

ENGINE

3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

15 CYLINDER HEAD, VALVETRAIN

DESCRIPTION AND OPERATION

BALANCE SHAFT OVERVIEW

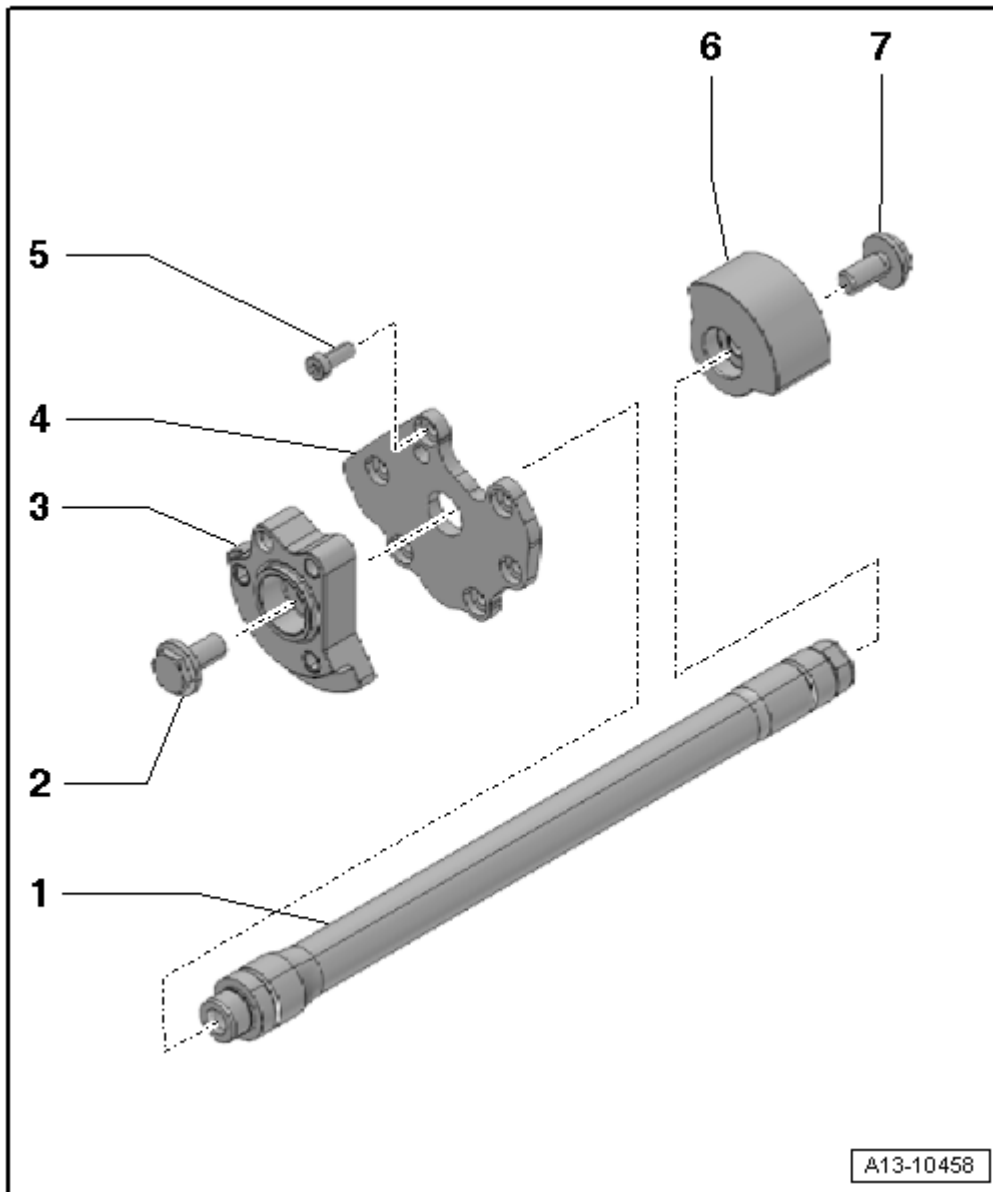


Fig. 1: Identifying Balancing Shaft, Component Overview
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1. Balance Shaft
 - Removing and installing, refer to **BALANCE SHAFT**
2. Bolt
 - 60 Nm
 - For loosening and tightening, use the locating pin T40116 as a counter holder
3. Balance Shaft Transmission Side
 - Can only be placed on the balance shaft in one position
4. Gear Carrier
5. Bolt
 - 13 Nm
6. Balance Shaft Belt Pulley Side
 - Can only be placed on the balance shaft in one position
7. Bolt
 - 60 Nm
 - For loosening and tightening, use the locating pin T40116 as a counter holder

CAMSHAFT TIMING CHAINS OVERVIEW

Left Camshaft Timing Chain

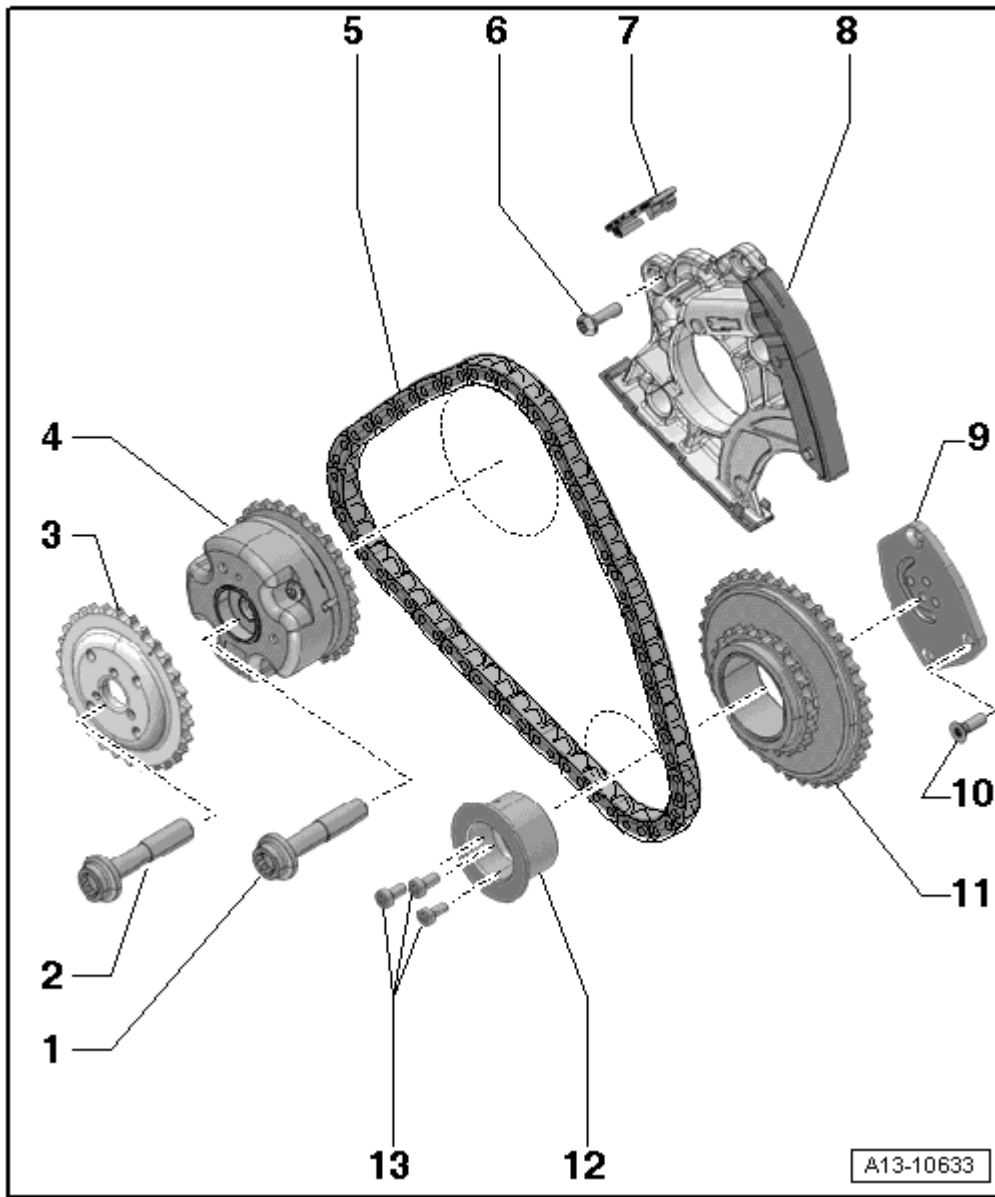


Fig. 2: Identifying Camshaft Timing Chains Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Replace
 - 80 Nm +90°
2. Bolt
 - Replace
 - 80 Nm +90°
3. Camshaft Chain Sprocket for the Exhaust Camshaft
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**

4. Camshaft adjuster for intake camshaft
 - Identification "Intake"
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
5. Left camshaft timing chain
 - Mark the running direction with paint for reinstallation
 - Remove from the camshafts, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS**
6. Bolt
 - 9 Nm
7. Gliding piece
8. Left camshaft timing chain tensioner
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
9. Drive chain sprocket bearing plate
10. Bolt
 - Replace
 - 8 Nm +45°
11. Left camshaft timing chain drive sprocket
12. Pivot pin for drive sprocket
 - for the left camshaft control chain
13. Bolts
 - Tightening specification 3

Right camshaft timing chain



1. Bolt
 - 80 Nm plus an additional 90° turn
 - Replace
2. Camshaft Chain Sprocket for the Exhaust Camshaft
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
3. Bolt
 - 80 Nm plus an additional 90° turn
 - Replace

4. Camshaft Adjuster for Intake Camshaft
 - Identification "Intake"
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
5. Bolt
 - Tightening specification -item 15- 15
6. Pivot Pin for Drive Sprocket
 - For the right camshaft timing chain
 - Asymmetrical version
 - Installed position, refer to **Fig. 17**
7. Right Camshaft Timing Chain Drive Sprocket
 - Installed position, refer to **Fig. 17**
8. Right Camshaft Timing Chain
 - Mark the running direction with paint for reinstallation
 - Remove from the camshafts, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS**
9. Thrust Washer for Drive Sprocket
 - For the right camshaft timing chain
 - Asymmetrical version
 - Installed position, refer to **Fig. 17**
10. Right Camshaft Timing Chain Tensioner
 - Removing and installing, refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**
11. Gliding Piece
12. Bolt
 - 9 Nm

CYLINDER HEAD OVERVIEW

NOTE: **The illustration shows the cylinder bank 2 cylinder head (left).**

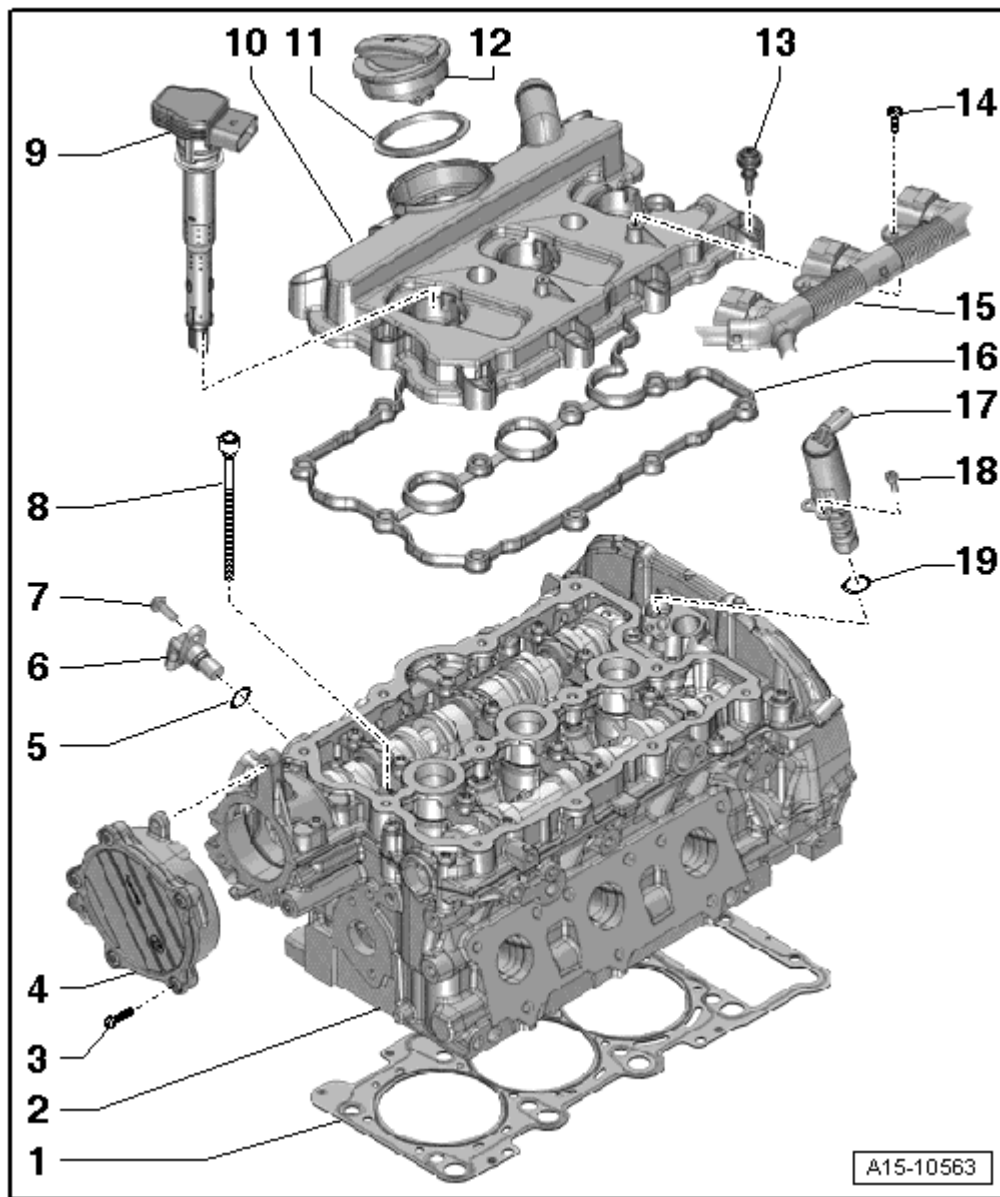


Fig. 4: Identifying Cylinder Head Overview

Courtesy of AUDI OF AMERICA, LLC

1. Cylinder Head Gasket

- Removing and installing, refer to **CYLINDER HEADS**
- Installed position: the part number faces the cylinder head
- Change the coolant and engine oil after replacing

2. Cylinder Head

- Removing and installing, refer to **CYLINDER HEADS**
- Check for distortion, refer to **Fig. 8**
- Reworking dimension, refer to **Fig. 9**
- Change the coolant and engine oil after replacing

3. Bolt
 - Tightening specification, refer to **Special Tools**
4. Vacuum Pump
 - Removing and installing, refer to **Removal and Installation**
5. O-ring
 - Replace
6. Camshaft Position Sensor
 - Cylinder bank 1 (right) Camshaft Position (CMP) sensor -G40-
 - Cylinder bank 2 (left) Camshaft Position (CMP) sensor 2 -G163-
7. Bolt
 - Tightening specification, refer to **Specifications**
8. Bolt
 - Replace
 - Follow the sequence when loosening **Fig. 106**
 - Tightening specification and sequence, refer to **Fig. 7**
9. Ignition Coil
 - Removing and installing, refer to **Removal and Installation**
10. Cylinder Head Cover
 - Removing and installing: left, refer to **LEFT CYLINDER HEAD COVER**, right refer to **RIGHT CYLINDER HEAD COVER**
11. Gasket
 - Replace if damaged or leaking
12. Cover
13. Bolt
 - Replace if the seal is damaged
 - Tightening specification and sequence: left cylinder head cover, refer to **Fig. 5**, right cylinder head cover, refer to **Fig. 6**
14. Bolt
 - Tightening specification, refer to **Specifications**
15. Connector Strip
 - For the ignition coils
16. Cylinder Head Cover Gasket
 - Replace if damaged or leaking
17. Camshaft Adjustment Solenoid Valve
 - Cylinder bank 1 (right) camshaft adjustment valve 1 -N205-
 - Cylinder bank 2 (left) camshaft adjustment valve 2 -N208-
18. Bolt
 - 5 Nm

19. O-ring

- Replace

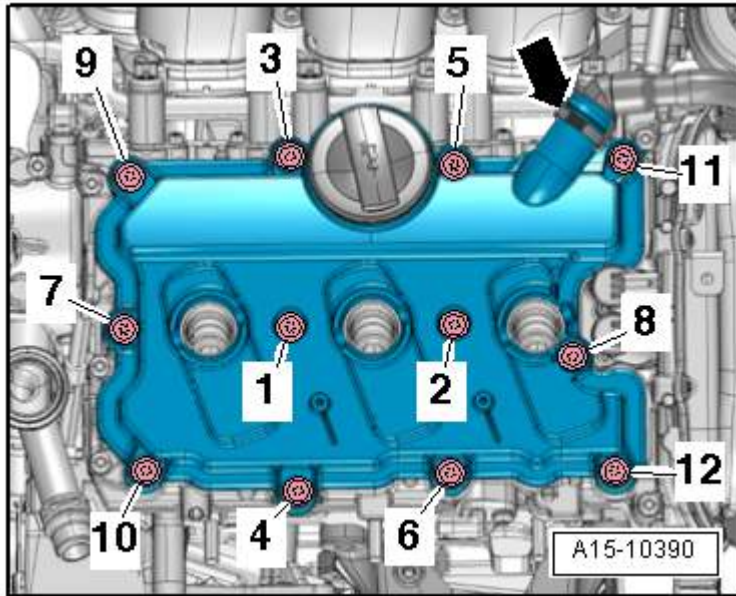


Fig. 5: Identifying Left Cylinder Head Cover Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts to 9 Nm in the following sequence: -1 to 12-.

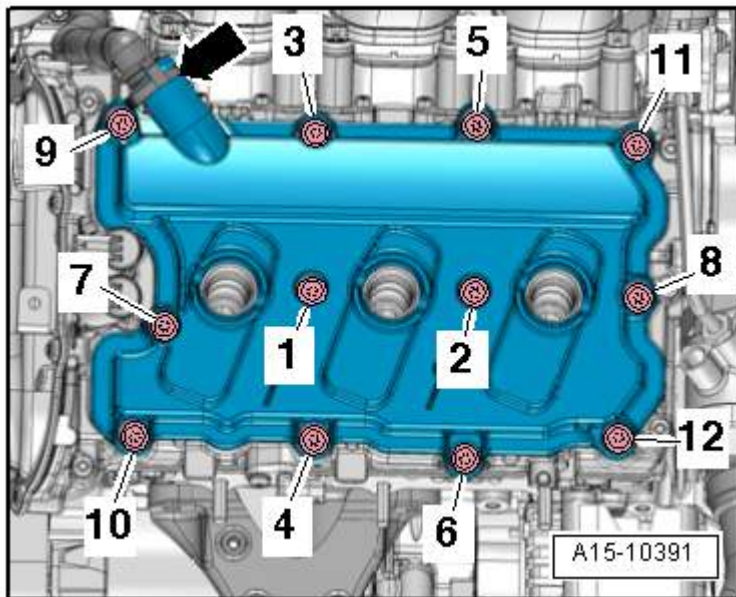


Fig. 6: Identifying Right Cylinder Head Cover Bolt, Tightening Sequence
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-- Tighten the bolts to 9 Nm in the following sequence: -1 to 12-.

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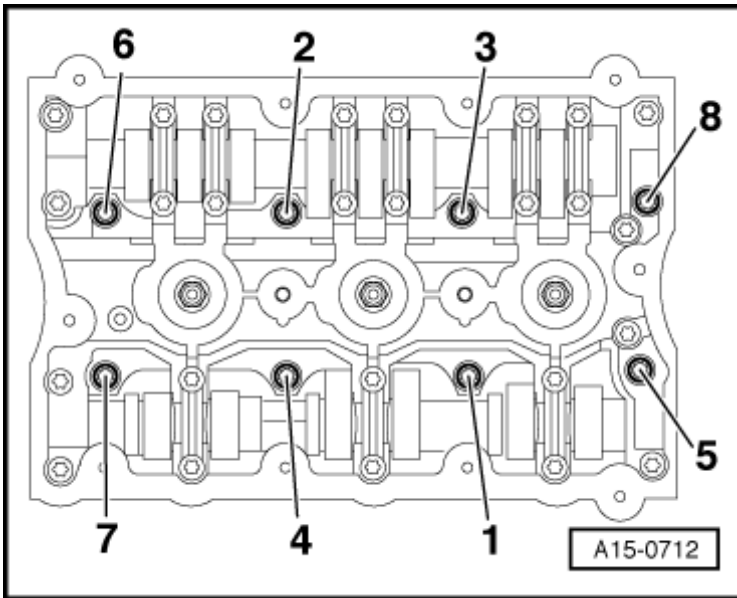


Fig. 7: Tightening Cylinder Head Bolts In Sequence
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 4 steps and in the sequence shown:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	Install all the way in by hand.
2.	-1 through 8-	40 Nm
3.	-1 through 8-	Tighten 90° further
4.	-1 through 8-	Tighten 90° further

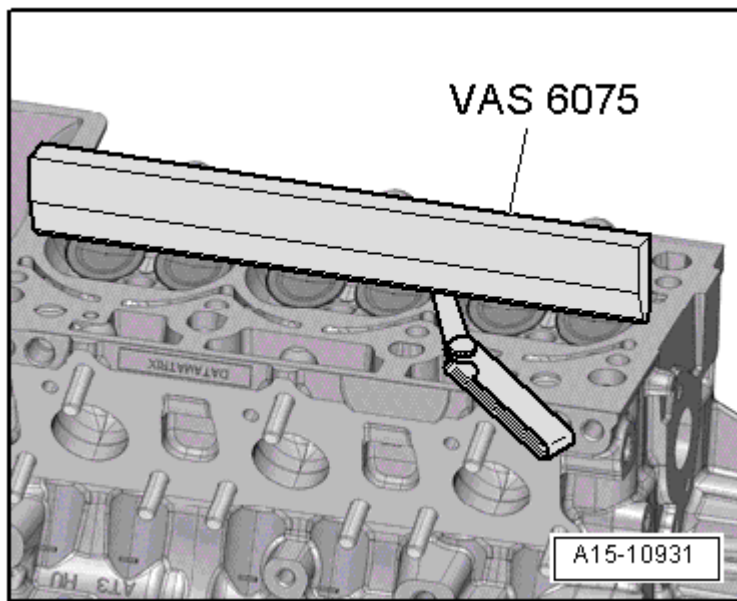


Fig. 8: Checking Cylinder Head for Distortion
Courtesy of AUDI OF AMERICA, LLC

-- Check the cylinder head on several locations for distortion using a straight edge 500 mm VAS 6075 and a feeler gauge.

- Maximum warp: 0.05 mm.

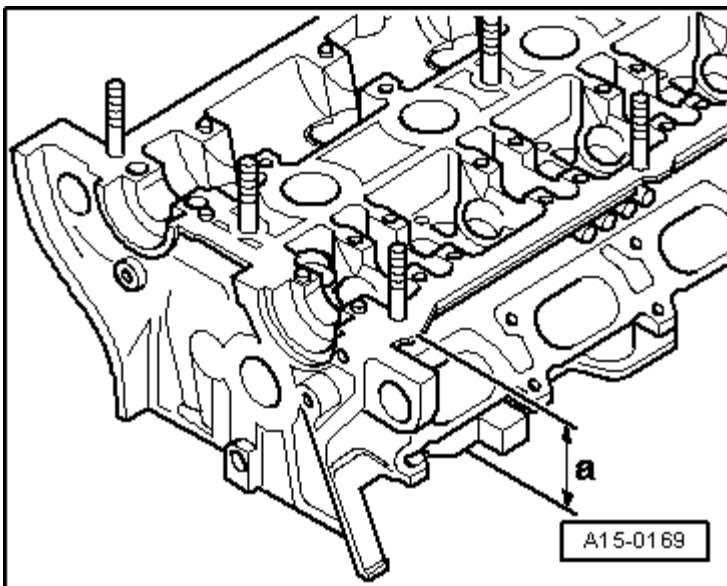


Fig. 9: Identifying Cylinder Head Refacing Dimension
Courtesy of AUDI OF AMERICA, LLC

Resurfacing cylinder head (face grinding) is only permissible to minimum dimension -a-.

- Minimum dimension -a- = 139.20 mm.

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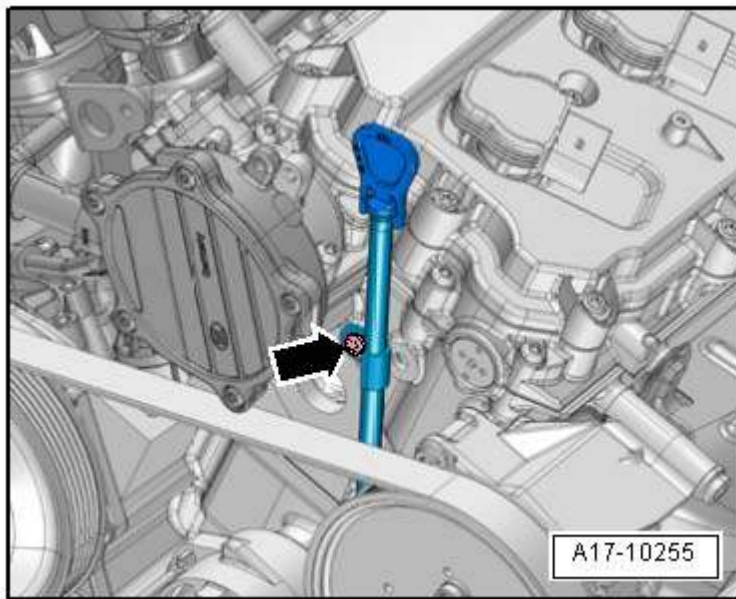


Fig. 10: Identifying Oil Dipstick Guide Tube Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolt -arrow- to 9 Nm.

POWER TAKE-OFF DRIVE CHAIN OVERVIEW

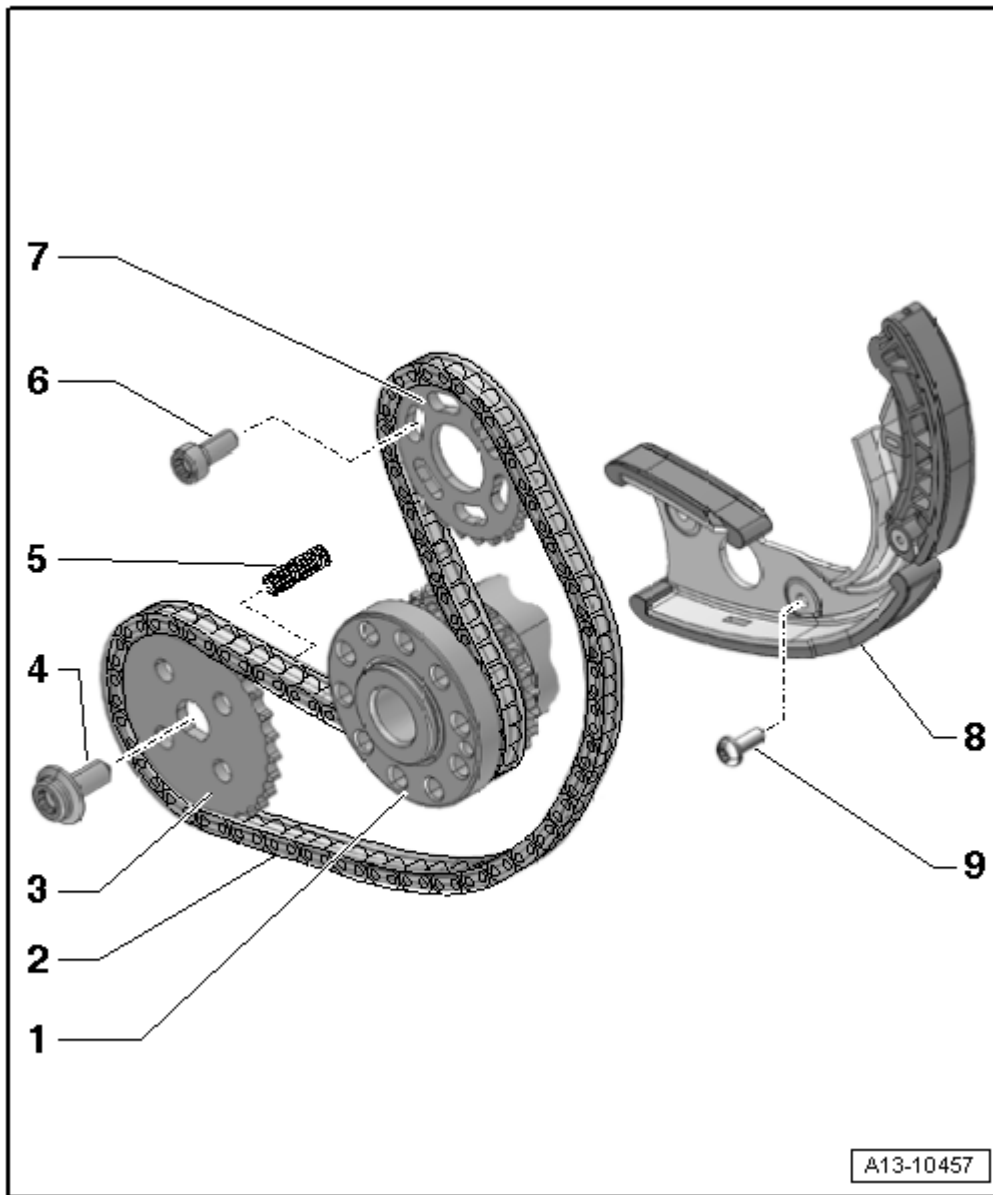


Fig. 11: Identifying Power Take-Off Drive Chain, From 04.06, Component Overview
 Courtesy of AUDI OF AMERICA, LLC

1. Crankshaft
2. Power Take-Off Drive Chain
 - Mark the running direction with paint for reinstallation
 - Removing and installing, refer to **POWER TAKE-OFF DRIVE CHAIN**
3. Drive Sprocket for Oil Pump
 - Installed position: The labeled side faces the engine
4. Bolt
 - 30 Nm plus an additional 90° turn
 - Replace

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5. Pressure Spring
6. Bolt
 - 15 Nm plus an additional 90° turn
 - Replace
7. Balance Shaft Chain Sprocket
 - Installed position: The labeled side faces the transmission
8. Chain Tensioner
 - With glide track
9. Bolt
 - 10 Nm plus an additional 45° turn
 - Replace

TIMING CHAIN COVERS OVERVIEW

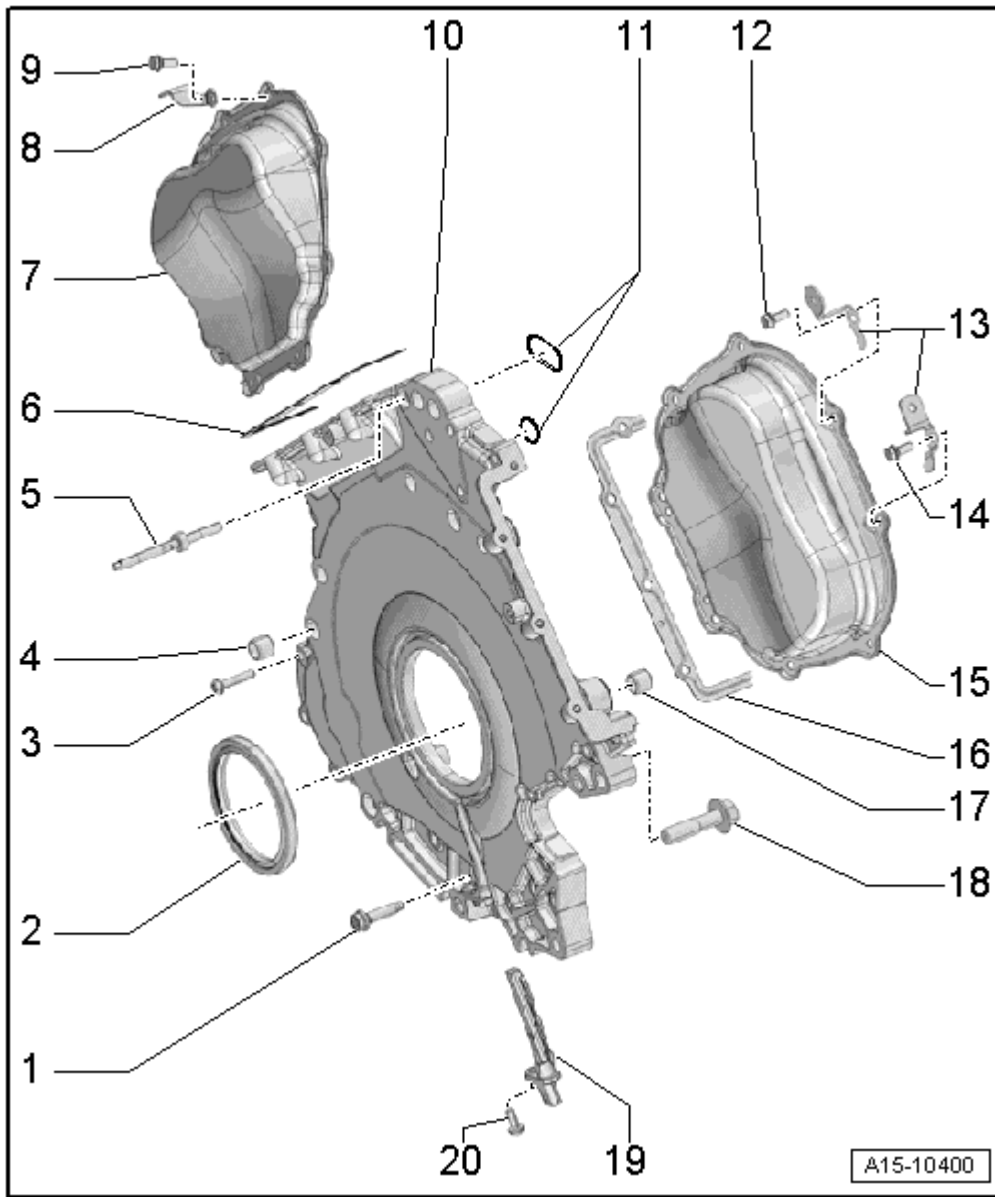


Fig. 12: Identifying Timing Chain Covers Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Replace
 - Tightening specification and sequence, refer to **Fig. 15**
2. Crankshaft Shaft Seal, Transmission Side
 - Removing and installing, refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**
3. Bolt
 - Replace
 - Tightening specification and sequence, refer to **Fig. 15**
4. Alignment Bushing

- Quantity: 2
- 5. Threaded Pin
 - Tightening specification, refer to **Fig. 15**
- 6. Left Cylinder Head Gasket
- 7. Left Timing Chain Cover
 - Removing and installing, refer to **LEFT AND RIGHT TIMING CHAIN COVERS**
- 8. Bracket
 - For wiring harness
- 9. Bolt
 - Replace
 - Tightening specification and sequence, refer to **Fig. 13**
- 10. Lower Timing Chain Cover
 - Removing and installing, refer to **LOWER TIMING CHAIN COVER**
- 11. Seals
 - Replace
- 12. Bolt
 - Tightening specification and sequence, refer to **Fig. 14**
- 13. Bracket
 - For the electrical connectors
- 14. Bolt
 - Replace
 - Tightening specification and sequence, refer to **Fig. 14**
- 15. Right Timing Chain Cover
 - Removing and installing, refer to **LEFT AND RIGHT TIMING CHAIN COVERS**
- 16. Right Cylinder Head Gasket
- 17. Alignment Bushing
 - Quantity: 2
- 18. Bolt
 - Tightening specification and sequence, refer to **Fig. 15**
- 19. Engine Speed (RPM) Sensor -G28-
 - Removing and installing, refer to **Removal and Installation**
- 20. Bolt
 - Tightening specification, refer to **Specifications**

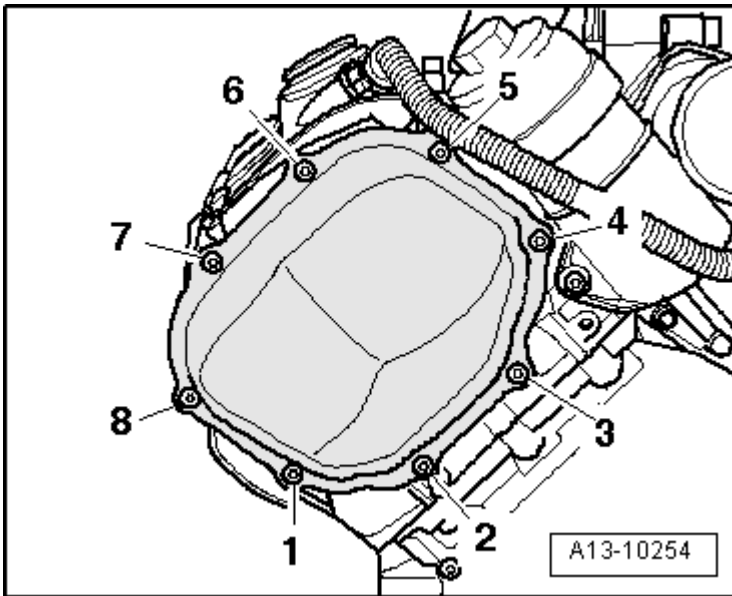


Fig. 13: Loosening/Tightening Bolts In Sequence For Left Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 2 steps and in the sequence shown:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	5 Nm
2.	-1 through 8-	Tighten 90° further

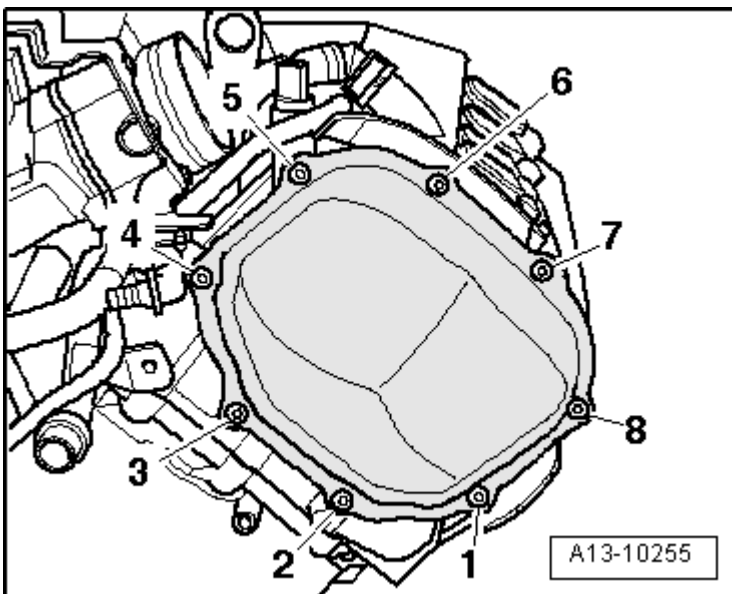


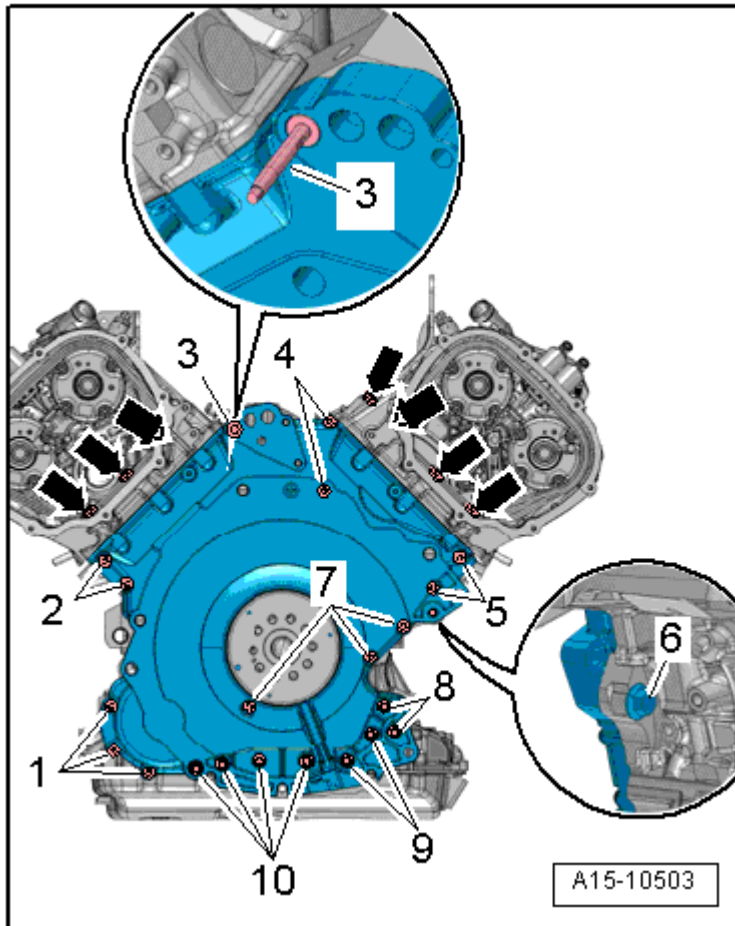
Fig. 14: Loosening/Tightening Bolts In Sequence For Right Timing Chain Cover

Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 2 steps and in the sequence shown:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	5 Nm
2.	-1 through 8-	Tighten 90° further

**Fig. 15: Identifying Lower Timing Chain Cover Bolt, Tightening Sequence**

Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten bolts in 8 stages as follows:

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Stage	Bolts	Tightening Specification/Additional Turn
1.	-Arrows-	3 Nm
2.	-1 through 10-	3 Nm in a diagonal sequence
3.	-1, 2, 4, 5, 7- and -arrows-	Tighten 90° further
4.	-8, 9, 10-	8 Nm
5.	-8, 9, 10-	Tighten 90° further
6.	-3-	16 Nm
7.	-6-	20 Nm
8.	-6-	Tighten 90° further

TIMING MECHANISM DRIVE CHAIN OVERVIEW

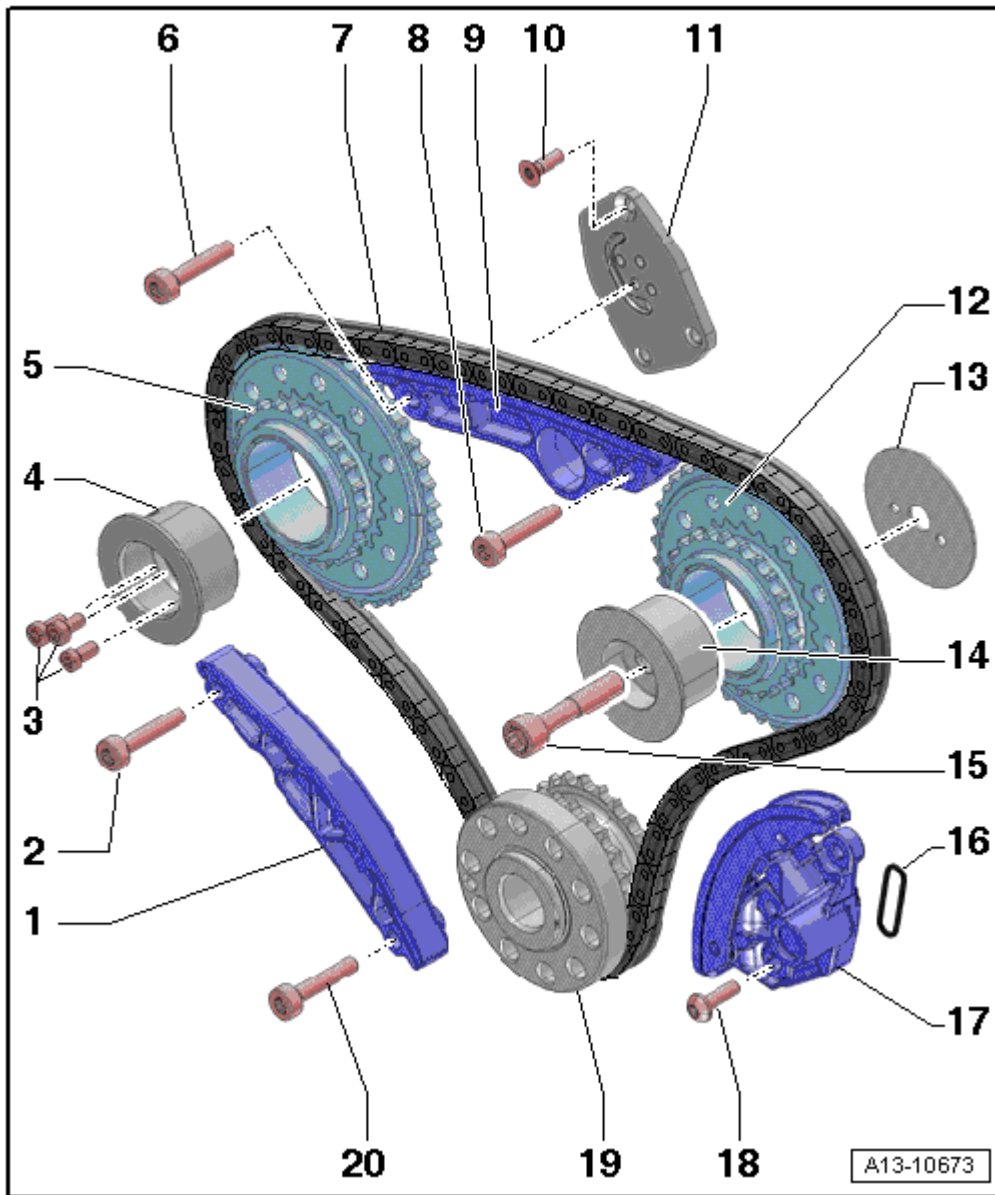


Fig. 16: Identifying Timing Mechanism Drive Chain Overview
 Courtesy of AUDI OF AMERICA, LLC

1. Guide Rail
2. Bolt
 - 10 Nm plus an additional 90° turn
 - Replace
3. Bolts
 - 5 Nm plus an additional 60° turn
 - Replace
4. Pivot Pin for Drive Sprocket
5. Drive Sprocket for Left Timing Chain

6. Bolt
 - 10 Nm plus an additional 90° turn
 - Replace
7. Power Take-Off Drive Chain
 - Mark the running direction with paint for reinstallation
 - Removing and installing, refer to **TIMING MECHANISM DRIVE CHAIN**
8. Bolt
 - 10 Nm plus an additional 90° turn
 - Replace
9. Guide Rail
10. Bolt
 - 8 Nm plus an additional 45° turn
 - Replace
11. Drive Chain Sprocket Bearing Plate
 - For the right camshaft timing chain
 - Asymmetrical version
12. Drive Sprocket for Right Timing Chain
 - Installed position, refer to **Fig. 17**
13. Thrust Washer
 - asymmetrical version
 - Installed position, refer to **Fig. 17**
14. Pivot Pin for Drive Sprocket
 - Asymmetrical version
 - Installed position, refer to **Fig. 17**
15. Bolt
 - 30 Nm plus an additional 90° turn
16. Gasket
 - Replace
17. Chain Tensioner
 - Removing and installing, refer to **TIMING MECHANISM DRIVE CHAIN**
18. Bolt
 - 9 Nm
19. Crankshaft
20. Bolt
 - 10 Nm plus an additional 90° turn
 - Replace

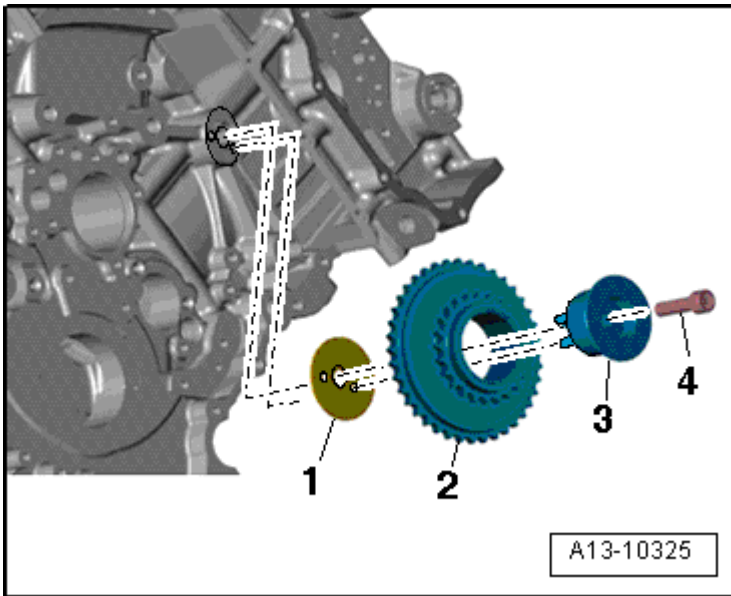


Fig. 17: Locating Mounting Pins For Camshaft Timing Chain Drive Sprocket
 Courtesy of AUDI OF AMERICA, LLC

- The alignment bushings in the right camshaft timing chain drive sprocket mounting pins -3- must engage in the holes in the thrust washer -1- and cylinder block.

