

ENGINE

2.0 Liter - Cylinder Head, Valvetrain - Engine Code(s): CAEB (Avant)

15 CYLINDER HEAD, VALVETRAIN

GENERAL INFORMATION

CYLINDER HEAD, SCREWDRIVER ACCESS

Screwdriver Access

Camshafts with screwdriver access have notches -arrows- in the camshafts.

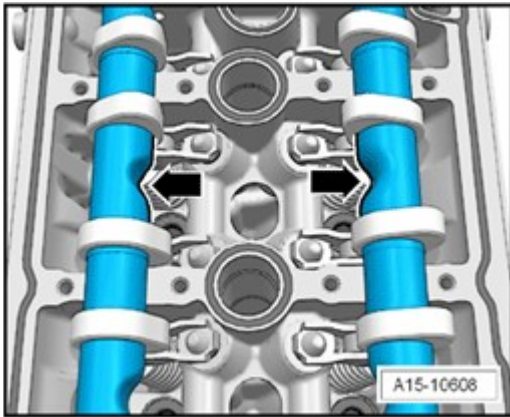


Fig. 1: Identifying Camshaft Recesses
Courtesy of AUDI OF AMERICA, LLC

Camshafts without screwdriver access do not have notches in the camshafts.

To check, turn the plugs -arrows- 90° counter clockwise in the direction of the -arrow- and remove them.

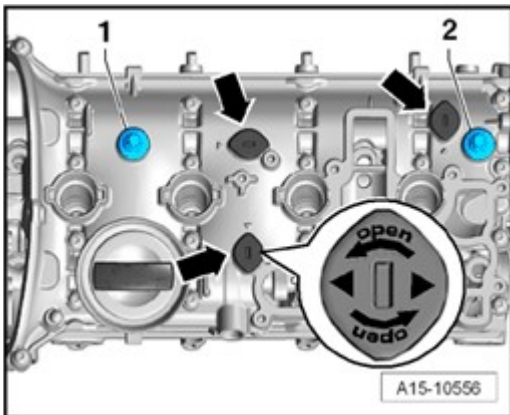


Fig. 2: Identifying Turning Plugs 90° Counter Clockwise
Courtesy of AUDI OF AMERICA, LLC

DESCRIPTION AND OPERATION

TIMING CHAIN GUARDS, CAMSHAFT ADJUSTMENT VALVE 1 -N205- OVERVIEW

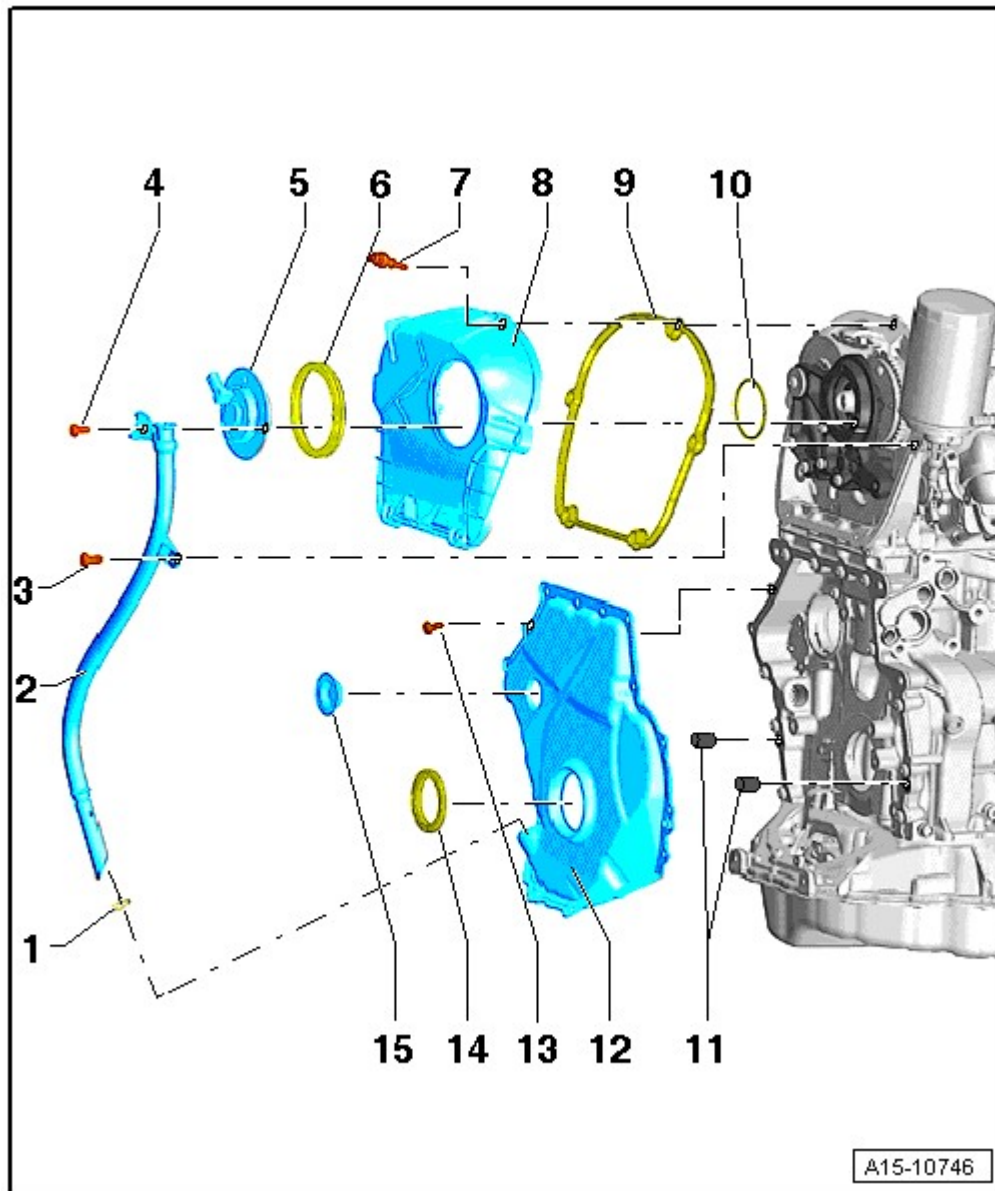


Fig. 3: Identifying Assembly Overview: Timing Chain Covers
 Courtesy of AUDI OF AMERICA, LLC

1. O-ring
 - Replace
 - Oil before assembling
2. Guide Tube for Oil Dipstick
3. Bolt
 - 9 Nm

4. Bolt
 - 9 Nm
5. Camshaft Adjustment Valve 1 -N205-
 - Removing and installing, refer to **Camshaft Adjustment Valve 1 -N205-**
6. Seal
 - Oil before assembling
 - Replace if damaged
7. Bolt
 - Tightening sequence, refer to **Fig. 4**
8. Upper Timing Chain Cover
 - Removing and installing, refer to **Fig. 4**
9. Gasket
 - Replace if damaged
10. O-ring
 - Replace
 - Oil before assembling
11. Alignment Pins
 - Centering the cover
12. Lower Timing Chain Cover
 - Replace, refer to **LOWER TIMING CHAIN COVER**
13. Bolt
 - Replace
 - Tightening sequence with 15 bolts, refer to **Fig. 5**
 - Tightening sequence with 8 bolts, refer to **Fig. 6**
14. Shaft Seal
 - For the vibration damper
 - Removing and installing, refer to **VIBRATION DAMPER SHAFT SEAL**
15. Sealing Plugs
 - Replace

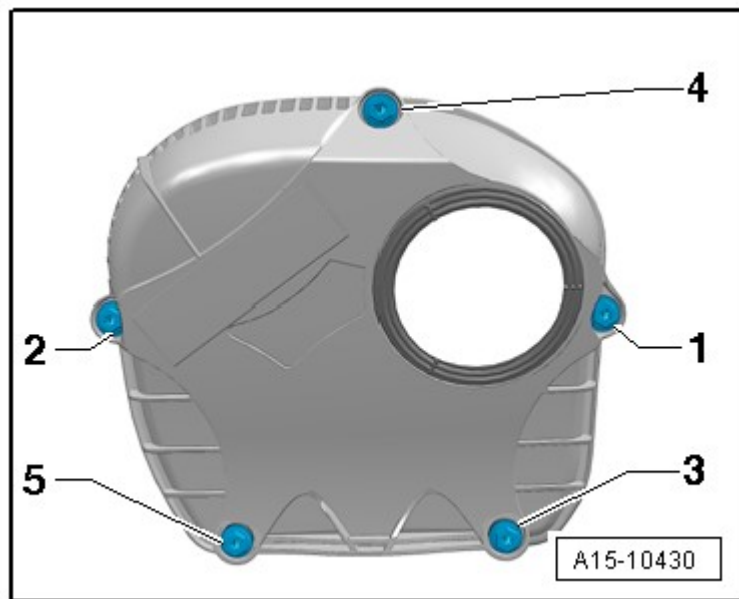


Fig. 4: Identifying Upper Timing Chain Cover - Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts -1 through 5- in the sequence shown:

-- Tighten the bolts to 9 Nm.

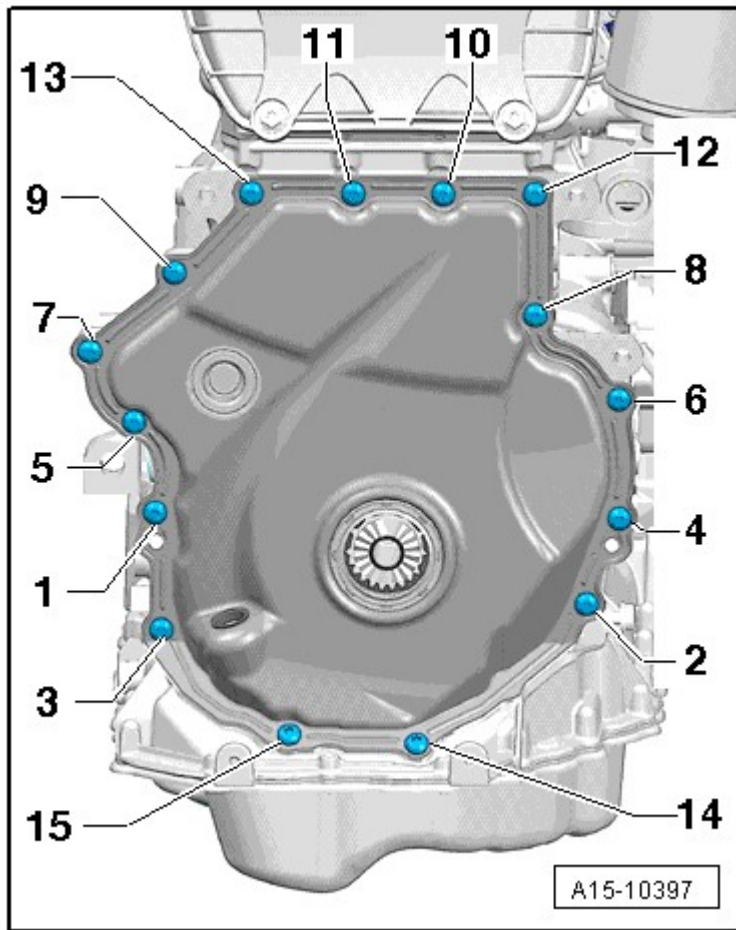


Fig. 5: Identifying Timing Chain Lower Cover Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

- Tighten the bolts -1 through 15- in 2 stages in the sequence shown:
- 1. Tighten the bolts to 8 Nm.
- 2. Tighten the bolts an additional 45°.

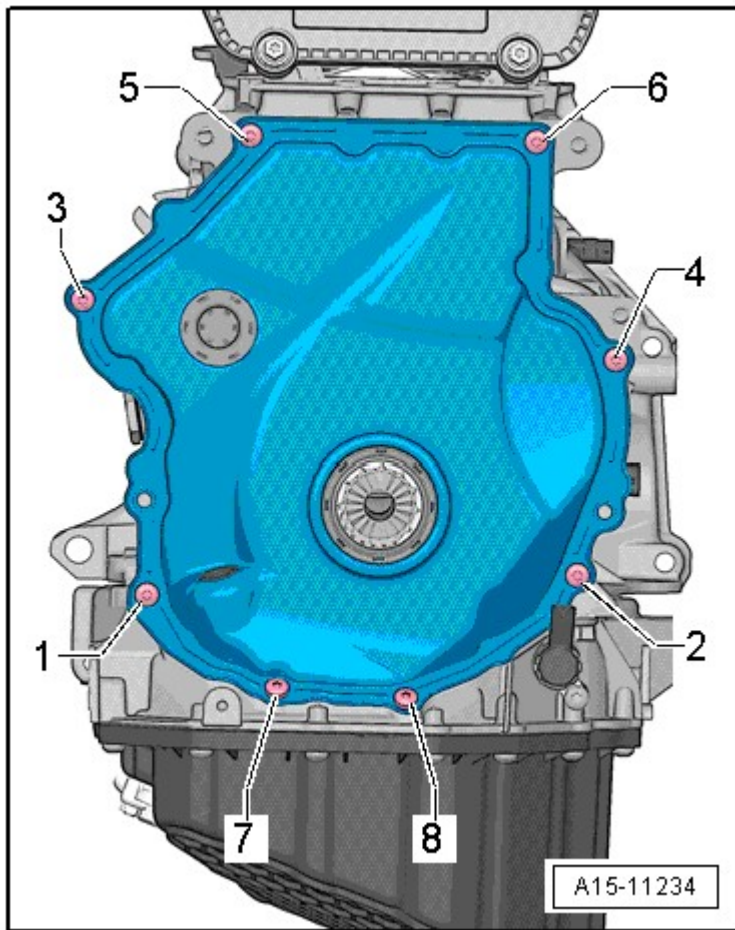


Fig. 6: Identifying Timing Chain Guard Lower Section - Tightening Sequence for 8 Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts -1 through 8- in 2 stages in the sequence shown:

-- 1. Tighten the bolts to 4 Nm.

-- 2. Tighten the bolts an additional 45°.

CAMSHAFT TIMING CHAIN OVERVIEW

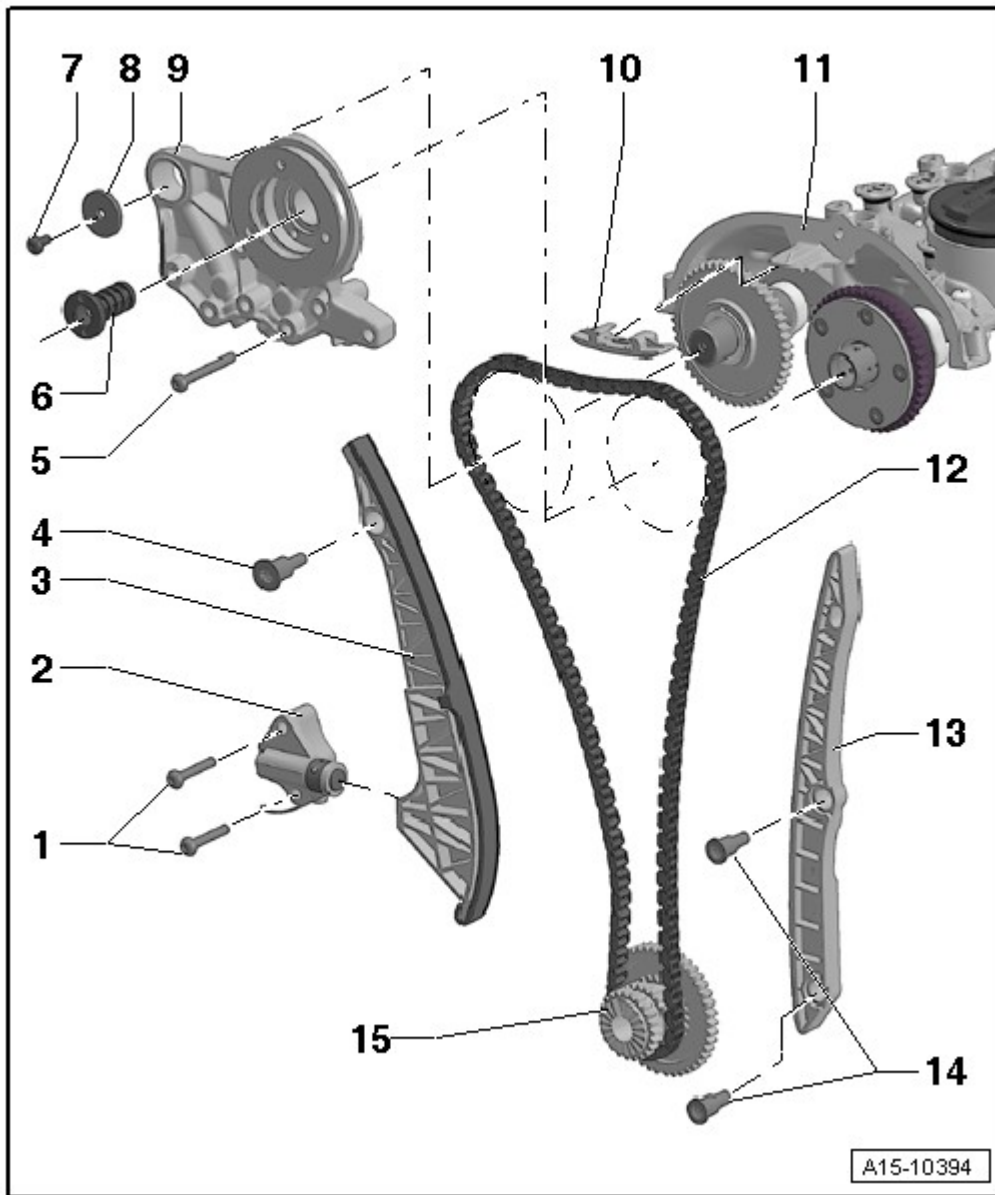


Fig. 7: Identifying Assembly Overview: Camshaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - 9 Nm
2. Chain Tensioner
 - Is under tension
 - Disconnect the locking pinT40011 before removing
3. Timing Chain Tensioning Rail
4. Guide Pins
 - 20 Nm
5. Bolt

- 9 Nm
6. Control Valve
 - 35 Nm
 - Left thread
 - Remove using the assembly tool T10352 or assembly tool T10352/1 depending on the version
 7. Bolt
 - 20 Nm + 90° turn
 - Replace
 8. Washer
 9. Bearing Bracket
 10. Camshaft Timing Chain Guide Rail
 11. Camshaft Housing
 12. Camshaft Timing Chain
 - Before removing, mark the direction of rotation with paint
 13. Camshaft Timing Chain Guide Rail
 14. Guide Pins
 - 20 Nm
 15. Three Stage Chain Sprocket
 - Crankshaft
 - Installed location, refer to **Fig. 8**

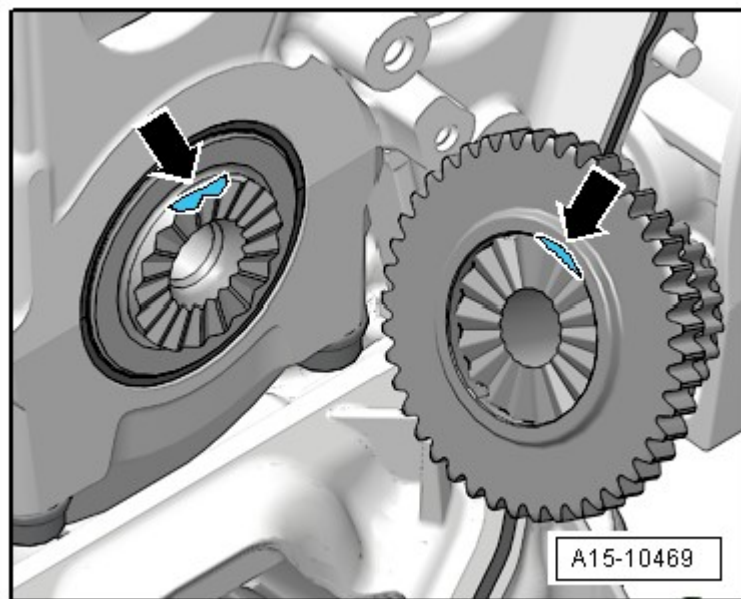


Fig. 8: Chain Sprocket Crankshaft, Installation Position
Courtesy of AUDI OF AMERICA, LLC

- Both surfaces must line up -arrows- across from each other.

BALANCE SHAFT TIMING CHAIN OVERVIEW

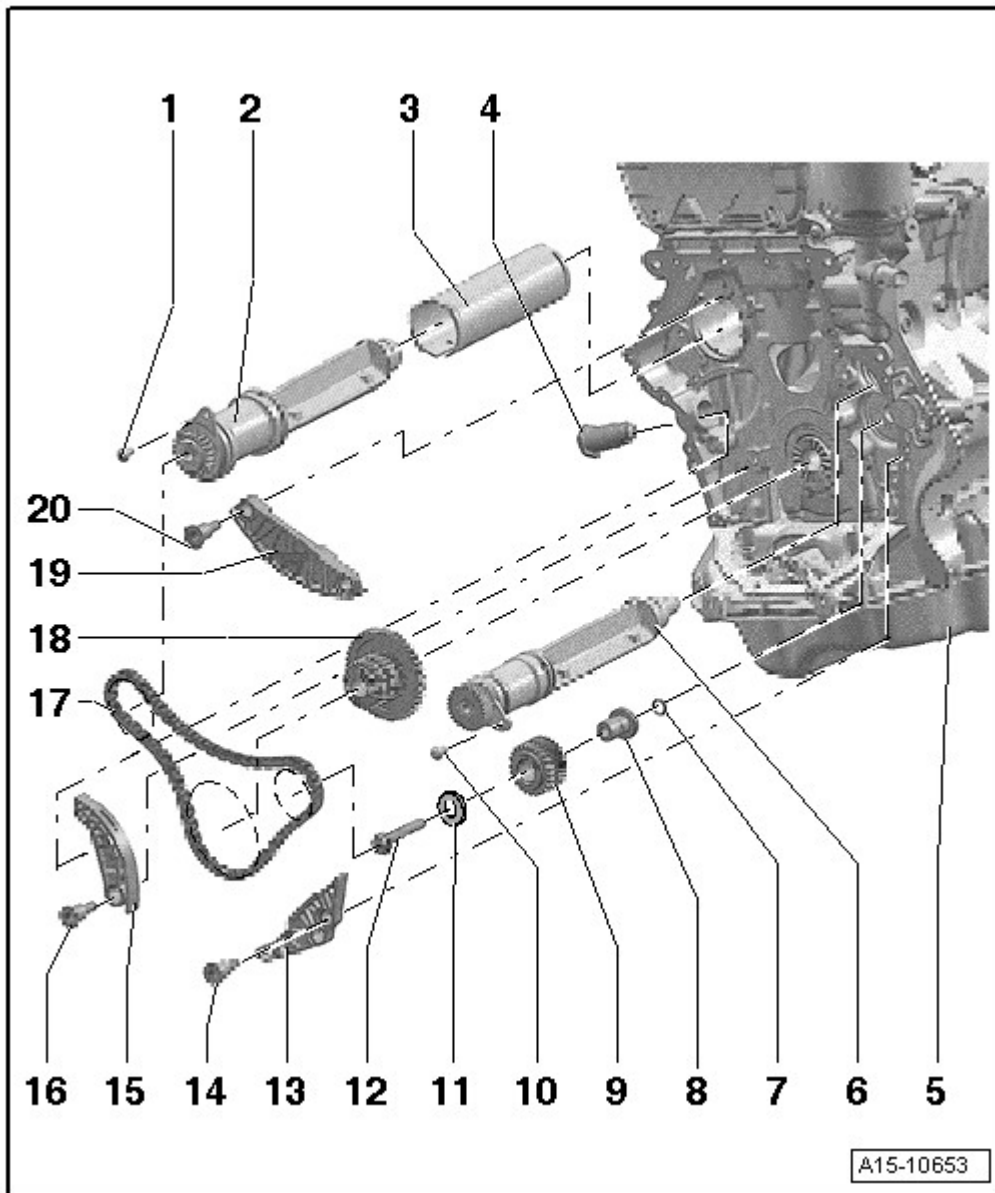


Fig. 9: Identifying Assembly Overview: Balance Shaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - 9 Nm
 - Replace
2. Balance Shaft
 - Exhaust side
 - Must be replaced after removing
 - Lubricate the bearing with engine oil

- Removing and installing, refer to **EXHAUST CAMSHAFT BALANCE SHAFT.**
- 3. Pipe for the Balance Shaft
 - Installed location, refer to **Fig. 10**
- 4. Chain Tensioner
 - 85 Nm
- 5. Cylinder Block
- 6. Balance Shaft
 - Intake side
 - Must be replaced after removing
 - Lubricate the bearing with engine oil
 - Removing and installing, refer to **INTAKE CAMSHAFT BALANCE SHAFT.**
- 7. O-ring
 - Lubricate with engine oil
- 8. Mounting Pin
 - Lubricate with engine oil
 - Installed location, refer to **Fig. 11**
- 9. Intermediate Sprocket
 - The intermediate sprocket must be replaced if the bolt is loosened.
- 10. Bolt
 - Replace
 - 9 Nm
- 11. Washer
- 12. Bolt
 - Replace
 - The intermediate sprocket must be replaced if the bolt is loosened.
 - Tightening sequence, refer to **Fig. 12**
- 13. Guide Rail
 - For timing chain
- 14. Guide Pins
 - 20 Nm
- 15. Tensioning Rail
 - For timing chain
- 16. Guide Pins
 - 20 Nm
- 17. Timing Chain
 - Removing and installing, refer to **BALANCE SHAFT TIMING CHAIN**
- 18. Three Stage Chain Sprocket
 - Installed location, refer to **Fig. 8.**

19. Guide Rail
 - For the balance shaft timing chain
20. Guide Pins
 - 20 Nm

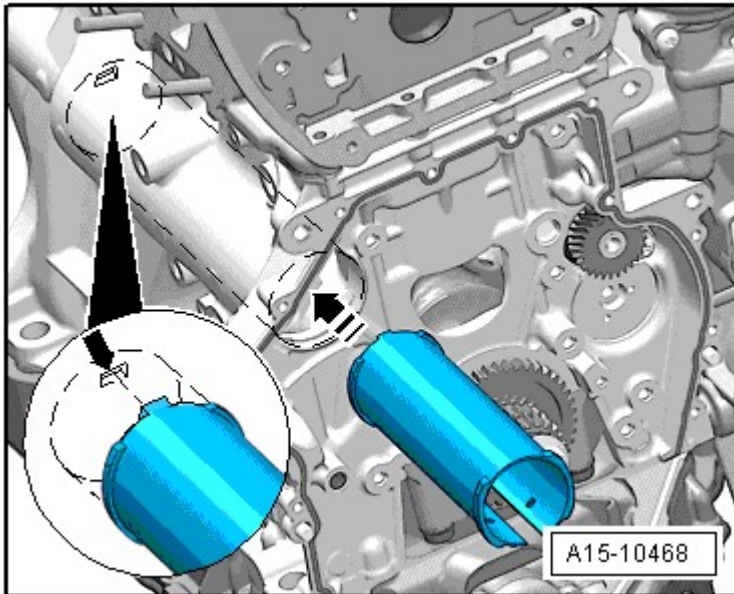


Fig. 10: Identifying Pipe For Balance Shaft - Installation Position
Courtesy of AUDI OF AMERICA, LLC

- The pin from the balance shaft pipe must fit into the groove -arrow-

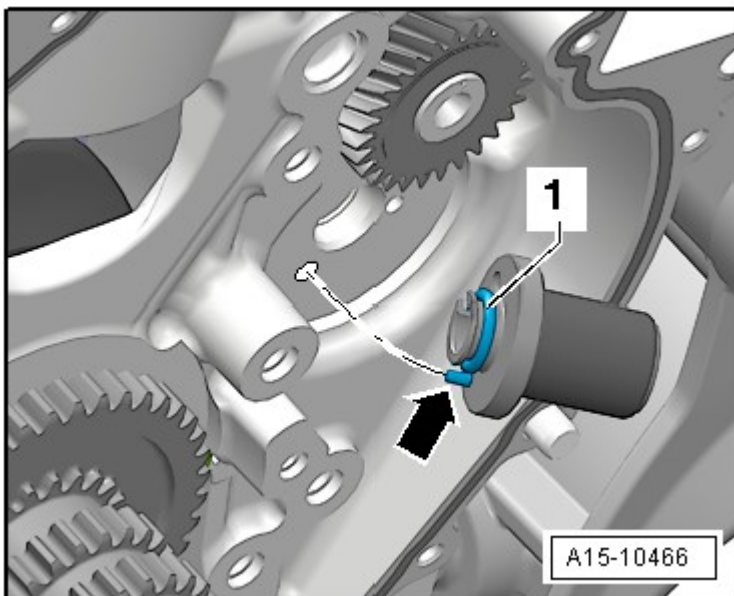


Fig. 11: Identifying Bearing Pins, Installation Position
Courtesy of AUDI OF AMERICA, LLC

- Replace and lubricate the O-ring -1-
- The alignment pin -arrow- for the bearing pins must engage in the hole in the cylinder block.
- Lubricate the bearing pins

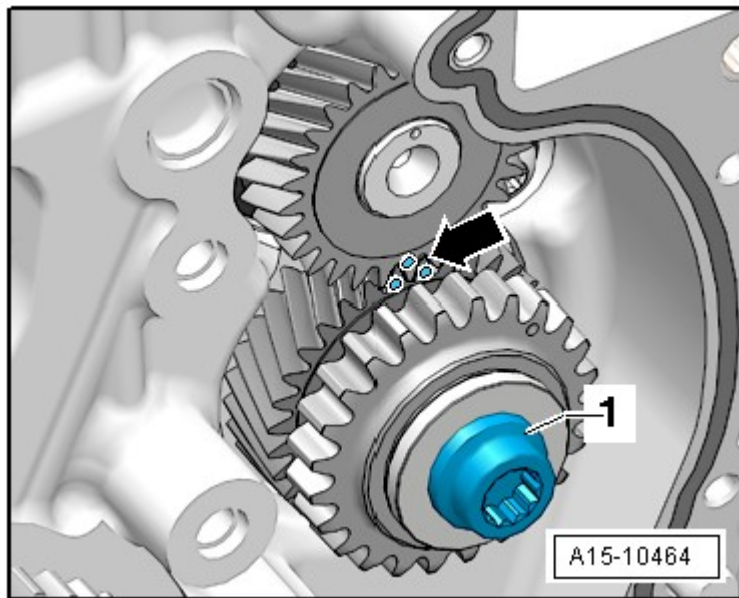


Fig. 12: Identifying Intermediate Shaft Sprocket
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Always replace the intermediate sprocket. Otherwise the backlash will not adjust itself and it could result in engine damage.

The new intermediate sprocket has an anti-friction coating that wears off after a short period of use, which automatically adjusts the backlash.

-- Tighten with a new bolt as follows:

-- Tighten to 10 Nm using a torque wrench.

-- Turn the intermediate sprocket.

The intermediate sprocket must not have any play. Loosen and tighten it again if necessary.

-- Tighten to 25 Nm using a torque wrench.

-- Tighten further 90° using a rigid wrench.

CYLINDER HEAD OVERVIEW, WITH SCREWDRIVER ACCESS

NOTE: Replace the cylinder head bolts.

Always replace self-locking nuts, bolts which have been tightened to tightening specifications as well as gaskets and O-rings.

The plastic protectors installed to protect the open valves must only be removed immediately before installing the cylinder head.

The engine oil and coolant must be changed if the cylinder head or cylinder head seal are replaced.

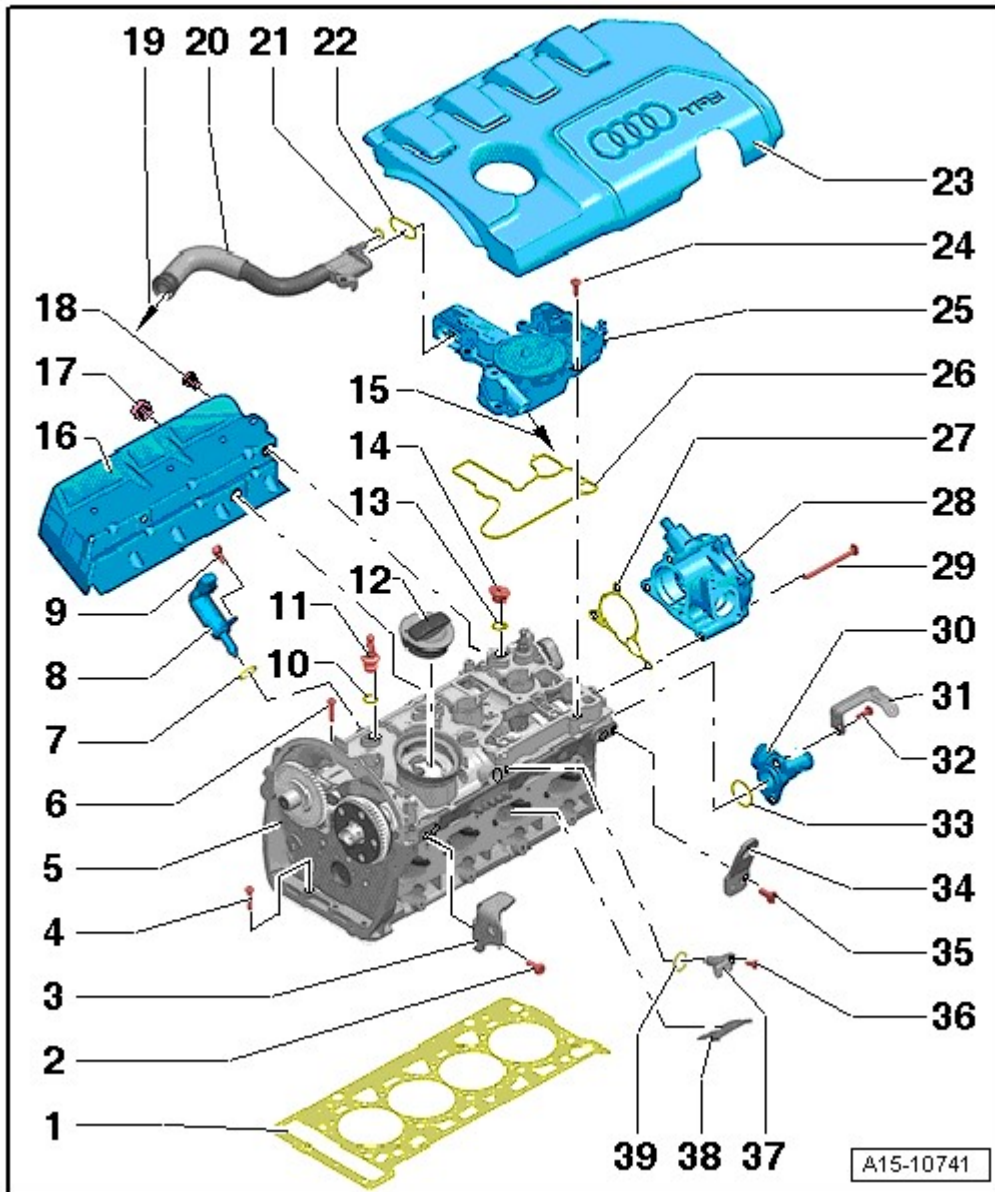


Fig. 13: Identifying Cylinder Head Overview
 Courtesy of AUDI OF AMERICA, LLC

1. Cylinder Head Gasket

- Replace
 - Note installation position: Parts number to cylinder head
2. Bolt
 - 25 Nm
 3. Transport Bracket
 4. Bolt
 - Tighten in 2 stages:
 - Tighten to 8 Nm.
 - Tighten 90° further using a rigid wrench.
 5. Cylinder Head
 - Removing and installing, refer to **CYLINDER HEAD WITH WRENCH CLEARANCE**
 - Check for distortion, refer to **Fig. 15**
 6. Cylinder Head Bolt
 - Replace
 - Follow the procedure when loosening.
 - Follow the procedure when tightening. Refer to **Fig. 160**.
 - Tighten in 3 stages:
 1. Tighten to 40 Nm.
 2. Tighten 90° further using a rigid wrench.
 3. Tighten 90° further using a rigid wrench.
 7. O-ring
 - Replace
 - Coat with engine oil
 8. Camshaft Adjuster Actuator
 9. Bolt
 - 5 Nm
 10. O-ring
 - Replace
 - Lubricate with engine oil
 11. Sealing Plugs
 - 5 Nm
 - With ball head for the engine cover
 12. Cap
 - With gasket
 13. O-ring
 - Replace

- Lubricate with engine oil
14. Sealing Plugs
 15. To the Intake Manifold
 16. Heat Shield
 17. Screw
 - 20 Nm
 18. Bolt
 - 20 Nm
 19. To the Intake Manifold/Turbocharger
 20. Ventilation Pipe
 21. O-ring
 - No replacement part
 22. Gasket
 - No replacement part
 23. Engine Cover
 24. Bolt
 - Tightening sequence, refer to **Fig. 14**
 25. Crankcase Ventilation
 26. Gasket
 - No replacement part
 27. Gasket
 - Replace if damaged
 28. Vacuum Pump
 - Removing and installing, refer to **Removal and Installation**
 29. Bolt
 - Tightening specifications, refer to **Description and Operation**
 30. Connecting Piece
 31. Mounting Plate
 32. Bolt
 - 9 Nm
 33. O-ring
 - Replace
 - Coat with coolant
 34. Transport Bracket
 35. Bolt
 - 25 Nm
 36. Bolt
 - 9 Nm

37. Camshaft Position Sensor -G40-
38. Partition Plate
39. O-ring
 - Replace
 - Lubricate with engine oil

Crankcase Ventilation, Tightening Sequence

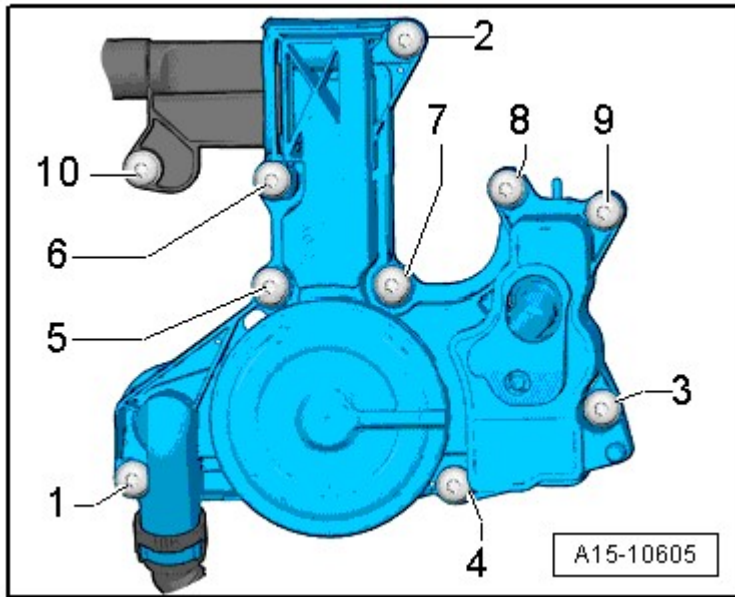


Fig. 14: Identifying Crankcase Ventilation - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE:

- The bolts are self-tapping. Only use original bolts when replacing the cylinder head, since the cylinder head is delivered without a thread for the installing the crankcase ventilation.
- It is not permitted to cut the thread with a thread cutter.

-- Tighten the crankcase ventilation bolts to 11 Nm in sequence -1 to 10--.

Checking Cylinder Head for Distortion

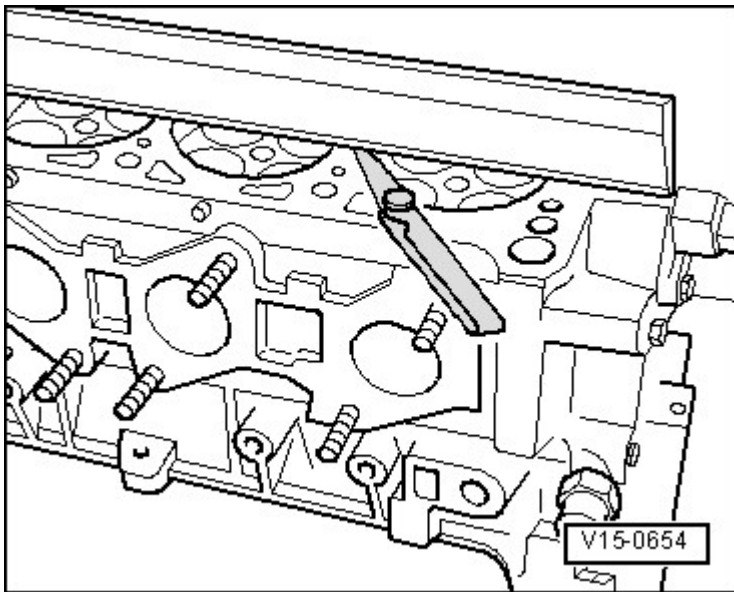


Fig. 15: Checking Cylinder Head For Distortion

Courtesy of AUDI OF AMERICA, LLC

-- Check the cylinder head for distortion with the straight edge and feeler gauge in several places.

- Max. permissible distortion: 0.05 mm

CYLINDER HEAD OVERVIEW, WITHOUT SCREWDRIVER ACCESS

NOTE:

- Replace the cylinder head bolts.
- Always replace self-locking nuts, bolts which have been tightened to tightening specifications as well as gaskets and O-rings.
- The plastic protectors installed to protect the open valves must only be removed immediately before installing the cylinder head.
- The engine oil and coolant must be changed if the cylinder head or cylinder head seal are replaced.

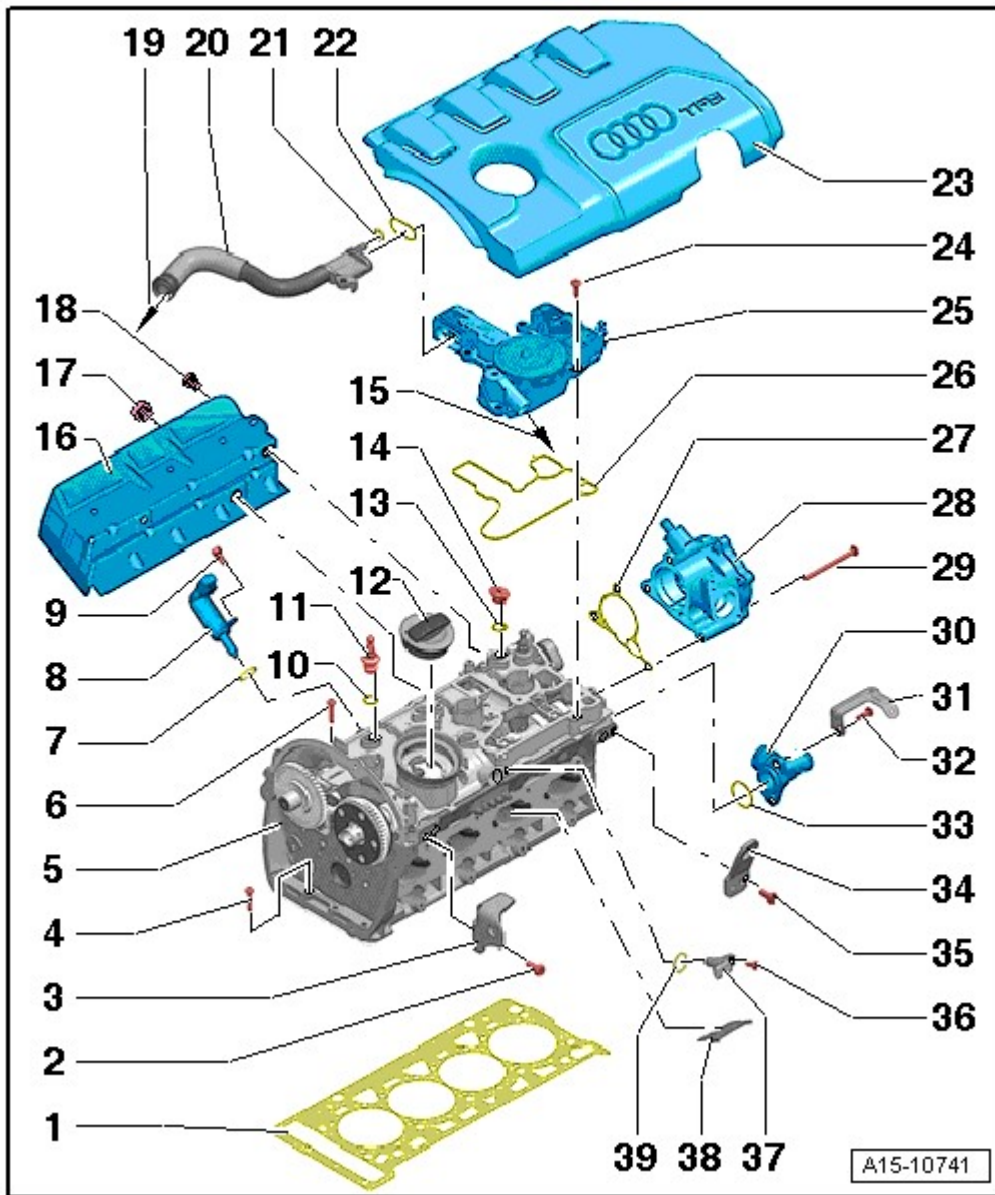


Fig. 16: Identifying Cylinder Head Overview

Courtesy of AUDI OF AMERICA, LLC

1. Cylinder Head Gasket
 - Replace
 - Note installation position: Parts number to cylinder head
2. Bolt
 - 25 Nm
3. Transport strap
4. Bolt
 - Replace
 - Follow the procedure when loosening. Refer to **Fig. 19**.

- Follow the procedure when tightening. Refer to **Fig. 20**.
5. Cylinder Head
 - Removing and installing, refer to **CYLINDER HEAD WITHOUT WRENCH CLEARANCE**
 - Check for distortion, refer to **Fig. 18**
 6. Cylinder Head Bolt
 - Replace
 - Follow the procedure when loosening. Refer to **Fig. 19**.
 - Follow the procedure when tightening. Refer to **Fig. 20**.
 7. O-ring
 - Replace
 - Coat with engine oil
 8. Camshaft Adjuster Actuator
 9. Bolt
 - 5 Nm
 10. O-ring
 - Replace
 - Lubricate with engine oil
 11. Sealing Plugs
 - 5 Nm
 - With ball head for the engine cover
 12. Cap
 - With gasket
 13. O-ring
 - Replace
 - Lubricate with engine oil
 14. Sealing Plugs
 15. To the Intake Manifold
 16. Heat Shield
 17. Bolt
 - 20 Nm
 18. Bolt
 - 20 Nm
 19. To the Intake Manifold/Turbocharger
 20. Ventilation Pipe
 21. O-ring
 - No replacement part
 22. Gasket
 - No replacement part

23. Engine Cover
24. Bolt
 - Tightening sequence **Fig. 17**
25. Crankcase Ventilation
26. Gasket
 - No replacement part
27. Gasket
 - Replace if damaged
28. Vacuum Pump
 - Removing and installing, refer to **Removal and Installation**
29. Bolt
 - Tightening specifications, refer to **Description and Operation**
30. Connecting Piece
31. Mounting Plate
32. Bolt
 - 9 Nm
33. O-ring
 - Replace
 - Coat with coolant
34. Transport Strap
35. Bolt
 - 25 Nm
36. Bolt
 - 9 Nm
37. Camshaft Position Sensor -G40-
38. Partition Plate
39. O-ring
 - Replace
 - Lubricate with engine oil

Crankcase Ventilation, Tightening Sequence

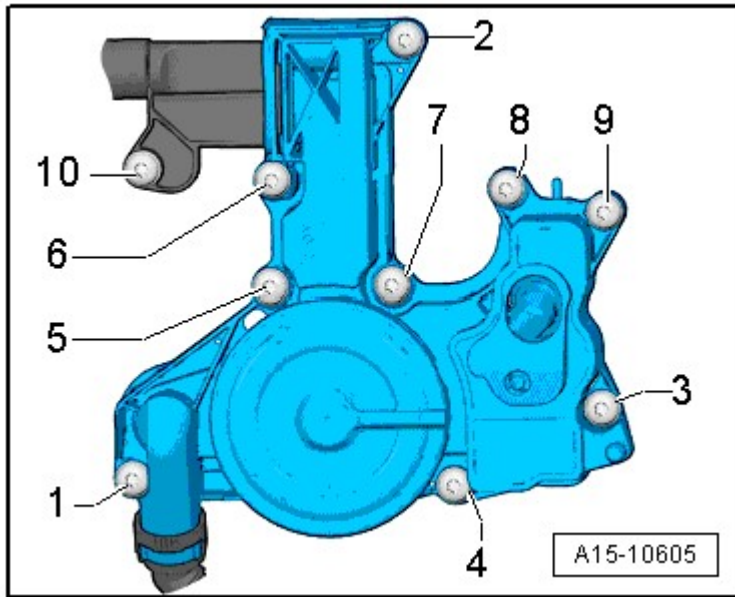


Fig. 17: Identifying Crankcase Ventilation - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE:

- The bolts are self-tapping. Only use original bolts when replacing the cylinder head, since the cylinder head is delivered without a thread for the installing the crankcase ventilation.
- It is not permitted to cut the thread with a thread cutter.
- Tighten the crankcase ventilation bolts to 11 Nm in -1 to 10- sequence.

Checking Cylinder Head for Distortion

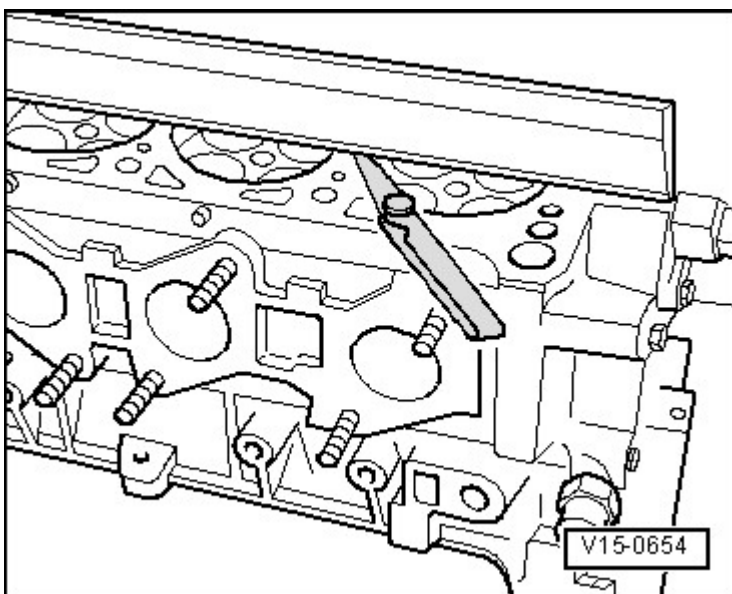


Fig. 18: Checking Cylinder Head For Distortion

Courtesy of AUDI OF AMERICA, LLC

-- Check the cylinder head for distortion with the straight edge and feeler gauge in several places.

- Max. permissible distortion: 0.05 mm

Loosening Cylinder Head

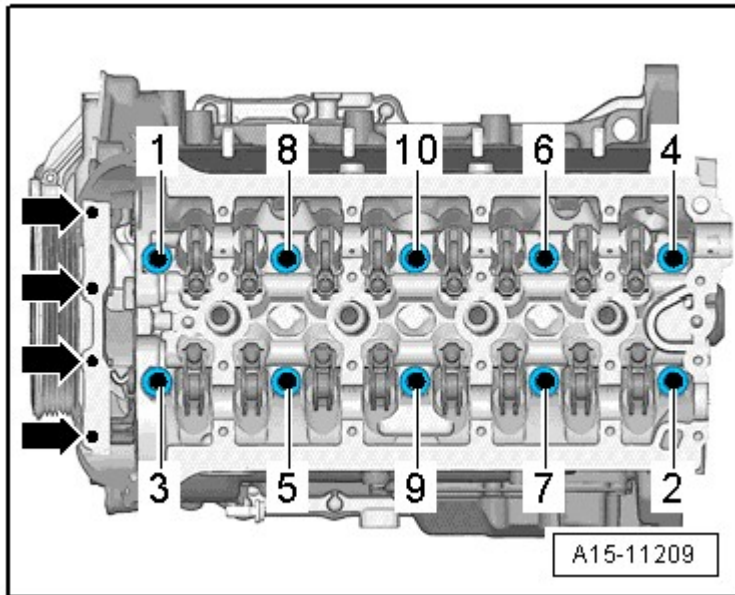


Fig. 19: Loosening Cylinder Head Bolts In Sequence

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows-.

-- Loosen the cylinder head bolts in sequence -1 through 10-

Cylinder Head Tightening Sequence

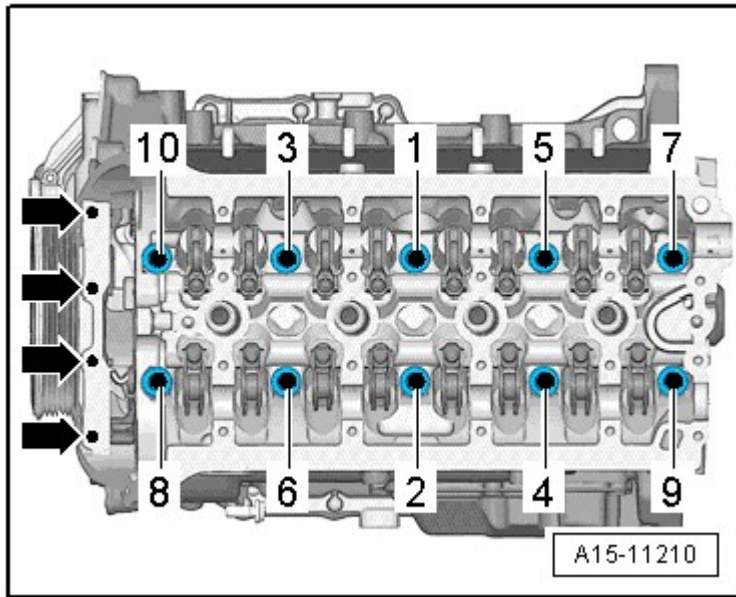


Fig. 20: Identifying Cylinder Head Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the cylinder head bolts in -1 through 10- sequence.

1. Tighten to 40 Nm using a torque wrench.
2. Tighten further 90° using a rigid wrench.
3. Tighten further 90° using a rigid wrench.
4. Tighten the bolts -arrows- to 8 Nm.
5. Tighten the bolts -arrows- 90° further using a rigid wrench.

VALVETRAIN OVERVIEW

NOTE:

- The cylinder head and the cylinder head cover must be replaced together.
- Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic equalization elements must seat themselves (otherwise the valves will crash into the pistons).
- After working on the valvetrain and lifters, carefully rotate the crankshaft by hand at least 2 full revolutions before starting to be sure that valves do not strike the pistons.
- Always replace the gaskets and seals.

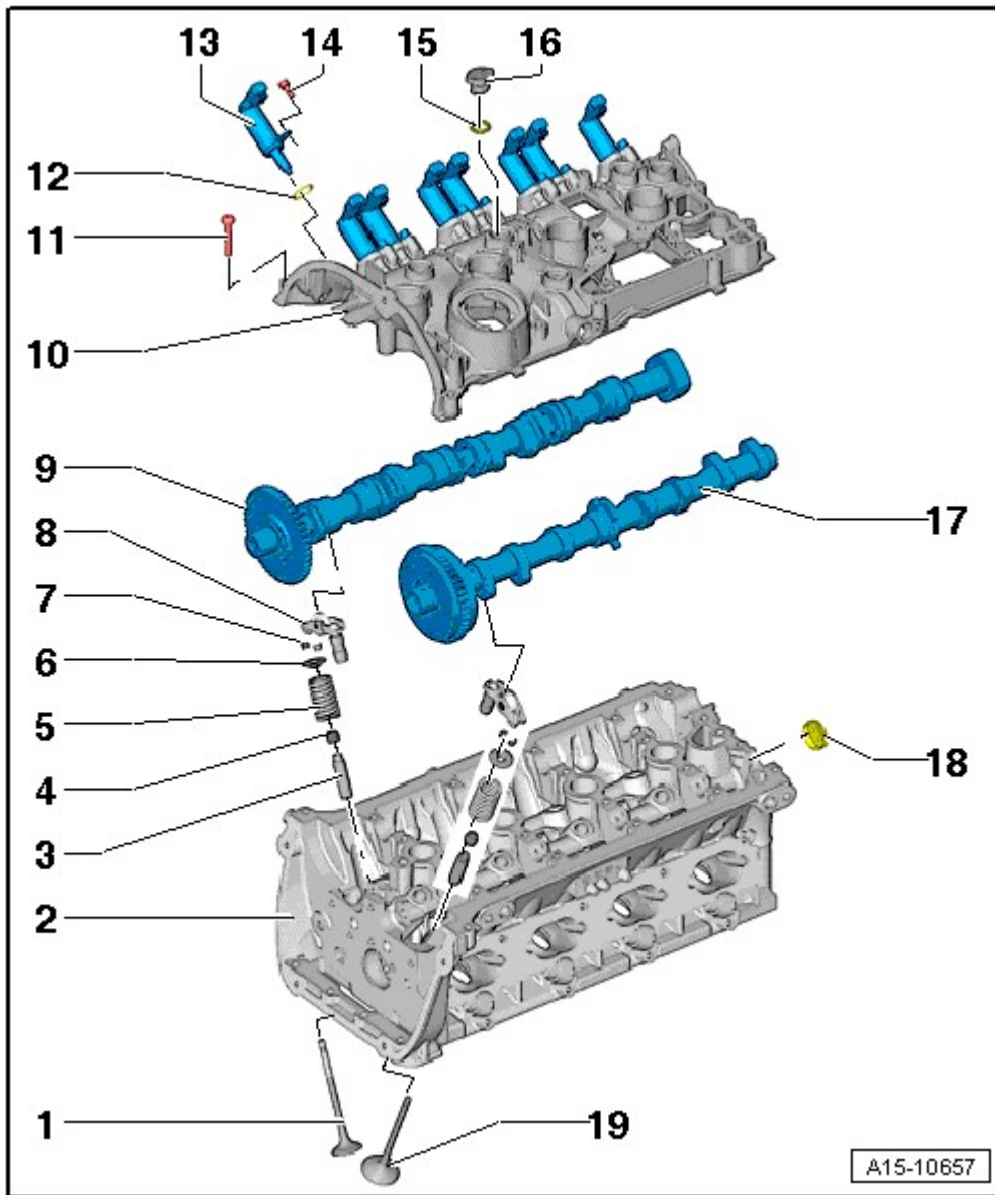


Fig. 21: Identifying Valvetrain Overview

Courtesy of AUDI OF AMERICA, LLC

1. Exhaust Valve
 - Do not rework, only lapping is permitted
 - For the correct valve dimensions, refer to **Fig. 24**
 - Valve guides, checking, refer to **VALVE GUIDES, CHECKING**
2. Cylinder Head
3. Valve Guide
 - Checking, refer to **VALVE GUIDES, CHECKING**
4. Valve Stem Seal
 - Replace, refer to **VALVE STEM SEALS WITH CYLINDER HEAD INSTALLED** or **VALVE**

STEM SEALS WITH CYLINDER HEAD REMOVED

5. Valve Spring
6. Valve Spring Plate
7. Valve Retainers
8. Hydraulic Adjusting Element
 - With roller rocker lever
 - Do not interchange
 - Lubricate contact surface
9. Exhaust Camshaft
 - Removing and installing, refer to **CAMSHAFTS**
 - Check radial clearance using Plastigage (roller rocker lever removed)
 - Radial clearance: 0.024 to 0.066 mm
 - Run-out: max. 0.04 mm
10. Cylinder Head Cover
 - With integrated camshaft bearings
 - Clean sealing surface, reworking is not permitted.
 - Remove old sealant residue.
11. Bolt
 - Replace
 - Loosening, refer to **Fig. 22**
 - Tightening sequence, refer to **Fig. 23**
12. O-ring
 - Replace
 - Coat with engine oil
13. Camshaft Adjuster Actuator
14. Bolt
 - 5 Nm
15. O-ring
 - Replace
 - Coat with engine oil
16. Sealing Plugs
17. Intake Camshaft
 - Removing and installing, refer to **CAMSHAFTS**
 - Check radial clearance using Plastigage (roller rocker lever removed)
 - Radial clearance: 0.024 to 0.066 mm
 - Run-out: max. 0.04 mm
18. Cap
 - Replace

- Removing with the cylinder head cover installed, pierce through one side of the cover with an awl and pry it out
- Installing **Fig. 225**

19. Intake Valve

- Do not rework, only lapping is permitted
- For the correct valve dimensions, refer to **Fig. 24**
- Valve guides, checking, refer to **VALVE GUIDES, CHECKING**

Loosening Cylinder Head Cover

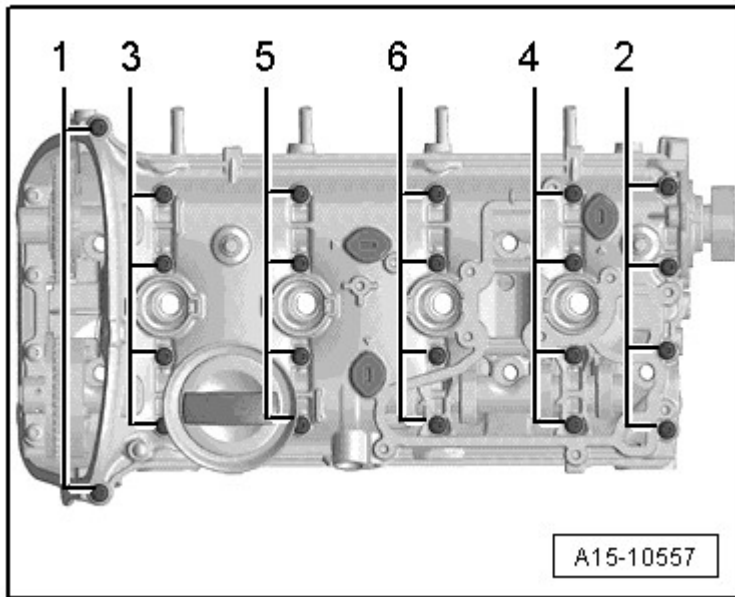


Fig. 22: Cylinder Head Cover Loosening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Loosen the cylinder head cover in sequence -1 through 6--.

Cylinder Head Cover Tightening Sequence

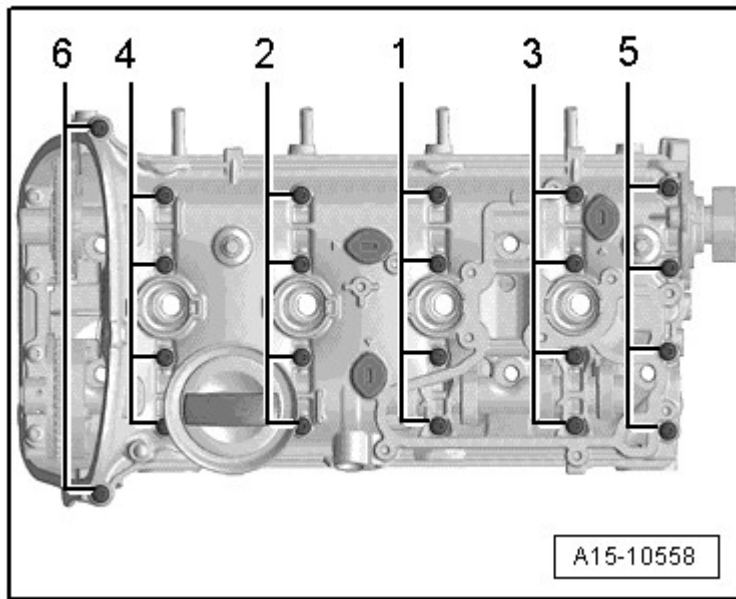


Fig. 23: Identifying Cylinder Head Cover Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Replace the bolts.

1. Hand-tighten bolts in several steps in -1 to 6- sequence.
2. Tighten the bolts in a -1 to 6- sequence to 8 Nm using a torque wrench.
3. Tighten the bolts an additional 90° using a rigid wrench in the sequence -1 to 6-.

NOTE: Make sure the cylinder head cover is not tilted.

Valve Dimensions

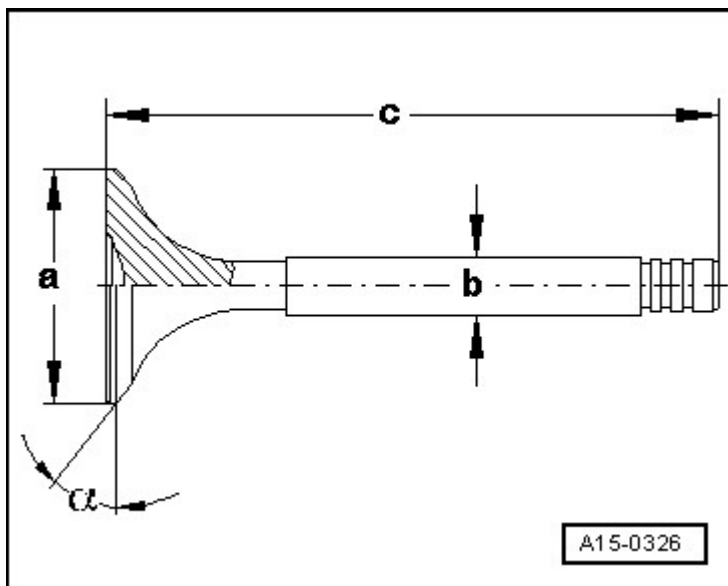


Fig. 24: Identifying Valve Dimensions

Courtesy of AUDI OF AMERICA, LLC

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

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

SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

Component	Bolt Size	Nm
Balance shaft for exhaust side ⁽²⁾	-	9
Balance shaft for intake side ⁽²⁾	-	9
Bearing bracket ^{(1), (2)}		
	-	9
	-	20 + 90°
Camshaft adjuster actuator	-	5
Camshaft position sensor	-	9
Camshaft timing chain guide rail, guide pins	-	20
Chain tensioner ⁽⁴⁾	-	9
Chain tensioner ⁽³⁾	-	85
Control valve	-	35
Cylinder head with wrench clearance ^{(2), (5)}		
Tighten in 3 stages:		
<ul style="list-style-type: none"> • Tighten to 40 Nm. • Tighten 90° further using a rigid wrench. • Tighten 90° further using a rigid wrench. 		
Tighten in 2 stages:		
<ul style="list-style-type: none"> • Tighten to 8 Nm • Tighten 90° further using a rigid wrench. 		
Guide rail for balance shaft timing chain	-	20
Guide rail for timing chain	-	20
Guide tube for oil dipstick	-	9

Heat shield	-	20
Mounting plate	-	9
Sealing plugs with ball head for the engine cover	-	5
Tensioning rail for timing chain	-	20
Timing chain tensioning rail, guide pins	-	20
Transport bracket	-	25

- (1) For bolt tightening clarification, refer to **CAMSHAFT TIMING CHAIN OVERVIEW** and see items -5 and 7-
- (2) Always replace
- (3) For bolt tightening clarification, refer to **BALANCE SHAFT TIMING CHAIN OVERVIEW** and see item -4-
- (4) For bolt tightening clarification, refer to **CAMSHAFT TIMING CHAIN OVERVIEW** and see item -2-
- (5) For bolt tightening clarification, refer to **CYLINDER HEAD OVERVIEW, WITH WRENCH CLEARANCE** and see items -4 and 6-

Upper Timing Chain Cover - Tightening Sequence

-- Tighten the bolts -1 through 5- in the sequence shown:

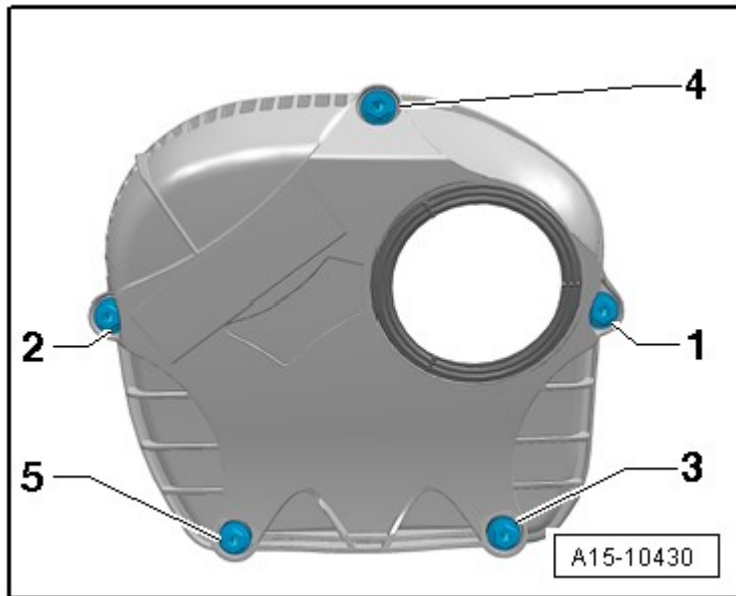


Fig. 25: Identifying Upper Timing Chain Cover - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts to 9 Nm.

