

ENGINE

3.2 Liter - General, Technical Data - Engine Mechanical - Engine Code(s): CALA (Coupe) (As of 11.2007)

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 **BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM.**

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 the injection and ignition system wiring or tester cables.
- Only clean engine with ignition switched off.
- If electrical connectors were disconnected, faults are saved in ECM:

-- Connect vehicle diagnosis, testing and information system VAS 5051B.

-- Start "Guided Functions" operating mode.

-- Generate readiness code in ECM.

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

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

-- Disconnect battery **Removal and Installation** .

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.

Note the Following When Working on the Subframe

CAUTION: Suspension components could be damaged.

- Do not rest the vehicle on its wheels if the subframe mount, steering gear or subframe cross brace are not installed correctly.
- Do not support the vehicle on the subframe or the subframe cross brace (e.g. by a floor jack or similar device).

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.

Risk of passenger airbag deploying in an accident.

- 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.

BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM

- The fuel injection system is separated into a high-pressure section (maximum approximately 120 bar) and a low-pressure section (approximately 6 bar).
- Before a component in the fuel injection system high pressure area is removed, the fuel pressure must be reduced to a residual pressure of approximately 6 bar, as described in the following.

Special tools and workshop equipment required

- Vehicle diagnostic, testing, and information system VAS 5051B

Procedure

Proceed as follows:

-- With ignition off, connect vehicle diagnosis, testing and information system VAS 5051B to the Data Link

Connector (DLC) using diagnostic lead.



Fig. 1: Connecting Diagnostic Cable VAS 5051/5A To Diagnostic Connector
Courtesy of AUDI OF AMERICA, LLC

-- Start engine and let it run at idle.

Display on VAS 5051B:

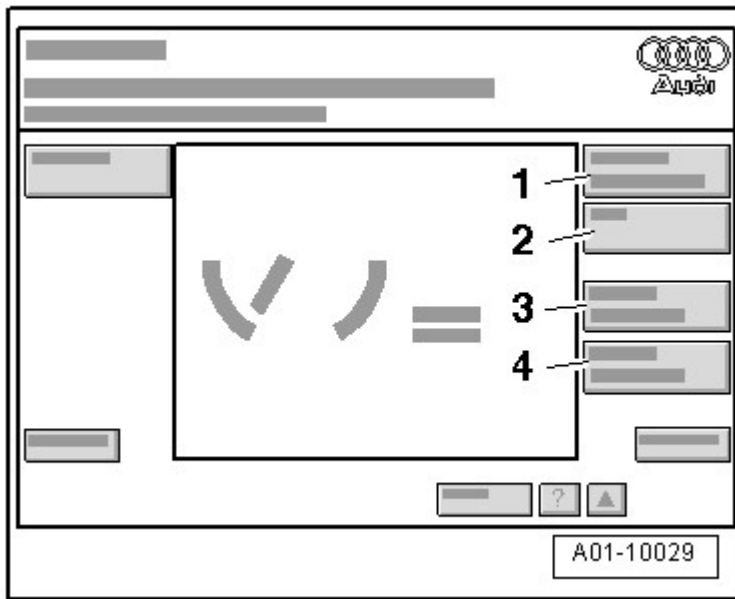


Fig. 2: Display On VAS 5051B - Vehicle Self-Diagnosis Button
Courtesy of AUDI OF AMERICA, LLC

-- Press the **Vehicle Self-Diagnosis** button -1- in selection.

Display on VAS 5051B:

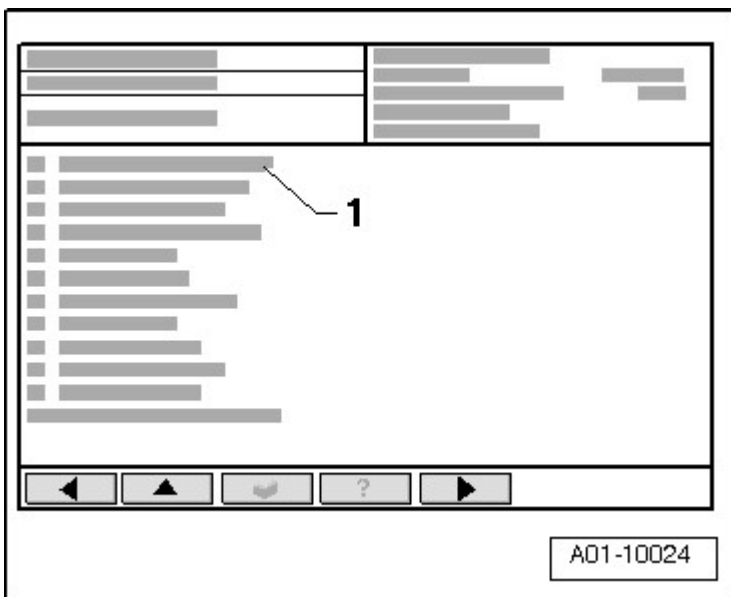


Fig. 3: Display On VAS 5051 - "006 - Basic Setting"
Courtesy of AUDI OF AMERICA, LLC

-- In selection -1-, press "On Board Diagnostic (OBD)" and continue by pressing --> button.

Display on VAS 5051B:

2009 Audi A5 Quattro

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Fig. 4: Display On VAS 5051 - "01 - Engine Electronics"
Courtesy of AUDI OF AMERICA, LLC

-- In selection -1-, press "Engine electronics" vehicle system and continue by pressing --> button.

Display on VAS 5051B:

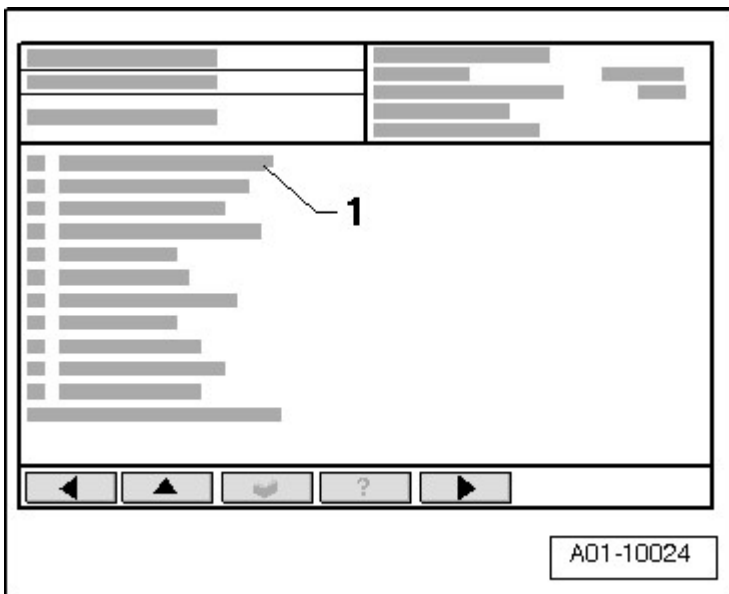


Fig. 5: Display On VAS 5051 - "006 - Basic Setting"
Courtesy of AUDI OF AMERICA, LLC

-- In selection -1-, press "Measured values" function and continue by pressing --> button.

Display on VAS 5051B:

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Fig. 6: Display On VAS 5051 - "006 - Basic Setting"
Courtesy of AUDI OF AMERICA, LLC

-- In selection -1-, press "Fuel pressure" measured value and continue by pressing --> button.

Display on VAS 5051B:

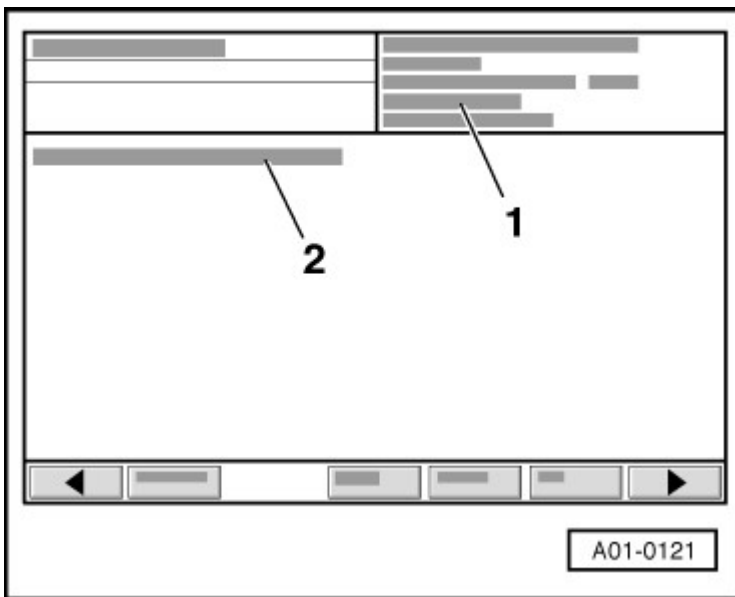


Fig. 7: VAS 5051 Tester Displaying Control Module Identification And Coding
Courtesy of AUDI OF AMERICA, LLC

-- Check display -2- for fuel pressure in fuel rail.

- With engine at idle, a value of approximately 35 kPa is displayed. This is the actual pressure in the fuel system generated by the high pressure pump.

NOTE: The unit "kPa" is also used instead of "bar" : 1 bar = 1 kPa.

-- Pry cover -1- on left of instrument panel off, for example using trim removal wedge 3409 -arrow-.

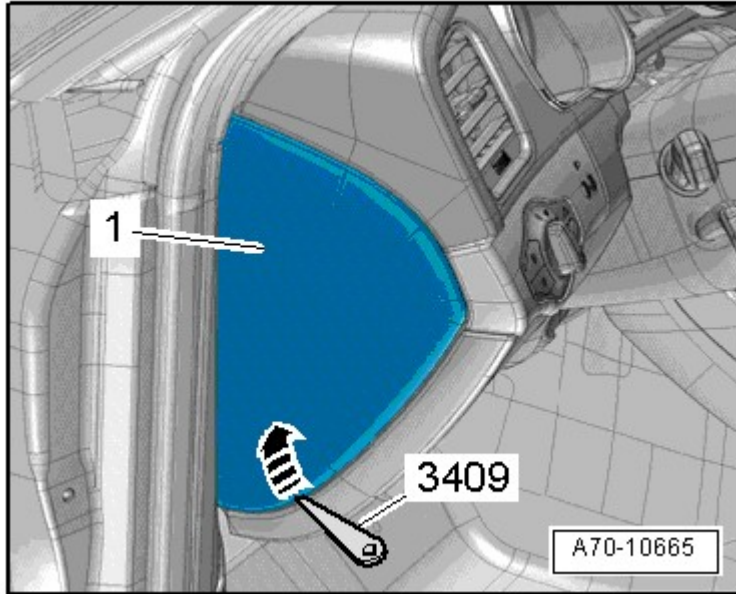


Fig. 8: Identifying Instrument Panel Cover
Courtesy of AUDI OF AMERICA, LLC

-- Remove fuse 3 -SC3- (third from top) in driver side instrument panel fuse holder -ST2- (brown).

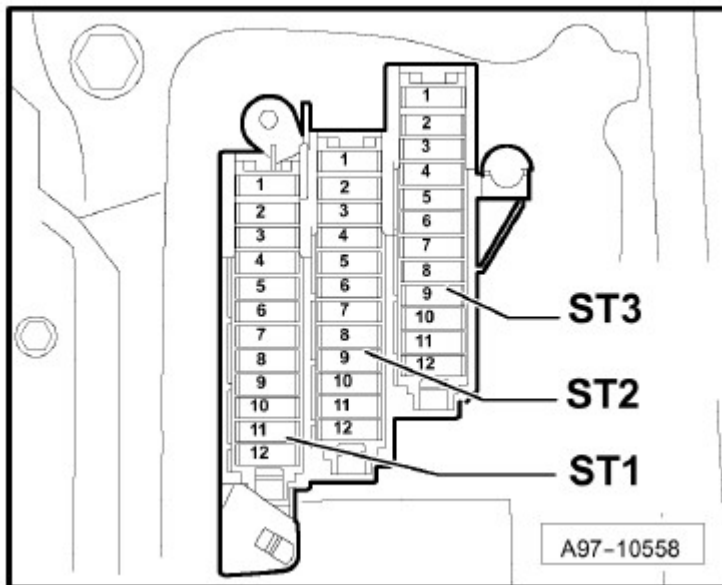


Fig. 9: Identifying Fuse Carrier
Courtesy of AUDI OF AMERICA, LLC

Display on VAS 5051B:

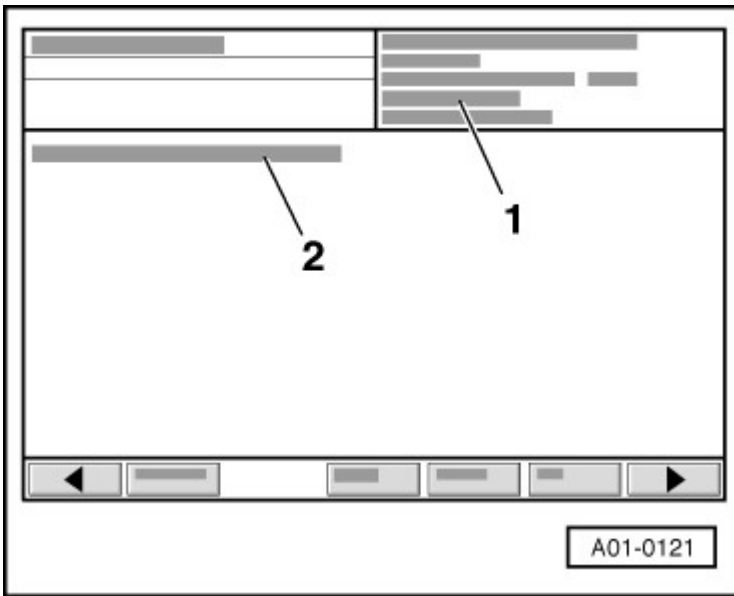


Fig. 10: VAS 5051 Tester Displaying Control Module Identification And Coding
Courtesy of AUDI OF AMERICA, LLC

-- With engine still running, checking display -2- for fuel pressure in fuel rail:

- The fuel pressure decreases rapidly because the mechanical high pressure pump is no longer supplied with fuel by the electrical fuel pump.

-- Switch ignition off as soon as fuel pressure drops just below 8 kPa.

NOTE: **The fuel pressure must not drop below 6 bar or the engine will shut off (the catalytic converter could be damaged).**

The fuel rail will continue to be filled with fuel, but it will no longer be under high pressure.

WARNING: Do not let fuel come into contact with skin.

- **Wear protective eye wear and clothing when opening the fuel system.**
- **Lay clean cloths around the connection before opening the high pressure area to collect any fuel that leaks out.**

-- Loosen wire at a connection immediately.

NOTE: **If the high pressure system is not opened immediately, the pressure will increase because of post-heating.**

Final Procedures

-- Insert fuse 3 -SC3- (third from top) in driver side instrument panel fuse holder -ST2- (brown).

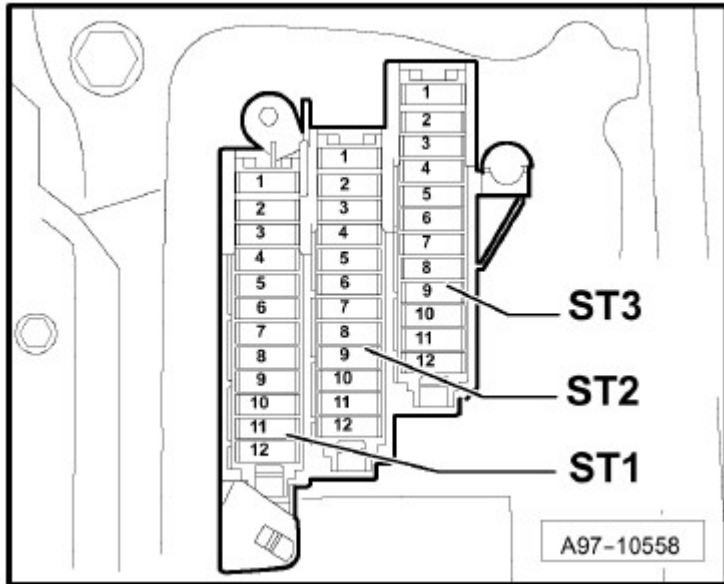


Fig. 11: Identifying Fuse Carrier

Courtesy of AUDI OF AMERICA, LLC

- Connect vehicle diagnosis, testing and information system VAS 5051B while ignition is switched off.
- Start "Guided Functions" operating mode.
- Generate readiness code in engine control module .

CLEAN WORKING CONDITIONS

Even a little contamination can lead to faults. When working on the fuel supply and 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.
- Plug open lines and connections immediately with appropriate protective caps.
- Place parts that have been removed on a clean surface and cover them. Use 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 outside of their original packaging (e.g. in tool boxes etc.).
- When system is open: Do not work with compressed air. Do not move vehicle unless absolutely necessary.
- Protect disconnected electrical connectors from dirt and moisture and only connect if dry.

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.

If there are doubts about the suitability of parts, generally use new parts.

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.

FUEL SYSTEM, CHECKING FOR LEAKS

Proceed as follows:

- Let engine run a few minutes at a moderate speed.
- Switch off ignition.
- Check 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 high pressure area again for leaks.

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.

ENGINE NUMBER

NOTE: **The engine number is only visible if the front engine cover is removed.**

- The engine number ("engine code" and "serial number") is located at front on cylinder block at top -arrow 1-.

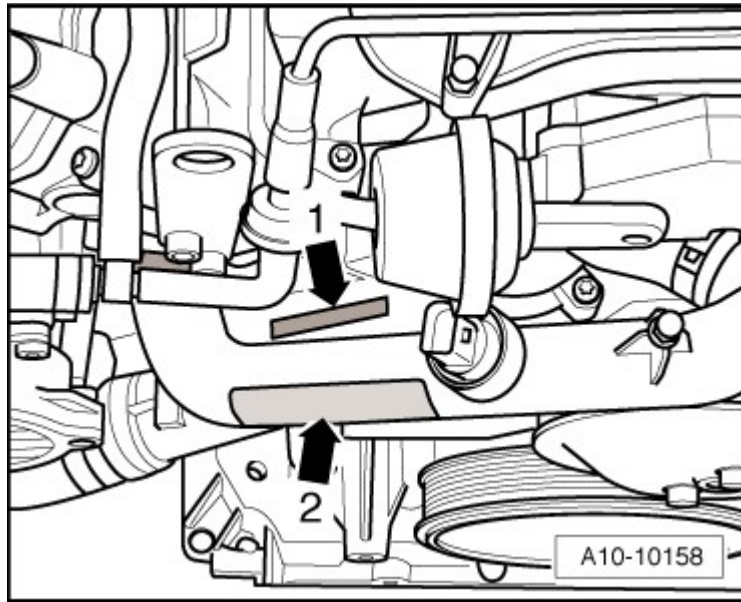


Fig. 12: Identifying "Engine Code" And "Serial Number"
 Courtesy of AUDI OF AMERICA, LLC

- Engine codes beginning with "C" are four-digit.
- The first 3 digits of the engine code stand for displacement and mechanical structure of the engine. They are stamped in the cylinder block, including the serial number.
- The fourth digit describes the engine output and torque and depends on the engine control module.

NOTE: Ignore -arrow 2-.

The 4 digit engine code is on the type plate, vehicle data label and engine control module.

Locations of the type plate and vehicle data label .

SPECIFICATIONS

ENGINE DATA

Code letters		CALA
Displacement	liter	3.123
Output	kW at RPM	195 at 6500
Torque	Nm at RPM	330 at 3250
Bore	dia. mm	84.5
Stroke	mm	92.8
Compression ratio		12.0
RON	at least	95 ¹⁾
Fuel injection and ignition system		Simos

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Ignition sequence	1-4-3-6-2-5
Turbocharger, G-Charger	no
Knock control	yes
Oxygen sensor regulation	4 sensors
Variable valve timing	Intake and exhaust
Variable intake manifold	yes
Secondary air injection system	no
Valve per cylinder	4

- ¹⁾ Unleaded RON 91 is also permitted, but performance is reduced.

ENGINE

3.2 Liter - Crankshaft, Cylinder Block - Engine Code(s): CALA (Coupe) (As of 11.2007)

13 CRANKSHAFT, CYLINDER BLOCK

DESCRIPTION AND OPERATION

RIBBED BELT ASSEMBLY OVERVIEW

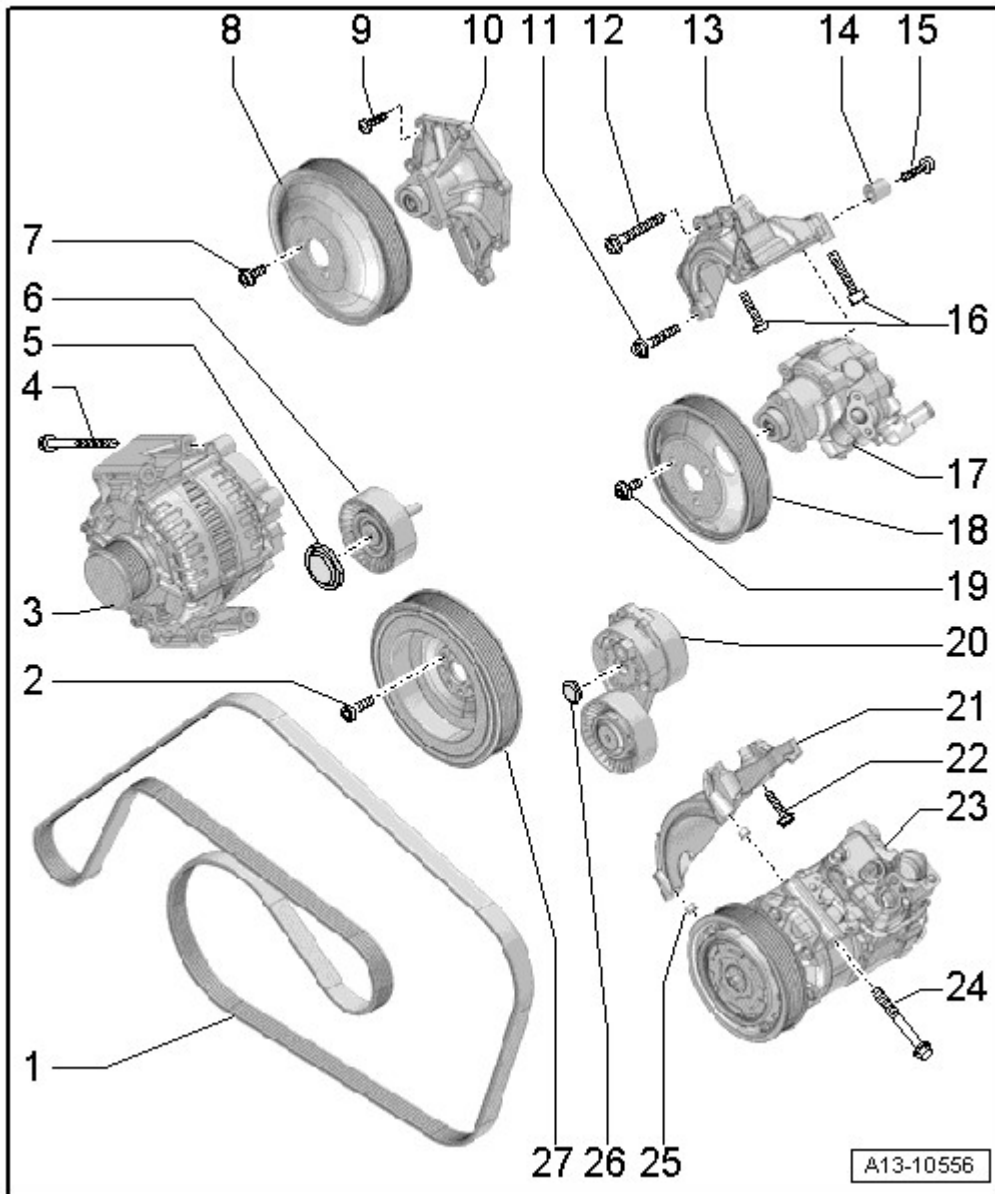


Fig. 1: Identifying Ribbed Belt Drive Overview

Courtesy of AUDI OF AMERICA, LLC

1. Ribbed belt
 - Check for wear
 - Before removing, mark direction of rotation using chalk or a felt-tip pen.
 - Removing and installing, refer to **RIBBED BELT**.
 - Do not kink
 - When installing, make sure it is seated correctly on pulleys
2. Bolt
 - Replace
 - 20 Nm + an additional 90° turn
3. Generator
 - Removing and installing, refer to **REMOVAL AND INSTALLATION**
4. Bolt
 - Tightening specifications, refer to **REMOVAL AND INSTALLATION**
5. Idler pulley cover
6. Idler pulley
 - 40 Nm
7. Bolt
 - Tightening specifications, refer to **COOLANT PUMP, THERMOSTAT AND CONNECTING PIECE ASSEMBLY OVERVIEW** .
8. Pulley, coolant pump
9. Bolt
 - Tightening specifications, refer to **COOLANT PUMP, THERMOSTAT AND CONNECTING PIECE ASSEMBLY OVERVIEW** .
10. Coolant pump
 - Removing and installing, refer to **COOLANT PUMP** .
11. Bolt
 - Tightening specifications, refer to **DESCRIPTION AND OPERATION**
12. Bolt
 - Tightening specifications, refer to **DESCRIPTION AND OPERATION**
13. Bracket, power steering pump
14. Slide bushing
15. Bolt
 - Tightening specifications, refer to **DESCRIPTION AND OPERATION**
16. Bolt
 - Tightening specifications, refer to **DESCRIPTION AND OPERATION**
17. Power steering pump
 - Removing and installing, refer to **DESCRIPTION AND OPERATION**
18. Pulley, power steering pump

- Removing and installing, refer to **DESCRIPTION AND OPERATION**
- 19. Bolt
 - Tightening specifications, refer to **DESCRIPTION AND OPERATION**
- 20. Tensioner element
 - Removing and installing, refer to **RIBBED BELT TENSIONER.**
 - 40 Nm
- 21. Bracket, air conditioning compressor
 - Be careful of alignment bushings when installing
- 22. Bolt
 - 20 Nm
- 23. Air conditioner compressor
 - Do not remove or disconnect refrigerant lines
 - Removing and installing, refer to **REMOVAL AND INSTALLATION**
 - Be careful of alignment sleeves and alignment bushing when installing
- 24. Bolt
 - Tightening specifications, refer to **REMOVAL AND INSTALLATION**
- 25. Alignment bushing
 - 2 pieces
- 26. Tensioner cover
- 27. Vibration damper
 - With pulley
 - Installation is only possible in one position because of offset holes
 - Removing and installing, refer to **VIBRATION DAMPER.**

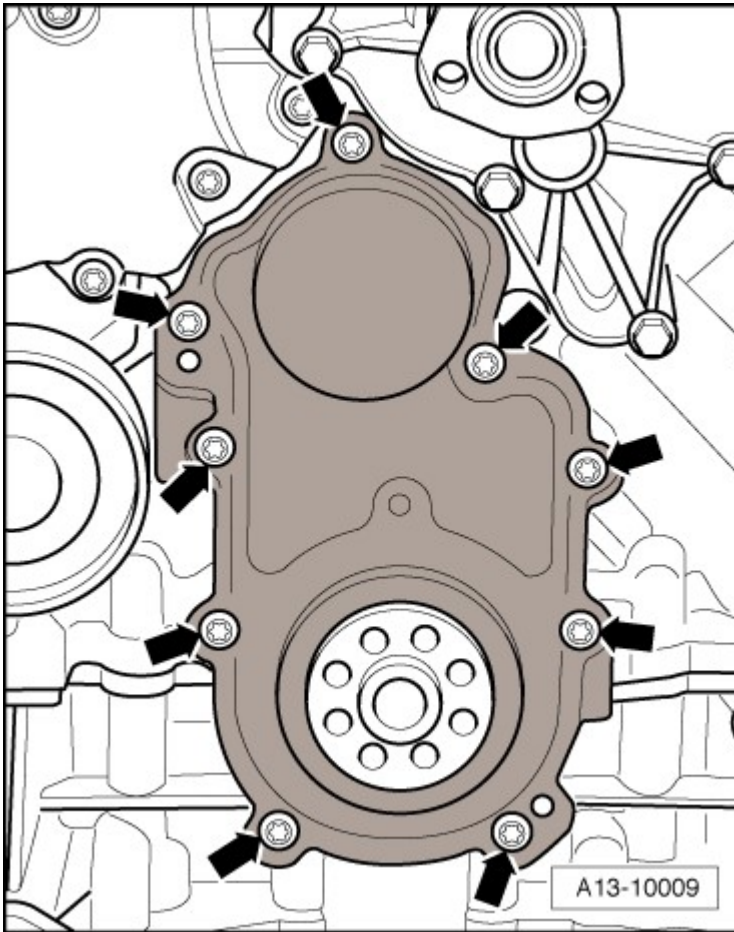


Fig. 2: Identifying Front Sealing Flange Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts -arrows- in a diagonal sequence in stages to 9 Nm.

DRIVE PLATE ASSEMBLY OVERVIEW

NOTE: To perform assembly work, secure the engine using the V6 FSI engine holder VAS 6095/1-5 on engine and transmission holder VAS 6095 ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER .

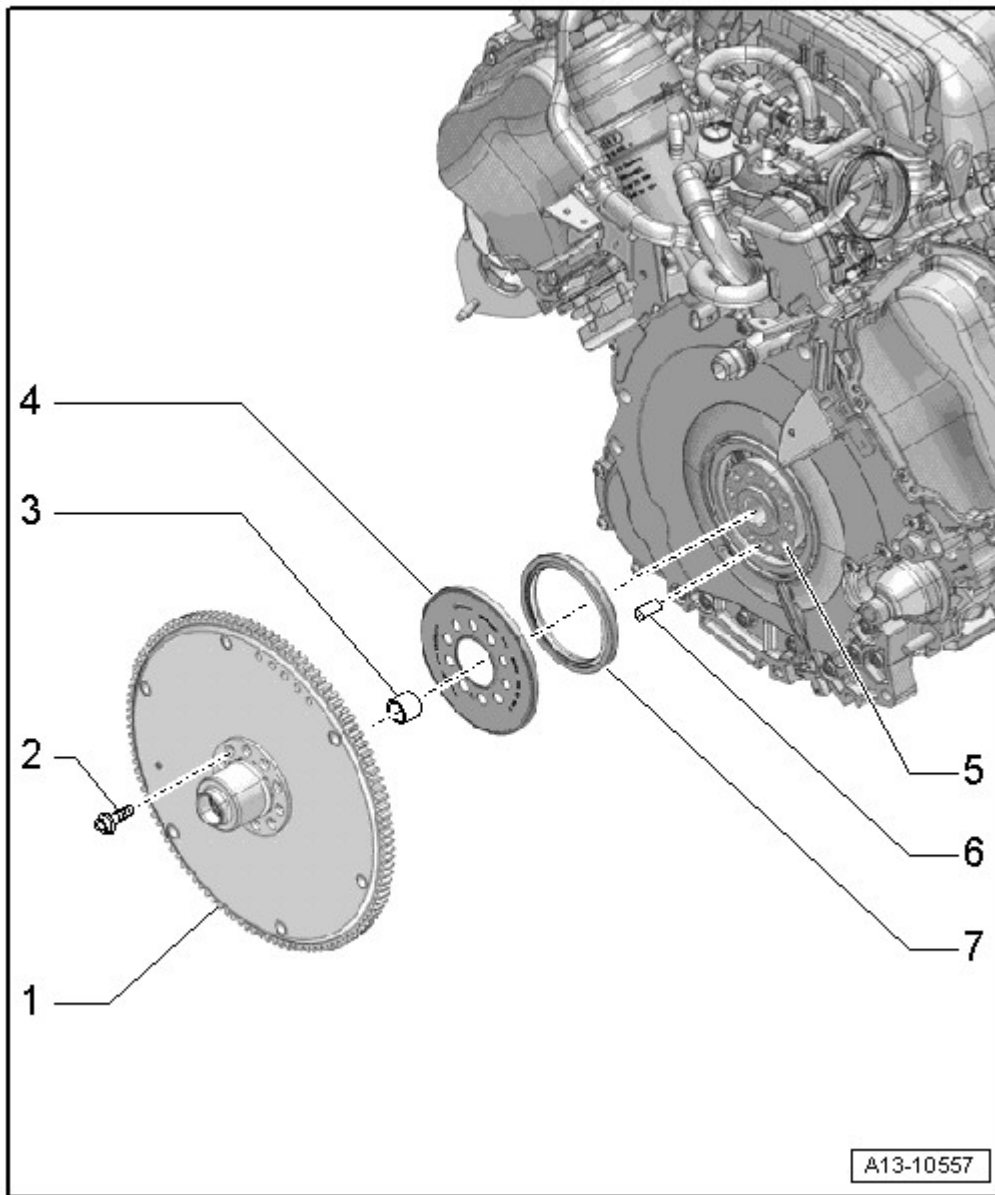


Fig. 3: DRIVE PLATE ASSEMBLY OVERVIEW

Courtesy of AUDI OF AMERICA, LLC

1. Drive plate
 - With bearing flange
 - Check running surfaces on bearing flange and clutch module holes for cracks and signs of wear.
 - Removing and installing, refer to **DRIVE PLATE**.
2. Bolt
 - Replace
 - 60 Nm + an additional 90° turn
3. Needle bearing
 - Only for vehicles with a manual transmission

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- Installation position: Closed side faces engine
 - Removing and installing, refer to **DRIVE PLATE NEEDLE BEARING.**
4. Sensor wheel
 - For engine speed (RPM) sensor -G28-
 5. Crankshaft
 6. Fitting pin
 7. Crankshaft seal, drive plate side
 - Replacing, refer to **CRANKSHAFT SEAL, DRIVE PLATE SIDE.**

CRANKSHAFT ASSEMBLY OVERVIEW

NOTE: To perform assembly work, secure engine using V6 FSI engine holder VAS 6095/1-5 on engine and transmission holder VAS 6095 **ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER .**

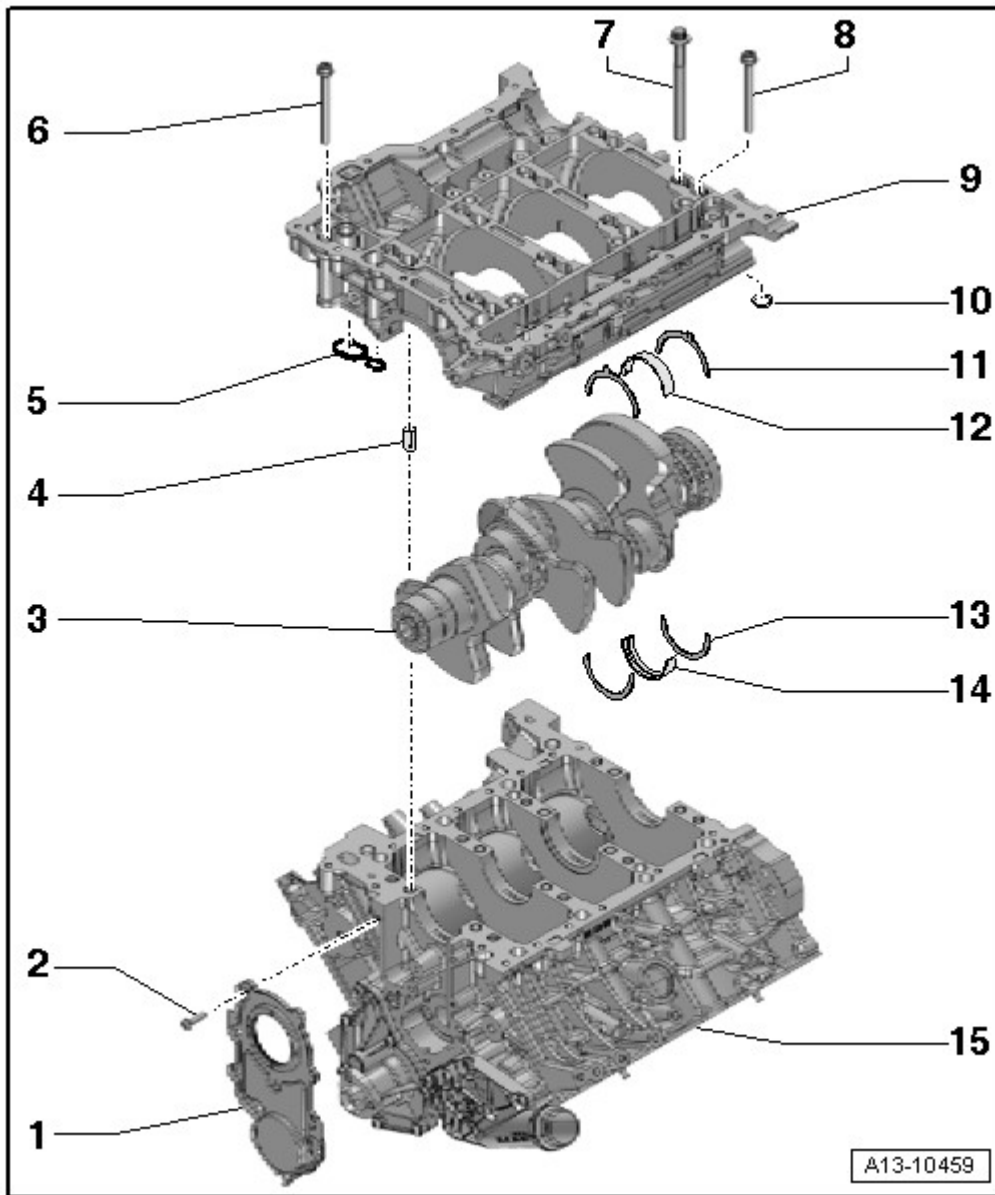


Fig. 4: Crankshaft Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Sealing flange, belt pulley side
 - Removing and installing, refer to **SEALING FLANGE AND CRANKSHAFT SEAL, BELT PULLEY SIDE.**
2. Bolt
 - Tightening specifications, refer to **Fig. 2**
3. Crankshaft
 - Measuring axial play, refer to **AXIAL CLEARANCE, MEASURING.**
 - Radial clearance, measuring, refer to **RADIAL CLEARANCE, MEASURING.**
 - Crankshaft dimensions, refer to **CRANKSHAFT DIMENSIONS.**

4. Alignment bushing
 - 4 pieces
 - Insert into guide frame, refer to **Fig. 7**
5. Gasket
 - Replace
6. Bolt
 - For guide frame to cylinder block sealing surfaces
 - Varying bolt lengths and bolt heads
 - Tightening sequence, refer to **Fig. 8**
7. Long bolt, large shoulder
 - For inner row of guide frame
 - Tightening sequence, refer to **Fig. 8**
8. Short bolt, small shoulder
 - For outer row of guide frame
 - Tightening sequence, refer to **Fig. 8**
9. Guide frame
 - With oil pressure regulation valve -N428-, refer to **Fig. 6**
 - To remove, remove timing chain guide rail, refer to item
 - Sealant application, refer to **Fig. 7**
 - Oil pressure regulation valve -N428-, removing and installing, refer to **OIL PRESSURE REGULATION VALVE** .
10. Seal
 - Replace
11. Thrust washer
 - Only on 3rd crankshaft bearing
 - Installation position: Lubricating grooves face outward
 - Note locating point in guide frame
12. Bearing shell
 - For guide frame without lubricating groove
 - Mark used bearing shells for reinstallation but not on running surface
 - Replace bearing shells that have worn down to nickel layer
 - Note installation position
 - Insert new bearing shells for guide frame with proper color marking, refer to **Fig. 10**
13. Not installed
14. Bearing shell
 - For cylinder block with oil groove
 - Mark used bearing shells for reinstallation but not on running surface
 - Replace bearing shells that have worn down to nickel layer

- Note installation position
- Insert new bearing shells for cylinder block with proper color marking, refer to **Fig. 9**

15. Cylinder block

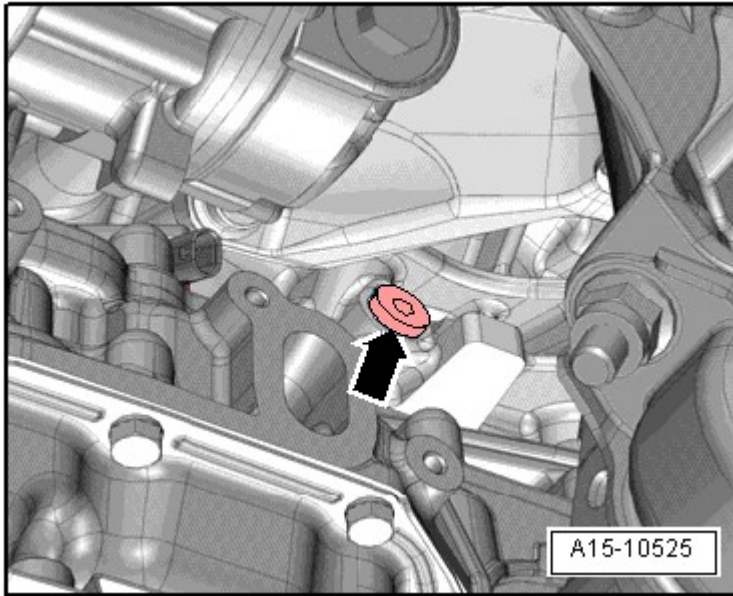


Fig. 5: Identifying Locking Bolt

Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace O-ring.

-- Tighten locking bolt -arrow- to 14 Nm.

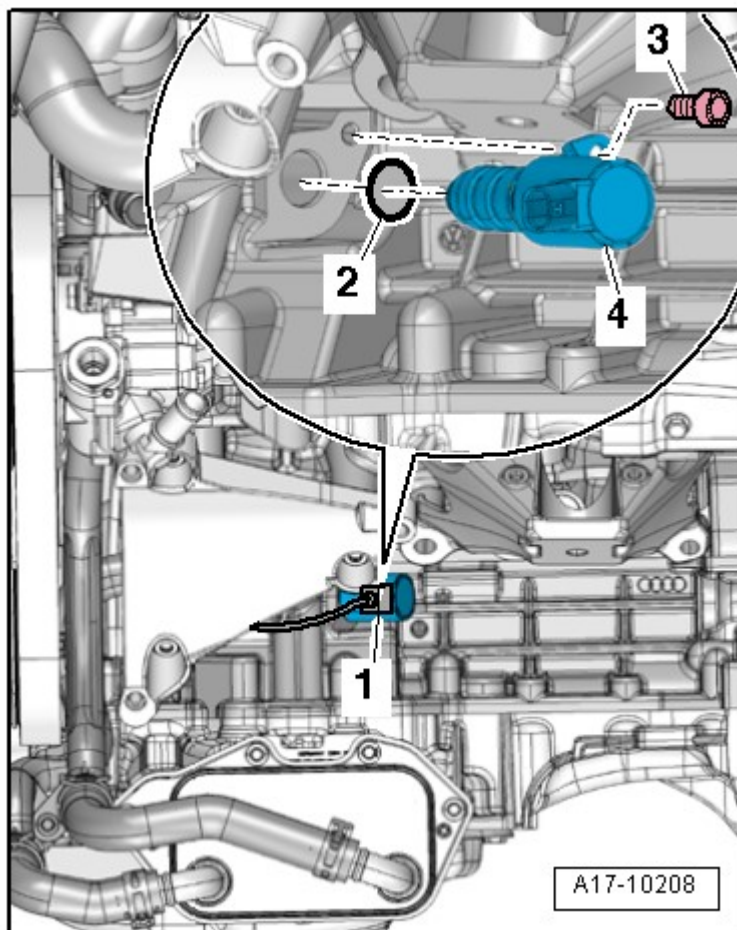


Fig. 6: Identifying Oil Pressure Regulation Valve -N428-
Courtesy of AUDI OF AMERICA, LLC

1. Electrical harness connector
2. O-ring - replace
3. Bolt - 9 Nm
4. Oil pressure regulation valve -N428-

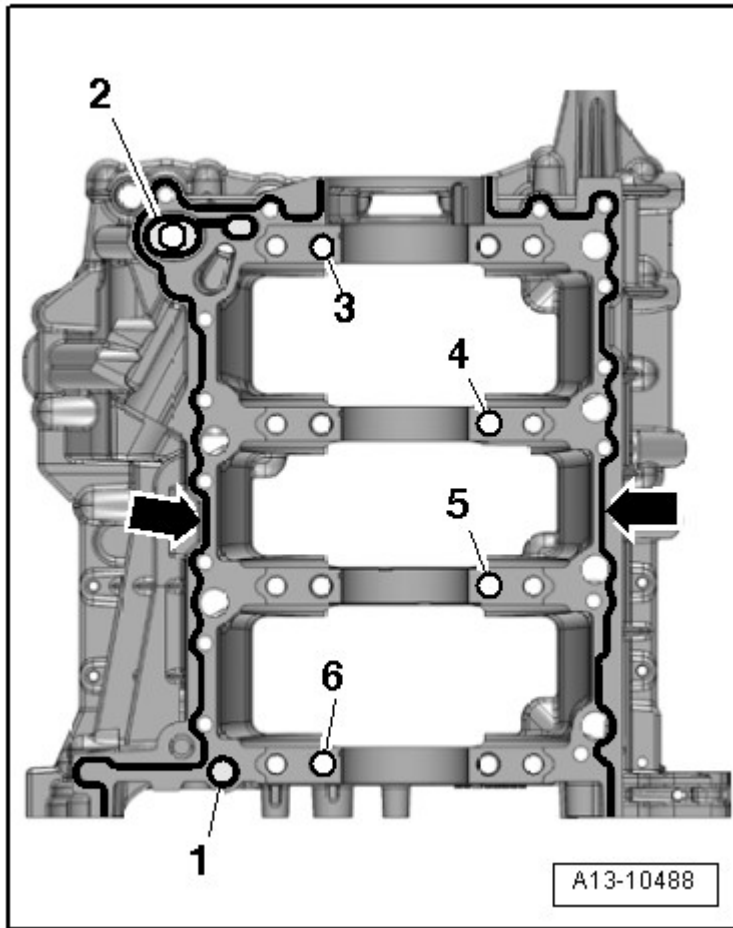


Fig. 7: Identifying Sealant Application
 Courtesy of AUDI OF AMERICA, LLC

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

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

- The groove of sealing surface must be completely filled with sealant.
- Sealant beads must be 1.5 to 2.0 mm above sealing surface.

-- Position seals -1- and -2-.

-- Check if alignment bushings -3 through 6- are inserted at locations in guide frame as shown in the illustration.

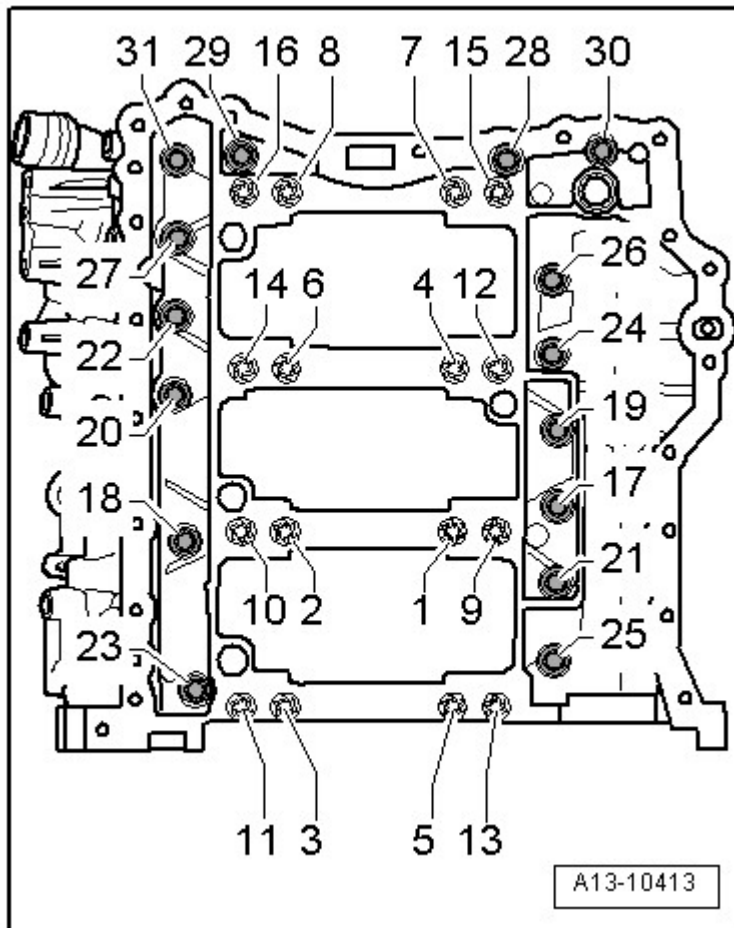


Fig. 8: Identifying Guide Frame Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Replace guide frame bolts.
- Insert long bolts in the inner row of guide frame.
- Tighten bolts -1 through 31- in 3 stages as follows:
- Tighten bolts to 50 Nm in the sequence -1 to 16-.
- Tighten bolts an additional 90° in sequence -1 to 16-.
- Tighten bolts for guide frame sealing surfaces on cylinder block to 23 Nm in sequence -17 to 31-.

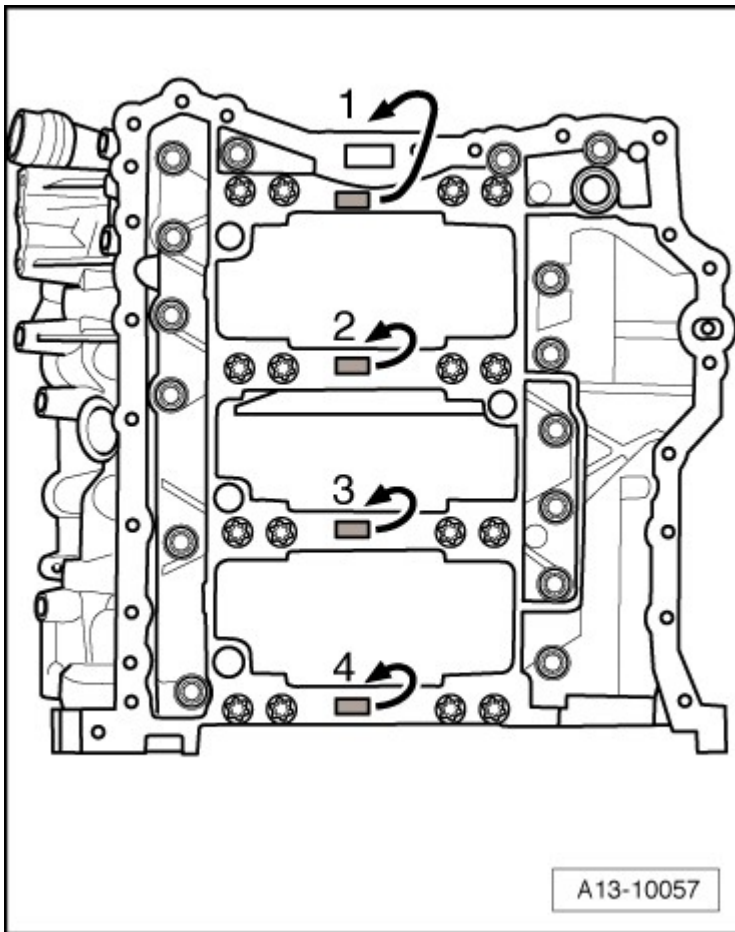


Fig. 9: Identifying Crankshaft Bearing Shells

Courtesy of AUDI OF AMERICA, LLC

- Bearing shells with 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 a letter on respective bearing on guide frame

Letter on guide frame	Color of bearing
R=	Red
G=	Yellow
B=	Blue
S=	Black

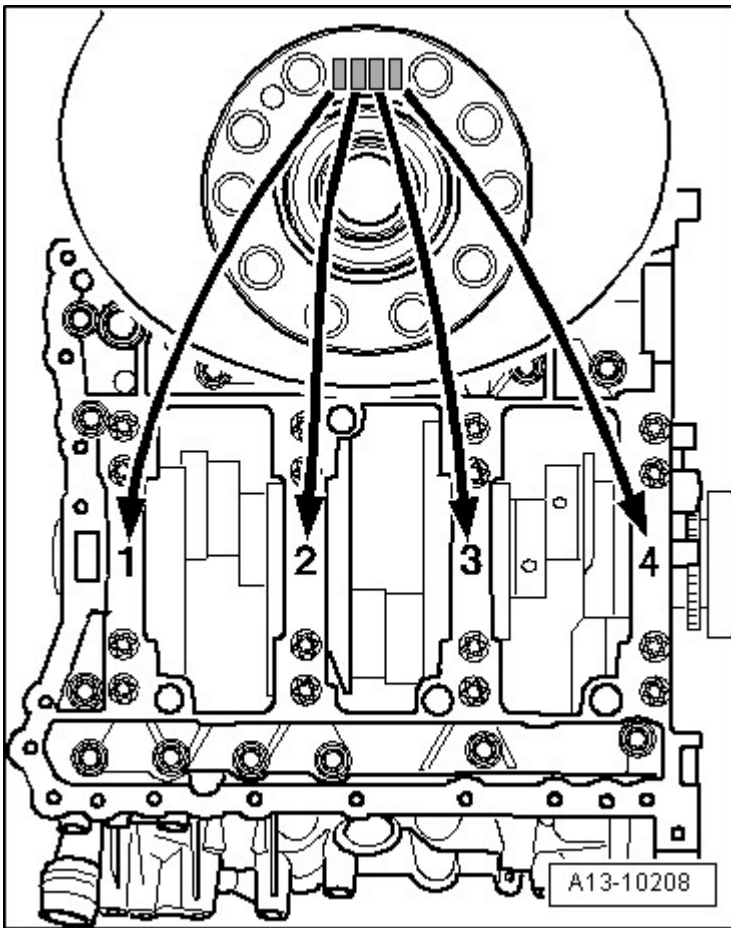


Fig. 10: Identifying Crankshaft Bearing Shells

Courtesy of AUDI OF AMERICA, LLC

- Bearing shells with 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 on flywheel flange of crankshaft by a row of letters. The first letter of the row of letters represents bearing "1", the second letter is for bearing "2", etc.

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

PISTONS AND CONNECTING ROD ASSEMBLY OVERVIEW

NOTE: Oil injector jet for piston cooling, refer to [Fig. 15](#)

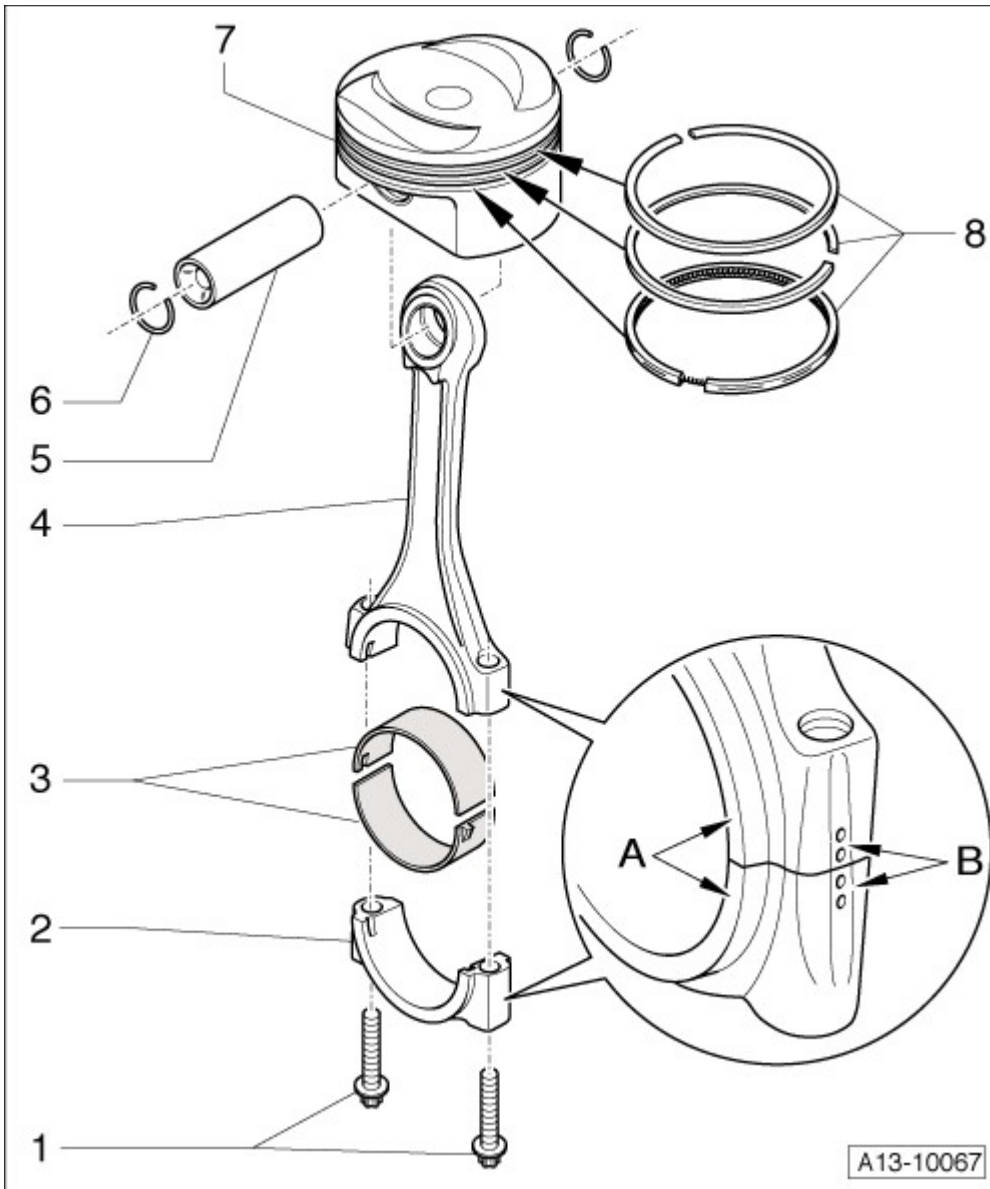


Fig. 11: Pistons & Connecting Rod Assembly Overview

Courtesy of AUDI OF AMERICA, LLC

1. Bolts

- Replace
- Lubricate threads and contact surface
- 30 Nm + an additional 90° turn
- Use old bolts for radial play measurement, tighten to 30 Nm but do not tighten further

2. Connecting rod bearing cap

- Mark for reinstallation
- Mark allocation to cylinder with paint -B-, refer to **Fig. 13**
- When installing bearing cap, observe: The wide thrust flange -A- must point to same side on

connecting rod and connecting rod bearing cap

- Installation position of connecting rod pairs, refer to **Fig. 14**

3. Bearing shell

The version depends on construction:

- Lower bearing shell (for bearing cap), identified by a dark-colored bearing. Upper bearing shell (for connecting rod) made of wear-resistant material, identified by a light-colored bearing

or

- The same bearing, no allocation
- Check that retaining tabs are secured
- Mark used bearing shells for reinstallation but not on running surface
- Replace bearing shells that have worn down to nickel layer
- Radial clearance, measuring, refer to **CONNECTING ROD, MEASURING RADIAL CLEARANCE**.
- To measure radial play, tighten bolt -1- to 30 Nm but no further

4. Connecting rod

- Only replace as set
- Mark allocation to cylinder with paint -B-, refer to **Fig. 13**
- When installing bearing cap, observe: The wide thrust flange -A- must point to the same side on connecting rod and connecting rod bearing cap
- Installation position of connecting rod pairs, refer to **Fig. 14**

5. Piston pin

- Heat piston to 60° C if it is difficult to move.
- Removing and installing using a drift VW 222 A

6. Circlip

- Replace

7. Piston

- Mark installation position and cylinder allocation, refer to **Fig. 12**
- Arrow on piston face points toward belt pulley side
- Checking, refer to **PISTON, CHECKING**.
- Install with piston ring compressor
- Piston and cylinder dimensions, refer to **PISTON AND CYLINDER DIMENSIONS**.
- Cylinder bore, checking, refer to **CYLINDER BORE, CHECKING**.

8. Piston rings

- Offset gaps by 120 degrees
- Use piston ring pliers for removal and installation
- Installation position: The "TOP" marking or side with writing faces piston crown.

- Checking ring gap, refer to **PISTON RING GAP, CHECKING.**
- Check piston ring groove clearance, refer to **PISTON RING GROOVE CLEARANCE, CHECKING.**

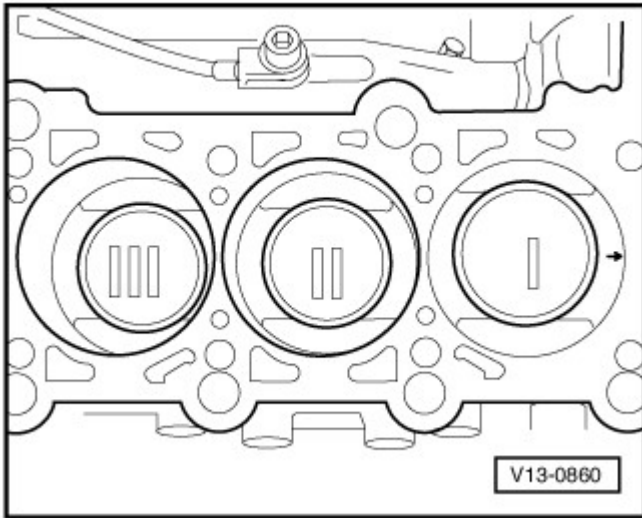


Fig. 12: Identifying Piston Position

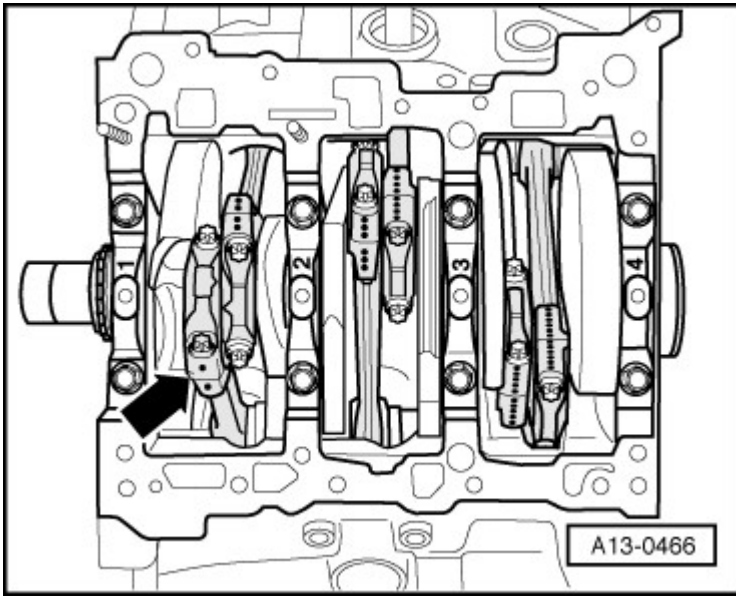
Courtesy of AUDI OF AMERICA, LLC

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:

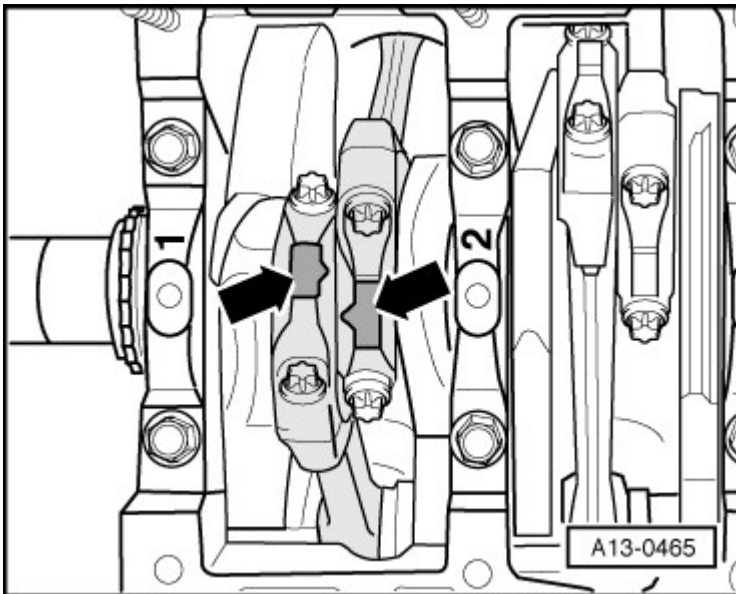
- The arrows on piston heads point to belt pulley side.

**Fig. 13: Identifying Belt Pulley Side**

Courtesy of AUDI OF AMERICA, LLC

NOTE: Only replace connecting rods as a set.

-- Mark connecting rod and connector rod bearing caps to each other and to the cylinder -arrow- with paint for installation.

**Fig. 14: Identifying Installed Connecting Rod Location**

Courtesy of AUDI OF AMERICA, LLC

- The molded tabs -arrows- on beveled surfaces of connecting rod pairs "1 and 2", "3 and 4" and "5 and 6" must face each other.

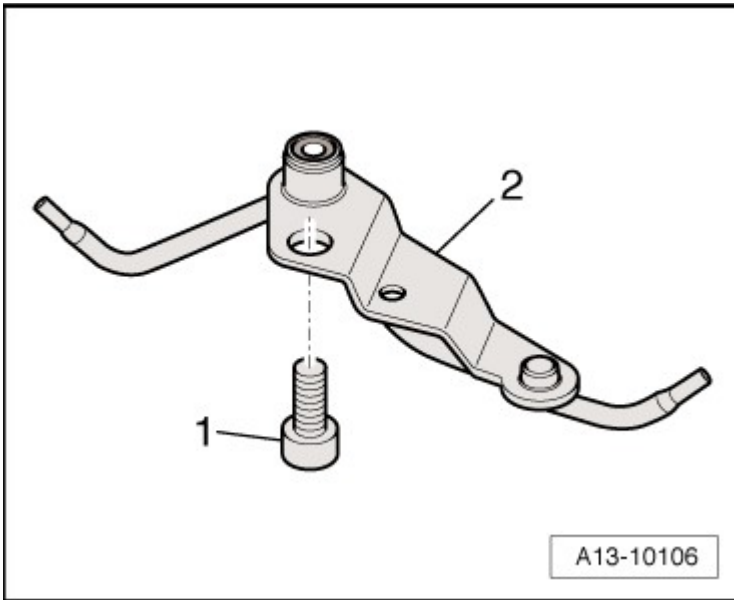


Fig. 15: Identifying Oil Spray Jet And Bolt
Courtesy of AUDI OF AMERICA, LLC

1. Insert bolt with locking compound and tighten to 9 Nm
2. Oil spray nozzle with spray nozzle valve (opening pressure 2 to 2.4 bar)

NOTE:

- Do not bend oil spray nozzles.
- Replace oil spry nozzles if they are bent.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Components	Bolt Size	Nm
Oil Pressure Regulation Valve Bolt		9
Oil Spray Jet Bolt		9
TDC Marking Lock Bolt		14

SEALING FLANGE, RIBBED BELT SIDE, TIGHTENING SEQUENCE AND SPECIFICATION

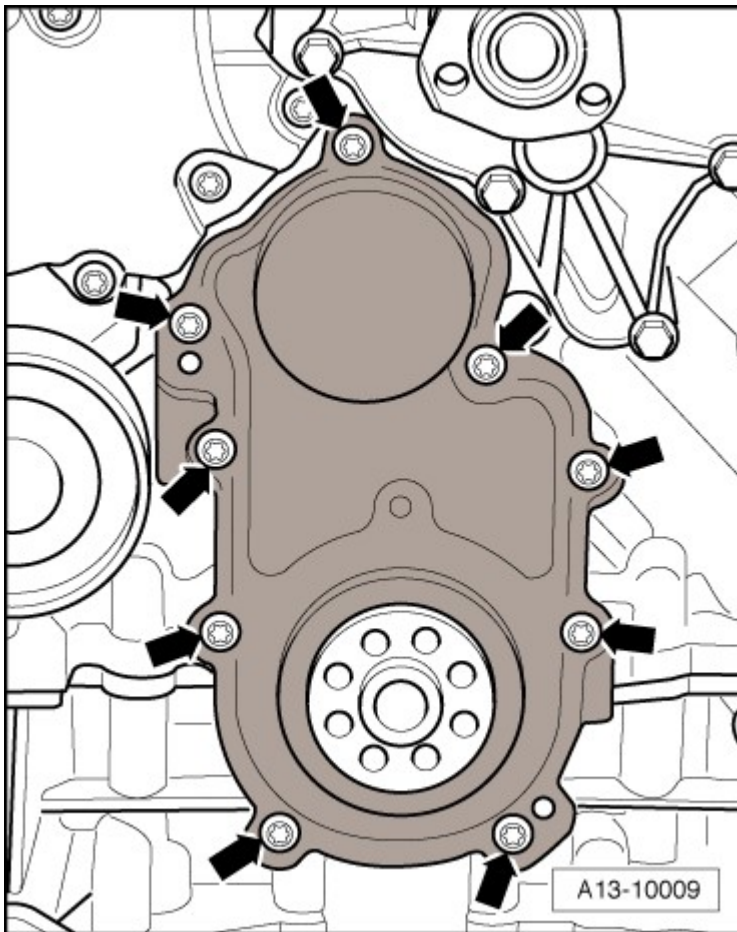


Fig. 16: Identifying Front Sealing Flange Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts -arrows- in a diagonal sequence in stages to 9 Nm.

GUIDE FRAME BOLT TIGHTENING SEQUENCE AND SPECIFICATION

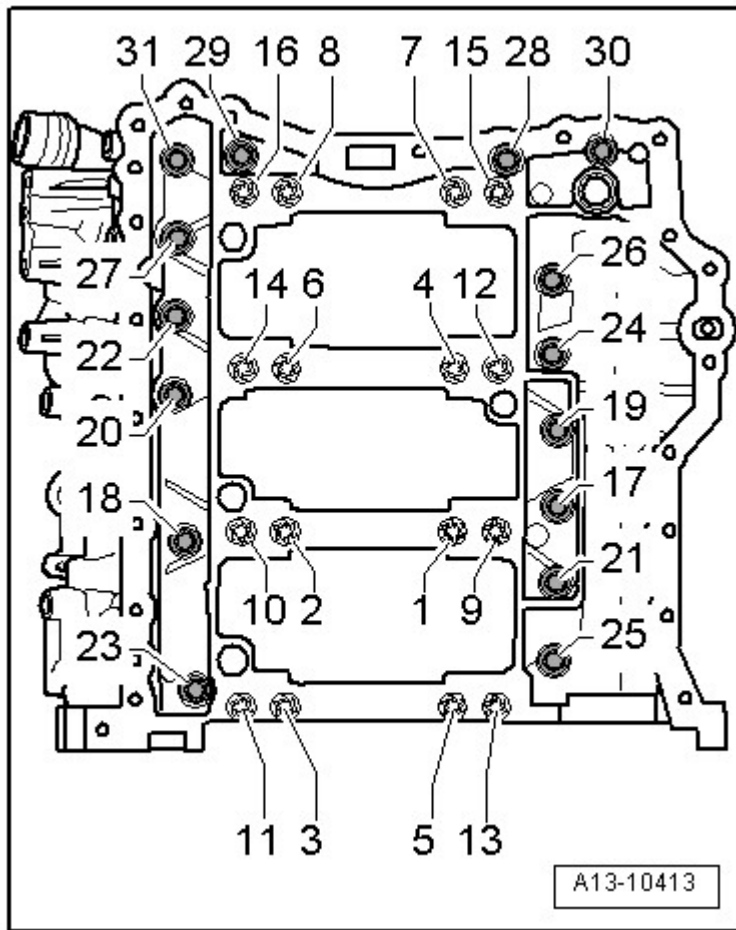


Fig. 17: Identifying Guide Frame Bolts Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

- Replace guide frame bolts.
- Insert long bolts in the inner row of guide frame.
- Tighten bolts -1 through 31- in 3 stages as follows:
- Tighten bolts to 50 Nm in the sequence -1 to 16-.
- Tighten bolts an additional 90° in sequence -1 to 16-.
- Tighten bolts for guide frame sealing surfaces on cylinder block to 23 Nm in sequence -17 to 31-.

CRANKSHAFT DIMENSIONS

Reconditioning dimension in mm	Crankshaft journal diameter	Crankshaft connecting rod journal diameter
Basic dimension	65.000 - 0.022 - 0.042	56.000 - 0.022 - 0.042

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Crankshaft, Cylinder Block - Engine Code(s): CALA (Coupe) (As of 11.2007)

PISTON AND CYLINDER DIMENSIONS

Reconditioning dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	84.49	84.51
• Dimensions with coating (thickness 0.02 mm). The coating wears off.		

DIAGNOSIS AND TESTING

AXIAL CLEARANCE, MEASURING

Special tools and workshop equipment required

- Dial gauge holder VW 387
- Dial gauge VAS 6079

PROCEDURE

Proceed as follows:

-- Install dial gauge VAS 6079 with dial gauge holder VW 387 on cylinder block as shown in the illustration.

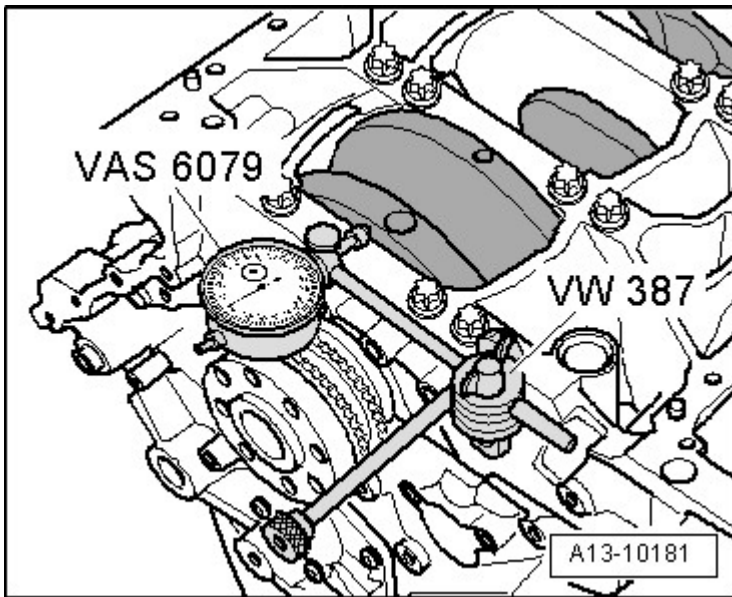


Fig. 18: Identifying Special Tools - Dial Indicator VAS 6079 With Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Place dial gauge against crankshaft counterweight.
- Press crankshaft against dial gauge by hand and set the gauge to "0".
- Press crankshaft off dial gauge and read measurement.

- Axial clearance: 0.15 to 0.25 mm.

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

- Plastigage

PROCEDURE

Proceed as follows:

NOTE:

- **Marked the used bearing for installation later, but not on the running surface.**
- **If the bearing shells are worn down to the nickel layer, they must be replaced.**

-- Remove guide frame and clean bearing 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.

-- Install guide frame.

-- Compare width of Plastigage with calibrated scale.

Radial clearance:

- New: 0.015 to 0.055 mm.
- Wear limit: 0.080 mm.

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

- Plastigage

PROCEDURE

Proceed as follows:

-- Remove connecting rod bearing cap.

- Clean bearing cap and journal.
- Place Plastigage over entire width of bearing journal or into bearing shells.
- Install connecting rod bearing cap and tighten to 30 Nm. Do not turn crankshaft.
- Reinstall connecting rod cover.
- Compare width of Plastigage with calibrated scale.

Radial clearance:

- New: 0.010 to 0.052 mm.
- Wear limit: 0.120 mm.

- Replace connecting rod bolts.

PISTON RING GAP, CHECKING

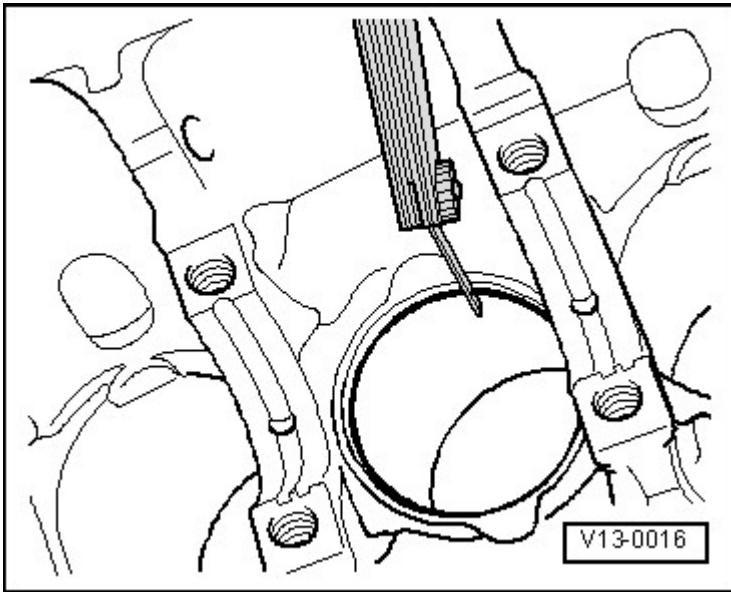


Fig. 19: Checking Piston Ring Gap
Courtesy of AUDI OF AMERICA, LLC

- Push piston ring squarely from above down to approximately 15 mm from bottom end of the cylinder.
- Use a piston without a piston ring for sliding in.

Piston ring dimensions in mm	New	Wear limit
1st Compression ring	0.35 to 0.50	0.8
2nd Compression ring	0.60 to 0.80	1.0
Oil scraping ring	0.25 to 0.50	0.8

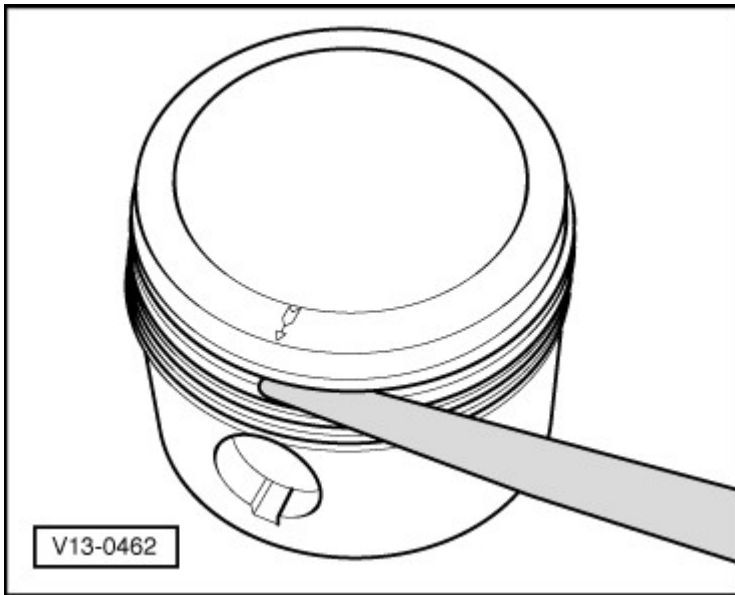
PISTON RING GROOVE CLEARANCE, CHECKING

Fig. 20: Checking Piston Ring Side Clearance
Courtesy of AUDI OF AMERICA, LLC

-- Clean piston ring groove before checking.

Piston ring dimensions in mm	New	Wear limit
Compression rings	0.02 to 0.08	0.20
Oil scraping ring	0.02 to 0.08	0.15

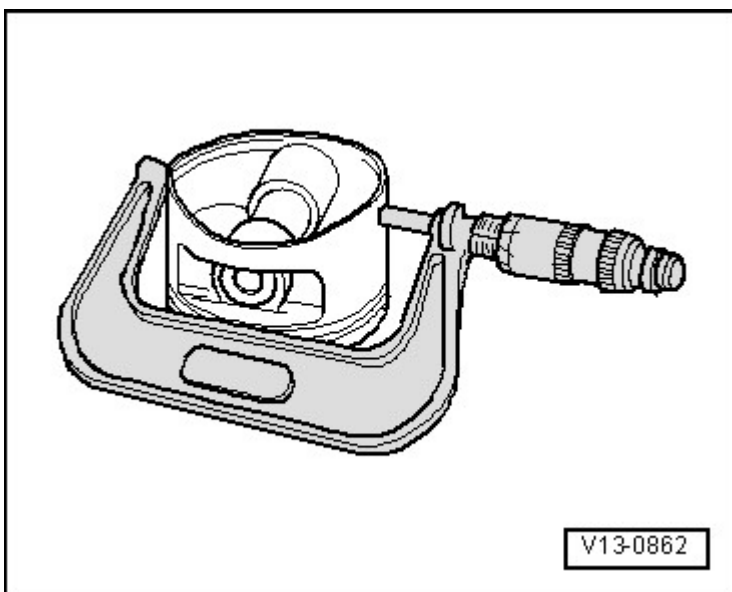
PISTON, CHECKING

Fig. 21: Checking Piston

Courtesy of AUDI OF AMERICA, LLC

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

- Maximum deviation from nominal dimension: 0.04 mm.

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

CYLINDER BORE, CHECKING

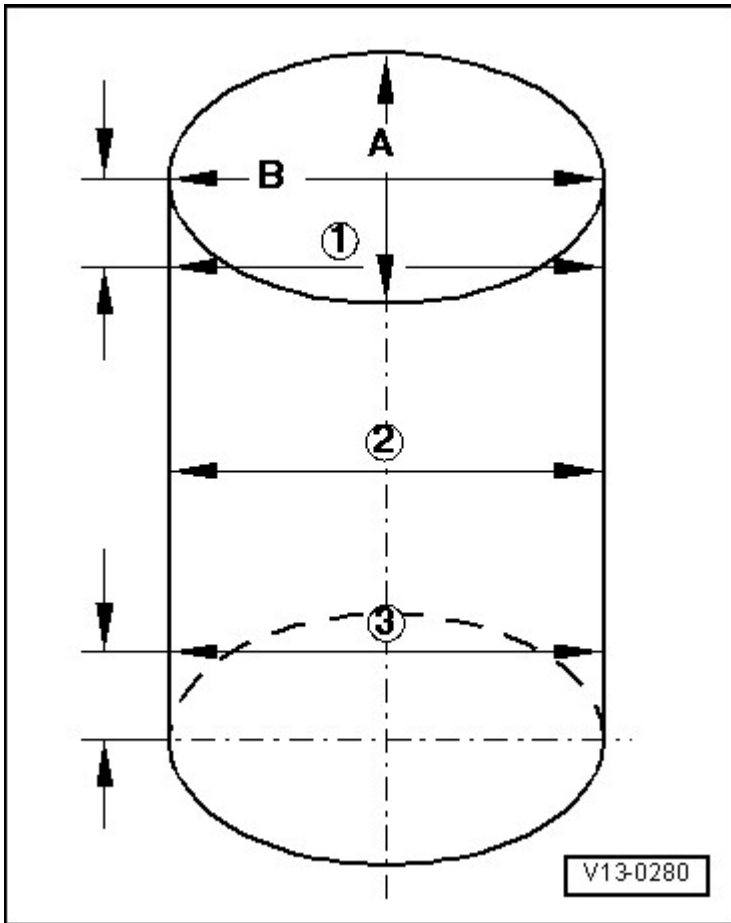


Fig. 22: Checking Cylinder Bores

Courtesy of AUDI OF AMERICA, LLC

-- Using an internal dial gauge 50 to 100 mm, measure at 3 points in diagonal sequence horizontally -A- and vertically -B-.

- Maximum deviation from nominal dimension: 0.08 mm.

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

REMOVAL AND INSTALLATION

RIBBED BELT**REMOVING**

Proceed as follows:

-- Remove noise insulation by loosening fasteners -1- and -2-.

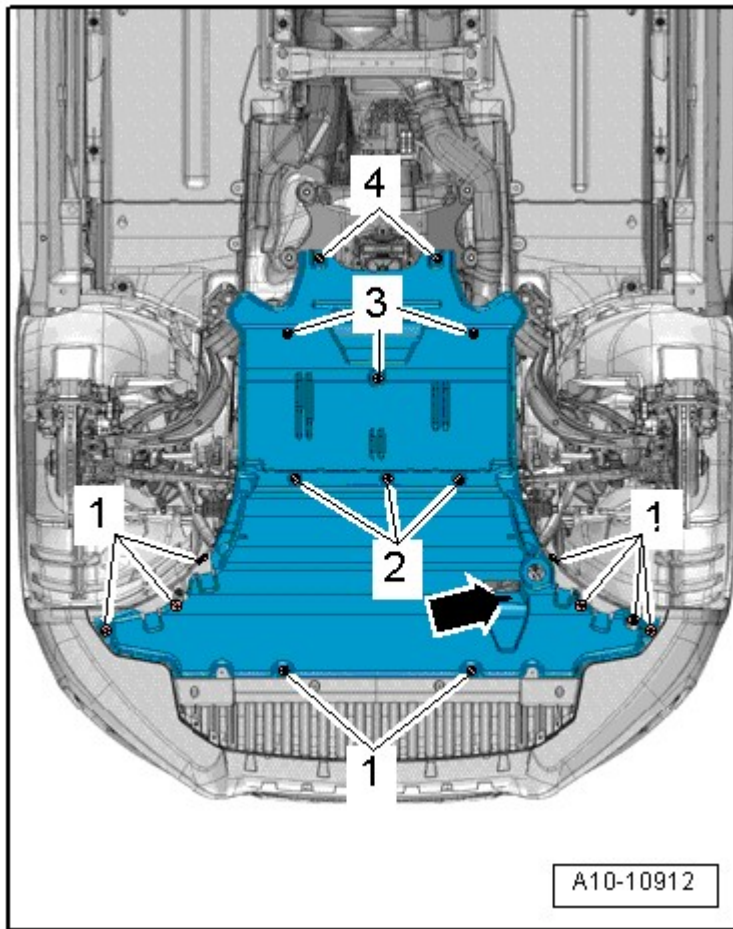


Fig. 23: Identifying Noise Insulation

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 tensioner clockwise -arrow- to release tension on ribbed belt.

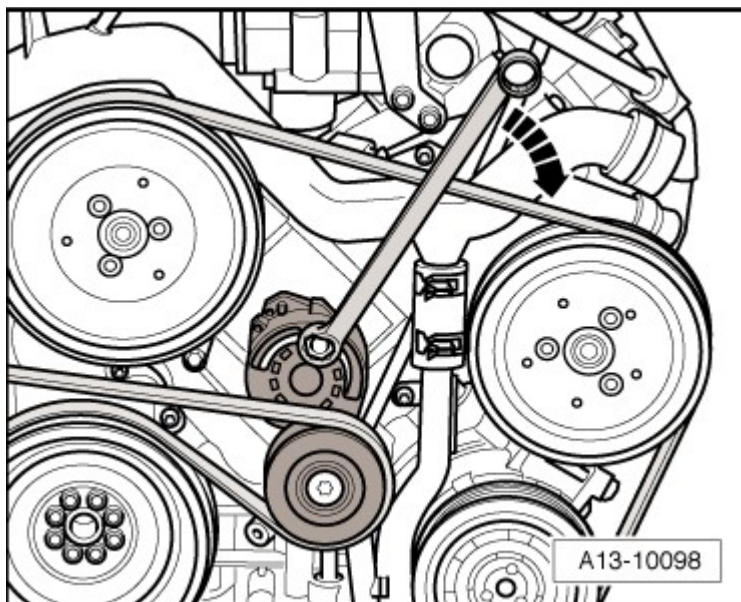


Fig. 24: Identifying Pivoting Tensioning Device To Relieve Tension On Ribbed Belt
Courtesy of AUDI OF AMERICA, LLC

-- Remove ribbed belt and release tensioner.

INSTALLING

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

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

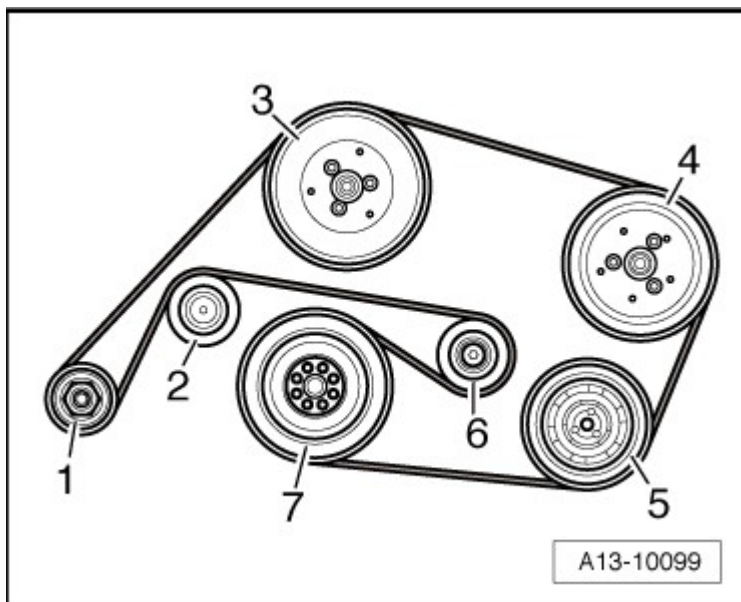


Fig. 25: Placing Ribbed Belt Over Belt Pulley
Courtesy of AUDI OF AMERICA, LLC

1. Generator
2. Idler pulley
3. Coolant pump
4. Power steering pump
5. Air conditioner compressor
6. Tensioner
7. Vibration damper

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

- Start engine and check belt routing.
- Install front noise insulation **Description and Operation** .

RIBBED BELT TENSIONER

REMOVING

Proceed as follows:

- Remove ribbed belt, refer to **RIBBED BELT**.
- Remove cover -1- and bolt below it.

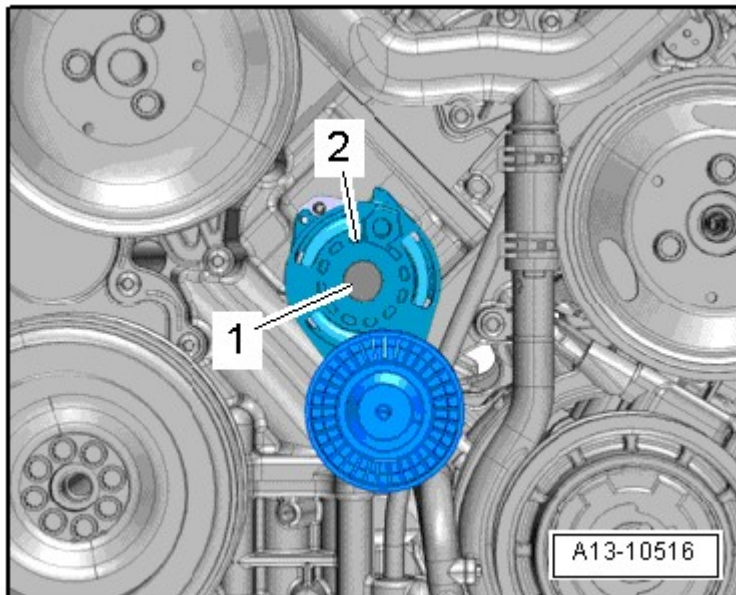


Fig. 26: Identifying Ribbed Belt Tensioner Components
Courtesy of AUDI OF AMERICA, LLC

- Remove ribbed belt tensioner -2- from cylinder block.

INSTALLING

- Tightening specifications, refer to **RIBBED BELT ASSEMBLY OVERVIEW**.

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

-- Install ribbed belt, refer to **RIBBED BELT**.

VIBRATION DAMPER**REMOVING**

Proceed as follows:

-- Remove ribbed belt, refer to **RIBBED BELT**.

-- Remove bolts -1- and vibration damper.

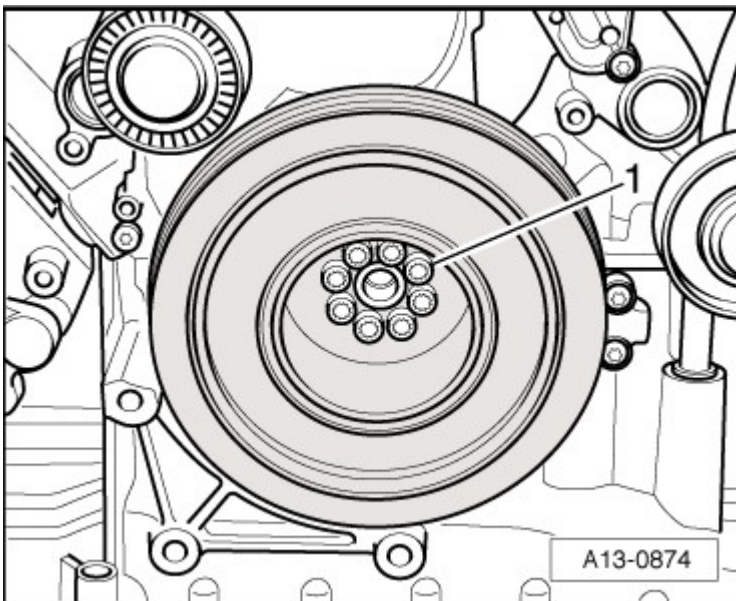


Fig. 27: Identifying Vibration Damper
Courtesy of AUDI OF AMERICA, LLC

INSTALLING

- Tightening specifications, refer to **RIBBED BELT ASSEMBLY OVERVIEW**.

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

NOTE:

- Replace vibration damper bolts.
- Installation is only possible in one position because of the offset holes.

-- Install ribbed belt, refer to **RIBBED BELT**.

SEALING FLANGE AND CRANKSHAFT SEAL, BELT PULLEY SIDE

Special tools and workshop equipment required

- Pin wrench 3212
- Assembly tool T40048
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

PROCEDURE

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

-- Remove front engine cover -bottom arrows--.

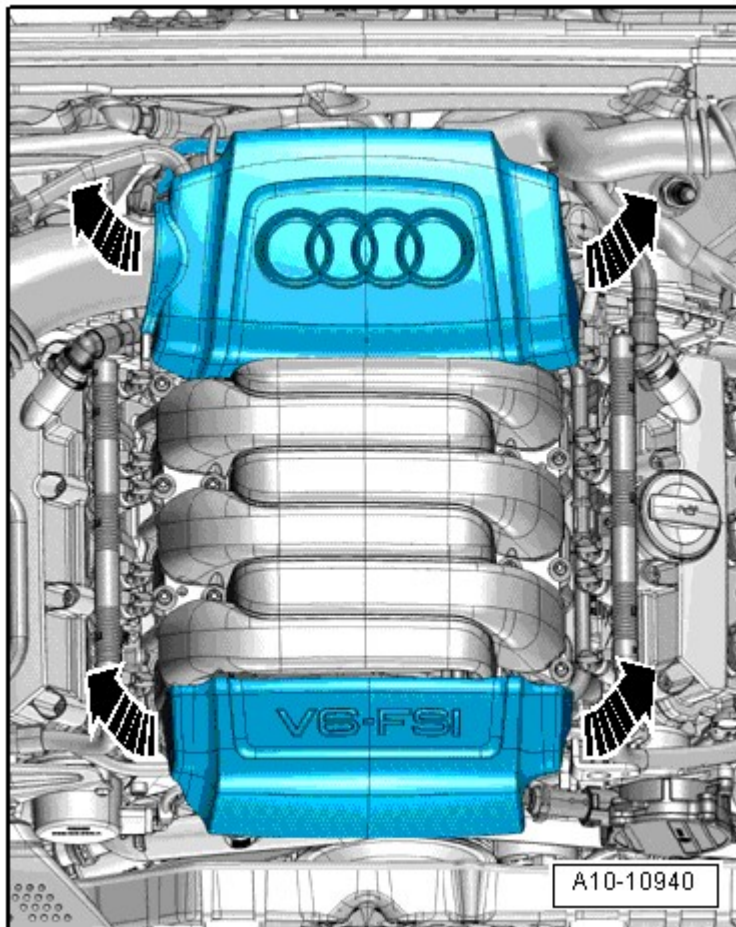


Fig. 28: Identifying Engine Cover
Courtesy of AUDI OF AMERICA, LLC

- Remove vibration damper with ribbed belt pulley, refer to **VIBRATION DAMPER**.
- Remove bolts for coolant pump pulley, using a spanner wrench 3212 to counter hold.

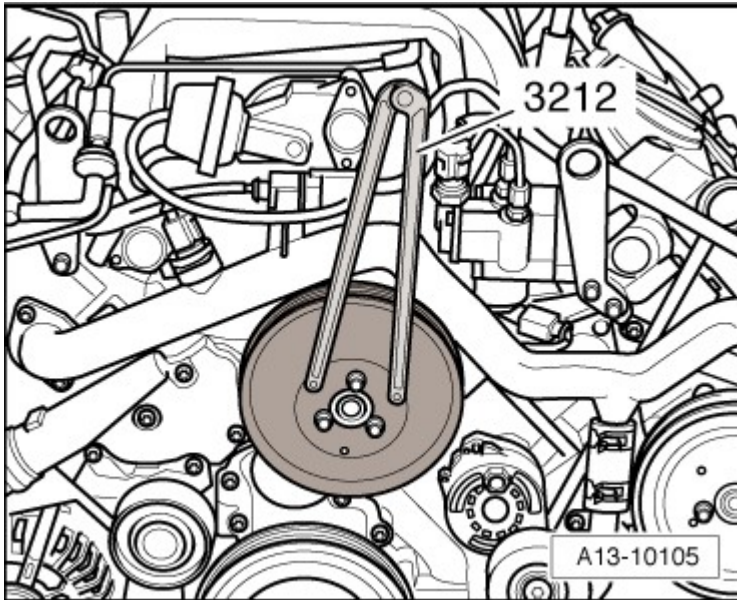


Fig. 29: Identifying Spanner Wrench 3212
Courtesy of AUDI OF AMERICA, LLC

- Remove bolts -arrows- and ribbed belt side, sealing flange.

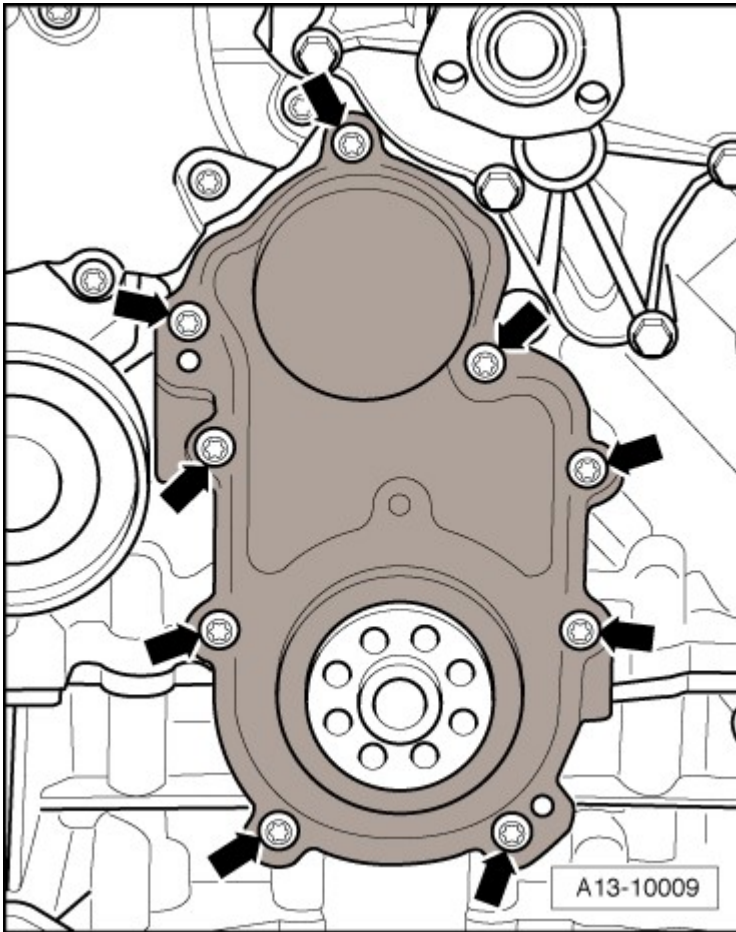


Fig. 30: Identifying Front Sealing Flange Bolts
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace ribbed belt side, sealing flange.

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

-- Remove sealant residue on cylinder block and upper section of oil pan, for example using a rotating plastic brush.

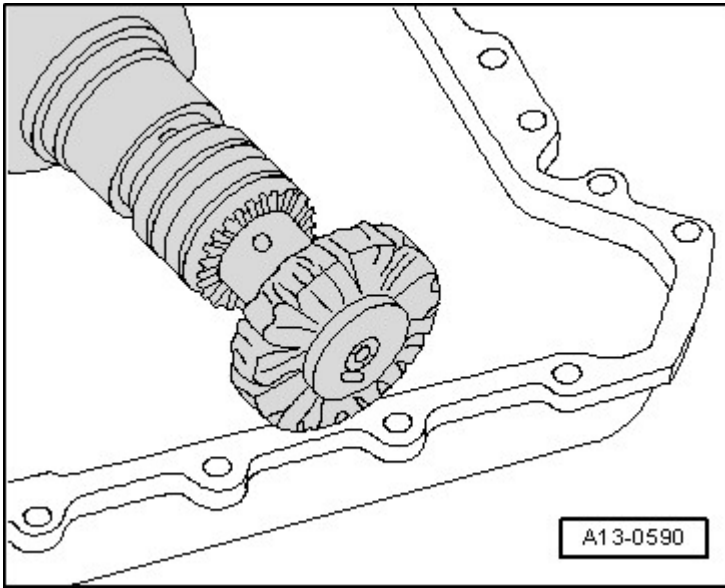


Fig. 31: Identifying Rotating Plastic Brush
Courtesy of AUDI OF AMERICA, LLC

- Clean sealing surfaces, must be free of oil and grease.
- Cut tube nozzle at front marking (nozzle diameter approximately 1.5 mm).

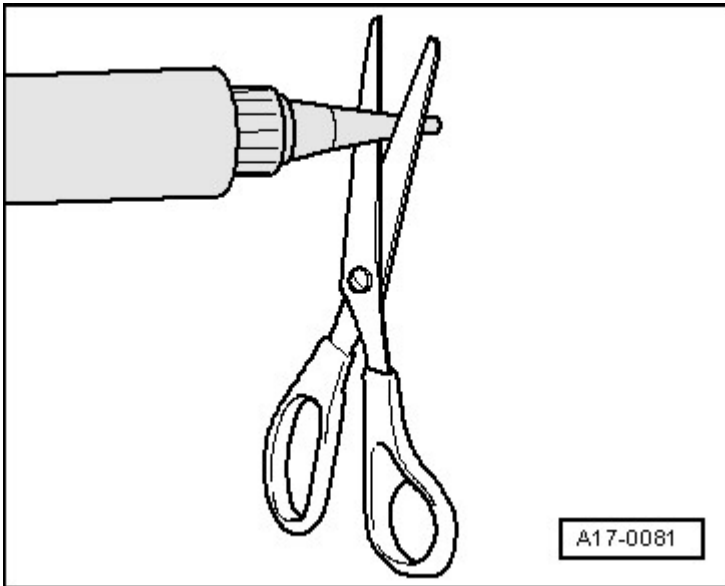


Fig. 32: Cutting Tube Nozzle
Courtesy of AUDI OF AMERICA, LLC

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

- Do not apply sealant bead thicker than indicated.

-- Apply sealant bead -arrow- to clean sealing surface on ribbed belt side sealing flange as shown in the illustration.

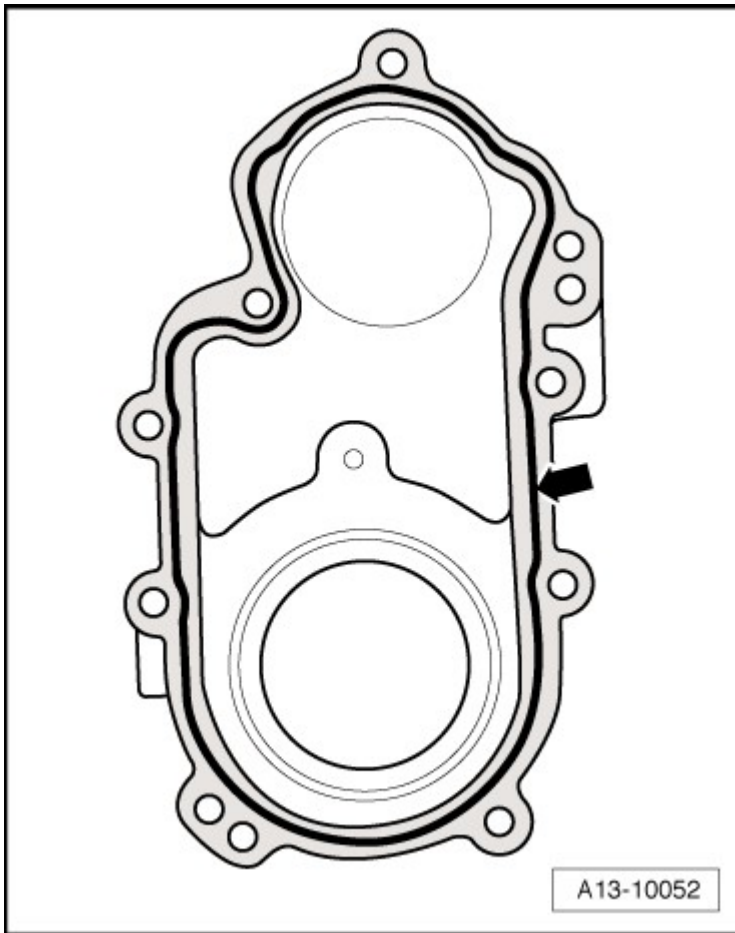


Fig. 33: Identifying Sealant Bead

Courtesy of AUDI OF AMERICA, LLC

- The groove of sealing surface must be completely filled with sealant.
- The sealant bead must be 1.5 to 2.0 mm above sealing surface.

NOTE: **The ribbed belt side, sealing flange must be installed within 5 minutes of applying the sealant.**

-- Place assembly device T40048/1 on pull sleeve T40048/2 and slide sealing flange -1- onto the pull sleeve.

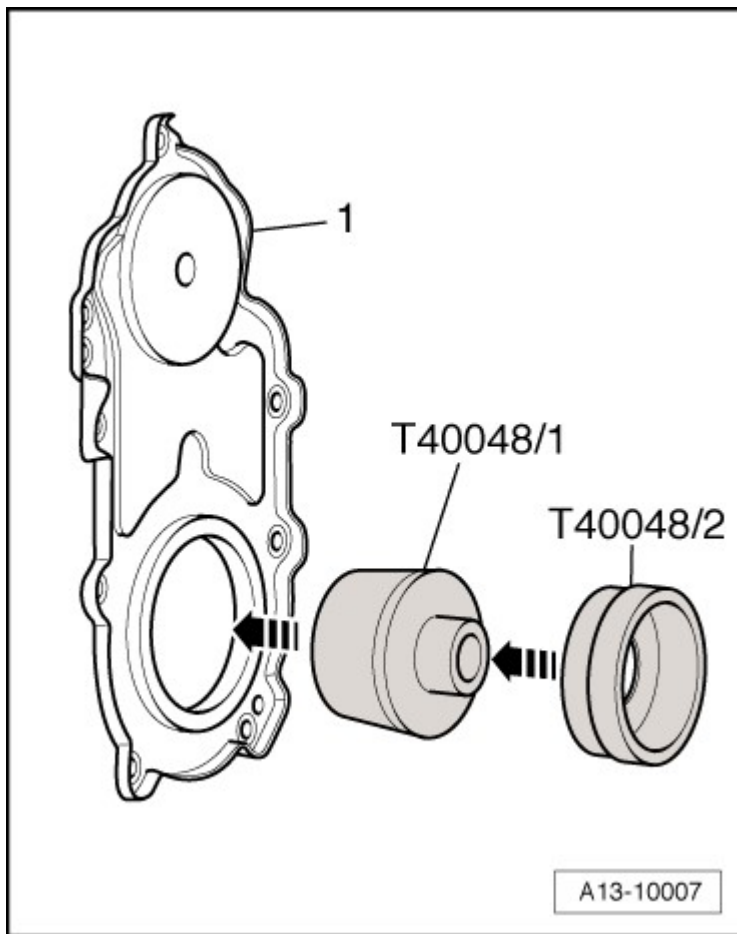


Fig. 34: Inserting Assembly Device T40048/1 Onto Pull Sleeve T40048/2 And Sliding Sealing Flange Onto Pull Sleeve

Courtesy of AUDI OF AMERICA, LLC

-- Remove assembly device.

-- Then position sealing flange with pull sleeve T40048/2 installed on crankshaft.

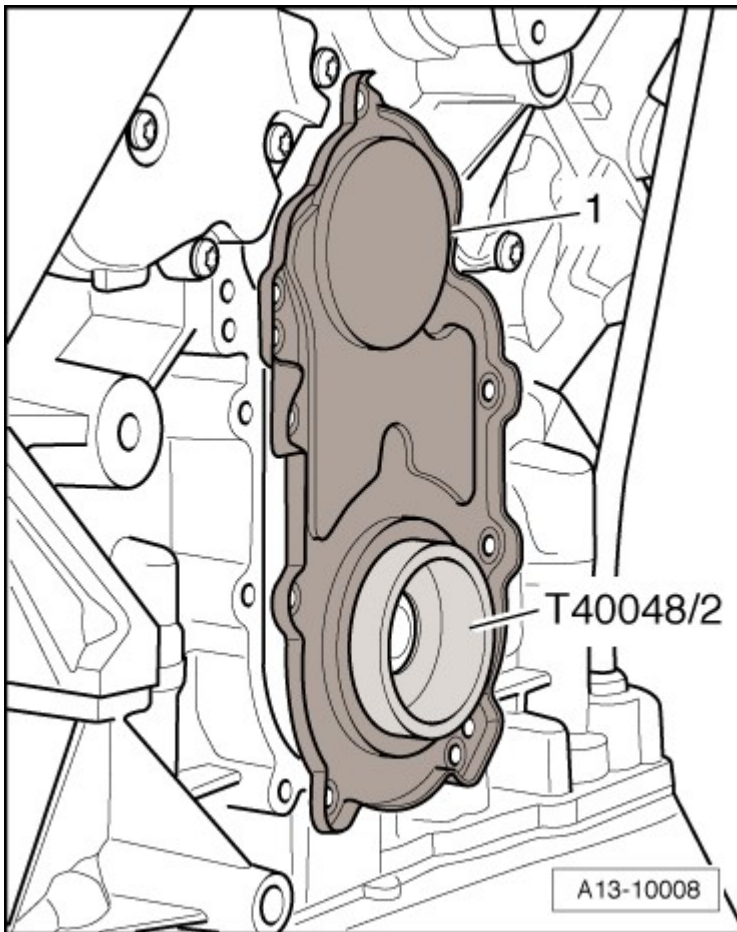


Fig. 35: Placing Sealing Flange With Inserted Pull Sleeve T40048/2 Onto Crankshaft
Courtesy of AUDI OF AMERICA, LLC

-- Without tipping, push sealing flange onto engine sealing surface and fasten.

