

ENGINE

4.2 Liter - General, Technical Data - Engine Mechanical - Engine Code(s): BAR

00 GENERAL, TECHNICAL DATA

GENERAL INFORMATION

SAFETY PRECAUTIONS

Note the following when working on the fuel system:

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

- Before opening high pressure area of the fuel injection system, fuel pressure must be relieved to residual pressure.
- To reduce remaining residual pressure, lay a clean cloth around the connector and carefully loosen connector.

-- Procedures before opening high pressure fuel injection system. Refer to General Information .

To prevent personal injury and damage to the injection and ignition system, observe the following:

- The ignition must be switched off before connecting or disconnecting injection and ignition system wiring or tester cables.
- Only clean engine with ignition switched off.
- If electrical connectors were disconnected and the engine was started, then malfunctions have been stored in the engine control modules. "Generate readiness code" in "Guided Functions" => Vehicle Diagnosis Tester.

CAUTION: Risk of destroying electrical components when battery is disconnected.

- Observe measures when disconnecting battery.
- Only disconnect battery with ignition switched off.

-- Disconnect battery. Refer to BATTERY, DISCONNECTING AND CONNECTING .

Note the following when working on the cooling system:

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

- When the engine is warm the cooling system is under pressure.
- To reduce pressure, cover coolant reservoir cap with cloth and carefully open.

CLEAN WORKING CONDITIONS

Even a little contamination can lead to faults. When working on the fuel supply and on the fuel injection system, observe the following guidelines for a clean working environment:

- Before loosening, connections and surrounding areas must be cleaned thoroughly with engine or brake cleaner, and then cleaned area must be dried completely.
- Seal the open lines and connections immediately with clean plugs, for example, from the engine bung set VAS 6122.
- Place removed parts on a clean surface and cover them with lint-free cloths.
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored out of their original packaging (for example in tool boxes etc.).
- If system is open, do not work with compressed air and do not move the vehicle.
- Protect disconnected electrical connectors from dirt and moisture and only connect if dry.

BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM**WARNING:**

- **The injection system is separated into a high-pressure section (maximum approximately 120 bar) and a low-pressure section (approximately 6 bar).**
- **Before opening high pressure area, fuel pressure must be reduced to a residual pressure of approximately 6 bar. Refer to General Information .**

WORKING ON VEHICLES WITH START/STOP SYSTEM

When working on a vehicle with the Start/Stop System, note the following:

WARNING: Danger of serious personal injury if the engine starts automatically on vehicles with the Start/Stop System.

- **If the Start/Stop System is activated (message in the instrument cluster), the engine can start automatically.**
- **Make sure the Start/Stop System is deactivated whenever working on the vehicle. Switch off the ignition and switch it on only when necessary.**

TEST AND MEASURING INSTRUMENTS DURING TEST DRIVE

If it is necessary to use testing and measuring devices on road tests, observe the following:

WARNING: Distraction and improperly secured test equipment can lead to accidents.

There is a risk that the passenger airbag could deploy in a collision.

- Operating testing and measuring equipment while driving creates a distraction.
- There is an increased risk of injury due to unsecured testing and measuring equipment.
- Always secure testers on the rear seat with a strap and have a second person on the rear seat operate them.

WORKING ON EXHAUST SYSTEM

Note the following when working on the exhaust system:

CAUTION: Danger of damaging the decoupling element.

- Decoupling element must not be bent more than 10°.
- Do not load decoupling element on cable.
- Do not damage wire mesh at decoupling element.

ENGINE NUMBER

NOTE: The engine code is also located on the vehicle data plate.

-- Pull front engine cover off -arrows-.

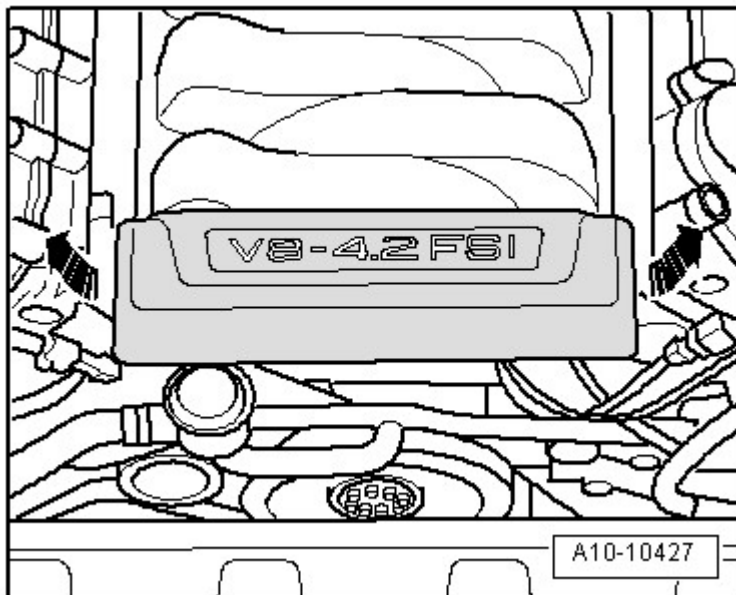


Fig. 1: Identifying Front Engine Cover, Electrical Connector, And Left Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

Engine number ("engine code" and "serial number") is located at front on cylinder block at top -arrow-.

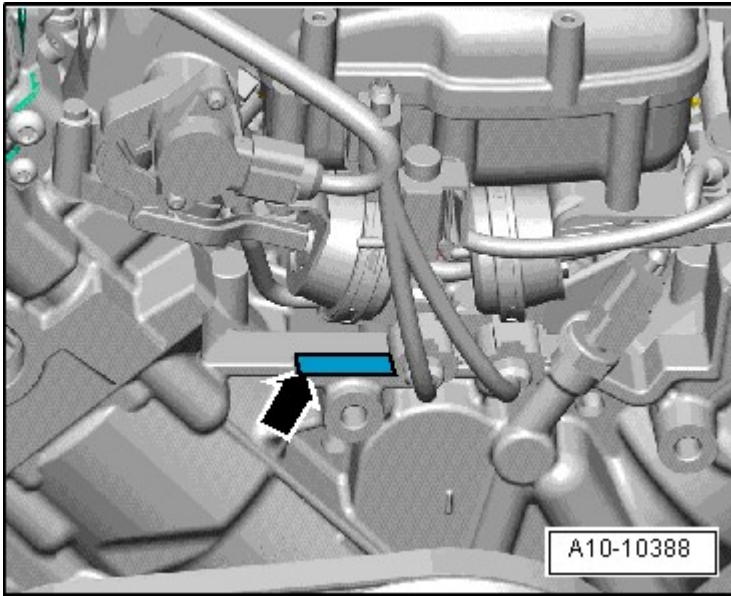


Fig. 2: Locating Engine Number
Courtesy of AUDI OF AMERICA, LLC

ENGINE CONTAMINANTS

- To prevent foreign objects from entering when working on the engine, seal open intake and exhaust channels with suitable plugs, for example from the engine bung set VAS 6122.
- If mechanical damage to a cylinder bank is found, check the intake and exhaust tract and the combustion chambers in the opposite cylinder bank for foreign objects to prevent further damage.

CONTACT CORROSION!

Contact corrosion can occur if incorrect fasteners (bolts, nuts, washers, etc.) are used.

For this reason, only install connecting elements that are treated with a special coating.

Also, rubber or plastic parts and adhesive consist of non-conductive materials.

Note:

- Only original replacement parts are recommended, they are checked and compatible with aluminum.
- Audi accessories are recommended.
- Damage due to contact corrosion is not covered by warranty.

LINES, ROUTING AND SECURING

To prevent mistakes and ensure the original installation location is kept, mark the hydraulic lines, vacuum lines or electrical lines before removing them. If necessary, draw sketches or take pictures.

SPECIFICATIONS

ENGINE DATA

Engine codes	BAR
Displacement	liter
Output	kW at RPM
Torque	Nm at RPM
Bore	Dia. mm
Stroke	mm
Compression ratio	
RON	
Fuel injection and ignition system	
Ignition sequence	
Exhaust gas recirculation	
Turbocharger	
Knock control	
Oxygen sensor regulation	
Variable valve timing	
Variable intake manifold	
Secondary Air Injection System	
Valve per cylinder	
(1) Super unleaded RON 95 is permissible, although with reduced power.	

DIAGNOSIS AND TESTING

FUEL SYSTEM, CHECKING FOR LEAKS

- Let the engine run a few minutes at a moderate speed.
- Switch off ignition.
- Check the entire fuel system for leaks.
- If there are leaks in spite of correct tightening specifications, the corresponding component must be replaced.
- Then perform a road test and depress the accelerator pedal all the way at least one time.
- Then check the high pressure area again for leaks.

VACUUM SYSTEM, CHECKING

Special tools and workshop equipment required

- Hand Vacuum Pump VAS 6213

Procedure

-- Check all vacuum lines in the vacuum system for:

- Cracks
- Damage caused by animals
- Crimps
- Leaks and leakage

-- Check the vacuum line leading to and from the solenoid valve.

-- If there is a fault, check the vacuum lines for the named component, but also all the vacuum lines.

-- If using the VAS 6213 does not produce any pressure or if the pressure drops again right away, then check the hand vacuum pump and the connection hoses for leaks.

SPECIAL TOOLS**Special tools and workshop equipment required**

- Hand Vacuum Pump VAS 6213

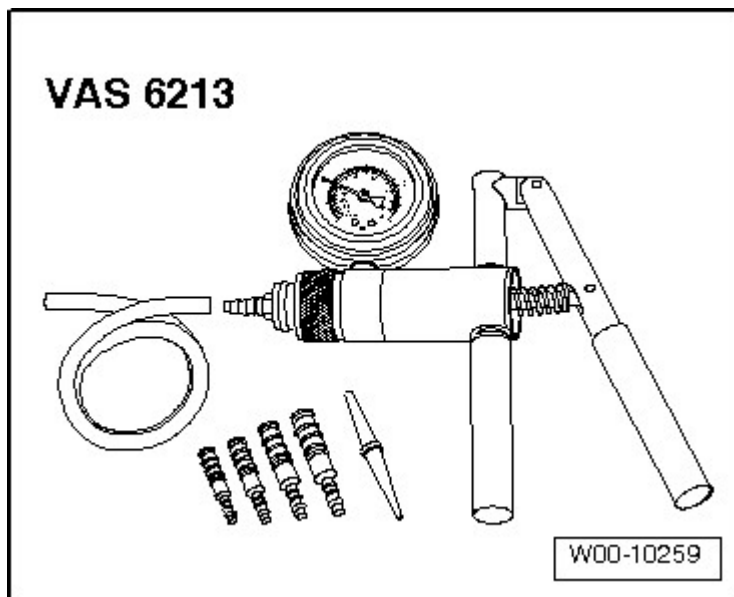


Fig. 3: Identifying Hand Vacuum Pump VAS 6213
Courtesy of AUDI OF AMERICA, LLC

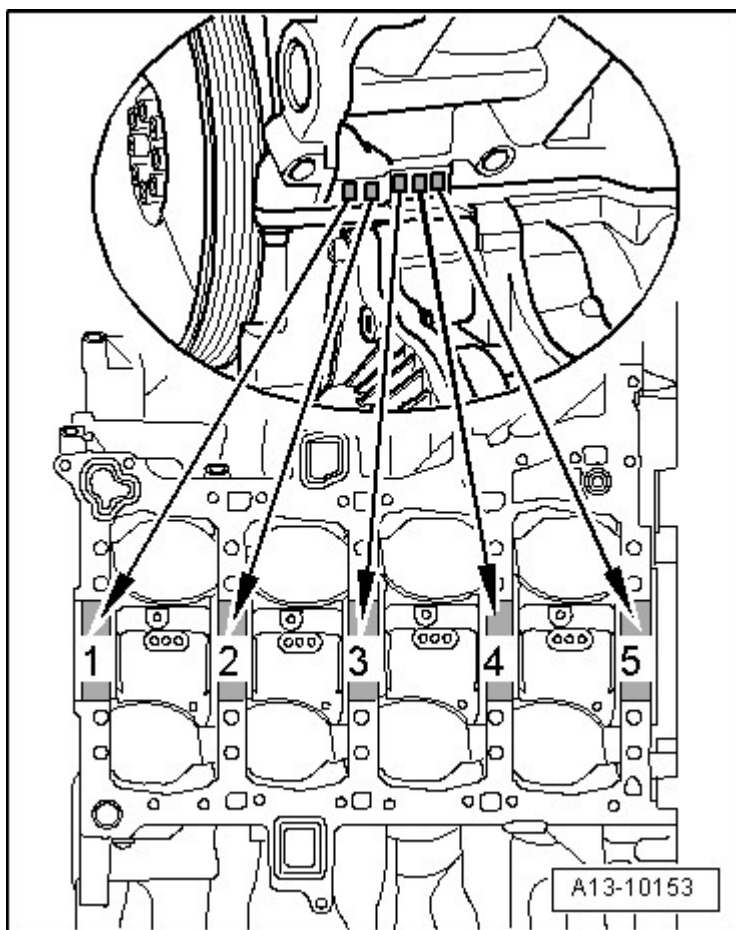
ENGINE**4.2 Liter - Crankshaft, Cylinder Block - Engine Code(s): BAR****13 CRANKSHAFT, CYLINDER BLOCK****GENERAL INFORMATION****MAIN BEARING SHELLS, NEW CRANKSHAFTS, ALLOCATING**

Fig. 1: Identifying Allocation Of Crankshaft Bearing Shells For Cylinder Block
 Courtesy of AUDI OF AMERICA, LLC

- Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- Allocation of bearing shells to cylinder block is marked by one letter each at front left on cylinder block (can be read from outside) as shown in the illustration.

Letter on cylinder block	Color of bearing
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ENGINE 4.2 Liter - Crankshaft, Cylinder Block - Engine Code(s): BAR

R=	Red
G=	yellow
B=	Blue

NOTE: In addition, the letters are also stamped on the guide frame.

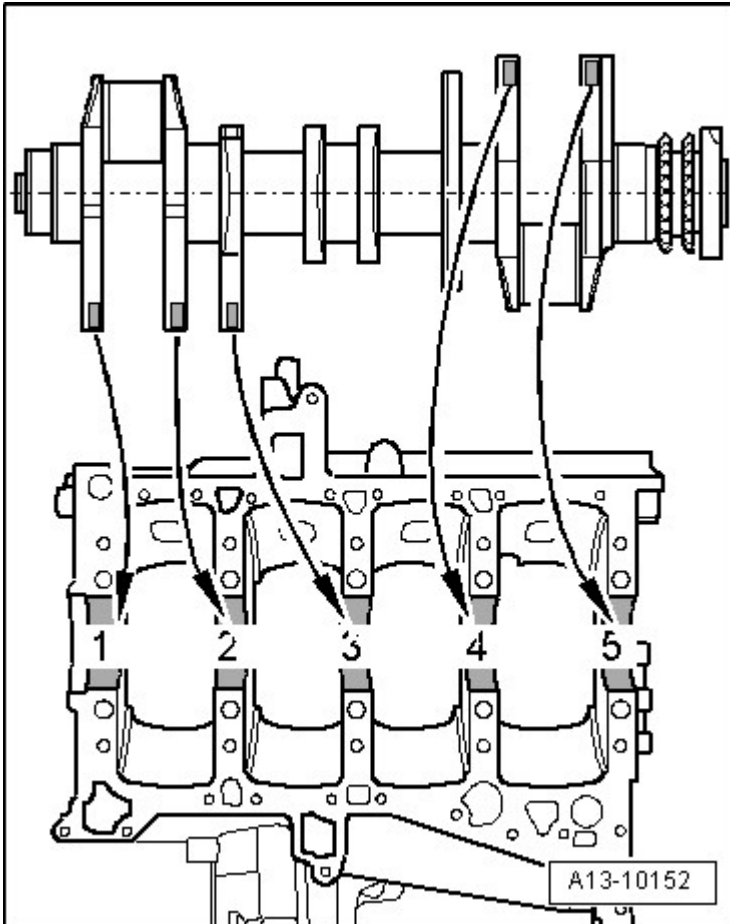


Fig. 2: Allocation Of Crankshaft Bearing Shells For Guide Frame - Crankshaft Manufactured By Alfin
Courtesy of AUDI OF AMERICA, LLC

- Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- Allocation of bearing shells to guide frame is marked by one colored dot each on crankshaft counterweight as shown in the illustration.

Colored dot on crankshaft	Color of bearing
Red	Red
Yellow	Yellow
Blue	Blue

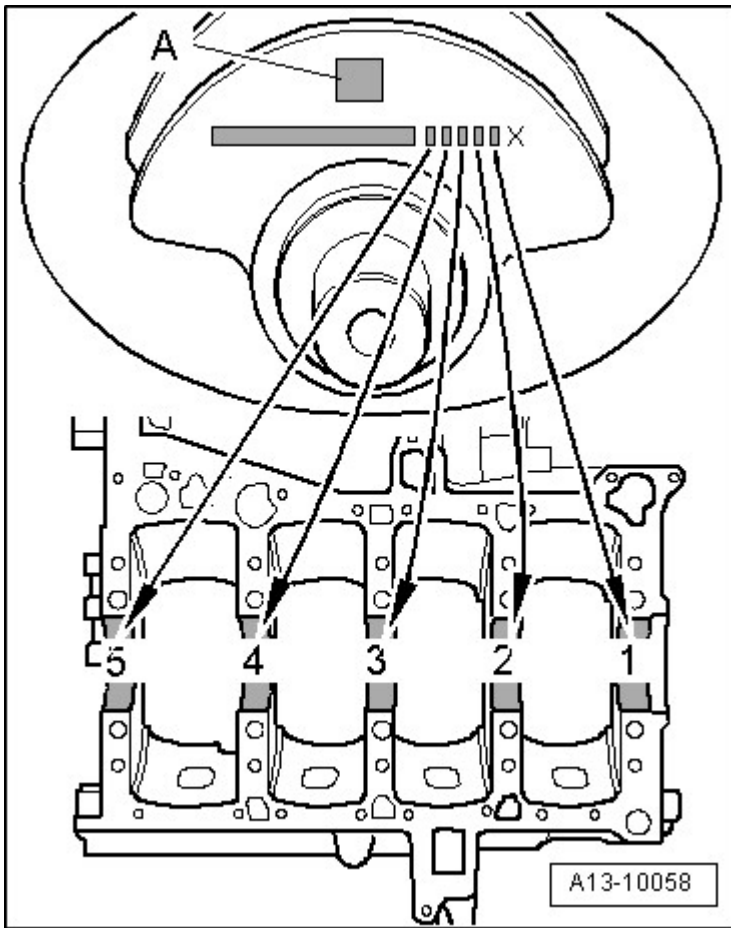


Fig. 3: Identifying Allocation Of Crankshaft Bearing Shells For Guide Frame - Crankshaft Manufactured By Weber
 Courtesy of AUDI OF AMERICA, LLC

- Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.
- The allocation of bearing shells to guide frame is identified by a letter on the front crankshaft counterweight, as shown in the illustration. The "X" marks the end of the letter sequence and is near the bearing 1 color identification on the belt pulley side.

NOTE: Ignore item -A-.

Letter on crankshaft	Color of bearing
R =	Red
G =	Yellow
B =	Blue

ALLOCATION OF MAIN BEARING SHELLS FOR USED AND REWORKED CRANKSHAFTS

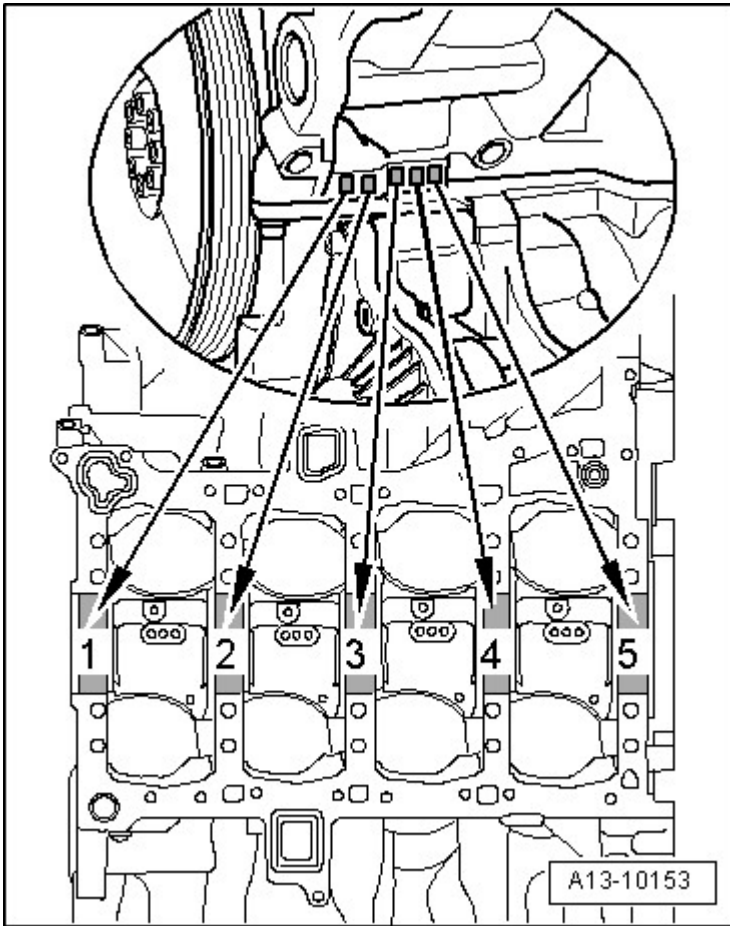


Fig. 4: Identifying Allocation Of Crankshaft Bearing Shells For Cylinder Block
 Courtesy of AUDI OF AMERICA, LLC

- Bearing shells are allocated to cylinder block corresponding to color markings stamped into cylinder block.
- For used and reworked crankshafts, the main crankshaft journals must be measured in order to allocate the matching bearing shells.
- Crankshaft dimensions, refer to **CRANKSHAFT DIMENSIONS**.
- Thicker over-sized bearing shells are available for reworked crankshafts. These have the same color markings as the original-size bearing shells.

Letter on cylinder block	Color of bearing
R =	Red
G =	Yellow
B =	Blue

Allocation of crankshaft bearing shells for guide frame

- For used and reworked crankshafts, the main crankshaft journals must be measured in order to allocate the matching bearing shells.
- Any other markings on the crankshaft are invalid when reworking crankshafts.
- Allocate bearing shells to the determined diameter of main crankshaft journals according to the following table.

Main crankshaft journals diameter Dimensions in mm	Color identification of bearing shells for guide frame		
	Red	Yellow	Blue
Basic dimension 65.000 ¹⁾	64.978 to 64.972	64.972 to 64.965	64.965 to 64.958
Repair stage 64.750 ¹⁾	64.728 to 64.722	64.722 to 64.715	64.715 to 64.708
<ul style="list-style-type: none"> ¹⁾ The same color marking is valid for the thicker over-sized bearing for reworked crankshafts as for new crankshafts despite the greater bearing thickness. 			

TORQUE CONVERTER BUSHING

-- On a vehicle with automatic transmission, check whether bearing bushing -arrow- is inserted at rear of crankshaft. Drive in bushing if necessary.

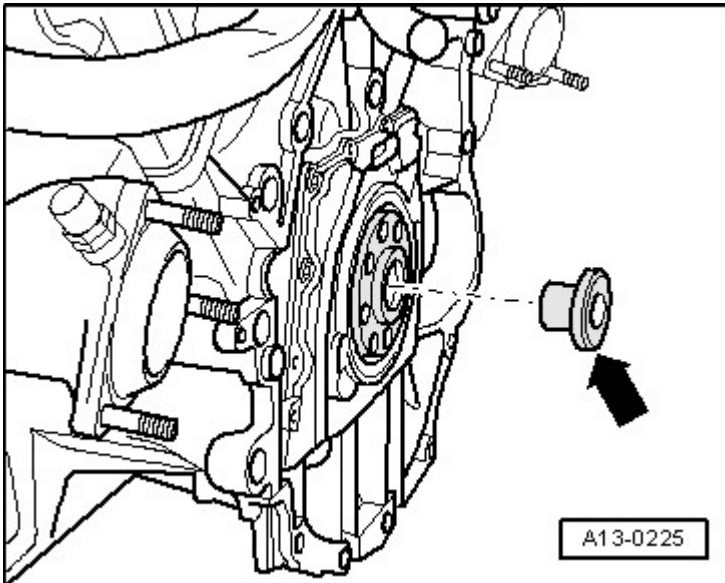


Fig. 5: Torque Converter Centering Bushing
Courtesy of AUDI OF AMERICA, LLC

DESCRIPTION AND OPERATION

GENERATOR RIBBED BELT DRIVE ASSEMBLY OVERVIEW

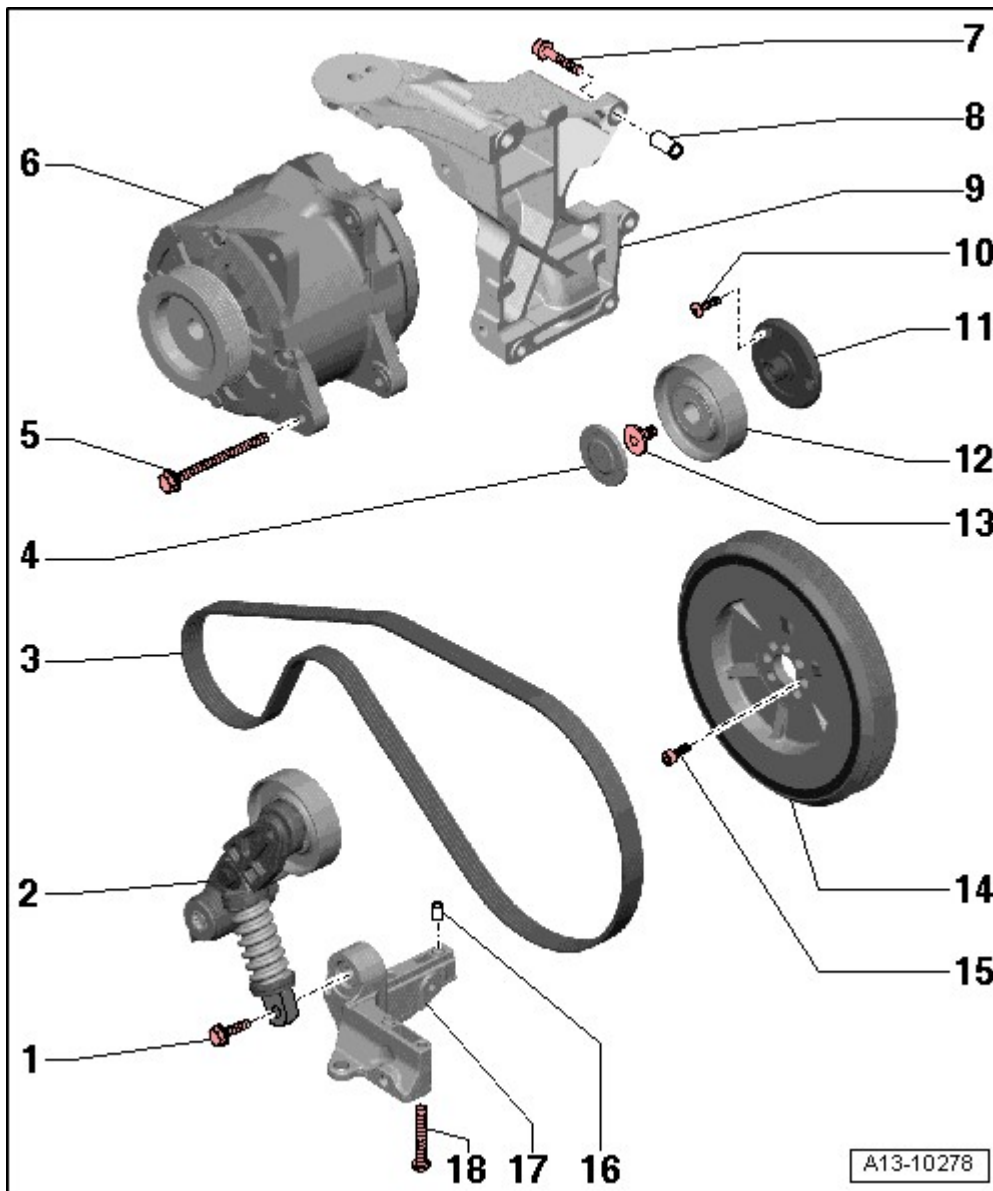


Fig. 6: Generator Ribbed Belt Drive, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - 22 Nm
2. Tensioning Device for Ribbed Belt
3. Ribbed Belt
 - Check for wear
 - Do not kink
 - Before removing, mark direction of rotation using chalk or felt-tip marker
 - Removal and installation, refer to **RIBBED BELT**
 - When installing, make sure it is seated correctly on the pulleys

4. Cap
5. Bolt
 - Tightening specifications, refer to **Specifications** and **Specifications**
6. Generator
 - Removal and installation, refer to **Removal and Installation**
7. Bolt
 - M8 - 22 Nm
 - M10 - 46 Nm
8. Alignment Bushing
 - For generator bracket
 - 2 pieces
9. Generator Bracket
 - Illustration does not correspond to version in vehicle
10. Bolt
 - 9 Nm
11. Bracket
 - For idler pulley
12. Idler Roller for Ribbed Belt
13. Bolt
 - 22 Nm
14. Vibration Damper
 - Removal and installation, refer to **VIBRATION DAMPER**
15. Bolt
 - Replace
 - Tightening order, refer to **Fig. 7**
16. Alignment Bushing
 - 2 pieces
17. Bracket
 - For ribbed belt tensioner
18. Bolt
 - Note bolt lengths
 - 9 Nm

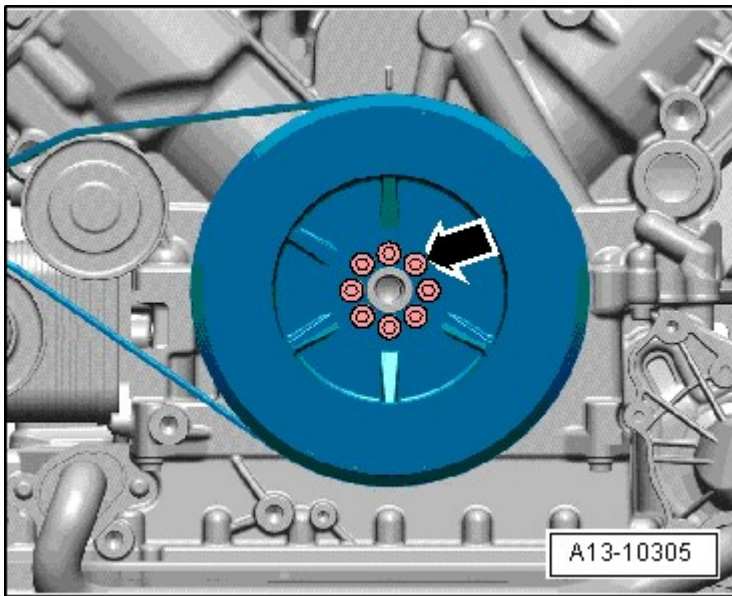


Fig. 7: Loosening Mounting Bolts On Vibration Damper
Courtesy of AUDI OF AMERICA, LLC

- Tighten bolts -arrow- in diagonal sequence in 3 stages as follows:
- Tighten the bolts to 15 Nm.
- Tighten the bolts to 22 Nm.
- Tighten the bolts an additional 90°.

DRIVE PLATE ASSEMBLY OVERVIEW

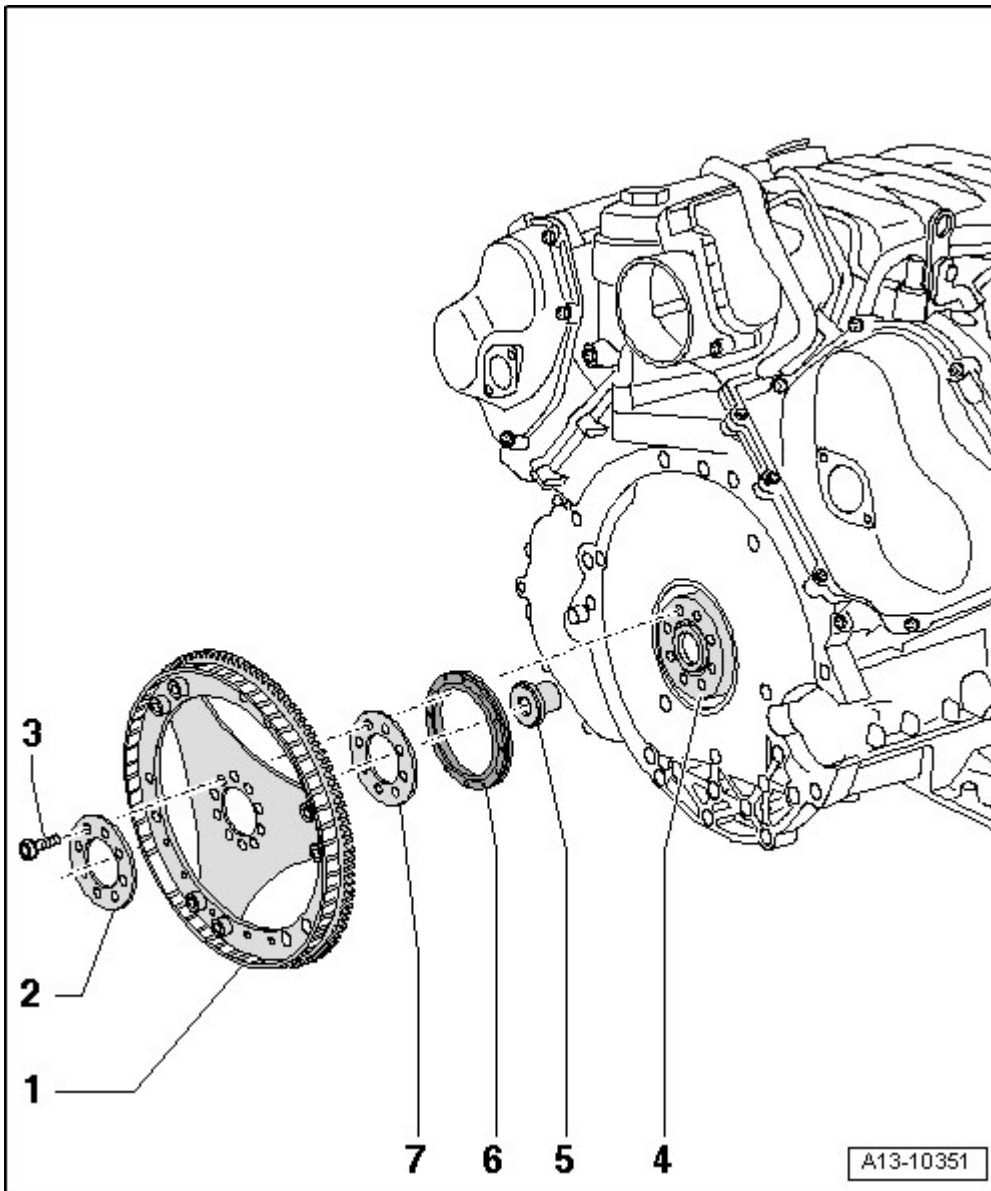


Fig. 8: Drive Plate, Assembly Overview
 Courtesy of AUDI OF AMERICA, LLC

1. Drive Plate
 - Removal and installation, refer to **DRIVE PLATE**
 - Mark for re-installation
2. Washer
 - 3.4 mm thick
 - Mark for re-installation
3. Bolt
 - Replace
 - 60 Nm plus an additional 90° turn

4. Crankshaft
5. Centering Bushing
 - For torque converter
 - Check availability
6. Shaft Seal
 - For the crankshaft, transmission side
 - Replacing, refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**.
7. Spacer Washer
 - 1.5 mm thick
 - Mark for re-installation

CRANKSHAFT ASSEMBLY OVERVIEW

NOTE: To perform assembly work, secure engine with V8 FSI engine holder 6095/1-6A to engine and transmission holder VAS 6095 **ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER** .

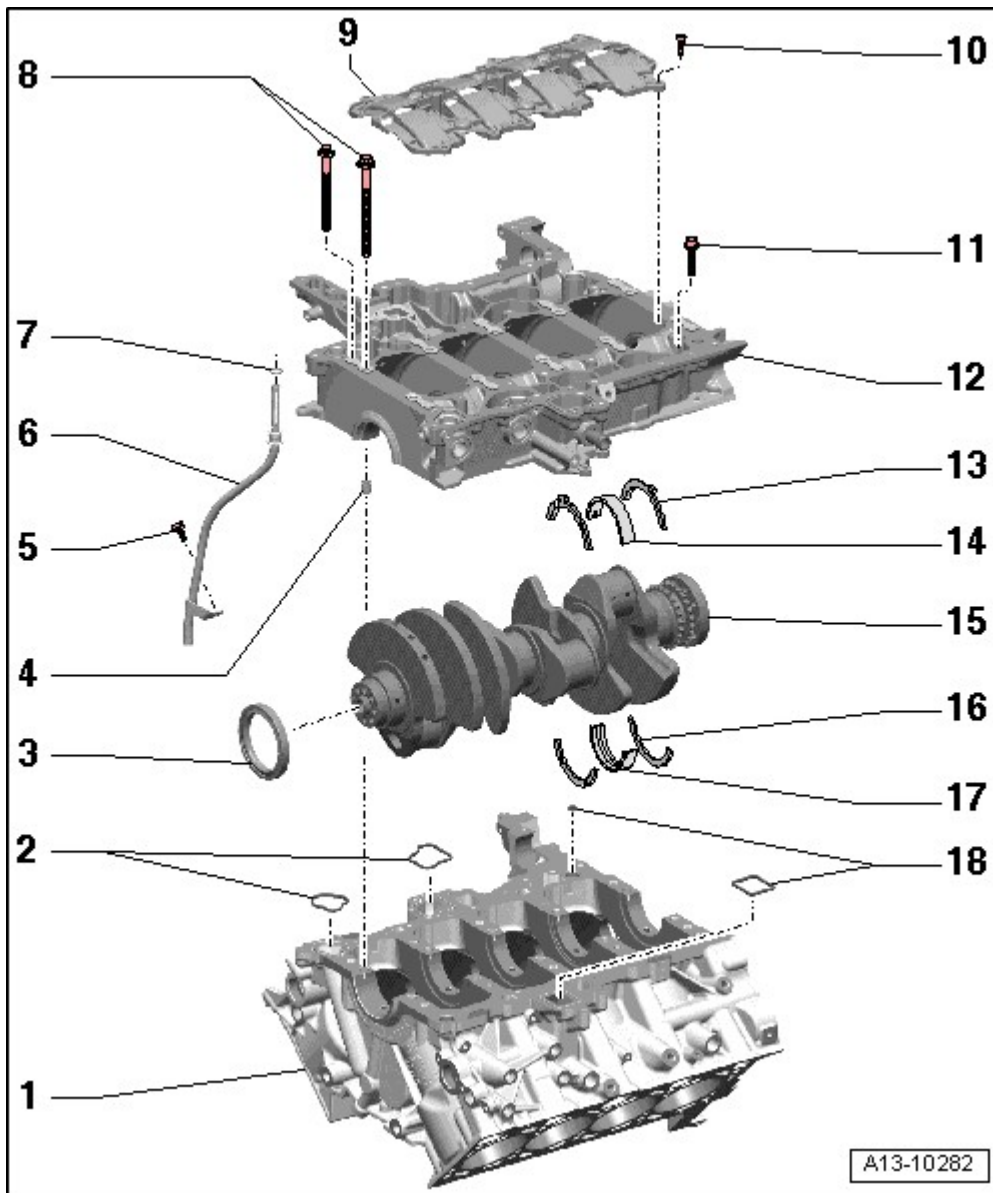


Fig. 9: Crankshaft, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Cylinder Block
 - Paired to item -12-
 - Sealant applied on cylinder block (for guide frame), refer to **Fig. 11**
2. Seals
 - Replace
3. Crankshaft Shaft Seal, Belt Pulley Side
 - Replacing, refer to **CRANKSHAFT SHAFT SEAL, BELT PULLEY SIDE, REPLACING.**
4. Alignment Bushing
 - 2 pieces

- Insert into guide frame
 - Installed location, refer to **Fig. 11**
5. Bolt
 - 9 Nm
 6. Guide Tube for Oil Dipstick
 7. O-ring
 - Replace
 8. Bolts
 - For guide frame
 - Replace
 - Various bolt sizes
 - Tightening order, refer to **Fig. 13**
 9. Baffle Plate
 10. Bolt
 - Tightening specification and sequence, refer to **Fig. 10**
 11. Bolt
 - For sealing surfaces of cylinder block/guide frame
 - Different bolt lengths
 - Tightening specification and sequence, refer to **Fig. 13**
 12. Bearing Bracket
 - Paired to item -1-
 - Sealant applied on cylinder block (for guide frame), refer to **Fig. 11**
 - Tightening specification and sequence, refer to **Fig. 13**
 13. Thrust Washer
 - Only at the 4th crankshaft bearing
 - Lubricating grooves face outward
 - Note locating point in guide frame
 - Measuring crankshaft axial clearance, refer to **AXIAL CLEARANCE, MEASURING**
 14. Bearing Shell
 - For guide frame without lubricating groove
 - Do not interchange used bearing shells (mark)
 - Insert new bearing shells for guide frame with proper color marking

New crankshafts, refer to **MAIN BEARING SHELLS, NEW CRANKSHAFTS, ALLOCATING**

Used and reworked crankshafts, refer to **ALLOCATION OF MAIN BEARING SHELLS FOR USED AND REWORKED CRANKSHAFTS**

15. Crankshaft

- Measuring axial play, refer to **AXIAL CLEARANCE, MEASURING**
- Radial clearance, measuring, refer to **RADIAL CLEARANCE, MEASURING**
- Do not turn crankshaft when measuring radial play
- Crankshaft dimensions, refer to **CRANKSHAFT DIMENSIONS**

16. Thrust Washer

- Only at the 4th crankshaft bearing
- Lubricating grooves face outward
- Measuring crankshaft axial clearance, refer to **AXIAL CLEARANCE, MEASURING**

17. Bearing Shell

- For cylinder block with oil groove
- Do not interchange used bearing shells (mark)
- Insert new bearing shells for cylinder block with proper color marking

New crankshafts, refer to **MAIN BEARING SHELLS, NEW CRANKSHAFTS, ALLOCATING**

Used and reworked crankshafts, refer to **ALLOCATION OF MAIN BEARING SHELLS FOR USED AND REWORKED CRANKSHAFTS**

18. Seals

- Replace

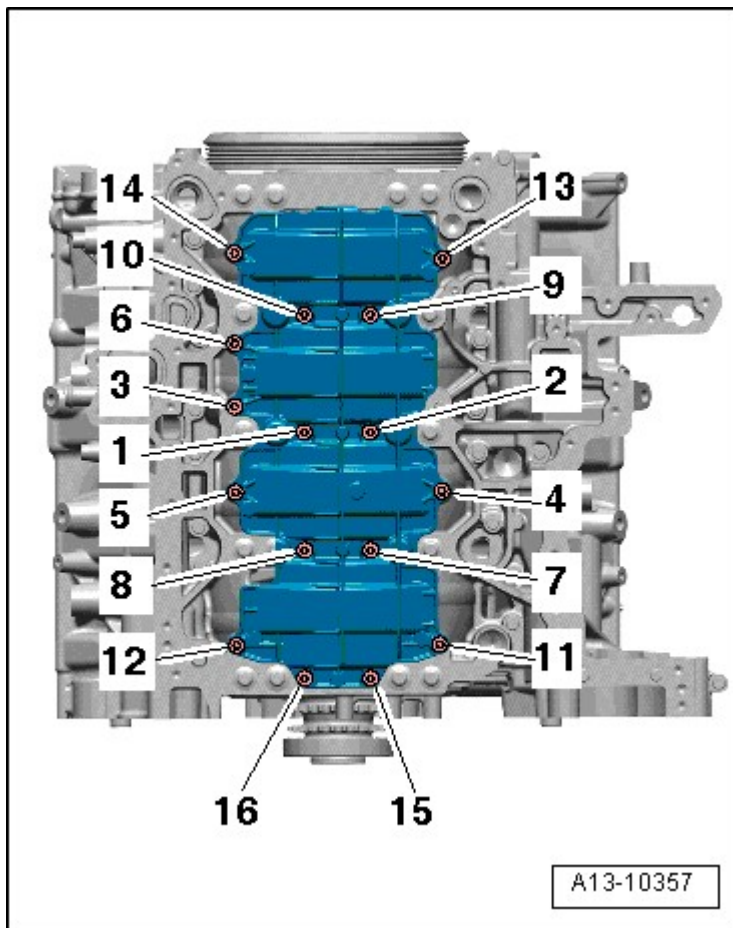


Fig. 10: Identifying Baffle Plate Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Then tighten the bolts in the sequence -1 to 16- to 9 Nm.

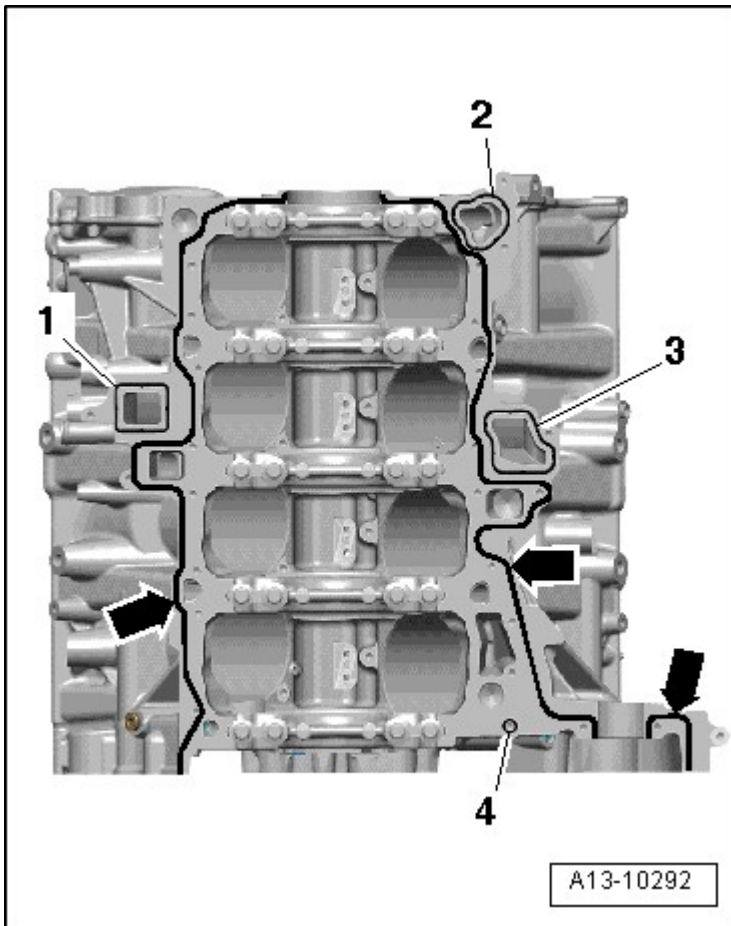


Fig. 11: Sealant Applied On Cylinder Block (For Guide Frame)
Courtesy of AUDI OF AMERICA, LLC

- Clean the sealing surfaces, they must be free of oil and grease.
- Apply sealant beads -arrows- to the clean sealing surfaces on the guide frame as illustrated.
 - Thickness of sealant beads: 2.0 mm.
- Install seals -1 to 4-.

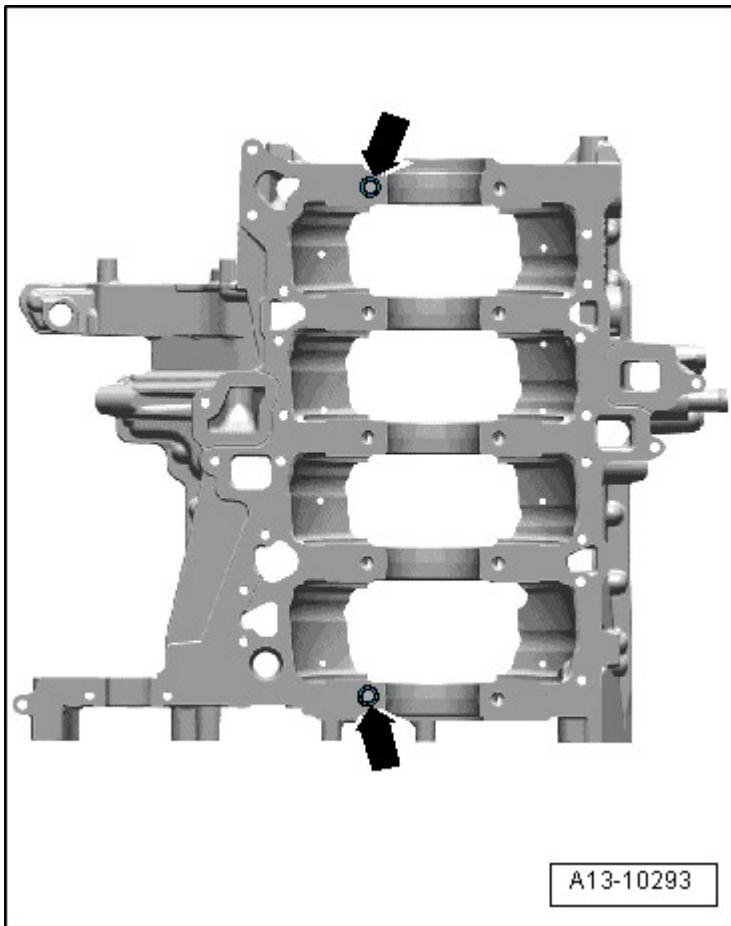


Fig. 12: Installation Position Of Alignment Bushings
Courtesy of AUDI OF AMERICA, LLC

-- Check whether alignment bushings -arrows- are inserted at locations in guide frame as shown in the illustration.

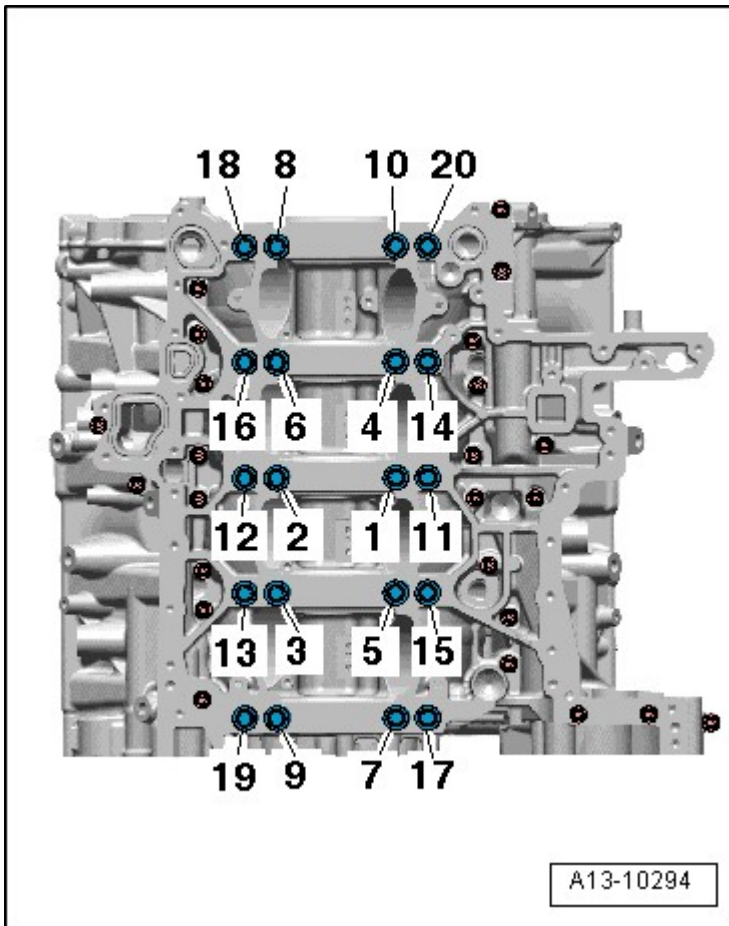


Fig. 13: Guide Frame Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Replace bolts -1 to 20-.
- Tighten bolts for guide frame as follows:
- Tighten bolts -1 to 10- to 30 Nm.
- Tighten bolts -11 to 20- to 20 Nm.
- Tighten bolts -1 to 10- to 50 Nm.
- Tighten bolts -11 to 20- to 30 Nm.
- Tighten the bolts -1 to 10- an additional 90°.
- Tighten the bolts -11 to 20- an additional 90°.
- Tighten the bolts for the cylinder block/guide frame sealing surface -highlighted in the illustration but not numbered- in a diagonal sequence to 9 Nm.

PISTONS AND CONNECTING ROD ASSEMBLY OVERVIEW

NOTE: Oil injector jet for piston cooling, refer to [Fig. 22](#).

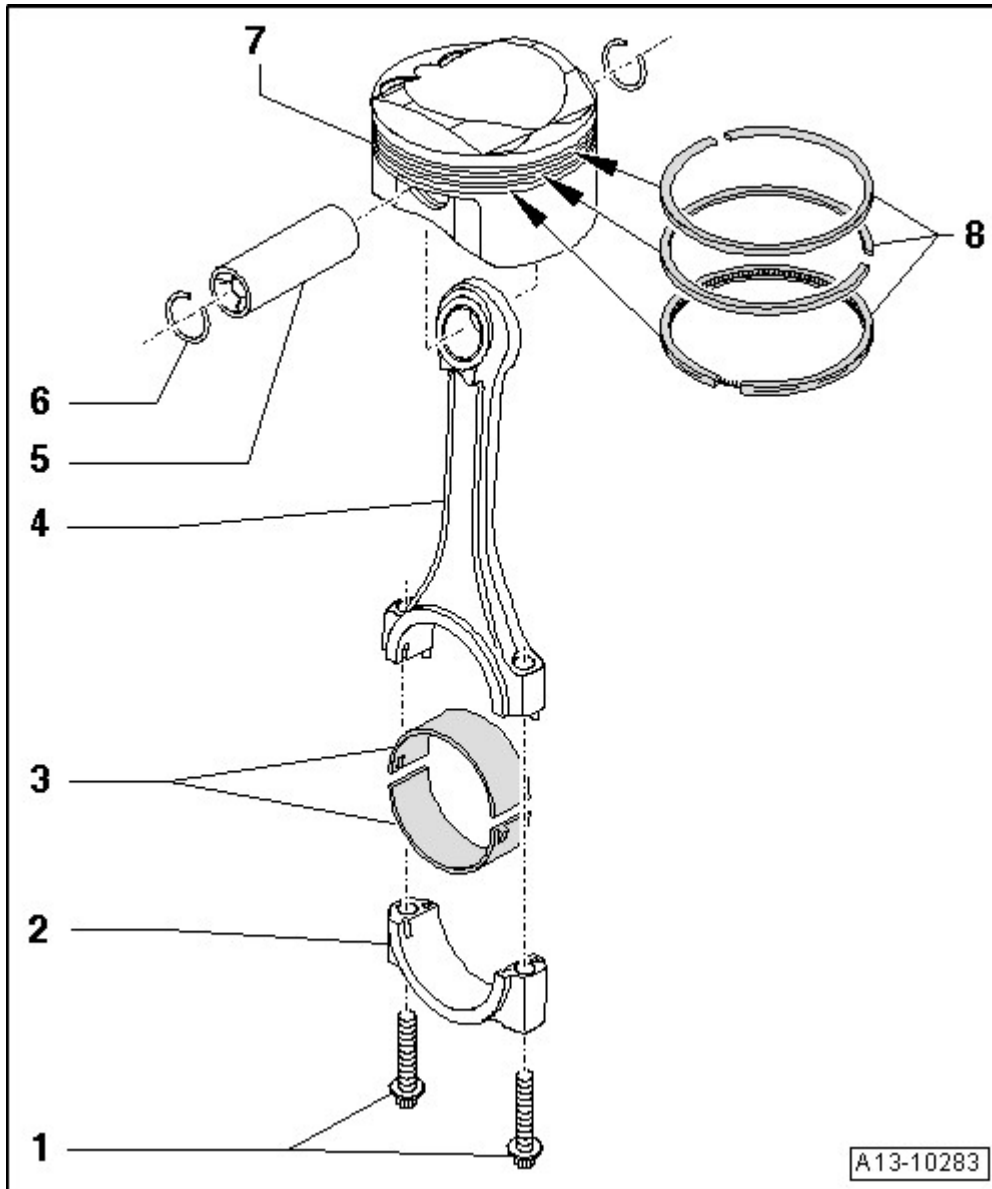


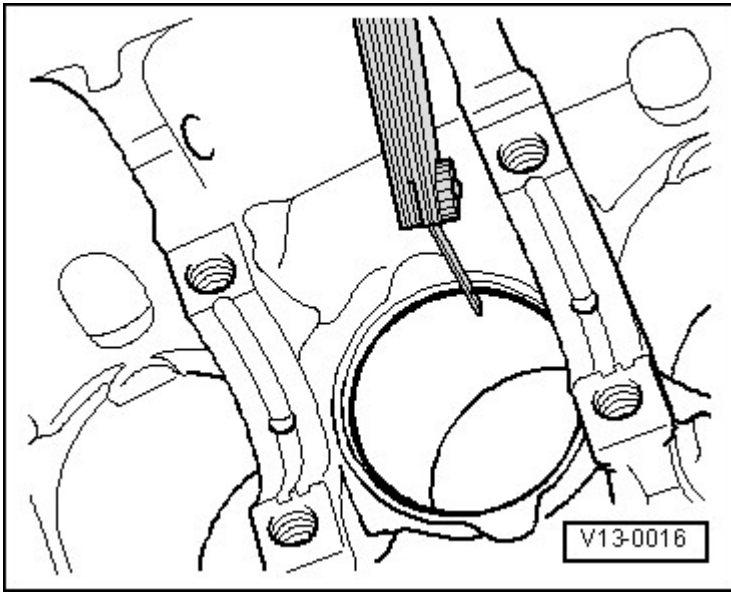
Fig. 14: Piston And Connecting Rod, Assembly Overview
Courtesy of AUDI OF AMERICA, LLC

1. Bolt

- Replace
- Lubricate threads and contact surface
- 50 Nm plus an additional 90° turn
- Tighten to 50 Nm to measure radial play, do not turn further

2. Connecting Rod Bearing Cap

- Do not interchange
 - Mark affiliation to cylinder with paint, refer to **Fig. 20**
 - Installation position of connecting rod pairs, refer to **Fig. 21**
3. Bearing Shells
- Check that retaining tabs are secured
 - Do not interchange used bearing shells (mark, but not on the running surface)
 - Radial clearance, measuring, refer to **CONNECTING ROD, MEASURING RADIAL CLEARANCE**
 - To measure radial play, tighten bolts item -1- to 60 Nm but no further
4. Connecting Rod
- Only replace as set
 - Mark affiliation to cylinder with paint, refer to **Fig. 20**
 - Installation position of connecting rod pairs, refer to **Fig. 21**
 - Axial play for each new connecting rod pair: 0.20 to 0.27 mm
 - Axial play wear limit: 0.30 mm
 - Radial clearance, measuring, refer to **CONNECTING ROD, MEASURING RADIAL CLEARANCE**
5. Piston Pin
- If tight, heat piston to 60 °C / 140 °F
 - Removing and installing using a drift VW 222 A
6. Circlip
- Replace
7. Piston
- Installation position of pistons, refer to **Fig. 19**
 - Piston and cylinder dimension, piston allocation to cylinder bore, refer to **PISTON AND CYLINDER DIMENSIONS**
 - Checking, refer to **Fig. 17**
 - Install with piston ring compressor
 - Measuring cylinder bore, refer to **Fig. 18**
8. Piston rings
- Offset gaps by 120°
 - Use piston ring pliers for removal and installation
 - "TOP" marking or inscribed side must point to piston head
 - Gap, measuring, refer to **Fig. 15**
 - Measuring side clearance, refer to **Fig. 16**

**Fig. 15: Checking Piston Ring Gap**

Courtesy of AUDI OF AMERICA, LLC

-- Slide piston ring down from above at a right angle to cylinder wall until it is approximately 15 mm from bottom edge of cylinder.

-- When sliding in, use a piston without piston rings.

Piston ring	New mm	Wear limit mm
1st Compression ring	0.20 to 0.35	0.8
2nd Compression ring	0.20 to 0.40	0.8
Oil scraping ring	0.20 to 0.40	0.8

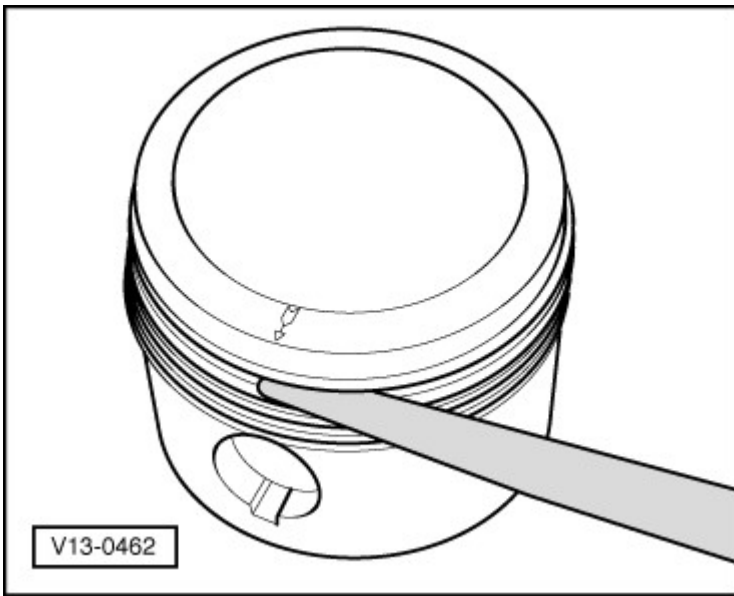


Fig. 16: Checking Piston Ring Side Clearance
 Courtesy of AUDI OF AMERICA, LLC

-- Clean the ring groove of piston before checking.

Piston ring	New mm	Wear limit mm
1st Compression ring	0.035 to 0.085	0.20
2nd Compression ring	0.005 to 0.045	0.15
Oil scraping ring	0.010 to 0.050	0.20

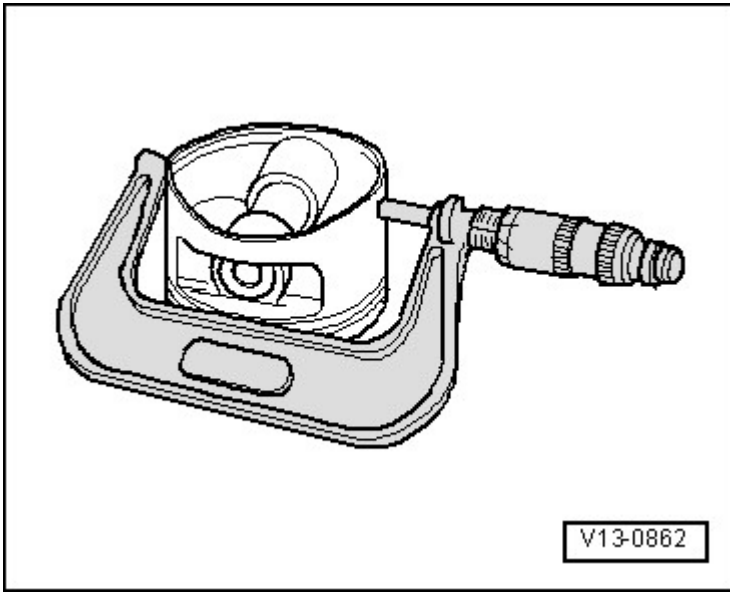


Fig. 17: Checking Piston

Courtesy of AUDI OF AMERICA, LLC

-- Measure approximately 15 mm from the lower edge at a 90° angle to the piston pin axis using an external micrometer 75 to 100 mm.

- Maximum deviation from nominal dimension: 0.03 mm.

Nominal dimension, refer to **PISTON AND CYLINDER DIMENSIONS**.

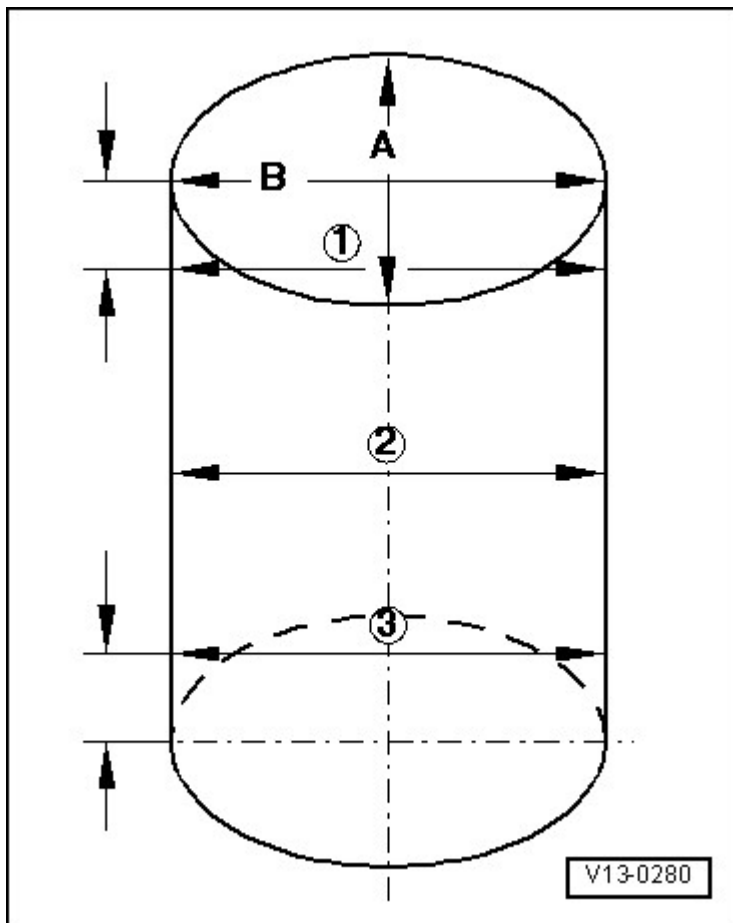


Fig. 18: Checking Cylinder Bores

Courtesy of AUDI OF AMERICA, LLC

-- Measure diagonally at 3 positions transversely -A- and longitudinally -B- using a cylinder gauge VAS 6078.

- Maximum deviation from nominal dimension: 0.08 mm.

Nominal dimension, refer to **PISTON AND CYLINDER DIMENSIONS**.

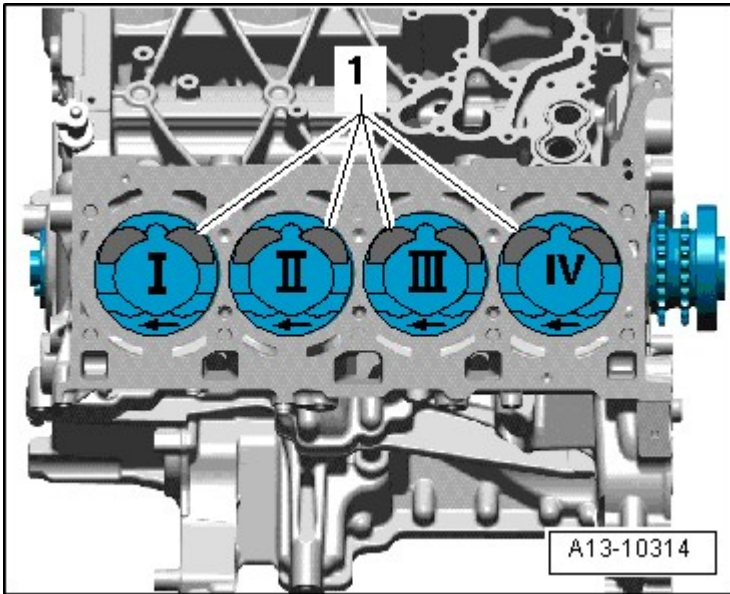


Fig. 19: Piston Installation Position

Courtesy of AUDI OF AMERICA, LLC

CAUTION: The coating on the piston crown could be destroyed.

- Mark the allocation to the cylinder on the piston crown with paint to install used pistons. Do not mark the piston crown with a punch, notch or similar object.

Installation position:

- Arrows on piston heads point to belt pulley side.
- Large valve recesses -1- point toward center of engine.

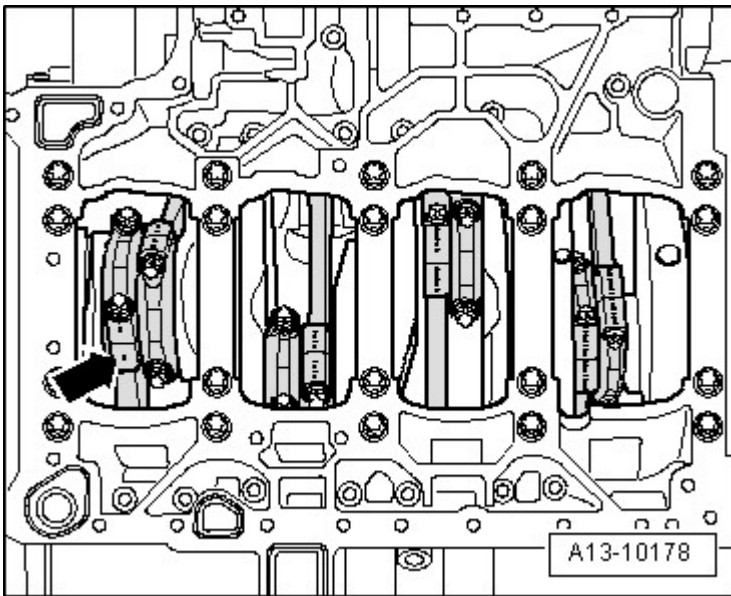


Fig. 20: Identifying Mark On Connecting Rod

Courtesy of AUDI OF AMERICA, LLC

NOTE: Only replace connecting rod as a set.

Do not interchange connecting rod bearings.

-- Mark connecting rod and connecting rod bearing cap to each other and to cylinder -arrow- with paint before removal.

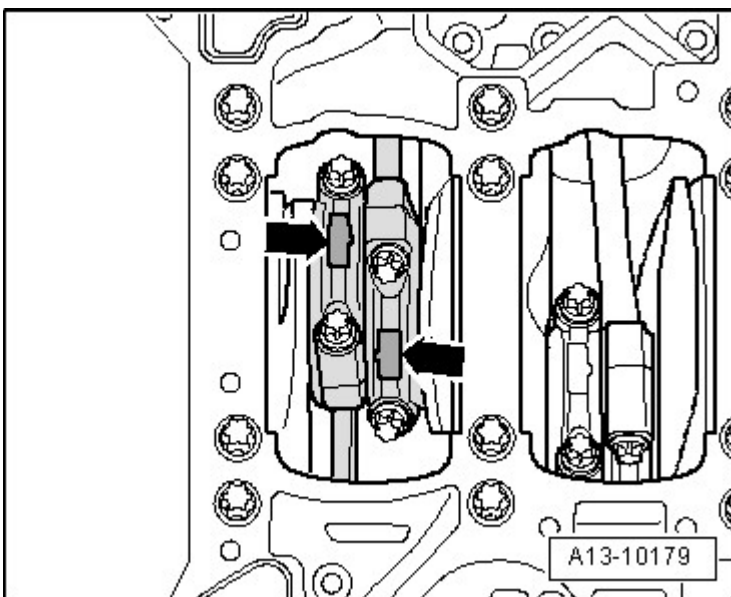


Fig. 21: Connecting Rod, Installed Location

Courtesy of AUDI OF AMERICA, LLC

- Molded tabs -arrows- at the beveled surfaces of the connecting rod pairs 1 and 2, 3 and 4, 5 and 6 as well

as 7 and 8 must point toward each other.

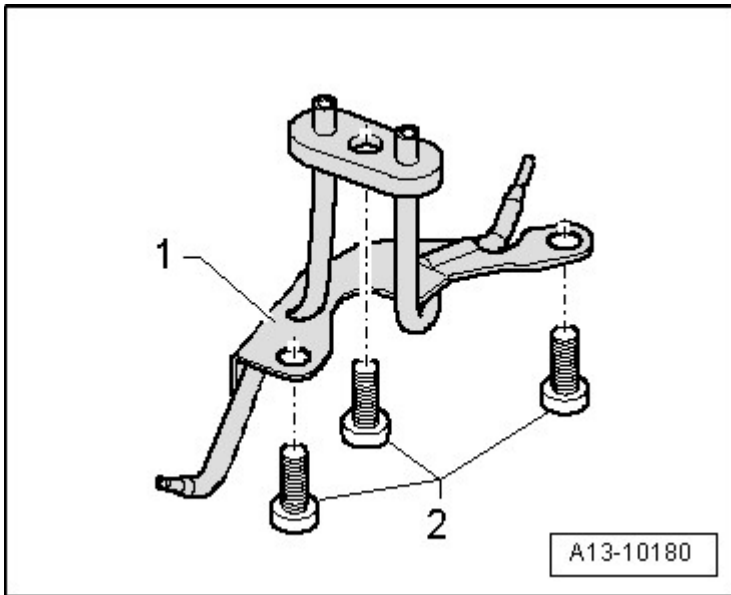


Fig. 22: Identifying Oil Spray Jet For Piston Cooling
Courtesy of AUDI OF AMERICA, LLC

1. Oil spray jet

NOTE: Do not bend piston spray nozzles.

Bend piston spray nozzles must be replaced.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Component	Bolt Size	Nm
Bracket for idler pulley		9
Bracket for ribbed belt tensioner		9
Connecting Rod		50 + 90°
Drive Plate		60 + 90°
Generator Bracket		
	M8	22
	M10	46
Guide Tube for Oil Dipstick		9
Idler Roller for Ribbed Belt		22
Tensioning Device for Ribbed Belt		22
<ul style="list-style-type: none"> • ¹ Always replace 		

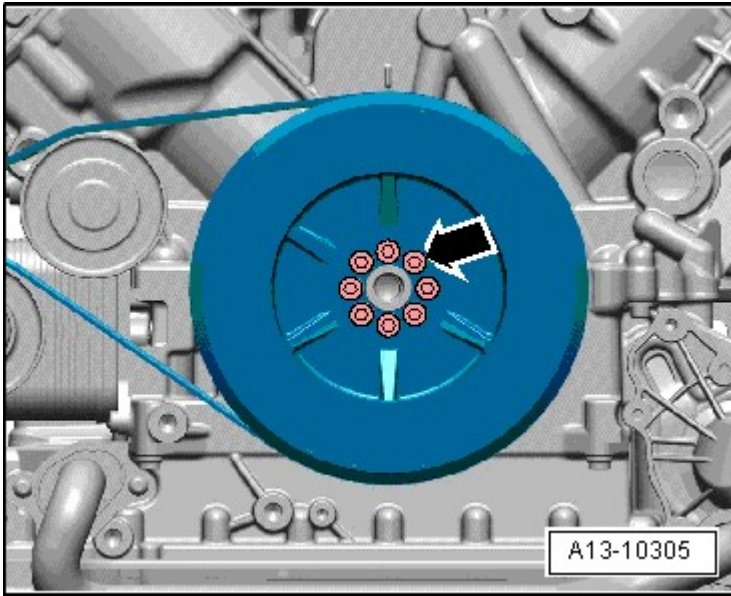
Vibration Damper Tightening Sequence

Fig. 23: Loosening Mounting Bolts On Vibration Damper
Courtesy of AUDI OF AMERICA, LLC

- Tighten bolts -arrow- in diagonal sequence in 3 stages as follows:
- Tighten the bolts to 15 Nm.
- Tighten the bolts to 22 Nm.
- Tighten the bolts an additional 90°.

Baffle Plate - Tightening Specifications and Sequence

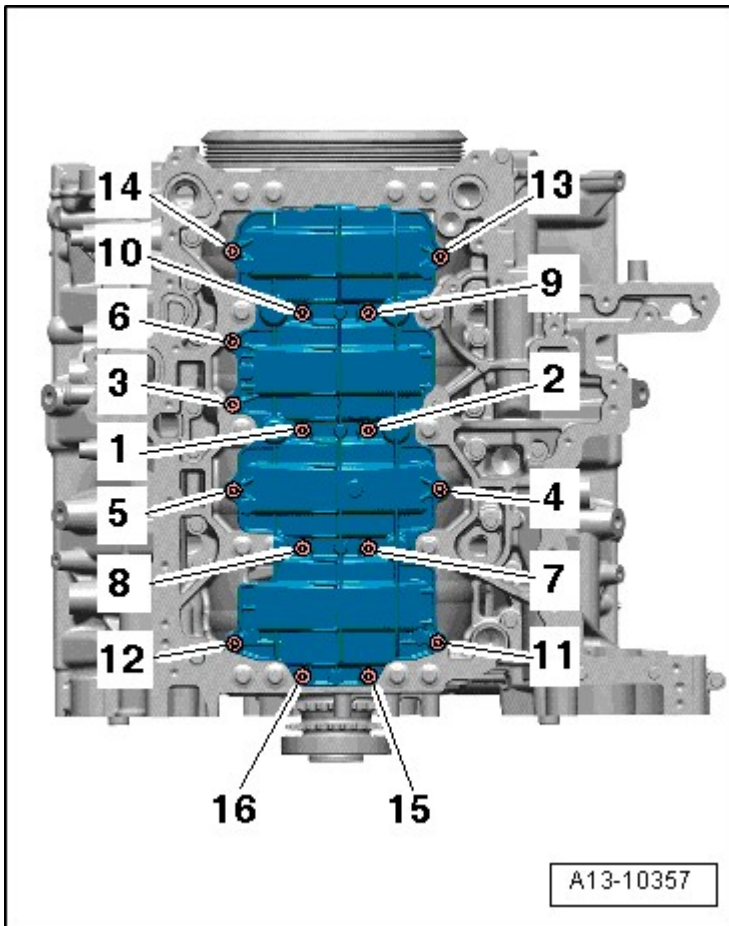


Fig. 24: Identifying Baffle Plate Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Then tighten the bolts in the sequence -1 to 16- to 9 Nm.

CRANKSHAFT DIMENSIONS

Reconditioning dimension in mm	Crankshaft journal diameter	Connecting rod journal diameter
Basic dimension	65.000 - 0.022 - 0.042	54.000 - 0.022 - 0.042
Repair stage	64.750 - 0.022 - 0.042	53.750 - 0.022 - 0.042

PISTON AND CYLINDER DIMENSIONS

Matching pistons are allocated to the different manufacturing stages of the cylinder block.

Cylinder bore diameter mm	Piston diameter mm
84.51 ± 0.05	84.49 ⁽¹⁾
84.61 ± 0.05	84.59 ⁽¹⁾
Measurement with coating (thickness = 0.01 mm). The coating wears off.	

(1)

DIAGNOSIS AND TESTING**AXIAL CLEARANCE, MEASURING****Special tools and workshop equipment required**

- Dial Gauge Holder VW 387
- Dial Gauge VAS 6079

Procedure

-- Secure VAS 6079 with VW 387 to cylinder block as shown in illustration.

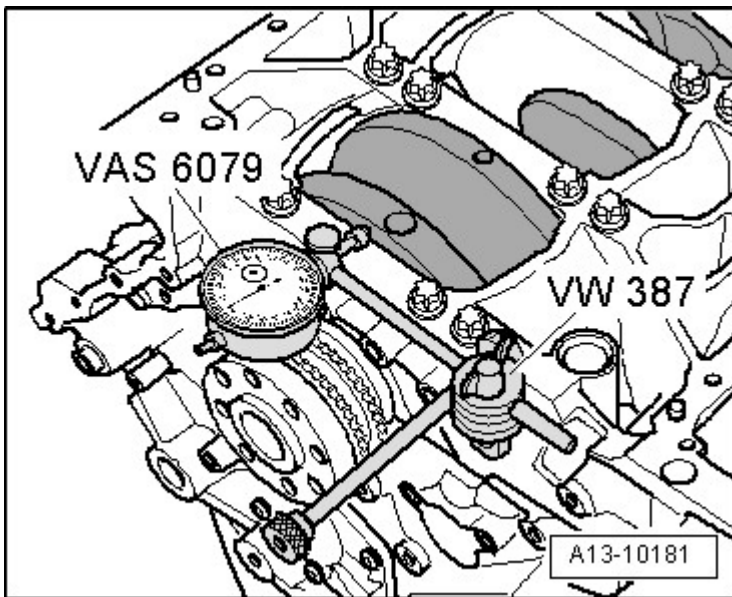


Fig. 25: Attaching Dial Indicator VAS 6079 Together With Dial Gauge Holder VW 387 To Cylinder Block And Setting Indicator Against Crankshaft Counterweight
Courtesy of AUDI OF AMERICA, LLC

- Position dial gauge against crankshaft counterweight.
- Press crankshaft by hand against gauge and set gauge to "0".
- Press crankshaft off gauge and read value.
- Axial clearance: 0.090 to 0.251 mm.

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

- Plastigage

Procedure

NOTE: **Marked the used bearing for installation later, but not on the running surface.**

Replace bearing shells worn down to the base layer.

- Remove guide frame and clean journals.
- Place Plastigage over entire width of bearing journal or into bearing shells.
 - Plastigage must rest in center of bearing shell.
- Install guide frame and tighten to 30 Nm. Do not turn crankshaft.
- Remove guide frame again.
- Compare width of Plastigage with measuring scale.

Radial clearance:

- New: 0.017 to 0.044 mm.
- Wear limit: 0.08 mm.

CONNECTING ROD, MEASURING RADIAL CLEARANCE**Special tools and workshop equipment required**

- Plastigage

Procedure

- Remove connecting rod bearing caps.
- Clean bearing caps and journals.
- Place Plastigage over entire width of bearing journal or into bearing shells.
- Install connecting rod bearing cap and tighten to 60 Nm. Do not turn crankshaft.
- Remove connecting rod bearing caps again.
- Compare width of Plastigage with measuring scale.

Radial clearance:

- New: 0.020 to 0.069 mm.
- Wear limit: 0.120 mm.

-- Replace bolts for connecting rod bearings.

REMOVAL AND INSTALLATION

RIBBED BELT

Removing

-- Pull front engine cover off -arrows-.

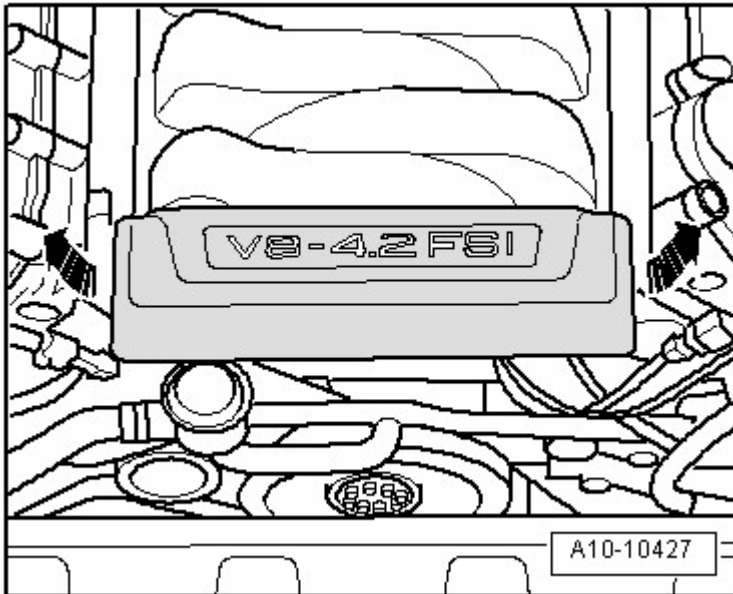


Fig. 26: Identifying Front Engine Cover, Electrical Connector, And Left Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

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.

-- Pivot tensioning device in direction of -arrow- to relieve tension on ribbed belt.

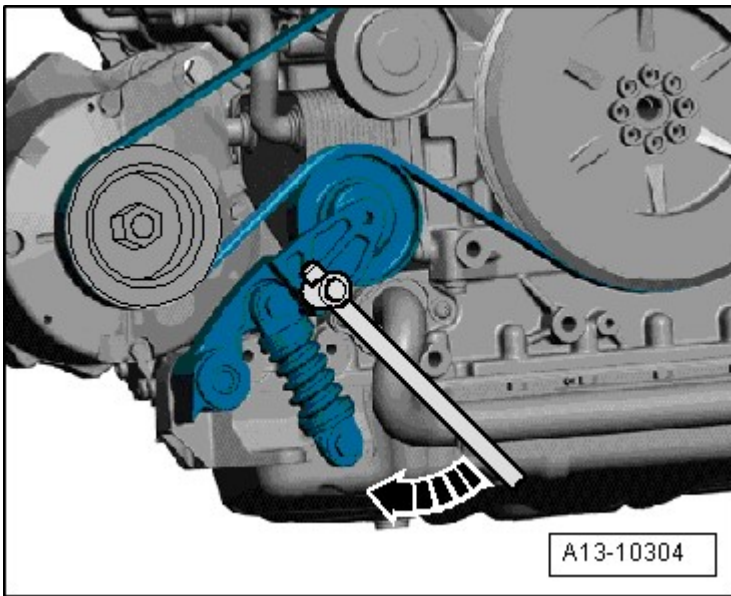


Fig. 27: Releasing Ribbed Belt Tension
Courtesy of AUDI OF AMERICA, LLC

-- Remove ribbed belt and release tensioning device.

Installing

Installation is in reverse order of removal, note the following:

-- Route ribbed belt -2- over belt pulley in the specified sequence.

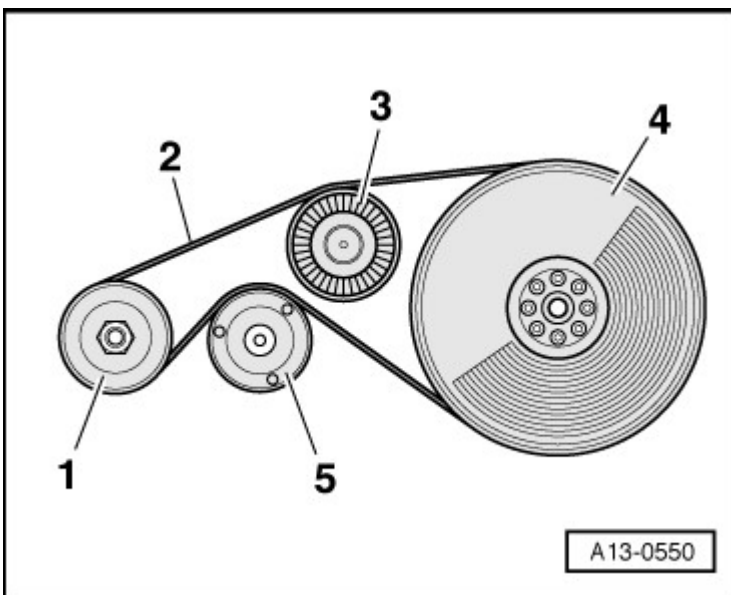


Fig. 28: Placing Ribbed Belt Over Belt Pulley In Sequence
Courtesy of AUDI OF AMERICA, LLC

- 1 -Generator
- 3 -Idler roller
- 4 -Vibration damper
- 5 -Tensioning roller

NOTE: When installing the ribbed belt, make sure it is seated correctly on the pulleys.

-- Start the engine and check the belt routing.

VIBRATION DAMPER

Removing

-- Pull front engine cover off -arrows-.

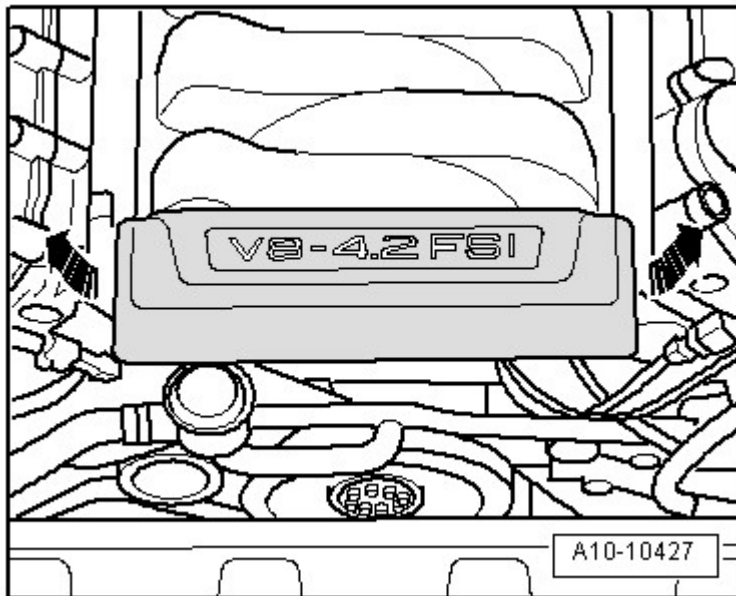


Fig. 29: Identifying Front Engine Cover, Electrical Connector, And Left Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

NOTE: To loosen and tighten vibration damper, counterhold on central nut of generator belt pulley using open end wrench.

-- Loosen the 8 mounting bolts -arrow- on vibration damper a few turns.

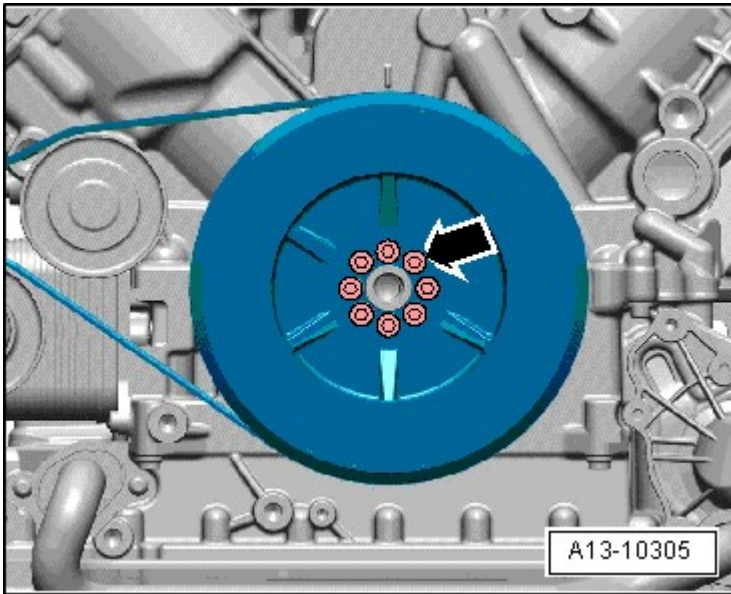


Fig. 30: Identifying Mounting Bolts On Vibration Damper
Courtesy of AUDI OF AMERICA, LLC

- Remove ribbed belt. Refer to **RIBBED BELT**.
- Remove bolts -arrows- and remove vibration damper.

Installing

- Tightening specifications, refer to **Fig. 7**.

Installation is in reverse order of removal, note the following:

NOTE: Replace bolts which have been tightened to torque.

- The vibration damper can only be installed in one position - note the alignment bushing.

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

CRANKSHAFT SHAFT SEAL, BELT PULLEY SIDE, REPLACING

Special tools and workshop equipment required

- Oil Seal Extractor T40019
- Assembly Device T40048

Procedure

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

-- Position the inner section of the T40019 so it is flush with outer section and secure it with the knurled screw.

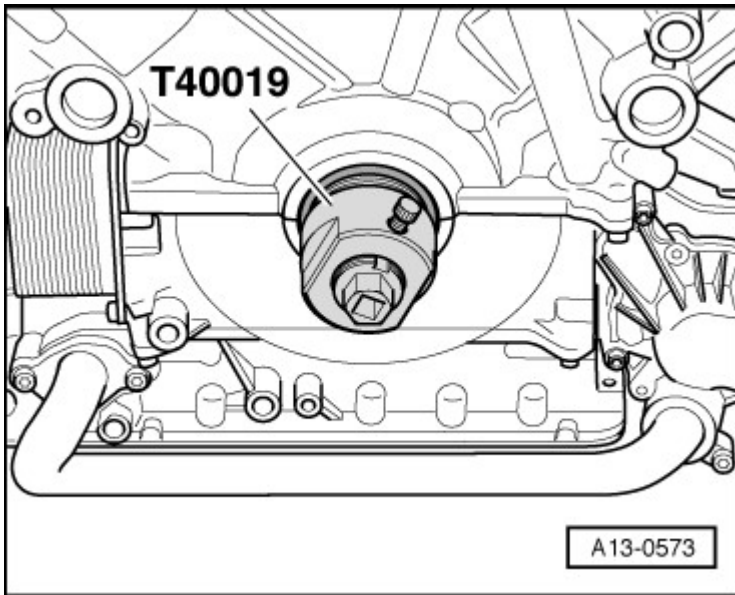


Fig. 31: Identifying Oil Seal Extractor T40019

Courtesy of AUDI OF AMERICA, LLC

-- Lubricate the seal remover threaded head, position it, and then install it into the shaft seal as far as possible using strong force.

-- Loosen the knurled screw and turn the inner portion against the crankshaft until the seal is pulled out.

-- Secure the seal remover in a vise at the flat spots and remove the seal using pliers.

-- Clean the running and sealing surfaces.

-- Place the T40048/1 on the T40048/2 and slide the shaft seal -1- onto the pull sleeve.

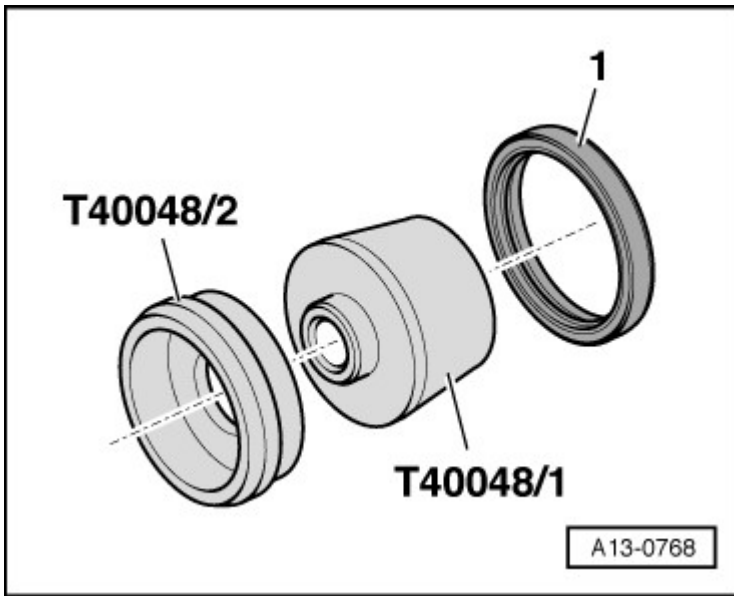


Fig. 32: Inserting Assembly Device T40048/1 Onto Pull Sleeve T40048/2 And Slide Seal Onto Pull Sleeve
Courtesy of AUDI OF AMERICA, LLC

-- Remove assembly device.

-- Place the T40048/2 on the crankshaft and slide the shaft seal -1- into the sealing surface on the engine.

