ENGINE

2.5 Liter - Crankshaft, Cylinder Block - Engine Code(s): BGP, BGQ, CBTA & CBUA

13 CRANKSHAFT, CYLINDER BLOCK

GENERAL INFORMATION

NEW CONNECTING ROD, SEPARATING

New connecting rods may not be separated at the location where they should be. If the connecting rod bearing cap cannot be removed by hand, proceed as follows:

-- Mark which cylinder the connecting rod belongs to.

-- Lightly clamp the connecting rod in a vise equipped with aluminum protective jaw pads.

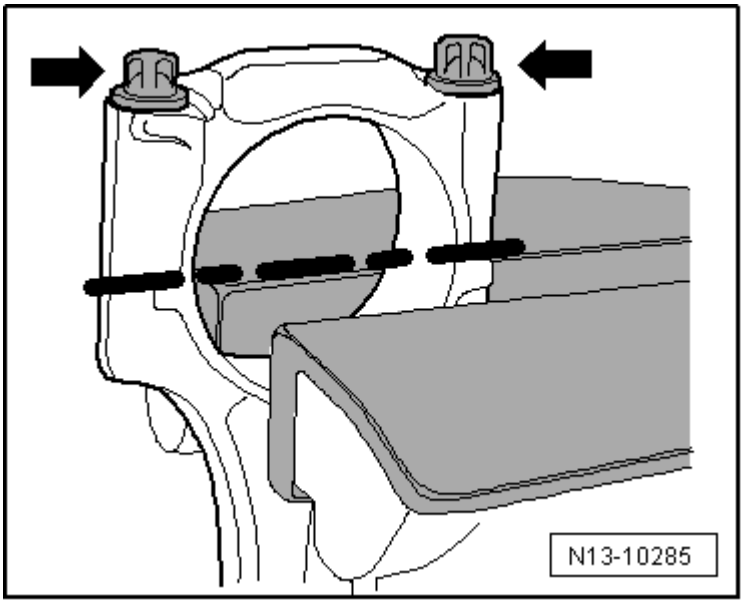


Fig. 1: Clamping Connecting Rod In Vise Equipped With Aluminum Protective Pads
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: Only clamp the connecting rod lightly to avoid damaging it.

Clamp the connecting rod below the dotted line.

-- Loosen both bolts -arrows- about five turns.

-- Carefully tap against the connecting rod bearing cap in the -direction of the arrow- with a plastic hammer until the cap is loose.

- 25 Nm

5. Lower Idler Pulley with Bracket
   - For the Air Conditioning (A/C) compressor ribbed belt.
   - Do not remove the pulley.
6. Bolt
   - 25 Nm
7. A/C Compressor
   - Removing and installing, refer to "Refrigerant Circuit Components" in **Removal and Installation** .
8. Bolt
   - 25 Nm
9. Coolant Pump
   - In the cylinder block.
   - Removing and installing, refer to **COOLANT PUMP** .
10. Ribbed Belt, Generator, Power Steering Pump and Coolant Pump
    - Belt routing, refer to **Fig. 4**.
    - Before removing, mark the rotation direction using chalk or a felt tip pen.
    - Check for wear.
    - Do not kink.
    - Removing and installing, refer to **RIBBED BELT**.
11. Ribbed Belt, A/C Compressor
    - Belt routing, refer to **Fig. 4**.
    - Before removing, mark the rotation direction using chalk or a felt tip pen.
    - Check for wear.
    - Do not kink.
    - Removing and installing, refer to **RIBBED BELT**.
12. Vibration Damper
    - To remove and install, lock the crankshaft. Refer to **CRANKSHAFT, LOCKING**.
13. Bolt
    - 50 Nm + an additional 90° (1/4 turn).
    - Always replace.
    - Only use strength category 10.9 bolts.
    - Quantity: 5
14. Bushing
    - Quantity: 2
15. Ribber Belt Tensioner, A/C Compressor Belt
    - 35 Nm
    - Do not remove the tensioning roller, remove the entire tensioner. Refer to **RIBBED BELT TENSIONER, A/C COMPRESSOR**.