Lower Timing Chain Guard - Tightening Sequence for 15 Bolts

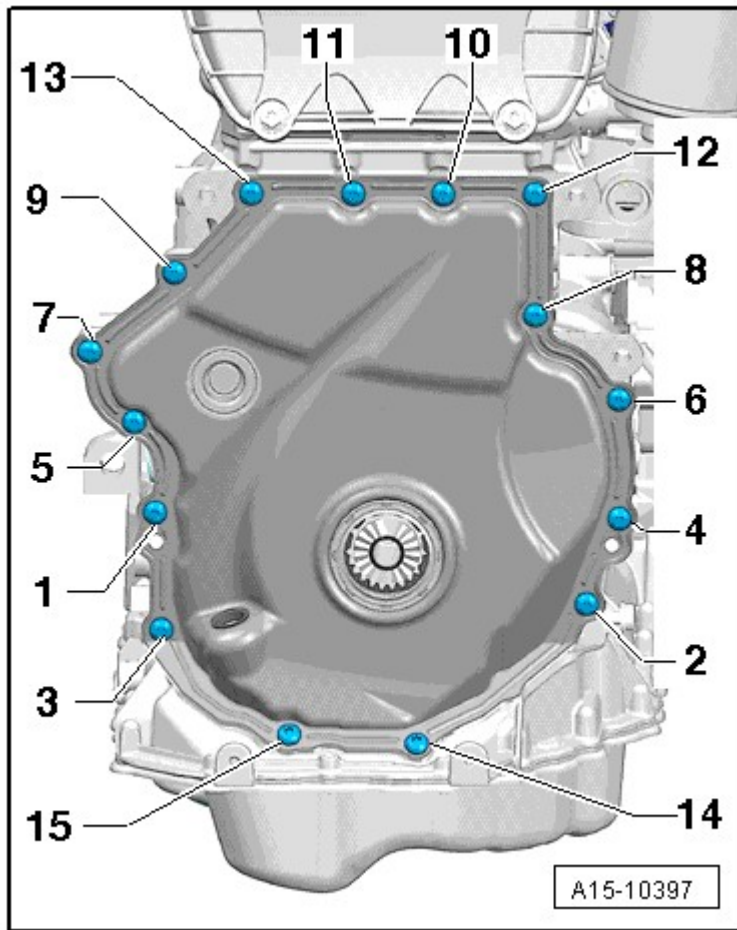


Fig. 26: Identifying Timing Chain Lower Cover Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts -1 through 15- in 2 stages in the sequence shown:

-- 1. Tighten the bolts to 8 Nm.

-- 2. Tighten the bolts an additional 45°.

Lower Timing Chain Guard - Tightening Sequence for 8 Bolts

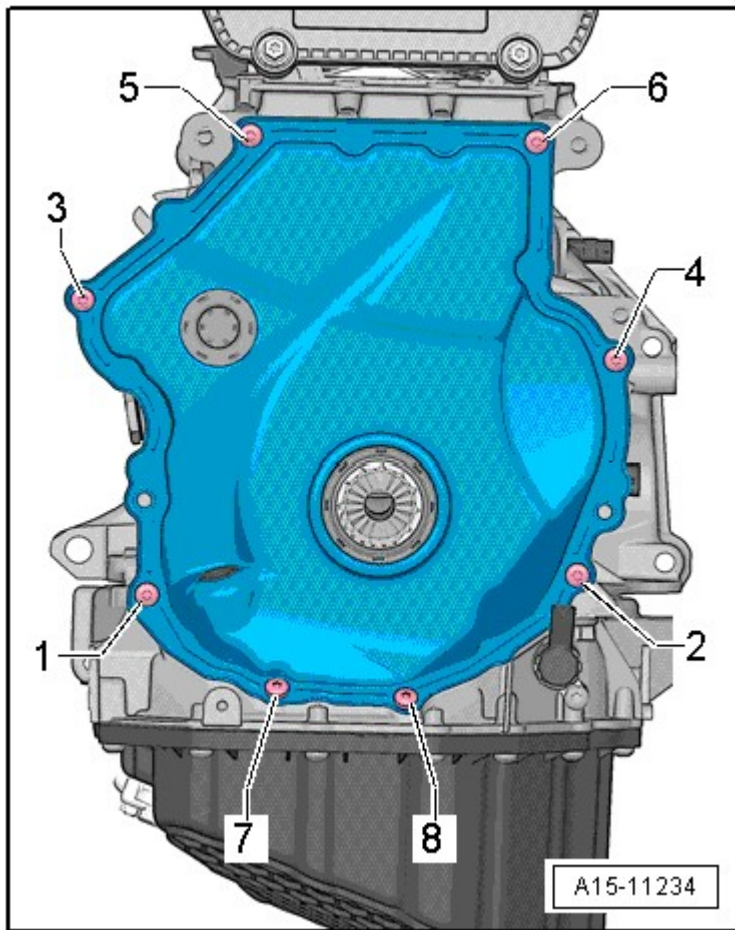


Fig. 27: Identifying Timing Chain Guard Lower Section - Tightening Sequence for 8 Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Tighten the bolts -1 through 8- in 2 stages in the sequence shown:

-- 1. Tighten the bolts to 4 Nm.

-- 2. Tighten the bolts an additional 45°.

Intermediate Shaft Sprocket Tightening Sequence

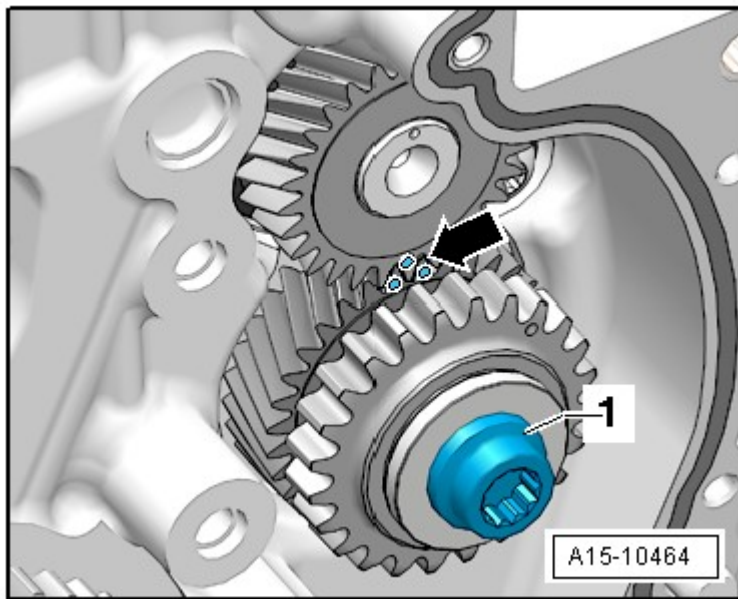


Fig. 28: Identifying Intermediate Shaft Sprocket
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Always replace the intermediate shaft sprocket. Otherwise the backlash will not adjust itself and it could result in engine damage.

The new intermediate shaft sprocket has an anti-friction coating that wears off after a short period of use, which automatically adjusts the backlash.

-- Tighten with a new bolt as follows:

1. Tighten to 10 Nm using a torque wrench.
2. Rotate the intermediate shaft sprocket.

The intermediate shaft sprocket must not have any play. Loosen and tighten it again if necessary.

3. Tighten to 25 Nm using a torque wrench.
4. Tighten further 90° using a rigid wrench.

Crankcase Ventilation, Tightening Sequence

NOTE:

- The bolts are self-tapping. Only use original bolts when replacing the cylinder head, since the cylinder head is delivered without a thread for the installing the crankcase ventilation.
- It is not permitted to cut the thread with a thread cutter.

-- Tighten the crankcase ventilation bolts to 11 Nm in sequence -1 through 10--.

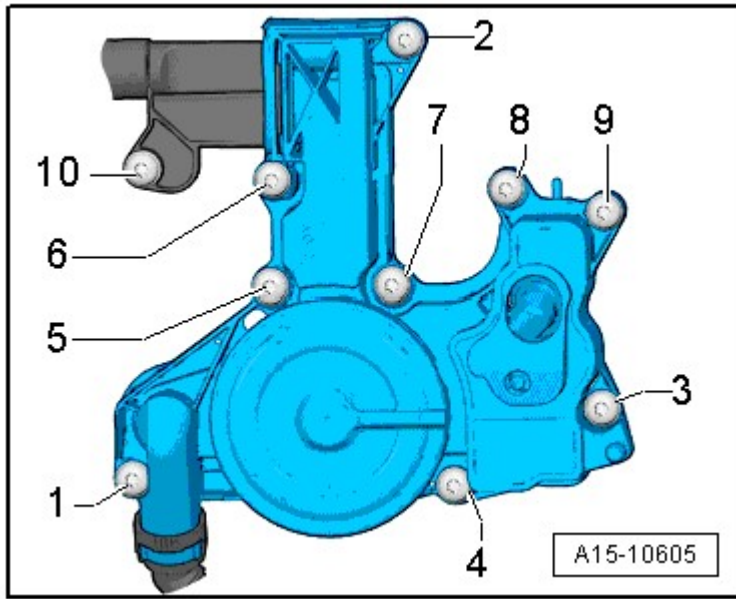


Fig. 29: Identifying Crankcase Ventilation - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

Cylinder Head Tightening Sequence

-- Tighten the cylinder head bolts in -1 through 10- sequence.

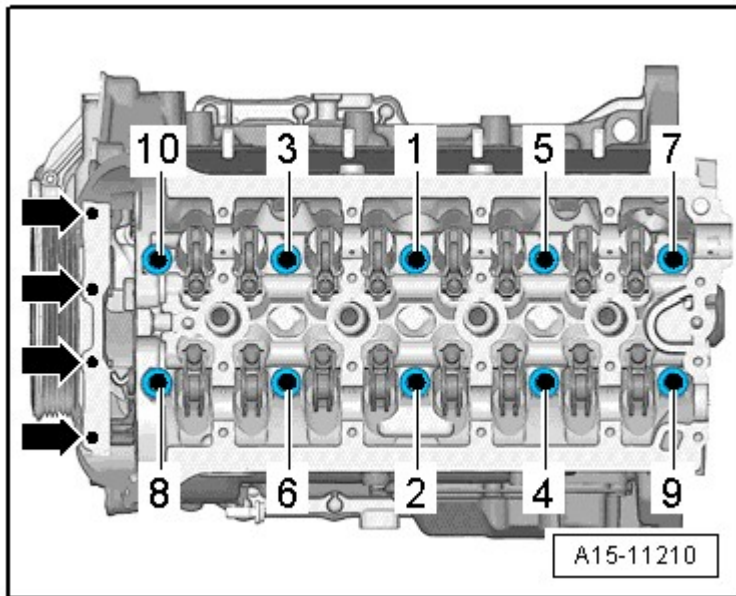


Fig. 30: Identifying Cylinder Head Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

1. -- Tighten to 40 Nm using a torque wrench.
2. -- Tighten further 90° using a rigid wrench.

3. -- Tighten further 90° using a rigid wrench.
4. -- Tighten the bolts -arrows- to 8 Nm.
5. -- Tighten the bolts -arrows- 90° further using a rigid wrench.

Cylinder Head Cover Tightening Sequence

-- Replace the bolts.

1. Hand-tighten bolts in several stages in sequence -1 through 6-

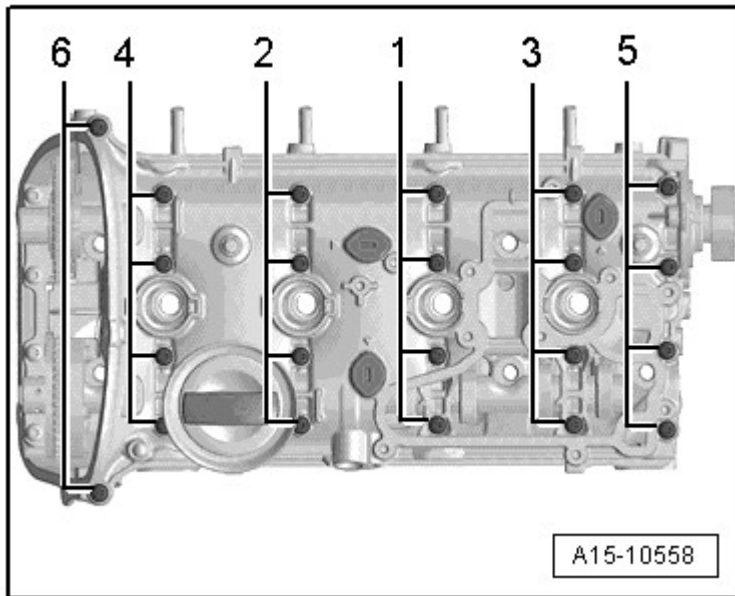


Fig. 31: Identifying Cylinder Head Cover Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

2. Tighten the bolts in sequence -1 through 6- to 8 Nm using a torque wrench.
3. Tighten the bolts an additional 90° using a rigid wrench in the sequence -1 through 6-.

NOTE: Make sure the cylinder head cover is not tilted.

DIAGNOSIS AND TESTING

VALVE TIMING, CHECKING

Special tools and workshop equipment required

- Dial Gauge 0-10 mm -VAS 6079-

-- Remove timing chain upper cover. Refer to **UPPER TIMING CHAIN GUARD.**

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

Turn the vibration damper, from underneath, in direction of engine rotation to Top Dead Center TDC.

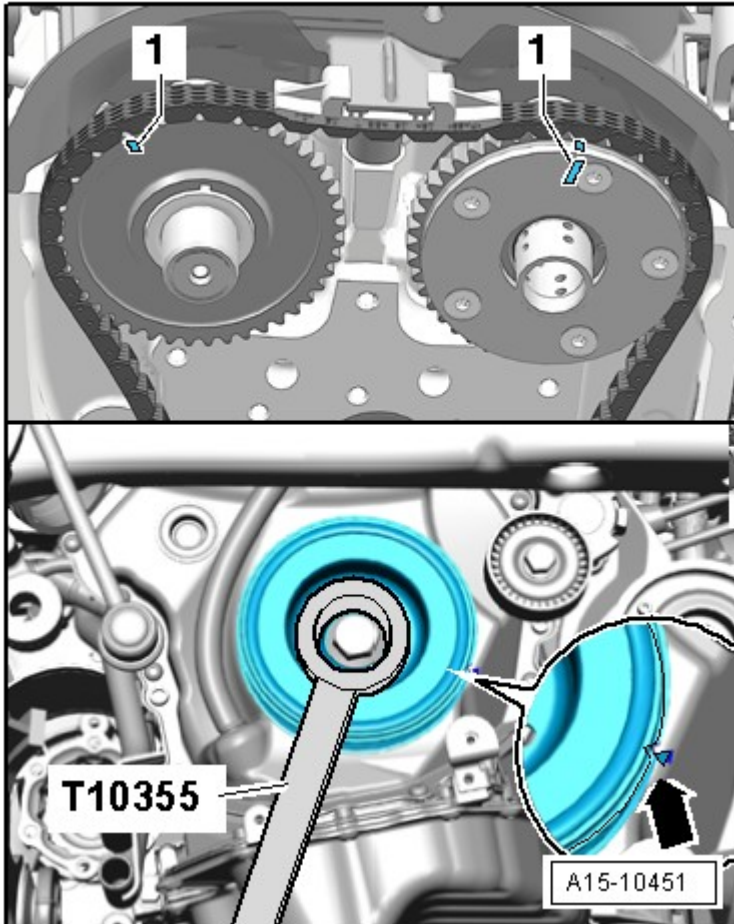


Fig. 32: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Use a ratchet with a 24 mm socket to turn the vibration damper. Always turn vibration damper in direction of engine rotation to "TDC". Do not turn the vibration damper backward to get to TDC!

- The notch on the vibration damper and the marking on the timing chain guard lower section must be opposite one another -arrow-.
- The markings -1- on the camshafts must point upward.

-- Measure the distance from the outer edge -1- to the marking -2- on the intake camshaft.

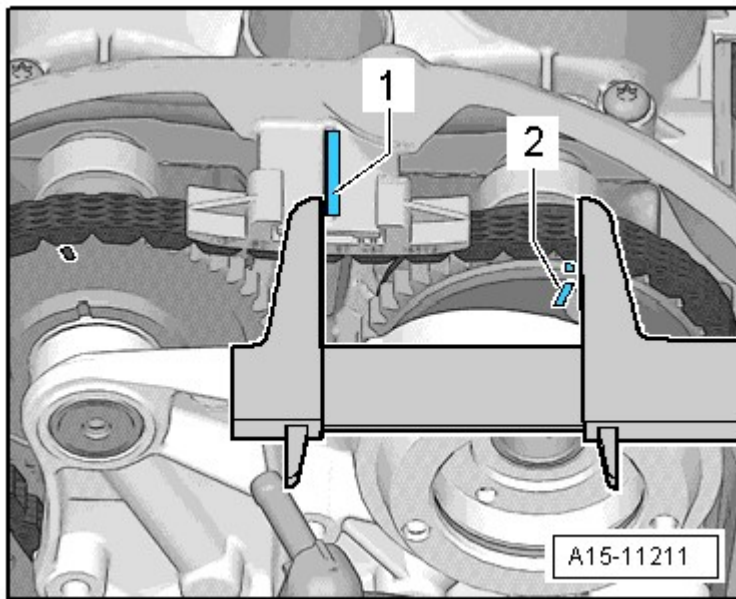


Fig. 33: Measuring Distance From Outer Edge To Marking On Intake Camshaft
 Courtesy of AUDI OF AMERICA, LLC

- Specified value: 61 to 64 mm.

-- Once the specified value is reached, measure the distance between the marking on the exhaust camshaft -3- and the marking on the intake camshaft -4-.

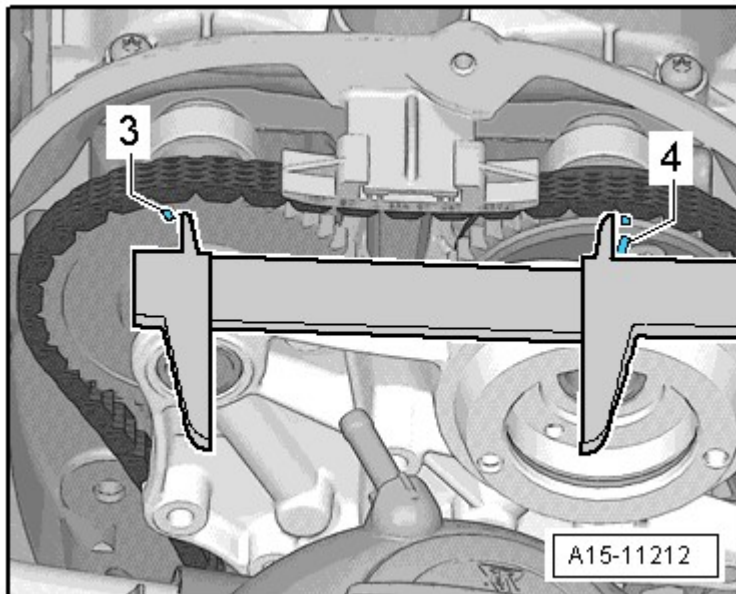


Fig. 34: Measuring Distance Between Marking On Exhaust Camshaft And Marking On Intake Camshaft
 Courtesy of AUDI OF AMERICA, LLC

- Specified value: 124 to 126 mm.

NOTE: If one tooth has an offset, there will be a deviation of approximately 6 mm from the specified value. Install the timing chain once again if there is an offset.

POSITIONING ENGINE AT TDC WITH DIAL GAUGE 0-10 MM -VAS 6079-

Special tools and workshop equipment required

- Dial Gauge 0-10 mm -VAS 6079-
- Dial Gauge Adapter -T10170- or Dial Gauge Adapter -T10170 A-
- Remove timing chain upper cover
- Turn the crankshaft with the socket SW 24 on the vibration damper in the direction of the engine rotation until the markings -arrows- are on top.

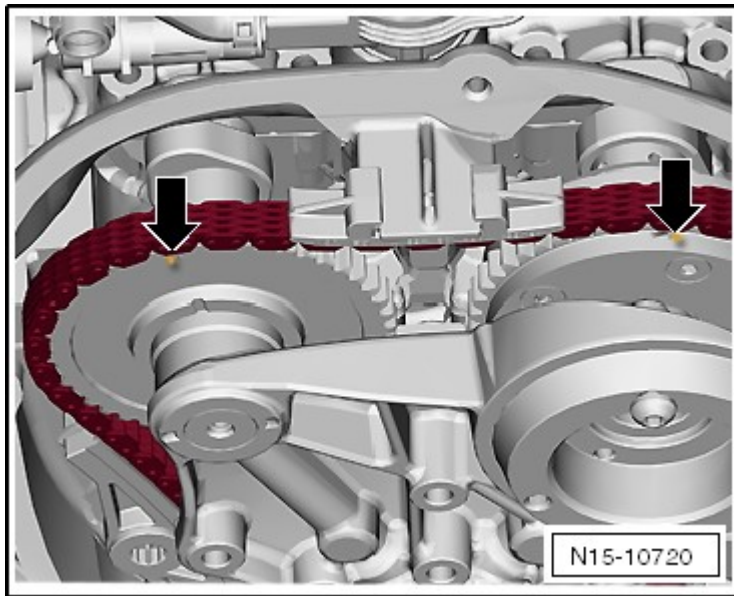
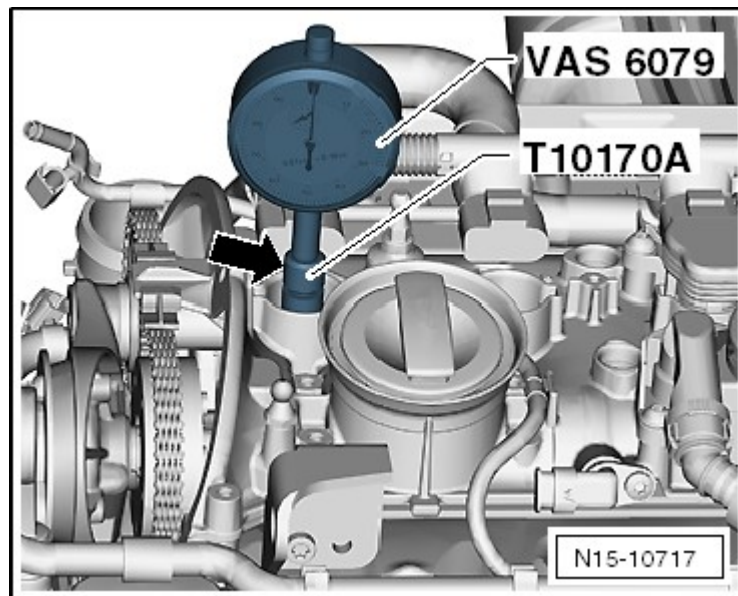


Fig. 35: Turning Crankshaft In Direction Of Engine Rotation Until Markings Are On Top
Courtesy of AUDI OF AMERICA, LLC

- Remove the spark plug from cylinder 1.
- Install the -T10170/A- all the way into the spark plug thread.
- Insert the -VAS 6079- with the -T10170A/1- all the way and secure it with the locking nut -arrow-.



**Fig. 36: Identifying Dial Gauge -VAS 6079- With Extending Piece -T10170A/-
Courtesy of AUDI OF AMERICA, LLC**

- Turn the crankshaft slowly to maximum dial reading in the direction of the engine rotation. When the maximum dial reading is reached (Bottom Dead Center (BDC) of the meter) position the piston at Top Dead Center (TDC).

NOTE: Use a ratchet with a 24 mm socket to turn the vibration damper. Always turn vibration damper in direction of engine rotation to TDC. Do not turn the vibration damper backward to get to TDC!

COMPRESSION PRESSURE, CHECKING

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Ignition Coil Puller T40039
- Compression Tester V.A.G 1763

Test Sequence

NOTE: Engine oil temperature min. 30°C (86°F)

Battery voltage at least 12.7 V

-- Remove the engine cover -arrows--.

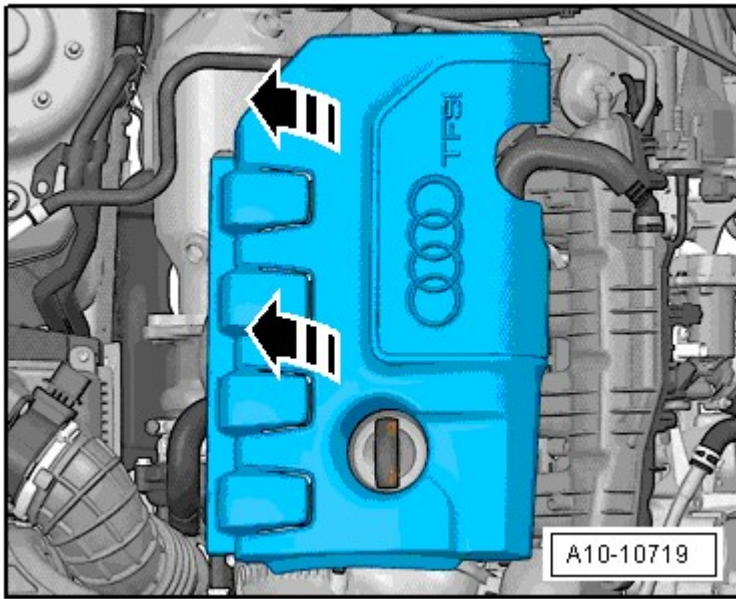


Fig. 37: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts on the ignition coil connector strip.
- Release the connector -arrows- and disconnect all the connectors at the same time from the ignition coils.

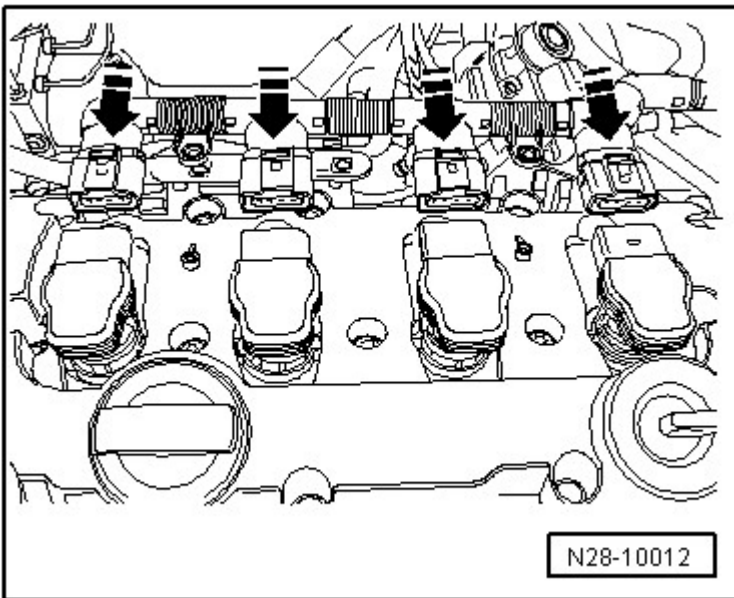


Fig. 38: Connecting Connectors To Ignition Coils

Courtesy of AUDI OF AMERICA, LLC

- Remove the ignition coils with the T40039.

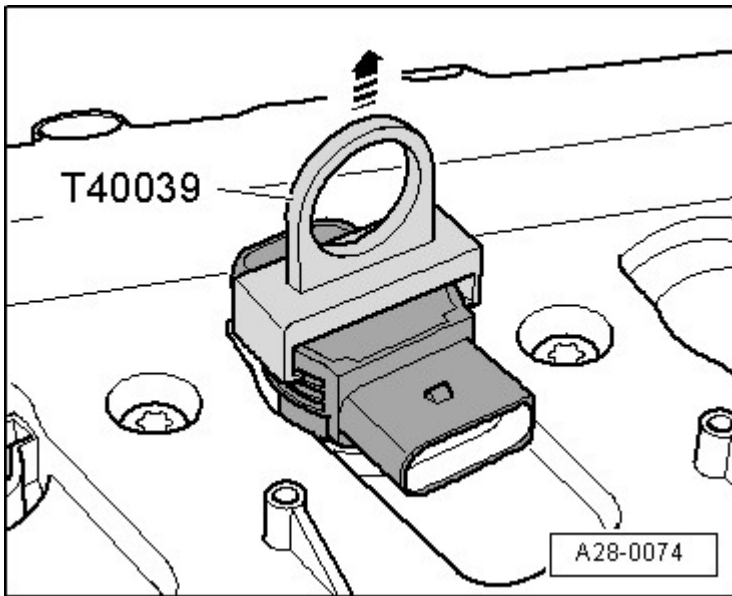


Fig. 39: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

- Remove the spark plugs using a 3122 B.
- Check compression using V.A.G 1763 and V.A.G 1763/6.

NOTE: Using tester see operating Instructions.

- Operate starter until tester shows no further pressure increase.

Compression Pressure:

New Bar Positive Pressure	Wear Limit Bar Positive Pressure	Difference Between Cylinders Bar Positive Pressure
11.0 to 14.0	7.0	Max. 3.0

- Install the spark plugs. Refer to MAINTENANCE PROCEDURES
- Install the ignition coils with output stages. Refer to Removal and Installation .

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

- Check the Engine Control Module (ECM) DTC memory. Refer to vehicle diagnostic, tester under "Guided Fault Finding".

VALVE GUIDES, CHECKING

Special tools and workshop equipment required

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

Test Sequence

-- Insert valve into guide. Valve stem end must be flush with the guide. Due to differences in valve stem diameter, make sure that only intake valves are used to check intake valve guides, and only exhaust valves are used to check exhaust valve guides.

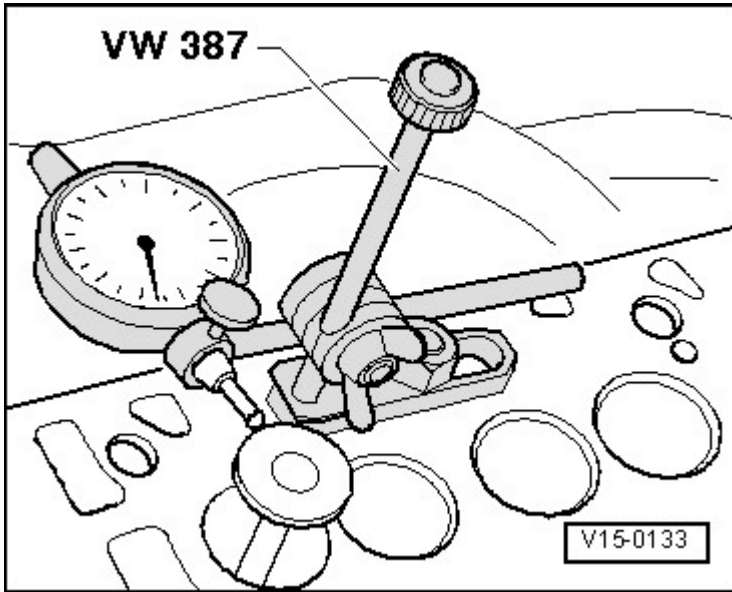


Fig. 40: Determining Valve Rock (Wear limit)
 Courtesy of AUDI OF AMERICA, LLC

-- Determine tip clearance.

Wear Limit

Intake Valve Guide	Exhaust Valve Guide
0.80 mm	0.80 mm

NOTE: If wear limit is exceeded, measure again using new valves. If wear limit is still exceeded, replace cylinder head.

If the valve is to be replaced as part of a repair, use a new valve for the calculation.

REMOVAL AND INSTALLATION

CAMSHAFT ADJUSTMENT VALVE 1 -N205-

Removing

-- Disconnect the connector from the camshaft adjustment valve 1 -1-.

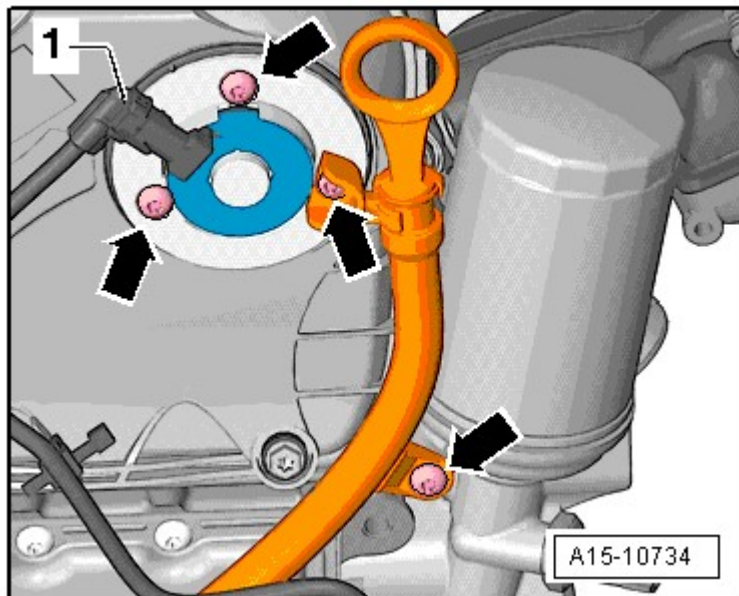


Fig. 41: Disconnecting Connector
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and then the camshaft adjustment valve 1.

Installing

Install in reverse order of removal. Note the following:

- Tightening specifications, refer to **TIMING CHAIN GUARDS, Camshaft Adjustment Valve 1 -N205- OVERVIEW.**

NOTE: Replace O-ring.

-- Coat the seal and the O-ring with engine oil.

UPPER TIMING CHAIN GUARD

Removing

-- Disconnect the connector from the camshaft adjustment valve 1 -N205- -1-.

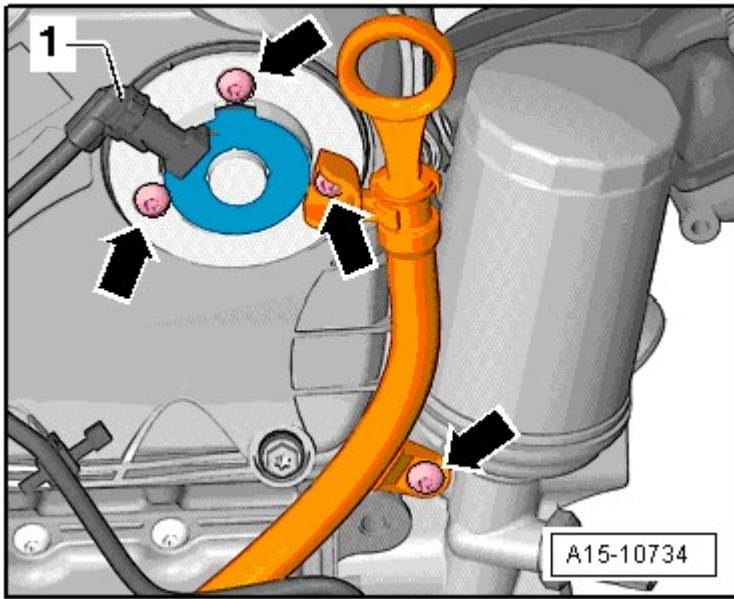


Fig. 42: Disconnecting Connector
 Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -arrows- and then the camshaft adjustment valve 1.
- Remove the bolts -1 through 5- and the timing chain guard upper section.

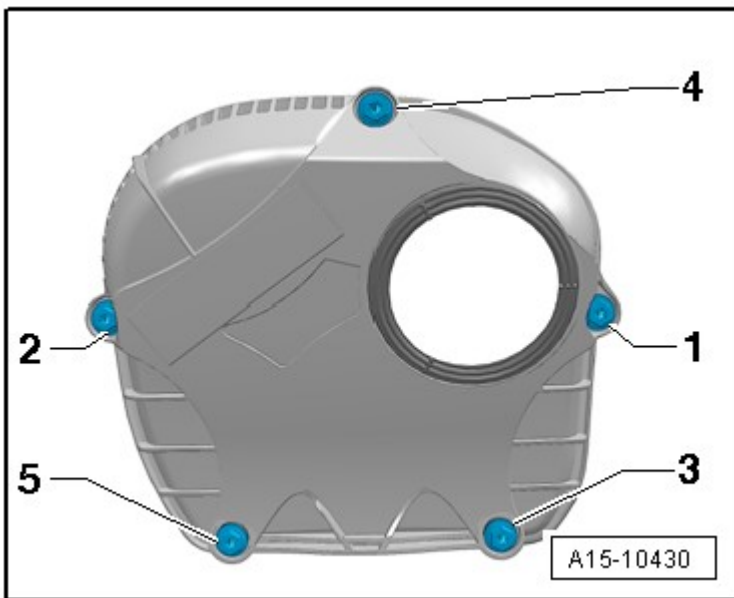


Fig. 43: Identifying Upper Timing Chain Cover - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

Installing

Install in reverse order of removal. Note the following:

- Tightening specifications, refer to **TIMING CHAIN GUARDS, Camshaft Adjustment Valve 1 -N205-OVERVIEW.**

NOTE: Replace O-ring.

- Coat the seal and the O-ring with engine oil.
- Install the timing chain upper cover, tightening sequence. Refer to **Fig. 4.**
- Install the camshaft adjustment valve 1. Refer to **Camshaft Adjustment Valve 1 -N205-.**

LOWER TIMING CHAIN COVER

Special tools and workshop equipment required

- Locking Tool T40098
- Counter Hold Tool T10355
- Thrust Piece T10368

Removing

- Remove the front noise insulation. Refer to **Description and Operation .**
- Remove the front bumper cover and bumper. Refer to **Removal and Installation .**
- Install the lock carrier in service position. Refer to **Description and Operation .**

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

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

- To release ribbed belt tension, rotate tensioner in direction of -arrow-.

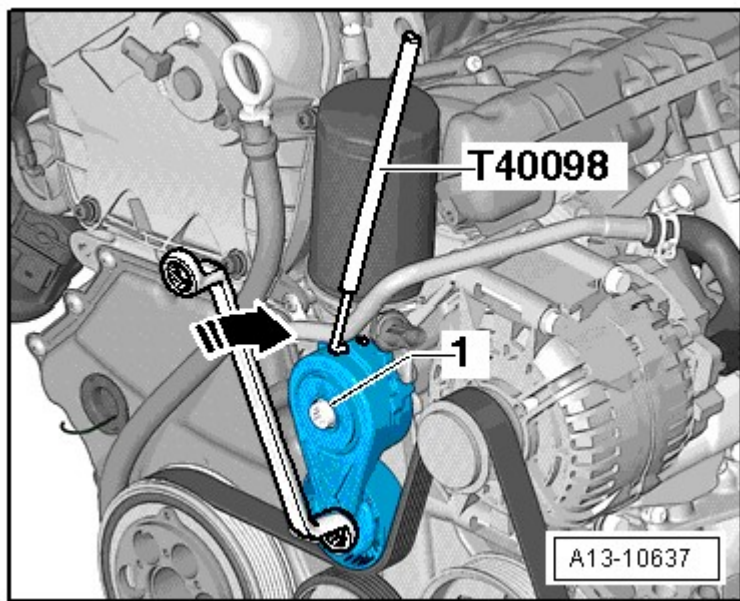


Fig. 44: Releasing Ribbed Belt Tension, Rotate Tensioner In Direction Of Arrow
 Courtesy of AUDI OF AMERICA, LLC

- Secure the tensioner with the T40098.
- Remove the bolt -1- and remove the ribbed belt tensioner from the accessory assembly bracket.
- Remove ribbed belt.
- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

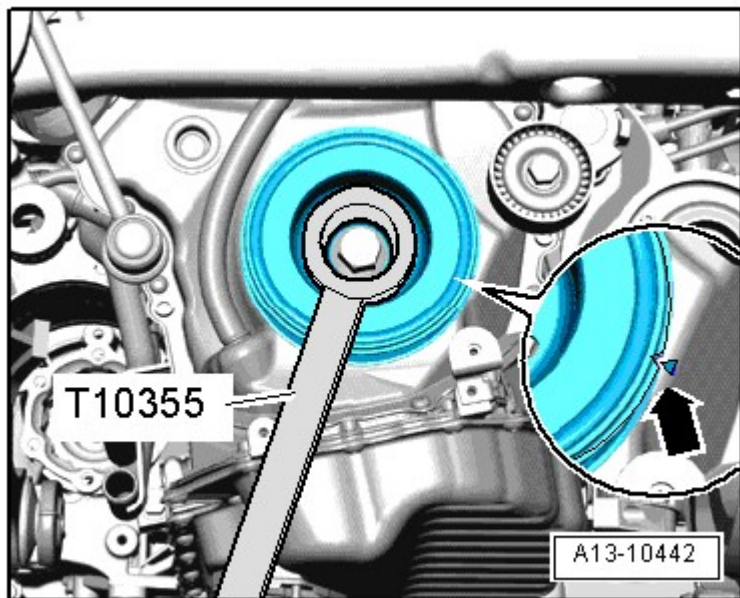


Fig. 45: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

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

-- Remove vibration damper bolt using the T10355.

-- Remove the vibration damper.

NOTE: To avoid damaging the splines, only install the vibration damper bolt with the T10368.

-- Install the vibration damper bolt and T10368 again.

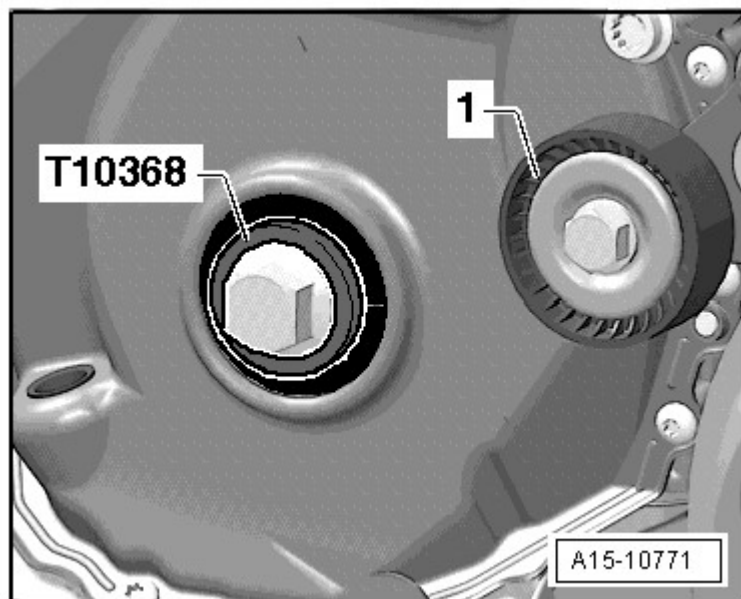


Fig. 46: Identifying Vibration Damper Bolt And T10368
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The engine could be destroyed.

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

-- Remove the idler roller -1-.

-- Remove the bolts -arrows- and remove the oil dipstick guide tube from the timing chain cover.

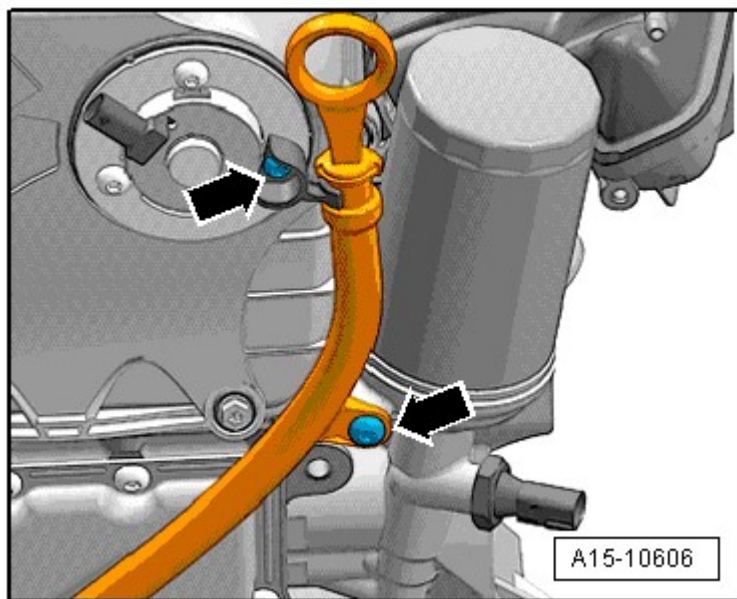


Fig. 47: Identifying Oil Dipstick Guide Tube And Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1 through 15--.

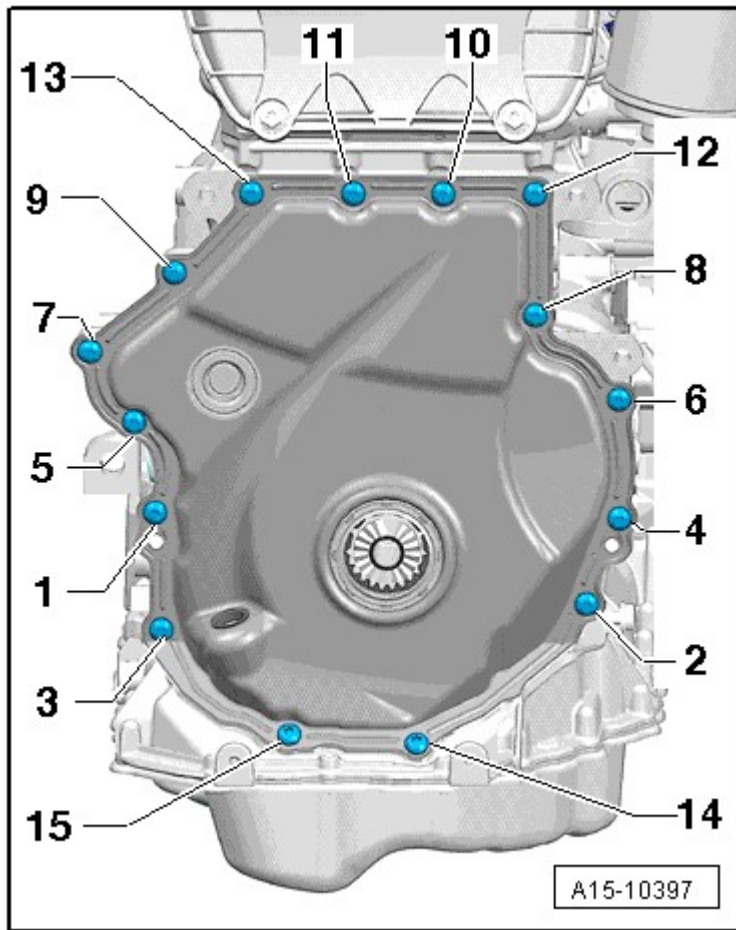


Fig. 48: Identifying Timing Chain Lower Cover Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

NOTE: There may be 8 bolts installed, depending on the version.

-- Pry off the timing chain guard lower section

Installing

- For the correct tightening specifications, refer to **TIMING CHAIN GUARDS, Camshaft Adjustment Valve 1 -N205- OVERVIEW**
- Silicon sealant

NOTE:

- Note the expiration date of the silicone sealant.
- The cover must be installed within 5 minutes after the silicone sealant has been applied.
- Replace the bolts which are being tightened with an additional turn.
- Replace sealing rings, seals and self-locking nuts.

CAUTION: Risk of contaminating lubricating system.

- **Cover open parts of the engine.**

- Remove any sealant residue on the cylinder block using a flat blade scraper.
- Clean any oil or grease off the sealing surfaces.
- Make sure both alignment bushings for centering the cover -arrows- are present.

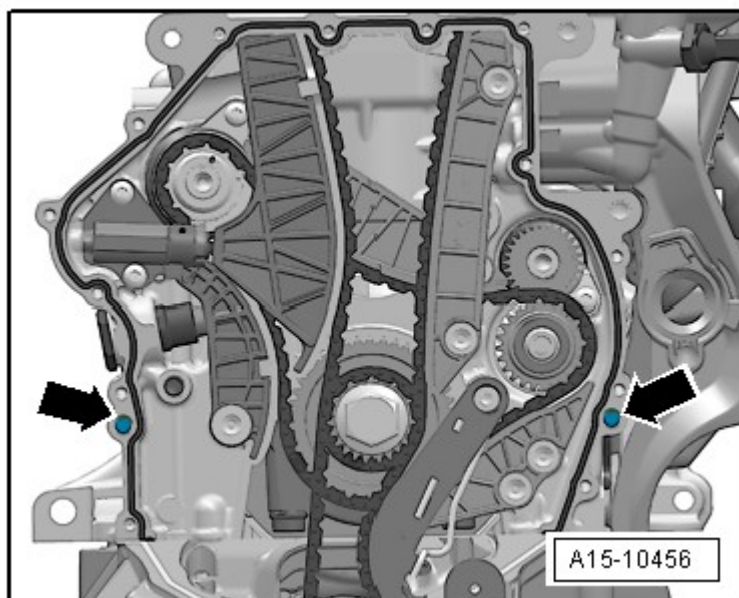


Fig. 49: Centering Cover Alignment Bushings
Courtesy of AUDI OF AMERICA, LLC

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

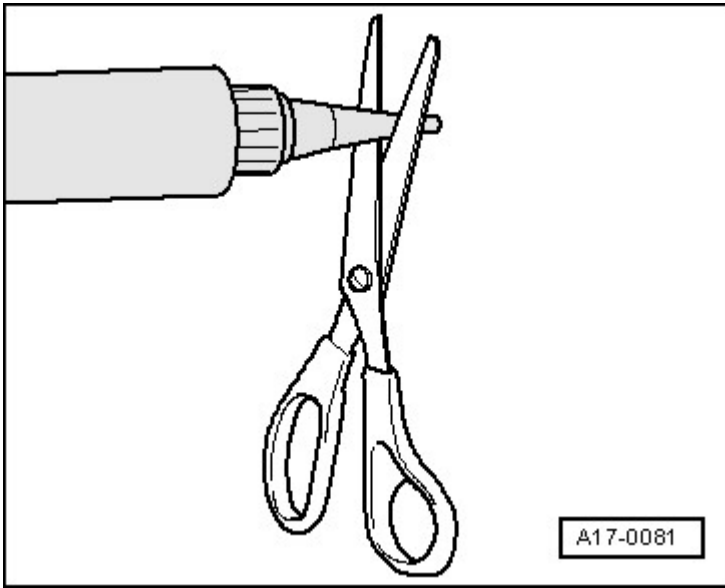


Fig. 50: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 mm)
Courtesy of AUDI OF AMERICA, LLC

Cover with 15 Bolts

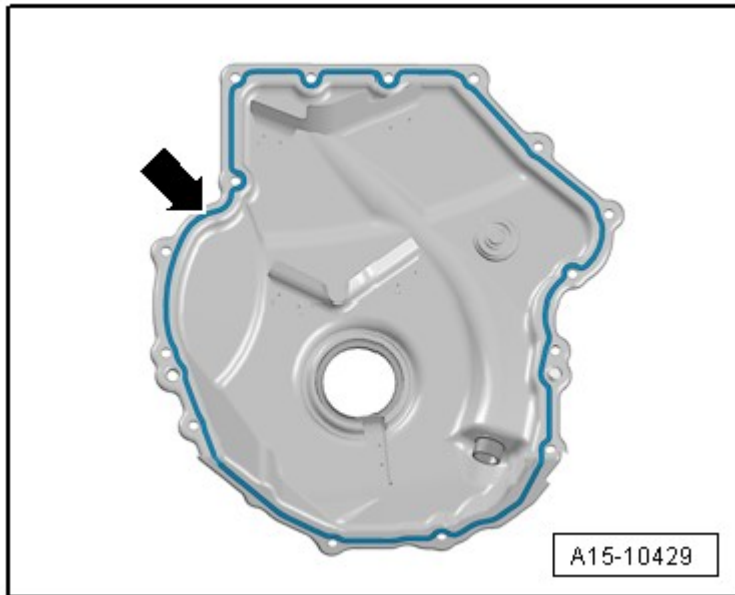


Fig. 51: Identifying Silicone Sealant Application Area For Cover Sealing Surface
Courtesy of AUDI OF AMERICA, LLC

-- Apply the silicone sealant on the clean sealing surface of the new cover as illustrated.

- Thickness of sealant bead: 2 to 3 mm

Cover with 8 Bolts

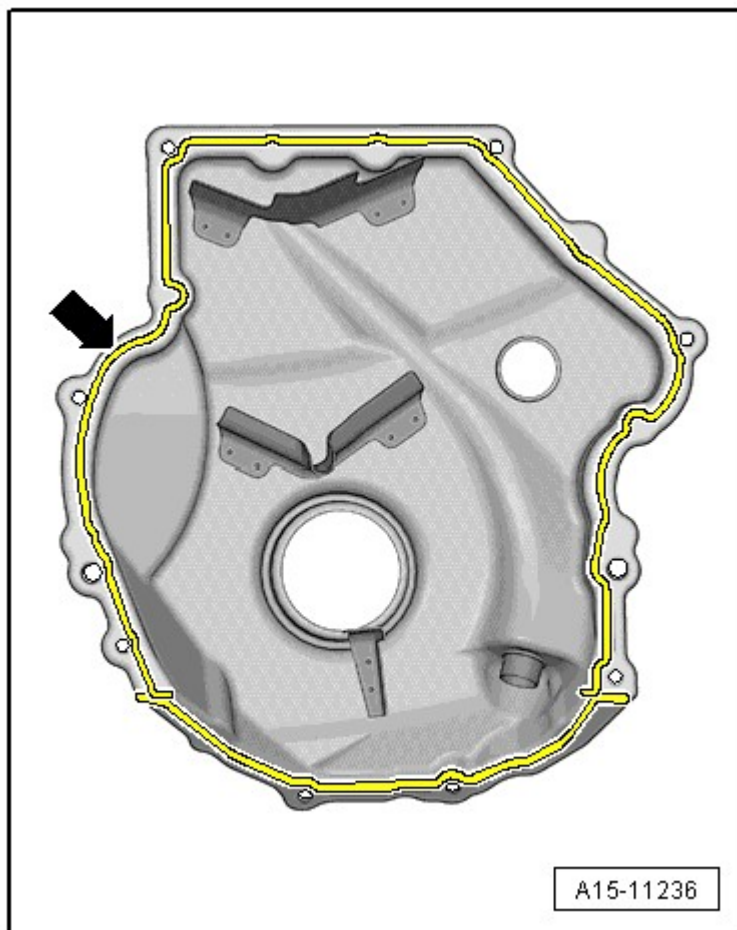


Fig. 52: Applying Silicone Sealant On Clean Sealing Surface Of New Cover
 Courtesy of AUDI OF AMERICA, LLC

-- Apply the silicone sealant on the clean sealing surface of the new cover as illustrated.

- Thickness of sealant bead: 2 to 3 mm.

NOTE:

- The cover must be installed within 5 minutes after the silicone sealant has been applied.
- The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake tube.

-- Immediately attach the cover and tighten the bolts:

- Cover with 15 bolts, refer to **Fig. 5**
- Cover with 8 bolts, refer to **Fig. 6**

NOTE:

After installing cover, allow sealant to dry for approximately 30 minutes. Only after then may the engine oil be replenished.

- Install vibration damper. Refer to **VIBRATION DAMPER** .
- Install the ribbed belt tensioning damper. Refer to **RIBBED BELT TENSIONING DAMPER** .
- Install the ribbed belt. Refer to **RIBBED BELT** .
- Install the service position. Refer to **Description and Operation** .
- Install the bumper and front bumper cover. Refer to **Removal and Installation** .
- Install the front noise insulation. Refer to **Description and Operation** .
- Check the oil level. Refer to **MAINTENANCE PROCEDURES**

VIBRATION DAMPER SHAFT SEAL**Special tools and workshop equipment required**

- Locking Tool T40098
- Counter Hold Tool T10355
- Thrust Piece T10368
- Pulling Hook T40274
- Thrust Piece T10354
- Pulling Hook T20143

Removing

- Remove the front noise insulation. Refer to **Description and Operation** .
- Remove the coolant fan electrical connector -1- from the bracket and disconnect it by sliding the retainer back -arrow- and pressing the release down.

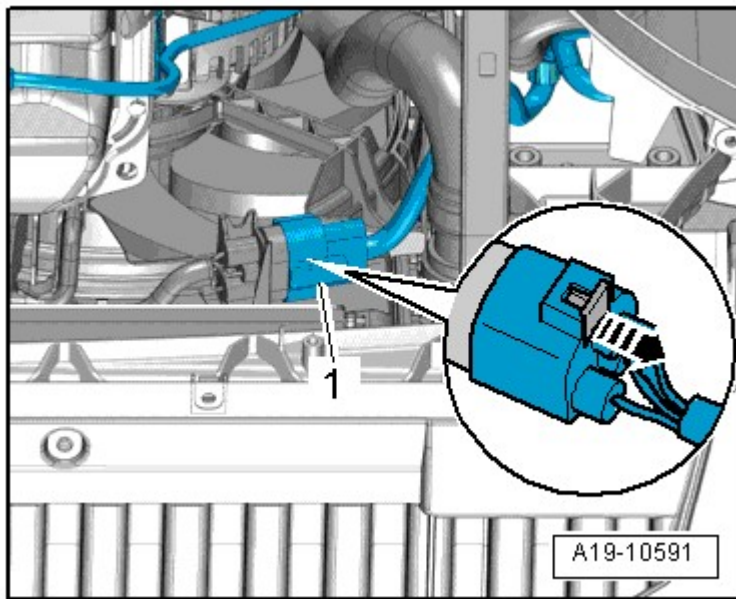


Fig. 53: Identifying Coolant Fan Electrical Connector
 Courtesy of AUDI OF AMERICA, LLC

- Free up the electrical wiring harness to the radiator fan control module.
- Disconnect electrical connectors -2- and -3-.

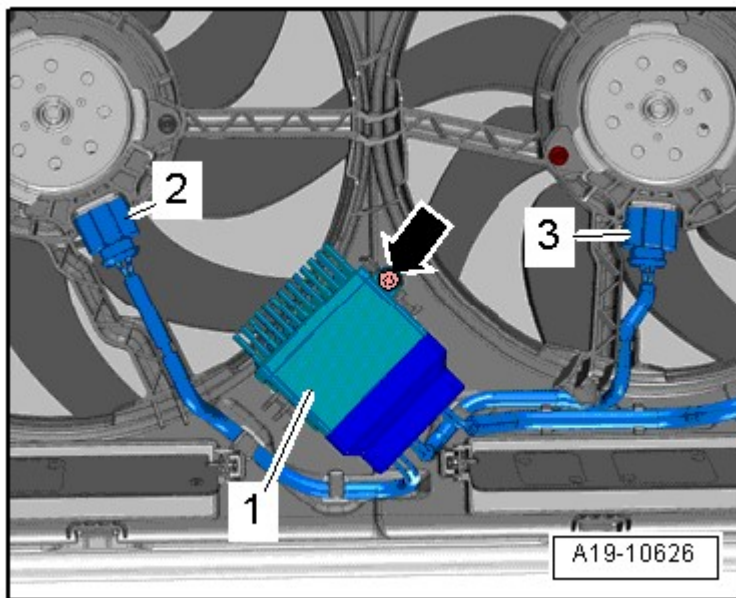


Fig. 54: Disconnecting Electrical Connectors
 Courtesy of AUDI OF AMERICA, LLC

- Remove the bolt -arrow- and the coolant fan control module -1-.

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

- Before removing ribbed belt, marking running direction with chalk or felt-tip pen for reinstallation later.

-- To release ribbed belt tension, rotate tensioner in direction of -arrow-.

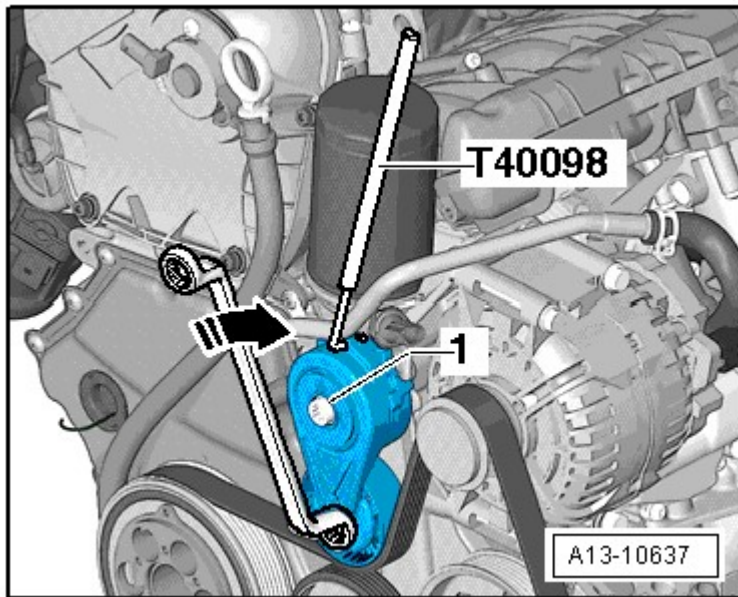


Fig. 55: Releasing Ribbed Belt Tension, Rotate Tensioner In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Secure the tensioner with the T40098.

-- Remove ribbed belt from vibration damper ribbed belt pulley.

CAUTION: The engine could be destroyed.

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

-- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

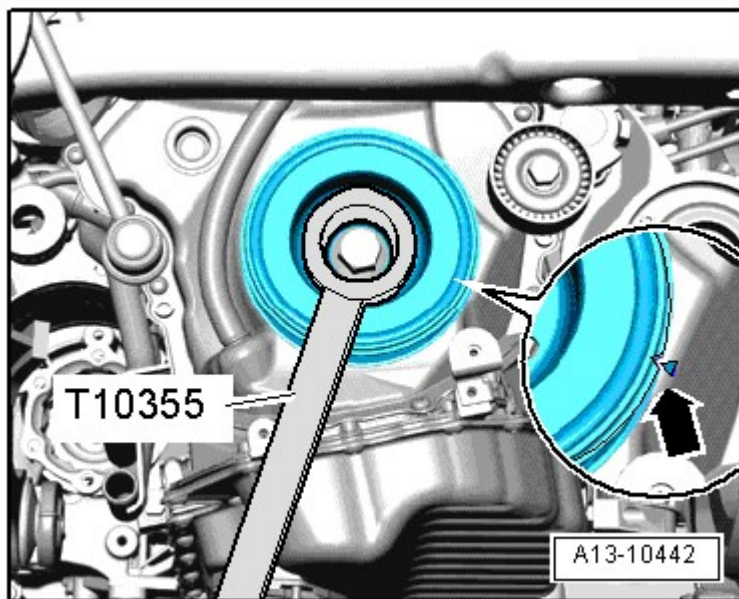


Fig. 56: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
Courtesy of AUDI OF AMERICA, LLC

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

-- Remove vibration damper bolt using the T10355.

-- Remove the vibration damper and attach the T10368.

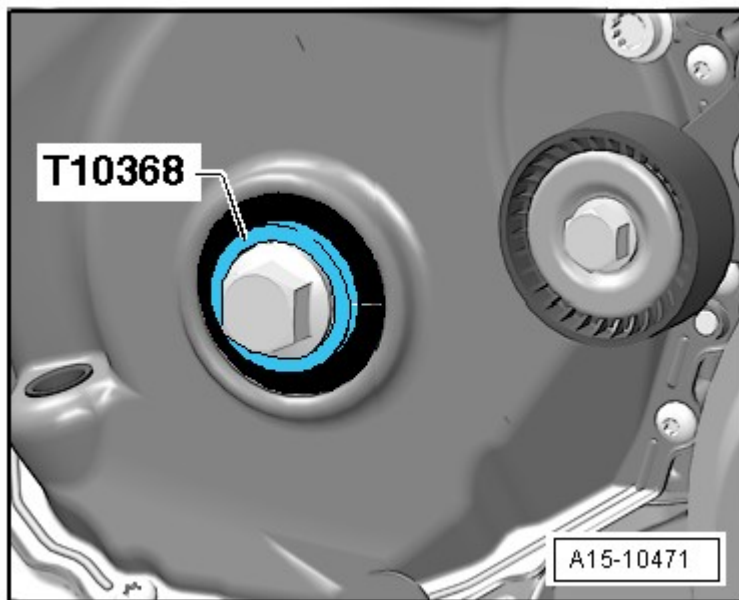


Fig. 57: Identifying Vibration Damper Bolt And Thrust Piece T10368
Courtesy of AUDI OF AMERICA, LLC

-- Remove the shaft seal with the T40274.

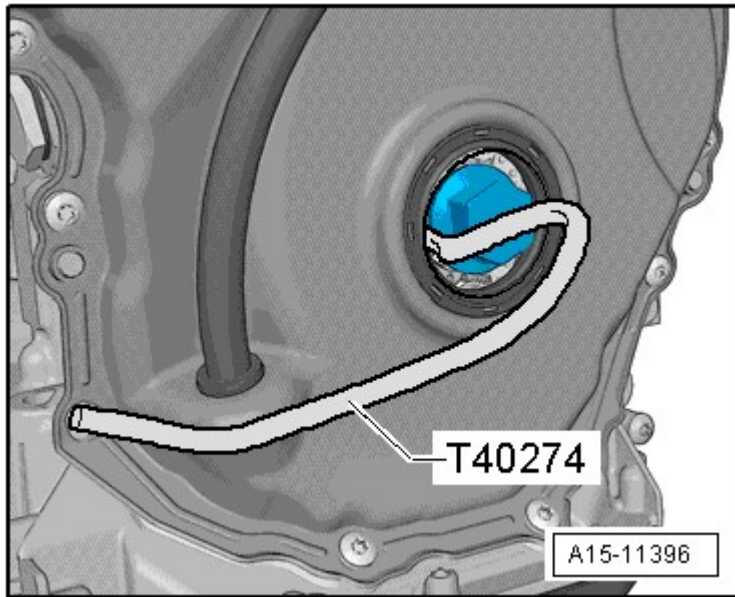


Fig. 58: Identifying Shaft Seal

Courtesy of AUDI OF AMERICA, LLC

Installing

- For the correct tightening specifications, refer to **RIBBED BELT DRIVE AND AUXILIARY COMPONENT BRACKET OVERVIEW** .

-- Clean running and sealing surface.

-- Remove the T10368.

-- Push the sealing ring -arrow- using the T10354 and the vibration damper bolt in all the way.

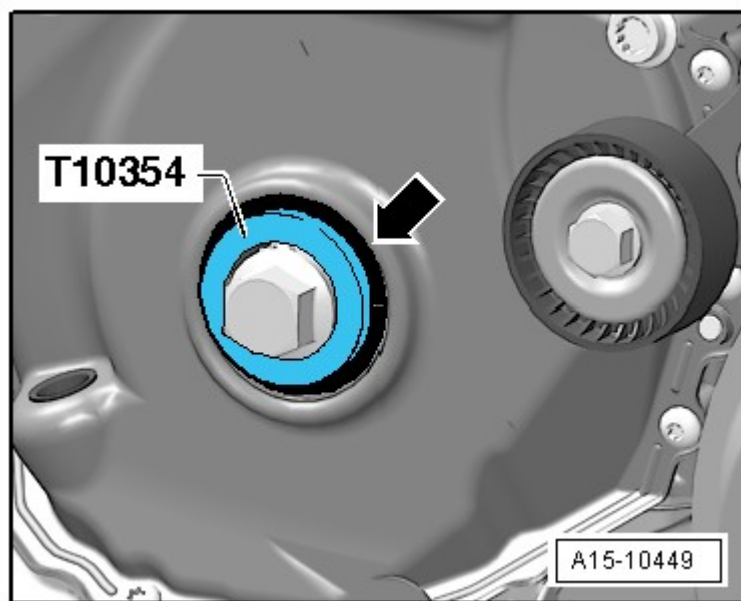


Fig. 59: Identifying Thrust Piece T10354
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace the vibration damper bolt with an O-ring.