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

-- Install coolant pump pulley, refer to **COOLANT PUMP, THERMOSTAT AND CONNECTING PIECE ASSEMBLY OVERVIEW** .

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

DRIVE PLATE

Special tools and workshop equipment required

- Counter-holder tool 10 - 201

NOTE: To perform assembly work, secure the engine using the V6 FSI engine holder VAS 6095/1-5 on engine and transmission holder VAS 6095, refer to **ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER** .

REMOVING

Proceed as follows:

- Transmission removed.

-- Insert counter hold tool 10 - 201 to loosen bolts.

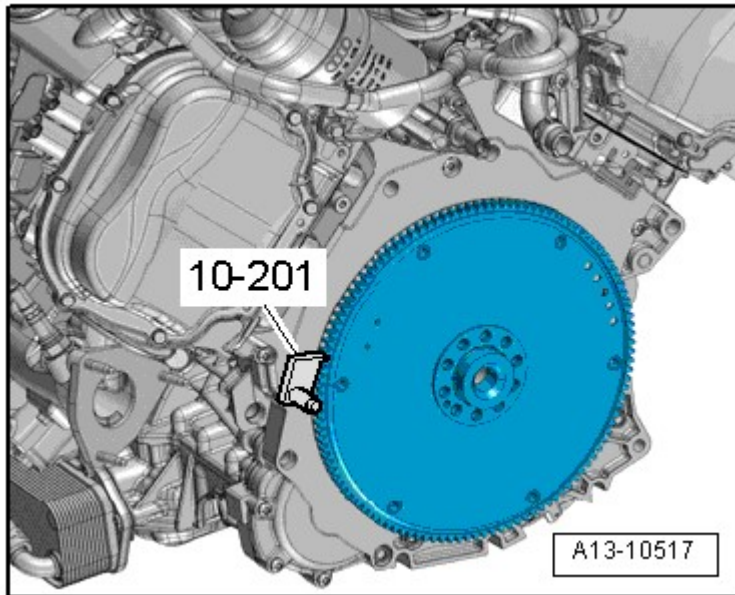


Fig. 36: Drive Plate Overview
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The outer surface of the bearing flange at the drive plate could be damaged.

- Use a multi-point socket wrench with a shaft at least 40 mm long to loosen and tighten drive plate bolts.

-- Remove bolts, drive plate and sensor wheel.

INSTALLING

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

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

NOTE:

- Replace drive plate bolts.
- There is a needle bearing in the drive plate. Check if the needle bearing is inserted before installing. Needle bearing, removing from and installing on drive plate, refer to **DRIVE PLATE NEEDLE BEARING**.

- Be careful of alignment bushings during installation.
- Reposition counter hold tool 10 - 201 to tighten bolts.

DRIVE PLATE NEEDLE BEARING**Special tools and workshop equipment required**

- Tube VW 418 A
- Tube 28 mm dia. 100 mm VW 421
- Sleeve 40 - 103

NOTE: To perform assembly work, secure the engine using the V6 FSI engine holder VAS 6095/1-5 on engine and transmission holder VAS 6095, refer to ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER .

PROCEDURE

Proceed as follows:

- Transmission removed.
- Remove drive plate, refer to DRIVE PLATE.
- Place Sleeve 40 - 103 under drive plate to remove and install.

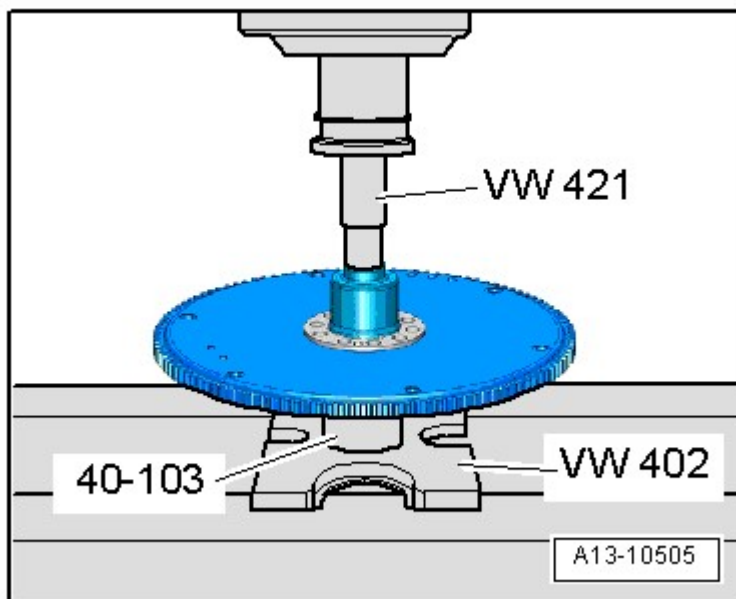


Fig. 37: Identifying Special Tools -- Drive Plate Needle Bearing Removal
Courtesy of AUDI OF AMERICA, LLC

-- Press bearing sleeve out using tube 28 mm dia. 100 mm VW 421 and shop press.

- The thinner end of tube 28 mm dia. 100 mm VW 421 faces toward drive plate.

-- Carefully press needle bearing in as far as stop using tube VW 418 A and shop press.

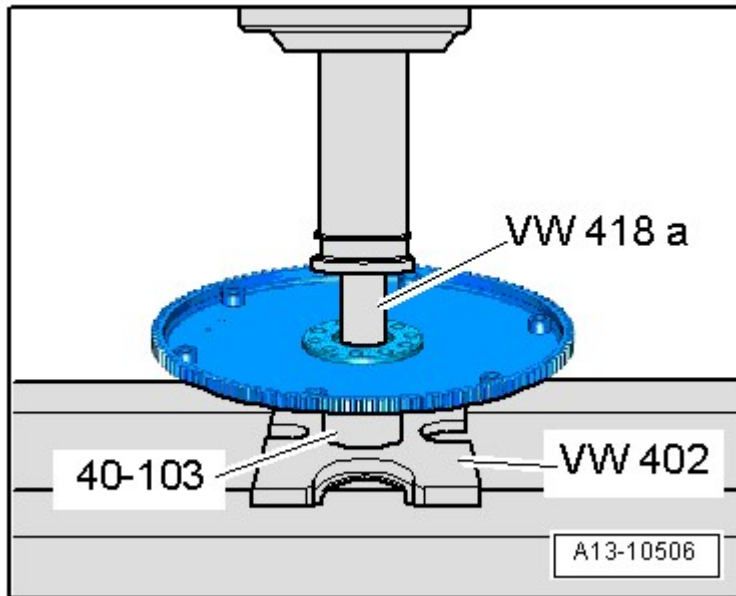


Fig. 38: Identifying Special Tools -- Drive Plate Needle Bearing Installation
Courtesy of AUDI OF AMERICA, LLC

- Installation position: The closed side of needle bearing faces toward engine.

-- Installing drive plate, refer to **DRIVE PLATE**.

CRANKSHAFT SEAL, DRIVE PLATE SIDE

Special tools and workshop equipment required

- Pulling fixture T10122
- Extractor hook T20143/2

NOTE: To perform assembly work, secure the engine using the V6 FSI engine holder VAS 6095/1-5 on engine and transmission holder VAS 6095, refer to **ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER** .

PROCEDURE

Proceed as follows:

- Transmission removed.

-- Remove drive plate, refer to **DRIVE PLATE**.

-- Pry out with a pulling hook T20143/2.

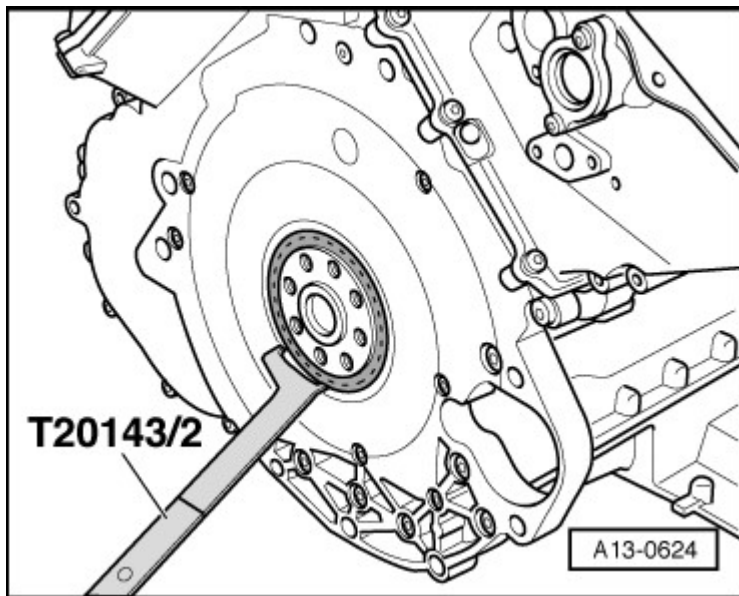


Fig. 39: Prying Out Sealing Ring Using Extractor Lever T20143/2
Courtesy of AUDI OF AMERICA, LLC

-- Clean running and sealing surface.

-- Place assembly device T10122/1 on pull sleeve T10122/2 and slide shaft seal -A- onto pull sleeve.

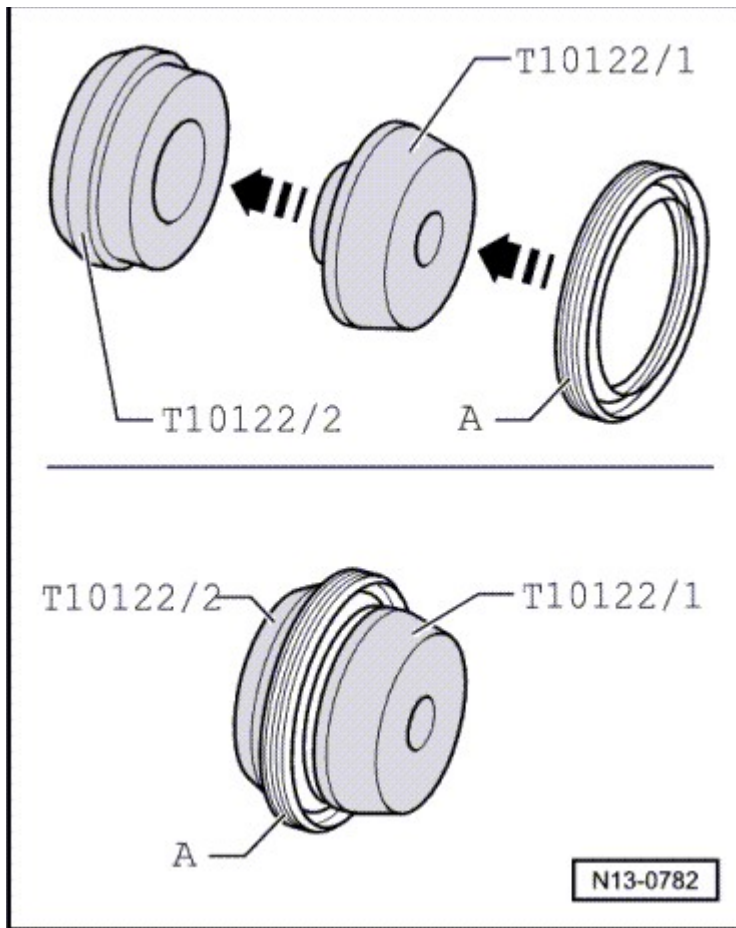


Fig. 40: Identifying Seal, Sleeve T10122/1 And Assembly Tool T10122/2
Courtesy of AUDI OF AMERICA, LLC

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

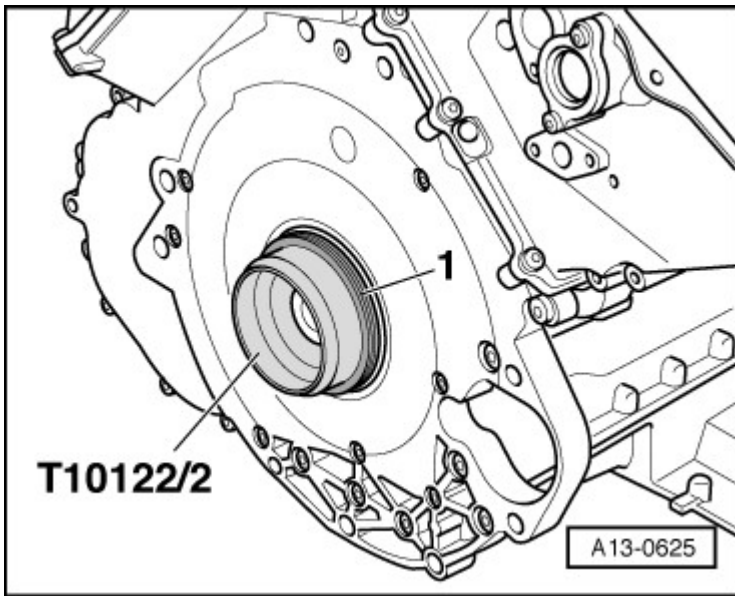


Fig. 41: Identifying Pull Sleeve T10122/2 With Sealing Ring On Crankshaft
Courtesy of AUDI OF AMERICA, LLC

-- Press shaft seal in evenly all around with thrust piece T10122/3 until flush.

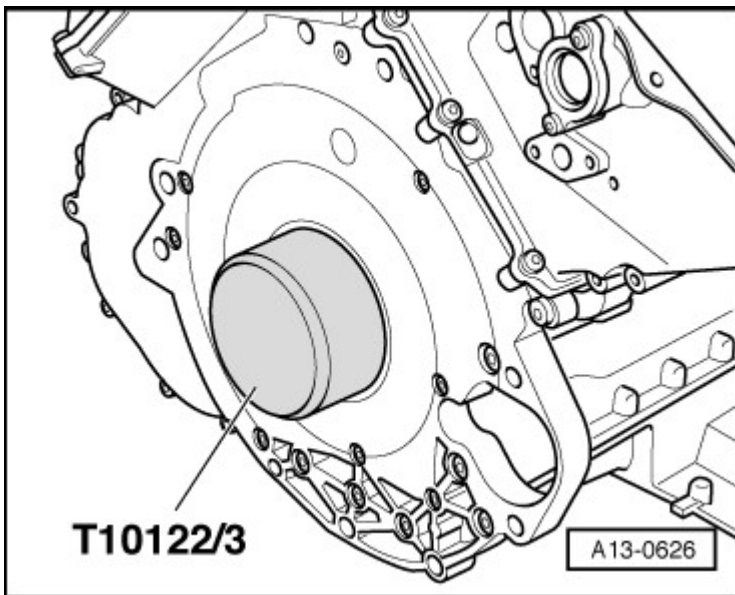


Fig. 42: Pressing In Seal Using T10122/3
Courtesy of AUDI OF AMERICA, LLC

-- Installing drive plate, refer to **DRIVE PLATE**.

SPECIAL TOOLS

Special tools and workshop equipment required

- Dial gauge holder VW 387

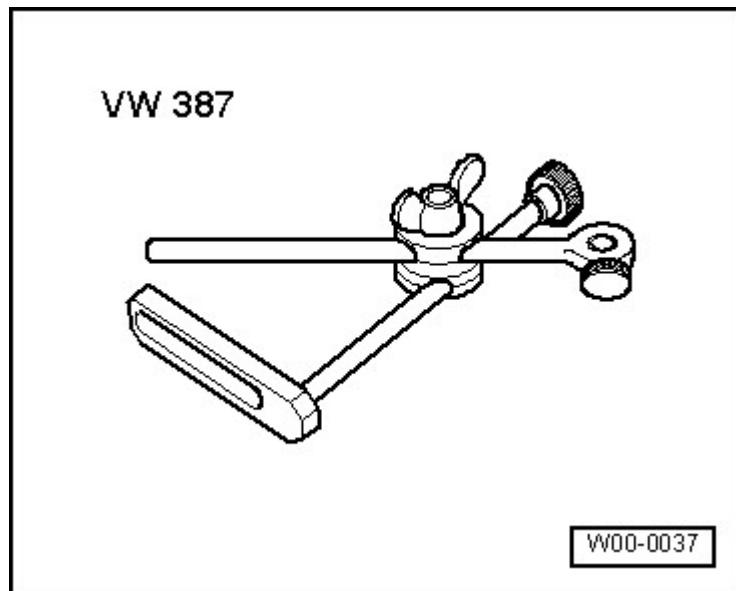


Fig. 43: Identifying Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Dial gauge VAS 6079

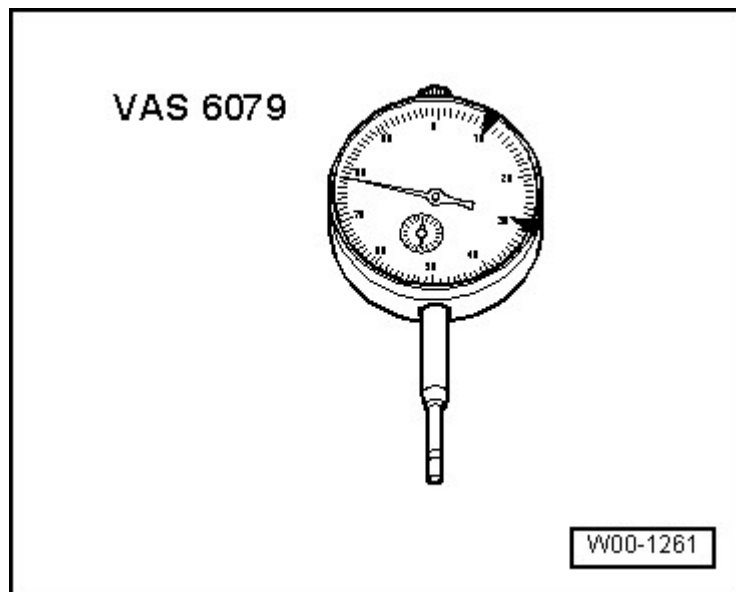


Fig. 44: Identifying Dial Gauge 0-10 mm VAS 6079
Courtesy of AUDI OF AMERICA, LLC

- Pin wrench 3212

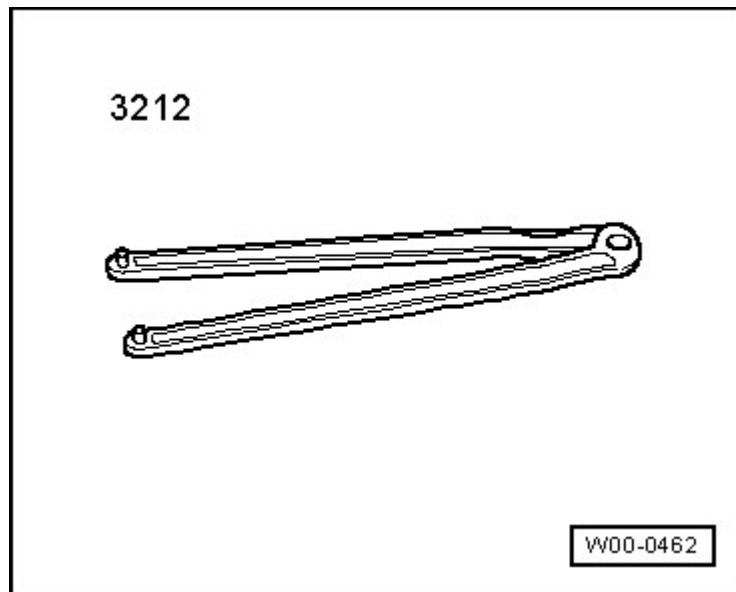


Fig. 45: Identifying Pin Wrench 3212
Courtesy of AUDI OF AMERICA, LLC

- Assembly tool T40048

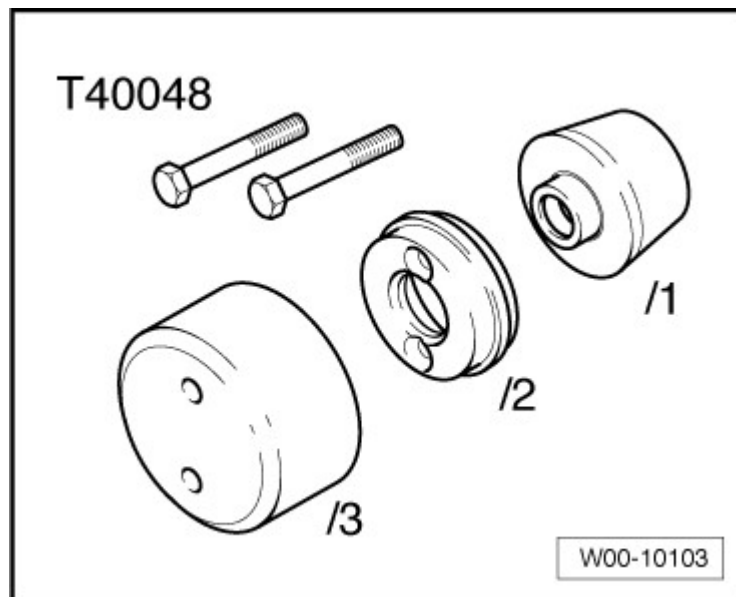


Fig. 46: Identifying Assembly Tool T40048
Courtesy of AUDI OF AMERICA, LLC

- Counter-holder tool 10 - 201

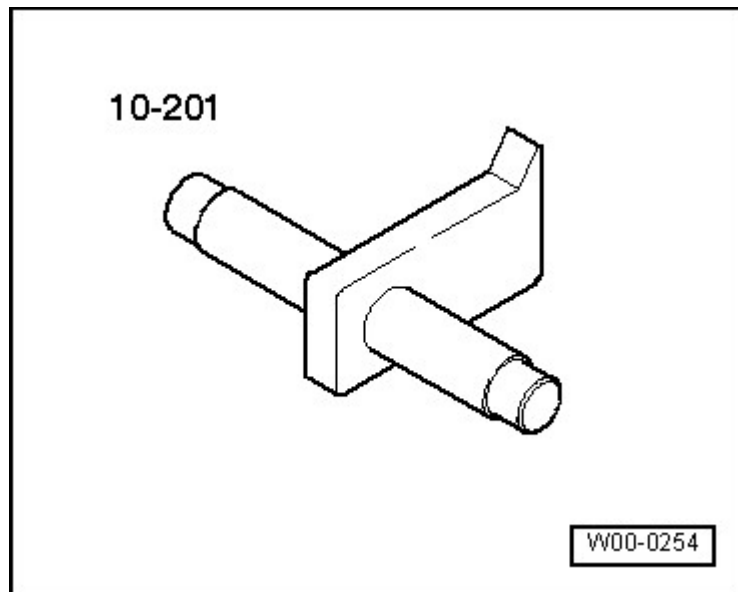


Fig. 47: Identifying Counter-holder tool 10 - 201
Courtesy of AUDI OF AMERICA, LLC

- Tube VW 418 A

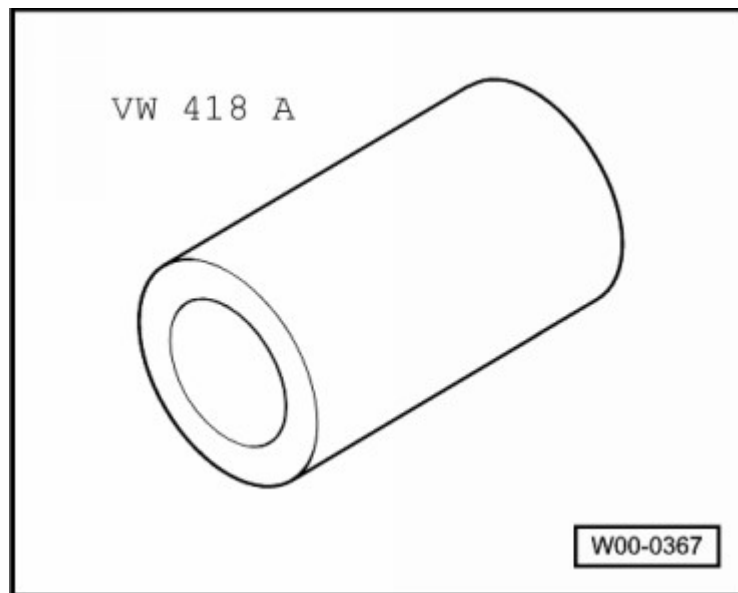


Fig. 48: Identifying Tube VW 418 A
Courtesy of AUDI OF AMERICA, LLC

- Tube 28 mm dia. 100 mm VW 421

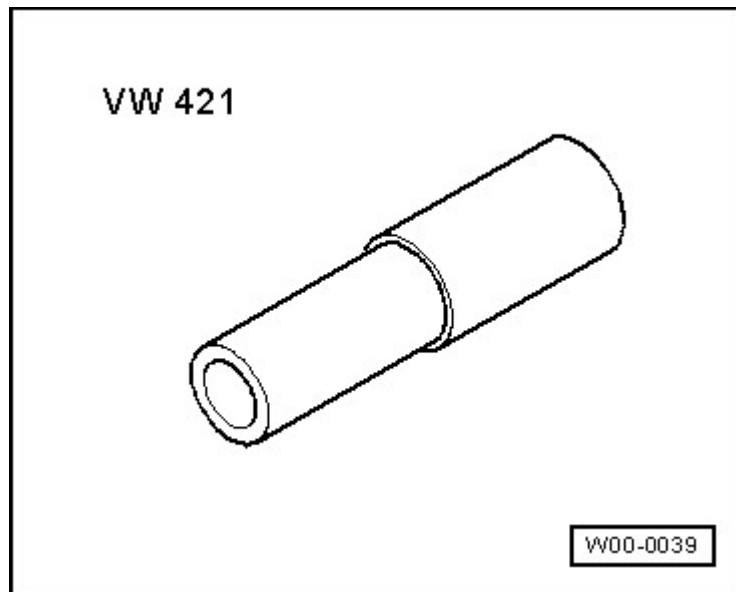


Fig. 49: Identifying Tube 28 mm dia. 100 mm VW 421
Courtesy of AUDI OF AMERICA, LLC

- Sleeve 40 - 103

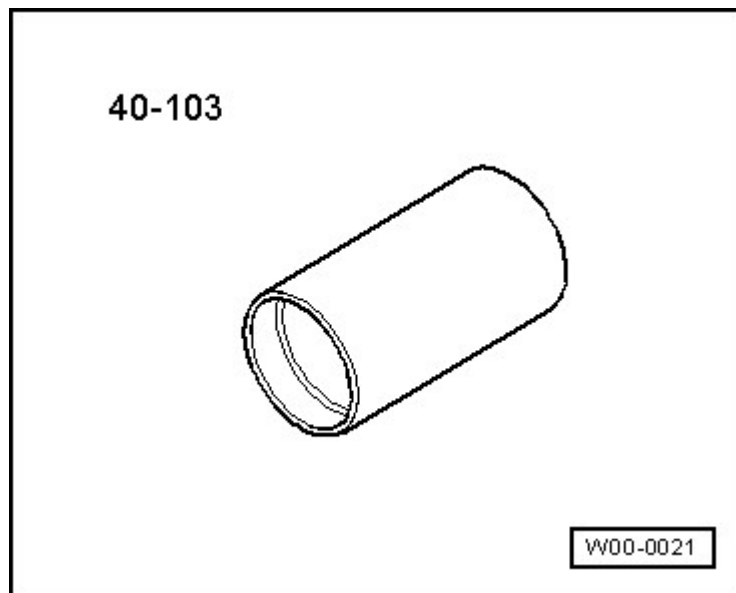


Fig. 50: Identifying Sleeve 40 - 103
Courtesy of AUDI OF AMERICA, LLC

- Pulling fixture T10122

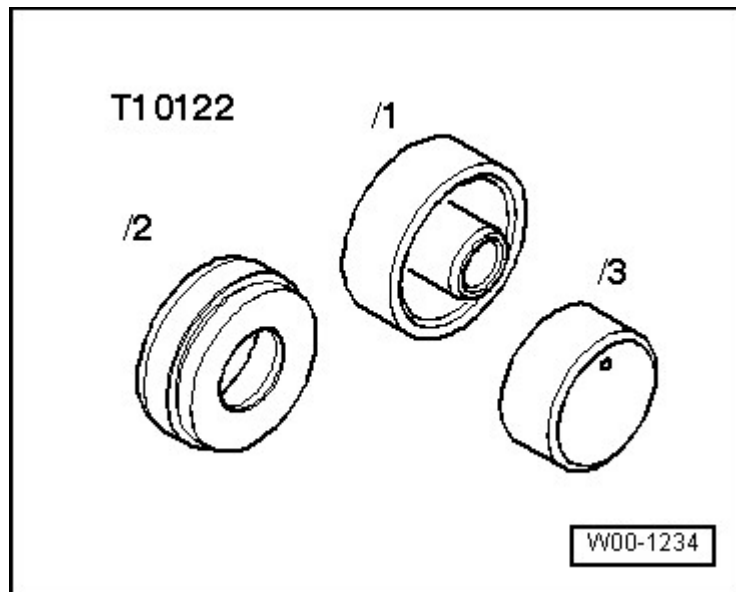


Fig. 51: Identifying Pulling Fixture T10122
Courtesy of AUDI OF AMERICA, LLC

- Extractor hook T20143/2

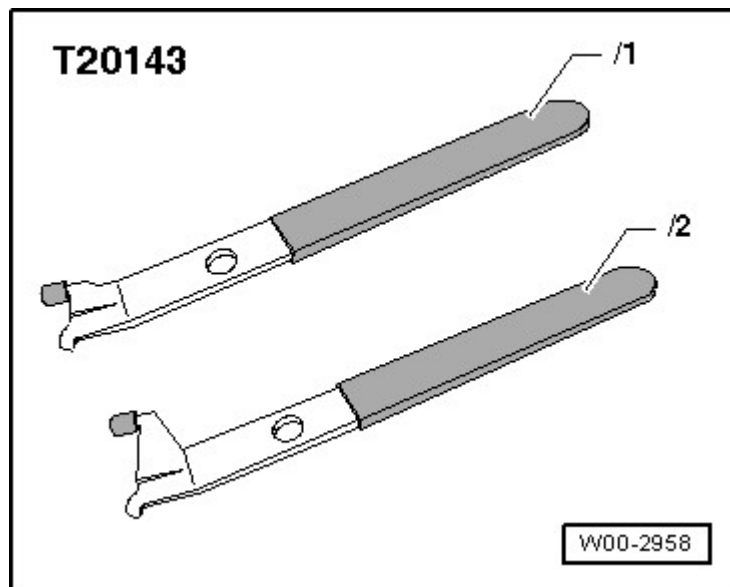


Fig. 52: Identifying Extractor hook T20143/2
Courtesy of AUDI OF AMERICA, LLC

ENGINE

3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

10 ENGINE ASSEMBLY

DESCRIPTION AND OPERATION

ENGINE MOUNT ASSEMBLY OVERVIEW

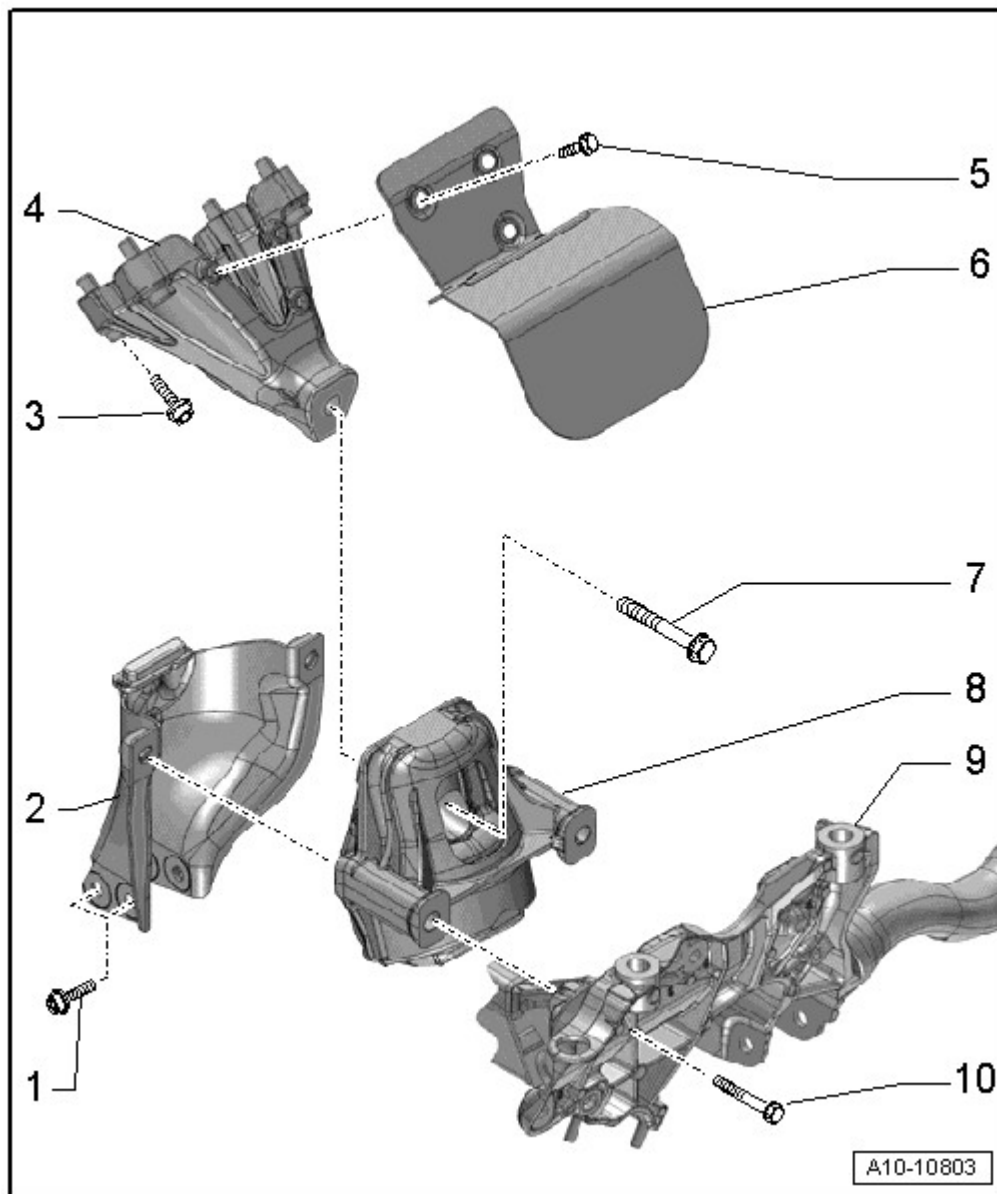


Fig. 1: Subframe Mount Assembly Overview
Courtesy of AUDI OF AMERICA, LLC

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

1. Bolt
 - 20 Nm
2. Retaining plate
 - For engine mount
3. Bolt
 - 40 Nm
4. Engine support
5. Bolt
 - 10 Nm
6. Heat shield
7. Bolt
 - Replace
 - 90 Nm + an additional 90° turn
8. Engine mount
 - Removing and installing: Left **LEFT ENGINE MOUNT**, right **RIGHT ENGINE MOUNT**.
9. Subframe
10. Bolt
 - 55 Nm

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Components	Bolt Size	Nm
Bolts and Nuts		
	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Ground Pin to Strut Tower		9

ENGINE TO TRANSMISSION BOLT TIGHTENING SEQUENCE AND SPECIFICATION

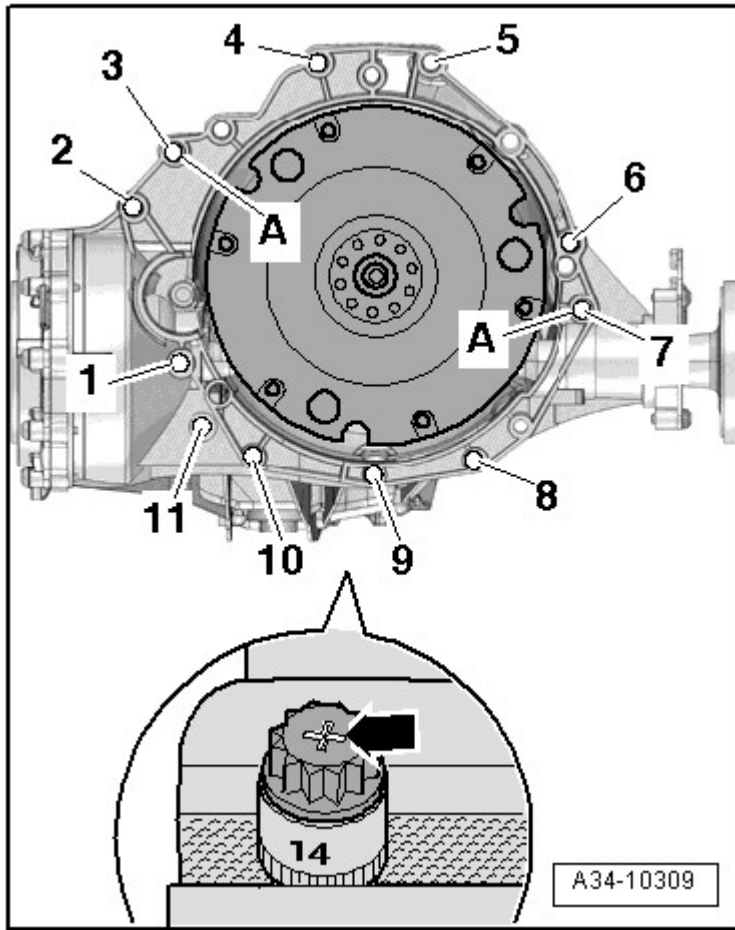


Fig. 2: Engine To Transmission Bolt Tightening Sequence And Specification
 Courtesy of AUDI OF AMERICA, LLC

Item	Bolt	Nm
1	M10 x 50 ¹⁾	65
2 to 6	M12 x 100 ²⁾	30 + 105° turn
7	M12 x 125 ²⁾	30 + 105° turn
8, 11	M10 x 60 ²⁾	15 + 105° turn
9, 10	M10 x 95 ²⁾	15 + 105° turn
A	Alignment sleeves for centering	
• ¹⁾ Bolt class 10.9. • ²⁾ Replace bolts.		

REMOVAL AND INSTALLATION

ENGINE, REMOVING - MANUAL TRANSMISSION

NOTE: Remove engine downward together with transmission and subframe while the lock carrier is installed.

Collect escaping coolant in a clean container for disposal or reuse.

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

NOTE: If the engine and transmission will be separated after removal, the supplementary set VAS 6131/14 will also be needed.

Special tools and workshop equipment required

- Old oil collecting and extracting device V.A.G 1782
- Hose clamp pliers V.A.G 1921
- Step ladder VAS 5085
- Scissor lift table VAS 6131 A with support set VAS 6131/10 and supplementary set VAS 6131/13
- Drip tray for workshop crane VAS 6208
- Pry lever - rmv outside mirror 80 - 200
- Counterhold tool T10172 with T10172/5 for vehicles with AWD
- Puller T40160
- Assembly aid T40169
- Bracket T40170

Procedure

Proceed as follows:

WARNING: Risk of vehicle tipping over with engine removed.

- Secure vehicle. Luggage compartment must be empty for this.

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 **BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM** .

CAUTION: Risk of destroying electrical components.

- Observe measures when disconnecting battery.

NOTE: Release electrical parking brake before disconnecting battery so the driveshaft can be rotated to remove it.

- Position front wheels so they are straight.
- Switch off ignition and remove ignition key.
- Raise luggage compartment liner and engage it on the body.
- Remove nut -1- and vehicle tool kit cover -2-.

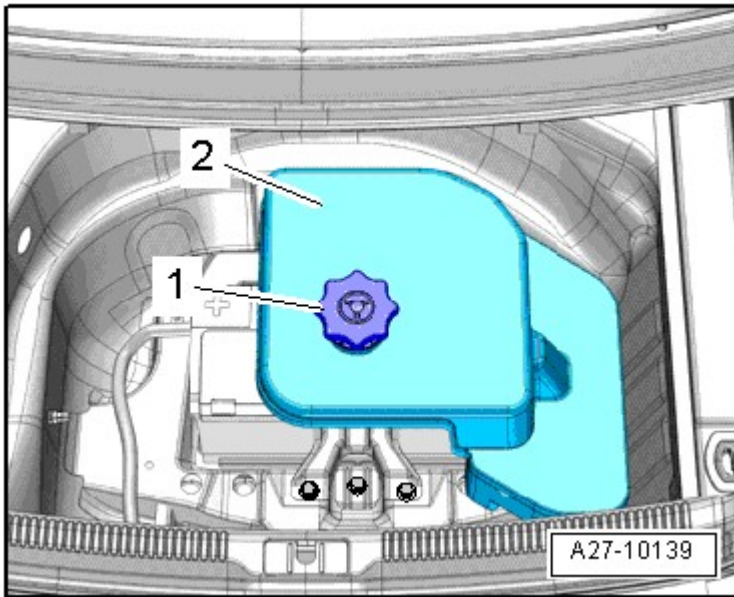


Fig. 3: Identifying Nut -1- And Tool Kit Cover -2-
Courtesy of AUDI OF AMERICA, LLC

- Pull cover -1- over negative terminal up slightly -arrow-.

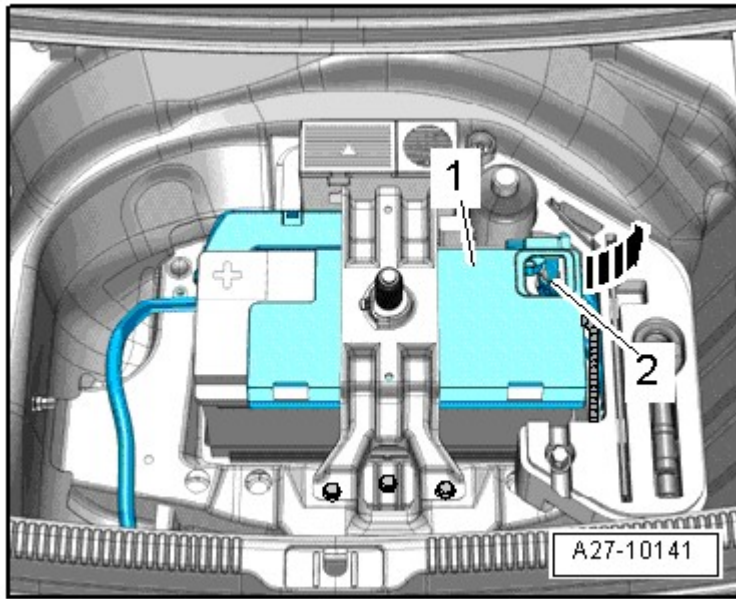


Fig. 4: Identifying Battery

Courtesy of AUDI OF AMERICA, LLC

- Loosen nut a few turns and remove ground (GND) wire terminal clamp -2- from the battery pole.
- Empty coolant circuit **COOLING SYSTEM, DRAINING AND FILLING** .
- Extract power steering fluid from reservoir with used oil collection and extraction device V.A.G 1782.
- Remove engine covers -arrows-.

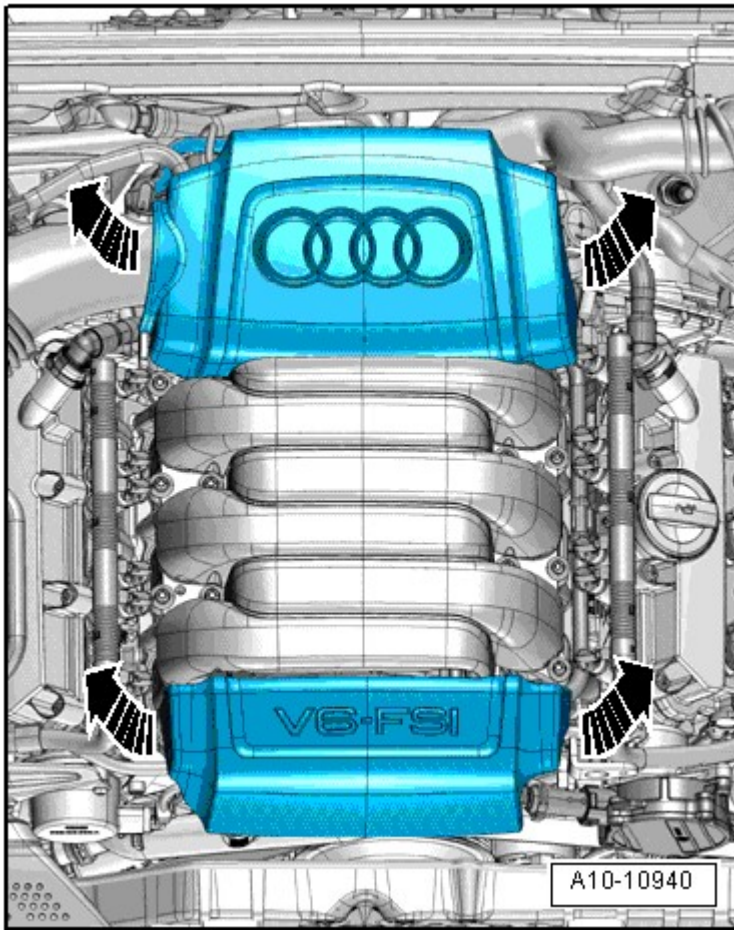


Fig. 5: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

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 coolant reservoir cap.

-- Remove left and right front wheels.

-- Remove left and right front wheel housing liners **Description and Operation** .

-- Remove noise insulation by loosening fasteners -1 through 4-.

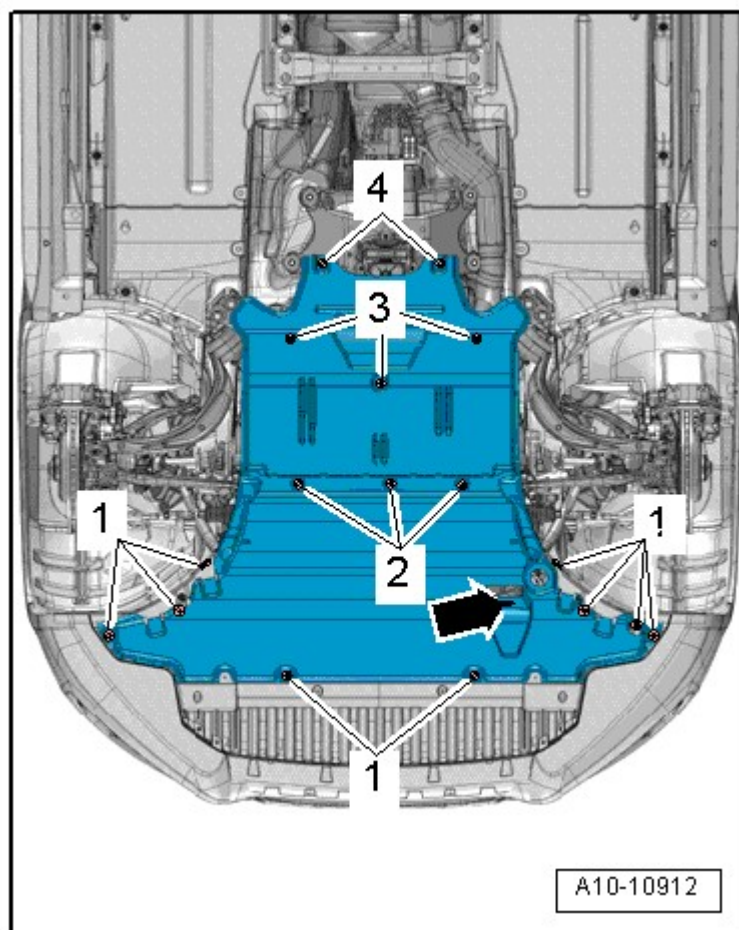


Fig. 6: Identifying Noise Insulation

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -arrow-.

- Place drip tray VAS 6208 under engine.
- Remove drain plug -1- and drain coolant.

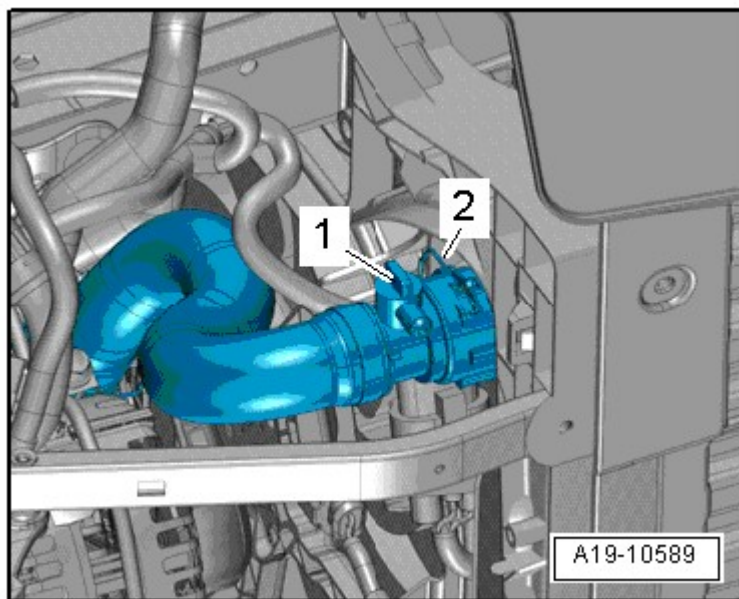


Fig. 7: Identifying Drain Plug And Draining Coolant
Courtesy of AUDI OF AMERICA, LLC

- Remove coolant hose -2- from radiator by raising retaining clip.
- Remove coolant hose -arrows- from oil cooler and drain remaining coolant.

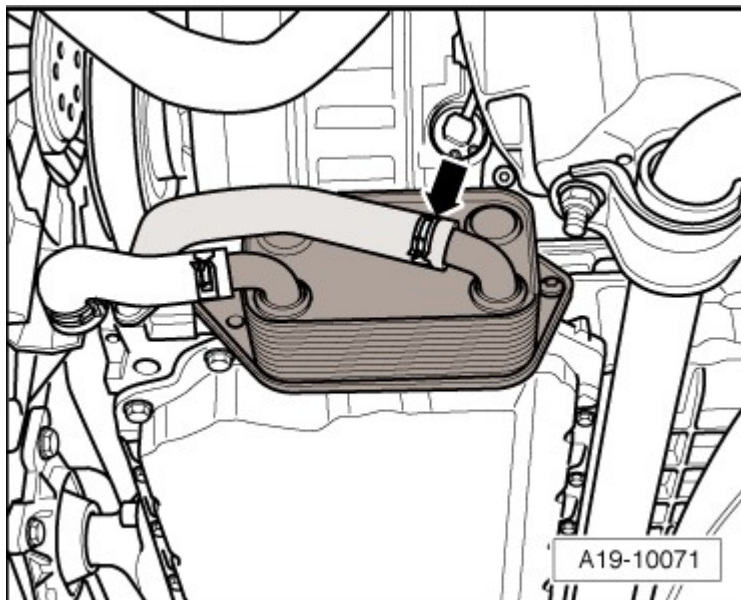


Fig. 8: Disconnecting Coolant Hose From Oil Cooler
Courtesy of AUDI OF AMERICA, LLC

- Place used oil collecting and extracting device V.A.G 1782 under separating point.

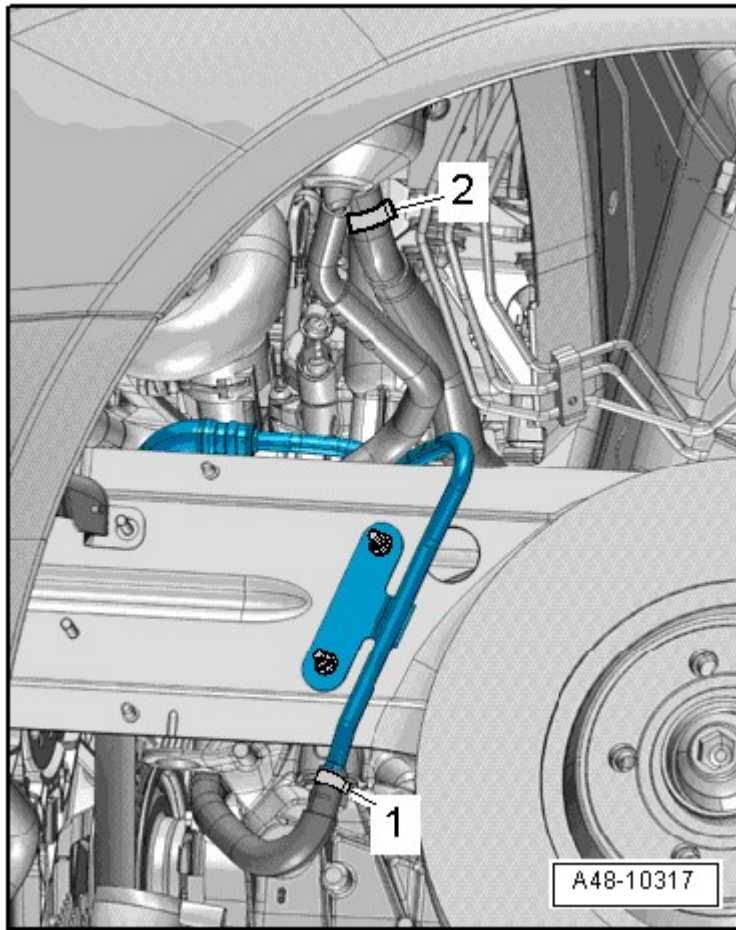


Fig. 9: Disconnecting Power Steering Hydraulic Oil Supply Line
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect power steering hydraulic oil supply line -2- and return line -1- in the left front wheel housing and free them up.

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

With Coolant Pump -V50-

-- Disconnect electrical connector -1-.

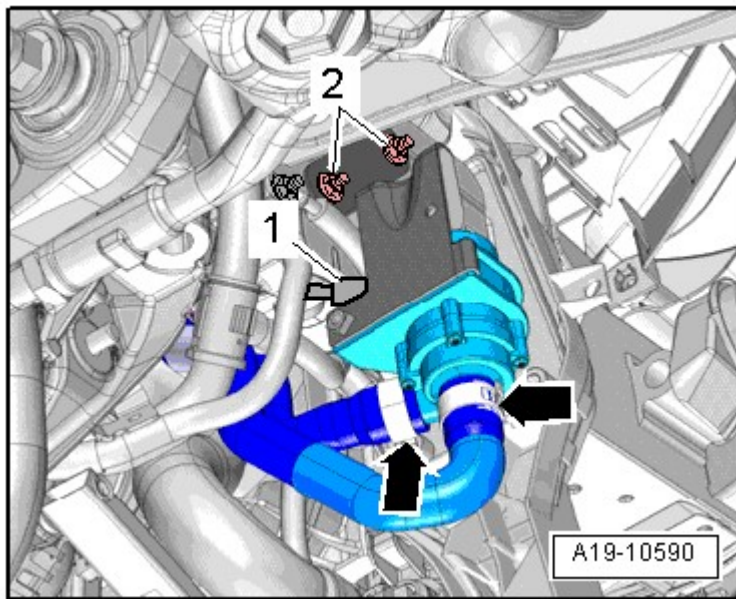


Fig. 10: Disconnecting Electrical Connector -1-
Courtesy of AUDI OF AMERICA, LLC

- Place drip tray VAS 6208 under engine.
- Remove coolant hose from coolant pump -V50- -right arrow-.

NOTE: Ignore -2- and -left arrow-.

Continuation for All

- Disconnect coolant fan electrical connector -1- by sliding retainer back -arrow- and pressing release down.

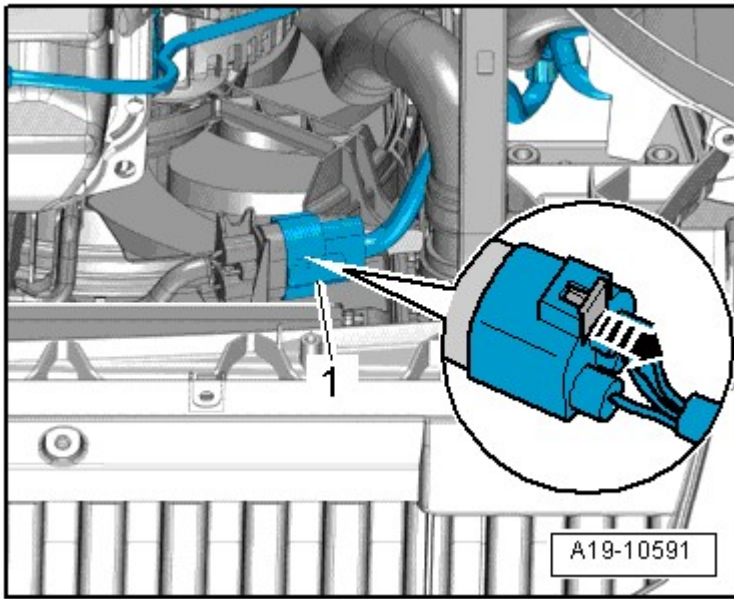


Fig. 11: Disconnecting Coolant Fan Electrical Connector -1- From Bracket
Courtesy of AUDI OF AMERICA, LLC

- Free up electrical wiring harness.
- Remove left and right bolts -1- and nuts -3- and lock carrier braces -2-.

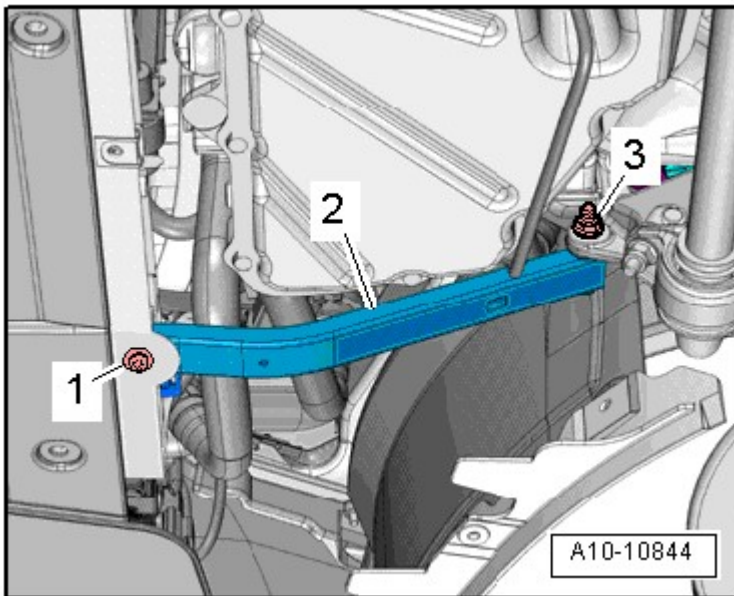


Fig. 12: Identifying Carrier Left Brace Components
Courtesy of AUDI OF AMERICA, LLC

- Remove nut -arrow- on right longitudinal member and free up ground (GND) wire.

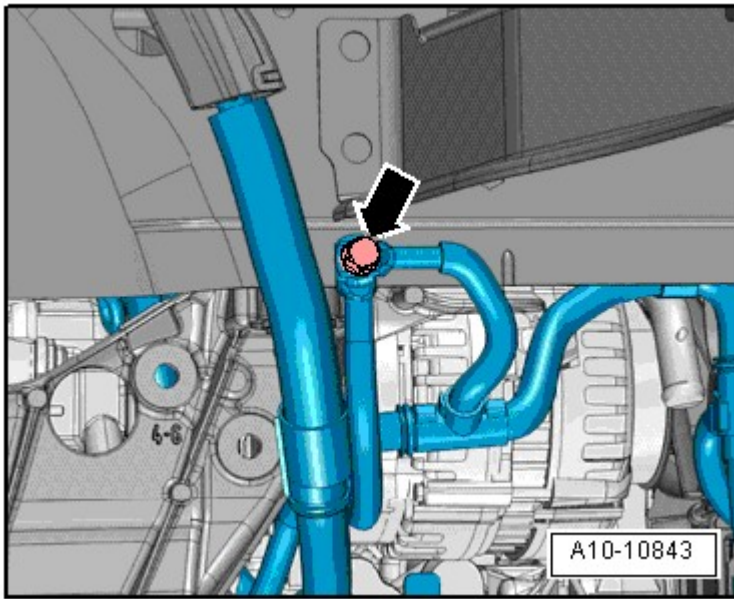


Fig. 13: Disconnecting Ground Wires -Arrow- From Right Longitudinal Member
Courtesy of AUDI OF AMERICA, LLC

-- Remove seal -arrow-.

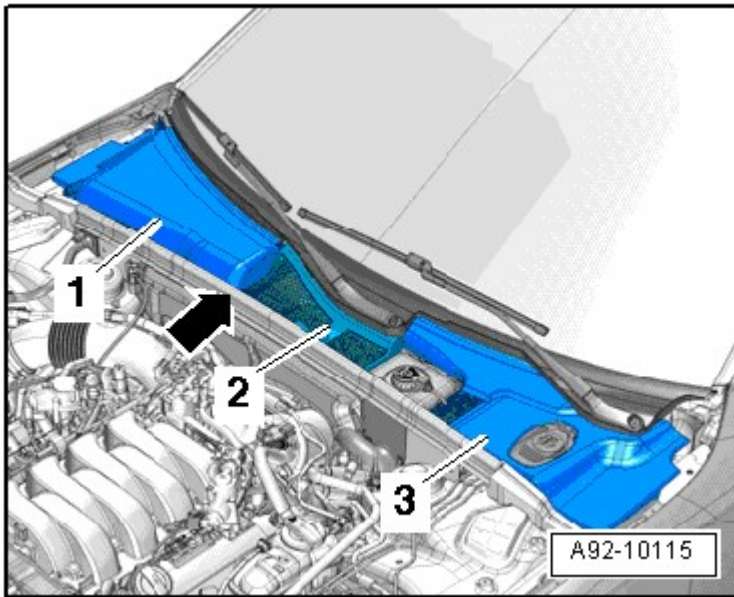


Fig. 14: Identifying Plenum Chamber Covers
Courtesy of AUDI OF AMERICA, LLC

-- Unclip plenum chamber covers -1, 2 and 3- and remove it.

-- Remove vacuum connection -2- from bulkhead by pulling vacuum hose -1- on rear side.

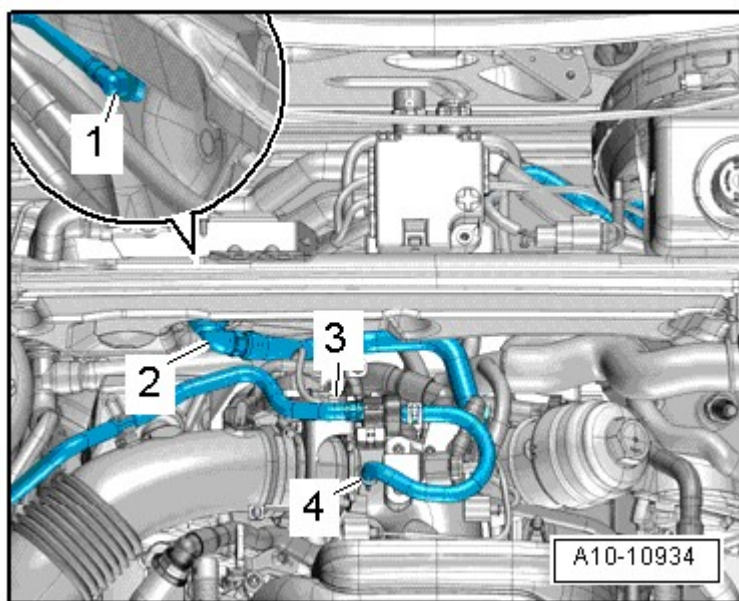


Fig. 15: Freeing Up Fuel Line And Wire To EVAP Canister At Air Guide Pipe
 Courtesy of AUDI OF AMERICA, LLC

- Free up fuel line and wire to EVAP canister at air guide pipe.
- Disconnect vacuum hose -arrow- to leak detection pump -V144-.

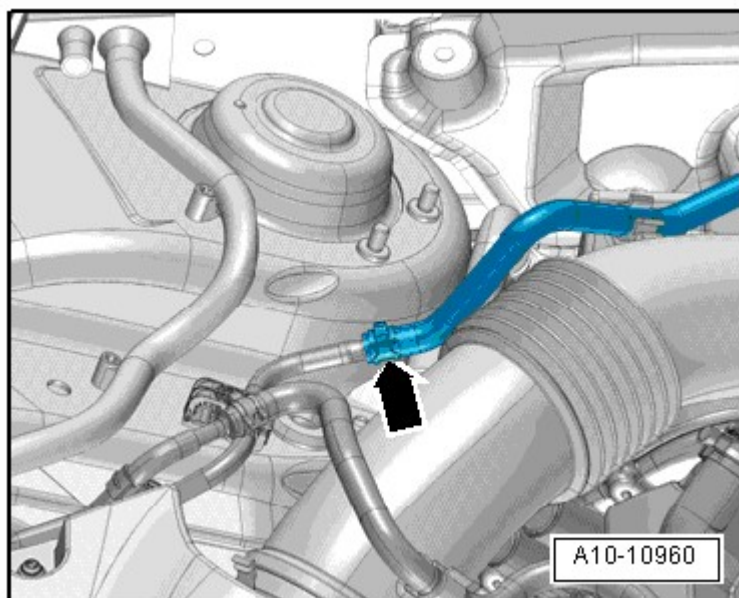


Fig. 16: Identifying Vacuum Hose -Arrow- To Leak Detection Pump -V144-
 Courtesy of AUDI OF AMERICA, LLC

- Remove air duct -arrows-.

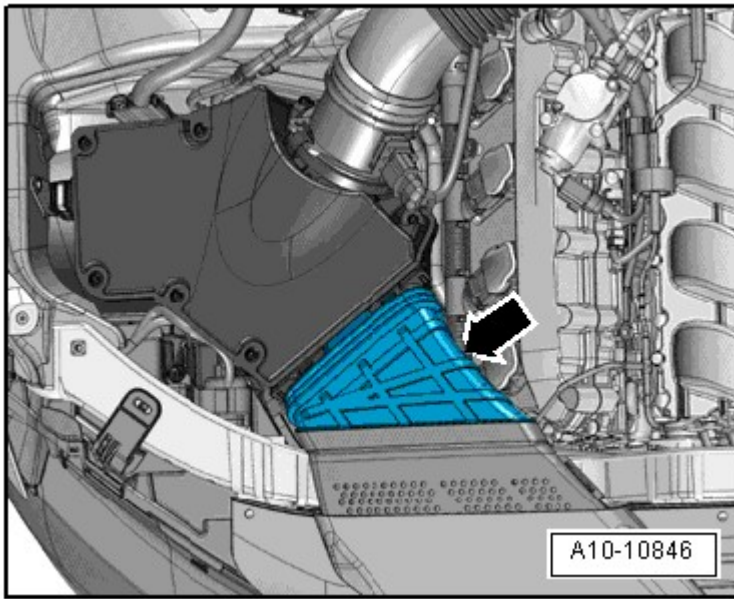


Fig. 17: Identifying Air Duct

Courtesy of AUDI OF AMERICA, LLC

-- Remove vacuum hose -3- from connection on air guide pipe.

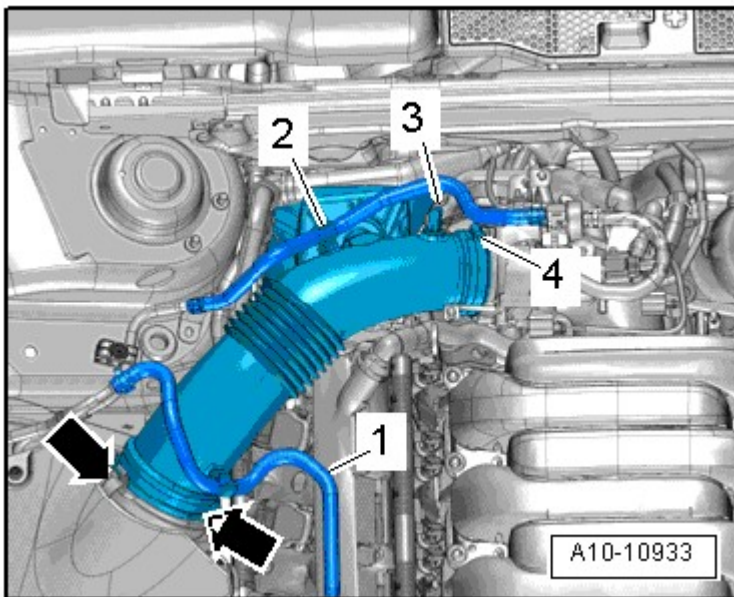


Fig. 18: Removing Air Guide Pipe By Loosening Hose Clamp -4- & Opening Clips -Arrows-

Courtesy of AUDI OF AMERICA, LLC

-- Remove air guide pipe by loosening hose clamp -4- and opening clips -arrows-.

NOTE: Ignore -1 and 2-.

-- Disconnect vacuum line -1-.

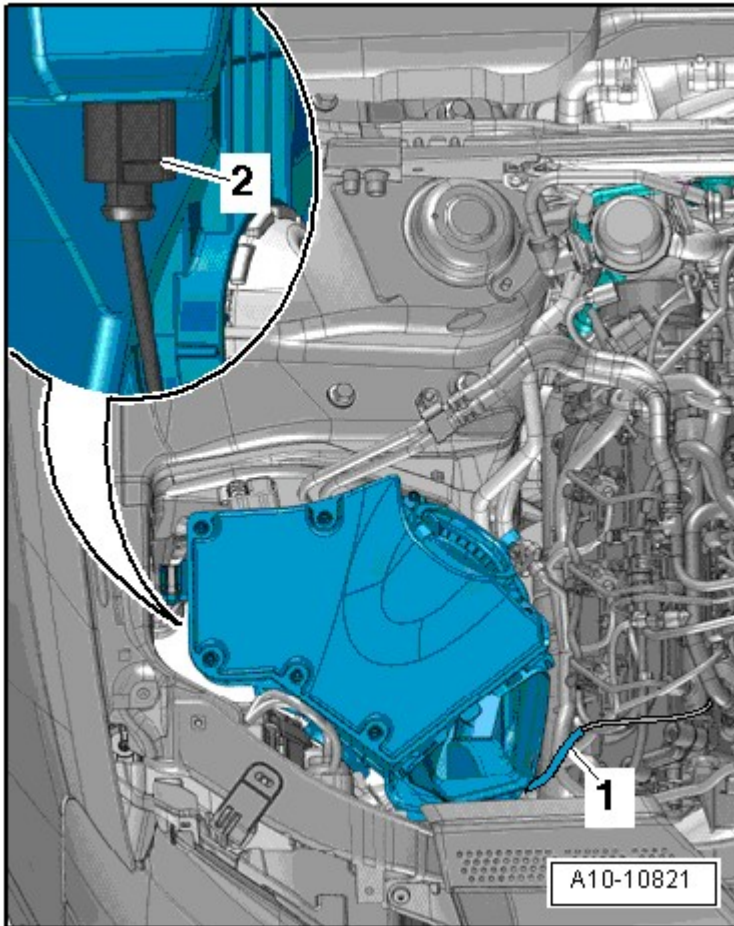


Fig. 19: Disconnecting Vacuum Line
Courtesy of AUDI OF AMERICA, LLC

-- Remove air filter housing and, if applicable, disconnect electrical connector -2- on rear side at intake air switch-over valve -N335-.

WARNING: Risk of injury from fuel.

- To reduce fuel pressure, lay cloths around connecting point before opening fuel system and carefully loosen.

CAUTION: Follow cleanliness precautions when working on the fuel supply system
CLEAN WORKING CONDITIONS .

-- Remove fuel supply line from high pressure pump -arrow- and lay it aside.

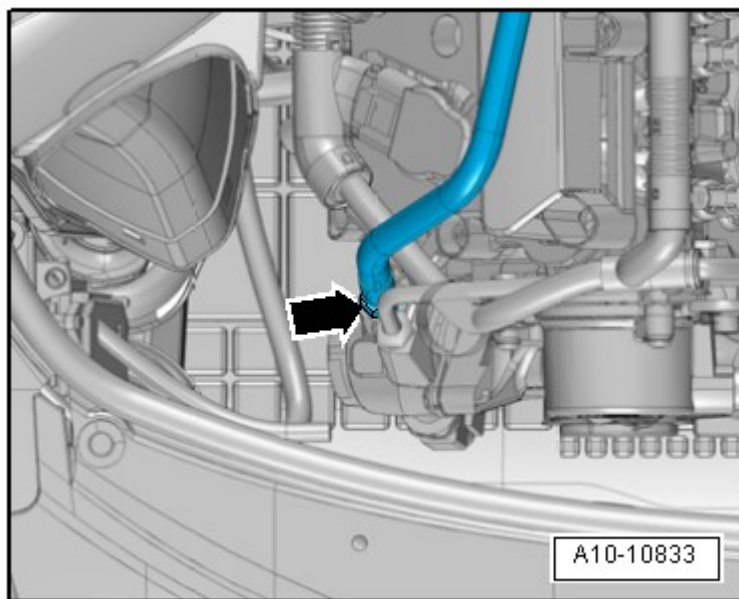


Fig. 20: Identifying Fuel Supply Hose
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect vacuum hose -1- and free it up.

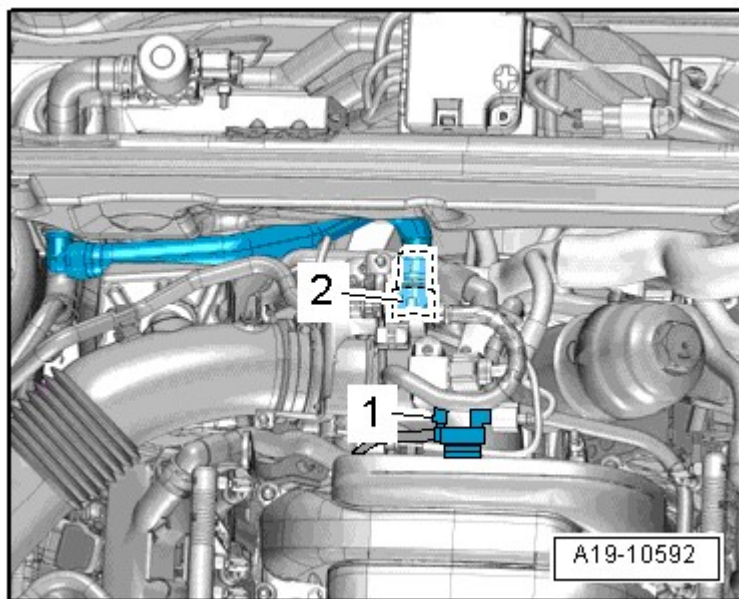


Fig. 21: Disconnecting Vacuum Hose And Free It Up, If Applicable
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -2- from upper coolant pipe by lifting retaining clamp.

-- In vehicles without a coolant pump -V50-, remove right front coolant hose -arrow- from front coolant pipe by lifting retaining clamp.

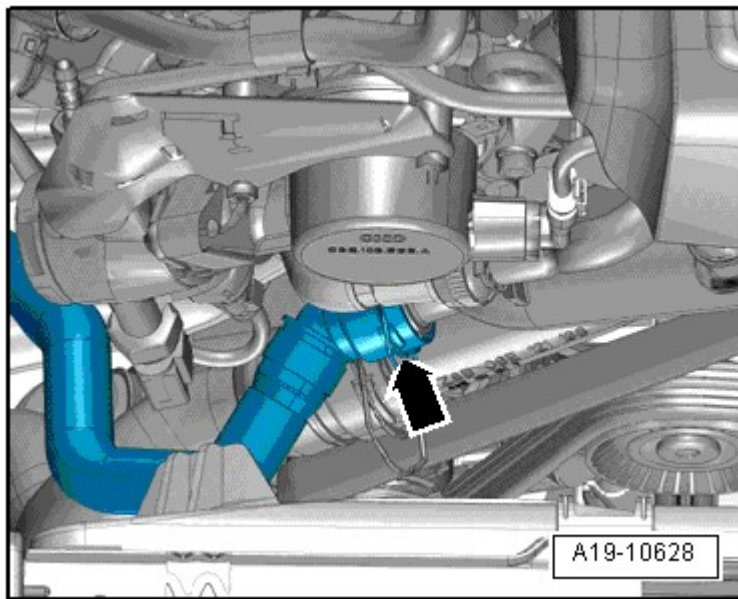


Fig. 22: Identifying Clamp And Right Front Coolant Hose -Arrow- To Front Coolant Pipe
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -arrow- from front coolant pipe by lifting retaining clamp.

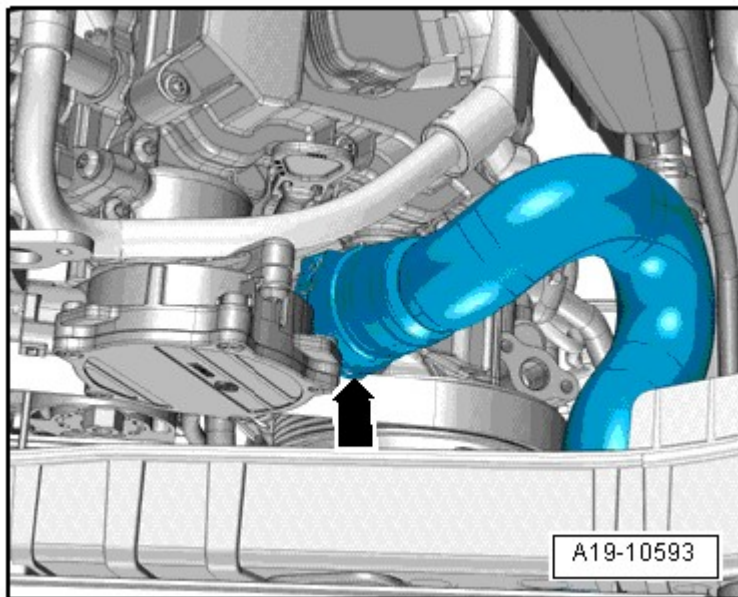


Fig. 23: Identifying Coolant Hose From Front Coolant Pipe By Lifting Retaining Clamp
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -3- from coolant reservoir and free it up.

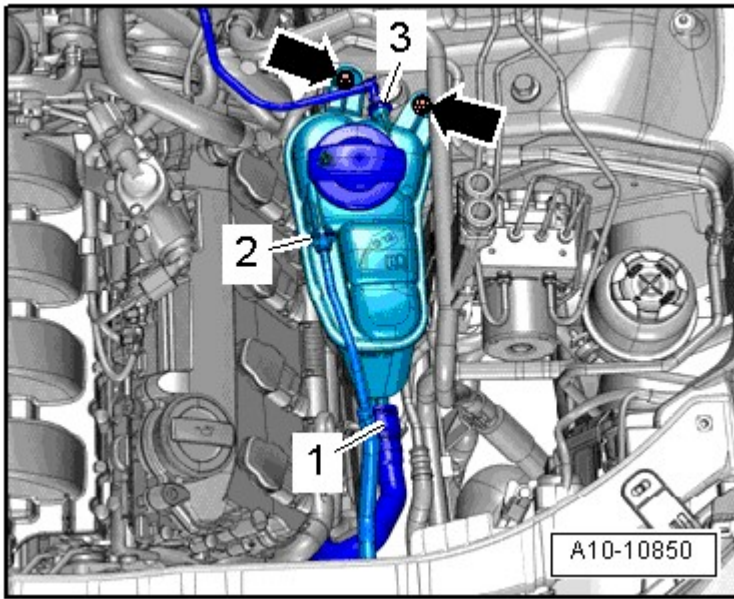


Fig. 24: Identifying Coolant Hose And Coolant Reservoir
Courtesy of AUDI OF AMERICA, LLC

- Remove bolts -arrows-, disconnect electrical connector on Engine Coolant Level (ECL) warning switch -F66- and lay coolant reservoir aside with coolant hoses -1- and -2- attached.
- Disconnect electrical connector -arrow- on power steering pump, if applicable.

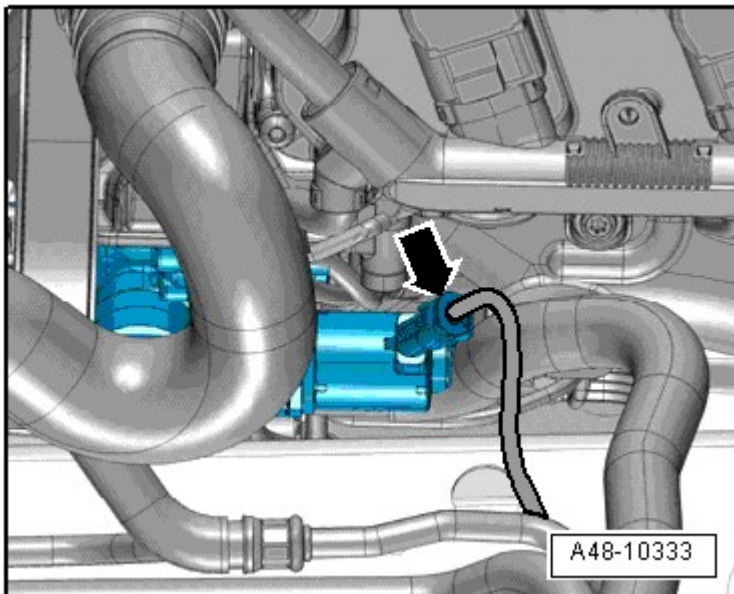


Fig. 25: Disconnecting Connector -Arrow- From Power Steering Pump
Courtesy of AUDI OF AMERICA, LLC

- Press hydraulic oil hose to the side.

CAUTION: Risk of damaging coolant lines and hoses.

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

-- Remove bolts -arrows- and refrigerant lines from A/C compressor.

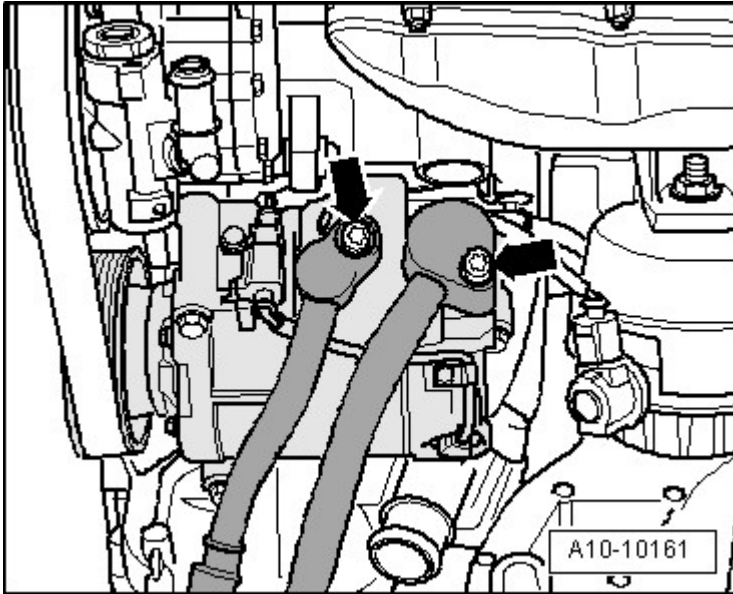


Fig. 26: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt and moisture from entering, seal open lines and connections with clean plugs or protective caps.

-- Release retainer -arrow A- and open cover -arrow B-.

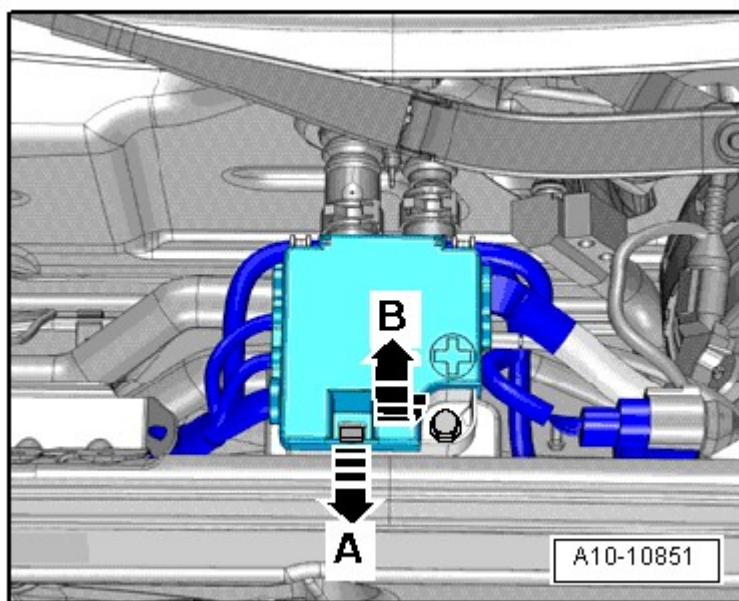


Fig. 27: Opening Terminal Box Cover
Courtesy of AUDI OF AMERICA, LLC

-- Remove nuts -1- and -2- for electrical wires.

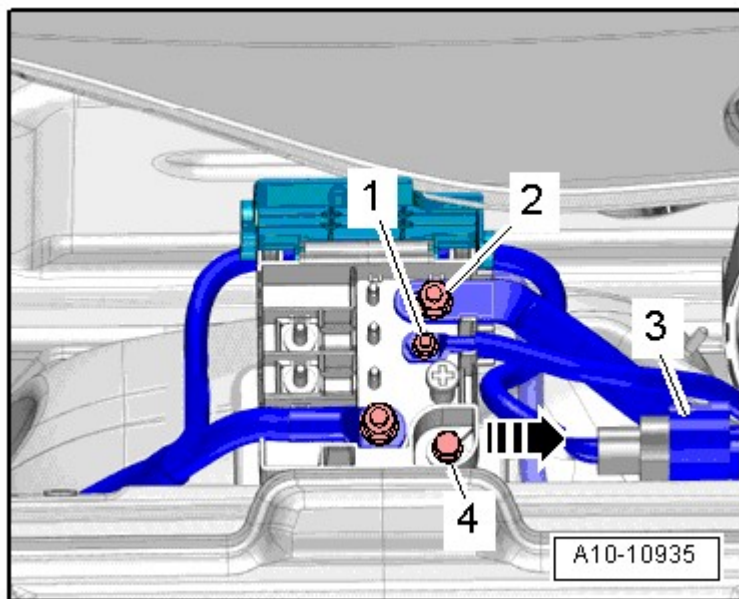


Fig. 28: Identifying Nut And Electrical Wires
Courtesy of AUDI OF AMERICA, LLC

-- Remove electrical connector -3- from bracket and disconnect it.

-- Remove bolt -4- and terminal 30 wire junction 2 -TV22- from tower brace -arrow-.

-- Release retainers from wheel housing side using a 5.5 mm open end wrench -1- -arrow- and remove wiring

bushing -2- upward.

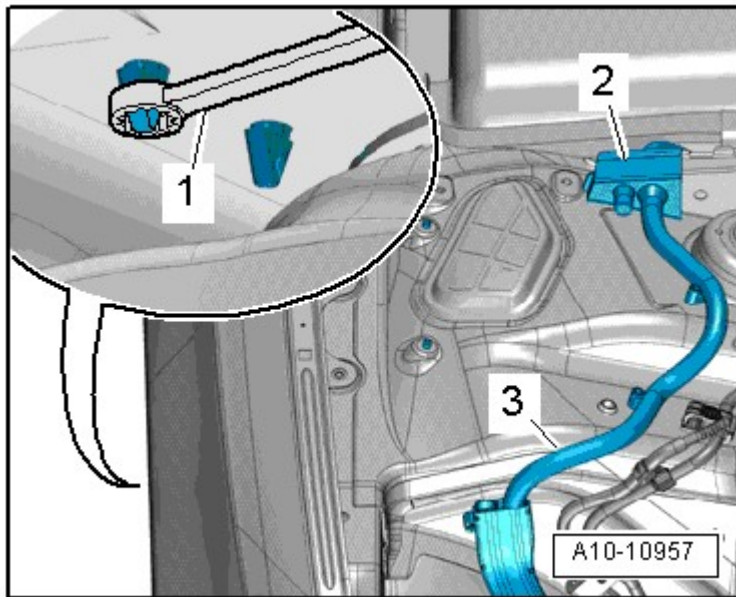


Fig. 29: Releasing Retainers From Wheel Housing Side Using A 5.5 Mm Open End Wrench
Courtesy of AUDI OF AMERICA, LLC

-- Free up wiring harness -3- to generator and starter using pry lever - rmv outside mirror 80 - 200.

-- Free up wiring duct by releasing retainer -arrow B- and pulling duct forward -arrow A-.

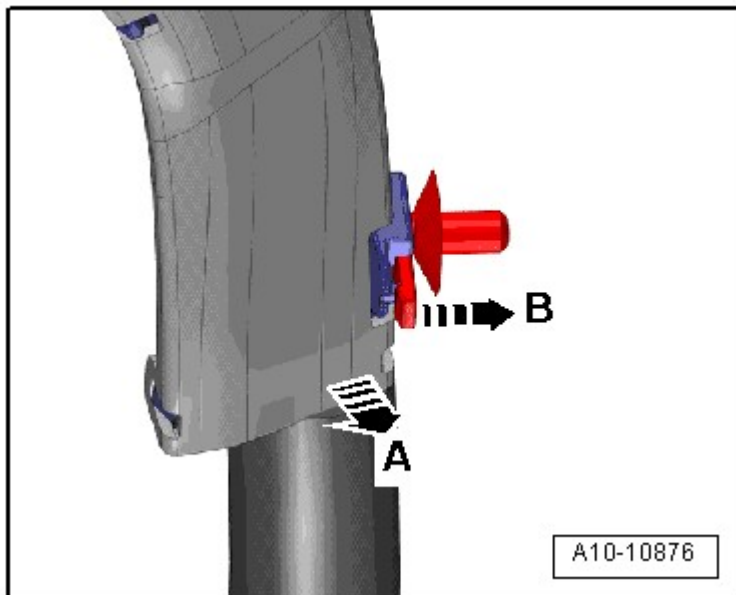


Fig. 30: Freeing Up Wiring Duct By Releasing Retainer
Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and tip washer fluid filler neck back -arrow A-.

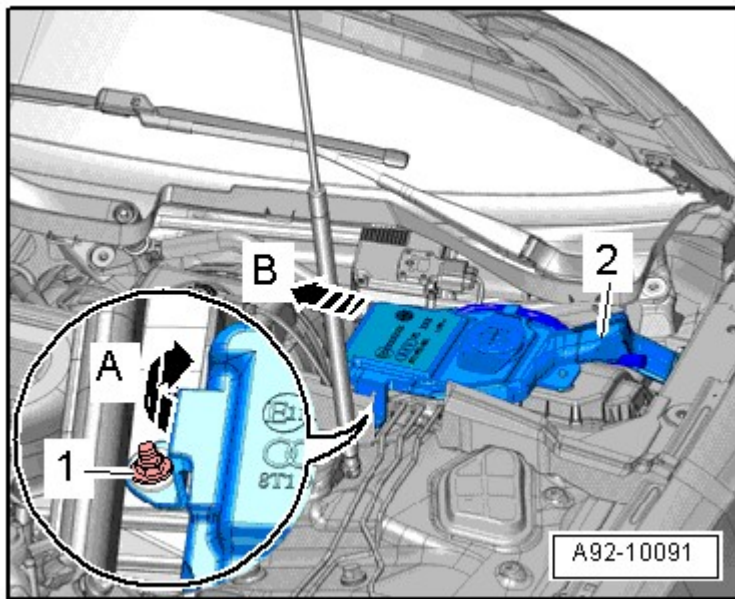


Fig. 31: Identifying Filler Neck With Filler Tube From Washer Fluid Reservoir And Opening In Body
Courtesy of AUDI OF AMERICA, LLC

- Remove filler neck -2- with filler tube from washer fluid reservoir and opening in body -arrow B-.
- Remove bolts -1- and nuts -2- and tower brace -3-.

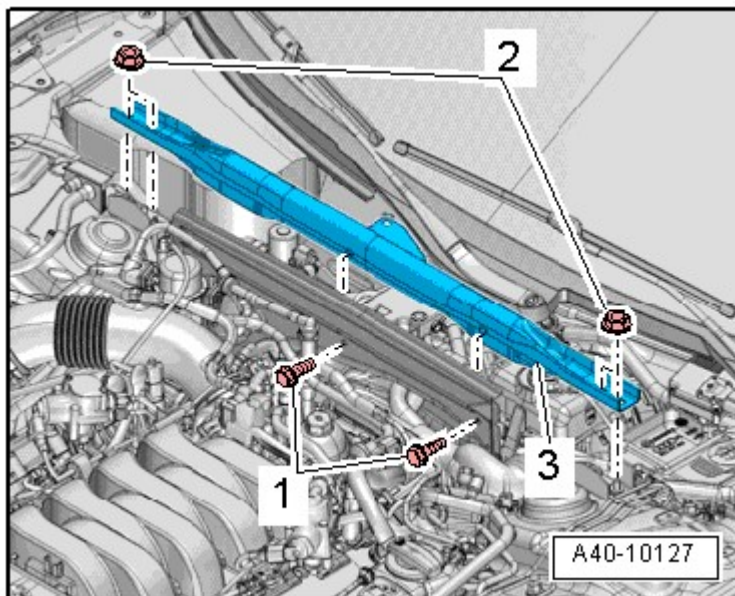


Fig. 32: Identifying Bolts, Nuts And Tower Brace
Courtesy of AUDI OF AMERICA, LLC

- Remove bolts -arrows- and engine compartment E-box cover.

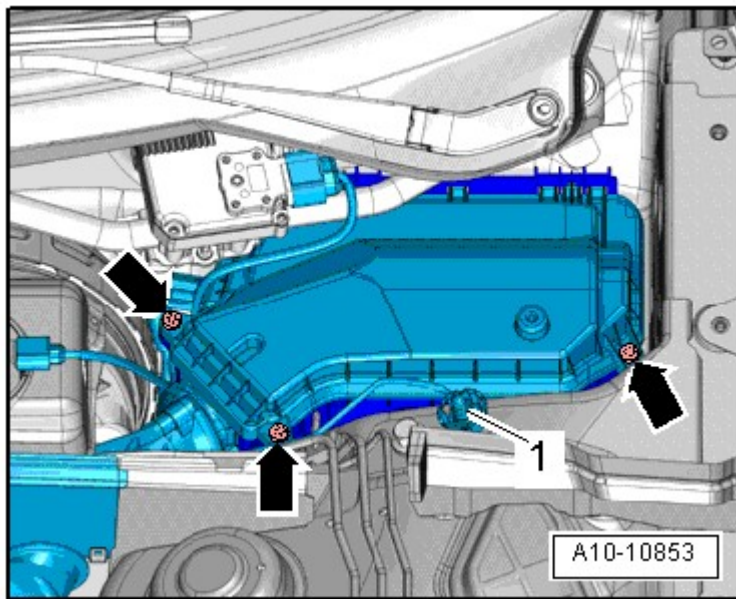


Fig. 33: Identifying E-Box Bolts & Cover
Courtesy of AUDI OF AMERICA, LLC

- Remove nut -1- and free up electrical wire.
- Release retainers -A arrows- and remove engine control module -arrow B-.

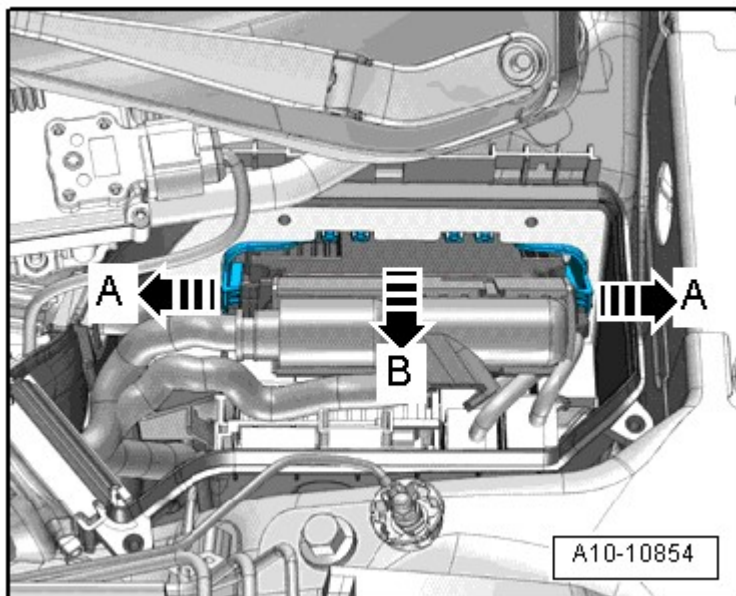


Fig. 34: Engine Control Module (ECM)
Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connector -2- if applicable.

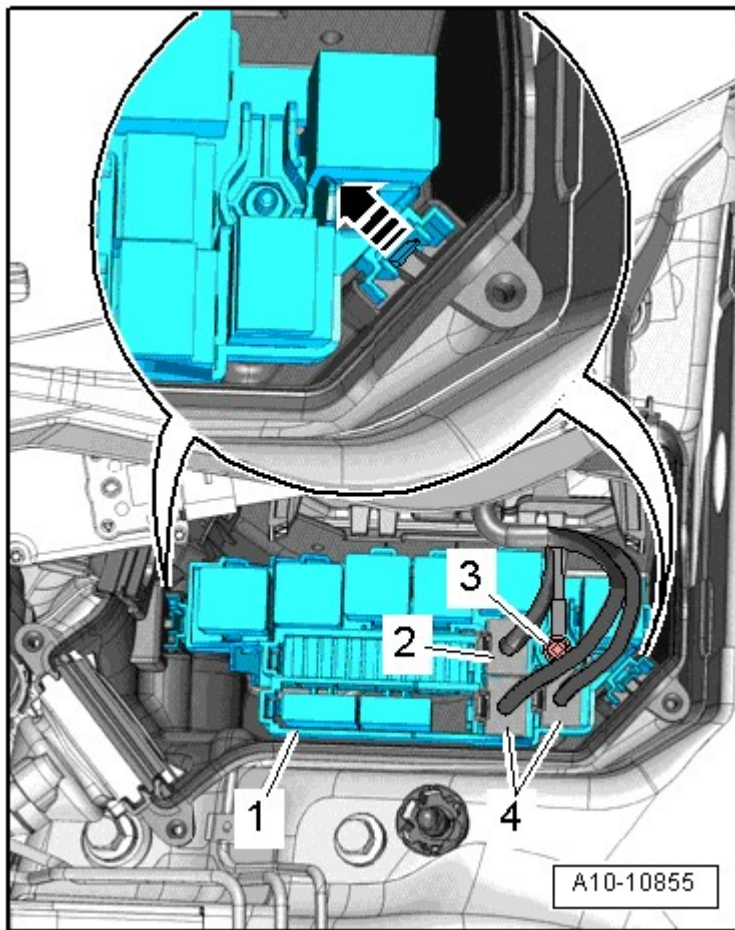


Fig. 35: Disconnecting Electrical Connectors
 Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connectors -4- and remove nut -3- for electrical wire.
- Release retainers -arrow- and remove relay carrier with fuse holder -1-.
- Disengage engine wiring harness at engine compartment E-box and free it up.
- Release retainers -A arrows- and remove wiring bushing -2- upward -arrow B-.

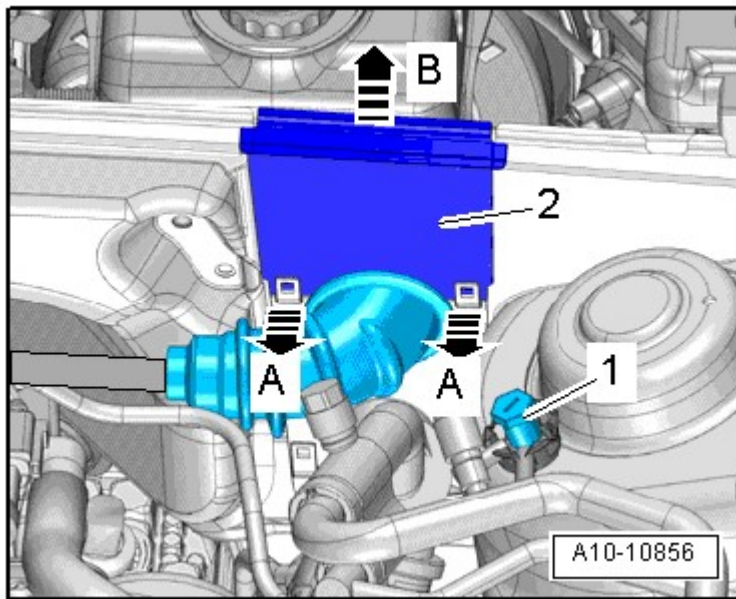


Fig. 36: Disengaging Catches -Arrows A- And Remove Upper Part Of Line Pass-Through -2- Upward - Arrow B-

Courtesy of AUDI OF AMERICA, LLC

- Remove ground pin -1- and free up electrical wire.
- Lay wiring harness on engine and secure engine control module against falling down.
- Disconnect electrical connectors -arrow- at left and right on front speed sensors.

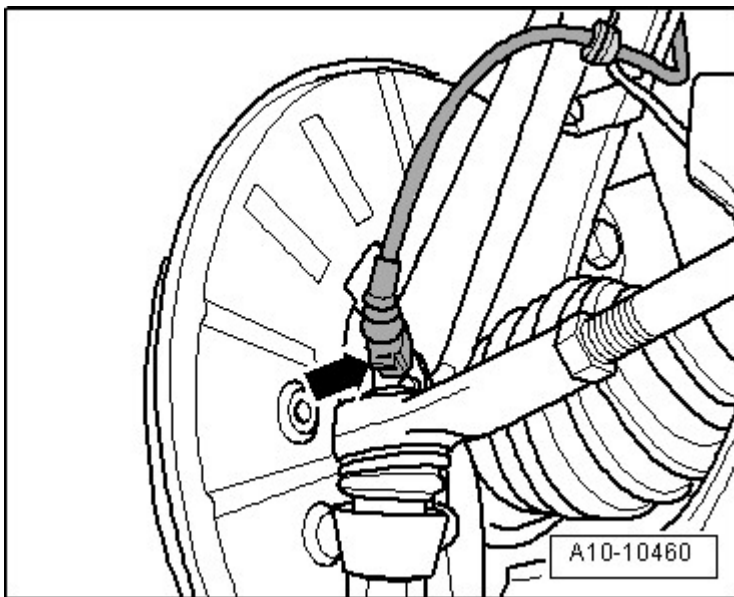


Fig. 37: Identifying Speed Sensor Connector

Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -1- on left front level control system sensor -G78- and right front level control system sensor -G289- and free up electrical wiring -arrow-.

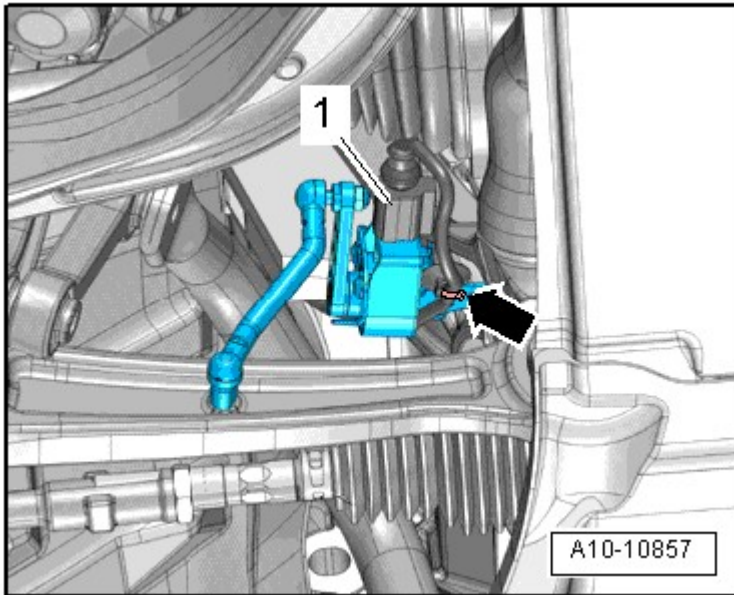


Fig. 38: Disconnecting Electrical Connector On Left Front Level Control System Sensor
Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical connector -2- on bracket by pulling retainer back -arrow A- and turning connector approximately 90° in direction of -arrow B-.

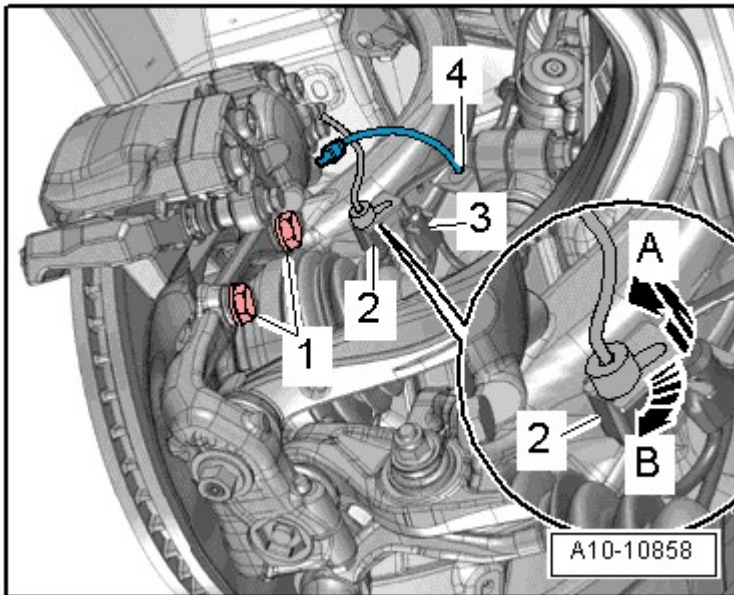


Fig. 39: Freeing Up Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical wiring -3- and brake line -4- on bracket.

-- Remove bolts -1- and secure brake caliper in wheel housing using wire.

CAUTION: Risk of damaging brake pistons.

- Do not operate brake pedal with brake caliper removed.

-- Remove nut -2- and bolt -1-.

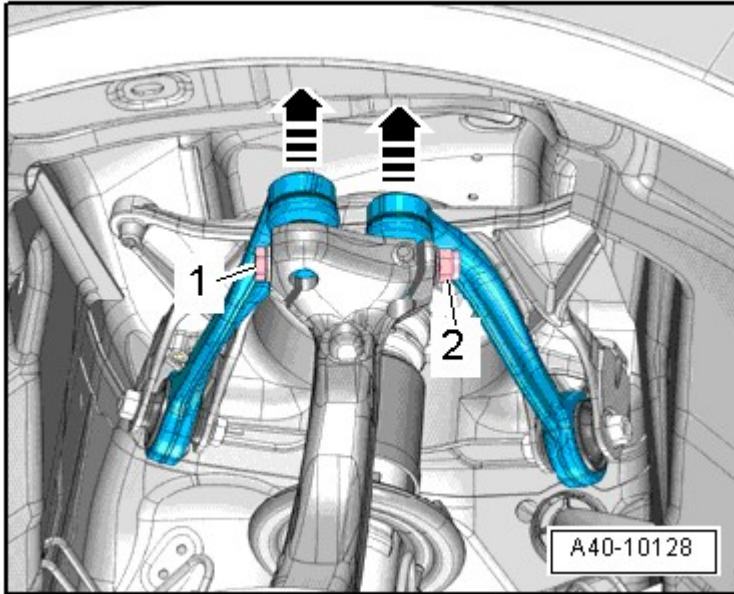


Fig. 40: Identifying Nut And Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Remove upper control arm upward from wheel bearing housing -arrows-.

-- Repeat procedure on the other side of the vehicle.

-- Remove left and right stabilizer bar bolts -3-.

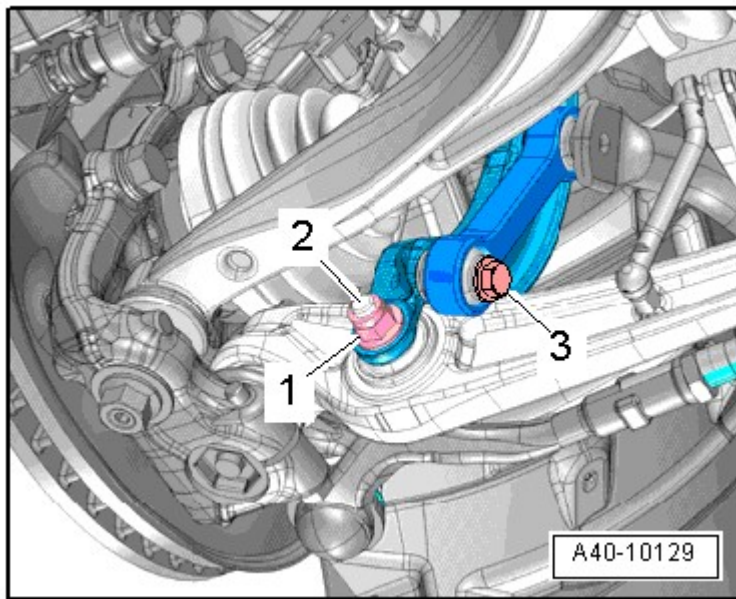


Fig. 41: Identifying Left And Right Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove left and right nuts -1-.

NOTE: The bolts -2- will be removed later.

-- Remove bolt -1- for power steering hydraulic fluid line bracket.

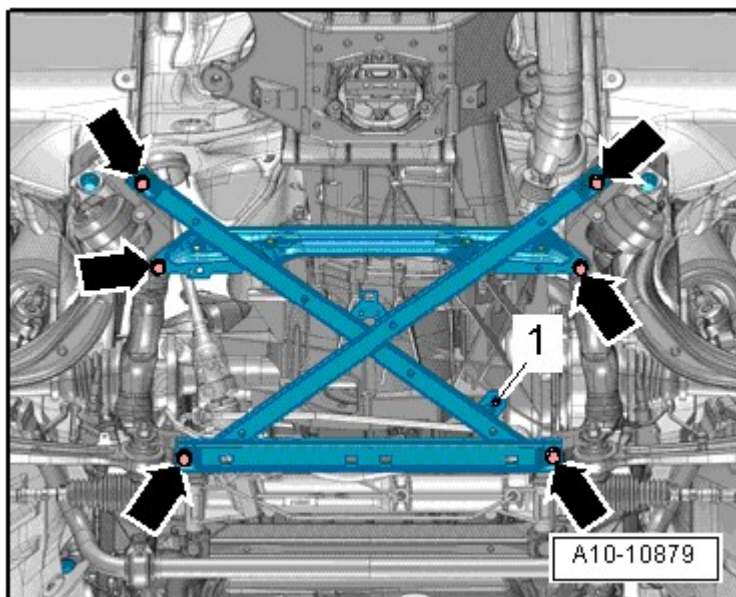


Fig. 42: Identifying Bolt From Power Steering Line
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Suspension components could be damaged.

- Do not rest the vehicle on its wheels if the subframe mount, steering gear or subframe cross brace are not installed correctly.

-- Remove bolts -arrows- and subframe cross brace.

-- Remove bolts -arrows- and front crossmember, if applicable.