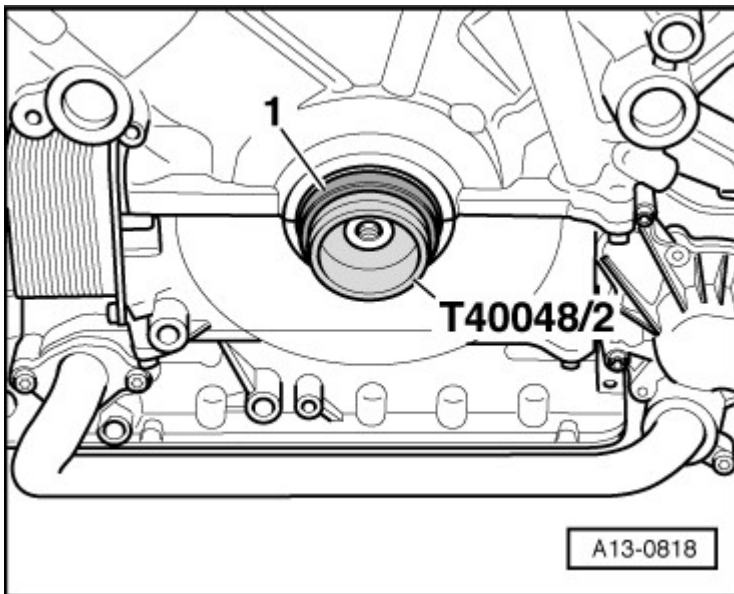


Fig. 33: Placing Pull Sleeve T40048/2 On Crankshaft And Sliding Seal Into Sealing Surface On Engine
Courtesy of AUDI OF AMERICA, LLC

- The pull sleeve remains on crankshaft for pressing in.

-- Position T40048/3 with 2 M8 X 55 mm bolts -arrows- on crankshaft.

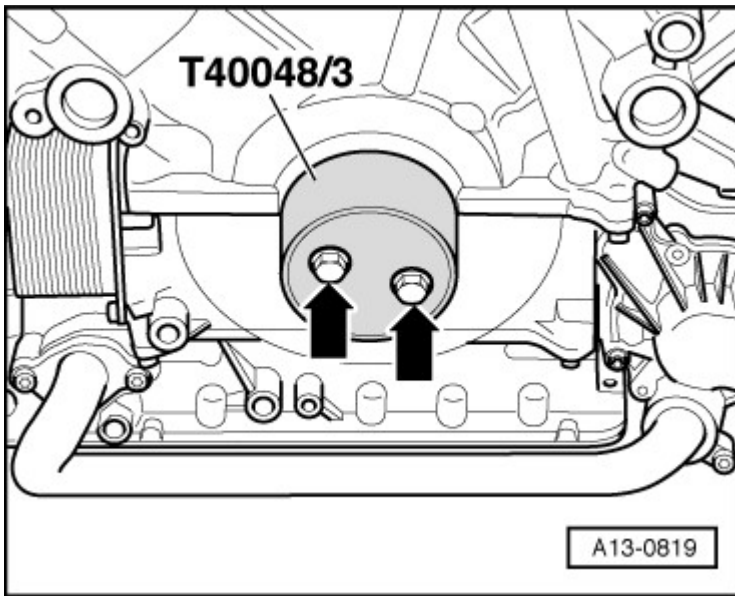


Fig. 34: Positioning Pressure Sleeve T40048/3 With Bolts On Crankshaft
Courtesy of AUDI OF AMERICA, LLC

-- Install the bolts by hand.

-- Tighten bolts $1 \frac{1}{2}$ turn each, alternating sides, to press the shaft seal in as far as the stop.

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

-- Install vibration damper, refer to **VIBRATION DAMPER**.

DRIVE PLATE

Special tools and workshop equipment required

- Counter Hold Tool 10-201

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .

-- Insert 10-201 to loosen bolts.

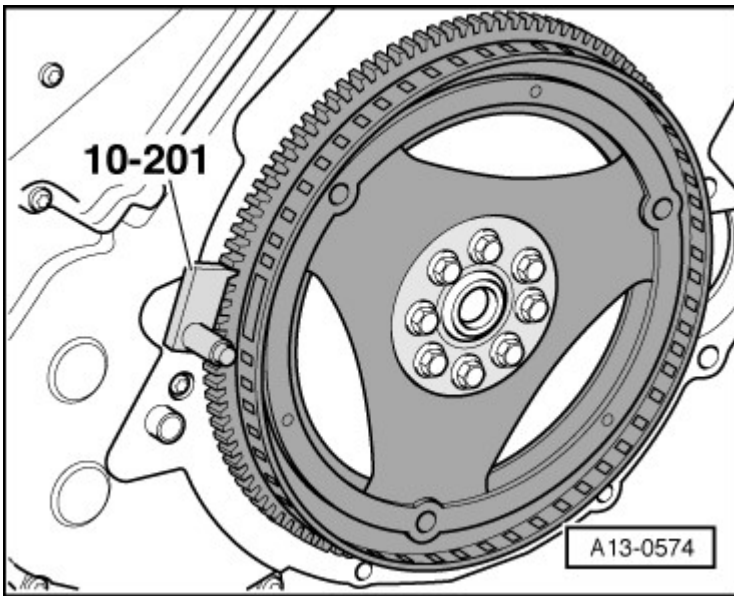


Fig. 35: Inserting Counter Hold Tool 10-201 To Loosen Bolts
Courtesy of AUDI OF AMERICA, LLC

- Mark the installation position on drive plate to crankshaft using a felt-tip marker.
- Remove drive plate.
- Remove spacer washer behind.

Installing

- Tightening specifications, refer to **DRIVE PLATE ASSEMBLY OVERVIEW**.

Installation is in reverse order of removal, note the following:

NOTE: **Replace bolts which have been tightened to torque.**

- Install drive plate with spacer washer.
- Reposition the 10-201 to tighten the bolts.

CRANKSHAFT SEAL, TRANSMISSION SIDE

Special tools and workshop equipment required

- Assembly Tool T10122
- Pulling Hook T20143

Procedure

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING**.

-- Remove drive plate. Refer to **DRIVE PLATE**.

-- Pry the shaft seal out with the T20143/2.

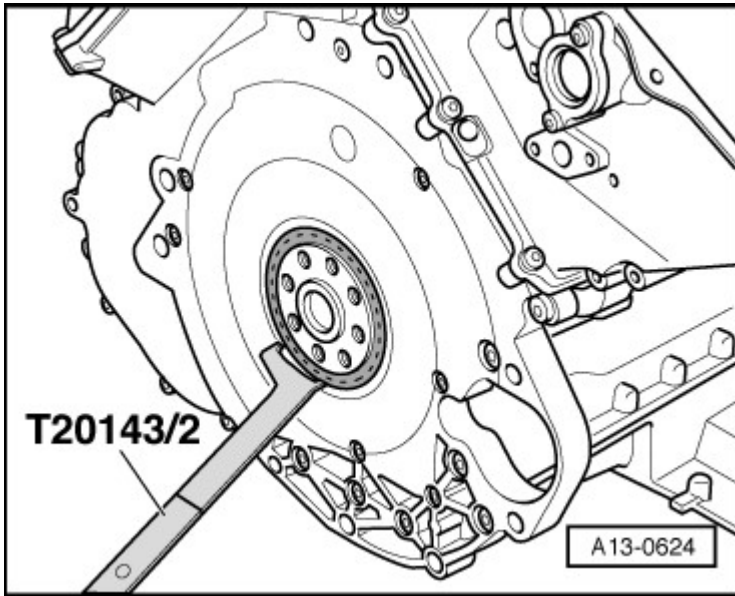


Fig. 36: Prying Out Sealing Ring Using Extractor Lever T20143/2
Courtesy of AUDI OF AMERICA, LLC

-- Clean the running and sealing surfaces.

-- Position the T10122/1 on the T10122/2 and slide the shaft seal -A- onto the pulling sleeve.

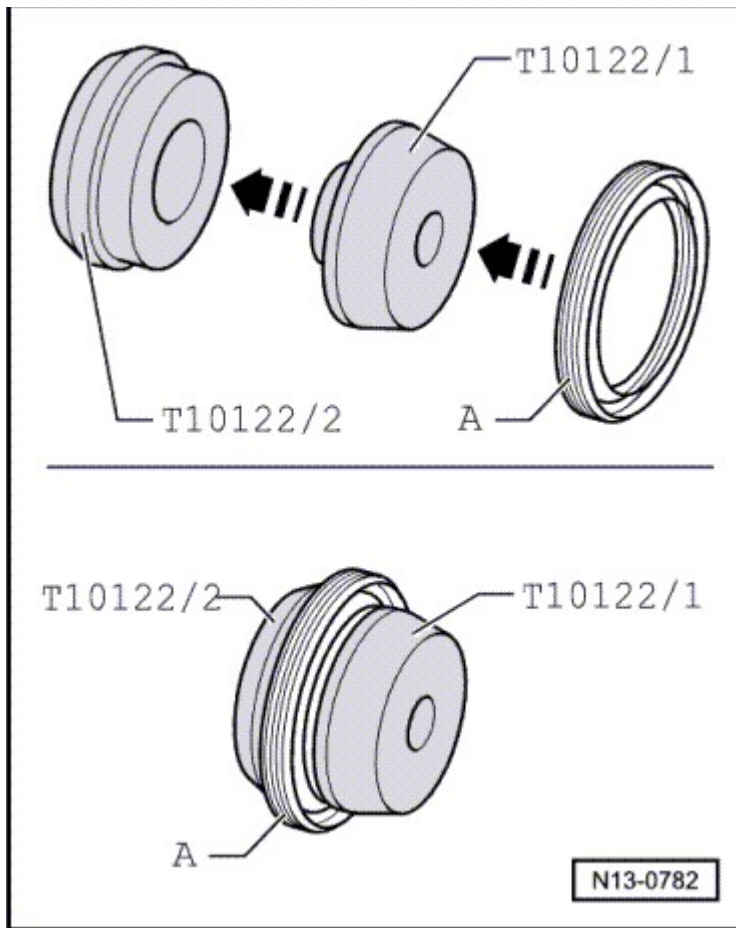


Fig. 37: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2
 Courtesy of AUDI OF AMERICA, LLC

- Remove assembly device.
- Position the T10122/2 with shaft seal -1- on the crankshaft.

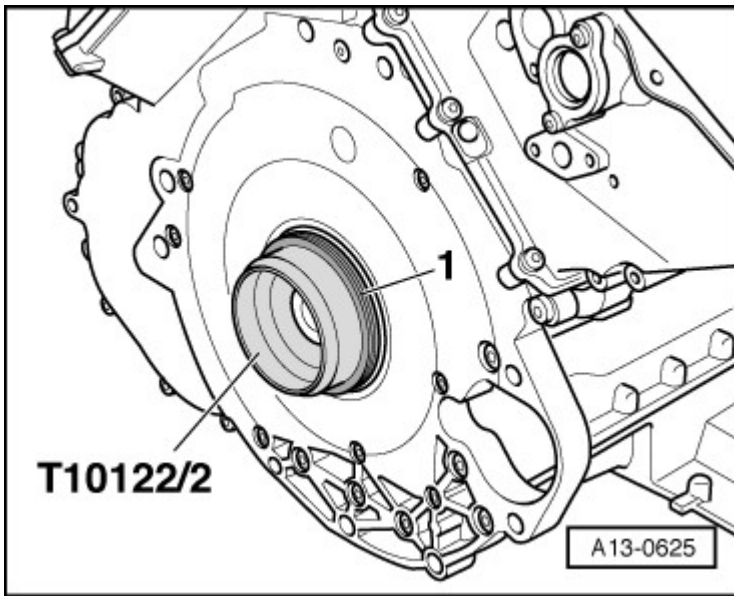


Fig. 38: Identifying Pull Sleeve T10122/2 With Sealing Ring On Crankshaft
Courtesy of AUDI OF AMERICA, LLC

-- Press the shaft seal in evenly and flush, using T10122/3.

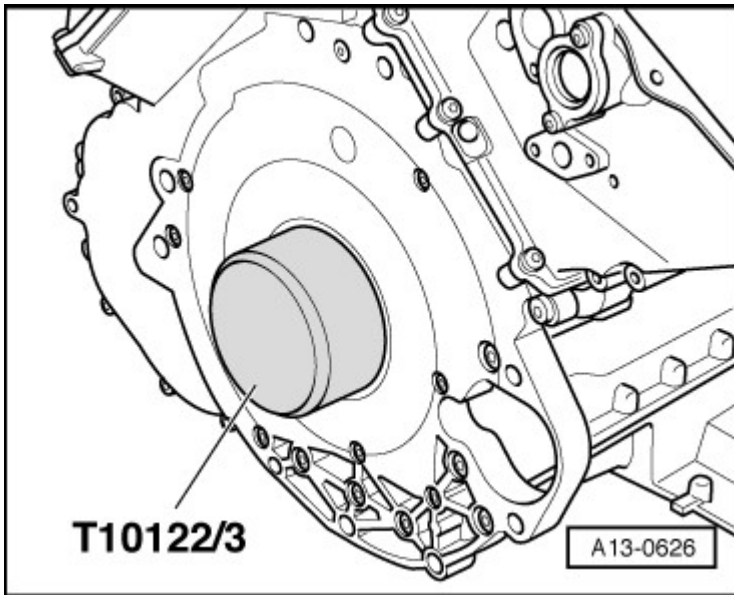


Fig. 39: Pressing In Seal Evenly All Around Until It Reaches Stop Using T10122/3
Courtesy of AUDI OF AMERICA, LLC

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

-- Install drive plate. Refer to **DRIVE PLATE**.

SPECIAL TOOLS

Special tools and workshop equipment required

- Dial Gauge Holder VW 387

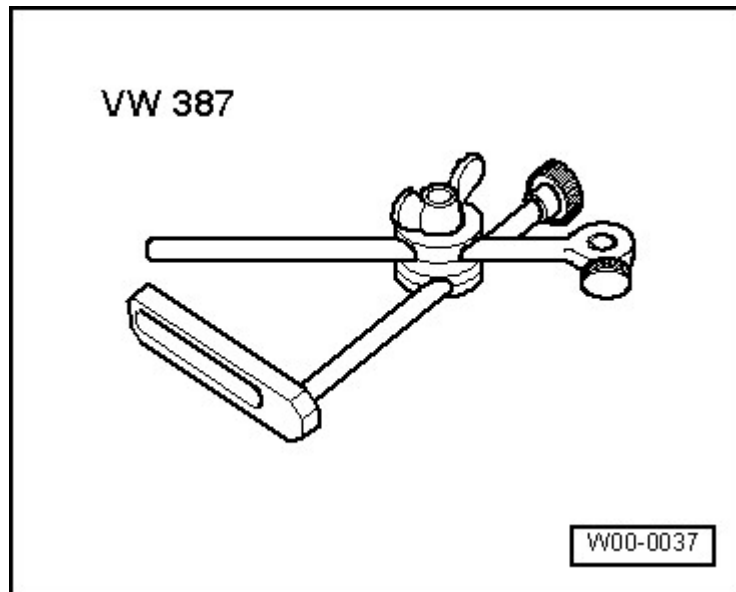


Fig. 40: Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge VAS 6079

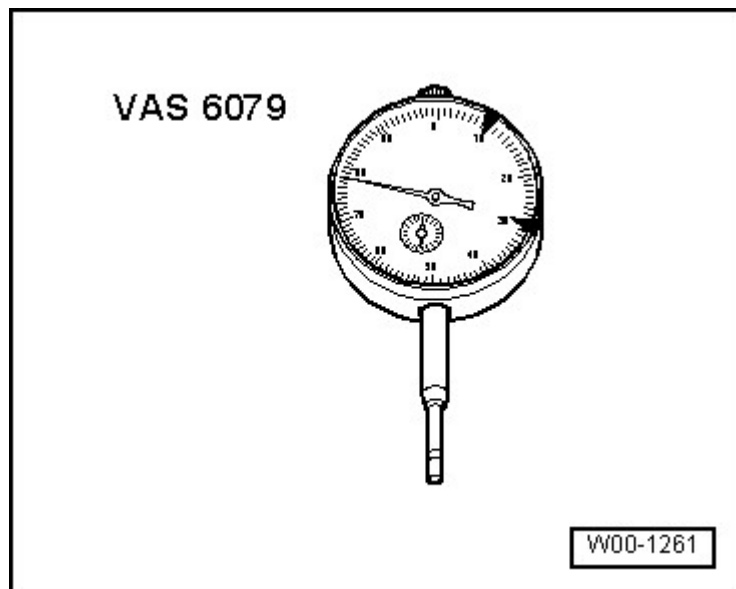


Fig. 41: Dial Gauge VAS 6079
Courtesy of AUDI OF AMERICA, LLC

- Oil Seal Extractor T40019

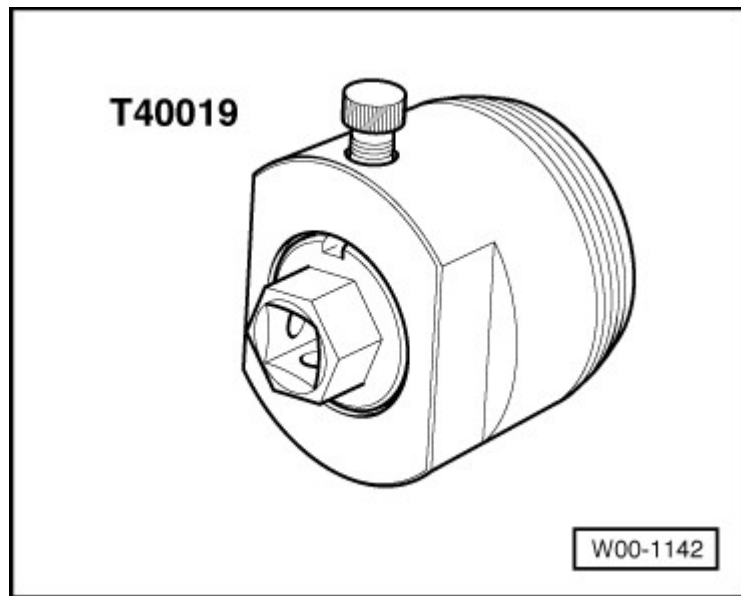


Fig. 42: Oil Seal Extractor T40019
Courtesy of AUDI OF AMERICA, LLC

- Assembly Device T40048

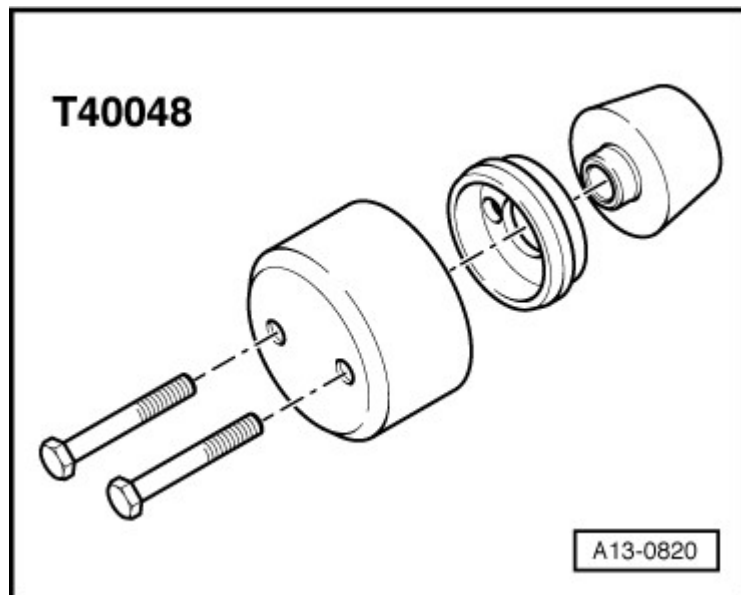


Fig. 43: Assembly Tool T40048
Courtesy of AUDI OF AMERICA, LLC

- Counter Hold Tool 10-201

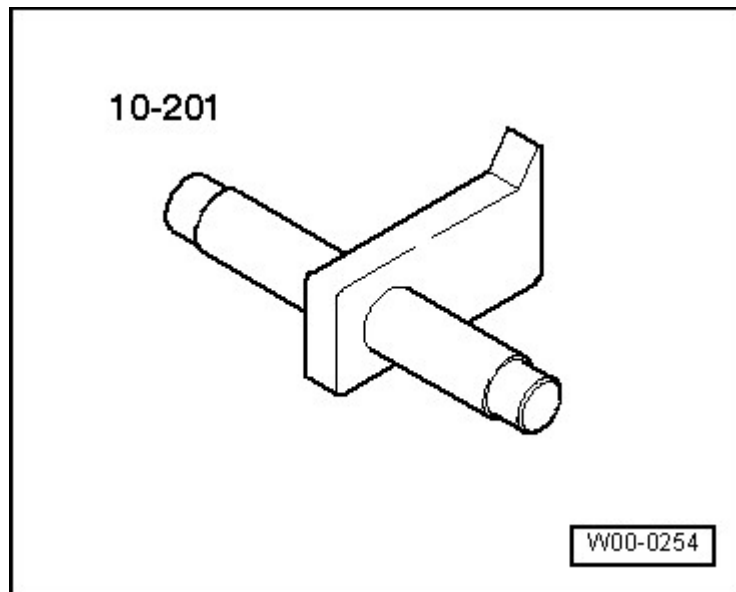


Fig. 44: Counter-Holder Tool 10 - 201
Courtesy of AUDI OF AMERICA, LLC

- Assembly Tool T10122

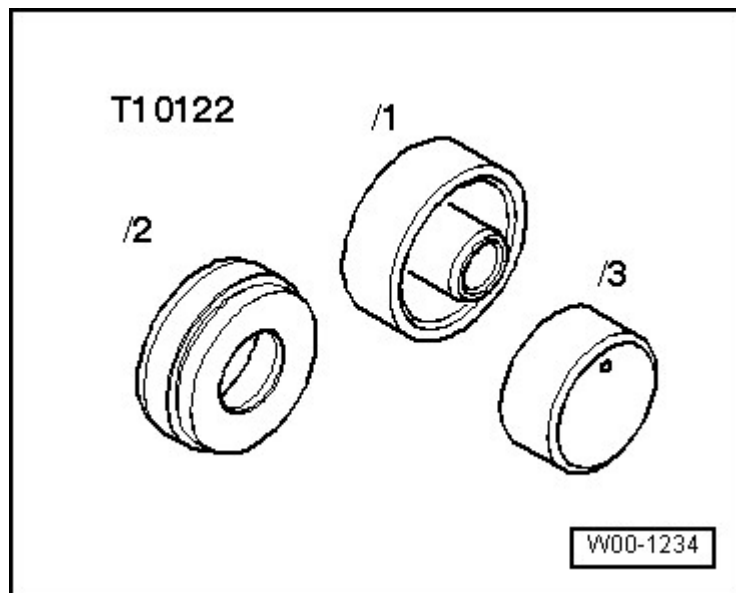


Fig. 45: Identifying Installation Tool T10122
Courtesy of AUDI OF AMERICA, LLC

- Pulling Hook T20143

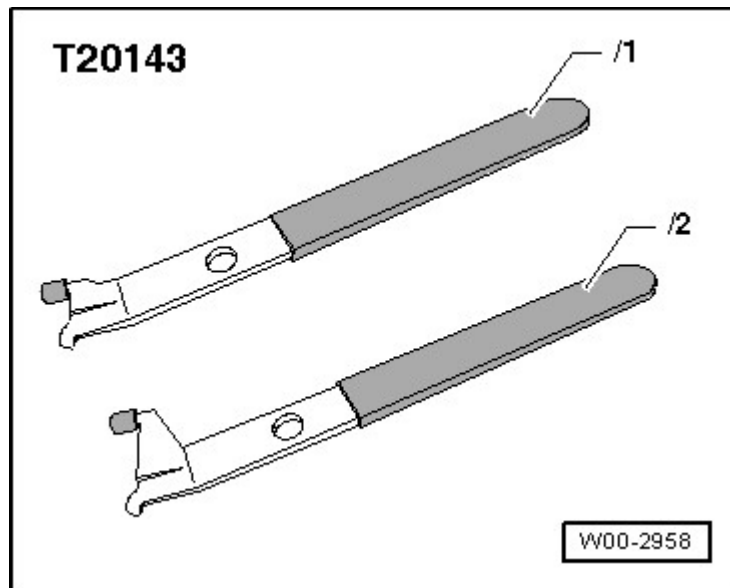


Fig. 46: Extractor Hook T20143
Courtesy of AUDI OF AMERICA, LLC

ENGINE

4.2 Liter - Cylinder Head, Valvetrain - Engine Code(s): BAR

15 CYLINDER HEAD, VALVETRAIN

DESCRIPTION AND OPERATION

TIMING CHAIN COVERS ASSEMBLY OVERVIEW

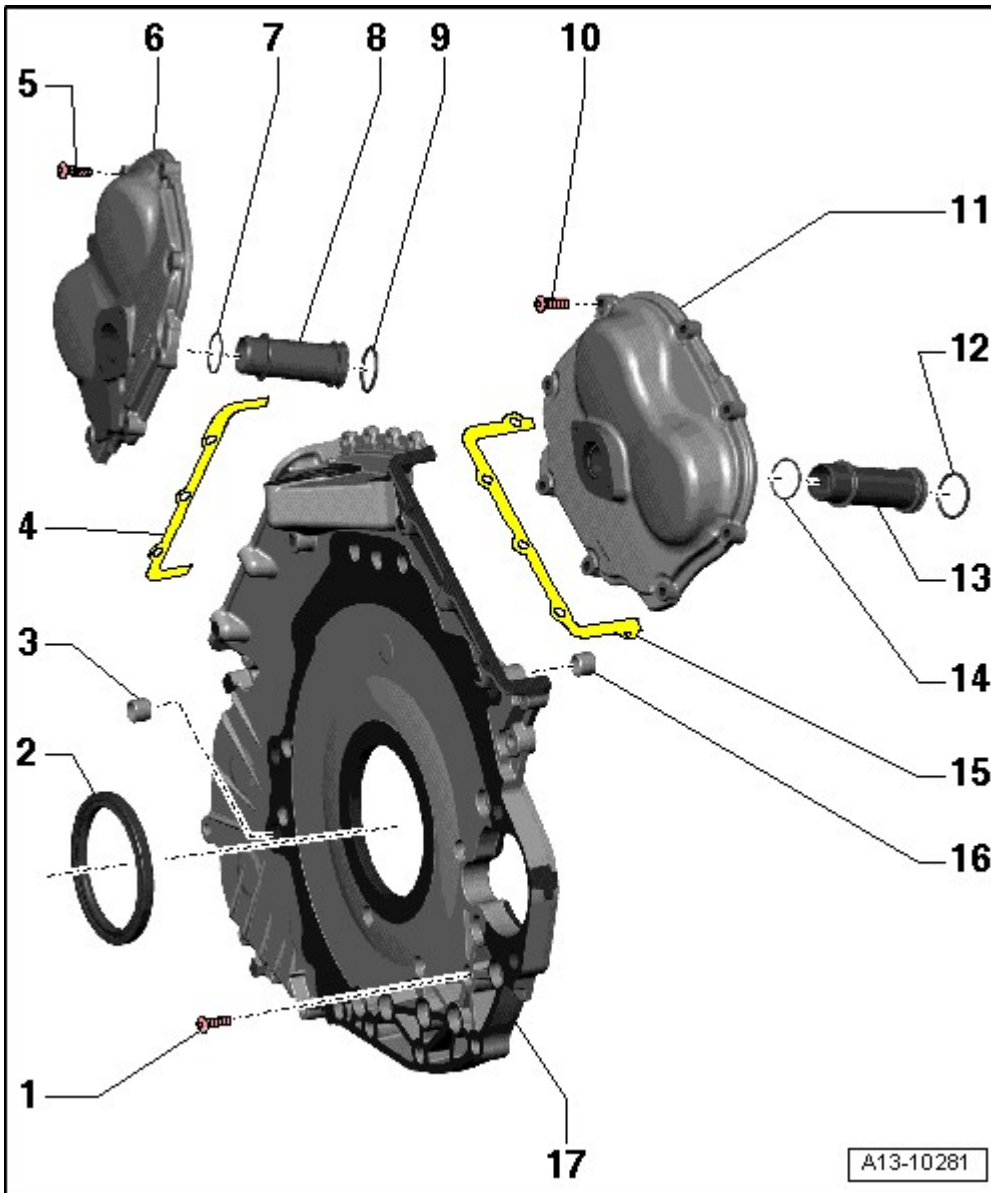


Fig. 1: Timing Chain Covers, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolt

- Tightening specification and sequence, refer to **Fig. 4**
- 2. Crankshaft Shaft Seal, Transmission Side
 - Replacing, refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE** .
- 3. Alignment Bushing
 - 2 pieces
- 4. Left Cylinder Head Gasket
- 5. Bolt
 - Tightening specification and sequence, refer to **Fig. 2**
- 6. Left Timing Chain Cover
 - Removal and installation, refer to **LEFT AND RIGHT TIMING CHAIN COVERS**
- 7. O-ring
 - Replace
- 8. Left Coolant Intermediate Pipe
 - Drive out with suitable drift
- 9. O-ring
 - Replace
- 10. Bolt
 - Tightening specification and sequence, refer to **Fig. 3**
- 11. Right Timing Chain Cover
 - Removal and installation, refer to **LEFT AND RIGHT TIMING CHAIN COVERS**
- 12. O-ring
 - Replace
- 13. Right Coolant Intermediate Pipe
 - Drive out with suitable drift
- 14. O-ring
 - Replace
- 15. Right Cylinder Head Gasket
- 16. Alignment Bushing
 - 2 pieces
- 17. Lower Timing Chain Cover
 - Removal and installation, refer to **LOWER TIMING CHAIN COVER**

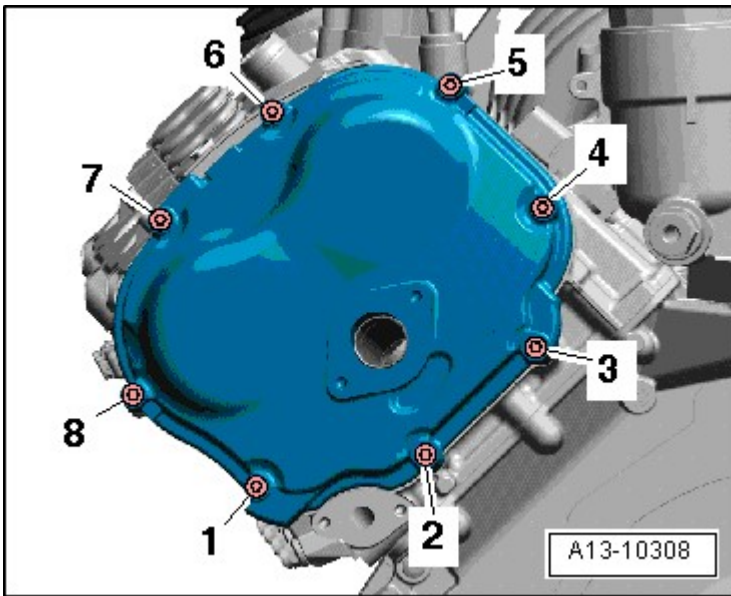


Fig. 2: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 8-.

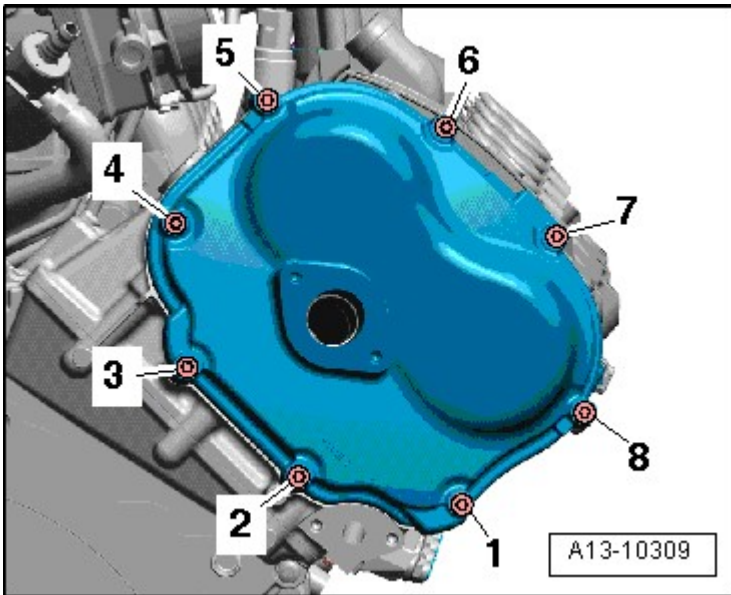


Fig. 3: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 8-.

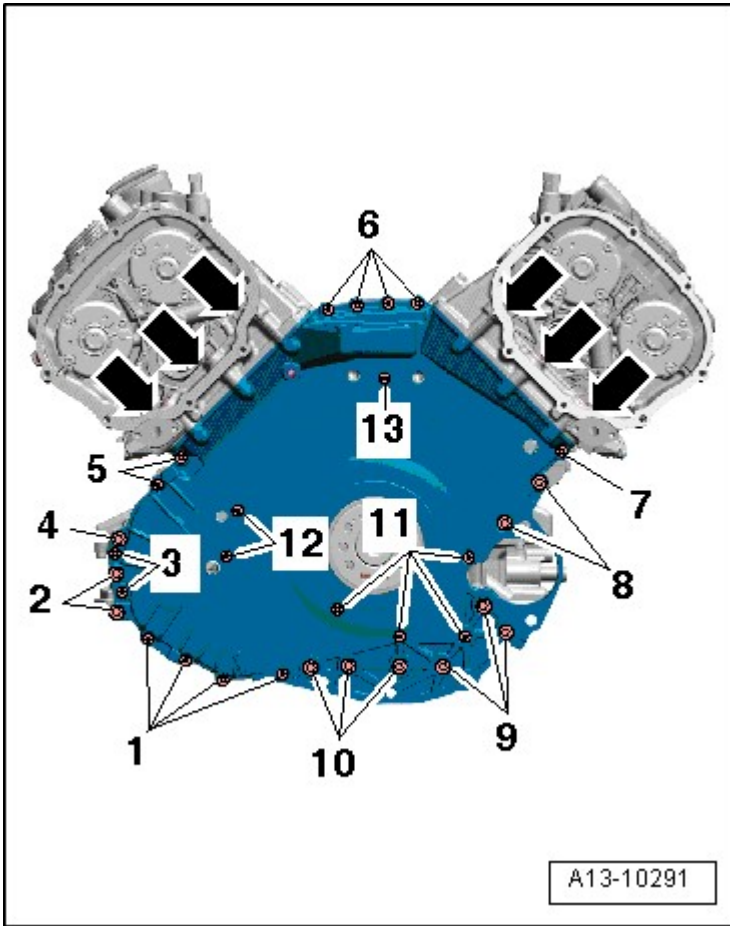


Fig. 4: Identifying Bolts And Lower Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

- Replace M6 bolts -1, 3, 5, 6, 7, 11, 12, 13- and -arrows-.
- Tighten bolts in 6 stages as follows:
- Pre-tighten the bolts -arrows- to 5 Nm.
- Tighten the bolts -1 to 13- in a diagonal sequence to 8 Nm using a torque wrench.
- Tighten bolts -arrows- to 8 Nm.
- Tighten M8 bolts -2, 4, 8, 9, 10- in a diagonal sequence to 22 Nm.
- Tighten the M6 bolts -1, 3, 5, 6, 7, 11, 12, 13- an additional 90° in a diagonal sequence.
- Tighten the bolts -arrows- an additional 90°.

CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW

Left camshaft timing chain

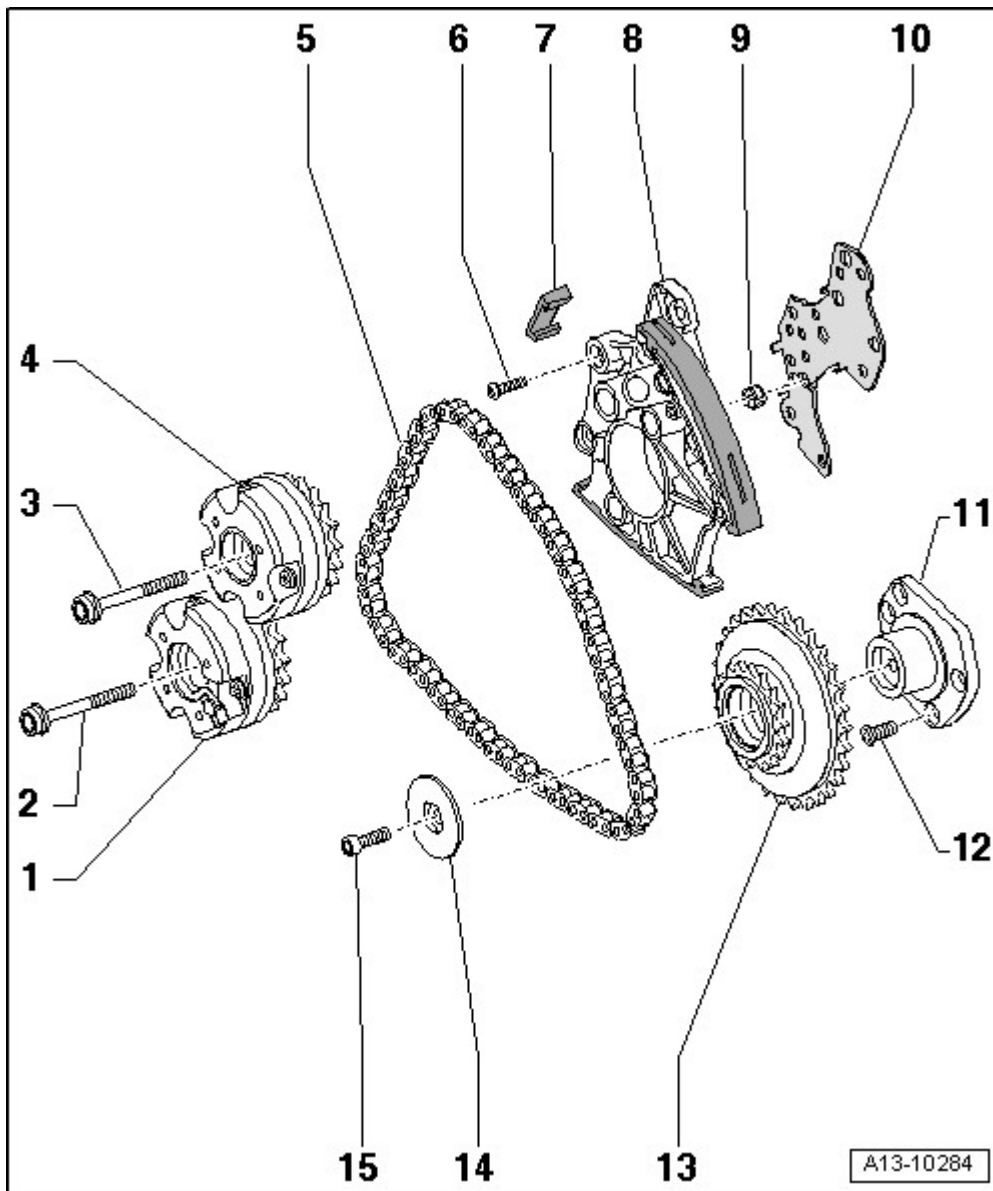


Fig. 5: Camshaft Timing Chain, Assembly Overview (Left Camshaft Timing Chain)
 Courtesy of AUDI OF AMERICA, LLC

1. Camshaft Adjuster for Exhaust Camshaft
 - Identification "Exhaust"
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
2. Bolt
 - Replace
 - 80 Nm plus an additional 90° turn
3. Bolt
 - Replace
 - 80 Nm plus an additional 90° turn

4. Camshaft Adjuster for Intake Camshaft
 - Identification "Intake"
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
5. Left Camshaft Timing Chain
 - Mark the running direction with pain before removing.
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
6. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
7. Guide Piece
8. Chain Tensioner for Left Camshaft Timing Chain
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
9. Oil Strainer
 - Set into the chain tensioner
 - Observe locating tabs on circumference
10. Gasket
 - Replace
 - Clipped onto the chain tensioner
11. Mounting Bracket for Drive Sprocket
12. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
13. Drive Sprocket for Left Camshaft Timing Chain
14. Thrust Washer for Drive Sprocket
15. Bolt
 - 22 Nm

Right camshaft timing chain

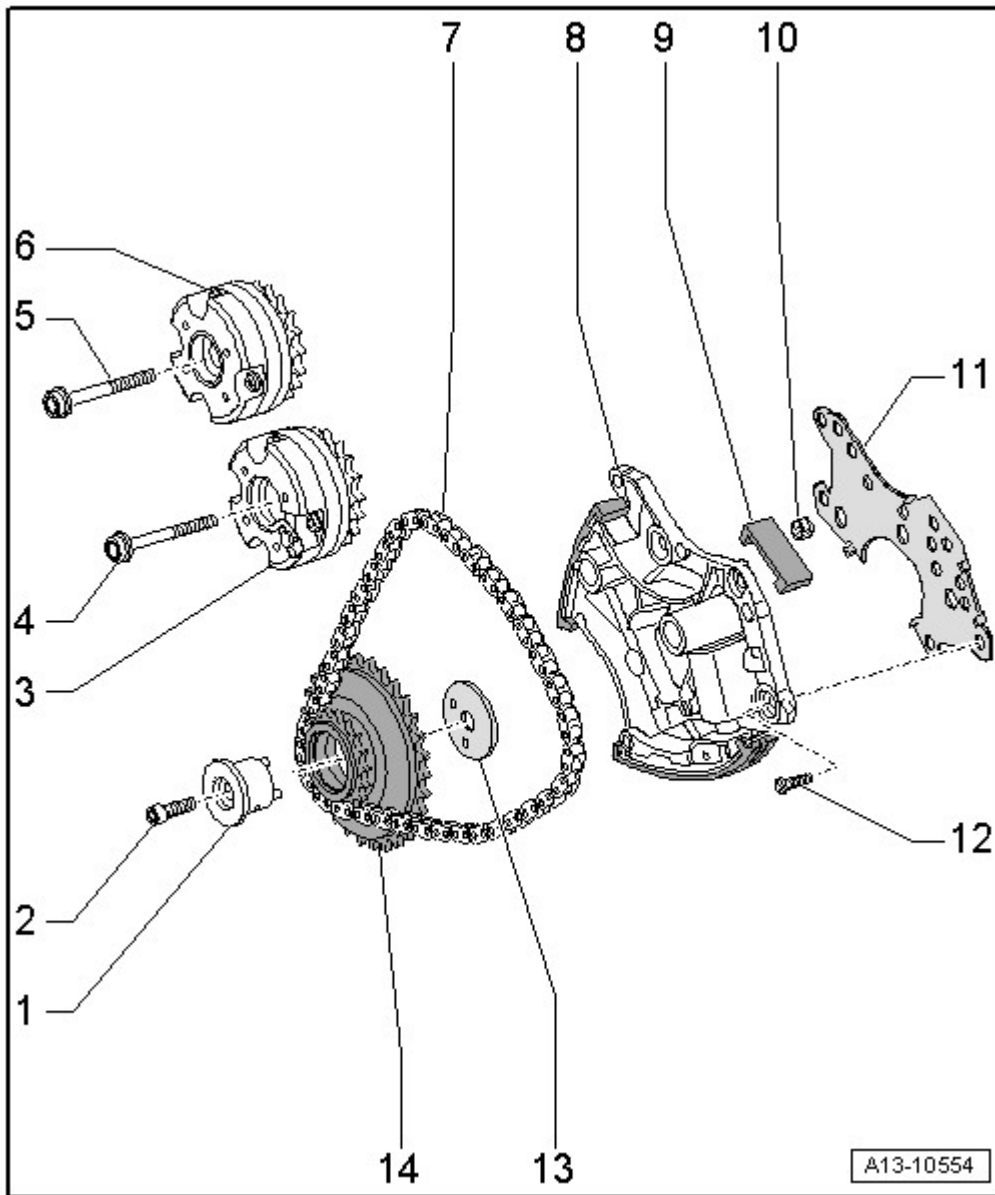


Fig. 6: Camshaft Timing Chain, Component Overview -- Right Camshaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

1. Pivot Pin for Drive Sprocket
 - For right camshaft timing chain
 - Asymmetrical version
 - Installed location, refer to **Fig. 7**
2. Bolt
 - 42 Nm
3. Camshaft Adjuster for Exhaust Camshaft
 - Identification "Exhaust"
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**

4. Bolt
 - Replace
 - 80 Nm plus an additional 90° turn
5. Bolt
 - Replace
 - 80 Nm plus an additional 90° turn
6. Camshaft Adjuster for Intake Camshaft
 - Identification "Intake"
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
7. Right Camshaft Timing Chain
 - Mark the running direction with pain before removing.
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
8. Chain Tensioner for Right Camshaft Timing Chain
 - Removal and installation, refer to **CAMSHAFT TIMING CHAIN**
9. Guide Piece
10. Oil Strainer
 - Set into the chain tensioner
 - Installation position: Observe locating tabs on circumference
11. Gasket
 - Replace
 - Clipped onto the chain tensioner
12. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
13. Thrust Washer for Drive Sprocket
14. Drive Sprocket for Right Camshaft Timing Chain

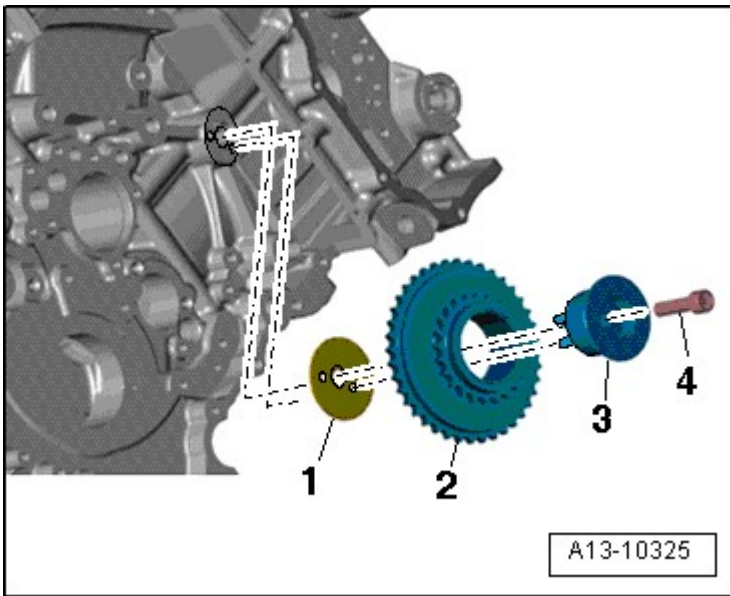


Fig. 7: Location Of Mounting Pins For Camshaft Timing Chain Drive Sprocket
 Courtesy of AUDI OF AMERICA, LLC

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

2 -

Drive sprocket for right camshaft timing chain

4 -

Bolt

TIMING MECHANISM DRIVE CHAIN ASSEMBLY OVERVIEW

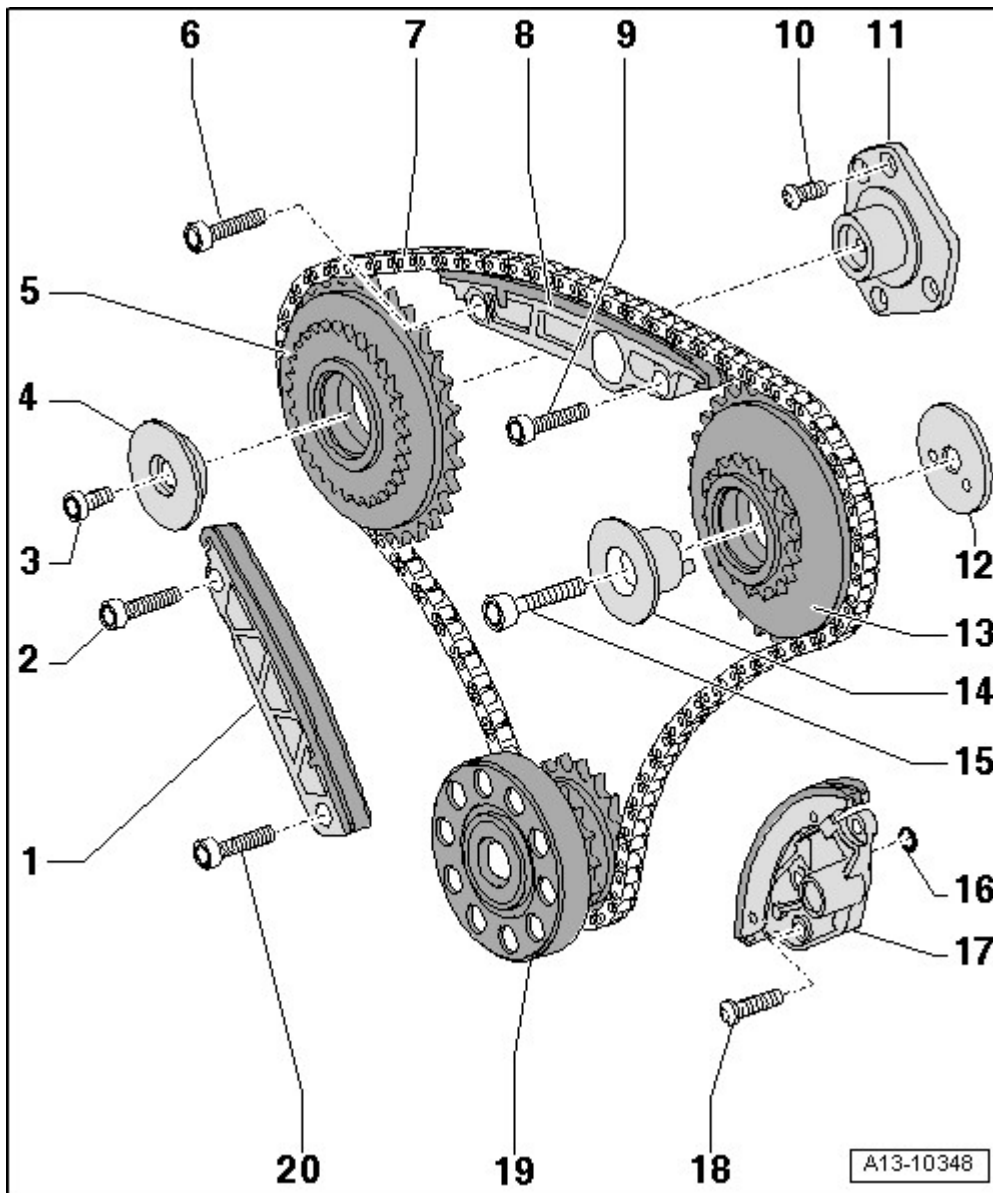


Fig. 8: Timing Mechanism Drive Chain, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Guide Rail
2. Bolt
 - Replace
 - 17 Nm plus an additional 90° turn
3. Bolt
 - Tightening specifications, refer to item -15- "Bolt" in numbered list under **CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW**
4. Thrust Washer for Drive Sprocket
5. Drive Sprocket for Left Timing Chain

6. Bolt
 - Replace
 - 17 Nm plus an additional 90° turn
7. Power Take-Off Drive Chain
 - Mark the running direction with pain before removing.
 - Removal and installation, refer to **TIMING MECHANISM DRIVE CHAIN**
8. Guide rail
9. Bolt
 - Replace
 - 17 Nm plus an additional 90° turn
10. Bolt
 - Tightening specifications, refer to item -12- "Bolt" in numbered list under **CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW**
11. Mounting Bracket for Drive Sprocket
 - For right camshaft timing chain
12. Thrust Washer
13. Drive Sprocket for Right Timing Chain
14. Pivot Pin for Drive Sprocket
 - Asymmetrical version
 - Installed location, refer to **Fig. 7**
15. Bolt
 - Tightening specifications, refer to item -2- "42 Nm" in numbered list under **CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW**
16. O-ring
 - Replace
17. Chain Tensioner
18. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
19. Crankshaft
20. Bolt
 - Replace
 - 17 Nm plus an additional 90° turn

POWER TAKE-OFF DRIVE CHAIN ASSEMBLY OVERVIEW

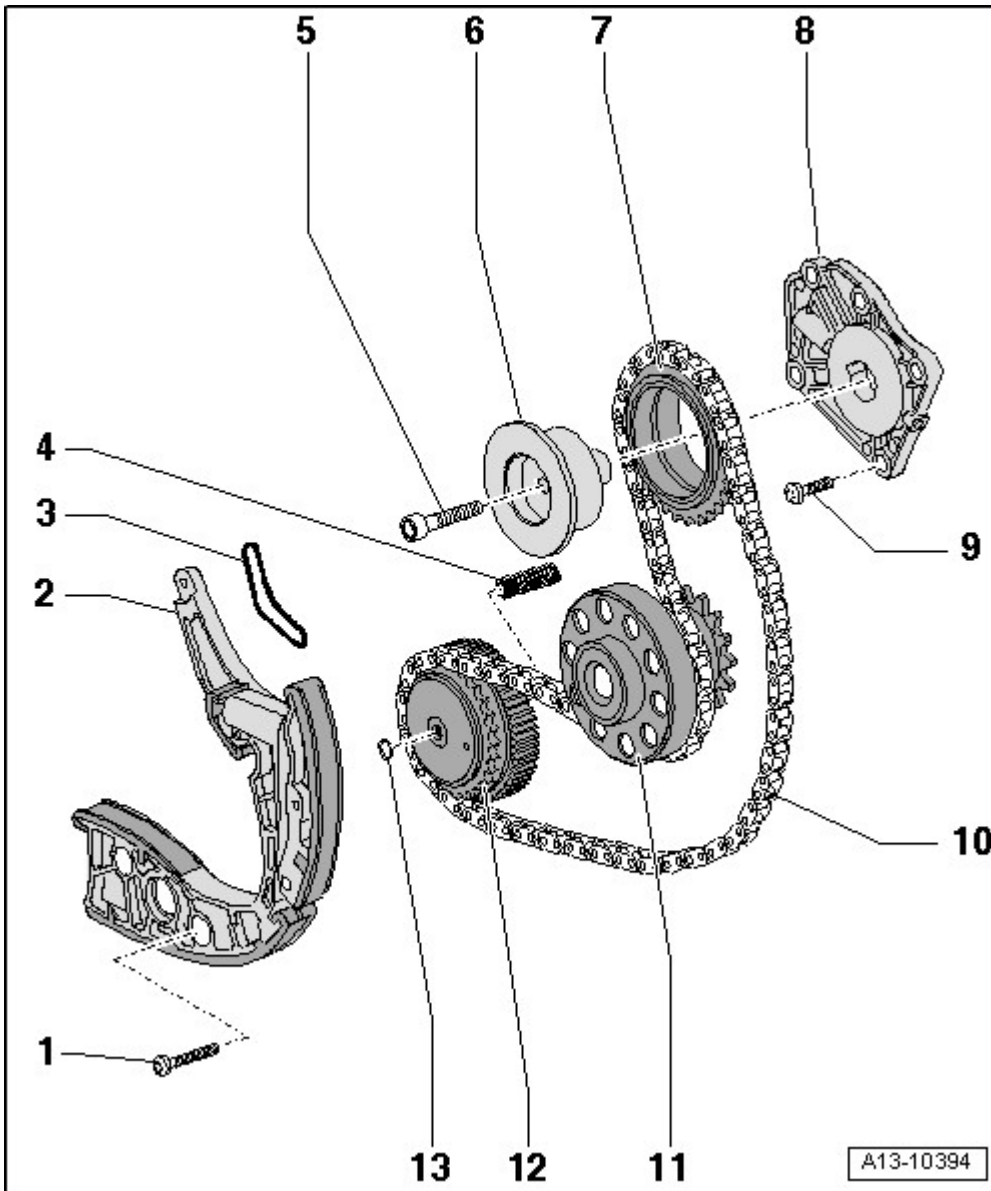


Fig. 9: Power Take-Off Drive Chain, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
2. Chain Tensioner
 - With glide track
3. Gasket
 - Replace
4. Spring
5. Bolt

- 42 Nm
- 6. Pivot Pin for Idler Sprocket
- 7. Idler Sprocket for Chain for Power Take-Off
- 8. Idler Sprocket Mounting Bracket
- 9. Bolt
 - Replace
 - 5 Nm plus an additional 90° turn
- 10. Power Take-Off Drive Chain
 - Mark the running direction with pain before removing.
 - Removal and installation, refer to **POWER TAKE-OFF DRIVE CHAIN**
- 11. Crankshaft
- 12. Drive Sprocket for Power Take-Off
- 13. Circlip

POWER TAKE-OFF ASSEMBLY OVERVIEW

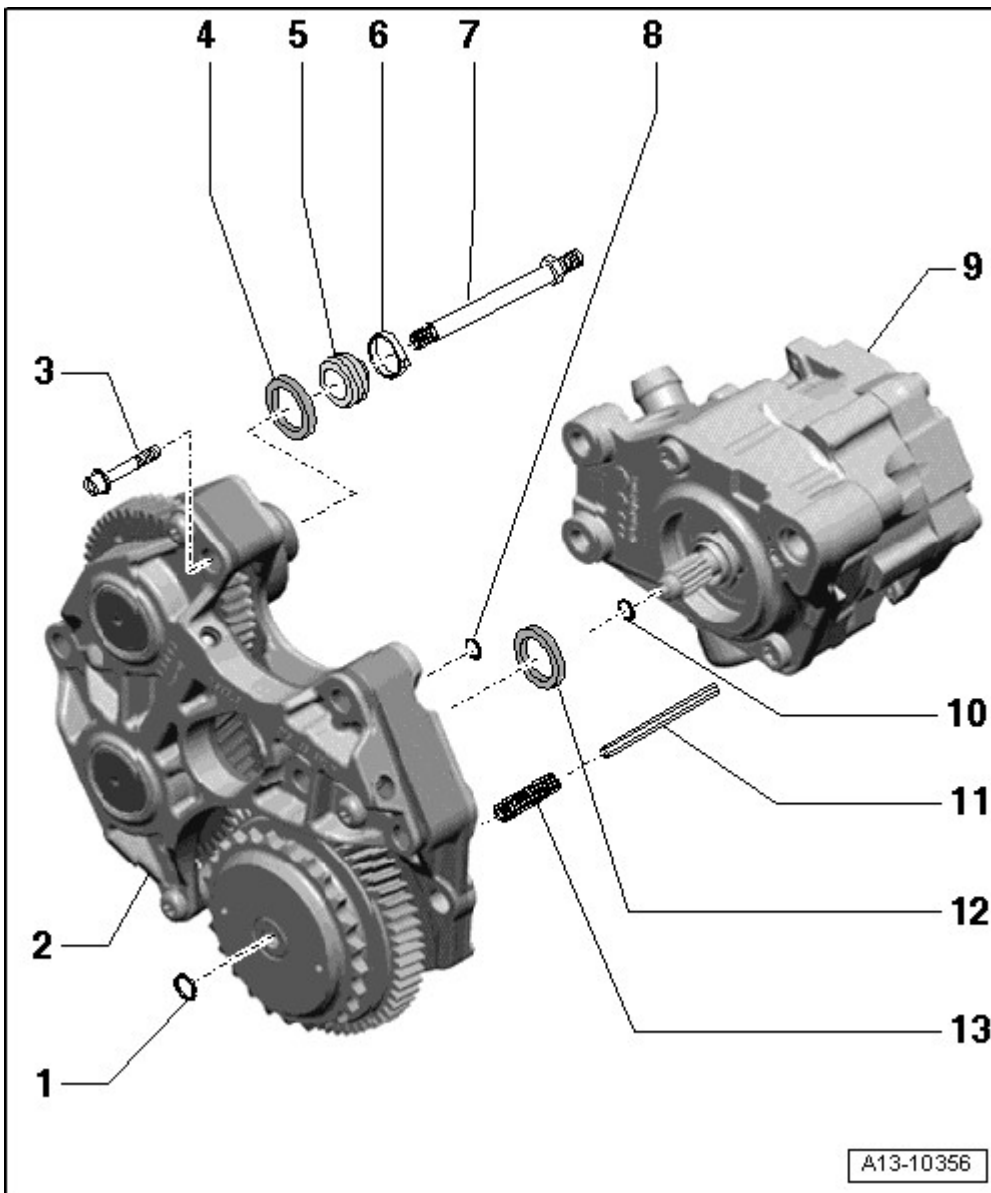


Fig. 10: Power Take-Off, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Circlip
2. Spur Gear Unit
 - Do not disassemble
 - Removal and installation, refer to **SPUR GEAR UNIT**
 - With semi-circular seal in the power steering pump motor
 - Semi-circular seal installation location, refer to **Fig. 11**
3. Bolt
 - 22 Nm
4. A/C Compressor Driveshaft Seal

- Replacing, refer to **POWER TAKE-OFF SEALS, REPLACING.**
- 5. Dust Seal Cap for A/C Compressor Drive
- 6. Clamp
- 7. Driveshaft for A/C Compressor
 - 60 Nm
- 8. O-ring
 - Replace
- 9. Power-Steering Pump
- 10. O-ring
 - Replace
- 11. Driveshaft for Oil Pump
- 12. Power Steering Pump Driveshaft Seal
 - Replacing, refer to **POWER TAKE-OFF SEALS, REPLACING.**
- 13. Spring

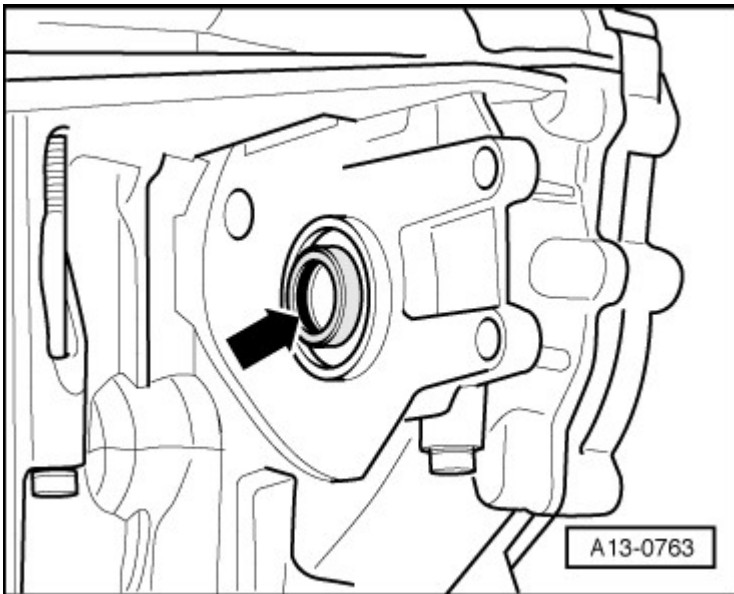


Fig. 11: Checking Whether O-Ring Is Inserted In Power Steering Pump Input Shaft
Courtesy of AUDI OF AMERICA, LLC

- In the power steering pump motor -arrow-.

CYLINDER HEAD ASSEMBLY OVERVIEW

NOTE: **Cylinder head for cylinder bank 2 (left) is shown in illustration.**



- © 2011 Mitchell Repair Information Company, LLC.

3. Cylinder Head Cover Gasket
 - Replace if damaged or leaking
4. Cylinder Head Cover
 - Removal and installation, refer to **LEFT CYLINDER HEAD COVER, RIGHT CYLINDER HEAD COVER**
5. Gasket
 - For cap
 - Replace if damaged or leaking
6. Cap
7. Ignition Coil
 - Remove with Ignition Coil Puller T40039
8. Bolt
 - Replace if seal is damaged
 - Tightening specifications and sequence, refer to: Left cylinder head cover **Fig. 13**, right cylinder head cover **Fig. 14**
9. Camshaft Adjustment Valve 2 -N208-
10. Bolt
 - 2.4 Nm
11. O-ring
 - Replace
12. Seal
 - Replace
13. Locking Bolt
 - 35 Nm
14. Bolt
 - 2.4 Nm
15. Camshaft Adjustment Valve 2 (exhaust) -N319-
16. O-ring
 - Replace
17. Cylinder Head Bolt
 - Replace
 - Observe sequence for loosening **LOOSEN THE CYLINDER HEAD BOLTS WITH THE T10070 IN THE SEQUENCE -1 TO 10-**
 - Tightening specification and sequence, refer to **Fig. 15**

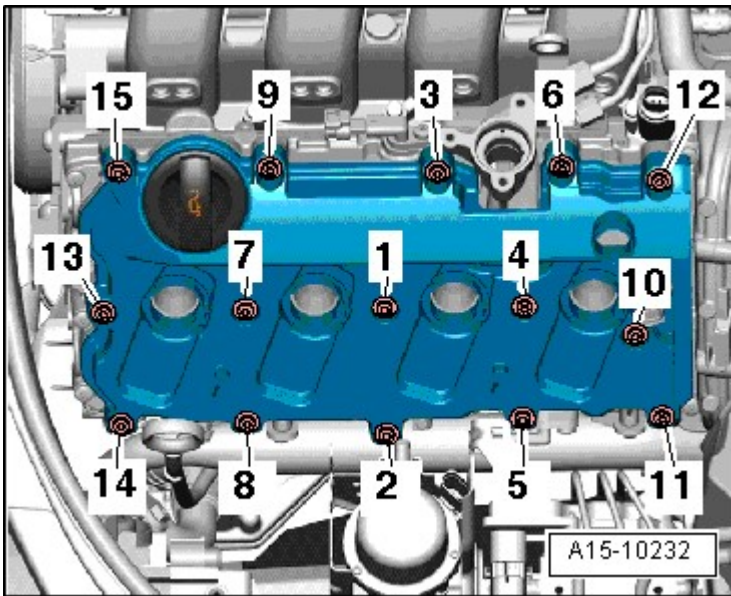


Fig. 13: Identifying Left Cylinder Head Cover Bolts Removal Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 15-.

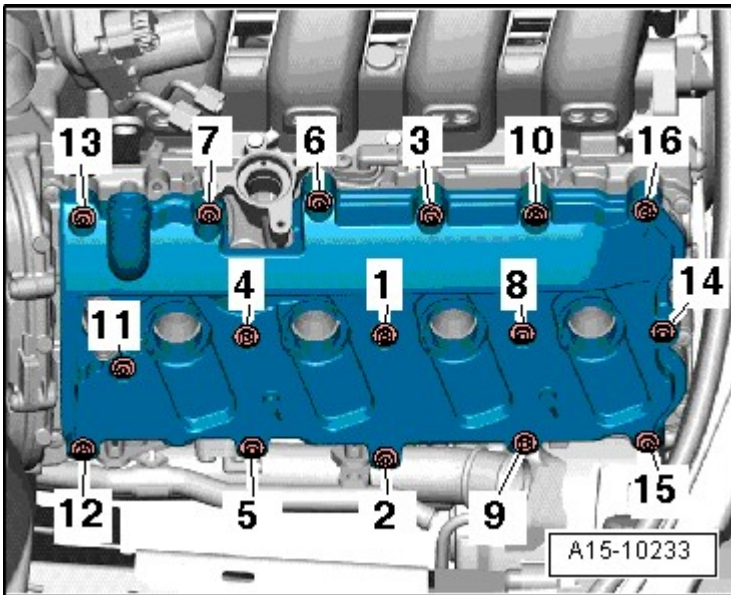


Fig. 14: Identifying Right Cylinder Head Cover Bolts Removal Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 16-.

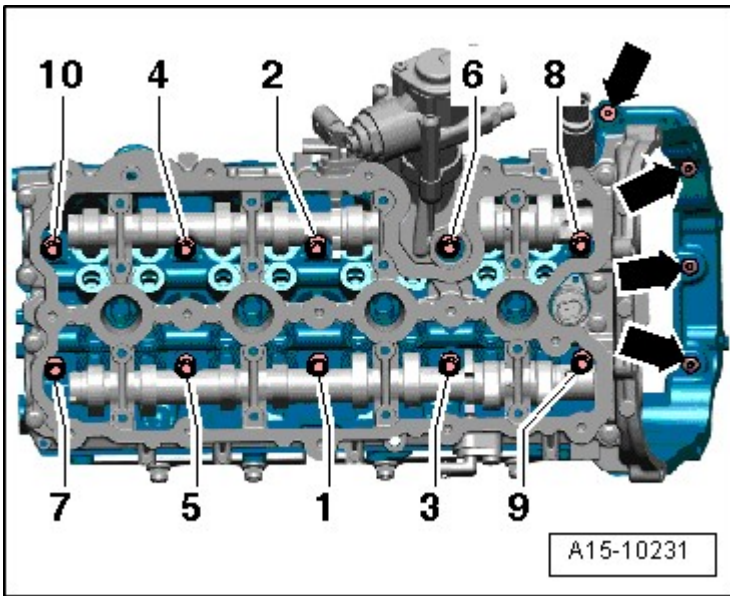


Fig. 15: Cylinder Head Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Tighten bolts in 5 stages in -1 to 5- sequence as follows:
- Install bolts by hand as far as stop.
- Tighten to 30 Nm.
- Tighten to 60 Nm.
- Tighten an additional 90°.
- Tighten an additional 90°.
- Insert bolts -arrows- with locking compound and tighten to 8 Nm; Locking compound.
- Tighten the bolts -arrows- an additional 90°.

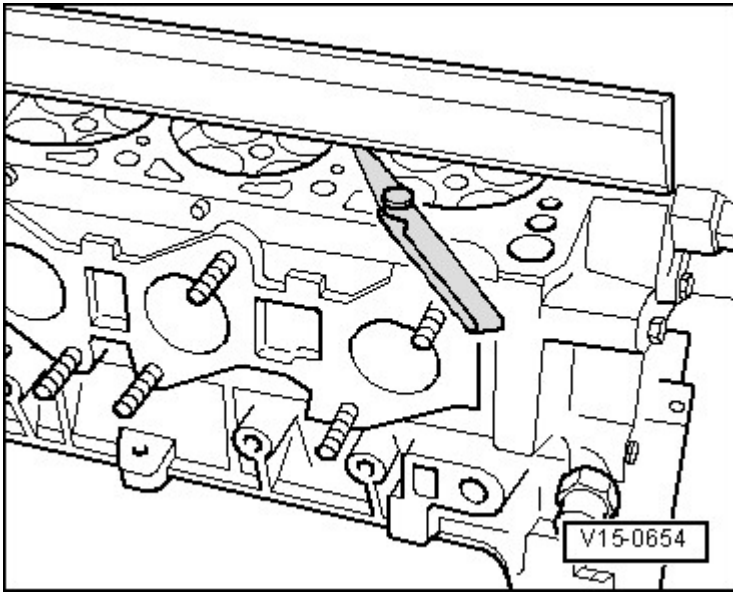


Fig. 16: Checking Cylinder Head For Distortion
Courtesy of AUDI OF AMERICA, LLC

-- Check cylinder head at multiple points for distortion, using straight edge and feeler gauges.

- Max. permissible distortion: 0.1 mm.

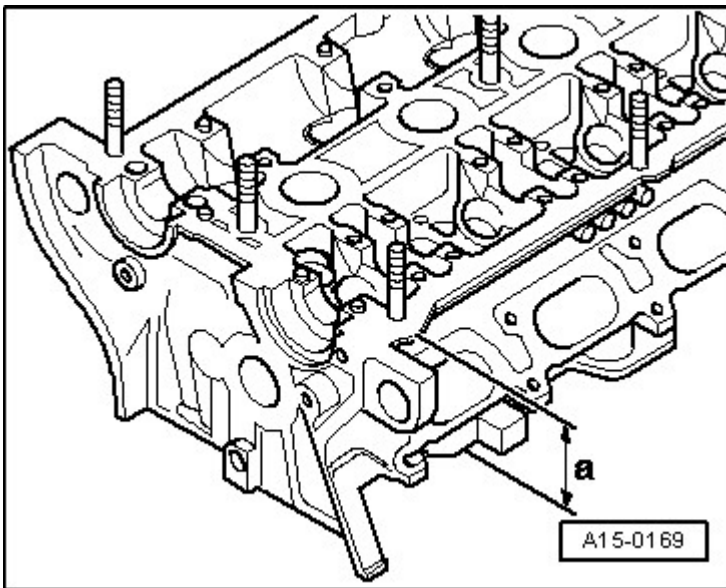


Fig. 17: Identifying Cylinder Head Refacing Dimension
Courtesy of AUDI OF AMERICA, LLC

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

- Minimum dimension: -a- = 139.5 mm.

VALVETRAIN ASSEMBLY OVERVIEW

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

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

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

NOTE: Cylinder head for cylinder bank 2(left) is shown in illustration.

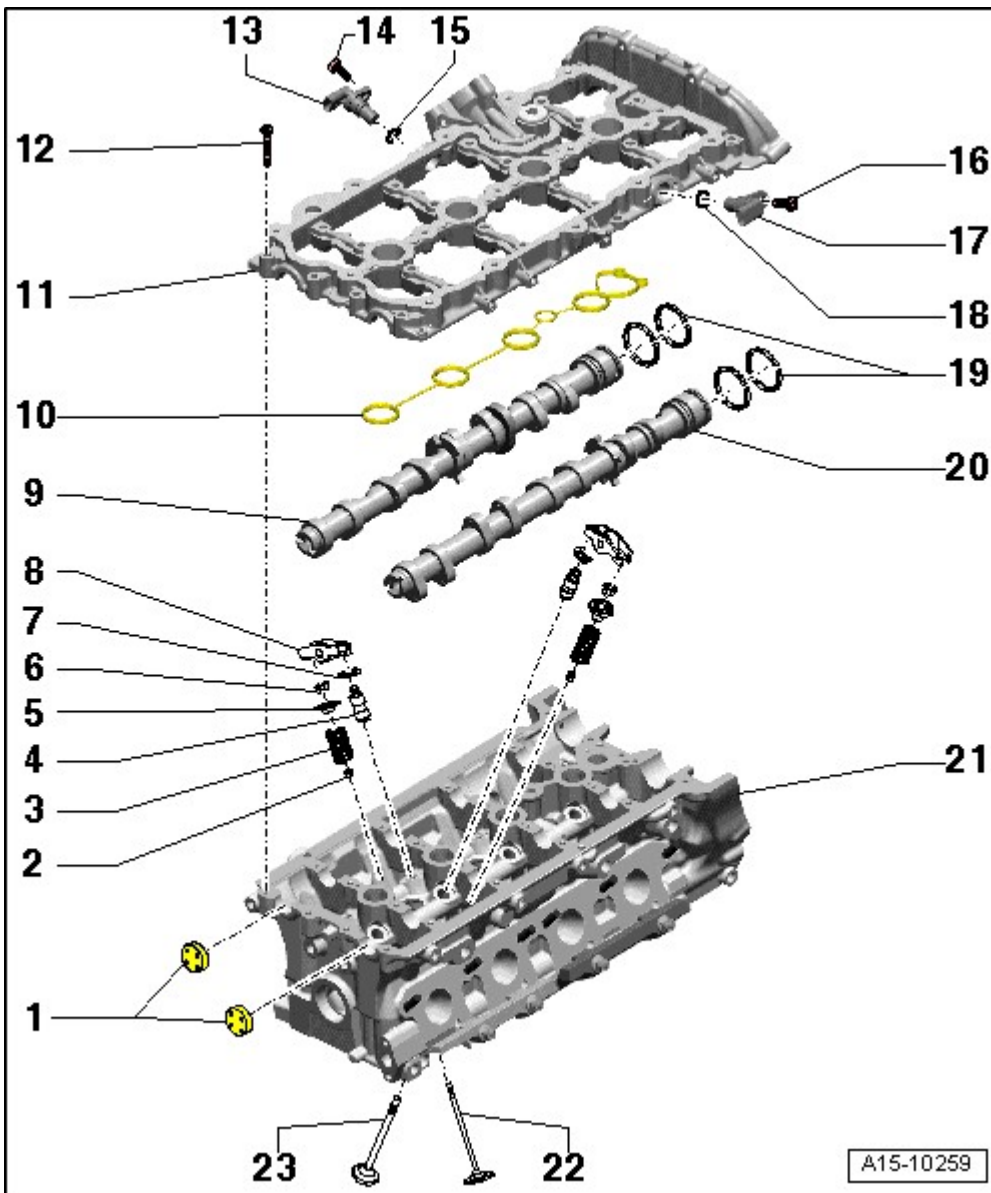


Fig. 18: Identifying Valvetrain, Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Sealing plug
2. Valve stem seal
 - replacing with the cylinder head installed **VALVE STEM SEALS, CYLINDER HEAD INSTALLED**
 - replacing with the cylinder head removed **VALVE STEM SEALS, WITH CYLINDER HEAD REMOVED**
3. Valve spring
 - Installed location **Fig. 20**
4. Hydraulic adjusting element

- clipped into roller rocker lever -item 8-
 - checking **HYDRAULIC ADJUSTING ELEMENTS, CHECKING**
 - Do not interchange
 - Lubricate contact surface
5. Valve spring plate
 6. Valve keys
 7. Securing clip
 - Check for secure seat
 8. Roller rocker lever
 - Do not interchange
 - Check roller for easy movement
 - Lubricate contact surface
 - To assemble, clip onto the hydraulic adjusting element -item 4- using a circlip -item 7-.
 9. Intake camshaft
 - Removal and installation **CAMSHAFTS**
 - Checking axial play **CAMSHAFTS, CHECKING AXIAL CLEARANCE**
 - Check radial clearance using Plastigage (roller rocker lever removed)
 - Radial clearance at bearing-dia. 24 mm: 0.024 to 0.066 mm
 - Radial clearance at bearing-dia. 36 mm: 0.032 to 0.078 mm
 - Run-out: max. 0.04 mm
 10. Gasket
 - Replace
 11. Bearing bracket
 - With integrated camshaft bearings
 - Removal and installation **CAMSHAFTS**
 12. Bolt
 - Tightening order **Fig. 19**
 13. Camshaft position (CMP) sensor 2 -G163-
 14. Bolt
 - 9 Nm
 15. O-ring
 - Replace
 16. Bolt
 - 9 Nm
 17. Camshaft position (CMP) sensor 4 -G301-
 18. O-ring
 - Replace
 19. Compression ring

- for camshaft adjuster

20. Exhaust camshaft

- Removal and installation **CAMSHAFTS**
- Checking axial play **CAMSHAFTS, CHECKING AXIAL CLEARANCE**
- Check radial clearance using Plastigage (roller rocker lever removed)
- Radial clearance at bearing-ø 24 mm: 0.024 to 0.066 mm
- Radial clearance at bearing-ø 36 mm: 0.032 to 0.078 mm
- Run-out: max. 0.04 mm

21. Cylinder Head

- Check valve guides **VALVE GUIDES, CHECKING**

22. Intake valve

- Do not rework, only grinding is permitted
- Mark installed position for re-installation
- Valve dimensions **VALVE DIMENSIONS**
- Check valve guides **VALVE GUIDES, CHECKING**

23. Exhaust valve

- Do not rework, only grinding is permitted
- Mark installed position for re-installation
- Valve dimensions **VALVE DIMENSIONS**
- Check valve guides **VALVE GUIDES, CHECKING**

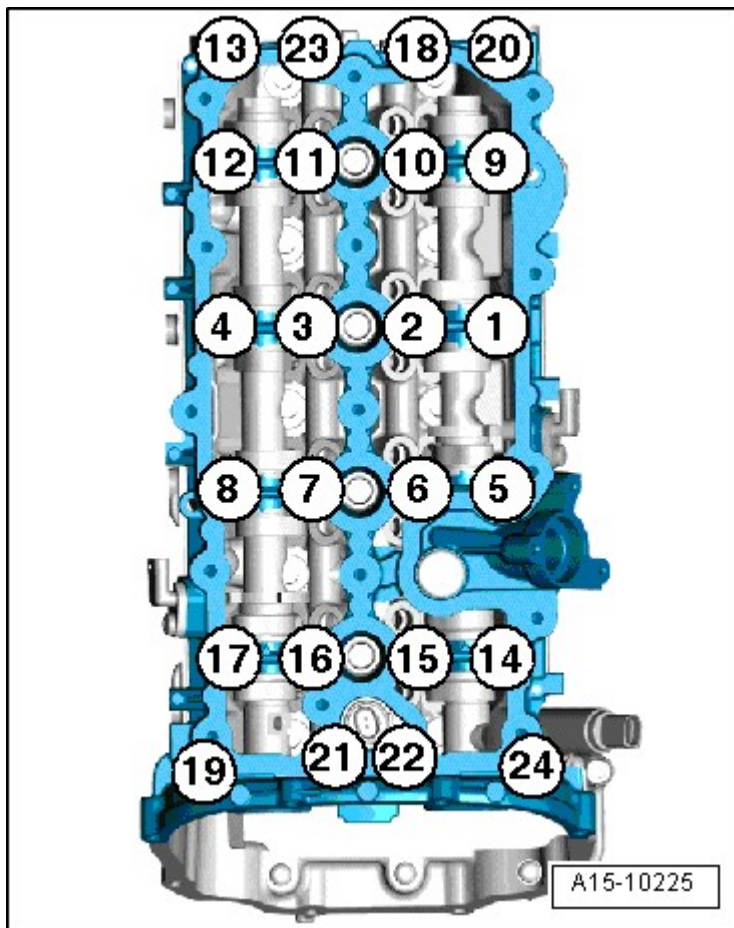


Fig. 19: Identifying Bearing Frame Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

- Tighten bolts in 2 stages in -1 to 24- sequence as follows.
- Install bolts by hand as far as stop.
- Tighten the bolts to 8 Nm.

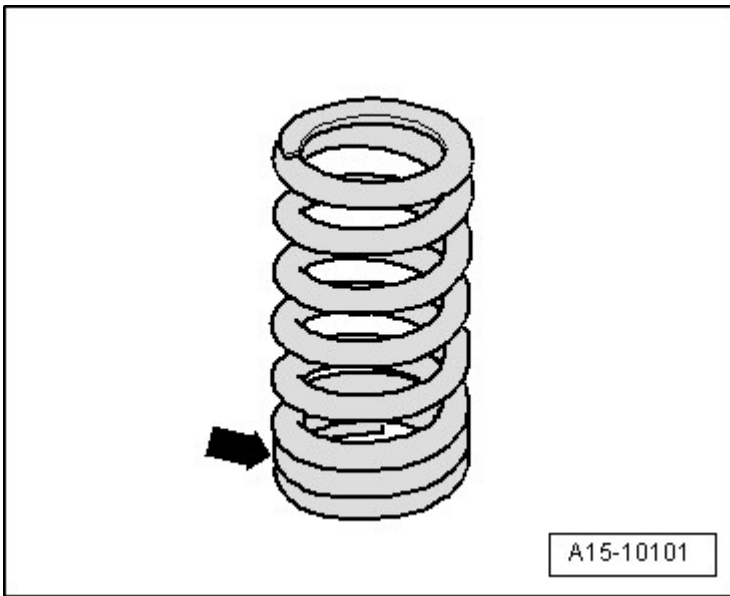


Fig. 20: Identifying Tight Spring Coils
 Courtesy of AUDI OF AMERICA, LLC

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

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Component	Bolt Size	Nm
Camshaft Adjuster for Exhaust Camshaft		80 + 90° ¹
Camshaft Adjuster for Intake Camshaft		80 + 90° ¹
Camshaft Adjustment Valve 2		2.4
Chain Tensioner		5 + 90° ¹
Chain Tensioner for Left Camshaft Timing Chain		5 + 90° ¹
Chain Tensioner for Right Camshaft Timing Chain		5 + 90° ¹
Chain Tensioner with Glide Track		5 + 90° ¹
Driveshaft for A/C Compressor		60
Drive Sprocket for Left Camshaft Timing Chain		22
Drive Sprocket for Right Timing Chain		42
Guide Rail		17 + 90° ¹
Idler Sprocket Mounting Bracket		5 + 90° ¹
Locking Bolt for Cylinder Head		35
Mounting Bracket for Drive Sprocket		5 + 90° ¹
Pivot Pin for Drive Sprocket		42
Pivot Pin for Idler Sprocket		42

Left Timing Chain Cover, Tightening Specifications and Sequence

-- Tighten bolts to 9 Nm in the sequence -1 to 8-.

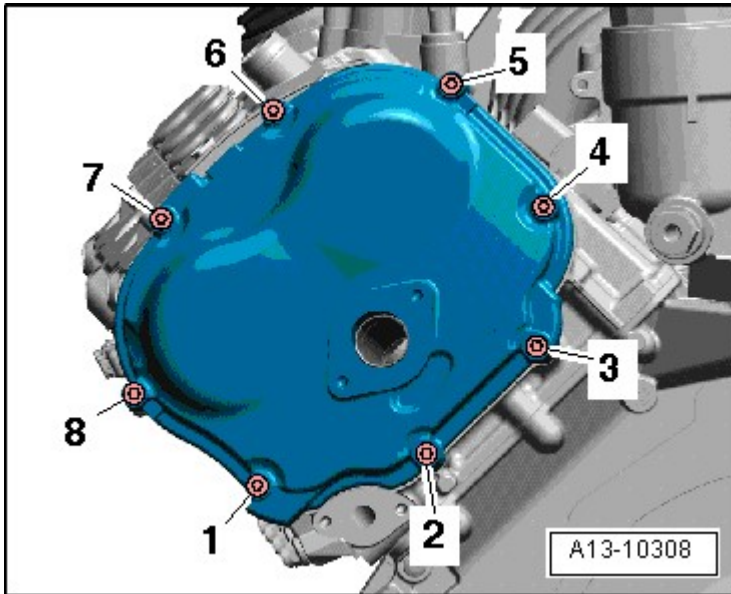


Fig. 21: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
 Courtesy of AUDI OF AMERICA, LLC

Right Timing Chain Cover, Tightening Specifications and Sequence

-- Tighten bolts to 9 Nm in the sequence -1 to 8-.

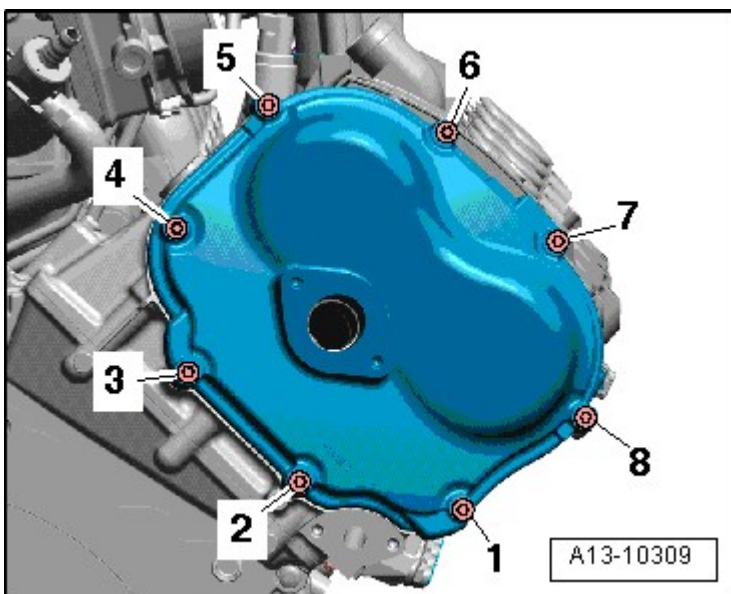


Fig. 22: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence

Courtesy of AUDI OF AMERICA, LLC

Lower Timing Chain Cover, Tightening Specifications and Sequence

-- Replace M6 bolts -1, 3, 5, 6, 7, 11, 12, 13- and -arrows-.

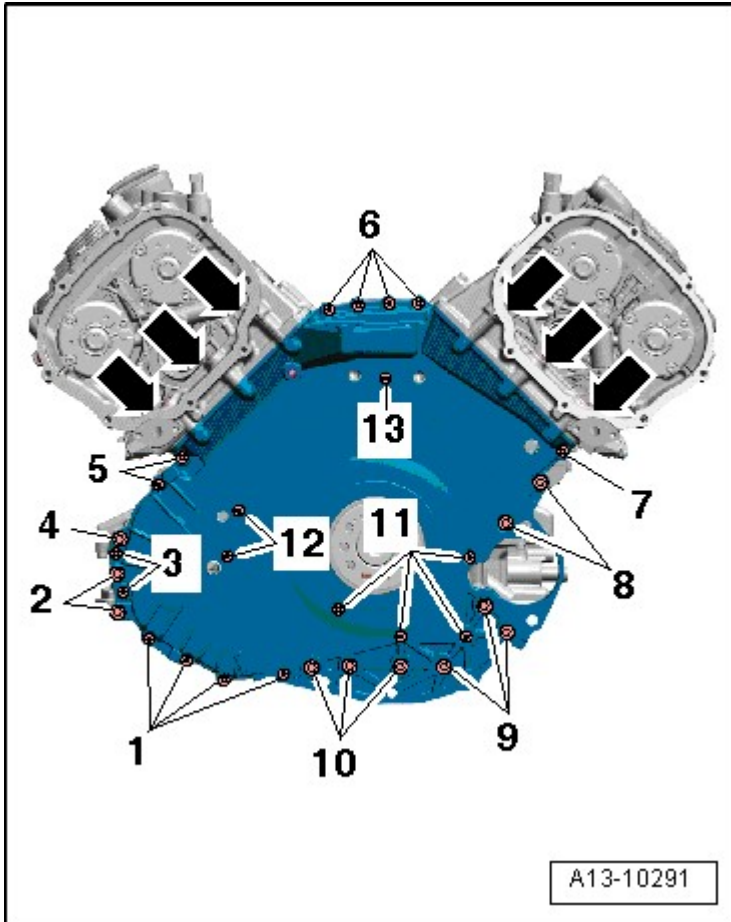


Fig. 23: Identifying Bolts And Lower Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 6 stages as follows:

-- Pre-tighten the bolts -arrows- to 5 Nm.

-- Tighten the bolts -1 to 13- in a diagonal sequence to 8 Nm using a torque wrench.

-- Tighten bolts -arrows- to 8 Nm.

-- Tighten M8 bolts -2, 4, 8, 9, 10- in a diagonal sequence to 22 Nm.

-- Tighten the M6 bolts -1, 3, 5, 6, 7, 11, 12, 13- an additional 90° in a diagonal sequence.

-- Tighten the bolts -arrows- an additional 90°.

Left Cylinder Head Cover, Tightening Specifications and Sequence

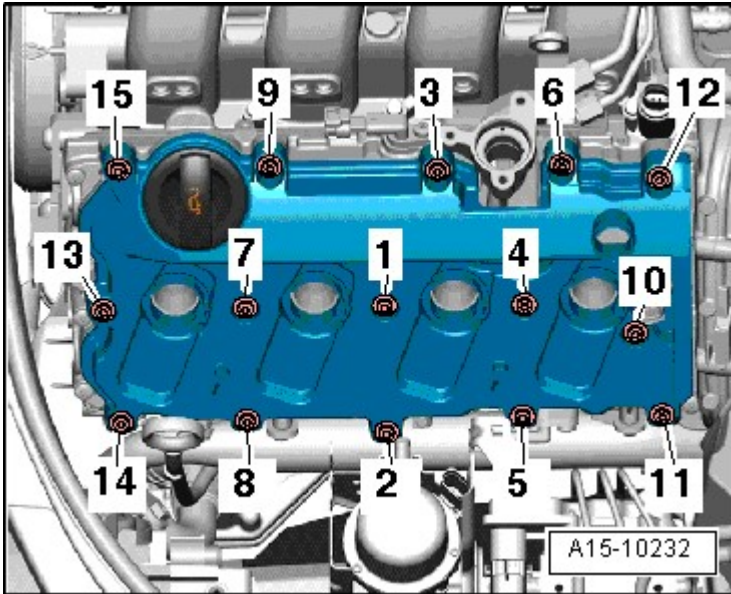


Fig. 24: Identifying Left Cylinder Head Cover Bolts Removal Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 15-.

Right Cylinder Head Cover, Tightening Specifications and Sequence

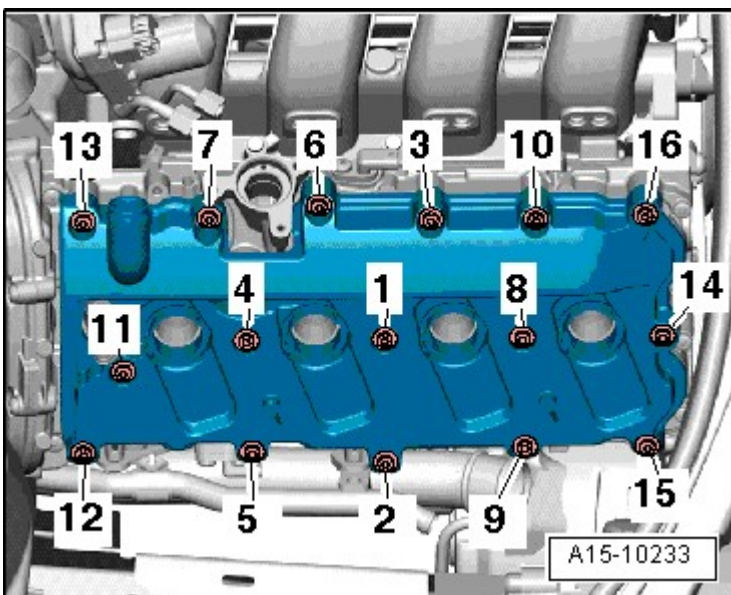


Fig. 25: Identifying Right Cylinder Head Cover Bolts Removal Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in the sequence -1 to 16-.

Cylinder Head, Tightening Specifications and Sequence

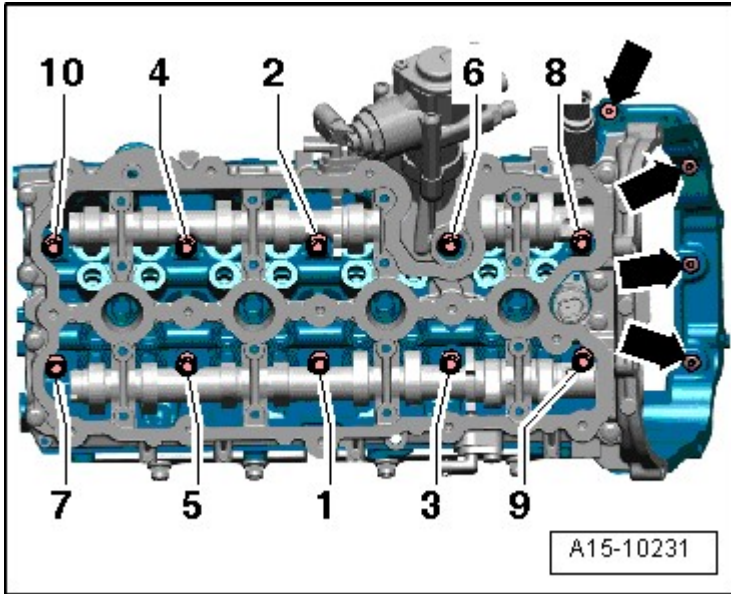


Fig. 26: Identifying Cylinder Head Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 5 stages in -1 to 5- sequence as follows:

-- Install bolts by hand as far as stop.

-- Tighten to 30 Nm.

-- Tighten to 60 Nm.

-- Tighten an additional 90°.

-- Tighten an additional 90°.

-- Insert screws -arrows- with locking compound and tighten to 8 Nm; Locking compound.