Assemble in reverse order of disassembly. When doing this note the following:

-- Install vibration damper. Refer to **VIBRATION DAMPER** .

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

CAMSHAFT TIMING CHAIN (WITHOUT NEW TOOLS)

Special tools and workshop equipment required

- Locking Tool T40098
- Counter Hold Tool T10355
- Assembly Tool T10352 and Assembly Tool T10352/1
- Locking Pin T40011

Removing

-- Remove the front bumper cover and the bumper. Refer to **Removal and Installation** .

-- Install the lock carrier in service position. Refer to **Description and Operation** .

-- Remove timing chain upper cover. Refer to **UPPER TIMING CHAIN GUARD**.

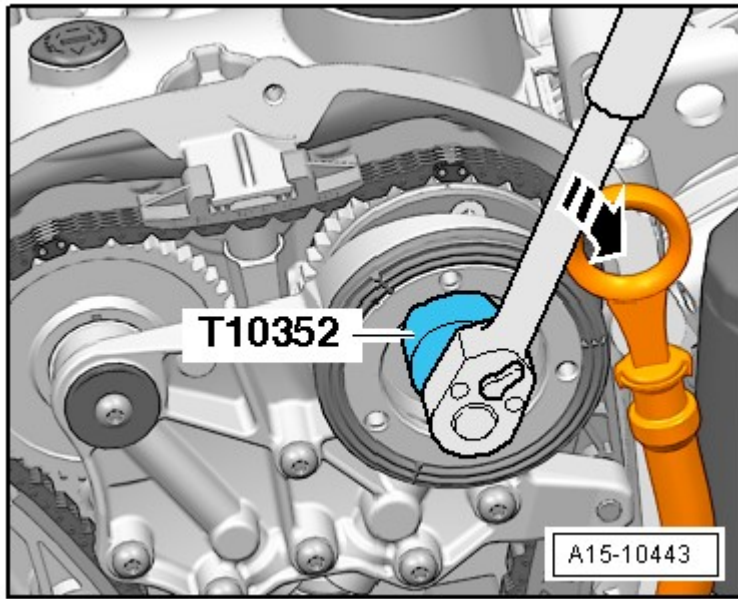


Fig. 60: Identifying Assembly Tool T10352 To Remove Control Valve
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The control valve has a left thread.

-- Remove the control valve using the T10352 or T10352/1 in direction of -arrow- depending on the version.

-- Remove the bolts -arrows- and remove the bearing bracket.

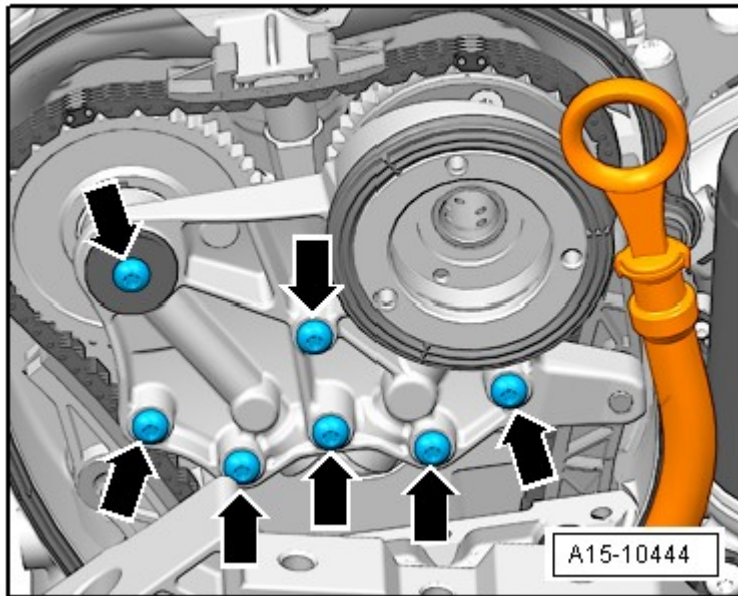


Fig. 61: Identifying Bearing Bracket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

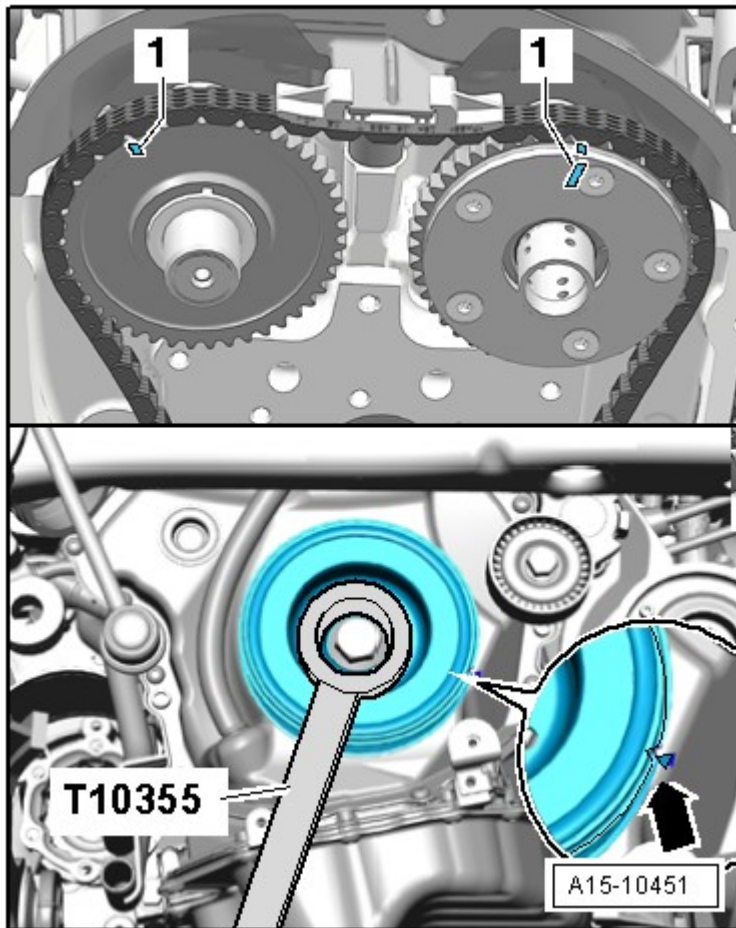


Fig. 62: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper must line up with the arrow marking on the timing chain lower cover.
- The markings -1- on the camshafts must point upward.

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

-- Press the oil pump chain tensioner in the direction of the -arrow- and secure it with the T40011.

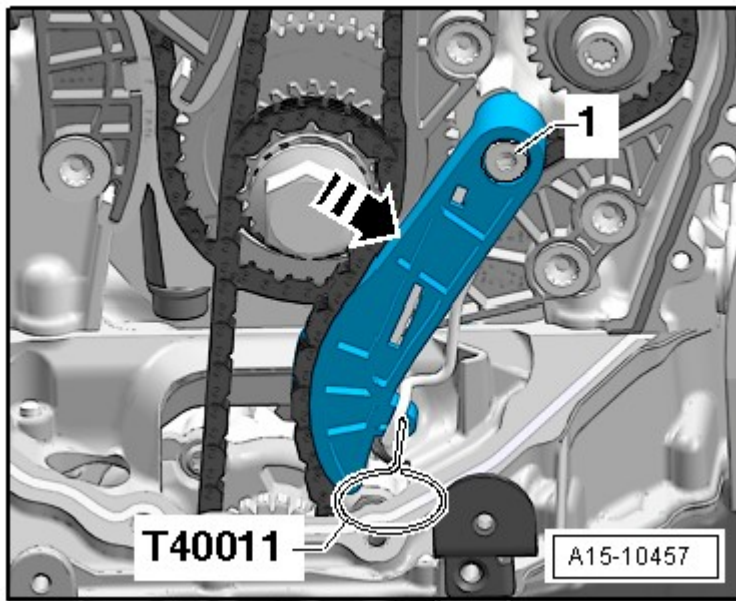


Fig. 63: Identifying Oil Pump Chain Tensioner And Locking Pin T40011
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the oil pump chain tensioner -1-.

-- Lift the chain tensioner locking wedge by inserting a scriber or a suitable screwdriver into the hole in the chain tensioner in the direction of -arrow 1-.

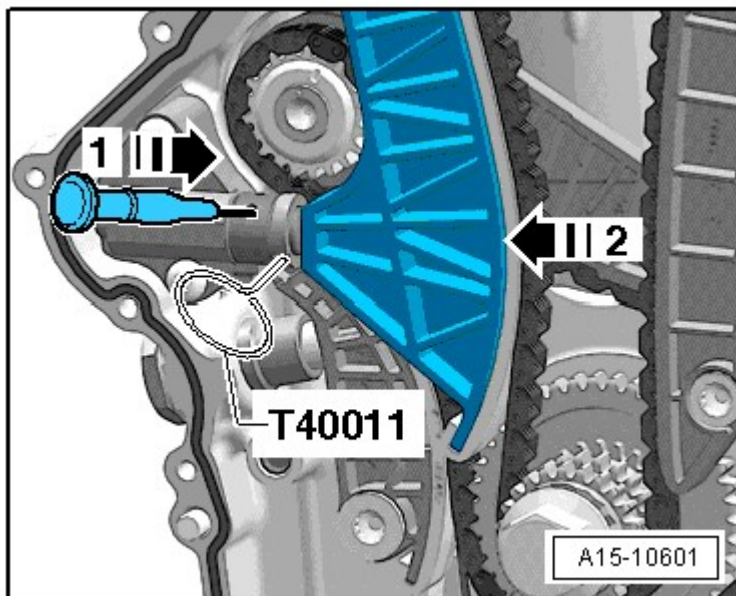


Fig. 64: Inserting Screwdriver Into Chain Tensioner Hole And Pressing Timing Chain Tensioning Rail
 Courtesy of AUDI OF AMERICA, LLC

-- Press the timing chain tensioning rail in the direction of -arrow 2- and secure it with the T40011.

-- Remove the camshaft timing chain from the cylinder head.

NOTE: The intake camshaft switches in the engine direction of rotation.

-- Remove the timing chain tensioning rail -2-.

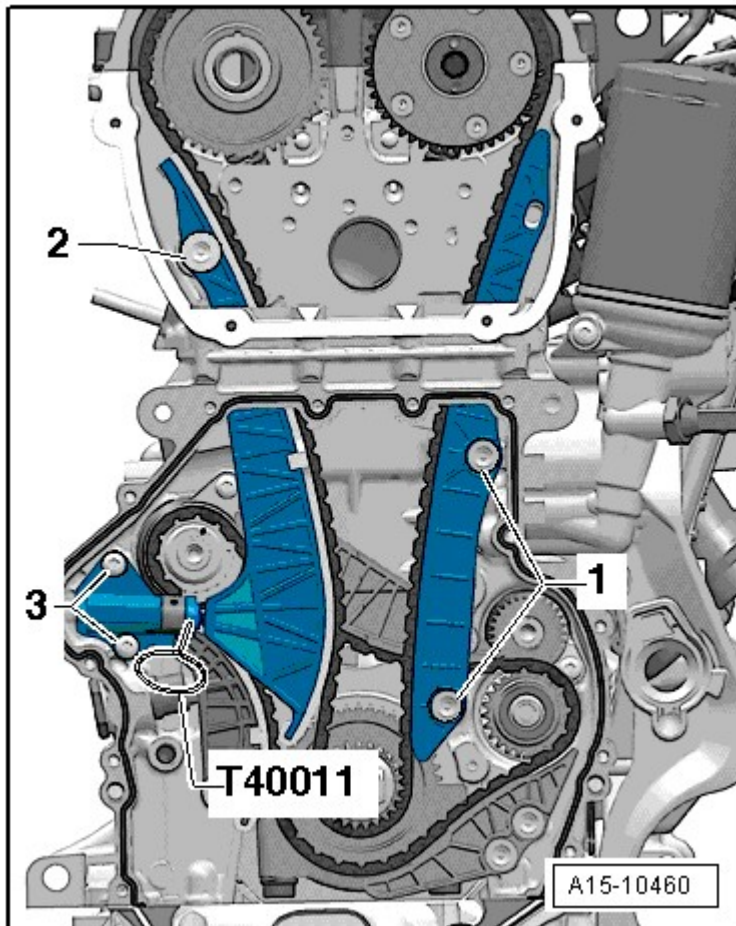


Fig. 65: Identifying Camshaft Timing Chain Tensioner Bolts, Camshaft Timing Chain Guide Rail And Guide Pins

Courtesy of AUDI OF AMERICA, LLC

-- Remove the guide rail for the camshaft timing chain -1-.

-- Remove the timing chain.

Installing

- Tightening specifications, refer to CAMSHAFT TIMING CHAIN OVERVIEW.

NOTE: The following must be performed in one sequence. A second technician is required for this.

The painted links of the timing chain must be positioned on the markings on the chain sprockets.

Hold the wrench tight until the tensioning rail is installed.

- Mount the timing chain on the exhaust camshaft.
- Mount the timing chain on the crankshaft.
- Turn the intake camshaft using the wrench in the direction of the -arrow- and mount the timing chain.

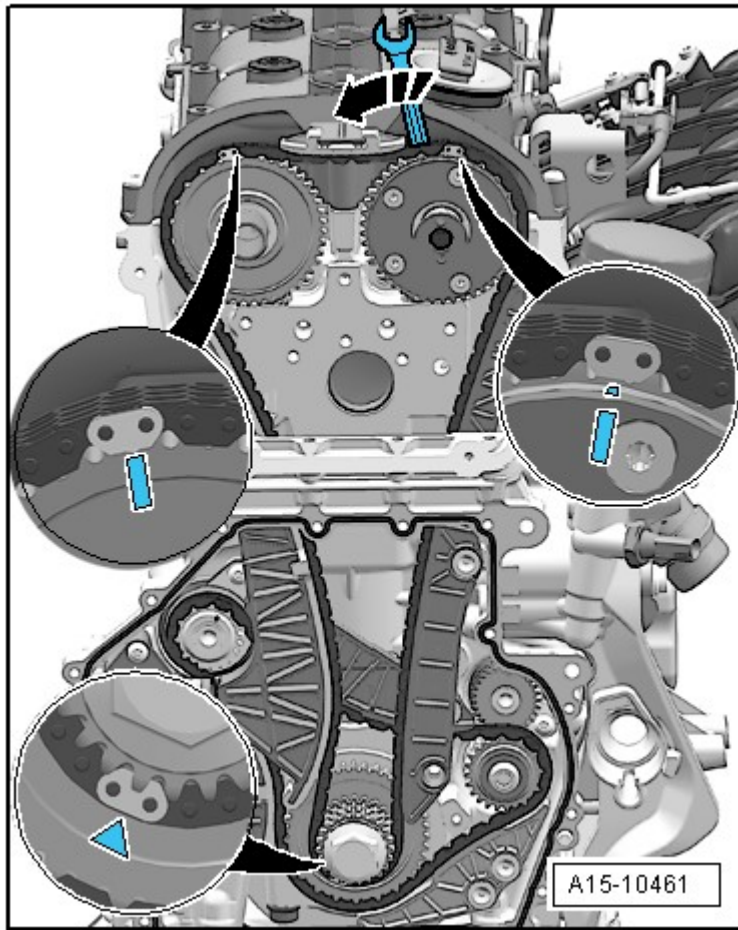


Fig. 66: Identifying Intake Camshaft Turned Using Wrench
Courtesy of AUDI OF AMERICA, LLC

- Install the timing chain tensioning rail and tighten the bolt -2-.

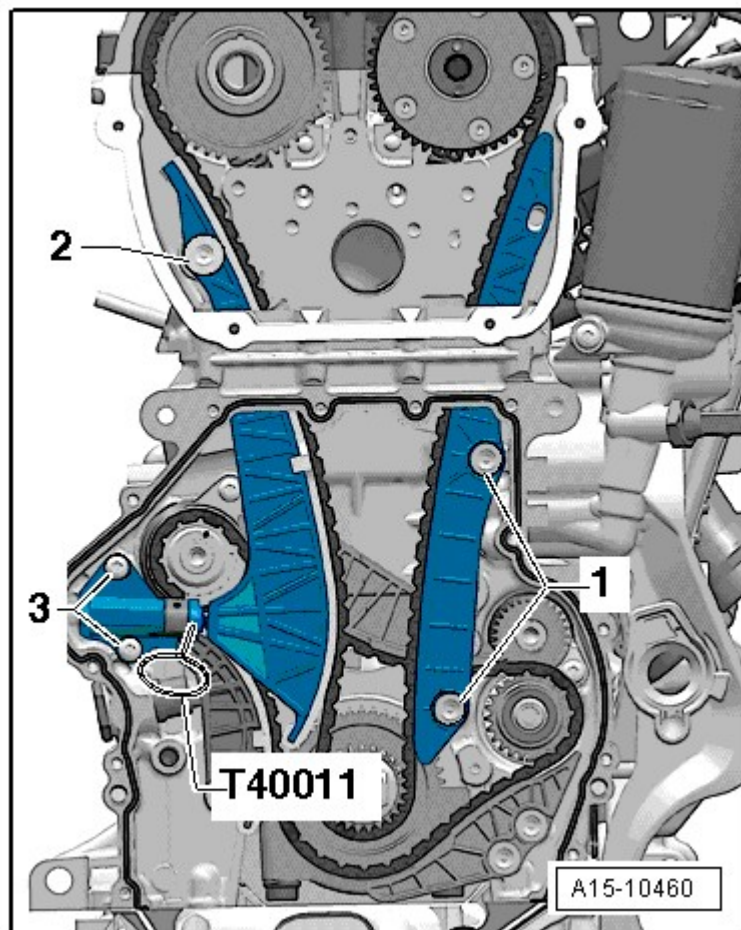


Fig. 67: Identifying Camshaft Timing Chain Tensioner Bolts, Camshaft Timing Chain Guide Rail And Guide Pins

Courtesy of AUDI OF AMERICA, LLC

-- Install the camshaft timing chain guide rail and tighten the bolts -1-.

-- Mount the bearing bracket and the bolts -arrows- hand-tight.

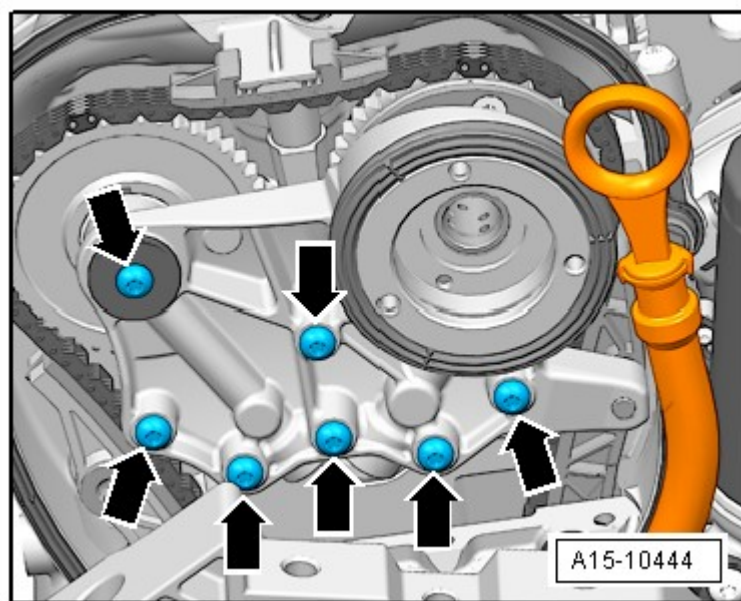


Fig. 68: Identifying Bearing Bracket Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40011.

-- Tighten the bolts -arrows-. Refer to CAMSHAFT TIMING CHAIN OVERVIEW.

-- Install the control valve. See item 6 in Fig. 7.

Assemble in reverse order of disassembly. When doing this note the following:

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

-- Install the timing chain guard upper section. Refer to UPPER TIMING CHAIN GUARD.

-- Install the ribbed belt tensioning damper. Refer to RIBBED BELT TENSIONING DAMPER.

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

-- Install the lock carrier in service position. Refer to Description and Operation.

-- Install the bumper and front bumper cover. Refer to Removal and Installation.

CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)

Special tools and workshop equipment required

- Locking Tool T40098
- Counter Hold Tool T10355

- Assembly Tool T10352 and Assembly Tool T10352/1
- Locking Pin T40011
- Pry Lever T40243
- Camshaft Locator T40271

Removing

- Remove the front bumper cover and bumper. Refer to **Removal and Installation** .
- Install the lock carrier in service position. Refer to **Description and Operation** .
- Remove timing chain upper cover. Refer to **UPPER TIMING CHAIN GUARD**.

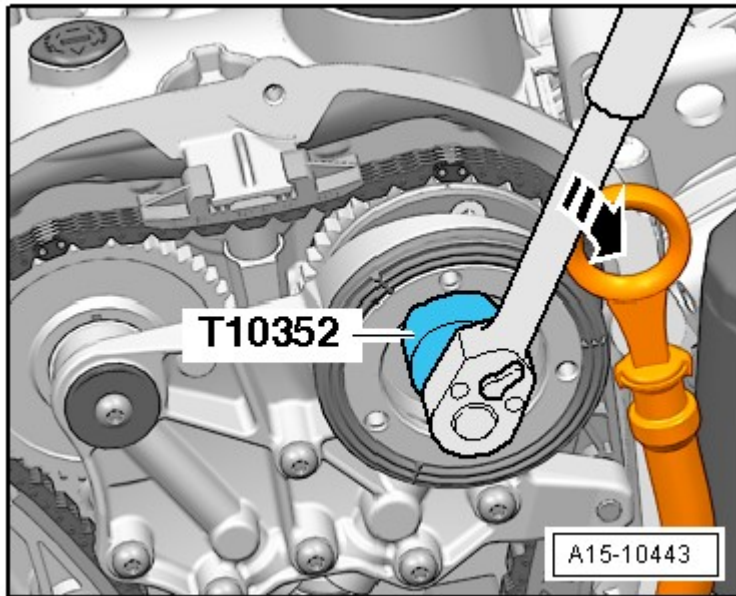


Fig. 69: Identifying Assembly Tool T10352 To Remove Control Valve
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The control valve has a left thread.

- Remove the control valve using the T10352 or T10352/1 in direction of -arrow- depending on the version.
- Remove the bolts -arrows- and remove the bearing bracket.

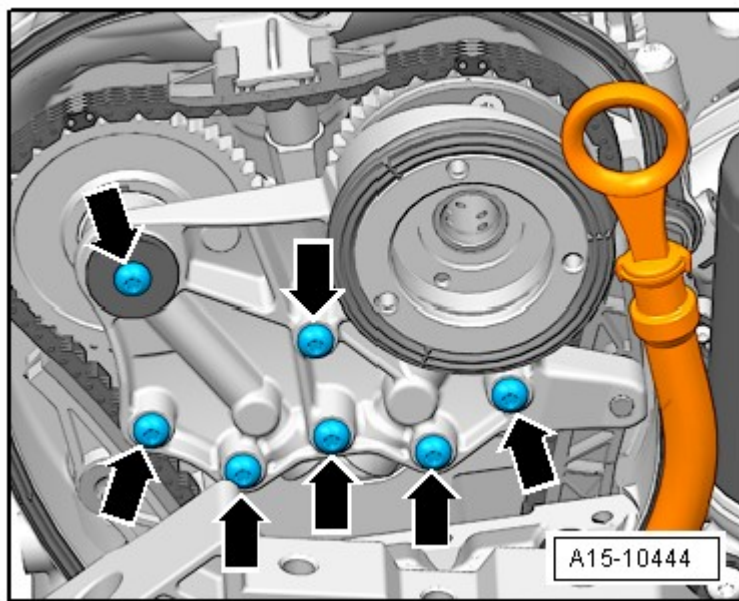


Fig. 70: Identifying Bearing Bracket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the vibration damper using the T10355 into the "TDC" position.

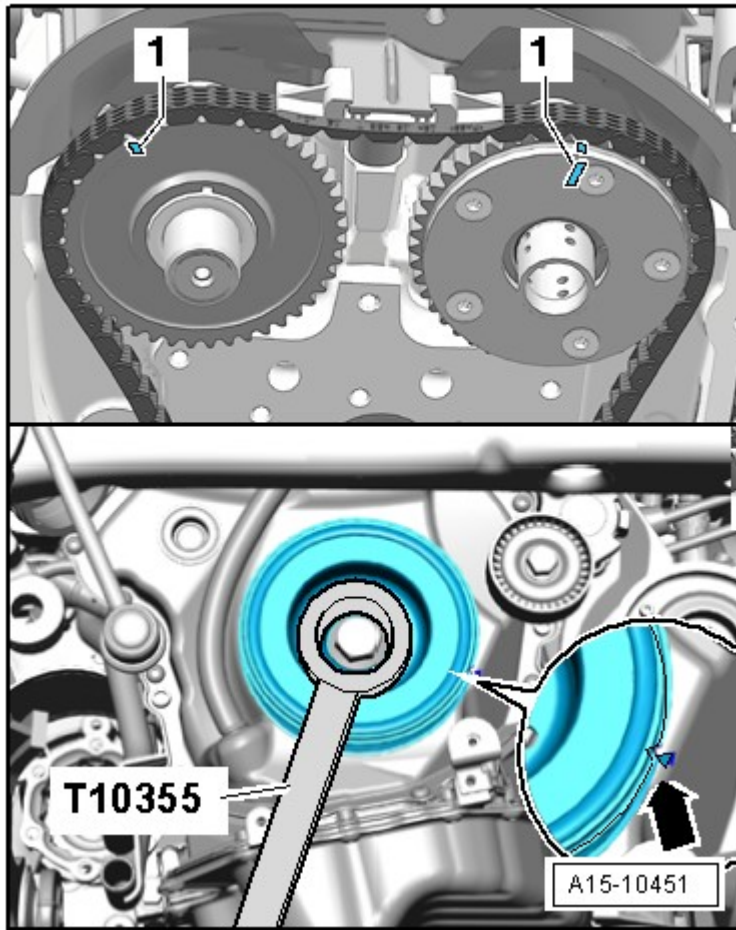


Fig. 71: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper and the marking on the timing chain guard lower section must be opposite one another -arrow-.
- The markings -1- on the camshafts must point upward.

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

-- Press the oil pump chain tensioner in the direction of the -arrow- and secure it with the T40011.

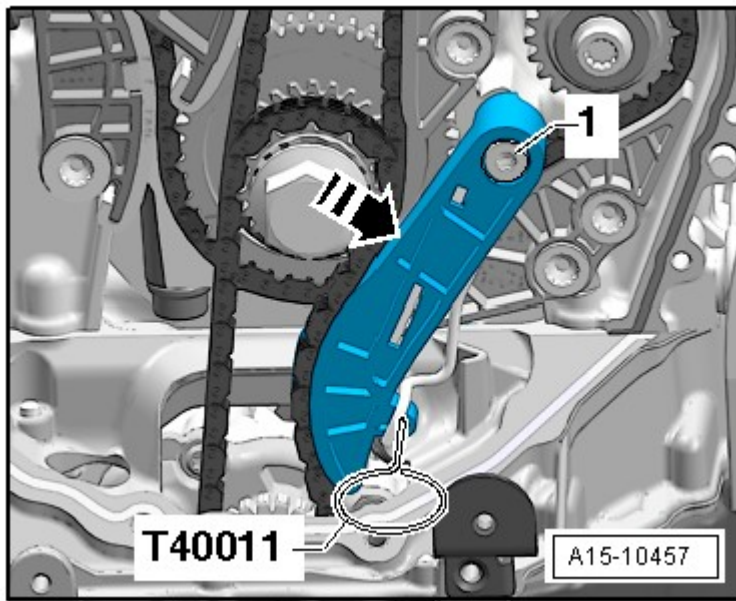


Fig. 72: Identifying Oil Pump Chain Tensioner And Locking Pin T40011
Courtesy of AUDI OF AMERICA, LLC

-- Remove the oil pump chain tensioner -1-.

-- Remove the bolts -arrows-.

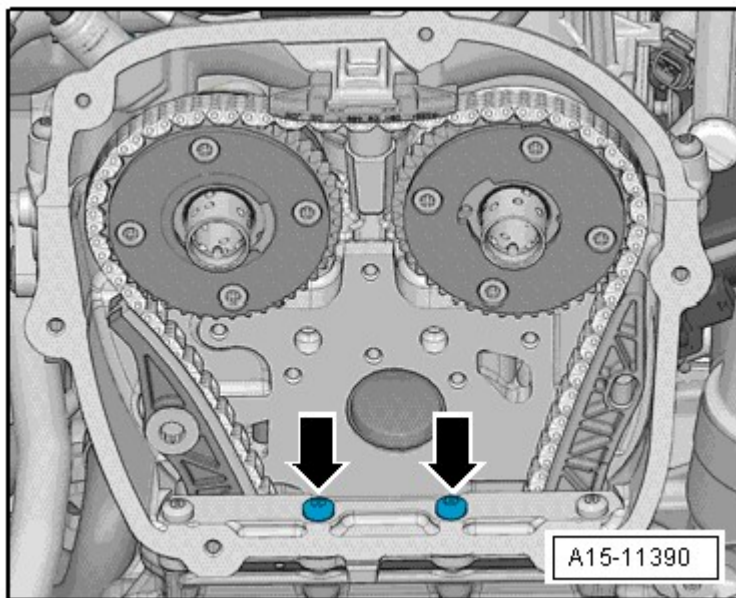


Fig. 73: Identifying Bolts
Courtesy of AUDI OF AMERICA, LLC

Two Different Chain Tensioners may be Installed Depending on the Version

Version 1

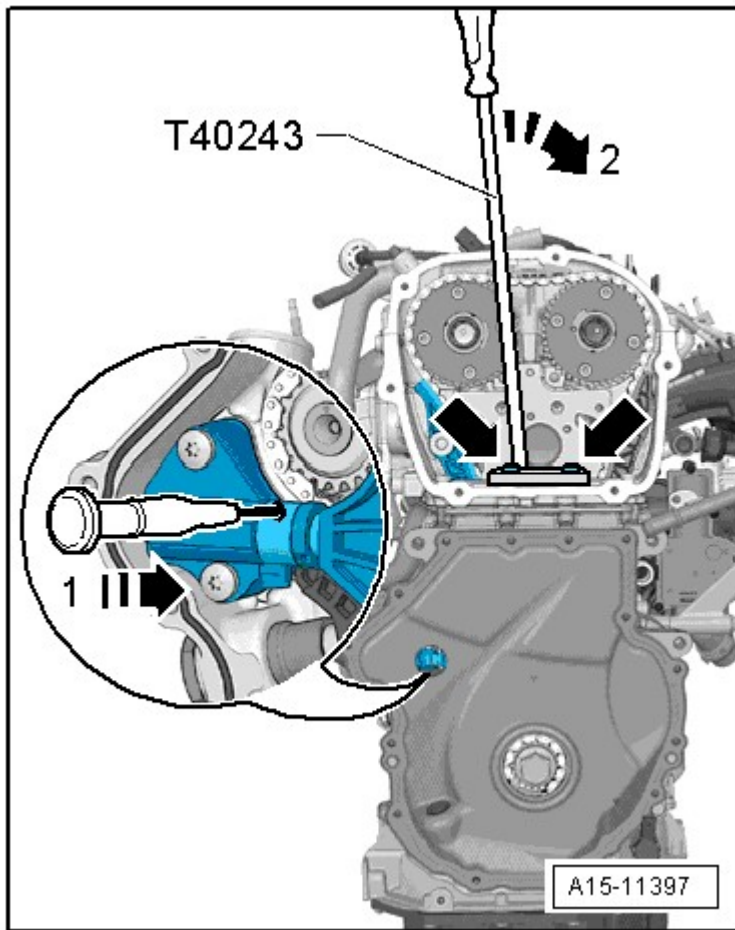


Fig. 74: Identifying Version 1

Courtesy of AUDI OF AMERICA, LLC

-- Install the T40243 -arrows-.

-- Insert a scribe or a suitable screwdriver into the opening for the chain tensioner in the direction of the -arrow 1- to lift up the locking wedge for the chain tensioner, slowly press down the T40243 and hold it in the direction of the -arrow 2-.

-- Secure the chain tensioner using T40011.

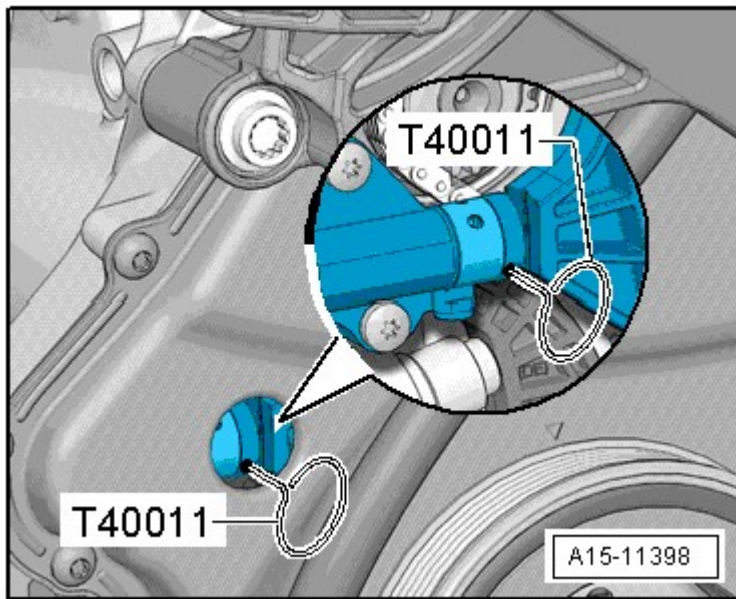


Fig. 75: Securing Chain Tensioner

Courtesy of AUDI OF AMERICA, LLC

Version 2

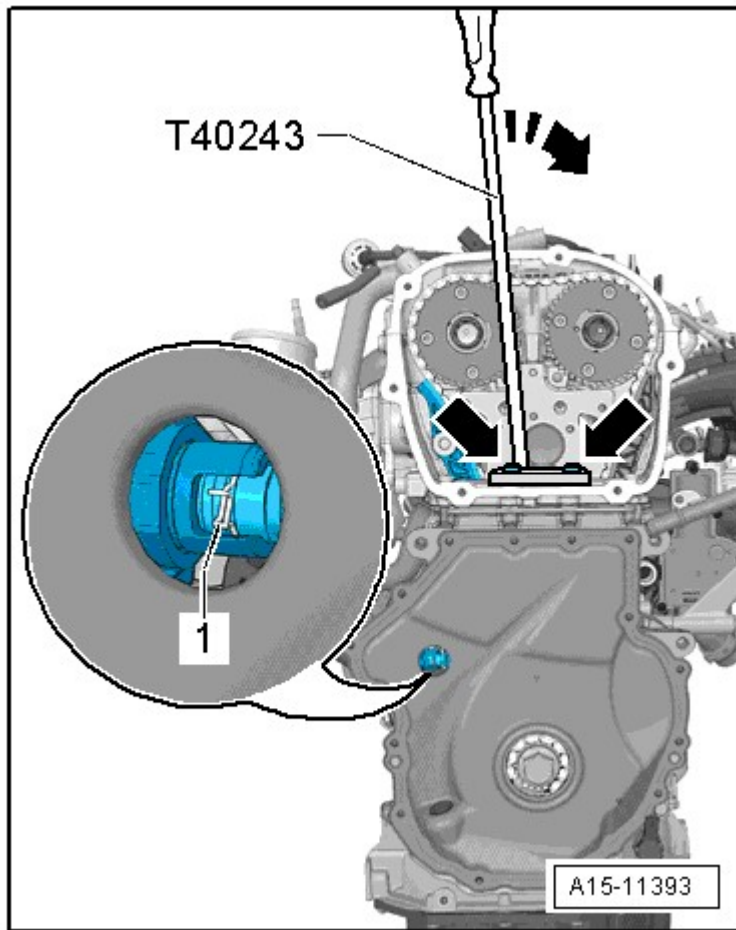


Fig. 76: Identifying Version 2

Courtesy of AUDI OF AMERICA, LLC

- Install the T40243 -arrows-.
- Press the chain tensioner locking ring -arrow- together and slowly press and hold the T40243 in the direction of the -arrow-.
- Secure the chain tensioner with the T40267.

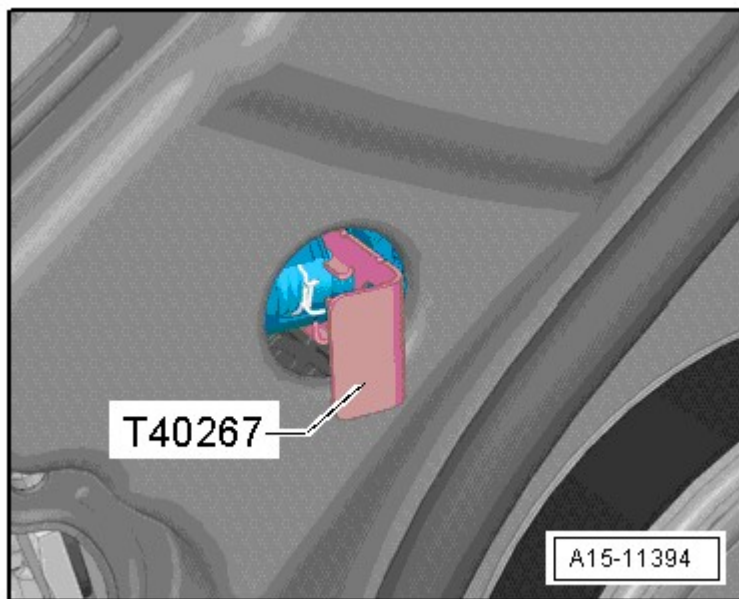


Fig. 77: Securing Chain Tensioner

Courtesy of AUDI OF AMERICA, LLC

All Versions

-- Remove the T40243.

-- Bolt the T40271/2 to the cylinder head and push the chain sprocket splines in the direction of the -arrow 2-. If necessary, turn the intake camshaft with a wrench in the direction of the -arrow 1-.

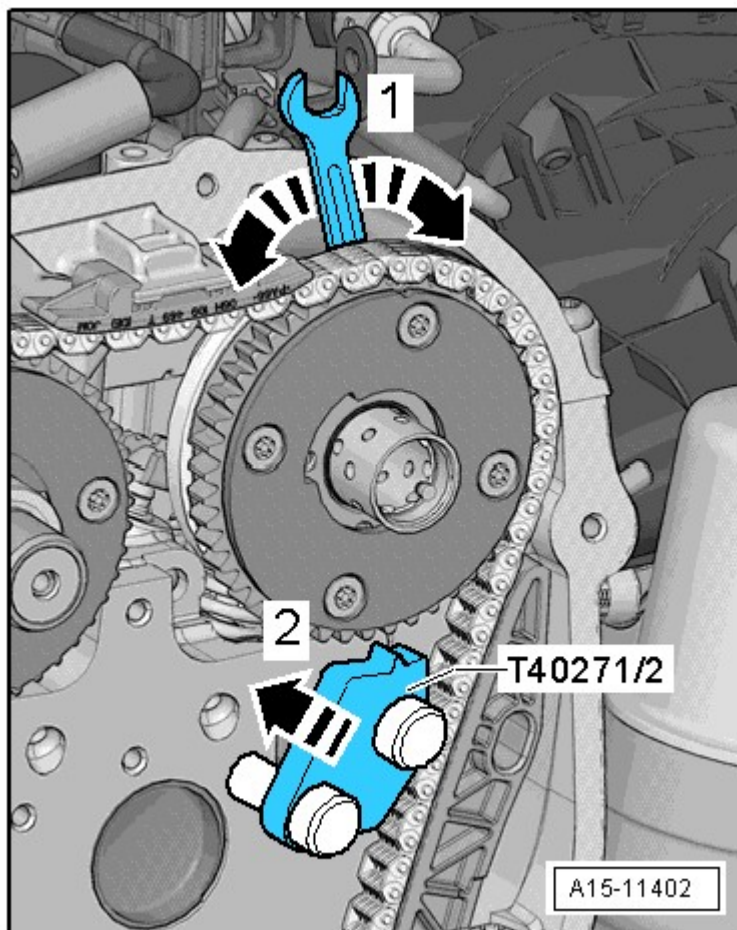


Fig. 78: Identifying Bolt Camshaft Locating Tool T40271/2
Courtesy of AUDI OF AMERICA, LLC

-- Attach the T40271/1 to the cylinder head.

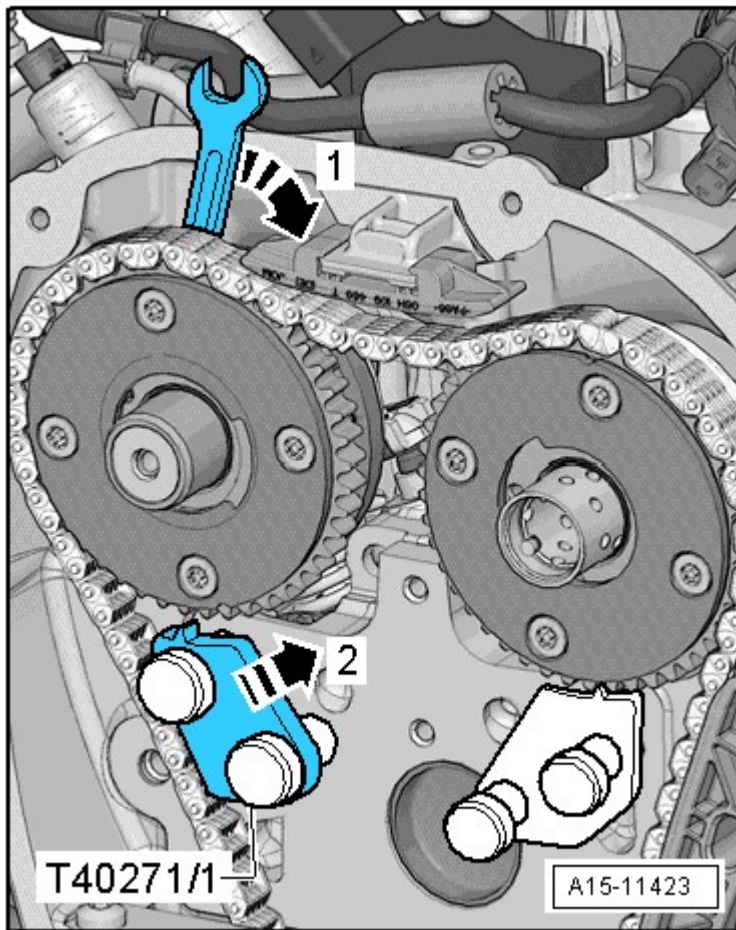


Fig. 79: Identifying Camshaft Locating Tool
Courtesy of AUDI OF AMERICA, LLC

-- Turn the exhaust camshaft with the wrench in the direction of the -arrow 1- and slide the T40271/1 in the chain sprocket splines in the direction of the -arrow 2-.

-- Remove the timing chain tensioning rail -2-.

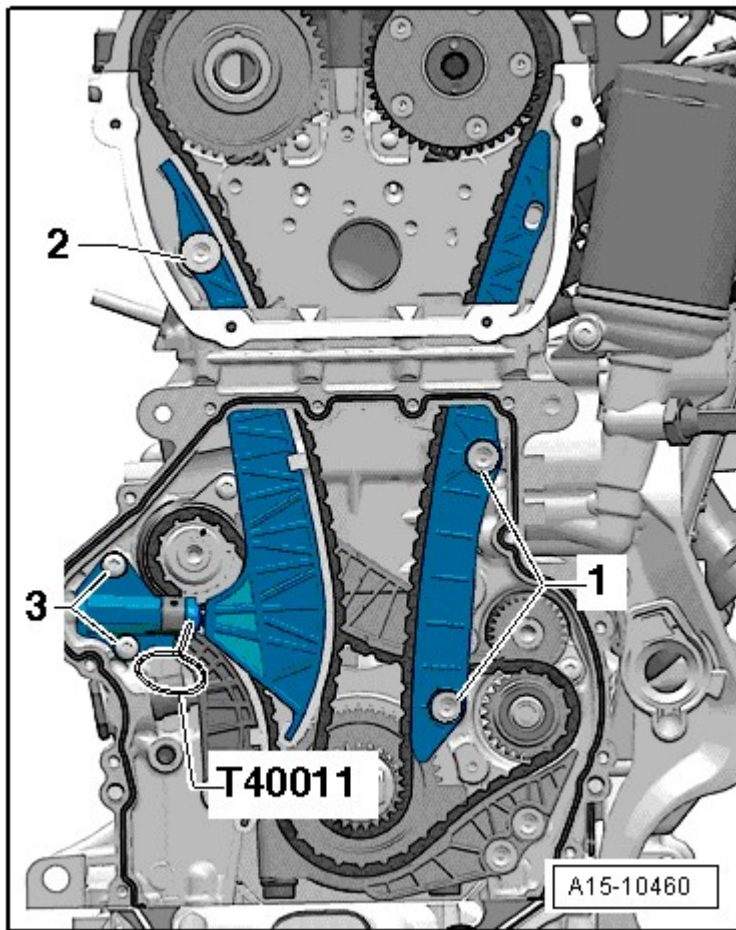


Fig. 80: Identifying Camshaft Timing Chain Tensioner Bolts, Camshaft Timing Chain Guide Rail And Guide Pins

Courtesy of AUDI OF AMERICA, LLC

-- Remove the guide rail for the camshaft timing chain -1-.

-- Remove the timing chain.

Installing

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

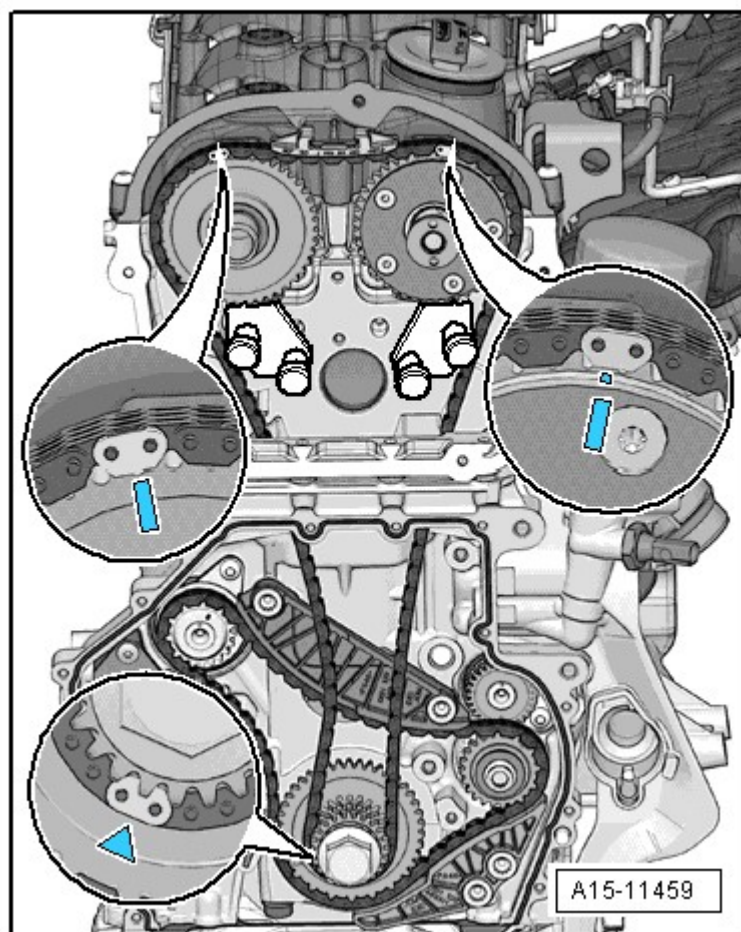


Fig. 81: Identifying Camshaft Timing Chain Overview
Courtesy of AUDI OF AMERICA, LLC

NOTE: The painted links of the timing chain must be positioned on the markings on the chain sprockets.

- Mount the timing chain on the intake camshaft.
- Mount the timing chain on the exhaust camshaft.
- Lay the timing chain on the crankshaft and hold it there.
- Install the timing chain tensioning rail and tighten the bolt -2-.

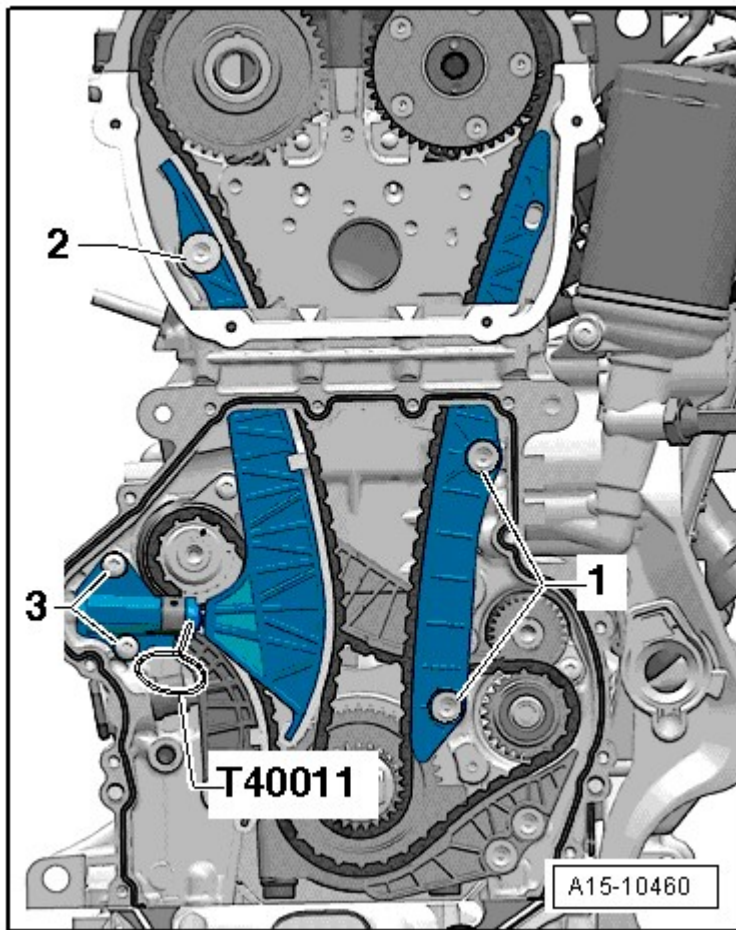


Fig. 82: Identifying Camshaft Timing Chain Tensioner Bolts, Camshaft Timing Chain Guide Rail And Guide Pins

Courtesy of AUDI OF AMERICA, LLC

-- Install the camshaft timing chain guide rail and tighten the bolts -1-.

-- Turn the exhaust camshaft in the direction of the -arrow 1-, slide out the camshaft locating tool T40271/1 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

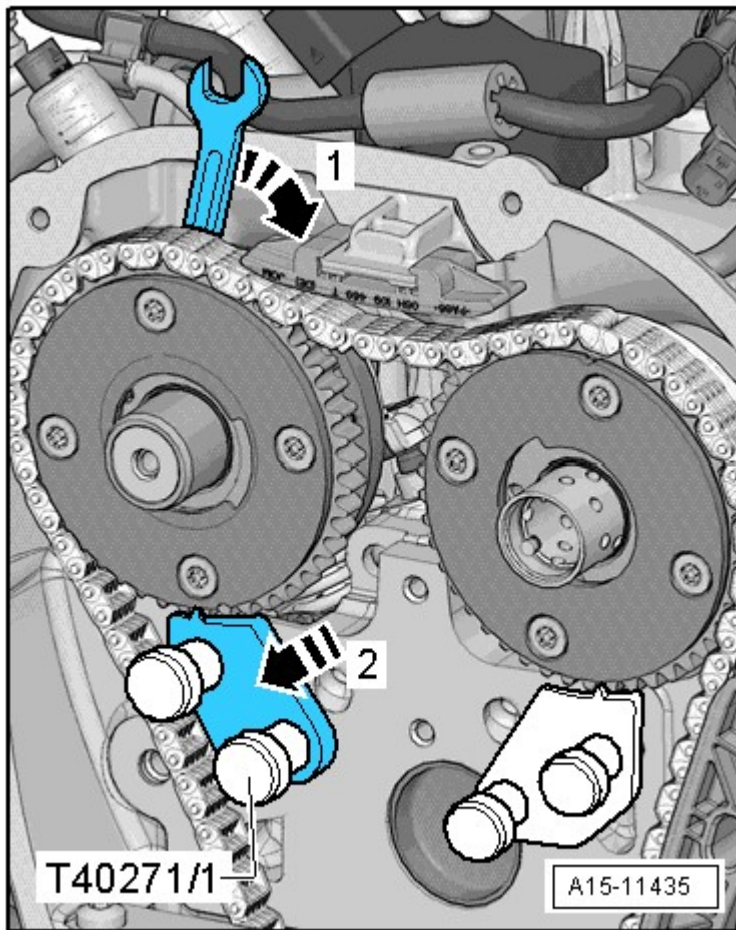


Fig. 83: Turning Exhaust Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Remove the camshaft locating tool T40271/1.

-- Turn the intake camshaft in the direction of the -arrow 1-, slide out the camshaft locating tool T40271/2 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

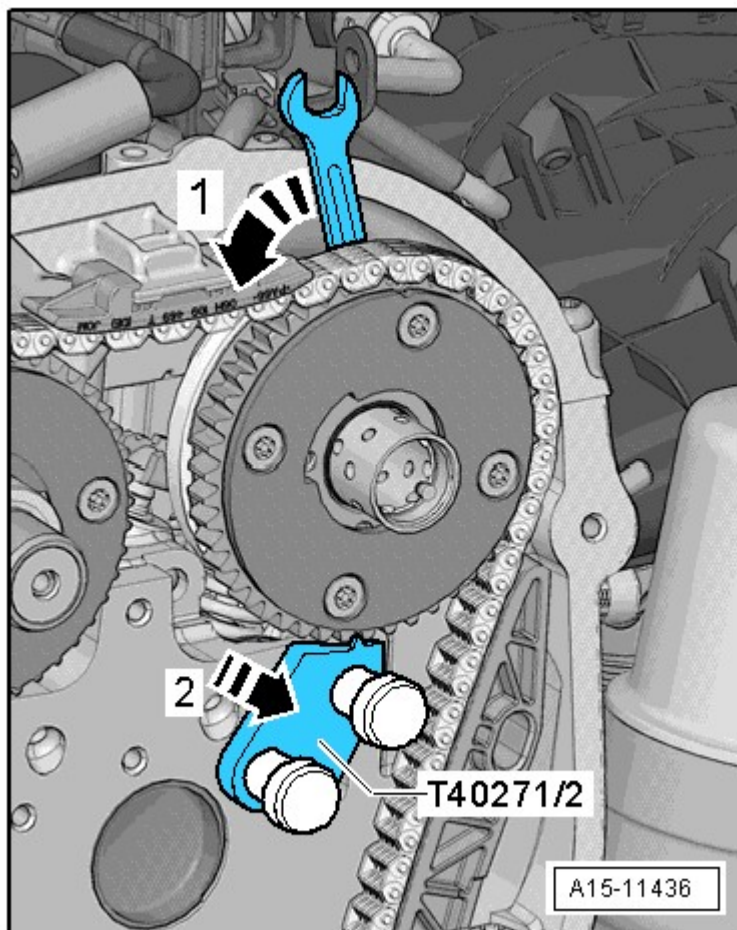


Fig. 84: Turning Intake Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40271/2.

-- Install the bolts -arrows- and tighten them.

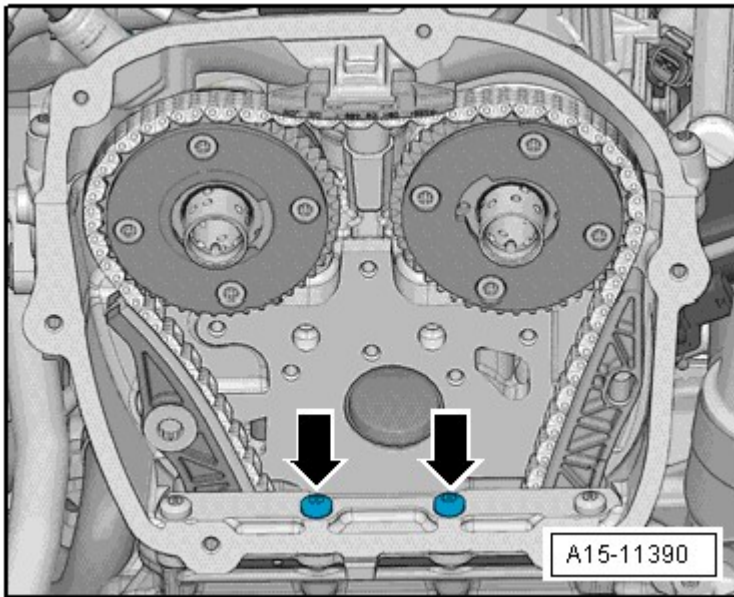


Fig. 85: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Mount the bearing bracket and the bolts -arrows- hand-tight.

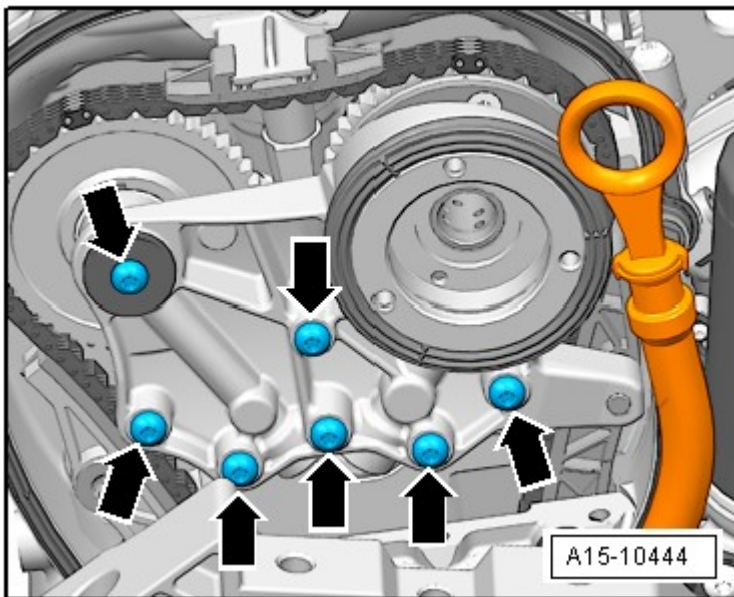


Fig. 86: Identifying Bearing Bracket Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40011 or the T40267, depending on the version.

-- Tighten the bolts -arrows-. Refer to CAMSHAFT TIMING CHAIN OVERVIEW.

-- Install the control valve -item 6- in Fig. 7.

Assemble in reverse order of disassembly. Note the following:

- Install the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.
- Install the ribbed belt tensioning damper. Refer to **RIBBED BELT TENSIONING DAMPER** .
- Install the ribbed belt. Refer to **RIBBED BELT** .
- Install the service position. Refer to **Description and Operation** .
- Install the bumper and front bumper cover. Refer to **Removal and Installation** .

BALANCE SHAFT TIMING CHAIN

Removing

- Remove timing chain upper cover. Refer to **UPPER TIMING CHAIN GUARD**.
- Remove the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Remove the camshaft timing chain. Refer to **CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)**.
- Remove the camshaft timing chain tensioner -3-.

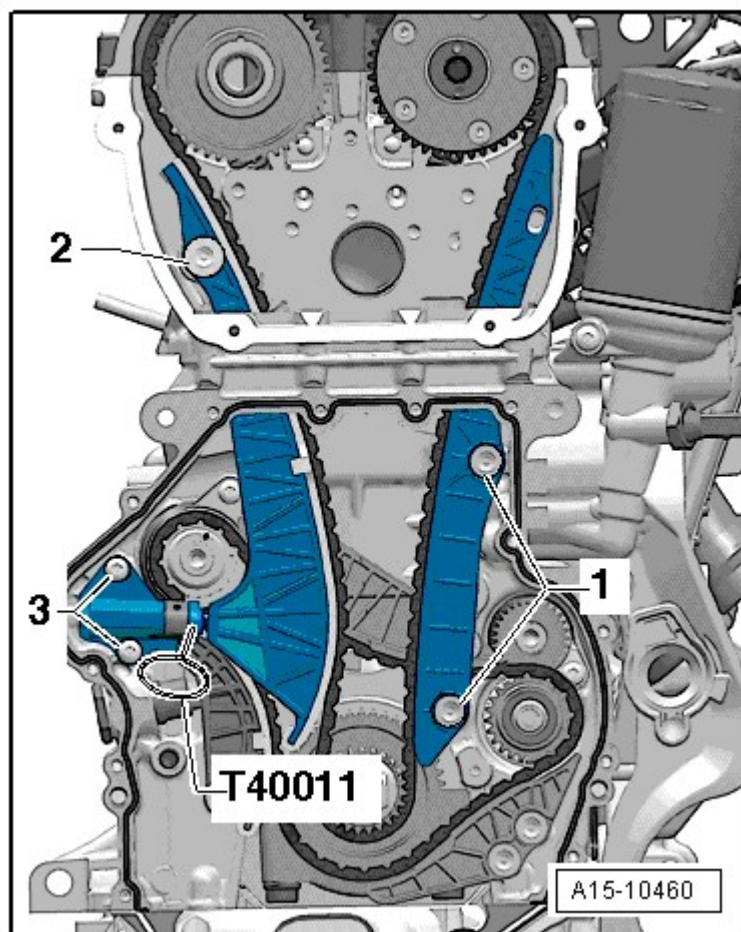


Fig. 87: Identifying Camshaft Timing Chain Tensioner Bolts, Camshaft Timing Chain Guide Rail And Guide Pins

Courtesy of AUDI OF AMERICA, LLC

-- Remove the balance shaft chain tensioner -1-.

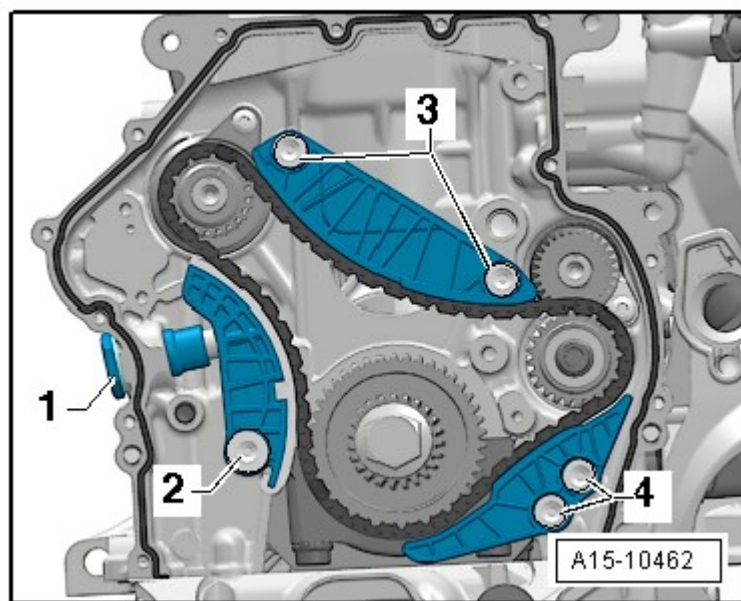


Fig. 88: Identifying Balance Shaft Timing Chain, Tensioning Rail And Guide Rails
Courtesy of AUDI OF AMERICA, LLC

- Remove the tensioning rail -2-.
- Remove the guide rail -3-.
- Remove the guide rail -4-.
- Remove the timing chain.

Installing

- Tightening specifications, refer to **BALANCE SHAFT TIMING CHAIN OVERVIEW**.
- Turn the intermediate sprocket/balance shaft to the marking -arrow-.

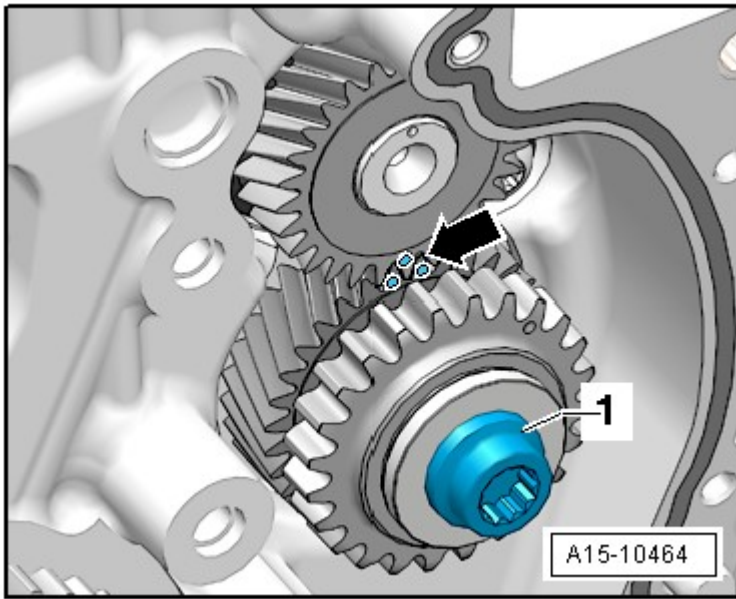


Fig. 89: Identifying Intermediate Shaft Sprocket
Courtesy of AUDI OF AMERICA, LLC

NOTE: The painted links of the timing chain must be positioned on the markings on the chain sprockets.

-- Mount the timing chain; the painted links of the timing chain must be positioned on the markings on the chain sprockets.

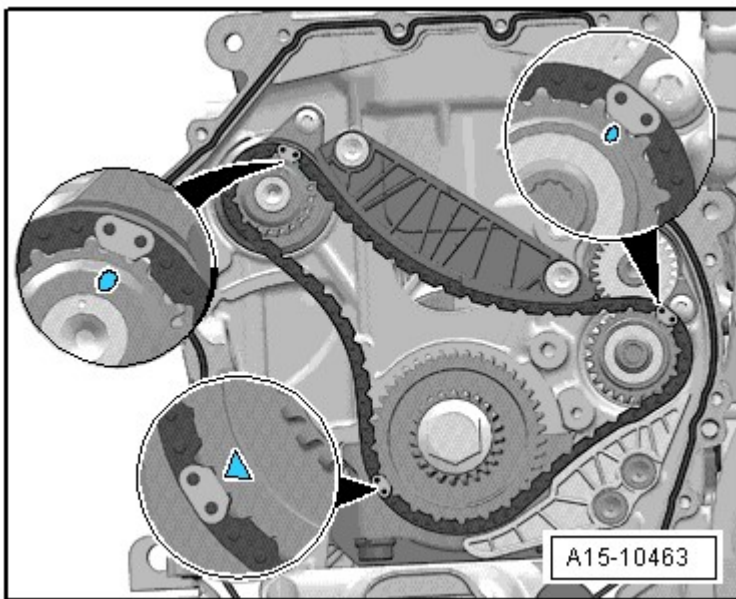


Fig. 90: Identifying Timing Chain Markings
Courtesy of AUDI OF AMERICA, LLC

-- Install the timing chain guide rail and tighten the bolts -4-.

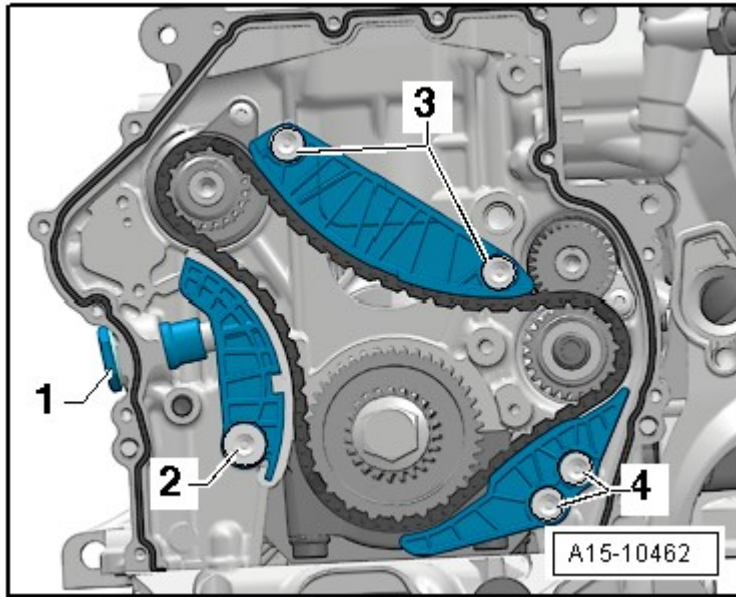


Fig. 91: Identifying Balance Shaft Timing Chain, Tensioning Rail And Guide Rails
 Courtesy of AUDI OF AMERICA, LLC

-- Install the timing chain guide rail and tighten the bolts -3-.