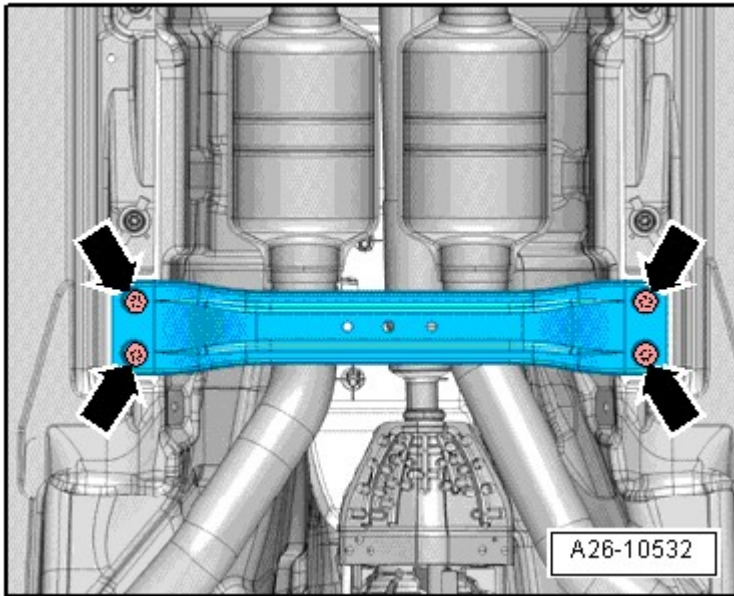


Fig. 43: Identifying Bolts And Front Crossmember
Courtesy of AUDI OF AMERICA, LLC

-- Remove left front muffler nuts -arrows-.

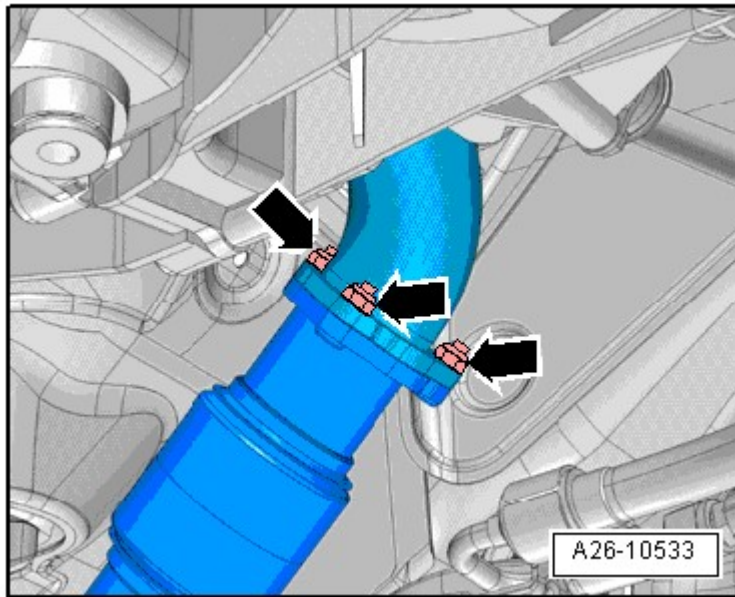


Fig. 44: Identifying Left Front Muffler Nuts
Courtesy of AUDI OF AMERICA, LLC

-- Remove right front muffler nuts -arrows-.

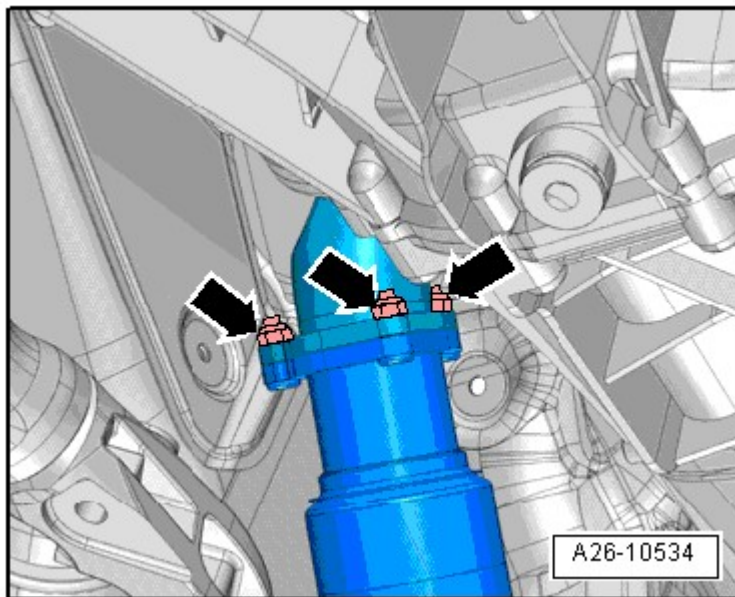


Fig. 45: Identifying Right Front Muffler Nuts
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The decoupling elements in the front muffler could be damaged.

- Do not bend decoupling elements in front muffler more than 10 degrees.

-- Loosen clamping sleeves -1- and -2-, slide them back and remove left and right front mufflers.

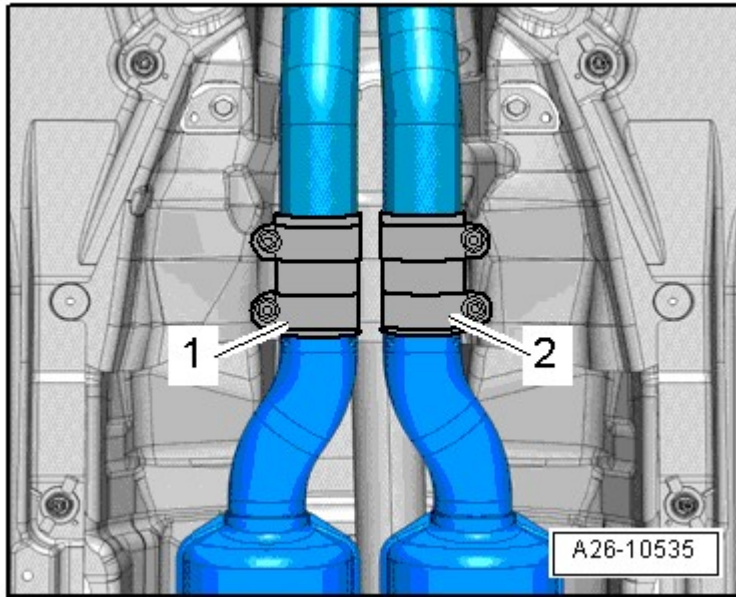


Fig. 46: Identifying Bolts Vehicles With Dual Exhaust System
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and driveshaft heat shield -1-.

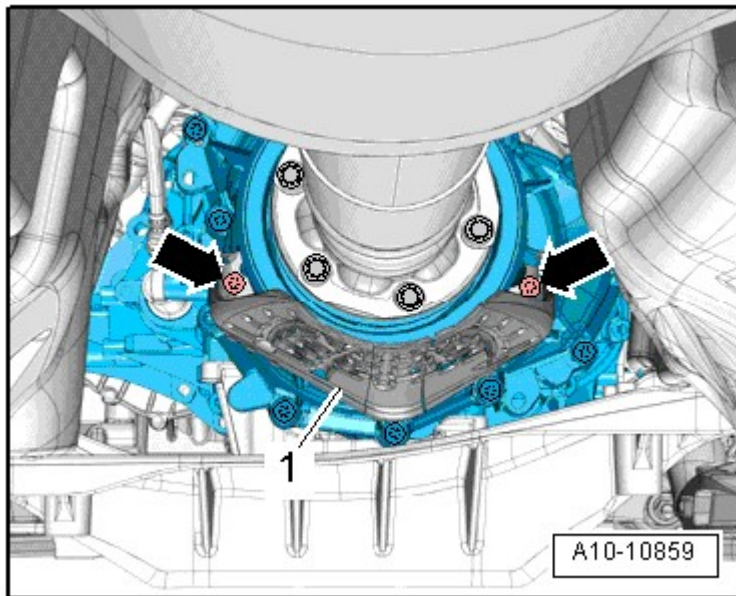


Fig. 47: Driveshaft Heat Shield - Tightening Specification
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts connecting driveshaft to transmission while holding using a counter hold tool T10172 with T10172/5.

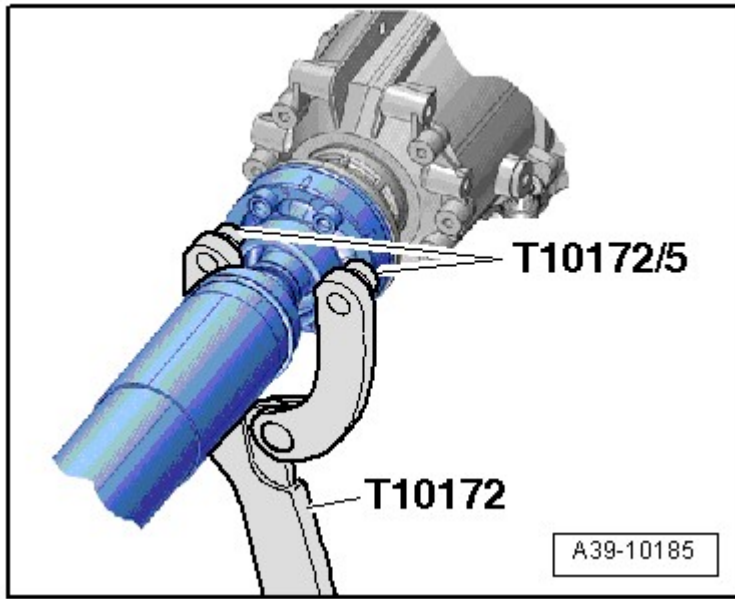


Fig. 48: Counterholding Driveshaft Using T10172 And T10172/5
Courtesy of AUDI OF AMERICA, LLC

- Slide driveshaft toward rear final drive; the constant velocity joints can move axially.
- Secure driveshaft to the side.

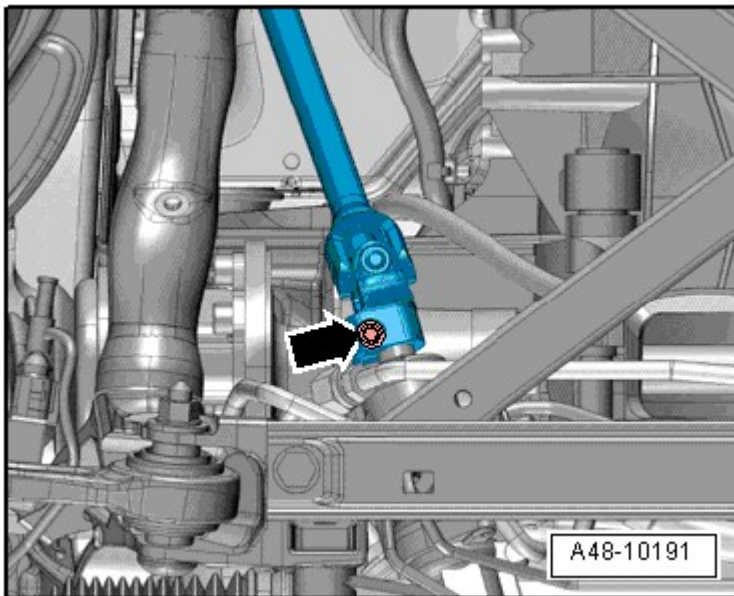


Fig. 49: Pressing CV Joint Off Steering Gear And Slide It Up
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The airbag spiral spring could be damaged.

- **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 -arrow- **Description and Operation** .
- Press constant velocity joint off steering gear and slide it all the way up.
- Remove bolt -2- and secure clutch slave cylinder sideways in the engine compartment.

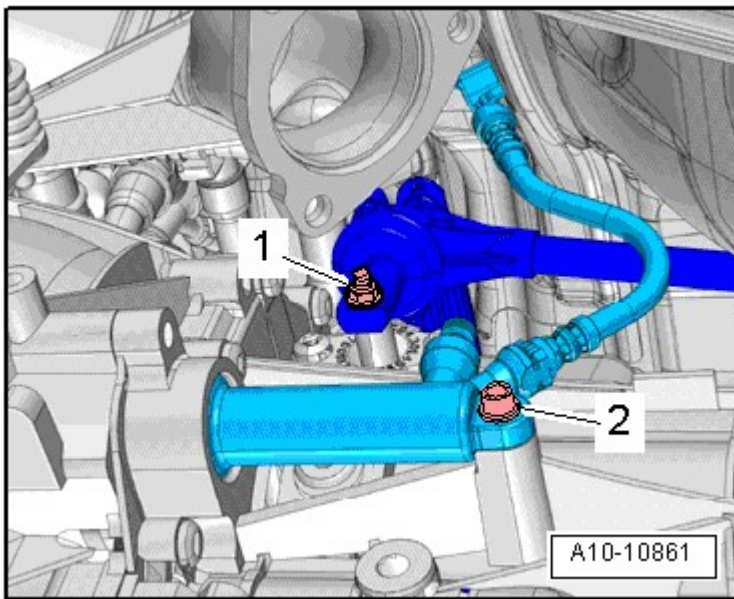


Fig. 50: Identifying Bolt And Clutch Slave Cylinder Secured Sideways In Engine Compartment
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of damaging clutch slave cylinder.

- **Do not operate clutch pedal anymore after slave cylinder has been removed.**

- Remove selector rod nut -1-.
- Position puller T40160 and remove selector rod -1-.

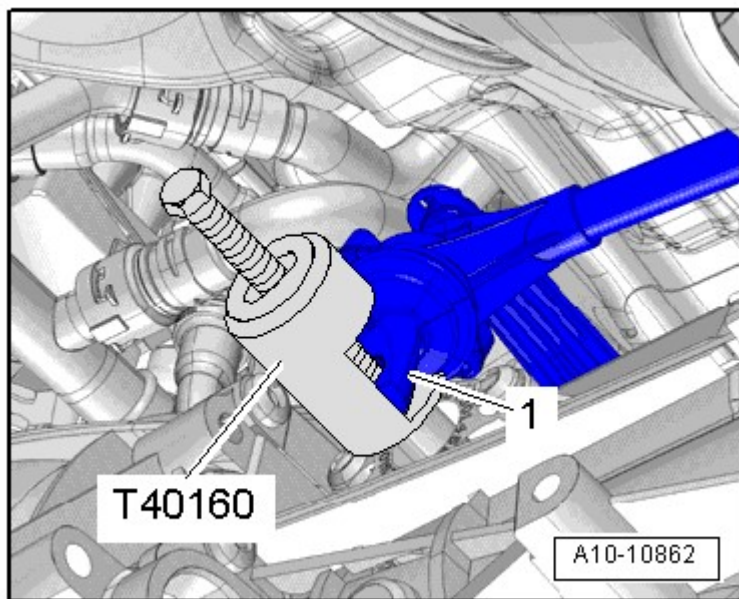


Fig. 51: Positioning Puller T40160 And Remove Selector Rod
Courtesy of AUDI OF AMERICA, LLC

Prepare Scissor Lift Platform

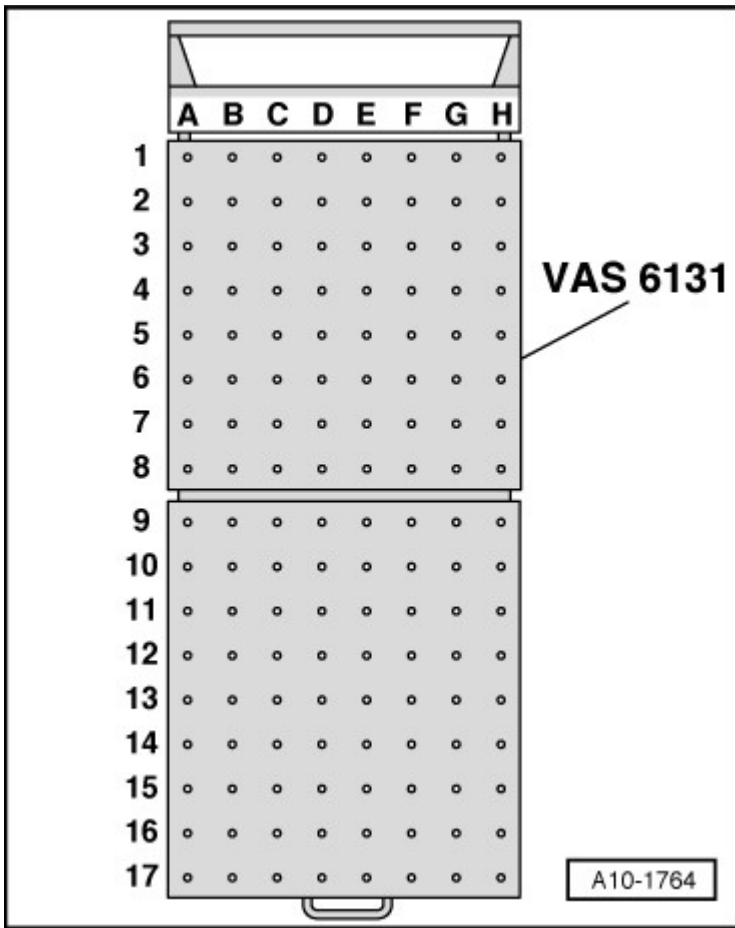


Fig. 52: Identifying Scissor Lift Platform VAS 6131

Courtesy of AUDI OF AMERICA, LLC

-- Equip scissor lift table VAS 6131 A with support set VAS 6131/10 and supplementary set VAS 6131/13 as follows:

Platform coordinates	Parts from support set VAS 6131/10 and supplementary set VAS 6131/13			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	-	-	/13-2
F8+H8	/13-6	-	-	/13-2
C14	/10-1	/10-3	/10-5	/10-13
F14	/10-1	/10-3	/10-5	/10-10

-- Next secure mounting elements to scissor lift table by hand.

-- Position scissor lift table VAS 6131 A horizontally.

- Note bubble level (sight glass) on support platform.

-- Guide scissor lift table VAS 6131 A under engine/transmission assembly.

WARNING: The subframe could cause an accident if it is not secured.

- **Do not loosen subframe bolts -2- and -3-.**

-- Remove left and right subframe bolts -1-.

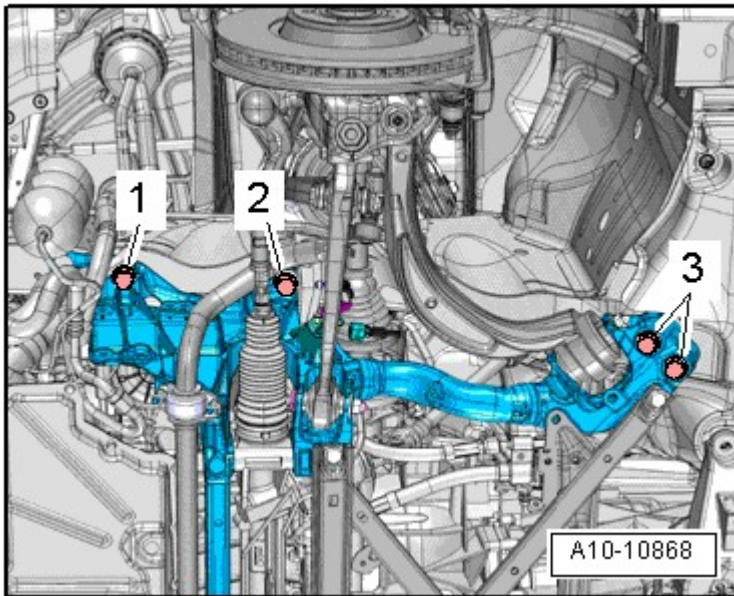


Fig. 53: Identifying Subframe Bolts (Tighten To Specifications)
Courtesy of AUDI OF AMERICA, LLC

-- Attach mounting elements from VAS 6131/10 and VAS 6131/13 at left and right front of subframe as shown in the illustration.

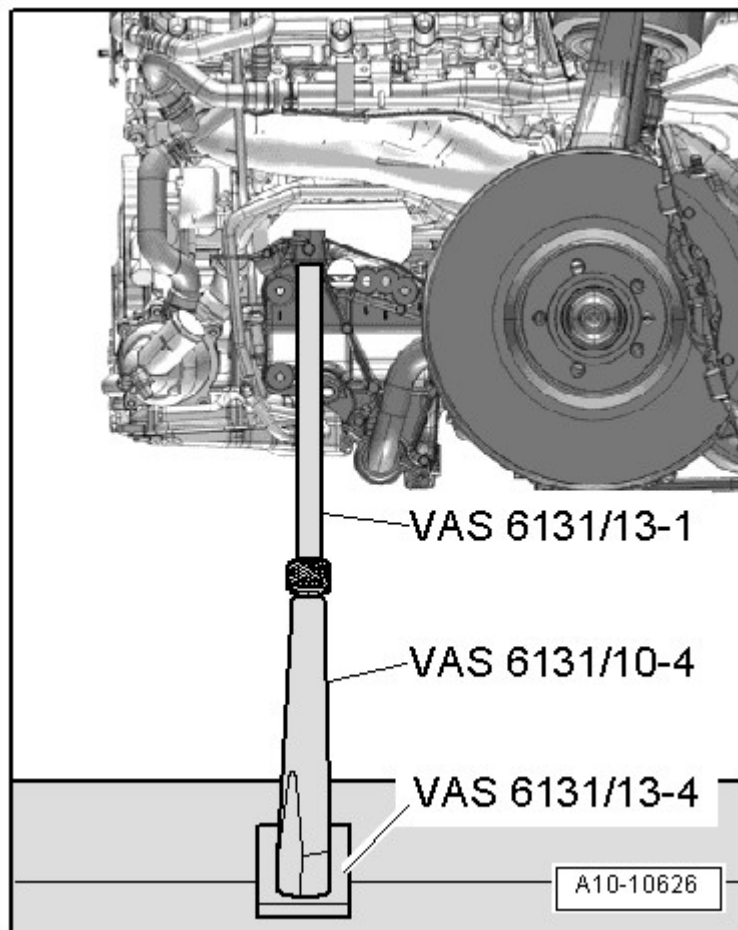


Fig. 54: Attaching At Left And Right Front Of Subframe
Courtesy of AUDI OF AMERICA, LLC

-- Ensure threaded spindles are completely installed.

-- Attach mounting elements from VAS 6131/10 at left and right rear on subframe cross brace front connecting points as shown in the illustration.

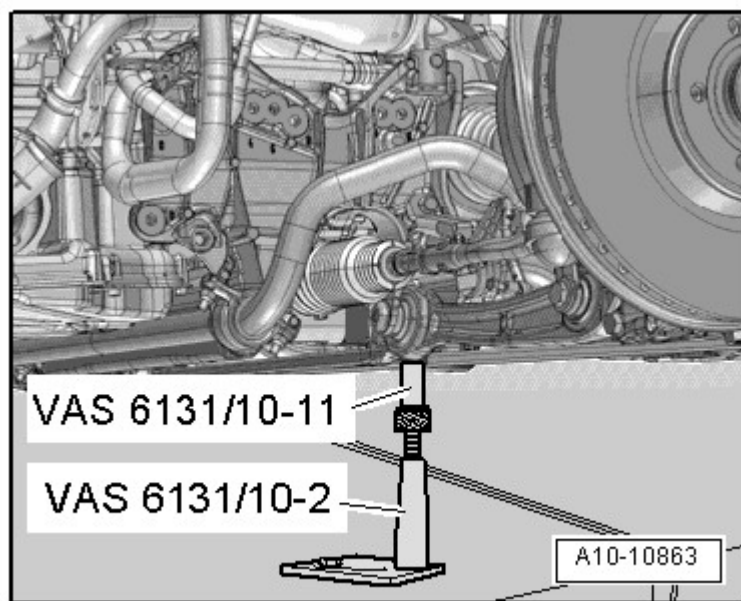


Fig. 55: Attaching At Left And Right Rear Of Subframe
 Courtesy of AUDI OF AMERICA, LLC

-- Attach mounting elements from VAS 6131/13 at lower left and right of wheel bearing housing as shown in the illustration.

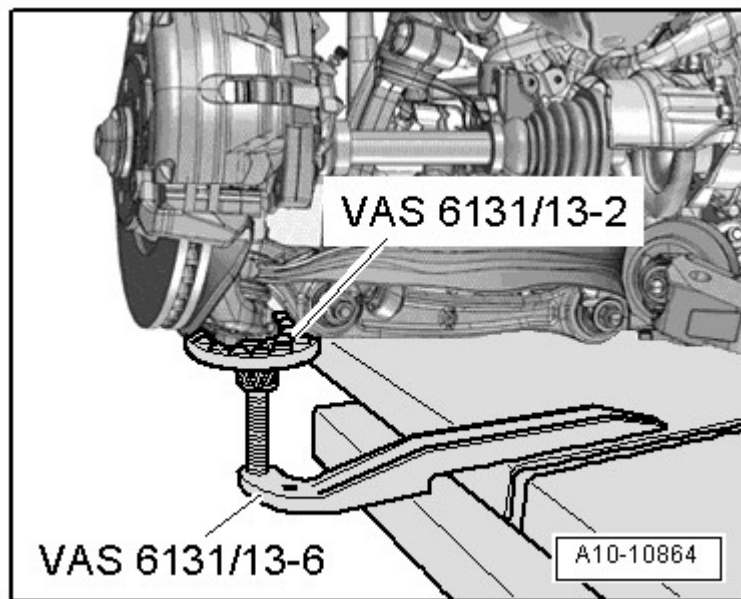


Fig. 56: Attaching At Lower Left And Right Of Wheel Bearing Housing
 Courtesy of AUDI OF AMERICA, LLC

-- Remove noise insulation retaining clips from crossmember.

-- Attach mounting elements from VAS 6131/10 at left and right rear of crossmember as shown in the illustration.

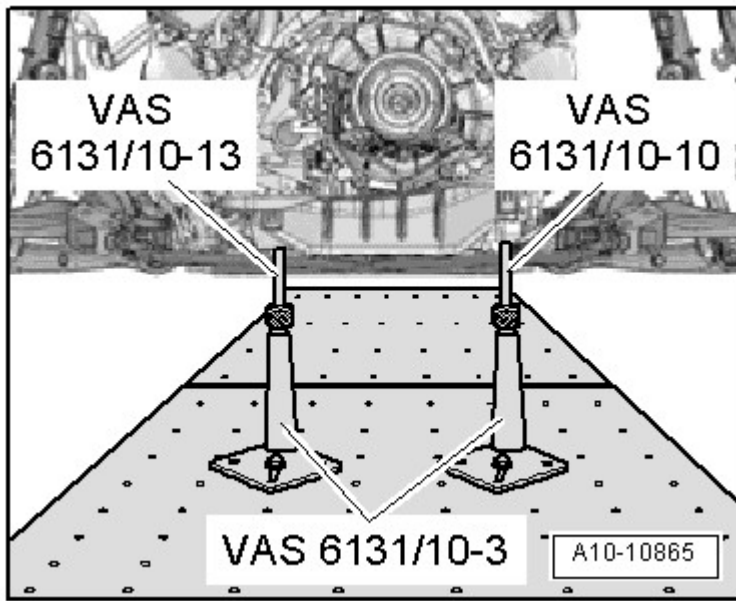


Fig. 57: Attaching At Left And Right Rear Of Crossmember
 Courtesy of AUDI OF AMERICA, LLC

- Rotate mounting element spindles upward until all mounting pins come into contact with mounting points.
- Attach mounting element base plates to scissor lift table VAS 6131 A and tighten to 20 Nm.
- Mark location of subframe and engine carrier to longitudinal members using a felt-tip pen.

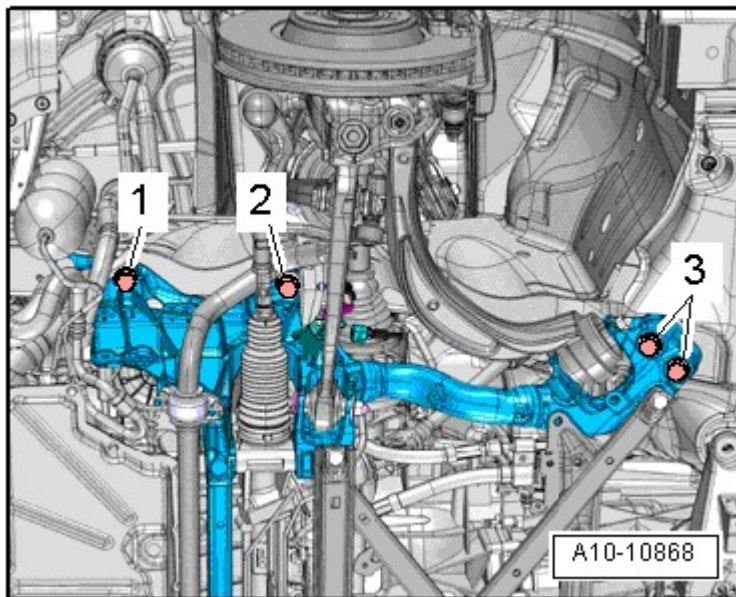


Fig. 58: Identifying Subframe Bolts (Tighten To Specifications)
 Courtesy of AUDI OF AMERICA, LLC

- Remove left and right subframe bolts -2- and -3- diagonally in stages.

NOTE: Ignore -1-.

-- Remove bolts -arrows- on tunnel crossmember.

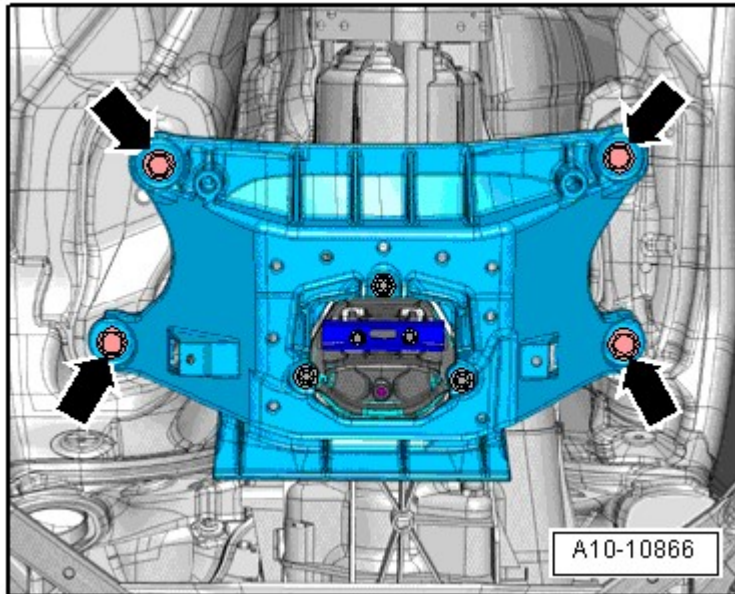


Fig. 59: Identifying Bolts & Tunnel Crossmember
Courtesy of AUDI OF AMERICA, LLC

-- Remove left and right bolts -2-.

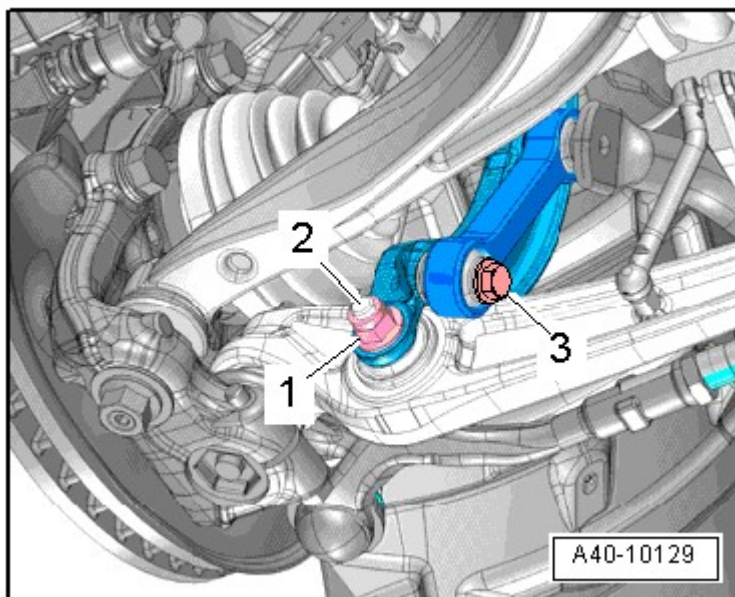


Fig. 60: Identifying Left And Right Bolts
Courtesy of AUDI OF AMERICA, LLC

NOTE: The nuts -1- and bolts -3- have already been removed.

CAUTION: Risk of damaging hose and wiring connections as well as engine compartment.

- Make sure all the hoses and lines between the engine, transmission, subframe and body have been disconnected.
- Carefully guide engine-transmission assembly with subframe out of engine compartment while lowering it.

-- Next lower engine/transmission assembly with scissor lift table VAS 6131 A only by dimension -a-.

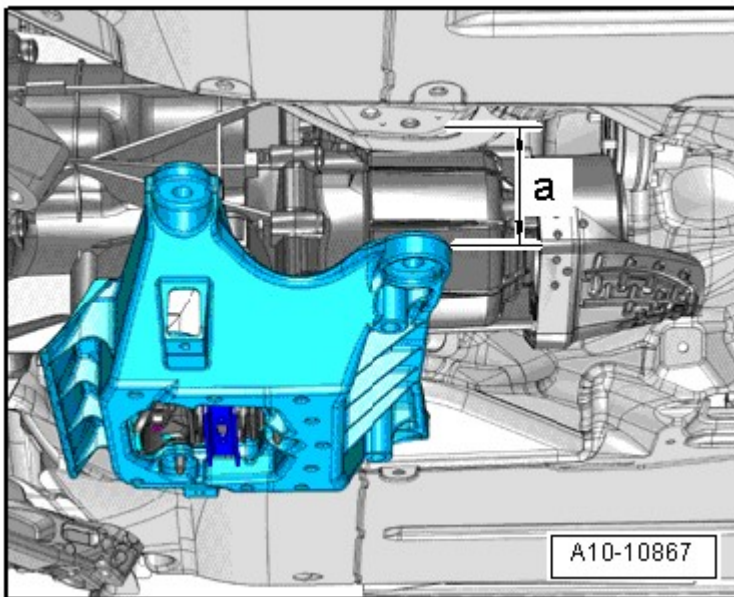


Fig. 61: Lowering Transmission
Courtesy of AUDI OF AMERICA, LLC

- Dimension -a- = 100 mm maximum.

-- Remove bolts -1- and -3- for selector rod and push rod.

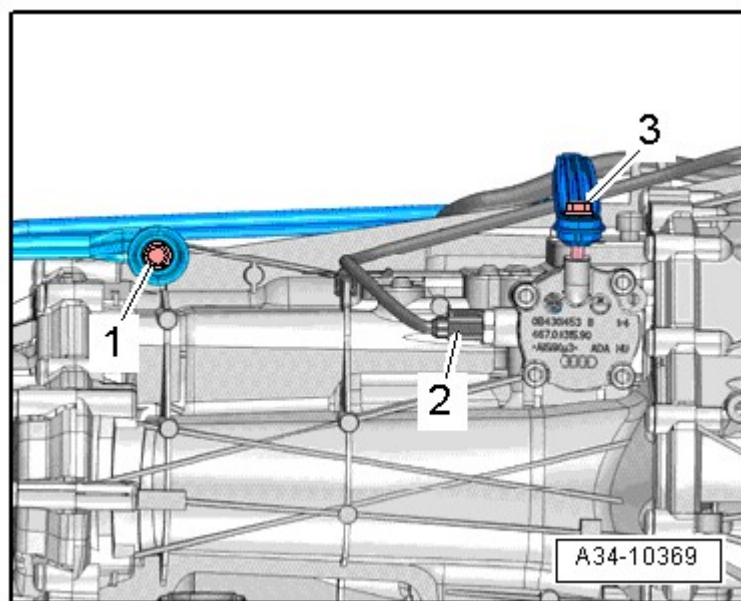


Fig. 62: Identifying Bolts, Selector Rod And Push Rod
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -2-.

-- Lower engine/transmission assembly more.

-- Remove scissor lift table VAS 6131 A with engine/transmission assembly under vehicle.

ENGINE AND TRANSMISSION, SEPARATING - MANUAL TRANSMISSION

Special tools and workshop equipment required

- Adapter T40058
- Support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14

Procedure

Proceed as follows:

- Engine/transmission assembly removed and placed on scissor lift table VAS 6131 A.

-- Remove electrical connector -1- for Oxygen Sensor (O2S) 2 behind Three Way Catalytic Converter (TWC) - G131- from bracket and disconnect it.

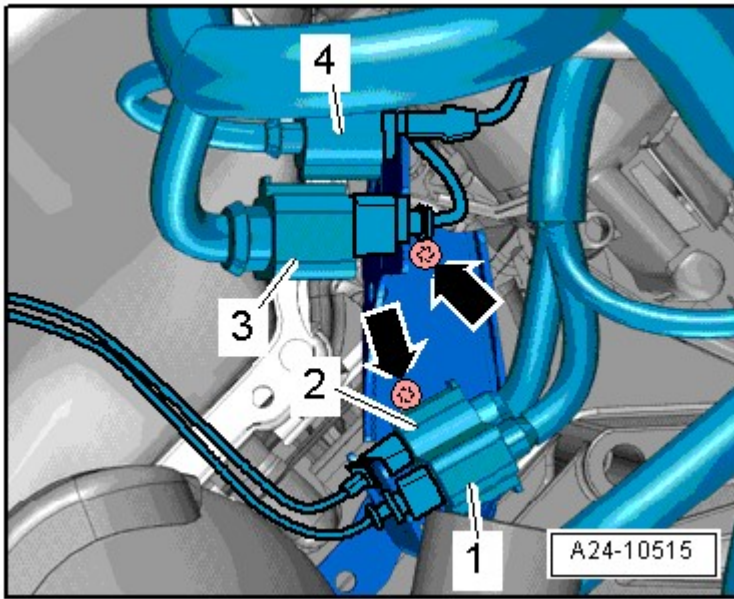


Fig. 63: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -2, 3 and 4- and -arrows-.

-- Remove nuts -arrows- and bolt -1- and left catalytic converter.

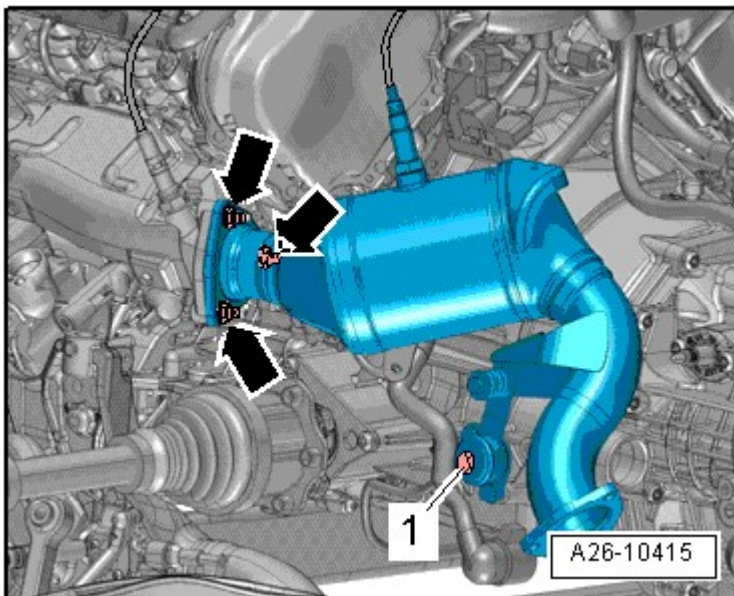


Fig. 64: Identifying Nuts, Bolt And Left Catalytic Converter
Courtesy of AUDI OF AMERICA, LLC

-- Remove electrical connector -1- for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC) - G130- from bracket and disconnect it.

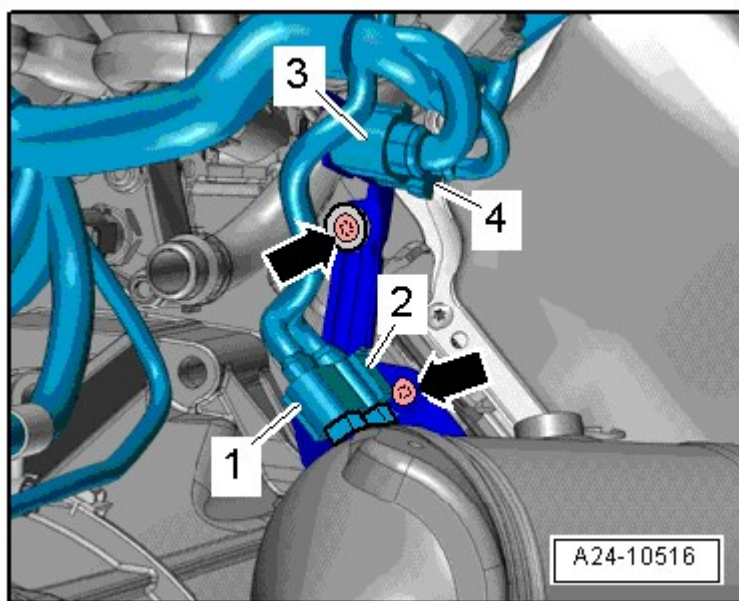


Fig. 65: Identifying Bolts -Arrows- And Right Connector Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -2, 3 and 4- and -arrows-.

-- Remove nuts -arrows- and bolt -1- and right catalytic converter.

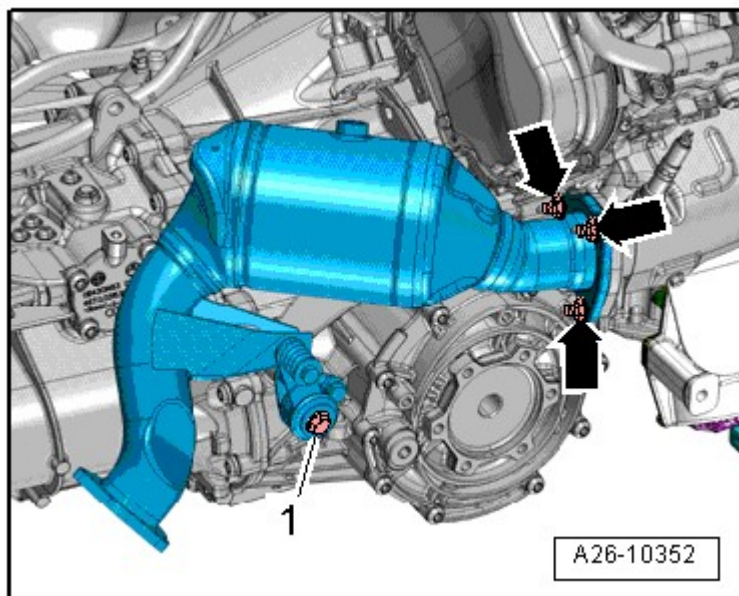


Fig. 66: Identifying Nuts, Bolts And Right Catalytic Converter
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -2- on engine speed (RPM) sensor -G28- and free up electrical wiring.

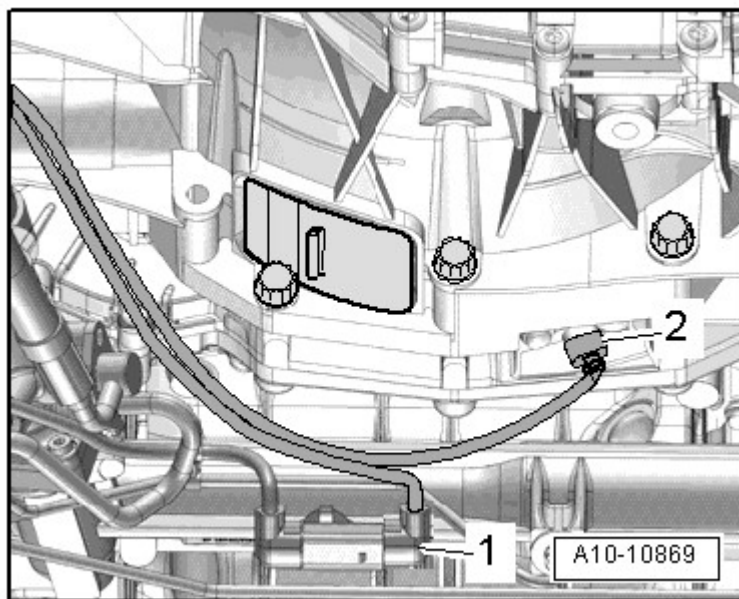


Fig. 67: Disconnecting Connector From Servotronic Solenoid Valve
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1-.

-- Disconnect electrical connector -2- on back-up light switch -F4-.

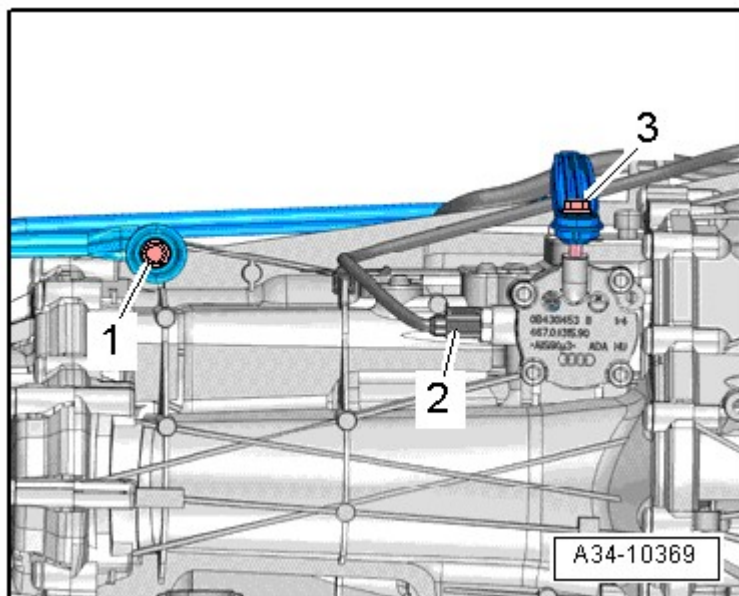


Fig. 68: Identifying Electrical Connector -2- On Back-Up Light Switch -F4-
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 and 3-.

-- Remove left and right drive axles from transmission flange shafts.

-- Remove bottom cover -1- from transmission -arrow-.

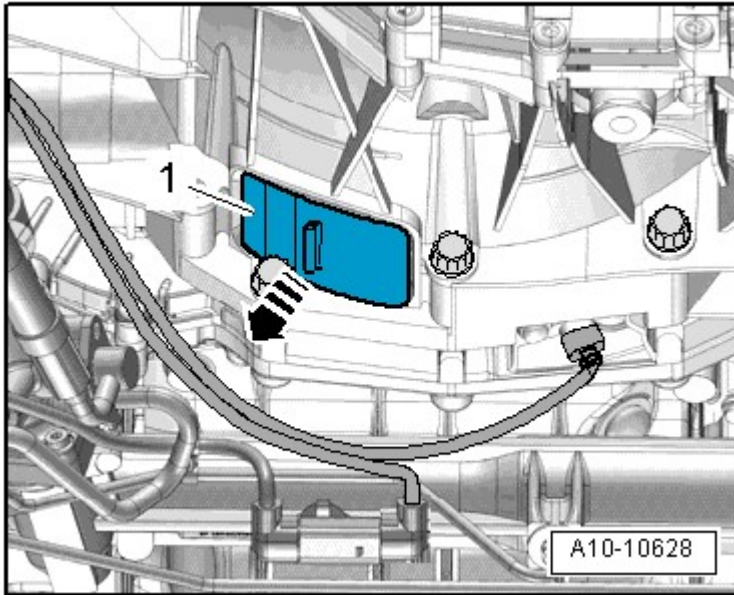


Fig. 69: Identifying Transmission Lower Cover
Courtesy of AUDI OF AMERICA, LLC

-- Insert adapter T40058 guide pins as follows:

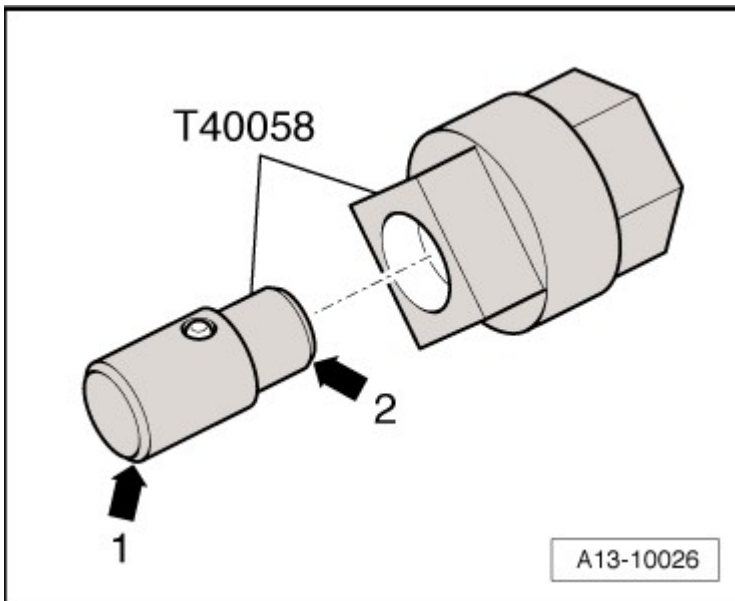


Fig. 70: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The large diameter -arrow 1- faces engine.

- Small diameter -arrow 2- points to adapter.

-- To loosen crankshaft, counter hold drive plate bolts using adapter T40058.

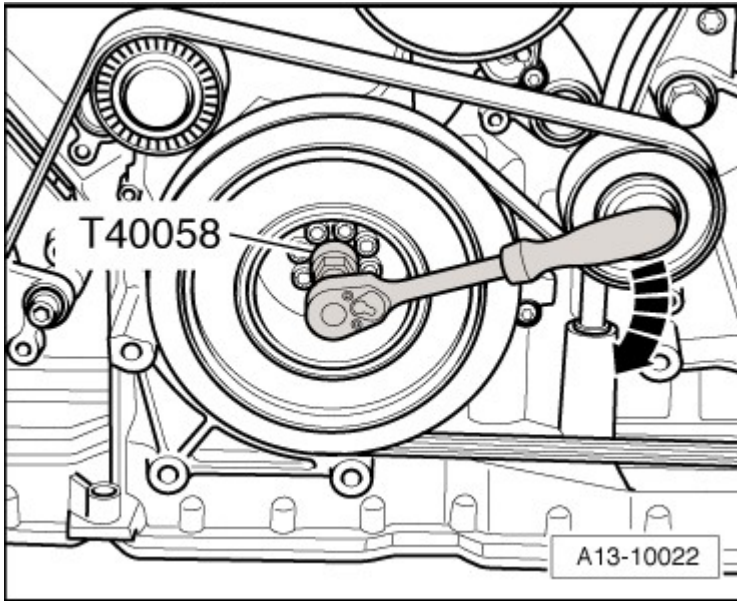


Fig. 71: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

NOTE: Only turn crankshaft in direction of engine rotation -arrow-.

-- Remove 6 clutch module bolts -arrow- by turning crankshaft 60 degrees in direction of engine rotation.

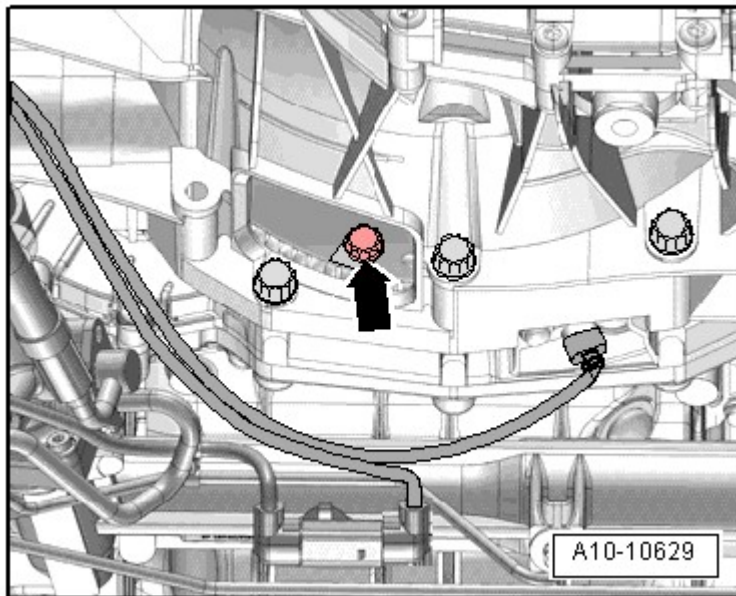


Fig. 72: Identifying Clutch Module First Bolt Installation Location

Courtesy of AUDI OF AMERICA, LLC

-- Equip scissor lift table VAS 6131 A with support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14 as follows:

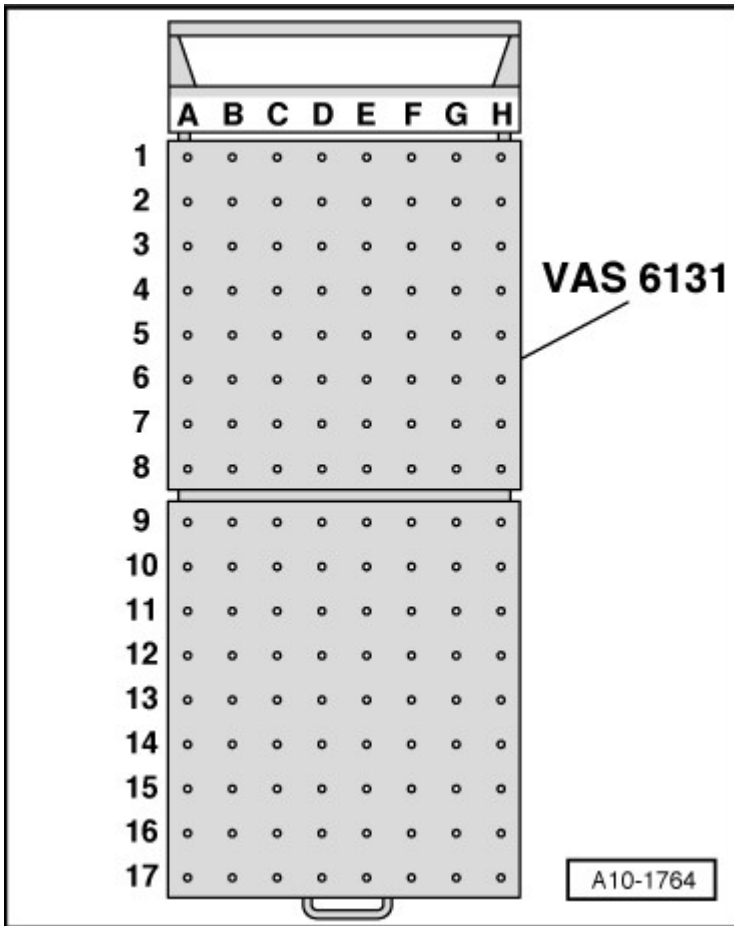


Fig. 73: Identifying Scissor Lift Platform VAS 6131
Courtesy of AUDI OF AMERICA, LLC

NOTE: The other attachments remain unchanged.

Platform coordinates	Parts from support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

-- Install joint support VAS 6131/13-7 at front right of engine in threaded hole as shown in the illustration.

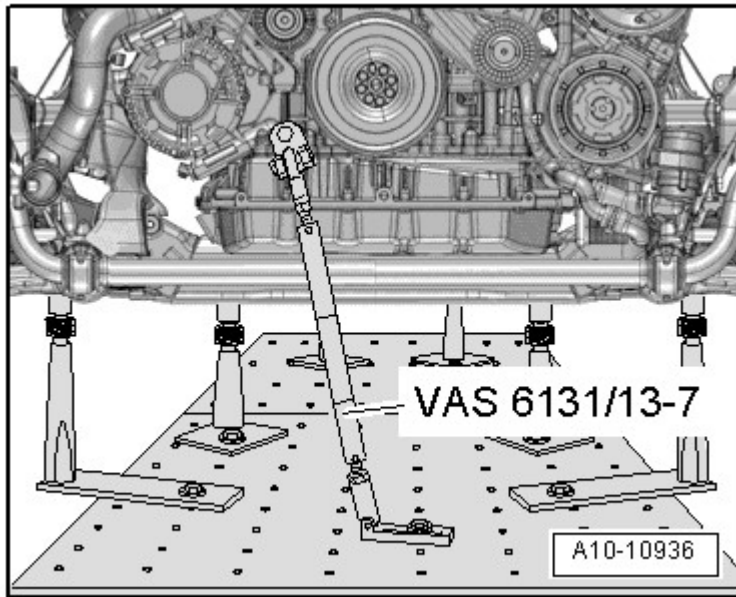


Fig. 74: Identifying Joint Support VAS 6131/13-7
Courtesy of AUDI OF AMERICA, LLC

-- Install joint support VAS 6131/13-7 on scissor lift table and tighten it to 20 Nm.

-- Attach mounting elements from VAS 6131/10 and transmission support VAS 6131/14 at front of transmission as shown in the illustration.

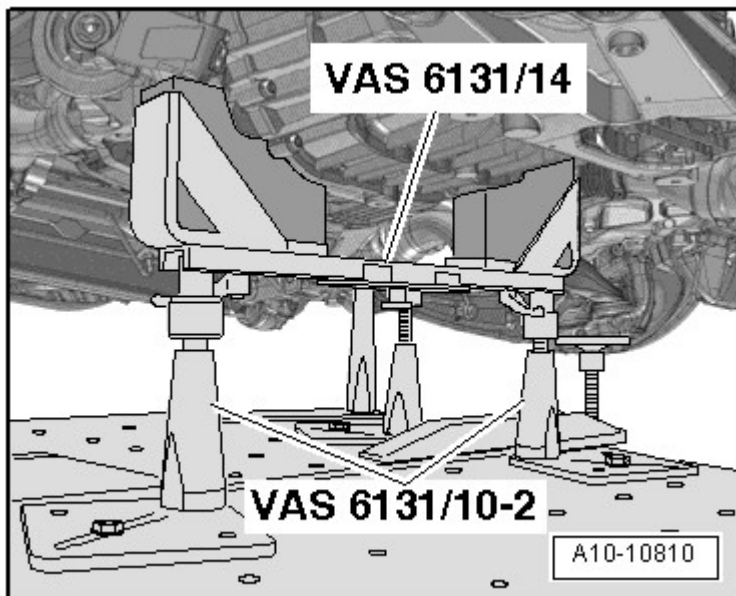


Fig. 75: Attaching Mounting Elements From Support Set For Audi VAS 6131/10
Courtesy of AUDI OF AMERICA, LLC

-- Rotate left and right spindles up until transmission support VAS 6131/14 rests firmly against the transmission.

- Attach mounting element base plates to scissor lift table VAS 6131 A and tighten to 20 Nm.
- Remove starter bolts -1- and -2-.

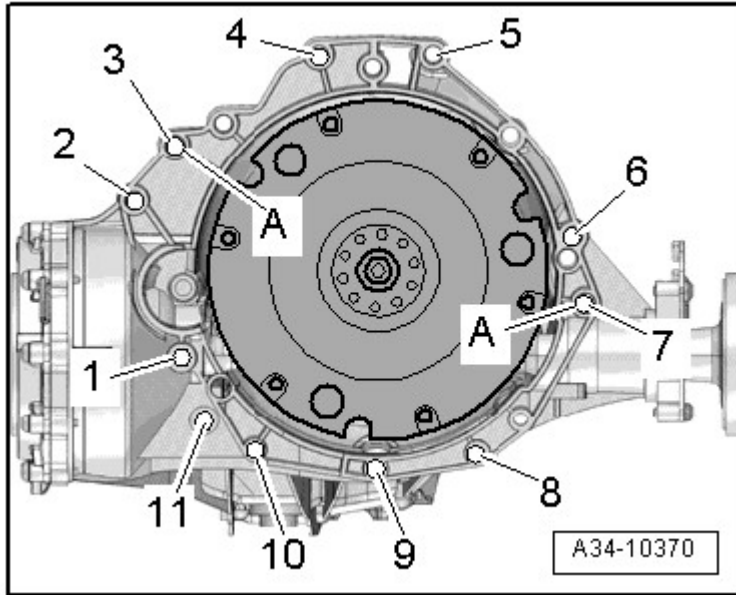


Fig. 76: Checking If Alignment Sleeves -A- For Centering Engine/Transmission Are In Cylinder Block
Courtesy of AUDI OF AMERICA, LLC

- Press starter off transmission and leave it in the installation position.
- Remove remaining bolts -3 through 11- connecting engine to the transmission.

NOTE: Ignore -A-.

- Loosen clamping bolts -1- on sides of scissor lift table VAS 6131 A and pull rear table plate with transmission toward rear -arrow-.

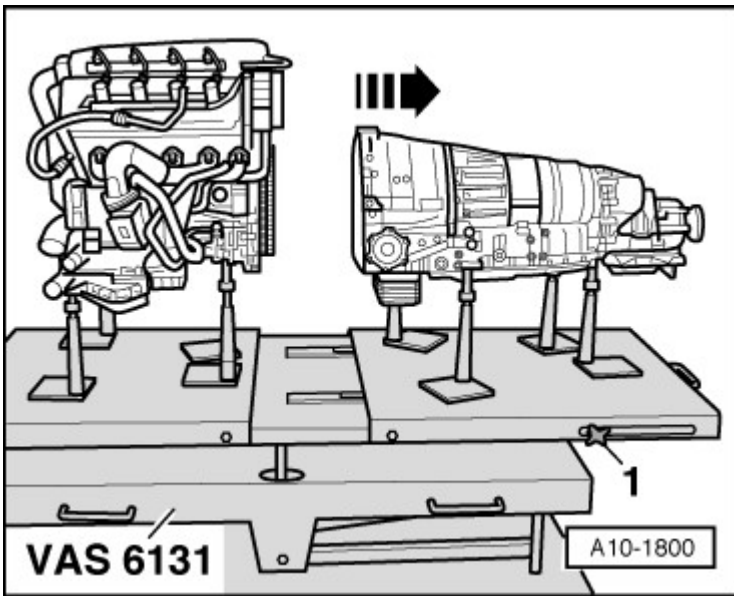


Fig. 77: Loosening Bolts 1- On Sides Of VAS 6131 A And Pull Rear Table Plate With Transmission Toward Rear -Arrow-
Courtesy of AUDI OF AMERICA, LLC

ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER - MANUAL TRANSMISSION

Special tools and workshop equipment required

- Lifting tackle 2024 A
- Engine and transmission holder VAS 6095 with V6 FSI engine holder VAS 6095/1-5
- Shop crane VAS 6100
- Lift arm extension for workshop crane VAS 6101

Procedure

Proceed as follows:

- The engine/transmission assembly is removed **ENGINE, REMOVING**; the engine and transmission are separated **ENGINE AND TRANSMISSION, SEPARATING**.
- Engine secured with joint support VAS 6131/13-7.

-- Disconnect electrical connector -arrow- on steering gear.

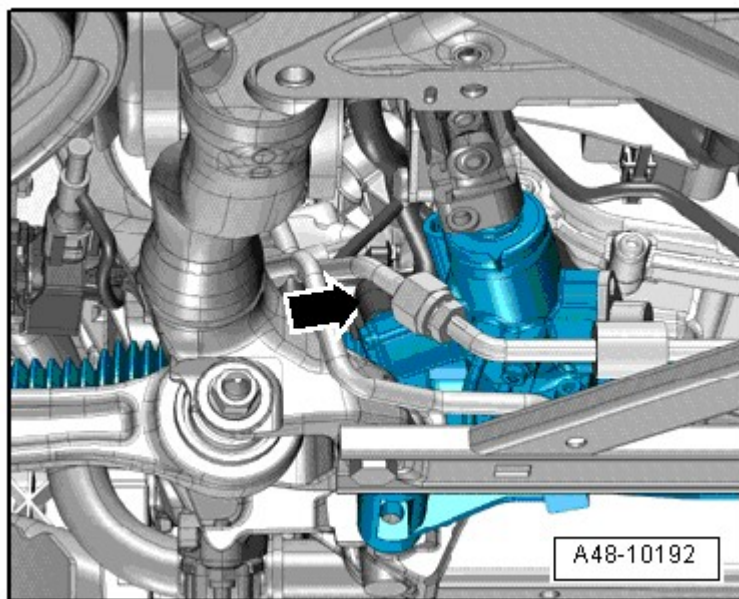


Fig. 78: Disconnecting Electrical Connector On Steering Gear
Courtesy of AUDI OF AMERICA, LLC

NOTE: To collect escaping hydraulic oil, lay a cloth under separating point.

-- Remove bolt -1- and disconnect power steering hydraulic oil line.

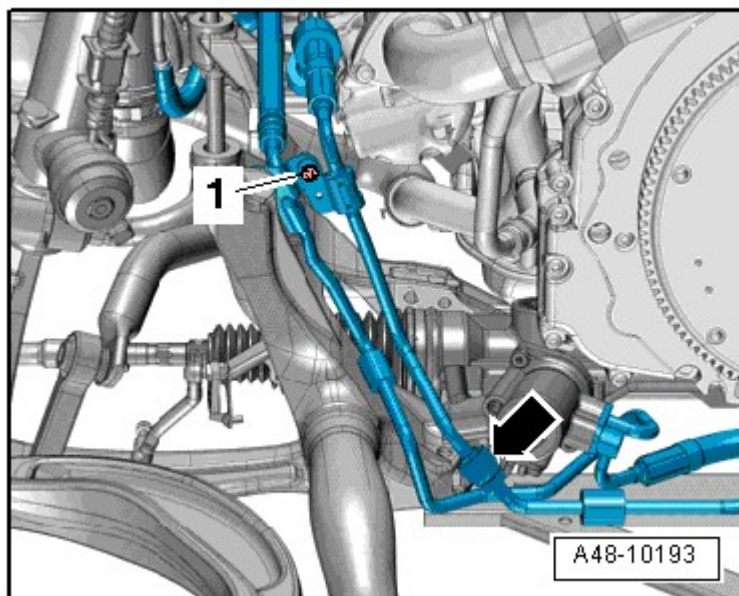


Fig. 79: Identifying Bolt -1-
Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

Ignore -arrow-.

-- Remove nut -1- and remove bracket with wiring harness from subframe.

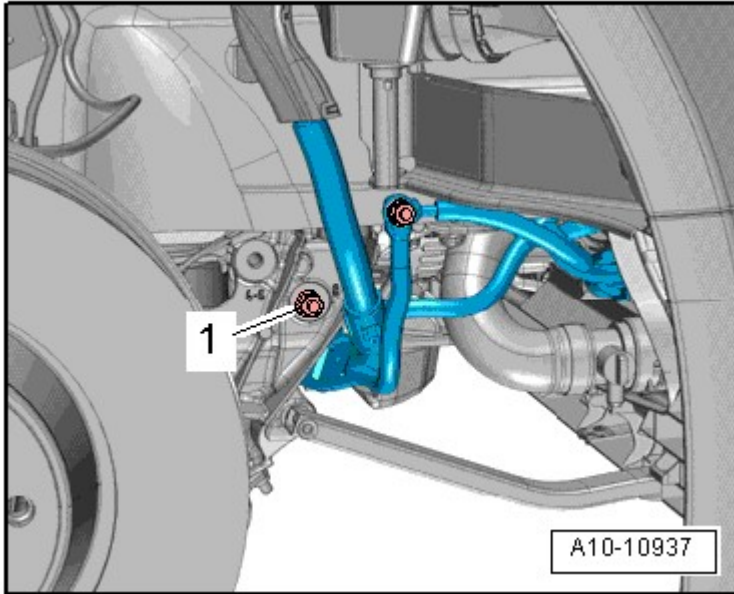


Fig. 80: Identifying Nut And Bracket With Wiring Harness From Subframe
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

-- Engage lifting tackle 2024 A on engine lifting eyes and on shop crane as shown in the illustration.

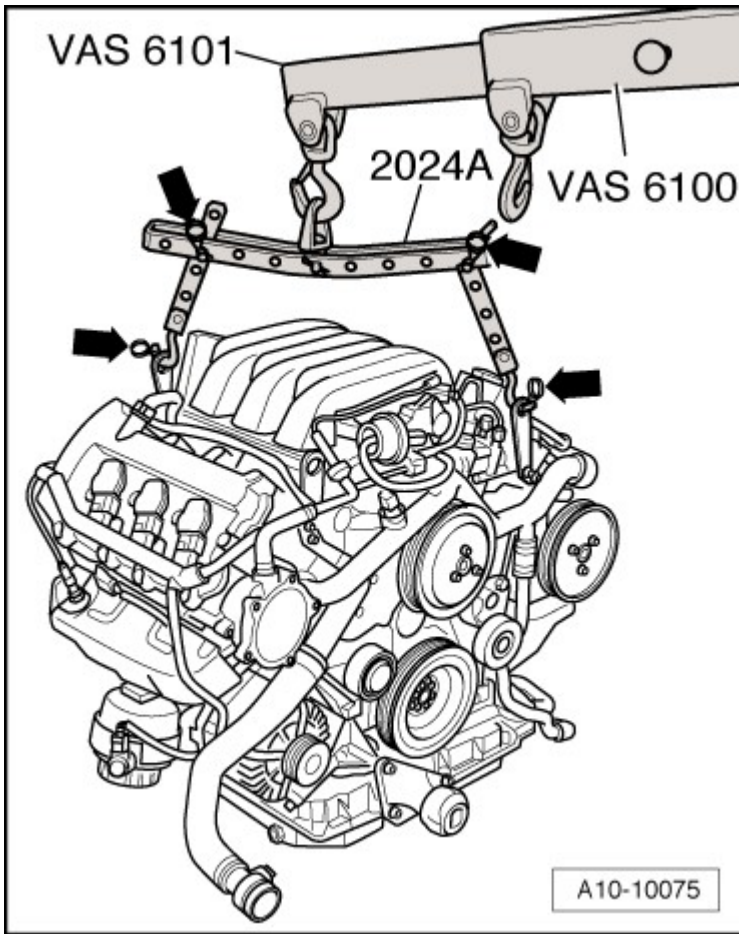


Fig. 81: Hooking Engine Sling 2024 A Onto Engine And Onto Workshop Crane VAS 6100 With Lift Arm Extension For Workshop Crane VAS 6101

Courtesy of AUDI OF AMERICA, LLC

NOTE: To be aligned to the center of gravity of the engine assembly, the hole rails of the lifting hook must be inserted as shown in the illustration.

WARNING: Risk of accident.

- Lifting hooks and alignment pins on lifting tackle must be secured with securing pins -arrows-.

-- Tension engine slightly with shop crane, do not raise.

-- Remove left engine mount bolt -3-.

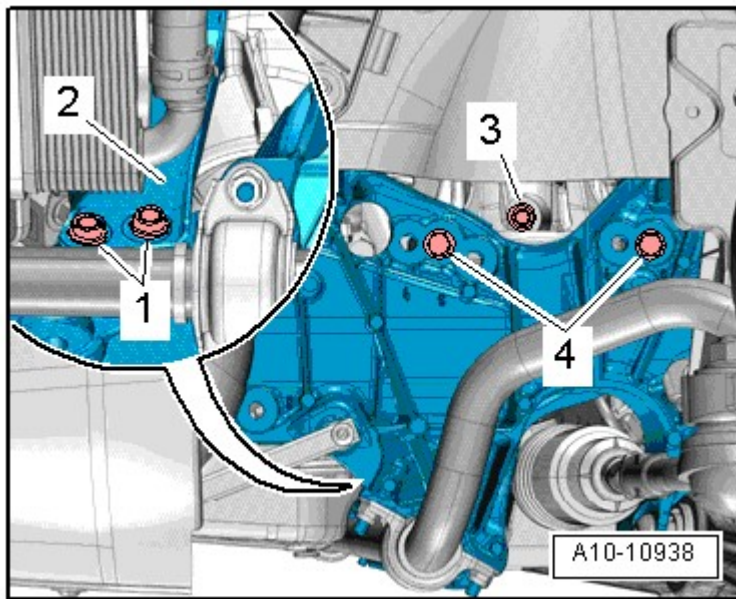


Fig. 82: Identifying Left Engine Mount Bolts -1-, -3- And -4-
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

Ignore -1, 2, 4-.

-- Remove right engine mount bolt -2-.

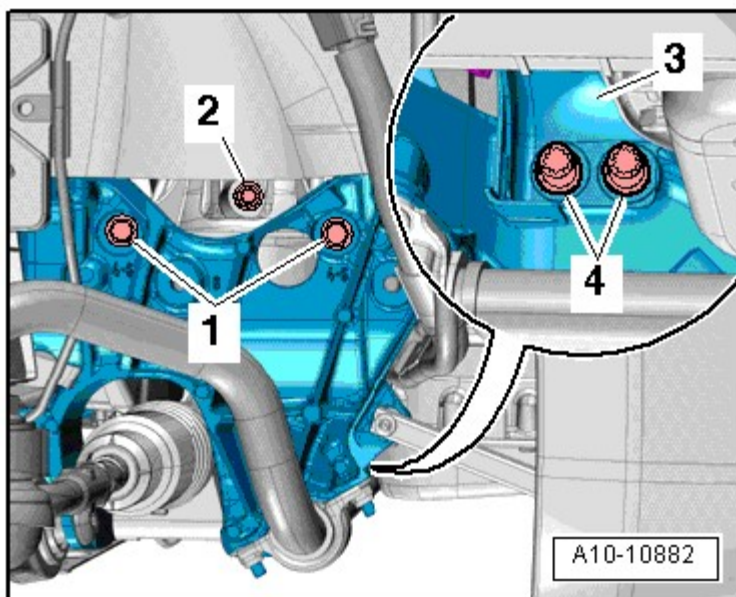


Fig. 83: Identifying Bolts And Right Engine Mount Retaining Plate
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

Ignore -1, 3, 4-

-- Remove joint support VAS 6131/13-7 from engine.

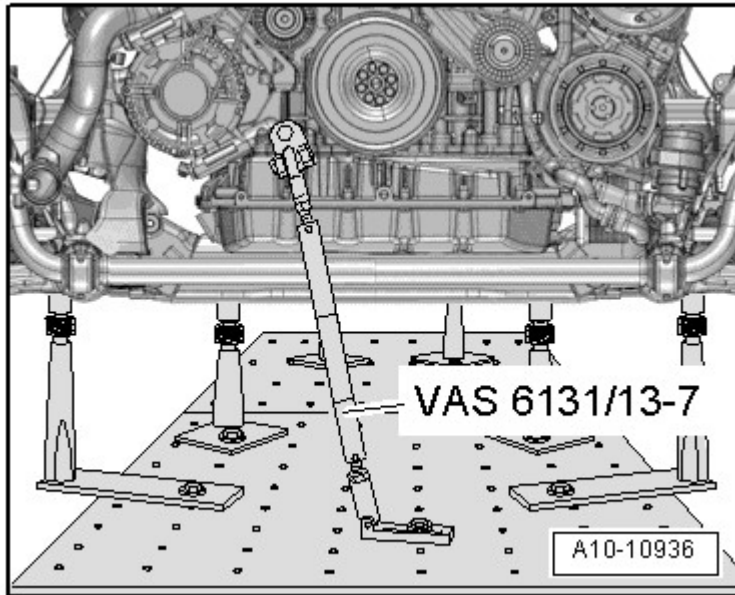


Fig. 84: Identifying Joint Support VAS 6131/13-7
Courtesy of AUDI OF AMERICA, LLC

-- Raise engine from engine carrier.

-- Remove bolts -arrows- and left engine support.

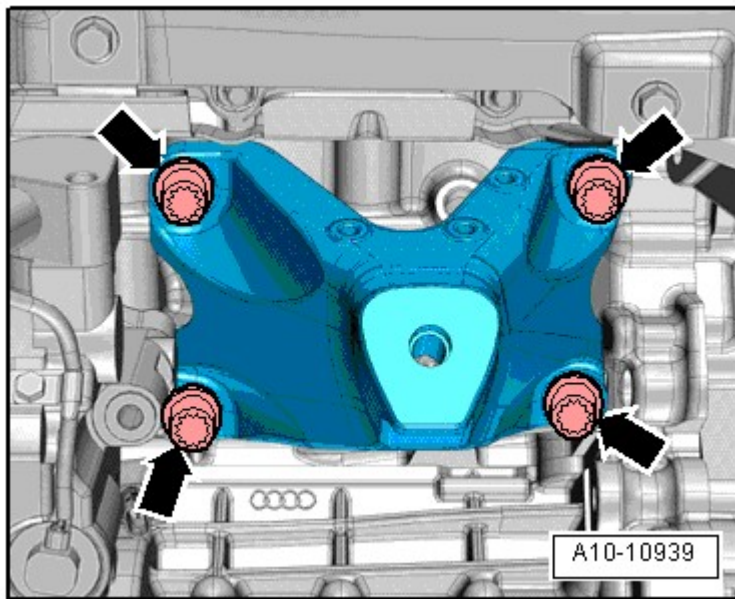


Fig. 85: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and free up ground (GND) wire at engine support.

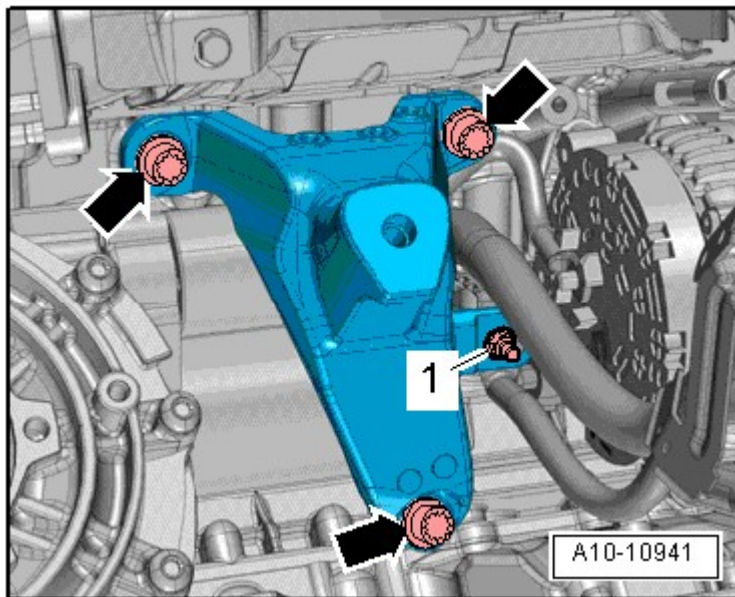


Fig. 86: Identifying Bolts & Right Engine Support

Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and right engine support.

-- Secure starter on engine.

-- Secure engine to engine and transmission holder VAS 6095 using bracket VAS 6095/1-5 and tighten to 40

Nm, as shown in the illustration.

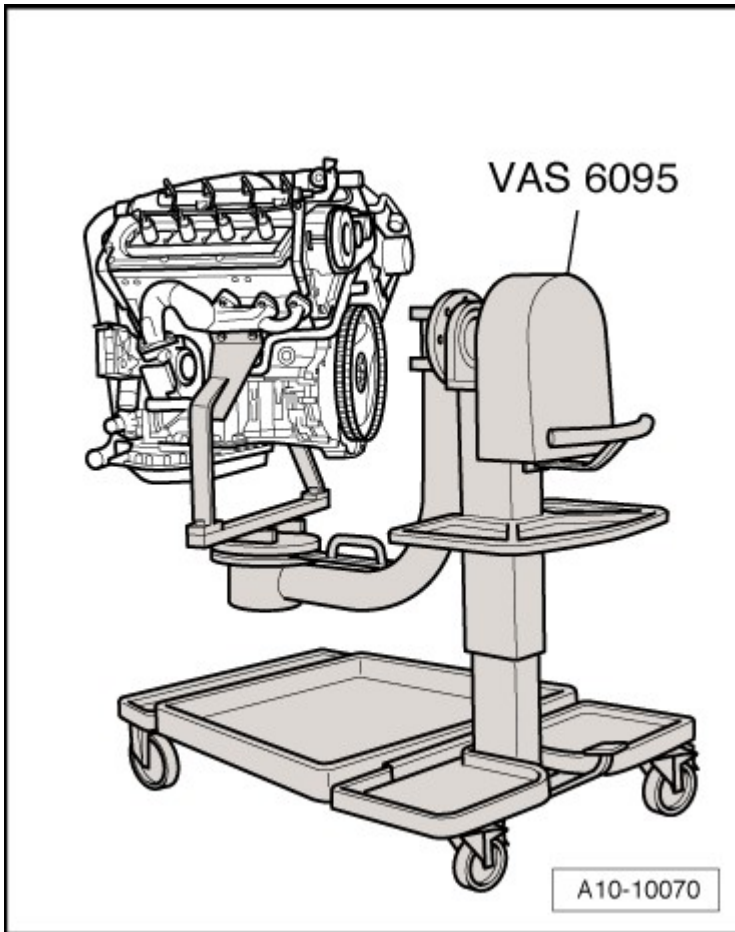


Fig. 87: Identifying Engine, Holder VAS 6095 And Bracket For V6 FSI Engine VAS 6095/1-5
Courtesy of AUDI OF AMERICA, LLC

ENGINE, INSTALLING - MANUAL TRANSMISSION

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 parts that have had the lubrication removed.

Tolerance for tightening specifications $\pm 15\%$.

Tightening specifications **ENGINE MOUNT ASSEMBLY OVERVIEW.**

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

Component		Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Exceptions:		
Ground pins to the strut tower		9

Securing engine to transmission

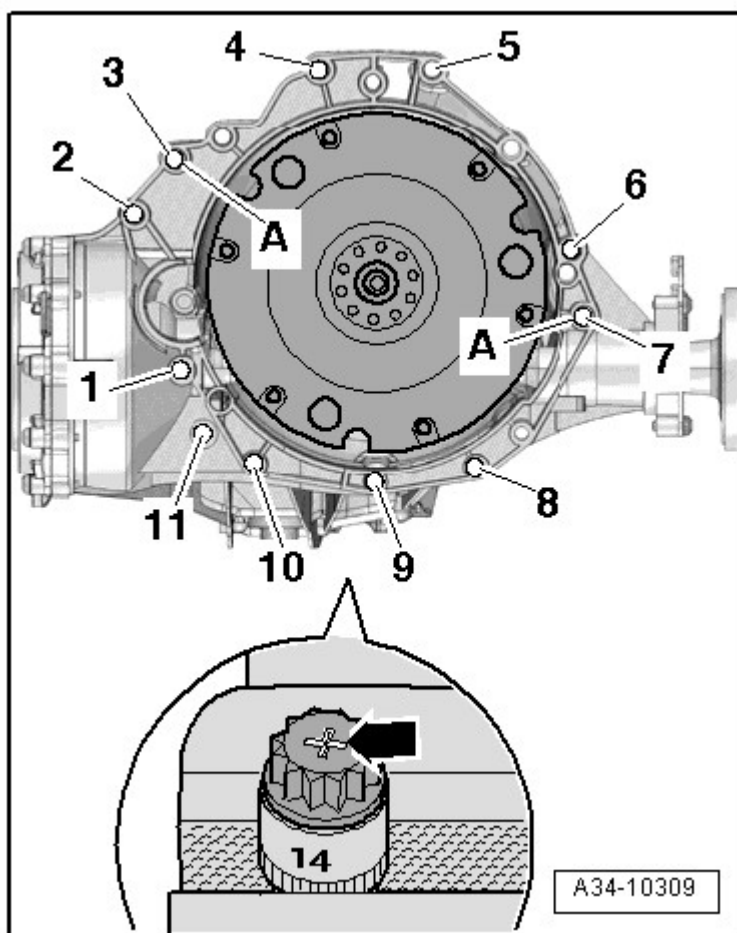


Fig. 88: Engine To Transmission Bolt Tightening Sequence And Specification
Courtesy of AUDI OF AMERICA, LLC

Item	Bolt	Nm
1	M10 x 50 ¹⁾	65
2 to 6	M12 x 100 ²⁾	30 + 105° turn
7	M12 x 125 ²⁾	30 + 105° turn

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

8, 11	M10 x 60 ²⁾	15 + 105° turn
9, 10	M10 x 95 ²⁾	15 + 105° turn
A	Alignment sleeves for centering	
• ¹⁾ Bolt class 10.9. • ²⁾ Replace bolts.		
(1) To avoid damaging the bolts when marking them, do not clamp them in a vise. Insert the bolt in a 14 mm socket with a 1/2 inch drive ratchet which is clamped into a vise, as shown in the illustration.		

- Aluminum bolts -2 through 11- may be used twice. After using the bolts once, mark them with an "X" made by a chisel -arrow-.

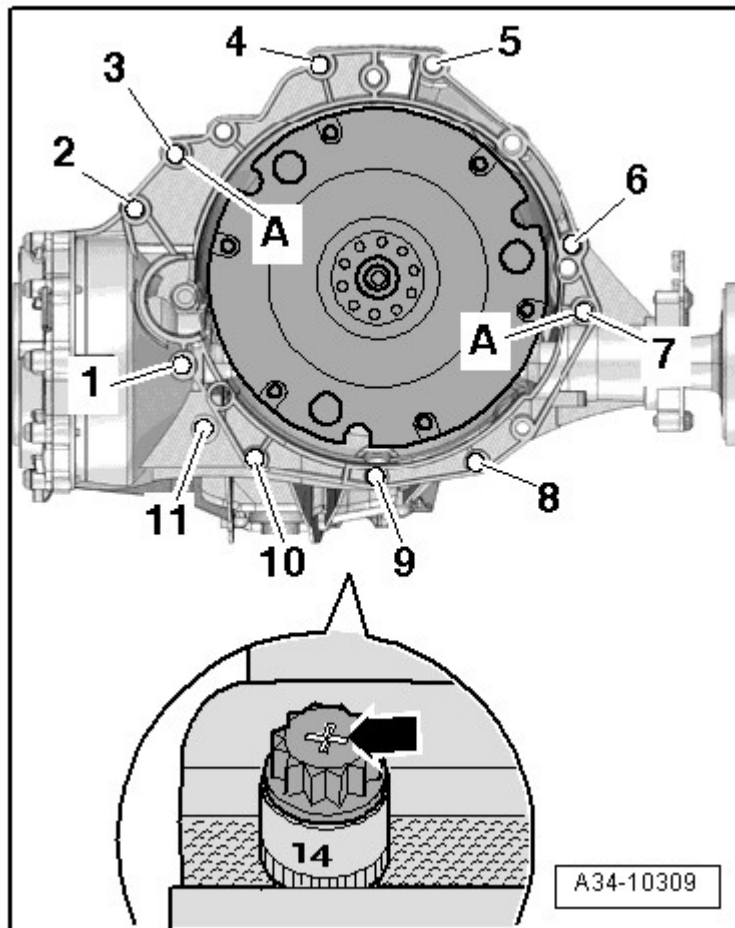


Fig. 89: Identifying Do Not Used Bolts Marked With An "X" Again
Courtesy of AUDI OF AMERICA, LLC

- Do not used bolts marked with an "X" again.
- There is no limit to the number of times the steel bolt -1- can be used.

Procedure

Proceed as follows:

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

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

There is a needle bearing in the drive plate. Check if the needle bearing is inserted before installing. Needle bearing, removing from and installing on drive plate DRIVE PLATE NEEDLE BEARING .

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

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

-- Check if alignment sleeves for centering the engine and transmission are in the cylinder block and insert them if they are not.

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

-- Install engine supports and engine mount **ENGINE MOUNT ASSEMBLY OVERVIEW**.

-- Complete the following steps before connecting the engine and transmission:

-- Insert assembly aid T40169 into transmission housing and clutch module from below as shown in the illustration.

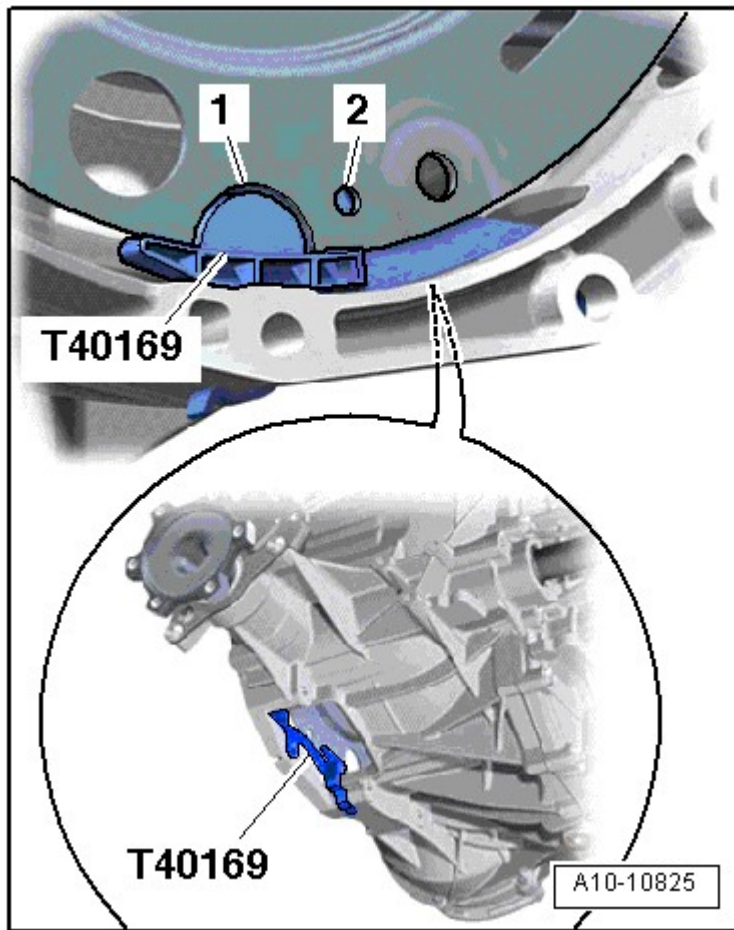


Fig. 90: Inserting Assembly Aid T40169 Into Transmission Housing
 Courtesy of AUDI OF AMERICA, LLC

- The assembly aid T40169 must engage in the semicircular opening -1- and in the inspection hole -2-.

NOTE: **The inspection hole is only in one location on the circumference so rotate the clutch module as needed.**

-- Insert transportation lock T40170 in the transmission housing from below and clamp it onto flange shaft -1-.

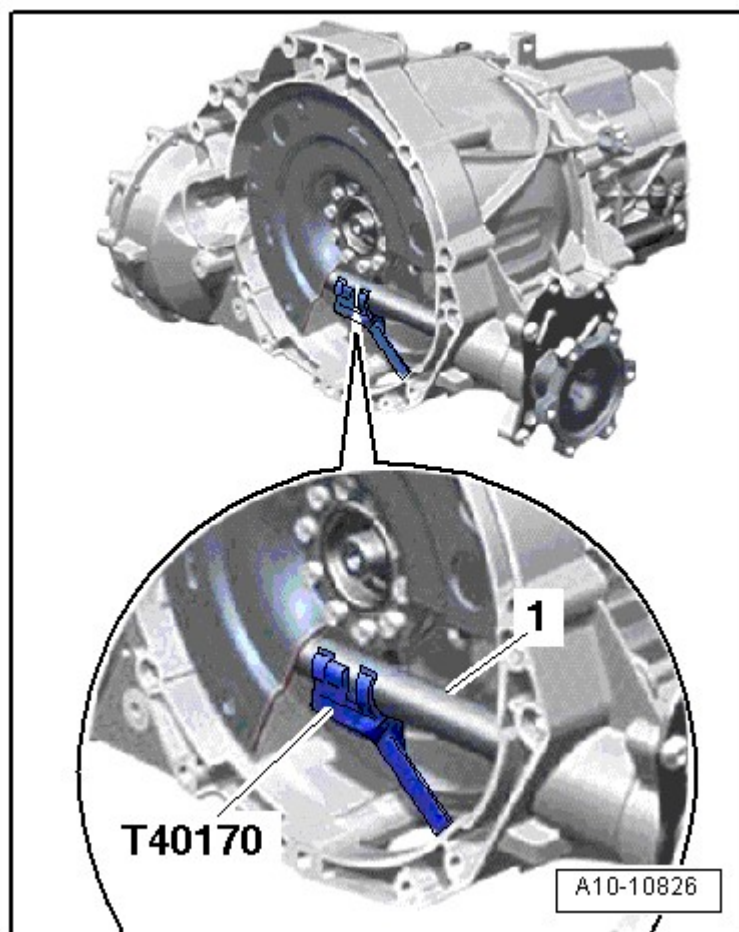


Fig. 91: Identifying Transportation Lock T40170

Courtesy of AUDI OF AMERICA, LLC

-- Also align drive plate to clutch module so tabs -2- on drive plate can engage in large holes -1- on clutch module.

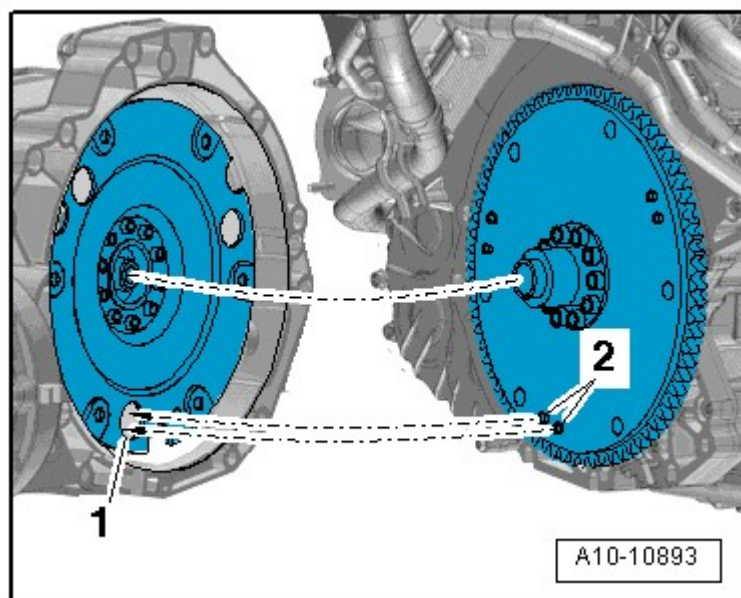


Fig. 92: Aligning Drive Plate To Clutch Module

Courtesy of AUDI OF AMERICA, LLC

NOTE: The tabs must not lie on any part of the clutch module that does not have a hole.

-- Position transmission on engine and tighten bolts -1 through 11-.

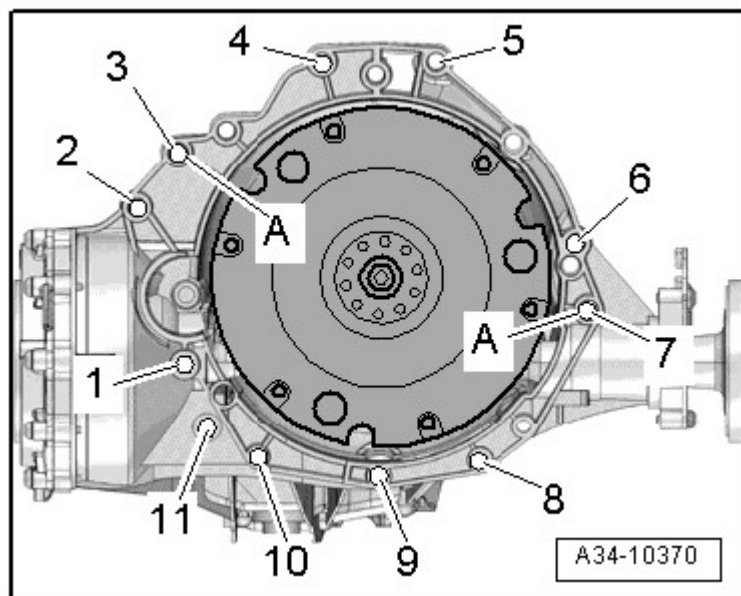


Fig. 93: Checking If Alignment Sleeves -A- For Centering Engine/Transmission Are In Cylinder Block

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -A-.

-- Tighten clutch module bolts -arrow- on drive plate in two stages while turning crankshaft 60 degrees
Removal and Installation .

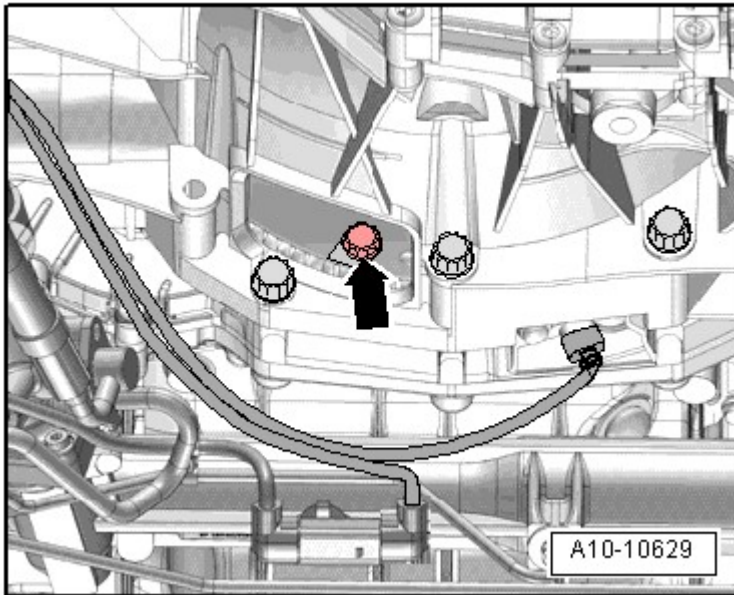


Fig. 94: Identifying Clutch Module First Bolt Installation Location
Courtesy of AUDI OF AMERICA, LLC

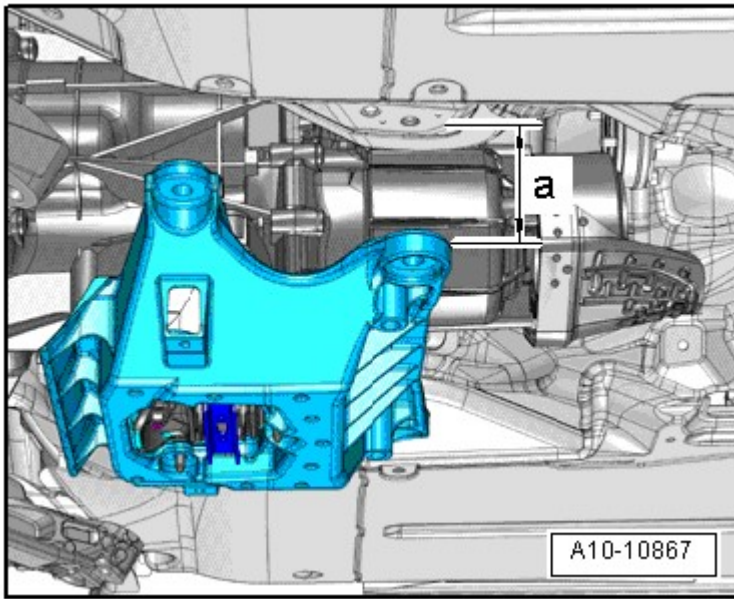
-- Install starter **Removal and Installation** .

-- Install power steering hydraulic oil lines **Removal and Installation** .

-- Install left and right drive axles on transmission flange shafts **Removal and Installation** .

-- Install catalytic converters: Left **LEFT CATALYTIC CONVERTER** , right **RIGHT CATALYTIC CONVERTER** .

-- Next, raise engine/transmission assembly high enough using scissor lift table VAS 6131 A until dimension - a- is reached between subframe and body.

**Fig. 95: Raising Transmission**

Courtesy of AUDI OF AMERICA, LLC

- Dimension -a- = at least 100 mm.
- Install shift rod and pivot rod **Description and Operation** .
- Continue raising engine/transmission assembly using scissor lift table VAS 6131 A.
- Align subframe and transmission carrier using marks made on longitudinal members during removal.
- Tighten subframe bolts only to tightening specifications, do not tighten them further (tighten bolts only after axle alignment) **Removal and Installation** .

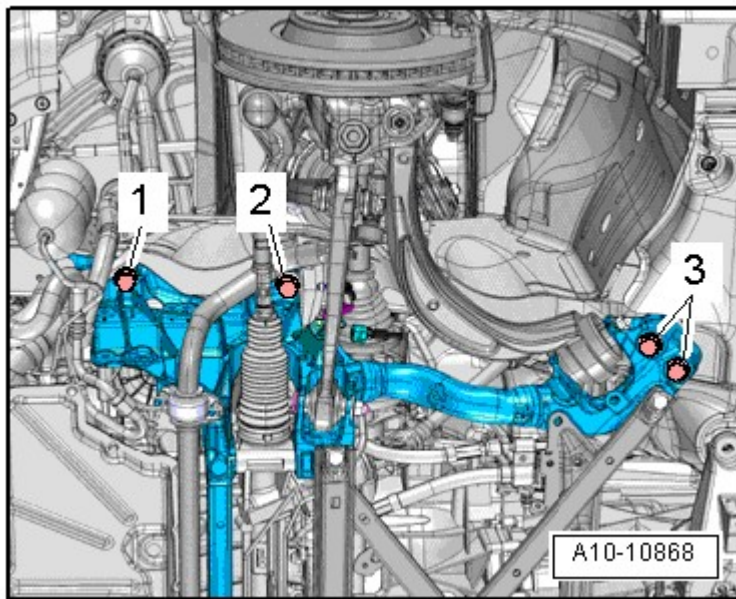


Fig. 96: Identifying Subframe Bolts (Tighten To Specifications)
 Courtesy of AUDI OF AMERICA, LLC

WARNING: Risk of accident due to loose connections.

- If the bolts in the subframe are not tightened to final specifications, vehicle must not be driven.

-- Tighten tunnel crossmember bolts -arrow- **Description and Operation** .

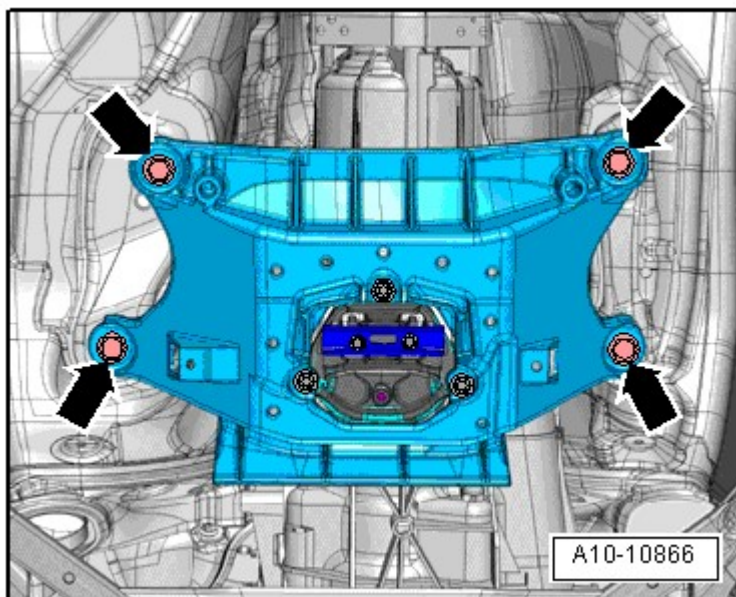


Fig. 97: Identifying Bolts & Tunnel Crossmember
 Courtesy of AUDI OF AMERICA, LLC

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

- Install clutch slave cylinder **Removal and Installation** .
- Install universal joint on steering gear **Description and Operation** .
- Install driveshaft **Removal and Installation** .
- Install front muffler **FRONT MUFFLER** .
- Install exhaust system free of stress **EXHAUST SYSTEM, INSTALLING** .
- Install subframe cross brace, upper control arm and stabilizer bar and tighten the suspension strut on control arm **Description and Operation** .
- Install brake caliper **Description and Operation**
- Install Engine Control Module (ECM) **Removal and Installation** .
- Electrical connections and routing, refer to appropriate SYSTEM WIRING DIAGRAM.
- Install electrical wires, terminal 30 wire junction 2 -TV22- and engine compartment E-box cover **Wiring** .
- Install tower brace **Description and Operation** .
- Install washer fluid reservoir filler tube **Removal and Installation** .
- Install refrigerant lines **Removal and Installation** .
- Follow measures after connecting battery **Removal and Installation** .

CAUTION: Risk of destroying control modules with excess voltage.

- **Do not use a battery charger for starting assistance!**

- Install air filter housing **Removal and Installation** .
- Install lock carrier braces **Description and Operation** .
- Fill engine oil and check oil level **ENGINE OIL, CHECKING LEVEL** .
- Before starting engine for the first time, check hydraulic oil in power steering reservoir **Diagnosis and Testing** .

NOTE: Power-steering pump must not run dry.

-- Connect coolant hose to connector on the radiator **Fig. 98**

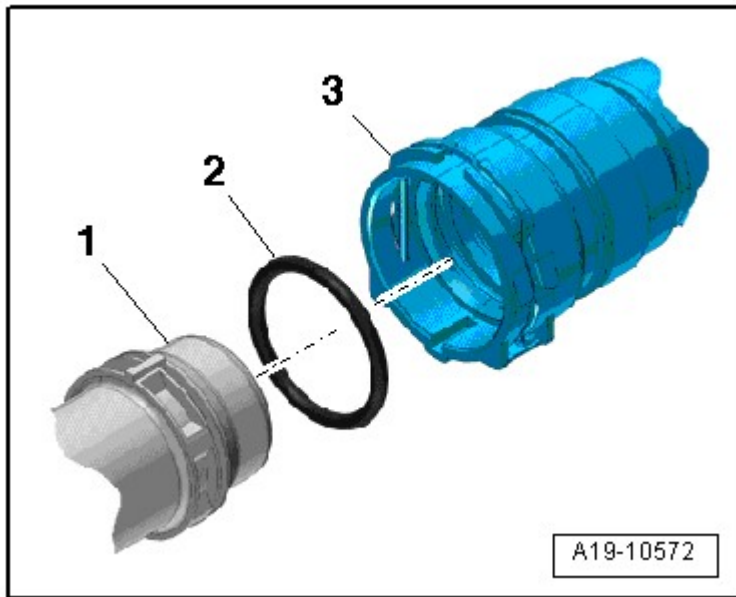


Fig. 98: Connecting Coolant Hose To Coupling
Courtesy of AUDI OF AMERICA, LLC

-- Fill with coolant **COOLING SYSTEM, DRAINING AND FILLING** .

NOTE: Do not use drained coolant in the following situations:

If cylinder head or cylinder block was replaced.

If coolant is contaminated.

-- Fill refrigerant circuit **DESCRIPTION AND OPERATION** .

-- Align subframe **Description and Operation** .

-- Perform axle alignment **Description and Operation** .

WARNING: Risk of accident due to loose connections.

- Tighten the subframe bolts to the specification after performing axle alignment.

-- Install noise insulation and the wheel housing liners. Noise insulation **Description and Operation** Wheel housing liner **Description and Operation** .

ENGINE, REMOVING - AUTOMATIC TRANSMISSION

NOTE: Remove the engine downward together with transmission and subframe while the lock carrier is installed.

Collect escaping coolant in a clean container for disposal or reuse.

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

NOTE: If the engine and transmission will be separated after removal, the supplementary set VAS 6131/14 will also be needed.

Special tools and workshop equipment required

- Old oil collecting and extracting device V.A.G 1782
- Hose clamp pliers V.A.G 1921
- Step ladder VAS 5085
- Scissor lift table VAS 6131 A with Support Set VAS 6131/10 and Supplementary Set VAS 6131/11 and VAS 6131/13
- Drip tray for workshop crane VAS 6208
- Pry lever - rmv outside mirror 80 - 200
- Counterhold tool T10172 with T10172/5

Procedure

Proceed as follows:

WARNING: Risk of vehicle tipping over with engine removed.

- Secure vehicle. Luggage compartment must be empty for this.

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 **BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM** .

CAUTION: Risk of destroying electrical components.

- Observe measures when disconnecting battery.

NOTE: Release electrical parking brake before disconnecting battery so the driveshaft can be rotated to remove it.

- Position front wheels so they are straight.
- Switch off ignition and remove ignition key.
- Raise luggage compartment liner and engage it on the body.
- Remove nut -1- and vehicle tool kit cover -2-.

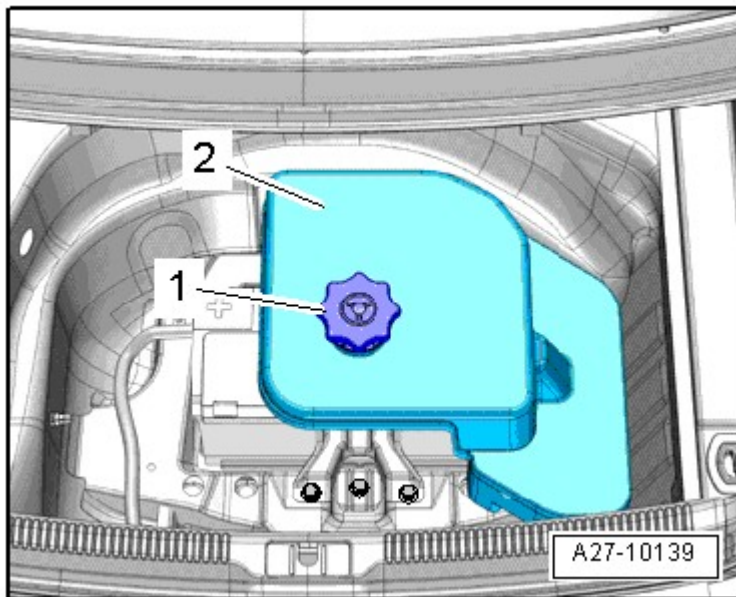


Fig. 99: Identifying Nut -1- And Tool Kit Cover -2-
Courtesy of AUDI OF AMERICA, LLC

- Pull cover -1- over negative terminal up slightly -arrow-.