-- Tighten the bolts -arrows- an additional 90°.

VALVE DIMENSIONS

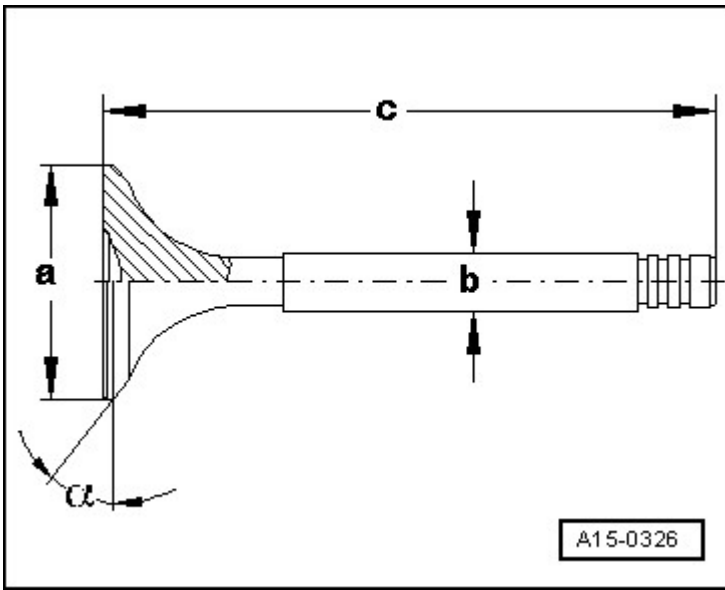


Fig. 27: Identifying Valve Dimensions
Courtesy of AUDI OF AMERICA, LLC

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

Dimension		Intake valve	Exhaust valve
Dia. a	mm	33.85 ± 0.10	28.0 ± 0.1
Dia. b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	103.97 ± 0.20	101.9 ± 0.2
a	Angle°	45	45

WARNING: Risk of injury if exhaust valves with sodium filling are disposed of improperly.

- Cut exhaust valve with sodium filling into 2 parts with a metal saw between shaft center and valve plate. While doing this, do not come into contact with water.
- Throw at the most 10 such sawed exhaust valves in a bucket filled with water and step back immediately.
- When there is contact with water, a sudden chemical reaction occurs which burns the sodium filling.
- The treated parts may then be discarded through conventional disposal channels.

DIAGNOSIS AND TESTING

COMPRESSION, CHECKING

Special tools and workshop equipment required

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

Procedure

- Engine oil temperature min. 30 °C / 86 °F
- Battery voltage min. 12.5 V

-- Switch off ignition.

-- Disconnect electrical connector on engine speed (RPM) sensor -G28- -arrow- at right of transmission.

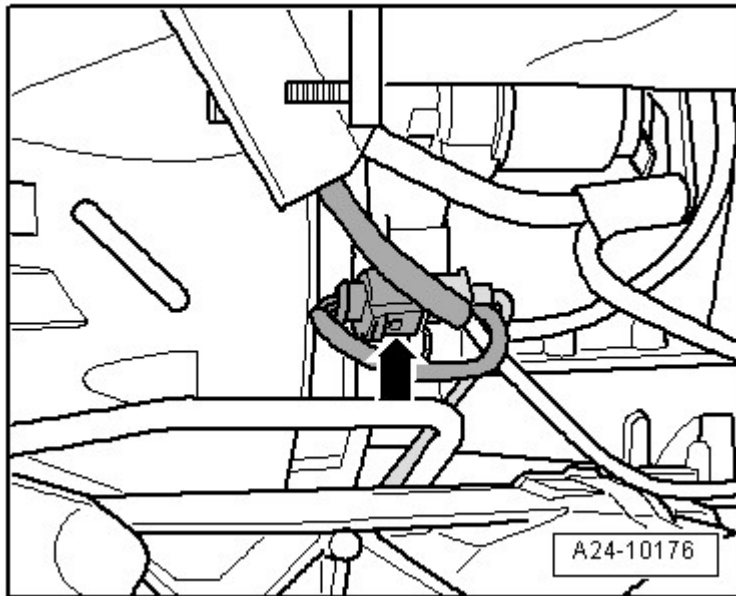


Fig. 28: Location of Engine Speed (RPM) Sensor -G28- Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -2- at Mass Air Flow (MAF) sensor 2 -G246-.

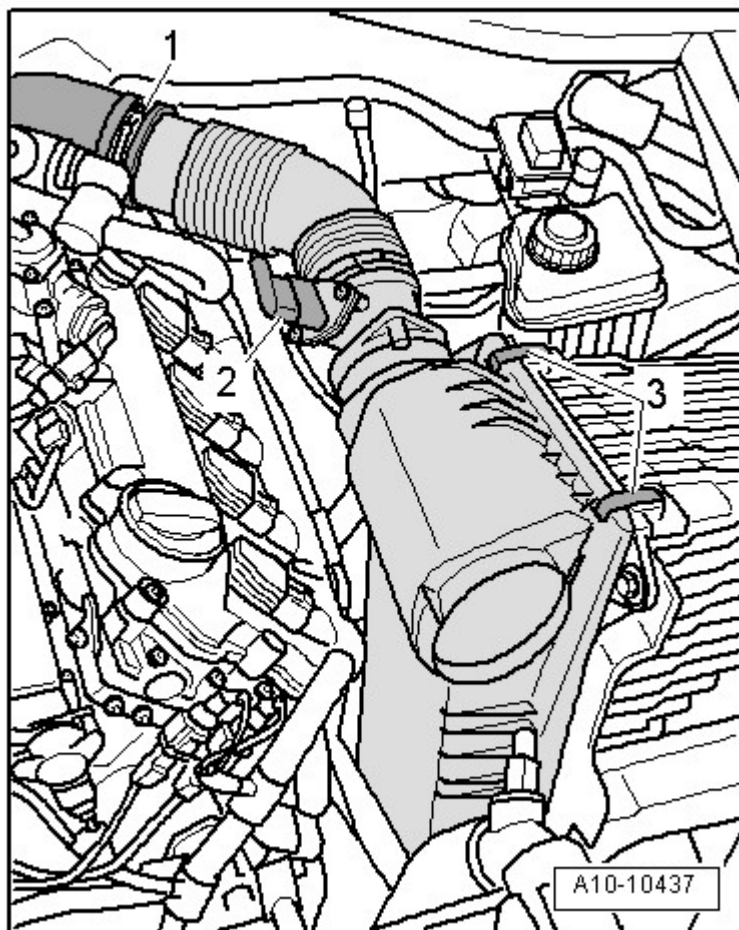


Fig. 29: Locating Electrical Connector, Air Guide Hose, And Retaining Clips
Courtesy of AUDI OF AMERICA, LLC

- Remove left air guide hose -1- from air duct.
- Release retaining clips -3- and remove upper left section of air filter housing.
- Disconnect hose -1- to Secondary Air Injection (AIR) pump.

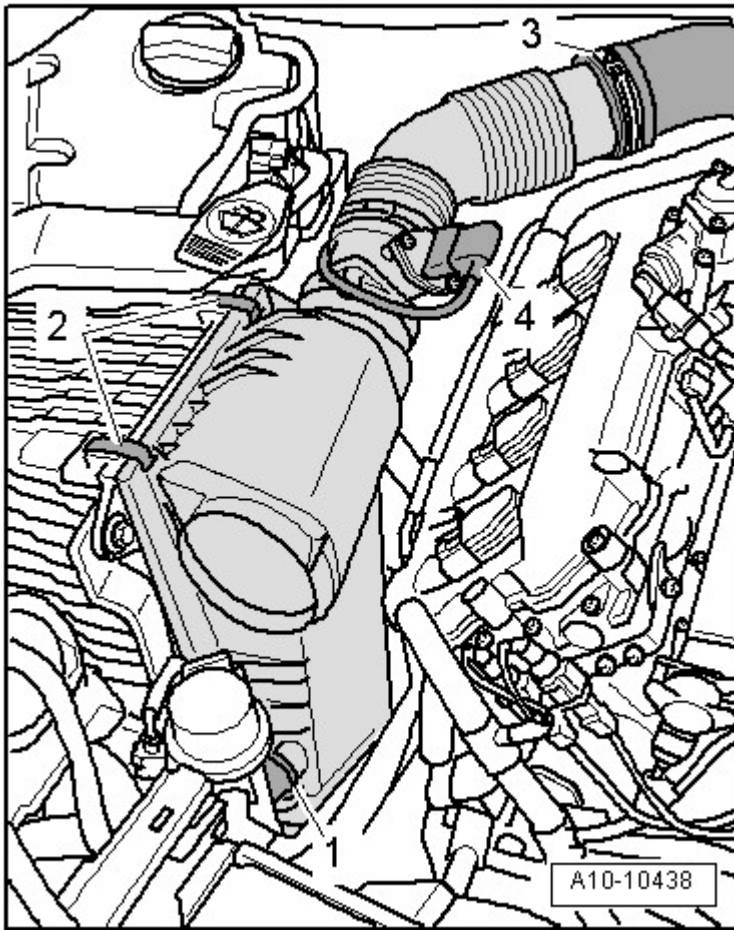


Fig. 30: Identifying Hose To Secondary Air Injection Pump, Electrical Harness Connector, Right Air Guide Hose, And Retaining Clips

Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical harness connector -4- at Mass Air Flow (MAF) sensor -G70-.
- Remove right air guide hose -3- from air duct.
- Release retaining clips -2- and remove upper right section of air filter housing from lower part.

Vehicles with air suspension:

NOTE: If necessary, remove electrical connector for Heated Oxygen Sensor (HO2S) 2 - G108- from bracket at right strut tower for better access.

- Press circlip -1- forward from hose coupling.

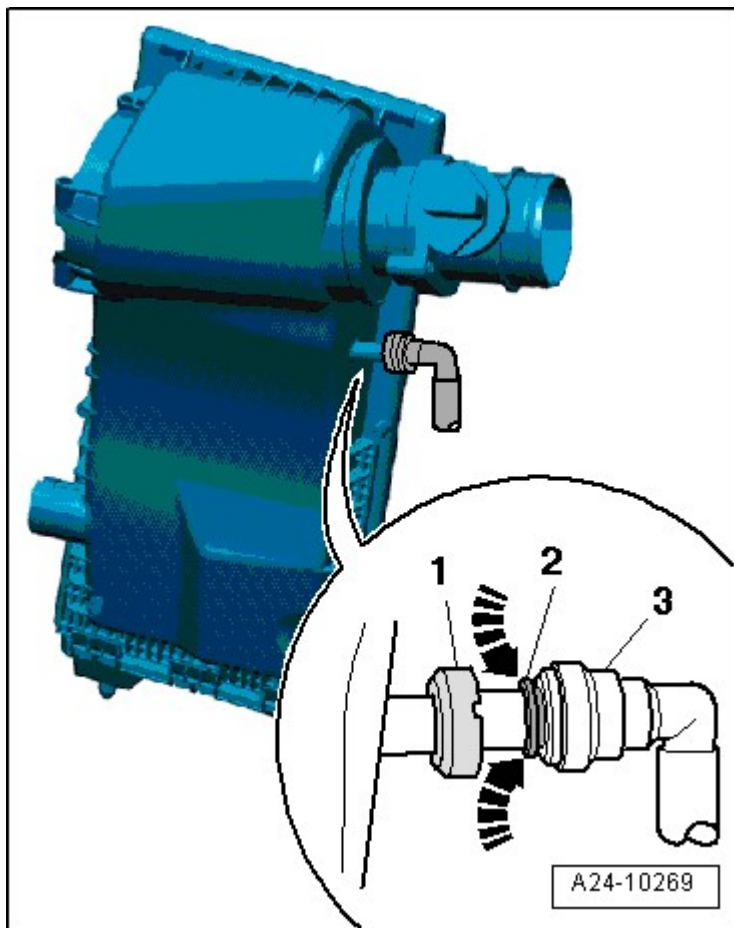


Fig. 31: Identifying Circlip, Release Ring And Ventilation Hose
 Courtesy of AUDI OF AMERICA, LLC

-- Press release ring -2- down -arrows- and remove vent hose -3- from upper section of air filter.

All Vehicles

-- Remove oil dipstick -1- from guide tube.

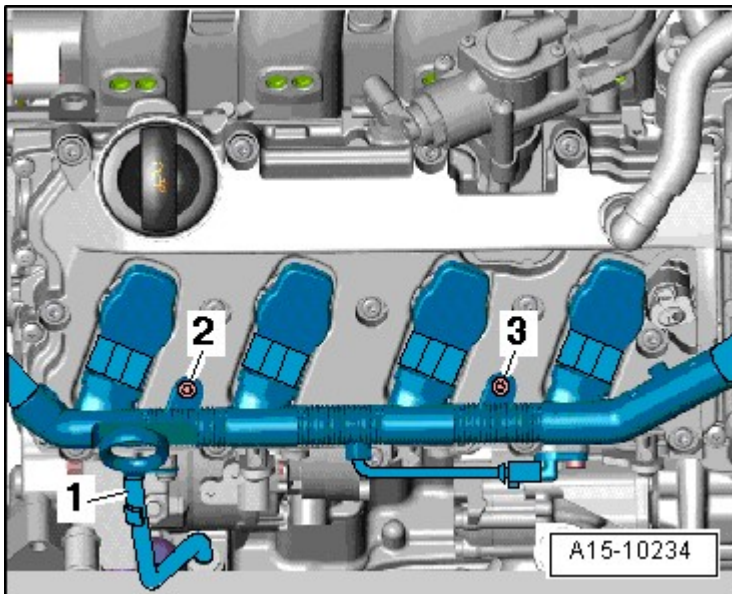


Fig. 32: Identifying Oil Dipstick, Bolts & Ignition Coils Electrical Harness Connectors
Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -2- and -3-.
- Disconnect electrical harness connectors at ignition coils.
- Press electrical wiring harness to side.
- Remove the bolts -1- and -2-.

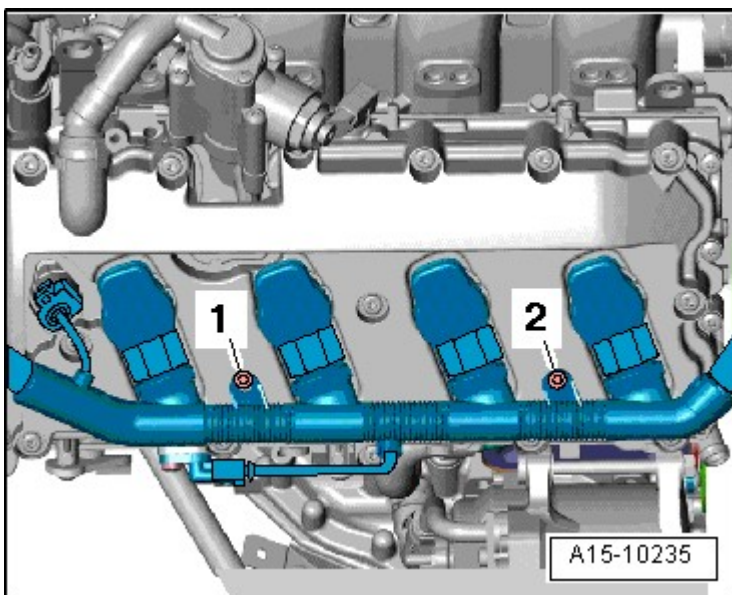


Fig. 33: Identifying Bolts & Ignition Coils Electrical Harness Connectors
Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical harness connectors at ignition coils.
- Press electrical wiring harness to side.
- Remove all ignition coils using T40039.

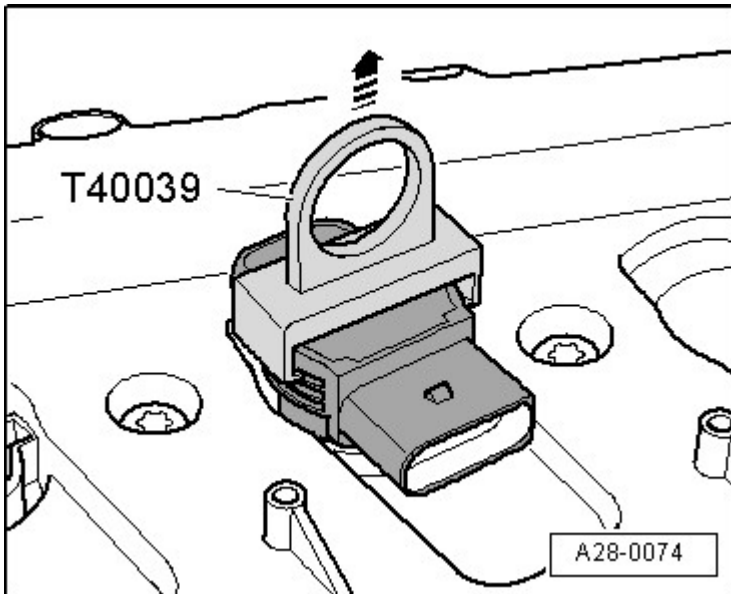


Fig. 34: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
 Courtesy of AUDI OF AMERICA, LLC

- Using 3122 B, remove spark plugs.
- Check compression using V.A.G 1763.
- Have a second technician press accelerator pedal completely and at the same time operate starter long enough until pressure increase no longer appears on tester.

Compression pressure	Bar pressure
New	10.0 to 14.0
Wear limit	9.0
Maximum difference between cylinders	3.0

Assembly is in reverse order of removal, note the following:

- Install sparks plugs.
- If electrical connectors were disconnected and the engine was started, then malfunctions have been stored in

the engine control module.

CAMSHAFTS, CHECKING AXIAL CLEARANCE

Special tools and workshop equipment required

- Dial Gauge Holder VW 387
- Dial Gauge VAS 6079

Procedure

- Perform measurement with guide frame removed.
- Secure VW 387 with VAS 6079 on cylinder head as shown in illustration.

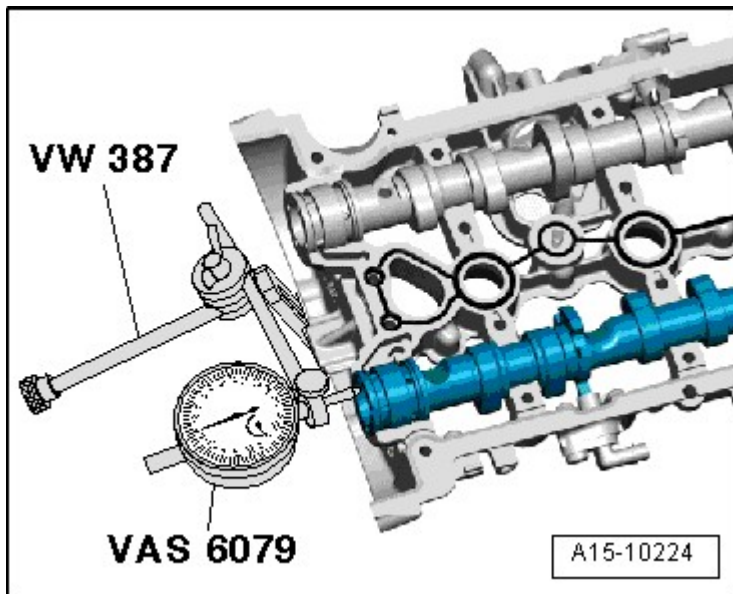


Fig. 35: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6079 On Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

- Determine axial clearance.
- Axial clearance: 0.100 to 0.191 mm.

HYDRAULIC ADJUSTING ELEMENTS, CHECKING

NOTE: The hydraulic adjusting elements cannot be repaired.

Irregular valve noises are normal while starting the engine.

Special tools and workshop equipment required

- Socket T40058
- Feeler gauge

Procedure

- Start engine and allow it to run until coolant fan has switched on once.
- Increase RPM to approximately 2500 for 2 minutes and perform road test if necessary.

NOTE: If irregular valve noises disappear but reappear during short drives, oil check valve must be replaced. Oil check valve location. Refer to OIL CHECK VALVE AND SPRAY NOZZLE VALVE ASSEMBLY OVERVIEW .

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

- Remove the cylinder head cover. Refer to LEFT CYLINDER HEAD COVER, RIGHT CYLINDER HEAD COVER.
- Insert the T40058 guide pins as follows:

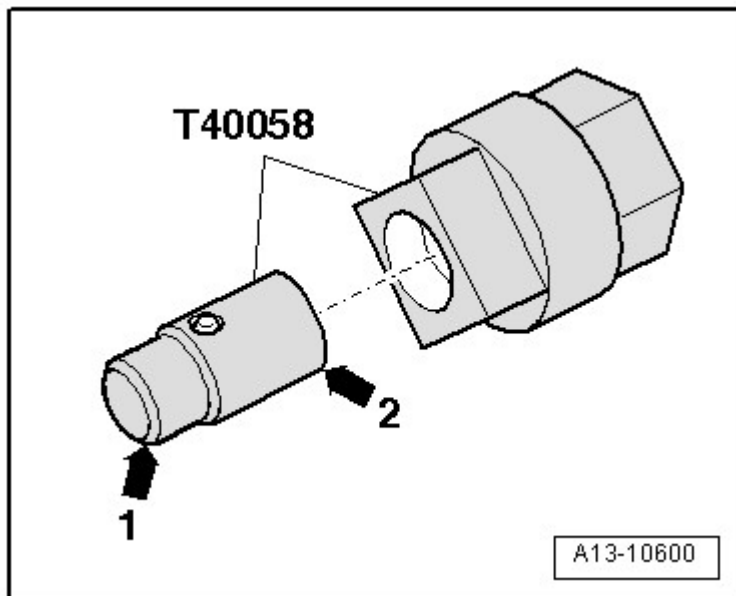


Fig. 36: Inserting T40058 Guide Pin
Courtesy of AUDI OF AMERICA, LLC

- Small diameter -arrow 1- points to engine.
- Large diameter -arrow 2- points to socket.

- Rotate the crankshaft until the cam lobes on the adjusting element to be checked face upward.

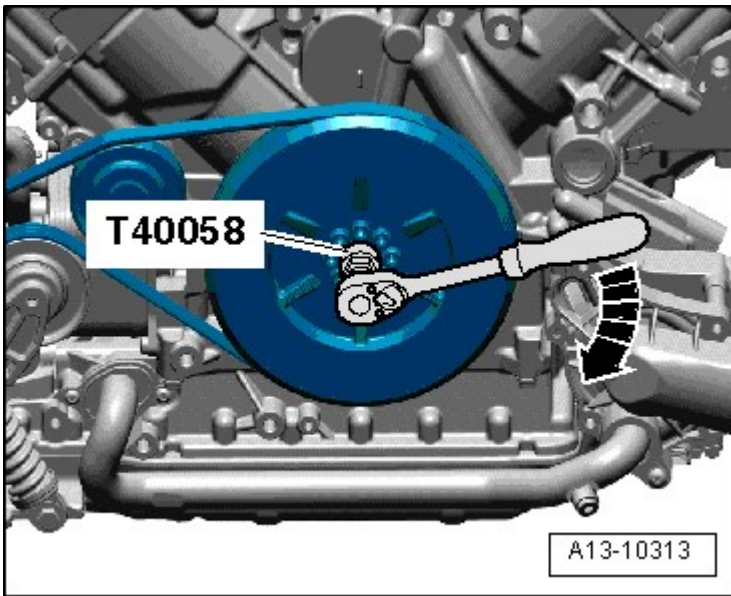


Fig. 37: Loosening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

-- To determine play between cam lobes and roller rocker lever, press lever down -arrow-.

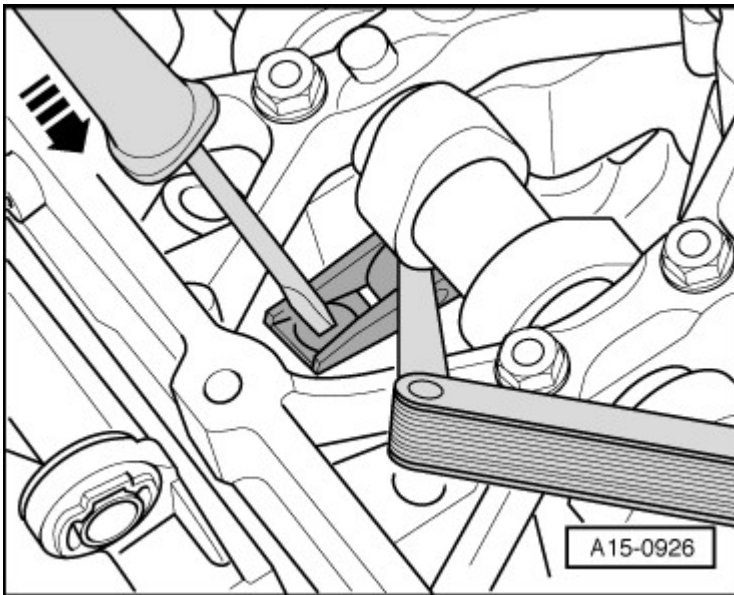


Fig. 38: Checking Play Between Cam Lobes And Roller Rocker Lever
Courtesy of AUDI OF AMERICA, LLC

If a 0.20 mm feeler gauge can be inserted between cam lobes and roller rocker lever:

-- Replace the hydraulic adjusting element. Refer to **CAMSHAFTS**.

Final procedures

-- Install cylinder head cover. Refer to **LEFT CYLINDER HEAD COVER**, **RIGHT CYLINDER HEAD COVER**.

VALVE GUIDES, CHECKING

Special tools and workshop equipment required

- Dial Gauge Holder VW 387
- Dial Gauge VAS 6079

Procedure

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

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

-- Insert valve into valve guide.

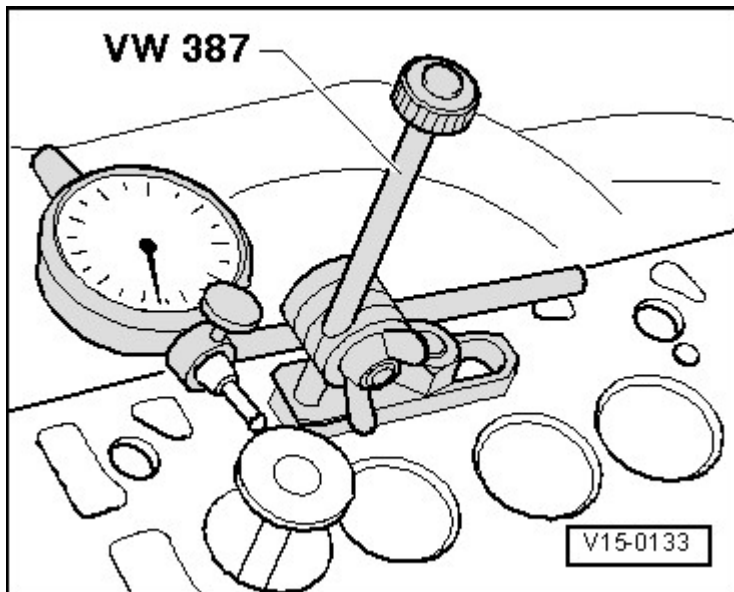


Fig. 39: Determining Valve Rock (Wear limit)
Courtesy of AUDI OF AMERICA, LLC

- Valve stem tip must seal with valve guide.

-- Determine tilt clearance.

- Wear limit: 0.8 mm.

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

-- If wear limit is still exceeded, replace cylinder head.

NOTE: **The valve guides cannot be replaced.**

VALVES, CHECKING

-- Check valves at stem and seating surface for traces of wear.

-- If there are clear traces of wear, replace valve.

REMOVAL AND INSTALLATION

LEFT AND RIGHT TIMING CHAIN COVERS

Special tools and workshop equipment required

- Hand drill with plastic brush attachment
- Protective eyewear
- Sealant.

Removing

NOTE: **All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.**

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

-- Remove left coolant pipe. Refer to **LEFT COOLANT PIPE** .

-- Remove right coolant pipe. Refer to **RIGHT COOLANT PIPE** .

-- Remove rear coolant pipe. Refer to **REAR COOLANT PIPE** .

-- Remove the windshield wiper arms -1- and -3-. Refer to **WINDSHIELD WIPER ARMS** .

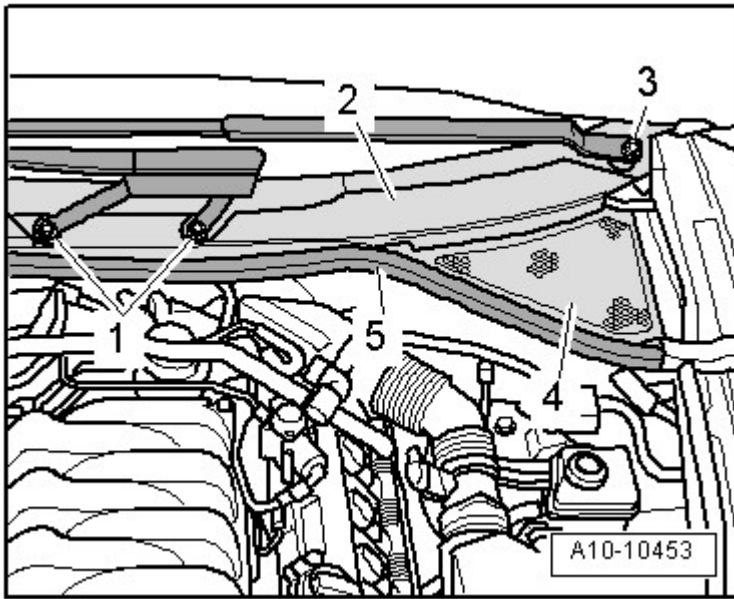


Fig. 40: Identifying Windshield Wiper, Driver Side, And Nut -3-.
 Courtesy of AUDI OF AMERICA, LLC

-- Remove rubber seal -5- and remove plenum chamber cover -4-.

CAUTION: The plenum chamber cover could be damaged.

- To prevent the cowl grille -2- from tearing when removing, coat the transition between the windshield and cowl grille with soapy water and pull the grille up vertically out of the fastening strip starting at the edge of the window.

-- Carefully remove plenum chamber cover -2- from retainers on windshield.

-- Unclip Engine Control Module (ECM) -1- from bracket.

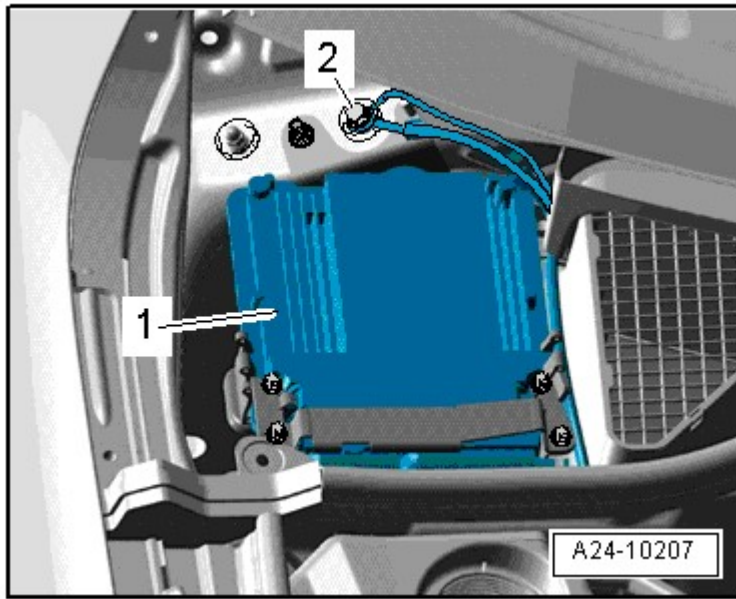


Fig. 41: Location of Engine Control Module (ECM) -J623- -1-
Courtesy of AUDI OF AMERICA, LLC

-- Free up the wiring harness.

NOTE: Electrical connectors on engine control module remain connected.

Ignore -2-.

-- Remove screws -arrows- and remove partition at left rear in engine compartment.

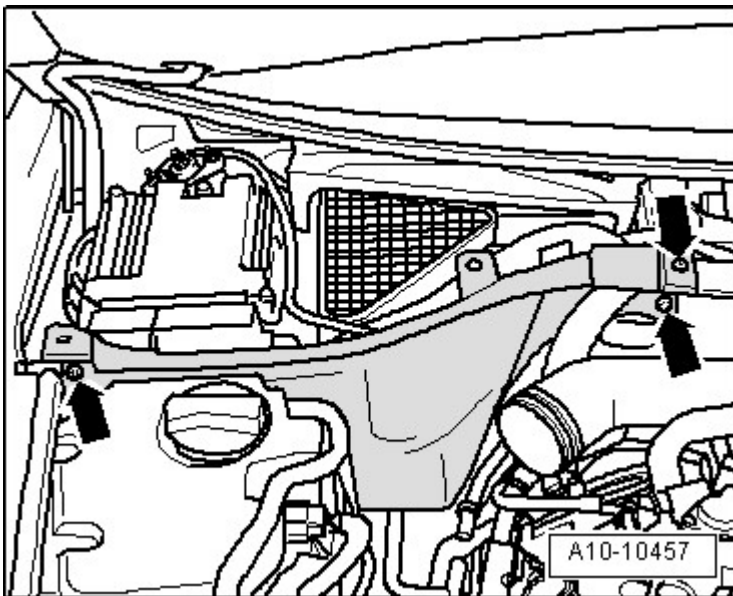


Fig. 42: Identifying Screws -Arrows- And Partition At Left Rear In Engine Compartment (1 Of 2)
Courtesy of AUDI OF AMERICA, LLC

-- Remove screws -arrows- and remove partition at left rear in engine compartment.

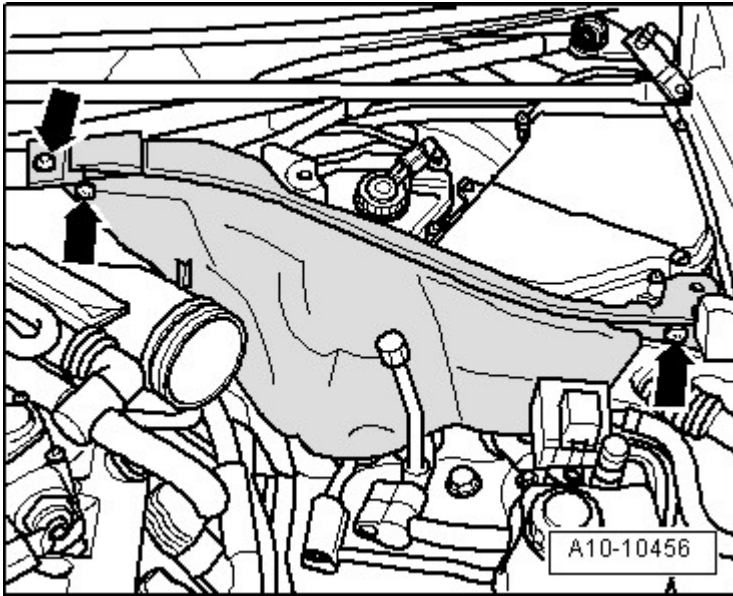


Fig. 43: Identifying Screws -Arrows- And Partition At Left Rear In Engine Compartment (2 Of 2)
 Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1 to 8- and remove left timing chain cover.

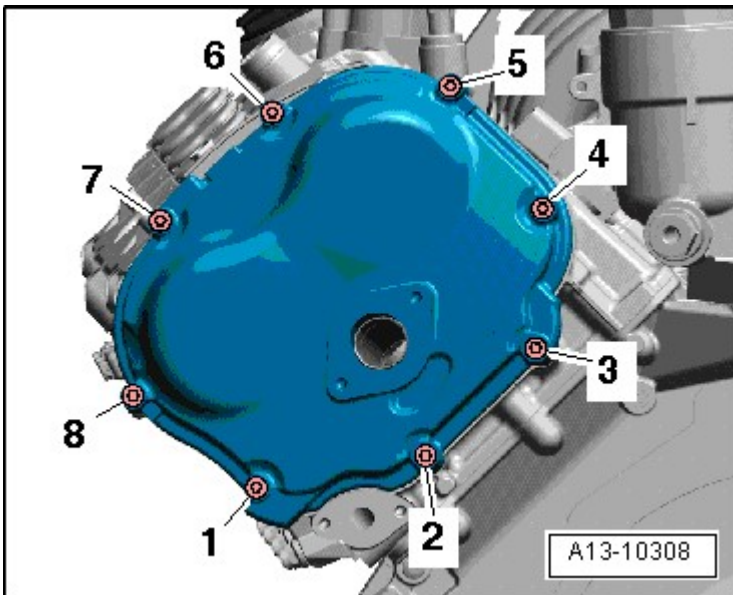


Fig. 44: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1 to 8- and remove right timing chain cover.

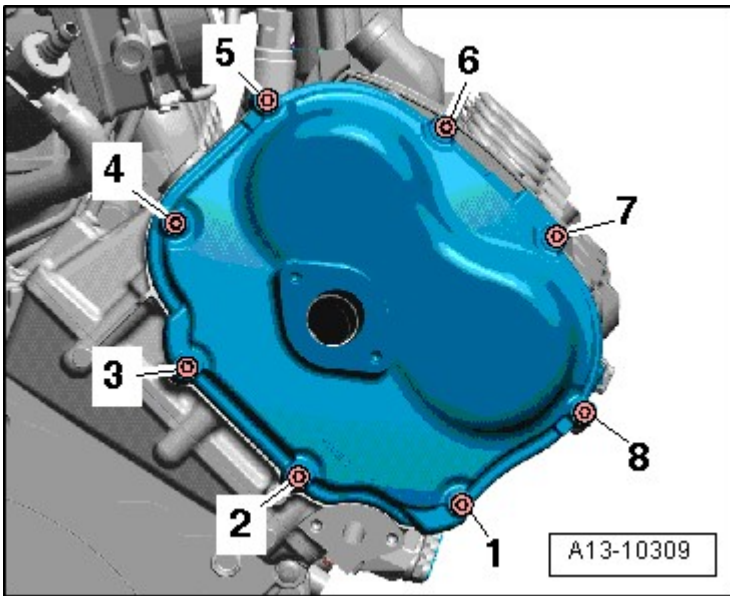


Fig. 45: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
Courtesy of AUDI OF AMERICA, LLC

INSTALLING

- Tightening specifications, refer to **Fig. 2** and **Fig. 3**.

NOTE: Replace M6 bolts and O-rings.

Secure all hose connections with hose clamps appropriate for the model.

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

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

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

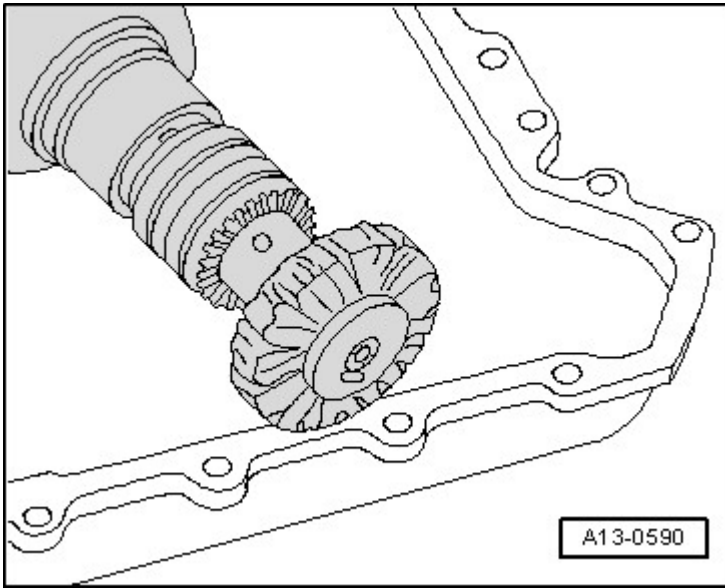


Fig. 46: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan
Courtesy of AUDI OF AMERICA, LLC

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

NOTE: **Note the expiration date of the sealing compound.**

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

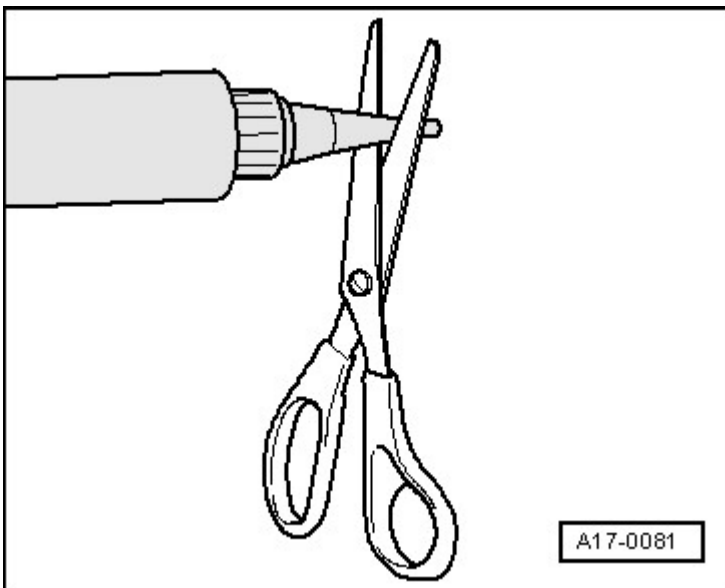


Fig. 47: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of AUDI OF AMERICA, LLC

-- Drive left coolant intermediate pipe -2- out of left timing chain cover with a suitable drift.

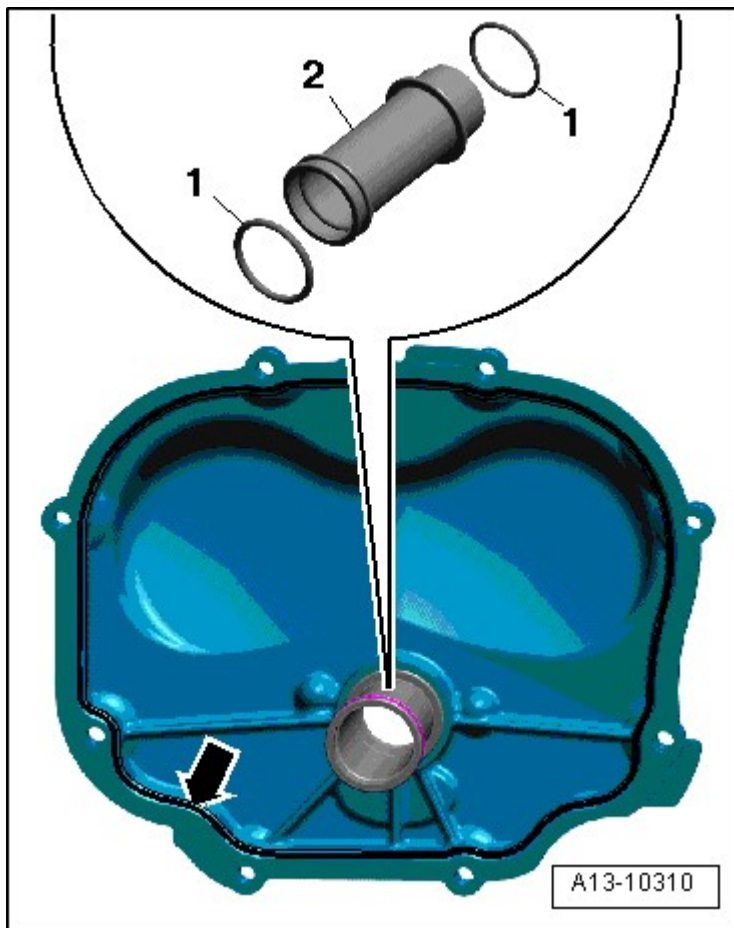


Fig. 48: Driving Left Coolant Intermediate Pipe Out Of Left Timing Chain Cover With Suitable Drift
 Courtesy of AUDI OF AMERICA, LLC

- Replace O-rings -1- at coolant intermediate pipe.
- Insert coolant intermediate pipe in left timing chain cover.

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

- Do not apply sealant bead thicker than indicated.

- Apply a sealant bead -arrows- on the clean sealing surfaces on the left timing chain cover as illustrated.

- Thickness of sealant bead: 2.5 mm.

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

- Positing left timing chain cover and tighten bolts. Refer to **Fig. 2**.

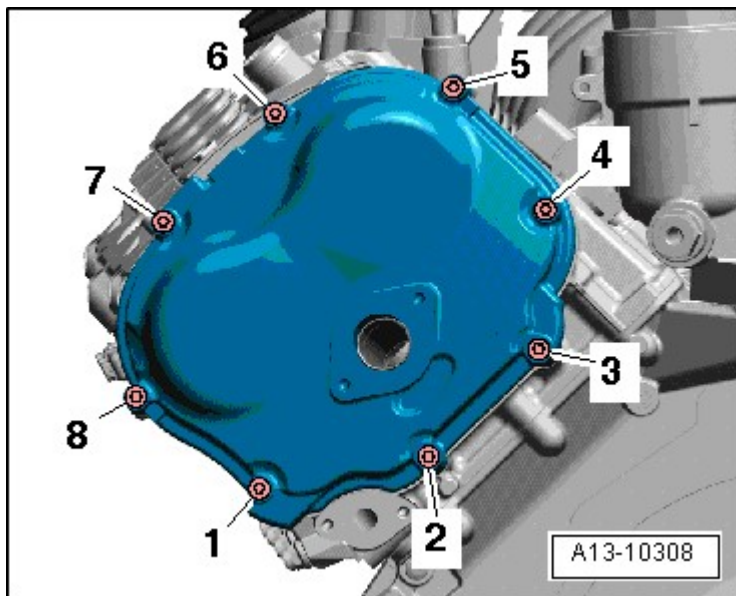


Fig. 49: Identifying Left Timing Chain Cover And Tighten/Removing Bolts Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Drive right coolant intermediate pipe -2- out of right timing chain cover with a suitable drift.

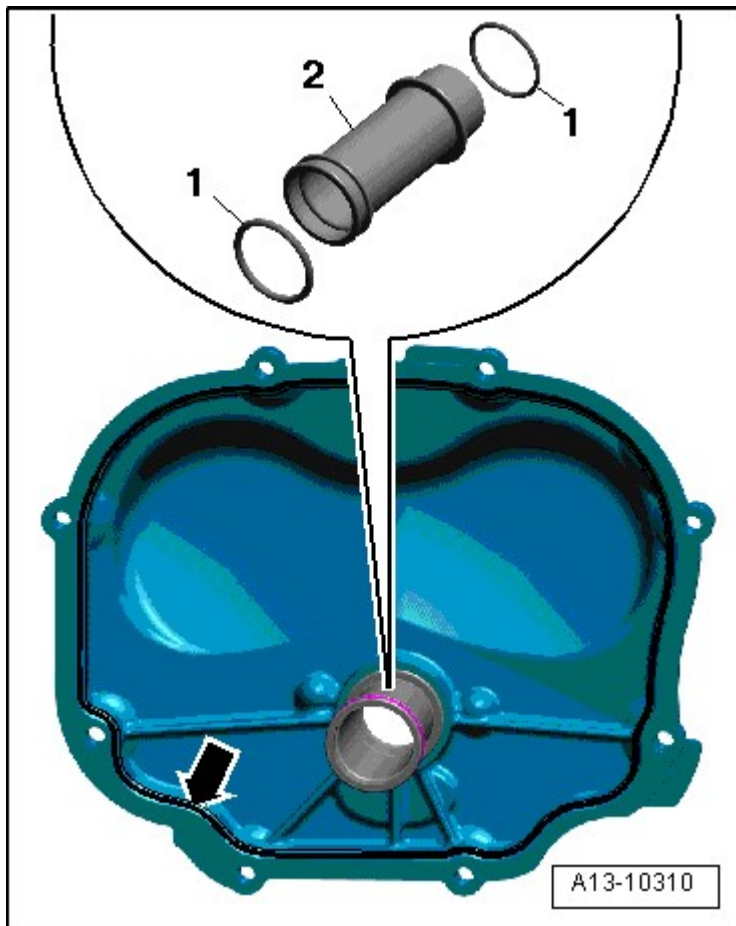


Fig. 50: Driving Left Coolant Intermediate Pipe Out Of Left Timing Chain Cover With Suitable Drift
 Courtesy of AUDI OF AMERICA, LLC

- Replace O-rings -1- at coolant intermediate pipe -2-.
- Insert coolant intermediate pipe in right timing chain cover.

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

- Do not apply sealant bead thicker than indicated.

- Apply a sealant bead -arrows- on the clean sealing surfaces on the right timing chain cover as illustrated.

- Thickness of sealant bead: 2.5 mm.

- Positing right timing chain cover and tighten bolts. Refer to **Fig. 3**.

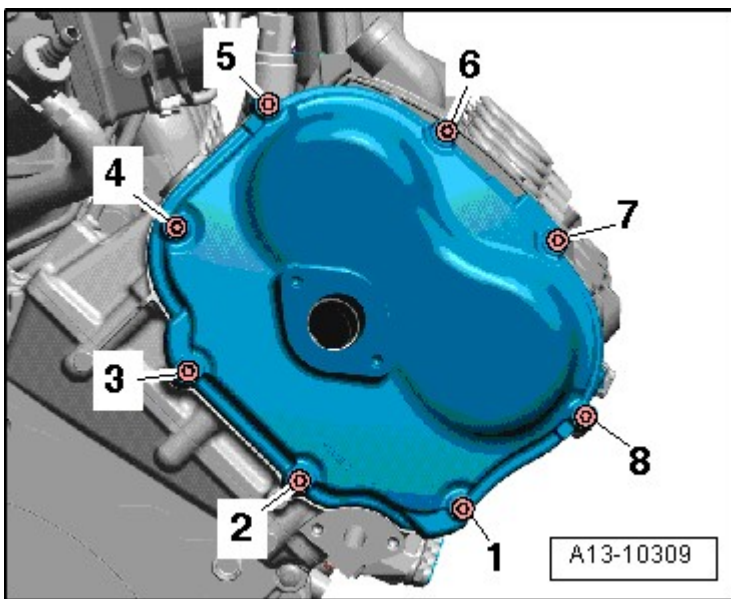


Fig. 51: Identifying Right Timing Chain Cover And Tighten/Removing Bolts Sequence
 Courtesy of AUDI OF AMERICA, LLC

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

- Install rear coolant pipe. Refer to **REAR COOLANT PIPE** .
- Install left coolant pipe. Refer to **LEFT COOLANT PIPE** .
- Install right coolant pipe. Refer to **RIGHT COOLANT PIPE** .
- Fill with coolant **COOLING SYSTEM, DRAINING AND FILLING => Filling** .

LOWER TIMING CHAIN COVER**Special tools and workshop equipment required**

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

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .
- Engine oil drained.

-- Remove drive plate. Refer to **DRIVE PLATE** .

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

-- Remove the intake manifold. Refer to **Removal and Installation** .

-- Remove oil filter housing. Refer to **OIL FILTER HOUSING** .

-- Remove the bolts -arrows-.

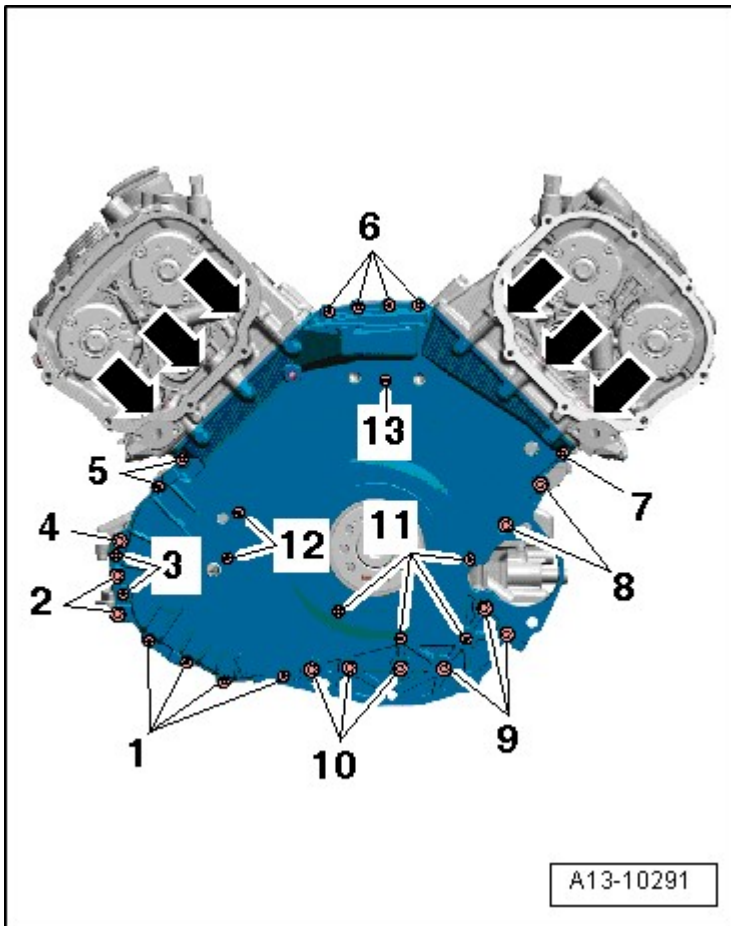


Fig. 52: Identifying Bolts And Lower Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

- Remove bolts -1 to 13- and remove lower timing chain cover.
- Press the rear crankshaft seal out of the lower timing chain cover.

Installing

- Tightening specifications **Fig. 4.**

Installation is in reverse order of removal, note the following:

- Pull alignment bushing out of top right of cylinder block.
- Chamfer the alignment bushing with a file, as shown in the illustration.

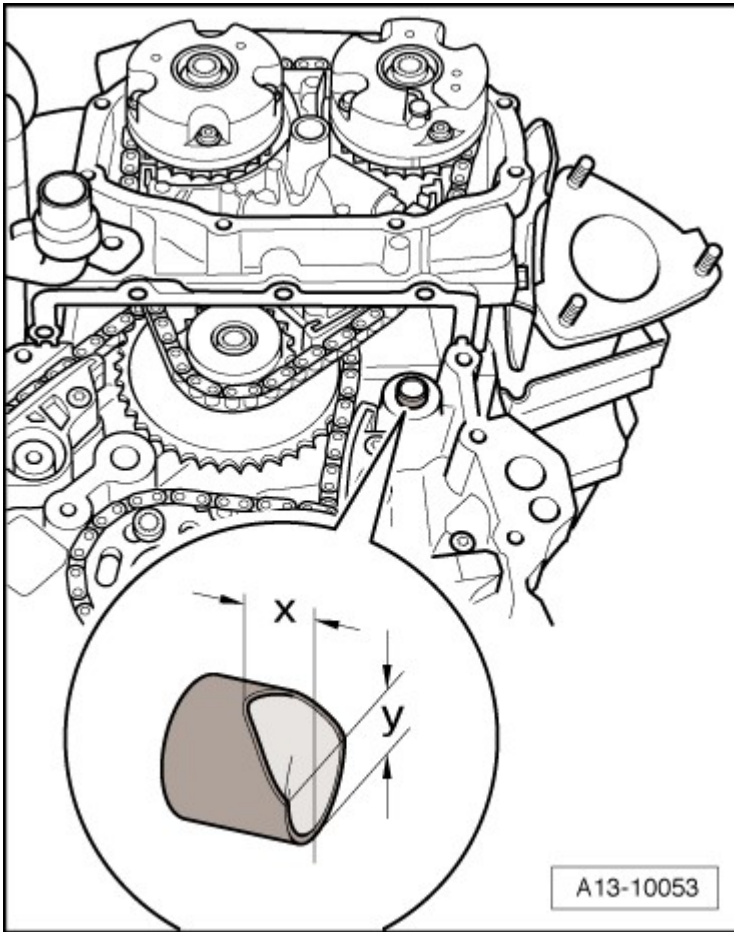


Fig. 53: Identifying Chamfer Alignment Bushing With File
Courtesy of AUDI OF AMERICA, LLC

- Dimension -x- = 6.5 mm.
- Dimension -y- = 8 mm.

-- Install the alignment bushing into the cylinder block so that the chamfered side faces upward.

NOTE: The chamfer simplifies installation of the lower timing chain cover with cylinder head installed.

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

-- Remove sealant residue in timing chain cover and cylinder block, for example with a rotating plastic brush.

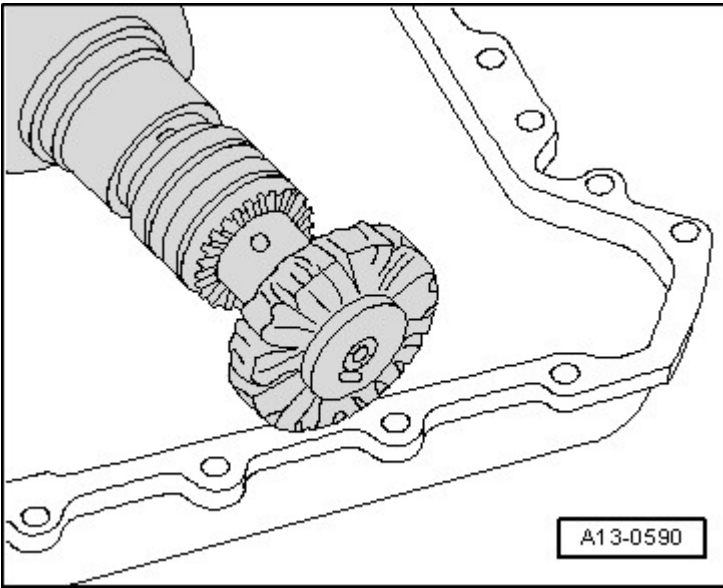


Fig. 54: Identifying Rotating Plastic Brush To Remove Sealant Residue From Sealing Flange, Cylinder Block And Upper Part Of Oil Pan

Courtesy of AUDI OF AMERICA, LLC

- Clean sealing surfaces so they are completely free of any oil or grease.
- Clean the old sealant from the holes -arrow- in the cylinder head gaskets.

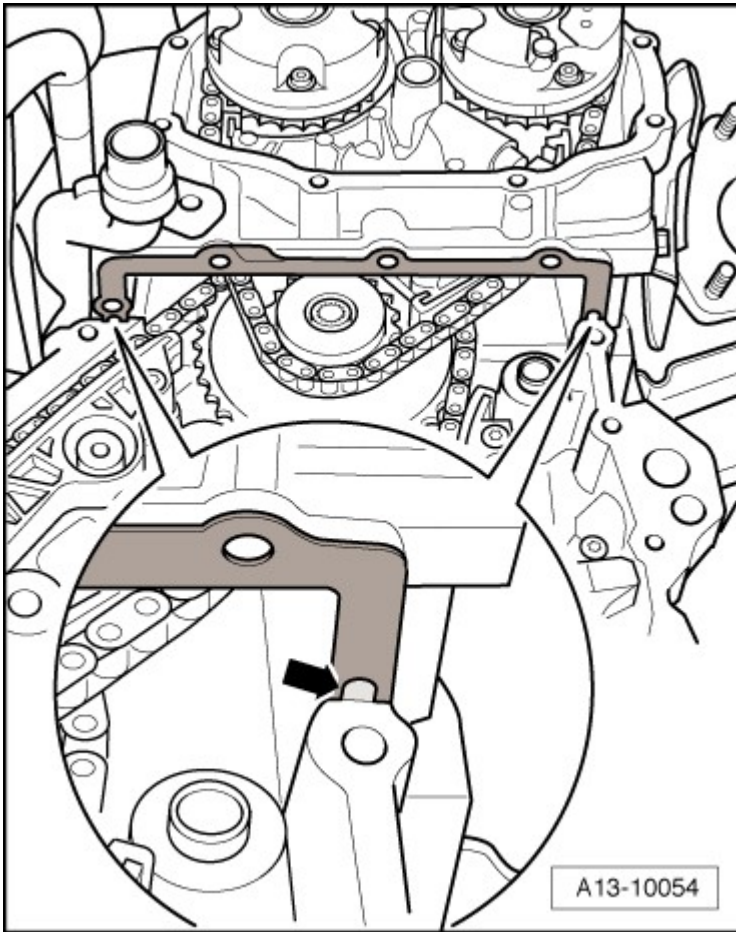


Fig. 55: Cleaning Old Sealant From Holes In Cylinder Head Gaskets

Courtesy of AUDI OF AMERICA, LLC

NOTE: With the cylinder head installed only half of the holes in the cylinder head gasket are visible.

CAUTION: The cylinder head seal could be damaged.

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

NOTE: A kinked cylinder head gasket must be replaced.

-- Bend the ends of the cylinder head gaskets very slightly downward -arrows- until the upper sealing surface of the gasket and cylinder head can be cleaned.

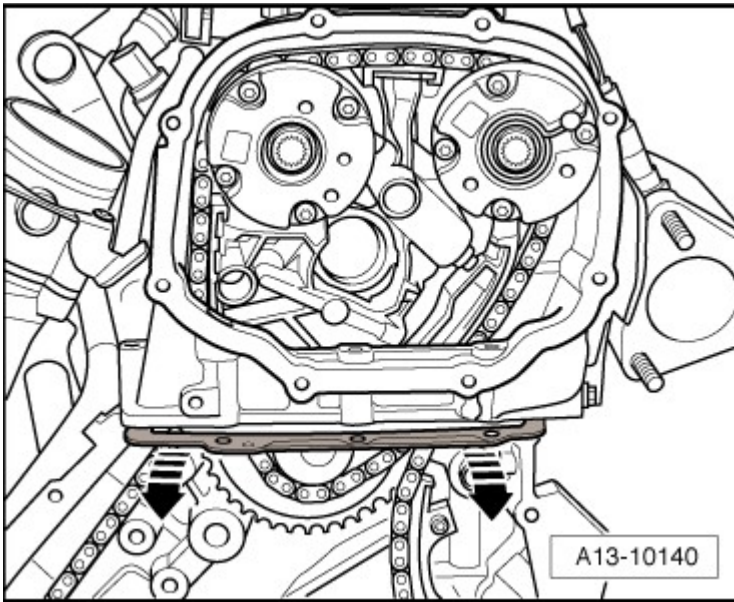


Fig. 56: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned
Courtesy of AUDI OF AMERICA, LLC

-- Clean both cylinder head gaskets, top and bottom, so they are completely free of any oil or grease.

NOTE: **Note the expiration date of the sealing compound.**

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

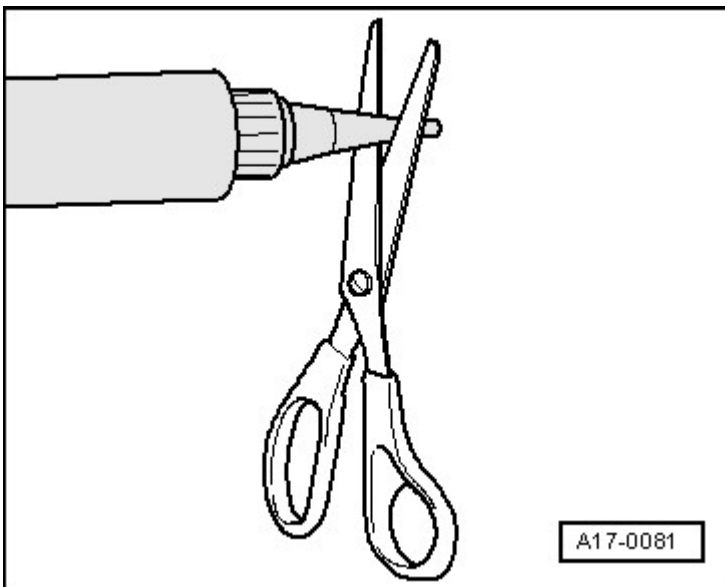


Fig. 57: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The cylinder head seal could be damaged.

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

NOTE: A kinked cylinder head gasket must be replaced.

-- Coat the sealing surfaces of the cylinder head gaskets, top and bottom, with a thin layer of sealant, slightly bending the cylinder head gaskets downward again -arrows- to do this.

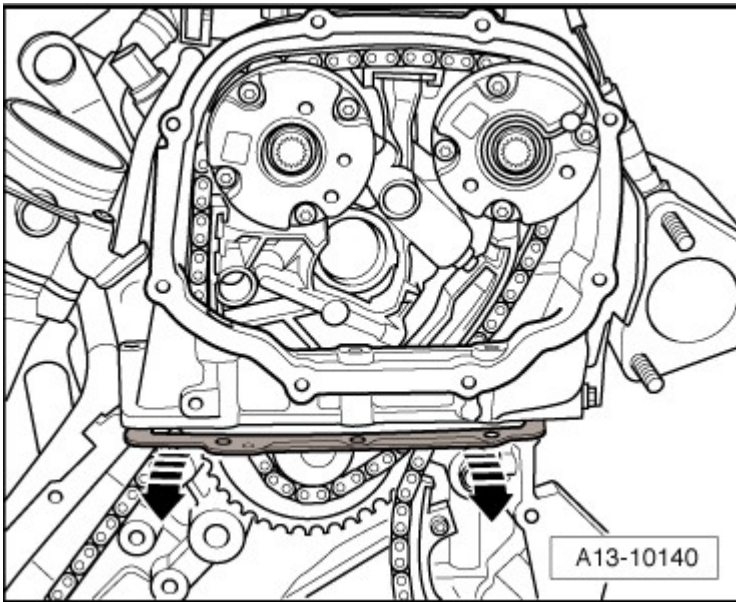


Fig. 58: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward Until Upper Sealing Surface Of Gasket And Cylinder Head Can Be Cleaned
Courtesy of AUDI OF AMERICA, LLC

-- To coat the surface between the cylinder head and gasket, use a flat object, for example a feeler gauge.

-- Fill the cleaned cylinder head seal holes -arrow- with sealant.

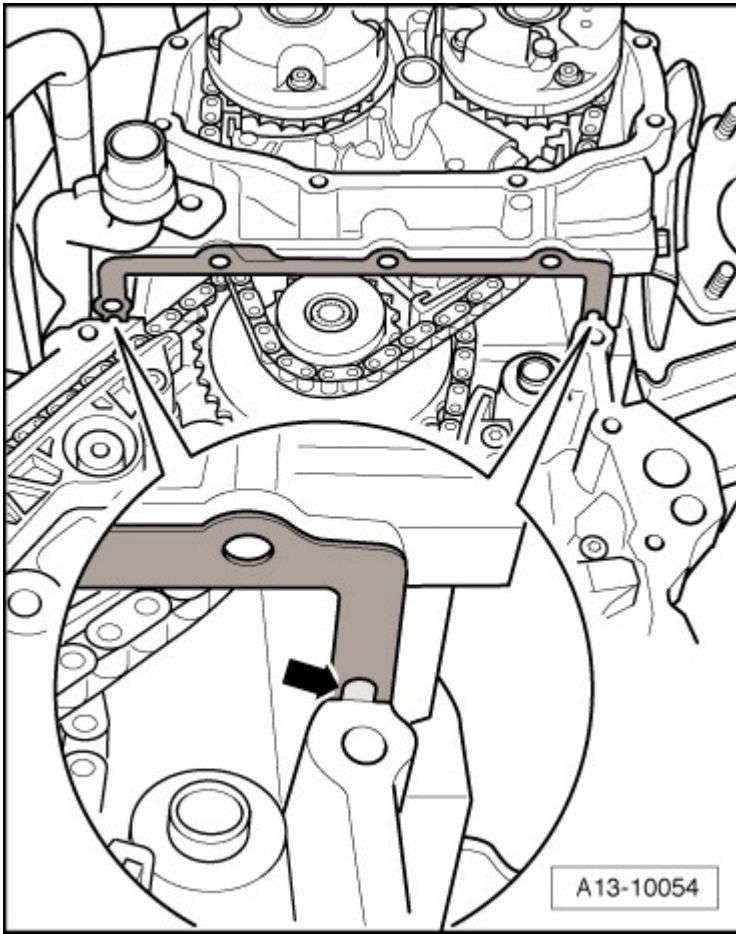


Fig. 59: Cleaning Old Sealant From Holes In Cylinder Head Gaskets
Courtesy of AUDI OF AMERICA, LLC

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

- Do not apply sealant beads thicker than indicated.

-- Apply sealant beads -1 to 9- on the clean sealing surfaces on the lower timing chain cover as illustrated.

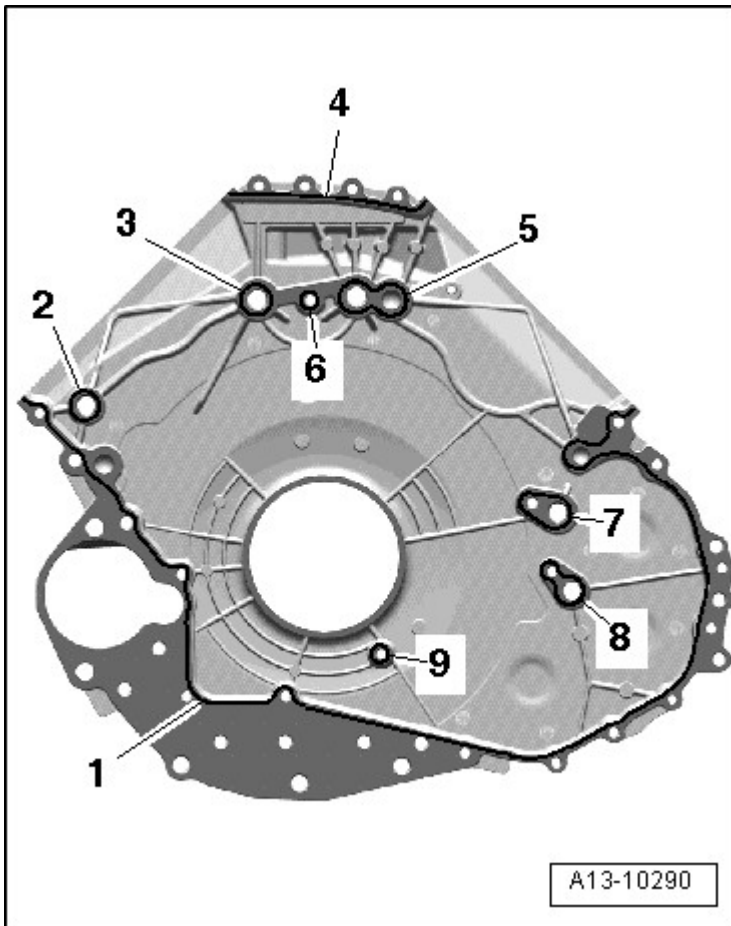


Fig. 60: Applying Sealant Beads On Clean Sealing Surfaces Of Lower Timing Chain Cover
Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant beads: 2.5 mm.

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

-- Set the lower timing chain cover in place, guiding the cover at an angle from below onto the sealing surface of the cylinder block and cylinder head.

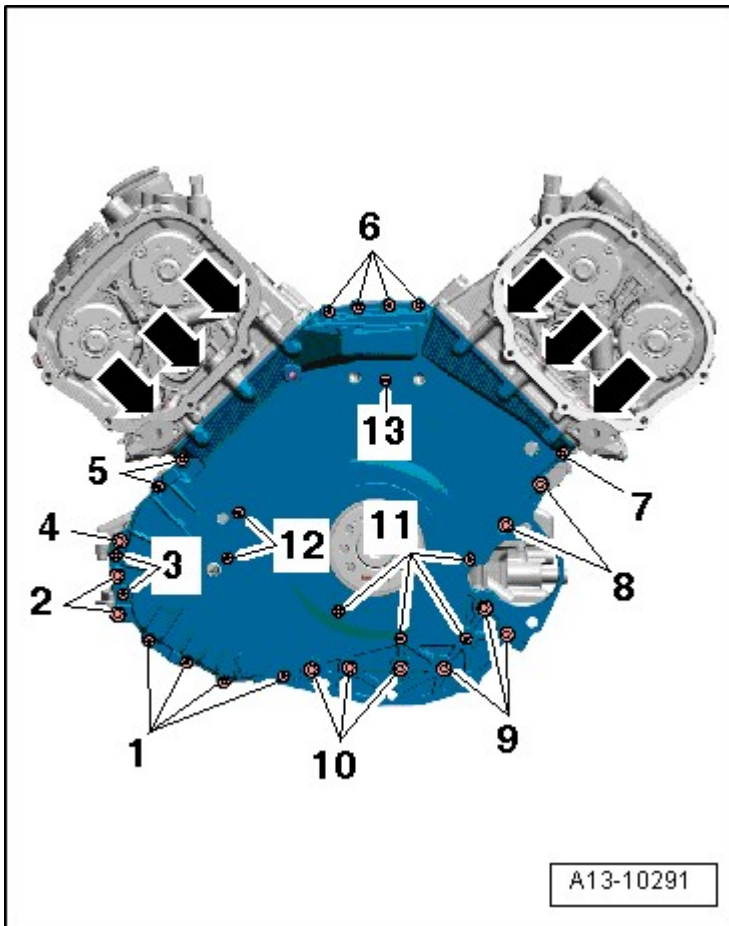


Fig. 61: Identifying Bolts And Lower Timing Chain Cover
 Courtesy of AUDI OF AMERICA, LLC

-- When installing, make sure that the cylinder head gaskets do not become damaged.

NOTE: A damaged cylinder head seal must be replaced.

-- Tighten bolts. Refer to **Fig. 4**.

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

-- Install the crankshaft seal on the transmission side. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE** .

-- Install oil filter housing. Refer to **OIL FILTER HOUSING** .

-- Install intake manifold. Refer to **Removal and Installation** .

-- Install left and right timing chain covers **INSTALLING**.

-- Install drive plate. Refer to **DRIVE PLATE** .

CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**Special tools and workshop equipment required**

- Crankshaft Holder 3242
- Torque Wrench V.A.G 1332
- Open Ring Spanner Insert, AF 24 mm V.A.G 1332/9
- Adapter T40058
- Camshaft Clamp T40070, quantity: 2
- Locking Pin T40071, quantity: 2
- Key T40079

Removing

NOTE: According to the following description, the timing chains for camshafts remain on engine.

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

-- Remove the cylinder head cover. Refer to LEFT CYLINDER HEAD COVER, RIGHT CYLINDER HEAD COVER.

-- Insert the T40058 guide pins as follows:

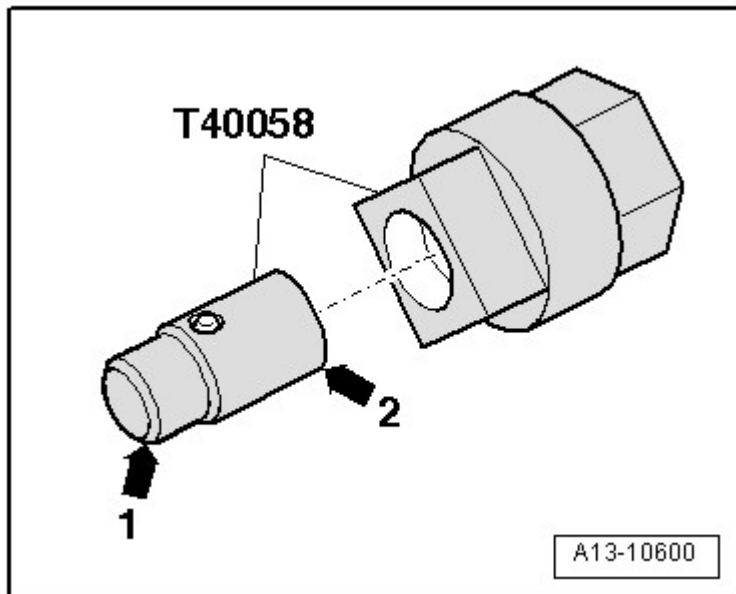


Fig. 62: Inserting T40058 Guide Pin
Courtesy of AUDI OF AMERICA, LLC

- Small diameter -arrow 1- points to engine.

- Large diameter -arrow 2- points to socket.

-- Using T40058, rotate crankshaft in direction of engine rotation -arrow- to "TDC".

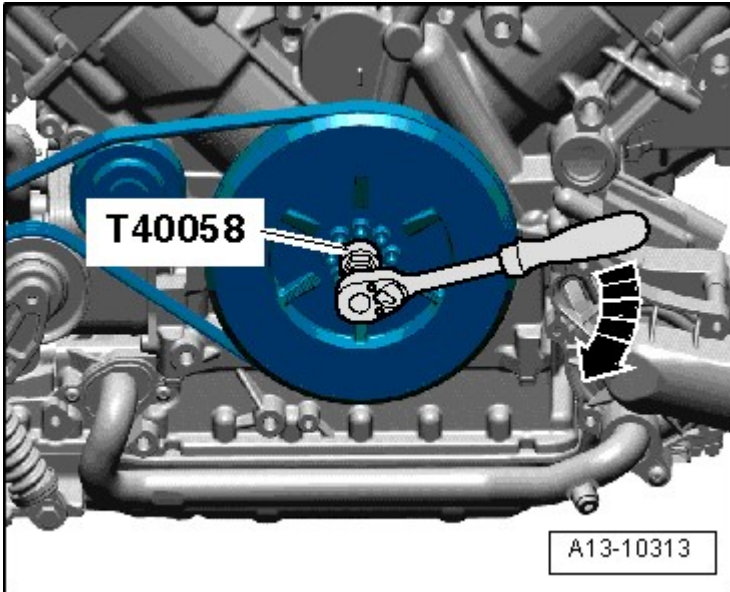


Fig. 63: Loosening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

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

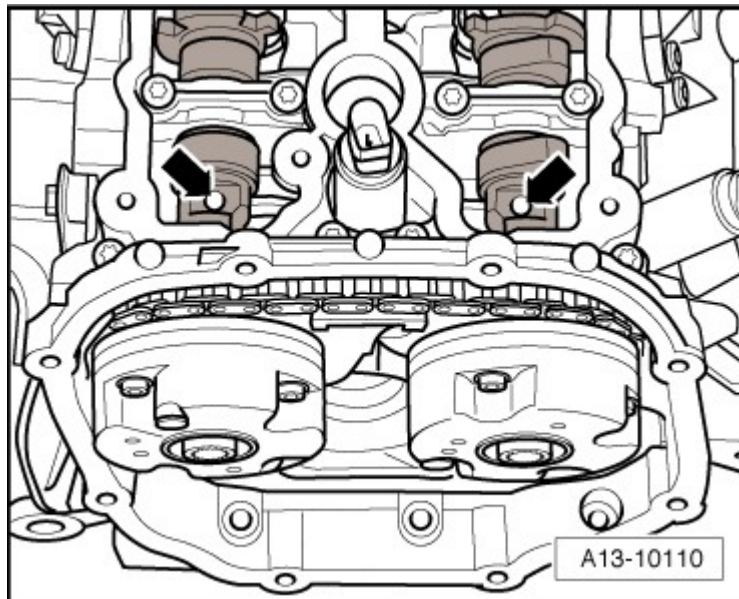


Fig. 64: Identifying Threaded Holes In Camshafts Must Face Upward
Courtesy of AUDI OF AMERICA, LLC

-- Mount the T40070 on both cylinder heads and tighten the bolts -arrows- to 25 Nm.

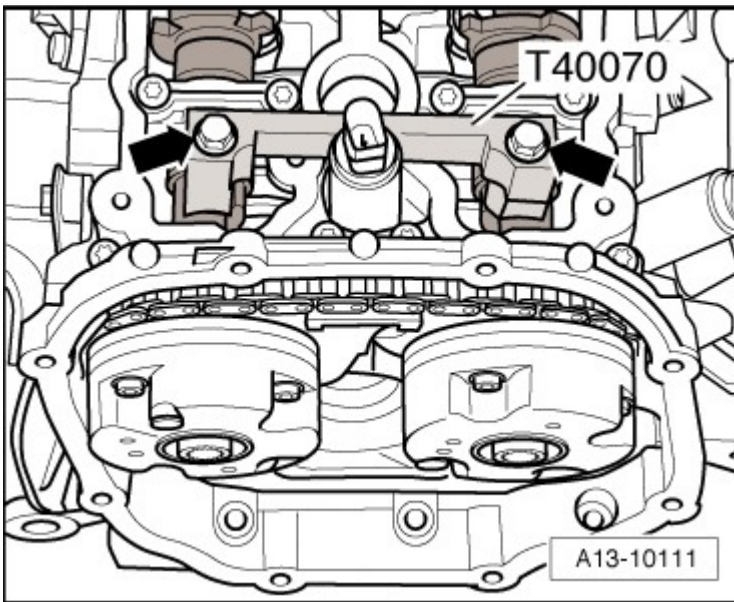


Fig. 65: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
 Courtesy of AUDI OF AMERICA, LLC

- The T40070 is correctly positioned when the holes for the cylinder head bolts remain free.

-- Remove locking bolt -arrow- from upper section of the oil pan.

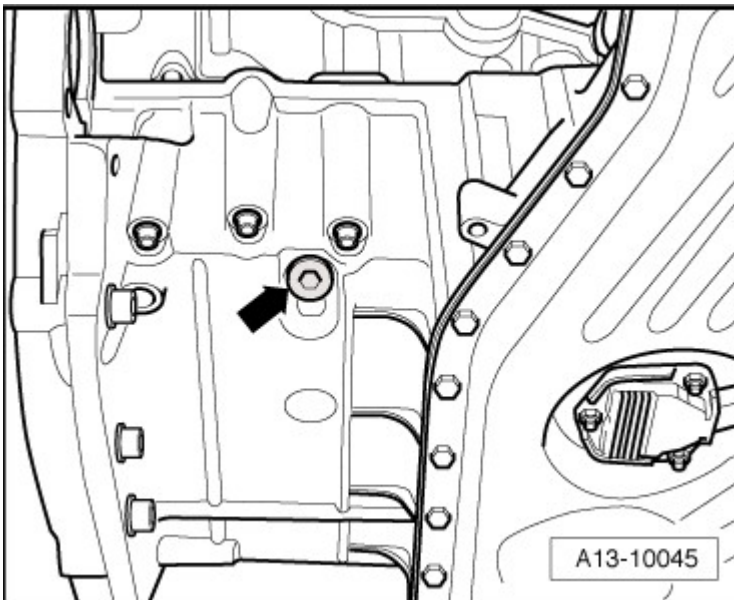


Fig. 66: Identifying Locking Bolt Of Upper Part Of Oil Pan
 Courtesy of AUDI OF AMERICA, LLC

-- Screw 3242 into hole to 20 Nm, if necessary rotate crankshaft very slightly back and forth to completely center the holder.

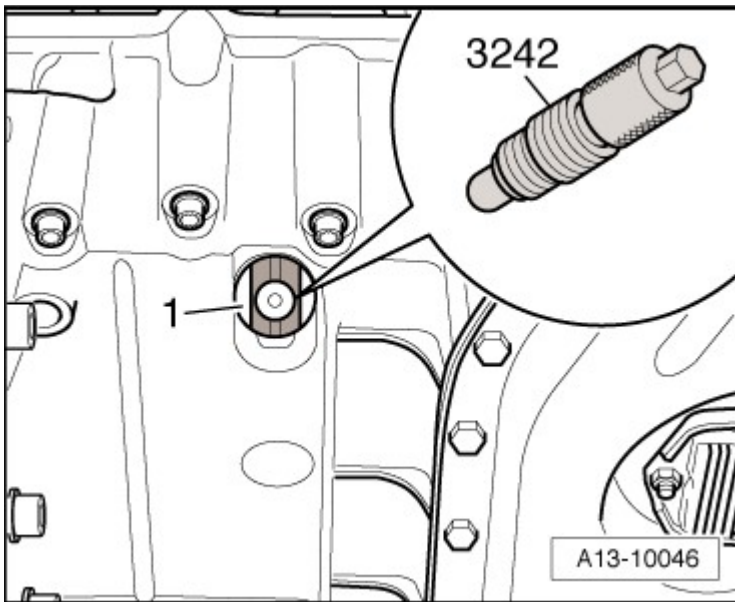


Fig. 67: Identifying Crankshaft Holder 3242 In Bore
 Courtesy of AUDI OF AMERICA, LLC

-- Press left camshaft timing chain tensioner glide track inward with a screwdriver -1- as far as stop and secure chain tensioner with T40071.

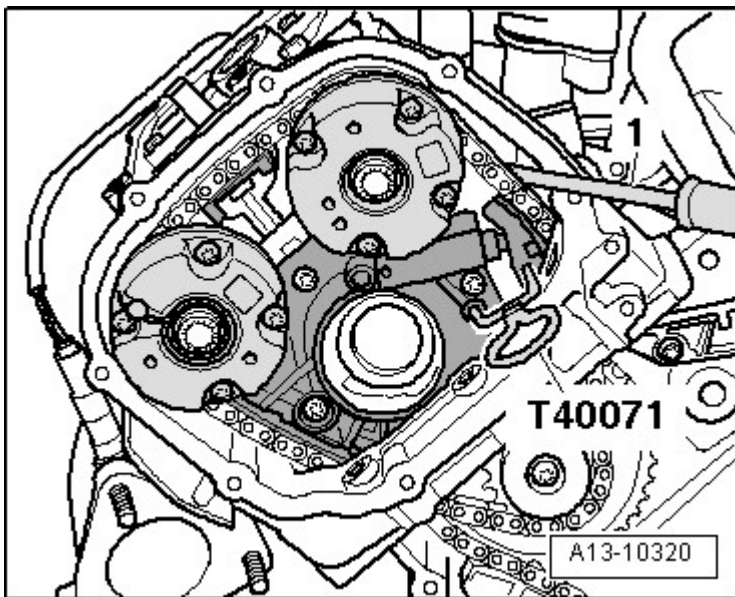


Fig. 68: Pressing Left Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071
 Courtesy of AUDI OF AMERICA, LLC

NOTE: The toothed belt tensioner is lubricated with oil and should only be compressed slowly by applying constant pressure.

-- Press right camshaft timing chain tensioner glide track inward with a screwdriver -1- as far as stop and secure chain tensioner with T40071.

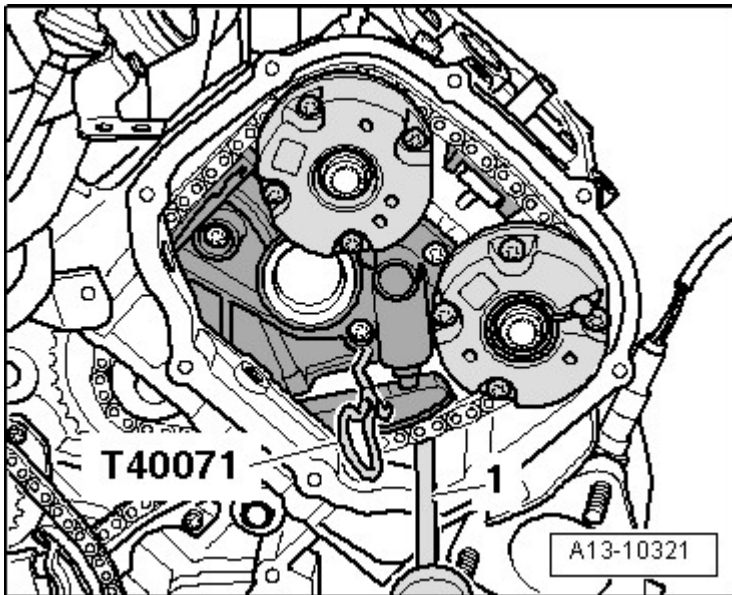


Fig. 69: Pressing Right Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071

Courtesy of AUDI OF AMERICA, LLC

NOTE: The toothed belt tensioner is lubricated with oil and should only be compressed slowly by applying constant pressure.

-- For re-installation, identify installation location of camshaft adjuster with paint.

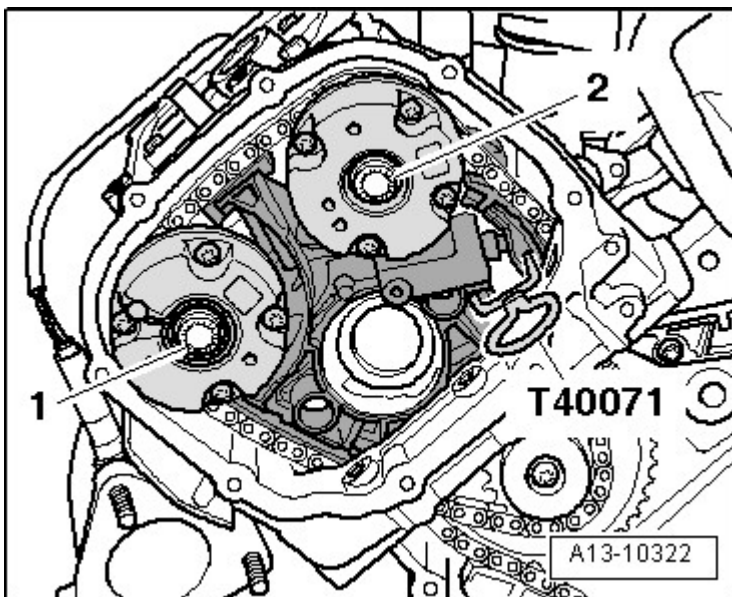


Fig. 70: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters

Courtesy of AUDI OF AMERICA, LLC

CAUTION: The engine could be destroyed.

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

-- Remove bolts -1- and -2- on left cylinder head and remove both camshaft adjusters.

-- For re-installation, identify installation location of camshaft adjuster with paint.

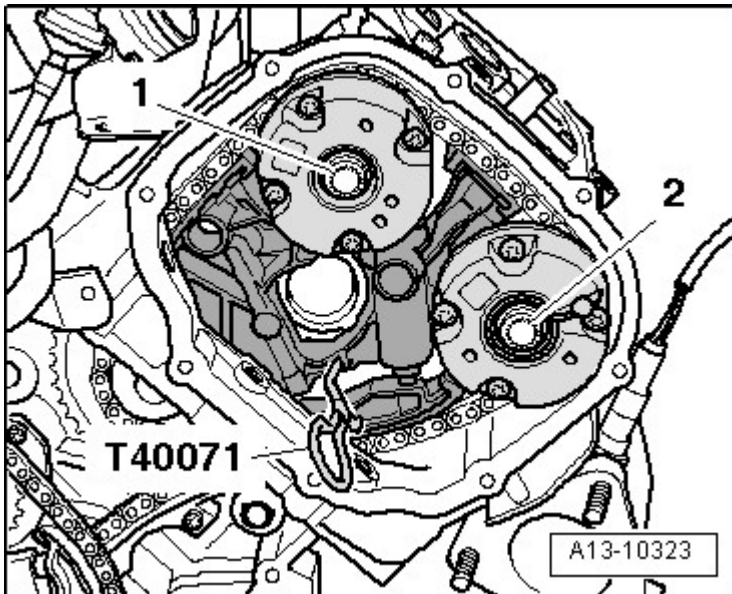


Fig. 71: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1- and -2- on right cylinder head and remove both camshaft adjusters.

INSTALLING

- Tightening specifications, refer to CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW, UPPER OIL PAN SECTION ASSEMBLY OVERVIEW.

NOTE: Replace bolts which have been tightened to torque.

Replace locking bolt O-ring.

CAUTION: Risk of damaging valves and piston crowns.

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

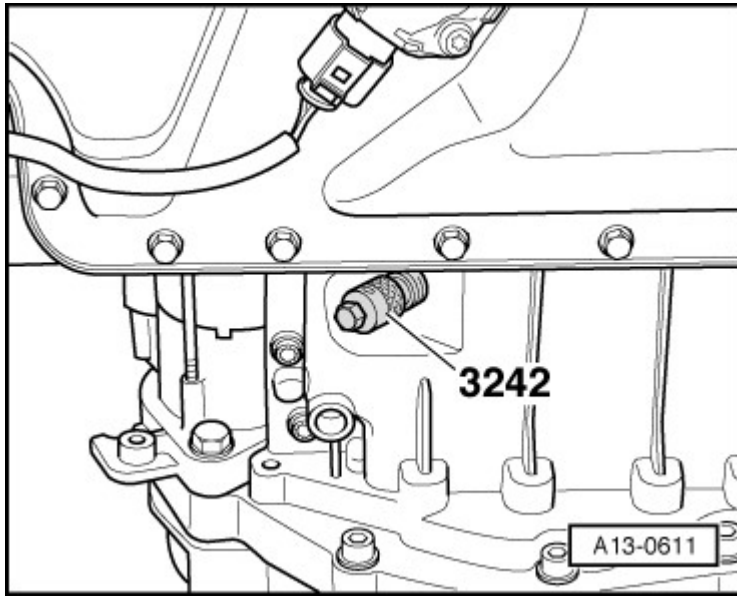


Fig. 72: Identifying Crankshaft Holder 3242 Into Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- Secure crankshaft in "TDC" position using 3242.
- T40070 mounted on both cylinder heads and fastened to 25 Nm -arrows-.

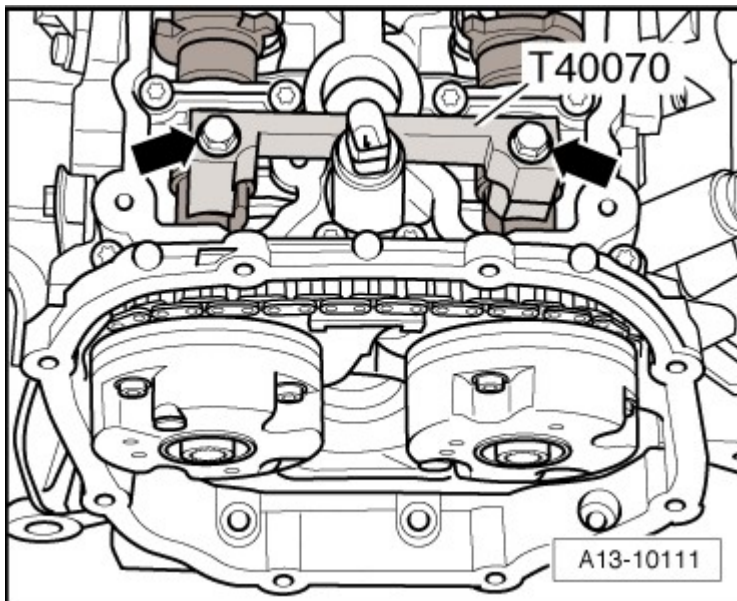


Fig. 73: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
Courtesy of AUDI OF AMERICA, LLC

NOTE: Reinstall left camshaft adjuster according to the mark applied during removal.

-- Replace camshaft bolts.

-- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in the bolts - 1- and -2-.

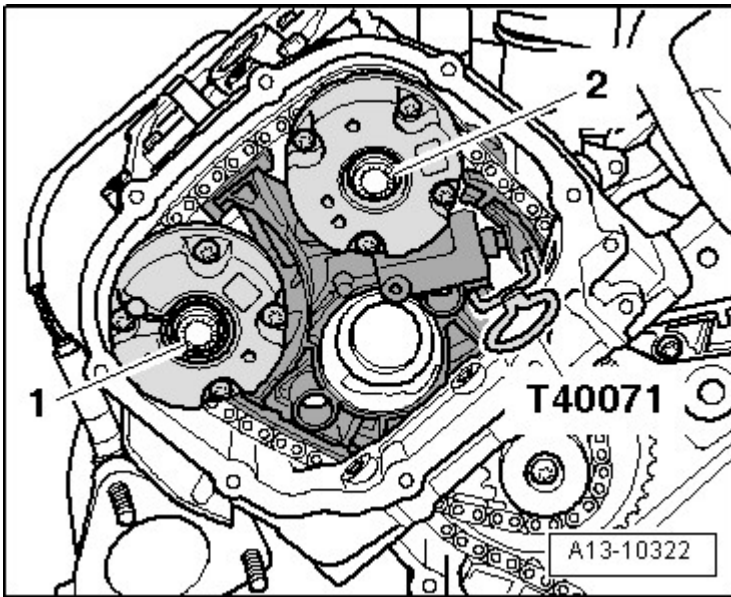


Fig. 74: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of AUDI OF AMERICA, LLC

- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.