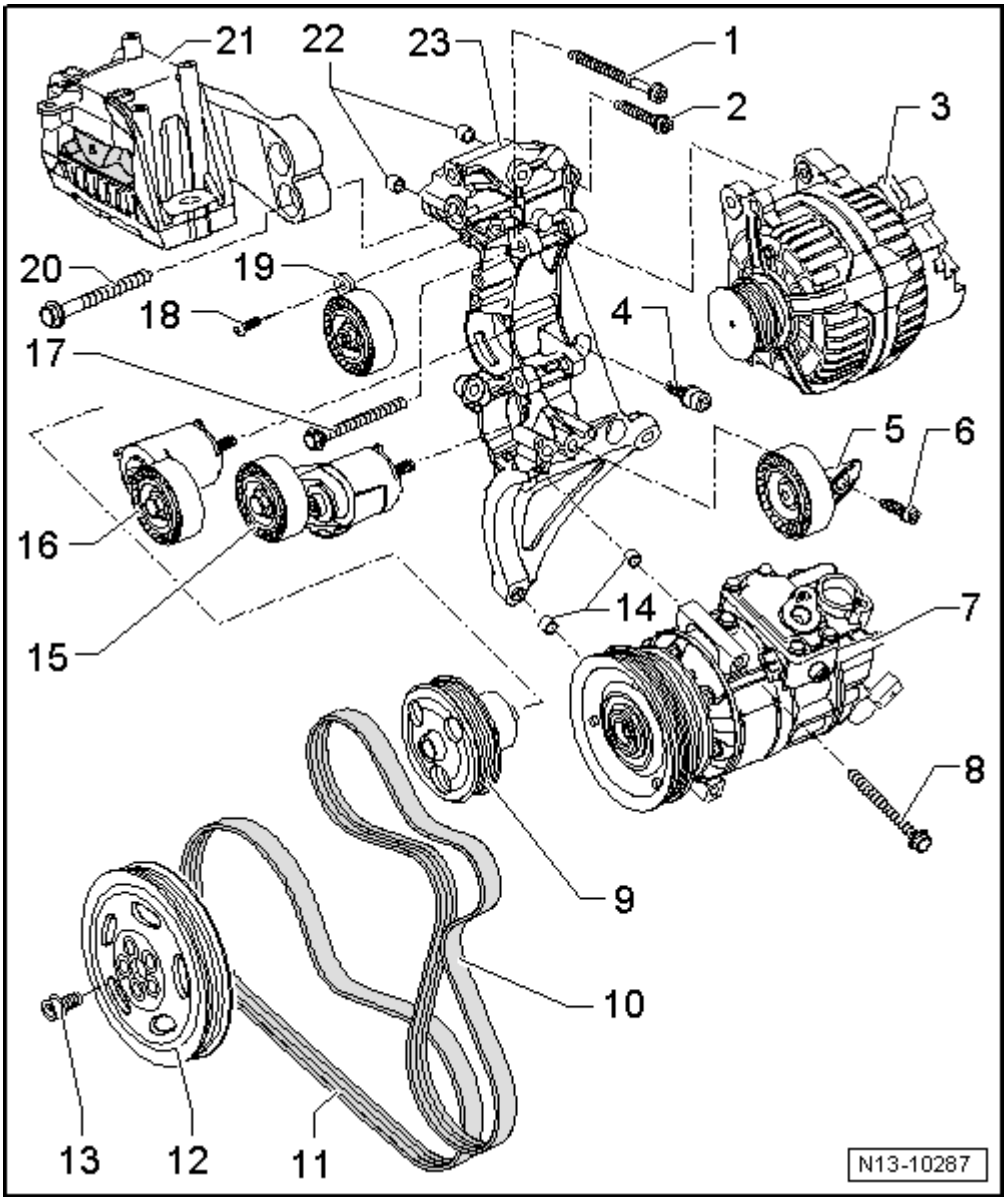


Fig. 5: Ribbed Belt Drive Overview
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt
   - 25 Nm
2. Bolt
   - 25 Nm
3. Generator
   - Removing and installing, refer to **Removal and Installation** .
   - To make it easier to position the generator, drive the threaded bushing for the generator bolt back slightly.
4. Bolt