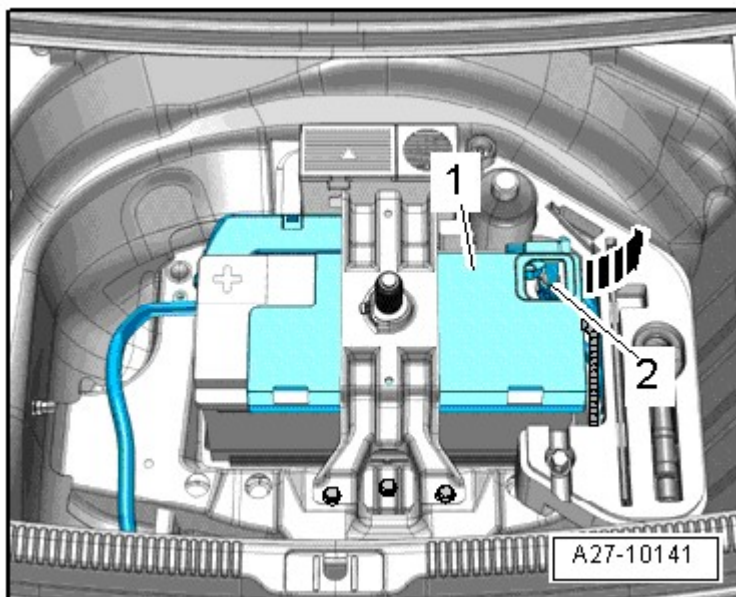
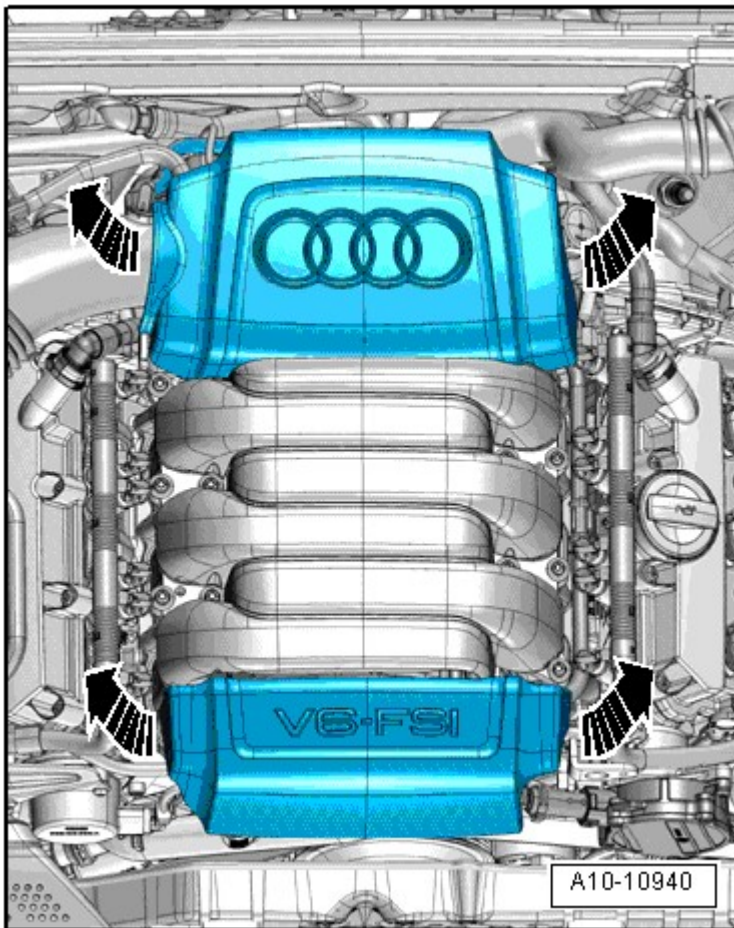


Fig. 100: Identifying Battery

Courtesy of AUDI OF AMERICA, LLC

- Loosen nut a few turns and remove ground (GND) wire terminal clamp -2- from battery pole.
- Empty coolant circuit **COOLING SYSTEM, DRAINING AND FILLING** .
- Extract power steering fluid from reservoir with used oil collection and extraction device V.A.G 1782.
- Remove engine covers -arrows-.

**Fig. 101: Identifying Engine Cover**

Courtesy of AUDI OF AMERICA, LLC

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 coolant reservoir cap.
- Remove left and right front wheels.
- Remove left and right front wheel housing liners **Description and Operation** .
- Remove noise insulation by loosening fasteners -1 through 4-.

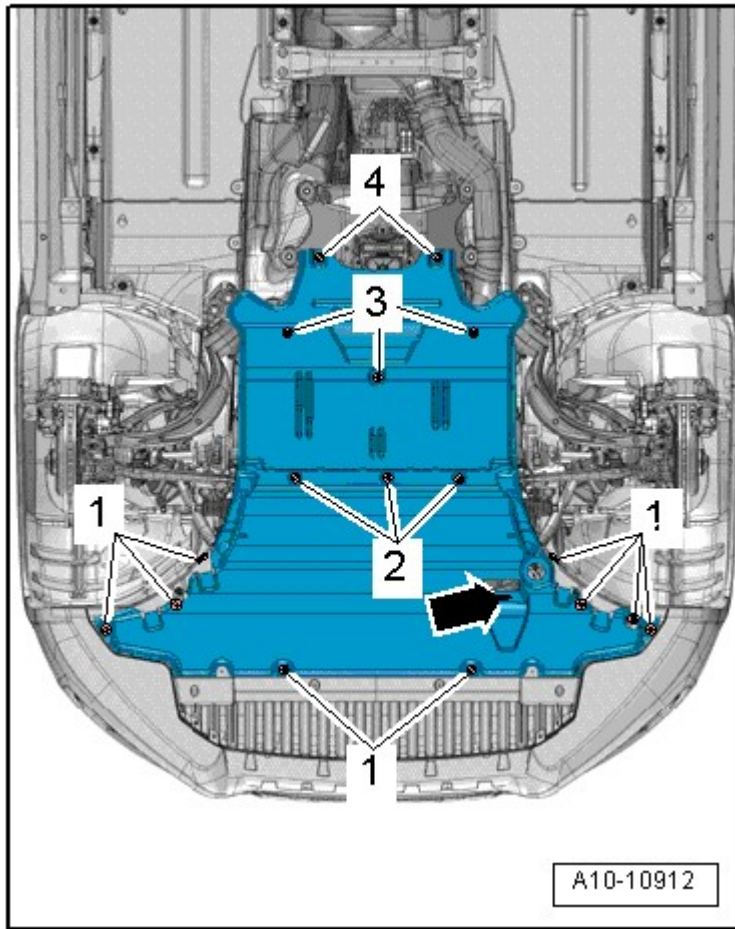


Fig. 102: Identifying Noise Insulation
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -arrow-.

- Place drip tray VAS 6208 under engine.
- Remove drain plug -1- and drain coolant.

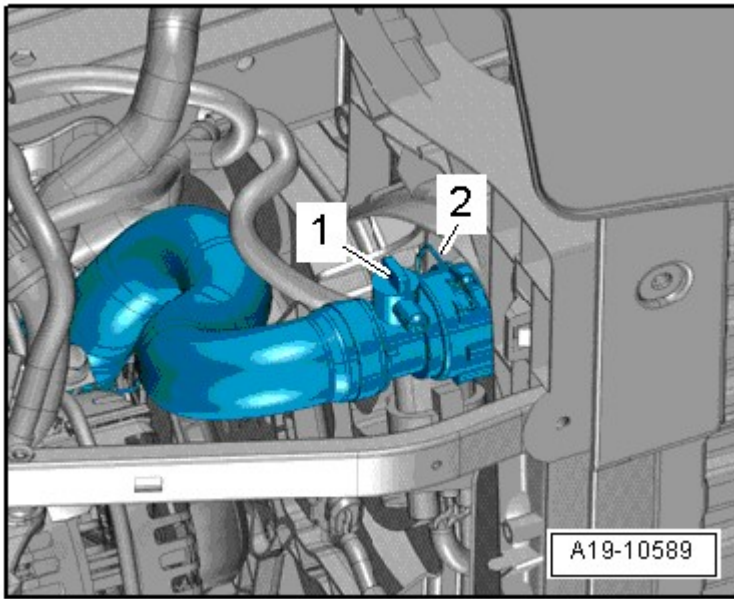


Fig. 103: Identifying Drain Plug And Draining Coolant
Courtesy of AUDI OF AMERICA, LLC

- Remove coolant hose -2- from radiator by raising retaining clip.
- Remove coolant hose -arrows- from oil cooler and drain remaining coolant.

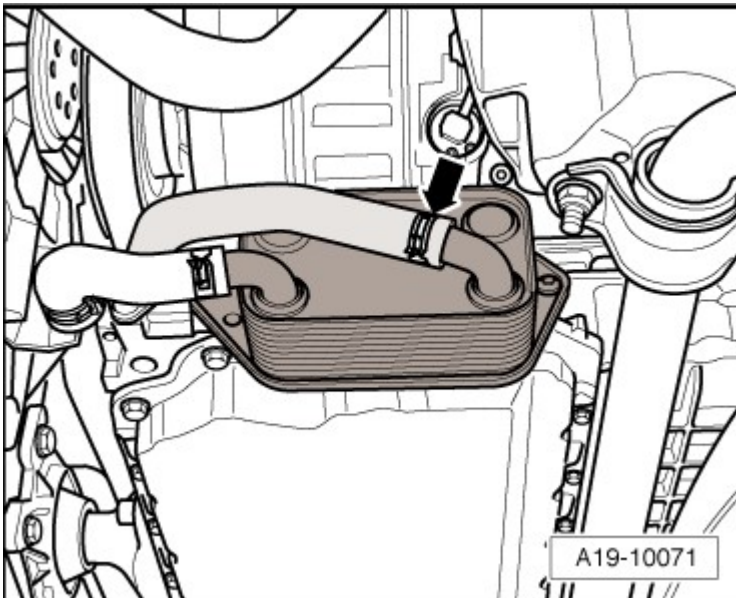


Fig. 104: Disconnecting Coolant Hose From Oil Cooler
Courtesy of AUDI OF AMERICA, LLC

- Place used oil collecting and extracting device V.A.G 1782 under separating point.
- Disconnect power steering hydraulic oil supply line -2- and return line -1- in left front wheel housing and free

them up.

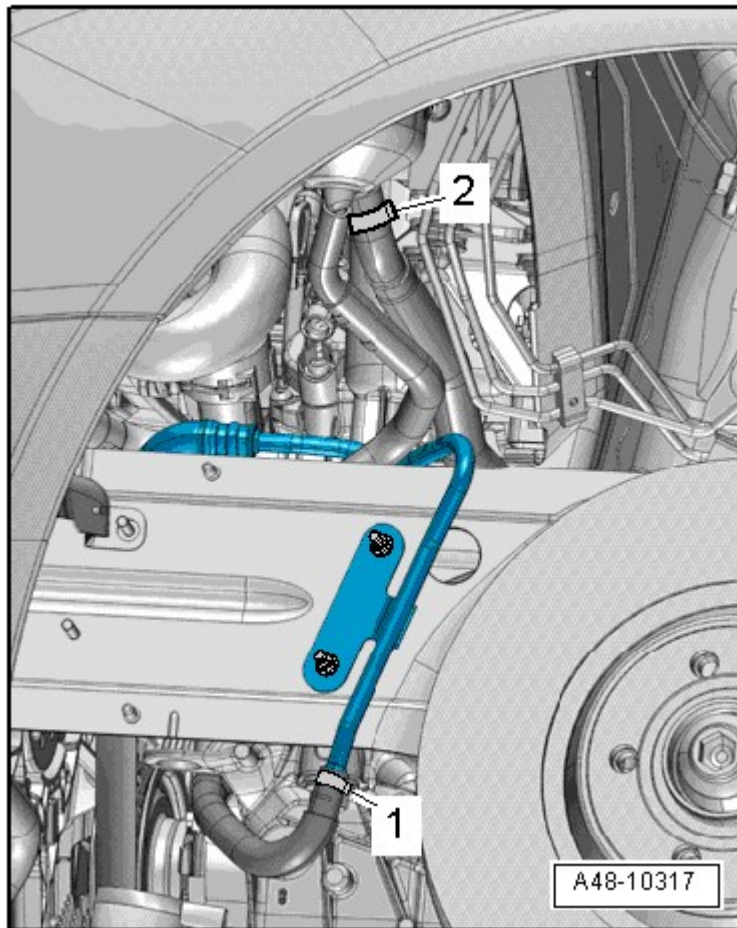


Fig. 105: Disconnecting Power Steering Hydraulic Oil Supply Line
Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

- Place used oil collecting and extracting device V.A.G 1782 under separating point.
- Mark locations of ATF lines -1- and -2- so they can be installed later and then disconnect them.

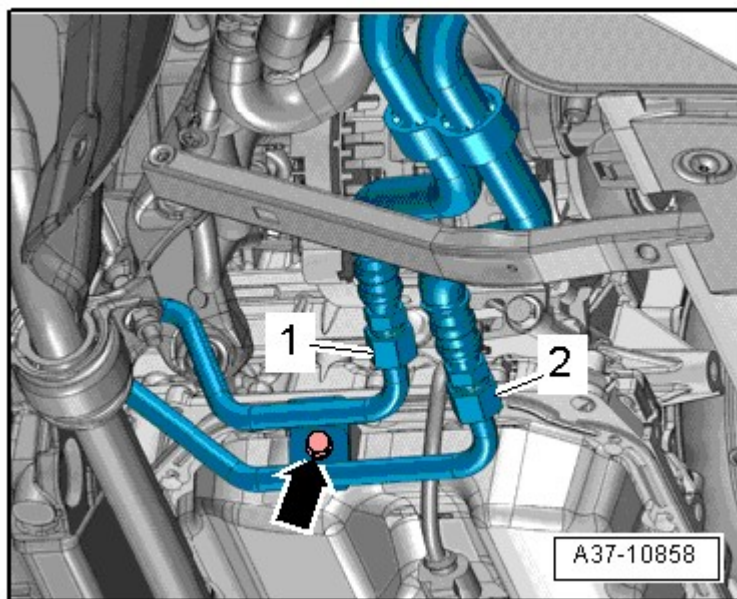


Fig. 106: Identifying ATF Line Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

Ignore -arrow-.

With a Coolant Pump -V50-

-- Disconnect electrical connector -1-.

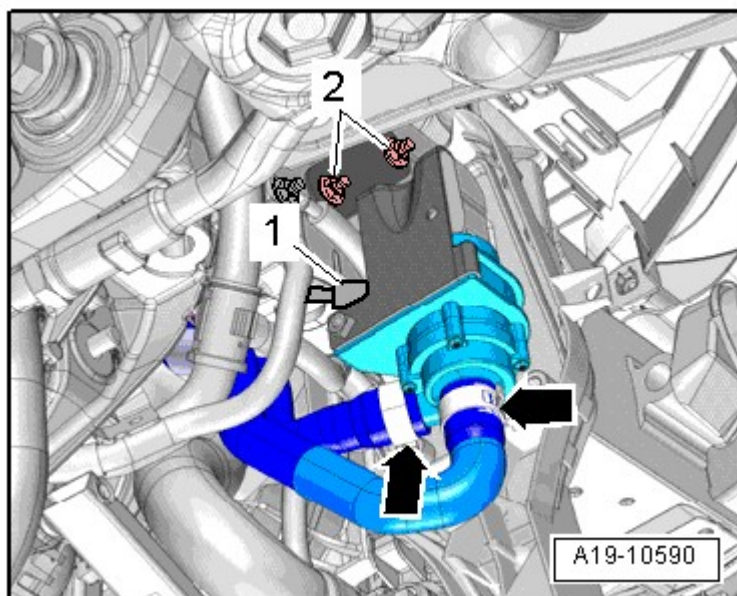


Fig. 107: Disconnecting Electrical Connector -1-
Courtesy of AUDI OF AMERICA, LLC

- Place drip tray VAS 6208 under engine.
- Remove coolant hose from coolant pump -V50- -right arrow-.

NOTE: Ignore -2- and -left arrow-.

Continuation for All

- Disconnect coolant fan electrical connector -1- by sliding retainer back -arrow- and pressing release down.

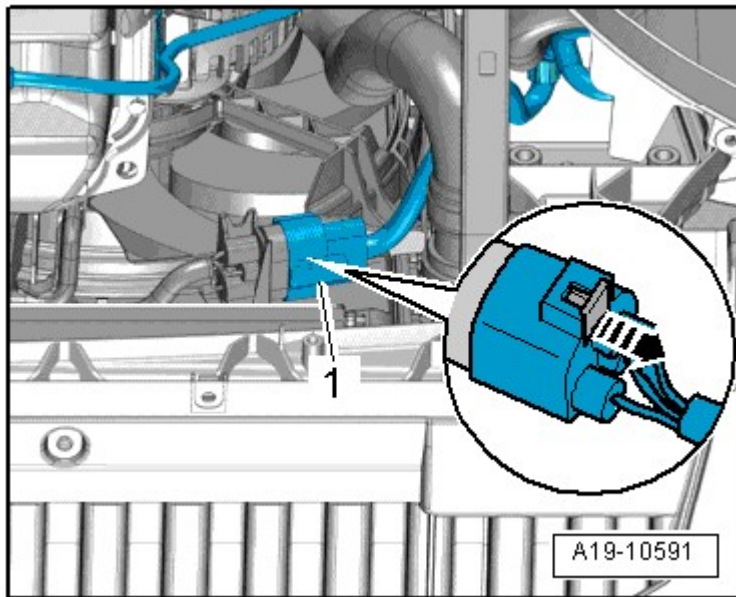


Fig. 108: Disconnecting Coolant Fan Electrical Connector -1- From Bracket
Courtesy of AUDI OF AMERICA, LLC

- Free up electrical wiring harness.
- Remove left and right bolt -1- and nut -3- and lock carrier brace -2-.

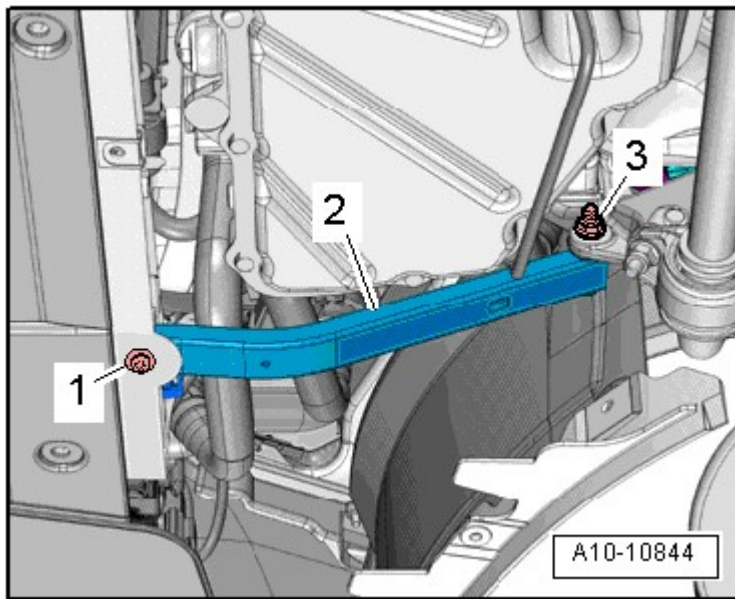


Fig. 109: Identifying Carrier Left Brace Components
Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -arrow- on right longitudinal member and free up ground (GND) wire.

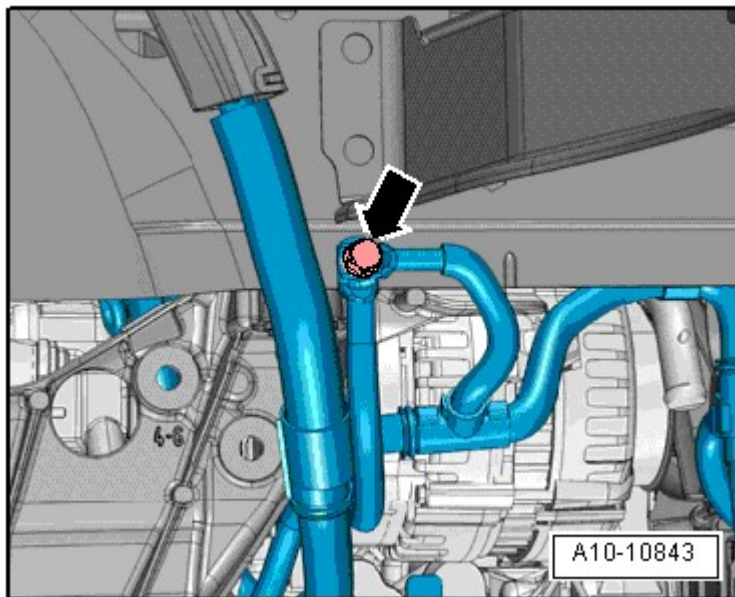


Fig. 110: Disconnecting Ground Wires -Arrow- From Right Longitudinal Member
Courtesy of AUDI OF AMERICA, LLC

-- Remove seal -arrow-.

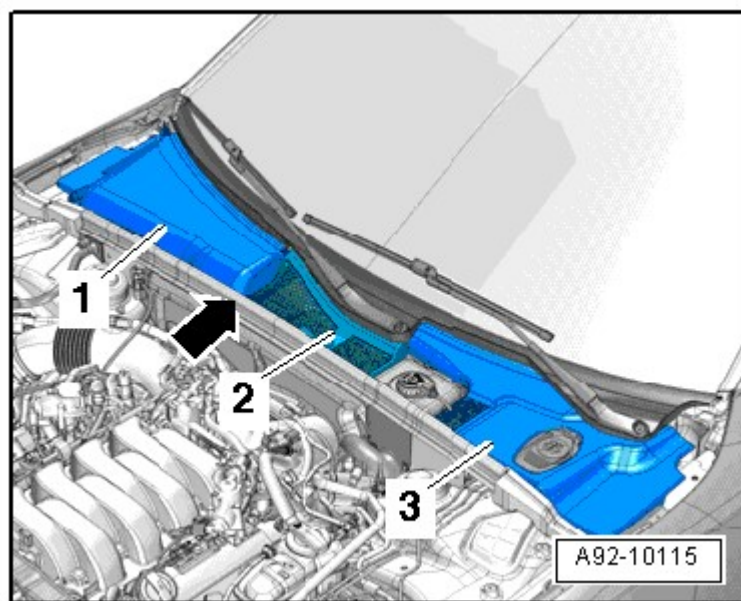


Fig. 111: Identifying Plenum Chamber Covers
 Courtesy of AUDI OF AMERICA, LLC

- Unclip plenum chamber covers -1, 2 and 3- and remove it.
- Remove vacuum connection -2- from bulkhead by pulling vacuum hose -1- on rear side.

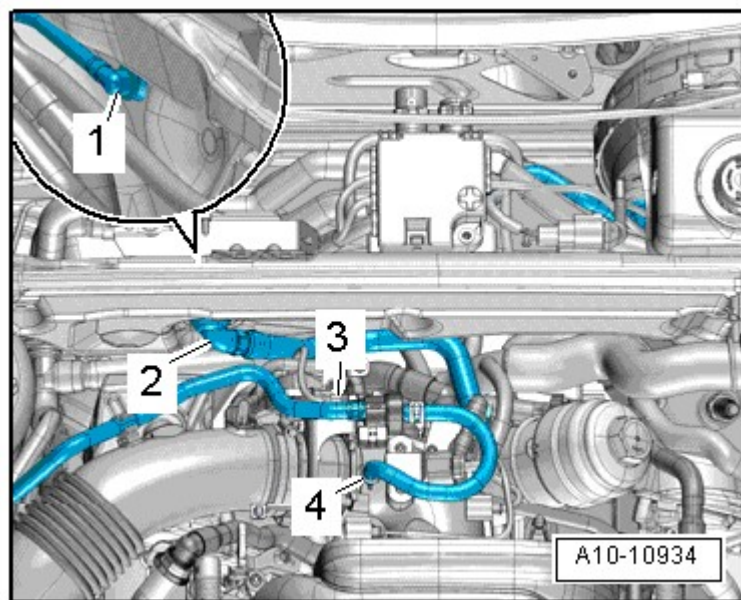


Fig. 112: Removing Vacuum Connection -2- From Bulkhead By Pulling Vacuum Hose -1-
 Courtesy of AUDI OF AMERICA, LLC

- Free up fuel line and wire to EVAP canister at air guide pipe.
- Disconnect electrical connector -3- on evaporative emission (EVAP) canister purge regulator valve -N80- and

disconnect vacuum hose -4-.

-- Disengage evaporative emission (EVAP) canister purge regulator valve -N80- from bracket and lay it aside with hose connected.

-- Disconnect vacuum hose -arrow- to leak detection pump -V144-.

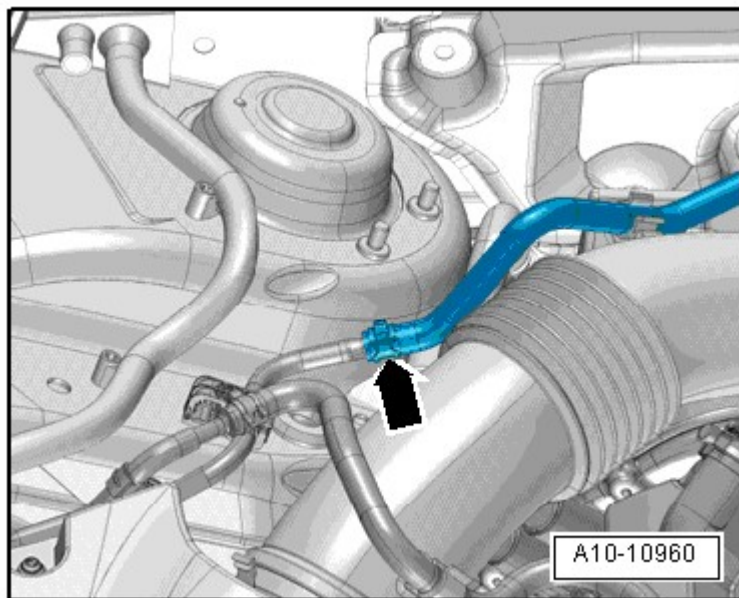


Fig. 113: Identifying Vacuum Hose -Arrow- To Leak Detection Pump -V144-
Courtesy of AUDI OF AMERICA, LLC

-- Remove air duct -arrows-.

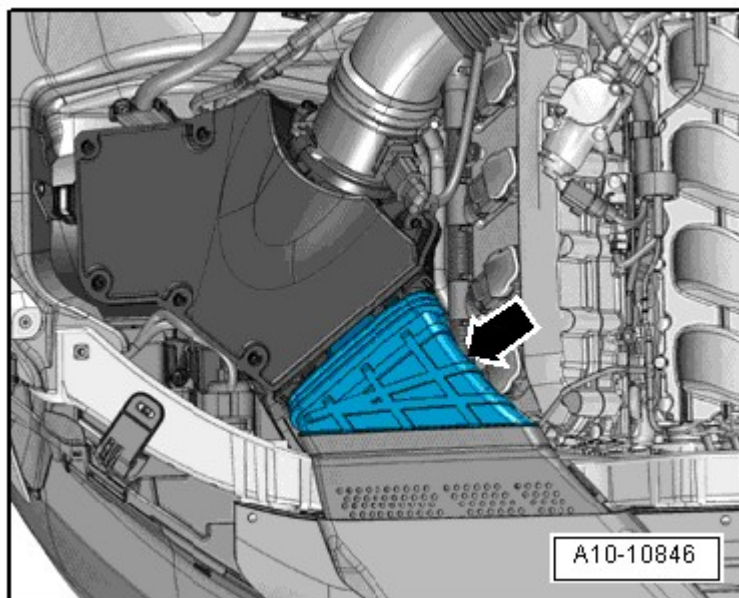


Fig. 114: Identifying Air Duct

Courtesy of AUDI OF AMERICA, LLC

-- Remove vacuum hose -3- from connection on air guide pipe.

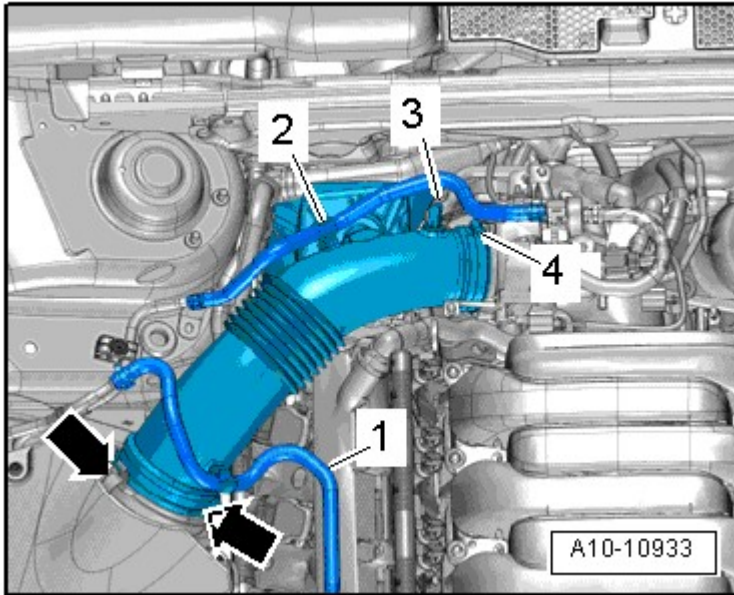


Fig. 115: Removing Air Guide Pipe By Loosening Hose Clamp -4- & Opening Clips -Arrows-
Courtesy of AUDI OF AMERICA, LLC

-- Remove air guide pipe by loosening hose clamp -4- and opening clips -arrows-.

NOTE: Ignore -1 and 2-.

-- Disconnect vacuum line -1-.

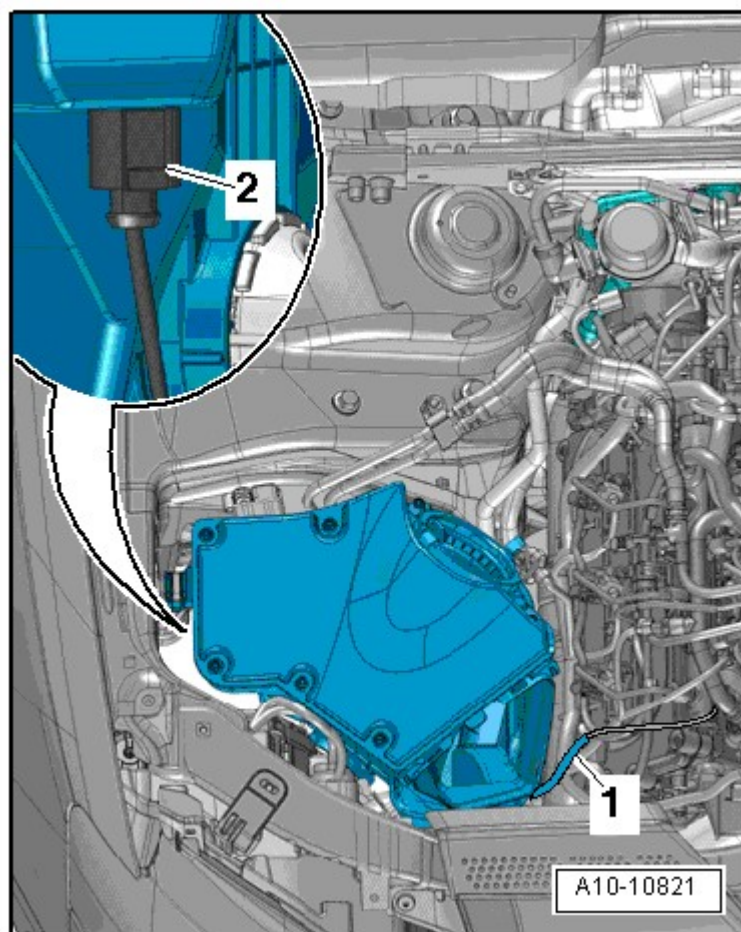


Fig. 116: Disconnecting Vacuum Line
 Courtesy of AUDI OF AMERICA, LLC

-- Remove air filter housing and, if applicable, disconnect electrical connector -2- on rear side at intake air switch-over valve -N335-.

WARNING: Risk of injury from fuel.

- To reduce fuel pressure, lay cloths around connecting point before opening fuel system and carefully loosen.

CAUTION: Follow cleanliness precautions when working on the fuel supply system
CLEAN WORKING CONDITIONS .

-- Remove fuel supply line from high pressure pump -arrow- and lay it aside.

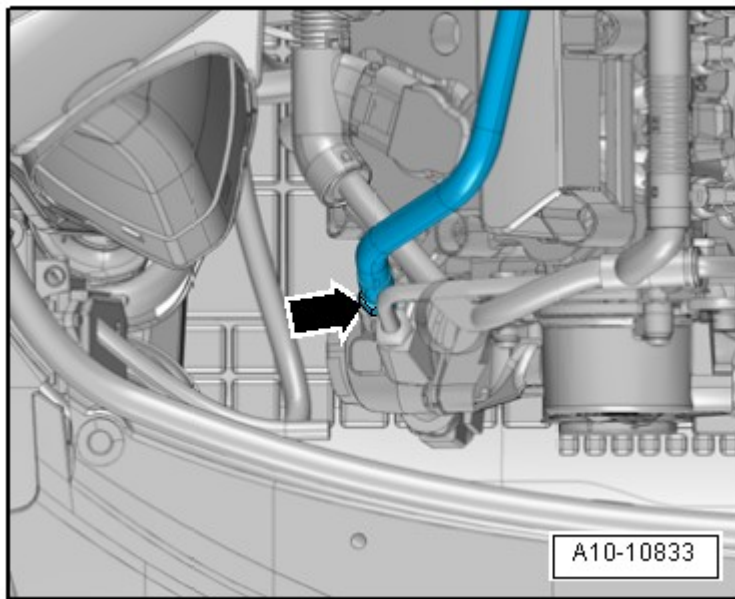


Fig. 117: Identifying Fuel Supply Hose
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect vacuum hose -1- and free it up.

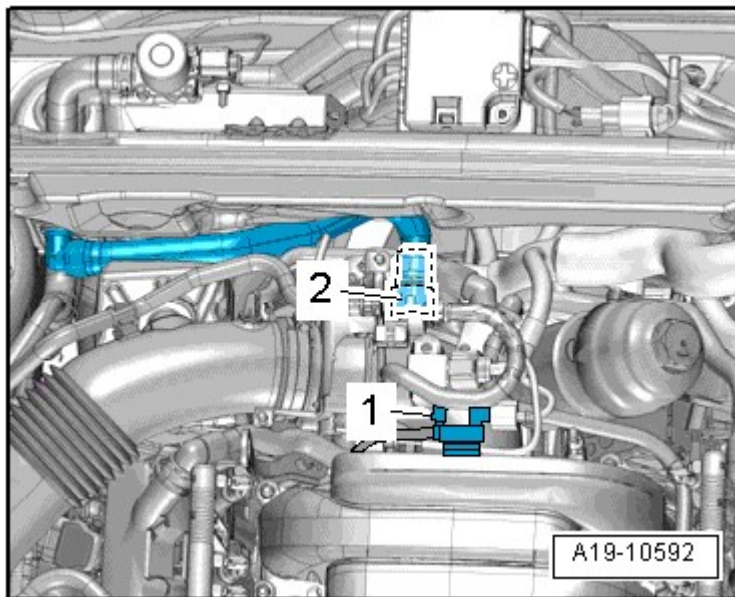


Fig. 118: Disconnecting Vacuum Hose And Free It Up, If Applicable
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -2- from upper coolant pipe by lifting retaining clamp.

-- In vehicles without a coolant pump -V50-, remove right front coolant hose -arrow- from front coolant pipe by lifting retaining clamp.

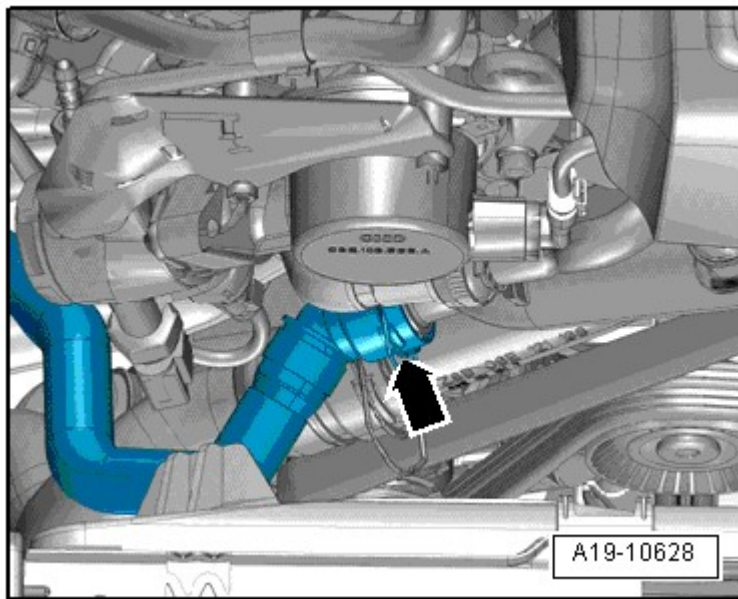


Fig. 119: Identifying Clamp And Right Front Coolant Hose -Arrow- To Front Coolant Pipe
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -arrow- from front coolant pipe by lifting retaining clamp.

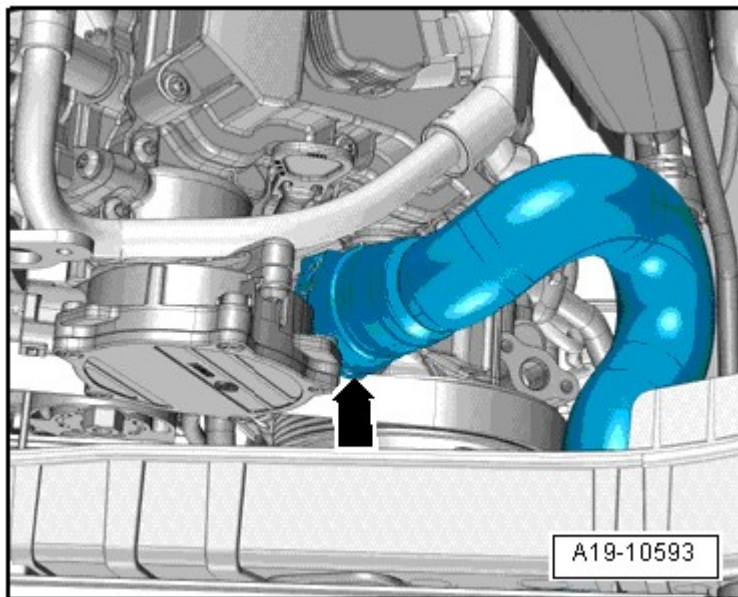


Fig. 120: Identifying Coolant Hose From Front Coolant Pipe By Lifting Retaining Clamp
Courtesy of AUDI OF AMERICA, LLC

-- Remove coolant hose -3- from coolant reservoir and free it up.

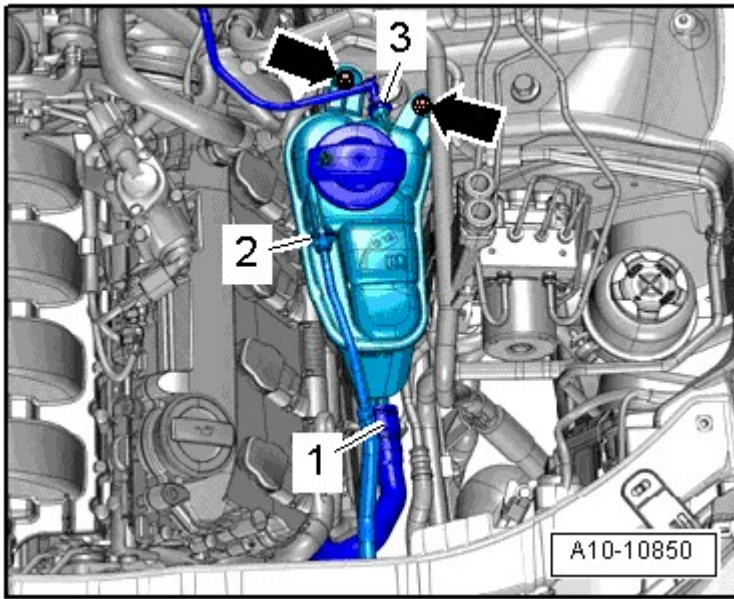


Fig. 121: Identifying Coolant Hose And Coolant Reservoir
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows-, disconnect electrical connector on Engine Coolant Level (ECL) warning switch -F66- and lay coolant reservoir aside with coolant hoses -1- and -2- attached.

-- Disconnect electrical connector -arrow- on power steering pump, if applicable.

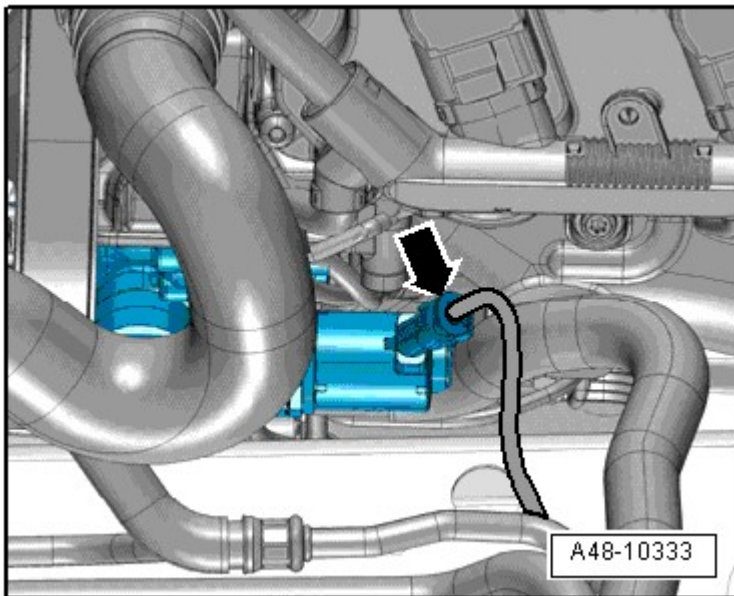


Fig. 122: Disconnecting Connector -Arrow- From Power Steering Pump
Courtesy of AUDI OF AMERICA, LLC

-- Press hydraulic hose down slightly.

CAUTION: Risk of damaging coolant lines and hoses.

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

-- Remove bolts -arrows- and refrigerant lines from A/C compressor.

NOTE: To prevent dirt and moisture from entering, seal open lines and connections with clean plugs or protective caps.

-- Release retainer -arrow A- and open cover -arrow B-.

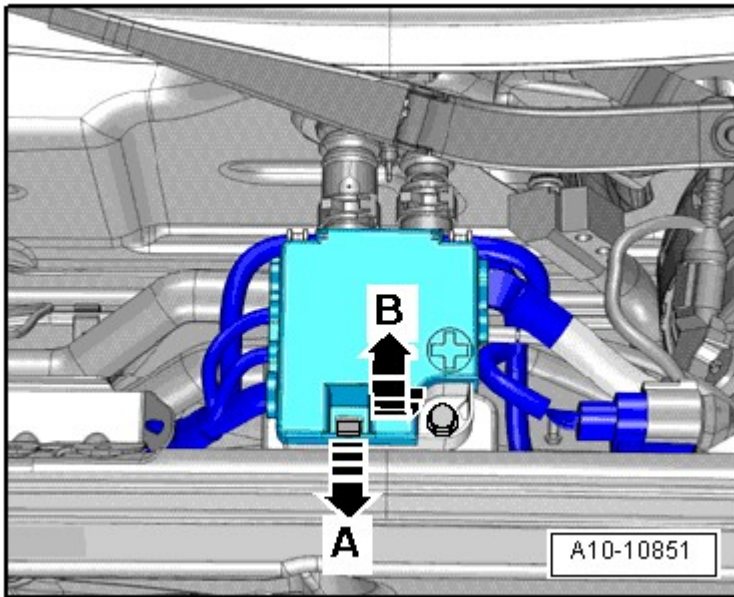


Fig. 123: Opening Terminal Box Cover
Courtesy of AUDI OF AMERICA, LLC

-- Remove nuts -1- and -2- for electrical wires.

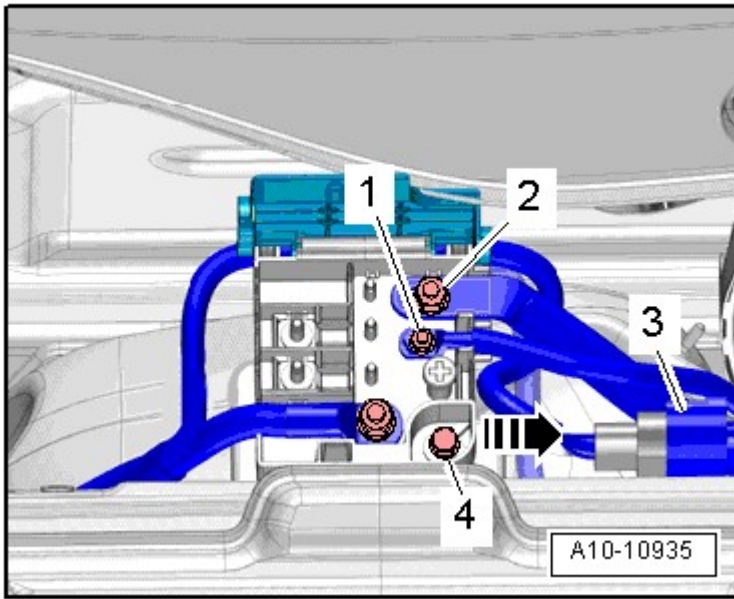


Fig. 124: Identifying Nut And Electrical Wires
Courtesy of AUDI OF AMERICA, LLC

- Remove electrical connector -3- from bracket and disconnect it.
- Remove bolt -4- and terminal 30 wire junction 2 -TV22- from tower brace -arrow-.
- Release retainers from wheel housing side using a 5.5 mm open end wrench -1- and remove wiring bushing -2- upward.

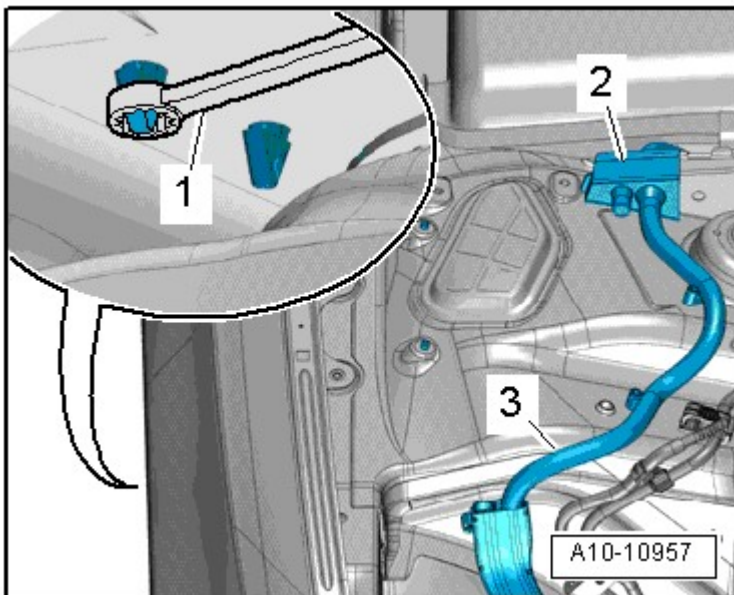


Fig. 125: Releasing Retainers From Wheel Housing Side Using A 5.5 Mm Open End Wrench
Courtesy of AUDI OF AMERICA, LLC

-- Free up wiring harness -3- to generator and starter using pry lever - rmv outside mirror 80 - 200.

-- Free up wiring duct by releasing retainer -arrow B- and pulling duct forward -arrow A-.

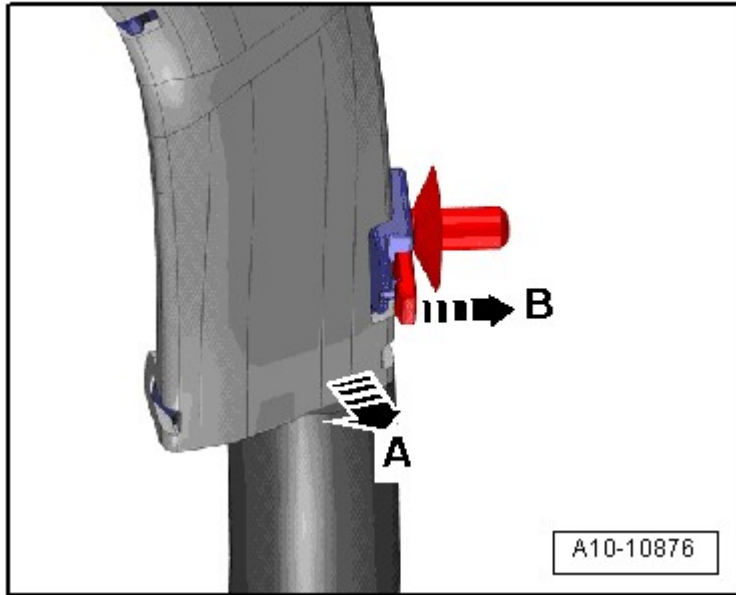


Fig. 126: Freeing Up Wiring Duct By Releasing Retainer
Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and tip washer fluid filler neck back -arrow A-.

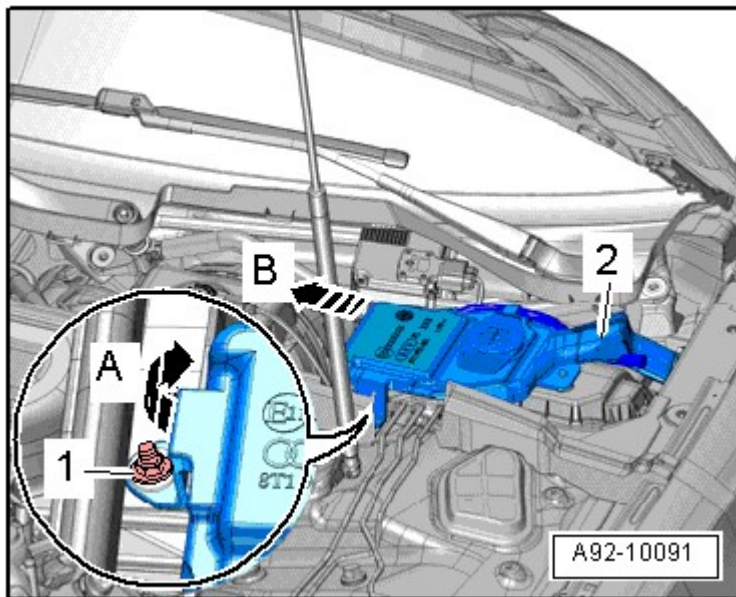


Fig. 127: Identifying Filler Neck With Filler Tube From Washer Fluid Reservoir And Opening In Body
Courtesy of AUDI OF AMERICA, LLC

-- Remove filler neck -2- with filler tube from washer fluid reservoir and opening in body -arrow B-.

-- Remove bolts -1- and nuts -2- and tower brace -3-.

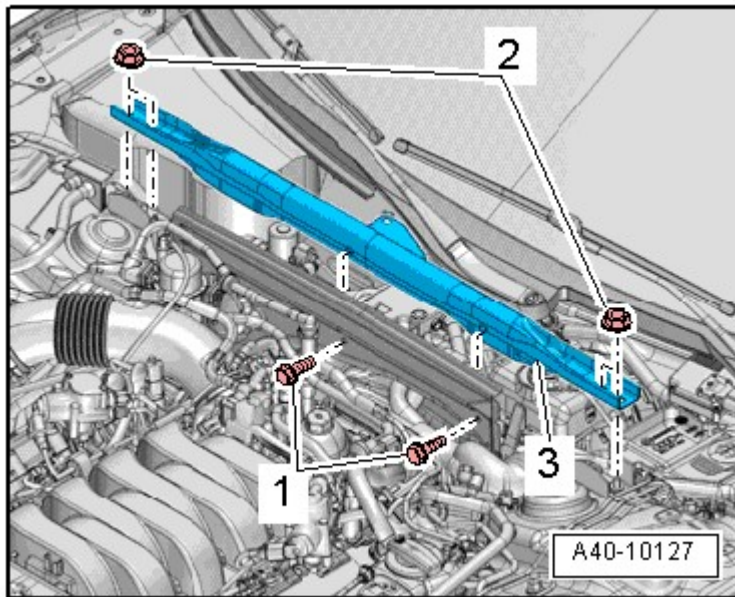


Fig. 128: Identifying Bolts, Nuts And Tower Brace
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and engine compartment E-box cover.

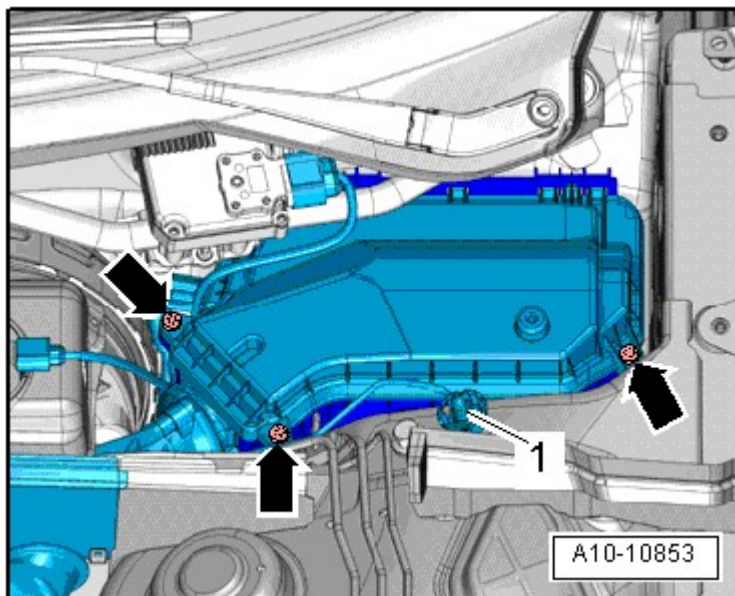


Fig. 129: Identifying E-Box Bolts & Cover
Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and free up electrical wire.

-- Release retainers -A arrows- and remove engine control module -arrow B-.

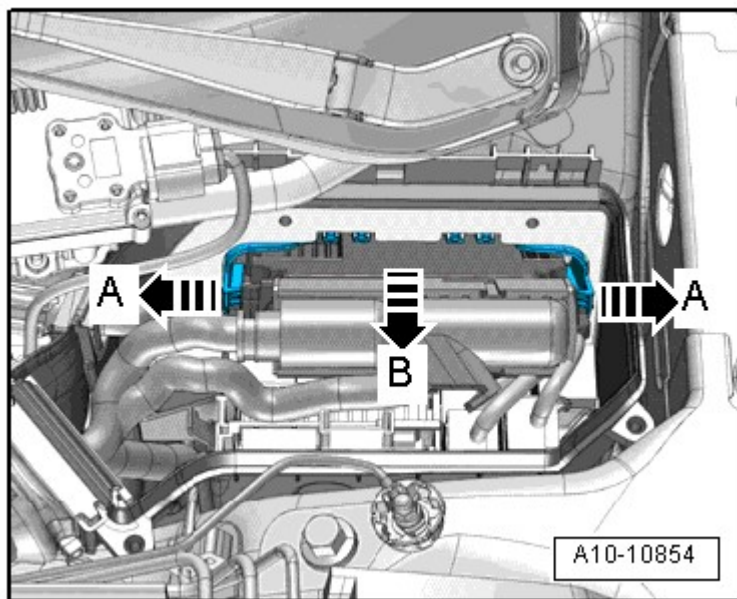


Fig. 130: Engine Control Module (ECM)
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -2- if applicable.

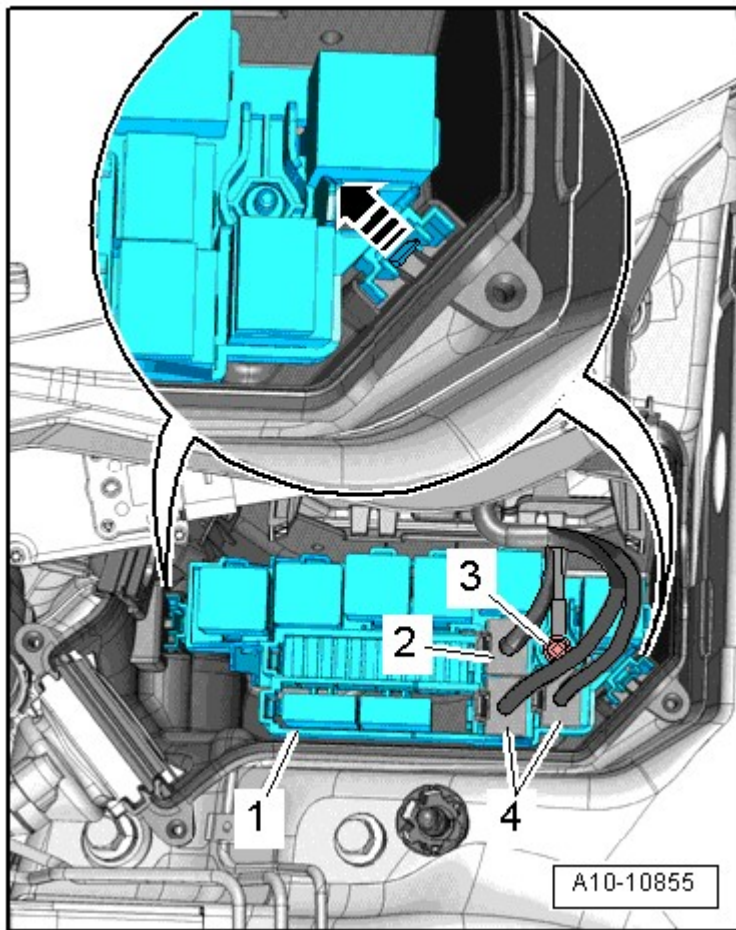


Fig. 131: Disconnecting Electrical Connectors

Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connectors -4- and remove nut -3- for electrical wire.
- Release retainers -arrow- and remove relay carrier with fuse holder -1-.
- Disengage engine wiring harness at engine compartment E-box and free it up.
- Release retainers -A arrows- and remove wiring bushing -2- upward -arrow B-.

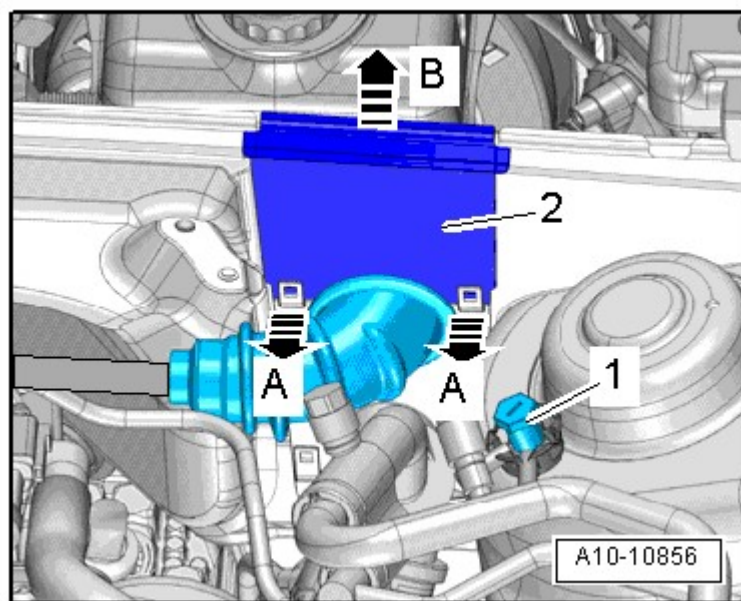


Fig. 132: Disengaging Catches -Arrows A- And Remove Upper Part Of Line Pass-Through -2- Upward - Arrow B-
 Courtesy of AUDI OF AMERICA, LLC

- Remove ground pin -1- and free up electrical wire.
- Lay wiring harness on engine and secure engine control module against falling down.
- Disconnect electrical connectors -arrow- at left and right on front speed sensors.

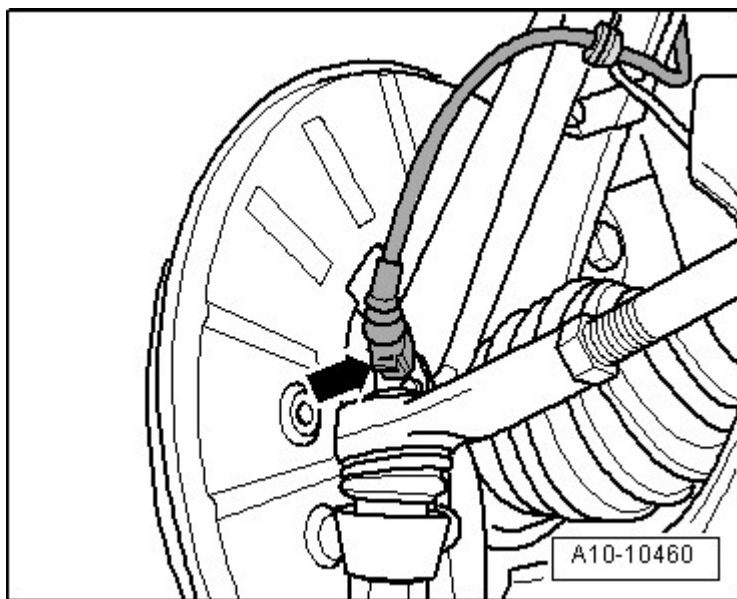


Fig. 133: Identifying Speed Sensor Connector
 Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -1- on left front level control system sensor -G78- and right front level control system sensor -G289- and free up electrical wiring -arrow-.

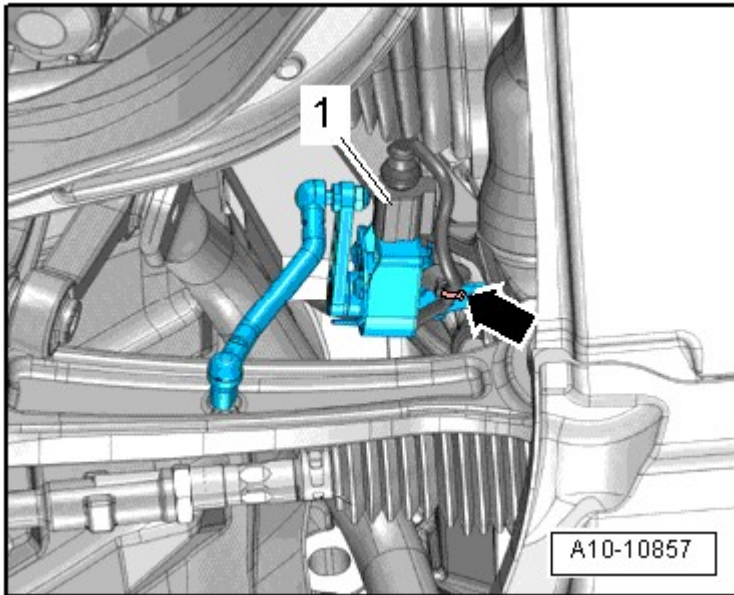


Fig. 134: Disconnecting Electrical Connector On Left Front Level Control System Sensor
Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical connector -2- on bracket by pulling retainer back -arrow A- and turning connector approximately 90° clockwise -arrow B-.

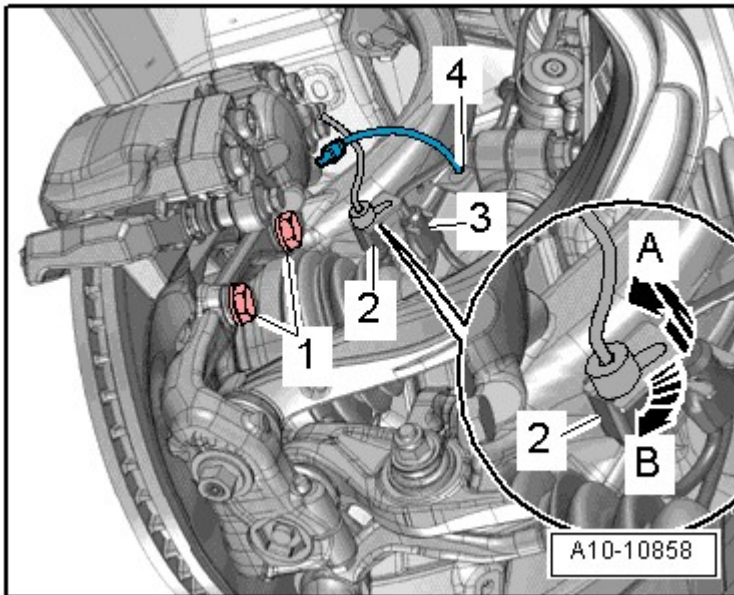


Fig. 135: Freeing Up Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

-- Free up electrical wiring -3- and brake line -4- on bracket.

-- Remove bolts -1- and secure brake caliper in wheel housing using wire.

CAUTION: Risk of damaging brake pistons.

- Do not operate brake pedal with brake caliper removed.

-- Remove nut -2- and bolt -1-.

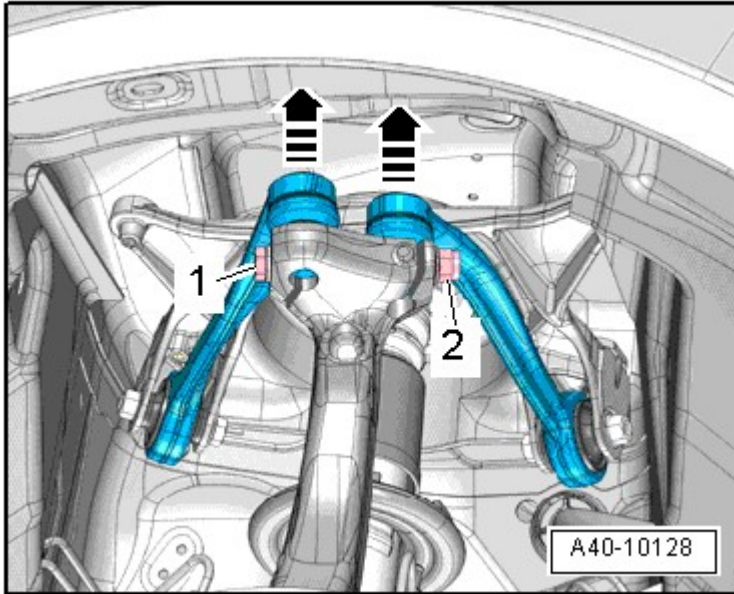


Fig. 136: Identifying Nut And Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Remove upper control arm upward from wheel bearing housing -arrows-.

-- Repeat procedure on other side of vehicle.

-- Remove left and right stabilizer bar bolts -3-.

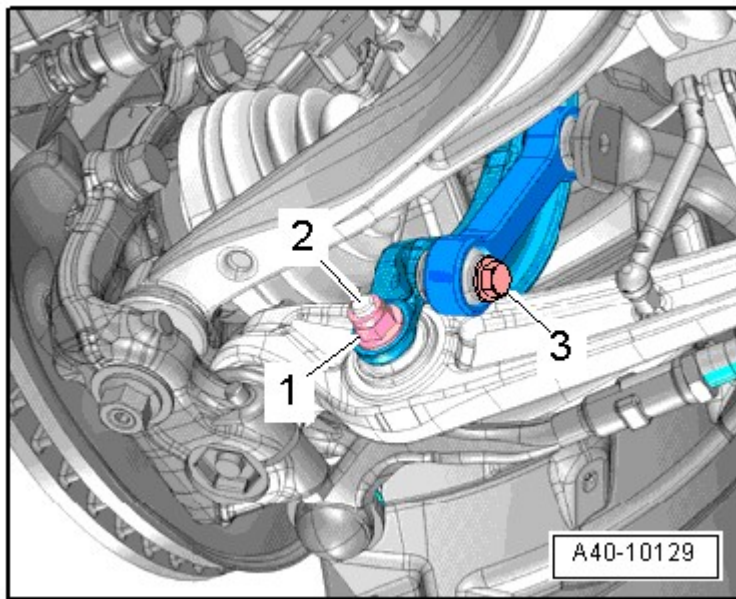


Fig. 137: Identifying Left And Right Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove left and right nuts -1-.

NOTE: The bolts -2- will be removed later.

-- Remove bolt -1- for power steering hydraulic fluid line bracket.

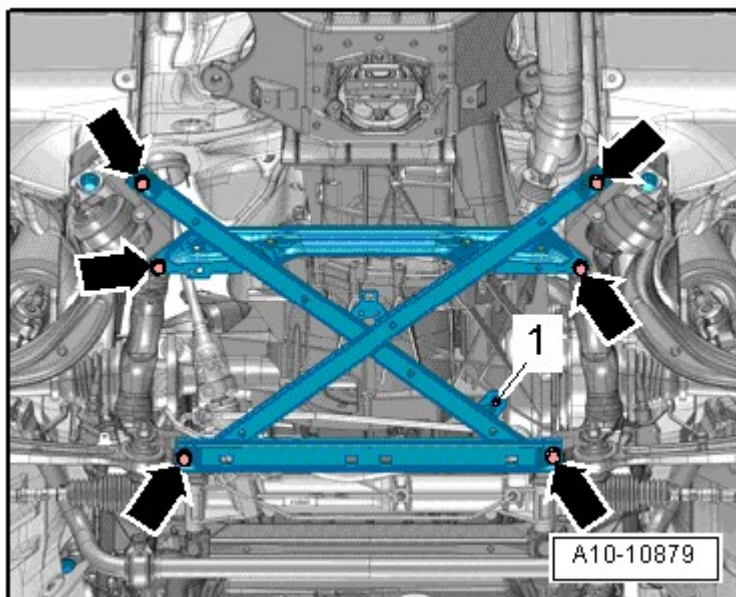


Fig. 138: Identifying Bolt From Power Steering Line
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Suspension components could be damaged.

- Do not rest vehicle on its wheels if the subframe mount, steering gear or subframe cross brace are not installed correctly.

-- Remove bolts -arrows- and subframe cross brace.

-- Remove bolts -arrows- and front crossmember, if applicable.

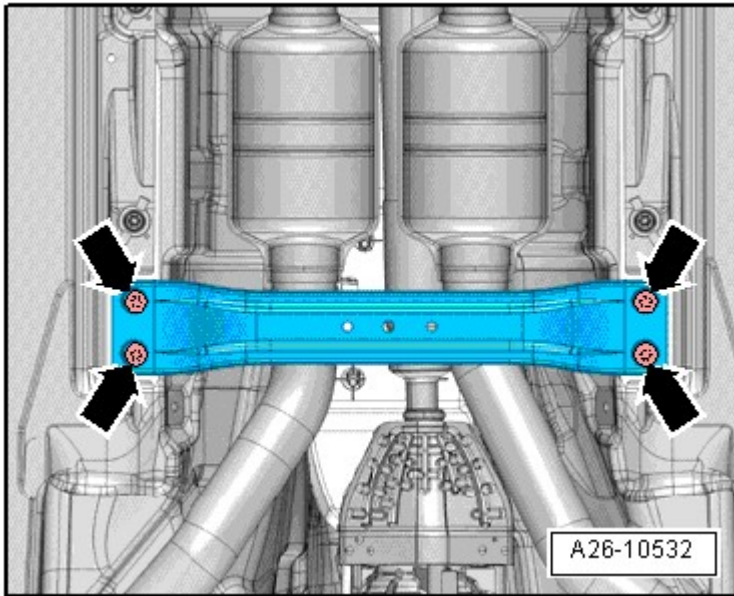


Fig. 139: Identifying Bolts And Front Crossmember
Courtesy of AUDI OF AMERICA, LLC

-- Remove left front muffler nuts -arrows-.

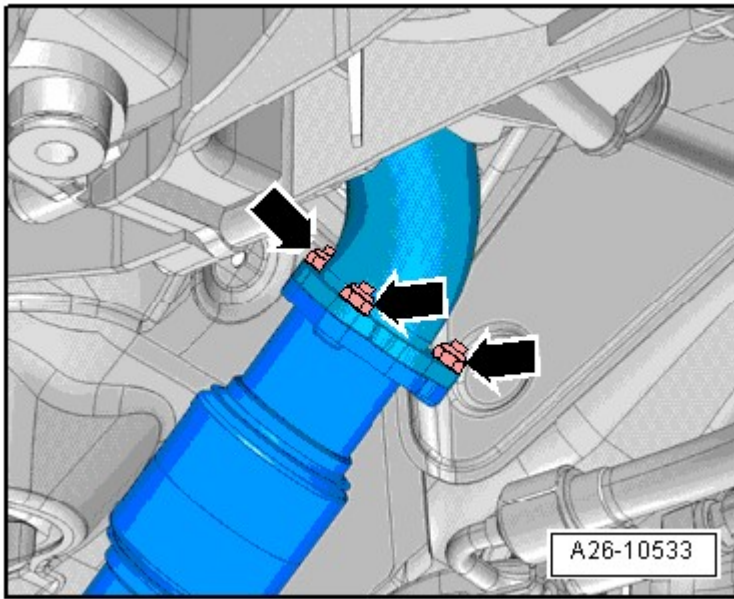


Fig. 140: Identifying Left Front Muffler Nuts
Courtesy of AUDI OF AMERICA, LLC

-- Remove right front muffler nuts -arrows-.

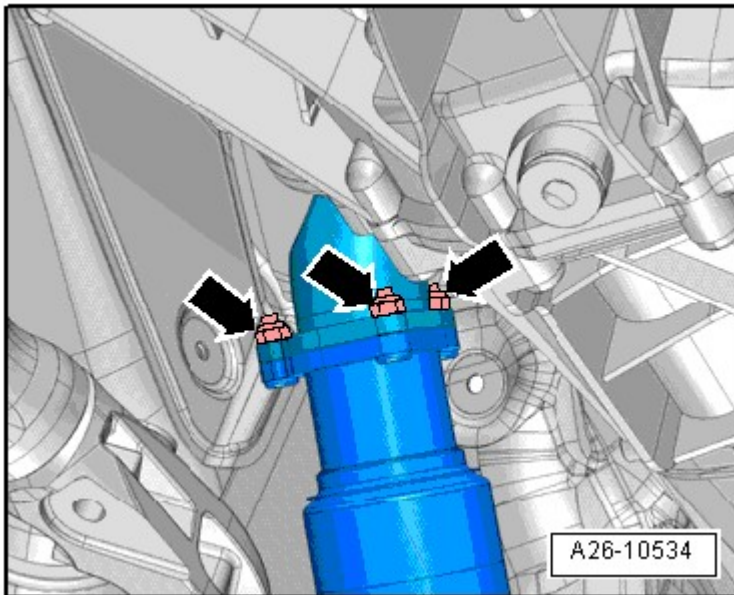


Fig. 141: Identifying Right Front Muffler Nuts
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The decoupling elements in the front muffler could be damaged.

- Do not bend decoupling elements in front muffler more than 10°.

-- Loosen clamping sleeves -1- and -2-, slide them back and remove left and right front mufflers.

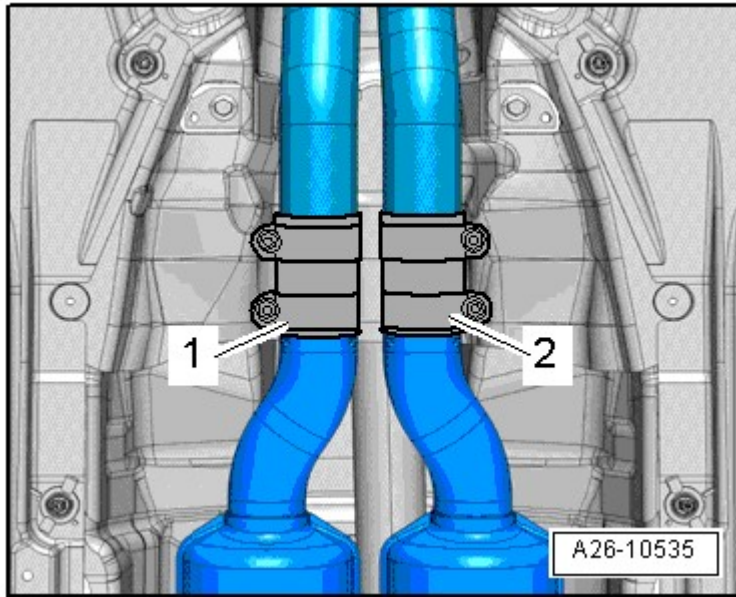


Fig. 142: Identifying Bolts Vehicles With Dual Exhaust System
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and driveshaft heat shield -1-.

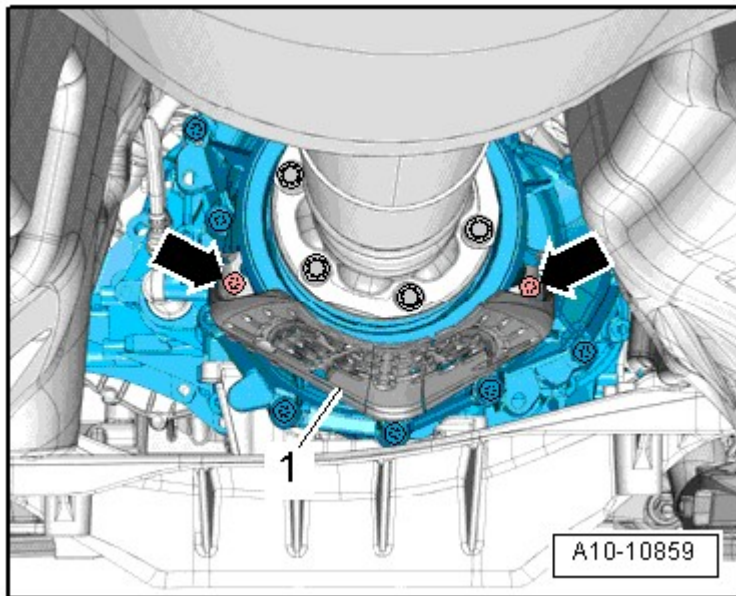


Fig. 143: Driveshaft Heat Shield - Tightening Specification
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts connecting driveshaft to transmission while holding using a counterhold tool T10172 with T10172/5.

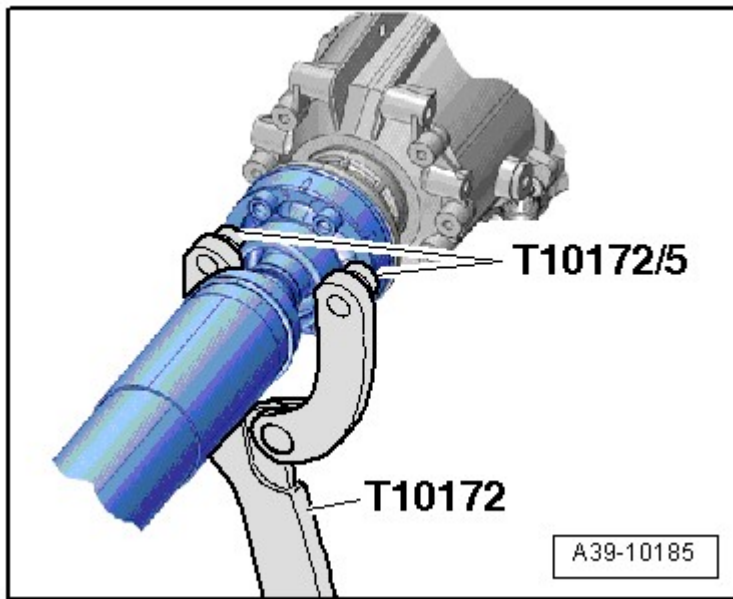


Fig. 144: Counterholding Driveshaft Using T10172 And T10172/5
Courtesy of AUDI OF AMERICA, LLC

- Slide driveshaft toward rear final drive; the constant velocity joints can move axially.
- Secure driveshaft to the side.

CAUTION: The airbag spiral spring could be damaged.

- 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 -arrow- Description and Operation .

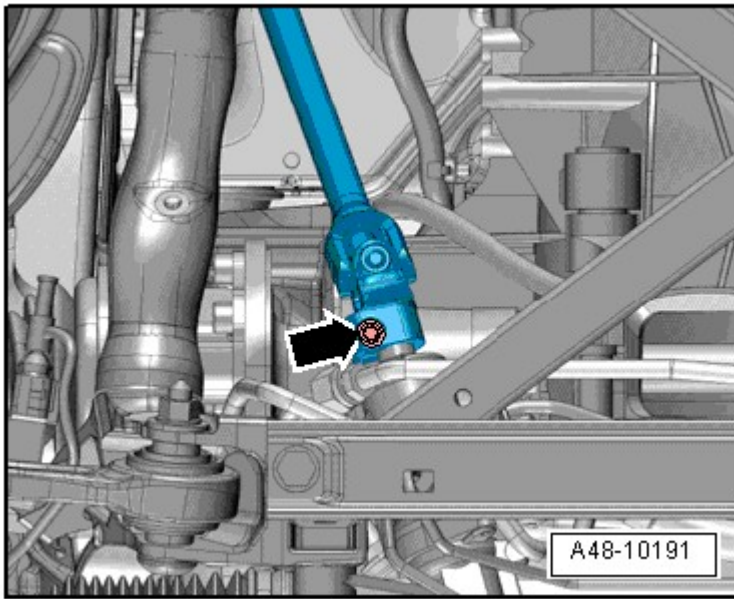


Fig. 145: Pressing CV Joint Off Steering Gear And Slide It Up
Courtesy of AUDI OF AMERICA, LLC

-- Press constant velocity joint off steering gear and slide it all the way up.

-- Remove selector lever cable ball socket -A- from selector shaft lever using pry lever - rmv outside mirror 80 - 200 -arrow-.

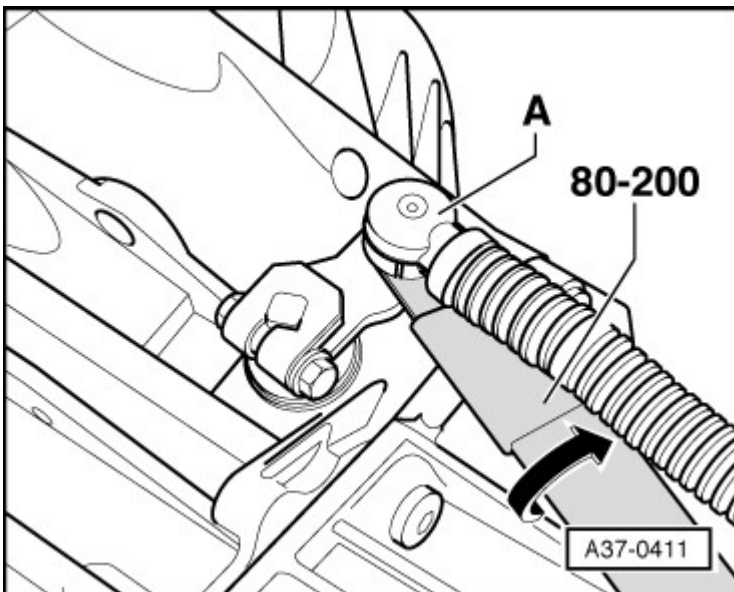


Fig. 146: Using Pry Lever 80-200 To Press Selector Lever Cable From Lever For Selector Shaft
Courtesy of AUDI OF AMERICA, LLC

-- Press securing clips -2- off and remove selector lever cable from transmission.

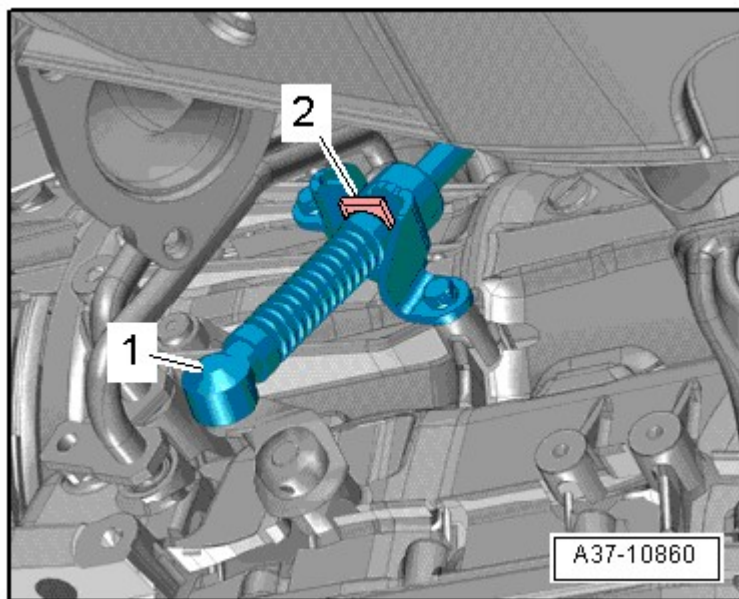


Fig. 147: Identifying Selector Lever Cable
Courtesy of AUDI OF AMERICA, LLC

NOTE: Do not bend or kink selector lever cable.

Ignore -1-

Prepare Scissor Lift Platform

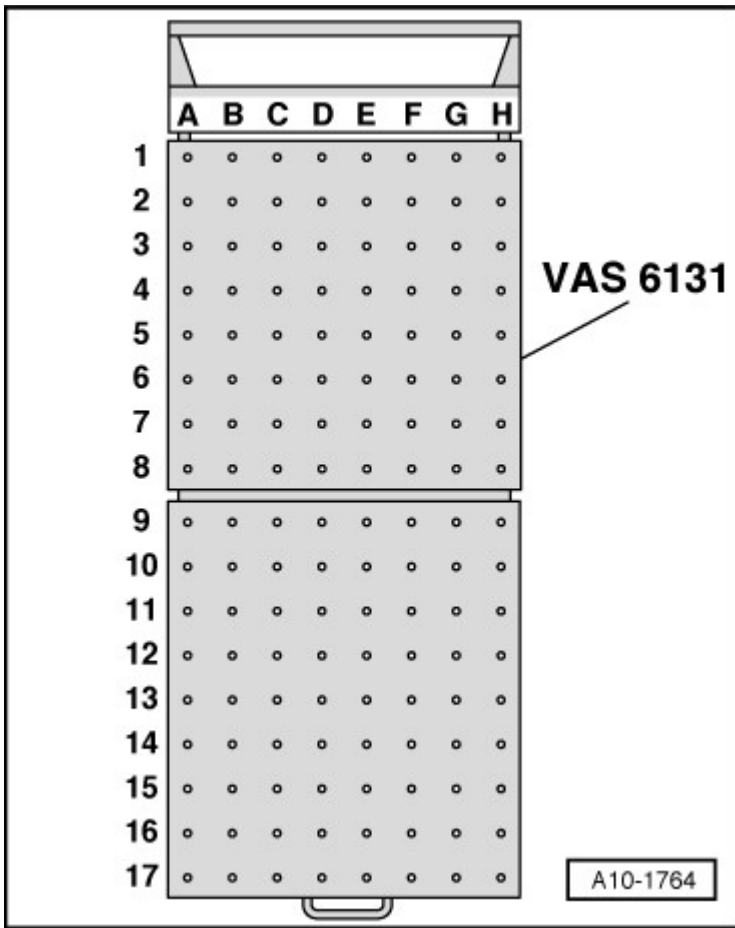


Fig. 148: Identifying Scissor Lift Platform VAS 6131

Courtesy of AUDI OF AMERICA, LLC

-- Equip scissor lift table VAS 6131 A with support set VAS 6131/10 and supplementary set VAS 6131/13 as follows:

Platform coordinates	Parts from support set VAS 6131/10 and supplementary set VAS 6131/13			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	-	-	/13-2
F8+H8	/13-6	-	-	/13-2
C14	/10-1	/10-4	/10-5	/10-7
F14	/10-1	/10-4	/10-5	/11-1

-- Next secure mounting elements to scissor lift table by hand.

-- Position scissor lift table VAS 6131 A horizontally.

- Note bubble level (sight glass) on support platform.

-- Guide scissor lift table VAS 6131 A under engine/transmission assembly.

WARNING: The subframe could cause an accident if it is not secured.

- Do not loosen subframe bolts -2- and -3-.

-- Remove left and right subframe bolts -1-.

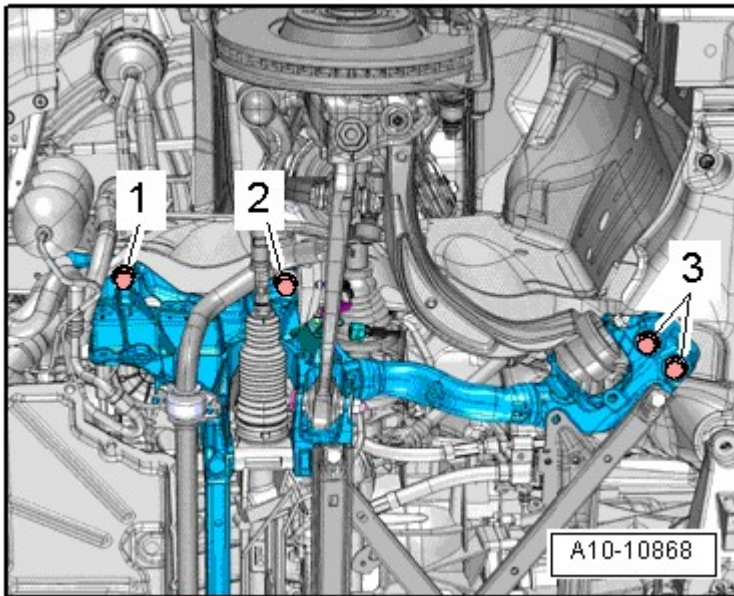


Fig. 149: Identifying Subframe Bolts (Tighten To Specifications)

Courtesy of AUDI OF AMERICA, LLC

-- Attach mounting elements from VAS 6131/10 and VAS 6131/13 at left and right front of subframe as shown in the illustration.

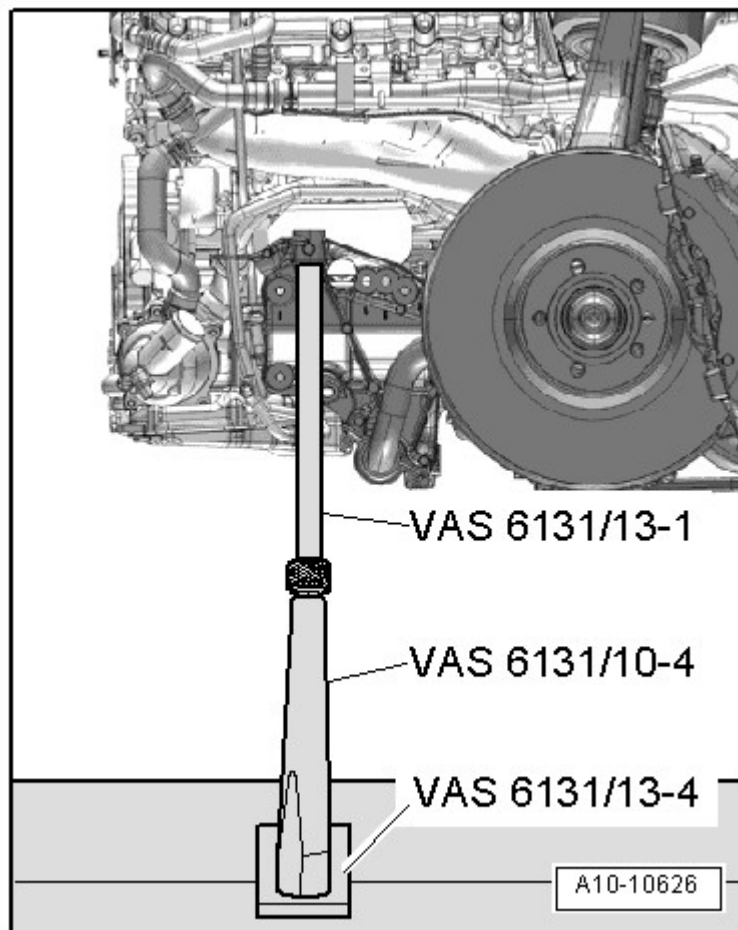


Fig. 150: Attaching At Left And Right Front Of Subframe
Courtesy of AUDI OF AMERICA, LLC

- Ensure threaded spindles are completely installed.
- Attach mounting elements from VAS 6131/10 at left and right rear on subframe cross brace front connecting points as shown in the illustration.

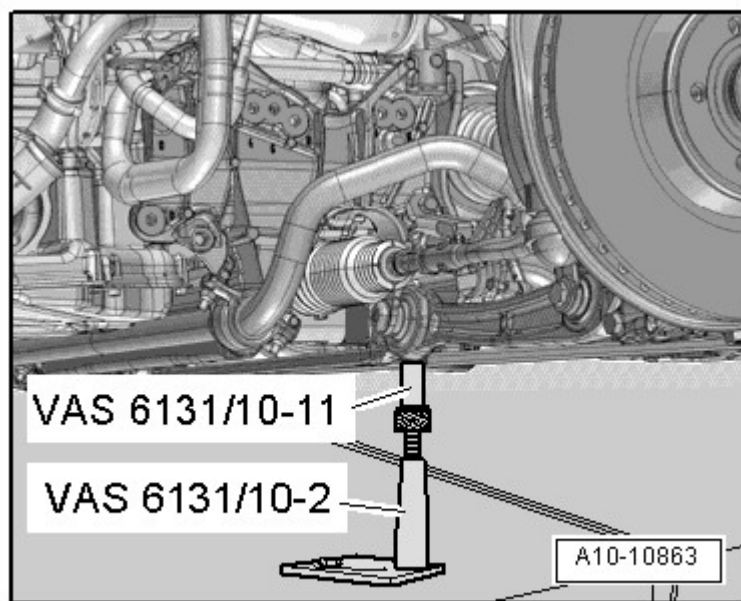


Fig. 151: Attaching At Left And Right Rear Of Subframe
 Courtesy of AUDI OF AMERICA, LLC

-- Attach mounting elements from VAS 6131/13 at lower left and right of wheel bearing housing as shown in the illustration.

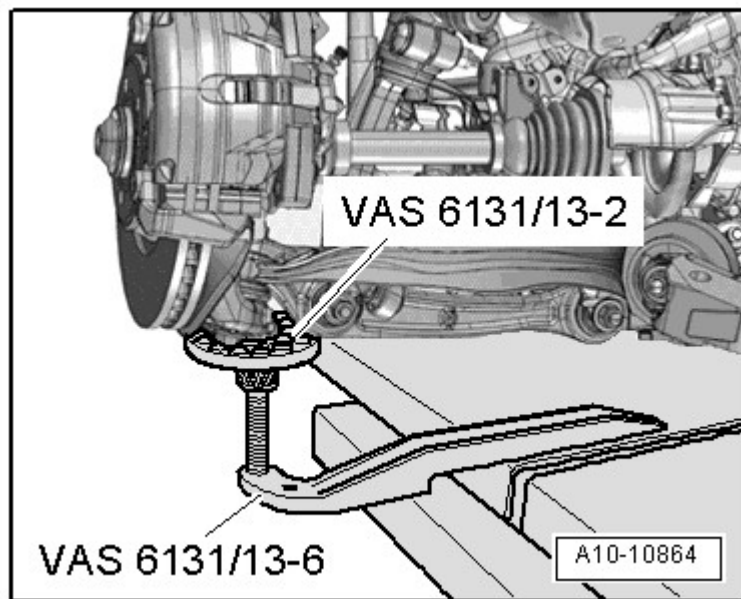


Fig. 152: Attaching At Lower Left And Right Of Wheel Bearing Housing
 Courtesy of AUDI OF AMERICA, LLC

-- Attach mounting elements from VAS 6131/10 and VAS 6131/11 at left and right rear of tunnel crossmember as shown in the illustration.

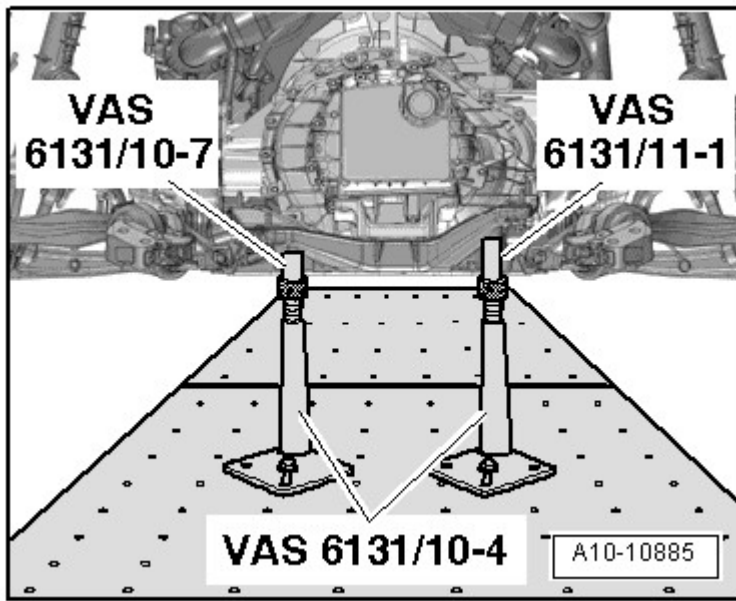


Fig. 153: Attaching VAS 6131/10 And VAS 6131/11 At Left And Right Rear Of Tunnel Crossmember
 Courtesy of AUDI OF AMERICA, LLC

- Rotate mounting element spindles upward until all mounting pins come into contact with mounting points.
- Attach mounting element base plates to scissor lift table VAS 6131 A and tighten to 20 Nm.
- Mark location of subframe and engine carrier to longitudinal members using a felt-tip pen.

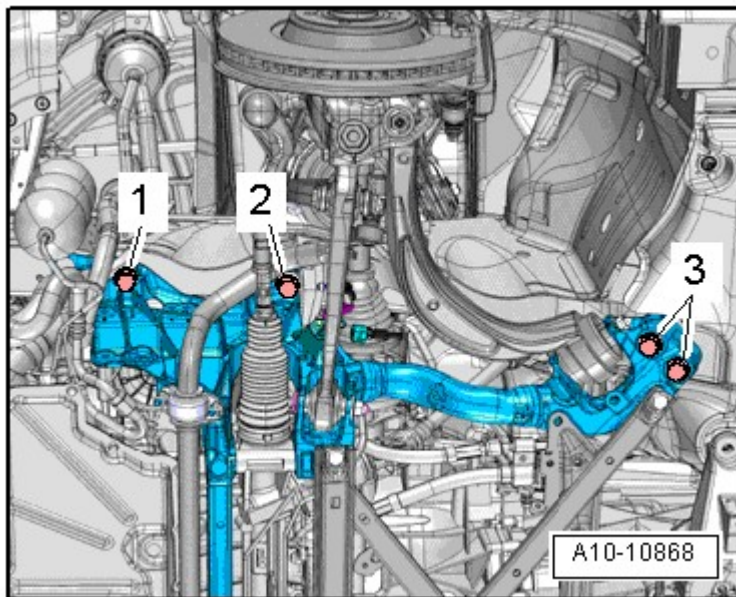


Fig. 154: Identifying Subframe Bolts (Tighten To Specifications)
 Courtesy of AUDI OF AMERICA, LLC

- Remove left and right subframe bolts -2- and -3- diagonally in stages.

NOTE: Ignore -1-.

-- Remove bolts -arrows- on tunnel crossmember.

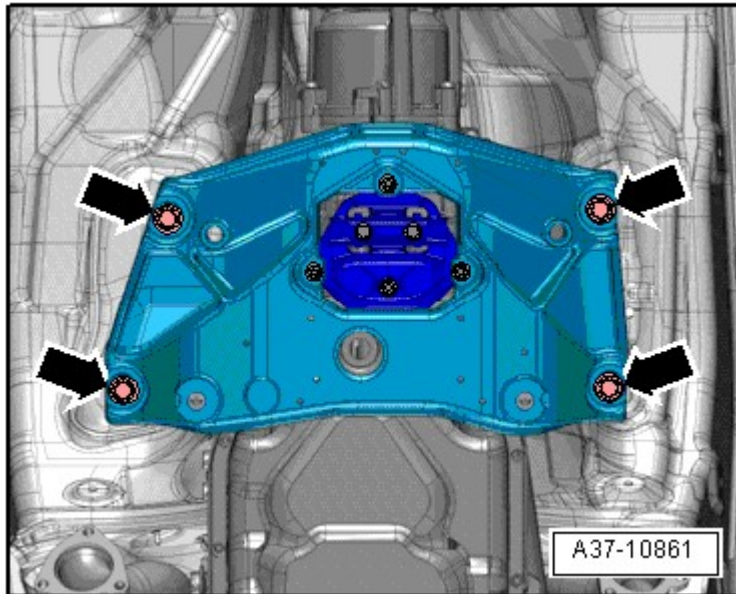


Fig. 155: Identifying Tunnel Crossmember
Courtesy of AUDI OF AMERICA, LLC

-- Remove left and right bolts -2-.

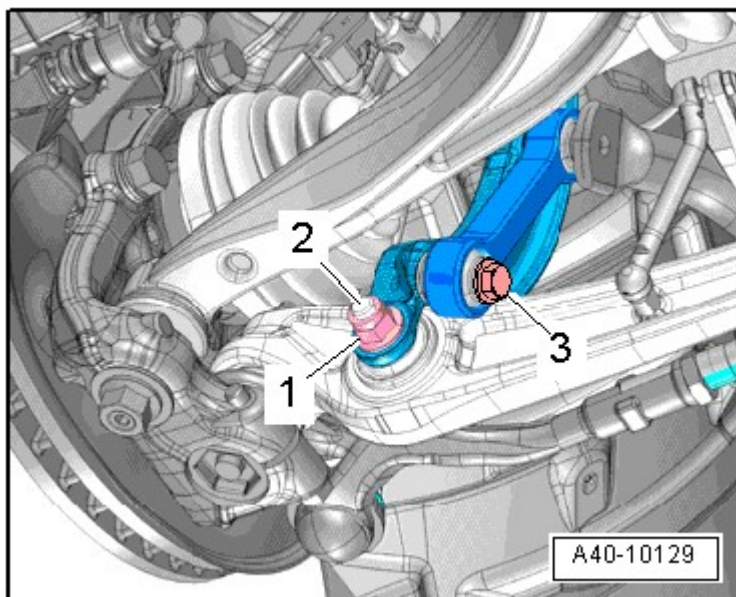


Fig. 156: Identifying Left And Right Bolts
Courtesy of AUDI OF AMERICA, LLC

NOTE: The nuts -1- and bolts -3- have already been removed.

CAUTION: Risk of damaging hose and wiring connections as well as engine compartment.

- **Make sure all the hoses and lines between the engine, transmission, subframe and body have been disconnected.**
- **Carefully guide engine-transmission assembly with subframe out of the engine compartment while lowering it.**

-- Lower engine/transmission assembly using scissor lift table VAS 6131 A.

-- Remove scissor lift table VAS 6131 A with engine/transmission assembly under vehicle.

ENGINE AND TRANSMISSION, SEPARATING - AUTOMATIC TRANSMISSION

Special tools and workshop equipment required

- Adapter T40058
- Support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14

Procedure

Proceed as follows:

- Engine/transmission assembly removed and placed on scissor lift table VAS 6131 A.

-- Remove electrical connector -arrow- for Oxygen Sensor (O2S) 2 behind Three Way Catalytic Converter (TWC) -G131- from bracket, disconnect it and lay it aside.

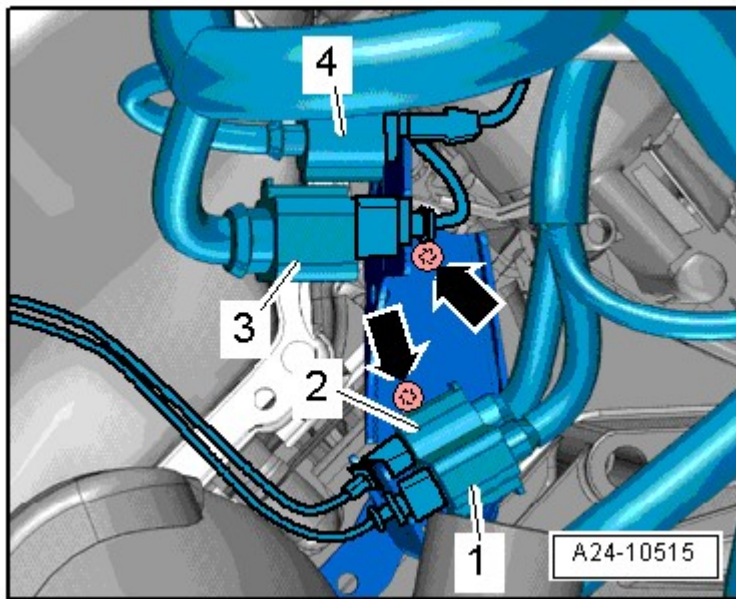


Fig. 157: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -2, 3 and 4- and -arrows-.

-- Remove nuts -arrows- and bolt -1- and left catalytic converter.

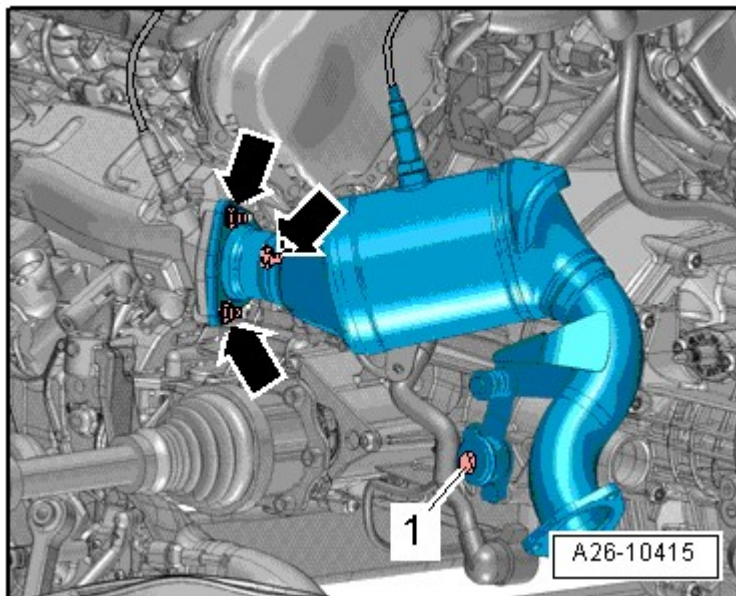


Fig. 158: Identifying Nuts, Bolt And Left Catalytic Converter
Courtesy of AUDI OF AMERICA, LLC

-- Remove electrical connector -1- for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC) - G130- from bracket and disconnect it.

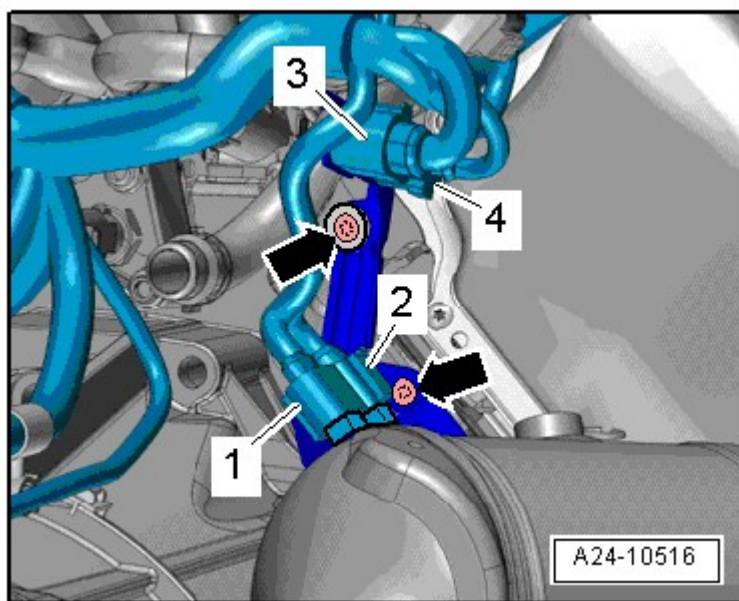


Fig. 159: Identifying Bolts -Arrows- And Right Connector Bracket
 Courtesy of AUDI OF AMERICA, LLC

- Remove electrical connector -2- from bracket.
- Remove bolts -arrow- and lay aside bracket with electrical connectors -3- and -4-.
- Remove nuts -arrows- and bolt -1- and right catalytic converter.

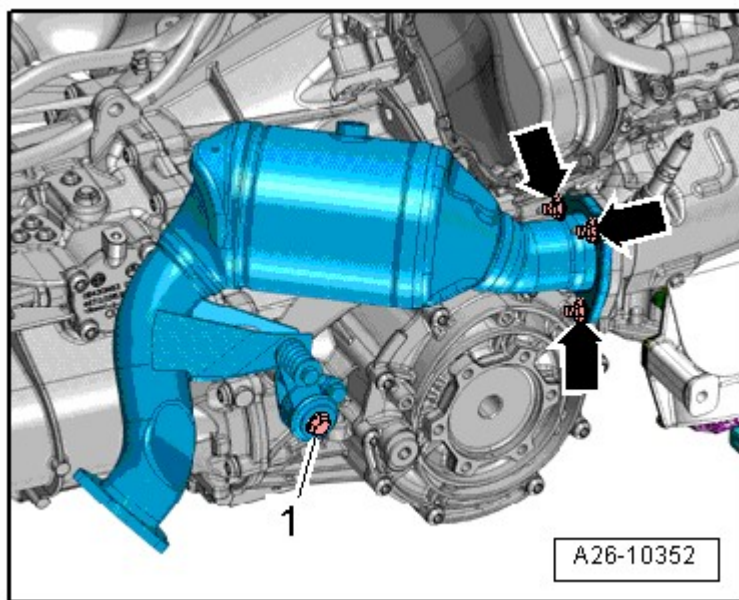


Fig. 160: Identifying Nuts, Bolts And Right Catalytic Converter
 Courtesy of AUDI OF AMERICA, LLC

- Disconnect electrical connector -2- on engine speed (RPM) sensor -G28- and free up electrical wiring.

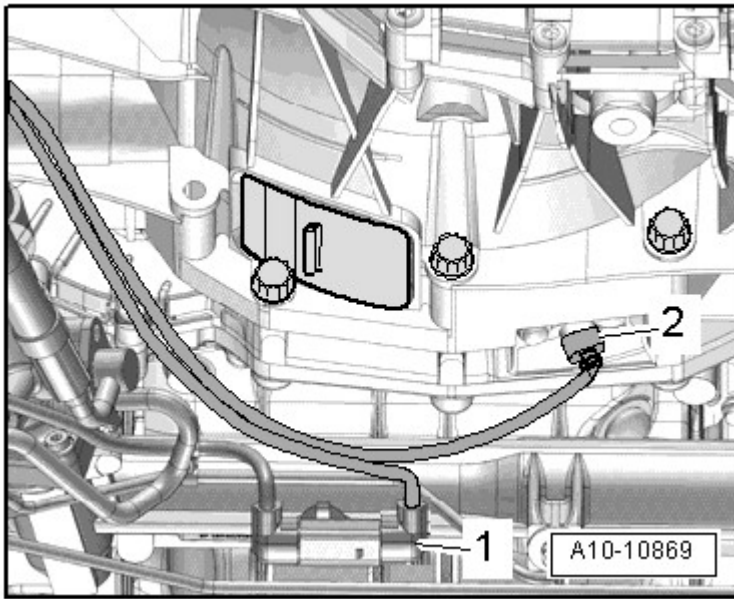


Fig. 161: Disconnecting Connector From Servotronic Solenoid Valve
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1-.

CAUTION: Risk of destroying transmission control module (mechatronic) with static discharge.

- Do not touch contacts in transmission connector with hands.

- Touch transmission housing (when not wearing gloves) to discharge static electricity.
- Disconnect electrical connector on transmission by rotating twist lock counterclockwise -arrow-.

