

ENGINE**2.0 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBFA & CCTA (Sedan) (A5 Platform)****13 CRANKSHAFT, CYLINDER BLOCK****GENERAL INFORMATION****CRANKSHAFT BEARING SHELL ALLOCATION**

The bearing shells are allocated to the cylinder block with the correct thickness by the factory. Colored dots serve to identify the bearing thicknesses.

The code letters on the lower contact surface or on the top of the cylinder block identify which bearing shell and where it must be installed on the cylinder block (upper bearing shell).

The code letters on the crankshaft identify which bearing shell and where they must be installed in the bearing cap (lower bearing shell).

The first letter is for bearing cap one, the second for bearing cap two, etc.

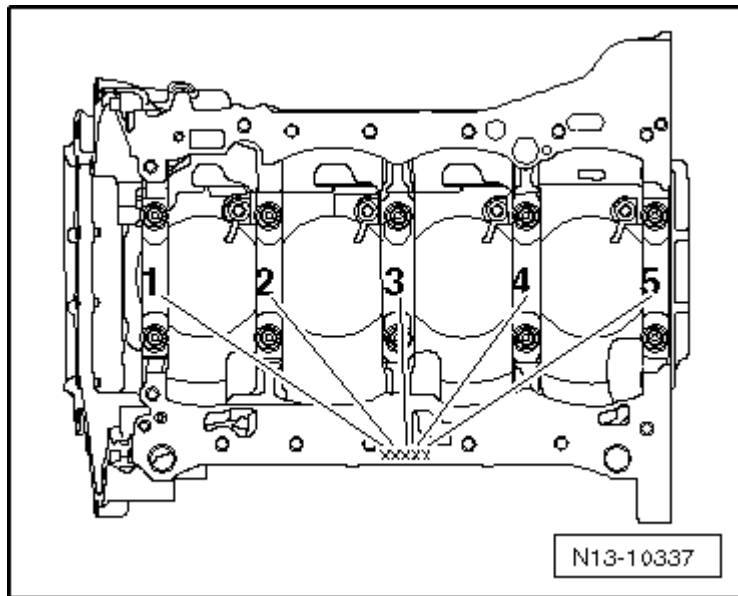
Cylinder Block:

Fig. 1: Locating Cylinder Block Identification On Top (Transmission Side) Of Cylinder Block
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The identification of the cylinder block may be located either on the oil pan sealing surface or on the top (transmission side) of the cylinder block.

The identification on the cylinder block is for the upper bearing shell.

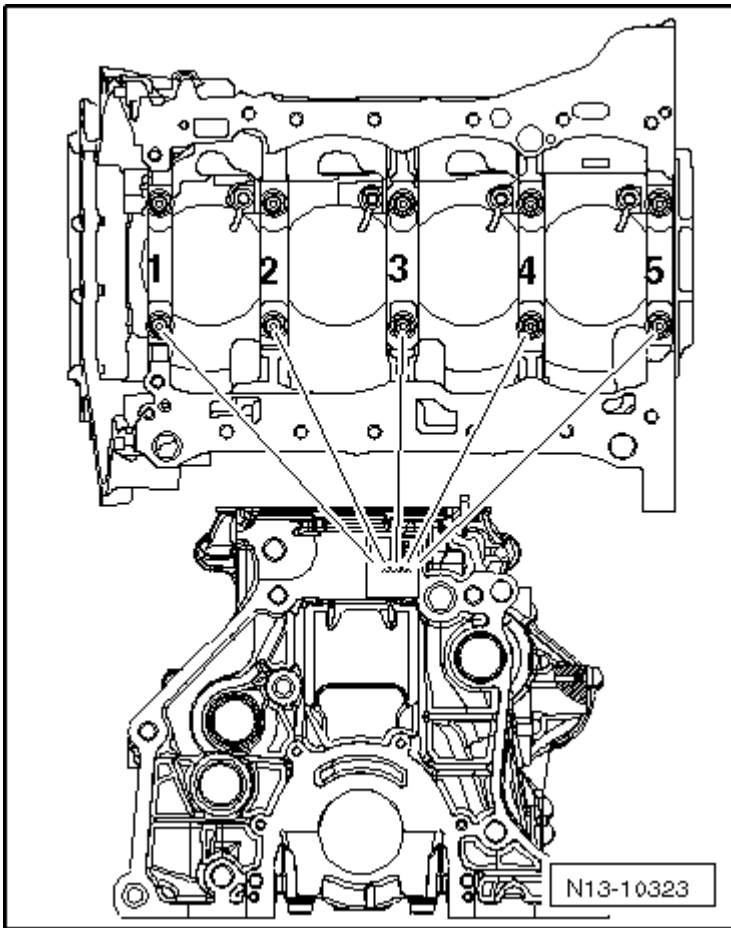
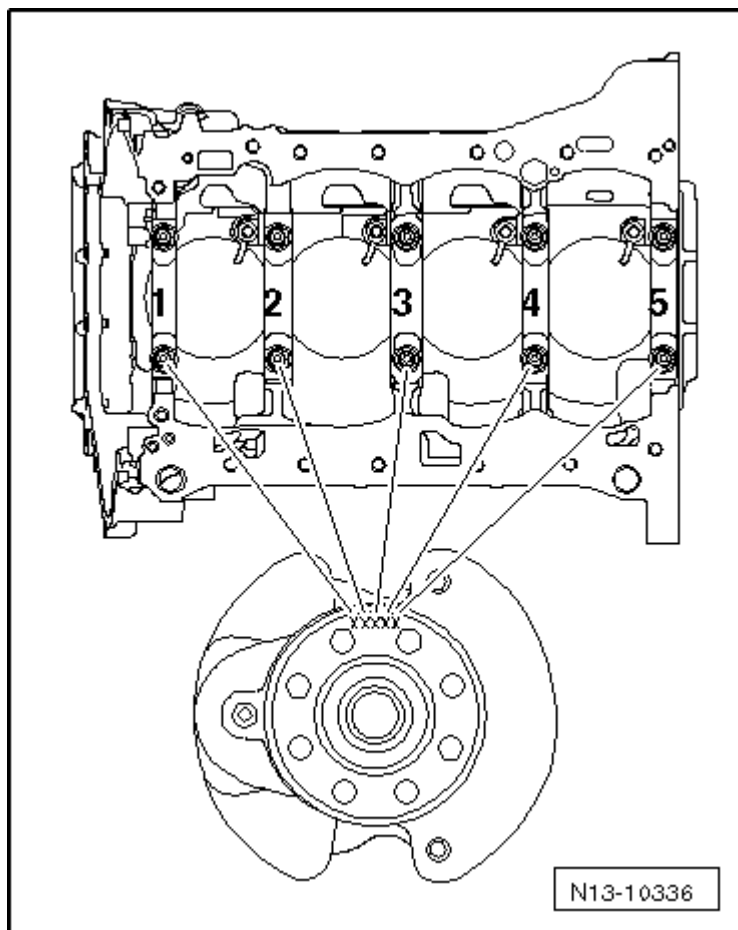


Fig. 2: Locating Identification On Cylinder Block
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Note the letters and then match them to the color identification in the table. **Color Identification.**

Crankshaft:

**Fig. 3: Locating Identification On Crankshaft**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

The identification on the crankshaft is for the lower bearing shell.

-- Note the letters and then match them to the color identification in the table. Go to: **Color Identification**.

Color Identification

- S = Black
- R = Red
- G = Yellow
- B = Blue
- W = White

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. Connecting Rod (List Item: 11) belongs to.

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

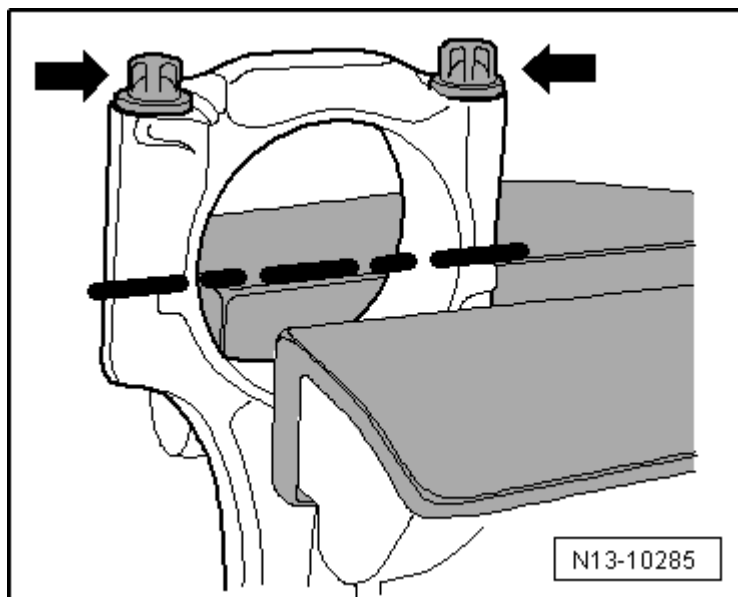


Fig. 4: Identifying Connecting Rod Clamped In Vise Equipped With Aluminum Protective Pads
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

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

Clamp the connecting rod below the dotted line.

-- Loosen both bolts -arrows- about 5 turns.

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

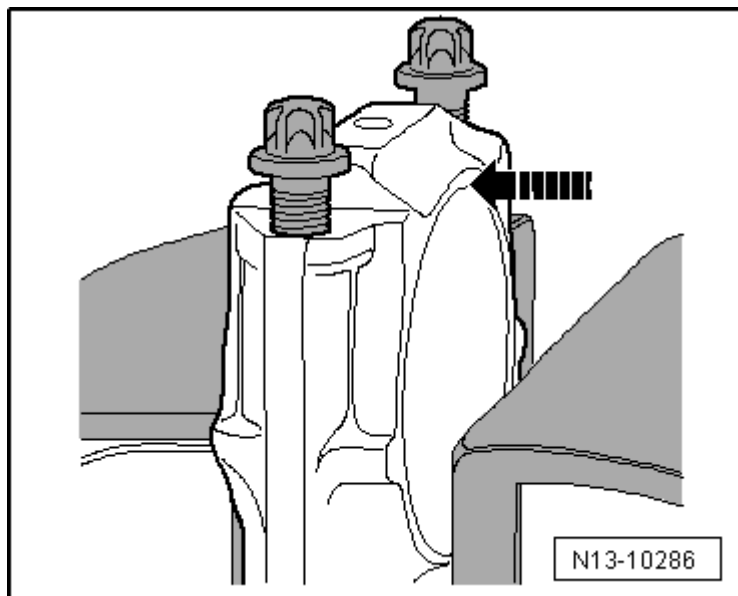


Fig. 5: Identifying Direction To Carefully Tap Against Connecting Rod Bearing Cap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

DESCRIPTION AND OPERATION

RIBBED BELT OVERVIEW

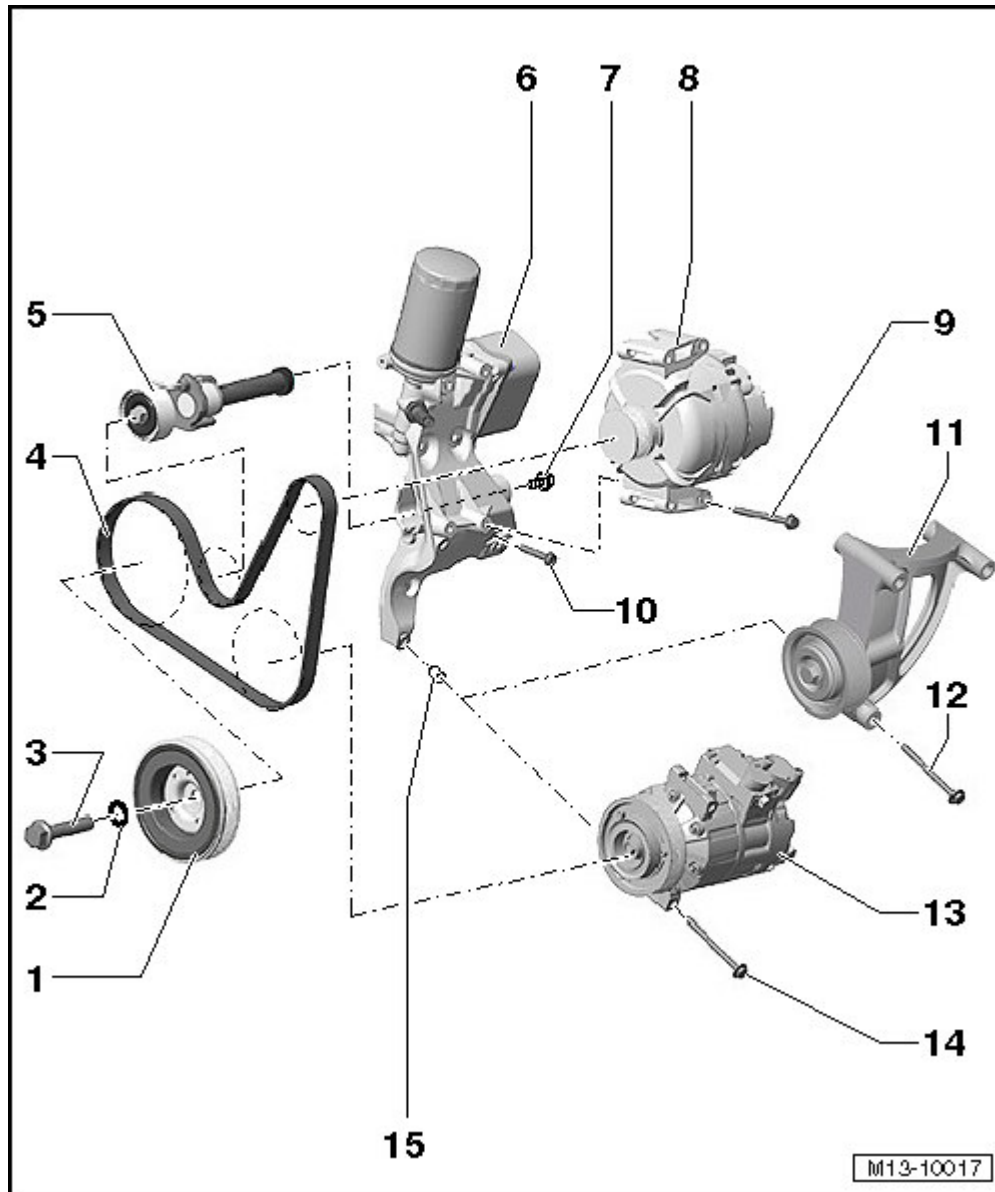


Fig. 6: View Of Ribbed Belt Overview
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Vibration Damper

- With the pulley for the ribbed belt.
- Removing and installing, refer to **VIBRATION DAMPER**.

2. O-ring

- No replacement part available, part of the bolt.

3. Bolt

- 150 Nm + 90° (1/4) additional turn.
- Always replace.
- Use the counter hold tool T10355 to loosen and tighten.

4. Ribbed Belt

- Check the belt for wear.
- Do not kink the belt when installing.

CAUTION: Risk of destroying due to reversed running direction of a used ribbed belt:

- **Before removing the ribbed belt, mark the running direction with chalk or a felt-tip pen for reinstallation later.**

- Removing and installing, refer to **RIBBED BELT**.
- When installing, make sure the belt is seated correctly on the pulleys.

5. Ribbed Belt Tensioner

- To release the tension on the ribbed belt, rotate using an open end wrench.
- Secure using the locking Pin T10060 A.
- Installed position, refer to **Fig. 7**.
- Removing and installing, refer to one of the following:

Jetta/GLI for MY 08 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09. Refer to **RIBBED BELT TENSIONER**.

6. Accessory Bracket

- With the oil pressure switch -F1-, oil filter and oil cooler.
- Removing and installing, refer to **ACCESSORY BRACKET**.
- Oil filter, oil cooler and oil pressure switch overview. Refer to **OIL FILTER, OIL COOLER AND OIL PRESSURE SWITCH OVERVIEW**.

7. Bolt

- 10 Nm

8. Generator

- Removing and installing, refer to **Removal and Installation**.

9. Bolt

- 23 Nm

10. Bolt

- Always replace.

- For the tightening sequence and tightening specification; refer to **Fig. 8**.

11. Bracket with Idler Pulley

- Not available in the US/Canadian market.
- For vehicles without Air Conditioning (A/C).

12. Bolt

- 25 Nm

13. A/C Compressor

- Do not remove or disconnect the refrigerant lines.
- Removing and installing. Refer to **Removal and Installation** .

14. Bolt

- 25 Nm

15. Alignment Sleeve

- For A/C compressor or bracket with idler pulley.

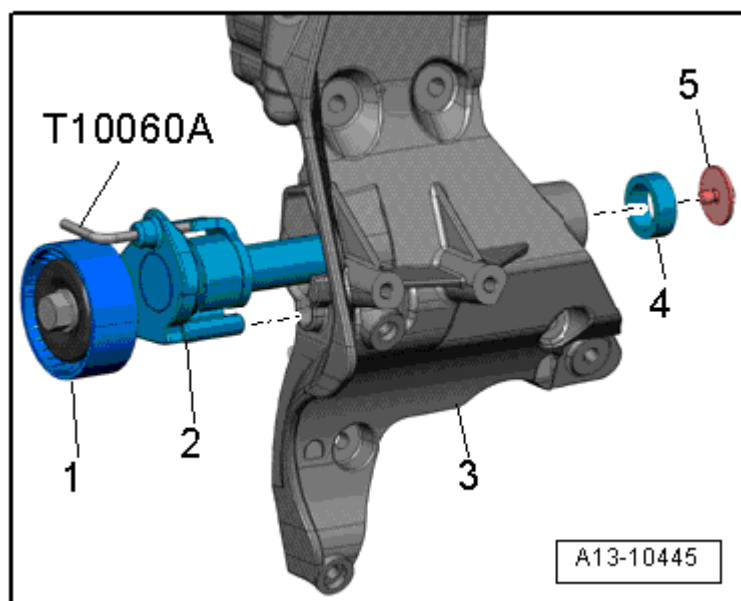


Fig. 7: Identifying Tensioning Device For Ribbed Belt
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Ribbed belt tensioner pulley
2. Support
3. Accessory bracket
4. Centering sleeve
5. Bolt

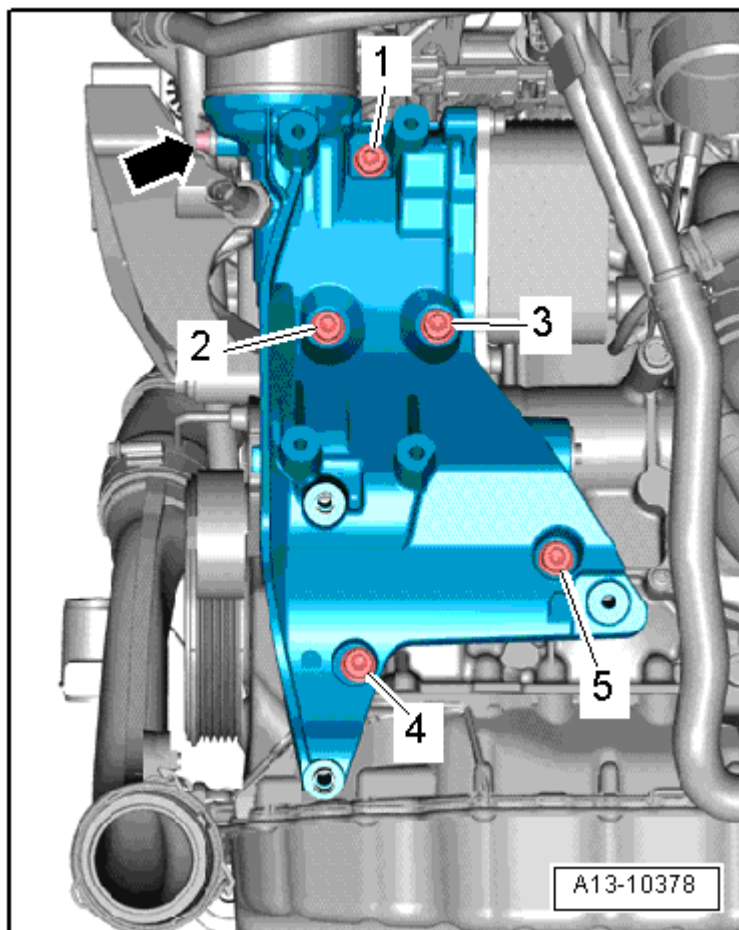


Fig. 8: Identifying Accessory Assembly Bracket Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331

Procedure

- Position the accessory bracket and install the bolt -4-.
- Tighten the bolts in 3 passes in sequence -1 through 5- as follows:
- Tighten the bolts by hand.
- Tighten the bolts to 20 Nm.
- Tighten the bolts an additional 90° (1/4) turn.

SEALING FLANGE AND DUAL MASS FLYWHEEL OVERVIEW

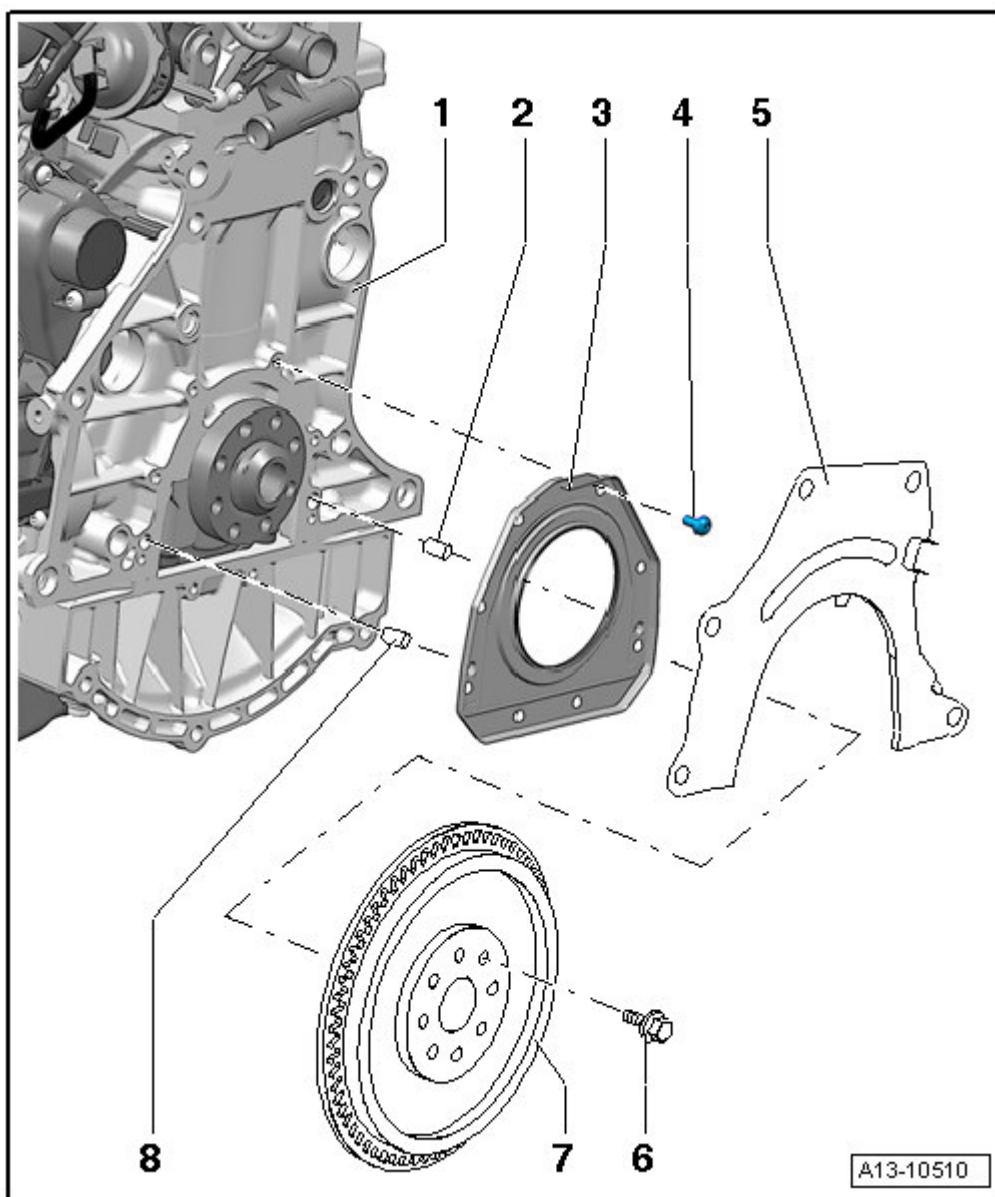


Fig. 9: Identifying Sealing Flange And Dual Mass Flywheel Assembly Overview
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Cylinder Block

- Crankshaft overview. Refer to **CRANKSHAFT OVERVIEW**.
- Piston and connecting rod overview. Refer to **PISTON AND CONNECTING ROD OVERVIEW**.

2. Alignment Pin

- Not installed.

3. Sealing Flange, Transmission Side

- With the seal.
- Always replace as a complete unit.

- Before installing, remove any remaining oil from the crankshaft journal with a clean cloth.
- Do not oil or grease the sealing lip of the seal.
- To install, use the provided guide sleeve.
- The guide sleeve may only be removed after the sealing flange has been slid onto the crankshaft.
- Removing and installing, refer to **SEALING FLANGE, TRANSMISSION SIDE**.

4. Bolt

- For the tightening sequence and tightening specification, refer to **Fig. 10**.

5. Intermediate Plate

- Must be located on the alignment sleeves.
- Be careful not to damage or bend when installing.
- Is hooked in at the sealing flange, refer to **Fig. 11**.

6. Bolt

- 60 Nm + 90° (1/4) additional turn.
- Always replace.
- For the dual mass flywheel.

7. Dual Mass Flywheel

- Removing and installing, refer to **DUAL MASS FLYWHEEL**.
- Only possible to install in one position, the bores are offset

8. Alignment Pin

- Not installed.

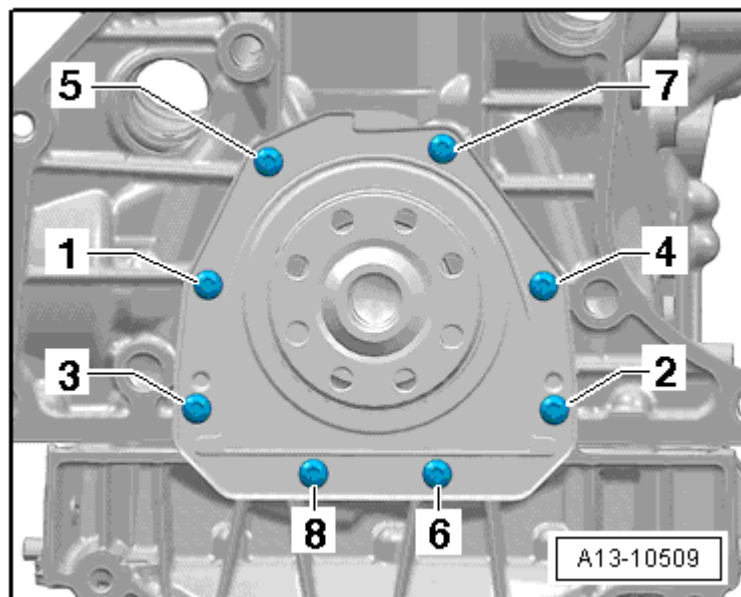


Fig. 10: Identifying Sealing Flange Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331

-- Tighten the bolts in 2 passes in sequence -1 through 8- as follows:

-- Tighten the bolts by hand.

-- Tighten the bolts to 9 Nm.

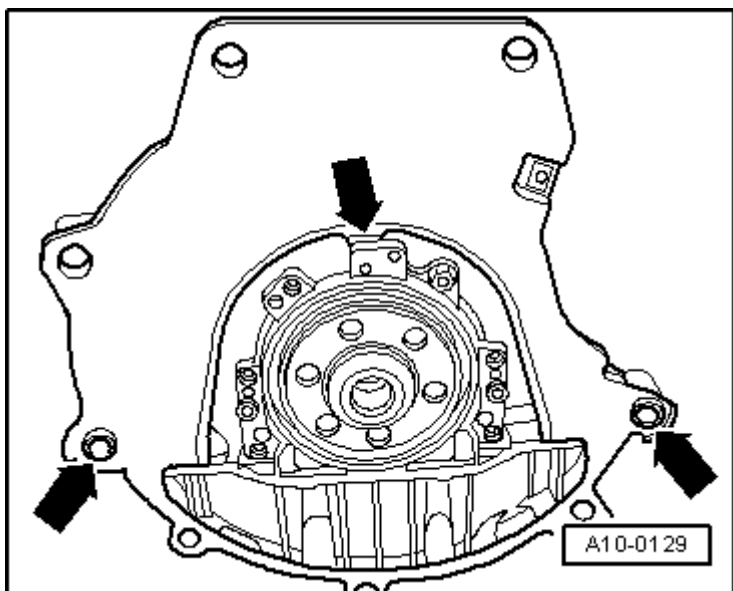


Fig. 11: Identifying Intermediate Plate Alignment Bushings
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Hook the intermediate plate in at the sealing flange and push it onto the alignment sleeves -arrows-.

CRANKSHAFT OVERVIEW

NOTE: **Secure the engine to the assembly stand using the engine and transmission holder VAS 6095 whenever performing any repairs. Refer to ENGINE, SECURING TO THE Engine and Transmission Holder VAS 6095 .**

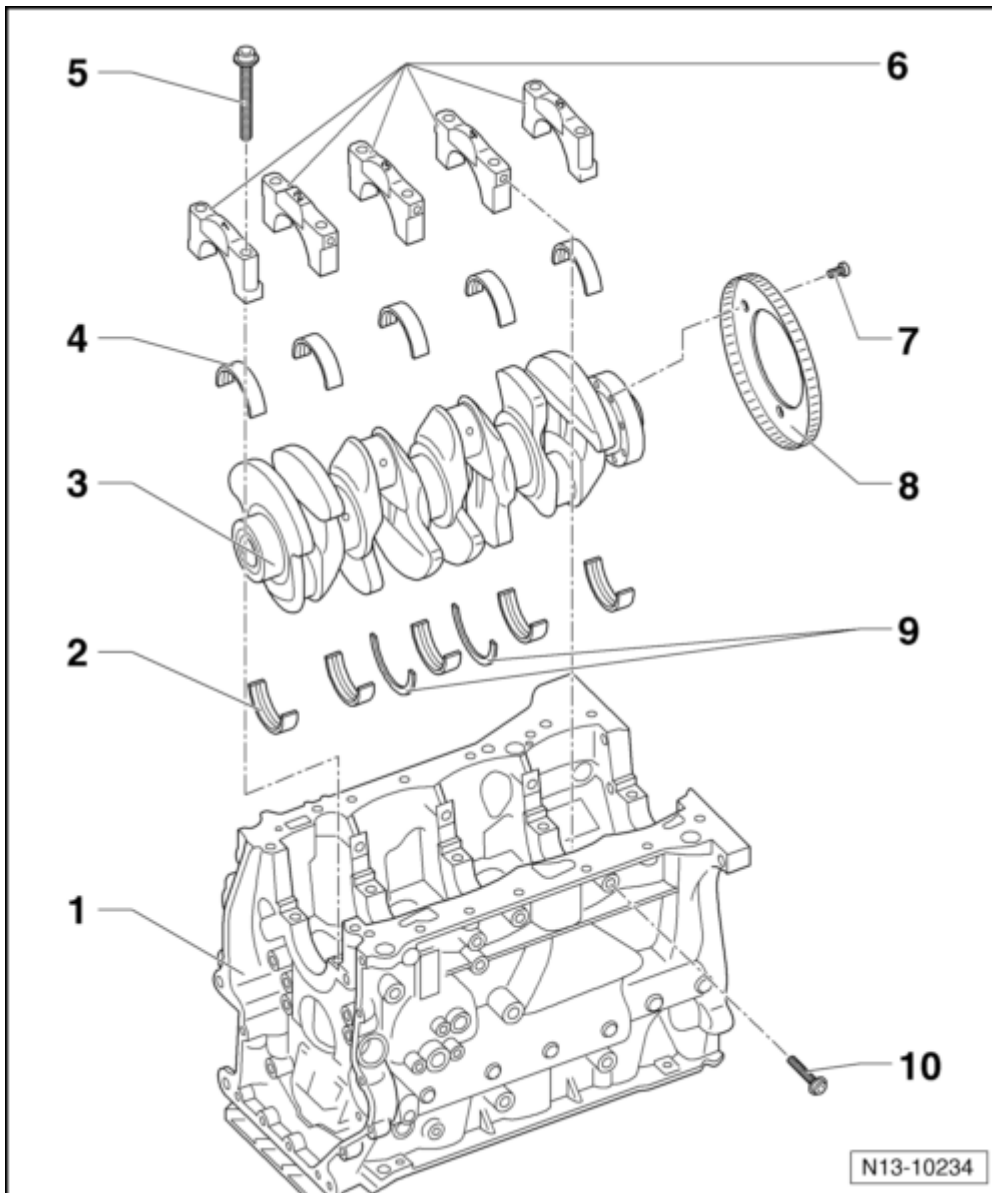


Fig. 12: Identifying Assembly Overview: Crankshaft
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Cylinder Block

- Checking the cylinder bore. Refer to **Fig. 18**.
- If the cylinder block is being replaced, then the bearing shells must be allocated. Refer to **CRANKSHAFT BEARING SHELL ALLOCATION**.
- For the correct piston and cylinder dimensions, refer to **PISTON AND CYLINDER DIMENSIONS**.

2. Bearing Shell, for the Cylinder Block

- With a lubricating groove.
- Do not interchange used bearing shells (mark them).

- Allocation, refer to **CRANKSHAFT BEARING SHELL ALLOCATION**.

3. Crankshaft

- After removal, lay aside so that the sensor wheel (List Item: 8) is not rested on and becomes damaged.
- If the crankshaft is being replaced, then the bearing shells must be allocated to the bearing cap. Refer to **CRANKSHAFT BEARING SHELL ALLOCATION**.
- Crankshaft bearing cap tightening sequence. Refer to **Fig. 13**.
- Crankshaft needle bearing, replacing (vehicles with a Direct Shift Gearbox (DSG). Refer to **CRANKSHAFT NEEDLE BEARINGS**.
- Checking the axial play. Refer to **CRANKSHAFT AXIAL PLAY, CHECKING**.
- Checking the radial play. Refer to **CRANKSHAFT RADIAL PLAY, CHECKING**.
- Do not rotate the crankshaft when measuring the radial play.
- Crankshaft dimensions, refer to **CRANKSHAFT DIMENSIONS**.

4. Bearing Shell, for the Bearing Cap

- Without a lubricating groove
- Do not interchange used bearing shells (mark them).
- Allocation, refer to **CRANKSHAFT BEARING SHELL ALLOCATION**.

5. Bolt

- Always replace.
- For the tightening sequence and specification; refer to **Fig. 13**.

6. Bearing Cap

- Bearing cap 1: Belt pulley side.
- Retaining tabs on the bearing shells and cylinder block/bearing caps must lie above one another.

7. Screw

- 10 Nm + 90° (1/4) additional turn.
- Always replace.
- Replace the sensor wheel every time the screws are loosened. Refer to **CRANKSHAFT SENSOR WHEEL, REPLACING**.

8. Sensor Wheel

- For the engine speed sensor -G28-.
- Only possible to install in one position, the bores are offset.
- Replace the sensor wheel every time screws are loosened. Refer to **CRANKSHAFT SENSOR WHEEL, REPLACING**.

9. Thrust Washers

- For bearing cap 3.

10. Bolt

- Always replace.
- Tightening sequence, refer to **Fig. 13**.

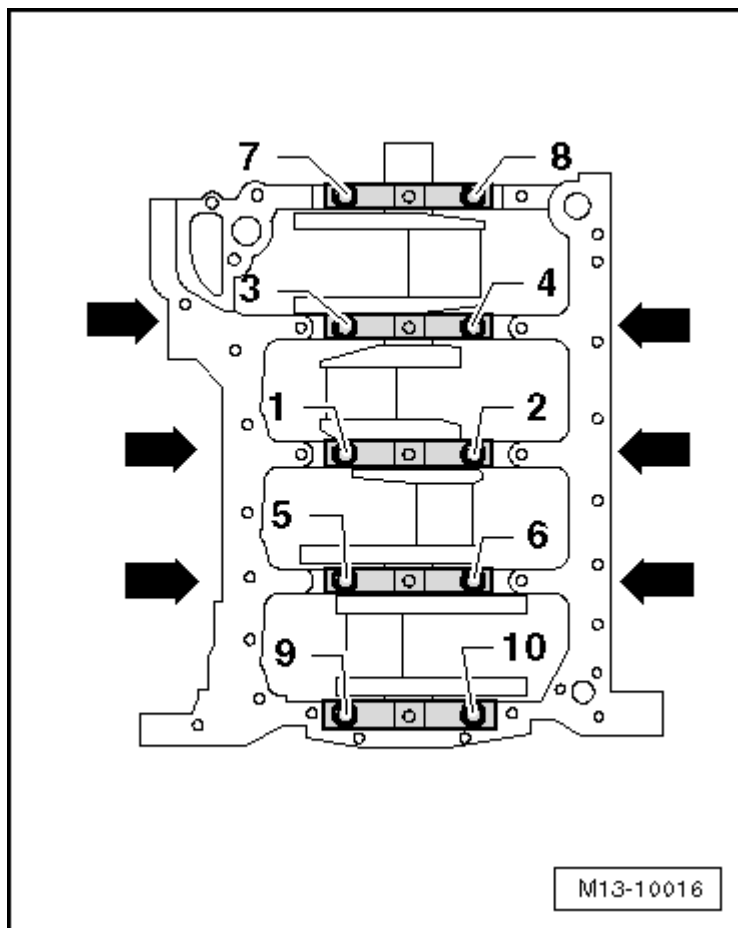


Fig. 13: Identifying Crankshaft Bearing Cap Bolt Tightening Sequence and Specification
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the crankshaft bearing cap bolts in sequence -1 through 10- :

1. Tighten the bolts -1 through 10- and the -arrows- by hand.
2. Tighten the bolts -1 through 10- to 65 Nm.
3. Tighten the bolts -1 through 10- an additional 90° (1/4) turn using a ratchet.
4. Tighten the bolts -arrows- to 20 Nm.
5. Tighten the bolts -arrows- and additional 90° (1/4) turn using a ratchet.

PISTON AND CONNECTING ROD OVERVIEW

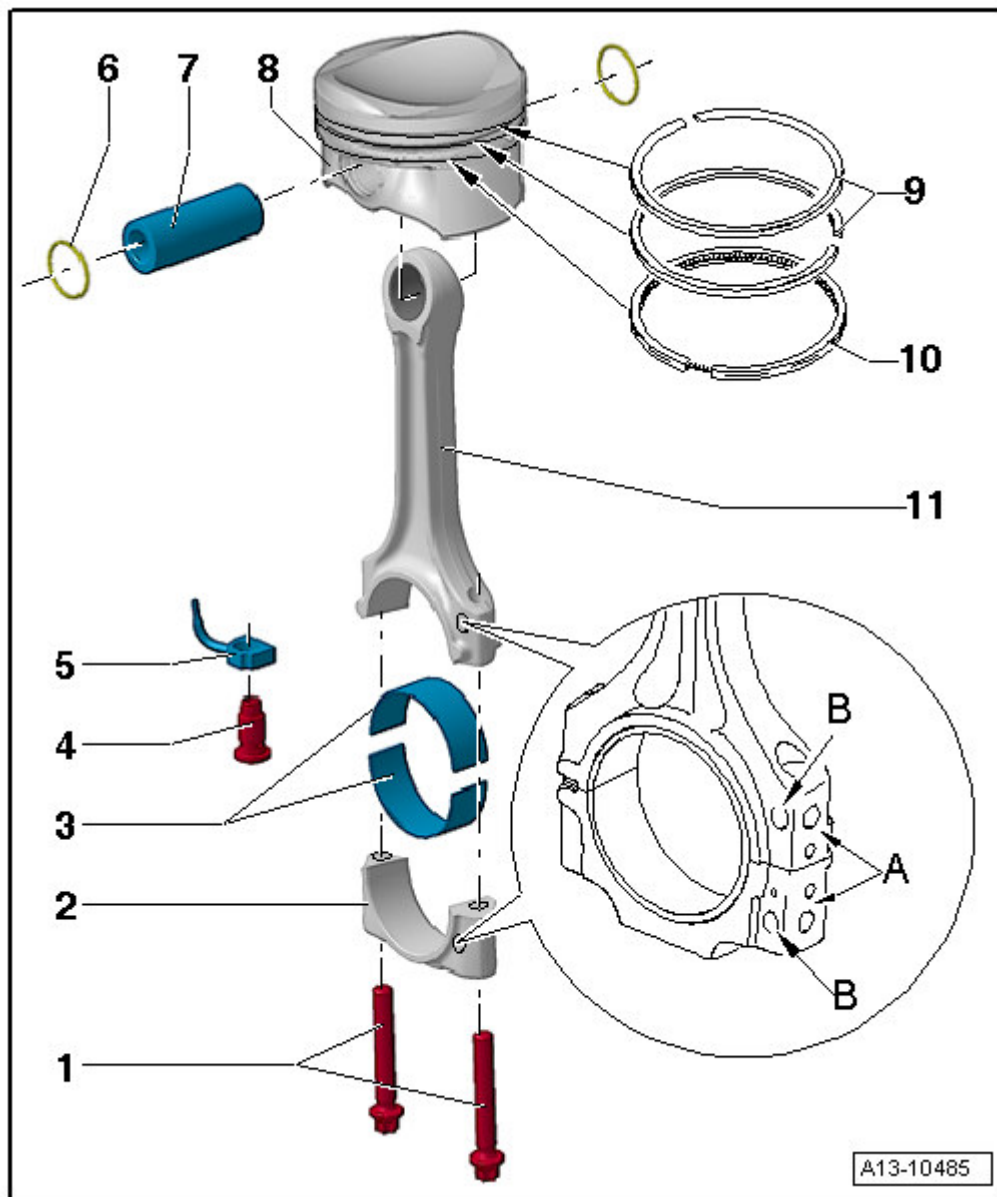


Fig. 14: Identifying Assembly Overview: Pistons And Connecting Rod
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 45 Nm + 90° (1/4) additional turn.
- Always replace.
- Use the old bolts to measure the radial play.
- Do not turn the additional 90° (1/4) turn when measuring the radial play.
- Lubricate the threads and contact surface.

2. Connecting Rod Bearing Cap

- Pay attention to the installed position.
- Mark the affiliation to the cylinder -A-.

- Installed position: The marks -B- point to the belt pulley side.
- Due to the way the separated connecting rod breaks (cracks), the cap fits only in one position and only onto the respective connecting rod.
- Separating a new connecting rod. Refer to **NEW CONNECTING ROD SEPARATING**.

3. Bearing Shells

- Note the installed position, refer to **Fig. 19**.
- Do not interchange used bearing shells (mark them).
- Axial play:

New: 0.10 to 0.35 mm

Wear limit: 0.4 mm

- Measure radial clearance using Plastigage.

New: 0.020 to 0.060 mm

Wear limit: 0.090 mm

Do not rotate the crankshaft when measuring the radial play.

4. Pressure Relief Valve

27 Nm

- Opening pressure 1.6 to 1.9 bar.

5. Oil Spray Jet

- For piston cooling.
- See notes in **OIL PAN AND OIL PUMP**.

6. Circlip

7. Piston Pin

- If difficult to move, heat the piston to approximately 60 °C (140 °F).
- Remove and install using the pilot drift VW 222 A.

8. Piston

- Mark the installed position and cylinder allocation.
- The arrow on the piston face points toward the belt pulley side.
- Install using a piston ring compressor.
- Checking, refer to **Fig. 17**.
- Checking the cylinder bore, refer to **Fig. 18**.
- For the correct piston and cylinder dimensions, refer to **PISTON AND CYLINDER DIMENSIONS**.

9. Compression Ring

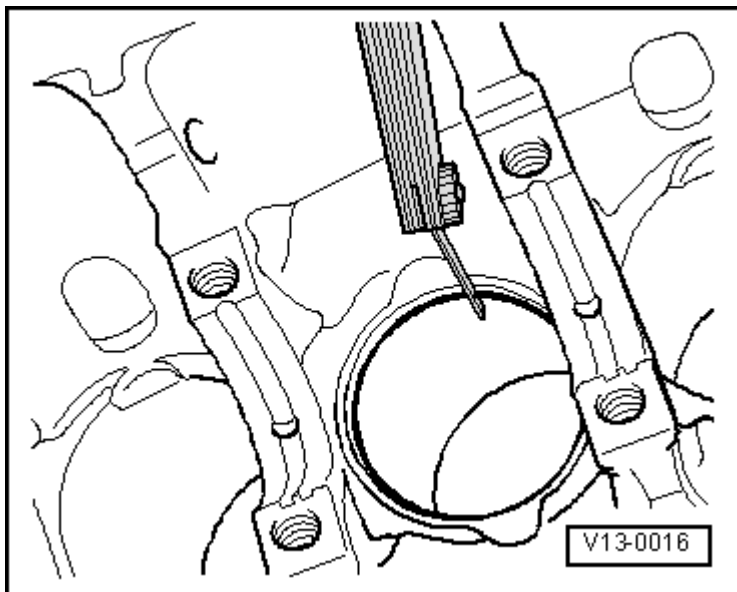
- Offset gaps by 120°
- Use piston ring pliers for removal and installation.
- The "TOP" mark must face up toward the piston crown.
- Checking the ring gap, refer to **Fig. 15**.
- Checking the piston ring groove clearance, refer to **Fig. 16**.