-- Install the timing chain tensioning rail and tighten the bolt -2-.

-- Install the timing chain tensioner -1-.

-- Check the setting one more time.

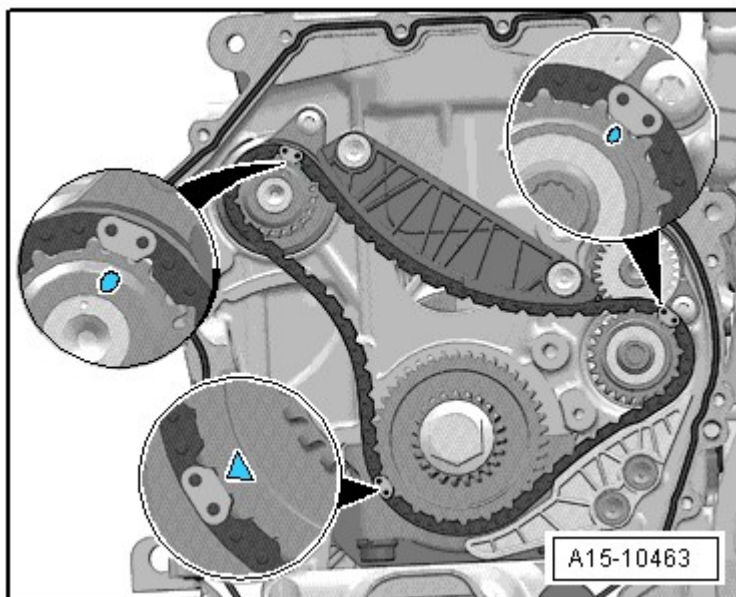
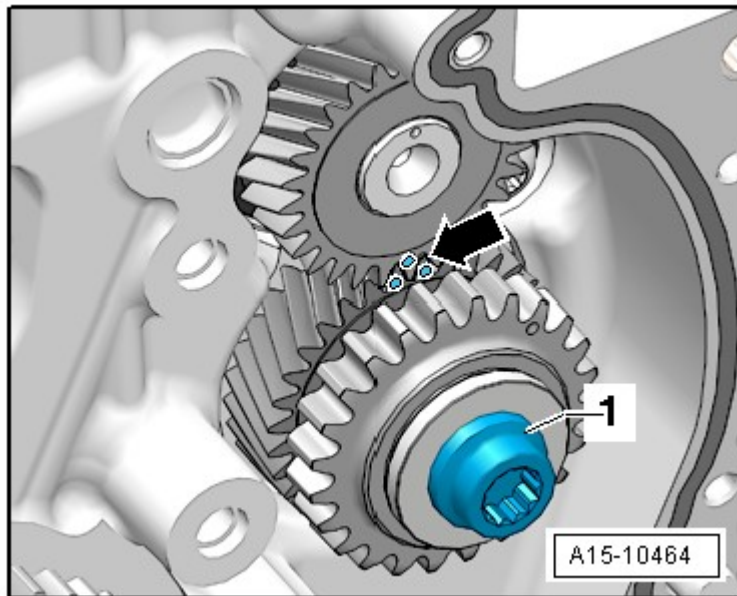


Fig. 92: Identifying Timing Chain Markings

Courtesy of AUDI OF AMERICA, LLC

-- Check the markings on the intermediate sprocket/balance shaft -arrow-.

**Fig. 93: Identifying Intermediate Shaft Sprocket**

Courtesy of AUDI OF AMERICA, LLC

NOTE: The marking on the intermediate sprocket/balance shaft is shown with the chain removed.

Assemble in reverse order of disassembly. When doing this note the following:

- Install camshaft timing chain. Refer to **CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)**.
- Install the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.
- Install the ribbed belt tensioning damper. Refer to **RIBBED BELT TENSIONING DAMPER**.
- Install the ribbed belt. Refer to **RIBBED BELT**.

INTAKE CAMSHAFT BALANCE SHAFT**Special tools and workshop equipment required**

- Puller T10394
- Puller T10055

Removing

NOTE: The intake camshaft balance shaft must be replaced after removal.

- Remove the coolant pump toothed belt. Refer to COOLANT PUMP TOOTHED BELT .
- Remove upper timing chain cover. Refer to UPPER TIMING CHAIN GUARD.
- Remove the lower timing chain cover. Refer to LOWER TIMING CHAIN COVER.
- Remove the camshaft timing chain. Refer to CAMSHAFT TIMING CHAIN (WITH NEW TOOLS).
- Remove the balance shaft timing chain. Refer to BALANCE SHAFT TIMING CHAIN.
- Remove the intermediate sprocket -1-.

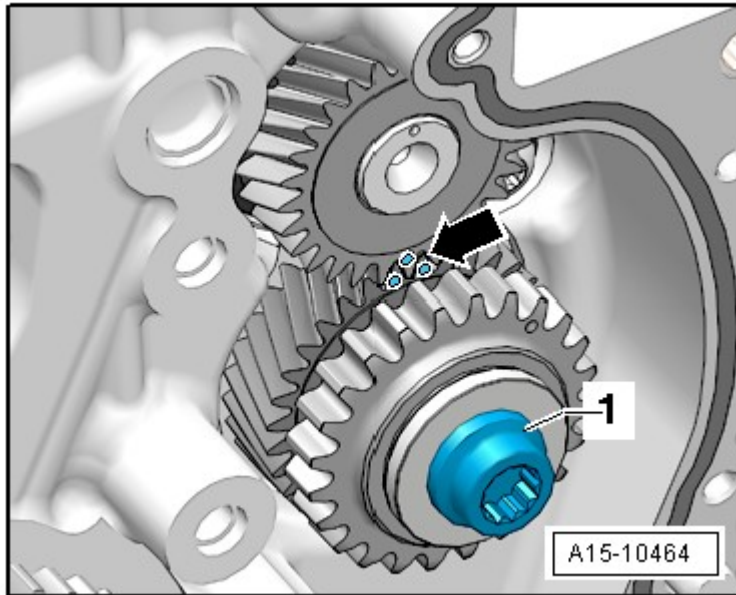


Fig. 94: Identifying Intermediate Shaft Sprocket
Courtesy of AUDI OF AMERICA, LLC

- Remove the bolt -2- on the intake camshaft balance shaft.

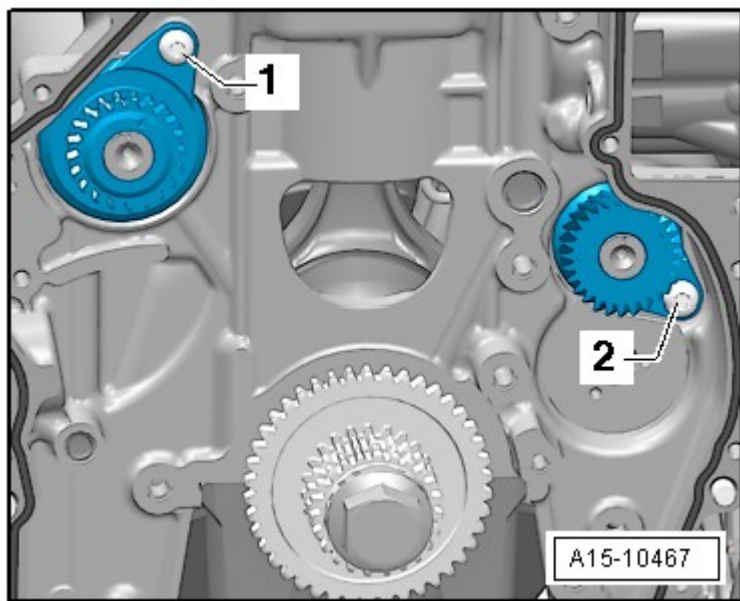


Fig. 95: Identifying Intake Camshaft Balance Shaft
Courtesy of AUDI OF AMERICA, LLC

-- Install the half shell T10394/1 from the T10394 and turn it upward in direction of -arrow-.

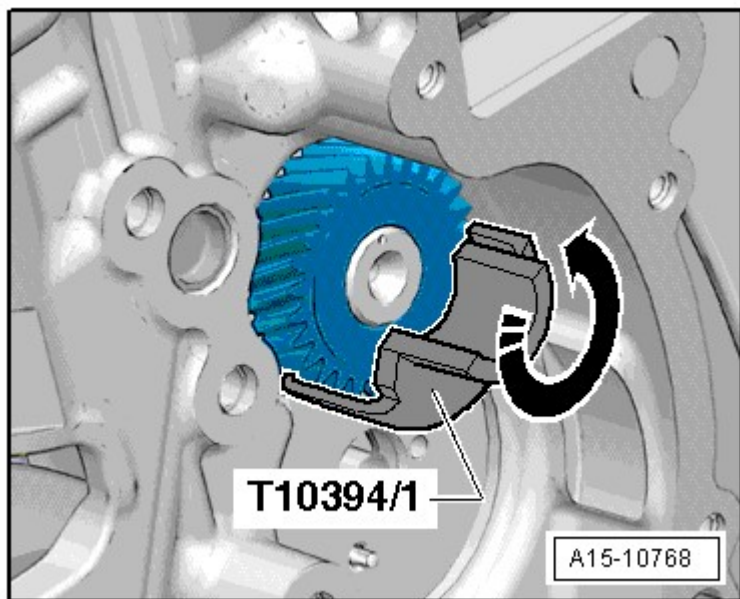


Fig. 96: Identifying Half Shell -T10394/1-
Courtesy of AUDI OF AMERICA, LLC

-- Install the T10394 and push the sliding sleeve in direction of -arrow-.

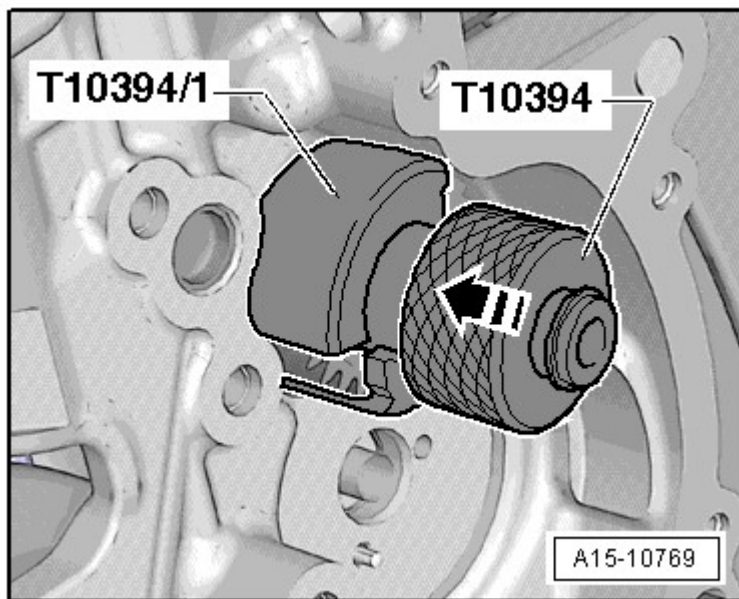


Fig. 97: Identifying Installation Of Puller Pieces -T10394- And -T10394/1-
 Courtesy of AUDI OF AMERICA, LLC

-- Install the T10055 into the T10394 and remove the balance shaft in direction of -arrow-.

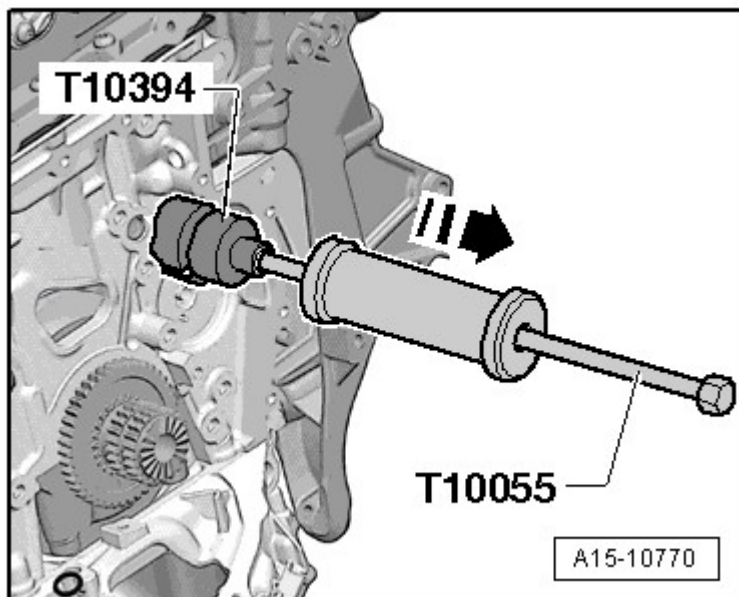


Fig. 98: Identifying Installation And Operation Of Puller -T10055-
 Courtesy of AUDI OF AMERICA, LLC

Installing

NOTE: Because of the small clearance between the balance shaft and cylinder block, the balance shaft may need to be cooled in order to install it. Check if the

balance shaft can be inserted into the cylinder block without forcing it in. If this is not the case, then the balance shaft must be installed cooled.

- Tightening specifications, refer to **BALANCE SHAFT TIMING CHAIN OVERVIEW**.

- Place the new balance shaft in a freezer for 30 minutes or spray it with commercially available cooling spray.
- Lubricate the balance shaft bearing with engine oil.
- Install the new intake camshaft shim and tighten the bolt -2-.

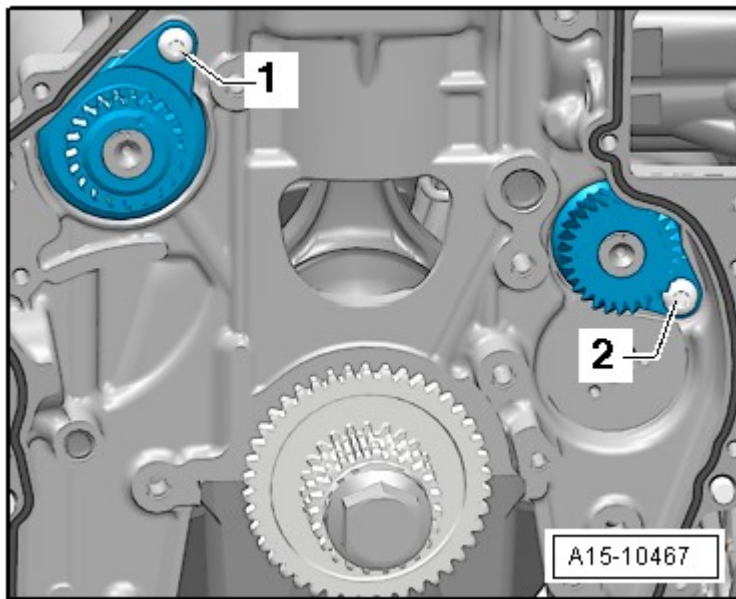


Fig. 99: Identifying Intake Camshaft Balance Shaft
Courtesy of AUDI OF AMERICA, LLC

- Replace the O-ring -1- and coat with engine oil.

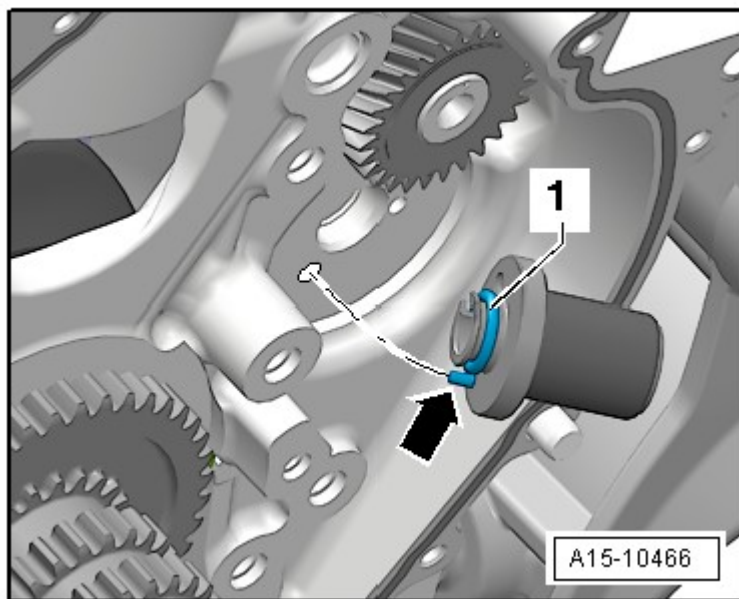


Fig. 100: Identifying Bearing Pins, Installation Position
Courtesy of AUDI OF AMERICA, LLC

-- Coat the mounting pin with engine oil and insert it. The alignment pin -arrow- for the mounting pin must engage in the hole in the cylinder block.

CAUTION: Always replace the intermediate sprocket. Otherwise the backlash will not adjust itself and it could result in engine damage.

The new intermediate sprocket has an anti-friction coating that wears off after a short period of use, which automatically adjusts the backlash.

-- Mark the tooth face on the intermediate sprocket with paint -arrow-.

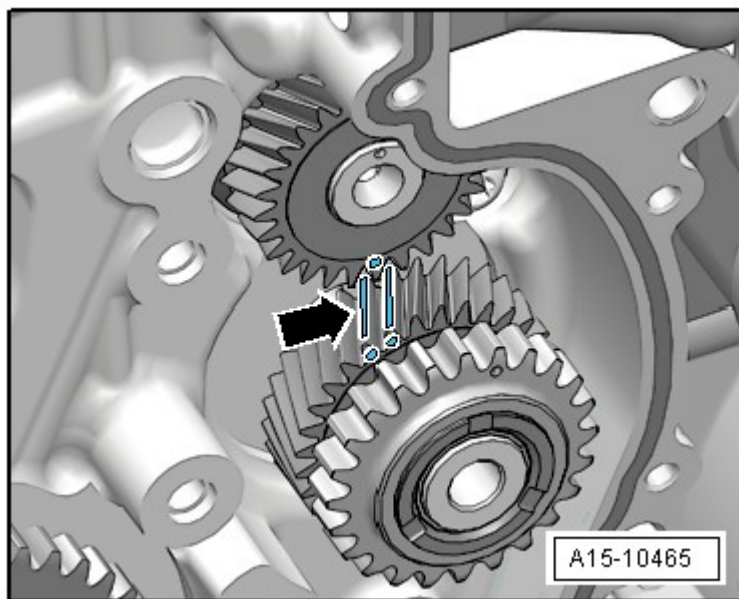


Fig. 101: Identifying Tooth Face On Intermediate Shaft Sprocket Marked With Paint
 Courtesy of AUDI OF AMERICA, LLC

-- Install the intermediate sprocket; the marking on the balance shaft must be between the markings on the tooth faces.

-- Tighten the intermediate sprocket bolt -1- : Tightening sequence, refer to **Fig. 12**.

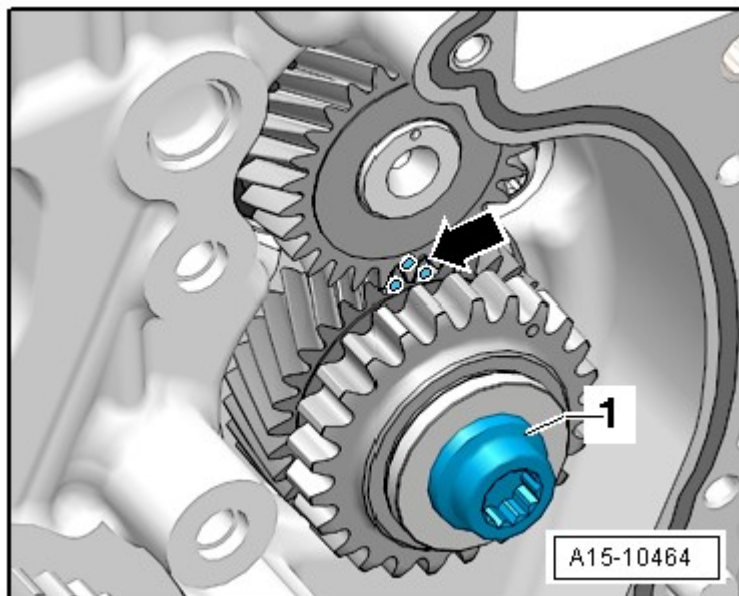


Fig. 102: Identifying Intermediate Shaft Sprocket
 Courtesy of AUDI OF AMERICA, LLC

-- Check the markings on the intermediate sprocket/balance shaft -arrow-.

Assemble in reverse order of disassembly. When doing this note the following:

- Install the balance shaft timing chain. Refer to **BALANCE SHAFT TIMING CHAIN**.
- Install camshaft timing chain. Refer to **CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)**.
- Install the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.
- Install the ribbed belt tensioning damper. Refer to **RIBBED BELT TENSIONING DAMPER** .
- Install the ribbed belt. Refer to **RIBBED BELT** .
- Replace the coolant pump drive seal. Refer to **COOLANT PUMP DRIVE SEAL, REPLACING** .
- Install the coolant pump toothed belt. Refer to **COOLANT PUMP TOOTHED BELT** .

EXHAUST CAMSHAFT BALANCE SHAFT

Special tools and workshop equipment required

- Puller T10394
- Puller T10055

Removing

NOTE: **The exhaust camshaft balance shaft must be replaced after removal.**

- Remove the upper timing chain cover. Refer to **UPPER TIMING CHAIN GUARD**.
- Remove the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Remove the camshaft timing chain. Refer to **CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)**.
- Remove the balance shaft timing chain. Refer to **BALANCE SHAFT TIMING CHAIN**.
- Remove the bolt -1- on the exhaust camshaft balance shaft.

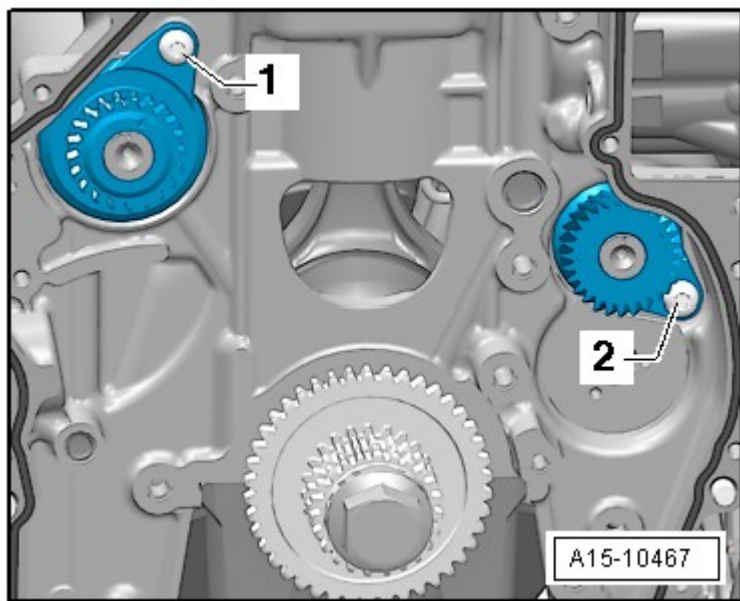


Fig. 103: Identifying Intake Camshaft Balance Shaft
Courtesy of AUDI OF AMERICA, LLC

-- Install the half shell T10394/1 from the T10394.

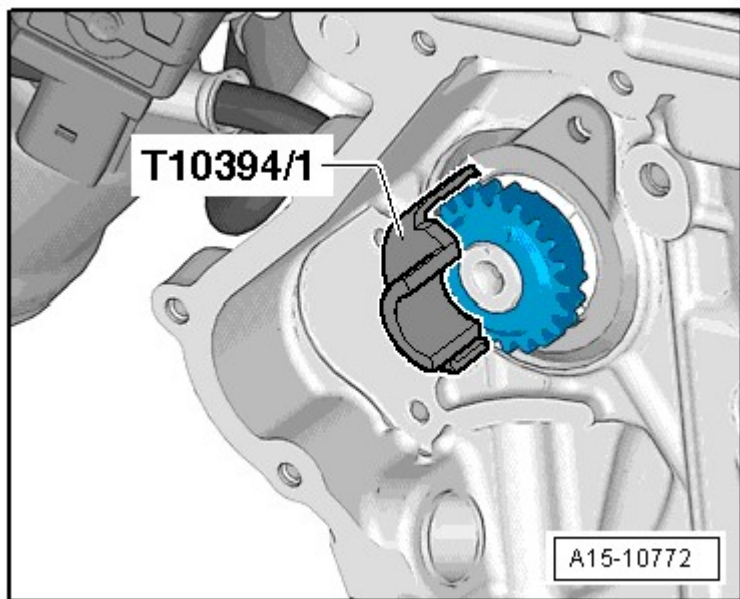


Fig. 104: Identifying Half Shell -T10394/1-
Courtesy of AUDI OF AMERICA, LLC

-- Install the T10394 and push the sliding sleeve in direction of -arrow-.

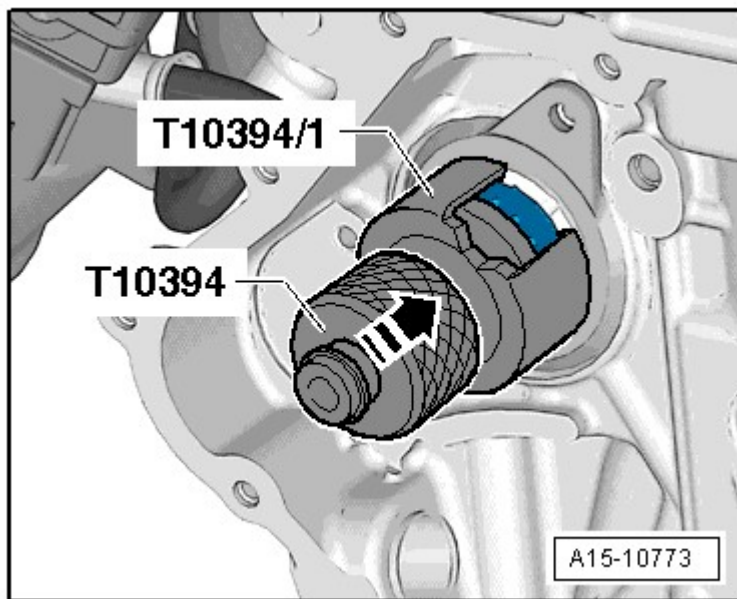


Fig. 105: Identifying Installation Of Puller Pieces -T10394- And -T10394/1-
 Courtesy of AUDI OF AMERICA, LLC

-- Install the T10055 into the T10394 and remove the balance shaft.

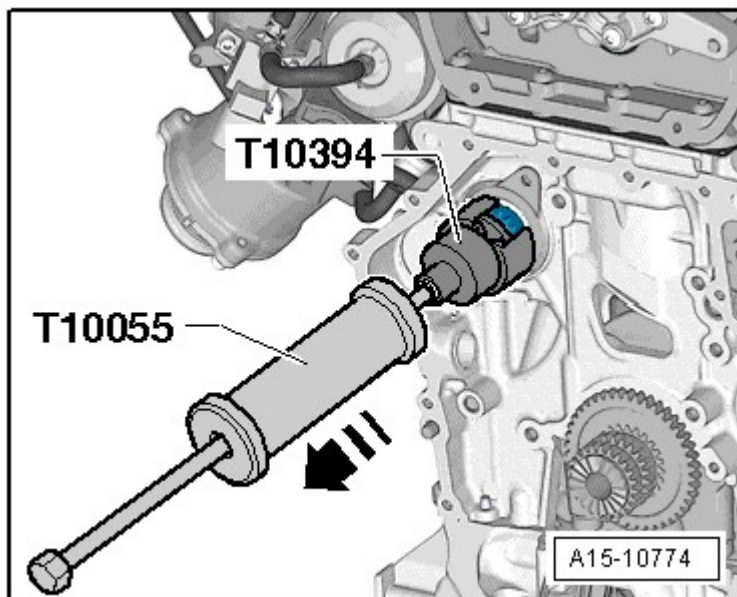


Fig. 106: Identifying Installation And Operation Of Puller -T10055-
 Courtesy of AUDI OF AMERICA, LLC

Installing

NOTE: Because of the small clearance between the balance shaft and cylinder block, the balance shaft may need to be cooled in order to install it. Check if the

balance shaft can be inserted into the cylinder block without forcing it in. If this is not the case, then the balance shaft must be installed cooled.

- Tightening specifications, refer to **BALANCE SHAFT TIMING CHAIN OVERVIEW**.

-- Check the installation position of the pipe for the balance shaft -arrow-.

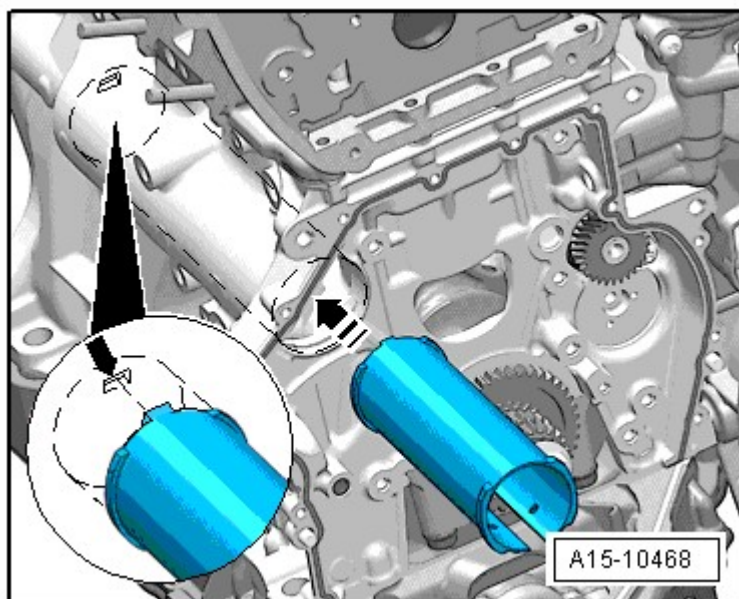


Fig. 107: Identifying Pipe For Balance Shaft - Installation Position
Courtesy of AUDI OF AMERICA, LLC

The pin -arrow- must engage in the groove.

- Place the new balance shaft in a freezer for 30 minutes or spray it with commercially available cooling spray.
- Lubricate the balance shaft bearing with engine oil.
- Install the new exhaust camshaft balance shaft.

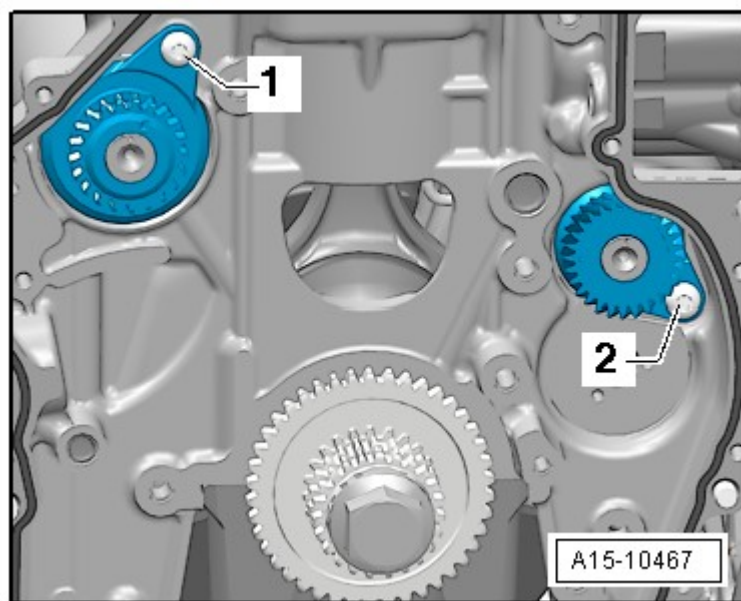


Fig. 108: Identifying Intake Camshaft Balance Shaft
 Courtesy of AUDI OF AMERICA, LLC

-- Before tightening the bolt -1- make sure the balance shaft lies level on the crankshaft.

NOTE: If the balance shaft is not level, then the pipe for the balance shaft must be installed again.

Assemble in reverse order of disassembly. When doing this note the following:

- Install the balance shaft timing chain. Refer to **BALANCE SHAFT TIMING CHAIN**.
- Install camshaft timing chain. Refer to **CAMSHAFT TIMING CHAIN (WITH NEW TOOLS)**.
- Install the lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.
- Install the ribbed belt tensioning damper. Refer to **RIBBED BELT TENSIONING DAMPER**.
- Install the ribbed belt. Refer to **RIBBED BELT**.

CYLINDER HEAD WITH WRENCH CLEARANCE

NOTE: Camshafts with screwdriver access have notches in the camshafts, refer to **Fig. 1**.

Special tools and workshop equipment required

- Ignition Coil Puller T40039
- Assembly Tool T10352 and Assembly Tool T10352/1
- Counter Hold Tool T10355
- Locking Pin T40011
- Drift T40196
- Polydrive Bit and Drive Socket T10070
- Engine Bung Set VAS 6122
- Polydrive Bit and Drive Socket T10070
- Pry Lever T40243
- Camshaft Locator T40271
- Spark Plug Removal Tool 3122 B

Removing

--

NOTE: During installation, cable ties must be installed at the same location.

**Always seal off any open channels in the intake and exhaust tract with plugs.
For example, use the plugs from the VAS 6122.**

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

WARNING: Risk of scalding due to hot steam and hot coolant.

- The coolant system is under pressure when the engine is warm.
- Reduce pressure by covering coolant reservoir cap with a cloth and carefully open.

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

-- Remove the engine cover -arrows-.

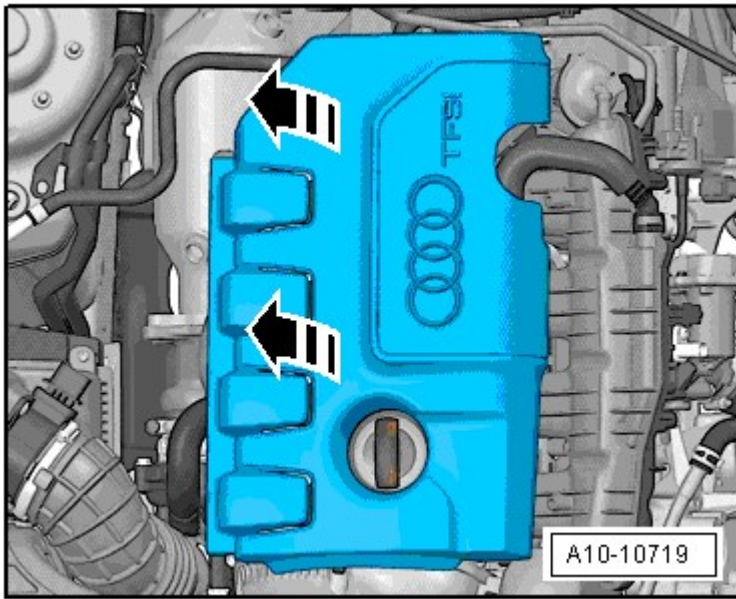


Fig. 109: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Remove the plenum chamber covers -1, 2 and 3--.

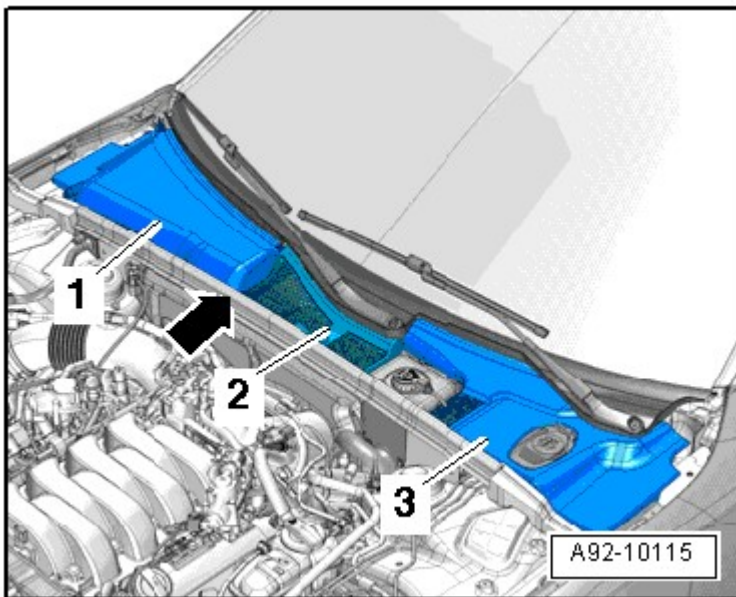


Fig. 110: Identifying Plenum Chamber Covers

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the vacuum connection -2- from the plenum chamber bulkhead by removing the vacuum hose -3- on the back side -arrow--.

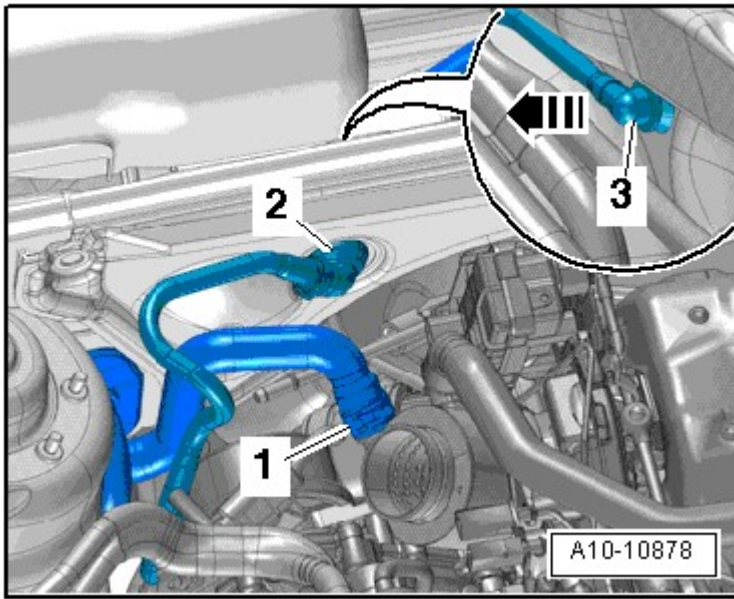


Fig. 111: Disconnecting Vacuum Connection
Courtesy of AUDI OF AMERICA, LLC

-- Remove the coolant hoses on the back of the cylinder head.

CAUTION: Risk of contamination to the fuel system.

- Note rules of cleanliness for working on the fuel injection system. Refer to **CLEAN WORKING CONDITIONS** .

-- Disconnect fuel lines -1 and 2-

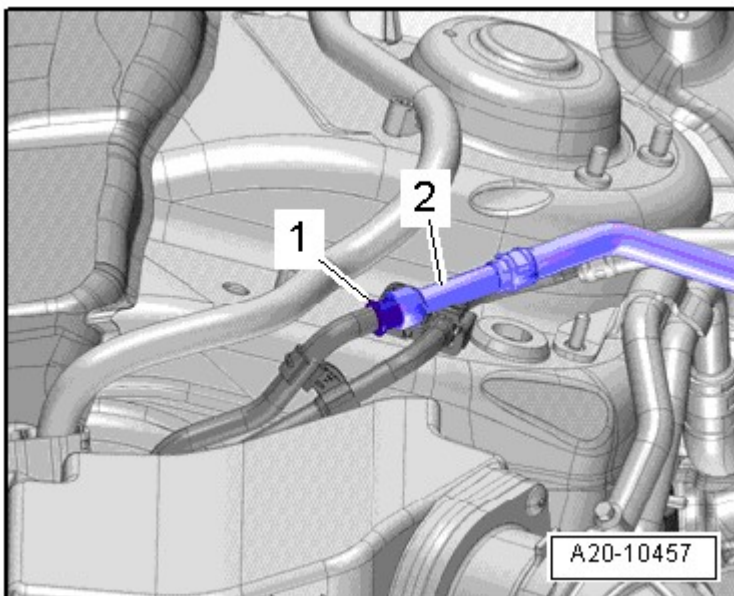


Fig. 112: Identifying Fuel Line

Courtesy of AUDI OF AMERICA, LLC

- Remove the front bumper cover and the bumper. Refer to **Removal and Installation** .
- Install the lock carrier in service position. Refer to **Description and Operation** .
- Disconnect the connector -1- from the Mass Airflow (MAF) Sensor -G70-.

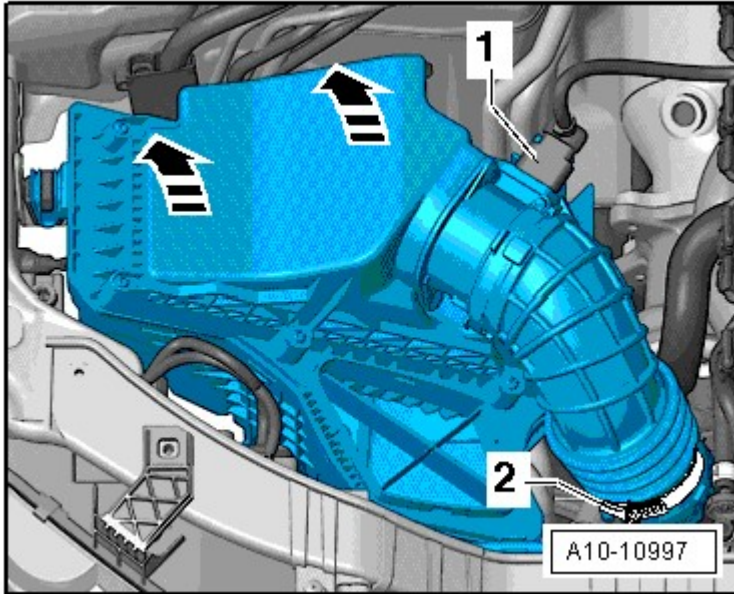


Fig. 113: Disconnecting Connector

Courtesy of AUDI OF AMERICA, LLC

- Loosen the air intake hose -2-.
- Remove the air filter housing upward -arrows-.
- Loosen the hose clamps -arrows- and remove the air guide hose.

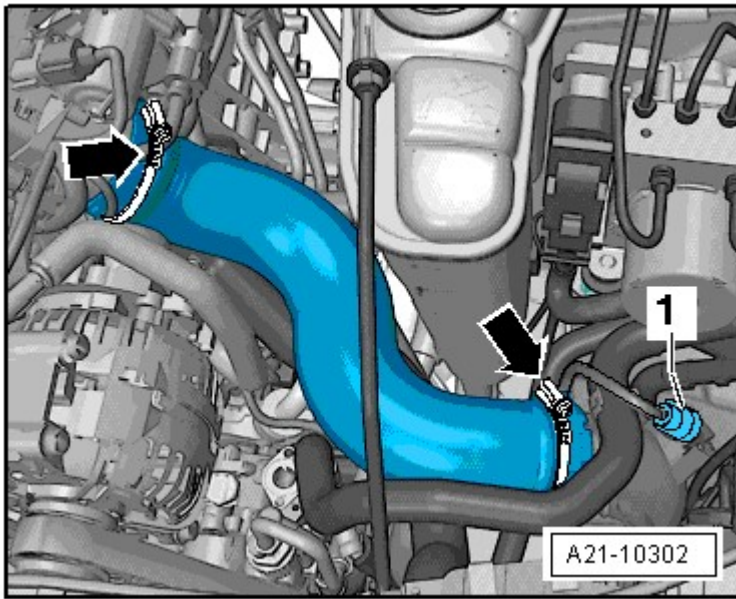


Fig. 114: Loosening Hose Clamps
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the following connectors.

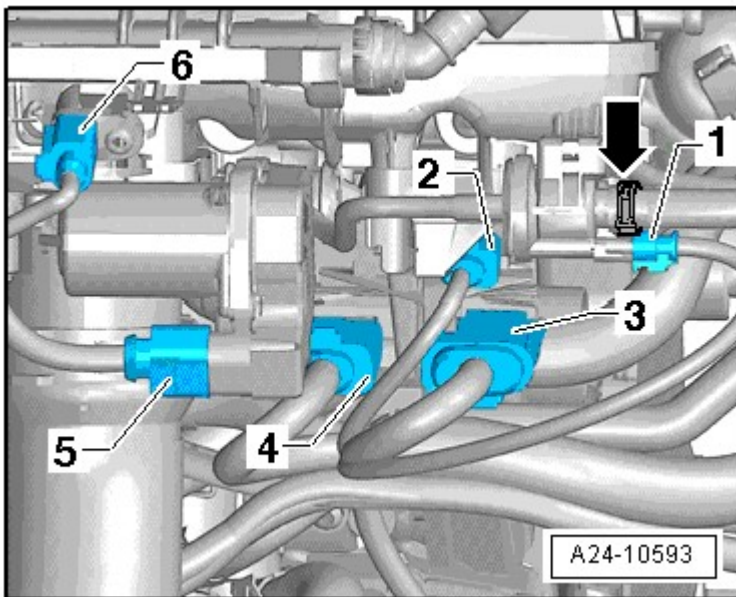


Fig. 115: Identifying Electrical Connectors
 Courtesy of AUDI OF AMERICA, LLC

2 - Disconnect from Knock Sensor (KS) 1 -G61-

3 - From the Intake Manifold Runner Control (IMRC) Valve -N316-, Fuel Pressure Sensor -G247- and the Camshaft Position (CMP) sensor -G40-.

4 - From the fuel injectors

5 - From the Throttle Valve Control Module -J338-.

6 - From the Intake Air Temperature (IAT) Sensor -G42-.

-- Disconnect the connector -2- and free up the wire.

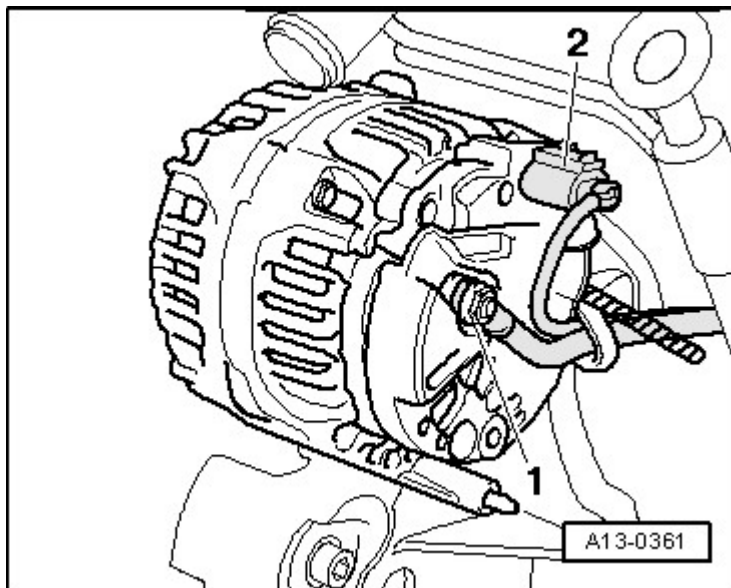


Fig. 116: Identifying Generator Electrical Connector And Terminal B+
Courtesy of AUDI OF AMERICA, LLC

-- Remove the coolant line bracket -arrow-.

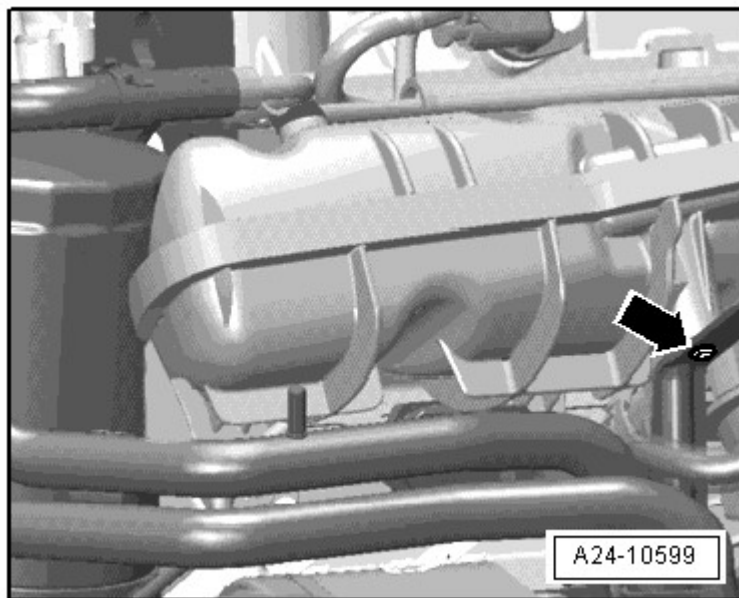


Fig. 117: Locating Coolant Line Bolt
Courtesy of AUDI OF AMERICA, LLC

NOTE: The engine is not shown in the illustrations that follow.

-- Remove the intake manifold bracket by removing the mounting nut -1- and bolt -2-.

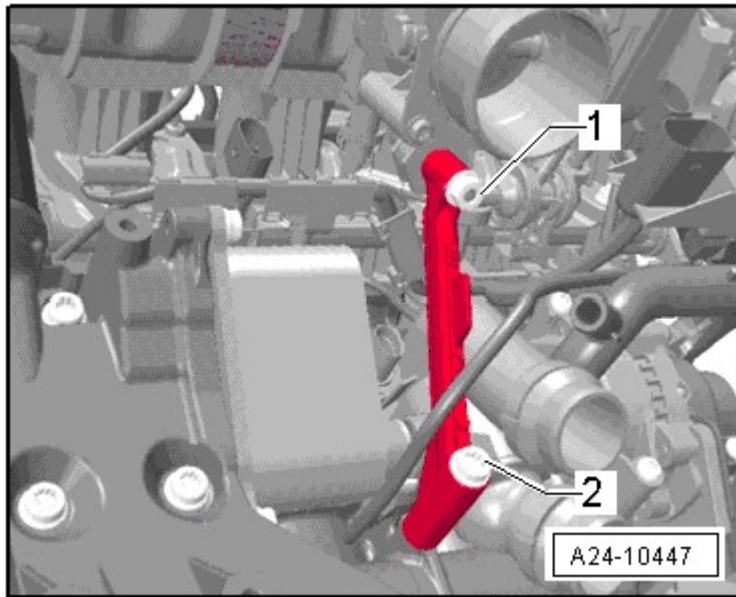


Fig. 118: Identifying Intake Manifold Bracket Mounting Nut And Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the coolant hose -arrow-.

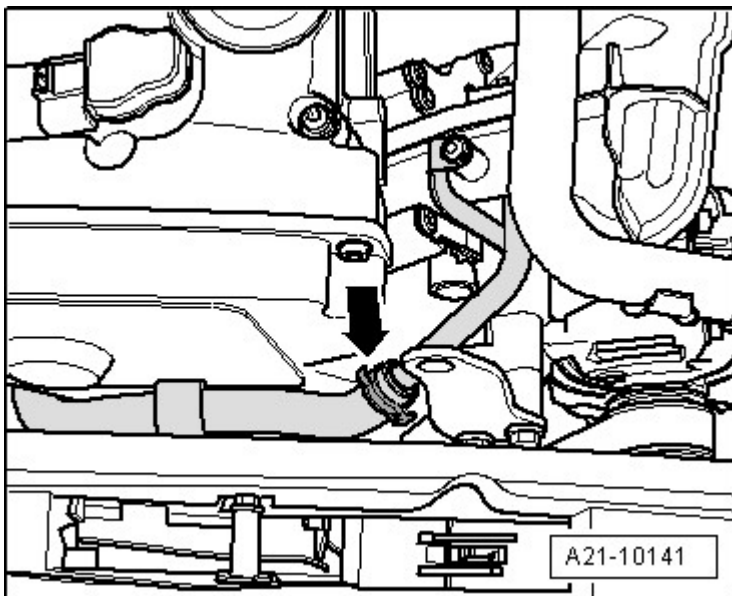


Fig. 119: Disconnecting Coolant Pipe

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1 and 2- and move the oil supply line to the side.

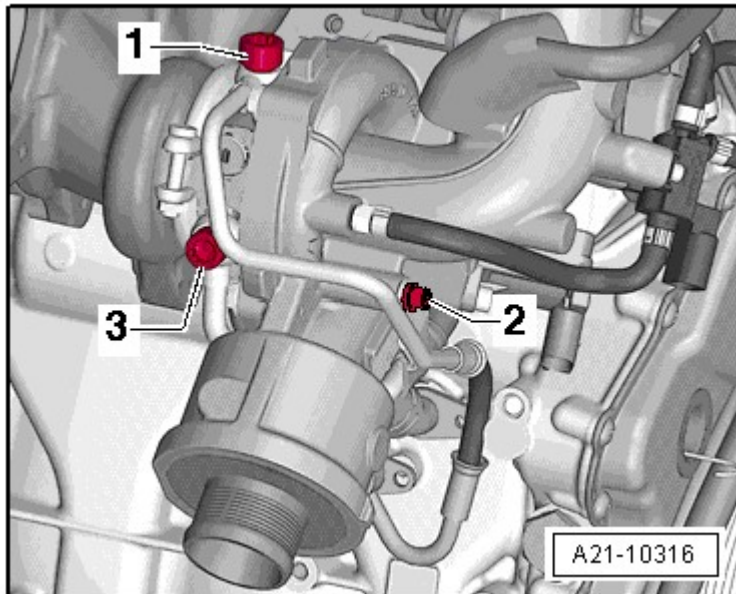


Fig. 120: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -3- and move the coolant line to the side.

-- Loosen the hose clamp -arrow-, pull off the air guide hose and move it to the side.

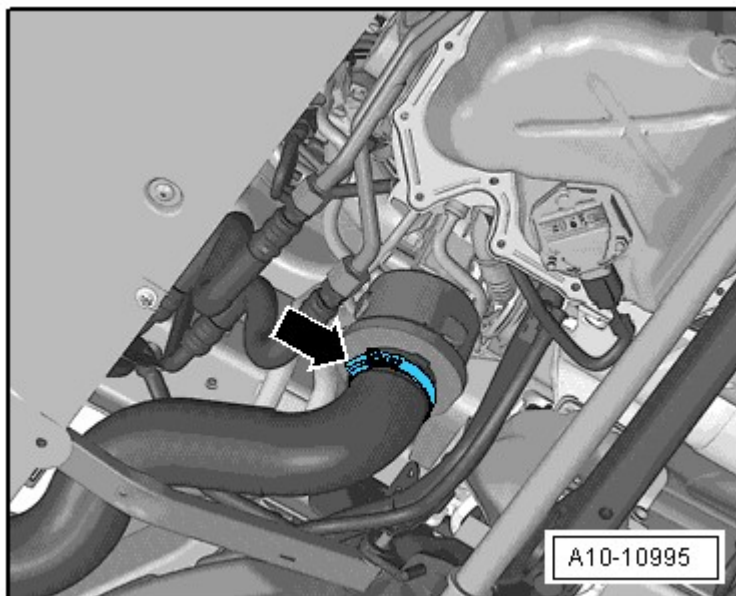


Fig. 121: Loosening Hose Clamp Pull Off Air Guide Hose

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors -1 and 4- from the oil pressure switch -F22- and the reduced oil pressure switch -F378-.

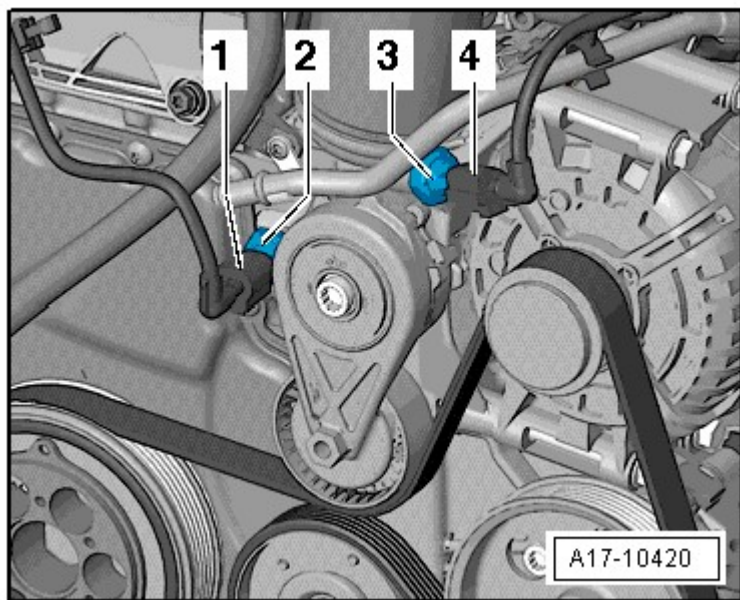


Fig. 122: Identifying Oil Pressure Switch
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors -1 and 2- and free up the wire.

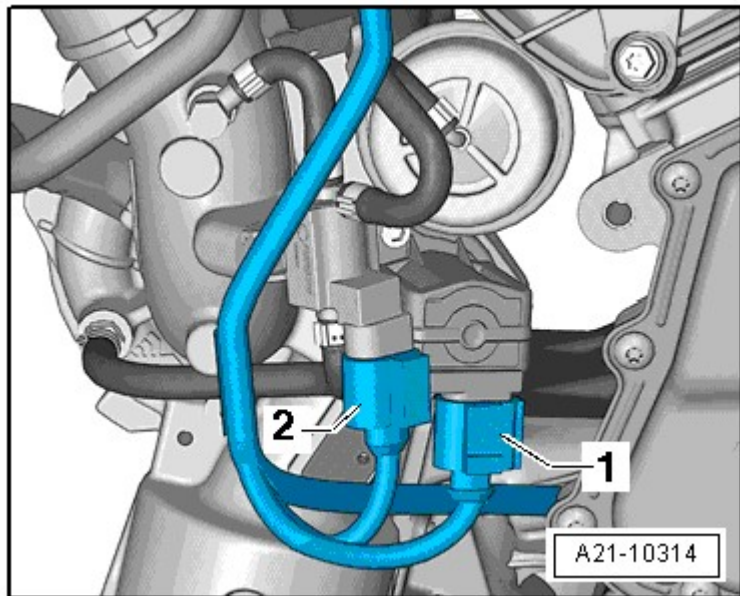


Fig. 123: Disconnecting Connectors
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and then remove the turbocharger support.

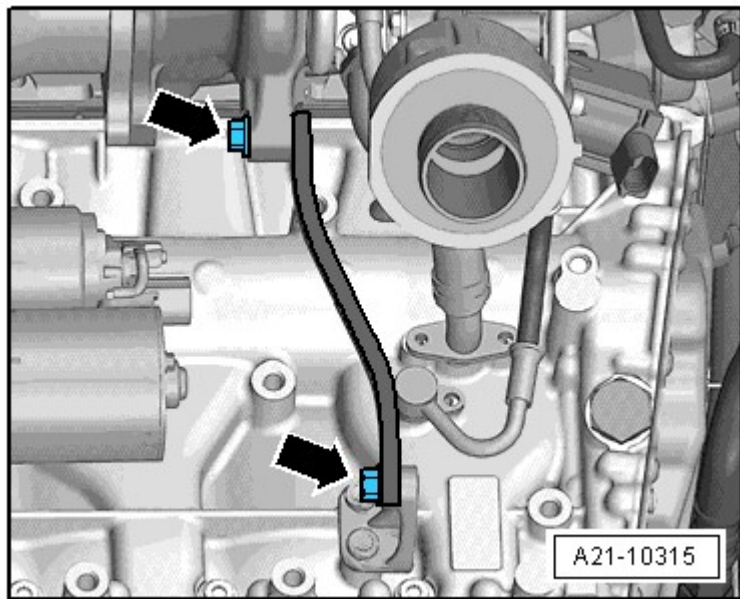


Fig. 124: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- on the oil return line.

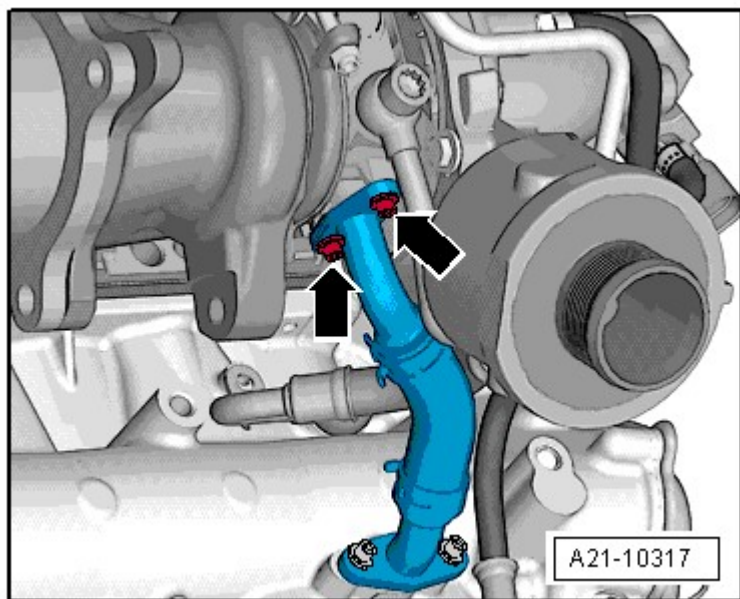


Fig. 125: Identifying Oil Return Line Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the nuts -arrows- and push the catalytic converter to the rear.

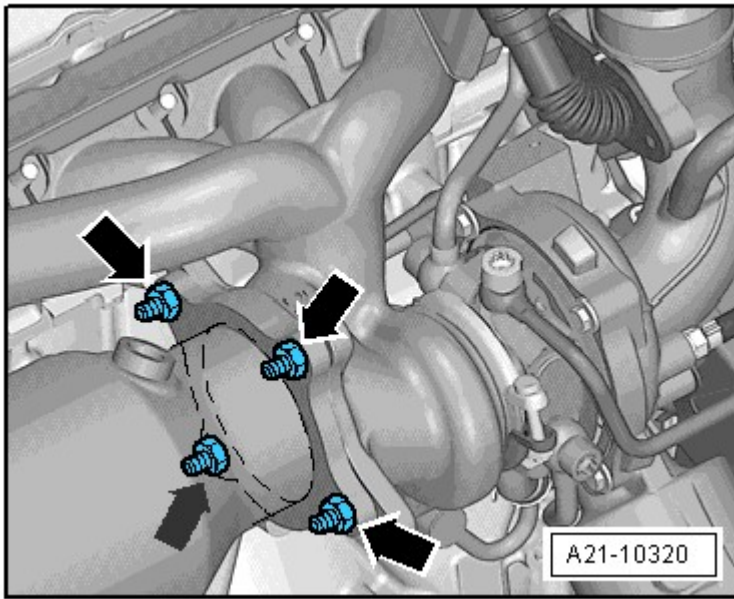


Fig. 126: Identifying Nuts And Catalytic Converter
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connector from the camshaft adjustment valve 1 -N205- -1-.

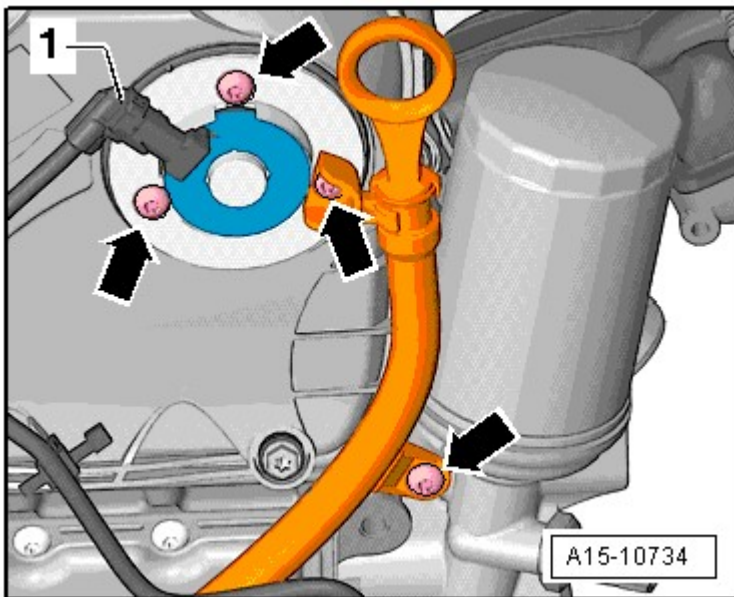


Fig. 127: Disconnecting Connector
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and then the camshaft adjustment valve 1 -N205-.

-- Remove the bolts -1 through 5- and the timing chain guard upper section.

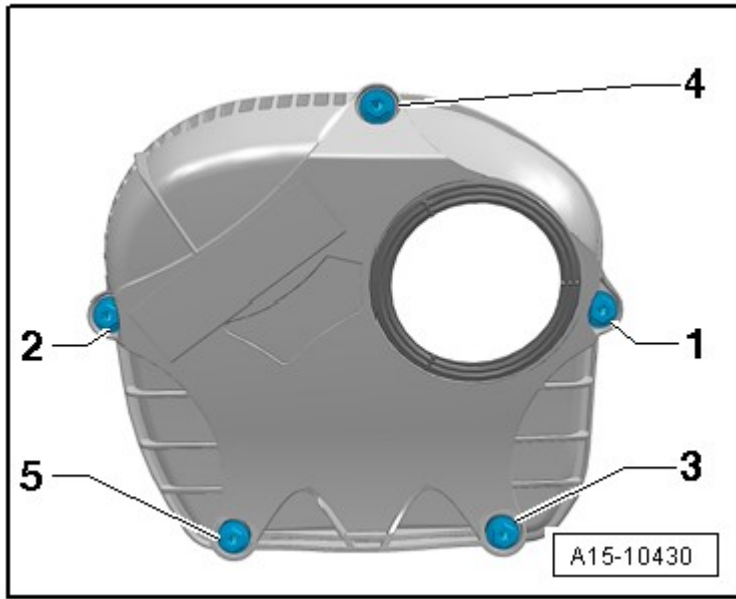


Fig. 128: Identifying Upper Timing Chain Cover - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts on the ignition coil connector strip.
- Release the connector -arrows- and disconnect all the connectors at the same time from the ignition coils.

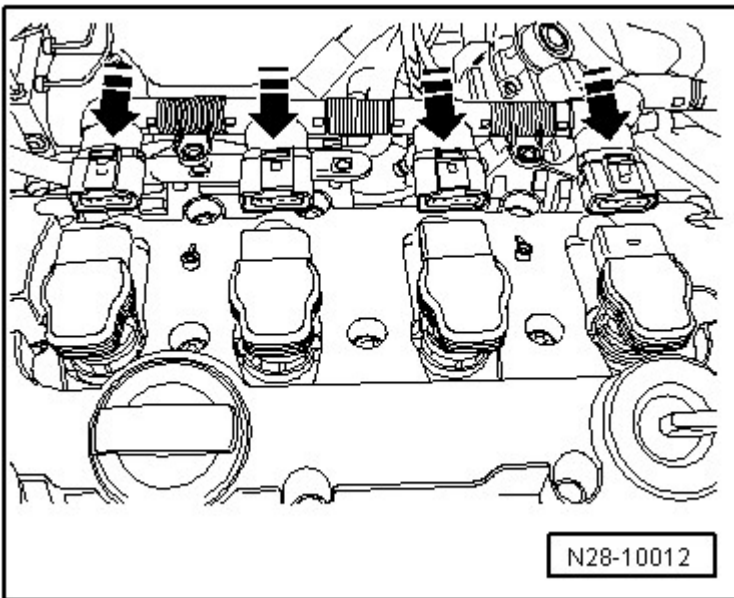


Fig. 129: Connecting Connectors To Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

- Remove the ignition coils with the T40039.