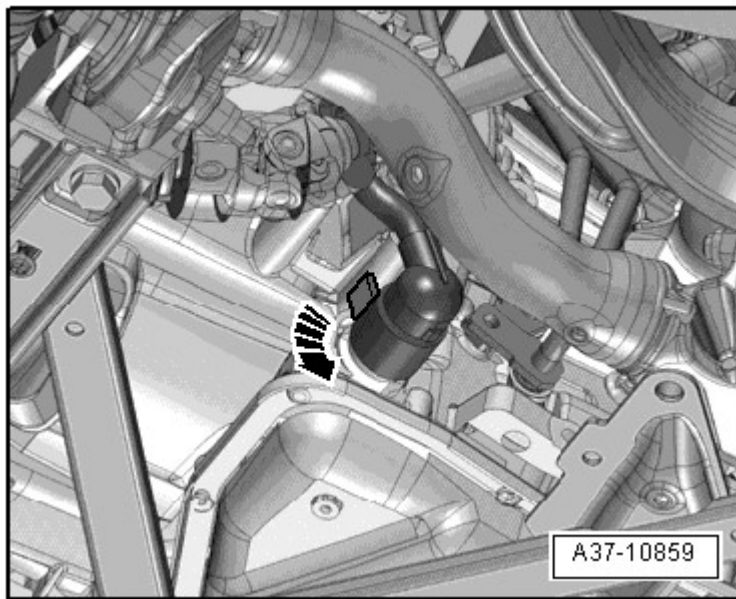


Fig. 162: Identifying Transmission Connector
Courtesy of AUDI OF AMERICA, LLC

- Free up electrical wiring harness on transmission.
- Remove left and right drive axles from transmission flange shafts.
- Remove bottom cover -1- from transmission -arrow-.

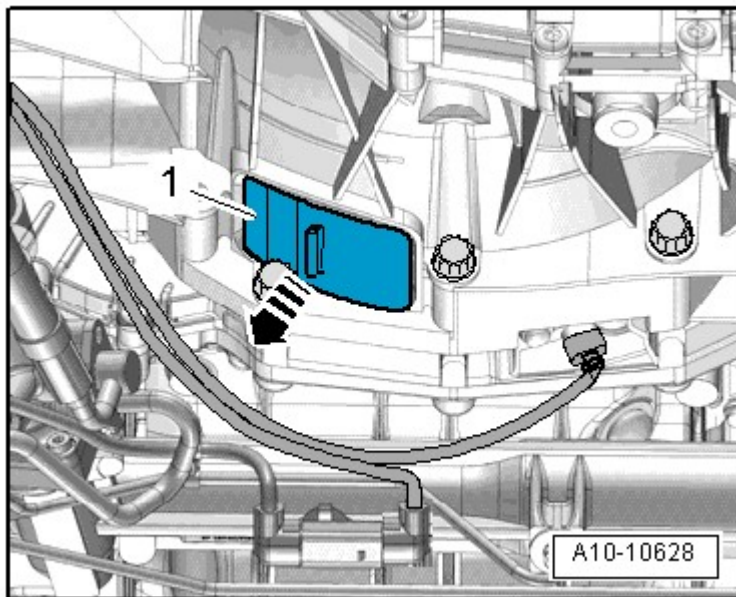


Fig. 163: Identifying Transmission Lower Cover
Courtesy of AUDI OF AMERICA, LLC

- Insert adapter T40058 guide pins as follows:

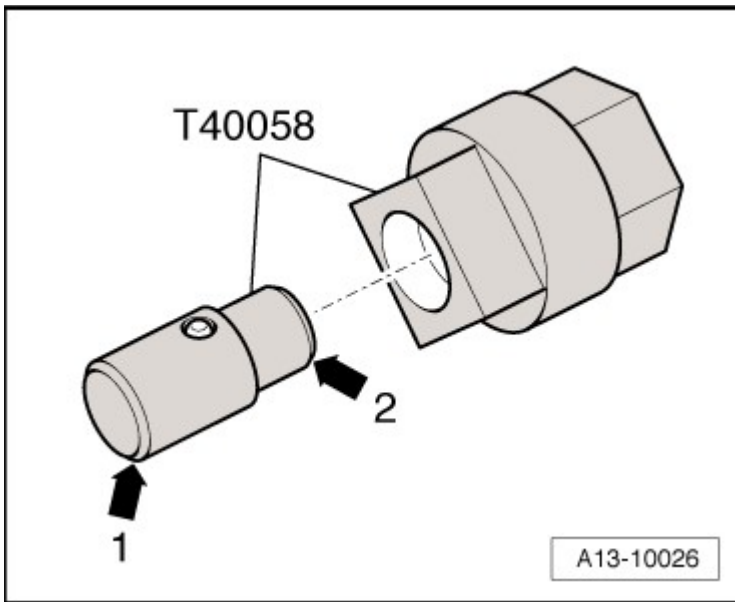


Fig. 164: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The large diameter -arrow 1- faces engine.
- Small diameter -arrow 2- points to adapter.

-- To loosen crankshaft, counter hold drive plate bolts using adapter T40058.

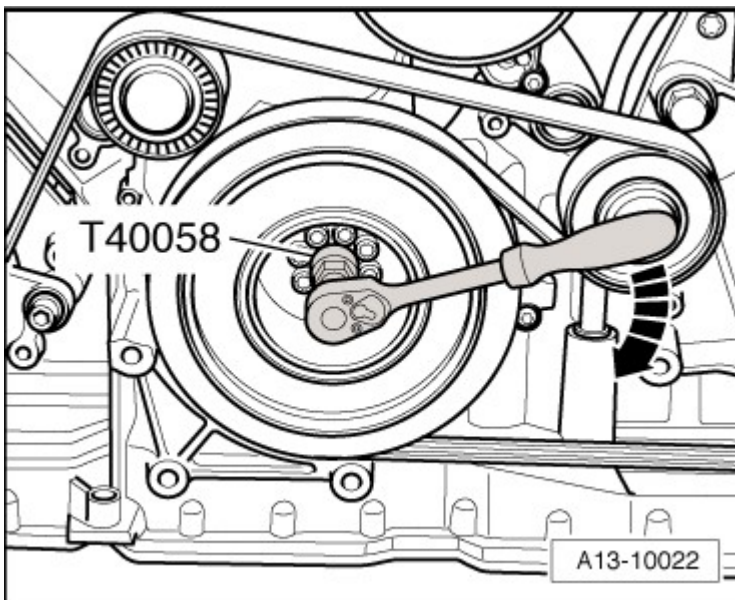


Fig. 165: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

NOTE: Only turn the crankshaft in the direction of engine rotation -arrow-.

-- Remove 6 torque converter bolts -arrow- by turning the crankshaft 60 degrees in direction of engine rotation.

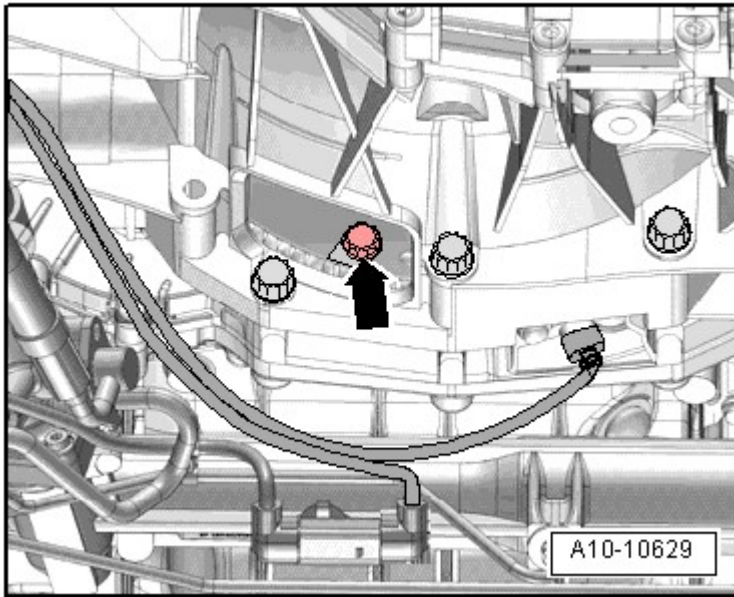


Fig. 166: Identifying Clutch Module First Bolt Installation Location
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolt -arrow- for ATF line bracket.

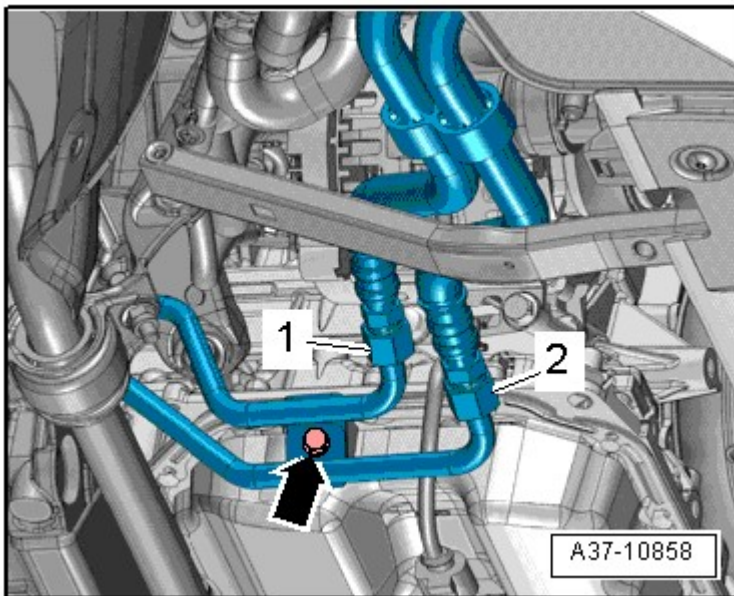


Fig. 167: Identifying ATF Line Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 and 2-.

NOTE: Place a cloth under separating point to prevent ATF from leaking out.

-- Remove bolts -1- and -2- and remove ATF lines from transmission and secure them at the top.

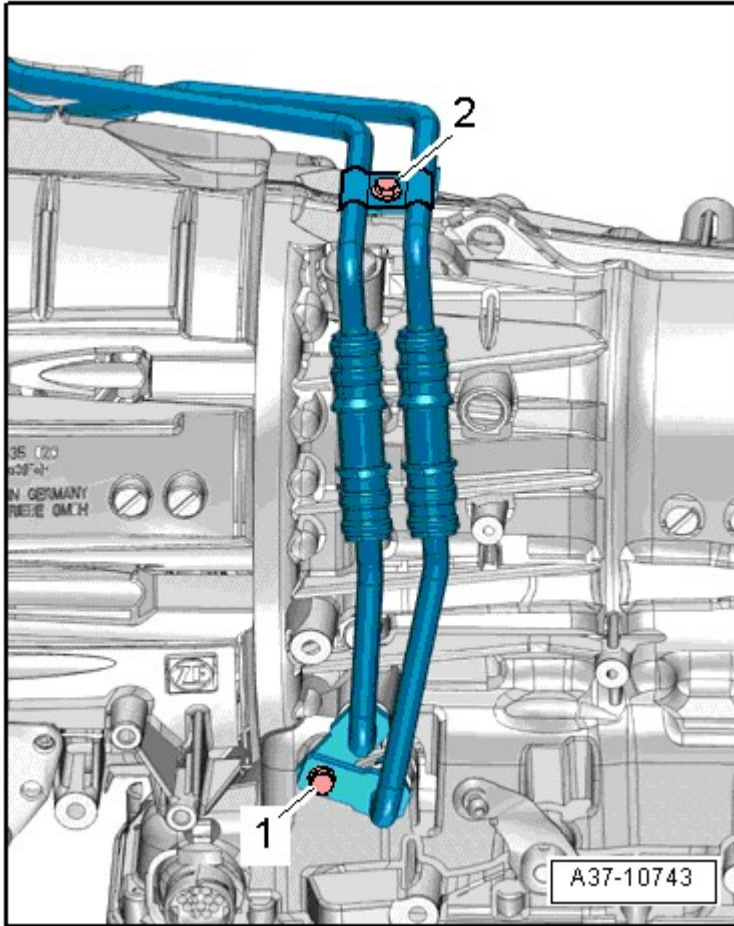


Fig. 168: Identifying Bolts And ATF Pipes From Transmission
Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

-- Equip scissor lift table VAS 6131 A with support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14 as follows:

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

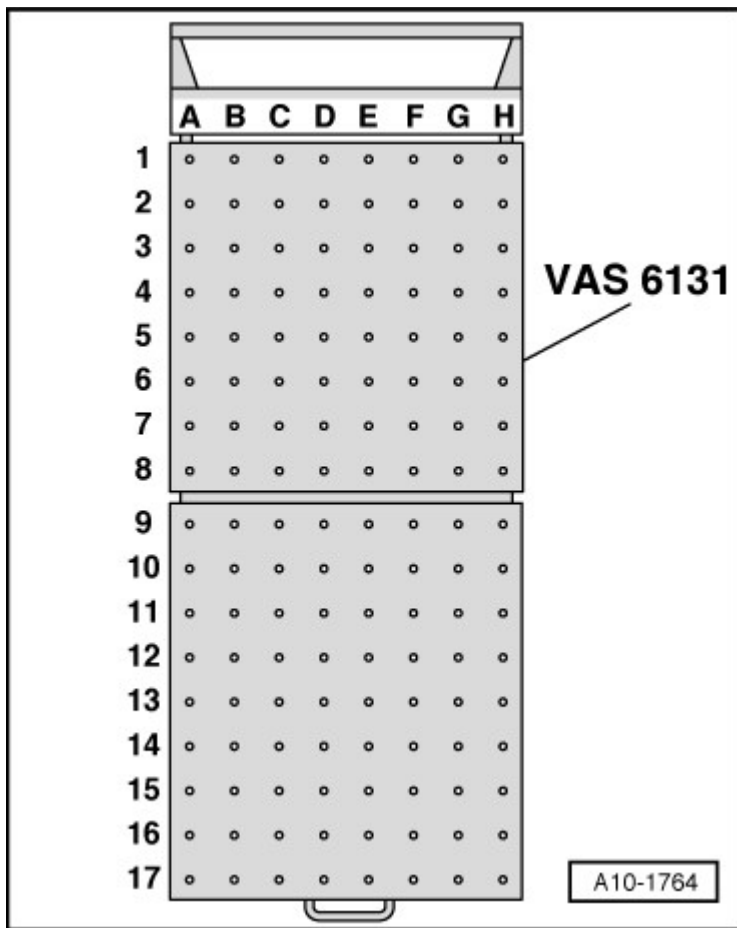


Fig. 169: Identifying Scissor Lift Platform VAS 6131

Courtesy of AUDI OF AMERICA, LLC

NOTE: The other attachments remain unchanged.

Platform coordinates	Parts from the support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

-- Install joint support VAS 6131/13-7 at right front of engine in threaded hole as shown in the illustration.

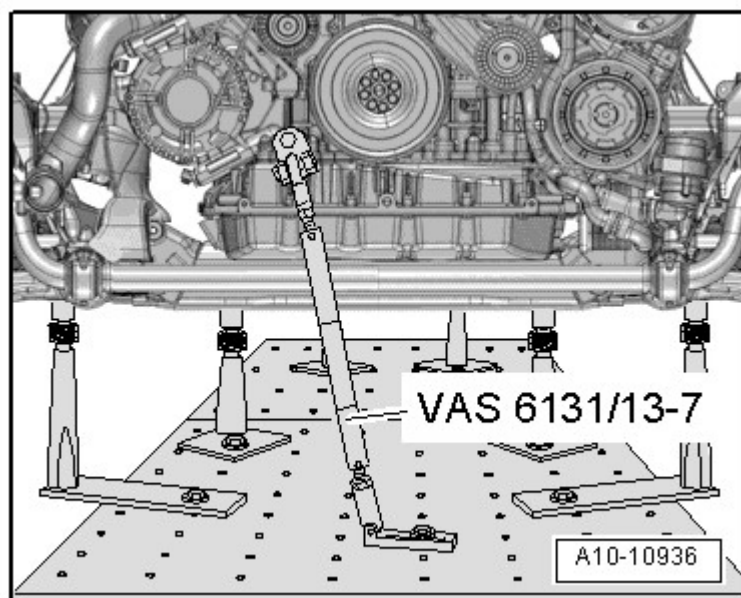


Fig. 170: Identifying Joint Support VAS 6131/13-7
Courtesy of AUDI OF AMERICA, LLC

-- Install joint support VAS 6131/13-7 on scissor lift table and tighten to 20 Nm.

-- Attach mounting elements from VAS 6131/10 and transmission support VAS 6131/14 at front of transmission as shown in the illustration.

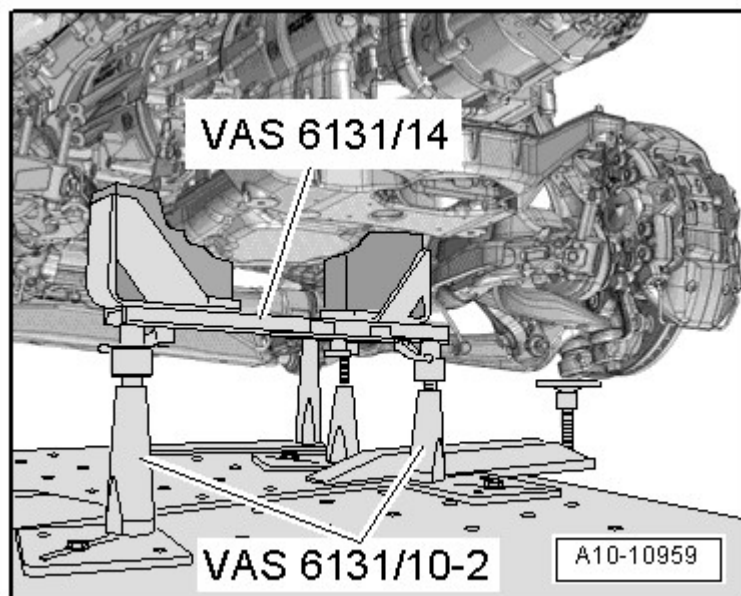


Fig. 171: Attaching Mounting Elements From VAS 6131/10 & Transmission Support
Courtesy of AUDI OF AMERICA, LLC

-- Rotate left and right spindles up until transmission support VAS 6131/14 rests firmly against the transmission.

- Attach mounting element base plates to Scissor Lift Table VAS 6131 A and tighten to 20 Nm.
- Remove starter bolts -1- and -2-.

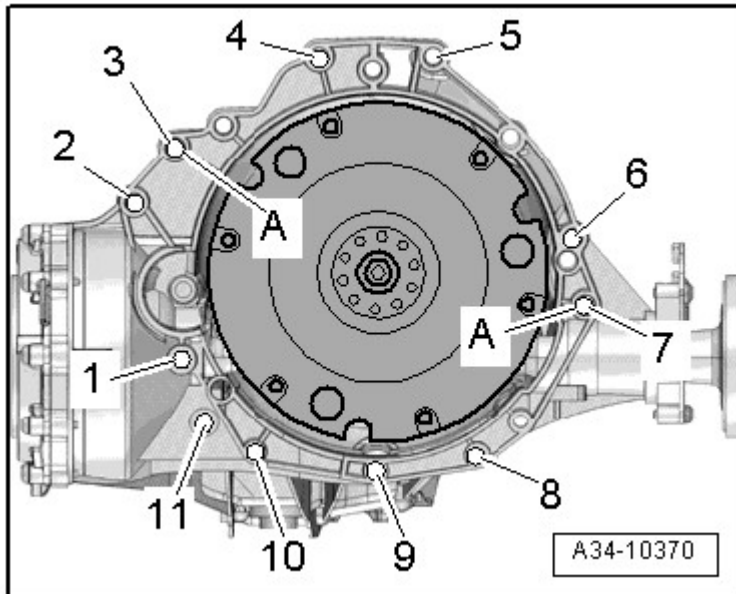
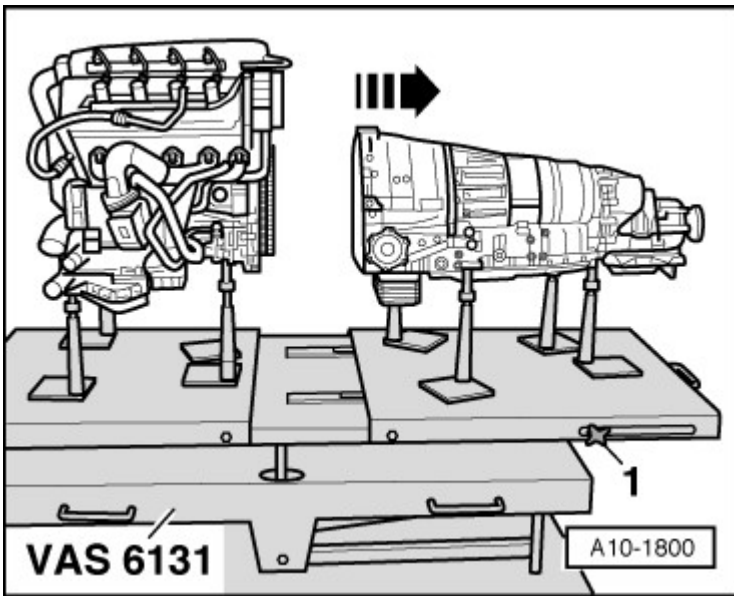


Fig. 172: Checking If Alignment Sleeves -A- For Centering Engine/Transmission Are In Cylinder Block
Courtesy of AUDI OF AMERICA, LLC

- Press starter off transmission and leave it in the installation position.
- Remove remaining bolts -3 through 11- connecting engine to transmission.

NOTE: Ignore -A-.

- Loosen clamping bolts -1- on sides of scissor lift table VAS 6131 A and pull rear table plate with transmission toward rear -arrow-.



**Fig. 173: Loosening Bolts -1- On Sides Of VAS 6131 A And Pull Rear Table Plate With Transmission Toward Rear -Arrow-
Courtesy of AUDI OF AMERICA, LLC**

ENGINE, SECURING TO ENGINE AND TRANSMISSION HOLDER - AUTOMATIC TRANSMISSION

Special tools and workshop equipment required

- Lifting tackle 2024 A
- Engine and transmission holder VAS 6095 with V6 FSI engine holder VAS 6095/1-5
- Shop crane VAS 6100
- Lift arm extension for workshop crane VAS 6101

Procedure

Proceed as follows:

- The engine/transmission assembly is removed **ENGINE, REMOVING**; the engine and transmission are separated **ENGINE AND TRANSMISSION, SEPARATING**.
- Engine secured with joint support VAS 6131/13-7.

-- Disconnect electrical connector -arrow- on steering gear.

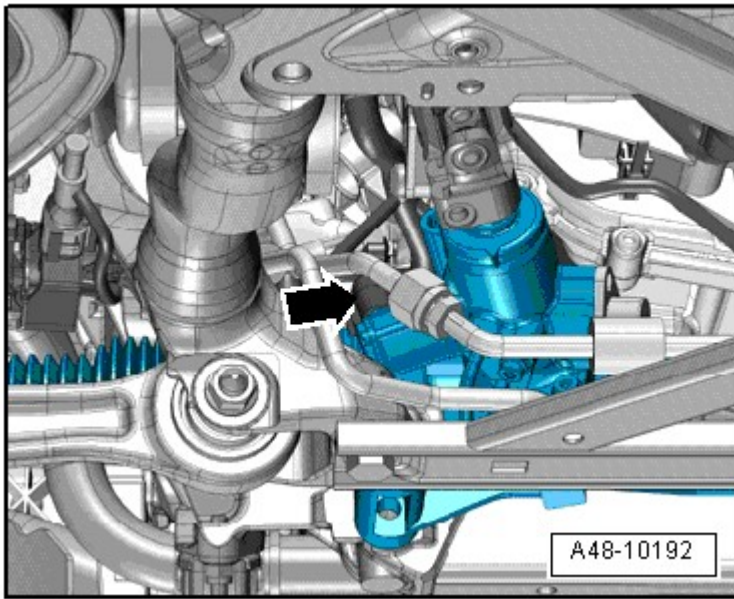


Fig. 174: Disconnecting Electrical Connector On Steering Gear
Courtesy of AUDI OF AMERICA, LLC

NOTE: To collect escaping hydraulic oil, lay a cloth under separating point.

-- Remove bolt -1- and disconnect power steering hydraulic oil line.

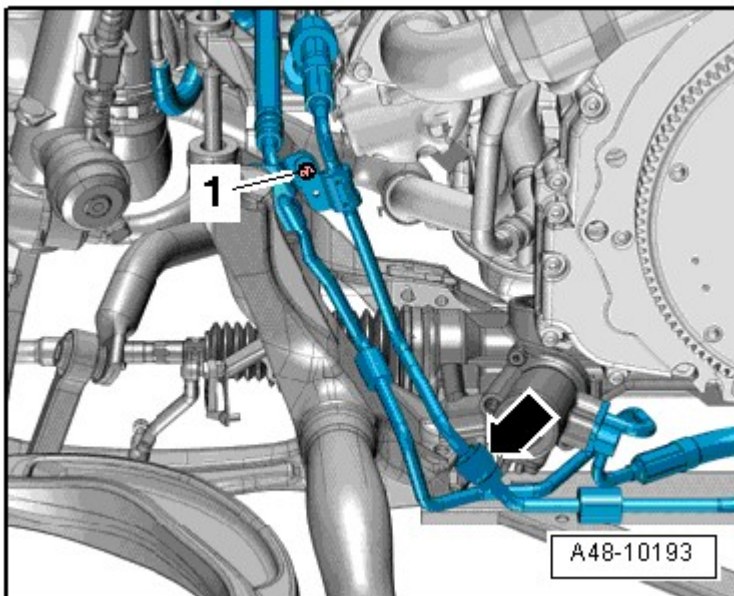


Fig. 175: Identifying Bolt -1-
Courtesy of AUDI OF AMERICA, LLC

NOTE: To prevent dirt from entering, seal open lines and connections with clean plugs or protective caps.

Ignore -arrow-.

-- Remove nut -1- and remove bracket with wiring harness from subframe.

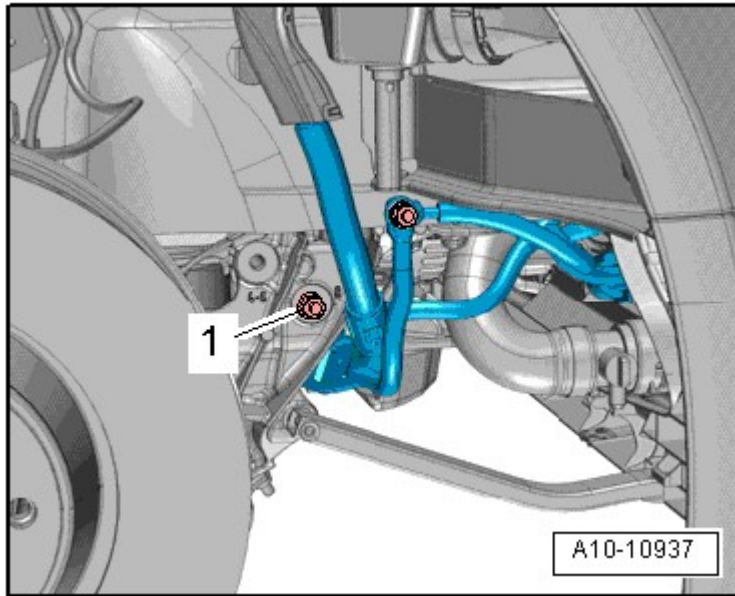


Fig. 176: Identifying Nut And Bracket With Wiring Harness From Subframe
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

-- Engage lifting tackle 2024 A on engine lifting eyes and on shop crane as shown in the illustration.

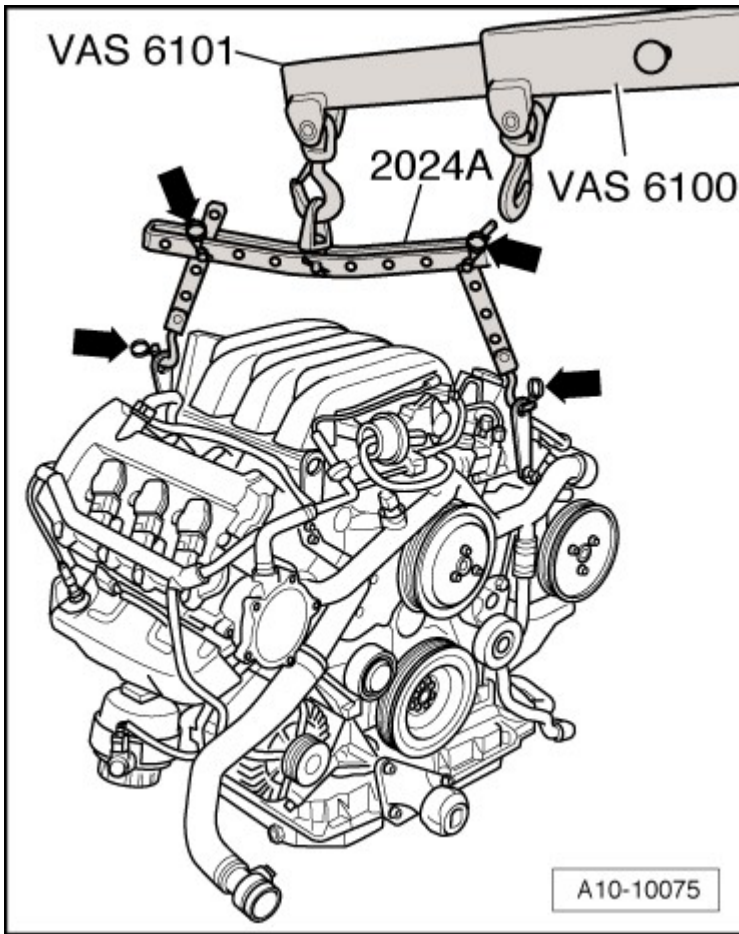


Fig. 177: Hooking Engine Sling 2024 A Onto Engine And Onto Workshop Crane VAS 6100 With Lift Arm Extension For Workshop Crane VAS 6101

Courtesy of AUDI OF AMERICA, LLC

NOTE: To be aligned to the center of gravity of the engine assembly, the hole rails of the lifting hook must be inserted as shown in the illustration.

WARNING: Risk of accident.

- Lifting hooks and alignment pins on lifting tackle must be secured with securing pins -arrows-.

-- Tension engine slightly with shop crane, do not raise.

-- Remove left engine mount bolt -3-.

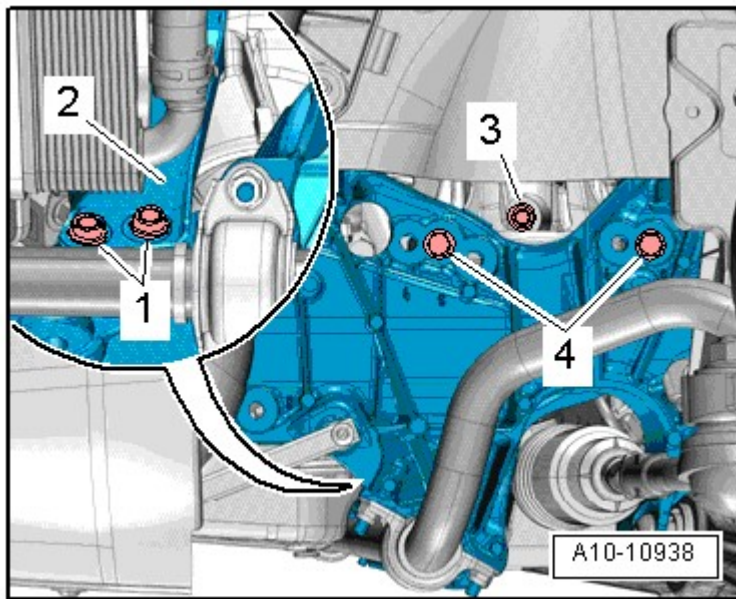


Fig. 178: Identifying Left Engine Mount Bolts -1-, -3- And -4-
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

Ignore -1, 2, 4-.

-- Remove right engine mount bolt -2-.

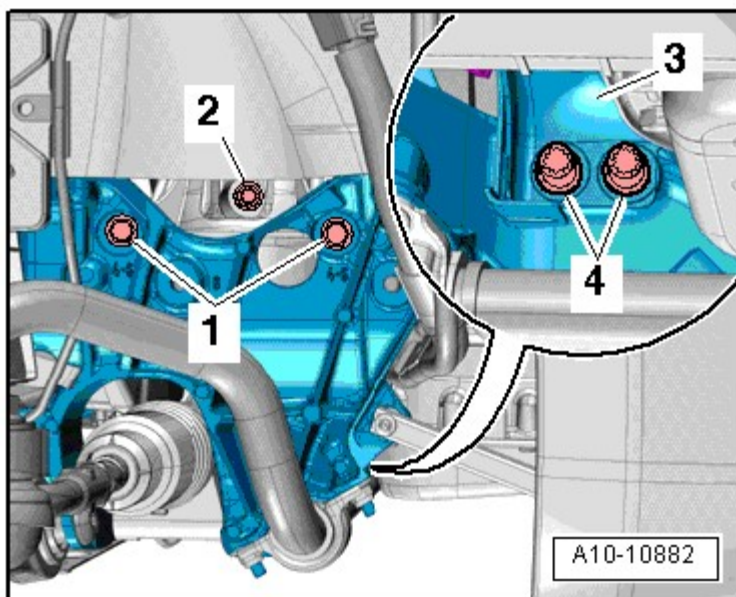


Fig. 179: Identifying Bolts And Right Engine Mount Retaining Plate
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the installation position with the engine installed.

Ignore -1, 3, 4-

-- Remove joint support VAS 6131/13-7 from engine.

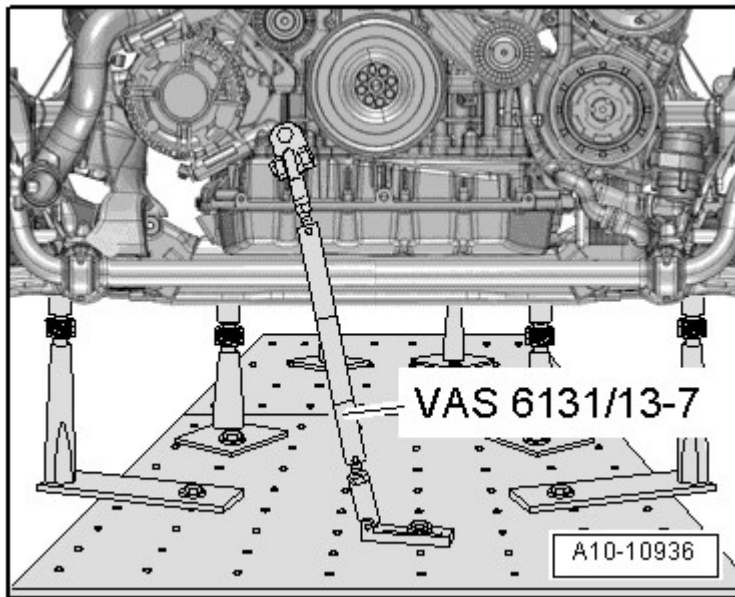


Fig. 180: Identifying Joint Support VAS 6131/13-7
Courtesy of AUDI OF AMERICA, LLC

-- Raise engine from engine carrier.

-- Remove bolts -arrows- and left engine support.

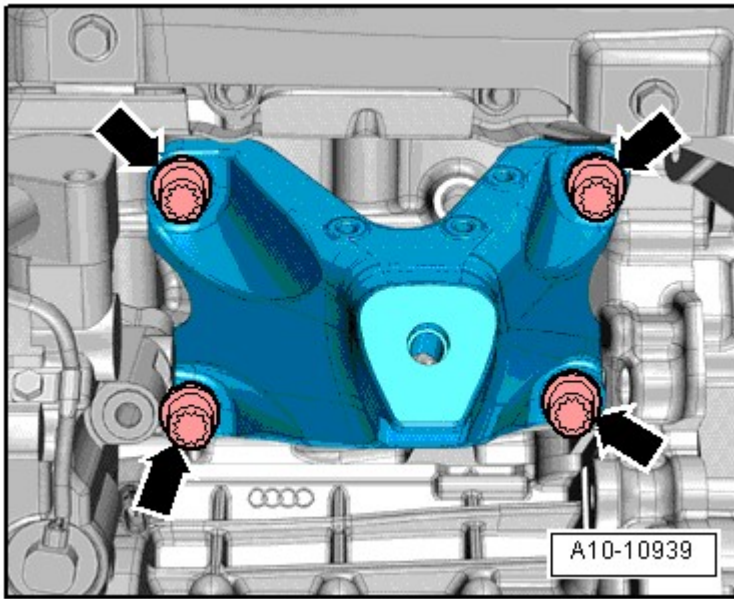


Fig. 181: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and free up ground (GND) wire at engine support.

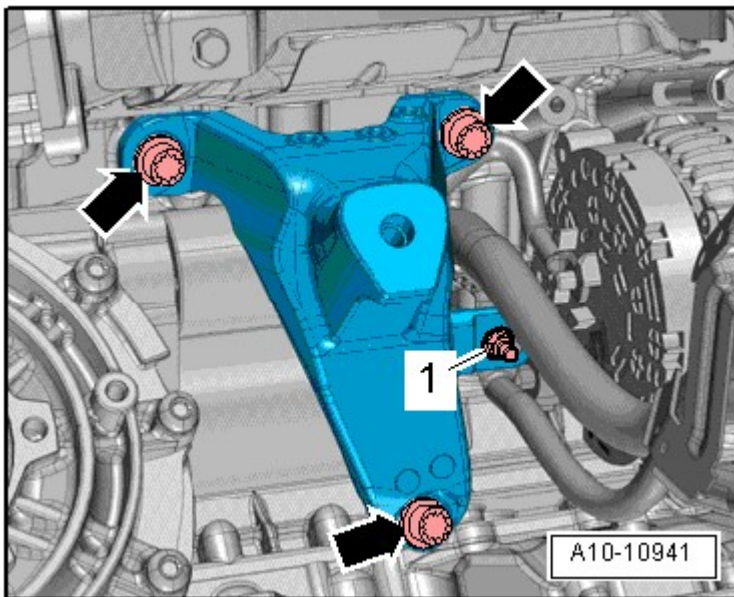


Fig. 182: Identifying Bolts & Right Engine Support

Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and right engine support.

-- Secure starter on engine.

-- Secure engine to engine and transmission holder VAS 6095 using bracket VAS 6095/1-5 and tighten to 40

Nm, as shown in the illustration.

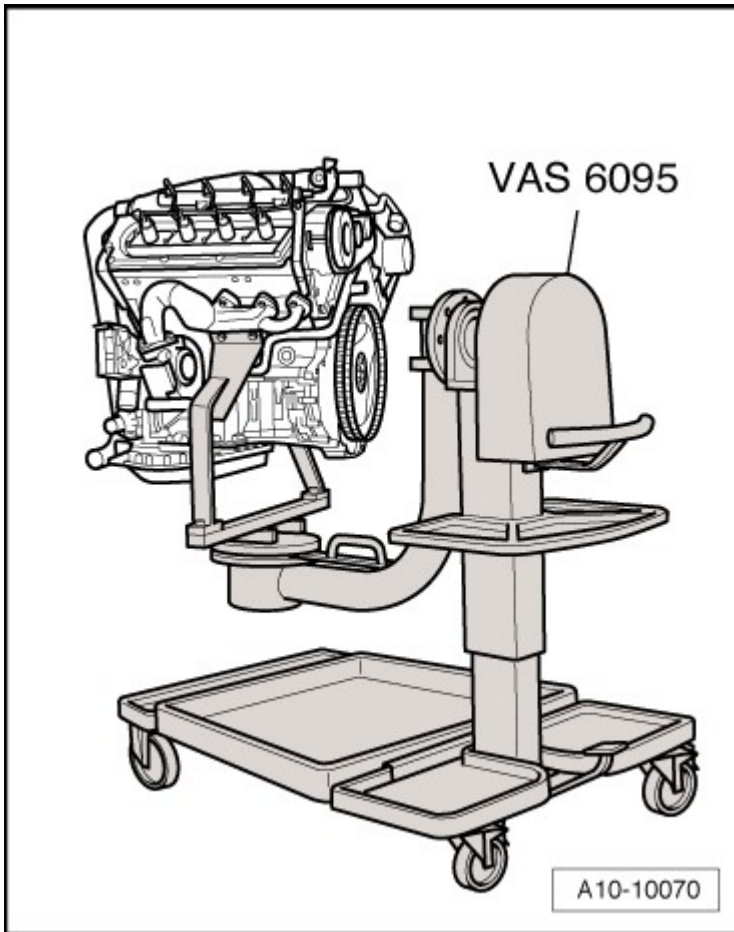


Fig. 183: Identifying Engine, Holder VAS 6095 And Bracket For V6 FSI Engine VAS 6095/1-5
Courtesy of AUDI OF AMERICA, LLC

ENGINE, INSTALLING - AUTOMATIC TRANSMISSION

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 parts that have had the lubrication removed.

Tolerance for tightening specifications $\pm 15\%$.

Tightening specifications **ENGINE MOUNT ASSEMBLY OVERVIEW.**

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

Component		Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Exceptions:		
Ground pins to strut tower		9

Securing engine to transmission

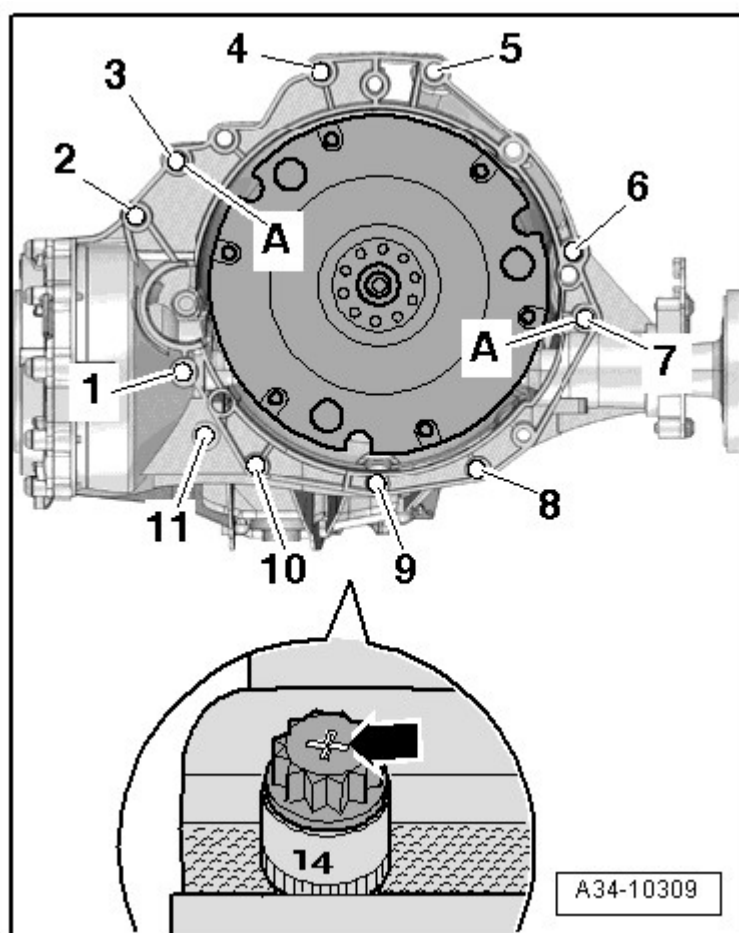


Fig. 184: Engine To Transmission Bolt Tightening Sequence And Specification
Courtesy of AUDI OF AMERICA, LLC

Item	Bolt	Nm
1	M10 x 50 ¹⁾	65
2 to 6	M12 x 100 ²⁾	30 + 105°
7	M12 x 125 ²⁾	30 + 105°

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

8, 11	M10 x 60 ²⁾	15 + 105°
9, 10	M10 x 95 ²⁾	15 + 105°
A	Alignment sleeves for centering	
• ¹⁾ Bolt class 10.9. • ²⁾ Replace bolts.		
(1) To avoid damaging the bolts when marking them, do not clamp them in a vise. Insert bolt in a 14 mm socket with a 1/2 inch drive ratchet which is clamped into a vise, as shown in the illustration.		

- Aluminum bolts -2 through 11- may be used twice. After using the bolts once, mark them with an "X" made by a chisel -arrow-.

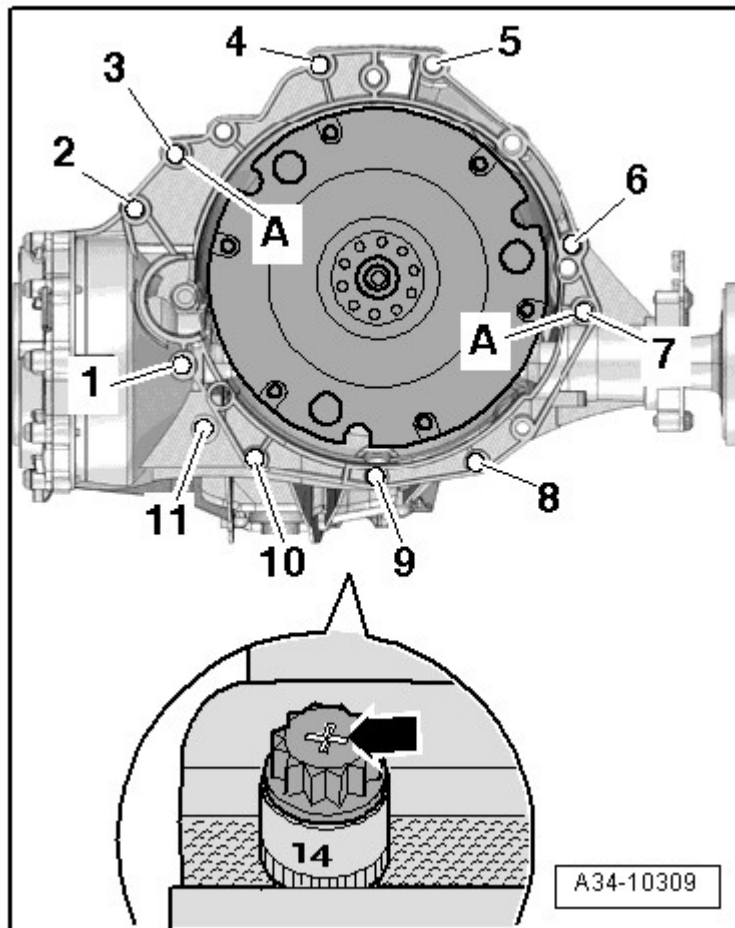


Fig. 185: Identifying Bolts Marked With An "X" May Not Be Used Again
Courtesy of AUDI OF AMERICA, LLC

- Do not used bolts marked with an "X" again.
- There is no limit to the number of times the steel bolt -1- can be used.

Procedure

Proceed as follows:

NOTE: Replace bolts which have been tightened to torque.

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

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

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

-- Check if alignment sleeves for centering the engine and transmission are in the cylinder block and insert them if they are not.

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

-- When joining the engine and subframe, hold ATF lines in their installation position.

-- Install engine supports and engine mount ENGINE MOUNT ASSEMBLY OVERVIEW.

-- Position transmission on engine and tighten bolts -1 through 11-.

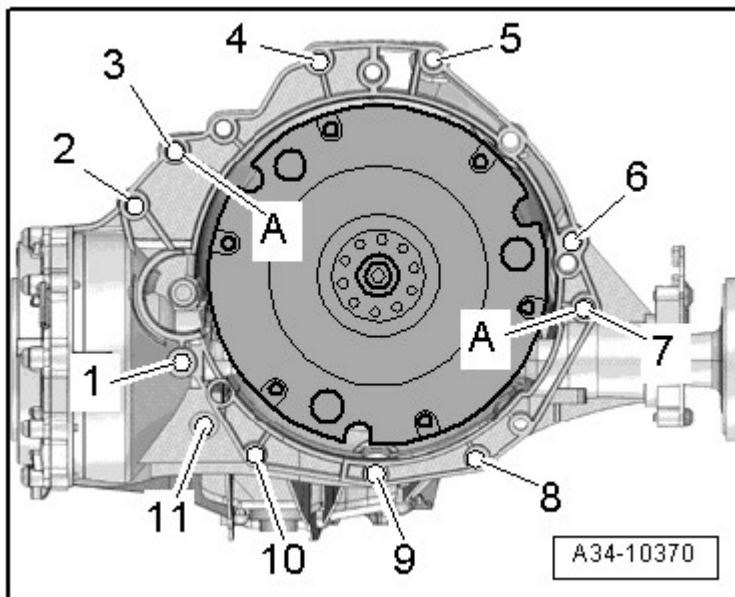


Fig. 186: Checking If Alignment Sleeves -A- For Centering Engine/Transmission Are In Cylinder Block
 Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -A-.

-- Tighten torque converter bolts -arrow- on drive plate in two stages while turning crankshaft 60 degrees

Removal and Installation .

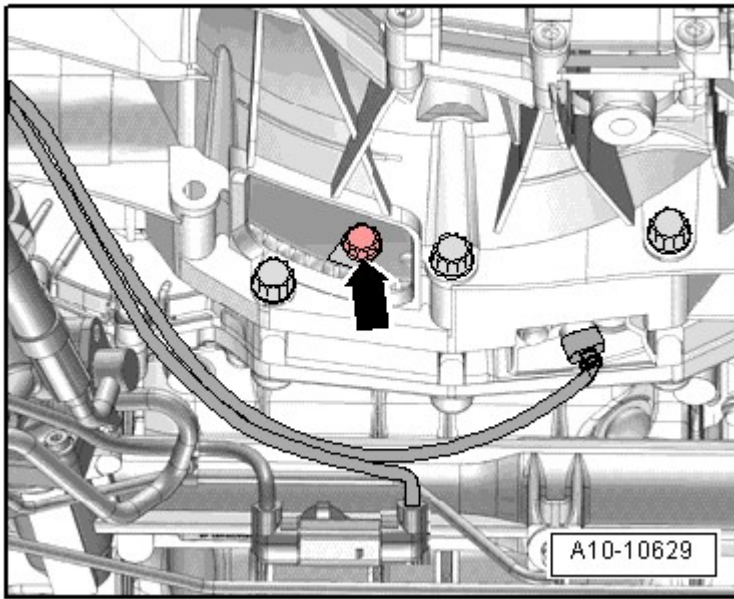


Fig. 187: Identifying Clutch Module First Bolt Installation Location
Courtesy of AUDI OF AMERICA, LLC

- Install starter **Removal and Installation** .
- Install power steering hydraulic oil lines **Removal and Installation** .
- Install left and right drive axles on transmission flange shafts **Removal and Installation** .
- Install catalytic converters: Left **LEFT CATALYTIC CONVERTER** , right **RIGHT CATALYTIC CONVERTER** .
- Raise engine/transmission assembly using scissor lift table VAS 6131 A.
- Align subframe and transmission carrier using marks made on longitudinal members during removal.
- Tighten subframe bolts only to tightening specifications, do not tighten them further (tighten bolts only after axle alignment) **Removal and Installation** .

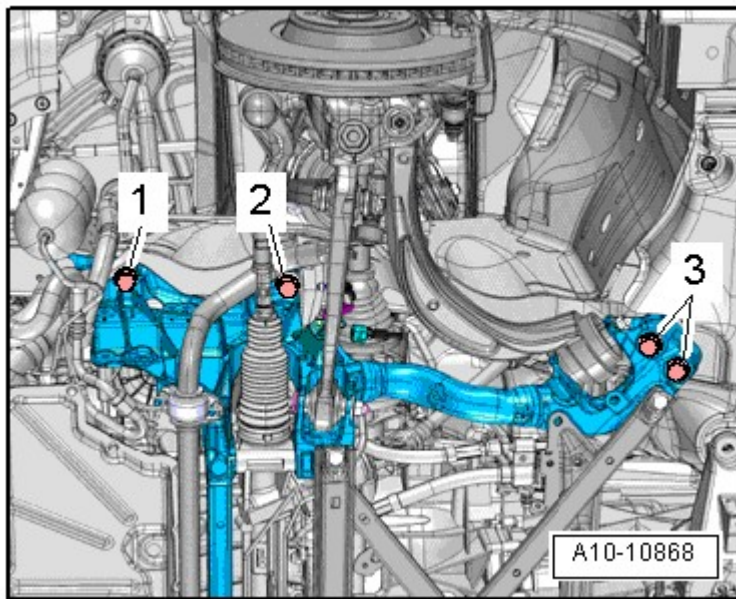


Fig. 188: Identifying Subframe Bolts (Tighten To Specifications)
 Courtesy of AUDI OF AMERICA, LLC

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.

-- Tighten tunnel crossmember bolts -arrow- **DESCRIPTION AND OPERATION** .

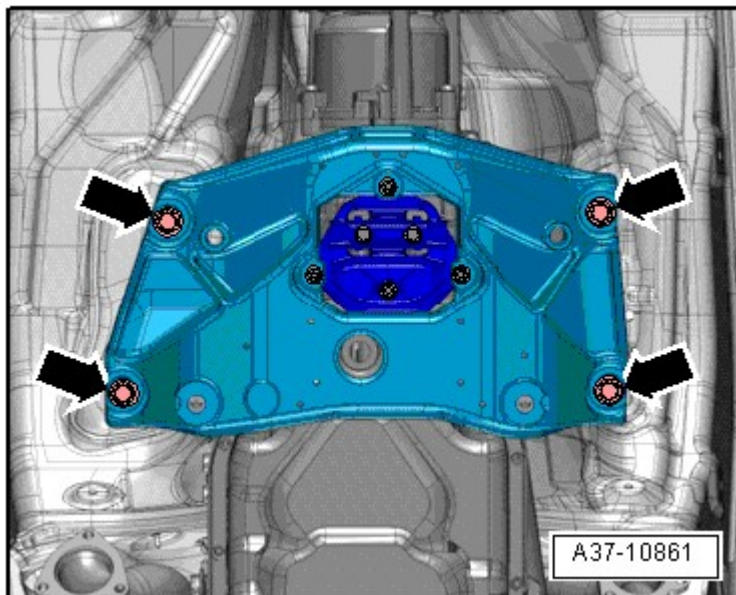


Fig. 189: Identifying Tunnel Crossmember
 Courtesy of AUDI OF AMERICA, LLC

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

- Install universal joint on steering gear **Description and Operation** .
- Install drive shaft **Removal and Installation** .
- Install front muffler **FRONT MUFFLER** .
- Install exhaust system free of stress **EXHAUST SYSTEM, INSTALLING** .
- Install subframe cross brace, upper control arm and stabilizer bar and tighten suspension strut on control arm **Description and Operation** .
- Install brake caliper **Description and Operation**
- Install Engine Control Module (ECM) **Removal and Installation** .
- Electrical connections and routing, refer to appropriate SYSTEM WIRING DIAGRAM.
- Install electrical wires, terminal 30 wire junction 2 -TV22- and engine compartment E-box cover **Wiring** .
- Install tower brace **Description and Operation** .
- Install washer fluid reservoir filler tube **Removal and Installation** .
- Install refrigerant lines **Removal and Installation** .
- Follow measures after connecting battery **Removal and Installation** .

CAUTION: Risk of destroying control modules with excess voltage.

- **Do not use a battery charger for starting assistance!**

- Install air filter housing **Description and Operation** .
- Install lock carrier braces **Description and Operation** .
- Fill engine oil and check the oil level **ENGINE OIL, CHECKING LEVEL** .
- Before starting engine for the first time, check hydraulic oil in power steering reservoir **Diagnosis and Testing** .

NOTE: Power-steering pump must not run dry.

- Connect coolant hose to connector on radiator **Fig. 98**

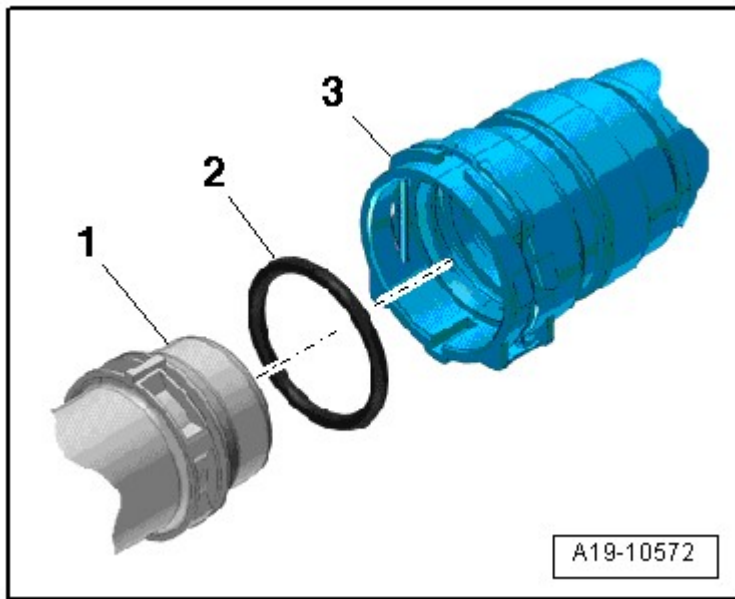


Fig. 190: Connecting Coolant Hose To Coupling
Courtesy of AUDI OF AMERICA, LLC

-- Fill with coolant COOLING SYSTEM, DRAINING AND FILLING .

NOTE: Do not use drained coolant in the following situations:

If cylinder head or cylinder block was replaced.

If coolant is contaminated.

-- Fill refrigerant circuit DESCRIPTION AND OPERATION .

-- Align subframe Description and Operation .

-- Perform axle alignment Description and Operation .

WARNING: Risk of accident due to loose connections.

- Tighten subframe bolts to specification after performing axle alignment.

-- Install noise insulation and wheel housing liners Description and Operation .

LEFT ENGINE MOUNT

Special tools and workshop equipment required

- Engine support bridge 10 - 222 A

- Engine support supplement set T40093

REMOVING

Proceed as follows:

- Place used oil collecting and extracting device V.A.G 1782 under engine.
- Remove bolts -arrows- and lay aside oil cooler with coolant hoses -1- and -2- connected.

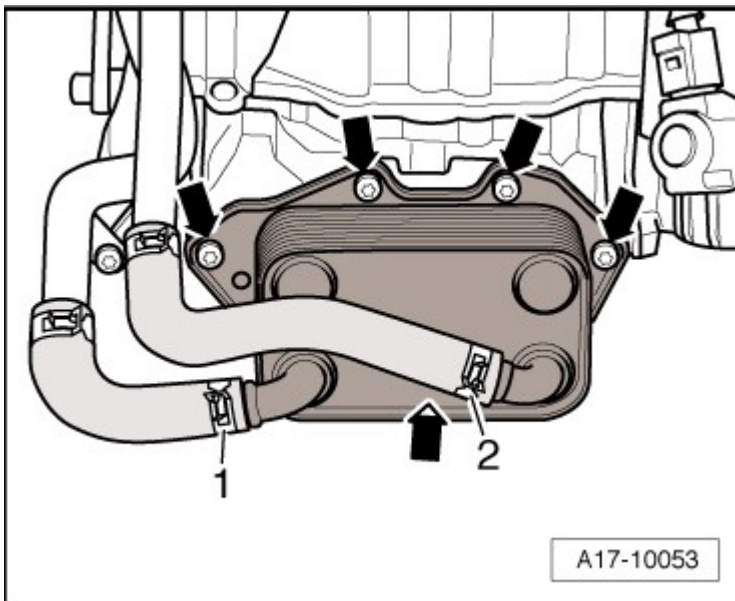


Fig. 191: Connecting/Disconnecting Coolant Hoses With Hose Clamps

Courtesy of AUDI OF AMERICA, LLC

- On vehicles with after-run coolant pump -V51-, remove it **AFTER-RUN COOLANT PUMP** , and oil cooler **OIL COOLER** .
- Remove air conditioner compressor **Removal and Installation** .
- Remove rear engine cover -top arrows-.

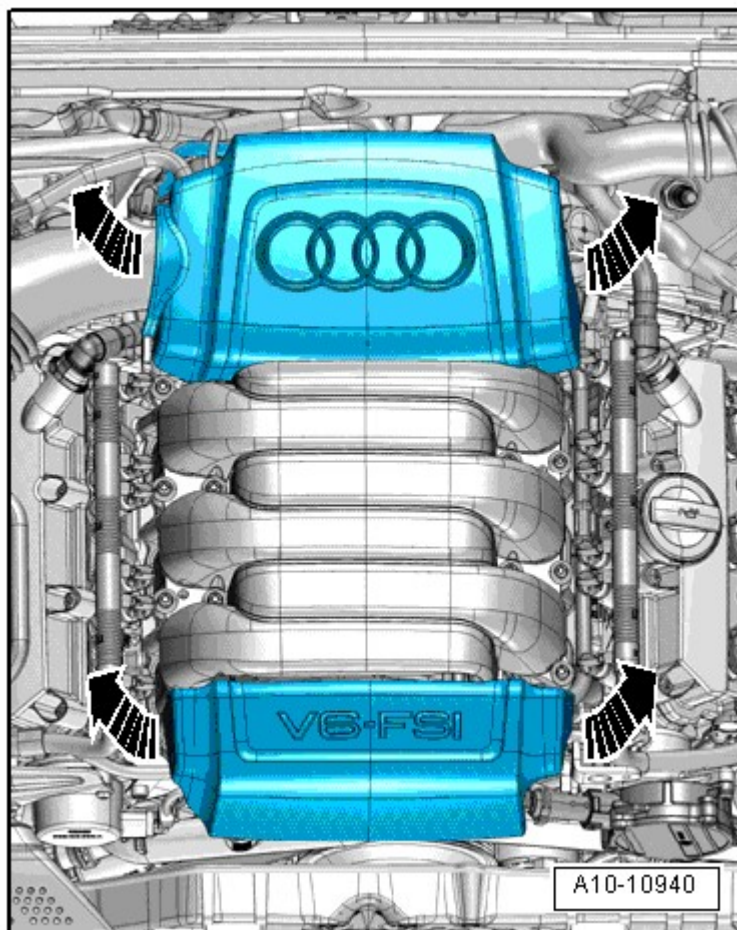


Fig. 192: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Position engine support bridge 10 - 222 A on left and right suspension strut tower with engine support basic set T40091/3 as shown in the illustration.

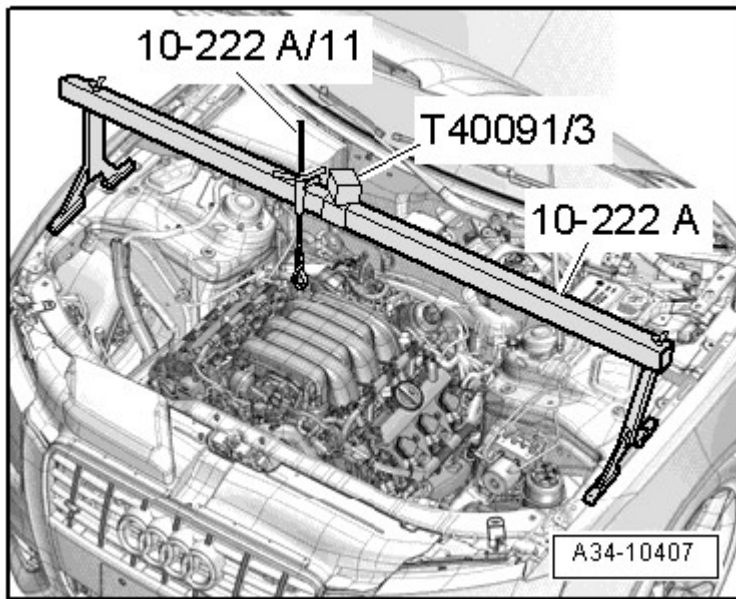


Fig. 193: Positioning Engine Support Bridge 10 - 222 A
Courtesy of AUDI OF AMERICA, LLC

-- Engage spindle 10 - 222 A /11 on right engine lifting eye.

-- Install additional engine support bridge 10 - 222 A components as shown in the illustration. Position supports T40093/3 on notches on longitudinal members.

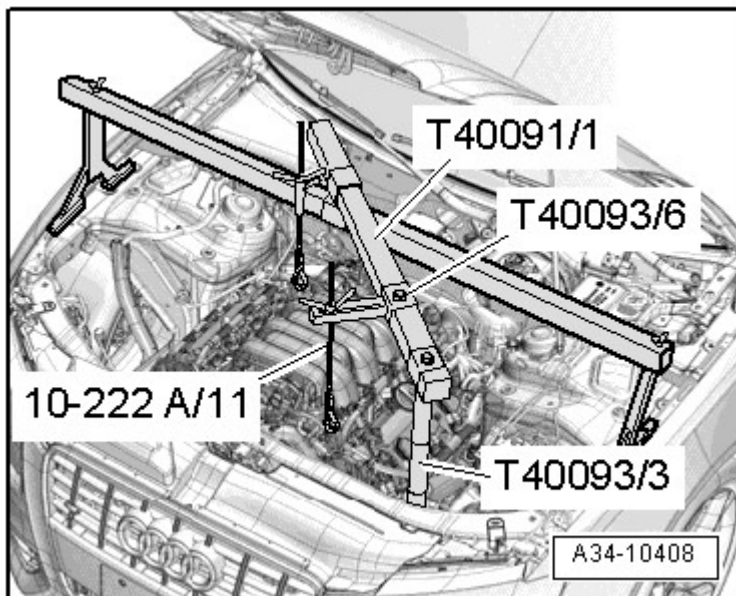


Fig. 194: Identifying Additional Engine Support Bridge 10 - 222 A
Courtesy of AUDI OF AMERICA, LLC

-- Engage spindle 10 - 222 A /11 on left engine lifting eye.

-- Lightly pretension engine with spindles.

-- Remove left subframe bolt -2-.

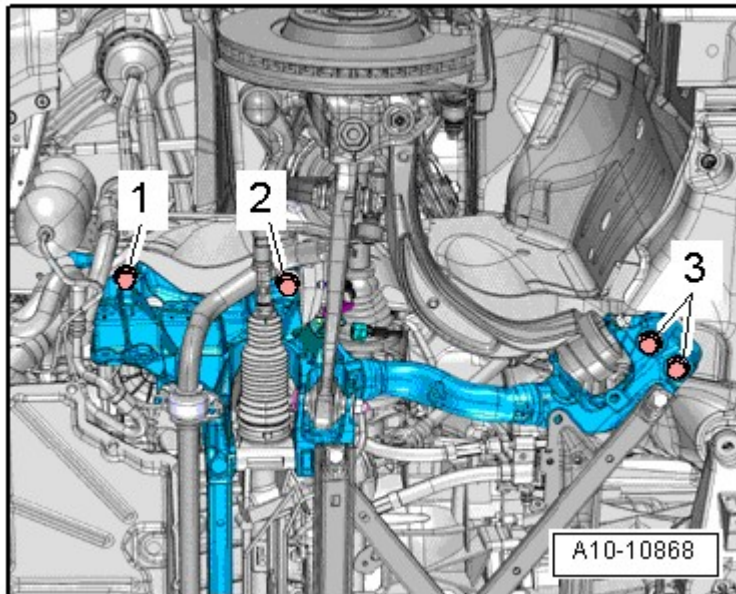


Fig. 195: Identifying Subframe Bolts (Tighten To Specifications)

Courtesy of AUDI OF AMERICA, LLC

NOTE: The left subframe bolts -1- and -3- and all the right subframe bolts remain installed.

-- Remove left engine mount bolts -1-, -3- and -4-.

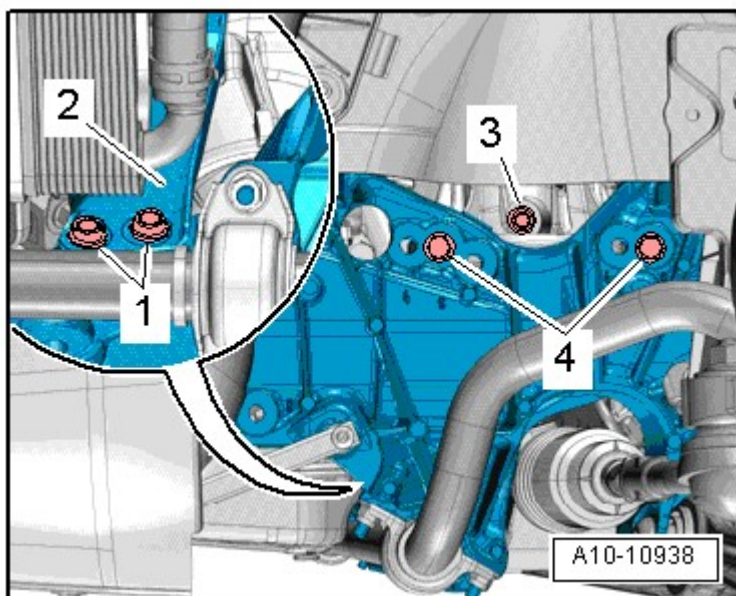


Fig. 196: Identifying Left Engine Mount Bolts -1-, -3- And -4-
Courtesy of AUDI OF AMERICA, LLC

-- Lay aside left engine mount retaining plate -2-.

-- Remove left engine mount.

INSTALLING

- Tightening specifications **ENGINE MOUNT ASSEMBLY OVERVIEW.**

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

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

-- Tighten subframe **Description and Operation** .

-- Install oil cooler **OIL COOLER** .

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

-- Install after-run coolant pump -V51- **AFTER-RUN COOLANT PUMP** .

RIGHT ENGINE MOUNT**Special tools and workshop equipment required**

- Engine support bridge 10 - 222 A

REMOVING

Proceed as follows:

-- Remove rear engine cover -top arrows-.

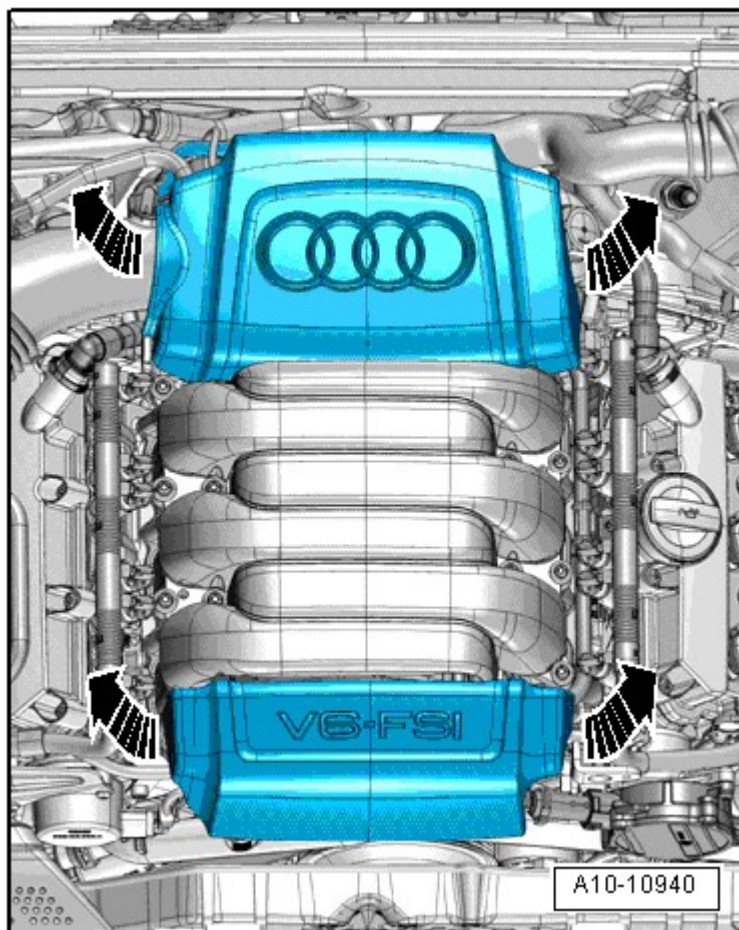


Fig. 197: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Position engine support bridge 10 - 222 A on left and right suspension strut tower as shown in the illustration.

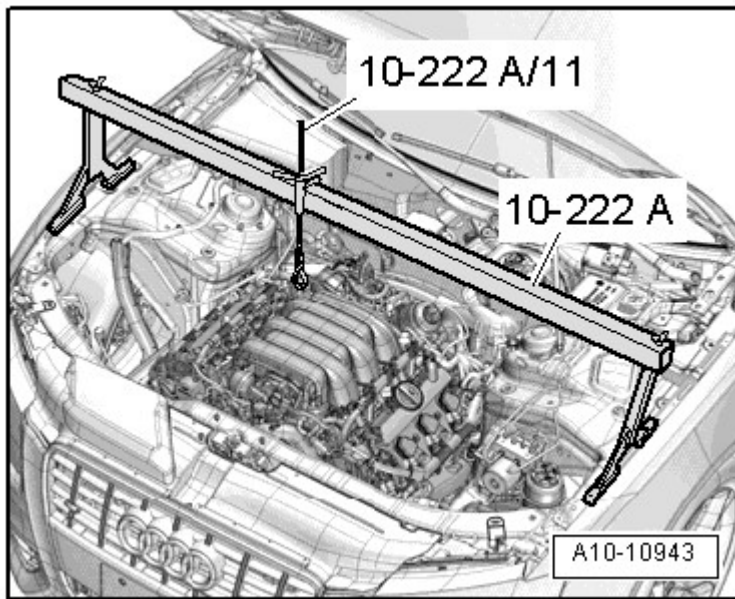


Fig. 198: Positioning Engine Support Bridge On Left And Right Suspension Strut Tower As Shown In Illustration

Courtesy of AUDI OF AMERICA, LLC

- Engage spindle 10 - 222 A /11 on right engine lifting eye and tension it slightly.
- Remove right front wheel.
- Remove right front wheel housing liner **Description and Operation** .
- Remove noise insulation by loosening fasteners -1- and -2-.

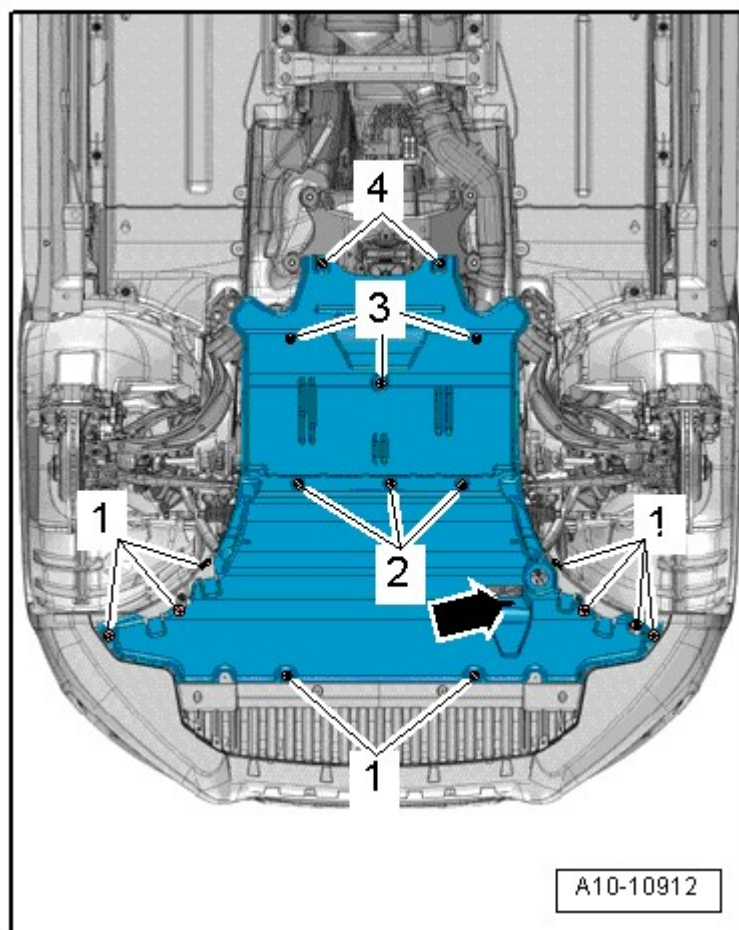


Fig. 199: Identifying Noise Insulation
Courtesy of AUDI OF AMERICA, LLC

-- Remove nut -1- and remove bracket with wiring harness from subframe.

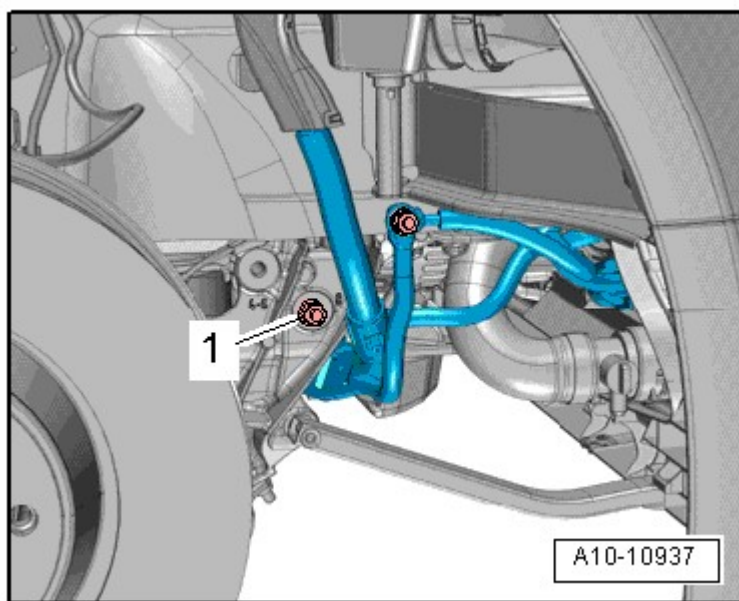


Fig. 200: Identifying Nut And Bracket With Wiring Harness From Subframe
 Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1, 2 and 4- and lay right engine mount retaining plate -3- aside.

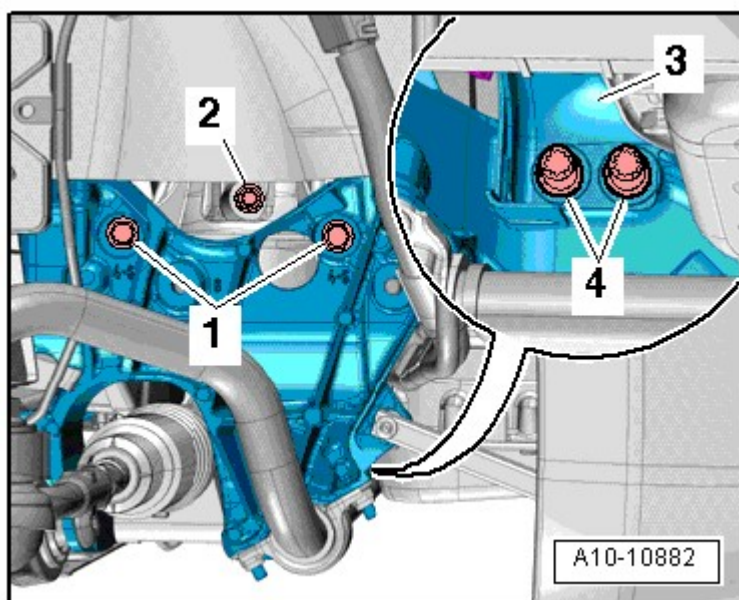


Fig. 201: Identifying Bolts And Right Engine Mount Retaining Plate
 Courtesy of AUDI OF AMERICA, LLC

-- In vehicles with automatic transmission, remove bolt -arrow- on the ATF line bracket.

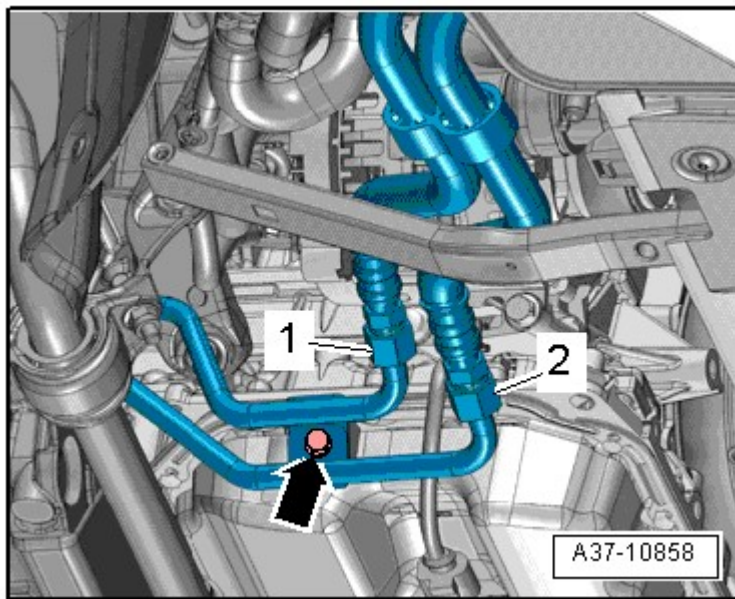


Fig. 202: Identifying ATF Line Bracket
Courtesy of AUDI OF AMERICA, LLC

-- Raise engine by dimension -a- using spindle 10 - 222 A /11.

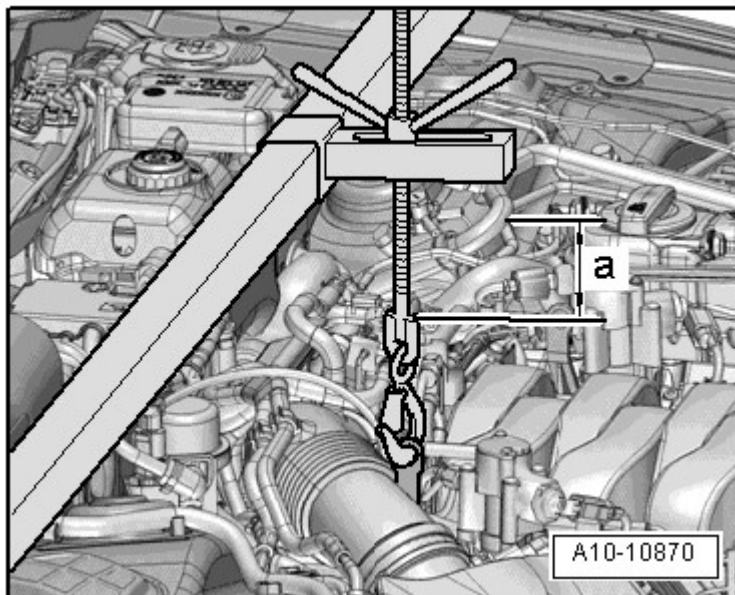


Fig. 203: Raising Engine By Dimension Using Spindle 10 - 222 A /11
Courtesy of AUDI OF AMERICA, LLC

- Dimension -a- = approximately 20 mm.

-- Remove right engine mount.

INSTALLING

- Tightening specifications **ENGINE MOUNT ASSEMBLY OVERVIEW.**

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

-- Install noise insulation and the wheel housing liners. **Description and Operation** .

SPECIAL TOOLS

Special tools and workshop equipment required

- Assembly aid T40169
- Bracket T40170
- Support set VAS 6131/10, supplementary set VAS 6131/13 and transmission support VAS 6131/14
- Pry lever - rmv outside mirror 80 - 200

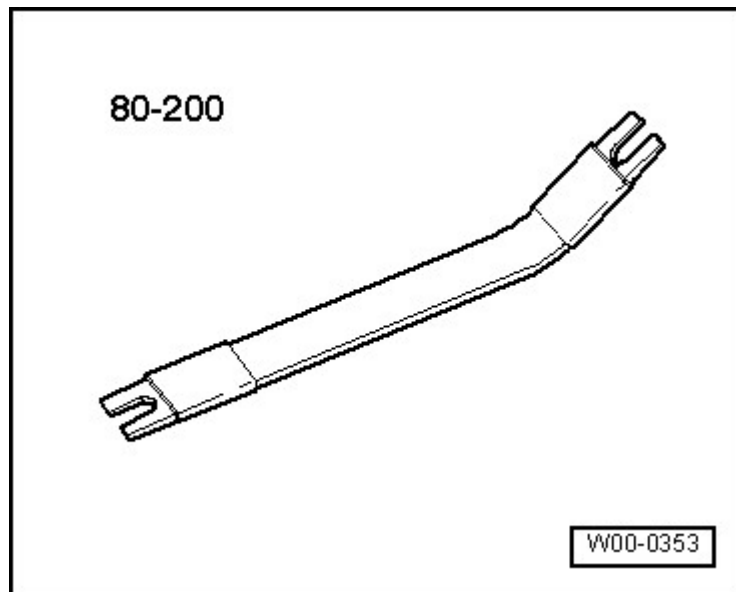


Fig. 204: 80-200 Pry Lever

Courtesy of AUDI OF AMERICA, LLC

- Counterhold tool T10172 with T10172/5

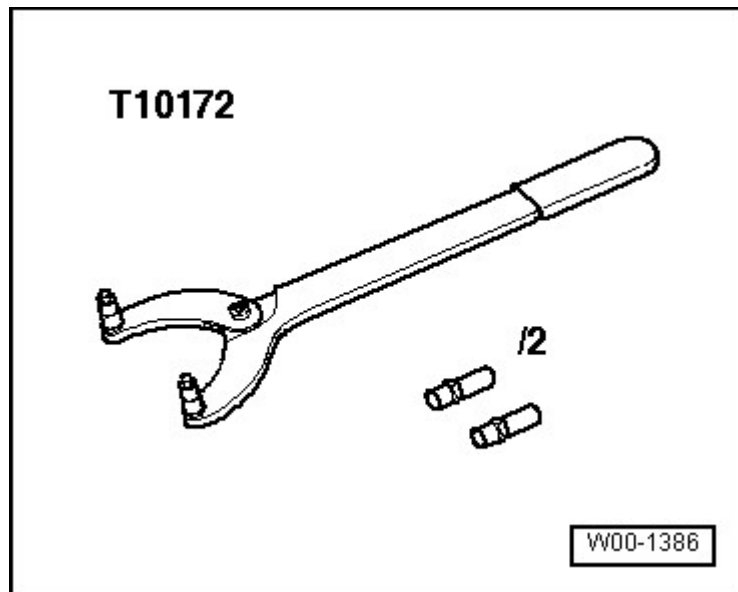


Fig. 205: Counter-Holder Tool T10172
Courtesy of AUDI OF AMERICA, LLC

- Puller T40160

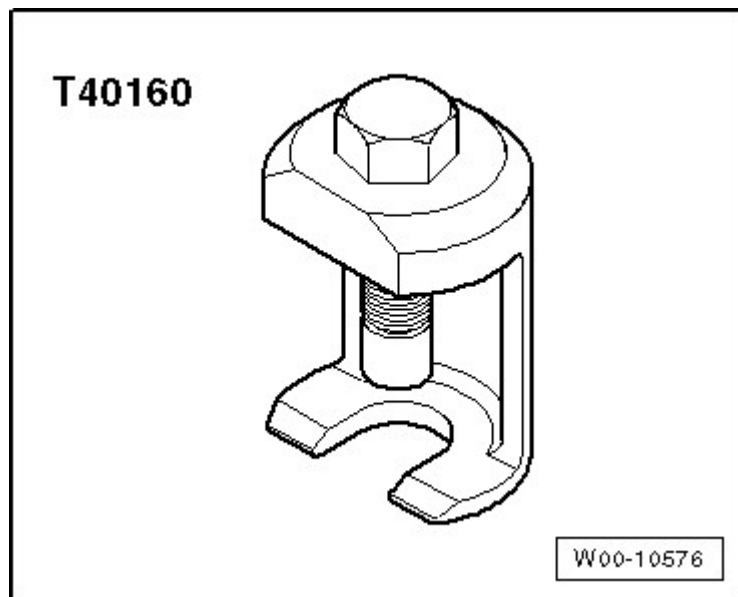


Fig. 206: Identifying Puller T40160
Courtesy of AUDI OF AMERICA, LLC

- Adapter T40058

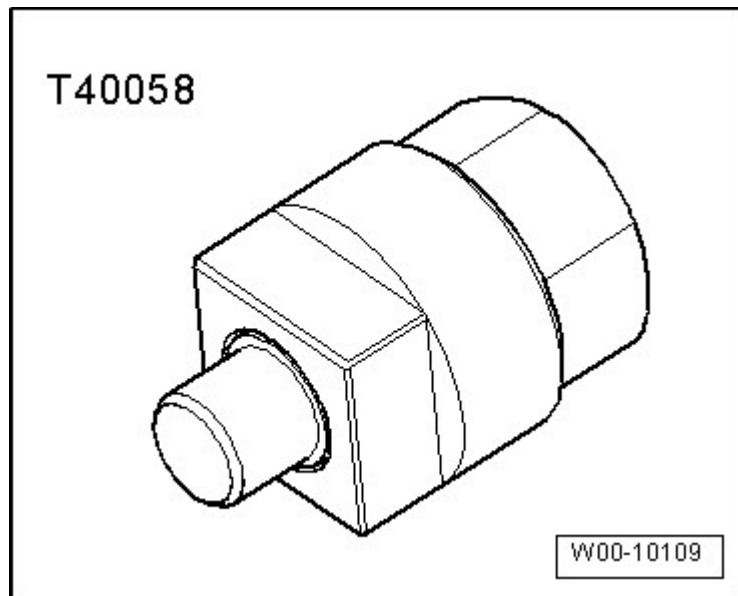


Fig. 207: Adapter (Socket) T40058
Courtesy of AUDI OF AMERICA, LLC

- Engine support bridge 10 - 222 A

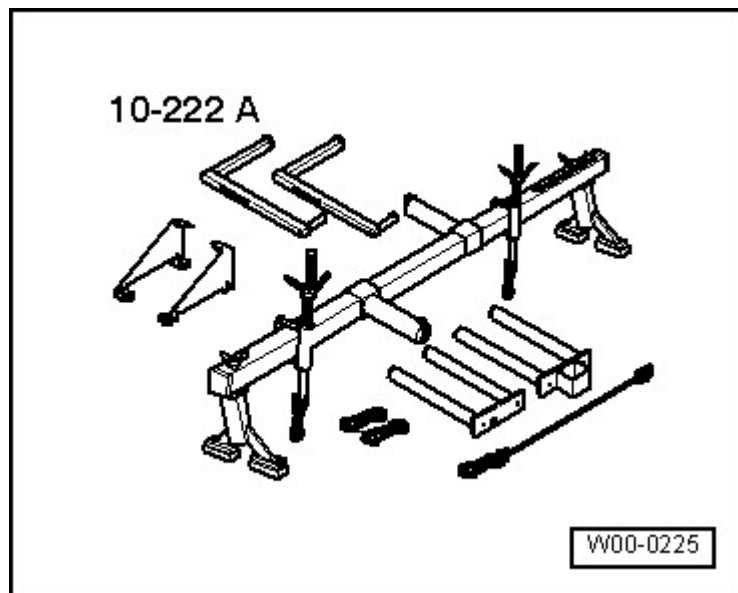


Fig. 208: Engine Support Bridge 10 - 222 A
Courtesy of AUDI OF AMERICA, LLC

- Engine support supplement set T40093

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Engine Assembly - Engine Code(s): CALA (Coupe) (As of 11.2007)

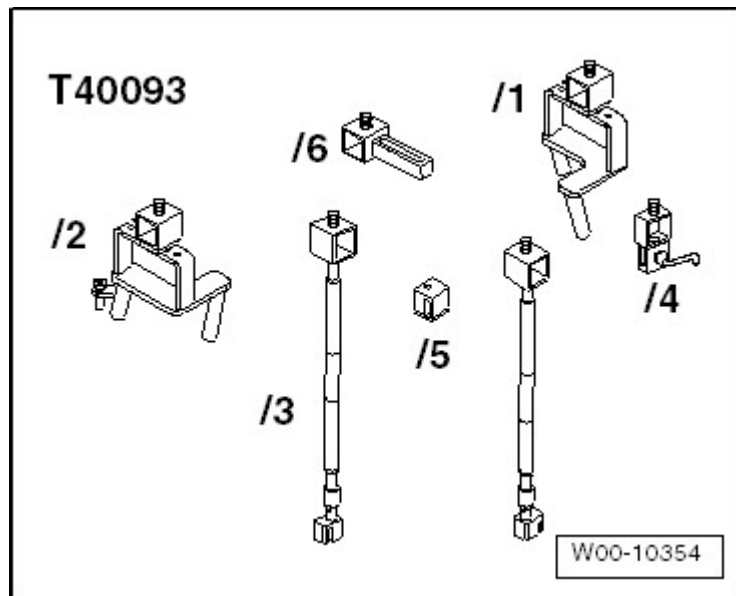


Fig. 209: Engine Support Supplement Set T40093
Courtesy of AUDI OF AMERICA, LLC

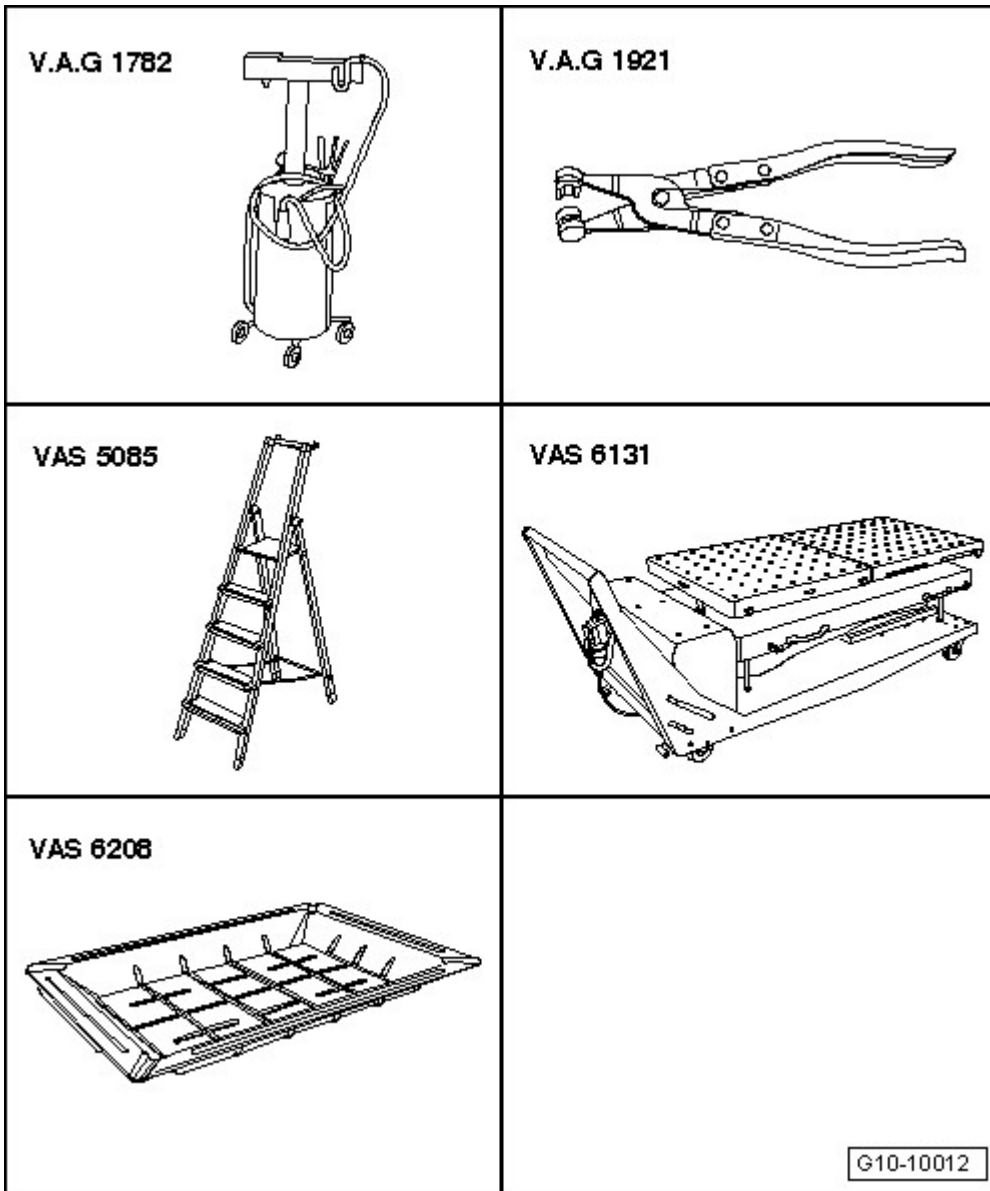


Fig. 210: Identifying Special Tools -- Engine, Removing
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Old oil collecting and extracting device V.A.G 1782
- Hose clamp pliers V.A.G 1921
- Step ladder VAS 5085
- Scissor lift table VAS 6131 A with support set VAS 6131/10 and supplementary set VAS 6131/13
- Drip tray for workshop crane VAS 6208

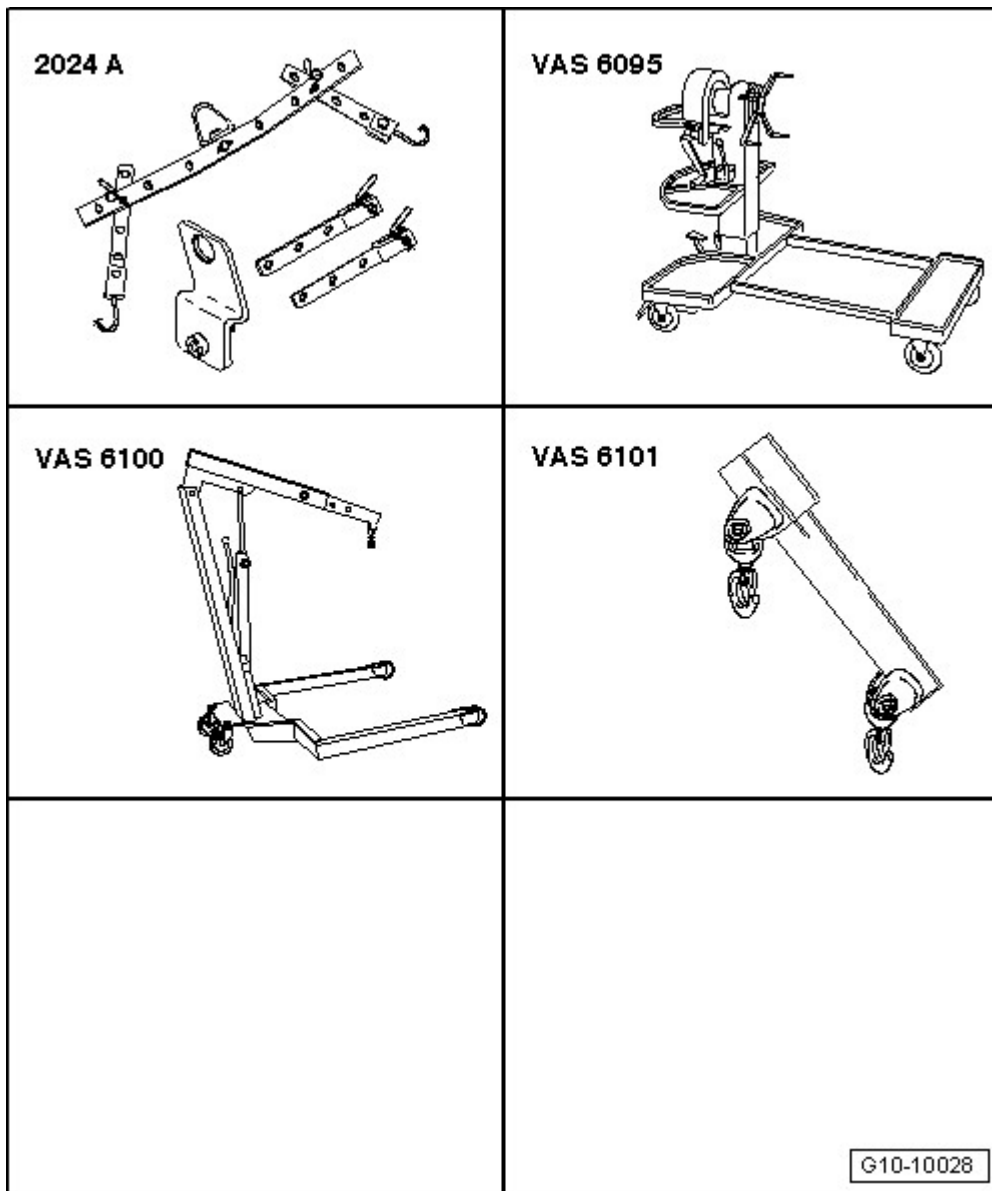


Fig. 211: Identifying Special Tools -- Engine, Securing To Engine And Transmission Holder
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Lifting tackle 2024 A
- Engine and transmission holder VAS 6095 with V6 FSI engine holder VAS 6095/1-5
- Shop crane VAS 6100
- Lift arm extension for workshop crane VAS 6101

ENGINE

3.2 Liter - Cylinder Head, Valvetrain - Engine Code(s): CALA (Coupe) (As of 11.2007)

15 CYLINDER HEAD, VALVETRAIN

DESCRIPTION AND OPERATION

TIMING CHAIN COVERS ASSEMBLY OVERVIEW

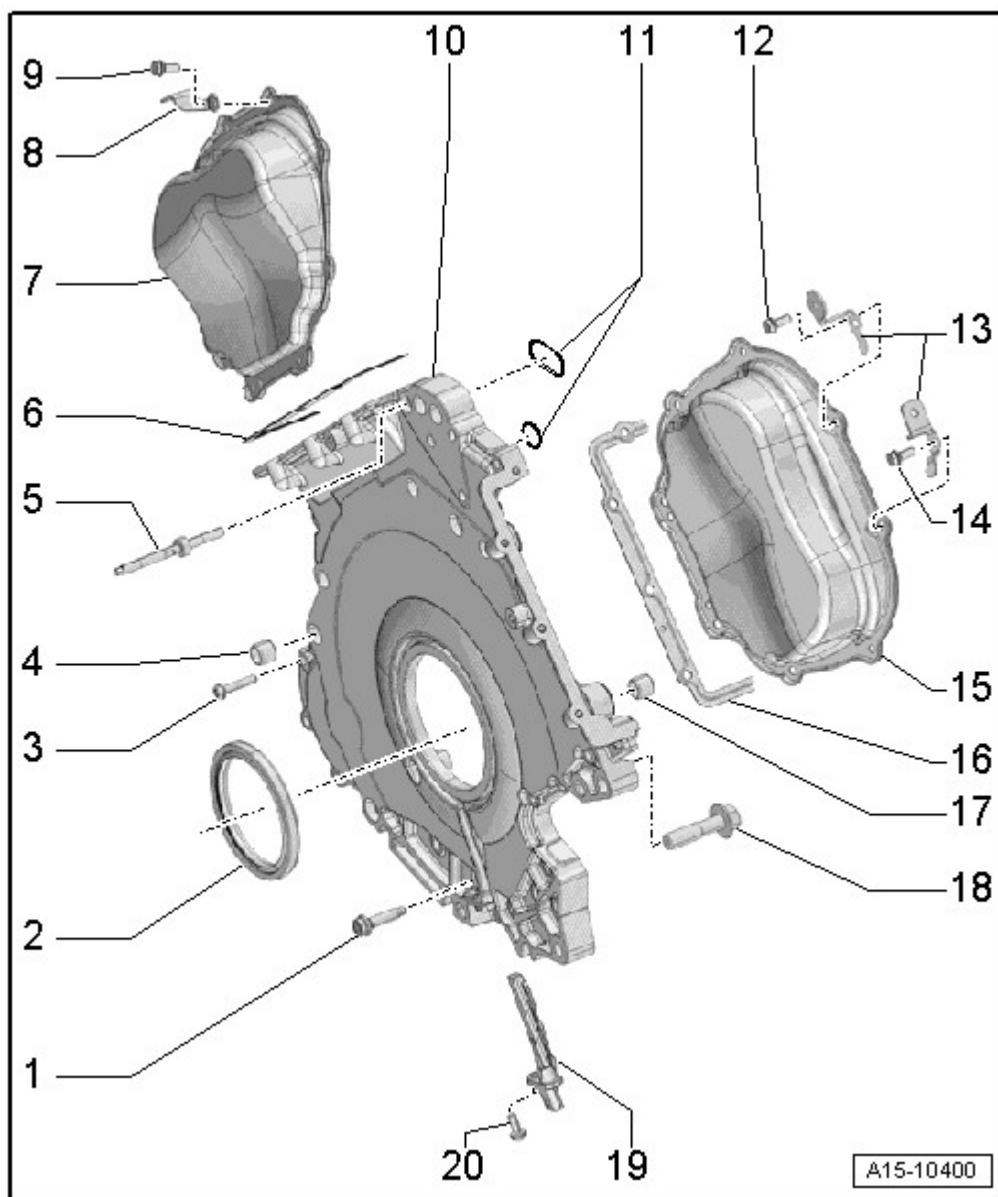


Fig. 1: Identifying Timing Chain Covers Overview
Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Tightening specification and sequence **Fig. 4**
2. Crankshaft seal, drive plate side
 - Replacing **CRANKSHAFT SEAL, DRIVE PLATE SIDE** .
3. Bolt
 - Tightening specification and sequence **Fig. 4**
4. Alignment bushing
 - 2 pieces
5. Bolt
 - Tightening specifications: 16 Nm
6. Left cylinder head gasket
7. Left timing chain cover
 - Removing and installing **LEFT AND RIGHT TIMING CHAIN COVERS.**
8. Bracket
 - For wiring harness
9. Bolt
 - Replace
 - Tightening specification and sequence **Fig. 2**
10. Lower timing chain cover
 - Removing and installing **LOWER TIMING CHAIN COVER**
11. Seals
 - Replace
12. Bolt
 - Tightening specification and sequence **Fig. 3**
13. Bracket
 - For electrical connectors
14. Bolt
 - Replace
 - Tightening specification and sequence **Fig. 3**
15. Right timing chain cover
 - Removing and installing **LEFT AND RIGHT TIMING CHAIN COVERS.**
16. Right cylinder head gasket
17. Alignment bushing
 - 2 pieces
18. Bolt
 - Tightening specification and sequence **Fig. 4**
19. Engine speed (RPM) sensor -G28-
 - Removing and installing **Removal and Installation**

20. Bolt

- Tightening specifications **Removal and Installation**

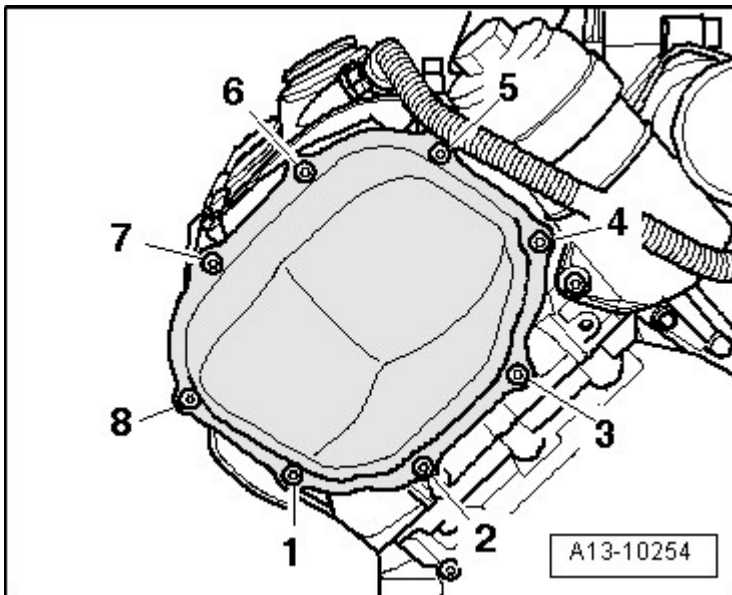


Fig. 2: Left Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

-- Replace bolts for left timing chain cover.

-- Tighten bolts in 2 stages in -1 to 8- sequence as follows:

-- Tighten to 5 Nm.-- Tighten an additional 90° turn.

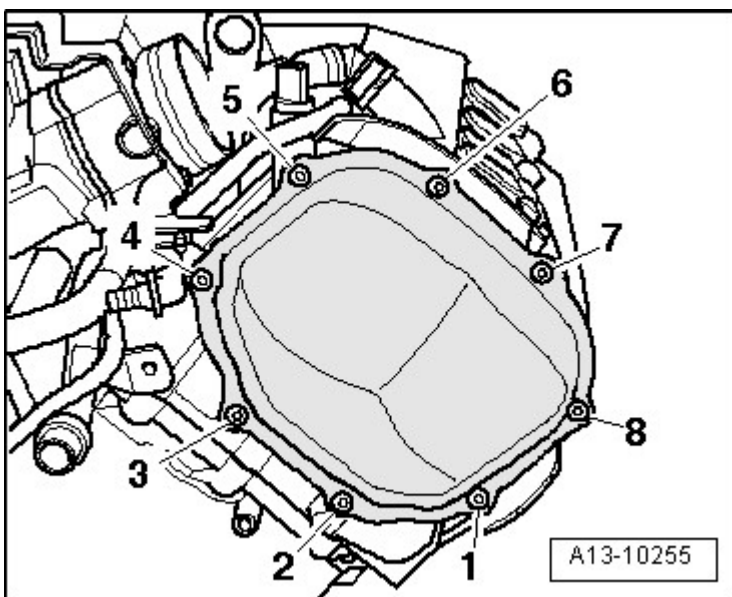


Fig. 3: Right Timing Chain Cover Bolt Tightening Sequence & Specification

Courtesy of AUDI OF AMERICA, LLC

-- Replace bolts for right timing chain cover.

-- Tighten bolts in 2 stages in -1 to 8- sequence as follows:

-- Tighten to 5 Nm.-- Tighten an additional 90° turn.

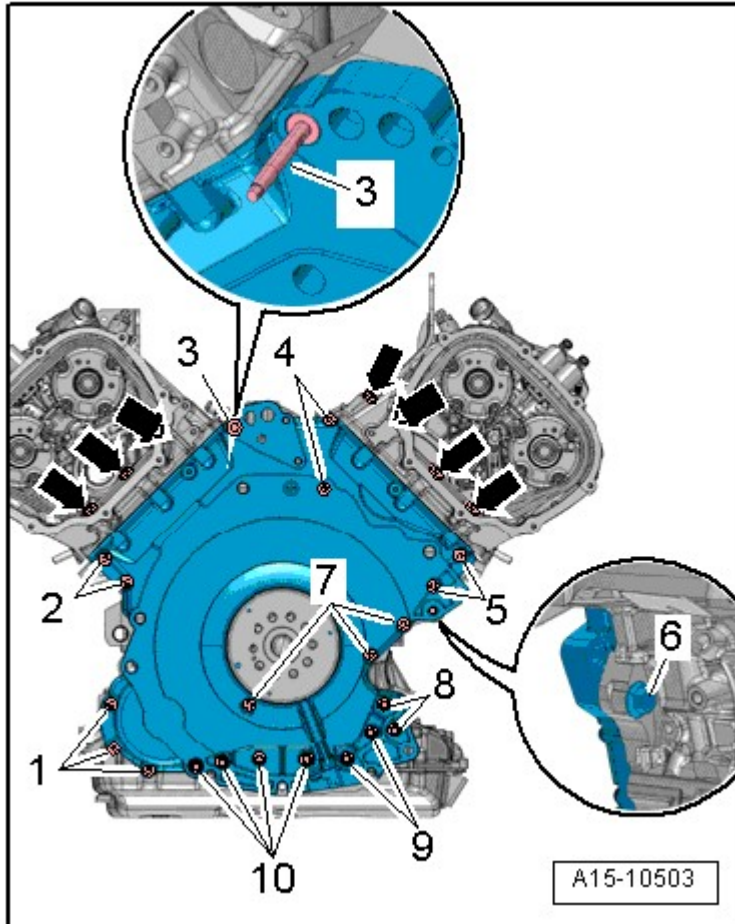


Fig. 4: Lower Timing Chain Cover Bolt Tightening Sequence & Specification

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 6 stages as follows:

-- Insert bolts -arrows- and tighten them to 5 Nm.-- Tighten bolts -1 to 10- in a diagonal sequence to 9 Nm using a torque wrench.-- Tighten bolts -arrows- to 9 Nm.-- Tighten bolts -8, 9 and 10- to 22 Nm.-- Tighten bolt -3- to 16 Nm.-- Tighten bolt -6- to 70 Nm.