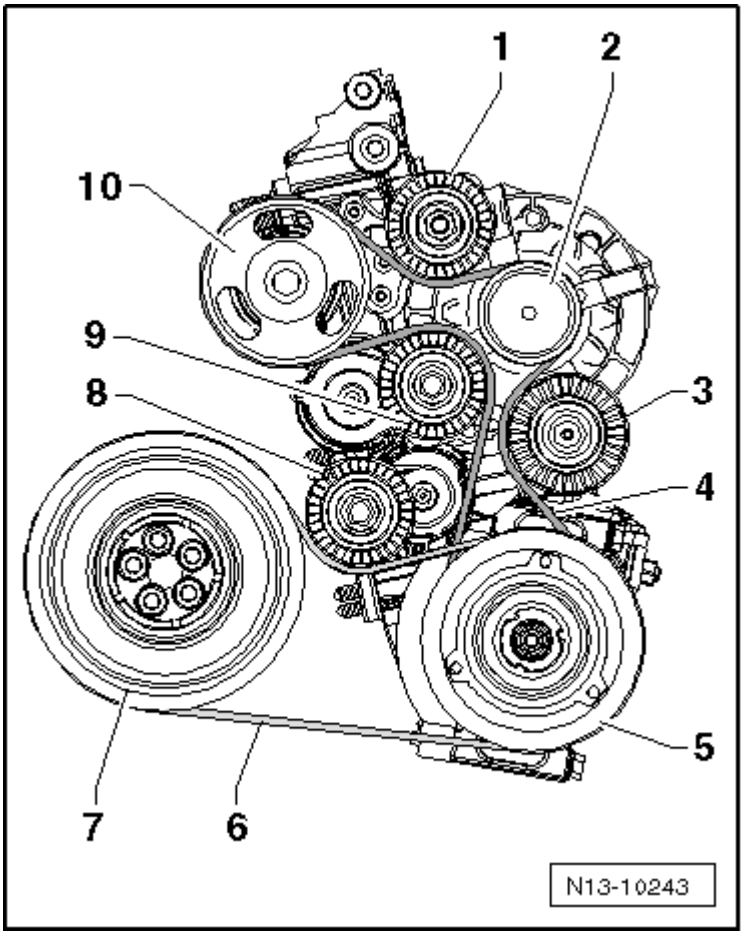


Fig. 6: Ribbed Belt Routing
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Upper idler pulley
2. Generator
3. Lower idler pulley
4. Ribbed belt, generator, power steering pump and coolant pump
5. A/C compressor
6. Ribbed belt, A/C compressor
7. Vibration Damper
8. Belt tensioner, A/C compressor ribbed belt
9. Belt tensioner, generator, power steering pump and coolant pump ribbed belt
10. Coolant pump

ENGINE OVERVIEW, REAR

Letter on Cylinder Block	Colored Dot on the Bearing Shell
G=	Yellow
B=	Blue
R=	Red

NOTE: **The -arrow- points in the direction of travel.**

If the colored dot is not visible, use the blue bearing shell.

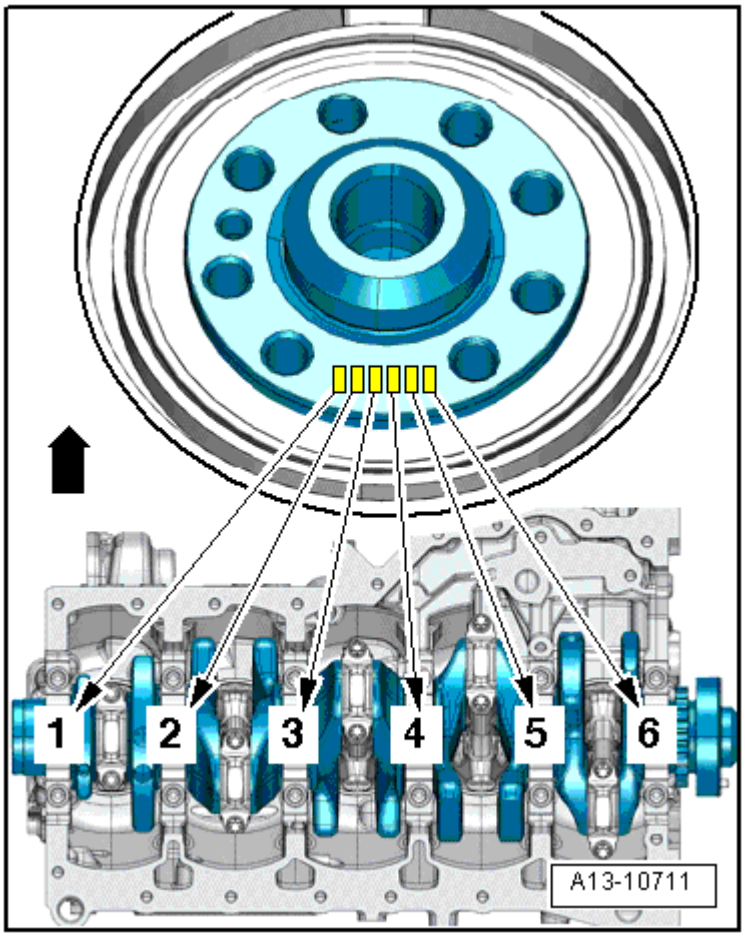


Fig. 14: Allocation, Lower Bearing Shells (Bearing Cap)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- From the factory, the lower bearing shells are allocated to the bearing cap with the correct thickness. Colored dots on the sides of the bearing shells serve to identify bearing shell thickness.
- The allocation of the bearing shells for the bearing cap is identified by a series of letters on the vibration damper. The first letter in the row of letters represents bearing "1", the second letter is for bearing "2",

