten the band clamp.
4. Connect the oil vapor pipe quick coupling.
5. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

CYLINDER HEAD > DESCRIPTION AND OPERATION > DESCRIPTION

Fig 1: Cylinder Head



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The cylinder head (1) is one-piece and made of aluminum alloy. The 4 valves per cylinder are interference fit in their respective valve guides in the respective cylinder head housings.

- The 16 valves of the cylinder head are operated by roller rocker arms controlled through a single camshaft.
- In the cylinder head is a frame which acts as a support for the camshaft. The upper half cap of the camshaft in turn supports another two shafts, which support the automatic clearance recovery rocker arms.
- The cylinder head is 97 mm in height.

CYLINDER HEAD > 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 HEAD > DIAGNOSIS AND TESTING > HYDRAULIC LASH ADJUSTER

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

- Engine oil level too high or too low. This may cause oil aeration. Aerated oil entering the adjusters may cause them to be spongy.
- Insufficient running time after rebuilding the cylinder head. Low speed running up to one hour may be required. Turn the engine off and let set for a few minutes before restarting. Repeat this several times after the engine has reached normal operating temperature.
- Low oil pressure.
- The oil screen in cylinder head or the oil passage to the cylinder head is plugged with debris.
- Air ingested into oil due to broken or cracked oil pump pick-up.
- Worn valve guides.
- Rocker arm ears contacting valve spring retainer.
- Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.
- Oil leak or excessive cam bearing wear in the cylinder head.
- Faulty lash adjuster. Check lash adjusters for "sponginess" while installed in the cylinder head and cam lobe at base circle. Depress part of rocker arm over the adjuster. Normal adjusters should feel firm when pressed quickly. When pressed very slowly, lash adjusters should collapse. Remove suspected lash adjusters, and replace. Before installation, make sure adjusters are full of oil. This can be verified by little plunger travel when lash adjuster is depressed quickly.

CYLINDER HEAD > CLEANING > CLEANING

CAUTION:

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

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

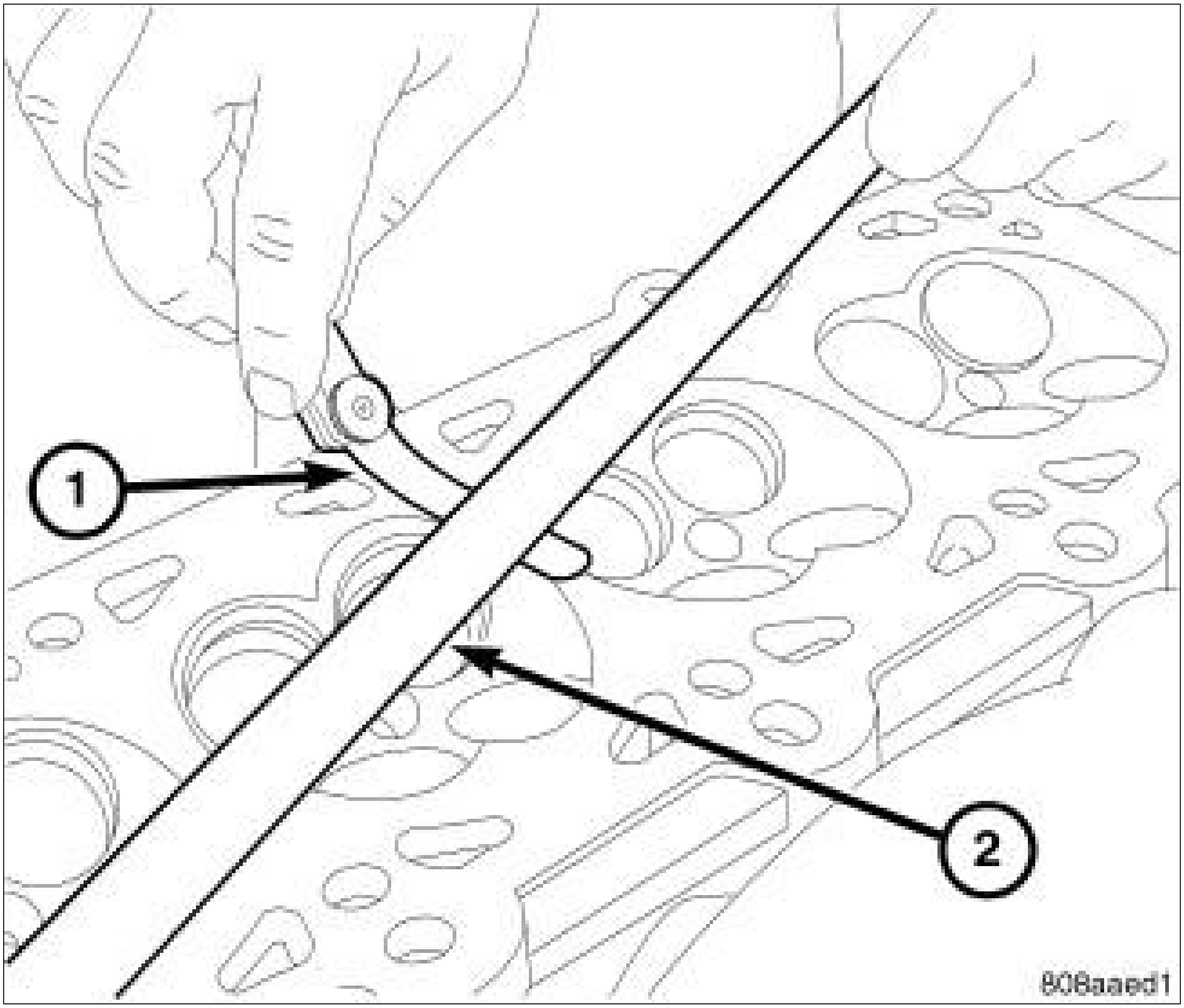
NOTE:

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

1. Remove all gasket material from cylinder head and block. Refer to ENGINE GASKET SURFACE PREPARATION . Do not damage the aluminum head sealing surface.
2. Clean all the engine oil passages.
3. Clean out the cylinder head bolt holes in the engine block.

CYLINDER HEAD > INSPECTION > INSPECTION

Fig 1: Checking Cylinder Head Flatness



Courtesy of CHRYSLER GROUP, LLC

NOTE:

Typical Cylinder Head shown in illustration.

1. Check the cylinder head for warping with a straight edge (2) and a feeler gauge (1).
2. The cylinder head must be flat within specification. Refer to ENGINE SPECIFICATIONS .
3. Remove any carbon or varnish deposits from inside of valve guides with a reliable guide cleaner.
4. Inspect the following components and verify that they are within specification.
    1. Valve Springs
    2. Valve Seats

3. Valve Guides
4. Valves

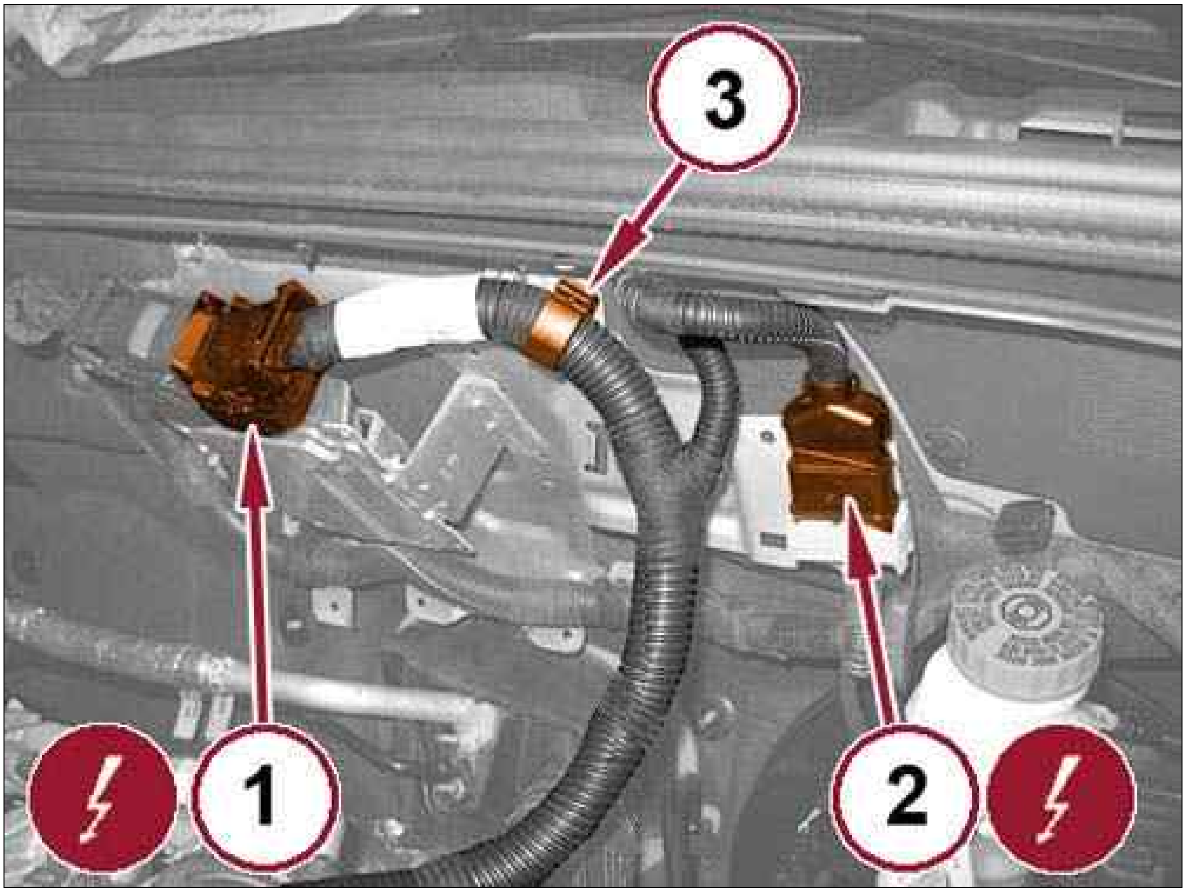
Refer to ENGINE SPECIFICATIONS .

CYLINDER HEAD > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Remove the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
3. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
4. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
5. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
6. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
7. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
8. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
9. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
10. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
11. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
12. Remove the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
13. Remove the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
14. Remove the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
15. Remove the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL AND INSTALLATION .
16. Remove the front oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
17. Remove the rear oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
18. Remove the exhaust manifold. Refer to MANIFOLD, EXHAUST, REMOVAL AND INSTALLATION .

19. Remove the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL AND INSTALLATION .

Fig 1: Powertrain Control Module (PCM) Wire Harness Connector, Engine Front Wire Harness & Clip



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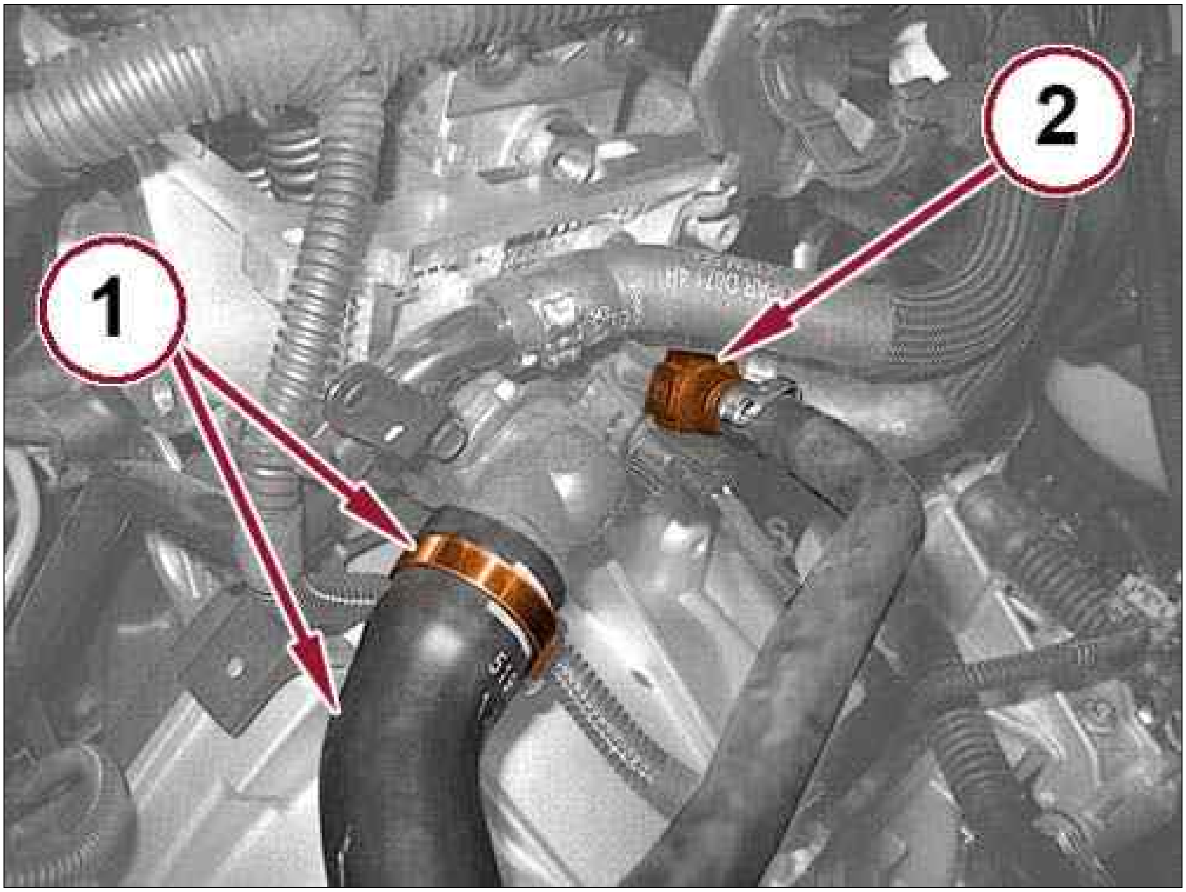
20. Disconnect the Powertrain Control Module (PCM) wire harness connector (1).

21. Disconnect the engine front wire harness (2).

22. Open the clip (3) and release the wiring.

Fig 2: Water Supply Hose Band & Degassing Pipe Quick Coupling



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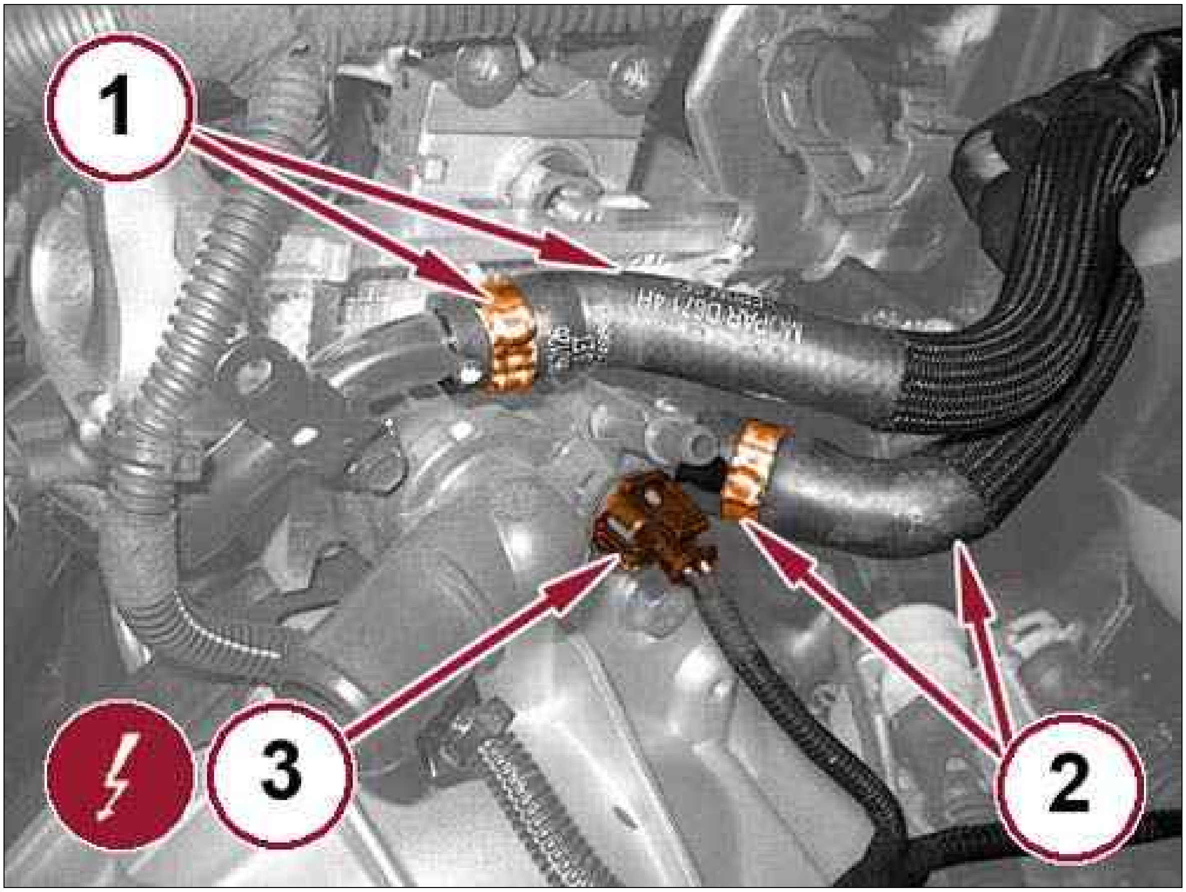
23. Loosen the band and disconnect the water supply hose (1) to the radiator, thermostat side.
24. Disconnect the quick coupling for the degassing pipe (2), thermostat side.

Fig 3: Water Return Pipe, Water Supply Pipe, Bands & Engine Coolant Temperature Sensor Wire Harness Connector



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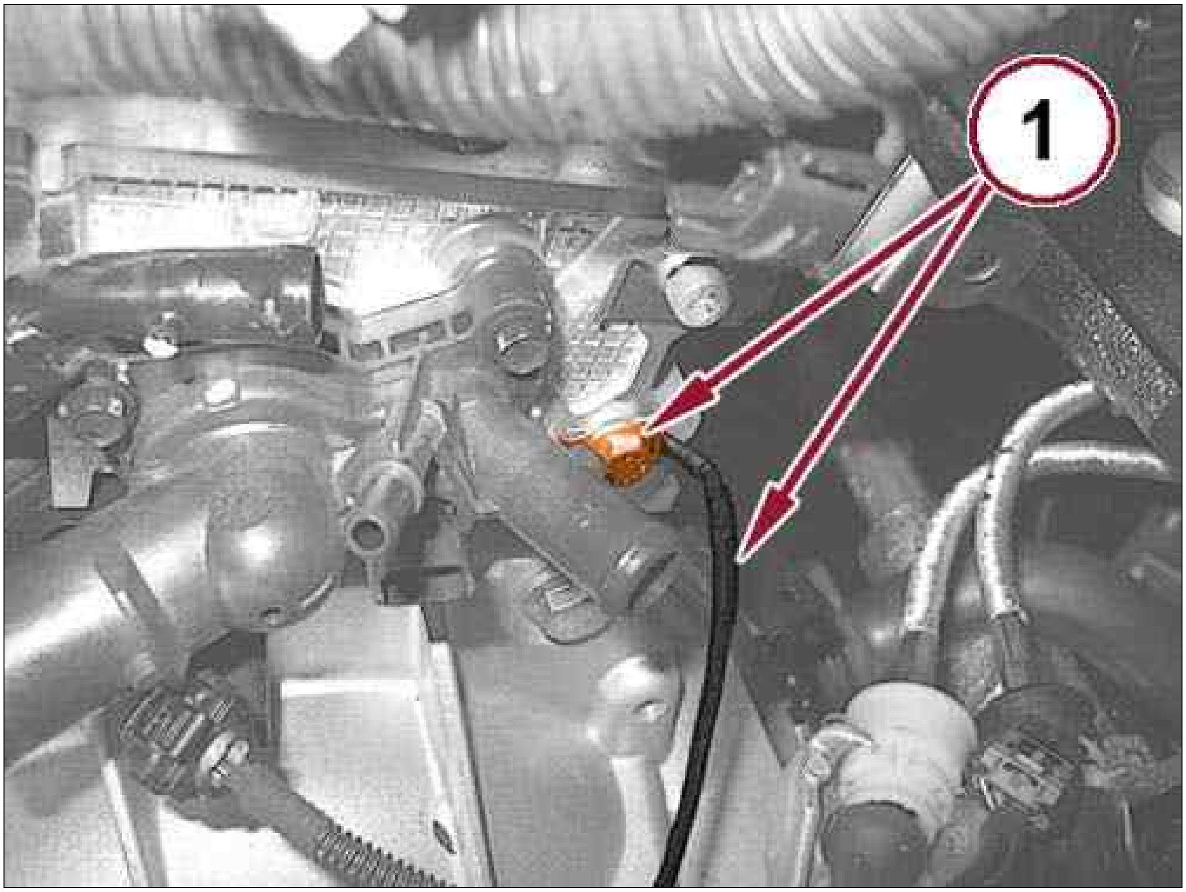
25. Loosen the band and disconnect the water return pipe (1) from the heater, pipe side.
26. Loosen the band and disconnect the water supply pipe (2) to the heater, thermostat side.
27. Detach the engine coolant temperature sensor wire harness connector (3).

Fig 4: Ground Cable & Bolt



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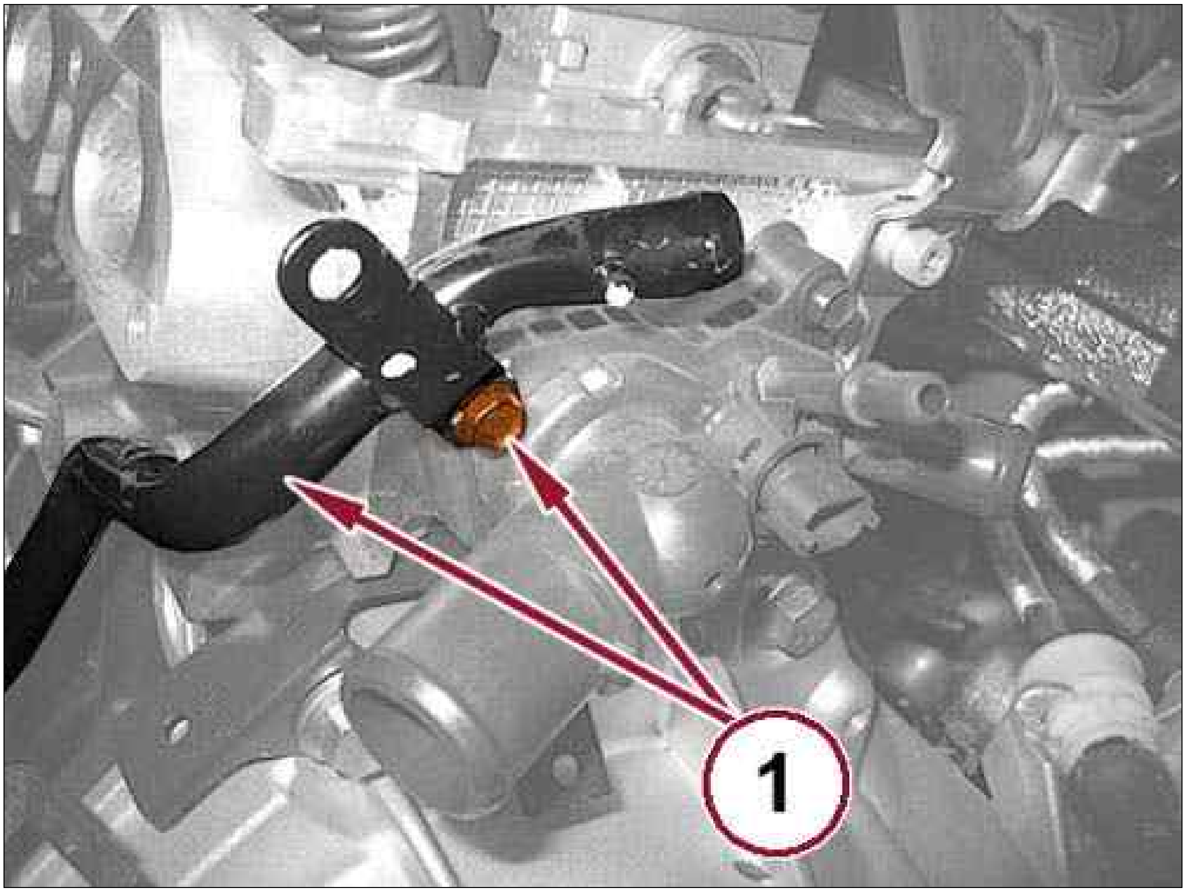
28. Remove the bolt and the ground cable.

Fig 5: Water Pump Return Pipe & Bolt



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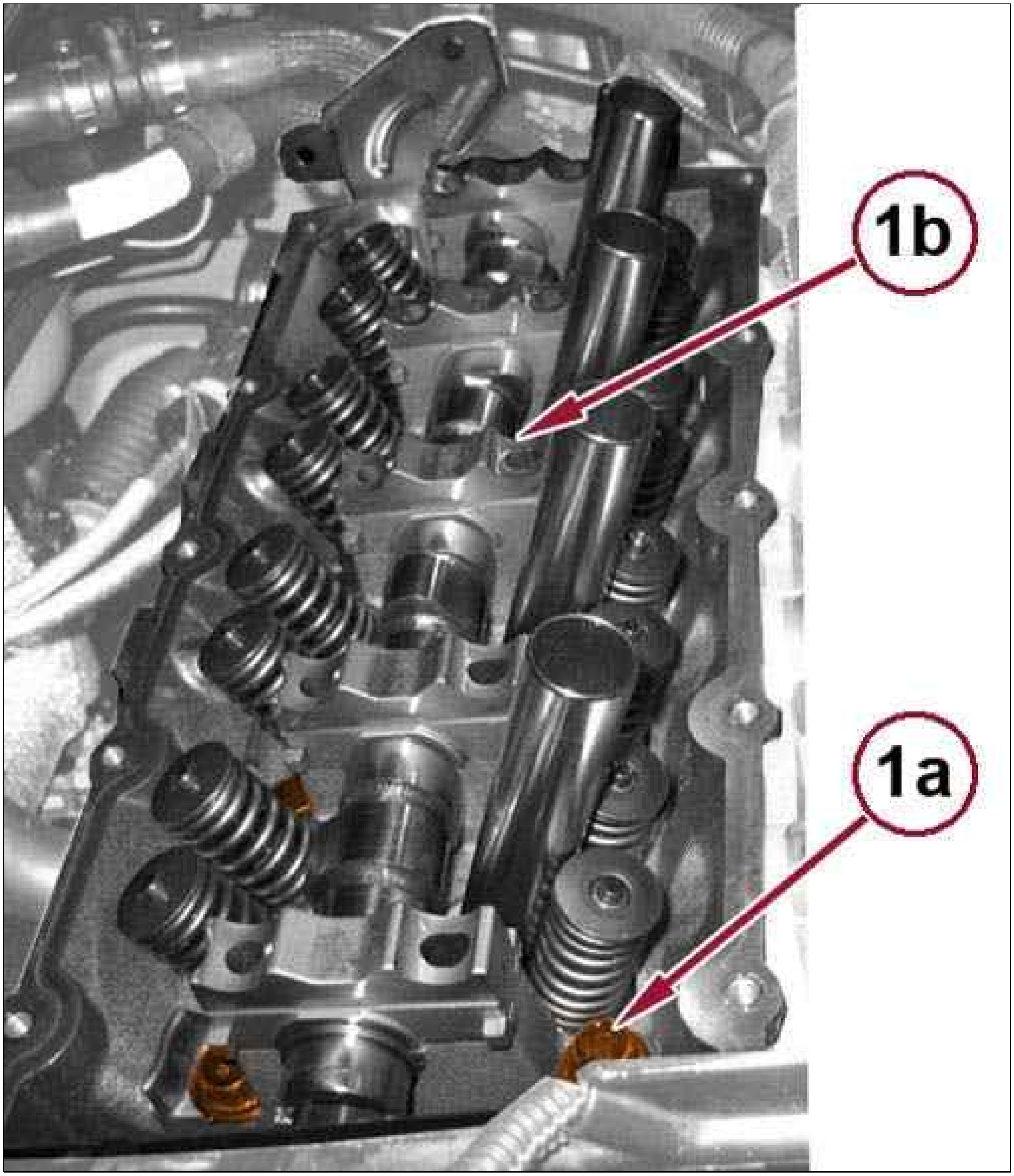
29. Remove the bolt and position aside the water pump return pipe.

Fig 6: Cylinder Head Bolts



Courtesy of CHRYSLER GROUP, LLC

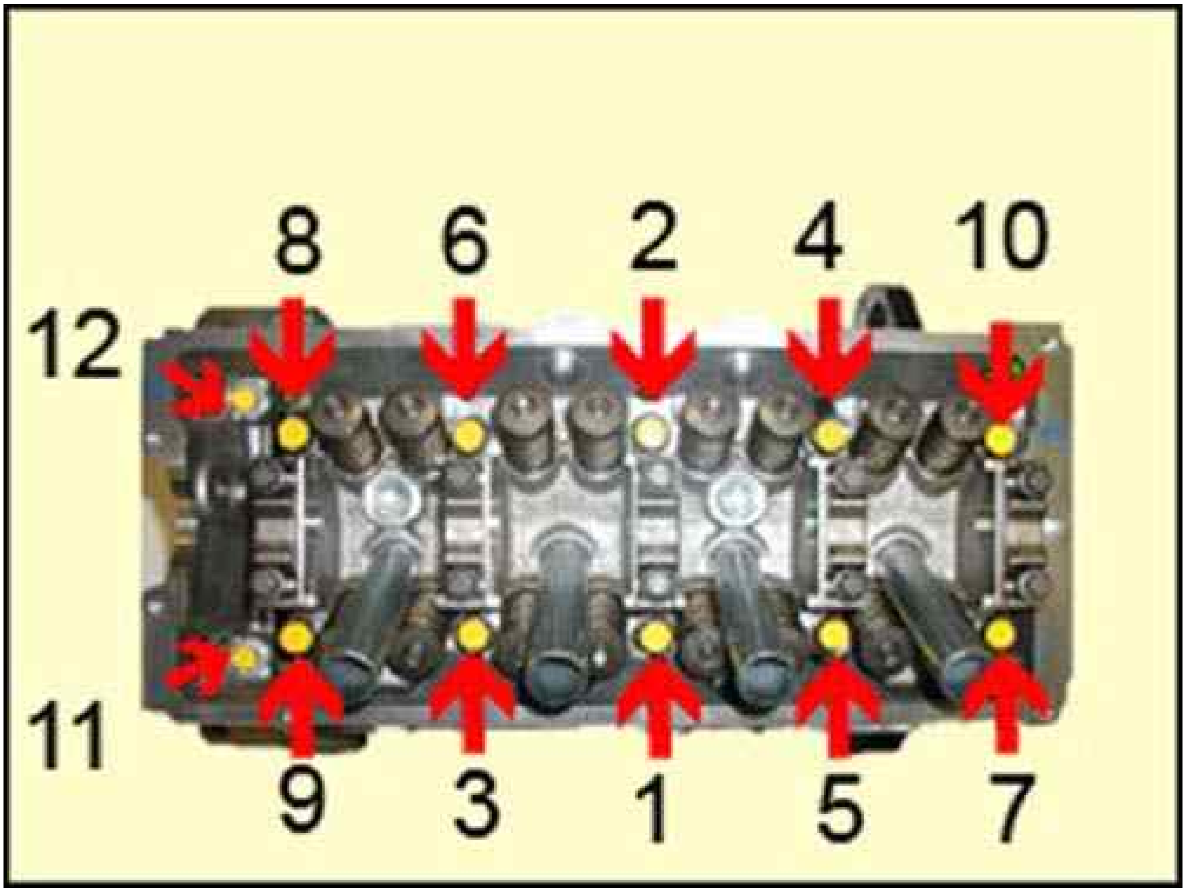
30. Remove the bolts (1a) and the cylinder head (1b).
31. Remove the gasket and check the condition of the locating bushes on the engine block.

CYLINDER HEAD > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Fit a new cylinder head gasket engaging the locating bushes on the engine block.

2. Place the cylinder head in position engaging the locating bushes on the engine block.

   Fig 1: Cylinder Head Bolt Tightening Sequence

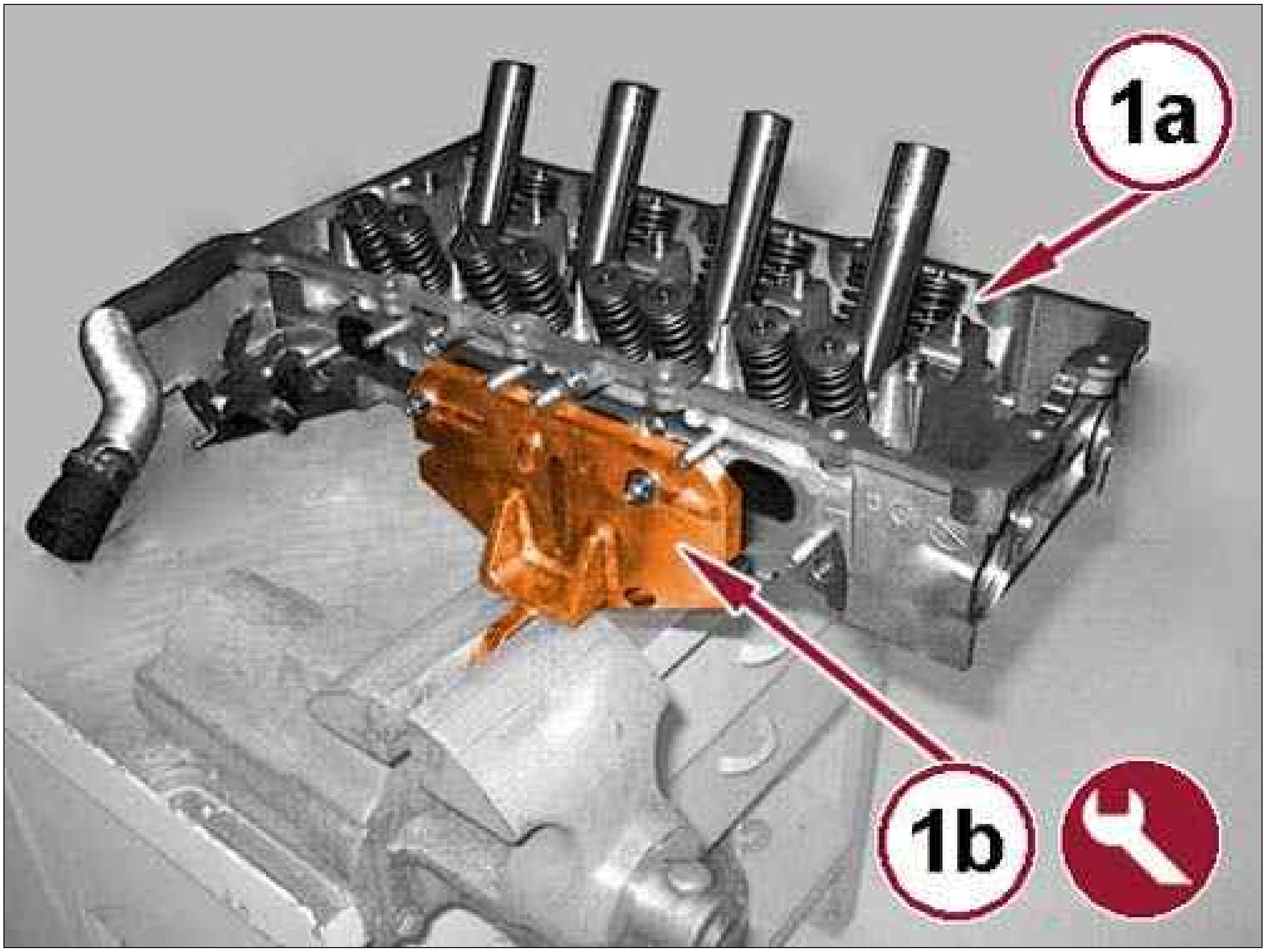
   Courtesy of CHRYSLER GROUP, LLC

3. PROCEED TIGHTENING THE CYLINDER HEAD SCREWS TO THE ENGINE BLOCK, FOLLOWING THE ORDER SHOWN IN THE FIGURE
4. The tightening stages are as follows:
   1. a - Tighten the bolts from 1 to 12 finger tight
   2. b - Tighten the bolts 1 to 10 to 20 N.m (15 ft. lbs.)
   3. c - Tighten the bolts 1 to 10 to 40 N.m (30 ft. lbs.)
   4. d - Tighten the bolts 11 to 12 to 15 N.m (11 ft. lbs.)
   5. e - Tighten the bolts 1 to 10 an additional 90° turn
   6. f - Tighten the bolts 1 to 10 an additional 90° turn
   7. g - Tighten the bolts 11 to 12 to 30 N.m (22 ft. lbs.).
5. Install the return pipe to the water pump in its housing and tighten the bolt to the proper specification. Refer to TORQUE SPECIFICATIONS .
6. Install the ground cable and securely tighten the bolt.
7. Connect the engine coolant temperature sensor wire harness connector.

8. Connect the water delivery pipe to the heater, thermostat side, and tighten the band.
9. Connect the water return pipe from the heater, pipe side and tighten the band.
10. Connect the quick coupling for the degassing pipe, thermostat side.
11. Connect the radiator coolant supply hose, thermostat side, and tighten the band.
12. Connect the engine front wire harness.
13. Connect the Powertrain Control Module (PCM) wire harness connector.
14. Engage the wiring retaining clip.
15. Install the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL AND INSTALLATION .
16. Install the exhaust manifold. Refer to MANIFOLD, EXHAUST, REMOVAL AND INSTALLATION .
17. Install the rear oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
18. Install the front oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
19. Install the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL AND INSTALLATION .
20. Install the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
21. Install the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
22. Install the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
23. Install the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
24. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
25. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
26. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
27. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
28. Evacuate and charge the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
29. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
30. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
31. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
32. Install the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
33. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

CYLINDER HEAD > REMOVAL AND INSTALLATION > DISASSEMBLY AND REASSEMBLY > DISASSEMBLY

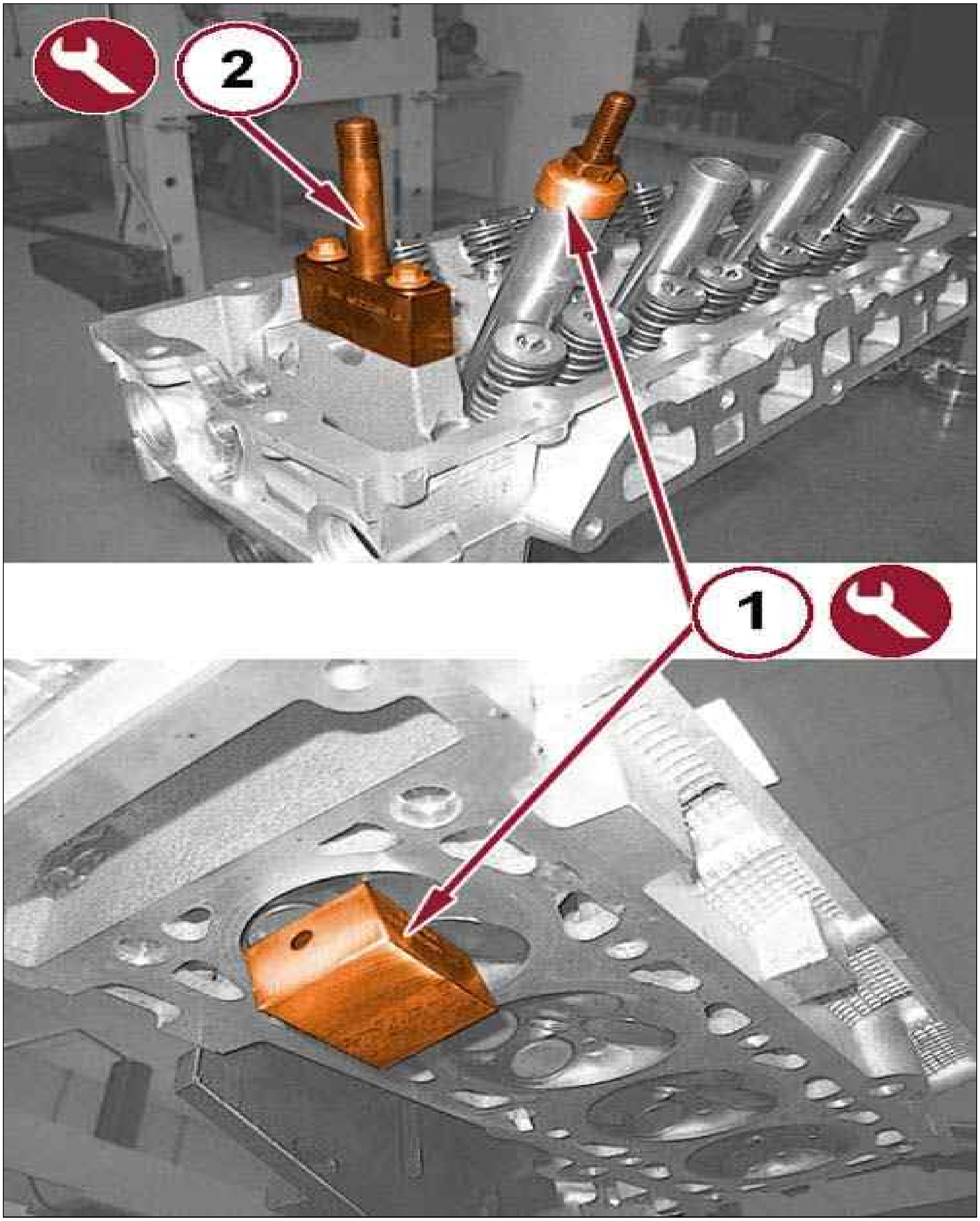
Fig 1: Placing Cylinder Head In A Vise Using Support Tool



Courtesy of CHRYSLER GROUP, LLC

1. Position the cylinder head (1a) in the vice, supporting it using the support tool (1b).

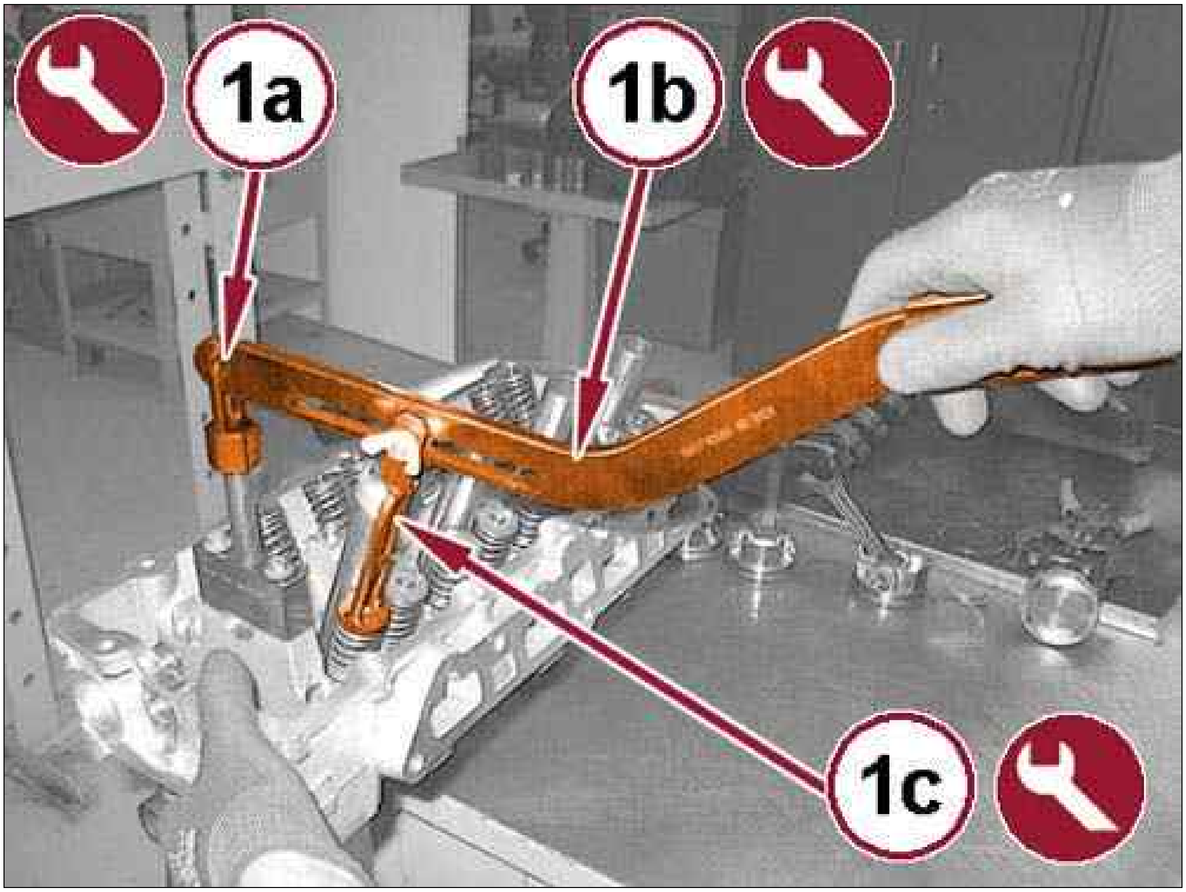
Fig 2: Fitting Valve Retaining Tool & Camshaft Front Support Tool



Courtesy of CHRYSLER GROUP, LLC

2. Fit the valve retaining tool (1).
3. Fit the tool on the camshaft front support (2).

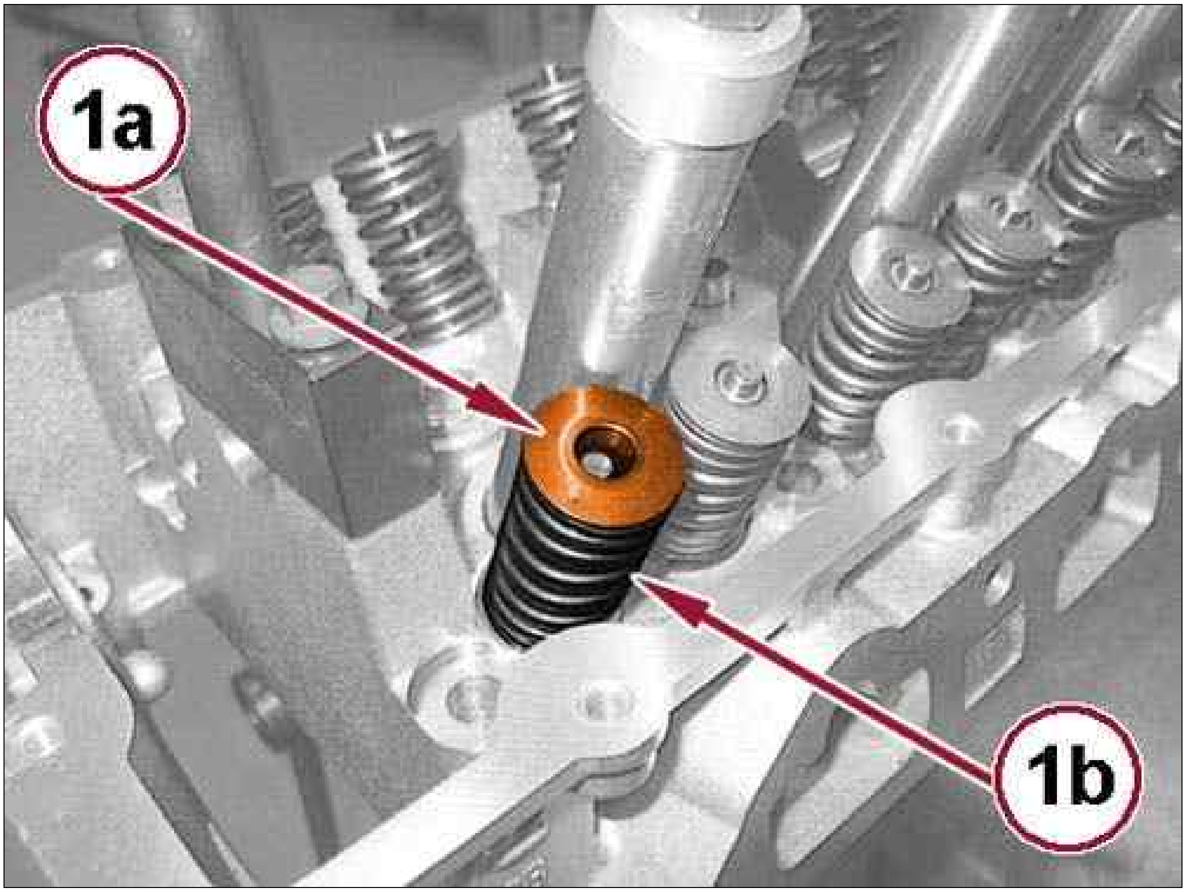
Fig 3: Compressing Valve Spring Using Special Tools



Courtesy of CHRYSLER GROUP, LLC

4. Using the tools (1a), (1b) and (1c), compress the spring and remove the valve spring upper shim retaining half-cones.

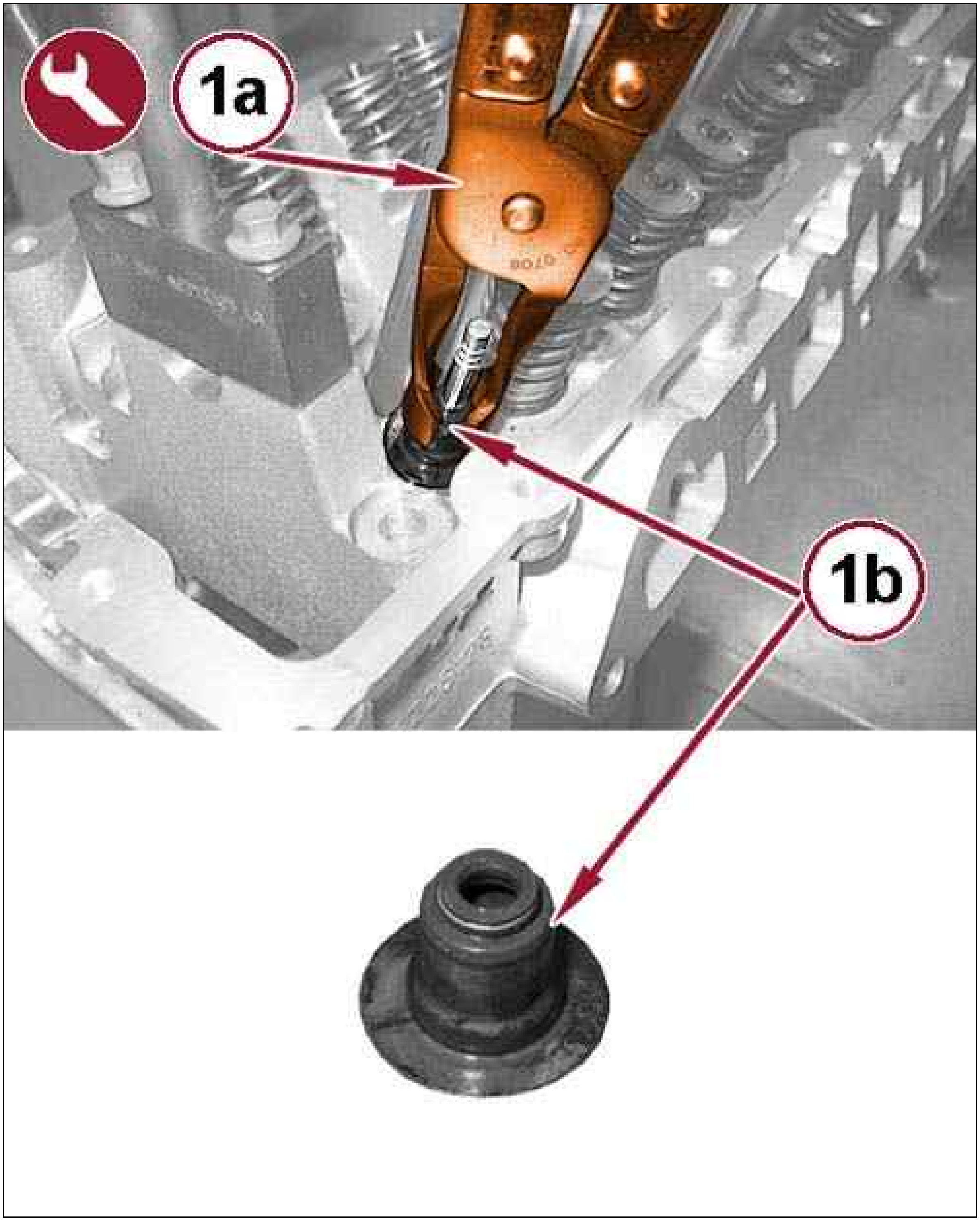
Fig 4: Upper Shim & Valve Spring



Courtesy of CHRYSLER GROUP, LLC

5. Remove the upper shim (1a) and the valve spring (1b).

Fig 5: Removing Oil Sealing Ring Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

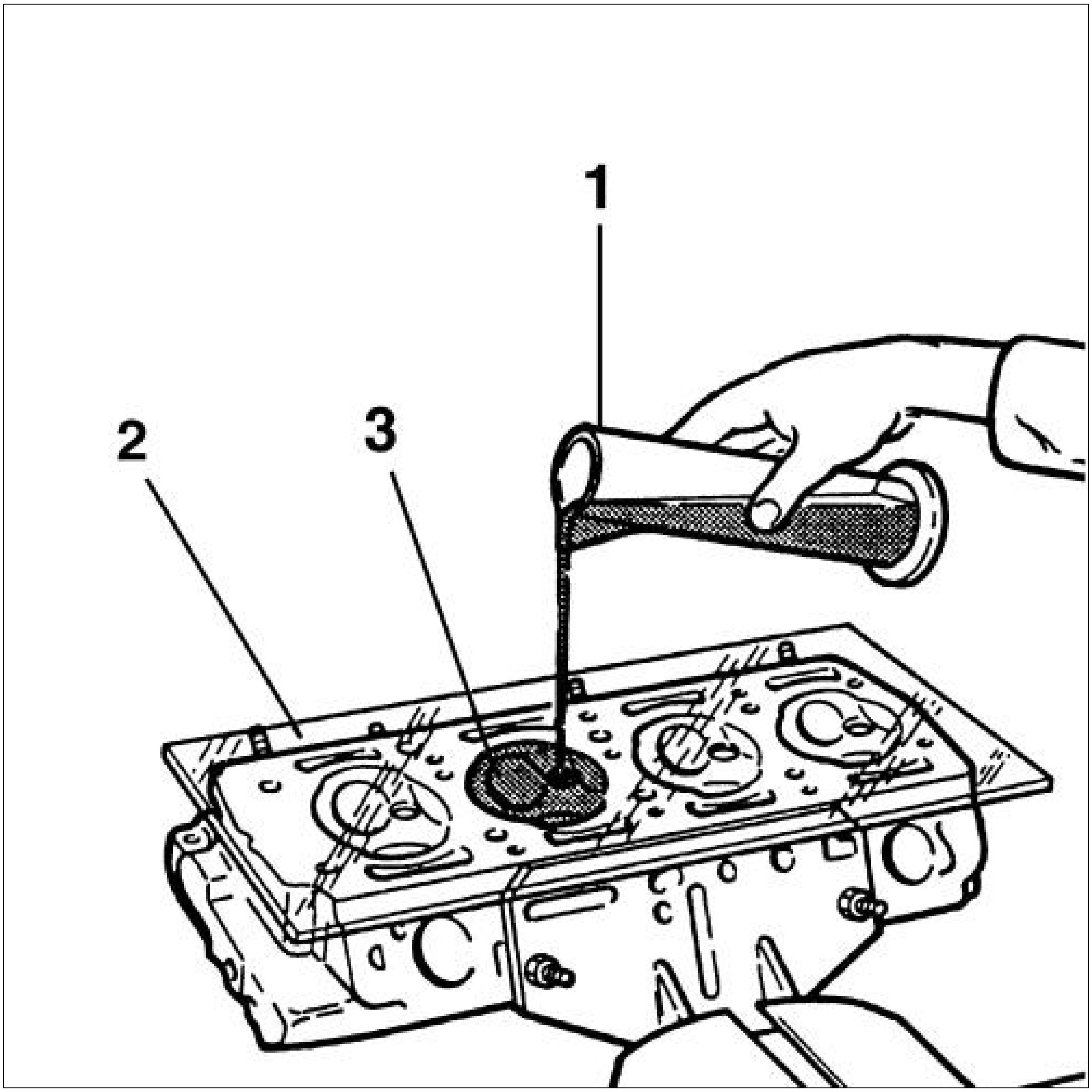
6. Using the tool (1a), remove the oil sealing rings (1b) with built-in spring lower shim.
7. Proceed in the same way for the remaining three valves of the cylinder.
8. Remove the valve retaining tool and keep the intake and exhaust valves.
9. Proceed in the same way for removing the valves of the remaining pistons.

10. Replace the valve guides. Refer to VALVE GUIDES, REMOVAL AND INSTALLATION .

CYLINDER HEAD > REMOVAL AND INSTALLATION > DISASSEMBLY AND REASSEMBLY > ASSEMBLY

1. Clean any residues of the gasket from the lower cylinder head plane.
2. Check that the flatness of the cylinder head lower surface corresponds to the recommended values.
3. If necessary, flatten the lower cylinder head surface; it is permitted to remove 0.1 mm of material from the minimum cylinder head height (factory value).
4. Check the volume of all combustion chambers proceeding as described below.
5. Fit the valves and spark plugs provisionally. Take a graduated burette containing a known amount of engine oil.
6. Rest a glass plate on the cylinder head with holes corresponding to the combustion chambers.

Fig 1: Filling Combustion Chamber On Cylinder Head With Oil

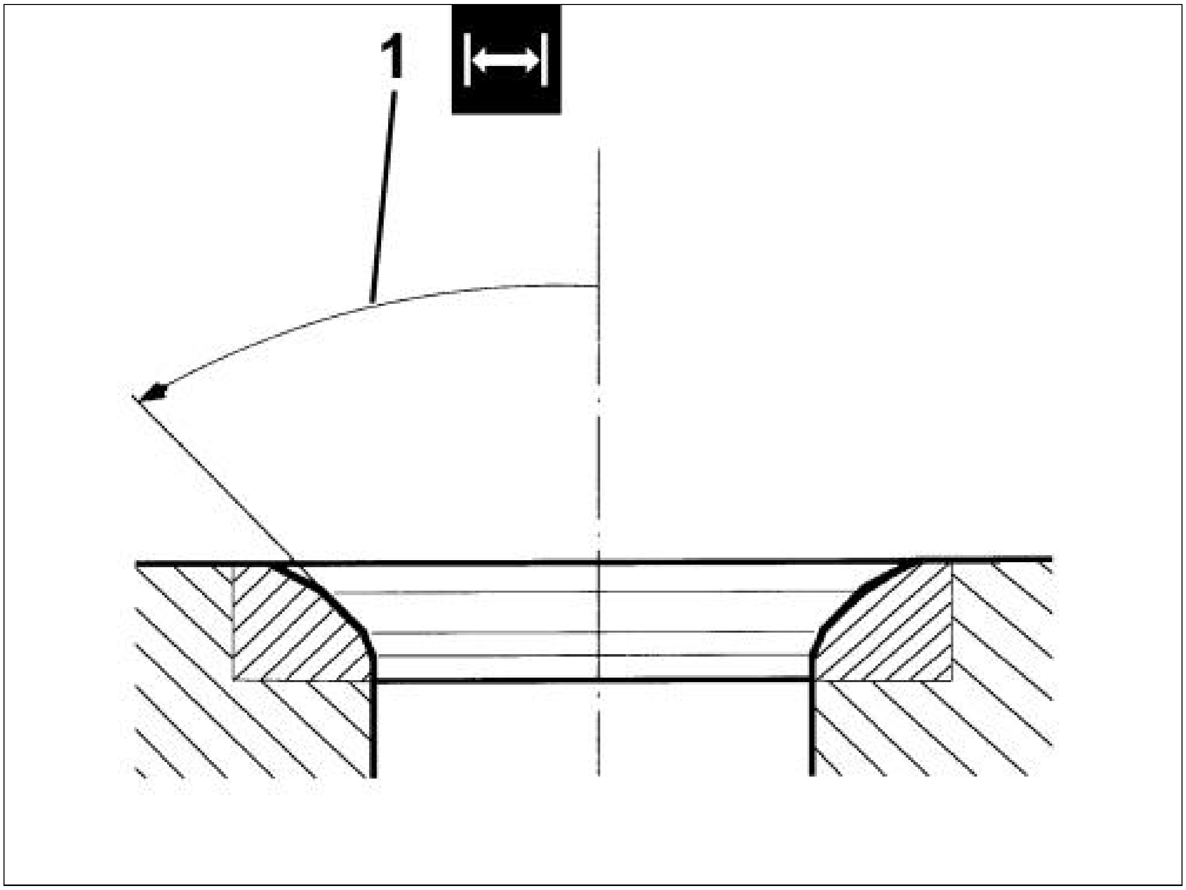


Courtesy of CHRYSLER GROUP, LLC

7. Fill the combustion chamber completely, taking care not to pour oil outside of the combustion chamber.
8. Wait about 10 minutes to allow the oil to decant.
9. Measure the amount of oil remaining in the burette and then calculate the difference between this and the amount of oil used initially with the burette full. The difference is the volume of the combustion chamber in the cylinder head.
10. Check that this value is within the specified values; if it is not, replace the cylinder head.
11. Check that the valve stem does not show signs of grooves or seizing.
12. Check that the diameter of the valve stems corresponds to the recommended figures; if not, replace the worn valves.

13. Check that the diameter of the valve head corresponds to the prescribed figures; if not, replace the worn valves.
14. Check that the inner diameter of the valve guide and the clearance between it and the valve are within specified values, otherwise replace the valve guide.
15. If necessary, replace the valve guides. Refer to VALVE GUIDES, REMOVAL AND INSTALLATION .
16. Check that the length of the valve springs released is within the prescribed values.
17. Using a suitable tool, check that the valve spring specifications correspond to the prescribed figures; if not, replace the worn components.
18. Check that the diameter of the camshaft bearings corresponds to the recommended figures; if not, replace the worn camshaft.
19. Check that the diameter of the camshaft supports corresponds to the prescribed figures; if not, replace the cylinder head.
20. Check that the clearance between the pins and the camshaft supports is within the prescribed values.
21. Check that the camshaft end float is within the prescribed values.
22. Check that the nominal camshaft cam lift corresponds to the recommended figures; if not, replace the worn camshaft.
23. Check that the total height of the shaft plus cam is within the prescribed values.

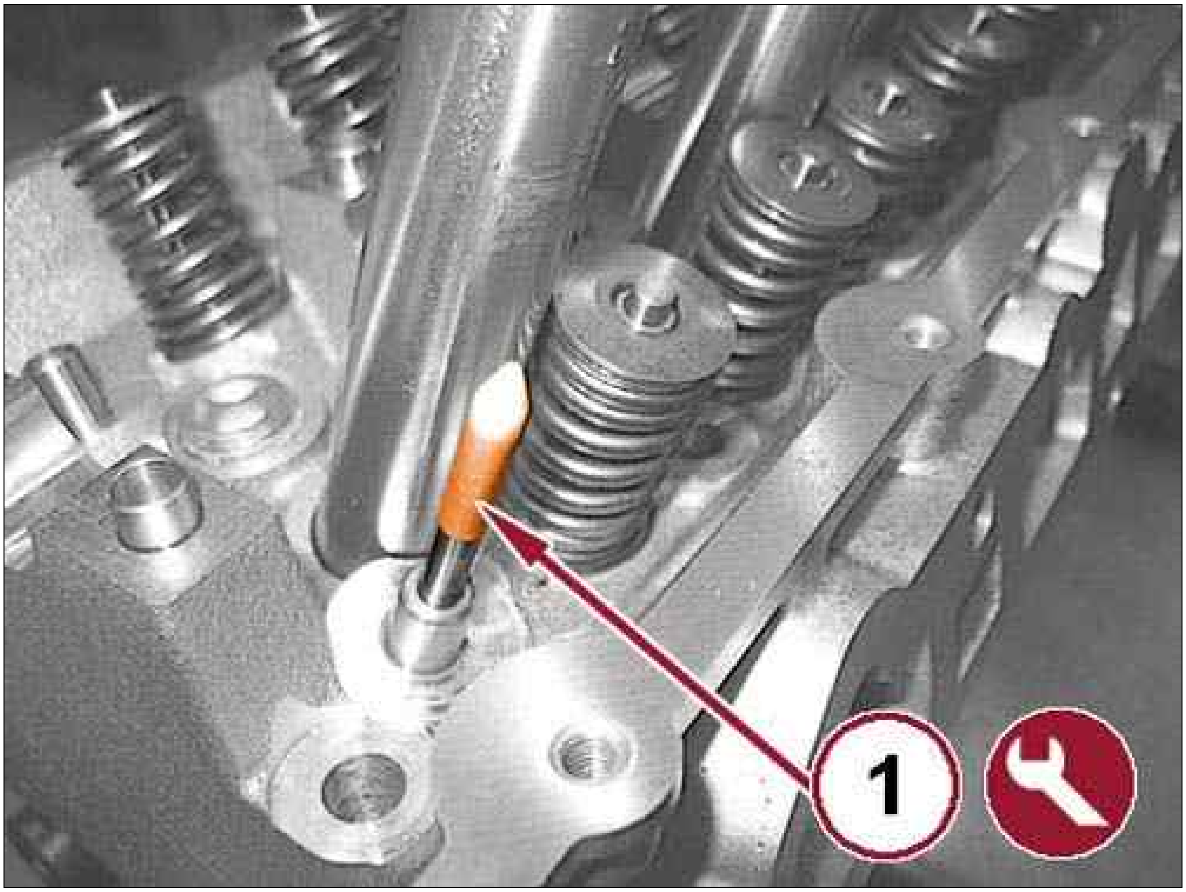
Fig 2: Grinding Valve Seat



Courtesy of CHRYSLER GROUP, LLC

24. Grind the valve seats to the prescribed size.
25. Grind the valve seats using a suitable tool.
26. Position the cylinder head in the vice using the tool.
27. Fit the valves in the seats, then support them using the valve retaining tool.

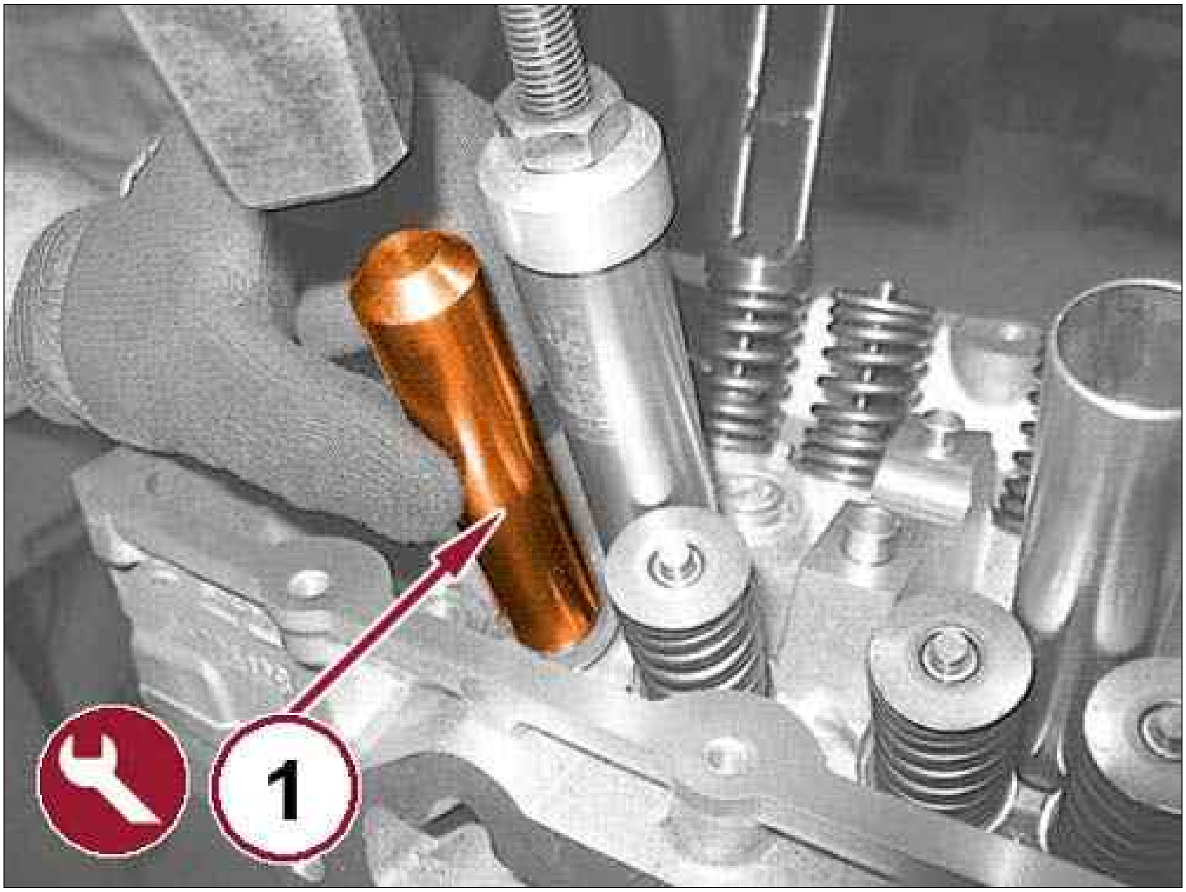
Fig 3: Positioning Fitting Tool For Installation Of Valve Guide Oil Seal



Courtesy of CHRYSLER GROUP, LLC

28. Position the fitting tool (1) for the installation of the valve guide oil seal as shown in the figure.

Fig 4: Fitting Valve Guide Oil Seal With Built-In Lower Shim Using Special Tool

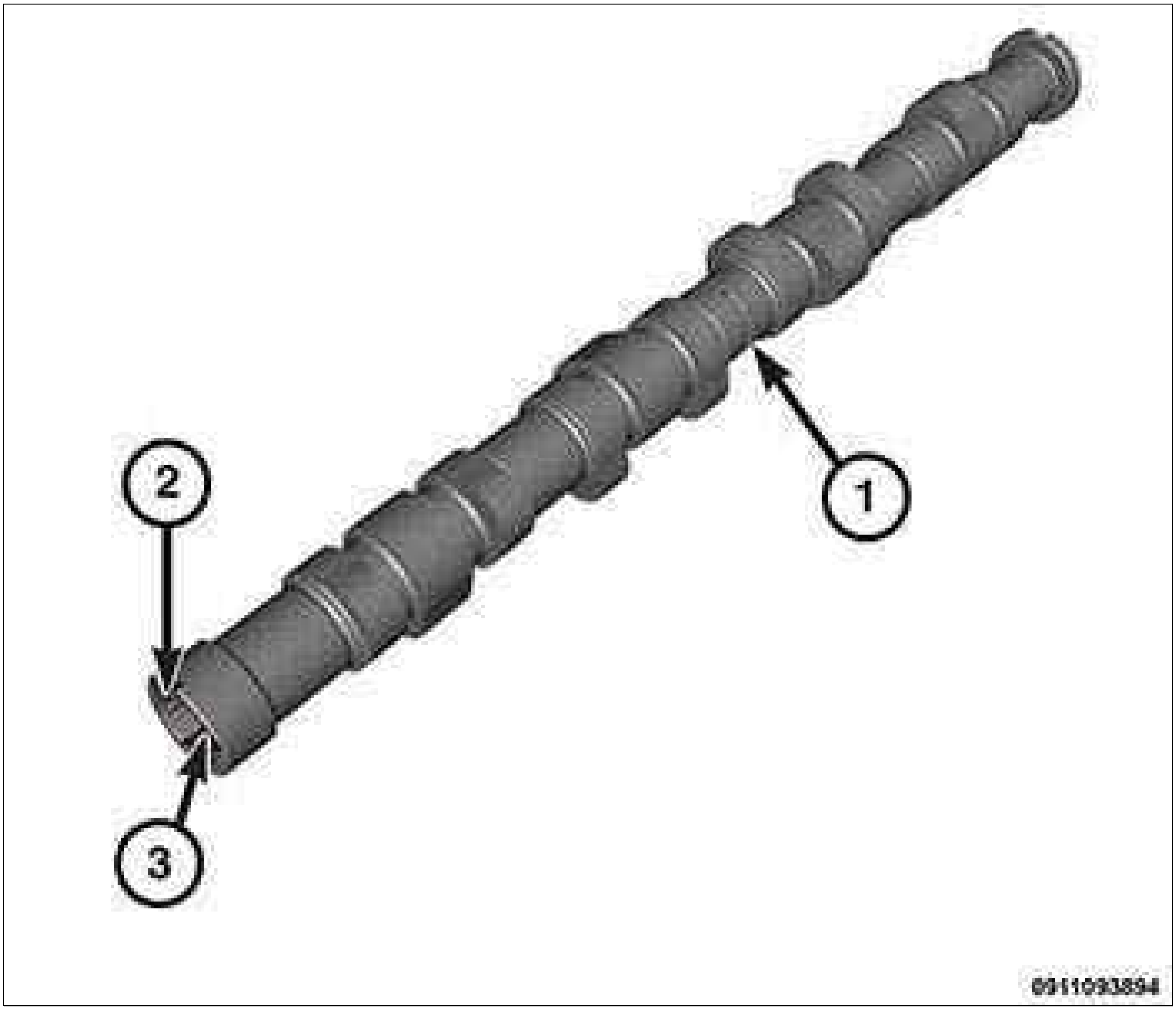


Courtesy of CHRYSLER GROUP, LLC

29. Fit the valve guide oil seal with built-in lower shim using the tool (1) as shown in the figure.
30. Place the valve spring and the upper shim back in the housing.
31. Place the upper shim retaining half-cones back in their housings with the tools used for the removal.
32. Proceed in a similar way for the other valves.
33. Remove the tools used for fitting the valves.
34. Undo the nuts and remove the cylinder head from the support tool.

CYLINDER HEAD > CAMSHAFT, ENGINE > DESCRIPTION > DESCRIPTION

Fig 1: Camshaft



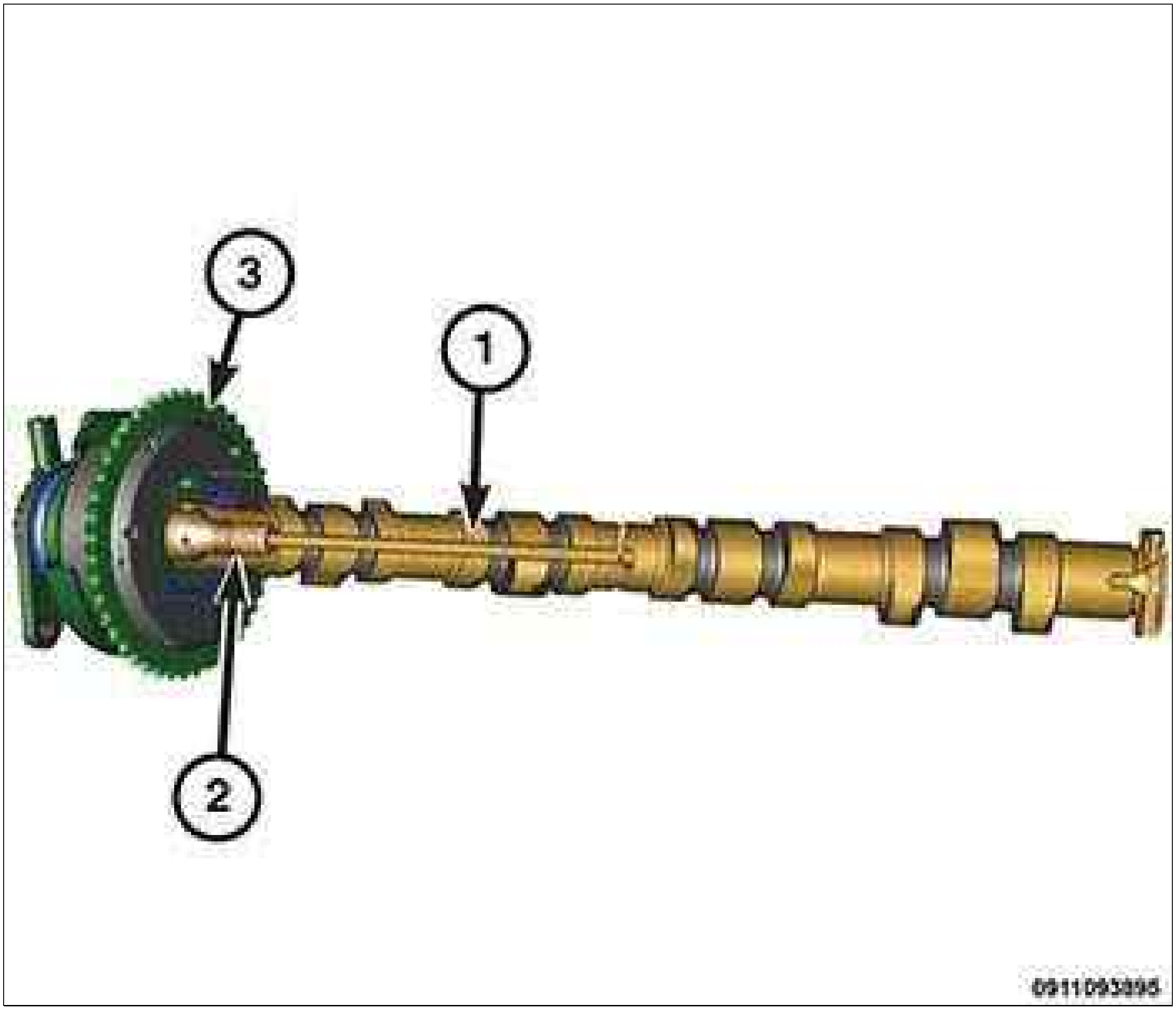
Courtesy of CHRYSLER GROUP, LLC

The cast-iron camshaft has three cams for each cylinder:

- Two - smaller - cams operate the rocker arms that move the intake valves.
- The cam - larger - operates a specific rocker arm that moves the exhaust valves.

The camshaft has 4 oil entry holes in the area with the first timing side bearing at the height where the variable valve timing unit is fixed on the camshaft. The holes are filled and pressurized with the engine oil from the cylinder head.

Fig 2: Variable Valve Timing (VVT) Unit, Fixing Screw & Oil Filling Duct



Courtesy of CHRYSLER GROUP, LLC

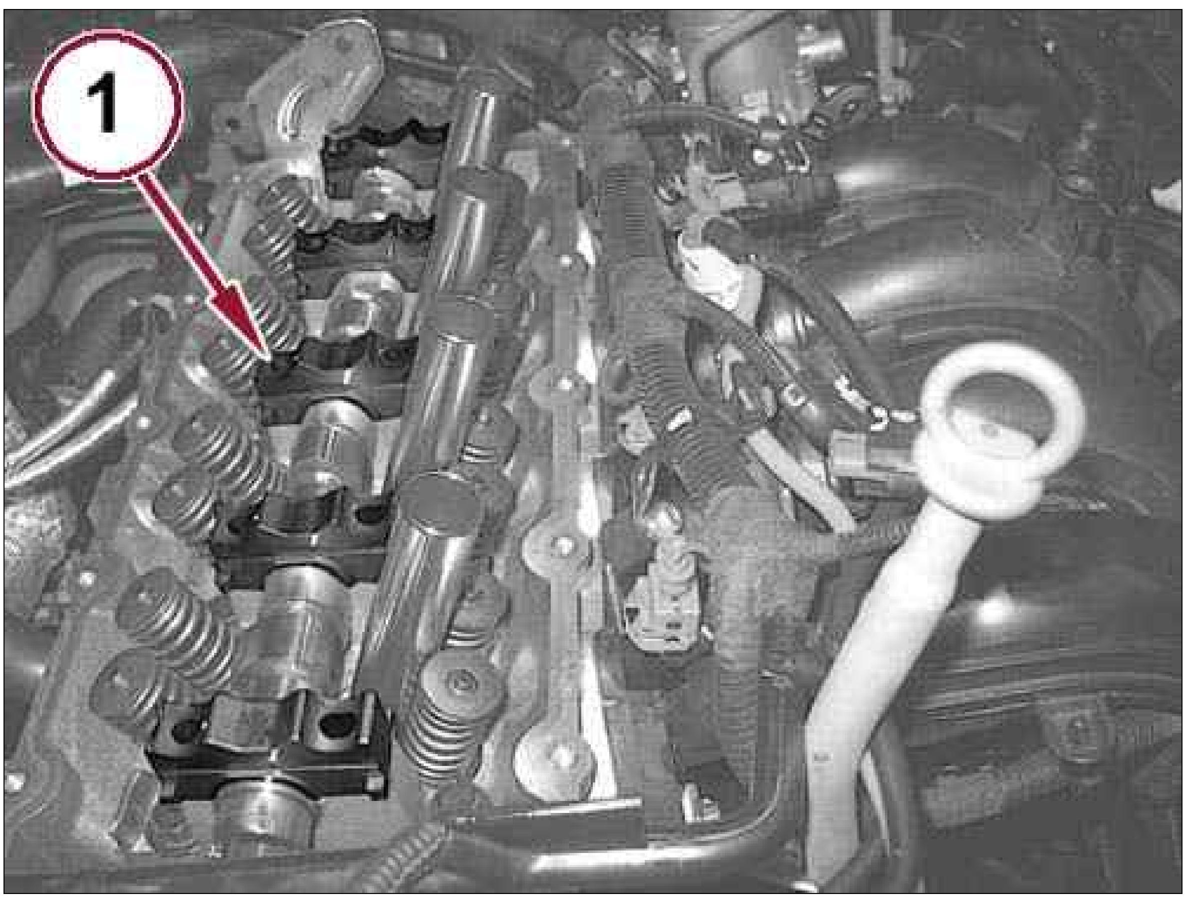
The engine oil is used both to lubricate the mounting and also for filling and the operation of the Variable Valve Timing (VVT) unit through the VVT unit fixing screw (2) and oil filling duct (1), which is hollow precisely in order to permit the transfer of oil to the VVT unit (3).

CYLINDER HEAD > CAMSHAFT, ENGINE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Remove the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
3. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
4. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .

5. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
6. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
7. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
8. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
9. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
10. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
11. Remove the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
12. Remove the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
13. Remove the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
14. Remove the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL AND INSTALLATION .