2 - Right camshaft timing chain drive sprocket

4 - Bolt

VALVE TRAIN OVERVIEW

CAUTION: Risk of damaging valves and piston heads after working on the valve train.

- The motor must not be started for about 30 minutes after installing camshafts because the hydraulic equalization elements must seat themselves.
- To ensure valves do not strike pistons when starting, carefully rotate engine at least 2 full revolutions.

NOTE: Cylinder heads with cracks between the valve seats, or between the valve seat and the spark plug threads, can continue to be used without reducing the service life, as long as the cracks have a width of max. 0.3 mm, or only the first 4 threads of the spark plug threads are cracked.

NOTE: The illustration shows the cylinder bank 2 cylinder head (left).

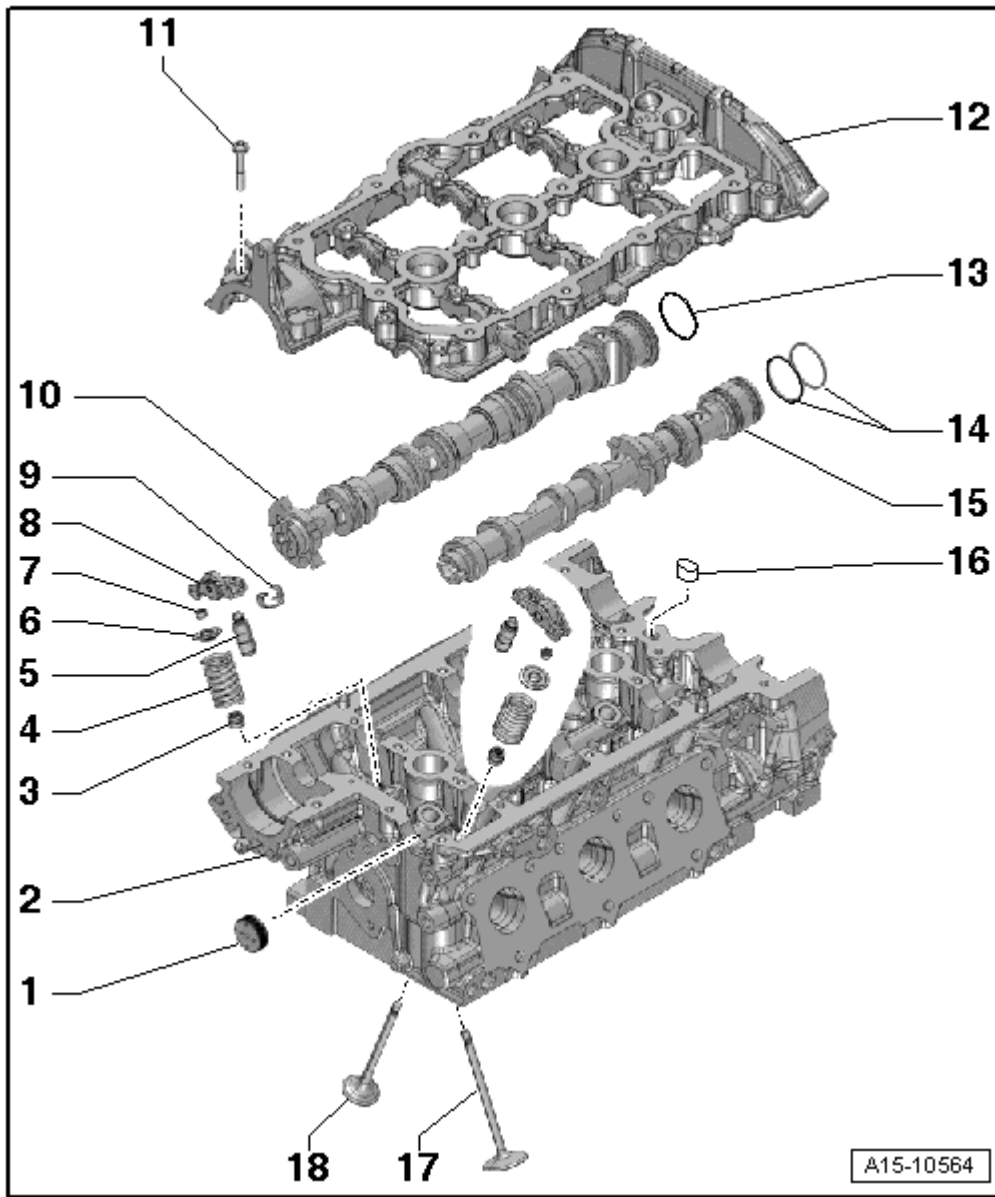


Fig. 18: Identifying Valvetrain Overview

Courtesy of AUDI OF AMERICA, LLC

1. Sealing Plug
 - Install with sealant; sealant,
2. Cylinder Head
 - Valve guides, checking, refer to **VALVE GUIDES, CHECKING**
3. Valve Stem Seal
 - Replacing with the cylinder head installed, refer to **VALVE STEM SEALS, CYLINDER HEAD INSTALLED**
 - Replacing with the cylinder head removed, refer to **VALVE STEM SEALS WITH CYLINDER HEAD REMOVED, REPLACING**

4. Valve Spring
 - Installed position, refer to **Fig. 19**
5. Hydraulic Adjusting Elements
 - Clipped into roller rocker lever -8-
 - Checking, refer to **HYDRAULIC ADJUSTING ELEMENTS, CHECKING**
 - Mark the installed position for installation later
 - Lubricate the running surfaces before installing
6. Valve Spring Plate
7. Valve Retainers
8. Roller Rocker Lever
 - Mark the installed position for installation later
 - Check roller for easy movement
 - Lubricate the running surfaces before installing
 - To assemble, clip onto the hydraulic adjusting element -9- with securing clip -5-
9. Clip
 - Not available individually
 - Make sure it is secure
10. Intake Camshaft
 - Removing and installing, refer to **CAMSHAFTS**
 - Axial play, measuring, refer to **CAMSHAFT, MEASURING AXIAL CLEARANCE**
 - Radial clearance, measuring, refer to **CAMSHAFT, MEASURING RADIAL CLEARANCE**
 - Maximum run out: 0.04 mm
11. Bolt
 - Replace
 - Tightening specification and sequence, refer to **Fig. 20**
12. Guide Frame
 - With integrated camshaft bearings
 - Removing and installing, refer to **CAMSHAFTS**
13. Compression Ring
14. Compression Ring
15. Exhaust Camshaft
 - Removing and installing, refer to **CAMSHAFTS**
 - Axial play, measuring, refer to **CAMSHAFT, MEASURING AXIAL CLEARANCE**
 - Radial clearance, measuring, refer to **CAMSHAFT, MEASURING RADIAL CLEARANCE**
 - Maximum run out: 0.04 mm
16. Oil Strainer
17. Intake Valve
 - Do not rework, only lapping is permitted

- Mark the installed position for installation later
- Checking, refer to **VALVES, CHECKING**
- Valve dimensions, refer to **VALVE DIMENSIONS**
- Valve guides, checking, refer to **VALVE GUIDES, CHECKING**

18. Exhaust Valve

- Do not rework, only lapping is permitted
- Mark the installed position for installation later
- Checking, refer to **VALVES, CHECKING**
- Valve dimensions, refer to **VALVE DIMENSIONS**
- Valve Guides, Checking, refer to **VALVE GUIDES, CHECKING**

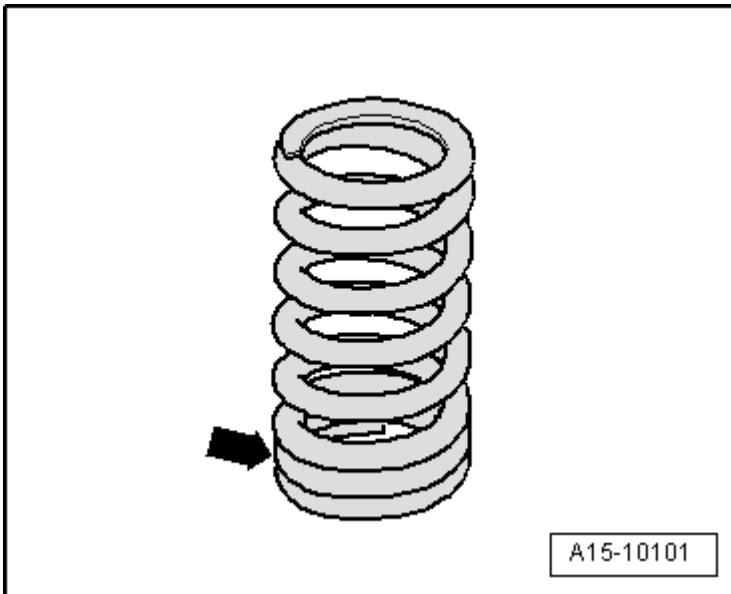


Fig. 19: Identifying Tight Spring Coils
Courtesy of AUDI OF AMERICA, LLC

- The tight spring coils -arrow- face toward the cylinder head.

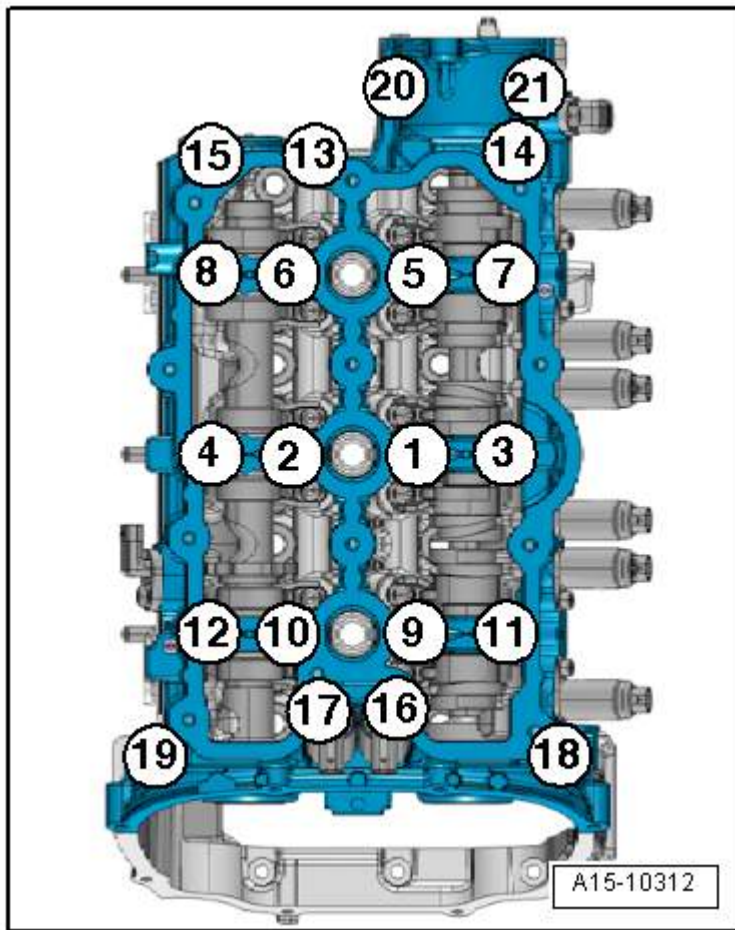


Fig. 20: Identifying Guide Frame Bolt, Tightening Sequence

Courtesy of AUDI OF AMERICA, LLC

NOTE: The guide frame for the left cylinder head camshaft is shown in the illustration. The right cylinder head is identical.

Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 3 steps and in the sequence shown:

Stage	Bolts	Tightening specification/additional turn
1.	-1 through 21-	Install the bolts all the way in by hand The guide frame must touch the entire contact surface on the

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		cylinder head.
2.	-1 through 21-	8 Nm
3.	-1 through 21-	Tighten 90° additional turn

SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

Component	Fastener Size	Nm
Balance Shaft Belt Pulley Side	-	60
Balance Shaft Chain Sprocket ¹	-	15 + 90°
Balance Shaft Transmission Side	-	60
Camshaft Adjuster for Intake Camshaft ¹	-	80 + 90°
Camshaft Adjustment Solenoid Valve	-	5
Camshaft Chain Sprocket for the Exhaust Camshaft ¹	-	80 + 90°
Chain Tensioner ²	-	9
Chain Tensioner with Glide Track ^{1, 3}	-	10 + 45°
Drive Chain Sprocket Bearing Plate ¹	-	8 + 45°
Drive Sprocket for Oil Pump ¹	-	30 + 90°
Gear Carrier	-	13
Guide Rail ¹	-	10 + 90°
Left Camshaft Timing Chain Tensioner	-	9
Pivot Pin for Drive Sprocket (left) ¹	-	5 + 60°
Pivot Pin for Drive Sprocket (right) ¹	-	30 + 60°
Right Camshaft Timing Chain Tensioner	-	9
¹ Always replace ² For bolt tightening clarification, refer to <u>TIMING MECHANISM DRIVE CHAIN OVERVIEW</u> and see items -7- ³ For bolt tightening clarification, refer to <u>POWER TAKE-OFF DRIVE CHAIN OVERVIEW</u> and see items -8-		

Left Cylinder Head Cover - Tightening Specification and Sequence

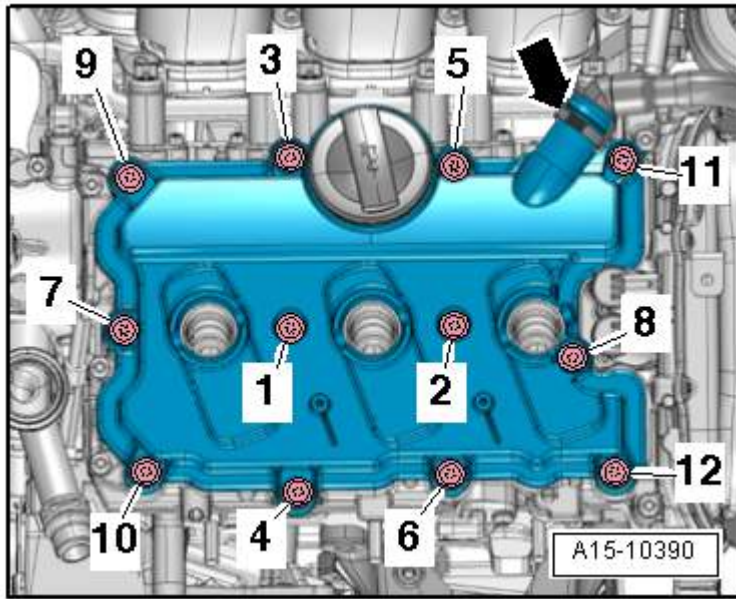


Fig. 21: Identifying Left Cylinder Head Cover Bolt, Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts to 9 Nm in the following sequence: -1 to 12-.

Right Cylinder Head Cover - Tightening Specification and Sequence

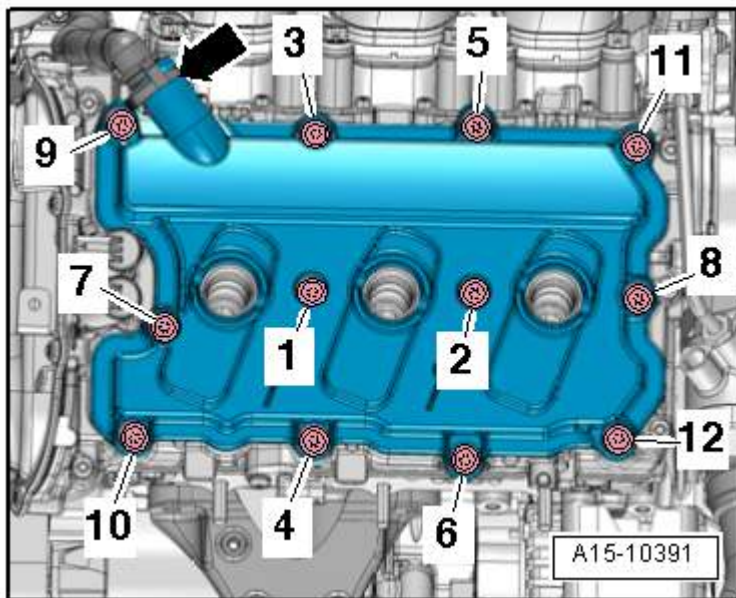


Fig. 22: Identifying Right Cylinder Head Cover Bolt, Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts to 9 Nm in the following sequence: -1 to 12-.

Cylinder Head - Tightening Specification and Sequence

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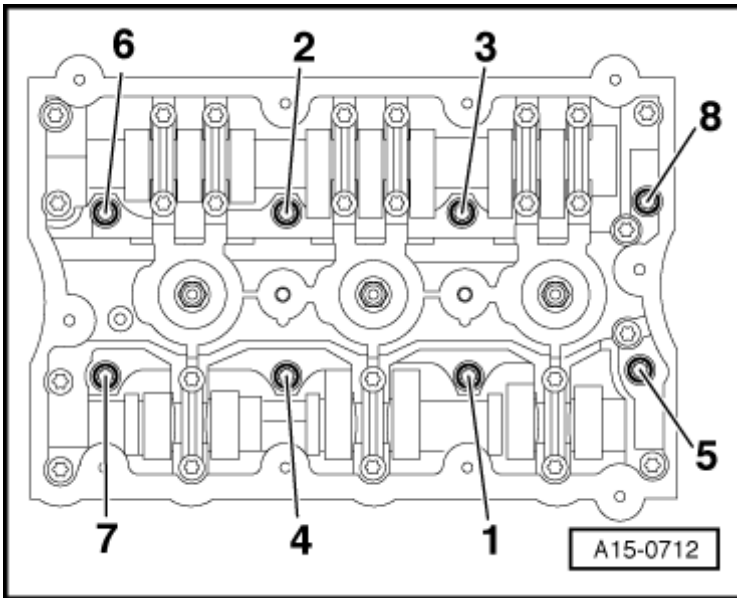


Fig. 23: Tightening Cylinder Head Bolts In Sequence
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 4 steps and in the sequence shown:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	Install all the way in by hand.
2.	-1 through 8-	40 Nm
3.	-1 through 8-	Tighten 90° further
4.	-1 through 8-	Tighten 90° further

Oil Dipstick Guide Tube - Tightening Specifications

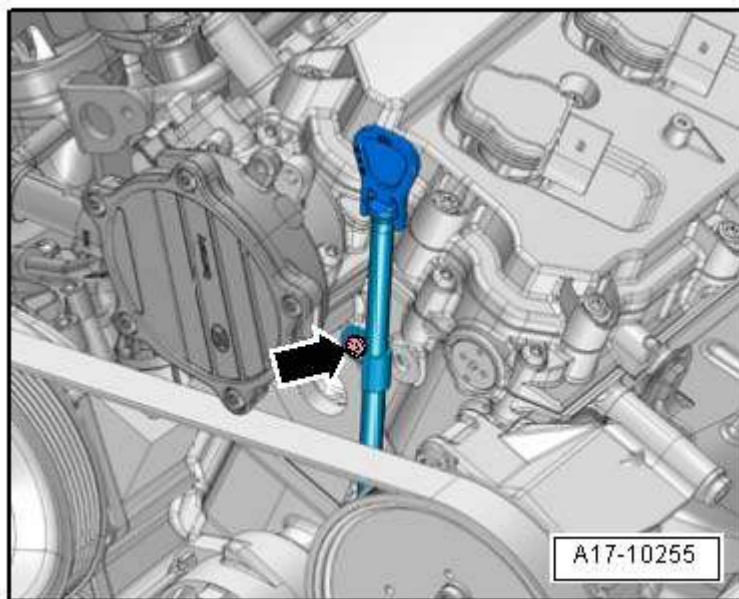


Fig. 24: Identifying Oil Dipstick Guide Tube Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolt -arrow- to 9 Nm.

Left Timing Chain Cover, Tightening Specifications and Sequence

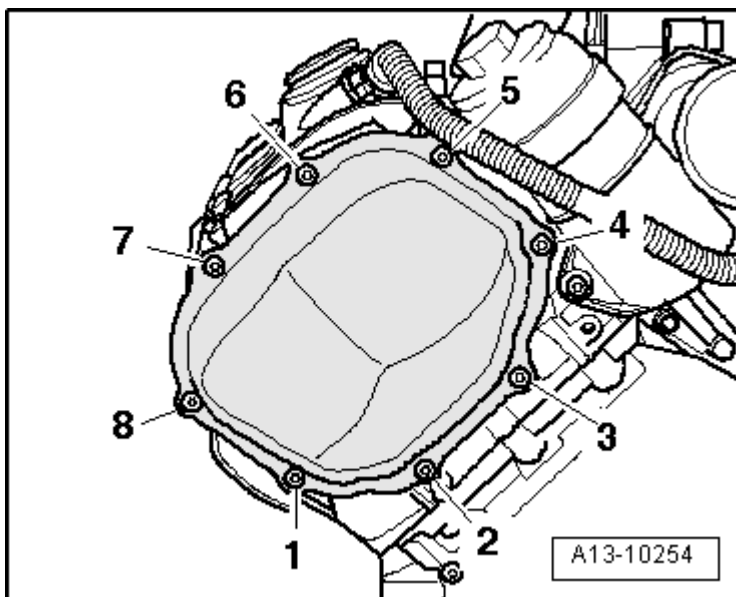


Fig. 25: Loosening/Tightening Bolts In Sequence For Left Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 2 steps and in the sequence shown:

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Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	5 Nm
2.	-1 through 8-	Tighten 90° further

Right Timing Chain Cover, Tightening Specifications and Sequence

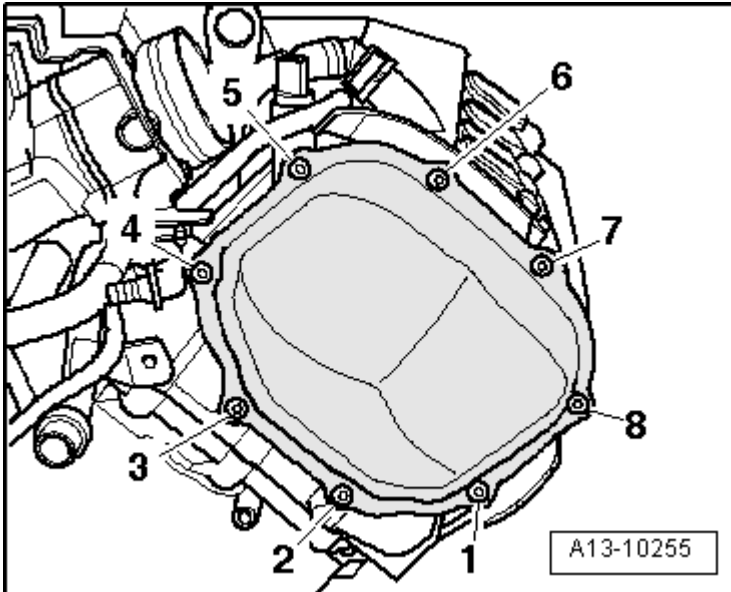


Fig. 26: Loosening/Tightening Bolts In Sequence For Right Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 2 steps and in the sequence shown:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-1 through 8-	5 Nm
2.	-1 through 8-	Tighten 90° further

Lower Timing Chain Cover, Tightening Specifications and Sequence

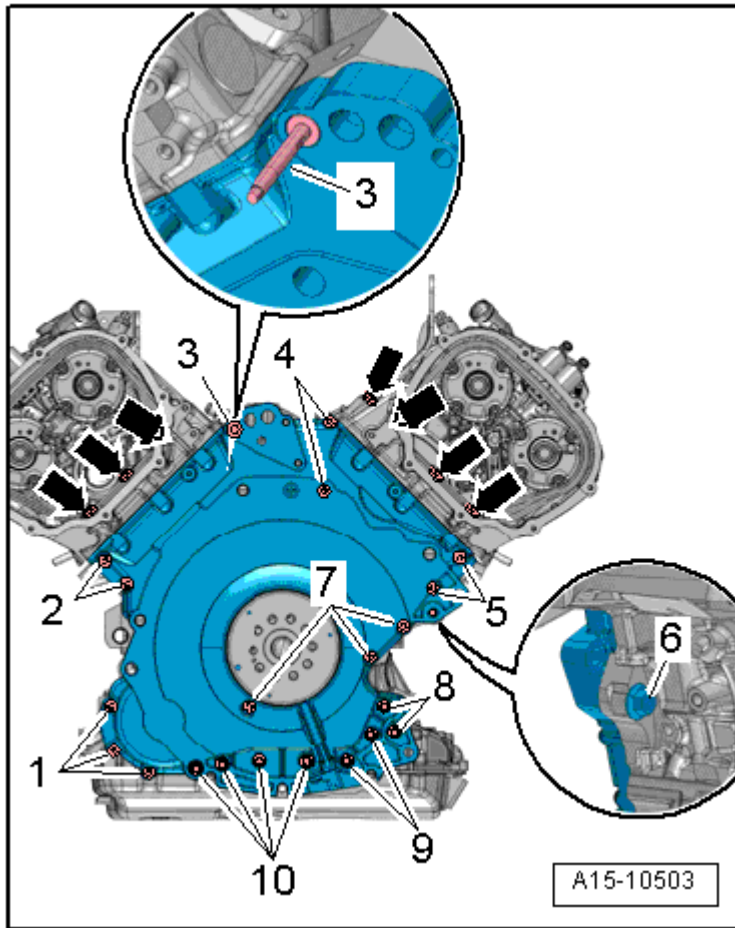


Fig. 27: Identifying Lower Timing Chain Cover Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace any bolts that were tightened with an additional turn.

-- Tighten bolts in 8 stages as follows:

Stage	Bolts	Tightening Specification/Additional Turn
1.	-Arrows-	3 Nm
2.	-1 through 10-	3 Nm in a diagonal sequence
3.	-1, 2, 4, 5, 7- and -arrows-	Tighten 90° further
4.	-8, 9, 10-	8 Nm
5.	-8, 9, 10-	Tighten 90° further
6.	-3-	16 Nm
7.	-6-	20 Nm
8.	-6-	Tighten 90° further

Camshaft Guide Frame Tightening Specifications and Sequence

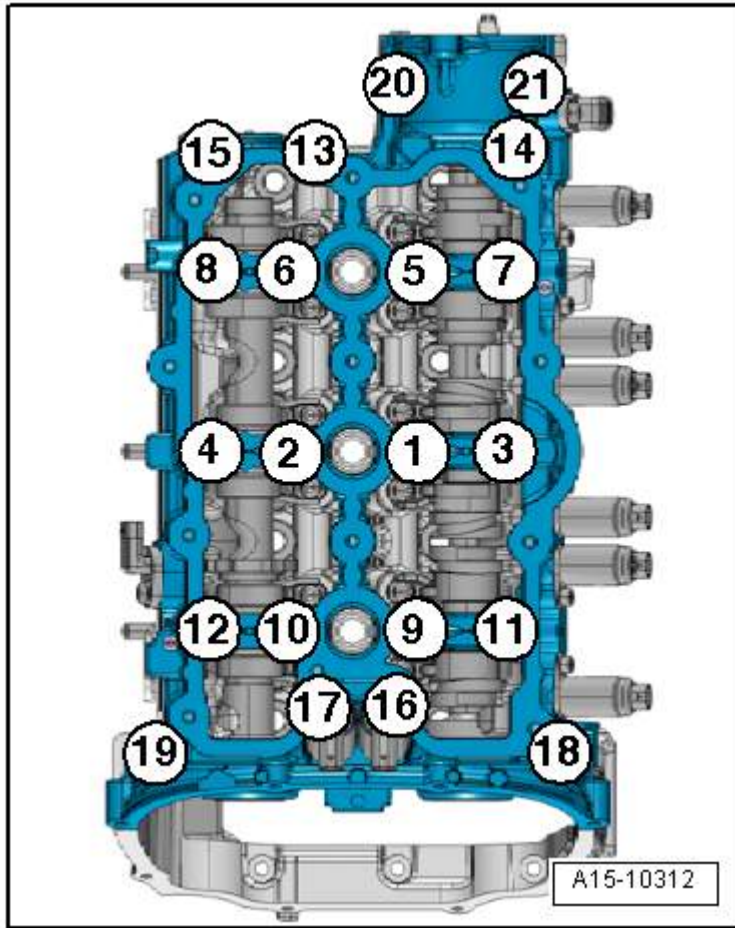


Fig. 28: Identifying Guide Frame Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE: The guide frame for the left cylinder head camshaft is shown in the illustration. The right cylinder head is identical.

Replace any bolts that were tightened with an additional turn.

-- Tighten the bolts in 3 steps and in the sequence shown:

Stage	Bolts	Tightening specification/additional turn
1.	-1 through 21-	Install the bolts all the way in by hand The guide frame must touch the

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		entire contact surface on the cylinder head.
2.	-1 through 21-	8 Nm
3.	-1 through 21-	Tighten 90° additional turn

VALVE DIMENSIONS

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

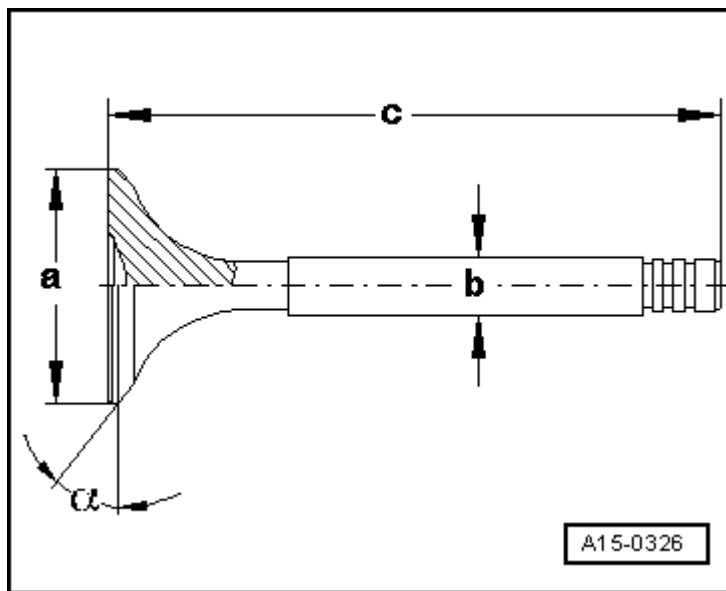


Fig. 29: Identifying Valve Dimensions
Courtesy of AUDI OF AMERICA, LLC

Dimension		Intake Valve	Exhaust Valve
Diameter a	mm	33/85 ± 0/10	28/0 ± 0/1
Diameter b	mm	5/98 ± 0/01	5/96 ± 0/01
c	mm	104/0 ± 0/2	101/9 ± 0/2
a	Angle°	45	45

WARNING:

- Worn sodium-filled exhaust valves must not be scrapped without first being properly treated.
- Using a metal saw, the valves must be cut in half between the shaft center and valve plate. While doing this, do not come into contact with water. After cutting open the valves, throw no more than 10 at a time into a bucket of water. Then, move quickly away, because a sudden chemical reaction will occur during which the sodium is

burnt away.

- The treated parts may then be discarded through conventional disposal channels.

DIAGNOSIS AND TESTING

CAMSHAFT, MEASURING AXIAL CLEARANCE

Special tools and workshop equipment required

- Dial Gauge Holder VW 387
- Dial Gauge 0-3 mm VAS 6080

Procedure

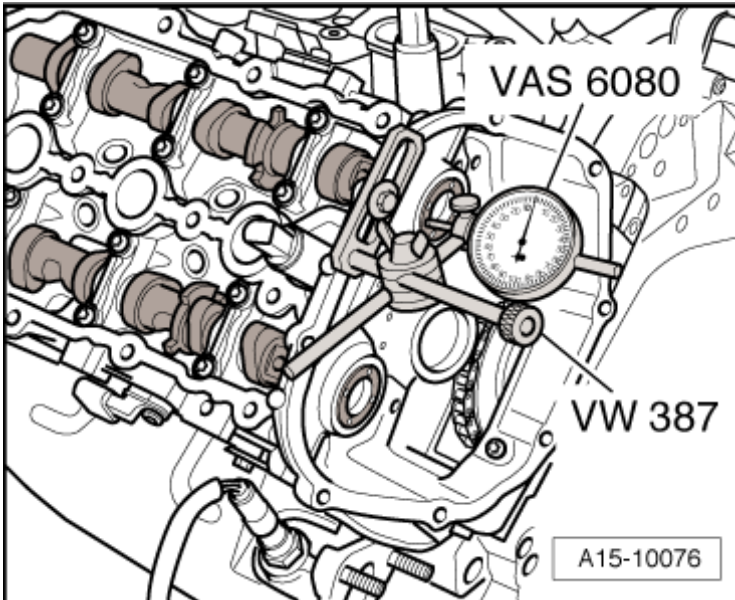


Fig. 30: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6080 On Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

- Remove the camshafts. Refer to **CAMSHAFTS**.
- Mark the assignment of the roller rocker lever for installation later.
- Remove the roller rocker lever and place it on a clean surface.
- Install the camshaft and the guide frame. Refer to **Fig. 20** and tighten the old bolts to 8 Nm.
- Secure the VW 387 with the VAS 6079 on the cylinder head as shown in the illustration.
- Press camshaft against dial gauge by hand.

- Set dial gauge to "0".
- Press camshaft off dial gauge and read the value:
 - Axial clearance: 0.100 to 0.191 mm.

CAMSHAFT, MEASURING RADIAL CLEARANCE**Special tools and workshop equipment required**

- Plastigage

Procedure

- Remove the camshafts. Refer to **CAMSHAFTS**.
- Mark the assignment of the roller rocker lever for installation later.
- Remove the roller rocker lever and place it on a clean surface.
- Clean the bearing and the bearing journals.
- Place Plastigage over entire width of bearing journal or into bearing.
 - Plastigage must rest in center of bearing.
- Install the camshafts, mount the guide frame and tighten the bolts to 8 Nm. Refer to **Fig. 20**. When doing this, be careful not to rotate the camshafts.
- Remove the bearing bracket and camshafts.
- Compare width of Plastigage with calibrated scale.

Radial clearance:

- For 24 mm diameter bearings: 0.024 to 0.066 mm
- For 36 mm diameter bearings: 0.032 to 0.078 mm

COMPRESSION, CHECKING**Special tools and workshop equipment required**

- Spark Plug Removal Tool 3122 B
- Compression Tester V.A.G 1763

Procedure

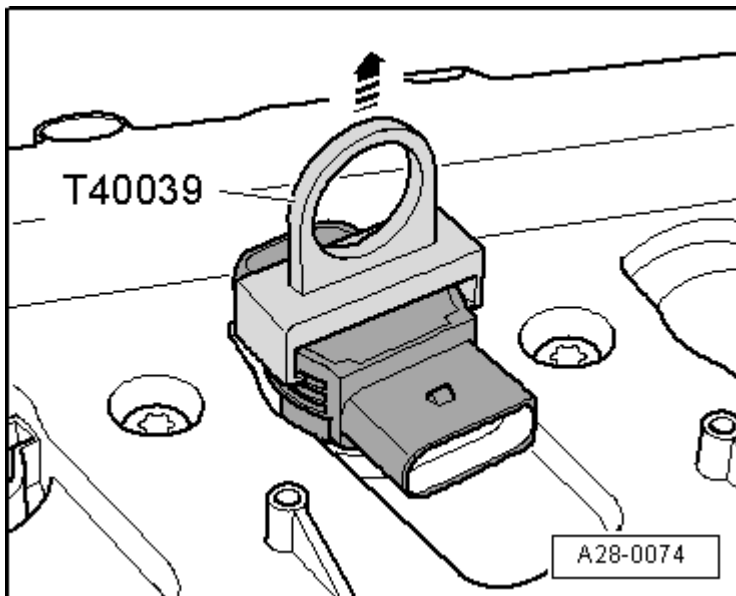


Fig. 31: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

- Engine oil temperature at least 30 °C (86 °F).
- Battery voltage at least 12.5 V.

-- Remove all ignition coils. Refer to **Removal and Installation** .

-- Disconnect the connector -2- to the fuel injectors on the rear of the left cylinder head.

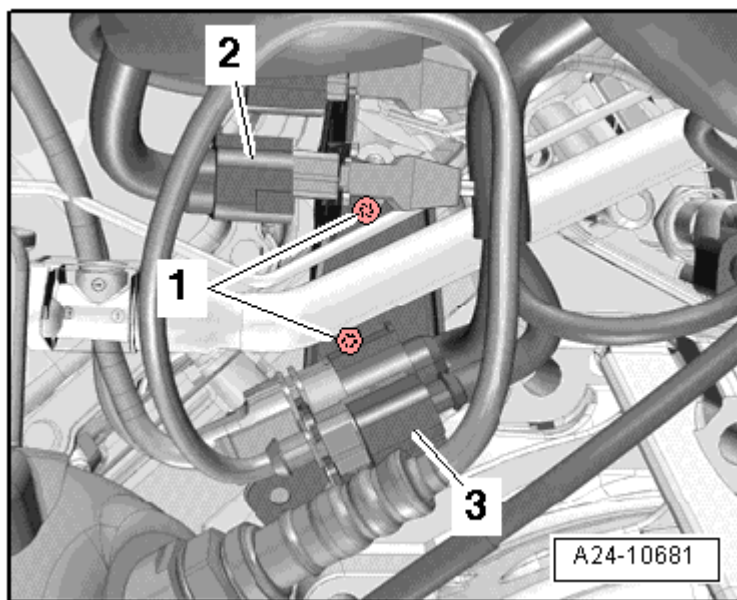


Fig. 32: Disconnecting Connector To Fuel Injectors (Left Cylinder Head)
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 and 3-

-- Disconnect the connector -2- to the fuel injectors on the rear of the right cylinder head.

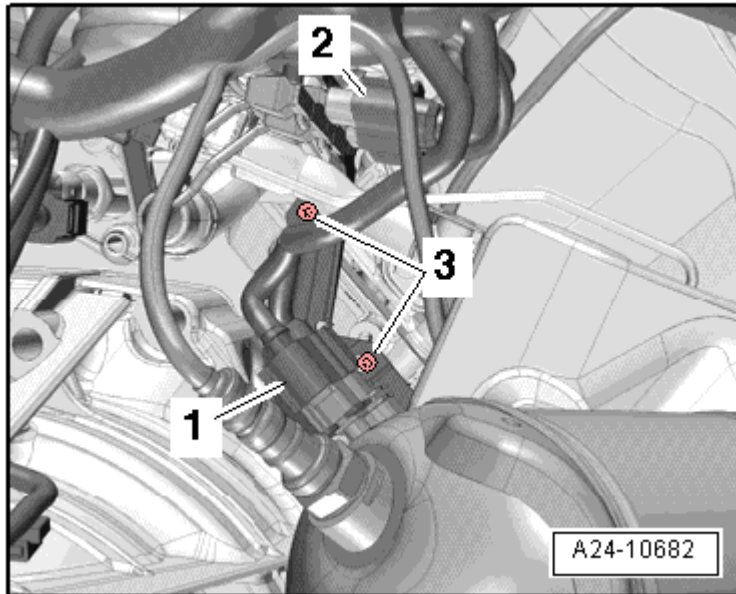


Fig. 33: Disconnecting Connector To The Fuel Injectors (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 and 3-

-- Remove the spark plugs with 3122 B.

-- Check compression pressure using the V.A.G 1763.

NOTE: Using tester see operating instructions.

-- Have a second technician press the accelerator pedal down all the way while operating the starter until the pressure increase is no longer displayed on the tester.

-- Repeat procedure on each cylinder.

Compression Pressure	Bar Pressure
New	11.0 to 14.0
Wear limit	10.0
Difference between cylinders	Max. 3.0

Assembling

Assemble in reverse order of disassembling. Note the following:

-- Install the spark plugs. Refer to **MAINTENANCE PROCEDURES**

-- If the connectors were disconnected and the engine was started, then malfunctions have been stored in the Engine Control Module (ECM) Diagnostic Trouble Code (DTC) memory. **Generate readiness code** in **Guided Functions** using the vehicle diagnostic tester.

HYDRAULIC ADJUSTING ELEMENTS, CHECKING

NOTE: **The hydraulic adjusting elements cannot be repaired.**

Irregular valve noises are normal while starting the engine.

Special tools and workshop equipment required

- Socket T40058 for vehicles with a S-Tronic transmission 0B5
- Feeler gauge

Procedure

-- Start the engine and let it run until the coolant fan switches on once.

-- Increase engine speed for about 2 minutes to approximately 2500 RPM, perform a road test if necessary.

-- If the hydraulic adjusting elements are still loud, determine which one is faulty as follows:

-- Remove the cylinder head cover. For the left side, refer to **LEFT CYLINDER HEAD COVER** and for the right side, refer to **RIGHT CYLINDER HEAD COVER**.

-- Rotate the crankshaft until the lobes on the hydraulic adjusting element to be checked face upward:

Vehicles with a Manual Transmission

-- Move the vehicle forward with 4th gear engaged and the ignition switched off.

Vehicles with S-Tronic Transmission 0B5

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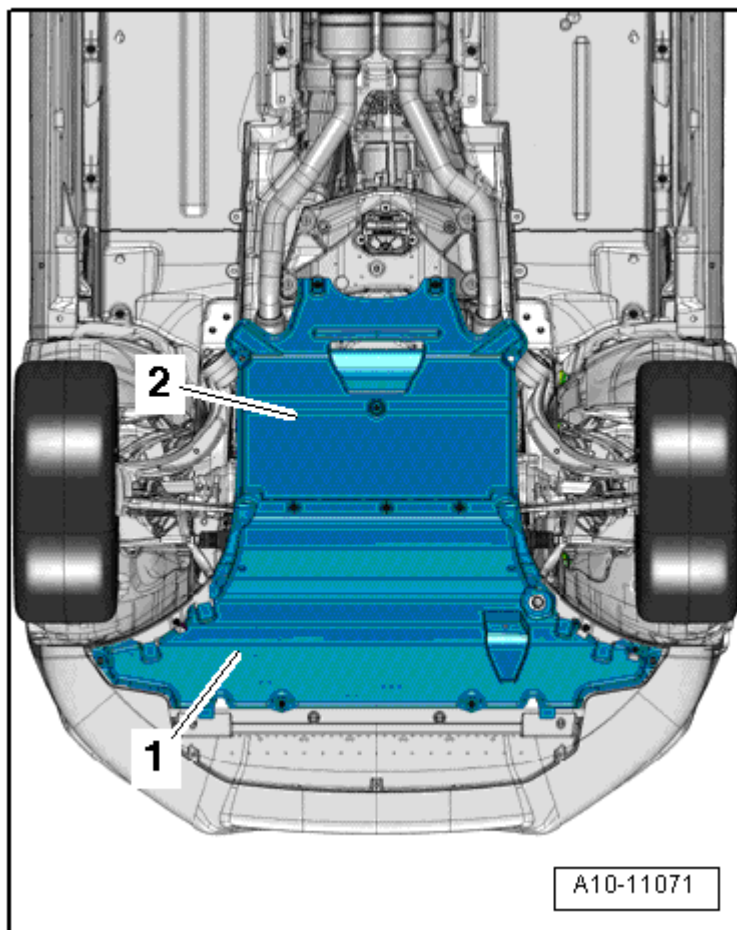


Fig. 34: Identifying Front Noise Insulation
Courtesy of AUDI OF AMERICA, LLC

- Remove the front noise insulation -1-. Refer to **Description and Operation** .
- Insert the T40058 guide pins as follows:

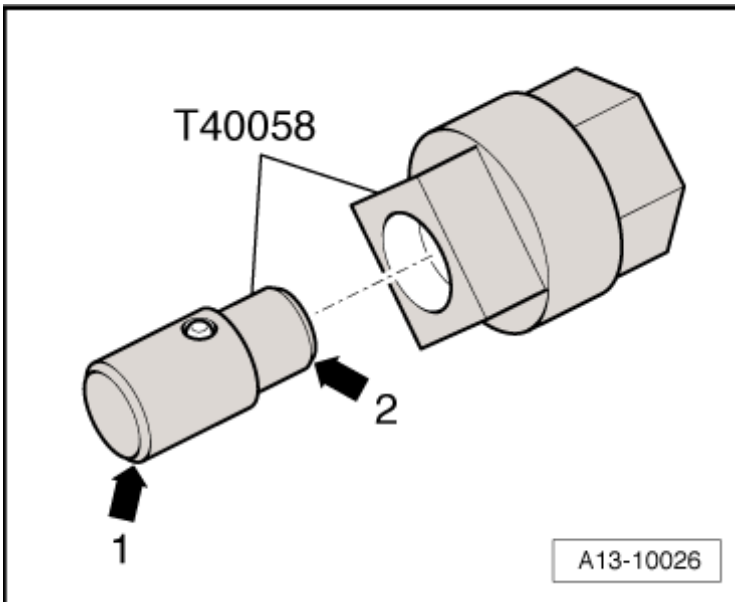


Fig. 35: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The large diameter -arrow 1- faces the engine.
- The small diameter -arrow 2- faces the adapter.