FASTENER TIGHTENING SPECIFICATIONS

Component	Fastener Size	Nm
Accessory Bracket to Cylinder Block Bolt	-	25
Air Conditioning Compressor to Accessory Bracket Bolt	-	25
Air Conditioning Compressor Ribbed Belt Tensioner to Accessory Bracket Bolt	-	35
Bracket to Cylinder Block Bolt	-	25
Brake Booster Vacuum Pump to Control Housing Cover Bolt	-	10
Connecting Rod Bearing Cap to Connecting Rod Bolt 1, 4	-	30 + 90°
Coolant Pipe Bolt/Nut	-	10
Coolant Pump to Cylinder Block Bolt	-	10
Cover Plate to Cylinder Block Bolt	-	10
Crankshaft Bearing Cap to Cylinder Block Bolt (1)	-	40 + 90°
Drive Plate/Flywheel to Crankshaft Bolt (1)	-	60 + 90°
Engine Mount to Accessory Bracket Bolt	-	40 + 90°
Engine Speed Sensor to Sealing Flange, Transmission Side Bolt	-	5
Generator and Coolant Pump Ribbed Belt Tensioner to Accessory Bracket Bolt	-	35
Intake Manifold Support/Oil Dipstick Guide Tube to Cylinder Block Bolt	-	25
Knock Sensor to Cylinder Block Bolt (3)	-	20
Locking Bolt to Cylinder Block	-	30
Lower Idler Pulley with Bracket to Accessory Bracket Bolt	-	25
Oil Filter Bracket to Cylinder Block Bolt	-	25
Pressure Relief Valve	-	27
Sealing Flange, Belt Pulley Side to Cylinder Block Bolt	-	10
Sealing Flange, Transmission Side to Cylinder Block Bolt	-	25
Thermostat Housing to Cylinder Block Bolt	-	10
Upper Idler Pulley with Bracket to Accessory Bracket Bolt	-	8
Vibration Damper Pulley to Crankshaft Bolt 1, 2		50 + 90°

(1) Always replace

(2) Only use a strength category 10.9 bolt

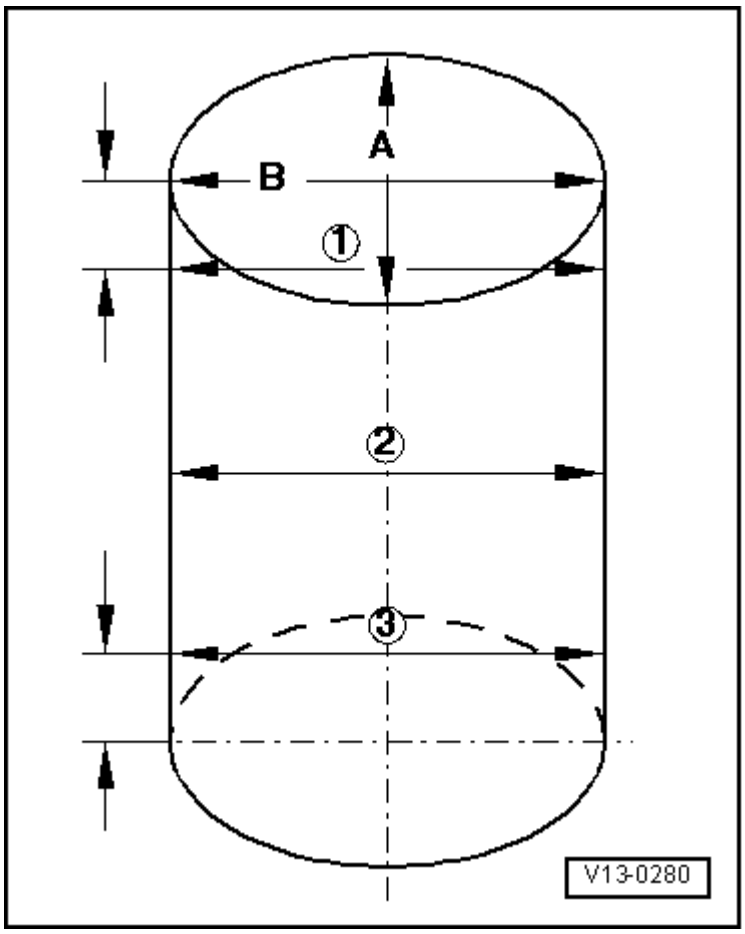


Fig. 25: Checking Cylinder Bores
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The cylinder bore must not be measured if the cylinder block is secured to the engine stand with the engine lateral bracket T03001, or else results may be incorrect.

Special tools and workshop equipment required

- Cylinder Gauge VAS 6078

-- Measure diagonally at 3 positions transversely -A- and longitudinally -B-.

Deviation from nominal size: Max. 0.08 mm.