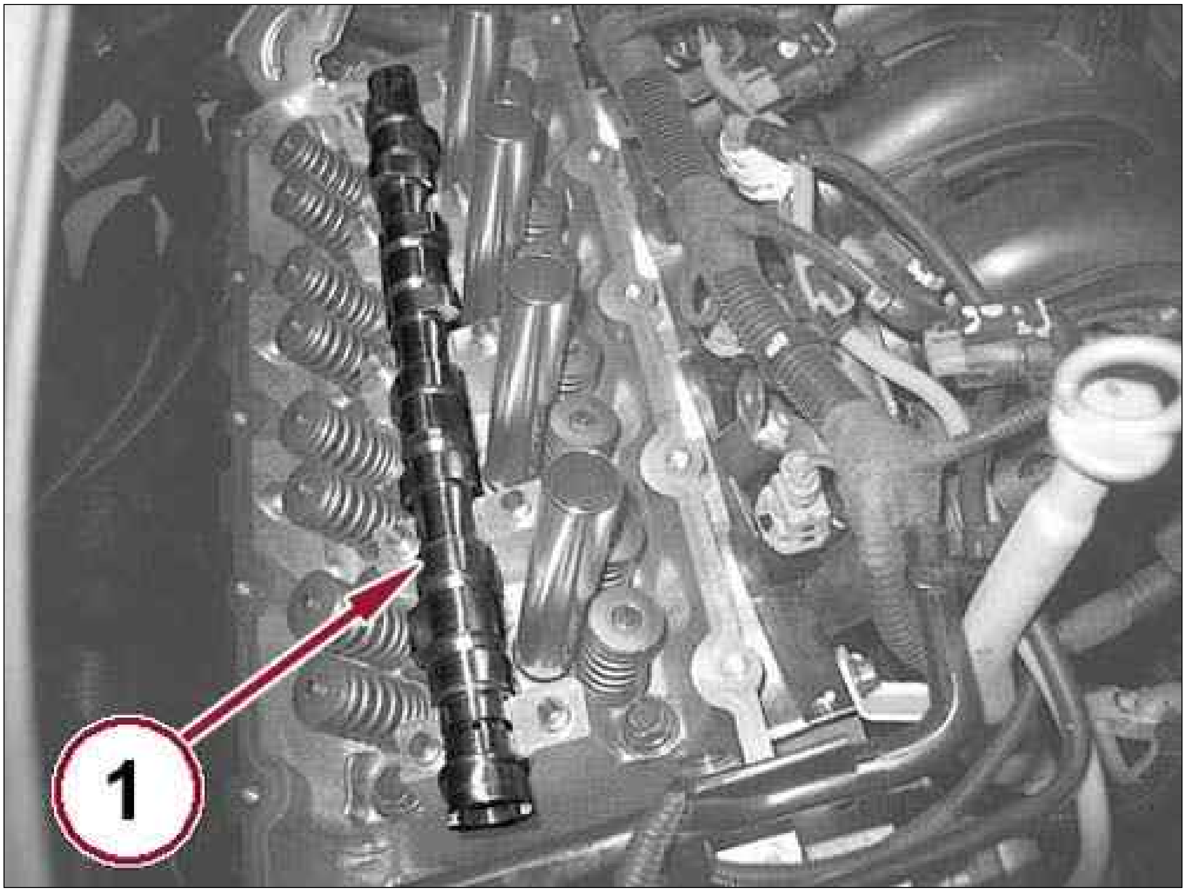
Fig 1: Camshaft Caps



Courtesy of CHRYSLER GROUP, LLC

15. Remove the camshaft caps (1).

Fig 2: Camshaft In Cylinder Head

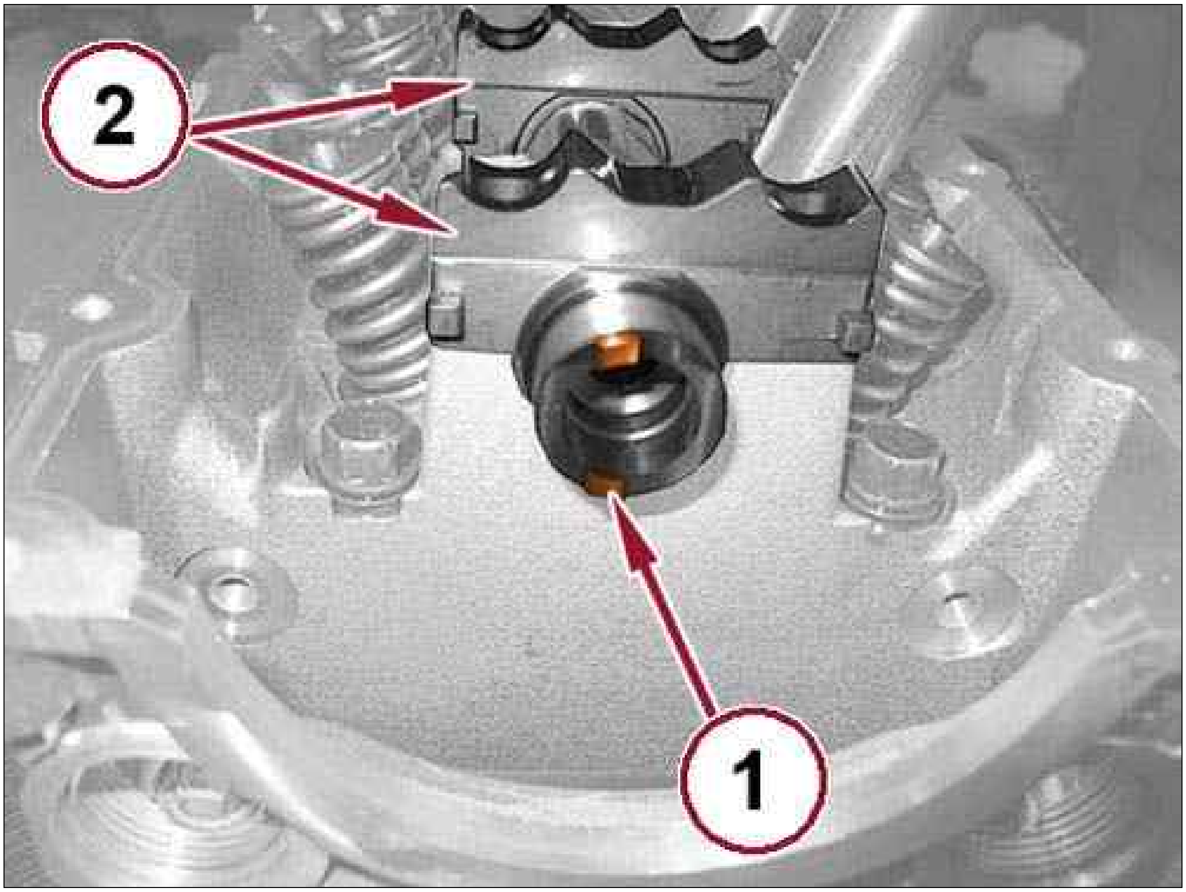


Courtesy of CHRYSLER GROUP, LLC

16. Remove the camshaft.

CYLINDER HEAD > CAMSHAFT, ENGINE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

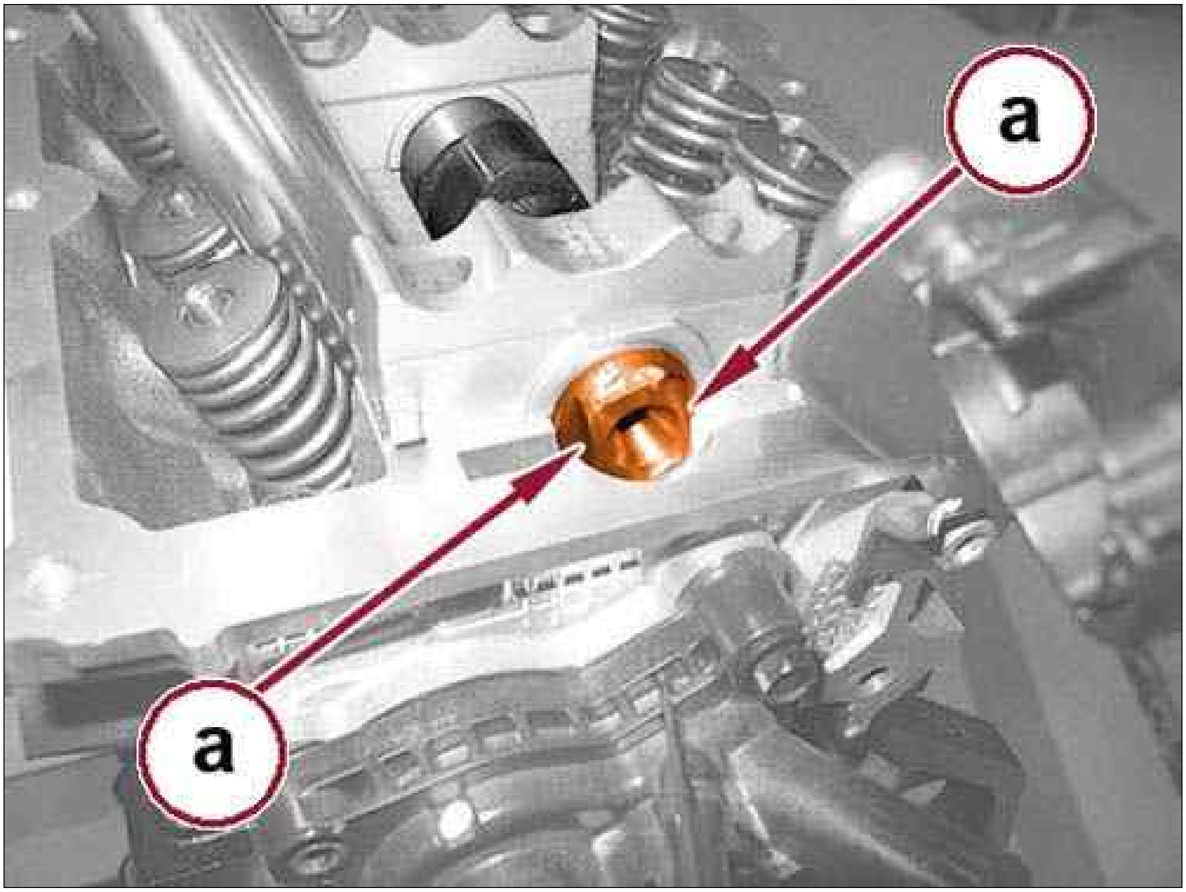
Fig 1: Placing Camshaft Caps & Camshaft In Housing And Positioning Camshaft So That 2 Pins Of Timing Side Stem Are Vertical And Face Exhaust Side



Courtesy of CHRYSLER GROUP, LLC

1. Place the camshaft in its housing and position it so that the two pins (1) of the timing side stem are vertical and face the exhaust side, as shown in illustration.
2. Place the camshaft caps (2) in their housings engaging the locating bushings and complying with the numbers printed on the top, from 1 to 5. The assembly direction goes from number 1, timing side, to number 5, flywheel side.
3. Each camshaft cap has two teeth that must be facing towards the timing drive chain side, so that the lubrication hole is facing towards the exhaust side.

Fig 2: Positioning Two Bevels Of Flywheel Side Stem Of Camshaft



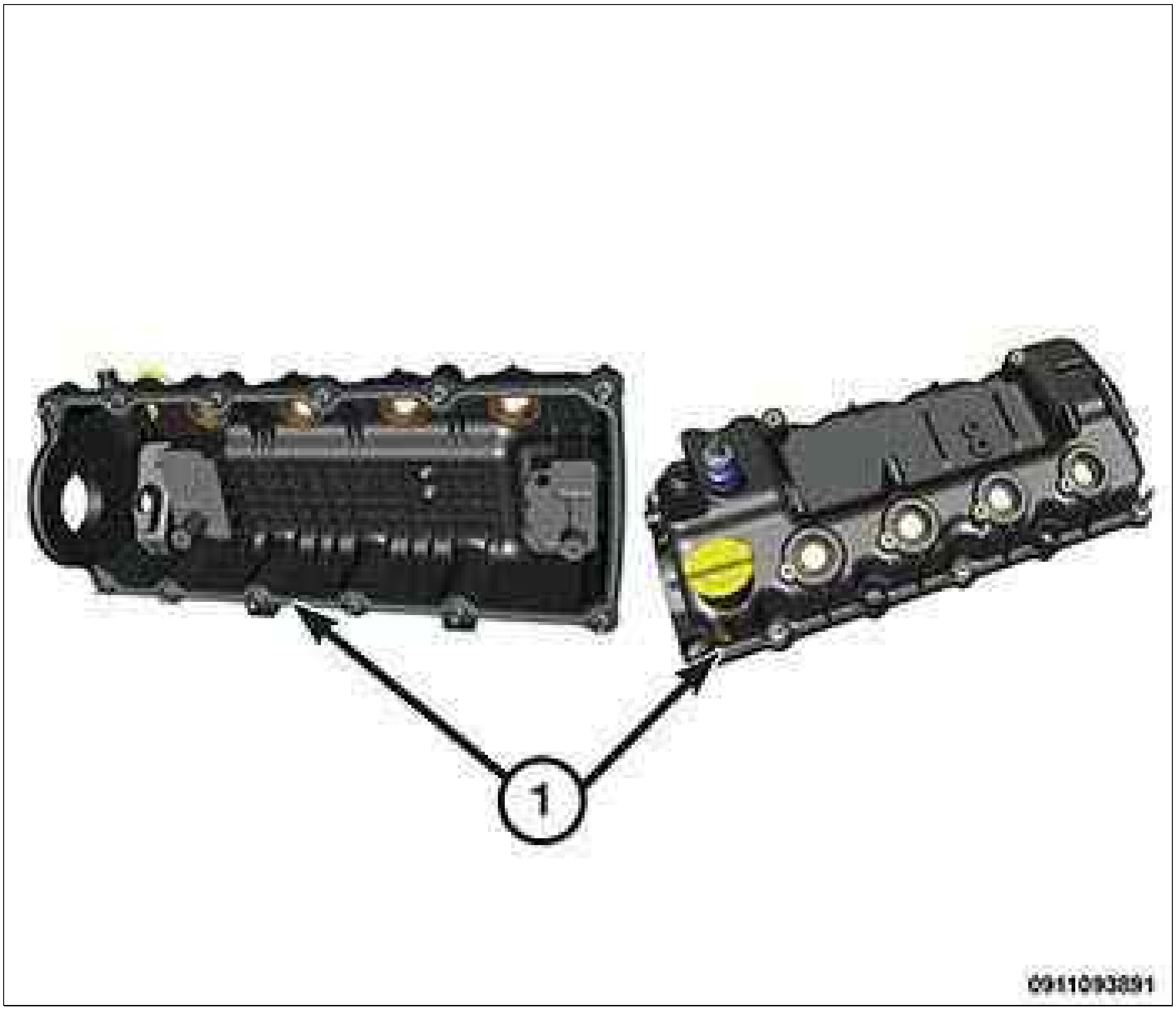
Courtesy of CHRYSLER GROUP, LLC

4. Position the camshaft as described, then make sure that the two bevels of the flywheel side stem are in the position shown in figure, for an easier fitting of a spanner to use as counter-torque in the following tightening of the variable valve timing system.
5. Install the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL AND INSTALLATION .
6. Install the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
7. Install the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
8. Install the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
9. Install the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
10. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
11. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
12. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
13. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .

14. Evacuate and charge the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
15. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
16. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
17. Install the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
18. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

CYLINDER HEAD > COVER(S), CYLINDER HEAD > DESCRIPTION > DESCRIPTION

Fig 1: Tappet Cover & Gasket



Courtesy of CHRYSLER GROUP, LLC

The tappet cover is made of plastic. A dedicated rubber seal is fitted in the part in contact with the cylinder head.

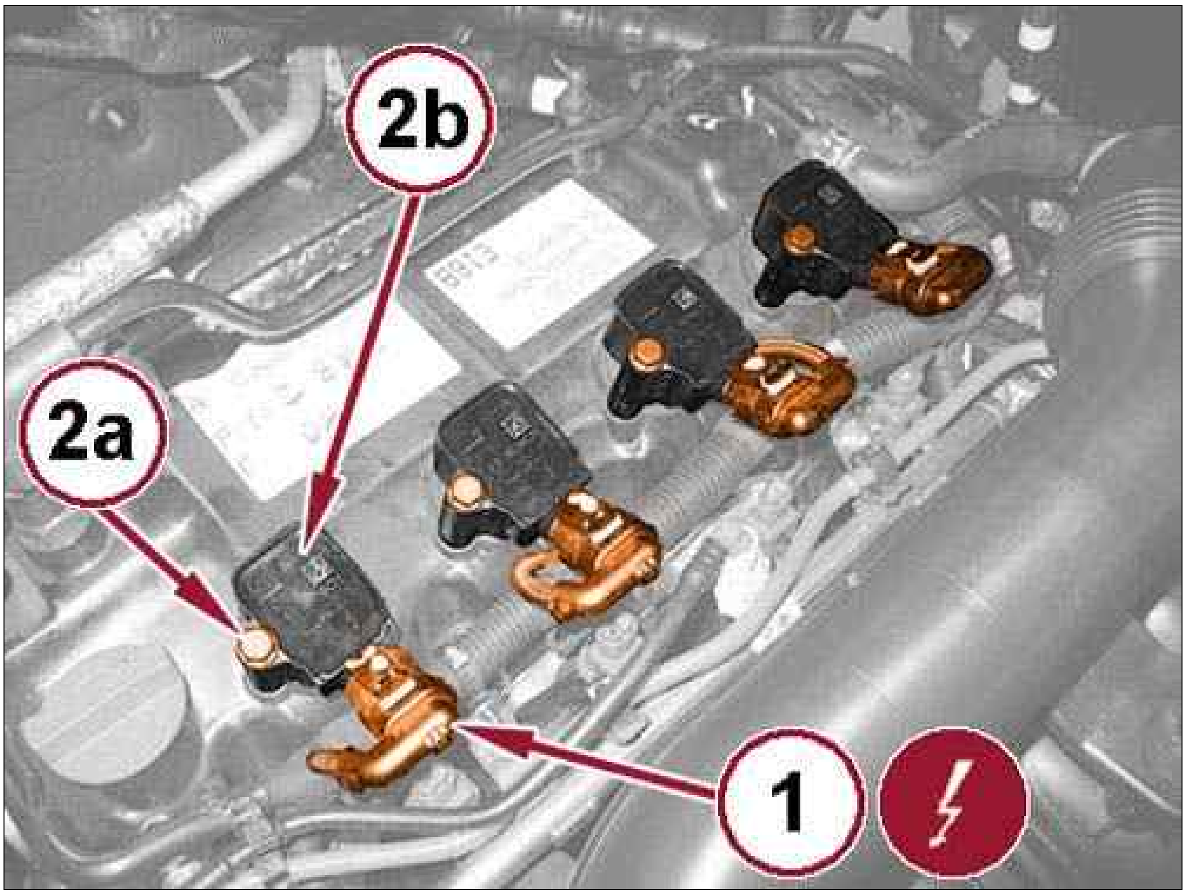
On the tappet cover are holes for inserting the ignition coils and timing sensor. Positioned between the coils and the timing sensor are specific rubber seals to prevent engine oil leaks.

Also on the tappet cover are two oil vapor recovery systems.

CYLINDER HEAD > COVER(S), CYLINDER HEAD > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

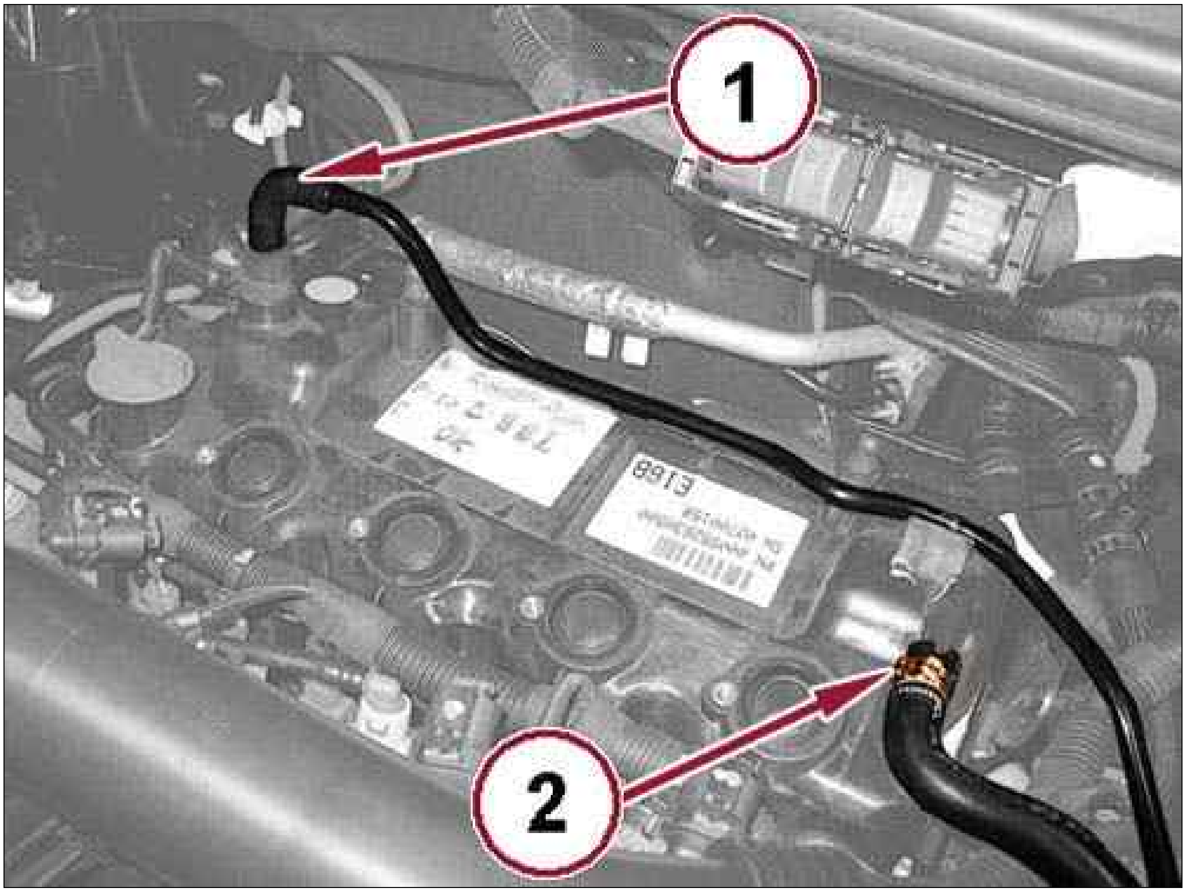
   Fig 1: Ignition Coils, Screws & Wire Harness Connectors



Courtesy of CHRYSLER GROUP, LLC

2. Disconnect the ignition coils wire harness connectors (1).
3. Undo the screws (2a) and remove the ignition coils (2b).

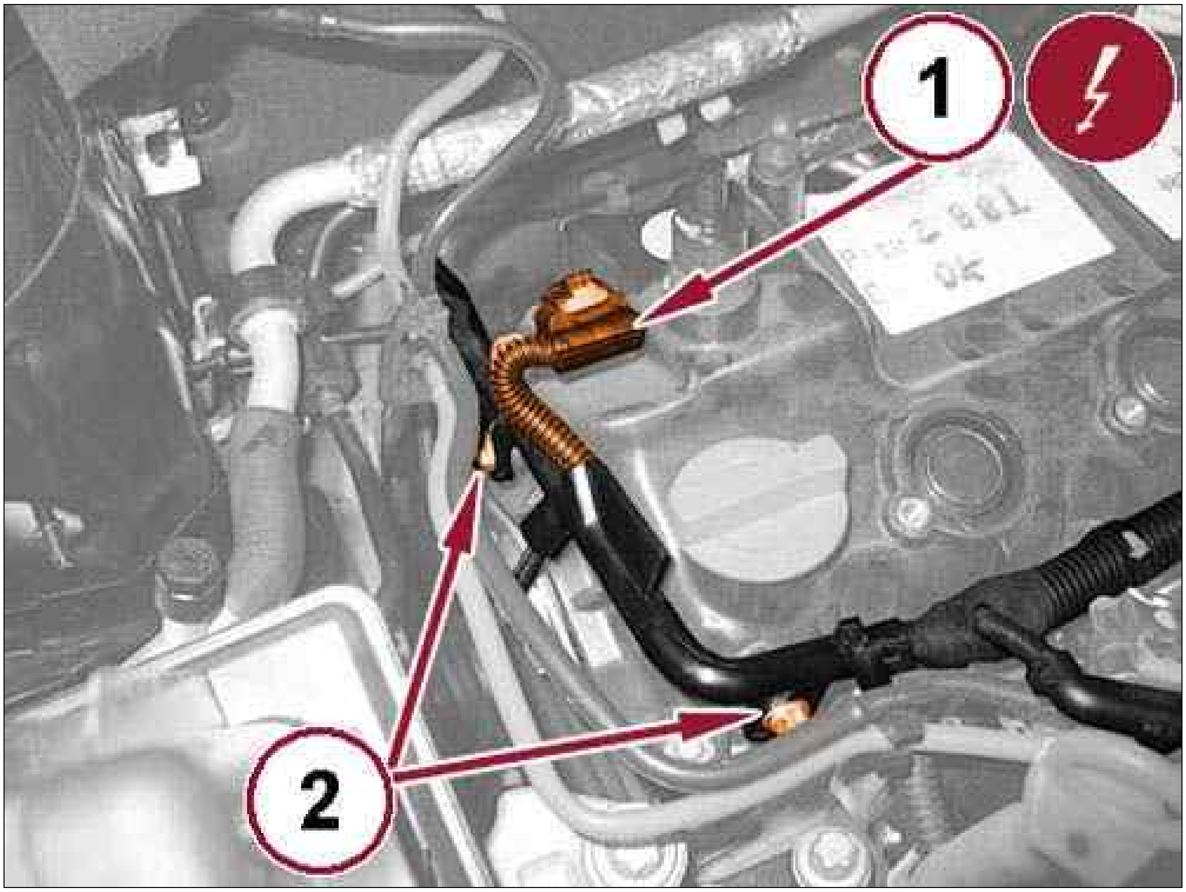
Fig 2: Oil Vapor Pipe At Tappet Cover & Band



Courtesy of CHRYSLER GROUP, LLC

4. Disconnect the oil vapor pipe from the tappet cover (1).
5. Loosen the band and disconnect the oil vapor pipe from the tappet cover (2).

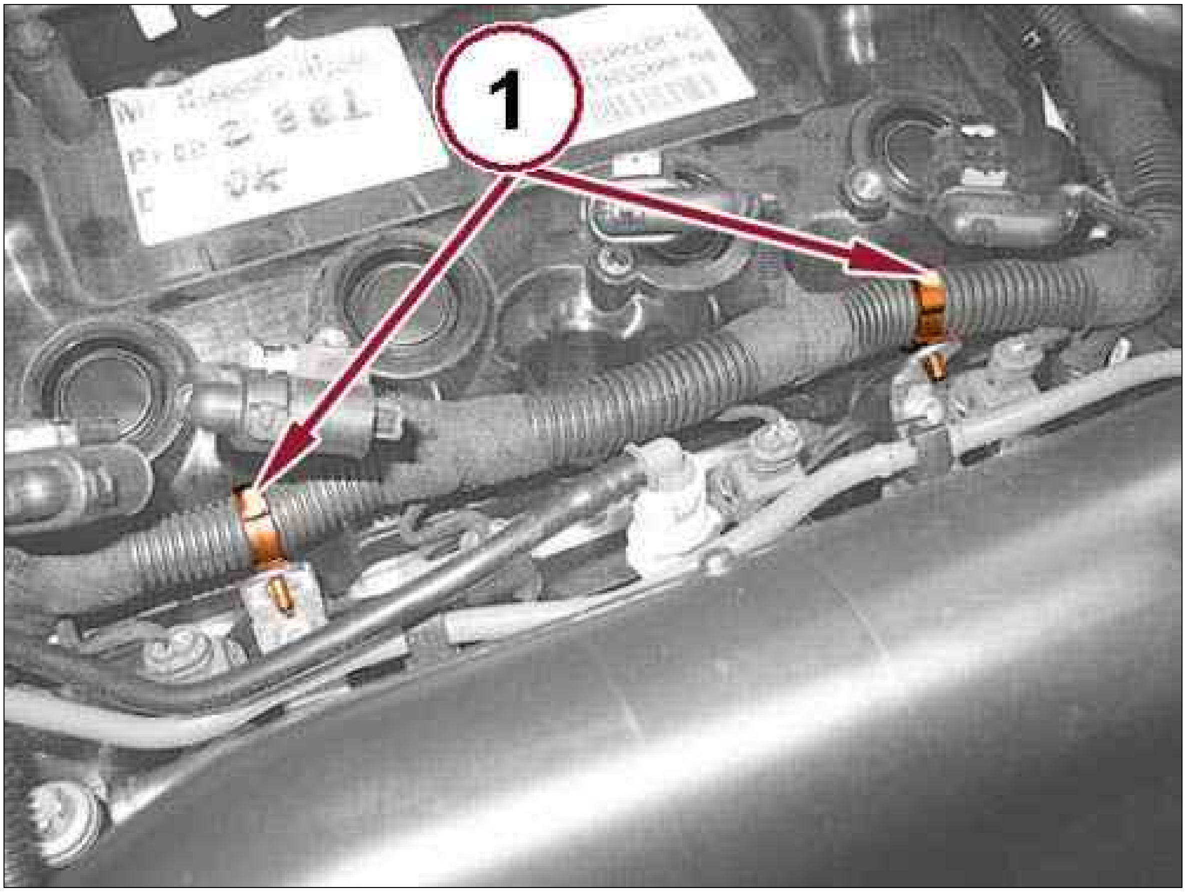
Fig 3: Timing Sensor Electrical Connection & Screws Attaching Wiring Duct To Tappet Cover



Courtesy of CHRYSLER GROUP, LLC

6. Detach the timing sensor electrical connection (1).
7. Undo the screws fixing the wiring duct to the tappet cover (2).

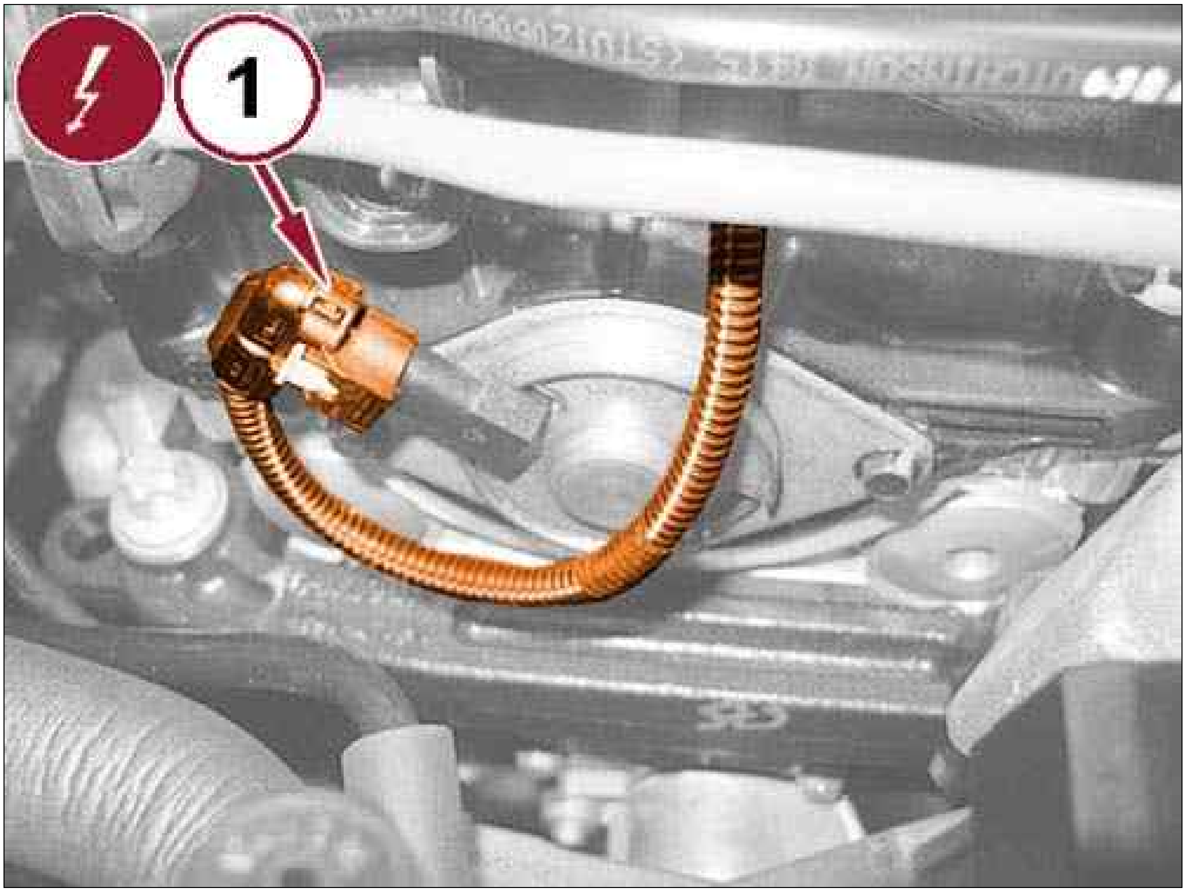
Fig 4: Wiring Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

8. Release the wiring retaining clips (1).

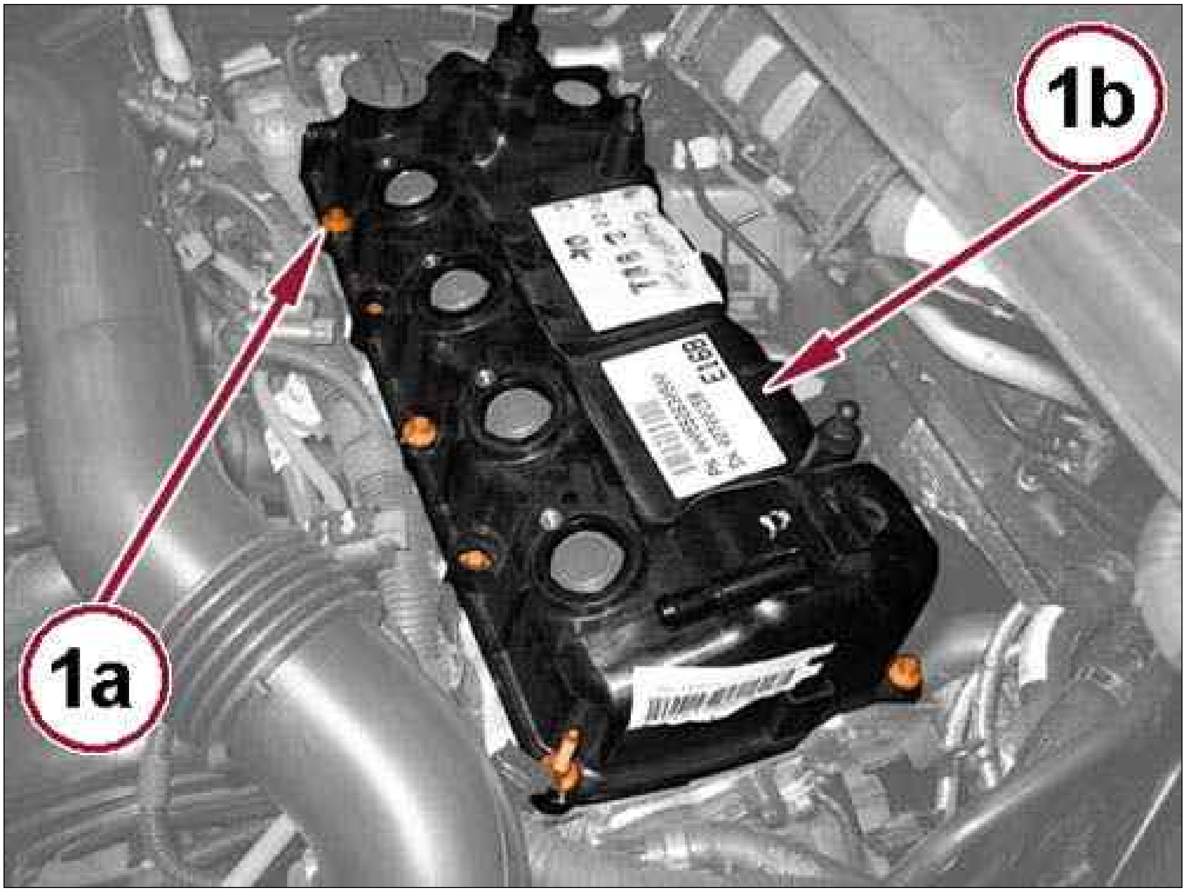
Fig 5: Variable Valve Timing System Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the variable valve timing system wire harness connector (1).
10. Release the wiring from the intermediate retaining clips.

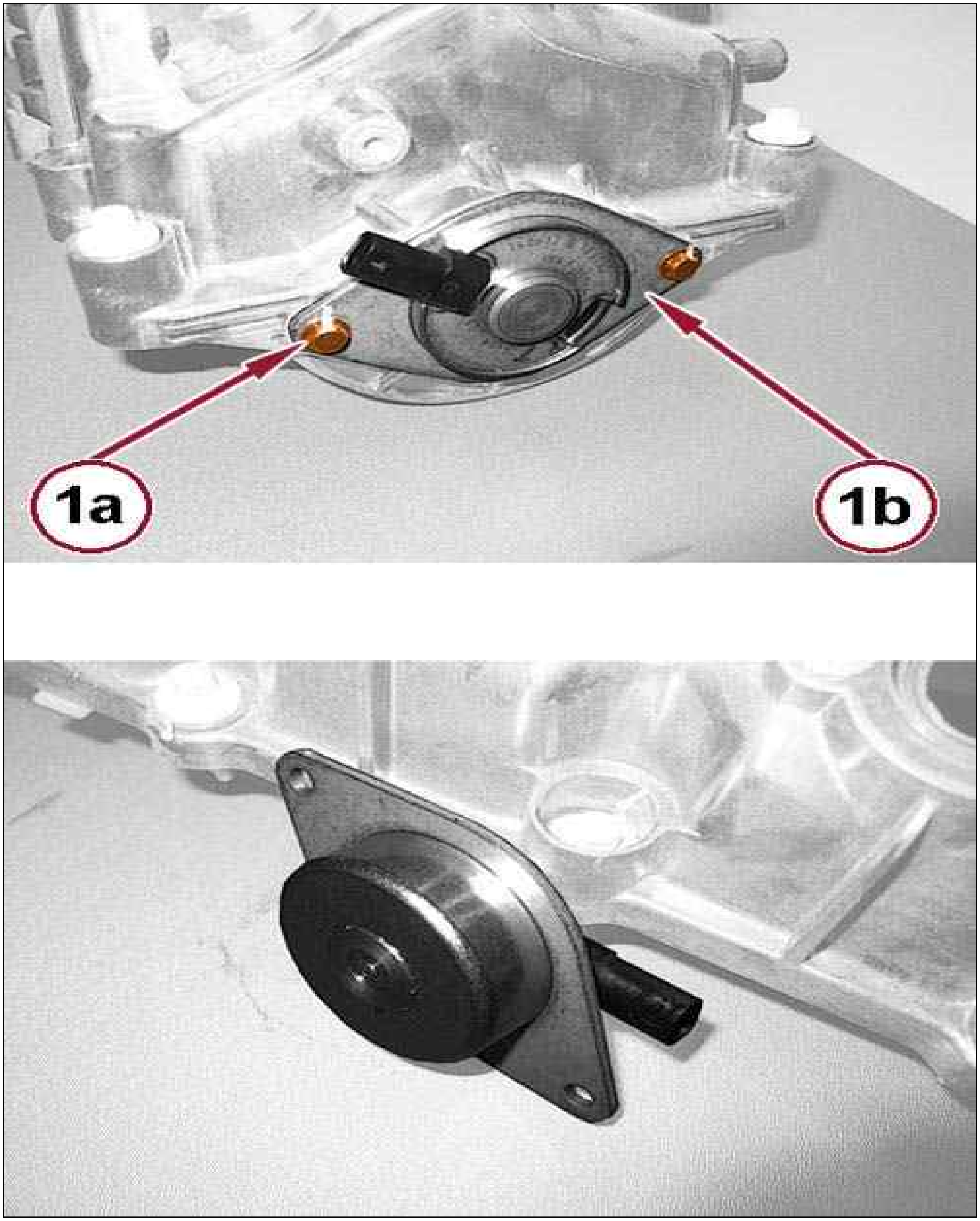
Fig 6: Tappet Cover & Screws



Courtesy of CHRYSLER GROUP, LLC

11. Undo the screws (1a) and remove the tappet cover (1b) complete with seal.

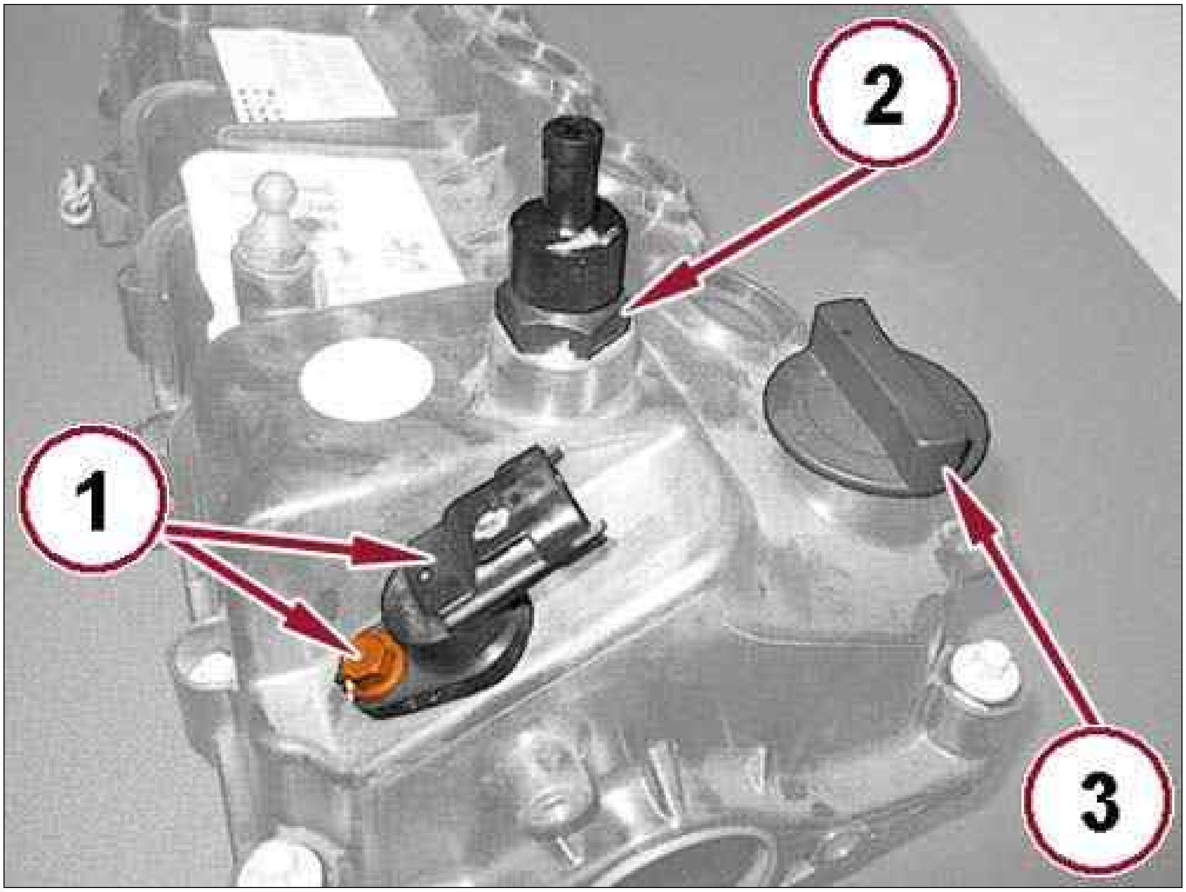
Fig 7: Variable Valve Timing System & Screws



Courtesy of CHRYSLER GROUP, LLC

12. If necessary:
13. Undo the screws (1a) and remove the variable valve timing system (1b) complete with gasket.

Fig 8: Camshaft Position (CMP) Sensor, Positive Crankcase Ventilation (PCV) Valve & Engine Oil Filler Plug

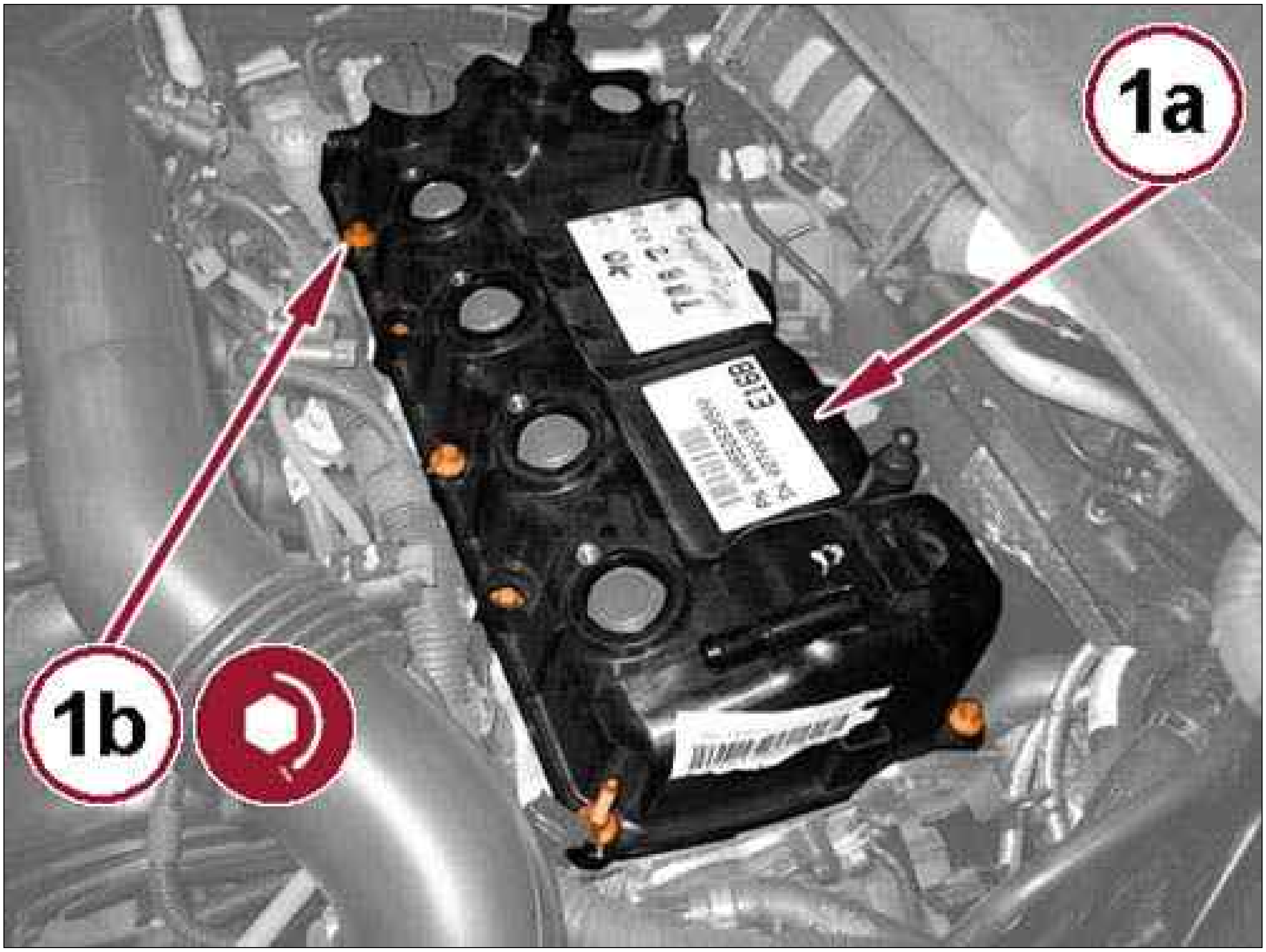


Courtesy of CHRYSLER GROUP, LLC

14. Remove the screw and the Camshaft Position (CMP) sensor (1).$
15. Remove the Positive Crankcase Ventilation (PCV) valve (2).
16. Remove the engine oil filler plug (3).

CYLINDER HEAD > COVER(S), CYLINDER HEAD > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

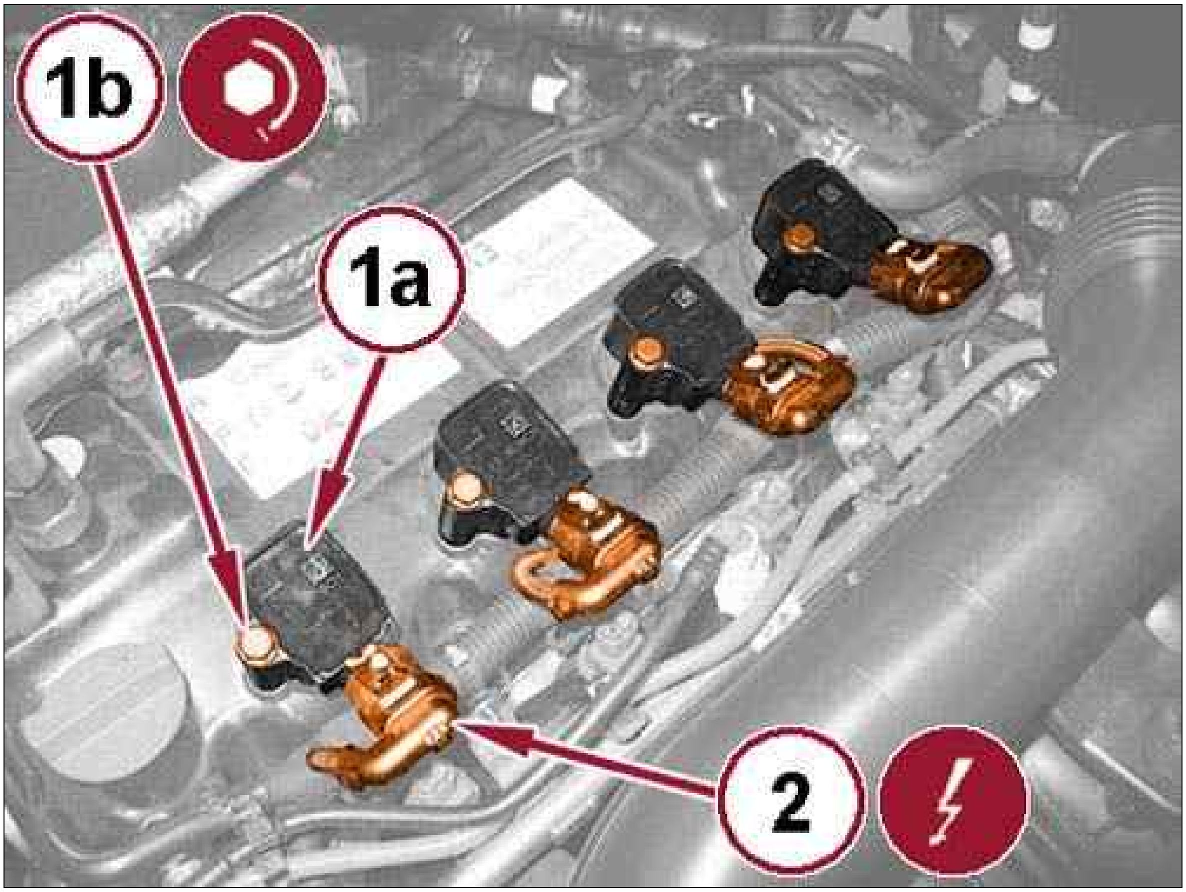
Fig 1: Tappet Cover & Screws



Courtesy of CHRYSLER GROUP, LLC

1. Install the tappet cover (1a) complete with **NEW** gasket in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
2. Connect the variable valve timing system wire harness connector and engage the wiring retaining clips.
3. Tighten the screws fixing the wiring duct to the tappet cover.
4. Connect the Camshaft Position (CMP) sensor wire harness connector and engage the wiring retaining clips.
5. Connect the oil vapor pipe to the tappet cover and tighten the band.
6. Connect the oil vapor pipe to the tappet cover.

Fig 2: Ignition Coils, Screws & Wire Harness Connectors



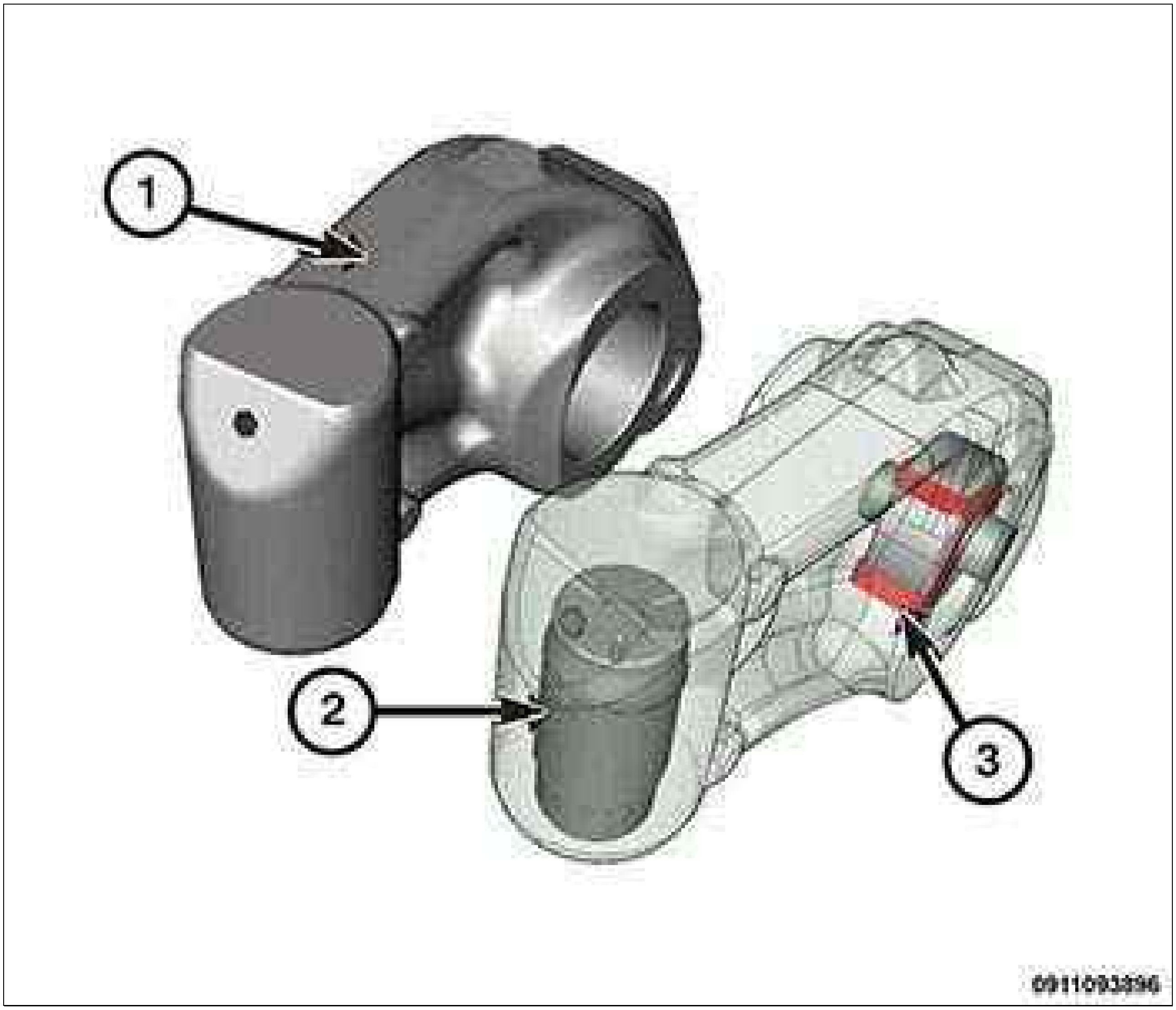
Courtesy of CHRYSLER GROUP, LLC

7. Fit the ignition coils (1a) in place and tighten the screws (1b) to the proper specification. Refer to SPECIFICATIONS .
8. Connect the ignition coils wire harness connectors (2).
9. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

CYLINDER HEAD > LIFTER(S), HYDRAULIC > DESCRIPTION > DESCRIPTION

INTAKE

Fig 1: Intake Side Rocker Arm & Hydraulic Tappet

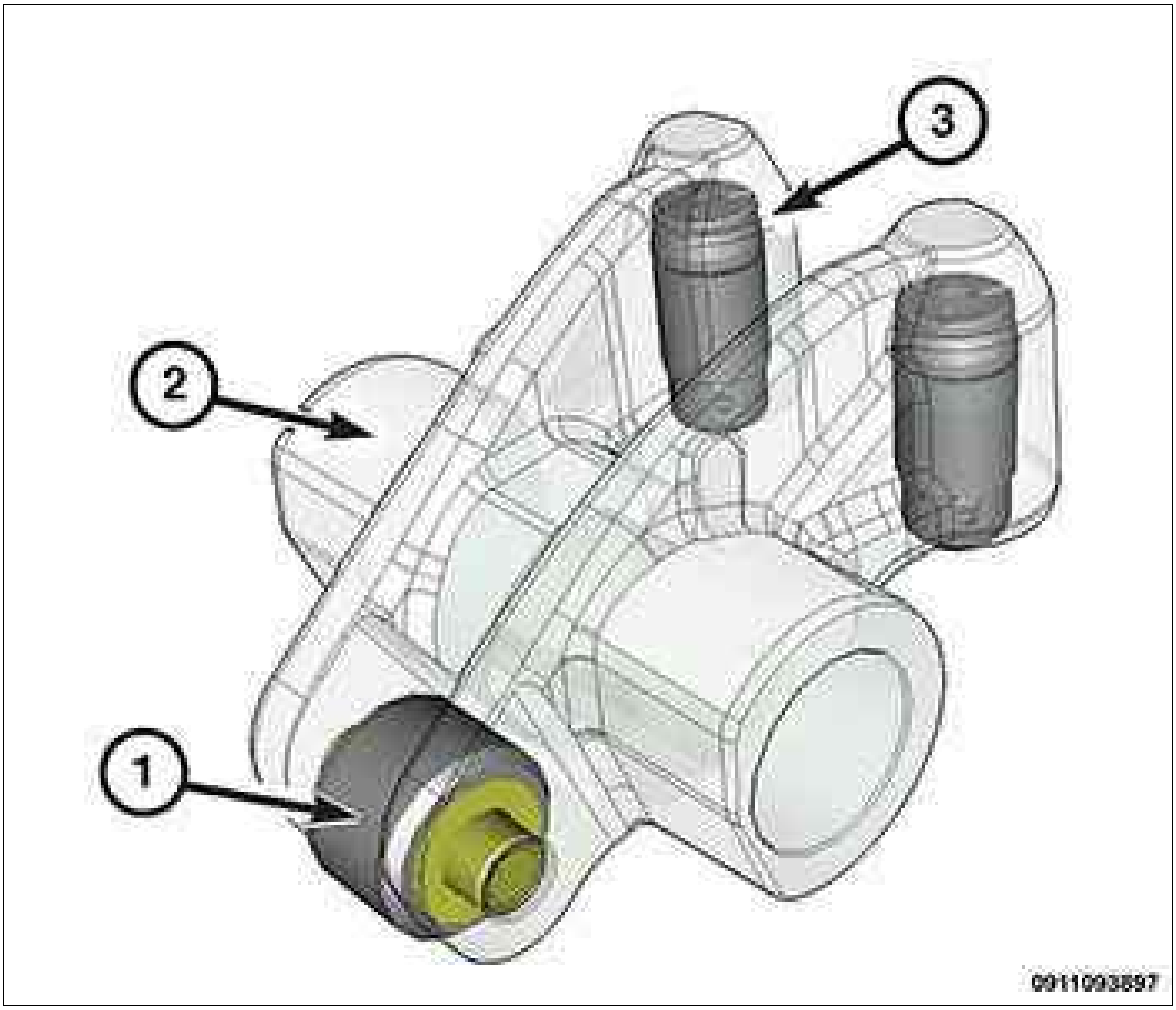


Courtesy of CHRYSLER GROUP, LLC

- There are two intake side rocker arms (1), one per valve, and they have a specific form according to the valve to be operated.
- They contain the hydraulic tappet (2) and oil transfer channels for lubricating and filling the tappet and act as supports for the roller bearing (3).

EXHAUST

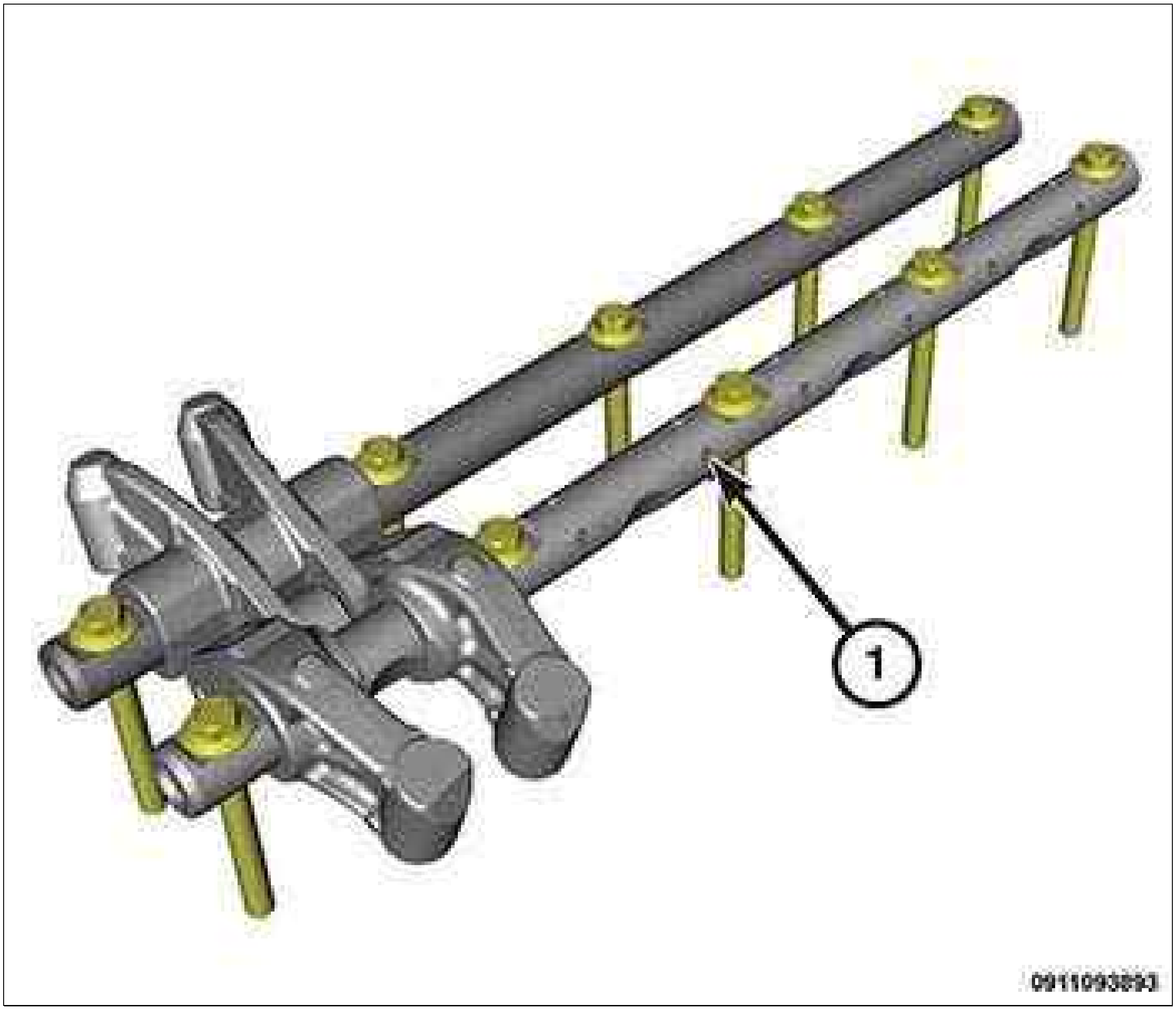
Fig 2: Exhaust Side Rocker Arm, Roller Bearing & Hydraulic Tappet



Courtesy of CHRYSLER GROUP, LLC

- There is a single exhaust side rocker arm (2), but it acts on both exhaust valves simultaneously. It contains the hydraulic tappets (3) and oil transfer channels for lubricating and filling the tappets and acts as support for the roller bearing (1).

Fig 3: Locating Holes In Shaft Body For Rocker Arm Bearing & Hydraulic Tappet Lubrication



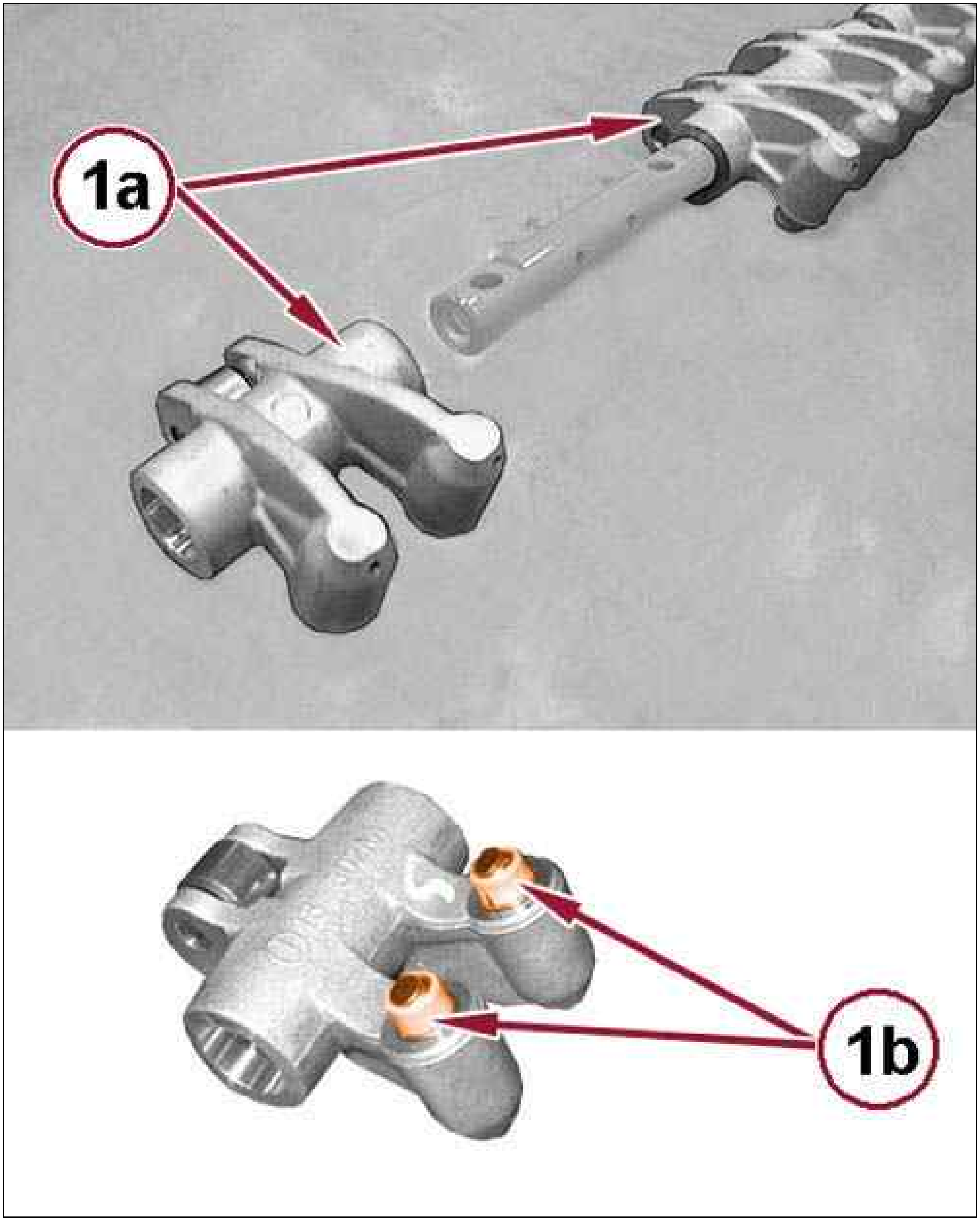
Courtesy of CHRYSLER GROUP, LLC

- There are two rocker arm supports, one per side. They are hollow and made of steel. Along the body of the shaft are the holes (1) used for lubricating the bearings for the rocker arms and the corresponding hydraulic lifters. Also on the shafts are other holes used for fixing them, with screws, to the cylinder head.

CYLINDER HEAD > LIFTER(S), HYDRAULIC > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

EXHAUST SIDE TAPPETS

Fig 1: Exhaust Side Rockers With Tappets



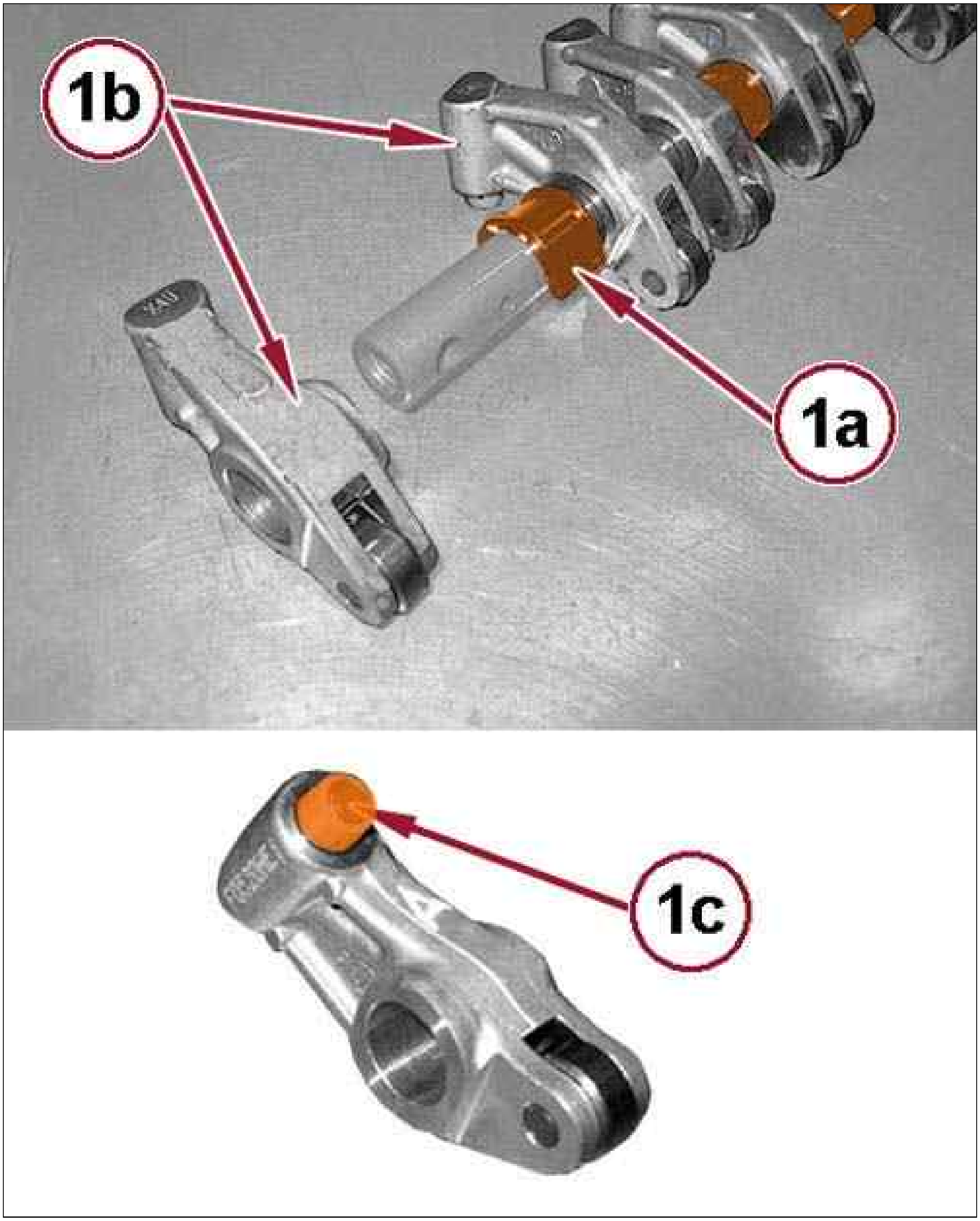
Courtesy of CHRYSLER GROUP, LLC

1. Take out the rockers (1a) with tappets (1b) from the rocker axle.

INTAKE SIDE TAPPETS

1. Remove the spacers (1a) and take out the rockers (1b) with tappets (1c) from the rocker axle.

Fig 2: Intake Side Spacers & Rockers With Tappets

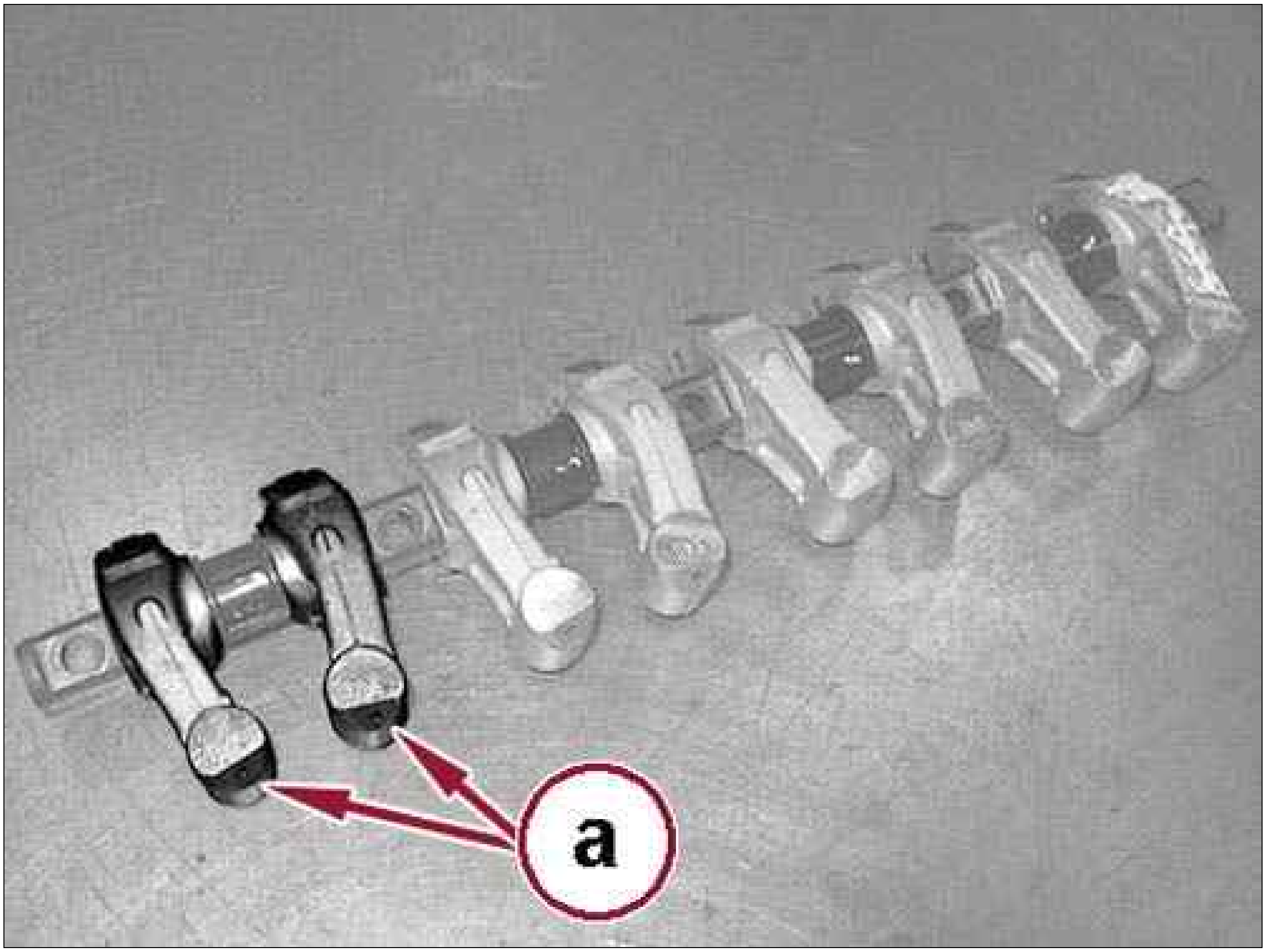


Courtesy of CHRYSLER GROUP, LLC

CYLINDER HEAD > LIFTER(S), HYDRAULIC > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

INTAKE SIDE TAPPETS

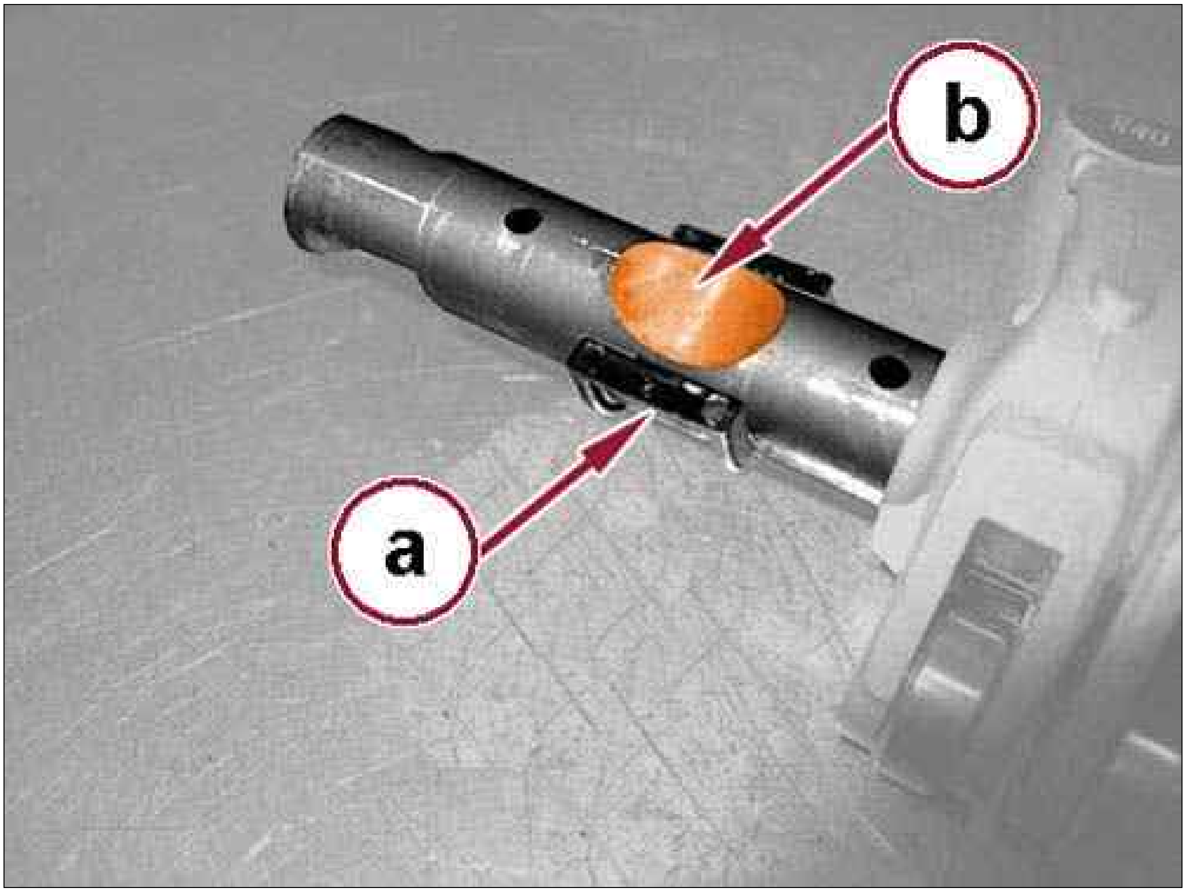
Fig 1: installing Intake Side Tappets



Courtesy of CHRYSLER GROUP, LLC

1. Place the rockers with tappets in their housings on the rocker axle.
2. The tappets of each cylinder must be installed with the tappet housings (a) reciprocally converging.

Fig 2: Intake Side Spacers Must Be Fitted Next To Grooves



Courtesy of CHRYSLER GROUP, LLC

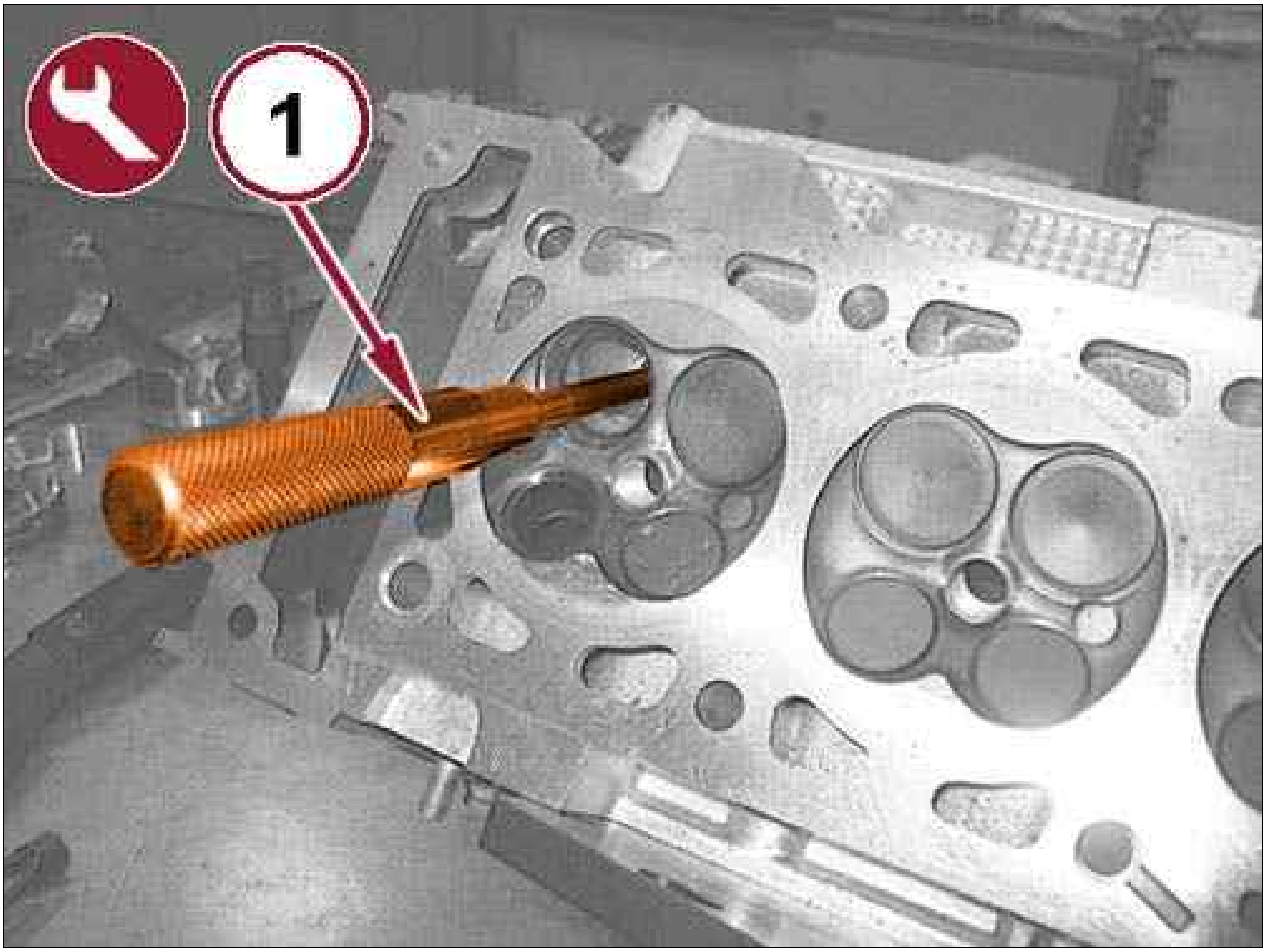
3. Install the spacers in the housings on the rocker axle.
4. The spacers (a) must be fitted next to the grooves (b) on the rocker axle, as shown in the figure.