CAMSHAFT TIMING CHAINS ASSEMBLY OVERVIEW

Left Camshaft Timing Chain

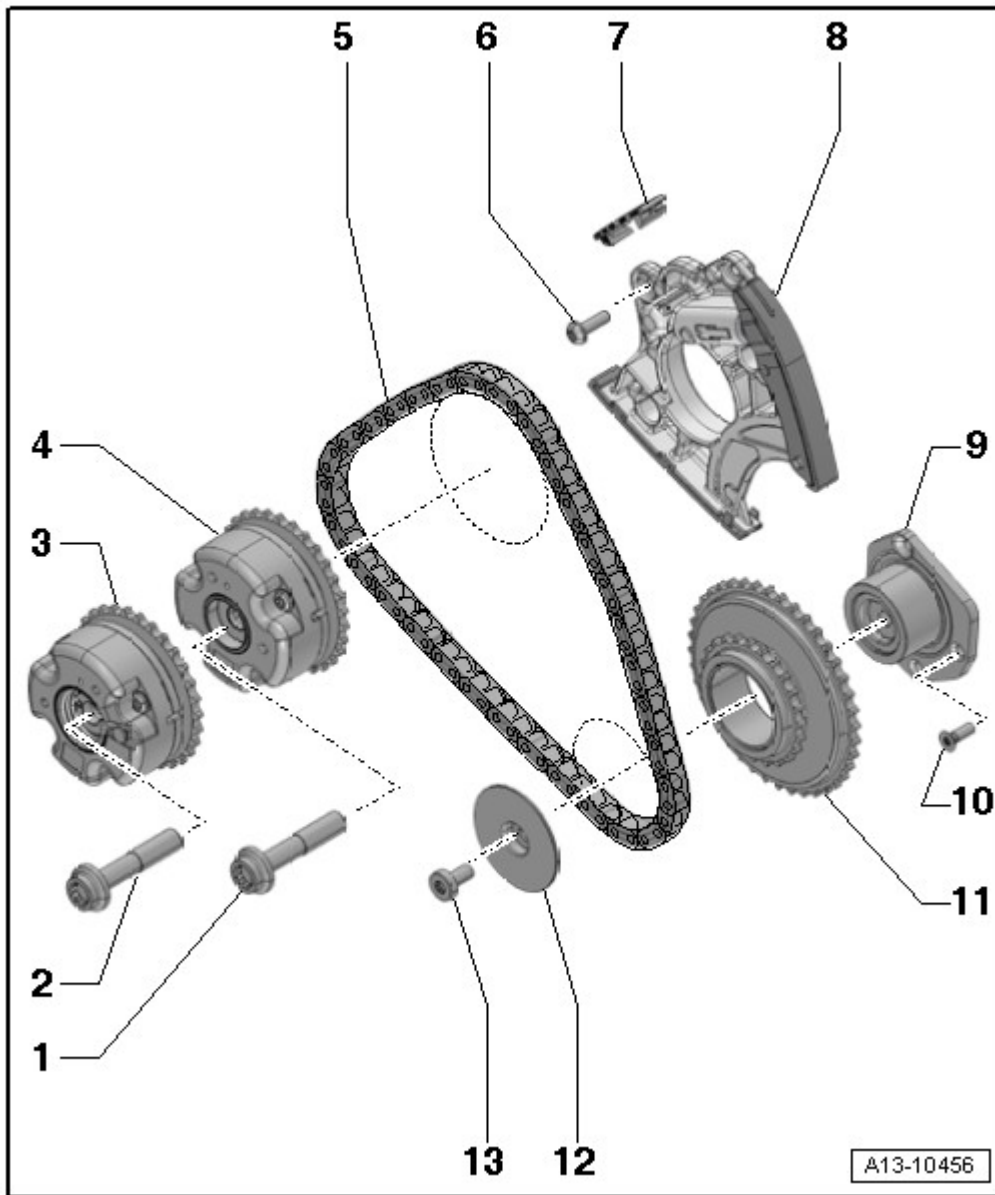


Fig. 5: Identifying Camshaft Timing Chains Assembly
Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Replace
 - 80 Nm + an additional 90° turn
2. Bolt
 - Replace
 - 80 Nm + an additional 90° turn
3. Camshaft adjuster for exhaust camshaft
 - Identification "Exhaust"
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM**

CAMSHAFTS.

4. Camshaft adjuster for intake camshaft
 - Identification "Intake"
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
5. Left camshaft timing chain
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
6. Bolt
 - 9 Nm
7. Guide piece
8. Left camshaft timing chain tensioner
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
9. Mounting bracket for drive sprocket
10. Bolt
 - Replace
 - 8 Nm + additional 45° turn
11. Left camshaft timing chain drive sprocket
12. Thrust washer for drive sprocket
13. Bolt
 - Replace
 - 6 Nm + an additional 60° turn

Right Camshaft Timing Chain

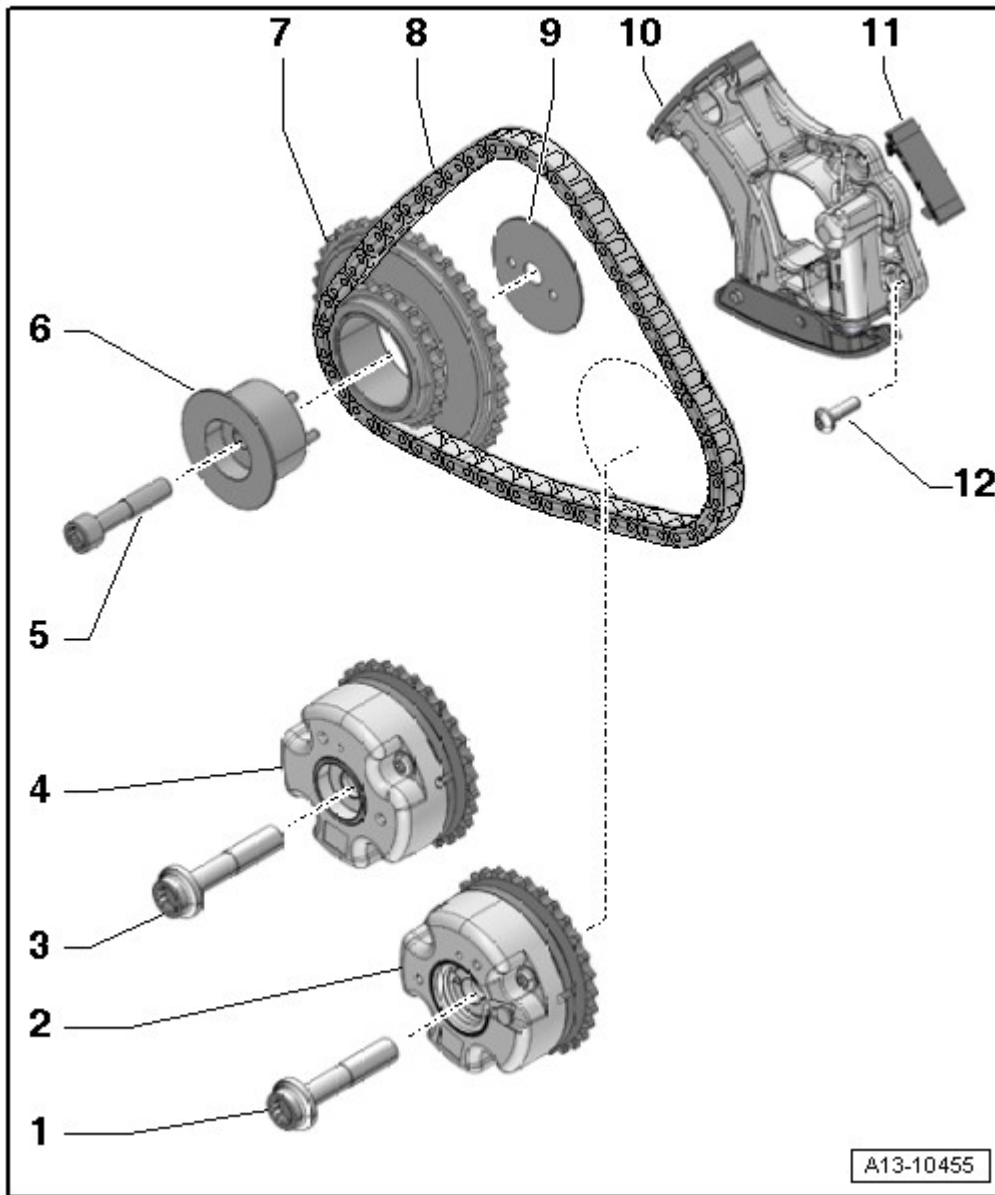


Fig. 6: Identifying Right Camshaft Timing Chain

Courtesy of AUDI OF AMERICA, LLC

1. Bolt
 - Replace
 - 80 Nm + an additional 90° turn
2. Camshaft adjuster for exhaust camshaft
 - Identification "Exhaust"
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
3. Bolt
 - Replace

- 80 Nm + an additional 90° turn
- 4. Camshaft adjuster for intake camshaft
 - Identification "Intake"
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
- 5. Bolt
 - Replace
 - 30 Nm + an additional 90° turn
- 6. Pivot pin for drive sprocket
 - For right camshaft timing chain
 - Asymmetrical version
 - Installed location **Fig. 8**
- 7. Right camshaft timing chain drive sprocket
 - Installed location **Fig. 8**
- 8. Right camshaft timing chain
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
- 9. Thrust washer for drive sprocket
 - For right camshaft timing chain
 - Asymmetrical version
 - Installed location **Fig. 8**
- 10. Right camshaft timing chain tensioner
 - Removing and installing **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
- 11. Guide piece
- 12. Bolt
 - 9 Nm

TIMING MECHANISM DRIVE CHAIN ASSEMBLY OVERVIEW

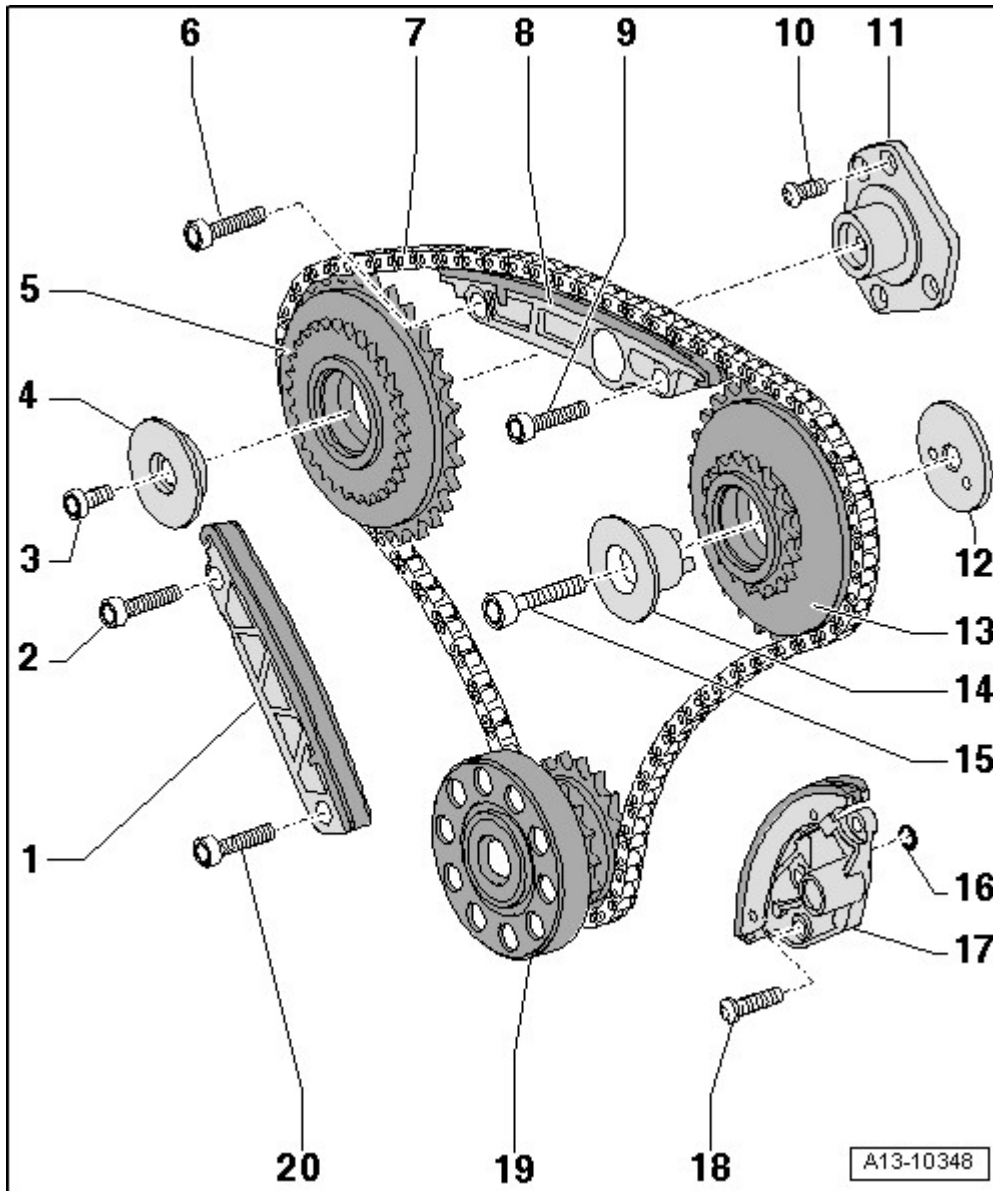


Fig. 7: Identifying Timing Mechanism Drive Chain, Assembly Overview
Courtesy of AUDI OF AMERICA, LLC

1. Guide rail
2. Bolt
 - Replace
 - 10 Nm + an additional 90° turn
3. Bolt
 - Tightening specifications: 6 Nm + an additional 60° turn
4. Thrust washer for drive sprocket
5. Drive sprocket for left timing chain
6. Bolt

- Replace
 - 10 Nm plus an additional 90° turn
7. Timing Mechanism Drive Chain
 - Removing and installing **TIMING MECHANISM DRIVE CHAIN.**
 8. Guide rail
 9. Bolt
 - Replace
 - 10 Nm plus an additional 90° turn
 10. Bolt
 - Tightening specifications, item 10 10
 11. Mounting bracket for drive sprocket
 - For right camshaft timing chain
 - Asymmetrical version
 - Installed location **Fig. 8**
 12. Thrust washer
 - Asymmetrical version
 - Installed location **Fig. 8**
 13. Drive sprocket for right timing chain
 - Installed location **Fig. 8**
 14. Pivot pin for drive sprocket
 - Asymmetrical version
 - Installed location **Fig. 8**
 15. Bolt
 - Tightening specifications, item 5 5
 16. O-ring
 - Replace
 17. Chain tensioner
 18. Bolt
 - 9 Nm
 19. Crankshaft
 20. Bolt
 - Replace
 - 10 Nm plus an additional 90° turn

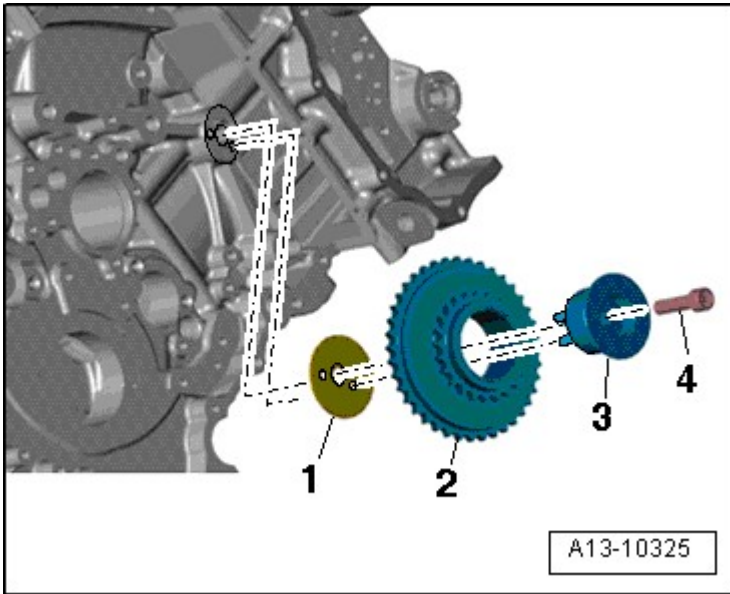


Fig. 8: Locating Camshaft Timing Chain Drive Sprocket Mounting Pins
Courtesy of AUDI OF AMERICA, LLC

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

2 - Right camshaft timing chain drive sprocket

4 - Bolt

POWER TAKE-OFF DRIVE CHAIN ASSEMBLY OVERVIEW

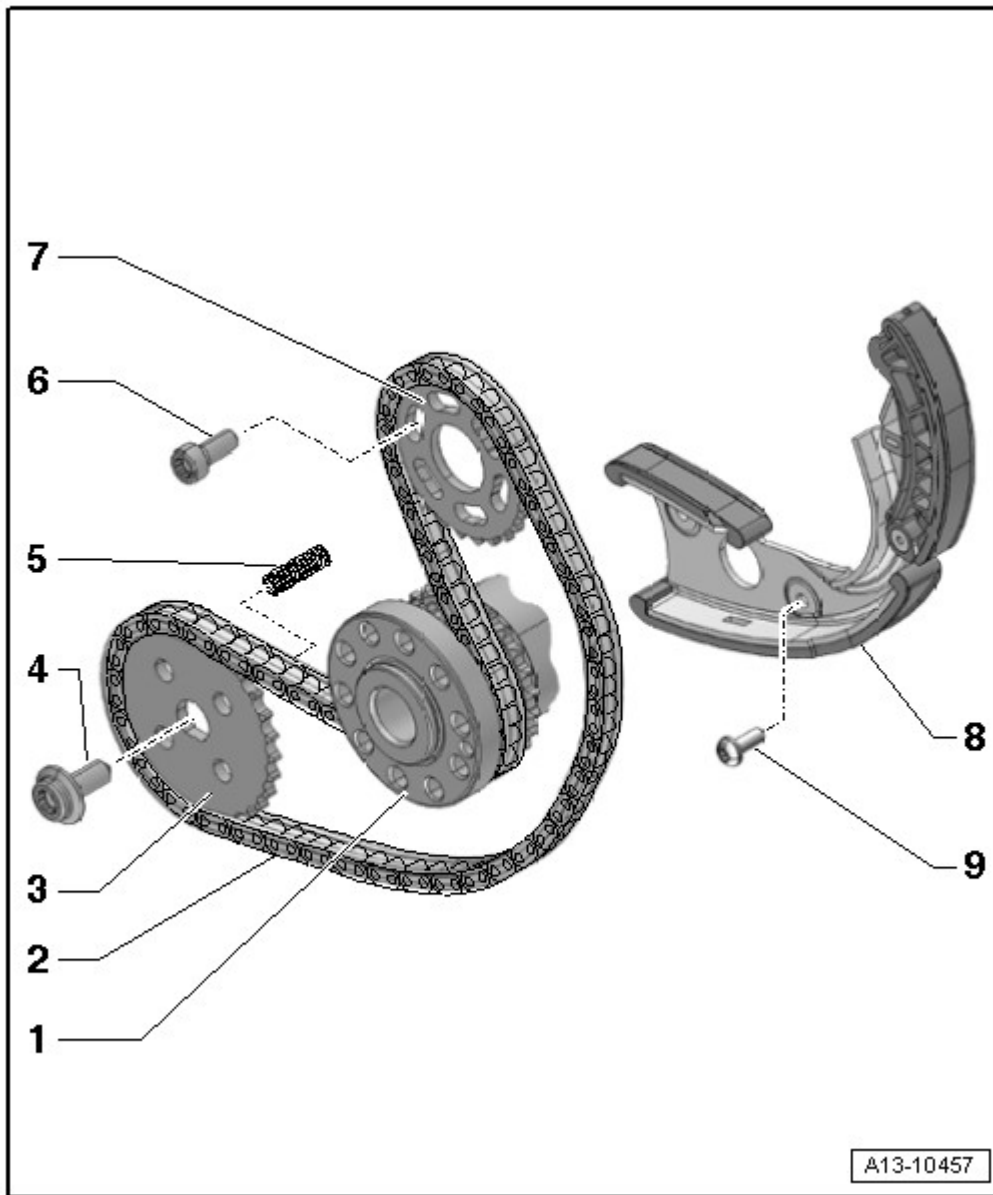


Fig. 9: Identifying Power Take-Off Drive Chain, From 04.06, Component Overview
 Courtesy of AUDI OF AMERICA, LLC

1. Crankshaft
2. Power take-off drive chain
 - Before removing, mark direction of rotation with paint
 - Removing and installing **POWER TAKE-OFF CHAIN**.
3. Drive sprocket for oil pump
 - Installation position: The labelled side faces the engine
4. Bolt
 - Replace
 - 30 Nm + an additional 90° turn

5. Spring
6. Bolt
 - Replace
 - 15 Nm + an additional 90° turn
7. Balance shaft chain sprocket
 - Installation position: The labelled side faces transmission
8. Chain tensioner
 - With guide rail
9. Bolt
 - Replace
 - 10 Nm + an additional 45° turn

BALANCE SHAFT ASSEMBLY OVERVIEW

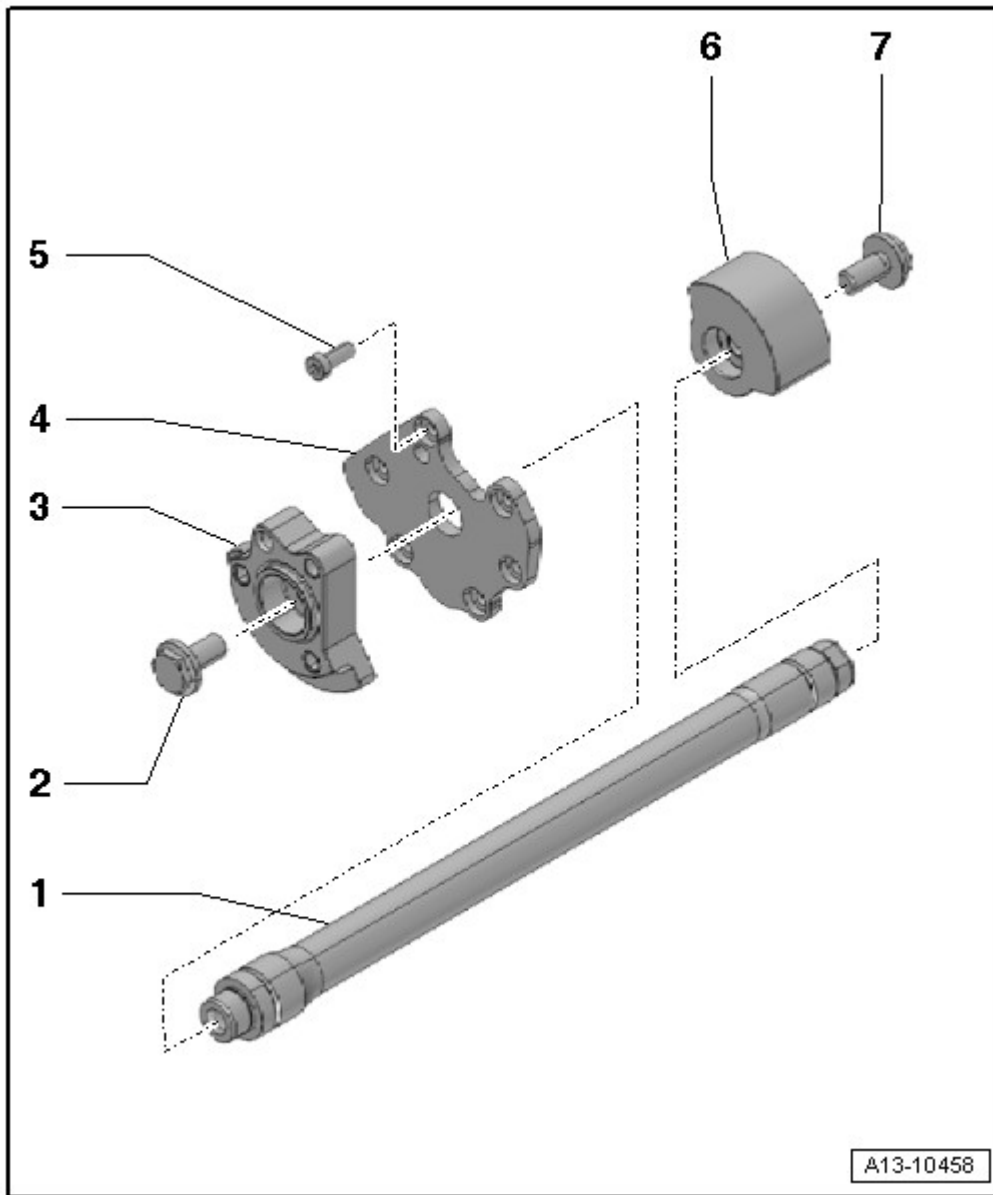


Fig. 10: Balance Shaft Overview

Courtesy of AUDI OF AMERICA, LLC

1. Balance shaft
 - Removing and installing **BALANCE SHAFT**.
2. Bolt
 - 60 Nm
 - To loosen and fasten, use 8 mm dia. drill bit as counter-holder
3. Balance shaft weight, drive plate side
 - Can only be placed on balance shaft in one position
4. Bearing end bracket
5. Bolt

- 13 Nm
- 6. Balance shaft weight, belt pulley side
 - Can only be placed on balance shaft in one position
- 7. Bolt
 - 60 Nm
 - To loosen and fasten, use 8 mm dia. drill bit as counter-holder

CYLINDER HEAD ASSEMBLY OVERVIEW

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

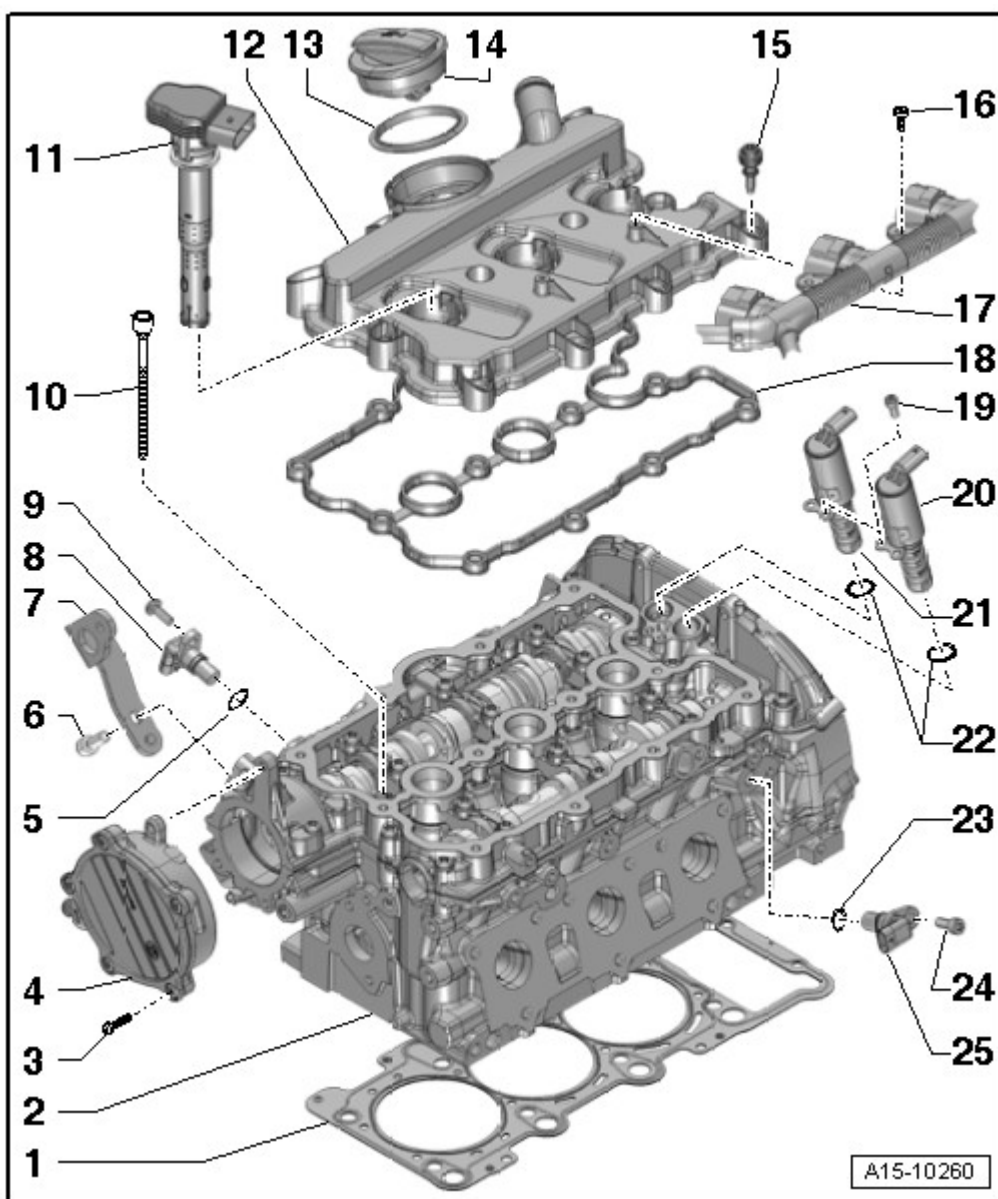


Fig. 11: Cylinder Head Overview

Courtesy of AUDI OF AMERICA, LLC

1. Cylinder head gasket
 - Replacing **CYLINDER HEADS.**
 - Installation position: Part number facing cylinder head
 - After replacing, change coolant and engine oil
2. Cylinder head
 - Removing **CYLINDER HEADS.**
 - Checking for distortion **Fig. 14**
 - Checking reworking dimension **Fig. 15**
 - Installing **CYLINDER HEADS.**
 - After replacing, change coolant and engine oil
3. Bolt
 - Tightening specifications **Brake Booster/Master Brake Cylinder Overview**
4. Vacuum pump
 - Removing and installing **Vacuum Pump V192 Overview**
5. O-ring
 - Replace
6. Bolt
 - 20 Nm
7. Engine lifting eye
8. Camshaft position sensor, intake camshaft
 - Cylinder bank 1 (right) Camshaft Position (CMP) sensor -G40-
 - Cylinder bank 2 (left) Camshaft Position (CMP) sensor 2 -G163-
9. Bolt
 - 9 Nm
10. Bolt
 - Loosening procedure **CYLINDER HEADS.**
 - Replace
 - Loosening procedure **CYLINDER HEADS.**
 - Tighten in 3 stages:
 - Tighten to 40 Nm.
 - Tighten an additional 90° turn.
 - Tighten an additional 90° turn.
11. Ignition coil
 - Use ignition coil puller T40039 for removal

12. Cylinder head cover
 - Removing and installing: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**
13. Gasket
 - Replace if damaged or leaking
14. Cap
15. Bolt
 - Replace if seal is damaged
 - Tightening specifications **Fig. 12** and **Fig. 13**.
16. Bolt
 - Tightening specifications **Removal and Installation**
17. Connector strip
 - For ignition coils
18. Cylinder head cover gasket
 - Replace if damaged or leaking
19. Bolt
 - 2.5 Nm
20. Solenoid valve for camshaft adjustment - exhaust side
 - Cylinder bank 1 (right) exhaust camshaft control valve 1 -N318-
 - Cylinder bank 2 (left) camshaft adjustment valve 2 (exhaust) -N319-
21. Solenoid valve for camshaft adjustment - intake side
 - Cylinder bank 1 (right) camshaft adjustment valve 1 -N205-
 - Cylinder bank 2 (left) camshaft adjustment valve 2 -N208-
22. O-rings
 - Replace
23. O-ring
 - Replace
24. Bolt
 - 9 Nm
25. Camshaft position sensor, exhaust camshaft
 - Cylinder bank 1 (right) Camshaft Position (CMP) sensor 3 -G300-
 - Cylinder bank 2 (left) Camshaft Position (CMP) sensor 4 -G301-

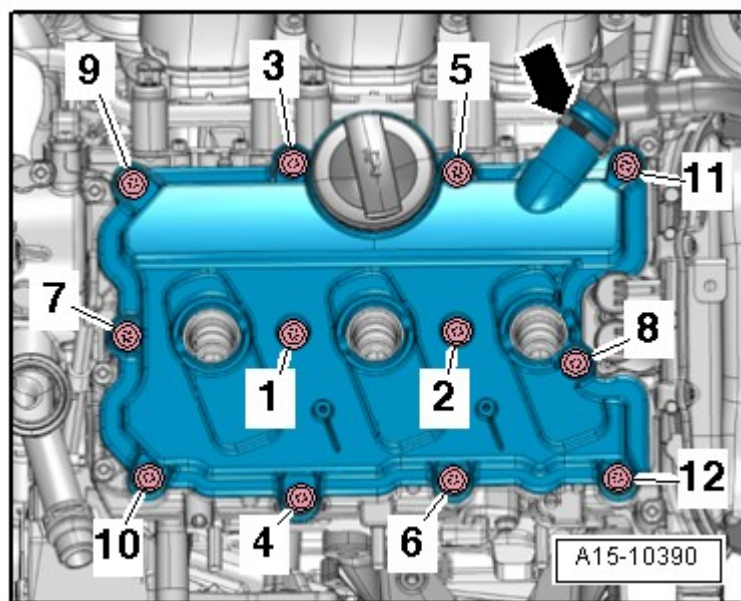


Fig. 12: Left Cylinder Head Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in sequence -1 to 12-.

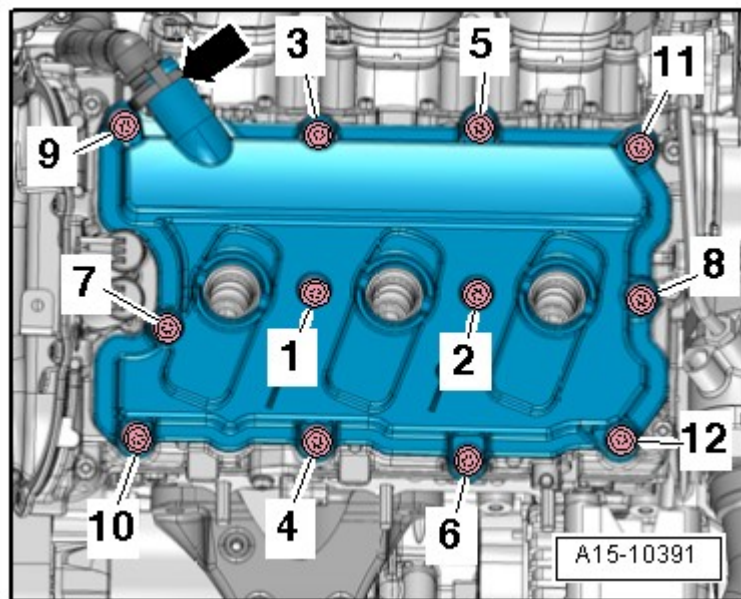


Fig. 13: Right Cylinder Head Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in sequence -1 to 12-.

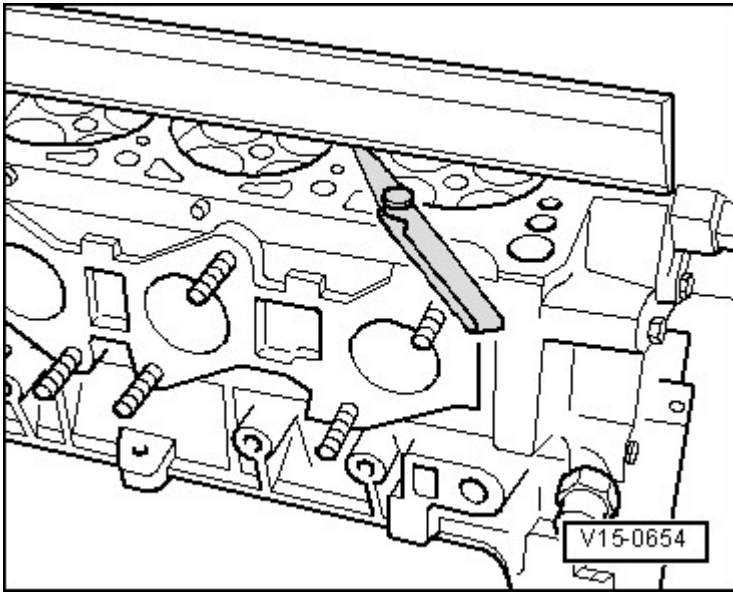


Fig. 14: Checking Cylinder Head For Distortion
Courtesy of AUDI OF AMERICA, LLC

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

- Maximum warpage: 0.05 mm.

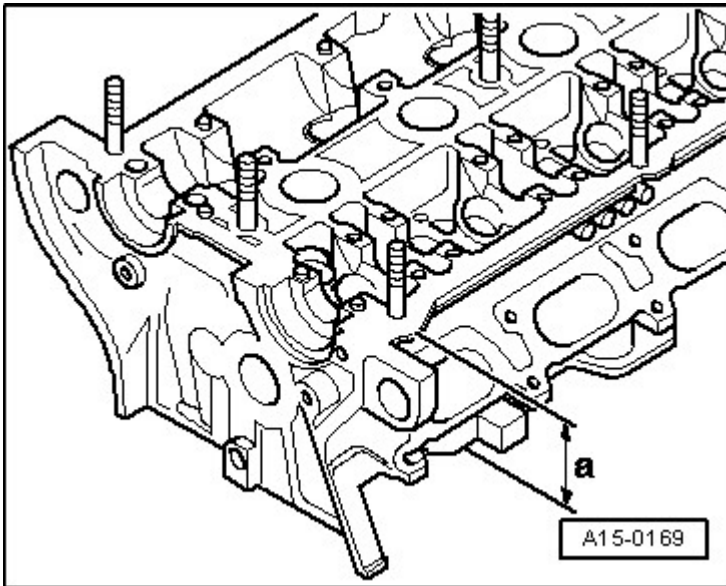


Fig. 15: Cylinder Head Refacing Dimension
Courtesy of AUDI OF AMERICA, LLC

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

- Minimum dimension -a- = 139.20 mm.

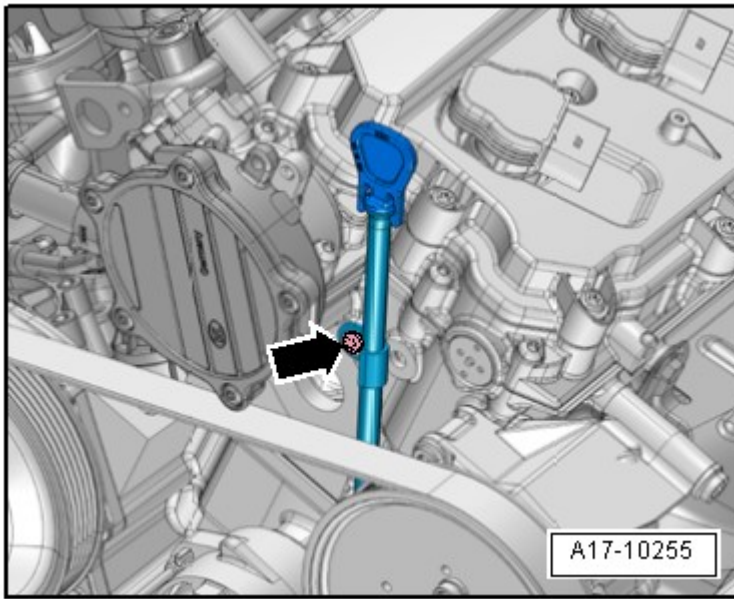


Fig. 16: Identifying Oil Dipstick Guide Tube Bolt
Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolt -arrow- to 9 Nm.

VALVETRAIN ASSEMBLY OVERVIEW

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

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



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4. Valve spring
 - Installed location **Fig. 19**
5. Hydraulic adjusting elements
 - Checking **HYDRAULIC ADJUSTING ELEMENTS, CHECKING.**
 - Mark installation position with paint for reinstallation
 - Lubricate running surfaces before installing
6. Valve spring plate
7. Valve keys
8. Roller rocker lever
 - Different versions for intake and exhaust side, do not interchange them
 - Check roller for easy movement
 - Lubricate running surfaces before installing
 - Clip to hydraulic adjusting element -5- with securing clip -9-
9. Securing clip
 - Different versions for intake and exhaust side, do not interchange them
 - Check for secure seat
10. Intake camshaft
 - With 3 camshaft sliders
 - Do not disassemble
 - Checking axial play **CAMSHAFTS, CHECKING AXIAL CLEARANCE.**
 - Removing and installing **CAMSHAFTS.**
 - 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
 - Maximum run-out: 0.04 mm
11. Bolt
 - Replace
 - Tightening sequence **Fig. 18**
12. Camshaft adjuster actuator
13. Bolt
 - 5 Nm
14. O-ring
 - Replace
15. Bearing bracket
 - With integrated camshaft bearings
 - Removing and installing **CAMSHAFTS.**
16. Compression ring
17. Compression ring

18. Exhaust camshaft

- Checking axial play **CAMSHAFTS, CHECKING AXIAL CLEARANCE.**
- Removing and installing **CAMSHAFTS.**
- 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
- Maximum run-out: 0.04 mm

19. Oil strainer

20. Intake valve

- Do not rework, only lapping is permitted
- Mark installed position for reinstallation
- Valve dimensions **VALVE DIMENSIONS.**
- Check valve guides **VALVE GUIDES, CHECKING.**

21. Exhaust valve

- Do not rework, only lapping is permitted
- Mark installed position for reinstallation
- Valve dimensions **VALVE DIMENSIONS.**
- Check valve guides **VALVE GUIDES, CHECKING.**

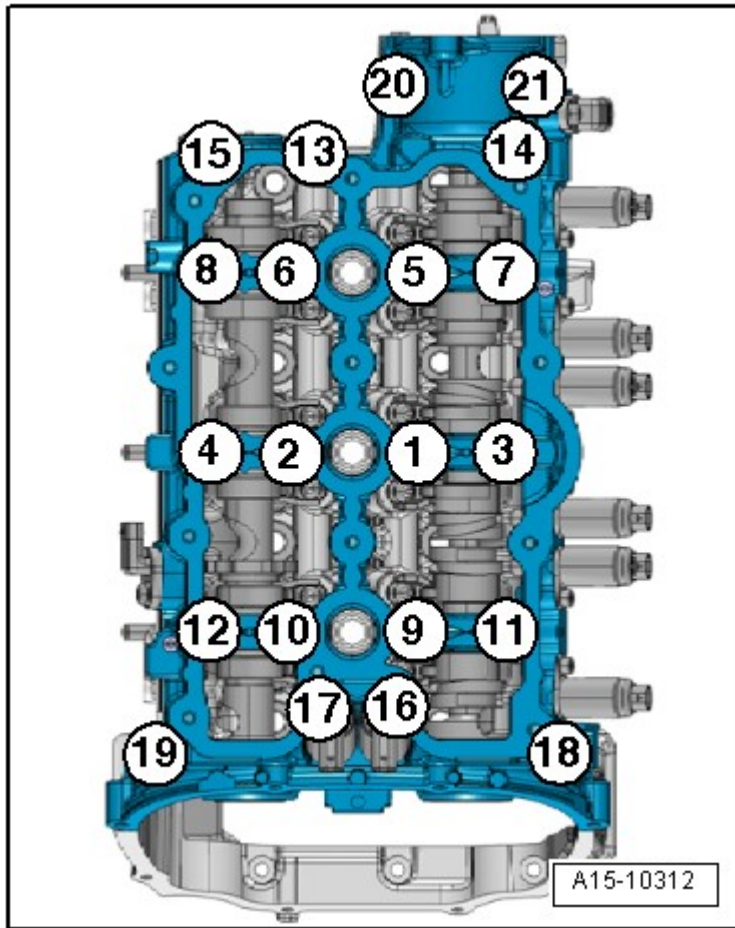


Fig. 18: Guide Frame Bolt, Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the guide frame for the left cylinder head.

- Replace guide frame bolts.
- Tighten bolts in 3 stages in sequence -1 to 21- :
- Install bolts by hand as far as stop.
 - The guide frame must be in contact with the entire contact surface of the cylinder head.
- Tighten to 8 Nm.
- Tighten an additional 90° turn.

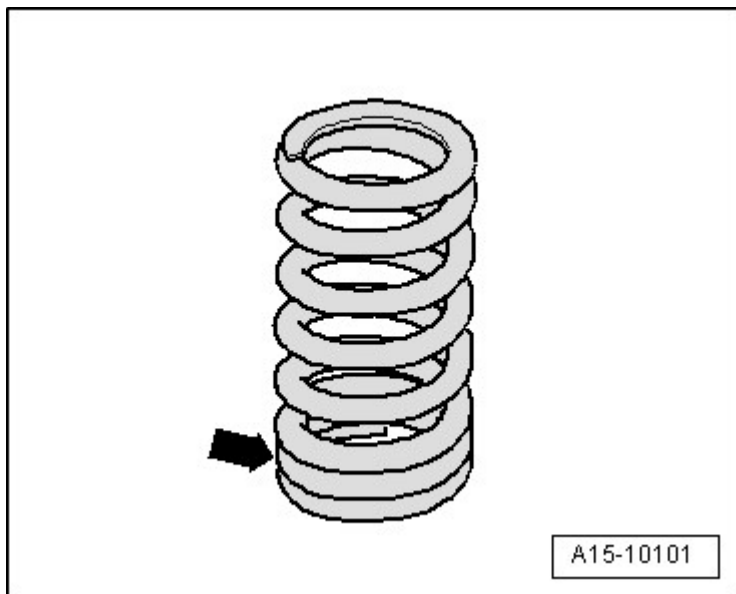


Fig. 19: Identifying Tight Spring Coils
 Courtesy of AUDI OF AMERICA, LLC

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

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Components	Bolt Size	Nm
Camshaft Adjuster Bolt ⁽¹⁾		80 + 90° turn
Camshaft Clamp Bolt		25
Crankshaft Holder		25
Oil Dipstick Tube Guide Bolt		9
(1) Always replace		

LEFT TIMING CHAIN COVER BOLT TIGHTENING SEQUENCE AND SPECIFICATION

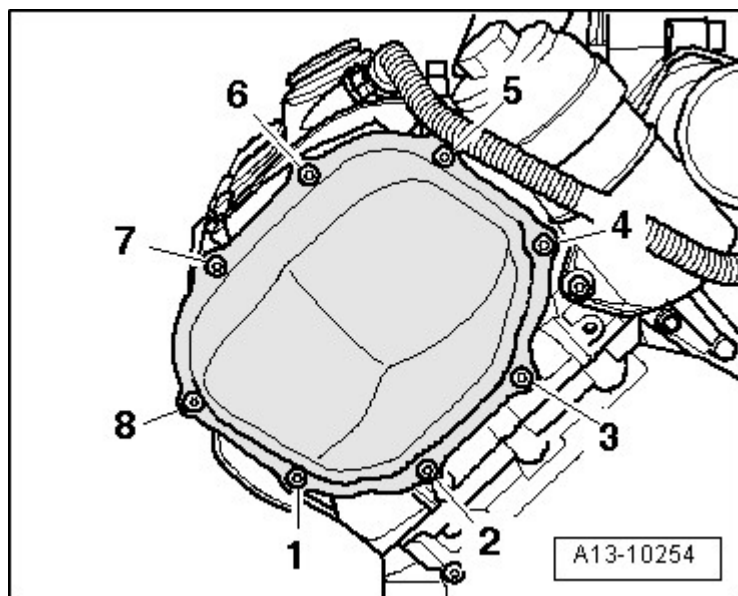


Fig. 20: Left Timing Chain Cover Bolt Tightening Sequence & Specification
 Courtesy of AUDI OF AMERICA, LLC

- Replace bolts for left timing chain cover.
- Tighten bolts in 2 stages in -1 to 8- sequence as follows:
- Tighten to 5 Nm.
- Tighten an additional 90° turn.

RIGHT TIMING CHAIN COVER BOLT TIGHTENING SEQUENCE AND SPECIFICATION

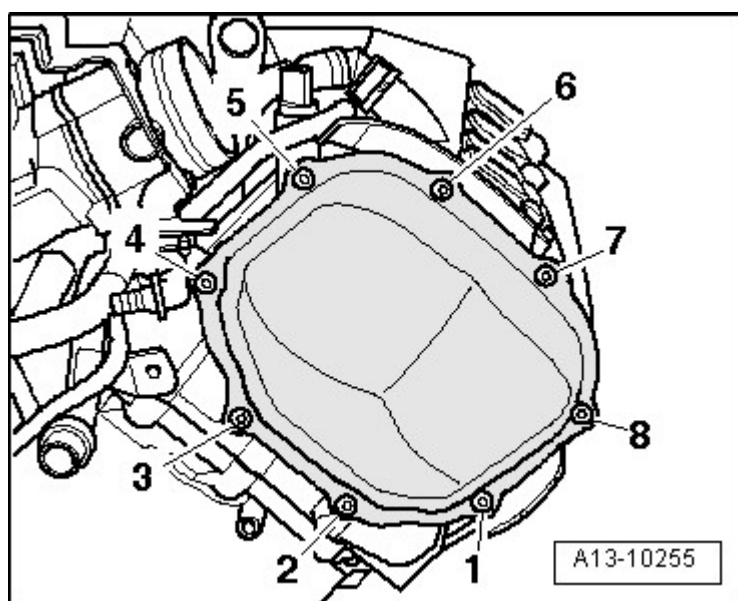


Fig. 21: Right Timing Chain Cover Bolt Tightening Sequence & Specification

Courtesy of AUDI OF AMERICA, LLC

- Replace bolts for right timing chain cover.
- Tighten bolts in 2 stages in -1 to 8- sequence as follows:
- Tighten to 5 Nm.
- Tighten an additional 90° turn.

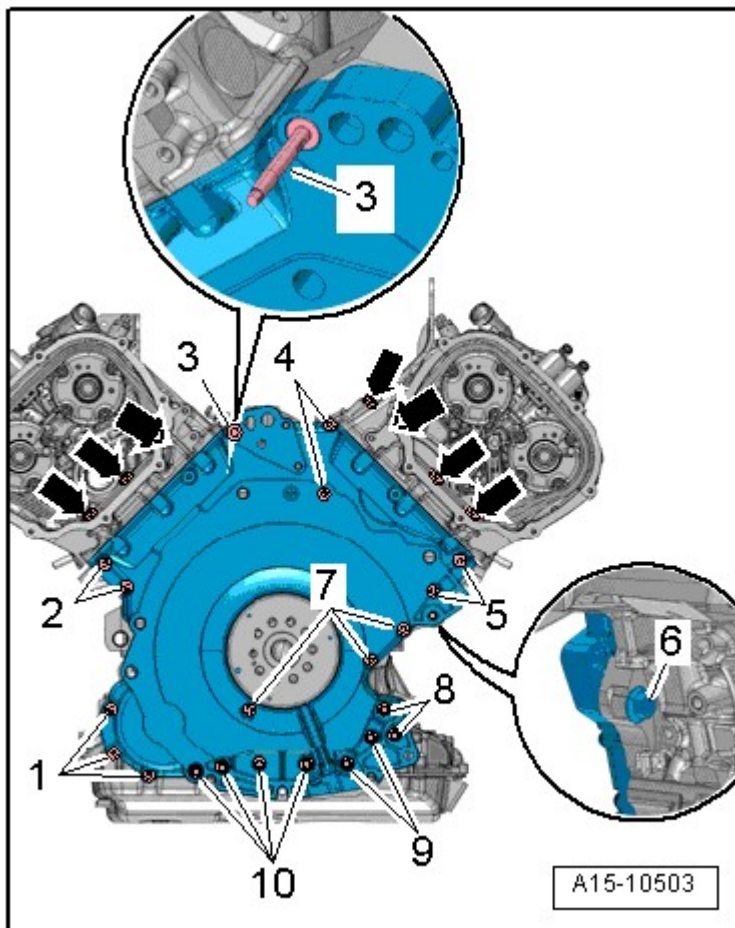
LOWER TIMING CHAIN COVER BOLT TIGHTENING SEQUENCE AND SPECIFICATION

Fig. 22: Lower Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

- Tighten bolts in 6 stages as follows:
- Insert bolts -arrows- and tighten them to 5 Nm.
- Tighten bolts -1 to 10- in a diagonal sequence to 9 Nm.

-- Tighten bolts -arrows- to 9 Nm.

-- Tighten bolts -8, 9 and 10- to 22 Nm.

-- Tighten bolt -3- to 16 Nm.

-- Tighten bolt -6- to 70 Nm.

LEFT CYLINDER HEAD COVER BOLT TIGHTENING SEQUENCE AND SPECIFICATION

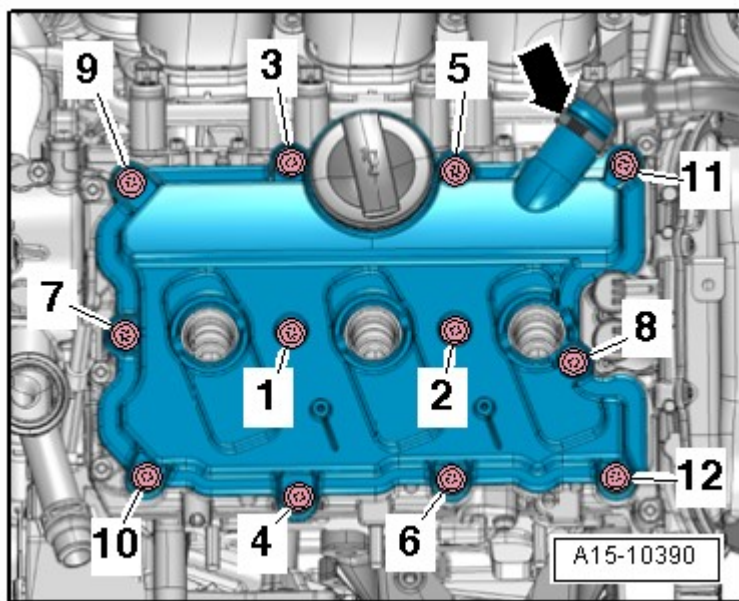


Fig. 23: Left Cylinder Head Cover Bolt Tightening Sequence & Specification
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in sequence -1 to 12-.

RIGHT CYLINDER HEAD COVER BOLT TIGHTENING SEQUENCE AND SPECIFICATION

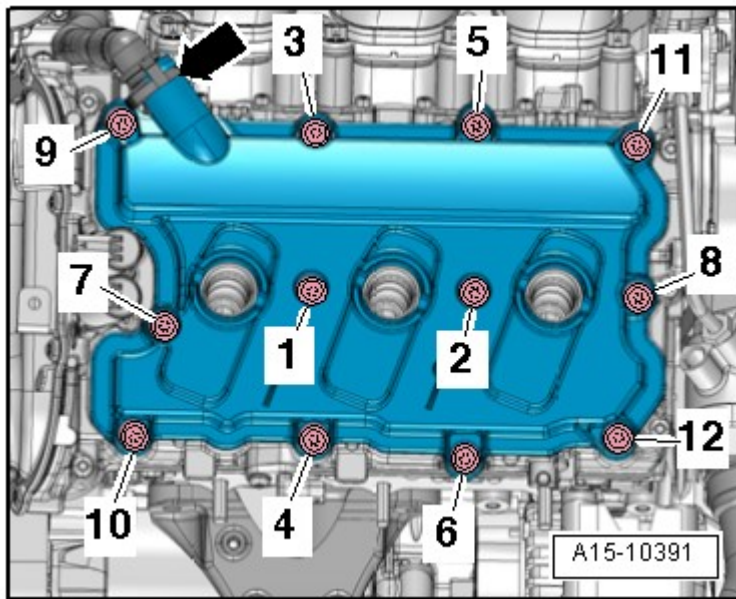


Fig. 24: Right Cylinder Head Cover Bolt Tightening Sequence & Specification
 Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts to 9 Nm in sequence -1 to 12-.

LEFT CYLINDER HEAD BOLT TIGHTENING SEQUENCE AND SPECIFICATION

-- Insert bolts -1 through 7- while sliding unloaded camshaft slider -A- accordingly.

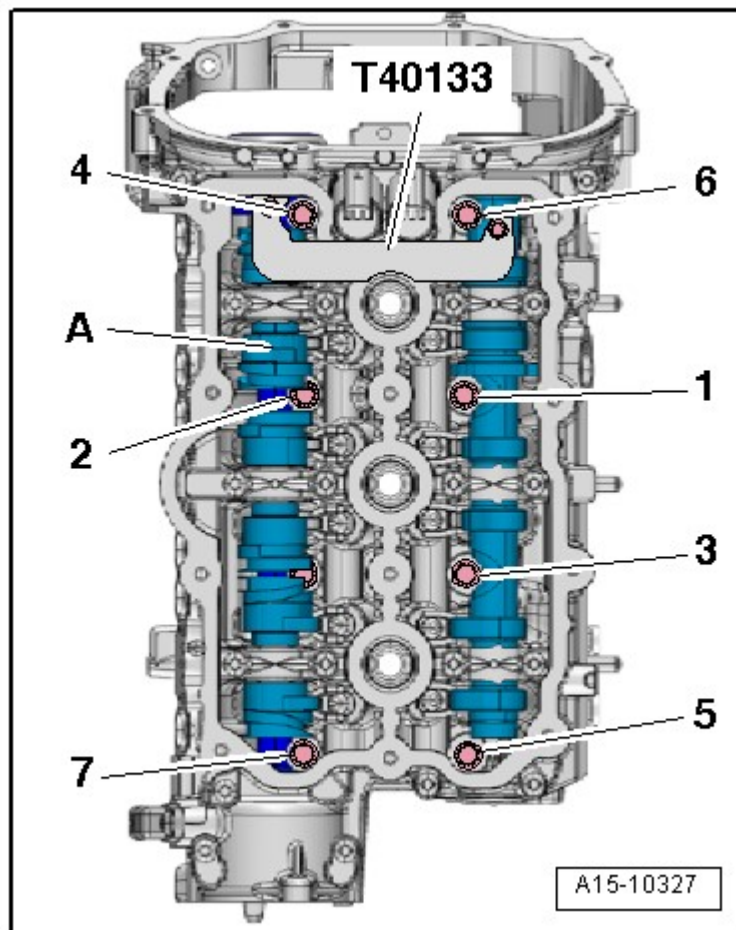


Fig. 25: Identifying Unloaded Camshaft Slider & Bolts (Left Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 3 stages in sequence -1 to 7- **CYLINDER HEAD ASSEMBLY OVERVIEW.**

-- Insert bolt -15- and tighten it in a total of 3 stages **CYLINDER HEAD ASSEMBLY OVERVIEW.**

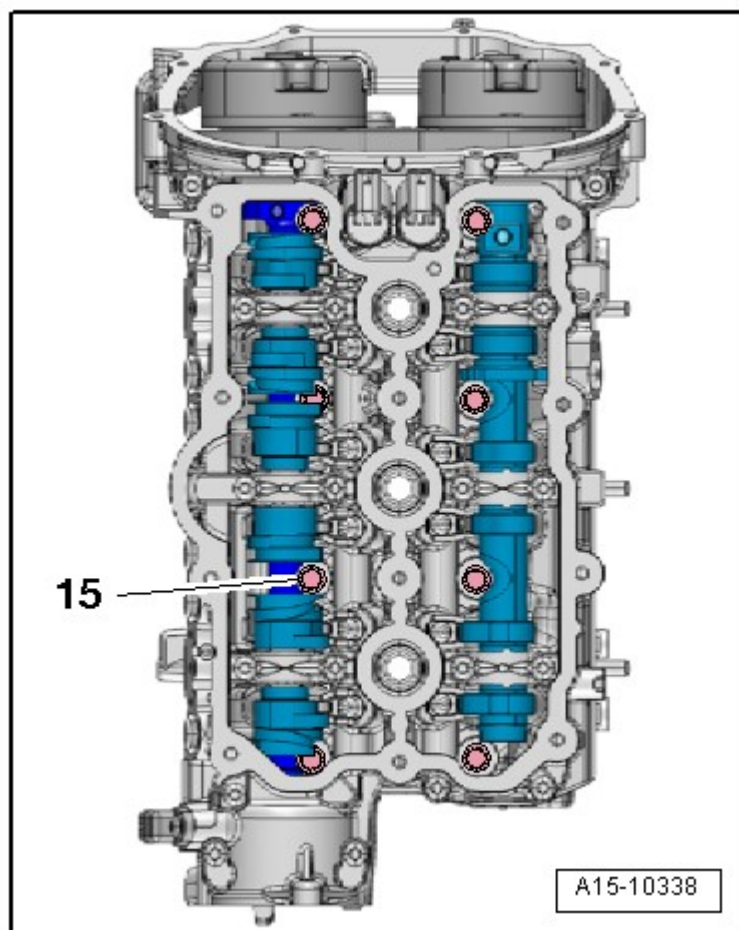


Fig. 26: Identifying Bolt

Courtesy of AUDI OF AMERICA, LLC

RIGHT CYLINDER HEAD BOLT TIGHTENING SEQUENCE AND SPECIFICATION

-- Insert bolts -8 through 14- while sliding unloaded camshaft sliders -D- and -E- accordingly.

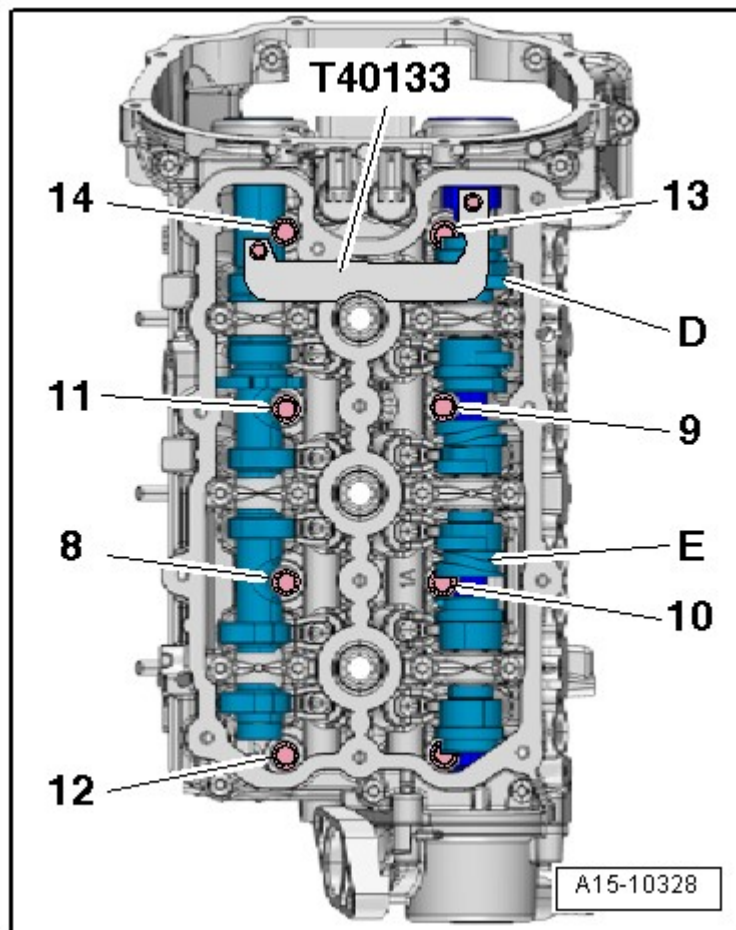


Fig. 27: Identifying Unloaded Camshaft Slider & Bolts (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 3 stages in sequence -8 to 14- **CYLINDER HEAD ASSEMBLY OVERVIEW.**

-- Insert bolt -16- and tighten it in a total of 3 stages **CYLINDER HEAD ASSEMBLY OVERVIEW.**

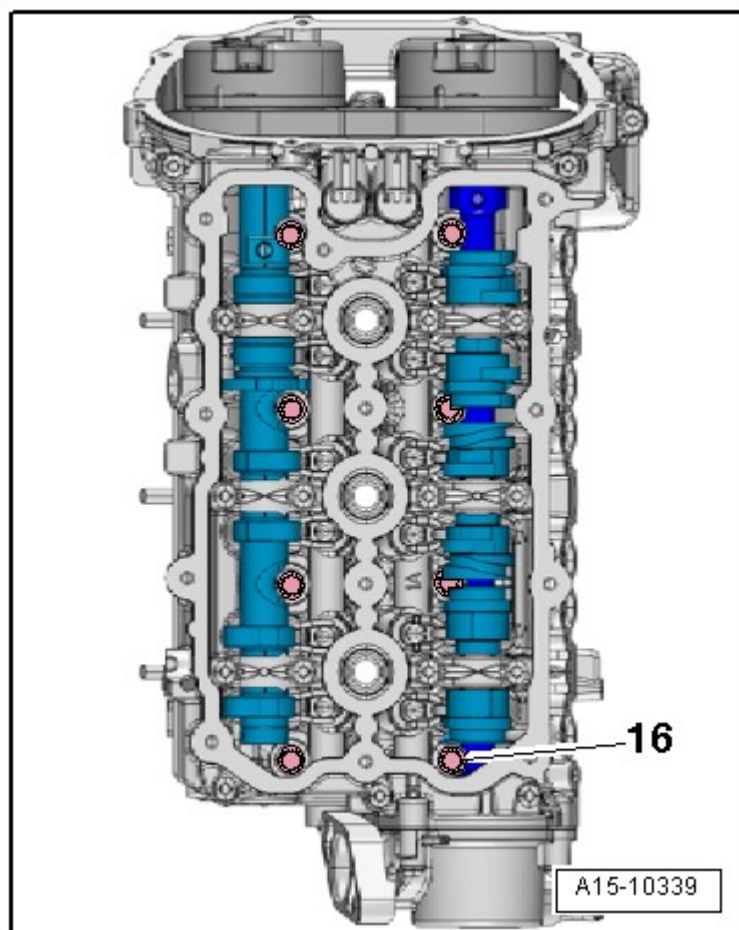


Fig. 28: Identifying Bolt -16-

Courtesy of AUDI OF AMERICA, LLC

GUIDE FRAME BOLT TIGHTENING SEQUENCE AND SPECIFICATION

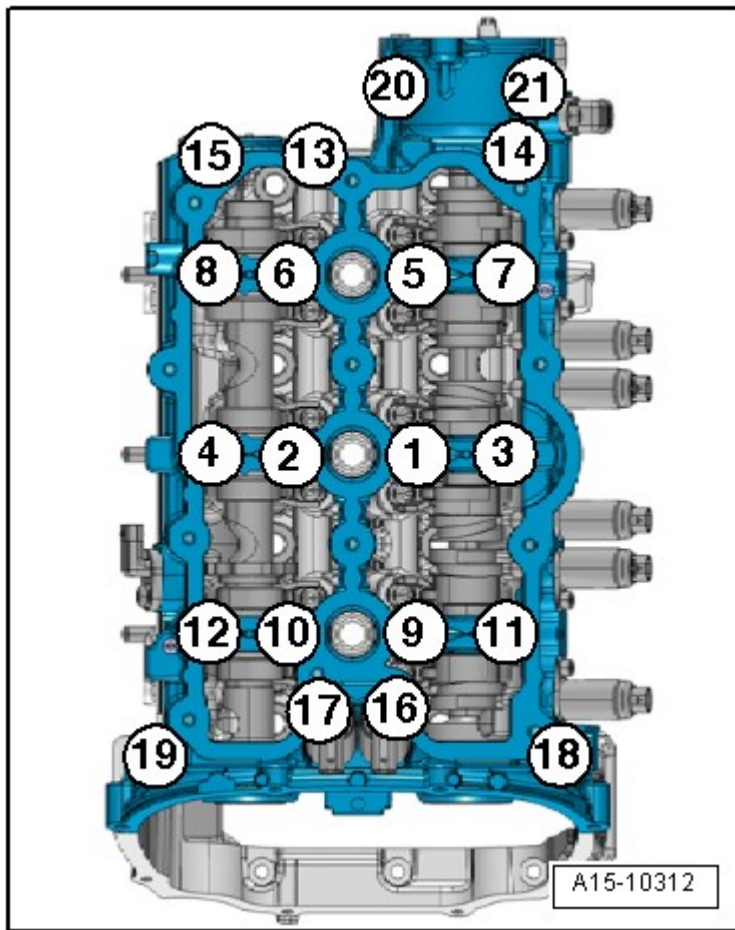


Fig. 29: Guide Frame Bolt, Tightening Sequence
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the guide frame for the left cylinder head.

-- Replace guide frame bolts.

-- Tighten bolts in 3 stages in sequence -1 to 21- :

-- Install bolts by hand as far as stop.

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

-- Tighten to 8 Nm.

-- Tighten an additional 90° turn.

VALVE DIMENSIONS

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

permitted.

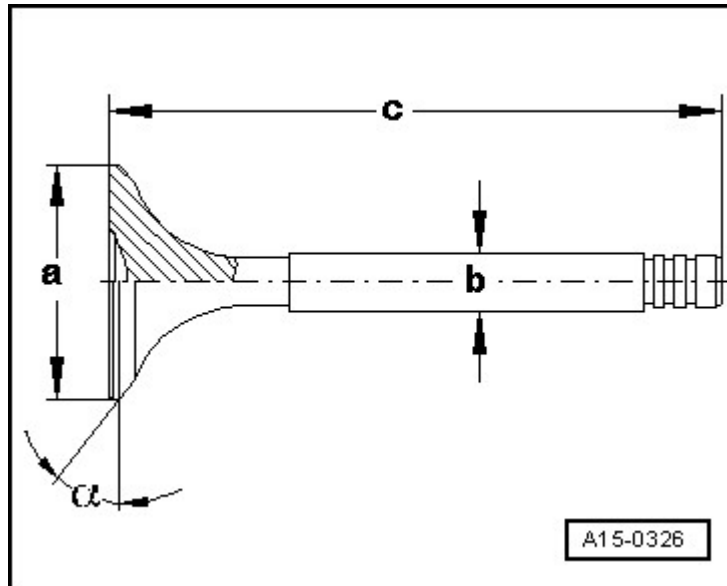


Fig. 30: Identifying Valve Dimensions
Courtesy of AUDI OF AMERICA, LLC

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	104.0 ± 0.2	101.9 ± 0.2
a	degrees	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

Proceed as follows:

- Engine oil temperature at least 30° C.
- Battery voltage at least 12.5 V.

-- Remove rear engine cover -top arrows-.

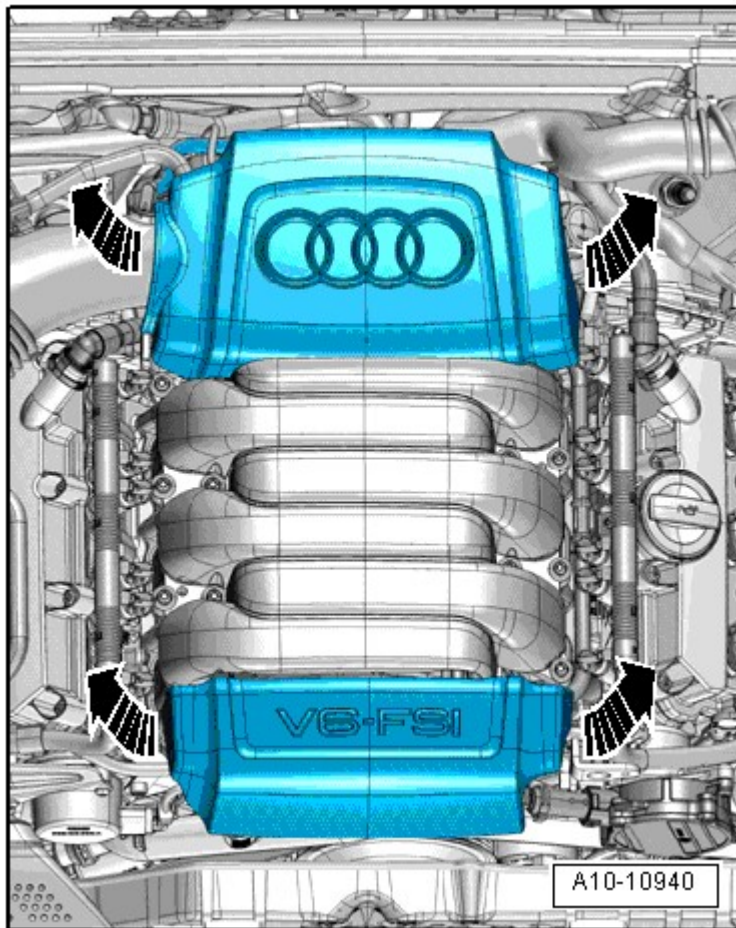


Fig. 31: Identifying Engine Cover
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows-.

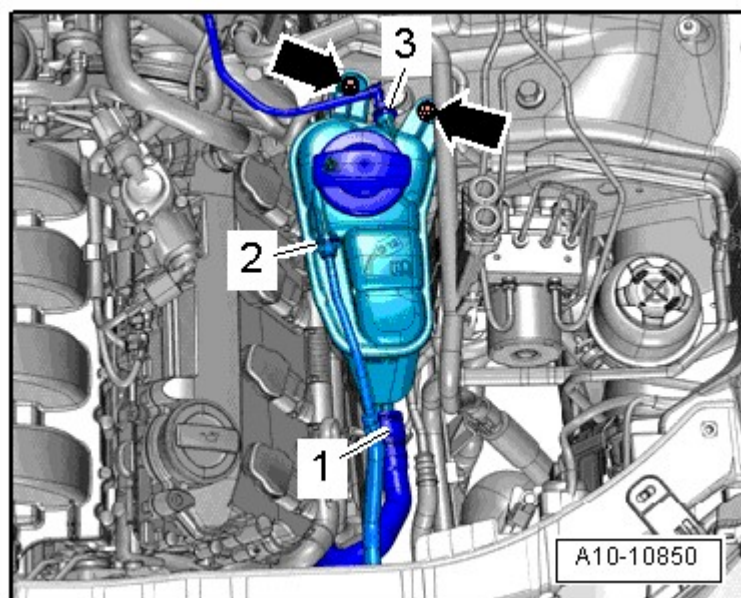


Fig. 32: Identifying Coolant Hose And Coolant Reservoir
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector on Engine Coolant Level (ECL) warning switch -F66- and lay coolant reservoir aside with coolant hoses -1, 2 and 3- connected.

-- Remove bolts -arrows- and disconnect electrical connectors to ignition coils on left cylinder head.

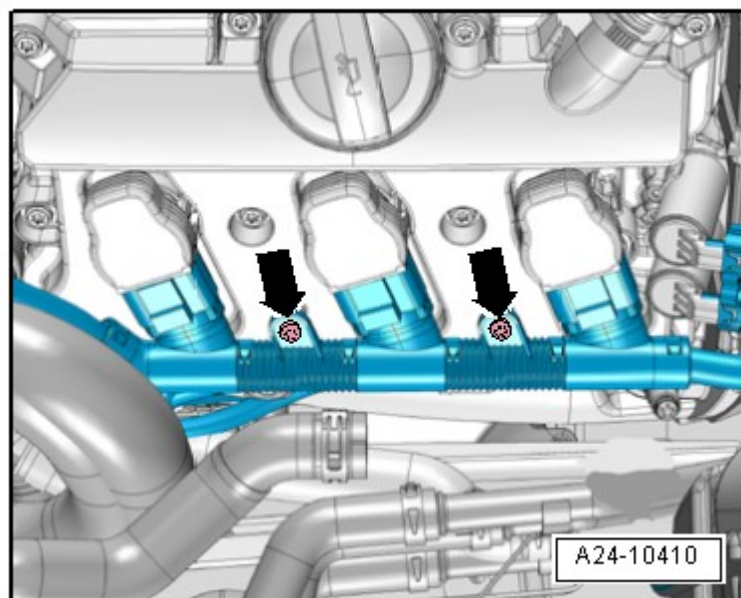


Fig. 33: Identifying Screws From Ignition Coil Wiring Harness
Courtesy of AUDI OF AMERICA, LLC

-- Press electrical wiring harness down slightly.

-- Disconnect electrical connector -3- to fuel injectors on rear of left cylinder head.

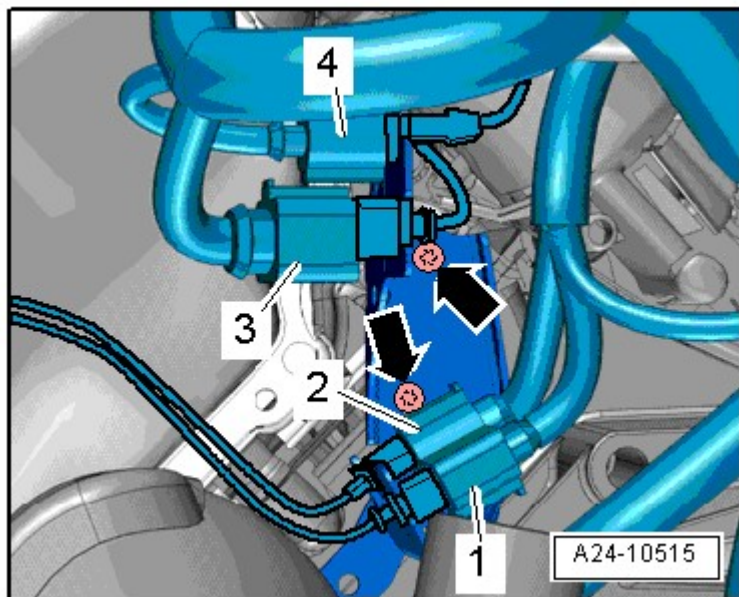


Fig. 34: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1, 2 and 4- and -arrows-.

-- Remove air duct -arrows-.

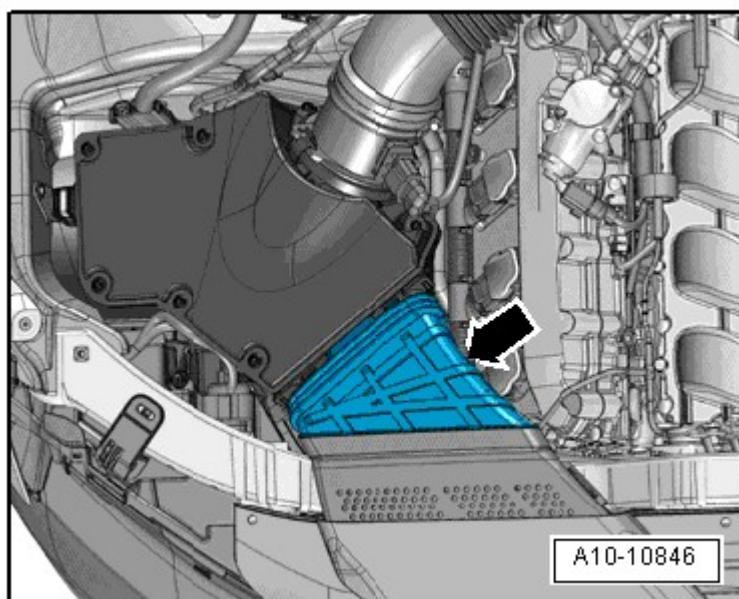


Fig. 35: Identifying Air Duct
Courtesy of AUDI OF AMERICA, LLC

-- Free up fuel line -1- and wire -2- to EVAP canister at the air guide pipe.

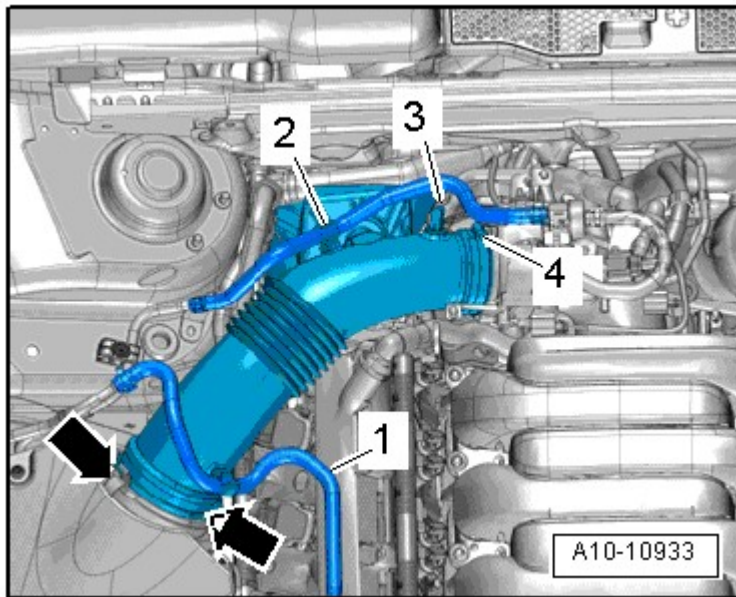


Fig. 36: Freeing Up Fuel Hose On Air Duct Pipe

Courtesy of AUDI OF AMERICA, LLC

-- Remove vacuum hose -3- from connection on air guide pipe.

-- Remove air guide pipe by loosening hose clamp -4- and opening clips -arrows-.

-- Disconnect vacuum line -1-.

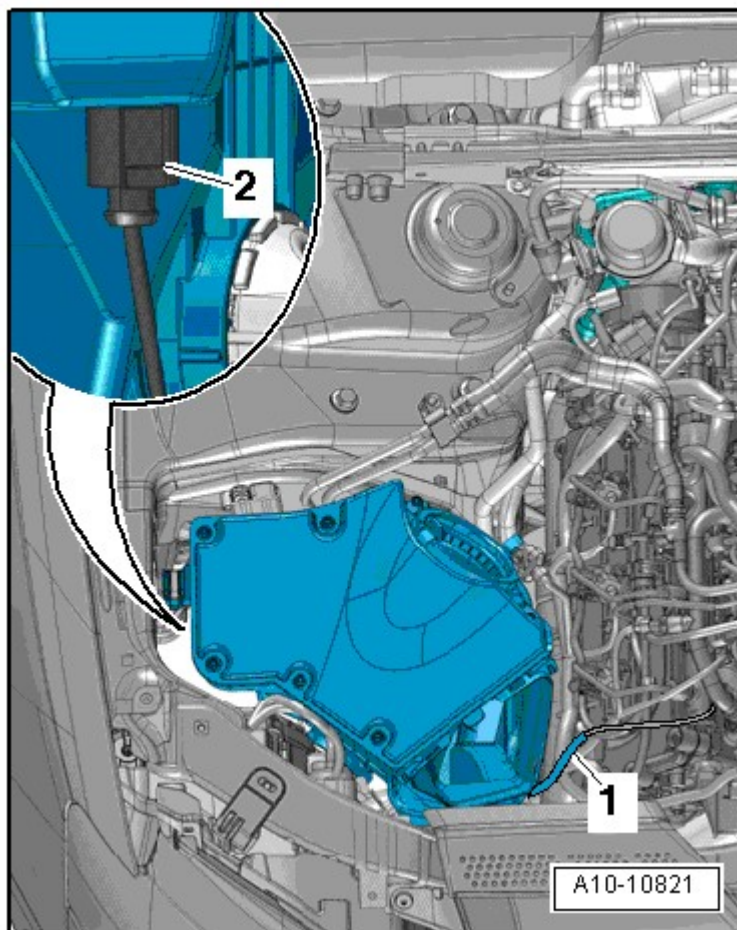


Fig. 37: Disconnecting Vacuum Line
Courtesy of AUDI OF AMERICA, LLC

-- Remove air filter housing and, if applicable, disconnect electrical connector -2- on rear side at intake air switch-over valve -N335-.

-- Remove bolts -arrows- and disconnect electrical connectors to ignition coils on right cylinder head.

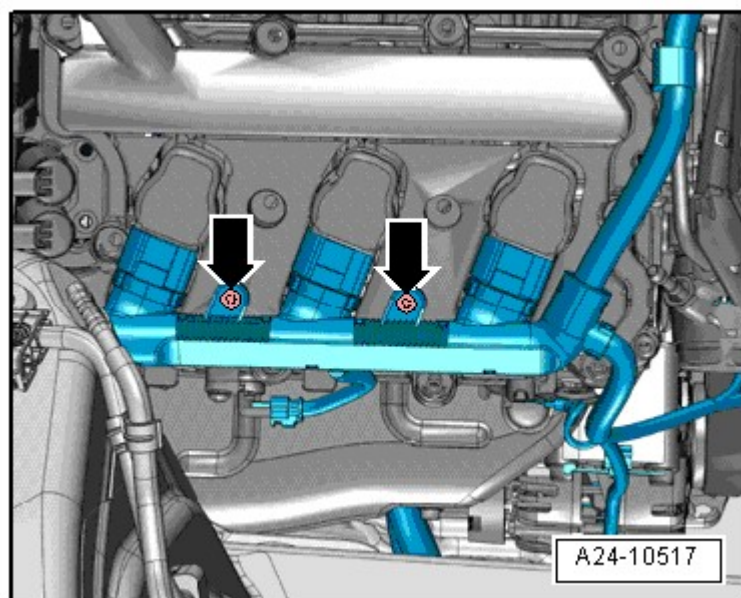


Fig. 38: Identifying Bolts On Right Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

-- Press electrical wiring harness to side.

-- Disconnect electrical connector -3- to fuel injectors on rear of right cylinder head.

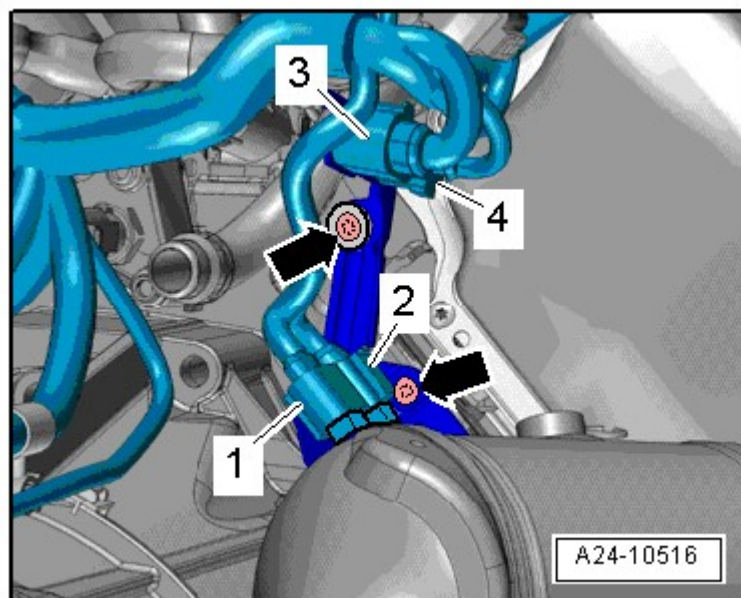


Fig. 39: Identifying Bolts -Arrows- And Right Connector Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1, 2 and 4- and -arrows-.

-- Remove all ignition coils using ignition coil puller T40039.

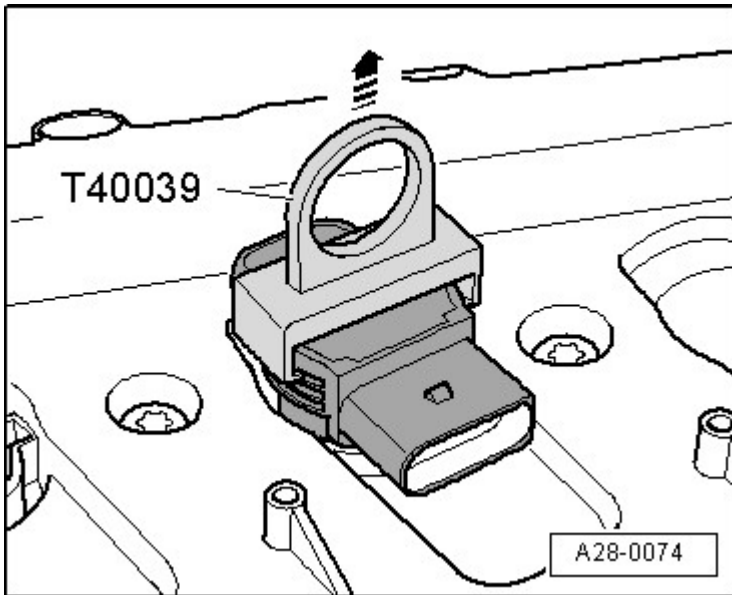


Fig. 40: Identifying Ignition Coil Puller T40039 Removing Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

-- Remove spark plugs with spark plug removal tool 3122 B.

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

NOTE: Using tester operating instructions.

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

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

ASSEMBLING

- Tightening specifications **CYLINDER HEAD ASSEMBLY OVERVIEW.**

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

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

-- Install spark plugs

Faults are saved in ECM when electrical connectors are disconnected:

- Connect vehicle diagnosis, testing and information system VAS 5051B.
- Start "Guided Functions" operating mode.
- Generate readiness code in ECM.

CAMSHAFTS, CHECKING AXIAL CLEARANCE

Special tools and workshop equipment required

- Dial gauge holder VW 387
- Dial gauge VAS 6080

Procedure

Proceed as follows:

- Perform measurement with roller rocker levers and hydraulic adjusting elements removed.
- Secure dial gauge holder VW 387 with dial gauge VAS 6079 on cylinder head as shown in the illustration.

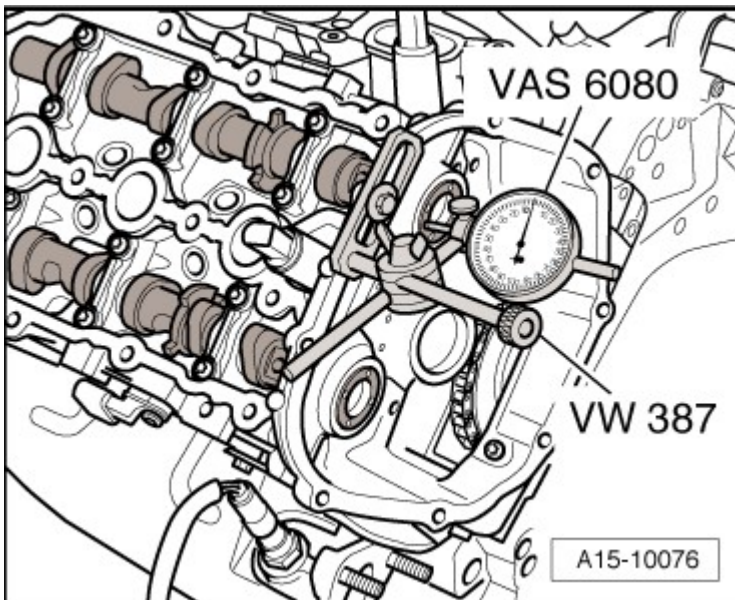


Fig. 41: Securing Dial Gauge Holder VW 387 To Dial Gauge VAS 6080 On Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

- Determine axial play.
 - 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

- Feeler gauge

Procedure

Proceed as follows:

- Start engine and let it run until coolant fan switches on once.
- Increase engine speed for about 2 minutes to approximately 2500 RPM, perform a road test if necessary.
- If hydraulic adjusting elements are still loud, determined which one is faulty as follows.
- Remove cylinder head cover: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.
- Rotate crankshaft until cam lobes on adjusting element that will be checked face upward. To do this, move vehicle forward with 4th gear engaged and ignition switched off.
- To determine the play between cam lobes and roller rocker lever, press lever down -arrow-.

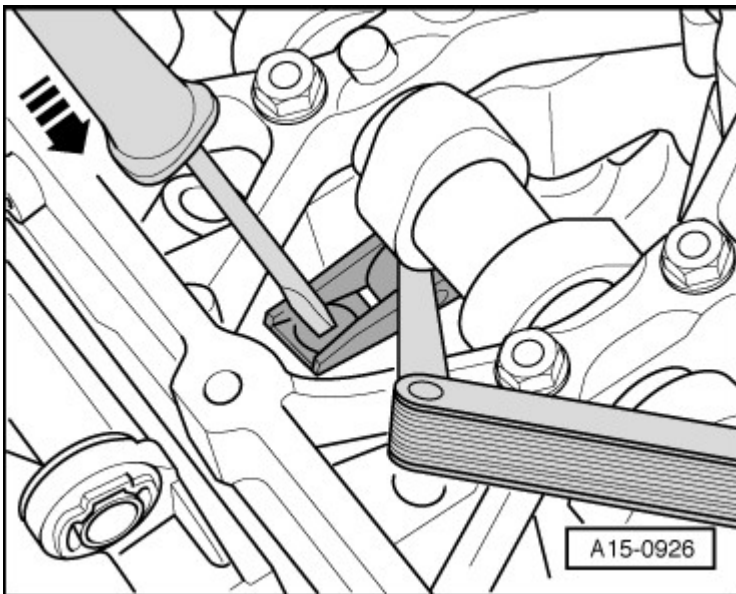


Fig. 42: Checking Play Between Cam Lobes And Roller Rocker Lever
Courtesy of AUDI OF AMERICA, LLC

-- If a 0.20 mm feeler gauge can slide between cam lobes and roller rocker lever, replace hydraulic adjusting element **CAMSHAFTS**.

Final Procedures

-- Install cylinder head cover: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.

VALVE GUIDES, CHECKING

Special tools and workshop equipment required

- Dial gauge holder VW 387
- Dial gauge VAS 6079

Procedure

Proceed as follows:

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

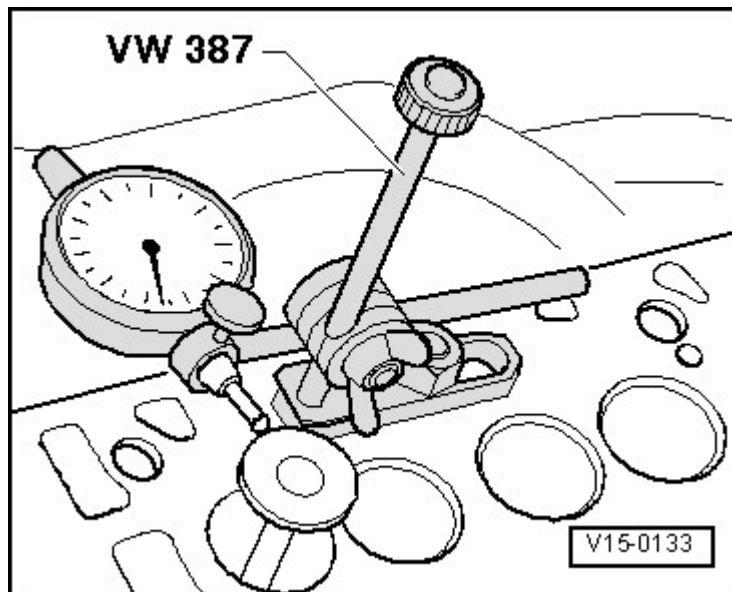


Fig. 43: Determining Valve Rock (Wear Limit)
Courtesy of AUDI OF AMERICA, LLC

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

-- Place valve in valve guide.

- Valve stem tip must seal with valve guide.

-- Determine tip clearance.

- Wear limit: 0.8 mm.

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

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

NOTE: The valve guides cannot be replaced.

VALVES, CHECKING

Proceed as follows:

-- 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 glasses
- Sealant

REMOVING

Proceed as follows:

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

-- Remove rear engine cover -top arrows-.

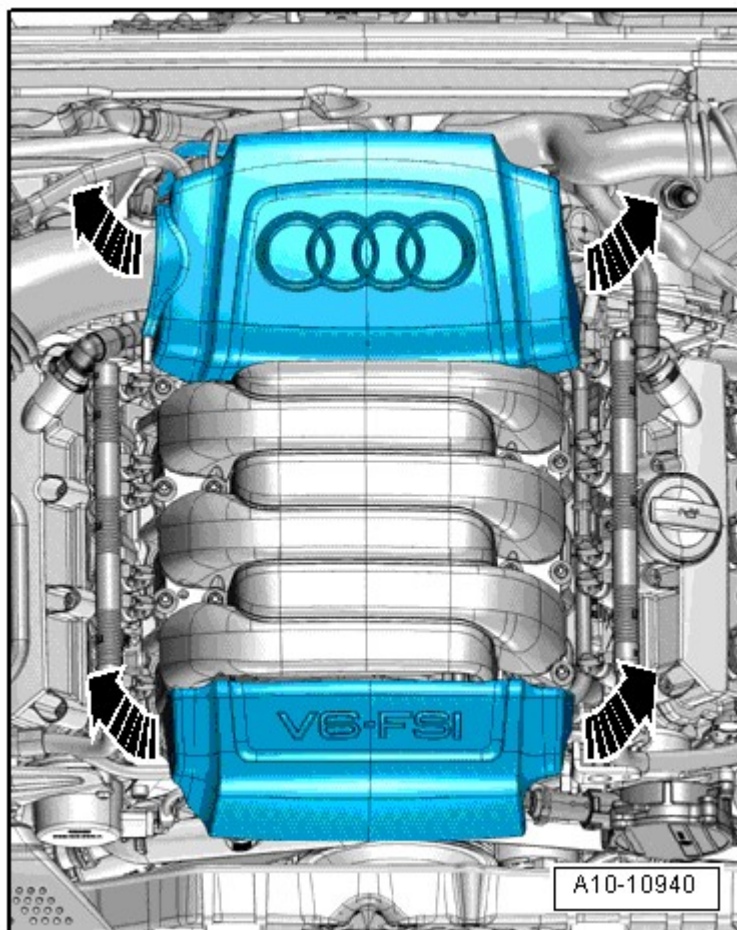


Fig. 44: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Remove plenum chamber bulkhead **Description and Operation** .

Left Timing Chain Cover

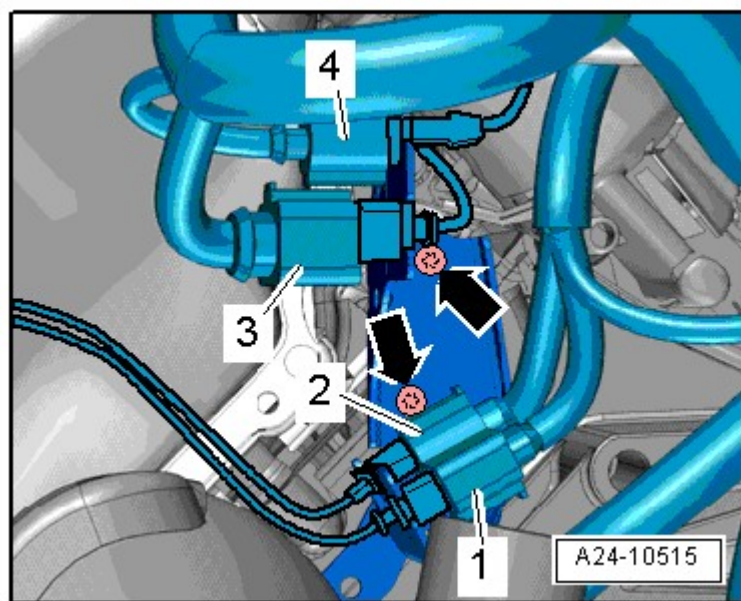


Fig. 45: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

-- Remove electrical connectors -1 through 4- from bracket and press to the side.

NOTE: Ignore -arrows-.

-- Free up electrical wires.

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

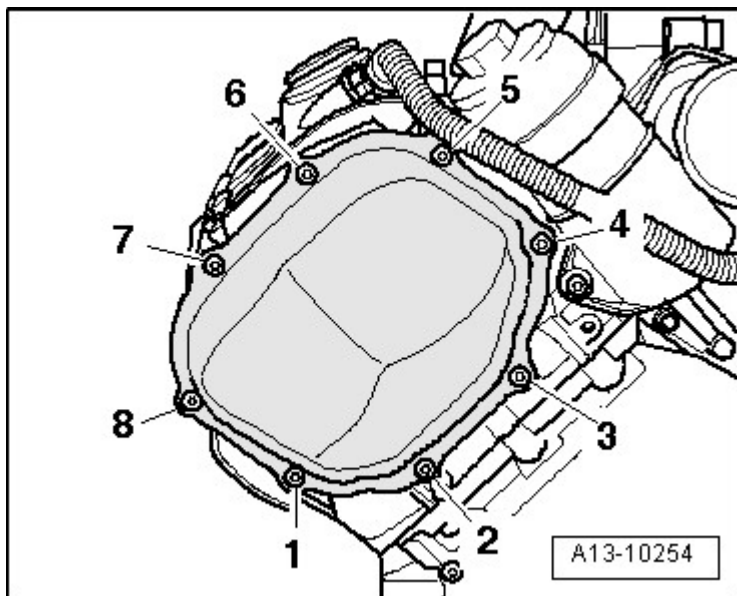


Fig. 46: Left Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

Right Timing Chain Cover

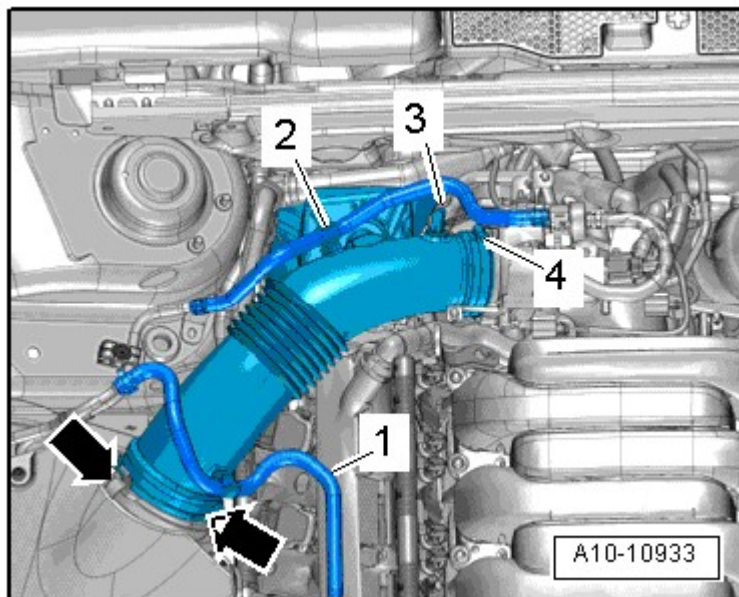


Fig. 47: Freeing Up Fuel Hose On Air Duct Pipe

Courtesy of AUDI OF AMERICA, LLC

- Free up fuel line -1- and wire -2- to EVAP canister at the air guide pipe.
- Remove vacuum hose -3- from connection on air guide pipe.
- Remove air guide pipe by loosening hose clamp -4- and opening clips -arrows-.
- Remove electrical connectors -1 through 4- from bracket and press to the side.

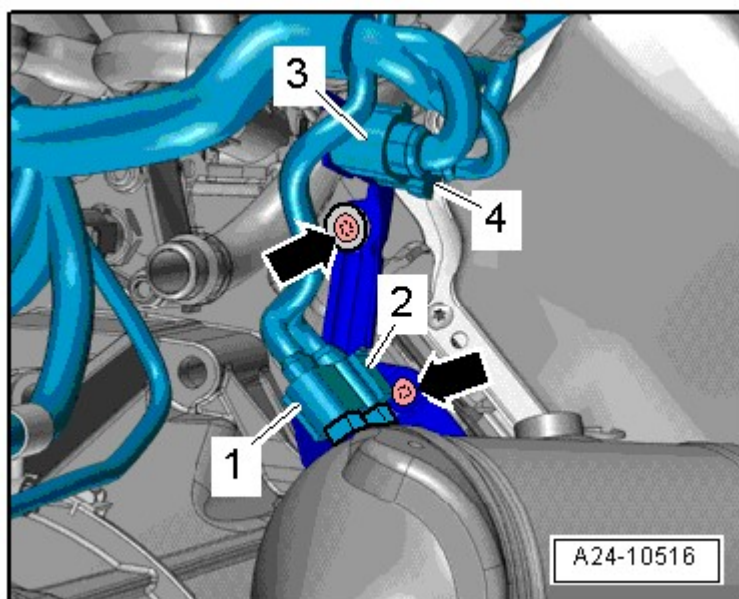


Fig. 48: Identifying Bolts -Arrows- And Right Connector Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -arrows-.

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

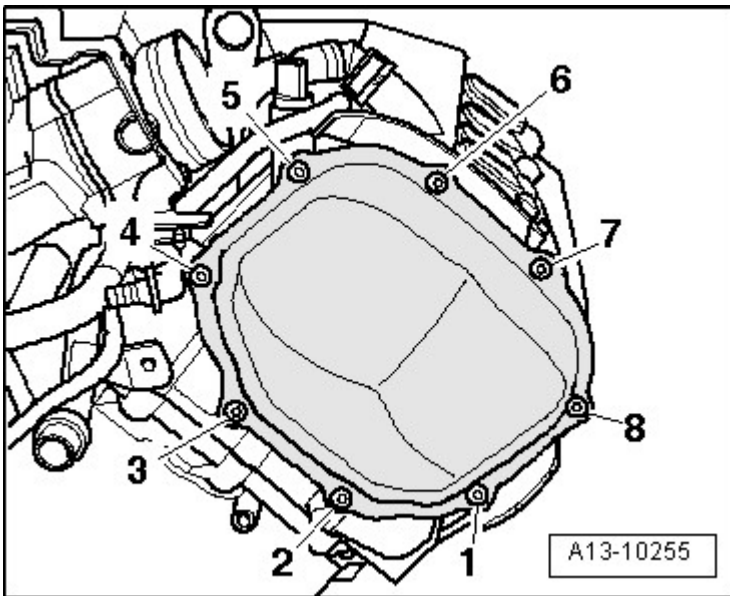


Fig. 49: Right Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

INSTALLING

- Tightening specifications **Fig. 2, Fig. 3**

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

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

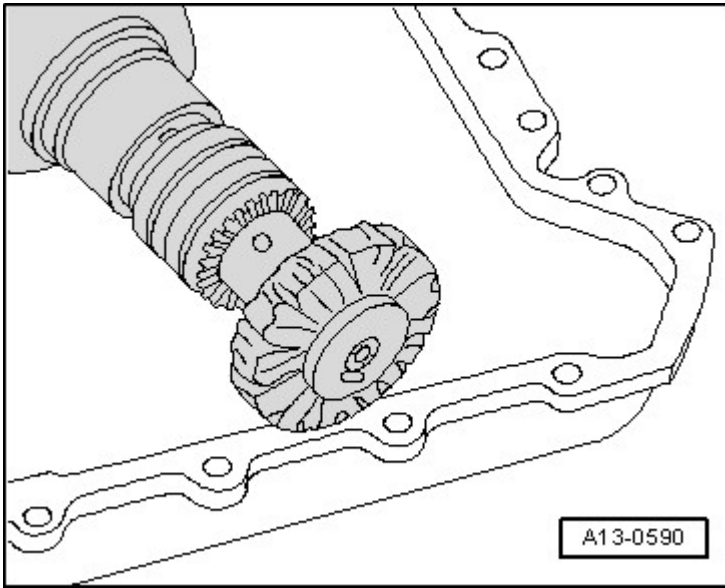


Fig. 50: Identifying Rotating Plastic Brush
Courtesy of AUDI OF AMERICA, LLC

- Clean sealing surfaces, must be free of oil and grease.
- Cut tube nozzle at front marking (nozzle diameter approximately 2 mm).

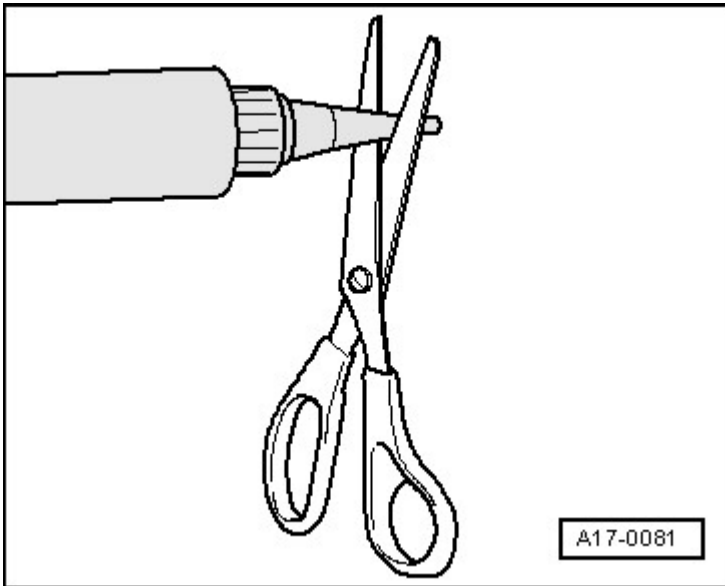


Fig. 51: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of AUDI OF AMERICA, LLC

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

- Do not apply sealant bead thicker than indicated.

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

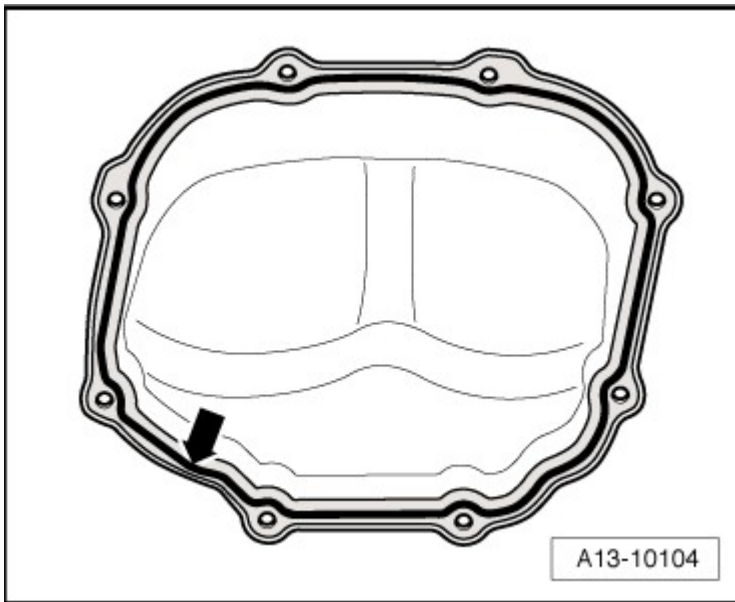


Fig. 52: Applying Sealant Bead On Clean Sealing Surfaces Of Left Cover For Timing Chain
Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant bead: 2.5 mm.