Piston and Cylinder Reconditioning Dimension

Honing Dimension	Piston Diameter	Cylinder Bore Diameter
Basic dimension mm	82.465 (1)	82.51
(1) The measurement does not include the graphite coating, which is 0.02 mm thick. The graphite		

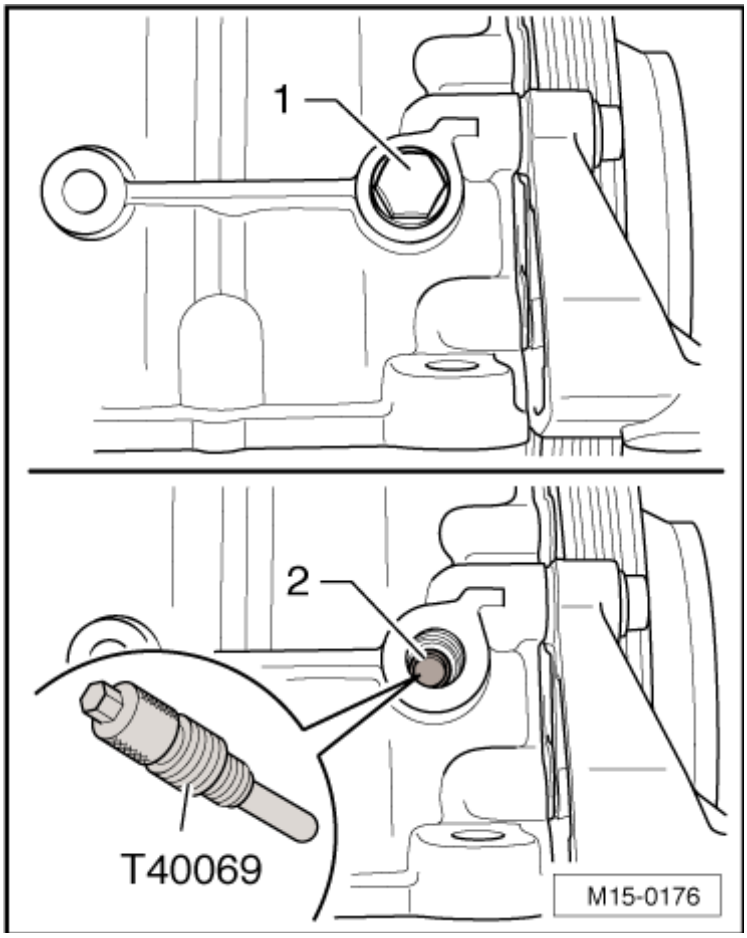


Fig. 33: Identifying Crankshaft Must Not Be Rotated Out Over TDC Marking
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Look through the threaded hole. Make sure the bore -2- in the crankshaft is lined up wit the threaded hole.

Use a mirror for this, if necessary

-- Rotate the crankshaft slightly, if necessary.

-- When the bore and hole line up, install the locking pin T40069 all the way into the threaded hole and tighten it to 10 Nm. Make sure the crankshaft cannot be rotated.

-- Remove the Air Conditioning (A/C) compressor ribbed belt. Refer to **RIBBED BELT**.

-- Loosen the bolts for the vibration damper and remove the vibration damper.

- Replace the bolts
- Use strength category 10.9 bolts only
- 50 Nm + an additional 90° (1/4) l turn

After Disassembly and Assembly Work

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Width of sealant bead: 2.5 to 3.0 mm
- Height of sealant bead above the sealing surface: approximately 1.0 mm

-- Insert the sealing flange using the oil seal guide sleeve T03004 on the crankshaft journal and press the sealing flange uniformly onto the cylinder block.

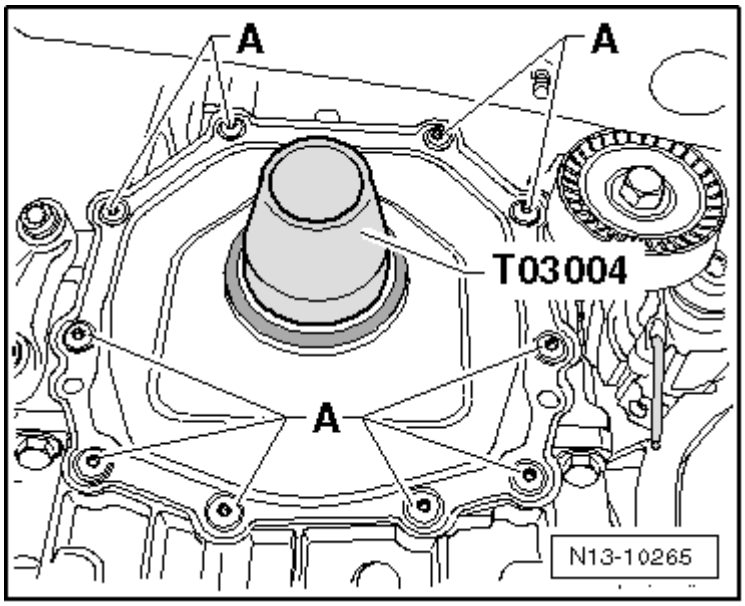


Fig. 41: Inserting Sealing Flange Using Assembly Sleeve T03004 On Crankshaft Journals
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the bolts -A- uniformly in a diagonal sequence.

The rest of the installation follows the reverse of the removal procedures. Note the following:

- Remove the locking pin T40069 from the cylinder block and install the plug.