10. Oil Scraping Ring

- 2 pieces.
- Install the upper steel ring so the gap is offset by 120° to the neighboring compression ring.
- Offset all oil scraping ring component gaps to each other.
- Checking the ring gap, refer to **Fig. 15**.
- The side clearance cannot be measured.

11. Connecting Rod

- Only replace as a set.
- Mark the affiliation to the cylinder -A-.
- Installed position: The marks -B- point to the belt pulley side.
- Separating a new connecting rod, refer to **NEW CONNECTING ROD SEPARATING**.

**Fig. 15: Identifying Check Of Piston Ring Gap**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Feeler Gauge

Test Sequence:

-- Push the ring squarely from above, down to approximately 15 mm from the bottom end of the cylinder. To do

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ENGINE 2.0 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBFA & CCTA (Sedan) (A5 Platform)

this use a piston without rings.

Piston Ring	Gap	
	New	Wear limit
Dimensions in mm		
Compression ring	0.20...0.40	0.80
Oil scraping ring	0.25...0.50	0.80

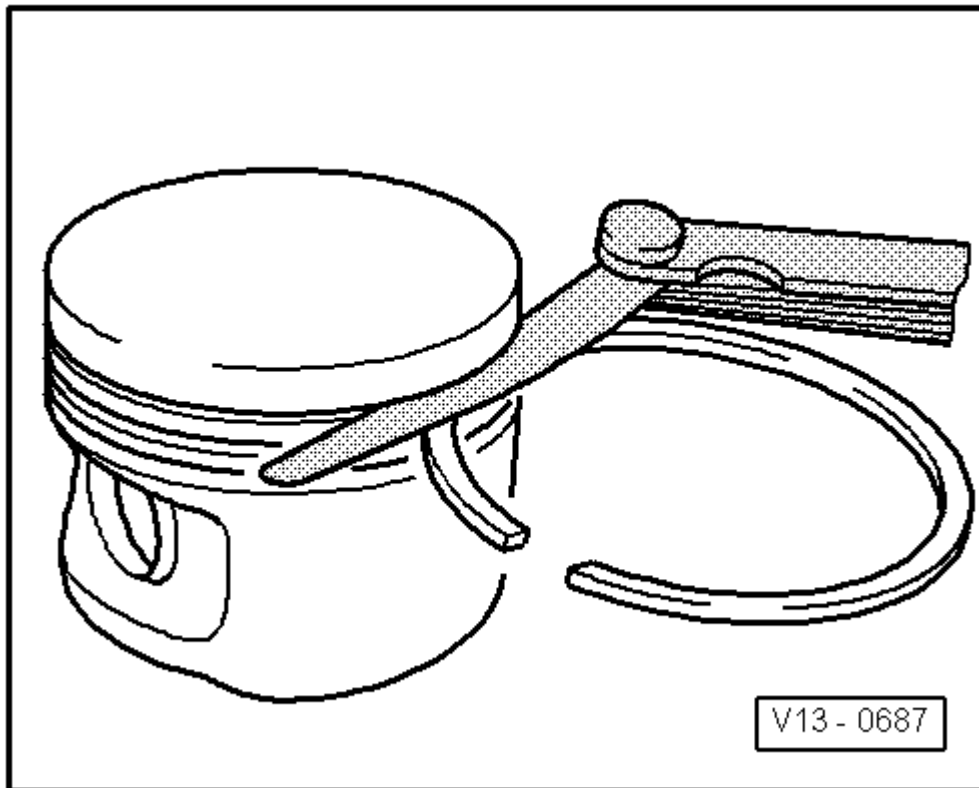


Fig. 16: Identifying Check Of Piston Ring Gap
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Feeler Gauge

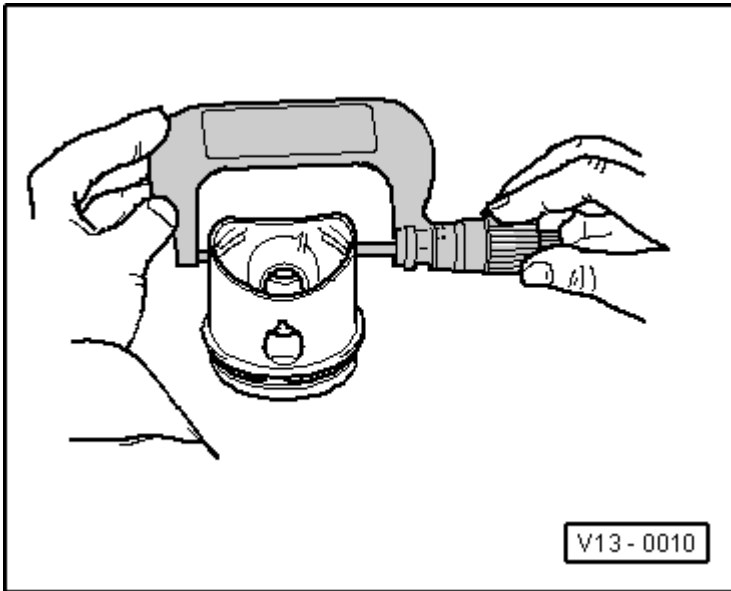
Test Sequence:

-- Clean the ring groove in the piston before checking.

Piston Ring	Ring to Groove Clearance	
	New	Wear limit
Dimensions in mm		
1. Compression ring	0.06...0.09	0.20
2. Compression ring	0.03...0.06	0.15

Oil scraping ring

cannot be measured

**Fig. 17: Identifying Check Of Piston**

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Micrometer 75-100 mm VAS 6071

Test Sequence:

-- Measure the piston approximately 10 mm from the bottom edge and at points offset 90° to the piston pin axis.

- Deviation from nominal dimension: Max. 0.04 mm.

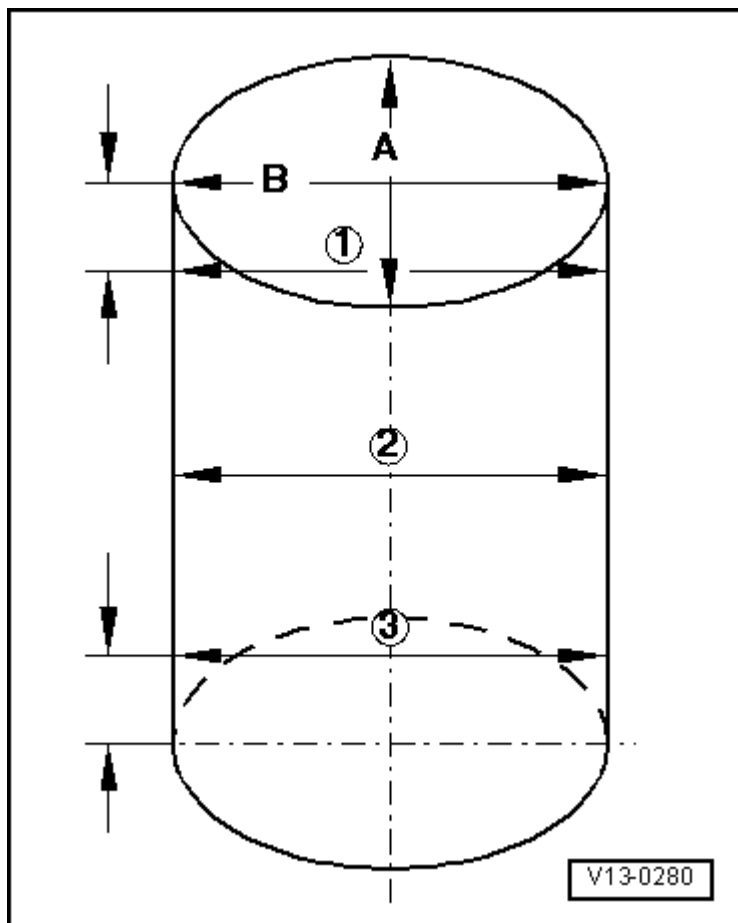


Fig. 18: Identifying Check Of Cylinder Bores

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Cylinder Gauge VAS 6078

CAUTION: Do not bore, hone, grind or rework the cylinder bores with workshop tools. Reworking damages the surface of the cylinder bore.

Test Sequence:

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

- Deviations from nominal dimension: Max. 0.08 mm

NOTE: Measurement of the cylinder bore may not be performed when the cylinder block is mounted on the engine and transmission holder VAS 6095, incorrect measurements are possible.

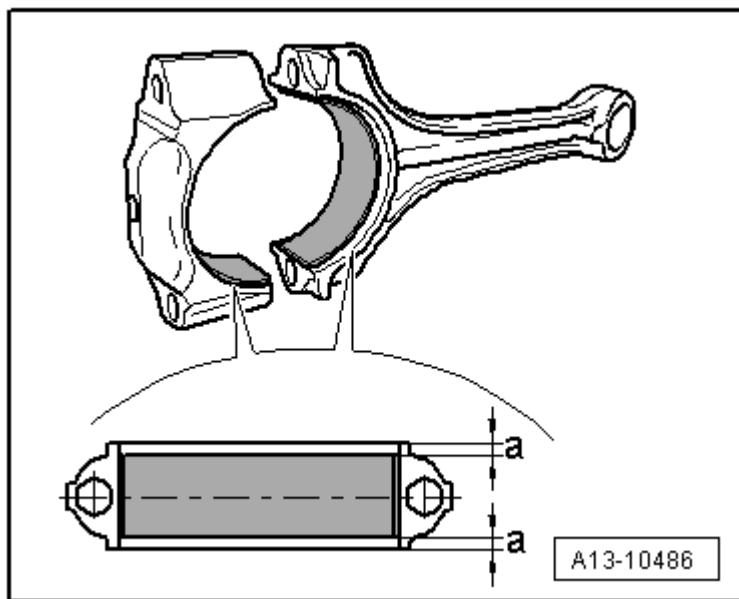


Fig. 19: Identifying Installed Position Of Bearing Shell
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place the bearing shells centrally into the connecting rod and connecting rod cap.

- Dimension -a- must be the same on the left and right sides.

SPECIFICATIONS

CRANKSHAFT DIMENSIONS

(Dimensions are in mm)

Honing Dimension ⁽¹⁾	Crankshaft Bearing Pin Diameter	Connecting Rod Bearing Pin Diameter
Basic dimension	58.00	47.80
(1) The preparation of worn crankshafts is not provided.		

PISTON AND CYLINDER DIMENSIONS

Honing Dimension	Piston and Cylinder Dimensions	
Dimensions in mm	Piston diameter ⁽¹⁾	Cylinder bore diameter ⁽¹⁾
Basic dimension	82.465	82.510
(1) Measurement is without the graphite coating (0.020 mm thick). The coating wears off.		

FASTENER TIGHTENING SPECIFICATIONS

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2010 Volkswagen Jetta TDI

ENGINE 2.0 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBFA & CCTA (Sedan) (A5 Platform)

Component	Fastener Size	Nm
Air Conditioning Compressor to Accessory Bracket Bolt	-	25
Connecting Rod Bolt ⁽¹⁾	-	45 + 90°
Dual Mass Flywheel to Crankshaft Bolt ⁽¹⁾	-	60 + 90°
Generator to Accessory Bracket Bolt	-	23
Pressure Relief Valve	-	27
Ribbed Belt Tensioner Bolt	-	10
Sensor Wheel to Crankshaft Screw ⁽¹⁾	-	10 + 90°
Vibration Damper to Crankshaft Bolt ⁽¹⁾	-	150 + 90°
(1) Always replace		

Accessory Bracket Bolt Tightening Sequence and Specification

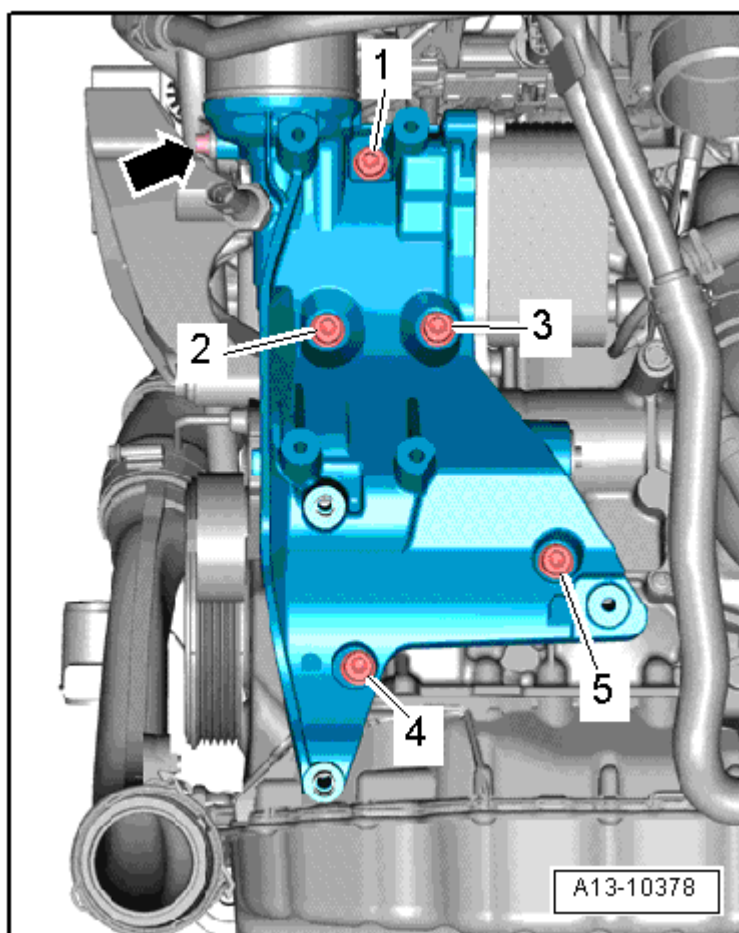


Fig. 20: Identifying Accessory Assembly Bracket Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Position the accessory bracket and then install the bolt -4-. Tighten the bolts in 3 passes in sequence -1

through 5- :

- First pass, tighten the bolts by hand.
- Second pass, tighten the bolts to 20 Nm.
- Final pass, tighten the bolts an additional 90° (1/4) additional turn.

Transmission Side Sealing Flange Bolt Tightening Sequence and Specification

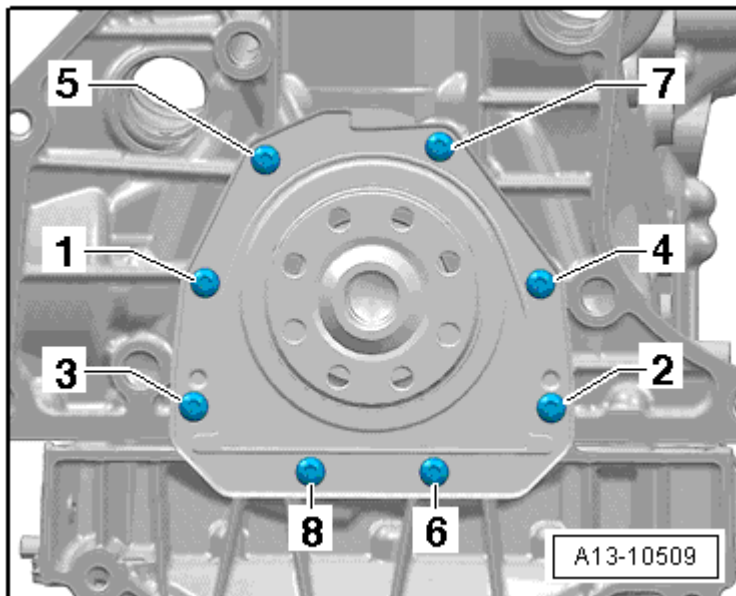


Fig. 21: Identifying Sealing Flange Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tighten the bolts in 2 passes in sequence -1 through 8- :
- First pass, tighten the bolts by hand.
- Final pass, tighten the bolts to 9 Nm.

Crankshaft Bearing Cap Bolt Tightening Sequence and Specification

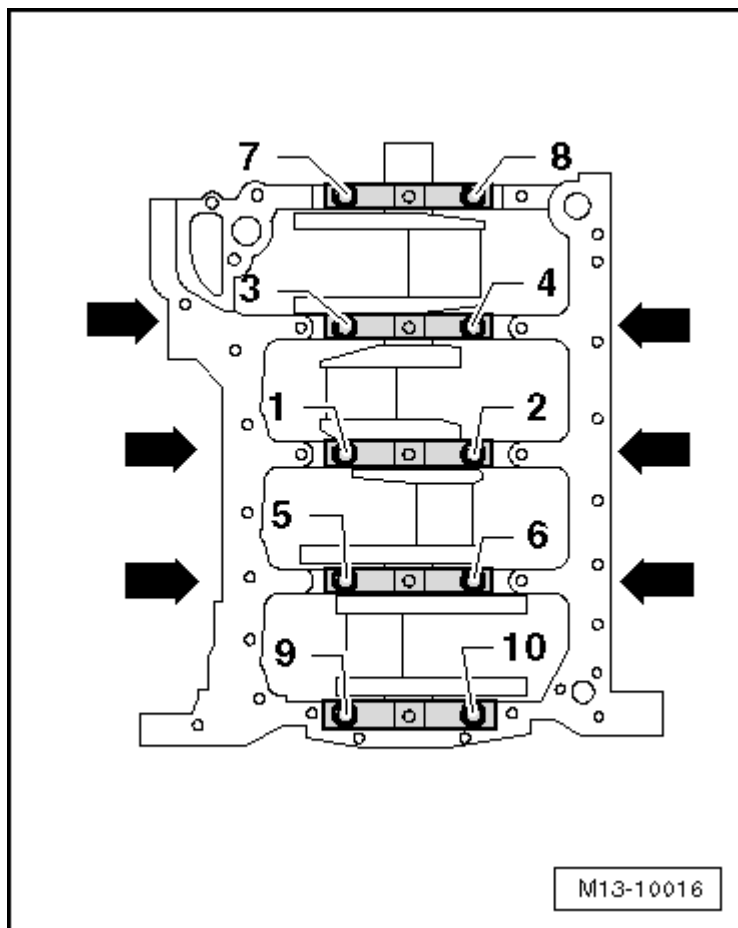


Fig. 22: Identifying Crankshaft Bearing Cap Bolt Tightening Sequence and Specification
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tighten the crankshaft bearing cap bolts in sequence -1 through 10- :
- Tighten the bolts -1 through 10- and the -arrows- by hand.
- Tighten the bolts -1 through 10- to 65 Nm.
- Tighten the bolts -1 through 10- an additional 90° (1/4) turn using a ratchet.
- Tighten the bolts -arrows- to 20 Nm.
- Tighten the bolts -arrows- an additional 90° (1/4) turn using a ratchet.

DIAGNOSIS AND TESTING

CRANKSHAFT AXIAL PLAY, CHECKING

Special Tools And Workshop Equipment Required

- Dial Gauge Holder VW 387

- Dial Gauge 0-10 mm VAS 6079

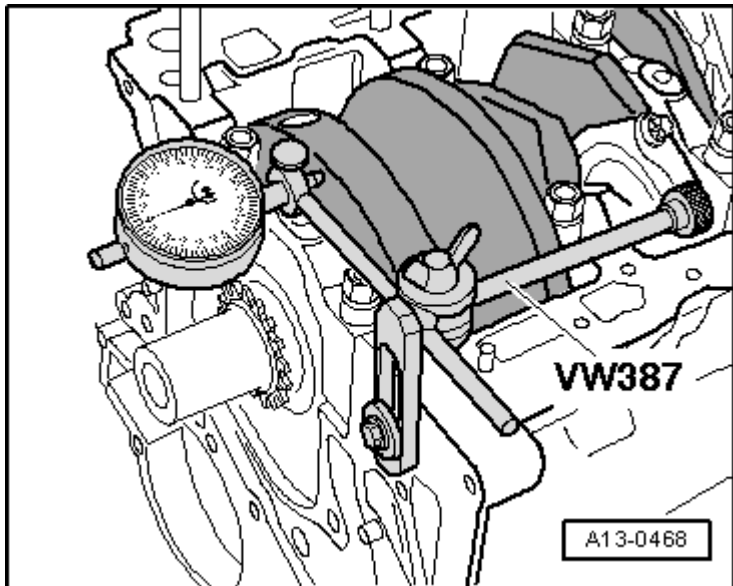
Test Sequence:

Fig. 23: Identifying Dial Indicator Attached Together With VW387 Dial Gauge Holder To Cylinder Block

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the dial gauge VAS 6079 with the dial gauge holder VW 387 to the cylinder block and set the indicator against the crankshaft counterweight.

-- Press the crankshaft by hand against the dial gauge and set the gauge to "0".

-- Press the crankshaft off the gauge and read the value.

Axial Clearance:

- New: 0.07 to 0.23 mm
- Wear limit: 0.30 mm

CRANKSHAFT RADIAL PLAY, CHECKING**Special Tools And Workshop Equipment Required**

- Plastigage

Conditions:

- Do not rotate the crankshaft when checking the radial clearance.

Test Sequence:

NOTE: **Do not interchange used bearings**

Bearing shells that are worn down to the nickel layer must be replaced.

- Remove the main bearing cap and clean the bearing cap and bearing journal.
- Place the Plastigage over the entire width of the bearing journal or onto the bearing shell.
 - The Plastigage must rest in the center of the bearing shell.
- Install the bearing cap and tighten the bolts to 60 Nm. Do not rotate the crankshaft when doing so.
- Remove the main bearing cap again.
- Compare the width of the Plastigage with the measuring scale.

Radial Clearance:

- New: 0.017 to 0.037 mm
- Wear limit: 0.15 mm

REMOVAL AND INSTALLATION**RIBBED BELT****Special Tools And Workshop Equipment Required**

- Locking Pin T10060 A

Removing

CAUTION: Risk of destroying due to reversed running direction of a used ribbed belt:

- **Before removing ribbed belt, mark the running direction with chalk or a felt-tip pen for reinstallation later.**

- Remove the noise insulation. Refer to **Description and Operation** .
- Release the locking clips -arrows- and remove the right charge air hose.

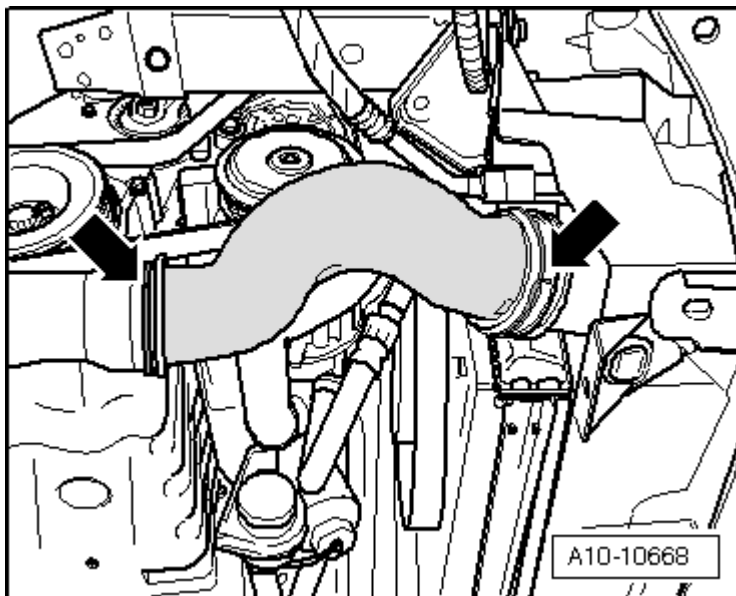


Fig. 24: Identifying Right Charge Air Guide Hose
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- To release the tension on the ribbed belt, rotate the tensioner in the -direction of the arrow- from underneath.

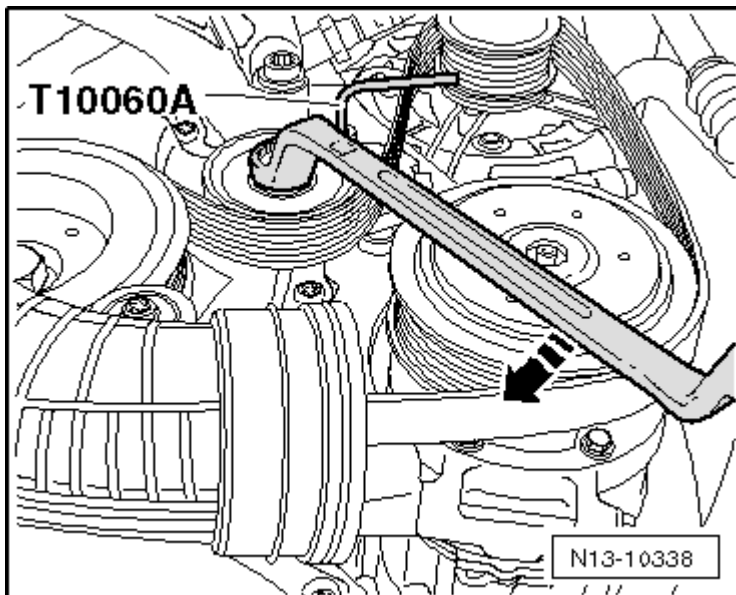


Fig. 25: Identifying Wrench And Locking Pin -T10060 A-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Secure the tensioner with the locking Pin T10060 A.

-- Remove the ribbed belt.

Installing

Install in reverse order of removal. When doing this note the following:

NOTE: Check to make sure the following components are secure before installing the ribbed belt: The belt tensioner, generator and A/C compressor or bracket with idler pullet.

-- Place the ribbed belts on the vibration damper, generator and A/C compressor belt pulleys.

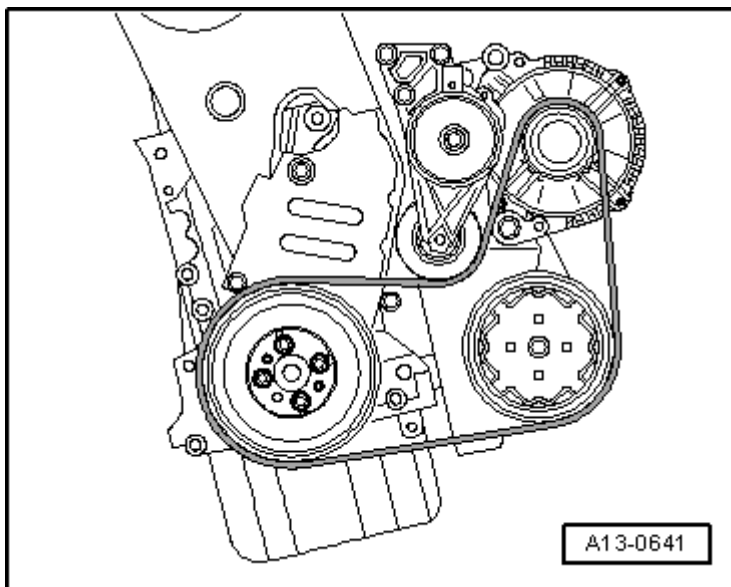


Fig. 26: Identifying Ribbed Belt Routing

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Using an box-end wrench, rotate the tensioner in the -direction of the arrow- and remove the locking Pin T10060 A.

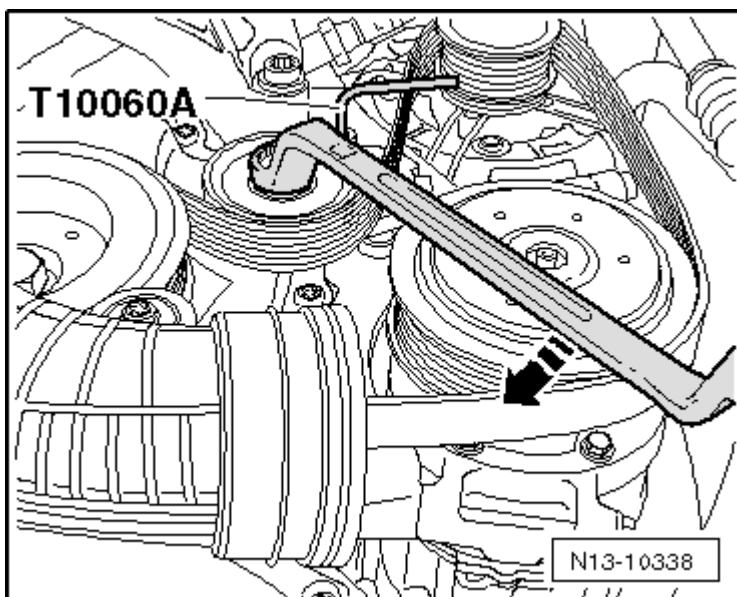


Fig. 27: Identifying Wrench And Locking Pin -T10060 A-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Release the tensioner.
- Check whether the ribbed belt is routed correctly.
- Start the engine and check whether ribbed belt runs correctly.

RIBBED BELT TENSIONER

Special Tools And Workshop Equipment Required

- Engine Support Bridge 10-222 A
- Bracket with Spindle and Hook 10-222 A/10
- Shackle 10-222 A/12
- Adapter 10-222 A/13 (quantity 2)
- Locking Pin T10060 A
- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332

Removing

- Remove the noise insulation. Refer to **Description and Operation** .
- Remove the right front wheel.
- Remove the front part of the right wheel housing liner. Refer to **Removal and Installation** .
- Remove the after-run coolant pump bracket bolt -2-.

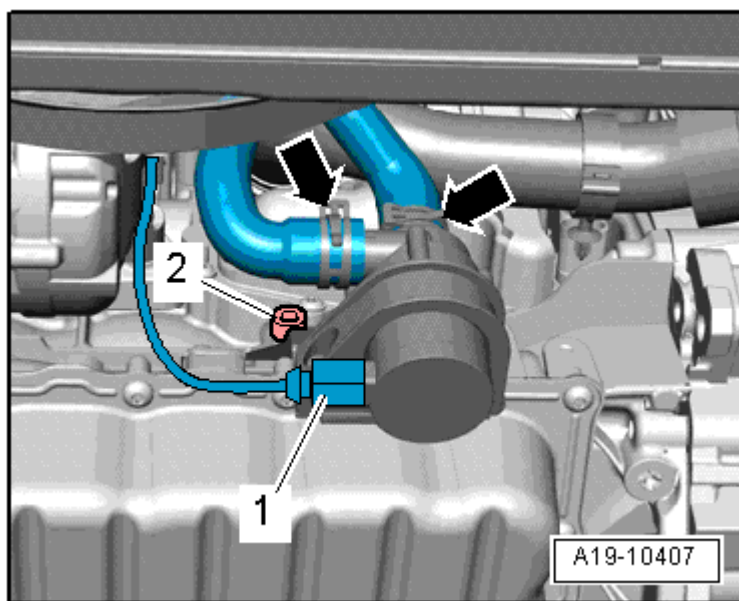


Fig. 28: Identifying After-Run Coolant Pump V51 Bracket Bolt -2-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The after-run coolant pump -V51- stays in the installed position.

-- First, remove the pendulum support bolt -1-.

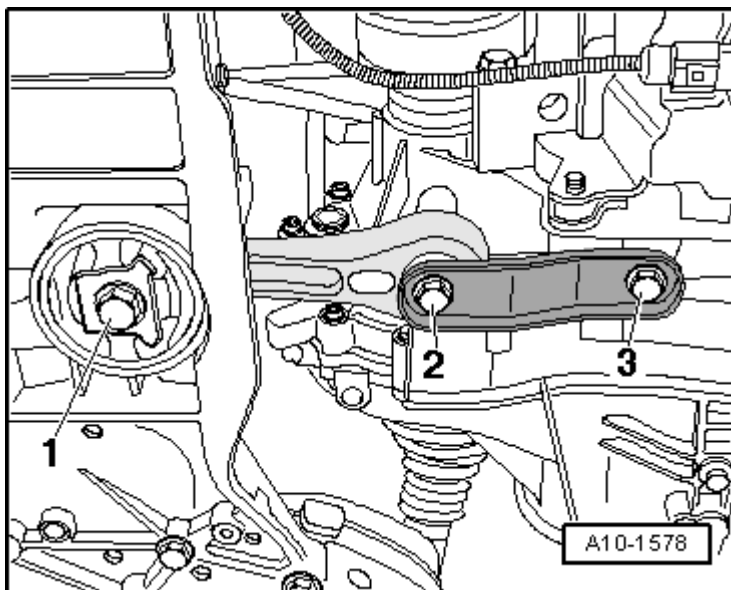


Fig. 29: Identifying Pendulum Support & Bolts
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Then, remove the bolts -2 and 3- and remove the pendulum support.

-- Remove the charge air pipe from the noise generator, if equipped. Refer to **CHARGE AIR PIPE FROM**

NOISE GENERATOR .

-- Install the engine support bridge 10-222 A using the following special tools:

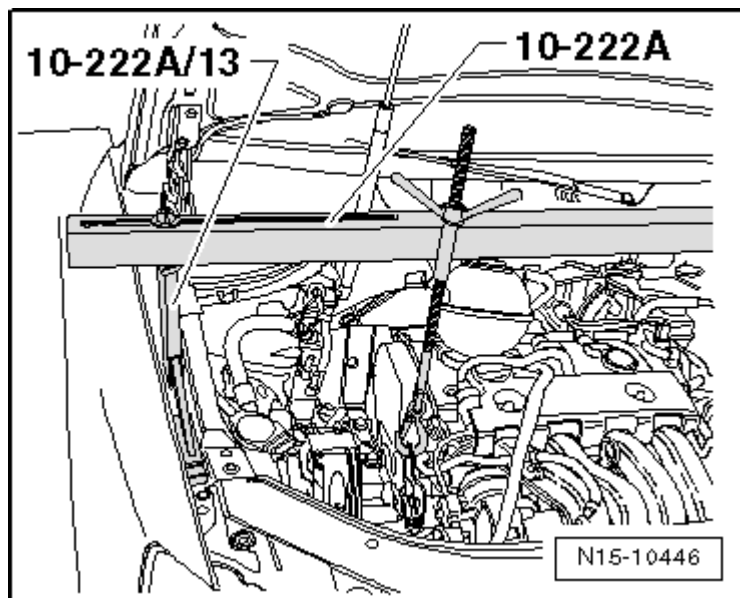


Fig. 30: Identifying Engine Support Bridge -10-222 A- And Special Tools
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Bracket with spindle and Hook 10-222 A/10
- Shackle 10-222 A/12
- Adapter 10-222 A/13 (Qty: 2)

-- Tension the engine with the spindle.

-- Remove the ribbed belt. Refer to **RIBBED BELT**.

-- Remove the engine mount to engine mount bracket bolts -arrows-.

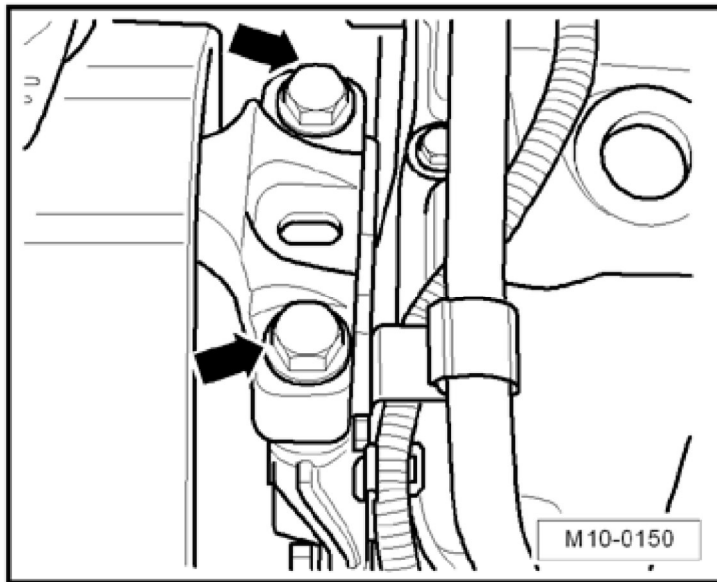


Fig. 31: Identifying Engine Mount Bolts

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Lower the engine approximately 55 mm.

-- Free up the electrical harness -arrow-.

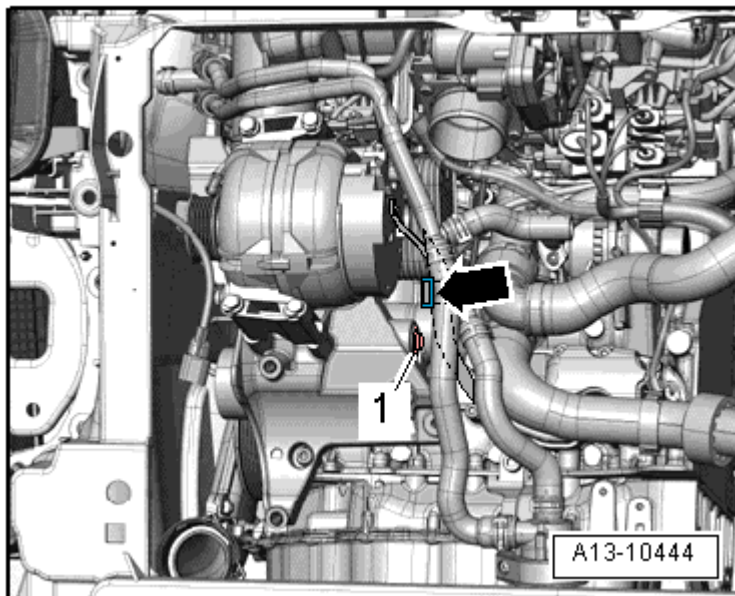


Fig. 32: Identifying Ribbed Belt Tensioner Bolt And Locating Electrical Wiring Harness

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolt -1- and remove the ribbed belt tensioner from the accessory bracket.

Installing

Install in reverse order of removal. When doing this note the following:

- Tightening specification for the ribbed belt components. Refer to **RIBBED BELT OVERVIEW**.
- Tightening specifications for the engine mount. Refer to **ENGINE AND TRANSMISSION MOUNT OVERVIEW**.

-- Insert the ribbed belt tensioner -1- into the accessory bracket -3- and tighten the bolt -5-.

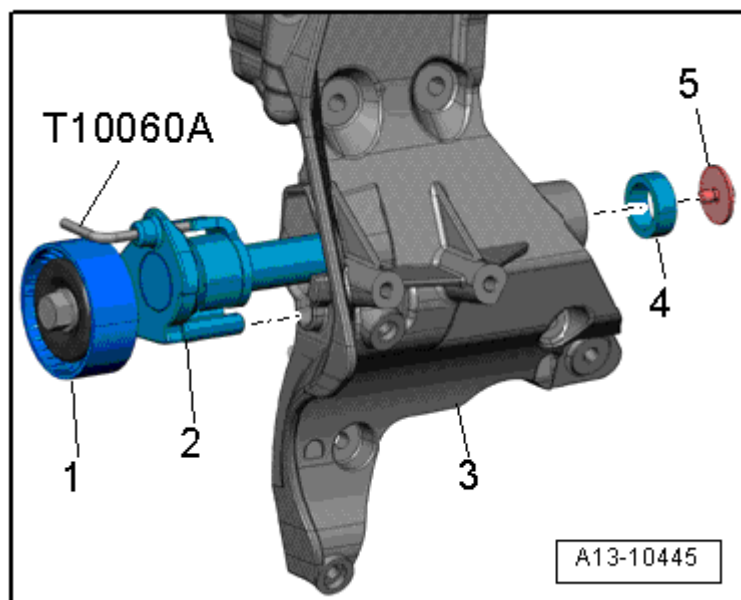


Fig. 33: Identifying Tensioning Device For Ribbed Belt
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Note the support -2- installed location: insert the support tab in the hole on the accessory bracket.
- Note the centering sleeve -4-.

-- Adjust the engine mount; refer to **ENGINE AND TRANSMISSION MOUNT, ADJUSTING**.

ACCESSORY BRACKET

Special Tools And Workshop Equipment Required

- Torque Wrench (5-50 Nm) V.A.G 1331

Removing

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

-- Remove the ribbed belt. Refer to **RIBBED BELT**.

-- Remove the charge air pipe from the noise generator, if equipped. Refer to **CHARGE AIR PIPE FROM**

NOISE GENERATOR .

- Remove the generator. Refer to **Removal and Installation** .
- Disconnect the connector from the oil pressure switch or from the oil pressure switches.
- Disconnect the solenoid clutch electrical connector -1- from Air Conditioning (A/C) compressor.

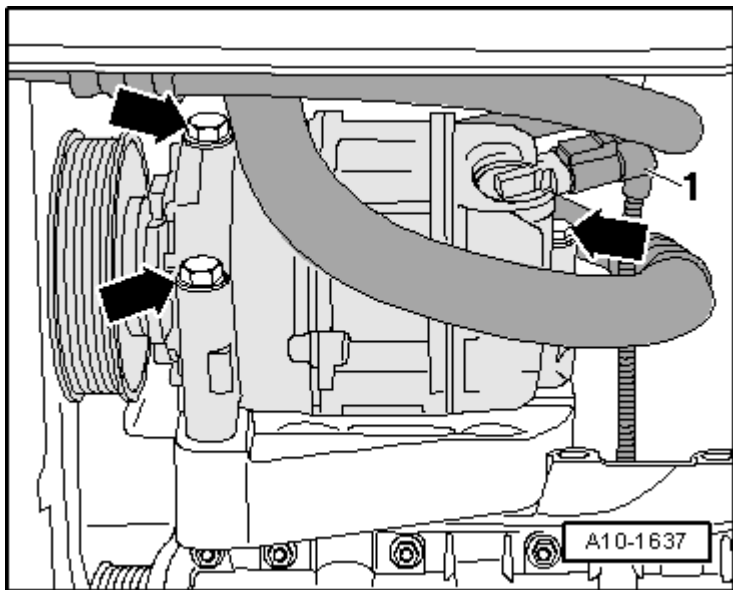


Fig. 34: Identifying A/C Compressor Bolts And Solenoid Clutch Electrical Connector
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

WARNING: Risk of injury from refrigerant:

- Do not open the A/C refrigerant circuit.

- Remove the A/C compressor bolts -arrows-.

CAUTION: Risk of damaging the refrigerant lines and hoses:

- Do not stretch, kink or bend the refrigerant lines and hoses.

- Tie up the compressor with the refrigerant lines attached to the longitudinal member.
- Remove the oil dipstick guide tube bolt -arrow-.

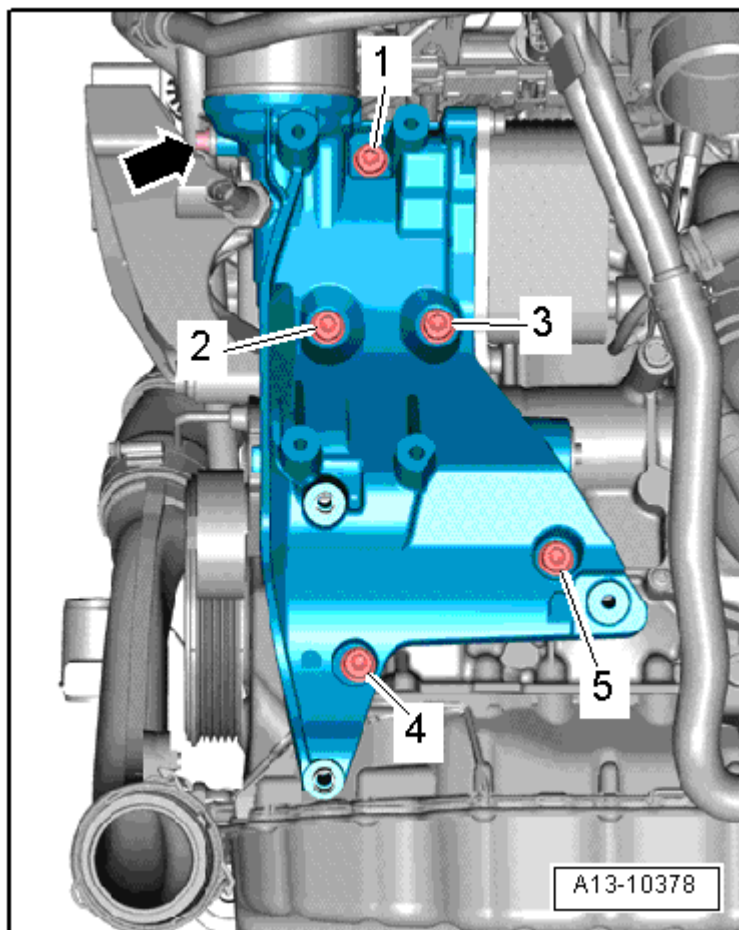


Fig. 35: Identifying Accessory Assembly Bracket Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolts -5 through 1- and remove the accessory bracket from the coolant pump housing.

Installing

Install in reverse order of removal. When doing this note the following:

NOTE: Tightening specifications, refer to **RIBBED BELT OVERVIEW**.

Replace the bolts that have been tightened to a torque angle.

Replace the O-rings and seals.

-- Lubricate the O-rings -4- with coolant.

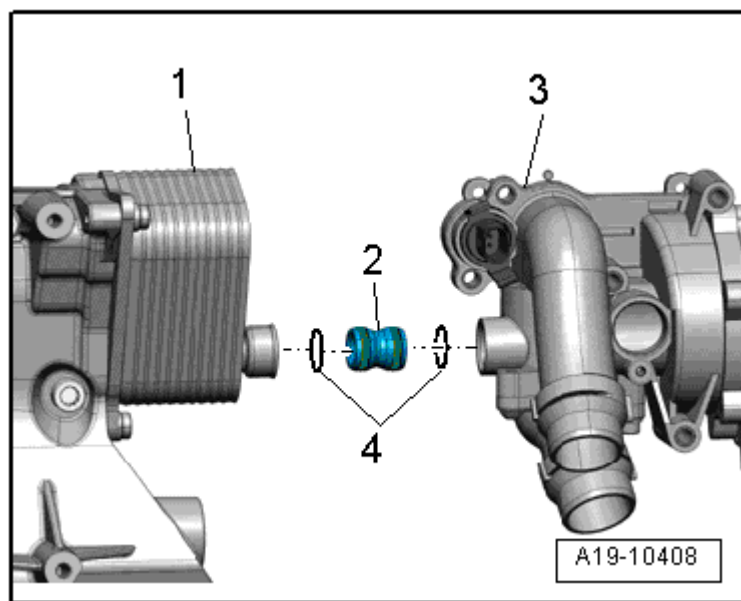


Fig. 36: Identifying Accessory Assembly Bracket, Coolant Pump Housing, Connection And O-Rings
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Install the connection -2- into the coolant pump housing -3-.
- Press the accessory bracket -1- onto the connection, install and tighten the bolts. Refer to **Fig. 8**.
- Install the A/C compressor. Refer to **Removal and Installation** .
- Install the generator. Refer to **Removal and Installation** .
- Install the ribbed belt. Refer to **RIBBED BELT**.
- Fill the coolant. Refer to **DRAINING AND FILLING** .