-- Rotate the crankshaft 180° further in direction of engine rotation -arrow- using the T40058 and wrench.

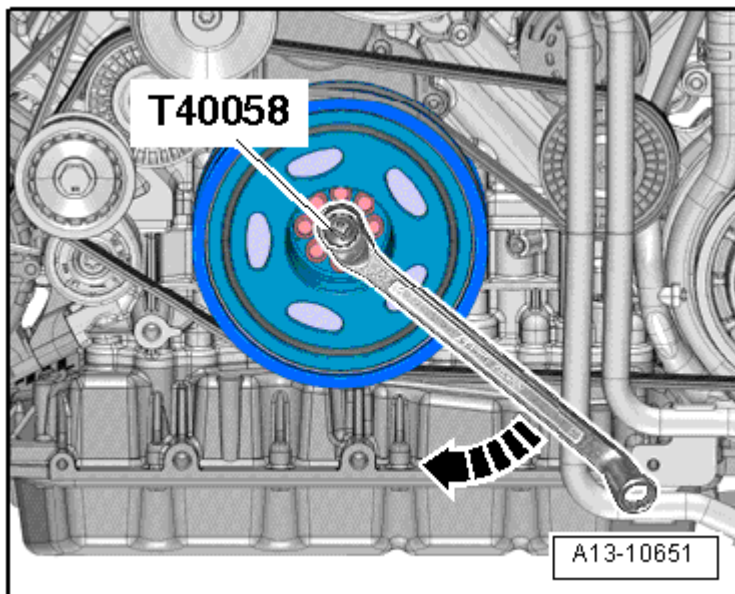


Fig. 36: Using Socket T40058 To Counter Hold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

All Vehicles

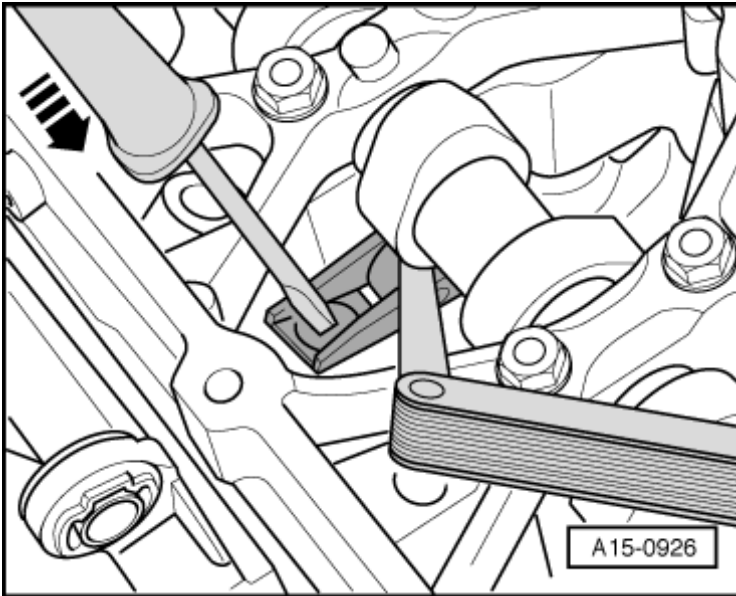


Fig. 37: Checking Play Between Cam Lobes And Roller Rocker Lever
Courtesy of AUDI OF AMERICA, LLC

- To determine the play between cam lobes and roller rocker lever, press lever down -arrow-.
- If a 0.20 mm feeler gauge can slide between the cam lobes and roller rocker lever, replace the hydraulic adjusting element. Refer to **CAMSHAFTS**.

Final Procedures

- Install the front noise insulation. Refer to **Description and Operation** .
- Install the cylinder head cover. For the left side, refer to **LEFT CYLINDER HEAD COVER** and for the right side, refer to **RIGHT CYLINDER HEAD COVER**.

VALVES, CHECKING

- Check valves at stem and contact surface for traces of wear.
- If there are clear traces of wear, replace valve.

VALVE GUIDES, CHECKING

Special tools and workshop equipment required

- Dial Gauge Holder VW 387
- Dial Gauge 0-10 mm VAS 6079

Procedure

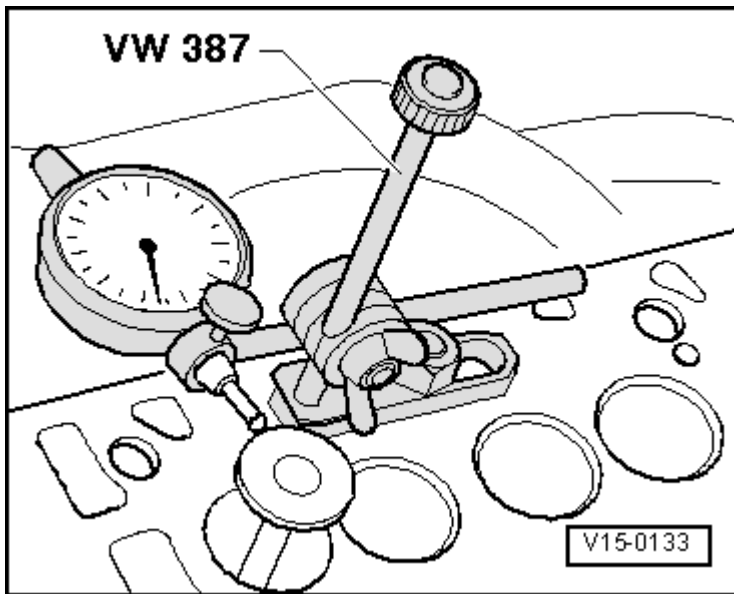


Fig. 38: Determining Valve Rock (Wear limit)

Courtesy of AUDI OF AMERICA, LLC

NOTE: If the valve is replaced during repair, use a new valve for measurement.

Due to different stem diameters, only use an intake valve in the intake guide and an exhaust valve in the exhaust guide.

-- Place valve in valve guide.

- Valve stem tip must seal with valve guide.

-- Determine tip clearance.

- Wear limit: 0.8 mm.

-- If wear limit is exceeded, measure using new valves.

-- Replace the cylinder head if the wear limit is still exceeded.

NOTE: The valve guides cannot be replaced.

REMOVAL AND INSTALLATION

BALANCE SHAFT

Special tools and workshop equipment required

- Locating Pins T40116
- Locking Pin T40069

REMOVING

- The transmission is removed. Refer to **Removal and Installation** or **Removal and Installation** .

-- Remove the belt pulley side sealing flange. Refer to **SEALING FLANGE WITH CRANKSHAFT SEAL, BELT PULLEY SIDE** .

-- Remove timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.

-- Remove the power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.

-- Secure the rear balance weight -1- to the engine using the T40116.

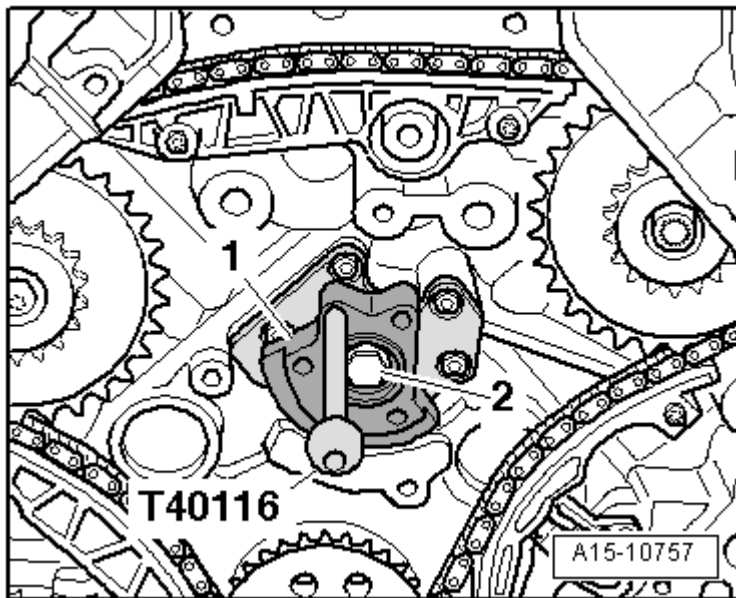


Fig. 39: Identifying Balance Weight -1-
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -2- and remove the balance weight from the balance shaft.

-- Remove the bolt -2- while counter holding the balance weight using the drift and remove the balance weight -1- from balance shaft at the front of the engine.

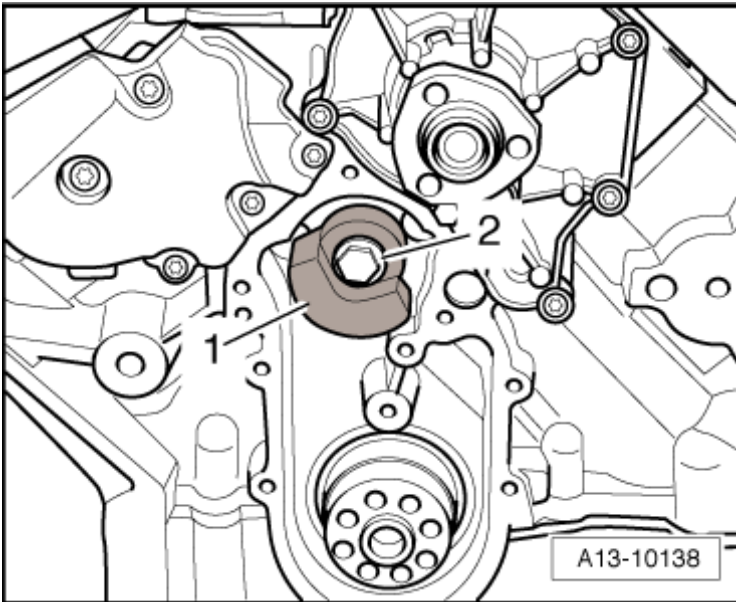


Fig. 40: Identifying Balance Weight -1- And Bolt -2-
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and the balance shaft and bearing end bracket at the rear of the engine.

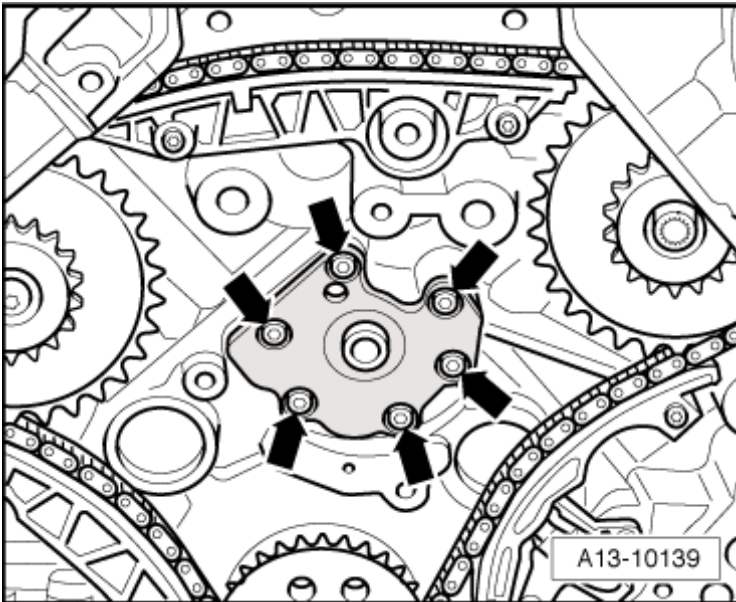


Fig. 41: Identifying Bearing End Bracket Bolts -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Remove the balance shaft back out of the cylinder block.

INSTALLING

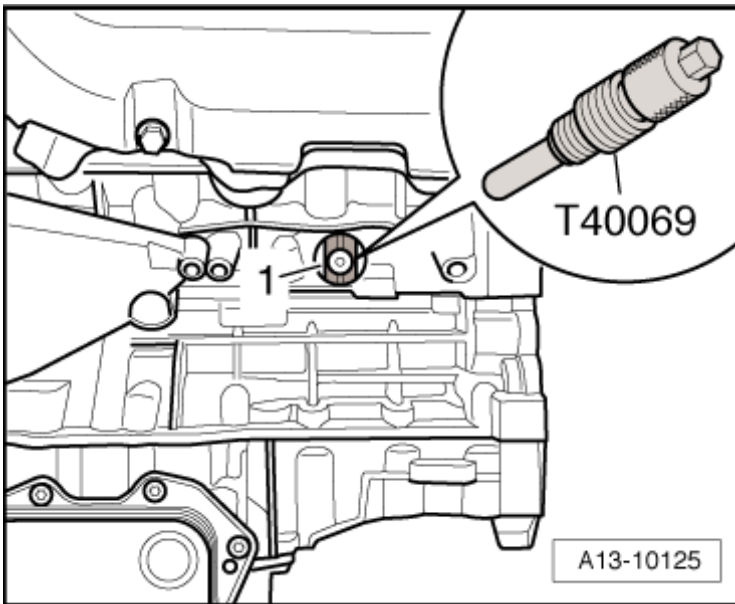


Fig. 42: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
 Courtesy of AUDI OF AMERICA, LLC

- Tightening specification, refer to **BALANCE SHAFT OVERVIEW**.
- Secure crankshaft -1- in "TDC" position using Locking Pin T40069.

Install in reverse order of removal. Note the following:

NOTE: **The balance weights can only be positioned one way on balance shaft.**

- Install the power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Install timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the belt pulley side sealing flange. Refer to **SEALING FLANGE WITH CRANKSHAFT SEAL, BELT PULLEY SIDE**.

CAMSHAFTS

Special tools and workshop equipment required

- Impact Puller T10133/3 from the Tool Set T10133
- Locating Pins T40116
- Locking Pin T40069
- Hand drill with plastic brush attachment
- Protective goggles
- Sealant

REMOVING

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-- Remove the camshaft timing chains from the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.

-- To remove the camshafts in the left cylinder head, remove the vacuum pump. Refer to **Removal and Installation** .

-- To remove the camshafts in the right cylinder head, remove the high pressure pump and pump motor housing. Refer to **Removal and Installation** .

-- Remove the bolt -arrows- and the camshaft adjuster valves.

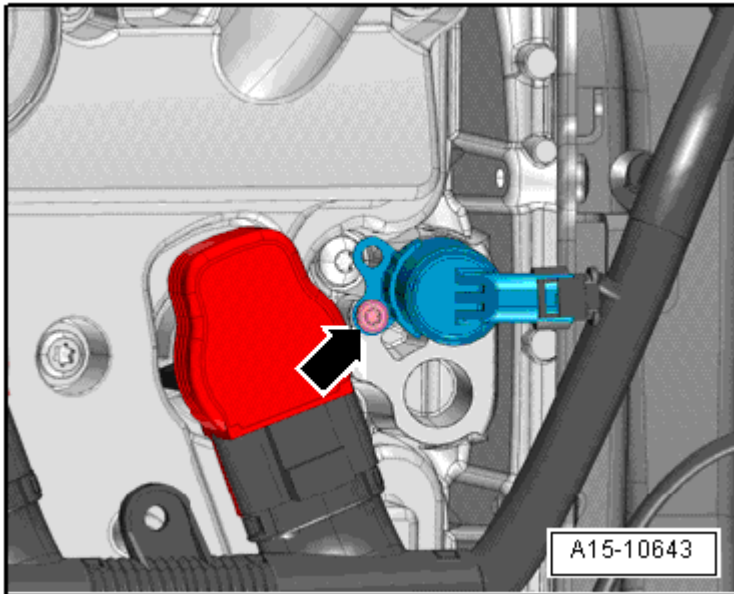


Fig. 43: Identifying Camshaft Adjustment Valve And Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the electrical connector -1- on the camshaft position sensor.

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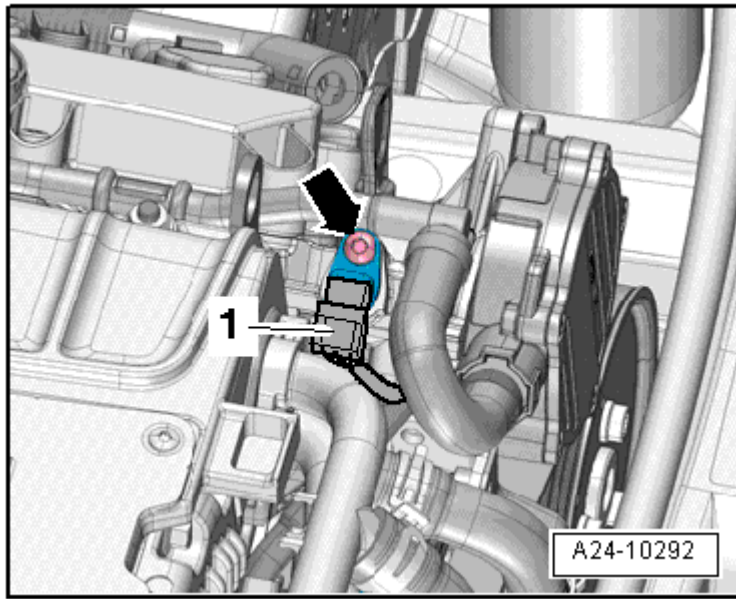


Fig. 44: Identifying Connector -1- From (CMP) Sensor
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -arrow-.

-- Loosen the guide frame bolts in the following sequence: -21 to 1-.

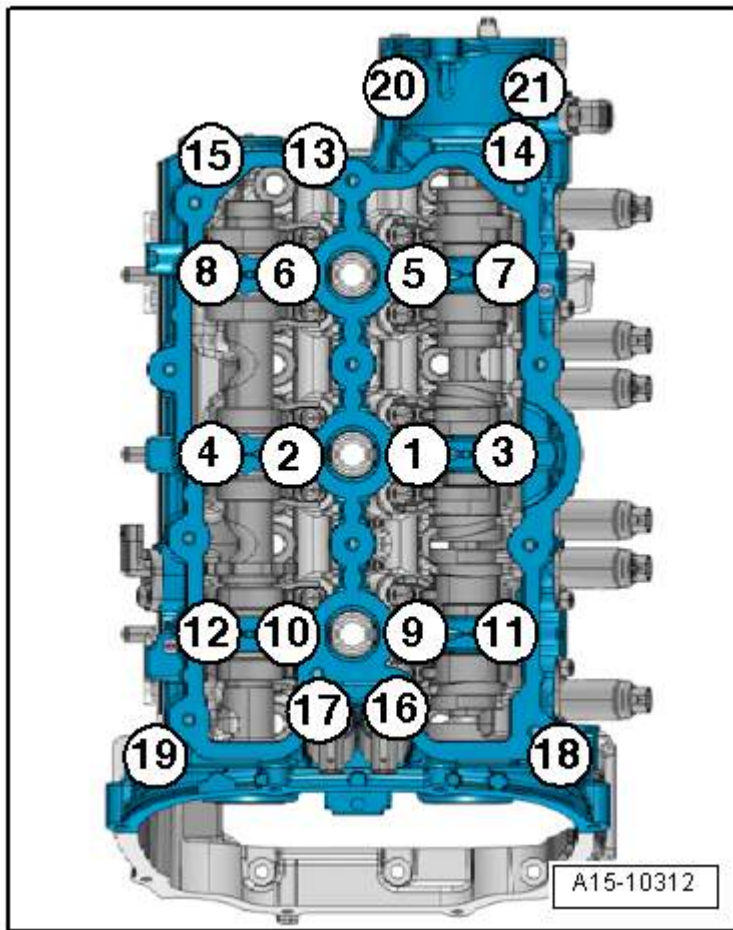


Fig. 45: Identifying Guide Frame Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Proceed in the same way with the right guide frame.

-- Remove the bolts, carefully loosen the guide from out of the bond and place is on a soft surface.

-- Remove the T40133 -arrows-.

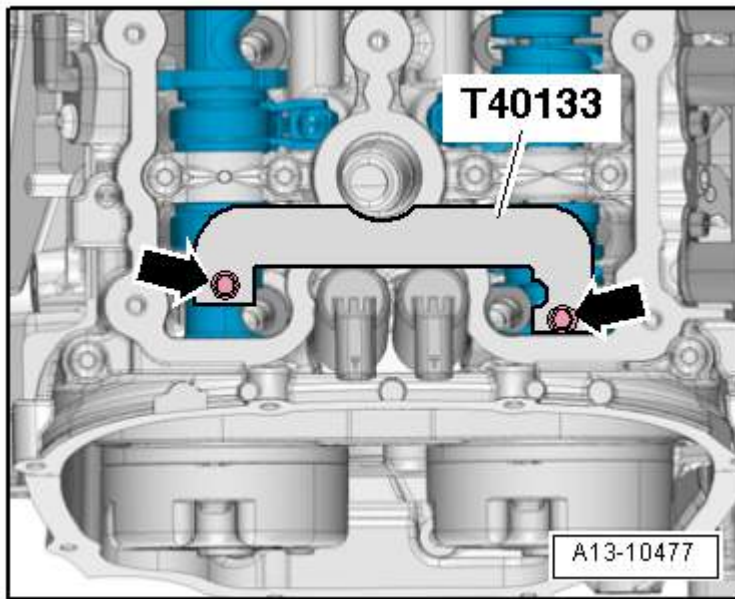


Fig. 46: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

-- Mark the camshafts and then remove them.

INSTALLING

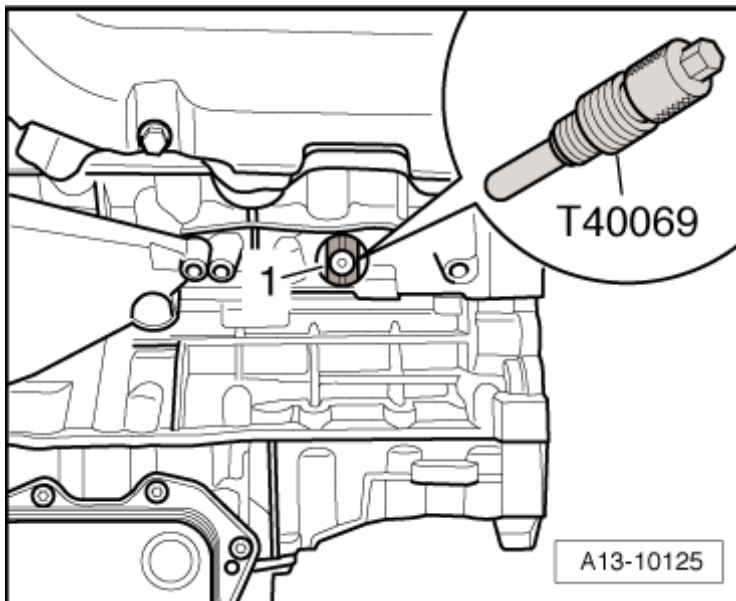


Fig. 47: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

Tightening specifications:

- CYLINDER HEAD OVERVIEW

- **Fig. 20**

NOTE: Replace the seals and sealing plugs.

- Secure crankshaft -1- in "TDC" position using T40069.
- The hydraulic adjusting elements and roller rocker lever are inserted.

CAUTION: Risk of contaminating lubricating system and bearing.

- Cover open parts of the engine.

WARNING: Danger of eye injury.

- Wear protective goggles.

-- Remove the sealant residue on the cylinder head and guide frame and the upper oil pan, for example using a rotating plastic brush.

-- Clean any oil or grease off the sealing surfaces.

-- Check the screen -arrow- for dirt; clean it if necessary.

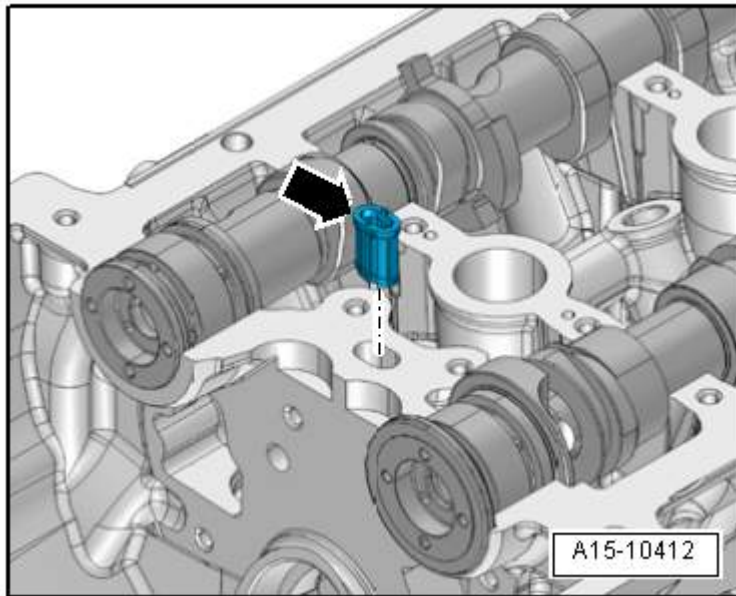


Fig. 48: Identifying Screen -Arrow-
Courtesy of AUDI OF AMERICA, LLC

-- Oil running surfaces of both camshafts.

-- Insert the camshafts in the guide frame.

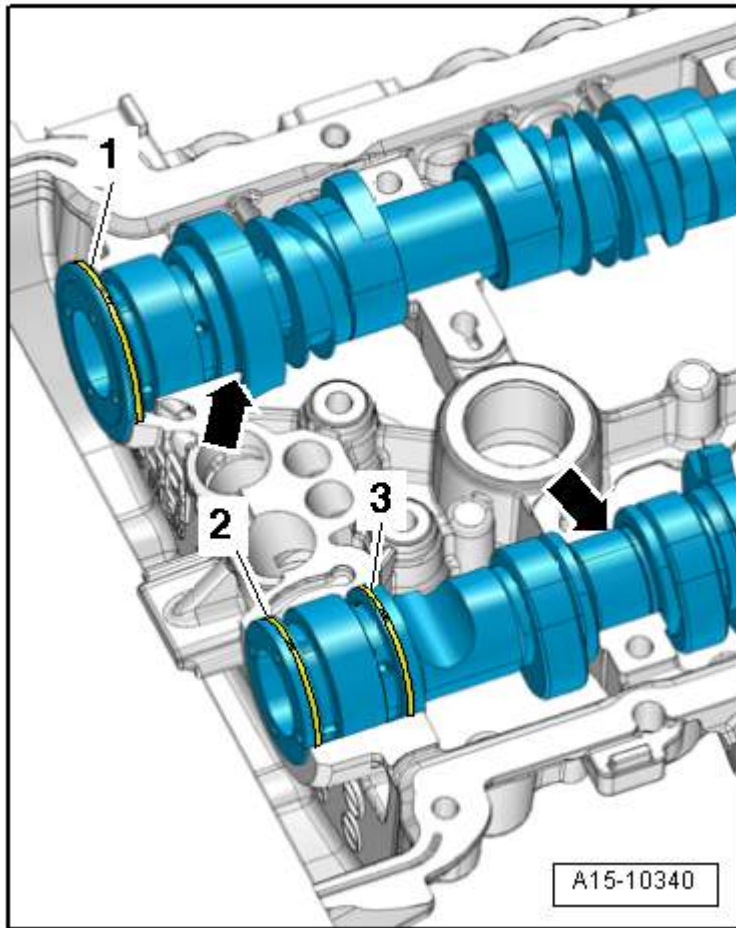


Fig. 49: Identifying Compression Ring Ends -1, 2 And 3-
Courtesy of AUDI OF AMERICA, LLC

- The placement of the camshafts must be exactly within the axial bearings -arrows- of the guide frame.
- The compression ring ends -1, 2 and 3- must face up or down. They must never face sideways.

-- Rotate the guide frame with the camshafts inserted while holding them securely in the frame.

-- Rotate the camshafts until the threaded holes -arrows- face upward.

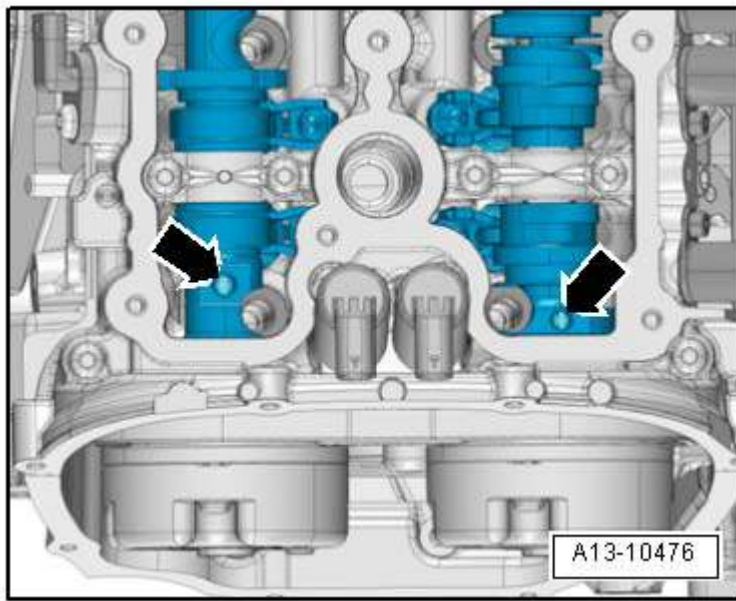


Fig. 50: Rotating Camshafts
Courtesy of AUDI OF AMERICA, LLC

- Check if the camshafts still lie in the guide frame axial bearings.
- Install the T40133 in both cylinder heads and tighten -arrows- to 25 Nm.

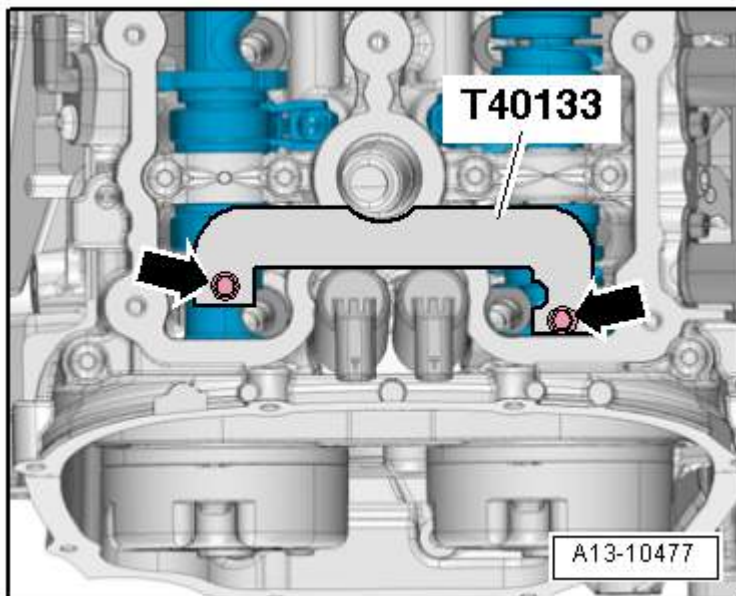


Fig. 51: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

NOTE: Note the expiration date of the sealing compound.

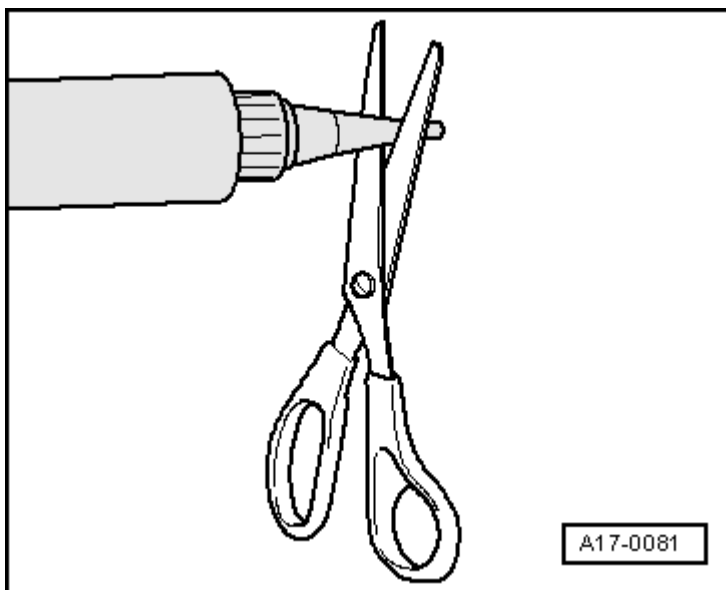


Fig. 52: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 mm)
Courtesy of AUDI OF AMERICA, LLC

- Cut the tube nozzle at the front marking (nozzle diameter approximately 2 mm).
- Rotate the guide frame again.

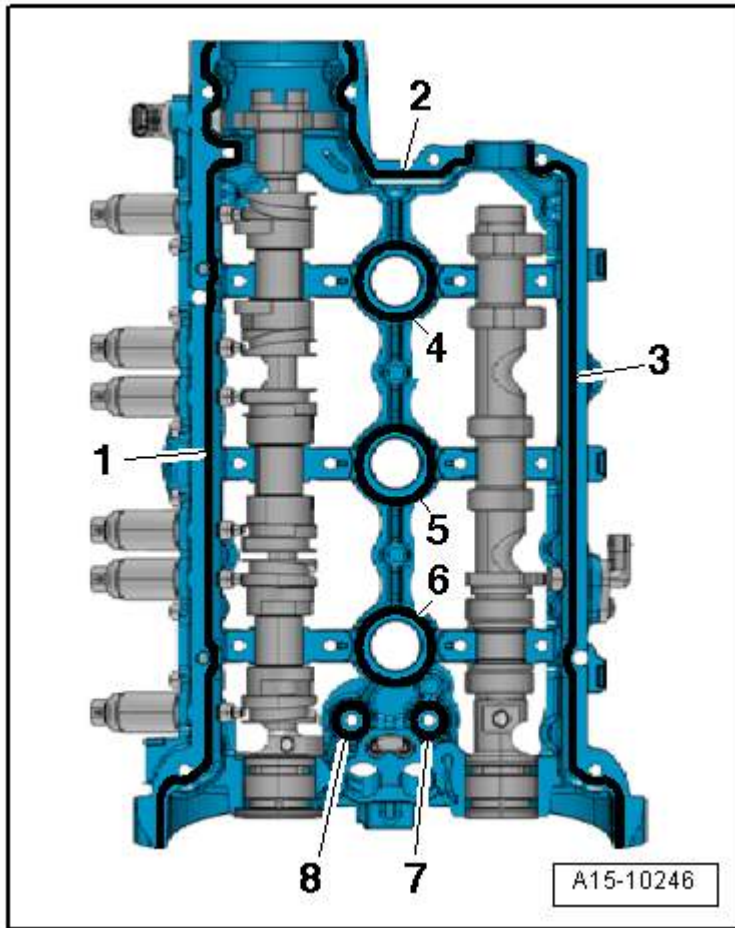


Fig. 53: Identifying Camshaft Guides
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: The lubrication system could be plugged with excess sealant.

- Do not apply sealant beads thicker than indicated.

-- Apply sealant beads -4 through 8- to the clean sealing surfaces on the guide frame as shown in the illustration.

- Thickness of sealant beads: 2.0 mm.

-- Apply sealant beads -1 through 3- to the clean sealing surfaces on the guide frame as shown in the illustration.

- Thickness of sealant beads: 2.5 mm.

NOTE: The guide frame must be installed within 5 minutes after applying the sealant.

-- Place the guide frame on the cylinder head.

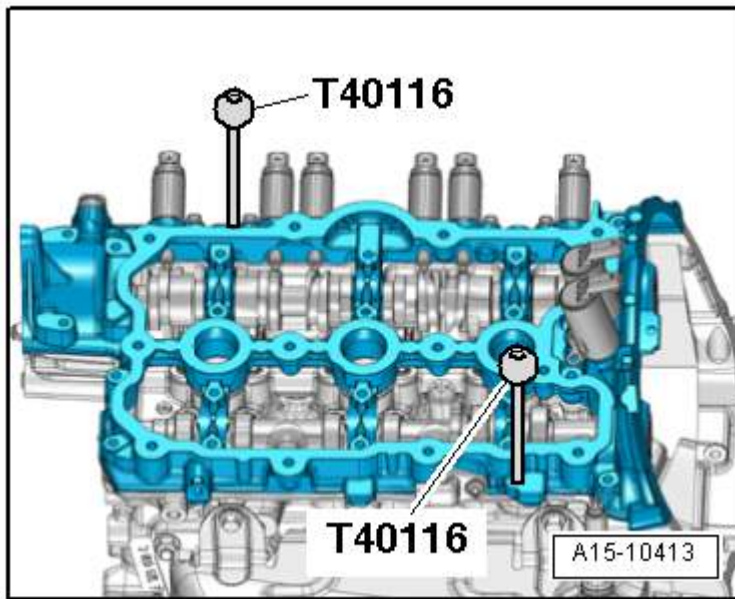


Fig. 54: Identifying T40116

Courtesy of AUDI OF AMERICA, LLC

- Insert the T40116 in the guide frame and cylinder head.
- Tighten the camshaft guide frame bolts. Refer to **Fig. 20**.

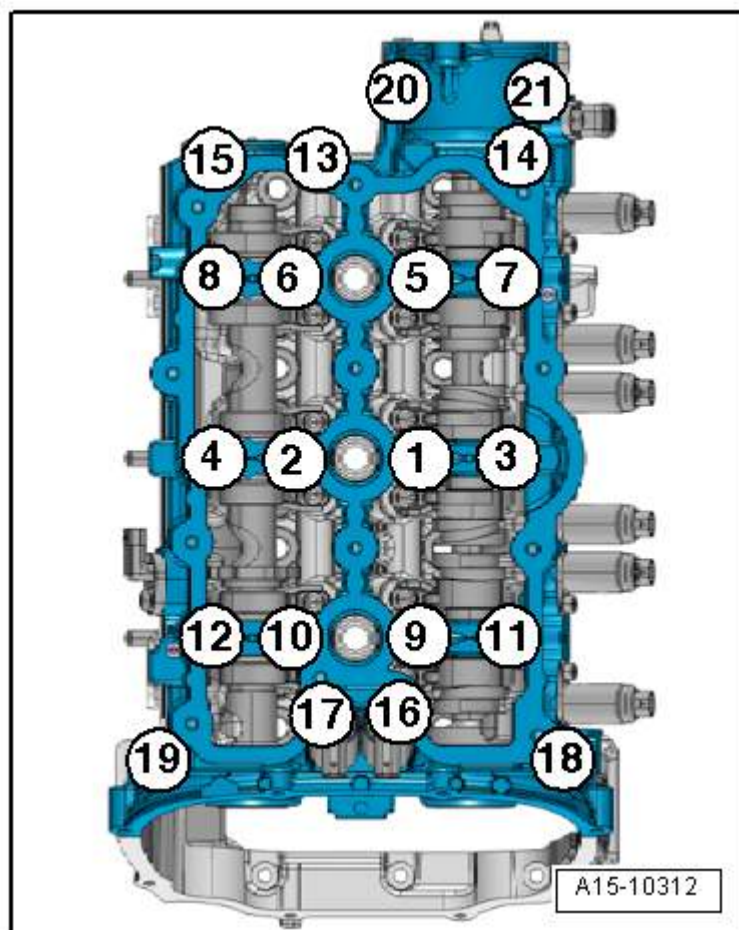


Fig. 55: Identifying Guide Frame Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE: After installing the guide frame, let the sealant harden for approximately 30 minutes.

-- Clean the hole in the cylinder head of any oil and grease.

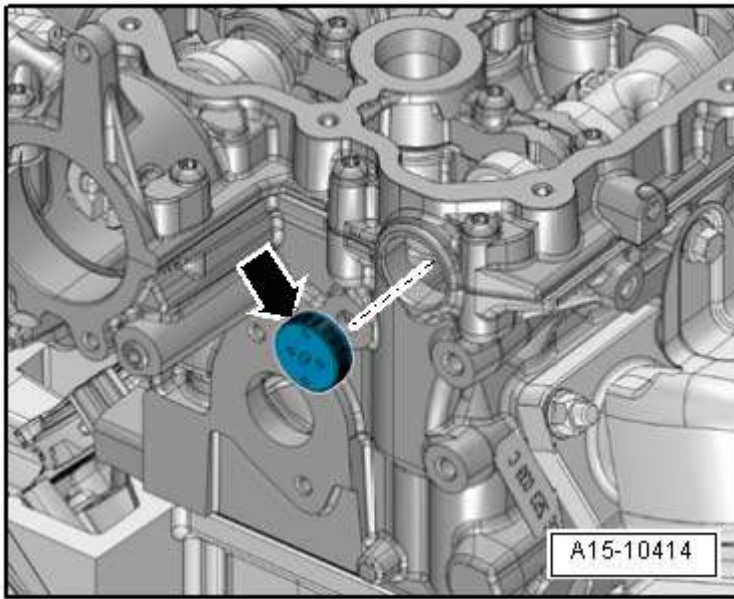


Fig. 56: Identifying Sealing Plug

Courtesy of AUDI OF AMERICA, LLC

- Coat the outer circumference of the sealing plug -arrow- with sealant; sealant
- Drive in the sealing plugs until they are flush.
- Remove the T40116 with the T10133/3.

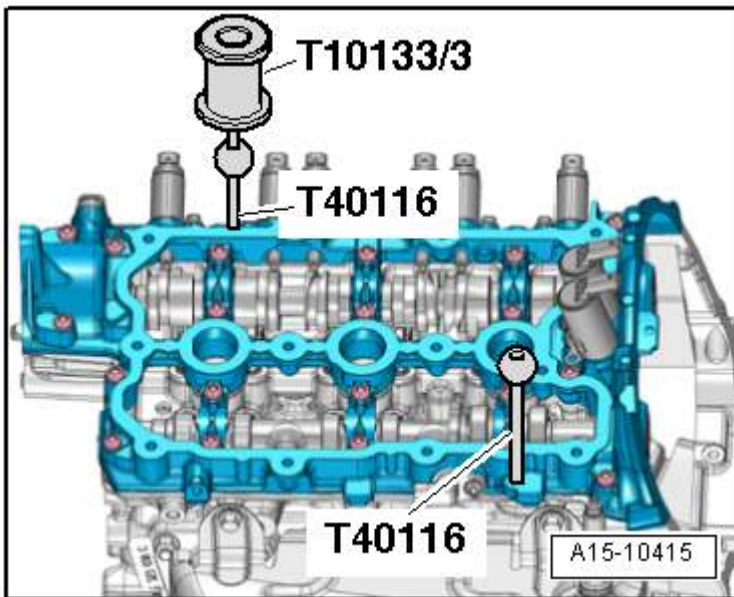


Fig. 57: Using T10133/3 To Remove T40116

Courtesy of AUDI OF AMERICA, LLC

Install in reverse order of removal paying attention to the following:

-- Install the high pressure pump motor housing and the high pressure pump. Refer to **Removal and Installation** .

-- Install the vacuum pump. Refer to **Removal and Installation** .

-- Position the camshaft timing chain on the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.

CAUTION: Risk of damaging valves and piston heads after working on valve train.

- The motor must not be started for about 30 minutes after installing camshafts because the hydraulic equalization elements must seat themselves.
- To ensure valves do not strike pistons when starting, carefully rotate engine at least 2 full revolutions.

CAMSHAFT TIMING CHAINS

Special tools and workshop equipment required

- Locking Pin T40071

REMOVING

- The transmission is removed. Refer to **Removal and Installation** or **Removal and Installation** .

-- Remove timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.

-- Remove the cylinder head covers. For the left side, refer to **LEFT CYLINDER HEAD COVER** and for the right side, refer to **RIGHT CYLINDER HEAD COVER**.

-- Remove the affected camshaft timing chain from the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.

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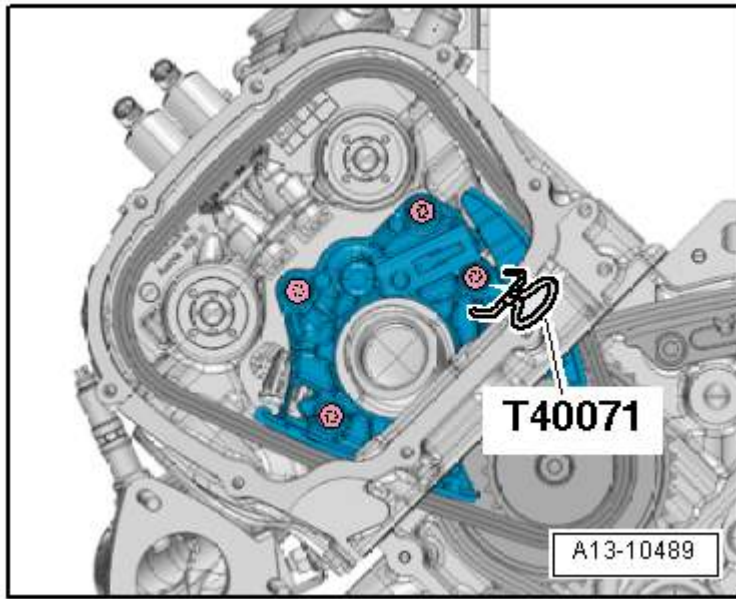


Fig. 58: Using T40071 To Secure Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

CAUTION: If the running direction is reversed on a used camshaft timing chain, it could be destroyed.

- Paint arrows to mark the left and right camshaft timing chain running direction so they can be installed again. Do not mark the camshaft timing chain with a punch, notch or something similar.

- Remove the T40071 and the left camshaft timing chain.
- Remove the bolts -1 and 2- and the right chain tensioner.

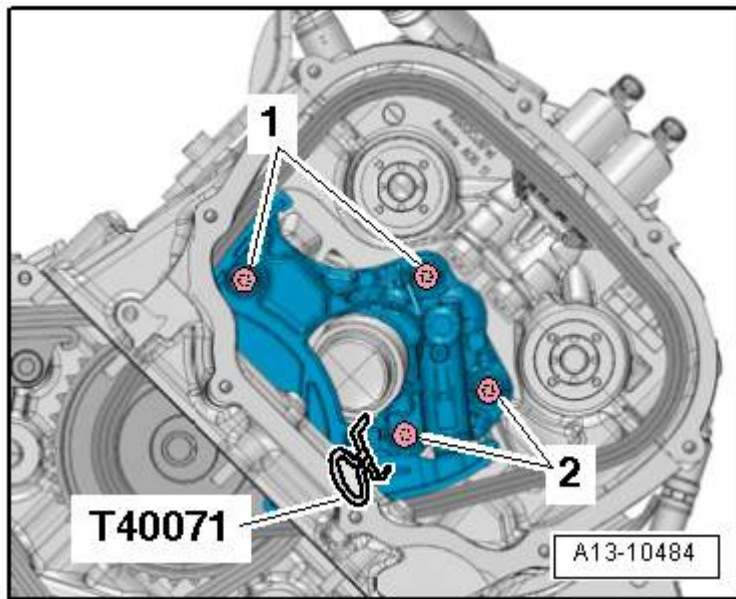


Fig. 59: Identifying Right Chain Tensioner Bolts -1 And 2-
Courtesy of AUDI OF AMERICA, LLC

-- Press the timing mechanism chain tensioner guide rail in the direction of the -arrow- and secure the chain tensioner using a T40071.