Tightening Specifications

Component	Nm
Vibration damper to crankshaft	50 Nm + an additional 90° (1/4) turn (replace the bolts)
Belt tensioner to accessory bracket	35
Sealing flange to cylinder block	10
Locking bolt to rear of cylinder block	30

SEAL, TRANSMISSION SIDE

Special tools and workshop equipment required

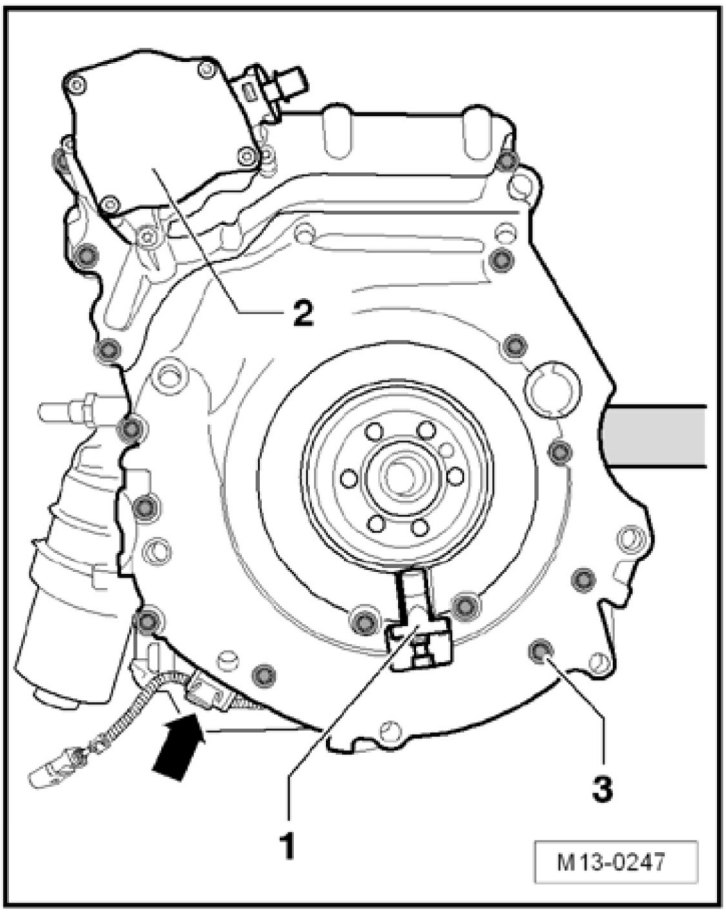


Fig. 48: Engine Speed Sensor, Vacuum Pump And Bolt
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolts -3-.

-- Remove the sealing flange -1- from the cylinder block -2- and from the lower oil pan -3- at the upper and lower marked locations using a screwdriver -A-.

- Secured to the cylinder block.
- Oil before installing on the pin.

5. Double Sprocket
   - Securing, refer to **OIL PUMP TIMING CHAIN OVERVIEW**.
6. Timing Chain
   - Removing:

     -- Follow the procedure for the "valve timing, adjusting". Refer to **VALVE TIMING, ADJUSTING**.

     -- Remove the vacuum pump. Refer to **VACUUM PUMP**.

     -- Mark the direction of travel.

   - Note when installing:

     -- Install in the original direction of rotation.

     -- The chain must lie correctly in the tensioning and guide rails.

     -- Adjust the valve timing. Refer to **VALVE TIMING, ADJUSTING**.

7. Strainer
   - Always replace.
8. Bolt
   - 10 Nm
9. Chain Tensioner
   - Secure using a locking pin T03006.
10. Gasket
    - Always replace.
11. Guide Rail
    - Oil before installing on the pin.
12. Bolt
    - 60 Nm + an additional 90° (1/4) additional turn.
    - Always replace.
13. Bolt
    - 60 Nm + an additional 90° (1/4) additional turn.
    - Always replace.

OIL PUMP TIMING CHAIN OVERVIEW

4. Bolt
    - 60 Nm + an additional 90° (1/4) additional turn.
    - Always replace.
5. Bolt
    - 60 Nm + an additional 90° (1/4) additional turn.
    - Always replace.
6. Intake Camshaft Adjuster
7. Seals
    - For the camshaft adjuster.
    - Note the installed position, refer to **CAMSHAFT**.
8. Timing Chain
    - Removing from the sprockets, refer to **VALVE TIMING, ADJUSTING**.
9. Cylinder Head
    - Do not grind the valve seats, only hand lapping is permitted.
10. Roller Rocker Arm with Hydraulic Lash Adjuster
    - Do not interchange.
    - Lubricate the contact surface.
11. Valve Retainers
12. Upper Spring Seat
13. Valve Spring
14. Valve Stem Seal
    - Removing and installing, refer to **VALVE SHAFT SEALS**.
15. Valve Guide
    - Checking, refer to **VALVE GUIDE, CHECKING**.
16. Intake Valve
    - Do not grind, only hand lapping is permitted.
    - Valve dimensions, refer to **VALVE DIMENSIONS**.
    - Valve guide, checking. Refer to **VALVE GUIDE, CHECKING**.
17. Exhaust Valve
    - Do not grind, only hand lapping is permitted.
    - Valve dimensions, refer to **VALVE DIMENSIONS**.
    - Valve guide, checking. Refer to **VALVE GUIDE, CHECKING**.
18. Sealing Plug
    - Always replace.
    - Installing, refer to **CAMSHAFT**.
19. Intake Camshaft
    - Removing and installing, refer to **CAMSHAFT**.
    - Check the radial clearance using Plastigage® (roller rocker arm is removed).