VIBRATION DAMPER

Special Tools And Workshop Equipment Required

- Locking Pin T10060 A
- Counter Hold Tool T10355

Removing

- Remove the noise insulation. Refer to **Description and Operation** .
- Remove the right front wheel.
- Remove the right front wheel housing liner. Refer to **Removal and Installation** .

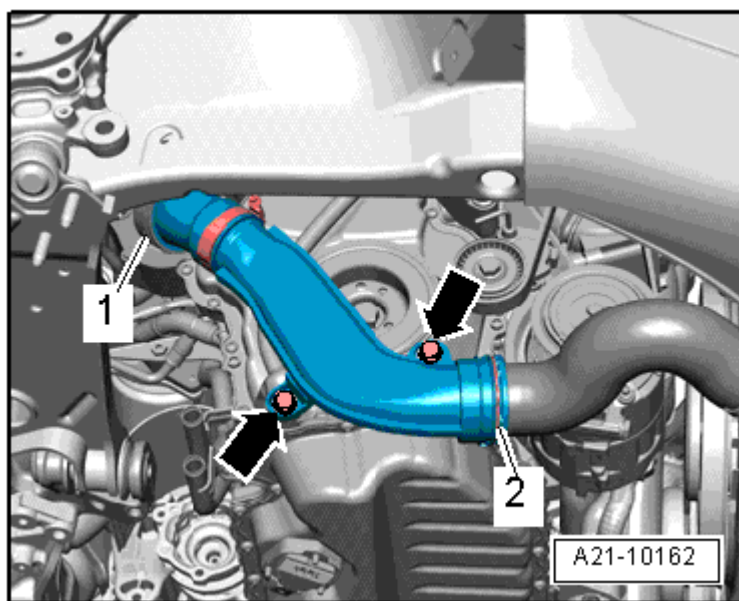


Fig. 37: Identifying Air Guide Pipe And Bolts

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the bolts -arrows-.
- Remove the air guide pipe by lifting the clamps -1 and 2-.
- Remove the ribbed belt. Refer to **RIBBED BELT**.
- Use the counter hold tool T10355 to rotate the vibration damper to Top Dead Center (TDC) -arrow- :

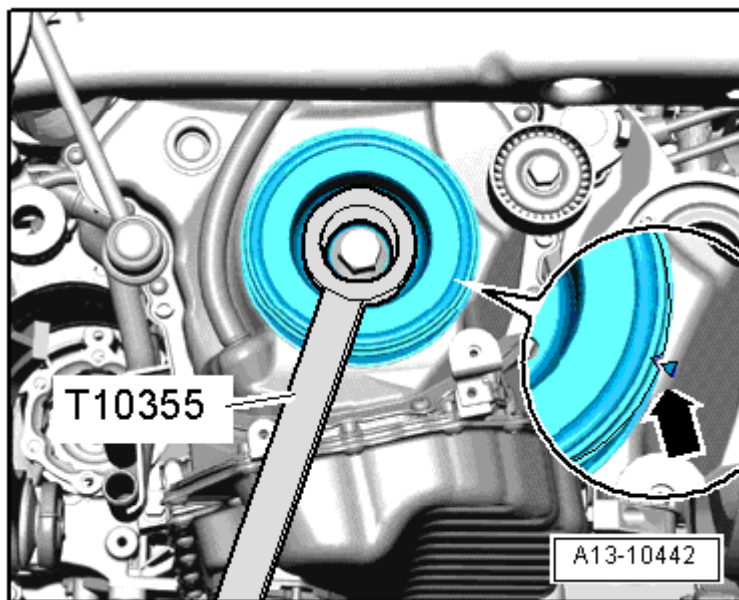


Fig. 38: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The notch on the vibration damper must line up with the arrow mark on the lower timing chain cover.

CAUTION: The engine could be destroyed:

- In order NOT to change the valve timing, the crankshaft must NOT be moved out of the TDC position when the vibration damper is removed.

-- Use the counter hold tool T10355 tool to remove the vibration damper bolt.

-- Remove the vibration damper.

Installing

Install in reverse order of removal. When doing this note the following:

NOTE: Tightening specifications, refer to RIBBED BELT OVERVIEW.

Replace the vibration damper bolt with O-ring -1-.

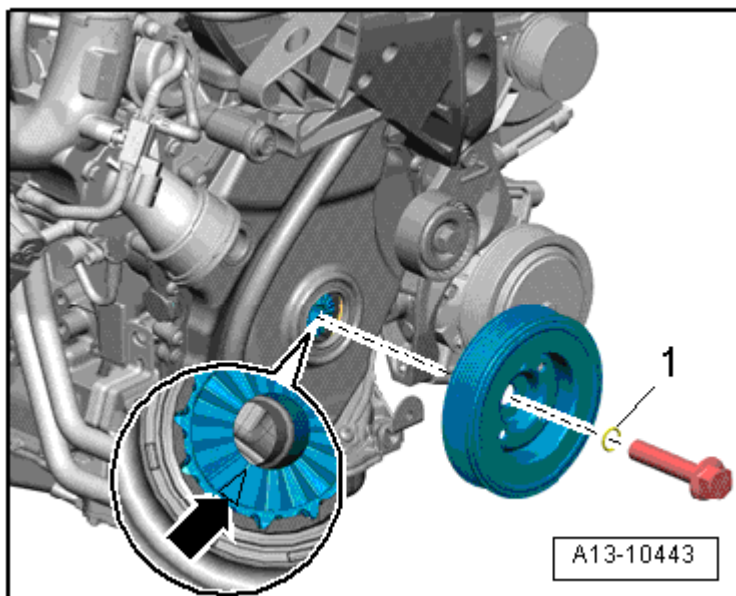


Fig. 39: Identifying O-Ring And Tooth Contour
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Lubricate the sealing lip on the seal with engine oil.

-- Mount the vibration damper; when doing this, pay attention to the tooth contour -arrow-.

DUAL MASS FLYWHEEL

Special Tools And Workshop Equipment Required

- Flywheel Retainer 3067

Removing

-- Remove the transmission. Refer to one of the following:

- Manual Transmission: **[For transmission(s) 02Q] TRANSMISSION** .
- Direct Shift Gearbox: **[For transmission(s) 02E] Removal and Installation** .

CAUTION: To prevent damage to the dual mass flywheel when removing, the bolts -B- must not be removed using an air-powered or impact wrench. Always remove the bolts by hand only!

-- Mark the dual mass flywheel to the engine.

-- Rotate the dual mass flywheel -A- so that the bolts -B- are centered with the holes -arrows-.

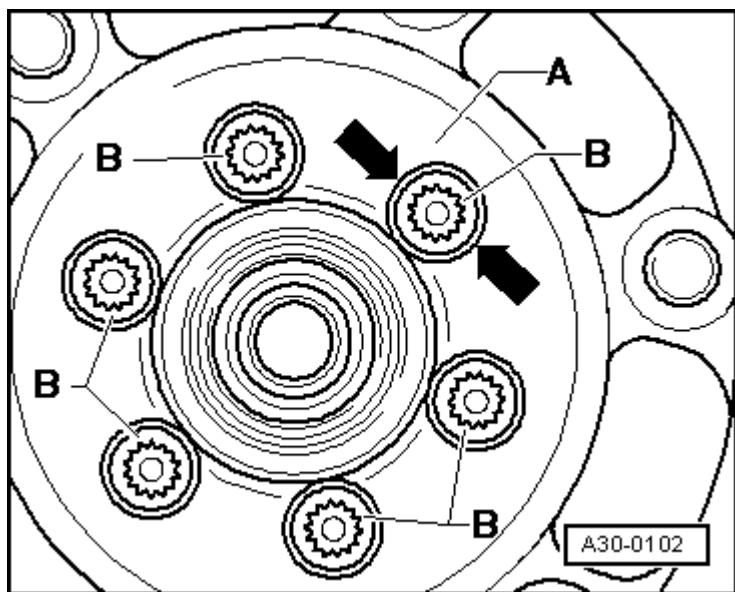


Fig. 40: Identifying Dual-Mass Flywheel & Bolts

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- When removing the bolts -B-, make sure that the bolt head does not contact the dual mass flywheel -arrows- and thereby cause damage when turning it further.

-- Install the flywheel retainer 3067 into the hole in the cylinder block -B-.

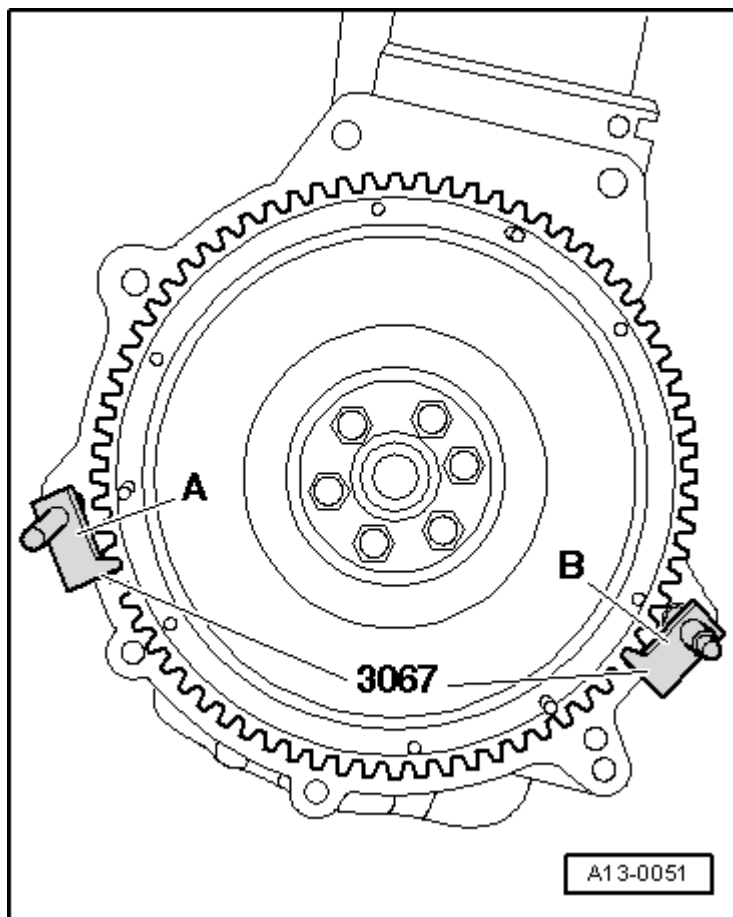


Fig. 41: Identifying Retainer -3067- Inserted In Hole On Cylinder Block
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the dual mass flywheel by hand.

Installing

Install in reverse order of removal. When doing this note the following:

Tightening specifications, refer to **SEALING FLANGE AND DUAL MASS FLYWHEEL OVERVIEW**.

-- Secure with new bolts.

-- Install the flywheel retainer 3067 into the hole in the cylinder block -A-.

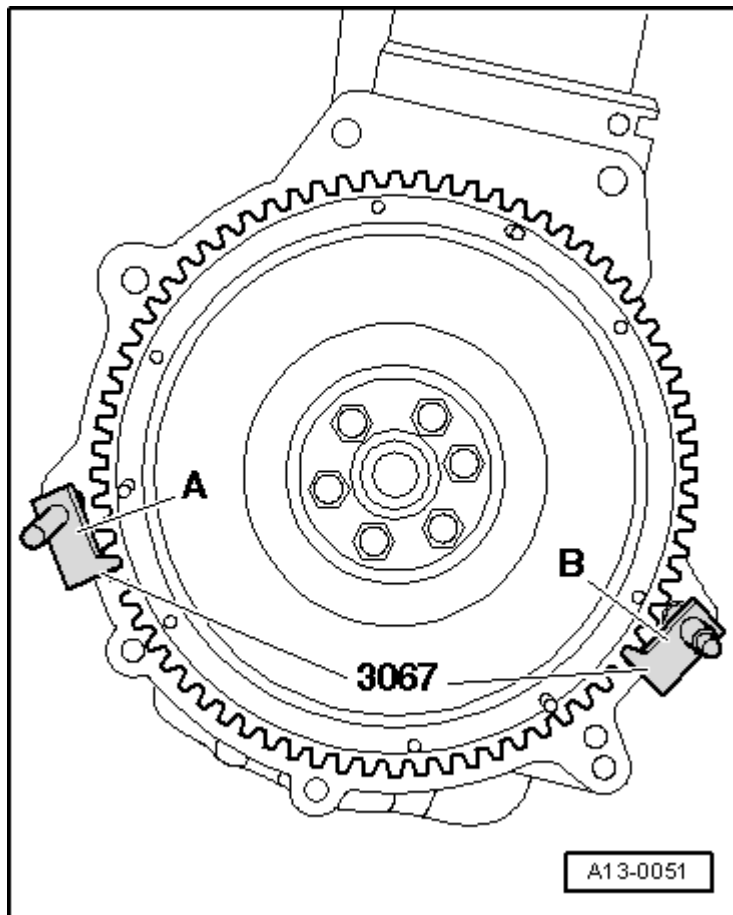


Fig. 42: Identifying Retainer -3067- Inserted In Hole On Cylinder Block
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

SEALING FLANGE, TRANSMISSION SIDE

Special Tools And Workshop Equipment Required

- Guide Sleeve T20097
- Silicone Sealant D 174 003 A2
- Flat Scraper
- Hand Drill with Plastic Brush Attachment
- Protective Eyewear

Requirement:

- The dual mass flywheel is removed. Refer to **DUAL MASS FLYWHEEL**.

Removing

-- Unhook the intermediate plate at the sealing flange and at the alignment sleeves -arrows-.

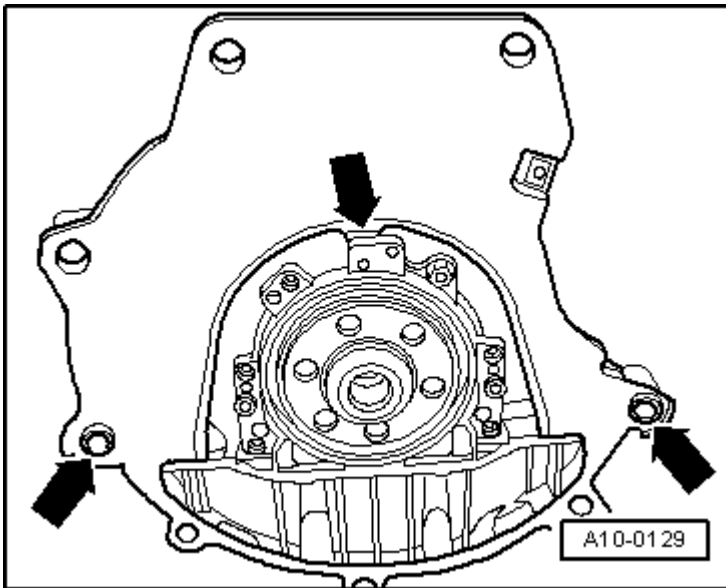


Fig. 43: Identifying Intermediate Plate Alignment Bushings
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the bolts -1 through 8- and remove the sealing flange.

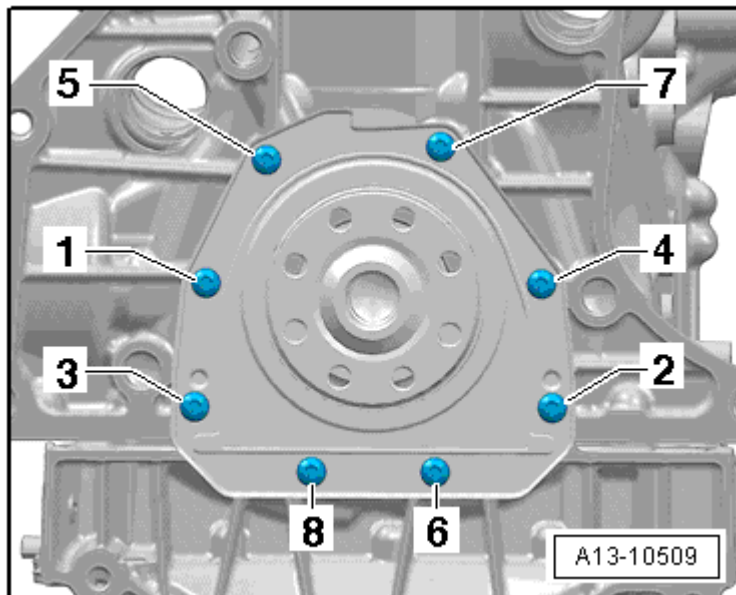


Fig. 44: Identifying Sealing Flange Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

NOTE: Note the expiration date of the silicone sealant.

The sealing flange must be installed within 5 minutes after applying the silicone

sealant.

-- Remove any sealant residue on the cylinder block using a flat blade scraper.

WARNING: Risk of eye injury.

- **Wear protective eyewear.**

-- Remove any sealant still on the sealing flange using a rotating plastic brush.

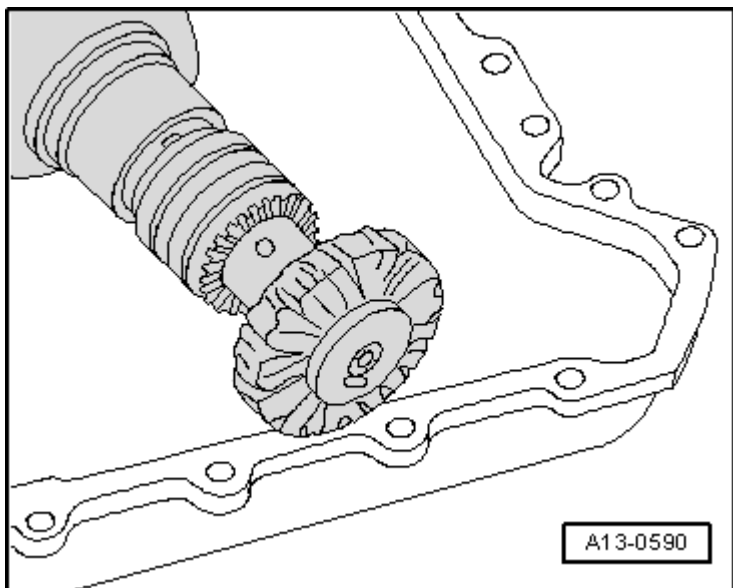


Fig. 45: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Clean the sealing surfaces, they must be free of oil and grease.

-- Remove any oil residue on the crankshaft using a clean cloth.

-- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 2 mm).

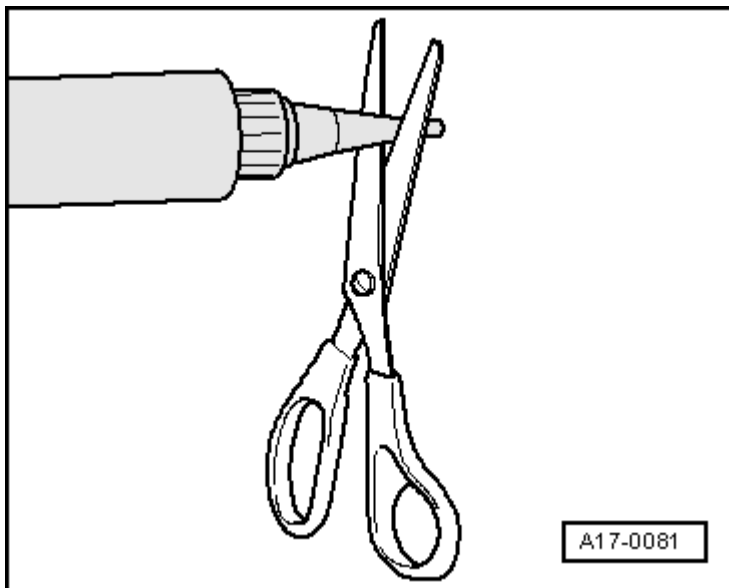


Fig. 46: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Apply the silicone sealant on the clean sealing surface of the sealing flange as shown.

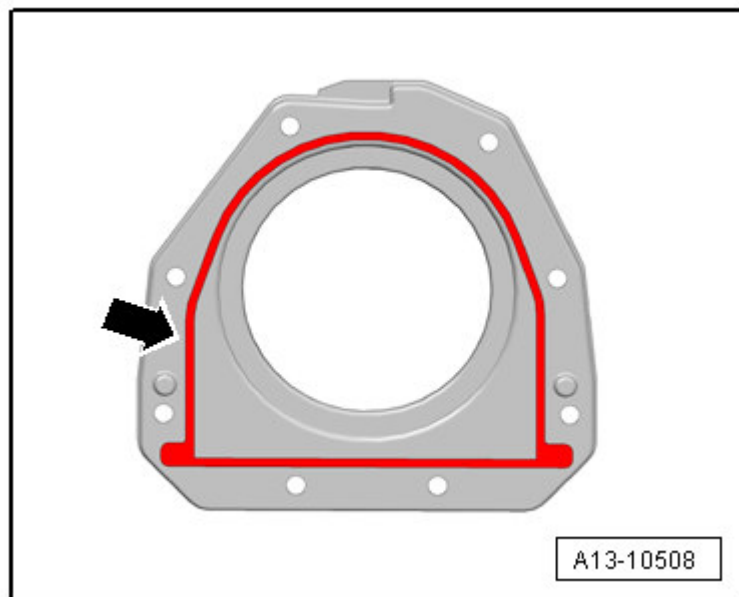


Fig. 47: Identifying Silicone Sealant Applied On Cover Sealing Surface
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Thickness of sealant bead: 2 to 3 mm

NOTE: **The sealing flange must be installed within 5 minutes after applying the silicone sealant.**

The sealant bead may not be thicker than specified, otherwise the excess sealant could enter the oil pan and clog the oil intake tube.

The guide sleeve T20097 may be removed only after the sealing flange has been installed on the crankshaft.

-- Install the guide sleeve T20097 on the crankshaft.

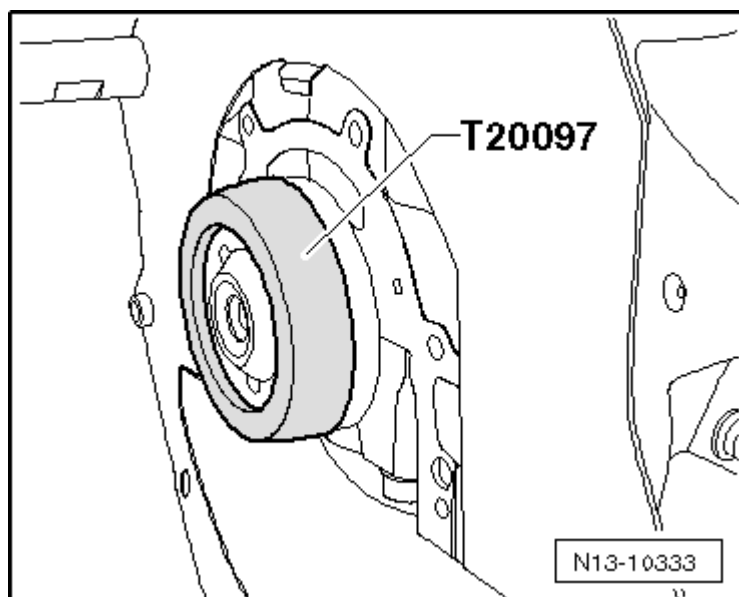


Fig. 48: Identifying Guide Sleeve On Crankshaft

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Slide the sealing flange onto the crankshaft and the guide sleeve T20097.

-- Tighten the sealing flange bolts.

Tightening sequence and torque specification, refer to **Fig. 10**.

NOTE: After installing the sealing flange, the sealant must dry for approximately 30 minutes. Only after then may the engine oil be added.

The rest of the installation is performed in the reverse order of removal.

CRANKSHAFT SENSOR WHEEL, REPLACING

-- Removing the engine. Refer to **ENGINE, REMOVING** .

-- Remove the sealing flange. Refer to **SEALING FLANGE, TRANSMISSION SIDE**.

-- Remove the upper oil pan. Refer to **UPPER OIL PAN** .

- Remove the balance shaft timing chain. Refer to **BALANCE SHAFT TIMING CHAIN** .
- Remove the Connecting Rod Bearing Caps (List Item: 2).
- Remove the crankshaft Bearing Caps (List Item: 6).
- Remove the crankshaft and the sensor wheel.
- Always replace the sensor wheel -2- whenever the screws -1- are removed.

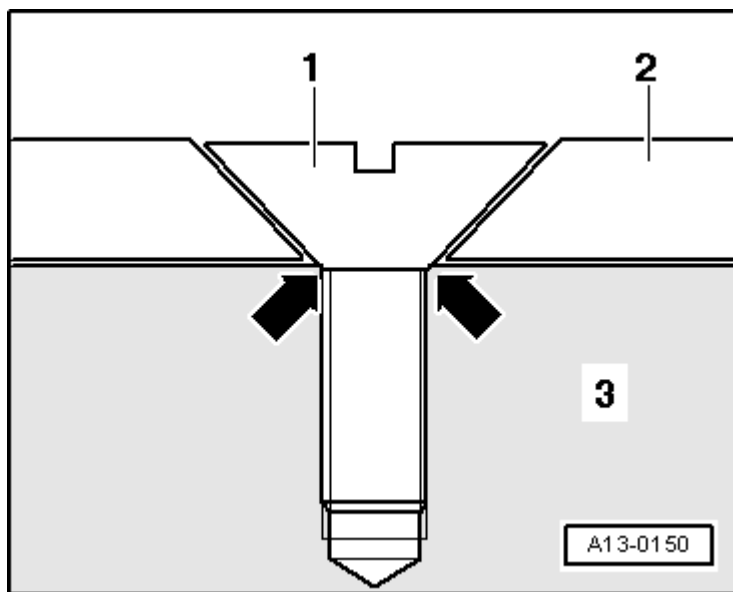


Fig. 49: Identifying Attachment Points, Countersunk Screws, Crankshaft & Sensor Wheel
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: After tightening a second time, the attachment point of the countersunk screws for the sensor wheel are so deformed that the screw heads lie on the crankshaft -3- -arrows- and the sensor wheel is loose underneath the screws.

Installation of the sensor wheel is only possible in one position, the bores are offset.

- Tightening specification, refer to **CRANKSHAFT OVERVIEW**.

CRANKSHAFT NEEDLE BEARINGS

Special Tools And Workshop Equipment Required

- Centering Mandrel 3176 or
- Drift VW 207 C
- Puller, for example, Kukko Extractor 14.5-18.5 mm 21/2
- Puller T10055

Conditions:

- The transmission is removed.

Removing

-- Remove the needle bearing using a commercially available puller, for example kukko extractor 14.5-18.5 mm 21/2 -arrow-, the adapter T10055/3 and the puller T10055.

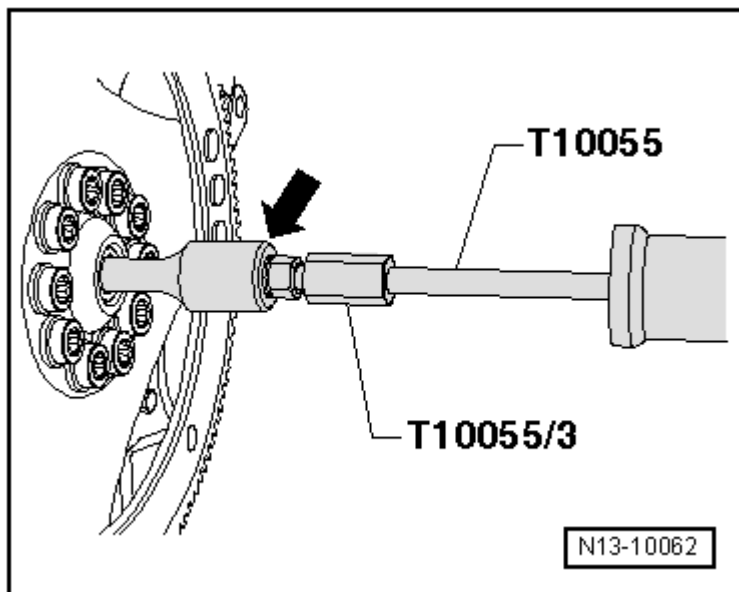


Fig. 50: Identifying Standard Extractor E.G. Kukko 21/2, Adapter T10055/3 And Puller T10055
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

NOTE: The side of the needle bearing with writing on it must be readable when installed.

-- Drive in the bearing using the drift VW 207 C or the centering mandrel 3176.

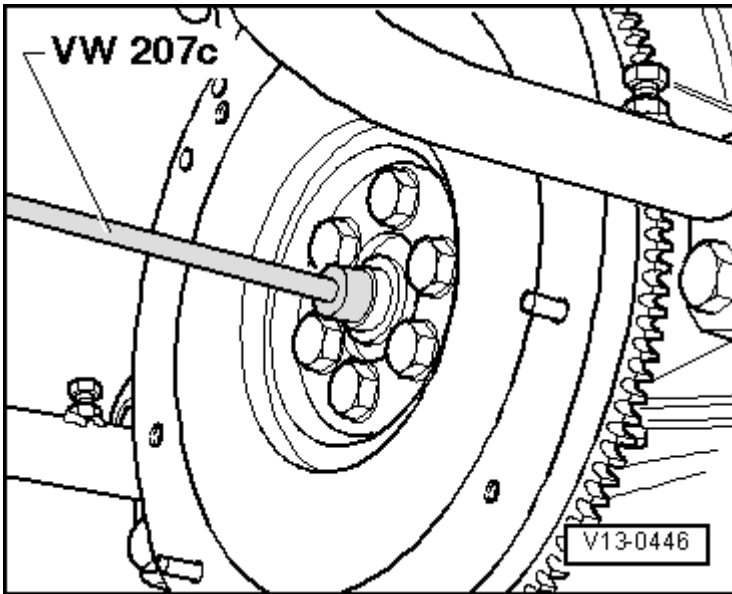


Fig. 51: Identifying Drift -VW 207 C- To Drive In Needle Bearing
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installed depth:

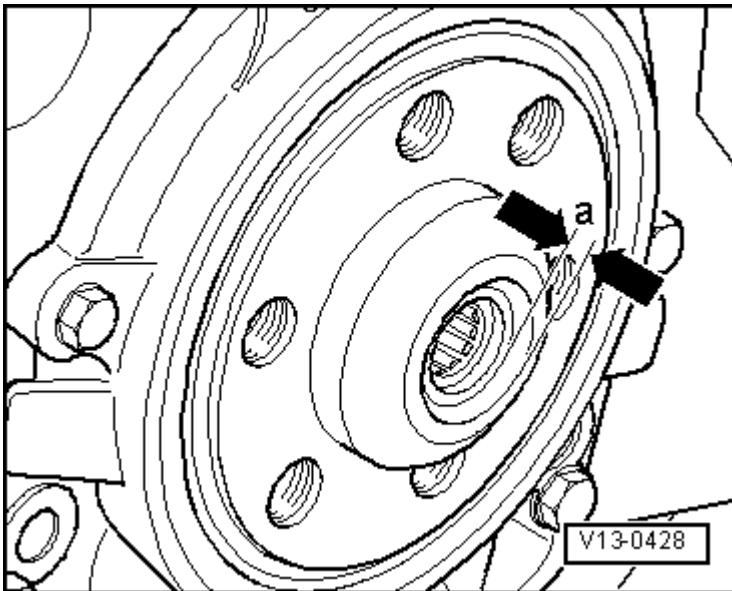


Fig. 52: Identifying Installation Depth Dimension
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Dimension: 1.5 to 1.8 mm -a-

SPECIAL TOOLS

Special Tools And Workshop Equipment Required

- Micrometer 75-100 mm VAS 6071
- Cylinder Gauge VAS 6078
- Guide Sleeve T20097
- Dial Gauge Holder VW 387

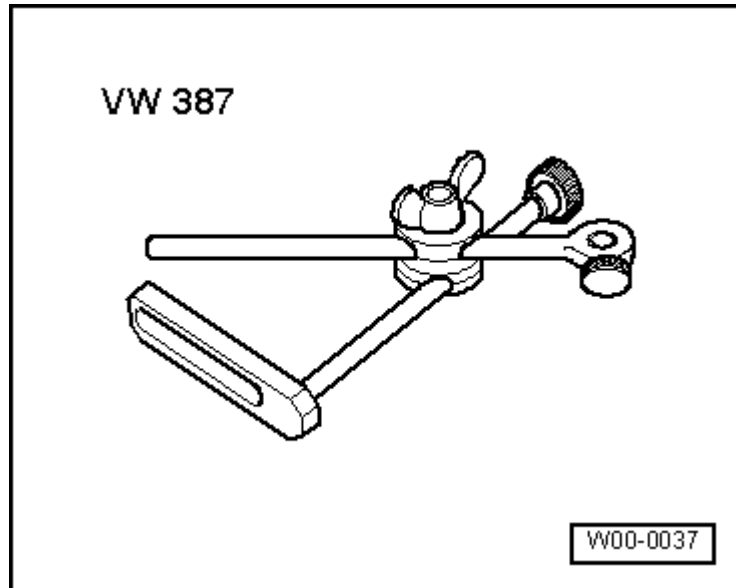


Fig. 53: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Dial Gauge 0-10 mm VAS 6079

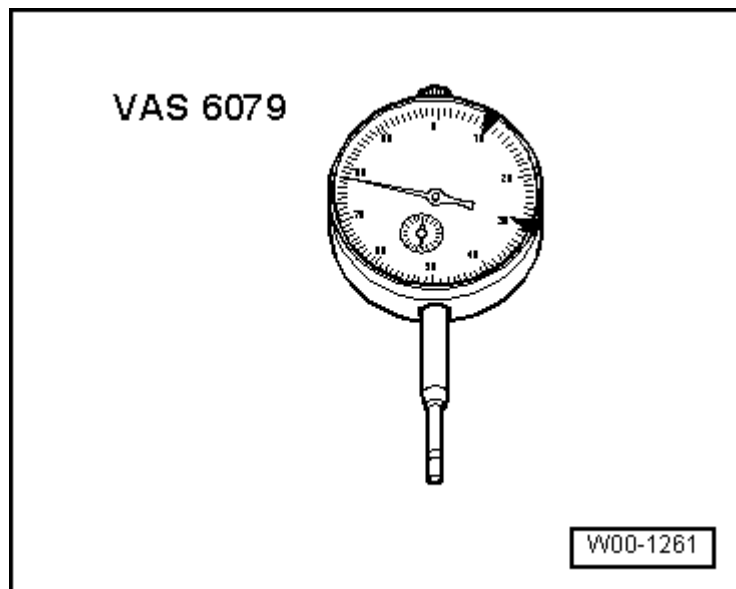


Fig. 54: Identifying Dial Gauge VAS 6079
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Torque Wrench (40-200 Nm) V.A.G 1332

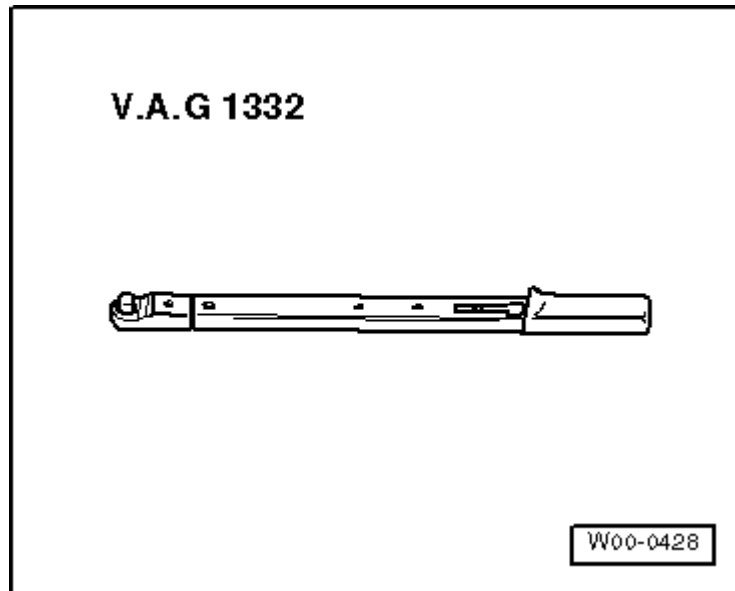


Fig. 55: Identifying Torque Wrench 40-200 Nm VAG 1332
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Counter Hold Tool T10355

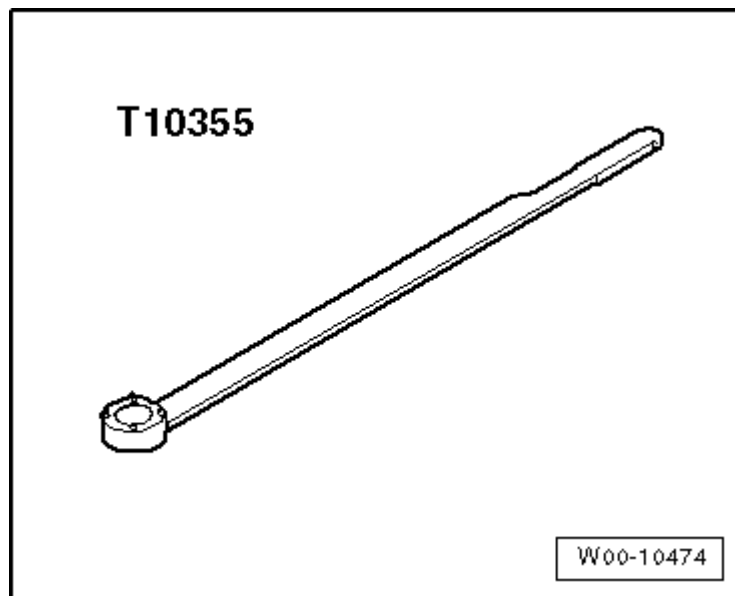


Fig. 56: Identifying Counter Hold Tool -T10355-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Flywheel Retainer 3067

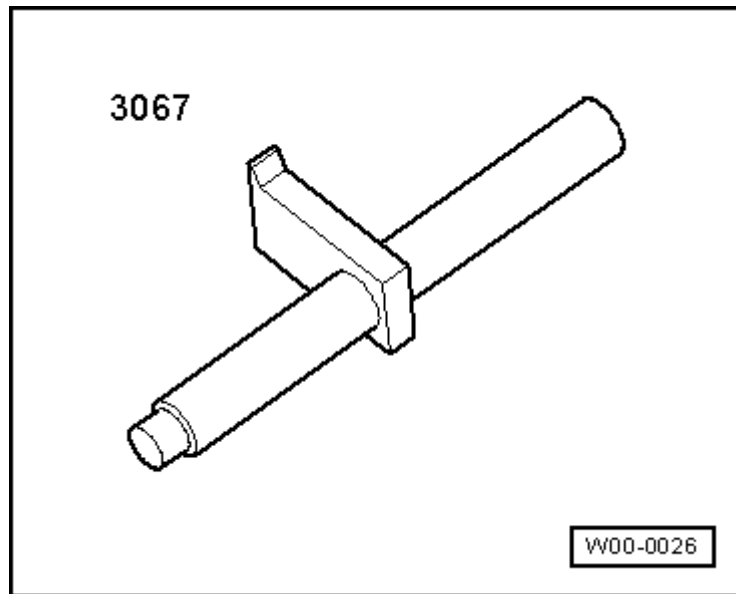


Fig. 57: Identifying 3067 Counter-Hold Tool

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

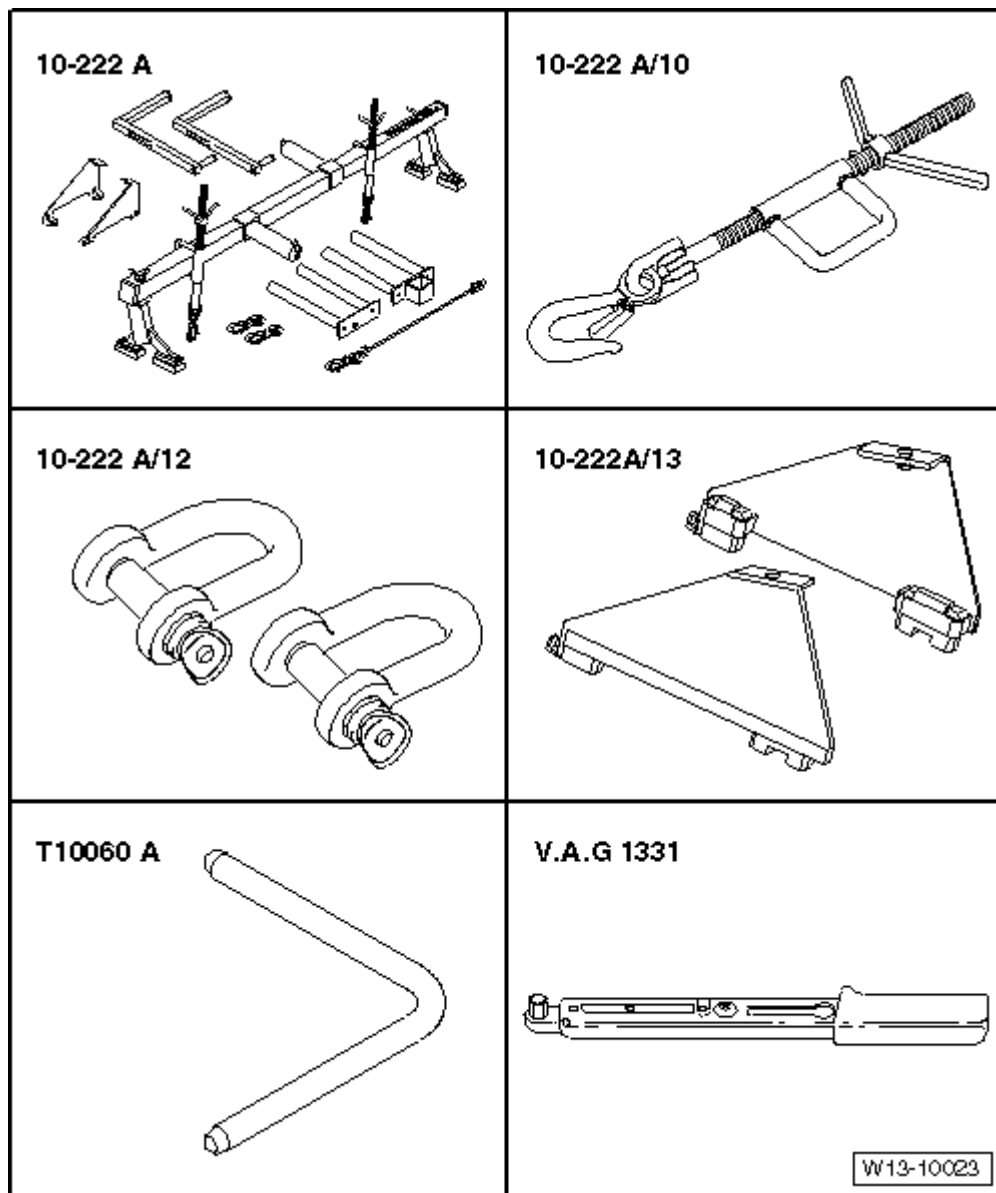


Fig. 58: Identifying Engine Support Bridge And Special Tools
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special Tools And Workshop Equipment Required

- Engine Support Bridge 10-222 A
- Bracket with Spindle and Hook 10-222 A/10
- Shackle 10-222 A/12
- Adapter 10-222 A/13
- Locking Pin T10060 A
- Torque Wrench (5-50 Nm) V.A.G 1331

2010 Volkswagen Jetta TDI

ENGINE 2.0 Liter - Crankshaft, Cylinder Block - Engine Code(s): CBFA & CCTA (Sedan) (A5 Platform)