EXHAUST SIDE TAPPETS

1. Place the rockers with tappets in their housings on the rocker axle.

CYLINDER HEAD > VALVE GUIDES > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

Fig 1: Removing Valve Guide Using Special Tool



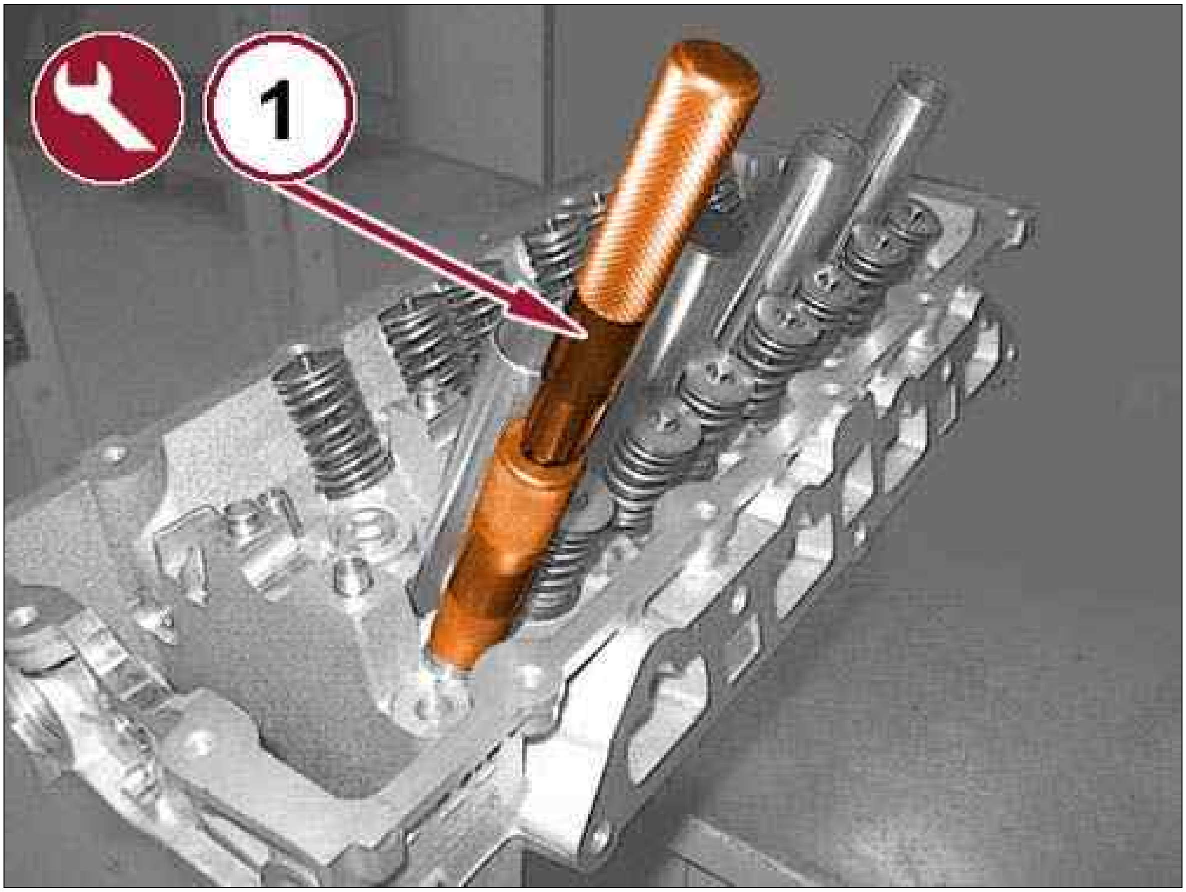
Courtesy of CHRYSLER GROUP, LLC

1. Remove the valve guide using the tool as shown in the figure.

CYLINDER HEAD > VALVE GUIDES > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Check that the diameter of the valve guide housing is within the prescribed values.
2. Check that the outer diameter of the new valve guide is within the prescribed values.
3. Check that the interference between the valve guide and the seat is within the prescribed values.
4. Before fitting the new valve guide, the cylinder head must be heated to a temperature of around 100°C (212°F).

Fig 1: Installing Valve Guide Using Special Tool

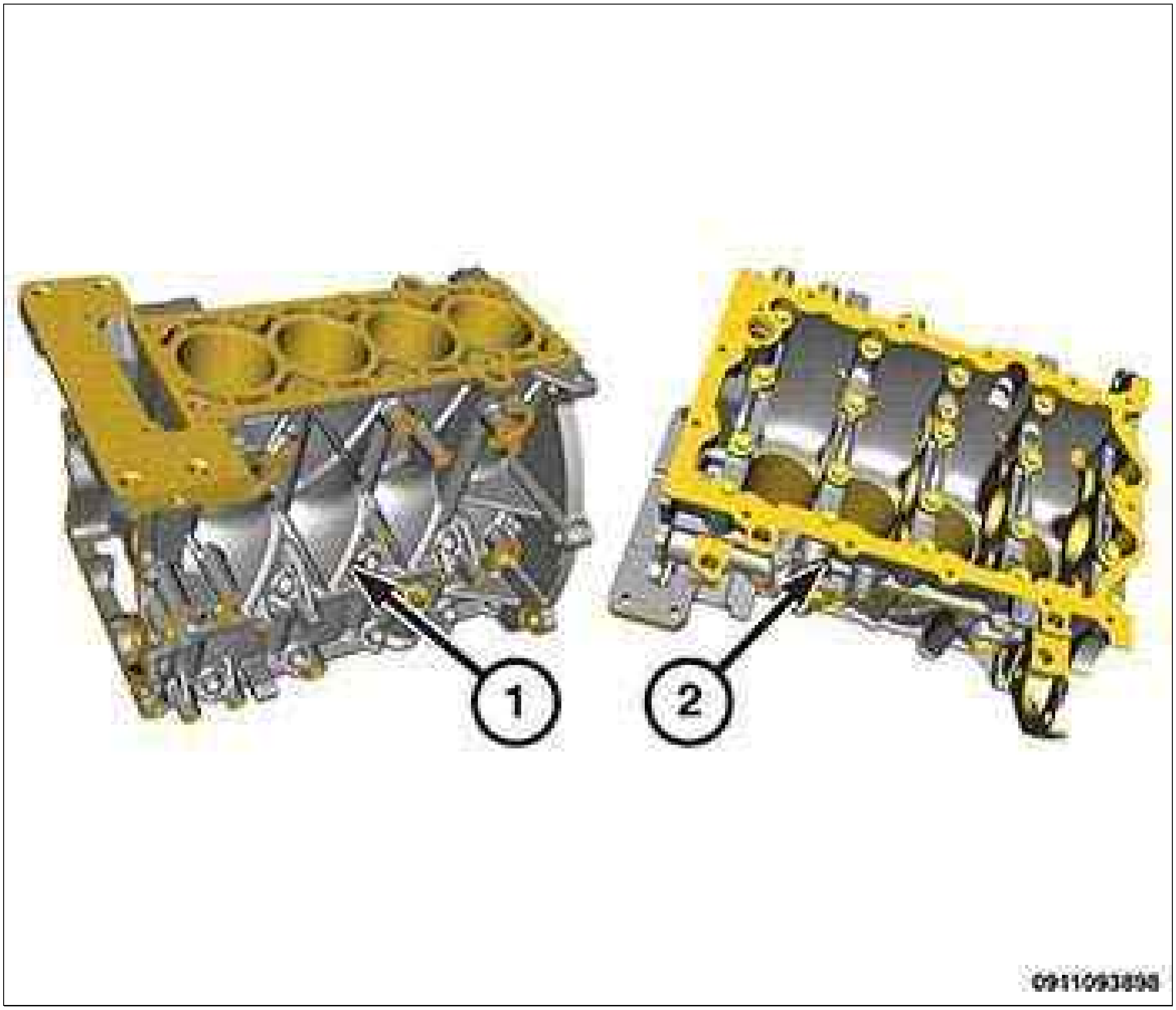


Courtesy of CHRYSLER GROUP, LLC

5. Fit the **NEW** valve guide using the tool (1) as shown in the figure.
6. If the valve guide is slightly distorted during fitting, ream the inner surface using a suitable size reamer.
7. Measure the inner diameter of the valve guide after refacing and the clearance with the valve; check that they are within the prescribed values.

ENGINE BLOCK > DESCRIPTION > DESCRIPTION

Fig 1: Cylinder Block

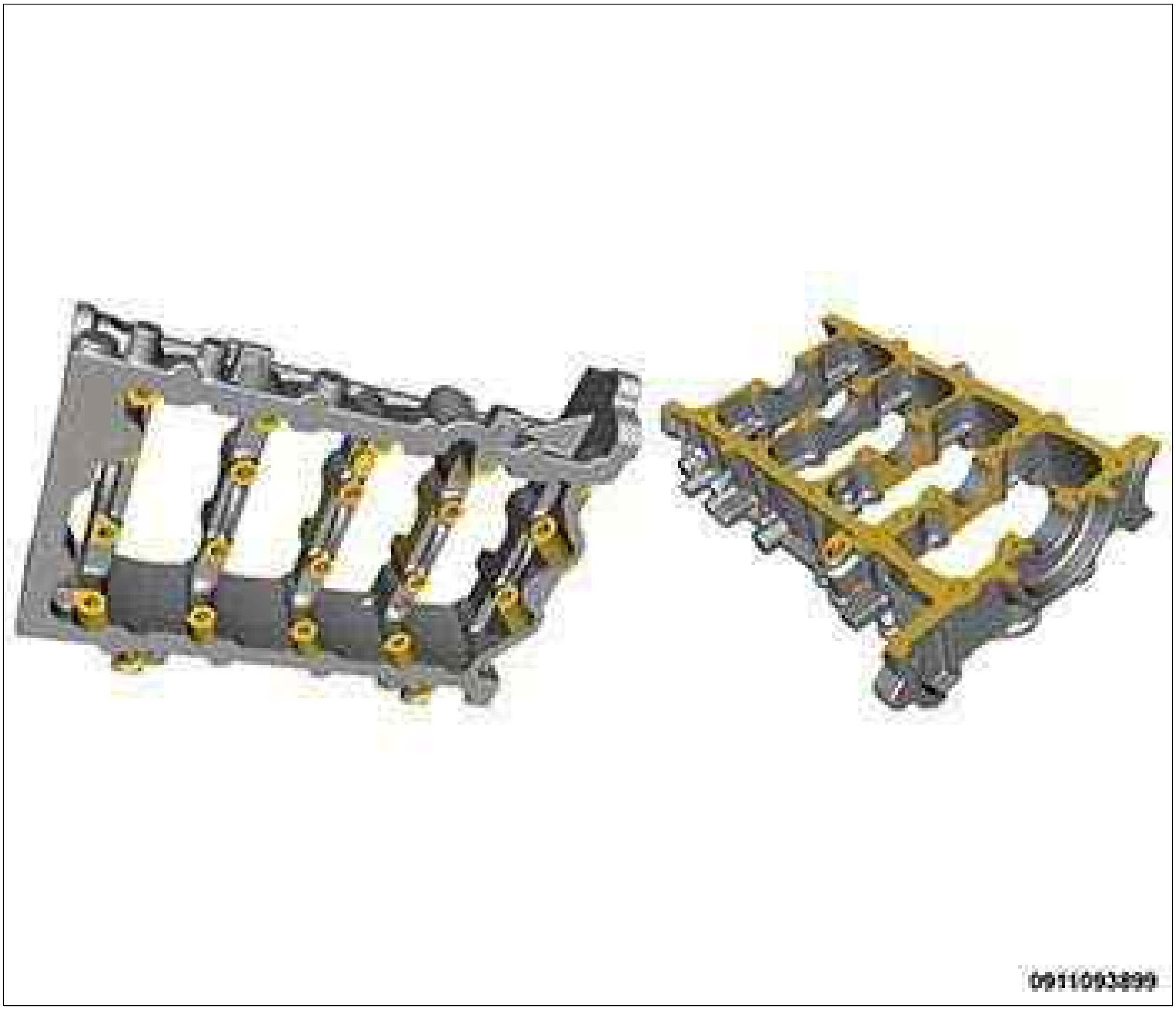


Courtesy of CHRYSLER GROUP, LLC

- The block is made of cast iron, and features high mechanical resistance.
- Special channels in the block walls carry coolant and lubrication fluid.
- The lower part of each cylinder contains a jet that sprays engine oil onto the piston crown to cool it and to ensure that the gudgeon pin is lubricated by the oil dripping from above.
- In addition to housing the cylinder liners/bores, the engine block supports the moving assemblies in the engine (pistons, connecting rods, crankshaft, etc.), the fixed elements (cylinder heads, oil sump, timing cover) and the auxiliary components (alternator, starter, climate control compressor, etc.).

ENGINE BLOCK > DESCRIPTION > LOWER BLOCK

Fig 1: Lower Block



Courtesy of CHRYSLER GROUP, LLC

- The lower block is made of cast iron, as are the 5 main bearings. The lower engine block is joined to the upper engine block by means of screws and locating dowels, to guarantee a precise fit.
- There is a bead of sealant between the two blocks to prevent oil leaks.
- The lower block helps to reduce the level of vibration and engine noise.

The lower block carries out the following functions:

- Acts as a bearing structure with the upper engine block.
- Supports the crank gear reactions and loads.
- Supports the oil pan and lubrication oil.
- Acts as a support for the main half bearings.

ENGINE BLOCK > STANDARD PROCEDURE > CYLINDER BORE DEGLAZING

Before deglazing, mask the crankcase area to keep abrasive materials from entering the engine lower end. Tape off any openings to prevent abrasive material from entering the coolant and oil circuits.

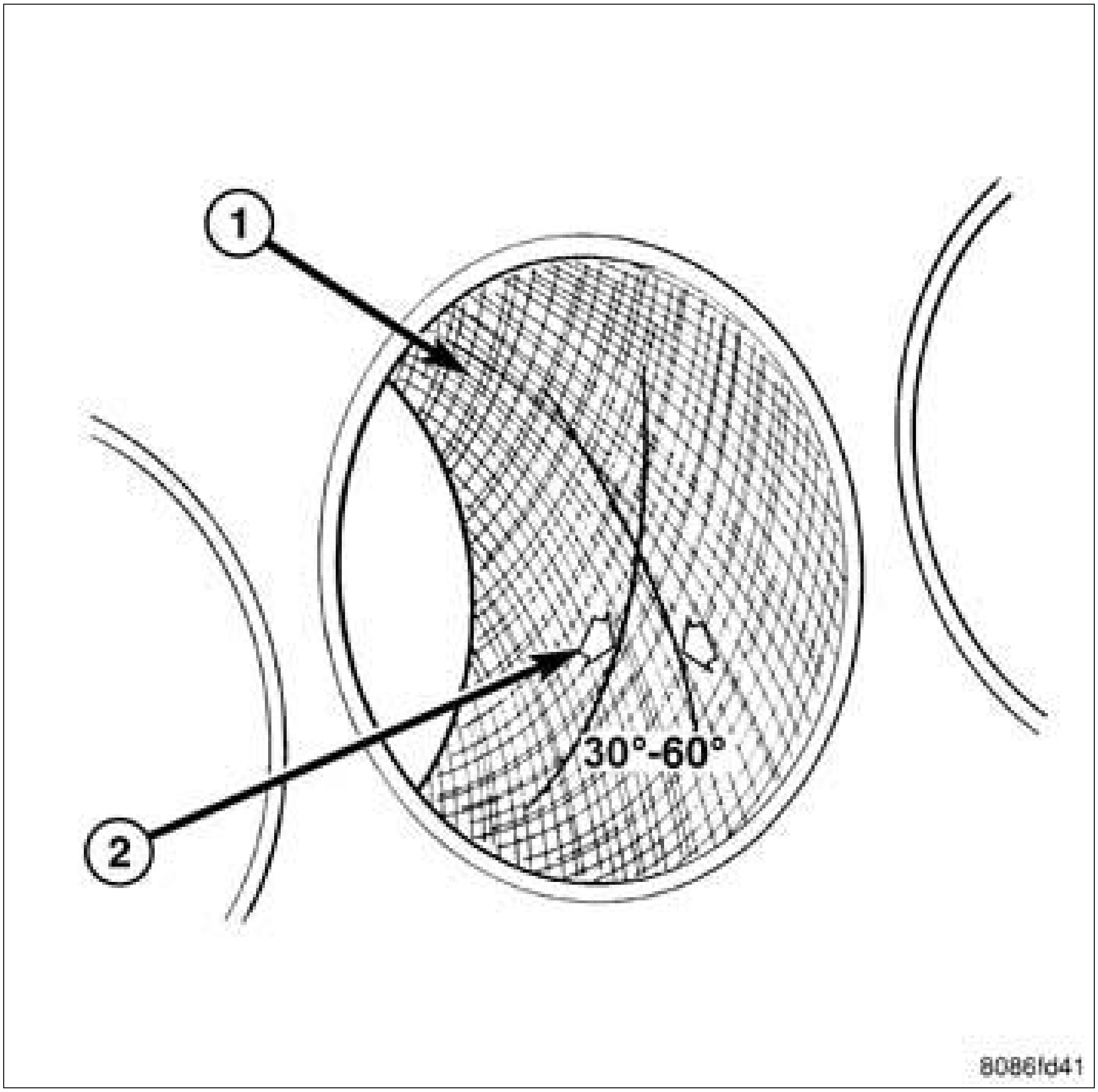
> *CAUTION:*
>
> *DO NOT use rigid type hones to remove cylinder wall glaze.*

1. Select an appropriate size flexible ball hone.

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

2. Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. About 20-60 strokes, depending on the condition of the cylinder bore, will be sufficient to provide a satisfactory surface. Use a light **honing** oil, available from major oil distributors.

Fig 1: Identifying Cylinder Bore Crosshatch Pattern



Courtesy of CHRYSLER GROUP, LLC

3. Deglazing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should intersect at 30° to 60° inclusive angle for proper seating of rings.

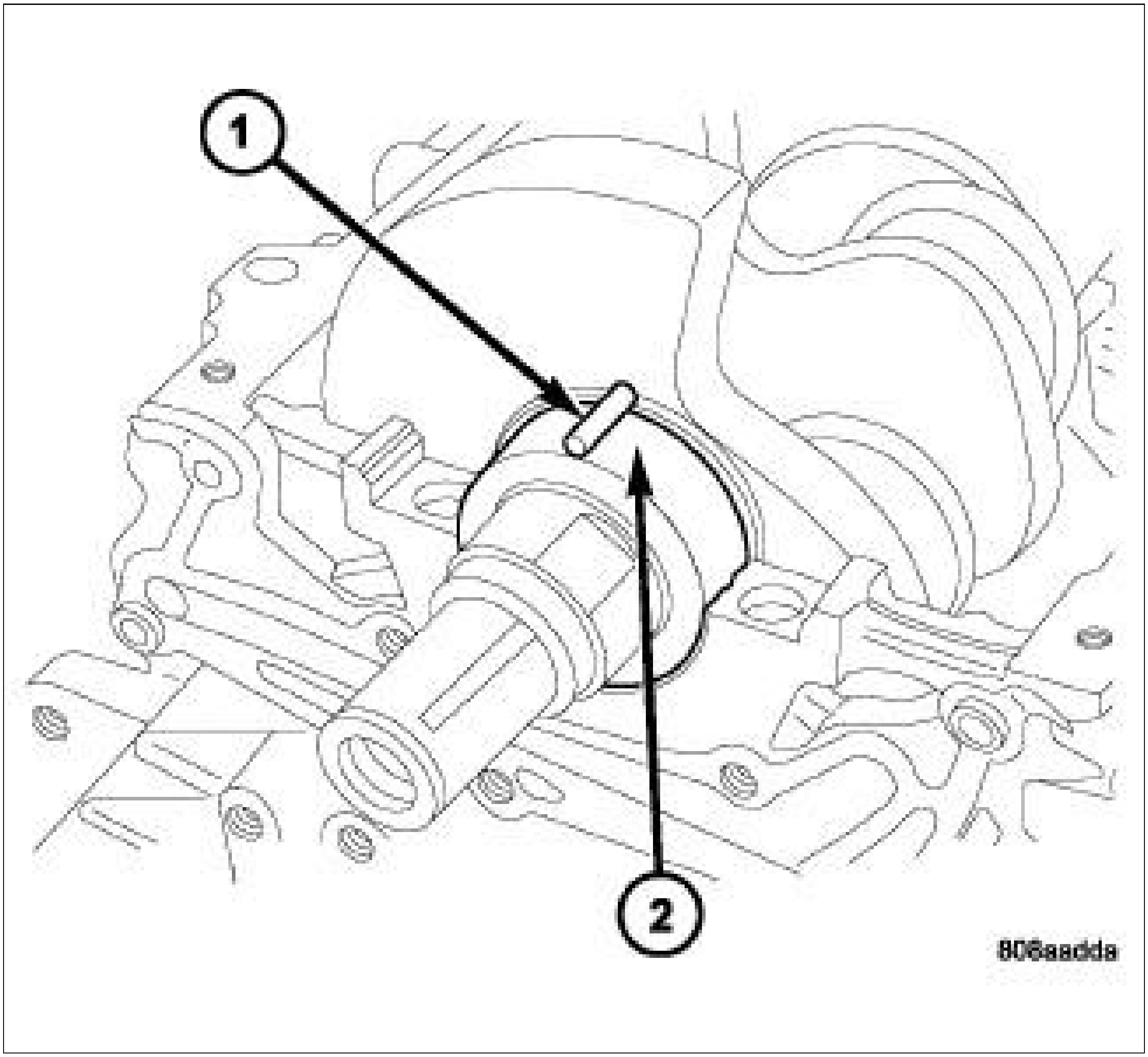
4. A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle (1). The number of up and down strokes per minute can be regulated to get the desired 30° to 60° inclusive angle (2). Faster up and down strokes increase the crosshatch angle.

5. After deglazing, 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. Upon completion, perform a visual inspection of the cylinder block passages to inspect for abrasive debris. If any debris is found, repeat the cleaning process.

> *NOTE:*
>
> *Cylinder bore diameter should not increase more than 20 microns during deglazing process from original nominal bore diameter, if the maximum of 20 microns is exceeded, the cylinder block must be replaced. If deglazing the cylinder bore cannot remove the light scratches and scuffs the cylinder block should be replaced.*

ENGINE BLOCK > STANDARD PROCEDURE > MEASURING BEARING CLEARANCE USING PLASTIGAGE

Fig 1: Plastigage Placed In Lower Shell-Typical



Courtesy of CHRYSLER GROUP, LLC

> *NOTE:*
>
> *Typical crankshaft journal shown in illustration.*

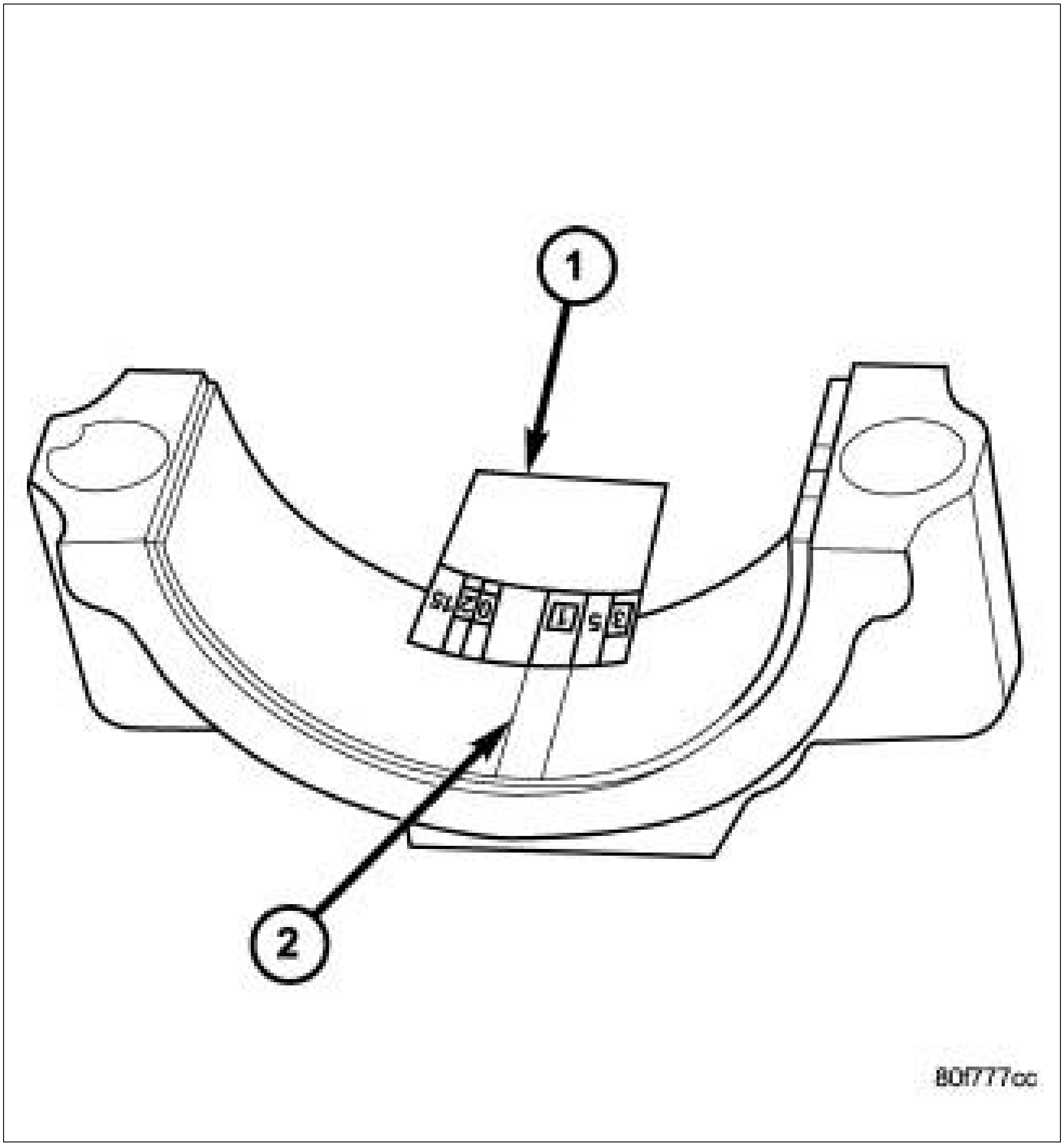
Engine crankshaft and connecting rod bearing clearances can be determined by the use of Plastigage or equivalent. The following is the recommended procedure for the use of Plastigage:

1. Remove the oil film from surface to be checked. Plastigage is soluble in oil.
2. Place a piece of Plastigage (1) across the entire width of the journal (In addition, suspected areas can be checked by placing the Plastigage in the suspected area). Plastigage must not crumble in use. If brittle, obtain fresh stock.

   > *NOTE:*
   >
   > *DO NOT rotate the crankshaft. Plastigage will smear, causing inaccurate results.*

3. Torque the bearing cap bolts of the bearing being checked to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 2: Measuring Bearing Clearance With Plastigage



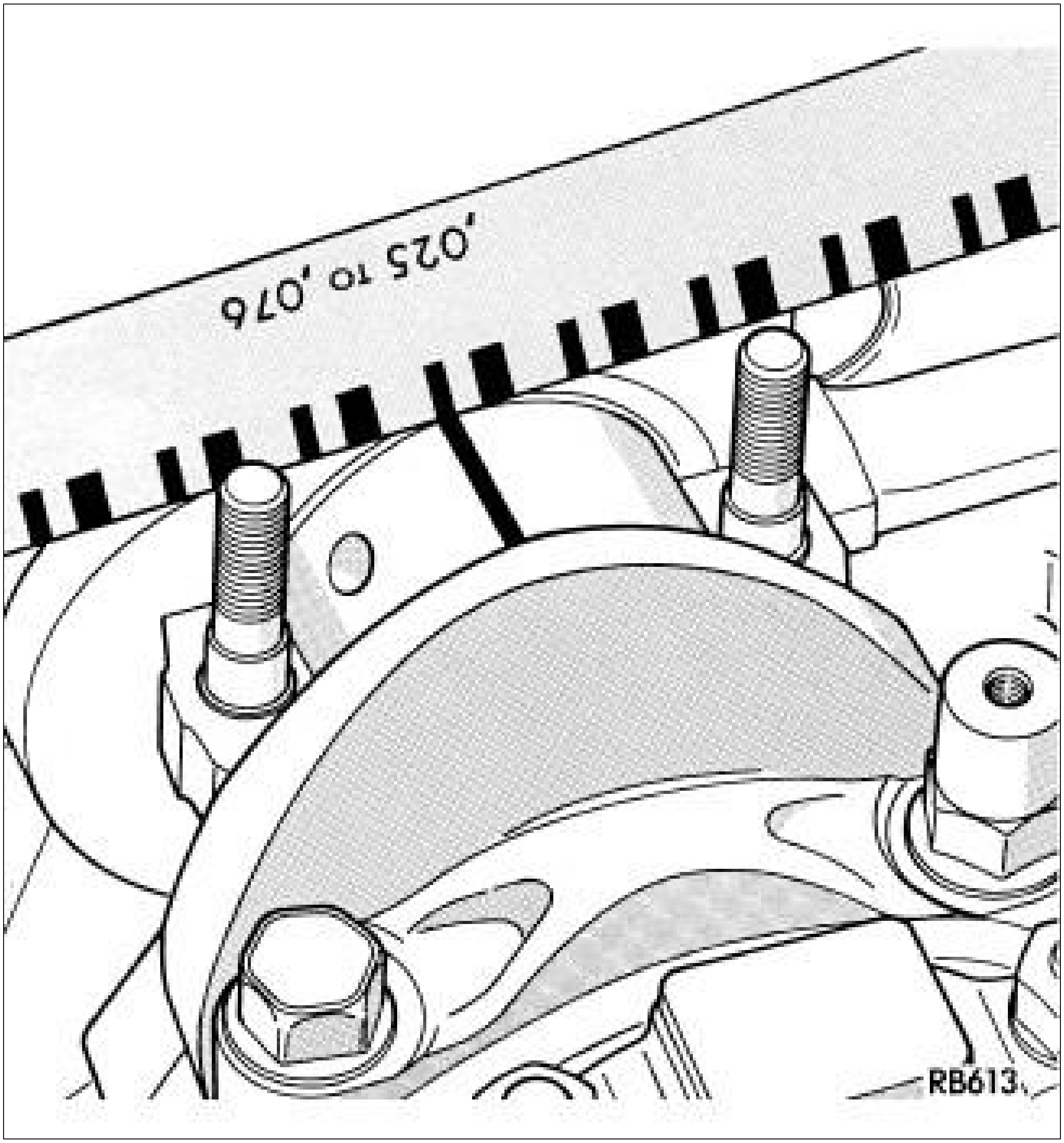
Courtesy of CHRYSLER GROUP, LLC

NOTE:

Typical connecting rod cap shown in illustration.

4. Remove the bearing cap and compare the width of the flattened Plastigage (2) with the scale provided on the package (1). Locate the band closest to the same width. This band shows the amount of clearance. Differences in readings between the ends indicate the amount of taper present or the possibility of foreign material trapped under the bearing insert.
5. Record all readings taken. Compare clearance measurements to specification. Refer to

Fig 3: Checking Connecting Rod Bearing Clearance-Typical



Courtesy of CHRYSLER GROUP, LLC

NOTE:

Typical connecting rod journal shown in illustration.

NOTE:

Plastigage is available in a variety of clearance ranges. Use the most appropriate range for the specifications you are checking. ***Plastigage generally is***

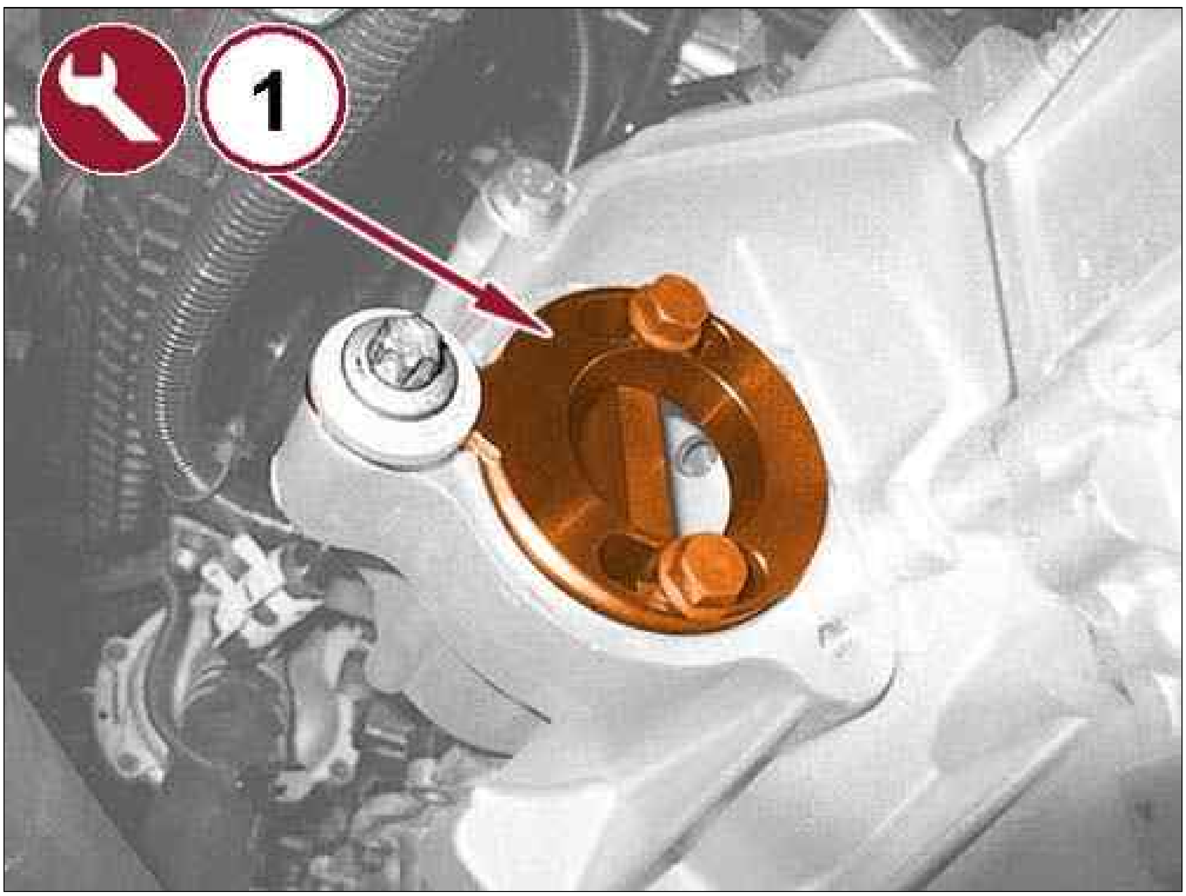
accompanied by two scales. One scale is in inches, the other is a metric scale.

6. Install the proper bearings to achieve the specified bearing clearances.
7. Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

ENGINE BLOCK > DAMPER, VIBRATION > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
2. Remove the starter motor. Refer to STARTER, REMOVAL AND INSTALLATION .
3. Remove the right front wheel house splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
4. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .

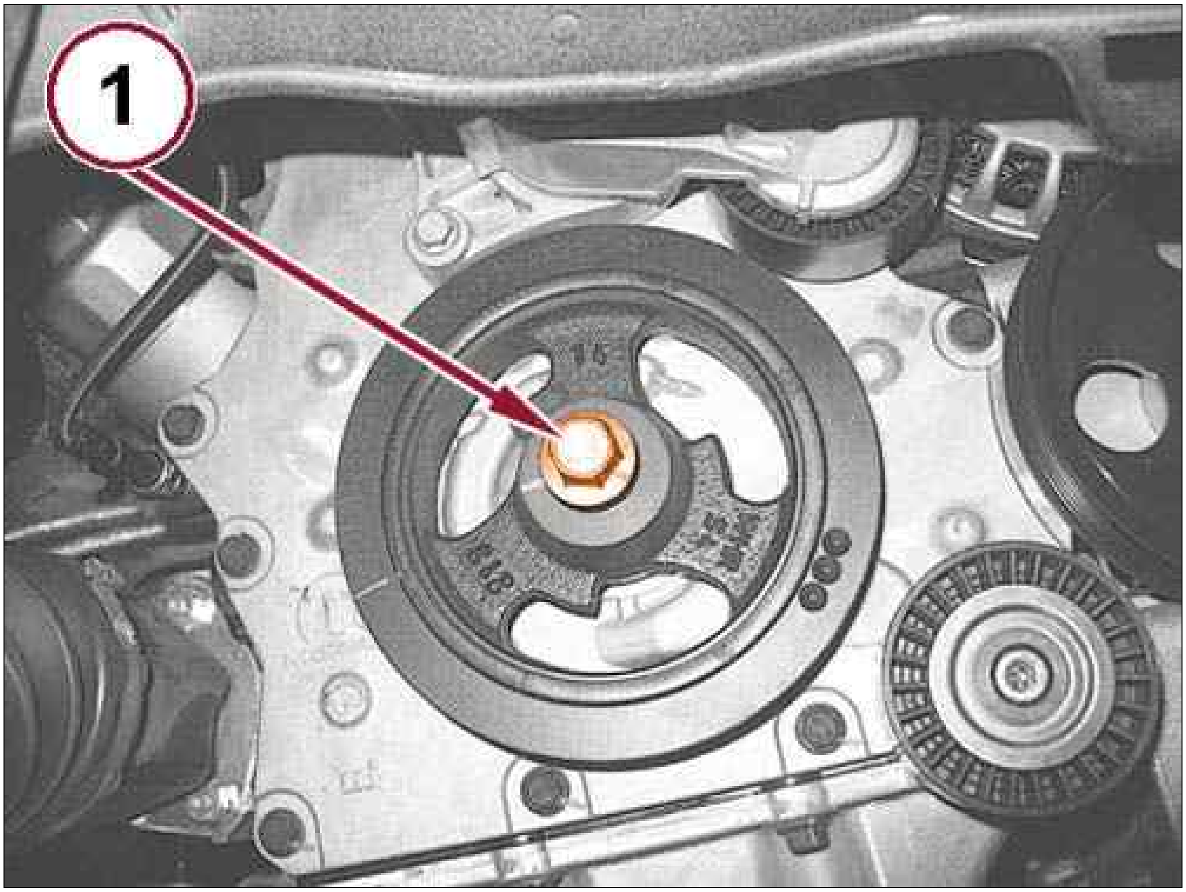
   Fig 1: Installing Flywheel Locking Tool In Starter Housing



Courtesy of CHRYSLER GROUP, LLC

5. Install the flywheel locking tool 2000041300 in the housing of the starter.

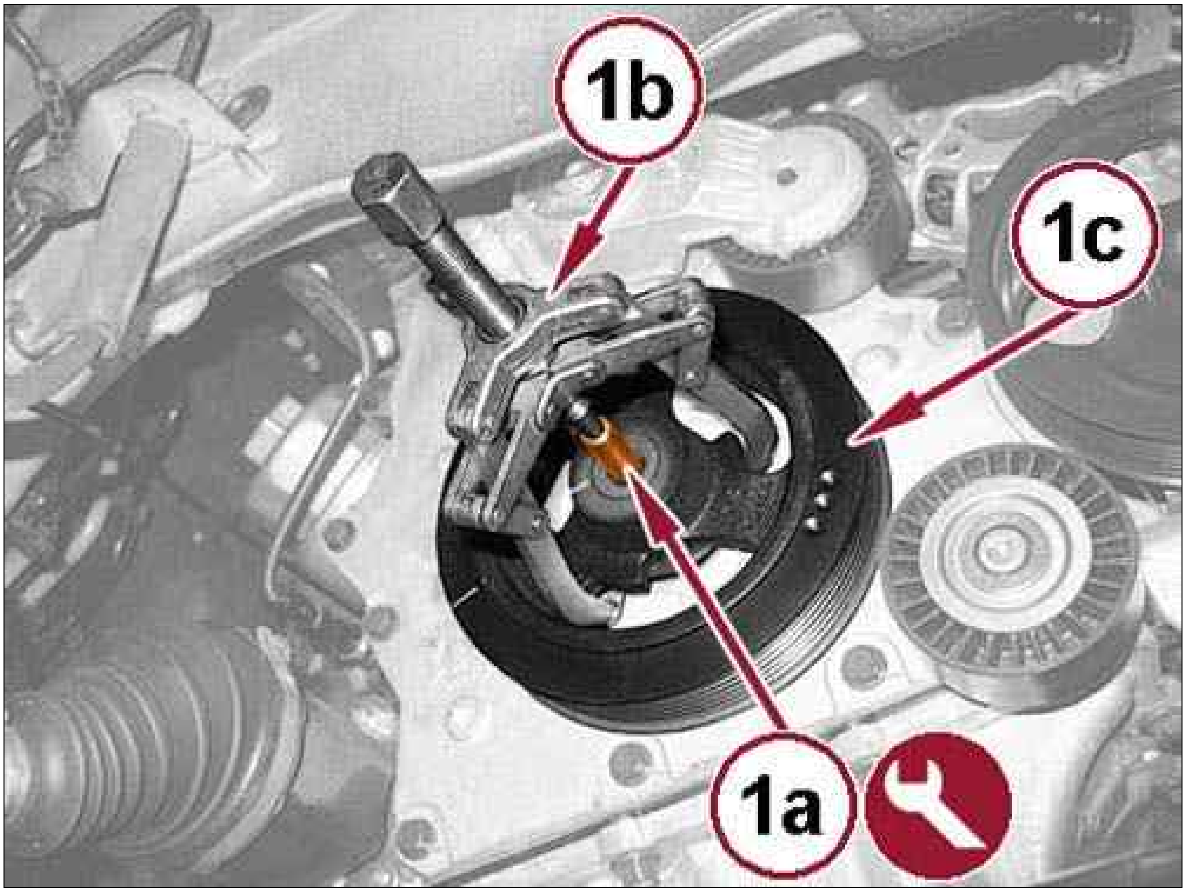
Fig 2: Vibration Damper Bolt



Courtesy of CHRYSLER GROUP, LLC

6. Remove the vibration damper bolt (1).

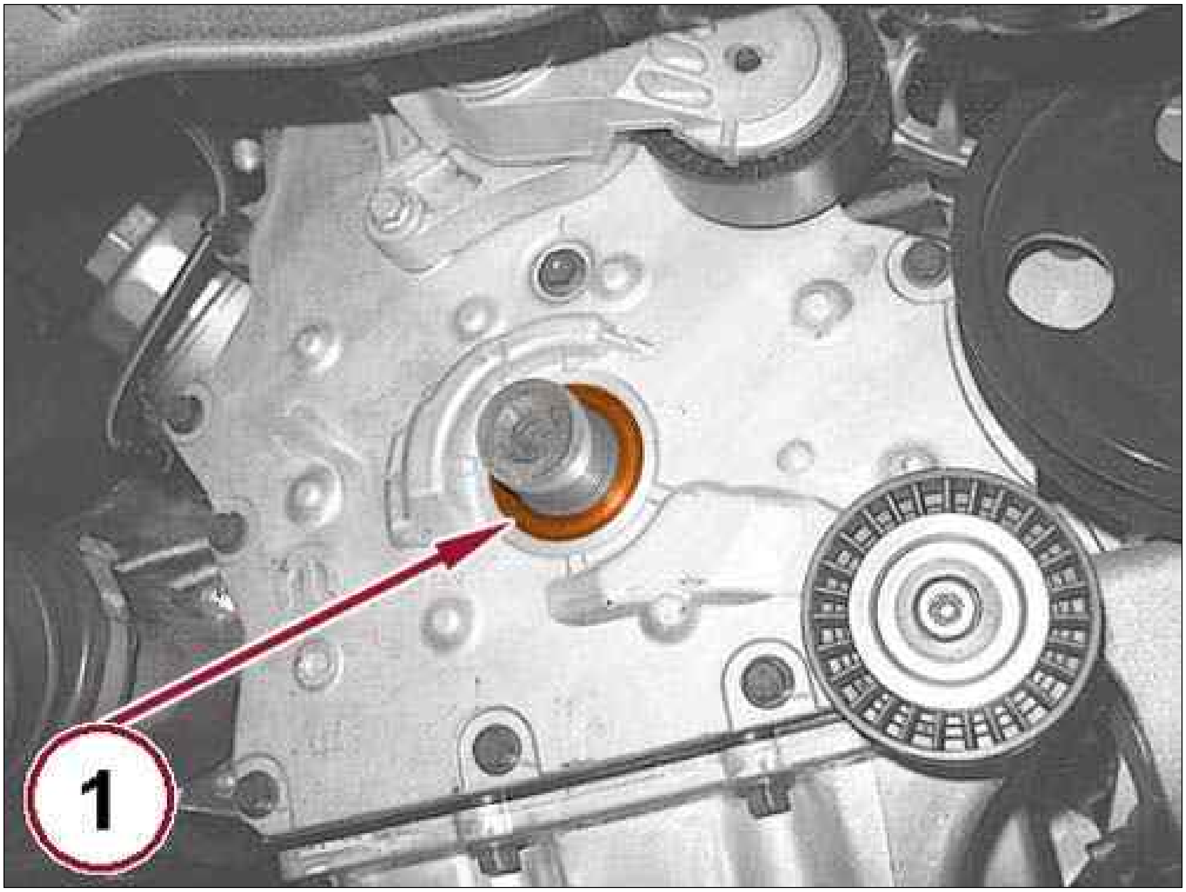
Fig 3: Removing Vibration Damper



Courtesy of CHRYSLER GROUP, LLC

7. Using the tool 2000040942 (1a) and suitable extractor (1b), remove the vibration damper (1c).

Fig 4: Front Crankshaft Oil Seal At Timing Cover

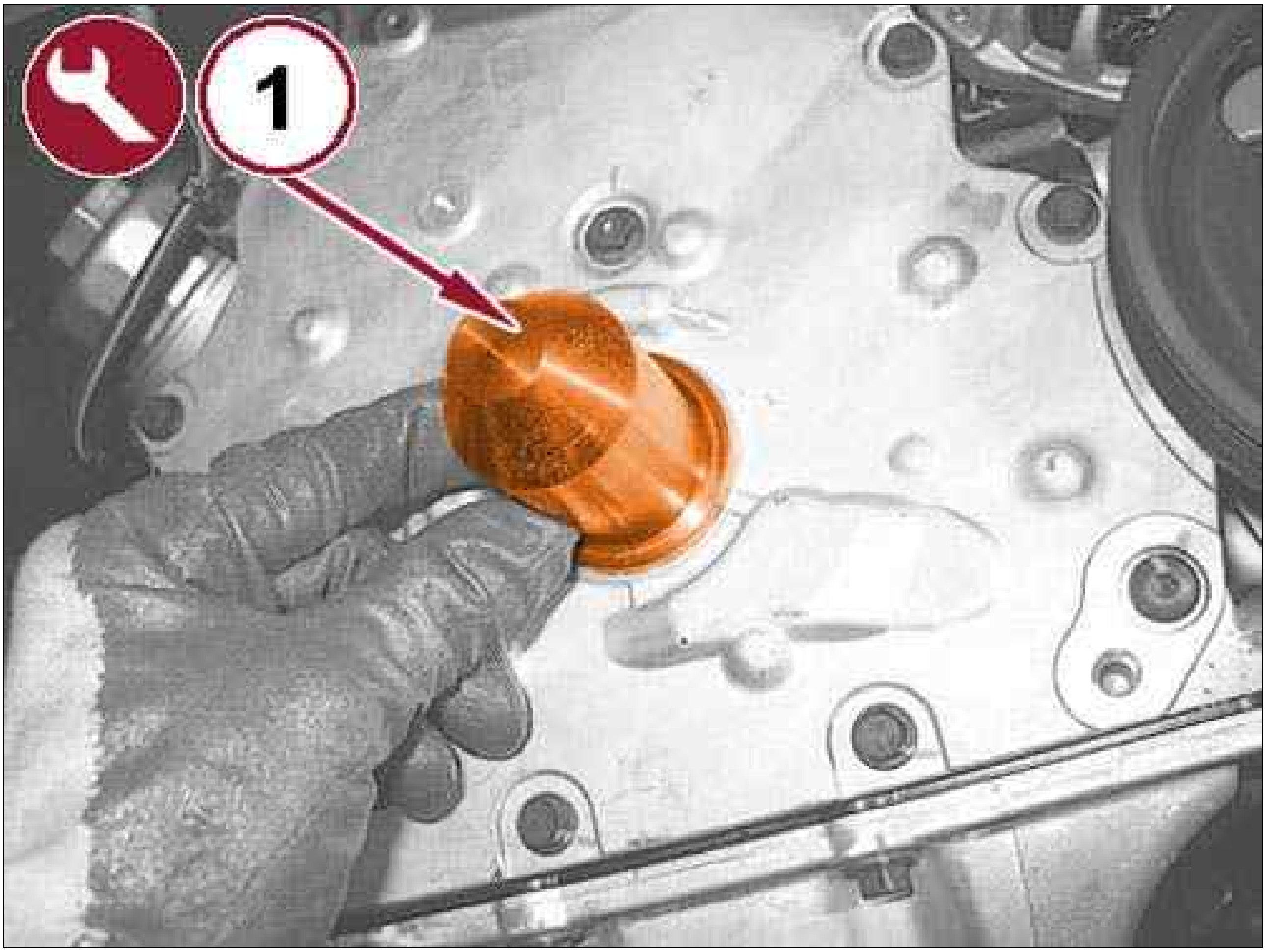


Courtesy of CHRYSLER GROUP, LLC

8. Remove the front crankshaft oil seal from the timing cover taking care not to damage its housing.

ENGINE BLOCK > DAMPER, VIBRATION > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

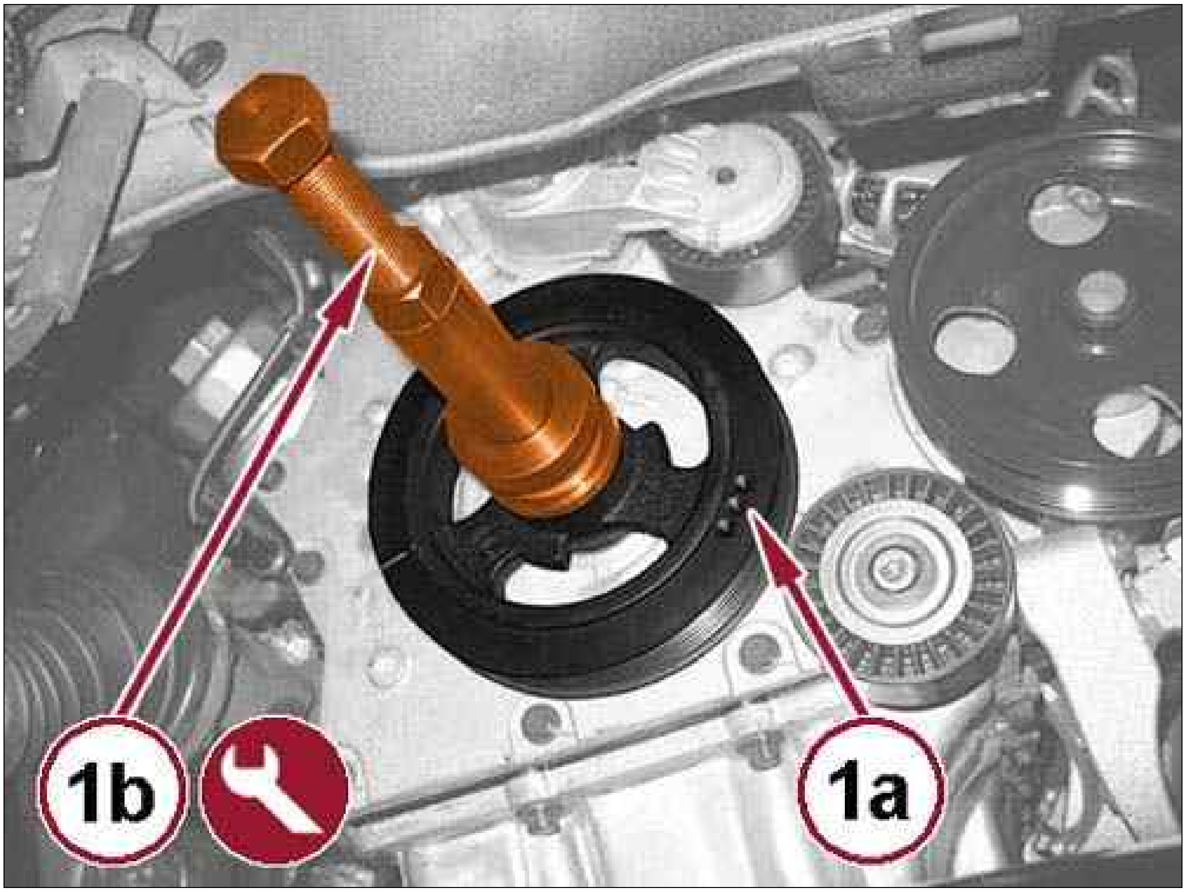
Fig 1: Installing Front Crankshaft Oil Seal Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

1. Using the fitting tool 2000040939 (1), install the **NEW** front crankshaft oil seal.

Fig 2: Installing Vibration Damper Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

2. Using the tool 2000040941 (1b), install the vibration damper (1a).
3. Install a **NEW** vibration damper and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .
4. Remove the flywheel locking tool 2000041300.
5. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
6. Install the right front wheel house splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
7. Install the starter motor. Refer to STARTER, REMOVAL AND INSTALLATION .
8. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

ENGINE BLOCK > RING(S), PISTON > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

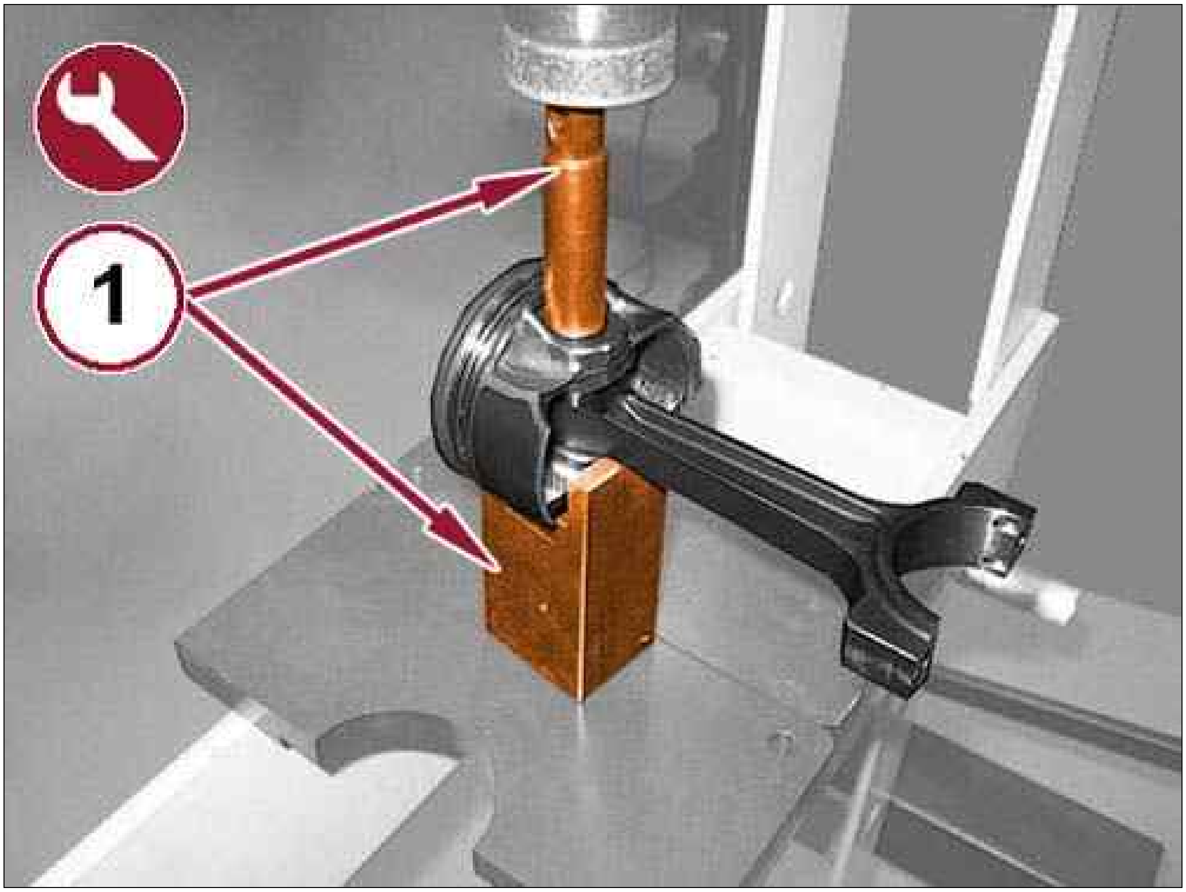
1. Position the connecting rod-piston assembly in a vice fitted with protective jaws.

Fig 1: Removing Sealing Rings From Piston

Courtesy of CHRYSLER GROUP, LLC

2. Remove the sealing rings from the piston using a suitable tool (1).

Fig 2: Removing Gudgeon Pin Using Hydraulic Press And Special Tools



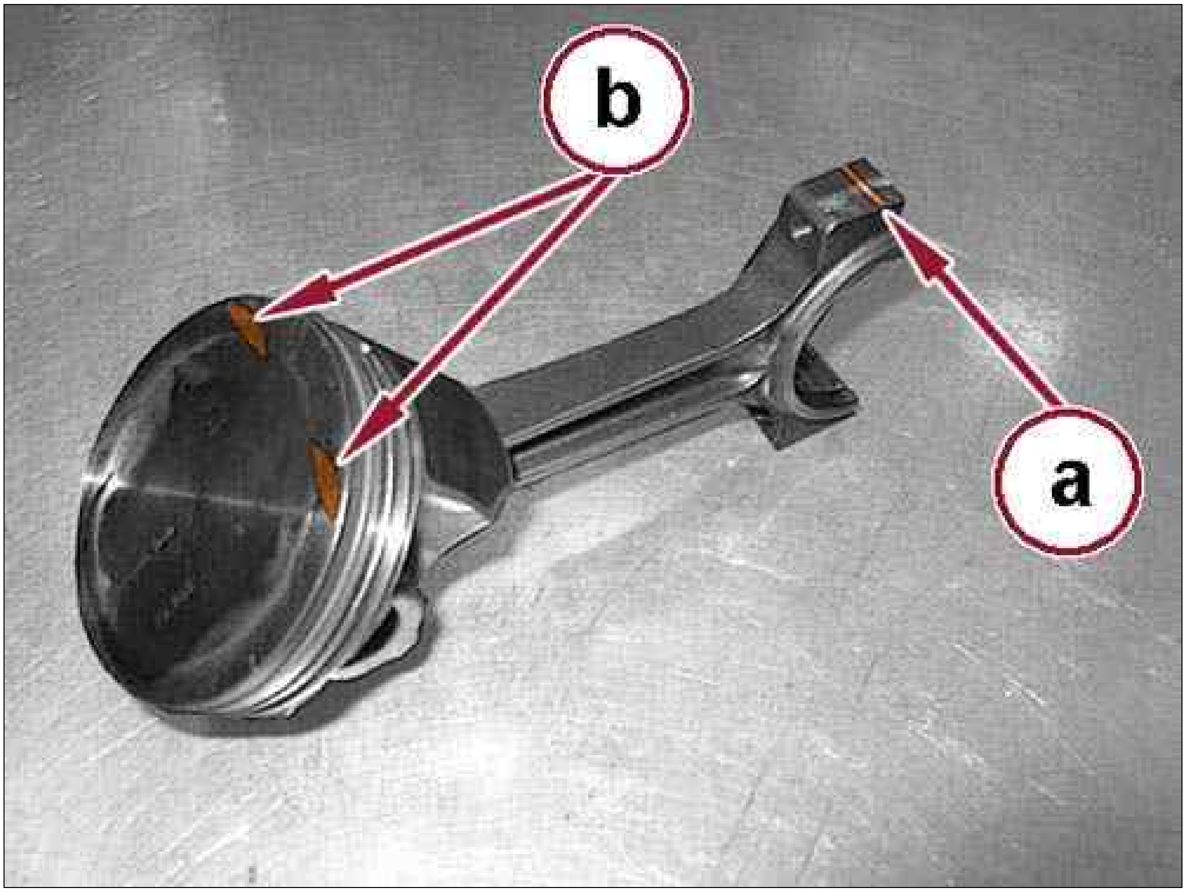
Courtesy of CHRYSLER GROUP, LLC

3. On the hydraulic press, with the tools positioned as shown in the figure, remove the gudgeon pin.

ENGINE BLOCK > RING(S), PISTON > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Clean any carbon residues from the piston crown.
2. Heat the connecting rod in an oven to a temperature of 240 °C to allow the fitting of the gudgeon pin.

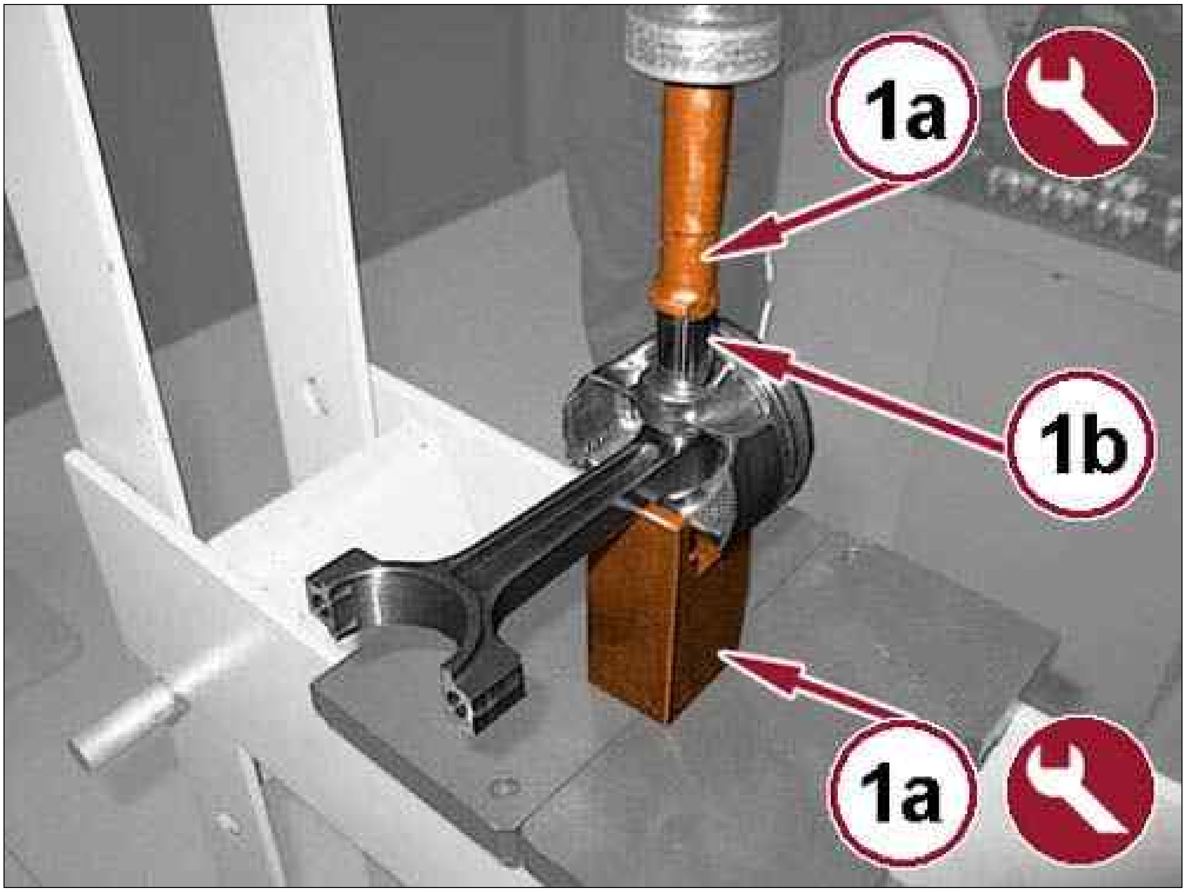
Fig 1: Joining Connecting Rod To Piston With Notch On Connecting Rod Positioned Next To Two Marks On Piston Crown For Intake Valves



Courtesy of CHRYSLER GROUP, LLC

3. Join the connecting rod to the piston so that the notch (a) on the connecting rod is next to the two marks (b) on the piston crown for the intake valves.

Fig 2: Installing Gudgeon Pin Using Hydraulic Press And Special Tools



Courtesy of CHRYSLER GROUP, LLC

4. On the hydraulic press, fit the gudgeon pin (1b) using the tool (1a) as shown in the figure.
5. Position the connecting rod-piston assembly in a vice fitted with protective jaws.
6. Fit the seals on the piston using a suitable tool.
7. All the sealing rings must be fitted with the word TOP upwards.
8. When the fitting is complete, position the references on the sealing rings so that they are not aligned with the gudgeon pin axis and are 120° offset from one another.

ENGINE BLOCK > ROD, PISTON AND CONNECTING > DESCRIPTION > DESCRIPTION

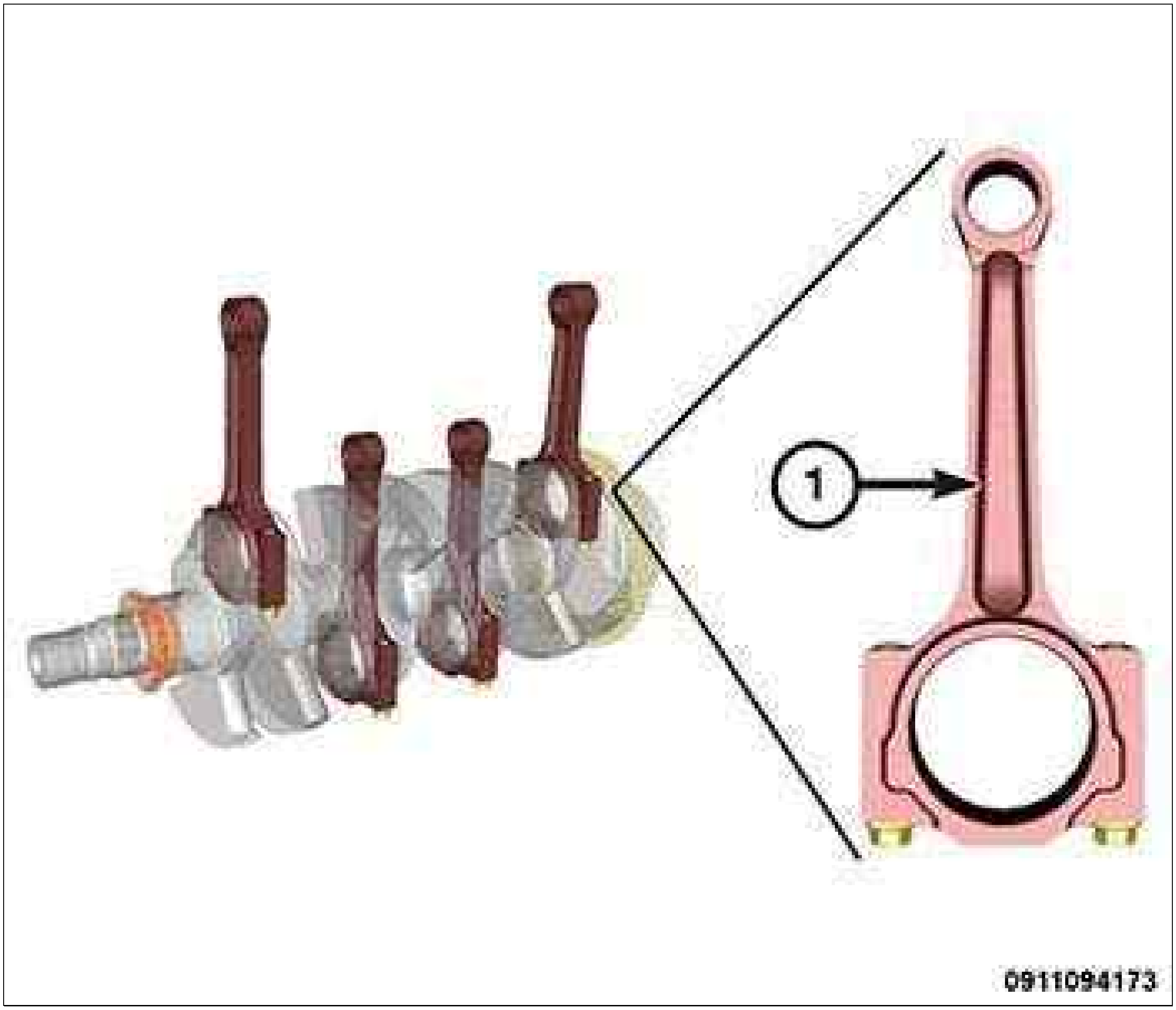
Fig 1: Piston Components

Courtesy of CHRYSLER GROUP, LLC

PISTON

- The pistons are made of aluminum alloys and have a graphite coating on the skirt, imprints for the valves and a small hollow for the combustion chamber on the crown. The pistons are further cooled by an oil jet; the compression seal is ensured by two piston rings, while the oil seal is provided by a third oil scraper ring.

Fig 2: Connecting Rod



Courtesy of CHRYSLER GROUP, LLC

CONNECTING ROD

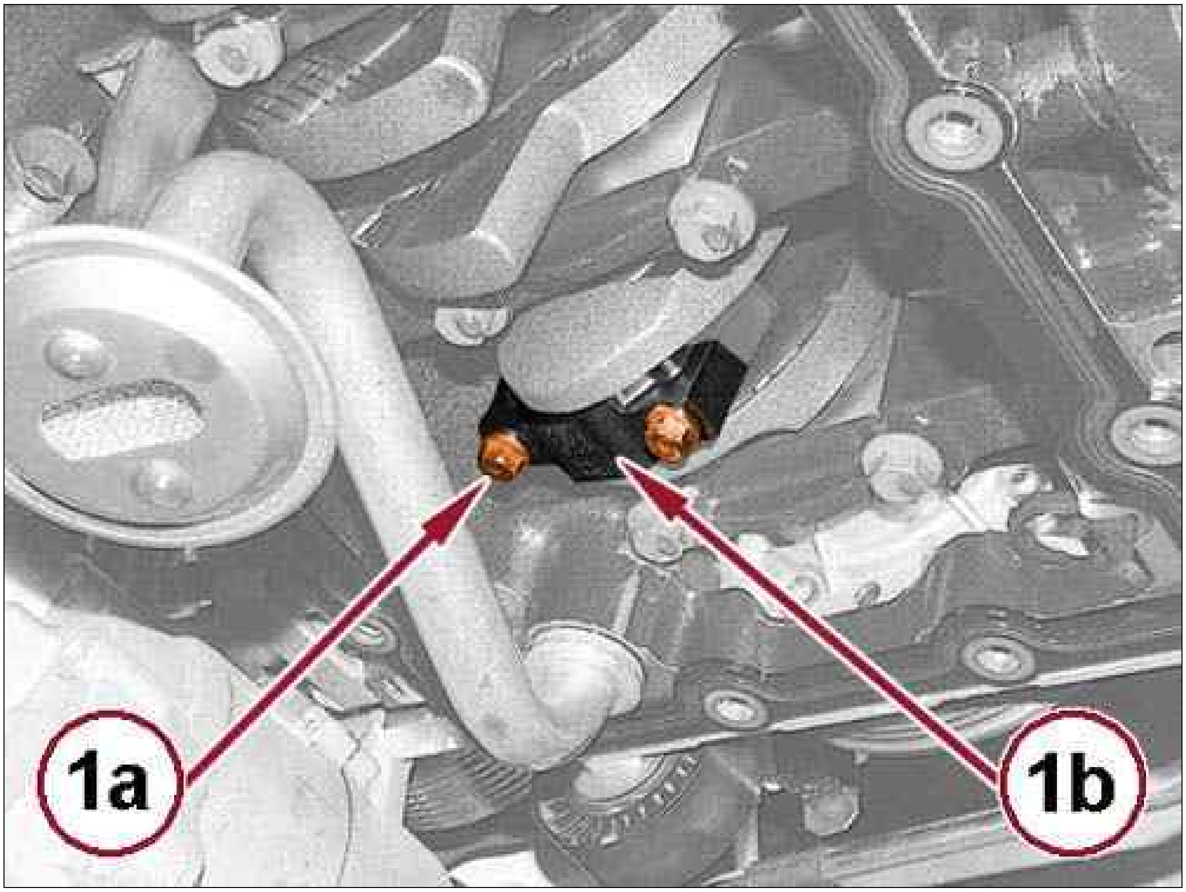
- The connecting rods (1) are made of steel. The piston pin is the floating type and works inside the bush inserted in the small end and is kept in place by two circlips on the piston. The last two digits of the external diameter of the big end are shown on the connecting rod cap. The weight of each individual connecting rod is approximately 420 g.

ENGINE BLOCK > ROD, PISTON AND CONNECTING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Remove the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
3. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

4. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
5. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
6. Drain the engine oil and replace the oil filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
7. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
8. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
9. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
10. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
11. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
12. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
13. Remove the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
14. Remove the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
15. Remove the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
16. Remove the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING .
17. Remove the front oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
18. Remove the rear oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
19. Remove the exhaust manifold. Refer to MANIFOLD, EXHAUST, REMOVAL AND INSTALLATION .
20. Remove the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL AND INSTALLATION .
21. Remove the cylinder head. Refer to CYLINDER HEAD, REMOVAL AND INSTALLATION .
22. Remove the oil pan. Refer to PAN, OIL, REMOVAL AND INSTALLATION .

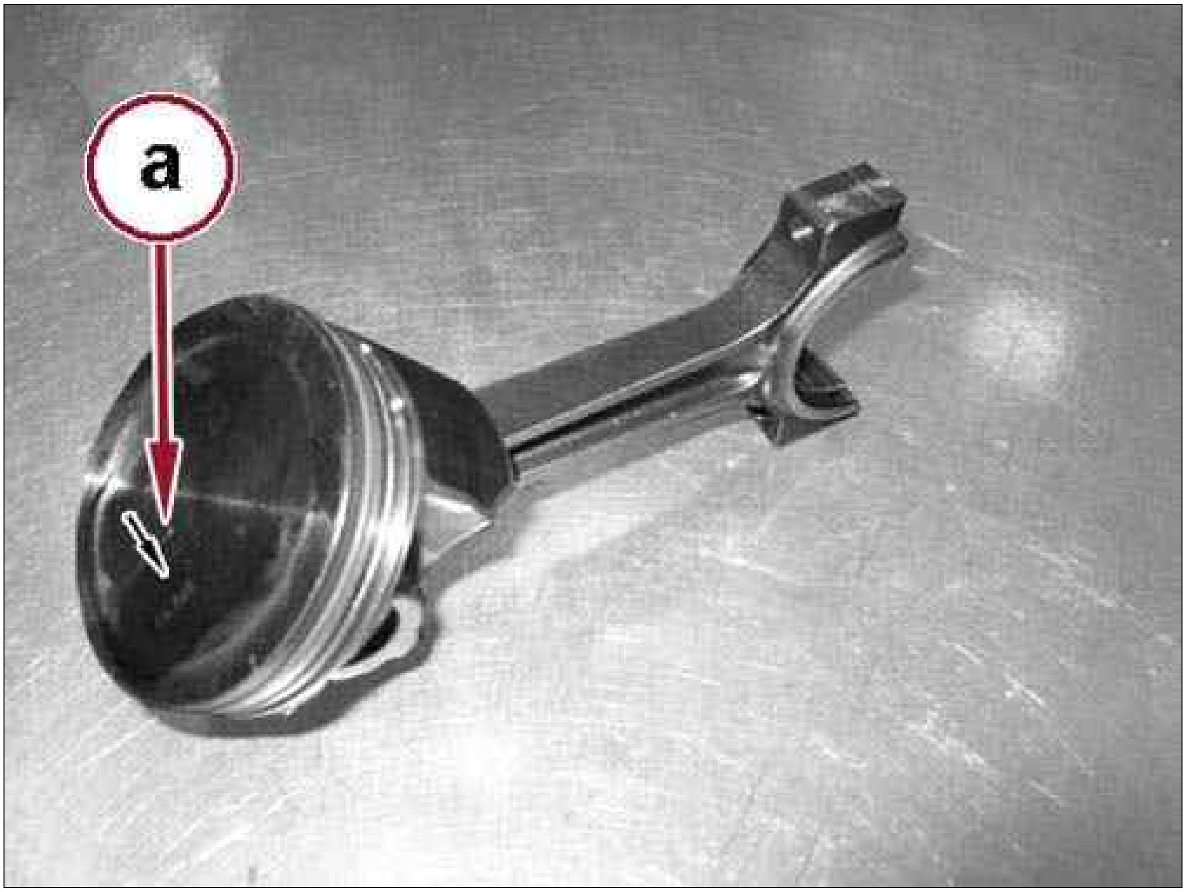
Fig 1: Connecting Rod Cap & Bolts



Courtesy of CHRYSLER GROUP, LLC

23. Remove the bolts (1a) and the connecting rod cap (1b) complete with half-bearing.

Fig 2: Arrow On Piston Crown Facing Timing Side Indicates Fitting Direction

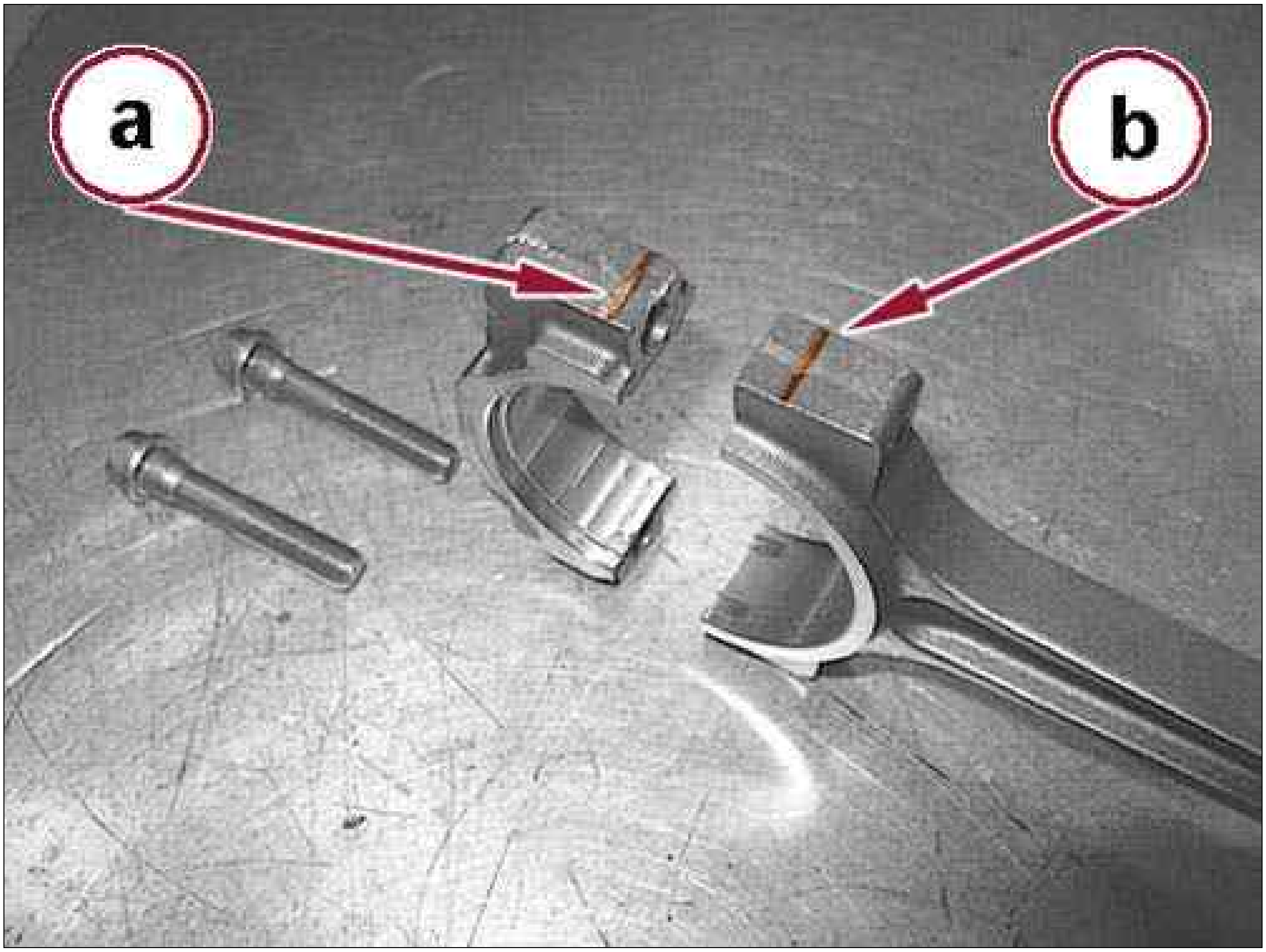


Courtesy of CHRYSLER GROUP, LLC

24. Remove the piston with connecting rod and half-bearing.
25. The arrow (a) on the piston crown facing the timing side indicates the fitting direction. The connecting rods are pre-set fracture rods and are supplied already fractured by parts together with the cap screws. The connecting rod caps are not interchangeable because the fracture profile differs from part to part.