-- Remove T40071.

-- Reinstall camshaft adjuster on right cylinder head according to the mark applied during removal.

-- Place camshaft timing chain onto drive sprocket and onto camshaft adjusters and loosely thread in the bolts - 1- and -2-.

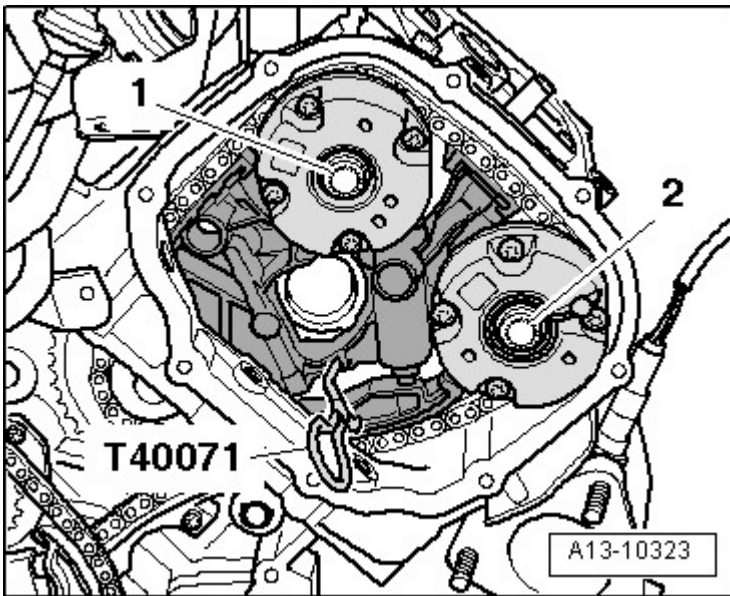


Fig. 75: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters
 Courtesy of AUDI OF AMERICA, LLC

- Both camshaft adjusters must be able to still be rotated on camshaft and must not tip.

-- Remove T40071.

-- Position T40079 on intake camshaft adjuster at left cylinder head.

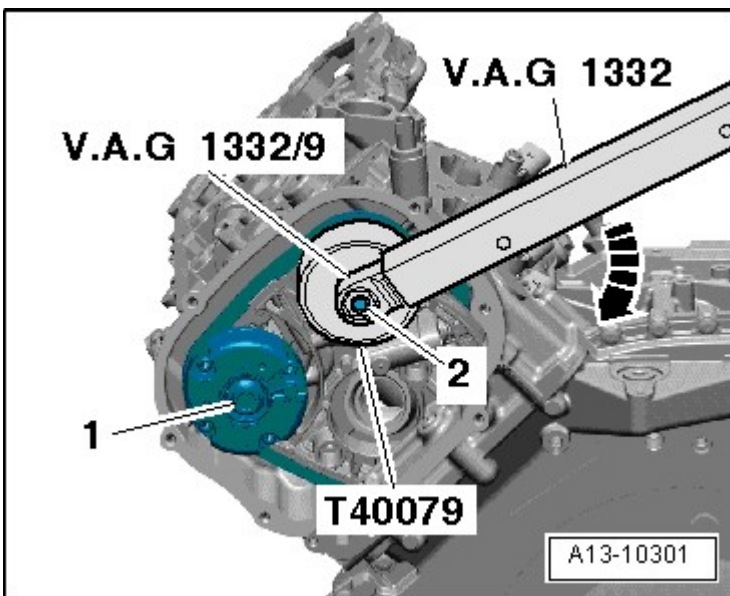


Fig. 76: Positioning Adapter T40079 On Intake Camshaft Adjuster At Left Cylinder Head
 Courtesy of AUDI OF AMERICA, LLC

-- Position V.A.G 1332 with V.A.G 1332/9 on T40079.

-- Have a second technician pre-tension camshaft adjuster to 40 Nm in direction of -arrow-.

-- Tighten bolts as follows while camshaft adjuster is held under pre-tension:

-- Pre-tighten bolt -1- to intake camshaft to 60 Nm.-- Pre-tighten bolt -2- to exhaust camshaft to 60 Nm.

-- Position T40079 on exhaust camshaft adjuster at right cylinder head.

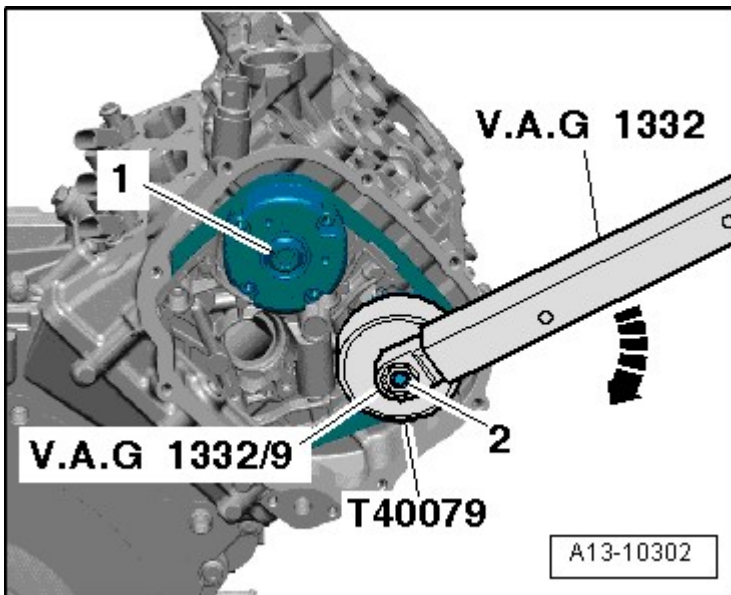


Fig. 77: Positioning Adapter T40079 On Exhaust Camshaft Adjuster At Right Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

-- Position V.A.G 1332 with V.A.G 1332/9 on T40079.

-- Have a second technician pre-tension camshaft adjuster to 40 Nm in direction of -arrow-.

-- Tighten bolts as follows while camshaft adjuster is held under pre-tension:

-- Pre-tighten bolt -1- to intake camshaft to 60 Nm.-- Pre-tighten bolt -2- to exhaust camshaft to 60 Nm.

-- Remove T40079.

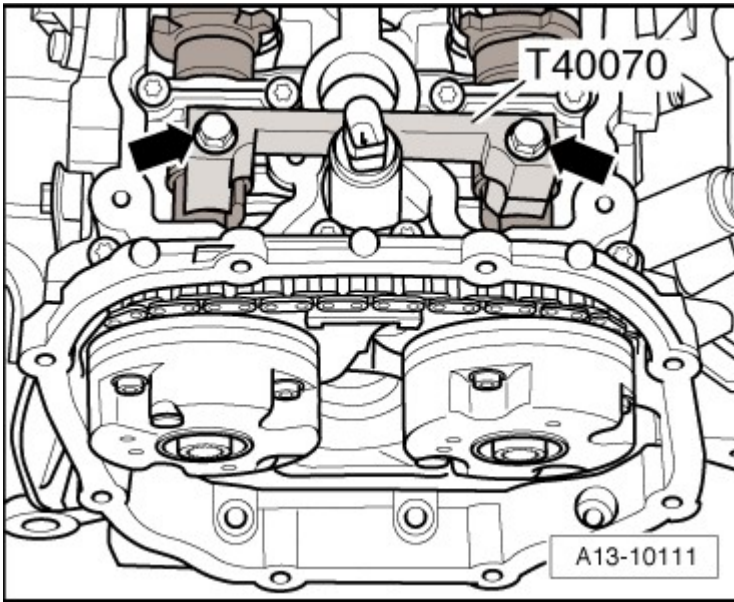


Fig. 78: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove T40070 on both cylinder heads -arrows-.

-- Tighten camshaft adjuster bolts on left cylinder head as follows:

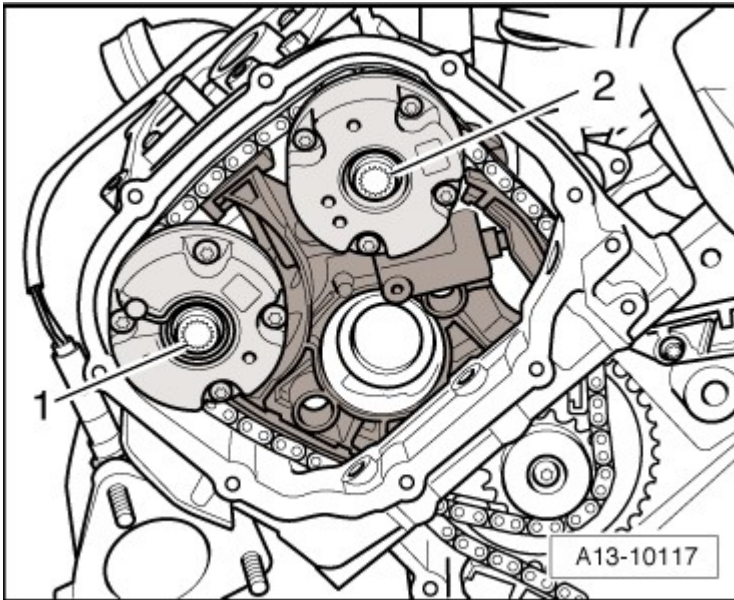


Fig. 79: Identifying Camshaft Adjuster Screws On Left Cylinder Head, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolt -1- to intake camshaft to final torque.-- Tighten bolt -2- to exhaust camshaft to final torque.

-- Tighten camshaft adjuster bolts on right cylinder head as follows:

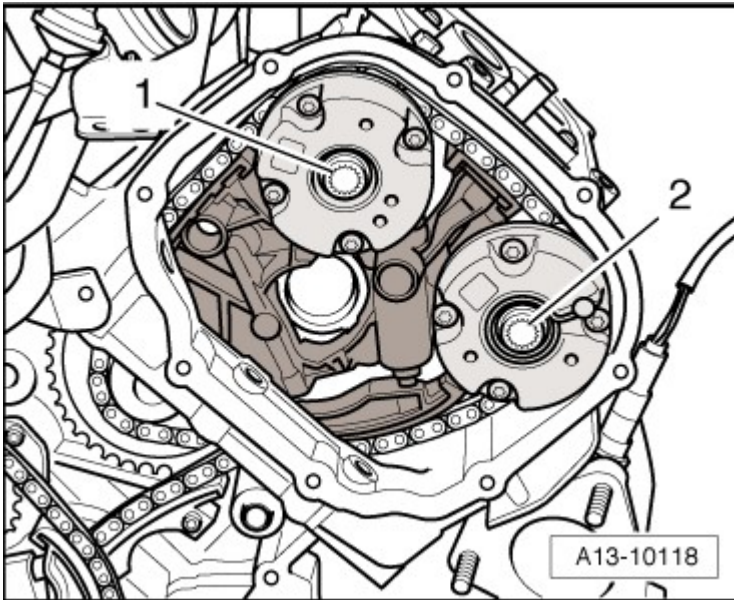


Fig. 80: Identifying Bolts For Camshaft Adjuster Using Multipoint Socket T10035
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolt -1- to intake camshaft to final torque.-- Tighten bolt -2- to exhaust camshaft to final torque.

-- Remove 3242.

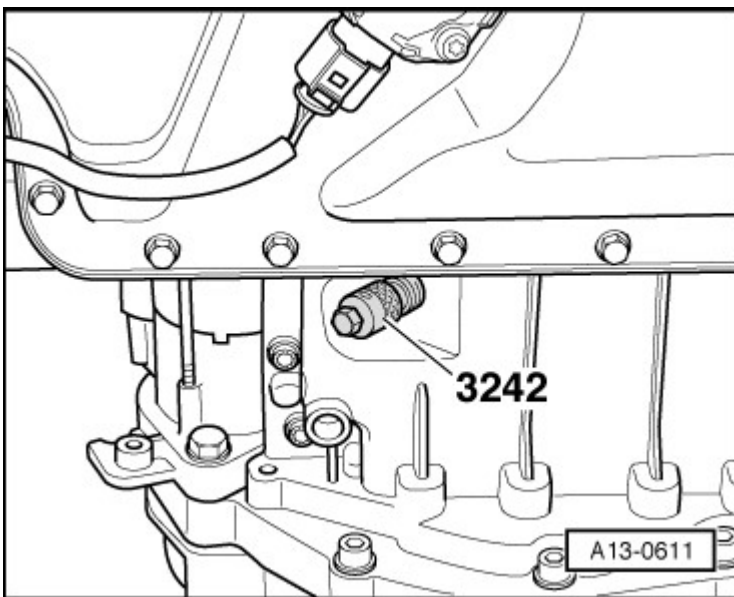


Fig. 81: Identifying Crankshaft Holder 3242 Into Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Using T40058 turn crankshaft two complete rotations in direction of engine rotation -arrow- until crankshaft

stands at "TDC" again.

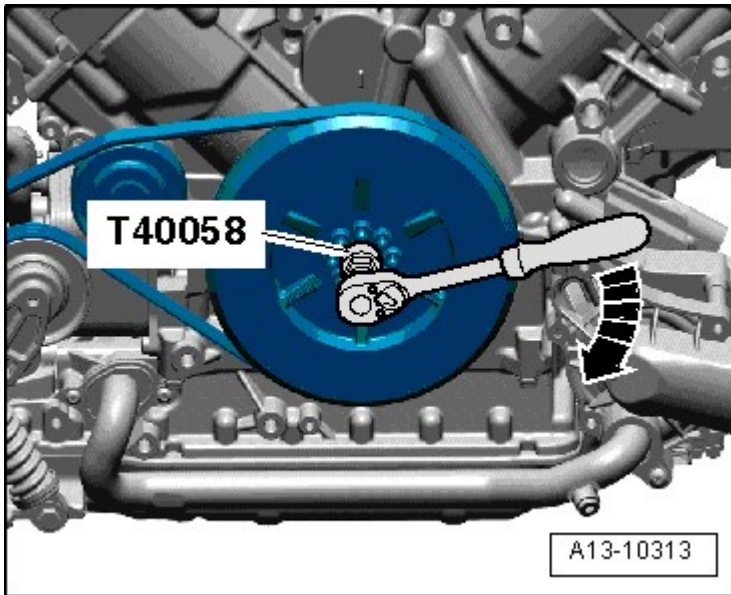


Fig. 82: Loosening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

NOTE: If rotated unintentionally beyond "TDC", turn back crankshaft again approximately 30° and set to "TDC" again.

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

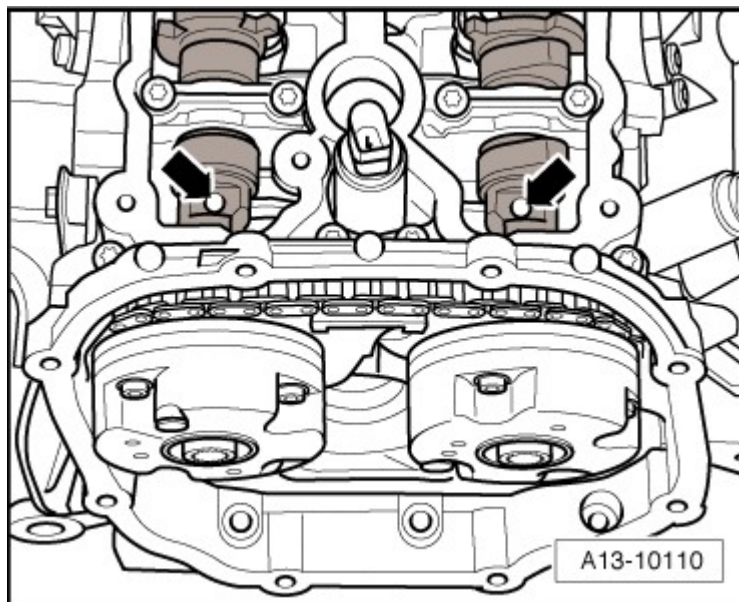


Fig. 83: Identifying Threaded Holes In Camshafts Must Face Upward
Courtesy of AUDI OF AMERICA, LLC

-- Mount the T40070 to both cylinder heads and tighten the bolts -arrows- to 25 Nm.

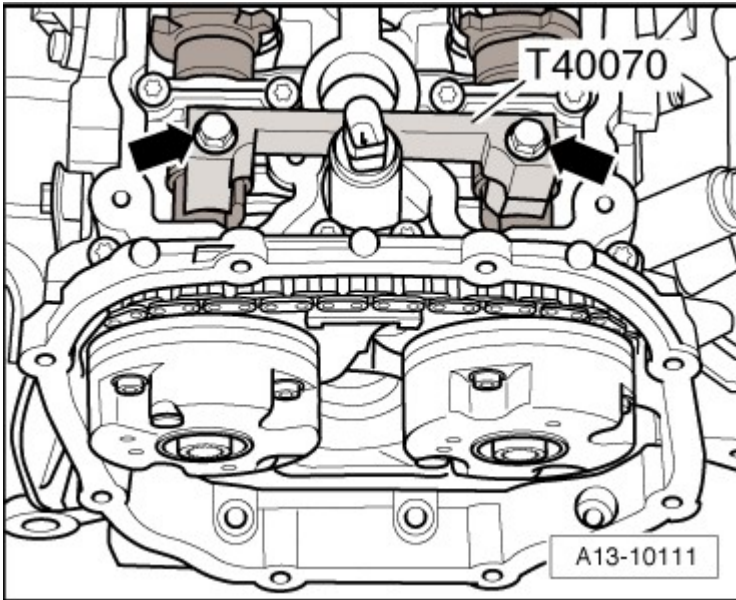


Fig. 84: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
Courtesy of AUDI OF AMERICA, LLC

- The T40070 is correctly positioned when the holes for the cylinder head bolts remain free.

-- Install 3242 in bore and tighten to 20 Nm.

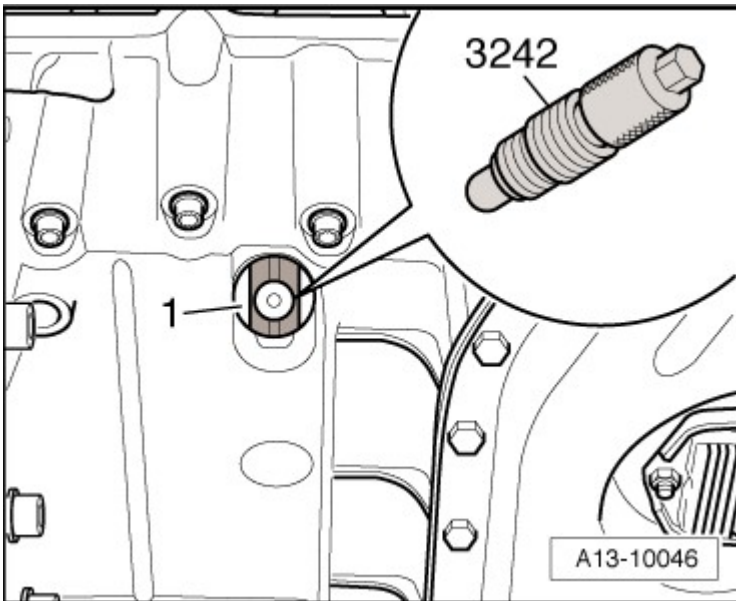


Fig. 85: Identifying Crankshaft Holder 3242 In Bore
Courtesy of AUDI OF AMERICA, LLC

- The 3242 must engage in the locating hole of the crankshaft -1-, otherwise repeat the adjustment.

- Remove camshaft locating tools on both cylinder heads.
- Remove 3242.
- Install "TDC" mark sealing plug with new seal in upper section of the oil pan.

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

- Install left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install cylinder head cover. Refer to **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.

CAMSHAFT TIMING CHAIN

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .
 - Engine oil drained.
- Remove drive plate. Refer to **DRIVE PLATE** .
 - Remove the cylinder head cover. Refer to **LEFT CYLINDER HEAD COVER**, **RIGHT CYLINDER HEAD COVER**.
 - Remove left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
 - Remove the intake manifold. Refer to **Removal and Installation** .
 - Remove oil filter housing. Refer to **OIL FILTER HOUSING** .
 - Remove lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
 - Remove camshaft timing chains from camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.

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

- **Paint arrows to mark the timing chain running direction so it can be installed again. Do not mark camshaft timing chain with punch, notch or something similar.**
- Remove bolts -1- and -2- and remove left chain tensioner and left camshaft timing chain.

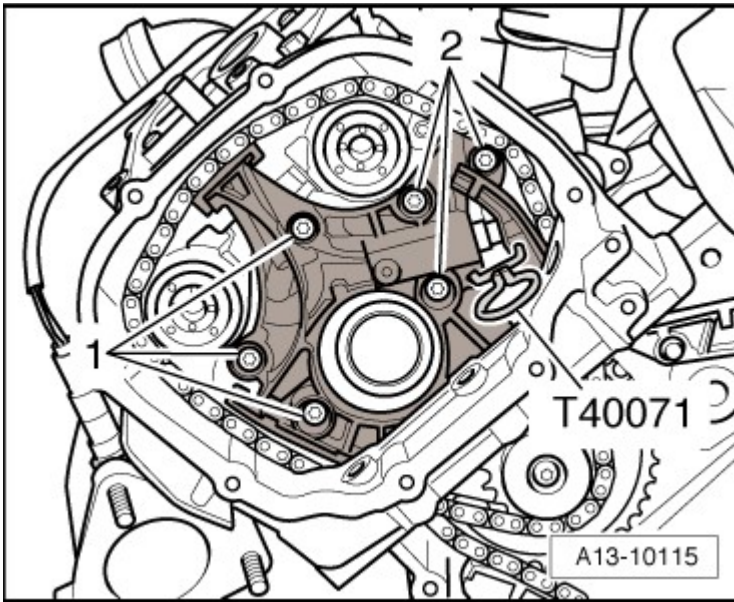


Fig. 86: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

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

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

-- Remove bolts -1- and -2- and remove right chain tensioner and right camshaft timing chain.

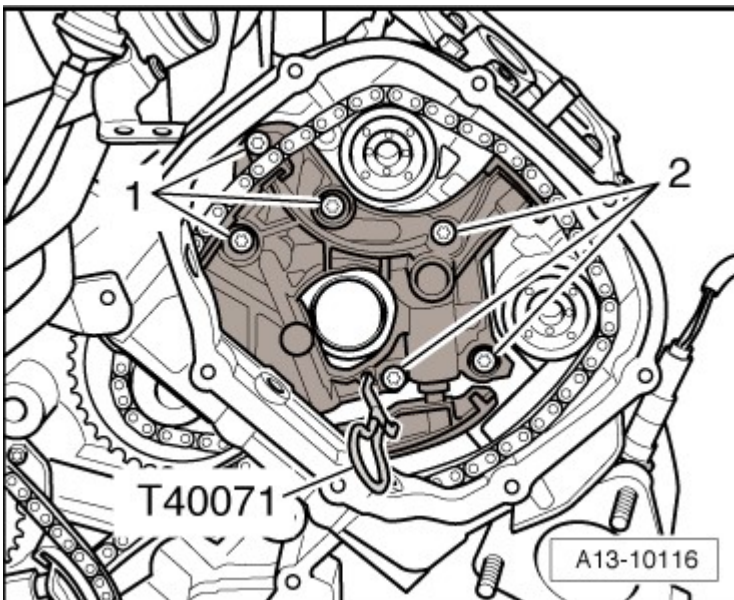


Fig. 87: Identifying Bolts For Right Chain Tensioner And Right Camshaft Timing Chain

Courtesy of AUDI OF AMERICA, LLC

INSTALLING

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

NOTE: If the tensioning element is to be removed from the chain tensioner, observe the installed position: Hole in housing floor faces toward chain tensioner, piston faces toward tensioning rail.

Replace bolts which have been tightened to torque.

Replace the gasket.

CAUTION: Risk of damaging valves and piston crowns.

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

-- Press left and right camshaft timing chain guide rail inward -arrow- as far as stop and secure chain tensioner with T40071.

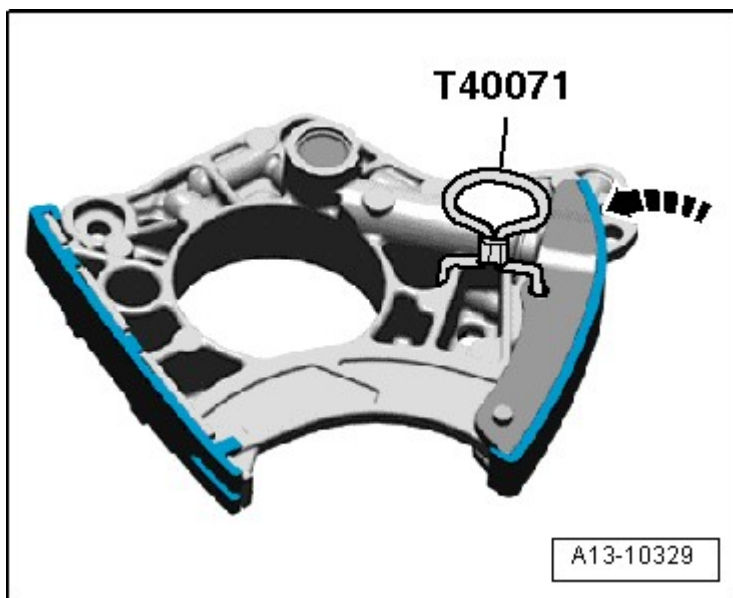


Fig. 88: Pressing Left/Right Camshaft Timing Chain Guide Rail Inward And Securing Chain Tensioner With Locking Pin T40071

Courtesy of AUDI OF AMERICA, LLC

-- Clean oil strainer -2- in both chain tensioners if necessary.

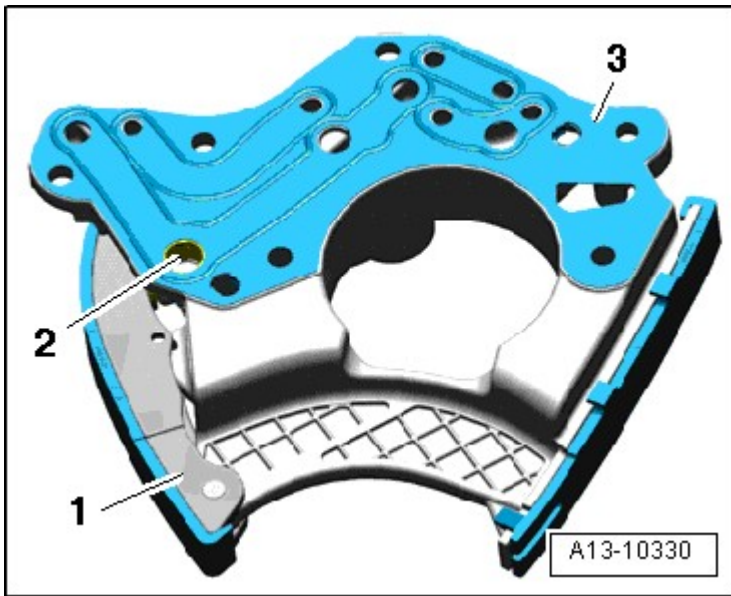


Fig. 89: Identifying Chain Tensioner Oil Screen, Gasket & Chain Tensioner
 Courtesy of AUDI OF AMERICA, LLC

-- Place a new gasket -3- onto the rear of the chain tensioner -1-.

-- Insert chain tensioner in left cylinder head and position camshaft timing chain according to mark applied during removal, as shown in illustration.

-- Tighten bolts -1 - and -2-.

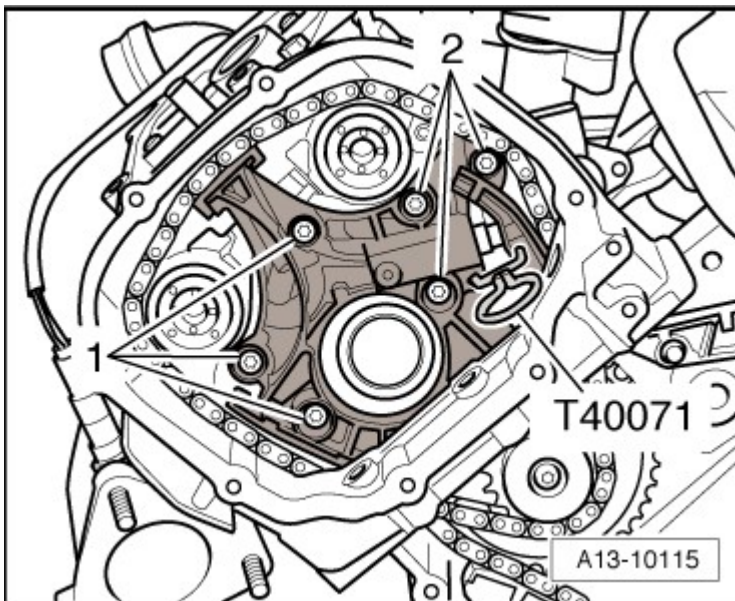


Fig. 90: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

-- Insert chain tensioner in right cylinder head and position camshaft timing chain according to mark applied

during removal, as shown in illustration.

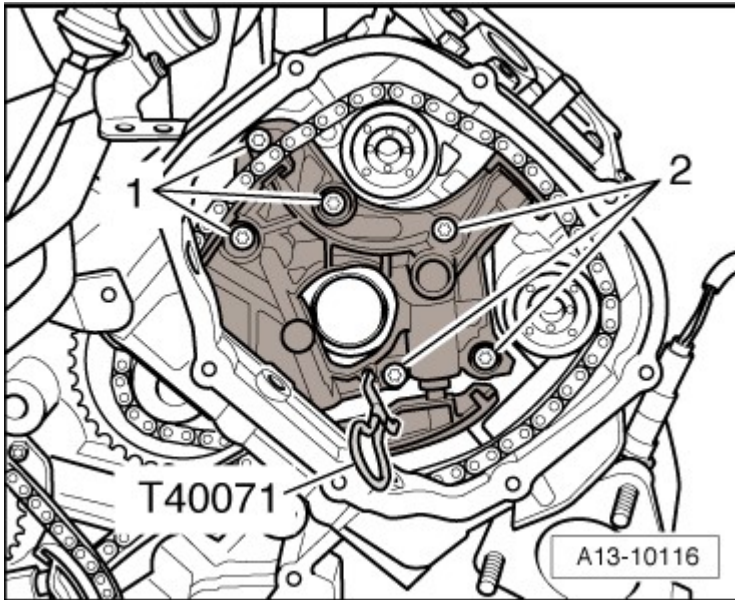


Fig. 91: Identifying Bolts For Right Chain Tensioner And Right Camshaft Timing Chain
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts -1- and -2-.

Further installation is in reverse order of removal, note the following:

- Position camshaft timing chains on camshafts **INSTALLING**.
- Install lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install oil filter housing. Refer to **OIL FILTER HOUSING** .
- Install intake manifold. Refer to **Removal and Installation** .
- Install left and right timing chain covers **INSTALLING**.
- Install cylinder head cover. Refer to **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.
- Install drive plate. Refer to **DRIVE PLATE** .

TIMING MECHANISM DRIVE CHAIN

Special tools and workshop equipment required

- Locking pin T40071

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .
- Engine oil drained.

-- Remove drive plate. Refer to **DRIVE PLATE** .

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

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

-- Remove the intake manifold. Refer to **Removal and Installation** .

-- Remove oil filter housing. Refer to **OIL FILTER HOUSING** .

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

-- Remove camshaft timing chains. Refer to **CAMSHAFT TIMING CHAIN**.

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

-- Push drive chain tensioner guide rail in direction of -arrow- and secure chain tensioner using T40071.

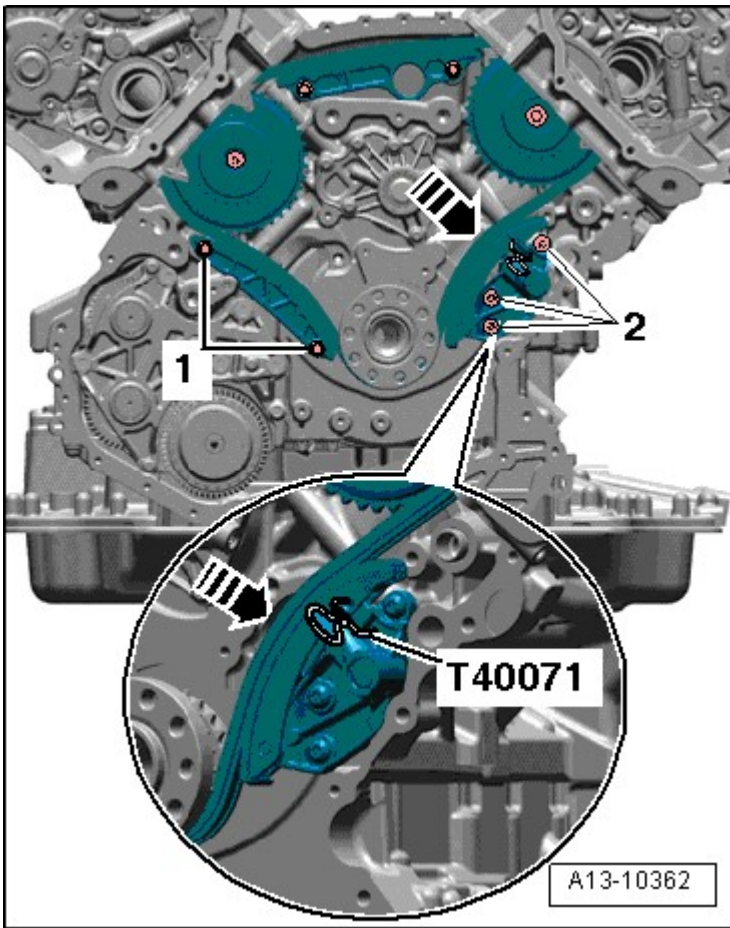


Fig. 92: Identifying Bolts And Chain Tensioner
 Courtesy of AUDI OF AMERICA, LLC

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

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

- Remove bolts -1- and remove guide rail.
- Remove bolts -2 to 4- and remove chain tensioner.
- Remove timing mechanism drive chain.

Installing

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

Installation is in reverse order of removal, note the following:

NOTE: Replace bolts which have been tightened to torque.

- Route timing mechanism drive chain according to marks applied to drive chain sprockets during removal.
- Install guide rail and tighten bolts -1-.

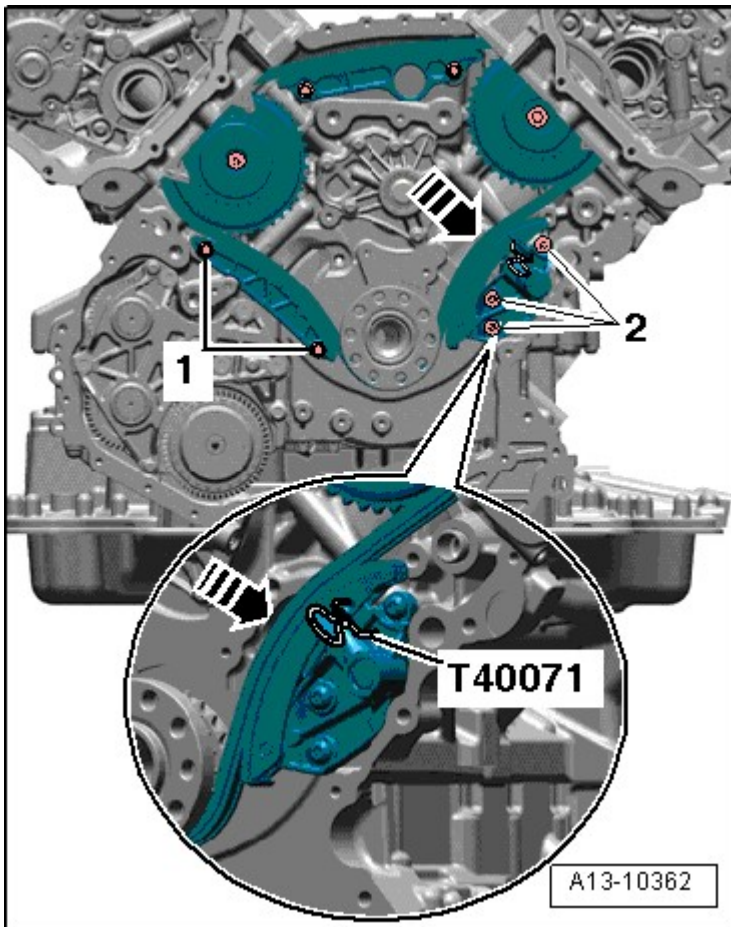


Fig. 93: Identifying Bolts And Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

- Install chain tensioner and tighten bolts -2-.
- Press drive chain tensioner guide rail in direction of -arrow- and remove T40071 from chain tensioner.
- Install power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Install camshaft timing chains **INSTALLING**.
- Install lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.

- Install the crankshaft seal on the transmission side. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE** .
- Install oil filter housing. Refer to **OIL FILTER HOUSING** .
- Install intake manifold. Refer to **Removal and Installation** .
- Install left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install cylinder head cover. Refer tot **LEFT CYLINDER HEAD COVER, RIGHT CYLINDER HEAD COVER**.
- Install drive plate. Refer to **DRIVE PLATE** .

POWER TAKE-OFF DRIVE CHAIN

Special tools and workshop equipment required

- Locking Pin T40071

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .
 - Engine oil drained.
- Remove drive plate. Refer to **DRIVE PLATE** .
 - Remove left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
 - Remove the intake manifold. Refer to **Removal and Installation** .
 - Remove oil filter housing. Refer to **OIL FILTER HOUSING** .
 - Remove lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.

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

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

- Press tensioning rail in direction of -arrow- and secure chain tensioner with T40071.

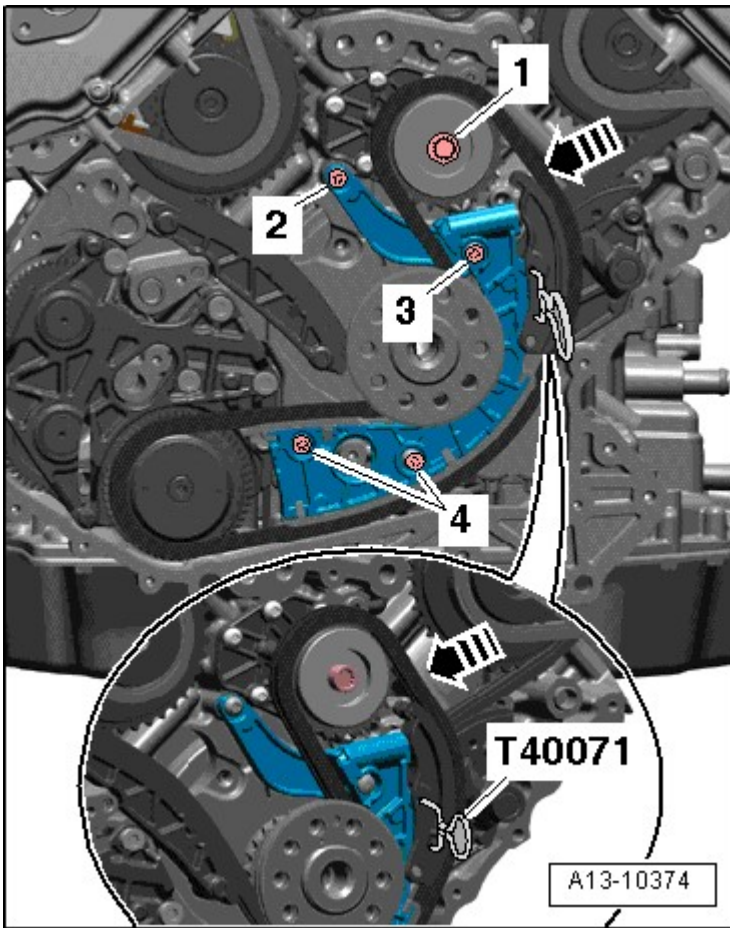


Fig. 94: Pressing Tensioning Rail And Securing Chain Tensioner With Locking Pin T40071
 Courtesy of AUDI OF AMERICA, LLC

- Remove bolt -1- and remove idler sprocket.
- Remove bolts -2 to 4- and remove chain tensioner.
- Remove power take-off drive chain.

Installing

- Tightening specifications, refer to **POWER TAKE-OFF DRIVE CHAIN ASSEMBLY OVERVIEW.**

Installation is in reverse order of removal, note the following:

NOTE: **Replace gaskets.**

Secure all hose connections with hose clamps appropriate for the model.

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

-- Install the crankshaft seal on the transmission side. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE** .

-- Install oil filter housing. Refer to **OIL FILTER HOUSING** .

-- Install intake manifold. Refer to **Removal and Installation** .

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

-- Install drive plate. Refer to **DRIVE PLATE** .

POWER TAKE-OFF SEALS, REPLACING

Special tools and workshop equipment required

- Thrust Piece T40192
- Thrust Piece T40193
- Seal Puller T40195

Procedure

-- On a vehicle with air suspension, activate vehicle lift mode. Refer to **Description and Operation** .

-- Remove power steering pump. Refer to **Removal and Installation** .

-- Remove air conditioning compressor. Refer to **Removal and Installation** .

-- Remove hose clamp at A/C compressor dust cap -arrow-.

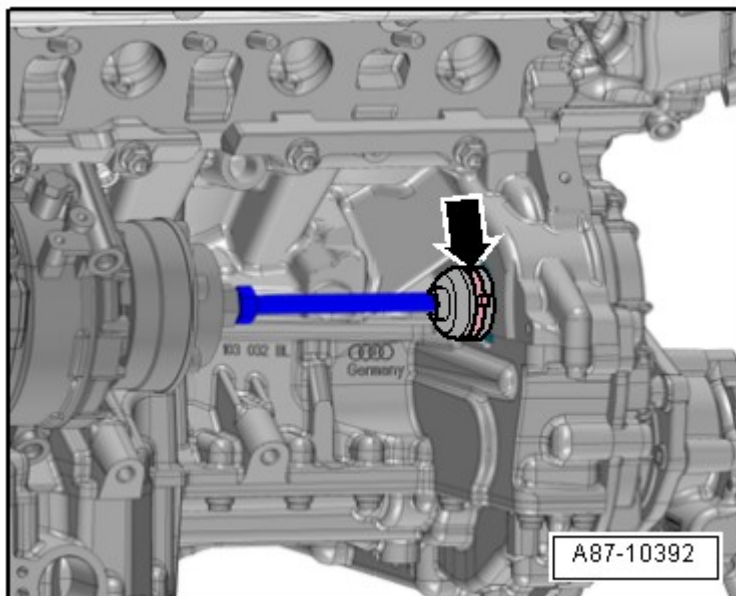


Fig. 95: Identifying Dust Cap -Arrow- On End Of Shaft For A/C Compressor Drive Spur Gear
Courtesy of AUDI OF AMERICA, LLC

- Remove the dust cap from the end of the shaft for the A/C compressor drive spur gear.
- Rotate the spindle on the T40195 all the way back.

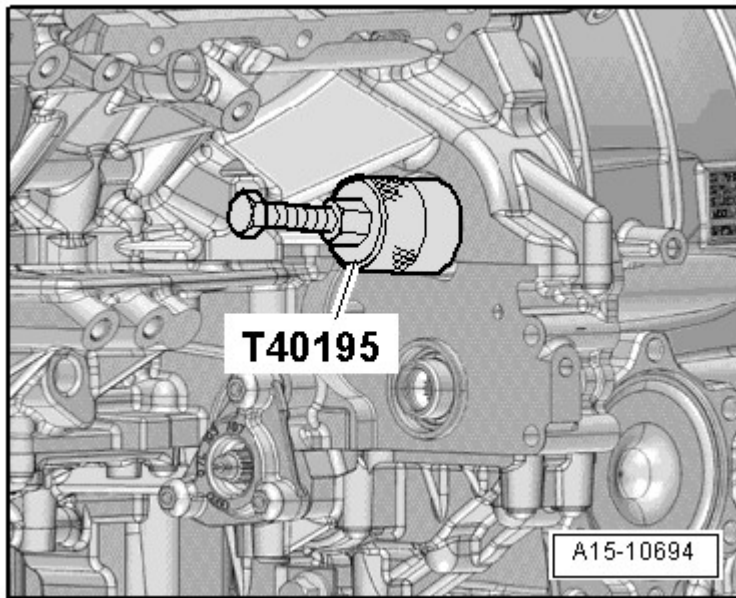


Fig. 96: Rotating Spindle On T40195 Back
Courtesy of AUDI OF AMERICA, LLC

- Lubricate the seal remover threaded head, position it, and install it in the shaft seal for the A/C compressor drive and power steering pump drive as far as possible using strong force.
- Rotate the inner section of the seal puller against the spur gear unit until the shaft seal is removed.

NOTE: **If the shaft seal breaks, position the seal puller a second time and remove the rest of the seal.**

- Clamp the seal puller in a vise at the hex bolt and remove the shaft seal with pliers.
- Clean running and sealing surface.
- Drive the A/C compressor drive shaft seal in as far as the stop using the T40192.

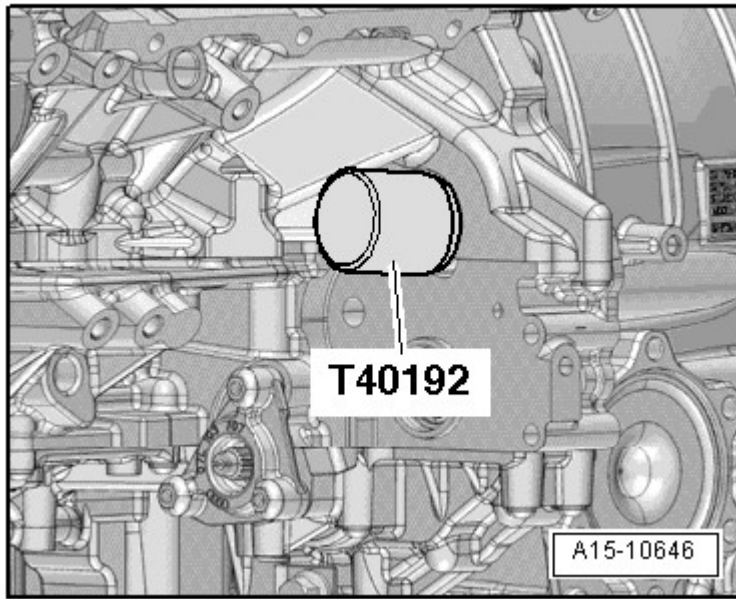


Fig. 97: Driving A/C Compressor Drive Shaft Seal In As Far As Stop Using T40192
Courtesy of AUDI OF AMERICA, LLC

-- Drive the power steering pump drive shaft seal in as far as the stop using the T40193.

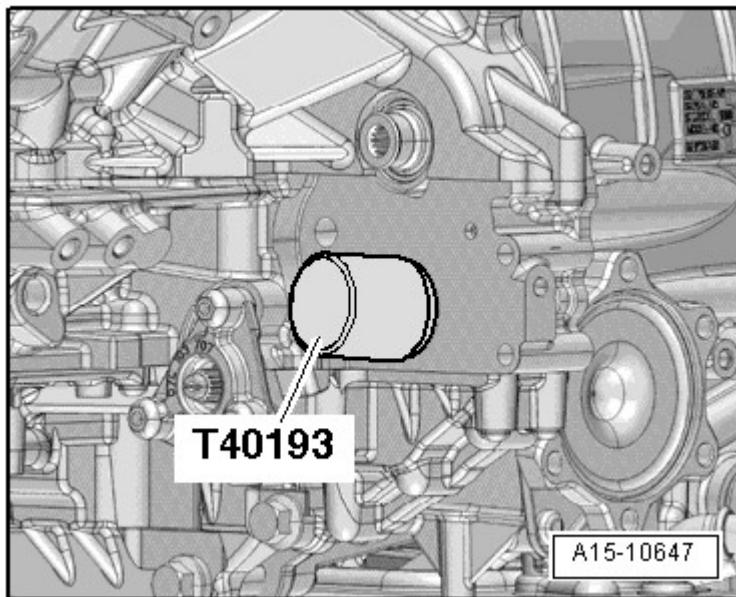


Fig. 98: Driving Power Steering Pump Drive Shaft Seal In As Far As Stop Using T40193
Courtesy of AUDI OF AMERICA, LLC

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

NOTE: **Secure the dust cap with a hose clamp appropriate to model.**

-- Slide dust seal cap -arrow- with hose clamp already installed onto shaft end of A/C compressor drive spur gear.

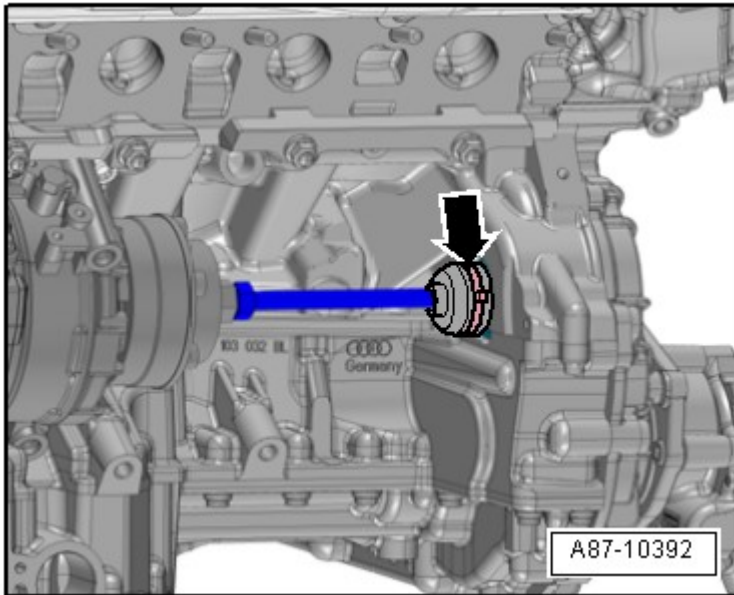


Fig. 99: Identifying Dust Cap -Arrow- On End Of Shaft For A/C Compressor Drive Spur Gear
 Courtesy of AUDI OF AMERICA, LLC

- Install A/C compressor. Refer to **Removal and Installation** .
- Install the power steering pump. Refer to **Removal and Installation** .
- On a vehicle with air suspension, deactivate vehicle lift mode. Refer to **Description and Operation** .

SPUR GEAR UNIT

Special tools and workshop equipment required

- Sealant.

Removing

- Engine-transmission assembly removed and separated on the scissor lift table VAS 6131 A. Refer to **ENGINE AND TRANSMISSION, SEPARATING** .
 - Engine oil drained.
- Remove drive plate. Refer to **DRIVE PLATE** .
- Remove left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Remove the intake manifold. Refer to **Removal and Installation** .

- Remove oil filter housing. Refer to **OIL FILTER HOUSING** .
- Remove lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Remove power-steering pump from cylinder block.
- Remove hose clamp at A/C compressor dust cap -arrow-.

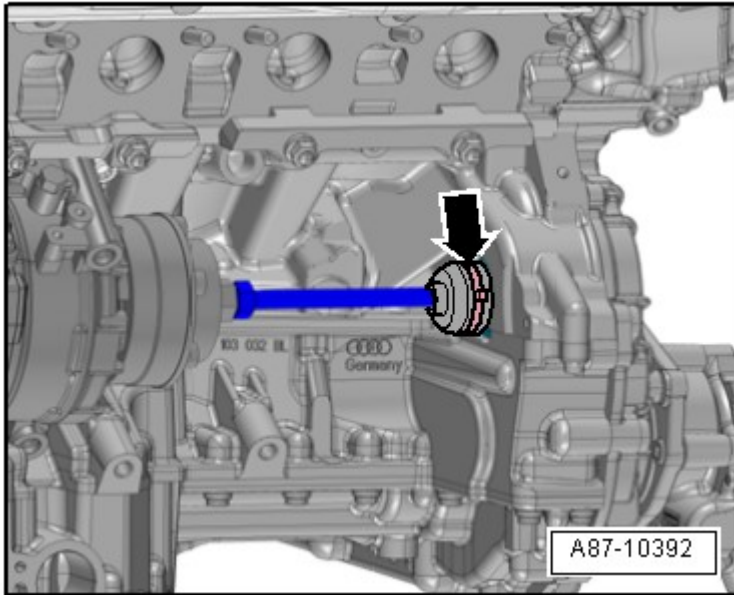


Fig. 100: Identifying Dust Cap -Arrow- On End Of Shaft For A/C Compressor Drive Spur Gear
Courtesy of AUDI OF AMERICA, LLC

- Remove the dust cap from the end of the shaft for the A/C compressor drive spur gear.
- Remove power take-off drive chain. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Remove bolts -1 to 6-.

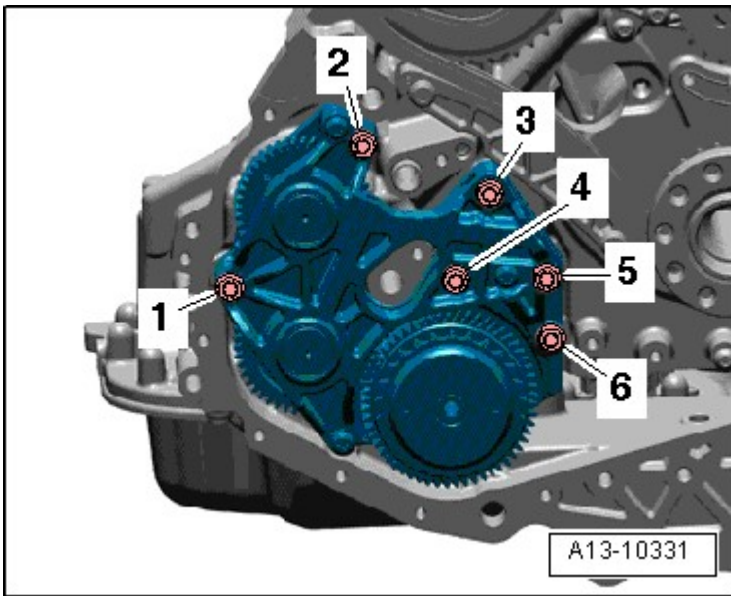


Fig. 101: Positioning Spur Gear Unit And Tighten Bolts In Diagonal Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Remove spur gear unit.

-- Remove compression spring -2- between spur gear unit -1- and oil pump input shaft -3-.

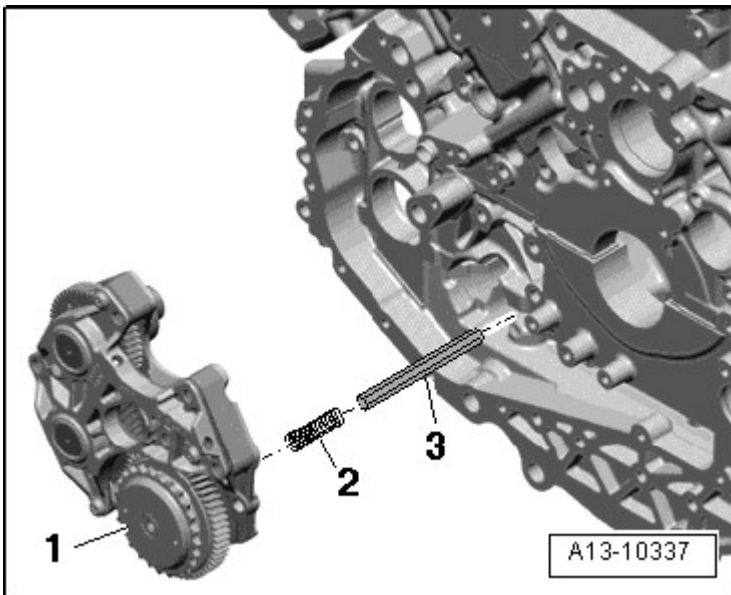


Fig. 102: Identifying Compress Spring -2- For Input Shaft -3- In Spur Gear Unit -1-
 Courtesy of AUDI OF AMERICA, LLC

-- Remove driveshaft -arrow- for oil pump.

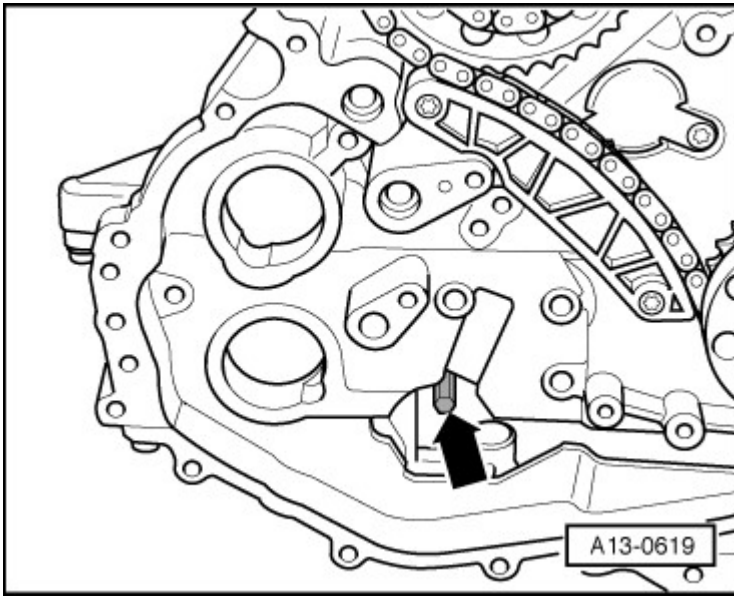


Fig. 103: Identifying Drive Shaft For Oil Pump
Courtesy of AUDI OF AMERICA, LLC

Installing

- Tightening specifications, refer to **POWER TAKE-OFF ASSEMBLY OVERVIEW**.

NOTE: Replace O-ring.

- Replace the shaft seals and semi-circular seal in the power steering pump drive if damaged. Refer to items -4- and -12- in numbered list **POWER TAKE-OFF ASSEMBLY OVERVIEW** and see **Fig. 11**.
- Remove sealant residue on spur gear unit and cylinder block.
- Clean the sealing surfaces, they must be free of oil and grease.
- Insert driveshaft -arrow- for oil pump into guide on oil pump.

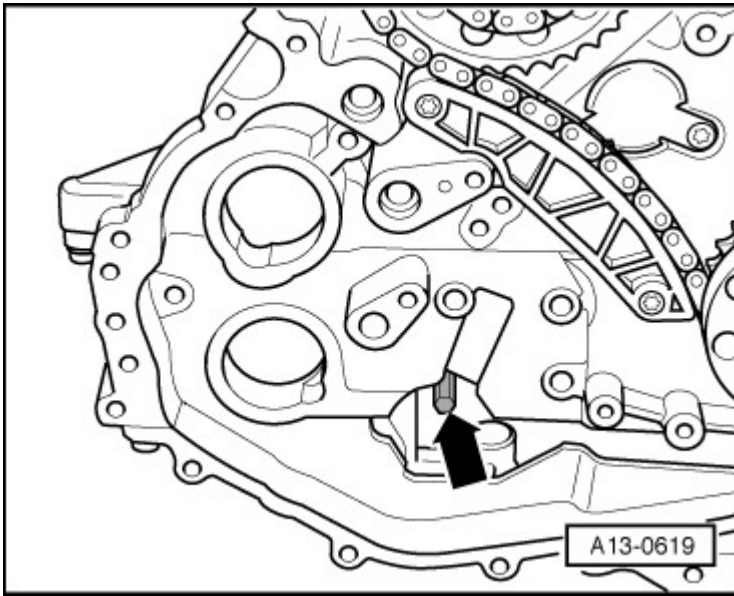


Fig. 104: Identifying Drive Shaft For Oil Pump

Courtesy of AUDI OF AMERICA, LLC

NOTE: To guarantee that the driveshaft engages correctly in the oil pump, insert the driveshaft into the oil pump separately, do not install together with the front bearing cap.

NOTE: Note the expiration date of the sealing compound.

-- Cut tube nozzle at front marking (nozzle diameter approximately 1.5 mm).

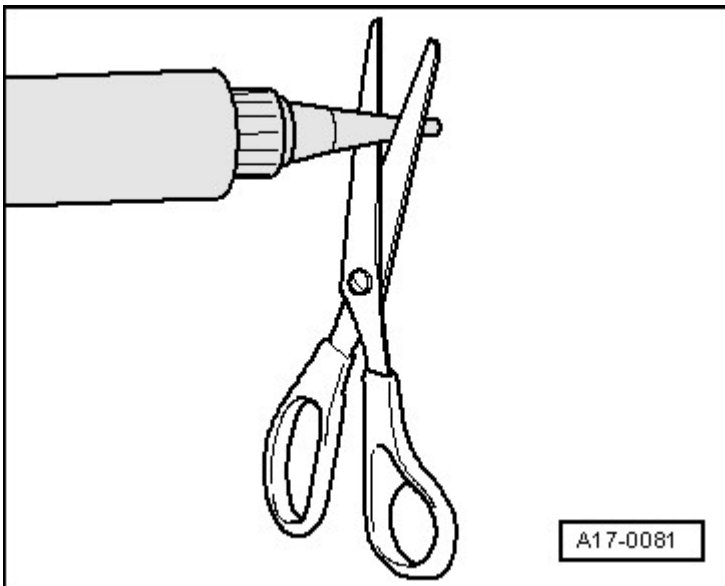


Fig. 105: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 1.5 mm)

Courtesy of AUDI OF AMERICA, LLC

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

- Do not apply sealant beads thicker than indicated.

-- Apply sealant beads -arrows- to clean sealing surfaces of spur gear unit as shown in illustration.

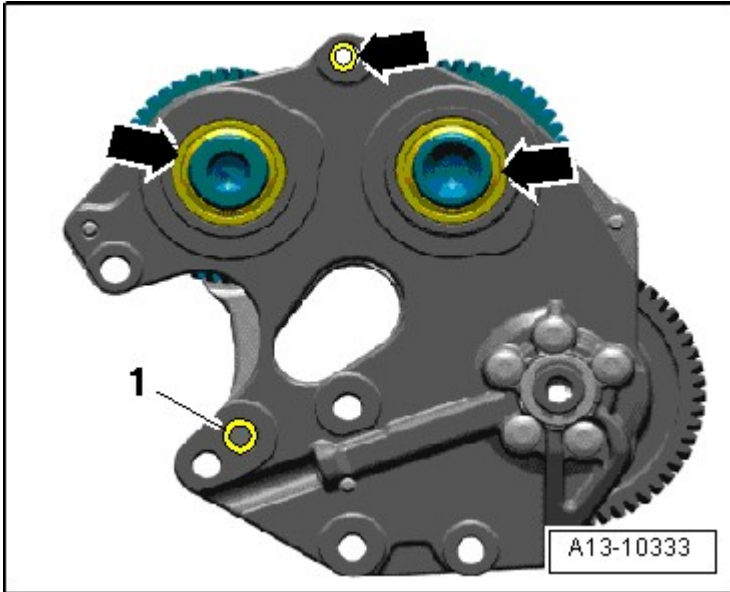


Fig. 106: Applying Sealant Beads To Clean Sealing Surfaces Of Spur Gear Unit
Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant beads: 2.0 mm.

-- Position O-ring -1- and secure it with some grease.

NOTE: The spur gear unit must be installed within 5 minutes after application of sealant.

-- Position compress spring -2- for input shaft -3- in spur gear unit -1-.

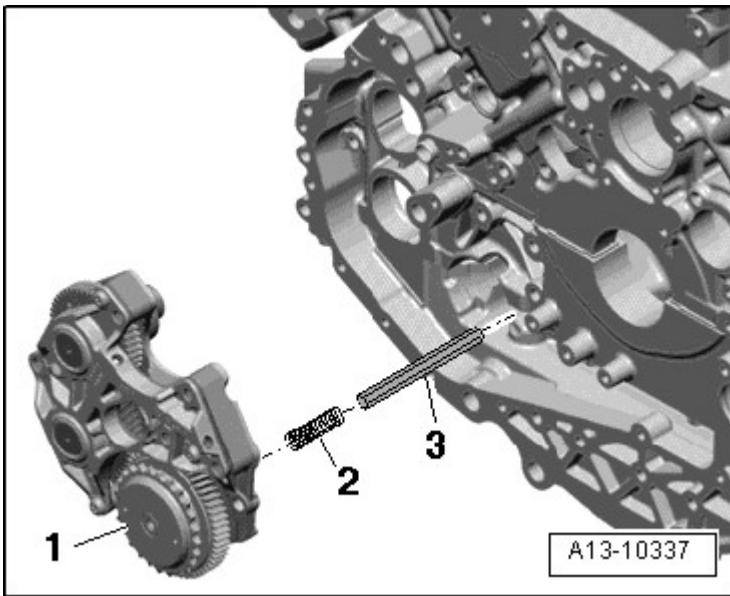


Fig. 107: Identifying Compress Spring -2- For Input Shaft -3- In Spur Gear Unit -1-
 Courtesy of AUDI OF AMERICA, LLC

-- Slide the dust cap -arrow- onto the end of the shaft for the A/C compressor drive spur gear with the hose clamp already installed and secure it.

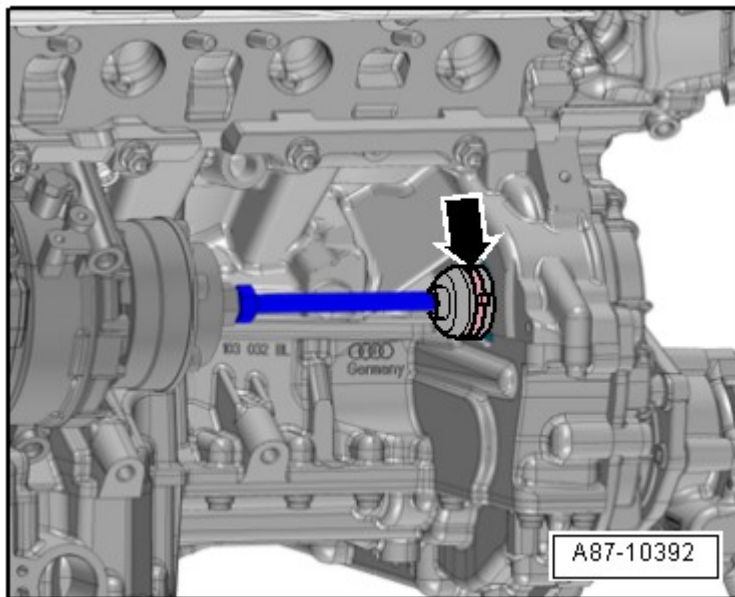


Fig. 108: Identifying Dust Cap -Arrow- On End Of Shaft For A/C Compressor Drive Spur Gear
 Courtesy of AUDI OF AMERICA, LLC

-- Position spur gear unit and tighten bolts -1 to 6- in a diagonal sequence in stages.

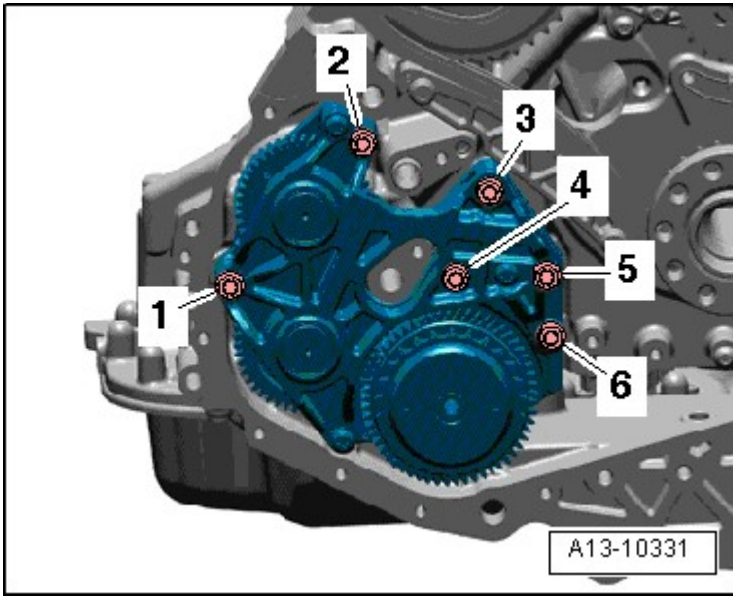


Fig. 109: Positioning Spur Gear Unit And Tighten Bolts In Diagonal Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Install oil pump drive chain and balance shaft. Refer to **POWER TAKE-OFF DRIVE CHAIN**.
- Slide power steering pump with new O-ring onto spur gear for power-steering pump drive.

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

- Install lower timing chain cover. Refer to **LOWER TIMING CHAIN COVER**.
- Install the crankshaft seal on the transmission side. Refer to **CRANKSHAFT SEAL, TRANSMISSION SIDE**.
- Install oil filter housing. Refer to **OIL FILTER HOUSING**.
- Install intake manifold. Refer to **Removal and Installation**.
- Install left and right timing chain covers. Refer to **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install drive plate. Refer to **DRIVE PLATE**.

LEFT CYLINDER HEAD COVER

Special tools and workshop equipment required

- Ignition Coil Puller T40039

Removing

- Disconnect electrical connector -2- at Mass Air Flow (MAF) sensor 2 -G246-.

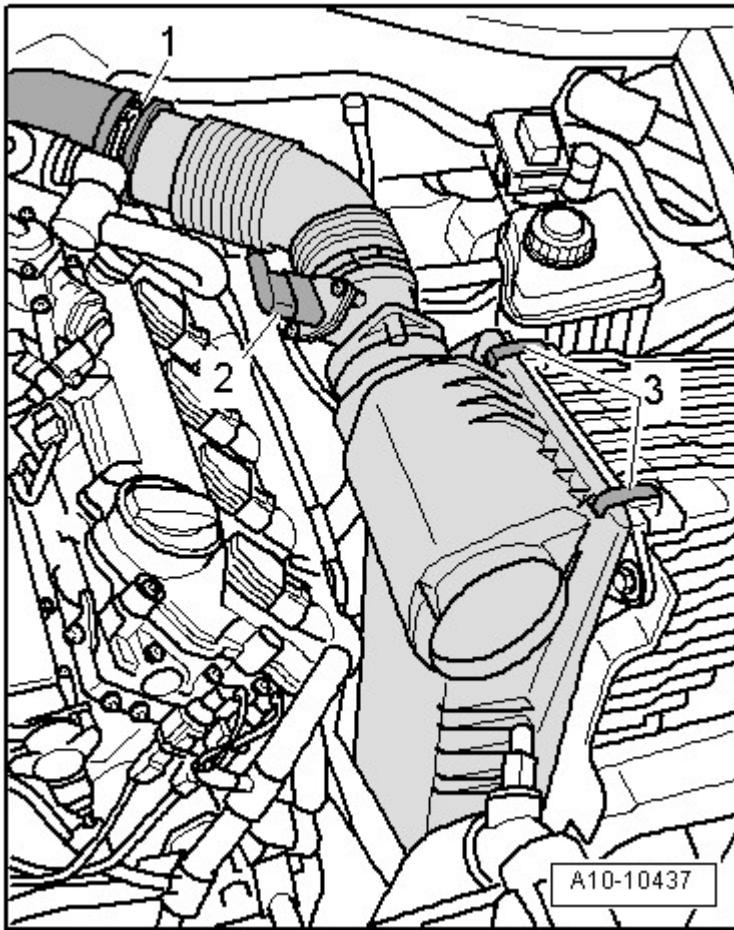


Fig. 110: Locating Electrical Connector, Air Guide Hose, And Retaining Clips
Courtesy of AUDI OF AMERICA, LLC

- Remove left air guide hose -1- from air duct.
- Release retaining clips -3- and remove upper left section of air filter housing.
- Remove oil dipstick -10- from guide tube.

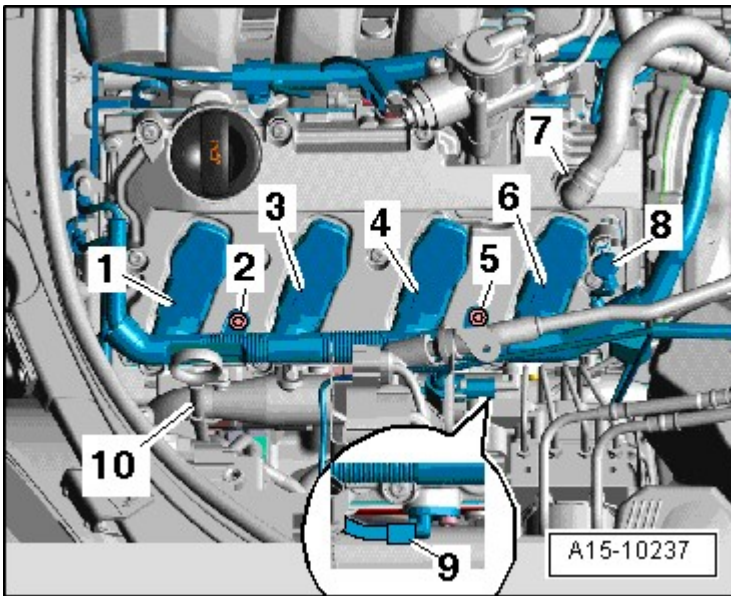


Fig. 111: Identifying Oil Dipstick, Bolts, Electrical Connectors, And Ventilation Hose
Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -2- and -5-.
- Disconnect electrical connectors -1, 3, 4, 6, 8, 9- and free up wiring harness.
- Remove crankcase ventilation hose -7- by pressing release buttons.
- Remove the ignition coils using the T40039.

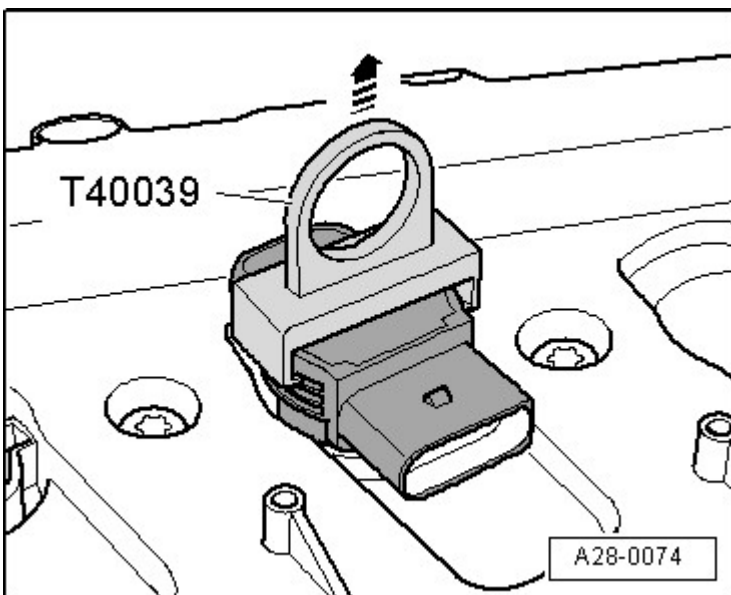


Fig. 112: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

-- Remove left cylinder head cover bolts in sequence -15 to 1-.

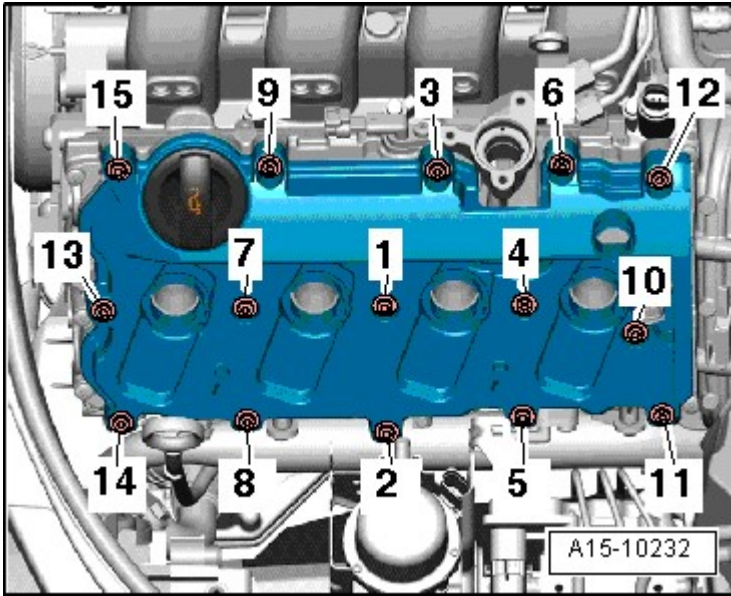


Fig. 113: Identifying Left Cylinder Head Cover Bolts Removal Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Remove cylinder head cover.

Installing

- Tightening specifications, refer to **Fig. 13**.

Installation is in reverse order of removal, note the following:

NOTE: Replace cylinder head cover gaskets if damaged.

Replace bolts for cylinder head cover if gasket is damaged.

Secure all hose connections with hose clamps appropriate for the model.

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

-- Tighten cylinder head cover bolts, refer to **Fig. 13**.

RIGHT CYLINDER HEAD COVER

Special tools and workshop equipment required

- Ignition Coil Puller T40039

Removing

-- Disconnect hose -1- to Secondary Air Injection (AIR) pump.

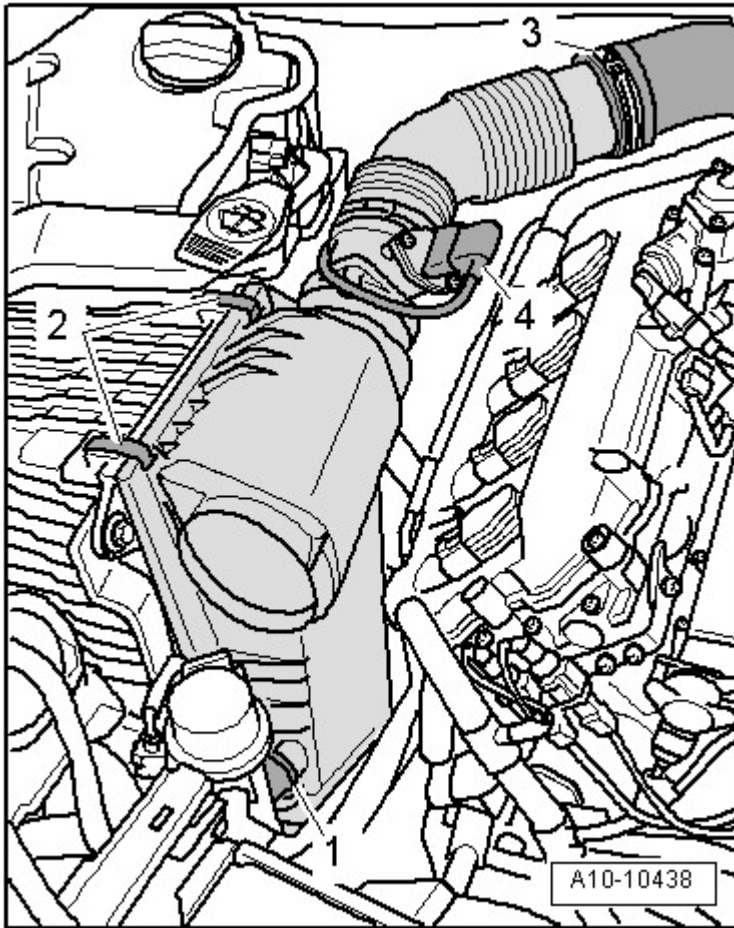


Fig. 114: Identifying Hose To Secondary Air Injection Pump, Electrical Harness Connector, Right Air Guide Hose, And Retaining Clips
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical harness connector -4- at Mass Air Flow (MAF) sensor -G70-.

-- Remove right air guide hose -3- from air duct.

-- Release retaining clips -2- and remove upper right section of air filter housing from lower section.

Vehicles with air suspension:

NOTE: If necessary, remove electrical connector for Heated Oxygen Sensor (HO2S) 2 - G108- from bracket at right strut tower for better access.

-- Press circlip -1- forward from hose coupling.

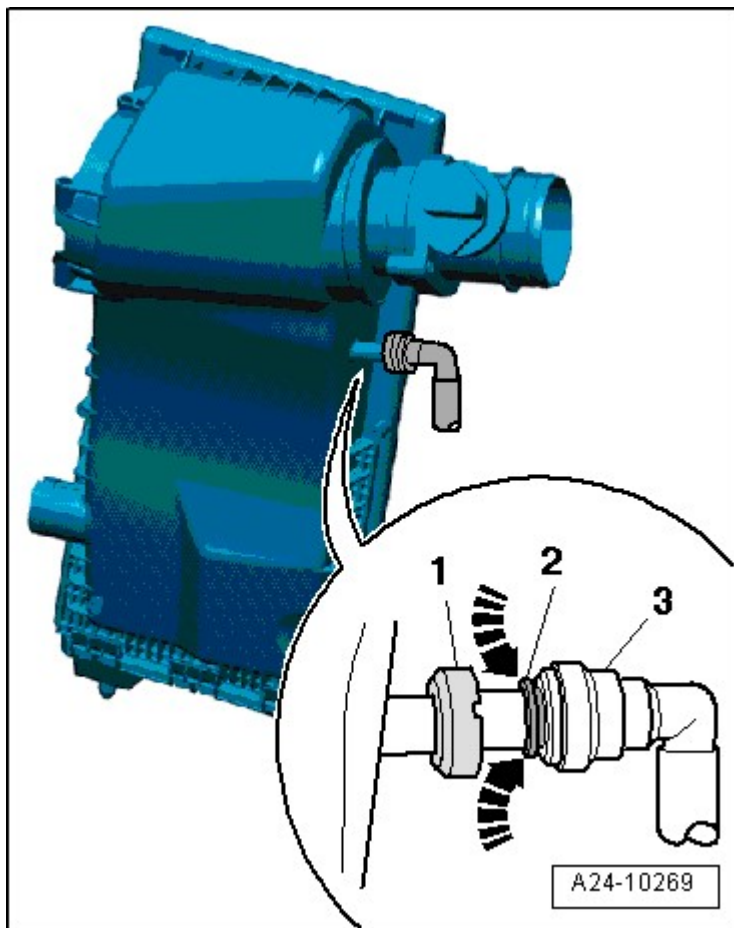


Fig. 115: Identifying Circlip, Release Ring And Ventilation Hose
 Courtesy of AUDI OF AMERICA, LLC

-- Press release ring -2- down -arrows- and remove vent hose -3- from upper section of air filter.

All Vehicles

-- Remove bolts -3- and -6- on right cylinder head.

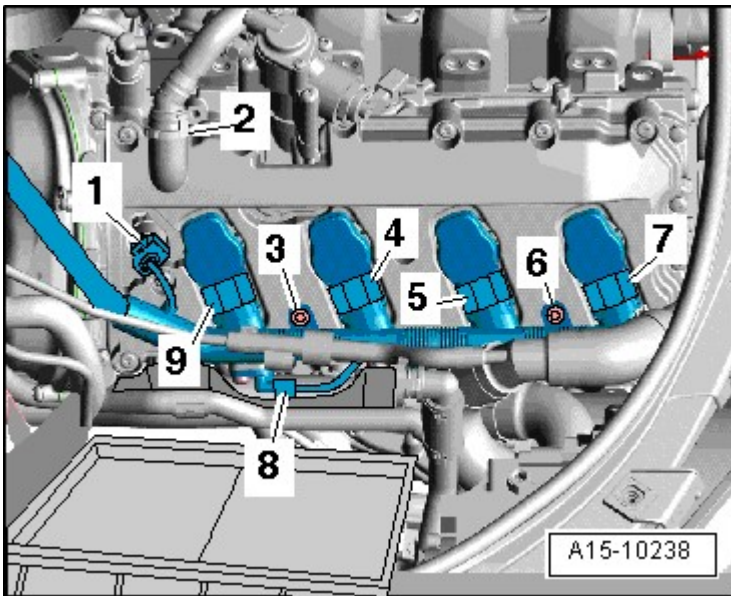


Fig. 116: Identifying Bolts On Right Cylinder Head & Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connectors -1, 4, 5, 7, 8, 9-.
- Remove crankcase ventilation hose -2-.
- Remove the ignition coils using the T40039.

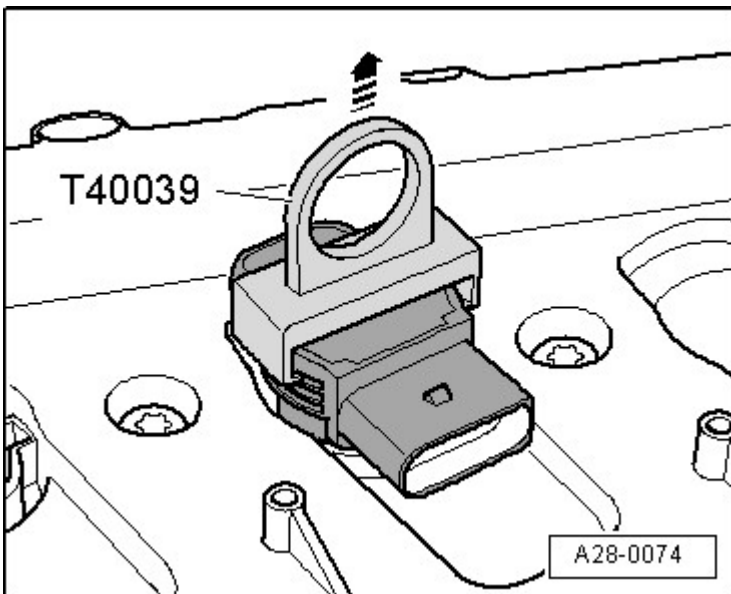


Fig. 117: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

- Remove right cylinder head cover bolts in sequence -16 to 1-.

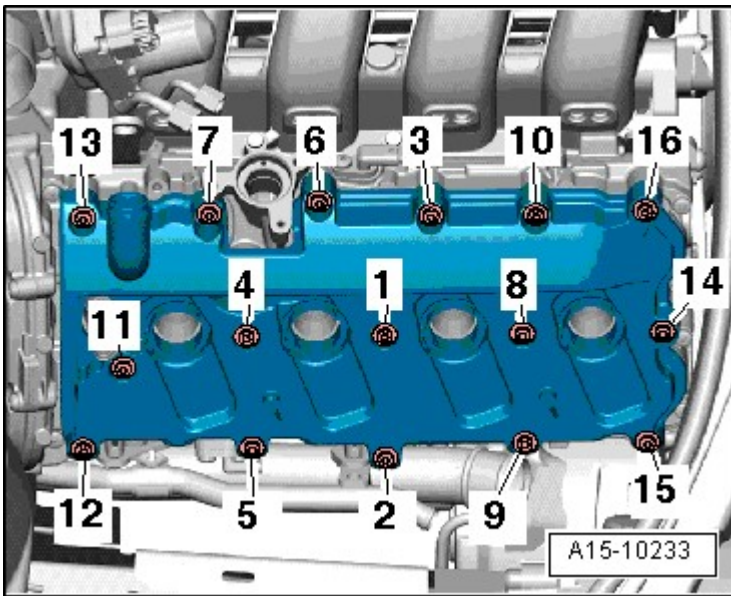


Fig. 118: Identifying Right Cylinder Head Cover Bolts Removal Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Remove cylinder head cover.

Installing

- Tightening specifications, refer to **Fig. 14**.

Installation is in reverse order of removal, note the following:

NOTE: Replace cylinder head cover gaskets if damaged.

Replace bolts for cylinder head cover if gasket is damaged.

Secure all hose connections with hose clamps appropriate for the model

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

-- Tighten cylinder head cover bolts. Refer to **Fig. 14**.

CYLINDER HEAD

Special tools and workshop equipment required

- Torque Wrench V.A.G 1331
- Tool Insert, AF 17 V.A.G 1331/6
- Socket Insert AF 14 V.A.G 1331/8
- Polydrive Bit and Drive Socket T10070

Removing

NOTE: Removal and installation at left cylinder head is depicted in the following description.

All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.

- Drain the coolant. Refer to **COOLING SYSTEM, DRAINING AND FILLING** .
- Remove left primary catalytic converter. Refer to **LEFT PRIMARY CATALYTIC CONVERTER** .
- Remove electrical connectors -1- and -2- for knock sensor 3 -G198- and knock sensor 4 -G199- from bracket.

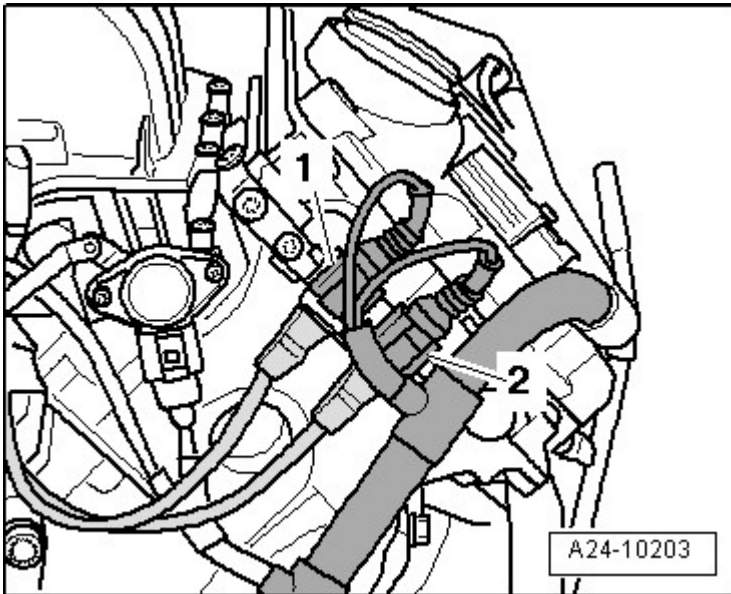


Fig. 119: Identifying Knock Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

- Version 1: Remove air guide hose to Secondary Air Injection (AIR) combi-valves -arrows-.

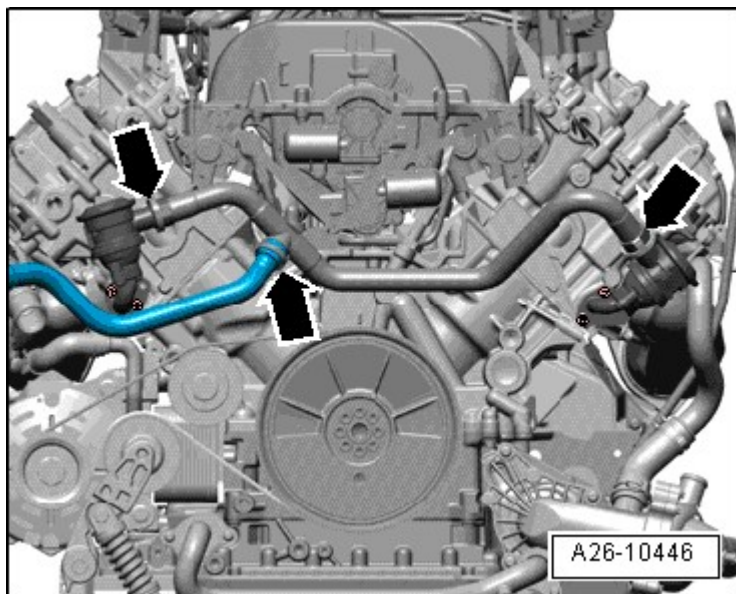


Fig. 120: Identifying Air Guide Hose To Secondary Air Injection (AIR) Combi-Valves
Courtesy of AUDI OF AMERICA, LLC

-- Version 2: Remove the vacuum hoses -1- and -3- from the secondary air injection combination valves.

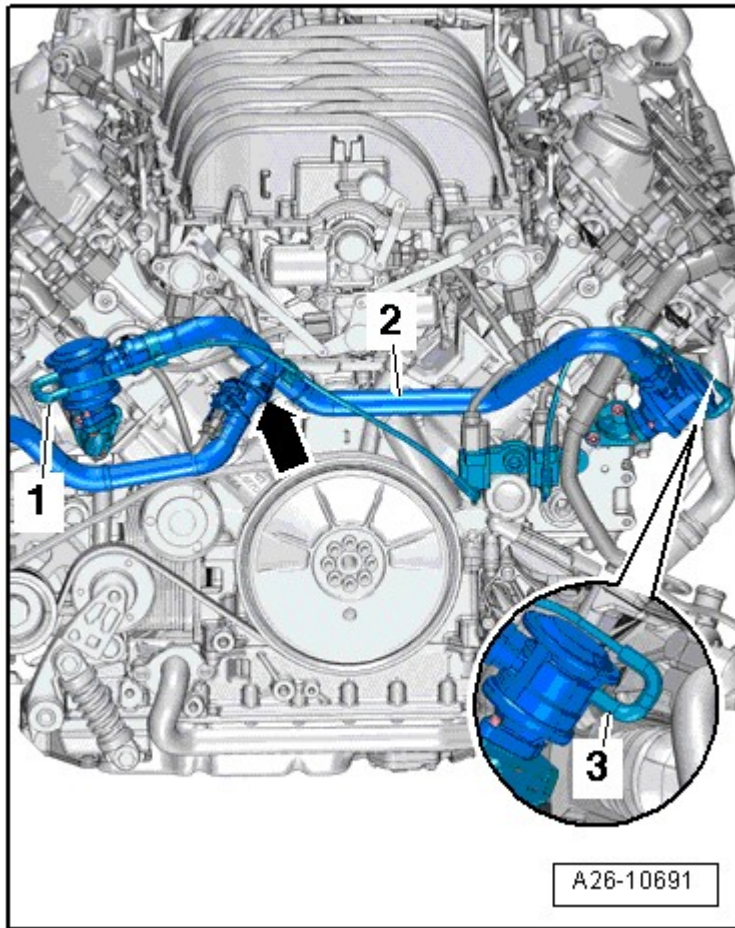


Fig. 121: Identifying Vacuum Hoses -1- And -3- And Air Guide Hose -2-
 Courtesy of AUDI OF AMERICA, LLC

- Remove the air guide hose -2- to the secondary air injection combination valves -arrows-.
- Remove the intake manifold. Refer to **Removal and Installation** .
- Remove left coolant pipe. Refer to **LEFT COOLANT PIPE** .
- Remove right coolant pipe. Refer to **RIGHT COOLANT PIPE** .
- Remove rear coolant pipe. Refer to **REAR COOLANT PIPE** .
- Remove camshaft timing chains from camshafts. Refer to **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
- Remove bolts -1- and -2- and remove right chain tensioner.

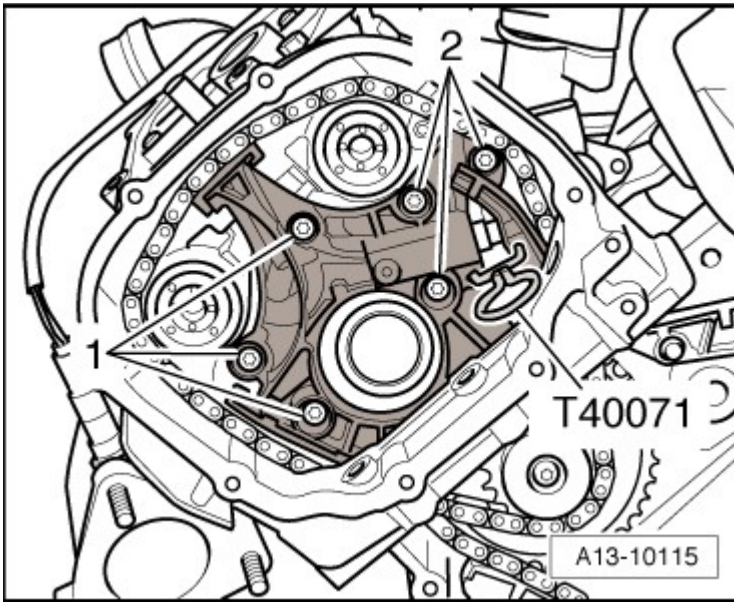


Fig. 122: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connectors -arrows- at fuel injectors.