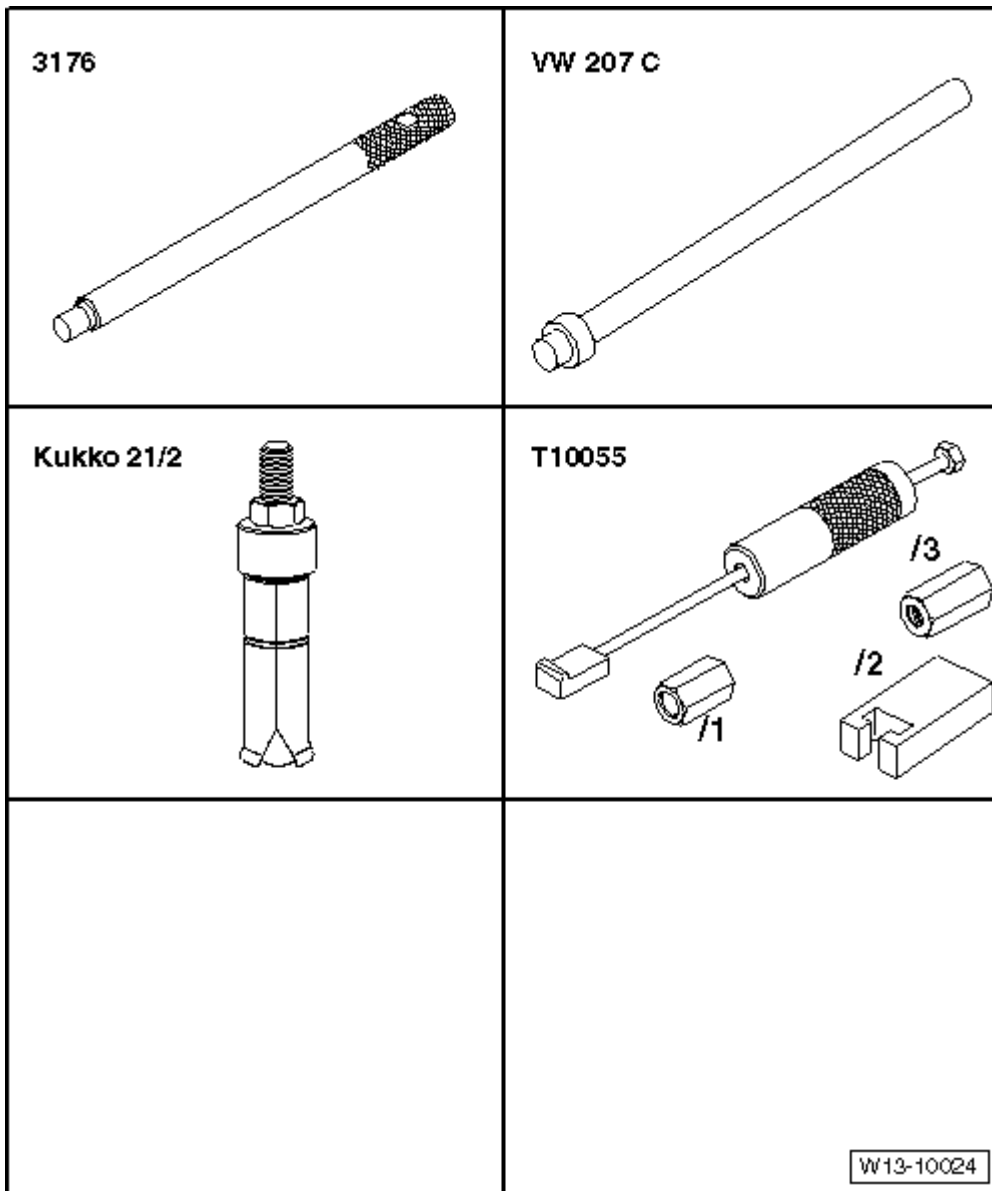


Fig. 59: Identifying Centering Mandrel 3176 And Special Tools
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special Tools And Workshop Equipment Required

- Centering Mandrel 3176
- Drift VW 207 C
- Puller, for example, Kukko Extractor 14.5-18.5 mm 21/2
- Puller T10055

ENGINE

2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBEA & CJAA (Sedan) (A5 Platform)

15 CYLINDER HEAD, VALVETRAIN

DESCRIPTION AND OPERATION

CYLINDER HEAD COVER OVERVIEW

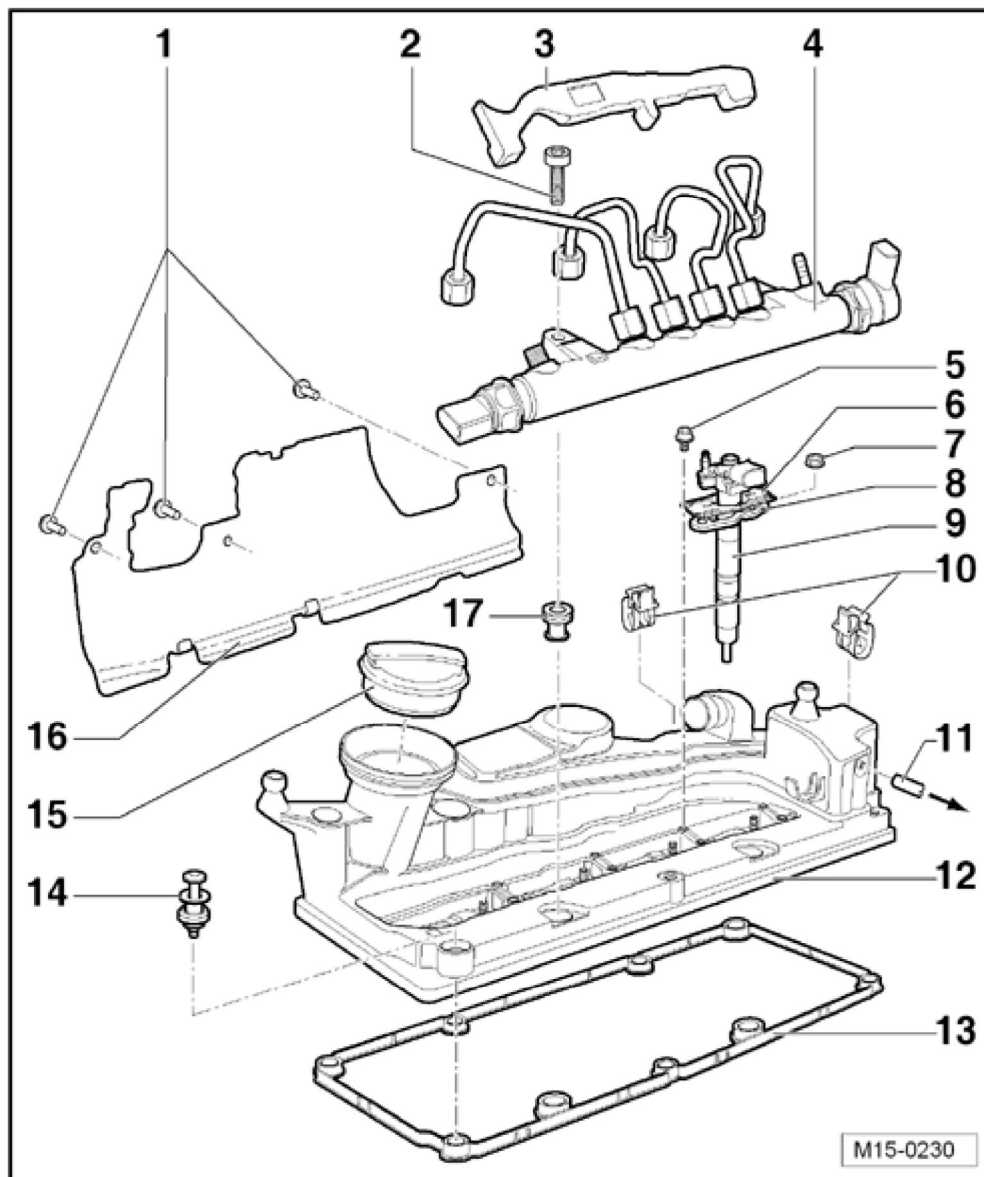


Fig. 1: Identifying Cylinder Head Cover Overview

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Bolt

- 5 Nm
2. **Bolt**
 - 22 Nm
 3. **Protective Strip**
 - For the fuel rail and high pressure lines.
 4. **Fuel Rail**
 - With high pressure lines.
 - Do not change the angles of the high pressure lines.
 - Overview, refer to **FUEL RAIL AND INJECTORS OVERVIEW** .
 5. **Bolt**
 - 5 Nm
 6. **Sealing Cap**
 7. **Nut**
 - 10 Nm
 8. **Tensioning Plate**
 - Always replace.
 - Note the installed position, refer to **Fig. 2**.
 9. **Fuel Injector**

Overview, refer to **FUEL RAIL AND INJECTORS OVERVIEW** .
 10. **Bracket**
 - For the wiring harness.
 11. **Vacuum Hose**
 - Make sure it is seated correctly and is routed without kinks.
 - To the wastegate bypass regulator valve -N75-
 12. **Cylinder Head Cover**
 - Removing and installing, refer to **CYLINDER HEAD COVER**.
 13. **Gasket**
 - Replace if damaged or leaking.
 14. **Bolt**
 - 10 Nm
 - Follow the loosening and tightening sequence, refer to **CYLINDER HEAD COVER**.
 15. **Cap**
 - Replace the seal if damaged.
 16. **Heat Shield**
 17. **Bushing**
 - For the fuel rail mounting.

- Replace if damaged.

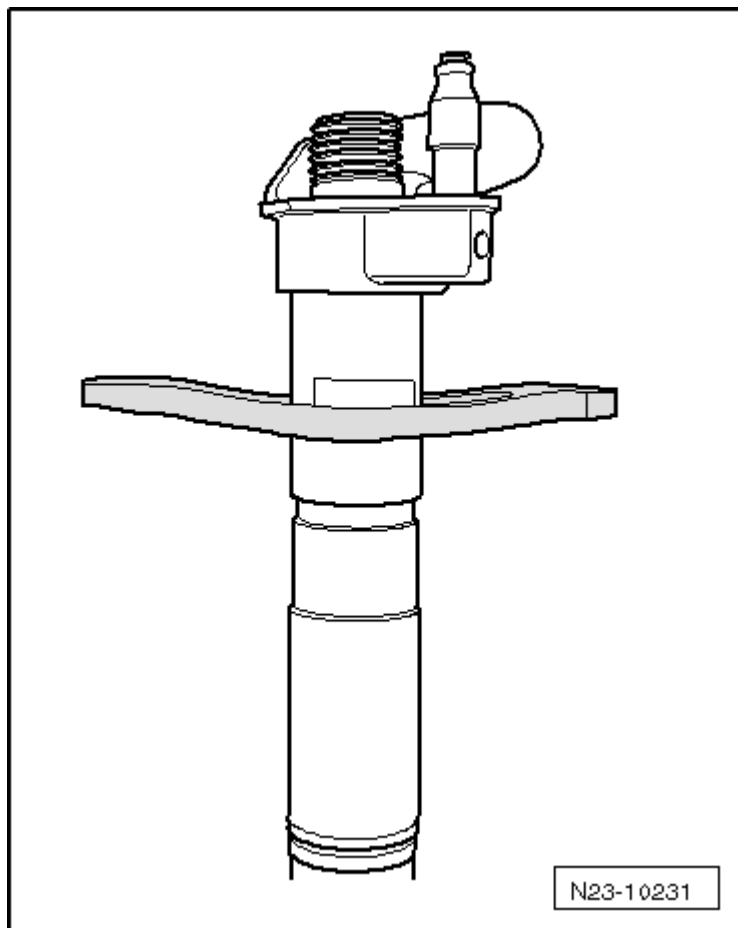


Fig. 2: Identifying Tensioning Plate Installed Position
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

CYLINDER HEAD OVERVIEW

NOTE: Only remove the plastic protectors installed to protect the open valves immediately before fitting the cylinder head.

When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.

Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the cracks have a Max. width of 0.5 mm.

After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

Always replace self-locking nuts, seals, gaskets and clamps.

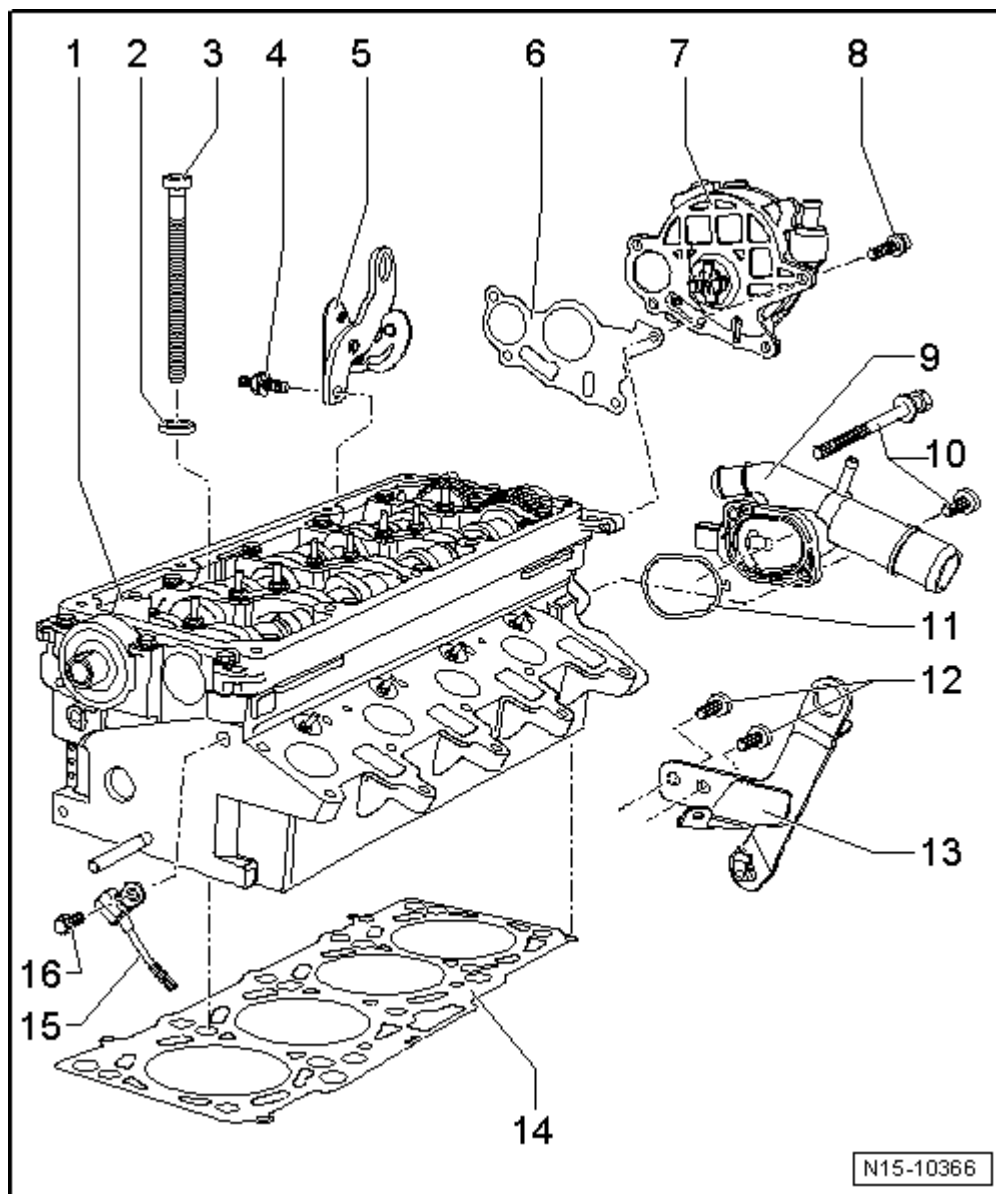


Fig. 3: Identifying Cylinder Head Overview

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Cylinder Head

- See the note above.
- Checking for distortion, refer to **Fig. 4**.
- Removing and installing, refer to **CYLINDER HEAD**.
- All of the coolant must be replaced after installation.
- Checking the compression, refer to **COMPRESSION, CHECKING**.

2. Washer

- For the cylinder head bolt.

3. Cylinder Head Bolt

- Observe the sequence for loosening and tightening, refer to **CYLINDER HEAD**.
- Before installing, insert the washers -item 2- into the cylinder head.

4. Stud Bolt

- 25 Nm

5. Lifting Eye**6. Gasket**

- Always replace.

7. Vacuum Pump

CAUTION: Do not disassemble the vacuum pump under any circumstances because it can cause the vacuum part to malfunction. The result would be brake booster failure.

- Removing and installing, refer to **VACUUM PUMP**.

8. Bolt

- 10 Nm

9. Coolant Connection

- Coolant hose connection diagram. Refer to **COOLANT HOSE CONNECTION DIAGRAM**.

10. Bolt

- 10 Nm

11. Seal

- Always replace.

12. Bolt

- 25 Nm

13. Lifting Eye**14. Cylinder Head Gasket**

- Always replace.
- Observe the identification, refer to **Fig. 5**.
- All of the coolant must be replaced after removing and installing.

15. Camshaft Position Sensor -G40-

- For the camshaft position.

16. Bolt

- 10 Nm

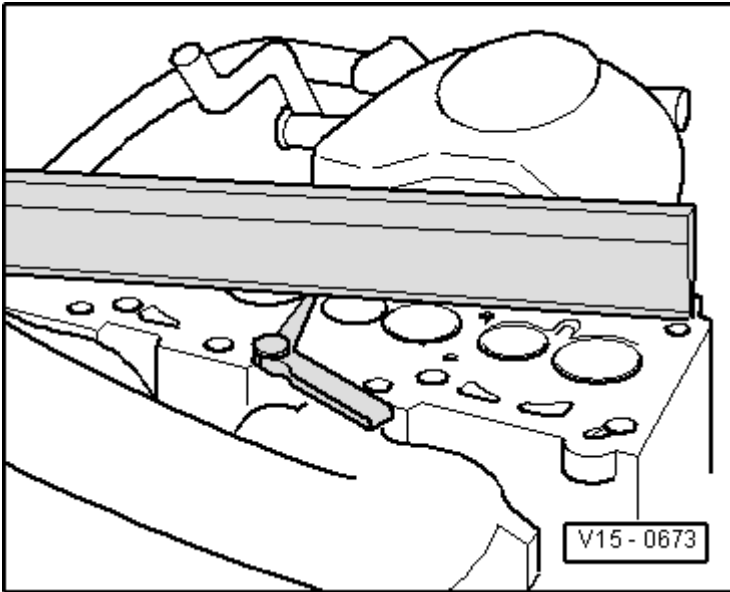


Fig. 4: Identifying Check Of Cylinder Head For Distortion
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Straight Edge 500 mm VAS 6075
- Feeler Gauge

Procedure

-- Check the cylinder head for distortion using straight edge 500 mm VAS 6075 and feeler gauge in several places.

- Max. permissible distortion: 0.10 mm

NOTE: **Remanufacturing diesel cylinder heads is not permitted.**

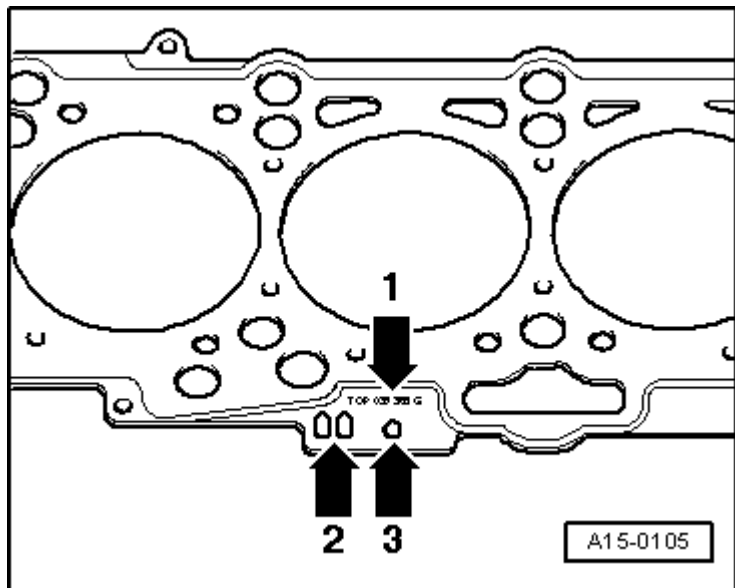


Fig. 5: Identifying Cylinder Head Gasket Identification

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Part number = -arrow 1-
- Control code = -arrow 2- (ignore this!)
- Holes = -arrow 3-
- Installed position: the mark faces up.

NOTE: Depending on piston projection, varying cylinder head gasket thicknesses can be installed. When replacing the gasket, install a new gasket with the same identification -arrow 3-.

Determine the piston position at Top Dead Center (TDC) when installing new pistons or a partial engine. Refer to PISTON PROJECTION IN TDC, CHECKING .

VALVETRAIN OVERVIEW

NOTE: Only remove the plastic protectors installed to protect the open valves immediately before positioning the cylinder head.

When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.

Cylinder heads with cracks between the valve seats can continue to be used without reducing service life, as long as the cracks have a Max. width of 0.5 mm.

After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).

After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.

Always replace gaskets and seals.

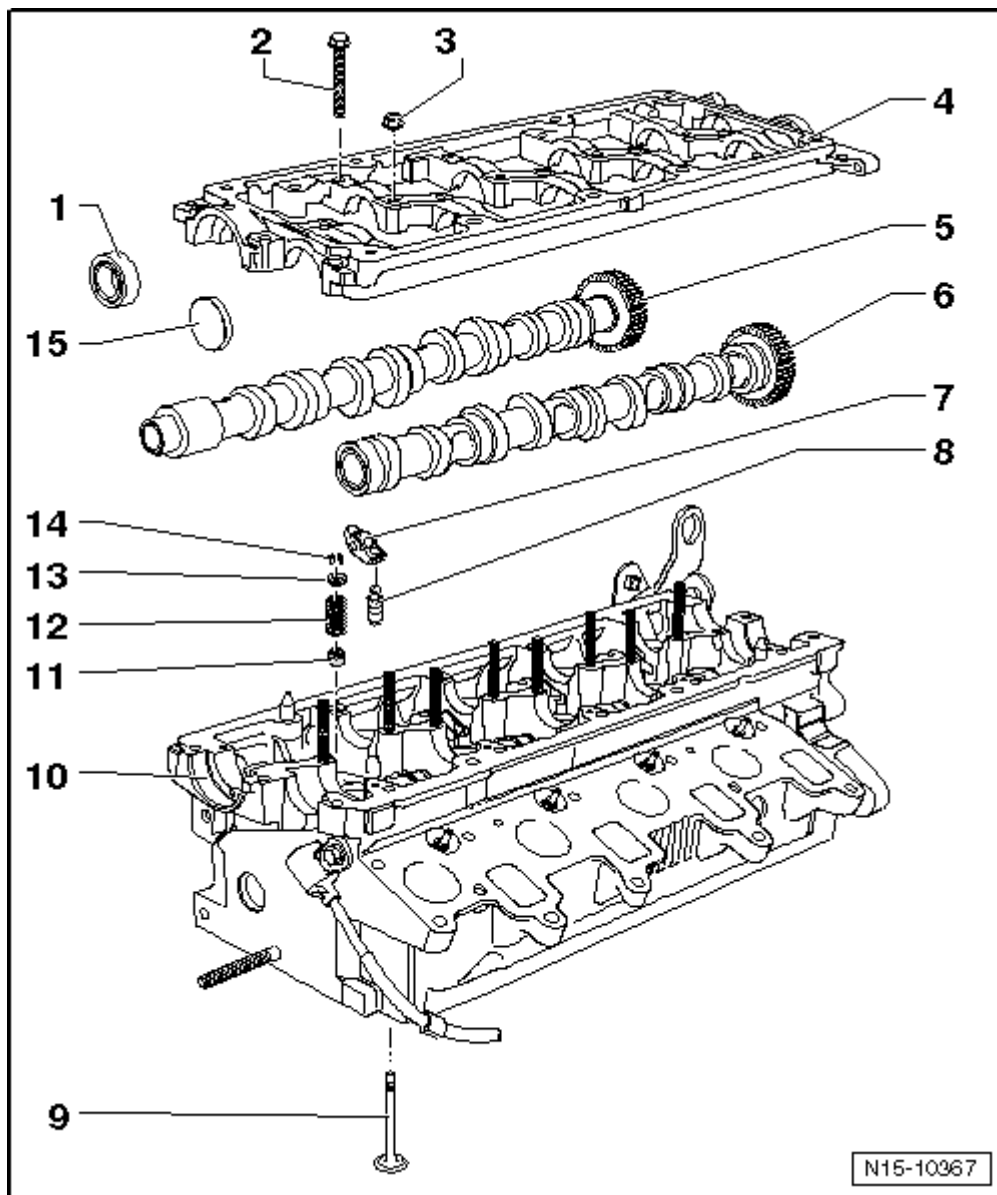


Fig. 6: Identifying Valvetrain Component Overview
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Seal

- Do not additionally oil or grease the sealing lip of the seal.
- Before installing, remove any remaining oil from the camshaft journal with a clean cloth.

- To install, tape over the groove on the camshaft taper.
 - Removing and installing, refer to **CAMSHAFT SEAL**.
2. **Bolt**
 - 10 Nm
 3. **Nut**
 - 10 Nm
 4. **Bearing Frame**
 - Follow the sequence for loosening and tightening **CAMSHAFTS**.
 - Seal using silicone adhesive Sealant D 176 501 A1.
 5. **Exhaust Camshaft**
 - Removing and installing, refer to **CAMSHAFTS**.
 6. **Intake Camshaft**
 - Removing and installing, refer to **CAMSHAFTS**.
 7. **Roller Rocker Lever**
 - Mark the installed position.
 - Do not interchange.
 - Check the roller for ease of movement.
 - Lubricate the running surfaces before installing.
 8. **Hydraulic Lash Adjusters**
 - Mark the installed position.
 - Do not interchange.
 - Lubricate the running surfaces before installing.
 9. **Valve**
 - Mark the installed position.
 - Do not grind, only hand lapping is permitted.
 - Valve dimensions, refer to **Fig. 7**.
 - Checking valve guides, refer to **VALVE GUIDE, CHECKING**.
 10. **Cylinder Head**
 - See the note above.
 - Checking for distortion, refer to **Fig. 4**.
 - Removing and installing, refer to **CYLINDER HEAD**.
 - All of the coolant must be replaced after installation.
 11. **Valve Stem Seal**

Replacing, refer to **VALVE STEM SEALS, CYLINDER HEAD INSTALLED**.
 12. **Valve Spring**
 13. **Valve Spring Plate**

14. Valve Retainers

15. Cap

- Always replace.
- Drive in using a suitable drift until it is flush.

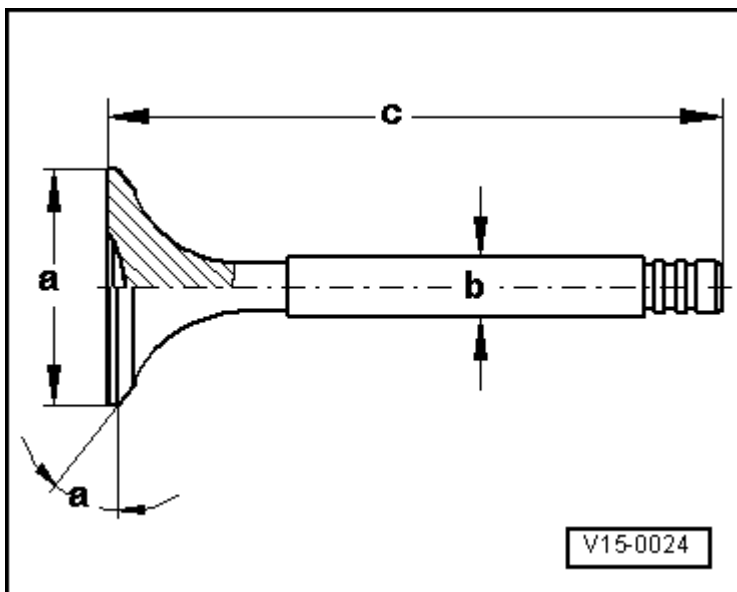


Fig. 7: Identifying Valve Dimensions

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: Intake and exhaust valves must not be refaced by grinding. Only hand lapping is permitted.

Dimension		Intake Valve	Exhaust Valve
diameter a	mm	26.60	26.00
diameter b	mm	5.940	5.940
c	mm	99.30	99.10
a	° angle	45	45

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Component	Fastener Size	Nm
Camshaft Position Sensor to Cylinder Head Bolt	-	10
Coolant Connection to Cylinder Head Bolt	-	10
Fuel Rail to Cylinder Head Cover Bolt	-	22
Heat Shield to Cylinder Head Cover Bolt	-	5
Injection Unit Cover to Cylinder Head Cover Bolt	-	5

2010 Volkswagen Jetta TDI

ENGINE 2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBEA & CJAA (Sedan) (A5 Platform)

Injection Unit Tensioning Bracket to Cylinder Head Cover Nut	-	10
Lifting Eye to Cylinder Head Stud/Bolt	-	25
Vacuum Pump to Cylinder Head Bolt	-	10

Cylinder Head Cover Bolt Tightening Sequence and Specification

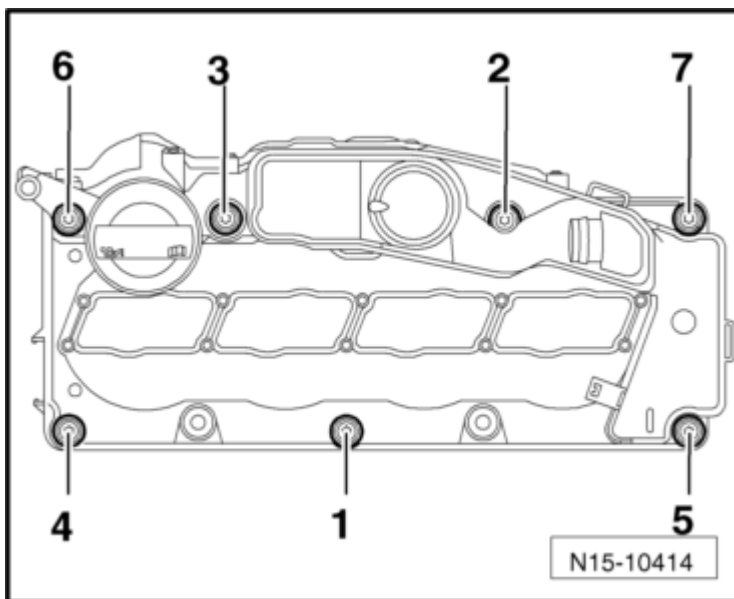


Fig. 8: Identifying Head Cover Bolts -1 Through 7- Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the bolts in sequence -1 through 7- to 10 Nm.

Cylinder Head Bolt Tightening Sequence and Specification

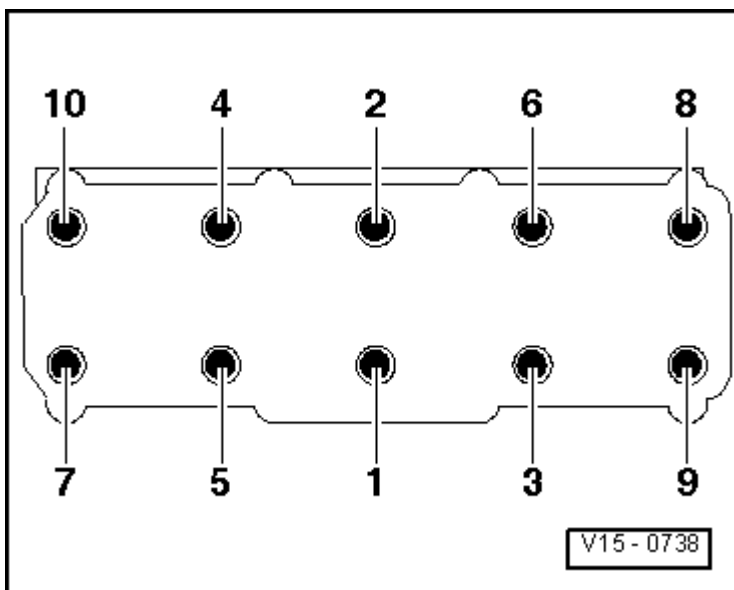


Fig. 9: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten cylinder head bolts in the sequence indicated, in four stages as follows:

1. Tighten using a Torque Wrench

Stage 1 = 35 Nm

Stage 2 = 60 Nm

2. Tighten further using a Ratchet

Stage 3 = an additional 90° (1/4) turn

Stage 4 = an additional 90° (1/4) turn

Bearing Frame Bolt Tightening Sequence and Specification

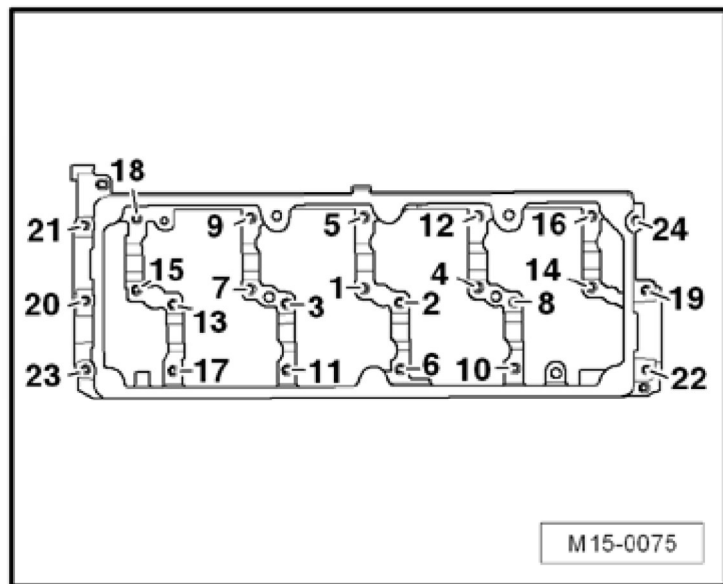


Fig. 10: Identifying Bearing Frame Bolt Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the bearing frame bolts and nuts in sequence -1 through 24- to 10 Nm.

DIAGNOSIS AND TESTING

COMPRESSION, CHECKING

NOTE: The compression can also be checked using a vehicle diagnostic tester such as the vehicle diagnosis, testing and information system VAS 5051 B.

Special tools and workshop equipment required

- Adapter V.A.G 1381/12
- Compression Tester V.A.G 1763

Test Conditions

- Engine oil temperature must be at least 30 °C (86 °F).
- The battery voltage must be at least 12.7 volts.
- All electrical consumers such as, for example, lights and rear window defogger, must be turned off.

Test Sequence

- Remove the glow plug from the corresponding cylinder. Refer to **GLOW PLUGS** .
- Install the adapter V.A.G 1381/12 in place of the glow plug.
- Check the compression pressure using compression tester V.A.G 1763.

NOTE: **Using the tester, refer to the tester operating instructions.**

- Operate the starter until the tester show there is no further increase in pressure.

Compression Pressure

- New: 25.0 to 31.0 bar
- Wear limit: 19.0 bar
- Permissible difference between all cylinders: maximum 5.0 bar

- Install the glow plug to the corresponding cylinder. Refer to **GLOW PLUGS** .

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

- Read the Engine Control Module (ECM) DTC memory and erase all DTC entries. Refer to "Guided Functions" in the vehicle diagnostic tester.

VALVE GUIDE, CHECKING**Special tools and workshop equipment required**

- Dial Gauge Holder VW 387
- Dial Gauge VAS 6079

Test Sequence

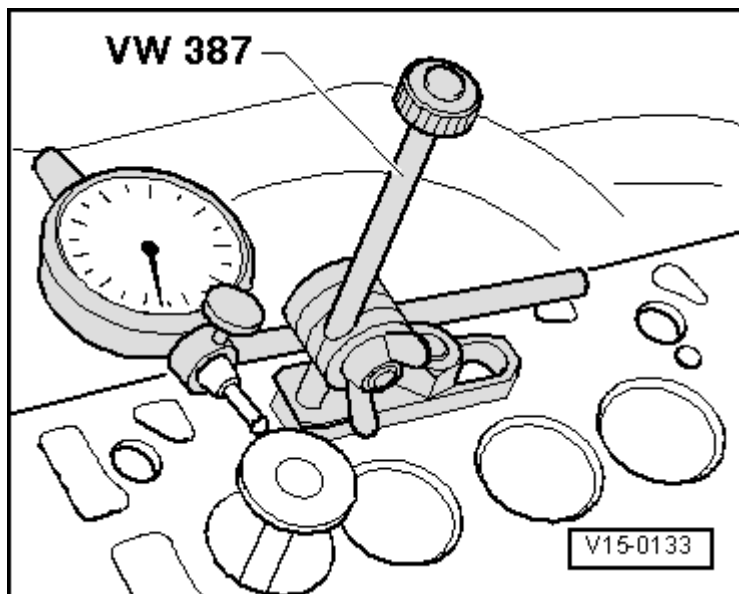


Fig. 11: Identifying Dial Gauge Holder VW 387 And Dial Gauge VAS 6079 To Determine Valve Rock (Wear Limit)

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Insert a new valve into the guide. The end of the valve stem must be flush with the guide. Use only the intake valve in the intake guide and the exhaust valve in the exhaust guide.

-- Determine tilt clearance.

- Wear limit: 1.30 mm.

-- If the tilt clearance exceeds the wear limit, the cylinder head must be replaced.

REMOVAL AND INSTALLATION

ENGINE COVER

Removing

-- Pull the corners of the engine cover -arrows- up off of the ball studs.

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ENGINE 2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBEA & CJAA (Sedan) (A5 Platform)

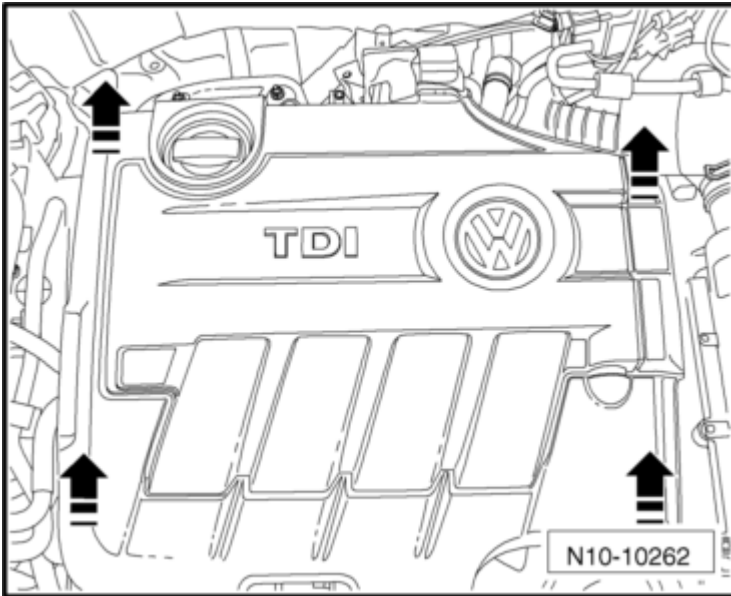


Fig. 12: Identifying Direction To Pull Engine Cover
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

CAUTION: Check the position of the 4 mounting elements (ball sockets) before installing the engine cover. Bring them back into the correct position if necessary. Otherwise the engine cover will be damaged.

-- Press the ball sockets on the engine cover into the correct installed position, if necessary.

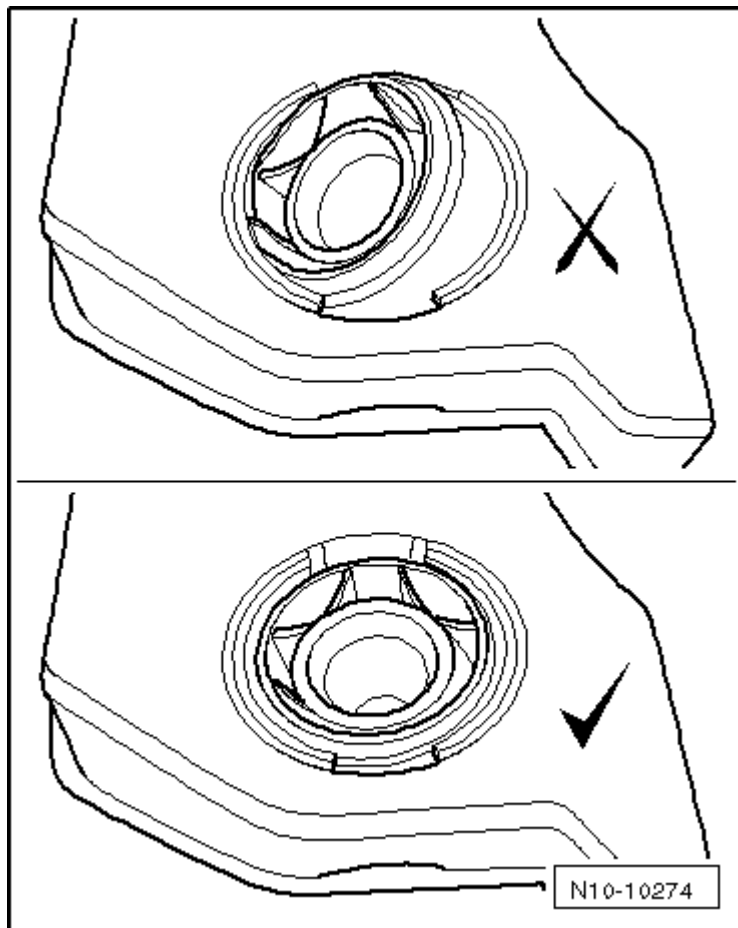


Fig. 13: Identifying Ball Sockets Correct Installed Position
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Position the engine cover on the ball studs and press down the corners onto the ball studs.

Camshaft Position Sensor -G40-

Removing

-- Remove the engine cover. Refer to **ENGINE COVER**.

-- Remove the fuel filter and the auxiliary fuel pump -V393-. Refer to **Auxiliary Fuel Pump -V393- (IN-LINE ELECTRIC FUEL PUMP)** .

-- Disconnect the connector from the engine coolant temperature sensor on radiator outlet -G83-.

-- Open the clips -arrows- and remove the toothed belt guard.

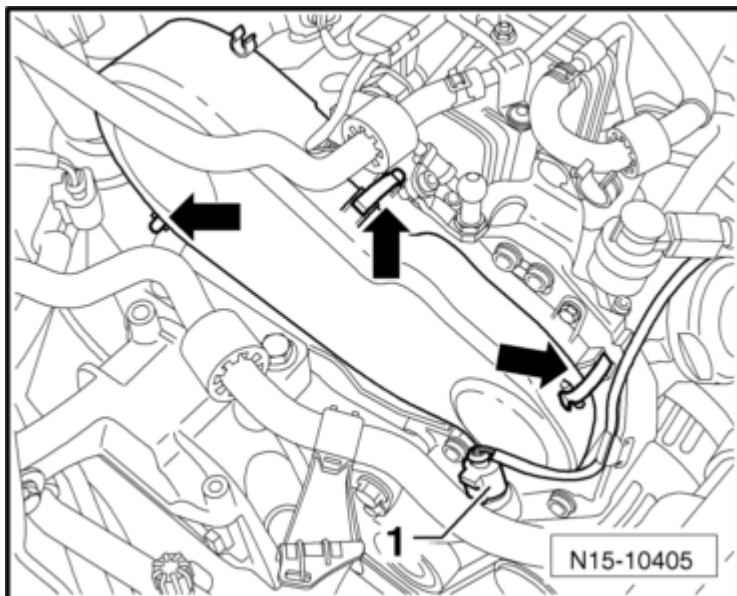


Fig. 14: Identifying Connector -1- And Clips -Arrows-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the front right wheel housing liner.

-- Remove the ribbed belt. Refer to **RIBBED BELT** .

-- Remove the vibration damper.

-- Rotate the engine to Top Dead Center (TDC) and secure the crankshaft toothed belt gear using the crankshaft stop T10050. Push the crankshaft stop from the front side of the toothed belt gear into the teeth. The toothed gear must be in the >>12 o'clock<< position.

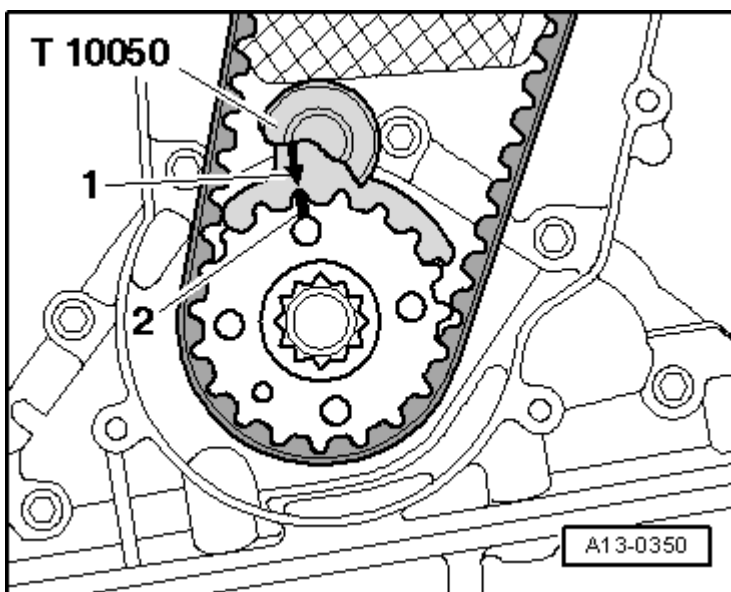


Fig. 15: Identifying Crankshaft Toothed Belt Pulley And Crankshaft Stop T10050

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The marks on the crankshaft toothed belt gear -2- and the crankshaft stop T10050 -1- must align. The pin on the crankshaft stop T10050 must engage in the hole on the sealing flange.

-- Loosen the camshaft gear bolts -1-.

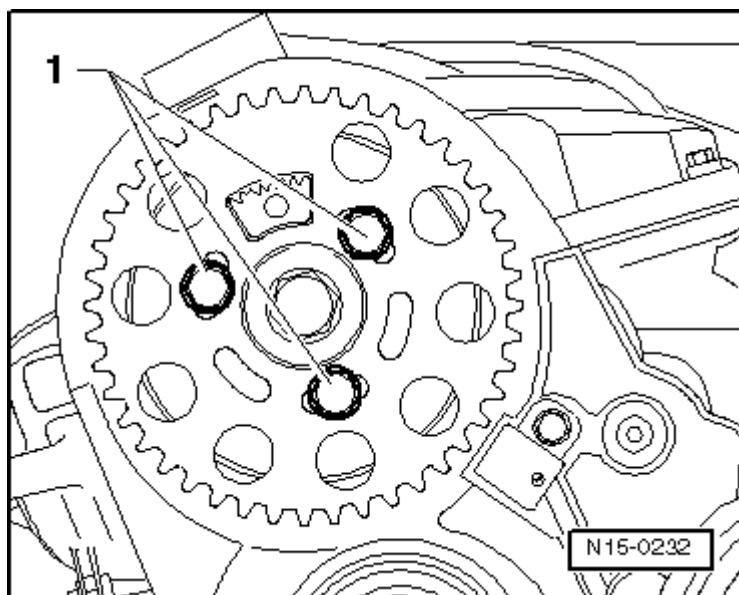


Fig. 16: Identifying Camshaft Pulley Securing Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Loosen the coolant pipe bolt -1- and then the high pressure pump toothed belt gear bolts -2-.