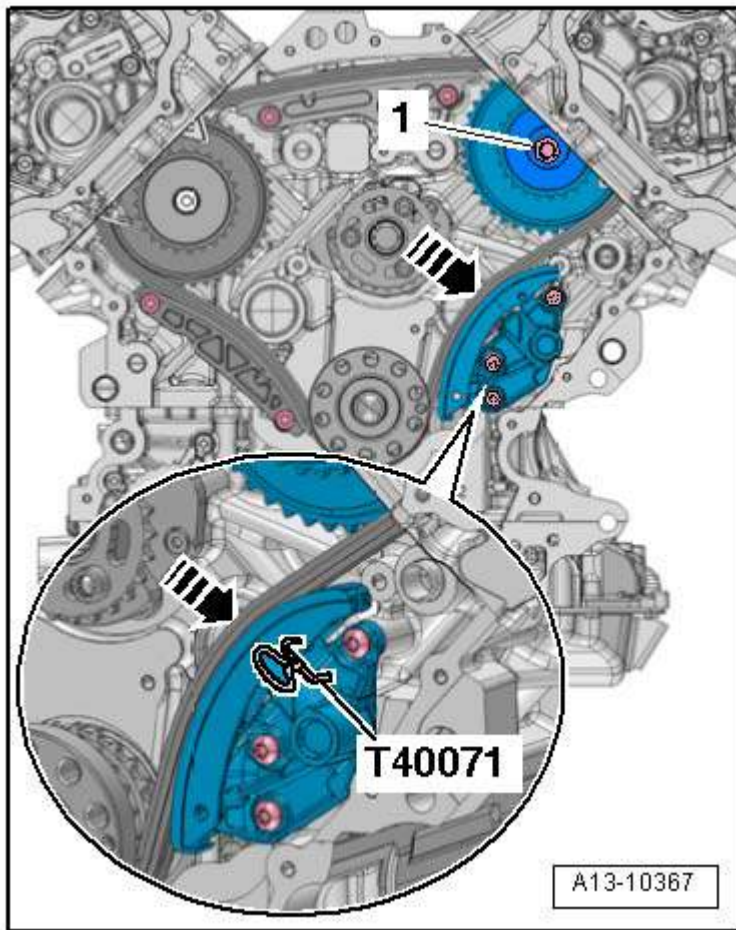


Fig. 60: Using T40071 On Chain Tensioner

Courtesy of AUDI OF AMERICA, LLC

- Remove the drive chain sprocket bolt -1-.
- Remove the drive chain sprocket and remove the right camshaft timing chain.

INSTALLING

- Tightening specifications, refer to CAMSHAFT TIMING CHAINS OVERVIEW.

NOTE: If the tensioning element was removed from the chain tensioner, note installation position: Hole in housing floor faces toward chain tensioner, piston faces toward tensioning rail.

Replace the bolts which are being tightened with an additional turn.

CAUTION: Risk of damaging valves and piston crowns.

- If camshafts are rotated, crankshaft may not rest with any piston at

"TDC".

-- Position the left camshaft timing chain according to the markings made during removal as shown in the illustration.

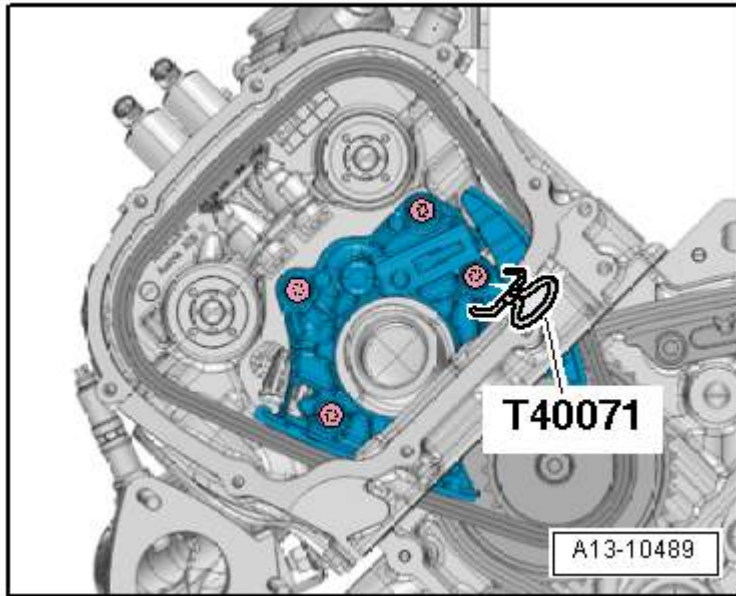


Fig. 61: Using T40071 To Secure Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

-- Press the guide rail for the left camshaft timing chain tensioner down and secure the chain tensioner using a T40071.

-- Guide the camshaft timing chain upward toward the cylinder head. Pay close attention to the markings when removing.

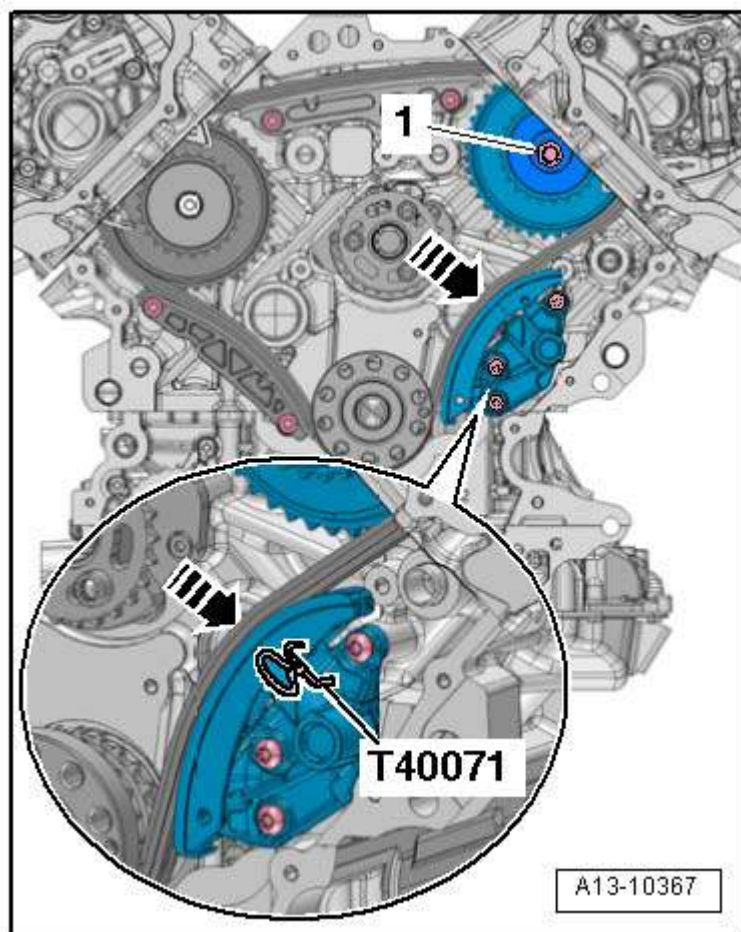


Fig. 62: Using T40071 On Chain Tensioner
 Courtesy of AUDI OF AMERICA, LLC

- Install the drive chain sprocket. Refer to **Fig. 17**.
- Tighten the mounting pin bolts -1-.
- Remove the T40071.

NOTE: Ignore -arrow-.

- Insert the chain tensioner at the right cylinder head and position the camshaft timing chain.

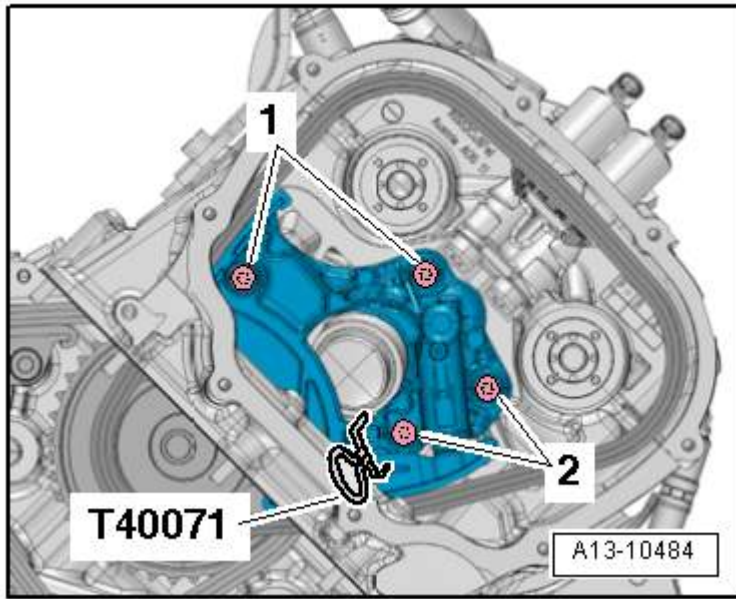


Fig. 63: Identifying Right Chain Tensioner Bolts -1 And 2-
 Courtesy of AUDI OF AMERICA, LLC

-- Fasten bolts -1 and 2--.

Install in reverse order of removal paying attention to the following:

-- Position the camshaft timing chain on the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**

-- Install timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER.**

CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS

Special tools and workshop equipment required

- Spanner Wrench 3212
- Multipoint Socket T10035
- Counterhold Tool Touareg V10 T10172 with Adapter T10172/2
- Socket T40058
- Locking Pin T40069
- Locking Pin T40071, quantity: 2
- Oil Collecting and Extracting Device V.A.G 1782
- Camshaft Clamp T40133, quantity: 2

REMOVING

NOTE: **The camshaft timing chains remain on the engine in the following description.**

If working on just one of the cylinder heads, it is not necessary to remove the timing chain cover on the opposite cylinder head.

- Remove the timing chain guard. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install the cylinder head: left refer to **LEFT CYLINDER HEAD COVER**, right refer to **RIGHT CYLINDER HEAD COVER**.
- Remove the ribbed belt from the tensioning element and release the tension on the tensioning element:
 - **RIBBED BELT, VEHICLES WITH HYDRAULIC POWER STEERING**
 - **RIBBED BELT, VEHICLES WITH ELECTRO-MECHANICAL POWER STEERING**
- Place the V.A.G 1782 under the engine.

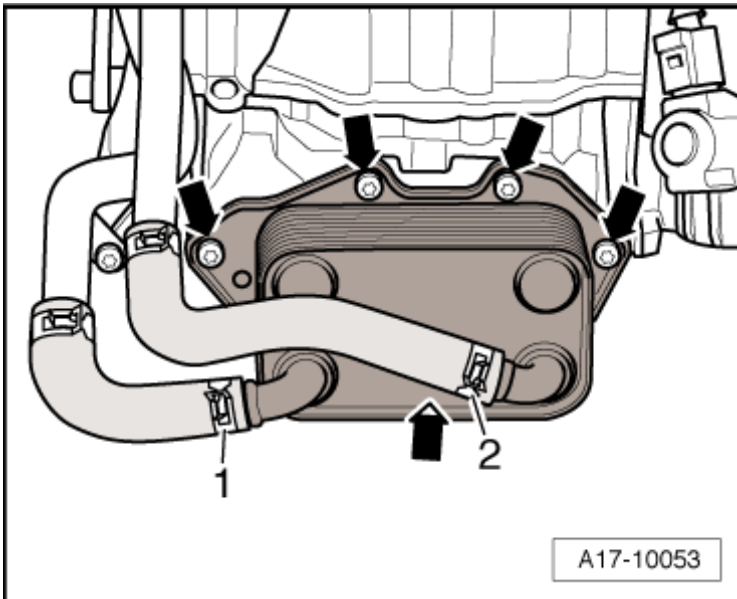


Fig. 64: Connecting/Disconnecting Coolant Hoses With Hose Clamps

Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -arrows- and move oil cooler to the side with the coolant hoses -1 and 2- still connected.

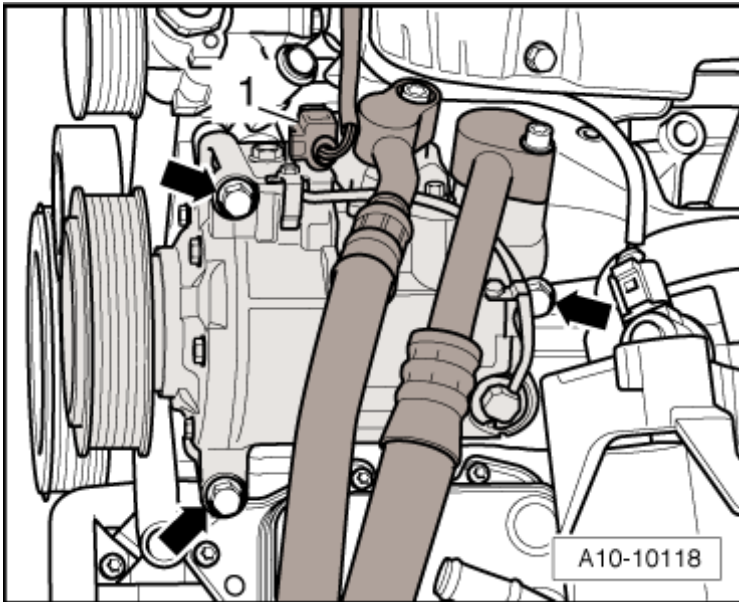


Fig. 65: Disconnecting Connector For Wiring To Air Conditioning Compressor Clutch Solenoid
Courtesy of AUDI OF AMERICA, LLC

WARNING: Refrigerant can cause serious personal injury.

- Do not open the air conditioning refrigerant circuit.

-- Remove Air Conditioning (A/C) compressor bolts -arrows-.

CAUTION: Danger of damaging the refrigerant lines and hoses.

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

-- Remove the A/C compressor from the bracket and with the lines still connected to the left longitudinal member, tie it up.

NOTE: Ignore -1-.

-- Insert the T40058 guide pins as follows:

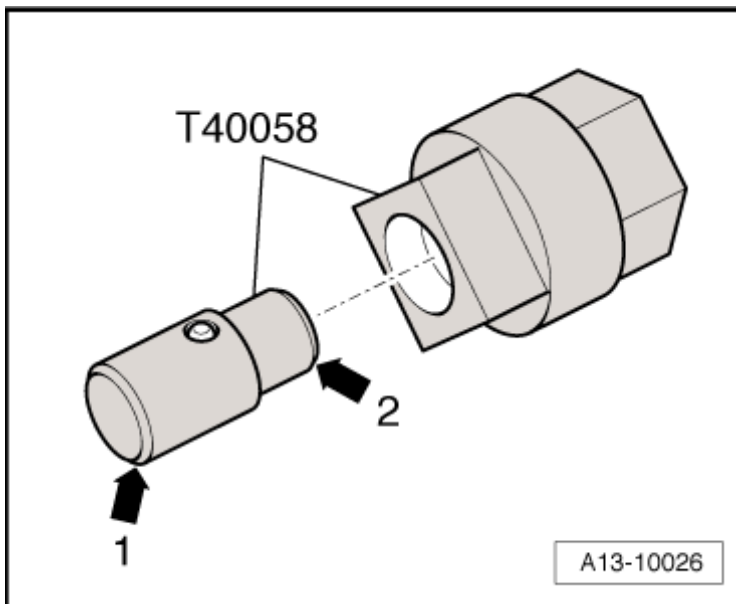


Fig. 66: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The large diameter -arrow 1- faces the engine.
- The small diameter -arrow 2- faces the adapter.

-- Remove the front noise insulation -1-, if necessary. Refer to **Description and Operation** .

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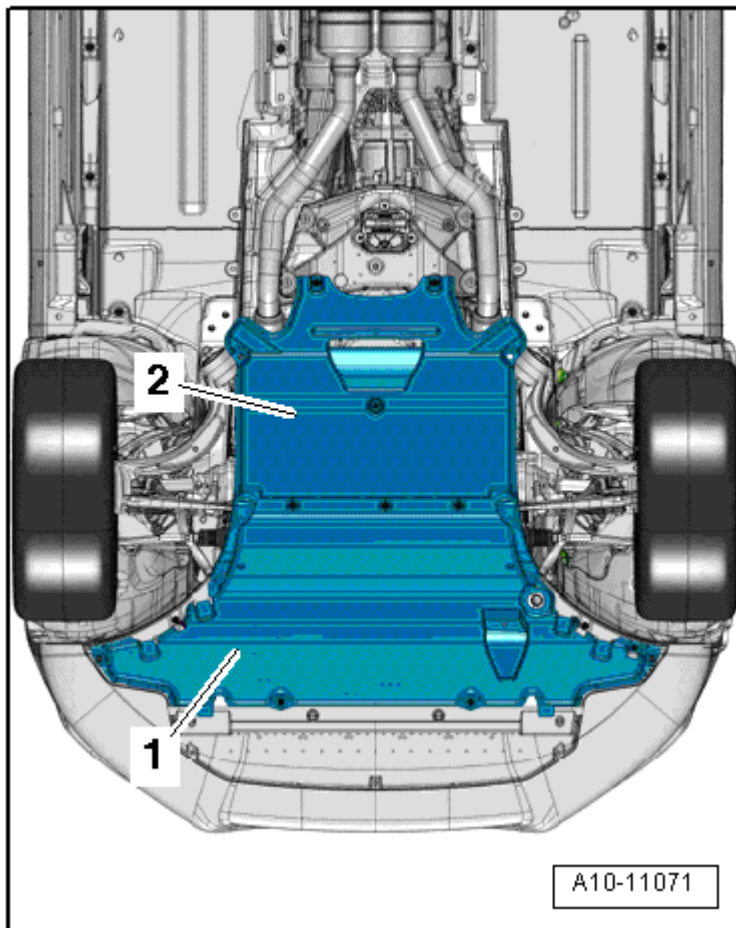


Fig. 67: Identifying Front Noise Insulation
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the crankshaft in the direction of engine rotation -arrow- to "TDC" using the T40058 and wrench.

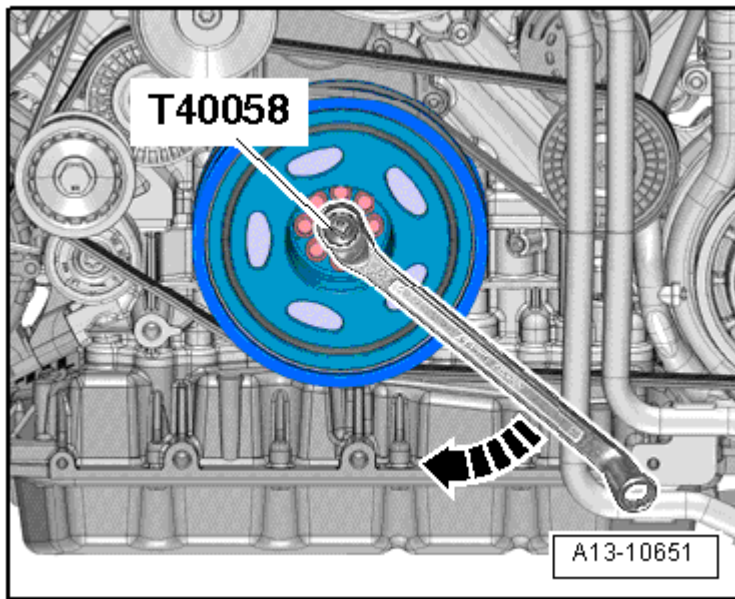


Fig. 68: Using Socket T40058 To Counter Hold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

- The threaded holes -arrows- in the camshafts must face upward.

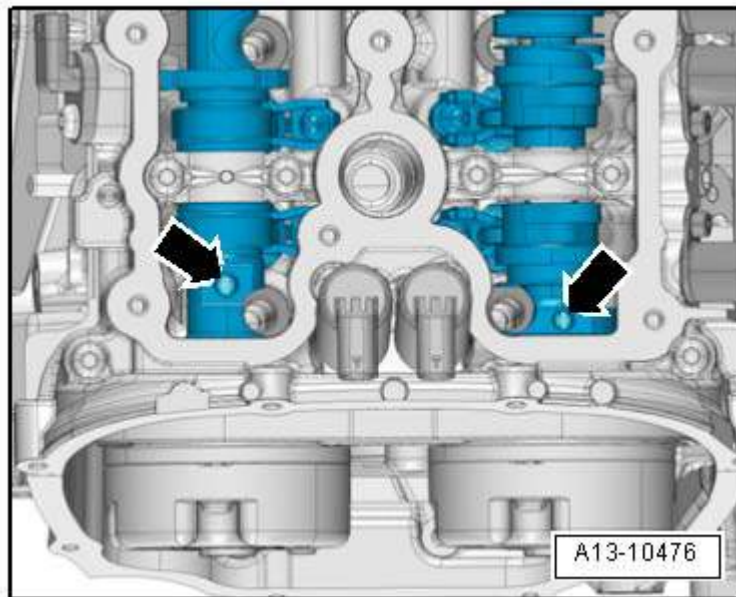


Fig. 69: Rotating Camshafts
Courtesy of AUDI OF AMERICA, LLC

-- Install the T40133 in both cylinder heads and tighten -arrows- to 25 Nm.

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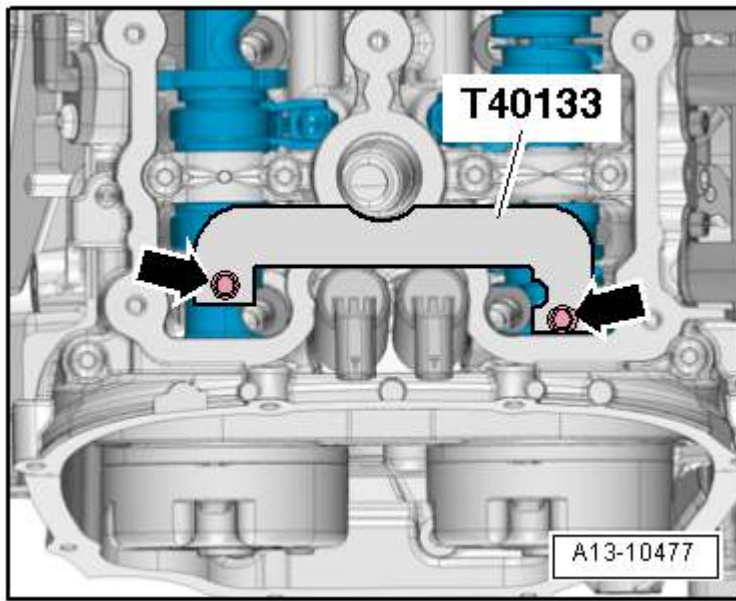


Fig. 70: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

-- Remove the locking bolt -arrow- for the "TDC" marking crankshaft from the cylinder block.

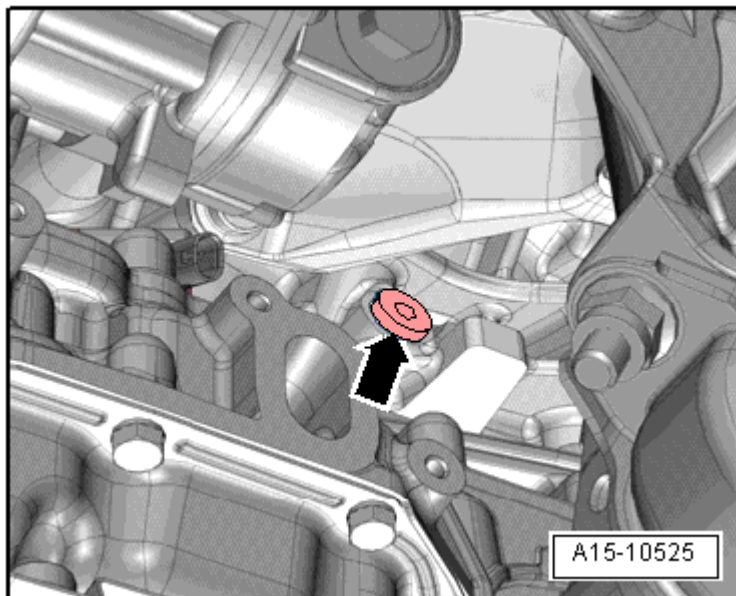


Fig. 71: Identifying Locking Bolt -Arrow-
Courtesy of AUDI OF AMERICA, LLC

-- Install the T40069 in the hole and tighten to 20 Nm. Turn the crankshaft -1- back slightly to completely center the bolt, if necessary.

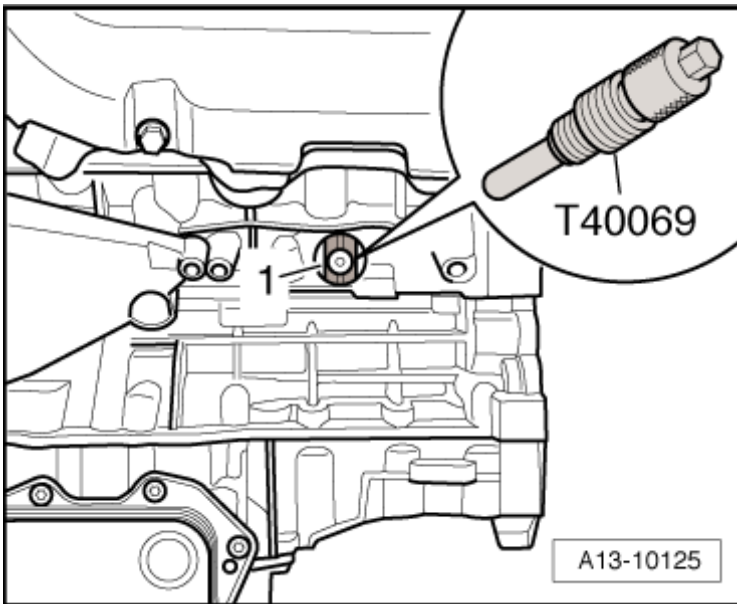


Fig. 72: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
 Courtesy of AUDI OF AMERICA, LLC

NOTE: The chain tensioner for the camshaft timing chain is oil-dampened. Compress it by slowly applying constant pressure.

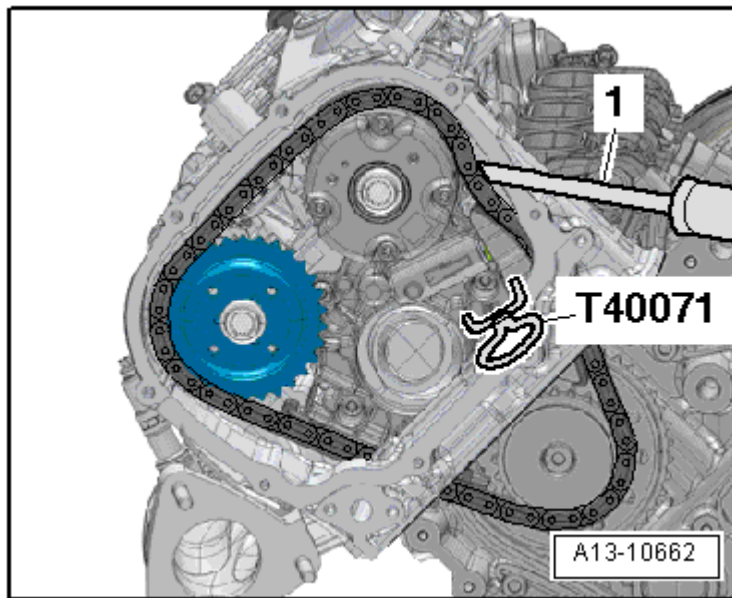


Fig. 73: Using T40071 And Screwdriver -1- To Secure Chain Tensioner
 Courtesy of AUDI OF AMERICA, LLC

- Press the left camshaft timing chain tensioner guide rails in as far as the stop using a screwdriver -1- and secure the chain tensioner with a T40071.
- Press the right camshaft timing chain tensioner guide rails in as far as the stop using a screwdriver -1- and

secure the chain tensioner with a T40071.

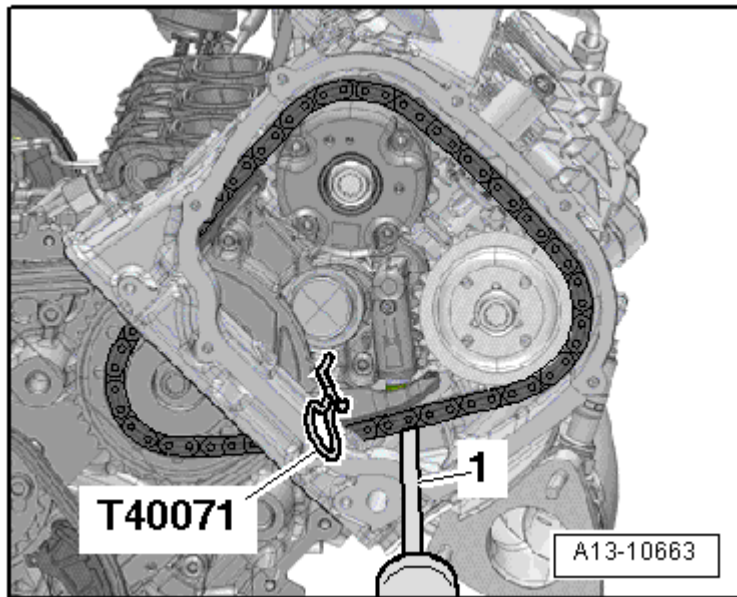


Fig. 74: Using T40071 And Screwdriver -1- To Secure Chain Tensioner
 Courtesy of AUDI OF AMERICA, LLC

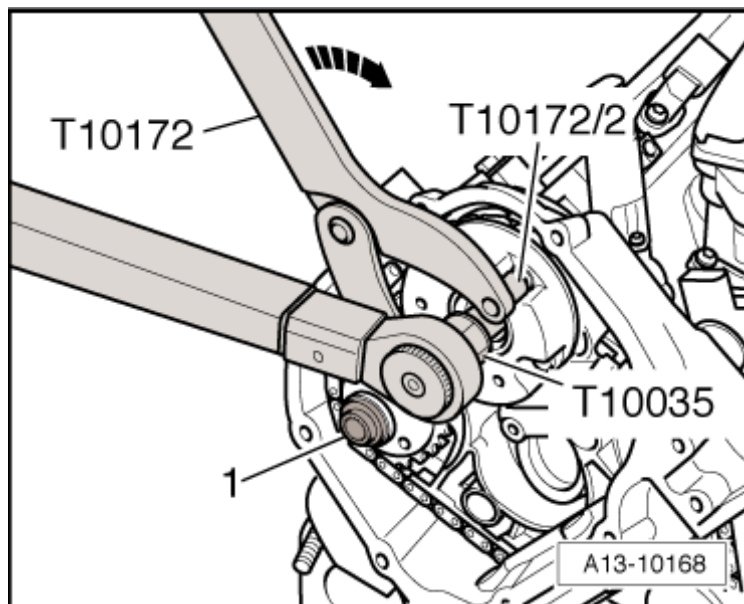


Fig. 75: Counterholding Affected Camshaft Adjuster
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: The camshafts can get damaged.

- Do not use the T40133 to counter hold when loosening the camshaft adjuster bolt or the camshaft sprocket.

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-- To counter hold at the affected camshaft adjuster, position the T10172 with pins T10172/2 and loosen the bolts using the socket T10035.

NOTE: Ignore -1- and -arrow-.

-- To counter hold, place the 3212 on the camshaft chain sprocket and loosen the bolt using the T10035.

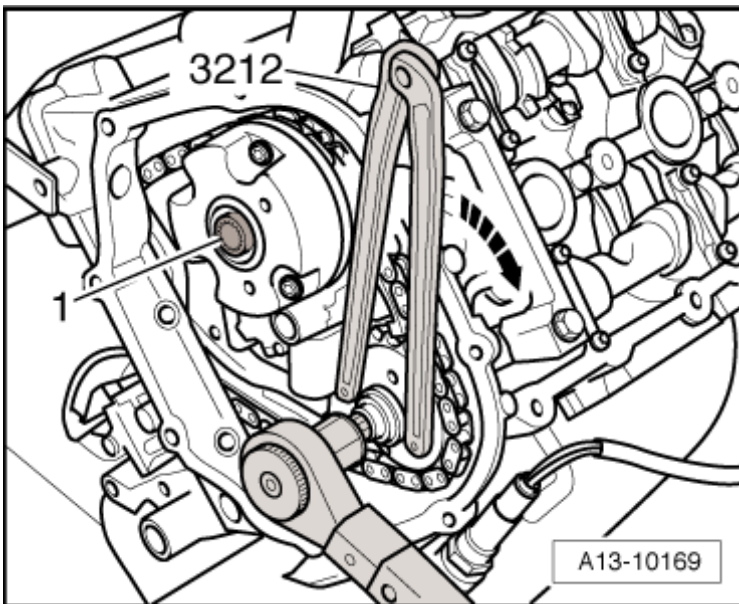


Fig. 76: Counterholding Exhaust Camshaft With 3212
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1- and -arrow-.

-- Mark the installation position of the camshaft adjuster and the camshaft chain sprocket in color for installing later.

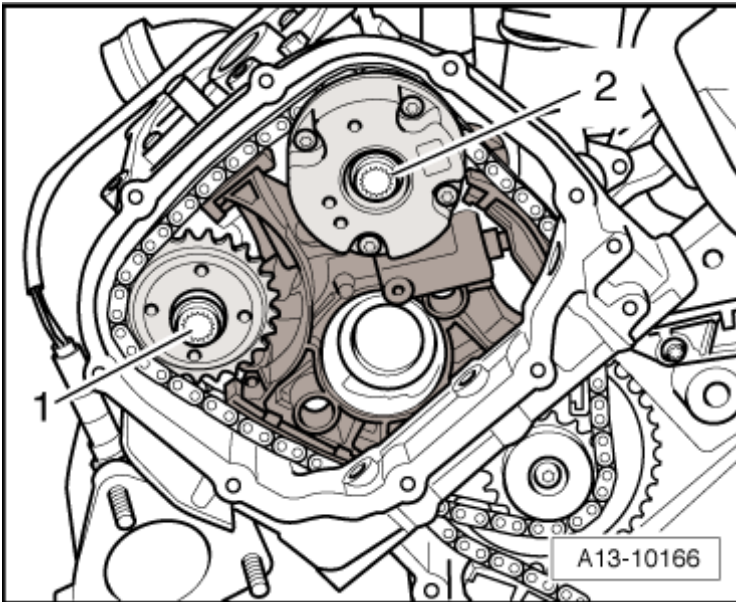


Fig. 77: Identifying Left Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Danger of causing damage to the engine.

- To prevent small parts from accidentally entering the engine through the opening in the timing chain compartment, cover the opening with a clean cloth.

-- Remove the bolts -1 and 2- on the left side of the cylinder cover, then remove the camshaft adjuster and the camshaft chain sprocket.

-- Mark the installation position of the camshaft adjuster and the camshaft chain sprocket in color for installing later.

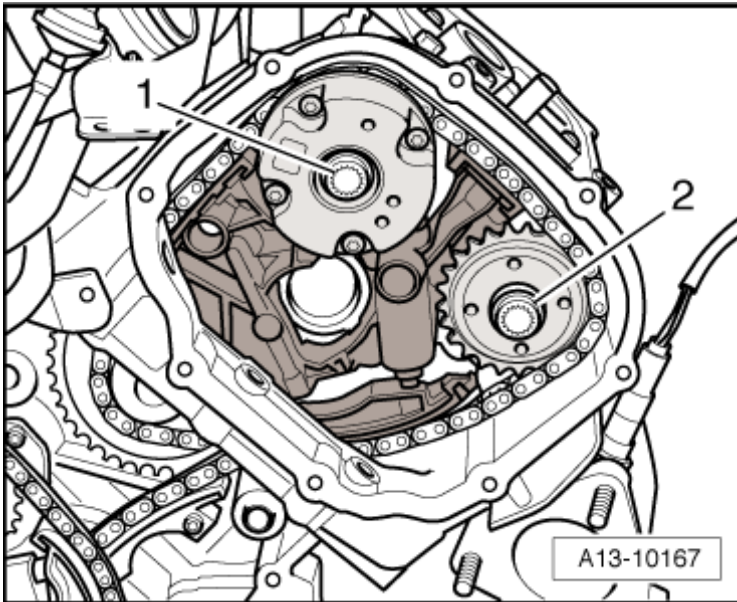


Fig. 78: Identifying Right Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1 and 2- on the right side of the cylinder cover, then remove the camshaft adjuster and the camshaft chain sprocket.

INSTALLING

- Tightening specifications, refer to **CAMSHAFT TIMING CHAINS OVERVIEW**.

NOTE: Replace any bolts that were tightened with an additional turn.

CAUTION: Risk of damaging valves and piston crowns.

- If camshafts are rotated, crankshaft may not rest with any piston at "TDC".
- Drive chain for timing mechanism installed. Refer to **TIMING MECHANISM DRIVE CHAIN**.

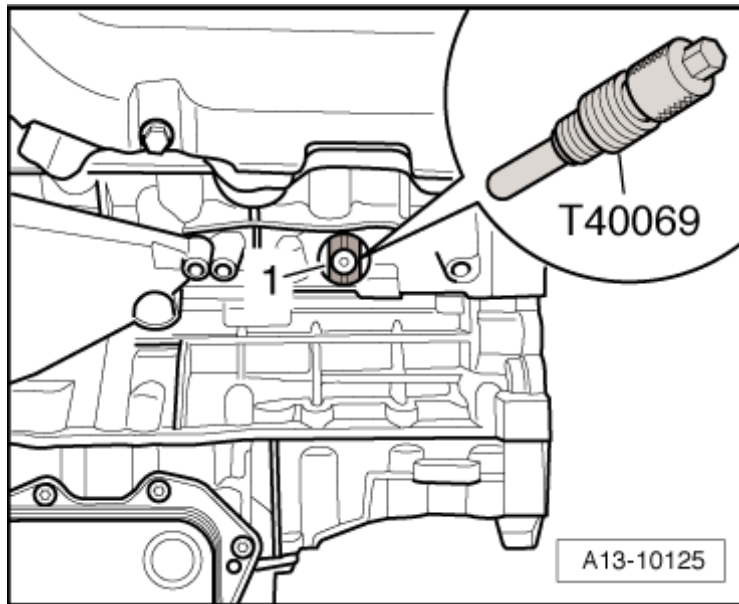


Fig. 79: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- Secure crankshaft -1- in "TDC" position using T40069.
- Secure the camshafts in the "TDC" position on both cylinder heads using the T40133 -arrows- (25 Nm).

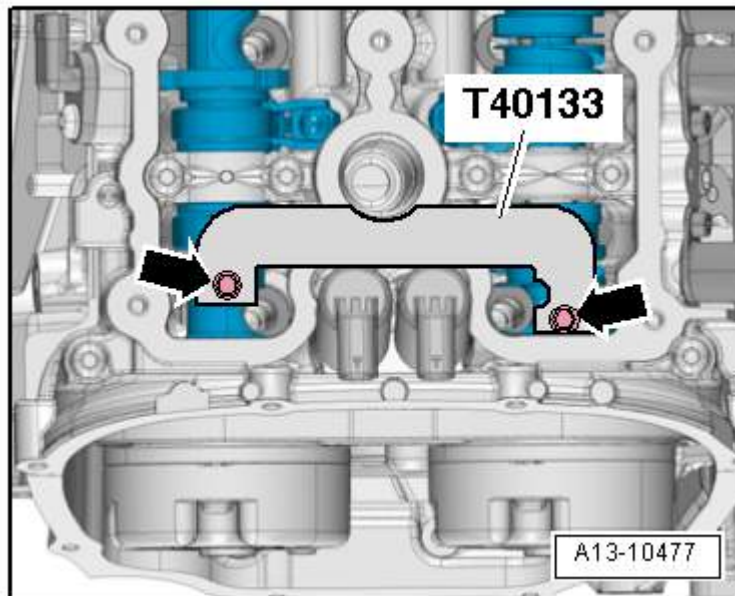


Fig. 80: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

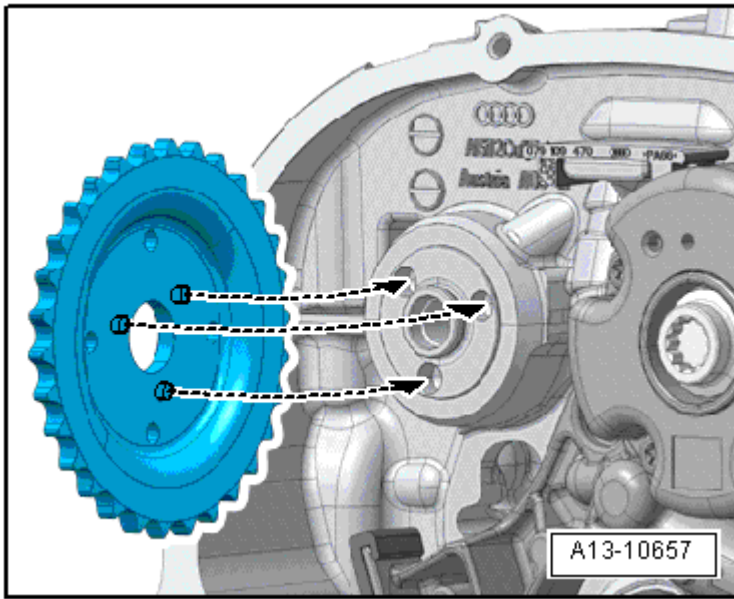


Fig. 81: Identifying Left Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The engine could be damaged.

- **The camshaft chain sprockets must only be installed according to the following work steps:**
- Install the camshaft chain sprockets according to the marks applied during removal.
- When mounting the camshaft chain sprockets, make sure that the pins on the camshaft chain sprockets engage in the holes on the camshafts -arrows-.
- Turn the camshaft chain sprocket on the camshaft counterclockwise until it stops -arrow-.

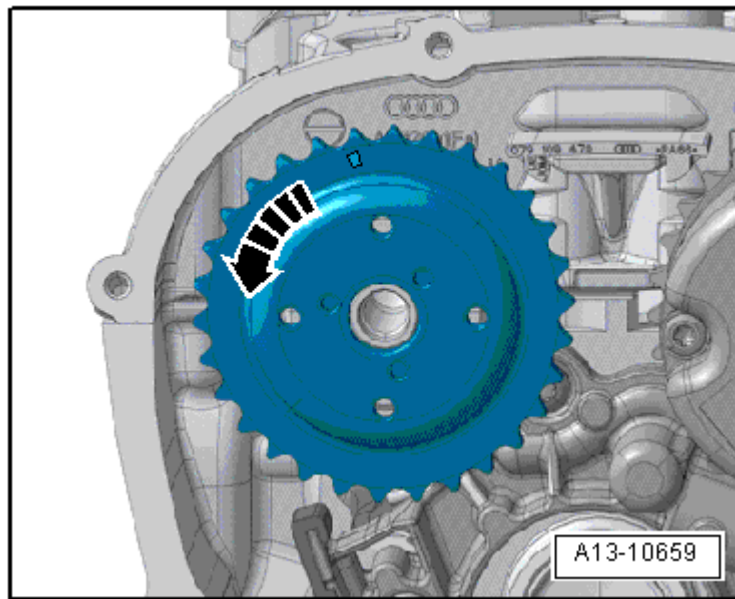


Fig. 82: Turning Camshaft Chain Sprocket
Courtesy of AUDI OF AMERICA, LLC

- The marking point -1- must align with the adjustment window -2-.

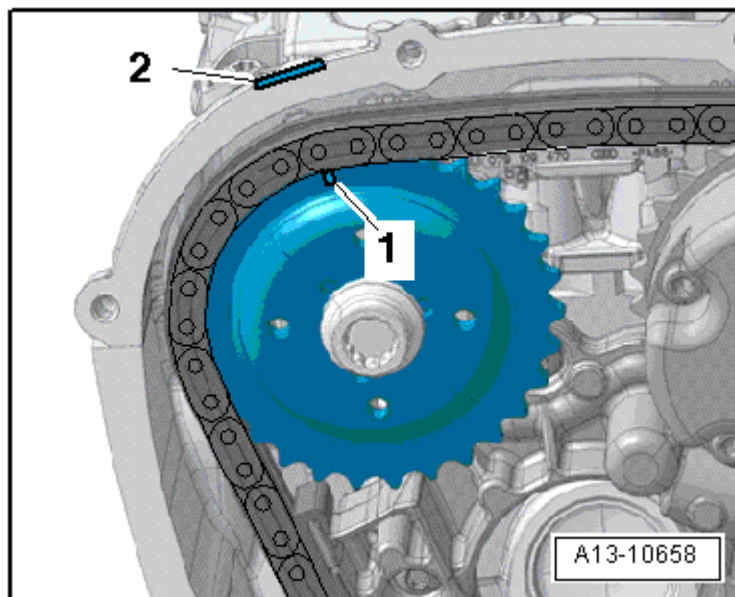


Fig. 83: Aligning Marking Point With Adjustment Window
Courtesy of AUDI OF AMERICA, LLC

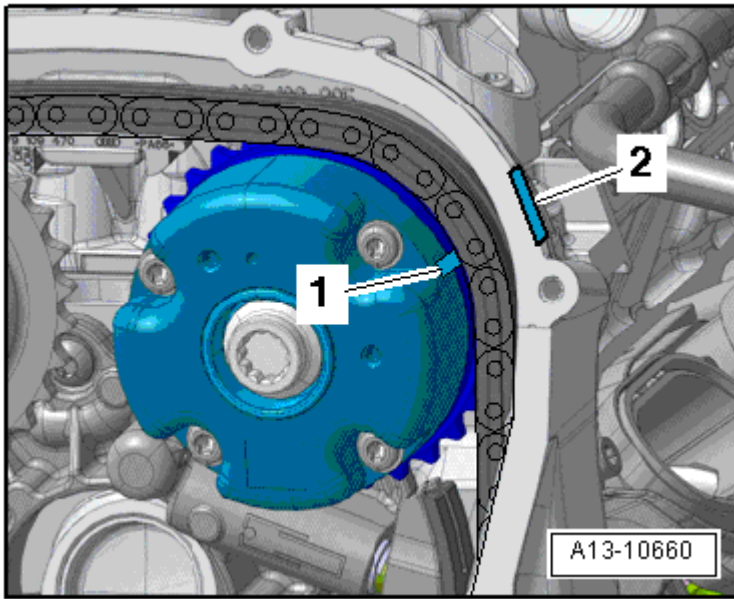


Fig. 84: Aligning Camshaft Adjuster Groove With Adjustment Window
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The engine could be damaged.

- The camshaft adjuster must only be installed according to the following work steps:

- Install the camshaft adjuster according to the marks applied during removal.
- The groove -1- in the camshaft adjuster must align with the adjustment window -2-.

-- Mount the left camshaft timing chain onto the drive chain sprocket, install the camshaft adjuster and camshaft chain sprocket and install the bolts -1 and 2- loosely.