NOTE: By disconnecting the connectors, Diagnostic Trouble Codes (DTCs) are stored to memory. After the test, check the DTC memory and erase, if necessary.

-- Read the Engine Control Module (ECM) DTC memory. Refer to the vehicle diagnostic tester.

VALVE TIMING, CHECKING

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Crankshaft Adapter T03003
- Locking Pin T40069
- Camshaft Clamp T40070

Procedure

-- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.

-- Remove the noise insulation. Refer to **Description and Operation** .

-- Remove the front section of the right wheel housing liner. Refer to **FRONT WHEEL HOUSING LINER** .

-- Install the crankshaft adapter T03003 onto the vibration damper bolts.

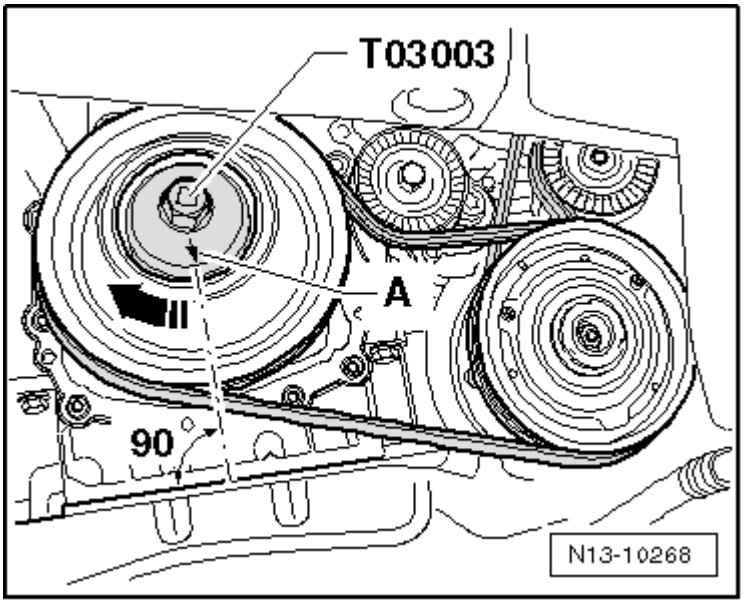


Fig. 11: Attaching Wrench T03003 Onto The Vibration Damper Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The crankshaft adapter T03003 can only be installed correctly in one position.

-- Rotate the crankshaft in engine rotation direction until the arrow -A- on the crankshaft adapter T03003 faces

-- Place the adjuster -2- and sprocket -3- in the timing chain as illustrated. Position the adjuster and sprocket onto the camshafts and install new bolts -1 and 4- and tighten them by hand.