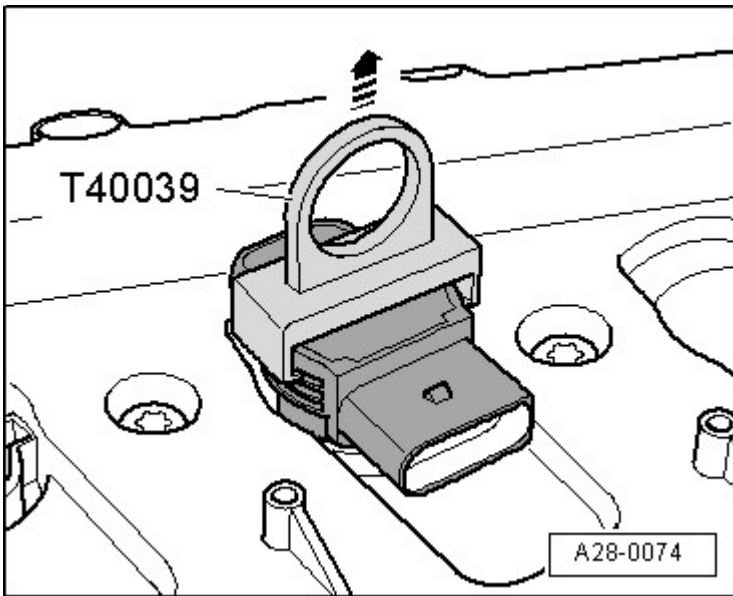


Fig. 130: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

- Remove the spark plugs using a 3122 B.
- Disconnect the hose for the crankcase ventilation - 1 -.

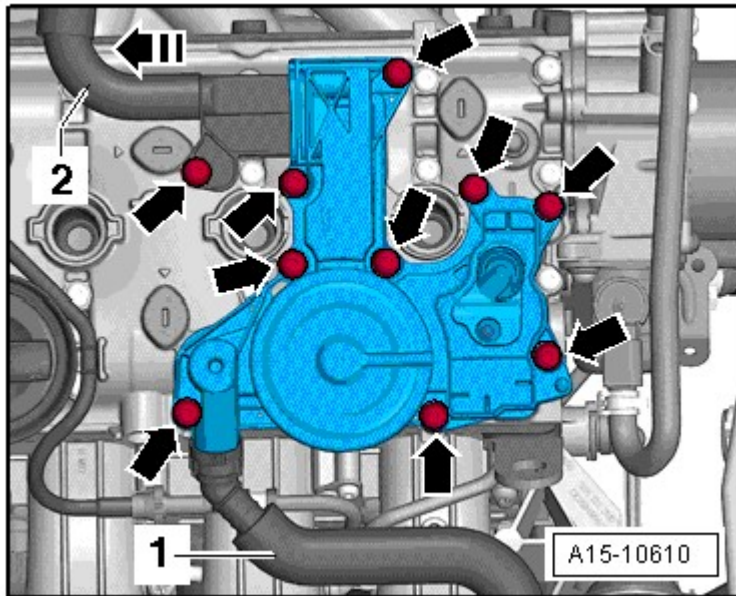


Fig. 131: Locating Crankcase Ventilation Bolts
 Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -arrows- and then remove the crankcase ventilation from the hose -2- in direction of -arrow-

-- Disconnect the connectors -arrows- from the camshaft adjuster actuators --.

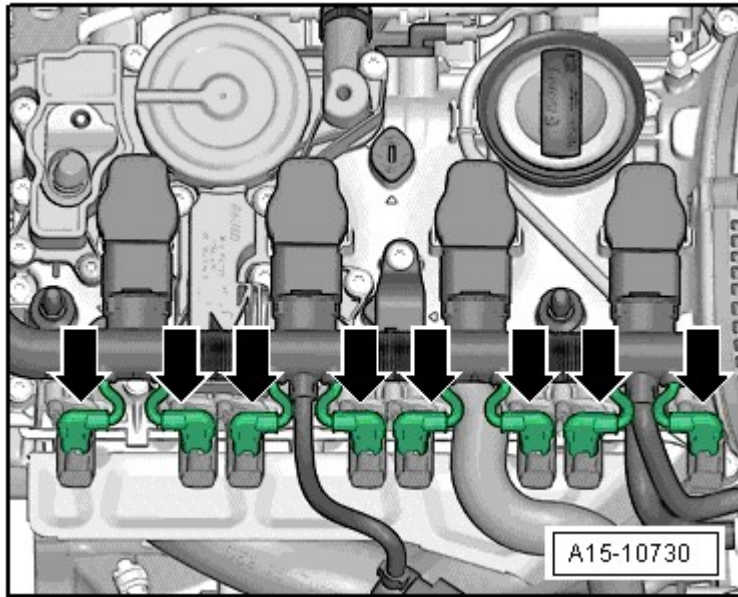


Fig. 132: Identifying Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the camshaft adjuster actuators -- -arrows-.

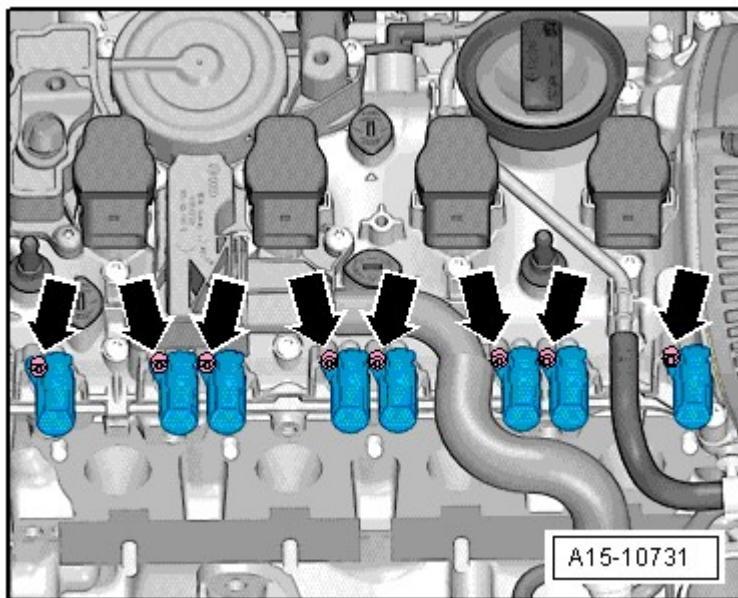


Fig. 133: Identifying Camshaft Adjuster Actuators
 Courtesy of AUDI OF AMERICA, LLC

-- Turn the sealing plug -arrows- counterclockwise 90° in the direction of the -arrow- and remove it.

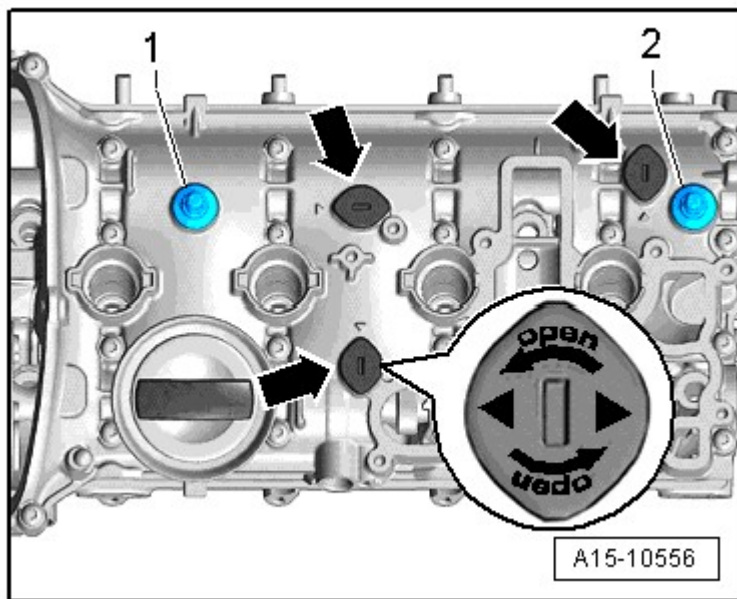


Fig. 134: Identifying Ball Head And Sealing Plug
Courtesy of AUDI OF AMERICA, LLC

- Remove the ball head -1 and 2-.
- Remove the cap.
- Rotate the vibration damper using the T10355 to "TDC" position.

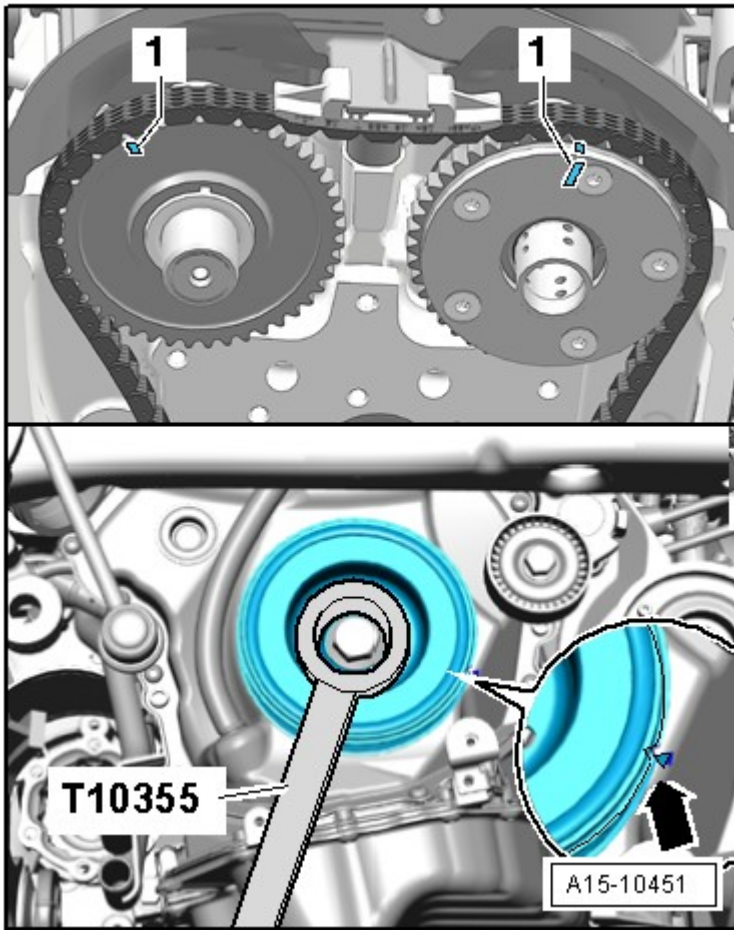


Fig. 135: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper and the marking on the timing chain guard lower section must be opposite of one another -arrow-.
- The markings -1- on the camshafts must point upward.

-- Remove the cylinder head bolts -1 and 2- with the T10070.

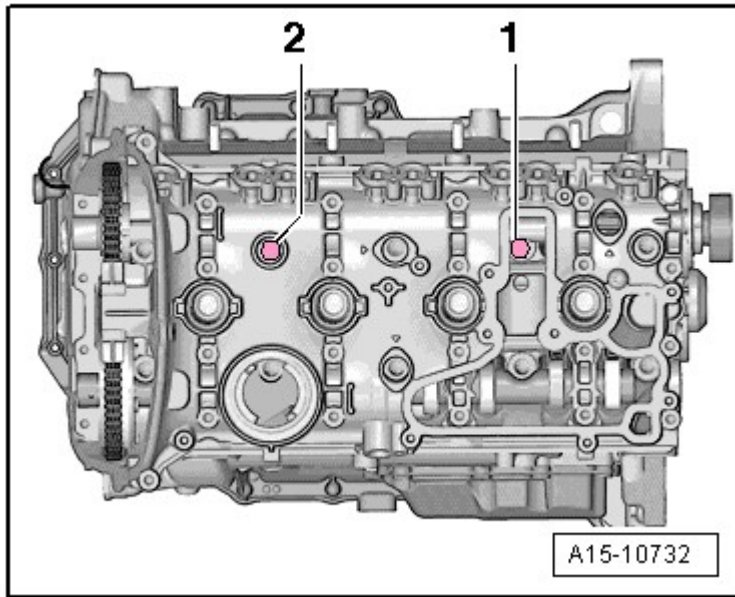


Fig. 136: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

CAUTION: Danger of causing damage to the engine.

- The T40196 may be installed only in the shown positions.

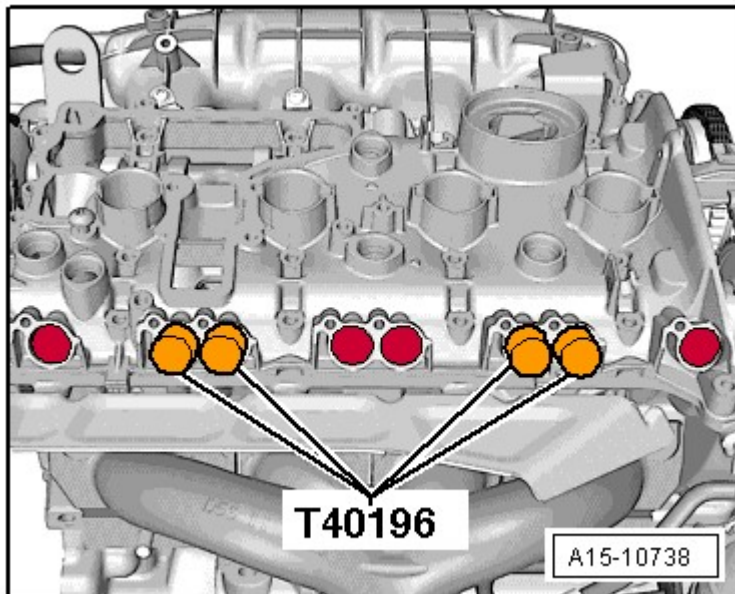


Fig. 137: Identifying T40196 Installation Positions

Courtesy of AUDI OF AMERICA, LLC

-- Install the T40196 as illustrated.

-- Turn the crankshaft 4 complete turns in the direction of engine rotation.

-- Remove the T40196.

CAUTION: The control valve has a left thread.

-- Remove the control valve using the T10352 or T10352/1 in direction of -arrow- depending on the version.

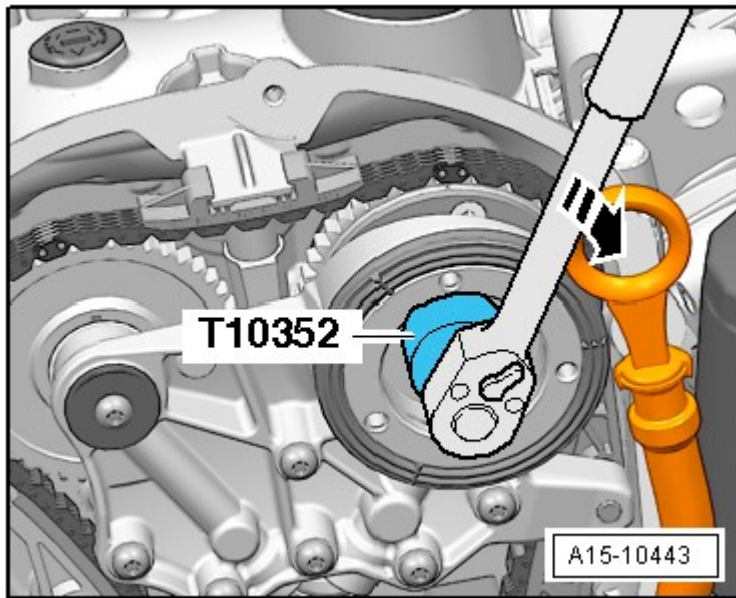


Fig. 138: Identifying Assembly Tool T10352 To Remove Control Valve
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and remove the bearing bracket.

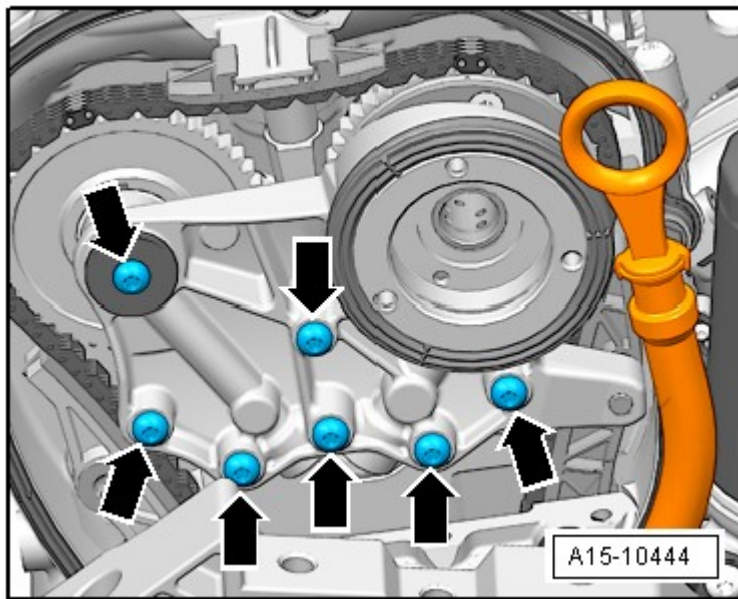


Fig. 139: Identifying Bearing Bracket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the vibration damper using the T10355 into the "TDC" position.

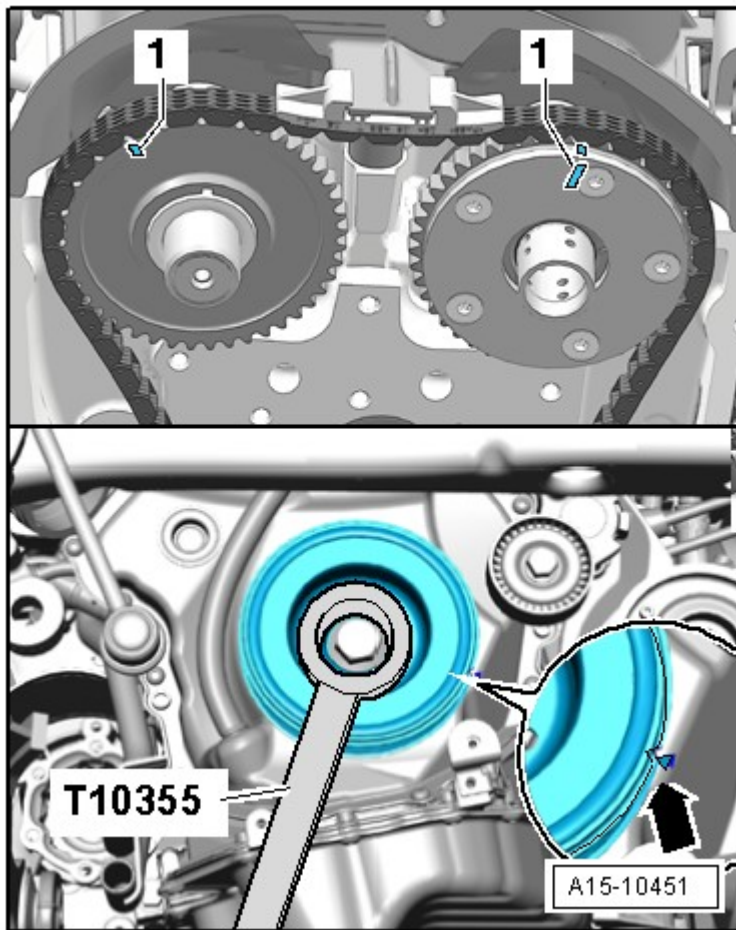


Fig. 140: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper and the marking on the timing chain guard lower section must be opposite one another -arrow-.
- The markings -1- on the camshafts must point upward.

-- Mark the camshaft timing chain and the cylinder head -arrows- to match the marking on the chain sprockets -1- with a waterproof marker.

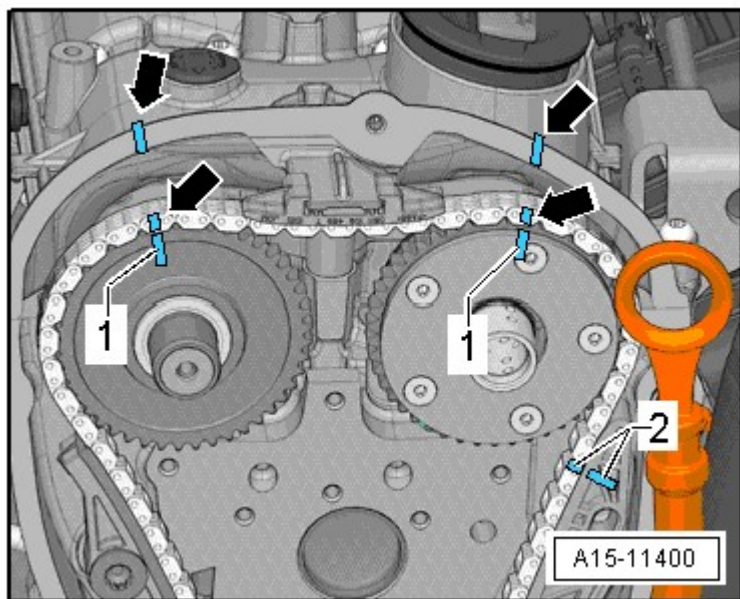


Fig. 141: Marking Camshaft Timing Chain And Cylinder Head
 Courtesy of AUDI OF AMERICA, LLC

-- In addition, mark the camshaft timing chain to the camshaft timing chain guide rail -2- with a permanent marker.

-- Remove the plug -arrow-.

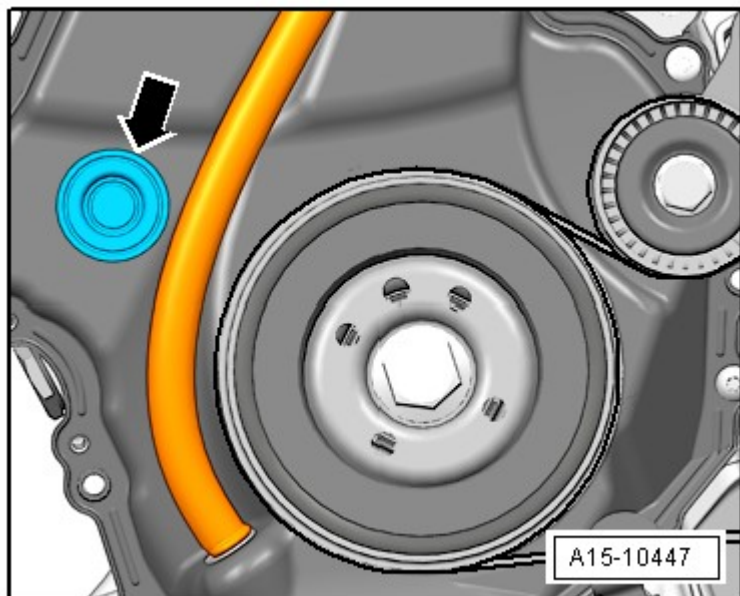


Fig. 142: Locating Plug
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows-.

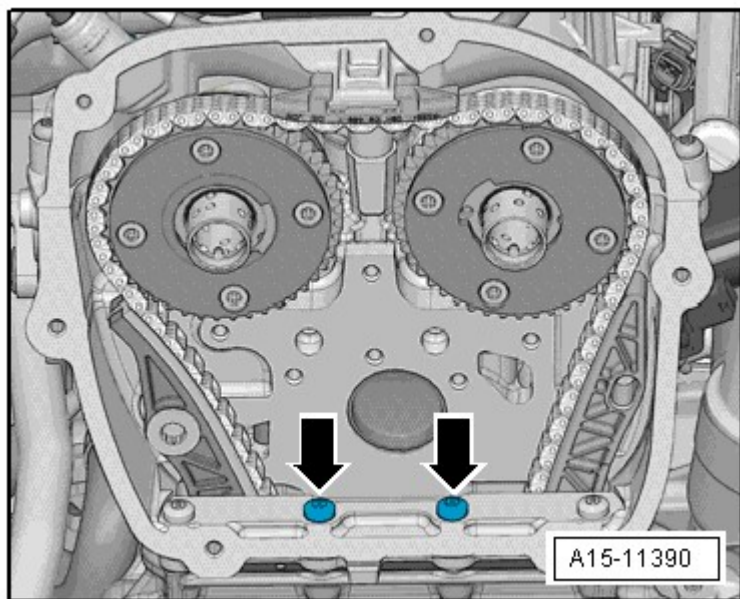


Fig. 143: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -arrow-.

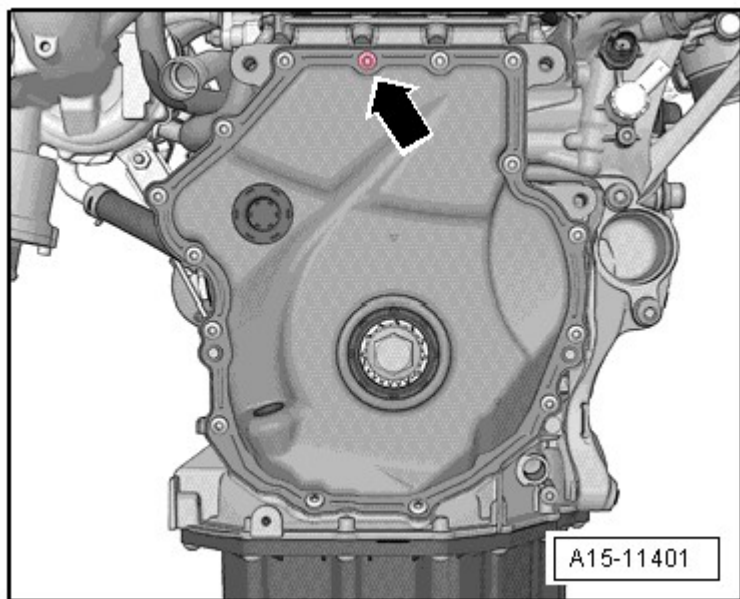


Fig. 144: Identifying Bolt

Courtesy of AUDI OF AMERICA, LLC

Two Different Chain Tensioners may be Installed Depending on the Version:

Version 1

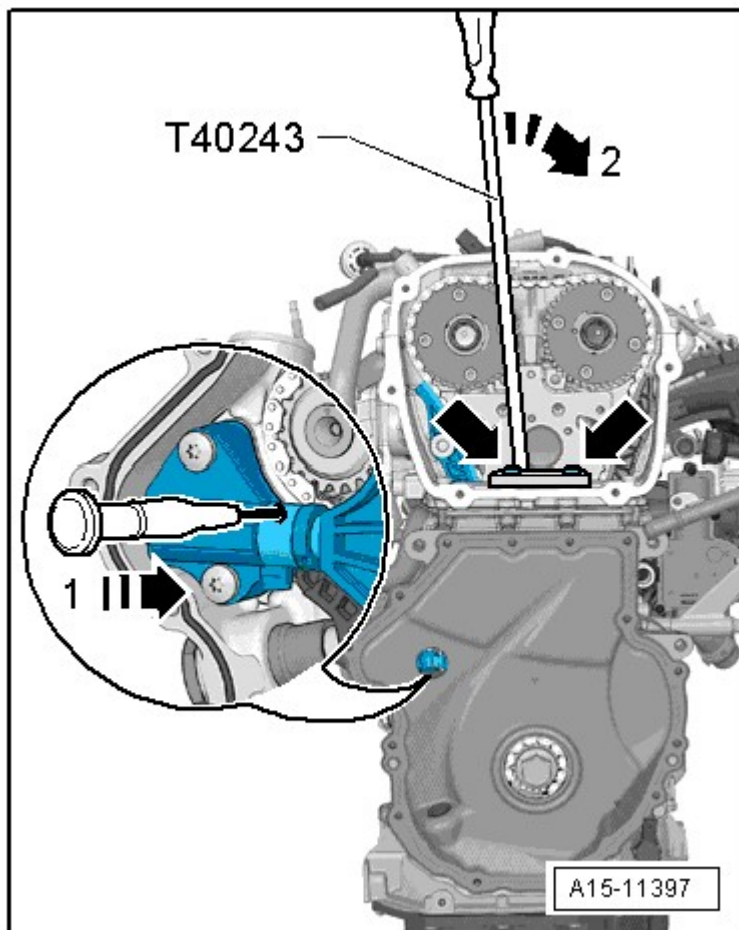


Fig. 145: Identifying Version 1
 Courtesy of AUDI OF AMERICA, LLC

-- Install the T40243 -arrows-.

-- Insert a scribe or a suitable screwdriver into the opening for the chain tensioner in the direction of the -arrow 1- to lift up the locking wedge for the chain tensioner, slowly press down the T40243 and hold it in the direction of the -arrow 2-.

-- Secure the chain tensioner using T40011.

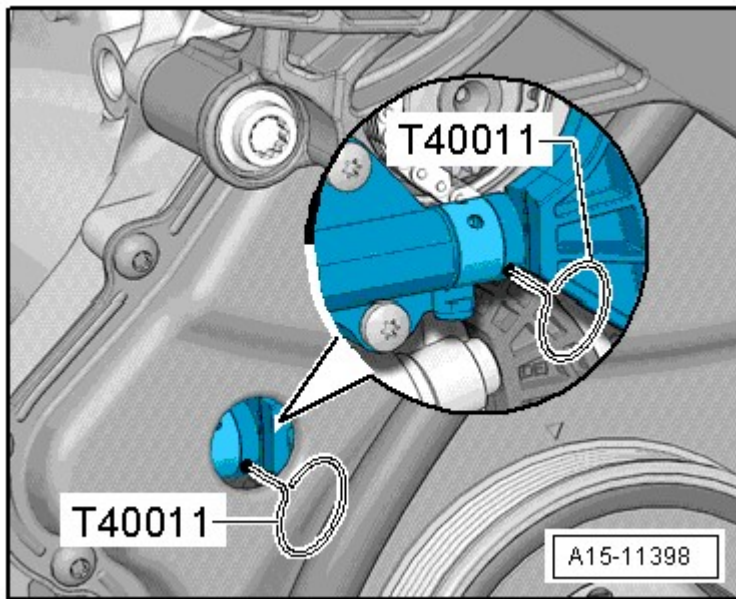


Fig. 146: Securing Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

Version 2

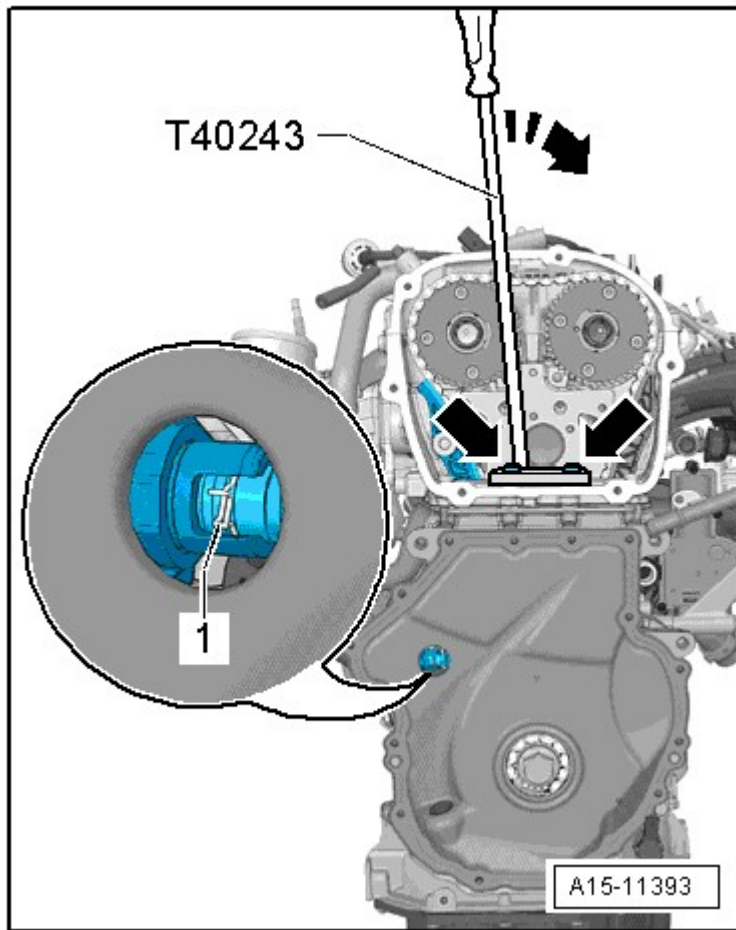


Fig. 147: Identifying Version 2
Courtesy of AUDI OF AMERICA, LLC

- Install the T40243 -arrows-.
- Press the chain tensioner locking ring -arrow- together and slowly press and hold the T40243 in the direction of the -arrow-.
- Secure the chain tensioner with the T40267.



Fig. 148: Securing Chain Tensioner With T40267
Courtesy of AUDI OF AMERICA, LLC

All Versions

-- Remove the T40243.

-- Bolt the T40271/2 to the cylinder head and push the chain sprocket splines in the direction of the -arrow 2-. If necessary, turn the intake camshaft with a wrench in the direction of the -arrow 1-.

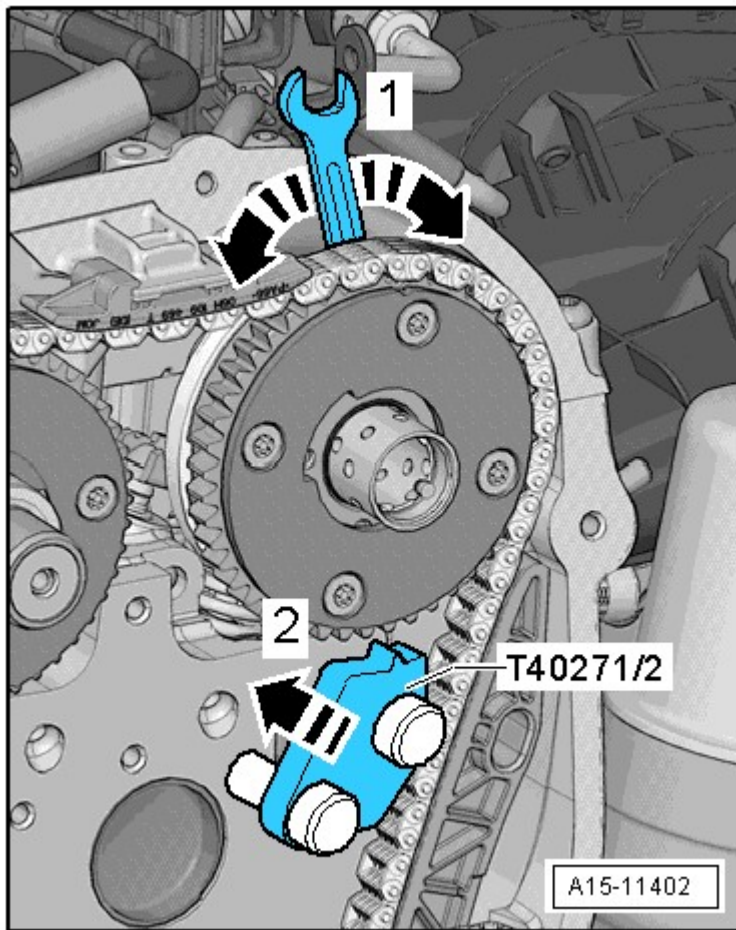


Fig. 149: Identifying Bolt Camshaft Locating Tool T40271/2
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -1- and guide the tensioning rail -2- downward.

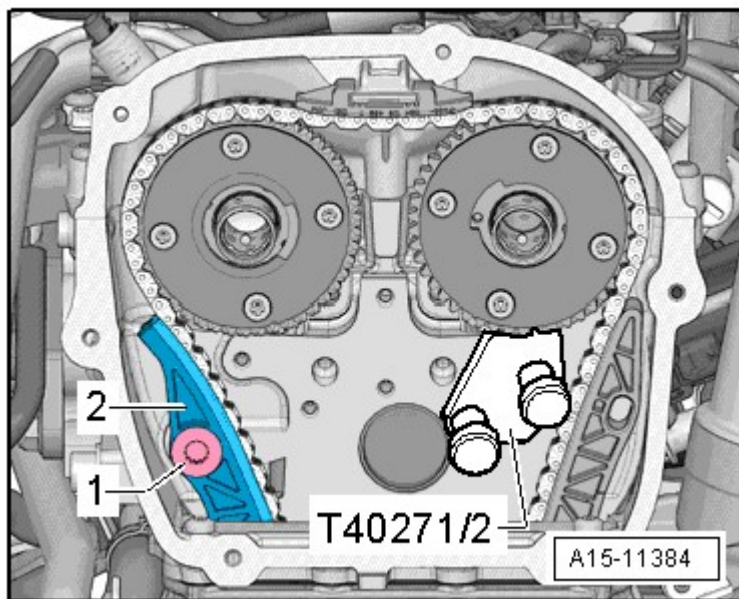


Fig. 150: Moving Tensioning Rail Up To Install Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Attach the camshaft locating tool T40271/1 to the cylinder head.

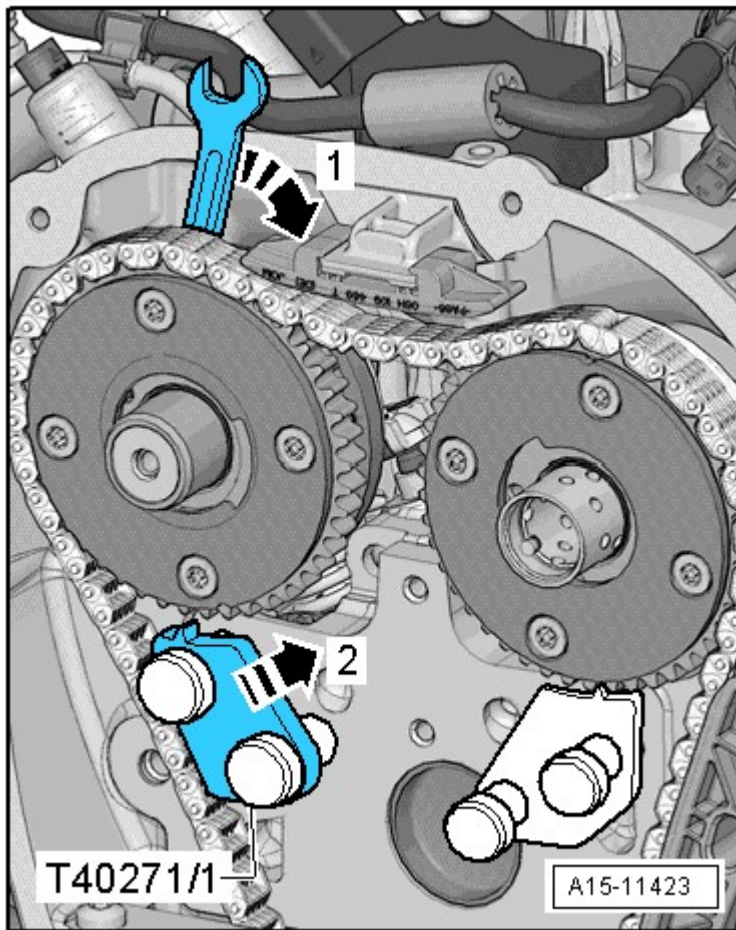


Fig. 151: Identifying Camshaft Locating Tool

Courtesy of AUDI OF AMERICA, LLC

-- Turn the exhaust camshaft with the wrench in the direction of the -arrow 1- and slide the camshaft locating tool T40271/1 in the chain sprocket splines in the direction of the -arrow 2-.

-- Remove the upper guide track -1- by unlocking the latch with a screwdriver and pushing the guide track forward.

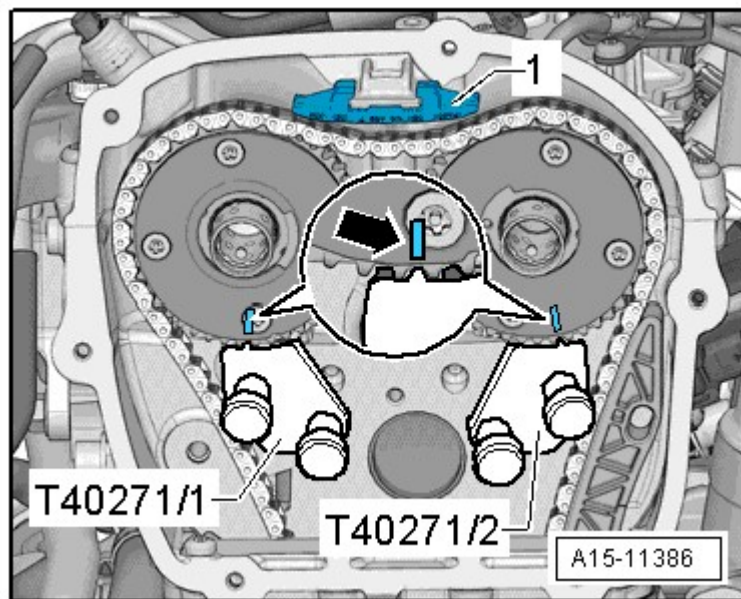


Fig. 152: Marking Camshaft Sprocket
 Courtesy of AUDI OF AMERICA, LLC

-- Remove camshaft timing chain from chain sprockets.

CAUTION: Risk of damaging valves and piston crowns.

- If the camshaft timing chain was removed from the cylinder head, then the crankshaft may not turn further.

-- Remove the bolts -arrows-.

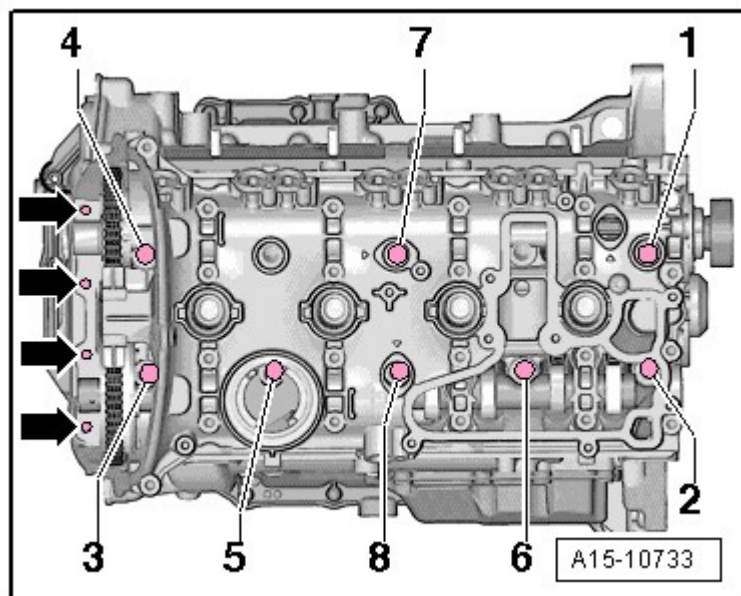


Fig. 153: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the cylinder head bolts with the T10070 in the following sequence: -1 through 8-.

NOTE: Make sure all wires and cables are disconnected.

Pay attention to the tension and guide tracks when lifting the cylinder head.

-- Remove the cylinder head.

-- Lay the cylinder head on a soft surface, such as foam.

Installing

- Tightening specifications, refer to **CYLINDER HEAD OVERVIEW, WITH WRENCH CLEARANCE.**

CAUTION: The sealing surfaces could be damaged.

- Carefully remove sealant residue from 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 valve train.

- To ensure valves do not strike the 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.

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 camshafts.

The hose supports, air guide pipes and hoses must be free of oil and grease before installing.

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

To mount the charge hoses on their connectors securely, spray the bolts on the used clamps with rust remover before installing.

It is necessary to replace all the coolant and engine oil whenever the cylinder head or the cylinder head gasket are replaced.

When Using a New Cylinder Head

-- Mark the camshaft sprocket to the T40271/1 and the T40271/2 -arrow-.

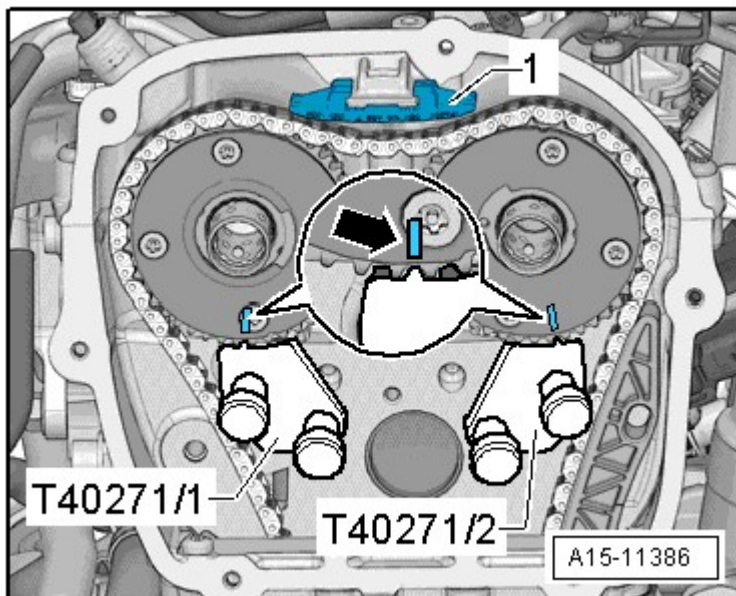


Fig. 154: Marking Camshaft Sprocket
Courtesy of AUDI OF AMERICA, LLC

-- Turn the intake camshaft with a wrench in the direction of the -arrow 1-, slide the T40271/2 out of the chain sprocket splines if the direction of the -arrow 2- and bring the camshaft into the rest position.

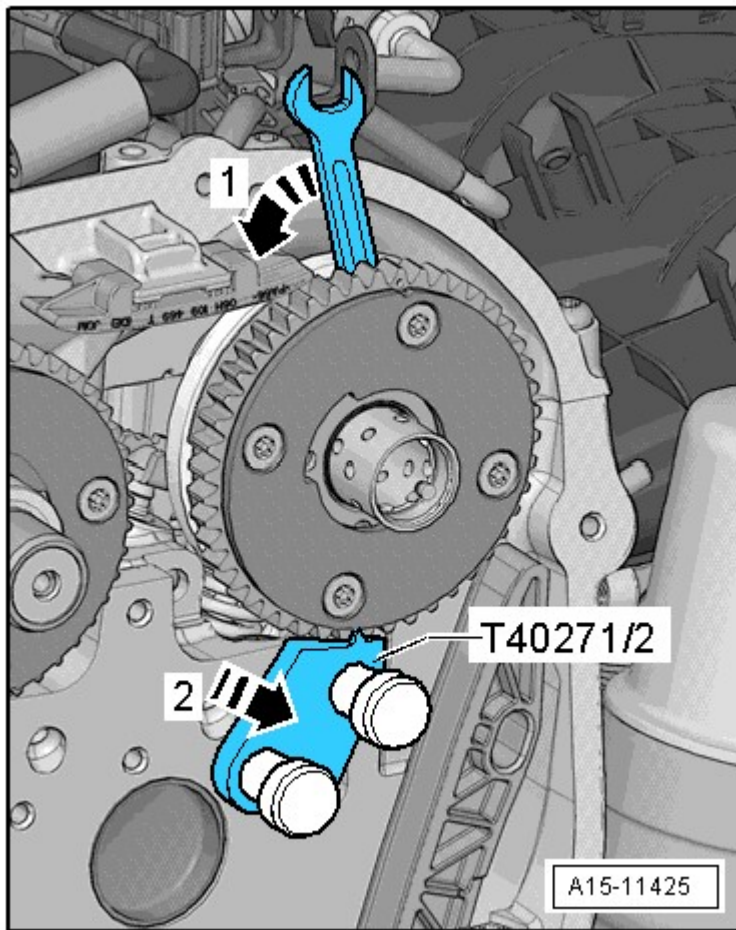


Fig. 155: Turning Intake Camshaft With Wrench In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40271/2.

-- Turn the exhaust camshaft with a wrench in the direction of the -arrow 1-, slide the T40271/1 out of the chain sprocket splines if the direction of the -arrow 2- and bring the camshaft into the rest position.

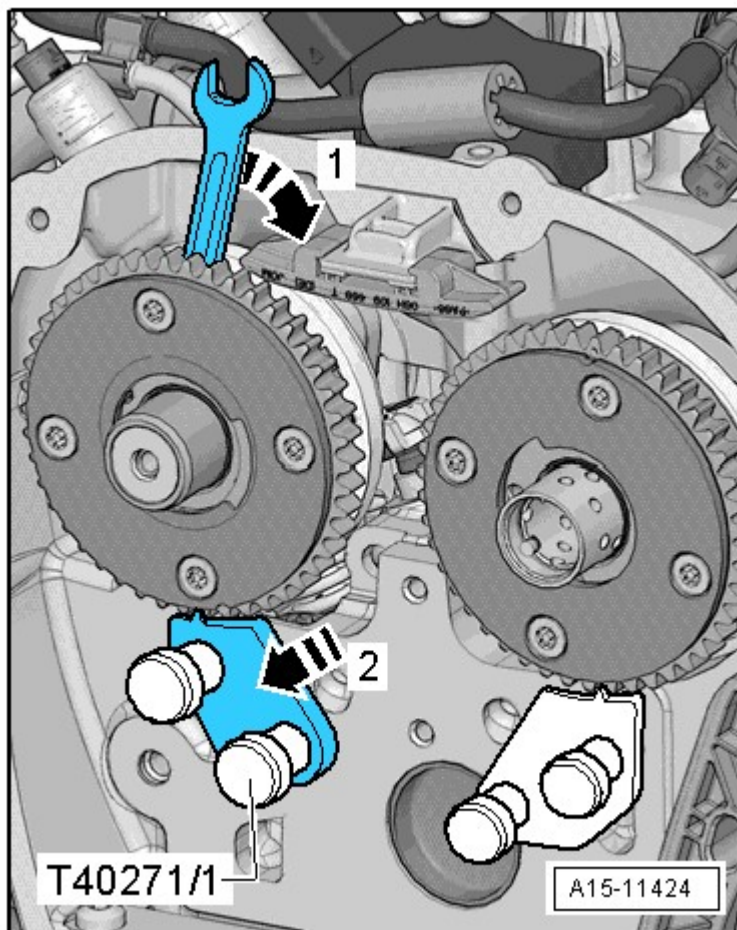


Fig. 156: Turning Exhaust Camshaft With Wrench In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

- Remove the T40271/1.
- Transfer the self-made markings from the old camshafts to the new camshafts.
- Attach the T40271/2 to the cylinder head.

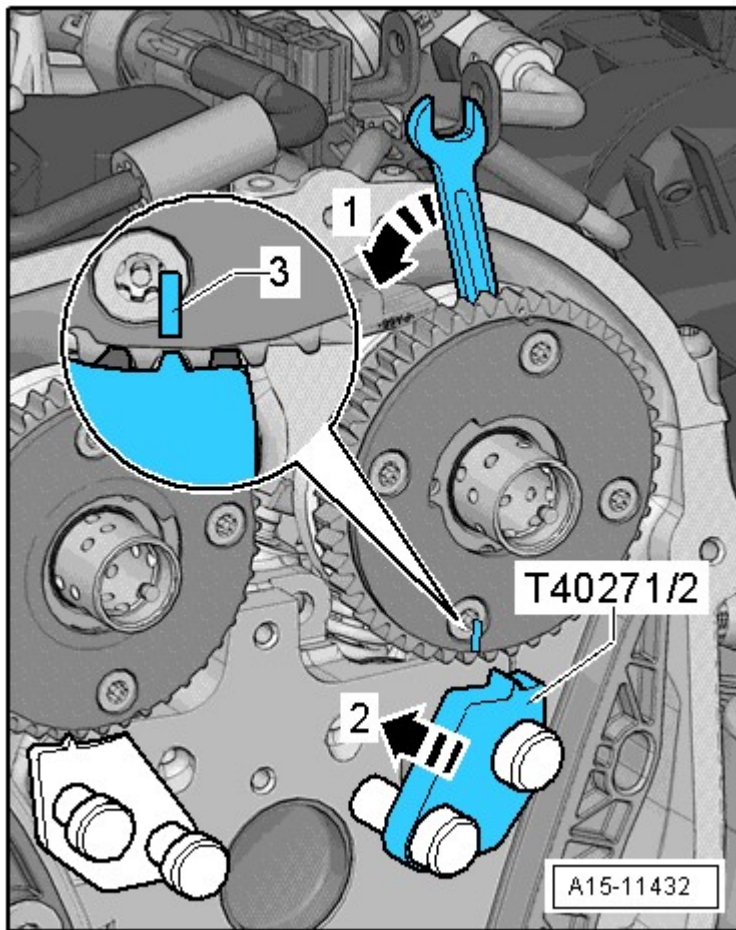


Fig. 157: Turning Intake Camshaft In Direction Of Arrow
 Courtesy of AUDI OF AMERICA, LLC

- Turn the intake camshaft in the direction of the -arrow 1- until the markings -3- align with the T40271/2.
- Slide the T40271/2 into the chain sprocket splines in the direction of the -arrow 2-.
- Attach the T40271/1 to the cylinder head.

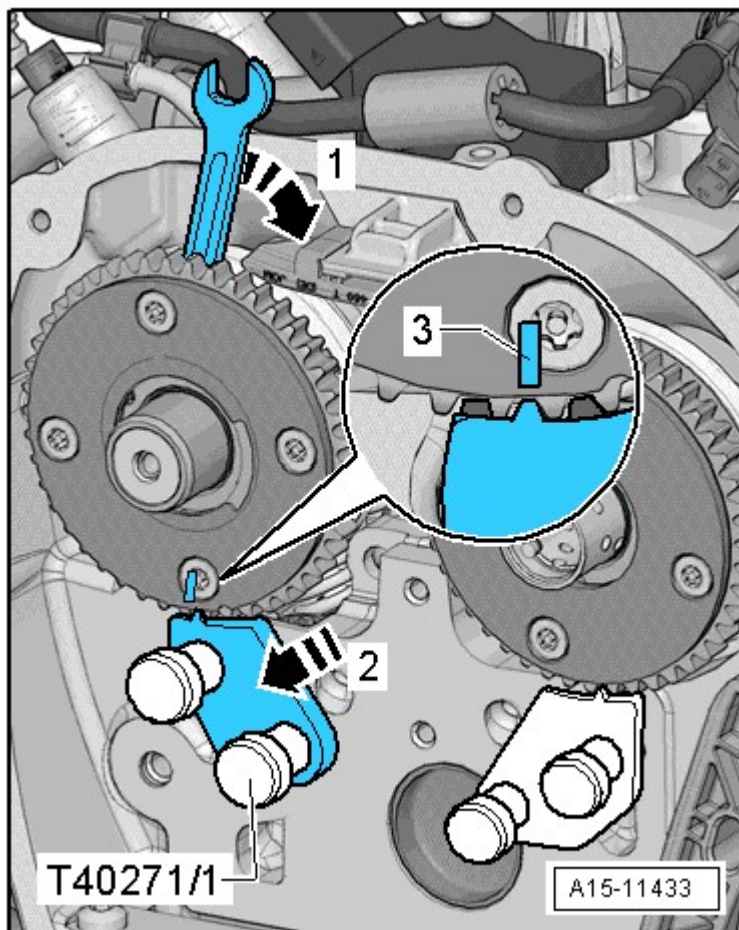


Fig. 158: Turning Exhaust Camshaft In Direction Of Arrow
 Courtesy of AUDI OF AMERICA, LLC

- Turn the exhaust camshaft in the direction of the -arrow 1- until the markings -3- align with the T40271/1.
- Slide the T40271/1 into the chain sprocket splines in the direction of the -arrow 2-.

All

- Set cylinder head gasket in place.

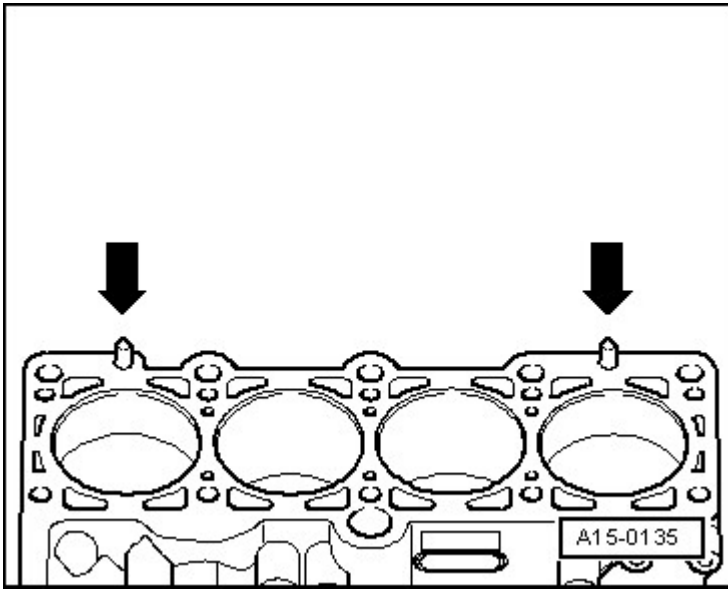


Fig. 159: Identifying Cylinder Block Centering Pins
 Courtesy of AUDI OF AMERICA, LLC

- Pay attention to centering pins in cylinder block -arrows-.
- Observe cylinder head seal location, identification: The part number must be visible from the intake side.

WARNING: When rotating the crankshaft, make sure the timing chain cannot damage any other components.

-- In the event the crankshaft has been rotated in the meantime: Set piston of cylinder 1 to TDC and turn crankshaft back again slightly.

-- Position the cylinder head.

-- Install the bolts -1 through 8-.

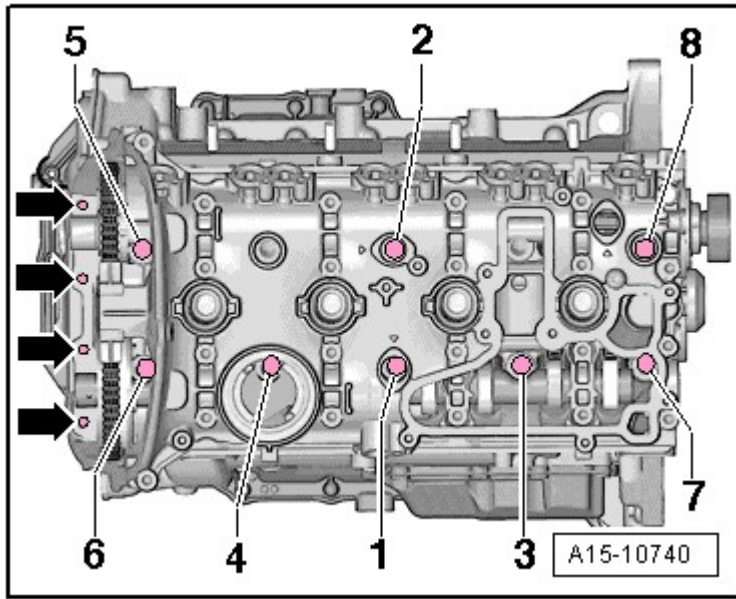


Fig. 160: Identifying Cylinder Head Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Install the cylinder head bolts in the following sequence -1 through 8- with the T10070 and tighten them all together in 3 stages -item 6- in **Fig. 13**.

-- Tighten the bolts -arrows- in two steps -item 4- in **Fig. 13**.

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

-- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

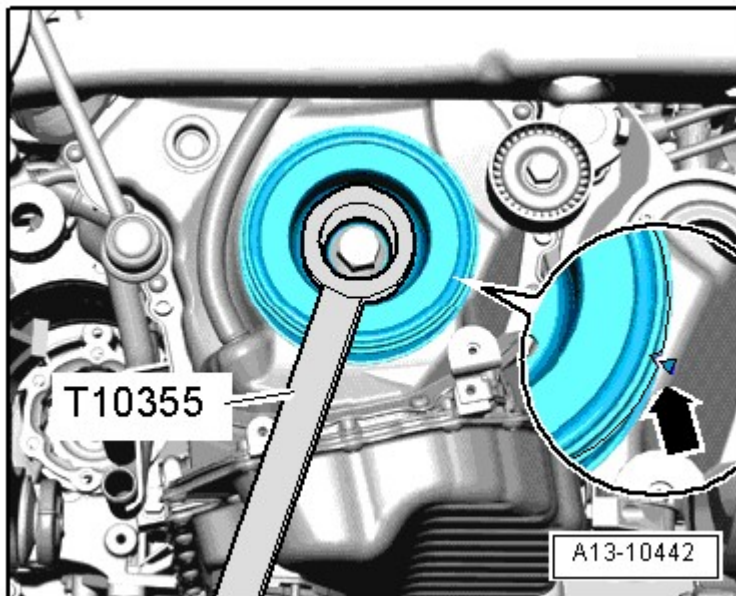


Fig. 161: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

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

-- Position the markings on the chain links -arrows- at the chain sprockets -1- to install the camshaft timing chain.

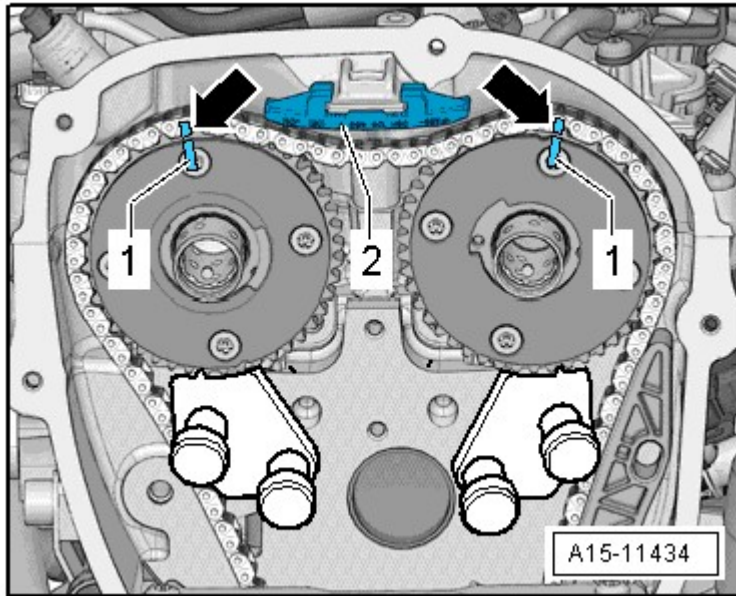


Fig. 162: Positioning Mark On Chain Links At Chain Sprockets
 Courtesy of AUDI OF AMERICA, LLC

-- Install the upper glide track -2-.

-- Turn the exhaust camshaft in the direction of the -arrow 1-, slide out the T40271/1 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

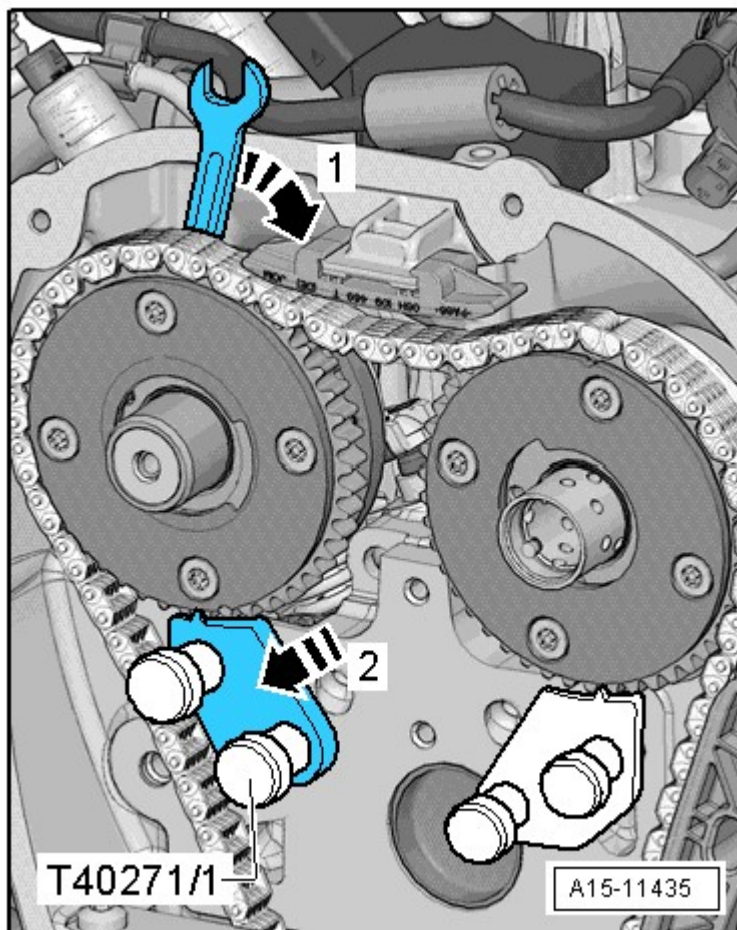


Fig. 163: Turning Exhaust Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

- Remove the T40271/1.
- Move the tensioning rail -2- up and install the bolt -1-.

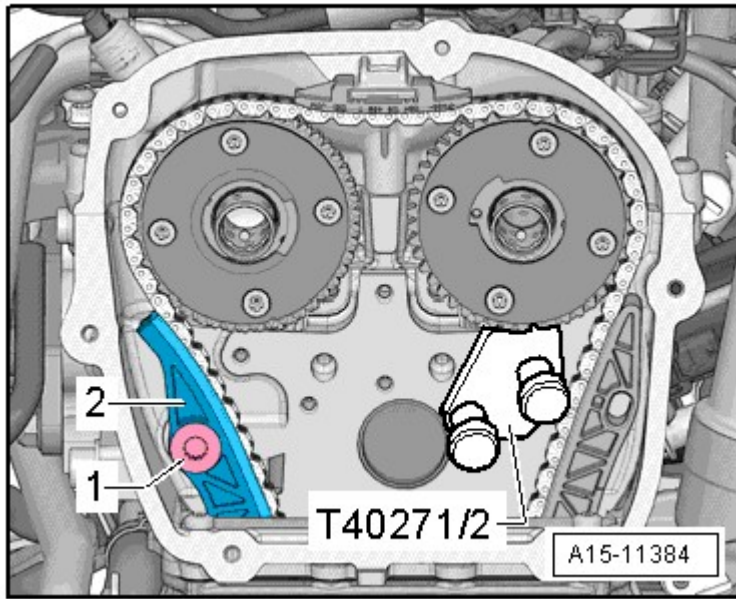


Fig. 164: Moving Tensioning Rail Up To Install Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Turn the intake camshaft in the direction of the -arrow 1-, slide out the T40271/2 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

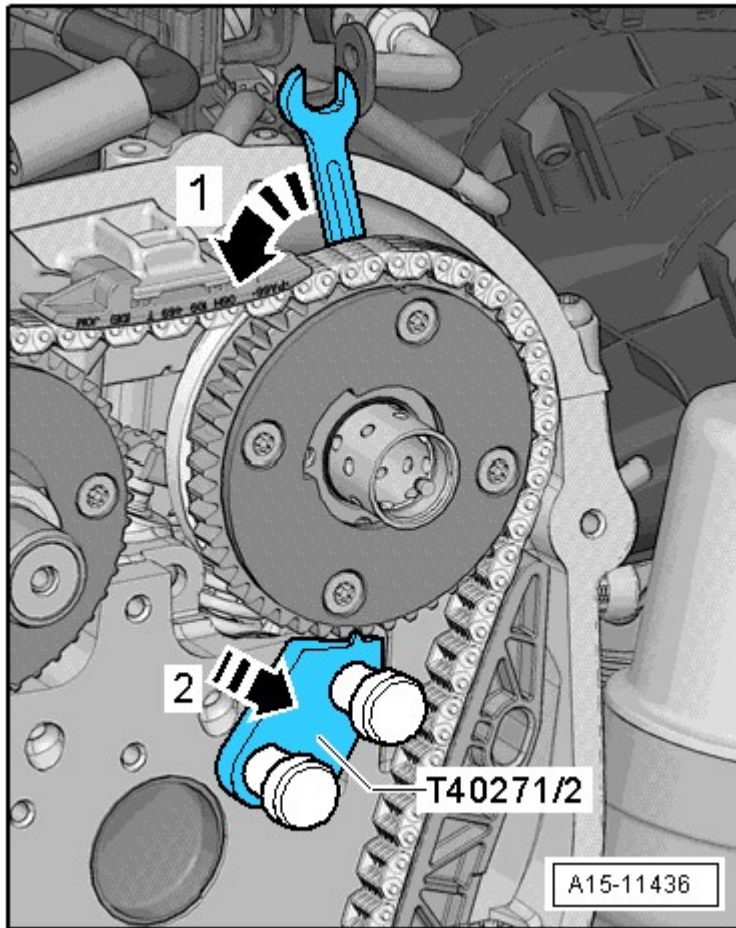


Fig. 165: Turning Intake Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40271/2.

-- Check the valve timing. The camshaft timing chain and cylinder head -arrows- must align with the markings on the chain sprocket -1-.