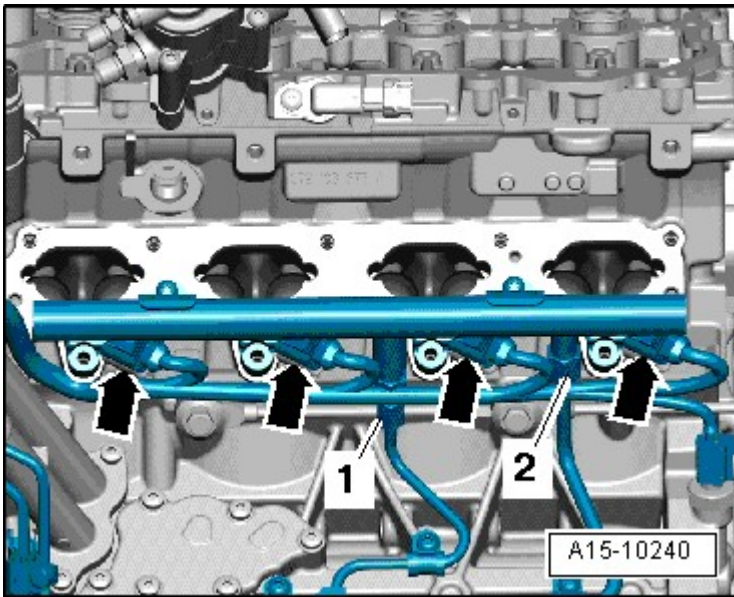


Fig. 123: Disconnecting Electrical Connectors At Fuel Injectors & Removing High Pressure Lines From Connector On Fuel Rail
Courtesy of AUDI OF AMERICA, LLC

-- Remove high pressure line -2- from connector on fuel rail.

-- Remove high pressure line -1- from connector on fuel rail. To do this, counterhold at hex head with and open-end wrench and loosen the union nut.

NOTE: Do not change the angles of the high pressure lines.

-- Remove locking bolt -arrow-.

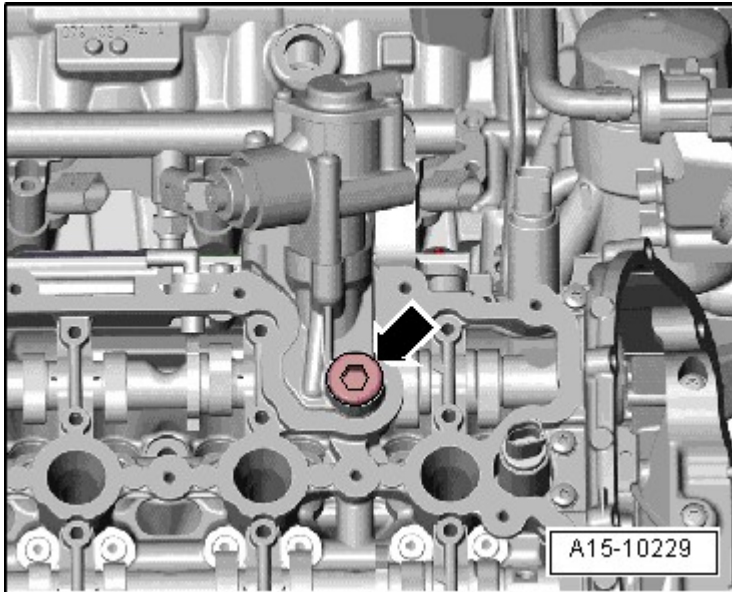


Fig. 124: Identifying Locking Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -arrows-.

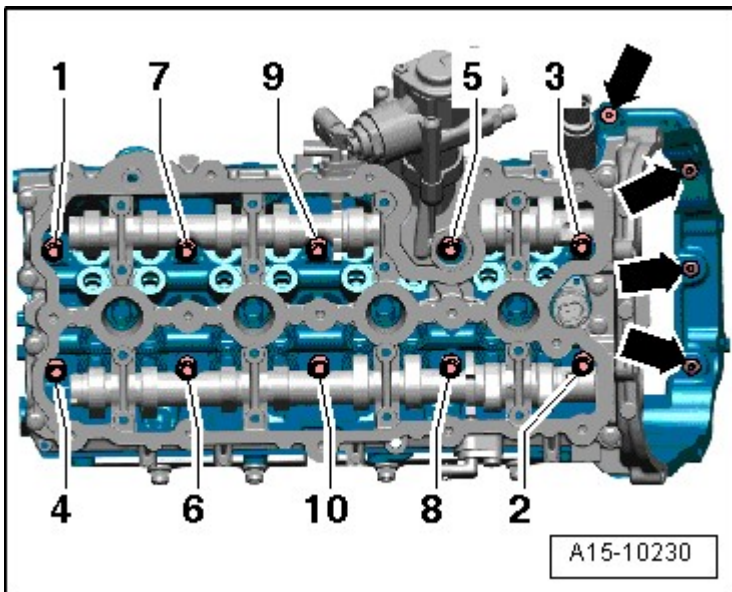


Fig. 125: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of AUDI OF AMERICA, LLC

LOOSEN THE CYLINDER HEAD BOLTS WITH THE T10070 IN THE SEQUENCE -1 TO 10-

-- Remove cylinder head bolts and carefully remove cylinder head.

-- Lay cylinder head on a soft surface (foam).

INSTALLING

- Tightening specifications. Refer to **CYLINDER HEAD ASSEMBLY OVERVIEW, Fig. 15, CAMSHAFT TIMING CHAIN ASSEMBLY OVERVIEW.**

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.

- No oil or coolant must be in the cylinder head bolt blind holes in the cylinder block.

Risk of leaks in cylinder head seal.

- 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 head 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 pistons when starting, carefully rotate engine at least 2 full revolutions.

NOTE: Replace bolts which have been tightened to torque.

Replace self-locking nuts as well as sealing rings and seals.

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

Secure all hose connections with hose clamps appropriate for the model.

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

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

-- Check whether camshafts of both cylinder heads stand in "TDC" position.

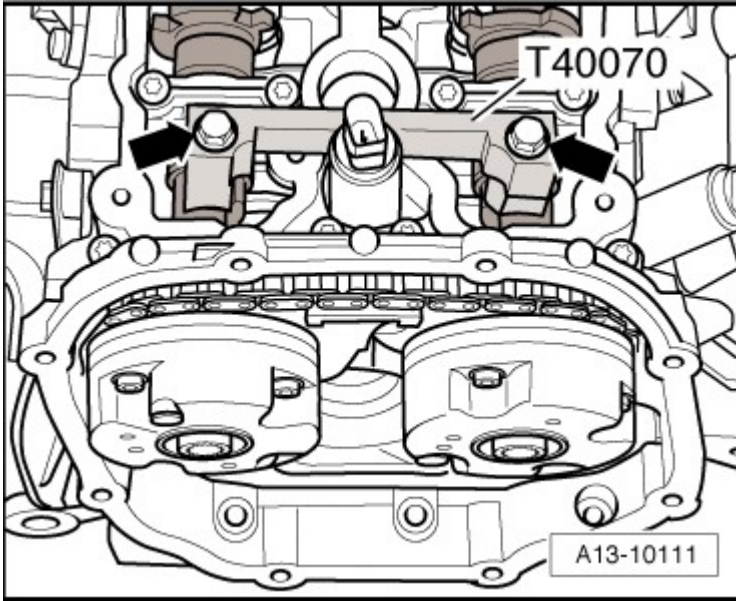


Fig. 126: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
Courtesy of AUDI OF AMERICA, LLC

- T40070 must be installed on both cylinder heads and tightened to 25 Nm.
- 3242 must be screwed in.

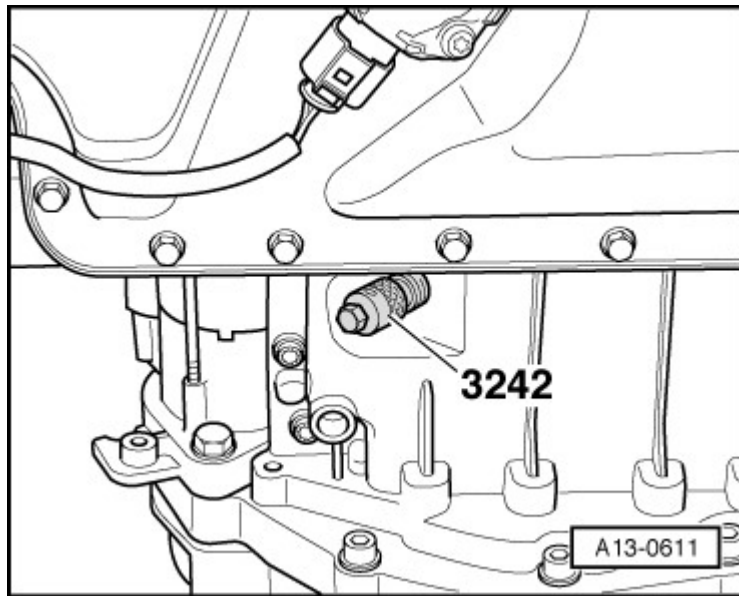


Fig. 127: Identifying Crankshaft Holder 3242 Into Hole, Removal/Installation
 Courtesy of AUDI OF AMERICA, LLC

-- Position cylinder head gasket.

- Pay close attention to alignment bushings in cylinder block -arrows-.

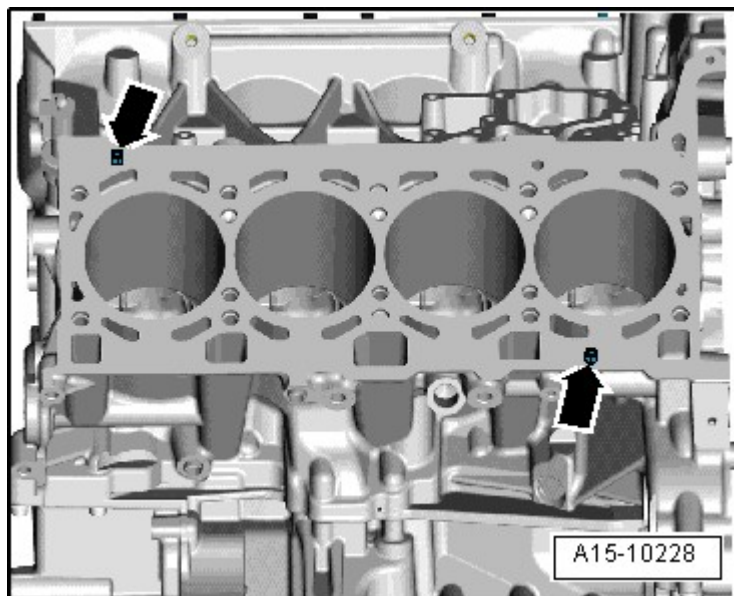


Fig. 128: Identifying Alignment Bushings In Cylinder Block
 Courtesy of AUDI OF AMERICA, LLC

- Pay attention to installation position of cylinder head gasket, marking "oben" (top) or part number must face toward cylinder head.

-- Install cylinder head.

-- Tighten cylinder head bolts. Refer to **Fig. 15**.

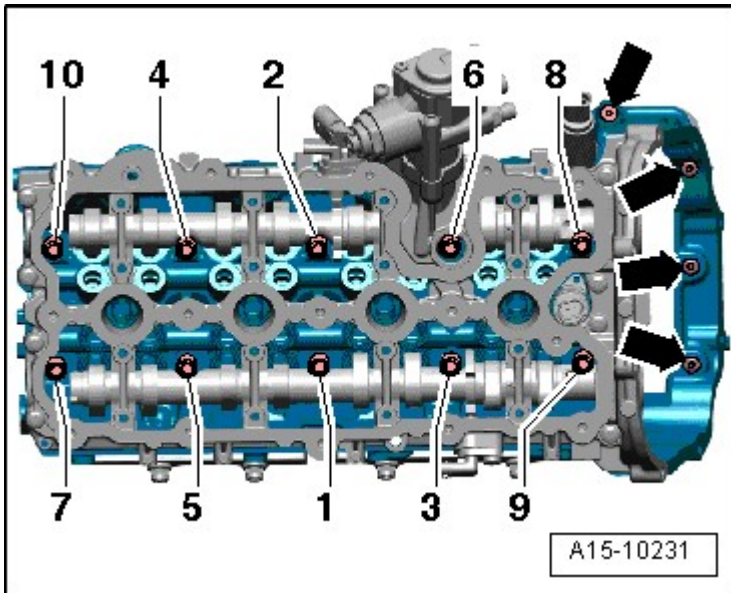


Fig. 129: Identifying Cylinder Head Tightening Sequence

Courtesy of AUDI OF AMERICA, LLC

NOTE: Bolts must not be tightened after repairs.

-- Tighten locking bolt -arrow-.

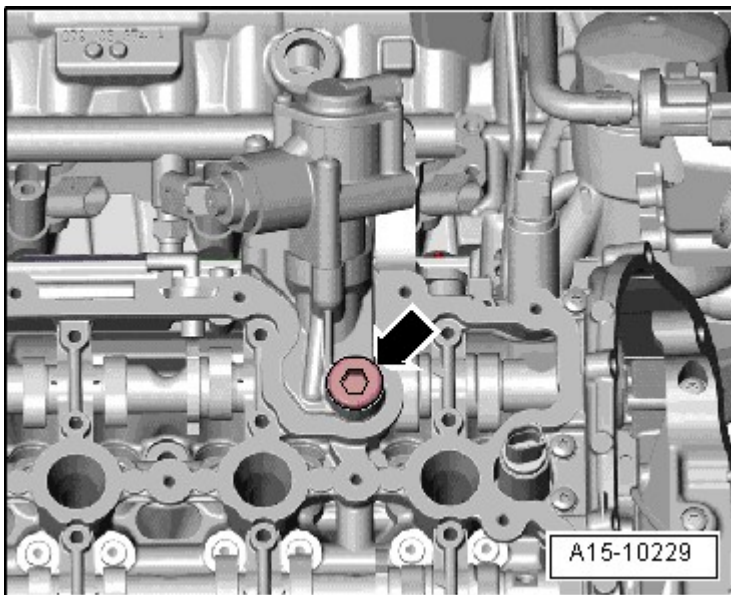


Fig. 130: Identifying Locking Bolt

Courtesy of AUDI OF AMERICA, LLC

-- Check whether camshaft timing chain tensioner guide rail is secured with Locking Pin T40071.

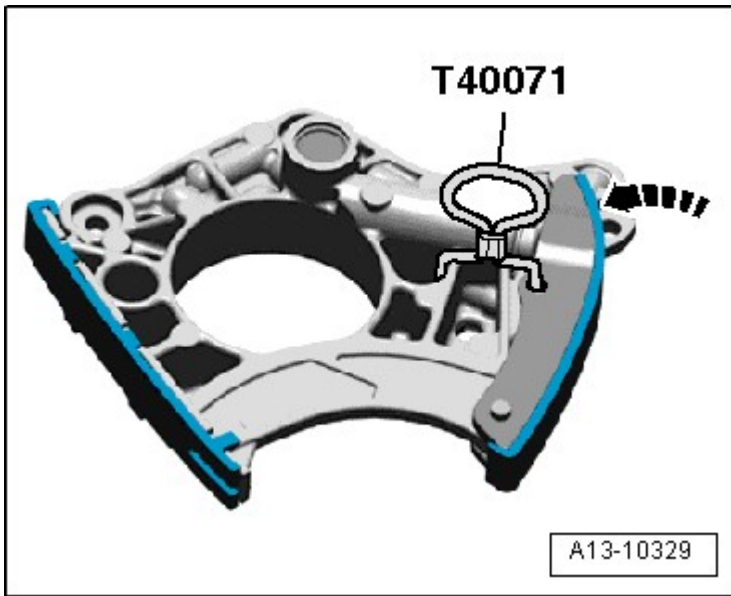


Fig. 131: Pressing Left/Right Camshaft Timing Chain Guide Rail Inward And Securing Chain Tensioner With Locking Pin T40071

Courtesy of AUDI OF AMERICA, LLC

NOTE: If the tensioning element is to be removed from the chain tensioner, observe the installed position: Hole in housing floor faces toward chain tensioner, piston faces toward tensioning rail.

Disregard -arrow-.

-- Clean chain tensioner oil screen -2- if necessary.

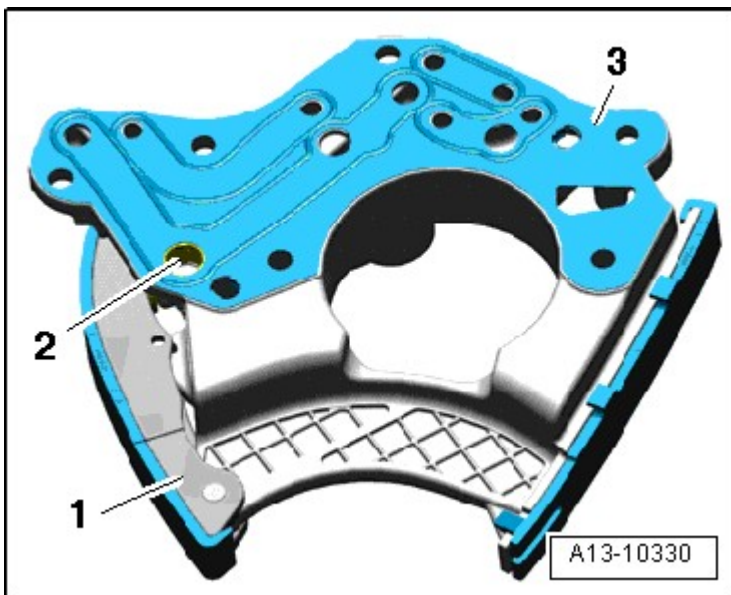


Fig. 132: Identifying Chain Tensioner Oil Screen, Gasket & Chain Tensioner

Courtesy of AUDI OF AMERICA, LLC

- Place a new gasket -3- onto the rear of the chain tensioner -1-.
- Set the chain tensioner in place and install the camshaft timing chain, as shown in the illustration.
- Tighten bolts -1 - and -2-.

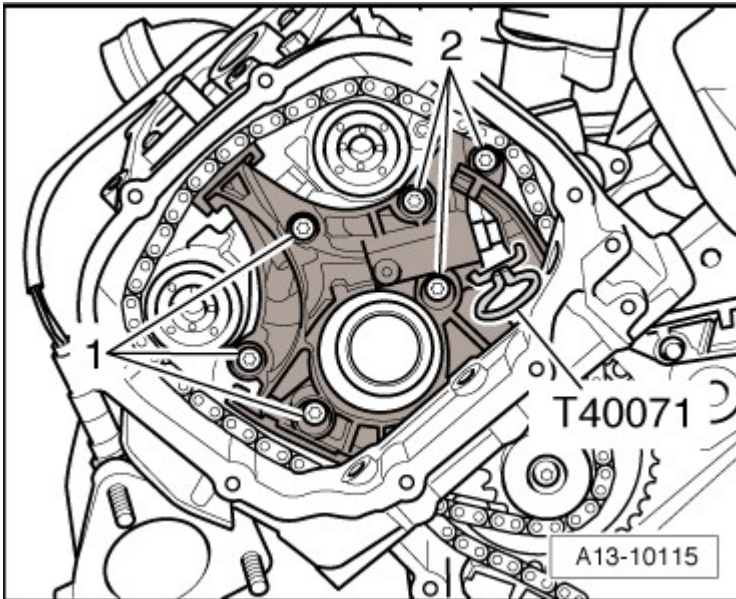


Fig. 133: Identifying Bolts For Left Chain Tensioner And Left Camshaft Timing Chain
 Courtesy of AUDI OF AMERICA, LLC

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

- Install camshaft timing chains **INSTALLING**.
- Install left and right timing chain covers **INSTALLING**.
- Install rear coolant pipe. Refer to **REAR COOLANT PIPE** .
- Install left coolant pipe. Refer to **LEFT COOLANT PIPE** .
- Install right coolant pipe. Refer to **RIGHT COOLANT PIPE** .
- Install cylinder head cover. Refer to **LEFT CYLINDER HEAD COVER, RIGHT CYLINDER HEAD COVER**.
- Install intake manifold. Refer to **Removal and Installation** .
- To tighten SW 14 union nut at fuel rail, use V.A.G 1331 with V.A.G 1331/8. Refer to **Description and Operation** .

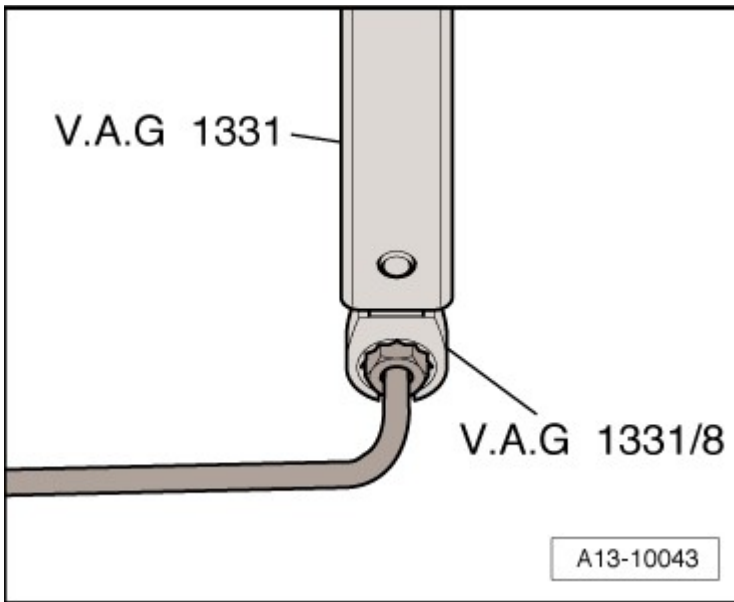


Fig. 134: Fastening High-Pressure Line At Fuel Rail Using Torque Wrench V.A.G 1331 With Open End Wrench Socket V.A.G 1331/8

Courtesy of AUDI OF AMERICA, LLC

-- To tighten SW 17 union nut at fuel rail, use the V.A.G 1331 with V.A.G 1331/6. Refer to **Description and Operation** .

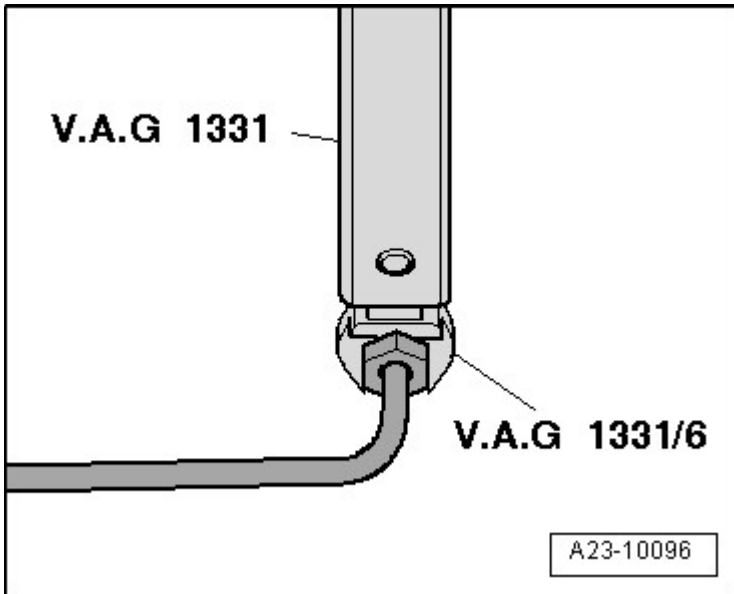


Fig. 135: Identifying SW 17 Union Nut At Fuel Rail, Torque Wrench V.A.G 1331 And SW 17 Socket V.A.G 1331/6

Courtesy of AUDI OF AMERICA, LLC

-- Install left primary catalytic converter. Refer to **LEFT PRIMARY CATALYTIC CONVERTER** .

-- Align exhaust system free of tension. Refer to **EXHAUST SYSTEM, INSTALLING** .

-- Change engine oil.

-- Replace coolant. Refer to **COOLING SYSTEM, DRAINING AND FILLING** .

CAMSHAFTS

Special tools and workshop equipment required

- Multipoint Socket T10035
- Impact Puller T10133/3 from the Tool Set T10133
- Socket T40058
- Locating Pins T40116
- Hand drill with plastic brush attachment
- Protective eyewear
- Sealant.

NOTE: Removal and installation at left cylinder head is depicted in the following description.

Removing

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

-- Disconnect electrical connector at intake camshaft position sensor -arrow-.

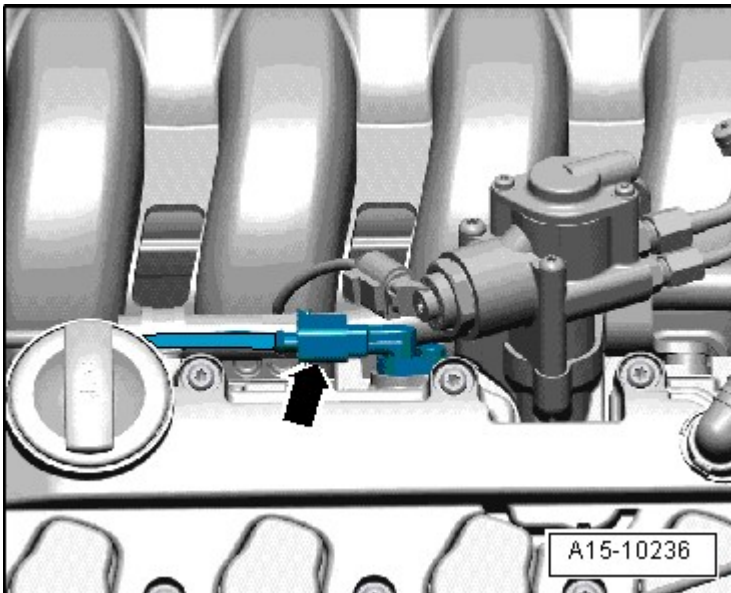


Fig. 136: Disconnecting Electrical Connector At Intake Camshaft Position Sensor
Courtesy of AUDI OF AMERICA, LLC

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

CAUTION: Risk of damaging valves and piston crowns.

- In the course of the following steps, the crankshaft must not stand with any piston at "TDC".

-- Remove 3242 from upper section of oil pan.

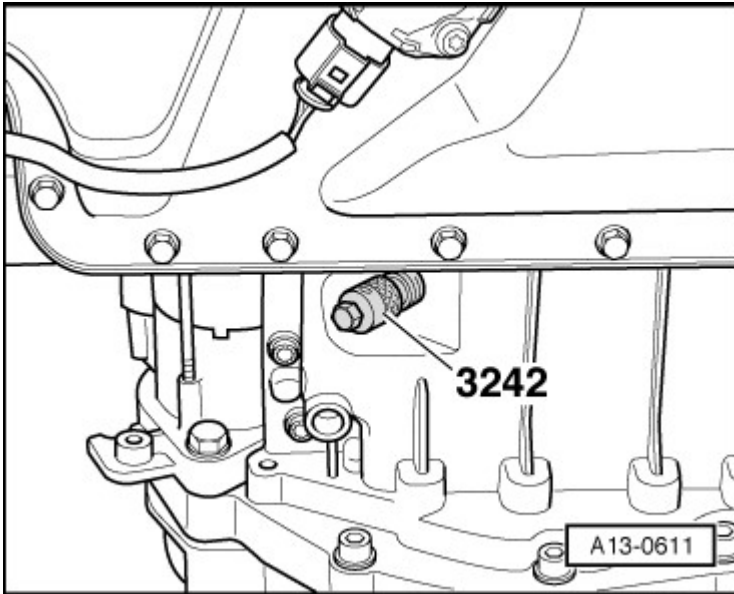


Fig. 137: Identifying Crankshaft Holder 3242 Into Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Insert the T40058 guide pins as follows:

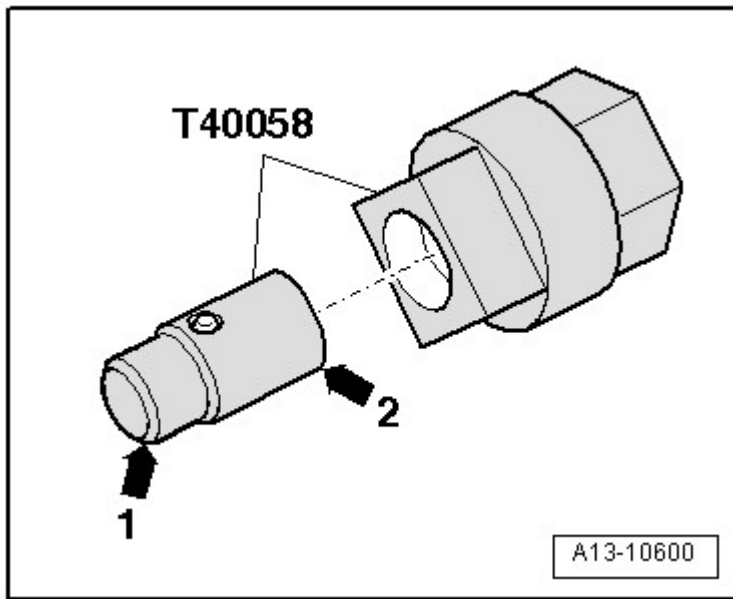


Fig. 138: Inserting T40058 Guide Pin
 Courtesy of AUDI OF AMERICA, LLC

- Small diameter -arrow 1- points to engine.
- Large diameter -arrow 2- points to socket.

-- Rotate crankshaft with T40058 opposite engine rotation direction 40° out of "TDC" position -arrow-.

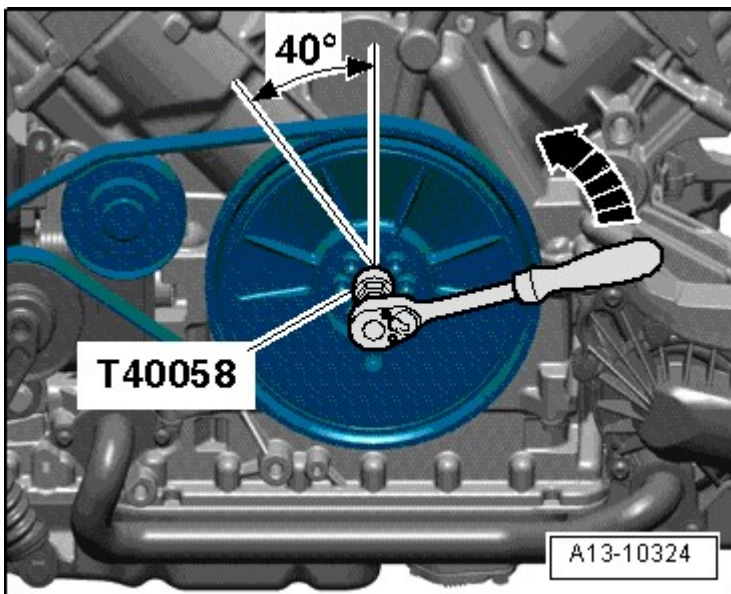


Fig. 139: Rotating Crankshaft With Socket T40058 Opposite Engine Rotation Direction 40 Degrees Out Of "TDC" Position

Courtesy of AUDI OF AMERICA, LLC

-- Remove T40070 at cylinder head.

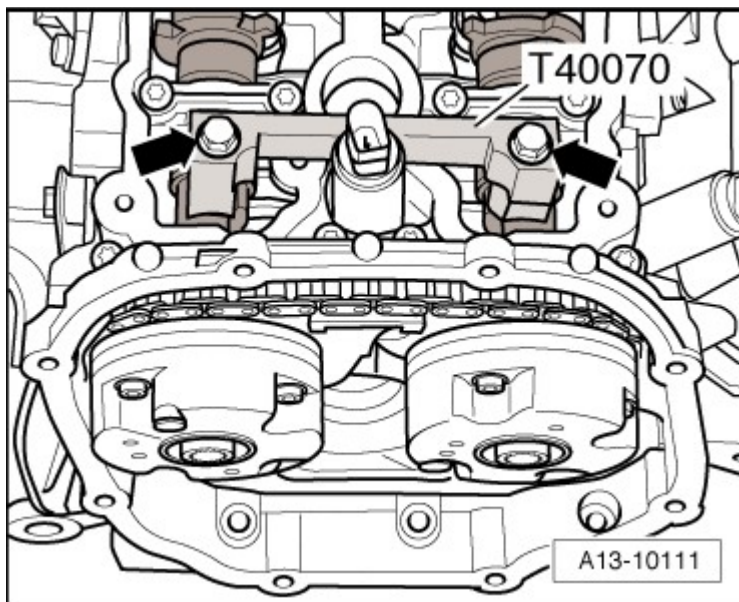


Fig. 140: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Loosen guide frame bolts in sequence -24 to 1--.

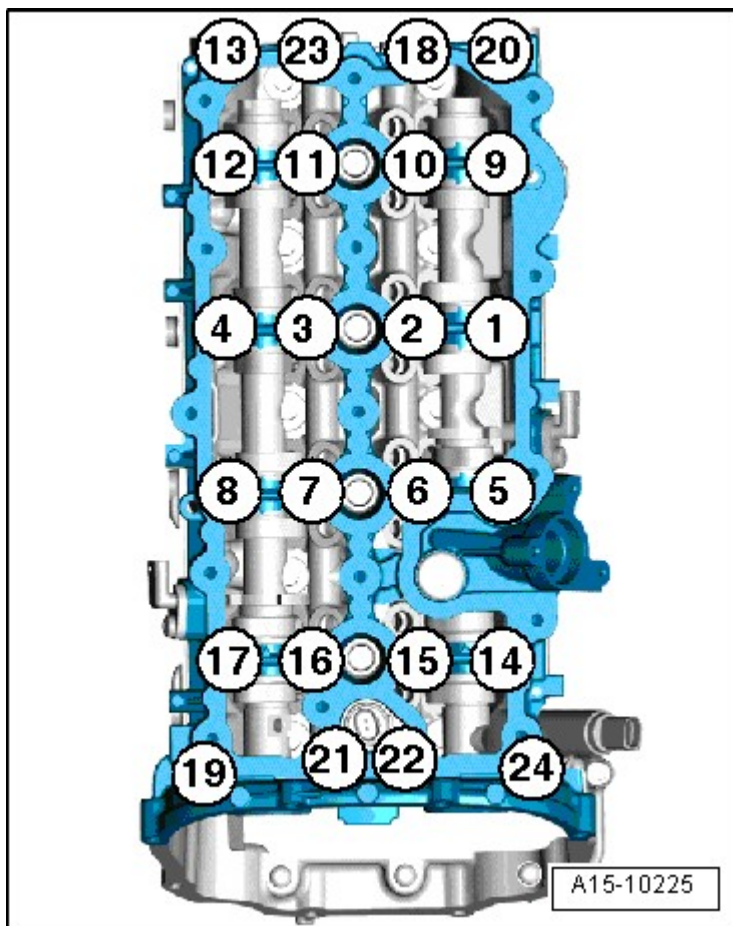


Fig. 141: Bearing Frame Tightening Sequence

Courtesy of AUDI OF AMERICA, LLC

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

-- Carefully remove guide frame.

-- Mark camshafts and remove them.

NOTE: Because the special tool cannot be used during installation, the alignment pins -arrows- on an engine with alignment pins must be driven out with a cotter pin driver.

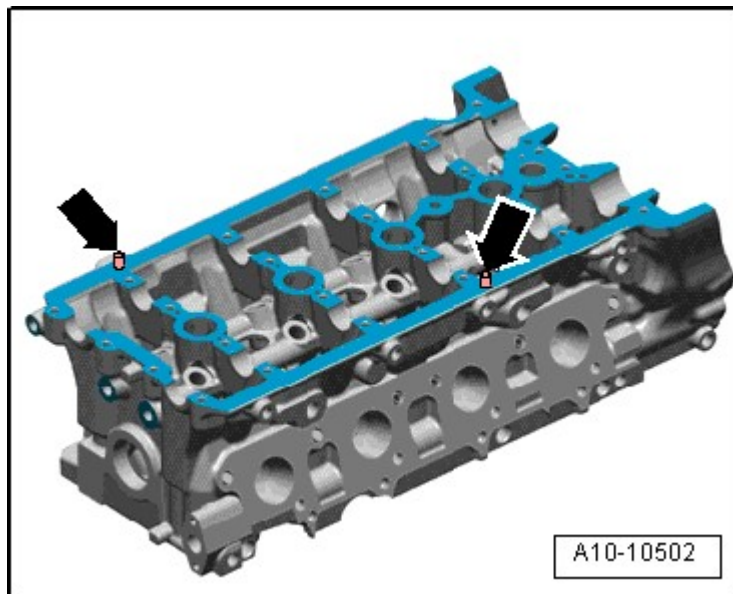


Fig. 142: Identifying Guide Frame Alignment Pins
Courtesy of AUDI OF AMERICA, LLC

Installing

- Tightening specifications, refer to **Fig. 19**.

NOTE: Always replace gaskets and seals.

WARNING: Risk of eye injury.

- Wear safety glasses.

CAUTION: Risk of contaminating lubricating system and bearing.

- Cover open parts of engine.

- Remove sealant residue on cylinder head and guide frame, for example with rotating plastic brush.
- Clean the sealing surfaces, they must be free of oil and grease.
- Oil journal surfaces of camshafts.
- Place camshafts in cylinder head, noting position of camshafts so that guide frame can be installed without tension.

Left cylinder head:

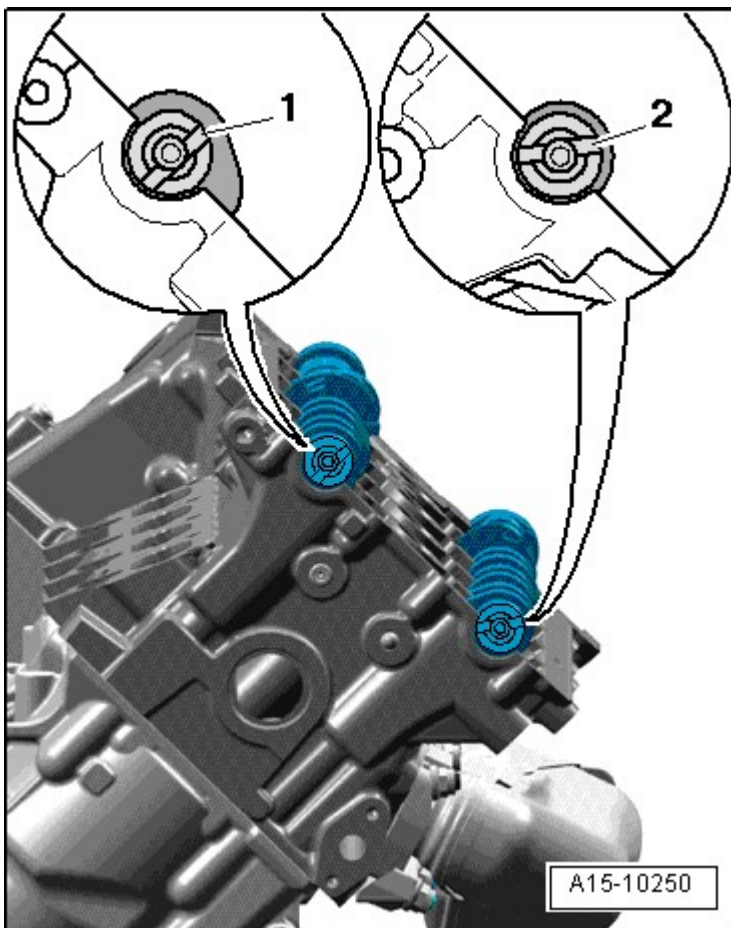


Fig. 143: Identifying Intake Camshaft & Exhaust Camshaft (Left Cylinder Head)
Courtesy of AUDI OF AMERICA, LLC

1. Intake camshaft
 2. Exhaust camshaft
- Groove on end of shaft must lie as shown in illustration.

Right cylinder head:

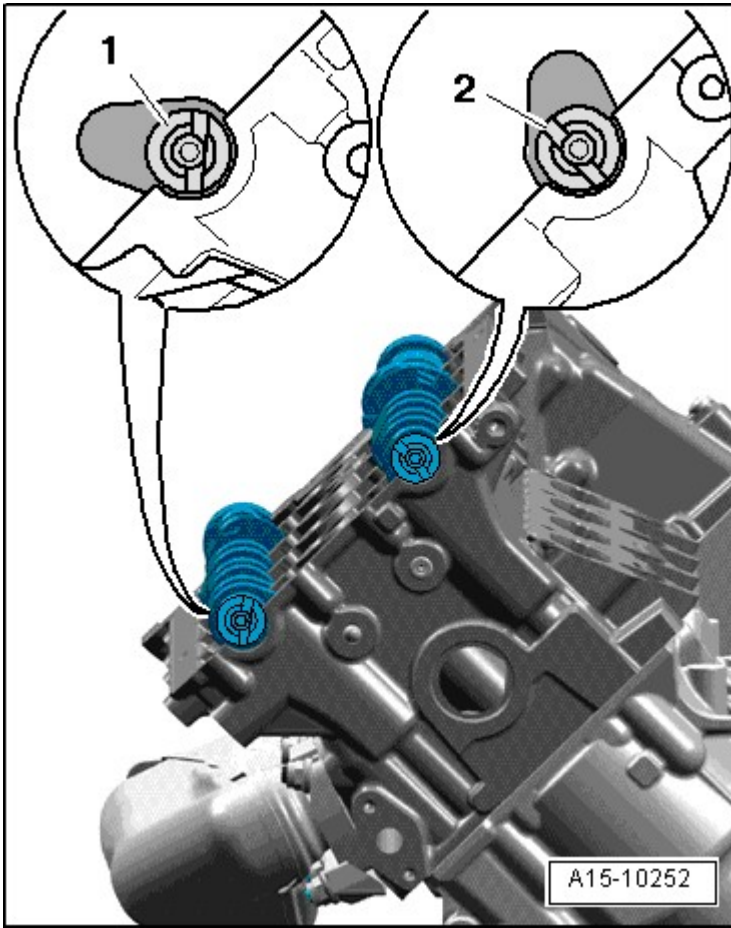


Fig. 144: Identifying Intake Camshaft & Exhaust Camshaft (Right Cylinder Head)
 Courtesy of AUDI OF AMERICA, LLC

1. Exhaust camshaft
 2. Intake camshaft
- Groove on end of shaft must lie as shown in illustration.

Continued for both sides:

-- Check location of compression ring ends.

- The compression ring ends -1- and -2- must face upward or downward, and must never face sideways.



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

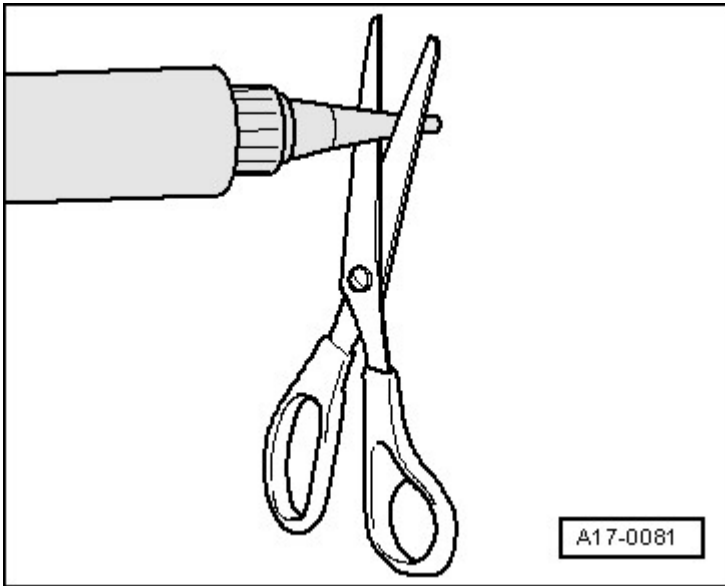


Fig. 146: Identifying Scissors To Cut Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
 Courtesy of AUDI OF AMERICA, LLC

-- Lay a new seal -2- in guide frame groove.

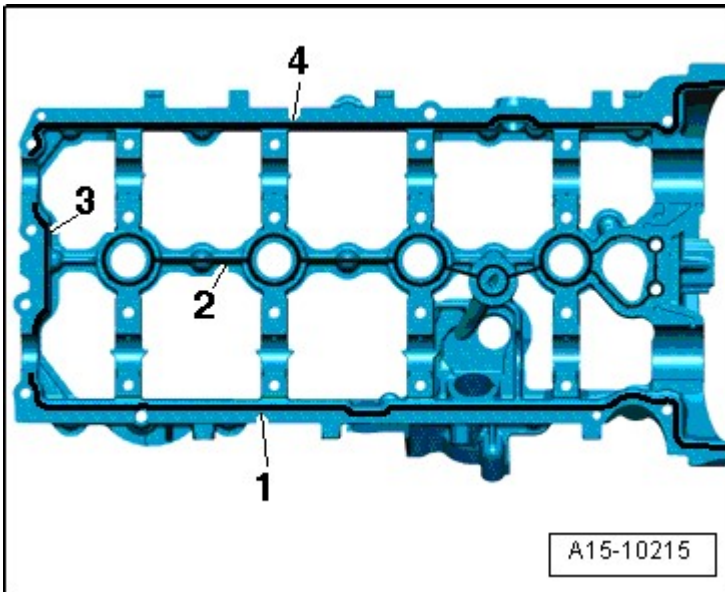


Fig. 147: Laying New Seal In Guide Frame Groove & Applying Sealant Beads On Clean Guide Frame Sealing Surfaces

Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of contaminating camshaft bearing with excess sealant.

- Do not apply sealant beads thicker than specified.

-- Apply sealant beads -1, 3, 4- on clean guide frame sealing surfaces as shown in illustration.

- Thickness of sealant beads: 2.5 mm.

-- Immediately place guide frame on cylinder head.

NOTE: Ensure camshafts can be inserted in guide frame axial bearing without force.

-- Insert the T40116 in the guide frame and cylinder head.

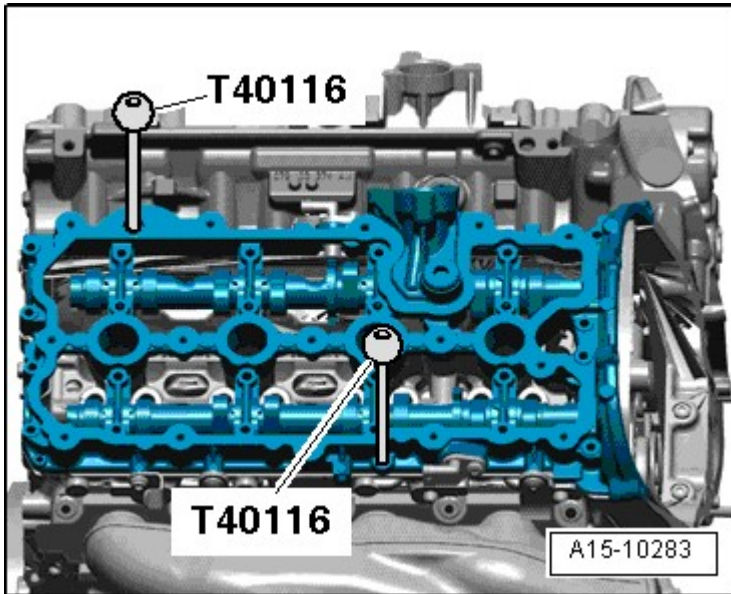


Fig. 148: Inserting Guide Frame Securing Pins T40116 In Guide Frame And Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

NOTE: Because the sealant begins hardening immediately, guide frame must be promptly positioned and tightened.

After the guide frame has been installed, sealant must harden approximately 30 minutes.

-- Tighten guide frame bolts. Refer to Fig. 19.

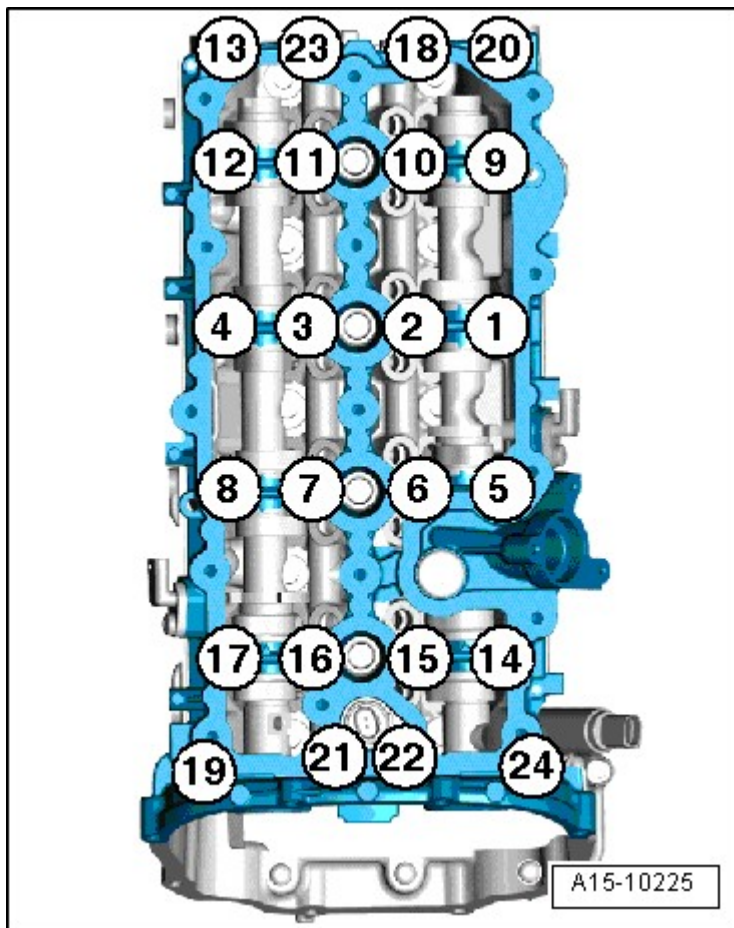


Fig. 149: Bearing Frame Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

-- Drive sealing plugs -arrows- in flush.

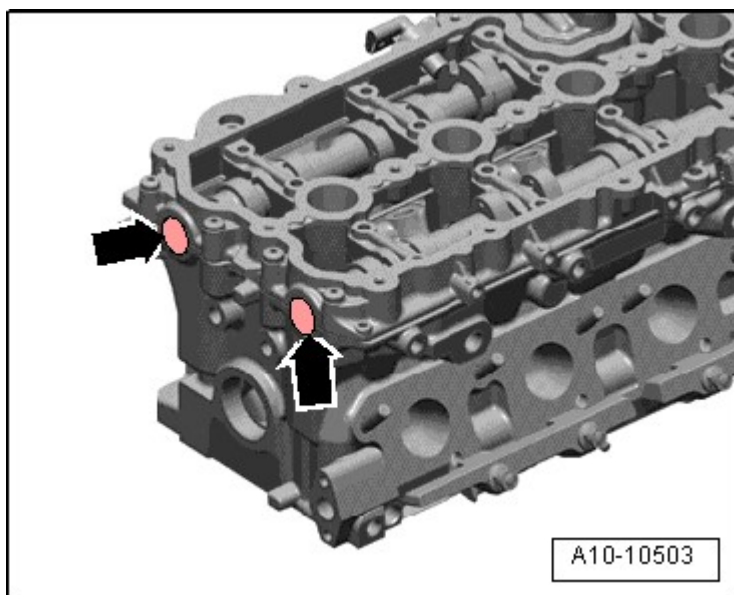


Fig. 150: Driving Sealing Plugs In Flush
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the T40116 with the T10133/3.

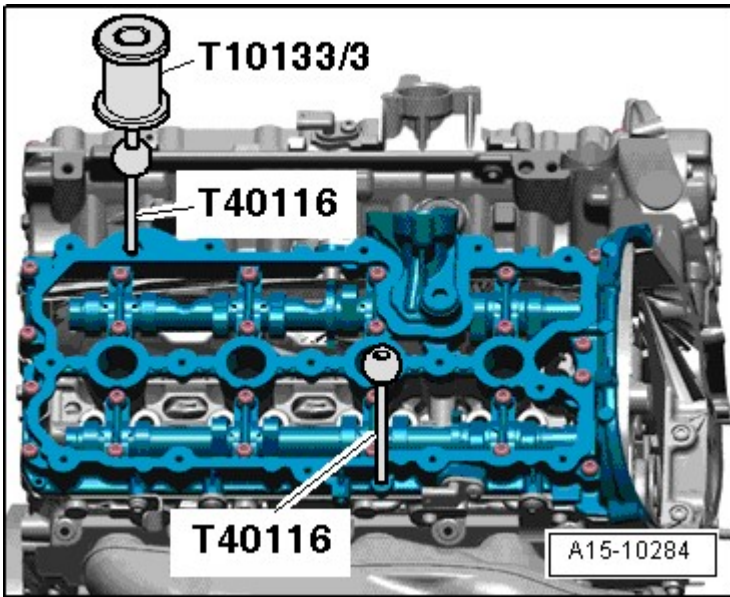


Fig. 151: Identifying Guide Frame Securing Pins T40116 With Impact Puller T10133/3
 Courtesy of AUDI OF AMERICA, LLC

-- Rotate the intake camshaft to "TDC" and the tighten camshaft adjuster screw -2- on the camshaft with a 24 mm socket -1- inserted between as illustrated.

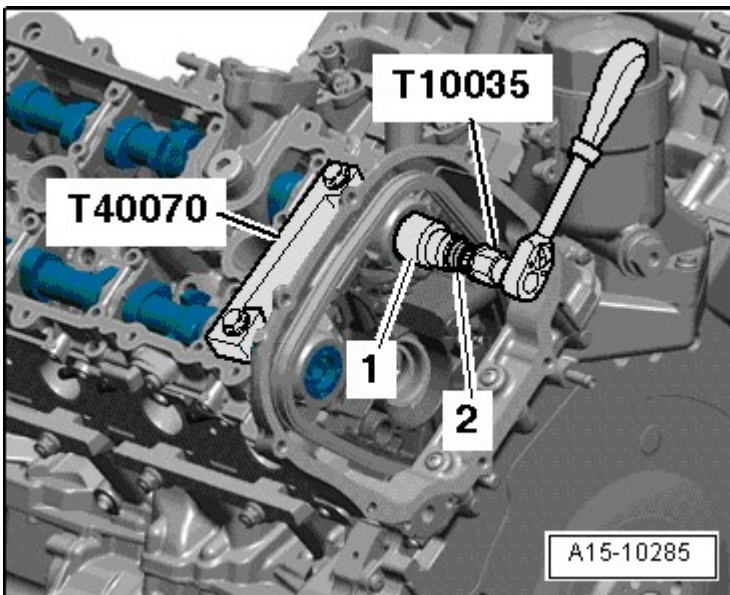


Fig. 152: Rotating Intake Camshaft To "TDC" And Tightening Camshaft Adjuster Screw On Camshaft With A Socket SW 24 Inserted Between
 Courtesy of AUDI OF AMERICA, LLC

NOTE: To tighten screw, counterhold socket with pliers if necessary.

-- Position a lever or ratchet with T10035 on screw and rotate camshaft until threaded holes for T40070 face up.

-- Next, loosely fasten T40070 to intake camshaft.

- The T40070 is correctly positioned when the holes for the cylinder head bolts remain free.

-- Adapt camshaft adjuster screw -2- and socket 24 -1- to exhaust camshaft.

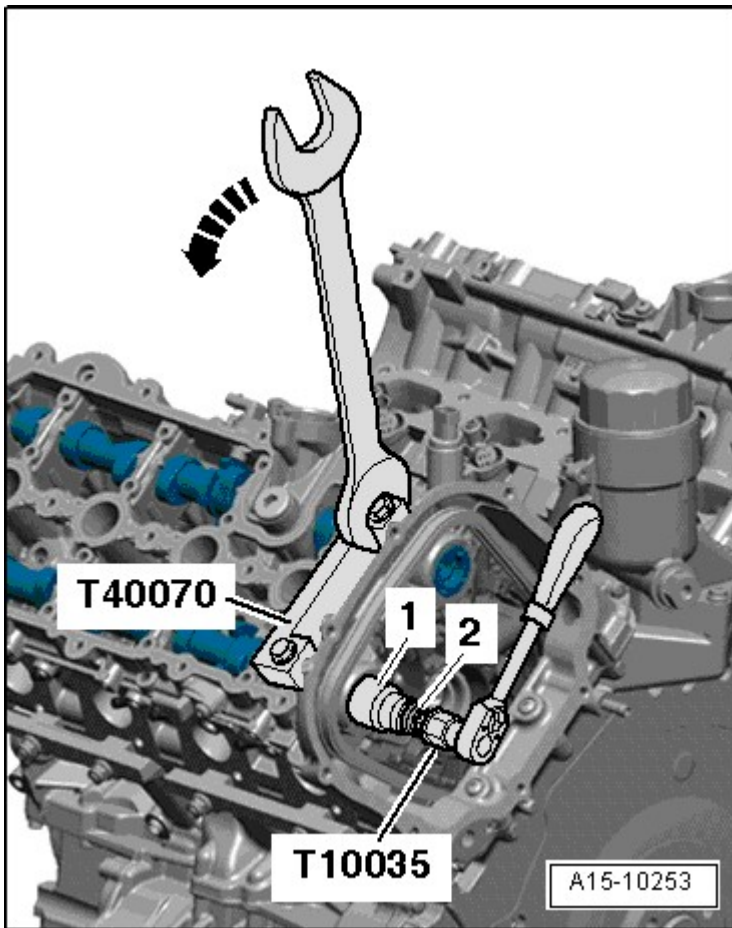


Fig. 153: Adapting Camshaft Adjuster Screw And Socket 24 To Exhaust Camshaft
Courtesy of AUDI OF AMERICA, LLC

-- Rotate exhaust camshaft until threaded hole for Camshaft Clamp T40070 faces up.

-- At the same time, position a counter-hole SW 24 on T40070 and swing T40070 against exhaust camshaft to install -arrow-.

-- Tighten T40070 by hand onto exhaust camshaft to avoid damaging threads (2nd technician needed).

-- Tighten T40070 bolts to 25 Nm.

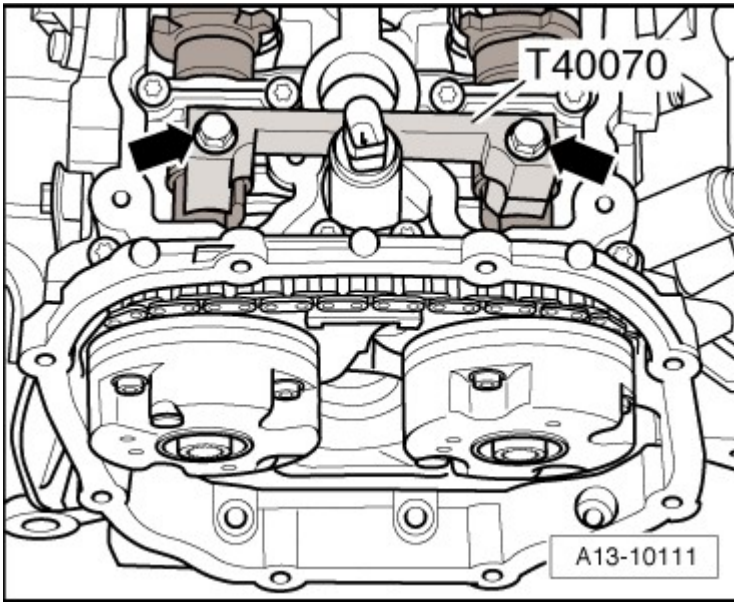


Fig. 154: Mounting Camshaft Locating Tool T40070 To Both Cylinder Heads And Tightening Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Using T40058, rotate crankshaft in direction of engine rotation -arrow- to "TDC".

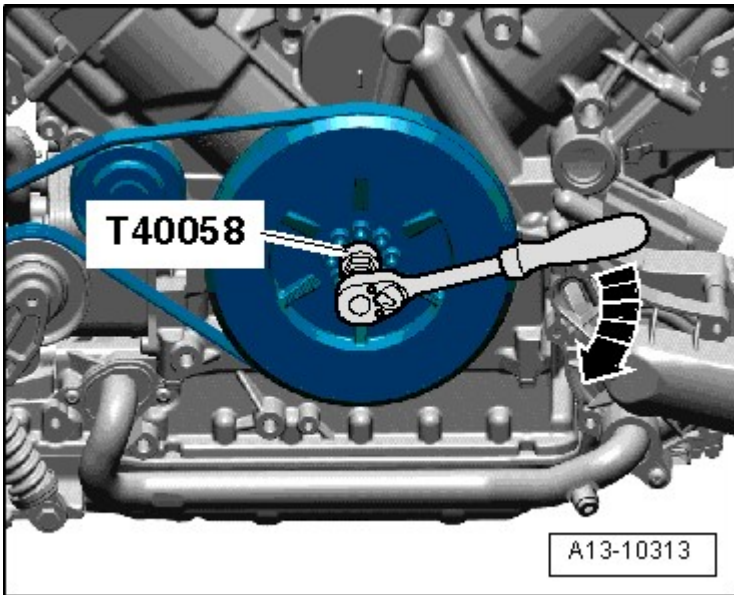


Fig. 155: Loosening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
 Courtesy of AUDI OF AMERICA, LLC

-- Screw 3242 into hole to 20 Nm, if necessary rotate crankshaft very slightly back and forth to completely center the holder.

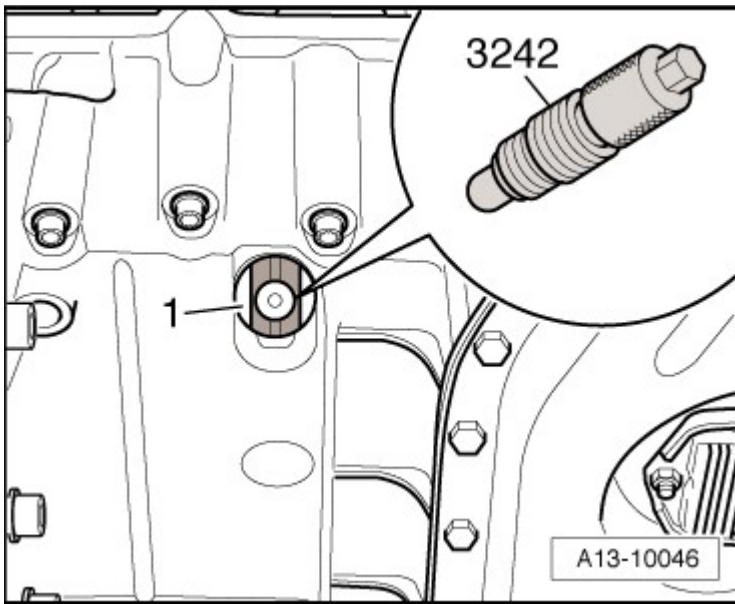


Fig. 156: Identifying Crankshaft Holder 3242 In Bore
 Courtesy of AUDI OF AMERICA, LLC

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

-- Position camshaft timing chains on camshafts **INSTALLING**.

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

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

VALVE STEM SEALS, CYLINDER HEAD INSTALLED

Special tools and workshop equipment required

- Spark Plug Wrench 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotters Asm/Dis-Asm Device VAS 5161
- Adapter T40012

Removing

-- Camshafts, removing, 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.
- Move piston for respective cylinder to "Bottom Dead Center (BDC) position".
- Using 3122 B, remove spark plugs.
- Place drift VAS 5161/3 on valve spring plate and loosen stuck valve keepers using a plastic hammer.

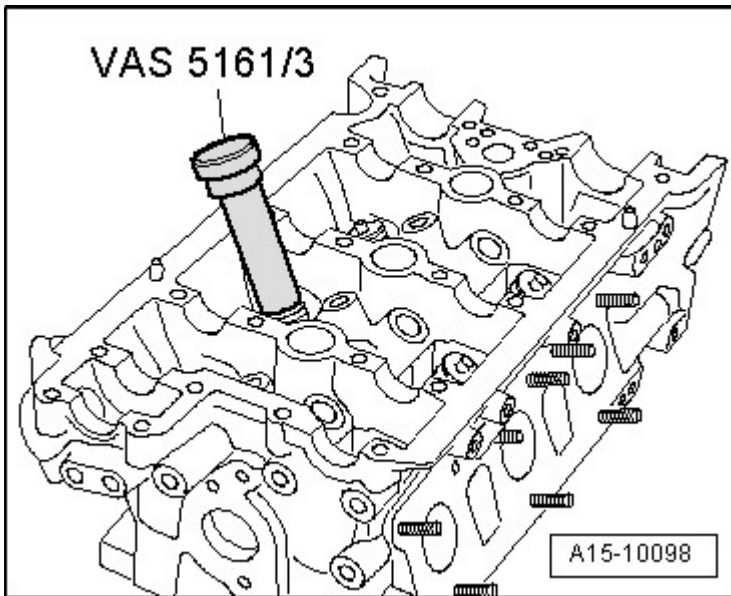


Fig. 157: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

- Position guide plate VAS 5161/19B on cylinder head.

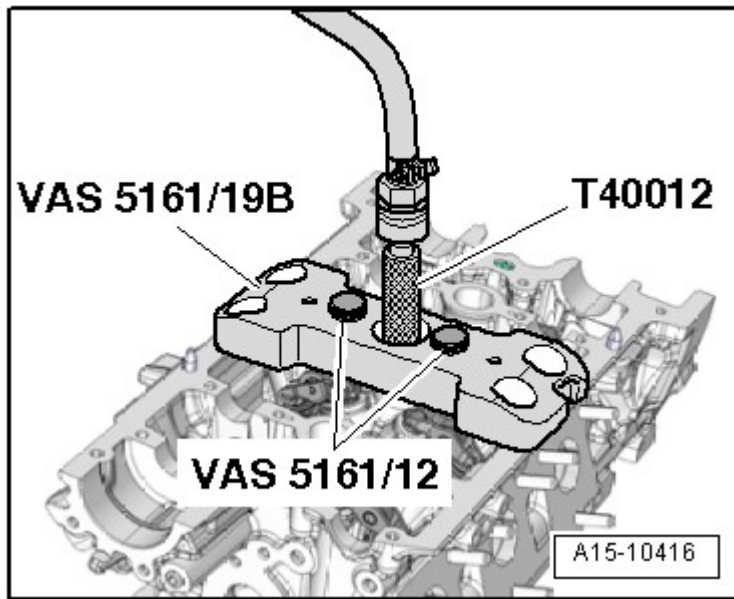


Fig. 158: Identifying VAS 5161/19B

Courtesy of AUDI OF AMERICA, LLC

- Secure guide plate with knurled screws VAS 5161/12.
- Screw T40012 with gasket by hand into respective spark plug thread and apply constant pressure.
 - Minimum pressure: 6 bar positive pressure.
- Secure engaging device VAS 5161/6 with installation fork VAS 5161/5 to guide plate.

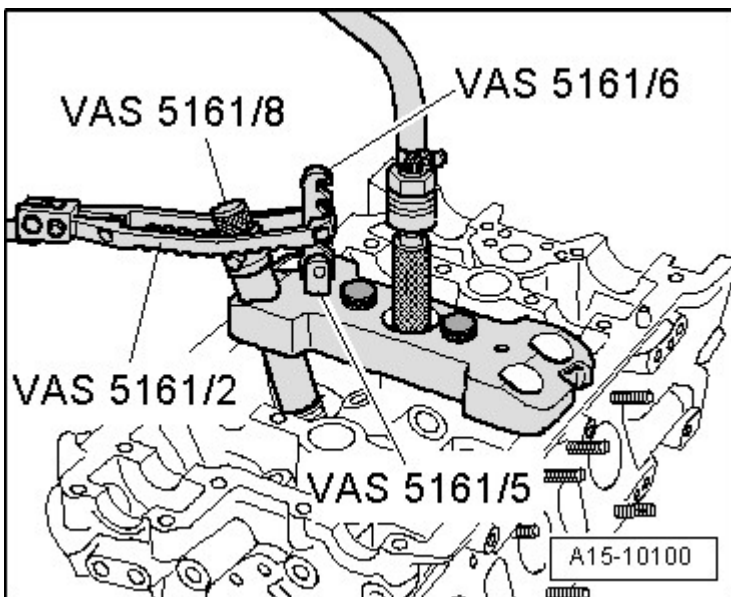


Fig. 159: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

Courtesy of AUDI OF AMERICA, LLC

- Push installation cartridge VAS 5161/8 into guide plate.
- Engage pressure fork VAS 5161/2 at engaging device and press down installation cartridge.
- At the same time, turn knurled bolt of installation cartridge to the right, until the points engage in the valve keepers.
- Lightly move knurled bolt back and forth, causing the valve retainers to be pressed apart and be captured in the installation cartridge.
- Release pressure fork.
- Take out installation cartridge.
- Unfasten guide plate and turn it aside.
 - Pressurized air hose remains connected.
- Remove valve spring with valve spring plate.
- Remove valve stem seal with 3364.

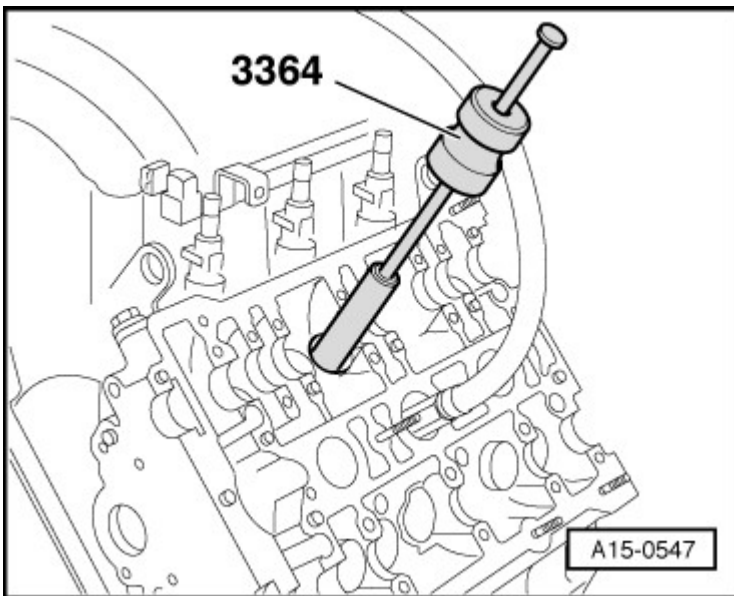


Fig. 160: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

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

- Using a drift, drive out roll pin -arrow- at puller with a drift and remove the impact puller attachment.

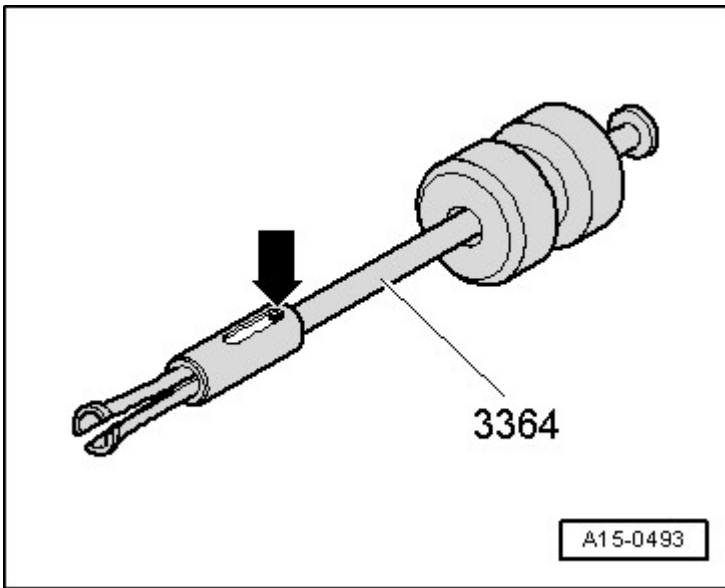


Fig. 161: Driving Out Spring Dowel Sleeve
Courtesy of AUDI OF AMERICA, LLC

-- Place lower part of puller on valve stem seal.

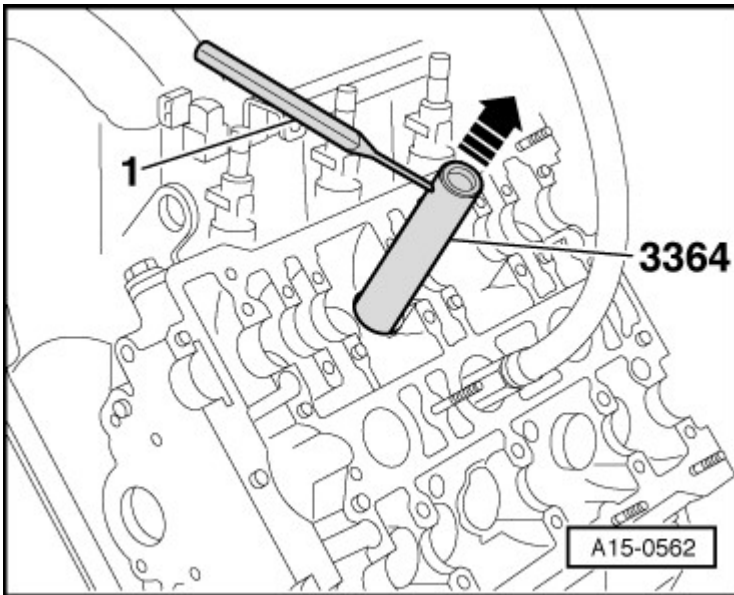


Fig. 162: Positioning Lower Part Of 3364 Valve Stem Removal Tool At Valve Stem Oil Seal
Courtesy of AUDI OF AMERICA, LLC

-- Secure puller with a drift or cotter pin driver -1-, as shown in illustration.

-- Place lever on puller and pull off valve stem seal -arrow-.

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.

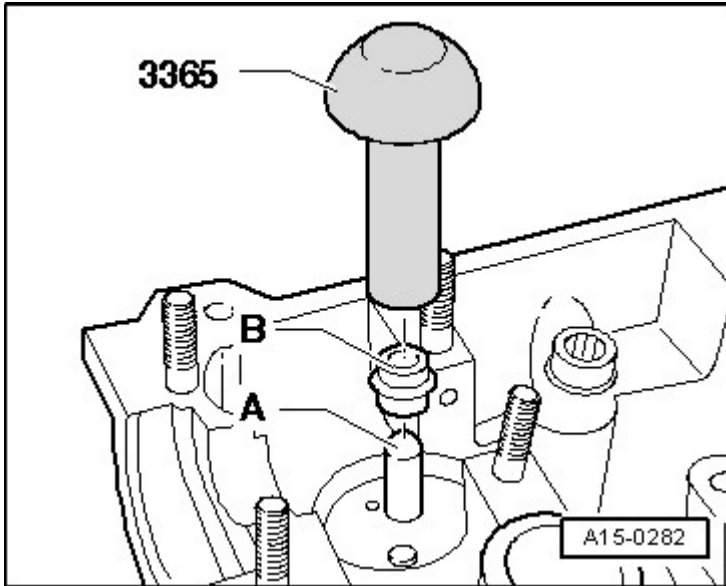


Fig. 163: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of AUDI OF AMERICA, LLC

- Lightly coat sealing lips of valve stem seal with oil.
- Push valve stem seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using 3365.
- Remove plastic sleeve again.

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

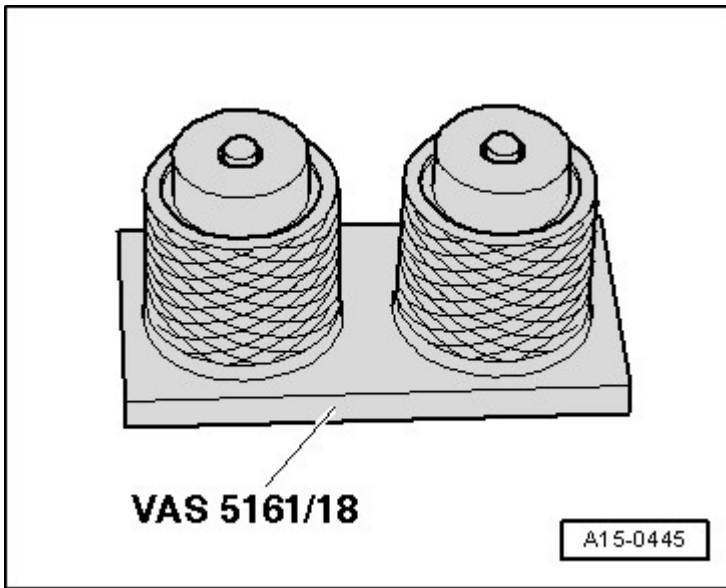


Fig. 164: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

- The large diameter of the valve keepers point upward.
- Press installation cartridge from above onto valve keepers inserting tool and capture keepers.
- Install valve spring and valve spring plate.

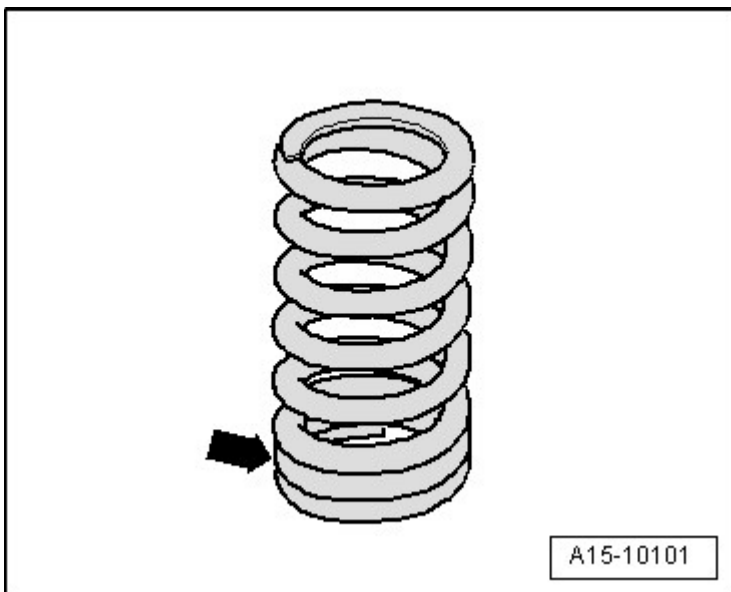


Fig. 165: Identifying Tight Spring Coils
Courtesy of AUDI OF AMERICA, LLC

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

- Screw guide plate onto cylinder head again.
- Insert installation cartridge into guide plate.

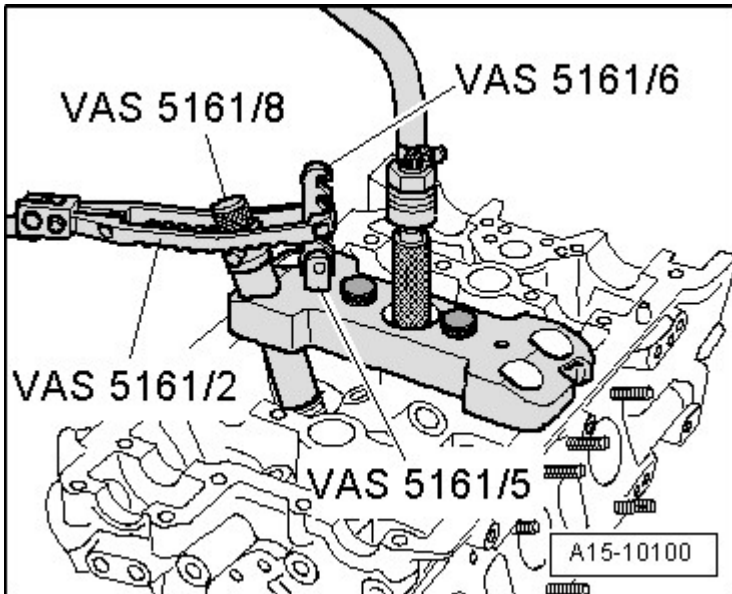


Fig. 166: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

Courtesy of AUDI OF AMERICA, LLC

- Press down pressure fork and pull knurled bolt upward turning to left and right, valve retainers are inserted in this manner.
- Release pressure fork with the knurled bolt still pulled.
- Repeat the procedure on each valve.

Assembling

Assembly is in reverse order of removal, note the following:

- Make sure all the roller rocker levers are seated correctly on the valve stem ends and are clipped onto the hydraulic adjusting elements.
- Install sparks plugs.
- Install 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
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tension Device VAS 6419

Procedure

- Camshafts, removing, refer to **CAMSHAFTS**.
- Mark the allocation of the roller rocker lever and the hydraulic adjusting elements so they can be installed again.
- If necessary, remove the roller rocker levers with the hydraulic adjusting elements and place them on a clean surface.
- Mount the VAS 6419 into the VAS 6095.

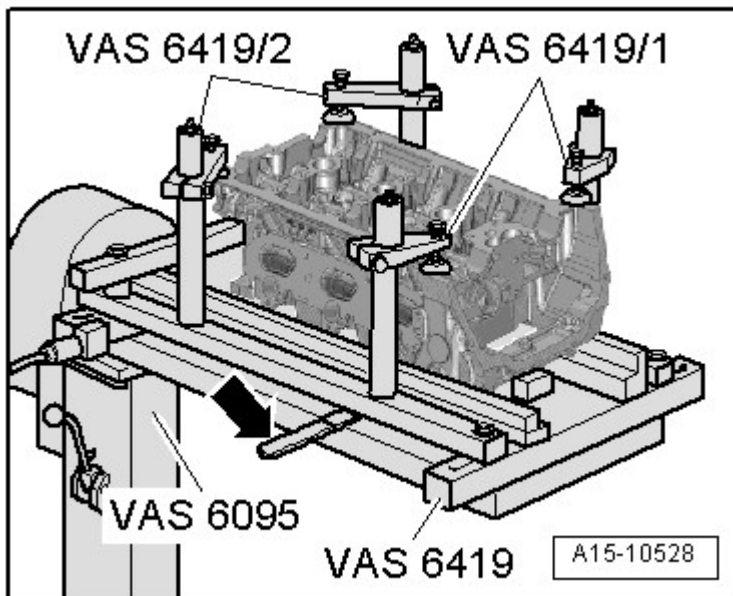


Fig. 167: Tensioning Cylinder Head On Tensioning Element VAS 6419
Courtesy of AUDI OF AMERICA, LLC

- Tension the cylinder head on the cylinder head tensioning device, as illustrated.
- Connect the cylinder head tensioning device to the compressed air.
- Slide the air cushion with the lever -arrow- under the combustion chamber onto the valve stem seal that will be removed.
- Let enough compressed air flow into the air cushion until it contacts the valve plate.

-- Position the drift VAS 5161/3 on the valve spring plate and loosen the stuck valve keepers with a plastic mallet.

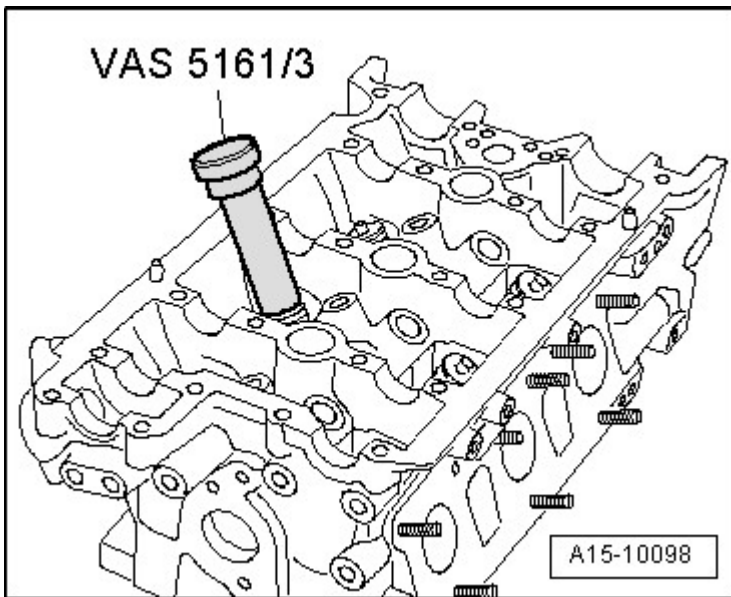


Fig. 168: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

-- Position guide plate VAS 5161/19B on cylinder head.

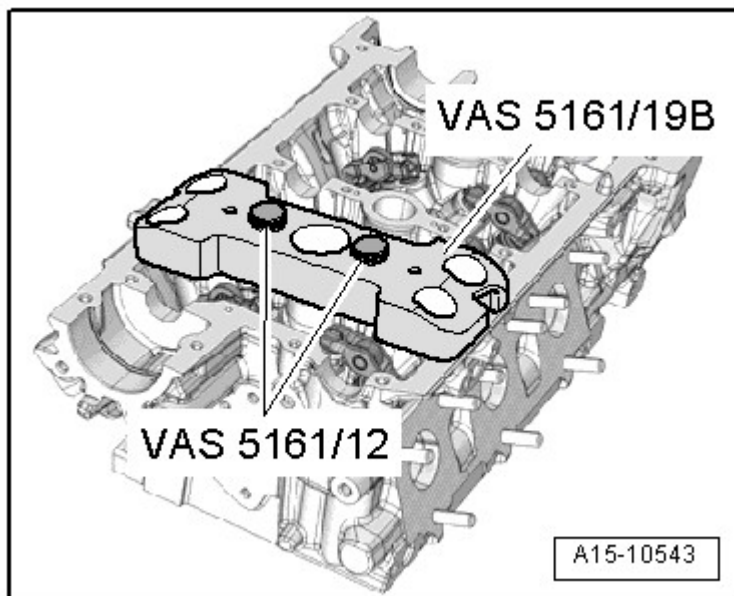


Fig. 169: Identifying Guide Plate VAS5161/19B Positioned On Cylinder Head

Courtesy of AUDI OF AMERICA, LLC

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

-- Install engaging device VAS 5161/6 with installation fork VAS 5161/5 in guide plate.

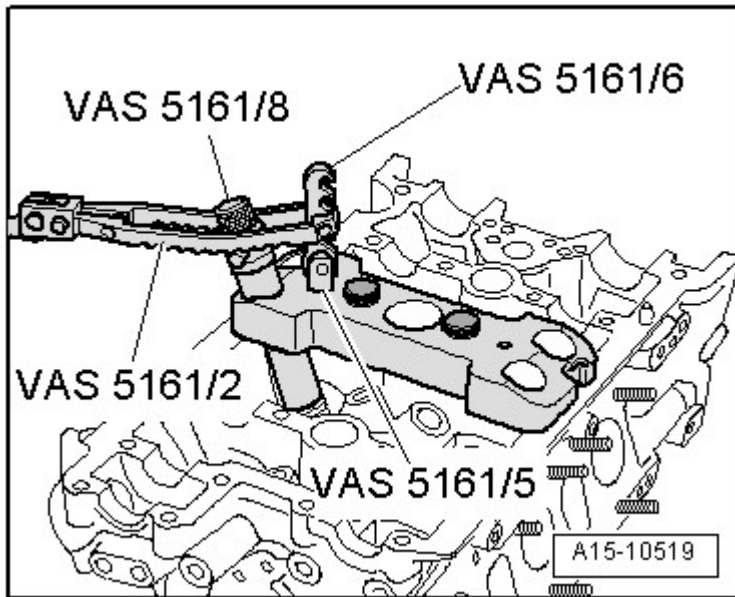


Fig. 170: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of AUDI OF AMERICA, LLC

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

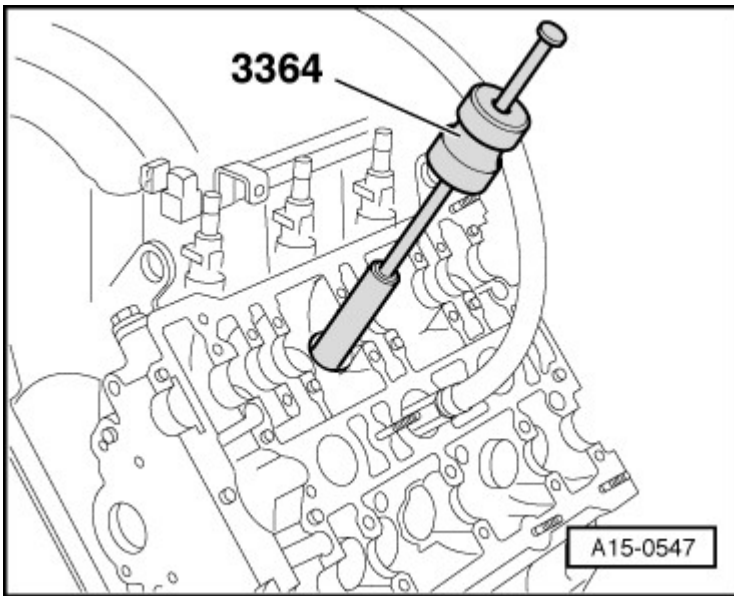


Fig. 171: Pulling Off Valve Stem Oil Seals Using Valve Seal Removal Tool 3364
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of damage when installing valve stem seals.

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

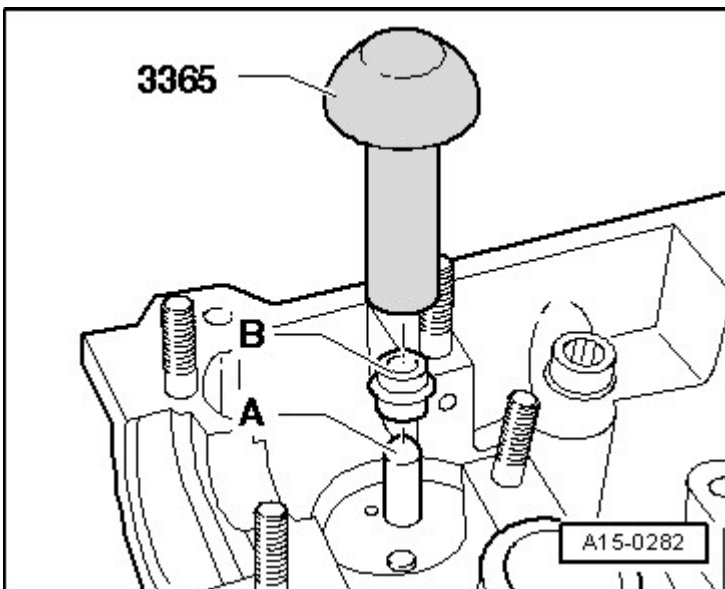


Fig. 172: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of AUDI OF AMERICA, LLC

-- 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.

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

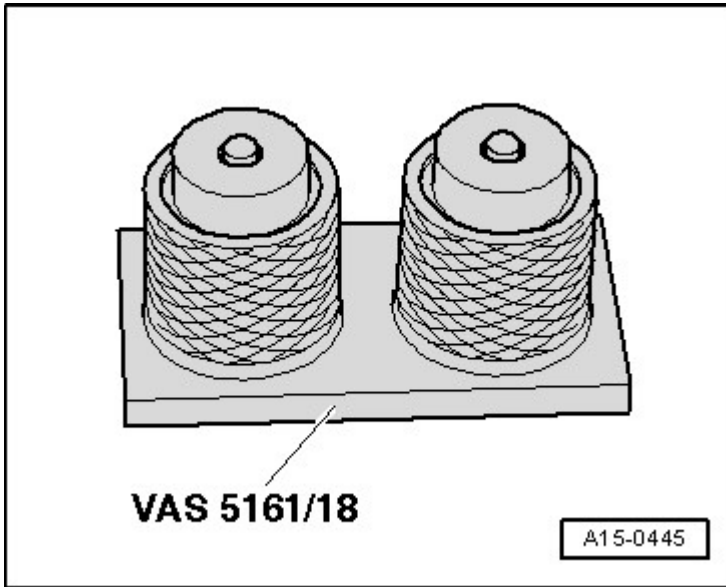


Fig. 173: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

- The large diameter of the valve keepers point upward.

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

-- Insert valve spring and valve spring plate.

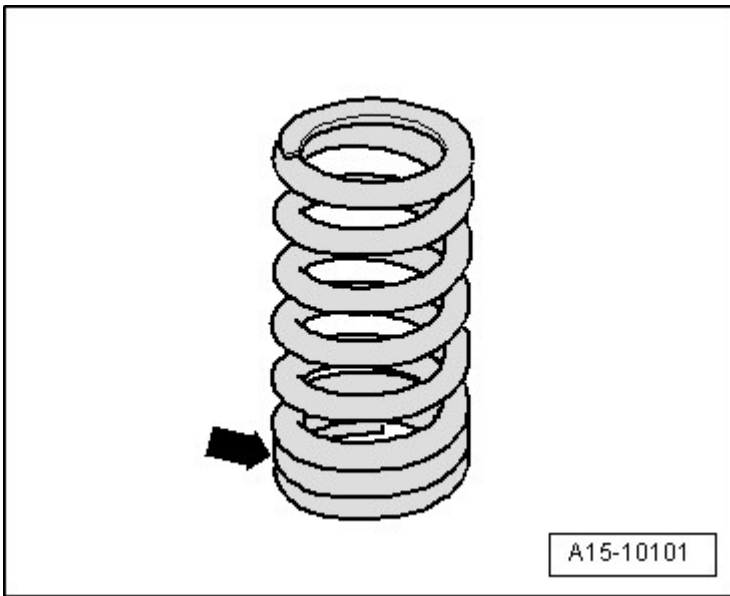


Fig. 174: Identifying Tight Spring Coils
Courtesy of AUDI OF AMERICA, LLC

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

-- Install the guide plate on the cylinder head.

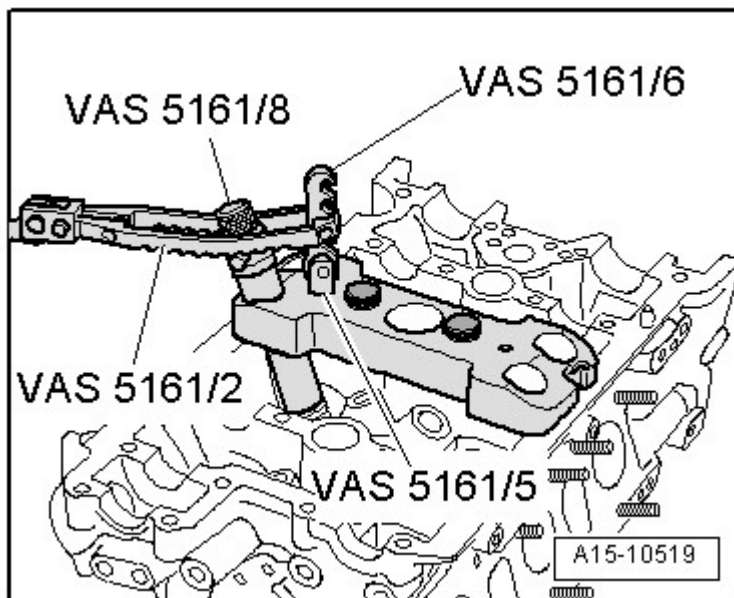


Fig. 175: Installing Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Into Guide Plate
Courtesy of AUDI OF AMERICA, LLC

-- Insert installation cartridge in guide plate.