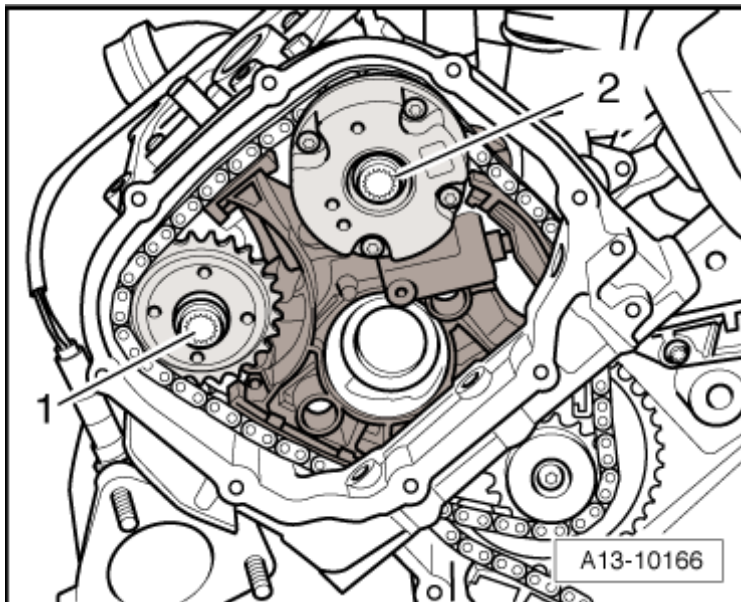


Fig. 85: Identifying Left Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

- The camshaft adjuster and the camshaft chain sprocket must be able to still be rotated on camshaft and must not tip.

-- Remove the T40071.

-- Install the camshaft adjuster on the right cylinder head according to the markings applied during removal.

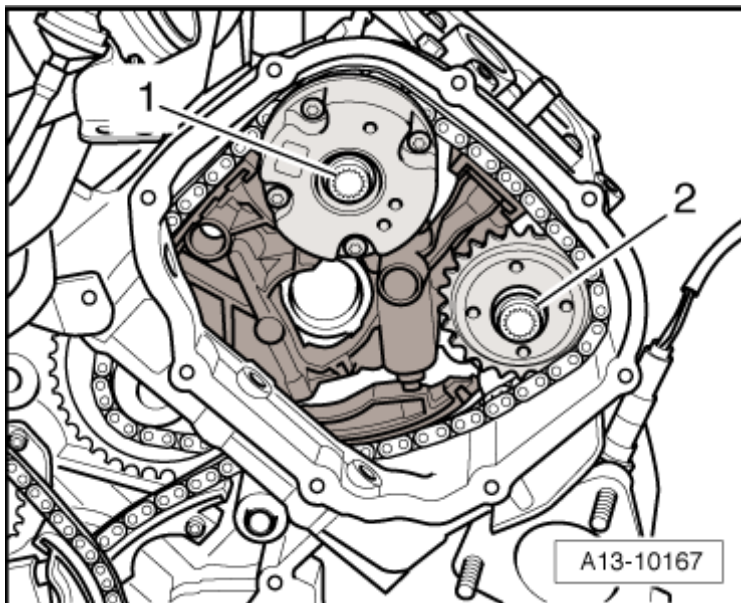


Fig. 86: Identifying Right Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Mount the right camshaft timing chain onto the drive chain sprocket, install the camshaft adjuster and

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camshaft chain sprocket and install the bolts -1 and 2- loosely.

- The camshaft adjuster and the camshaft chain sprocket must be able to still be rotated on camshaft and must not tip.

-- Remove the T40071.

-- Mount the 3212 onto the camshaft chain sprocket for the right exhaust camshaft.

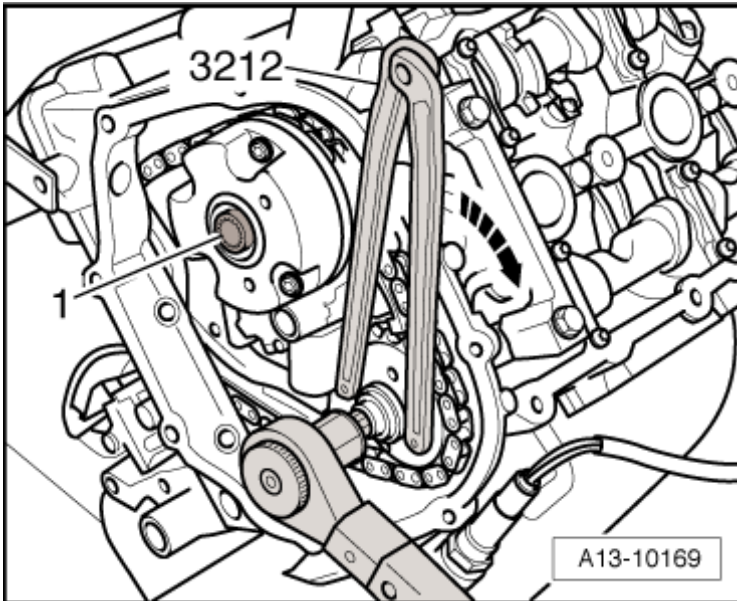


Fig. 87: Counterholding Exhaust Camshaft With 3212
Courtesy of AUDI OF AMERICA, LLC

-- Have a second technician hold the camshaft timing chain tensioned by pressing the camshaft chain sprocket in the direction of the -arrow-.

-- Tighten the bolts as follows while the camshaft chain sprocket is still held under tension.

Stage	Bolt	Tightening specifications
1.		to the exhaust camshaft 80 Nm
1.	-1-	to the intake camshaft 80 Nm

-- Position the T10172 with the pins T10172/2 on the left intake camshaft adjuster.

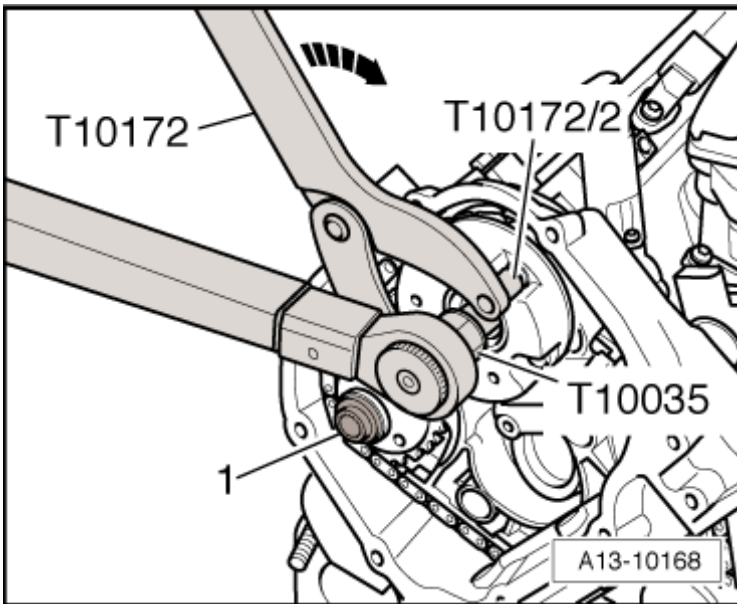


Fig. 88: Counterholding Affected Camshaft Adjuster
 Courtesy of AUDI OF AMERICA, LLC

-- Have a second technician hold the camshaft timing chain tensioned by pressing the counter hold tool in the direction of the -arrow-.

-- Tighten the bolts as follows while the camshaft adjuster is still held under tension.

Stage	Bolt	Tightening specifications
1.	-1-	to the exhaust camshaft 80 Nm
1.		to the intake camshaft 80 Nm

-- Tighten the camshaft adjuster bolts and the camshaft chain sprocket on the left cylinder head as follows:

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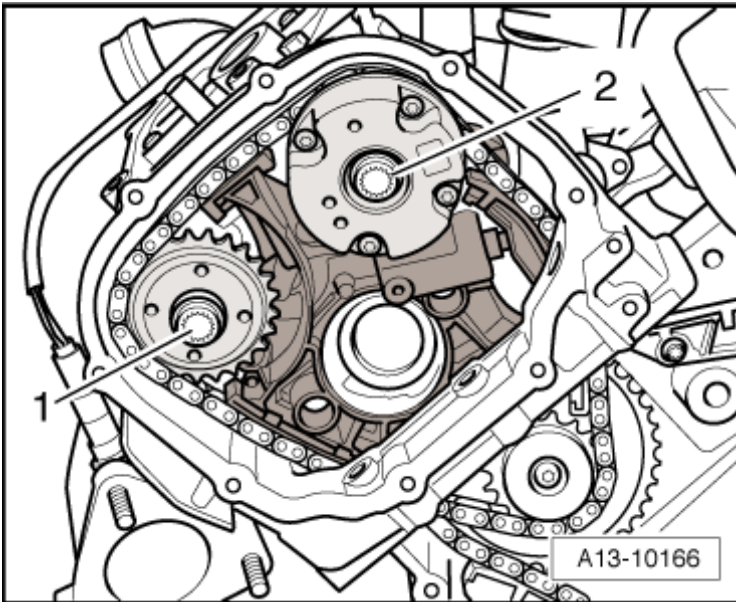


Fig. 89: Identifying Left Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

Stage	Bolt	Tightening specifications
2.	-1-	to the exhaust camshaft final tightening specification
2.	-2-	to the intake camshaft final tightening specification

-- Tighten the camshaft adjuster bolts and the camshaft chain sprocket on the right cylinder head as follows:

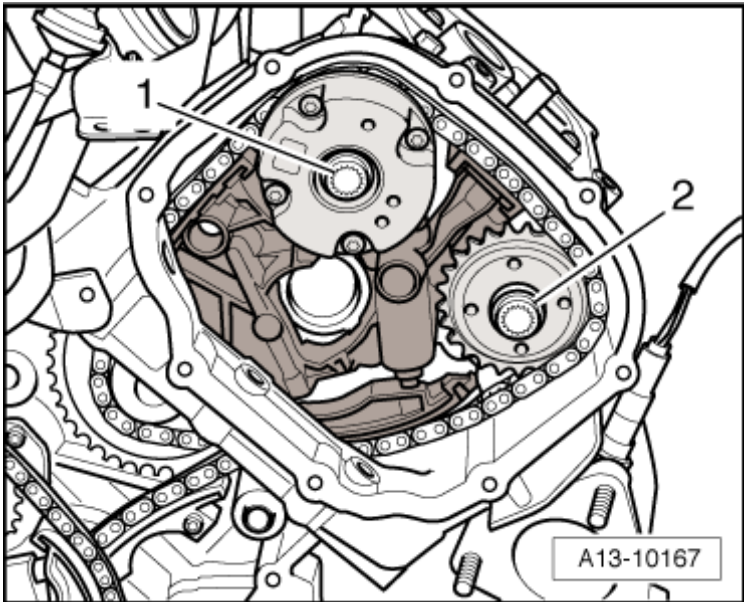


Fig. 90: Identifying Right Camshaft Adjuster And Camshaft Sprocket Bolts
Courtesy of AUDI OF AMERICA, LLC

Stage	Bolt	Tightening specifications
2.	-1-	to the intake camshaft final tightening specification
2.	-2-	to the exhaust camshaft final tightening specification

-- Remove the T40133 on both cylinder heads -arrows-.

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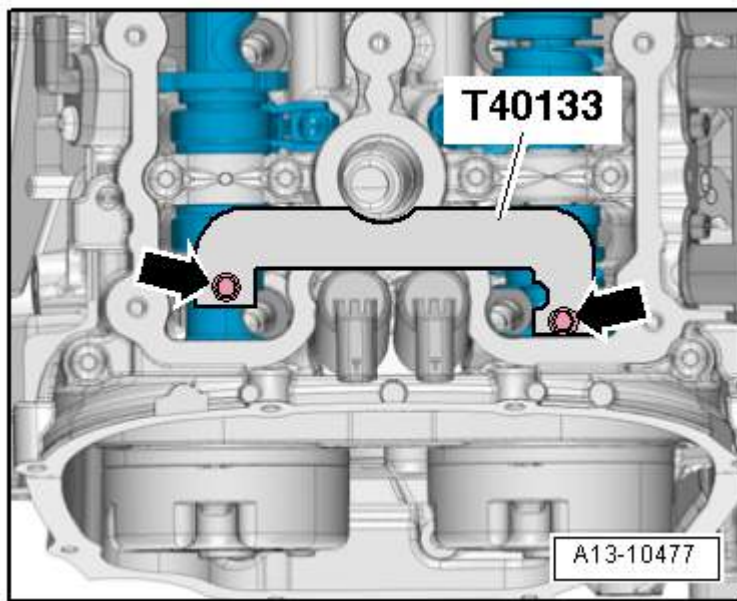


Fig. 91: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

-- Remove the T40069.

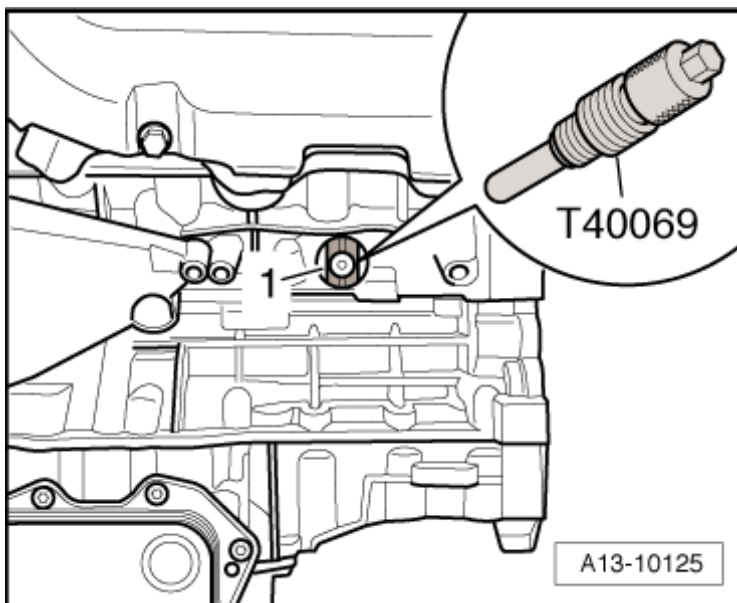


Fig. 92: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Using the T40058 and a closed wrench, turn the crankshaft two turns in the direction of engine rotation - arrow- until it is back at "TDC".

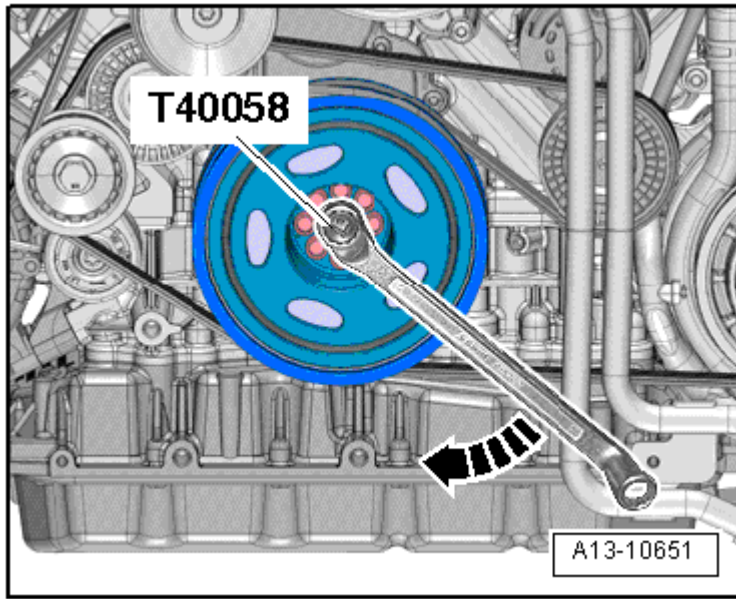


Fig. 93: Using Socket T40058 To Counter Hold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

NOTE: If it is accidentally rotated beyond "TDC", rotate it back approximately 30° and set it to "TDC" again.

- The threaded holes -arrows- in the camshafts must face upward.

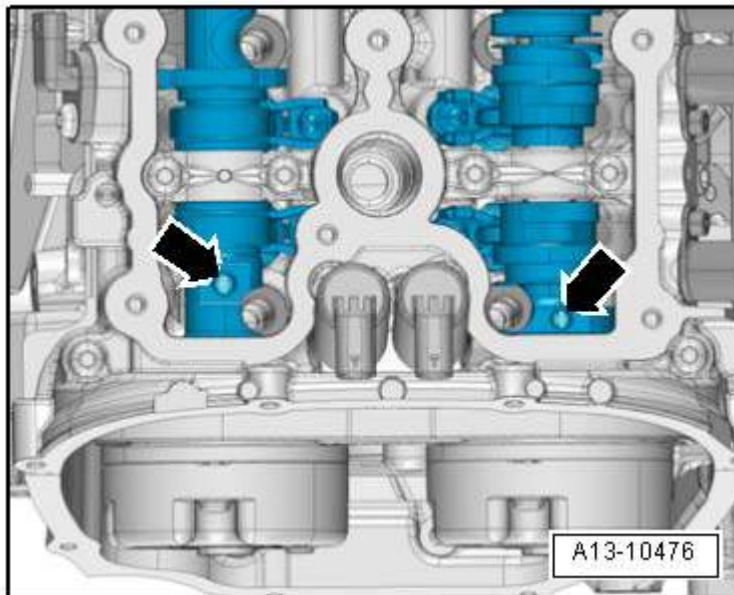


Fig. 94: Rotating Camshafts
Courtesy of AUDI OF AMERICA, LLC

-- Install the T40133 in both cylinder heads and tighten -arrows- to 25 Nm.

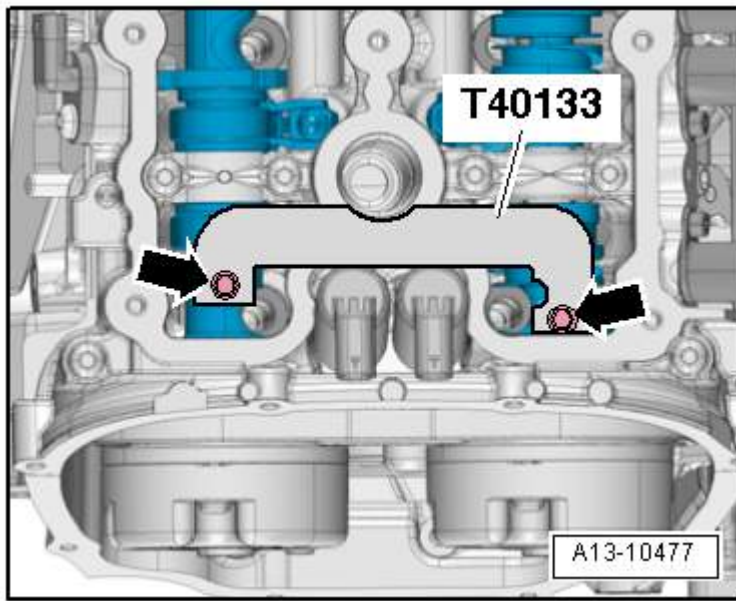


Fig. 95: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

-- Install the T40069 directly in the hole.

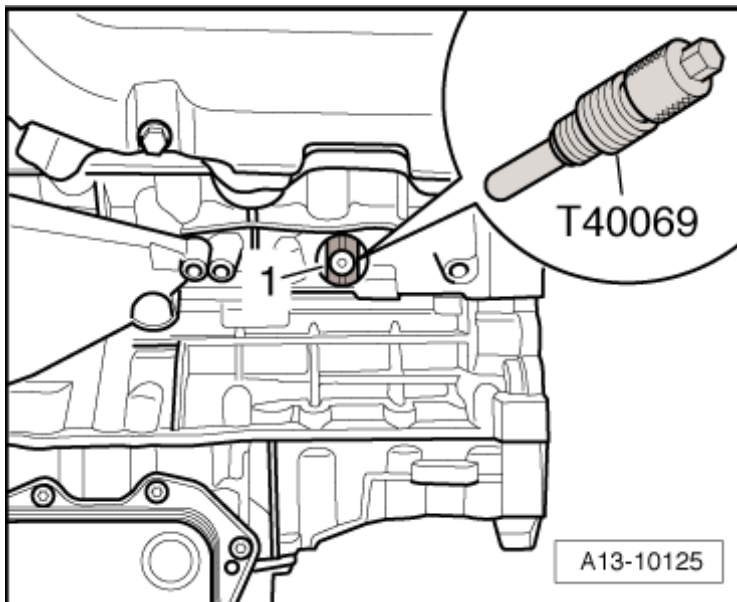


Fig. 96: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- The T40069 must engage in the locating hole of the crankshaft -1-, otherwise repeat the adjustment.

-- Remove the camshaft locating pins on both cylinder heads.

-- Remove the crankshaft holder.

Install in reverse order of removal paying attention to the following:

-- Install the locking bolt "TDC" mark crankshaft. Refer to **Fig. 97**.

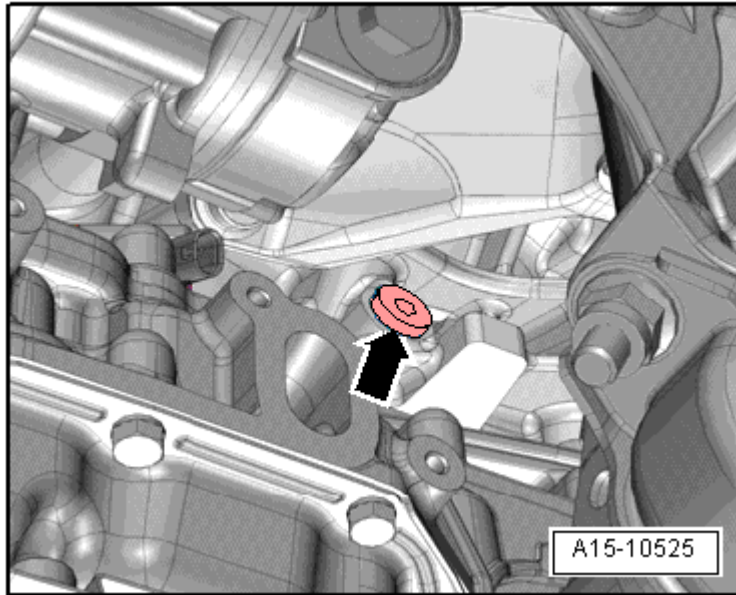


Fig. 97: Identifying Locking Bolt -Arrow-
Courtesy of AUDI OF AMERICA, LLC

-- Install A/C compressor. Refer to **Removal and Installation** .

-- Install the oil cooler. Refer to **ENGINE OIL COOLER** .

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

-- Installing the ribbed belt:

- **RIBBED BELT, VEHICLES WITH HYDRAULIC POWER STEERING**
- **RIBBED BELT, VEHICLES WITH ELECTRO-MECHANICAL POWER STEERING**

-- Install the cylinder head covers. For the left side, refer to **LEFT CYLINDER HEAD COVER** and for the right side, refer to **RIGHT CYLINDER HEAD COVER**.

-- Install the left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.

CYLINDER HEADS

Special tools and workshop equipment required

- Spanner Wrench 3212
- Camshaft Clamp T40133

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- Locking Pin T40069

REMOVING

- Engine installed.

NOTE: The following information describes how to remove both cylinder heads at the same time.

If only one cylinder head will be removed, follow the applicable instructions in the following description.

When installing, bring all cable ties back to same positions.

WARNING: There is a risk of injury because the fuel is under very high pressure.

- Reduce the fuel pressure down to residual pressure before opening the high pressure area of the fuel injection system.

-- Reduce fuel pressure in high pressure area. Refer to General Information .

-- Remove the upper coolant pipe. Refer to UPPER COOLANT PIPE .

-- Removing the ribbed belt:

- RIBBED BELT, VEHICLES WITH HYDRAULIC POWER STEERING
- RIBBED BELT, VEHICLES WITH ELECTRO-MECHANICAL POWER STEERING

-- Remove the lower section of the intake manifold. Refer to Removal and Installation .

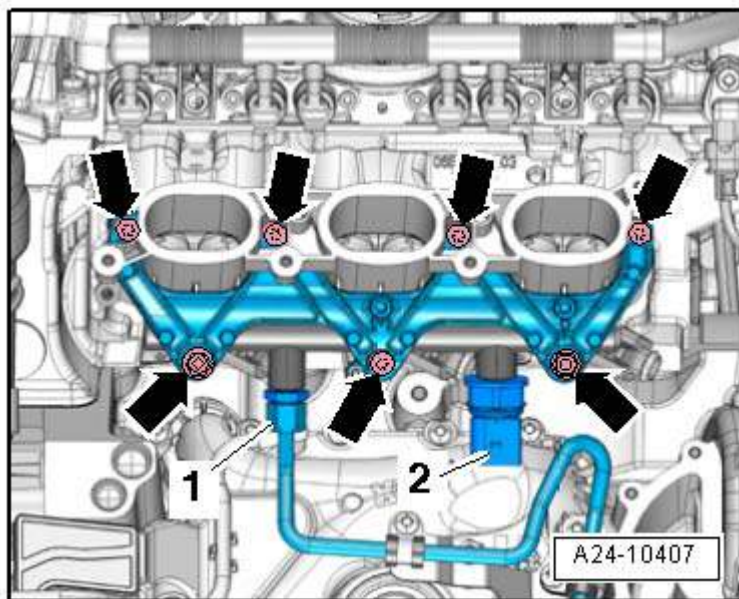


Fig. 98: Disconnecting Fuel Injector Connectors
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors on the fuel injectors.

-- Remove the affected camshaft timing chain from the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**

Vehicles with Hydraulic Power Steering

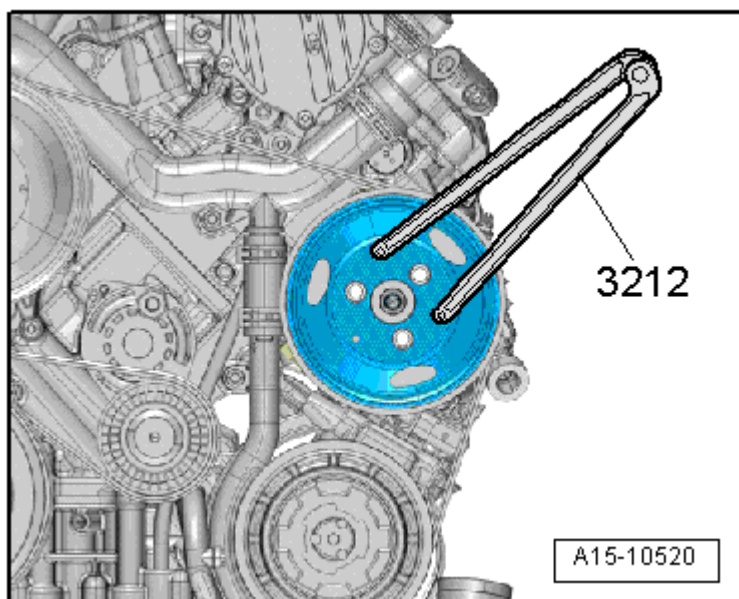


Fig. 99: Identifying Coolant Pump Pulley Bolts
Courtesy of AUDI OF AMERICA, LLC

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- Remove the bolts for the coolant pump ribbed belt pulley, using a 3212 to counter hold.
- Remove the bolts -1 and 2- and lay the power steering pump aside.

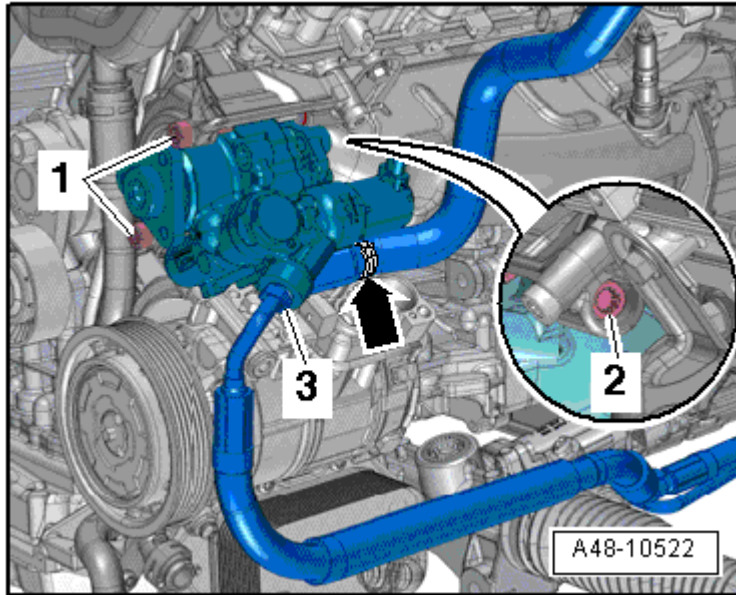


Fig. 100: Dynamic Steering Installation Location
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation location on a vehicle with dynamic steering.

Ignore -3- and -arrow-.

All Vehicles

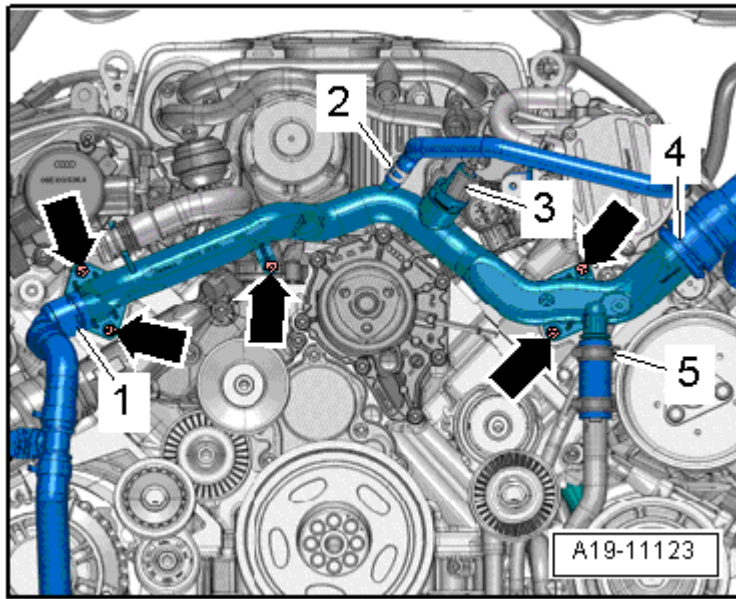


Fig. 101: Disconnecting Engine Coolant Temperature Sensor Connector
Courtesy of AUDI OF AMERICA, LLC

- Disconnect the connector -3- from the engine coolant temperature sensor -G62-.
- Remove the bolts -arrows-.
- Remove the clips -1 and 4-, loosen the clamp -2- and remove the coolant hoses from the front coolant pipe.

NOTE: Ignore -5-.

- Remove the threaded connection -1- and move the fuel supply line to the side.

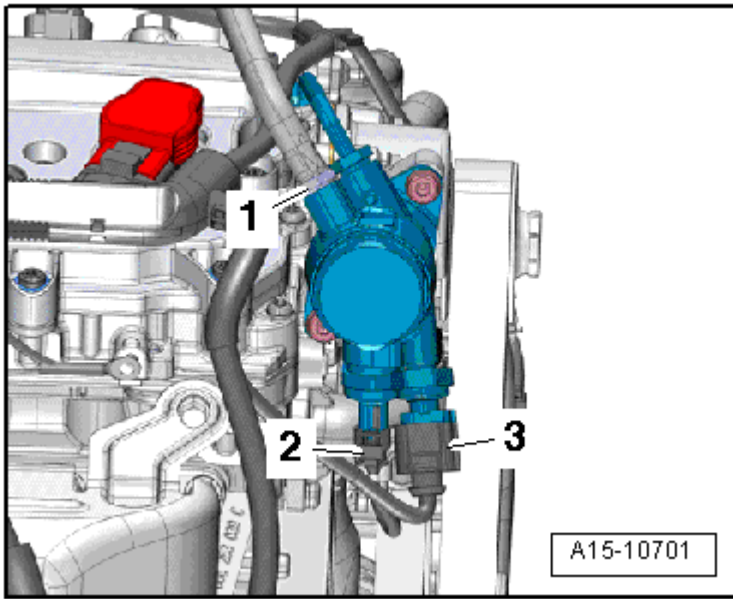


Fig. 102: Identifying Fuel Supply Line
Courtesy of AUDI OF AMERICA, LLC

- Disconnect the connectors -2 and 3-.
- Remove the bolt -arrow- and remove the oil dipstick and guide tube.

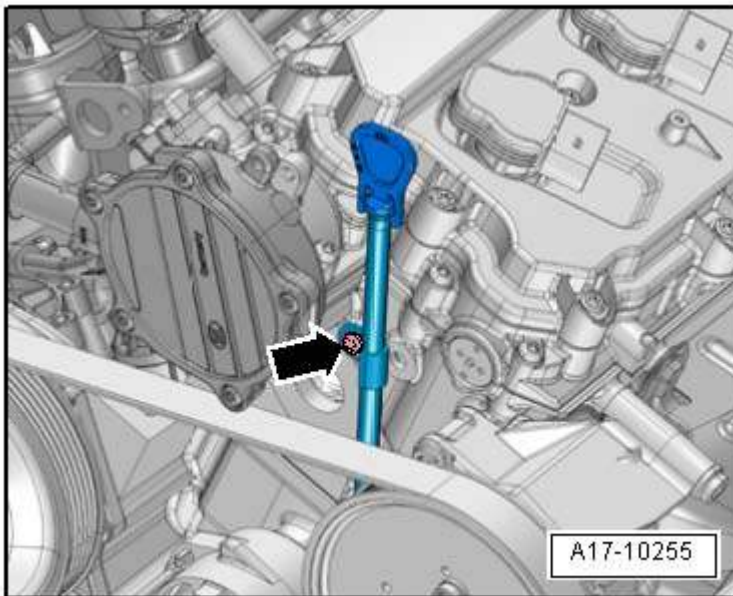


Fig. 103: Identifying Oil Dipstick Guide Tube Bolt
Courtesy of AUDI OF AMERICA, LLC

- Open the clamp -arrow- and remove the vacuum hose from the vacuum pump.

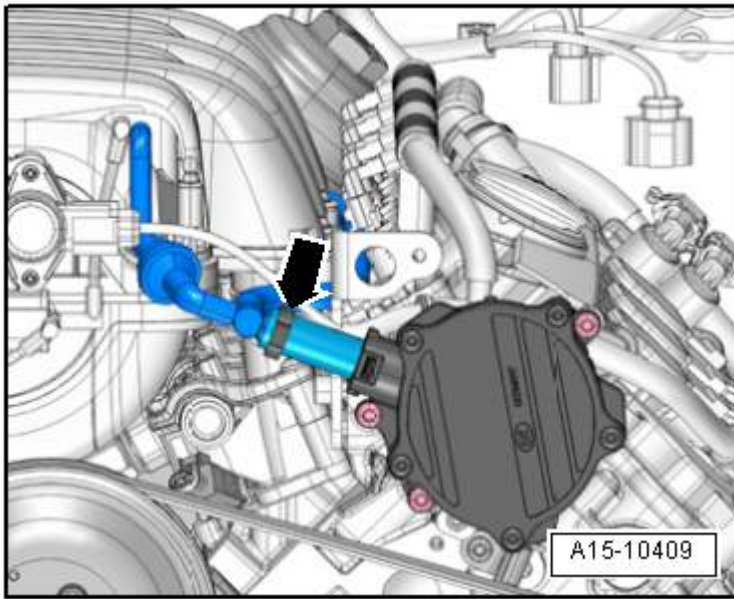


Fig. 104: Identifying Vacuum Pump Hose
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- on the rear of the cylinder head.

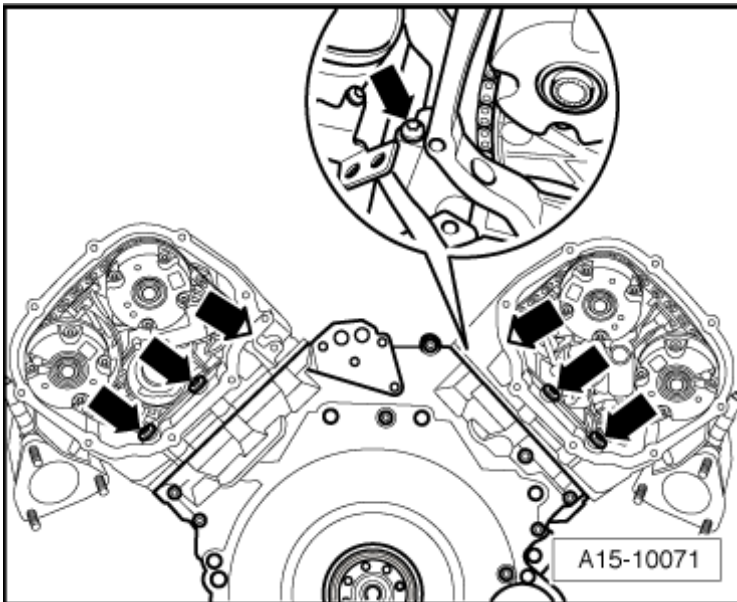


Fig. 105: Identifying Cylinder Head Bolts
Courtesy of AUDI OF AMERICA, LLC

- Left cylinder head: 3 bolts.
- Right cylinder head: 4 bolts.

-- Loosen the cylinder head bolts in the following sequence -1 through 8-.

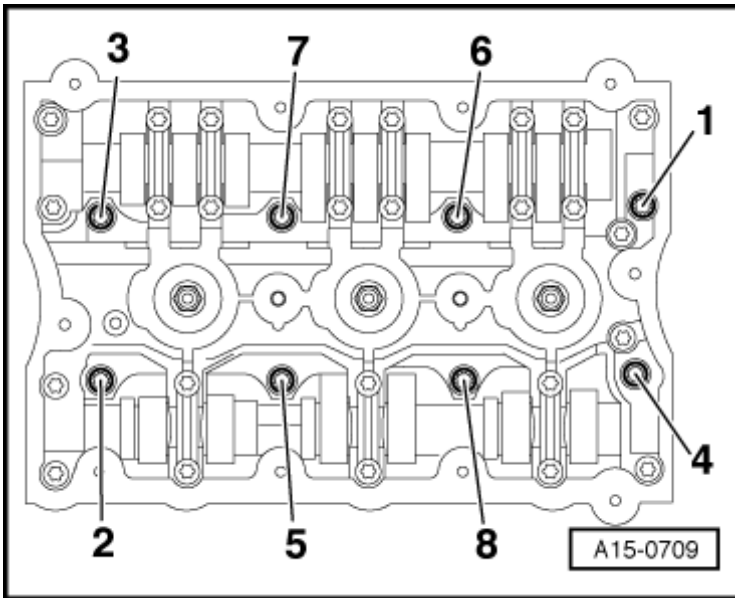


Fig. 106: Identifying Cylinder Head Bolts Loosening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts, remove the cylinder head and place it on a soft surface (foam).

INSTALLING

Tightening specifications:

- **Fig. 7**
- **Fig. 15**

CAUTION: The sealing surfaces could be damaged.

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

Risk of damaging cylinder block.

- There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.

Risk of cylinder head seal leaking.

- Carefully remove all grinding and sanding residue.
- Only unpack new cylinder head gasket immediately prior to installation.
- To prevent cylinder head seal silicone layer and recessed area from

being damaged, always handle seal extremely carefully.

Risk of damaging open valves.

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

Risk of damaging valves and piston heads after working on the valve train.

- **To ensure valves do not strike pistons when starting, carefully rotate engine at least 2 full revolutions.**

NOTE: Replace the bolts which are being tightened with an additional turn.

Replace self-locking nuts, sealing rings, seals and O-rings.

Note different sealant for cylinder head sealing surfaces and bolts.

If a replacement cylinder is installed, the contact surfaces between the hydraulic adjusting elements, roller rocker levers and cam running surfaces must be lubricated before installing the cylinder head cover.

Secure all hose connections with hose clamps of the same type as those equipped by the factory,

The coolant and engine oil must be changed whenever replacing the cylinder head or cylinder head seal.

- **Secure the camshafts in the "TDC" position on both cylinder heads using the T40133 -arrows- (25 Nm).**

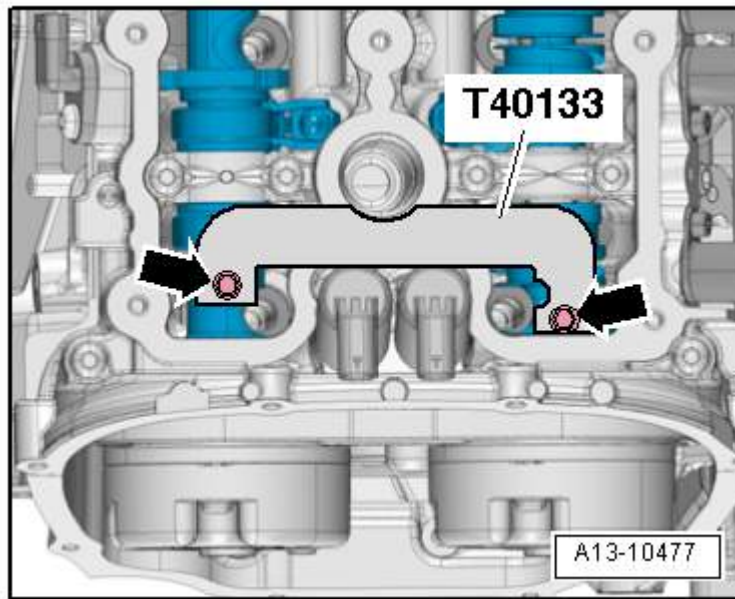


Fig. 107: Identifying Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

- The T40133 is correctly positioned when the holes for the cylinder head bolts remain free.
- Secure crankshaft -1- in "TDC" position using T40069.

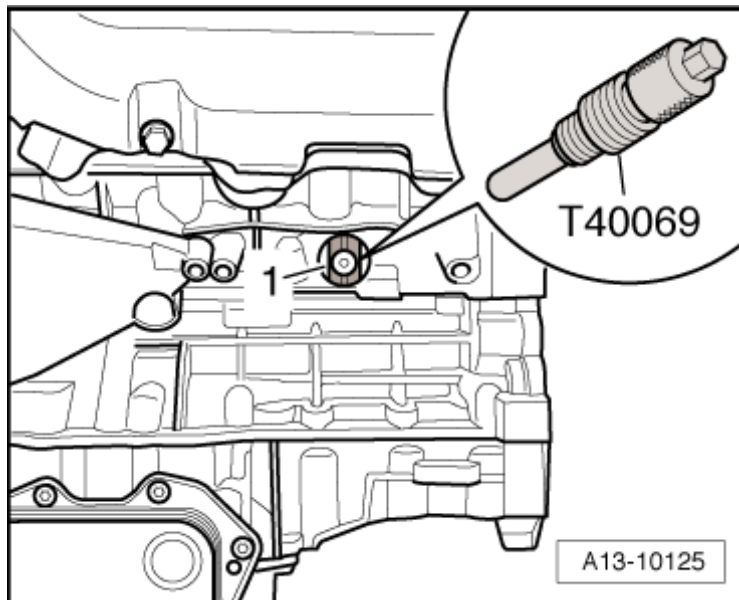


Fig. 108: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Install new seals and O-rings for the front coolant pipe.

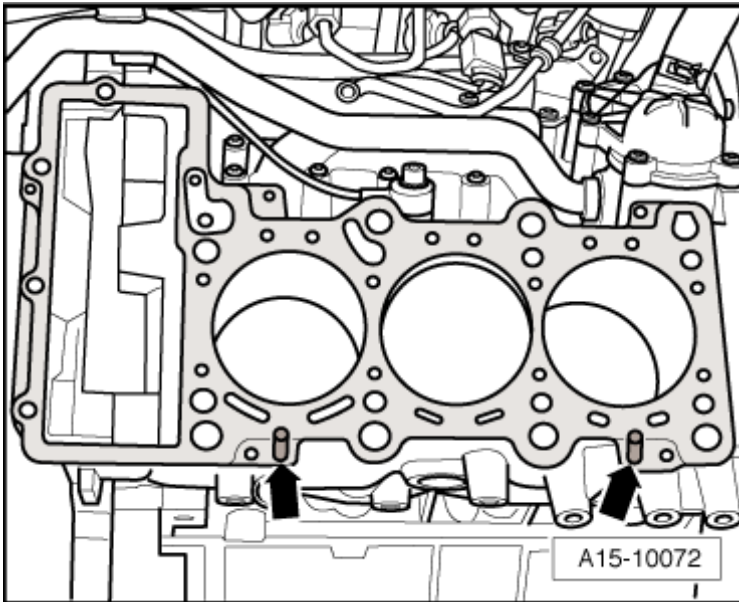


Fig. 109: Paying Close Attention To Centering Pins In Cylinder Block
Courtesy of AUDI OF AMERICA, LLC

-- Set cylinder head gasket in place.

- Installed position: The marking "top" or the part number must be legible.
- Pay close attention to the alignment bushings in the cylinder block -arrows-.

-- Set cylinder head in place.

-- Tighten the cylinder head bolts. Refer to **Fig. 7**.

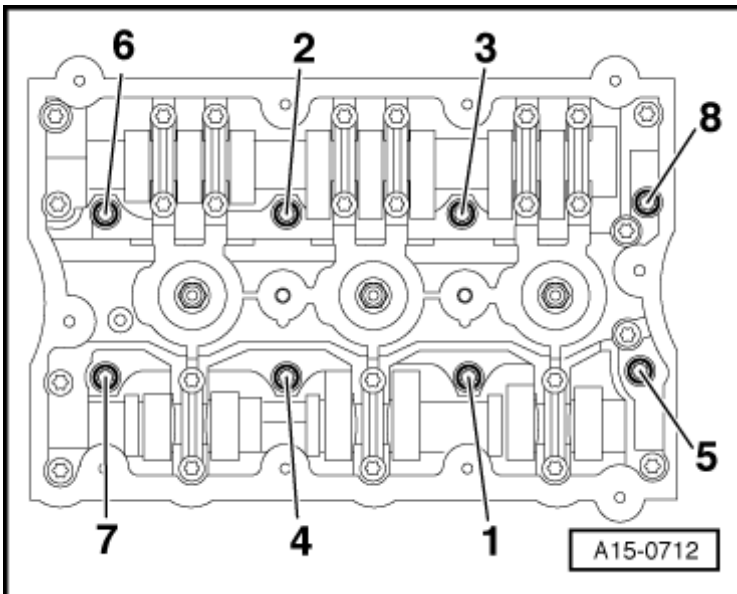


Fig. 110: Tightening Cylinder Head Bolts In Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts -arrows- for the lower timing chain cover. Refer to **Fig. 15**.