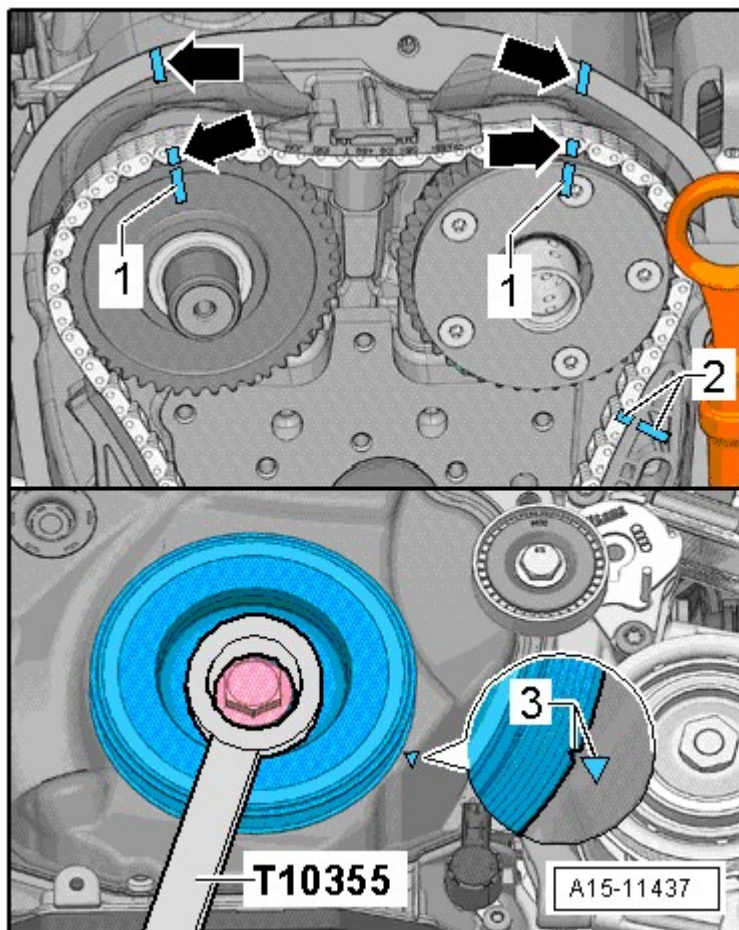


Fig. 166: Checking Valve Timing

Courtesy of AUDI OF AMERICA, LLC

- The markings for the camshaft timing chain and the camshaft timing chain glide track -2- must be opposite one another.
- The notch on the vibration damper must be opposite the marking on the lower section of the timing chain guard -3-.
- Mount the bearing bracket and the bolts -arrows- hand-tight.

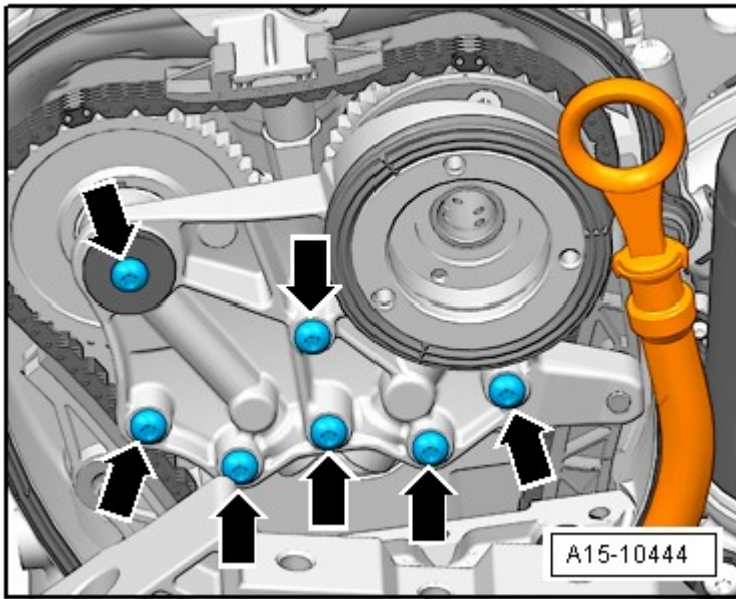


Fig. 167: Identifying Bearing Bracket Bolts
 Courtesy of AUDI OF AMERICA, LLC

- Remove the T40011 or the T40267, depending on the version.
- Tighten the bolts -arrows-. Refer to CAMSHAFT TIMING CHAIN OVERVIEW.
- Install the bolt -arrow-.

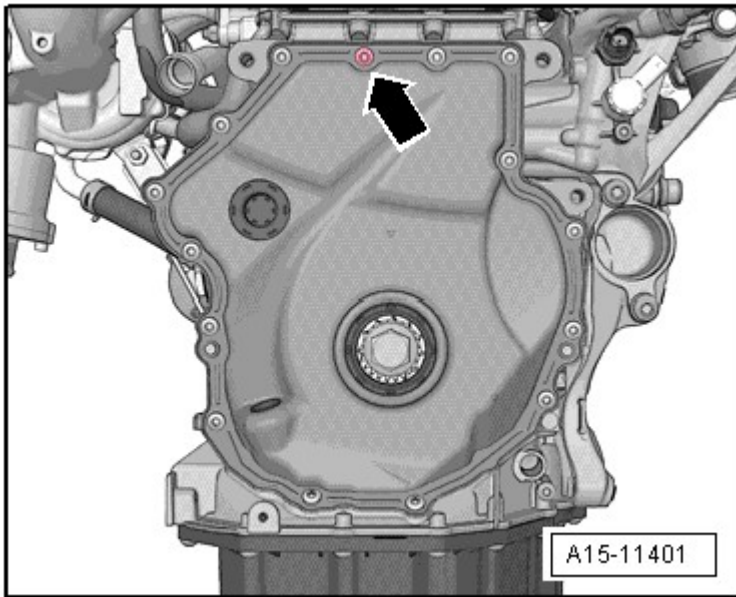


Fig. 168: Identifying Bolt
 Courtesy of AUDI OF AMERICA, LLC

- Install the control valve -item 6- in Fig. 7.

-- Install the T40196 as illustrated.

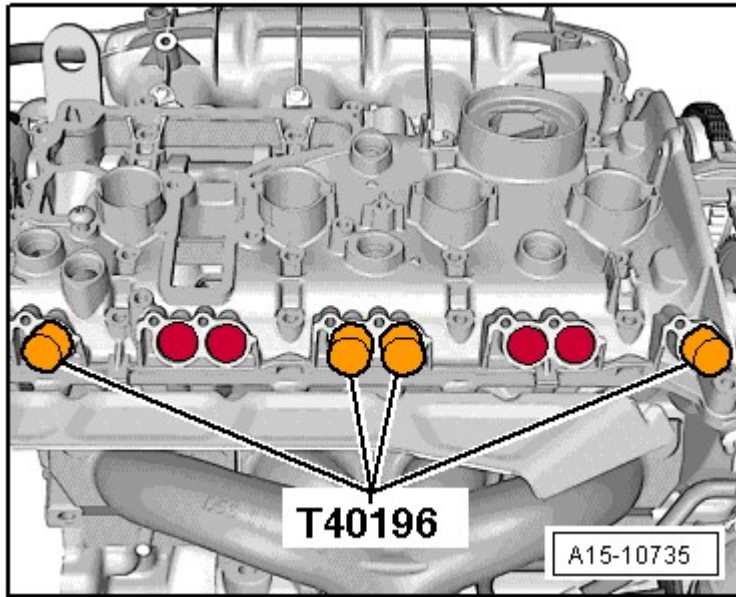


Fig. 169: Identifying T40196, Installation Locations
Courtesy of AUDI OF AMERICA, LLC

-- Turn the crankshaft 4 complete turns in the direction of engine rotation.

-- Remove the T40196.

-- Install the bolts -1 and 2-.

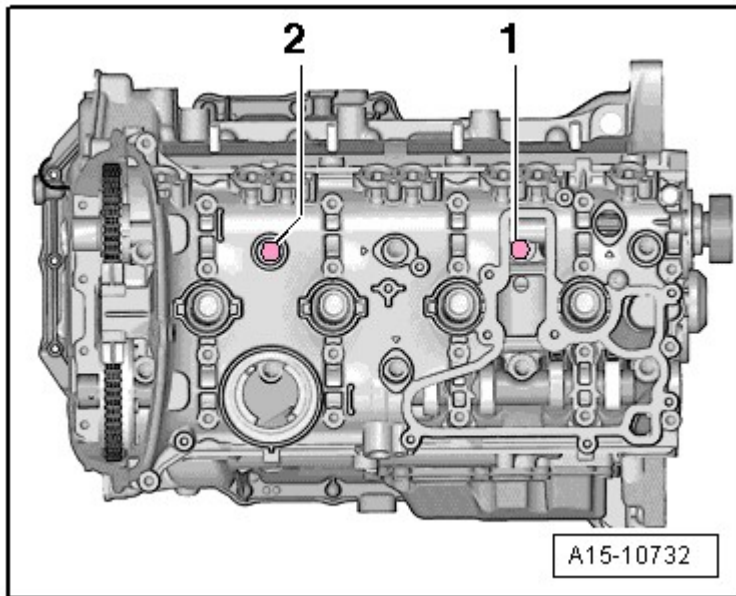


Fig. 170: Identifying Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Install the cylinder head bolts in the following sequence -1 and 2- with the T10070 and tighten them all together in 3 stages -item 6- in **Fig. 13**.

Further assembly is performed in the reverse order of removal, thereby observing the following:

-- Change the engine oil. Refer to **MAINTENANCE PROCEDURES**

-- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.

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

WARNING: Do not use a charger as a starting aid. There is the risk that the vehicle control modules could be damaged.

CYLINDER HEAD WITHOUT WRENCH CLEARANCE

NOTE: Camshafts without screwdriver access do not have notches in the camshafts, refer to Fig. 1.

Special tools and workshop equipment required

- Engine Bung Set VAS 6122
- Polydrive Bit and Drive Socket T10070
- Spark Plug Removal Tool 3122 B

Removing

NOTE: During installation, cable ties must be installed at the same location.

Always seal off any open channels in the intake and exhaust tract with plugs. For example, use the plugs from the VAS 6122.

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

CAUTION: Risk of damaging valves and piston crowns.

- Do not turn the crankshaft if the camshaft has been removed.

WARNING: Risk of scalding due to hot steam and hot coolant.

- The coolant system is under pressure when the engine is warm.
- Reduce pressure by covering coolant reservoir cap with a cloth and carefully opening.

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

-- Remove the plenum chamber covers -1, 2 and 3-

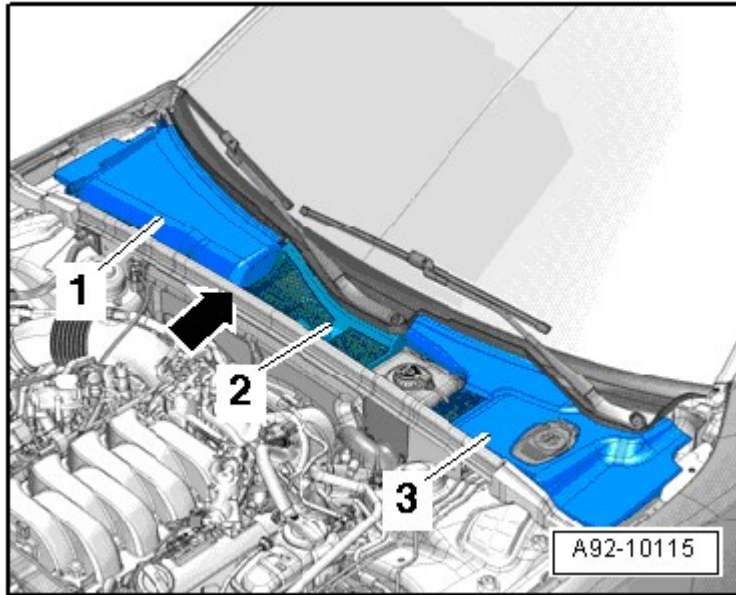


Fig. 171: Identifying Plenum Chamber Covers

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the vacuum connection -2- from the plenum chamber bulkhead by remove the vacuum hose -3- on the back side -arrow-.

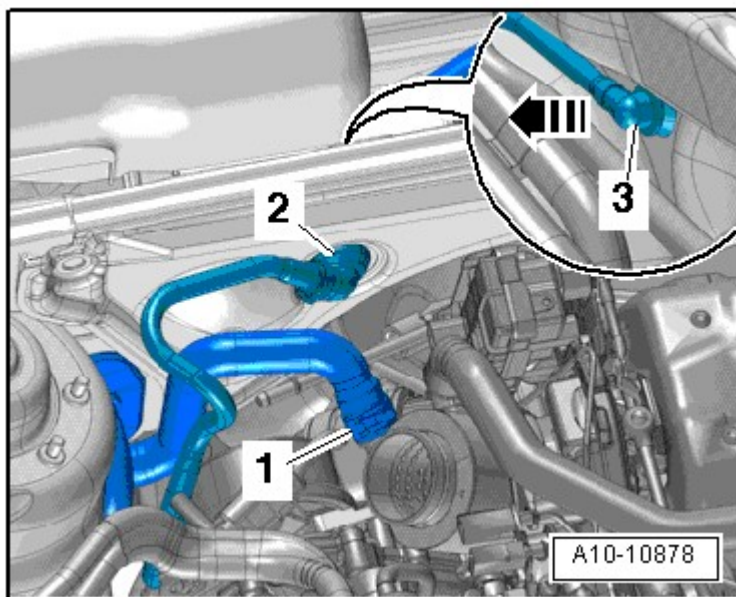


Fig. 172: Disconnecting Vacuum Connection

Courtesy of AUDI OF AMERICA, LLC

-- Remove the coolant hoses on the back of the cylinder head.

CAUTION: Risk of contamination to the fuel system.

- Note rules of cleanliness for working on the fuel injection system. Refer to **CLEAN WORKING CONDITIONS** .

-- Disconnect fuel lines -1 and 2-

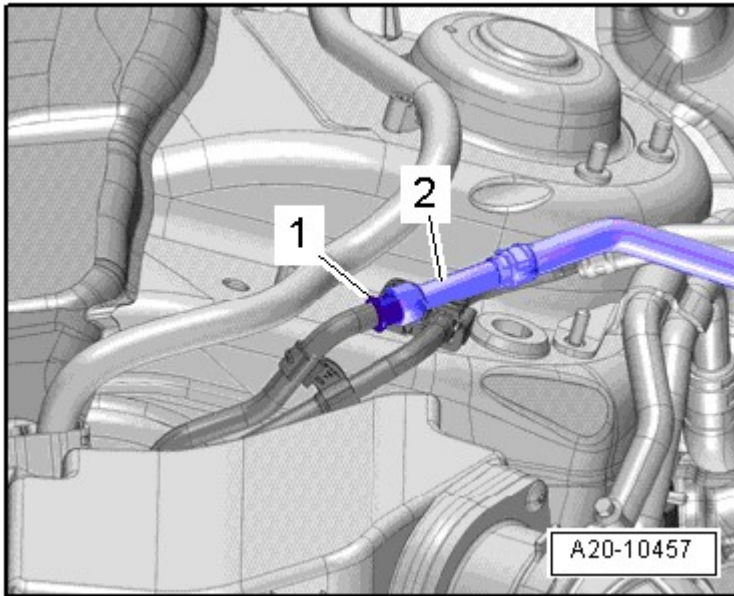


Fig. 173: Identifying Fuel Line

Courtesy of AUDI OF AMERICA, LLC

-- Loosen the hose clamps -arrows- and remove the air guide hose.

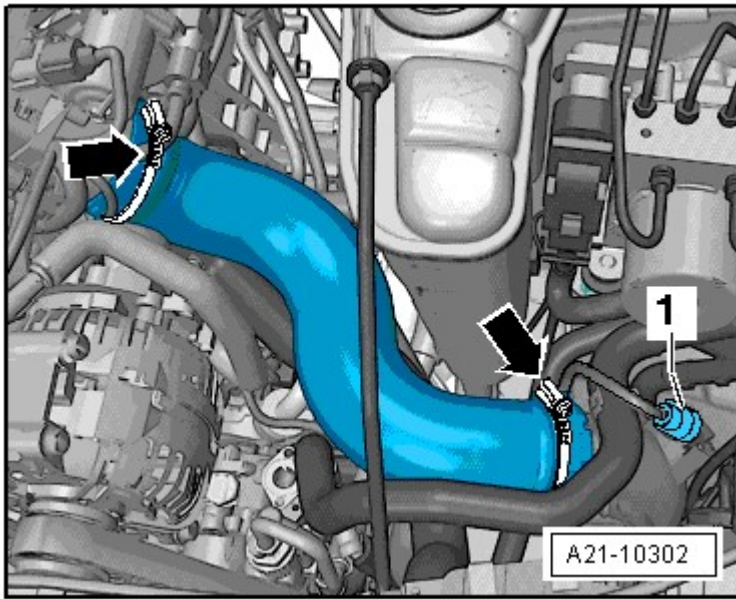


Fig. 174: Loosening Hose Clamps
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the following connectors.

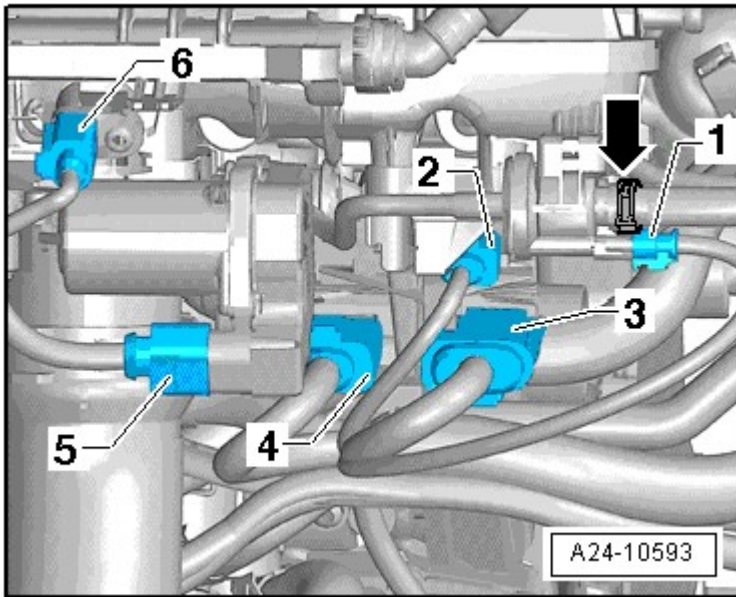


Fig. 175: Identifying Electrical Connectors
 Courtesy of AUDI OF AMERICA, LLC

2 - Disconnect from Knock Sensor (KS) 1 -G61-

3 - From the Intake Manifold Runner Control (IMRC) Valve -N316-, Fuel Pressure Sensor -G247- and the Camshaft Position (CMP) Sensor -G40-.

4 - From the fuel injectors

5 - From the Throttle Valve Control Module -J338-.

6 - From the Intake Air Temperature (IAT) Sensor -G42-.

-- Disconnect the connector -2- and free up the wire.

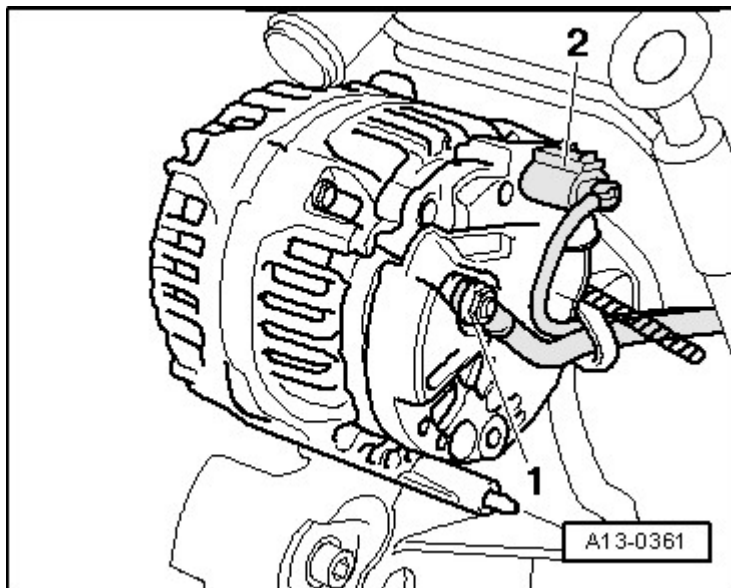


Fig. 176: Identifying Generator Electrical Connector And Terminal B+
Courtesy of AUDI OF AMERICA, LLC

-- Remove the coolant line bracket -arrow-.

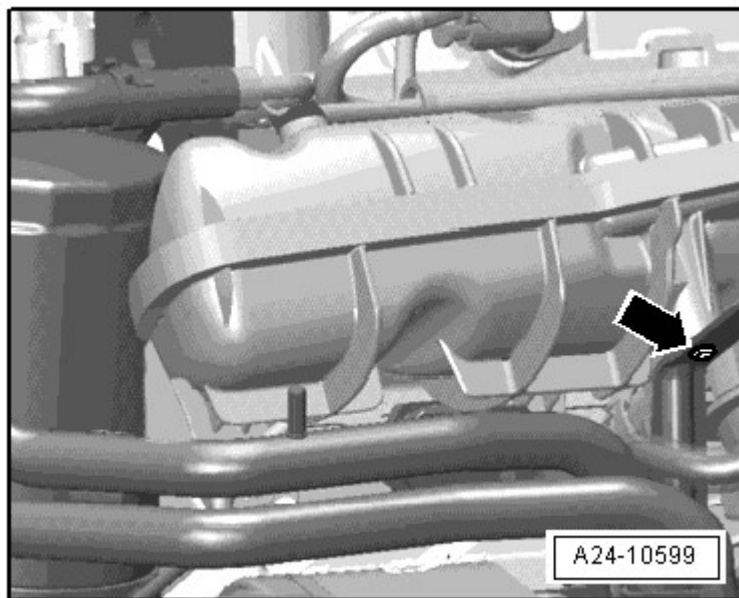


Fig. 177: Locating Coolant Line Bolt
Courtesy of AUDI OF AMERICA, LLC

NOTE: The engine is not shown in the illustrations that follow.

-- Remove the intake manifold bracket by removing the mounting nut -1- and bolt -2-.

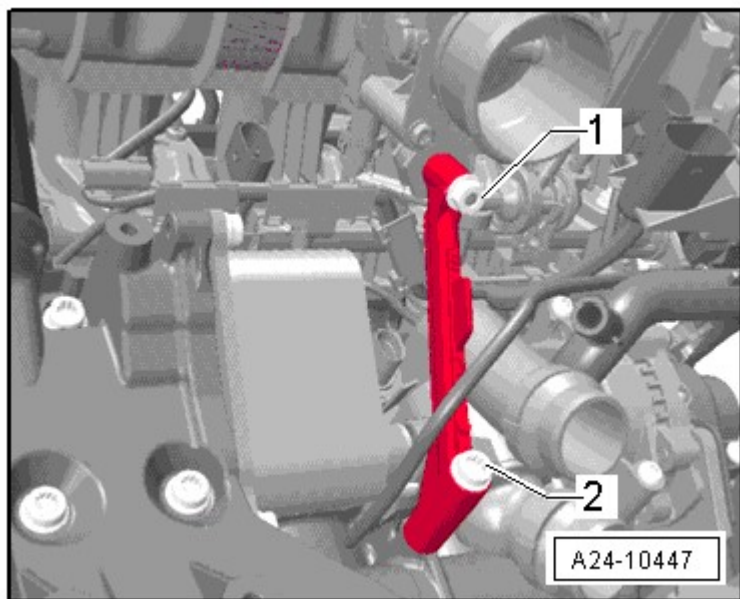


Fig. 178: Identifying Intake Manifold Bracket Mounting Nut And Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the coolant hose -arrow-.

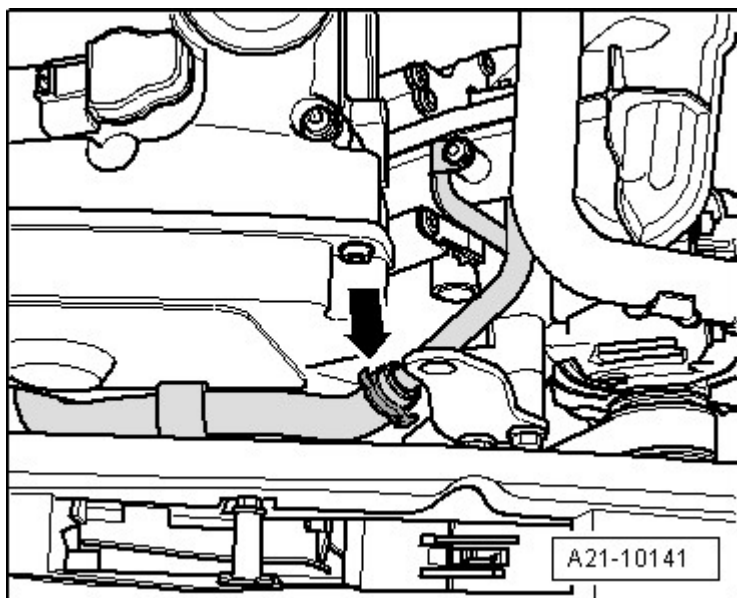


Fig. 179: Disconnecting Coolant Pipe

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1 and 2- and move the oil supply line to the side.

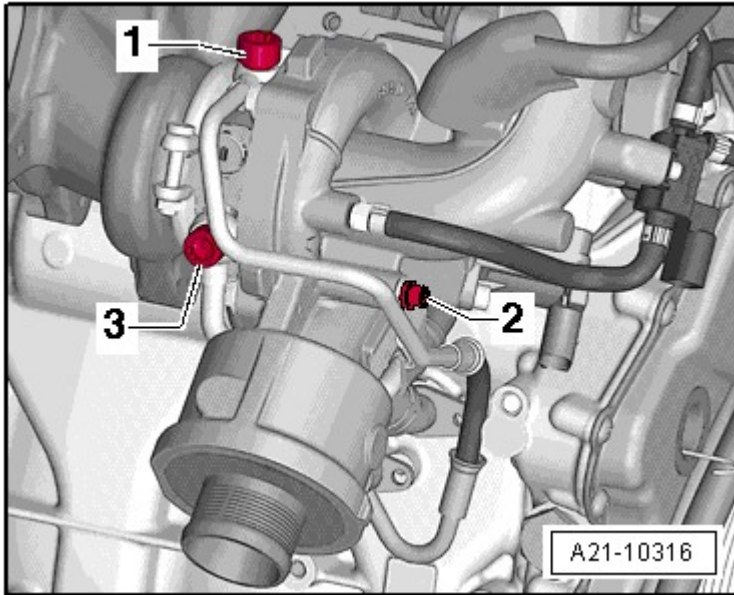


Fig. 180: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -3- and move the coolant pipe to the side.

-- Loosen the hose clamp -arrow-, pull off the air guide hose and move it to the side.

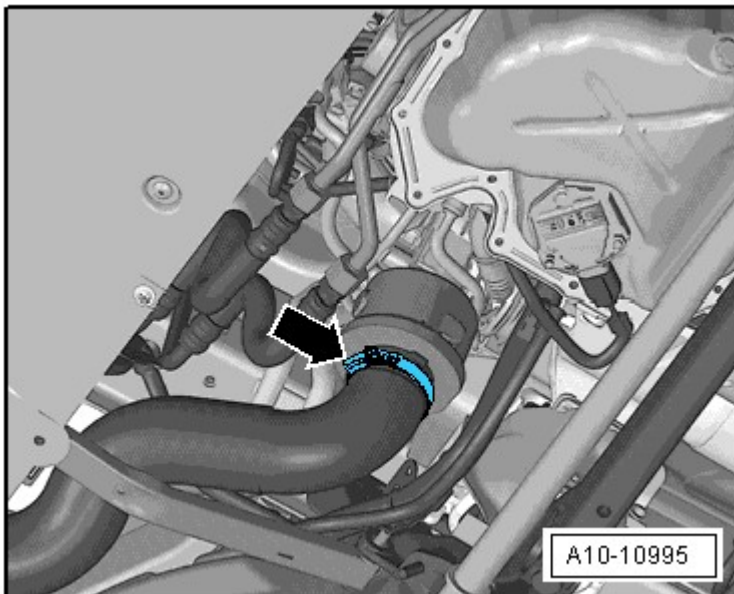


Fig. 181: Loosening Hose Clamp Pull Off Air Guide Hose

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors -1 and 4- from the oil pressure switch -F22- and the reduced oil pressure switch -F378-.

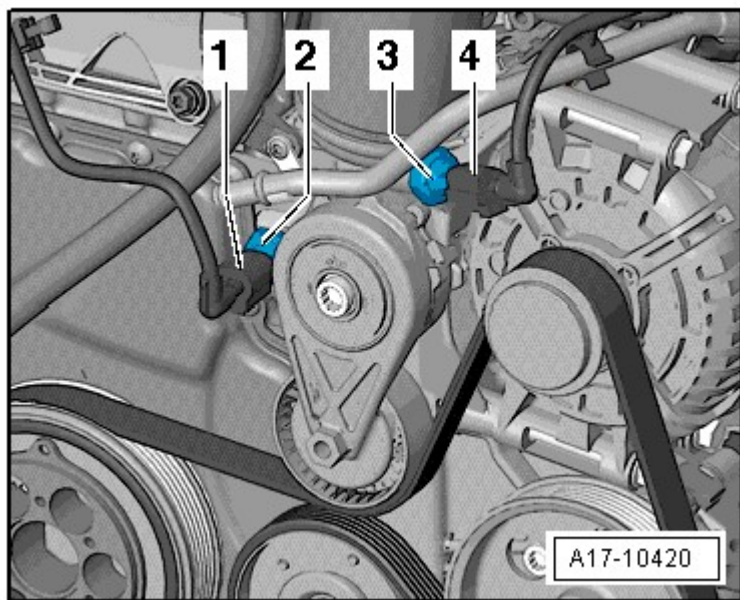


Fig. 182: Identifying Oil Pressure Switch
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors -1 and 2- and free up the wire.

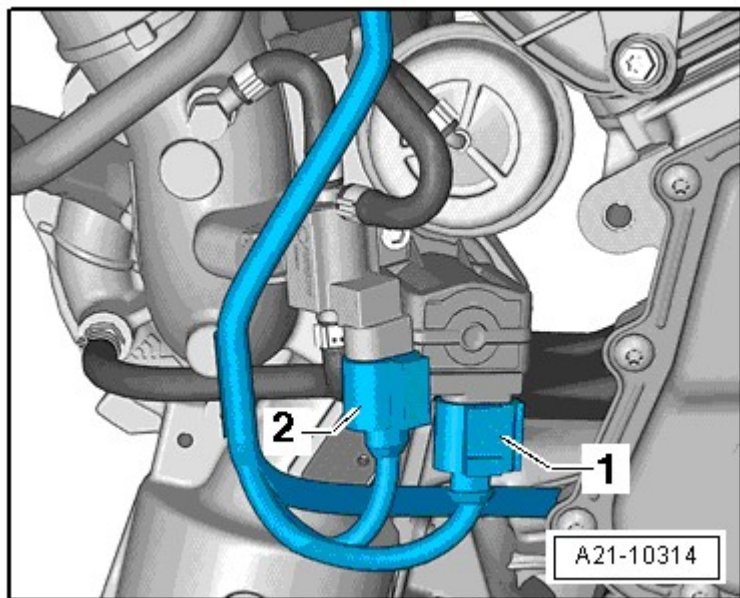


Fig. 183: Disconnecting Connectors
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and then remove the turbocharger support.

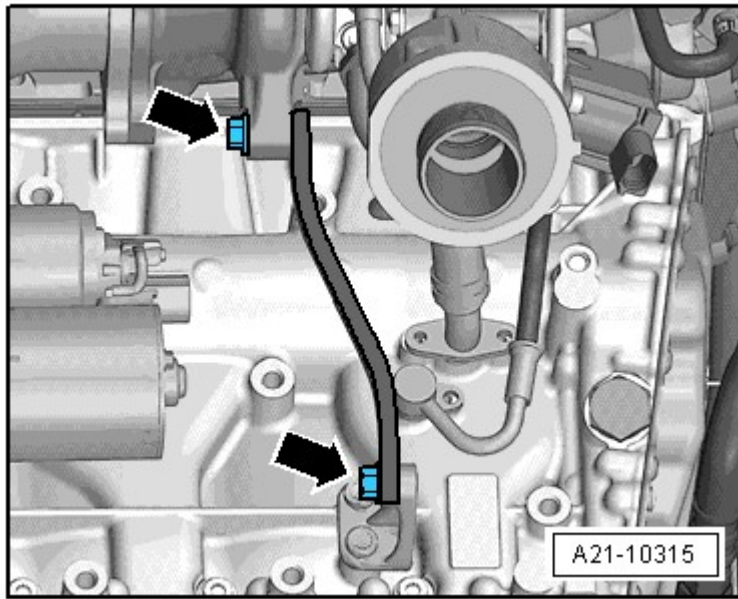


Fig. 184: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- on the oil return line.

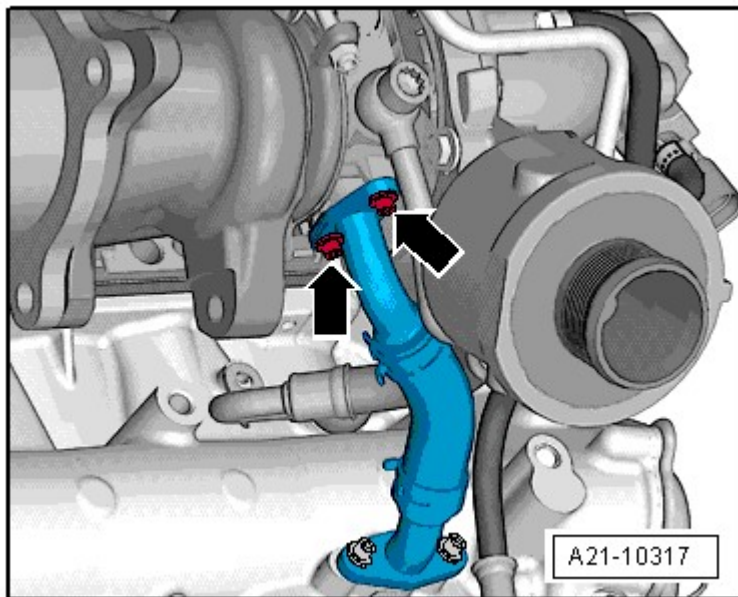


Fig. 185: Identifying Oil Return Line Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the nuts -arrows- and push the catalytic converter to the rear.

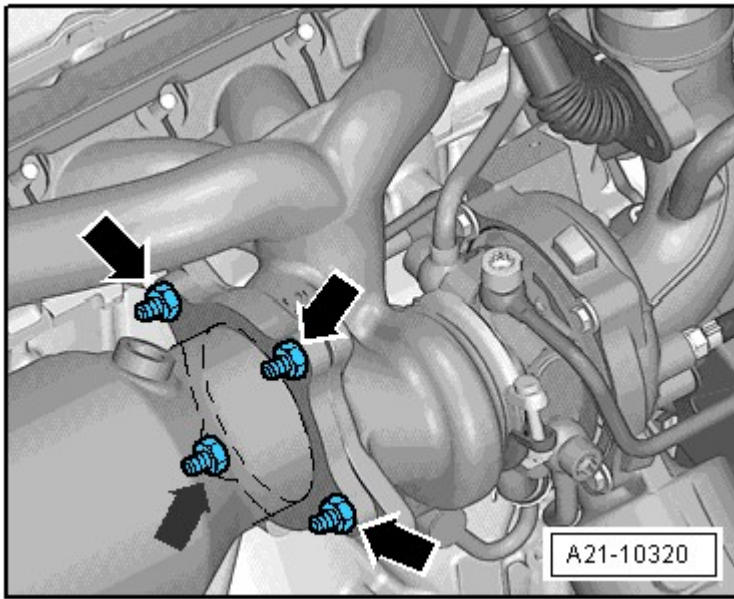


Fig. 186: Identifying Nuts And Catalytic Converter
 Courtesy of AUDI OF AMERICA, LLC

- Remove the spark plugs using a 3122 B.
- Remove the bolts -arrows-.

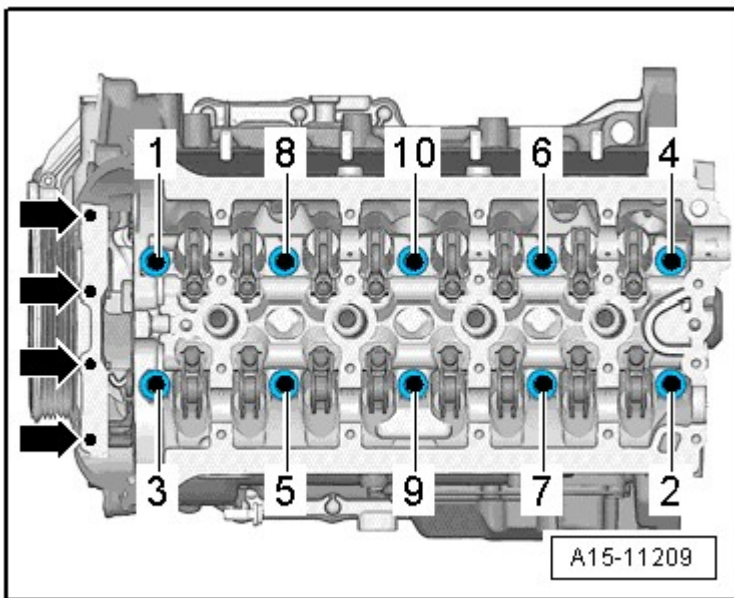


Fig. 187: Loosening Cylinder Head Bolts In Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Remove the cylinder head bolts in sequence -1 through 10- using the T10070.

NOTE: Make sure all wires and cables are disconnected!

Pay attention to the tension and guide tracks when lifting the cylinder head.

-- Remove the cylinder head.

-- Lay the cylinder head on a soft surface, such as foam.

Installing

- For the correct tightening specifications, refer to **CYLINDER HEAD WITHOUT WRENCH CLEARANCE**.

CAUTION: The sealing surfaces could be damaged.

- Carefully remove sealant residue from 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 valvetrain.

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

NOTE:

- Replace the bolts which are being tightened with an additional turn.
- Replace sealing rings, seals and self-locking nuts.

- 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 camshafts.
- The hose supports, air guide pipes and hoses must be free of oil and grease before installing.
- Secure all hose connections with hose clamps appropriate for the model.
- To mount the charge hoses on their connectors securely, spray the bolts on the used clamps with rust remover before installing.
- The engine oil and coolant must be changed if the cylinder head or cylinder head seal are replaced.

-- Set cylinder head gasket in place.

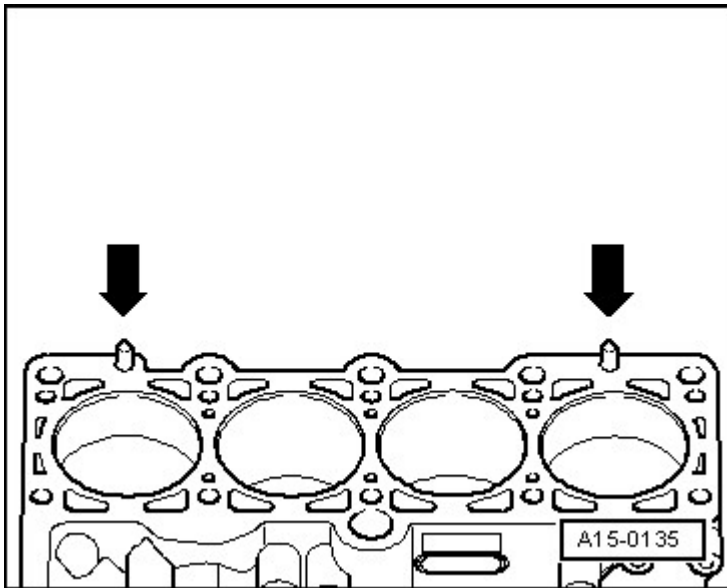


Fig. 188: Identifying Cylinder Block Centering Pins
Courtesy of AUDI OF AMERICA, LLC

- Pay attention to centering pins in cylinder block -arrows-.
- Observe cylinder head seal location, identification: The part number must be visible from the intake side.

WARNING: When rotating the crankshaft, make sure the timing chain cannot damage any other components.

-- In the event the crankshaft has been rotated in the meantime: Set piston of cylinder 1 to Top Dead Center (TDC) and turn crankshaft back again slightly.

-- Set cylinder head in place.

-- Insert cylinder head bolts and tighten by hand.

-- Cylinder head tightening sequence. Refer to [Fig. 20](#).

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

-- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

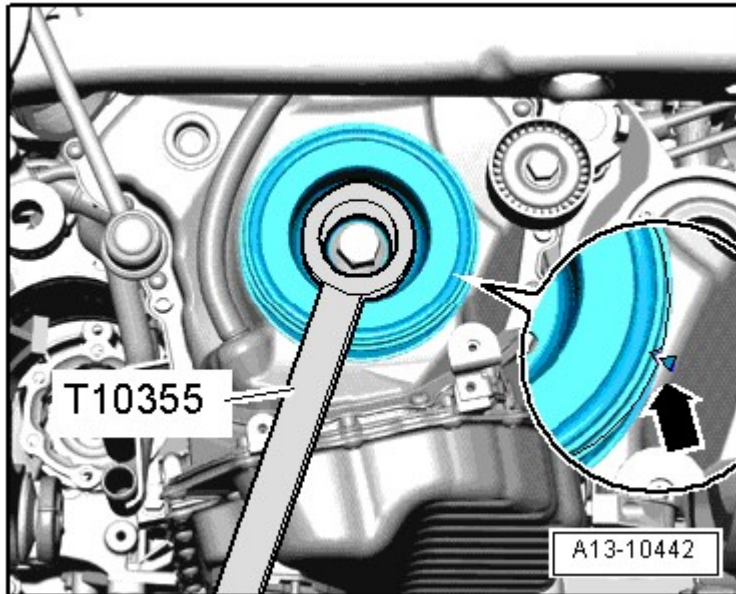


Fig. 189: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
Courtesy of AUDI OF AMERICA, LLC

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

Further installation is performed in the reverse order of removal, thereby observing the following:

-- Install the camshafts. Refer to [CAMSHAFTS](#).

-- Install the timing chain guard upper section. Refer to [UPPER TIMING CHAIN GUARD](#).

-- Change the engine oil. Refer to [MAINTENANCE PROCEDURES](#)

-- Replace coolant. Refer to [COOLANT, DRAINING AND FILLING](#) .

WARNING: Do not use a battery charger for starting assistance! There is the risk that the vehicle control modules could be damaged.

CAMSHAFTS

Special tools and workshop equipment required

- Ignition Coil Puller T40039
- Assembly Tool T10352/1
- Counter hold tool T10355
- Locking Pin T40011
- Thrust Piece T10174
- Drift T40196
- Spacers T40191
- Pry Lever T40243
- Camshaft Locator T40271

Removing

NOTE: The sealing surfaces of the lower cylinder head cover and on the upper cylinder head must not be reworked.

The camshaft bearings are integrated in the cylinder head or cylinder head cover. The tension must be released from the camshaft timing chain before removing the cylinder head cover.

If the cylinder head cover was removed, then the cap -item 18 - in VALVETRAIN OVERVIEW must be replaced.

During installation, cable ties must be installed at the same location.

-- Install the lock carrier in service position. Refer to Description and Operation .

-- Remove the engine cover -arrows-.

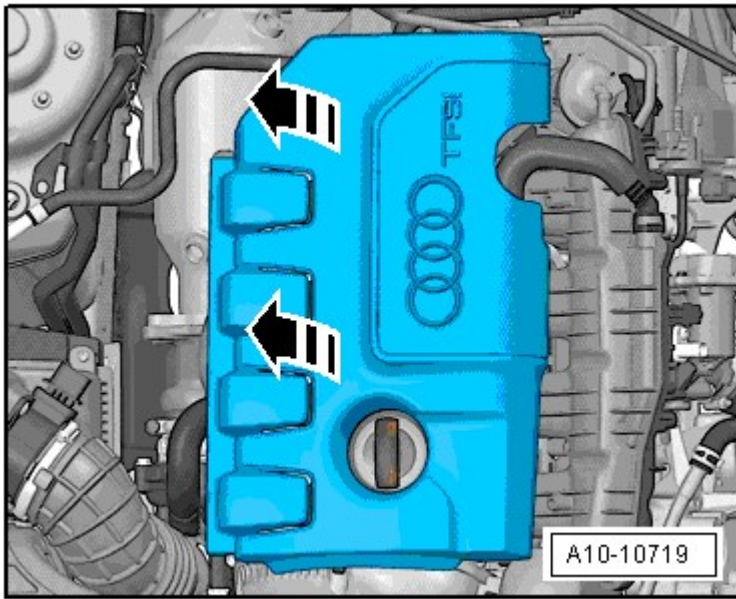


Fig. 190: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

- Remove both the lower air guide and the air guide hose.
- Disconnect the connector -1- from the Mass Airflow (MAF) Sensor -G70-.

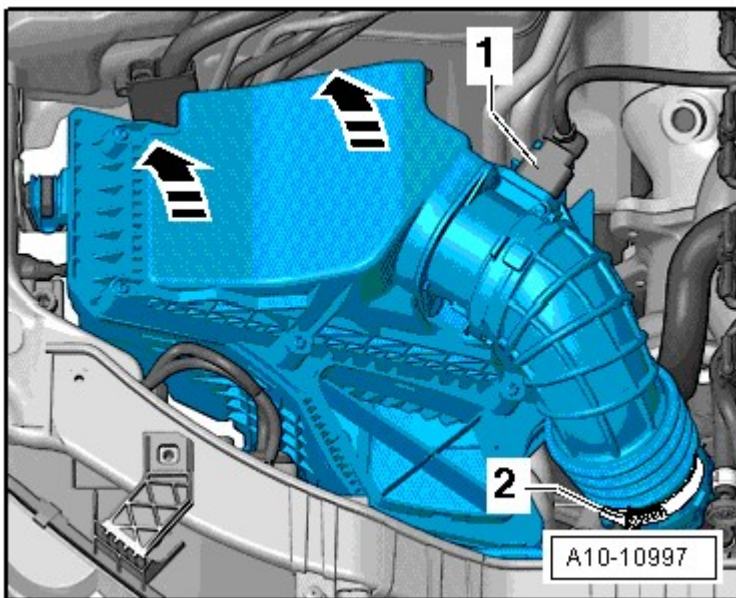


Fig. 191: Disconnecting Connector

Courtesy of AUDI OF AMERICA, LLC

- Loosen the air intake hose -2-.
- Remove the air filter housing upward -arrows-.

-- Remove the bolts on the ignition coil connector strip.

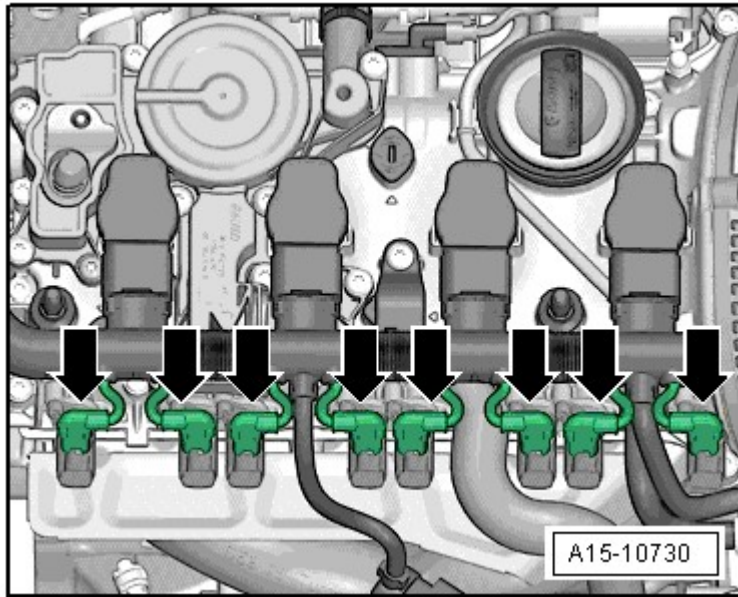


Fig. 192: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the connectors -arrows- from the camshaft adjuster actuators.

-- Release the connector -arrows- and disconnect all the connectors at the same time from the ignition coils.

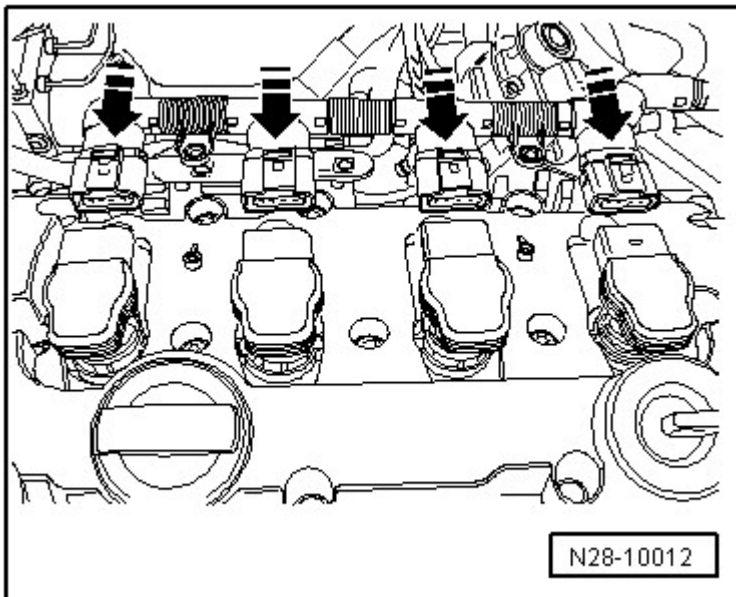


Fig. 193: Connecting Connectors To Ignition Coils

Courtesy of AUDI OF AMERICA, LLC

-- Remove the ignition coils with the T40039.

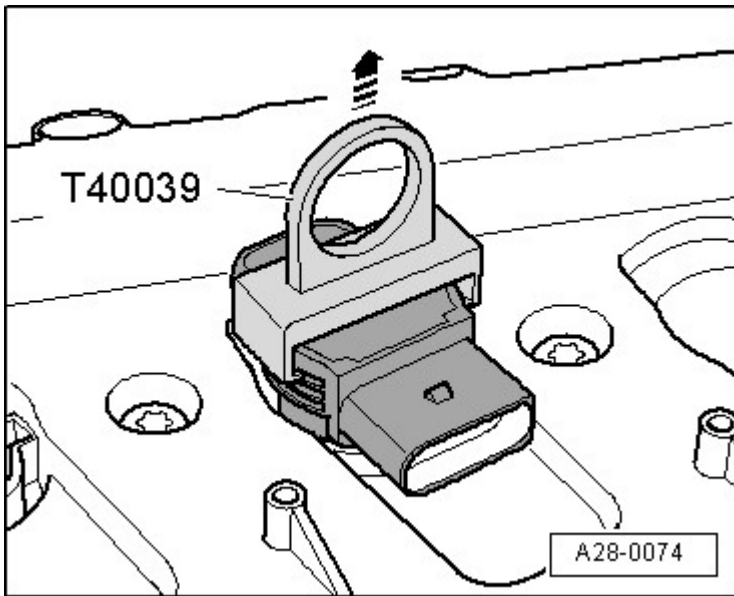


Fig. 194: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

-- Remove the camshaft adjuster actuators -arrows-.

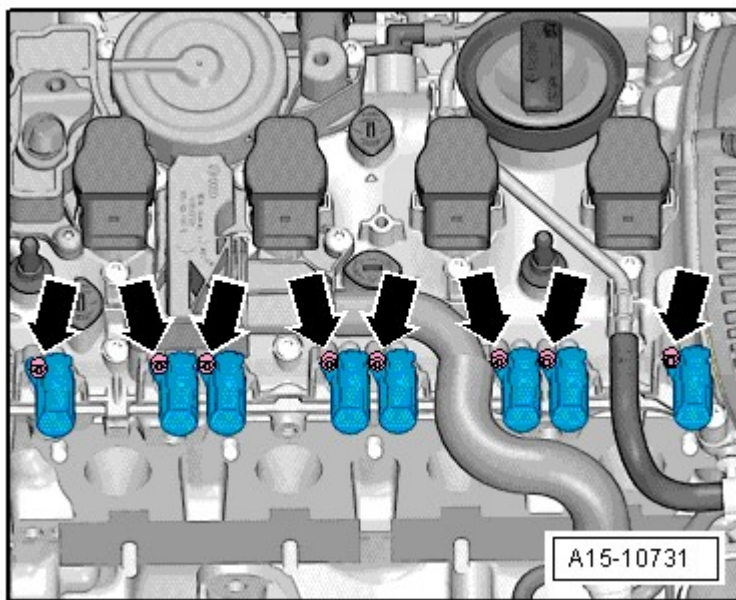


Fig. 195: Identifying Camshaft Adjuster Actuators
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect the hose for the crankcase ventilation -1-.

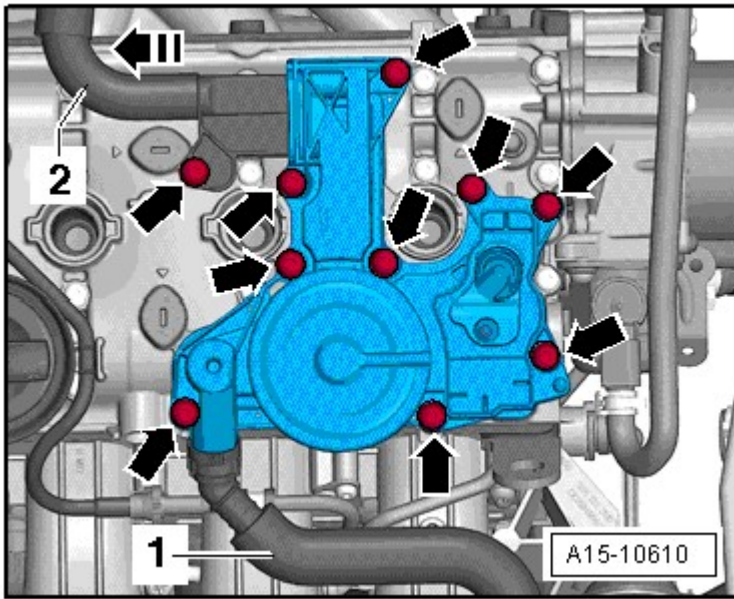


Fig. 196: Locating Crankcase Ventilation Bolts
 Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -arrows- and then remove the crankcase ventilation from the hose -2- in direction of -arrow-.
- Disconnect the wire -arrows-.

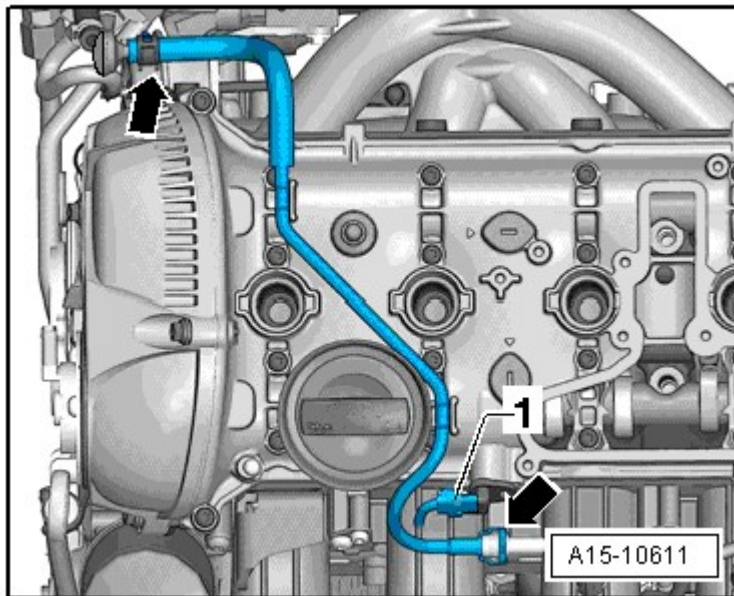


Fig. 197: Disconnecting Wire
 Courtesy of AUDI OF AMERICA, LLC

- Disconnect the connector -1- from the camshaft position sensor -G40-.

-- Disconnect the connector from the camshaft adjustment valve 1 -N205- -1-.

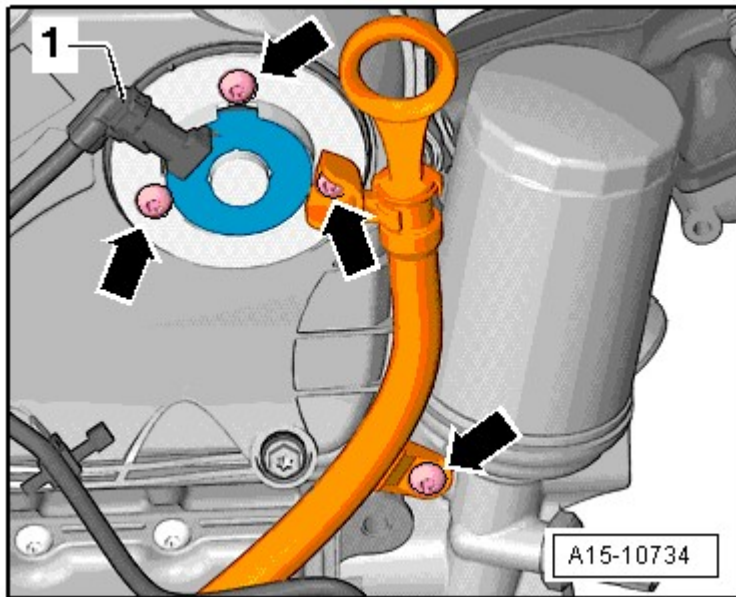


Fig. 198: Disconnecting Connector
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and then the camshaft adjustment valve 1 -N205-.

-- Remove the bolts -1 through 5- and the timing chain guard upper section.

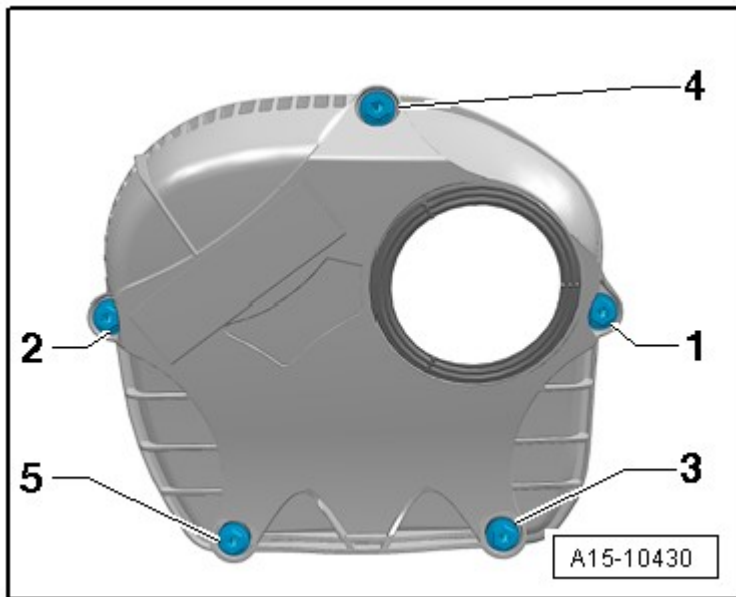


Fig. 199: Identifying Upper Timing Chain Cover - Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: The control valve has a left thread.

-- Remove the control valve using the T10352/1 in the direction of the -arrow-.

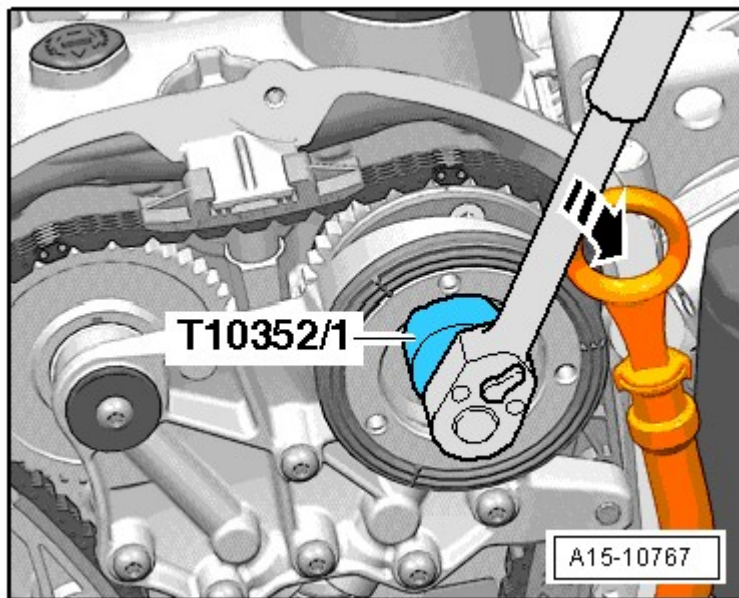


Fig. 200: Identifying Control Valve
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows- and remove the bearing bracket.

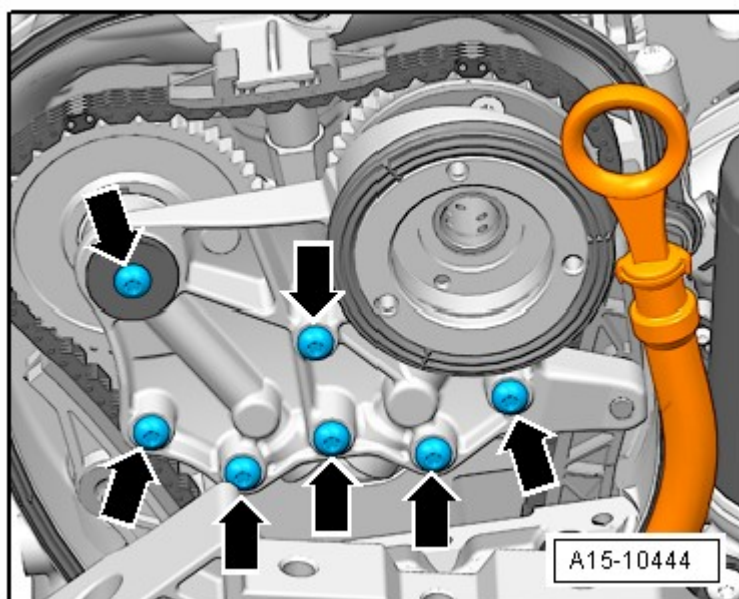


Fig. 201: Identifying Bearing Bracket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the vibration damper using the T10355 to "TDC" position.

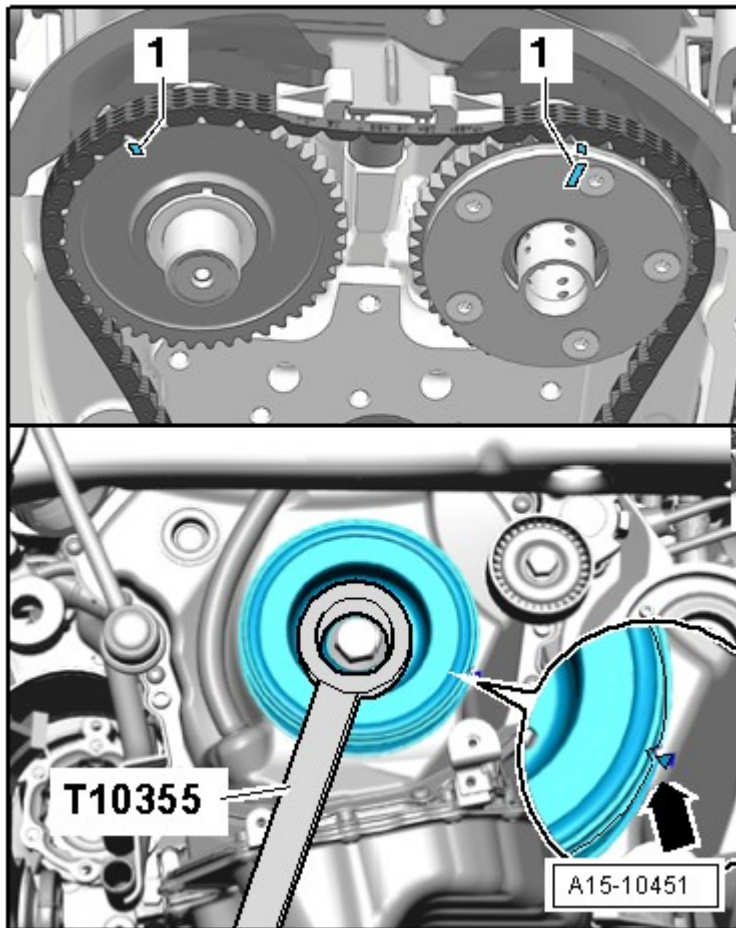


Fig. 202: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
 Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper and the marking on the timing chain guard lower section must be opposite one another -arrow-.
- The markings -1- on the camshafts must point upward.

CAUTION: Danger of causing damage to the engine.

- The T40196 may be installed only in the shown positions.

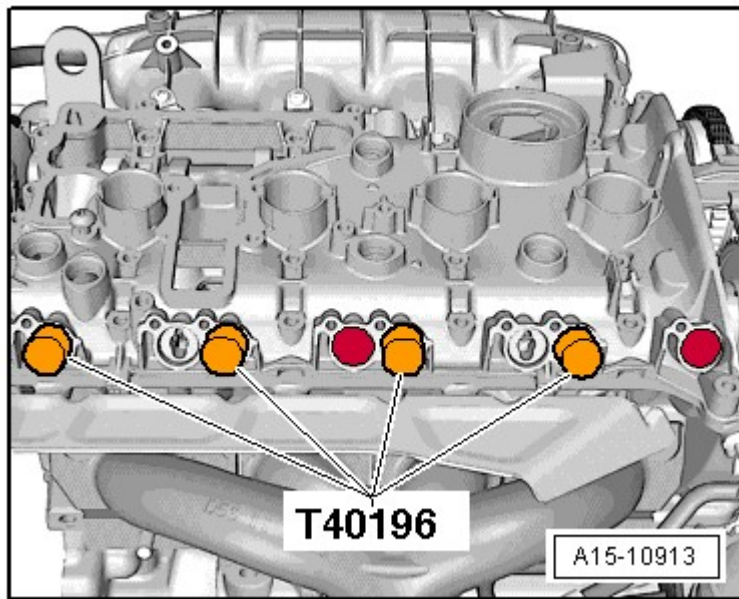


Fig. 203: Identifying T40196 Installed In Exact Position
Courtesy of AUDI OF AMERICA, LLC

- Install the T40196 as illustrated.
- Turn the crankshaft 2 complete turns in the direction of engine rotation.

NOTE: The engine back at Top Dead Center (TDC).

- Remove the T40196.
- Mark the camshaft timing chain and the cylinder head -arrows- to match the marking on the chain sprockets - 1- with a waterproof marker.

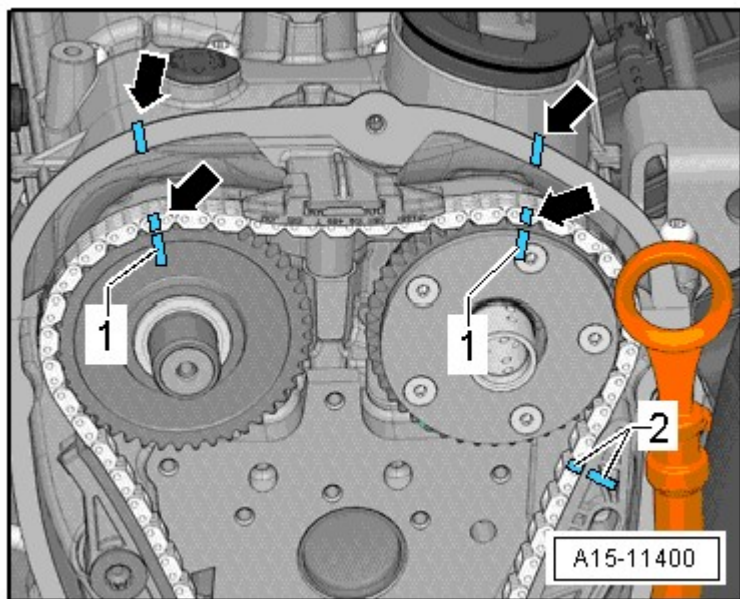


Fig. 204: Marking Camshaft Timing Chain And Cylinder Head
 Courtesy of AUDI OF AMERICA, LLC

-- In addition, mark the camshaft timing chain to the camshaft timing chain guide rail -2- with a permanent marker.

-- Remove the plug -arrow-.