-- Press the pressure fork down and pull the knurled screw up while turn left and right. This inserts the valve

retainers.

- Release the pressure fork with the knurled screw still raised.
- Repeat the procedure on each valve.

Assembling

Assembly is in reverse order of removal, note the following:

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

SPECIAL TOOLS

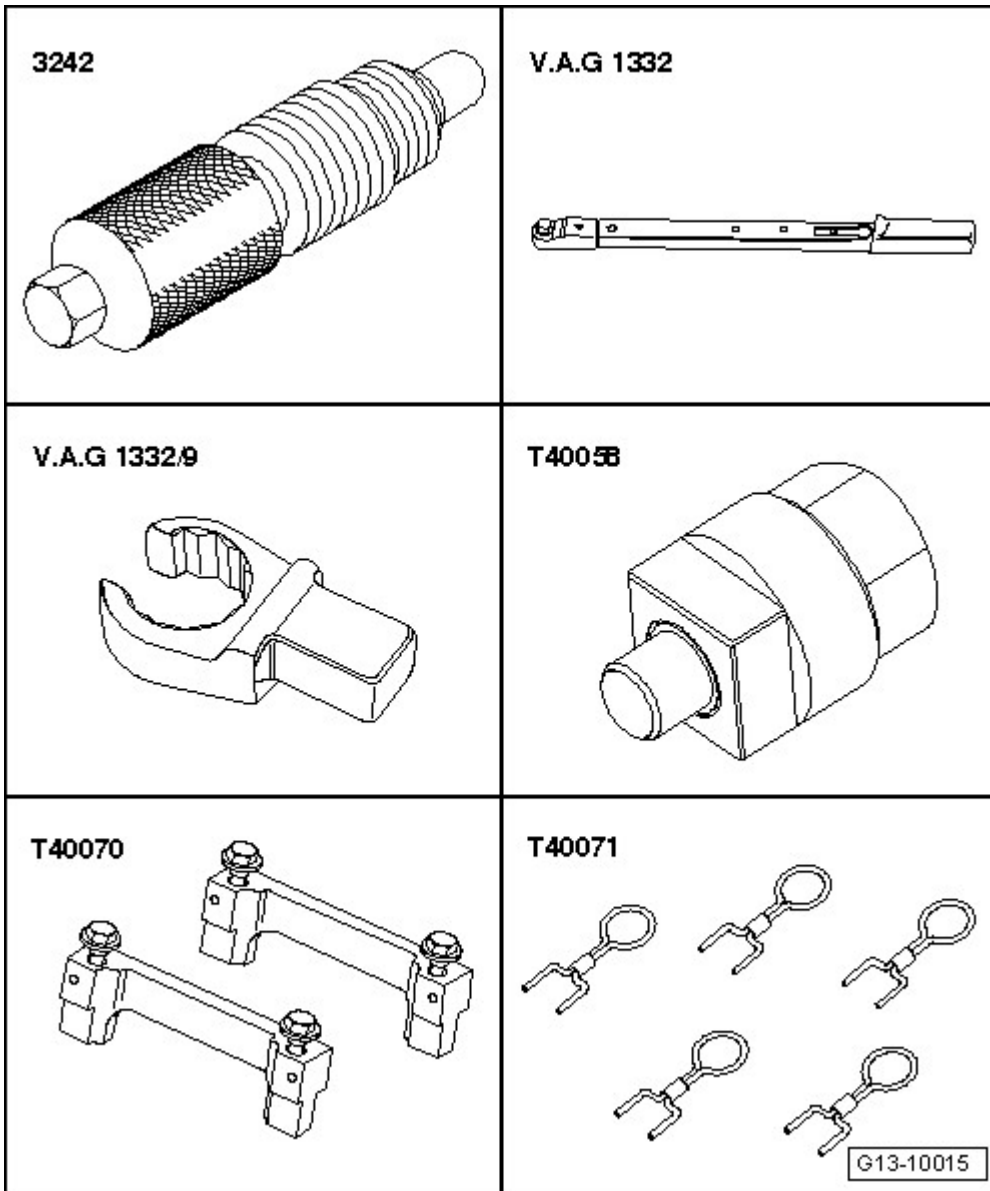


Fig. 176: Identifying Special Tools -- Camshaft Timing Chain, Removing From Camshaft
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Crankshaft Holder 3242
- Torque Wrench V.A.G 1332
- Open Ring Spanner Insert, AF 24 mm V.A.G 1332/9
- Adapter T40058
- Camshaft Clamp T40070, quantity: 2
- Locking Pin T40071, quantity: 2

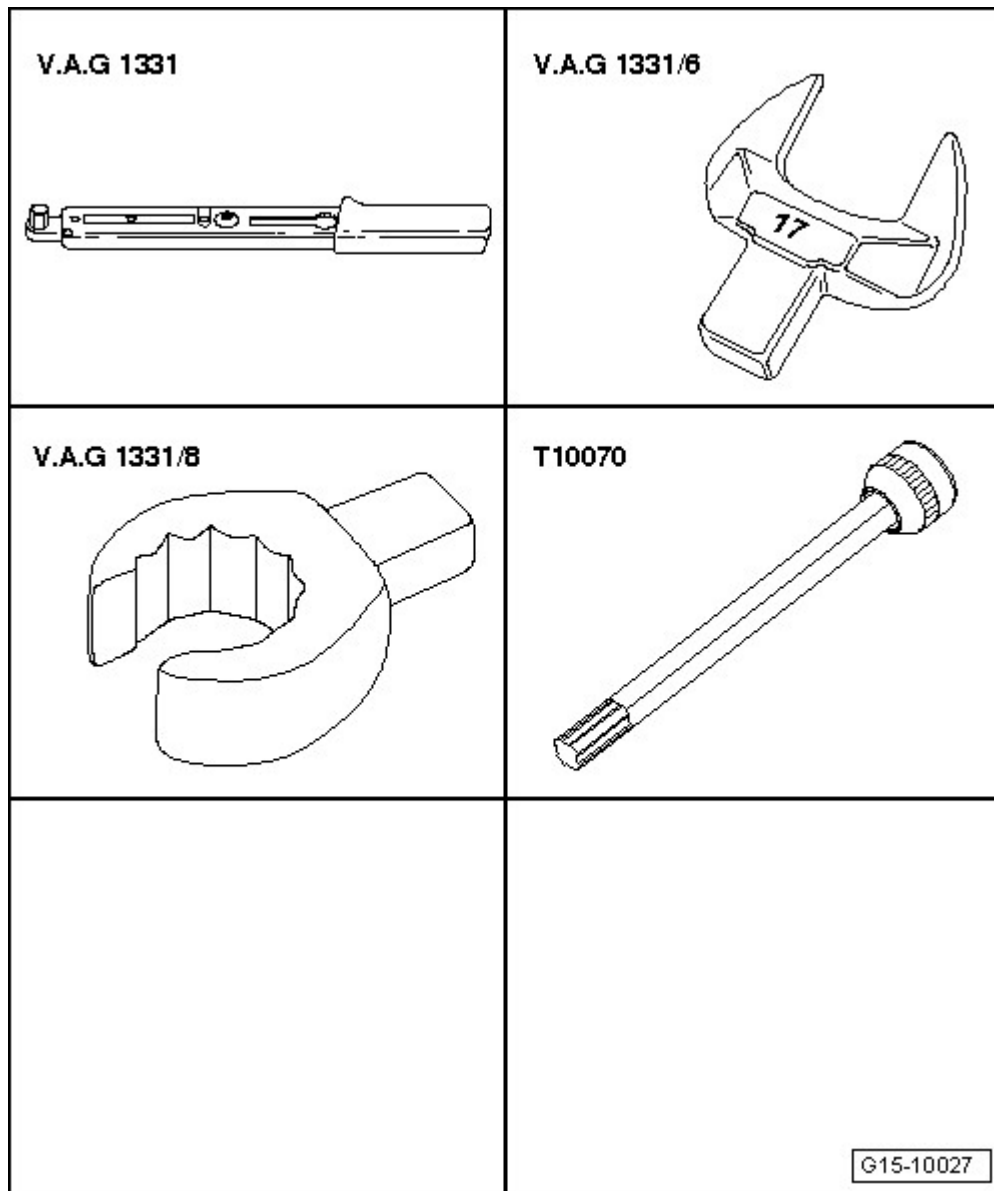


Fig. 177: Identifying Special Tools -- Cylinder Head, Removing And Installing
Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Torque Wrench V.A.G 1331
- Tool Insert, AF 17 V.A.G 1331/6
- Socket Insert AF14 V.A.G 1331/8
- Polydrive Bit and Drive Socket T10070

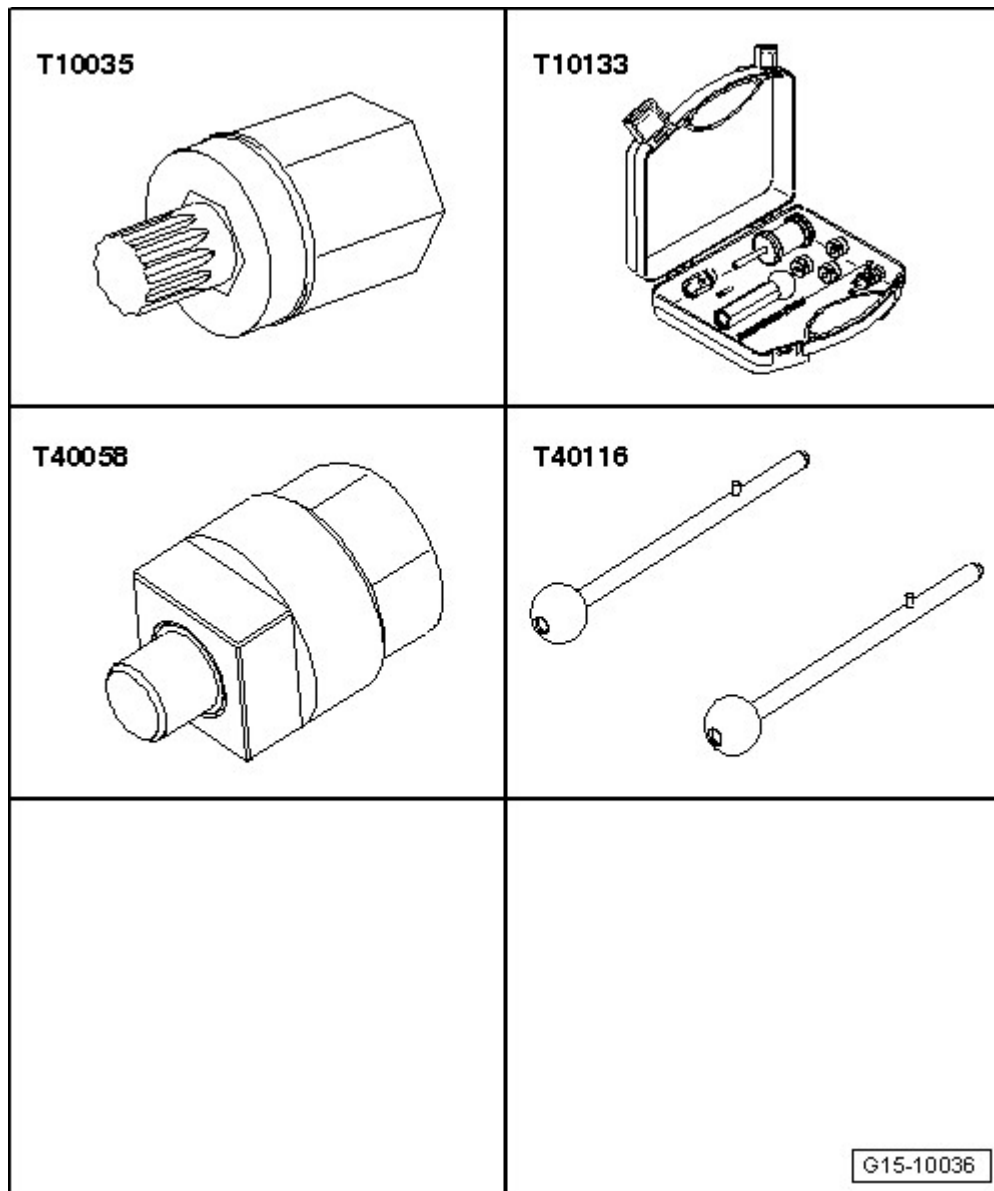


Fig. 178: Identifying Special Tools -- Camshafts, Removing And Installing
Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Multipoint Socket T10035
- Impact Puller T10133/3 from the Tool Set T10133
- Socket T40058
- Locating Pins T40116

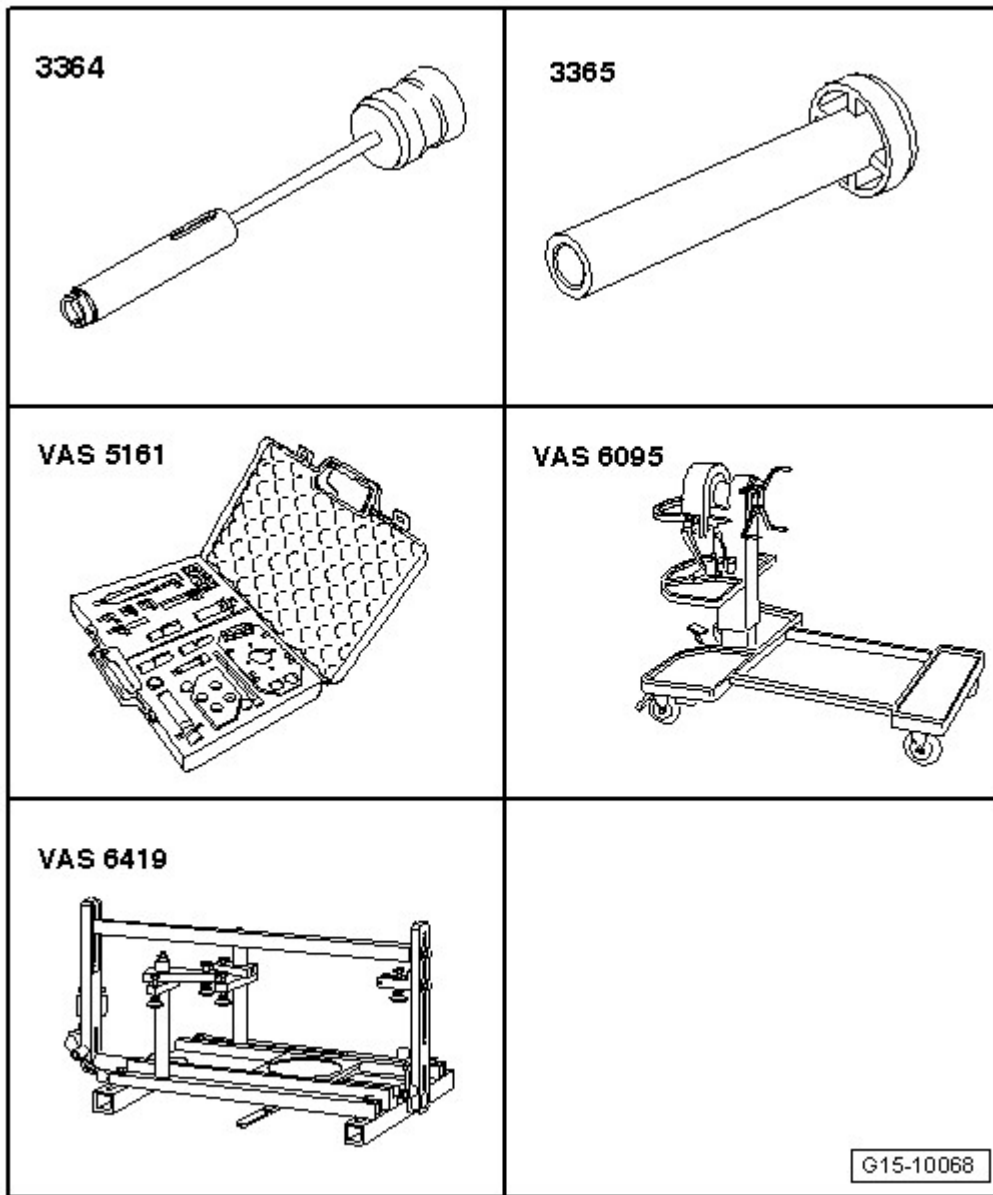


Fig. 179: Identifying Special Tools -- Valve Stem Seals, Cylinder Head Installed
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotteners Asm/Dis-Asm Device VAS 5161
- Engine and Transmission Holder VAS 6095
- Cylinder Head Tension Device VAS 6419

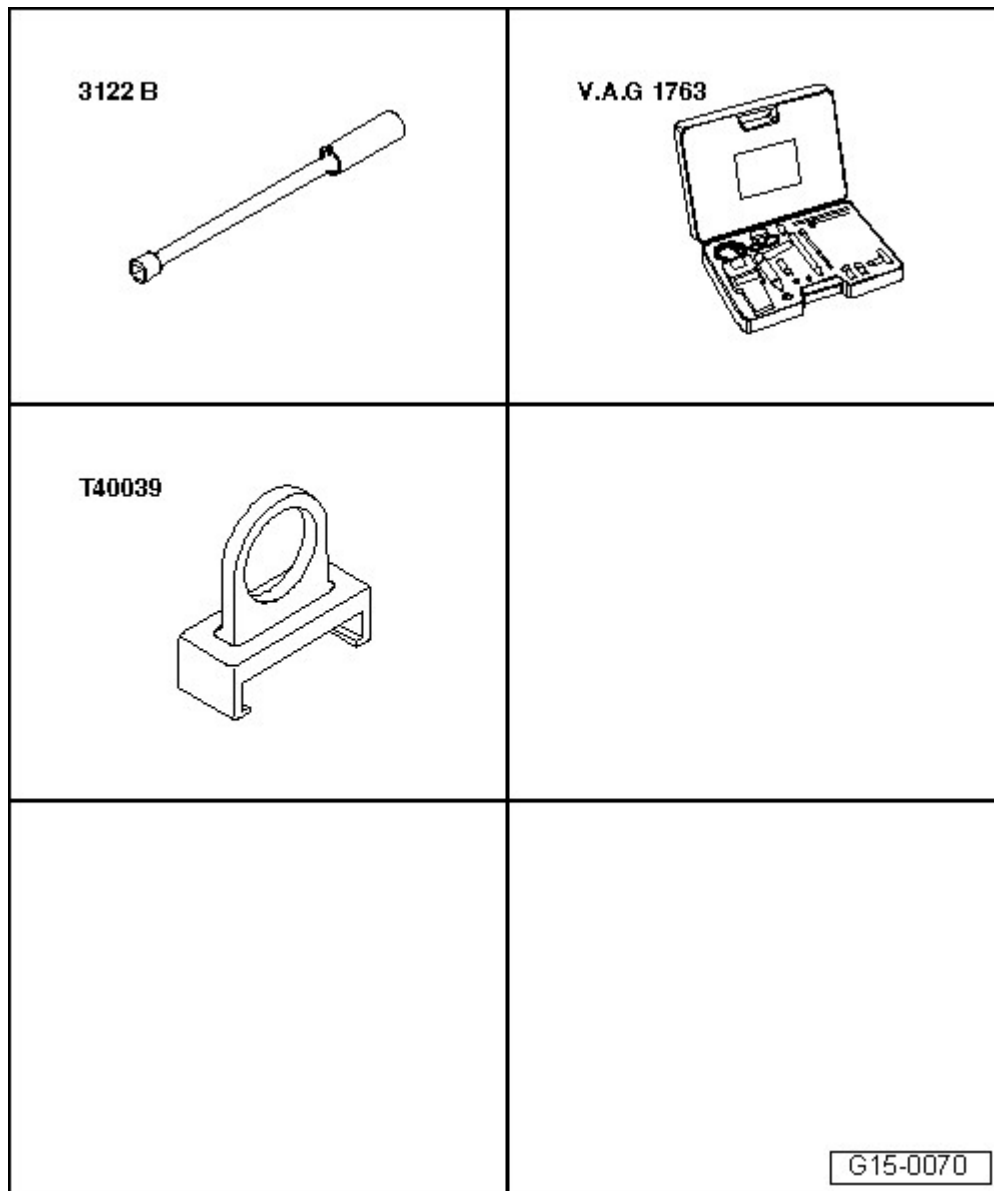


Fig. 180: Identifying Special Tools -- Pressures, Checking
Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

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

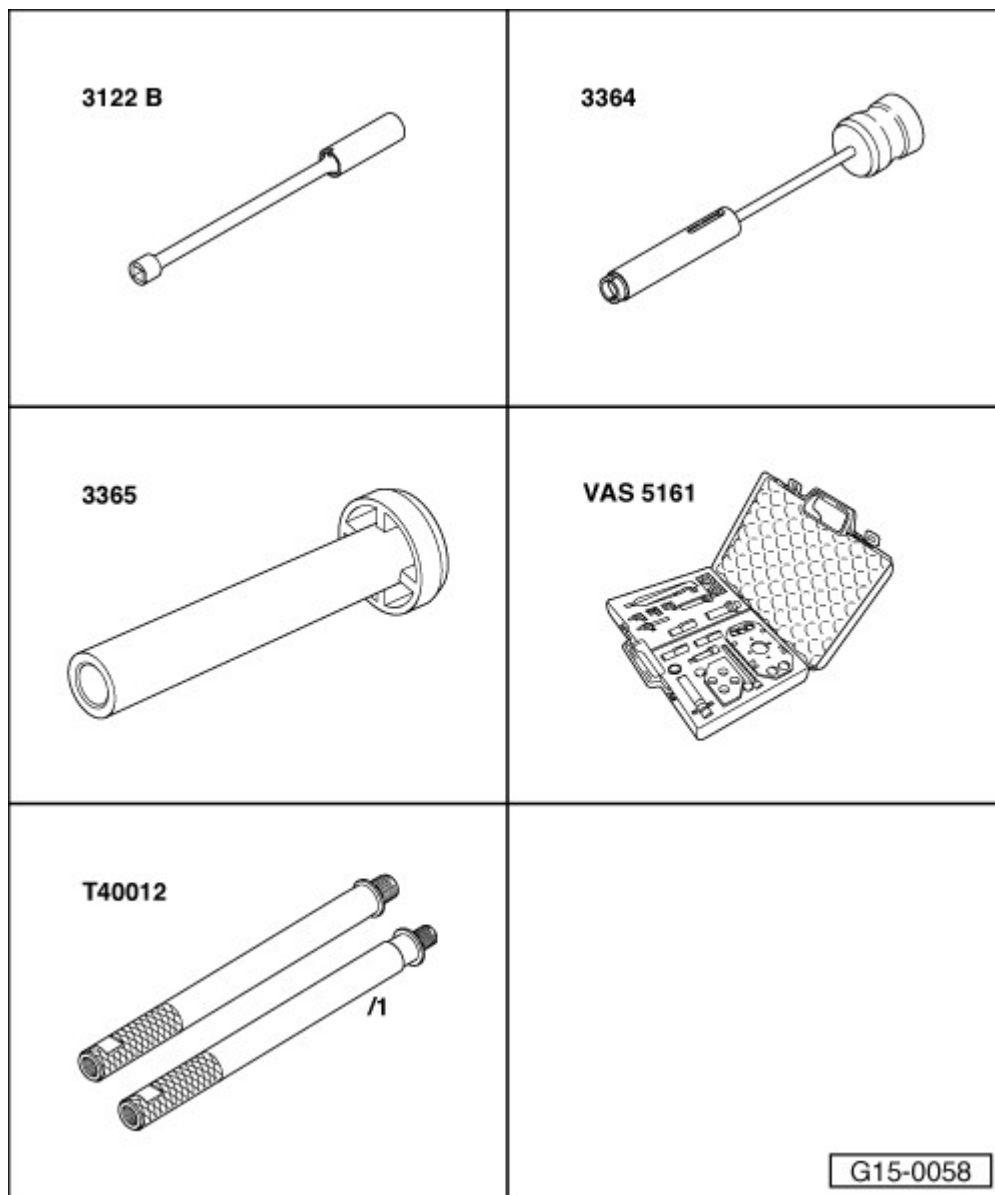


Fig. 181: Identifying Special Tools -- Valve Stem Seals, Cylinder Head Installed, Replacing
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spark Plug Wrench 3122 B
- Valve Seal Removal Tool 3364
- Valve Stem Seal Driver 3365
- Valve Cotteners Asm/Dis-Asm Device VAS 5161
- Adapter T40012

Special tools and workshop equipment required

- Dial Gauge Holder VW 387

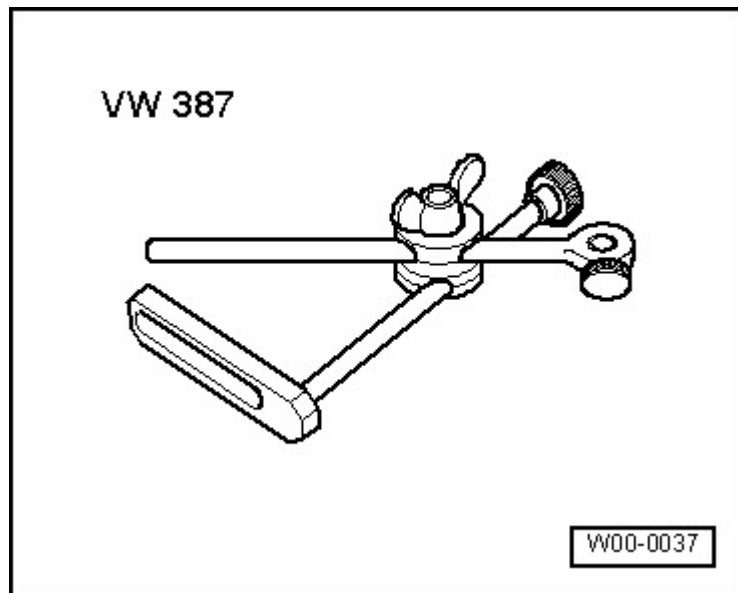


Fig. 182: Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Dial Gauge VAS 6079

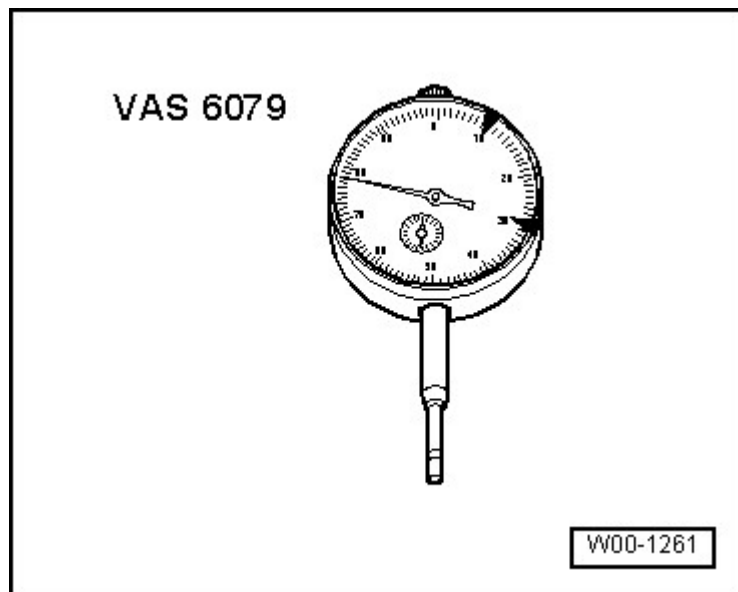


Fig. 183: Dial Gauge VAS 6079
Courtesy of AUDI OF AMERICA, LLC

- Socket T40058

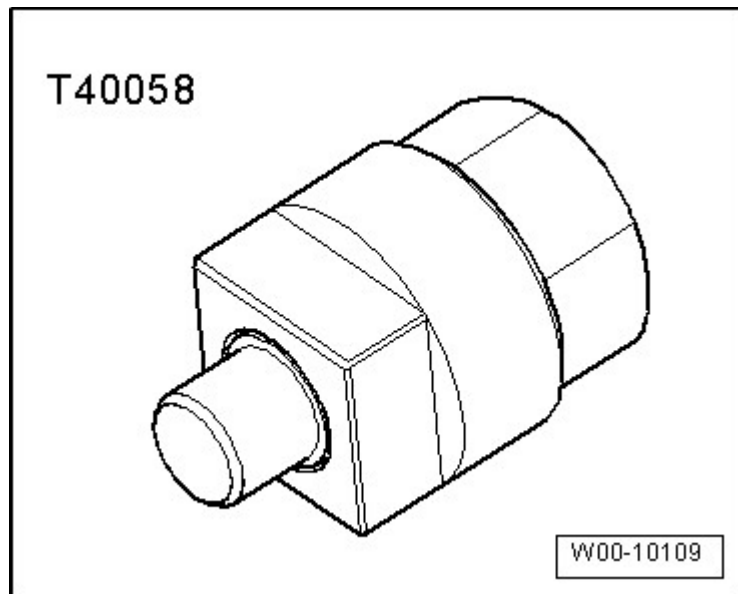


Fig. 184: Adapter (Socket) T40058
Courtesy of AUDI OF AMERICA, LLC

- Key T40079

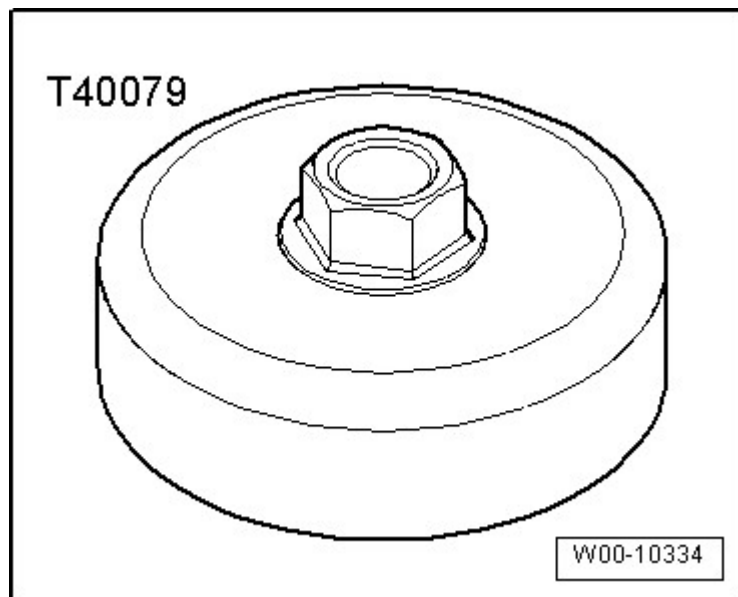


Fig. 185: Adapter (Key) T40079
Courtesy of AUDI OF AMERICA, LLC

- Thrust Piece T40192

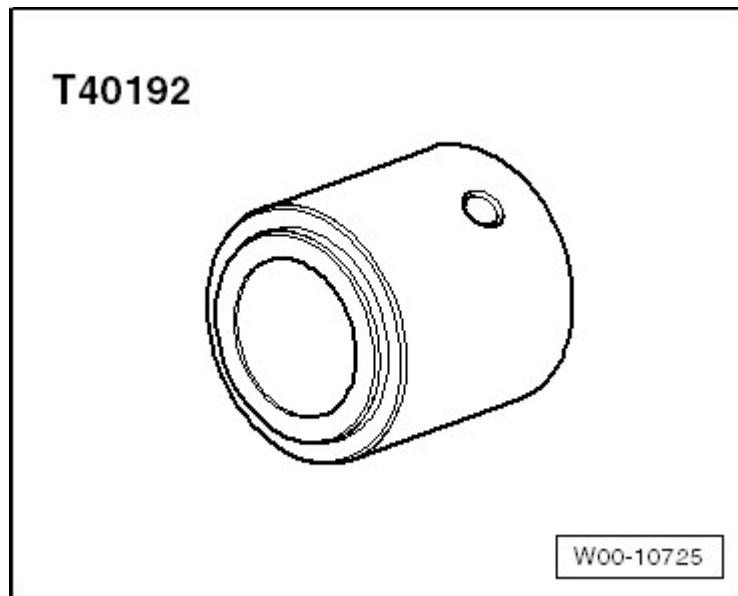


Fig. 186: Identifying Thrust Piece T40192
Courtesy of AUDI OF AMERICA, LLC

- Thrust Piece T40193

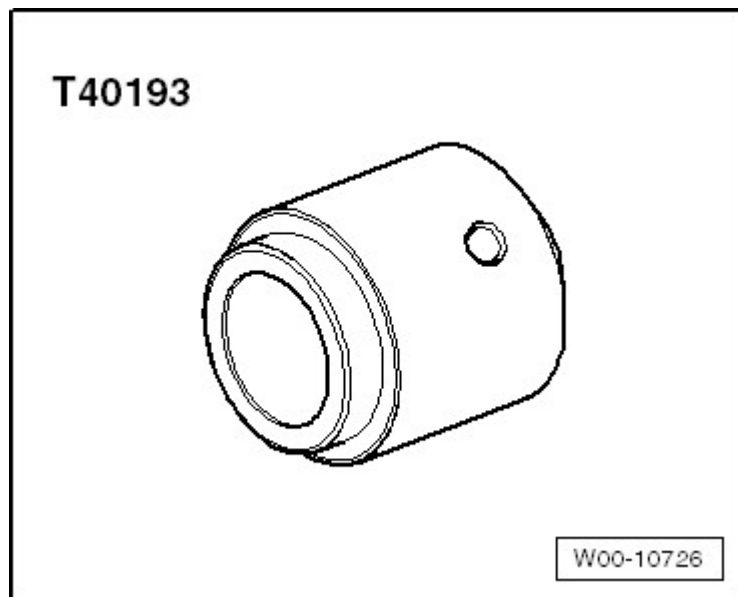


Fig. 187: Identifying Thrust Piece T40193
Courtesy of AUDI OF AMERICA, LLC

- Seal Puller T40195

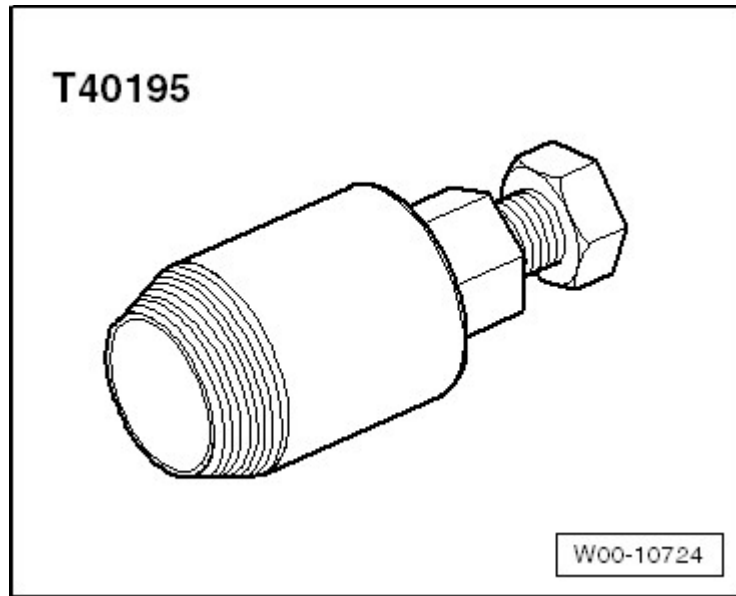


Fig. 188: Identifying Seal Puller T40195
Courtesy of AUDI OF AMERICA, LLC

ENGINE

4.2 Liter - Engine Assembly - Engine Code(s): BAR

10 ENGINE ASSEMBLY

GENERAL INFORMATION

ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER

Special tools and workshop equipment required

- Lifting Tackle 3033
- Engine and Transmission Holder VAS 6095 with V8 FSI Engine Holder 6095/1-6A
- Shop Crane VAS 6100
- Lift Arm Extension for Workshop Crane VAS 6101
- Scissor Lift Table VAS 6131
- Joint Support VAS 6131/13-7

Procedure

- Engine/transmission assembly removed and separated on VAS 6131. Refer to **ENGINE AND TRANSMISSION, SEPARATING.**
- Engine secured with VAS 6131/13-7.

NOTE: Place a rag under separating point to catch escaping hydraulic fluid.

-- Remove power steering pressure line banjo fitting -arrow-.

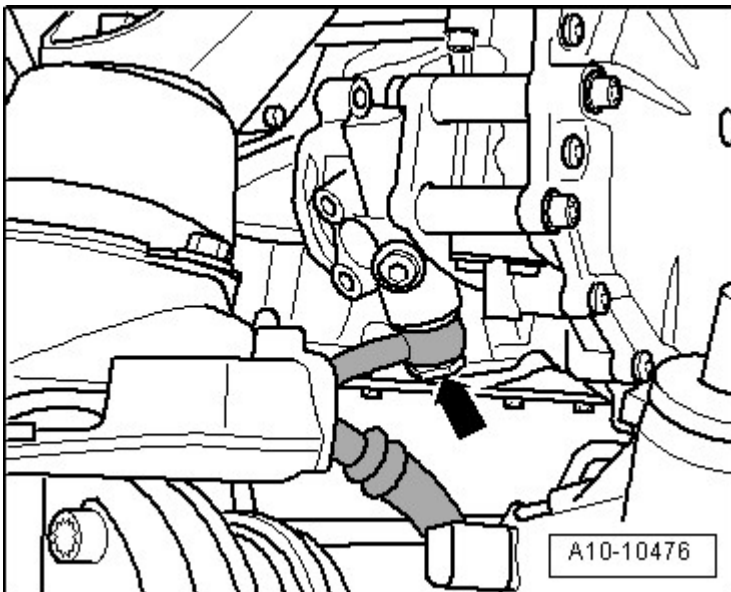


Fig. 1: Identifying Power Steering Pressure Line Banjo Fitting
Courtesy of AUDI OF AMERICA, LLC

-- Remove engine bracket bolts at left and right -arrows-.

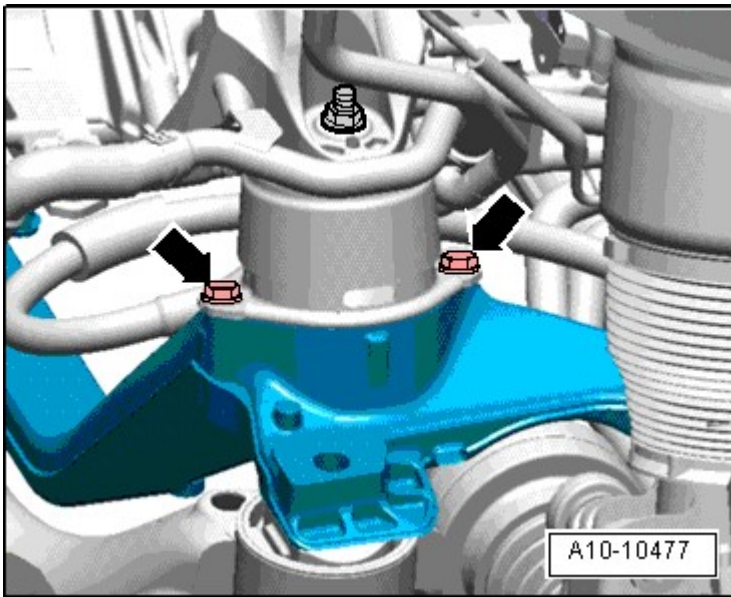


Fig. 2: Identifying Engine Bracket Bolts At Left And Right
Courtesy of AUDI OF AMERICA, LLC

NOTE: Engine carrier remains in installation location.

-- Engage 3033 on engine lifting eyes and on VAS 6100 with VAS 6101 as shown in the illustration.

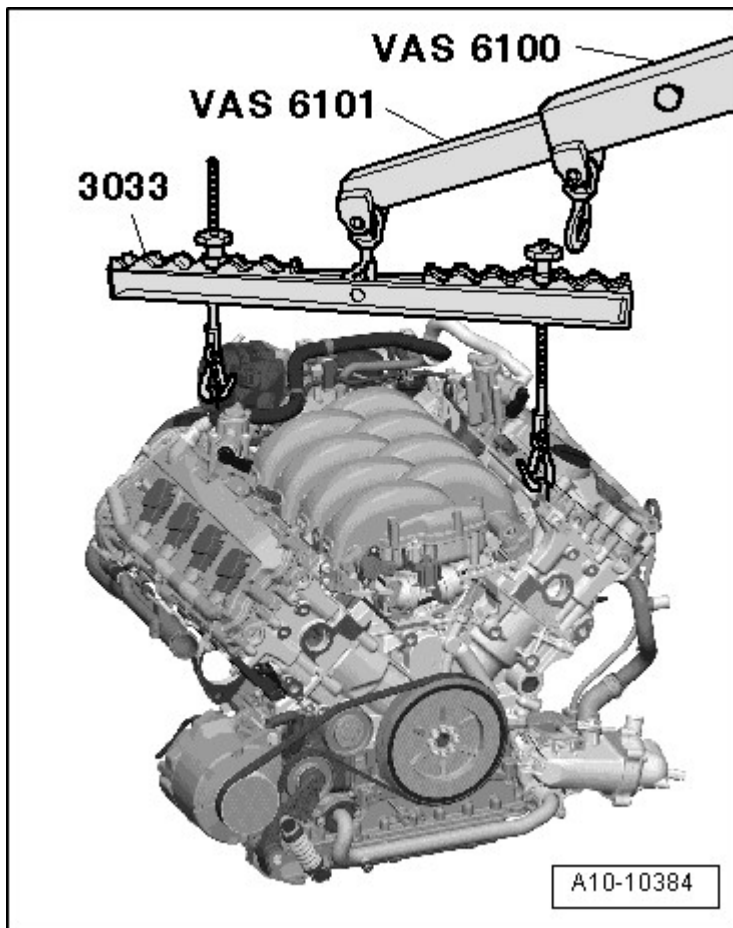


Fig. 3: Engaging Lifting Tackle 3033 On Engine Lifting Eyes And On Shop Crane VAS 6100 With Lift Arm Ext./Workshop Hoist VAS 6101
Courtesy of AUDI OF AMERICA, LLC

- Tension engine slightly with workshop crane, do not lift.
- Remove VAS 6131/13-7 from engine.

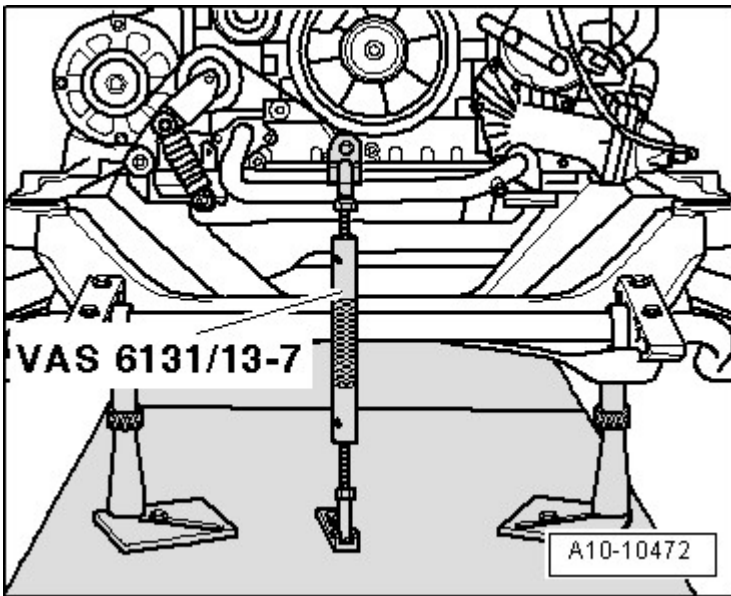


Fig. 4: Identifying Joint Support VAS6131/13-7 At Front Of Engine
Courtesy of AUDI OF AMERICA, LLC

- Raise engine from engine carrier.
- Remove bolts at left and right -arrows- and remove engine support.

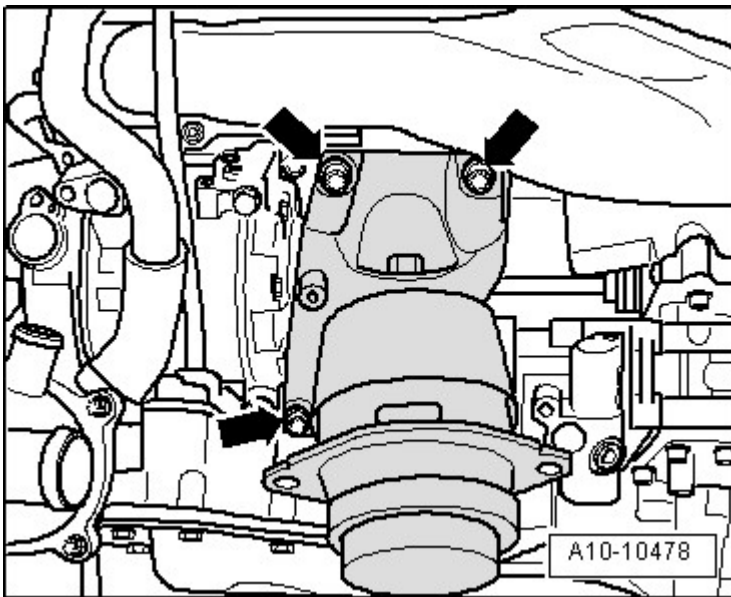


Fig. 5: Identifying Engine Bracket On Right And Left Side Of Engine
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left engine support.

- Secure the engine on the VAS 6095 with the 6095/1-6A as illustrated.

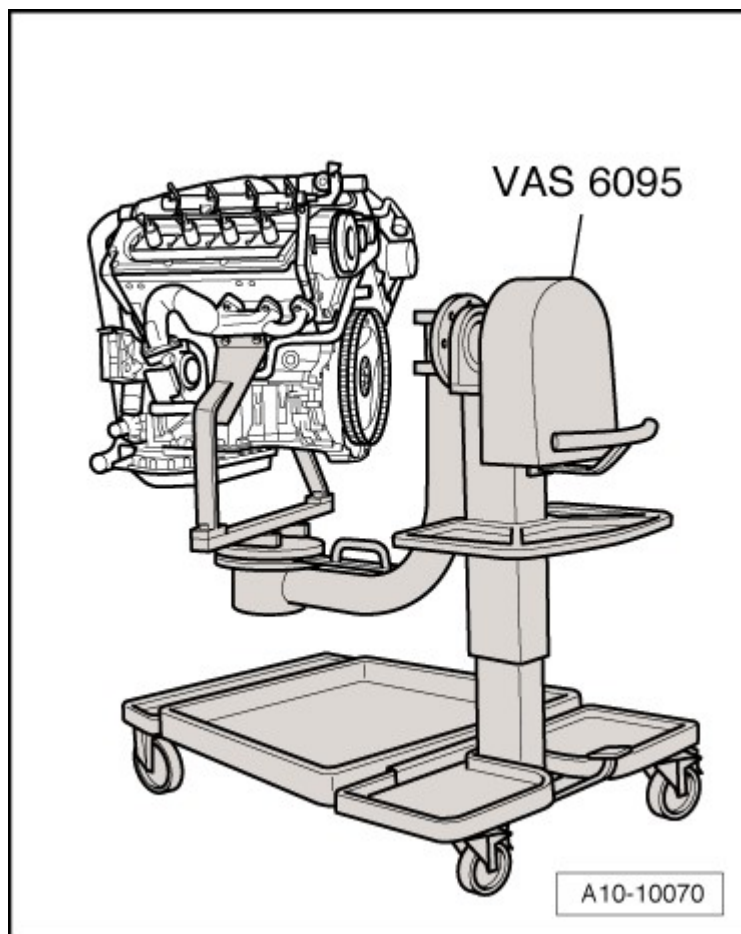


Fig. 6: Identifying Engine, Holder VAS 6095 And Bracket For V6 FSI Engine VAS 6095/1-5
Courtesy of AUDI OF AMERICA, LLC

DESCRIPTION AND OPERATION

SUBFRAME ASSEMBLY OVERVIEW

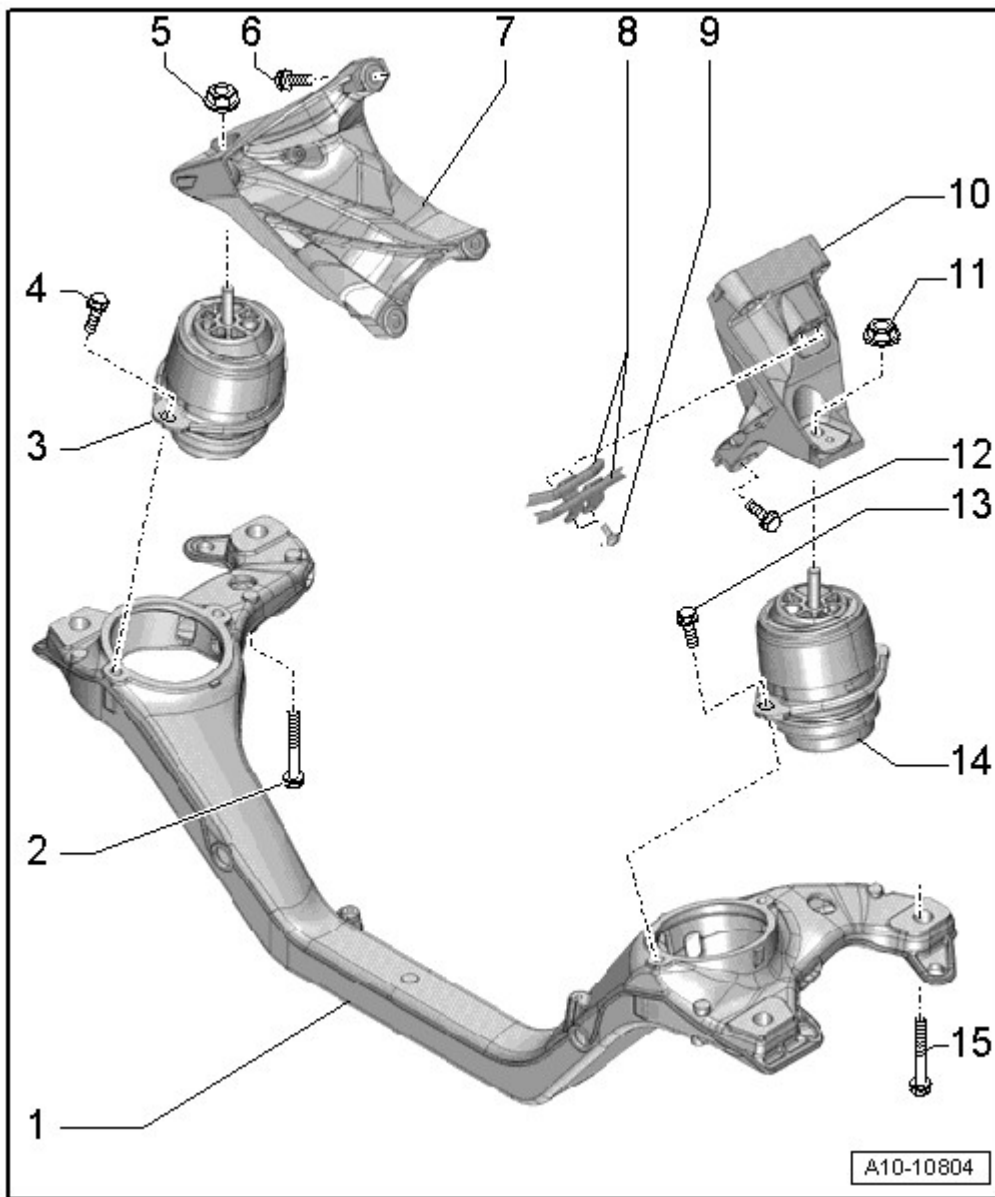


Fig. 7: Identifying Subframe Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Engine Carrier
2. Bolt
 - Replace
 - 120 Nm plus an additional 180° turn
3. Engine Mount, Right
 - Removal and installation, refer to **ENGINE MOUNT**
4. Bolt
 - 60 Nm
5. Nut

2010 Audi Q7 4.2

ENGINE 4.2 Liter - Engine Assembly - Engine Code(s): BAR

- 75 Nm
- 6. Bolt
 - Replace
 - 50 Nm plus an additional 90° turn
- 7. Right Engine Support
- 8. Not Installed
- 9. Not Installed
- 10. Left Engine Support
- 11. Nut
 - 75 Nm
- 12. Bolt
 - Replace
 - 50 Nm plus an additional 90° turn
- 13. Bolt
 - 60 Nm
- 14. Engine Mount, Left
 - Removal and installation, refer to **ENGINE MOUNT**
- 15. Bolt
 - Replace
 - 120 Nm plus an additional 180° turn

SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

Component	Bolt Size	Nm
Bolts/nuts		
	M6	9
	M8	20
	M10	40
	M12	65
Exceptions:		
Drive plate to torque converter		85 ⁽¹⁾
Engine Carrier		120 + 180° ⁽¹⁾
Engine Mount, Left		60
Engine Mount, Right		60
Left Engine Support		
Bolt		50 + 90° ⁽¹⁾
Nut		75

Right Engine Support

Bolt		50 + 90° (1)
Nut		75

(1) Always replace

() For bolt tightening clarification, refer to and see item -5-

Engine/Transmission, Fastening

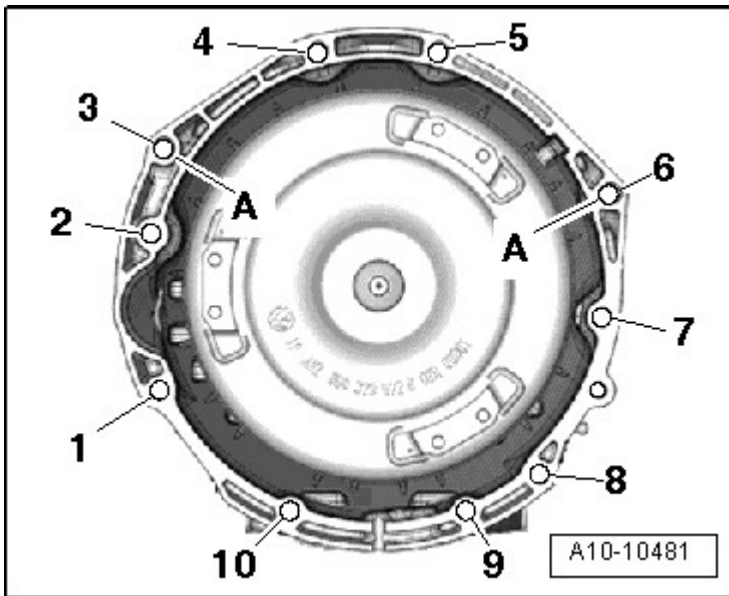


Fig. 8: Identifying Alignment Sleeves -A- And Engine/Transmission Connecting Bolts
 Courtesy of AUDI OF AMERICA, LLC

Item	Bolt	Nm
1, 2	M10x70	45
3 to 6	M12 x 80	80
7	M12x140	80
8	M12x70	80
9, 10	M12x50	80
A	Alignment sleeves for centering	

REMOVAL AND INSTALLATION

ENGINE, REMOVING

NOTE: With lock carrier installed, engine is removed downward with transmission and subframe.

Drained coolant must be stored in a clean container for disposal or reuse.

All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.

Special tools and workshop equipment required

- Pry Lever - Rmv Outside Mirror 80 - 200
- Used Oil Collecting and Extracting Device V.A.G 1782
- Step Ladder VAS 5085
- Engine Bung Set VAS 6122
- Scissor Lift Table VAS 6131 A with Support Set VAS 6131/10 as well as Supplementary Set VAS 6131/11, VAS 6131/13 and qty. 3 VAS 6131/10-2
- Drip Tray for Workshop Crane VAS 6208
- Hose Clamp Pliers VAS 6362
- Counterhold Tool T10172 with T10172/8
- Ball Joint Puller T10187

Procedure

-- On a vehicle with air suspension, activate vehicle lift mode. Refer to **Description and Operation** .

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

- **Before opening high pressure area of the fuel injection system, fuel pressure must be relieved to residual pressure.**

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

CAUTION: Risk of destroying electrical components.

- **Observe measures when disconnecting battery.**

NOTE: So that the front wheels can still be turned with the battery disconnected, the battery must only be disconnected with ignition key inserted.

Place the selector lever in the "N" position and release the electromechanical parking brake before disconnecting the battery so that the driveshaft can still move freely.

-- Position driver's seat as far back and up as possible using the full seat adjustment range.

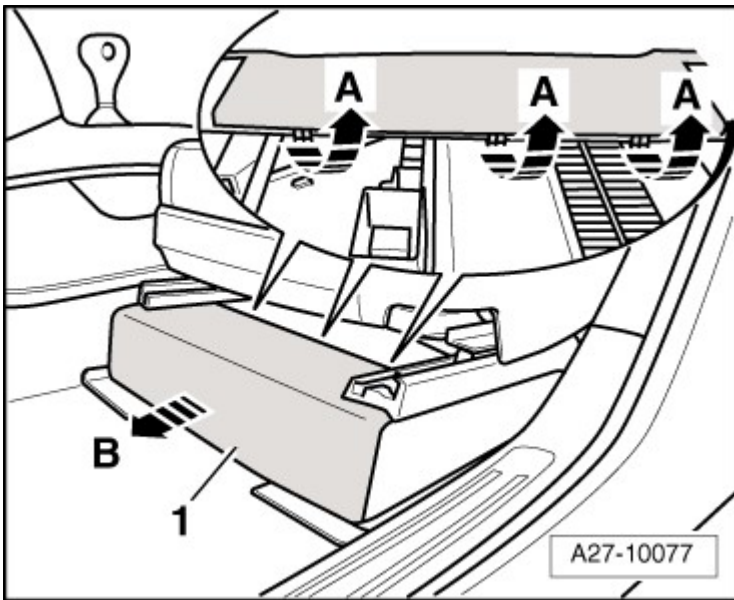


Fig. 9: Identifying Cover -1-
Courtesy of AUDI OF AMERICA, LLC

- Switch off ignition.
- Grasp under the seat and release retaining clips on rear side of cover -1- in direction of -arrow A-.
- Then remove cover in direction of -arrow B- from driver's seat console.
- Pry the cover -1- out of the floor covering using a 80 - 200.

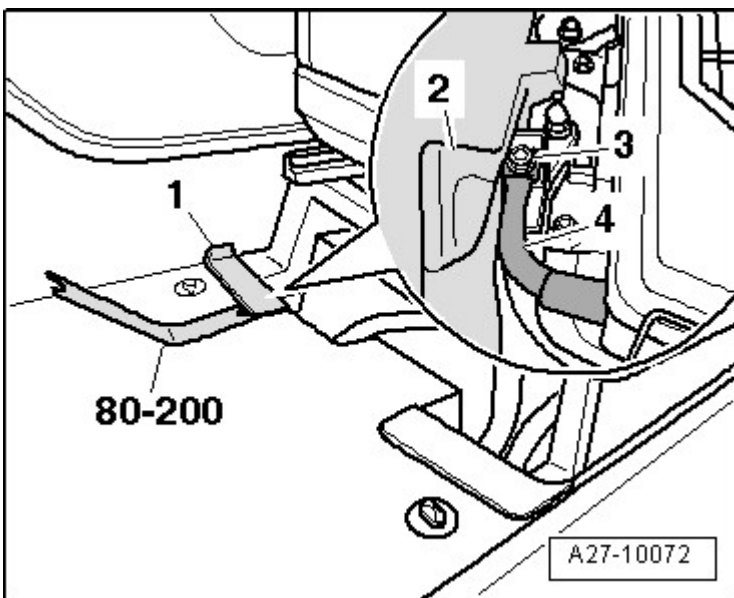


Fig. 10: Prying Cover -1- With 80 - 200 From Floor Covering
Courtesy of AUDI OF AMERICA, LLC

- Raise the floor covering -2- slightly in the Ground (GND) cable area.
- Remove nut -3- and remove Ground (GND) cable -4- from Ground point.
- Discharge refrigerant circuit.
- Extract power steering fluid from the reservoir using the V.A.G 1782.

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

- When the engine is warm the cooling system is under pressure.
- To reduce pressure, cover coolant reservoir cap with cloth and carefully open.

- Open the cap on the coolant reservoir.
- Remove both front wheels.
- Remove screws and remove front -1- and rear -2- noise insulation.

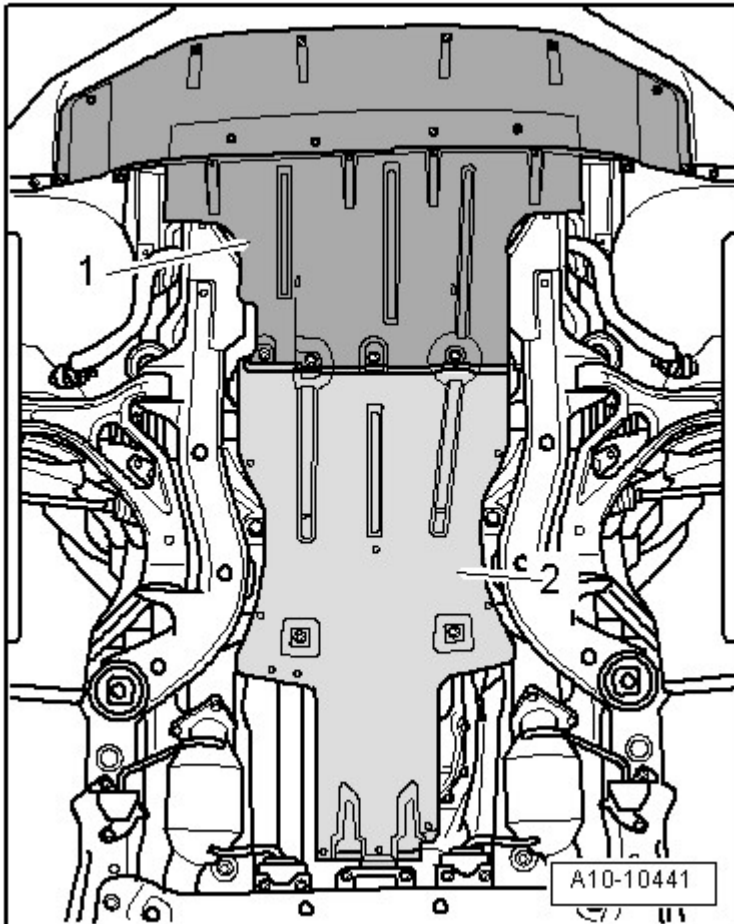
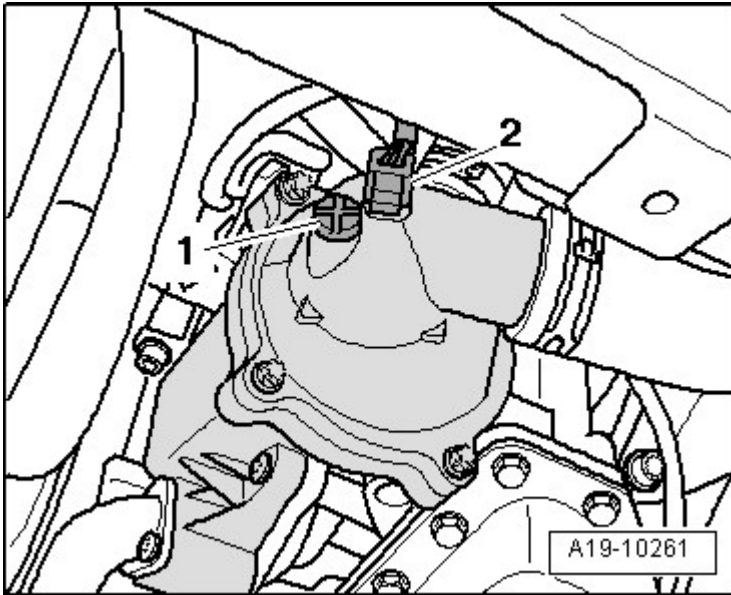


Fig. 11: Identifying Front/Rear Noise Insulation

Courtesy of AUDI OF AMERICA, LLC

- Remove left and right front wheel housing liners. Refer to **Removal and Installation** .
- Place VAS 6208 under engine.
- Remove drain plug -1- on map controlled engine cooling thermostat -F265- and allow coolant to drain.

**Fig. 12: Identifying Drain Plug At Coolant Thermostat Housing**

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore item -2-.

- Remove drain plug -arrow- at front coolant pipe and drain coolant.

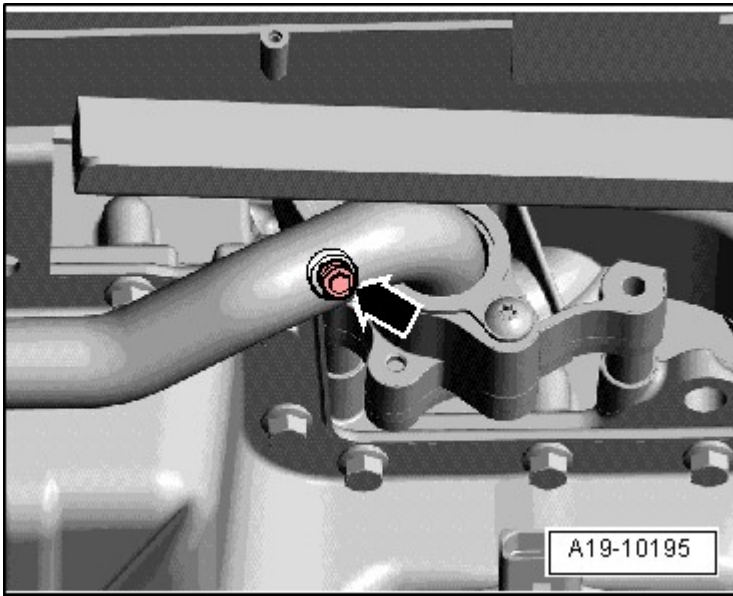


Fig. 13: Identifying Drain Plug At Front Coolant Pipe
Courtesy of AUDI OF AMERICA, LLC

-- Lift the clamp to remove the lower coolant hose -arrow- and let the coolant drain.

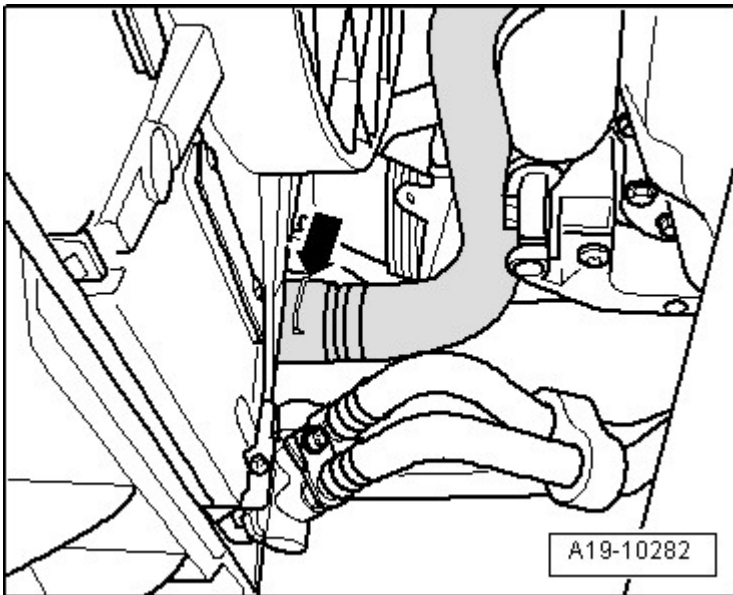


Fig. 14: Identifying Lower Right Coolant Hose For Radiator
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hoses from coolant pipes -arrows- and drain remaining coolant.

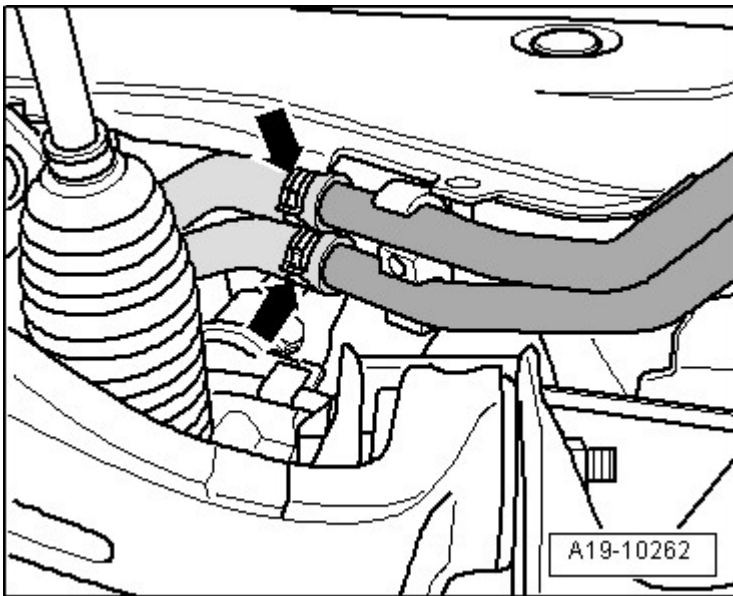


Fig. 15: Identifying Hose Connections To Heater Core
Courtesy of AUDI OF AMERICA, LLC

-- Pull rear engine cover off -arrows-.



Fig. 16: Pulling Rear Engine Cover
Courtesy of AUDI OF AMERICA, LLC

-- Pull front engine cover off -arrows-.

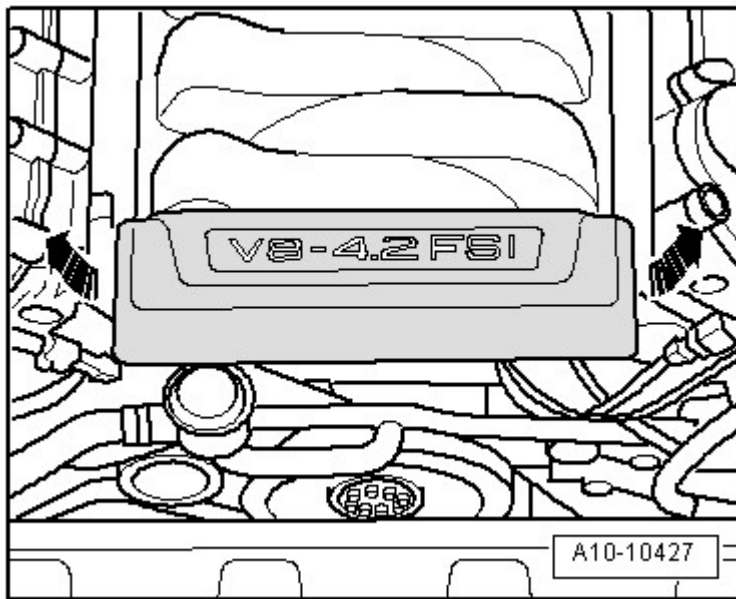


Fig. 17: Identifying Front Engine Cover, Electrical Connector, And Left Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

-- Remove cover over radiator -arrows-.

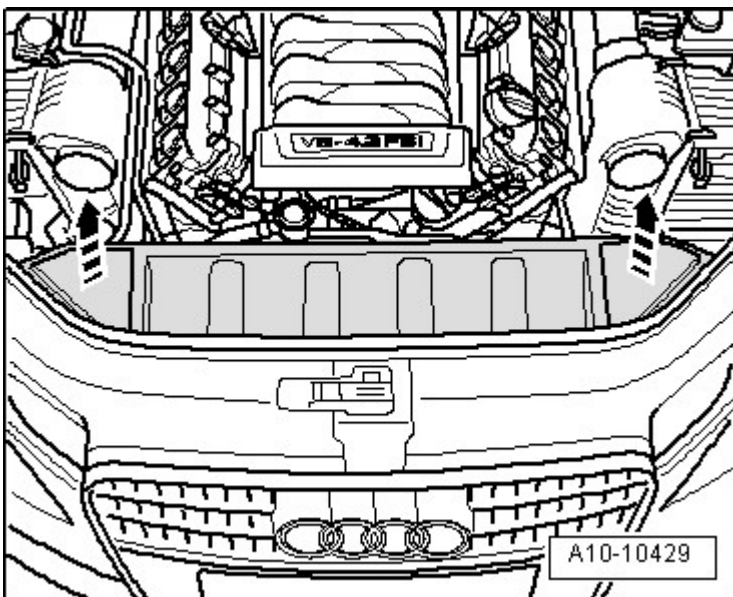


Fig. 18: Identifying Cover Over Radiator -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect coolant hose -1-.

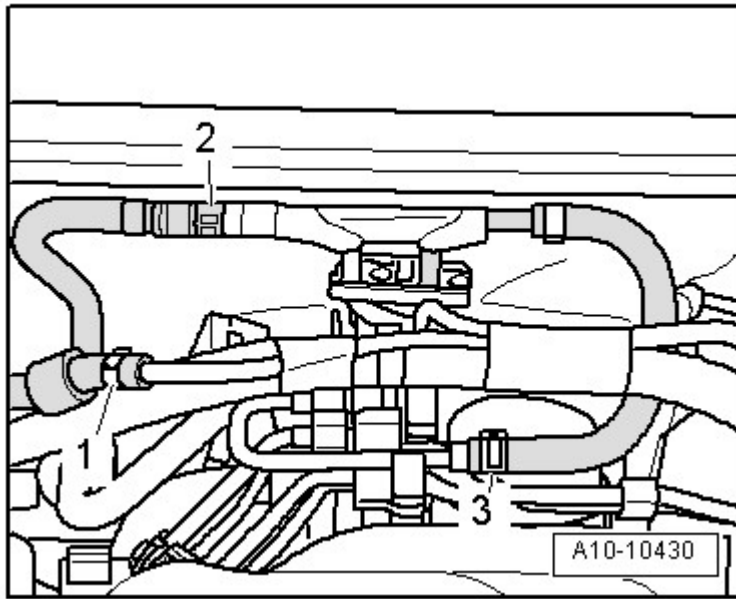


Fig. 19: Identifying Vacuum Hose To Evaporative Emission (EVAP) Canister Purge Regulator Valve N80
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect vacuum hose -2- to Evaporative Emission (EVAP) canister purge regulator valve -N80- by pressing release button.

-- Free up vacuum hose.

WARNING: Risk of injury from fuel.

- To reduce fuel pressure, lay cloths around connecting point before opening fuel system and carefully loosen.

-- Disconnect fuel supply line -3- at distribution piece.

-- Disconnect electrical connector -2- at Mass Air Flow (MAF) sensor 2 -G246-.

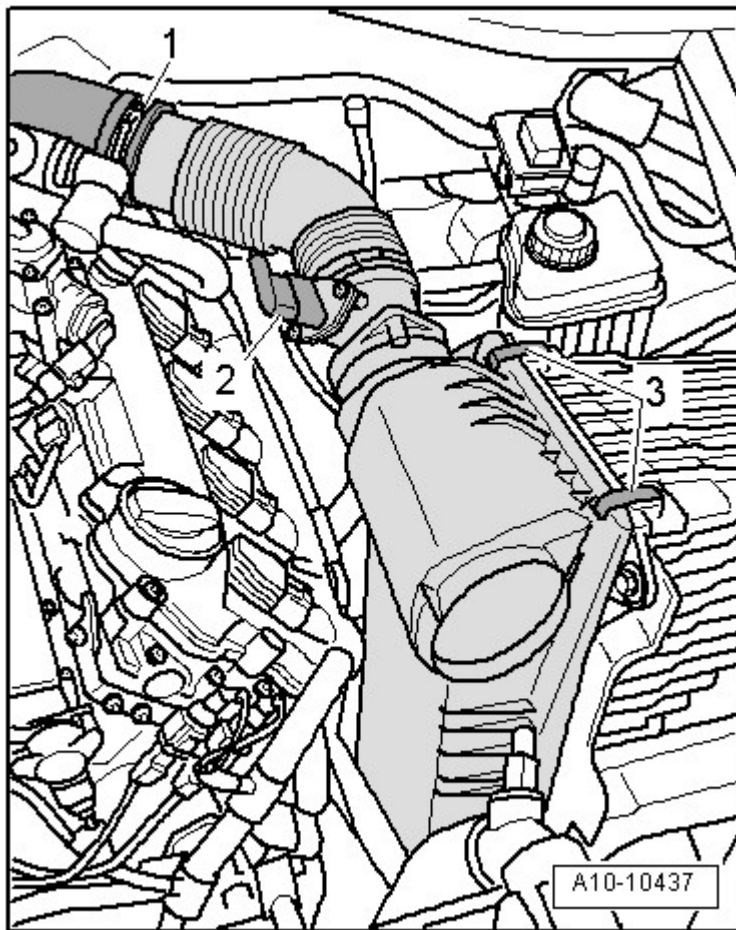


Fig. 20: Locating Electrical Connector, Air Guide Hose, And Retaining Clips
Courtesy of AUDI OF AMERICA, LLC

- Remove left air guide hose -1- from air duct.
- Release retaining clips -3- and remove upper left section of air filter housing.
- Open the cover over the terminal 30 wire junction 2 -TV22- -arrow-.

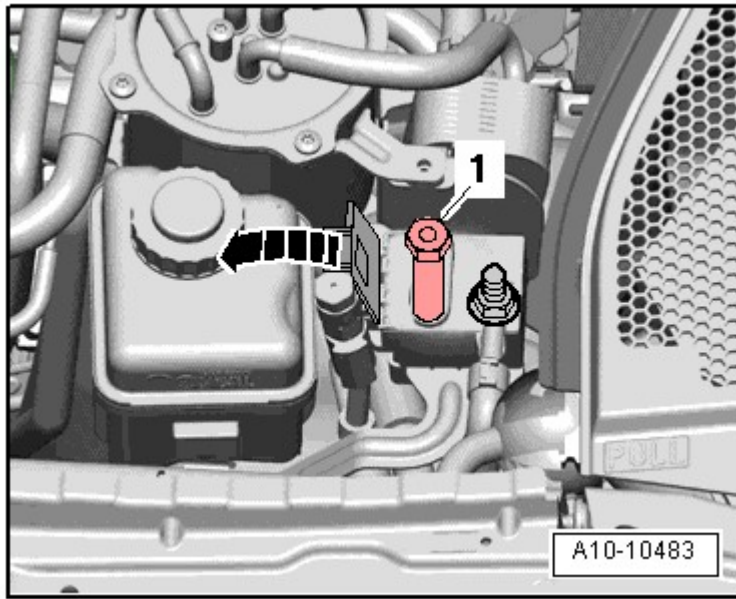


Fig. 21: Identifying Battery Jump Start Terminal -U6- Pins
Courtesy of AUDI OF AMERICA, LLC

-- Remove the bolts -1- for the battery jump start terminal -U6- and free up the electrical wire.

NOTE: Place a rag under separating point to catch escaping hydraulic fluid.

-- Remove hose -arrow- from power steering fluid reservoir.

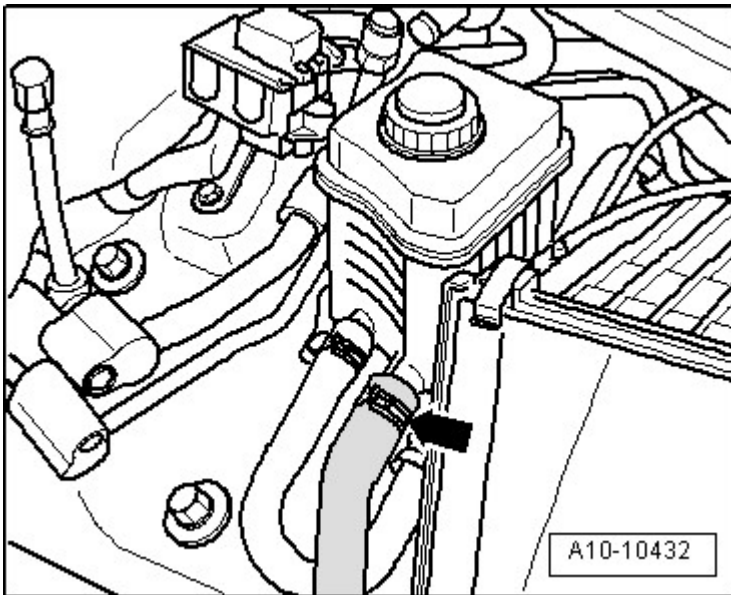


Fig. 22: Identifying Hose For Power Steering Fluid Reservoir
Courtesy of AUDI OF AMERICA, LLC

-- Separate the electrical connector -1-.

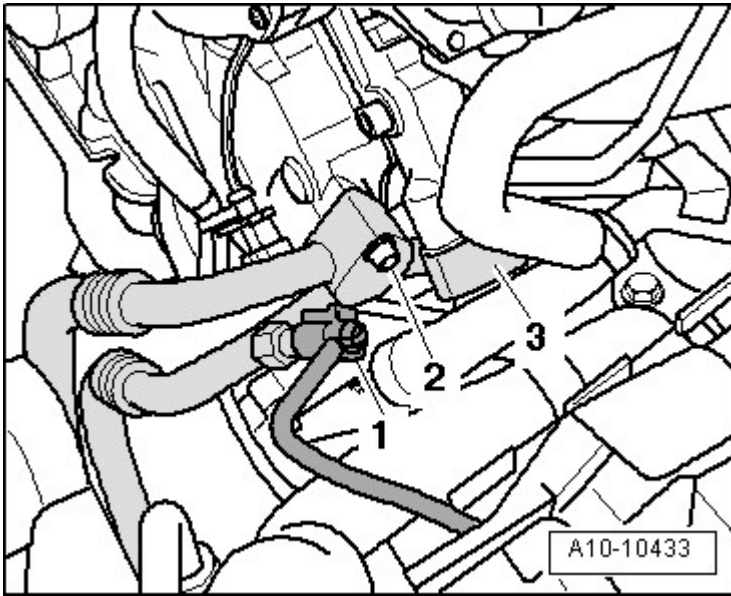


Fig. 23: Identifying Refrigerant Lines From A/C Compressor
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of damaging coolant lines and hoses.

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

-- Remove refrigerant lines -2- and -3- from A/C compressor.

-- Seal open lines and connections with clean plugs from the VAS 6122 to prevent dirt and moisture from entering.

-- Disconnect electrical connector -1- at Engine Coolant Temperature (ECT) sensor (on radiator) -G83-.

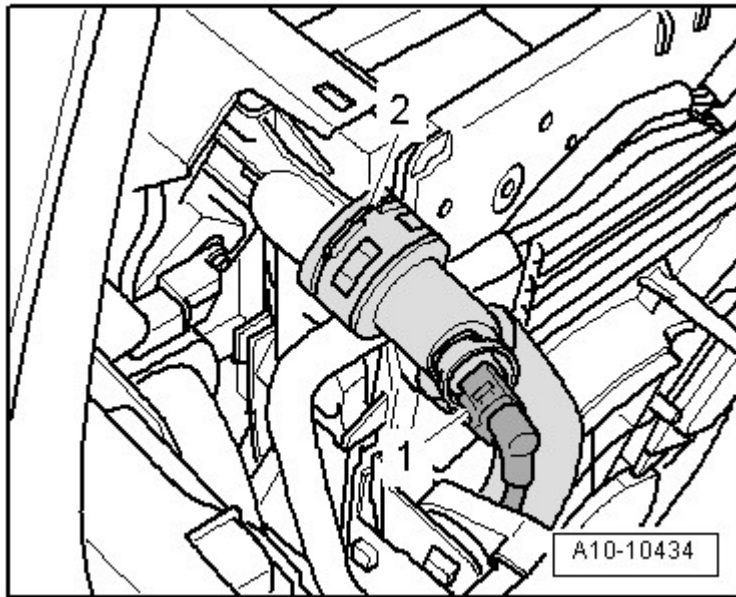


Fig. 24: Identifying Engine Coolant Temperature (ECT) Sensor (On Radiator) G83 And Upper Coolant Hose Connection

Courtesy of AUDI OF AMERICA, LLC

-- Lift the retaining clip -2- and remove the upper coolant hose from the radiator.

-- Remove coolant hose -arrow- to radiator from right coolant pipe.

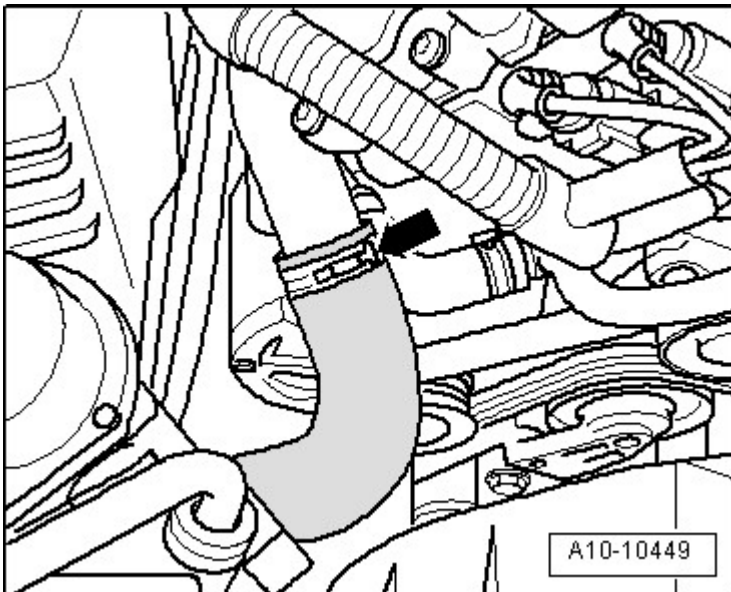


Fig. 25: Identifying Quick Coupling On Upper Cooler And Lower Hose On Coolant Pipe

Courtesy of AUDI OF AMERICA, LLC

-- Remove air guide hose -arrow- from connecting hose to Secondary Air Injection (AIR) combi-valves.

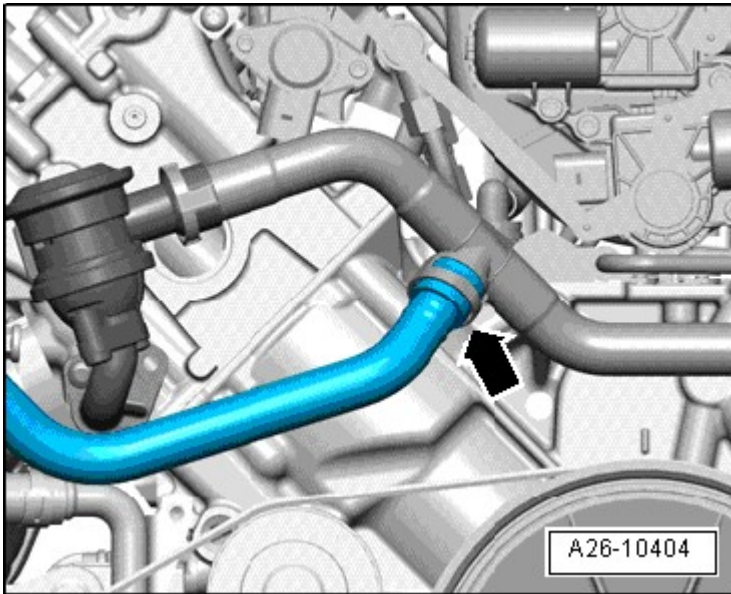


Fig. 26: Identifying Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

-- Unclip front differential breather line -arrow- from brake system vacuum pump -V192-.

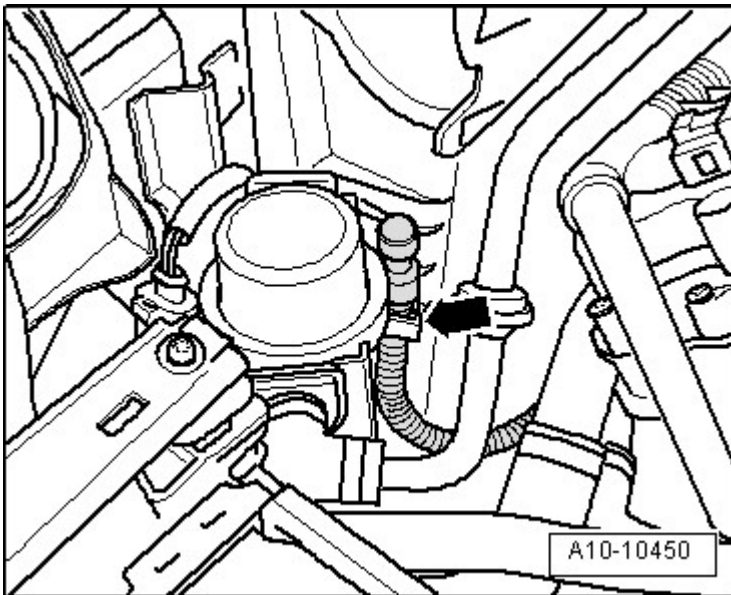


Fig. 27: Identifying Transmission Ventilation Hose
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect hose -1- to Secondary Air Injection (AIR) pump.

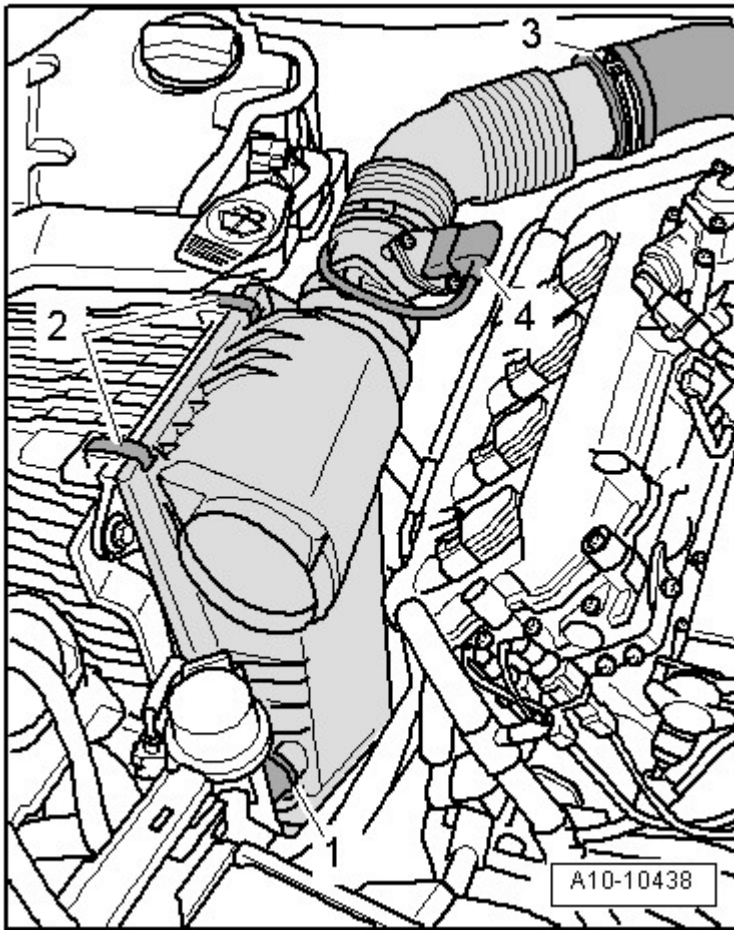


Fig. 28: Identifying Hose To Secondary Air Injection Pump, Electrical Harness Connector, Right Air Guide Hose, And Retaining Clips

Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical harness connector -4- at Mass Air Flow (MAF) sensor -G70-.
- Remove right air guide hose -3- from air duct.
- Release retaining clips -2- and remove upper right section of air filter housing from lower section.

Vehicles with air suspension:

NOTE: If necessary, remove electrical connector for Heated Oxygen Sensor (HO2S) 2 - G108- from bracket at right strut tower for better access.

- Press circlip -1- forward from hose coupling.

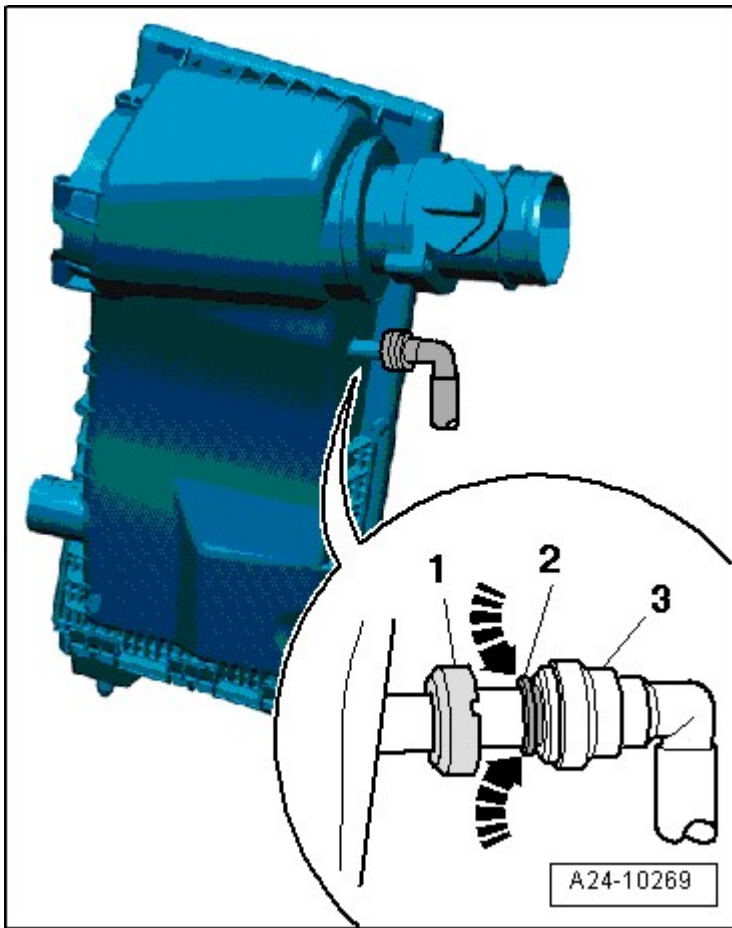


Fig. 29: Identifying Circlip, Release Ring And Ventilation Hose
Courtesy of AUDI OF AMERICA, LLC

-- Press release ring -2- down -arrows- and remove vent hose -3- from upper section of air filter.

All Vehicles

-- Remove coolant hose -arrow- from coolant reservoir.

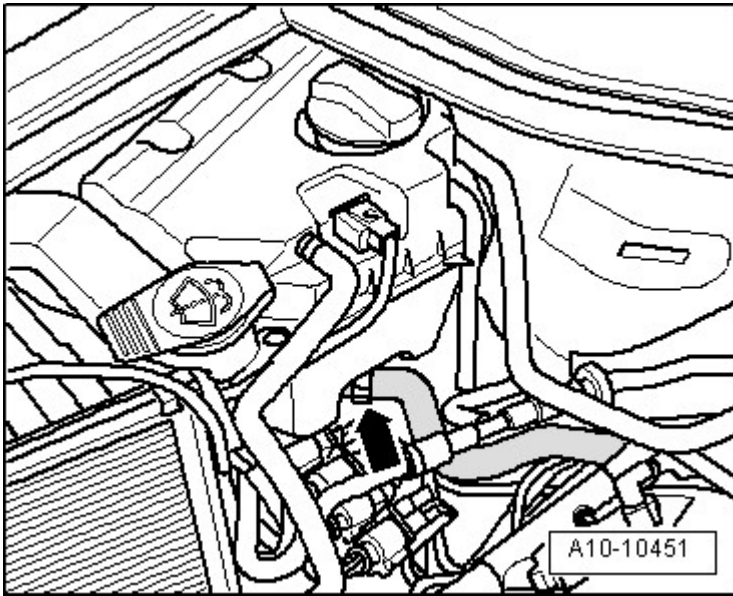


Fig. 30: Identifying Coolant Hose

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect vacuum hose -arrow- to suction jet pump.