ENGINE BLOCK > ROD, PISTON AND CONNECTING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

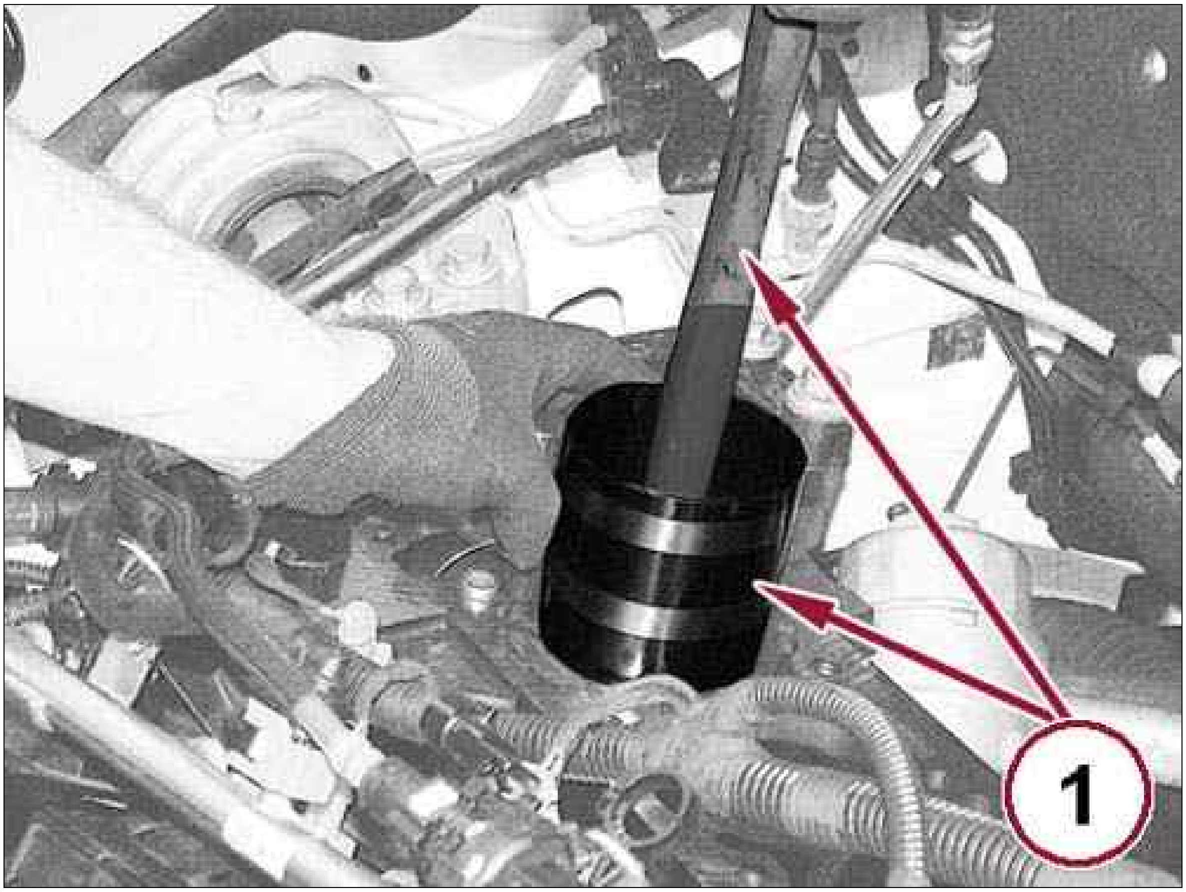
Fig 1: Aligning Notch On Connecting Rod Cap With Notch On Connecting Rod



Courtesy of CHRYSLER GROUP, LLC

1. A notch (a) is present on the connecting rod caps, which should be aligned with the notch (b) on the connecting rod. These reference notches should be facing the intake side.

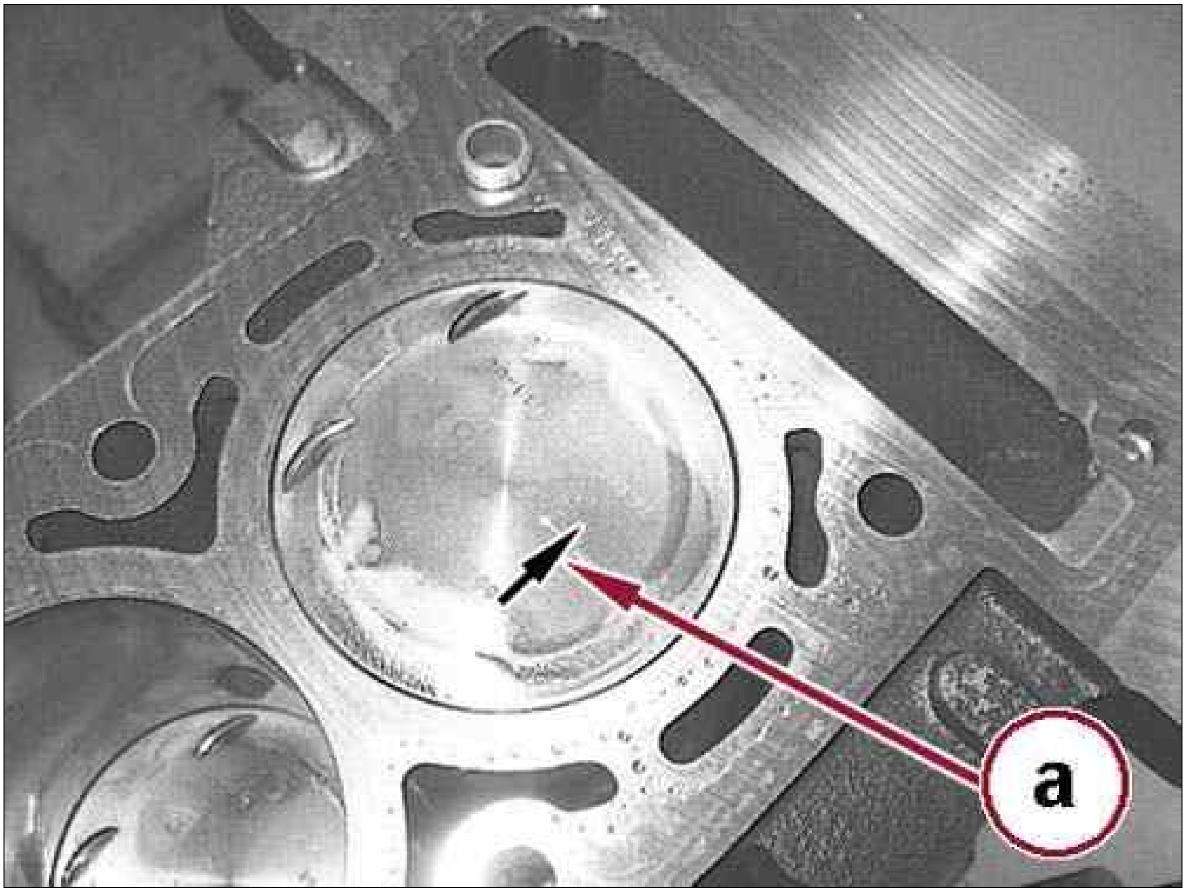
Fig 2: Installing Piston Assembly Into Cylinder Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

2. Fit the connecting rod-piston assembly with half-bearings using a suitable tool (1) to compress the sealing rings and then fit the piston into the cylinder liner.

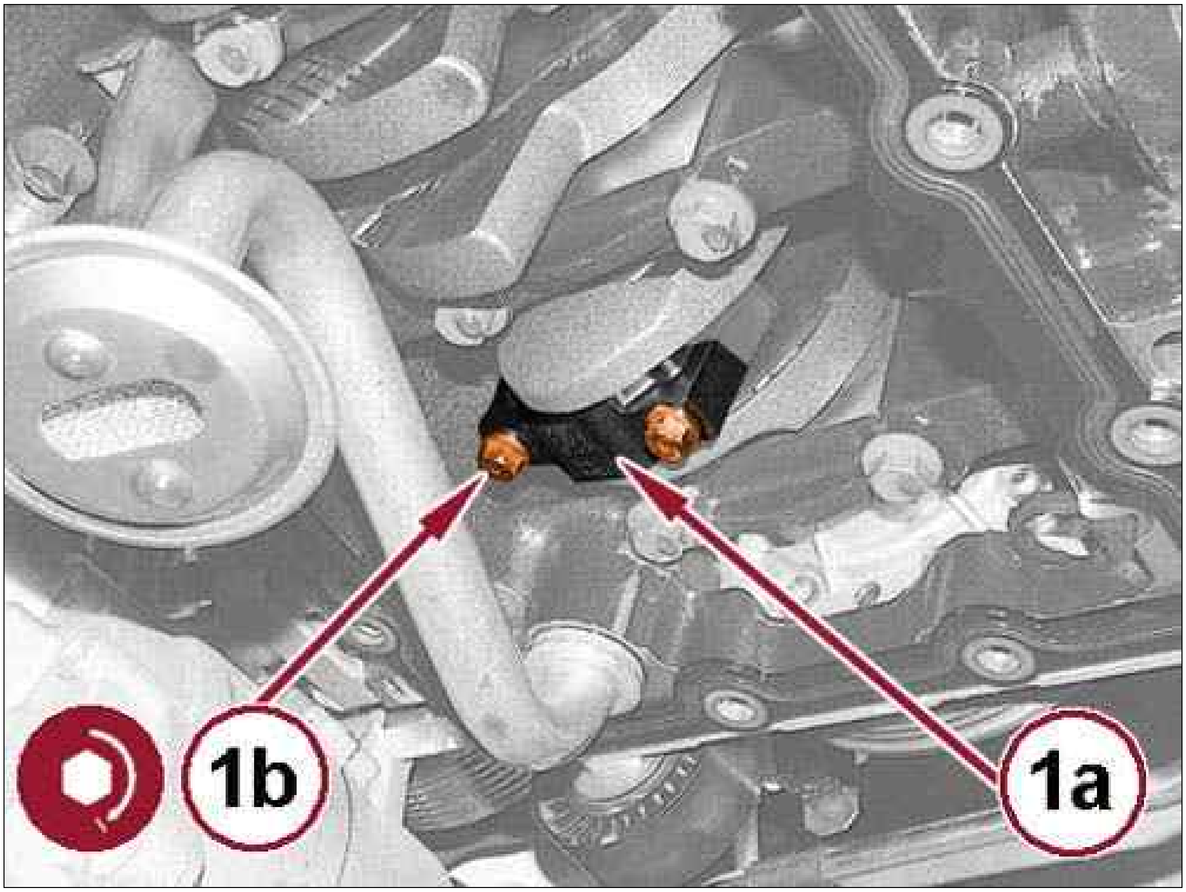
Fig 3: Arrow On Piston Crown Facing Timing Side Indicates Fitting Direction



Courtesy of CHRYSLER GROUP, LLC

3. The arrow (a) on the piston crown facing the timing side indicates the fitting direction.

Fig 4: Connecting Rod Cap & Bolts



Courtesy of CHRYSLER GROUP, LLC

4. Place the bearing cap (1a), complete with half-bearing, back in its housing and tighten the screws (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .
5. Install the oil pan. Refer to PAN, OIL, REMOVAL AND INSTALLATION .
6. Install the cylinder head. Refer to CYLINDER HEAD, REMOVAL AND INSTALLATION .
7. Install the intake manifold. Refer to MANIFOLD, INTAKE, REMOVAL AND INSTALLATION .
8. Install the exhaust manifold. Refer to MANIFOLD, EXHAUST, REMOVAL AND INSTALLATION .
9. Install the rear oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
10. Install the front oxygen sensor. Refer to SENSOR, OXYGEN, REMOVAL AND INSTALLATION .
11. Install the timing chain and sprocket. Refer to CHAIN AND SPROCKETS, TIMING, REMOVAL AND INSTALLATION .
12. Install the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
13. Install the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
14. Install the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
15. Install the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND

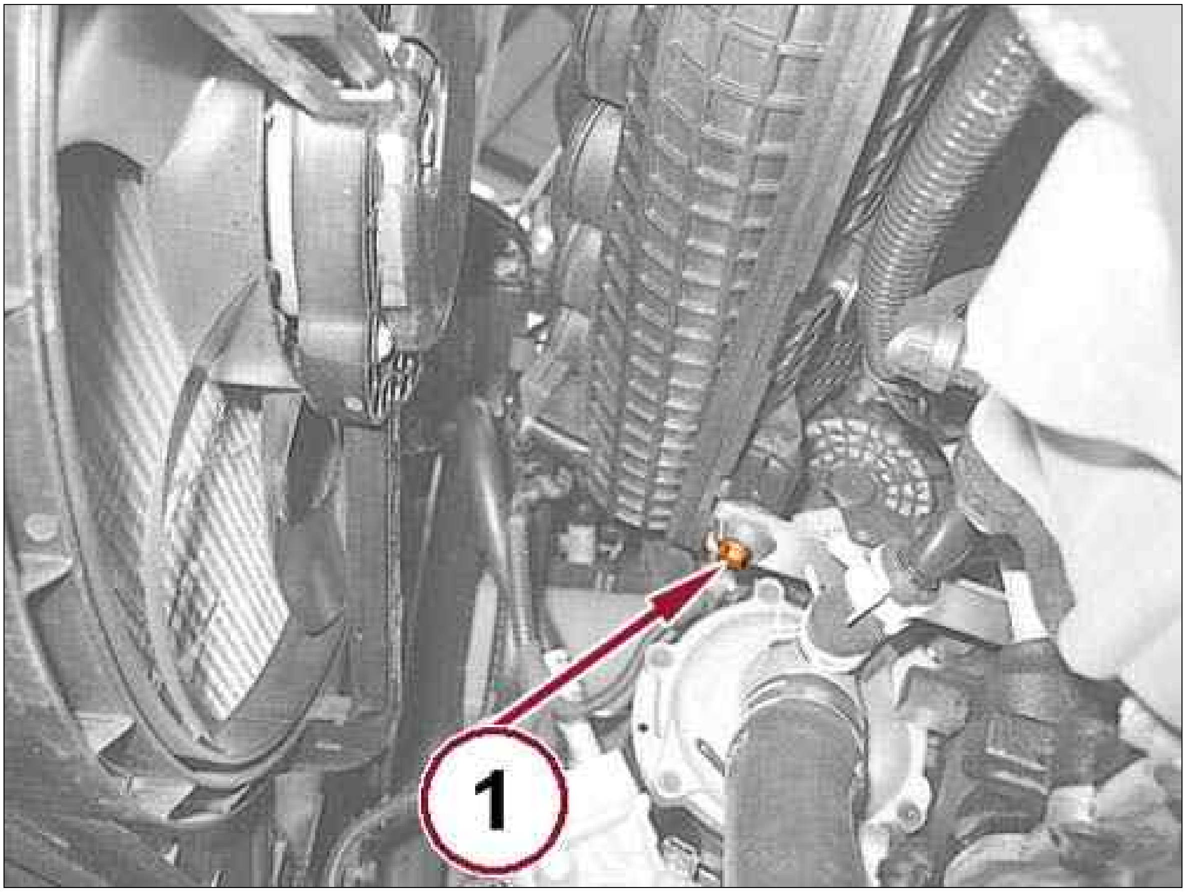
INSTALLATION .

16. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
17. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
18. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
19. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
20. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
21. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
22. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
23. Install the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
24. Evacuate and charge the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
25. Fill the engine with oil and replace the oil filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
26. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

MANIFOLDS > MANIFOLD, INTAKE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Open the fuse box cover in the engine compartment, remove the fuse F21 and start the engine several times until the pressure in the distribution manifold is discharged.
3. Fit the fuse removed previously and close the fuse box casing.
4. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
5. Remove the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .

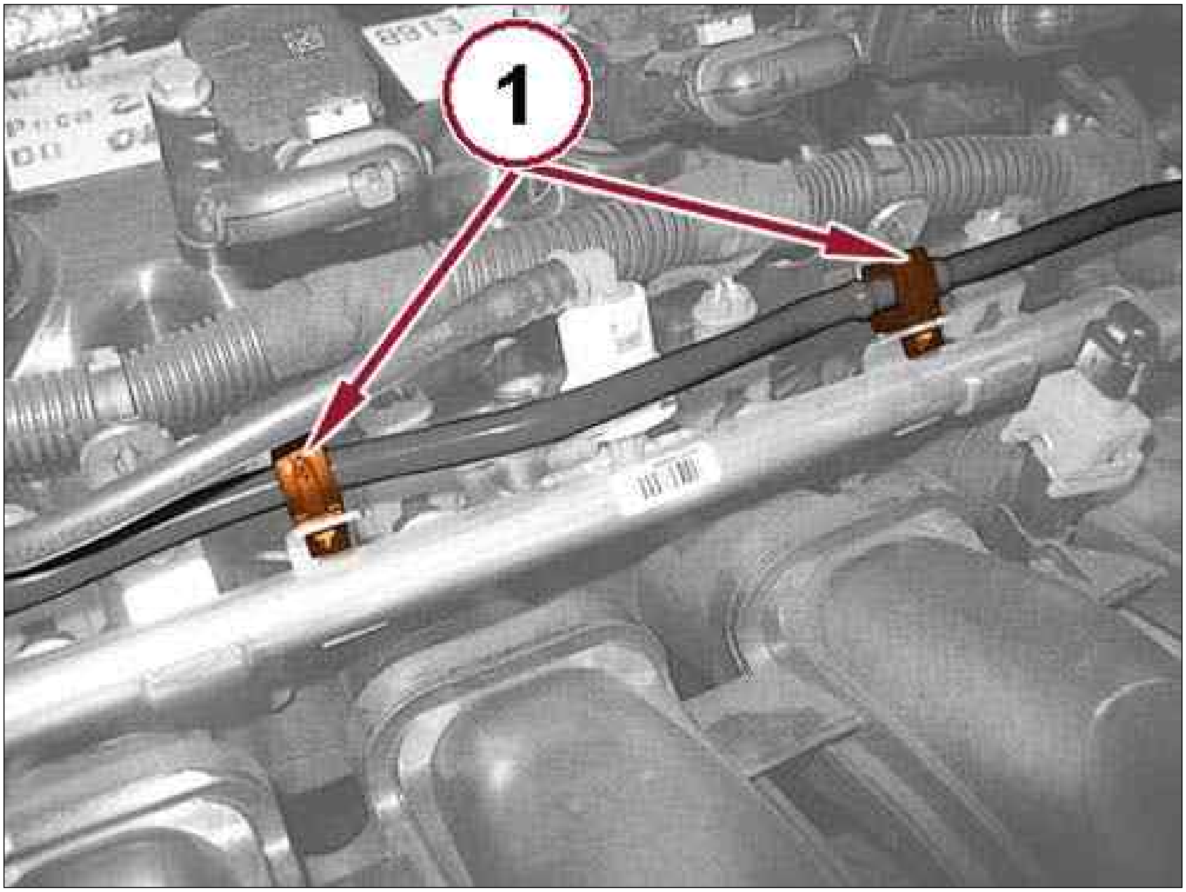
Fig 1: Air Chamber To Bracket Bolt



Courtesy of CHRYSLER GROUP, LLC

6. Remove the bolt (1) securing the air chamber to the bracket.

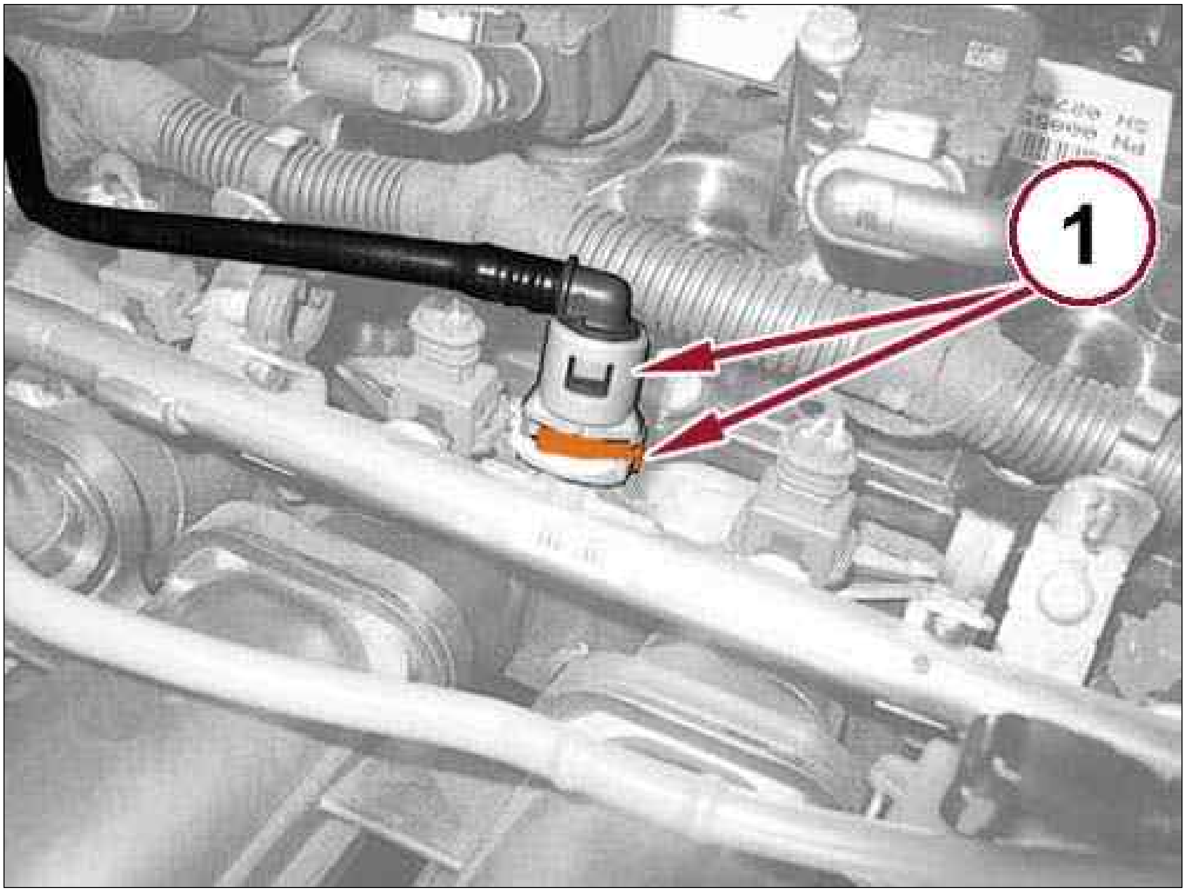
Fig 2: Fuel Vapor Pipe Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

7. Release the retaining clips and remove the fuel vapor pipe (1).

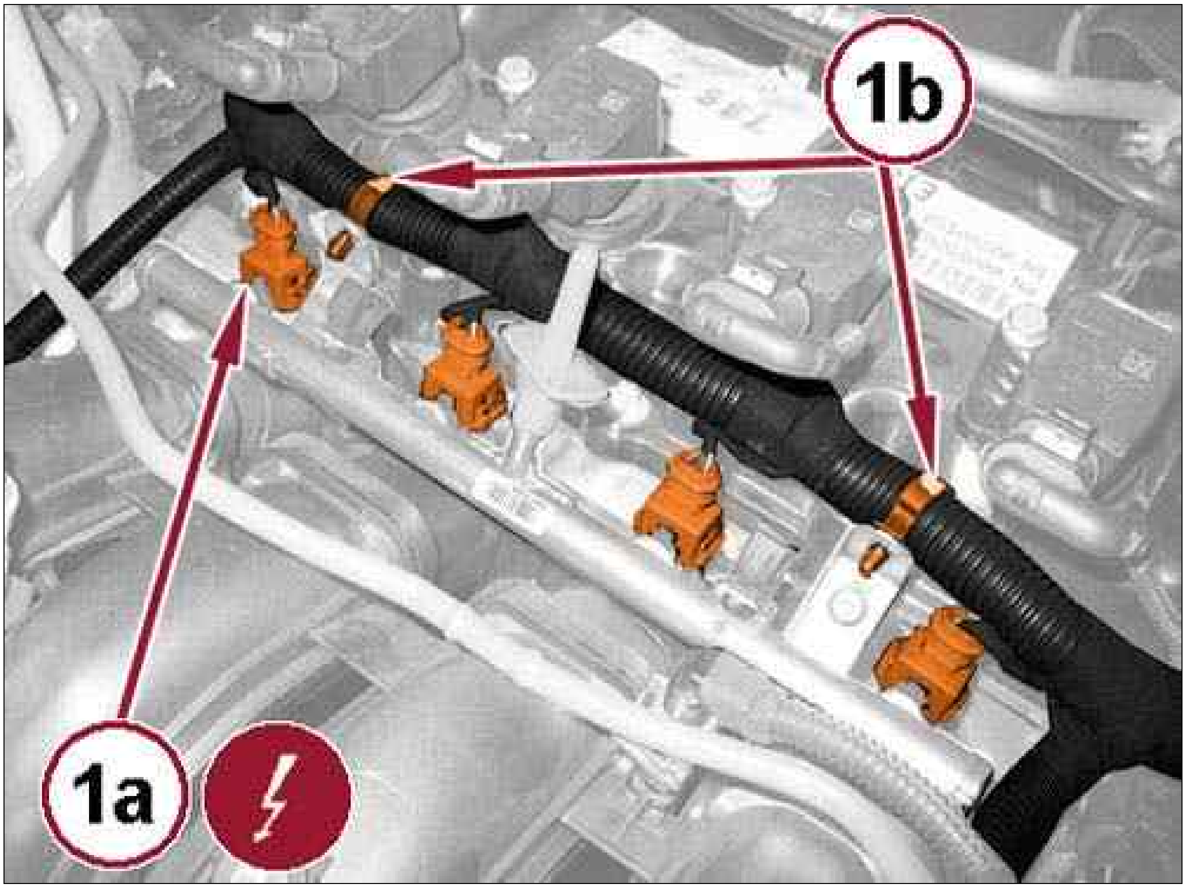
Fig 3: Fuel Supply Line Quick Coupling



Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the quick coupling for the fuel supply line (1).

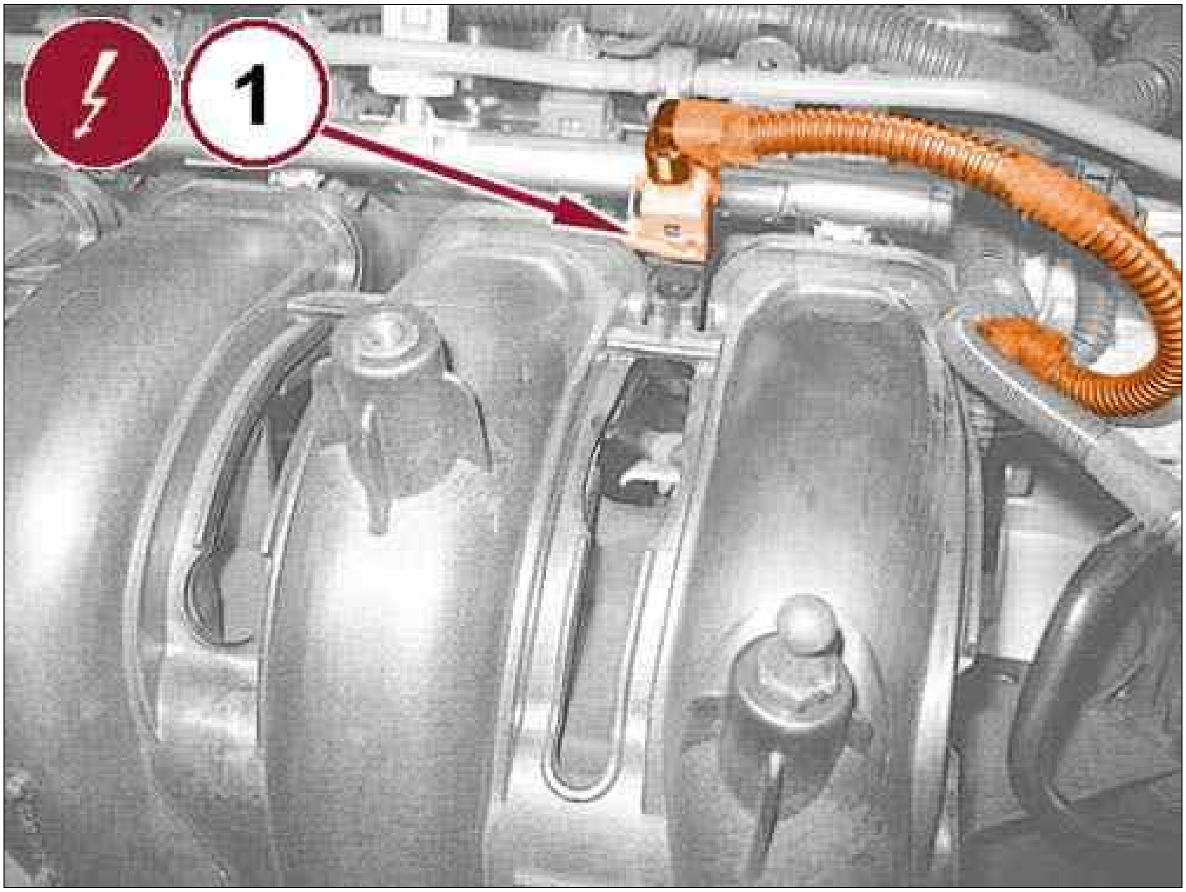
Fig 4: Fuel Injector Wire Harness Connectors & Wiring Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the fuel injector wire harness connectors (1a) and release the wiring retaining clips (1b).

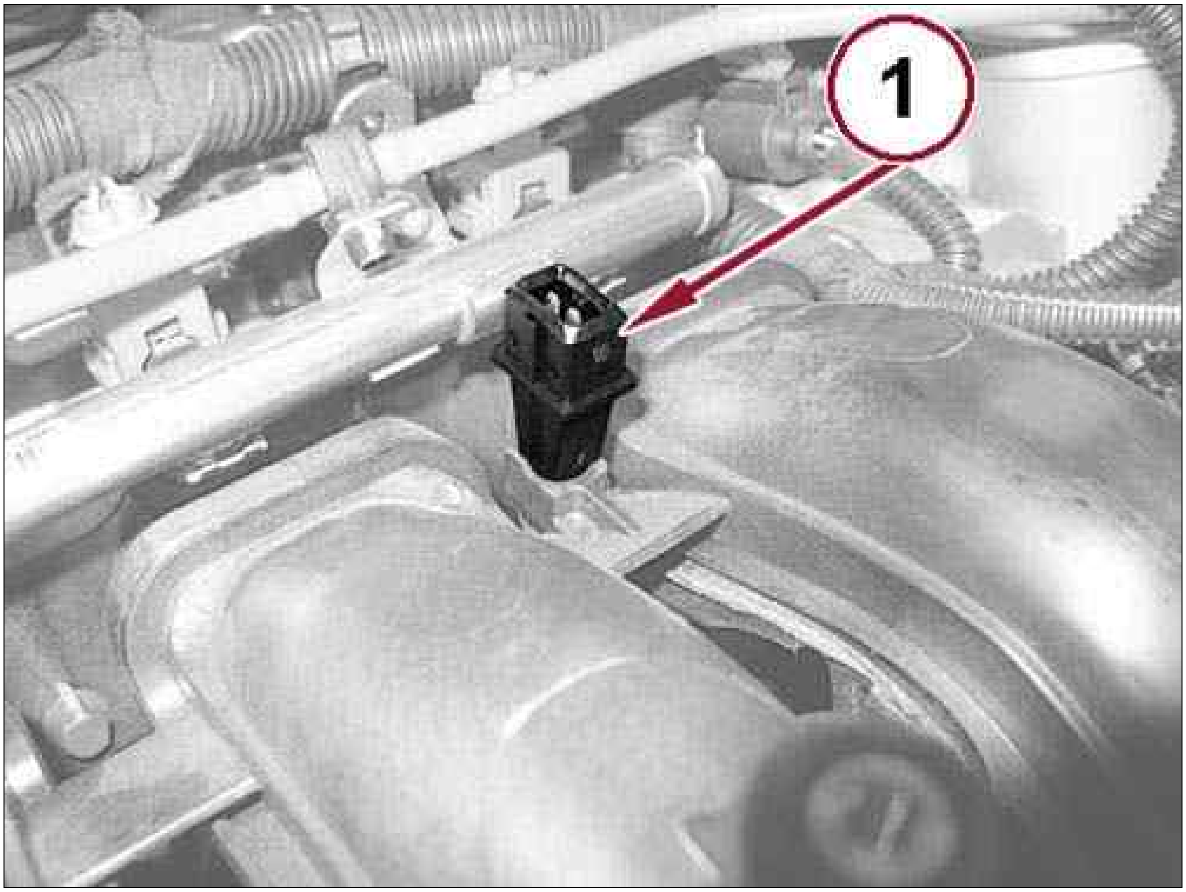
Fig 5: Knock Sensor Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the knock sensor wire harness connector (1).

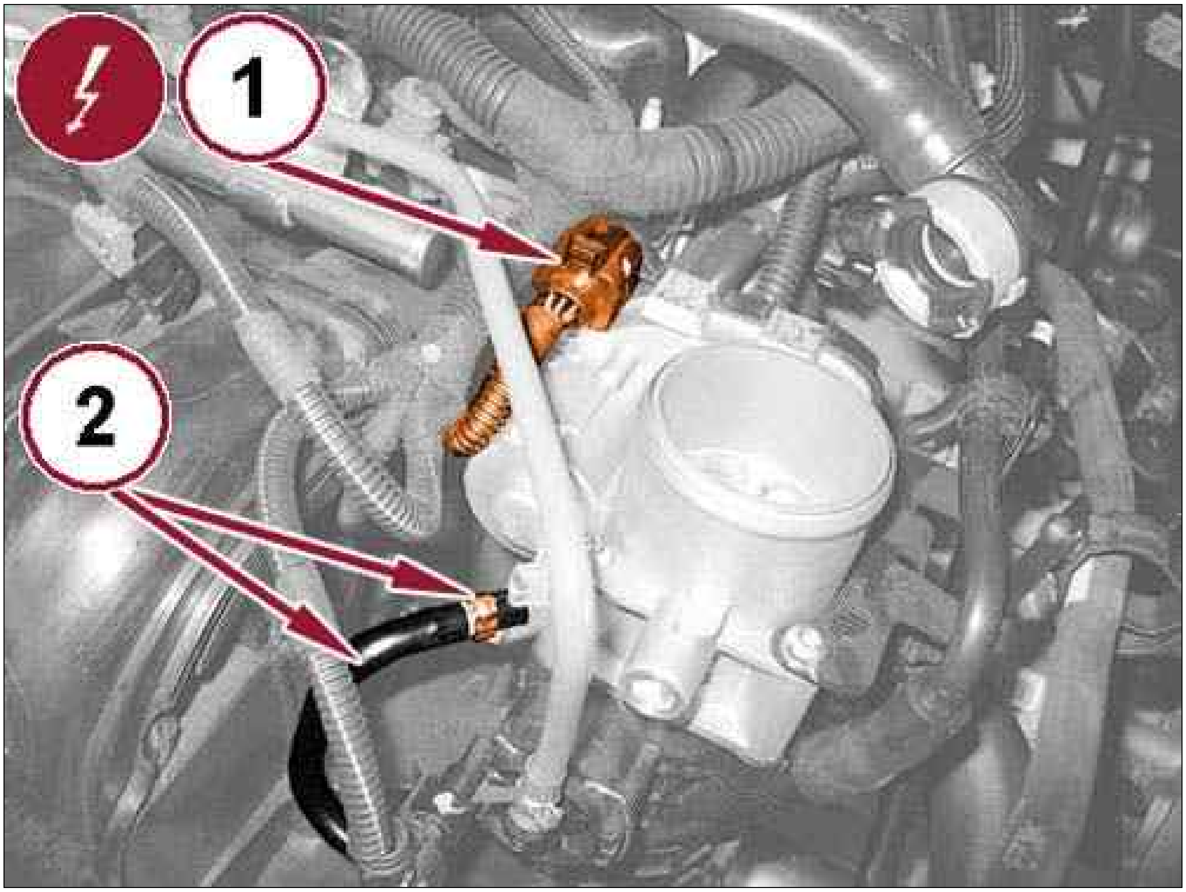
Fig 6: Knock Sensor



Courtesy of CHRYSLER GROUP, LLC

11. Remove the knock sensor (1).

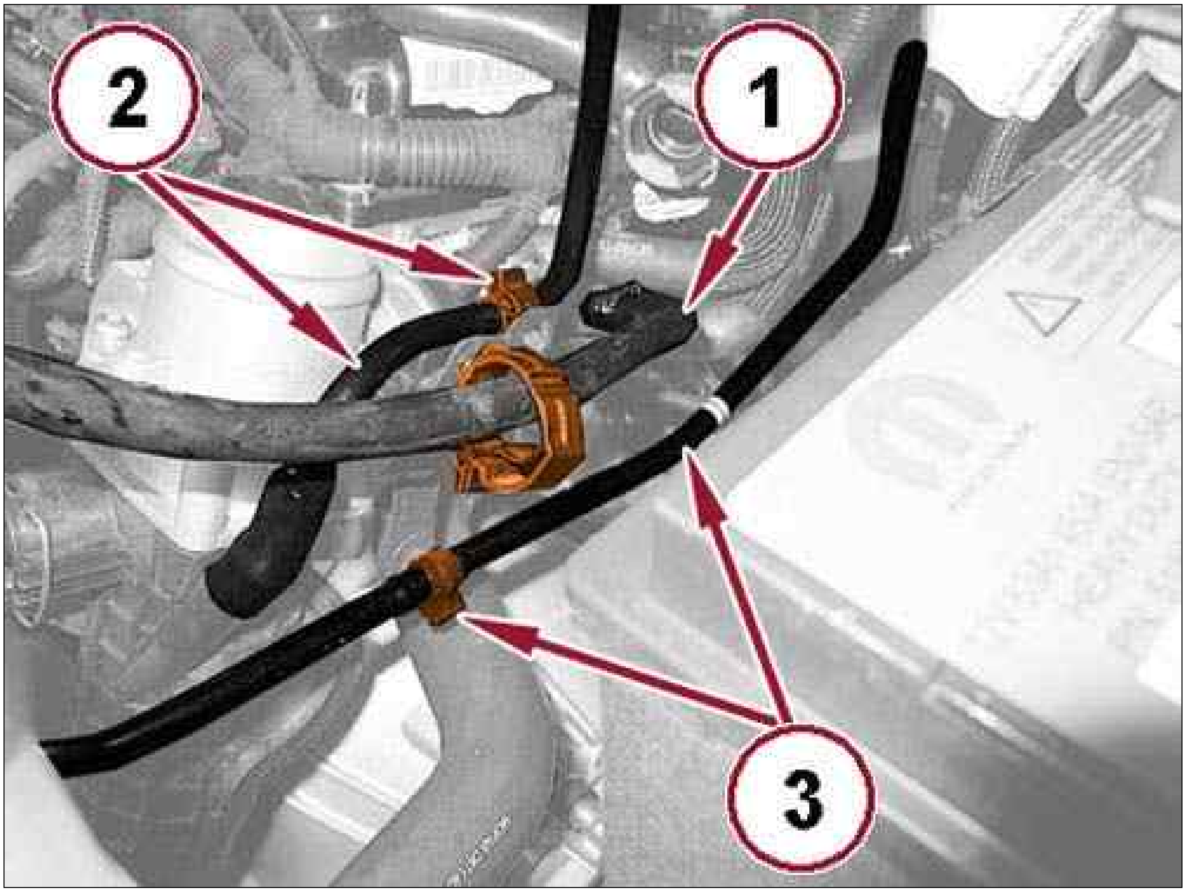
Fig 7: Throttle Body Wire Harness Connector, Brake Servo Vacuum Air Pipe & Band



Courtesy of CHRYSLER GROUP, LLC

12. Disconnect the throttle body wire harness connector (1).
13. Loosen the band and disconnect the brake servo vacuum air pipe (2).

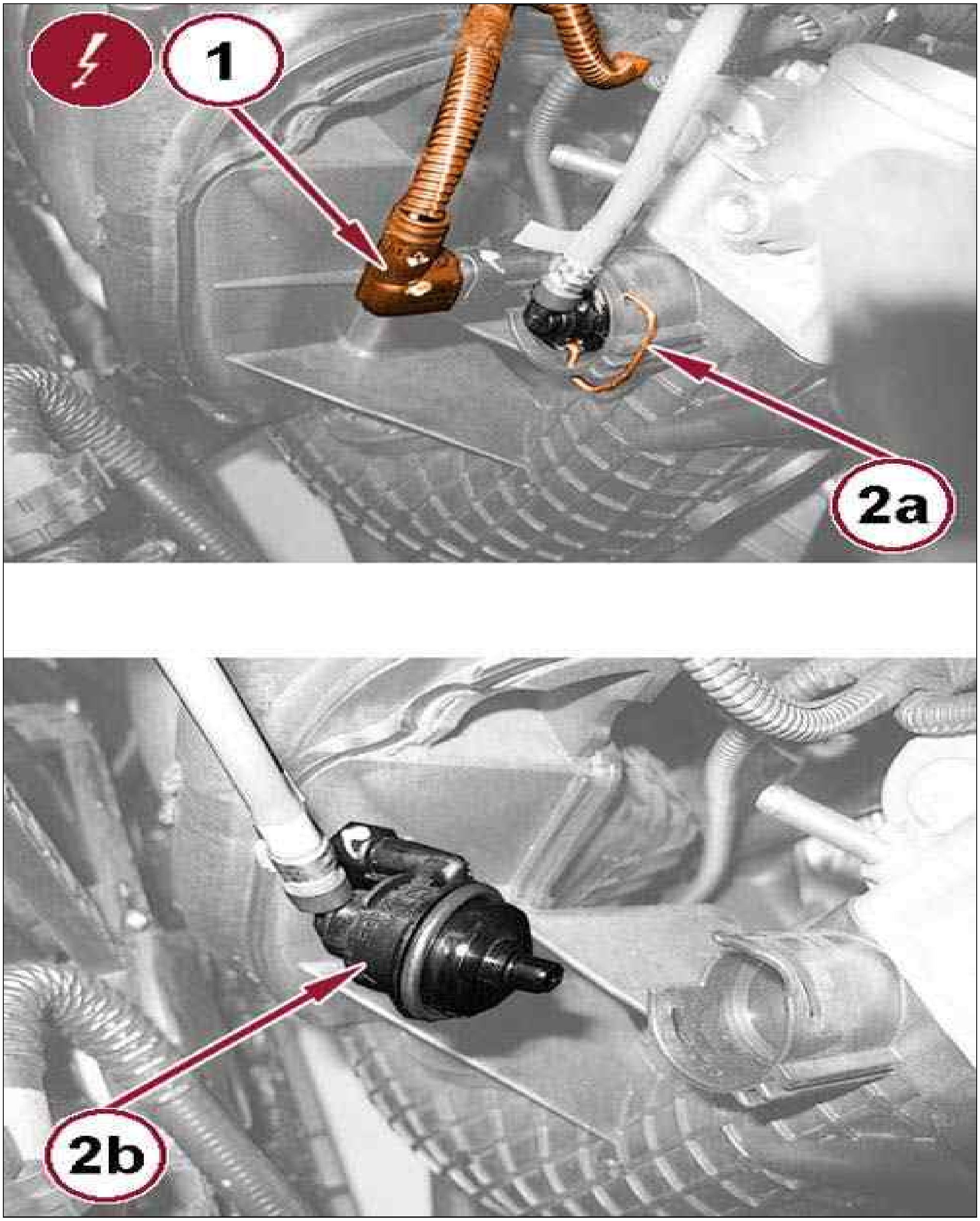
Fig 8: Degassing Pipe, Oil Vapor Pipe At Intake Manifold, Vacuum Air Pipe For Brake Servo & Clips



Courtesy of CHRYSLER GROUP, LLC

14. Open the clip and release the degassing pipe (1).
15. Open the clip and disconnect the oil vapor pipe from the intake manifold (2).
16. Open the clip and release the vacuum air pipe for brake servo (3).

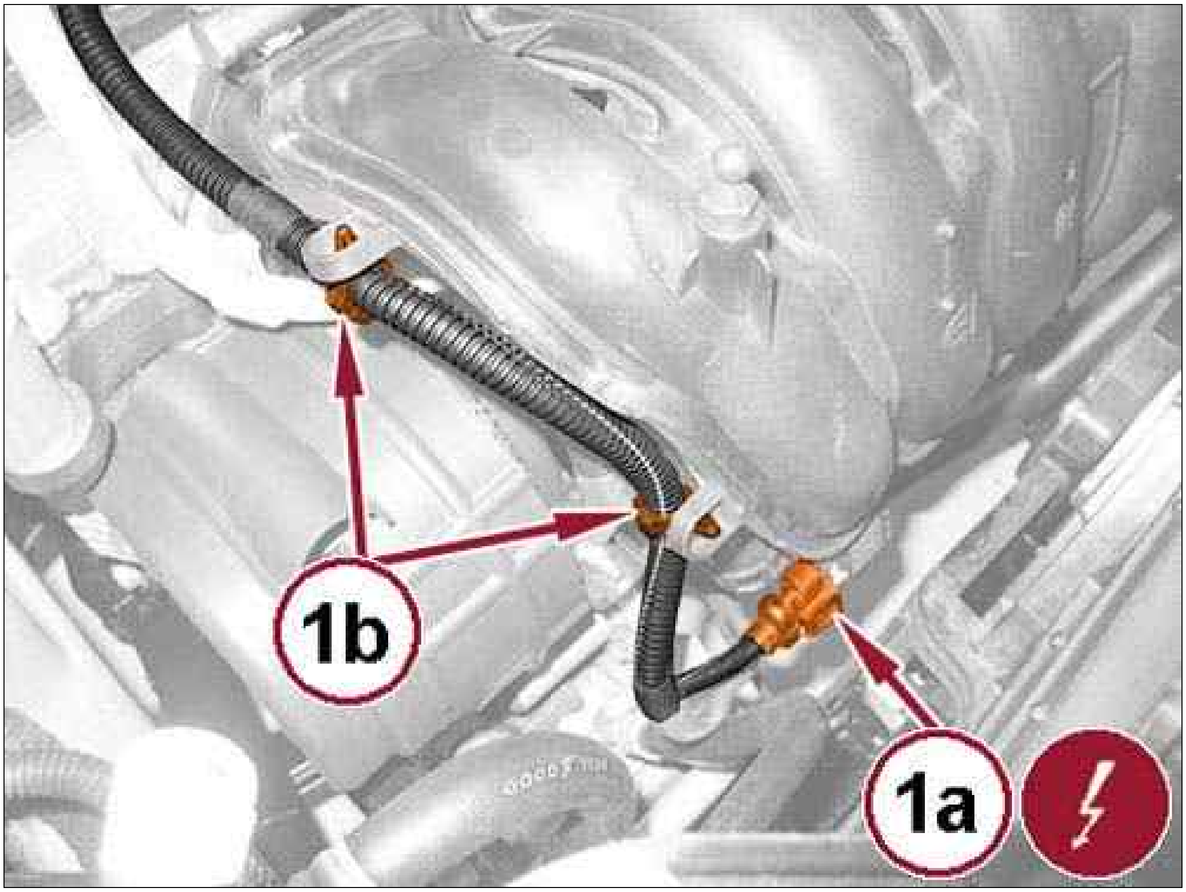
Fig 9: Fuel Vapor Recovery Solenoid Wire Harness Connector, Fuel Vapor Recovery Solenoid Valve & Clip



Courtesy of CHRYSLER GROUP, LLC

17. Detach the fuel vapor recovery solenoid wire harness connector (1).
18. Open the clip (2a) and disconnect the fuel vapor recovery solenoid valve (2b) complete with O-ring.

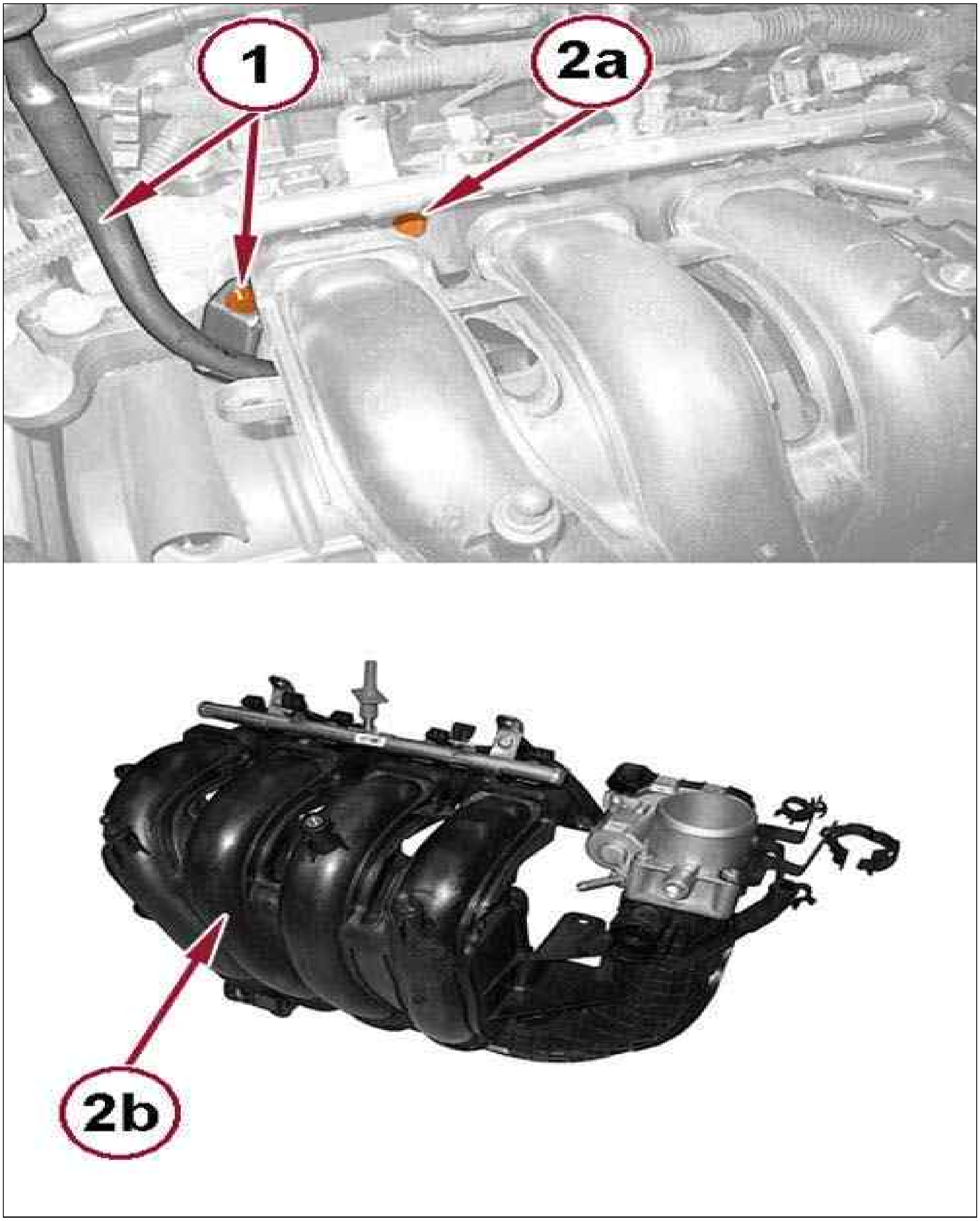
Fig 10: Air Pressure And Temperature Sensor Wire Harness Connector & Wiring Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

19. Disconnect the air pressure and temperature sensor (1a) wire harness connector and release the wiring retaining clips (1b).

Fig 11: Engine Oil Dipstick Tube, Intake Manifold & Bolts

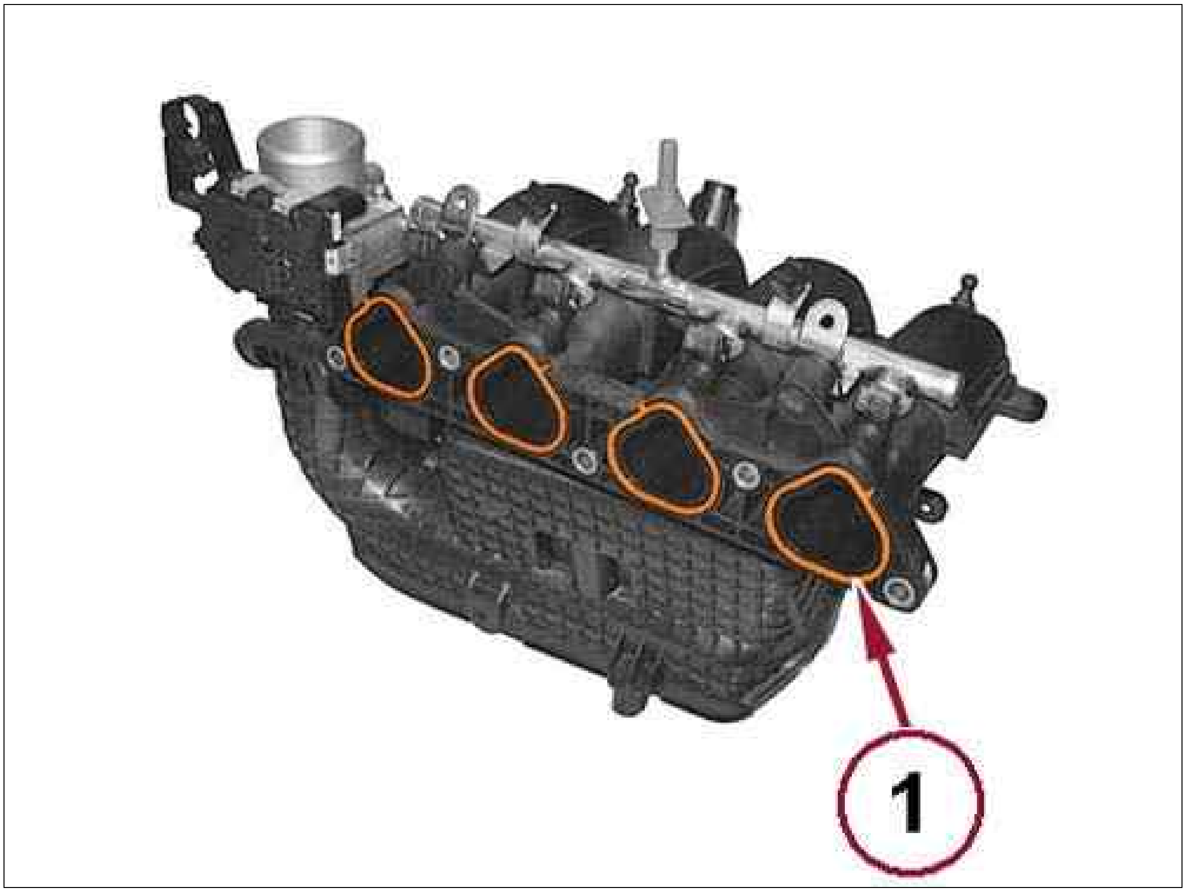


Courtesy of CHRYSLER GROUP, LLC

20. Remove the bolt securing the engine oil dipstick tube (1).

21. Remove the bolts (2a) and the intake manifold (2b).

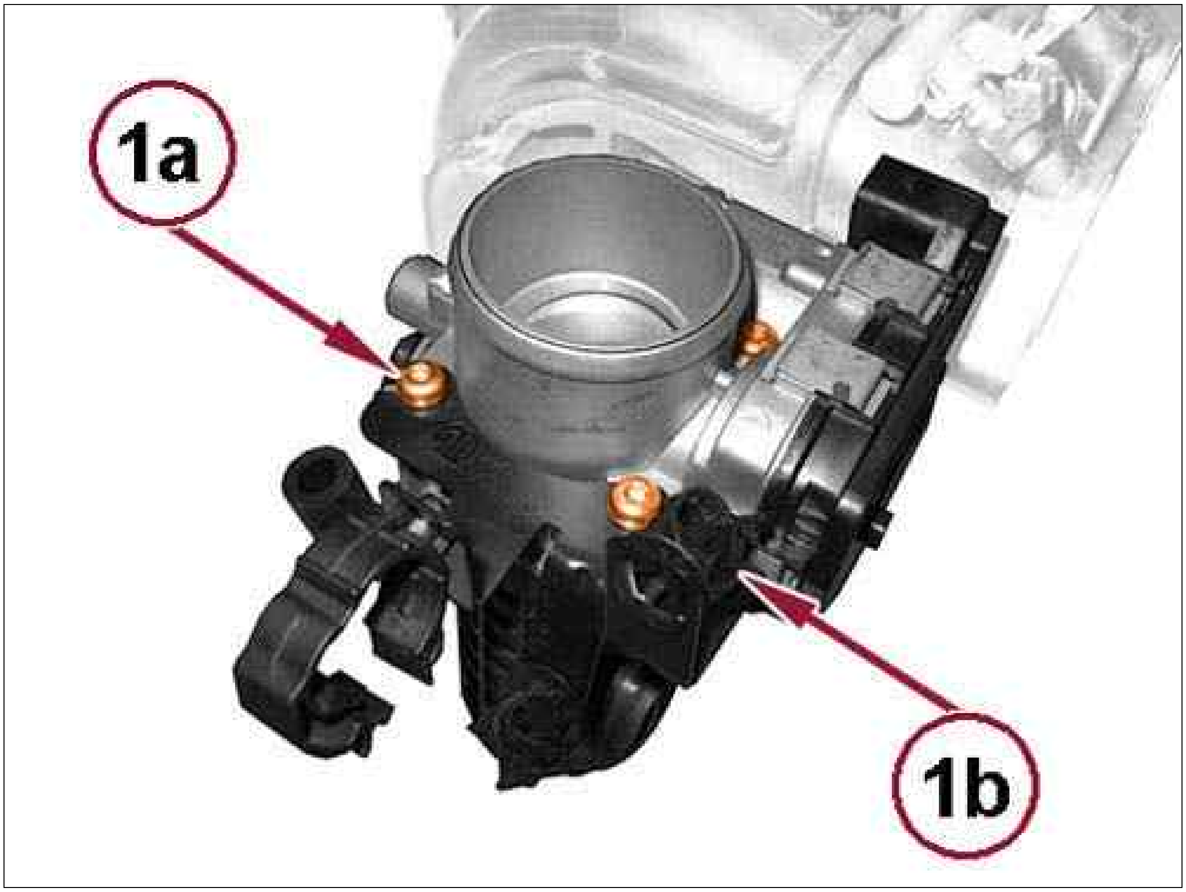
Fig 12: Intake Manifold Gaskets



Courtesy of CHRYSLER GROUP, LLC

22. Remove the intake manifold gaskets (1).

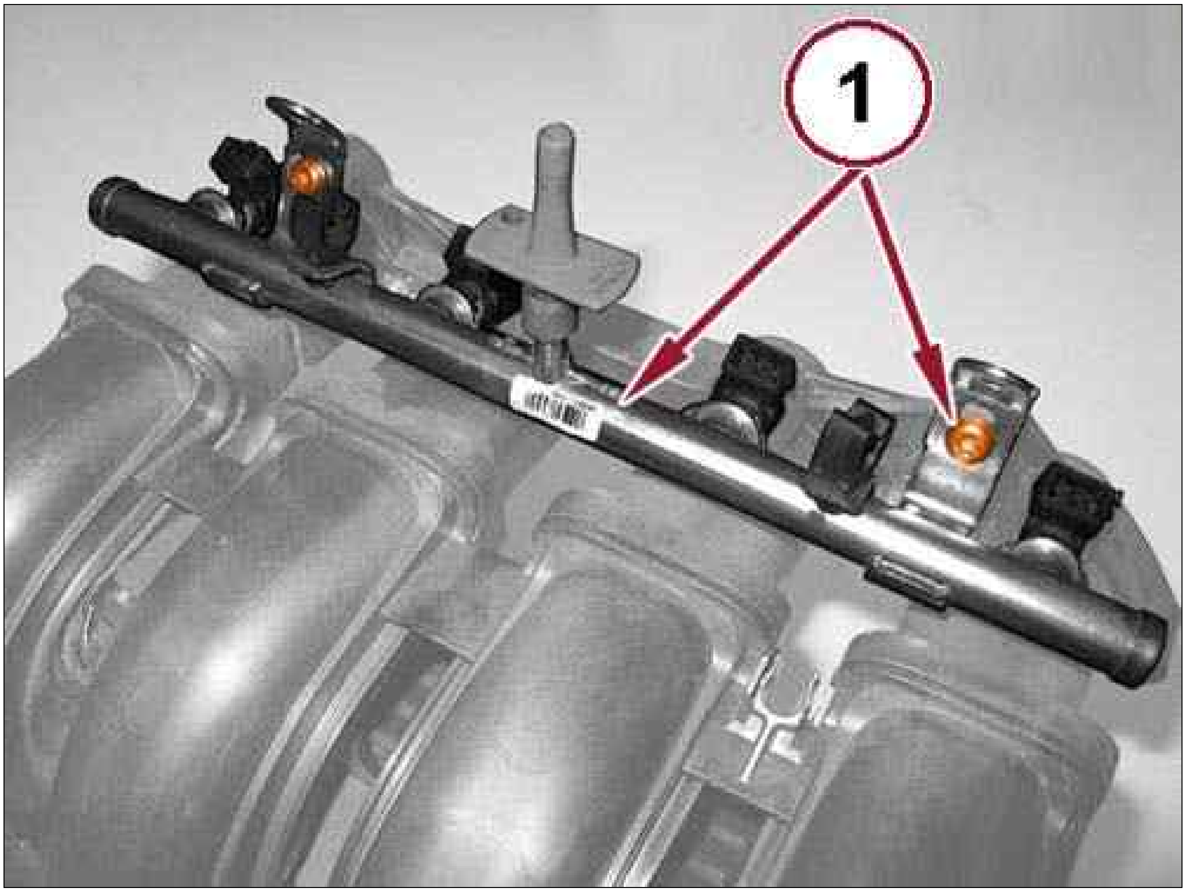
Fig 13: Throttle Body & Screws



Courtesy of CHRYSLER GROUP, LLC

23. Remove the screws (1a) and the throttle body (1b) complete with bracket.

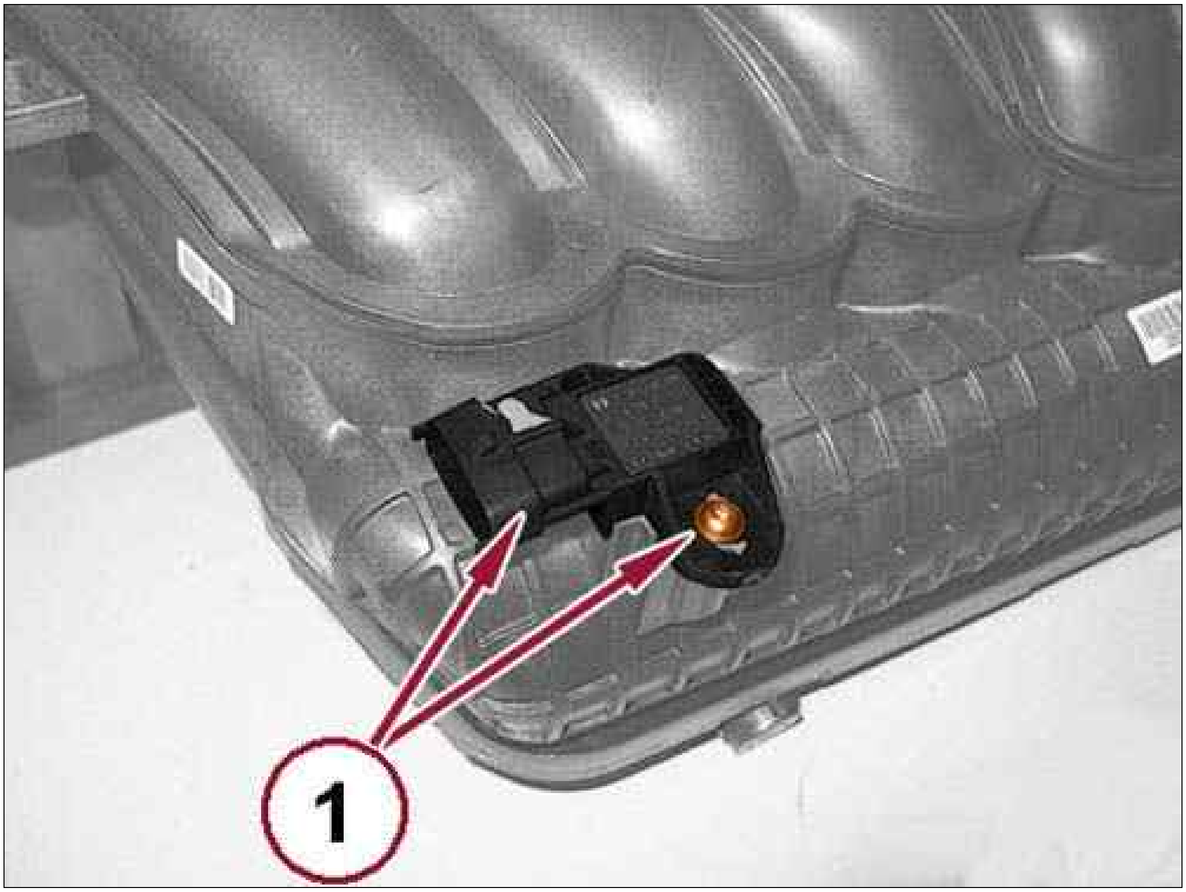
Fig 14: Fuel Rail, Injectors & Screws



Courtesy of CHRYSLER GROUP, LLC

24. Remove the screws and the fuel rail complete with injectors.

Fig 15: Air Pressure And Temperature Sensor & Screws



Courtesy of CHRYSLER GROUP, LLC

25. Remove the screw and the air pressure and temperature sensor.

MANIFOLDS > MANIFOLD, INTAKE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. Install the air pressure and temperature sensor in its housing and secure it using the screw.
2. Install the fuel rail and securely tighten the screws.
3. Install the throttle body assembly and tighten the screws to the proper specification. Refer to FUEL INJECTION, SPECIFICATIONS .
4. Install **NEW** gaskets on the intake manifold.
5. Install the intake manifold and tighten the **NEW** bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .
6. Install the engine oil dipstick tube bolt and securely tighten.
7. Connect the air pressure and temperature sensor wire harness connector and close the wiring retaining clips.
8. Using a **New** O-ring, connect the fuel vapor recovery solenoid valve and close the retaining

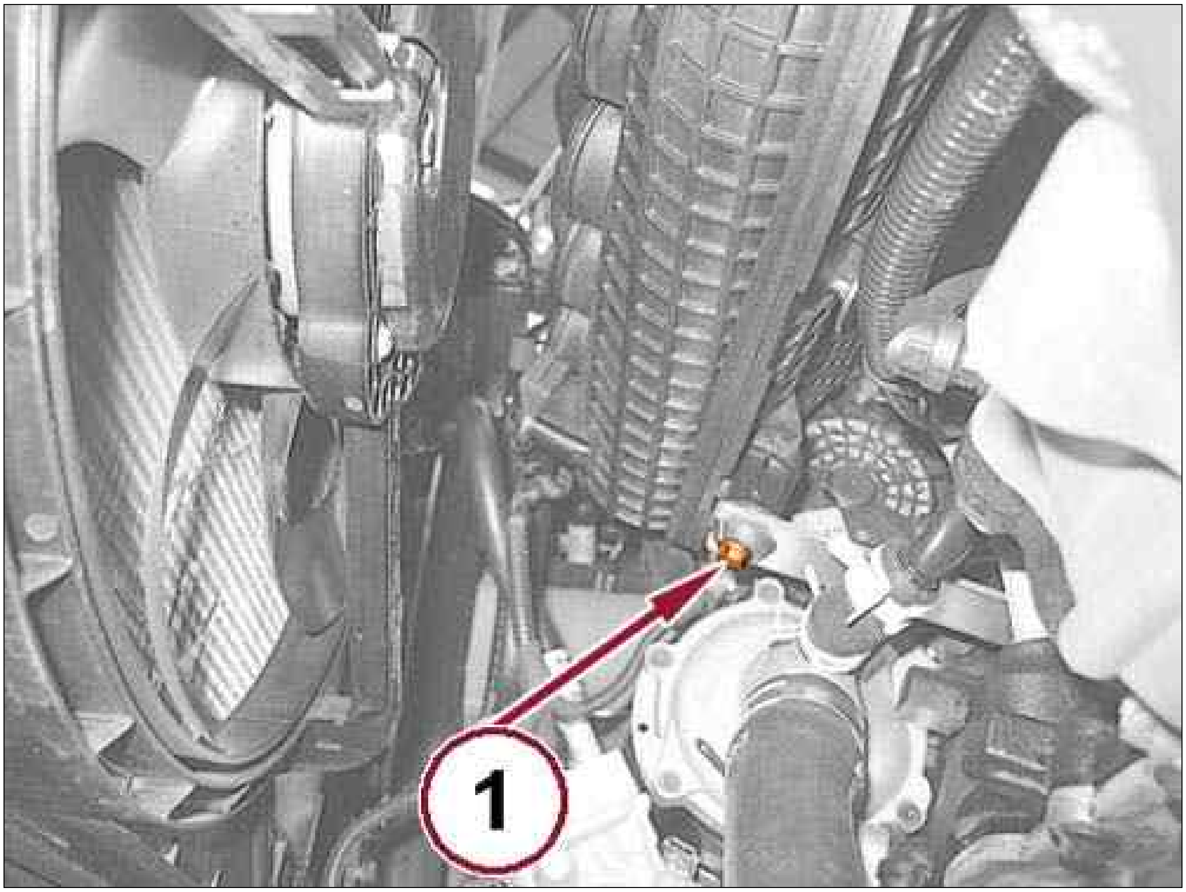
clip.

9. Connect the fuel vapor recovery solenoid wire harness connector.
10. Engage the fuel vapor pipe retaining clips.
11. Engage the brake servo vacuum air pipe retaining clip.
12. Connect the oil vapor pipe to the intake manifold and engage the retaining clip.
13. Engage the degassing pipe retaining clip.
14. Connect the brake servo vacuum air pipe to the throttle body and tighten the band.
15. Connect the throttle body wire harness connector.
16. Install the knock sensor.
17. Connect the knock sensor wire harness connector.
18. Connect the fuel injector wire harness connector and engage the wiring retaining clips.
19. Connect the quick coupling for the fuel supply pipe.
20. Install the bolt securing the air chamber to the bracket and securely tighten.
21. Install the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
22. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
23. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

MANIFOLDS > MANIFOLD, EXHAUST > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Open the fuse box cover in the engine compartment, remove the fuse F21 and start the engine several times until the pressure in the distribution manifold is discharged.
3. Fit the fuse removed previously and close the fuse box casing.
4. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
5. Remove the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .

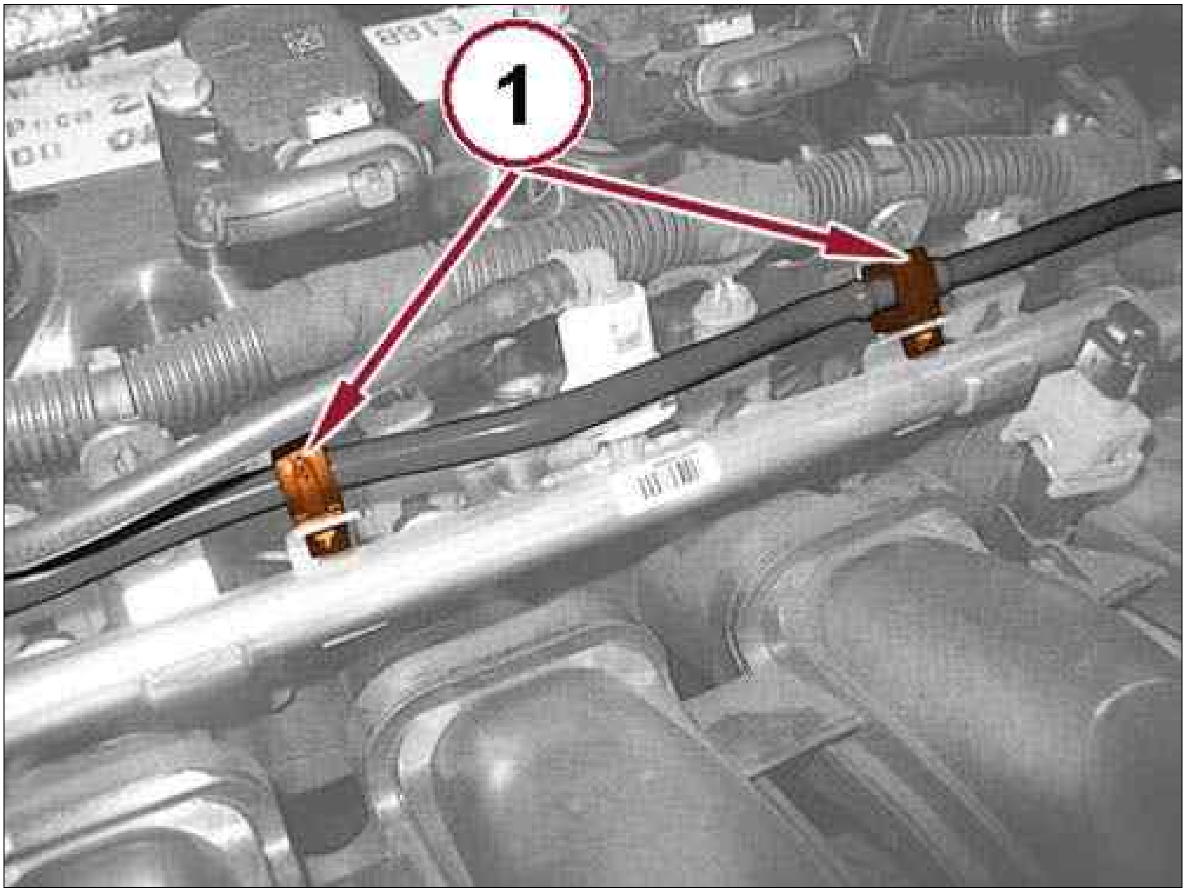
Fig 1: Air Chamber To Bracket Bolt



Courtesy of CHRYSLER GROUP, LLC

6. Remove the bolt (1) securing the air chamber to the bracket.

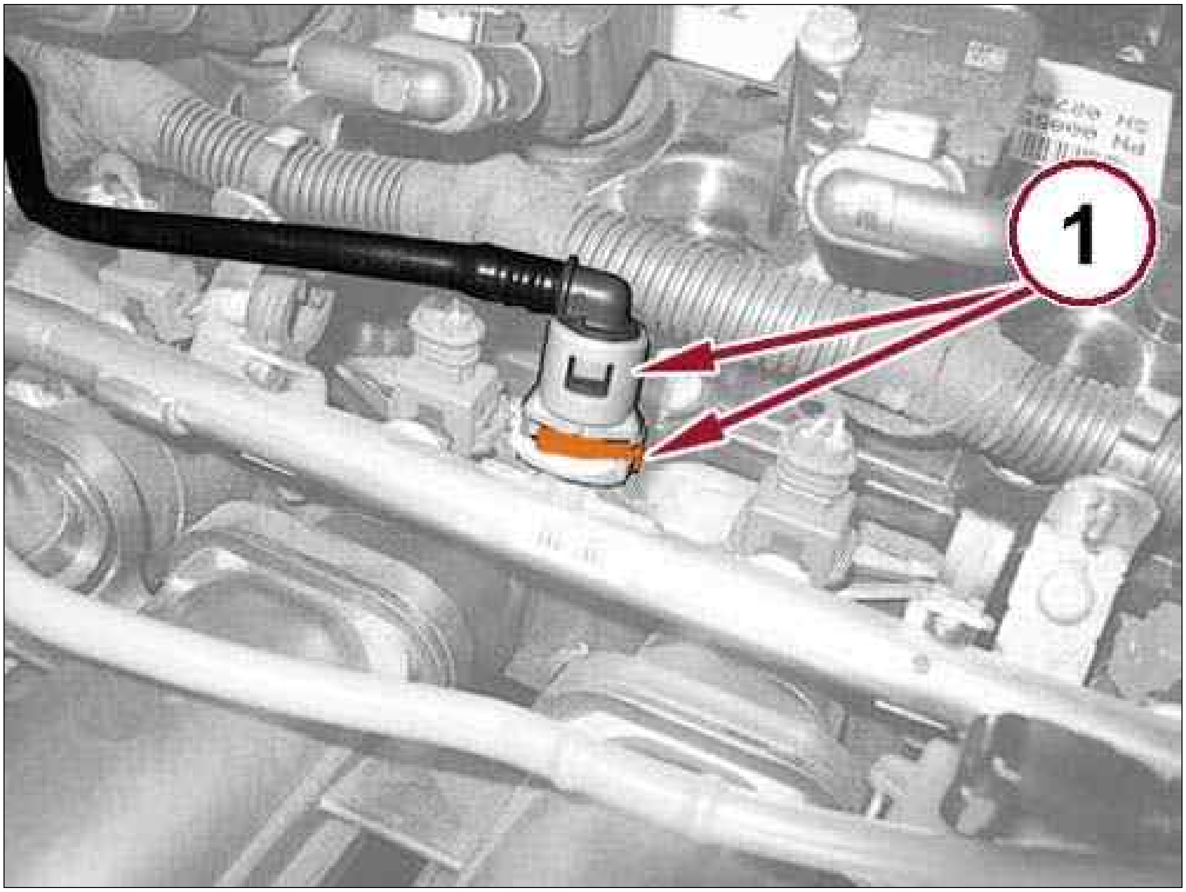
Fig 2: Fuel Vapor Pipe Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

7. Release the retaining clips and remove the fuel vapor pipe (1).

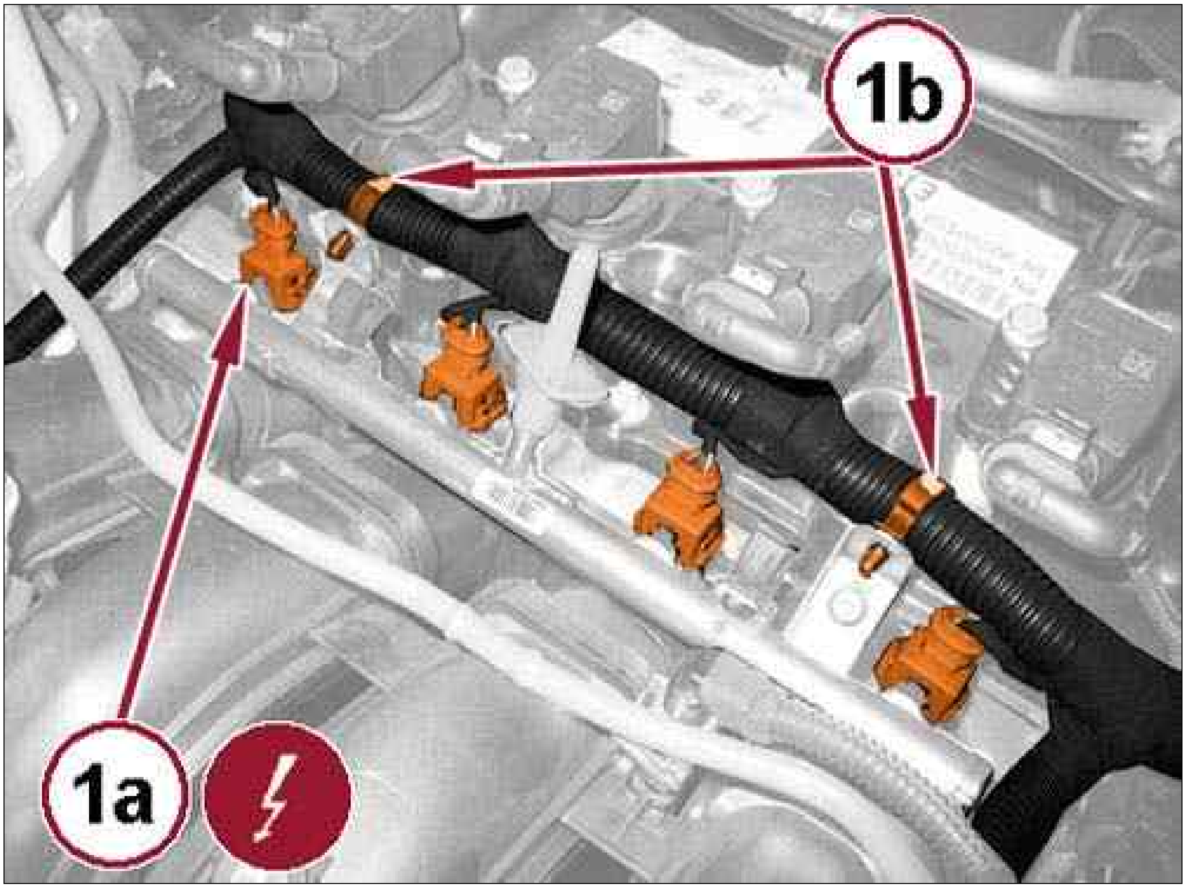
Fig 3: Fuel Supply Line Quick Coupling



Courtesy of CHRYSLER GROUP, LLC

8. Disconnect the quick coupling for the fuel supply line (1).

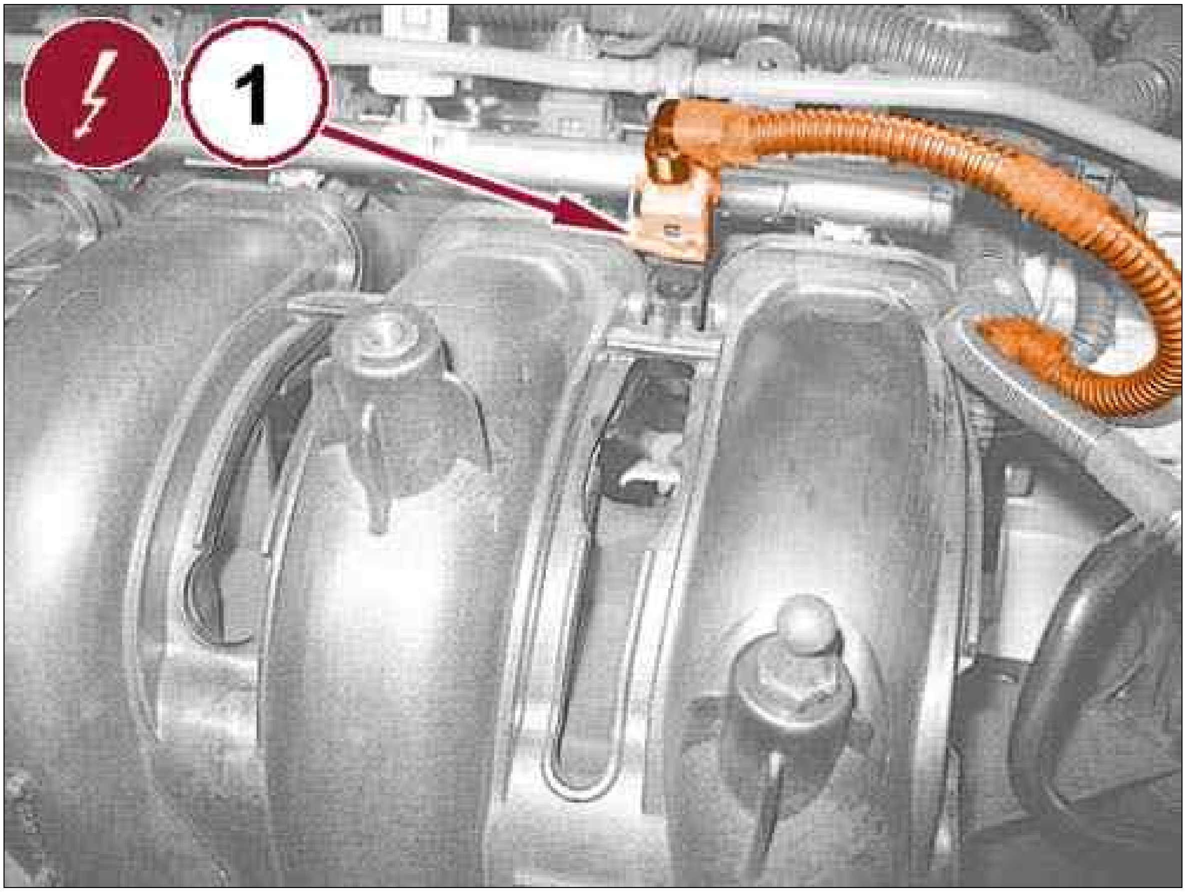
Fig 4: Fuel Injector Wire Harness Connectors & Wiring Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

9. Disconnect the fuel injector wire harness connectors (1a) and release the wiring retaining clips (1b).

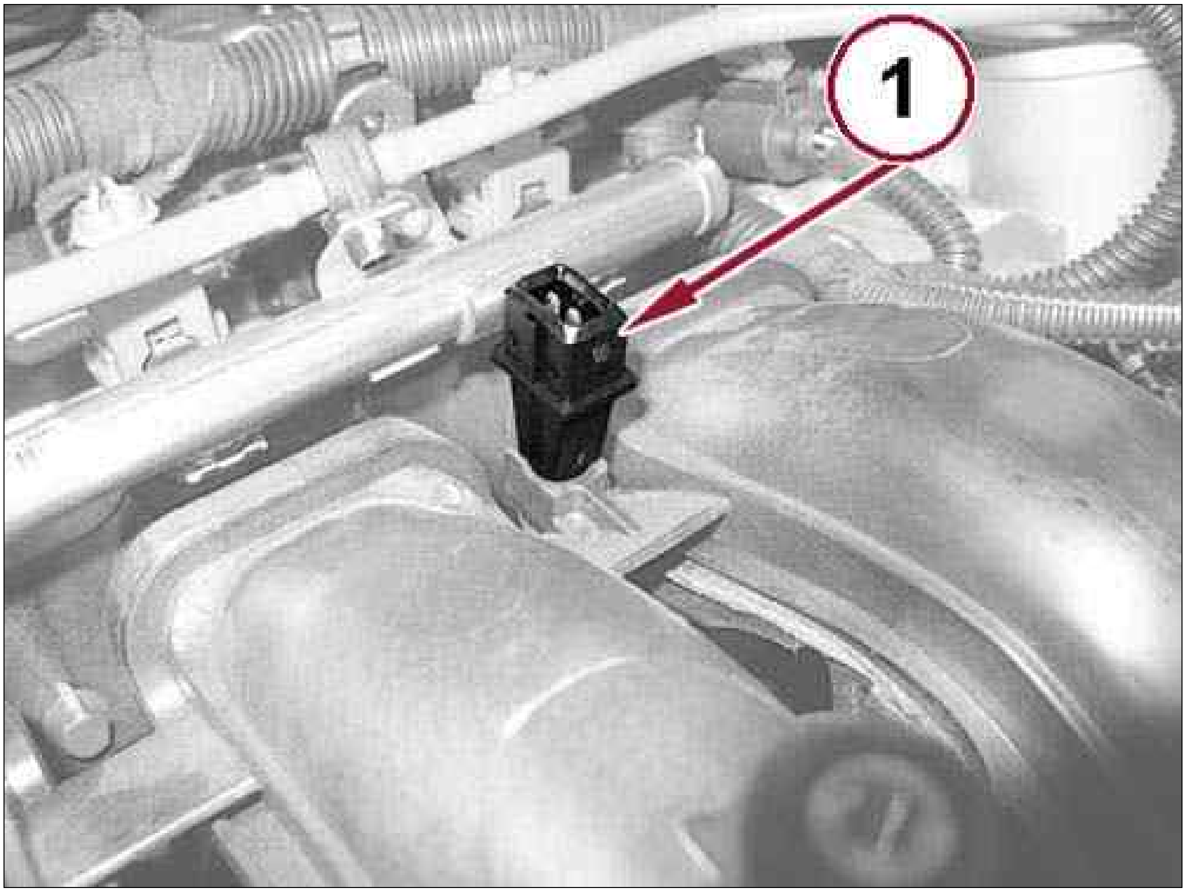
Fig 5: Knock Sensor Wire Harness Connector



Courtesy of CHRYSLER GROUP, LLC

10. Disconnect the knock sensor wire harness connector (1).

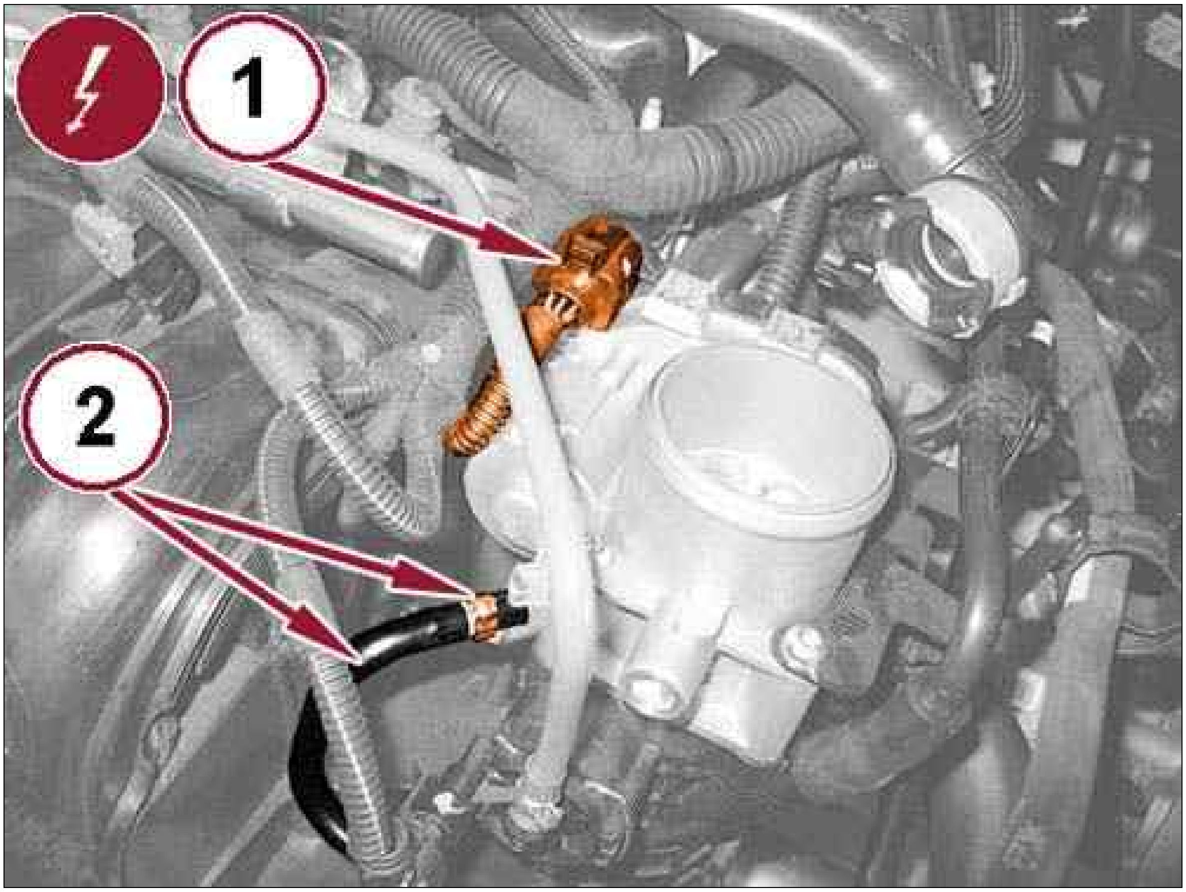
Fig 6: Knock Sensor



Courtesy of CHRYSLER GROUP, LLC

11. Remove the knock sensor (1).

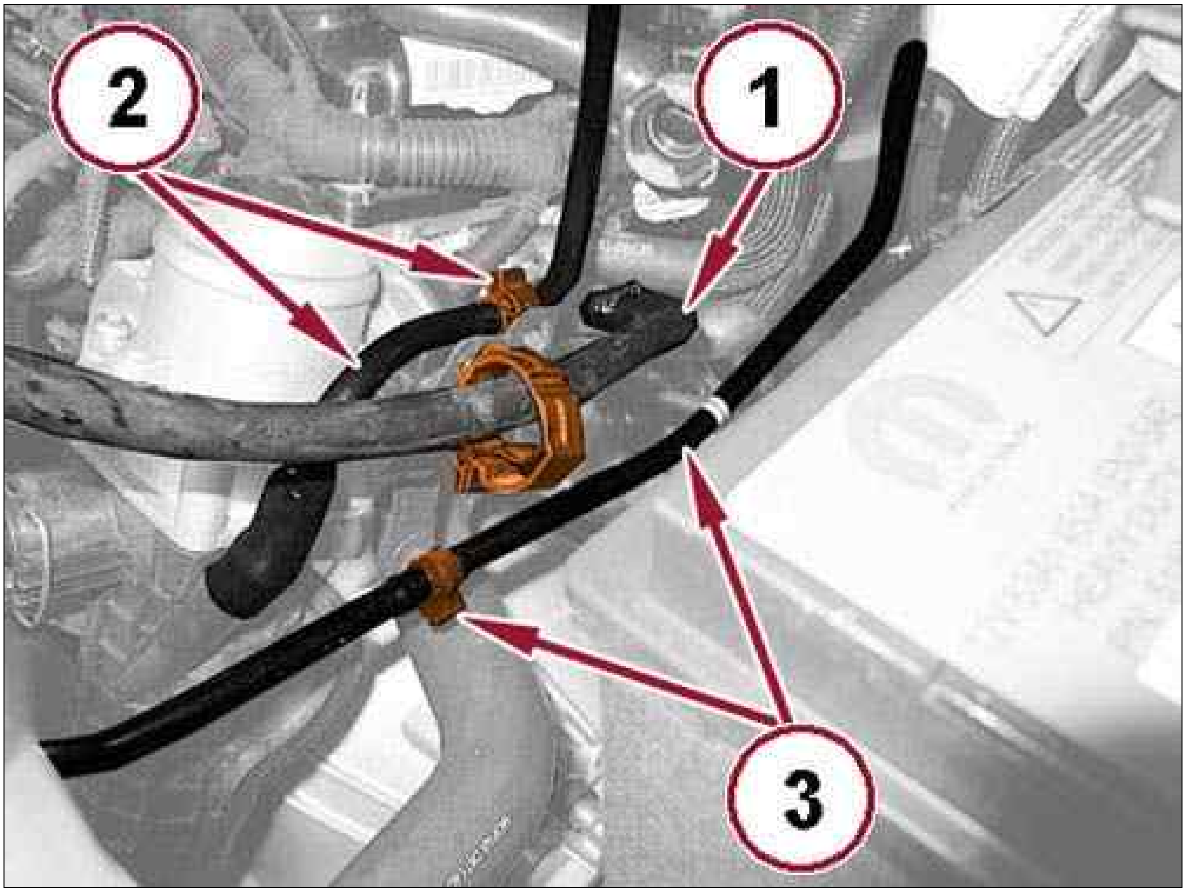
Fig 7: Throttle Body Wire Harness Connector, Brake Servo Vacuum Air Pipe & Band



Courtesy of CHRYSLER GROUP, LLC

12. Disconnect the throttle body wire harness connector (1).
13. Loosen the band and disconnect the brake servo vacuum air pipe (2).