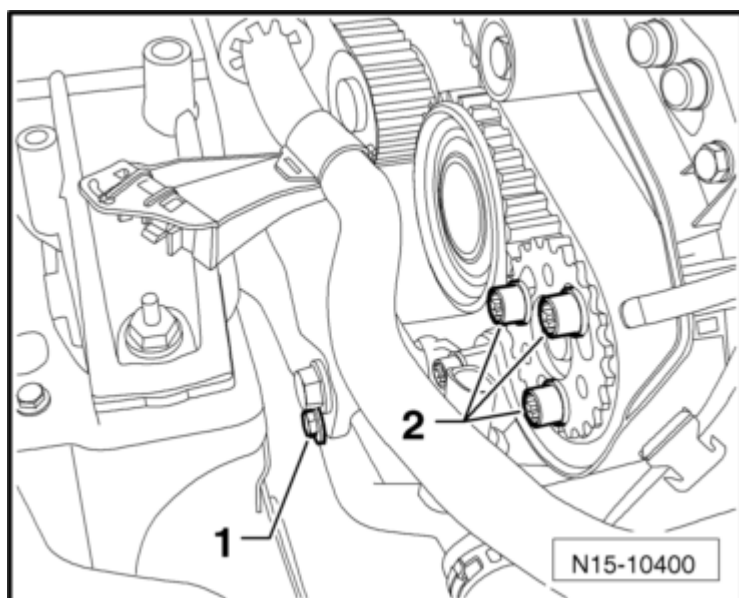


Fig. 17: Identifying Coolant Pipe Bolt -1- And High Pressure Fuel Pump Toothed Belt Gear -2-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Loosen the nut -1- for the tensioner and rotate the tensioner eccentric pulley counterclockwise -arrow- using the special wrench, long reach T10264 until it is possible to lock the tensioner using the locking tool T10265.

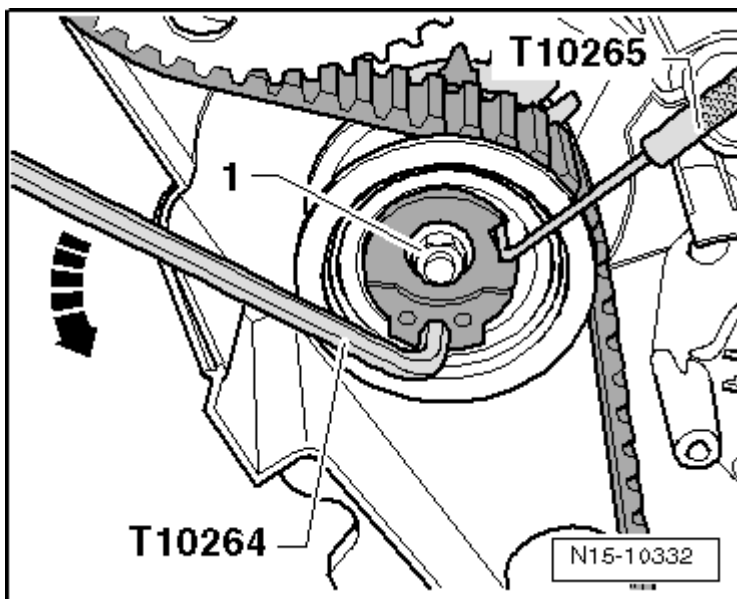


Fig. 18: Identifying Long Reach T10264 And Locking Tool T10265

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Now, rotate the tensioner eccentric pulley clockwise -arrow- all the way and tighten the nut -1- by hand.

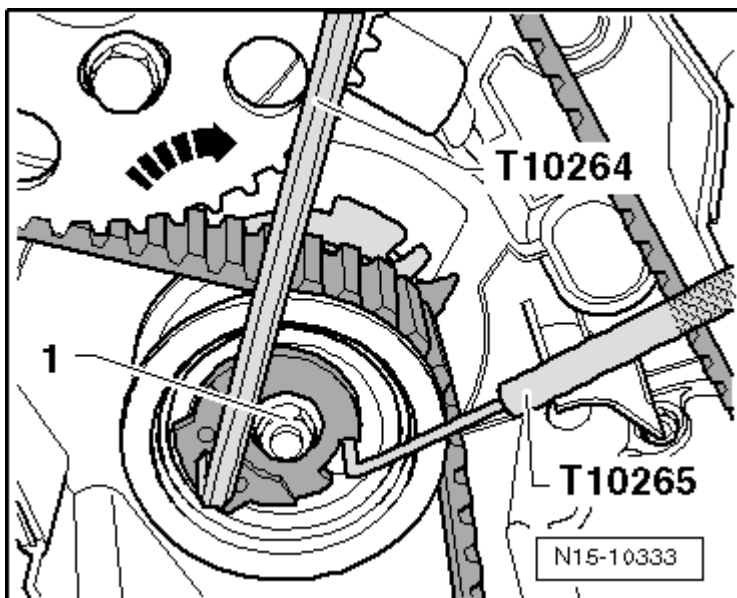


Fig. 19: Identifying Long Reach T10264 And Locking Tool T10265

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the toothed belt from the idler roller and the high pressure pump.

-- Disconnect the Camshaft Position (CMP) sensor connector -arrow-.

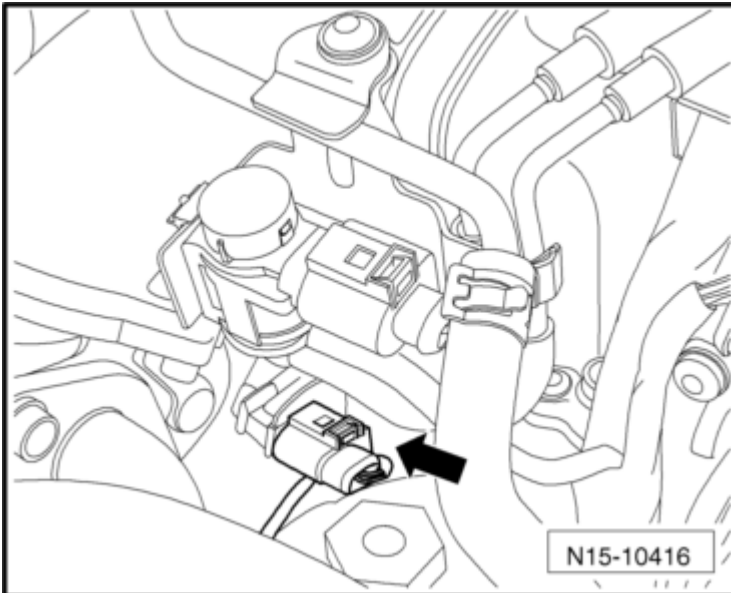


Fig. 20: Identifying Camshaft Position Sensor -G40- Connector -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the connector from the mount.

-- Remove the CMP sensor -arrow-.

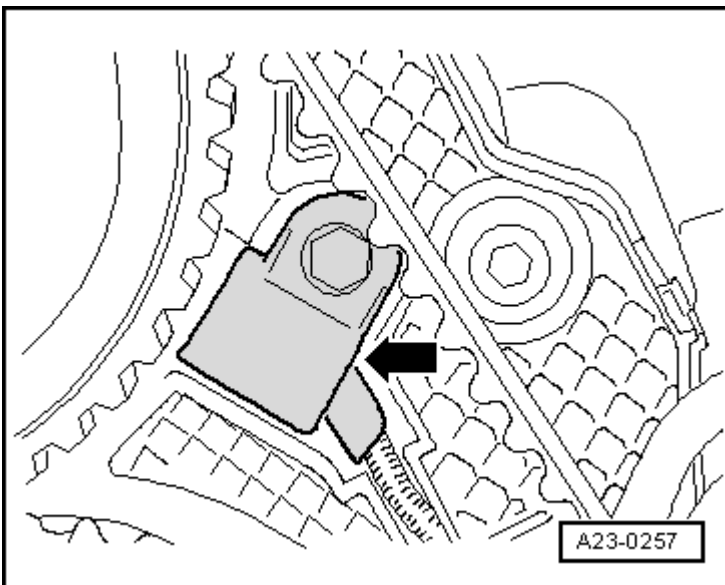


Fig. 21: Identifying CMP Sensor -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the ribs, using a screwdriver and remove the cover for the repair opening -arrows-.

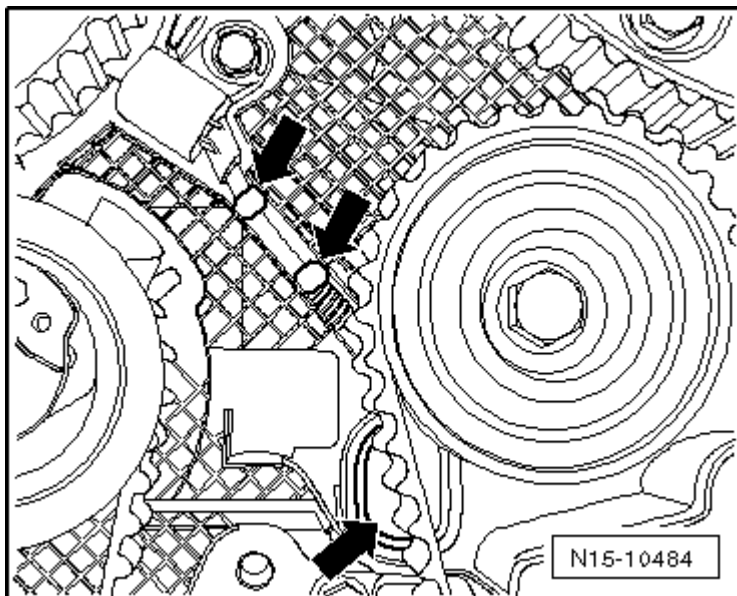


Fig. 22: Identifying Repair Opening -Arrows-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the CMP sensor from the cylinder head and guide the connector through the opening in the toothed belt guard.

Installing

Installation is performed in reverse order. When doing this note the following:

- Seal the hole in the toothed belt guard with a rubber plug.

-- Mount the toothed belt and adjust the valve timing. Refer to **TOOTHED BELT**.

CYLINDER HEAD COVER

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331
- Hose Clip Pliers VAS 6362
- Socket T40055
- Ratchet, Reversible V.A.G 1331/1
- Engine Bung Set VAS 6122

CAUTION:

- Follow the safety precautions when working on the diesel direct injection system. Refer to **SAFETY PRECAUTIONS** .
- Observe rules for cleanliness. Refer to **CLEAN WORKING CONDITIONS** .

Always follow these instructions before and during work.

NOTE: **Cylinder head cover overview. Refer to CYLINDER HEAD COVER OVERVIEW.**

Removing

WARNING: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all lines and wires in their original locations.
- For example, fuel, hydraulic, Evaporative Emission (EVAP), coolant, refrigerant, brake fluid and vacuum lines.
- Ensure sufficient clearance to all moving or hot components.

-- Remove the engine cover. Refer to ENGINE COVER.

-- Remove the protective strip.

-- Disconnect the connectors from the fuel injectors -A-, the exhaust pressure sensor 1 -G450- -B- and the fuel pressure sensor -G247- -C-.

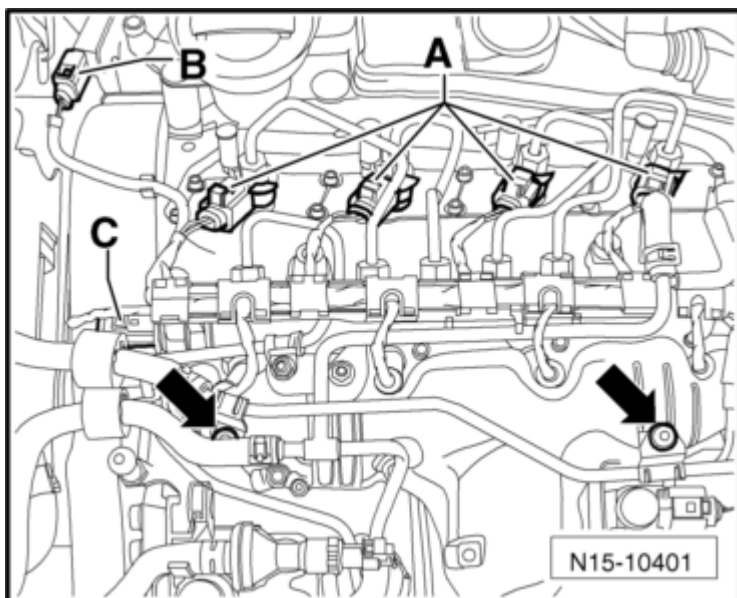


Fig. 23: Identifying Fuel Injectors -A-, Exhaust Pressure Sensor 1 -G450- -B- And Fuel Pressure Sensor -G247- -C-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the coolant line bolts -arrows- from the intake manifold and lay the line in front of the intake manifold.

-- Unclip the wiring harness for the glow plugs from the wiring guide.

CAUTION: Always follow the procedure "glow plug connectors, disconnecting and installing".

-- Disconnect the glow plug connectors. Refer to **GLOW PLUG CONNECTOR, DISCONNECTING AND CONNECTING** .

-- Remove the fuel return line bolt from the intake manifold.

-- Reposition the hose clamp -arrow- using hose clip pliers VAS 6362 and remove the line from the fuel rail.

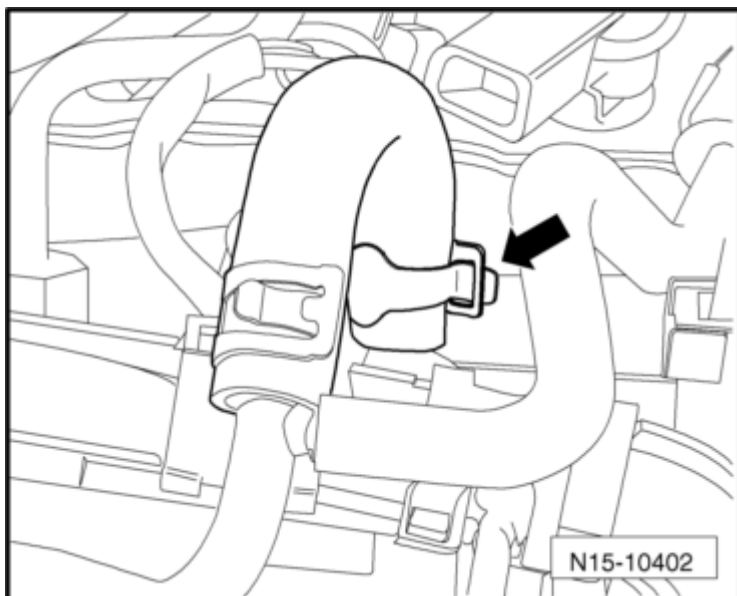


Fig. 24: Identifying Hose Clamp -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Before removing, clean the return line connection on the fuel injectors (for example using a commercially available detergent).

-- Cover the return line connections with a cloth.

-- Remove the fuel return line connections on the fuel injectors. Pull them upward to release them -arrow-.

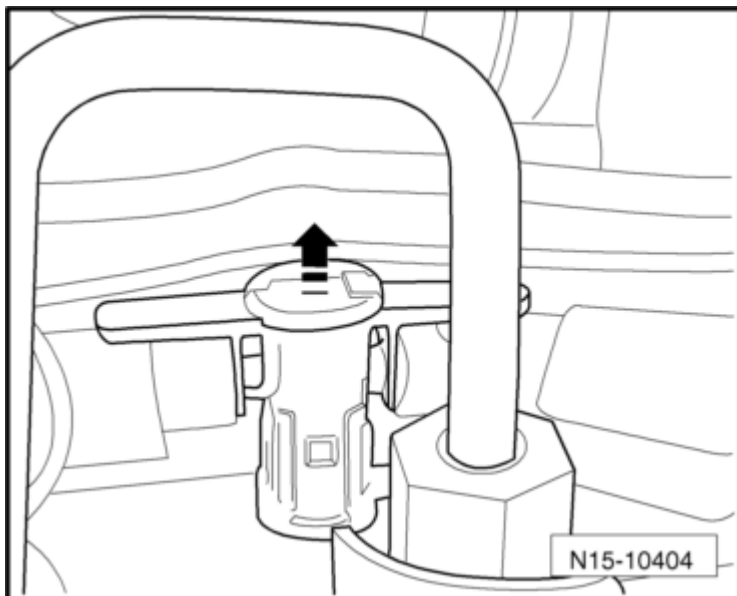


Fig. 25: Identifying Fuel Return Line Connections On Fuel Injectors
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: Follow the rules of cleanliness.

Do not let any dirt to get into the disconnected return lines or into the connections for the fuel injection units.

- Reposition the hose clamp using hose clip pliers VAS 6362 and remove the fuel return line.
- Reposition the hose clamp -4- using hose clip pliers VAS 6362 and remove the fuel return line at the high pressure fuel pump.

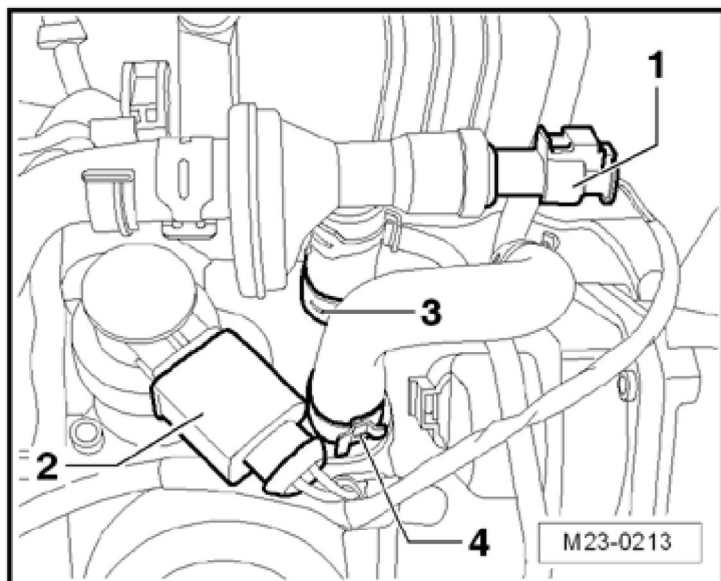


Fig. 26: Identifying Hose Clamp -4-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Seal the lines so that the fuel system is not contaminated by dirt, etc.
- Remove the fuel return line and lay the lines in front of the intake manifold.
- Disconnect the connector from the charge pressure actuator position sensor -G581- -arrow- at the turbocharger vacuum diaphragm and guide the line out of the retainers.

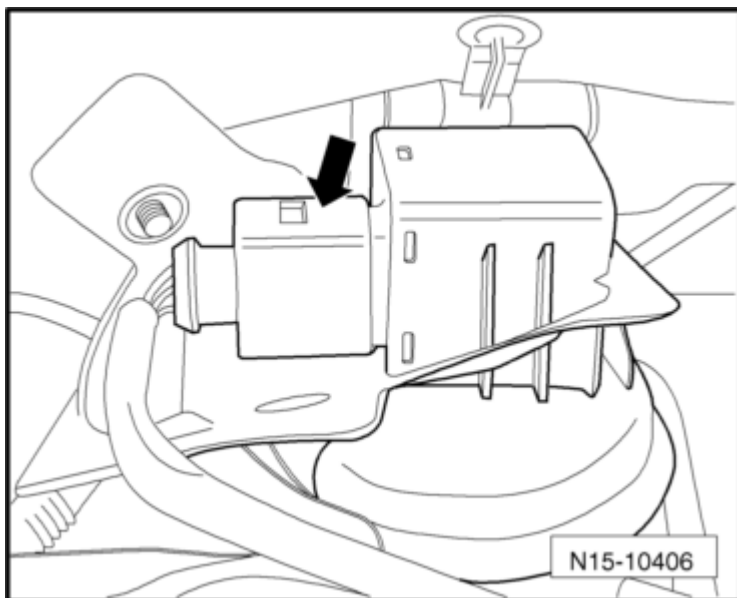


Fig. 27: Identifying Connector To Charge Pressure Actuator Position Sensor -Arrow-

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Disconnect the connector from the fuel pressure regulator valve -N276- -arrow-.

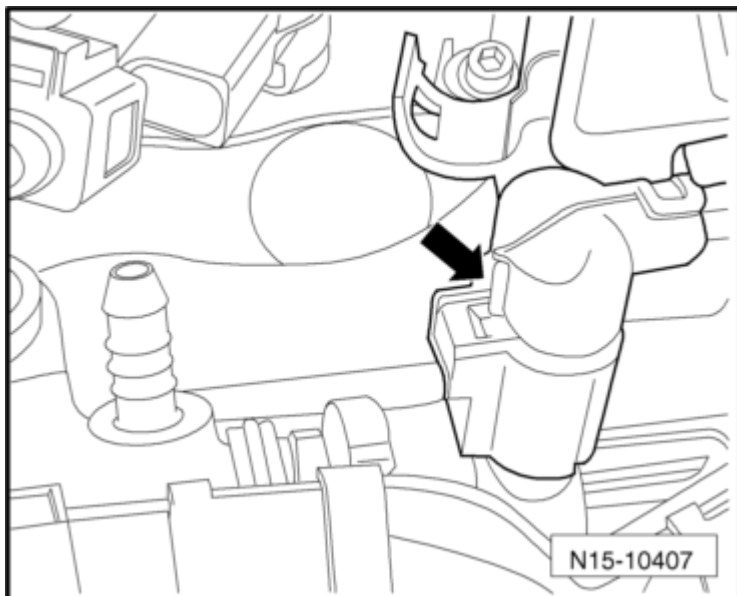


Fig. 28: Identifying Connector To Fuel Pressure Regulator Valve -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the line guide on the fuel rail and lay it aside.
- Remove the vacuum hose from the cylinder head cover.
- Remove the remaining vacuum hoses from the bracket on the cylinder head cover.
- Disconnect the connector -1- from the engine coolant temperature sensor on radiator outlet -G83-, open the clips -arrows- and remove the upper toothed belt guard.

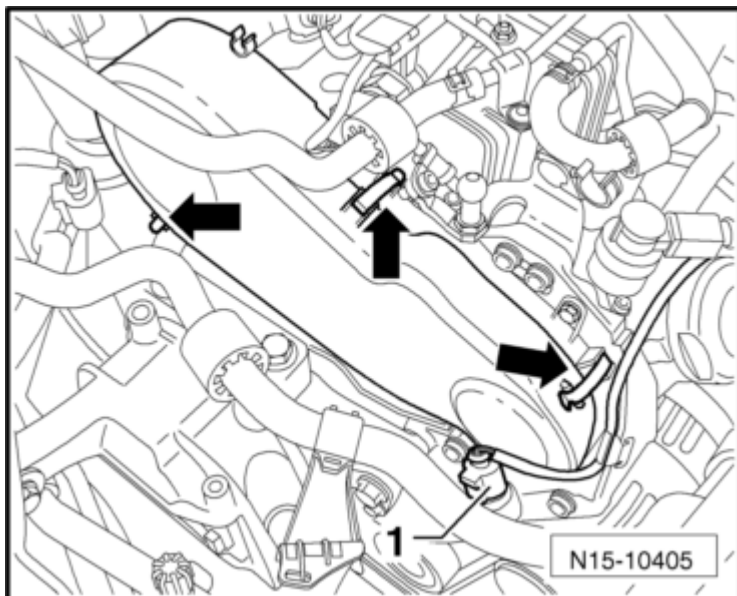


Fig. 29: Identifying Connector -1- And Clips -Arrows-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the crankcase ventilation hose between the intake tube and the cylinder head cover.

NOTE: **The crankcase ventilation hose is destroyed when it is removed.**

-- Remove the high pressure fuel line between the high pressure fuel pump and fuel rail.

-- Remove the high pressure fuel lines between the fuel rail and fuel injectors.

-- Remove the bolts -arrows- and the fuel rail.

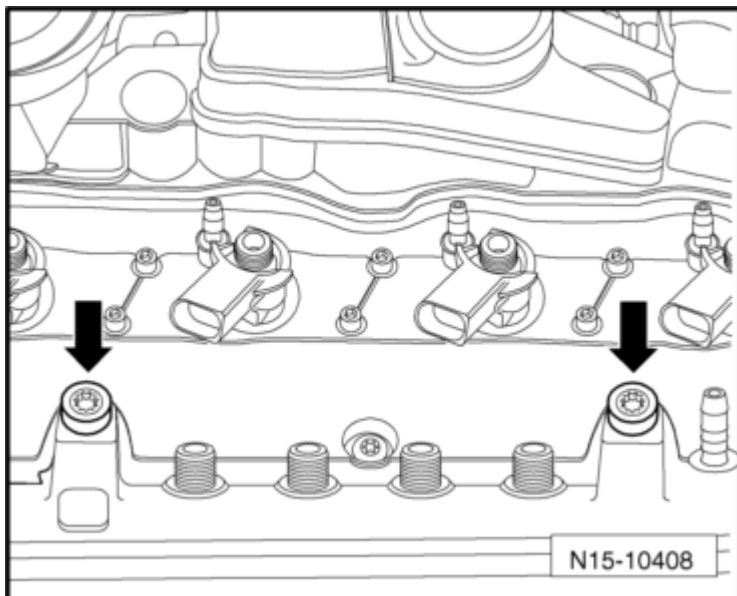


Fig. 30: Identifying Bolts -Arrows- And Fuel Rail

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the fuel injectors. Refer to **FUEL INJECTOR** .

-- Remove the cylinder head cover bolts in sequence -7 through 1-.

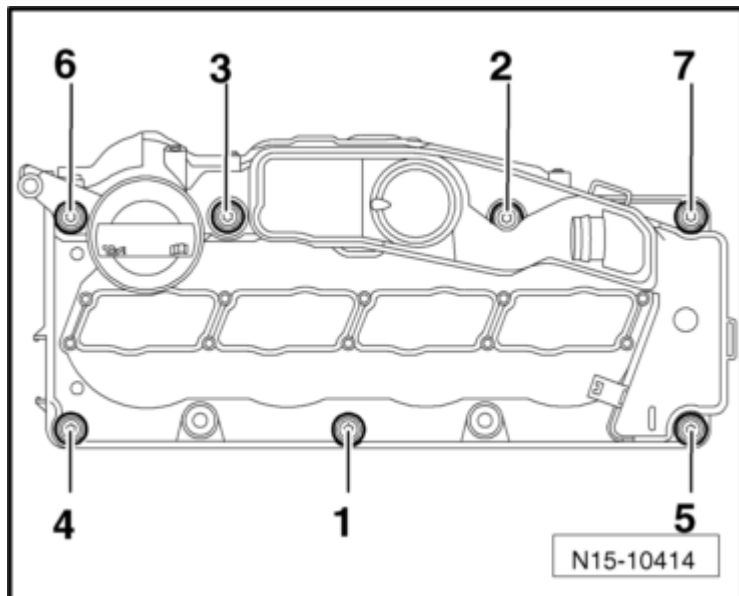


Fig. 31: Identifying Head Cover Bolts -1 Through 7- Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the cylinder head cover.

Installing

Install in reverse order of removal. When doing this note the following:

- Replace the cylinder head cover gasket if it leaks or is damaged.
- When installing the high pressure line or fuel lines, make sure no dirt or contaminants enter the fuel system.
- Only remove the sealing plugs right before installing the fuel lines.
- Do not change the angles of the high pressure lines
- Make sure line connections are securely fastened.
- Do not swap the supply and return lines.

-- First, tighten the cylinder head cover bolts by hand in sequence -1 through 7-.

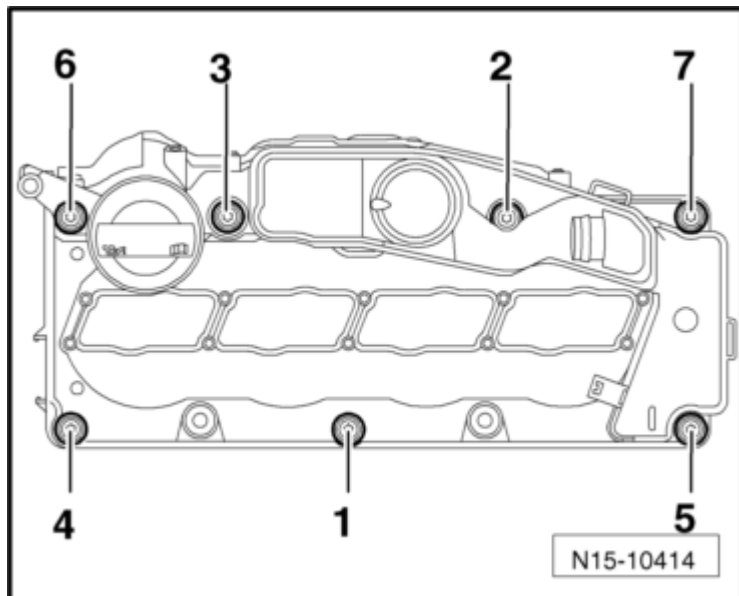


Fig. 32: Identifying Head Cover Bolts -1 Through 7- Tightening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Tighten the cylinder head cover bolts in sequence -1 through 7- to specification.

- Tightening specification, see -item 14- in the **CYLINDER HEAD COVER OVERVIEW**.

-- Install the upper toothed belt guard.

-- Make sure the upper toothed belt guard is clipped to the cylinder head cover correctly.

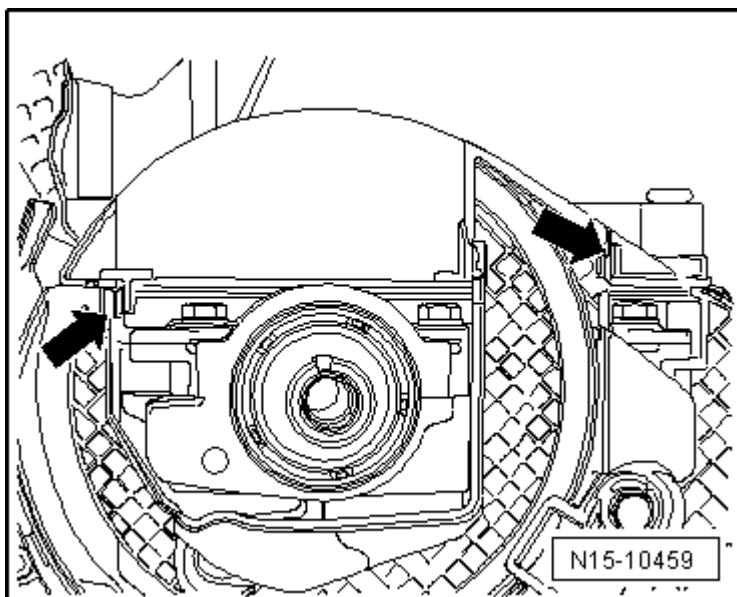


Fig. 33: Identifying Upper Toothed Belt Guard
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: **The camshaft gear is not shown in the illustration.**

-- Press the upper toothed belt guard in the area with the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.

-- Check the clearance between the hub and the upper toothed belt guard.

-- Tighten the high pressure line union nuts by hand.

-- Make sure the high pressure line is free of tension.

-- Use the torque wrench (5-50 Nm) V.A.G 1331 with the ratchet, reversible V.A.G 1331/1 and the socket T40055 to tighten the high pressure line.

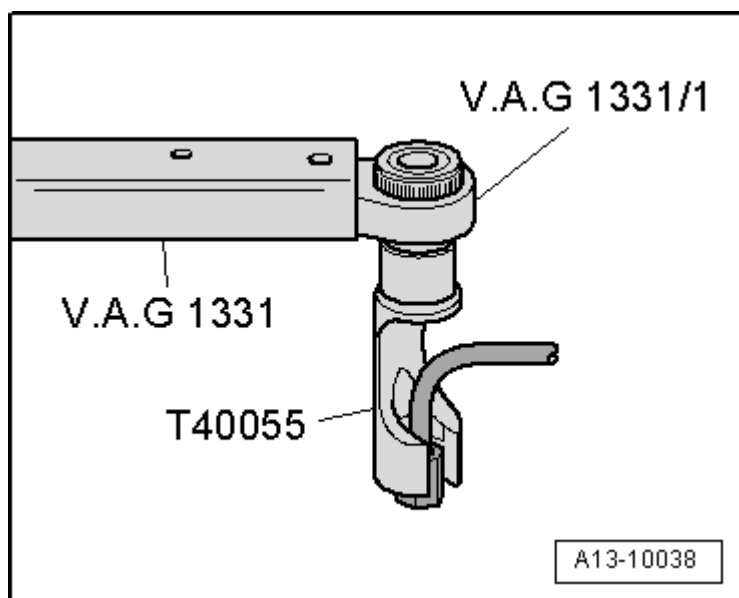


Fig. 34: Identifying Torque Wrench V.A.G 1331T, Reversible V.A.G 1331/1 And Socket T40055
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Tightening Specifications

- Cylinder head cover overview, refer to **CYLINDER HEAD COVER OVERVIEW**.
- Fuel system overview, refer to **FUEL RAIL AND INJECTORS OVERVIEW** .

-- Fill the fuel system, refer to **FUEL SYSTEM, FILLING AND BLEEDING** .

TOOTHED BELT

Special tools and workshop equipment required

- Diesel Injection Pump Locking Pin 3359
- Crankshaft Stop T10050

2010 Volkswagen Jetta TDI

ENGINE 2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBEA & CJAA (Sedan) (A5 Platform)

- Counterhold Tool Touareg V10 T10172
- Special Wrench, Long Reach T10264
- Locking Tool T10265
- Torque Wrench V.A.G 1331 (5-50 Nm)
- Torque Wrench V.A.G 1332 (40-200 Nm)

NOTE: **Toothed belt overview. Refer to TOOTHED BELT OVERVIEW .**

Requirements

- Ignition is turned off.
- Engine must be cold.

NOTE: **Adjustments to the toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.**

The engine mount bracket must be removed to remove/install the belt tensioner. Refer to ENGINE MOUNT AND BRACKET .

Removing

-- Remove the engine cover. Refer to ENGINE COVER.

-- Remove the fuel filter. Refer to FUEL FILTER .

-- Remove the auxiliary fuel pump -V393-. Refer to Auxiliary Fuel Pump -V393- (IN-LINE ELECTRIC FUEL PUMP) .

-- Disconnect the connector -1- from the engine coolant temperature sensor on radiator outlet -G83-, open the clips -arrows- and remove the upper toothed belt guard.

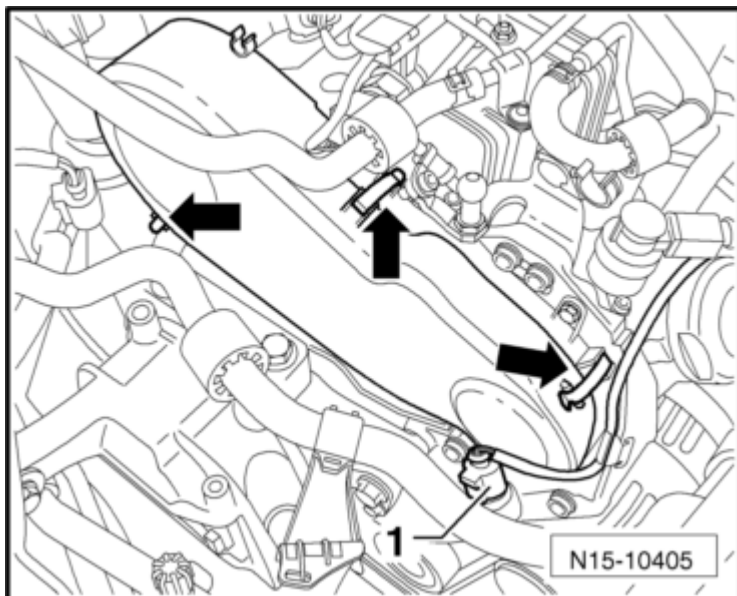


Fig. 35: Identifying Connector -1- And Clips -Arrows-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the right front wheel housing liner. Refer to **Removal and Installation** .
- Remove the ribbed belt. Refer to **RIBBED BELT** .
- Remove the vibration damper.
- Remove the lower and center toothed belt guard bolts -arrows-.

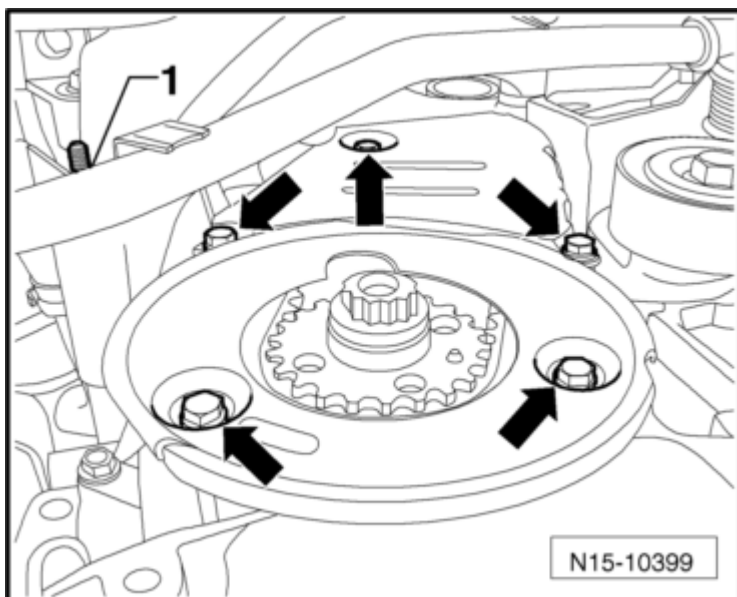


Fig. 36: Identifying Lower And Center Toothed Belt Guard Bolts -Arrows-
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the coolant pipe nut -1-.

-- Rotate the engine to Top Dead Center (TDC) and secure the crankshaft toothed belt gear using the crankshaft stop T10050. Push the crankshaft stop from the front side of the toothed belt gear into the teeth. The toothed gear must be in the >>12 o'clock<< position.

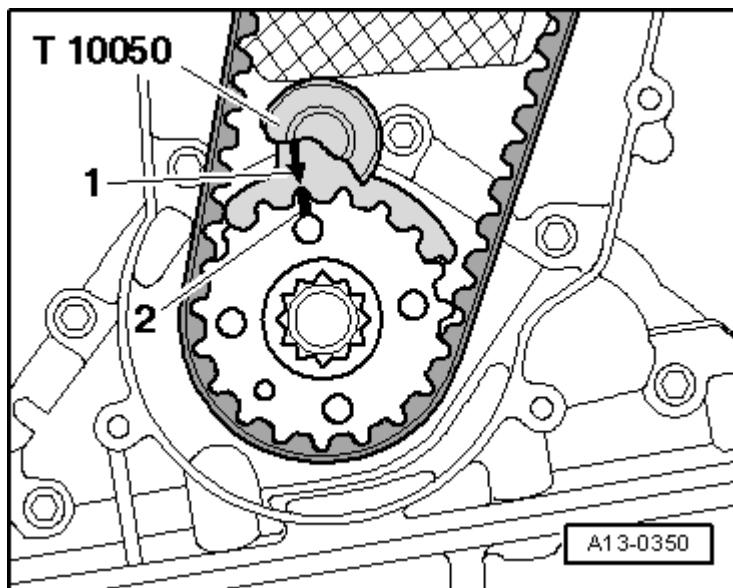


Fig. 37: Identifying Crankshaft Toothed Belt Pulley And Crankshaft Stop T10050
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The marks on the crankshaft toothed belt gear -2- and the crankshaft stop T10050 -1- must align. The pin on the crankshaft stop T10050 must engage in the hole on the sealing flange.

-- Mark the rotational direction of the toothed belt.

-- Loosen the bolts -1- for the camshaft gear.

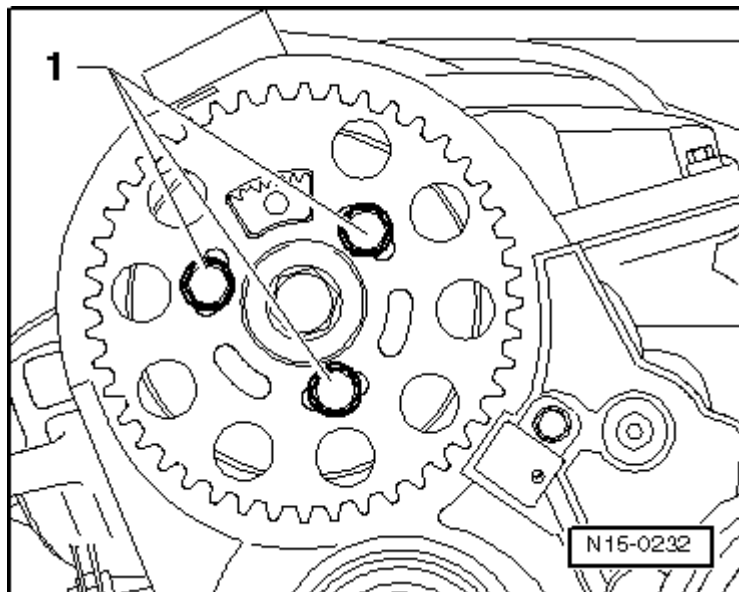


Fig. 38: Identifying Camshaft Pulley Securing Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Loosen the coolant pipe bolt -1- and then the bolts for the high pressure fuel pump toothed belt gear -2-.

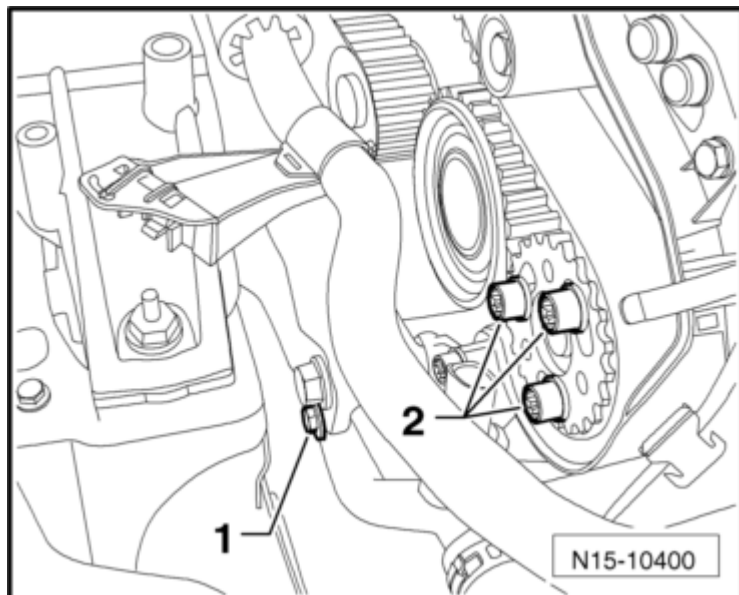


Fig. 39: Identifying Coolant Pipe Bolt -1- And High Pressure Fuel Pump Toothed Belt Gear -2-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Loosen the nut -1- on the tensioner and turn the tensioner eccentric pulley counterclockwise in the -direction of the arrow- using the special wrench, long reach T10264 until it is possible to lock the tensioner using the locking tool T10265.

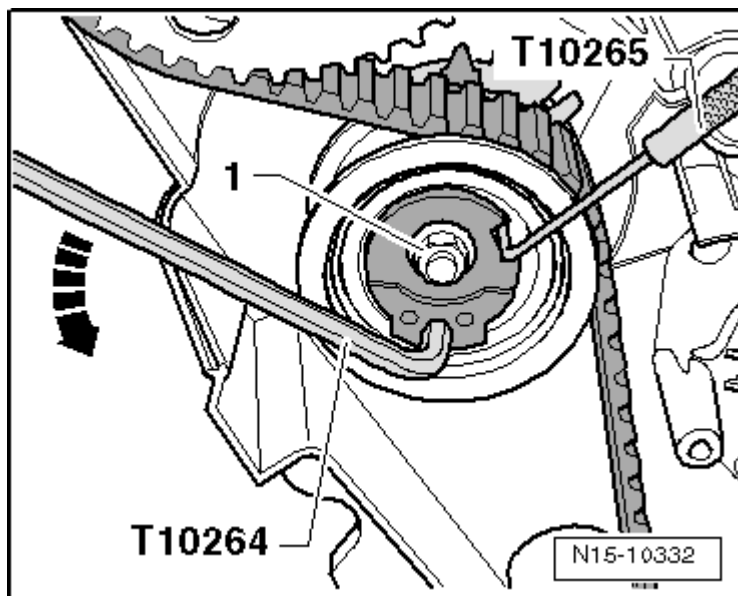


Fig. 40: Identifying Long Reach T10264 And Locking Tool T10265
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Now, turn the tensioner eccentric pulley clockwise in the -direction of the arrow- all the way and tighten the nut -1- by hand.