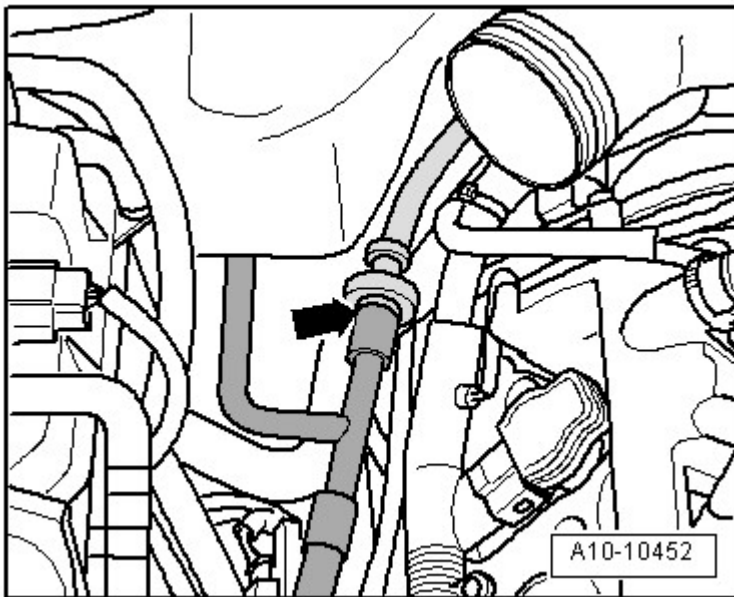


Fig. 31: Identifying Vacuum Hose To Suction Jet Pump

Courtesy of AUDI OF AMERICA, LLC

-- Remove electrical connectors -1 to 4- from bracket on right strut tower.

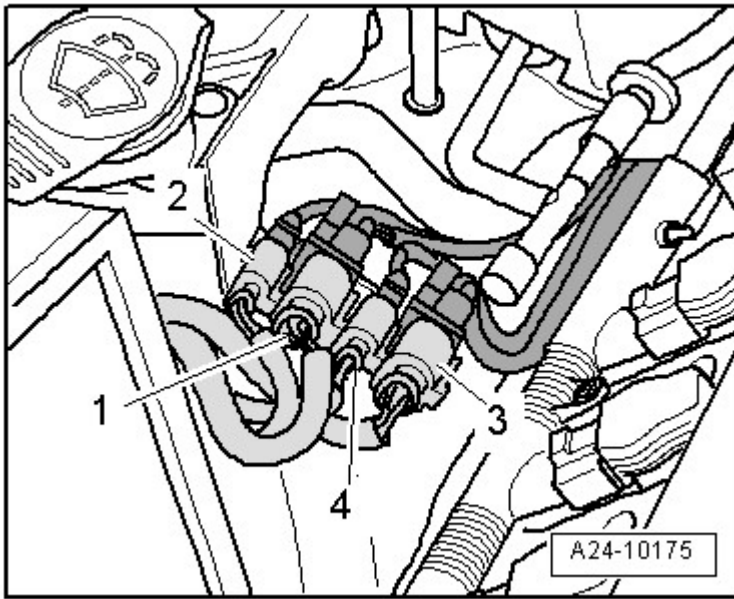


Fig. 32: Identifying Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connectors and free up electrical lines.
- Remove the windshield wiper arms -1- and -3-. Refer to **WINDSHIELD WIPER ARMS** .

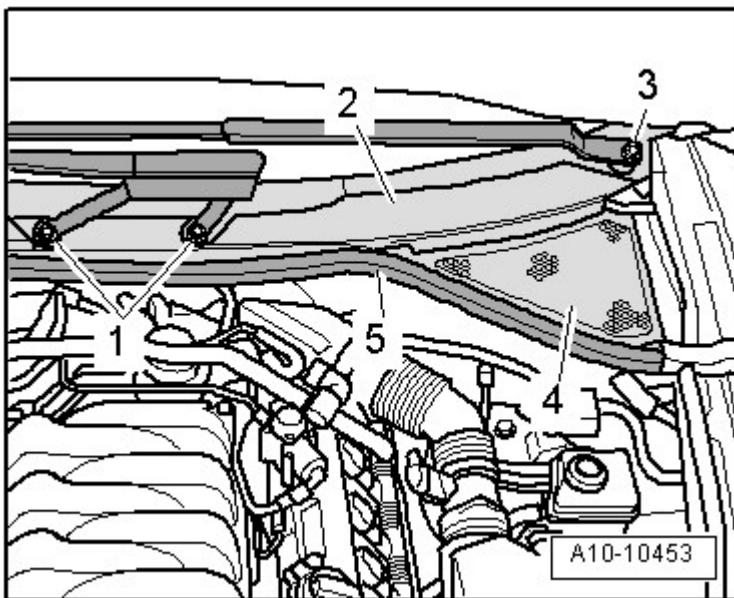


Fig. 33: Identifying Windshield Wiper, Driver Side, And Nut -3-, Plenum Chamber Cover -4- And Rubber Seal -5-
Courtesy of AUDI OF AMERICA, LLC

- Remove rubber seal -5- and remove plenum chamber cover -4-.

CAUTION: The plenum chamber cover could be damaged.

- To prevent the cowl grille -2- from tearing when removing, coat the transition between the windshield and cowl grille with soapy water and pull the grille up vertically out of the fastening strip starting at the edge of the window.

-- Carefully remove plenum chamber cover -2- from retainers on windshield.

-- Remove cover for E-Box in plenum chamber -arrows-.

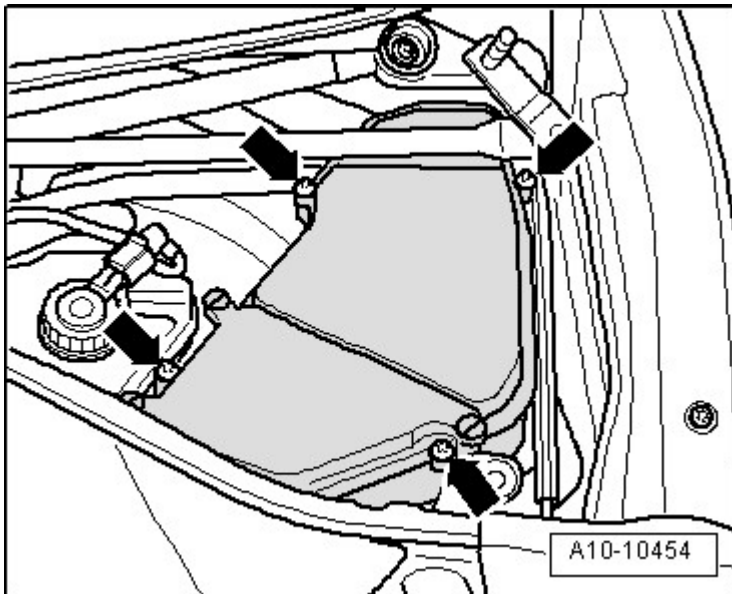


Fig. 34: Identifying Bolts To E-Box Plenum Chamber Cover -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connectors -1 to 3- at E-box plenum chamber connector station.

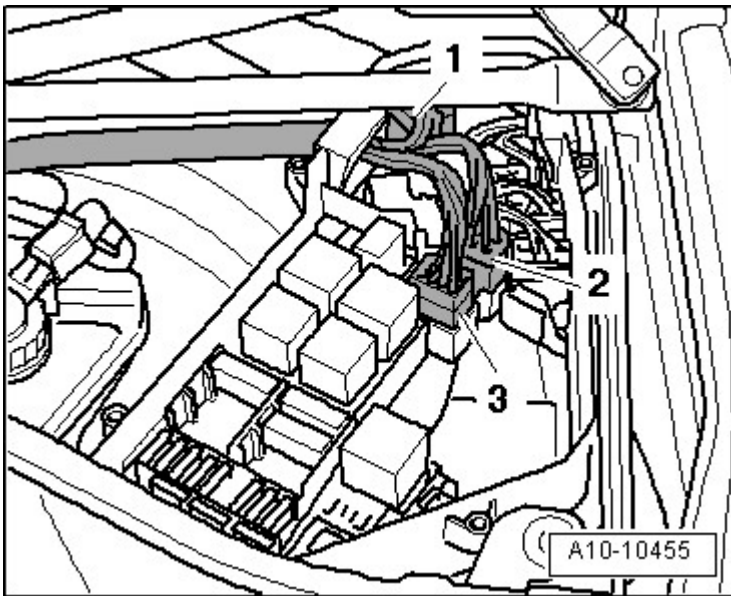


Fig. 35: Identifying Electrical Connectors -1 To 3- At E-Box Plenum Chamber Connector Station
Courtesy of AUDI OF AMERICA, LLC

- Free up the wiring harness.
- Remove Ground (GND) connection -2-.

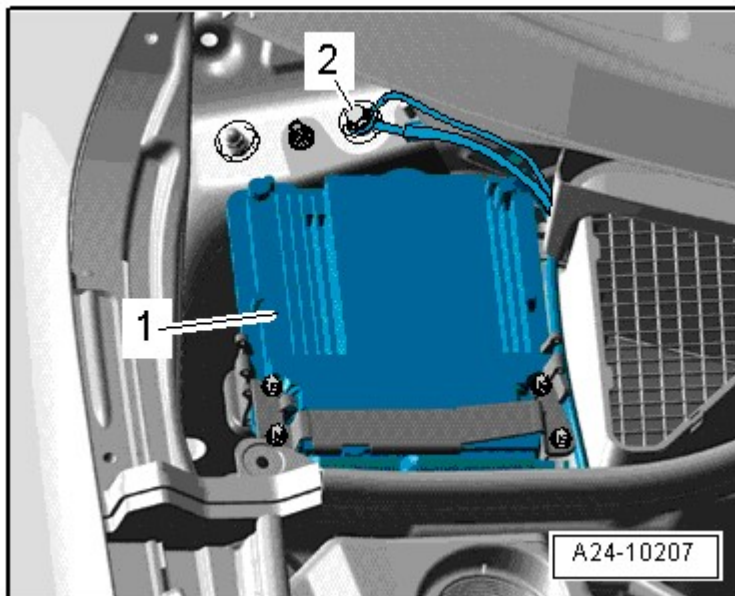


Fig. 36: Location Of Engine Control Module (ECM) -J623- -1-
Courtesy of AUDI OF AMERICA, LLC

- Remove engine control module -1-. Refer to **Removal and Installation**
- Free up electrical wiring harness to engine.

-- Remove screws -arrows- and remove partition at left rear in engine compartment.

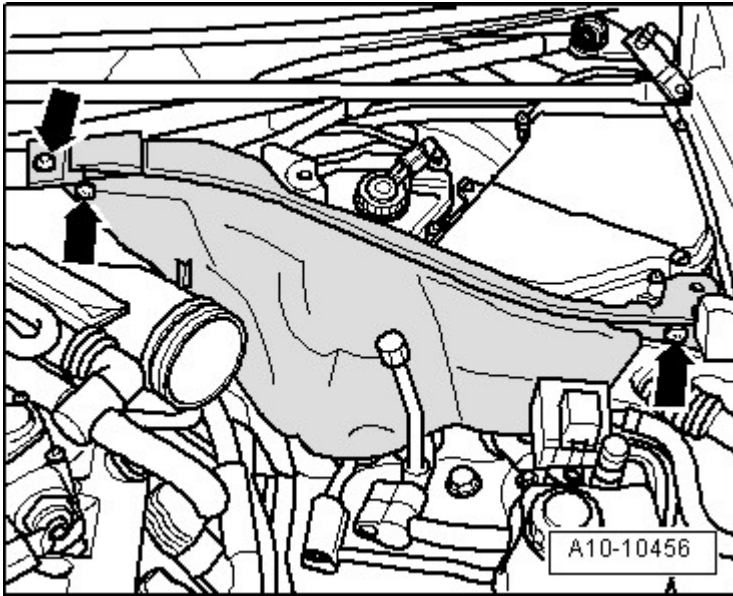


Fig. 37: Identifying Screws -Arrows- For Partition At Left Rear In Engine Compartment
Courtesy of AUDI OF AMERICA, LLC

-- Remove screws -arrows- and remove partition at right rear in engine compartment.

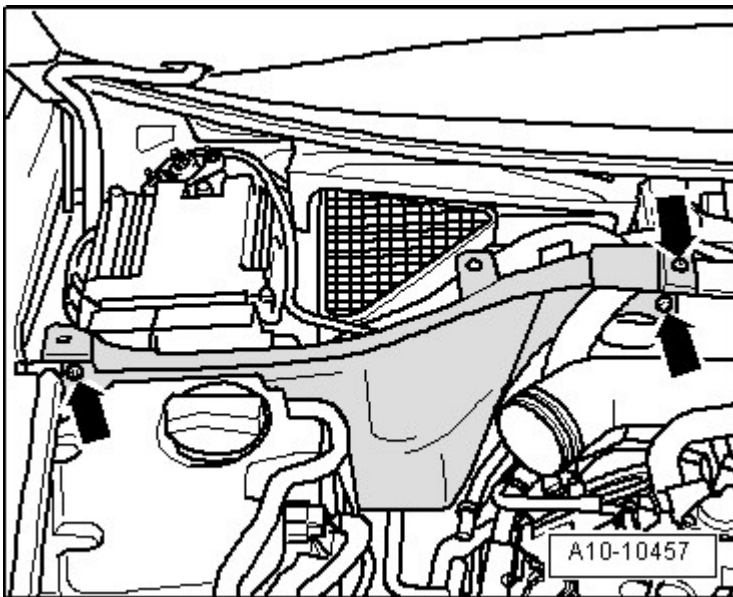


Fig. 38: Identifying Screws -Arrows- For Partition At Right Rear In Engine Compartment
Courtesy of AUDI OF AMERICA, LLC

-- Loosen upper control arm nut a few turns and pull joint off with T10187.

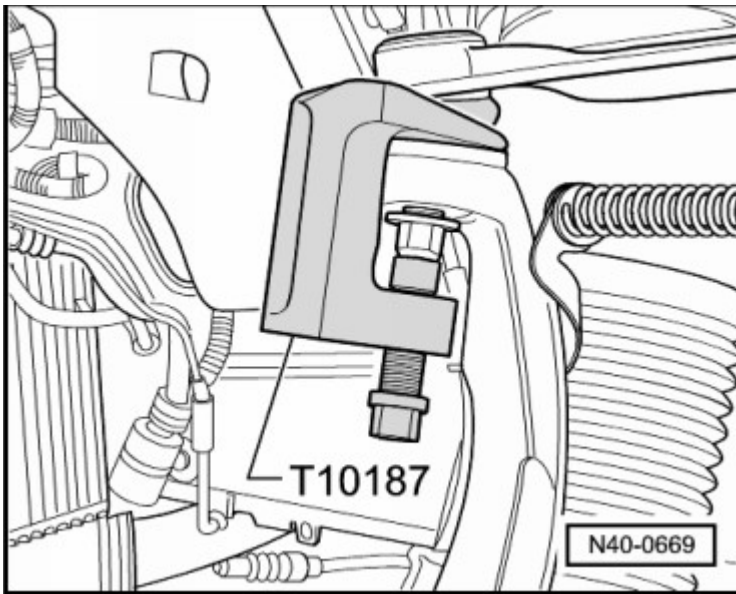


Fig. 39: Pressing Out Upper Control Arm
 Courtesy of AUDI OF AMERICA, LLC

- Completely remove upper control arm nut.
- Repeat procedure on opposite side of vehicle.
- Disconnect electrical connectors -arrow- at left and right on front speed sensors.

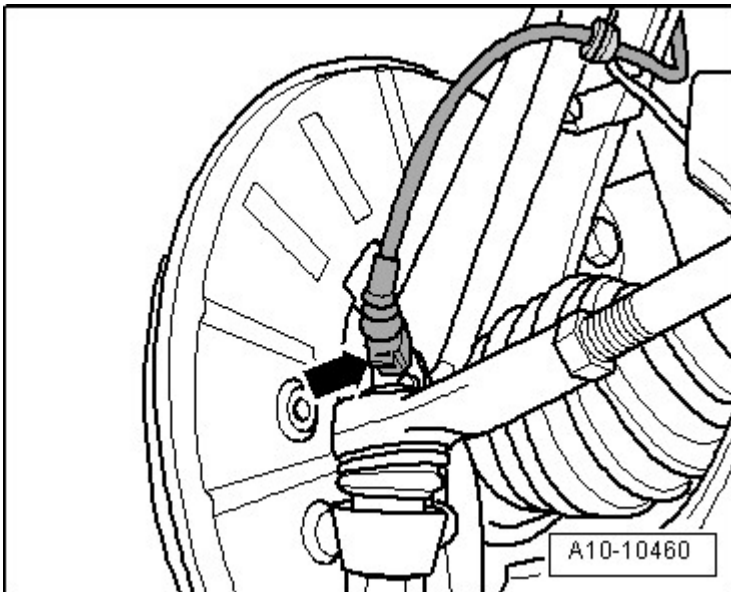


Fig. 40: Identifying Speed Sensor Connector
 Courtesy of AUDI OF AMERICA, LLC

- Remove wiring harness bolts -arrows-.

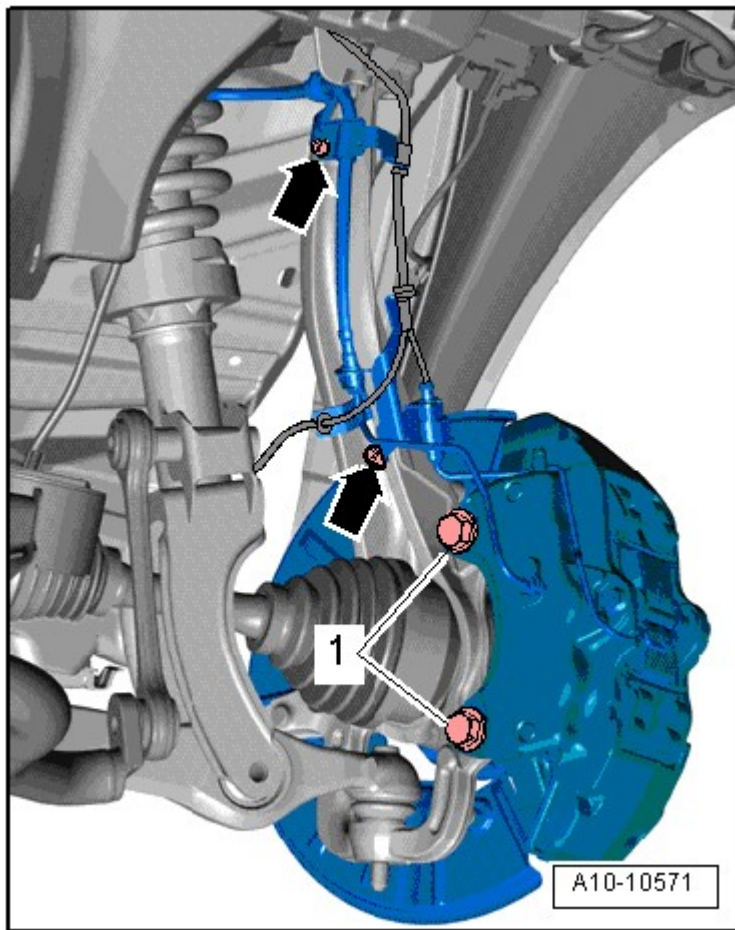


Fig. 41: Identifying Wire Harness Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove brake caliper bolts -1-.

NOTE: Do not change brake line bend shape.

-- Engage brake caliper in wheel housing with wire.

CAUTION: Risk of damaging brake pistons.

- Do not operate brake pedal with brake caliper removed.

-- Repeat procedure on opposite side of vehicle.

-- Disconnect lower threaded connection -2- at left and right on stabilizer bar.

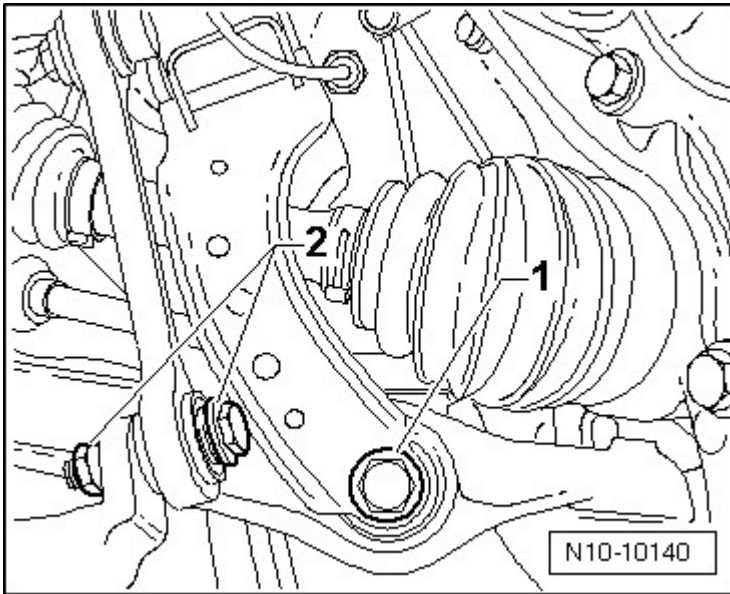


Fig. 42: Identifying Right/Left Lower Bolt On Stabilizer Bar
Courtesy of AUDI OF AMERICA, LLC

-- Remove nuts from bolts -1- at left and right on strut.

NOTE: Bolts -1- are removed later.

-- Remove bolts -arrows- at transfer case/rear driveshaft connection.

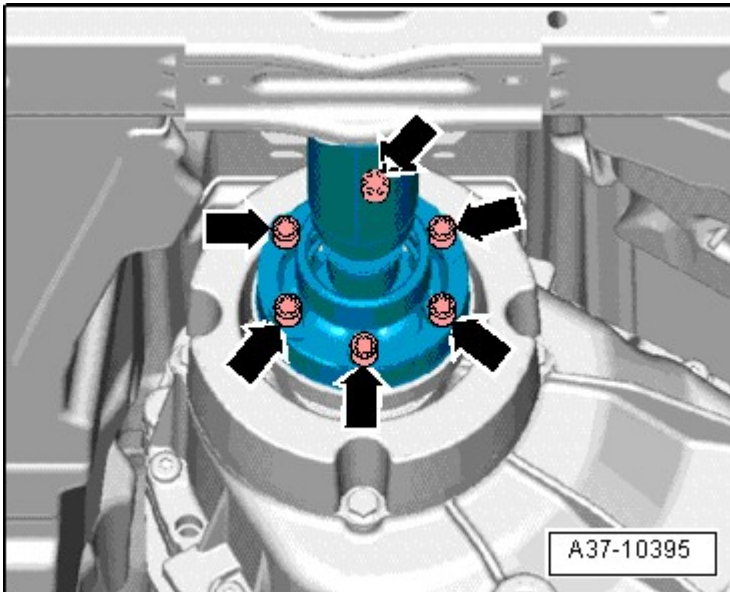


Fig. 43: Identifying Bolts -Arrows- At Transfer Case/Rear Driveshaft Connection
Courtesy of AUDI OF AMERICA, LLC

-- Counterhold with the T10172 with T10172/8.

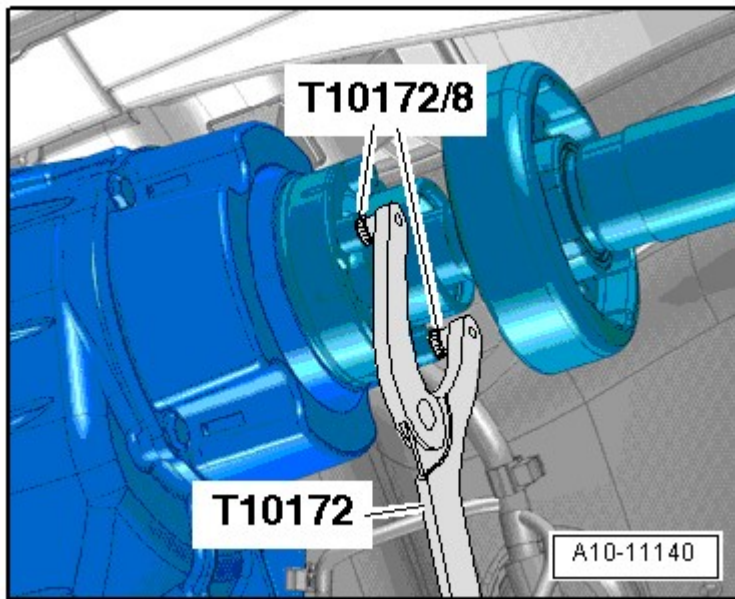


Fig. 44: Counterholding With T10172 With T10172/8
Courtesy of AUDI OF AMERICA, LLC

-- Slide driveshaft back to rear final drive; CV joints can move axially.

-- Remove bracket for noise insulation -arrows-.

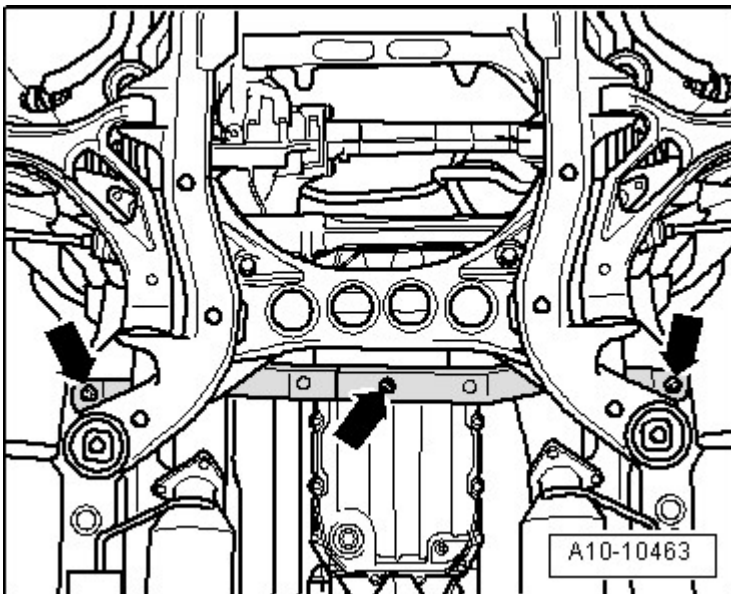


Fig. 45: Identifying Bracket For Noise Insulation
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Danger of damaging the decoupling element.

- Decoupling element must not be bent more than 10°.

- Do not load decoupling element on cable.
- Do not damage wire mesh at decoupling element.

-- Disconnect exhaust system at clamping sleeves -1- and -2-.

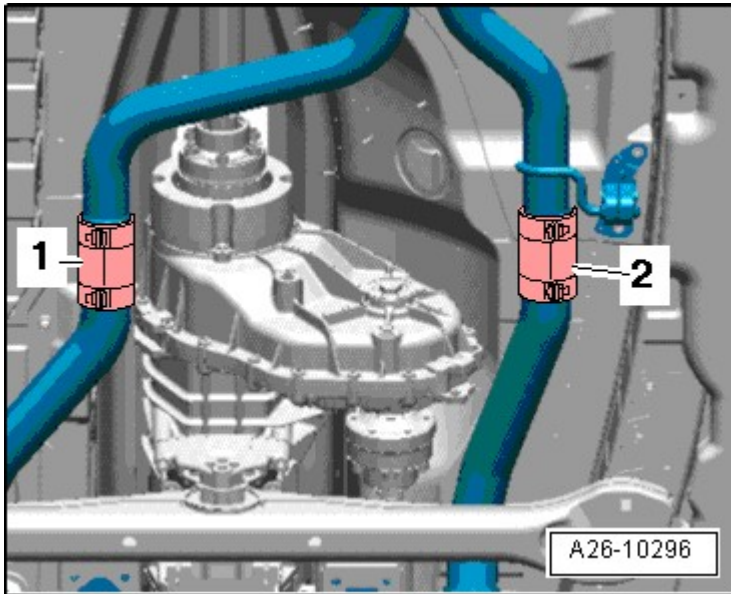


Fig. 46: Identifying Double Pipe Clamps Between Catalytic Converter/Front Muffler
Courtesy of AUDI OF AMERICA, LLC

-- Remove exhaust system bracket at left and right from longitudinal members -arrows-.

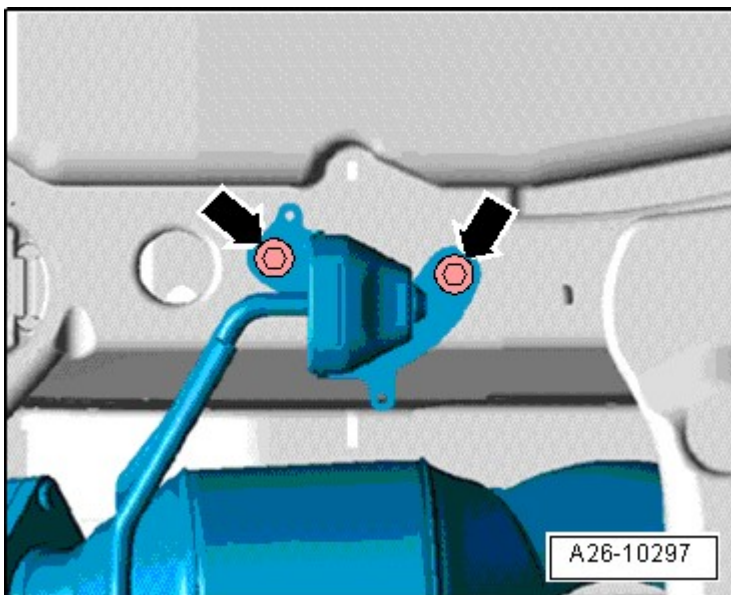


Fig. 47: Identifying Exhaust System Bracket At Left And Right From Longitudinal Members -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Remove selector lever cable heat shield -arrows-.

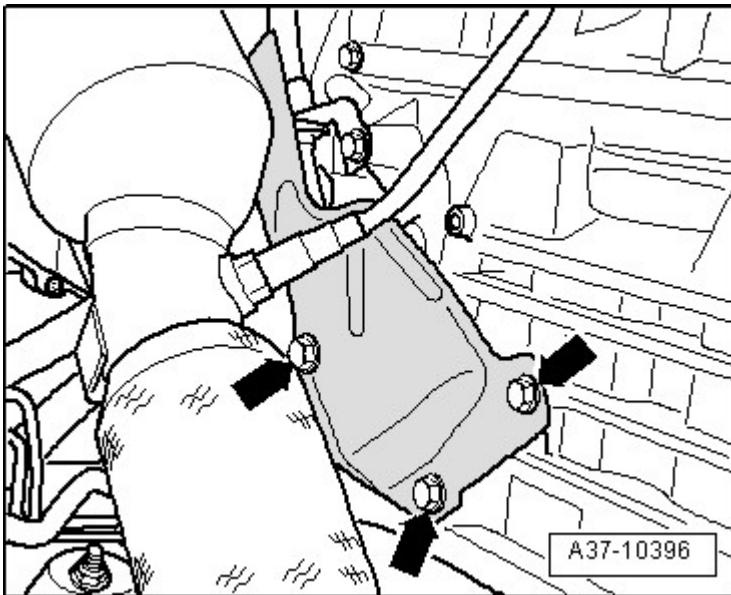


Fig. 48: Identifying Selector Lever Cable Heat Shield/Ball Head
Courtesy of AUDI OF AMERICA, LLC

-- Press the selector lever cable ball head -2- off the selector shaft lever using the 80 - 200.

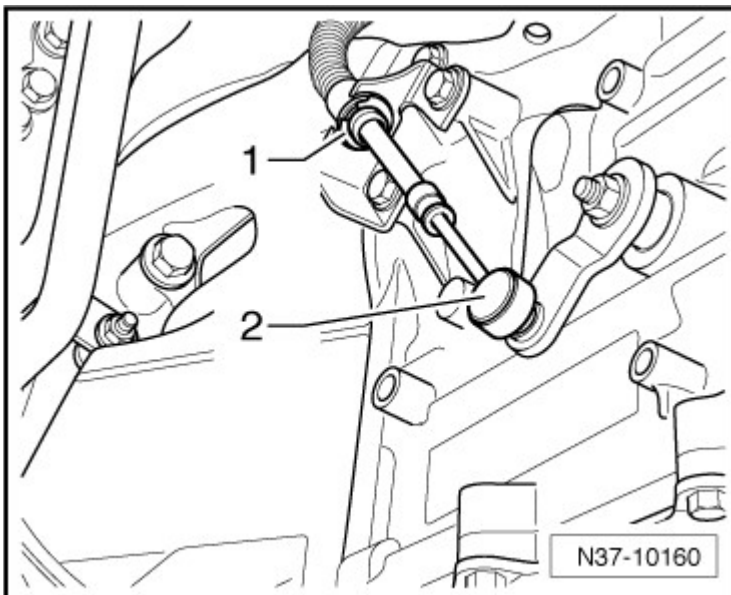


Fig. 49: Identifying Locking Washer & Selector Lever Cable
Courtesy of AUDI OF AMERICA, LLC

-- Remove securing clip -1- and remove selector lever cable from transmission.

NOTE: Do not bend or kink selector lever cable.

-- Disconnect electrical connector -arrow- at steering gear.

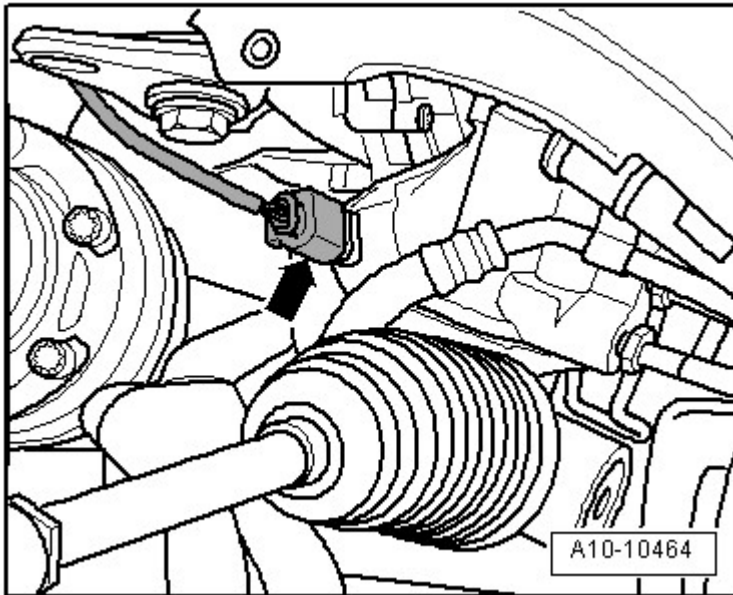


Fig. 50: Identifying Electrical Connector And Heat Shield
Courtesy of AUDI OF AMERICA, LLC

-- Remove heat shield -A- from steering gear.

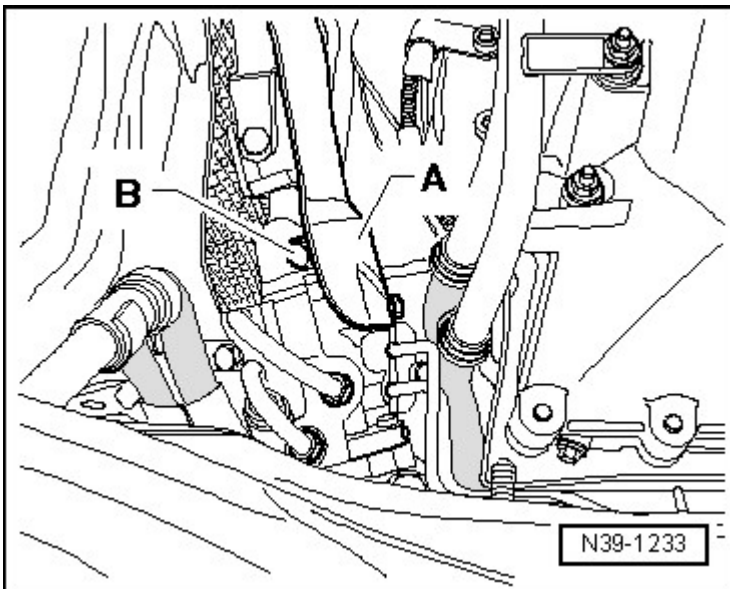


Fig. 51: Identifying Universal Joint Bolt
Courtesy of AUDI OF AMERICA, LLC

CAUTION:

- Separate universal joint from steering gear only when front wheels are in straight ahead position.

- **Do not change steering wheel position and steering gear position any more, secure steering wheel with adhesive tape.**

-- Remove universal joint bolt -B-. Refer to **Removal and Installation** .

-- Press universal joint off of steering gear.

-- Place the V.A.G 1782 under the engine.

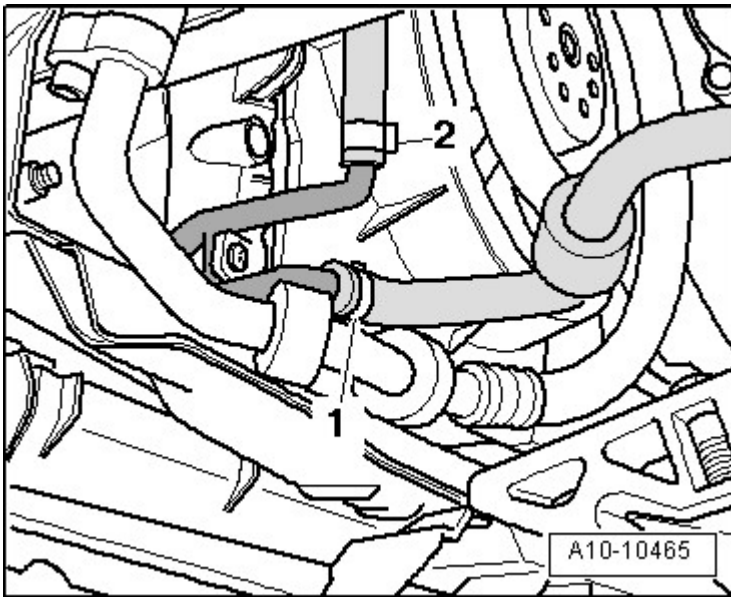


Fig. 52: Identifying Hydraulic Line Hose

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect hydraulic line -1- to power steering cooler at left of lock carrier.

NOTE: Ignore item -2-.

NOTE: Observe the rules of cleanliness for working on automatic transmissions. Refer to **CLEAN WORKING CONDITIONS** .

-- Remove bolt -arrow- and disconnect ATF-lines from ATF thermostat.

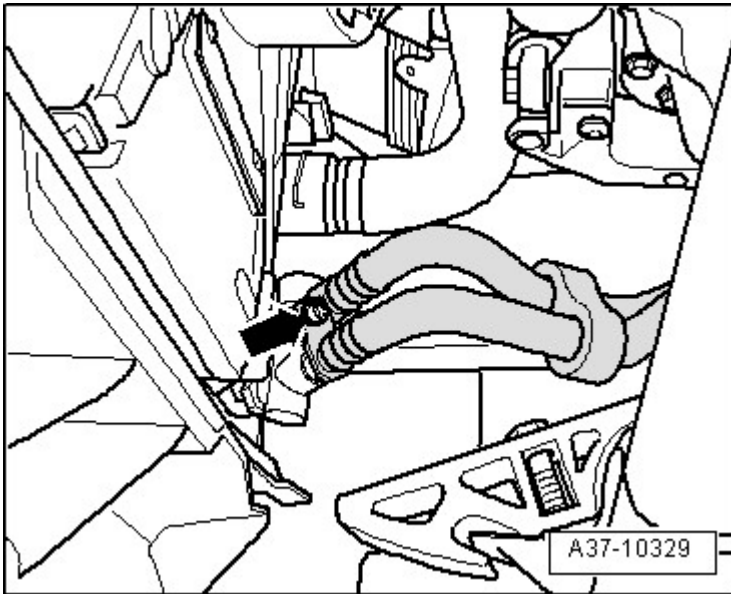


Fig. 53: Identifying Lines From Transmission Oil Cooler And Rear Mounting Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove Ground (GND) connection -1- from right longitudinal member.

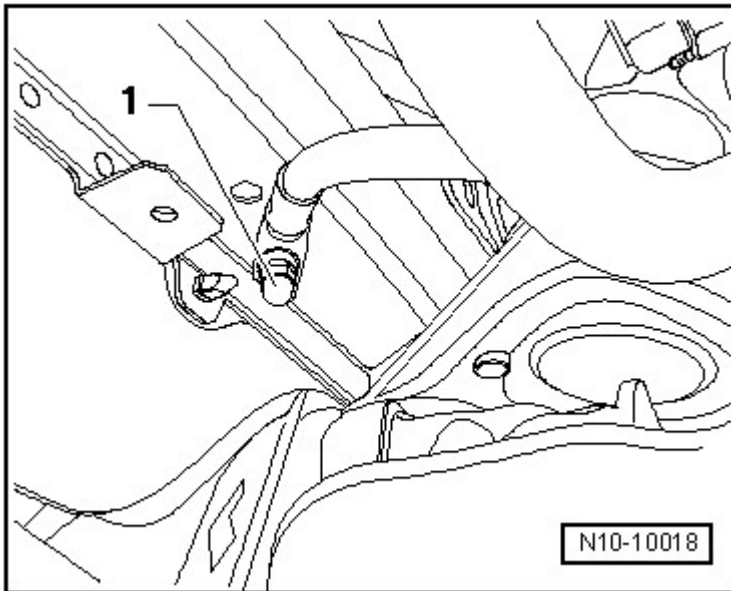


Fig. 54: Identifying Ground (GND) Cable On Longmember
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connectors -1 to 3- for automatic transmission 09D.

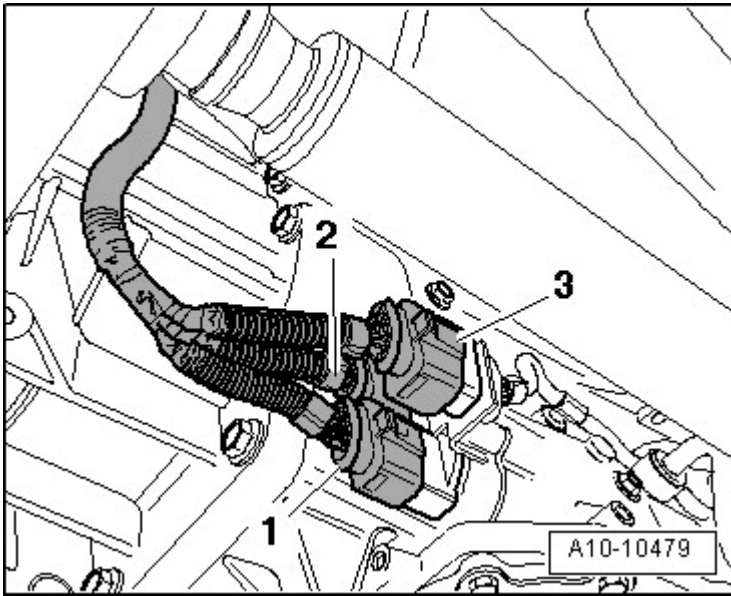


Fig. 55: Connecting Connectors -1 Through 3-
 Courtesy of AUDI OF AMERICA, LLC

To separate engine from transmission after remove engine/transmission assembly:

-- Remove ATF line -1- from transmission.

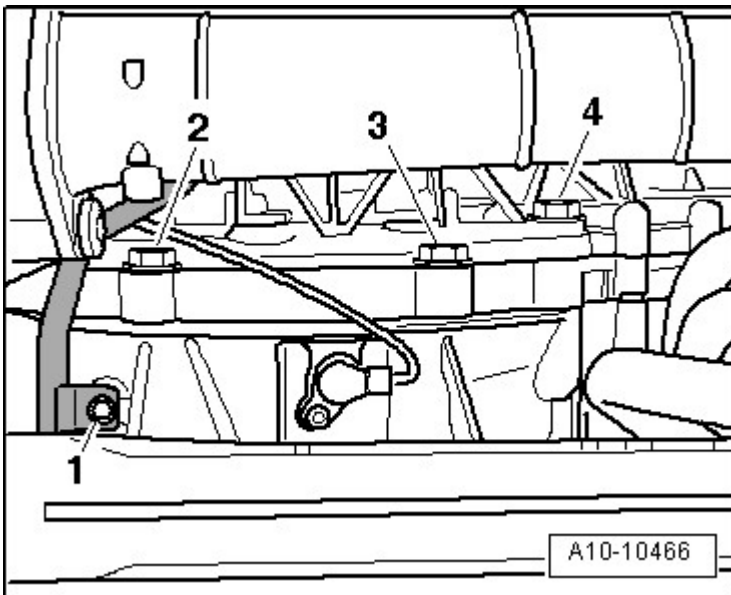


Fig. 56: Identifying Engine Speed (RPM) Sensor G28 And ATF Line
 Courtesy of AUDI OF AMERICA, LLC

-- Remove the 3 lower engine/transmission connection bolts -2 to 4-.

Prepare scissor lift platform:

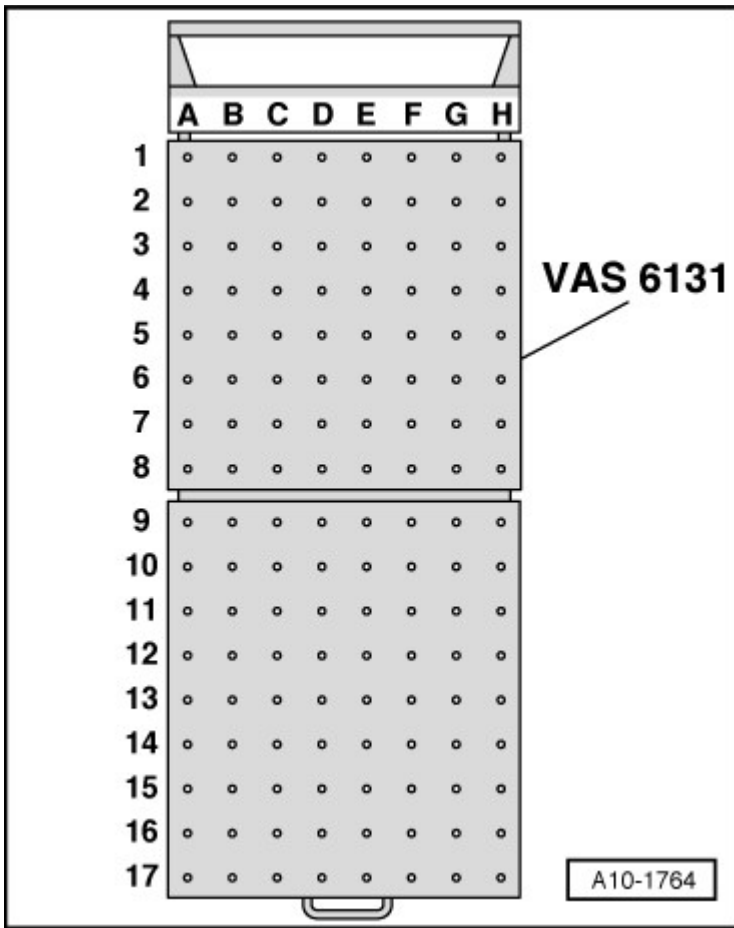


Fig. 57: Identifying Scissor Lift Platform VAS 6131
Courtesy of AUDI OF AMERICA, LLC

-- Equip VAS 6131 with VAS 6131/10 as well as VAS 6131/11 and VAS 6131/13 as follows:

Platform coordinates	Parts from Support Set VAS 6131/10, Supplementary Set VAS 6131/11 and VAS 6131/13			
B2	/10-1	/10-2	/10-5	/11-1
G2	/10-1	/10-2	/10-5	/11-1
A4 and C4	/13-5	-	-	/13-2
F4 and H4	/13-6	-	-	/13-2
B5	/13-4	/10-2	/10-5	/13-1
G5	/13-4	/10-2	/10-5	/13-1
C7	/10-1	/10-2	/10-5	/10-8
F7	/10-1	/10-2	/10-5	/10-8
B14	/10-1	/10-3	/10-5	/10-7
G14	/10-1	/10-3	/10-5	/10-7

-- Install attachments on scissor lift table by hand first.

-- Place scissor lift platform VAS 6131 in horizontal position.

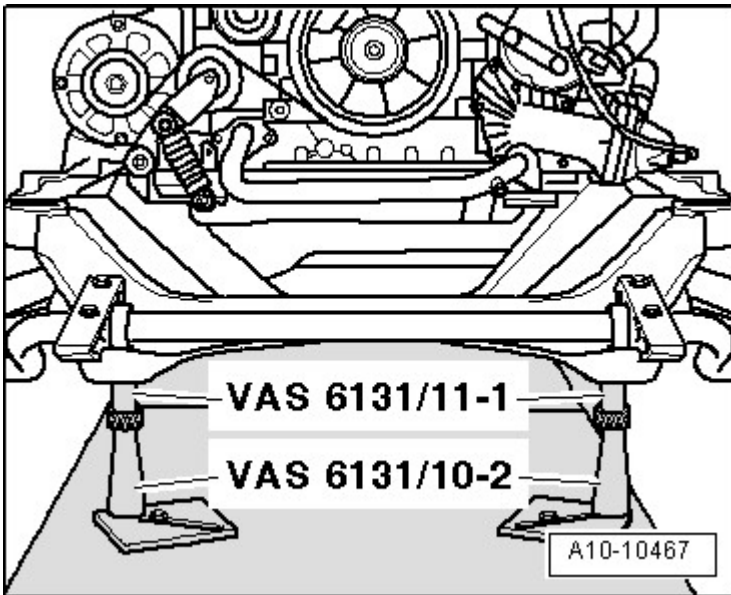


Fig. 58: Attaching Mounting Elements From VAS 6131/10 And VAS 6131/11 At Front Of Subframe
Courtesy of AUDI OF AMERICA, LLC

- Note bubble level (sight glass) on support platform.

-- Guide scissor lift table under engine/transmission assembly.

-- Position the support elements from the VAS 6131/10 and VAS 6131/11 on the front of the subframe as illustrated.

-- Make sure that the threaded spindles are completely screwed in.

-- Position the support elements from the VAS 6131/10 and VAS 6131/13 on the engine carrier as illustrated.

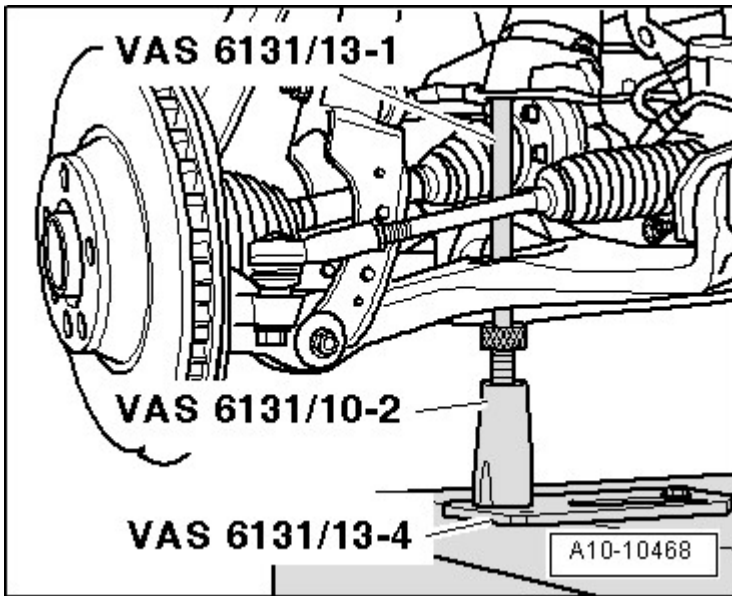


Fig. 59: Positioning Support Elements From VAS6131/10 And VAS6131/13 On Engine Carrier
 Courtesy of AUDI OF AMERICA, LLC

-- Position the support elements from the VAS 6131/13 on the suspension struts as illustrated.

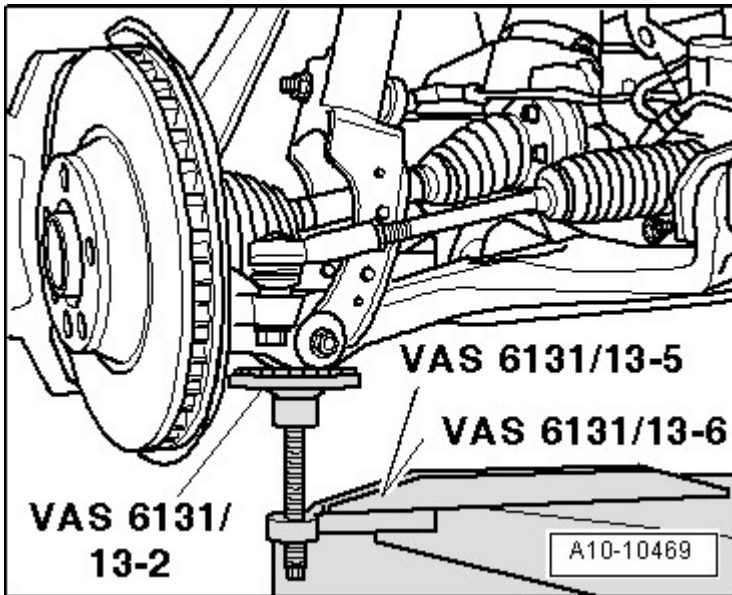


Fig. 60: Positioning Support Elements From VAS 6131/13 On Strut Supports
 Courtesy of AUDI OF AMERICA, LLC

-- Position the support elements from the VAS 6131/10 on the rear of the transmission as illustrated.

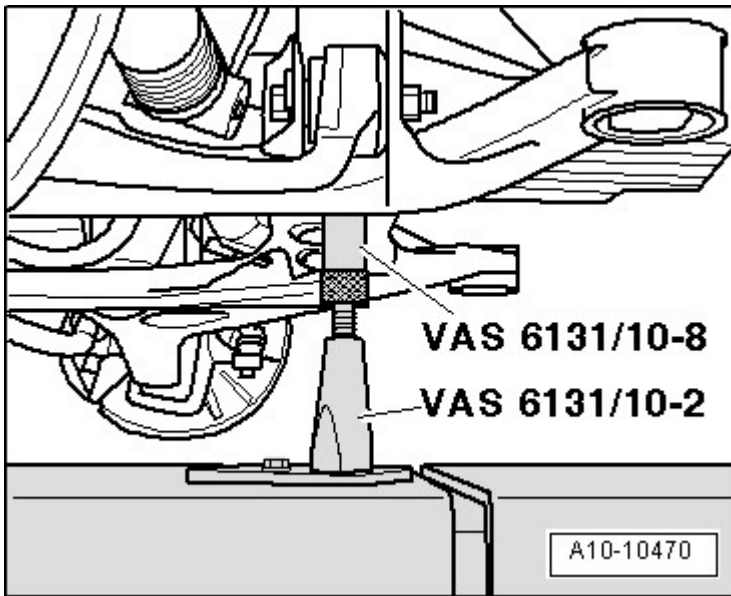


Fig. 61: Attaching Mounting Elements From VAS 6131/10 At Rear Of Subframe
 Courtesy of AUDI OF AMERICA, LLC

-- Position the support elements from the VAS 6131/10 on the left and right of the subframe as illustrated.

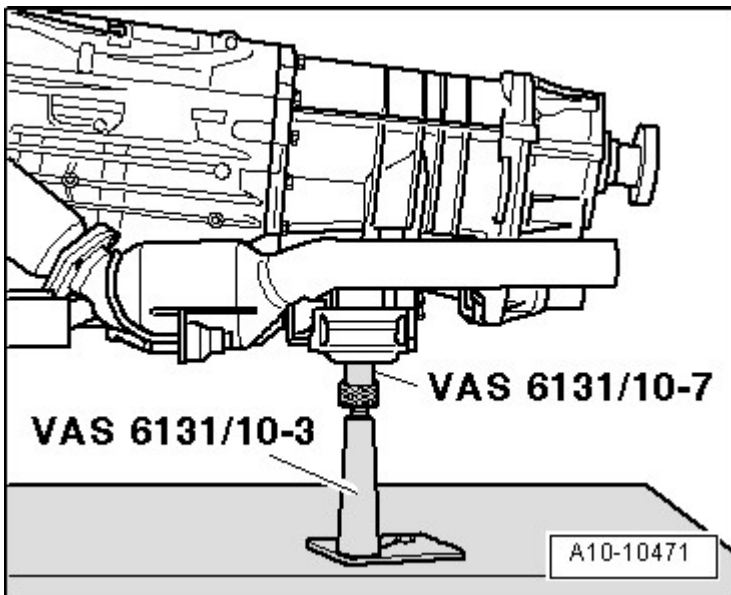


Fig. 62: Identifying Support Elements From VAS6131/10 On Left And Right Of Subframe
 Courtesy of AUDI OF AMERICA, LLC

- Twist spindles of attachments upward far enough until all support pins make contact at support points.
- Tighten base plates for support elements to 20 Nm on scissor lift platform VAS 6131.
- Remove bolt -1- at left and right.

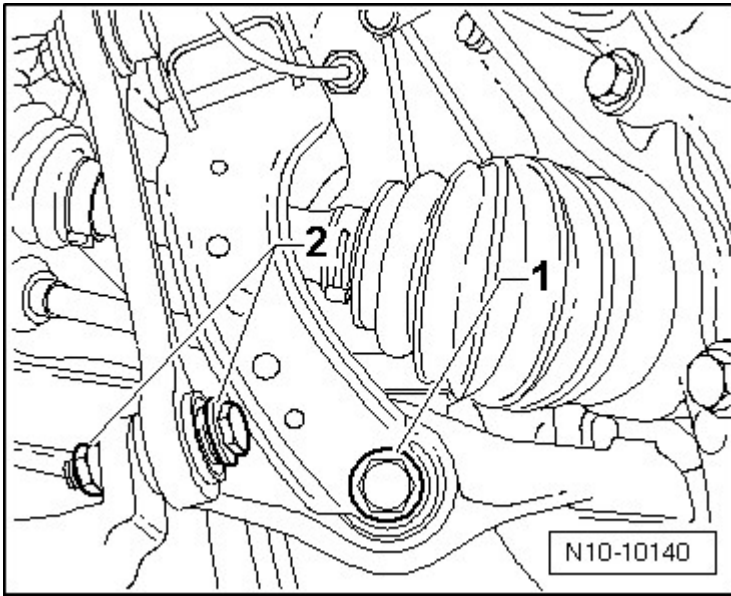


Fig. 63: Identifying Right/Left Lower Bolt On Stabilizer Bar
Courtesy of AUDI OF AMERICA, LLC

NOTE: **The threaded connection -2- has already been disconnected.**

-- Mark installation position of subframe, engine carrier and transmission carrier to longitudinal members using a felt-tip marker.

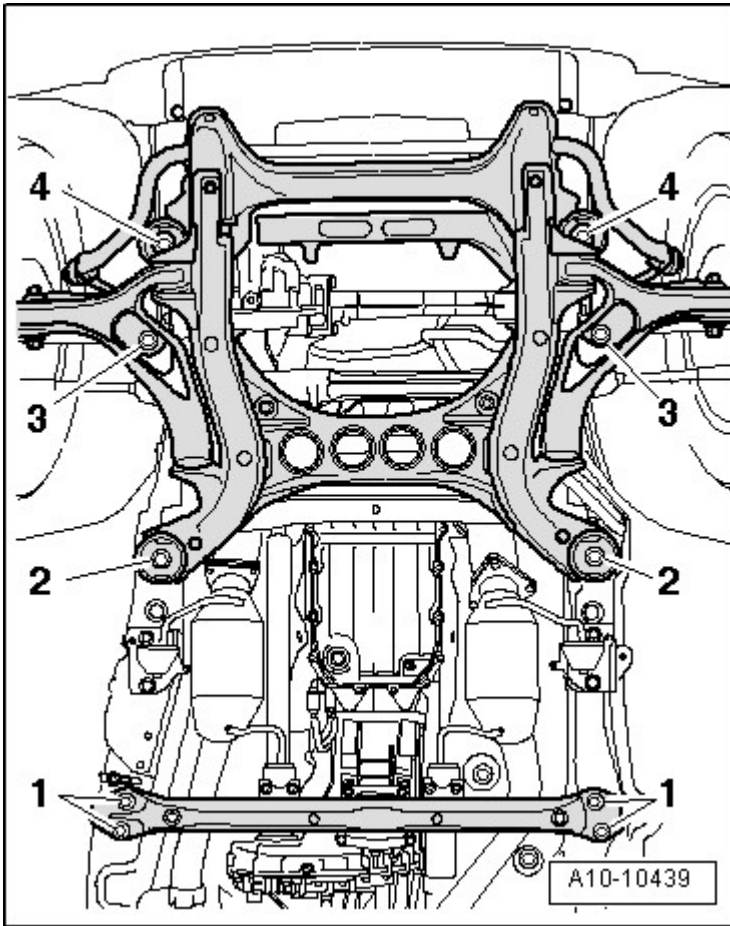


Fig. 64: Identifying Bolts -4- And Engine Carrier Bolts -3-
 Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1 to 4- in diagonal sequence and in stages.

NOTE: Verify that all hoses and lines between engine/transmission subassembly and body have been disconnected.

While lowering, carefully guide engine/transmission assembly out of engine compartment in order to prevent damage.

Carefully guide suspension struts onto longitudinal members.

-- Lower engine/transmission subassembly downward.

-- Push scissor lift platform VAS 6131 with engine/transmission subassembly under vehicle.

ENGINE AND TRANSMISSION, SEPARATING

Special tools and workshop equipment required

- Bracket 30-211 A
- Support Set VAS 6131/10 and Supplementary Set VAS 6131/12 and VAS 6131/13
- Counterhold tool T10172 with T10172/6
- Adapter T40058

Procedure

- Engine/transmission unit removed and attached to scissor lift platform VAS 6131.

NOTE: All cable ties opened or cut during engine removal must be reinstalled at the same locations during installation.

-- Equip scissor lift table VAS 6131 with Support Set VAS 6131/10 and additional parts from supplementary set VAS 6131/12 and VAS 6131/13 as follows:

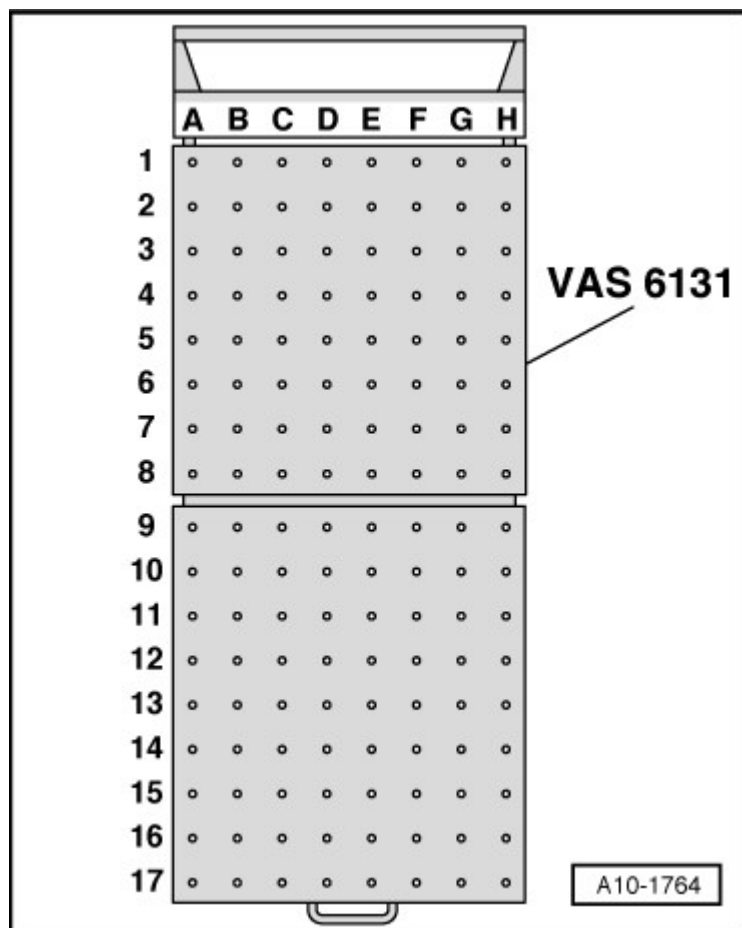


Fig. 65: Identifying Scissor Lift Platform VAS6131

Courtesy of AUDI OF AMERICA, LLC

NOTE: The other attachments remain unchanged.

Platform coordinates	Parts from Support Set VAS 6131/10, Supplementary Set VAS 6131/12 and VAS 6131/13			
E1	/13-7			
C10	/10-1	/10-4	/10-5	/13-2
E10	/10-1	/10-4	/10-5	/13-2
G10	/10-1	/12-2	/10-5	/13-3

-- Tighten joint support VAS 6131/13-7 at front of engine in threaded holes.

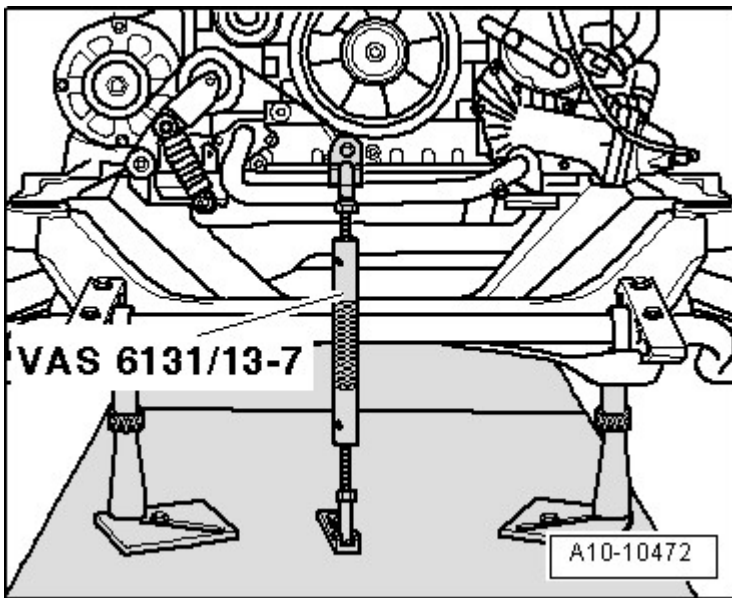


Fig. 66: Identifying Joint Support VAS6131/13-7 At Front Of Engine
 Courtesy of AUDI OF AMERICA, LLC

-- Secure joint support VAS 6131/13-7 to scissor lift table.

-- Attach the support elements from the VAS 6131/10 and VAS 6131/13 at the front under the transmission ATF oil pan as illustrated.

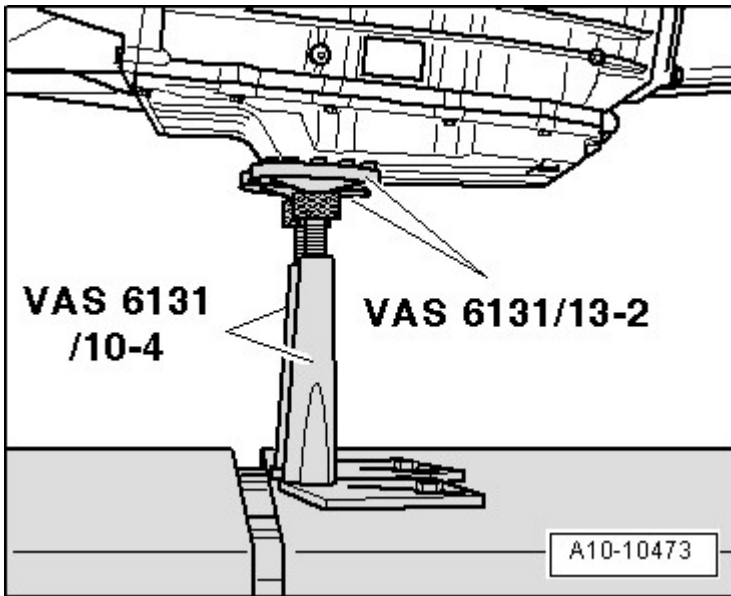


Fig. 67: Identifying Support Elements From VAS6131/10 And VAS6131/13 At Front Under Transmission ATF Oil Pan

Courtesy of AUDI OF AMERICA, LLC

-- Prepare the support elements from the VAS 6131/10, VAS 6131/12 and VAS 6131/13 to support the driveshaft as illustrated.

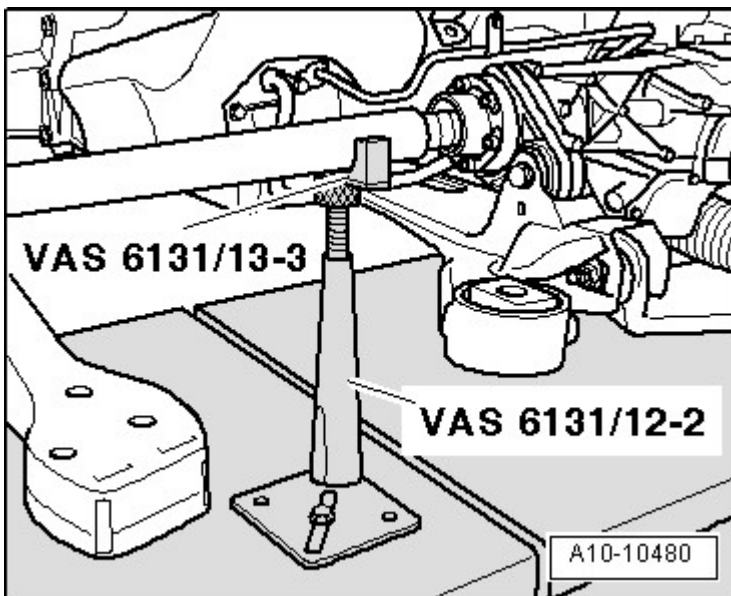


Fig. 68: Identifying Support Elements VAS6131/12 And VAS6131/13 To Support Driveshaft

Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical wires to oxygen sensors.

-- Remove bolts -arrows- at left main catalytic converter bracket.

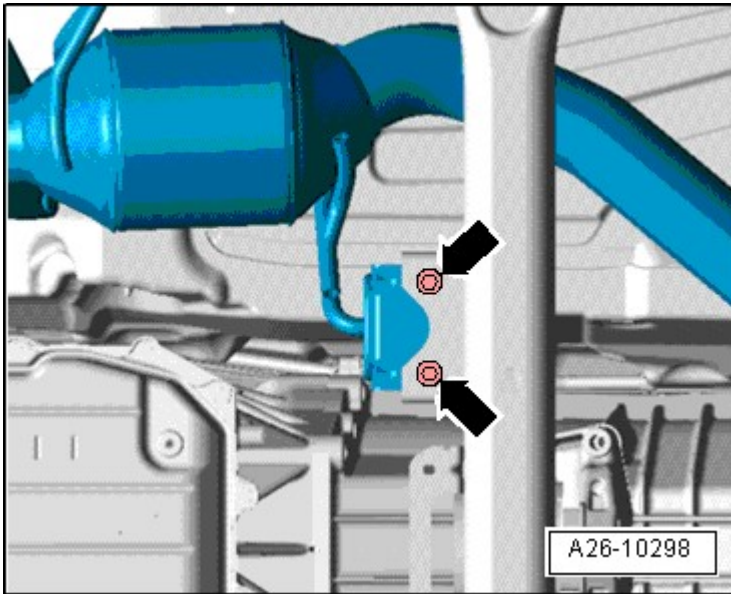


Fig. 69: Identifying Bolts -Arrows-
 Courtesy of AUDI OF AMERICA, LLC

-- Remove bolt -2- at left primary catalytic converter strap.

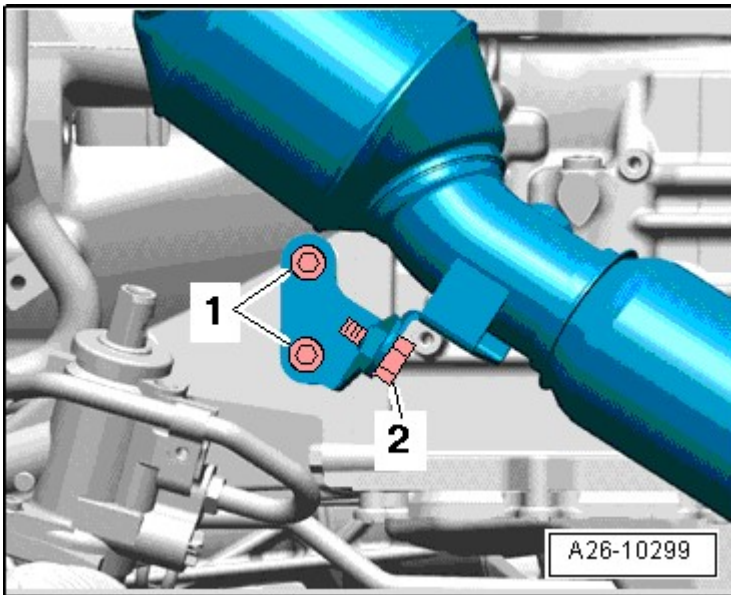


Fig. 70: Identifying Bolt At Left Primary Catalytic Converter Strap
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore item -1-.

-- Remove nuts -1 to 3-.

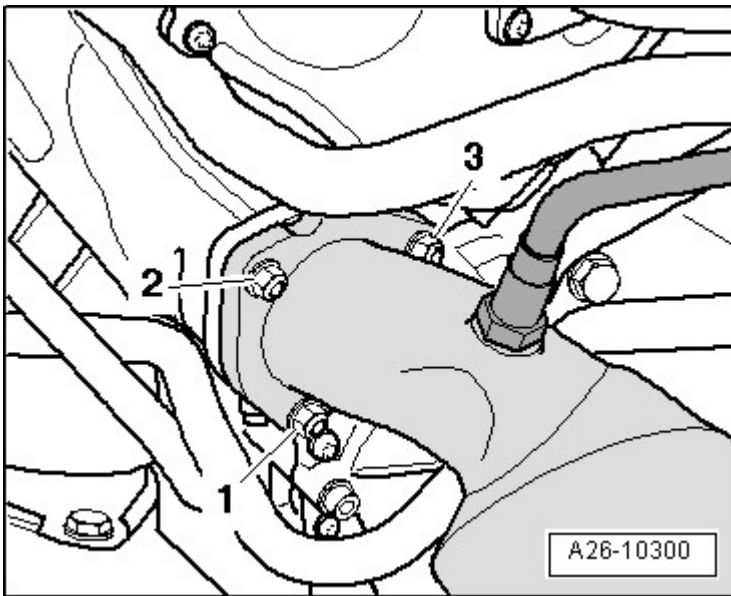


Fig. 71: Identifying Nuts

Courtesy of AUDI OF AMERICA, LLC

- Remove left front and main catalytic converters.
- Remove bolt -arrows- at right main catalytic converter bracket.

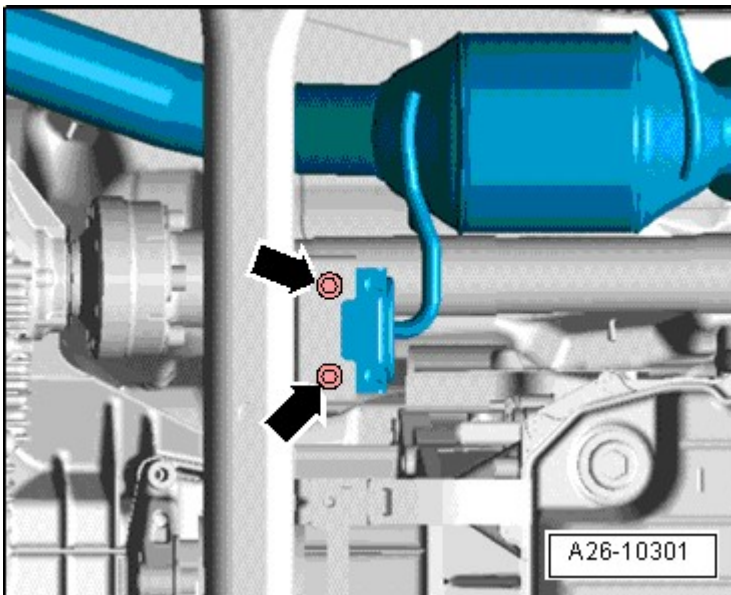


Fig. 72: Identifying Bolt At Right Main Catalytic Converter Bracket

Courtesy of AUDI OF AMERICA, LLC

- Remove bolt -arrow- at right primary catalytic converter strap.

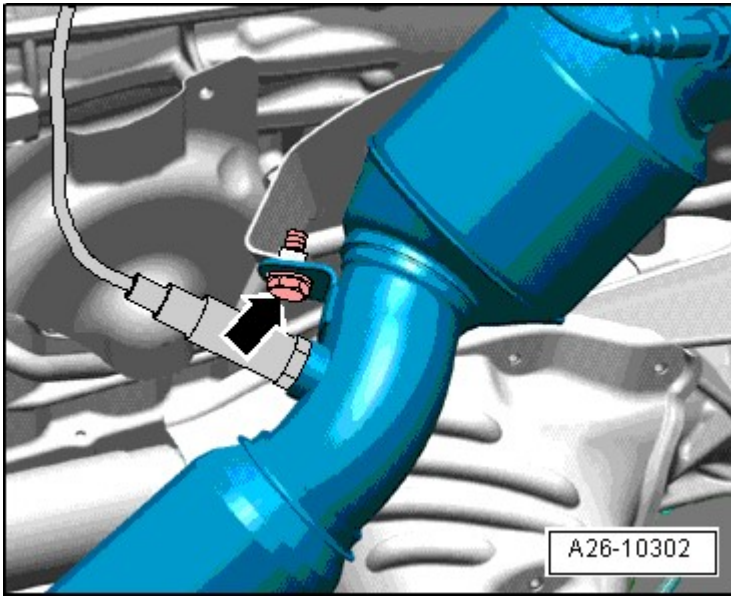


Fig. 73: Identifying Bolt At Right Primary Catalytic Converter Strap
Courtesy of AUDI OF AMERICA, LLC

-- Remove nuts -1 to 3--.

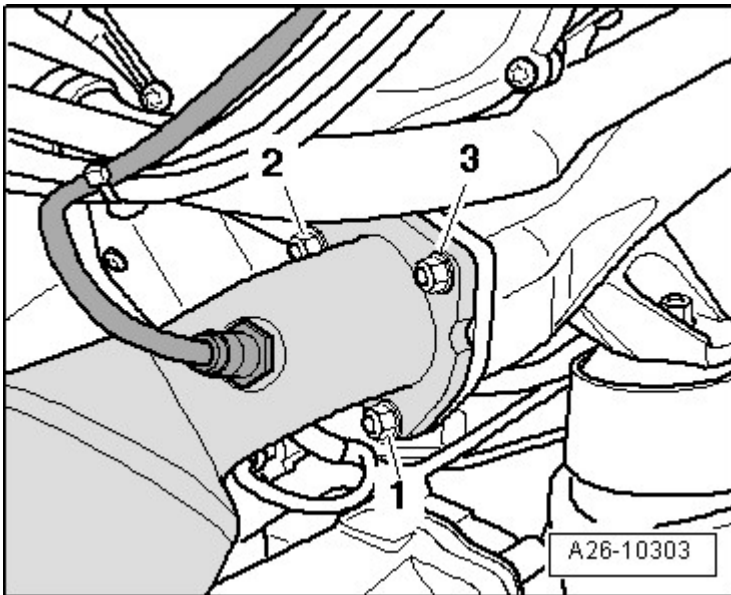


Fig. 74: Identifying Nuts, Securing Bolts, And ATF Line
Courtesy of AUDI OF AMERICA, LLC

-- Remove right primary and main catalytic converters.

-- Remove bolts -arrows- at transfer case/front driveshaft connection.

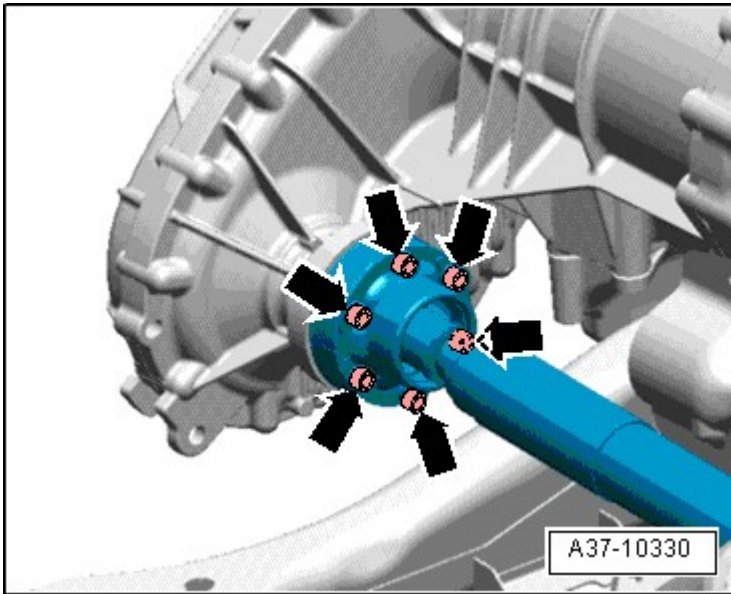


Fig. 75: Identifying Driveshaft Bolts -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Counterhold with the T10172 with T10172/6.

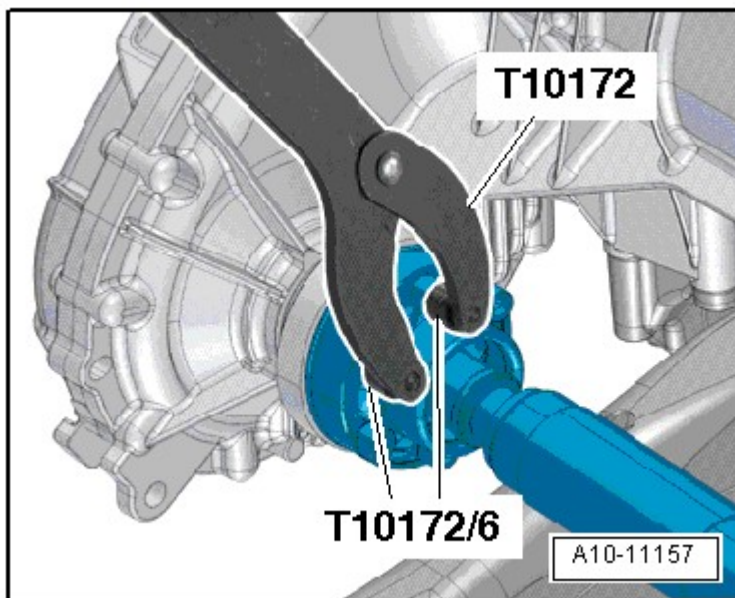


Fig. 76: Counterholding With T10172 And T10172/6
Courtesy of AUDI OF AMERICA, LLC

NOTE: Place a rag under separating point to catch escaping hydraulic fluid.

-- Remove bolts -1- and nut -2- and remove power steering supply pipe.

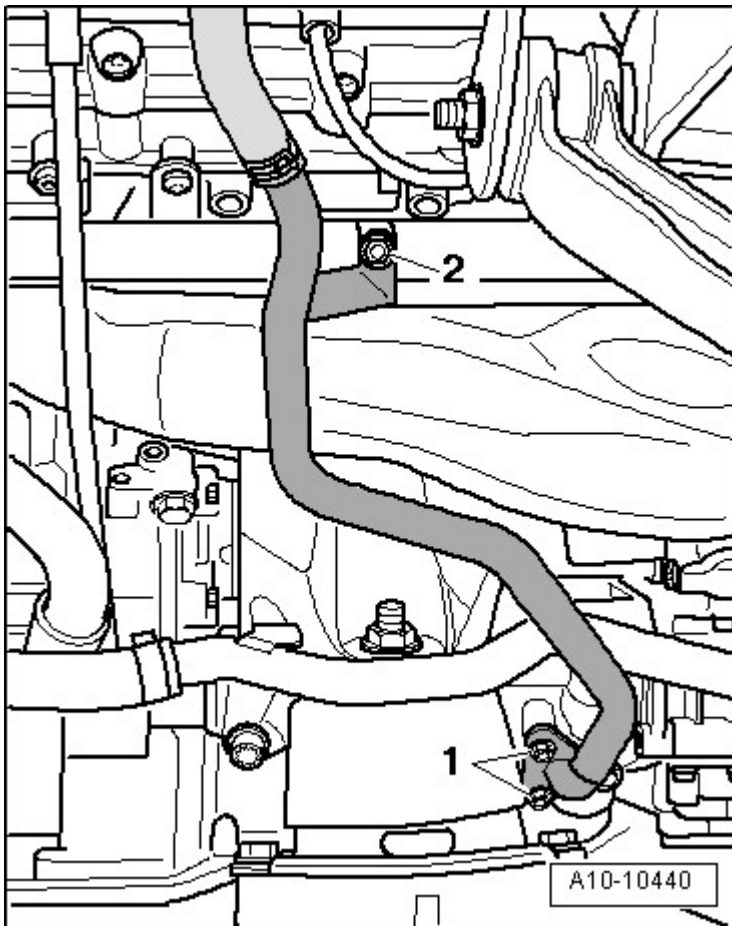


Fig. 77: Identifying Bolts And Nut For Power Steering Supply Line
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1 to 4--.

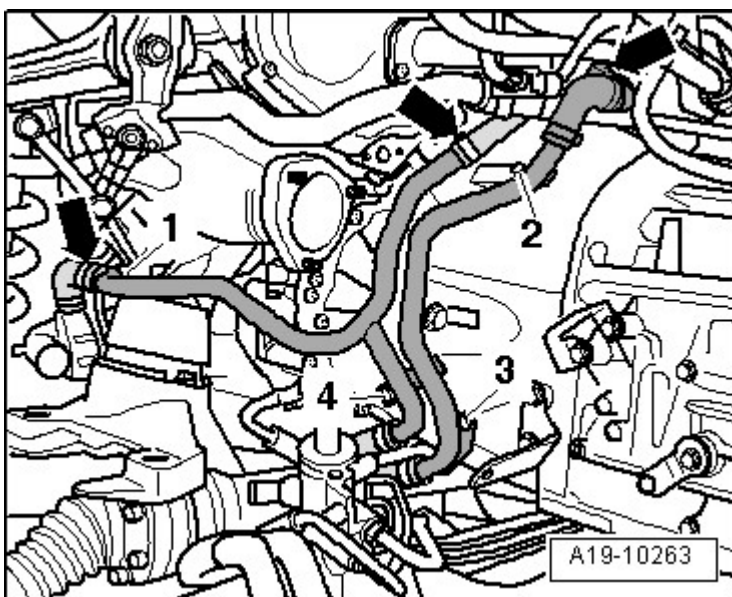
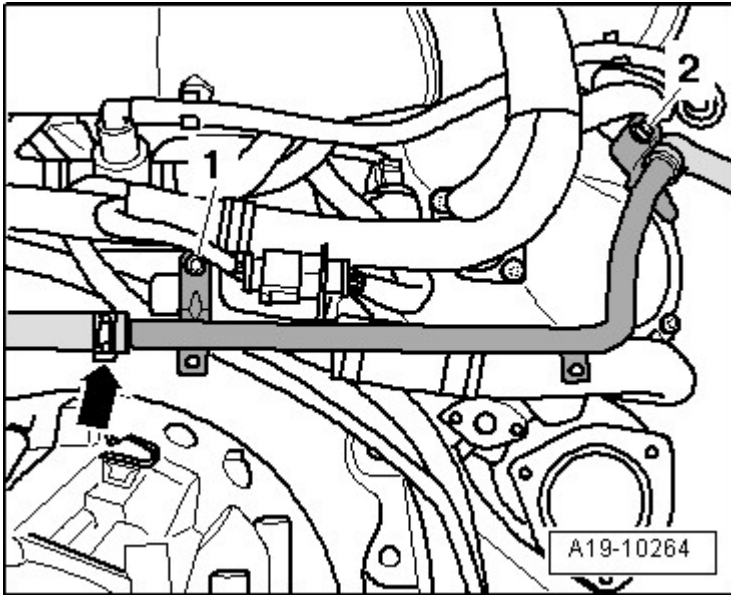


Fig. 78: Identifying Bolts And Coolant Hoses

Courtesy of AUDI OF AMERICA, LLC

- Remove coolant hoses -arrows-.
- Remove both left rear coolant pipes.
- Remove bolts -1- and -2- and remove right rear coolant pipe.

**Fig. 79: Identifying Nut And Bolt On Rear Right Coolant Pipe**

Courtesy of AUDI OF AMERICA, LLC

NOTE: Disregard -arrow-.

NOTE: Place a cloth under separation point to catch escaping ATF.

Observe the rules of cleanliness for working on automatic transmissions. Refer to CLEAN WORKING CONDITIONS .

- Remove bolts -1- and -2- and remove ATF lines from transmission.
- Remove bolt -arrow-.

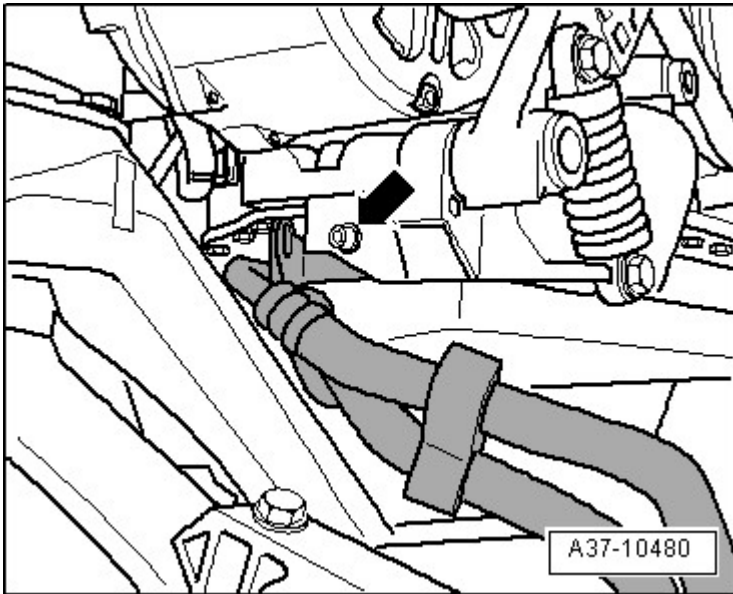


Fig. 80: Identifying Bolt In Front Of Right Side Of Long Member
Courtesy of AUDI OF AMERICA, LLC

-- Leave ATF lines in installation location.

-- Remove heat shield bolts -arrows-.

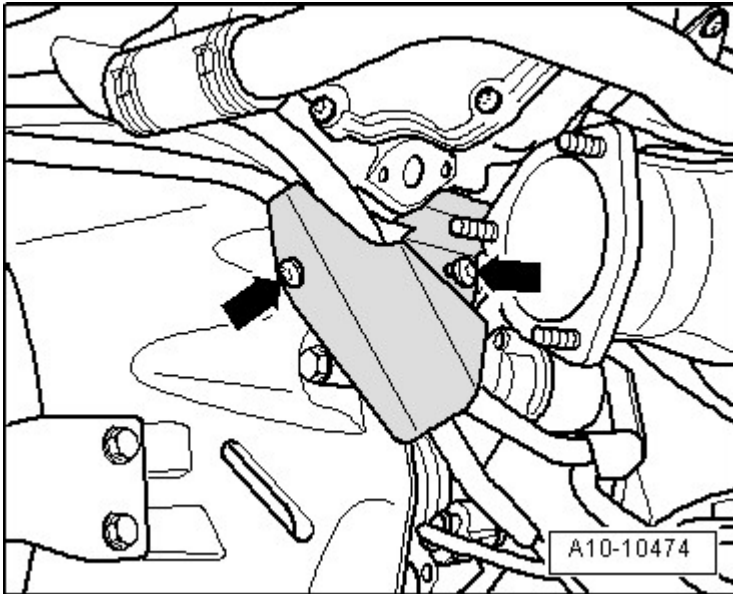


Fig. 81: Identifying Heat Shield Bolts -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical wiring below.

-- Disconnect electrical connector -arrow- to Engine Speed (RPM) Sensor -G28-.

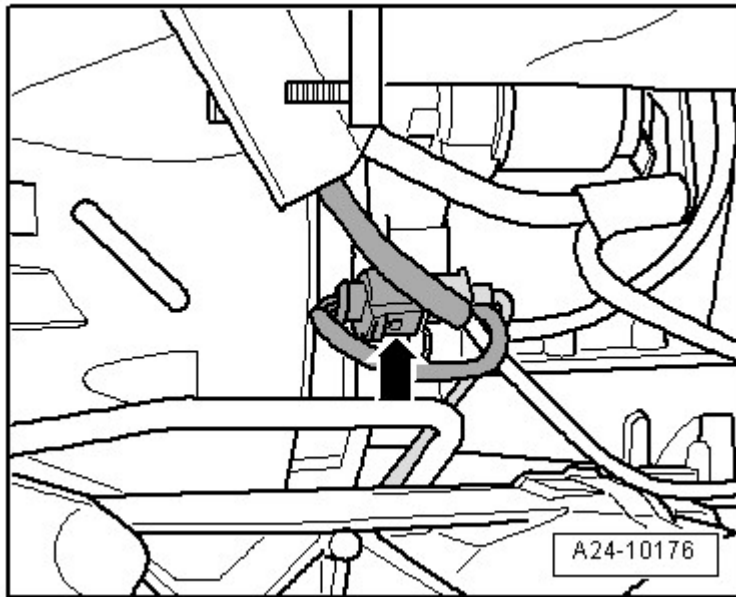


Fig. 82: Location Of Engine Speed (Rpm) Sensor -G28- Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

- Remove electrical connector from bracket and free up electrical wiring.
- Remove starter bolts -1- and -2-.

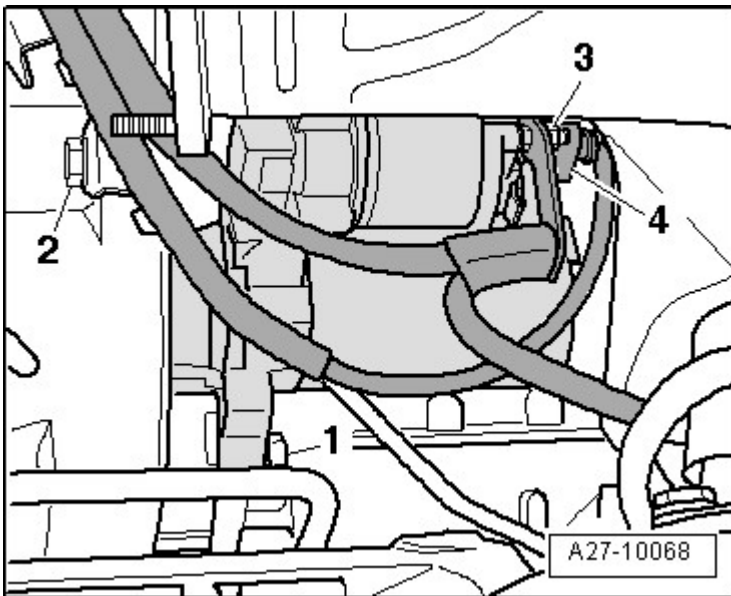


Fig. 83: Identifying Starter Bolts -1 To 2-, B+ Wire -3-, And Electrical Connector -4-
Courtesy of AUDI OF AMERICA, LLC

- Swing starter slightly towards engine.
- Separate the electrical connector -4-.