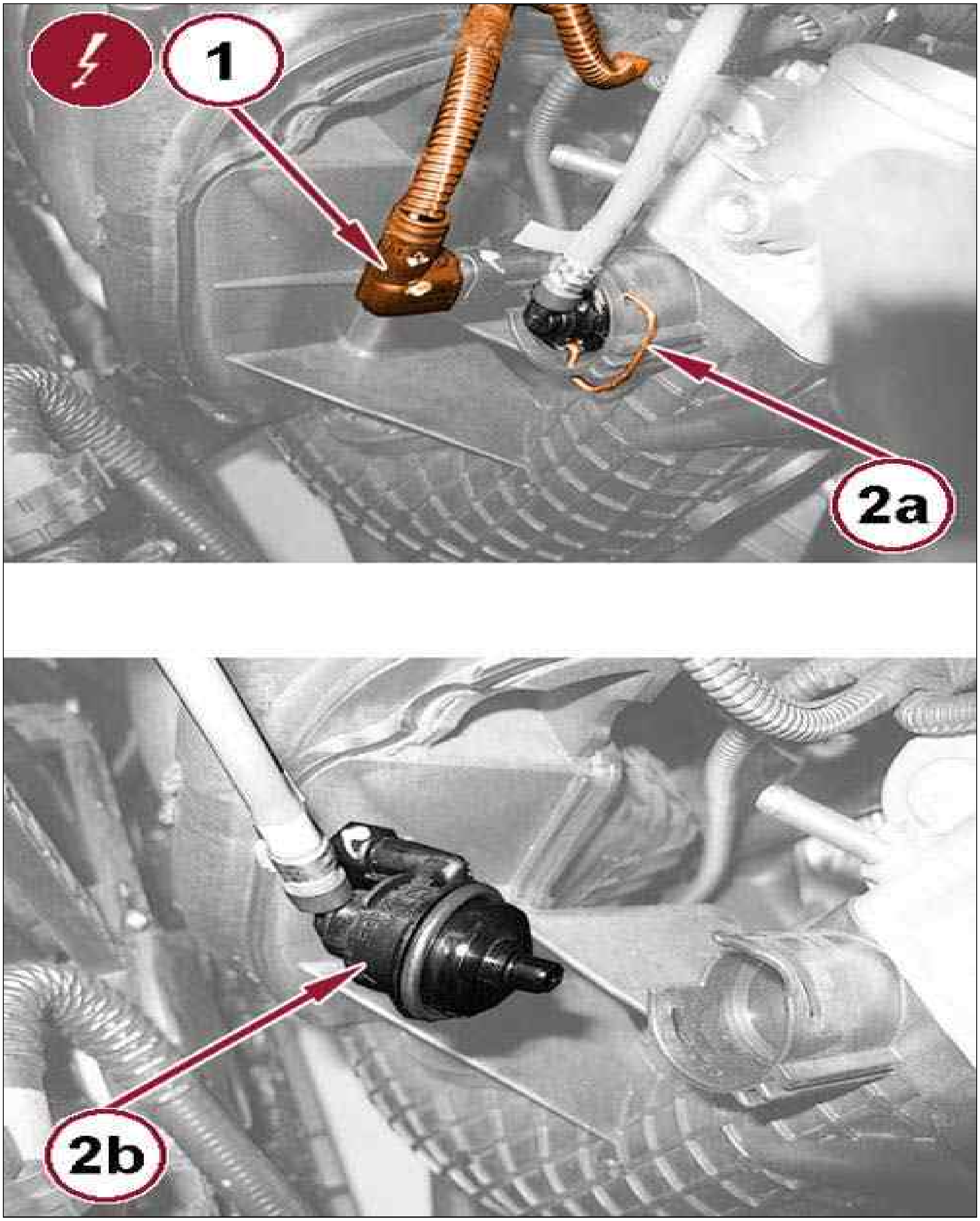
Fig 8: Degassing Pipe, Oil Vapor Pipe At Intake Manifold, Vacuum Air Pipe For Brake Servo & Clips



Courtesy of CHRYSLER GROUP, LLC

14. Open the clip and release the degassing pipe (1).
15. Open the clip and disconnect the oil vapor pipe from the intake manifold (2).
16. Open the clip and release the vacuum air pipe for brake servo (3).

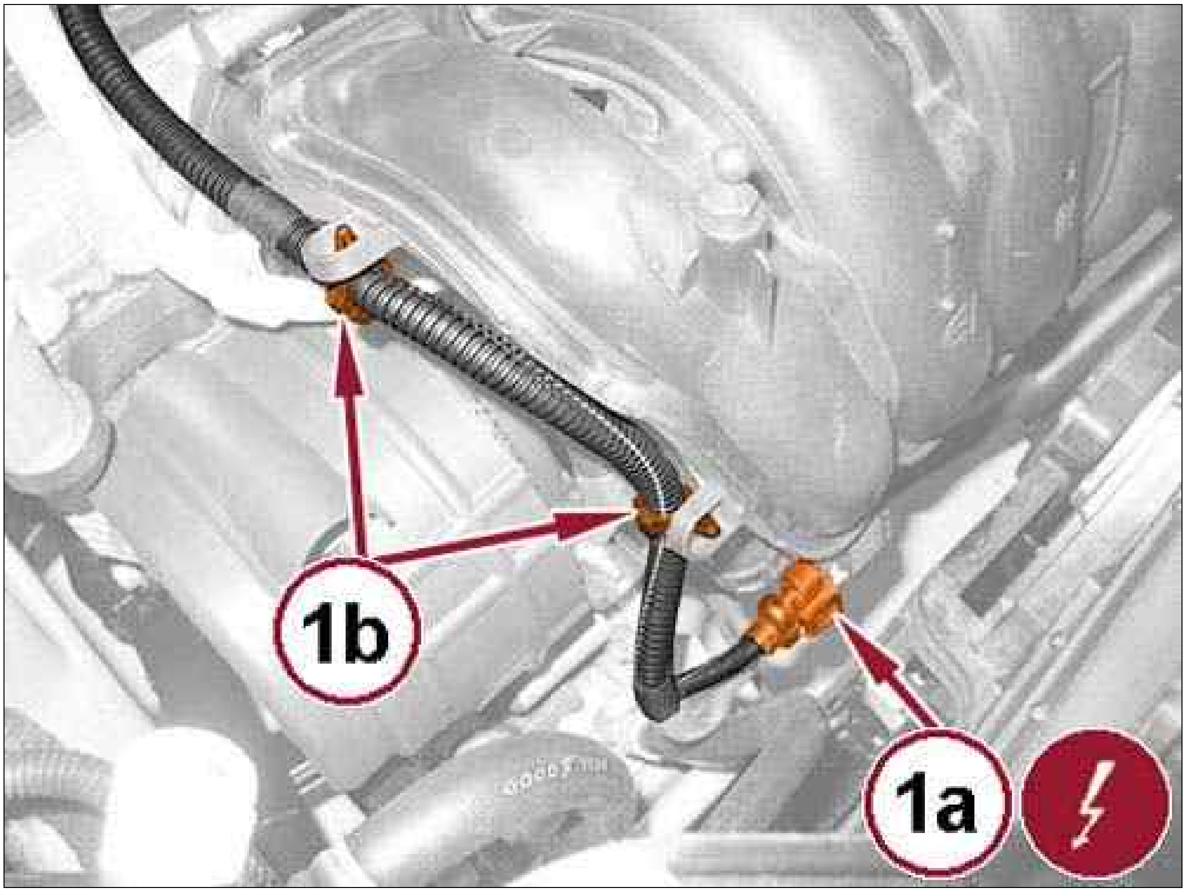
Fig 9: Fuel Vapor Recovery Solenoid Wire Harness Connector, Fuel Vapor Recovery Solenoid Valve & Clip



Courtesy of CHRYSLER GROUP, LLC

17. Detach the fuel vapor recovery solenoid wire harness connector (1).
18. Open the clip (2a) and disconnect the fuel vapor recovery solenoid valve (2b) complete with O-ring.

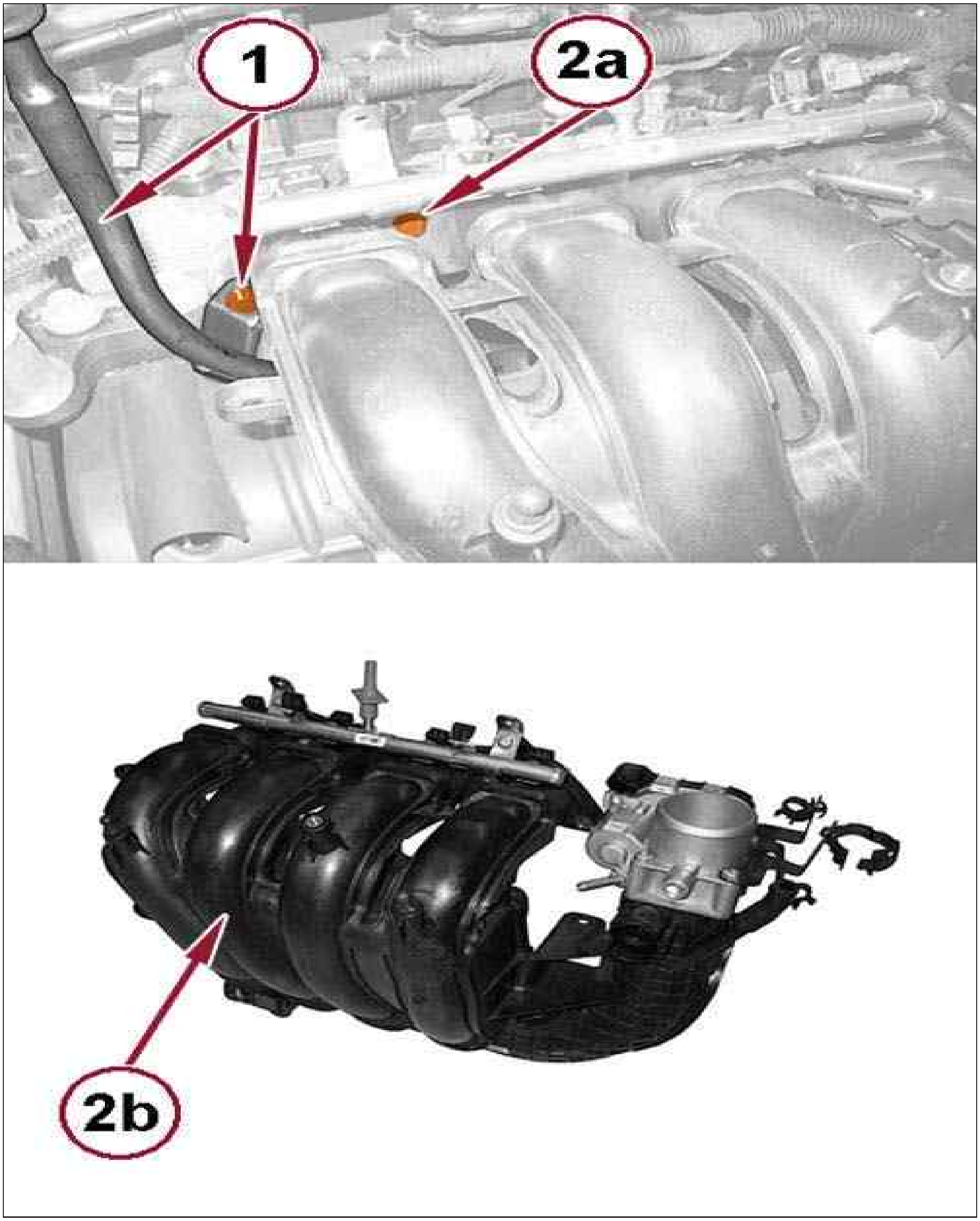
Fig 10: Air Pressure And Temperature Sensor Wire Harness Connector & Wiring Retaining Clips



Courtesy of CHRYSLER GROUP, LLC

19. Disconnect the air pressure and temperature sensor (1a) wire harness connector and release the wiring retaining clips (1b).

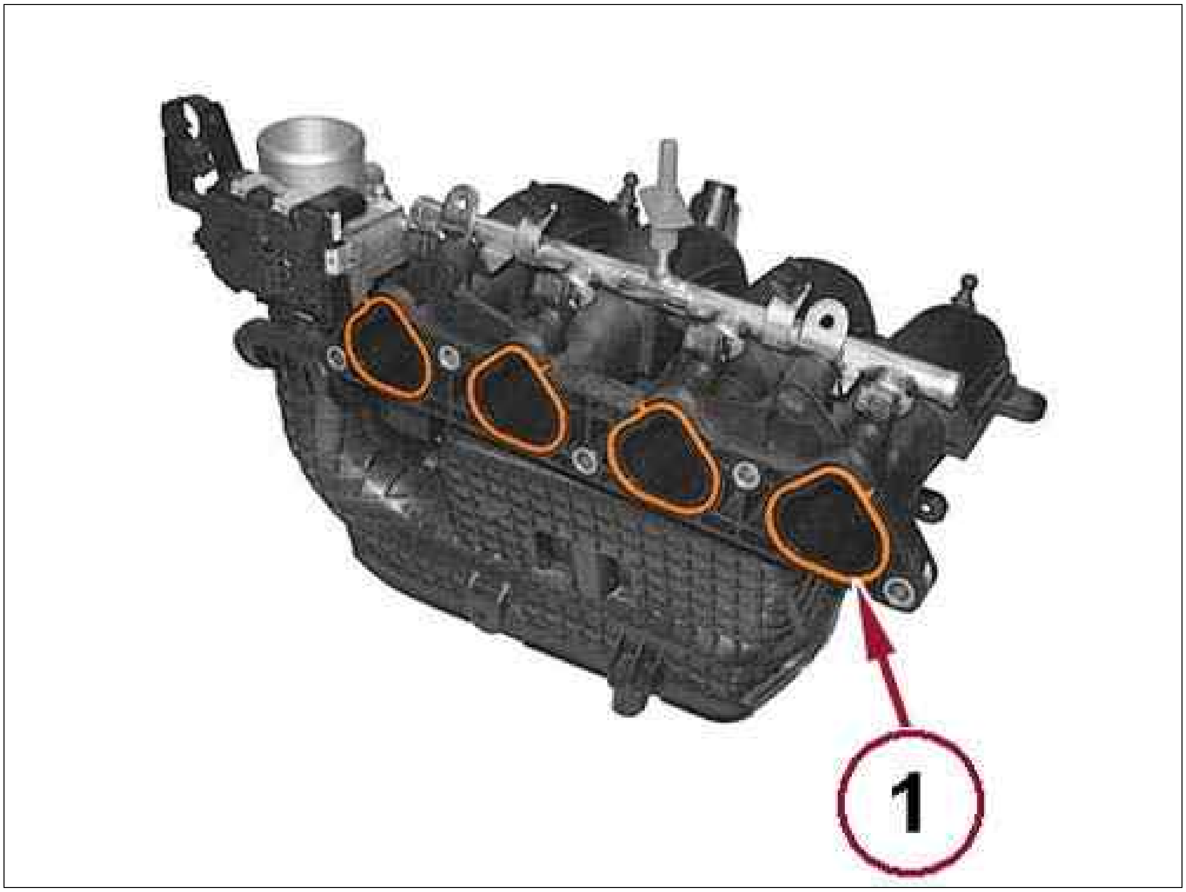
Fig 11: Engine Oil Dipstick Tube, Intake Manifold & Bolts



Courtesy of CHRYSLER GROUP, LLC

20. Remove the bolt securing the engine oil dipstick tube (1).
21. Remove the bolts (2a) and the intake manifold (2b).

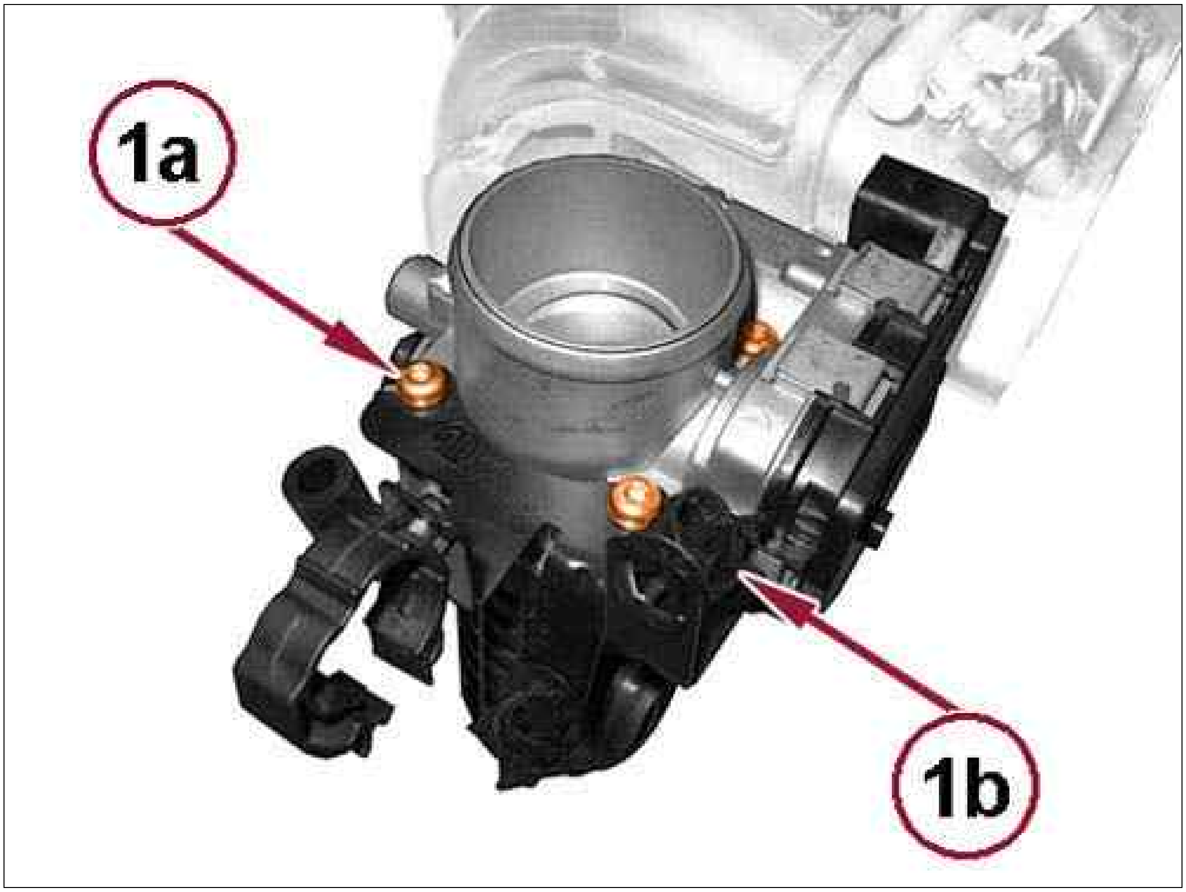
Fig 12: Intake Manifold Gaskets



Courtesy of CHRYSLER GROUP, LLC

22. Remove the intake manifold gaskets (1).

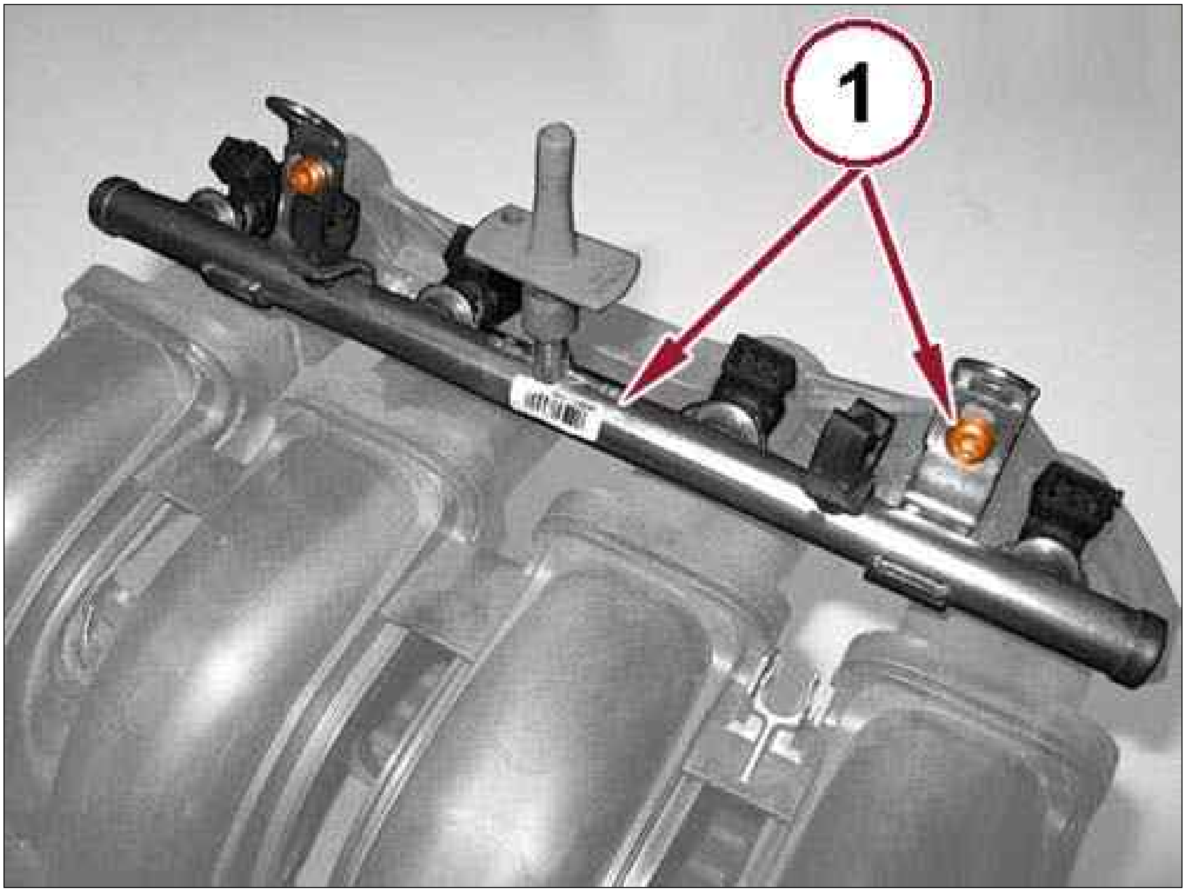
Fig 13: Throttle Body & Screws



Courtesy of CHRYSLER GROUP, LLC

23. Remove the screws (1a) and the throttle body (1b) complete with bracket.

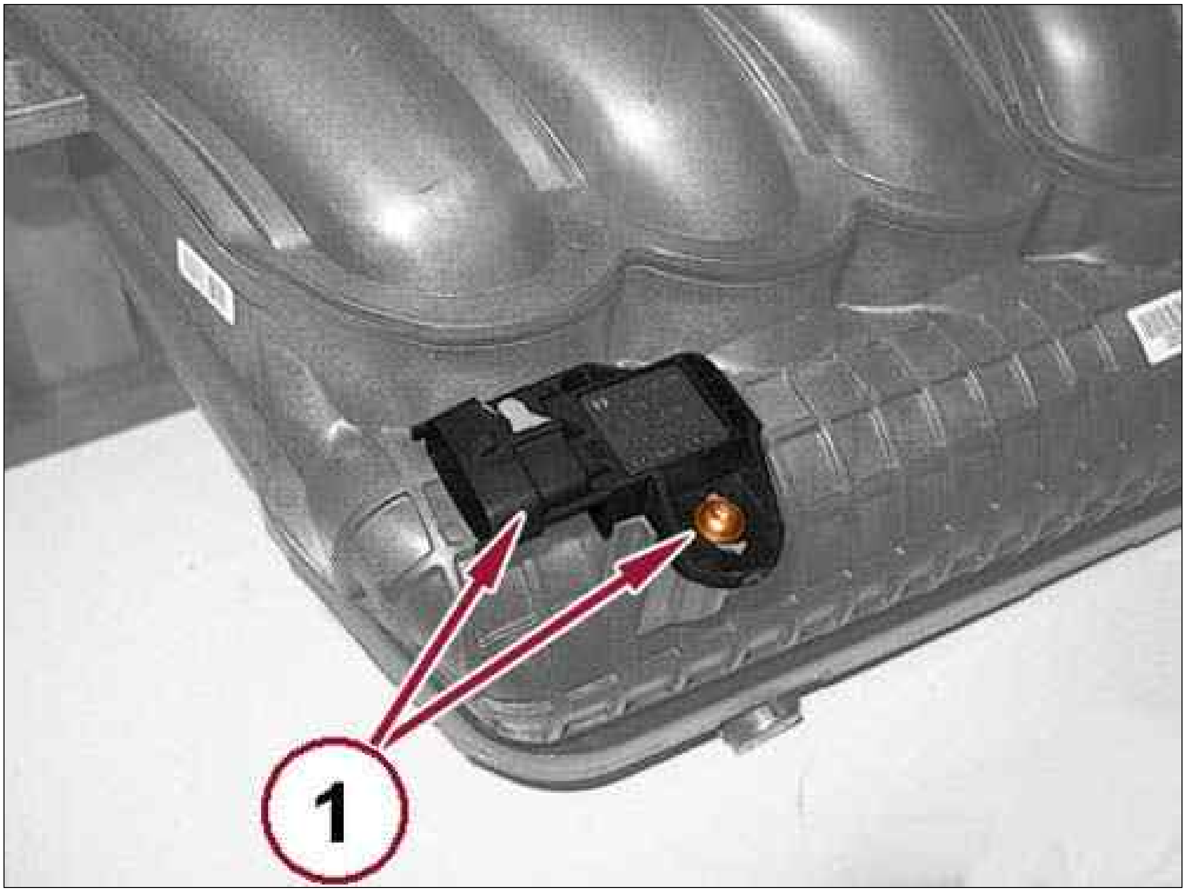
Fig 14: Fuel Rail, Injectors & Screws



Courtesy of CHRYSLER GROUP, LLC

24. Remove the screws and the fuel rail complete with injectors.

Fig 15: Air Pressure And Temperature Sensor & Screws



Courtesy of CHRYSLER GROUP, LLC

25. Remove the screw and the air pressure and temperature sensor.

MANIFOLDS > MANIFOLD, EXHAUST > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

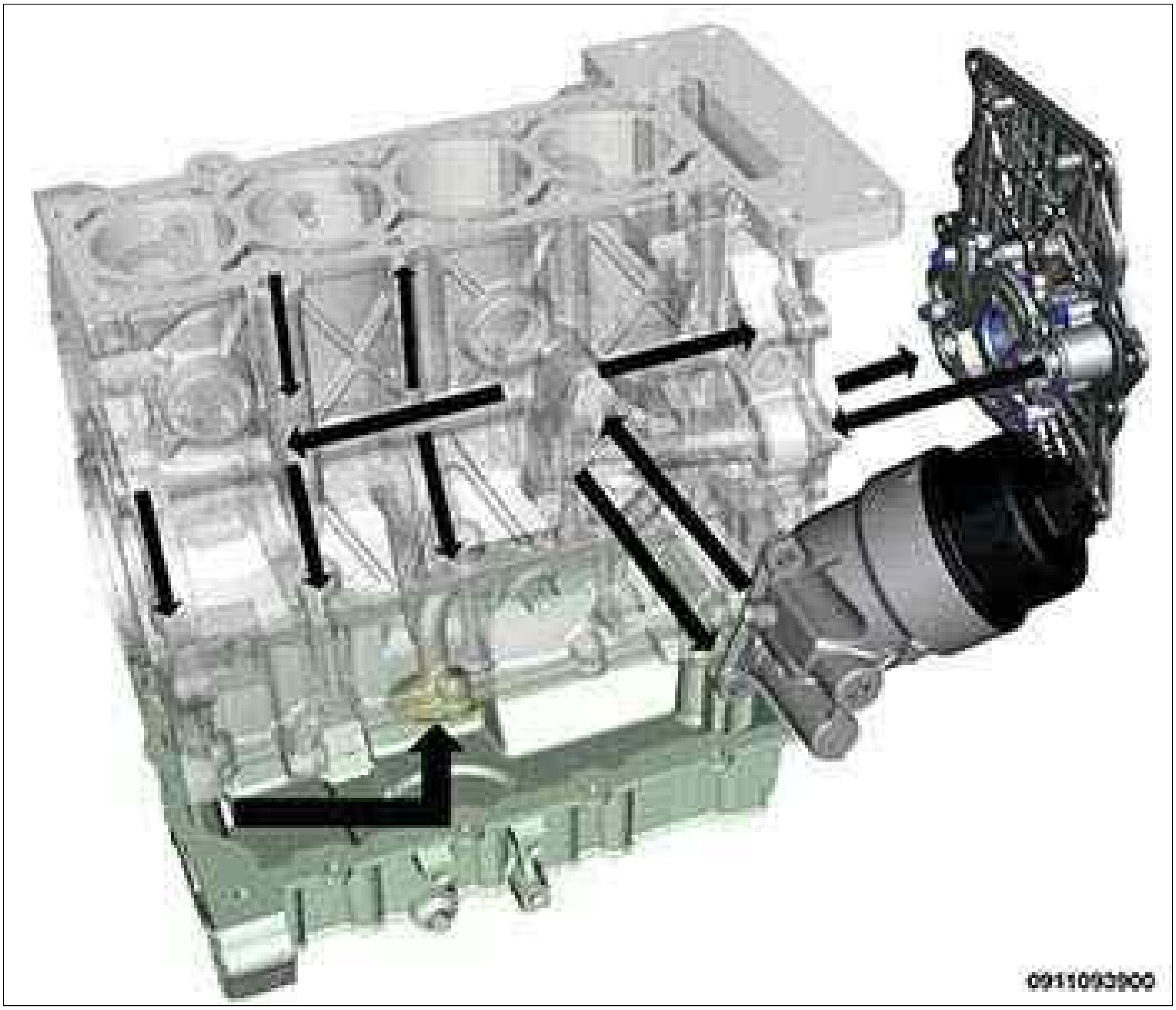
1. Install the air pressure and temperature sensor in its housing and secure it using the screw.
2. Install the fuel rail and securely tighten the screws.
3. Install the throttle body assembly and tighten the screws to the proper specification. Refer to FUEL INJECTION, SPECIFICATIONS .
4. Install **NEW** gaskets on the intake manifold.
5. Install the intake manifold and tighten the **NEW** bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .
6. Install the engine oil dipstick tube bolt and securely tighten.
7. Connect the air pressure and temperature sensor wire harness connector and close the wiring retaining clips.
8. Using a **New** O-ring, connect the fuel vapor recovery solenoid valve and close the retaining

clip.

9. Connect the fuel vapor recovery solenoid wire harness connector.
10. Engage the fuel vapor pipe retaining clips.
11. Engage the brake servo vacuum air pipe retaining clip.
12. Connect the oil vapor pipe to the intake manifold and engage the retaining clip.
13. Engage the degassing pipe retaining clip.
14. Connect the brake servo vacuum air pipe to the throttle body and tighten the band.
15. Connect the throttle body wire harness connector.
16. Install the knock sensor.
17. Connect the knock sensor wire harness connector.
18. Connect the fuel injector wire harness connector and engage the wiring retaining clips.
19. Connect the quick coupling for the fuel supply pipe.
20. Install the bolt securing the air chamber to the bracket and securely tighten.
21. Install the air cleaner hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
22. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
23. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

LUBRICATION > DESCRIPTION > DESCRIPTION

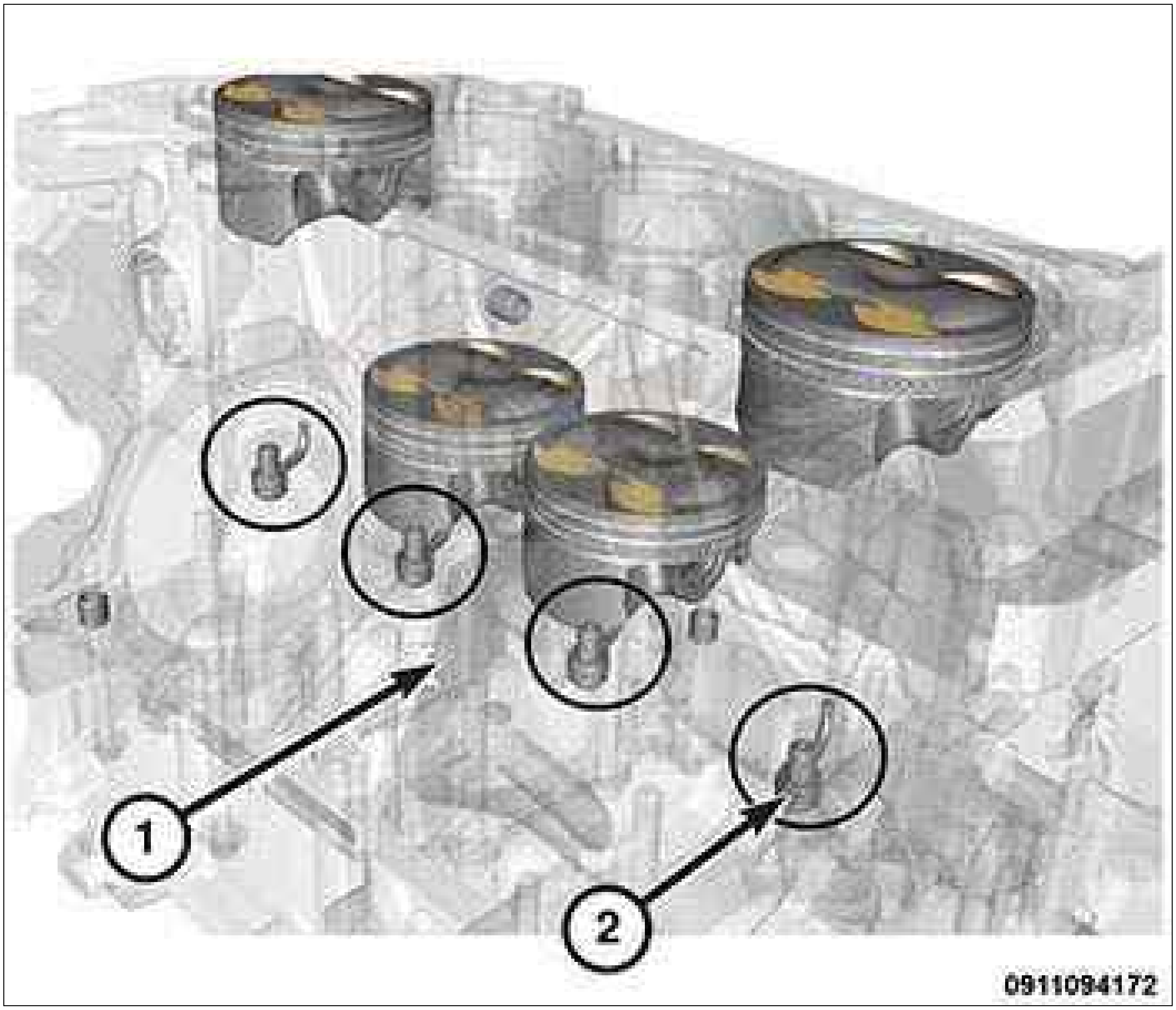
Fig 1: Engine Oil Flow In Engine Block



Courtesy of CHRYSLER GROUP, LLC

- The engine oil is drawn up from the sump through the suction head connected to the oil pump. The engine oil pressure and hydraulic chain tensioner are positioned on the engine oil delivery duct, inside the monobloc.
- The bearing unit and engine oil filter are fixed on the exhaust side engine block.

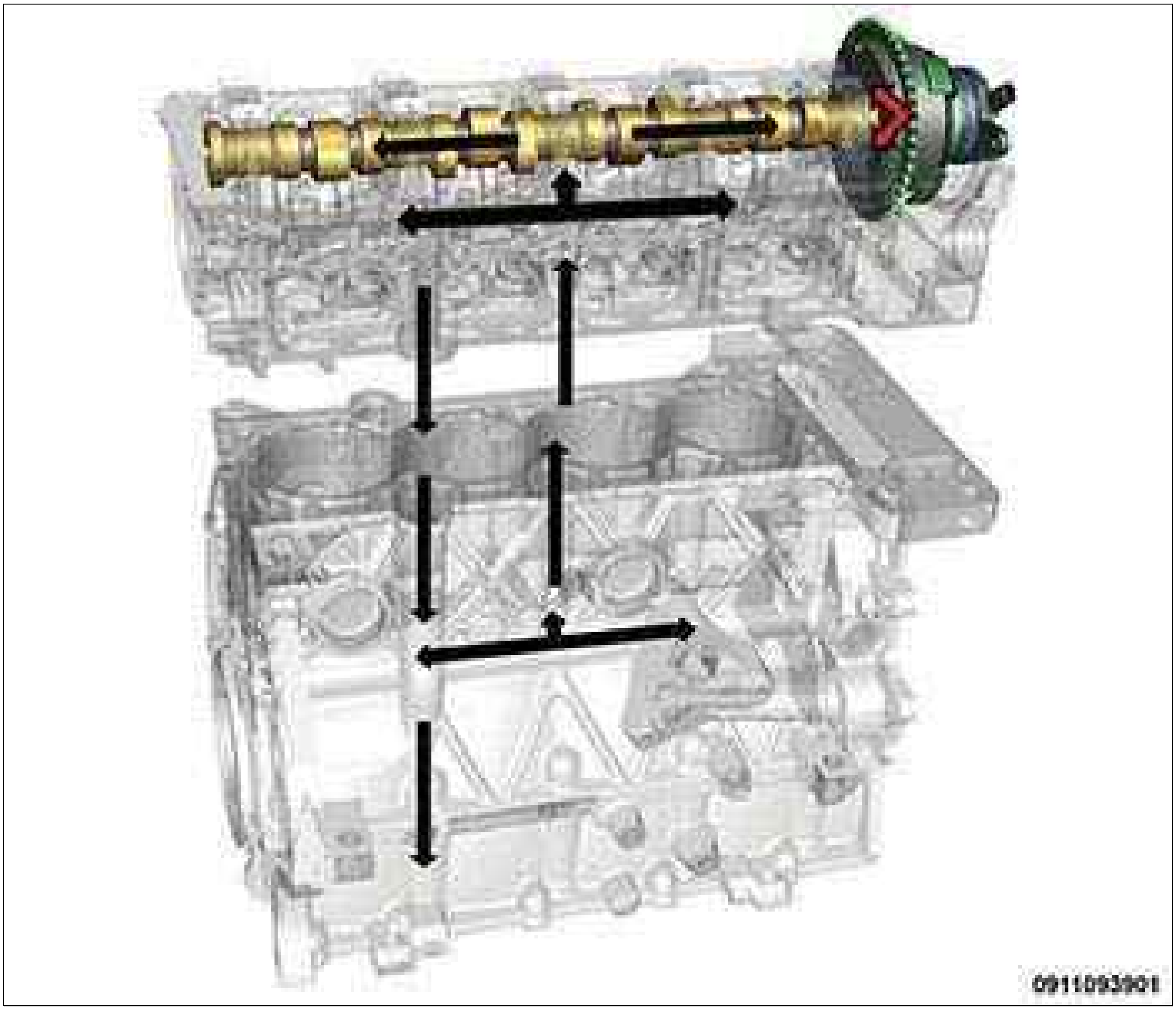
Fig 2: Oil Supply Duct & Engine Oil Jets



Courtesy of CHRYSLER GROUP, LLC

- The same oil supply duct (1) through specific channels in the monobloc, allows the engine oil to reach the main bearings, crankshaft and crankpins in order to lubricate them.
- The oil also reaches four jets (2), in the block, which spray oil under the piston crowns in order to cool them.

Fig 3: Engine Oil Flow In Cylinder Head



Courtesy of CHRYSLER GROUP, LLC

- When the engine oil has passed through the block via a specific duct, it arrives at the cylinder head.
- The ducts in the cylinder head allow the engine oil to arrive at the supports for the camshaft, rocker arms and hydraulic tappets, and through the ducts on the camshaft it arrives at the Variable Valve Timing (VVT) unit to permit its operation.
- The oil that collects in the cylinder head returns to the block and then to the oil sump through dedicated channels both on the cylinder head and the block.

LUBRICATION > DIAGNOSIS AND TESTING > ENGINE OIL LEAK

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

1. Do not clean or de-grease the engine at this time because some solvents may cause rubber to

swell, temporarily stopping the leak.

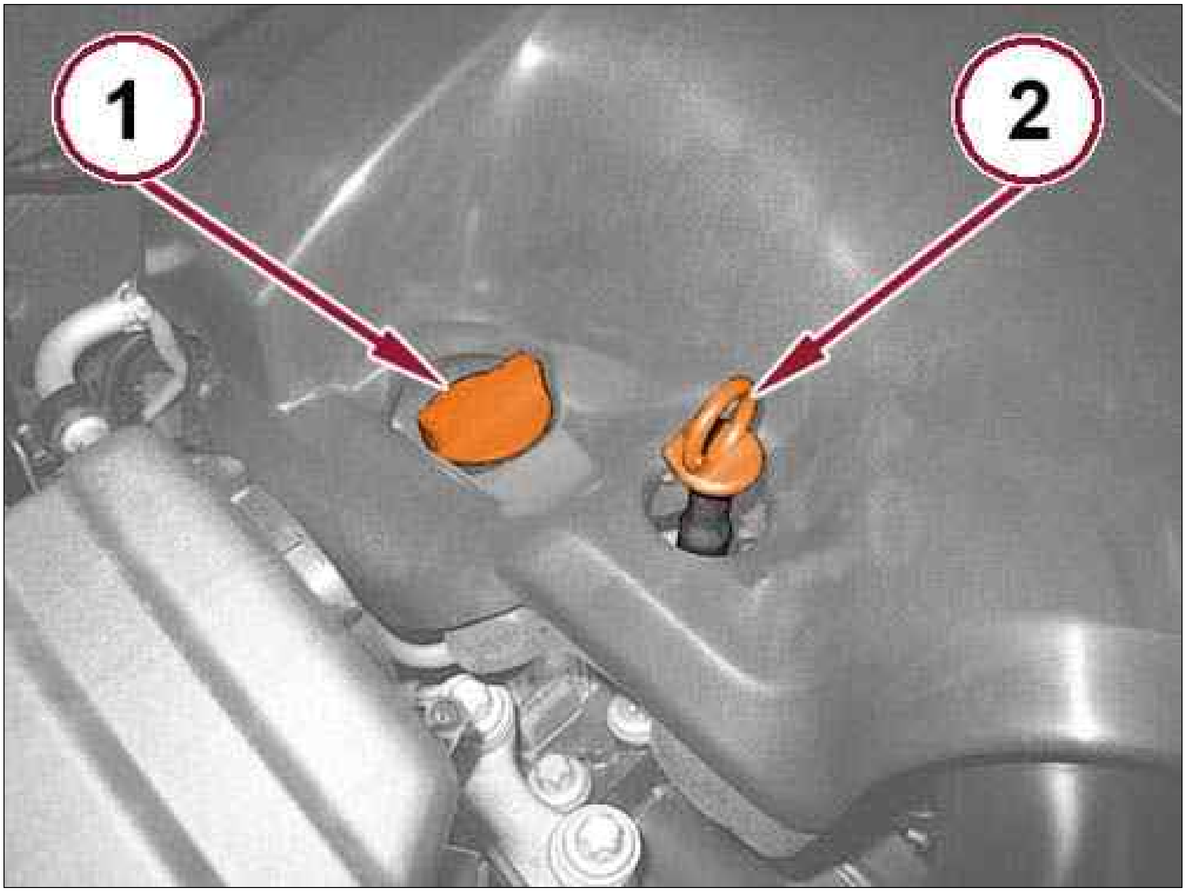
2. Add an oil soluble dye (use as recommended by the manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine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

   If the oil leak source is not positively identified at this time, proceed with the air leak detection test method.

LUBRICATION > FILTER, ENGINE OIL > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION

1. Engine oil is dangerous for the skin: keep contact with skin to a minimum and if there is contact wash with soap and water.
2. Raise and support the vehicle. Refer to HOISTING, STANDARD PROCEDURE .
3. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
4. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
5. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .

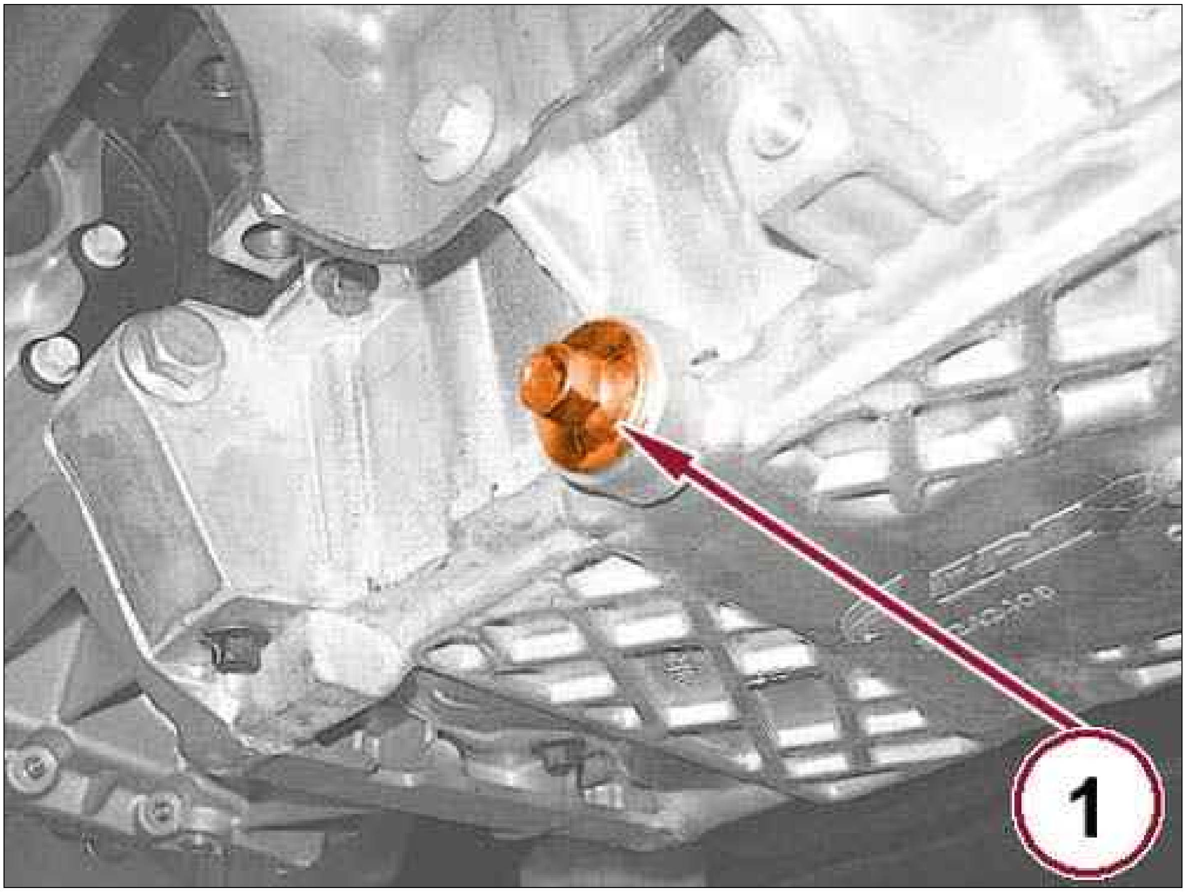
Fig 1: Engine Oil Filler Cap & Oil Dipstick



Courtesy of CHRYSLER GROUP, LLC

6. With the engine hot, remove the engine oil filler cap (1).
7. Take out the engine oil dipstick (2).

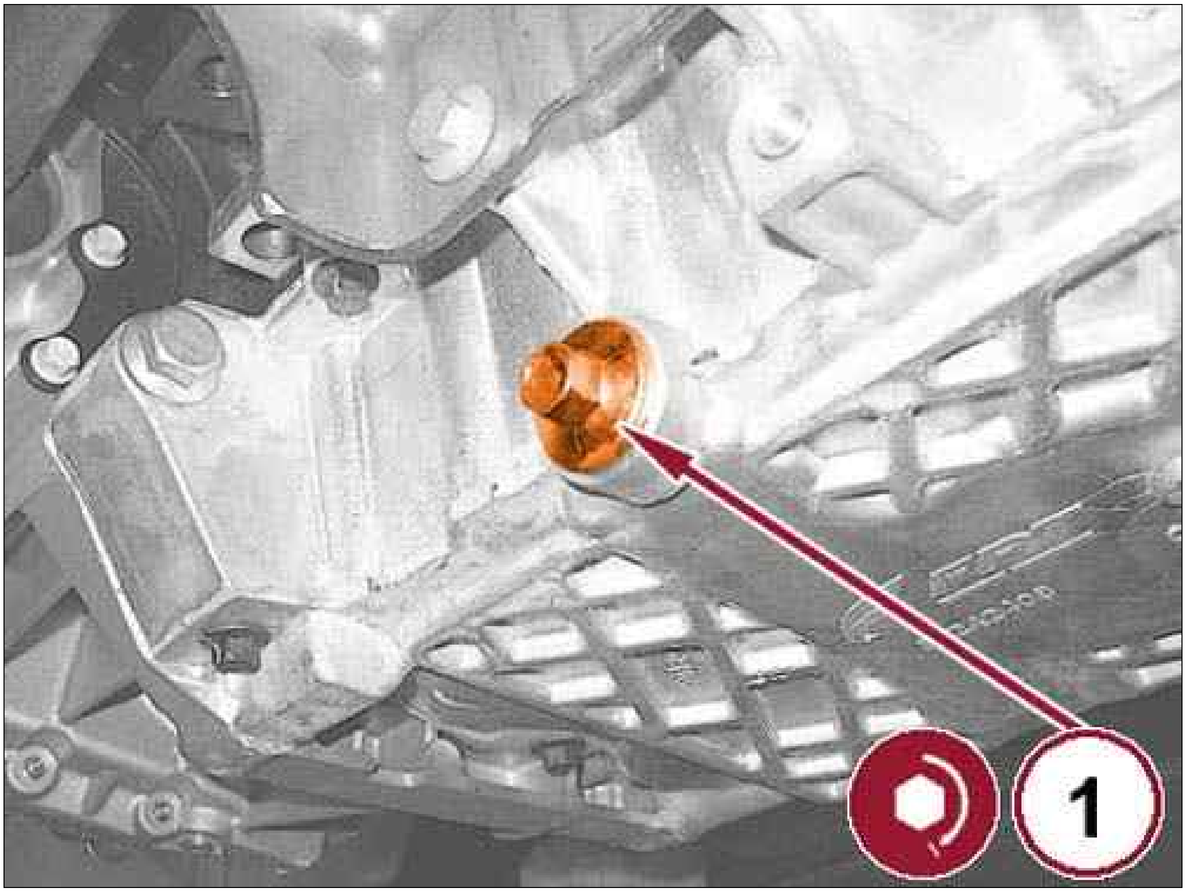
Fig 2: Engine Oil Pan Drain Plug



Courtesy of CHRYSLER GROUP, LLC

8. Remove the drain plug (1) and drain oil completely into a suitable container.
9. Be very careful when removing the draining plug; the oil could be very hot.
10. Do not dispose of oil into the environment as indiscriminate dispersion of this product causes pollution.

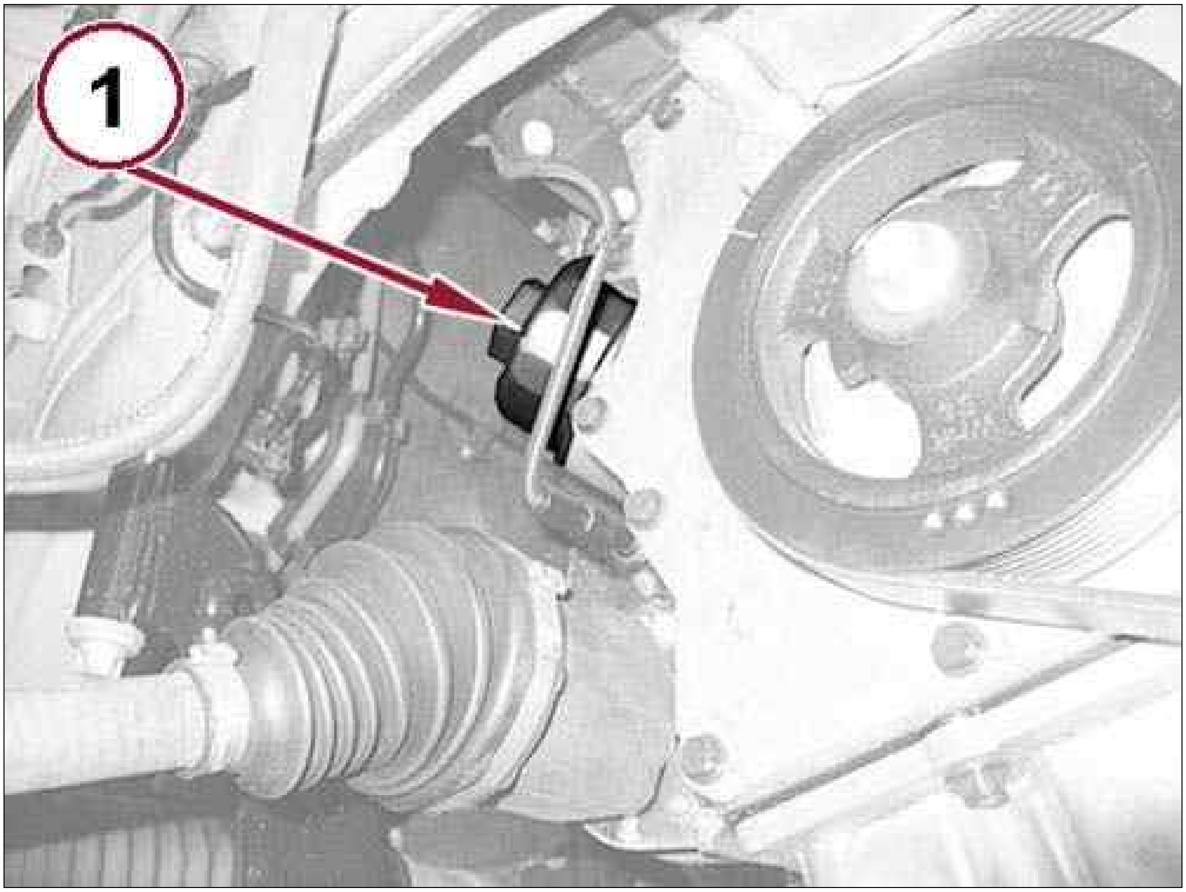
Fig 3: Engine Oil Pan Drain Plug



Courtesy of CHRYSLER GROUP, LLC

11. Clean the engine oil drain plug and tighten it with the gasket to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 4: Engine Oil Filter Cover With Filter Element



Courtesy of CHRYSLER GROUP, LLC

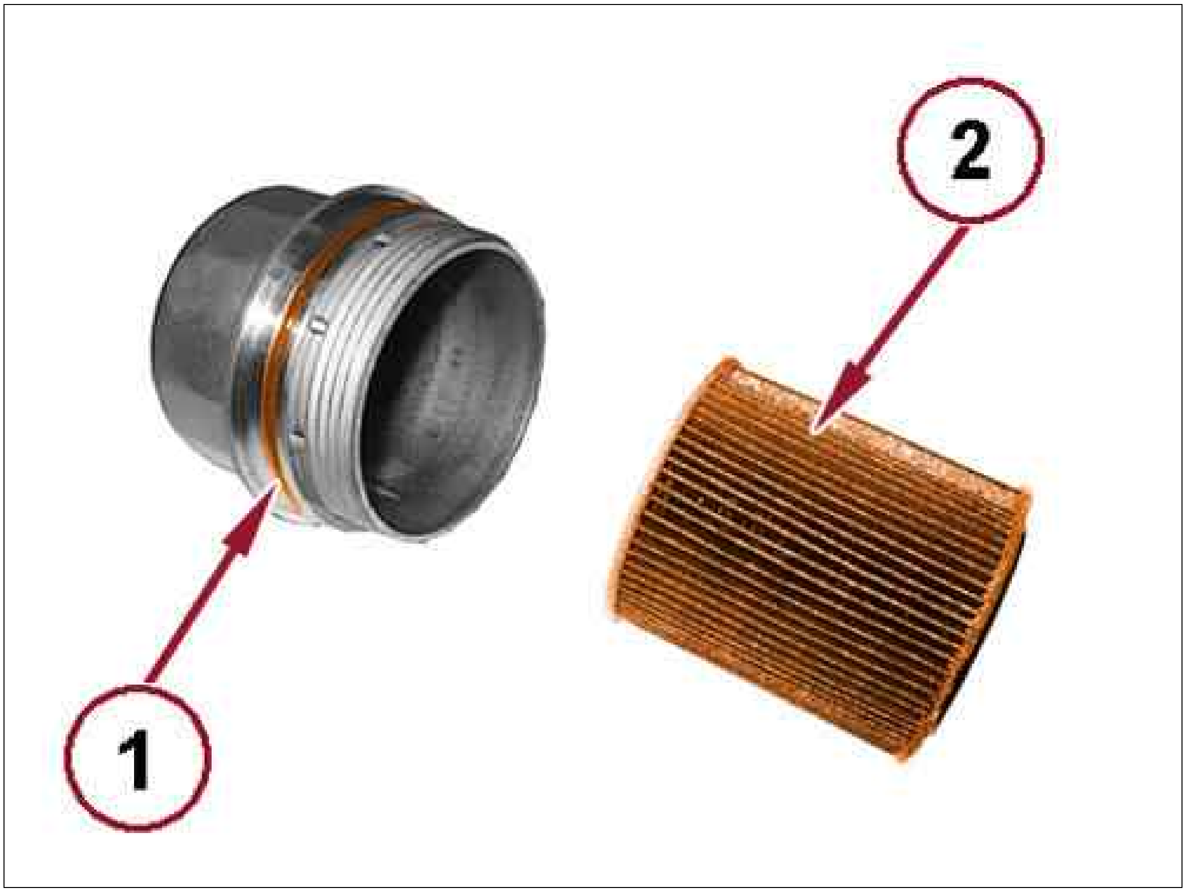
12. Remove the engine oil filter cover complete with filter element.

Fig 5: Oil Filter Element

Courtesy of CHRYSLER GROUP, LLC

13. Remove the filter element and the O-ring (1).

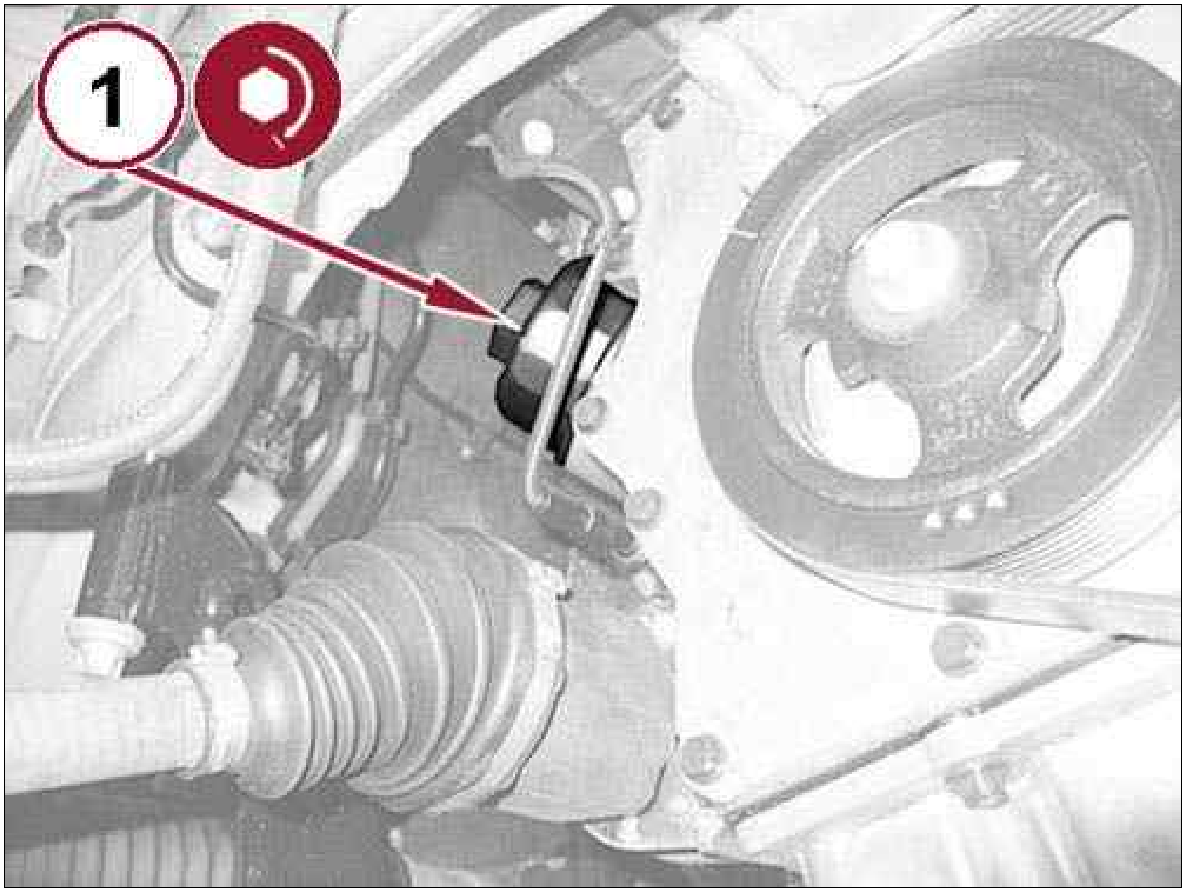
Fig 6: Oil Filter Cover O-Ring & Filter Element



Courtesy of CHRYSLER GROUP, LLC

14. Fit a **NEW** O-ring (1) on the engine oil filter cover.
15. Press fit a **NEW** filter element (2) in the cover fitting the retaining clips.

Fig 7: Engine Oil Filter Cover With Filter Element



Courtesy of CHRYSLER GROUP, LLC

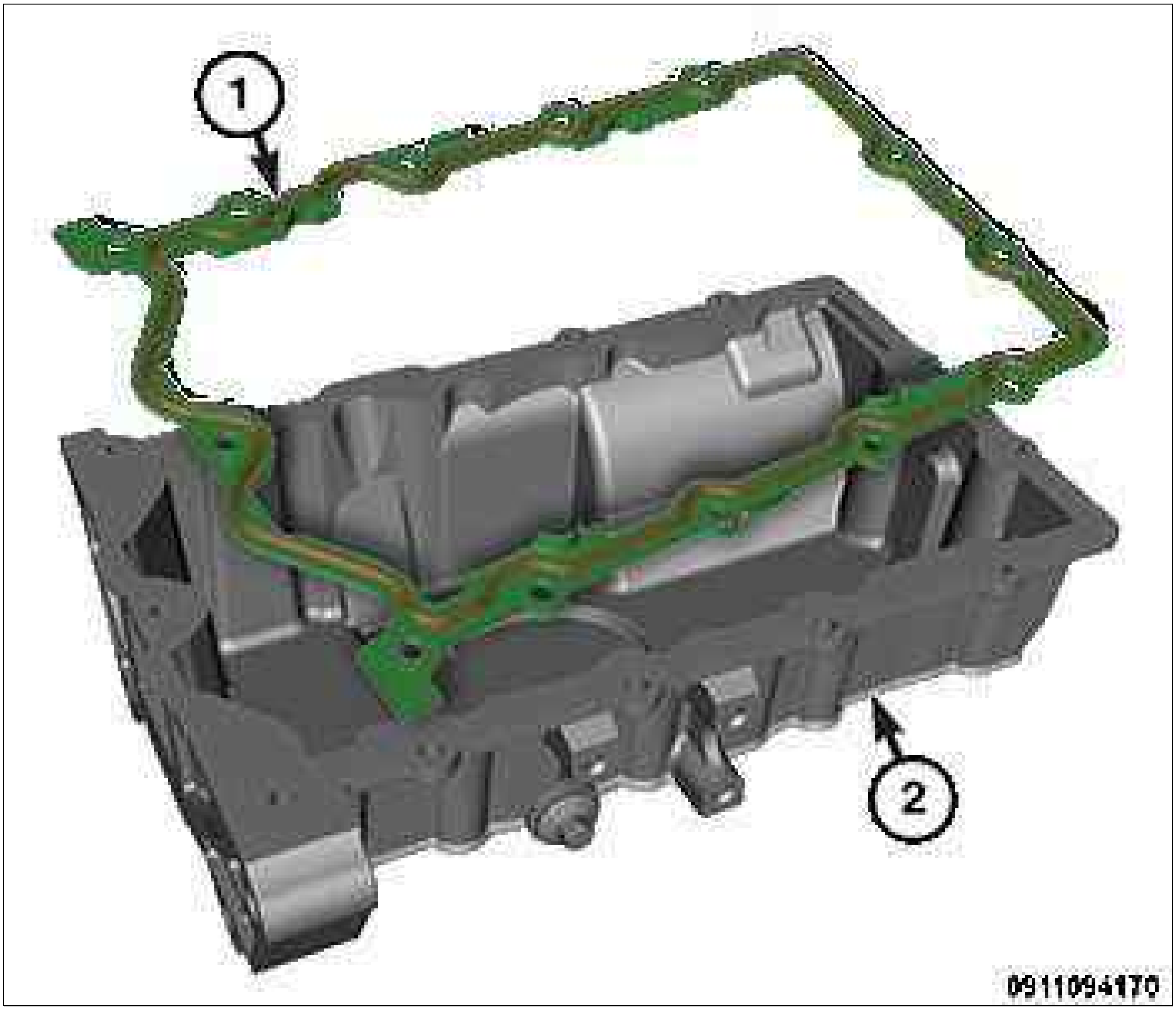
16. Place the engine oil filter in position and tighten the cover to the proper specification. Refer to TORQUE SPECIFICATIONS .
17. Refill the engine lubrication circuit with the prescribed oil. Refer to CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS .
18. The table shows the quantity for periodic replacement.
19. Check that the engine oil level is correct using the dipstick.
20. The oil level is checked with the vehicle on a flat surface.
21. Fit the filler cap, let the engine idle for about 2 minutes, switch off the engine and then wait for several minutes.
22. With engine cold, check the oil level and make sure there are no leaks.
23. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
24. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
25. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .

26. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

27. Remove the support and lower the vehicle.

LUBRICATION > PAN, OIL > DESCRIPTION > DESCRIPTION

Fig 1: Engine Oil Pan & Gasket



Courtesy of CHRYSLER GROUP, LLC

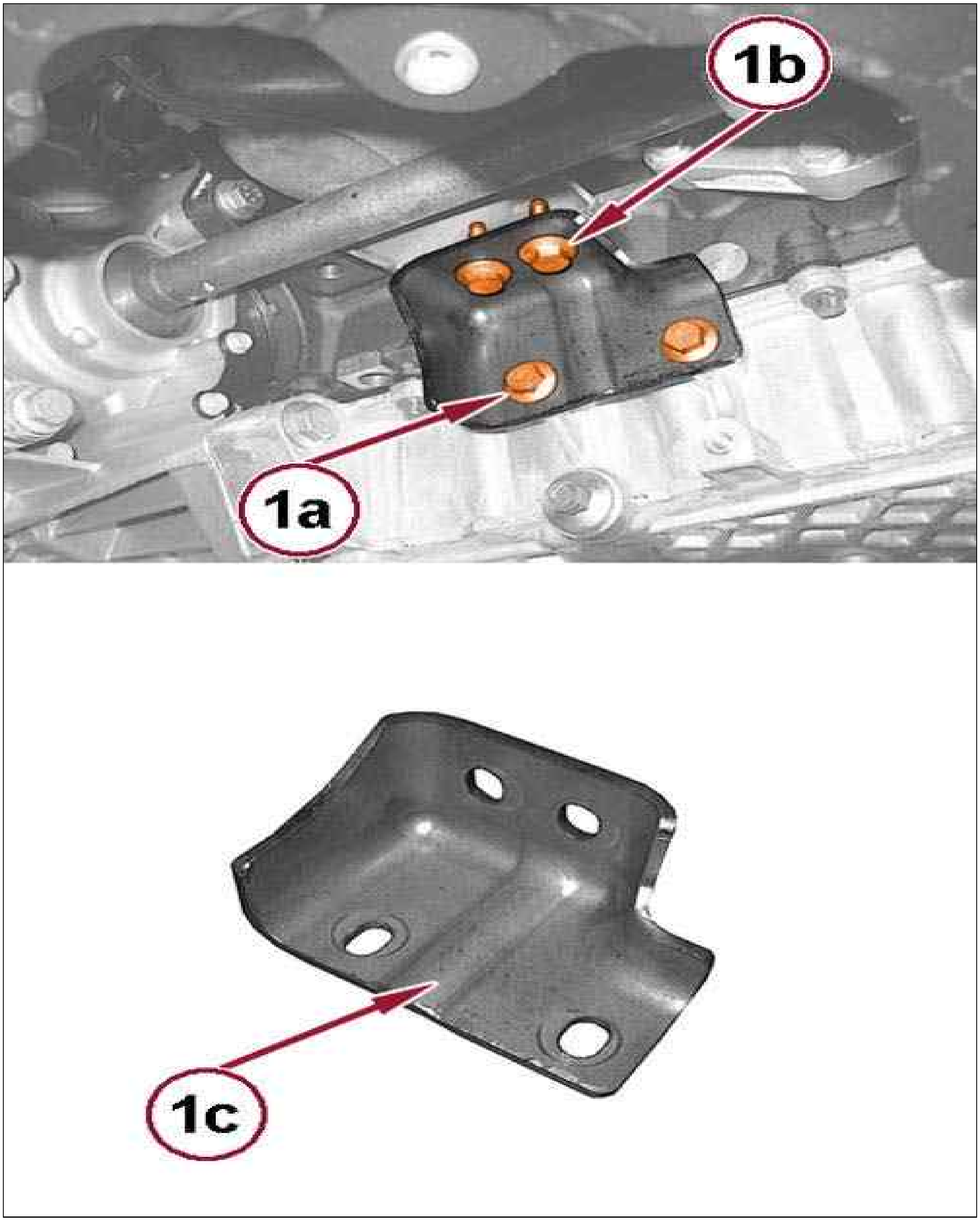
- The oil pan (2) contains the engine lubrication oil and is made of aluminum; it includes a threaded oil drainage opening with plug.
- Block seal is achieved through a rubber seal gasket (1).
- The sump is fixed to the engine block and front cover (timing side) with screws.

LUBRICATION > PAN, OIL > REMOVAL AND INSTALLATION > REMOVAL AND

INSTALLATION > REMOVAL

1. Remove the right tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
2. Remove the right front wheel house. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
3. Recover the refrigerant from the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
4. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
5. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
6. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
7. Drain the engine oil and remove the oil filter. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .

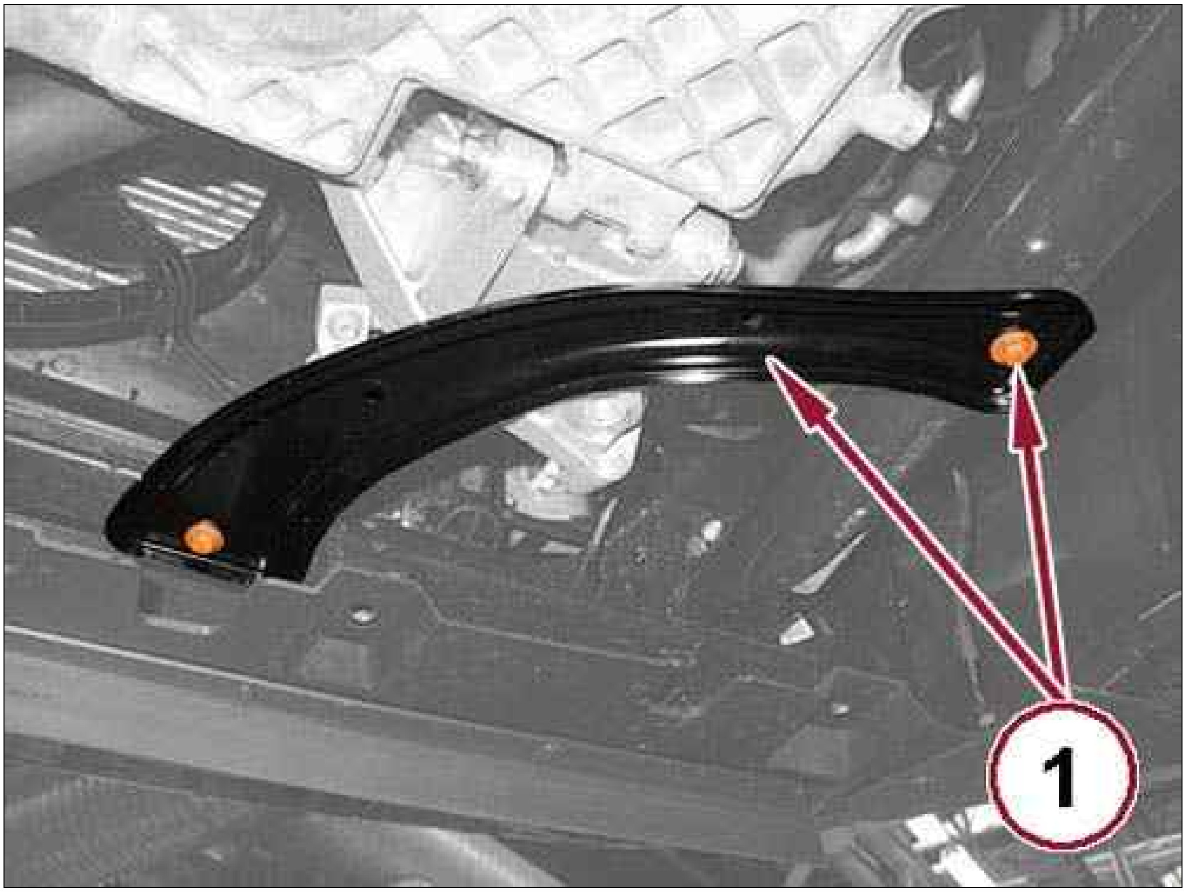
Fig 1: Catalytic Converter Mounting Bracket & Bolts



Courtesy of CHRYSLER GROUP, LLC

8. Remove the bolts (1a), (1b) and the catalytic converter mounting bracket (1c).

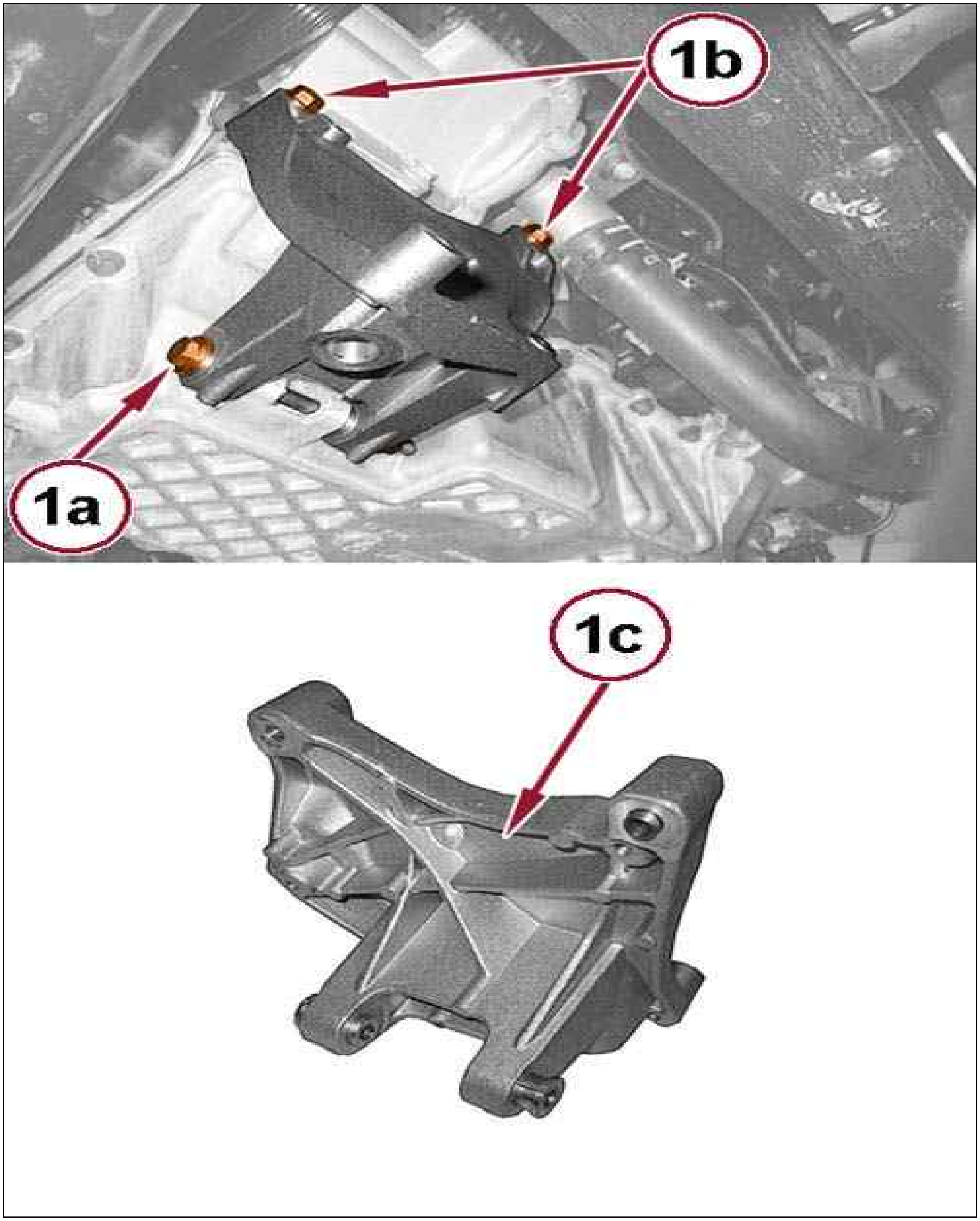
Fig 2: Front End Reinforcement & Bolts



Courtesy of CHRYSLER GROUP, LLC

9. Remove the bolts (1) and the front end reinforcement.

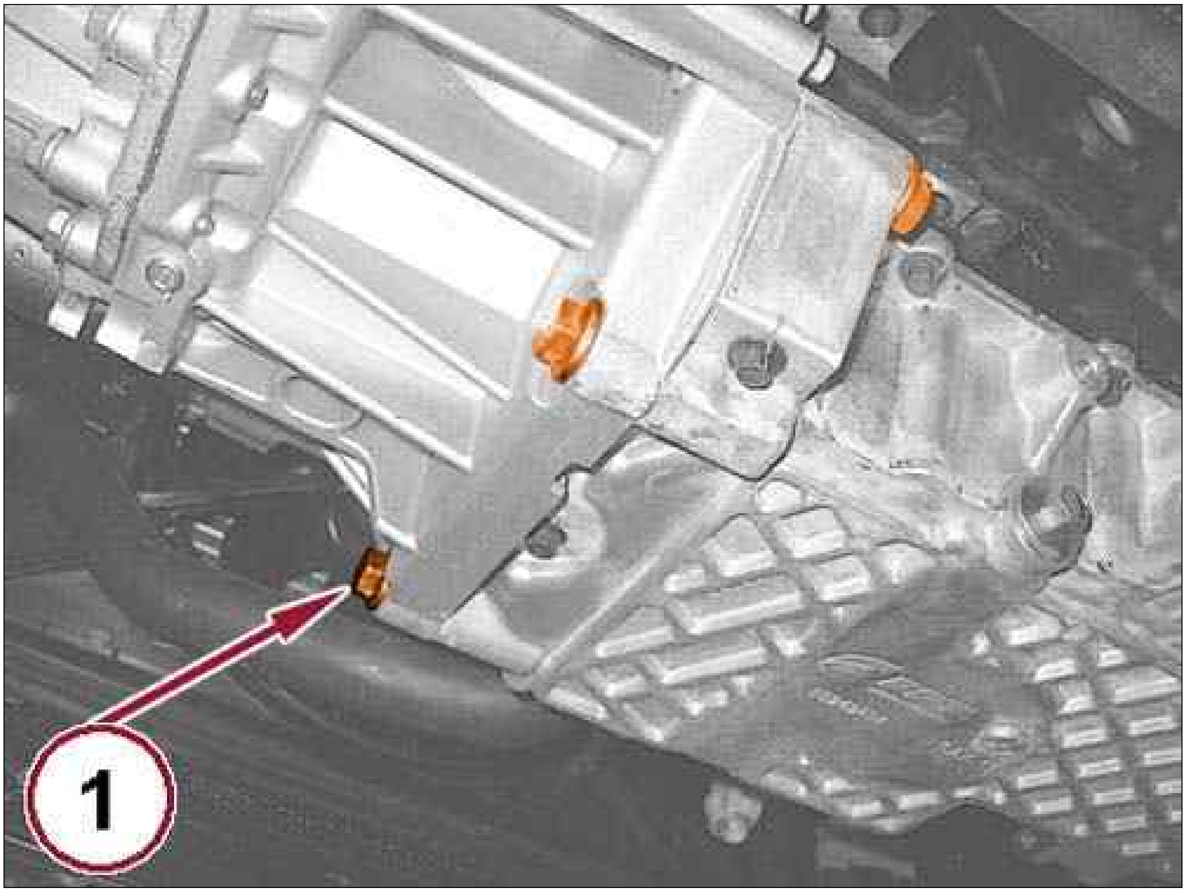
Fig 3: Air Conditioning Compressor Mounting & Bolts



Courtesy of CHRYSLER GROUP, LLC

10. Remove the bolts (1a), (1b) and the air conditioning compressor mounting (1c).

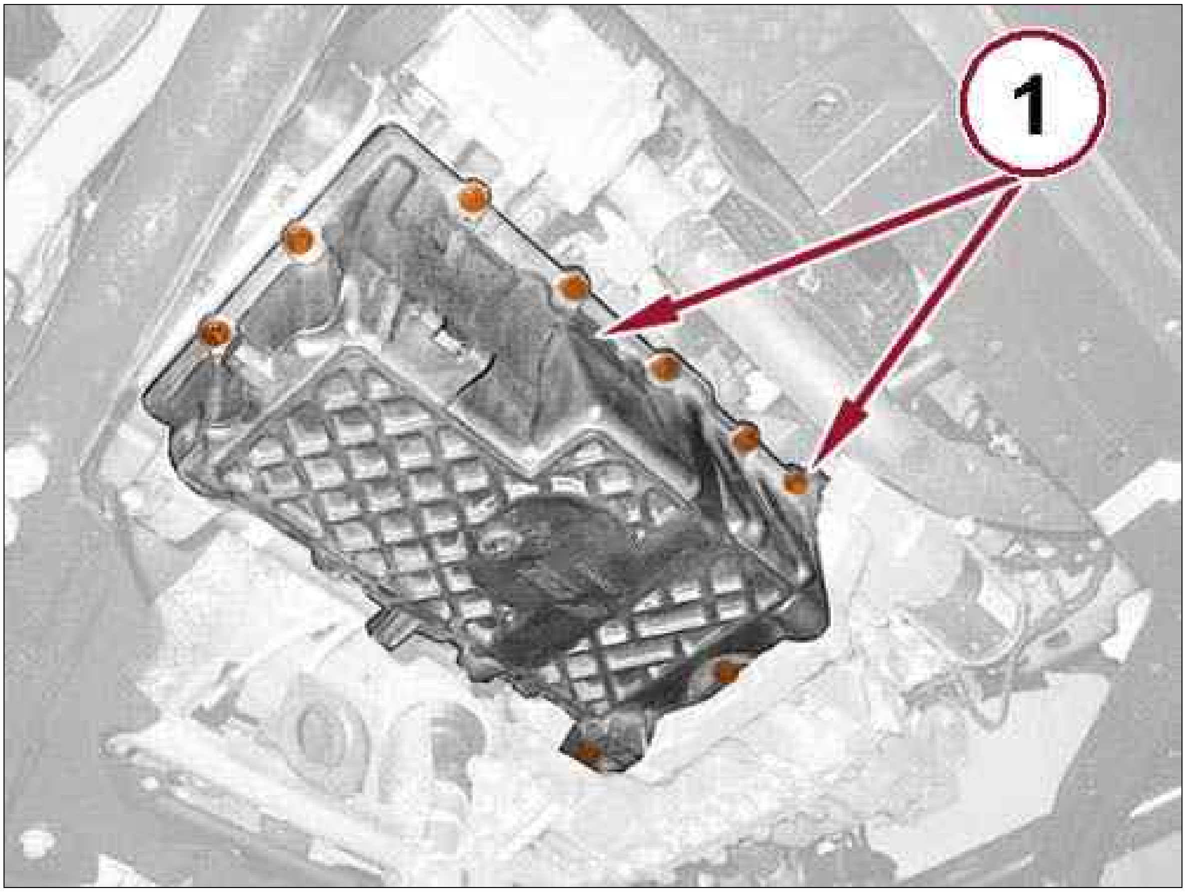
Fig 4: Gearbox To Engine Oil Sump Bolt



Courtesy of CHRYSLER GROUP, LLC

11. Remove the front and rear bolts securing the gearbox to the engine oil sump.

Fig 5: Engine Oil Pan & Bolts

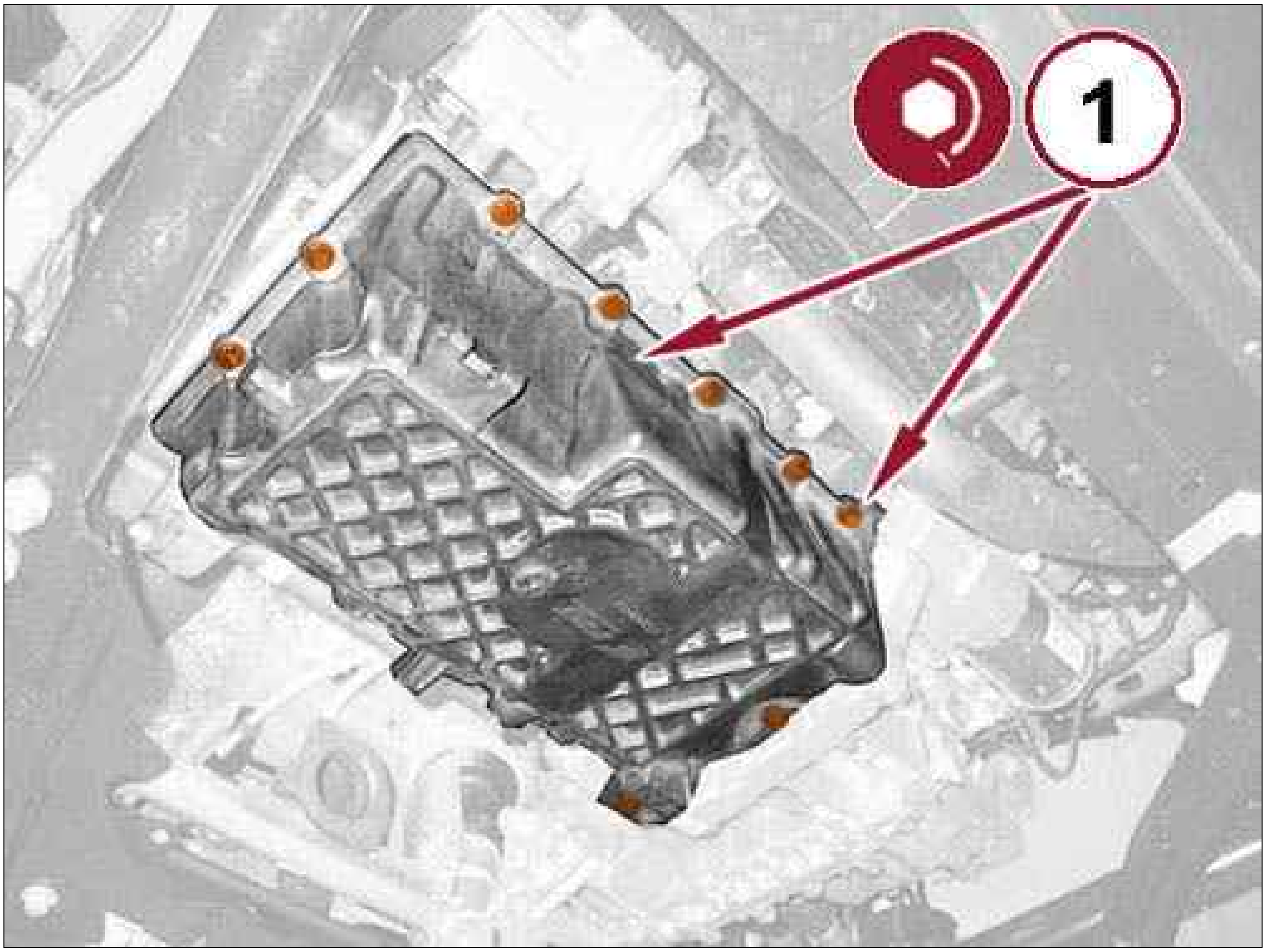


Courtesy of CHRYSLER GROUP, LLC

12. Remove the bolts (1) and the engine oil pan complete with gasket.

LUBRICATION > PAN, OIL > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

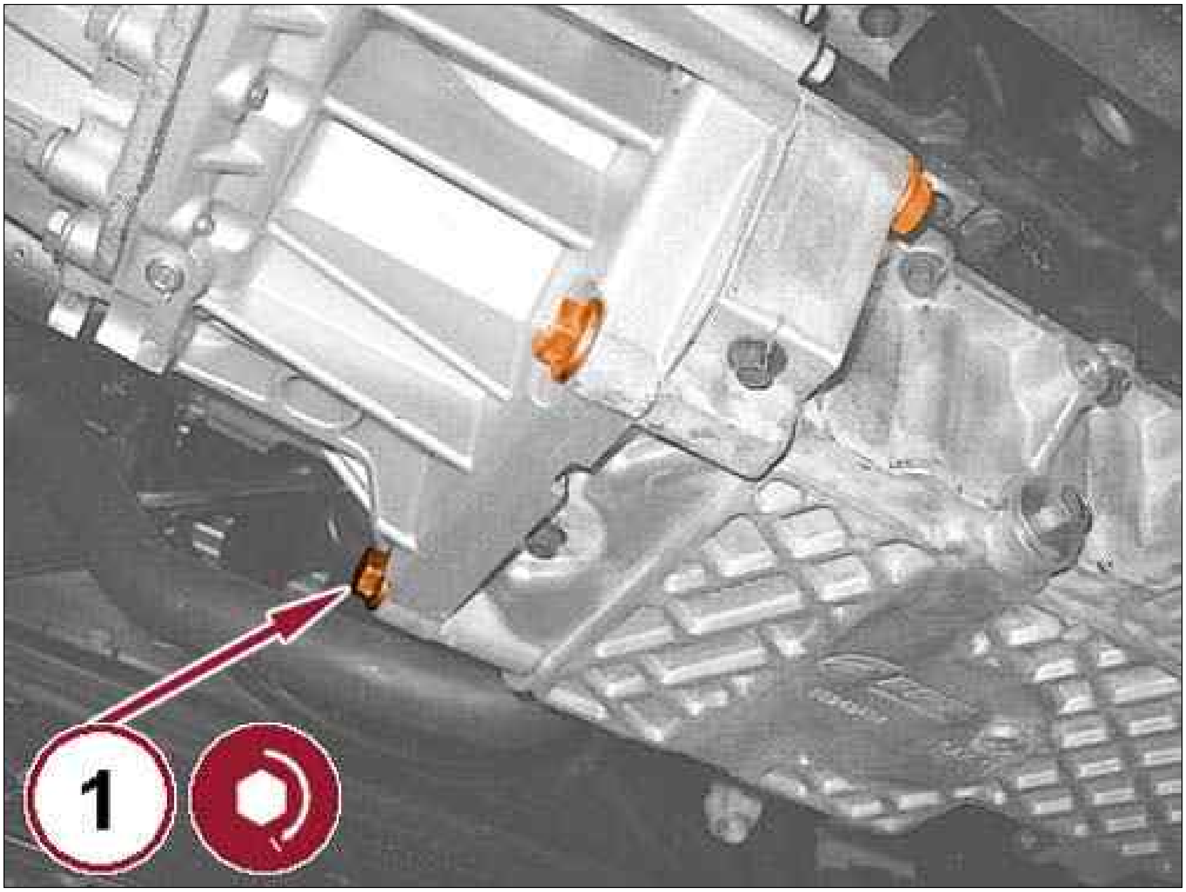
Fig 1: Engine Oil Pan & Bolts



Courtesy of CHRYSLER GROUP, LLC

1. Using a **NEW** gasket, install the engine oil pan. Tighten the bolts (1) finger tight.

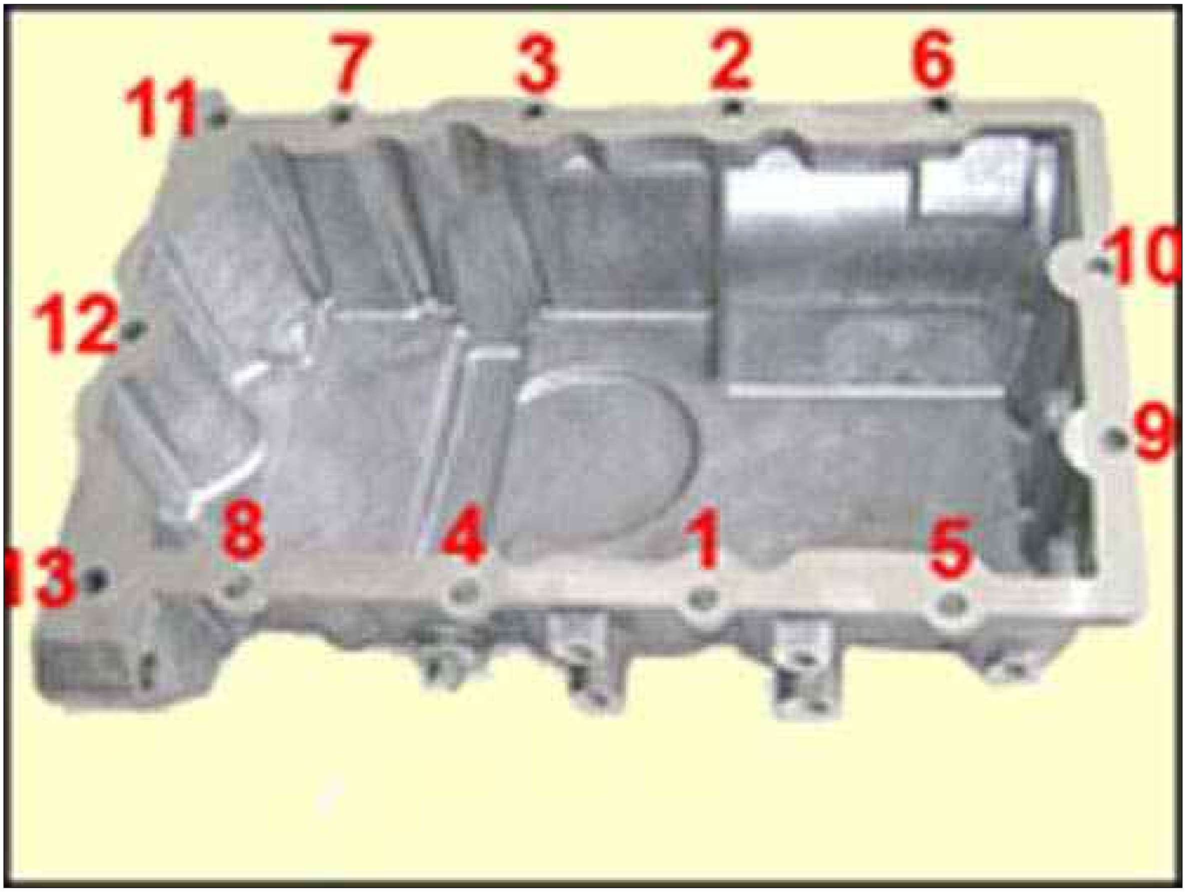
Fig 2: Gearbox To Engine Oil Sump Bolt



Courtesy of CHRYSLER GROUP, LLC

2. Install the front and rear bolts (1) securing the transmission to the engine oil pan and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .

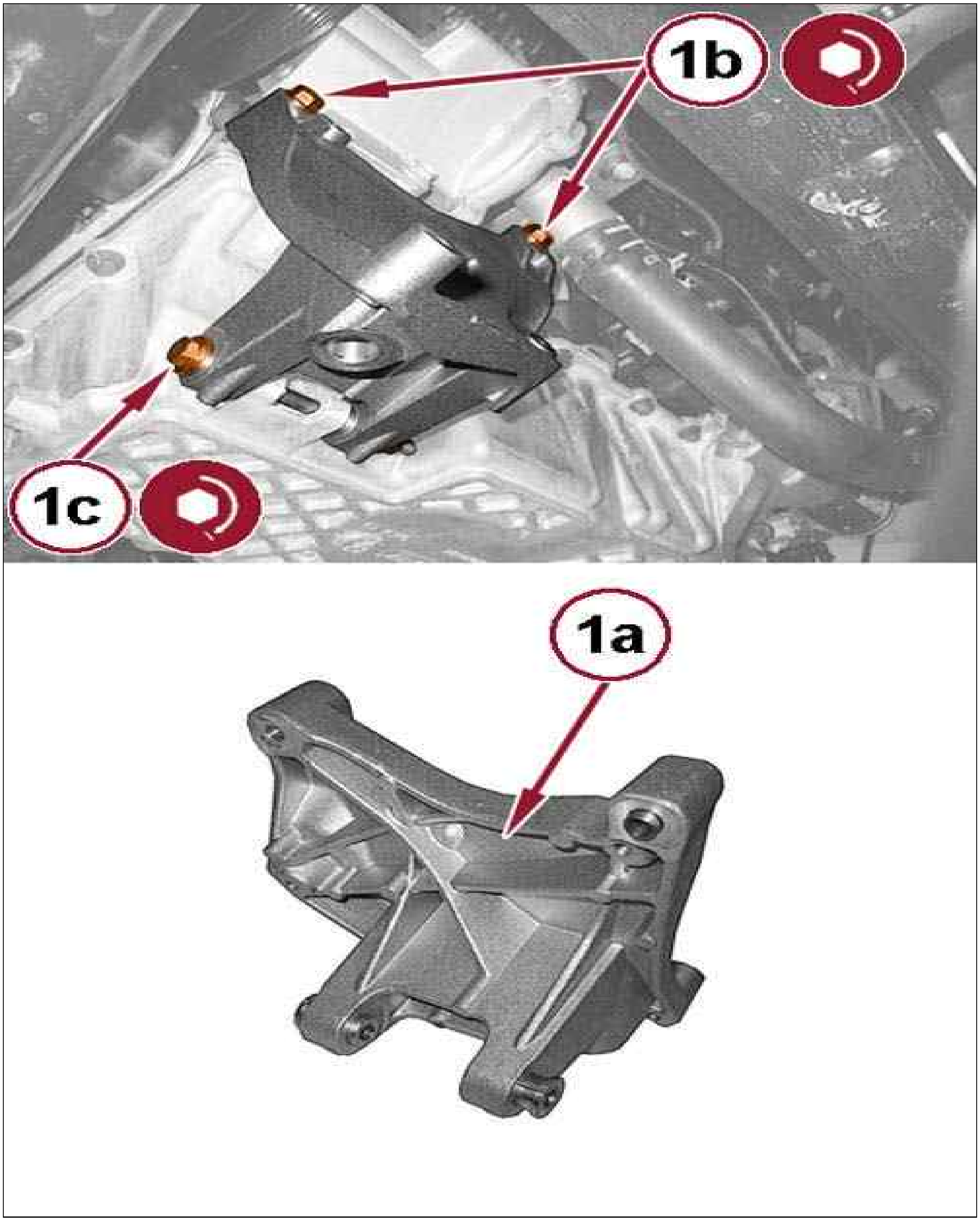
Fig 3: Engine Oil Pan Bolt Tightening Sequence



Courtesy of CHRYSLER GROUP, LLC

3. Using the tightening sequence shown in illustration, tighten the bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .

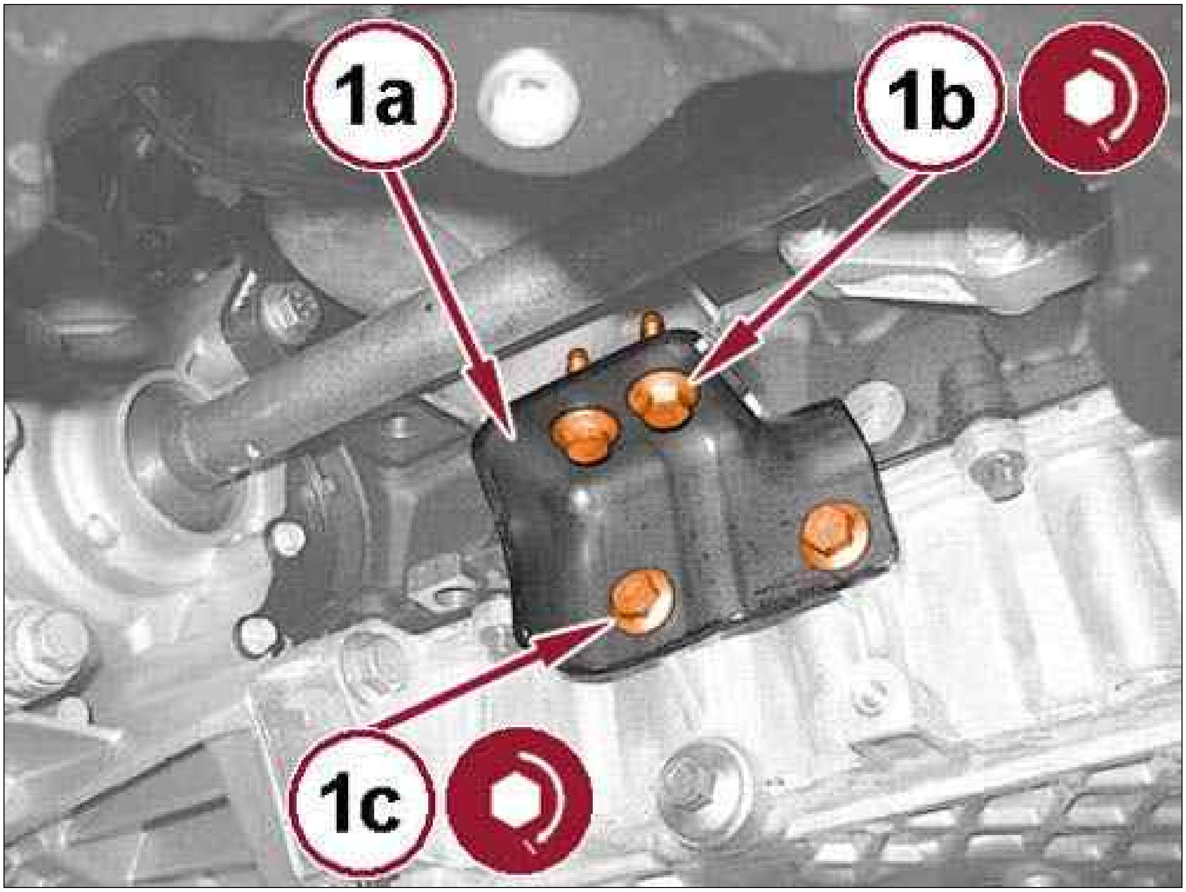
Fig 4: Air Conditioning Compressor Mounting & Bolts



Courtesy of CHRYSLER GROUP, LLC

4. Install the air conditioning compressor mount (1a). Tighten the bolt (1b), (1c) to the proper specification. Refer to TORQUE SPECIFICATIONS .
5. Install the front end reinforcement and securely tighten the bolts.

Fig 5: Installing Catalytic Converter Mounting Bracket



Courtesy of CHRYSLER GROUP, LLC

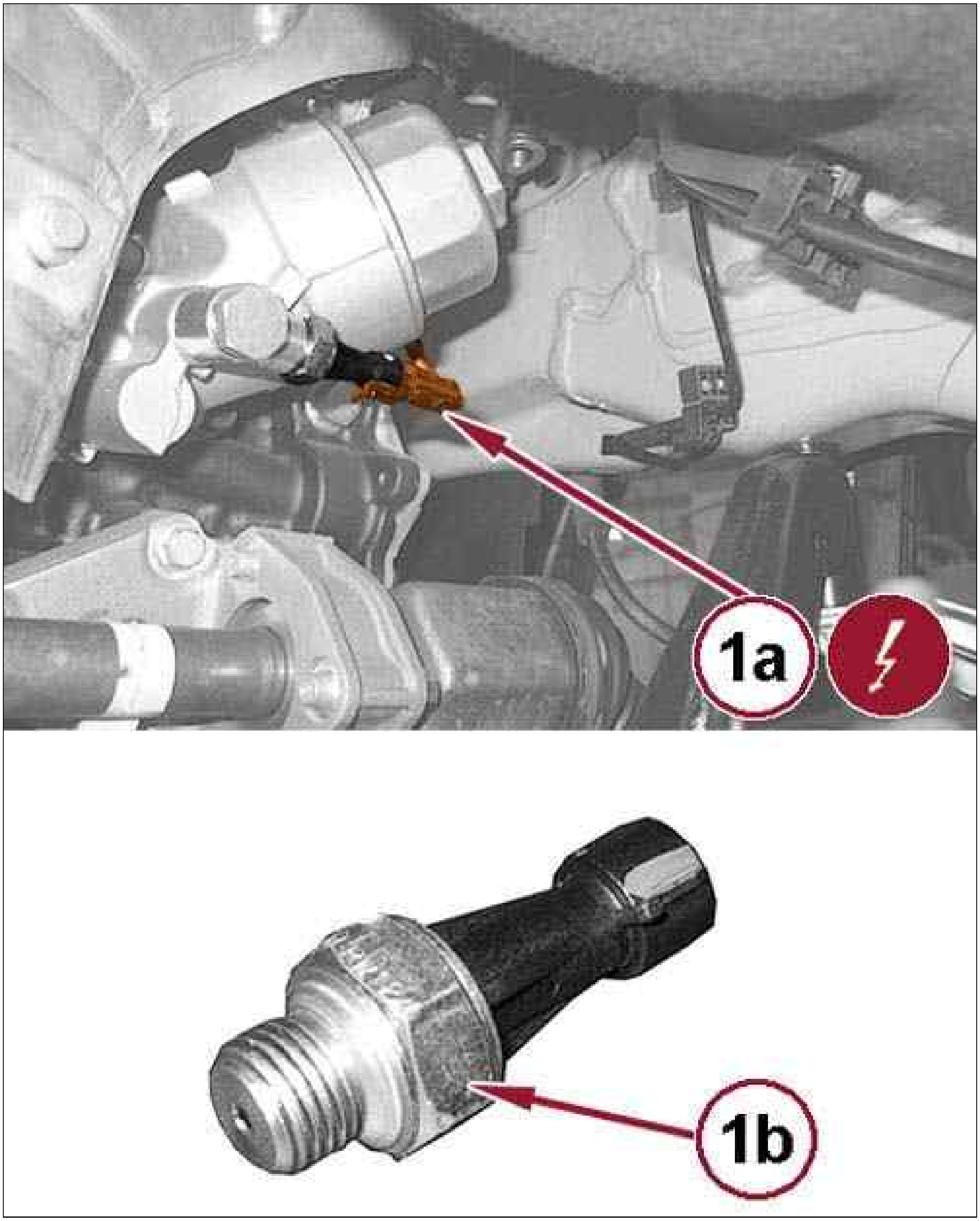
6. Install the catalytic converter mounting bracket (1a) Tighten the bolts (1b) and (1c) to the proper specification. Refer to TORQUE SPECIFICATIONS .
7. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
8. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
9. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .
10. Install a **NEW** oil filter and fill the engine with the recommended engine oil. Refer to FILTER, ENGINE OIL, REMOVAL AND INSTALLATION .
11. Evacuate and charge the A/C system. Refer to PLUMBING, STANDARD PROCEDURE .
12. Install the right front wheel house. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
13. Install the right tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

LUBRICATION > SENSOR, OIL PRESSURE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .

2. Position a suitable container to collect the oil that will come out of the housing for the engine oil pressure warning light switch.

Fig 1: Engine Oil Warning Light Switch & Wire Harness Connector

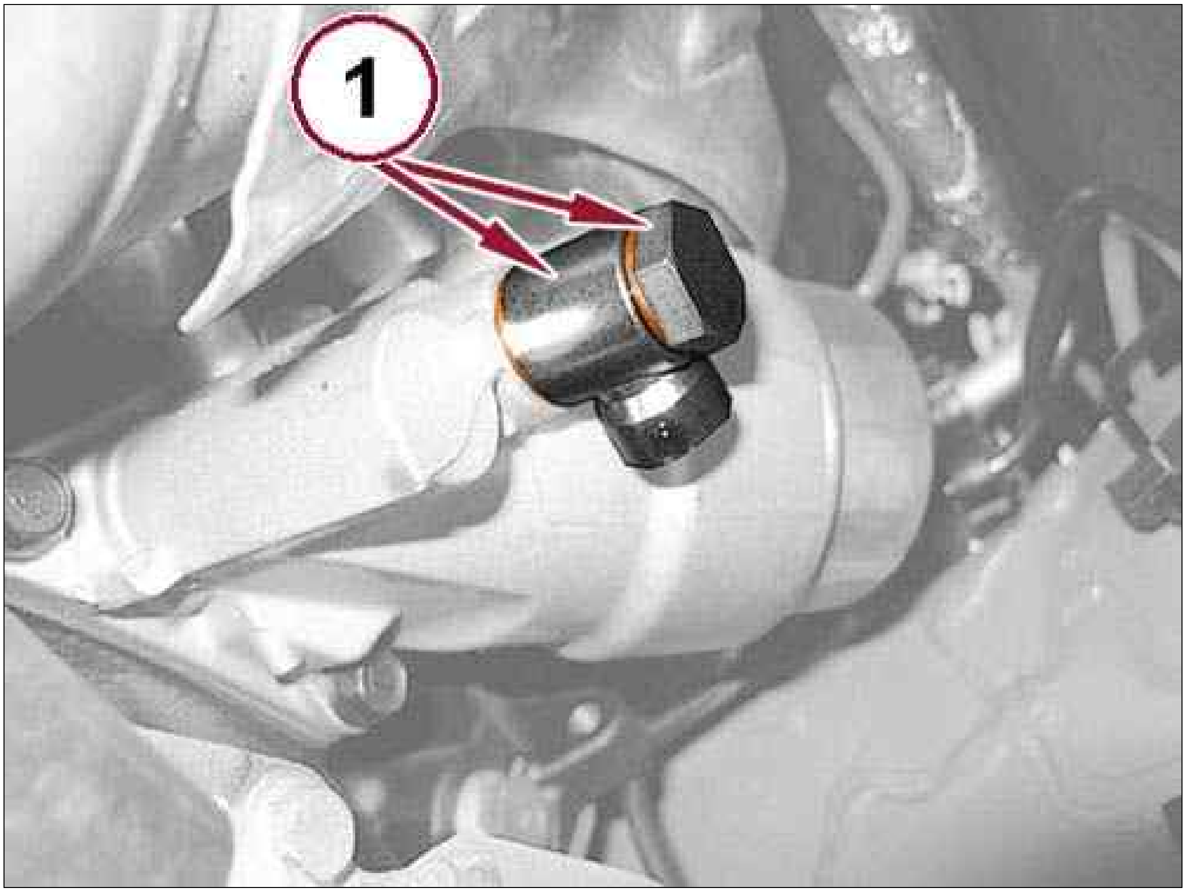


Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the engine oil warning light switch (1b) wire harness connector (1a).

4. Remove the engine oil warning light switch (1b).

Fig 2: Bolt, Fitting & Gaskets



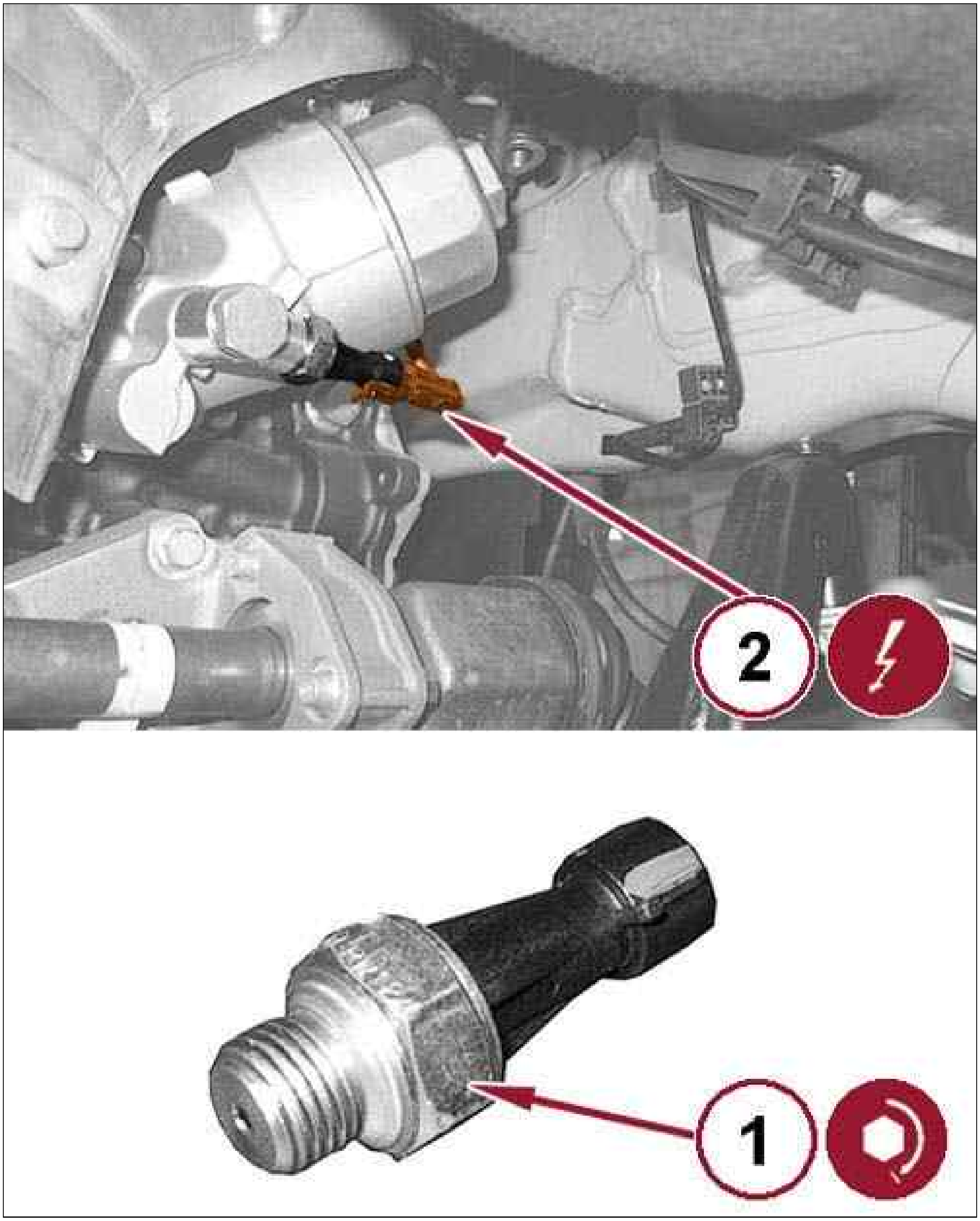
Courtesy of CHRYSLER GROUP, LLC

5. If necessary, remove the bolt and the fitting complete with gaskets.

LUBRICATION > SENSOR, OIL PRESSURE > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

1. If removed, install the fitting complete with **NEW** gaskets and securely tighten.

Fig 1: Engine Oil Warning Light Switch & Wire Harness Connector

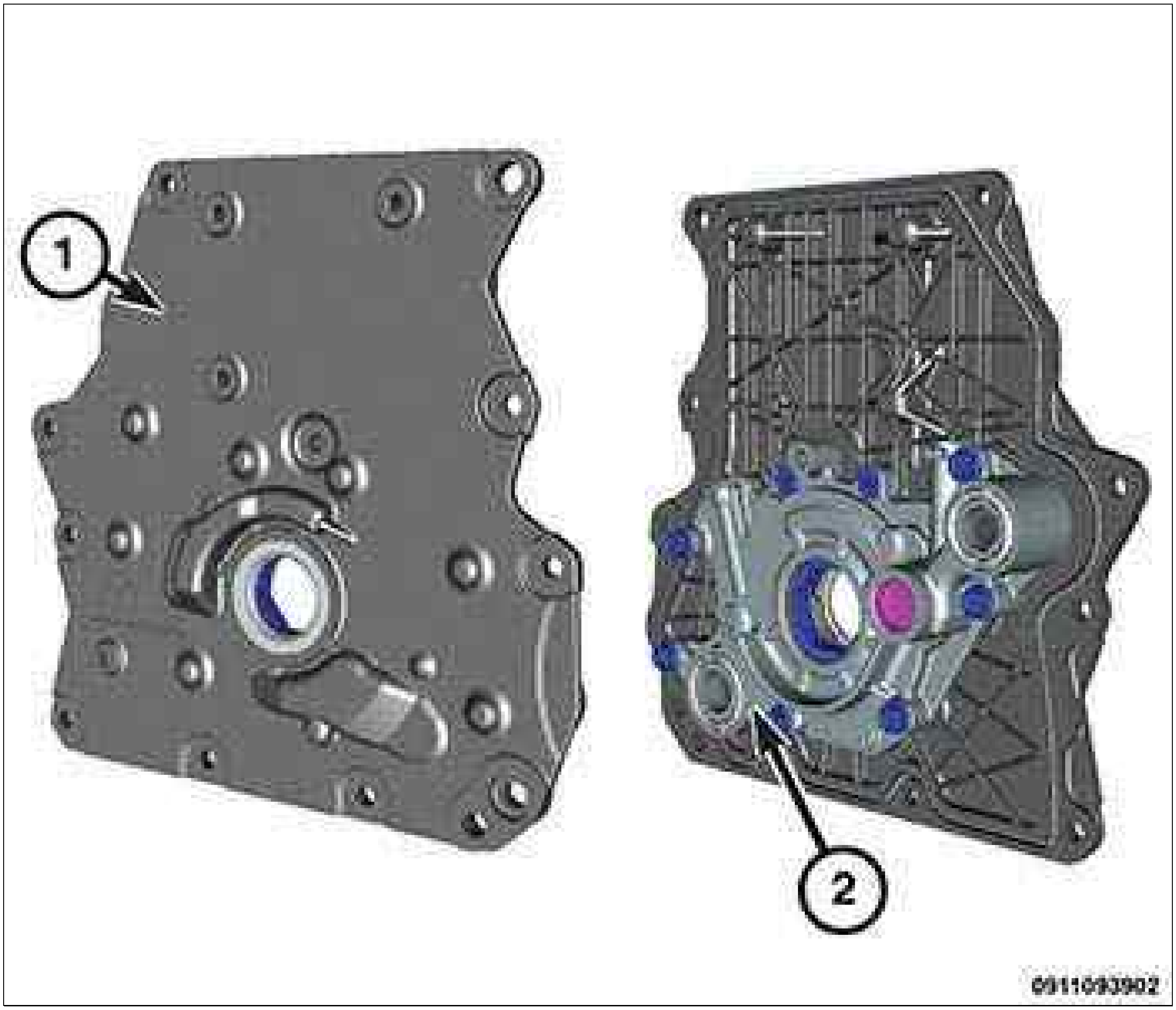


Courtesy of CHRYSLER GROUP, LLC

2. Install the engine oil warning light switch (1) in its housing and tighten it to the proper specification. Refer to TORQUE SPECIFICATIONS .
3. Connect the engine oil warning light switch wire harness connector (2).
4. Install the belly pan. Refer to BELLY PAN, REMOVAL AND INSTALLATION .

LUBRICATION > PUMP, ENGINE OIL > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > DESCRIPTION

Fig 1: Timing Cover & Oil Pump

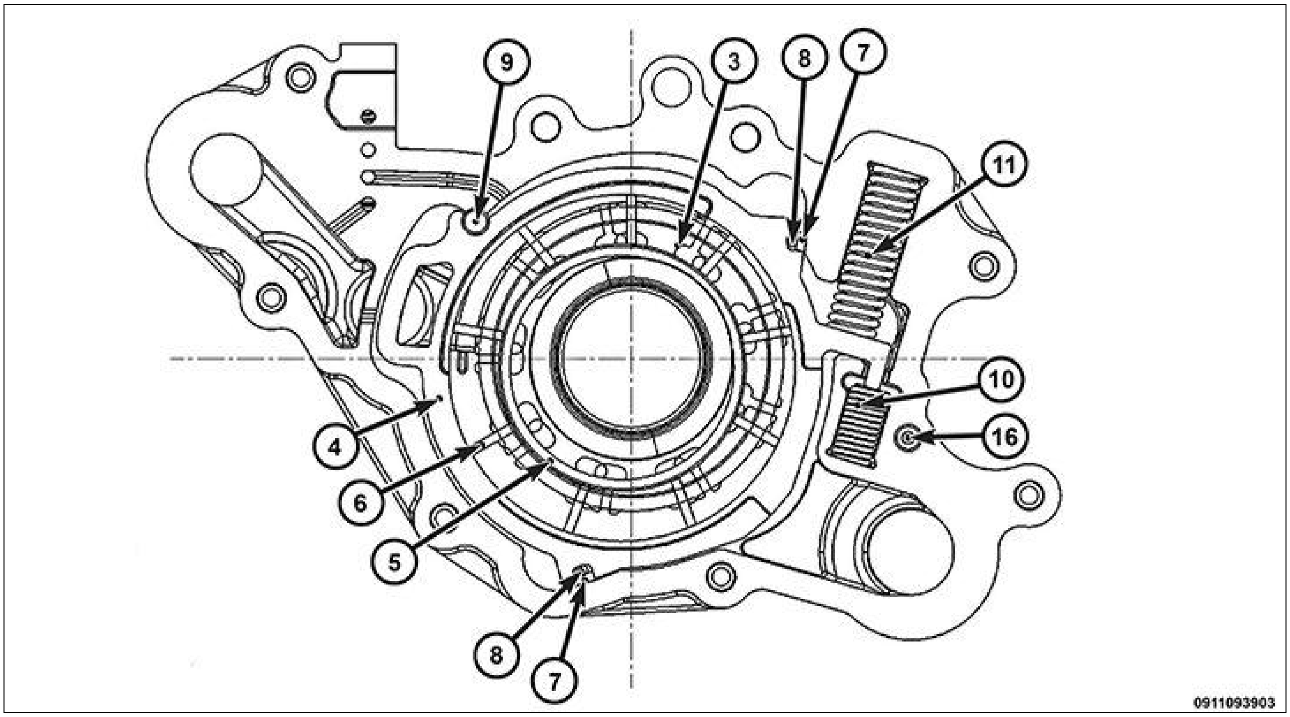


Courtesy of CHRYSLER GROUP, LLC

- The oil pump (2) is coupled to the timing cover (1) using screws. Engine oil is drawn up from the sump via the vacuum created by the rotation of vane rotor fitted to the crankshaft.
- The pump features specific springs that vary the pump displacement according to the stator position and engine operating conditions. Varying the displacement allows a reduction in consumption and, as a consequence, a reduction in CO? emissions. The lower displacement allows the pump to process a lower oil quantity, reducing the pump power uptake from the engine. In this way consumption and emissions are reduced.

LUBRICATION > PUMP, ENGINE OIL > DESCRIPTION AND OPERATION > DESCRIPTION AND OPERATION > OPERATION

Fig 1: Oil Pump Components



Courtesy of CHRYSLER GROUP, LLC

- Inside the engine oil pump, in addition to the relief or overpressure valve (12), there are two springs (10, 11) of different forces and lengths positioned in contact with the pump's stator.
- The stator pivots (4) on one side on a pin (9) and on the other is positioned in contact with two springs (10, 11). The link created between pin (9) and stator (4) permits minor rotation to increase or decrease the eccentricity with respect to the crankshaft axis. The rotor (3), on the other hand, is on the crankshaft and has little vanes free to exit from and return inside the rotor, so as to adapt to the configuration of stator movement.
- The stator (4) pivots on one side on a pin (9) and on the other is positioned in contact with two springs (10, 11). The link created between pin (9) and stator (4) permits minor rotation to increase or decrease the eccentricity with respect to the crankshaft axis. The rotor (3), on the other hand, is on the crankshaft and has little vanes (6) free to exit from and return inside the rotor (3), so as to adapt to the configuration of stator movement.
- When the engine oil pressure exceeds a value of 5.0 bar and overcomes the reaction of the relief or overpressure valve (12), the pressure moves the valve to the extent that it opens the connecting duct between pressure chamber and oil filter delivery duct, so as to limit the maximum pressure value in the circuit to a preset limit.

LUBRICATION > PUMP, ENGINE OIL > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION

1. For oil pump removal, refer to the engine timing cover service procedure. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .

VALVE TIMING > DESCRIPTION AND OPERATION > DESCRIPTION-AND-OPERATION > DESCRIPTION

Fig 1: Valve Timing Components

Courtesy of CHRYSLER GROUP, LLC

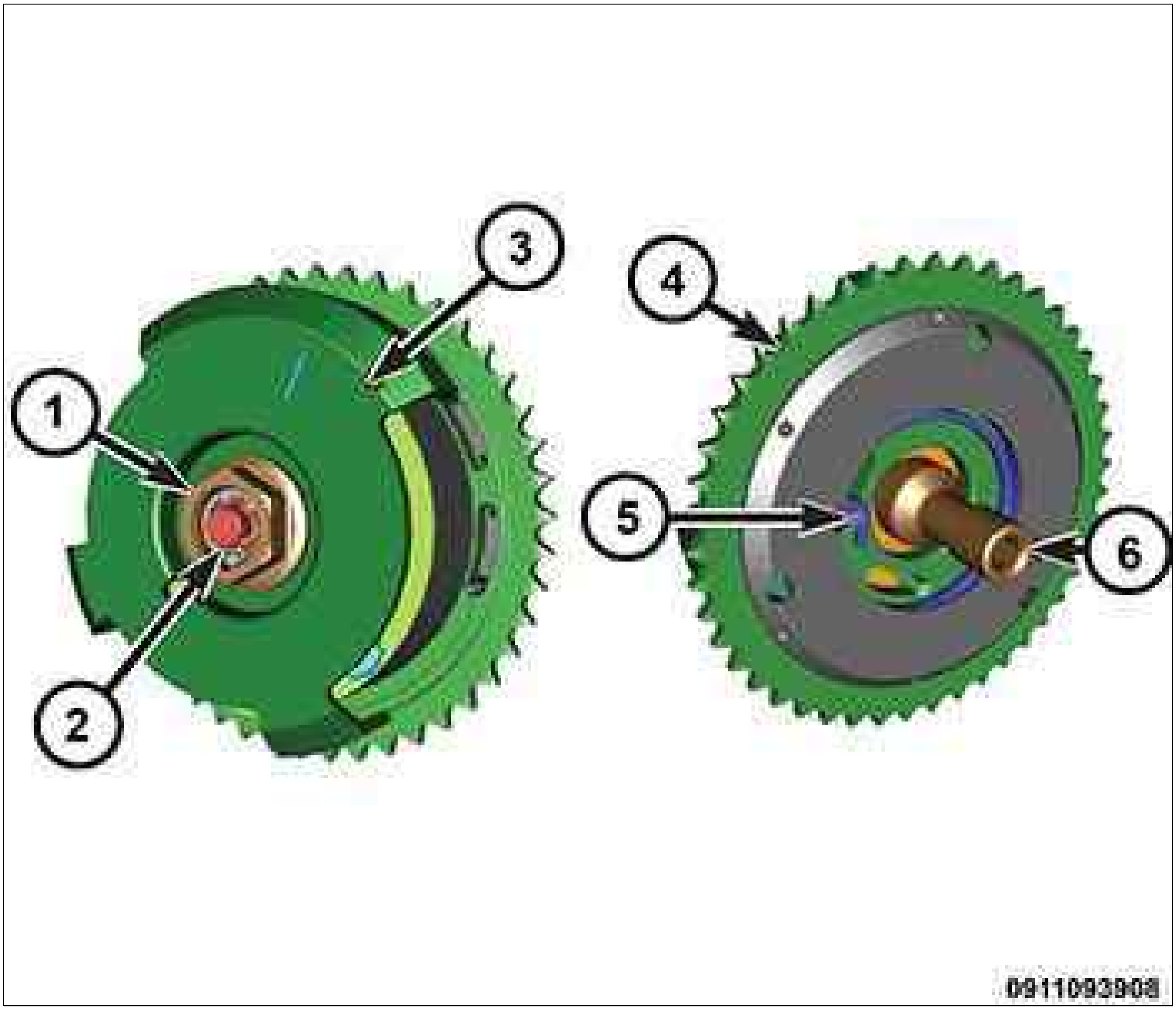
1. Oil Pressure Switch, 2. Hydraulic Chain Tensioner, 3. Moving Pad, 4. Fixed Pad, 5. Crankshaft Gear, 6. Camshaft Pulley on Variable Valve Timing (VVT) unit.

The timing control comprises a chain controlled via the gear, splined on the crankshaft, which transmits the drive to the gear of the VVT unit fixed to the camshaft.

The chain is guided by a fixed pad and the mobile pad. It is tensioned by the hydraulic tensioner acting on the mobile pad, which ensures a reduction in noise during operation and the correct gear control, maintaining the tension on the loose section of the chain.

The two guide/pads are secured to the engine block with bolts.

Fig 2: Variable Valve Timing System Components



Courtesy of CHRYSLER GROUP, LLC

The VVT system consists of: VVT unit fixing screw head (1), Slider valve (2), Toothed timing wheel (3), Camshaft ring gear (4), VVT unit default position recall spring (5), VVT unit fixing screw body (6).

The "continuous" VVT unit is capable of modifying the position of the camshaft in relation to the crankshaft by approximately 45°.

In this way the engine is working with optimum timing in all operating points.

The variable valve timing is managed entirely by the Powertrain Control Module, which:

- Detects the camshaft position via the timing sensor
- Alters this position according to the engine operation on the basis of a calibrated map
- Keeps the camshaft position under control.

The variable valve timing actuator comprises a rotor integral with the camshaft, which is able to rotate with respect to the ring gear moved by the crankshaft via chain. The rotor is equipped with vanes and is moved by the pressure of the engine oil acting on these vanes.

- There are two compartments (the advance compartment and the delay compartment) created at the two sides of each of these vanes: the oil can flow into one compartment or the other.
- The pressure of the oil entering one compartment, pushes the vane to one side and the oil in the other compartment is discharged. This rotates the rotor and thereby also the camshaft in a certain direction (advance or delay).
- If the engine oil alternatively enters one compartment and the other continuously for the same time, the pressures at the two sides of the rotor are dynamically balanced and it remains still.
- Engine oil flow is effected through a slider valve that brings the oil channels on the cylinder fixing screw into communication with the advance or delay compartments created inside the VVT unit itself, all of which is managed by an actuator fixed on the tappet cover.
- The slider valve that manages the distribution of oil for the VVT unit compartments is inside the screw used to fix the VVT unit to the camshaft.
- The VVT unit is also fitted with a locking pawl that integrates the stator with the rotor when there is no oil pressure. This measure prevents unnecessary motion of the stator in the engine starting stage, which would begin with a considerable timing valve opening/closing delay.

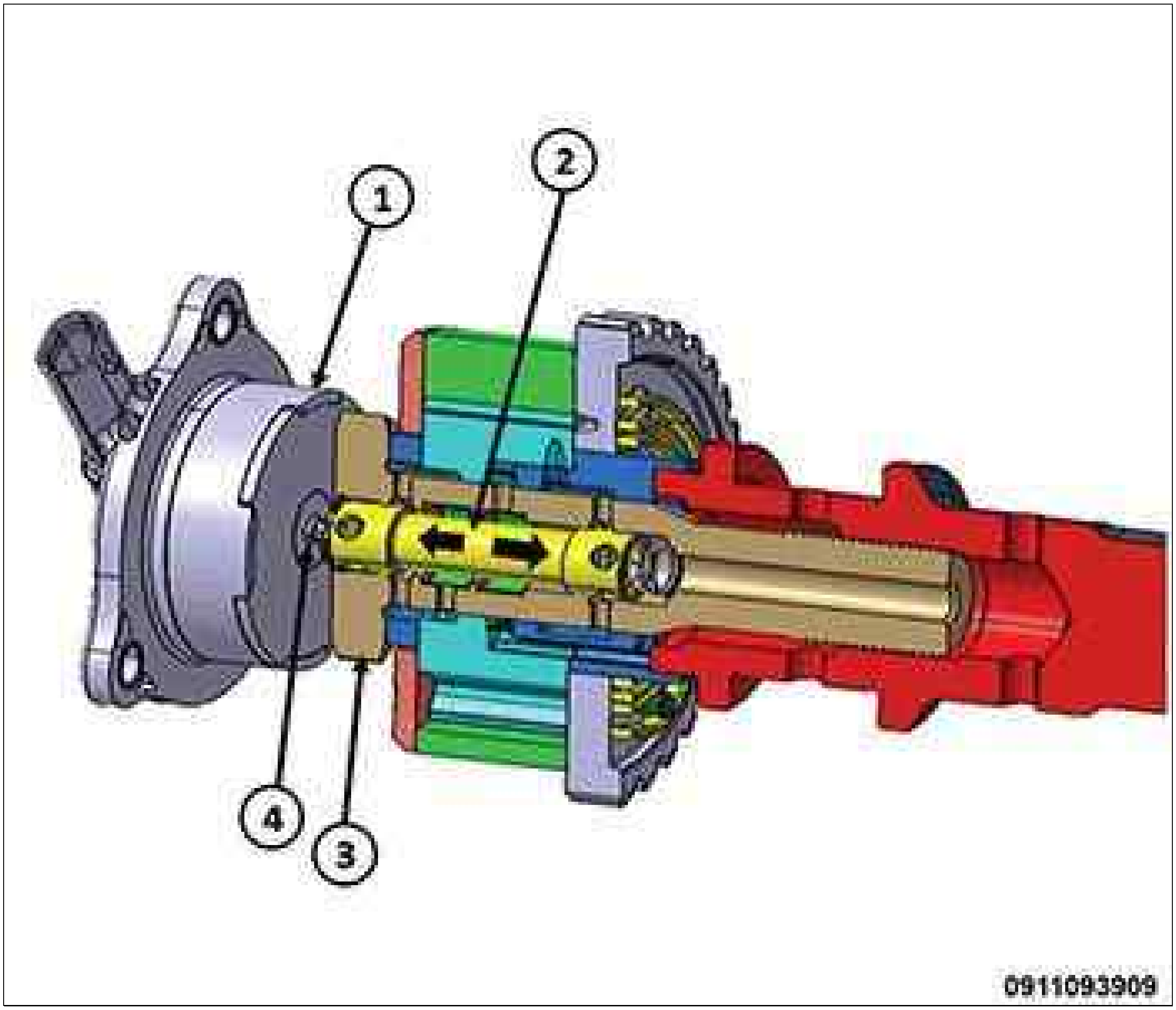
The position of the VVT unit is altered by changing the oil pressure through the slider valve. A voltage signal is applied to the VVT actuator solenoid (1) to start the VVT movement. The solenoid plunger (4) either extends or retracts. The plunger pushes against the slider valve (2), pushing the valve backwards and forwards to direct the flow of oil one way or another.

When the engine is being started, the pressure in the system overcomes the pressure of the spring and releases the locking pin of the variable valve timing unit (1). The VVT remains in this position until it receives a signal from the Powertrain Control Module to the actuator solenoid. When the engine stops, with the reduction in oil pressure, the VVT unit locking pin returns to its original position, also assisted by a spring inside the VVT unit itself.

The position of the slider valve (1) inside the fixing screw (2) determines which openings and chambers inside the VVT are supplied to anticipate (3), maintain (4) or delay (5) crankshaft pinion timing with respect to the camshaft. The valve contributes towards bringing oil from the chambers to the sump (6). The timing sensor controls the position of the camshaft with respect to the crankshaft and provides feedback to the Powertrain Control Module. The stator starts moving when the oil pressure pushes against the blades (6) of the VVT body. The component is physically fixed to the camshaft and for this reason the rotation of this component turns the camshaft with respect to the standard position of the gear (7).

VALVE TIMING > DESCRIPTION AND OPERATION > DESCRIPTION-AND-OPERATION > OPERATION

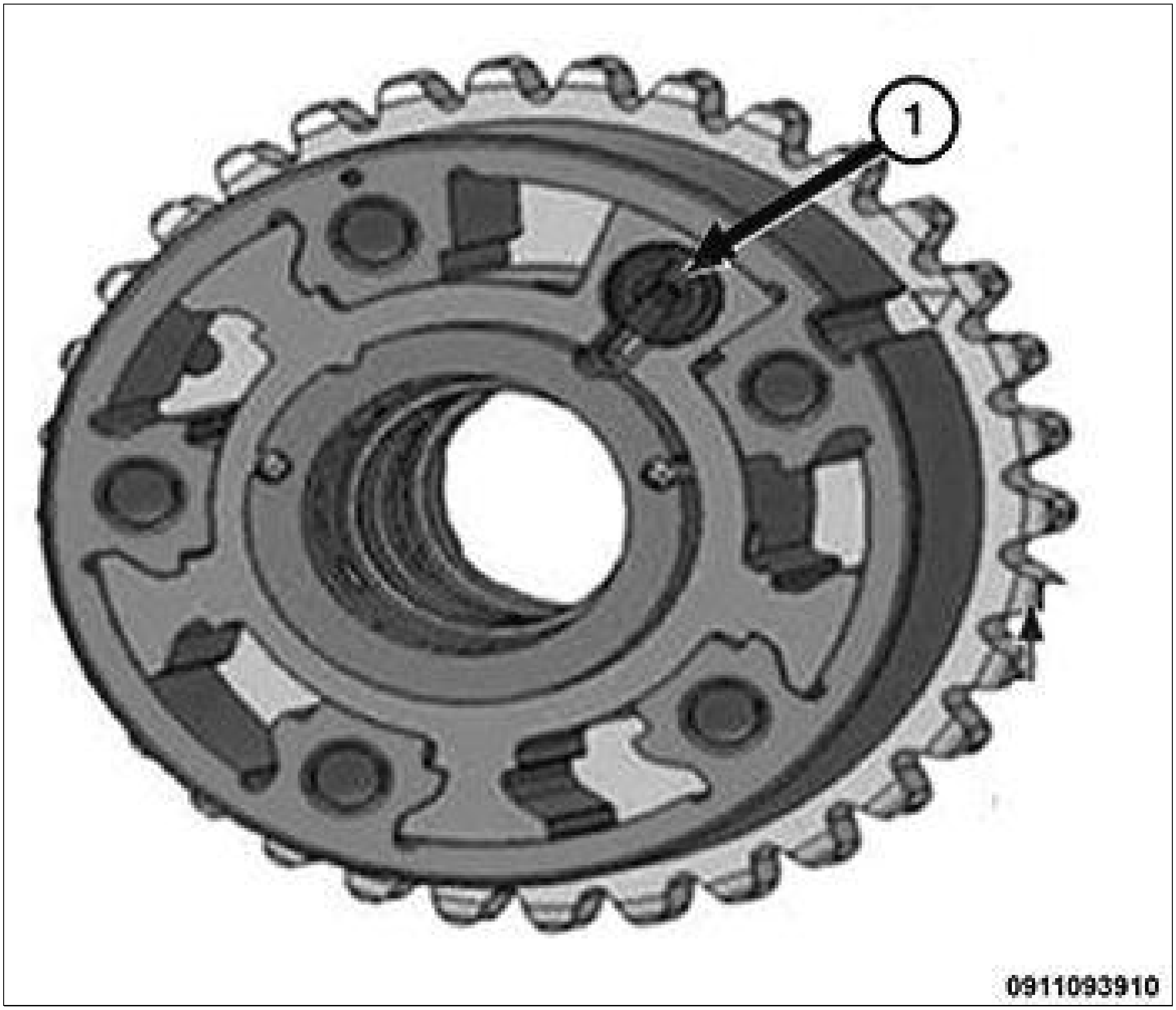
Fig 1: Variable Valve Timing System Operation



Courtesy of CHRYSLER GROUP, LLC

- The position of the VVT unit is altered by changing the oil pressure through the slider valve. A voltage signal is applied to the VVT actuator solenoid (1) to start the VVT movement. The solenoid plunger (4) either extends or retracts. The plunger pushes against the slider valve (2), pushing the valve backwards and forwards to direct the flow of oil one way or another.

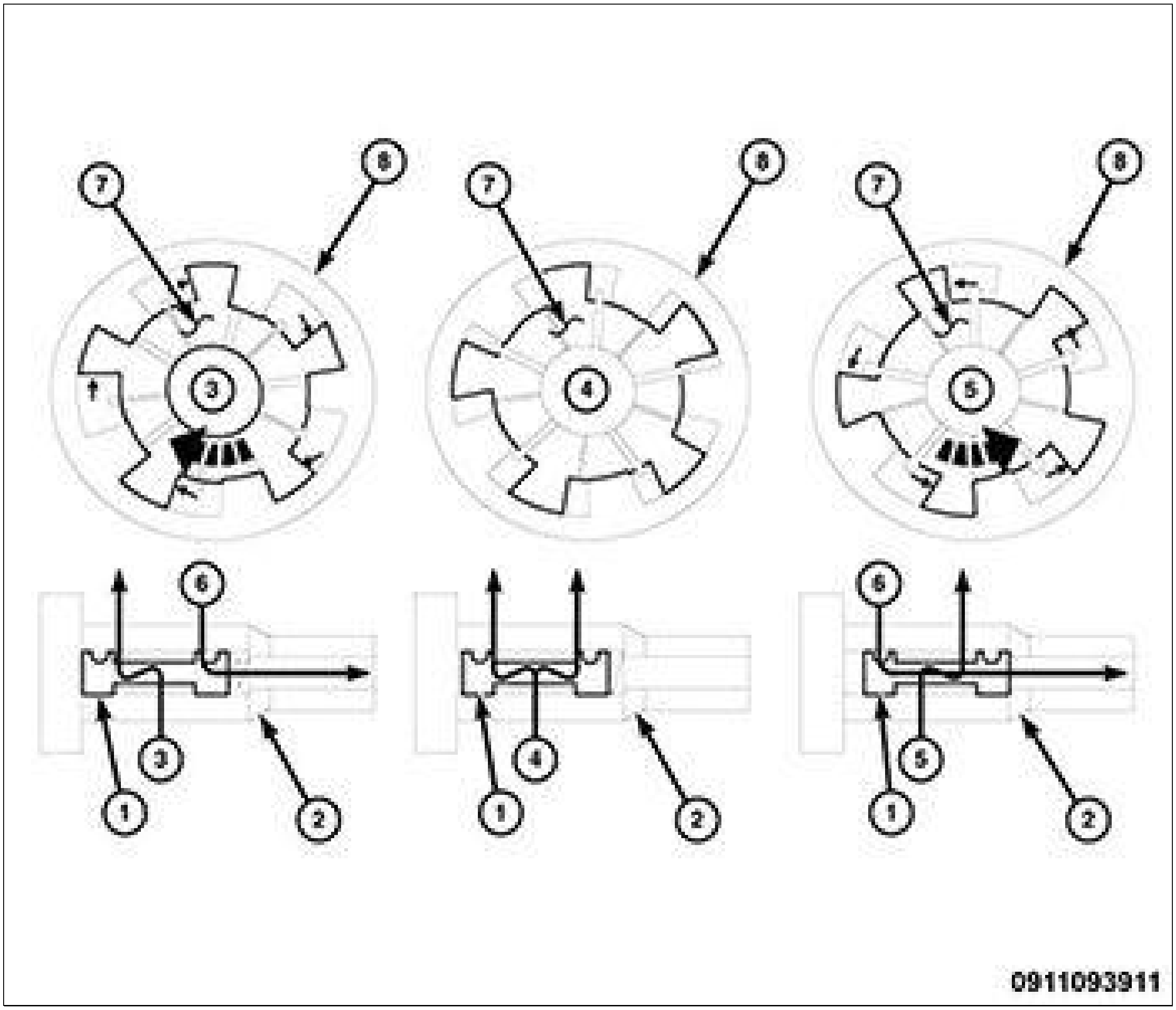
Fig 2: Locking Pin Of Variable Valve Timing Unit



Courtesy of CHRYSLER GROUP, LLC

- When the engine is being started, the pressure in the system overcomes the pressure of the spring and releases the locking pin of the variable valve timing unit (1). The VVT remains in this position until it receives a signal from the Powertrain Control Module to the actuator solenoid. When the engine stops, with the reduction in oil pressure, the VVT unit locking pin returns to its original position, also assisted by a spring inside the VVT unit itself.

Fig 3: Variable Valve Timing System Component Operation



Courtesy of CHRYSLER GROUP, LLC

- The position of the slider valve (1) inside the fixing screw (2) determines which openings and chambers inside the VVT are supplied to anticipate (3), maintain (4) or delay (5) crankshaft pinion timing with respect to the camshaft. The valve contributes towards bringing oil from the chambers to the sump (6). The timing sensor controls the position of the camshaft with respect to the crankshaft and provides feedback to the Powertrain Control Module. The stator starts moving when the oil pressure pushes against the blades (6) of the VVT body. The component is physically fixed to the camshaft and for this reason the rotation of this component turns the camshaft with respect to the standard position of the gear (7).

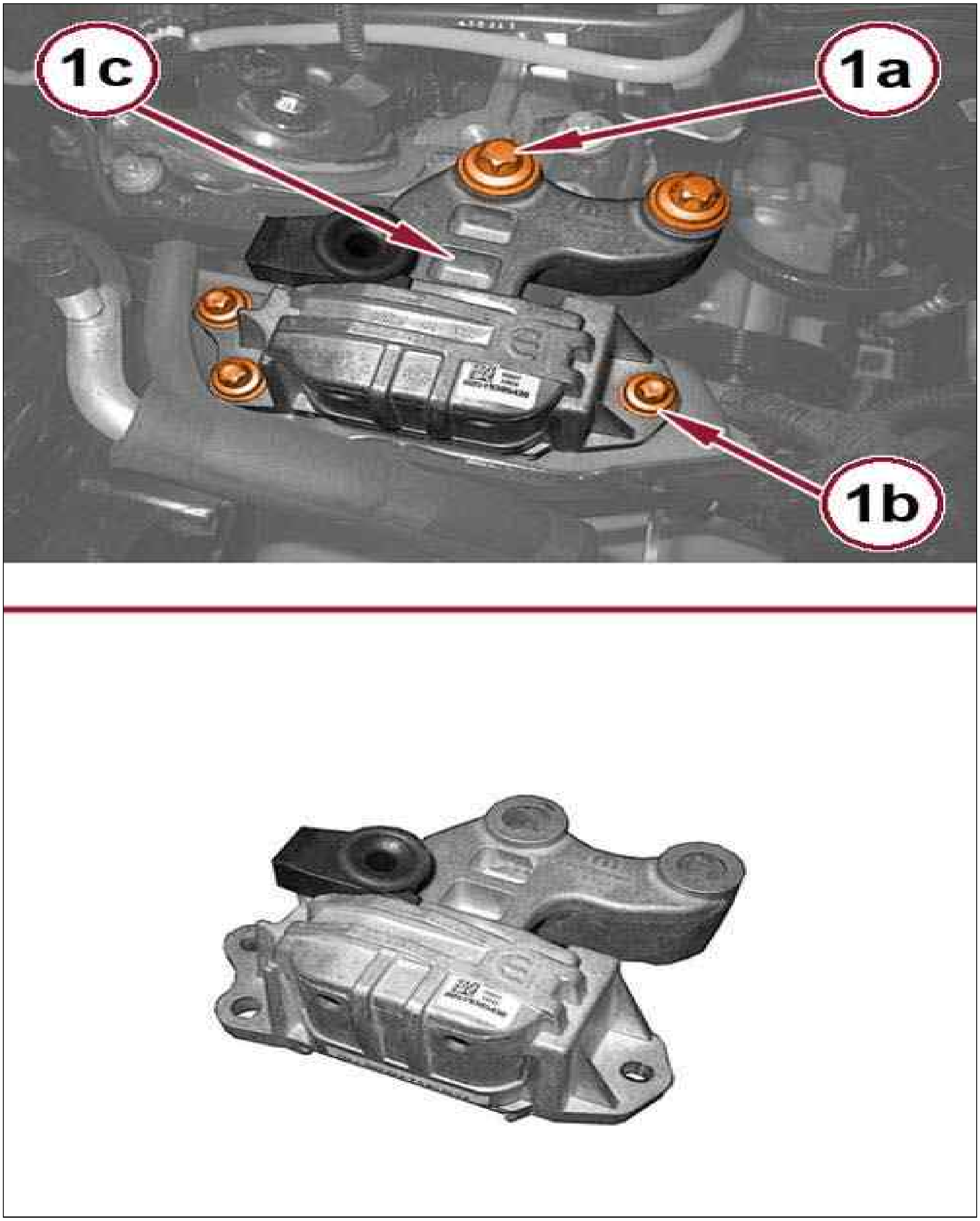
VALVE TIMING > CHAIN AND SPROCKETS, TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
2. Remove the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND

INSTALLATION .

3. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
4. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
5. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
6. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
7. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
8. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
9. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
10. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
11. Remove the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
12. Remove the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
13. Remove the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
14. Position a floor jack under the engine to support the engine.

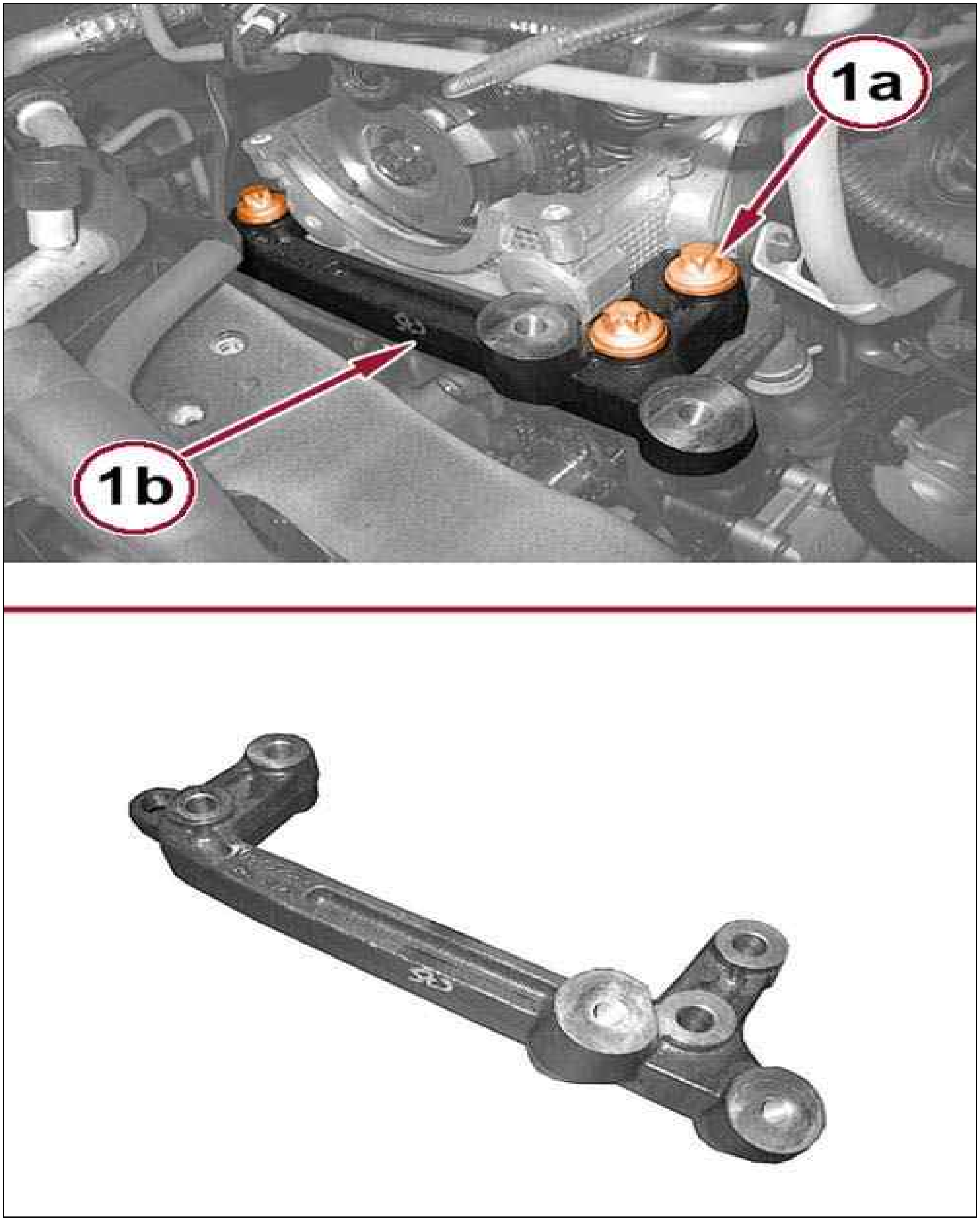
Fig 1: Right Side Engine Mount & Bolts



Courtesy of CHRYSLER GROUP, LLC

15. Remove the bolts (1a), (1b), and the right side engine mount (1c).

Fig 2: Right Side Engine Mount Bracket & Bolts



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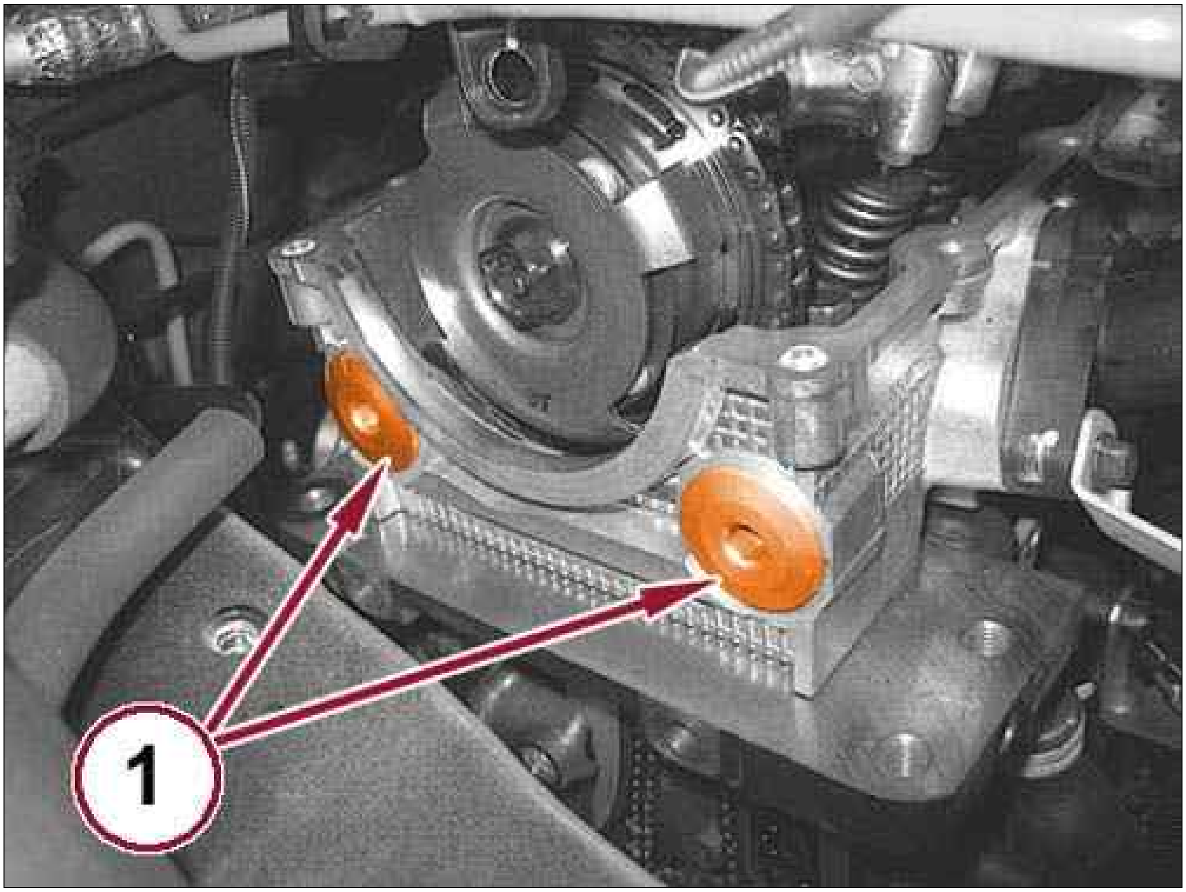
16. Remove the bolts (1a) and the right side engine mount bracket (1b).