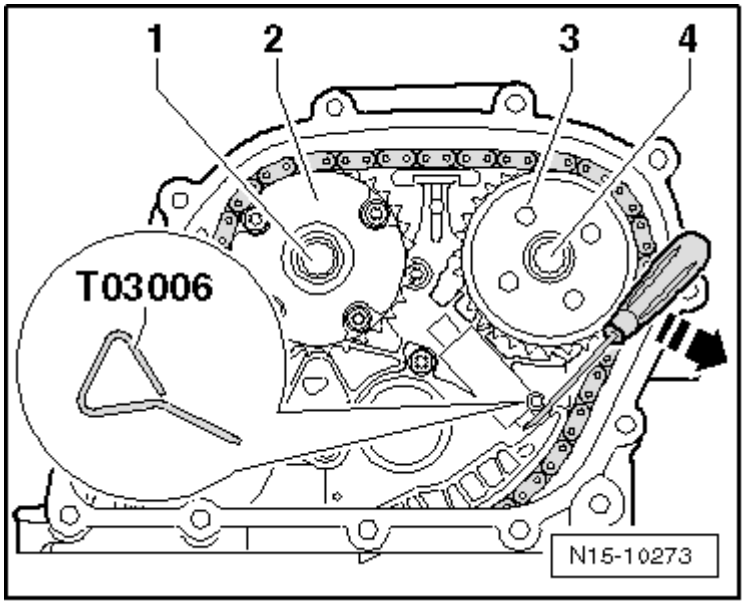


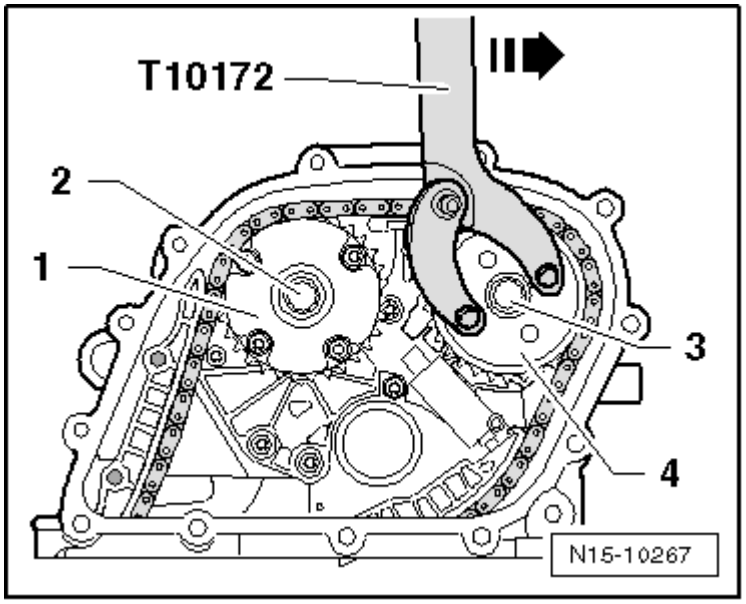
Fig. 22: Placing Chain Sprockets Into Timing Chain
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The adjuster and sprocket must still be able to be rotated, however they must not tilt.

NOTE: Make sure that timing chain lies correctly in the tensioning and guide rails.

-- Relieve the tension on the chain tensioner by pressing in the piston and pulling out the locking pin T03006.

-- Attach the modified counterhold tool T10172 to the exhaust camshaft sprocket -4-.



-- Drain the coolant. Refer to **COOLANT, DRAINING AND FILLING** .

-- Remove the engine cover with air filter. Refer to **ENGINE COVER WITH AIR FILTER** .

-- Remove the battery. Refer to **Removal and Installation** .

-- Remove the cover -1- for the E-box and remove the wire -2-.

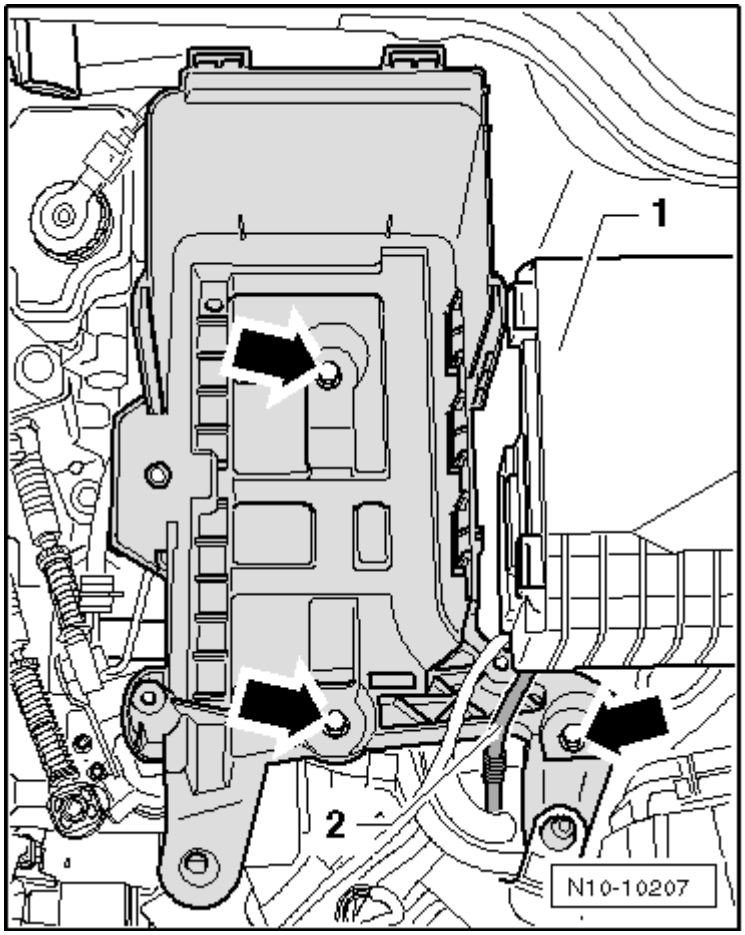


Fig. 31: Identifying Battery Holder & Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolts -arrows- and remove the battery tray from the vehicle.

WARNING: Hot steam may escape when opening the expansion tank cap. Wear protective goggles and protective clothing to prevent damage to eyes and scalding. Cover the cap with a cloth and open very carefully.

-- Remove the intake manifold. Refer to **INTAKE MANIFOLD** .

-- Install the transport strap back onto the cylinder head in order to better hold the cylinder head during removal.