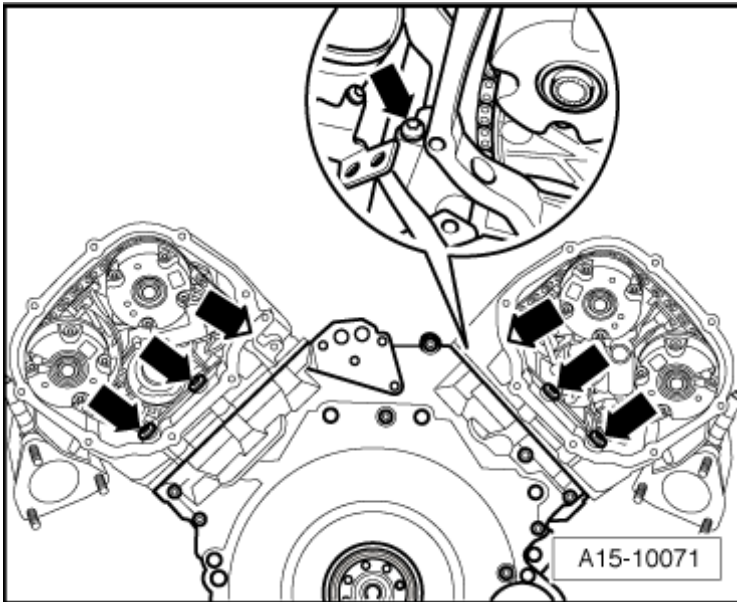


Fig. 111: Identifying Cylinder Head Bolts
Courtesy of AUDI OF AMERICA, LLC

- Left cylinder head: 3 bolts.
- Right cylinder head: 4 bolts.

NOTE: **There is no requirement to tighten the cylinder head bolts after repairs.**

Install in reverse order of removal paying attention to the following:

- Install oil dipstick guide tube. Refer to **Fig. 10**.
- Install front coolant pipe. Refer to **FRONT COOLANT PIPE** .
- Install the power steering pump. Refer to **Removal and Installation** .
- Position the camshaft timing chain on the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.
- Remove the lower section of the intake manifold. Refer to **Removal and Installation** .
- Installing the ribbed belt:
 - **RIBBED BELT, VEHICLES WITH HYDRAULIC POWER STEERING**
 - **RIBBED BELT, VEHICLES WITH ELECTRO-MECHANICAL POWER STEERING**
- Install the upper coolant pipe. Refer to **UPPER COOLANT PIPE** .

-- Change the engine oil, refer to **MAINTENANCE PROCEDURES**

-- Replace coolant. Refer to **COOLANT, DRAINING AND FILLING** .

LEFT CYLINDER HEAD COVER

REMOVING

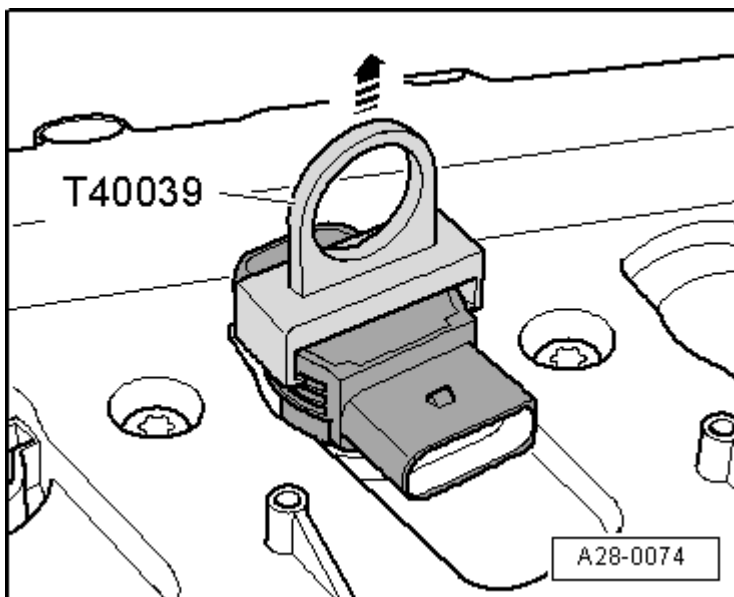


Fig. 112: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

-- Remove ignition coils. Refer to **Removal and Installation** .

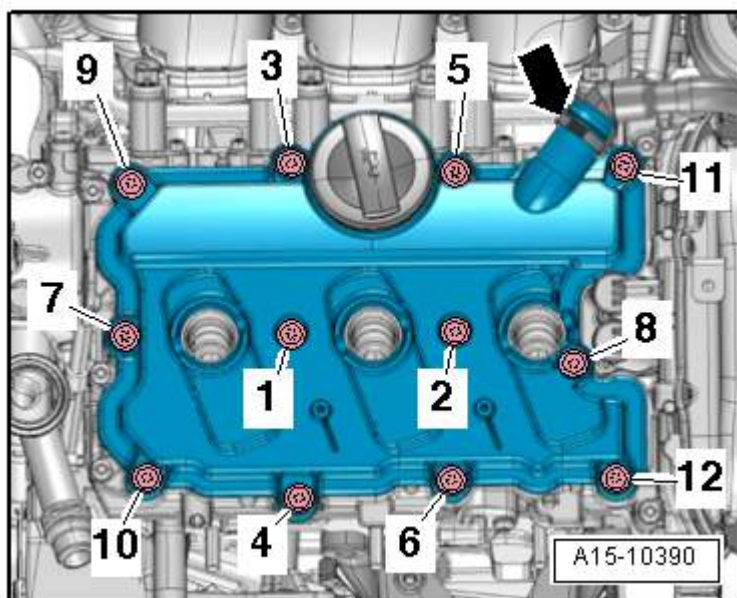


Fig. 113: Identifying Left Cylinder Head Cover Bolt, Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of violating emissions legislation.

- **Do not open the hose connection -arrow-.**

-- Remove the bolts in the following sequence -12 to 1- and lay the left cylinder head aside with the crankcase ventilation hose -arrow- connected.

INSTALLING

Install in reverse order of removal. Note the following:

- Tightening specifications, refer to **Fig. 5**.

NOTE: Replace the cylinder head seal if it is damaged.

Replace the cylinder head cover bolts when replacing the damaged seal.

Replace the O-ring.

-- Clean any oil or grease off the sealing surfaces.

-- Tighten the left cylinder head cover bolts. Refer to **Fig. 5**.

-- Install ignition coils. Refer to **Removal and Installation** .

LEFT AND RIGHT TIMING CHAIN COVERS

Special tools and workshop equipment required

- Hand drill with plastic brush attachment
- Protective goggles
- Sealant

REMOVING

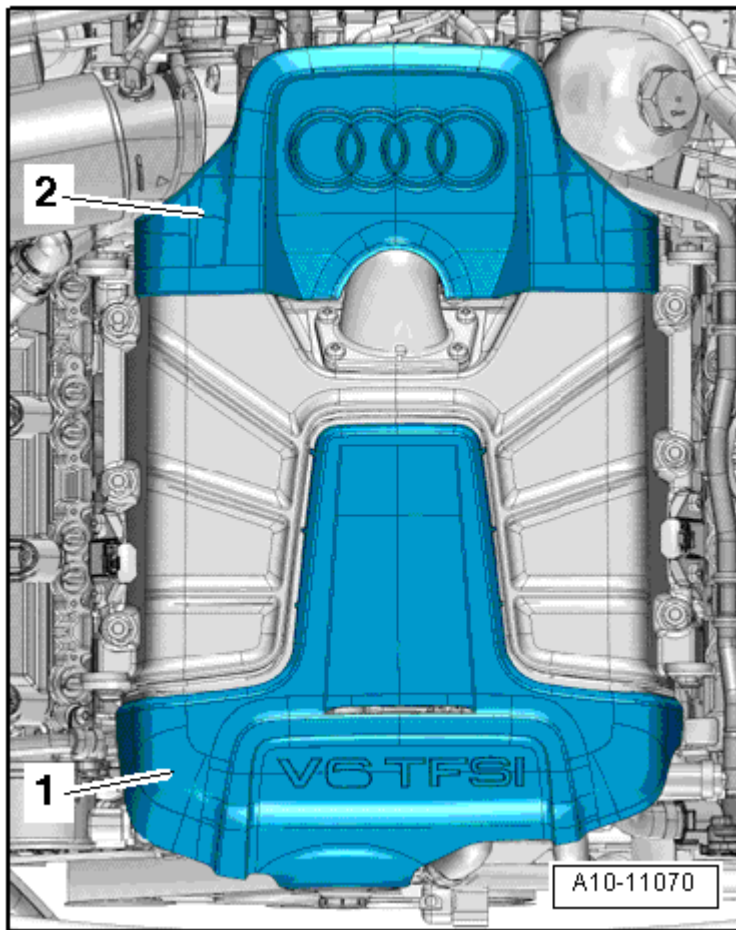


Fig. 114: Identifying Engine Cover -1- And -2-
Courtesy of AUDI OF AMERICA, LLC

NOTE: When installing, bring all cable ties back to same positions.

-- Remove the rear engine cover -2- upward.

-- Remove the affected secondary air injection combination valve. For the left one, refer to **SECONDARY AIR INJECTION LEFT COMBINATION VALVE** and for the right one, refer to **SECONDARY AIR INJECTION RIGHT COMBINATION VALVE**.

Left Timing Chain Cover

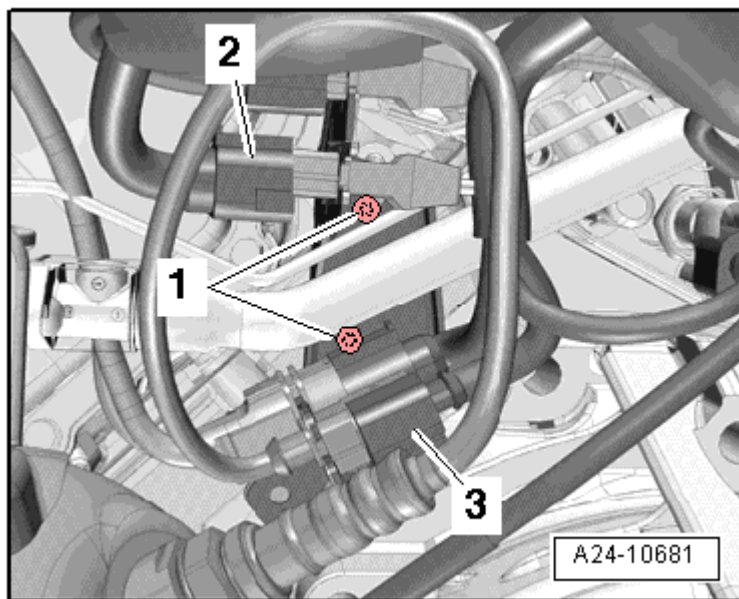


Fig. 115: Disconnecting Connector To Fuel Injectors (Left Cylinder Head)
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1- and move the bracket together with the wiring harnesses to the side.

NOTE: Ignore -2 and 3-.

-- Remove the bolts -1 to 8-.

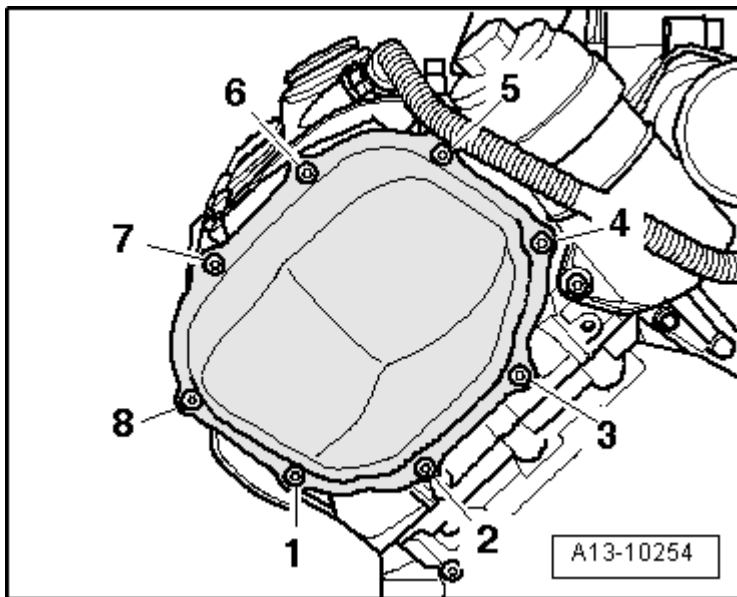
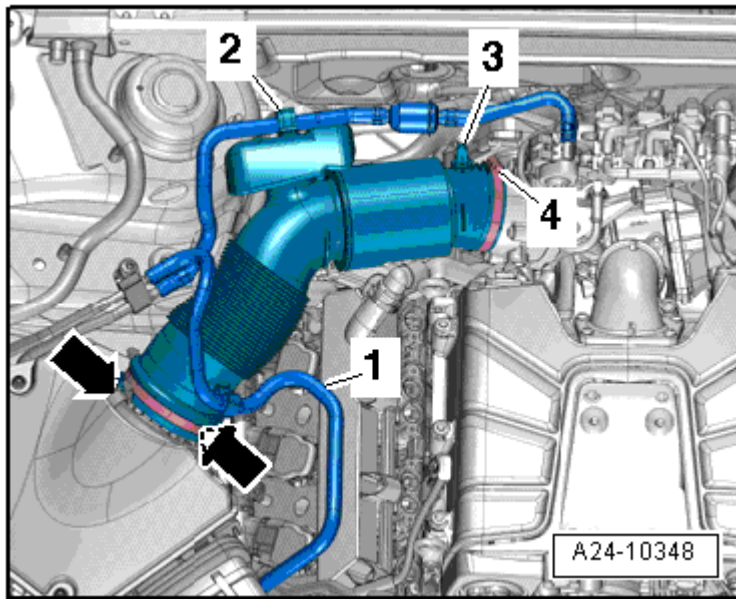


Fig. 116: Loosening/Tightening Bolts In Sequence For Left Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

-- Carefully remove the left cover for the timing chain from the bond.

Right Timing Chain Cover**Fig. 117: Identifying Air Guide Pipe**

Courtesy of AUDI OF AMERICA, LLC

- Free up the fuel hose -1- and the EVAP canister hose -2- on the air duct pipe.
- Remove the vacuum hose -3- from the air guide pipe connection.
- Remove the air guide pipe by loosening the hose clamp -4- and opening the clips -arrows-.
- Remove the bolts -3- and move the bracket together with the wiring harnesses to the side.

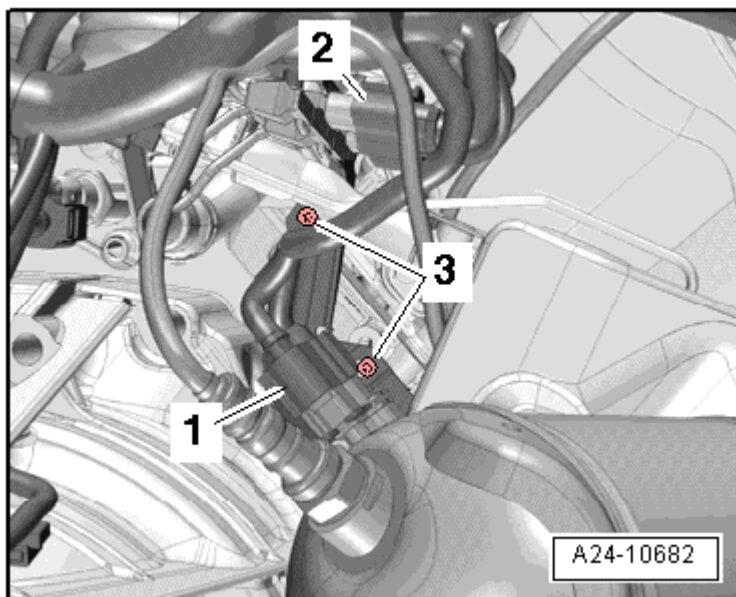


Fig. 118: Disconnecting Connector To Fuel Injectors (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 and 2-.

-- Remove the bolts -1 to 8-.

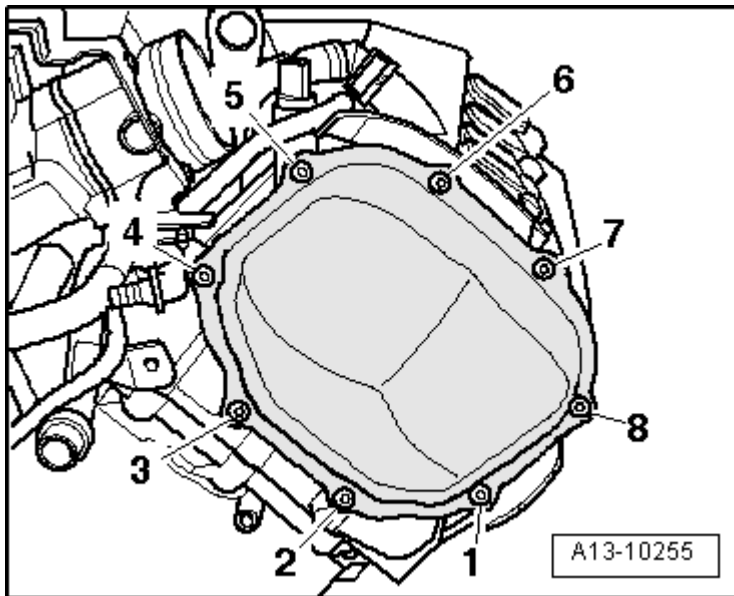


Fig. 119: Loosening/Tightening Bolts In Sequence For Right Timing Chain Cover

Courtesy of AUDI OF AMERICA, LLC

-- Carefully remove the right cover for the timing chain from the bond.

INSTALLING

Tightening specifications:

- **Fig. 13**
- **Fig. 14**

NOTE: Replace any bolts that were tightened with an additional turn.

Replace the O-rings.

-- Remove any old sealant from the surfaces.

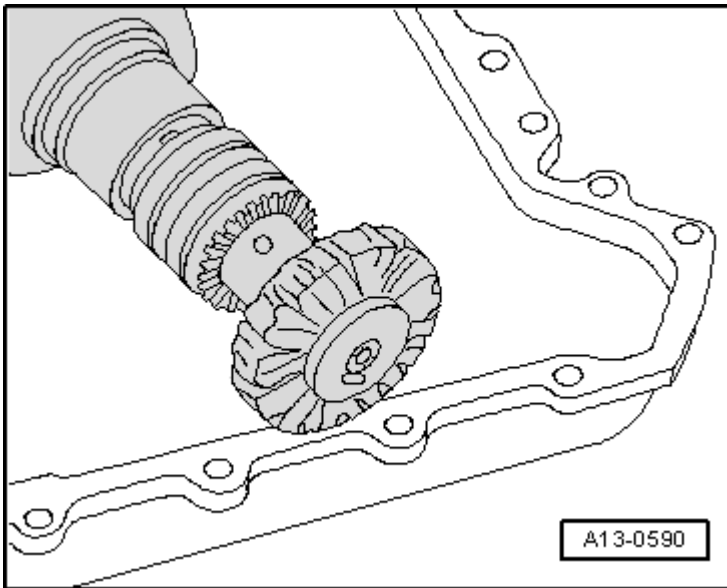


Fig. 120: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Danger of eye injury.

- Wear protective goggles.

-- Remove the sealant residue on the covers for the timing chain, cylinder block and cylinder head, for example using a rotating plastic brush.

-- Clean any oil or grease off the sealing surfaces.

NOTE: Note the expiration date of the sealing compound.

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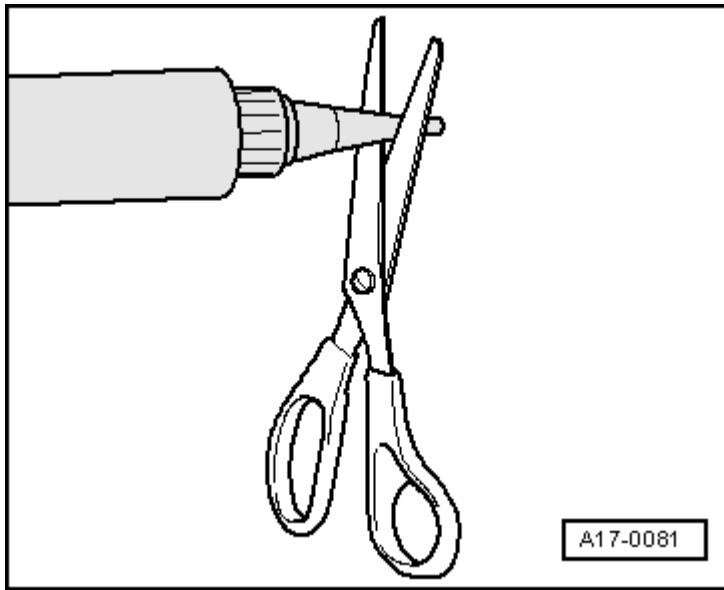


Fig. 121: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 mm)
Courtesy of AUDI OF AMERICA, LLC

-- Cut the tube nozzle at the front marking (nozzle diameter approximately 2 mm).

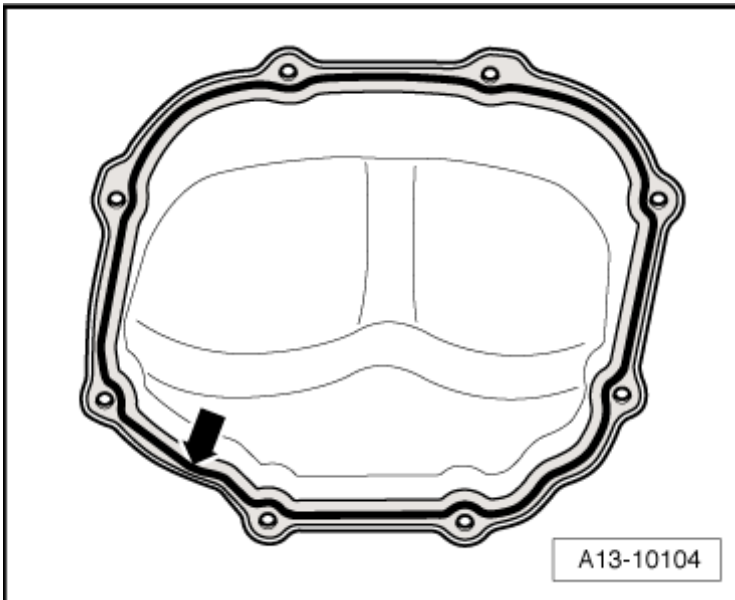


Fig. 122: Applying Sealant Bead On Clean Sealing Surfaces Of Left Cover For Timing Chain
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The lubrication system could be plugged with excess sealant.

- Do not apply sealant bead thicker than indicated.

-- Apply the sealant bead -arrow- to the clean sealing surfaces on the left timing chain cover as shown in the

illustration.

- Thickness of sealant bead: 2.5 mm.

NOTE: Covers for timing chain must be installed within 5 minutes after applying sealant.

-- Position the left timing chain cover and tighten the bolts. Refer to **Fig. 13**.

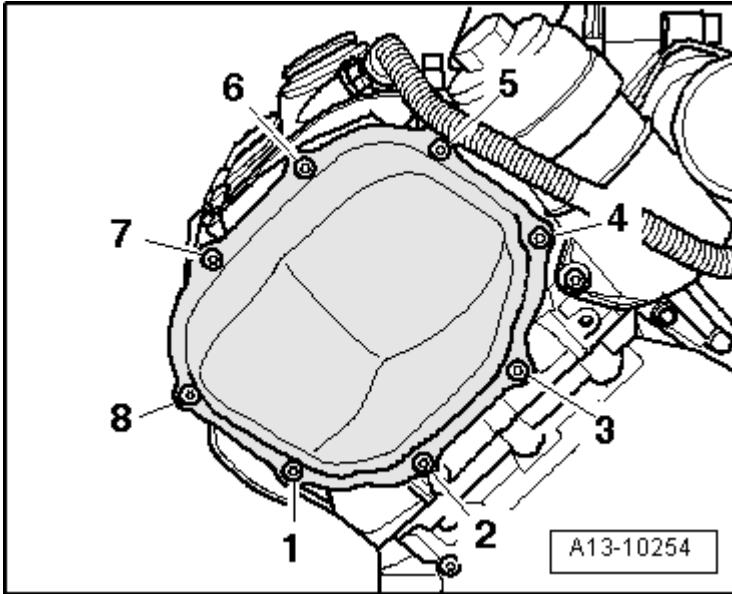


Fig. 123: Loosening/Tightening Bolts In Sequence For Left Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

-- Apply the sealant bead -arrow- to the clean sealing surfaces on the right timing chain cover as shown in the illustration.

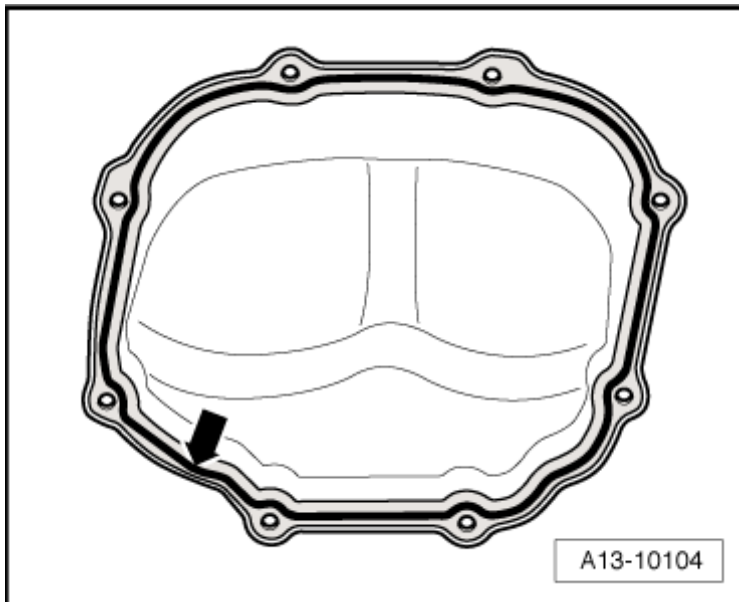


Fig. 124: Applying Sealant Bead On Clean Sealing Surfaces Of Left Cover For Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant bead: 2.5 mm.

-- Position the right timing chain cover and tighten the bolts. Refer to **Fig. 14**.

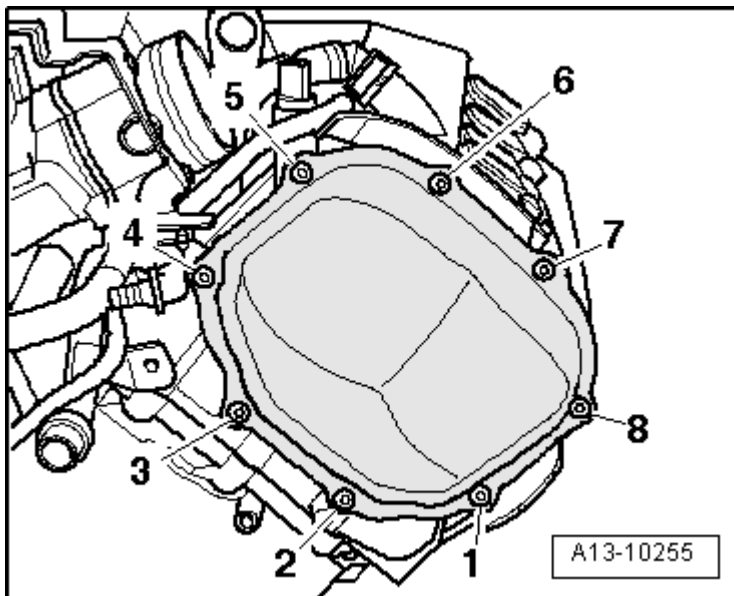


Fig. 125: Loosening/Tightening Bolts In Sequence For Right Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

Install in reverse order of removal paying attention to the following:

NOTE: Secure all hose connections with hose clamps of the same type as those

equipped by the factory,

-- Install the secondary air injection combination valve. For the left one, refer to **SECONDARY AIR INJECTION LEFT COMBINATION VALVE** and for the right one, refer to **SECONDARY AIR INJECTION RIGHT COMBINATION VALVE** .

LOWER TIMING CHAIN COVER

Special tools and workshop equipment required

- Hand drill with plastic brush attachment
- Protective goggles
- Sealant

REMOVING

- The transmission is removed. Refer to **Removal and Installation** or **Removal and Installation** .
- Engine oil drained, refer to **MAINTENANCE PROCEDURES**

NOTE: When installing, bring all cable ties back to same positions.

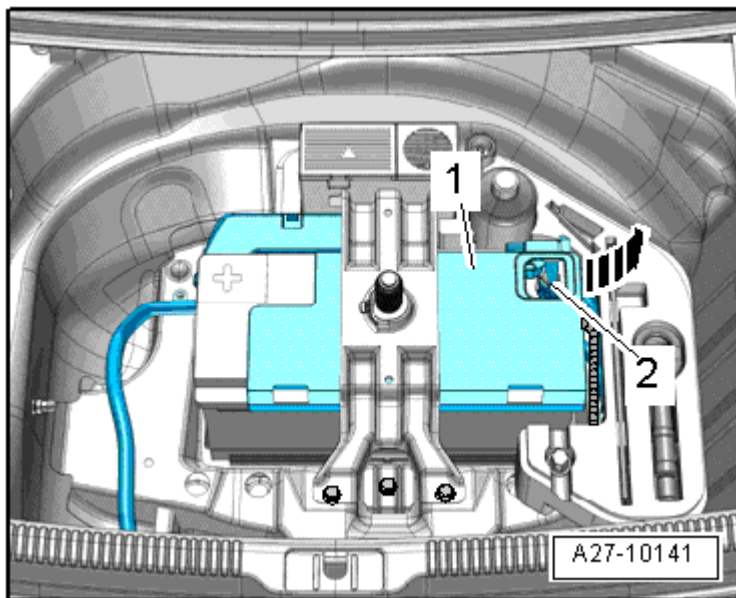


Fig. 126: Identifying Battery

Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of destroying electrical components.

- Complete the steps for disconnecting the battery.

2012 Audi S4

ENGINE 3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

- Turn off the ignition and remove the key.
- Disconnect the Ground (GND) cable -2- from the battery post. Refer to **Removal and Installation** .
- Remove the drive plate. Refer to **DRIVE PLATE** .
- Remove the left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Remove the oil filter housing. Refer to **OIL FILTER HOUSING** .
- Remove the generator. Refer to **Removal and Installation** .

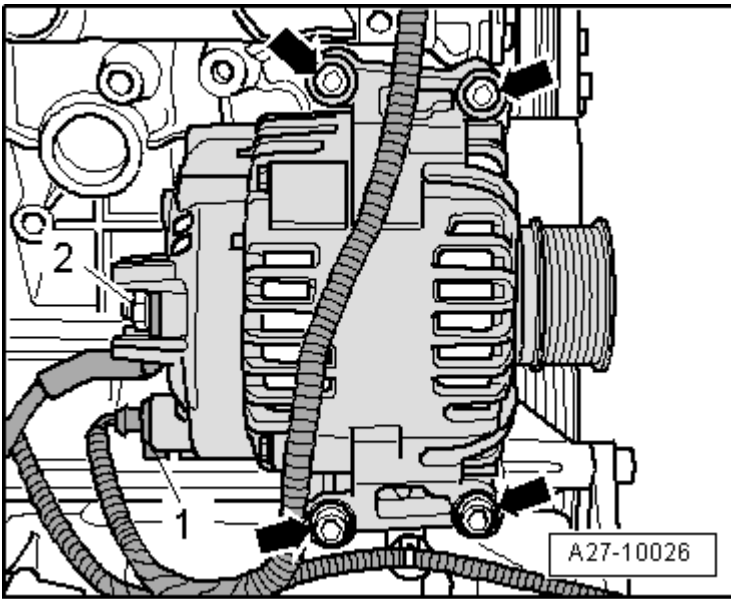


Fig. 127: Identifying Bolts, Electrical Connections, And Generator
Courtesy of AUDI OF AMERICA, LLC

- Disconnect the starter electrical connector -3- by sliding the retainer back and pressing the release down.

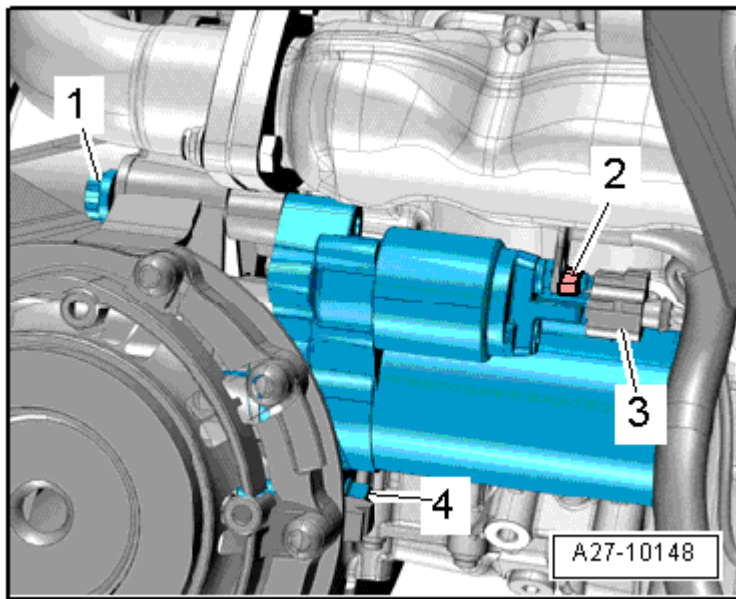


Fig. 128: Disconnecting Starter Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

-- Remove the electrical wire nut -2- and starter.

NOTE: Ignore -1 and 4-.

-- Remove the bolts -arrows-.

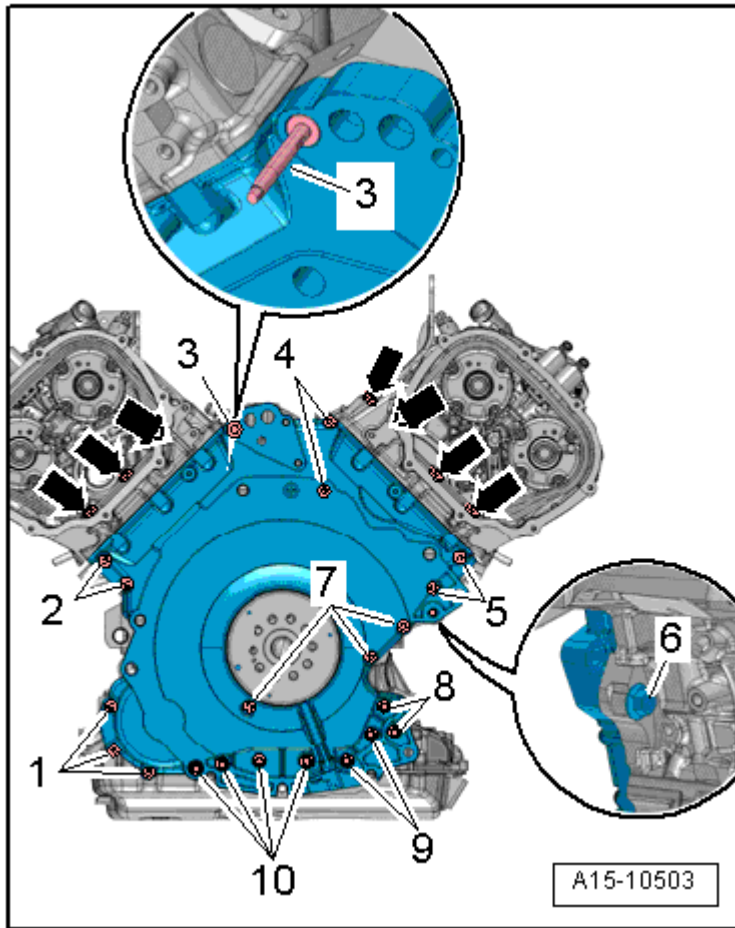


Fig. 129: Identifying Lower Timing Chain Cover Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Loosen and remove the bolts -1 through 10- in a diagonal sequence.
- Carefully separate the timing chain guard lower section from the bond.
- Press the transmission side of the crankshaft shaft seal out of the lower timing chain cover.

INSTALLING

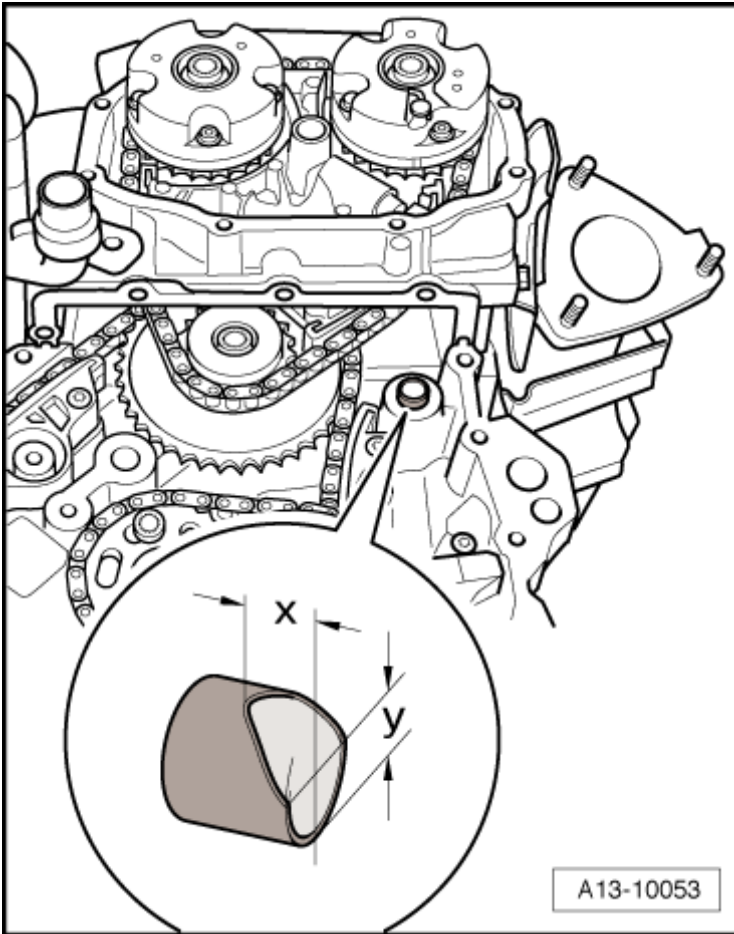


Fig. 130: Identifying Chamfer Alignment Bushing With File
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace seals, gaskets and O-rings.

- Remove the right upper alignment bushing from the cylinder block.
- Grind the alignment bushing down at an angle as shown in the illustration.
 - Dimension -x- = 6.5 mm.
 - Dimension -y- = 8 mm.
- Insert the alignment bushing in the cylinder block so the angled side faces up.

NOTE: Because of the chamfer, the lower timing chain cover can be positioned more easily when the cylinder head is installed.

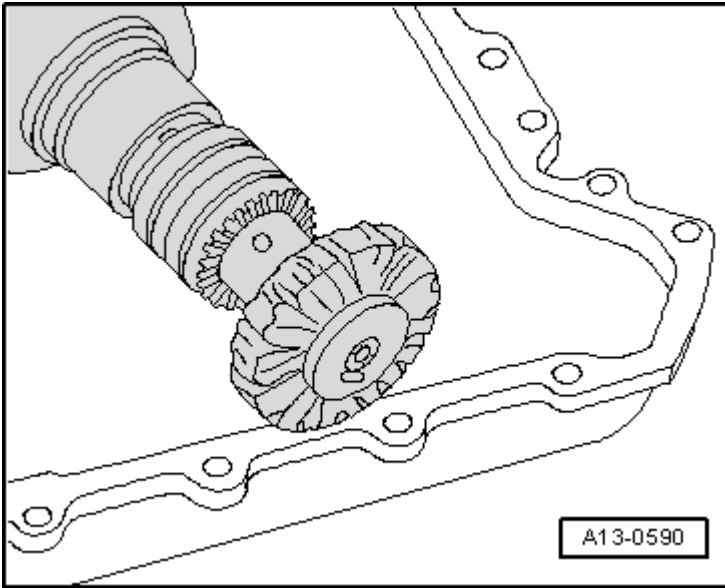


Fig. 131: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Danger of eye injury.

- Wear protective goggles.

-- Remove the sealant residue on the cover for the timing chain, cylinder block and cylinder head, for example using a rotating plastic brush.

-- Clean any oil or grease off the sealing surfaces.

-- Clean the threaded holes in the cylinder block for connecting the engine and transmission using a thread tap before installing the transmission.

-- Clean old sealant out of the holes -arrow- in the cylinder head seals.

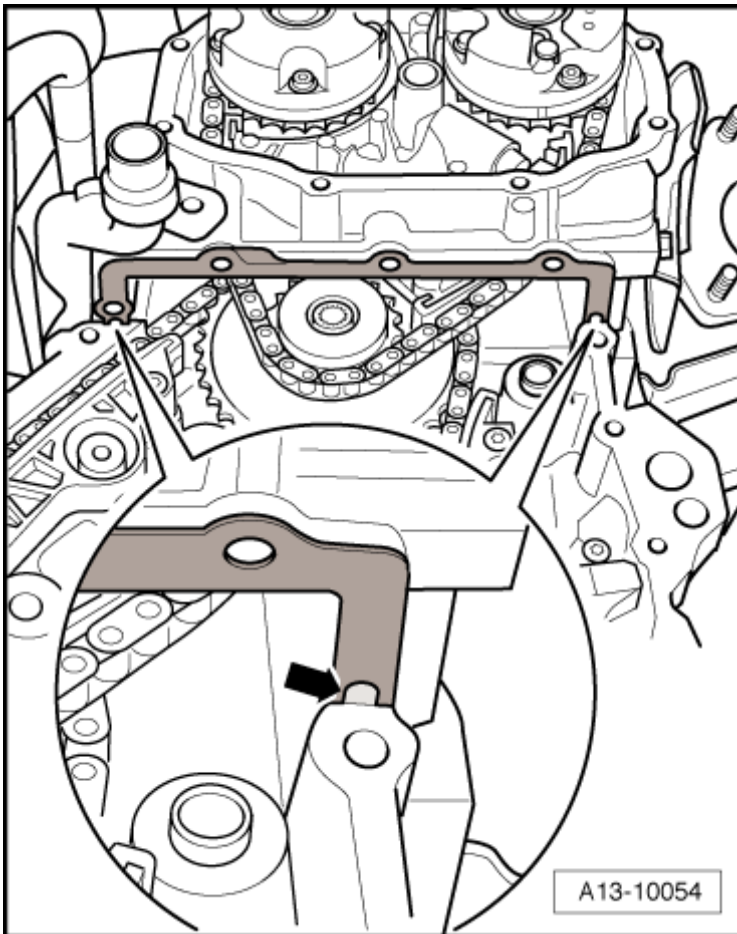


Fig. 132: Cleaning Old Sealant From Holes In Cylinder Head Gaskets
Courtesy of AUDI OF AMERICA, LLC

NOTE: With cylinder head installed, holes in cylinder head seal are only half visible.

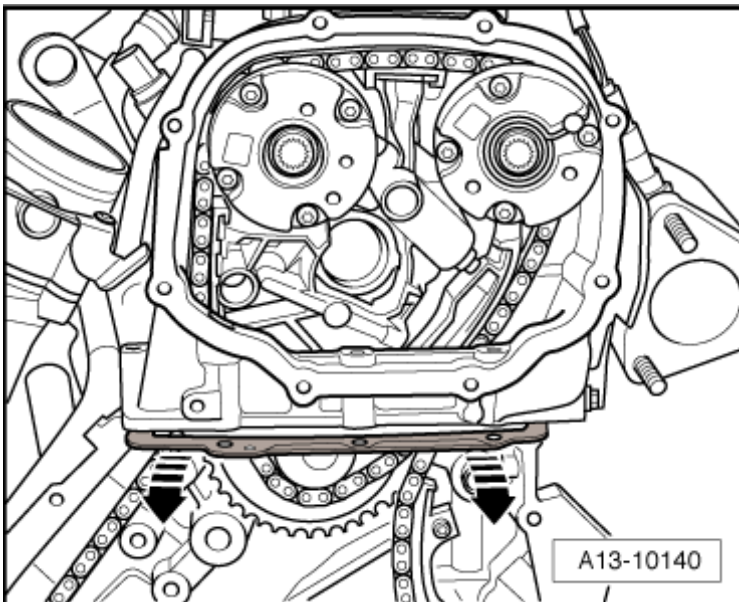


Fig. 133: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of AUDI OF AMERICA, LLC

CAUTION: The cylinder head seal could be damaged.

- Only bend ends of cylinder head seals slightly, do not kink.

NOTE: A kinked cylinder head seal must be replaced.

-- Bend the end of the cylinder head seals down slightly -arrows- until the upper sealing surface of the seals and the cylinder head can be cleaned.

-- Clean any oil and grease off the cylinder head seals.

NOTE: Note the expiration date of the sealing compound.

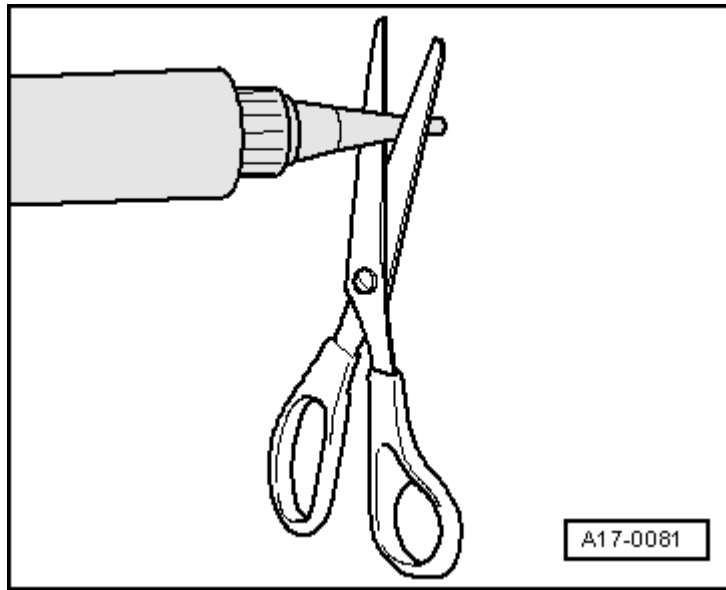


Fig. 134: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 mm)
Courtesy of AUDI OF AMERICA, LLC

-- Cut the tube nozzle at the front marking (nozzle diameter approximately 2 mm).

NOTE: The sealant must be applied to several places on the engine, as described in the following.

-- Lightly coat top and bottom cylinder head seal sealing surfaces with lubricant by bending the seals down slightly again -arrows-.