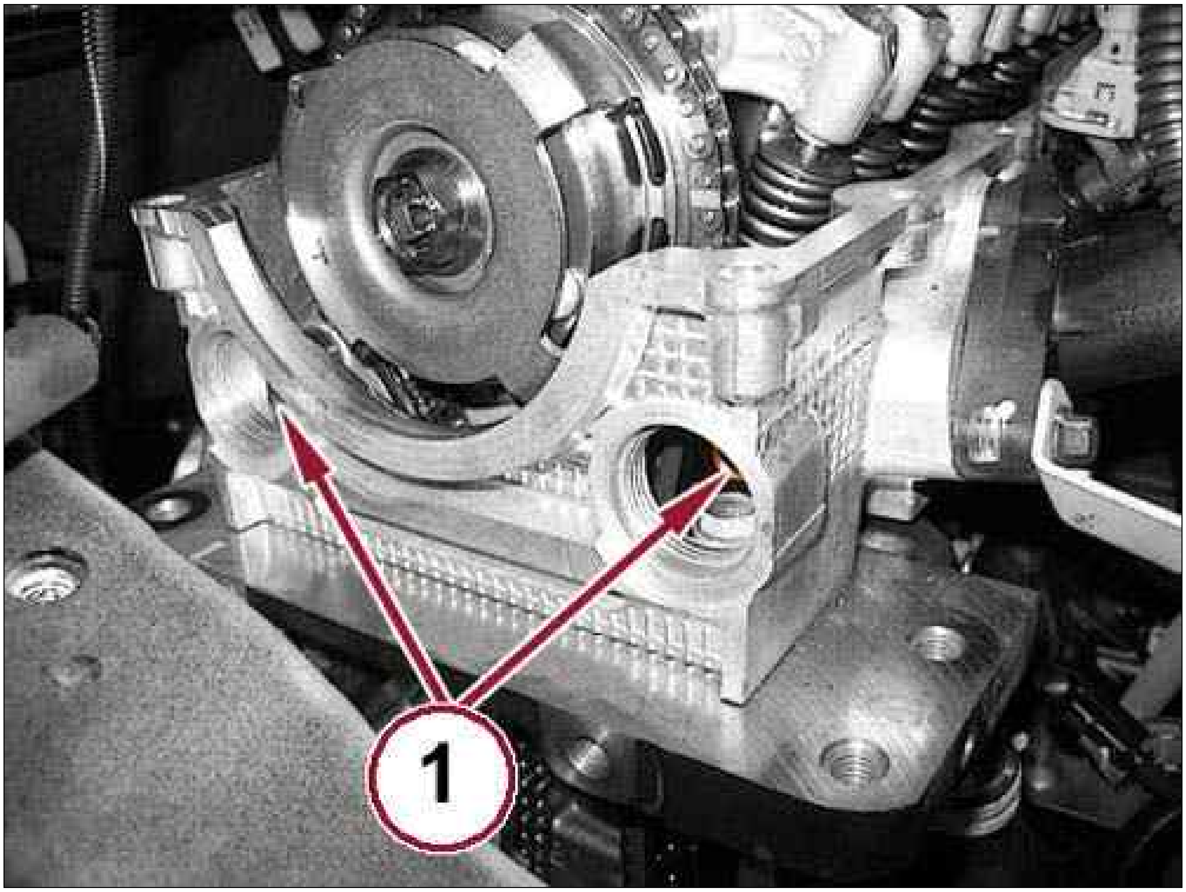
Fig 3: Access Caps For Timing Drive Chain Pad Fixing Screws



Courtesy of CHRYSLER GROUP, LLC

17. Remove the plugs (1) with seals.

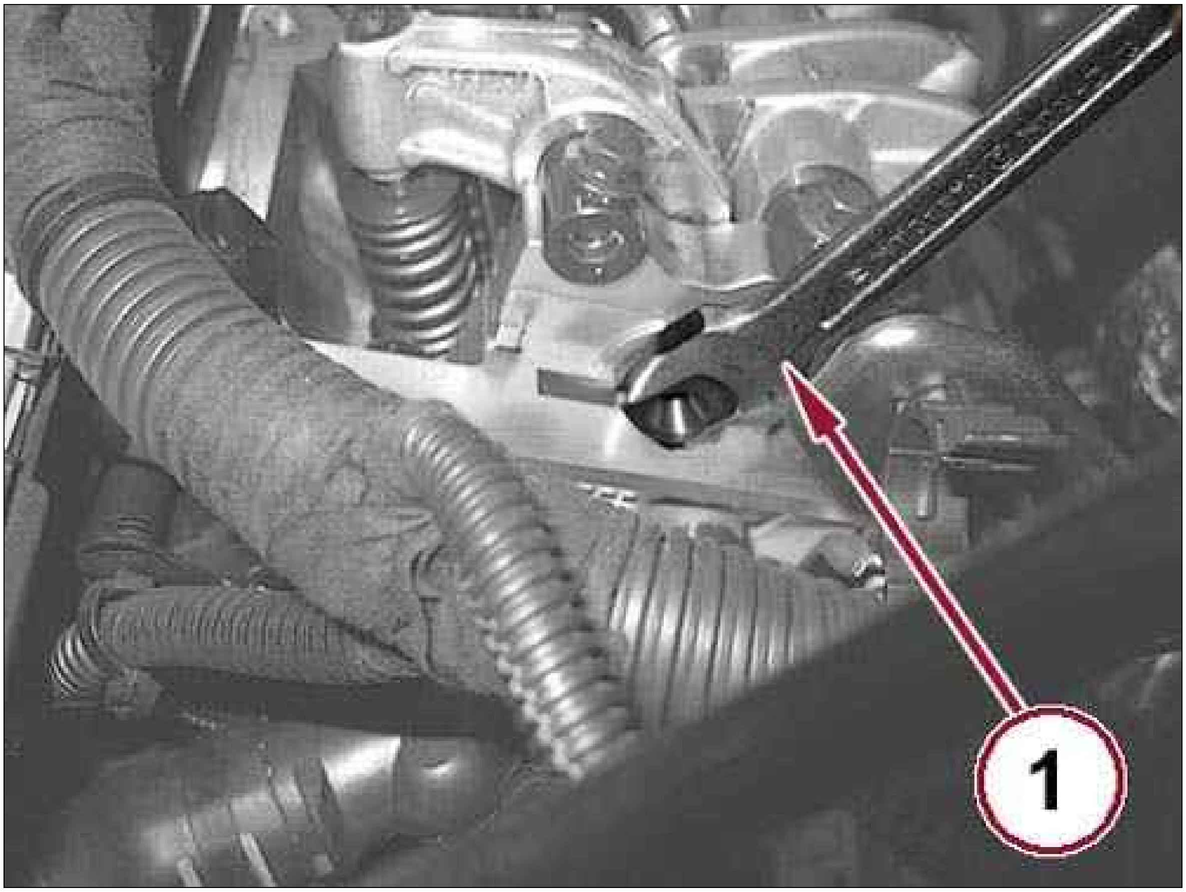
Fig 4: Chain Tensioning Pads Bolts



Courtesy of CHRYSLER GROUP, LLC

18. Remove the bolts (1) for the chain tensioning pads to the cylinder head.

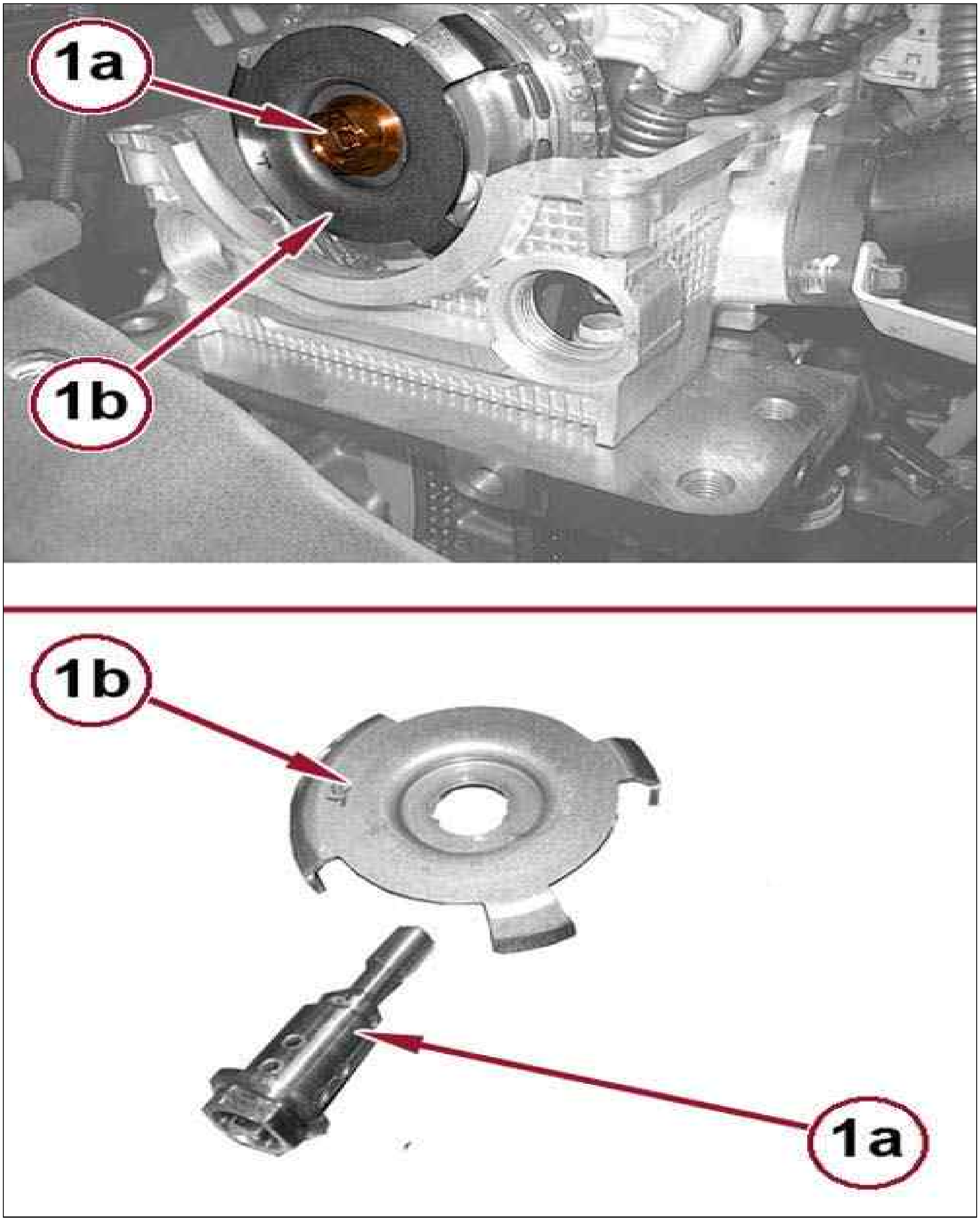
Fig 5: Positioning Wrench On Rear Stem Of Camshaft



Courtesy of CHRYSLER GROUP, LLC

19. Position a suitable wrench (1) on the rear stem of the camshaft.

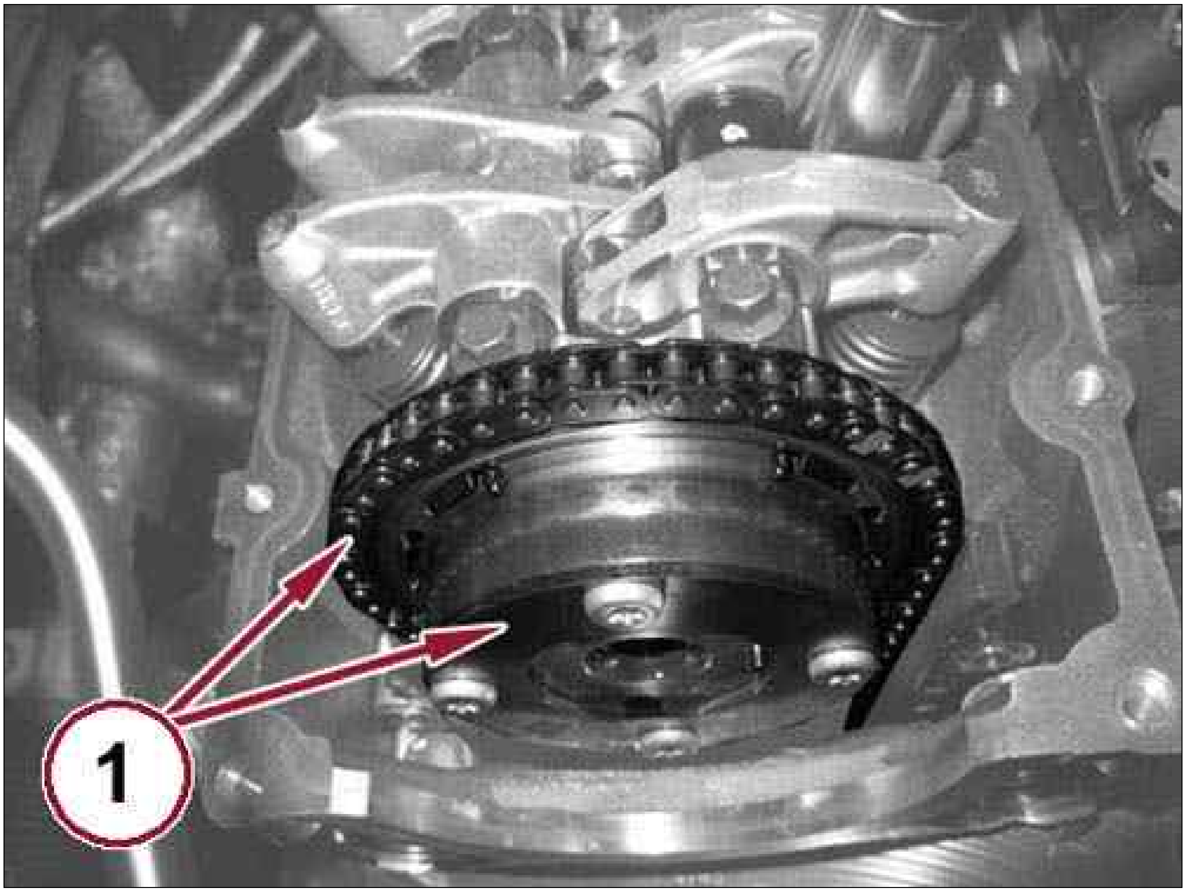
Fig 6: Removing Bolt Fixing Variable Valve Timing System & Toothed Wheel



Courtesy of CHRYSLER GROUP, LLC

20. Apply counter-torque using the wrench previously placed on the rear stem of the camshaft, remove the bolt (1a) fixing the variable valve timing system and the toothed wheel (1b).

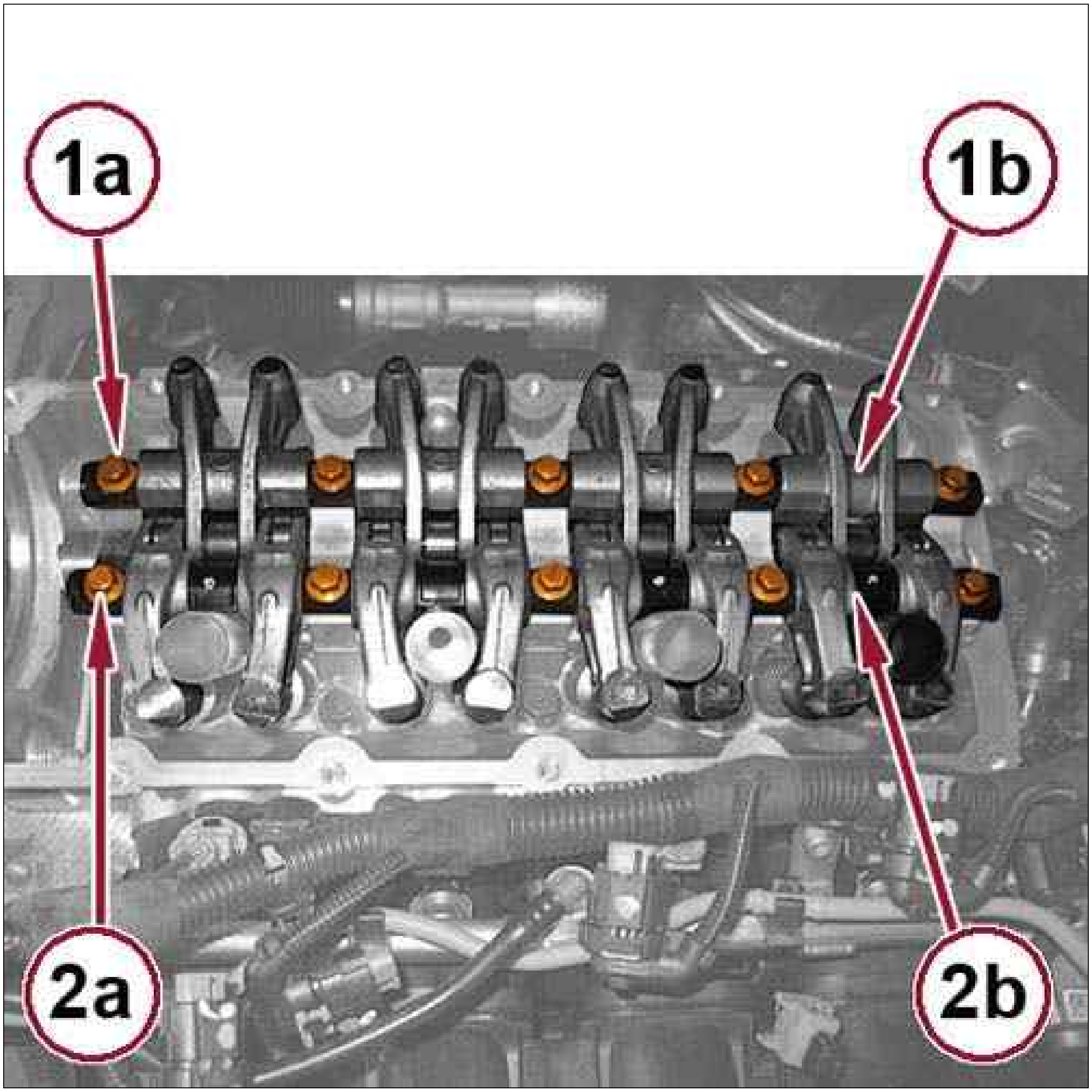
Fig 7: Variable Valve Timing System & Chain



Courtesy of CHRYSLER GROUP, LLC

21. Remove the variable valve timing system from the camshaft with its chain (1).

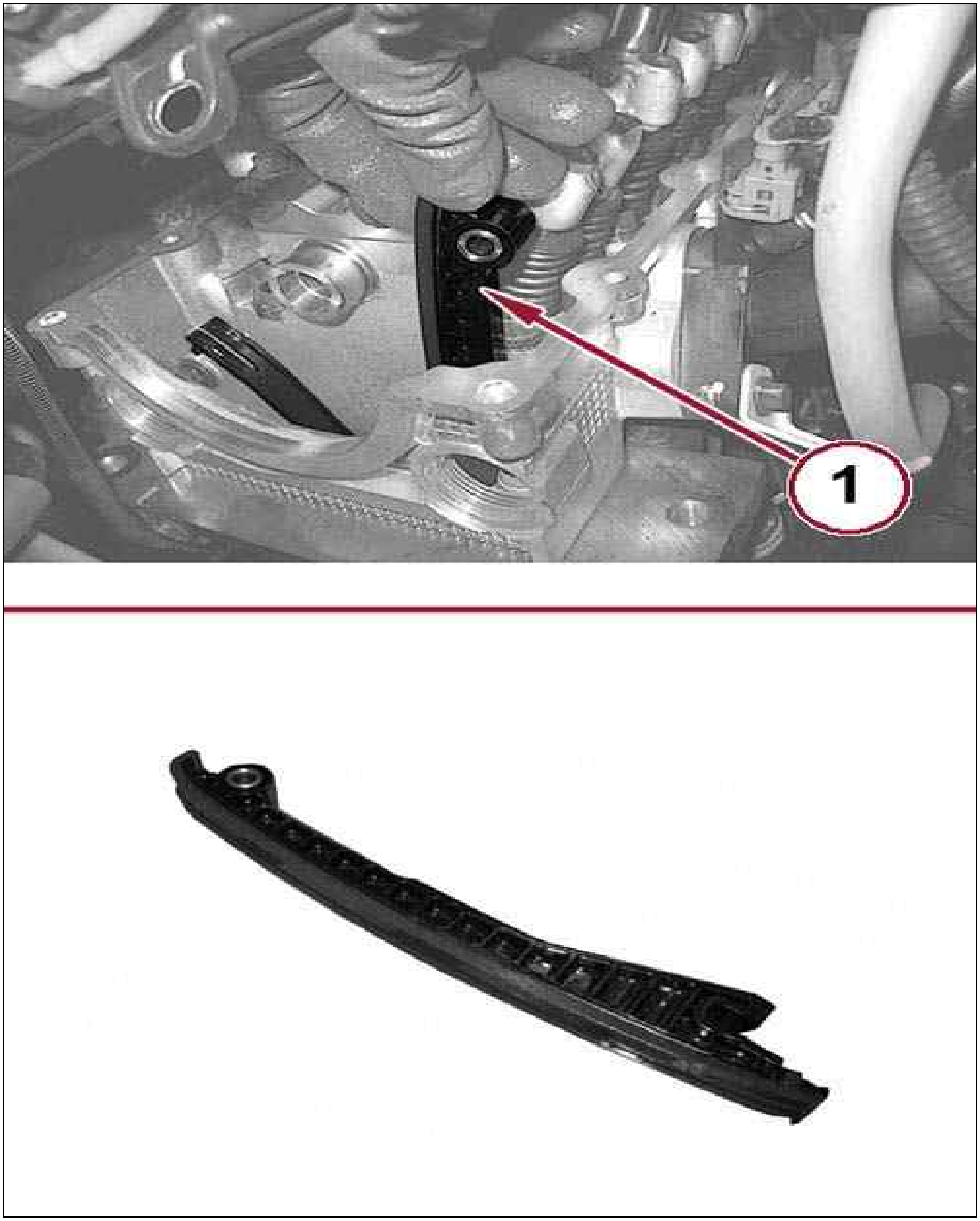
Fig 8: Exhaust Side Rocker Assembly & Bolts



Courtesy of CHRYSLER GROUP, LLC

22. Remove the bolts (1a) and the exhaust side rocker assembly (1b).
23. Remove the bolts (2a) and the intake side rocker assembly (2b).

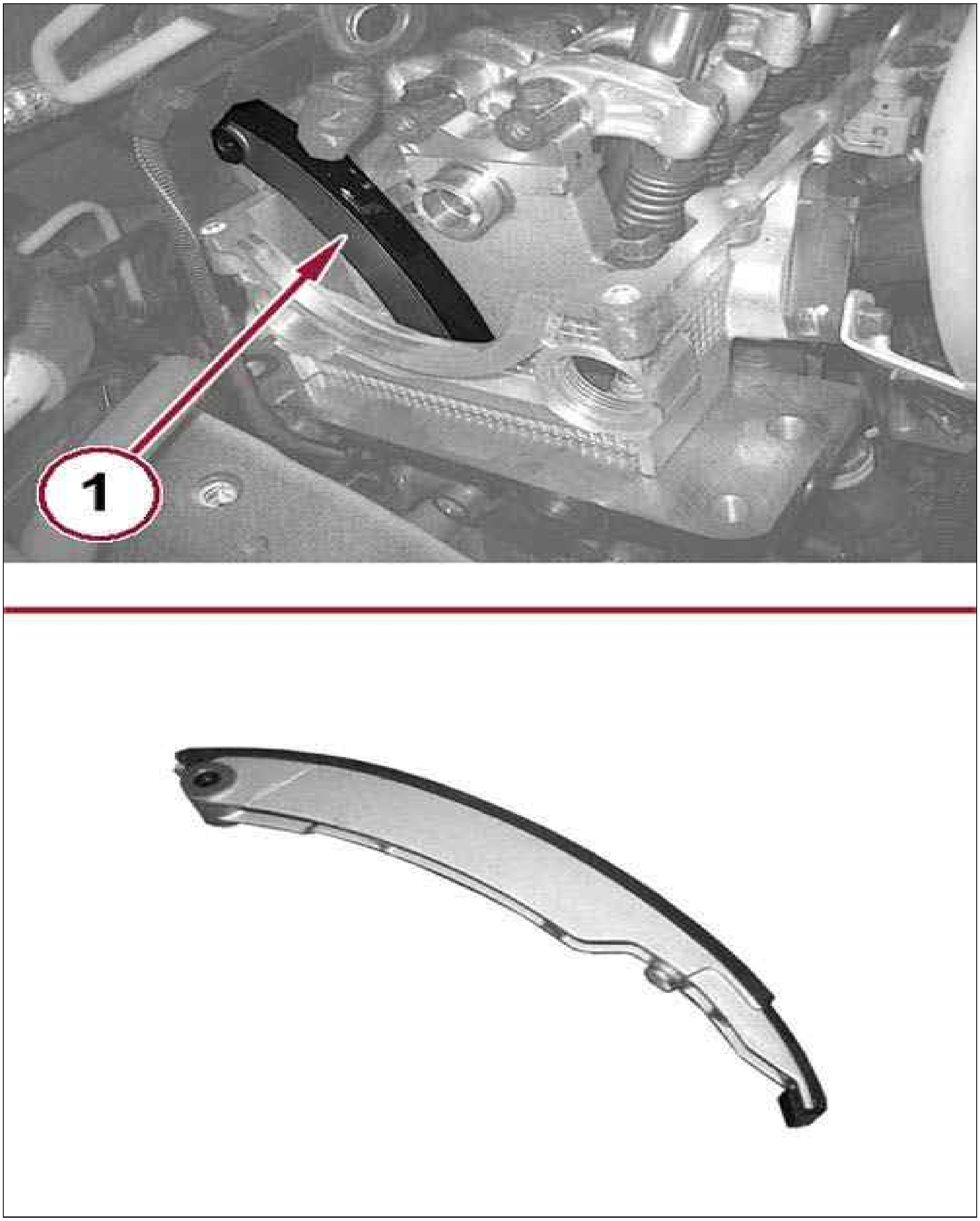
Fig 9: Timing Chain Tensioning Fixed Pad



Courtesy of CHRYSLER GROUP, LLC

24. If necessary, remove the chain tensioning pads proceeding as described below.
25. Remove the timing chain tensioning fixed pad (1).

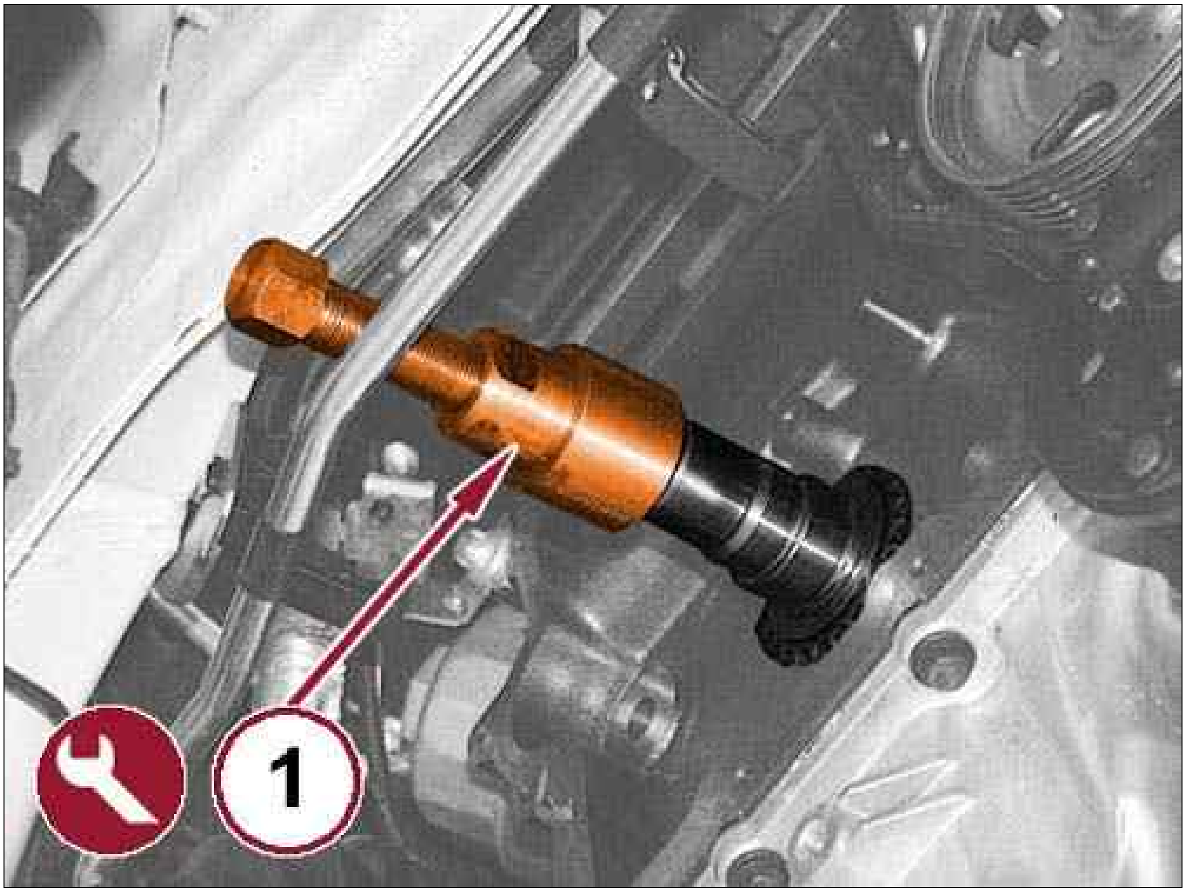
Fig 10: Timing Chain Tensioning Pad



Courtesy of CHRYSLER GROUP, LLC

26. Remove the timing chain tensioning pad (1).

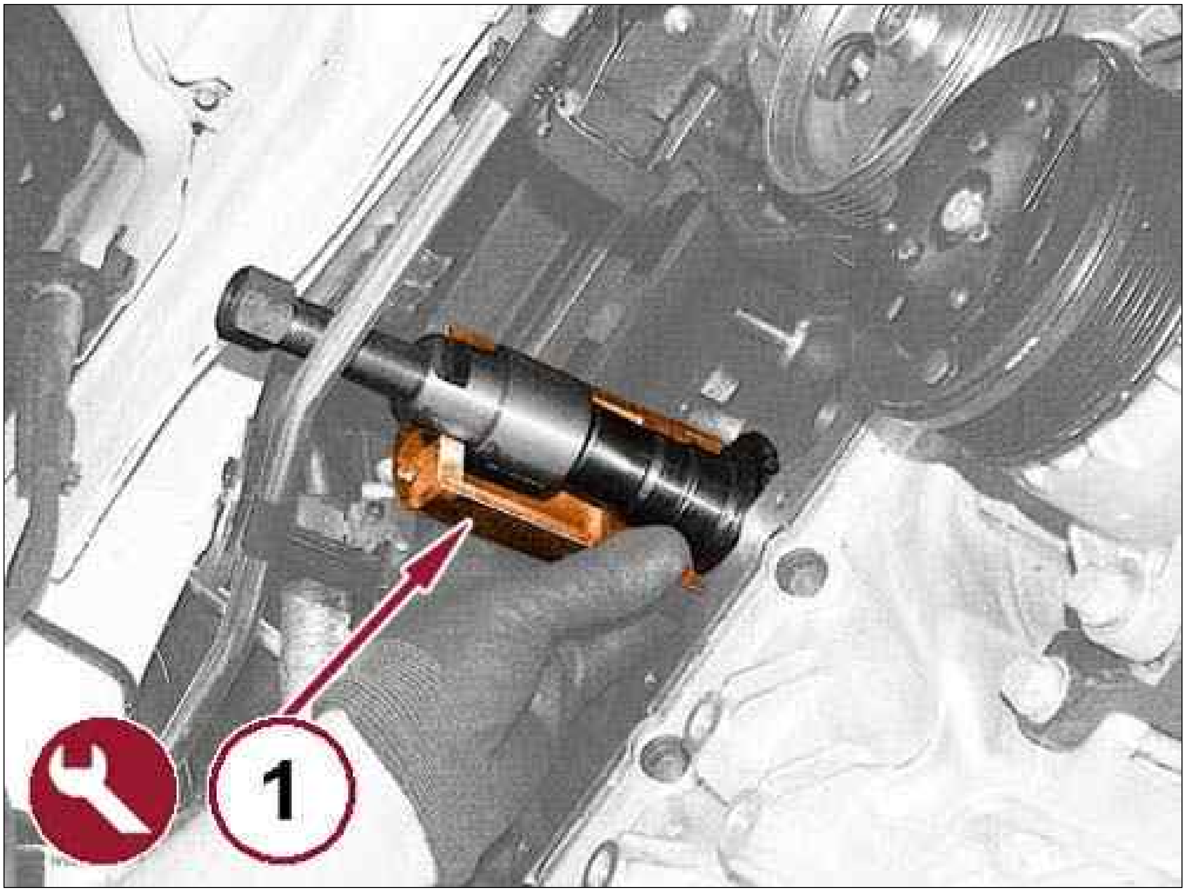
Fig 11: Removing Timing Drive Chain Toothed Drive Pulley Using Special Tool



Courtesy of CHRYSLER GROUP, LLC

27. If necessary, remove the timing drive chain toothed drive pulley, proceeding as described below.
28. Temporarily fit the rigid support and the flexible mounting for the engine support, timing side.
29. Fit the 2000040946 tool (1), following the sequence described below.
30. Fit the centre pin of the equipment.

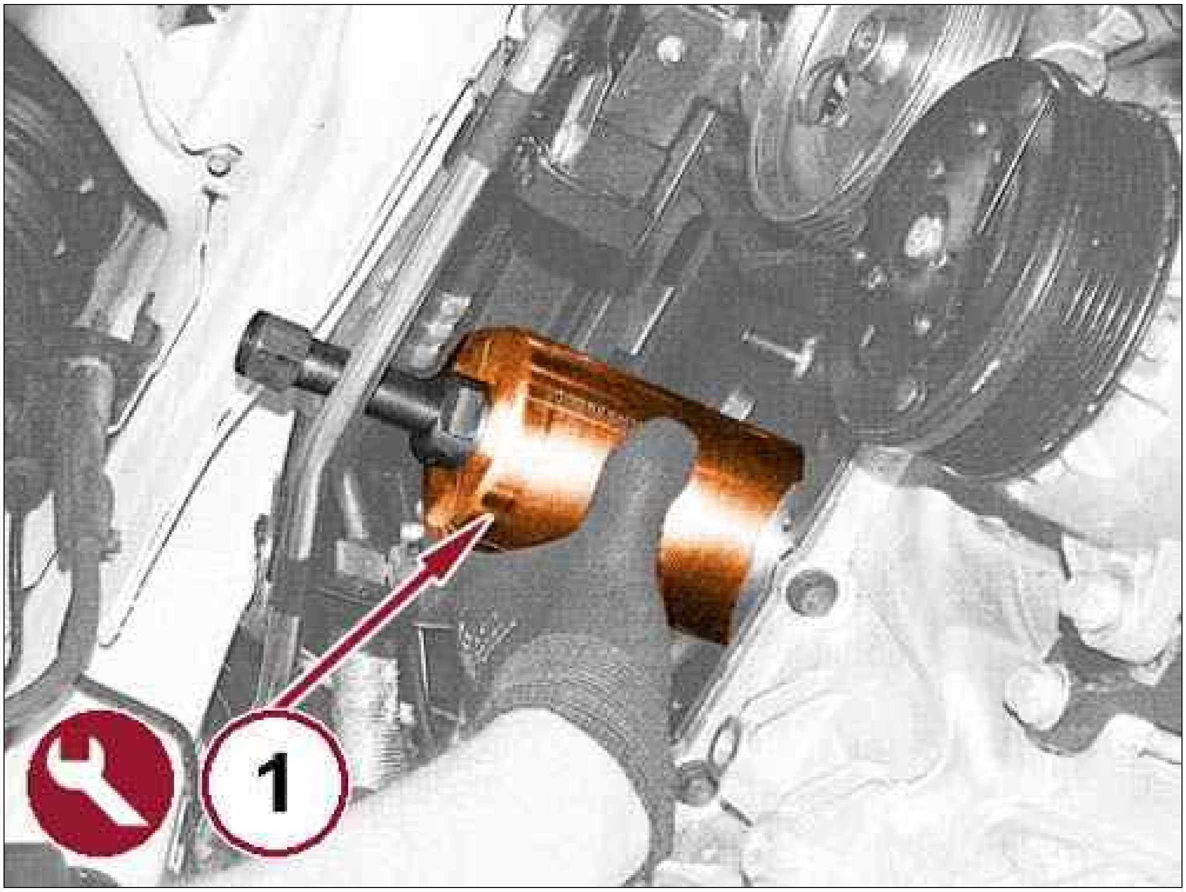
Fig 12: Installing First Half Casing Of Special Tool



Courtesy of CHRYSLER GROUP, LLC

31. Fit the first half-casing of the equipment.

Fig 13: Installing Second Half Casing Of Special Tool



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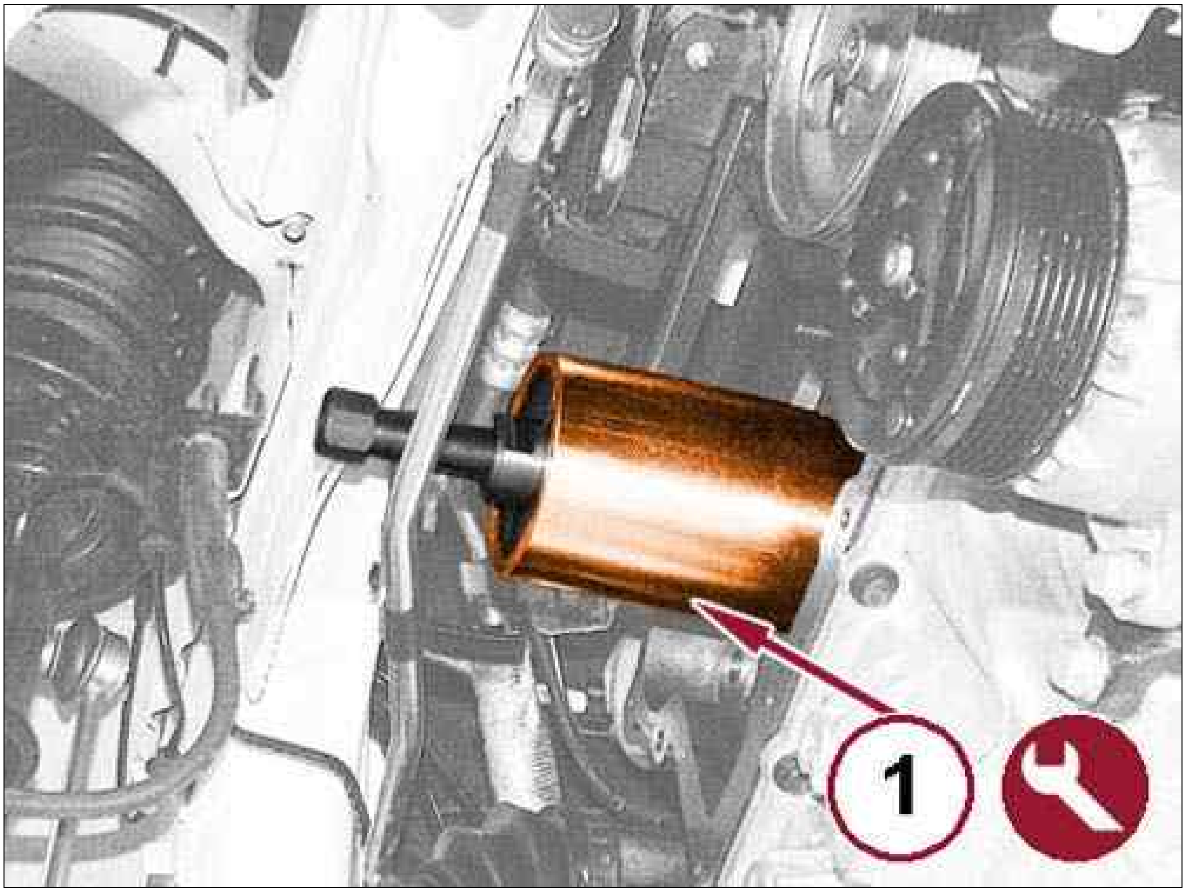
32. Fit the second half-casing of the equipment (1).

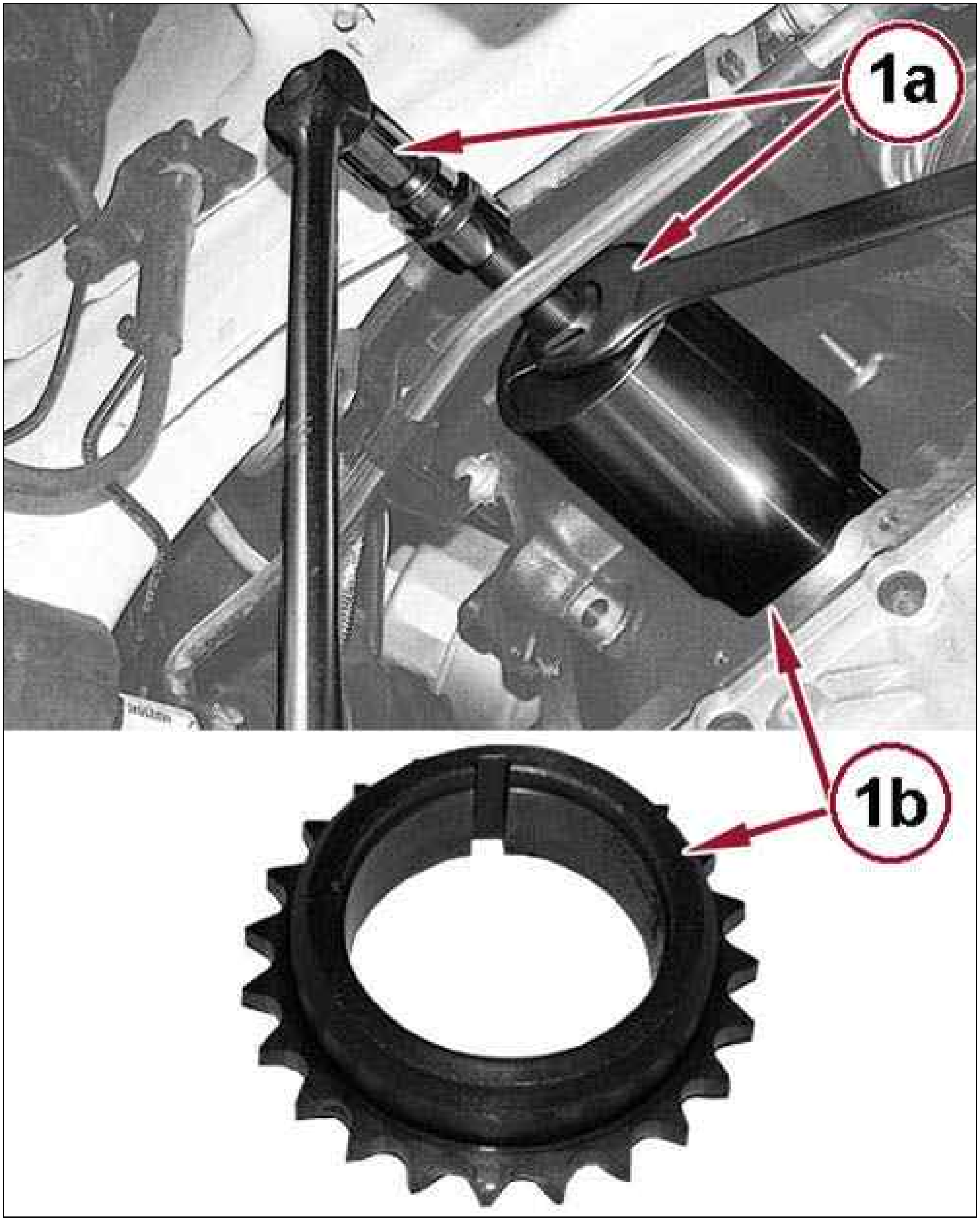
Fig 14: Installing Retaining Cylinder Of Special Tool



Courtesy of CHRYSLER GROUP, LLC

33. Fit the retaining cylinder (1).

Fig 15: Flywheel Locking Tool & Toothed Drive Pulley



Courtesy of CHRYSLER GROUP, LLC

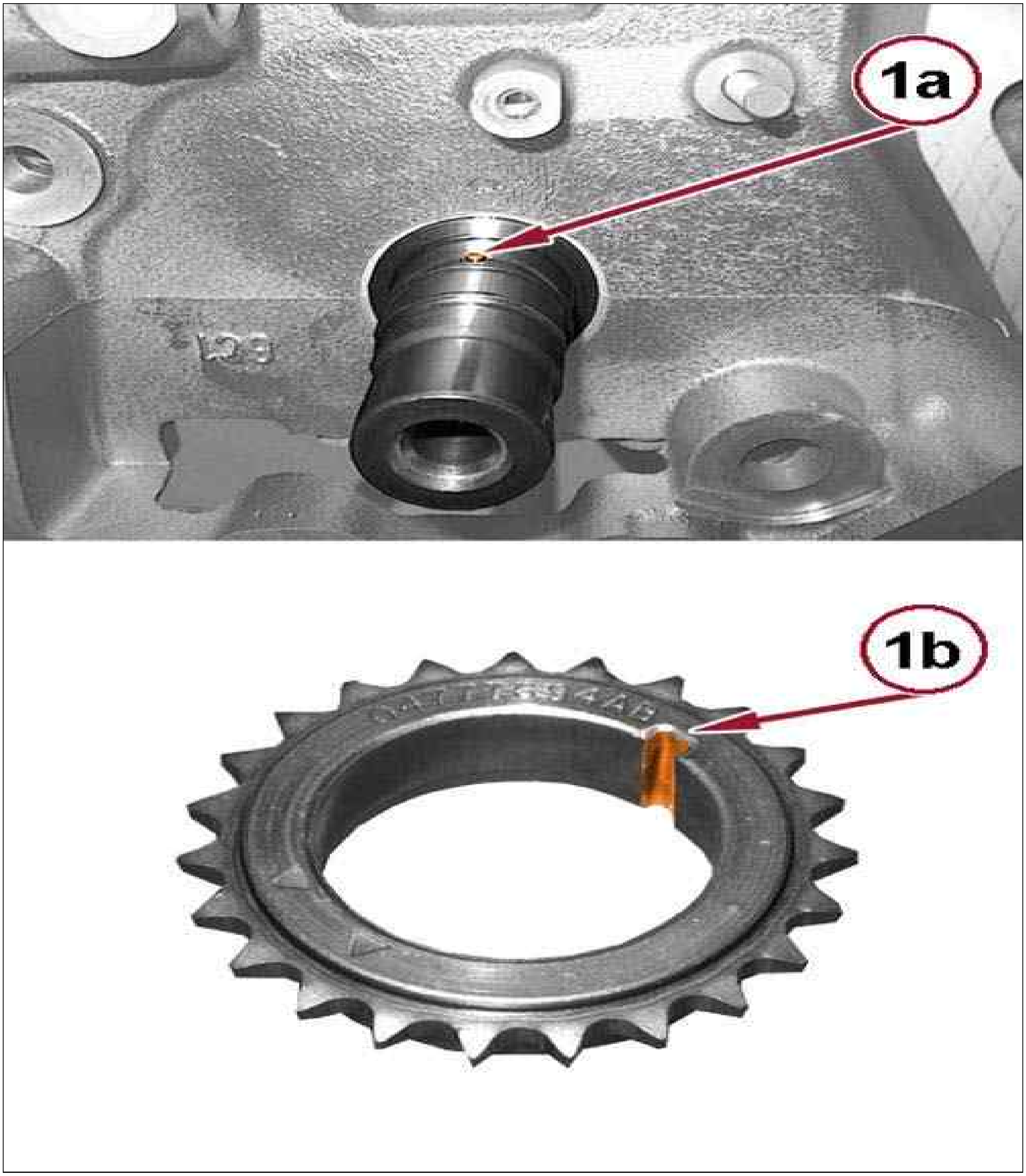
34. Use the wrenches (1a) to remove the toothed drive pulley (1b).

35. Remove the flywheel locking tool 2000041300 used previously to remove the service pulley.

36. Remove the spark plugs.

VALVE TIMING > CHAIN AND SPROCKETS, TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

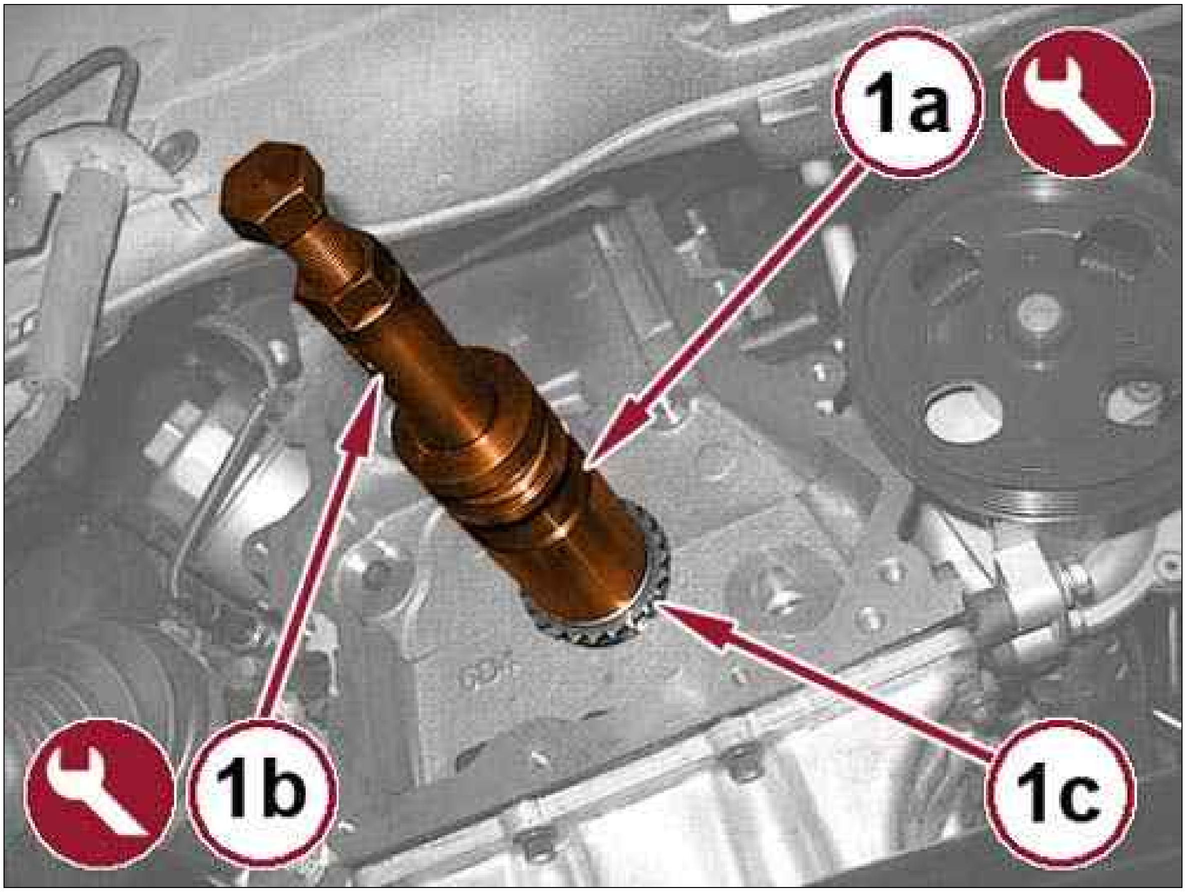
Fig 1: Aligning Crankshaft Pin In Groove



Courtesy of CHRYSLER GROUP, LLC

1. If it was previously removed, place the timing chain drive gear back in its housing, making sure the pin (1a) of the crankshaft is aligned with the groove (1b).

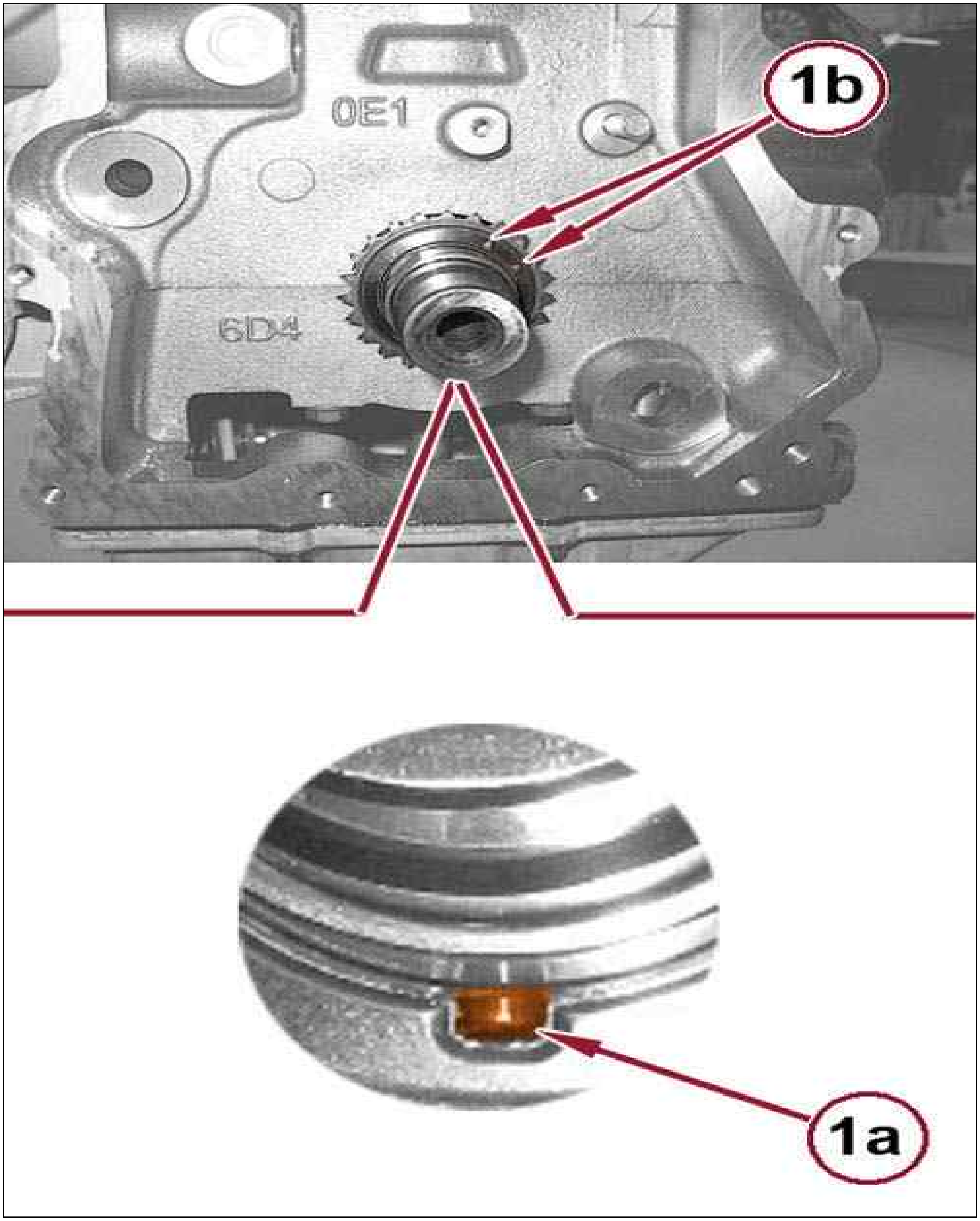
Fig 2: Installing Toothed Drive Pulley Using Special Tools



Courtesy of CHRYSLER GROUP, LLC

2. Use the 2000040943 tools (1a) and 2000040941 (1b) to install the toothed drive pulley (1c).

Fig 3: Rotating Crankshaft To Position Pin At Bottom To Ensure Two Triangles Printed On Gear Correspond As Shown



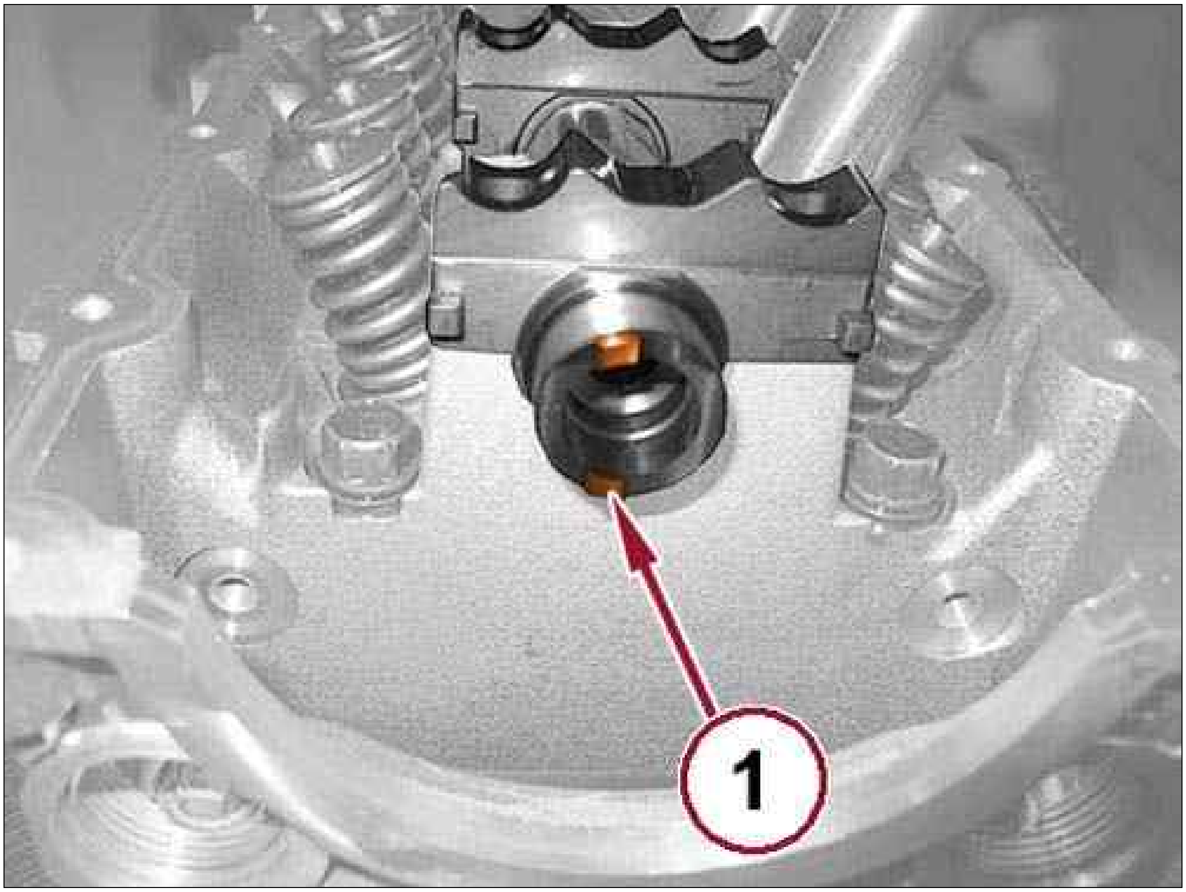
Courtesy of CHRYSLER GROUP, LLC

3. Rotate the crankshaft to position the pin (1a) at the bottom, so that the two triangles (1b) printed on the gear correspond to the position shown in the figure.
4. Install the timing chain tensioner pads.
5. Install the timing chain tensioner pads bolts and tighten the to the proper specification. Refer to

TORQUE SPECIFICATIONS .

6. Using **NEW** seals, install the plugs and tighten to the proper specification. Refer to TORQUE SPECIFICATIONS .

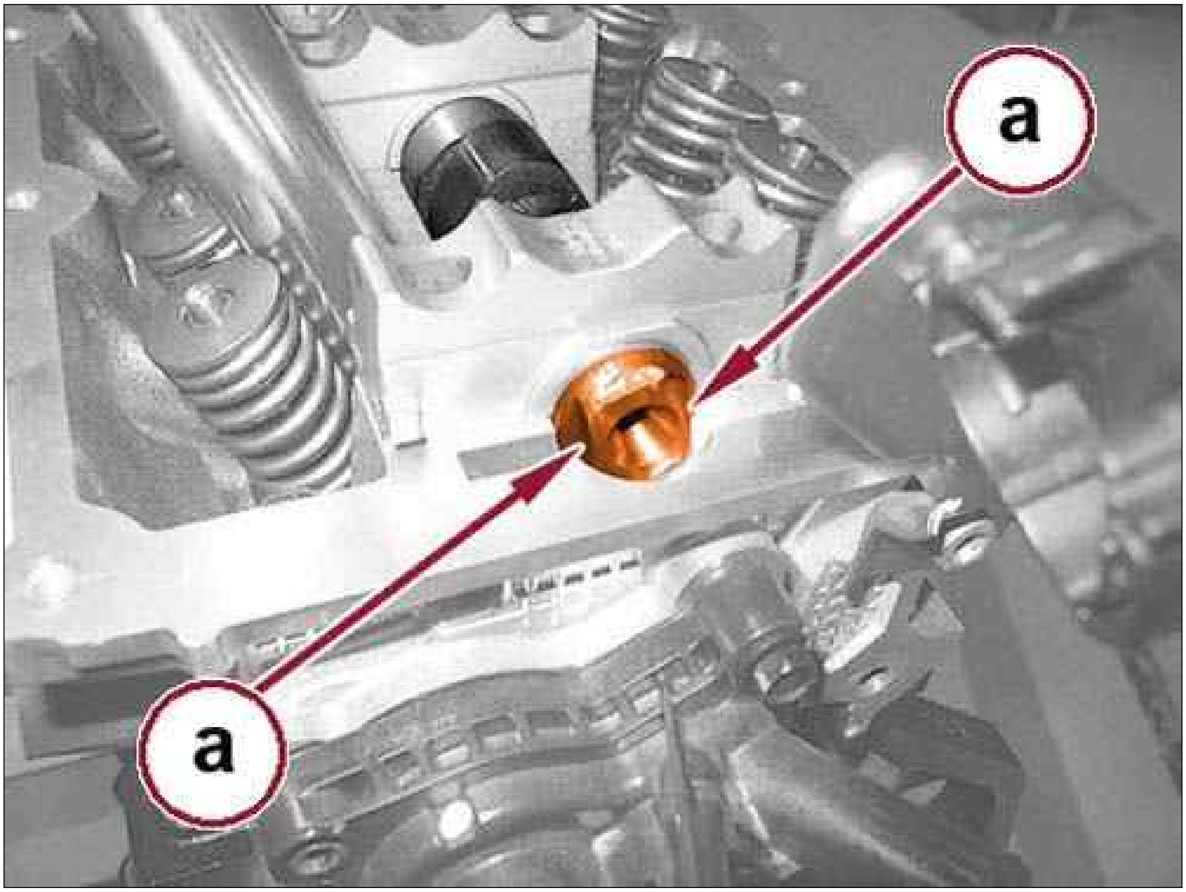
Fig 4: Ensuring Two Pins Of Camshaft Front Stem Are Vertical And Face Exhaust Side



Courtesy of CHRYSLER GROUP, LLC

7. Check that the two pins (1) of the camshaft front stem are vertical and face the exhaust side, as shown in illustration.

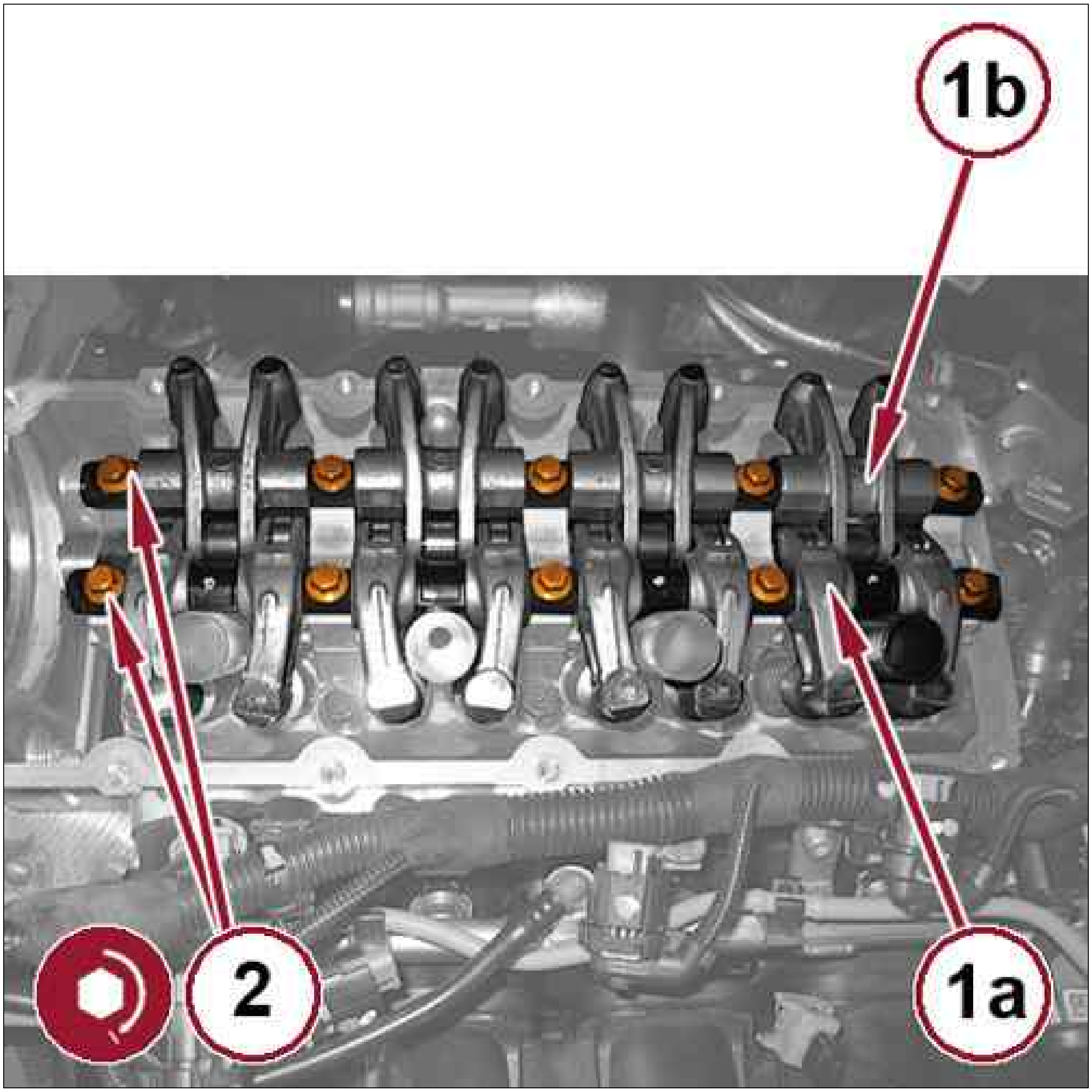
Fig 5: Ensure Two Bevels Of Rear Stem Are In Position Shown



Courtesy of CHRYSLER GROUP, LLC

8. Position the camshaft as described, then make sure that the two bevels (a) of the rear stem are in the position shown in figure, for an easier fitting of a suitable wrench to use as counter-torque in the following tightening of the variable valve timing system.

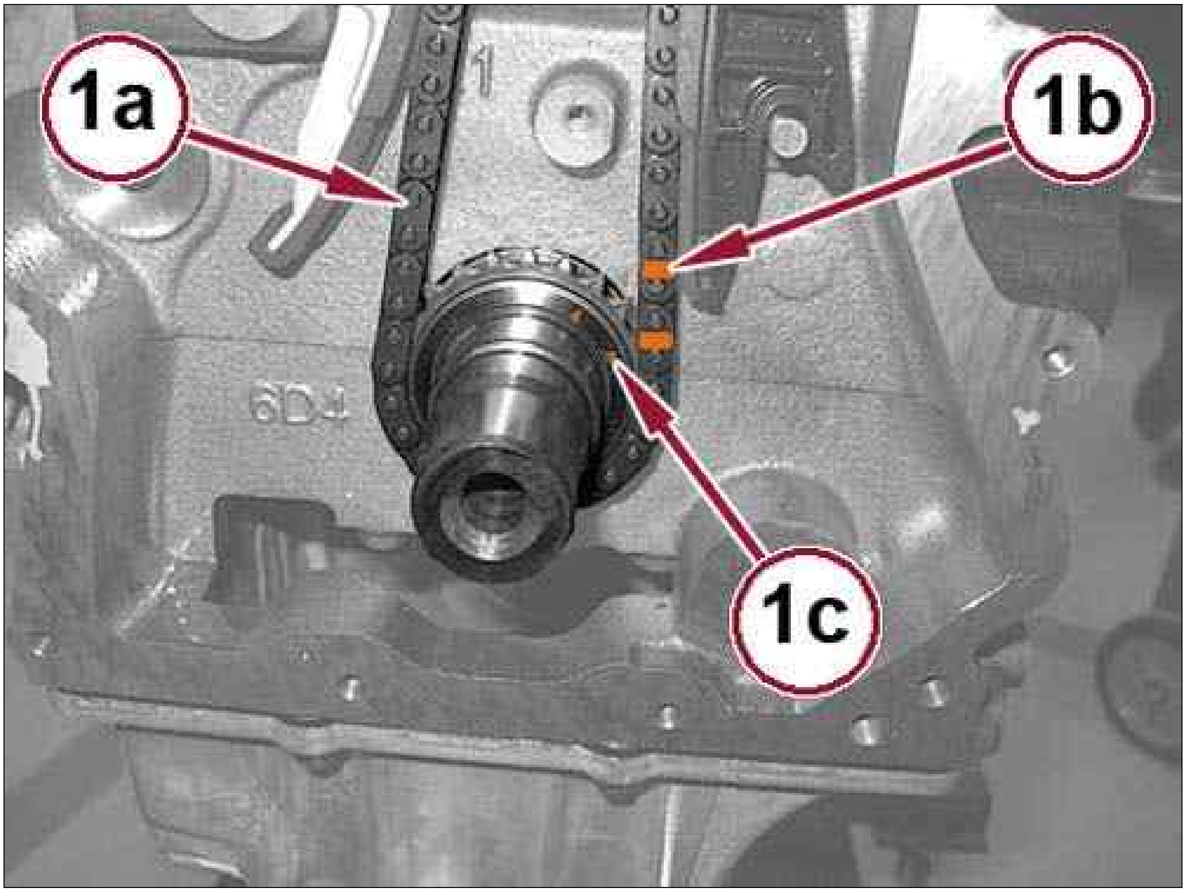
Fig 6: Installing Rocker Arm Assembly & Bolts



Courtesy of CHRYSLER GROUP, LLC

9. Install the rocker arm assembly in their housings on the intake side (1a), exhaust side (1b) and tighten the bolts (2) finger tight.
10. Check that each hydraulic tappet matches with the relevant valve correctly.
11. Tighten the rocker arm assembly bolts (2) to the proper specification. Refer to TORQUE SPECIFICATIONS .

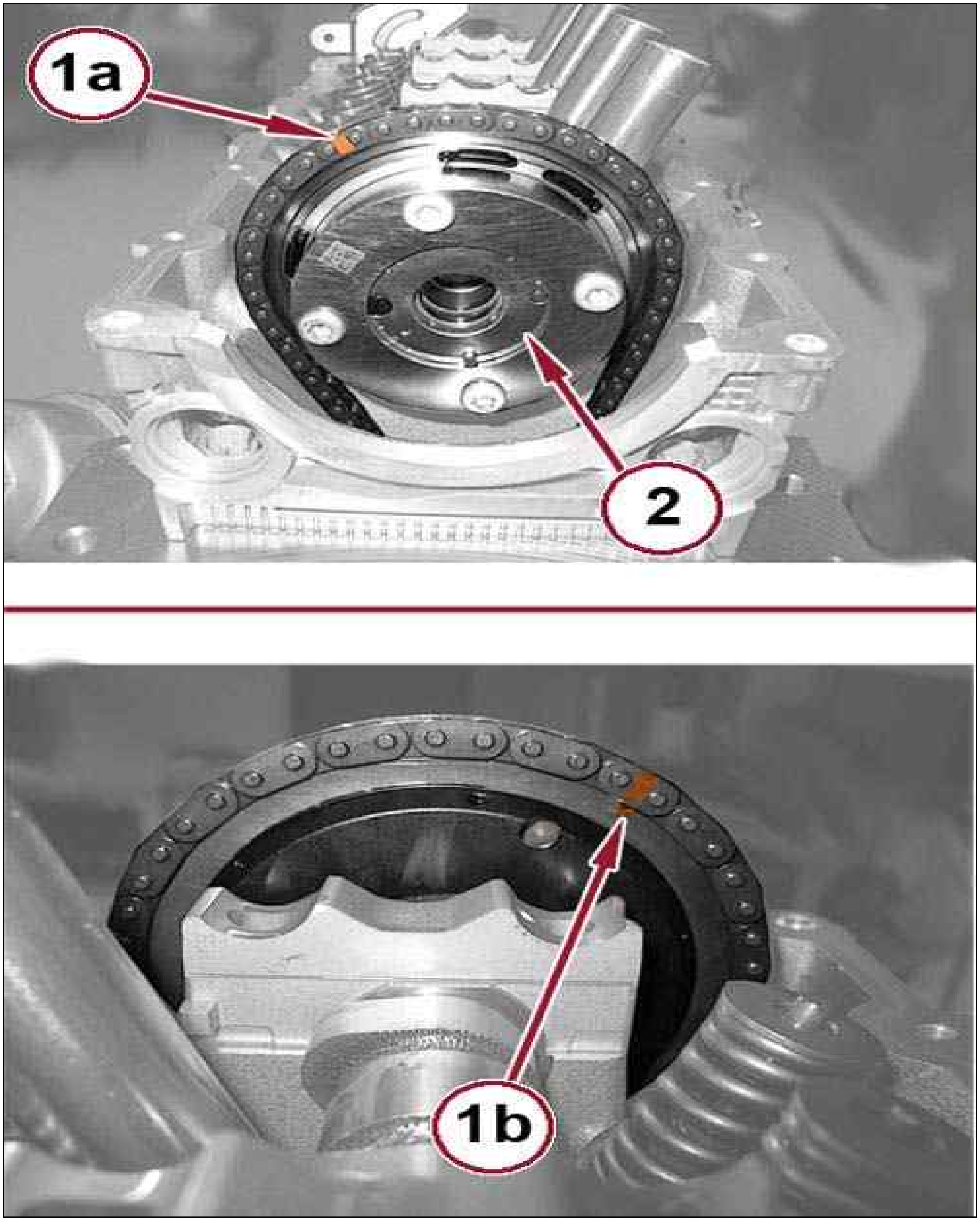
Fig 7: Placing Timing Drive Chain In Position To Ensure Yellow References Correspond To Two Triangles



Courtesy of CHRYSLER GROUP, LLC

12. Place the timing drive chain (1a) in position, engaging the teeth of the drive gear, so that the two yellow references (1b) correspond to the two triangles (1c).

Fig 8: Engaging Upper Branch Of Timing Drive Chain In Variable Valve Timing System Teeth To Ensure Yellow Reference Corresponds To Reference Printed At Back Of Variable Valve Timing System

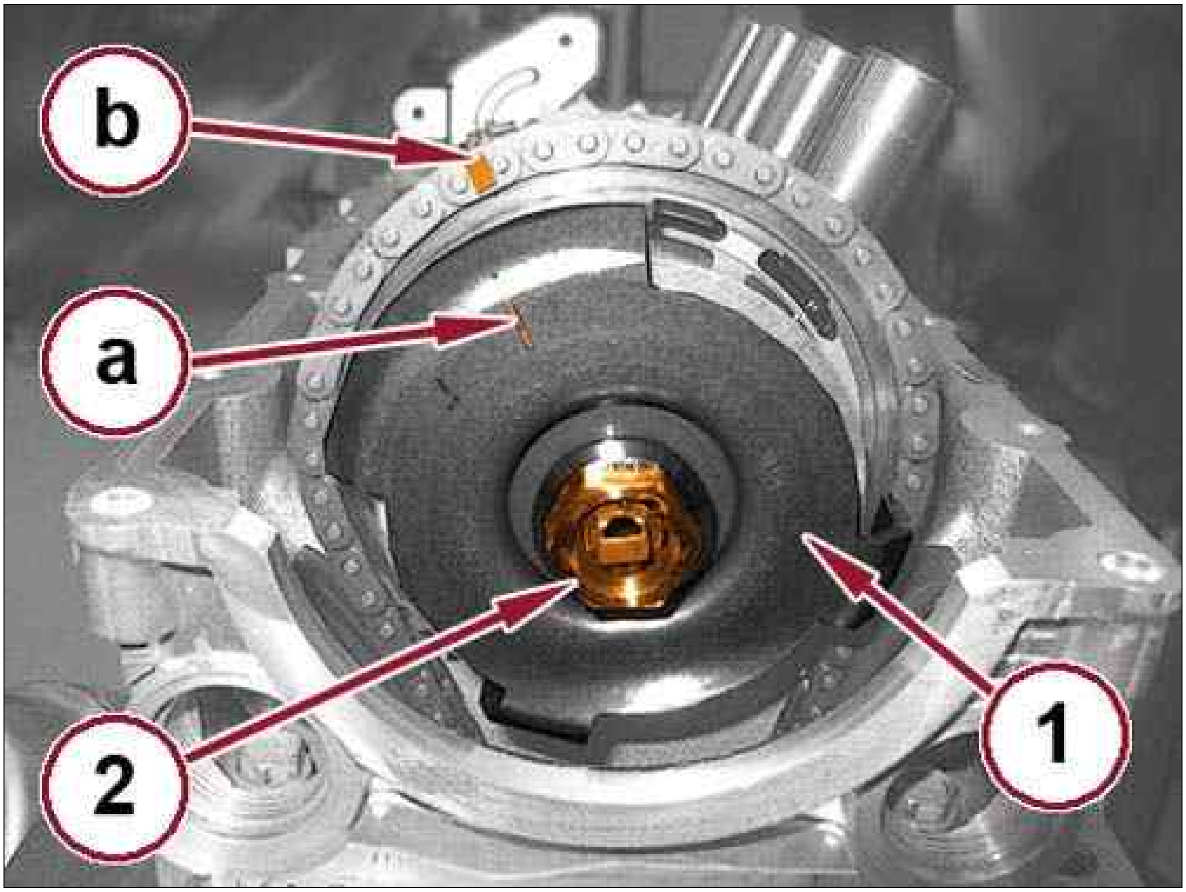


Courtesy of CHRYSLER GROUP, LLC

13. Engage the upper branch of the timing drive chain in the variable valve timing system teeth, so that the yellow reference (1a) corresponds to the reference (1b) printed at the back of the variable valve timing system (2).
14. Place the variable valve timing system (2) with chain in its housing, engaging the two pins of

the camshaft stem.

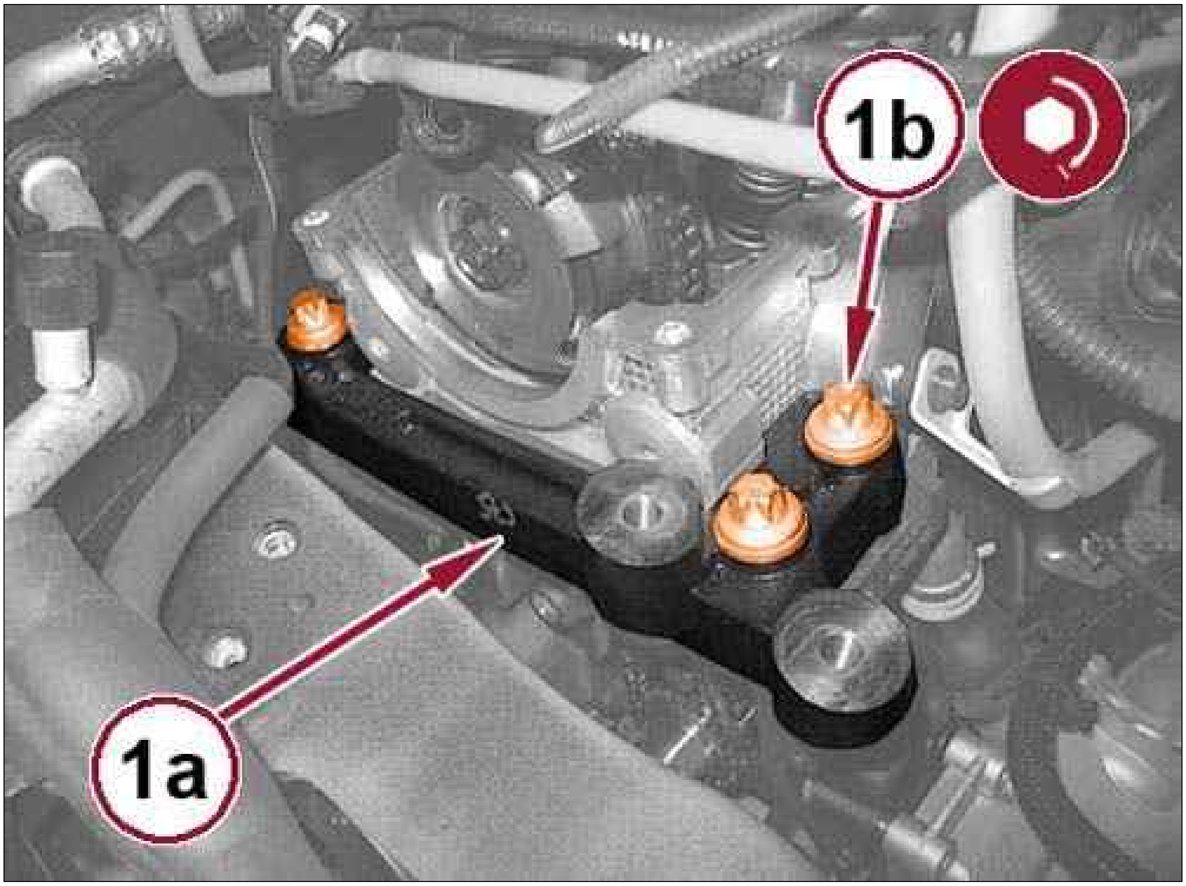
Fig 9: Ensuring Notch Cut Into Toothed Wheel Corresponds To Yellow Notch Of Timing Drive Chain



Courtesy of CHRYSLER GROUP, LLC

15. Place the toothed wheel in position, engaging the variable valve timing system pin.
16. Check that the notch (a) cut into the toothed wheel corresponds to the yellow notch (b) of the timing drive chain.
17. Install the variable valve timing system fixing screw, without tightening it.
18. Applying counter-torque with a suitable wrench on the rear stem of the camshaft, tighten the variable valve timing system fixing bolt (2) to the proper specification. Refer to TORQUE SPECIFICATIONS .