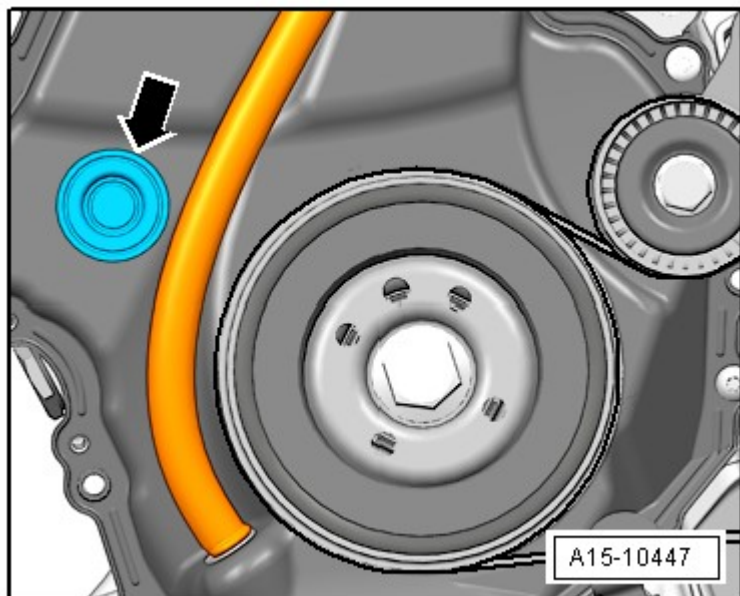


Fig. 205: Locating Plug
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows-.

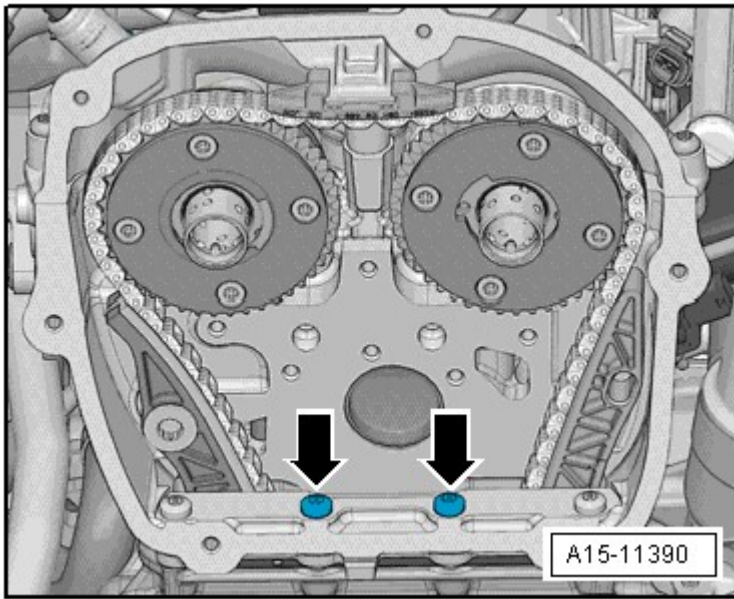


Fig. 206: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -arrow-.

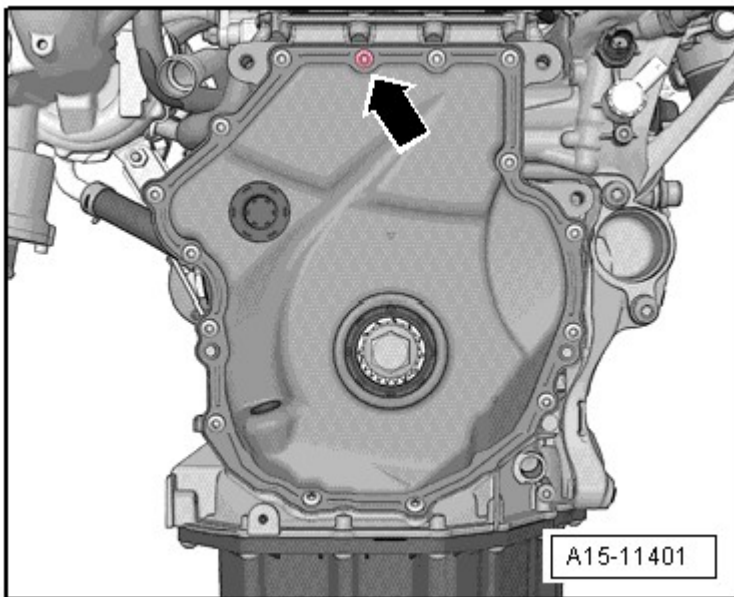


Fig. 207: Identifying Bolt

Courtesy of AUDI OF AMERICA, LLC

Two different chain tensioners may be installed depending on the version:

Version 1

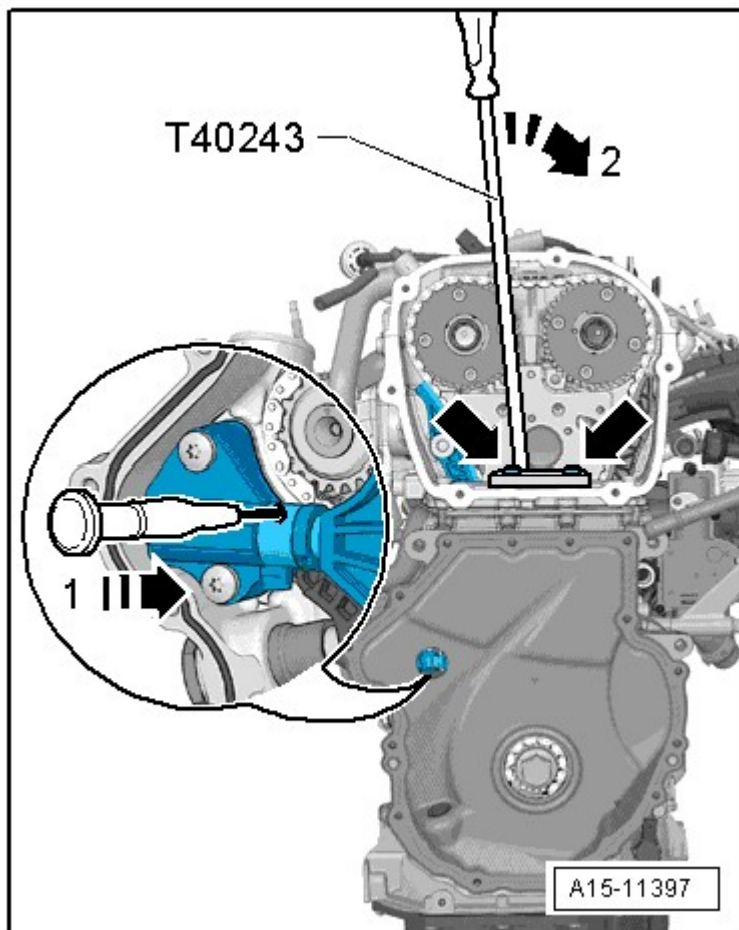


Fig. 208: Identifying Version 1

Courtesy of AUDI OF AMERICA, LLC

-- Install the T40243 -arrows-.

-- Insert a scriber or a suitable screwdriver into the opening for the chain tensioner in the direction of the -arrow 1- to lift up the locking wedge for the chain tensioner, slowly press down the T40243 and hold it in the direction of the -arrow 2-.

-- Secure the chain tensioner using T40011.

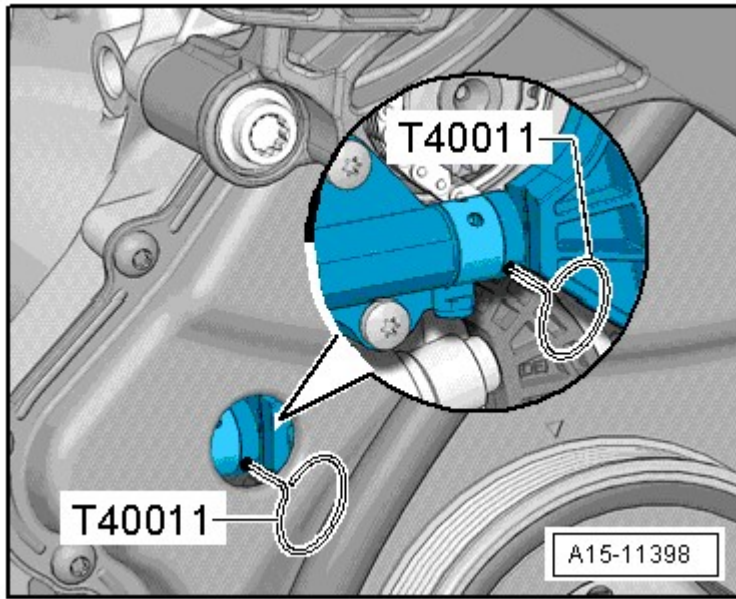


Fig. 209: Securing Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

Version 2

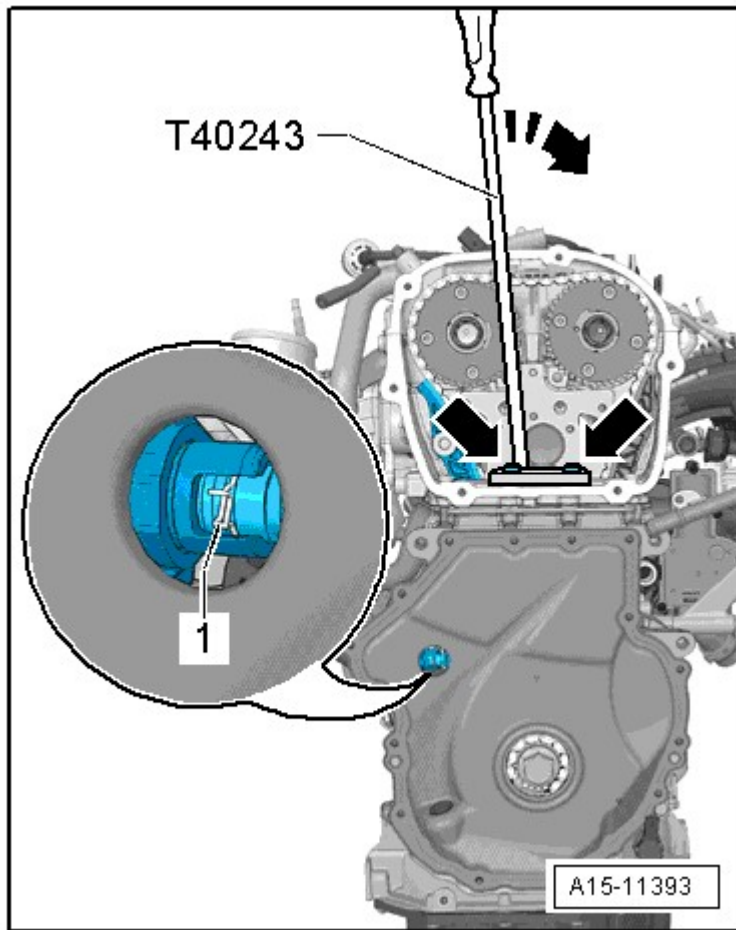


Fig. 210: Identifying Version 2
Courtesy of AUDI OF AMERICA, LLC

- Install the T40243 -arrows-.
- Press the chain tensioner locking ring -arrow- together and slowly press and hold the T40243 in the direction of the -arrow-.
- Secure the chain tensioner with the T40267.

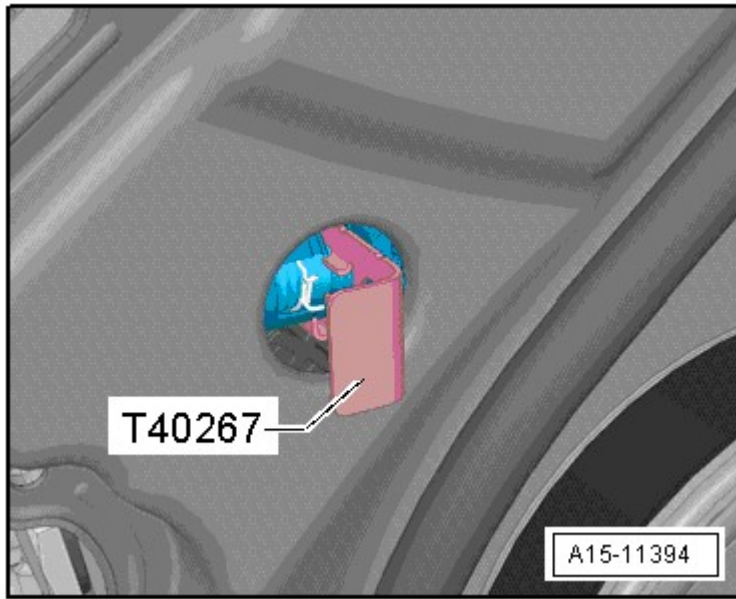


Fig. 211: Securing Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40243.

-- Bolt the camshaft locating tool T40271/2 to the cylinder head and push the chain sprocket splines in the direction of the -arrow 2-. If necessary, turn the intake camshaft with a wrench in the direction of the -arrow 1-.

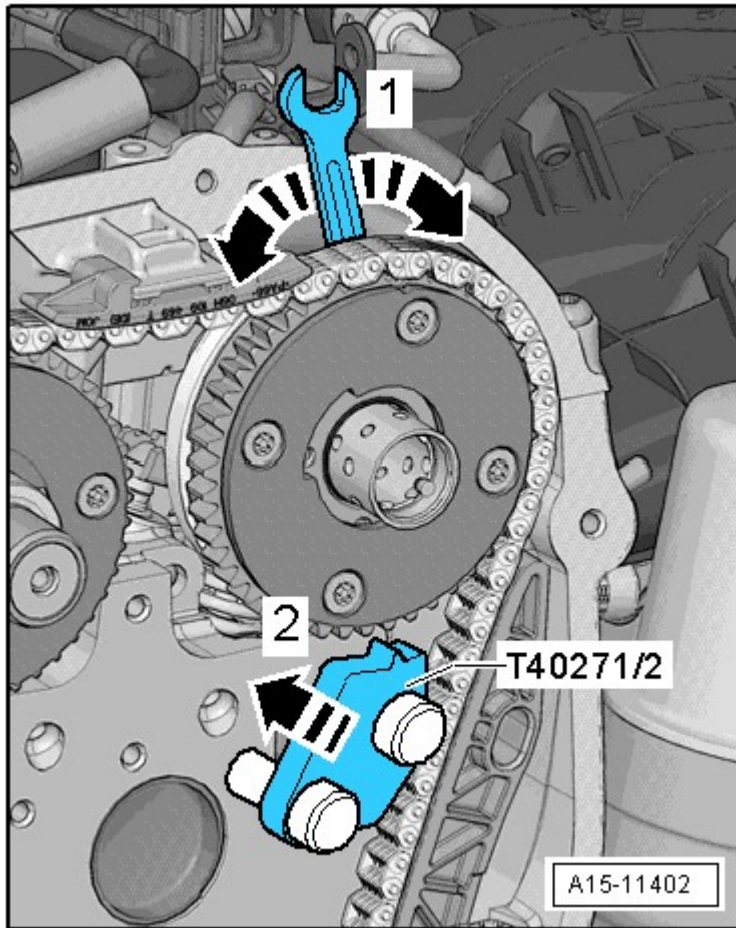


Fig. 212: Identifying Bolt Camshaft Locating Tool T40271/2
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolt -1- and guide the tensioning rail -2- downward.

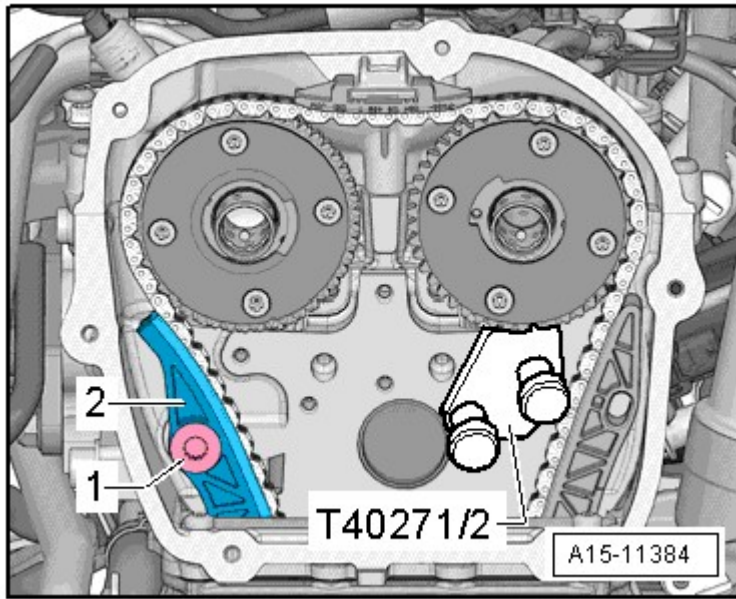


Fig. 213: Moving Tensioning Rail Up To Install Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Attach the camshaft locating tool T40271/1 to the cylinder head.

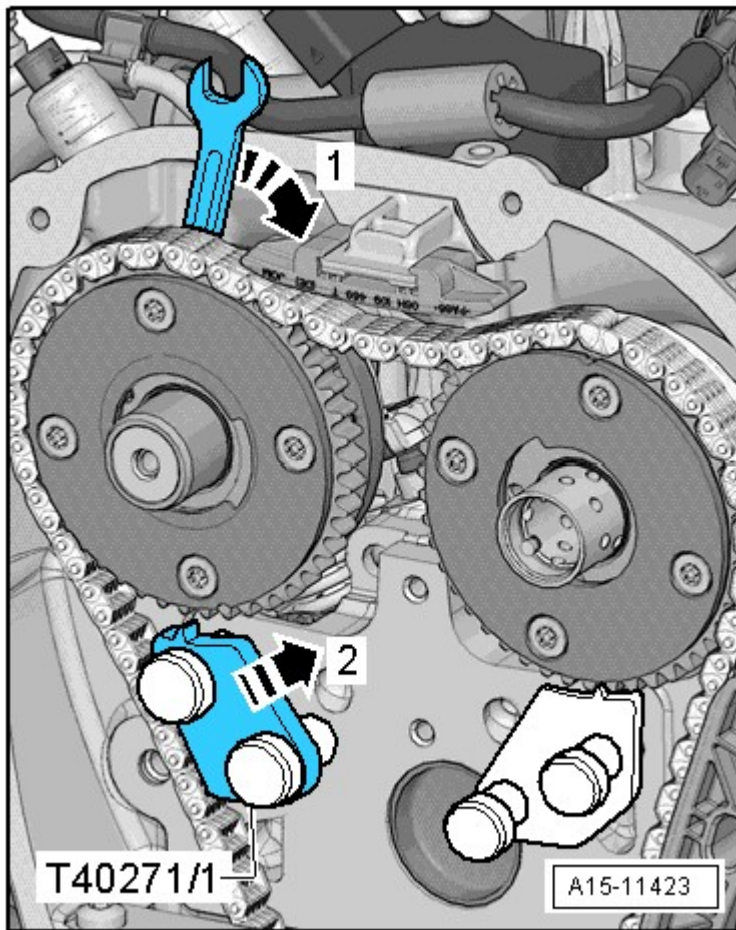


Fig. 214: Identifying Camshaft Locating Tool

Courtesy of AUDI OF AMERICA, LLC

-- Turn the exhaust camshaft with the wrench in the direction of the -arrow 1- and slide the T40271/1 in the chain sprocket splines in the direction of the -arrow 2-.

-- Mark the camshaft sprocket to the T40271/1 and the T40271/2 -arrow-.

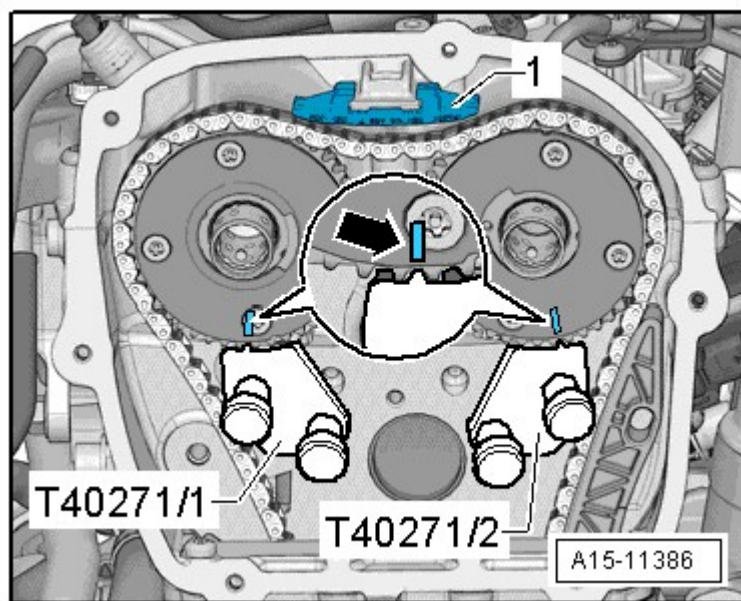


Fig. 215: Marking Camshaft Sprocket
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the upper guide track -1- by unlocking the latch with a screwdriver and pushing the guide track forward.

-- Remove camshaft timing chain from chain sprockets.

CAUTION: Risk of damaging valves and piston crowns.

- If the camshaft timing chain was removed from the cylinder head, then the crankshaft may not be turn further.

-- Turn the intake camshaft with a wrench in the direction of the -arrow 1-, slide the T40271/2 out of the chain sprocket splines if the direction of the -arrow 2- and bring the camshaft into the rest position.

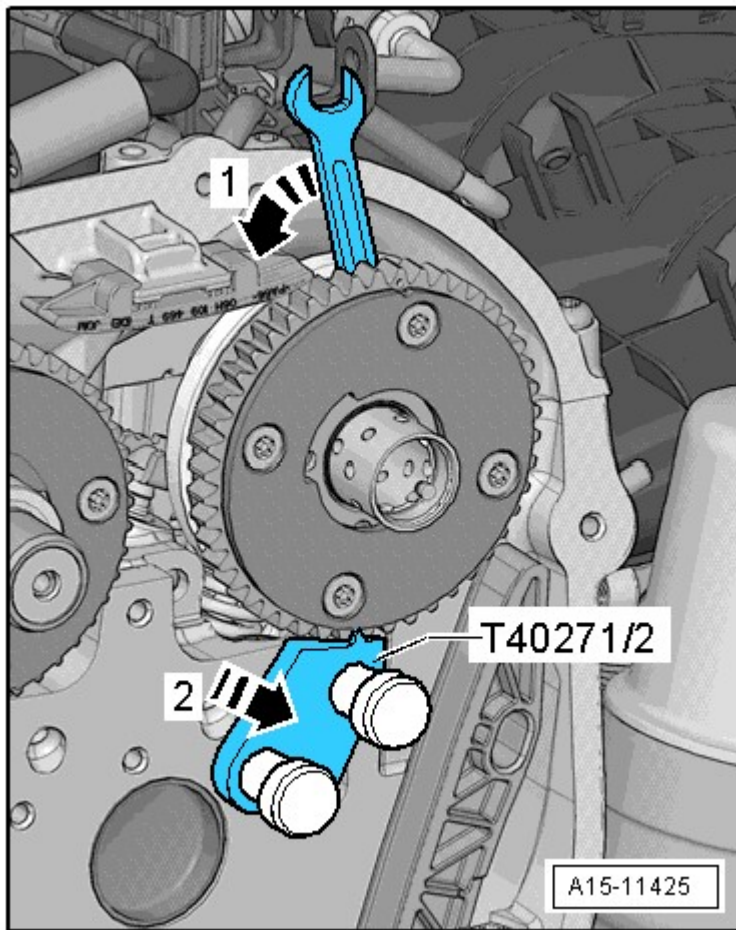


Fig. 216: Turning Intake Camshaft With Wrench In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Turn the exhaust camshaft with a wrench in the direction of the -arrow 1-, slide the T40271/1 out of the chain sprocket splines in the direction of the -arrow 2- and bring the camshaft into the rest position.

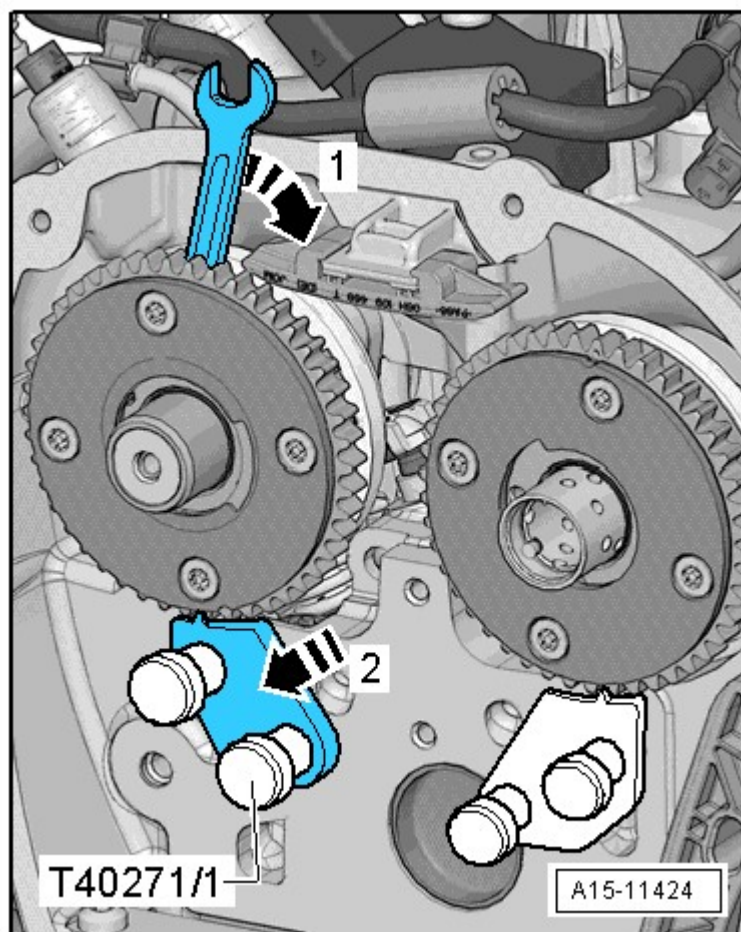


Fig. 217: Turning Exhaust Camshaft With Wrench In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

- Remove the high pressure pump. Refer to **Removal and Installation** .
- Remove vacuum pump. Refer to **Removal and Installation** .
- Remove the cylinder head cover bolts in -1 to 6- sequence.

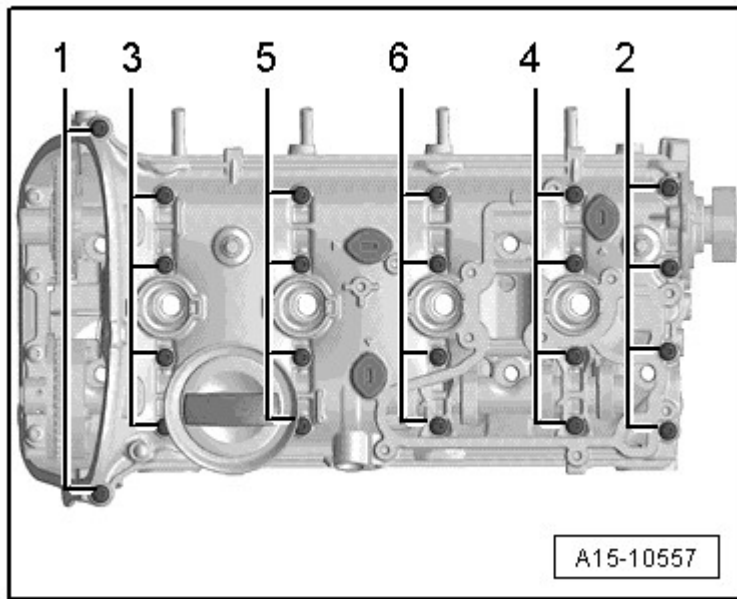


Fig. 218: Cylinder Head Cover Loosening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Remove the cylinder head cover.
- Remove the camshafts.

CAUTION: Risk of contaminating lubricating system and bearing.

- **Cover open parts of engine.**

Installing

- Tightening specifications, refer to VALVETRAIN OVERVIEW.

NOTE: Sealing surfaces must be completely free of oil and grease.

The pistons must not be positioned at TDC.

Make sure that all roller cam followers make contact correctly on valve stem ends.

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

WARNING: Danger of eye injury.

- **Wear protective goggles**

CAUTION: Risk of contaminating lubricating system and bearing.

- **Cover open parts of engine.**

-- Remove any seal out of the groove in the cylinder head cover as well as from any sealing surface using, for example, a rotating plastic brush.

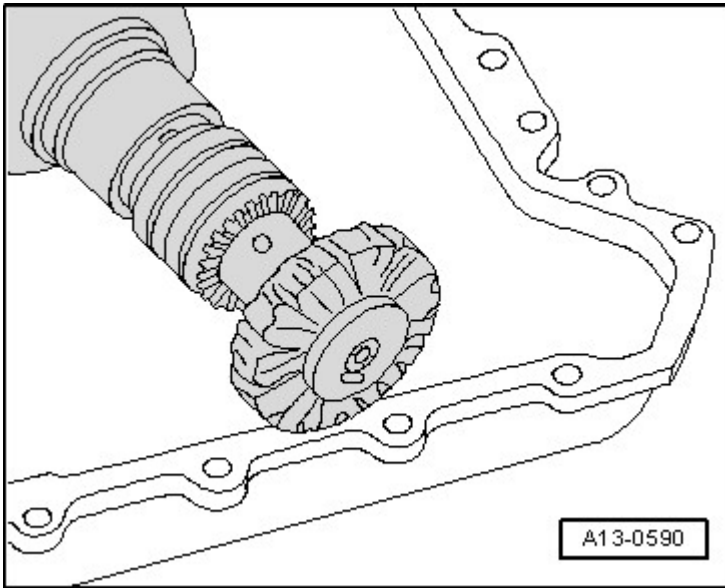


Fig. 219: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of AUDI OF AMERICA, LLC

- Clean sealing surfaces, must be free of oil and grease.
- Lubricate the running surfaces of both camshafts.

For new camshafts

- Transfer the self-made markings from the old camshafts to the new camshafts.

All

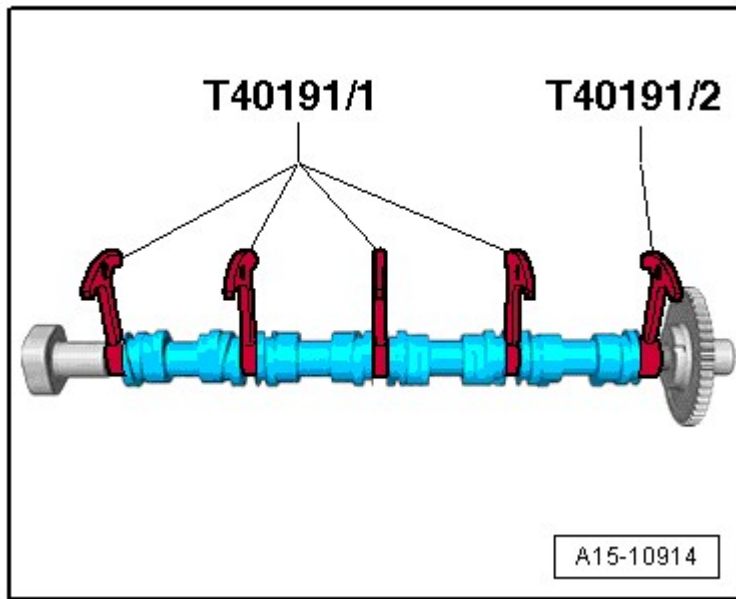


Fig. 220: Transferring Self-Made Markings From Old Camshafts To New Camshafts
Courtesy of AUDI OF AMERICA, LLC

WARNING: Danger of eye injury.

- **Wear protective goggles**

-- Install the camshaft with the T40191 as illustrated, move the spacers into the correct position if necessary.

NOTE: If necessary, use a second set of T40191 or T40191/1.

-- Install the camshafts into the cylinder head; the factory markings -arrows- must be located as shown in the illustration.

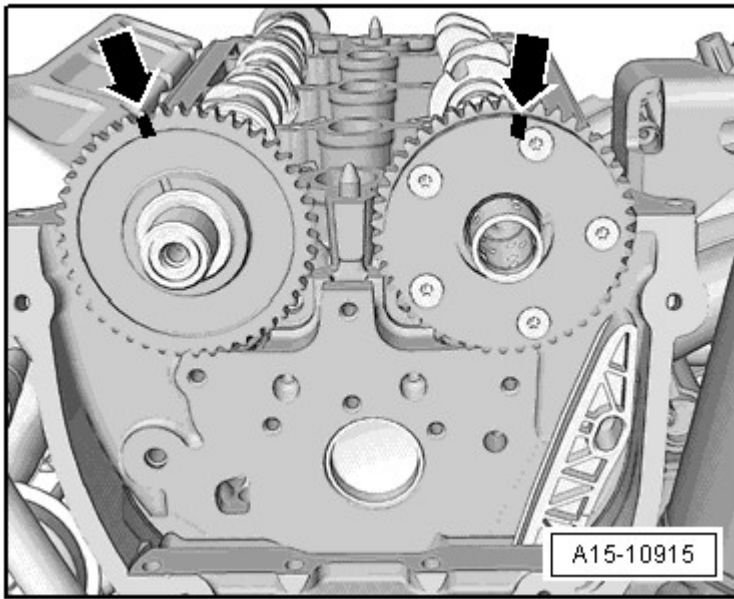


Fig. 221: Identifying Camshafts Installed And Aligned In Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore the self-made markings.

-- Check the alignment -arrows- of the camshafts.

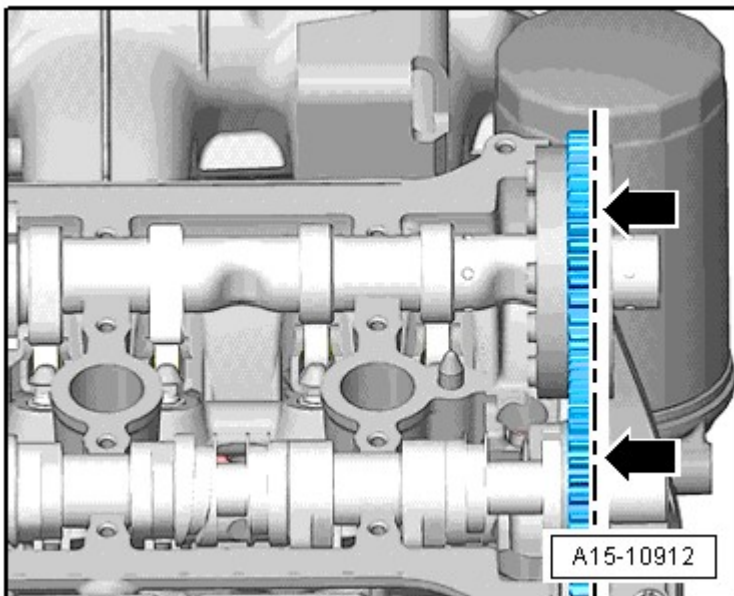


Fig. 222: Checking Alignment
Courtesy of AUDI OF AMERICA, LLC

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

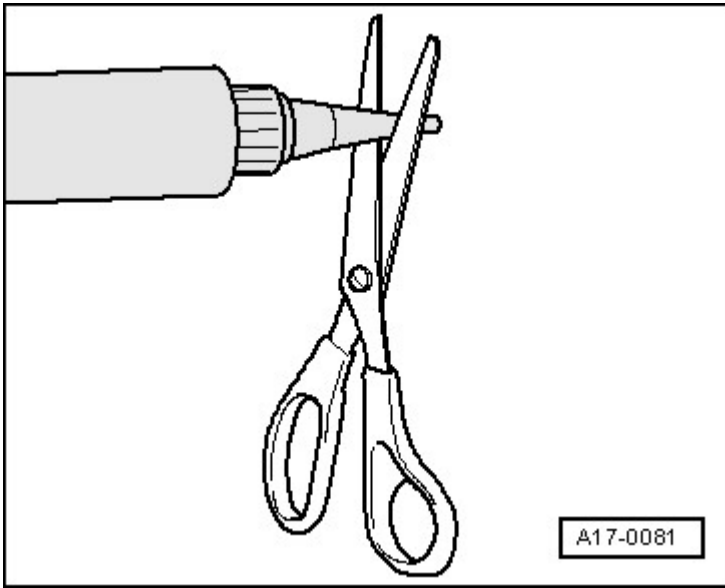


Fig. 223: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 mm)
Courtesy of AUDI OF AMERICA, LLC

-- Apply the silicone sealant on the clean sealing surface of the cylinder head cover as illustrated -arrows-.

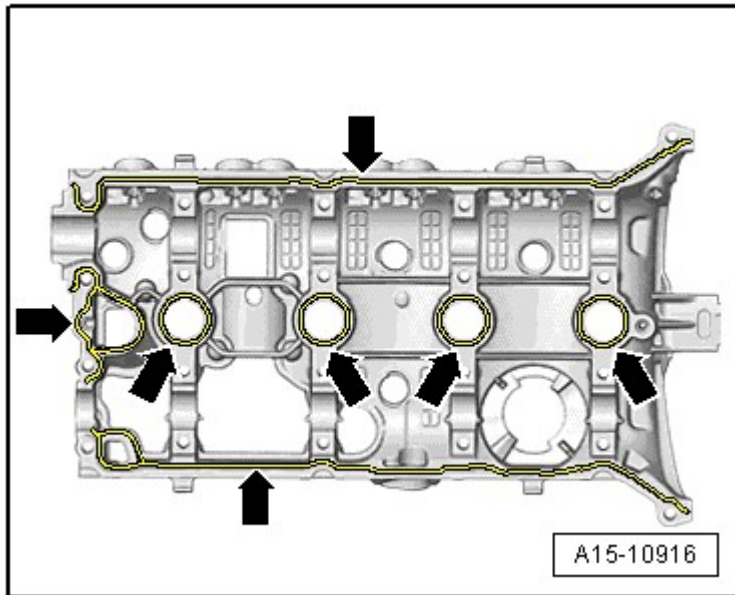


Fig. 224: Applying Silicone Sealant On Clean Sealing Surface
Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant bead: 2 to mm.

NOTE: The cylinder head cover must be installed within 5 minutes after application of silicone sealant.

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

Note the expiration date of the sealing compound.

Sealant

- Mount the cylinder head cover on the cylinder head.
- Replace the cylinder head cover bolts.
- Tighten the bolts in several steps, tightening sequence. Refer to **Fig. 23**.

NOTE: Make sure the cylinder head cover is not tilted.

- Drive the cap -1- in without sealing using the T10174.

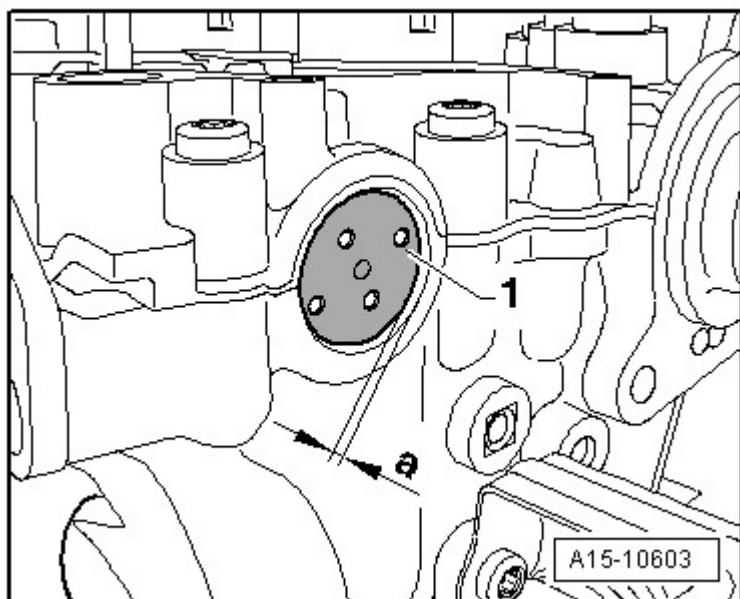


Fig. 225: Driving Cap In Using Thrust Piece T10174
Courtesy of AUDI OF AMERICA, LLC

-a-: 1 to 2 mm

- Rotate the vibration damper using the T10355 into the "TDC" position -arrow-.

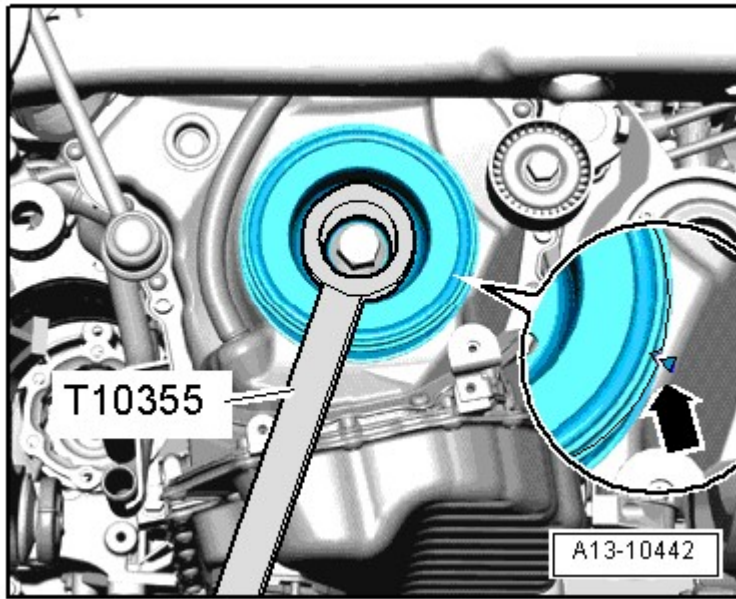


Fig. 226: Identifying Vibration Damper Rotated Into "OT" Position Using Counter Hold Tool T10355
Courtesy of AUDI OF AMERICA, LLC

- The notch on the vibration damper must line up with the arrow marking on the timing chain lower cover.
- Turn the intake camshaft in the direction of the -arrow 1- until the markings -3- align with the T40271/2.

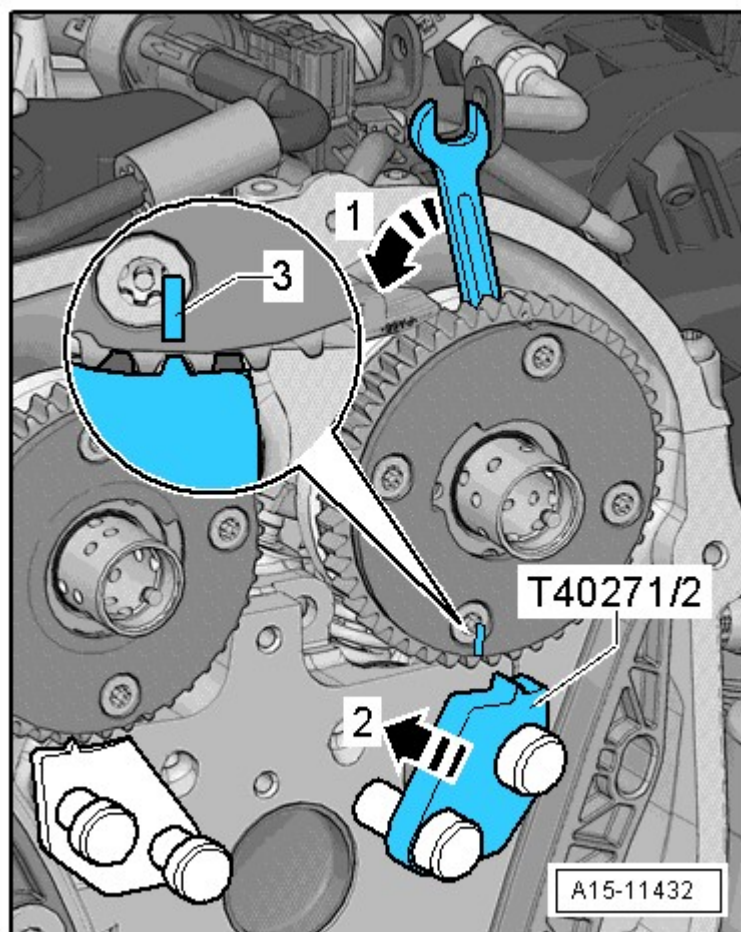


Fig. 227: Turning Intake Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

- Slide the T40271/2 into the chain sprocket splines in the direction of the -arrow 2-.
- Turn the exhaust camshaft in the direction of the -arrow 1- until the markings -3- align with the T40271/1.

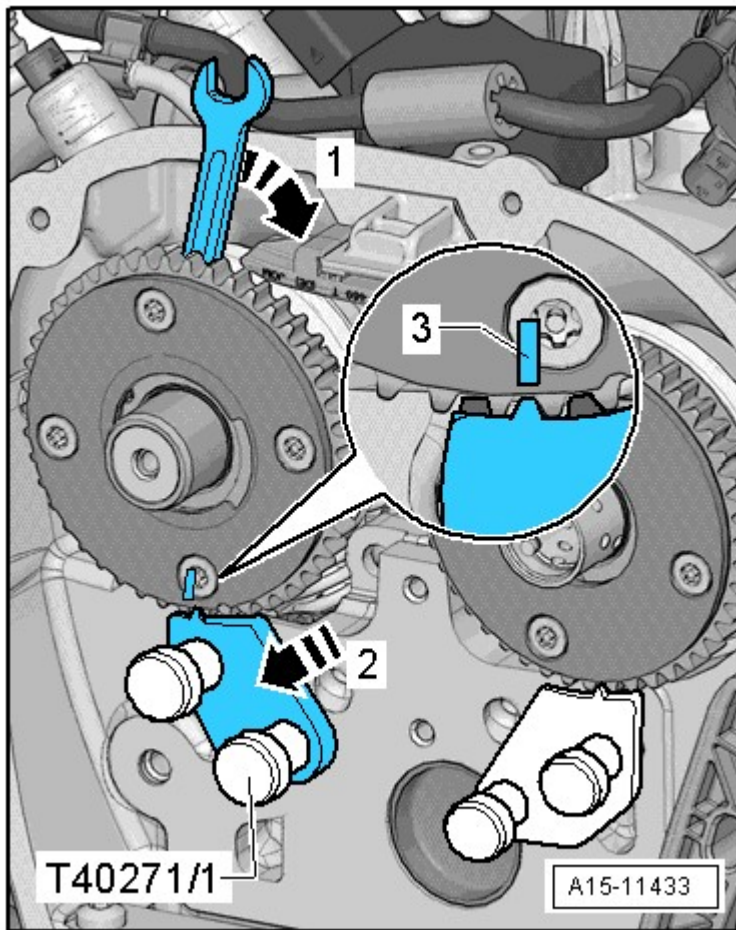


Fig. 228: Turning Exhaust Camshaft In Direction Of Arrow
 Courtesy of AUDI OF AMERICA, LLC

-- Slide the T40271/1 into the chain sprocket splines in the direction of the -arrow 2-.

-- Position the markings on the chain links -arrows- at the chain sprockets -1- to install the camshaft timing chain.

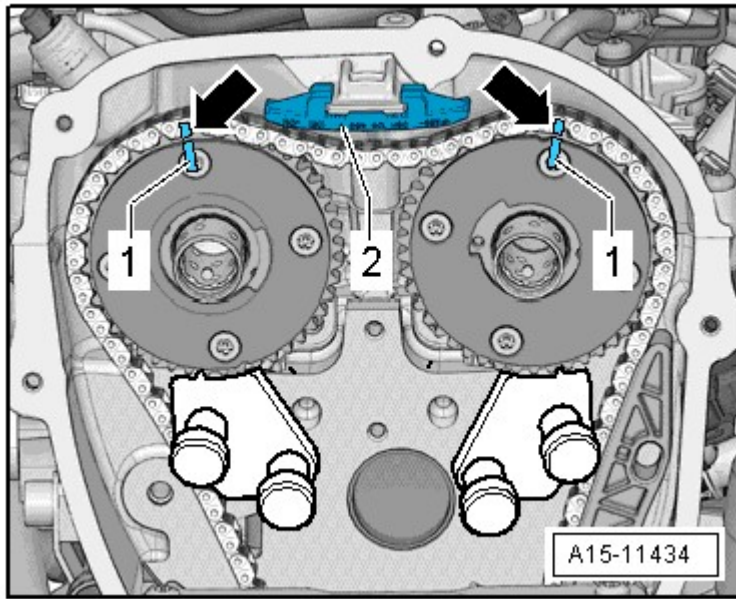


Fig. 229: Positioning Mark On Chain Links At Chain Sprockets
Courtesy of AUDI OF AMERICA, LLC

-- Install the upper glide track -2-.

-- Turn the exhaust camshaft in the direction of the -arrow 1-, slide out the T40271/1 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

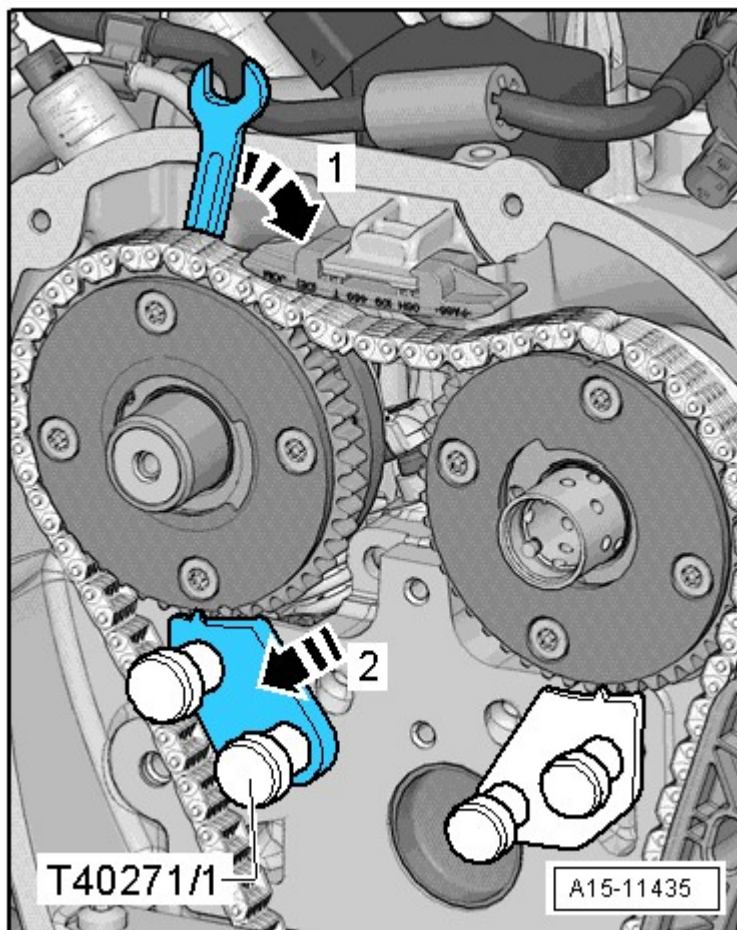


Fig. 230: Turning Exhaust Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

- Remove the T40271/1.
- Move the tensioning rail -2- up and install the bolt -1-.

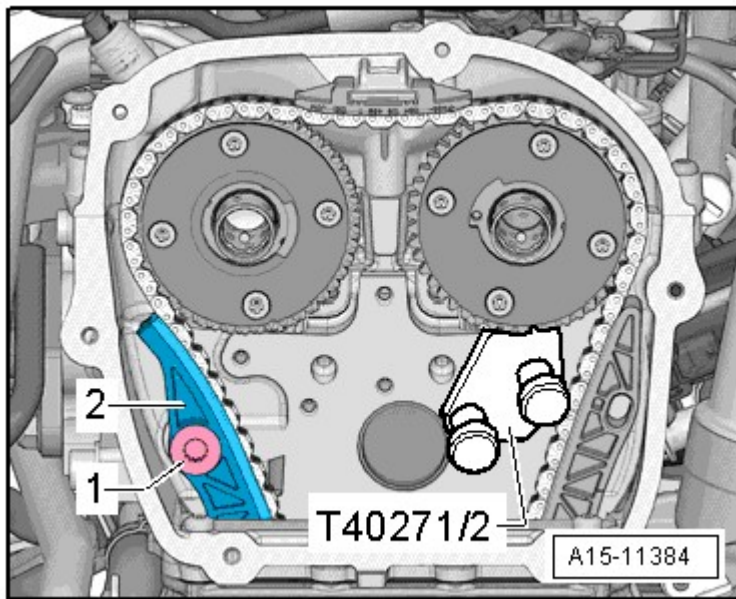


Fig. 231: Moving Tensioning Rail Up To Install Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Turn the intake camshaft in the direction of the -arrow 1-, slide out the T40271/2 from the chain sprocket splines in the direction of the -arrow 2- and release the camshaft.

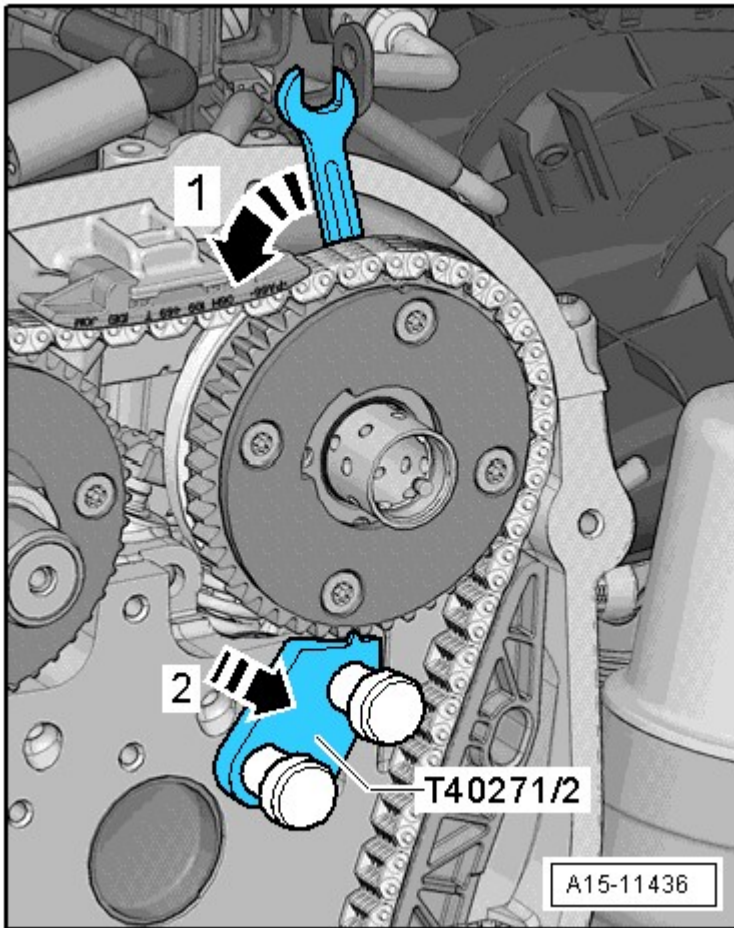


Fig. 232: Turning Intake Camshaft In Direction Of Arrow
Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40271/2.

-- Check the valve timing. The camshaft timing chain and cylinder head -arrows- must align with the markings on the chain sprocket -1-.

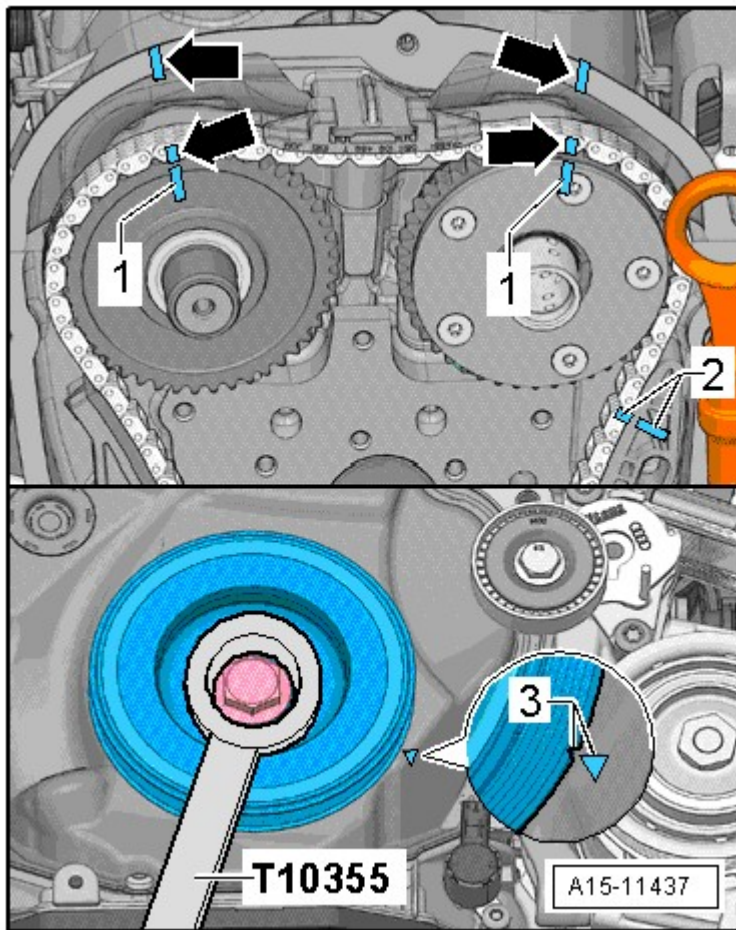


Fig. 233: Checking Valve Timing

Courtesy of AUDI OF AMERICA, LLC

- The markings for the camshaft timing chain and the camshaft timing chain glide track -2- must be opposite one another.
- The notch on the vibration damper must be opposite the marking on the lower section of the timing chain guard -3-.
- Mount the bearing bracket and the bolts -arrows- hand-tight.

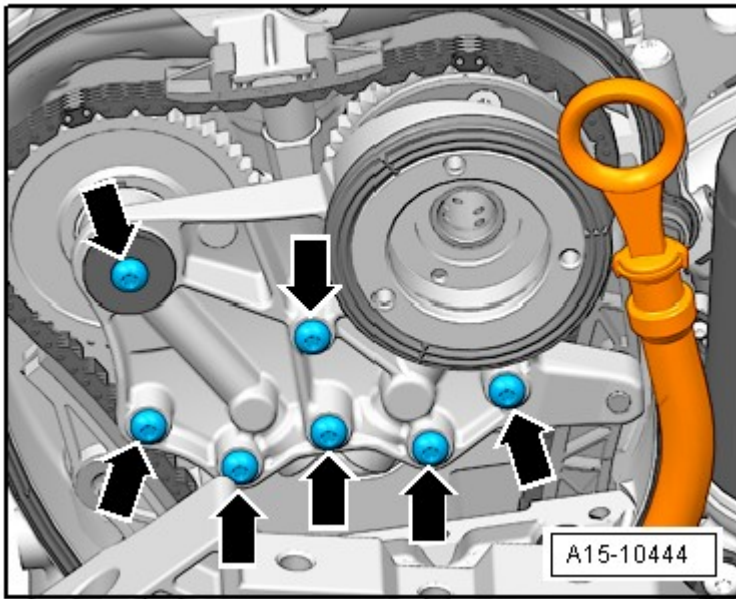


Fig. 234: Identifying Bearing Bracket Bolts
 Courtesy of AUDI OF AMERICA, LLC

- Remove the T40011 or the T40267, depending on the version.
- Tighten the bolts -arrows-. Refer to CAMSHAFT TIMING CHAIN OVERVIEW.
- Install the bolt -arrow-.

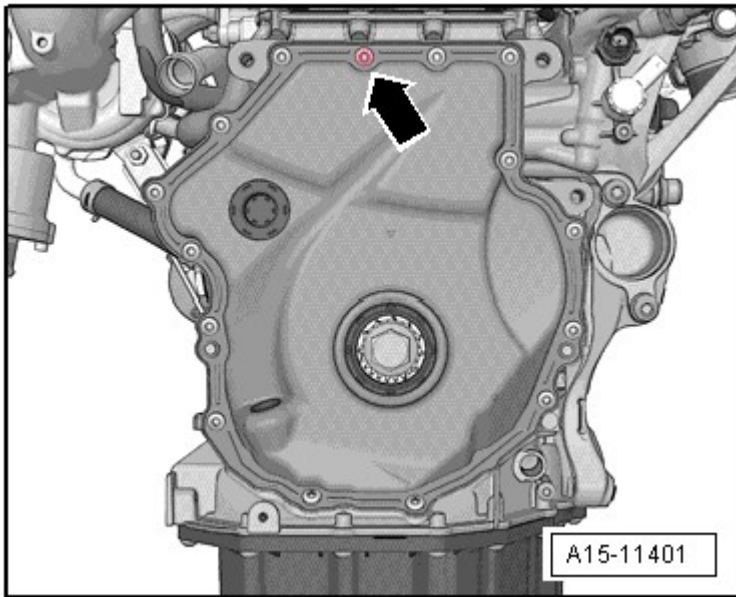


Fig. 235: Identifying Bolt
 Courtesy of AUDI OF AMERICA, LLC

- Install the control valve -item 6- in Fig. 7.

-- Install the T40196 as illustrated.

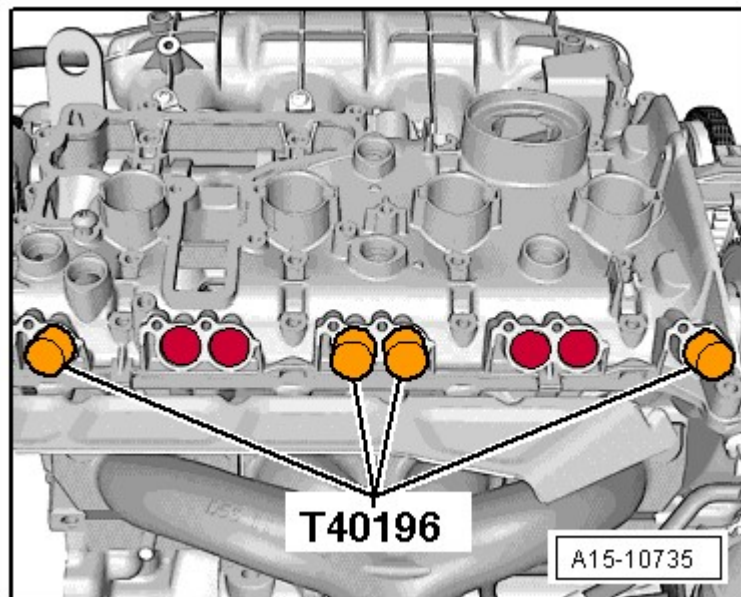


Fig. 236: Identifying T40196, Installation Locations

Courtesy of AUDI OF AMERICA, LLC

-- Turn the crankshaft 4 complete turns in the direction of engine rotation.

-- Remove the T40196.

-- Install the timing chain guard upper section. Refer to **UPPER TIMING CHAIN GUARD**.

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

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

-- Install the service position. Refer to **Description and Operation** .

-- Install the air filter housing. Refer to **Removal and Installation** .

Assemble in reverse order of disassembly.

VALVE STEM SEALS WITH 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
- Adapter T40012

- Torque Wrench 5-50 Nm V.A.G 1331
- Valve Cotters Asm/Dis-Asm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B

Valve Stem Seals, Removing

-- 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 using a 3122 B.

-- Tighten the VAS 5161/19B on the cylinder head as shown using the knurled bolts VAS 5161/12.

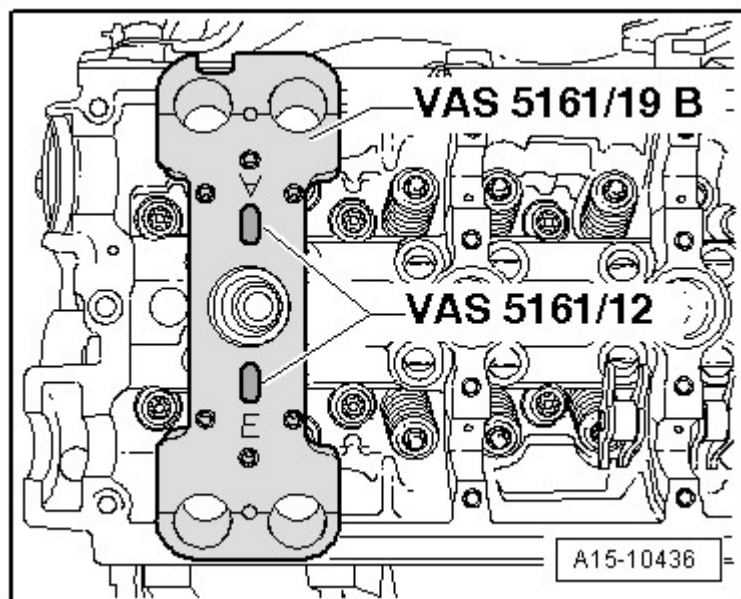


Fig. 237: Identifying FSI Engine VAS 5161/19B Guide Plate Tightened On Cylinder Head Using Knurled Bolts VAS 5161/12

Courtesy of AUDI OF AMERICA, LLC

-- Move piston for respective cylinder to "Bottom Dead Center (BDC) position".

-- Install the T40012 in the spark plug threads.

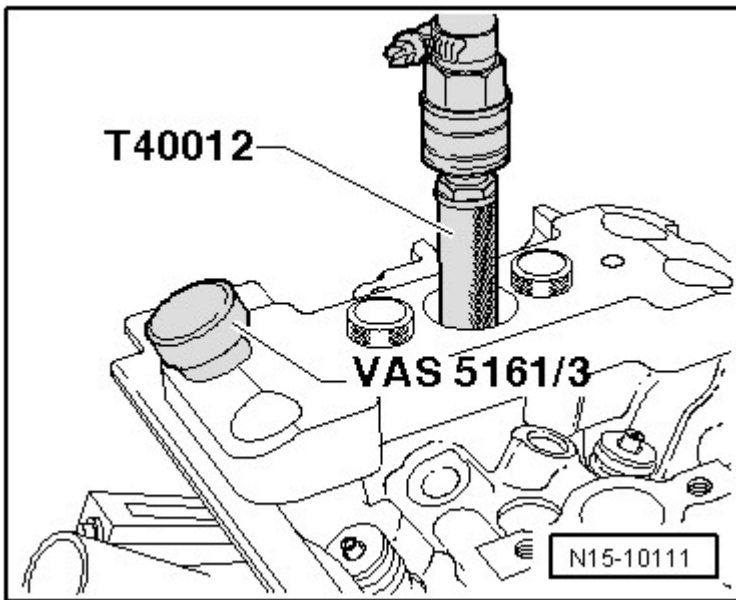


Fig. 238: Identifying Drift VAS 5161/3 And Plastic Mallet To Loosen Stuck Valve Keepers
 Courtesy of AUDI OF AMERICA, LLC

- Connect compressed air with at least 6 bar pressure.
- Loosen stuck valve retainers using a drift VAS 5161/3 and a plastic hammer.

Intake Side

- Install the engaging device VAS 5161/6 with the installation fork VAS 5161/5 in the center threads of the VAS 5161/19B.

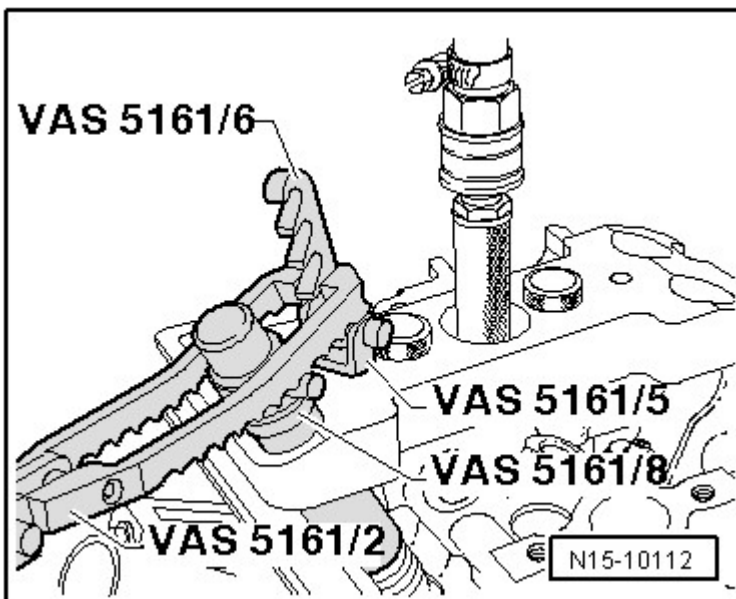


Fig. 239: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into Guide Plate VAS 5161/19

Courtesy of AUDI OF AMERICA, LLC

- Insert the installation cartridge VAS 5161/8 in the VAS 5161/19B.
- Engage the pressure fork VAS 5161/2 on the engaging device VAS 5161/6.