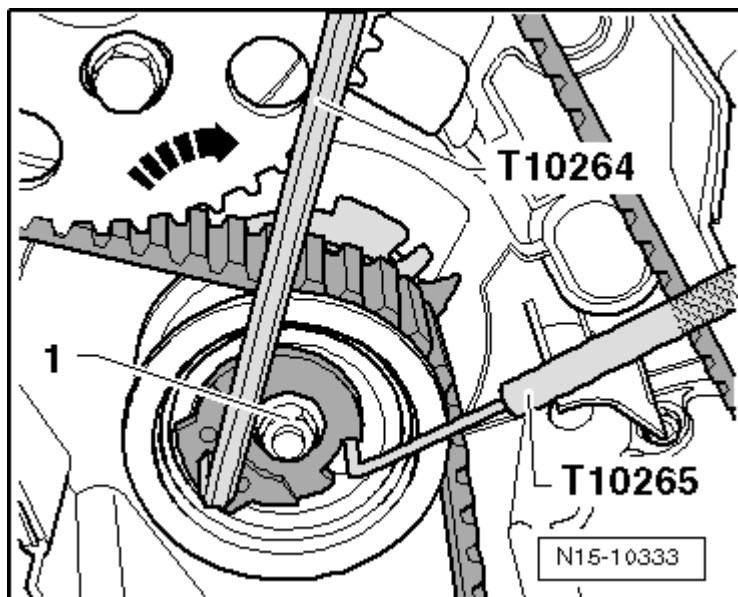


Fig. 41: Identifying Long Reach T10264 And Locking Tool T10265
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- First, remove the toothed belt from the idler roller and then from the remaining gears.

Installing and Tensioning

Requirements

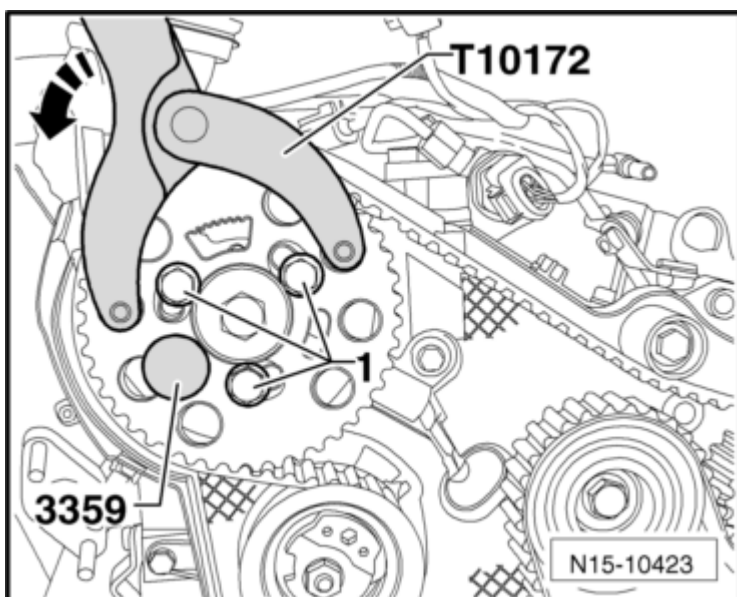
- Ignition is turned off.
- Engine must be cold.
- The locking tool T10265 must be inserted in the tensioner and the roller must be secured on the right stop.
- Secure the crankshaft using the crankshaft stop T10050.

NOTE: Adjustments to the toothed belt may generally only be performed when the engine is cold, because the indicator position of the tensioning element changes depending on engine temperature.

The engine mount bracket must be removed to remove/install the tensioner. Refer to ENGINE MOUNT AND BRACKET .

Procedure

-- Rotate the camshaft hub using the counterhold tool Touareg V10 T10172 and the adapter T10172/4 until it can be secured in place. Use at least one bolt -1- tightened by hand to do that.



**Fig. 42: Identifying T10172 Pushed In -Direction Of Arrow- And Bolts -1-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

-- Secure the camshaft hub using the diesel injection pump locking Pin 3359. To do this, push the pin through the empty outer slot and into the cylinder head bore.

-- Loosen the bolts -1- that were tightened by hand.

-- If necessary, rotate the high pressure fuel pump hub with a screwdriver at the bolt heads -1- until it can be secured.

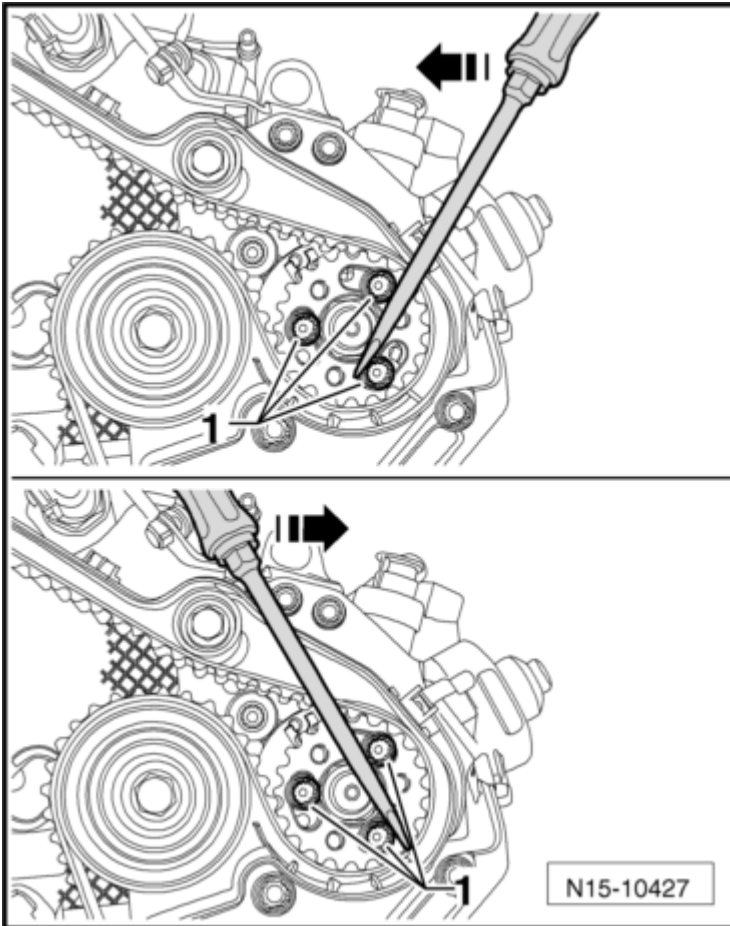


Fig. 43: Identifying Screwdriver Secured At Bolt Heads -1-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Secure the high pressure fuel pump hub using the diesel injection pump locking Pin 3359. To do that, slide the pin into the hole outside the toothed belt sprocket.

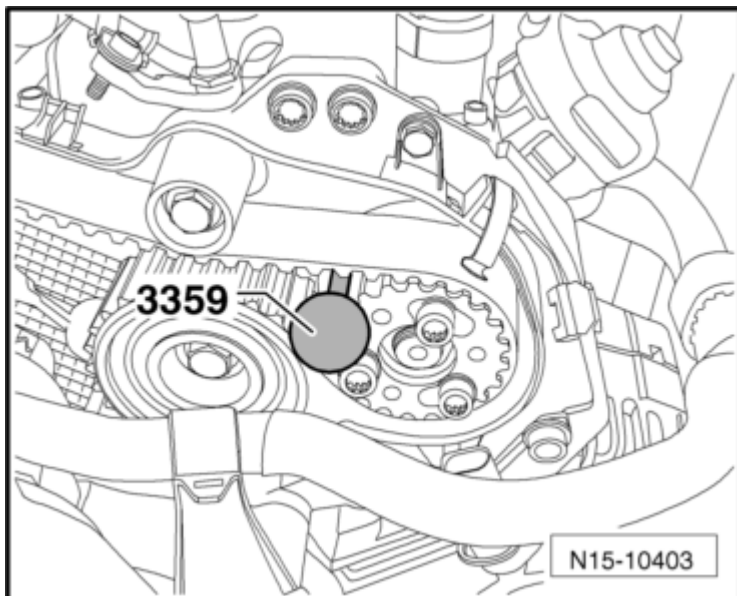
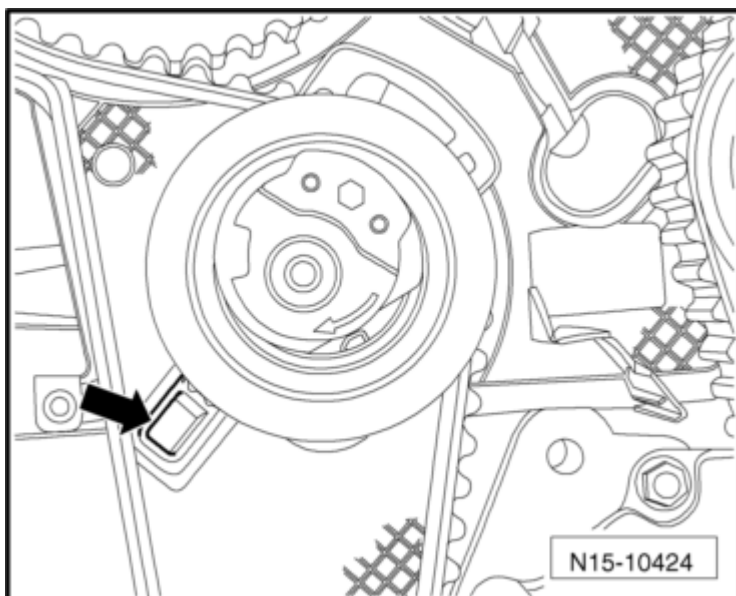


Fig. 44: Identifying Diesel Injection Pump Locking Pin 3359
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

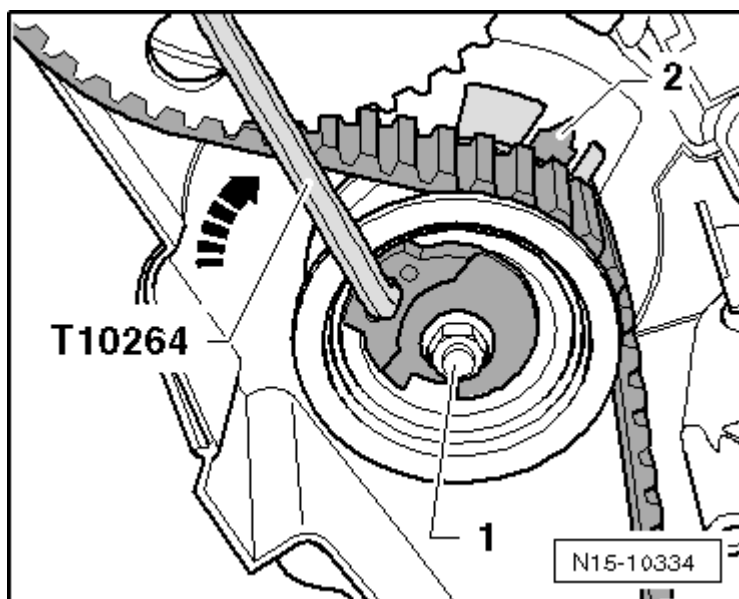
- Rotate the camshaft gear and high pressure fuel pump gear clockwise in their slots as far as the stop.
- Install the toothed belt on the crankshaft gear, the tensioner, the camshaft gear, coolant pump toothed belt gear and the fuel high pressure toothed belt gear.
- Lay the toothed belt on the tensioner last.
- Loosen the tensioner nut and remove the locking pin T10265.

NOTE: **Make sure the tensioner is properly positioned in the rear toothed belt guard - arrow-.**



**Fig. 45: Identifying Tensioner Positioned In Rear Toothed Belt Guard -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

-- Carefully rotate the tensioner eccentric pulley clockwise using the special wrench, long reach T10264 until the indicator is centered in the base plate gap -2-.



**Fig. 46: Identifying Long Reach T10264 And Nut -1-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

- Make sure the nut -1- does not rotate with it.

-- Hold the tensioner in this position and tighten the nut on it.

- Tightening specification, see -item 6- in the **TOOTHED BELT OVERVIEW** .

-- Position the counterhold tool Touareg V10 T10172 as illustrated. Push the T10172 in the -direction of the arrow- and hold the camshaft gear tensioned.

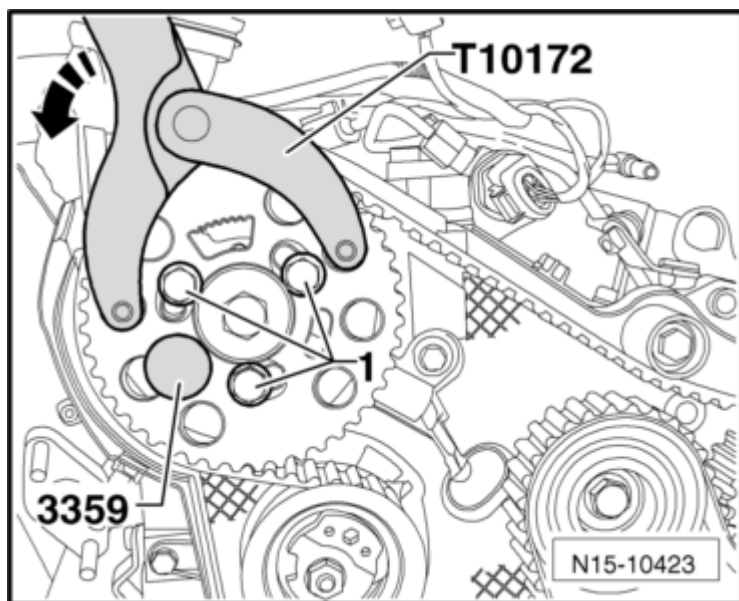


Fig. 47: Identifying T10172 Pushed In -Direction Of Arrow- And Bolts -1-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- In this position, tighten the bolts -1- for the camshaft gear and high pressure fuel pump toothed belt gear.

- Tightening specification: 20 Nm.

-- Remove the diesel injection pump locking Pin 3359 and the crankshaft stop T10050.

-- Rotate the crankshaft at least two rotations in engine rotation direction and position it just before cylinder 1 TDC.

-- Position the crankshaft stop T10050 on the crankshaft toothed belt gear again.

-- Now, turn the crankshaft in engine rotation direction until the crankshaft stop tab -arrow- engages the sealing flange.

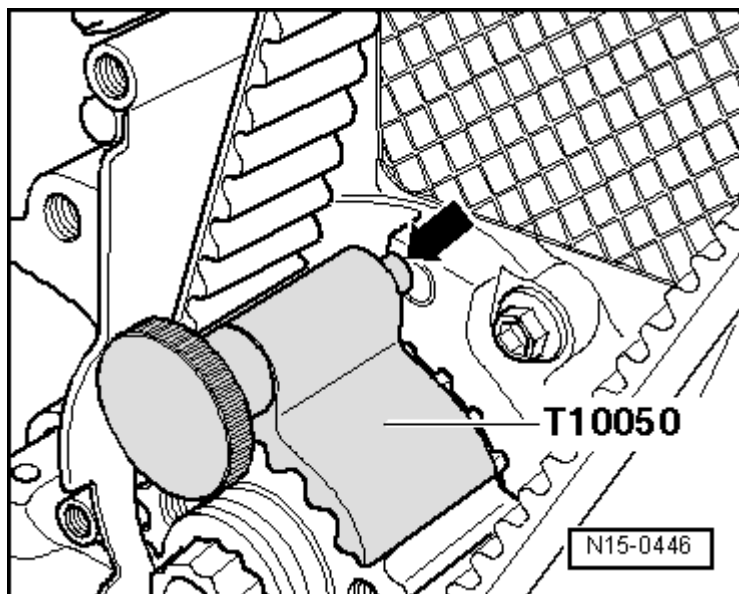


Fig. 48: Identifying Crankshaft Stop T10050

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: In the following check, only the camshaft and crankshaft are secured. It is difficult to find the securing point on the high pressure fuel pump hub. A small deviation -arrow- does not affect engine operation.

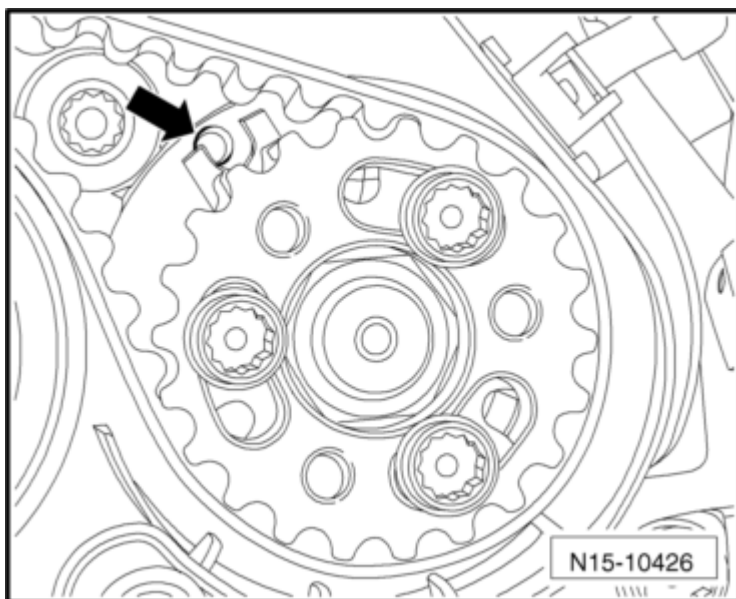


Fig. 49: Identifying Small Deviation -Arrow- On High Pressure Fuel Pump Hub
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Check if:

- the camshaft hub can be secured using the diesel injection pump locking Pin 3359 and

- the tensioner indicator is centered with or a maximum of 5 mm to the right of the base plate gap.

If the camshaft hub cannot be secured:

- Pull the crankshaft stop T10050 toward the back until the tab opens the hole.
- Rotate the crankshaft opposite engine rotation direction until it is slightly past TDC.
- Now, rotate the crankshaft slowly in engine rotation direction until the camshaft hub can be secured.
- After securing, loosen the bolts on the camshaft toothed belt gear.

If the crankshaft stop T10050 tab is to the left of the hole

- Rotate the crankshaft in engine rotation direction until the crankshaft stop tab engages the sealing flange.

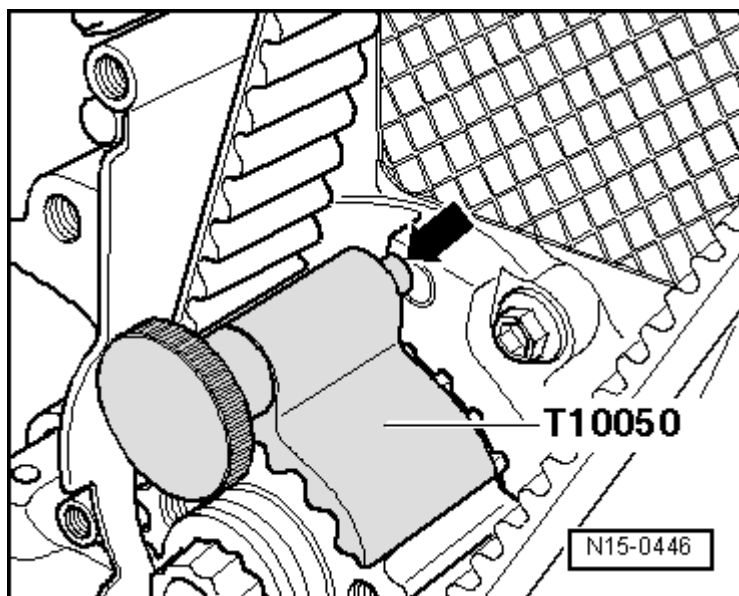


Fig. 50: Identifying Crankshaft Stop T10050

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tighten the bolts on the camshaft toothed belt gear.

- Tightening specification: 20 Nm.

If the crankshaft stop T10050 tab is to the right of the hole

- Rotate the crankshaft slightly opposite engine rotation direction.
- Now, rotate the crankshaft in engine rotation direction until the crankshaft stop tab engages the sealing flange.

-- Tighten the bolts on the camshaft toothed belt gear.

- Tightening specification: 20 Nm.

Continued

-- Remove the diesel injection pump locking Pin 3359 and the crankshaft stop T10050.

-- Rotate the crankshaft at least two rotations in engine rotation direction and position it just before cylinder 1 TDC.

-- Check again.

If the camshaft hub can now be secured:

-- Tighten the bolts as follows:

- Tighten the camshaft toothed belt gear bolt an additional 45° (1/8) turn. Counterhold it using the counterhold tool Touareg V10 T10172 and the adapter T10172/4.
- Tighten the high pressure fuel pump toothed belt gear bolt an additional 90° (1/4) turn. Counterhold it using the counterhold tool Touareg V10 T10172 and the adapter T10172/8.

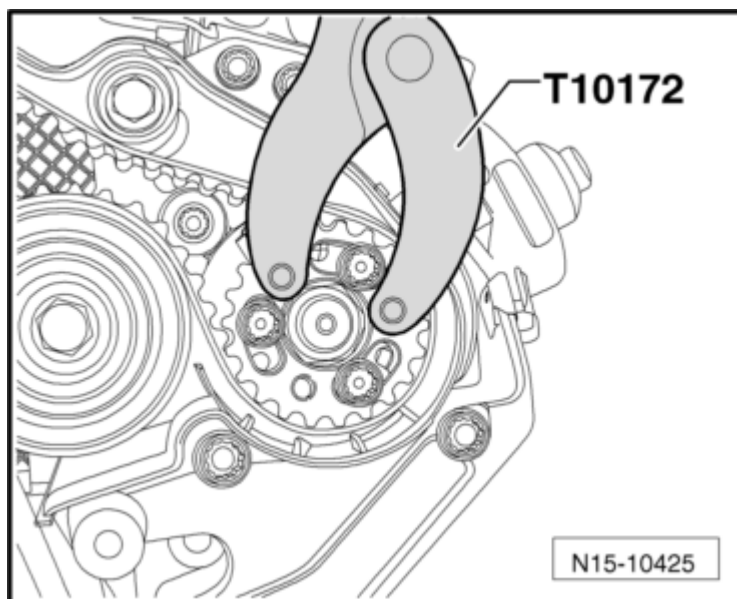


Fig. 51: Identifying Counterhold Tool Touareg V10 T10172
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the lower and center toothed belt guard bolts -arrows-.

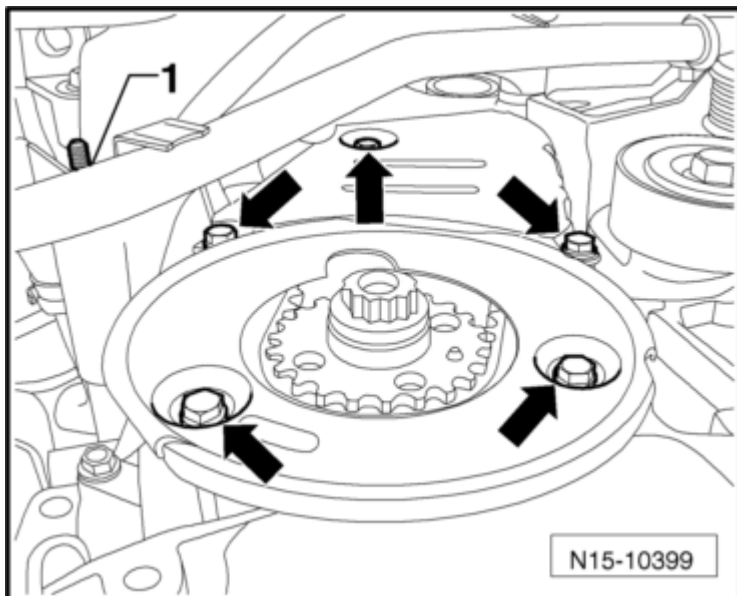


Fig. 52: Identifying Lower And Center Toothed Belt Guard Bolts -Arrows-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tightening specifications, see -item 27- in the **TOOTHED BELT OVERVIEW** .

-- Install the vibration damper.

- Tightening specification, see -item 28- in the **TOOTHED BELT OVERVIEW** .

-- Install the ribbed belt. Refer to **RIBBED BELT** .

-- Install the upper toothed belt guard.

-- Make sure the upper toothed belt guard is clipped to the cylinder head cover correctly.

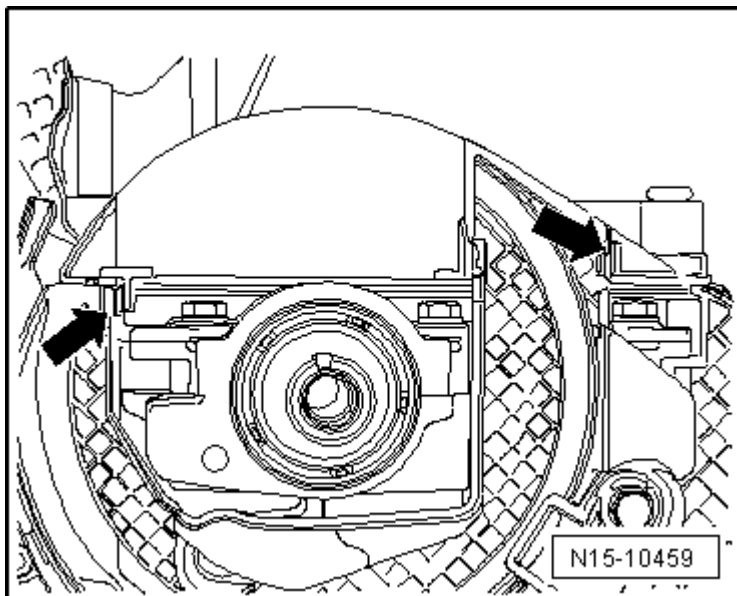


Fig. 53: Identifying Upper Toothed Belt Guard

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The camshaft gear is not shown in the illustration.

-- Press the upper toothed belt guard in the area with the clips -arrows- against the cylinder head cover until the clips engage with each other. Use a screwdriver to press the guard if necessary.

-- Check the clearance between the hub and the upper toothed belt guard.

-- Install the right front wheel housing liner. Refer to **Removal and Installation** .

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

The rest of the installation is basically a reverse of the removal procedure. When doing this note the following:

- Route the fuel hoses free of kinks.
- Ensure the fuel hoses are seated securely.
- Do not interchange the supply and return lines (the return line is blue or has a blue mark, the supply line is white or has a white mark).
- Clip the fuel hoses into the retainers.

-- Install the auxiliary fuel pump. Refer to **Auxiliary Fuel Pump -V393- (IN-LINE ELECTRIC FUEL PUMP)** .

-- Install the fuel filter. Refer to **FUEL FILTER** .

-- Install the engine cover. Refer to **ENGINE COVER**.

CYLINDER HEAD

Special tools and workshop equipment required

- Guide Pins & Handle - 1112 mm 3070
- Diesel Injection Pump Locking Pin 3359
- Crankshaft Stop T10050
- Camshaft Gear Counter-Holder T10051
- Puller T10052
- Socket Insert XZN 10 T10385
- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Drip Tray for VAS 6100 VAS 6208
- Engine Bung Set VAS 6122

- CAUTION:**
- Follow the safety precautions when working on the diesel direct injection system. Refer to SAFETY PRECAUTIONS .
 - Observe the rules for cleanliness. Refer to CLEAN WORKING CONDITIONS .

Always follow these instructions before and during work.

NOTE: Toothed belt overview. Refer to TOOTHED BELT OVERVIEW .

Cylinder head cover overview. Refer to CYLINDER HEAD COVER OVERVIEW.

Cylinder head overview. Refer to CYLINDER HEAD OVERVIEW.

Turbocharger and exhaust manifold with attachments overview. Refer to TURBOCHARGER AND EXHAUST MANIFOLD WITH ATTACHMENTS OVERVIEW .

Charge air cooler components overview. Refer to CHARGE AIR COOLER COMPONENT OVERVIEW .

Intake manifold and attachments overview. Refer to INTAKE MANIFOLD AND ATTACHMENTS OVERVIEW .

Particulate filter with NOx reduction catalyst overview. Refer to one of the following:

Engine code CBEA, refer to PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW .

Engine code CJAA, refer to PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW .

Exhaust Gas Recirculation (EGR) system overview. Refer to EXHAUST GAS RECIRCULATION SYSTEM COMPONENT OVERVIEW .

Hose connections are secured with either spring type or clamp type clamps.

Always replace clamp-type clamps with spring type clamps.

Hose clip pliers VAS 6362 or hose clip pliers VAS 6340 are recommended for installing spring type clamps.

All cable ties which are opened or cut off when removing the cylinder head, must be replaced in the same position when installing the cylinder head.

Removing

NOTE: To perform the procedure, the battery ground cable must be disconnected. See if a coded radio is installed. If so, obtain the anti-theft code beforehand.

WARNING: When doing any repair work, especially in the engine compartment, pay attention to the following due to clearance issues:

- Route all lines and wires in their original locations.
- For example, fuel, hydraulic, Evaporative Emission (EVAP), coolant, refrigerant, brake fluid and vacuum lines.
- Ensure sufficient clearance to all moving or hot components.

-- Remove the engine cover. Refer to ENGINE COVER.

-- Remove the air filter housing. Refer to AIR FILTER HOUSING .

CAUTION: Electronic components could be destroyed when the battery is disconnected:

- Follow the required steps when disconnecting the battery.

-- Turn off the ignition and disconnect the ground cable -arrow- from the battery. Refer to Removal and Installation .

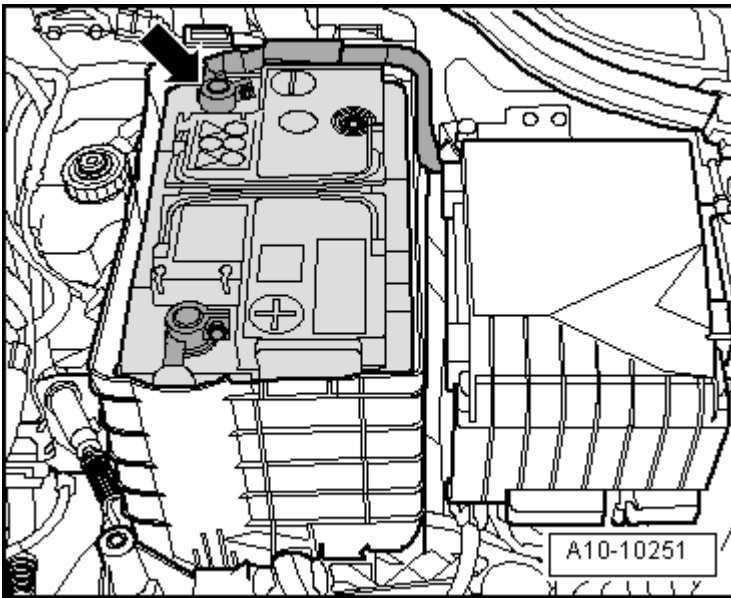


Fig. 54: Identifying Battery And Ground Cable

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the battery, the battery tray bolts -arrows- and tray.

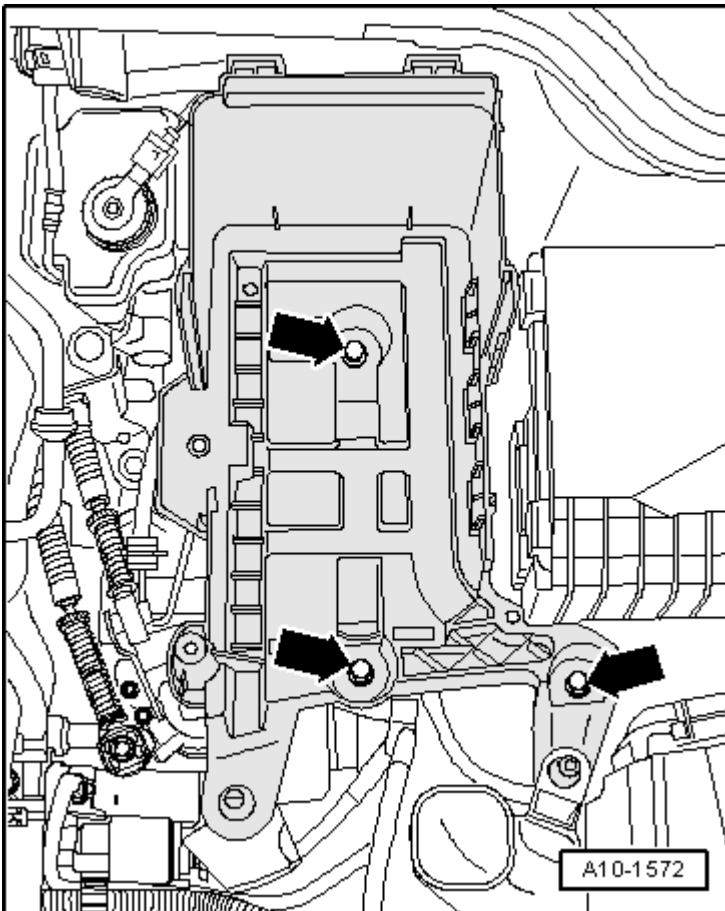
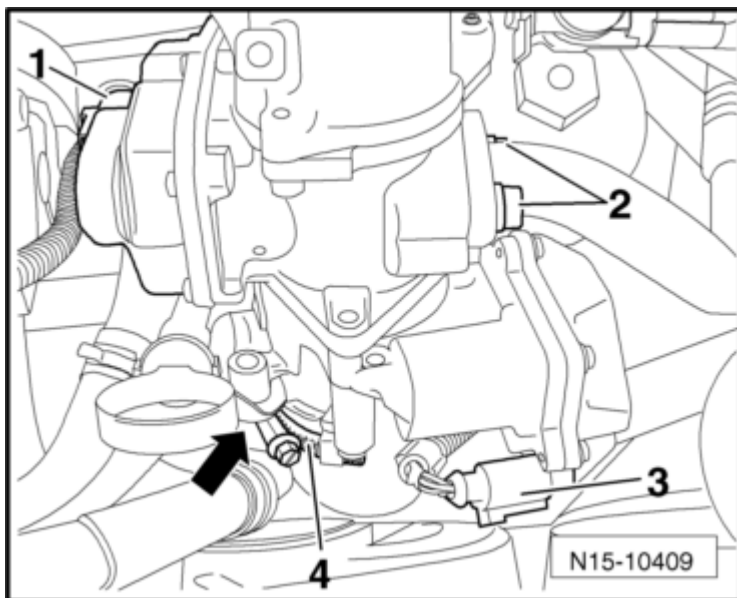


Fig. 55: Identifying Battery Holder Bolts**Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.
- Remove the toothed belt from the camshaft. Refer to **TOOTHED BELT**.
- Remove the camshaft gear and hub. Refer to **CAMSHAFTS**.
- Disconnect the connector from the exhaust gas recirculation vacuum regulator solenoid valve -N18- -1- and the throttle valve control module -J338- -3-.

**Fig. 56: Identifying Exhaust Gas Recirculation Vacuum Regulator Solenoid Valve -1-, Throttle Valve Control Module -J338- -3- And Clamp -4-****Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

- Loosen the clamp -4- and remove the charge air hose.
- Remove the oil dipstick tube bracket -arrow-.
- Remove the fan shroud and fans. Refer to **FAN SHROUD AND FANS**.
- Remove the bolts -arrows- from the charge air pipe and disconnect the connector -1- from the charge air pressure sensor -G31-.

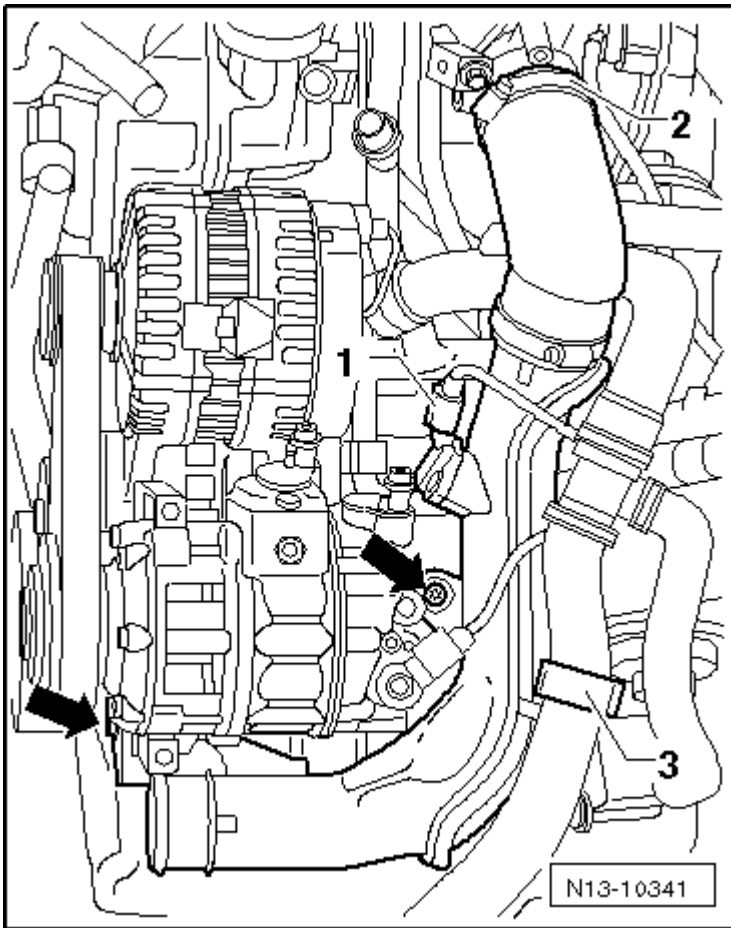


Fig. 57: Identifying Connector -1-, Clamp -2 And Coolant Hose -3-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Open the clamp -2-, free up the coolant hose -3- and remove the charge air pipe.

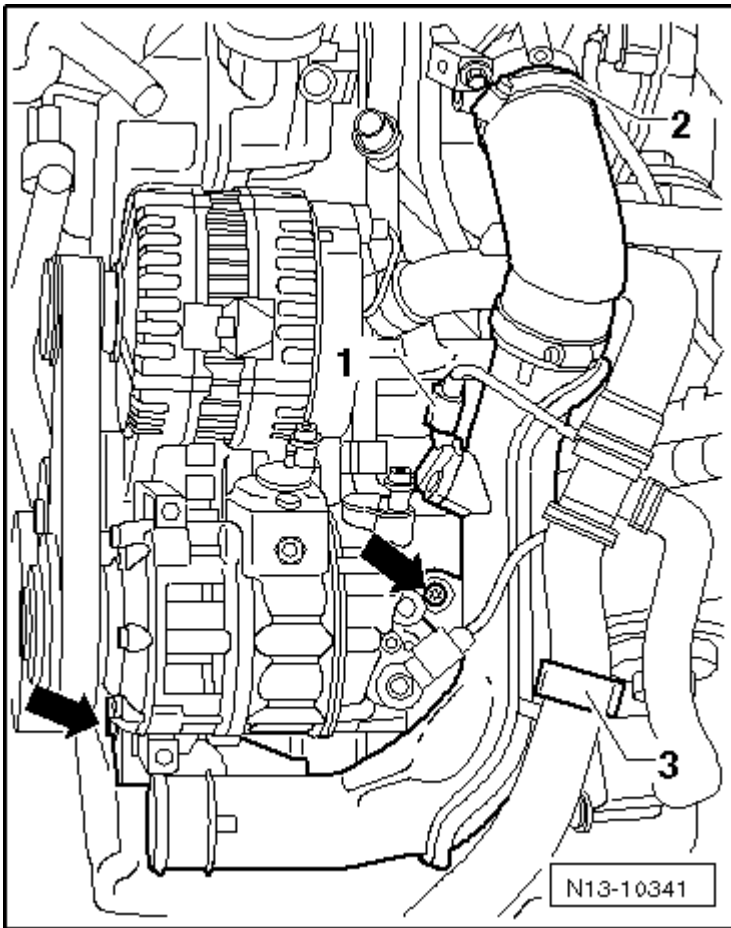


Fig. 58: Identifying Connector -1-, Clamp -2 And Coolant Hose -3-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the oil supply line. Refer to **OIL SUPPLY LINE TO TURBOCHARGER** .
- Unclip the Engine Control Module (ECM) wiring harness from the wiring guide -arrow-.

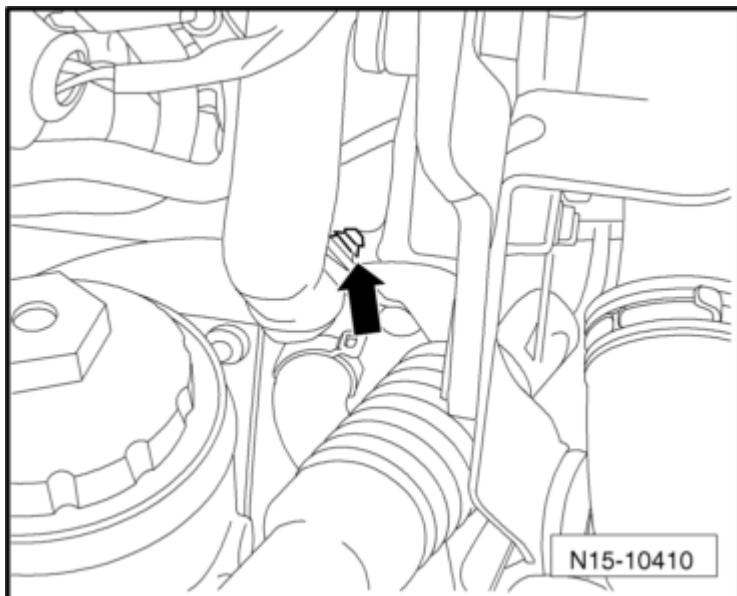


Fig. 59: Identifying Engine Control Module (ECM) Wiring Guide -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

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

-- Disconnect the connector from the charge pressure actuator position sensor -G581- -2- at the turbocharger vacuum diaphragm.

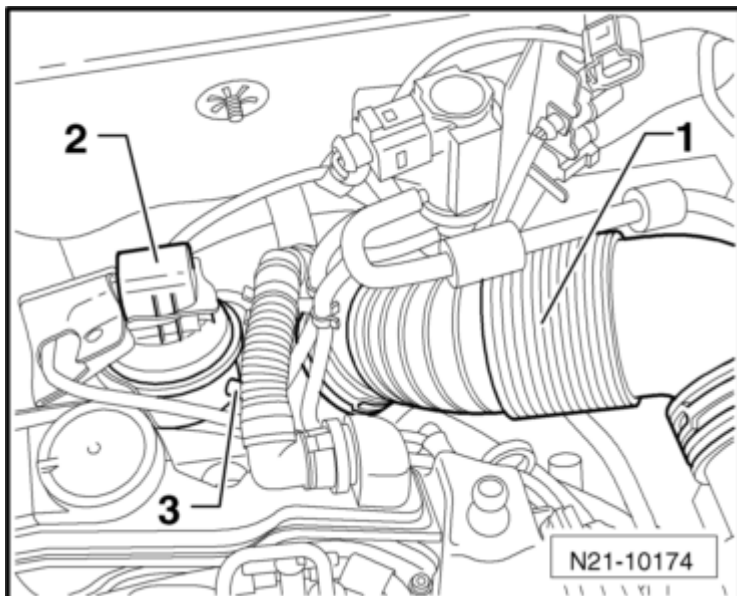


Fig. 60: Identifying Connector To Charge Pressure Actuator Position Sensor -G581- -2- And Vacuum Hose -3-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Disconnect the vacuum hose -3- from the vacuum diaphragm on the turbocharger.

-- Disconnect the >>black<< connector for the exhaust gas temperature sensor 1 -G235- -2- at the plenum chamber bulkhead.

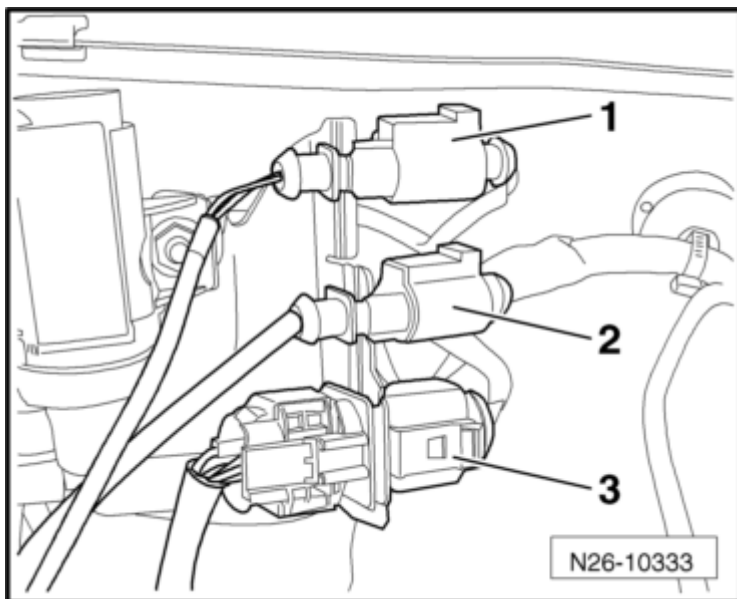


Fig. 61: Identifying >>Black<< Connector To Exhaust Gas Temperature Sensor 1 -G235- -2-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Guide the wire out of the mount on the plenum chamber bulkhead and on the turbocharger.

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

-- Remove the right drive axle heat shield bolts -arrows- and shield.

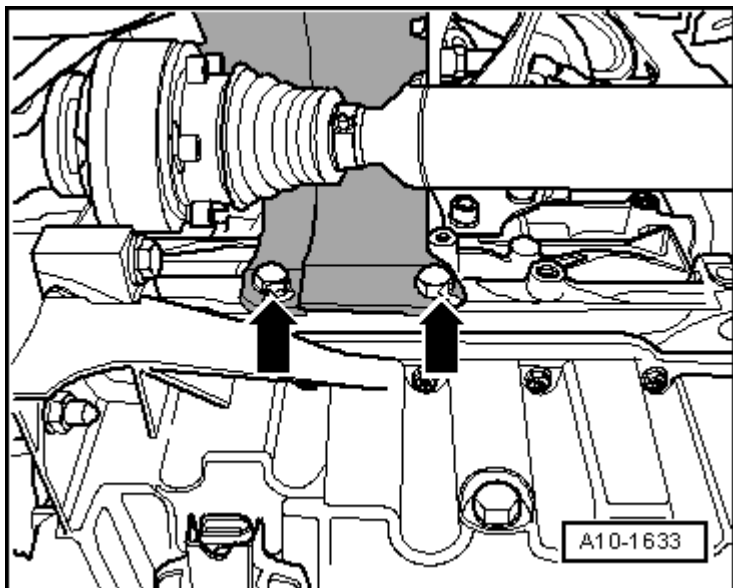


Fig. 62: Identifying Protective Cap For Drive Axle On Engine
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the charge air pipe bolts and the hose from the turbocharger.