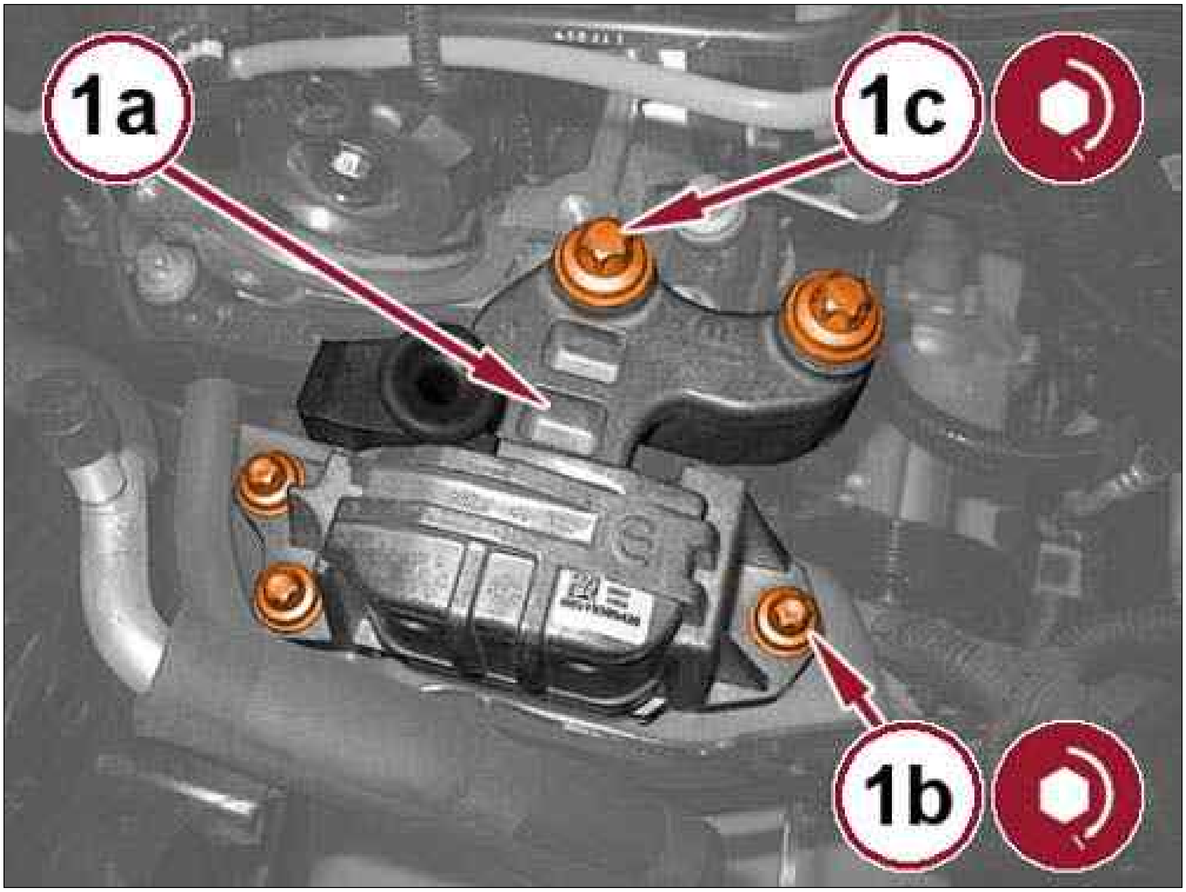
Fig 10: Engine Mount Bracket & Bolts



Courtesy of CHRYSLER GROUP, LLC

19. Install the engine mount bracket (1a) and tighten the bolts (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 11: Right Side Engine Mount & Bolts



Courtesy of CHRYSLER GROUP, LLC

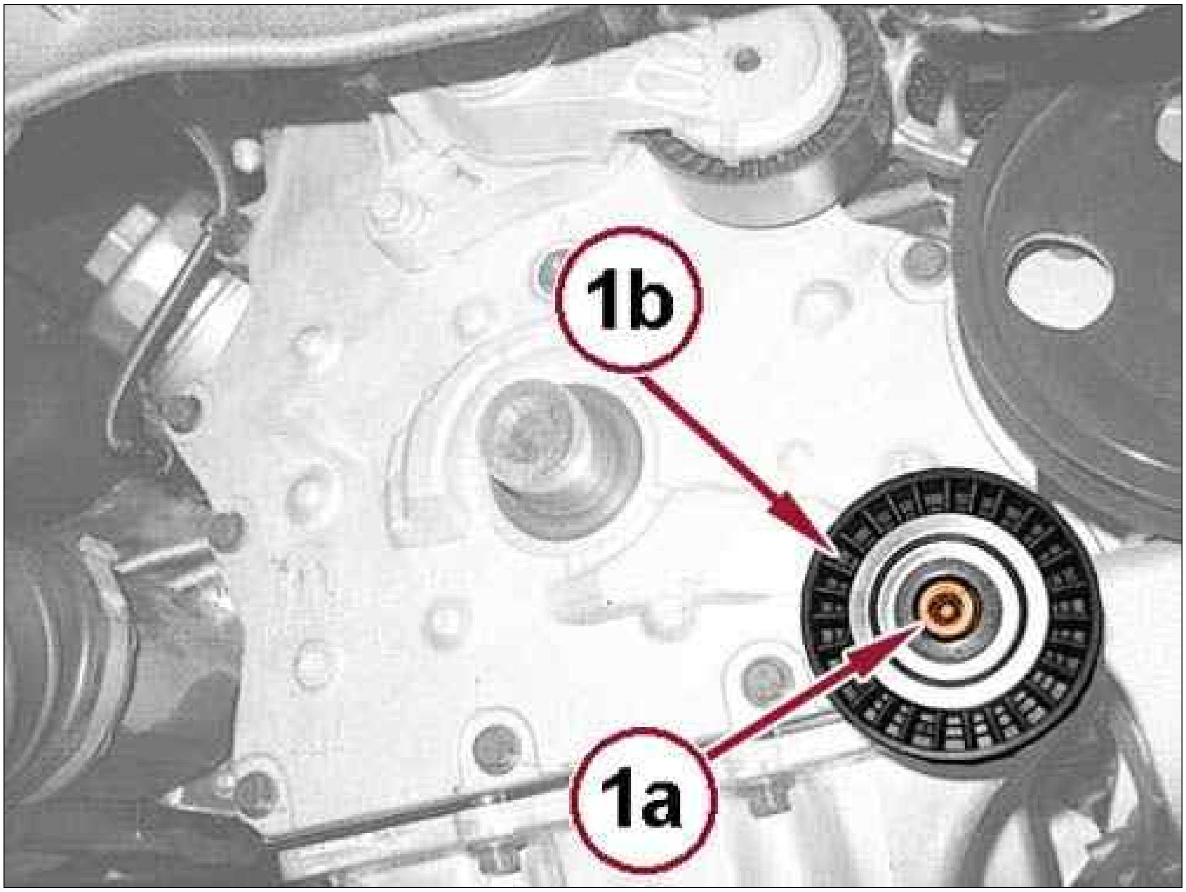
20. Install the right side engine mount (1a) and tighten the bolts (1b) and (1c) to the proper specification. Refer to TORQUE SPECIFICATIONS .
21. Remove the floor jack from supporting the engine.
22. Install the clean air hose. Refer to HOSE, CLEAN AIR, REMOVAL AND INSTALLATION .
23. Install the air cleaner body. Refer to BODY, AIR CLEANER, REMOVAL AND INSTALLATION .
24. Install the engine timing tensioner. Refer to TENSIONER, ENGINE TIMING, REMOVAL AND INSTALLATION .
25. Install the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
26. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
27. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
28. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
29. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
30. Evacuate and charge the A/C system with refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .

31. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
32. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
33. Install the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
34. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .

VALVE TIMING > COVER(S), ENGINE TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
2. Remove the wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
3. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
4. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
5. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
6. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
7. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .

Fig 1: Idler Pulley & Bolt



Courtesy of CHRYSLER GROUP, LLC

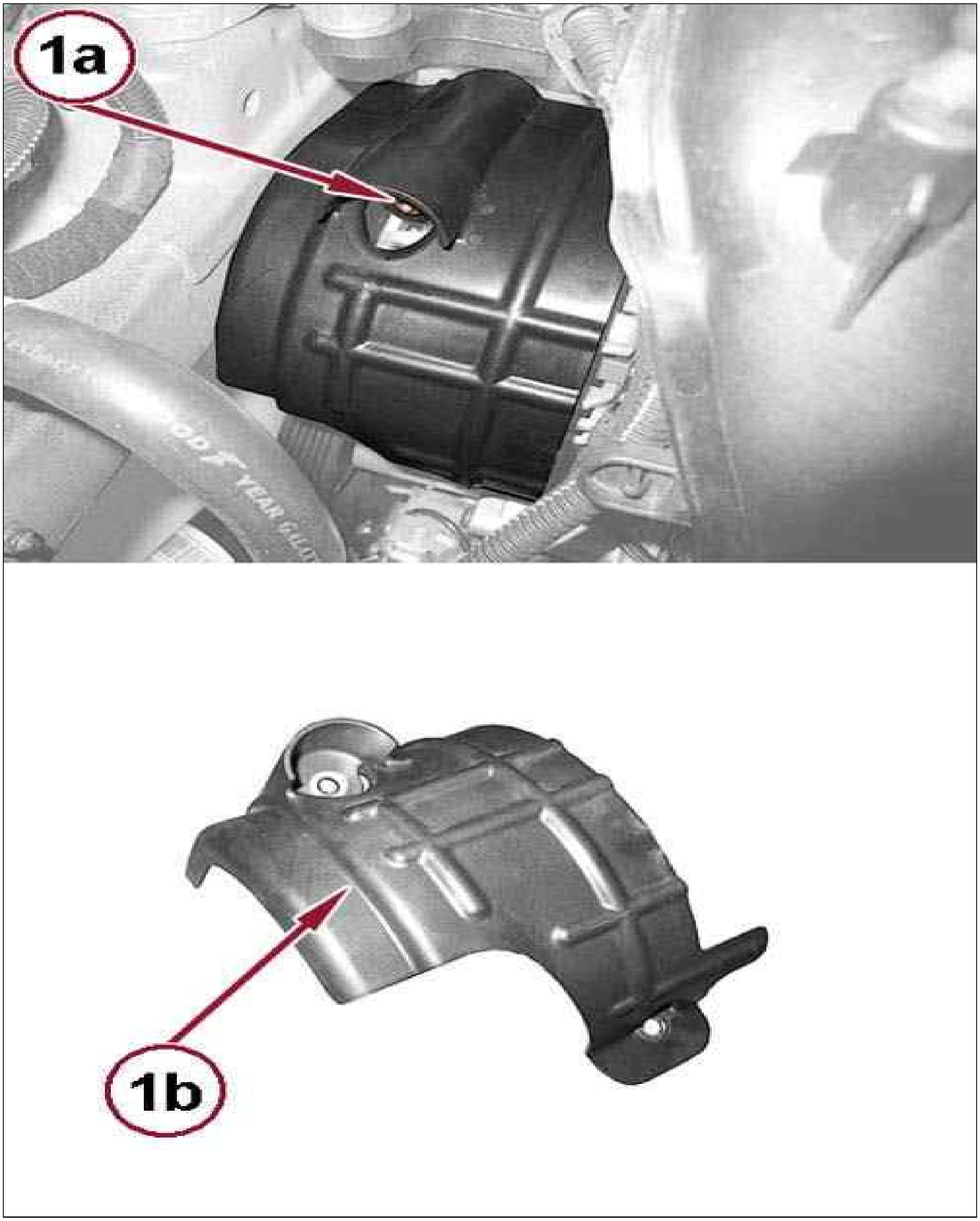
8. Remove the bolt (1a) and the idler pulley (1b).

Fig 2: Belt Tensioner & Bolts

Courtesy of CHRYSLER GROUP, LLC

9. Remove the bolts (1a) and the belt tensioner (1b).

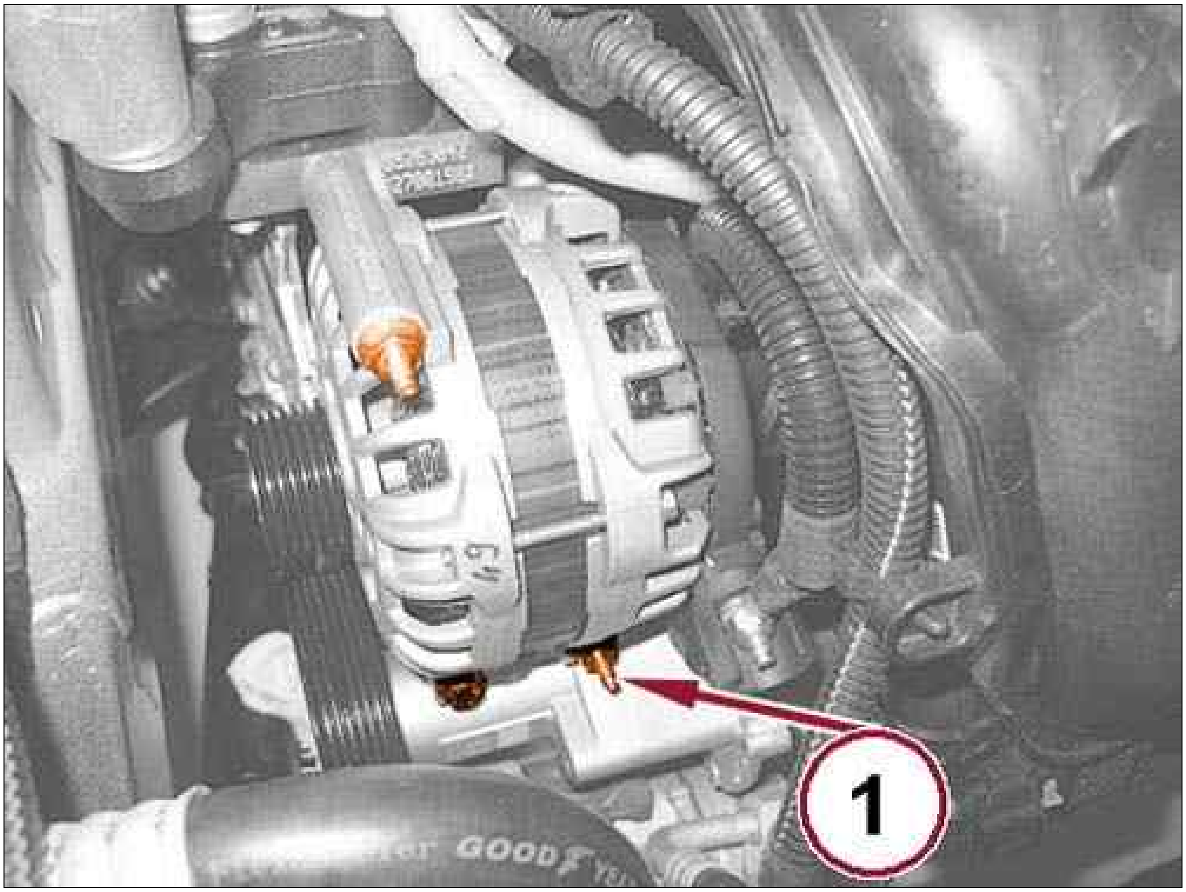
Fig 3: Generator Shield & Nuts



Courtesy of CHRYSLER GROUP, LLC

10. Remove the nuts (1a) and the generator shield (1b).

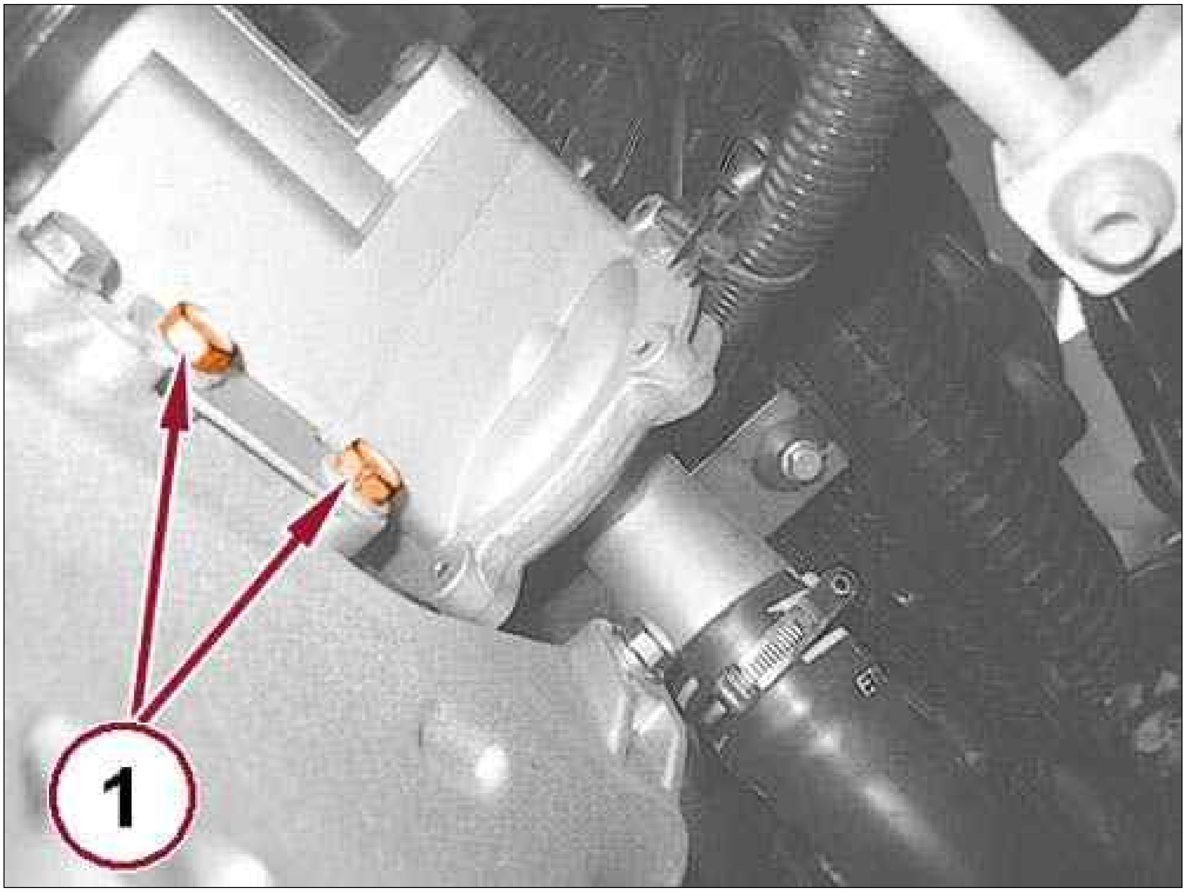
Fig 4: Generator & Bolts



Courtesy of CHRYSLER GROUP, LLC

11. Loosen the bolts (1) securing the generator.

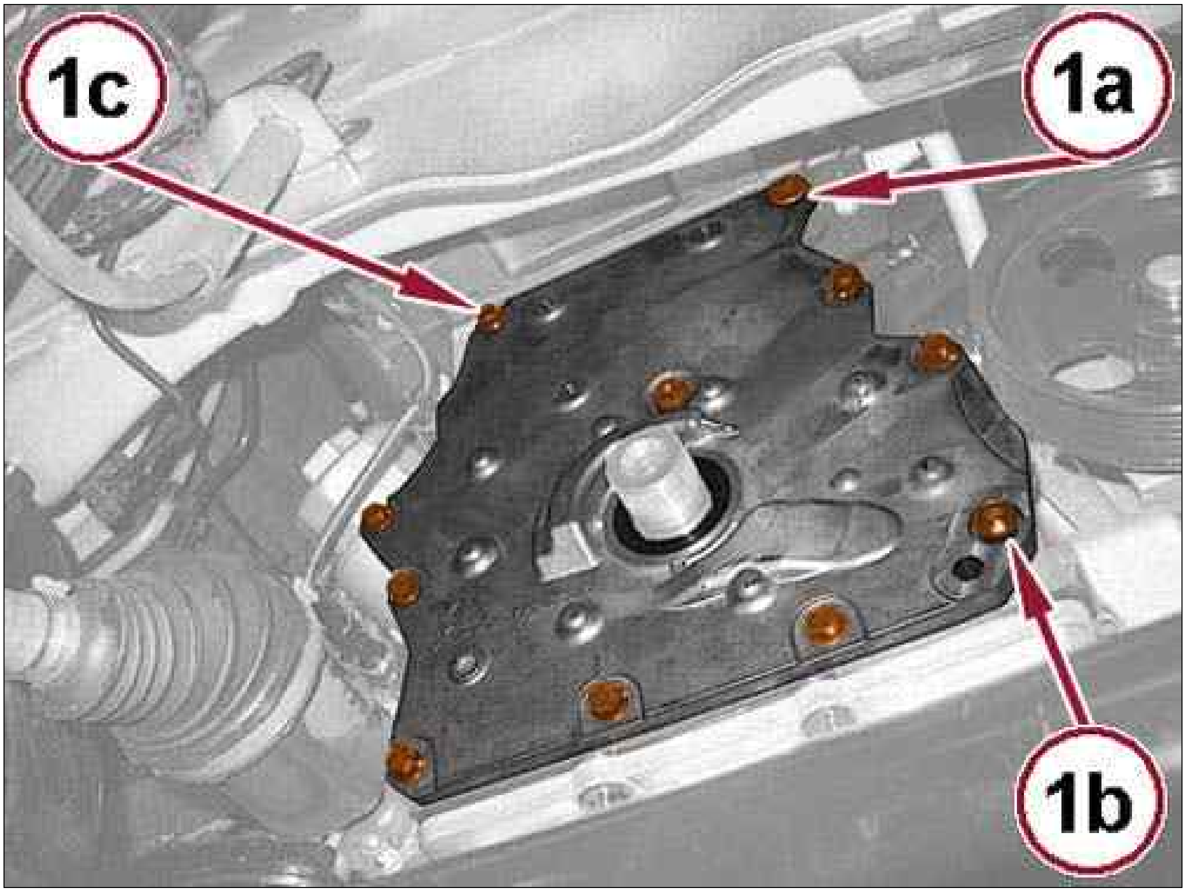
Fig 5: Water Pump Lower Bolts



Courtesy of CHRYSLER GROUP, LLC

12. Loosen the lower bolts securing the water pump.

Fig 6: Timing Cover, Torx Bolts & Bolts

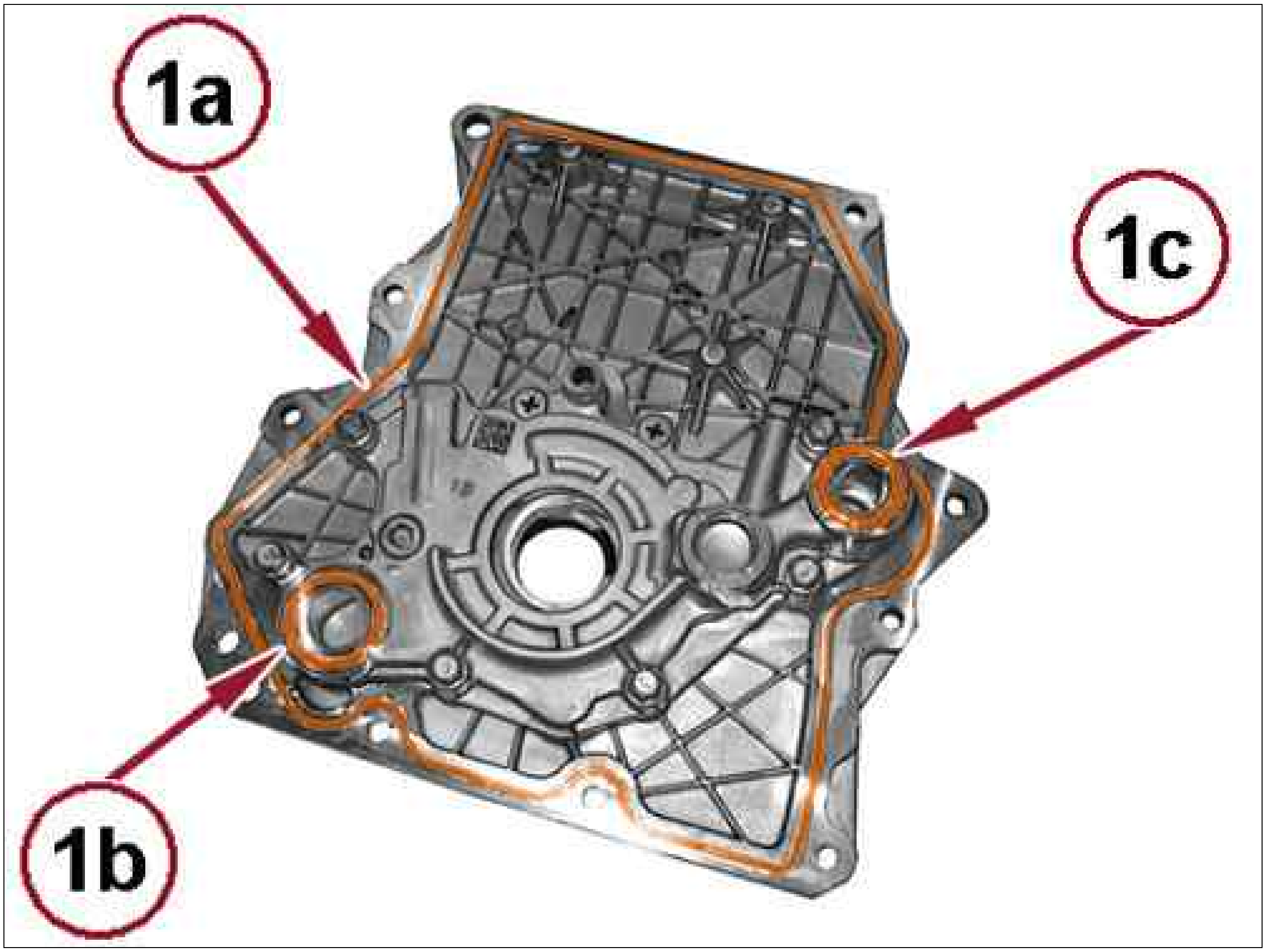


Courtesy of CHRYSLER GROUP, LLC

13. Remove the Torx bolts (1a), (1b) and the remaining bolts (1c) securing the timing cover.
14. Separate the alternator and the water pump to the engine block to remove the timing cover, with oil pump.
15. Remove the residues of sealant, the oil seal and the gaskets of the timing cover.

VALVE TIMING > COVER(S), ENGINE TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

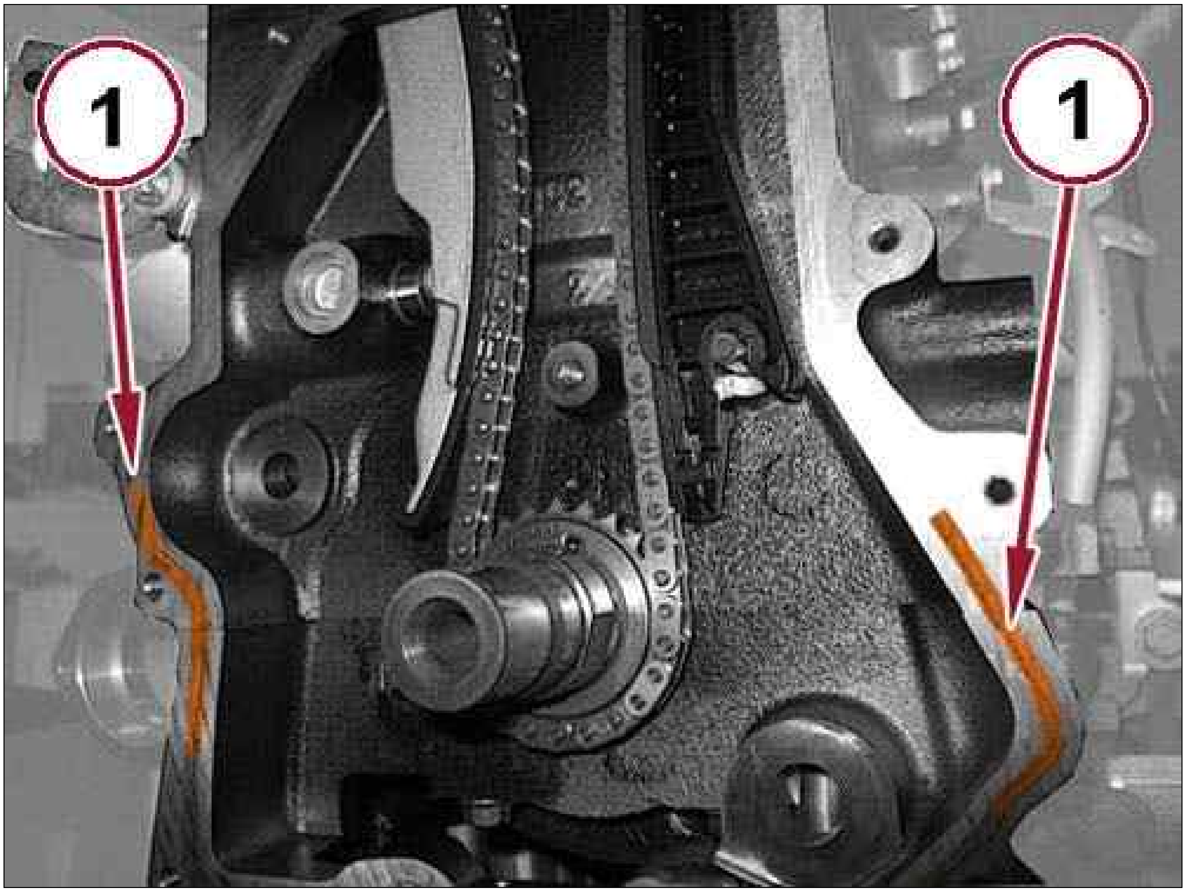
Fig 1: Timing Cover & Gaskets



Courtesy of CHRYSLER GROUP, LLC

1. Install the **NEW** gaskets (1a), (1b) and (1c) on the timing cover.

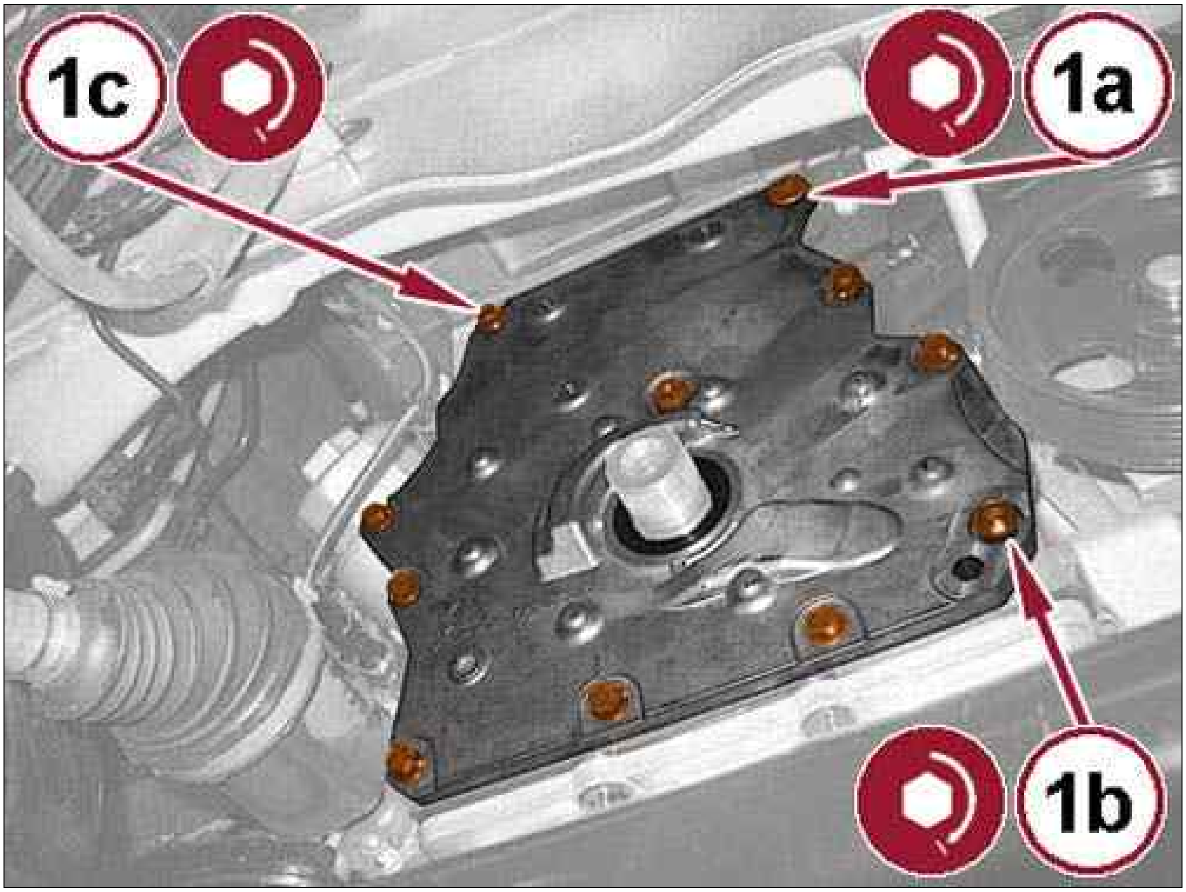
Fig 2: Applying A Bead Of Sealant In Specified Areas



Courtesy of CHRYSLER GROUP, LLC

2. Apply a bead of sealant (1) in the areas shown in the figure.

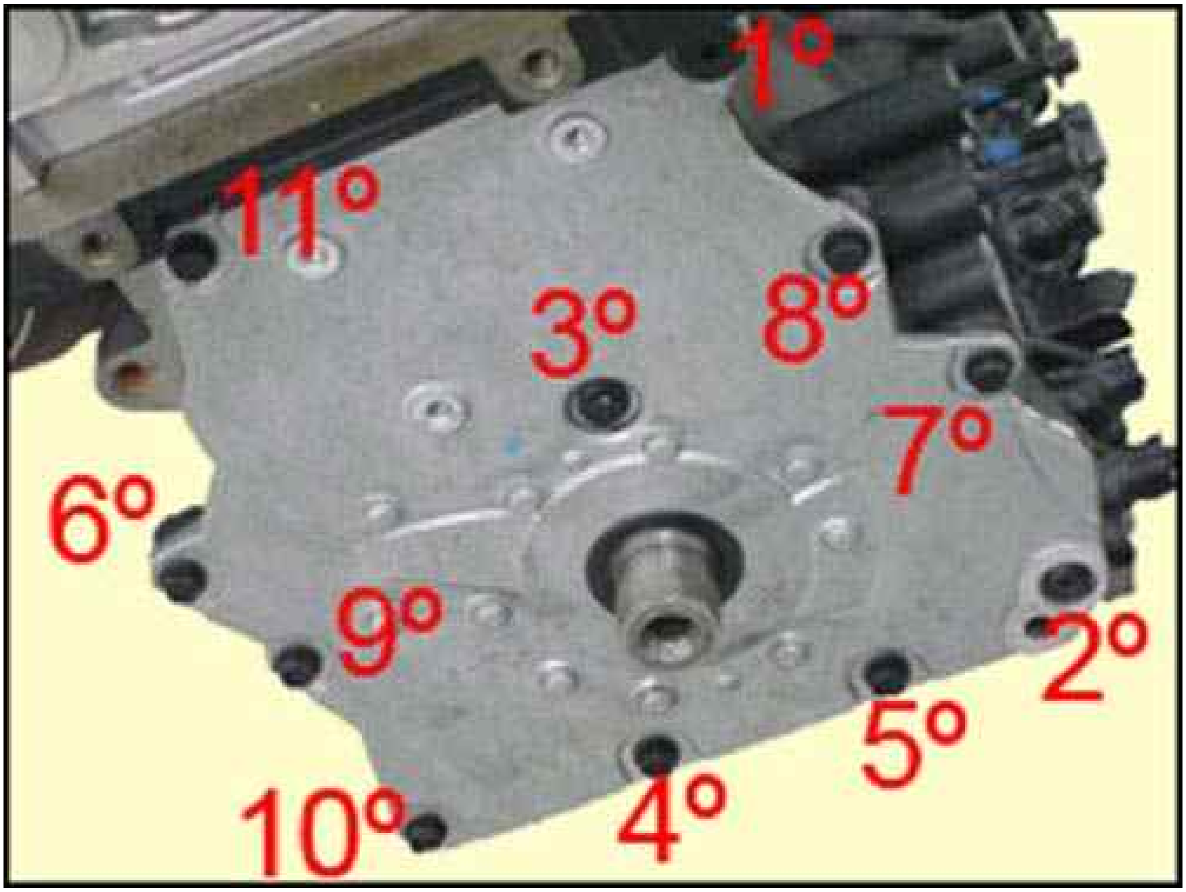
Fig 3: Timing Cover & Bolts



Courtesy of CHRYSLER GROUP, LLC

3. Install the timing cover and tighten the bolts (1a), (1b) and (1c) finger tight.

Fig 4: Timing Cover Bolt Tightening Sequence



Courtesy of CHRYSLER GROUP, LLC

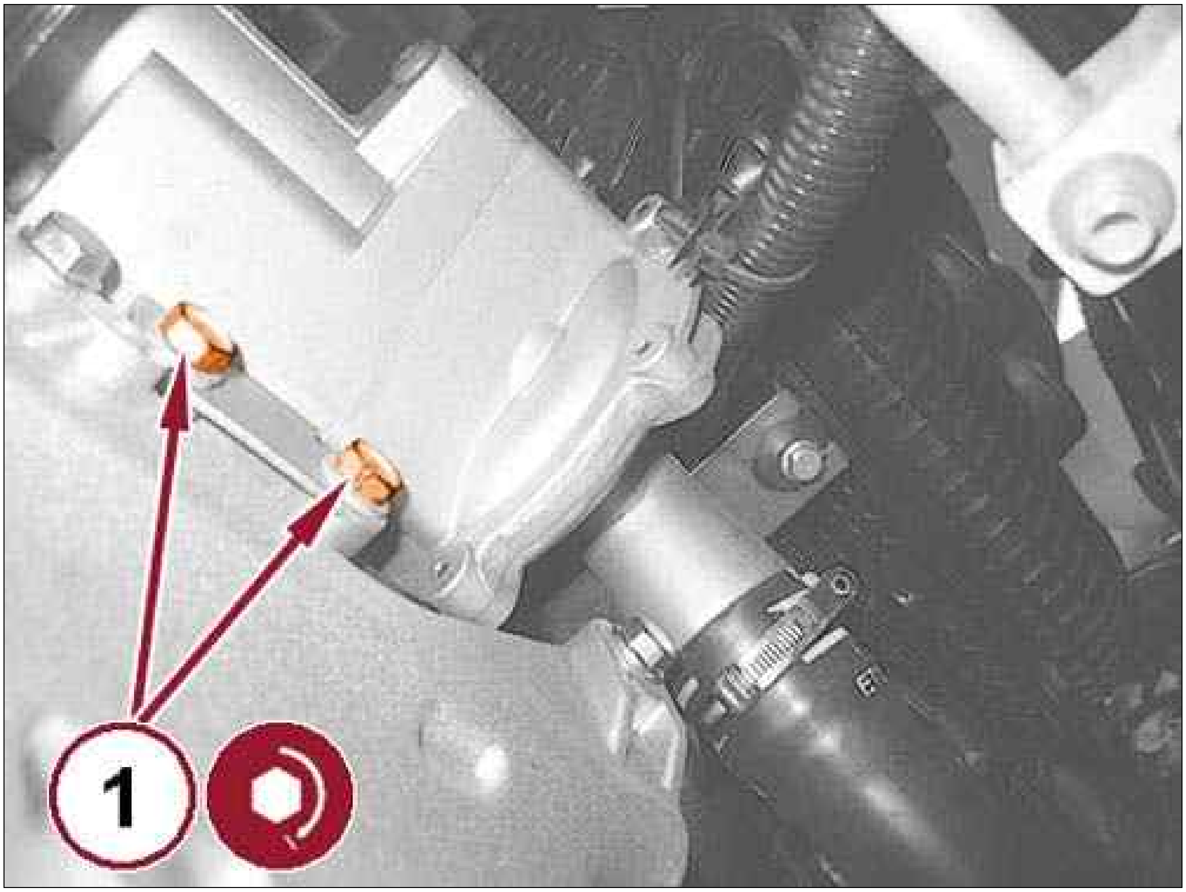
Using the tightening sequence shown in illustration, tighten the bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .

Fig 5: Central Screw & Sealing Ring

Courtesy of CHRYSLER GROUP, LLC

4. The central screw shown in the figure passes through the oil pump and is therefore equipped with a sealing ring. Tighten the bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .

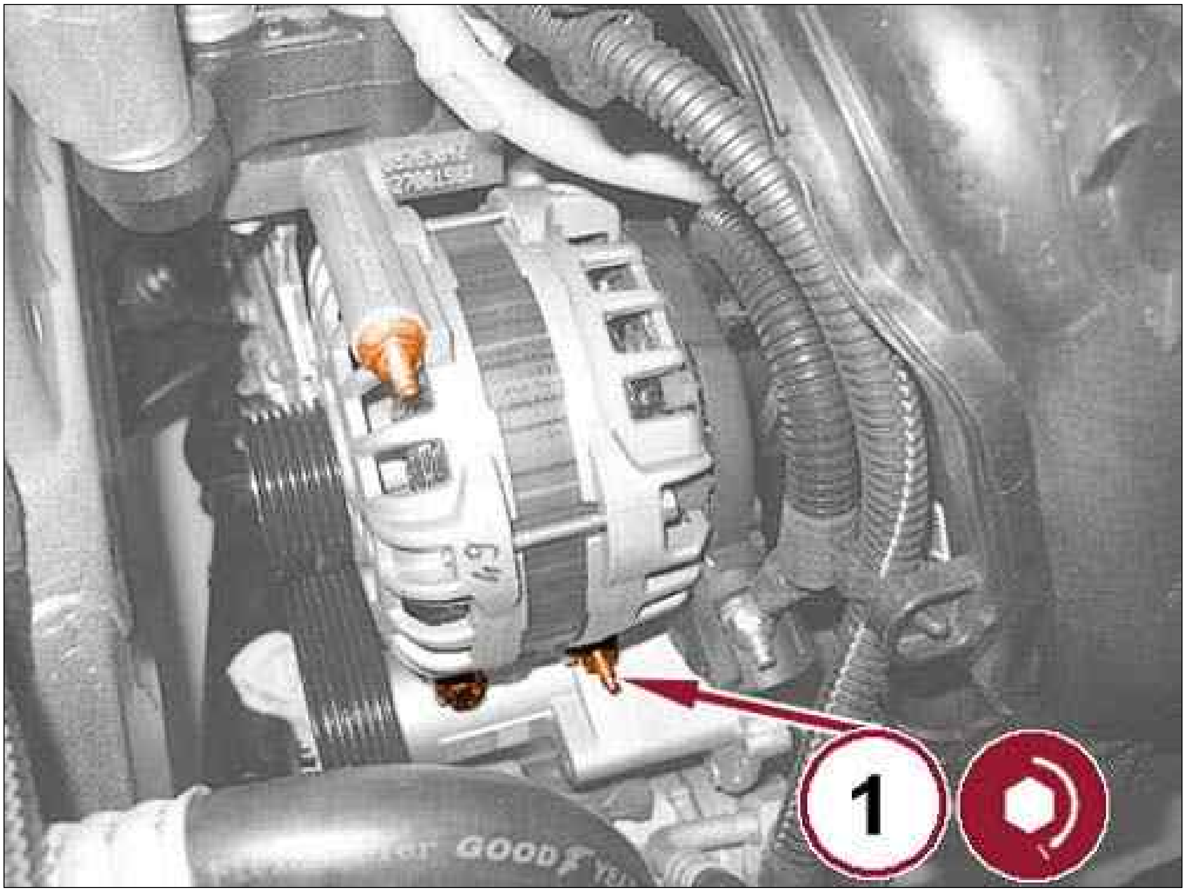
Fig 6: Water Pump Lower Bolts



Courtesy of CHRYSLER GROUP, LLC

5. Tighten the lower water pump bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .

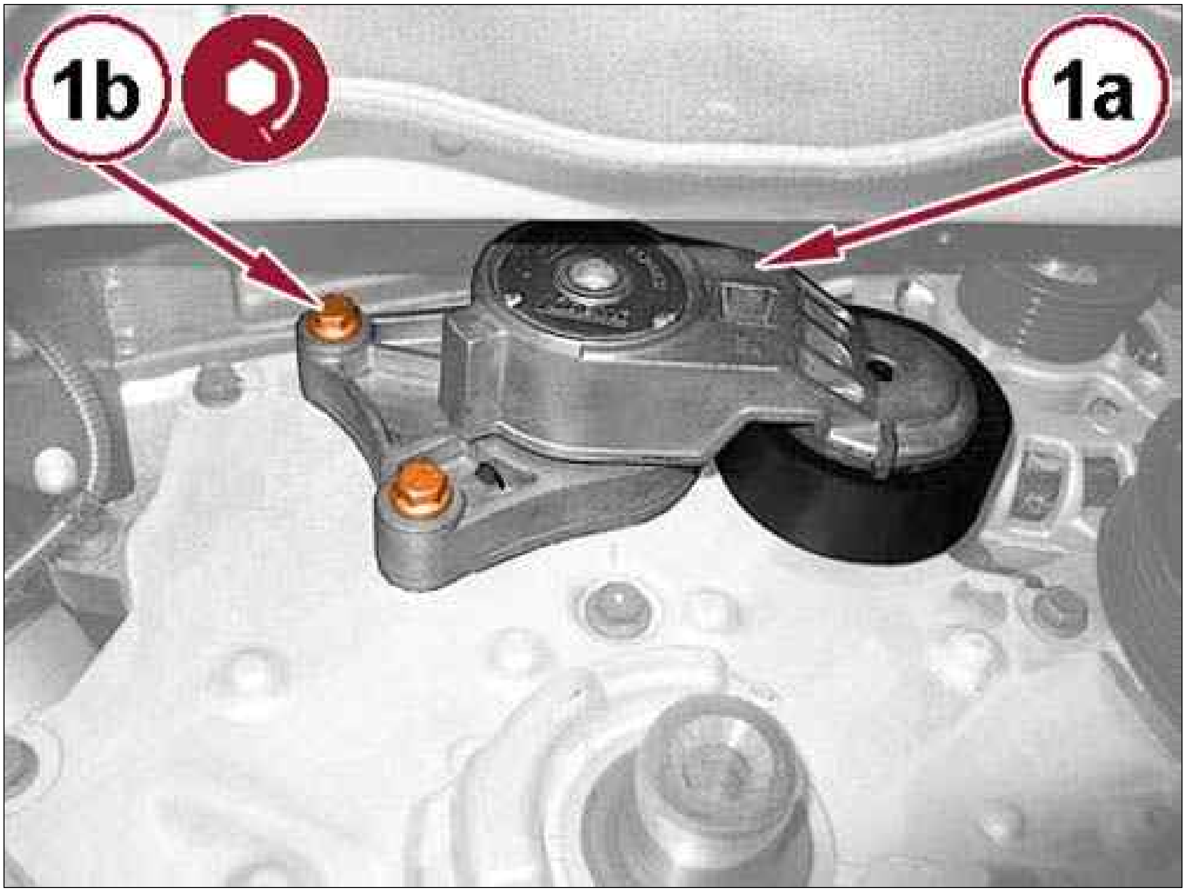
Fig 7: Generator Bolt



Courtesy of CHRYSLER GROUP, LLC

6. Tighten the generator bolts to the proper specification. Refer to TORQUE SPECIFICATIONS .
7. Install the generator shield and securely tighten the nuts.

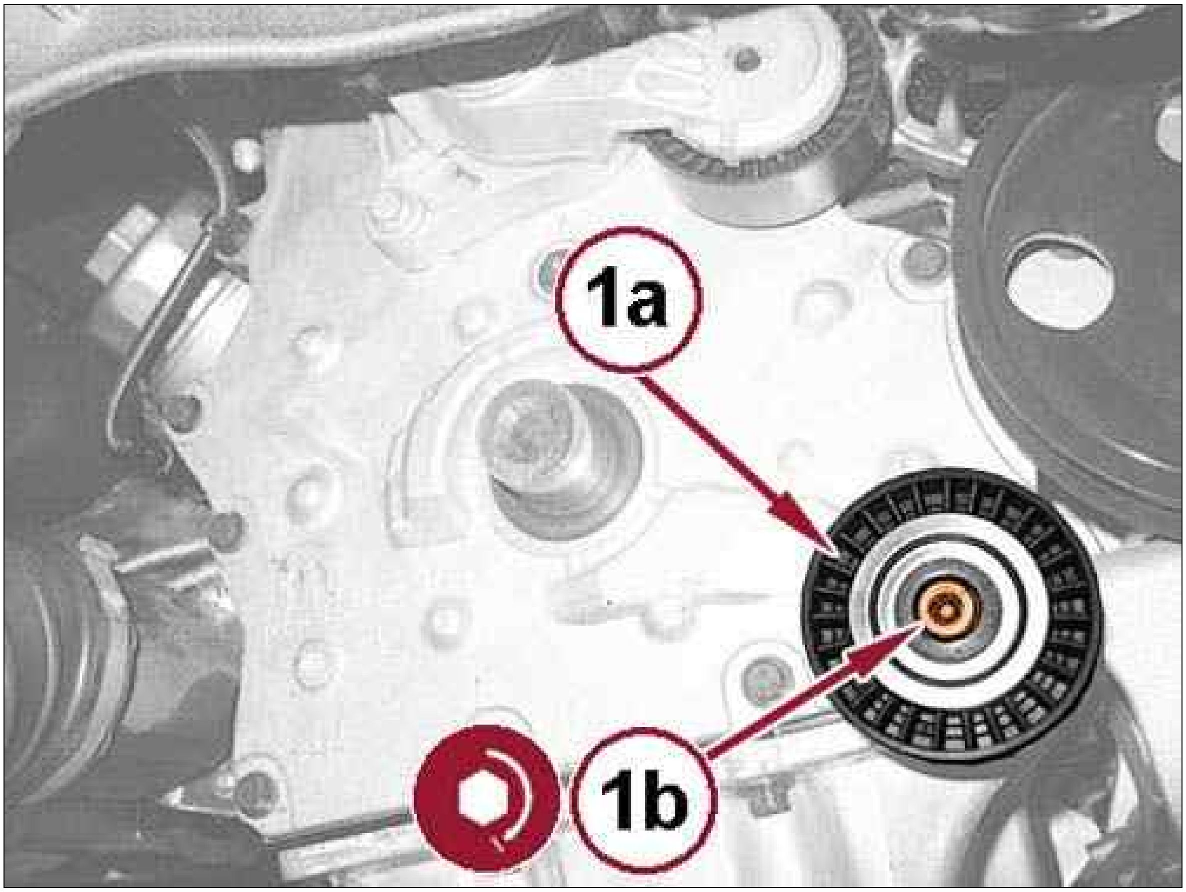
Fig 8: Belt Tensioner & Bolts



Courtesy of CHRYSLER GROUP, LLC

8. Install the belt tensioner (1a) and tighten the bolts (1b) to the proper specification. Refer to SPECIFICATIONS .

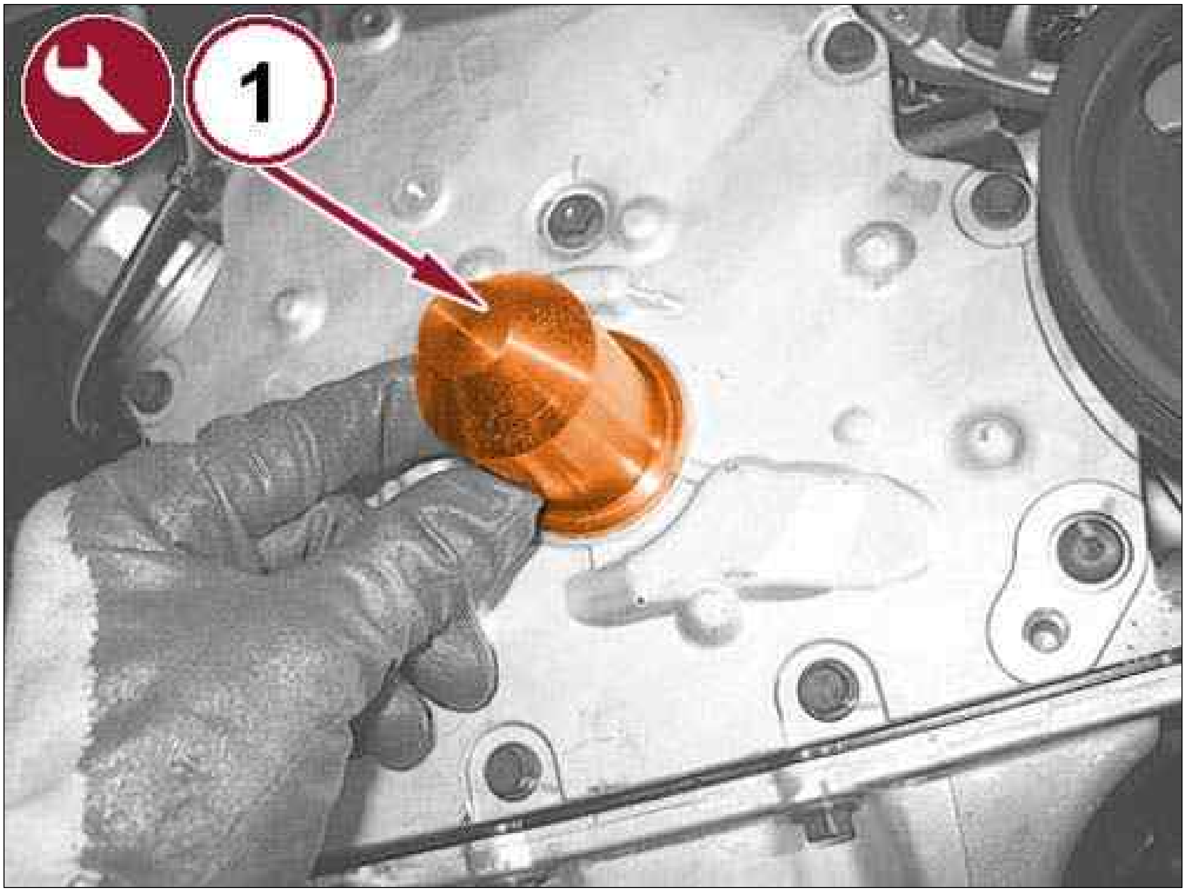
Fig 9: Idler Pulley & Bolt



Courtesy of CHRYSLER GROUP, LLC

9. Install the idler pulley (1a) and tighten the bolt (1b) to the proper specification. Refer to SPECIFICATIONS .

Fig 10: Installing Front Crankshaft Oil Seal Using Special Tool

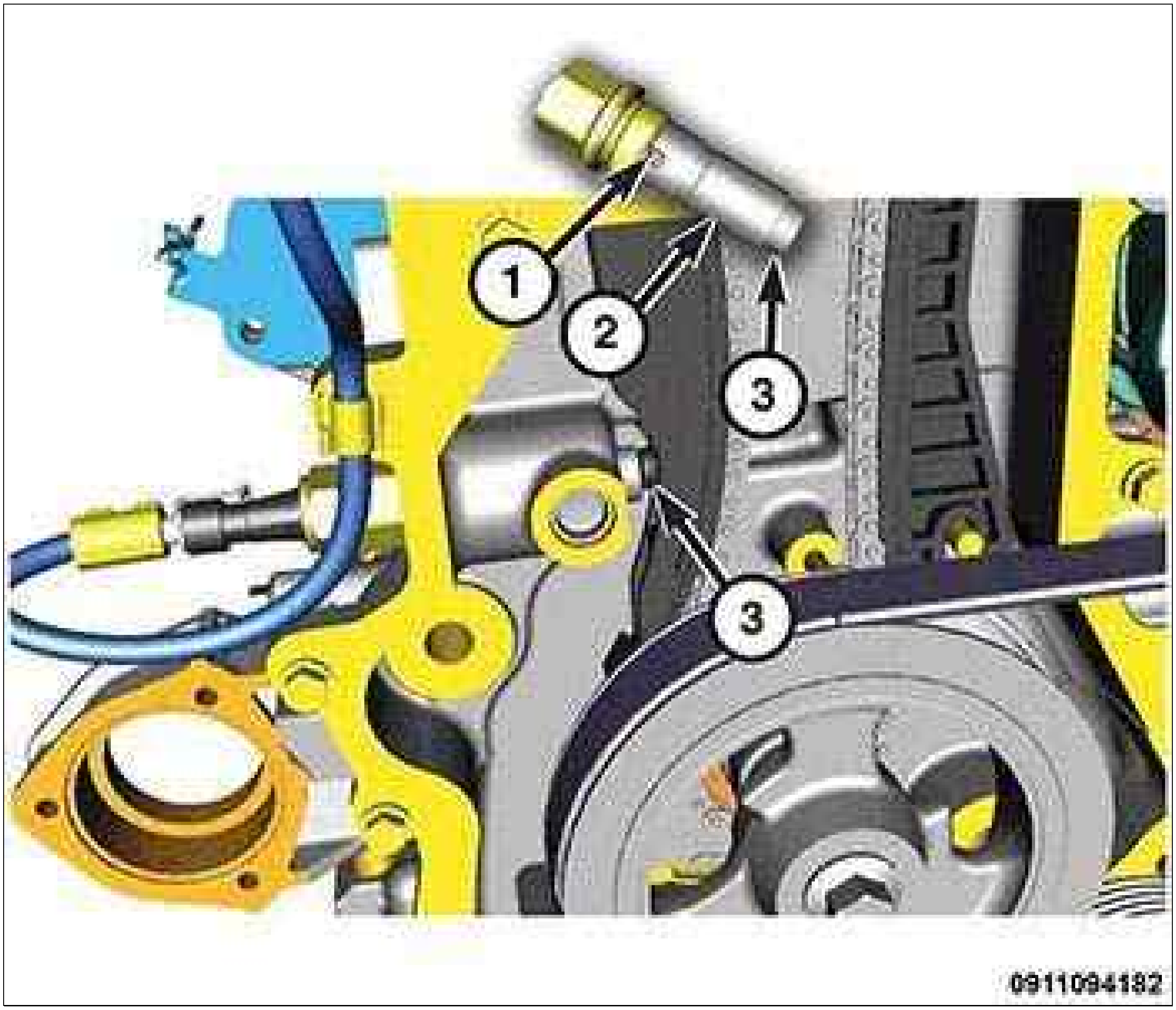


Courtesy of CHRYSLER GROUP, LLC

10. Using the 2000040939 tool (1), install a **NEW** front crankshaft oil seal.
11. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
12. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
13. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
14. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
15. Evacuate and fill the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
16. Install the wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
17. Install the tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .

VALVE TIMING > TENSIONER, ENGINE TIMING > DESCRIPTION > DESCRIPTION

Fig 1: Hydraulic Engine Timing Tensioner



Courtesy of CHRYSLER GROUP, LLC

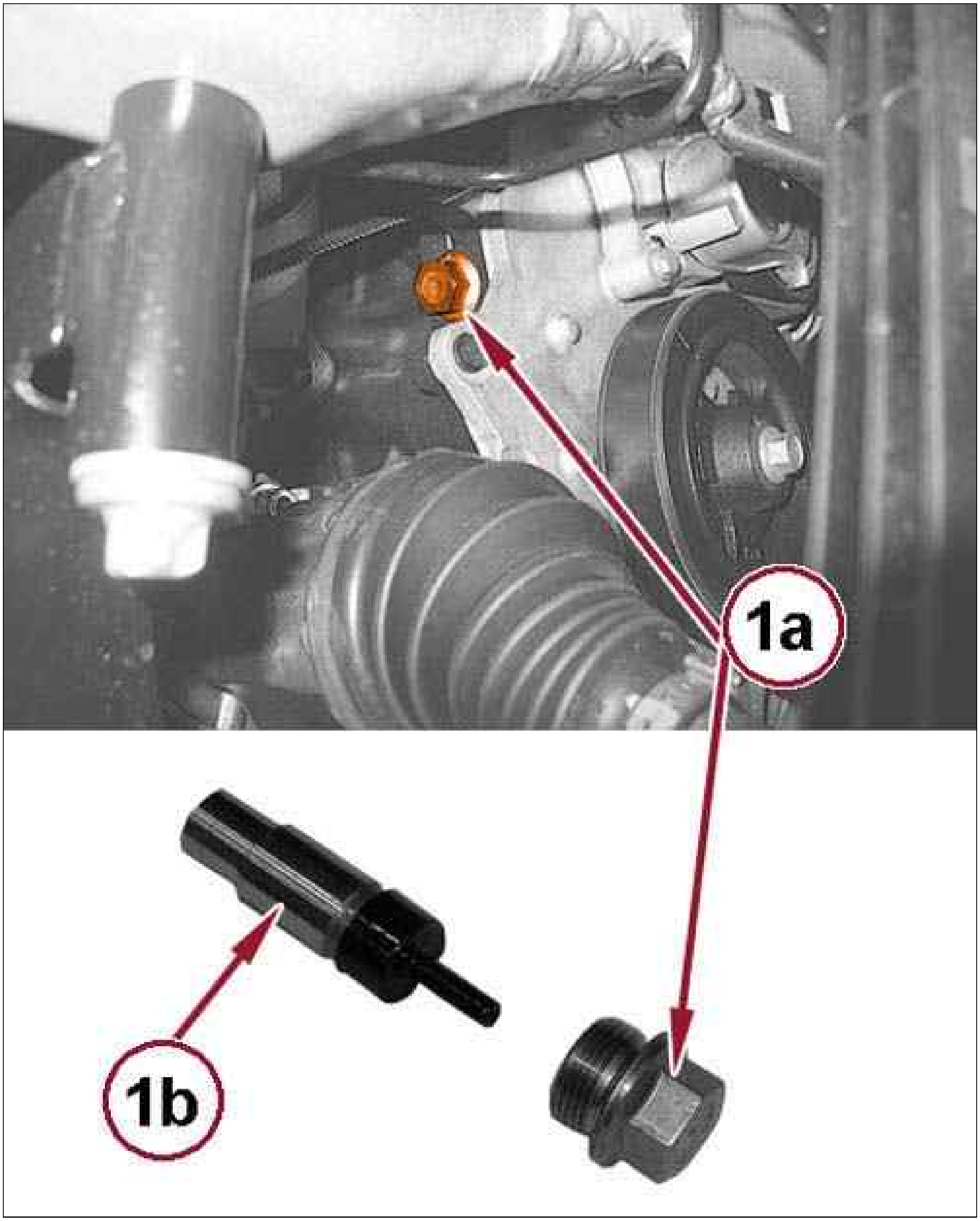
The hydraulic tensioner ensures the correct tensioning of the timing chain. It is hydraulic and acts on the mobile pad.

VALVE TIMING > TENSIONER, ENGINE TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > REMOVAL

1. Remove the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .
2. Remove the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .
3. Recover the A/C system refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
4. Remove the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
5. Remove the starter. Refer to STARTER, REMOVAL AND INSTALLATION .

6. Remove the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
7. Remove the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
8. Remove the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
9. Remove the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
10. Remove the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .

Fig 1: Engine Timing Tensioner & Cap

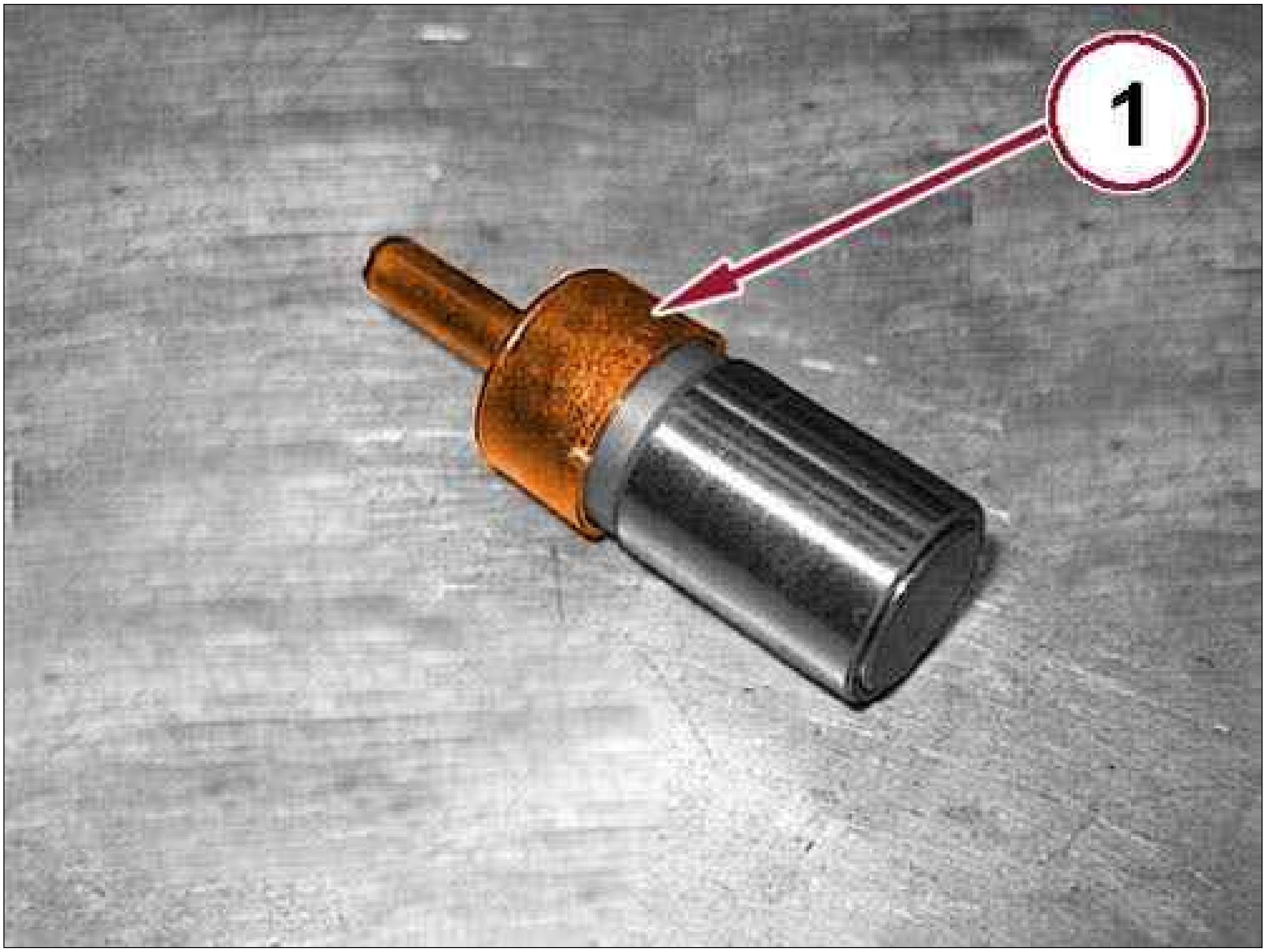


Courtesy of CHRYSLER GROUP, LLC

11. Remove the cap (1a) and the engine timing tensioner (1b).

VALVE TIMING > TENSIONER, ENGINE TIMING > REMOVAL AND INSTALLATION > REMOVAL AND INSTALLATION > INSTALLATION

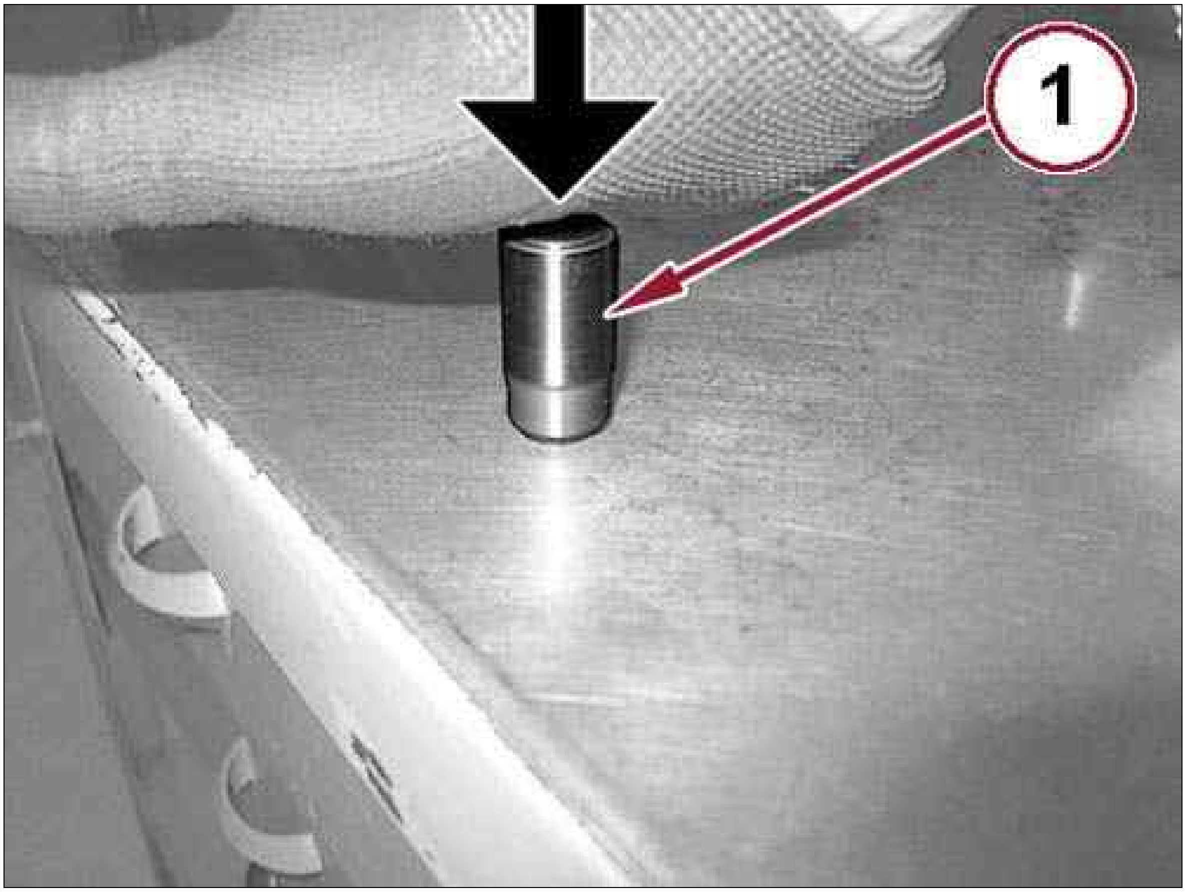
Fig 1: Moving Tensioner Cover



Courtesy of CHRYSLER GROUP, LLC

1. Remove the cover (1) of the moving tensioner for the timing control.

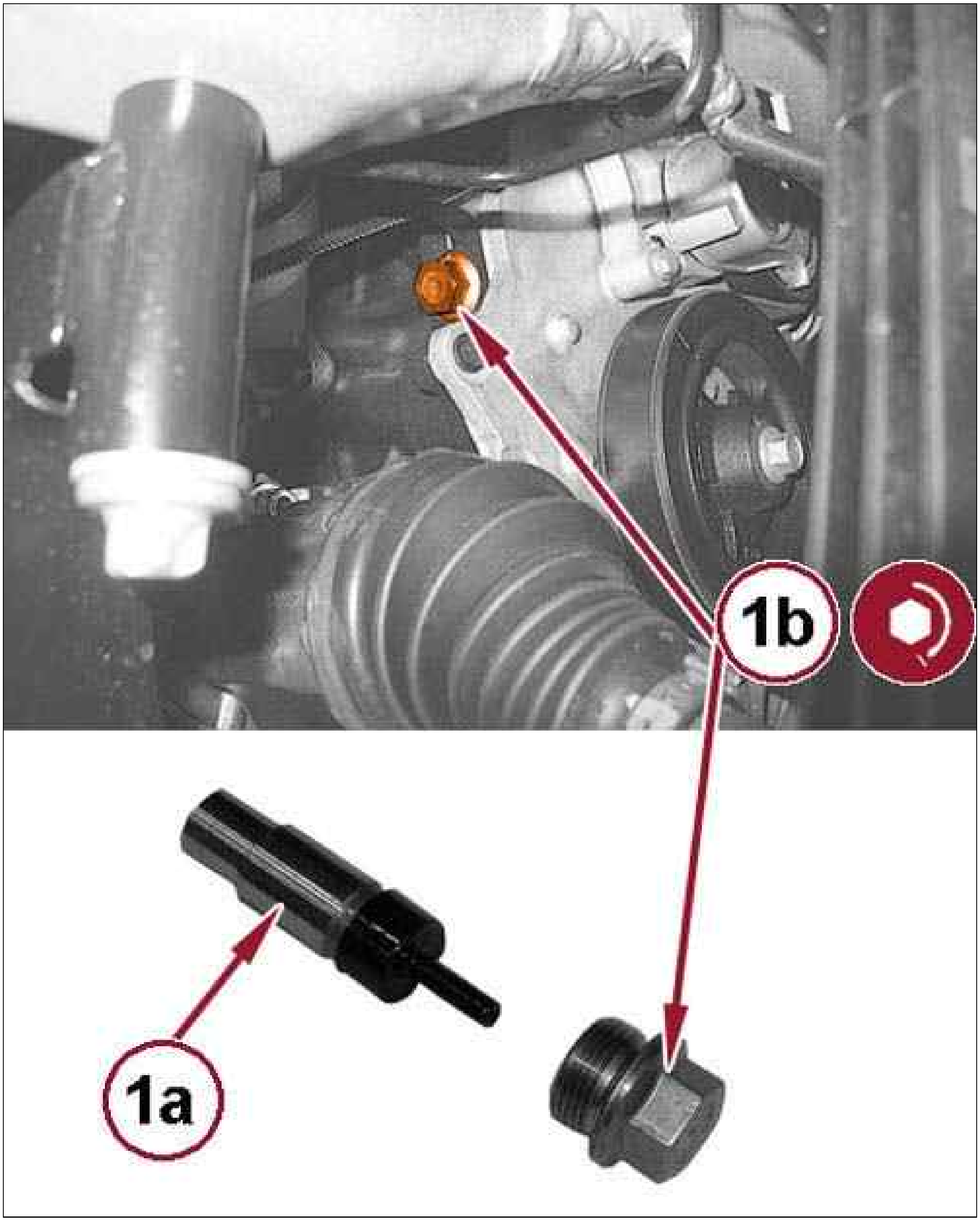
Fig 2: Engaging Moving Tensioner For Timing Drive Chain



Courtesy of CHRYSLER GROUP, LLC

2. Push down the engine timing tensioner (1) as shown in the figure.

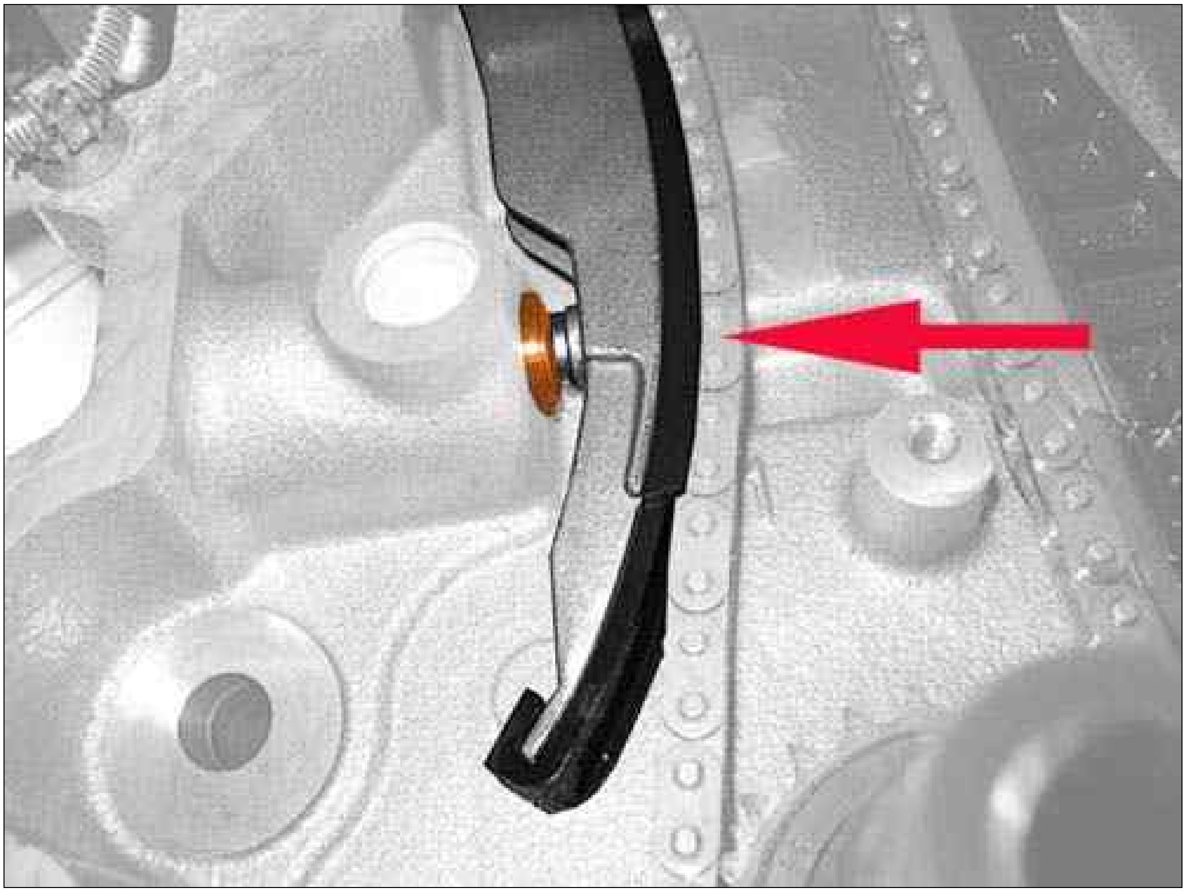
Fig 3: Timing Tensioner & Cover



Courtesy of CHRYSLER GROUP, LLC

3. Install the cover (1b) on the timing tensioner (1a).
4. Install the timing tensioner (1a) complete with gasket and tighten the cap (1b) to the proper specification. Refer to TORQUE SPECIFICATIONS .

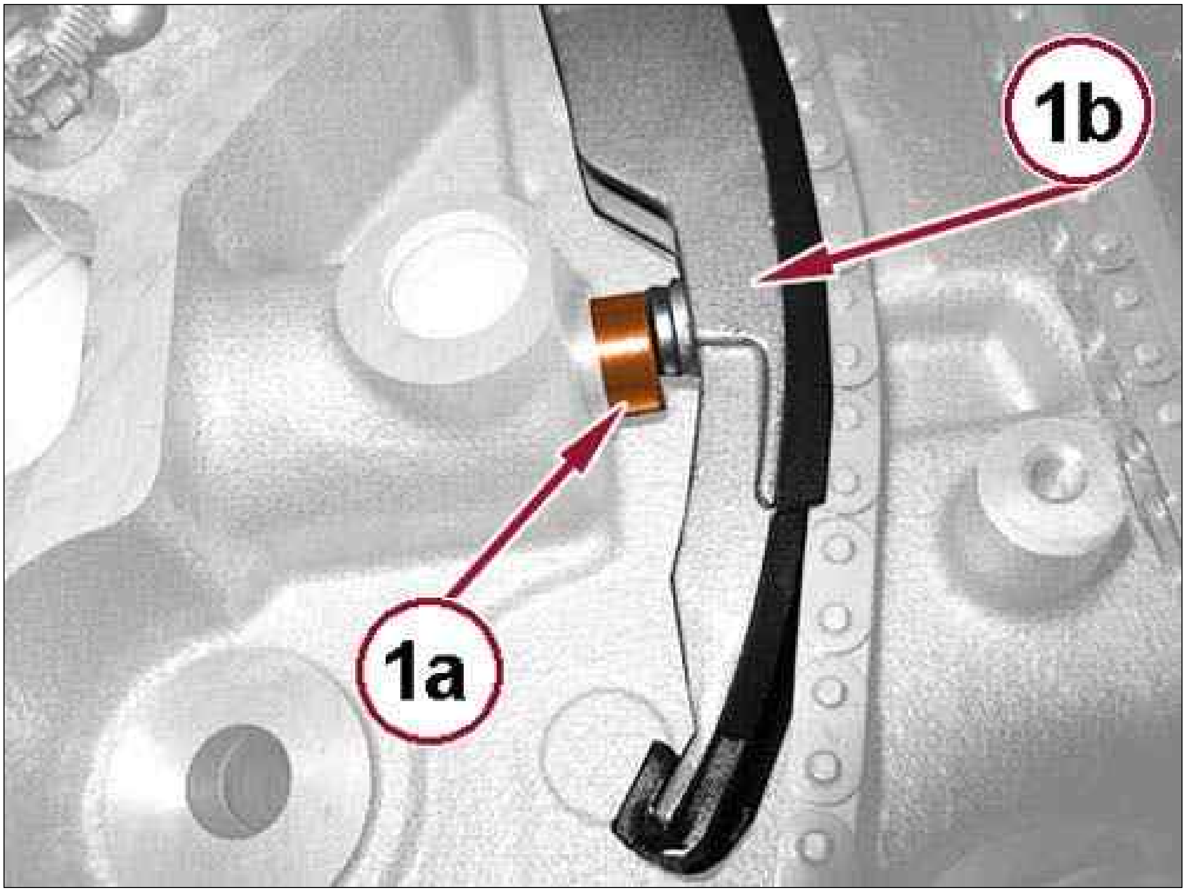
Fig 4: Releasing Piston Of Timing Drive Chain Mobile Tensioner



Courtesy of CHRYSLER GROUP, LLC

5. Press on the timing chain tensioner pad to release the piston of the timing chain tensioner.

Fig 5: Ensuring Piston Of Mobile Tensioner Touches Mobile Pad



Courtesy of CHRYSLER GROUP, LLC

6. Check that the piston of the timing chain tensioner (1a) touches the timing chain tensioner pad (1b).
7. Install the cylinder head cover. Refer to COVER(S), CYLINDER HEAD, REMOVAL AND INSTALLATION .
8. Install the engine cover. Refer to COVER, ENGINE, REMOVAL AND INSTALLATION .
9. Install the engine timing cover. Refer to COVER(S), ENGINE TIMING, REMOVAL AND INSTALLATION .
10. Install the A/C compressor. Refer to COMPRESSOR, A/C, REMOVAL AND INSTALLATION .
11. Install the vibration damper. Refer to DAMPER, VIBRATION, REMOVAL AND INSTALLATION .
12. Install the starter. Refer to STARTER, REMOVAL AND INSTALLATION .
13. Install the serpentine belt. Refer to BELT, SERPENTINE, REMOVAL AND INSTALLATION .
14. Evacuate and charge the A/C system with refrigerant. Refer to PLUMBING, STANDARD PROCEDURE .
15. Install the right front wheelhouse splash shield. Refer to SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION .

16. Install the right front tire and wheel assembly. Refer to REMOVAL AND INSTALLATION .