Exhaust Side

- Install the engaging device VAS 5161/6 with the installation fork VAS 5161/5 in the outer threads of the VAS 5161/19B.

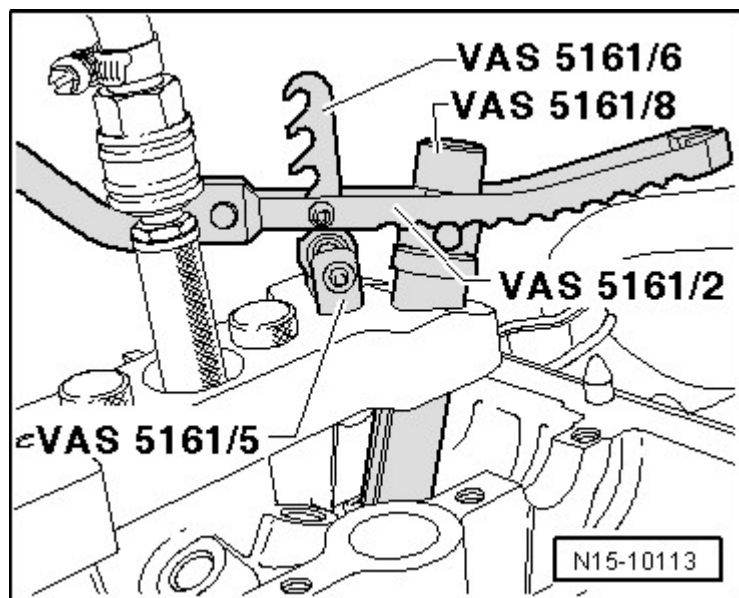


Fig. 240: Identifying Pressure Forks VAS 5161/2 Engaged
Courtesy of AUDI OF AMERICA, LLC

- Press the installation cartridge VAS 5161/8 down while rotating its knurled bolt to the right until the points engage in the valve retainers.
- Move the knurled wheel back and forth slightly. This presses the valve retainers apart and captures them in the installation cartridge.
- Release the pressure fork VAS 5161/2.
- Remove the installation cartridge VAS 5161/8.
- Remove the valve stem seals using 3364.

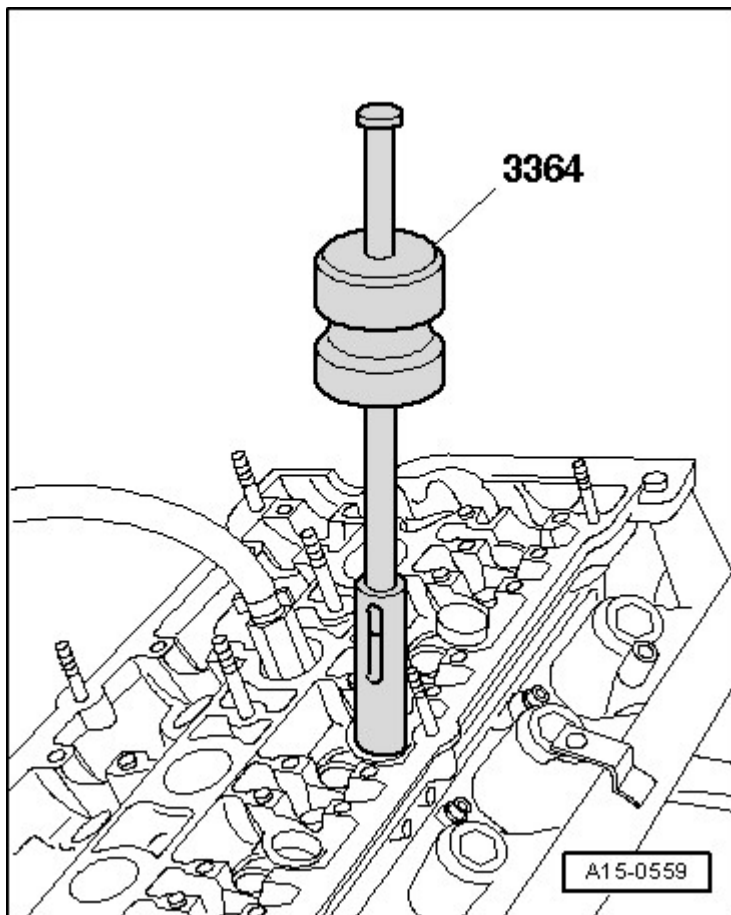


Fig. 241: Identifying Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

-- If the 3364 cannot be used because there is not enough space, drive the roll pin -arrow- out using a drift and remove the impact attachment.

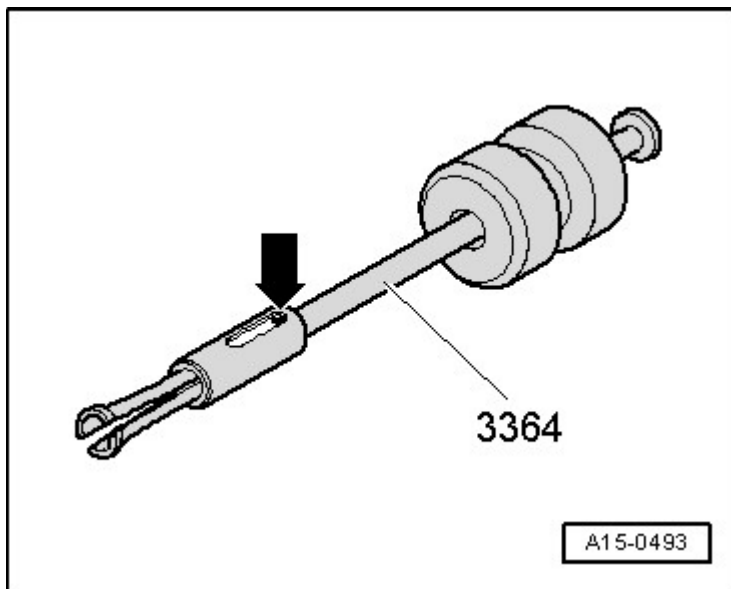
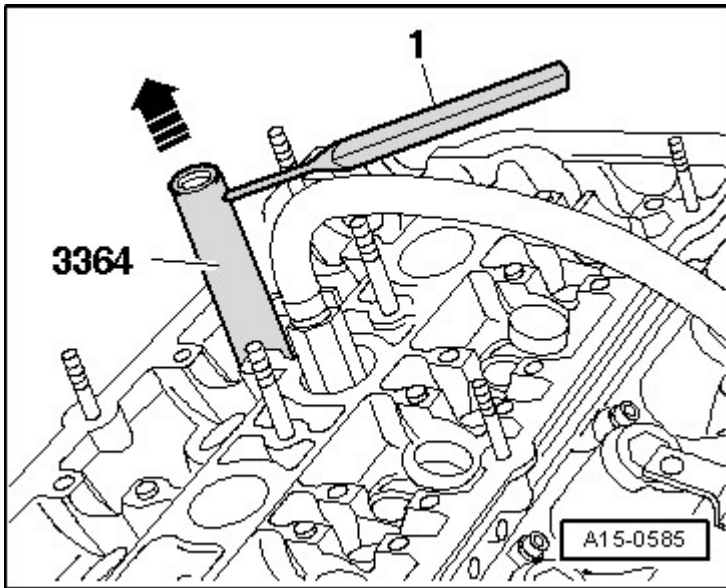


Fig. 242: Driving Out Spring Dowel Sleeve

Courtesy of AUDI OF AMERICA, LLC

-- Position the lower part of the 3364 on the valve stem seal.

**Fig. 243: Identifying Placement Of Lower Part Of Valve Seal Removal Tool 3364 On To Valve Stem Oil Seal**

Courtesy of AUDI OF AMERICA, LLC

-- Place the drift -1- in the hole in the lower section of the removal tool.

-- Position the lever on the removal tool and remove the valve stem seal -arrow-.

Valve Stem Seals, Installing

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

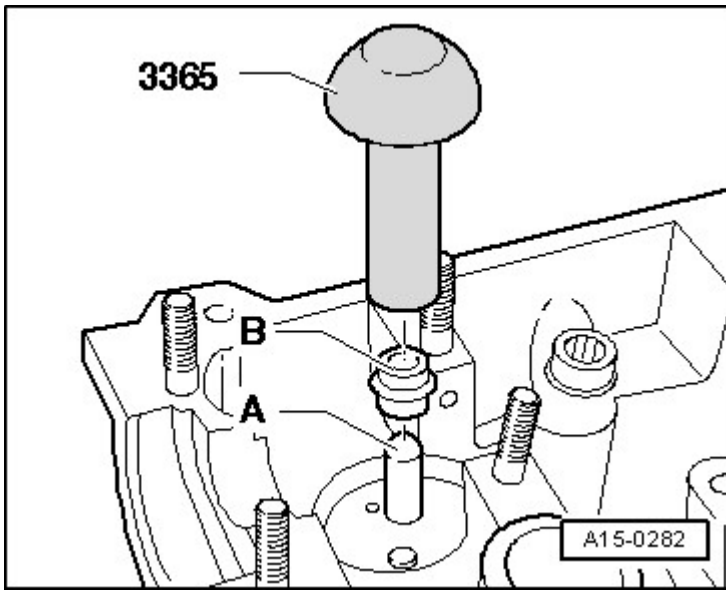


Fig. 244: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
 Courtesy of AUDI OF AMERICA, LLC

- Oil the sealing lip of valve stem seal -B-, insert into 3365 and carefully slide onto valve guide.
- Remove the plastic sleeve -A-.
- Insert the valve spring and valve spring plate.
- Connect the VAS 5161 as illustrated.

Intake Side

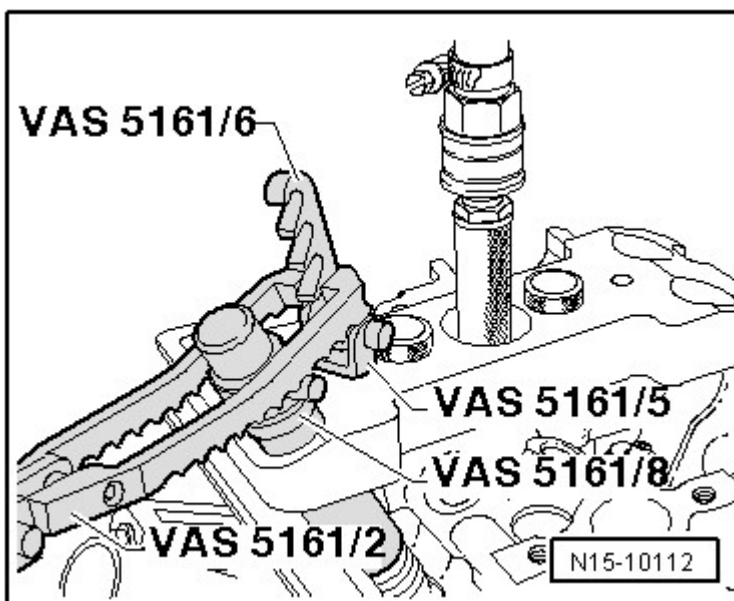


Fig. 245: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into

Guide Plate VAS 5161/19

Courtesy of AUDI OF AMERICA, LLC

Exhaust Side

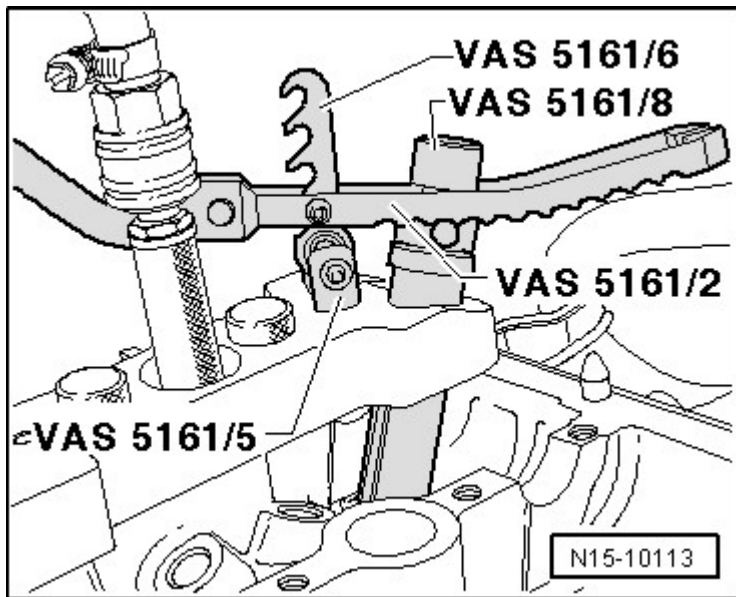


Fig. 246: Identifying Pressure Forks VAS 5161/2 Engaged

Courtesy of AUDI OF AMERICA, LLC

NOTE: If the valve retainers were removed from the installation cartridge, they must be inserted into valve insertion device VAS 5161/18 next.

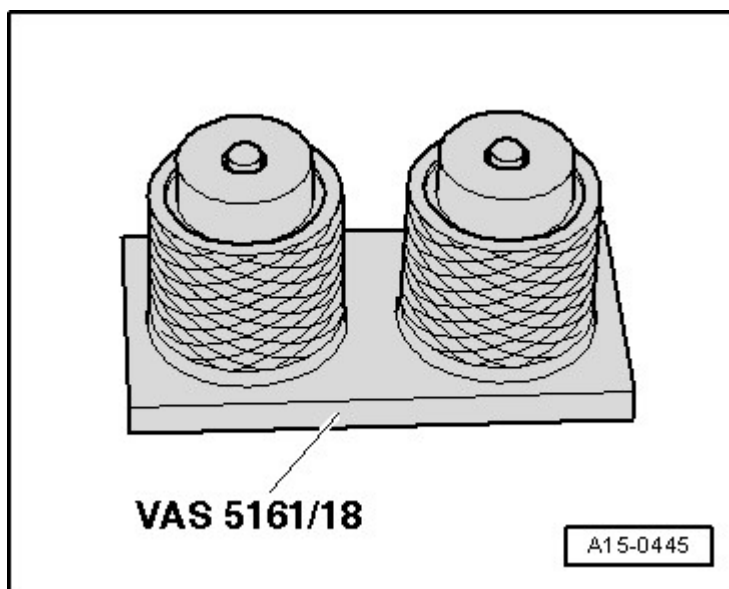


Fig. 247: Identifying Installation Cartridge VAS 5161/8

Courtesy of AUDI OF AMERICA, LLC

Press the installation cartridge VAS 5161/8 onto the insertion device from above and capture the valve retainers.

-- Press the VAS 5161/8 down with the pressure fork VAS 5161/2 and rotate the cartridge knurled bolt back and forth while pulling up.

-- Release the VAS 5161/2 with the knurled bolt pulled.

-- Remove the VAS 5161.

Further assembly is performed in the reverse order of removal, thereby observing the following:

-- Install the camshafts, refer to CAMSHAFTS.

VALVE STEM SEALS WITH CYLINDER HEAD REMOVED

Special tools and workshop equipment required

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotters Asm/Dis-Asm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tensioning Device VAS 6419

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.

-- 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 chamber onto the valve stem seal that will be removed.

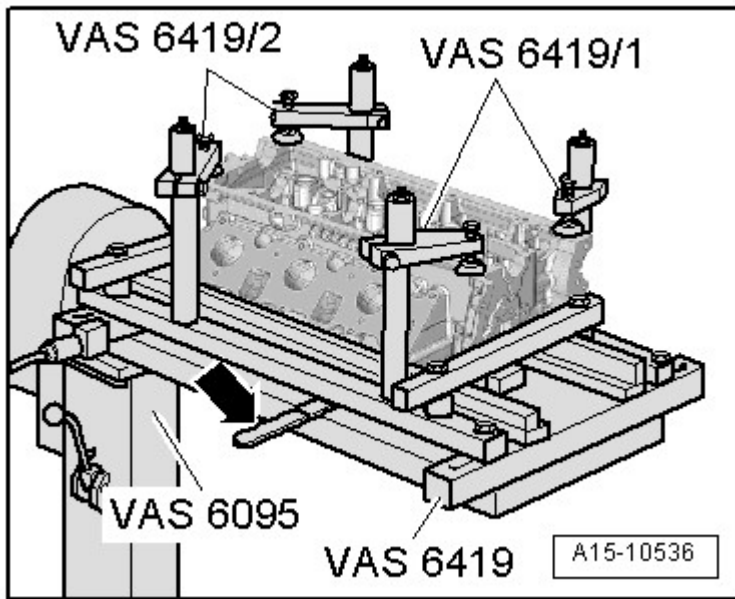


Fig. 248: Sliding Air Cushion With Lever Under Combustion Chamber
 Courtesy of AUDI OF AMERICA, LLC

- Let enough compressed air flow into the air cushion until it contacts the valve plate.
- Tighten the VAS 5161/19B on the cylinder head as shown using the knurled bolts VAS 5161/12.

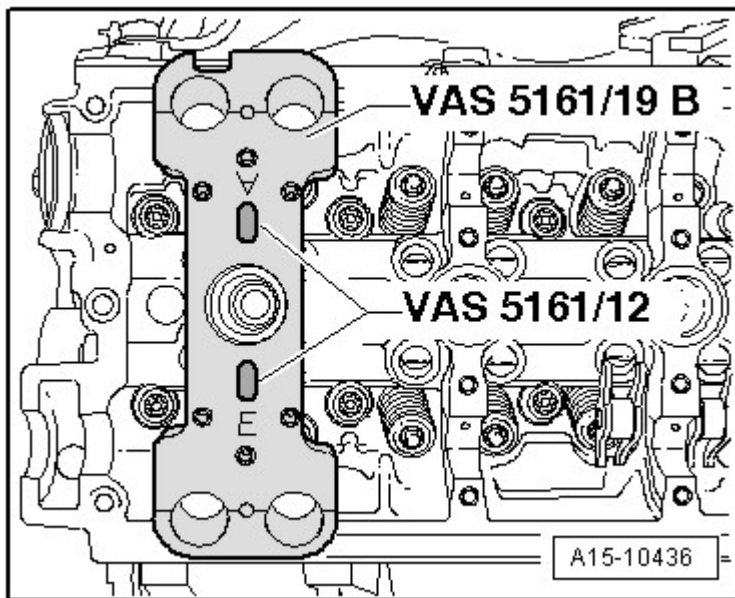


Fig. 249: Identifying FSI Engine VAS 5161/19B Guide Plate Tightened On Cylinder Head Using Knurled Bolts VAS 5161/12
 Courtesy of AUDI OF AMERICA, LLC

- Insert the drift VAS 5161/3 in the guide plate and loosen the stuck valve retainers with a plastic mallet.

Intake Side

-- Install the engaging device VAS 5161/6 with the installation fork VAS 5161/5 in the center threads of the VAS 5161/19B.

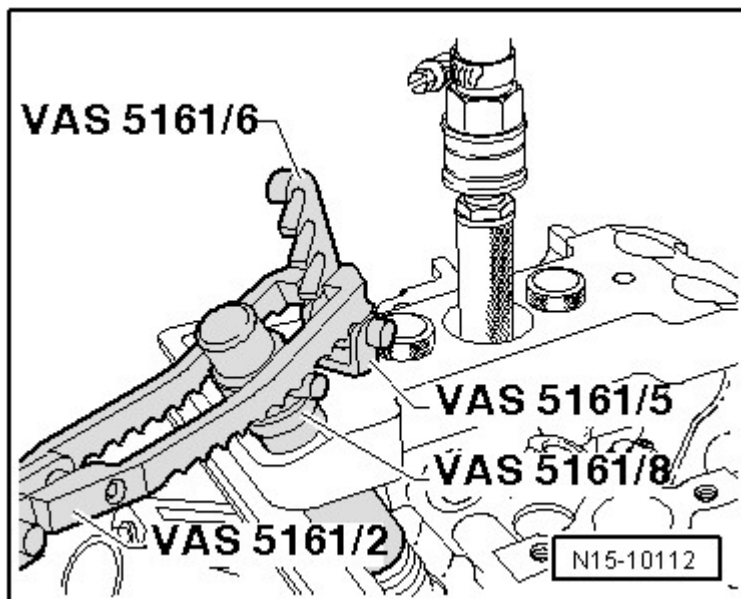


Fig. 250: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into Guide Plate VAS 5161/19

Courtesy of AUDI OF AMERICA, LLC

-- Insert the installation cartridge VAS 5161/8 in the guide plate for FSI engine VAS 5161/19B.

-- Engage the pressure fork VAS 5161/2 on the engaging device VAS 5161/6.

Exhaust Side

-- Install the engaging device VAS 5161/6 with the installation fork VAS 5161/5 in the outer threads of the VAS 5161/19B.

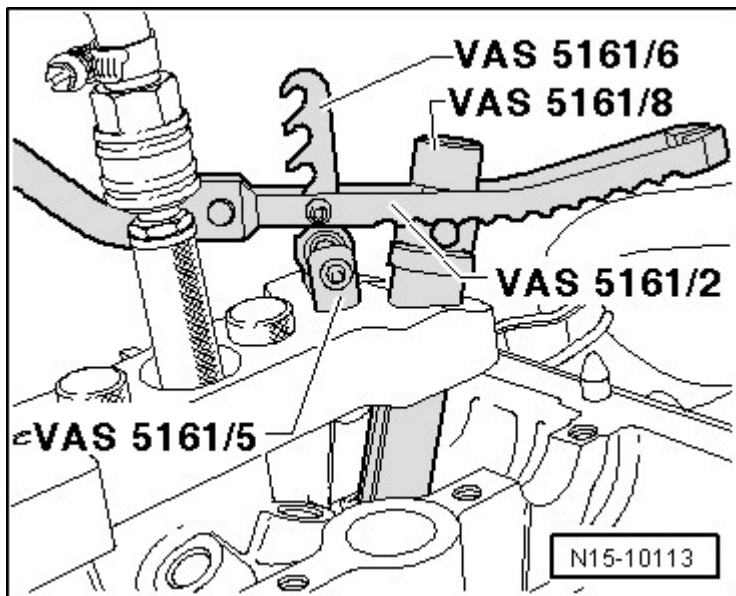


Fig. 251: Identifying Pressure Forks VAS 5161/2 Engaged
 Courtesy of AUDI OF AMERICA, LLC

- Press the installation cartridge VAS 5161/8 down while rotating its knurled bolt to the right until the points engage in the valve retainers.
- Move the knurled wheel back and forth slightly. This presses the valve retainers apart and captures them in the installation cartridge.
- Release the pressure fork VAS 5161/2.
- Remove the installation cartridge VAS 5161/8.
- Remove valve stem seals using the 3364.

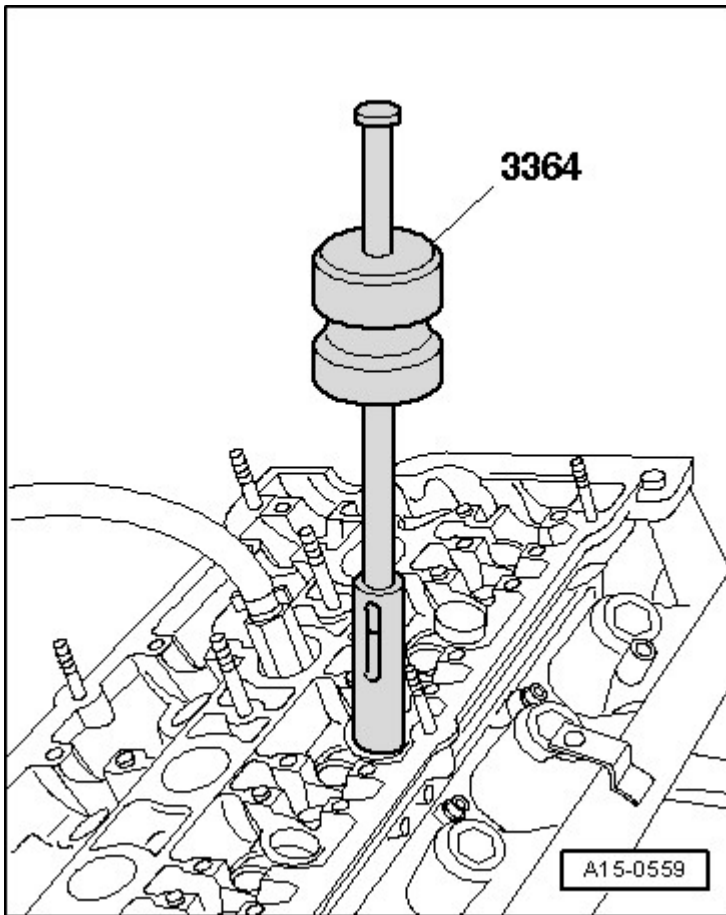


Fig. 252: Identifying Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

Valve Stem Seals, Installing

CAUTION: Risk of damage when installing valve stem seals.

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

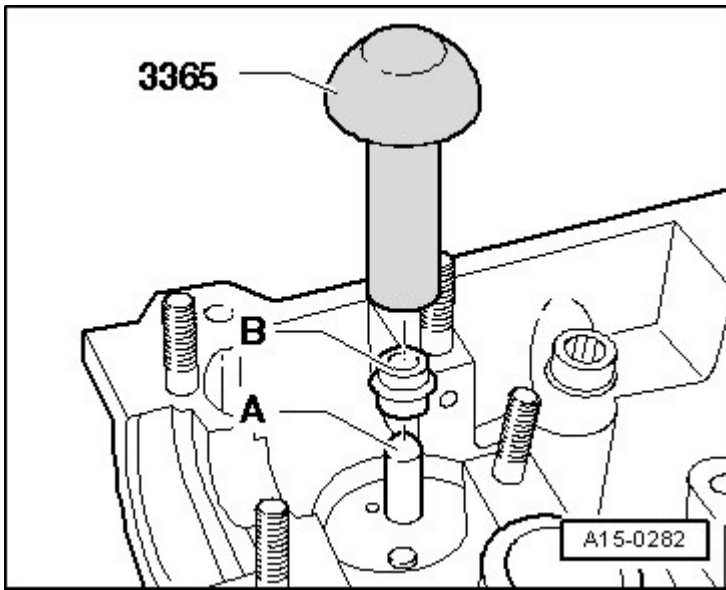


Fig. 253: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of AUDI OF AMERICA, LLC

- 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.
- Insert the valve spring and valve spring plate.
- Install the VAS 5161 as illustrated.

Intake Side

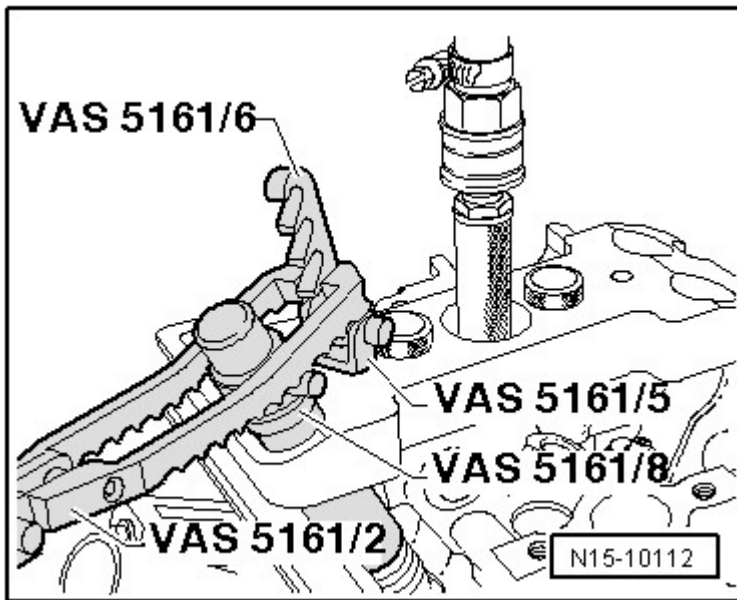


Fig. 254: Identifying Engaging Device VAS 5161/6 With Installation Forks VAS 5161/5 Installed Into Guide Plate VAS 5161/19

Courtesy of AUDI OF AMERICA, LLC

Exhaust Side

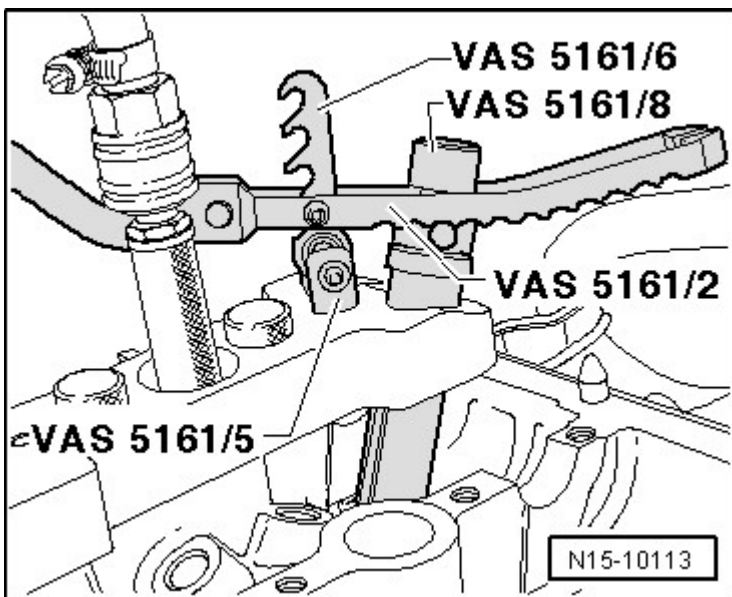


Fig. 255: Identifying Pressure Forks VAS 5161/2 Engaged

Courtesy of AUDI OF AMERICA, LLC

NOTE: If the valve retainers were removed from the installation cartridge, they must be inserted into valve insertion device VAS 5161/18 next.

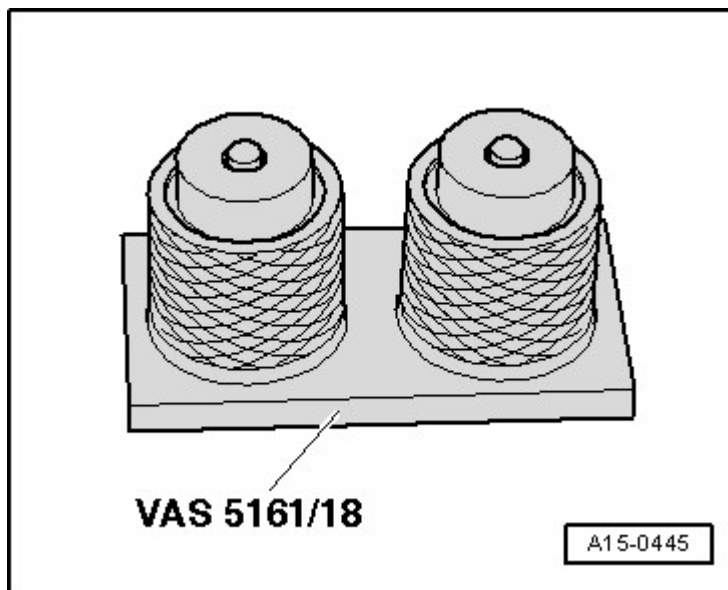


Fig. 256: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

Press the installation cartridge VAS 5161/8 onto the insertion device from above and capture the valve retainers.

- Press the VAS 5161/8 down with the pressure fork VAS 5161/2 and rotate the cartridge knurled bolt back and forth while pulling up.
- Release the VAS 5161/2 with the knurled bolt pulled.
- Remove the VAS 5161.

Assemble in reverse order of disassembly. When doing this note the following:

- Install the camshafts, refer to CAMSHAFTS.

SPECIAL TOOLS

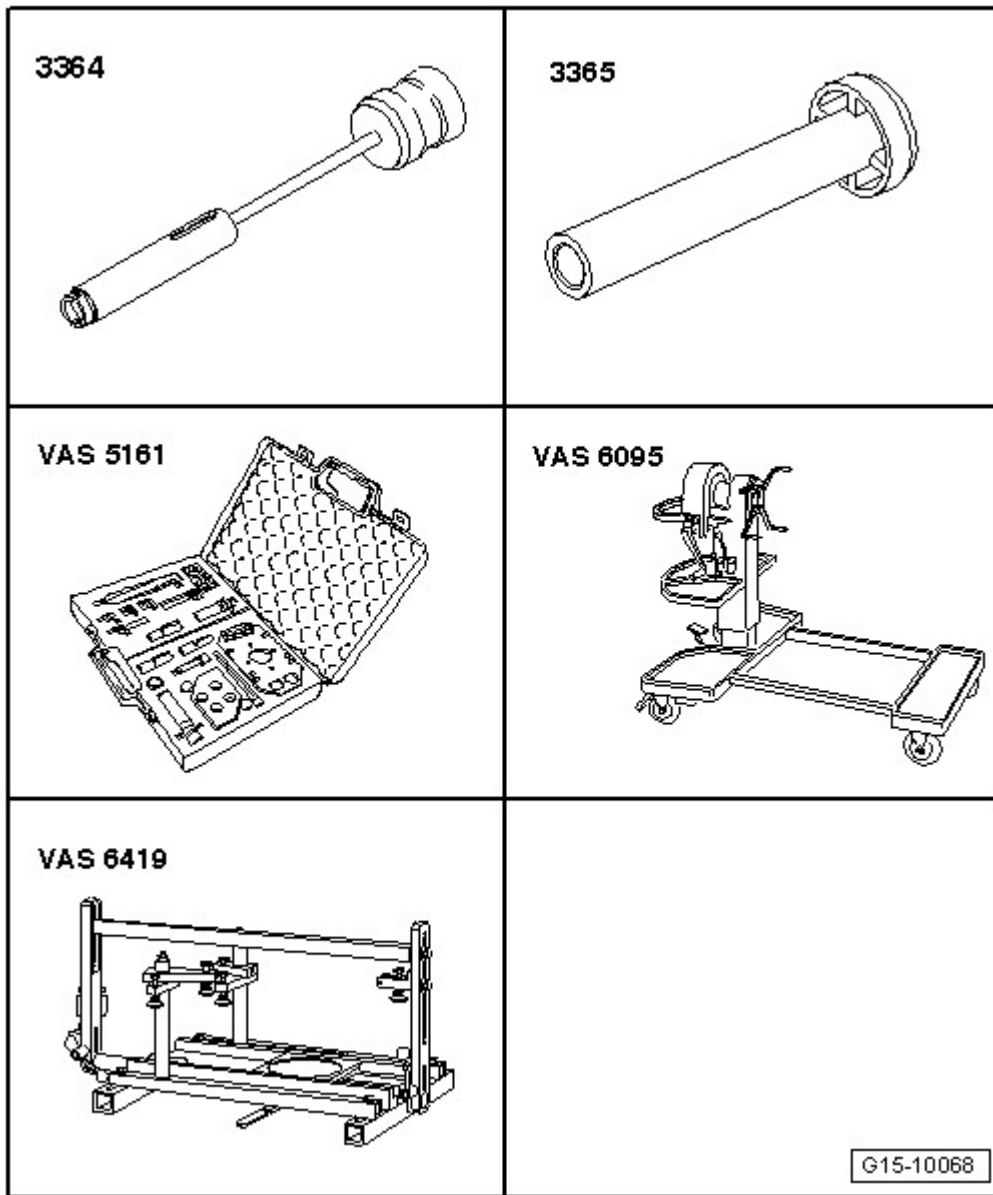


Fig. 257: Identifying Special Tools And Workshop Equipment
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotters Asm/Dis-Asm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tensioning Device VAS 6419

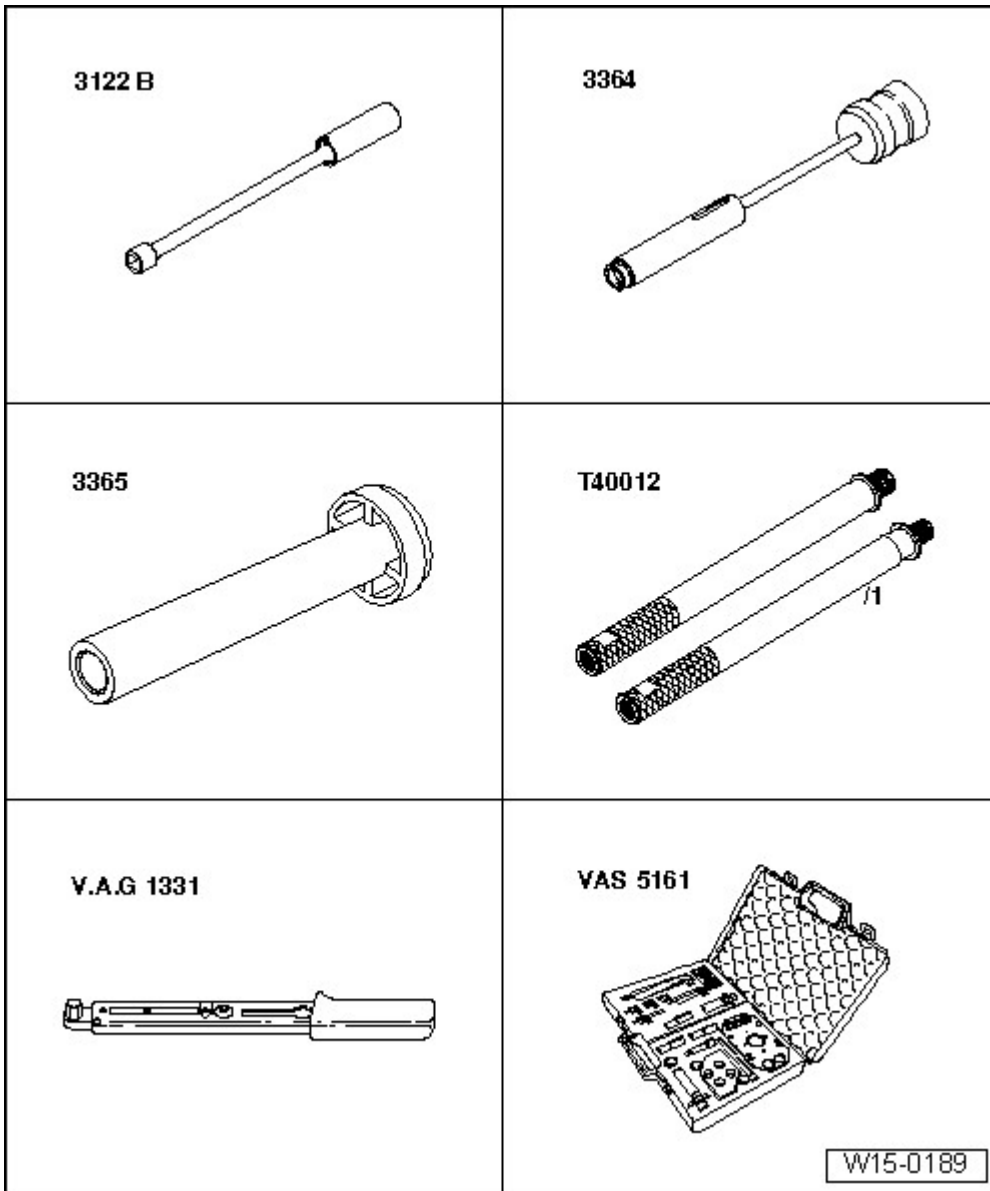


Fig. 258: Identifying Special Tools - Valve Stem Seals, Replacing
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spark Plug Removal Tool 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Adapter T40012
- Torque Wrench 5-50 Nm V.A.G 1331
- Valve Cotters Asm/Dis-Asm Device VAS 5161
- Guide Plate for FSI Engine VAS 5161/19B

Special tools and workshop equipment required

- Polydrive Bit and Drive Socket T10070

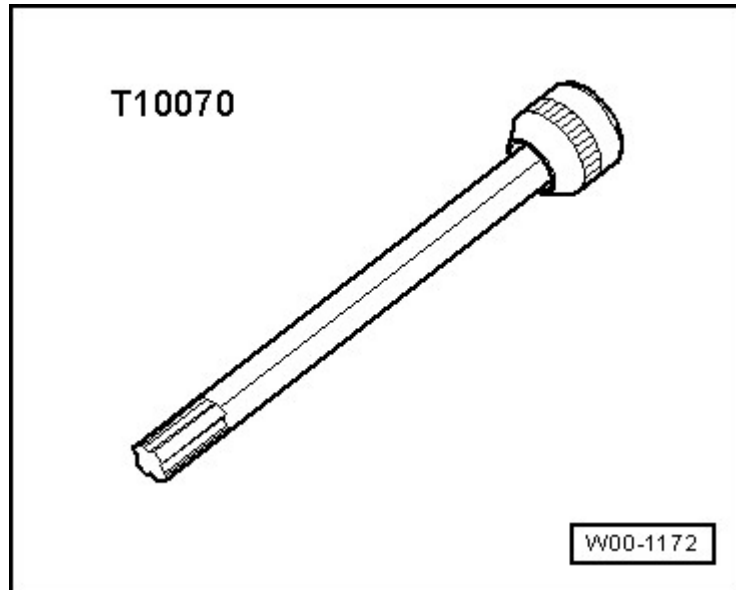


Fig. 259: Socket T10070
Courtesy of AUDI OF AMERICA, LLC

- Ignition Coil Puller T40039

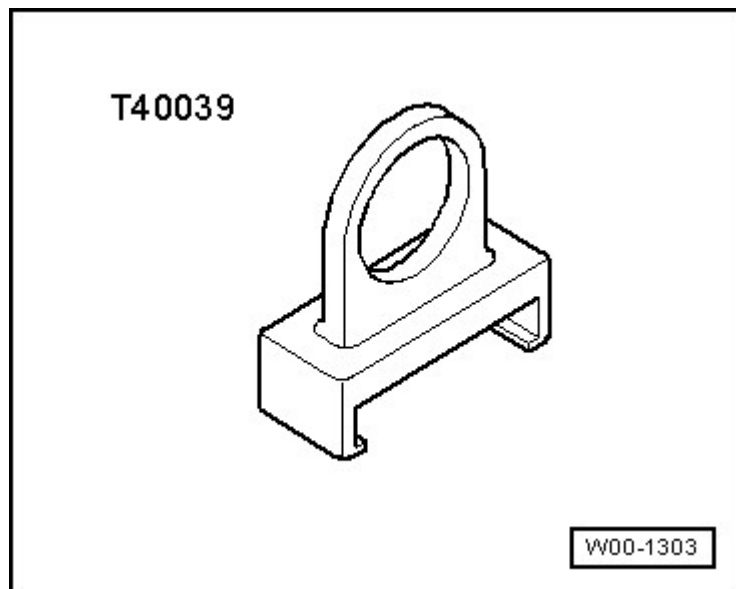


Fig. 260: Identifying Extractor T40039
Courtesy of AUDI OF AMERICA, LLC

- Compression Tester V.A.G 1763

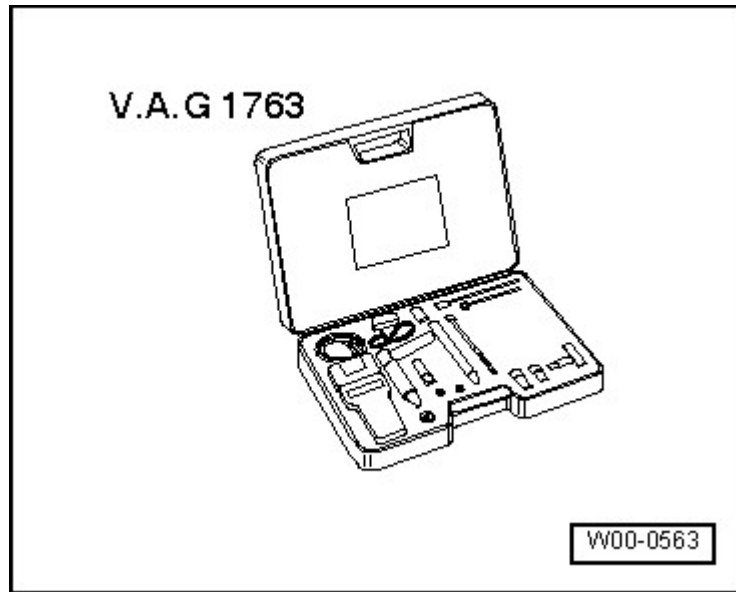


Fig. 261: Compression Tester V.A.G 1763
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge Holder VW 387

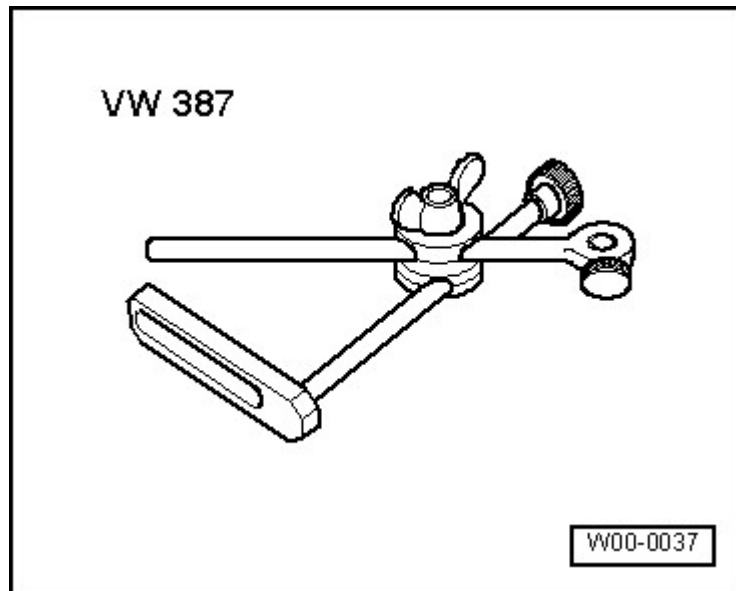


Fig. 262: Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge 0-10 mm VAS 6079

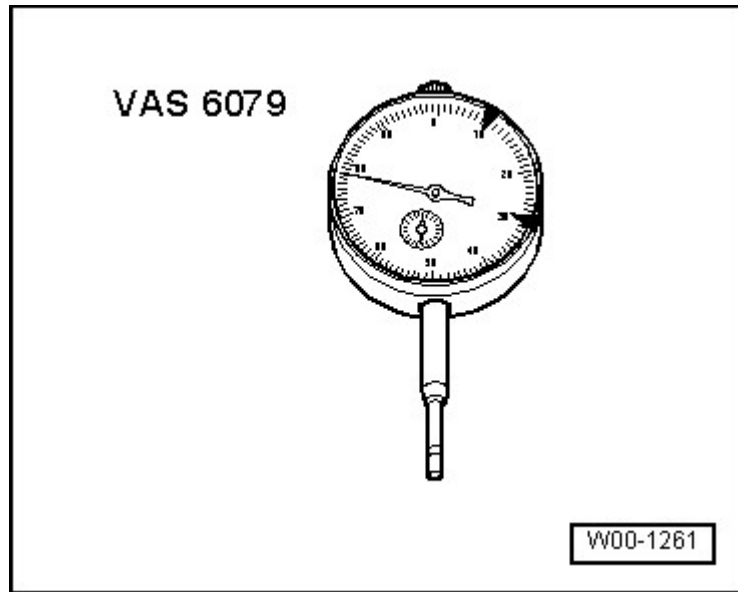


Fig. 263: Dial Gauge VAS 6079
Courtesy of AUDI OF AMERICA, LLC

- Locking Tool T40098

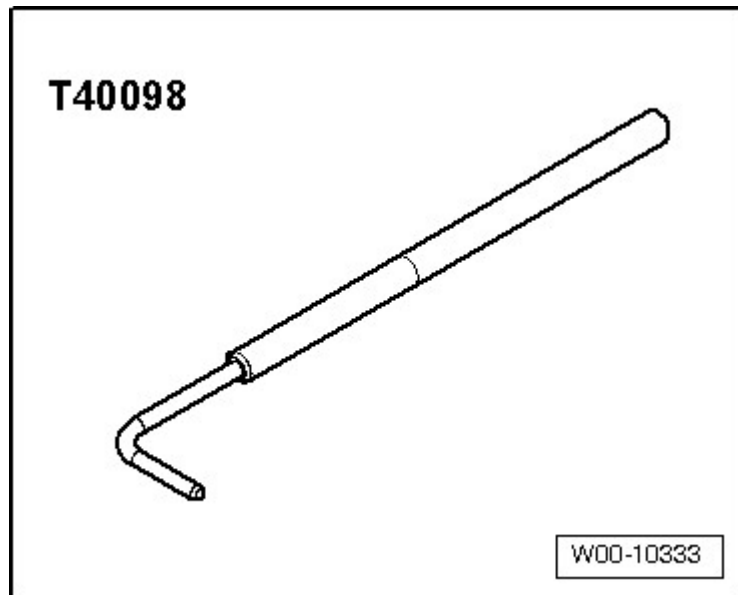


Fig. 264: Identifying Locking Tool T40098
Courtesy of AUDI OF AMERICA, LLC

- Counter Hold Tool T10355

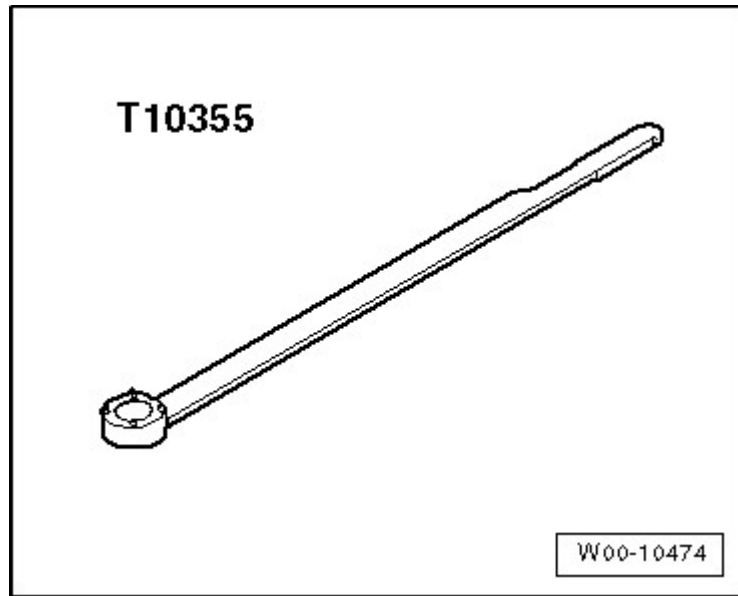


Fig. 265: Counter-Holder Tool T10355
Courtesy of AUDI OF AMERICA, LLC

- Thrust Piece T10368

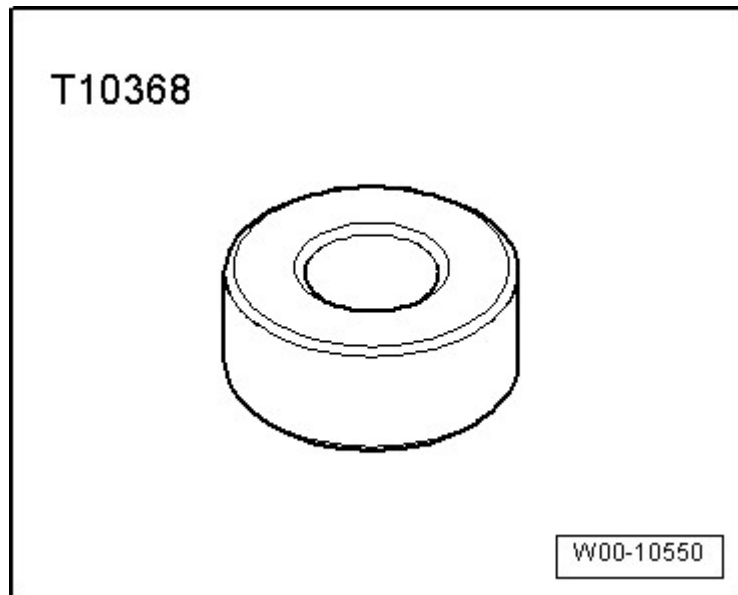


Fig. 266: Thrust Piece T10368
Courtesy of AUDI OF AMERICA, LLC

- Thrust Piece T10354

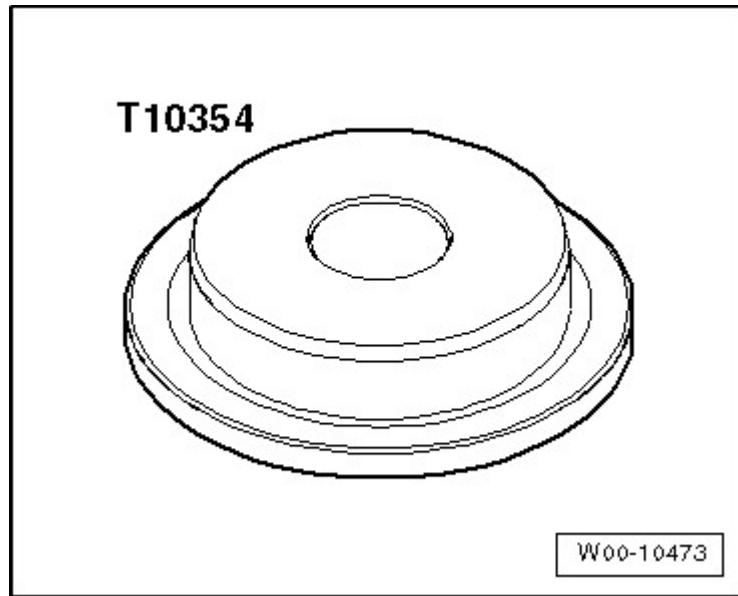


Fig. 267: Identifying Thrust Piece T10354
Courtesy of AUDI OF AMERICA, LLC

- Pulling Hook T20143

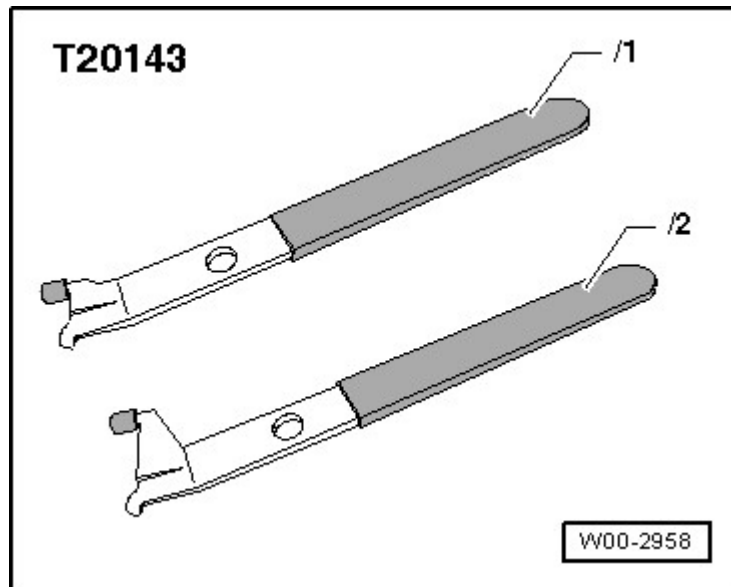


Fig. 268: Extractor Hook T20143
Courtesy of AUDI OF AMERICA, LLC

- Assembly Tool T10352 and Assembly Tool T10352/1

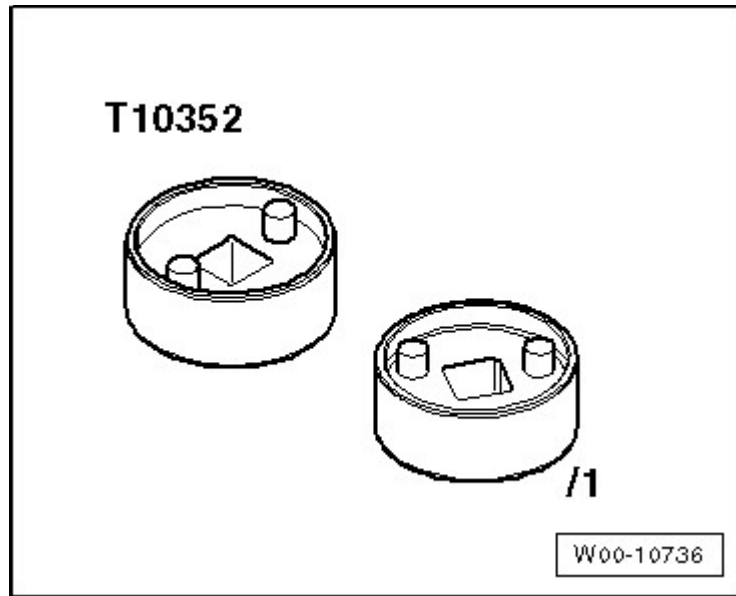


Fig. 269: Assembly Tool T10352 And Assembly Tool T10352/1
Courtesy of AUDI OF AMERICA, LLC

- Locking Pin T40011

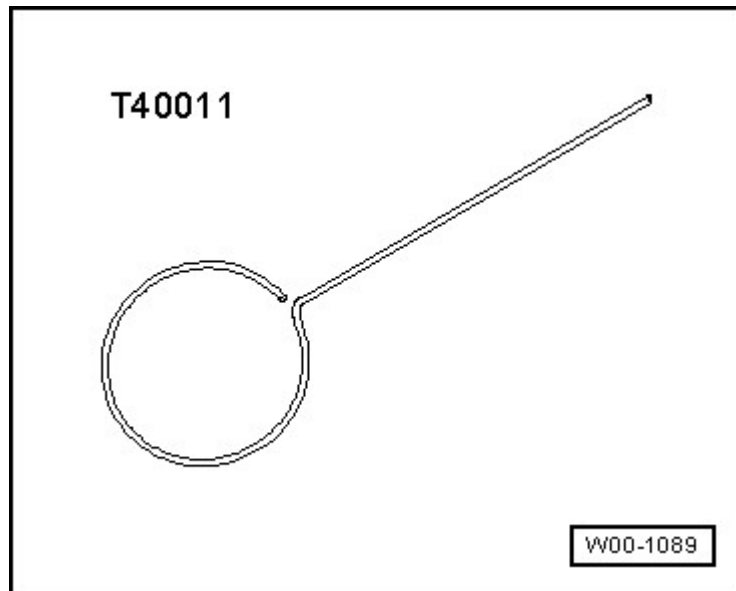


Fig. 270: Identifying Locking Pin T40011
Courtesy of AUDI OF AMERICA, LLC

- Puller T10394

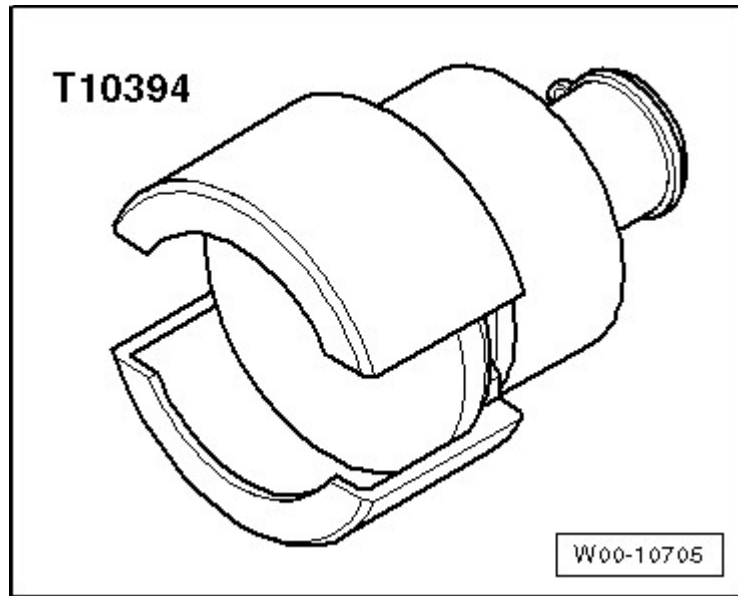


Fig. 271: Identifying Puller T10055
Courtesy of AUDI OF AMERICA, LLC

- Puller T10055

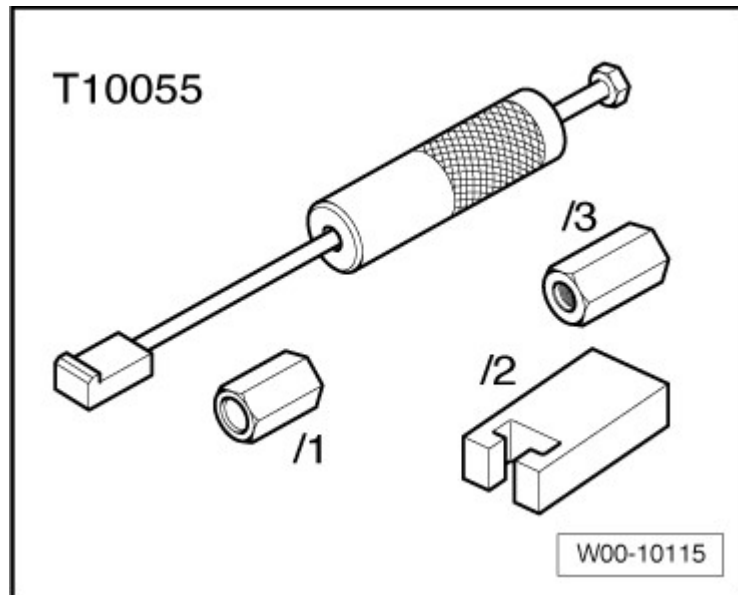


Fig. 272: Identifying Puller T10055 With Adapter T10055/3
Courtesy of AUDI OF AMERICA, LLC

- Drift T40196

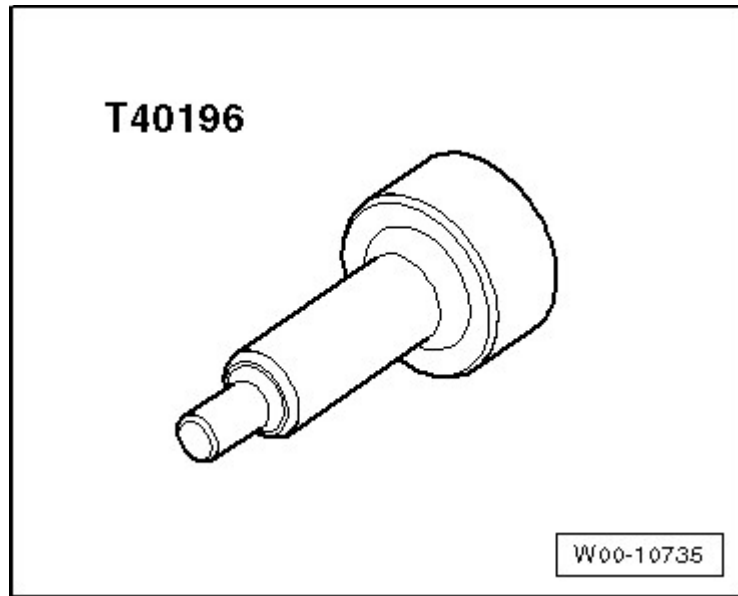


Fig. 273: Identifying Drift T40196
Courtesy of AUDI OF AMERICA, LLC

- Engine Bung Set VAS 6122

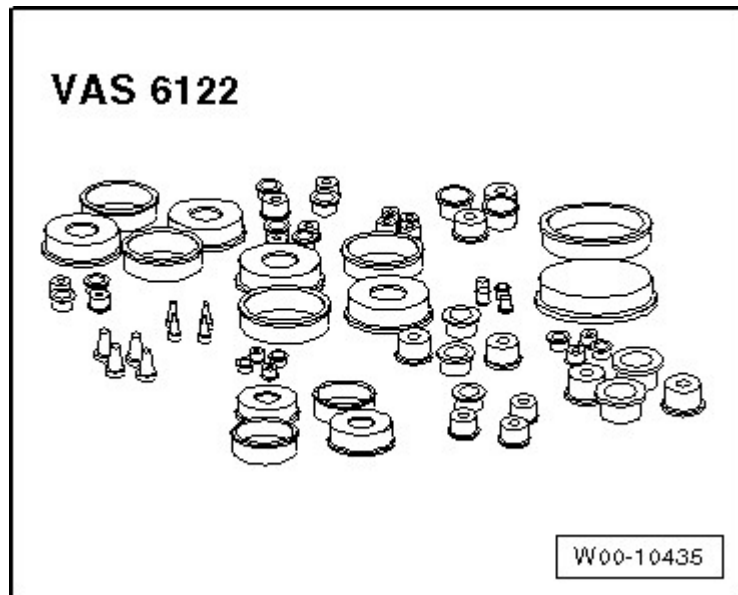


Fig. 274: Engine Bung Set Plugs VAS 6122
Courtesy of AUDI OF AMERICA, LLC

- Thrust Piece T10174

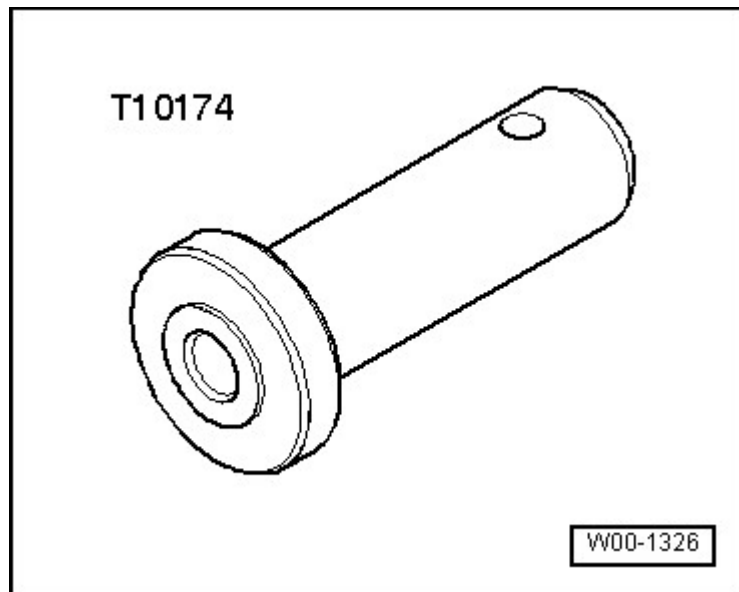


Fig. 275: Identifying Thrust Piece T10174
Courtesy of AUDI OF AMERICA, LLC

- Spacers T40191

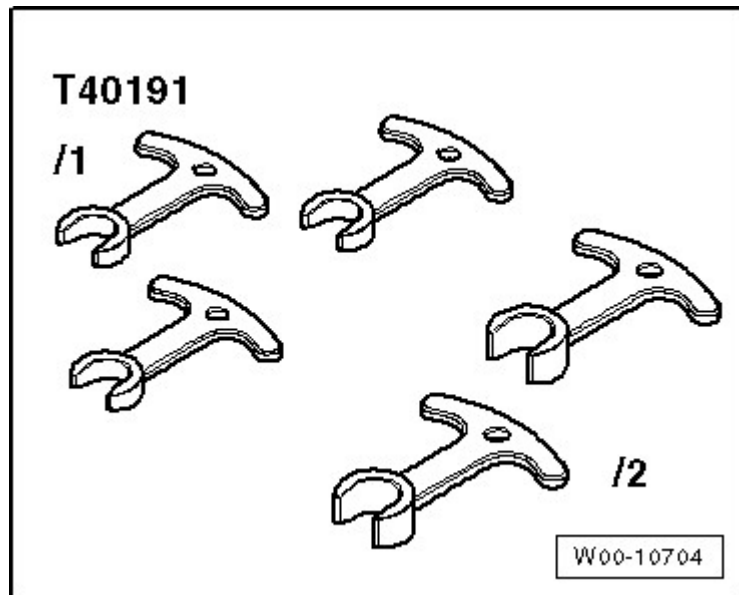


Fig. 276: Identifying Spacers T40191
Courtesy of AUDI OF AMERICA, LLC

- Not illustrated:
- Polydrive Bit and Drive Socket T10070
- Pry Lever T40243
- Camshaft Locator T40271
- Pulling Hook T40274