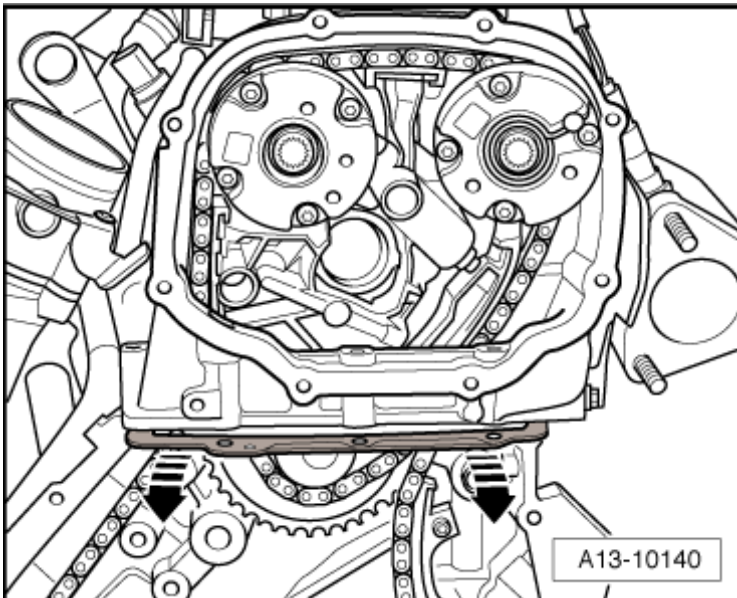


Fig. 135: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned

Courtesy of AUDI OF AMERICA, LLC

- Use a flat object such as a feeler gauge to coat the surface between the cylinder head and seal.
- Fill the cleaned cylinder head seal holes -arrow- with sealant.

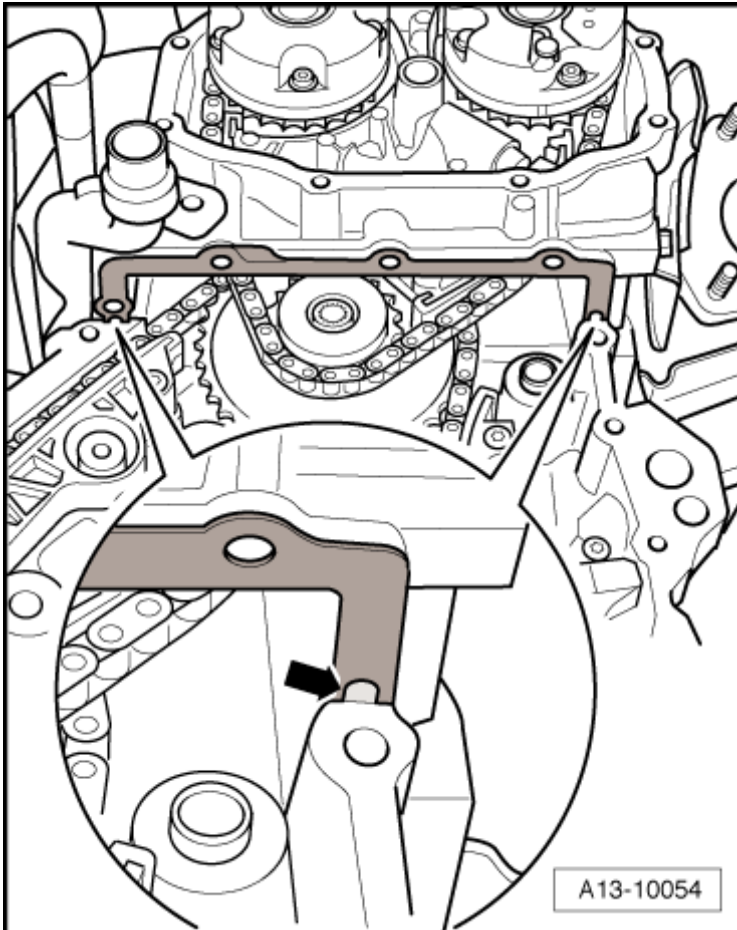


Fig. 136: Cleaning Old Sealant From Holes In Cylinder Head Gaskets
Courtesy of AUDI OF AMERICA, LLC

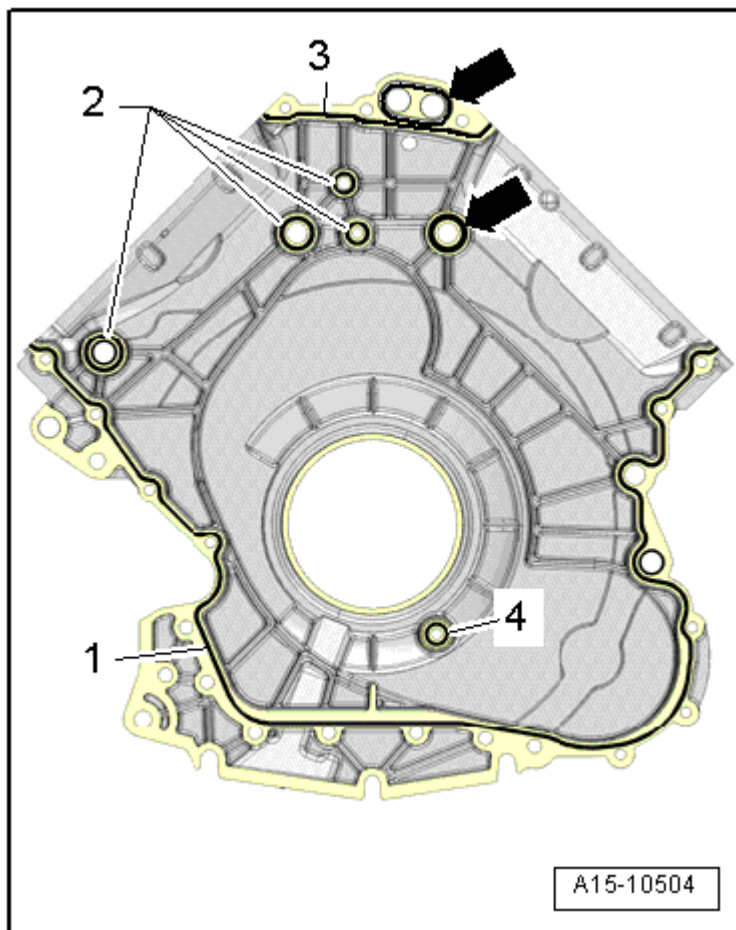


Fig. 137: Identifying Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: The lubrication system could be plugged with excess sealant.

- Do not apply sealant bead thicker than indicated.

-- Apply sealant beads -1 through 4- on the clean lower timing chain cover sealing surfaces as shown in the illustration.

- The groove of the sealing surface must be completely filled with sealant.
- The sealant beads must be 1.5 to 2.0 mm above the sealing surface.
- Draw through the sealant bead -2- as illustrated, even though the groove is intermittent.

NOTE: Timing chain cover must be installed within 5 minutes of applying sealant.

-- Insert the seals -arrows- in the grooves on the lower timing chain cover.

-- Position the lower timing chain cover, guiding it diagonally from below to the sealing surface on the cylinder block and cylinder head.

- When positioning, ensure the cylinder head seals are not damaged.
- Tighten the bolts for the lower timing chain cover. Refer to **Fig. 15**.

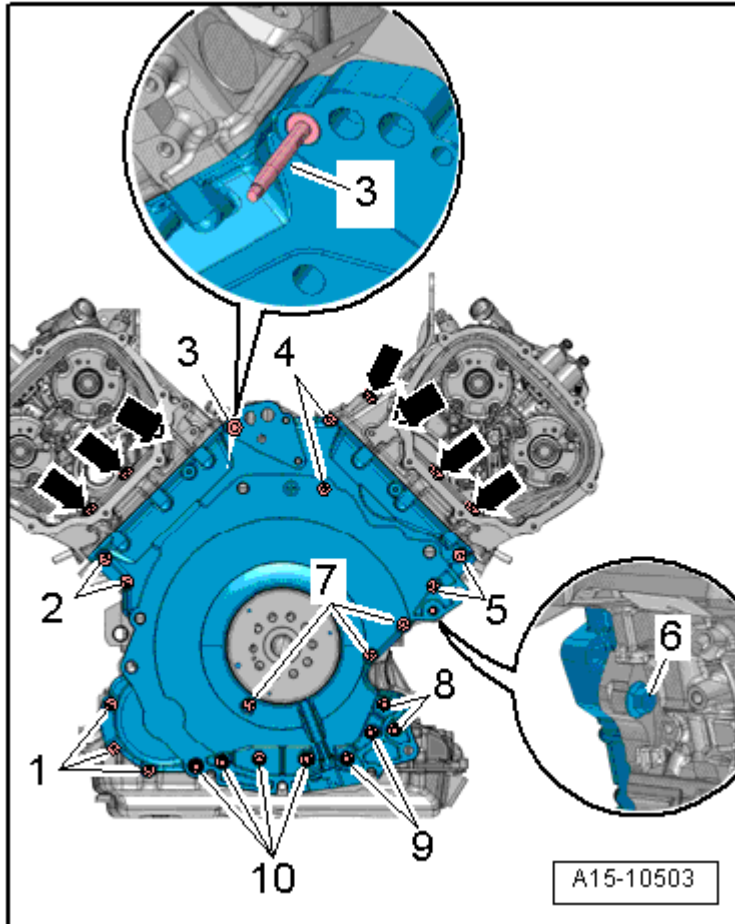


Fig. 138: Identifying Lower Timing Chain Cover Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

Install in reverse order of removal paying attention to the following:

- Install the transmission-side crankshaft shaft seal. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**.
- Install the starter and generator. Refer to **Removal and Installation**.
- Install the oil filter housing. Refer to **OIL FILTER HOUSING**.
- Install the left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install the drive plate. Refer to **DRIVE PLATE**.
- Fill the engine oil and check the level, refer to **MAINTENANCE PROCEDURES**.

TIMING MECHANISM DRIVE CHAIN**Special tools and workshop equipment required**

- Locking Pin T40071

REMOVING

- The transmission is removed. Refer to **Removal and Installation** or **Removal and Installation**.
- Remove timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.
- Remove the camshaft timing chains from the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.
- Remove the power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Press the drive chain tensioner guide rail in the direction of the -arrow- and secure the chain tensioner with a T40071.

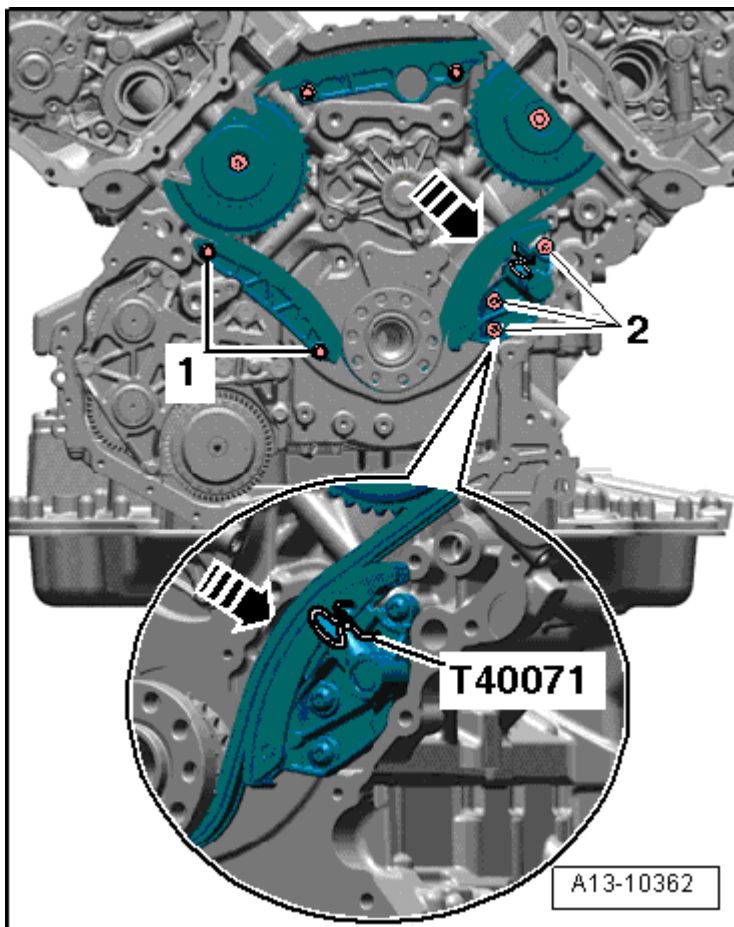


Fig. 139: Identifying Bolts And Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

2012 Audi S4

ENGINE 3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

CAUTION: Risk of destroying due to reversed running direction on a used drive chain.

- **Mark the drive chain running direction with -arrows- using paint for installation later. Do not mark the drive chain with a punch, notch or something similar.**

- Remove the bolts -1- and the guide rail.
- Remove the bolts -2- and the chain tensioner.
- Remove the timing mechanism drive chain.

INSTALLING

Install in reverse order of removal. Note the following:

- Tightening specifications, refer to **TIMING MECHANISM DRIVE CHAIN OVERVIEW**.

NOTE: Replace any bolts that were tightened with an additional turn.

- Position the timing mechanism drive chain according to the markings made on the drive chain sprockets during removal.
- Install the guide rail and tighten the bolts -1-.

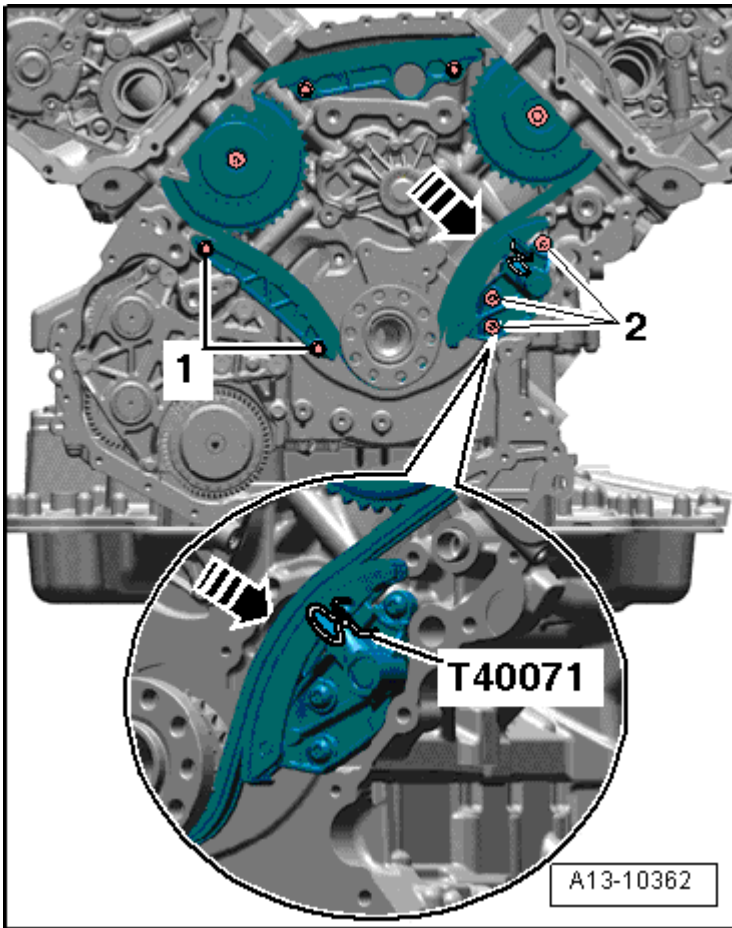


Fig. 140: Identifying Bolts And Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

- Install the chain tensioner and tighten the bolts -2-.
- Press the drive chain tensioner guide rail in direction of -arrow- and remove the T40071.
- Install the power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Position the camshaft timing chain on the camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.
- Install timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.

POWER TAKE-OFF DRIVE CHAIN

Special tools and workshop equipment required

- Key T40049
- Locking Pin T40069
- Locking Pin T40071

- Locating Pins T40116

REMOVING

- The transmission is removed. Refer to Removal and Installation or Removal and Installation .

-- Remove timing chain lower cover. Refer to LOWER TIMING CHAIN COVER.

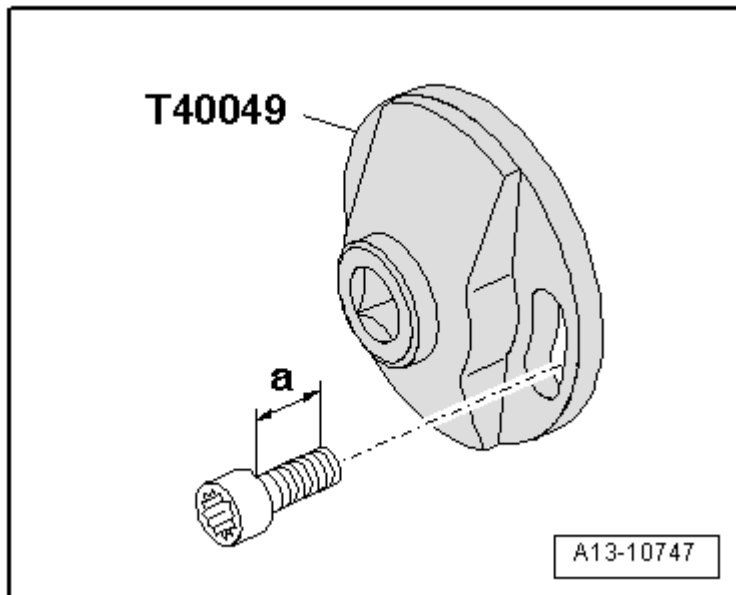


Fig. 141: Identifying T40049 And Bolts With A 22 Mm Maximum Thread Length -A-
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Danger of damaging the drive chain because the bolt thread is too long.

- Use bolts with a 22 mm maximum thread length -a- to attach the T40049.
- If only longer bolts are available, then the bolt head must be installed in such a way so that thread length is still 22 mm only.

-- Install the T40049 with 2 bolts -arrows- on the back of the crankshaft.

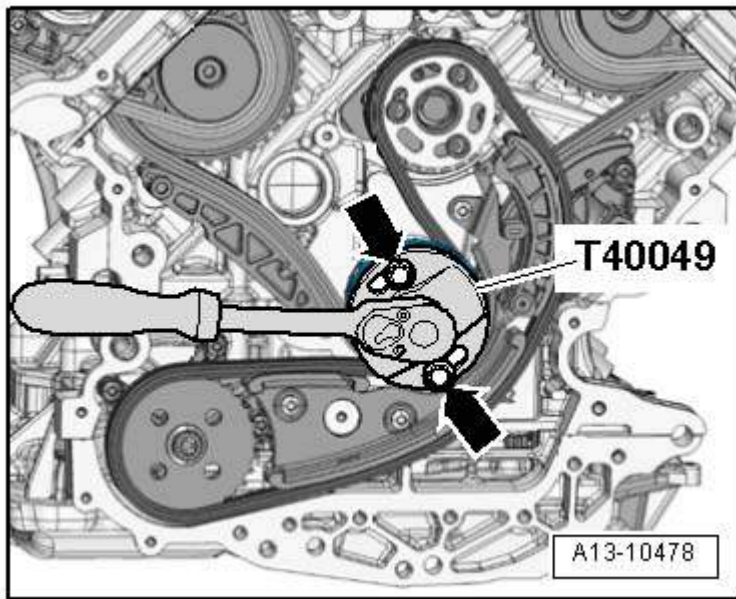


Fig. 142: Identifying Key T40049 At Rear On Crankshaft Using Old Bolts For Dual-Mass Flywheel, Installation

Courtesy of AUDI OF AMERICA, LLC

-- Remove the locking bolt -arrow- for the "TDC" marking crankshaft from the cylinder block.

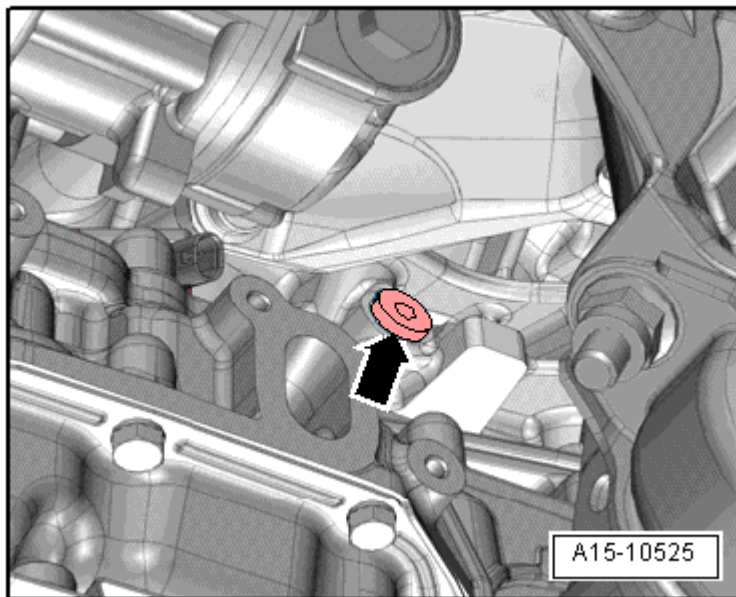


Fig. 143: Identifying Locking Bolt -Arrow-

Courtesy of AUDI OF AMERICA, LLC

-- Rotate the crankshaft in the direction of engine rotation to "TDC".

-- Install the T40069 in the hole and tighten to 20 Nm. Turn the crankshaft -1- back and slightly to completely center the bolt, if necessary.

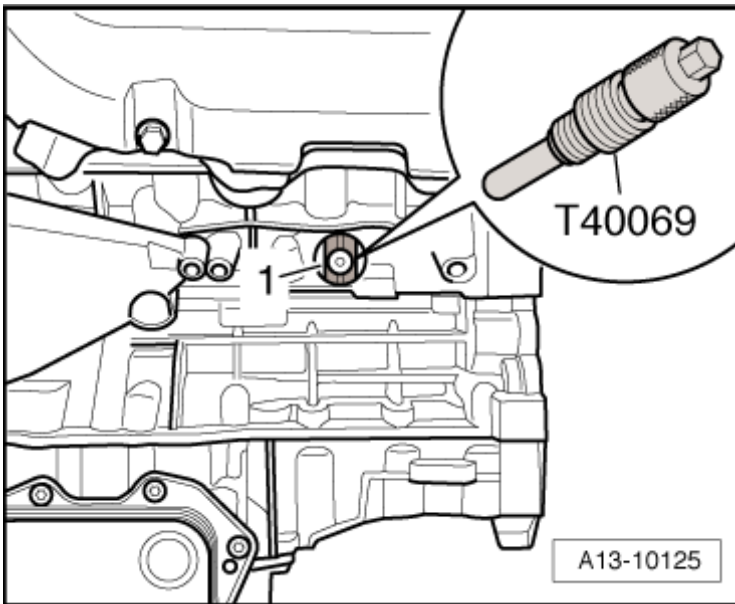


Fig. 144: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
 Courtesy of AUDI OF AMERICA, LLC

-- Press the chain tensioner guide rail in direction of -arrow- and secure chain tensioner using a T40071.

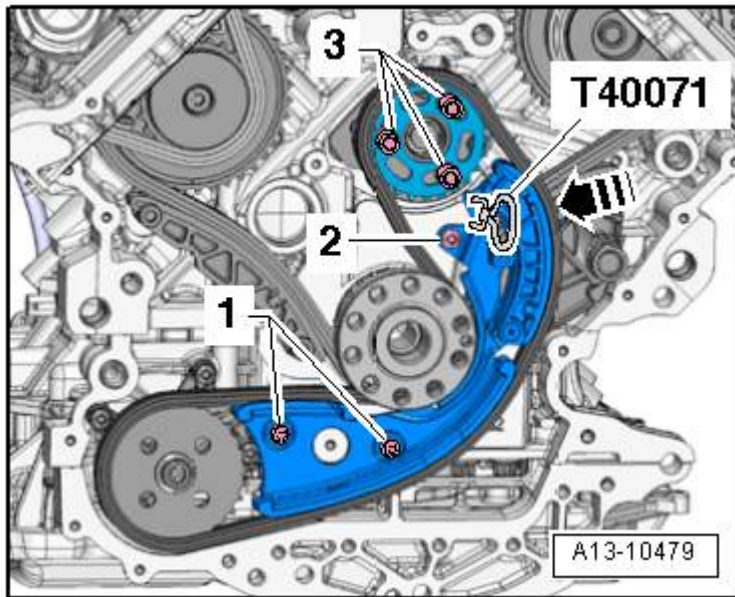


Fig. 145: Pressing Chain Tensioner Guide Rail And Securing Chain Tensioner Using Locking Pin T40071
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of destroying due to reversed running direction on a used drive chain.

- Mark the drive chain running direction with -arrows- using paint for installation later. Do not mark the drive chain with a punch, notch or

something similar.

- Remove the bolts -3- and the balance shaft chain sprocket.
- Remove the bolts -1 and 2- and the chain tensioner with the chain.

INSTALLING

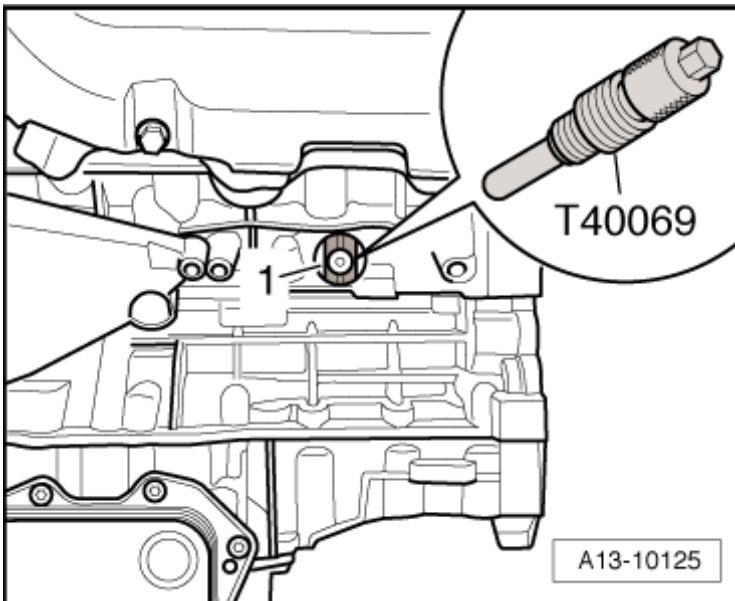


Fig. 146: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- Tightening specifications, refer to **POWER TAKE-OFF DRIVE CHAIN OVERVIEW.**
- Secure crankshaft -1- in "TDC" position using T40069.

- Mount the chain tensioner together with the chain and the balance shaft sprocket.

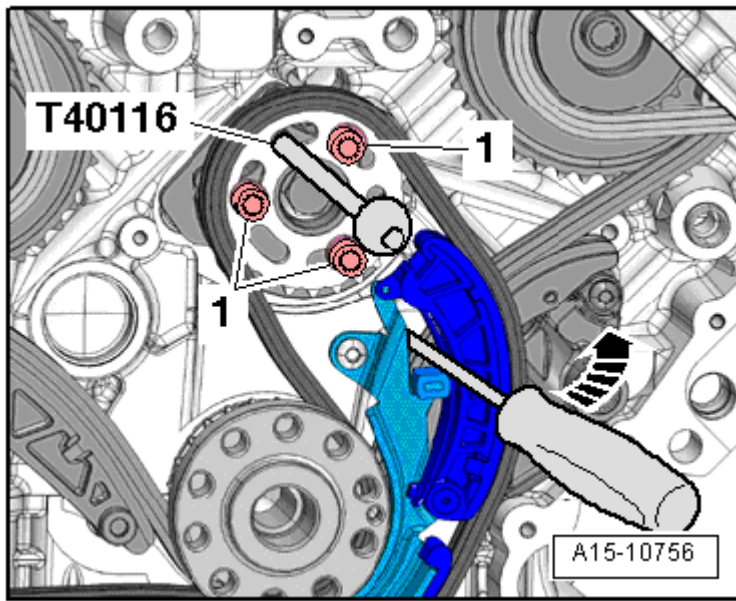


Fig. 147: Locking Balance Shaft In TDC Using T40116
 Courtesy of AUDI OF AMERICA, LLC

-- Lock the balance shaft in the "TDC" position with the T40116.

- The slots in the balance shaft sprocket must be at the middle position in relation to the threaded holes of the balance shaft. If necessary, adjust chain by one tooth.

-- Tighten the chain tensioner bolts.

-- Install the chain sprocket bolts -1- loosely.

- It must still be possible to rotate the chain sprocket on the balance shaft and it must not tip.

-- Remove the T40071 to release the chain tensioner.

-- Press against the chain tensioner guide rail -arrow- with a screwdriver and simultaneously fasten the bolts -1- for the sprocket.

-- Remove the T40116 from the balance shaft.

Install in reverse order of removal paying attention to the following:

-- Install timing chain lower cover. Refer to **LOWER TIMING CHAIN COVER**.

-- Install the locking bolt "TDC" mark crankshaft **Fig. 97**.

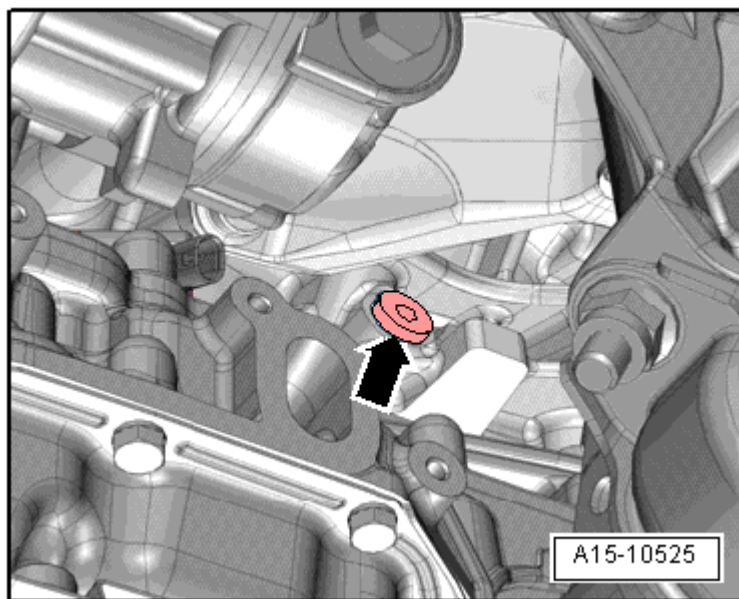


Fig. 148: Identifying Locking Bolt -Arrow-
Courtesy of AUDI OF AMERICA, LLC

RIGHT CYLINDER HEAD COVER

REMOVING

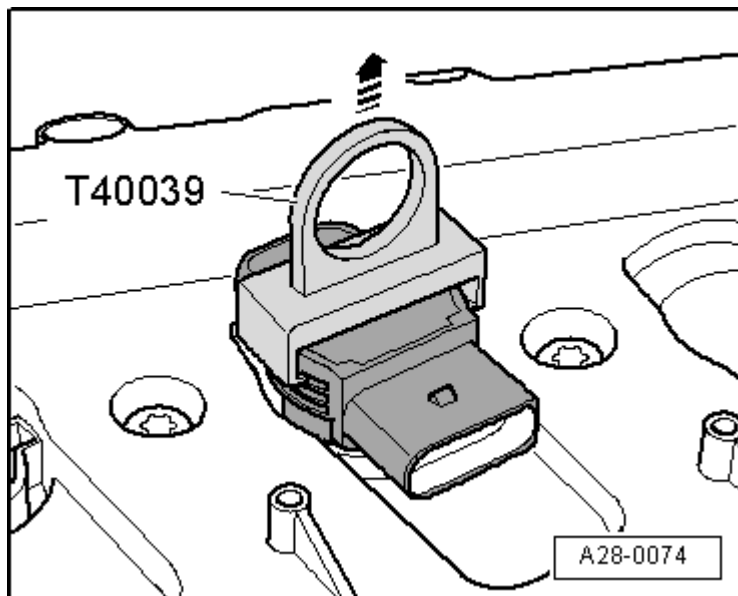


Fig. 149: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

-- Remove ignition coils. Refer to **Removal and Installation** .

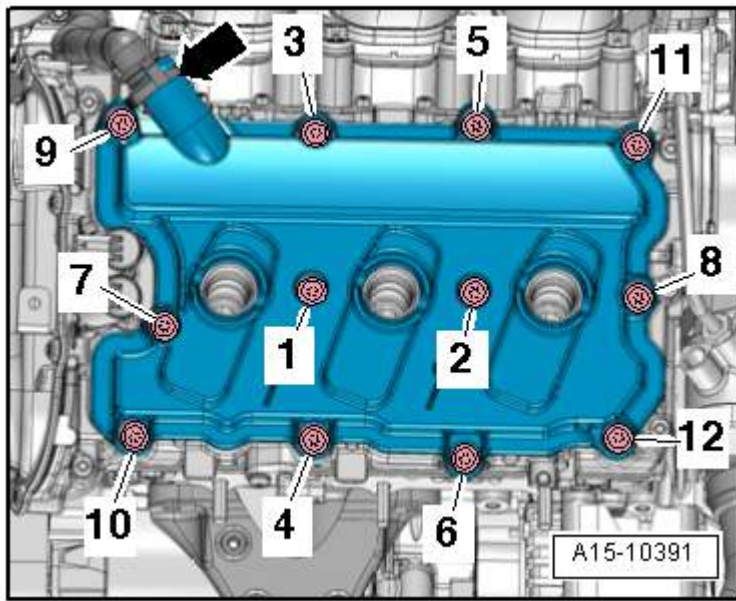


Fig. 150: Identifying Right Cylinder Head Cover Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of violating emissions legislation.

- Do not open the hose connection -arrow-.

-- Remove the bolts in the following sequence -12 to 1- and lay the right cylinder head aside with the crankcase ventilation hose -arrow- connected.

INSTALLING

Install in reverse order of removal. Note the following:

- Tightening specifications, refer to Fig. 6.

NOTE: Replace the cylinder head seal if it is damaged.

Replace the cylinder head cover bolts when replacing the damaged seal.

Replace the O-ring.

-- Clean any oil or grease off the sealing surfaces.

-- Tighten the right cylinder head cover bolts. Refer to Fig. 6.

-- Install ignition coils. Refer to Removal and Installation .

VALVE STEM SEALS, CYLINDER HEAD INSTALLED

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotter Disassembly/Assembly Device VAS 5161 with Guide Plate for FSI Engine VAS 5161/19B
- Adapter T40012
- Drift VAS 5161/3
- Installation Cartridge VAS 5161/8
- Pressure Fork VAS 5161/2
- Installation Fork VAS 5161/5
- Engaging Device VAS 5161/6
- Knurled Screws VAS 5161/12
- Insertion Device VAS 5161/18

Procedure

- Remove the camshafts. Refer to **CAMSHAFTS**.
- Mark the allocation of the roller rocker lever and the hydraulic adjusting elements so they can be installed again.
- If necessary, remove the roller rocker levers with the hydraulic adjusting elements and place them on a clean surface.
- Remove the spark plugs with 3122 B.
- Move piston for respective cylinder to "Bottom Dead Center (DC) position".
- Position the VAS 5161/3 on the valve spring plate and loosen the stuck valve retainers with a plastic mallet.

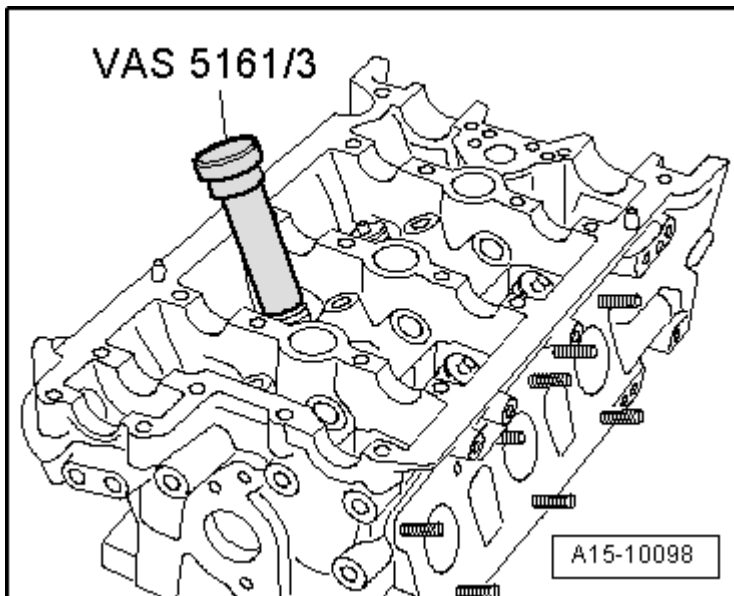


Fig. 151: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

-- Mount the VAS 5161/19B on the cylinder head.

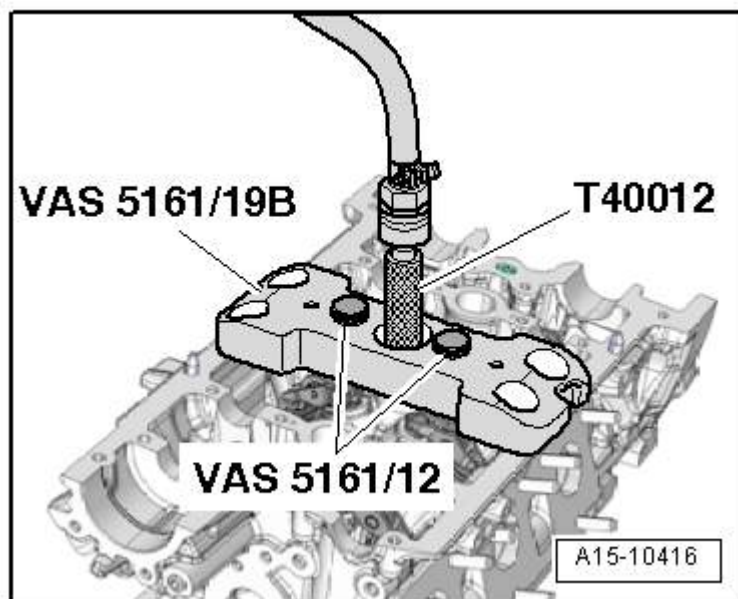


Fig. 152: Identifying VAS 5161/19B

Courtesy of AUDI OF AMERICA, LLC

-- Secure the guide plate with the VAS 5161/12.

-- Install T40012 with sealing ring in respective spark plug thread and hand tighten.

-- Connect the adapter to the compressed air using a commercially available intermediate piece and give steady pressure.

- Minimum pressure: 6 bar positive pressure.

-- Install VAS 5161/6 with VAS 5161/5 in guide plate.

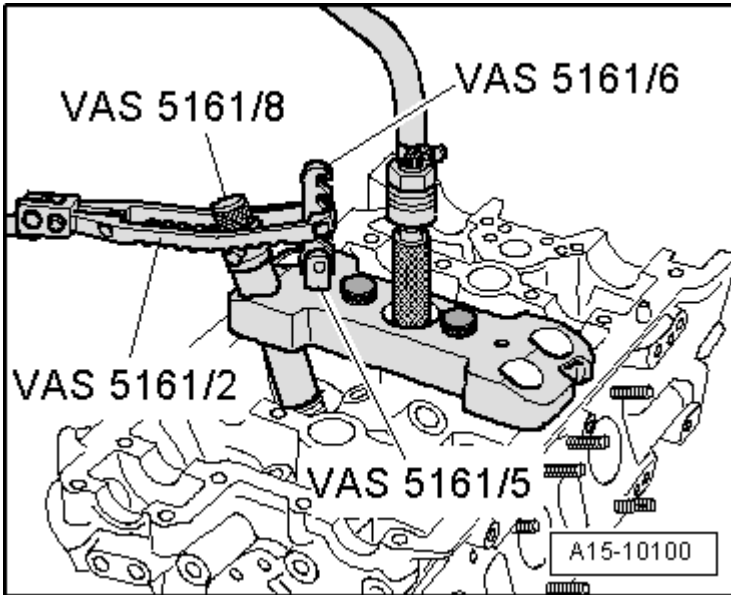


Fig. 153: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

Courtesy of AUDI OF AMERICA, LLC

-- Slide VAS 5161/8 in guide plate.

-- Engage VAS 5161/2 on engaging device and press installation cartridge down.

-- At the same time, rotate installation cartridge knurled screw right until points engage in the valve retainers.

-- Move the knurled wheel left and right slightly. This presses the valve retainers apart and captures them in the installation cartridge.

-- Release the pressure fork.

-- Remove installation cartridge.

-- Unfasten guide plate and turn it aside.

- Pressurized air hose remains connected.

-- Remove the valve spring and the valve spring plate.

-- Remove the valve stem seal with the 3364.

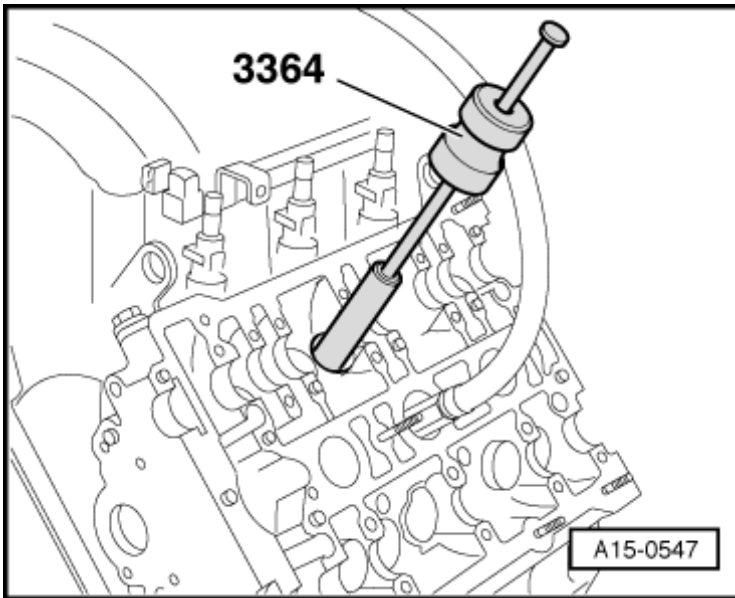


Fig. 154: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

If the 3364 cannot be used, on several valve stem seals due to restricted clearance, proceed as follows:

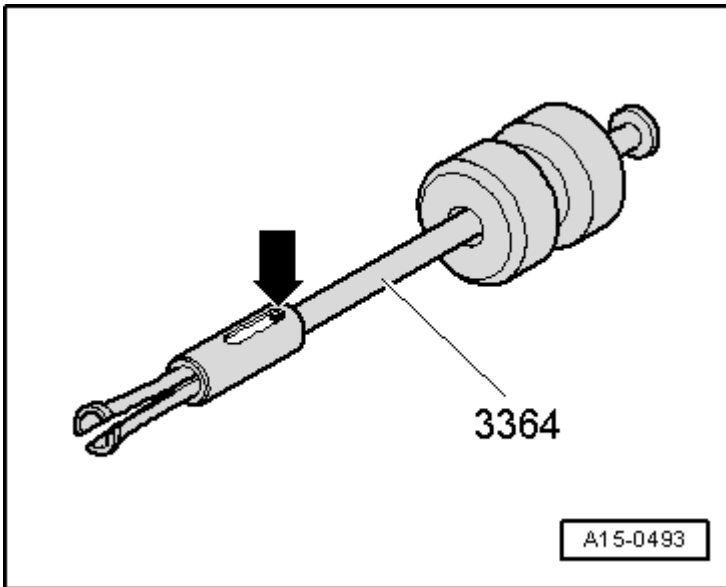


Fig. 155: Driving Out Spring Dowel Sleeve
Courtesy of AUDI OF AMERICA, LLC

- Remove the roll pin -arrow- on the puller with a drift and remove the impact puller attachment.
- Position the lower part of the 3364 on the valve stem seal.

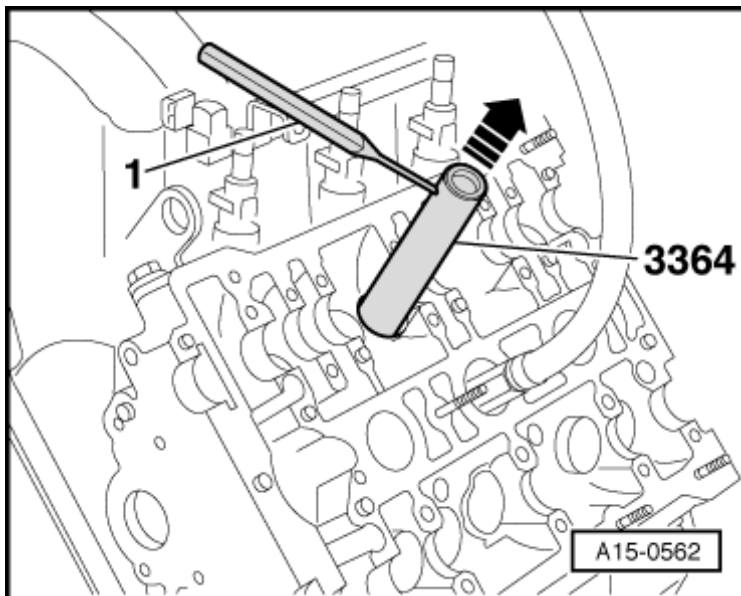


Fig. 156: Positioning Lower Part Of 3364 Valve Stem Removal Tool At Valve Stem Oil Seal
 Courtesy of AUDI OF AMERICA, LLC

- Secure the puller with a drift or cotter pin drive -1- as shown in the illustration.
- Position the valve lever on the puller and remove the valve stem seal -arrow-.

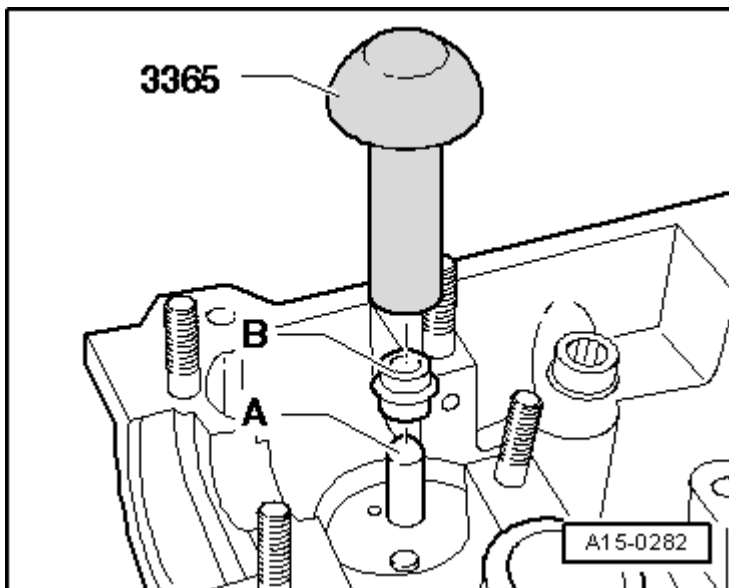


Fig. 157: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of damage when installing valve stem seals.

- Place the plastic sleeve -A- that is attached to the valve stem seals -B- on valve stem.

- Lightly oil valve stem seal.
- Slide valve shaft seal onto plastic sleeve.
- Carefully press valve stem seal onto valve guide with 3365.
- Remove plastic sleeve.

If the valve retainers were removed from the installation cartridge, they must then be inserted into the VAS 5161/18.