-- Remove B+ wire -3-.

-- Remove the starter.

-- Insert the T40058 guide pins as follows:

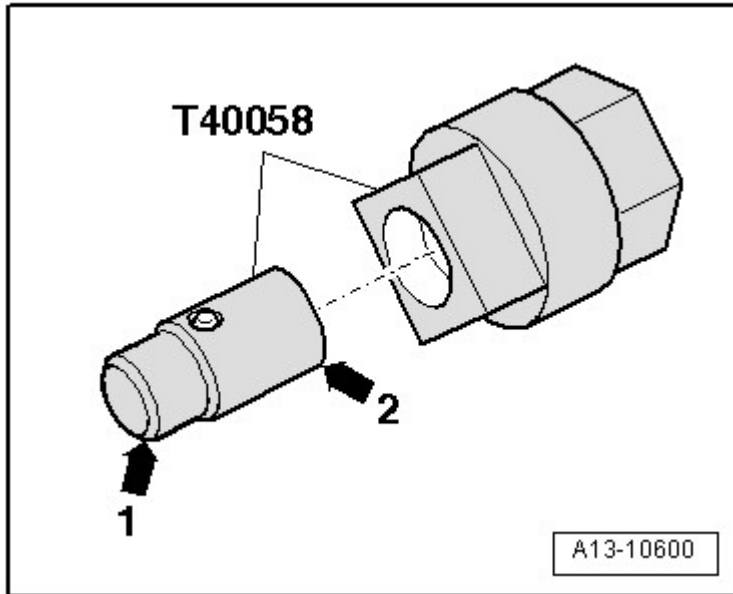


Fig. 84: Inserting T40058 Guide Pin
Courtesy of AUDI OF AMERICA, LLC

- Small diameter -arrow 1- points to engine.
- Large diameter -arrow 2- points to socket.

-- To loosen torque converter bolts, counterhold crankshaft using T40058.

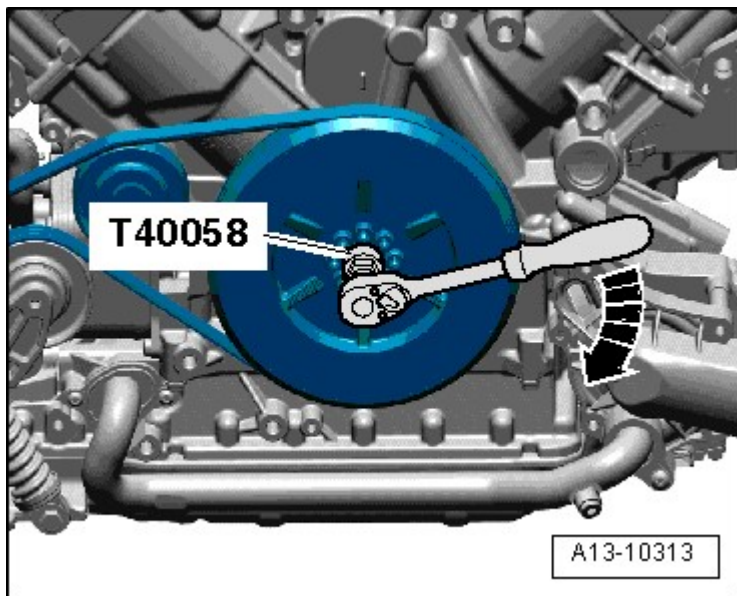


Fig. 85: Loosening Torque Converter Bolts Using Adapter T40058 To Counterhold Crankshaft
Courtesy of AUDI OF AMERICA, LLC

NOTE: Only turn the crankshaft in the direction of engine rotation -arrow-.

-- Remove two torque converter bolts that are located close to each other -arrows-.

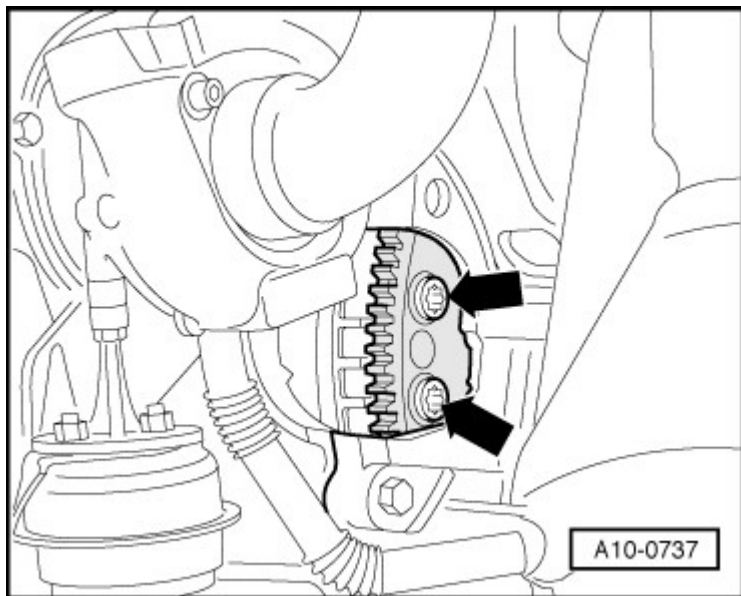


Fig. 86: Identifying Two Torque Converter Bolts Located Close To Each Other -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Rotate the crankshaft approximately 110° in the direction of engine rotation and remove the next pair of bolts.

-- Rotate the crankshaft again approximately 110° in the direction of engine rotation and remove the next pair of bolts.

-- Remove engine/transmission connecting bolts -3 to 10-.

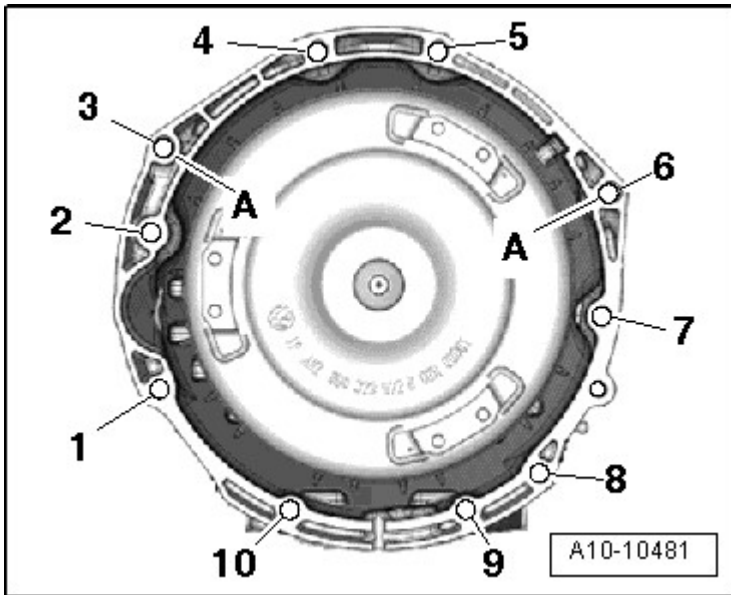


Fig. 87: Identifying Alignment Sleeves -A- And Engine/Transmission Connecting Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- Press transmission off of engine while pressing torque converter off of drive plate -arrow-.

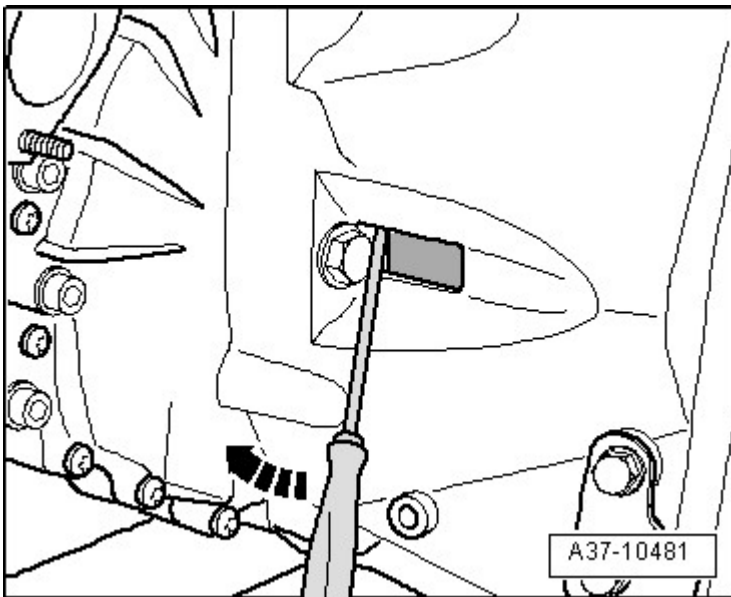


Fig. 88: Press Transmission Off Engine While Pressing Torque Converter Off Drive Plate -Arrow-
 Courtesy of AUDI OF AMERICA, LLC

-- Loosen clamping screws -1- on sides of scissor lift table VAS 6131 and then pull rear table section with transmission back slightly.

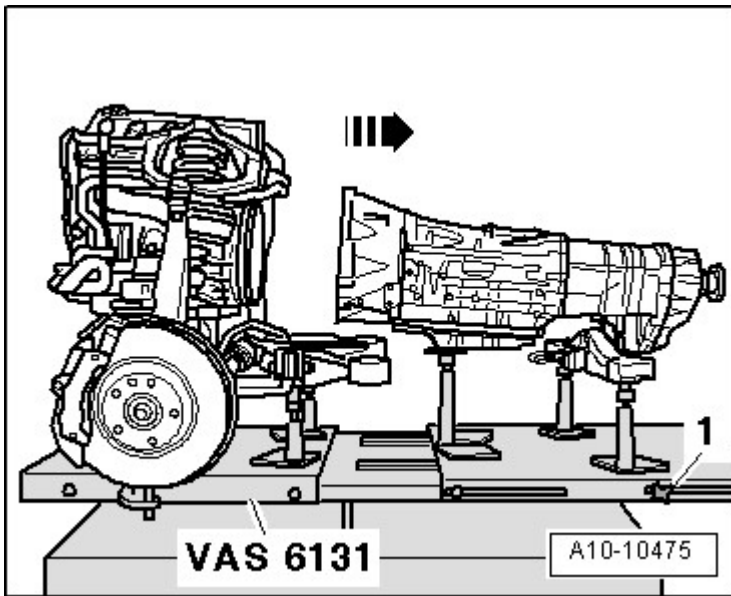


Fig. 89: Identifying Separation Of Engine And Transmission
Courtesy of AUDI OF AMERICA, LLC

-- Secure torque converter in transmission with 30-211 A to prevent it from falling down.

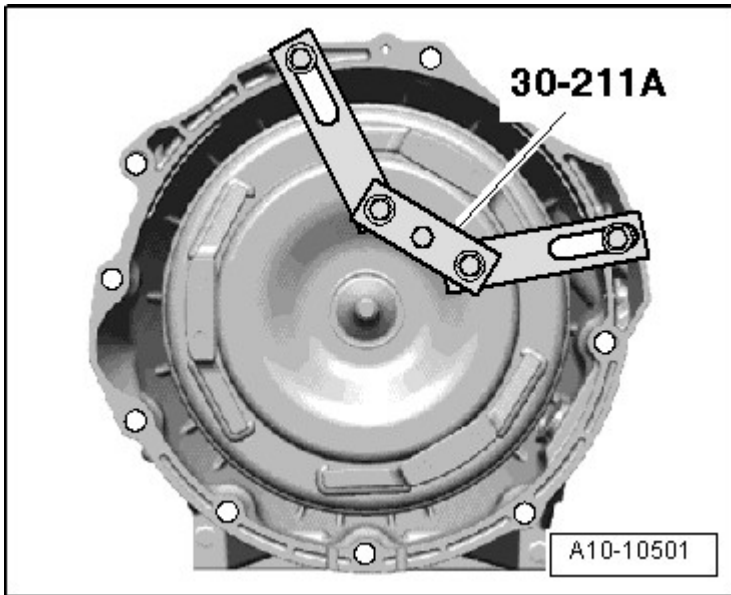


Fig. 90: Identifying Bracket -30-211A- Attached To Secure Torque Converter
Courtesy of AUDI OF AMERICA, LLC

ENGINE, INSTALLING

Tightening Specifications

NOTE: Tightening specifications only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.

Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.

Do not use any degreased parts.

Tolerance for torque specifications $\pm 15\%$.

Component	Nm
Bolts/nuts	
M6	9
M8	20
M10	40
M12	65
	85 ⁽¹⁾
(1) Replace bolts.	

Subframe mount, refer to **SUBFRAME ASSEMBLY OVERVIEW**.

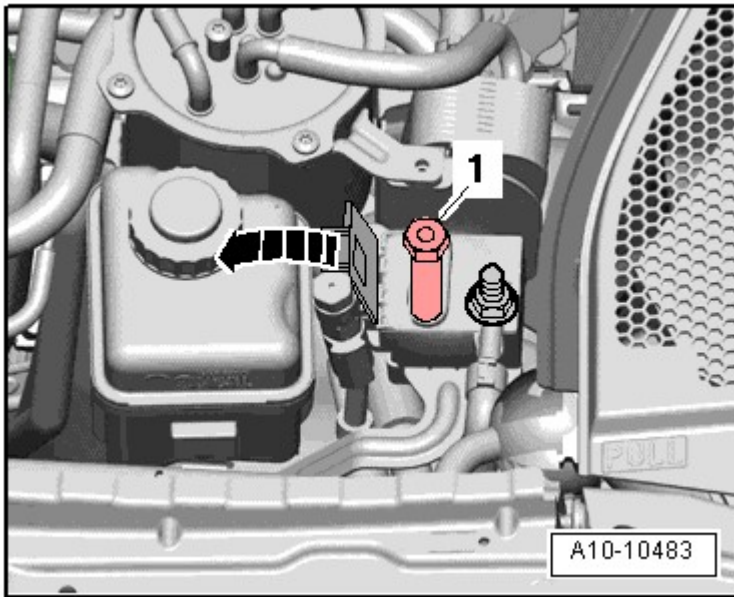


Fig. 91: Identifying Battery Jump Start Terminal -U6- Pins
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the pins -1- for the battery jump start terminal -U6- to 15 Nm.

Ground connection in the right of the plenum chamber

-- Tighten the nut -2- to 9 Nm.

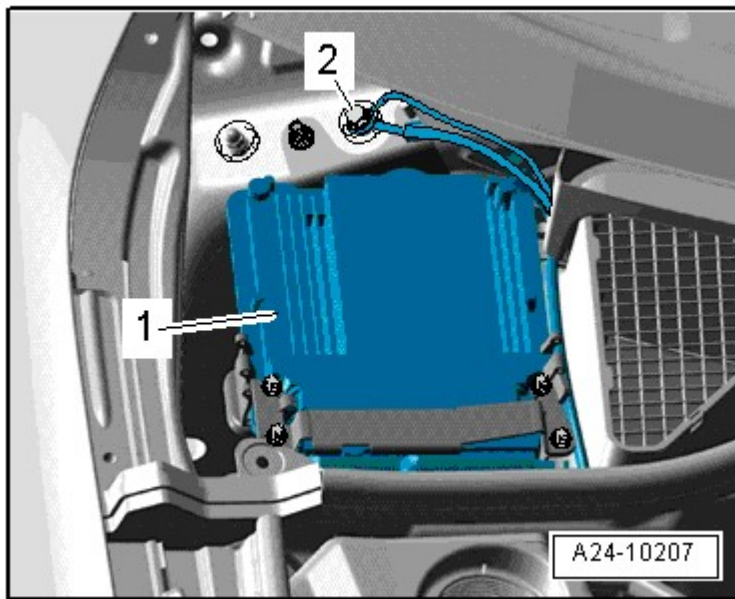


Fig. 92: Location of Engine Control Module (ECM) -J623- -1-
 Courtesy of AUDI OF AMERICA, LLC

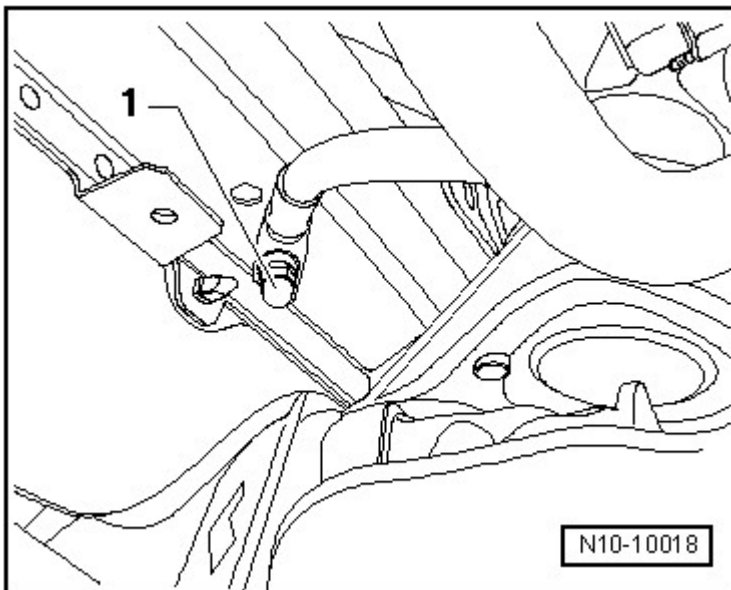


Fig. 93: Identifying Ground (GND) Cable On Longmember
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten the nut -1- to 15 Nm.

Engine/Transmission, Fastening

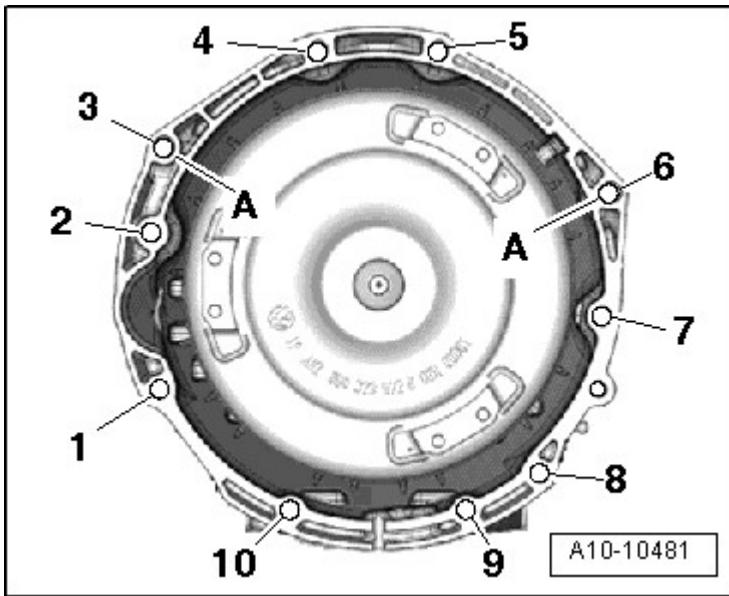


Fig. 94: Identifying Alignment Sleeves -A- And Engine/Transmission Connecting Bolts
 Courtesy of AUDI OF AMERICA, LLC

Item	Bolt	Nm
1, 2	M10x70	45
3 to 6	M12 x 80	80
7	M12x140	80
8	M12x70	80
9, 10	M12x50	80
A	Alignment sleeves for centering	

Procedure

Installation is in reverse order of removal, note the following:

- NOTE:**
- Replace bolts which have been tightened to torque.**
 - Replace self-locking nuts and bolts as well as sealing rings, seals and O-rings.**
 - Only remove the plugs or caps after installing the lines.**
 - Secure all hose connections with hose clamps appropriate for the model.**
 - During installation, all cable ties must be installed at the same location.**

-- Install left and right engine supports.

-- Make sure the alignment sleeves -A- for centering the engine and transmission in the cylinder block are present. Insert the alignment sleeves if they are missing.

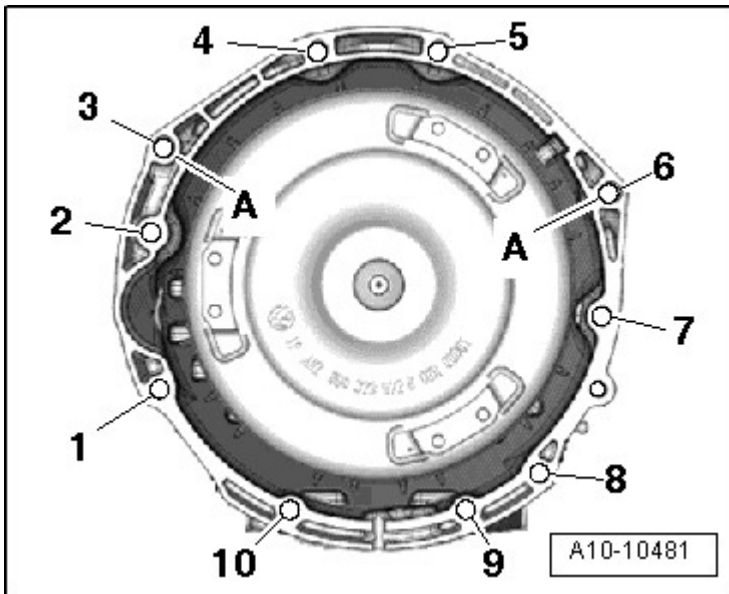


Fig. 95: Identifying Alignment Sleeves -A- And Engine/Transmission Connecting Bolts
 Courtesy of AUDI OF AMERICA, LLC

-- On a vehicle with automatic transmission, check whether bearing bushing -arrow- is inserted at rear of crankshaft. Drive in bushing if necessary.

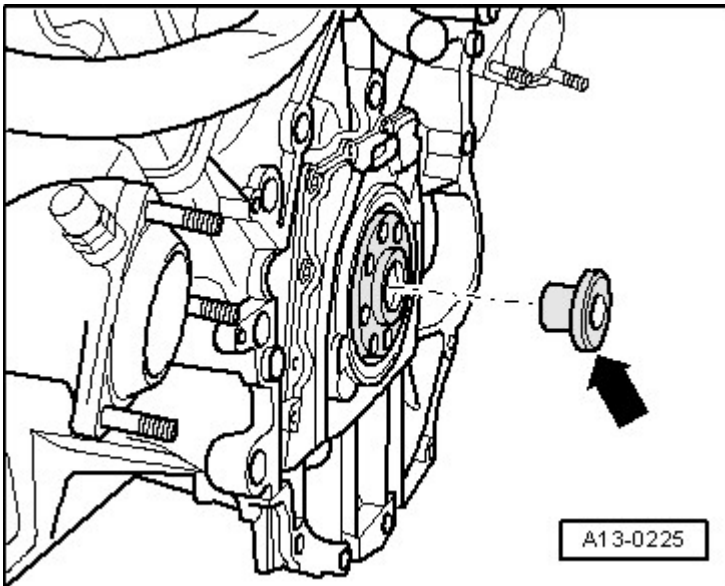


Fig. 96: Identifying Torque Converter Centering Bushing
 Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of destroying ATF pump coupling plate by inserting torque converter incorrectly.

- Check torque converter installation dimension.

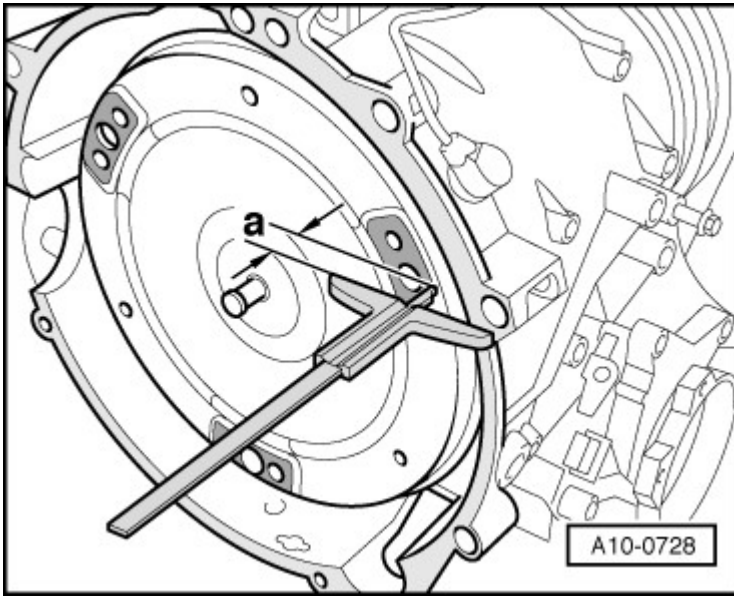


Fig. 97: Measuring Torque Converter
Courtesy of AUDI OF AMERICA, LLC

When torque converter is installed correctly, distance between lower contact surfaces of threaded holes at torque converter and contact surface of bell housing on Automatic Transmission 09D is approximately 22 mm.

If torque converter is not fully engaged, the distance is approximately 10 mm.

-- Before installing an exchanged engine, make sure the semi-circular ring -arrow- is inserted in the power steering pump input shaft.

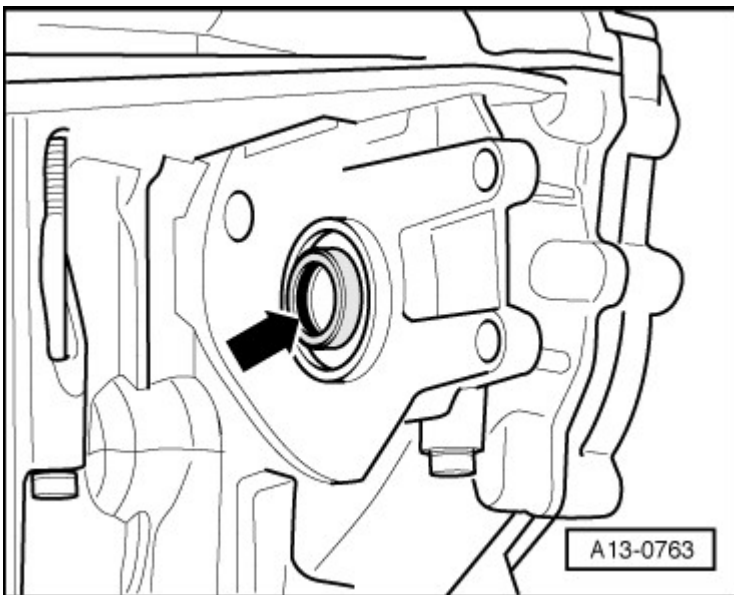


Fig. 98: Checking Whether O-Ring Is Inserted In Power Steering Pump Input Shaft
Courtesy of AUDI OF AMERICA, LLC

-- Before guiding engine and transmission together, rotate torque converter and drive plate so that holes or threaded holes are same height as opening on removed starter -arrows-.

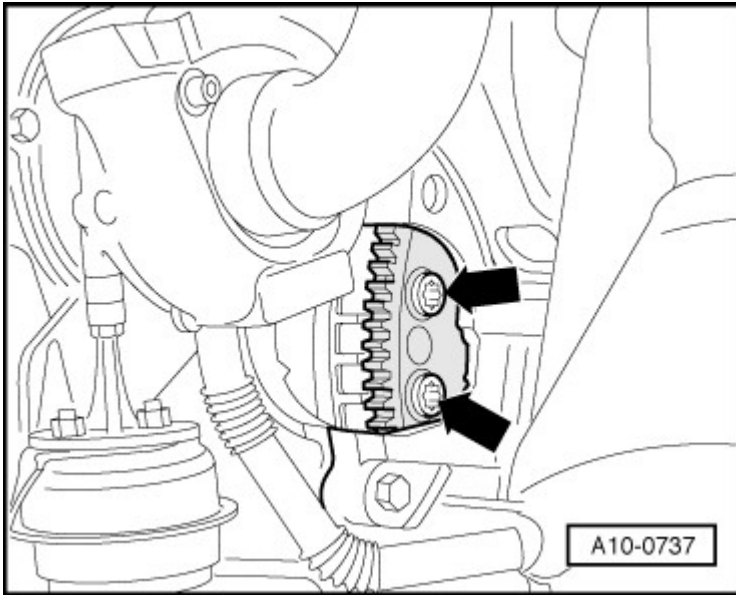


Fig. 99: Identifying Two Torque Converter Bolts Located Close To Each Other -Arrows-
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of destroying automatic transmission.

- Keep checking whether the torque converter behind the drive plate can be turned before and during tightening of the bolts at engine/transmission connection. If the torque converter cannot be turned, it must be assumed that it is inserted incorrectly.
- Only secure torque converter to drive plate with new original bolts.

-- Bolt transmission to engine.

-- Tighten the torque converter. Refer to **TORQUE CONVERTER, INSTALLING** .

The rest of the installation is in reverse order of removal, note the following.

-- Install power steering pressure line. Refer to **Description and Operation** .

-- Install starter. Refer to **REMOVAL AND INSTALLATION** .

-- Install ATF lines. Refer to **ATF PIPES AND COOLER** .

-- Install right rear coolant pipe **REAR RIGHT COOLANT PIPE** .

-- Install left rear coolant pipe. Refer to **REAR LEFT COOLANT PIPES** .

- Install the front driveshaft on the transfer case. Refer to **Removal and Installation** .
- Install primary catalytic converter. Refer to **LEFT PRIMARY CATALYTIC CONVERTER** , **RIGHT PRIMARY CATALYTIC CONVERTER** .
- Using VAS 6131, slowly guide engine/transmission unit with subframe into body from below.
- Align subframe, engine carrier and transmission carrier according to markings applied on longitudinal members during removal.
- Only tighten the subframe, engine carrier and transmission carrier bolts to the specification and only after the vehicle alignment is complete. Refer to **Removal and Installation** .

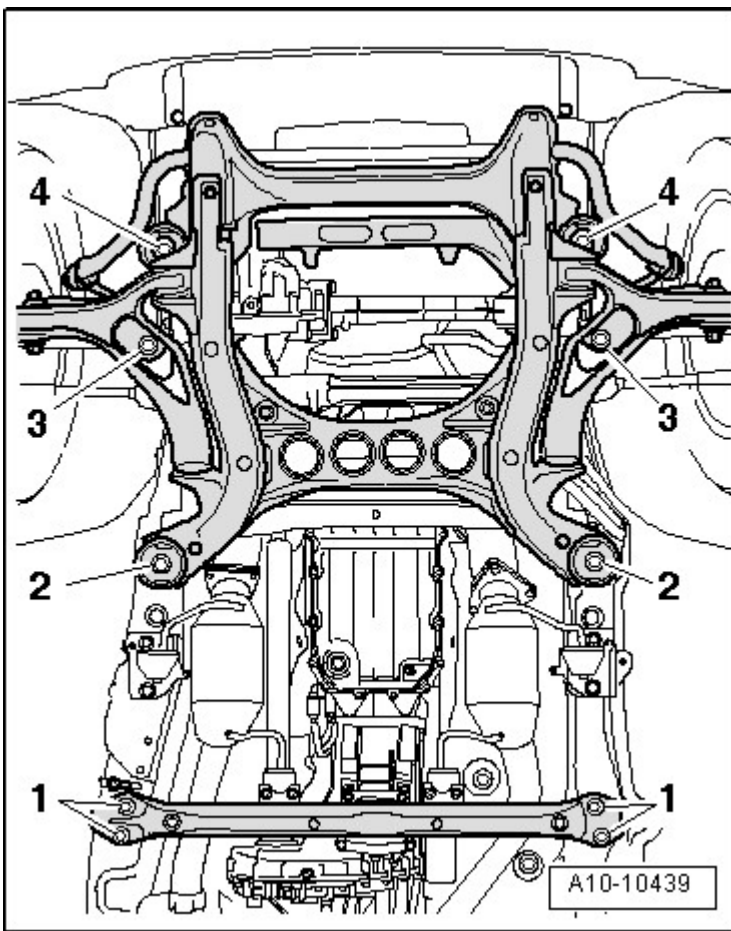


Fig. 100: Identifying Bolts -4- And Engine Carrier Bolts -3-
Courtesy of AUDI OF AMERICA, LLC

WARNING: Risk of accident due to loose connections.

- If the bolts in the subframe are not tightened to final torque, vehicle must not be driven.

- Install universal joint on steering gear. Refer to **Removal and Installation** .
- Install selector lever cable and check adjustment if necessary. Refer to **SELECTOR MECHANISM, CHECKING** .
- Align exhaust system free of tension. Refer to **EXHAUST SYSTEM, INSTALLING** .
- Install the rear driveshaft on the transfer case. Refer to **Removal and Installation** .
- Install stabilizer bar. Refer to **Removal and Installation** .
- Install brake caliper. Refer to **Removal and Installation** .
- Install the suspension struts and control arms. Refer to **Removal and Installation** .
- Install Engine Control Module (ECM). Refer to **Removal and Installation** .
- Remove the plenum chamber E-box cover. Refer to **Removal and Installation** .
- Install refrigerant lines. Refer to **Removal and Installation** .
- Tighten the battery jump start point -U6- pins. Refer to **Fig. 91**.
- Tighten the ground connection on the right longitudinal member. Refer to **Fig. 93**.
- Electrical connections and routing.
- Observe safety precautions after connecting battery. Refer to **Removal and Installation** .

CAUTION: Risk of destroying control modules with excess voltage.

- **Do not use a battery charger for starting assistance!**

- Install wiper arms and adjust. Refer to **WINDSHIELD WIPER ARMS** .
- Fill the engine oil and check the oil level.
- Before starting engine for the first time, check the fluid level in power steering reservoir. Refer to **General Information** .

NOTE: Power-steering pump must not run dry.

- Connect the coolant hoses with the connector coupling. Refer to **Fig. 101**.

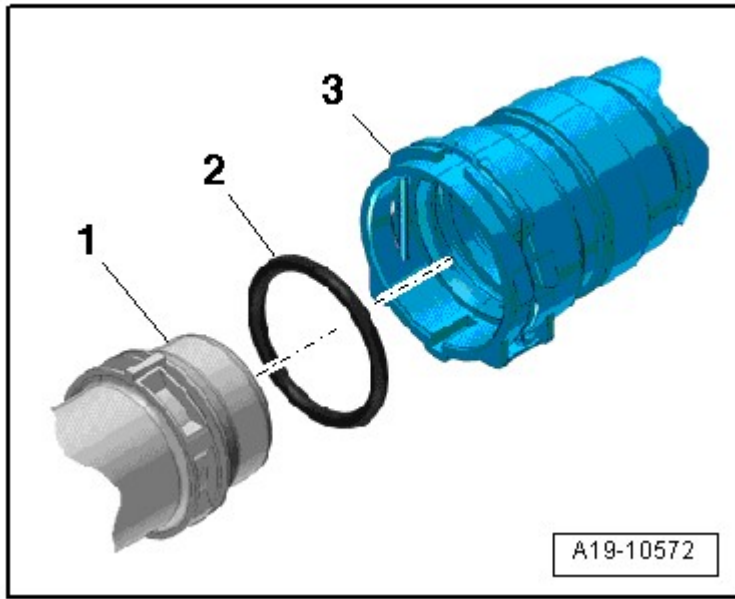


Fig. 101: Connecting Coolant Hose To Coupling
Courtesy of AUDI OF AMERICA, LLC

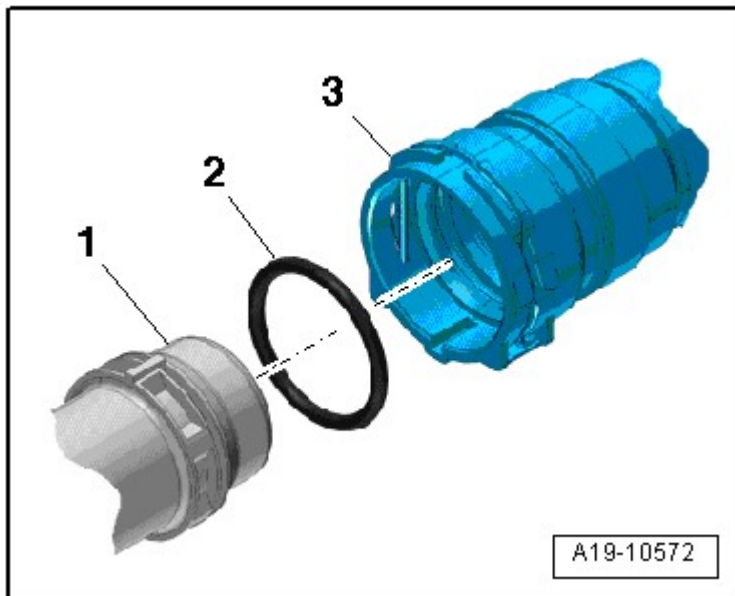


Fig. 102: Connecting Coolant Hose To Coupling
Courtesy of AUDI OF AMERICA, LLC

-- Fill with coolant COOLING SYSTEM, DRAINING AND FILLING => Filling .

NOTE: Do not use drained coolant in the following situations:

If the cylinder head or cylinder block was replaced.

If the coolant is contaminated.

- Fill refrigerant circuit.
- Align subframe and engine carrier. Refer to **Removal and Installation** .
- Align transmission carrier and tighten it. Refer to **Removal and Installation** .
- Install the front wheels and perform an alignment. Refer to **WHEEL ALIGNMENT** .

WARNING: Risk of accident due to loose connections.

- Tighten subframe bolts to final torque after axle alignment.

- Install the noise insulation bracket and the noise insulation. Refer to **Removal and Installation** .
- On a vehicle with air suspension, deactivate vehicle lift mode. Refer to **Description and Operation** .

ENGINE MOUNT**Special tools and workshop equipment required**

- Engine Support Bridge 10-222 A
- Bracket with Spindle and Hook 10-222 A /10, qty. 2
- Adapter 10-222 A /19
- Adapter 10-222 A /22
- Hose Clamps Up to 25 mm Dia. 3094
- Engine Support Basic Set T40091
- Engine Support Supplement Set T40093

Removing

- On a vehicle with air suspension, activate vehicle lift mode. Refer to **Description and Operation** .
- Pull rear engine cover off -arrows-.



Fig. 103: Pulling Rear Engine Cover
Courtesy of AUDI OF AMERICA, LLC

-- Pull front engine cover off -arrows-.

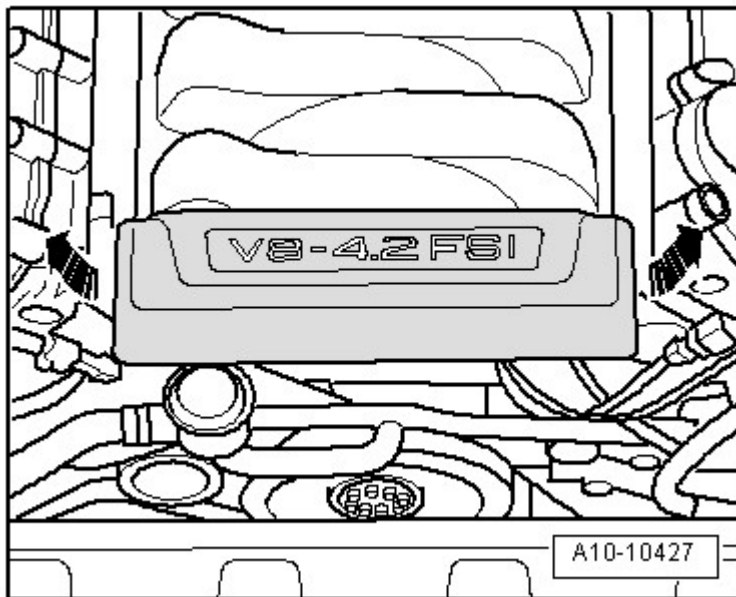


Fig. 104: Identifying Front Engine Cover, Electrical Connector, And Left Air Guide Hose
Courtesy of AUDI OF AMERICA, LLC

-- Remove left and right air filter housing. Refer to **Removal and Installation** .

-- Remove screws and remove front -1- and rear -2- noise insulation.

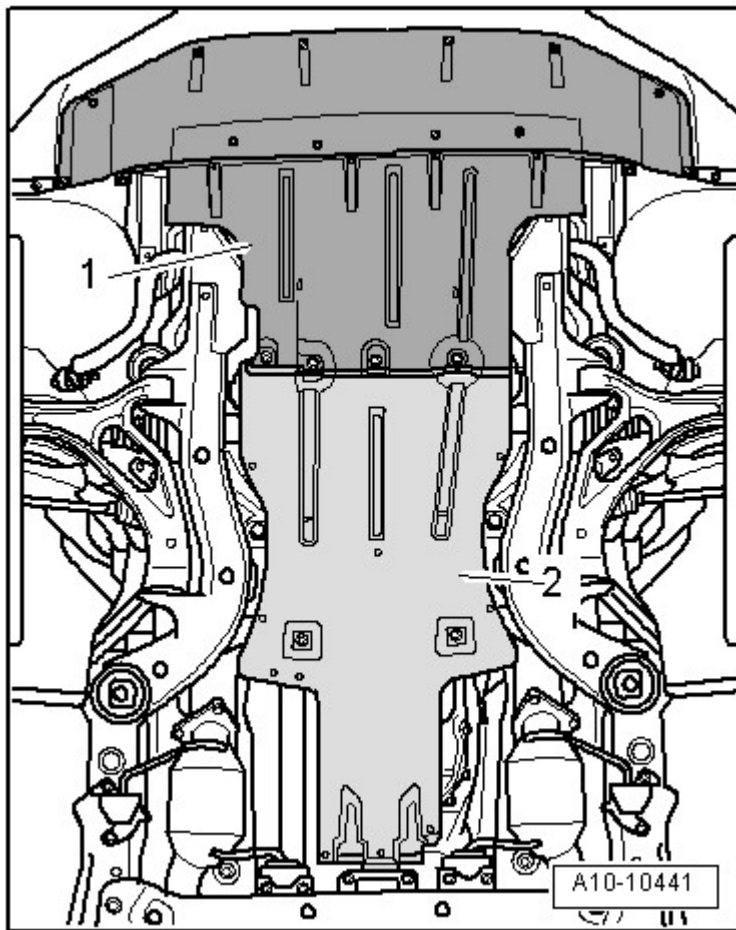


Fig. 105: Identifying Front/Rear Noise Insulation
 Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant line retaining clamp nuts and bolts -arrows-.

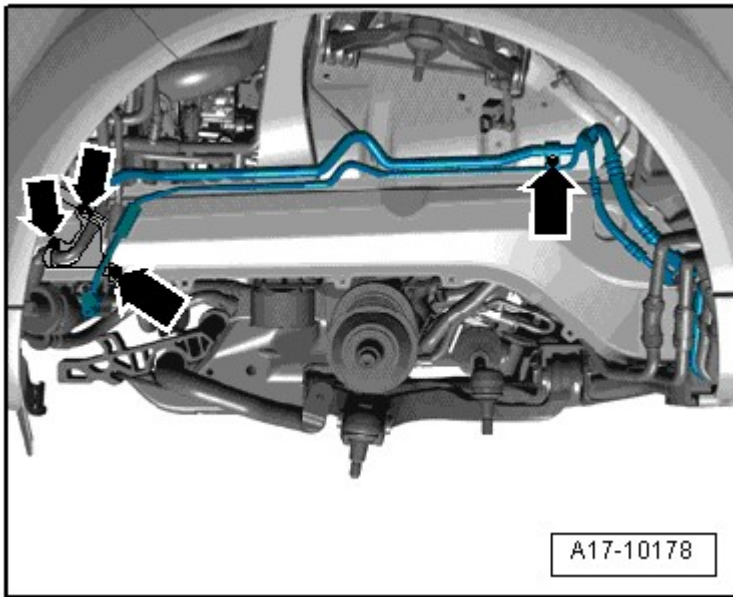


Fig. 106: Identifying Coolant Line Retaining Clamp Nuts And Bolts -Arrows-
 Courtesy of AUDI OF AMERICA, LLC

NOTE: With connections removed, coolant lines can be moved aside slightly to position the 10-222 A /19 on the longitudinal members.

-- Position 10-222 A with 10-222 A /22 and T40091/3 on bolted fender edges.

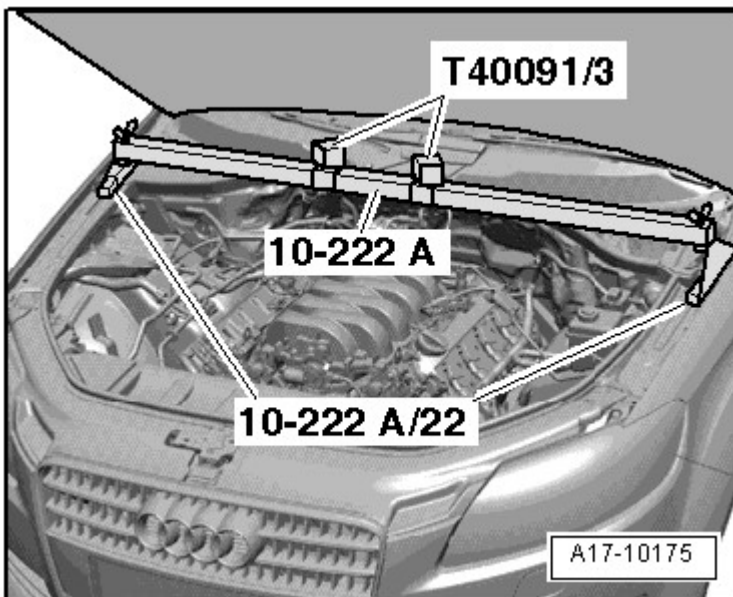


Fig. 107: Identifying 10-222 A With 10-222 A /22 And T40091/3
 Courtesy of AUDI OF AMERICA, LLC

-- Install additional 10-222 A parts as shown in illustration. Position the 10-222 A /19 on the notches on the

longitudinal members.

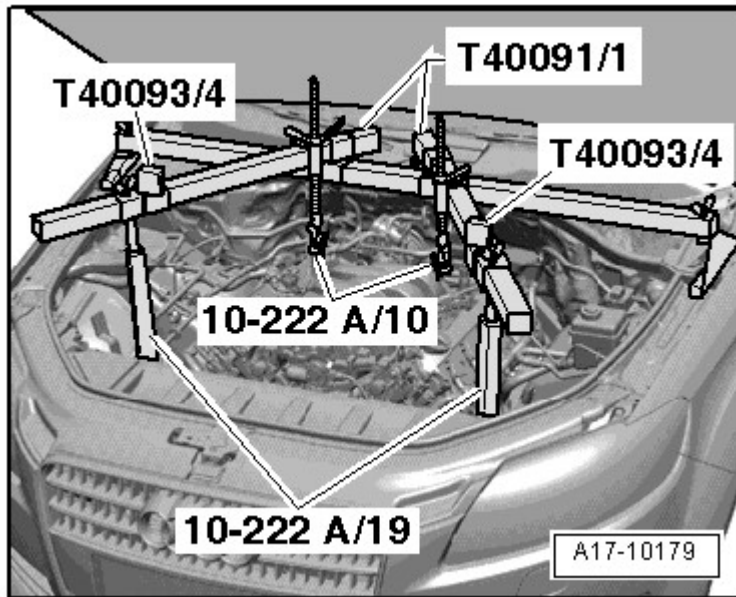


Fig. 108: Engaging 10-222 A /10 In Rear Engine Lifting Eyes
Courtesy of AUDI OF AMERICA, LLC

-- Engage 10-222 A /10 in rear engine lifting eyes.

-- Slide the T40091/2 with both T40093/5 into both connectors T40093/4.

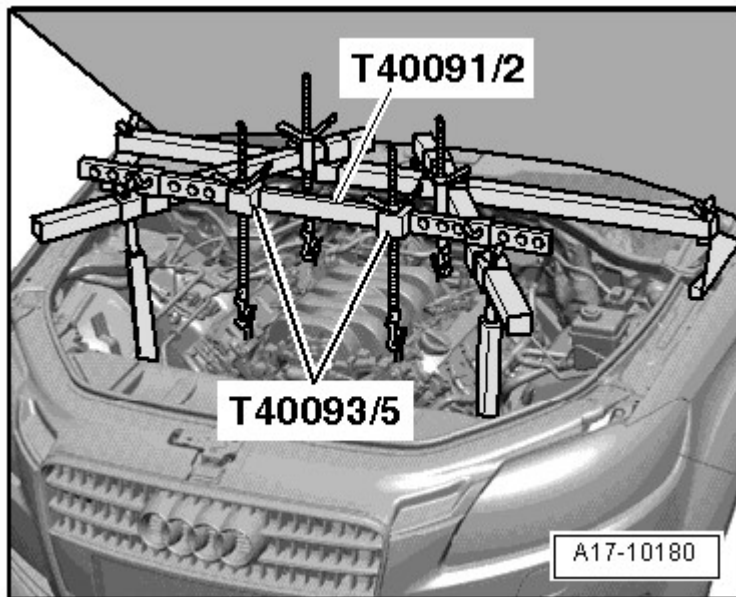


Fig. 109: Sliding T40091/2 With Both Slides T40093/5 Into Both T40093/4
Courtesy of AUDI OF AMERICA, LLC

-- Install long spindles from 10-222 A and engage hooks in front engine lifting eyes.

WARNING: Secure T40091/2 with pins and T40093/4.

-- Raise engine until engine supports are above threaded engine bracket pins and tension all spindles evenly to achieve even weight distribution.

Left engine mount:

Clamp off the return line -1- and suction line -2- at the hydraulic fluid reservoir using 3094.

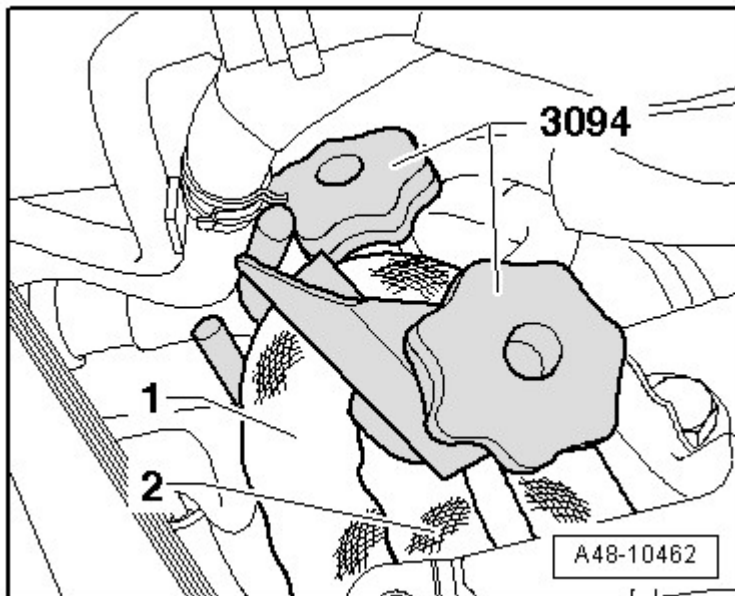


Fig. 110: Clamping Off Return Line -1- And Suction Line -2- At Hydraulic Fluid Reservoir Using 3094
Courtesy of AUDI OF AMERICA, LLC

NOTE: Place a rag under separating point to catch escaping hydraulic fluid.

-- Remove the bolts -1- and nuts -2- and lay the power steering supply pipe aside.

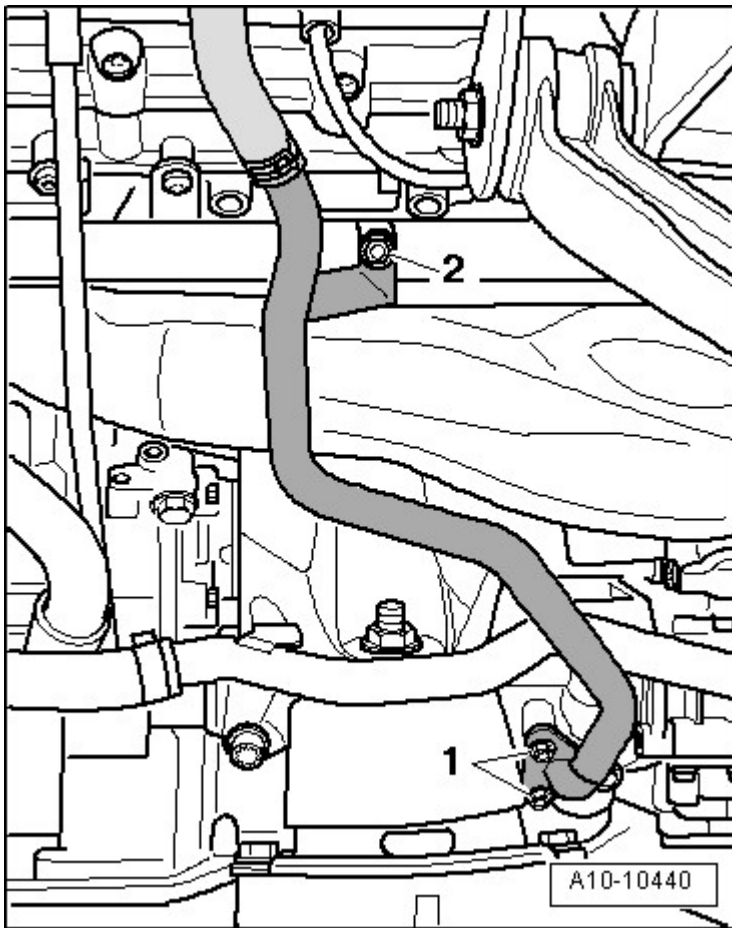


Fig. 111: Identifying Bolts And Nut For Power Steering Supply Line
Courtesy of AUDI OF AMERICA, LLC

Right engine mount:

-- Remove the bolts -1- and the heat shield.

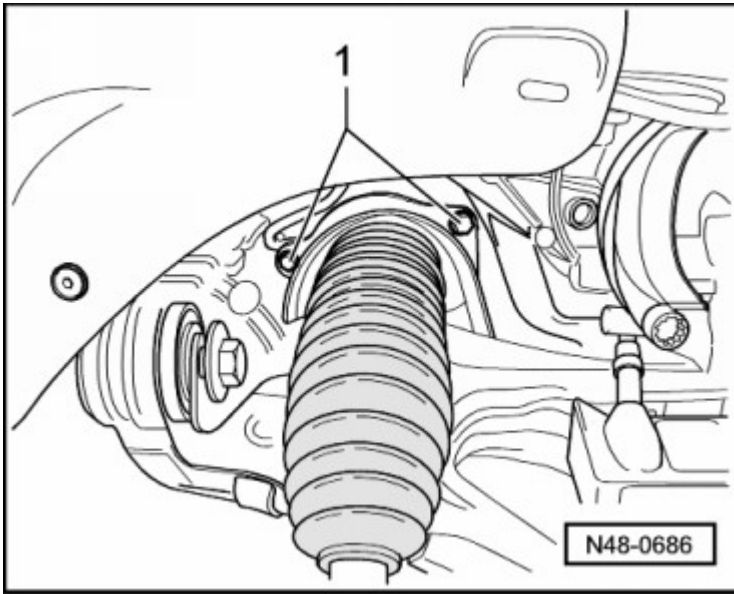


Fig. 112: Identifying Bolts -1- And Heat Shield
 Courtesy of AUDI OF AMERICA, LLC

Continued for both sides:

-- Remove nut -1- and the bolts -arrows-.

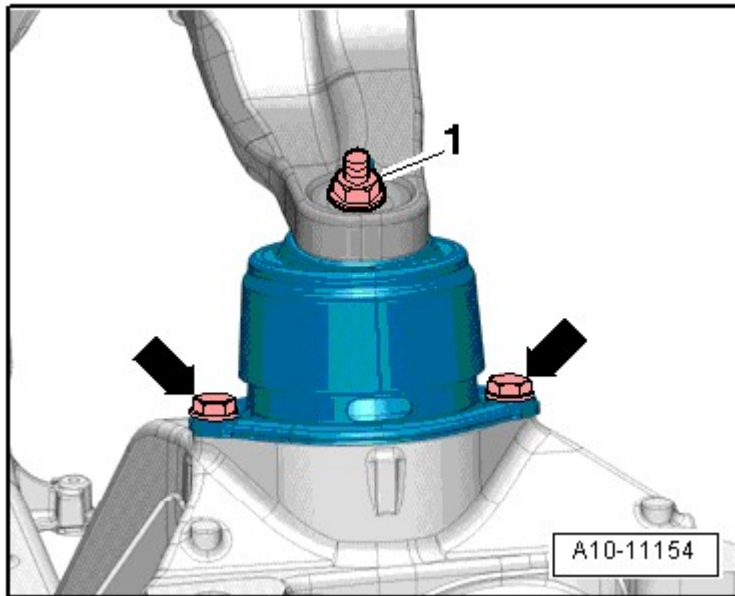


Fig. 113: Identifying Nut -1- And Bolts -Arrows-
 Courtesy of AUDI OF AMERICA, LLC

-- Raise the engine using the spindles far enough so the engine support is above the threaded pins in the engine mount.

-- Remove the engine mount.

NOTE: To remove the right engine support, turn the steering to the right until it stops.

Installing

- Tightening specifications, refer to **SUBFRAME ASSEMBLY OVERVIEW**.

Installation is in reverse order of removal, note the following:

- Install the heat shield for the steering gear boot. Refer to **Removal and Installation** .
- Install the power steering supply pipe. Refer to **Removal and Installation** .
- Check the power steering hydraulic fluid level. Refer to **General Information** .
- Install air filter housing. Refer to **Removal and Installation** .
- On a vehicle with air suspension, deactivate vehicle lift mode. Refer to **Description and Operation** .

SPECIAL TOOLS

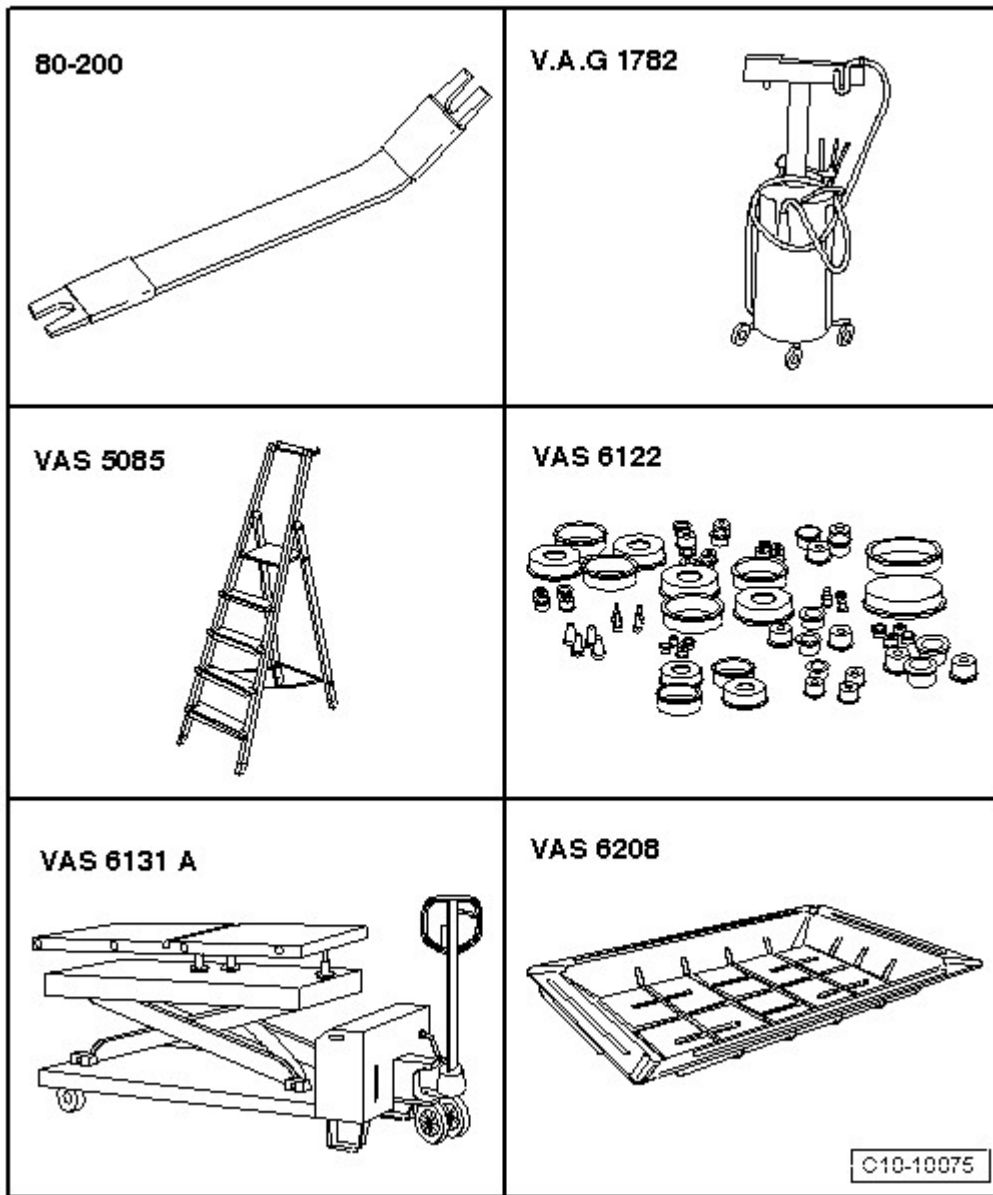


Fig. 114: Identifying Special Tools -- Engine, Removing
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Pry Lever - Rmv Outside Mirror 80 - 200
- Used Oil Collecting and Extracting Device V.A.G 1782
- Step Ladder VAS 5085
- Engine Bung Set VAS 6122
- Scissor Lift Table VAS 6131 A with Support Set VAS 6131/10 as well as Supplementary Set VAS 6131/11, VAS 6131/13 and qty. 3 VAS 6131/10-2
- Drip Tray for Workshop Crane VAS 6208

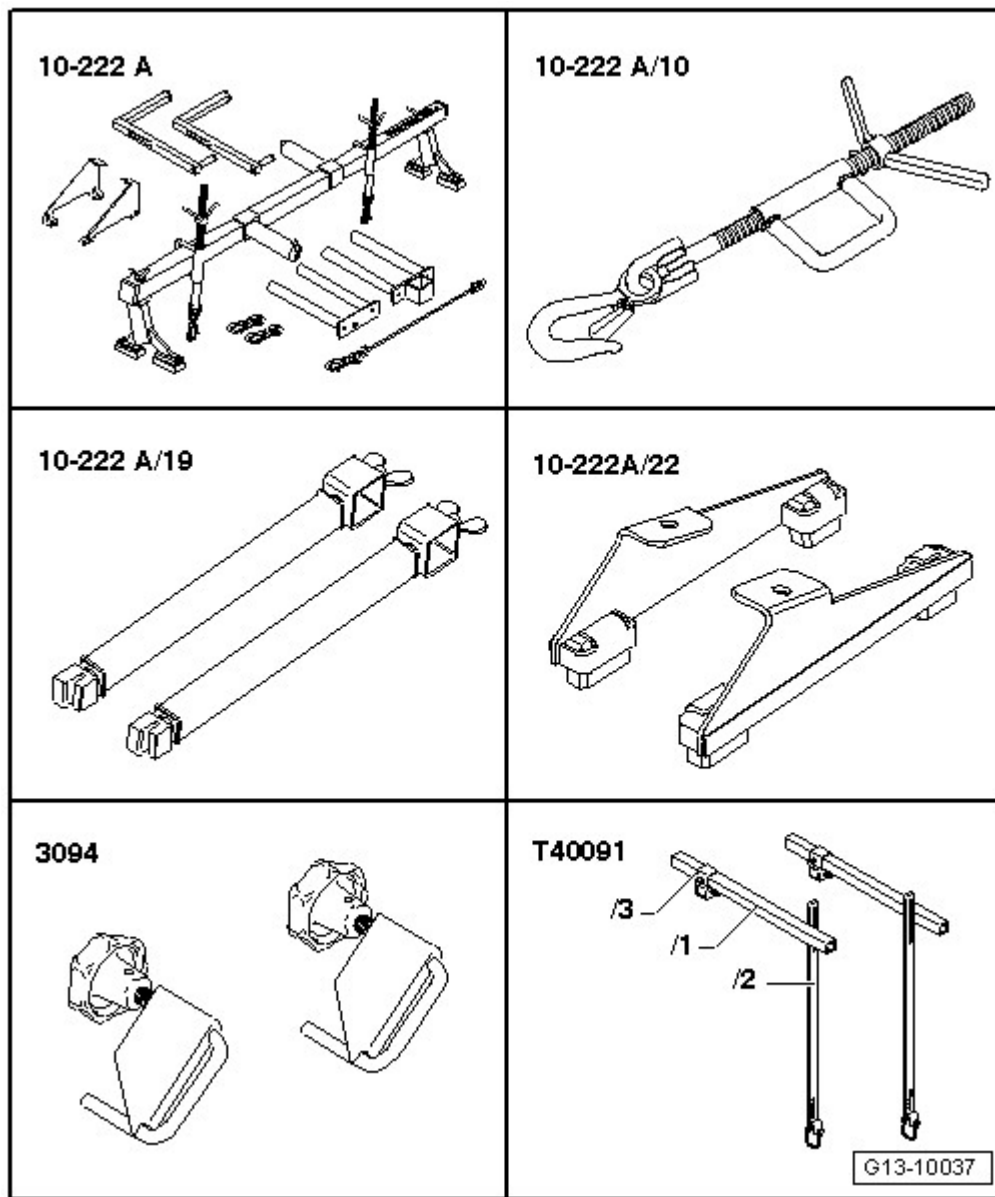


Fig. 115: Identifying Special Tools -- Engine Mount, Replacing
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Engine Support Bridge 10-222 A
- Bracket with Spindle and Hook 10-222 A /10, qty. 2
- Adapter 10-222 A /19
- Adapter 10-222 A /22
- Hose Clamps Up to 25 mm Dia. 3094
- Engine Support Basic Set T40091

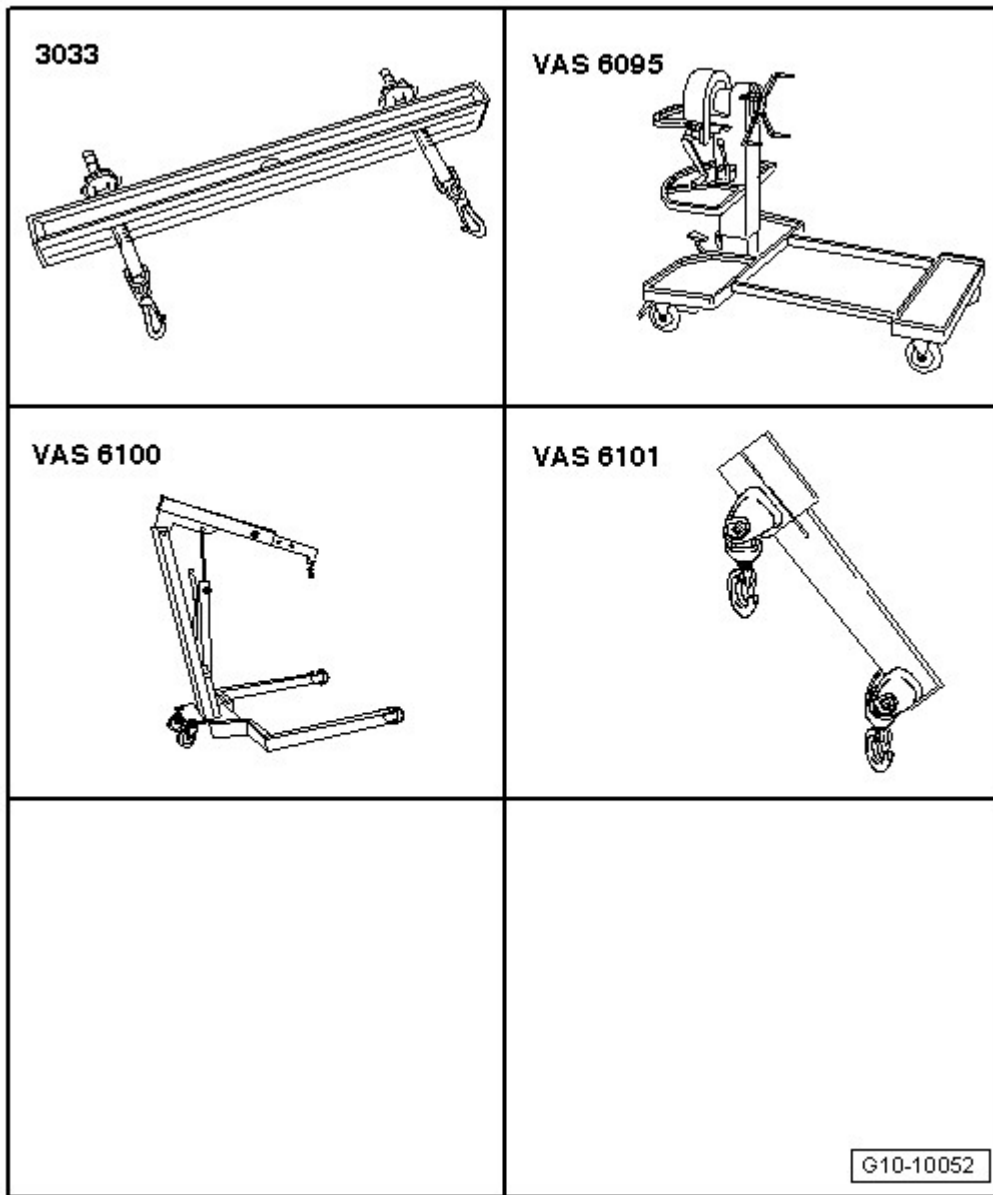


Fig. 116: Identifying Special Tools -- Engine, Securing To Assembly Stand
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Lifting Tackle 3033
- Engine and Transmission Holder VAS 6095 with V8 FSI Engine Holder 6095/1-6A
- Shop Crane VAS 6100
- Lift Arm Extension for Workshop Crane VAS 6101

Special tools and workshop equipment required

- Hose Clamp Pliers VAS 6362

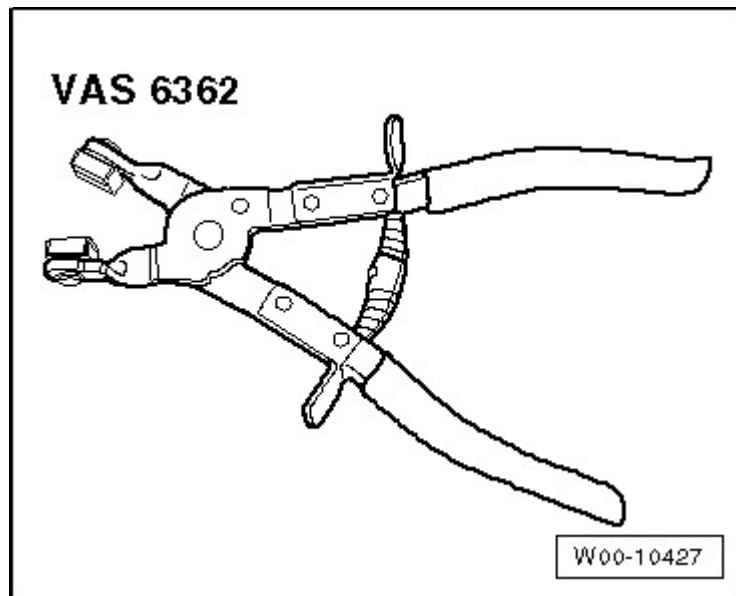


Fig. 117: Identifying Clamp Pliers VAS 6362
Courtesy of AUDI OF AMERICA, LLC

- Counterhold Tool T10172 with T10172/8

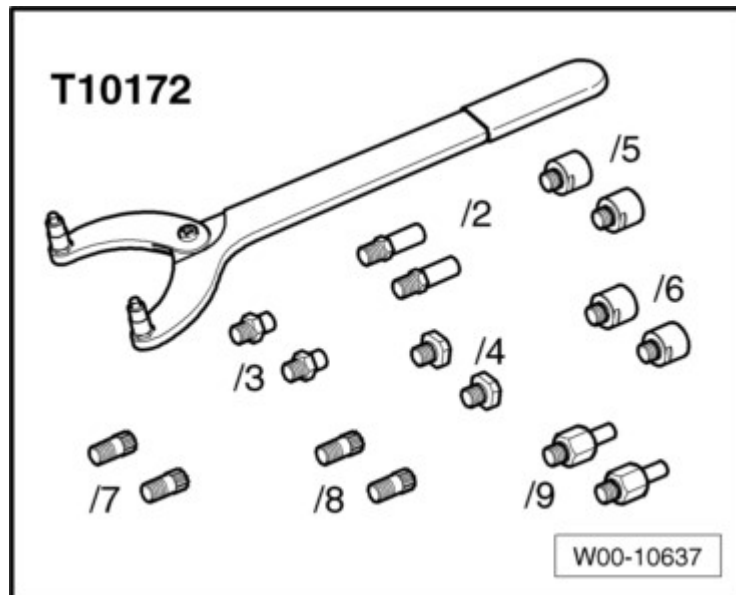


Fig. 118: Identifying Counterhold Tool T10172
Courtesy of AUDI OF AMERICA, LLC

- Ball Joint Puller T10187

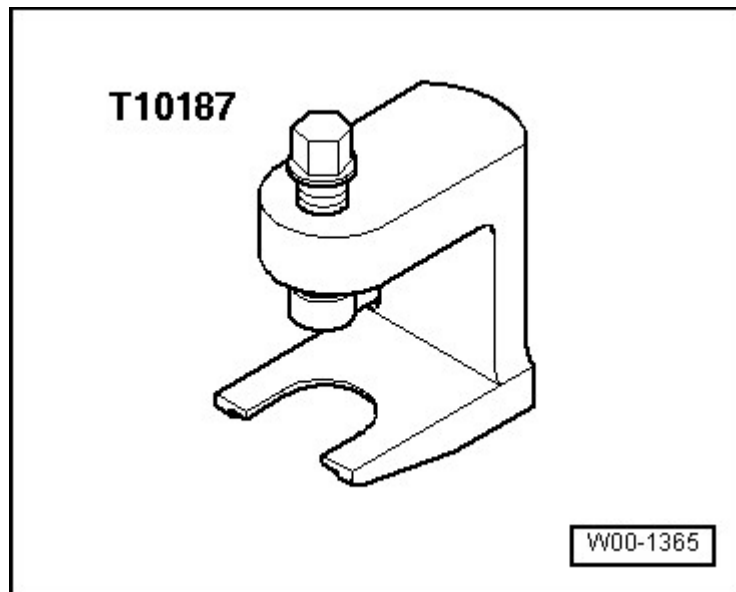


Fig. 119: Identifying Ball Joint Puller T10187
Courtesy of AUDI OF AMERICA, LLC

- Bracket 30-211 A

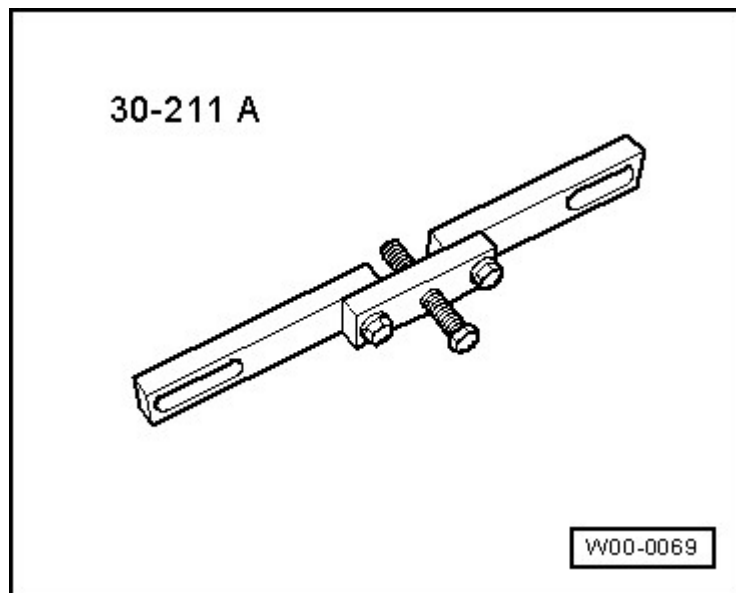


Fig. 120: Identifying Bracket 30-211 A
Courtesy of AUDI OF AMERICA, LLC

- Adapter T40058

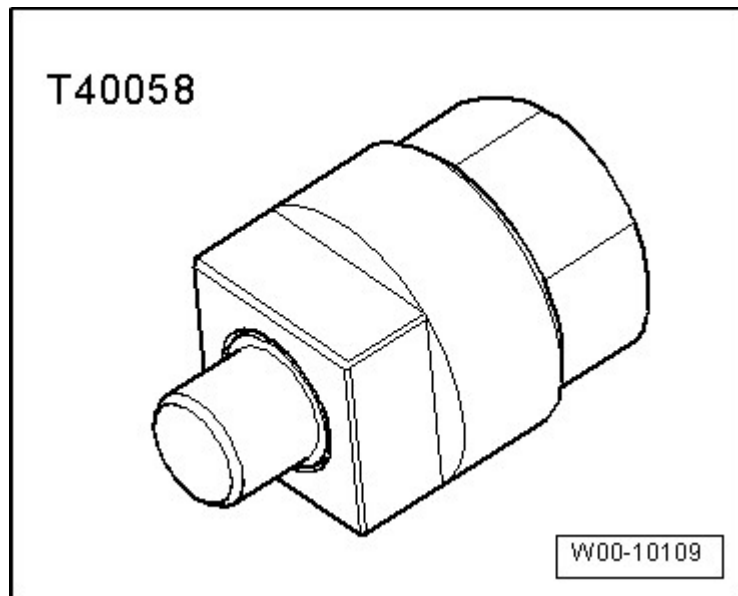


Fig. 121: Identifying Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- Engine Support Supplement Set T40093

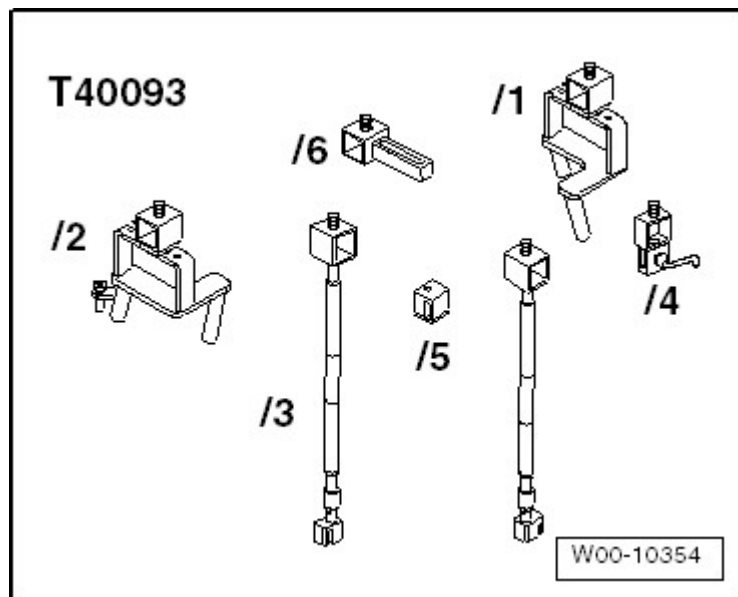


Fig. 122: Identifying Engine Support Supplement Set T40093
Courtesy of AUDI OF AMERICA, LLC

ENGINE**4.2 Liter - Ignition/Glow Plug System - Engine Code(s): BAR****28 IGNITION/GLOW PLUG SYSTEM****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS**

Component	Bolt Size	Nm
Wiring for Ignition Coils at Cylinder Head Cover		5

TECHNICAL DATA

Engine codes	BAR (4.2L / 4V / 257 kW engine)
Idle speed (not adjustable)	Approximately 650 RPM ⁽¹⁾
Ignition timing	Not adjustable, regulated by control module
Ignition/Glow Plug System	Single coil ignition system with 8 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables.
Spark plugs	Names
	Tightening Specifications
Ignition sequence	1-5-4-8-6-3-7-2
(1) Depending on engine control module (ECM) requirements.	

REMOVAL AND INSTALLATION**IGNITION COILS****Special tools and workshop equipment required**

- Ignition Coil Puller T40039

Removing**Cylinder bank 2 (left)**

-- Disconnect electrical connector -2- at Mass Air Flow (MAF) Sensor 2 -G246--.

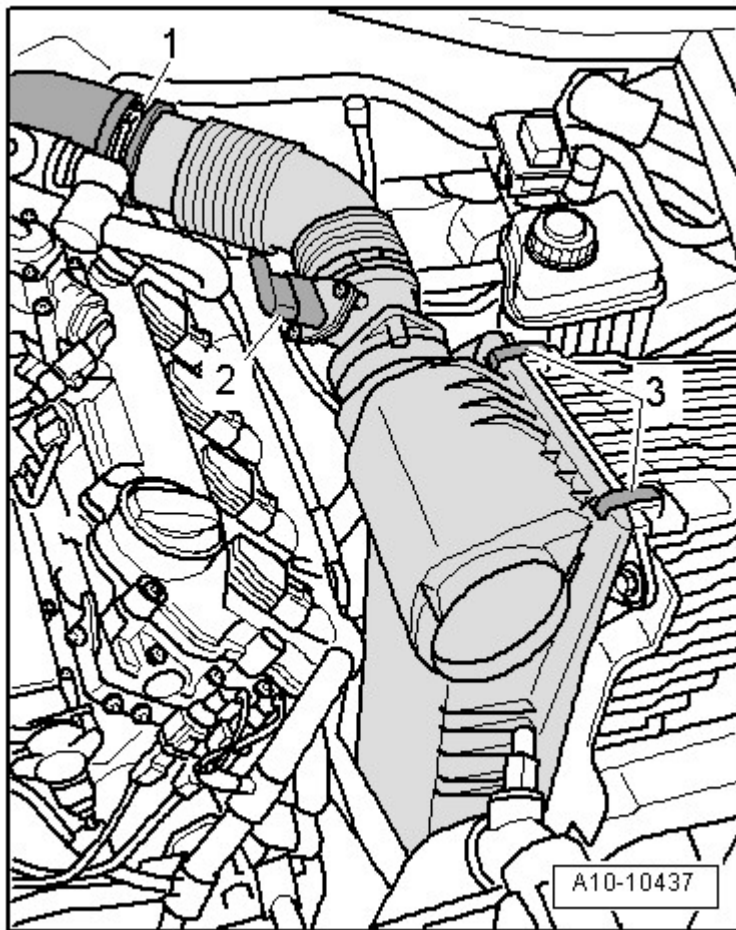


Fig. 1: Locating Electrical Connector, Air Guide Hose, And Retaining Clips
Courtesy of AUDI OF AMERICA, LLC

- Remove left air guide hose -1- from air duct.
- Release clips -3- and remove the left air filter upper section.
- Remove oil dipstick -1- from guide tube.

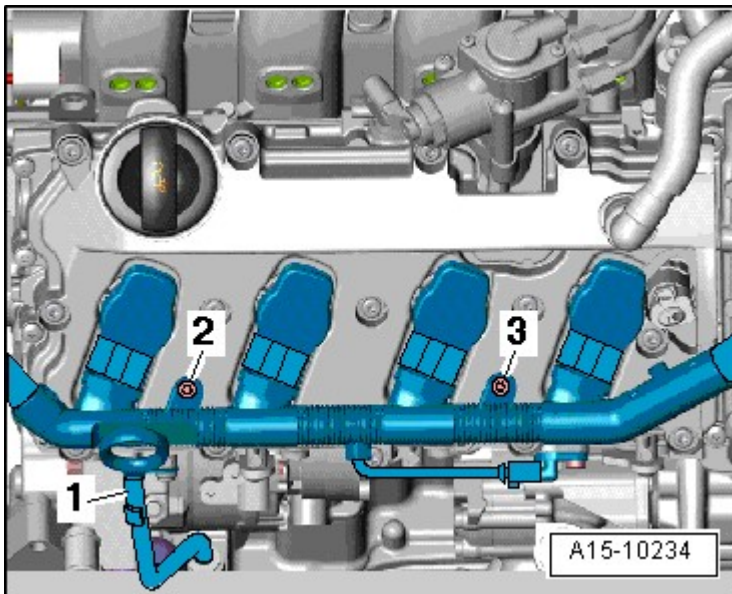


Fig. 2: Identifying Oil Dipstick, Bolts & Ignition Coils Electrical Harness Connectors
Courtesy of AUDI OF AMERICA, LLC

- Remove the bolts -2- and -3-.
- Disconnect electrical harness connectors at ignition coils.
- Press electrical wiring harness to side.

Cylinder bank 1 (right)

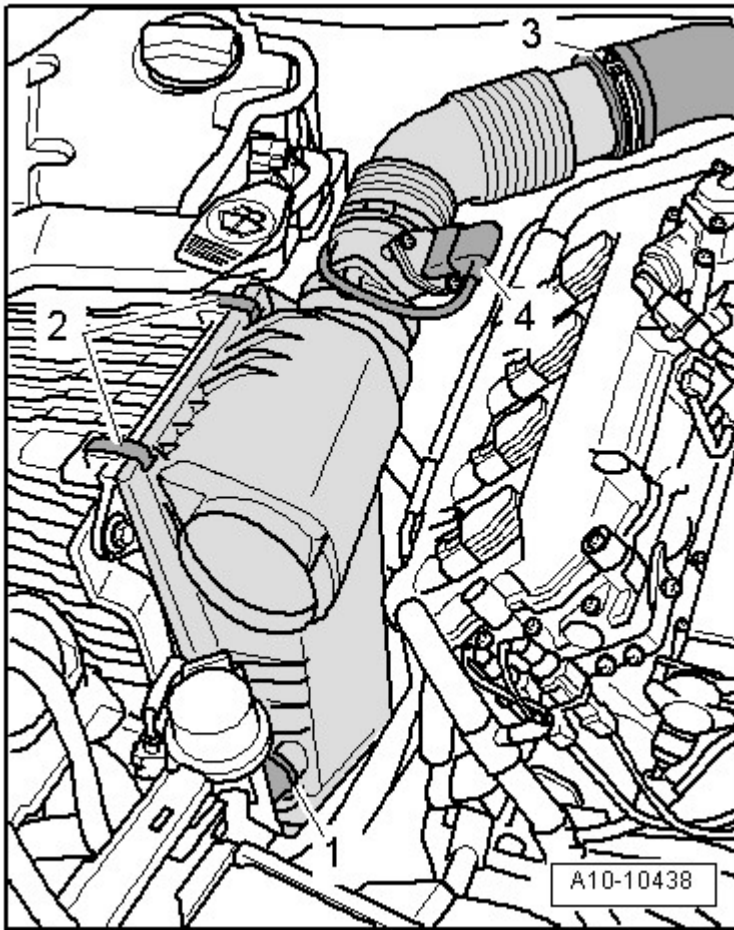


Fig. 3: Identifying Hose To Secondary Air Injection Pump, Electrical Harness Connector, Right Air Guide Hose, And Retaining Clips

Courtesy of AUDI OF AMERICA, LLC

- Disconnect hose -1- to Secondary Air Injection (AIR) pump.
- Disconnect electrical harness connector -4- at Mass Air Flow (MAF) Sensor -G70-.
- Remove right air guide hose -3- from air duct.
- Open the clips -2- and remove the right air filter upper section from the air filter lower section.

Vehicles with air suspension

NOTE: If necessary, remove electrical connector for Heated Oxygen Sensor (HO2S) 2 - G108- from bracket at right strut tower for better access.

- Press circlip -1- forward from hose coupling.

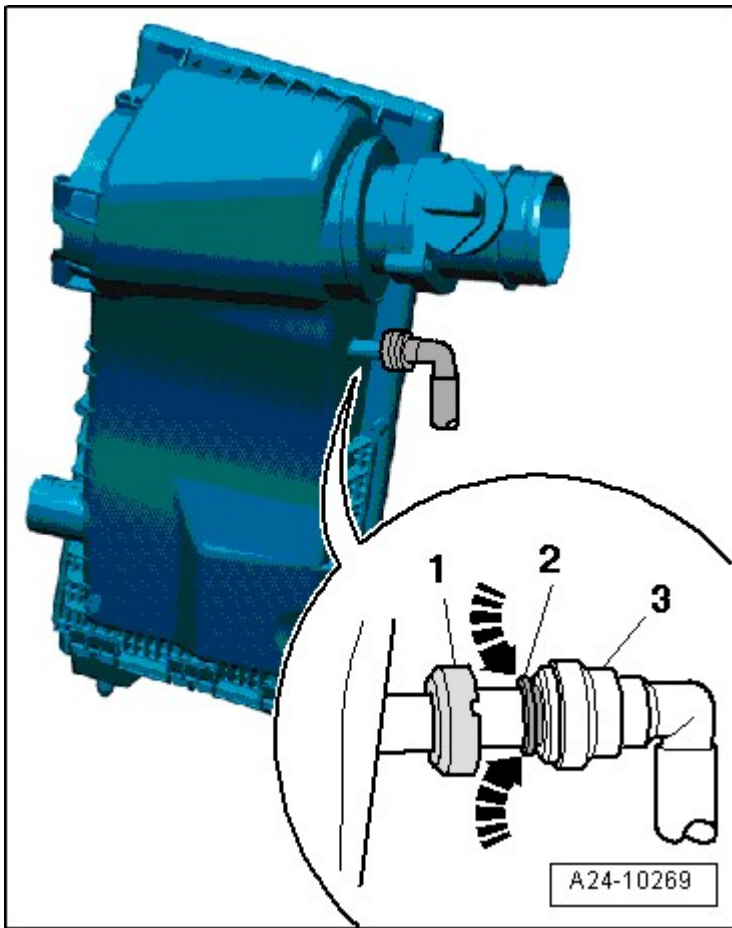


Fig. 4: Circlip, Release Ring And Ventilation Hose
Courtesy of AUDI OF AMERICA, LLC

-- Press the release ring -2- down -arrows- and remove the ventilation hose -3- from the air filter upper section.

All:

-- Remove the bolts -1- and -2-.

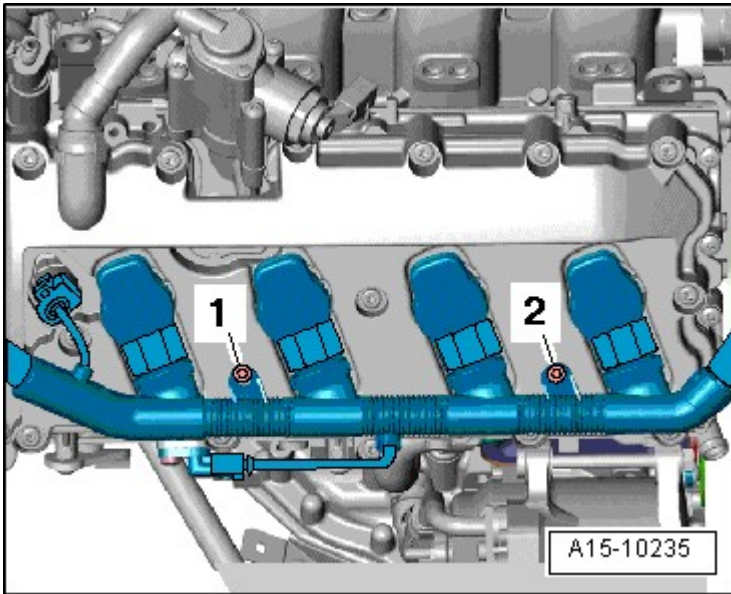


Fig. 5: Identifying Bolts & Ignition Coils Electrical Harness Connectors
Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical harness connectors at ignition coils.
- Press electrical wiring harness to side.

Continued for both sides

- Remove the ignition coils using the T40039.

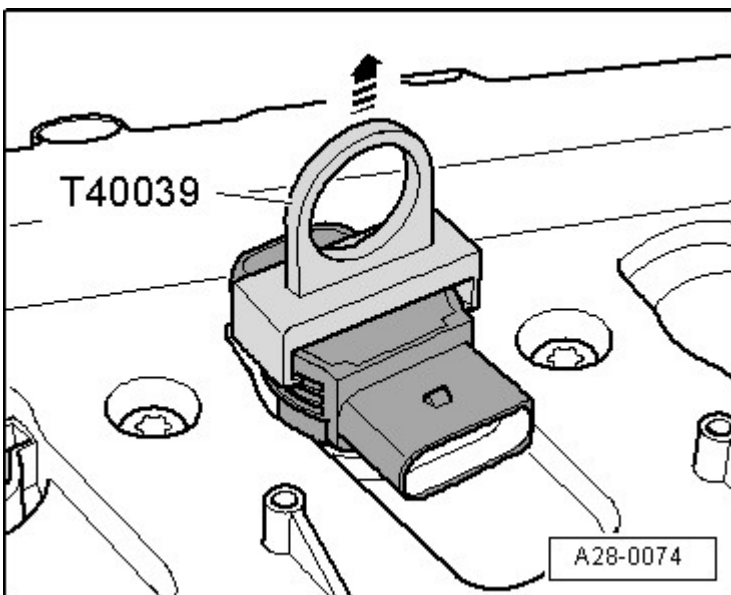


Fig. 6: Identifying Ignition Coil Puller T40039 To Remove Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

Installing

Installation is in reverse order of removal.

Tightening Specifications

Component	Nm
Wiring for Ignition Coils at Cylinder Head Cover	5

SPECIAL TOOLS

Special tools and workshop equipment required

- Ignition Coil Puller T40039

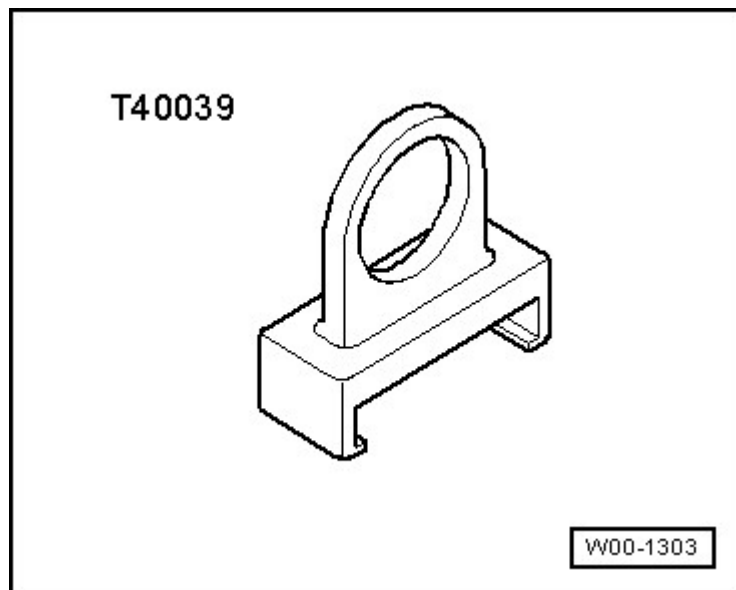


Fig. 7: Identifying Extractor T40039
Courtesy of AUDI OF AMERICA, LLC