-- Mark the installed position of the exhaust gas temperature sensor 1 and remove it.

-- Remove the heat shield and disconnect the connector from the exhaust pressure sensor 2 -G451-. Refer to one of the following:

- Engine code CBEA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- Engine code CJAA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .

-- Remove the control wire between the EGR housing and the exhaust pressure sensor 2. Refer to one of the following:

- Engine code CBEA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- Engine code CJAA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .

-- Remove the bolts and bracket with the exhaust pressure sensor 2 and lay them aside (the control wire to the particulate filter remains connected).

-- Remove the lower bracket for the particulate filter.

NOTE: **Remove the nuts above the bracket using wrench SW13 T10384.**

-- Remove the EGR filter.

-- Disconnect the connector -arrow- from the engine coolant temperature sensor -G62- and guide the wire out.

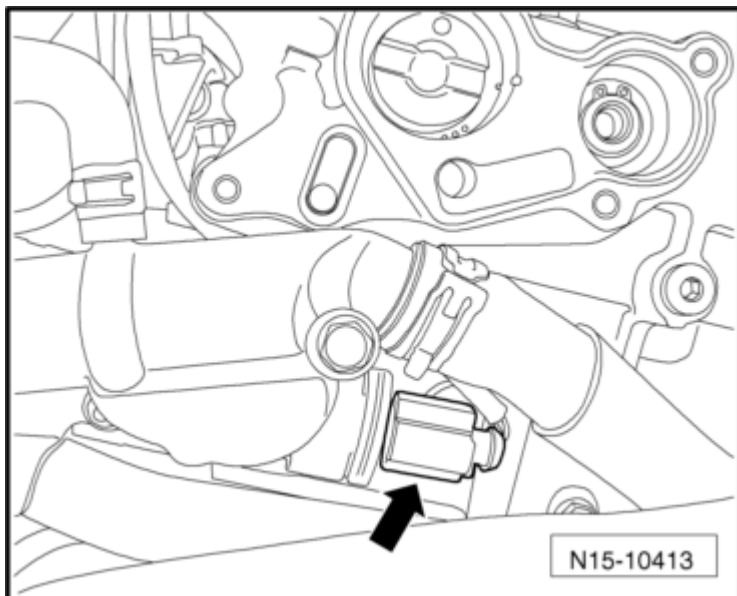


Fig. 63: Identifying Connector -Arrow- To Engine Coolant Temperature Sensor
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the particulate filter from the upper bracket and remove the bracket from the cylinder head.
- Remove the clamp between the particulate filter and turbocharger.
- Remove the banjo bolt from the turbocharger support.
- Remove the stud bolt from the turbocharger support.
- Rotate the lower section of the support 90° and remove the support downward from the upper section.
- Remove the coolant hoses at the cylinder head coolant connections.
- Remove the bolt -arrow- from the rear toothed belt guard.

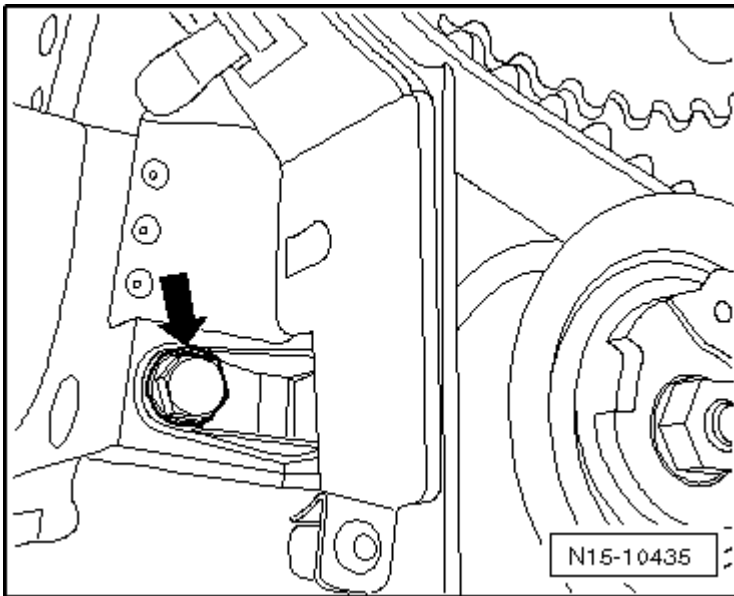


Fig. 64: Identifying Nut To Toothed Belt Tension
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the nut from the toothed belt tension.
- Disconnect the camshaft position sensor -G40- connector -arrow-.

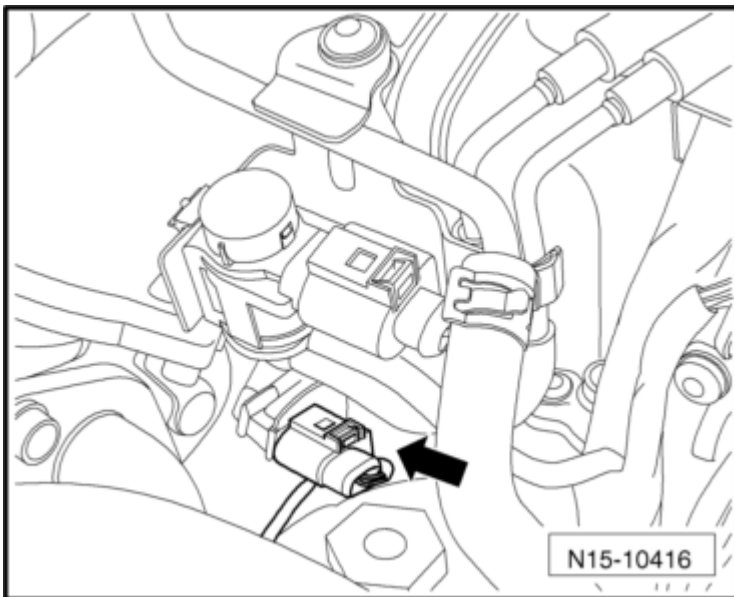


Fig. 65: Identifying Camshaft Position Sensor -G40- Connector -Arrow-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Drain the coolant. Refer to **DRAINING AND FILLING** .
- Remove the cylinder head bolts in sequence -1 through 10-.

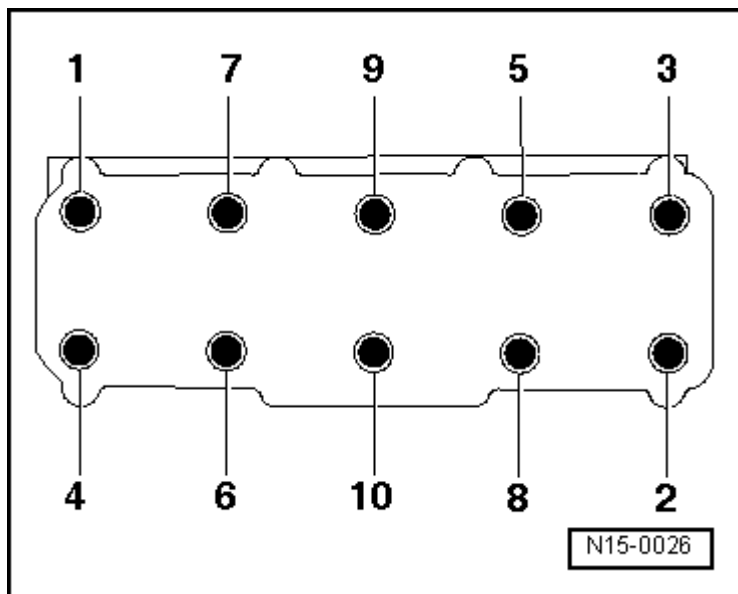


Fig. 66: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: A second technician is needed when removing the cylinder head.

The toothed belt tensioner is pulled off the stud bolt when lifting the cylinder head off.

The turbocharger oil return line is pulled out of the support when lifting the cylinder head off.

Make sure all necessary electrical wires are disconnected!

-- Raise the cylinder head at the transmission side first and guide it back out of the toothed belt guard. Be careful not to let the toothed belt tensioner fall.

-- Lay the cylinder head down so that the oil return line is not bent. Place a wooden block under the exhaust manifold if necessary.

Installing

CAUTION: The sealing surfaces could be damaged:

- Carefully remove any sealant residue from the cylinder head and cylinder block.
- Make sure that no long scrapes or scratches result.

Risk of damaging the cylinder block:

- There must be no oil or coolant in the blind holes for the cylinder

head bolts in the cylinder block.

Risk of the cylinder head gasket leaking:

- **Carefully remove all grinding and sanding residue.**
- **Only unpack a new cylinder head gasket immediately prior to installation.**
- **To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the gasket extremely carefully.**

Risk of damaging open valves:

- **If a replacement cylinder head is installed, only remove the accompanying plastic base immediately before installing to protect the open valves.**

Risk of damaging valves and piston heads after working on valvetrain:

- **To ensure valves do not strike pistons when starting, carefully rotate engine at least 2 full revolutions.**
- **Before installing, check if the oil return pipe coupling element is bent and therefore stretched. If that is the case, tiny cracks can form that can lead to leaks. Replace the oil return pipe before installing the cylinder head if necessary.**

NOTE: Always replace cylinder head bolts.

Replace the gaskets, seals, self-locking nuts and clamps.

Carefully remove residual sealant from the cylinder head and cylinder block. Make sure that no long scrapes or scratches result. When using sand paper, grit must not be below 100.

Thoroughly remove all sanding and grinding residue.

Only unpack the new cylinder head gasket immediately prior to installation.

-- Before installing the cylinder head, remove the crankshaft stop T10050 and rotate the crankshaft back opposite the engine rotation direction until all of the pistons are nearly even under Top Dead Center (TDC).

-- Place the cylinder head gasket with the identification upward.

-- Slide the guide pins3070 into the outer bores on the intake side to center.

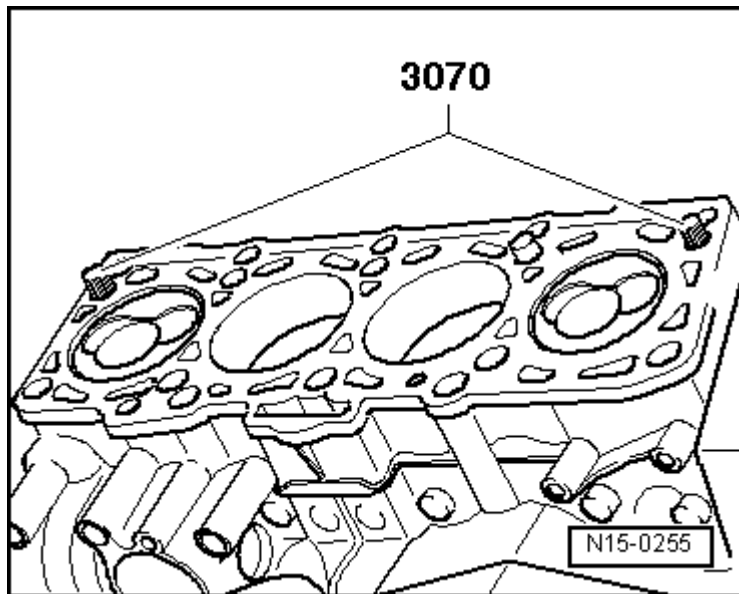


Fig. 67: Identifying Installed Guide Pins

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The tensioner must be placed on the studs when positioning the cylinder head.

- Install the cylinder head, insert the eight cylinder head bolts and tighten them by hand.
- Remove the guide pins 3070 through the bolt holes using the guide pin handle. Insert the cylinder head bolts.
- Tighten the cylinder head bolts in the sequence -1 through 10- indicated, in four stages as follows:

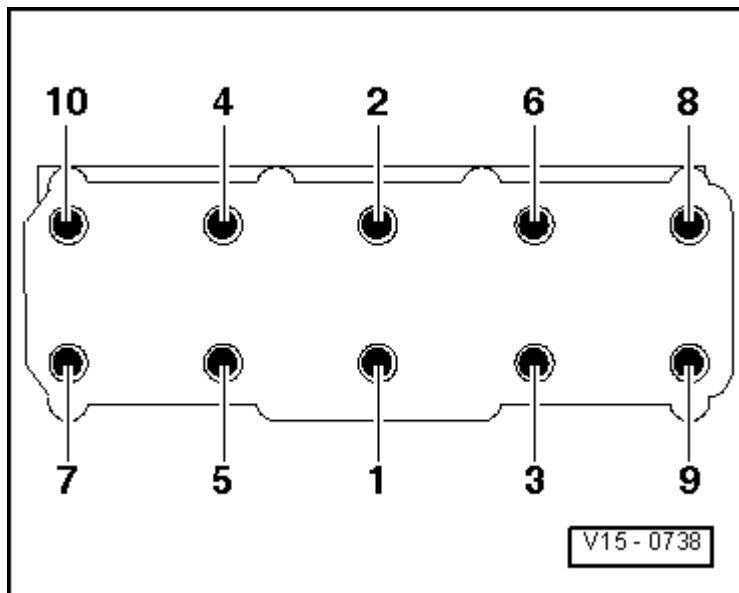


Fig. 68: Identifying Cylinder Head Bolt Tightening Sequence

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

1. Tighten the bolts using a torque wrench:

Stage I - 35 Nm

Stage II - 60 Nm

2. Tighten the bolts further using a ratchet:

Stage III - an additional 90° (1/4) turn

Step IV - an additional 90° (1/4) turn

-- Secure the toothed belt guard on the back of the cylinder head.

- Tightening specifications, see -item 14- in the **TOOTHED BELT OVERVIEW** .

-- Install the camshaft gear and hub. Refer to **CAMSHAFTS**.

-- Secure the camshaft and the high pressure fuel pump using the diesel injection pump locking Pin 3359.

-- Rotate the crankshaft in engine rotation direction and secure the crankshaft using the crankshaft stop T10050.

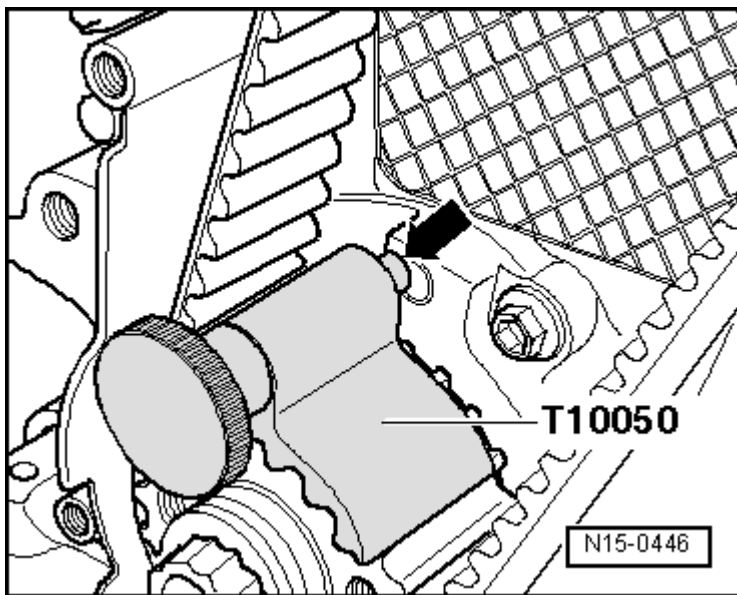


Fig. 69: Identifying Crankshaft Stop T10050

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install and tension the toothed belt. Refer to **TOOTHED BELT**.

The additional numbered steps must be followed to ensure the particulate filter with the NOx reduction catalytic converter is installed correctly:

NOTE: After installing the particulate filter with NOx reduction catalytic converter, make sure it is free of tension.

Always replace self-locking nuts, seals, gaskets and clamps.

CAUTION: The coupling elements between the particulate filter and NOx reduction catalytic converter can be damaged. When removing and installing:

- Do not bend the coupling element more than 10°.
- Do not stretch the coupling element.
- Do not damage the wire mesh on the coupling element.

-- Position the lower bracket with the nuts on the cylinder block and on the particulate filter. (Do not tighten the nuts.)

-- Position the new clamp with a new gasket between the particulate filter and turbocharger (do not tighten the clamp):

- Make sure the clamp is in the correct installed position. Refer to one of the following:
- Engine Code CBEA, refer to **MUFFLER OVERVIEW** .
- Engine Code CJAA, refer to **MUFFLER OVERVIEW** .

-- Install the EGR filter -item 9- in the **EXHAUST GAS RECIRCULATION SYSTEM COMPONENT OVERVIEW** .

-- Position a new clamp between the particulate filter and EGR filter (do not tighten the clamp):

- Make sure the clamp is in the correct installed position. Refer to one of the following:
- Engine code CBEA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- Engine code CJAA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .

-- Position the particulate filter on the upper bracket with the bolt. (Do not tighten the bolt.)

-- Tighten the mounting elements in the following sequence:

-- Clamp between the particulate filter and turbocharger.

-- Lower bracket to the cylinder block:

-- Lower bracket to the particulate filter:

-- Upper bracket to the particulate filter:

-- Upper bracket to the cylinder head:

-- Clamp between the particulate filter and EGR filter:

- Tightening specifications, refer to one of the following:
- Engine code CBEA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- Engine code CJAA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .

Further installation is performed in reverse order. When doing this note the following:

- Replace the self-locking nuts and seals.
- Position the charge air pipe connecting hose before securing the turbocharger.
- Note the exhaust gas temperature sensor 1 installed position.
- Replace the banjo bolt with the turbocharger support gaskets and oil return pipe O-rings.
- Do not stretch the oil return pipe coupling element when installing the turbocharger support.
- Make sure lines connections are securely fastened.

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

-- Install the right drive axle heat shield and bolts -arrows-. Refer to **DRIVE AXLE HEAT SHIELDS** .

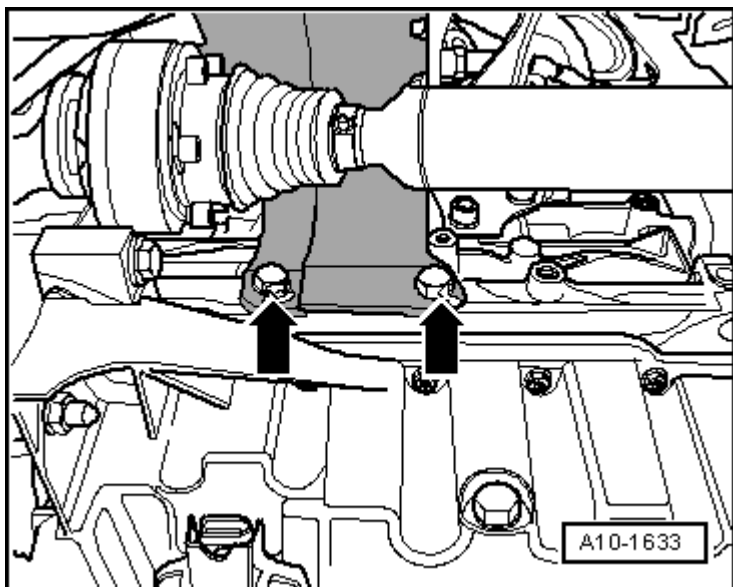


Fig. 70: Identifying Protective Cap For Drive Axle On Engine
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Tightening Specifications

- **TOOTHED BELT OVERVIEW**
- **CYLINDER HEAD COVER OVERVIEW**
- **CYLINDER HEAD OVERVIEW**
- **TURBOCHARGER AND EXHAUST MANIFOLD WITH ATTACHMENTS OVERVIEW** .
- **CHARGE AIR COOLER COMPONENT OVERVIEW**
- **INTAKE MANIFOLD AND ATTACHMENTS OVERVIEW**
- Engine code CBEA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- Engine code CJAA, refer to **PARTICULATE FILTER WITH NOX REDUCTION CATALYTIC CONVERTER OVERVIEW** .
- **EXHAUST GAS RECIRCULATION SYSTEM COMPONENT OVERVIEW**

NOTE: **Electrical connections and routings. Refer to DESCRIPTION AND OPERATION .**

-- Observe the notes after reconnecting the battery. Refer to **REMOVAL AND INSTALLATION** .

-- Fill with coolant. Refer to **DRAINING AND FILLING** .

-- Fill the fuel system. Refer to **FUEL SYSTEM, FILLING AND BLEEDING** .

VACUUM PUMP

Special tools and workshop equipment required

- Torque Wrench (5-50 Nm) V.A.G 1331

CAUTION: Do not disassemble the vacuum pump under any circumstances because it can cause the vacuum part to malfunction. The result would be brake booster failure.

Removing

-- Remove the engine cover. Refer to **ENGINE COVER**.

-- Remove the air filter housing. Refer to **AIR FILTER HOUSING** .

-- Remove the vacuum hose -1- from the vacuum pump -4-.

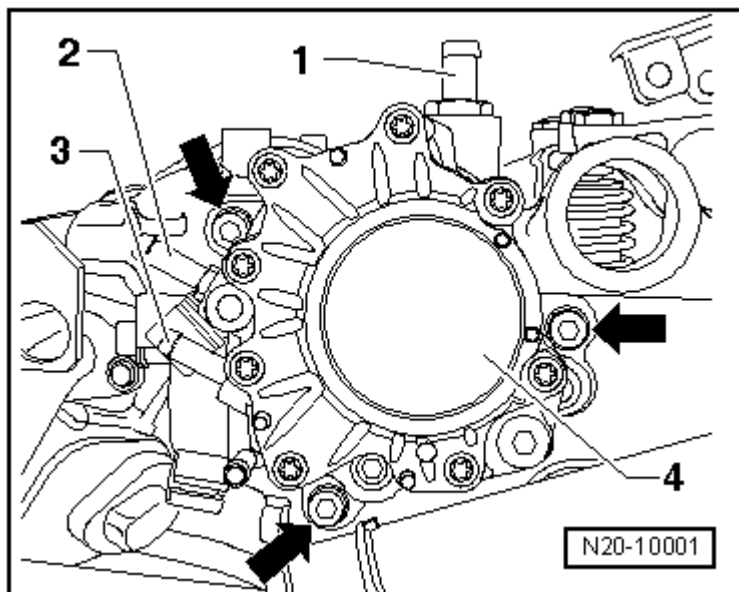


Fig. 71: Identifying Vacuum Hose -1- And Vacuum Pump -4-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the charge air pipe bolts and then press the pipe down slightly to reach the rear threaded connection on the vacuum pump.

-- Remove the vacuum pump bolts -arrows-.

-- Remove the vacuum pump -4- from the cylinder head.

Installing

Install in reverse order of removal. When doing this note the following:

- Make sure the vacuum pump coupling is seated correctly in the camshaft.
- Always replace the vacuum pump gasket.
- Make sure lines connections are securely fastened.

-- Install the vacuum pump -4- and tighten the bolts -arrows-.



- Install the engine cover. Refer to **ENGINE COVER**.

Special tools and workshop equipment required

- Diesel Injection Pump Locking Pin 3359
- Camshaft Gear Counter-Holder T10051
- Puller T10052
- Camshaft Fitting Tool T40094
- Camshaft Clamping Tool T40095
- Camshaft Tensioning Tool T40096
- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- Hand Drill with Plastic Brush Attachment

- Protective Eyewear
- Silicone Adhesive Sealant D 176 501 A1

Removing

- Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to **TOOTHED BELT**.
- Remove the cylinder head cover. Refer to **CYLINDER HEAD COVER**.
- Remove bolts -1- from the camshaft gear.

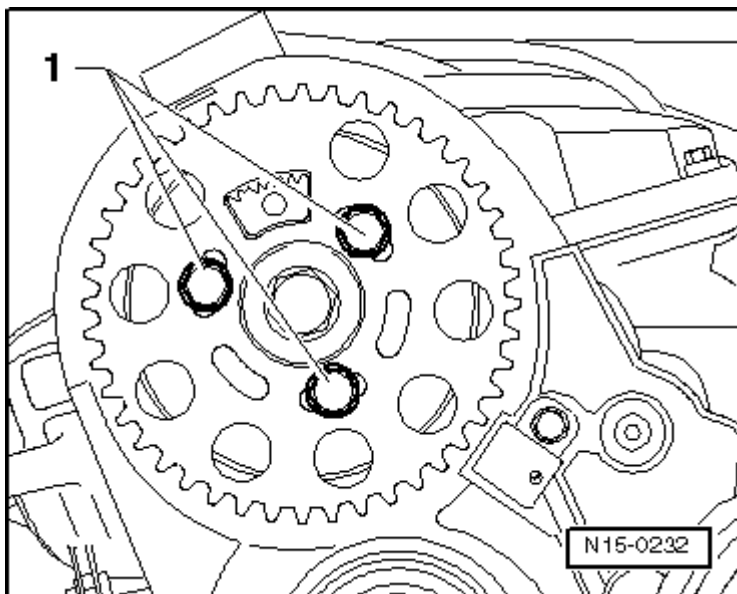


Fig. 73: Identifying Camshaft Pulley Securing Bolts
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the camshaft gear from the hub.
- Counter-hold the hub using the camshaft gear counter-holder T10051 and loosen the hub bolt -1-.

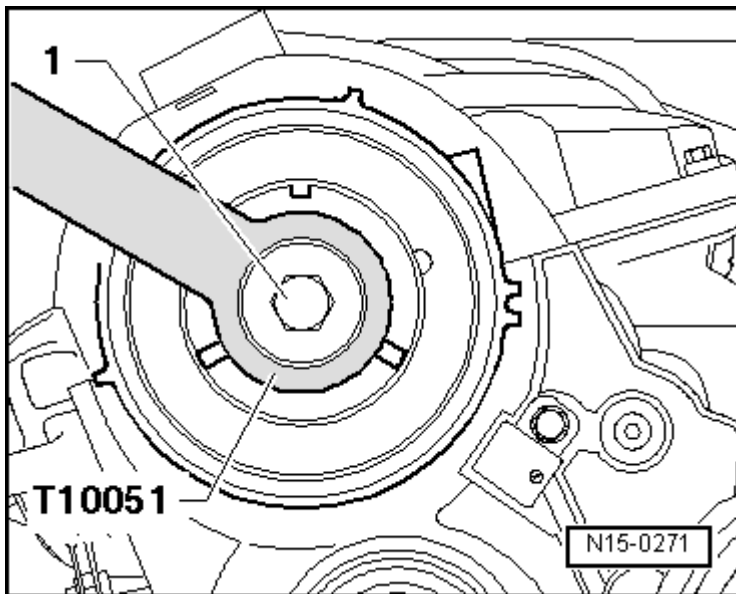


Fig. 74: Identifying Counterhold T10051

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Loosen the bolt for the hub by approximately 2 turns.
- Position the puller T10052 and align it to the bores in the hub.

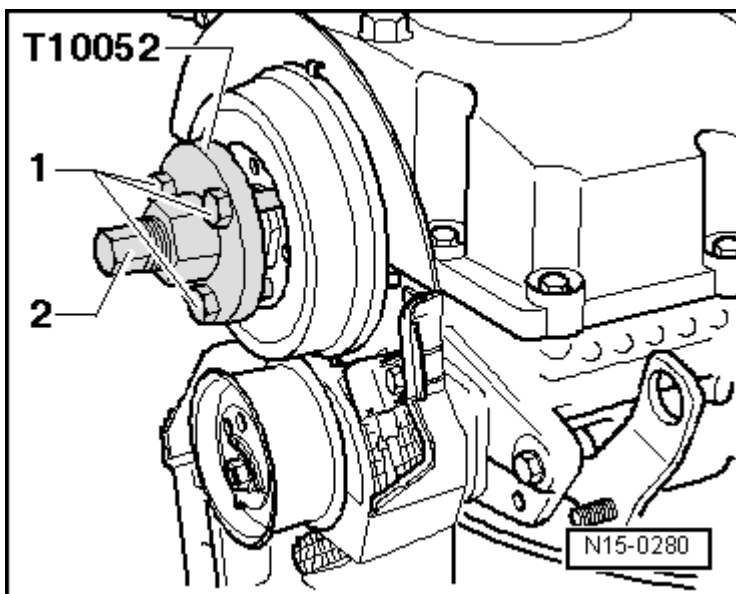


Fig. 75: Identifying Puller T10052

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tighten the bolts -1-.
- Tension the hub by tightening the puller T10052 -2- evenly until it can be removed from the camshaft taper.

NOTE: Hold the puller T10052 with a 30 mm wrench.

- Remove the hub from the cone of the camshaft.
- Remove the vacuum pump. Refer to VACUUM PUMP.
- Remove the bearing frame bolts and nuts in sequence -24 through 1-.

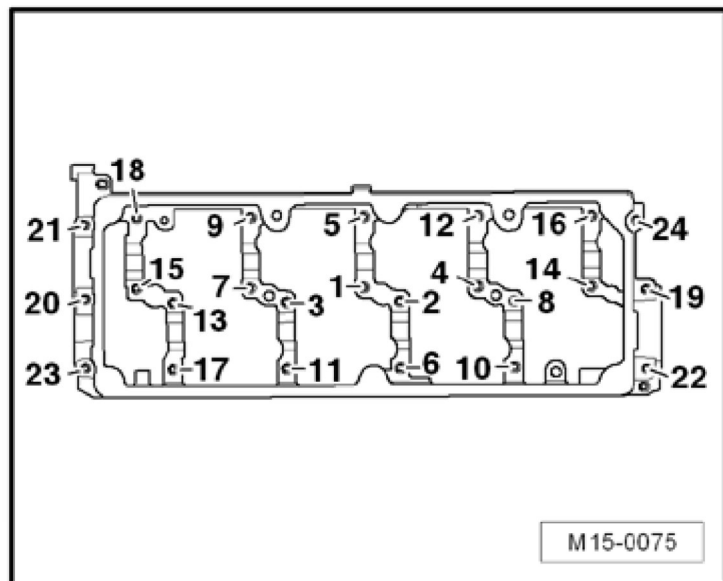


Fig. 76: Identifying Bearing Frame Bolts Removal Sequence -24 Through 1-
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Remove the bearing frame.
- Carefully remove the camshafts.

Installing

NOTE: Note the expiration date of the silicone adhesive Sealant D 176 501 A1.

Seal the separating surfaces between the bearing frame and cylinder head using silicone adhesive Sealant D 176 501 A1.

- CAUTION:**
- Only install the camshafts with the camshaft fitting tool T40094 as described below. Otherwise the axial bearing in the bearing frame will be destroyed and the cylinder head will have to be replaced.
 - Make sure that no sealant residue enters the cylinder head and bearings.

WARNING: Wear safety glasses.

- Remove any sealant still on the cylinder head and bearing frame with a rotating plastic brush.
- Clean the sealing surfaces, they must be free of oil and grease.
- Oil the journal surfaces of camshafts.

Assemble the camshaft fitting tool T40094 as follows:

- Remove the mounts T40094/3, T40094/4 and T40094/5 from the base plate. Loosen the threaded connections from below.

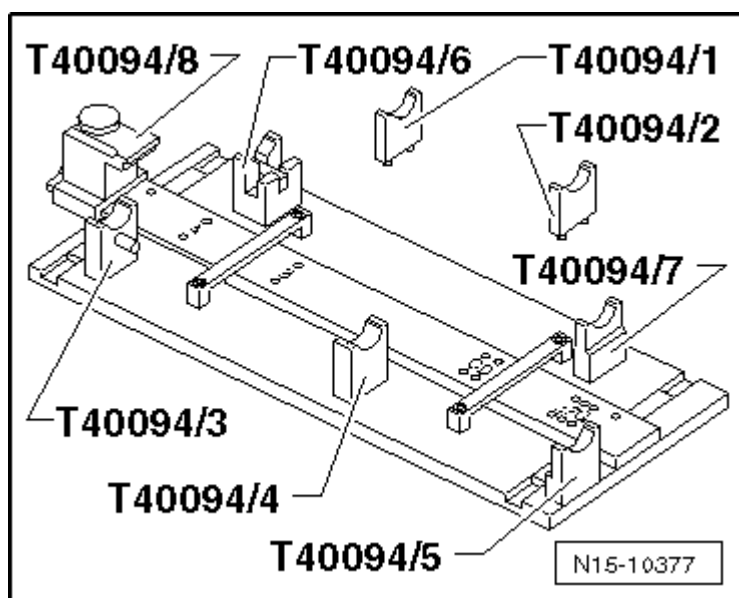


Fig. 77: Identifying Mounts T40094/1 To T40094/8
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: If the camshaft fitting tool T40094 mounts are not marked, mark the removed mounts, for example, with numbers, to assure it can be assembled later.

- Install the mounts T40094/9 and T40094/10 in the empty outer locations.

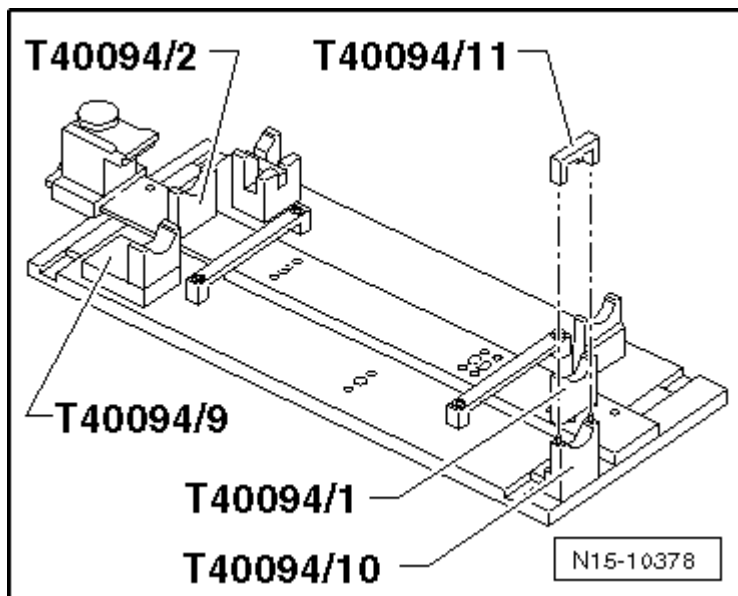


Fig. 78: Identifying Mounts T40094/1, T40094/2, T40094/9, T40094/10 and T40094/11
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Position mount T40094/2 on location "A" and mount T40094/1 on location "F".

-- First install the intake camshaft as illustrated. Make sure the indentation -arrow- for the cylinder head bolt faces >>outward<<.

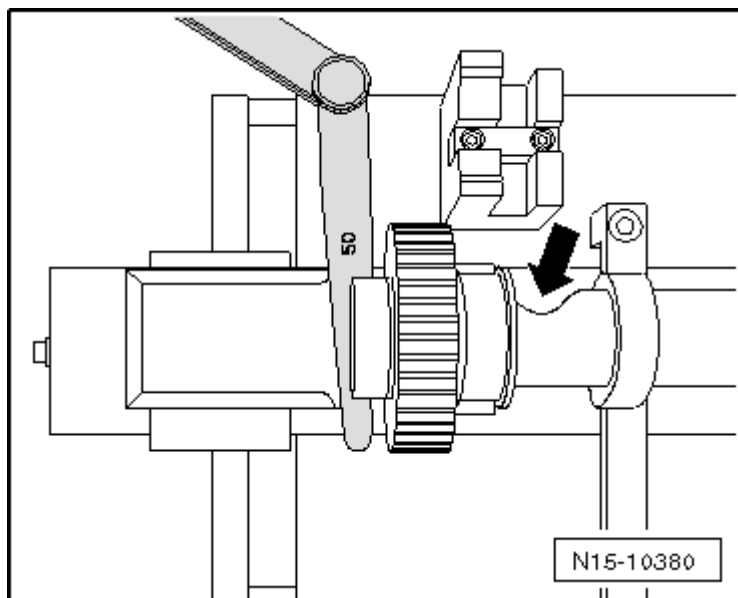


Fig. 79: Identifying 0.50 mm Feeler Gauge
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Position the 0.50 mm feeler gauge and slide the mount T40094/8 into the groove on the intake camshaft.

-- Install the exhaust camshaft.

-- Secure the exhaust camshaft above the groove -arrow- with the cover T40094/11.

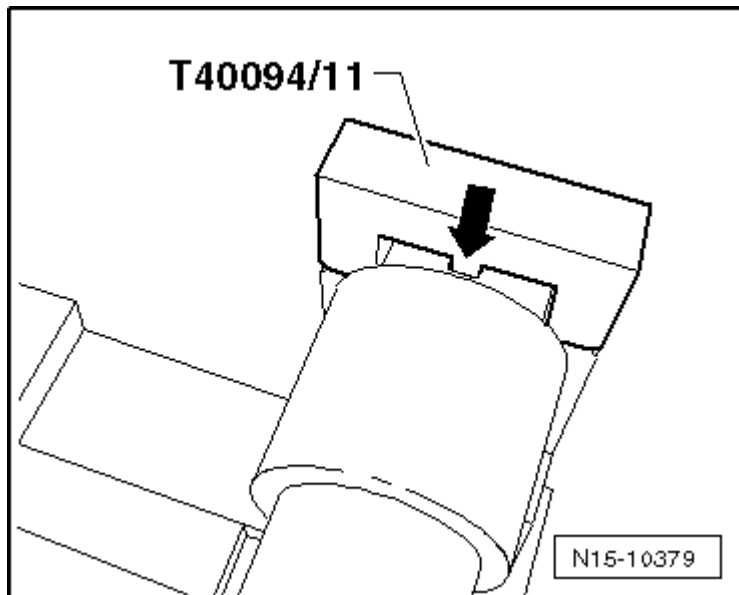


Fig. 80: Identifying Cover T40094/11

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Mount the tensioning tool T40096/1 on the toothed gears on the exhaust camshaft.

CAUTION: Make sure the clamping jaw marked with an arrow is on the wider gear.

-- Tighten the tensioning tool T40096/1 with the knurled thumb screw until the tooth faces align. Use a 13 mm open end wrench if necessary.

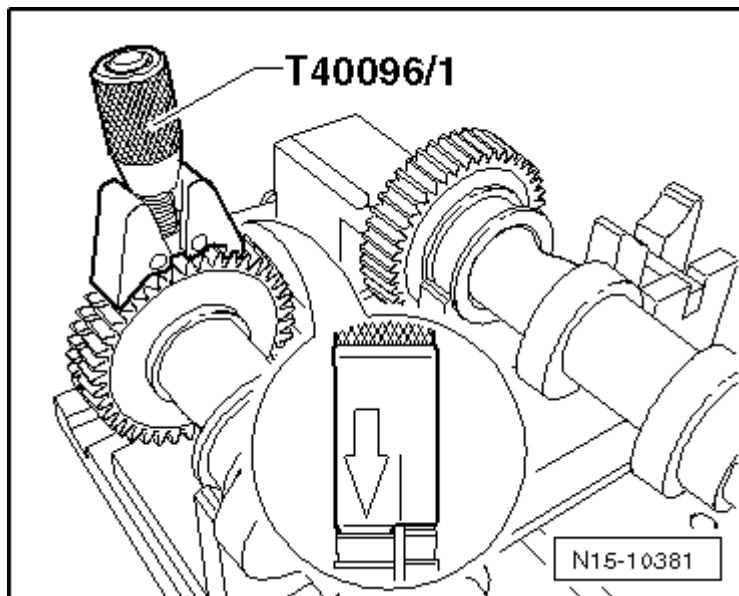
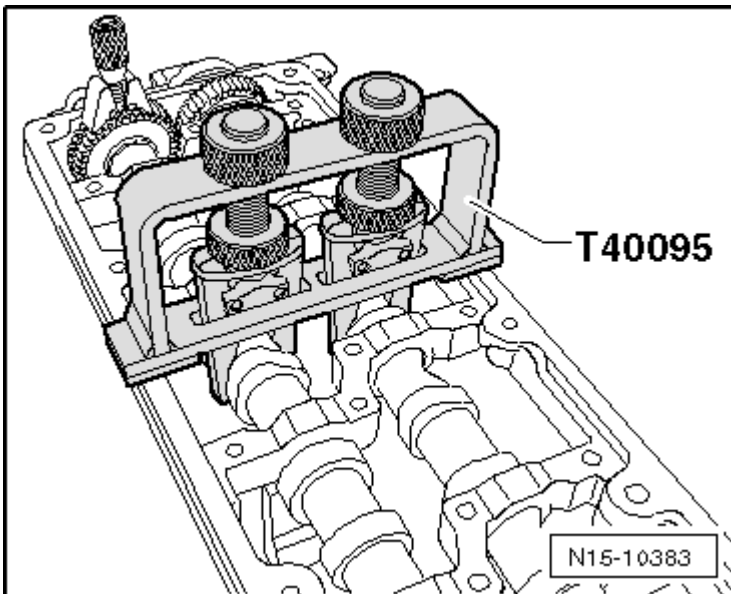


Fig. 81: Identifying Tensioning Tool T40096/1**Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

- Slide the intake camshaft toward the exhaust camshaft until the splines mesh.
- Position the bearing frame on the camshafts.
 - All the camshaft bearings must align on the camshafts.
- Position the camshaft clamping tool T40095 as illustrated and secure the camshafts in the bearing frame.

**Fig. 82: Identifying Camshaft Clamping Tool T40095****Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.**

- Remove the cover T40094/11.
- Remove the mount T40094/8 from the groove in the intake camshaft.
- Cut the sealant tube nozzle at the front mark (nozzle diameter: approximately 3 mm).

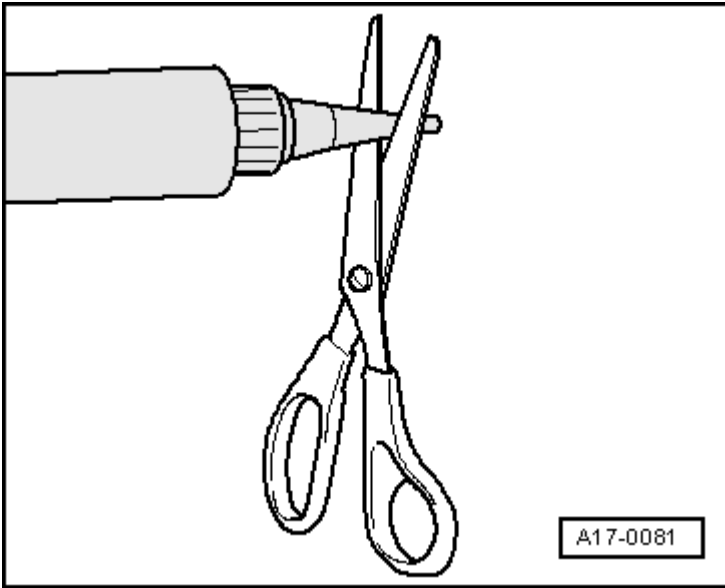


Fig. 83: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 3 Mm)
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Apply the silicone adhesive Sealant D 176 501 A1 to the clean sealing surface of the cylinder head as illustrated. The sealant bead must be:

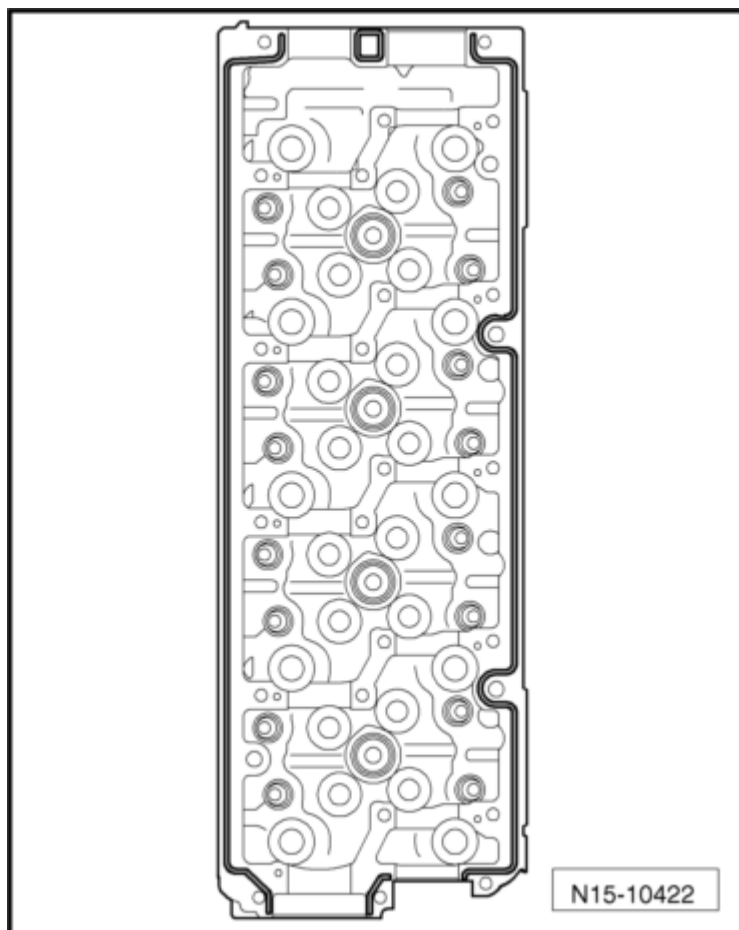


Fig. 84: Identifying Silicone Adhesive Sealant Pattern
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- 2 to 3 mm thick
- Apply on the inner side in the area with the threaded holes

NOTE: **The sealant beads must not be thicker than 2 to 3 mm or the excess sealant can enter the camshaft bearing.**

-- Remove the camshafts with the bearing frame and the camshaft clamping tool T40095 from the camshaft fitting tool T40094.