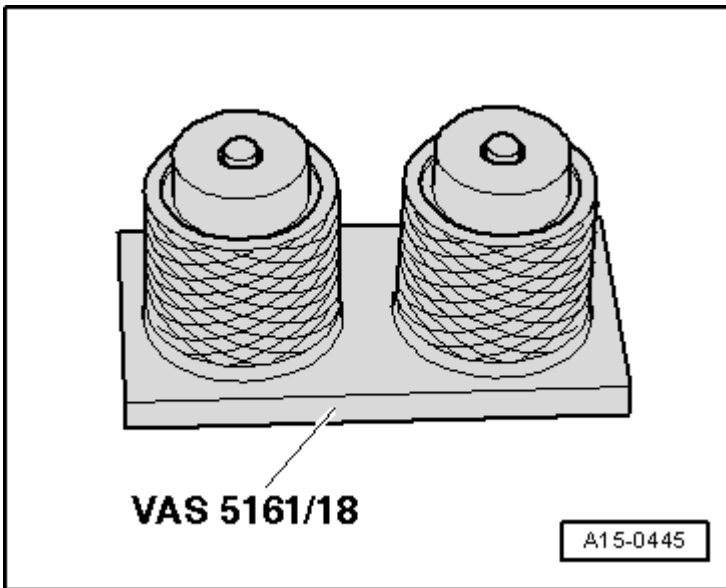


Fig. 158: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

- The large diameter of the valve retainers point upward.
- Press installation cartridge from above onto valve retainer inserting tool and capture retainers.
 - Insert valve spring and valve spring plate.
 - Installed position, valve spring. Refer to **Fig. 19**.
 - Mount the VAS 5161/19B on the cylinder head.

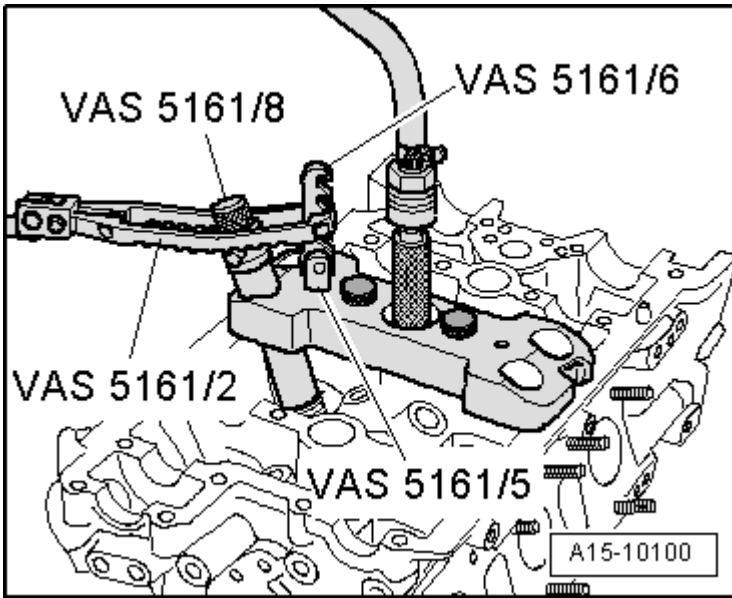


Fig. 159: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

Courtesy of AUDI OF AMERICA, LLC

- Insert installation cartridge in guide plate.
- Press the pressure fork down and pull the knurled screw up while turning left and right. This inserts the valve retainers.
- Release the pressure fork with the knurled screw still raised.
- Repeat the procedure on each valve.

Assembling

Assemble in reverse order of disassembling. Note the following:

- Make sure all the roller rocker levers lie on the ends of the valve stems correctly and are clipped onto the respective hydraulic adjusting elements.
- Install the spark plugs, refer to **MAINTENANCE PROCEDURES**
- Install the camshafts. Refer to **CAMSHAFTS**.

CAUTION: Risk of damaging valves and piston heads after working on the valve train.

- The motor must not be started for about 30 minutes after installing camshafts because the hydraulic equalization elements must seat themselves.
- To ensure valves do not strike pistons when starting, carefully rotate

engine at least 2 full revolutions.

VALVE STEM SEALS WITH CYLINDER HEAD REMOVED, REPLACING

Special tools and workshop equipment required

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotter Disassembly/Assembly Device VAS 5161 A with Guide Plate for FSI Engine VAS 5161/19B
- Drift VAS 5161/3
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tensioning Device VAS 6419
- Pressure Fork VAS 5161/2
- Installation Fork VAS 5161/5
- Engaging Device VAS 5161/6
- Installation Cartridge VAS 5161/8
- Knurled Screws VAS 5161/12

Procedure

-- Remove the camshafts. Refer to **CAMSHAFTS**.

-- Mark the allocation of the roller rocker lever and the hydraulic adjusting elements so they can be installed again.

-- If necessary, remove the roller rocker levers with the hydraulic adjusting elements and place them on a clean surface.

-- Mount the VAS 6419 into the VAS 6095.

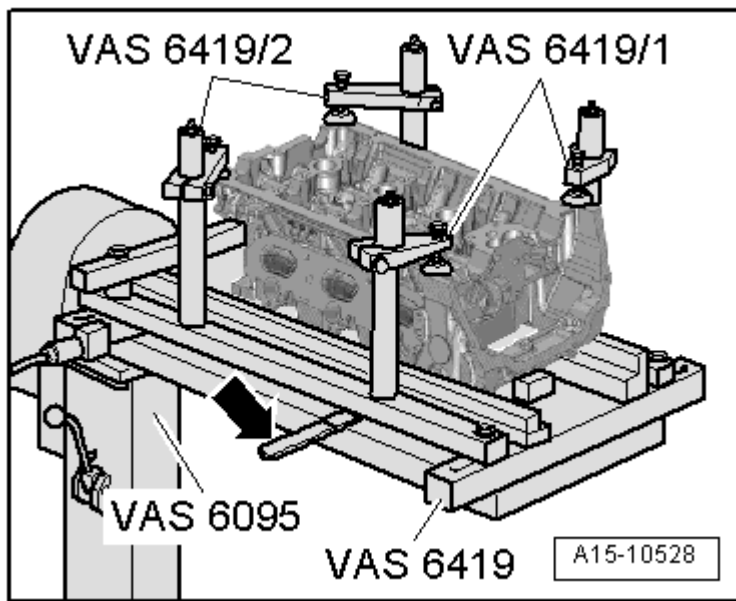


Fig. 160: Tensioning Cylinder Head On Tensioning Element VAS 6419
Courtesy of AUDI OF AMERICA, LLC

- Tension the cylinder head on the cylinder head tensioning device, as illustrated.
- Connect the cylinder head tensioning device to the compressed air.
- Slide the air cushion with the lever -arrow- under the combustion chambers onto the valve stem seal that will be removed.
- Let enough compressed air flow into the air cushion until it contacts the valve plate.
- Position the VAS 5161/3 on the valve spring plate and loosen the stuck valve retainers with a plastic mallet.

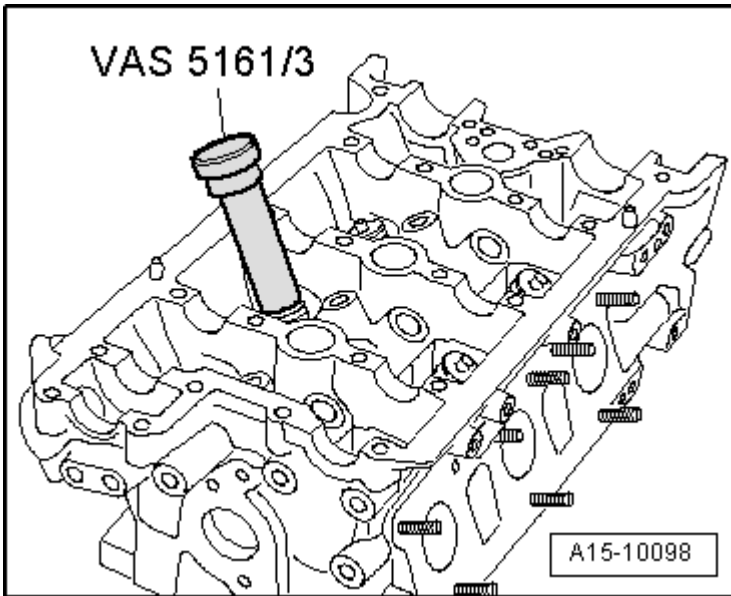


Fig. 161: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

-- Mount the VAS 5161/19B on the cylinder head.

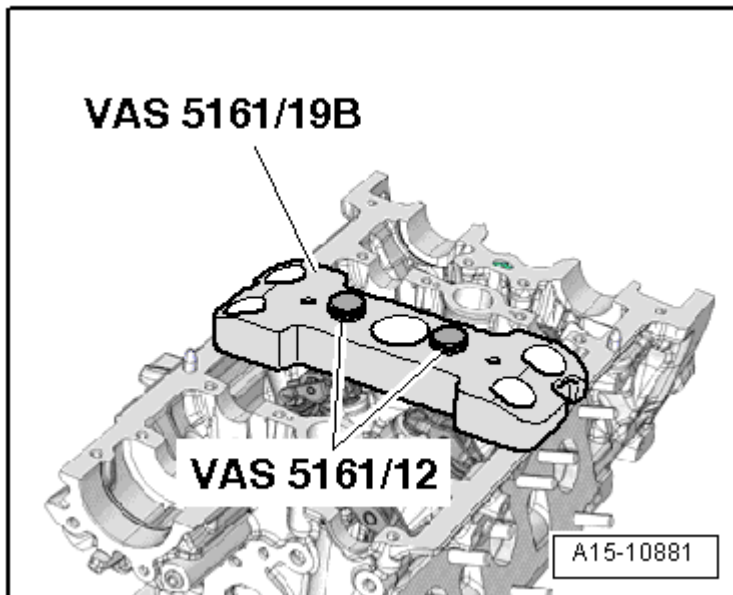


Fig. 162: Identifying VAS 5161/12

Courtesy of AUDI OF AMERICA, LLC

-- Secure the guide plate with the VAS 5161/12.

-- Install VAS 5161/6 with VAS 5161/5 in guide plate.

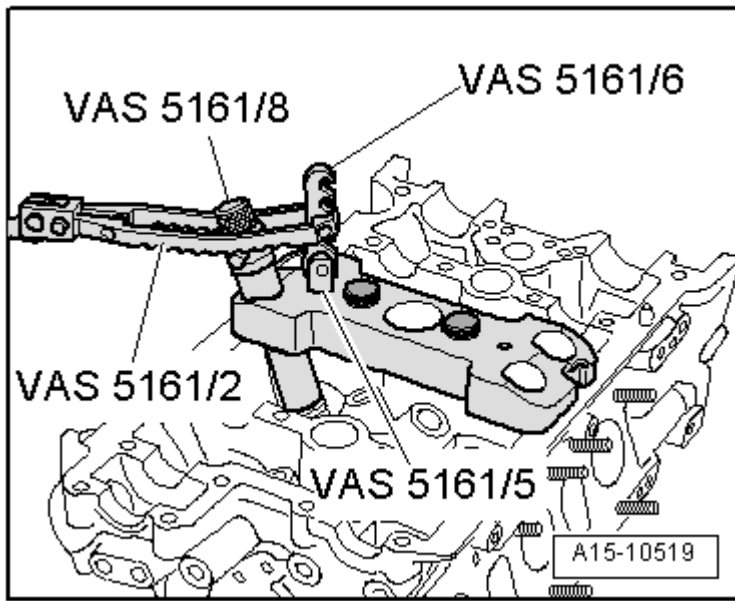


Fig. 163: Identifying Engaging Device VAS 5161/6, Installation Fork VAS 5161/5 And Guide Plate, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

- Slide VAS 5161/8 in guide plate.
- Engage VAS 5161/2 on engaging device and press installation cartridge down.
- At the same time, rotate installation cartridge knurled screw right until points engage in valve retainers.
- Move the knurled wheel left and right slightly. This presses the valve retainers apart and captures them in the installation cartridge.
- Release the pressure fork.
- Remove installation cartridge.
- Unfasten guide plate and turn it aside.
- Remove the valve spring and the valve spring plate.
- Remove the valve stem seal with the 3364.

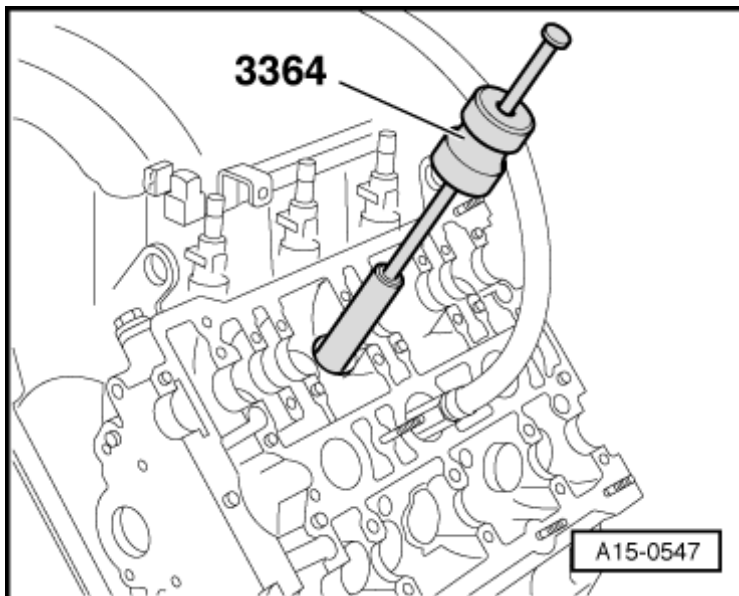


Fig. 164: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

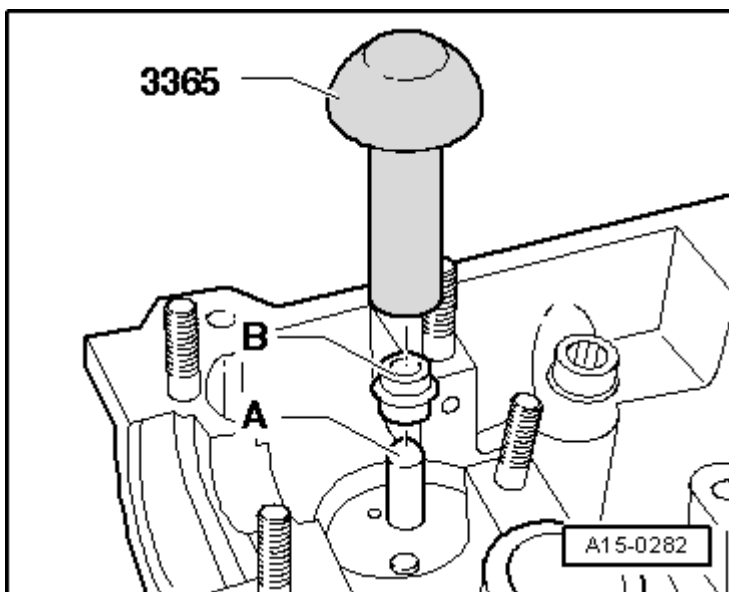


Fig. 165: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of damage when installing valve stem seals.

- Place plastic sleeve -A- that is attached to valve stem seals -B- on valve stem.

-- Lightly oil valve stem seal.

-- Slide valve shaft seal onto plastic sleeve.

-- Carefully press valve stem seal onto valve guide with 3365.

-- Remove plastic sleeve.

When the valve retainers were removed from the installation cartridge, they must be inserted in the valve retainer inserting tool next VAS 5161/18.

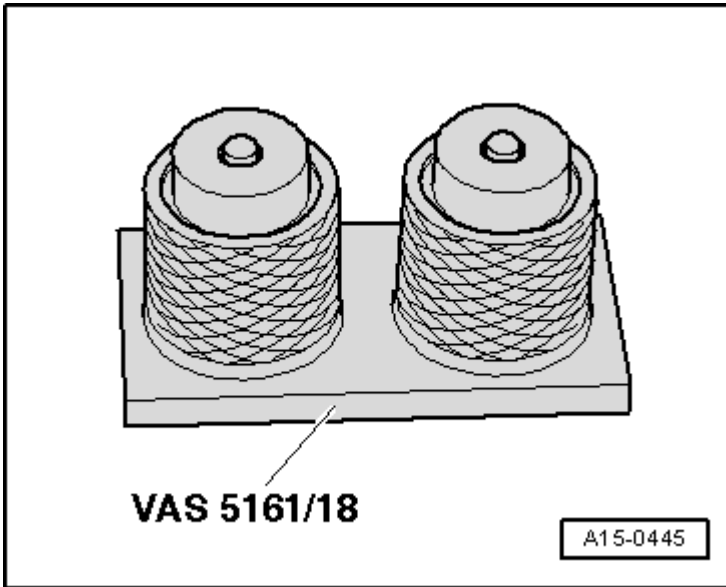


Fig. 166: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

- The large diameter of the valve retainers point upward.

-- Press installation cartridge from above onto valve retainer inserting tool and capture retainer.

-- Insert valve spring and valve spring plate.

- Installed position, valve spring, refer to **Fig. 19**.

-- Mount the VAS 5161/19B on the cylinder head.

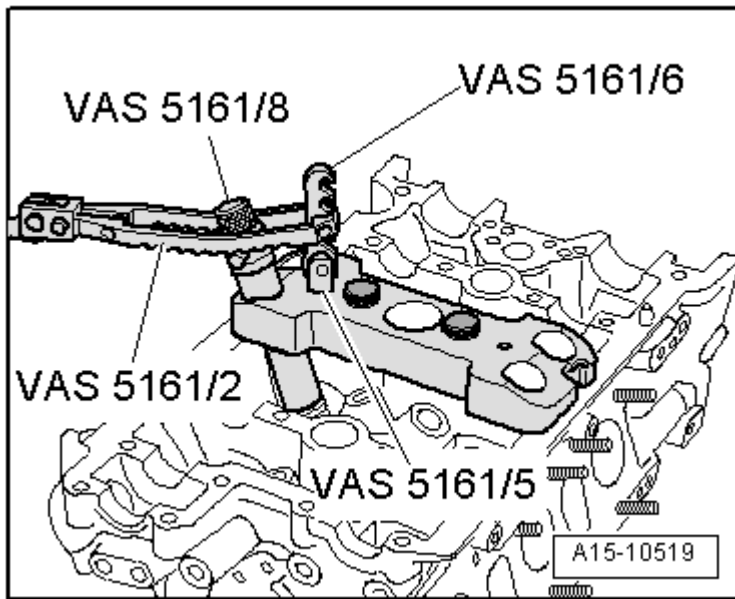


Fig. 167: Identifying Engaging Device VAS 5161/6, Installation Fork VAS 5161/5 And Guide Plate, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

- Insert installation cartridge in the guide plate.
- Press the pressure fork down and pull the knurled screw up while turning left and right. This inserts the valve retainers.
- Release the pressure fork with the knurled screw still raised.
- Repeat the procedure on each valve.

Assembling

Assemble in reverse order of disassembling. Note the following:

- Make sure all the roller rocker levers lie on the ends of the valve stems correctly and are clipped onto the respective hydraulic adjusting elements.
- Install the camshafts. Refer to **CAMSHAFTS**.

SPECIAL TOOLS

2012 Audi S4

ENGINE 3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

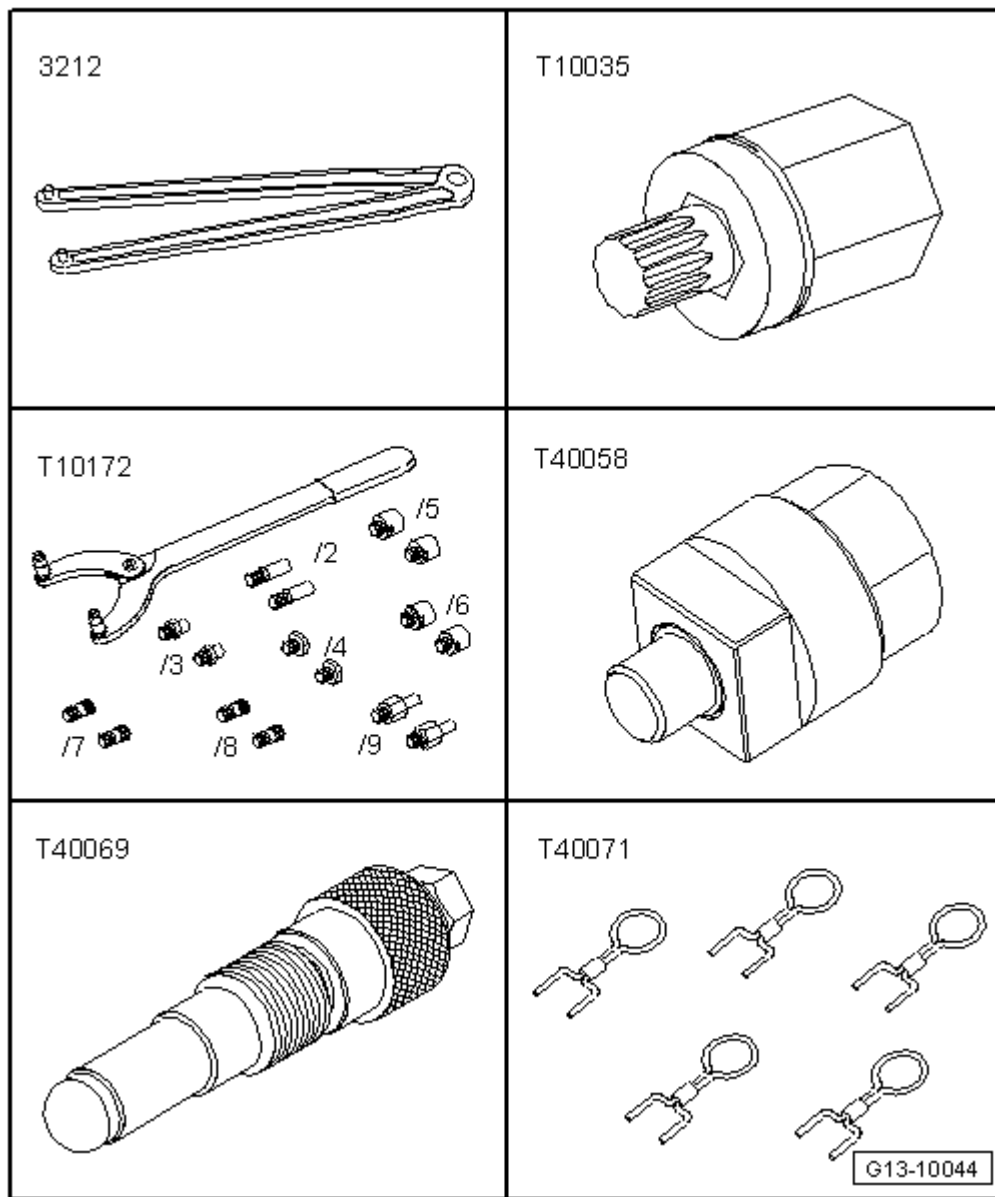


Fig. 168: Special Tools And Workshop Equipment (1 Of 3)

Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spanner Wrench 3212
- Multipoint Socket T10035
- Counterhold Tool Touareg V10 T10172 with Adapter T10172/2
- Socket T40058
- Locking Pin T40069
- Locking Pin T40071, quantity: 2

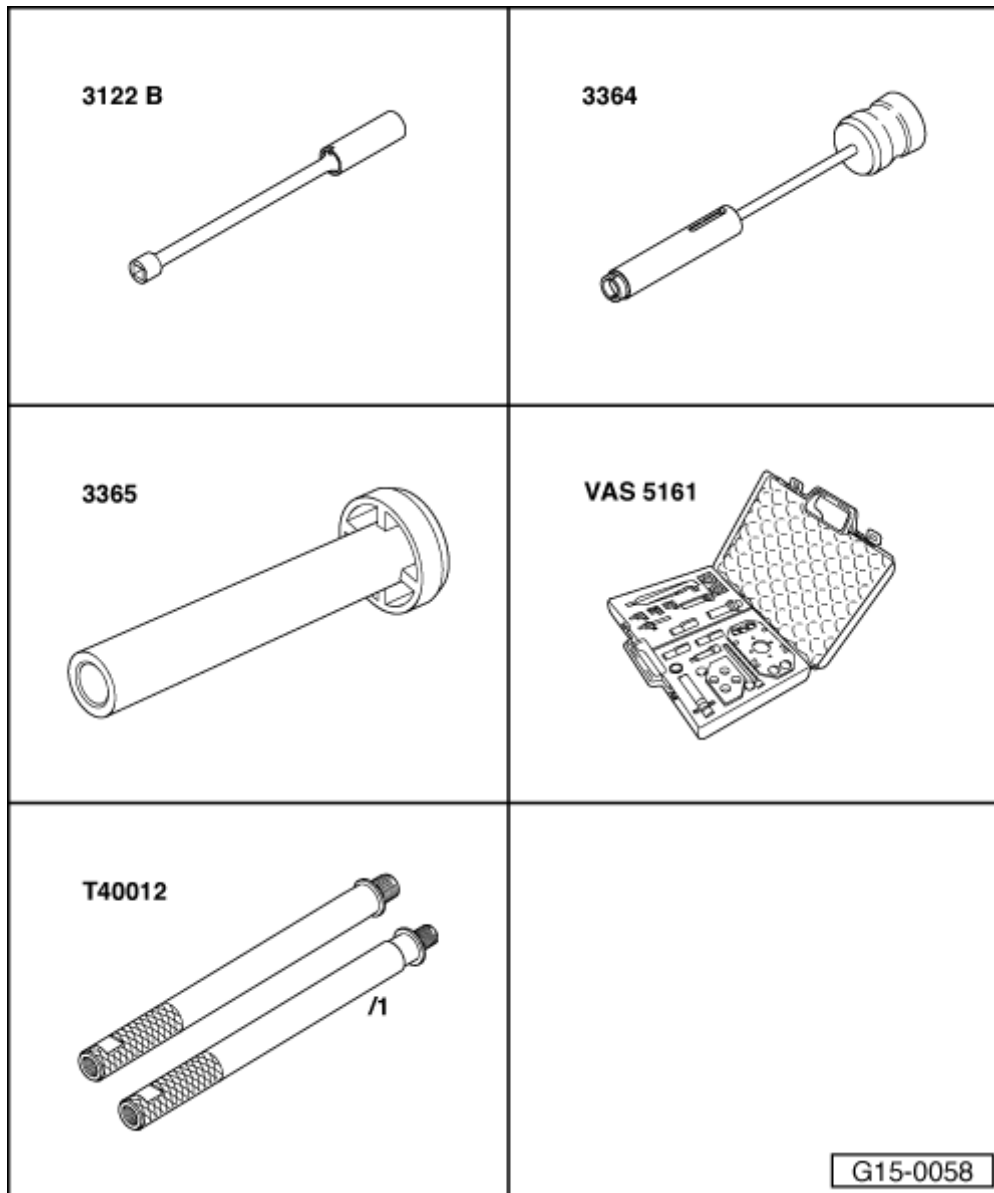


Fig. 169: Special Tools And Workshop Equipment (2 Of 3)

Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotter Disassembly/Assembly Device VAS 5161 with Guide Plate for FSI Engine VAS 5161/19B
- Adapter T40012

2012 Audi S4

ENGINE 3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

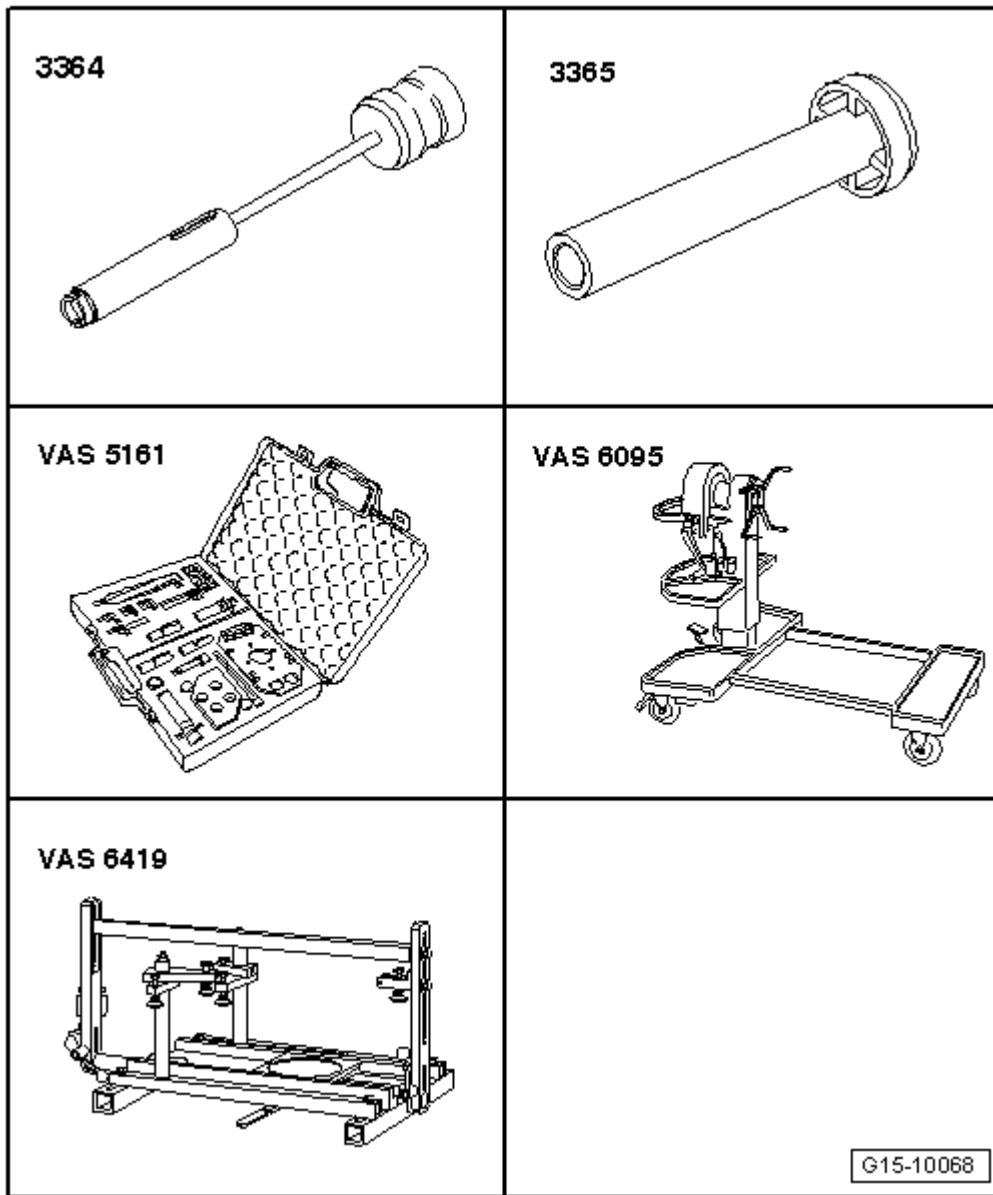


Fig. 170: Special Tools And Workshop Equipment (3 Of 3)

Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotter Disassembly/Assembly Device VAS 5161 A with Guide Plate for FSI Engine VAS 5161/19B
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tensioning Device VAS 6419

Special tools and workshop equipment required

- Impact Puller T10133/3 from the Tool Set T10133

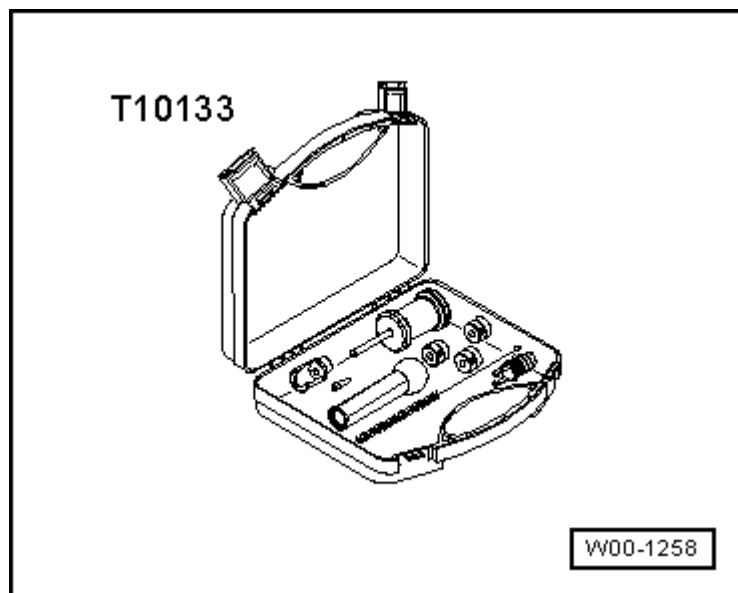


Fig. 171: Identifying Tool Set T10133
Courtesy of AUDI OF AMERICA, LLC

- Key T40049

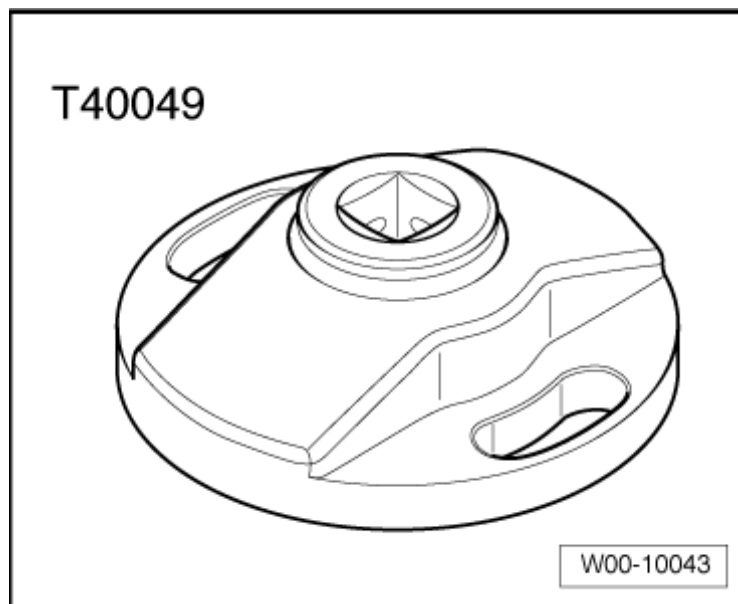


Fig. 172: Identifying Key T40049
Courtesy of AUDI OF AMERICA, LLC

- Socket T40058

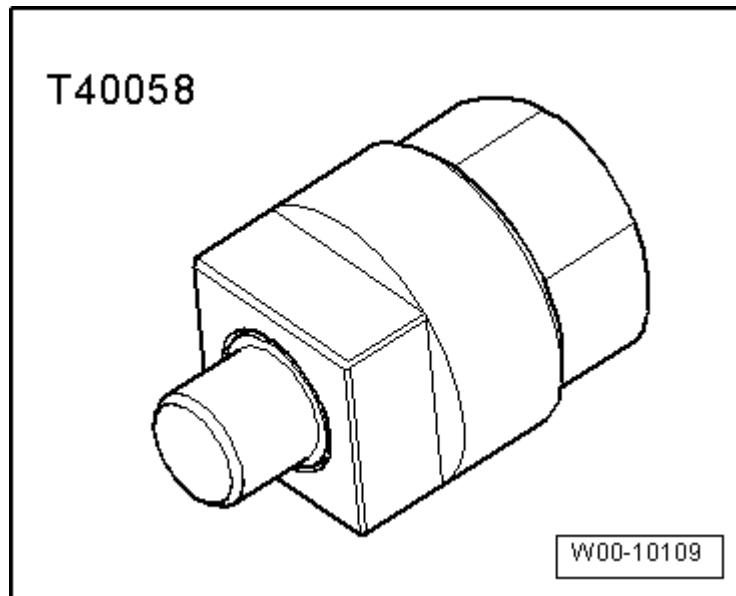


Fig. 173: Identifying Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- Locating Pins T40116

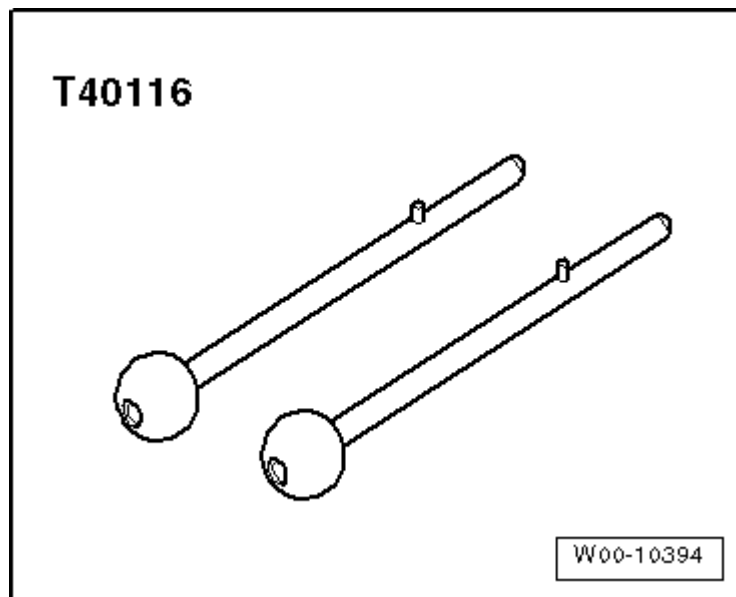


Fig. 174: Locating Pins T40116
Courtesy of AUDI OF AMERICA, LLC

- Camshaft Clamp T40133, quantity: 2

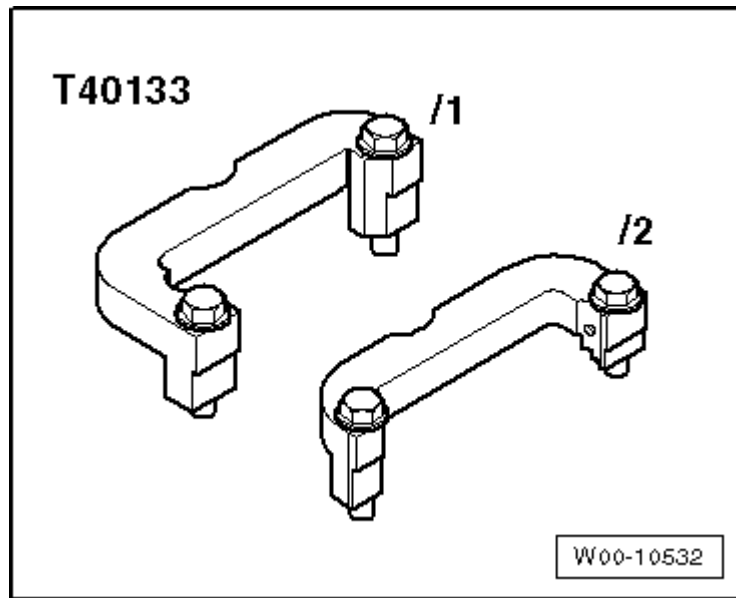


Fig. 175: Identifying Camshaft Clamp T40133
Courtesy of AUDI OF AMERICA, LLC

- Compression Tester V.A.G 1763

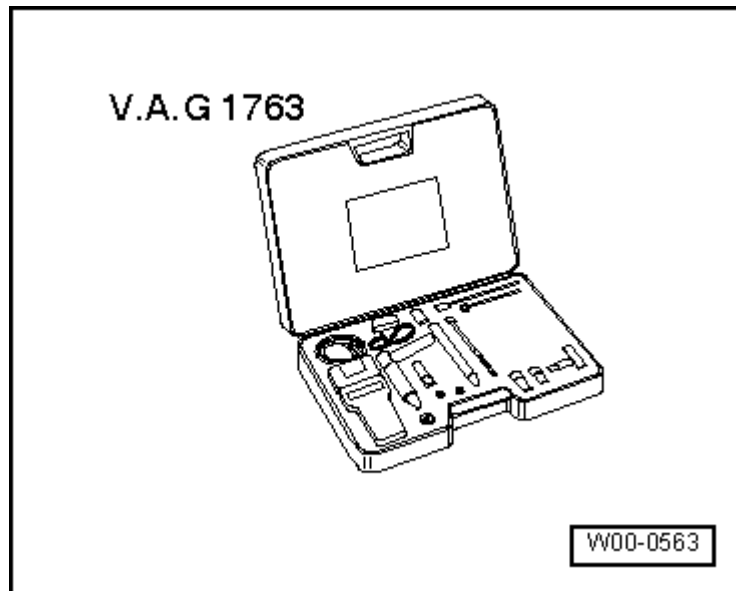


Fig. 176: Identifying Compression Tester V.A.G 1763
Courtesy of AUDI OF AMERICA, LLC

- Oil Collecting and Extracting Device V.A.G 1782

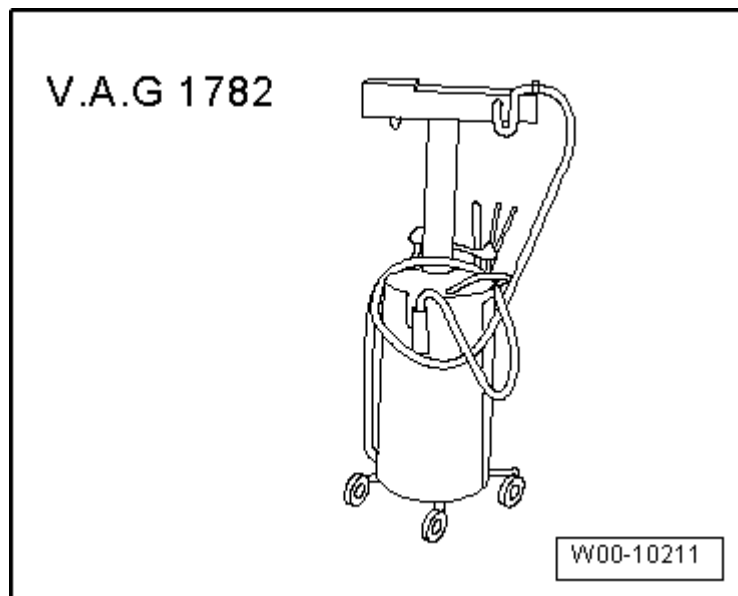


Fig. 177: Identifying Oil Extractor V.A.G 1782
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge 0-10 mm VAS 6079

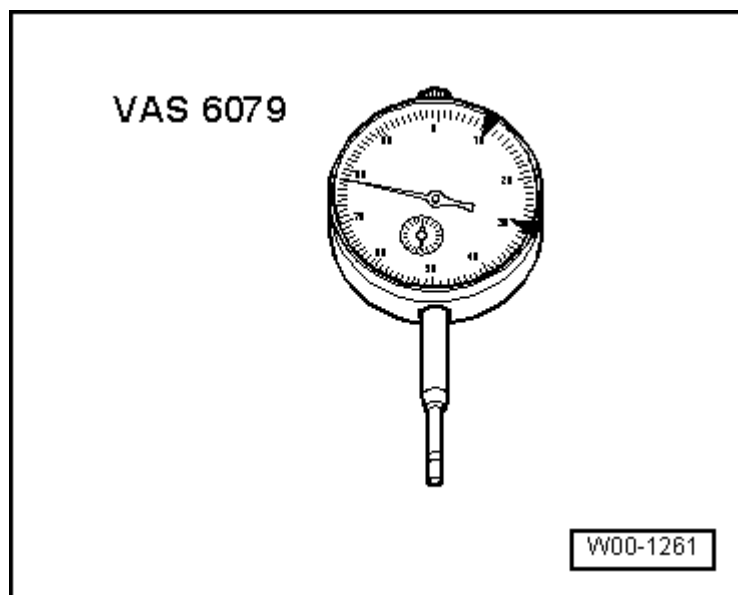


Fig. 178: Identifying Dial Gauge VAS 6079
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge 0-3 mm VAS 6080

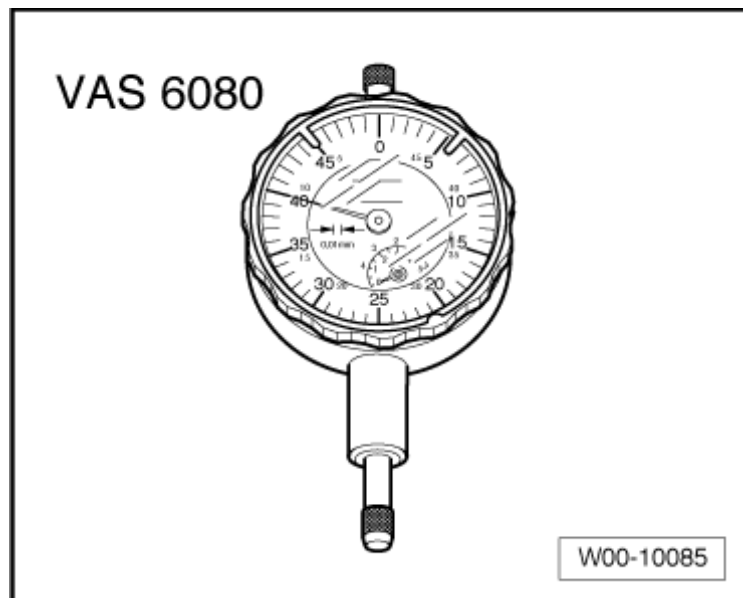


Fig. 179: Identifying Dial Gauge VAS 6080
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge Holder VW 387

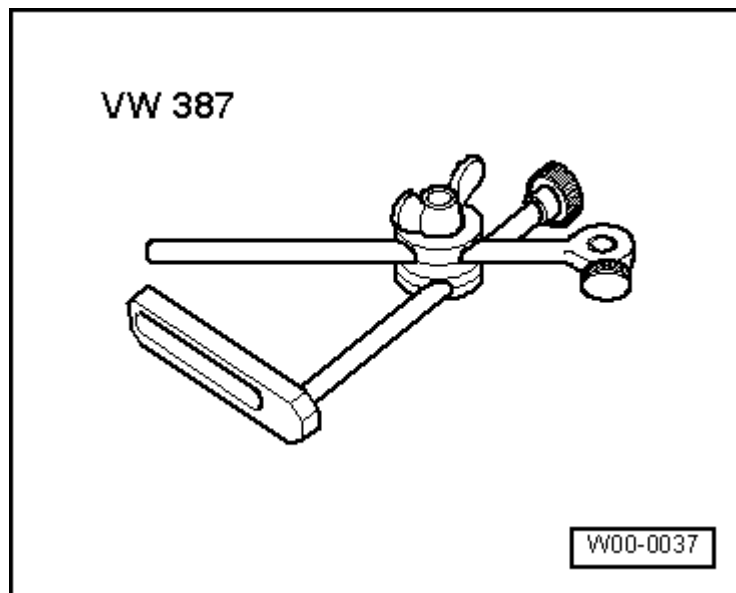


Fig. 180: Identifying Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Not illustrated:
- Locking Pin T40069
- Locking Pin T40071
- Pressure Fork VAS 5161/2
- Drift VAS 5161/3

2012 Audi S4

ENGINE 3.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CCBA (Sedan)

- Installation Fork VAS 5161/5
- Engaging Device VAS 5161/6
- Installation Cartridge VAS 5161/8
- Knurled Screws VAS 5161/12
- Insertion Device VAS 5161/18
- Straight Edge 500 mm VAS 6075