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

-- Position left timing chain cover and tighten bolts in sequence -1 to 8- **Fig. 2**

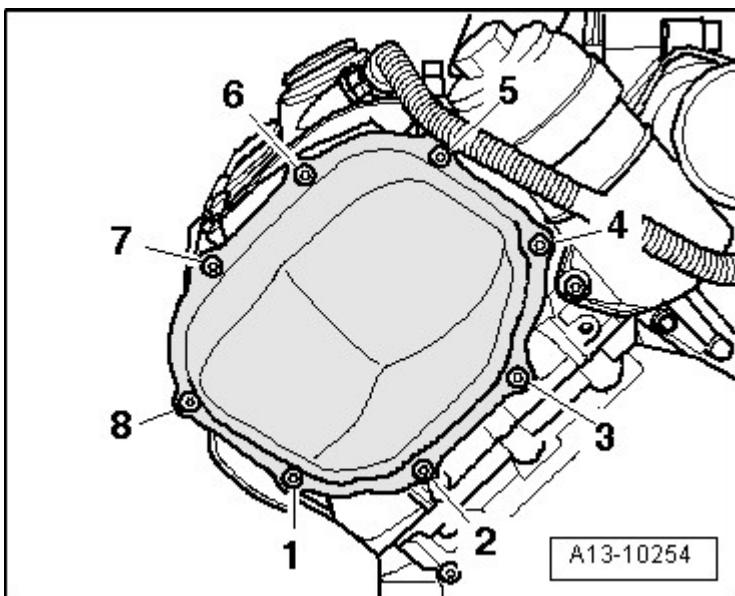


Fig. 53: Left Timing Chain Cover Bolt Tightening Sequence & Specification

Courtesy of AUDI OF AMERICA, LLC

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

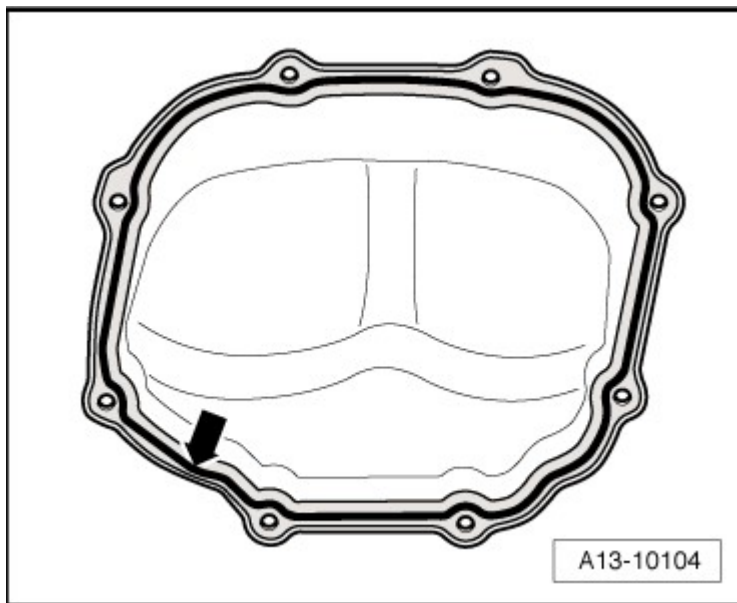


Fig. 54: Applying Sealant Bead On Clean Sealing Surfaces Of Left Cover For Timing Chain
Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant bead: 2.5 mm.

-- Position right timing chain cover and tighten bolts in sequence -1 to 8- **Fig. 3**

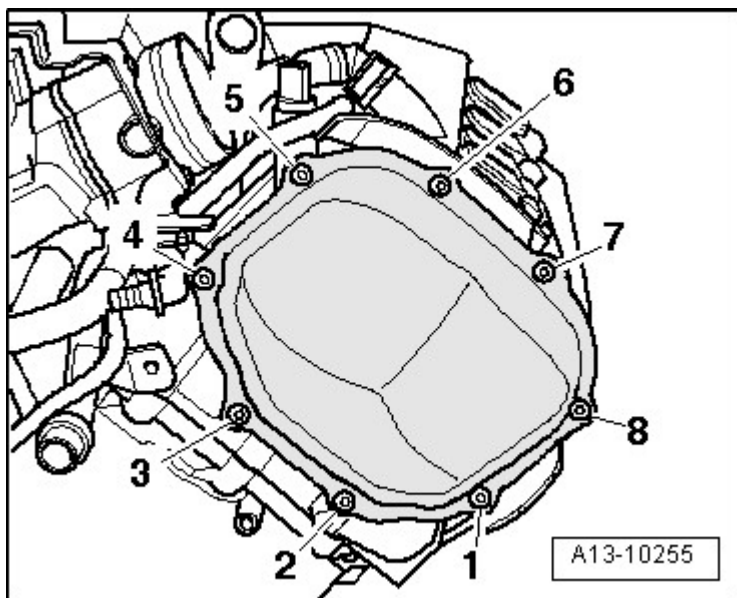


Fig. 55: Right Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

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

NOTE: **Secure all hose connections with hose clamps appropriate for the model.**

-- Install plenum chamber bulkhead **Description and Operation** .

LOWER TIMING CHAIN COVER

Special tools and workshop equipment required

- Old oil collecting and extracting device V.A.G 1782
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

REMOVING

Proceed as follows:

- Transmission removed.

NOTE: **During installation, all cable ties must be re-installed at the same location.**

CAUTION: Risk of destroying electrical components.

- **Observe measures when disconnecting battery.**

-- Disconnect battery **Removal and Installation** .

-- Place used oil collecting and extracting device V.A.G 1782 under engine and drain engine oil.

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

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

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

-- Remove generator **Removal and Installation** .

-- Remove left and right bolts -arrows- and electrical connector bracket.

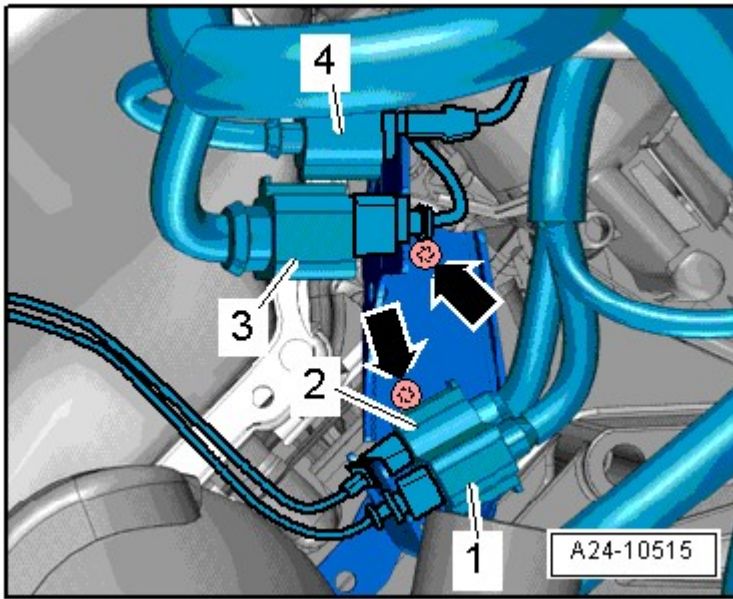


Fig. 56: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

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

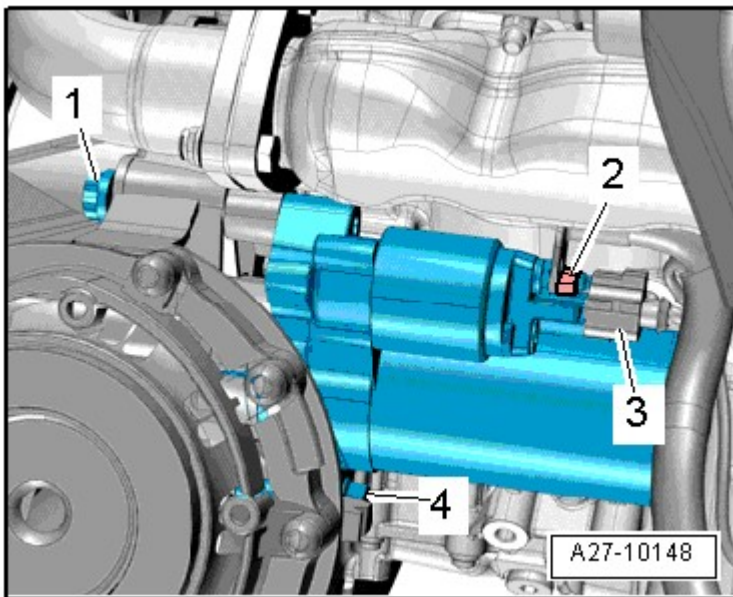


Fig. 57: Disconnecting Starter Electrical Connector
Courtesy of AUDI OF AMERICA, LLC

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

NOTE: Ignore -1 and 4-.

-- Remove bolts -arrows-.

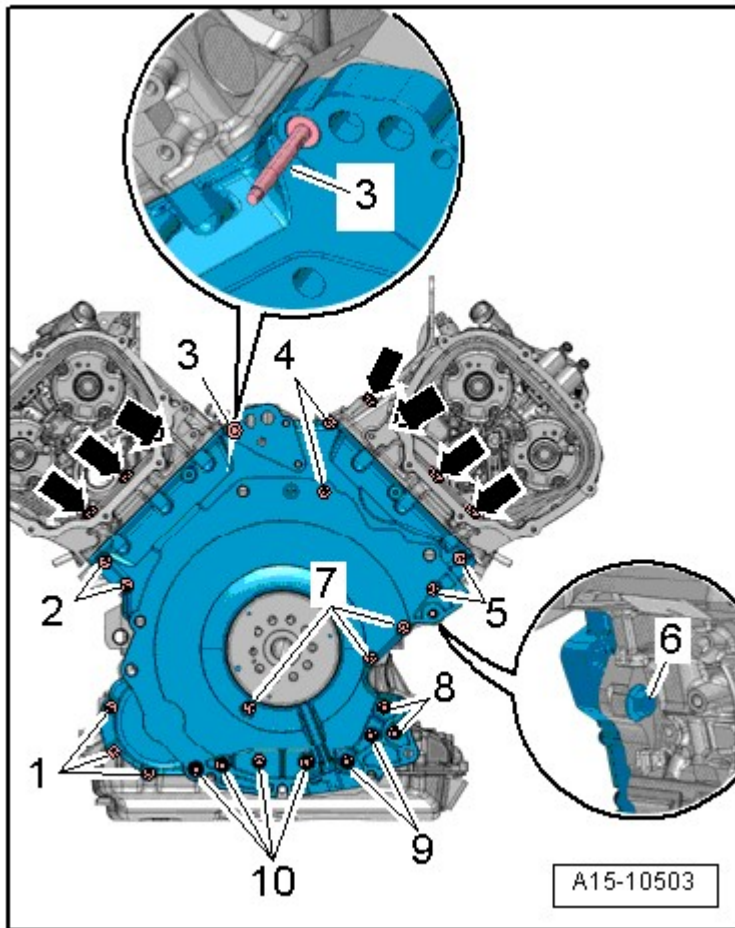


Fig. 58: Lower Timing Chain Cover Bolt Tightening Sequence & Specification
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1 through 10- and remove lower timing chain cover.

-- Press transmission side of crankshaft shaft seal out of lower timing chain cover.

INSTALLING

- Tightening specifications **Fig. 4**

NOTE: Replace seals, gaskets and O-rings.

-- Remove right upper alignment bushing from cylinder block.

-- Grind alignment bushing down at an angle as shown in the illustration.

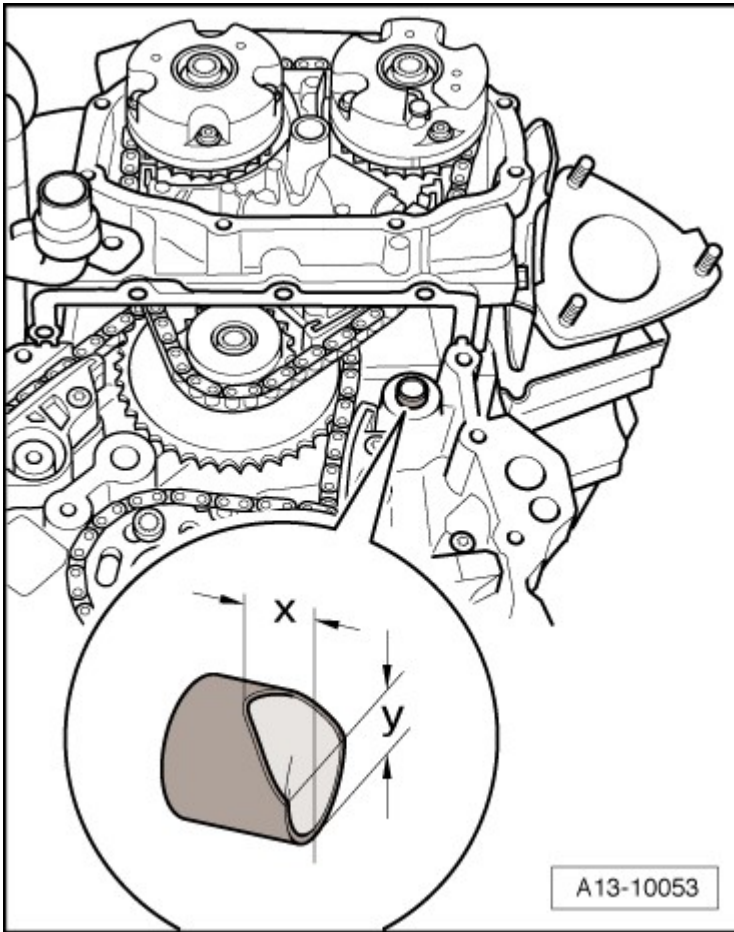


Fig. 59: Chamfer Alignment Bushing With File
Courtesy of AUDI OF AMERICA, LLC

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

-- Insert alignment bushing in cylinder block so the angled side faces up.

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

CAUTION: Risk of contaminating lubricating system.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

-- Remove sealant residue on cover for timing chain, cylinder block and cylinder head, for example using a

rotating plastic brush.

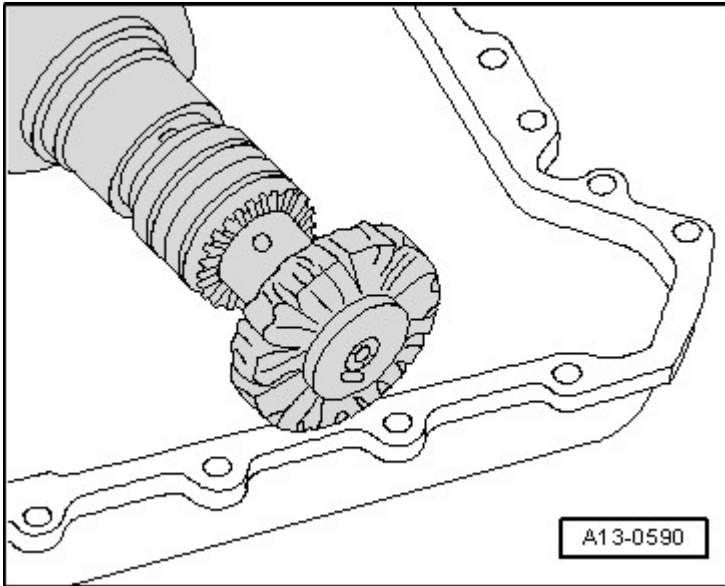


Fig. 60: Identifying Rotating Plastic Brush

Courtesy of AUDI OF AMERICA, LLC

- Clean sealing surfaces, must be free of oil and grease.
- Clean threaded holes in cylinder block for connecting engine and transmission using a thread tap before installing the transmission.
- Clean old sealant out of holes -arrow- in cylinder head seals.

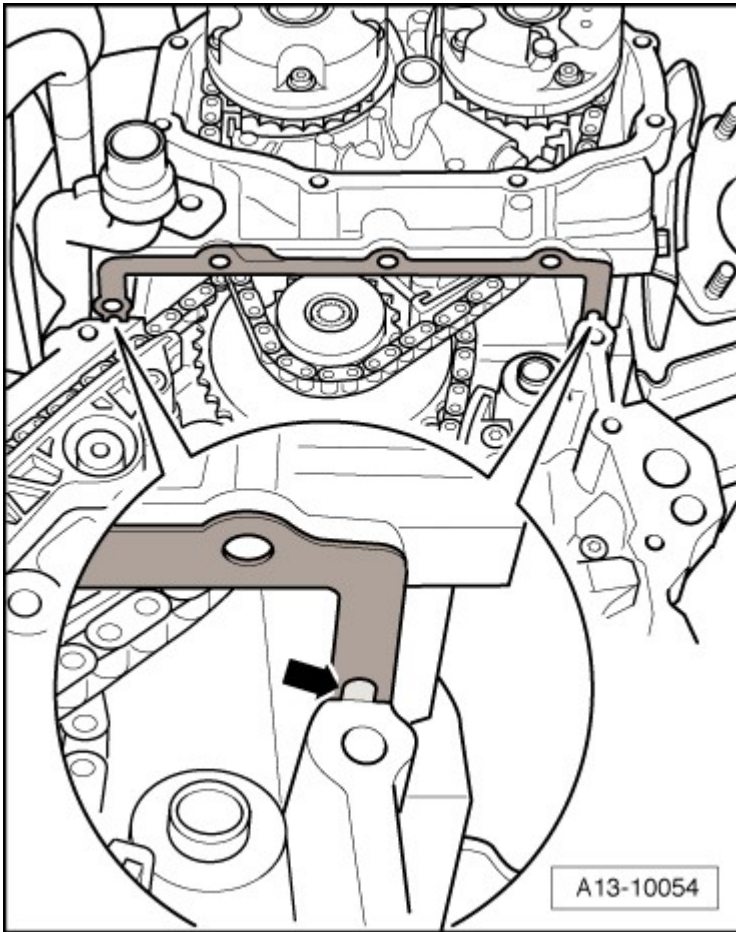


Fig. 61: Cleaning Old Sealant From Holes In Cylinder Head Gaskets
Courtesy of AUDI OF AMERICA, LLC

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

CAUTION: The cylinder head seal could be damaged.

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

NOTE: A kinked cylinder head seal must be replaced.

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

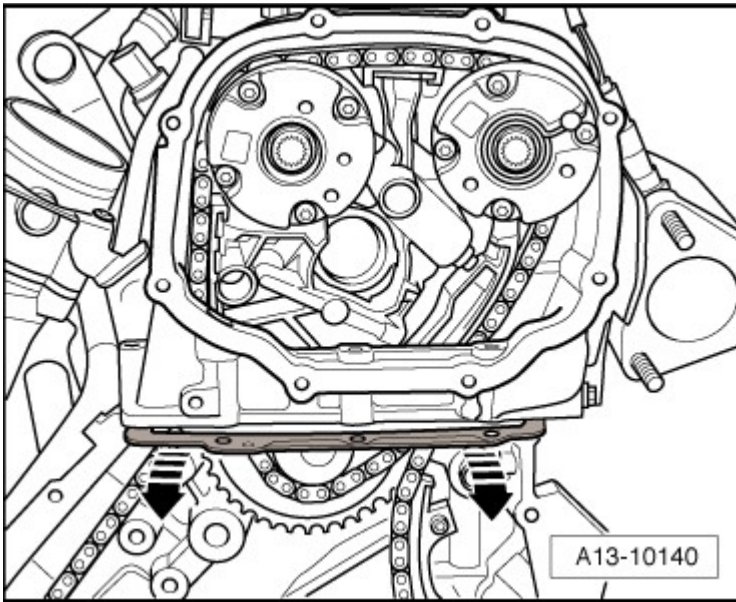


Fig. 62: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward
Courtesy of AUDI OF AMERICA, LLC

- Clean top and bottom of the cylinder head seals so they are free of oil and grease.
- Cut tube nozzle at front marking (nozzle diameter approximately 2 mm).

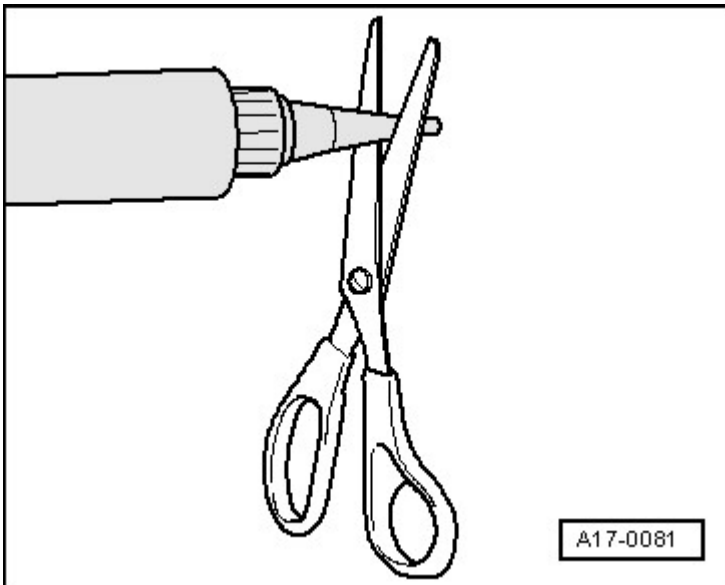


Fig. 63: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of AUDI OF AMERICA, LLC

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

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

again -arrows-.

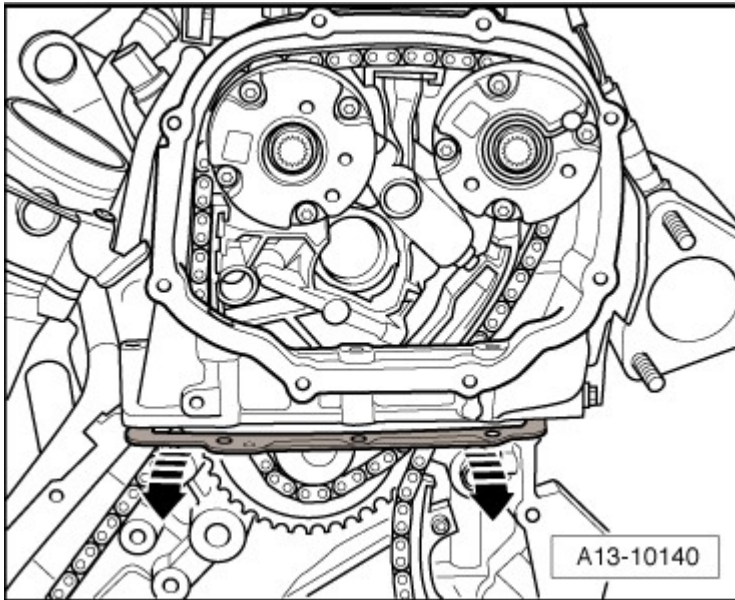


Fig. 64: Bending Ends Of Cylinder Head Gaskets Very Slightly Downward
Courtesy of AUDI OF AMERICA, LLC

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

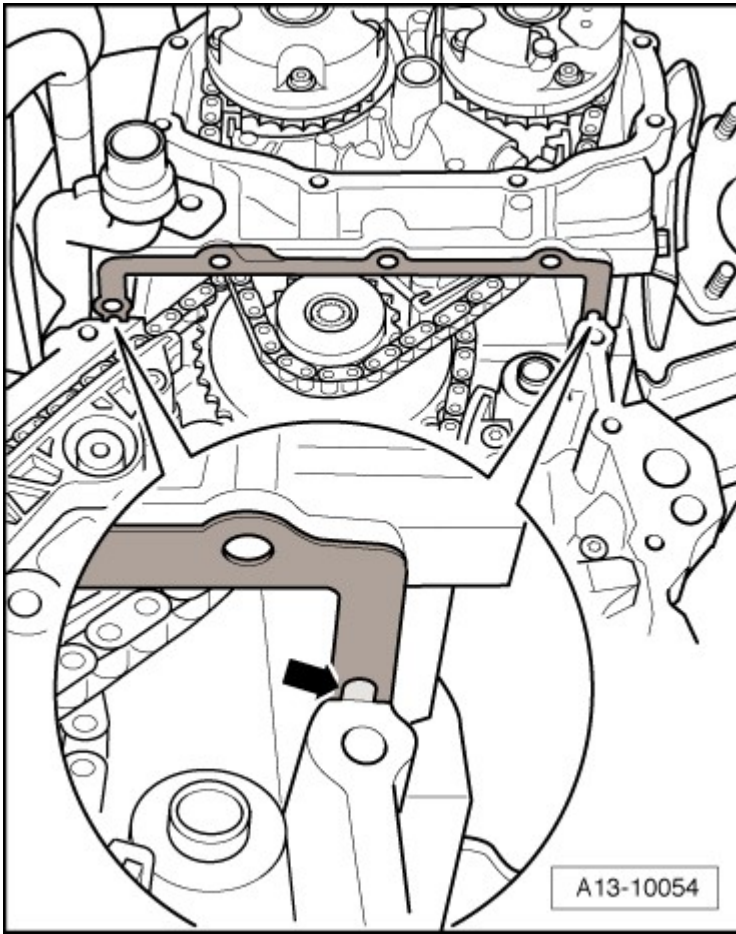


Fig. 65: Cleaning Old Sealant From Holes In Cylinder Head Gaskets
Courtesy of AUDI OF AMERICA, LLC

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

- Do not apply sealant bead thicker than indicated.

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

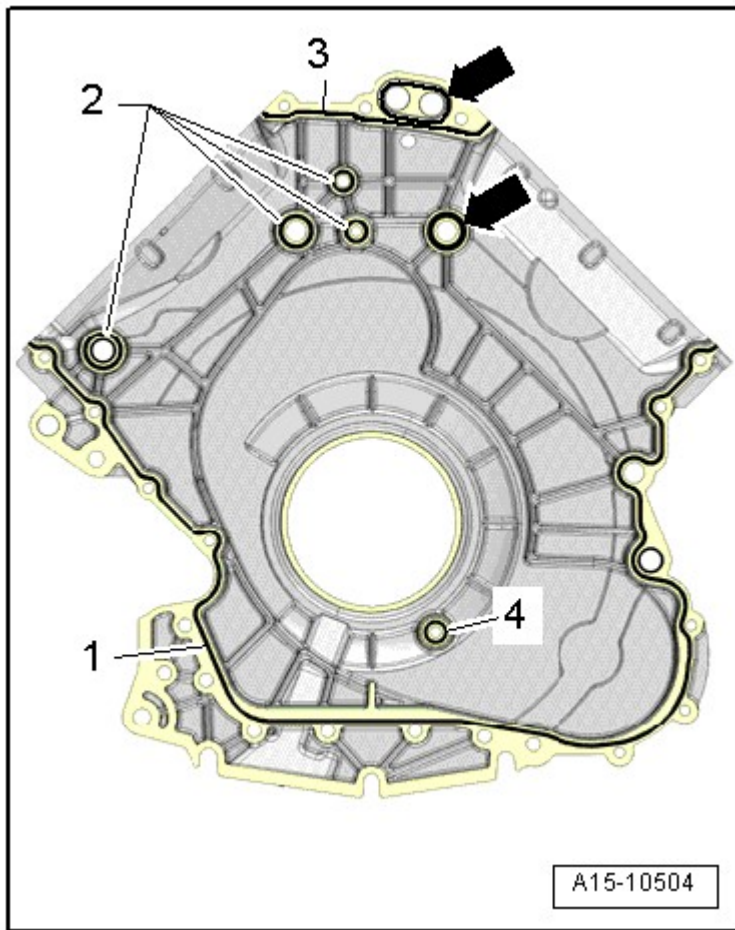


Fig. 66: Applying Sealant Beads -1 Through 4-
Courtesy of AUDI OF AMERICA, LLC

- The groove of sealing surface must be completely filled with sealant.
- Sealant beads must be 1.5 to 2.0 mm above the sealing surface.
- The sealant bead -2- must be drawn through as shown in the illustration even though the groove is intermittent.

NOTE: The sealant only needs to cure for approximately 5 minutes after applying.

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

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

-- When positioning, ensure the cylinder head seals are not damaged.

-- Tighten bolts for the lower timing chain cover **Fig. 4**

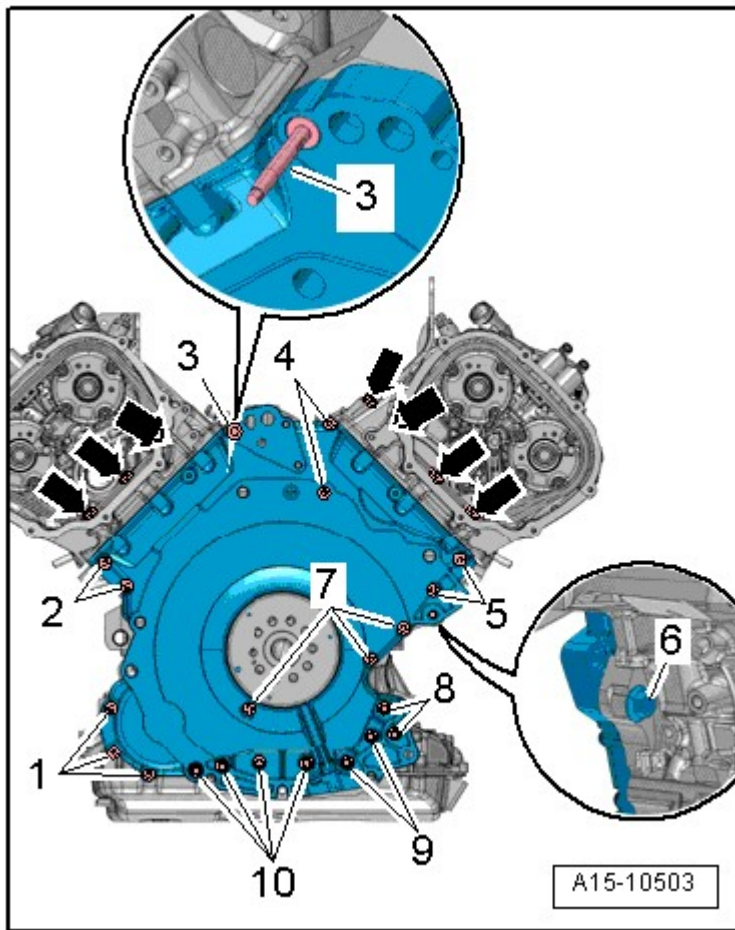


Fig. 67: Lower Timing Chain Cover Bolt Tightening Sequence & Specification
 Courtesy of AUDI OF AMERICA, LLC

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

- Install starter **Removal and Installation** .
- Install generator **Removal and Installation** .
- Install oil filter housing **OIL FILTER HOUSING** .
- Install left and right timing chain covers **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install transmission-side crankshaft shaft seal **CRANKSHAFT SEAL, DRIVE PLATE SIDE** .
- Installing drive plate **DRIVE PLATE** .
- Fill engine oil and check oil level **ENGINE OIL, CHECKING LEVEL** .

CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS

Special tools and workshop equipment required

- Torque wrench V.A.G 1332
- Assembly tool V.A.G 1332/9
- Multi-point socket T10035
- Counter-holder tool T10172
- Adapter T40058
- Locking pin T40069
- Old oil collecting and extracting device V.A.G 1782
- Locking pin T40071, qty. 2
- Camshaft clamp T40133, qty. 2

REMOVING

Proceed as follows:

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

-- Remove the respective cylinder head cover: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.

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

-- Remove noise insulation by loosening fasteners -1 through 4-.

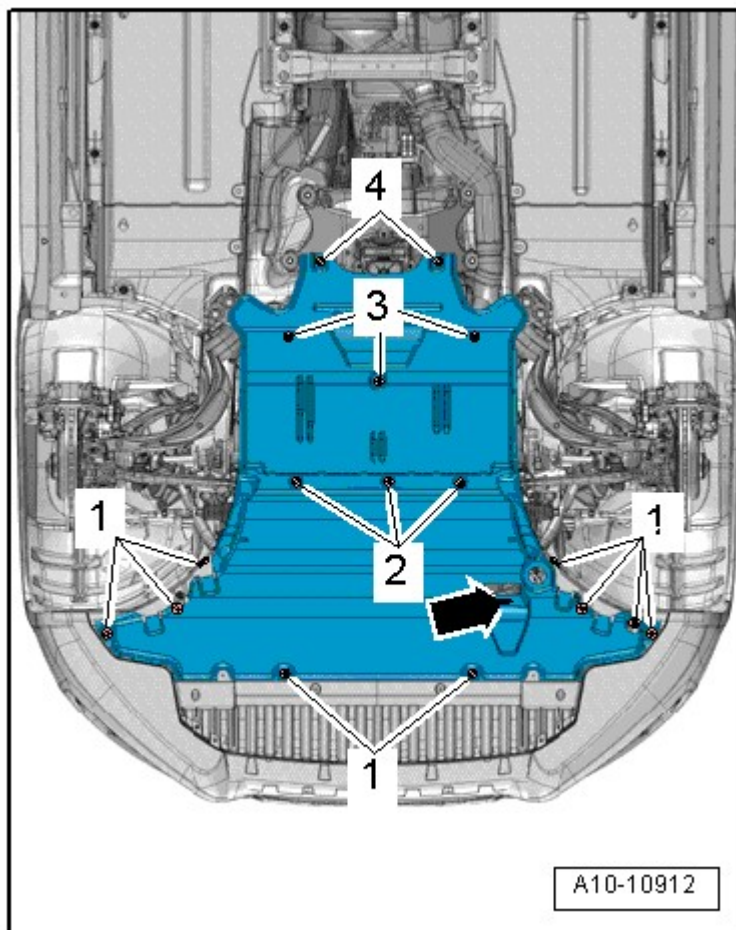


Fig. 68: Identifying Noise Insulation

Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -arrow-.

Without After-Run Coolant Pump -V51-

-- Remove bolt -1- and nut -3- and lock carrier left brace -2-.

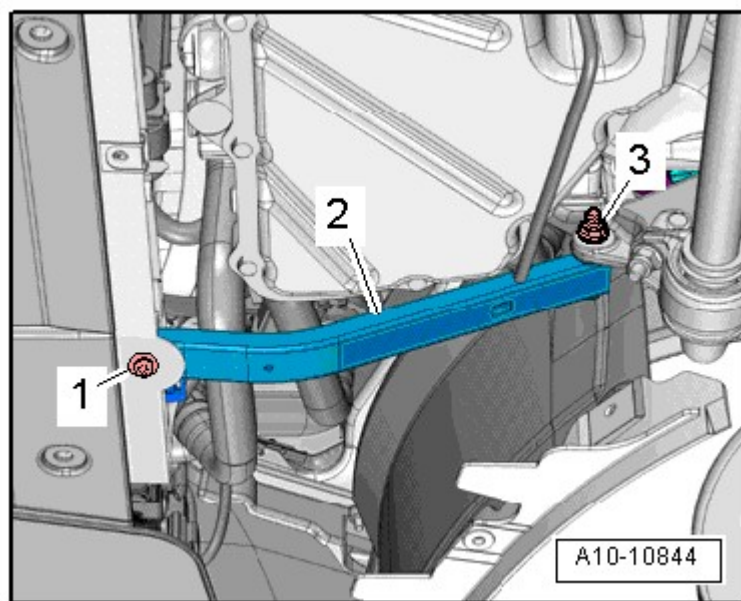


Fig. 69: Identifying Carrier Left Brace Components
Courtesy of AUDI OF AMERICA, LLC

-- Place used oil collecting and extracting device V.A.G 1782 under engine.

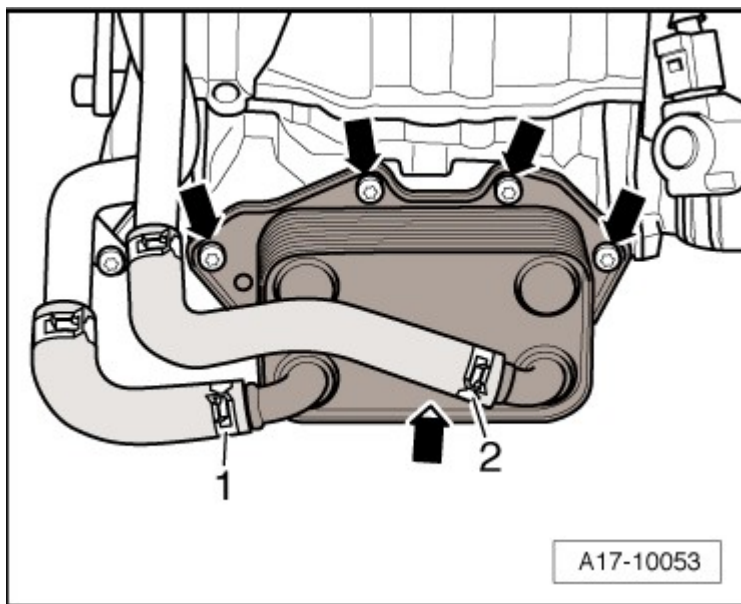


Fig. 70: Connecting/Disconnecting Coolant Hoses With Hose Clamps
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows- and lay aside oil cooler with coolant hoses -1- and -2- connected.

With After-Run Coolant Pump -V51-

-- Remove after-run coolant pump -V51- **AFTER-RUN COOLANT PUMP** , and oil cooler **OIL COOLER** .

Continuation for All+

-- Insert adapter T40058 guide pins as follows:

- The large diameter -arrow 1- faces engine.

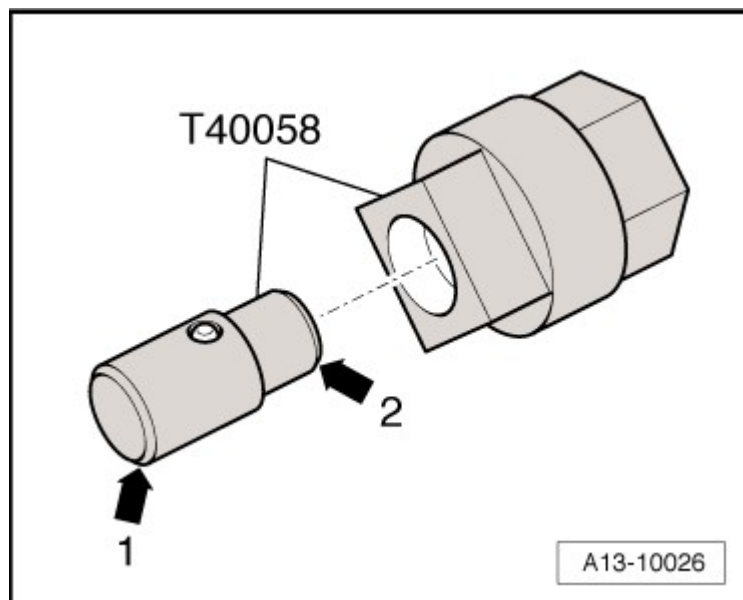


Fig. 71: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- Small diameter -arrow 2- points to adapter.

-- Turn crankshaft in direction of engine rotation -arrow- to "TDC" using adapter T40058.

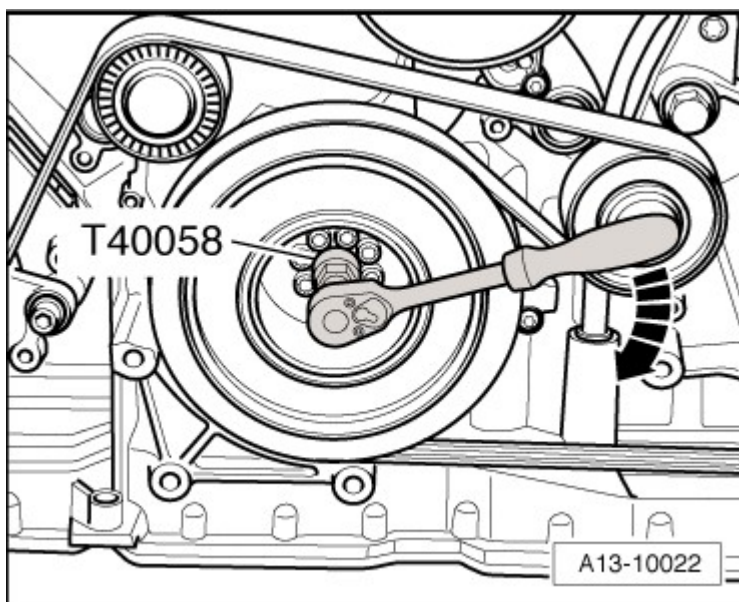


Fig. 72: Identifying TDC With Special Tool Adapter T40058

Courtesy of AUDI OF AMERICA, LLC

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

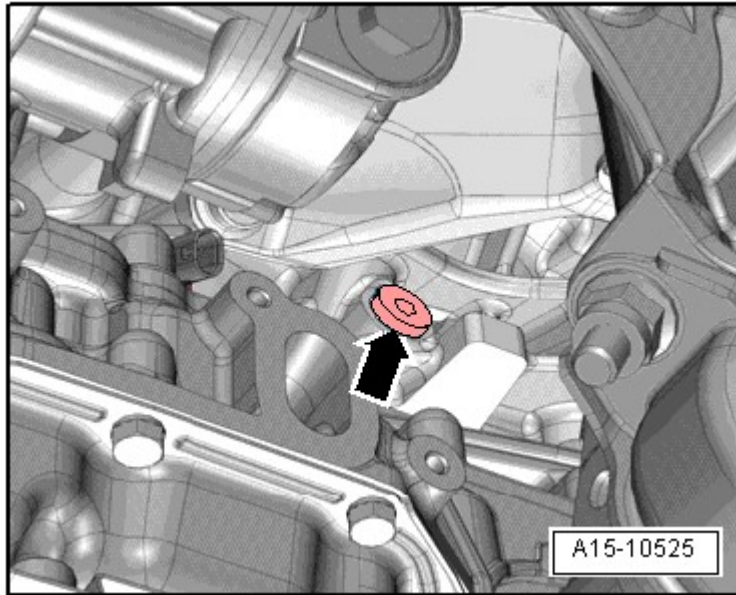


Fig. 73: Identifying Locking Bolt

Courtesy of AUDI OF AMERICA, LLC

NOTE: The crankshaft locating hole is difficult to find when the engine is installed.

Rotate engine until the small notch -1- on the vibration damper aligns at the left of the housing separation point -2- between the cylinder block and the guide frame. This makes it easier to install the locking pin T40069.

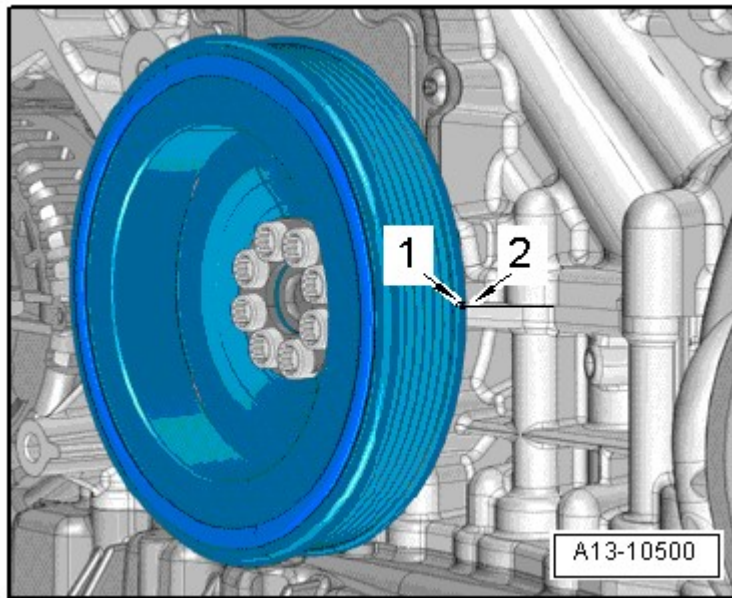


Fig. 74: Identifying Vibration Damper Alignment Notch
Courtesy of AUDI OF AMERICA, LLC

The marking on the vibration damper is only there to help. The exact "TDC" location is only reached by installing the locking pin T40069.

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

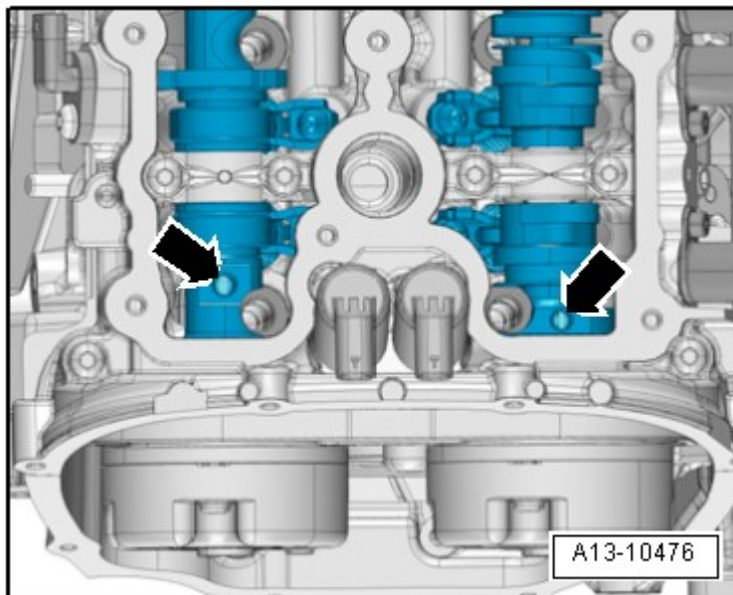


Fig. 75: Identifying Camshaft Threaded Holes
Courtesy of AUDI OF AMERICA, LLC

-- Install crankshaft holder T40069 in hole and tighten to 20 Nm. Turn crankshaft back slightly to completely

center bolt, if necessary.

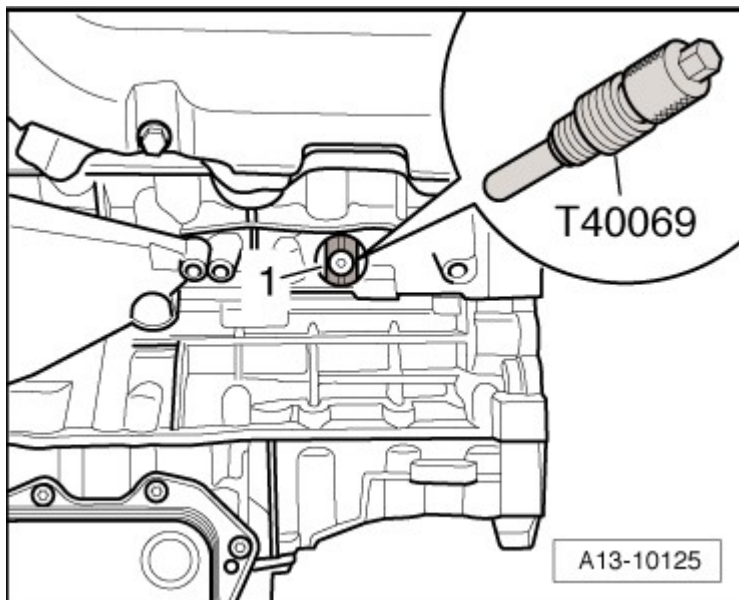


Fig. 76: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
 Courtesy of AUDI OF AMERICA, LLC

-- Install camshaft clamp T40133 in both cylinder heads and tighten bolts -arrows- to 25 Nm.

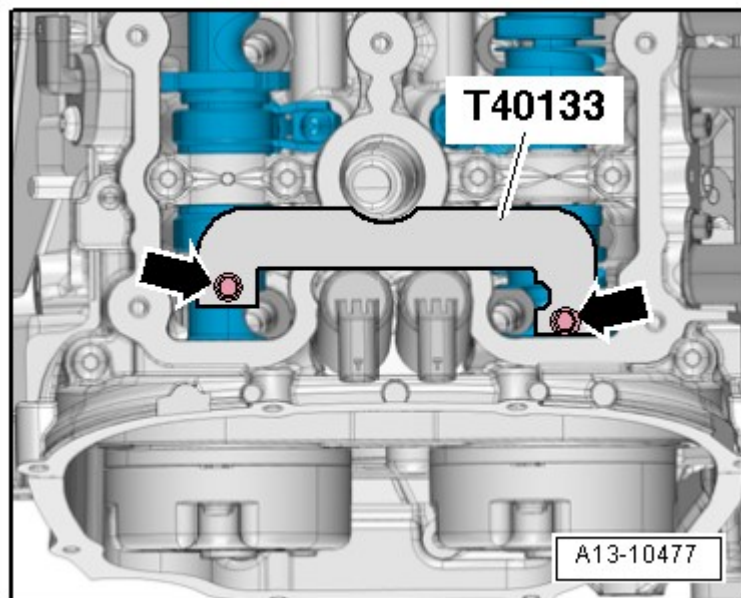


Fig. 77: Camshaft Adjuster T40133
 Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

-- Press left camshaft timing chain tensioner guide rails in as far as stop using a screwdriver -1- and secure chain

tensioner with a locking pin T40071.

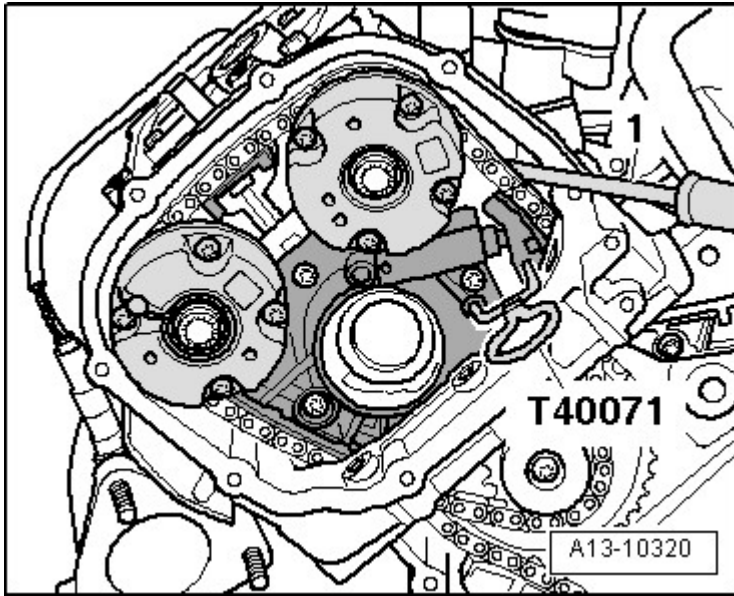


Fig. 78: Pressing Left Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071
 Courtesy of AUDI OF AMERICA, LLC

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 guide rails in as far as stop using a screwdriver -1- and secure chain tensioner with a locking pin T40071.

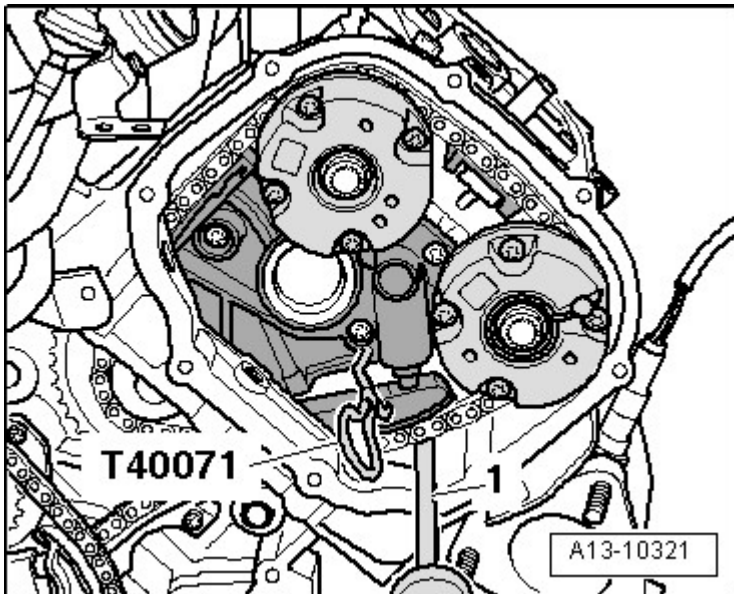


Fig. 79: Pressing Right Camshaft Timing Chain Tensioner Glide Track Inward With Screwdriver As Far As Stop And Securing Chain Tensioner With Locking Pin T40071

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.

CAUTION: The camshaft could be damaged.

- Do not use the camshaft locating tool T40133 to counterhold when loosening the camshaft adjuster bolts -1-.

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

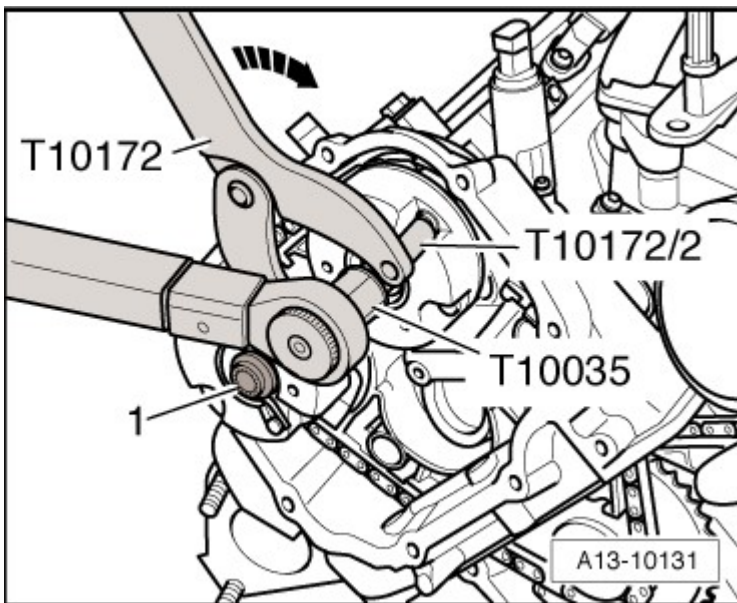


Fig. 80: Removing/ Installing Left Camshaft Adjuster
Courtesy of AUDI OF AMERICA, LLC

-- Mark installation position of camshaft adjuster with paint for installation later.

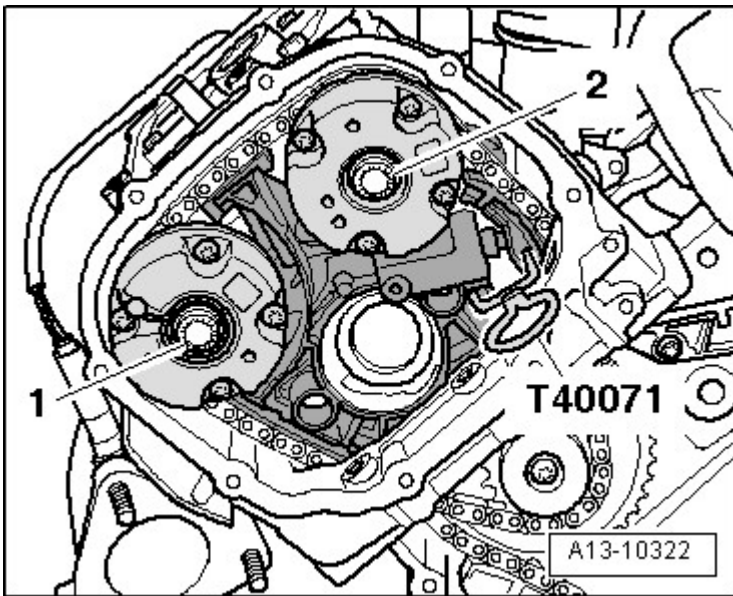


Fig. 81: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters
 Courtesy of AUDI OF AMERICA, LLC

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.

-- Mark installation position of camshaft adjuster with paint for installation later.

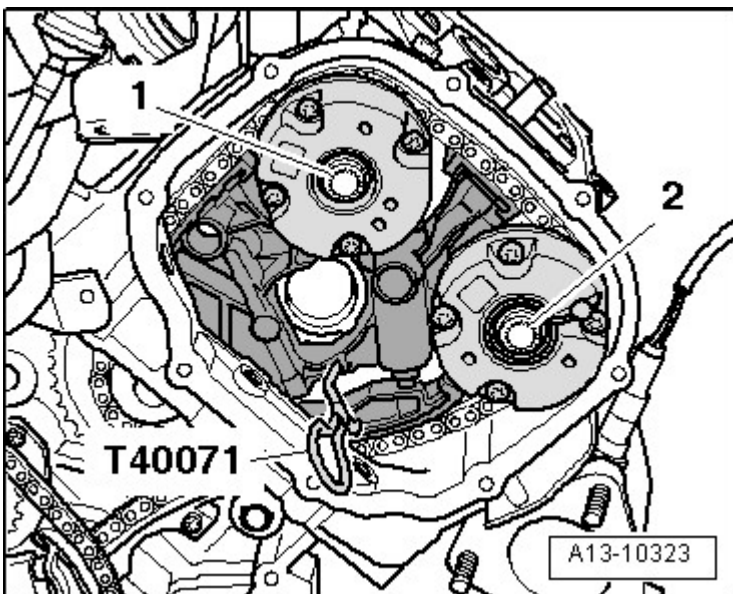


Fig. 82: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters

Courtesy of AUDI OF AMERICA, LLC

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

INSTALLING

- Tightening specifications CAMSHAFT TIMING CHAINS ASSEMBLY OVERVIEW, Fig. 98

NOTE: Replace bolts which have been tightened to torque.

Replace O-ring for "TDC" marking locking bolt.

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 TIMING MECHANISM DRIVE CHAIN.

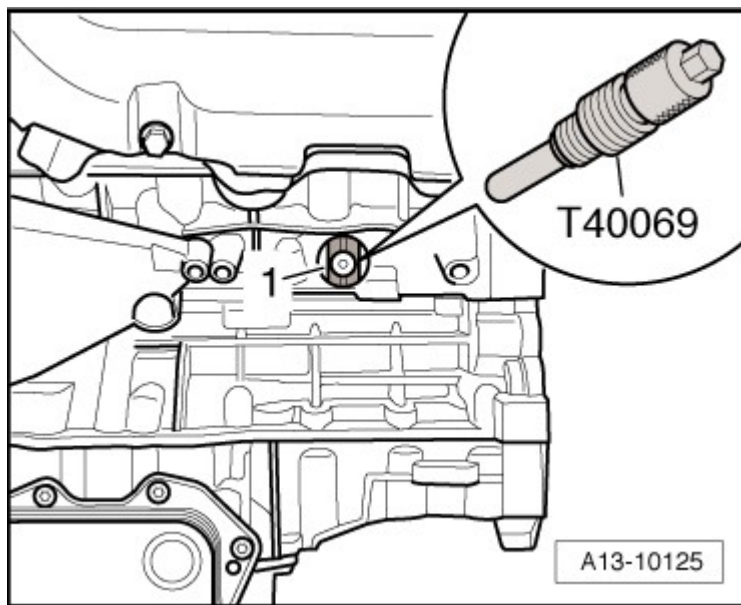


Fig. 83: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- Secure crankshaft in "TDC" position using crankshaft holder T40069.
- Camshaft clamp T40133 mounted on both cylinder heads and fastened to 25 Nm -arrows-.

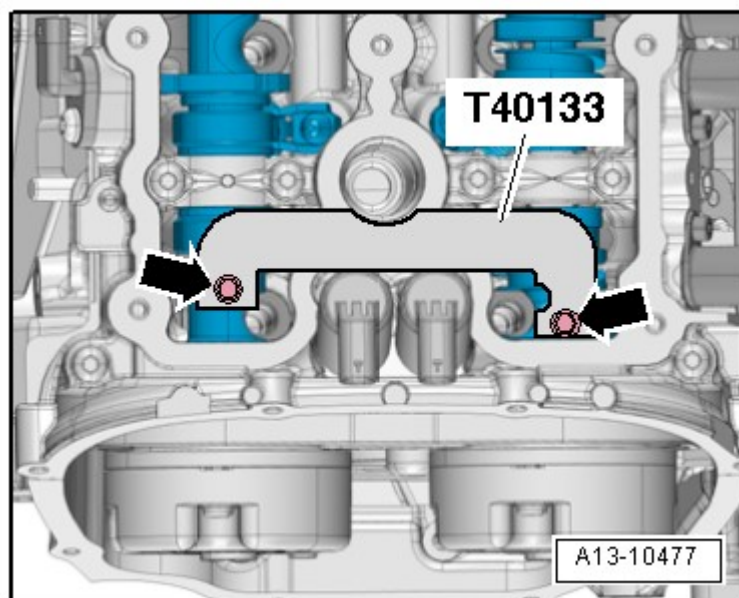


Fig. 84: Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

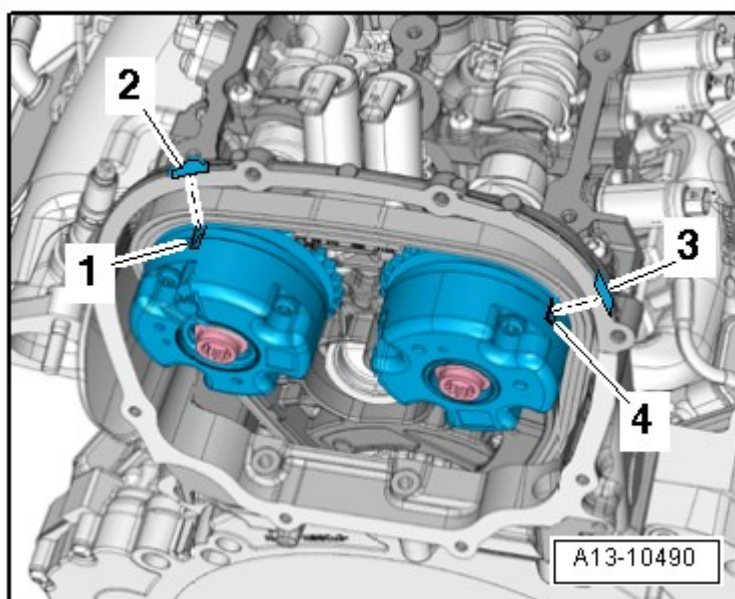


Fig. 85: Identifying Camshaft Adjuster Alignment
Courtesy of AUDI OF AMERICA, LLC

CAUTION: The engine could be damaged.

- For the following steps, only install the camshaft adjuster so the grooves -1- and -4- are aligned with the windows (beveled surfaces) -

2- and -3-.

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

-- Position left camshaft timing chain on drive sprocket and camshaft adjuster and loosely install bolts -1- and -2-.

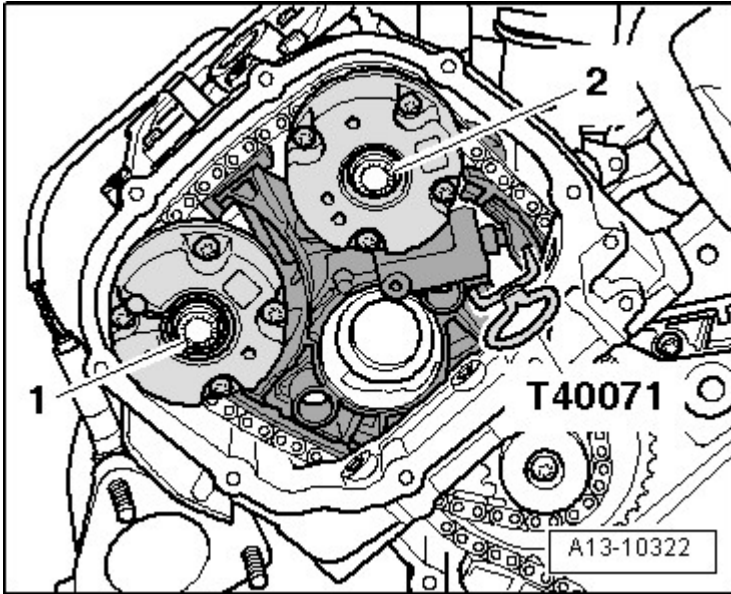


Fig. 86: Identifying Bolts On Left Cylinder Head And Removing Both Camshaft Adjusters
Courtesy of AUDI OF AMERICA, LLC

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

-- Remove locking pin T40071.

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

-- Position right camshaft timing chain on drive sprocket and camshaft adjuster and loosely install bolts -1- and -2-.

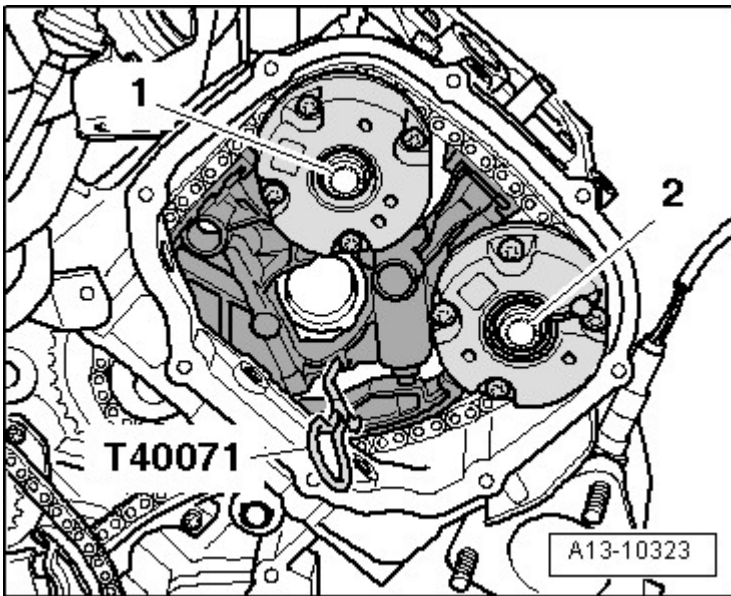


Fig. 87: Identifying Bolts On Right Cylinder Head And Removing Both Camshaft Adjusters
 Courtesy of AUDI OF AMERICA, LLC

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

-- Remove locking pin T40071.

-- Position counter hold tool T10172 with pins T10172/2 on left intake camshaft adjuster.

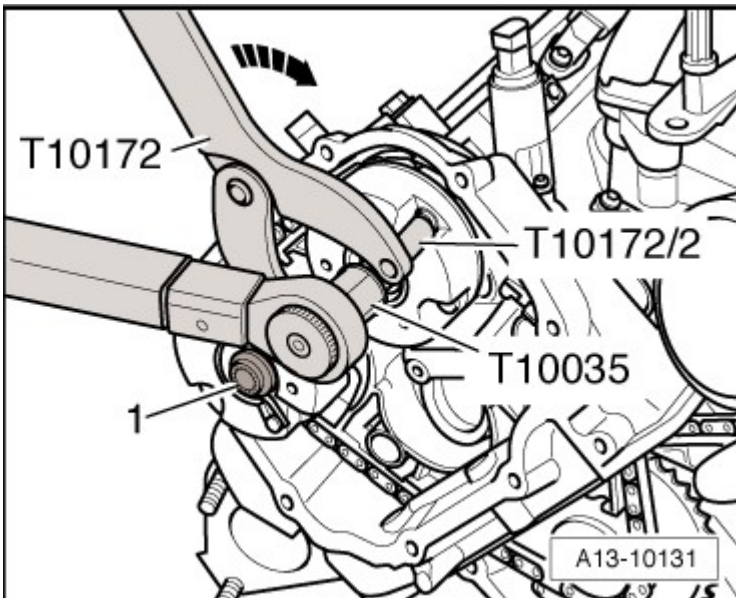


Fig. 88: Removing/ Installing Left Camshaft Adjuster
 Courtesy of AUDI OF AMERICA, LLC

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

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Cylinder Head, Valvetrain - Engine Code(s): CALA (Coupe) (As of 11.2007)

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

-- Tighten bolt on intake camshaft to 80 Nm.-- Pre-tighten bolt -1- on exhaust camshaft to 80 Nm.

-- Position counter hold tool T10172 with pins T10172/2 on right exhaust camshaft adjuster.

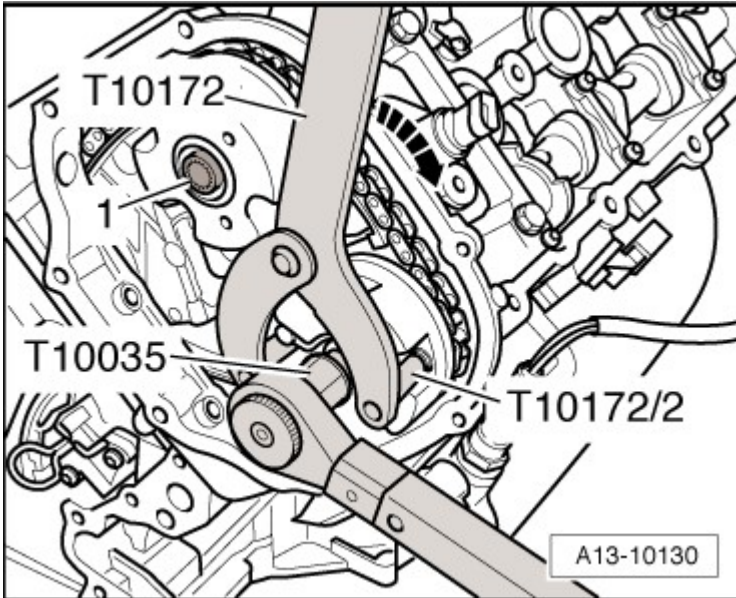


Fig. 89: Removing/ Installing Right Camshaft Adjuster
Courtesy of AUDI OF AMERICA, LLC

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

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

-- Tighten bolt on exhaust camshaft to 80 Nm.-- Pre-tighten bolt -1- on intake camshaft to 80 Nm.

-- Remove camshaft clamp T40133 on both cylinder heads -arrows-.

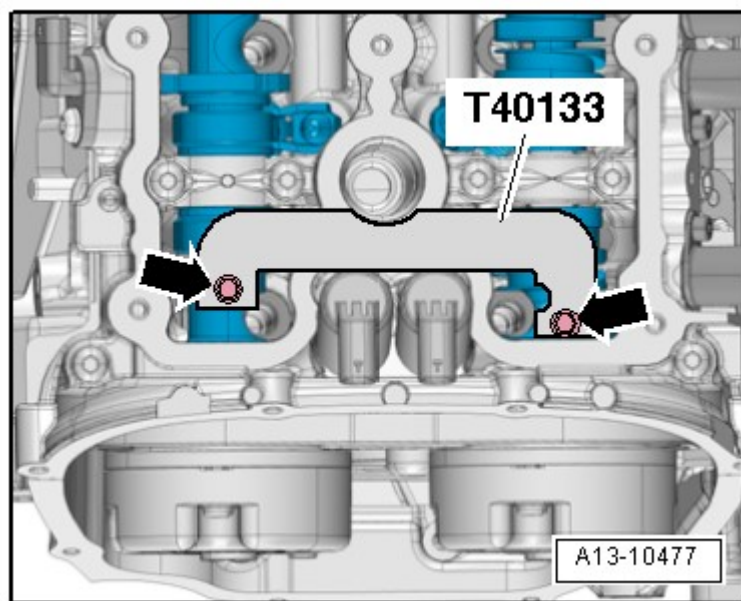


Fig. 90: Camshaft Adjuster T40133

Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows the left cylinder head.

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

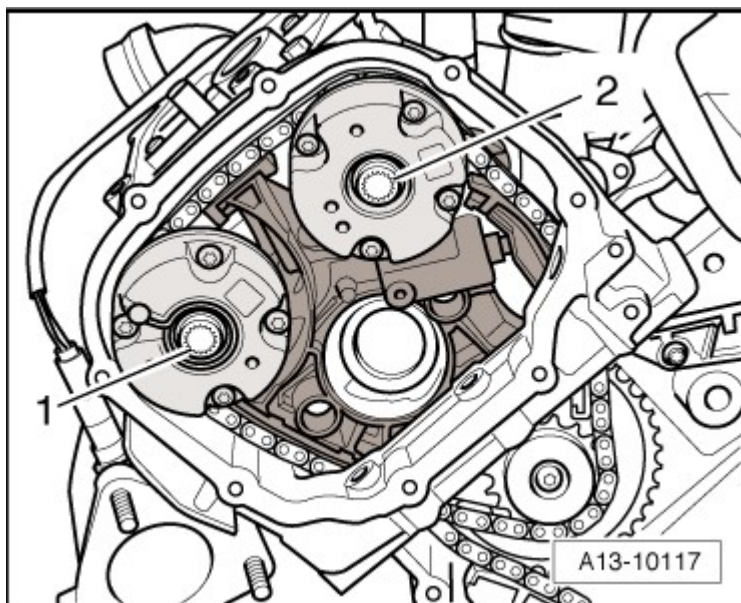


Fig. 91: Identifying Camshaft Adjuster Screws On Left Cylinder Head, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

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

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

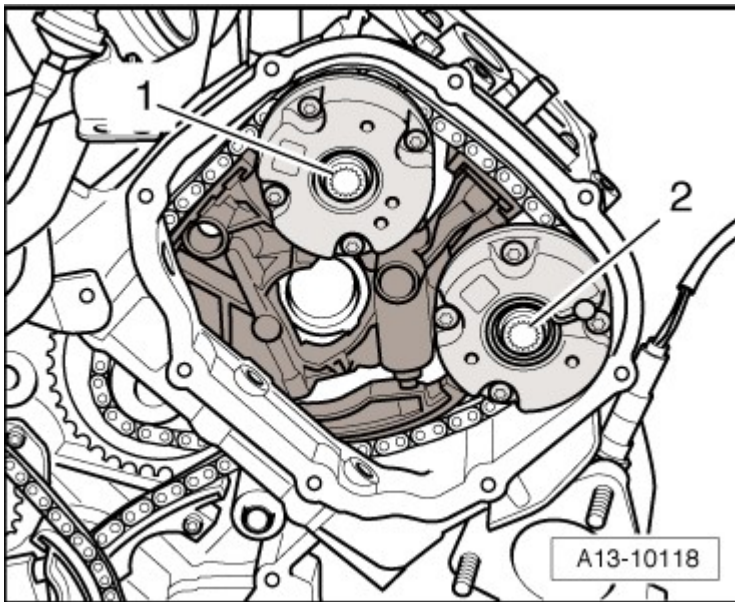


Fig. 92: Identifying Bolts For Camshaft Adjuster Using Multipoint Socket T10035

Courtesy of AUDI OF AMERICA, LLC

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

-- Remove crankshaft holder T40069.

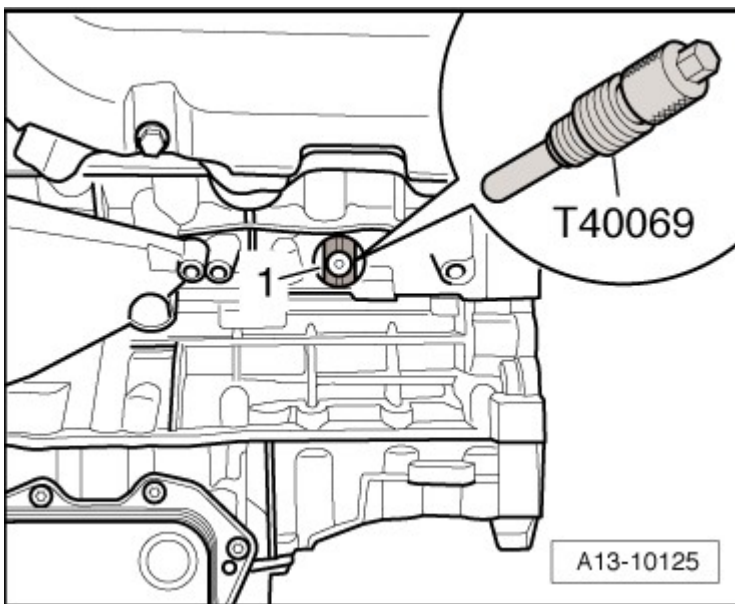


Fig. 93: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

-- Using adapter T40058, turn crankshaft two turns in direction of engine rotation -arrow- until it is back at "TDC".

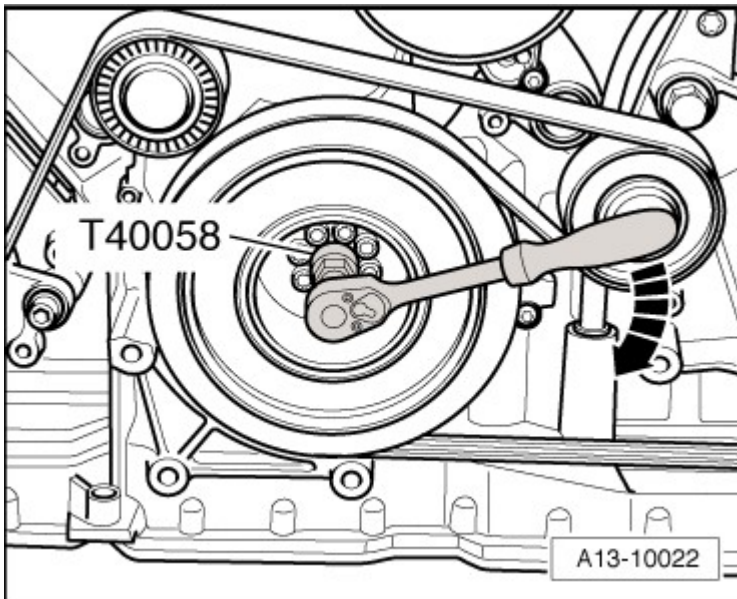


Fig. 94: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

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

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

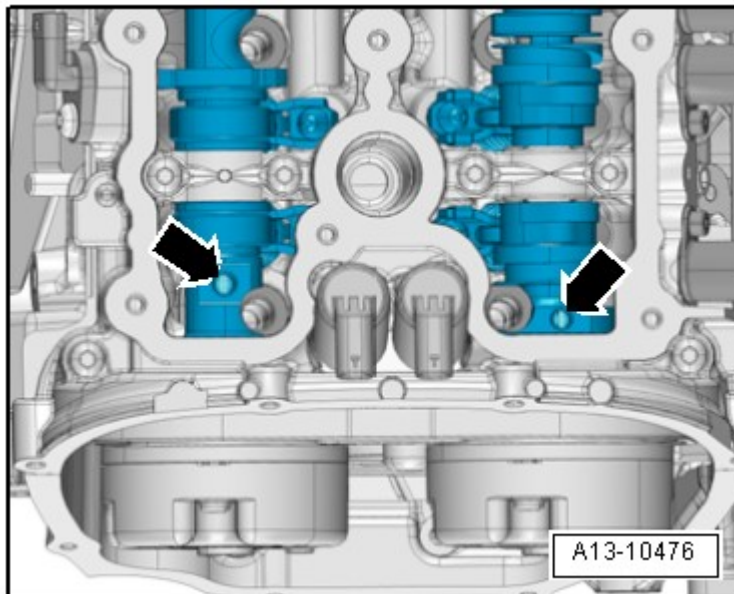


Fig. 95: Identifying Camshaft Threaded Holes
Courtesy of AUDI OF AMERICA, LLC

-- Install camshaft clamp T40133 in both cylinder heads and tighten bolts -arrows- to 25 Nm.

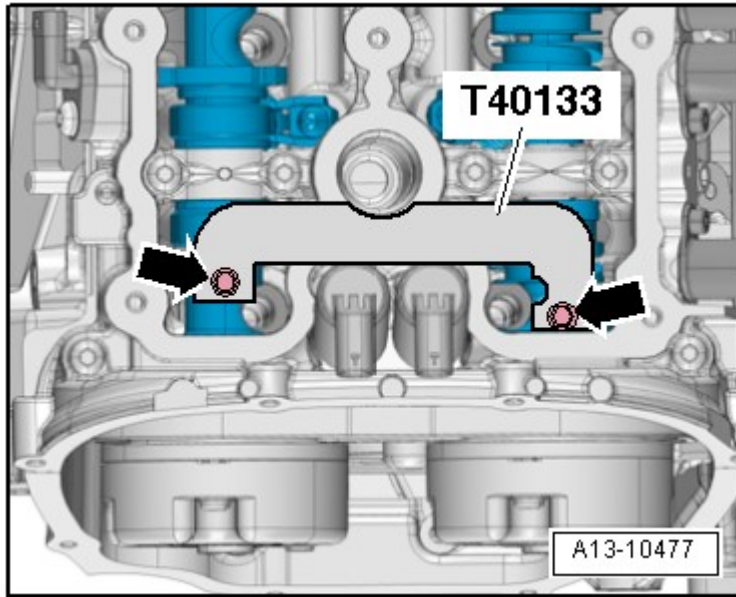


Fig. 96: Camshaft Adjuster T40133

Courtesy of AUDI OF AMERICA, LLC

-- Install locking pin T40069 directly in hole.

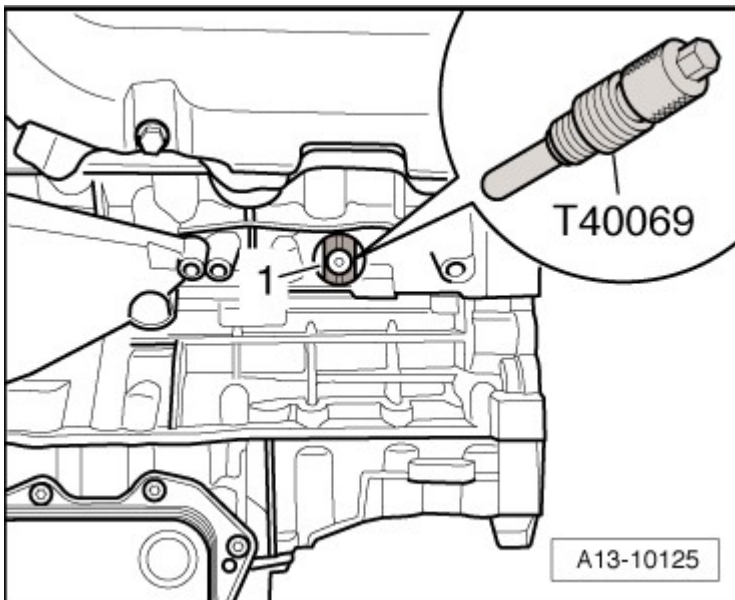


Fig. 97: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

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

-- Remove camshaft locating pins on both cylinder heads.

-- Remove crankshaft holder T40069.

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

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

-- Install cylinder head covers: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.

-- Install after-run coolant pump -V51- **AFTER-RUN COOLANT PUMP** .

-- Install oil cooler **OIL COOLER** .

-- Install lock carrier brace **Description and Operation** .

-- Install front noise insulation **Description and Operation** .

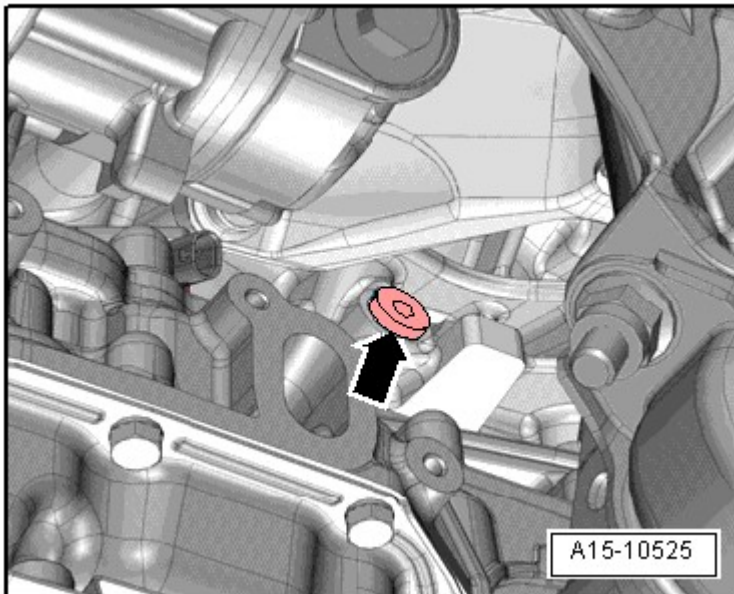


Fig. 98: Identifying Locking Bolt
Courtesy of AUDI OF AMERICA, LLC

CAMSHAFT TIMING CHAINS

REMOVING

Proceed as follows:

- Transmission removed.

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

-- Remove camshaft timing chains from camshafts **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 left and right camshaft timing chain running direction so they can be installed again. Do not mark camshaft timing chain with punch, notch or something similar.

-- Remove locking pin T40071 and left camshaft timing chain.

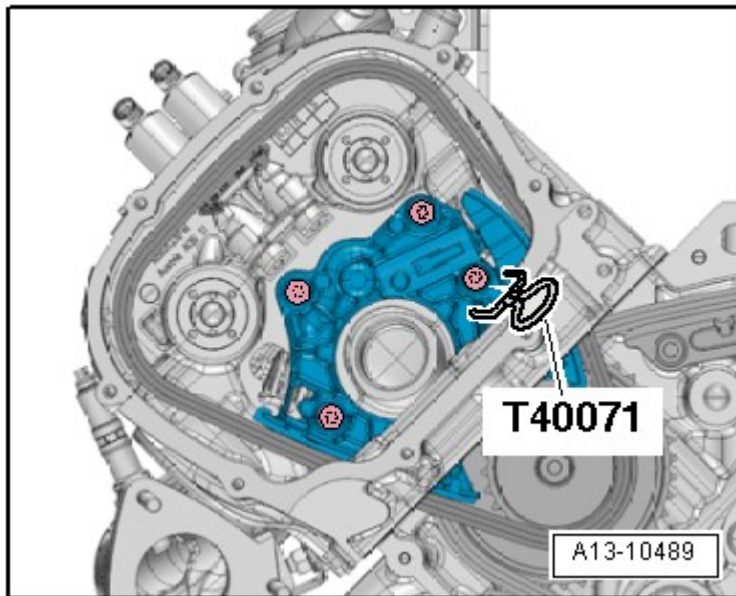
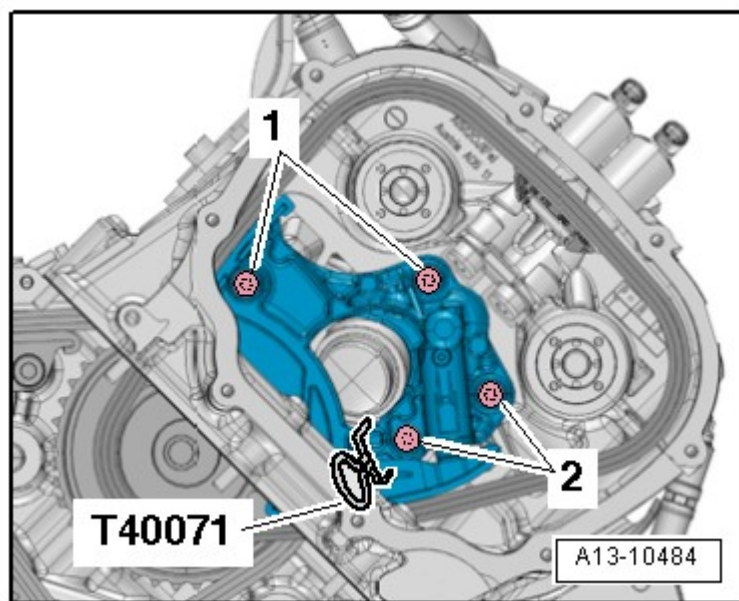


Fig. 99: Identifying Special Tool - T40071
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1- and -2- and right chain tensioner.

**Fig. 100: Chain Tensioner**

Courtesy of AUDI OF AMERICA, LLC

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

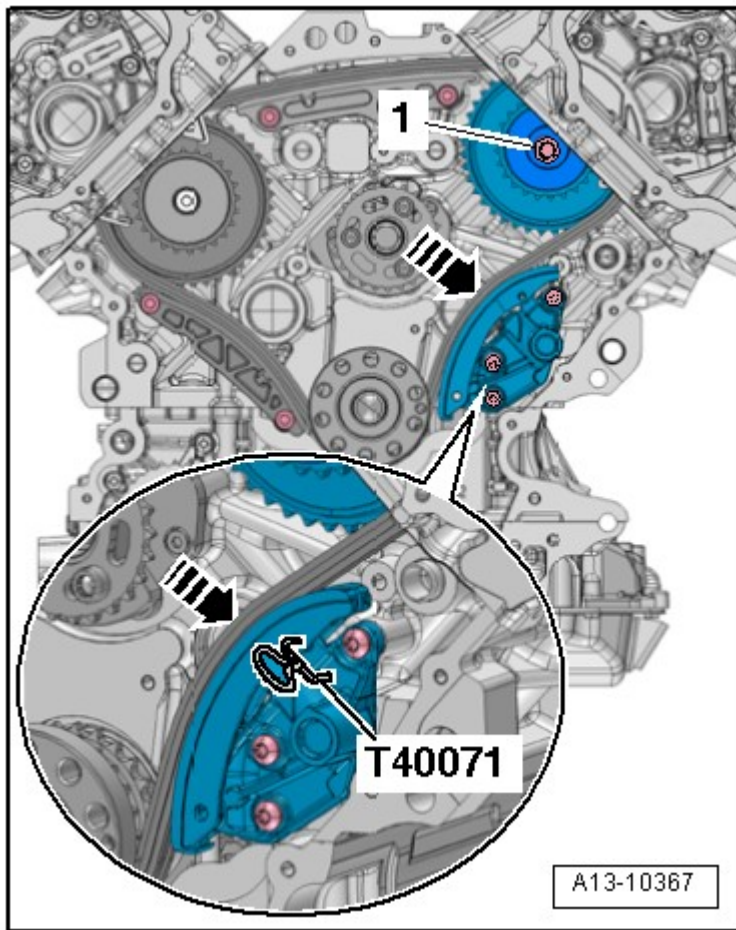


Fig. 101: Chain Tensioner Using T40071
Courtesy of AUDI OF AMERICA, LLC

-- Loosen drive chain sprocket bolt -1- 1 turn.

-- Tilt drive chain sprocket with mounting pins to side slightly and remove right camshaft timing chain upward.

INSTALLING

- Tightening specifications CAMSHAFT TIMING CHAINS ASSEMBLY OVERVIEW.

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

Replace bolts which have been tightened to specifications.

CAUTION: Risk of damaging valves and piston crowns.

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

"TDC".

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

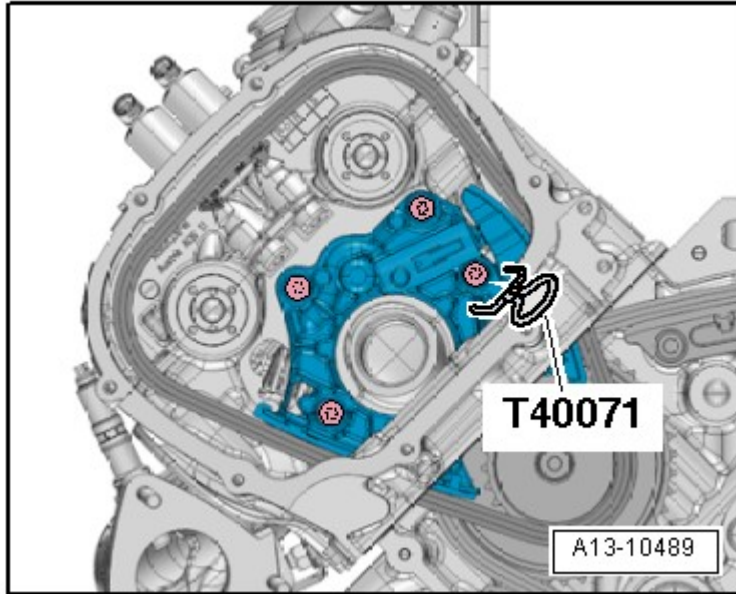


Fig. 102: Identifying Special Tool - T40071

Courtesy of AUDI OF AMERICA, LLC

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

-- Guide right camshaft timing chain on drive sprocket mounting pins while noting markings made during removal.

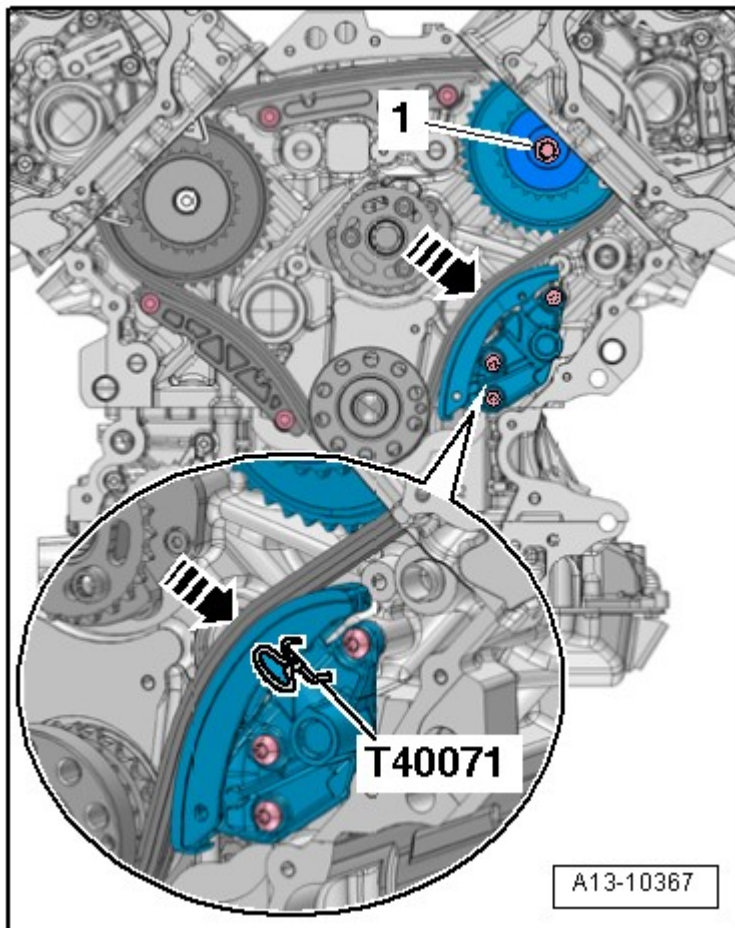


Fig. 103: Chain Tensioner Using T40071
Courtesy of AUDI OF AMERICA, LLC

- Tighten mounting pin bolts -1-.
- Remove locking pin T40071.
- Insert chain tensioner at right cylinder head and position camshaft timing chain.

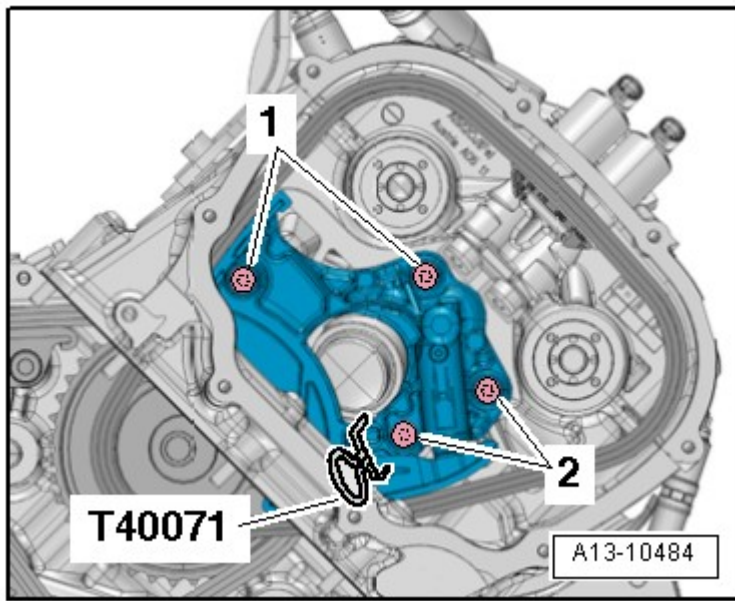


Fig. 104: Chain Tensioner

Courtesy of AUDI OF AMERICA, LLC

-- Fasten bolts -1- and -2-.

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

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

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

-- Fill engine oil and check oil level **ENGINE OIL, CHECKING LEVEL .**

TIMING MECHANISM DRIVE CHAIN

Special tools and workshop equipment required

- Securing pin T40071

REMOVING

Proceed as follows:

- Transmission removed.

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

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

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

-- Press drive chain tensioner guide rail in direction of -arrow- and secure chain tensioner with a locking pin T40071.

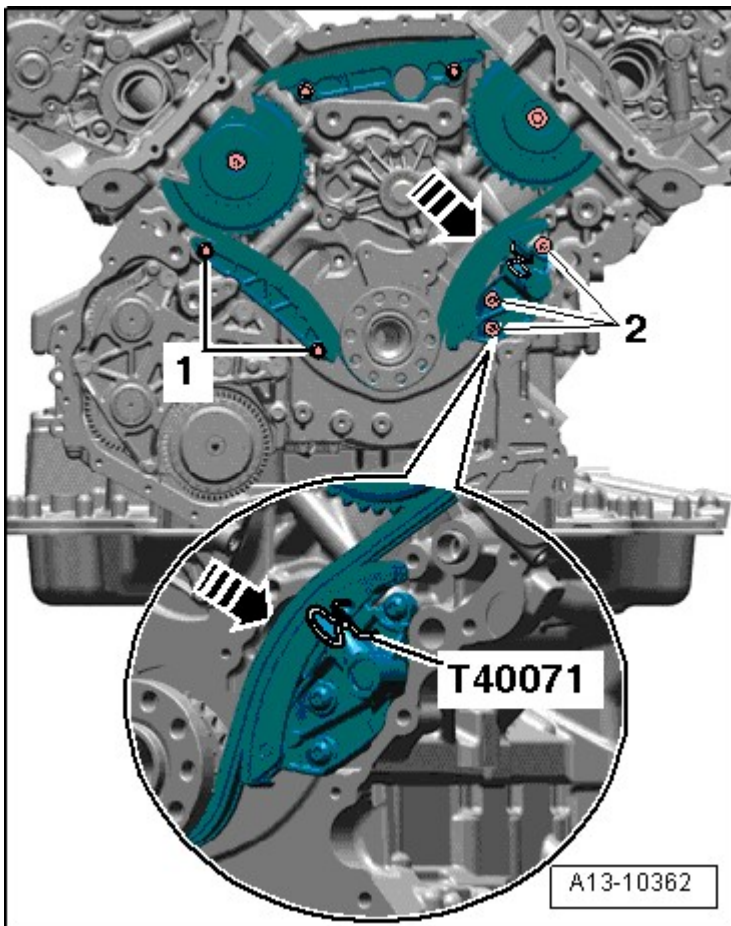


Fig. 105: Identifying Bolts And Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

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 guide rail.

-- Remove bolts -2- and chain tensioner.

-- Remove timing mechanism drive chain.

INSTALLING

- Tightening specifications **TIMING MECHANISM DRIVE CHAIN ASSEMBLY OVERVIEW.**

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

NOTE: Replace bolts which have been tightened to specification.

-- Position timing mechanism drive chain according to the markings made on the drive chain sprockets during removal.

-- Install guide rail and tighten the bolts -1-.

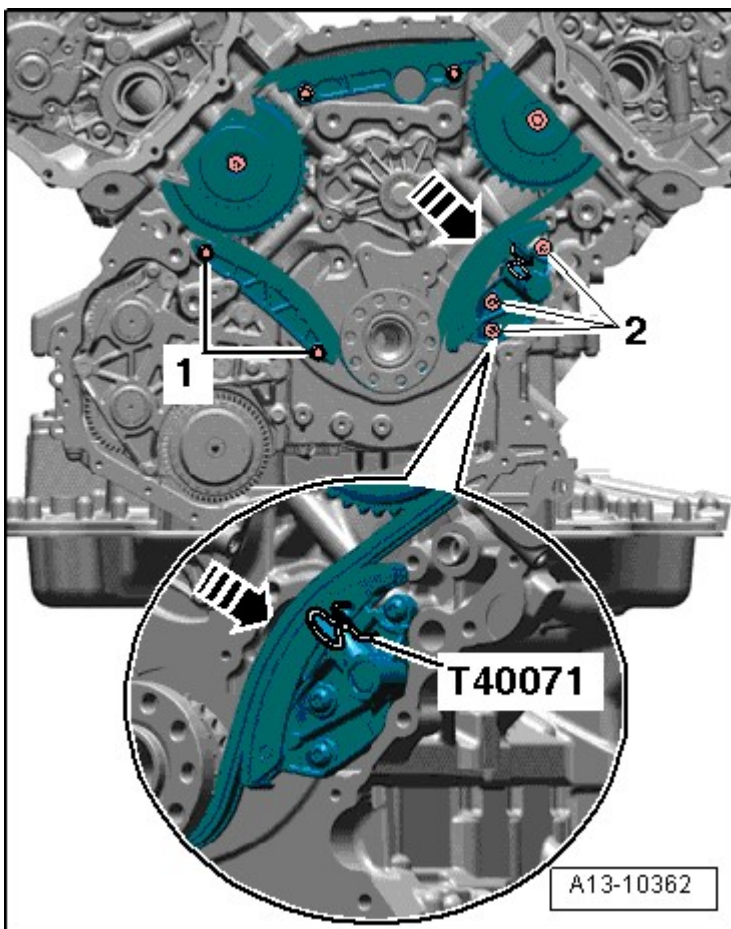


Fig. 106: Identifying Bolts And Chain Tensioner
Courtesy of AUDI OF AMERICA, LLC

-- Install chain tensioner and tighten bolts -2-.

-- Press drive chain tensioner guide rail in direction of -arrow- and pull securing pin T40071 out of chain tensioner.

-- Install power take-off drive chain **POWER TAKE-OFF CHAIN**.

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

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

-- Fill engine oil and check oil level **ENGINE OIL, CHECKING LEVEL** .

POWER TAKE-OFF CHAIN

Special tools and workshop equipment required

- Wrench T40049
- Securing pin T40071
- Drill bit dia. 8 mm

REMOVING

Proceed as follows:

- Transmission removed.

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

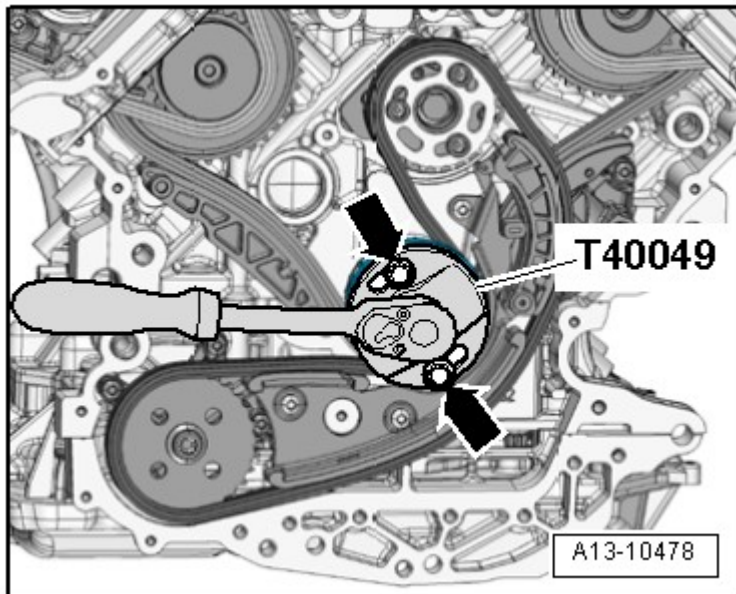


Fig. 107: Identifying Key T40049 At Rear On Crankshaft Using Old Bolts For Dual-Mass Flywheel, Installation

Courtesy of AUDI OF AMERICA, LLC

CAUTION: The drive chain could be destroyed.

- **Place a washer under the bolt heads to prevent the bolts from pinching the drive chain.**

-- Install key T40049 at rear of crankshaft using two old drive plate bolts -arrows-.

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

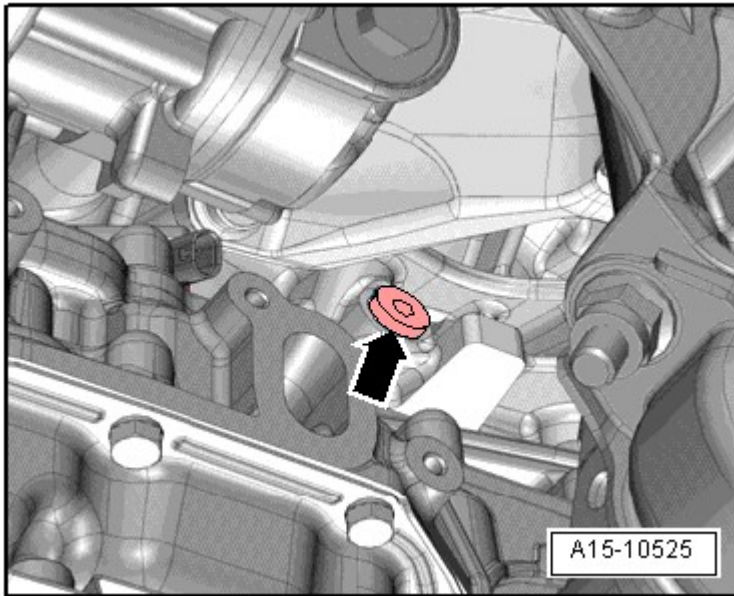


Fig. 108: Identifying Locking Bolt

Courtesy of AUDI OF AMERICA, LLC

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

NOTE: The crankshaft locating hole is difficult to find when the engine is installed.

Rotate the engine until the small notch -1- on the vibration damper aligns at the left of the housing separation point -2- between the cylinder block and the guide frame. This makes it easier to install locking pin T40069.

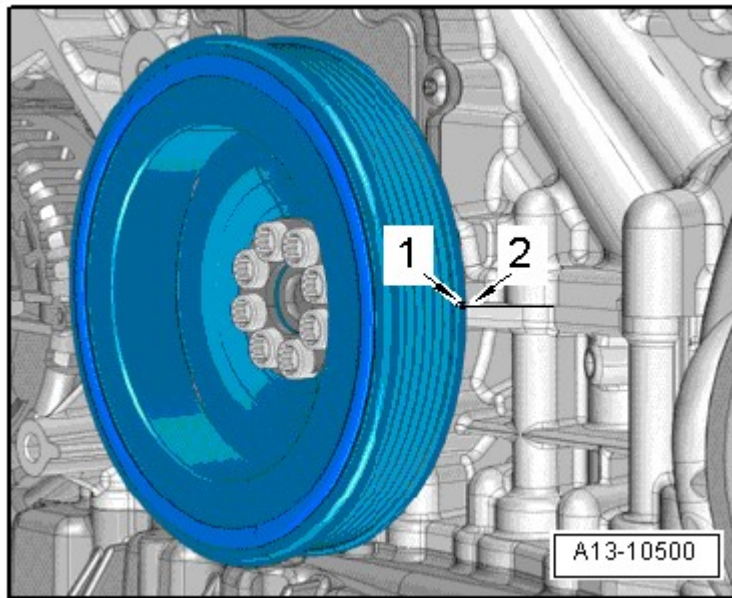


Fig. 109: Identifying Vibration Damper Alignment Notch
Courtesy of AUDI OF AMERICA, LLC

The marking on the vibration damper is only there to help. The exact "TDC" location is only reached by installing the locking pin T40069.

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

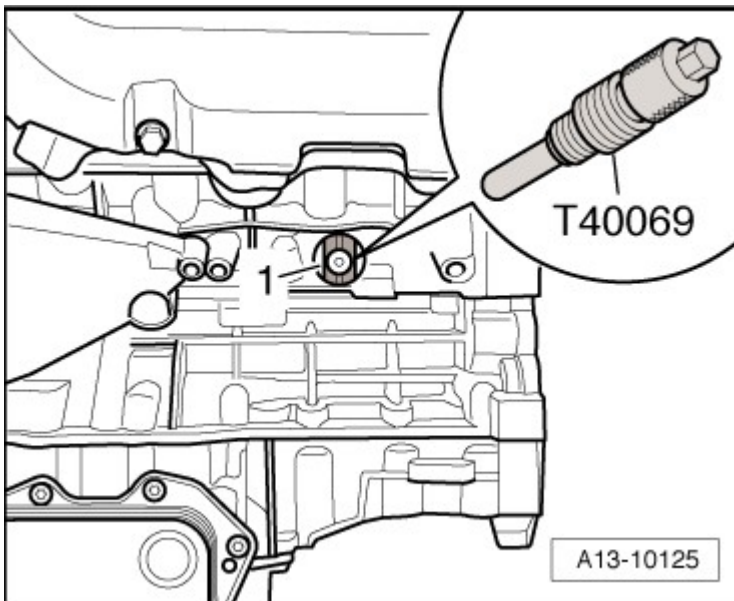


Fig. 110: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

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

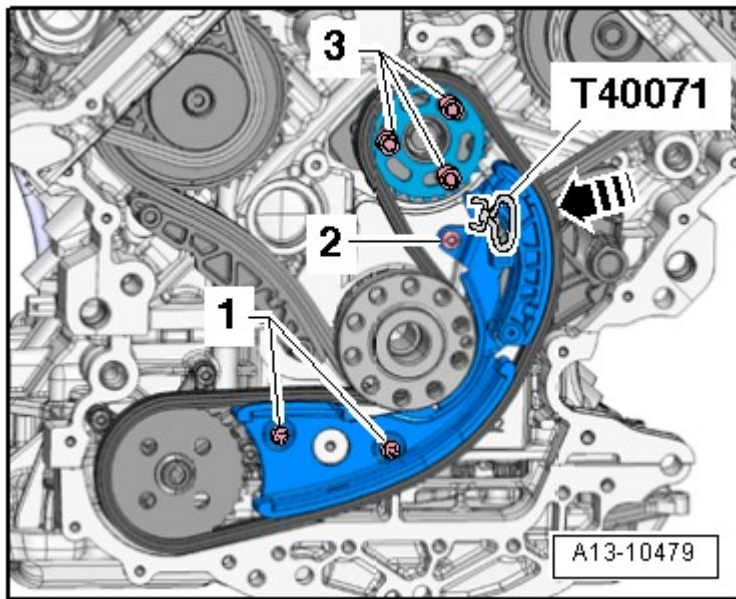


Fig. 111: Pressing Chain Tensioner Guide Rail And Securing Chain Tensioner Using Locking Pin T40071
 Courtesy of AUDI OF AMERICA, LLC

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

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

-- Remove bolts -3- and balance shaft chain sprocket.

-- Remove bolts -1- and -2- and chain tensioner with drive chain.

INSTALLING

- Tightening specifications **TIMING MECHANISM DRIVE CHAIN ASSEMBLY OVERVIEW, Fig. 98**
- Secure crankshaft -1- in "TDC" position using crankshaft holder T40069.

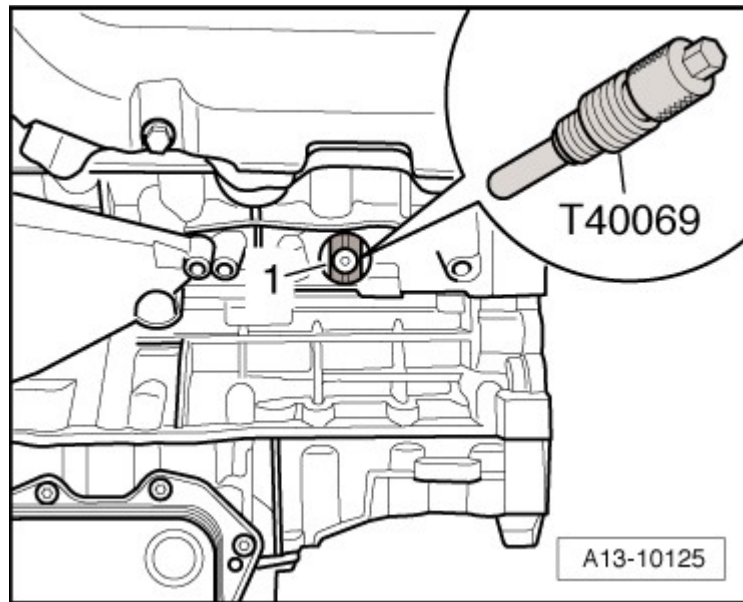


Fig. 112: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- Install chain tensioner with drive chain and balance shaft chain sprocket.
- To protect against cuts, wrap point and cutting edges on an 8 mm diameter drill bit with insulating tape.
- Secure balance shaft in "TDC" position using an 8 mm diameter drill bit -2-.