-- Carefully install the camshafts and bearing frame to the cylinder head.

-- First, tighten the bearing frame bolts and nuts by hand in sequence -1 through 24-.

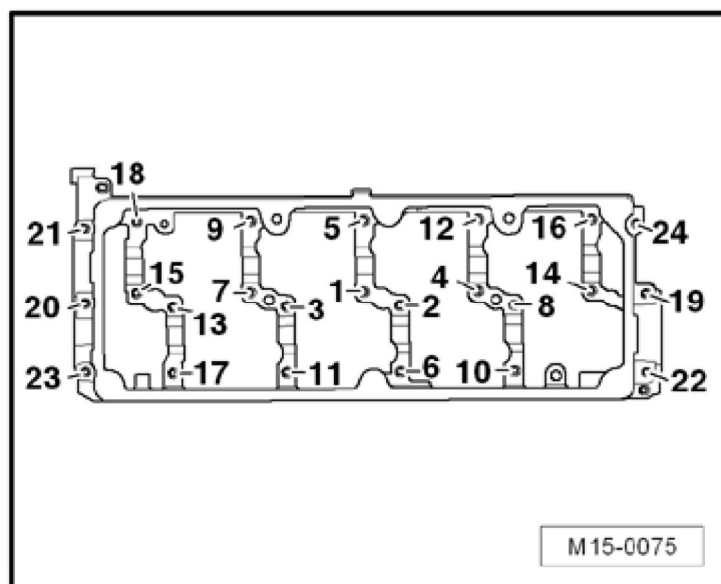


Fig. 85: Identifying Bearing Frame Bolts And Nuts Tightening Sequence
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- The bearing frame must be in contact with the entire contact surface of the cylinder head.

-- Tighten the bearing frame bolts and nuts in sequence -1 through 24-.

- Tightening specifications, see -items 2 and 3- in the VALVETRAIN OVERVIEW.

-- Remove the camshaft clamping tool T40095 and the tensioning tool T40096/1.

-- Replace the camshaft seal. Refer to CAMSHAFT SEAL.

-- Drive a new cap onto the cylinder head with a suitable drift until it is flush.

The rest of the installation is performed in reverse order of removal, noting the following:

NOTE: After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic lash adjusters must seat themselves (otherwise the valves will crash into the pistons).

After working on the valvetrain, carefully rotate the engine by hand at least 2 full revolutions to ensure that valves do not strike the pistons when starting.

-- Place the hub on the camshaft.

-- Counterhold the hub with the camshaft gear counter holder T10051 and tighten the hub bolt -1-.

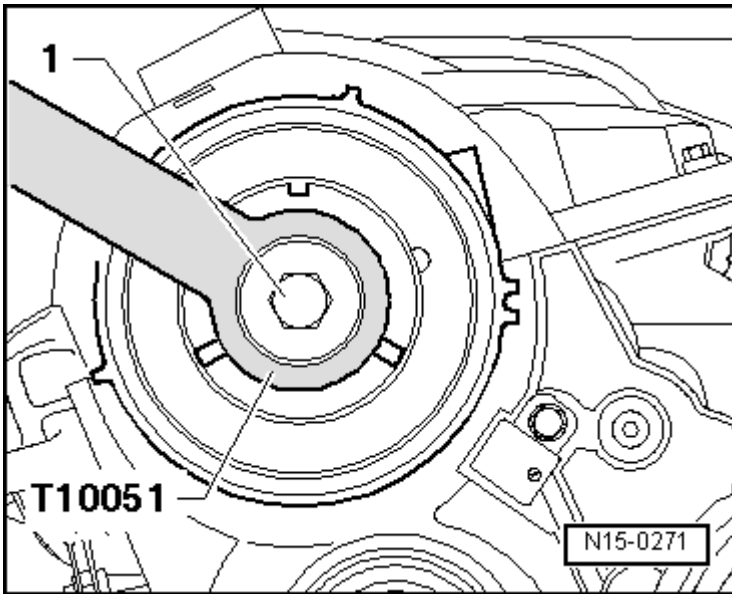


Fig. 86: Identifying Counterhold T10051

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Tightening specification, see -item 11- in the TOOTHED BELT OVERVIEW .

-- Push the camshaft gear onto the hub.

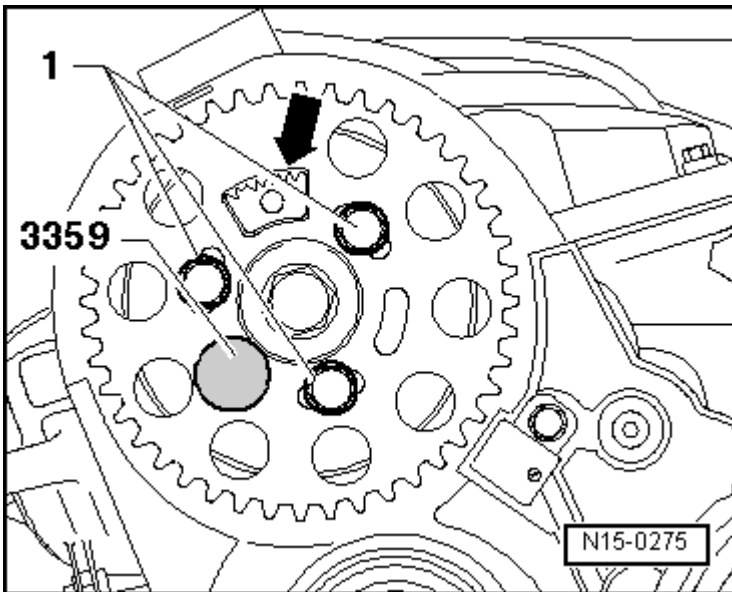


Fig. 87: Identifying Camshaft Pulley Bolts

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: The toothed segment -arrow- of the camshaft gear must face upward.

-- Install the bolts -1- into the camshaft gear by hand to eliminate play.

- Lock the hub using the diesel injection pump locking Pin 3359.
- Install and tension the toothed belt. Refer to **TOOTHED BELT**.
- Install the vacuum pump. Refer to **VACUUM PUMP**.
- Install the cylinder head cover. Refer to **CYLINDER HEAD COVER**.

CAMSHAFT SEAL

Special tools and workshop equipment required

- Oil Seal Driver 10-203
- Seal Extractor 3240
- Torque Wrench (5-50 Nm) V.A.G 1331
- Torque Wrench (40-200 Nm) V.A.G 1332
- M12 x 65 Bolt

Removing

- Remove the toothed belt from the camshaft and the high pressure fuel pump. Refer to **TOOTHED BELT**.
- Remove the camshaft gear and hub. Refer to **CAMSHAFTS**.
- Insert the thrust piece 3240/1 into the camshaft.

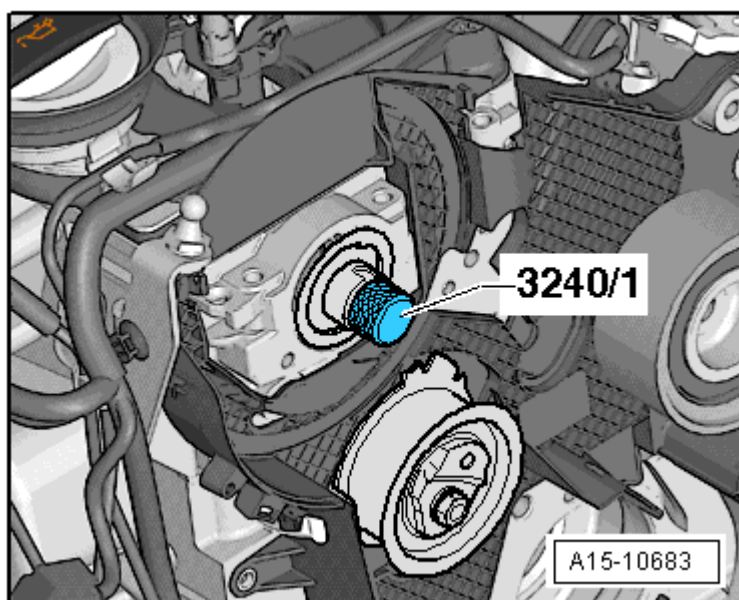


Fig. 88: Identifying Thrust Piece 3240/1 Inserted In Camshaft
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Remove the inner portion of seal puller 3240 two rotations (approximately 3 mm) from the outer portion and secure with the knurled thumb screw.

-- Grease the threaded head of the seal Extractor 3240, position and forcefully screw as far as possible into the seal.

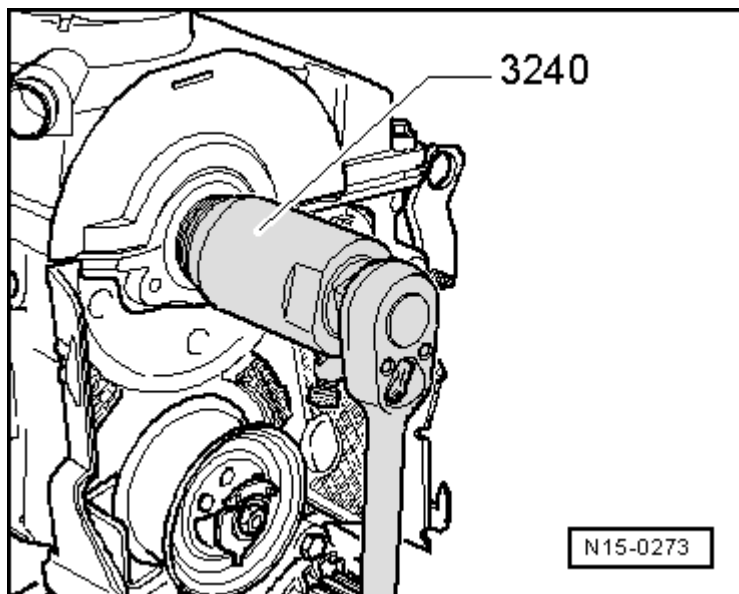


Fig. 89: Identifying Special Tool - 3240

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Loosen the knurled thumb screw and turn the inner part against the camshaft until the seal is removed.

Installing

NOTE: The sealing lip of the seal may not be additionally oiled or greased.

-- Before installing, remove any remaining oil from the camshaft journal with a clean cloth.

-- Mount the guide sleeve 3240 on the camshaft as illustrated.

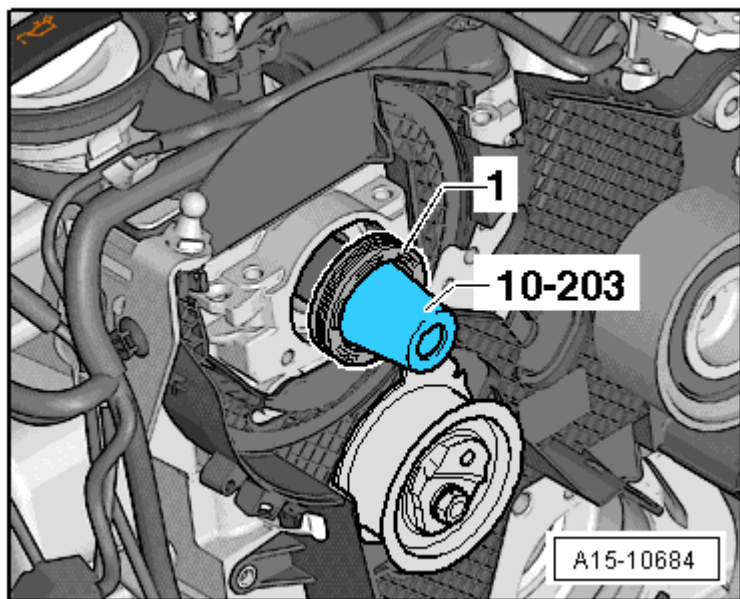


Fig. 90: Identifying Seal -1- Pressed In To Stop Using Seal Driver 10-203
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Carefully slide the seal -1- over the guide sleeve and onto the camshaft.
- Press the seal in as far as the stop using the seal driver 10-203 thrust piece and a M12 x 65 bolt.

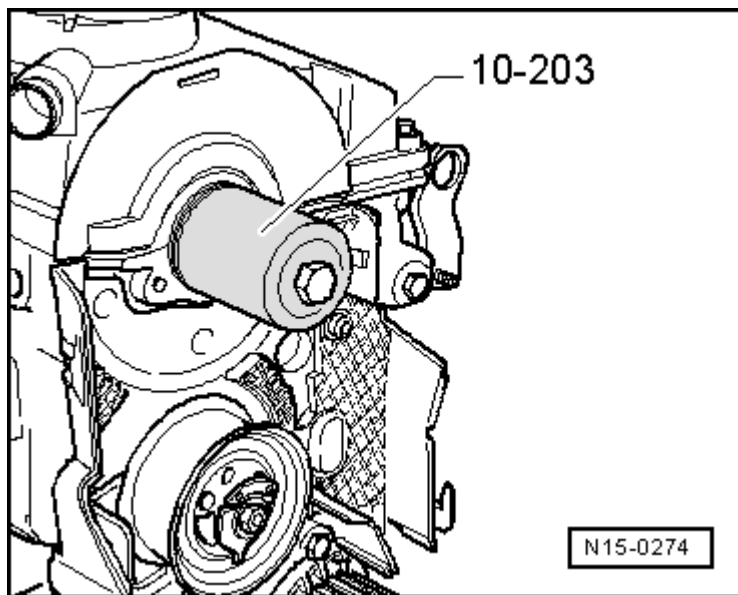


Fig. 91: Identifying Seal Pressed In To Stop Using Seal Driver 10-203
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Install the camshaft sprocket and hub. Refer to **CAMSHAFTS**.
- Install and tension the toothed belt. Refer to **TOOTHED BELT**.

VALVE STEM SEALS, CYLINDER HEAD INSTALLED**Special tools and workshop equipment required**

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Torque Wrench (5-50 Nm) V.A.G 1331
- Valve Cotters Asm/Disasm Device VAS 5161

Removing

- Remove the glow plugs. Refer to **GLOW PLUGS** .
- Remove the camshafts. Refer to **CAMSHAFTS**.
- Position the guide plate VAS 5161/23 on the cylinder head.

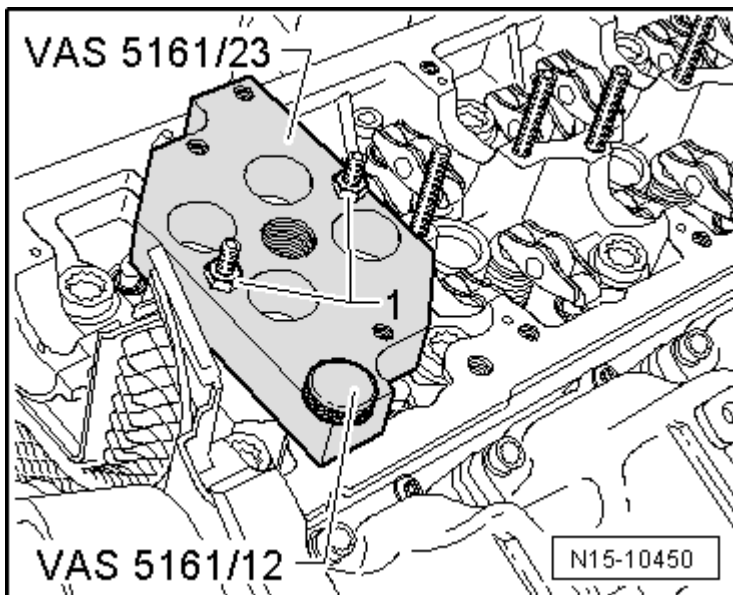


Fig. 92: Identifying Guide Plate VAS 5161/23 Secured Using Knurled Screw VAS 5161/12
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Secure the guide plate VAS 5161/23 to the intake manifold side using a knurled screw VAS 5161/12 and on the studs using collarless M6 nuts -1- tightened by hand.
- Install the compression stud VAS 5161/10 in the guide plate VAS 5161/23.

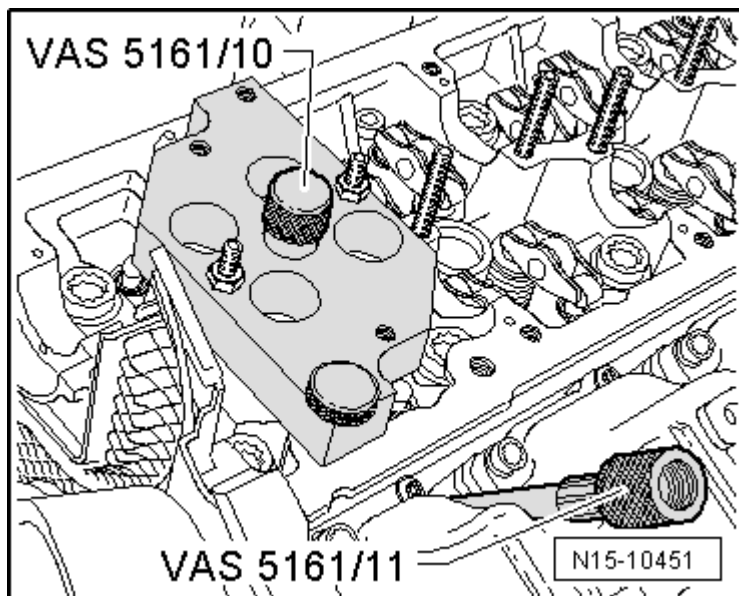


Fig. 93: Identifying Compression Stud VAS 5161/10 Installed In Guide Plate VAS 5161/23
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the adapter for compressed air connection VAS 5161/11 into the respective glow plug threads and tighten by hand.

-- Insert the punch VAS 5161/3 into the guide plate VAS 5161/23 and loosen the valve retainers using a plastic mallet.

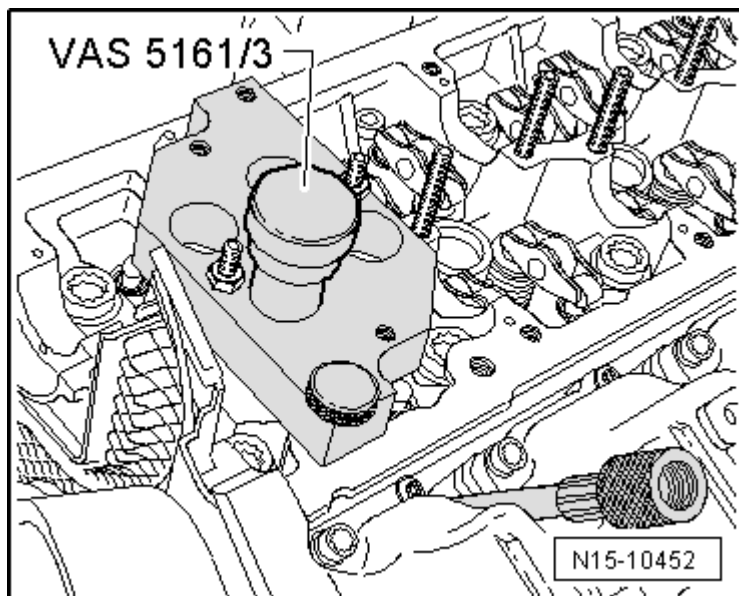


Fig. 94: Identifying Punch VAS 5161/3 Installed In Guide Plate VAS 5161/23
 Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Install the guide forks M6/M8 with threaded studs VAS 5161/5 in the guide plate VAS 5161/23 with the retainer VAS 5161/6.

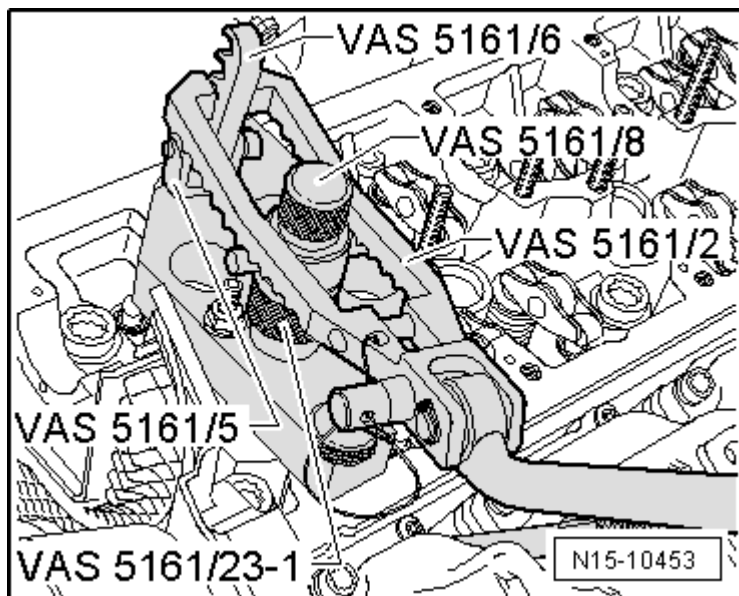


Fig. 95: Identifying Assembly Cartridges VAS 5161/2, Valve Insertion Device VAS 5161/8 And Guide Plate VAS 5161/23

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Push the knurled spacer ring VAS 5161/23-1 onto the assembly cartridge VAS 5161/8.
- Connect the adapter for compressed air connection VAS 5161/11 to compressed air with a commercially available connector and apply a constant pressure.
 - Minimum pressure: 6 bar
- Engage the pressure fork with lever for assembly cartridge VAS 5161/2 at the retainer VAS 5161/6 and press down the assembly cartridge VAS 5161/8.
- At the same time, turn the knurled thumb screw on the assembly cartridge VAS 5161/8 clockwise until the points engage in the valve retainers.
- Lightly move the knurled thumb screw back and forth, this causes the valve retainers to be pressed apart and captured in the assembly cartridge VAS 5161/8.
- Release the pressure fork with lever for assembly cartridge VAS 5161/2.
- Remove the assembly cartridge VAS 5161/8 with the knurled spacer ring VAS 5161/23-1, the valve plate and the valve spring.
- Pull off the valve stem seal using the valve seal removal Tool 3364.

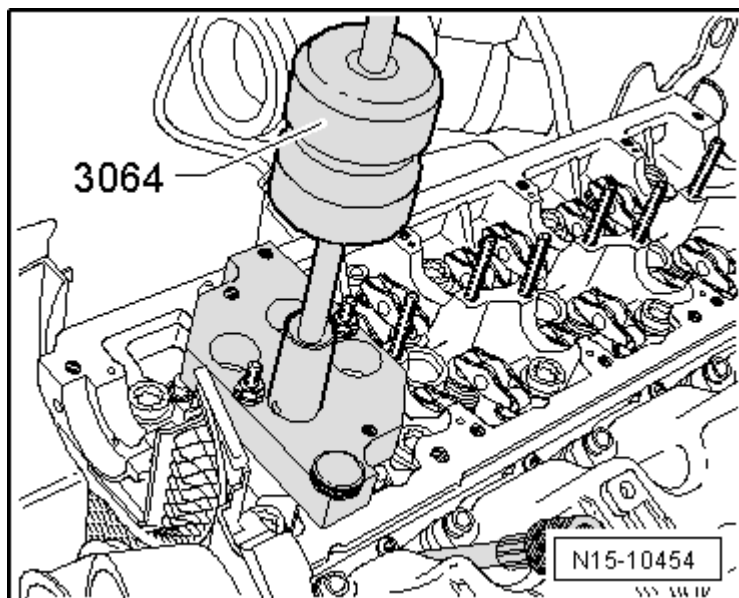


Fig. 96: Identifying Tool 3064 And Punch VAS 5161/3
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Installing

NOTE: A plastic sleeve -A- is supplied with the new valve stem seal.

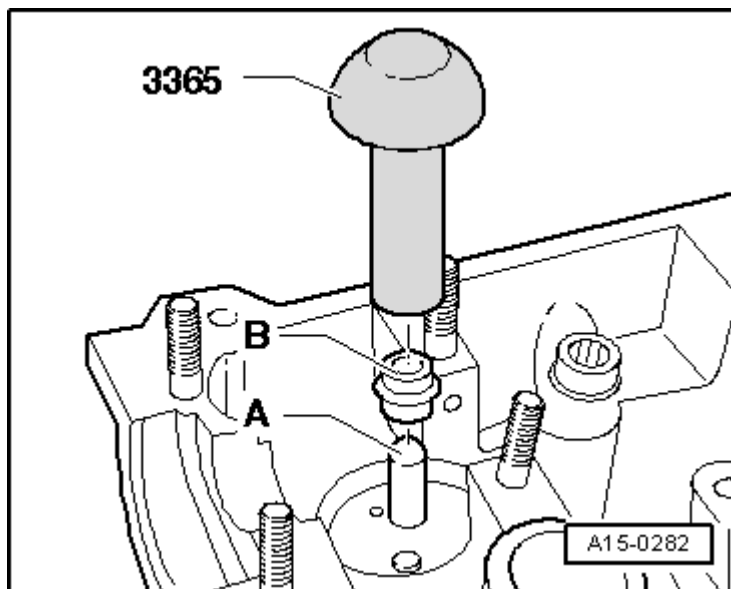


Fig. 97: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Place the plastic sleeve -A- on the valve stem to prevent damage to the new valve stem seal -B-.

-- Lightly coat the valve stem seal lips -B- with oil.

- Slide the valve stem seal -B- onto the plastic sleeve -A-.
- Carefully press the valve stem seal onto the valve guide using the valve stem seal Driver 3365.
- Tap lightly on the driver with a plastic mallet until the valve stem seal is at the stop.
- Remove the plastic sleeve again -A-.
- Insert the valve spring and valve plate in the cylinder head.
- If the valve retainers were removed from the assembly cartridge VAS 5161/8, they must then be inserted into the valve insertion device VAS 5161/18.

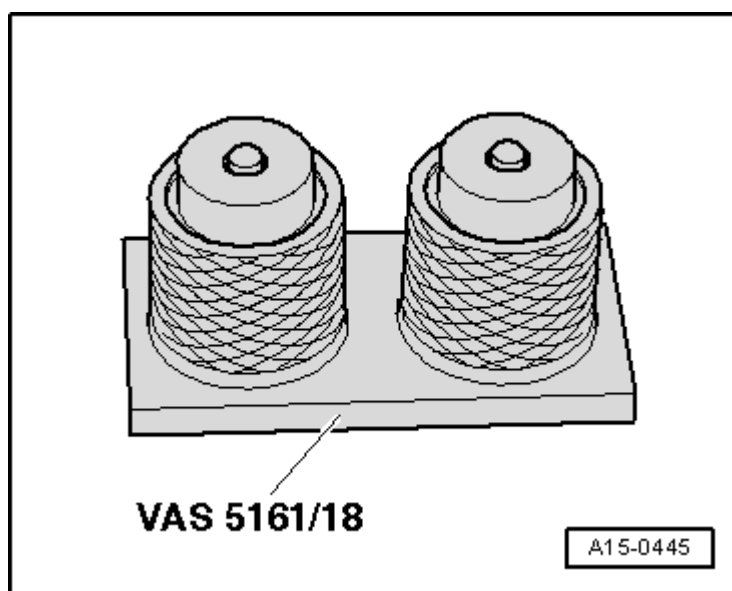


Fig. 98: Identifying Installation Cartridge VAS 5161/8
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

NOTE: **The large diameter of the valve retainers point upward.**

- Press the assembly cartridge VAS 5161/18 onto the valve insertion device VAS 5161/8 from above and take up the valve retainers.
- Insert the valve insertion device VAS 5161/8 into the guide plate VAS 5161/23.

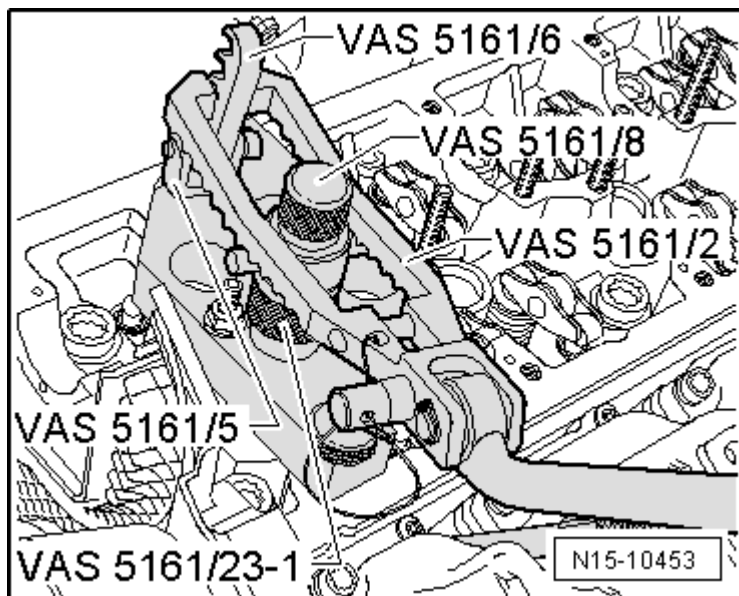


Fig. 99: Identifying Assembly Cartridges VAS 5161/2, Valve Insertion Device VAS 5161/8 And Guide Plate VAS 5161/23

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

-- Press the pressure fork with lever for assembly cartridge VAS 5161/2 down and pull the knurled thumb screw upward while turning it left and right to insert the valve retainers.

-- Release the pressure fork with lever for assembly cartridge VAS 5161/2 with the knurled thumb screw still pulled.

The rest of the installation is performed in reverse order of removal, noting the following:

-- Install the camshafts. Refer to CAMSHAFTS.

NOTE: After installing the camshafts, the engine may not be started for approximately 30 minutes. The hydraulic lash adjusters must seat themselves (otherwise the valves will crash into the pistons).

After working on the valvetrain, carefully rotate the engine by hand at least 2 full revolutions to ensure that the valves do not strike the pistons when starting.

-- Install the glow plugs. Refer to GLOW PLUGS.

SPECIAL TOOLS

Special tools and workshop equipment required

- Straight Edge 500 mm VAS 6075
- Socket T40055
- Ratchet, Reversible V.A.G 1331/1

- Engine Bung Set VAS 6122
- Guide Pins & Handle - 1112 mm 3070
- Camshaft Gear Counter-Holder T10051
- Puller T10052
- Socket Insert XZN 10 T10385
- Drip Tray for VAS 6100 VAS 6208
- Camshaft Fitting Tool T40094
- Camshaft Clamping Tool T40095
- Camshaft Tensioning Tool T40096
- Oil Seal Driver 10-203
- Seal Extractor 3240
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotters Asm/Disasm Device VAS 5161
- Adapter V.A.G 1381/12

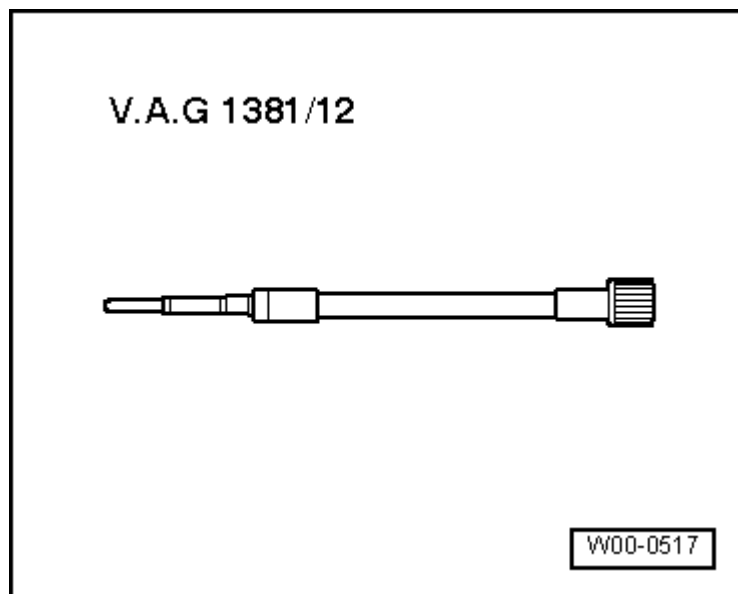


Fig. 100: Identifying Adapter V.A.G 1381/12

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Compression Tester V.A.G 1763

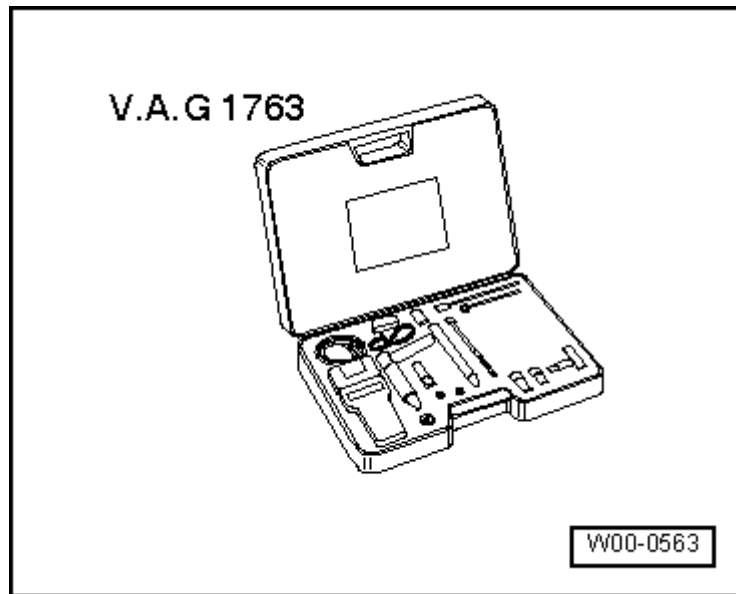


Fig. 101: Identifying Compression Tester V.A.G 1763
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Dial Gauge Holder VW 387

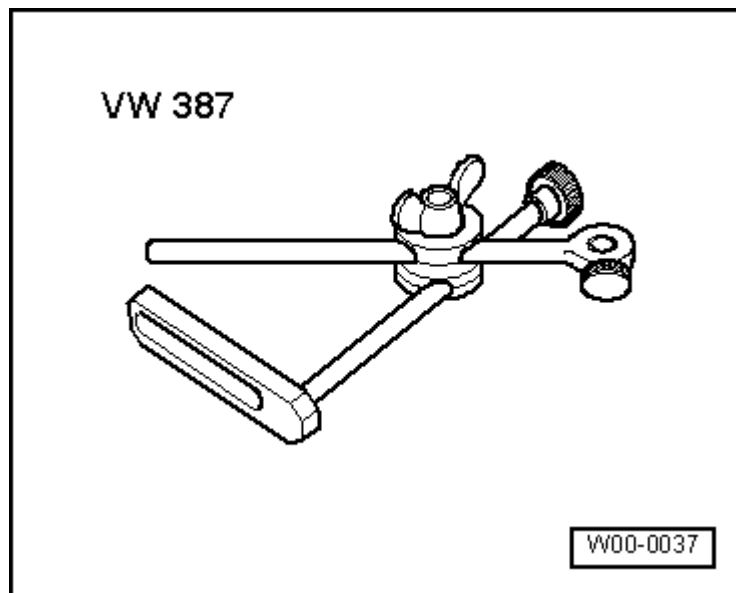


Fig. 102: Identifying Dial Gauge Holder VW 387
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Dial Gauge (0-10 mm) VAS 6079

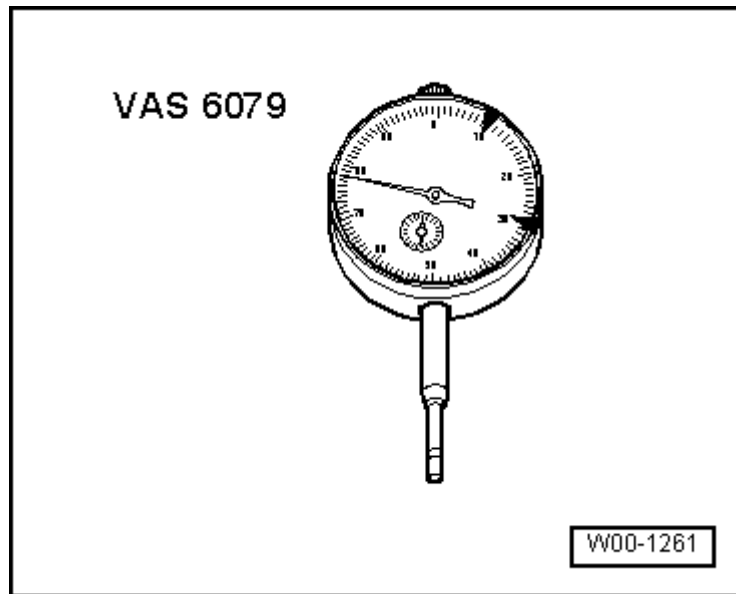


Fig. 103: Identifying Dial Gauge VAS 6079

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Torque Wrench (5-50 Nm) V.A.G 1331

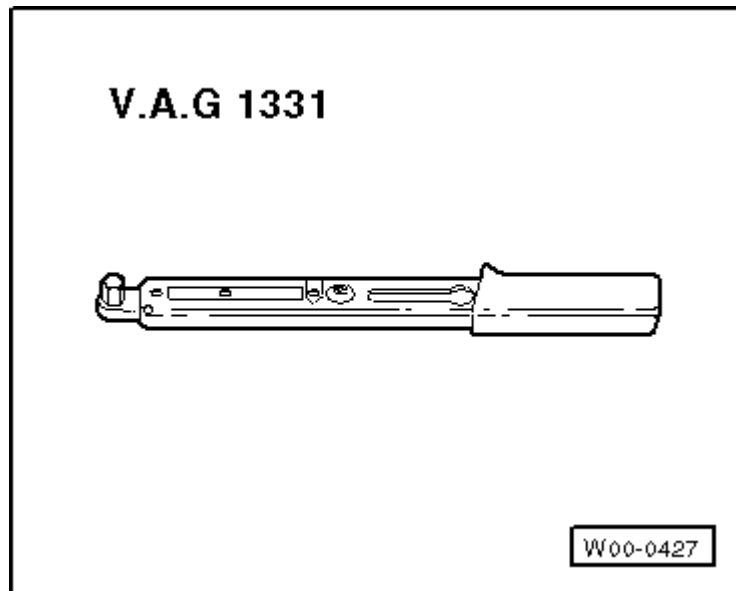


Fig. 104: Identifying Torque Wrench (5 To 50 Nm) V.A.G 1331

Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Hose Clip Pliers VAS 6362

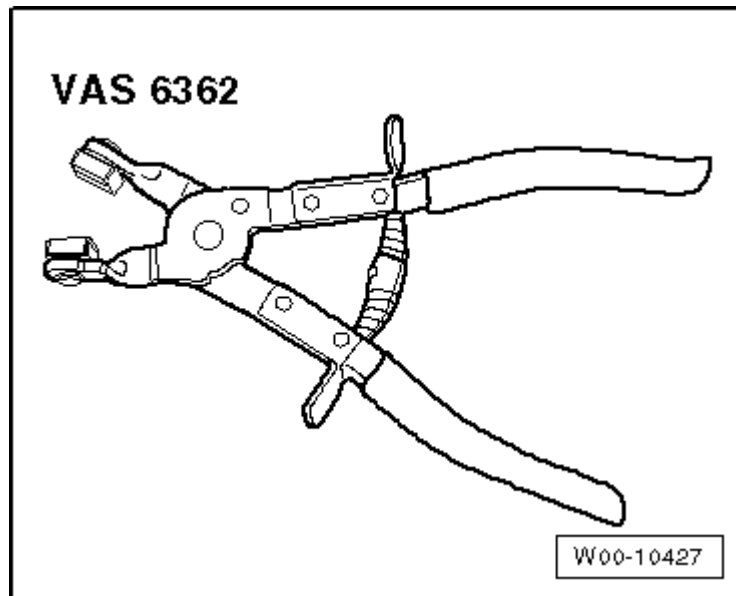


Fig. 105: Identifying Clamp Pliers VAS 6362
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

- Torque Wrench (40-200 Nm) V.A.G 1332

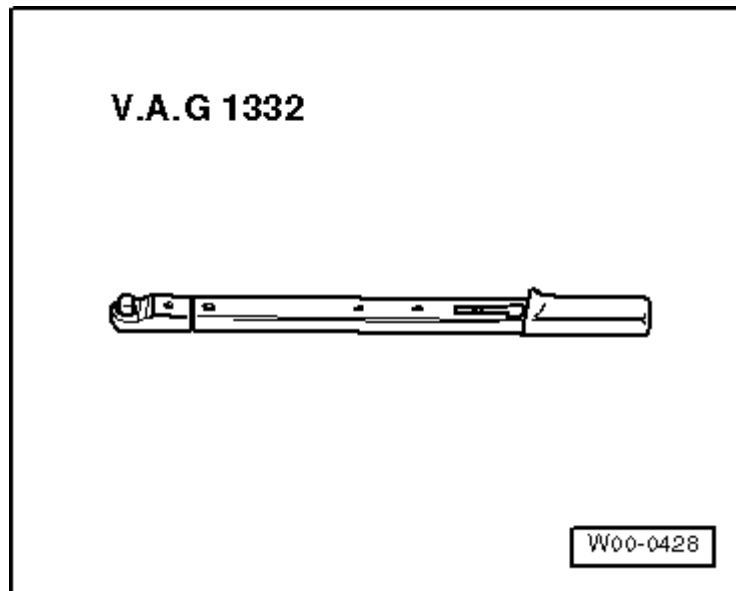


Fig. 106: Identifying Torque Wrench 40-200 Nm VAG 1332
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

2010 Volkswagen Jetta TDI

ENGINE 2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CBEA & CJAA (Sedan) (A5 Platform)

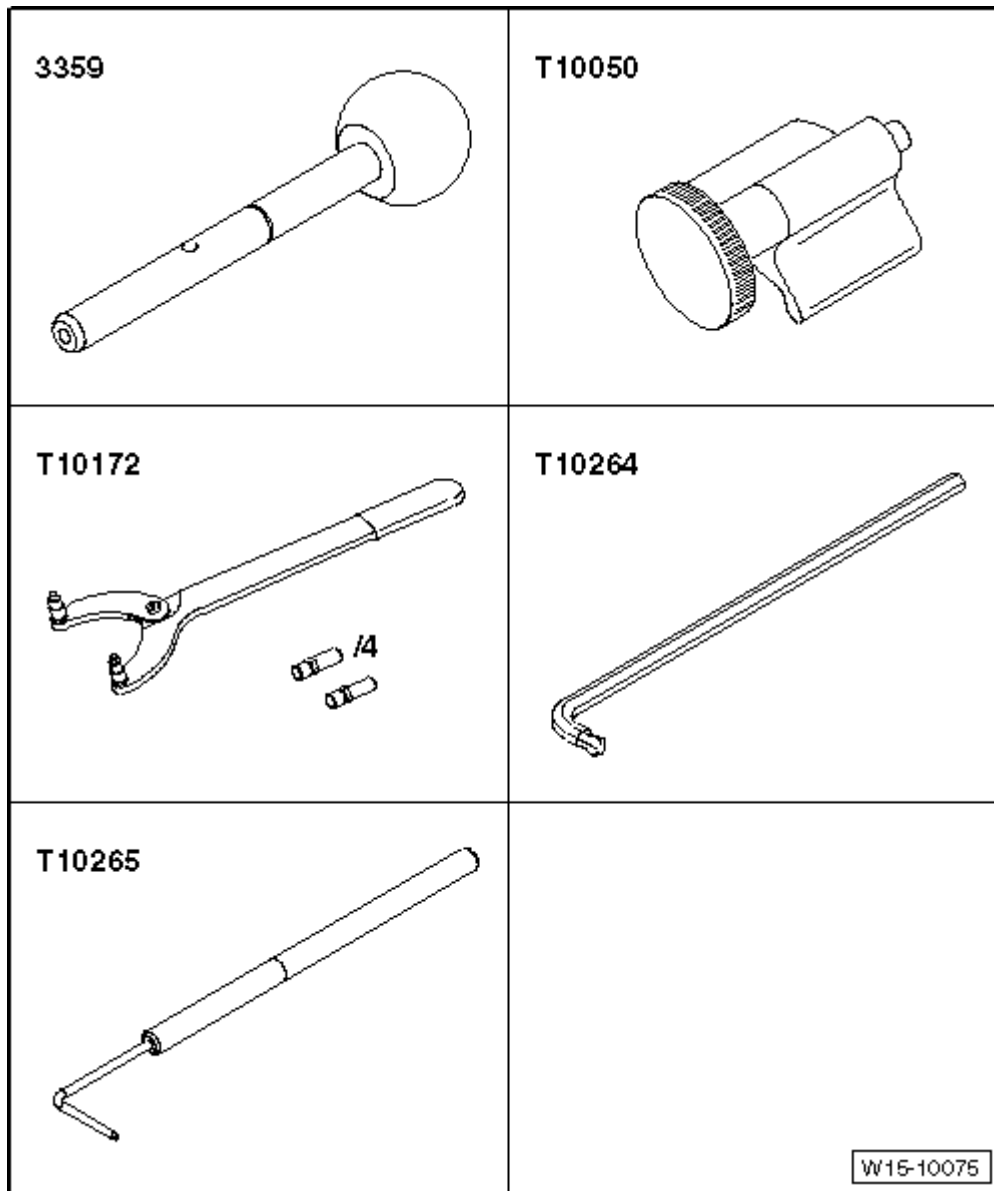


Fig. 107: Identifying Diesel Injection Pump Remove/Install Components
Courtesy of VOLKSWAGEN GROUP OF AMERICA, INC.

Special tools and workshop equipment required

- Diesel Injection Pump Locking Pin 3359
- Crankshaft Stop T10050
- Counterhold Tool Touareg V10 T10172
- Special Wrench, Long Reach T10264
- Locking Tool T10265