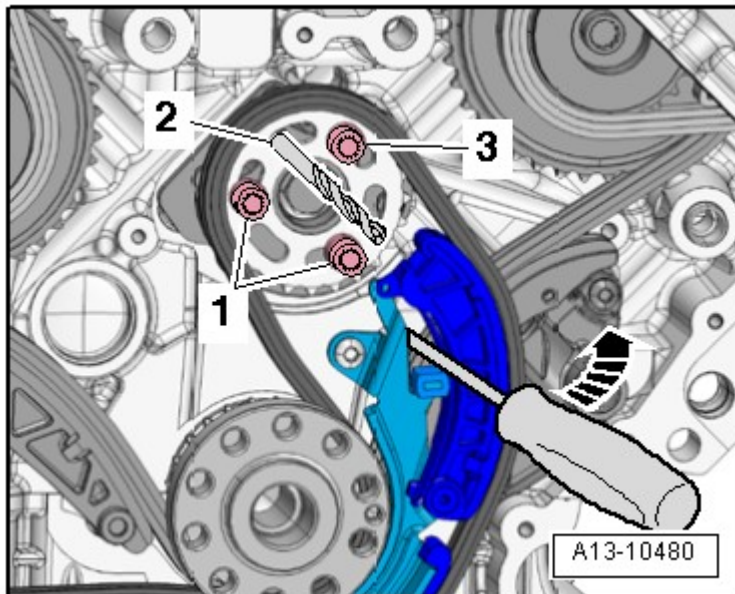


Fig. 113: Securing Balance Shaft Using An 8 Mm Dia. Drill Bit At "TDC"
Courtesy of AUDI OF AMERICA, LLC

- The slots in the balance shaft sprocket must be at the middle position in relation to the threaded holes of

the balance shaft. If necessary, adjust chain by one tooth.

-- Tighten chain tensioner bolts.

-- Loosely install chain sprocket bolts -1- and -3-.

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

-- Remove locking pin T40071 to release chain tensioner.

-- Press against chain tensioner guide rail -arrow- using a screwdriver while tightening chain sprocket bolts -1- and -3-.

-- Remove drill bit -2- from balance shaft.

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

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

-- Fill engine oil and check oil level **ENGINE OIL, CHECKING LEVEL** .

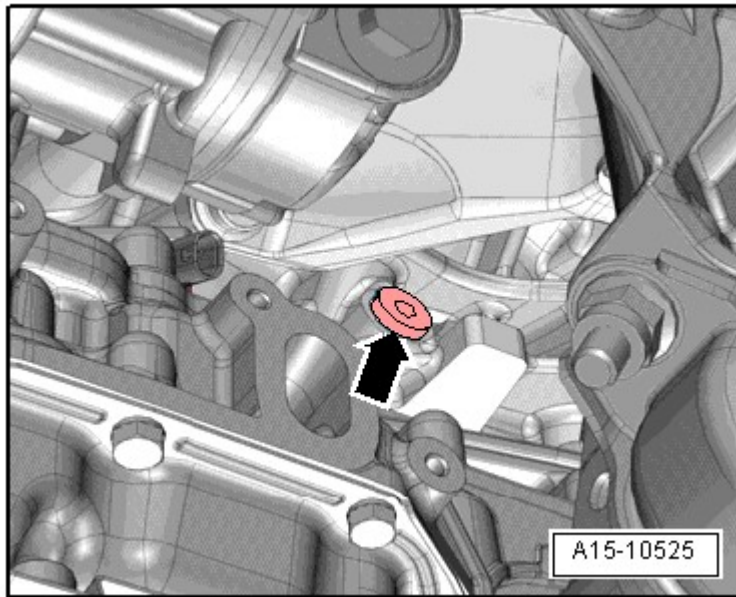


Fig. 114: Identifying Locking Bolt

Courtesy of AUDI OF AMERICA, LLC

BALANCE SHAFT

Special tools and workshop equipment required

- Old oil collecting and extracting device V.A.G 1782

REMOVING

Proceed as follows:

- Transmission removed.

-- Remove belt pulley side sealing flange **SEALING FLANGE AND CRANKSHAFT SEAL, BELT PULLEY SIDE** .

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

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

-- To protect against cuts, wrap point and cutting edges on an 8 mm diameter drill bit with insulating tape.

-- Secure balance weight -2- at rear of engine with an 8 mm diameter drill bit -1-.

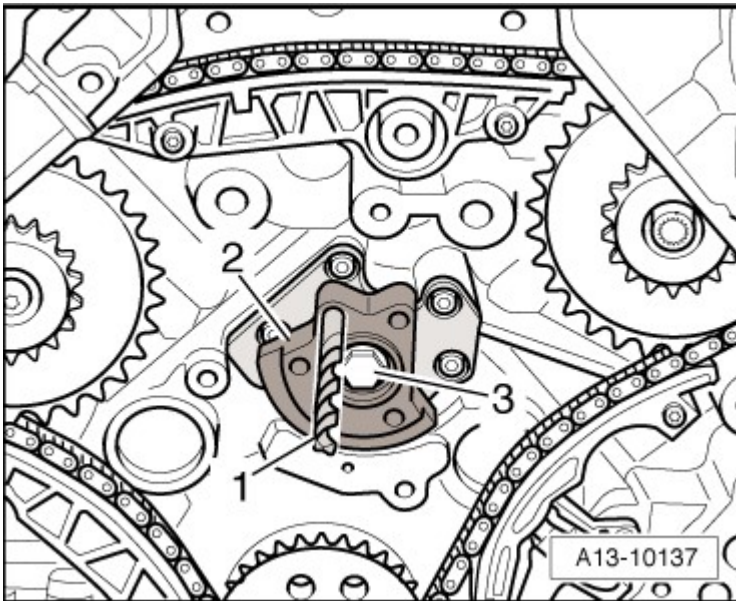


Fig. 115: Securing Balance Weight

Courtesy of AUDI OF AMERICA, LLC

-- Remove bolt -3- and remove balance weight from balance shaft.

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

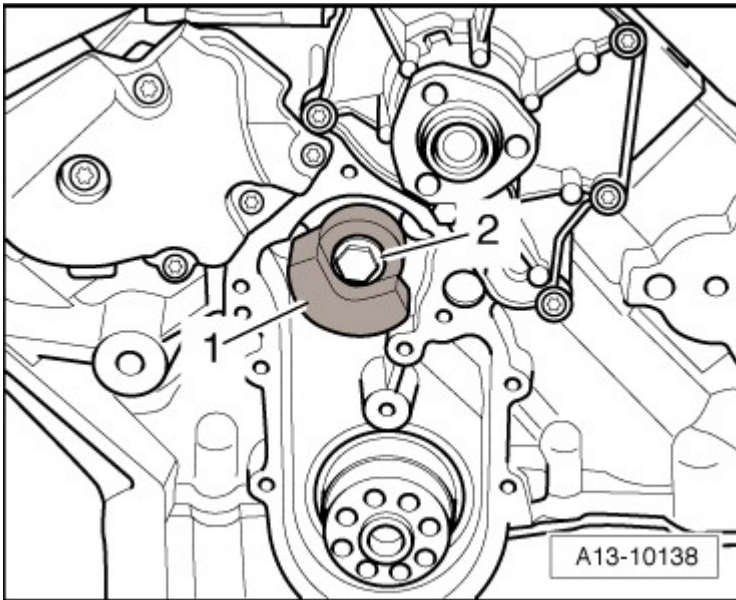


Fig. 116: Identifying Balance Weight -1- And Bolt -2-
Courtesy of AUDI OF AMERICA, LLC

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

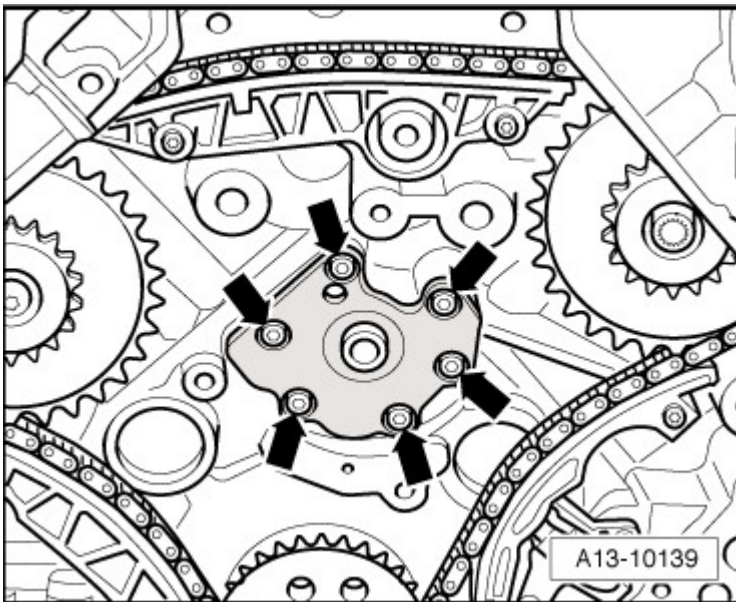


Fig. 117: Identifying Bearing End Bracket Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove balance shaft back out of cylinder block.

INSTALLING

- Tightening specifications **BALANCE SHAFT ASSEMBLY OVERVIEW, Fig. 98**
- Secure crankshaft -1- in "TDC" position using crankshaft holder T40069.

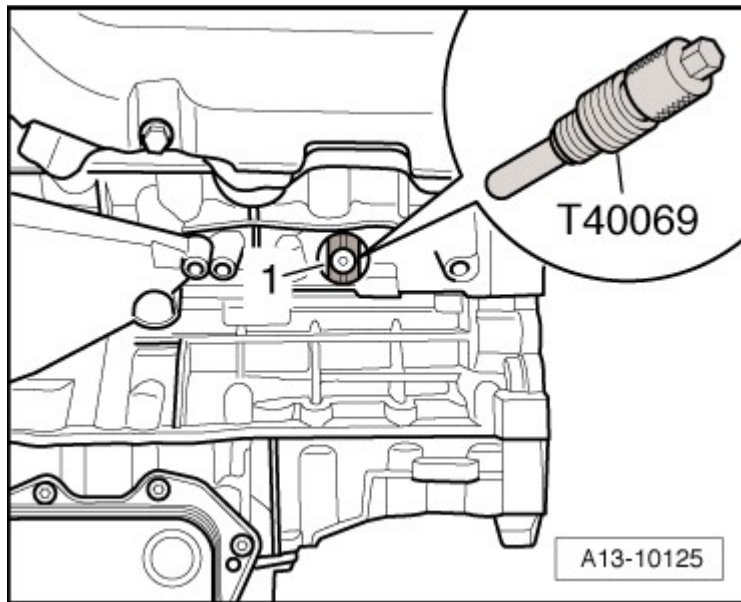


Fig. 118: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

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

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

- Install power take-off drive chain **POWER TAKE-OFF CHAIN**.
- Install timing chain lower cover **LOWER TIMING CHAIN COVER**.
- Install belt pulley side sealing flange **SEALING FLANGE AND CRANKSHAFT SEAL, BELT PULLEY SIDE** .
- Fill engine oil and check the oil level **ENGINE OIL, CHECKING LEVEL** .

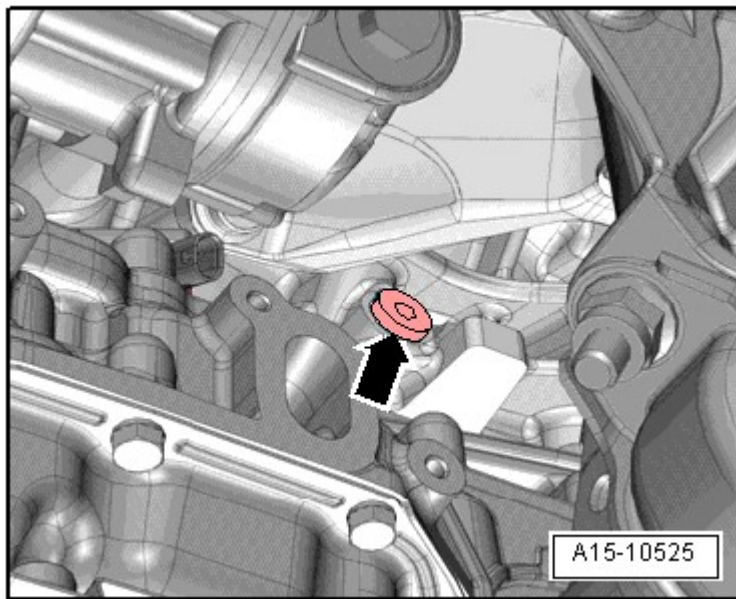


Fig. 119: Identifying Locking Bolt
Courtesy of AUDI OF AMERICA, LLC

LEFT CYLINDER HEAD COVER

Special tools and workshop equipment required

- Ignition coil puller T40039

REMOVING

Proceed as follows:

-- Remove engine covers -arrows-.

2009 Audi A5 Quattro

ENGINE 3.2 Liter - Cylinder Head, Valvetrain - Engine Code(s): CALA (Coupe) (As of 11.2007)

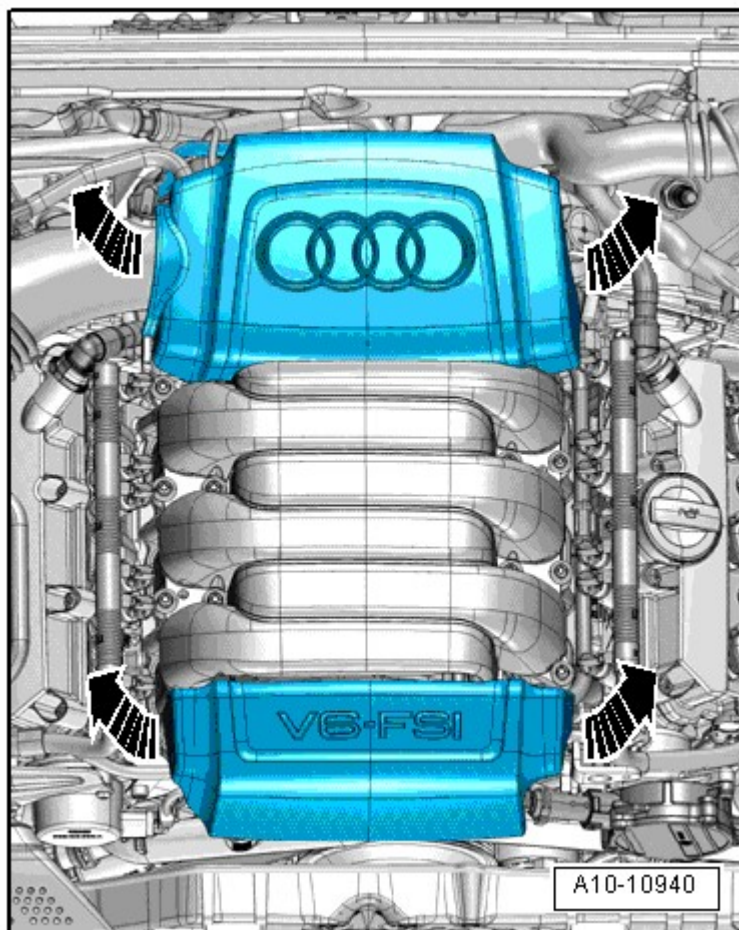


Fig. 120: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -arrows-.

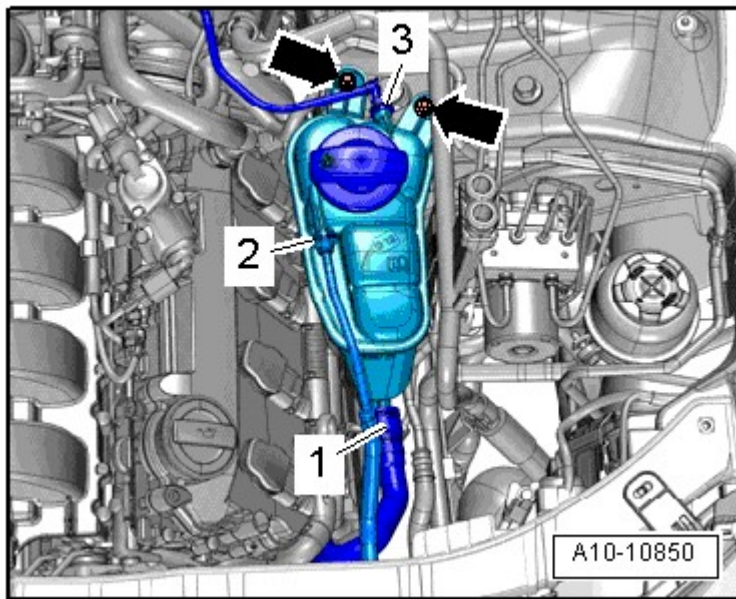


Fig. 121: Identifying Coolant Hose And Coolant Reservoir
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector on Engine Coolant Level (ECL) warning switch -F66- and lay coolant reservoir aside with coolant hoses -1, 2 and 3- connected.

-- Remove bolts -arrows- on left cylinder head and disconnect electrical connectors to ignition coils.

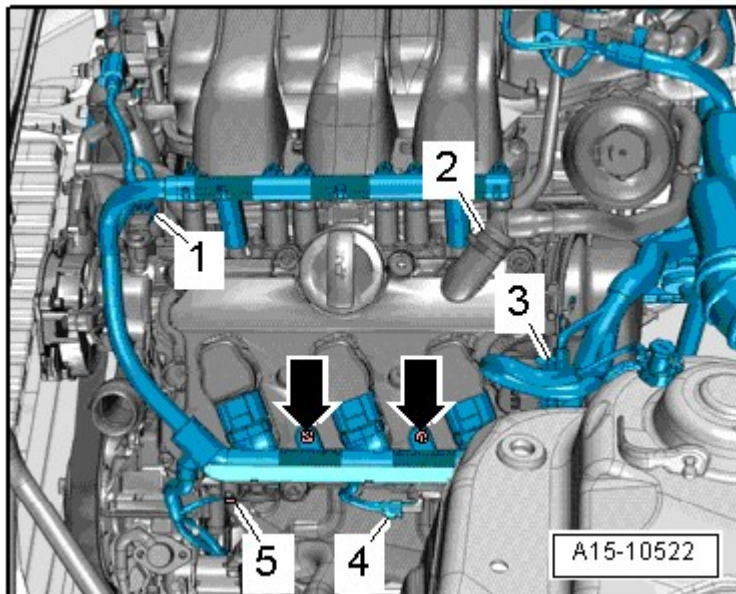


Fig. 122: Identifying Bolts On Left Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -1- on Camshaft Position (CMP) sensor 2 -G163- and -4- on Camshaft Position (CMP) sensor 4 -G301-.

-- Remove ground (GND) wire bolt -5-.

NOTE: Ignore -2-.

-- Disconnect electrical connectors -3- on camshaft adjustment valve 2 -N208- and camshaft adjustment valve 2 (exhaust) -N319-, while following the note below.

NOTE: The connecting bracket -3- on the camshaft adjustment valve electrical connectors -1- and -2- prevents them from being exchanged and must not be removed from the connectors.

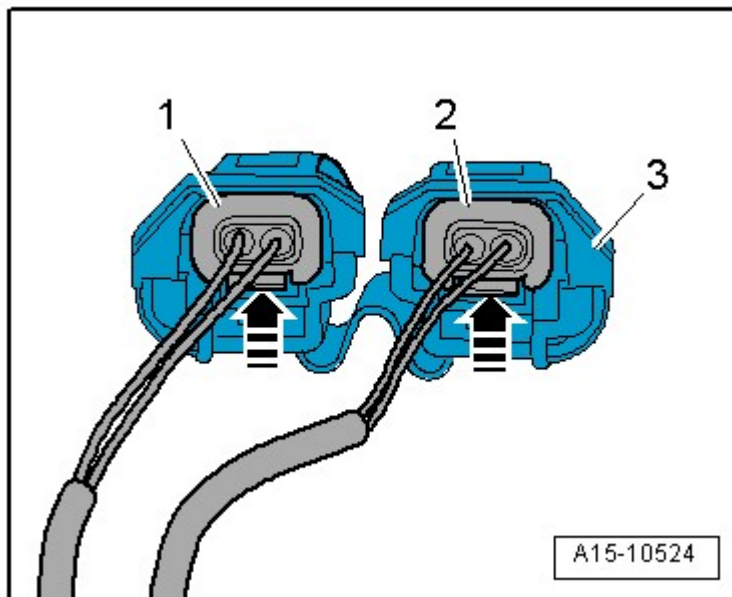


Fig. 123: Identifying Connecting Bracket -3- On Camshaft Adjustment Valve Connectors -1- And -2-
Courtesy of AUDI OF AMERICA, LLC

-- To disconnect, press both connectors -arrows- and remove them both together from camshaft adjustment valve 2 -N208- and camshaft adjustment valve 2 (exhaust) -N319-.

-- Move electrical wiring harness to side.

-- Remove ignition coils with ignition coil puller T40039.

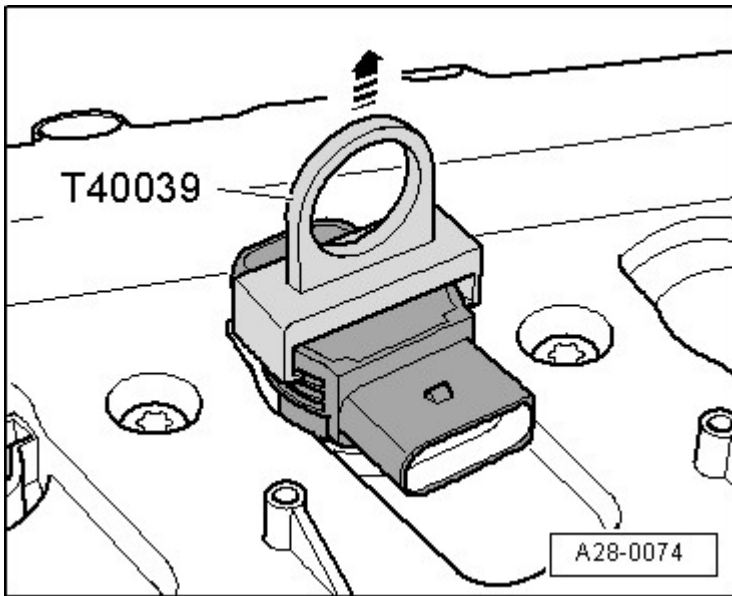


Fig. 124: Identifying Ignition Coil Puller T40039 Removing Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of violating emissions legislation on vehicles.

- Do not open the hose connection -arrow-.

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

INSTALLING

- Tightening specifications **Fig. 12**.

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

NOTE: Replace cylinder head seal if it is damaged.

Replace cylinder head cover bolts when replacing the damaged seal.

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

-- Tighten left cylinder head cover bolts **Fig. 12**

RIGHT CYLINDER HEAD COVER

Special tools and workshop equipment required

- Ignition coil puller T40039

REMOVING

Proceed as follows:

-- Remove engine covers -arrows-.

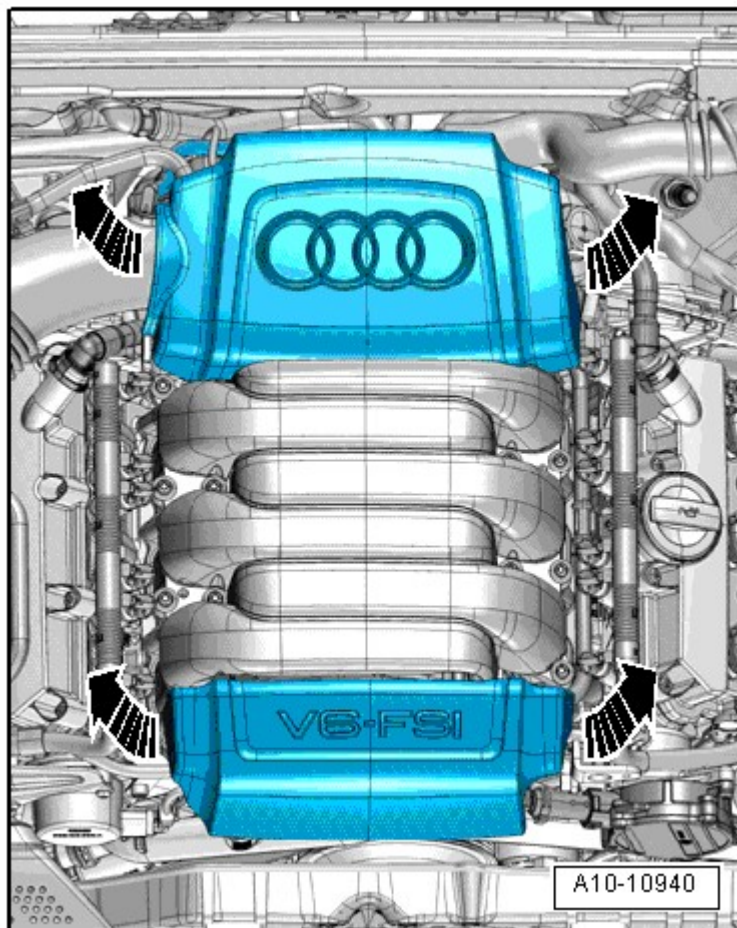


Fig. 125: Identifying Engine Cover

Courtesy of AUDI OF AMERICA, LLC

-- Remove air duct -arrows-.

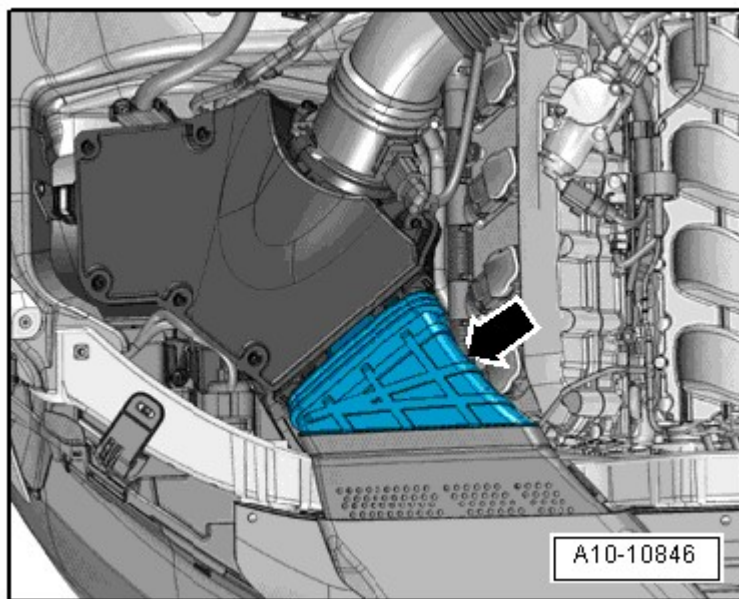


Fig. 126: Identifying Air Duct

Courtesy of AUDI OF AMERICA, LLC

-- Free up fuel line -1- and wire -2- to EVAP canister at air guide pipe.

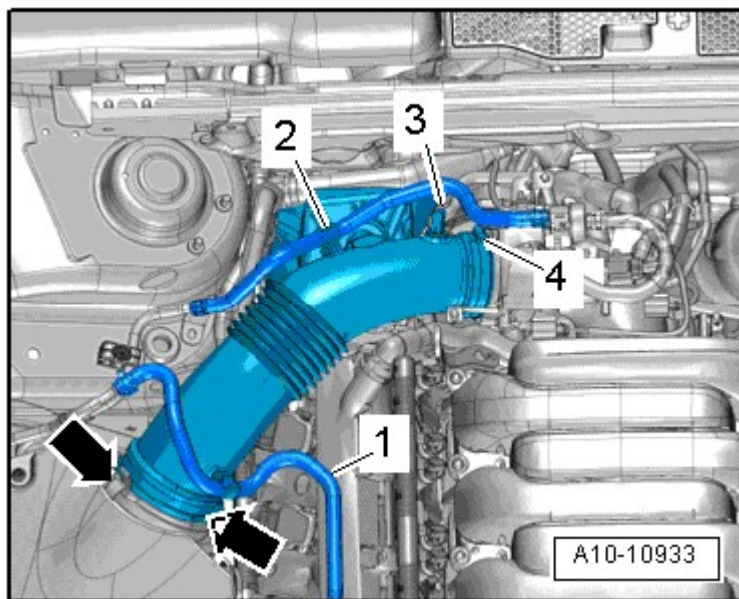


Fig. 127: Freeing Up Fuel Hose On Air Duct Pipe

Courtesy of AUDI OF AMERICA, LLC

-- Remove vacuum hose -3- from connection on air guide pipe.

-- Remove air guide pipe by loosening hose clamp -4- and opening clips -arrows-.

-- Disconnect vacuum line -1-.

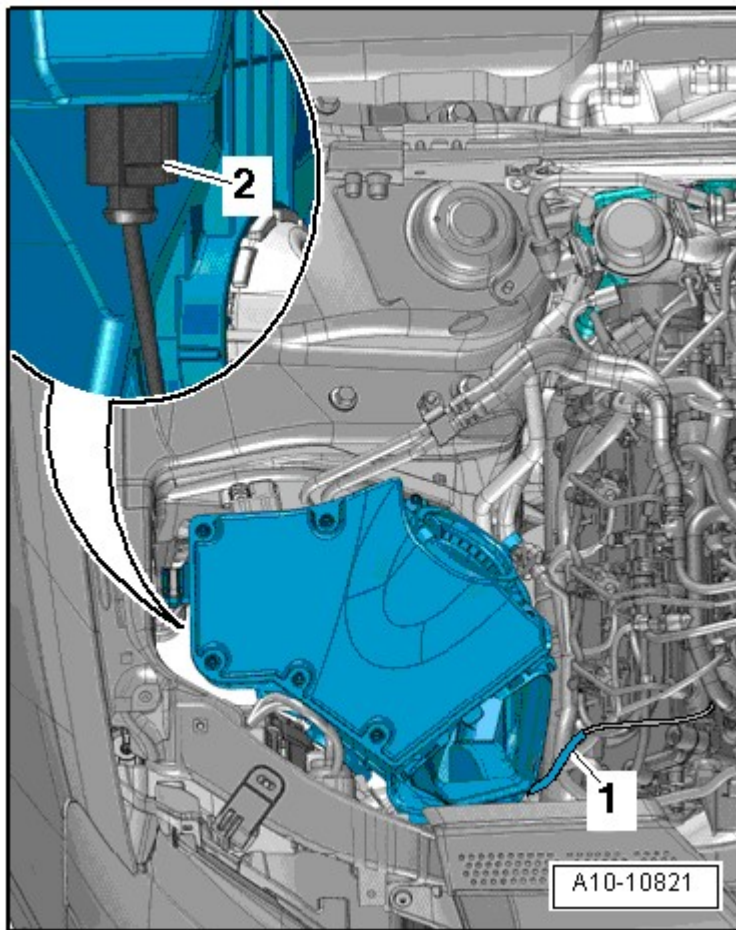


Fig. 128: Disconnecting Vacuum Line
Courtesy of AUDI OF AMERICA, LLC

-- Remove air filter housing and, if applicable, disconnect electrical connector -2- on rear side at intake air switch-over valve -N335-.

-- Remove bolts -arrows- on right cylinder head and disconnect electrical connectors to ignition coils.

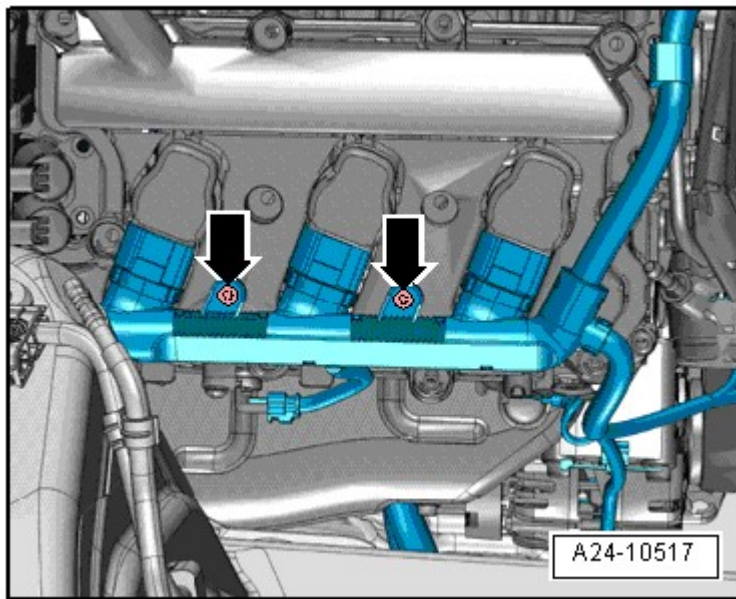


Fig. 129: Identifying Bolts On Right Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -5- on Camshaft Position (CMP) sensor 3 -G300-.

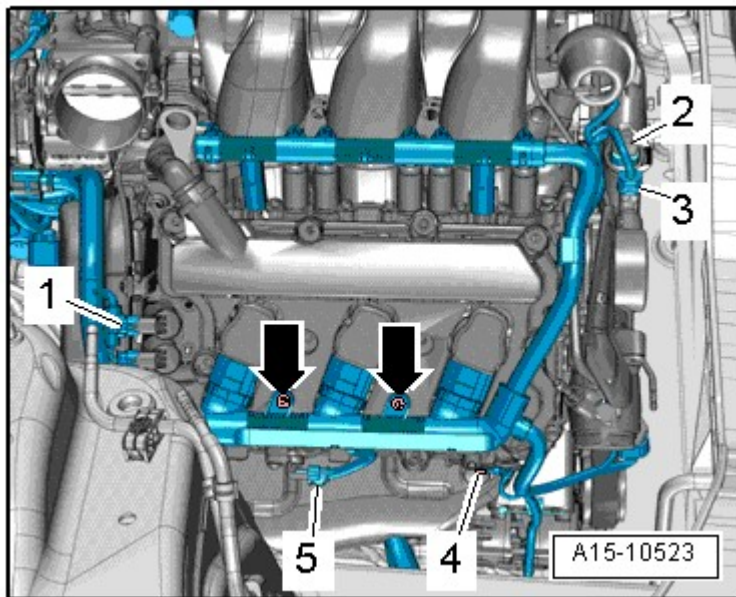


Fig. 130: Disconnecting Electrical Connector On Camshaft Position
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -2, 3 and 4-.

-- Disconnect electrical connectors -1- on camshaft adjustment valve 1 -N205- and camshaft adjustment valve 1 (exhaust) -N318-, while following the note below.

NOTE: The connecting bracket -3- on the camshaft adjustment valve electrical connectors -1- and -2- prevents them from being exchanged and must not be removed from the connectors.

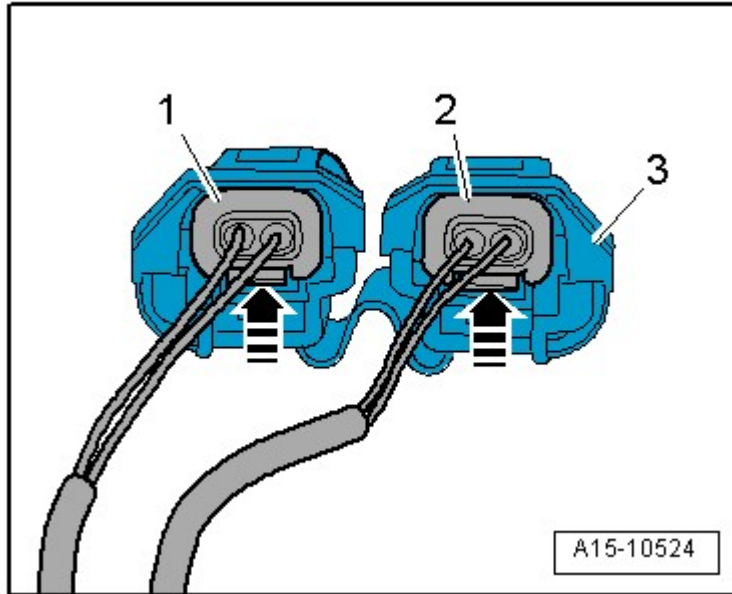


Fig. 131: Identifying Connecting Bracket -3- On Camshaft Adjustment Valve Connectors -1- And -2-
Courtesy of AUDI OF AMERICA, LLC

-- To disconnect, press both connectors -arrows- and remove them both together from camshaft adjustment valve 1 -N205- and camshaft adjustment valve 1 (exhaust) -N318-.

-- Press electrical wiring harness to side.

-- Remove ignition coils with ignition coil puller T40039.

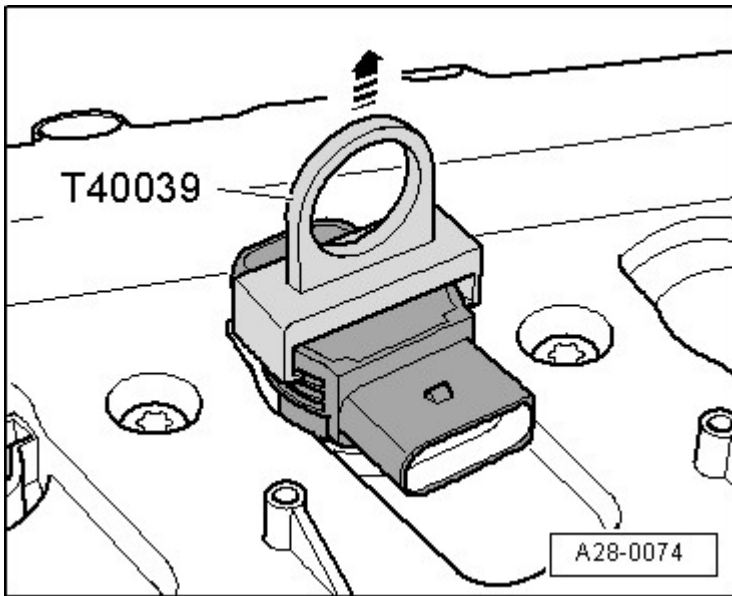


Fig. 132: Identifying Ignition Coil Puller T40039 Removing Ignition Coils
Courtesy of AUDI OF AMERICA, LLC

CAUTION: Risk of violating emissions legislation on vehicles.

- Do not open the hose connection -arrow-.

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

INSTALLING

- Tightening specifications **Fig. 13**

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

NOTE: Replace cylinder head seal if it is damaged.

Replace cylinder head cover bolts when replacing damaged seal.

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

-- Tighten right cylinder head cover bolts **Fig. 13**

CYLINDER HEADS

Special tools and workshop equipment required

- Pin wrench 3212
- Adapter T40058

- Locking pin T40069
- Camshaft locator T40133

REMOVING

- Engine installed.

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

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

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 **BEFORE OPENING HIGH PRESSURE FUEL INJECTION SYSTEM** .

-- Remove upper coolant pipe **UPPER COOLANT PIPE** .

-- Remove ribbed belt **RIBBED BELT** .

-- Remove lower section of intake manifold **Removal and Installation** .

-- Disconnect electrical connectors on the fuel injectors.

-- Remove left catalytic converter **LEFT CATALYTIC CONVERTER** .

-- Remove right front muffler **FRONT MUFFLER** .

-- Remove nuts -arrows- and bolt -1- and press right catalytic converter to the side.

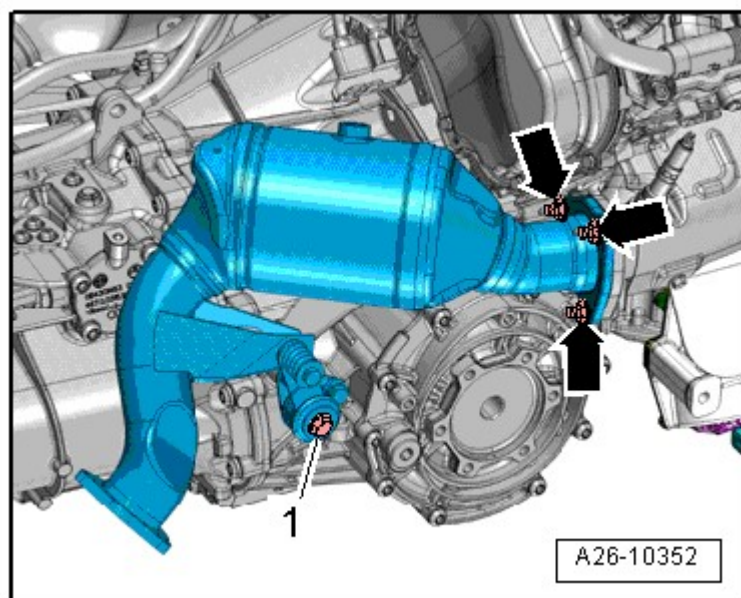


Fig. 133: Identifying Nuts, Bolts And Right Catalytic Converter
Courtesy of AUDI OF AMERICA, LLC

NOTE: The installation location is shown with engine removed.

-- Remove bolts -arrows- for coolant pump ribbed belt pulley using a spanner wrench 3212 to counter hold.

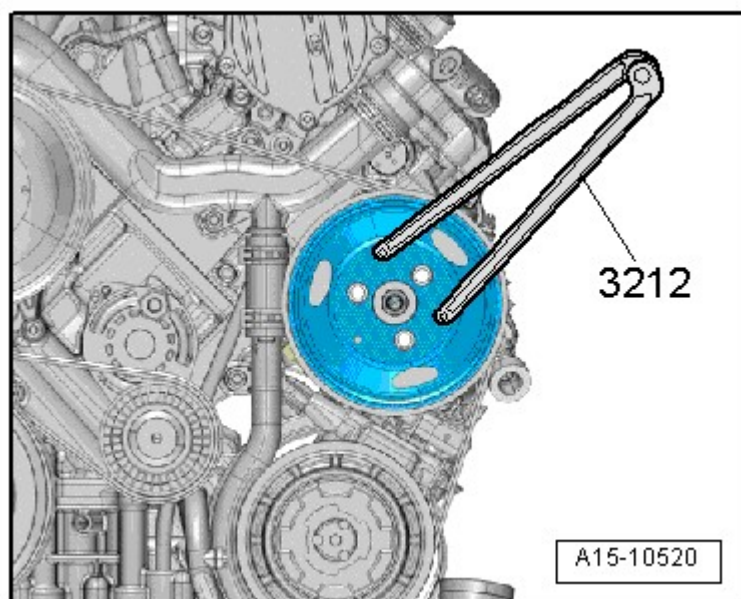


Fig. 134: Identifying Coolant Pump Pulley Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1- and -2-, loosen bolt -3- and move power steering pump to side.

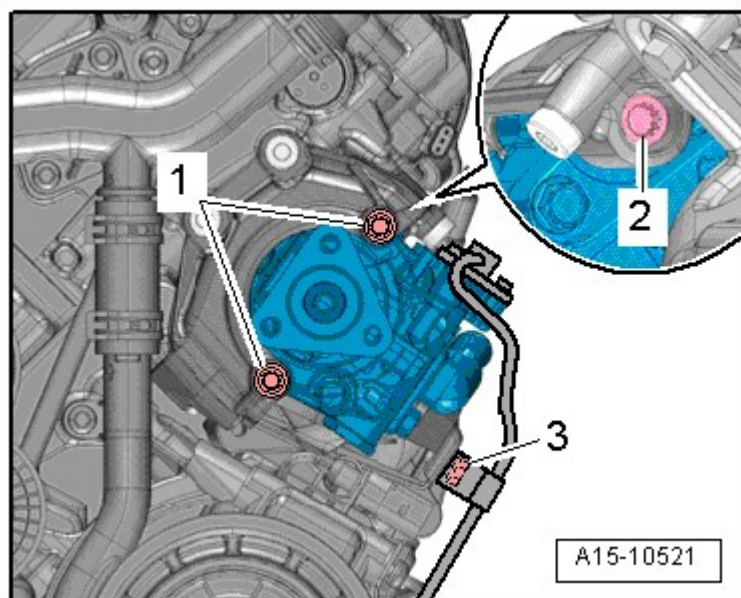


Fig. 135: Identifying Power Steering Pump & Bolts
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connector -3- for Engine Coolant Temperature (ECT) sensor -G62-.

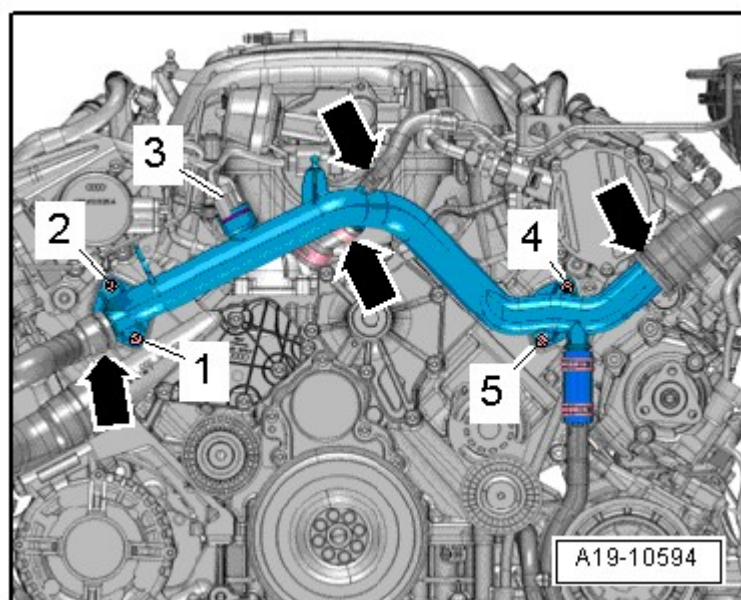


Fig. 136: Disconnecting Electrical Connector For Engine Coolant Temperature ECT Sensor
Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1, 2, 4 and 5- on front coolant pipe.

NOTE: Ignore -arrows-.

-- Remove threaded connection -2- and move fuel supply line to side.

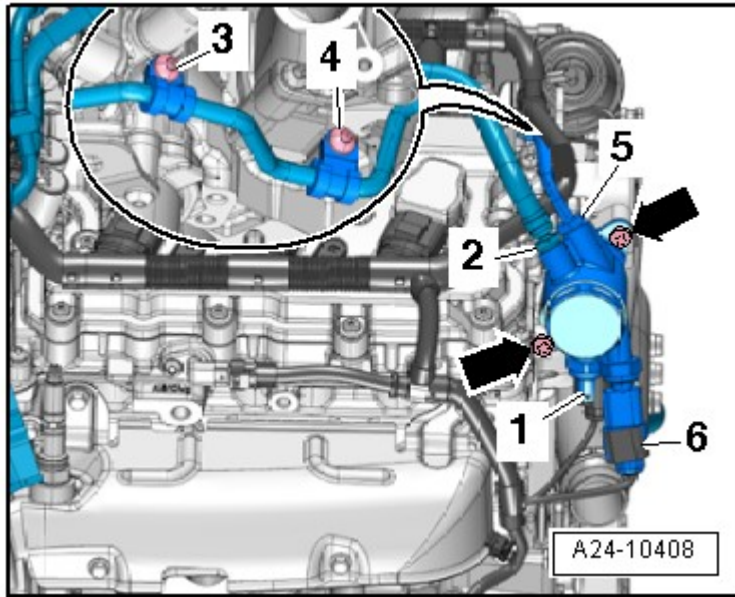


Fig. 137: Identifying High-Pressure Fuel Pump Components
Courtesy of AUDI OF AMERICA, LLC

-- Disconnect electrical connectors -1- and -6-.

NOTE: Ignore -3, 4 and 5- and the -arrows-.

-- Disconnect right and left electrical connectors -arrows- on camshaft adjuster actuators.

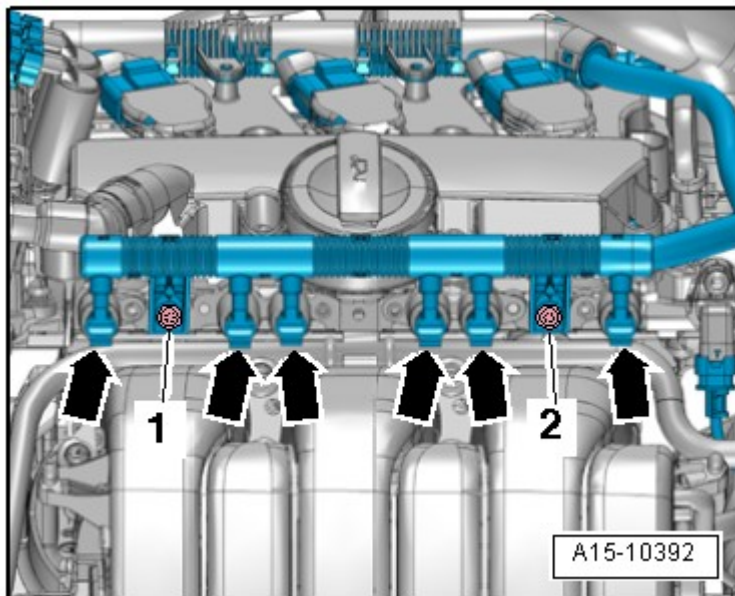


Fig. 138: Disconnecting Right And Left Electrical Connectors On Camshaft Adjuster Actuators

Courtesy of AUDI OF AMERICA, LLC

-- Remove bolts -1- and -2- and free up electrical wiring harness.

-- Remove cylinder head cover: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.

-- Disconnect electrical connector -3- on Camshaft Position (CMP) sensor -G40-.

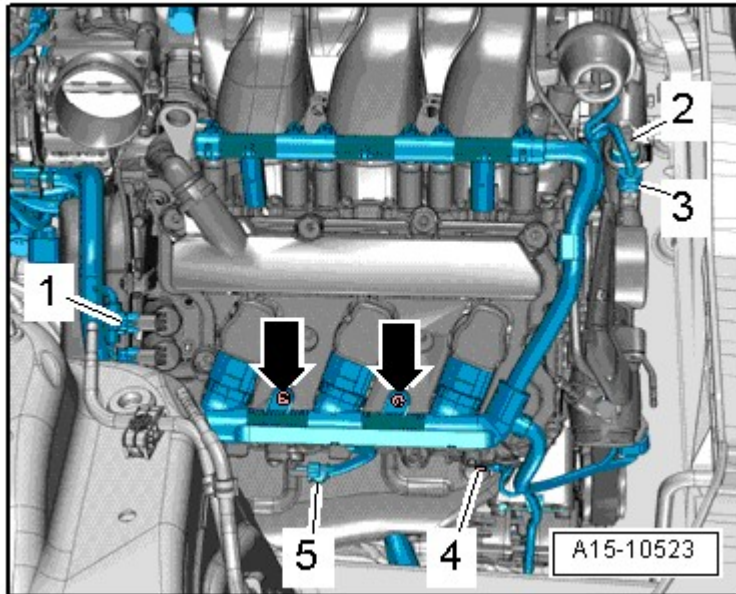


Fig. 139: Disconnecting Electrical Connector On Camshaft Position

Courtesy of AUDI OF AMERICA, LLC

-- Remove ground (GND) wire bolt -4-.

NOTE: Ignore -1, 2, 5-.

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

-- Remove bolts -arrows- and bracket for left connectors.

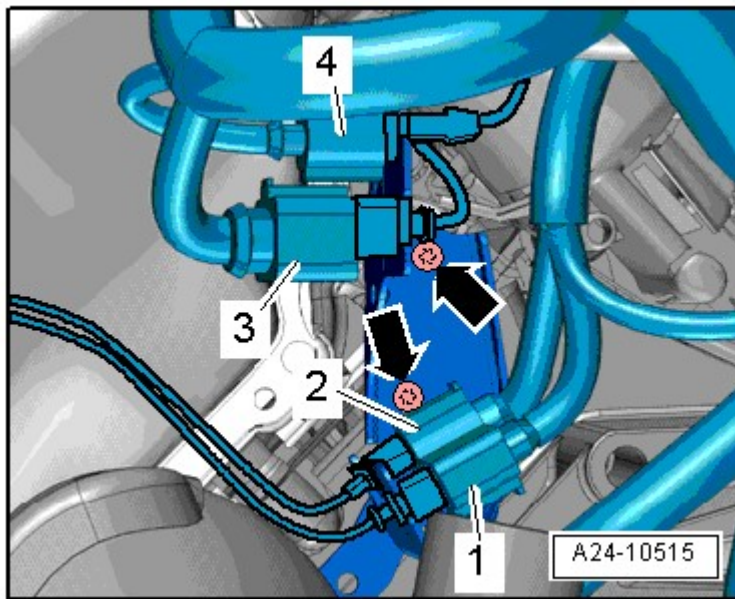


Fig. 140: Cylinder Bank 2 Oxygen Sensor Electrical Connectors
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 through 4-.

-- Remove bolts -arrows- and bracket for right connectors.

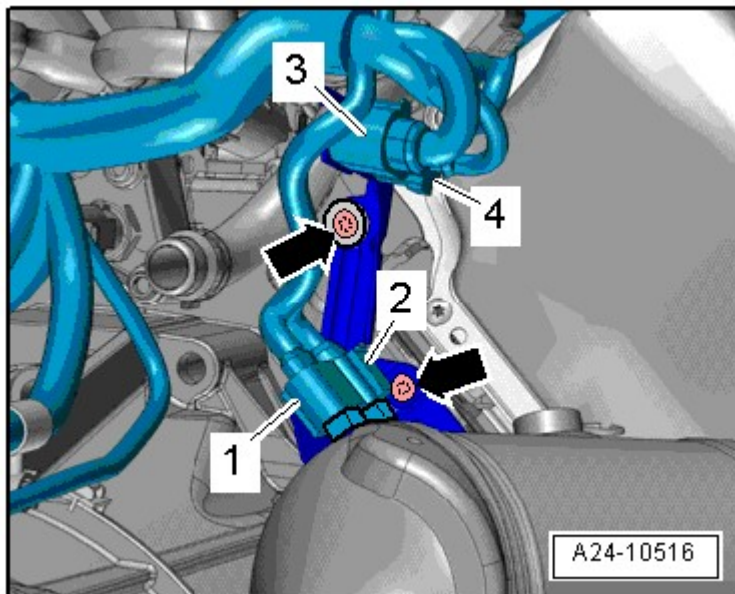


Fig. 141: Identifying Bolts -Arrows- And Right Connector Bracket
Courtesy of AUDI OF AMERICA, LLC

NOTE: Ignore -1 through 4-.

-- Remove bolt -arrow- and remove oil dipstick with guide tube.

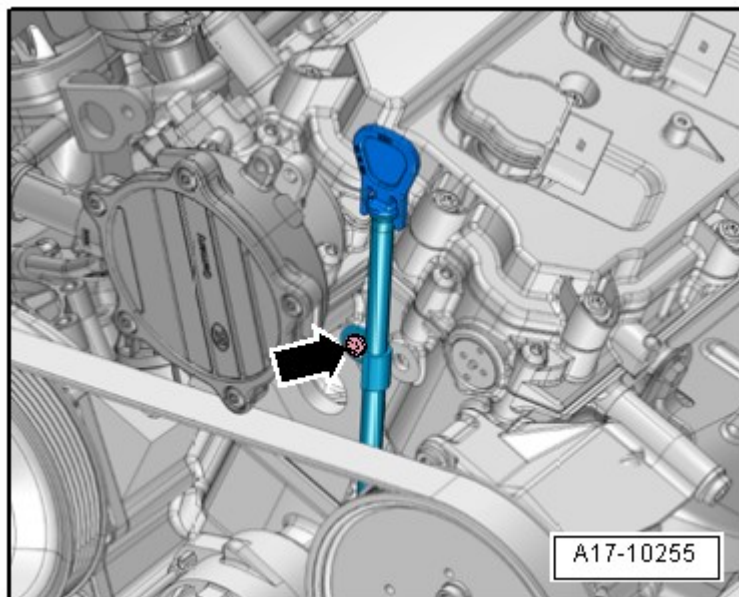


Fig. 142: Identifying Oil Dipstick Guide Tube Bolt

Courtesy of AUDI OF AMERICA, LLC

-- Remove vacuum hose from vacuum pump -arrow- and free it up.

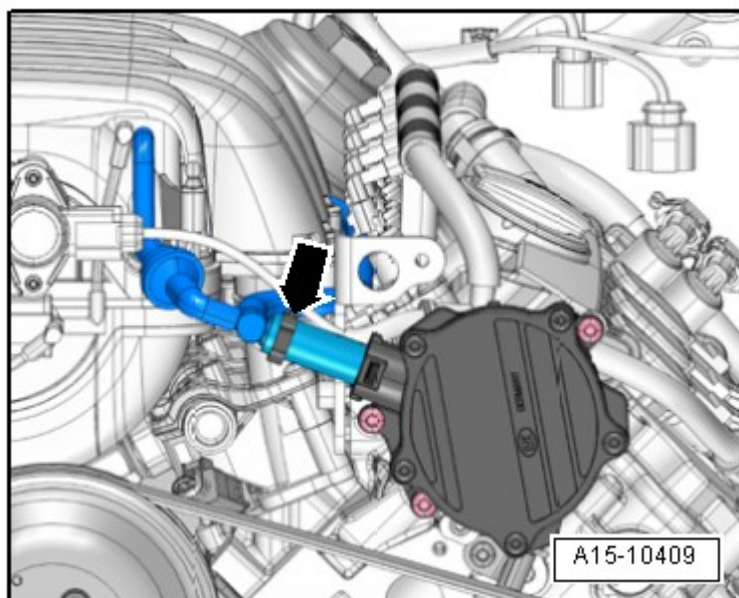


Fig. 143: Identifying Vacuum Pump Hose

Courtesy of AUDI OF AMERICA, LLC

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

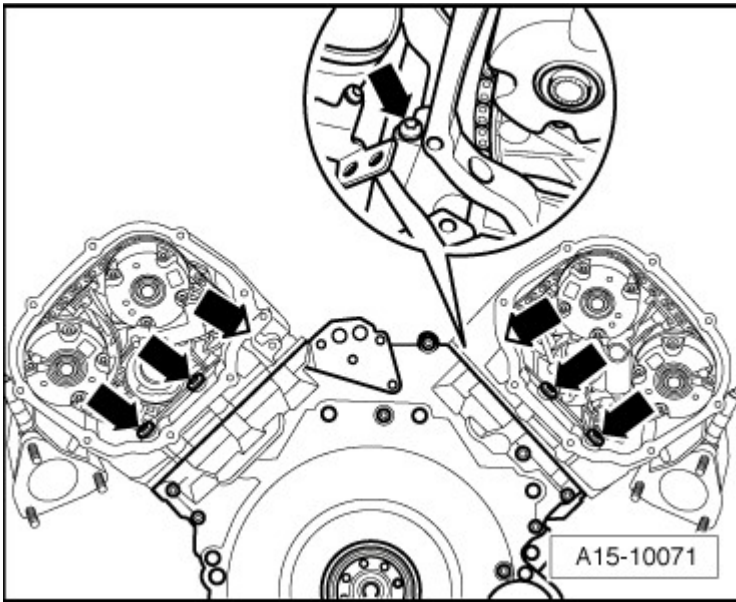


Fig. 144: Identifying Bolts At Rear Of Cylinder Head
 Courtesy of AUDI OF AMERICA, LLC

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

NOTE: The cams on the intake camshaft partially restrict access to the cylinder head bolts, such as bolts -1- and -2- shown in this example.

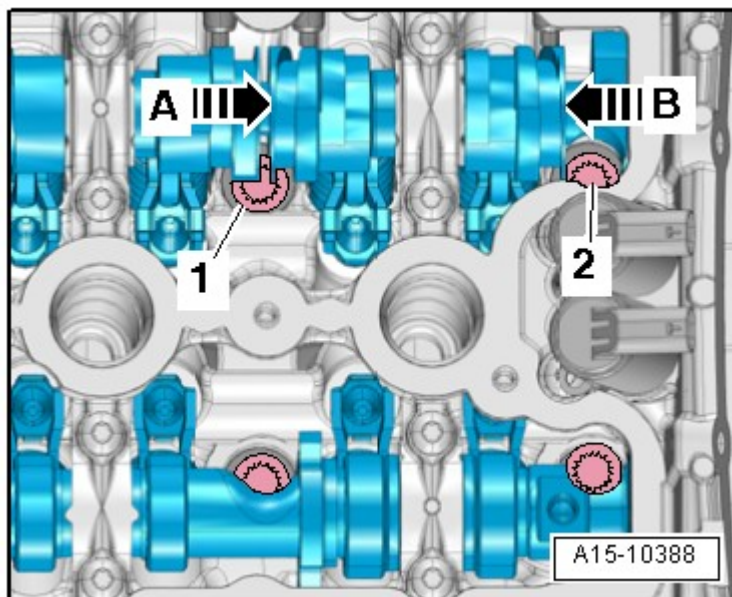


Fig. 145: Intake Camshaft Partially Restrict Access To Cylinder Head Bolts, Such As Bolts Shown In This Example
 Courtesy of AUDI OF AMERICA, LLC

The slider on the camshaft must be pressed in direction of -arrow A- using a plastic wedge to remove the bolt -1-.

The slider on the camshaft must be pressed in direction of -arrow B- using a plastic wedge to remove the bolt -2-.

CAUTION: Risk of damage.

- The camshaft slider must only slide in the base-circle phase, that is the rocker arm on the slider that will be moved must not be loaded with a cam. When loosening the cylinder head bolts, follow the sequence described in the following instruction.

There is a risk it could break.

- The camshaft sliders must not slide on the thin ribs.

-- Insert adapter T40058 guide pins as follows:

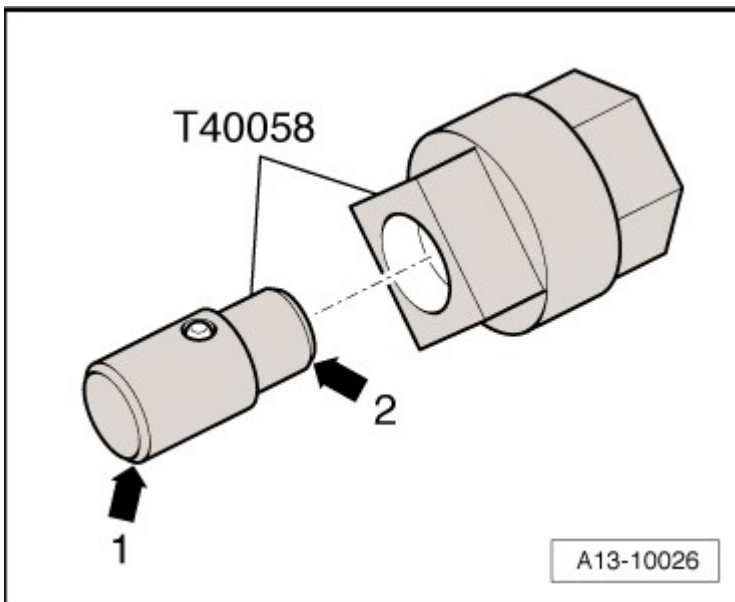


Fig. 146: Identifying Guide Pin And Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The large diameter -arrow 1- faces engine.
- Small diameter -arrow 2- points to adapter.

-- Rotate crankshaft in direction of engine rotation -arrow- using adapter T40058 until camshaft position shown in the following illustration is reached.

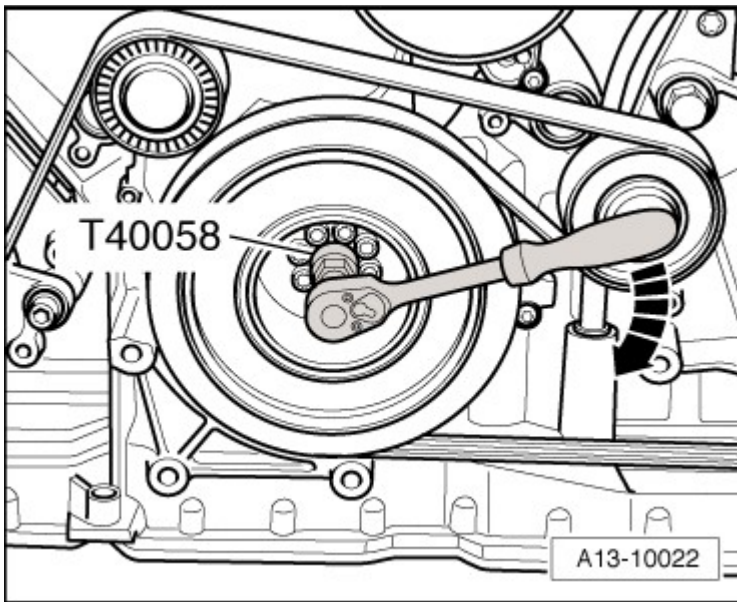


Fig. 147: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The openings -arrows- on exhaust camshafts must face toward outer side of engine as shown in the illustration.

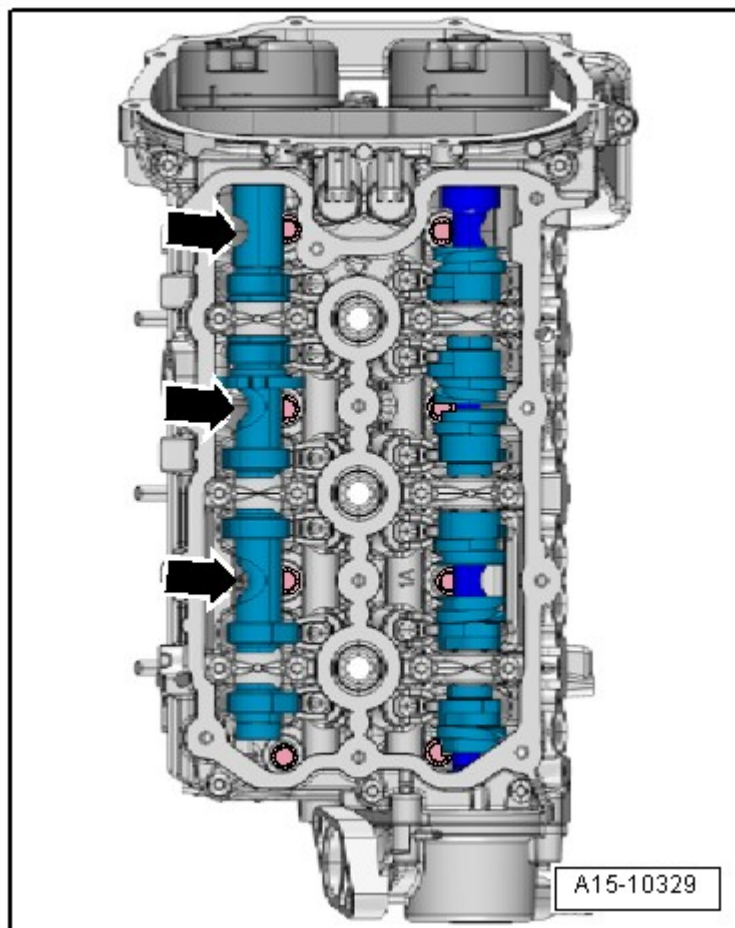


Fig. 148: Identifying Exhaust Camshaft Openings Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Slide unloaded camshaft slider -B- as far as stop in direction of -arrow-.

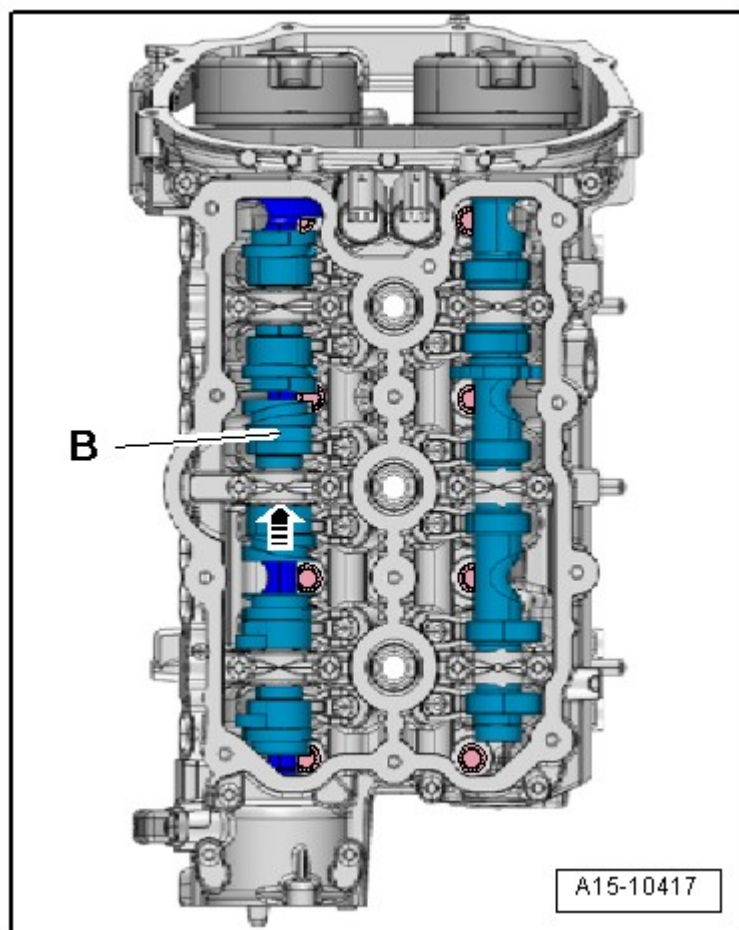


Fig. 149: Sliding Unloaded Camshaft Slide As Far As Stop In Direction
Courtesy of AUDI OF AMERICA, LLC

Right Cylinder Head

-- Slide unloaded camshaft slider -F- as far as the stop in direction of -arrow-.

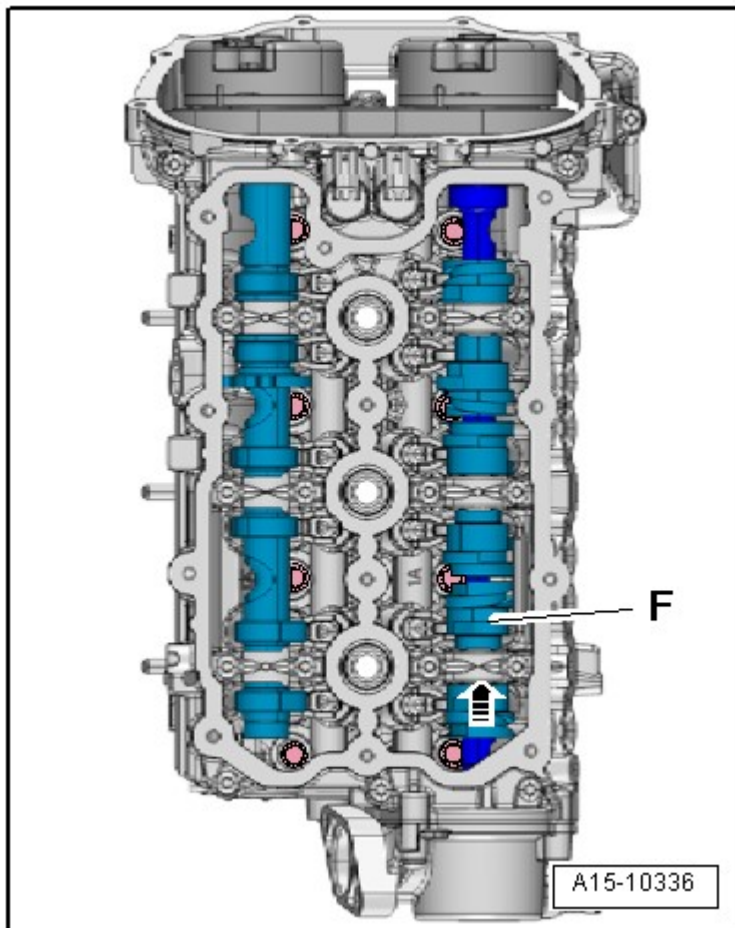


Fig. 150: Sliding Unloaded Camshaft Slide As Far As Stop In Direction
Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder Heads

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

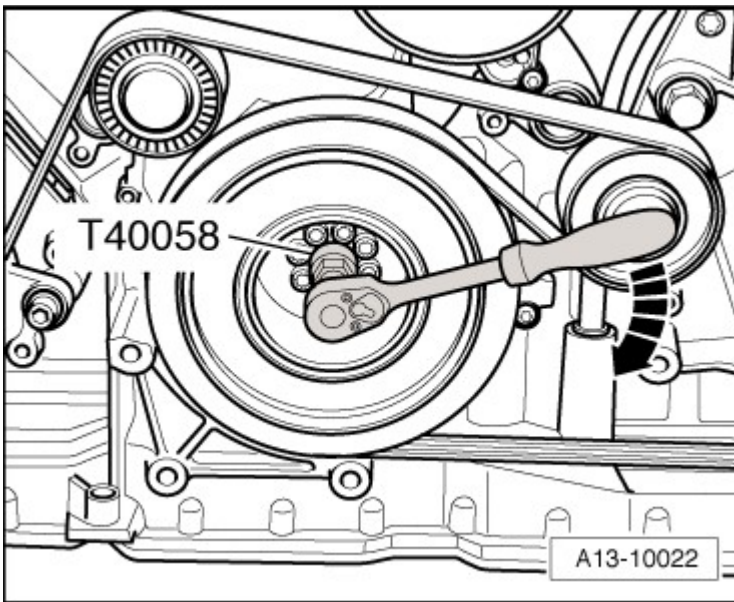


Fig. 151: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

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

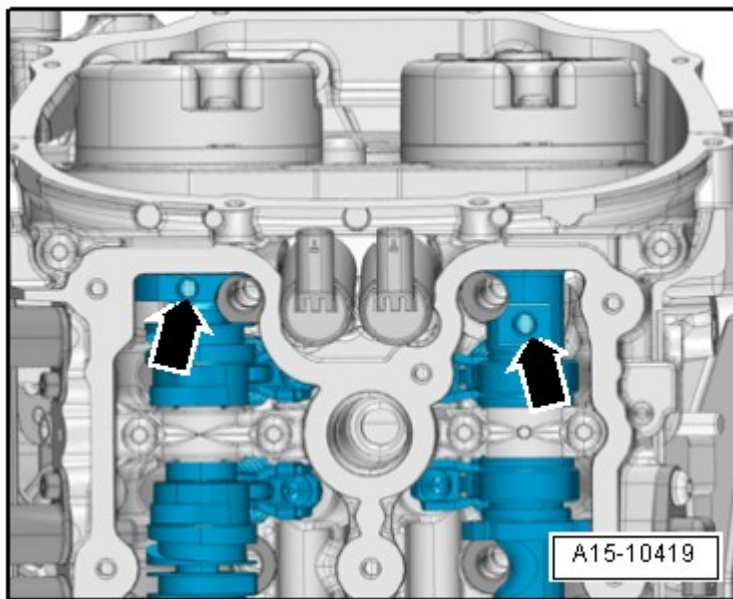


Fig. 152: Identifying Camshaft Threaded Hole Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Remove bolt -1-.

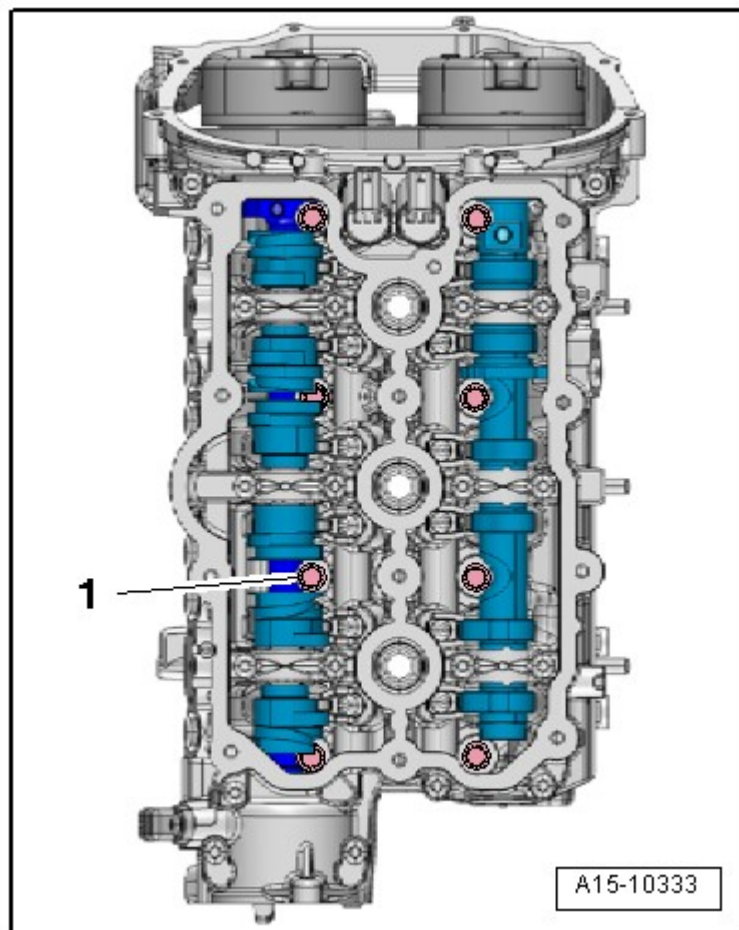


Fig. 153: Identifying Bolt (Left Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

Right Cylinder head

-- Remove bolt -2-.

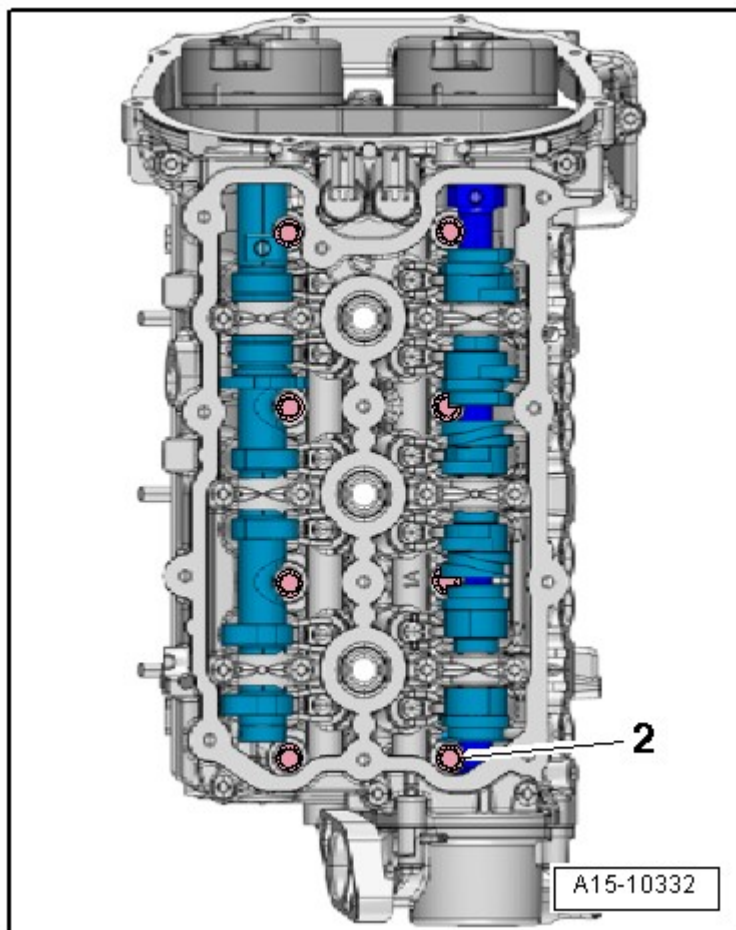


Fig. 154: Identifying Bolt (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder heads

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

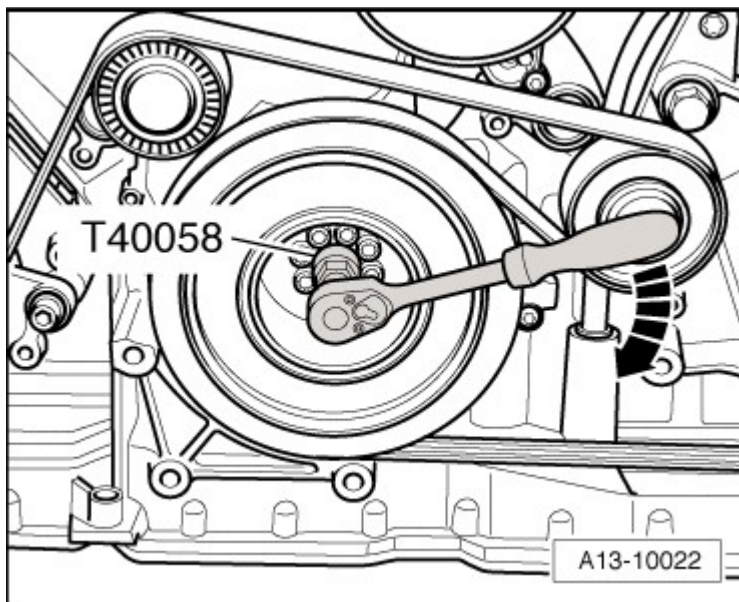


Fig. 155: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The openings -arrows- on exhaust camshafts must face toward outer side of the engine.

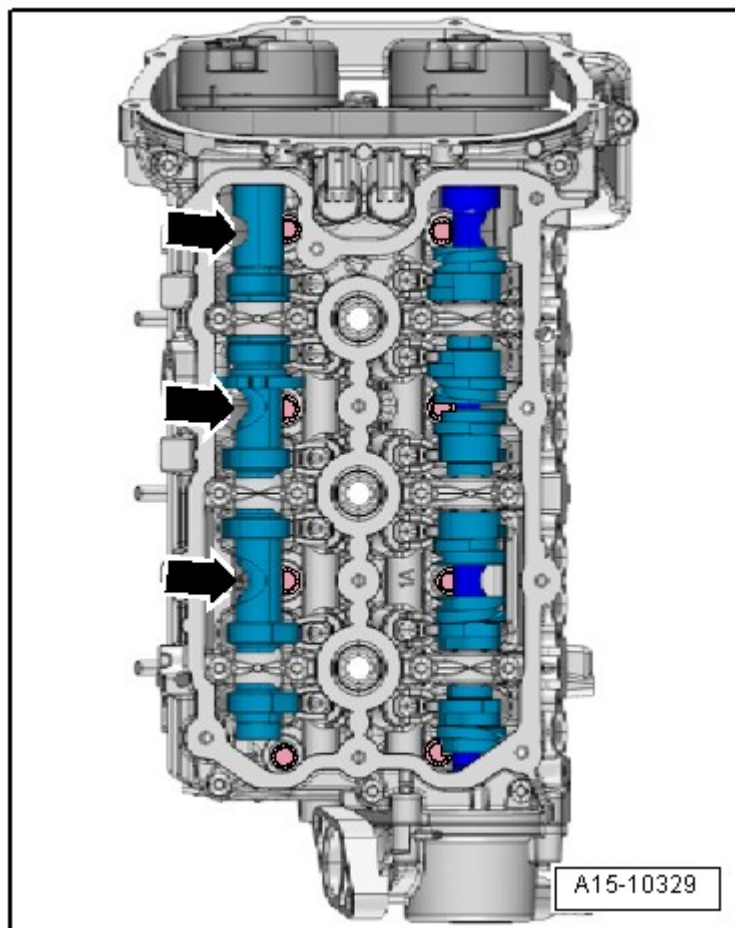


Fig. 156: Identifying Exhaust Camshaft Openings Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Slide unloaded camshaft sliders -B- and -C- as far as stop in direction of -arrow-.

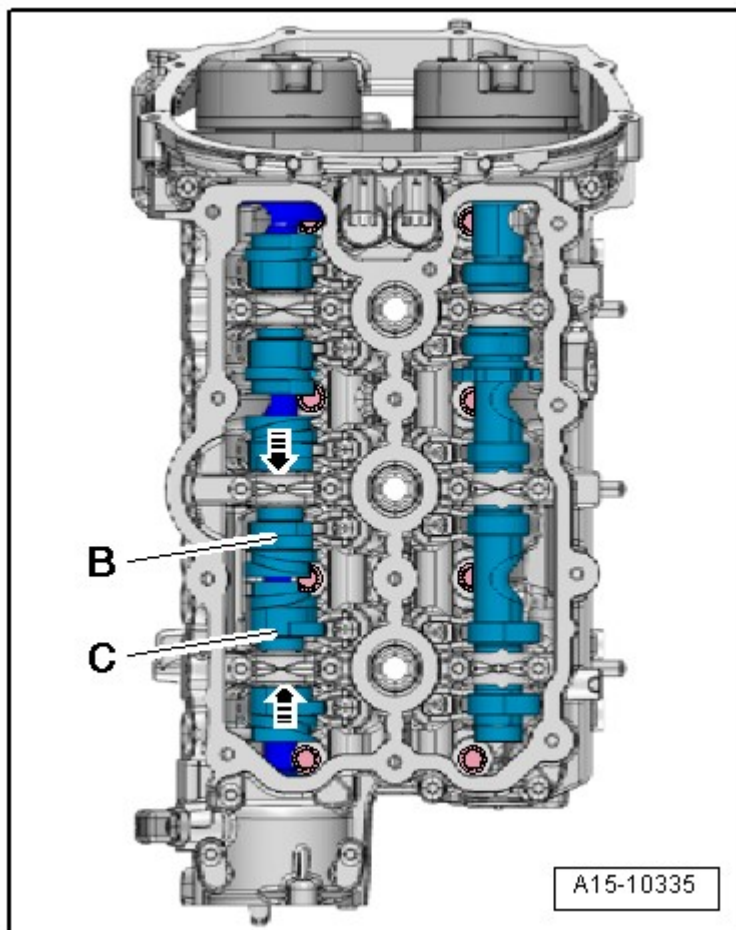


Fig. 157: Sliding Unloaded Camshaft Sliders As Far As The Stop In Direction Of -Arrow-
Courtesy of AUDI OF AMERICA, LLC

Right Cylinder Head

-- Slide unloaded camshaft slider -F- as far as stop in direction of -arrow-.

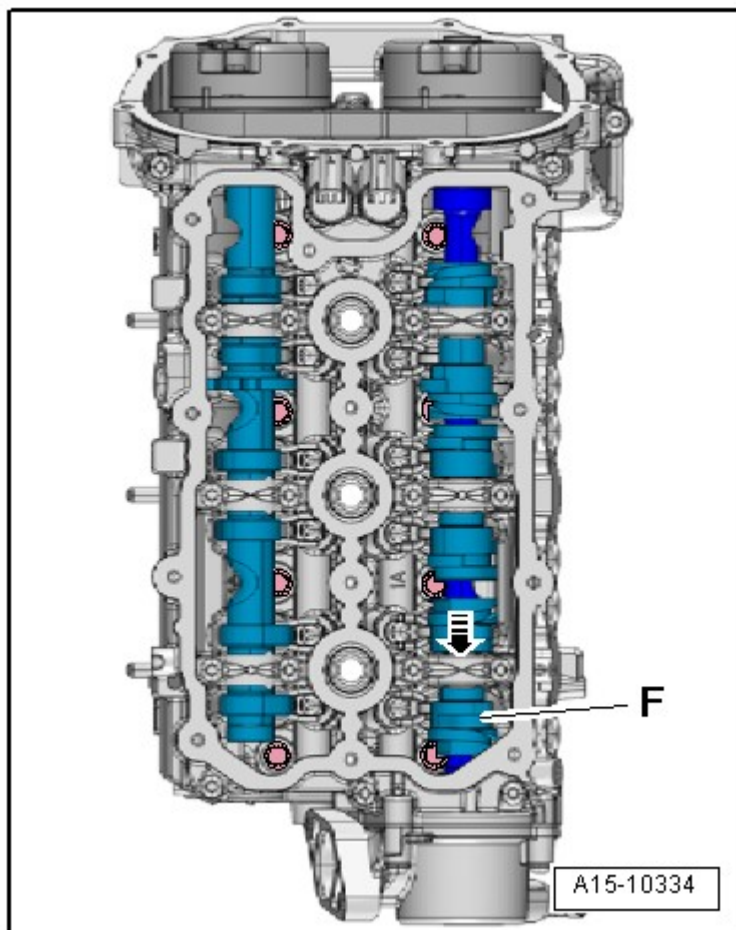


Fig. 158: Sliding Unloaded Camshaft Sliders As Far As The Stop In Direction Of -Arrow-
Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder Heads

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

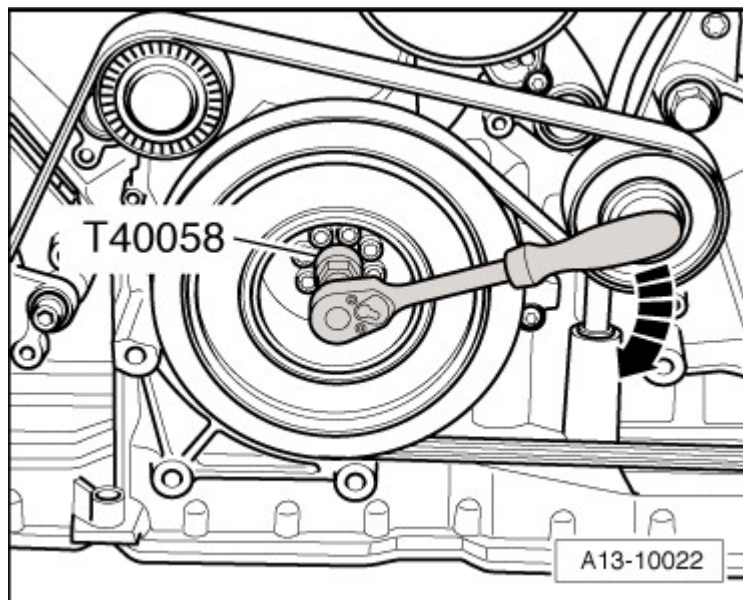


Fig. 159: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

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

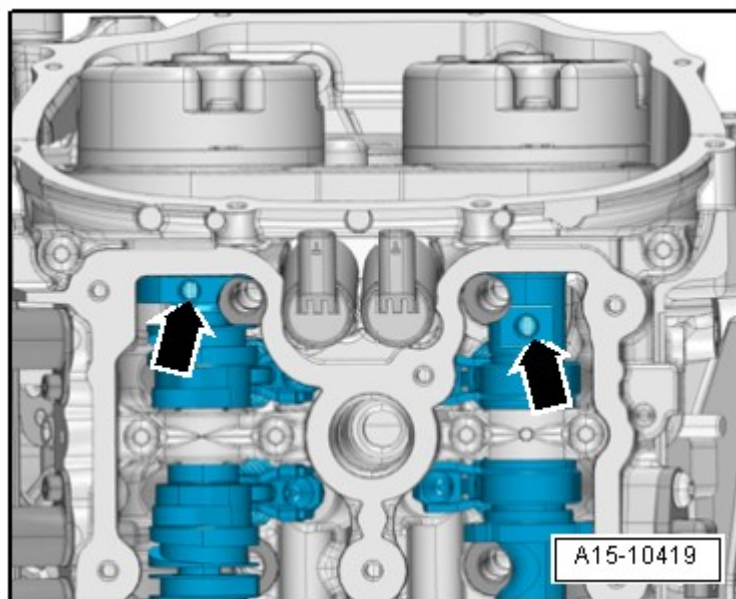


Fig. 160: Identifying Camshaft Threaded Hole Alignment
Courtesy of AUDI OF AMERICA, LLC

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

CAUTION: Risk of damaging valves and piston crowns.

- If the camshaft timing chain was also only removed on one cylinder head, the crankshaft must not be rotated any more.

Left Cylinder Head

-- Remove bolts -3 through 9- while sliding unloaded camshaft slider -A- accordingly.

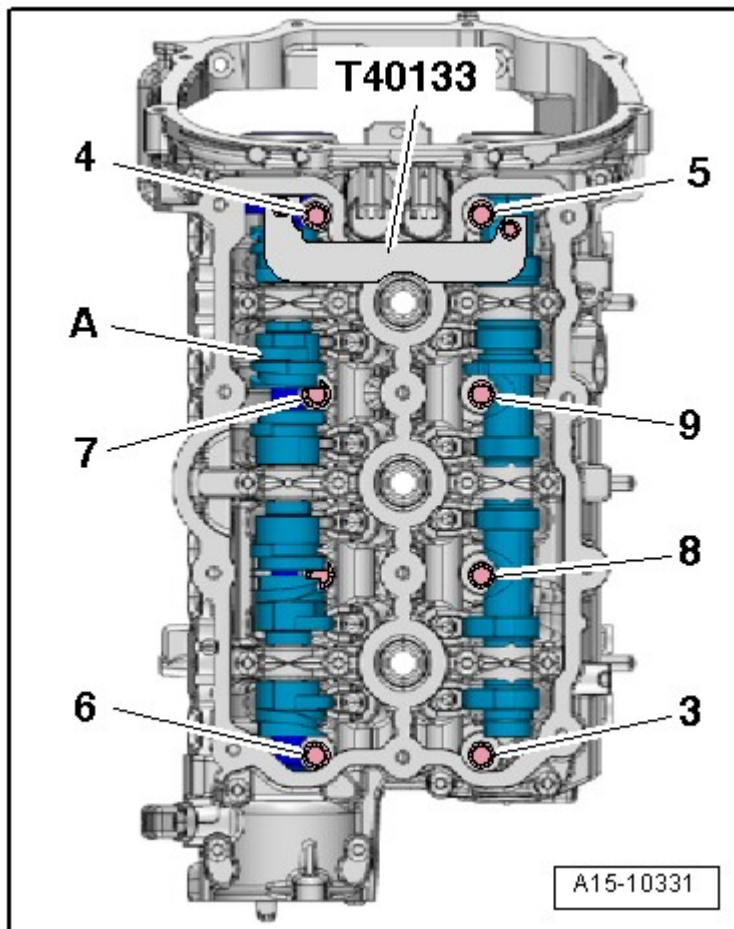


Fig. 161: Identifying Bolts -3 Through 9- And Unloaded Camshaft Slider -A-
Courtesy of AUDI OF AMERICA, LLC

-- Remove cylinder head.

Right Cylinder Head

-- Remove bolts -10 through 16- while sliding unloaded camshaft sliders -D- and -E- accordingly.

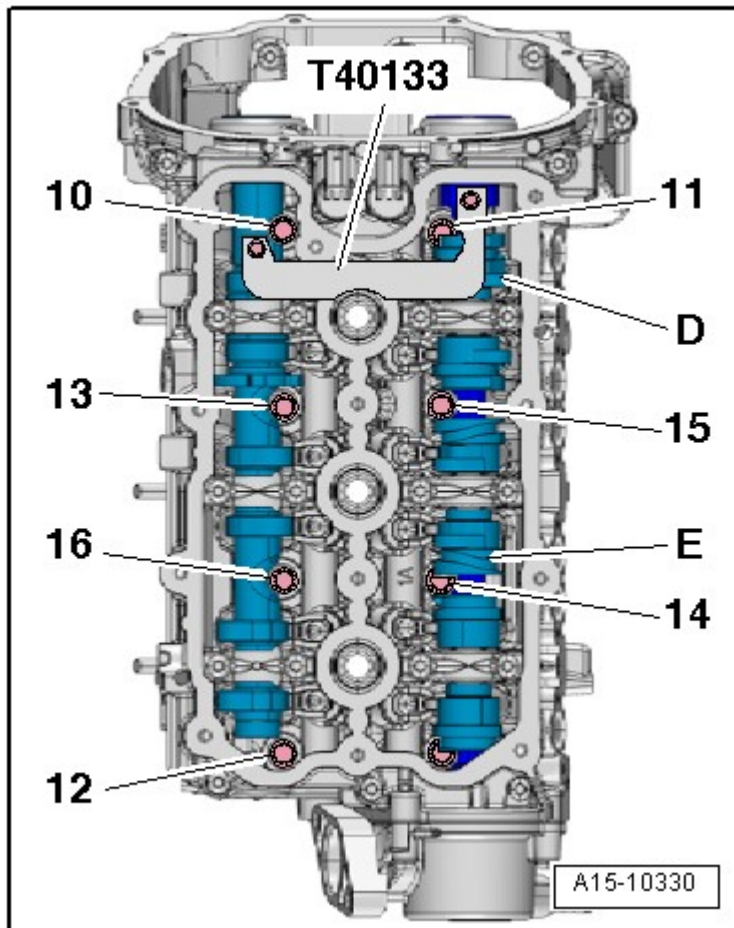


Fig. 162: Identifying Bolts -10 Through 16- And Unloaded Camshaft Sliders -D- & -E-
 Courtesy of AUDI OF AMERICA, LLC

-- Remove cylinder head.

INSTALLING

- Tightening specifications CYLINDER HEAD 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.

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

Risk of cylinder head seal leaking.

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

Risk of damaging open valves.

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

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

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

NOTE: Replace bolts which have been tightened to specifications.

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

Note different sealant for cylinder head sealing surfaces and bolts.

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

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

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

-- Before installing cylinder head, set crankshaft and camshafts to "TDC" and install camshaft locator T40133 on both cylinder heads and tighten to 25 Nm -arrows-.

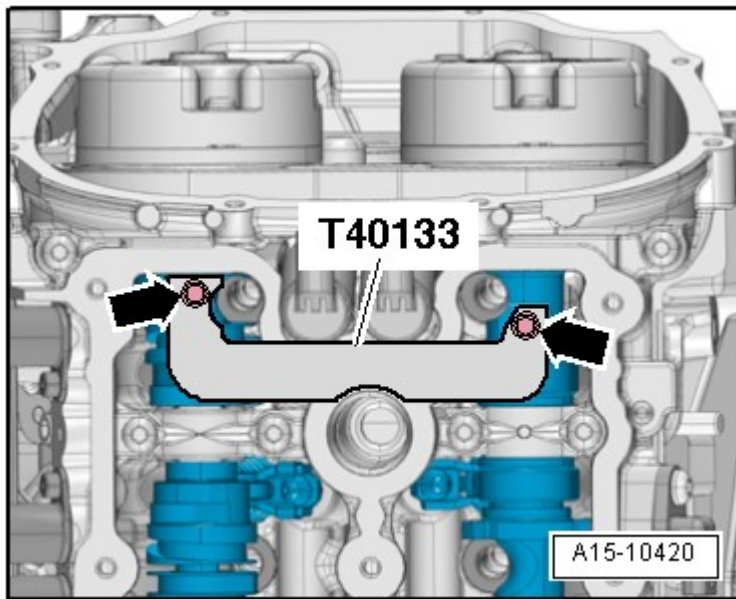


Fig. 163: Before Installing Cylinder Head, Set Crankshaft And Camshafts To "TDC"
Courtesy of AUDI OF AMERICA, LLC

- The camshaft locating tool T40133 is correctly positioned when holes for cylinder head bolts remain free.
- Crankshaft holder T40069 must be installed into the crankshaft.

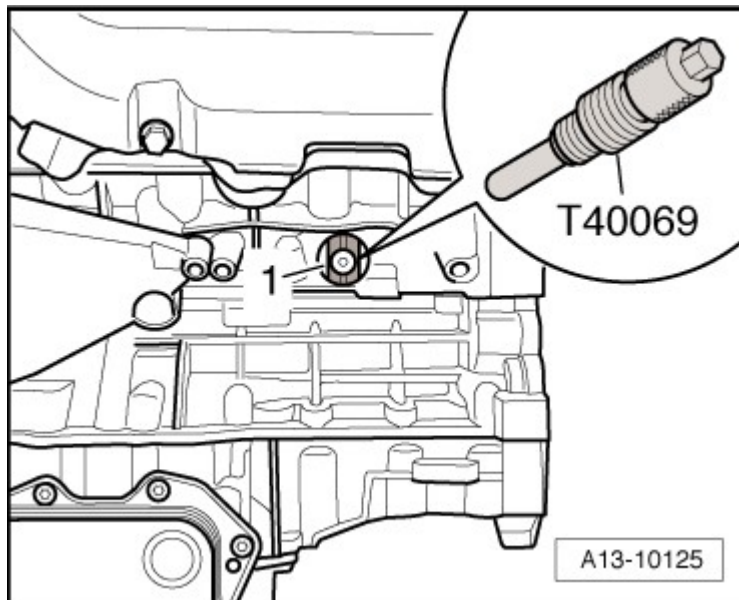


Fig. 164: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

-- Set cylinder head gasket in place.

- Pay close attention to centering pins -arrows- in cylinder block.

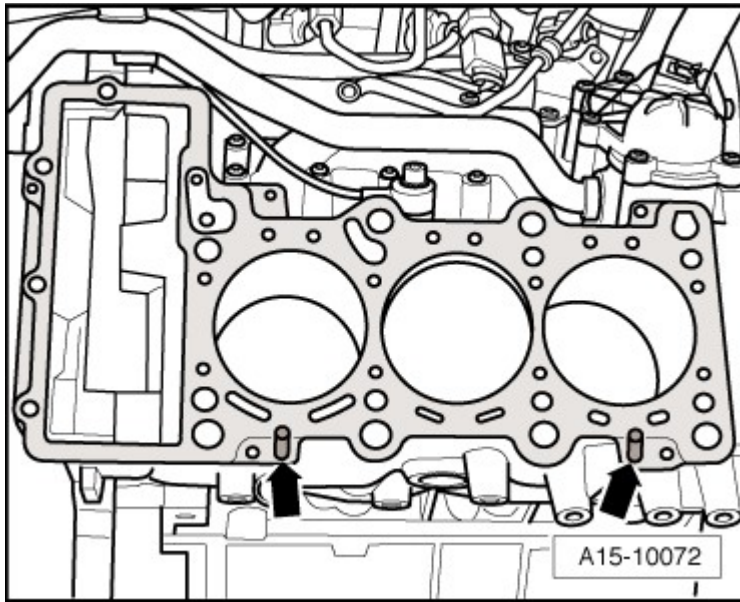


Fig. 165: Identifying Alignment Bushings In Cylinder Block -Arrows-
Courtesy of AUDI OF AMERICA, LLC

- Cylinder head seal installation position: Marking "oben" or part number must face toward cylinder head.

-- Position cylinder head.

Left Cylinder Head

-- Insert bolts -1 through 7- while sliding unloaded camshaft slider -A- accordingly.

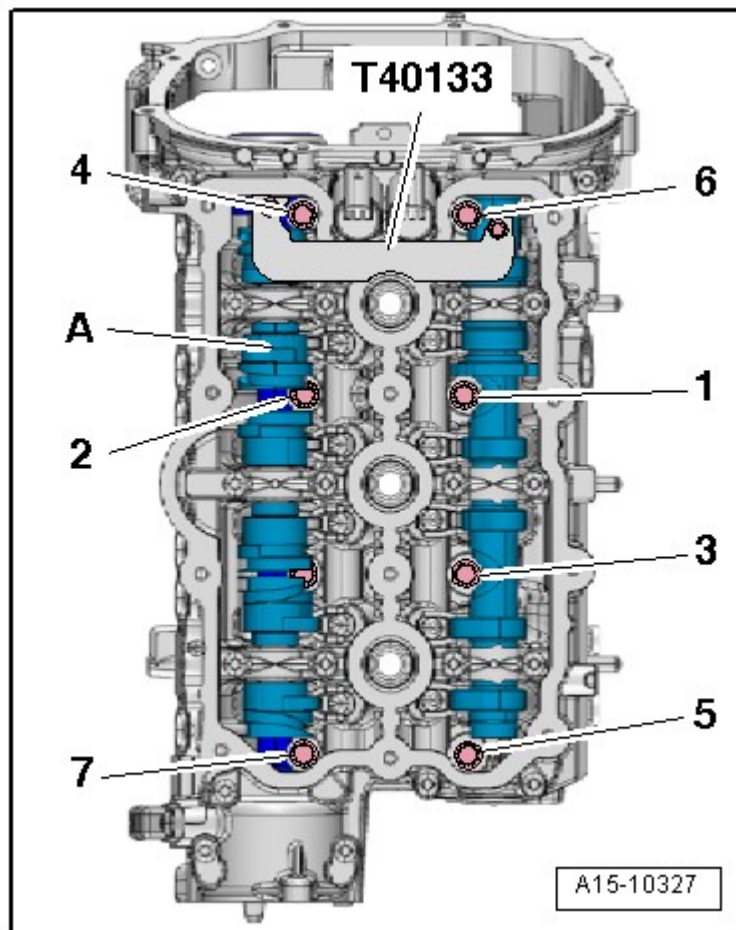


Fig. 166: Identifying Unloaded Camshaft Slider & Bolts (Left Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 3 stages in sequence -1 to 7- **CYLINDER HEAD ASSEMBLY OVERVIEW.**

Right Cylinder Head

-- Insert bolts -8 through 14- while sliding unloaded camshaft sliders -D- and -E- accordingly.

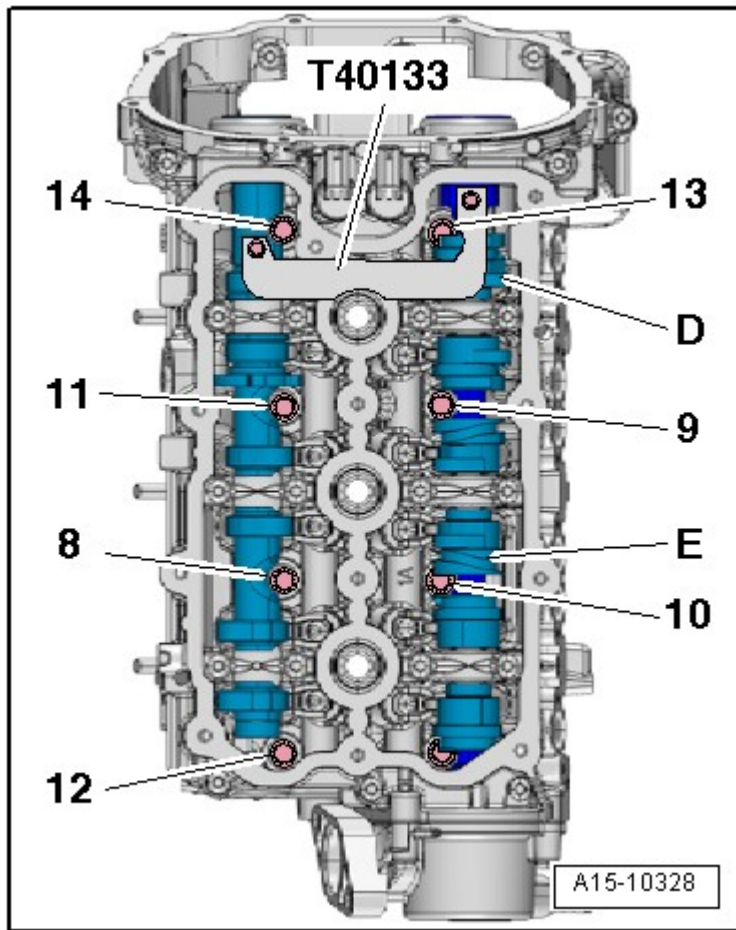


Fig. 167: Identifying Unloaded Camshaft Slider & Bolts (Right Cylinder Head)

Courtesy of AUDI OF AMERICA, LLC

-- Tighten bolts in 3 stages in sequence -8 to 14- CYLINDER HEAD ASSEMBLY OVERVIEW.

Continuation for Both Cylinder Heads

-- Position camshaft timing chain on camshafts CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.

-- Remove camshaft locator T40133 and locking pin T40069.

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

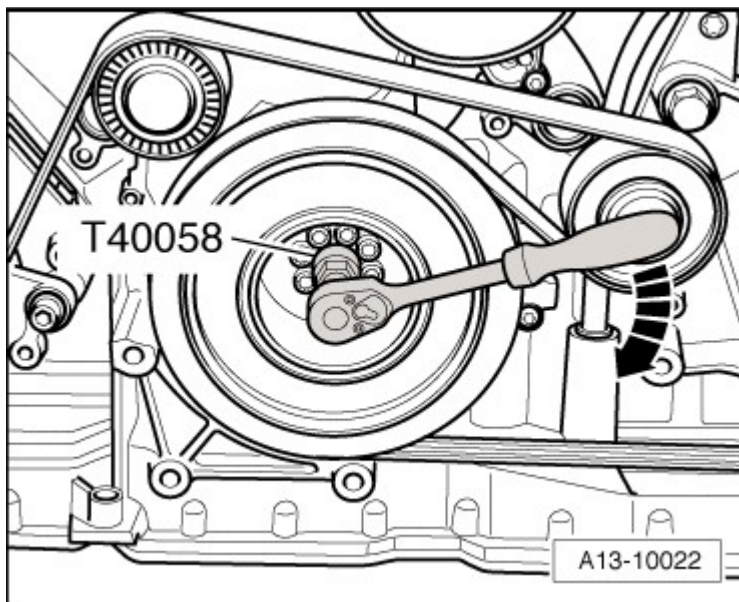


Fig. 168: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The openings -arrows- on exhaust camshafts must face toward outer side of the engine.

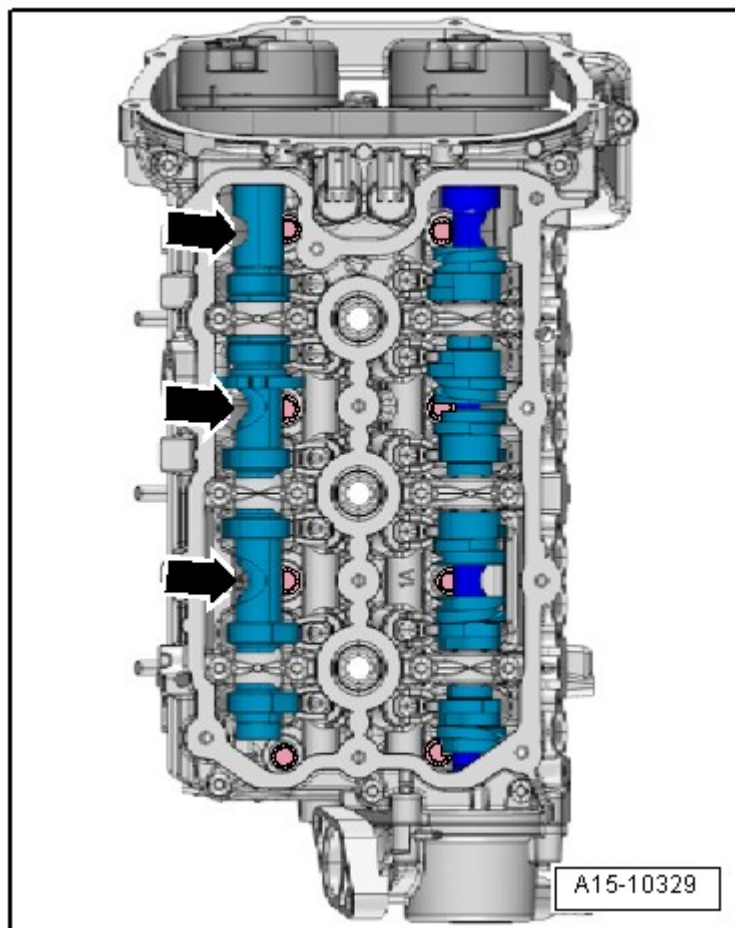


Fig. 169: Identifying Exhaust Camshaft Openings Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Slide unloaded camshaft sliders -B- and -C- as far as stop in direction of -arrow-.

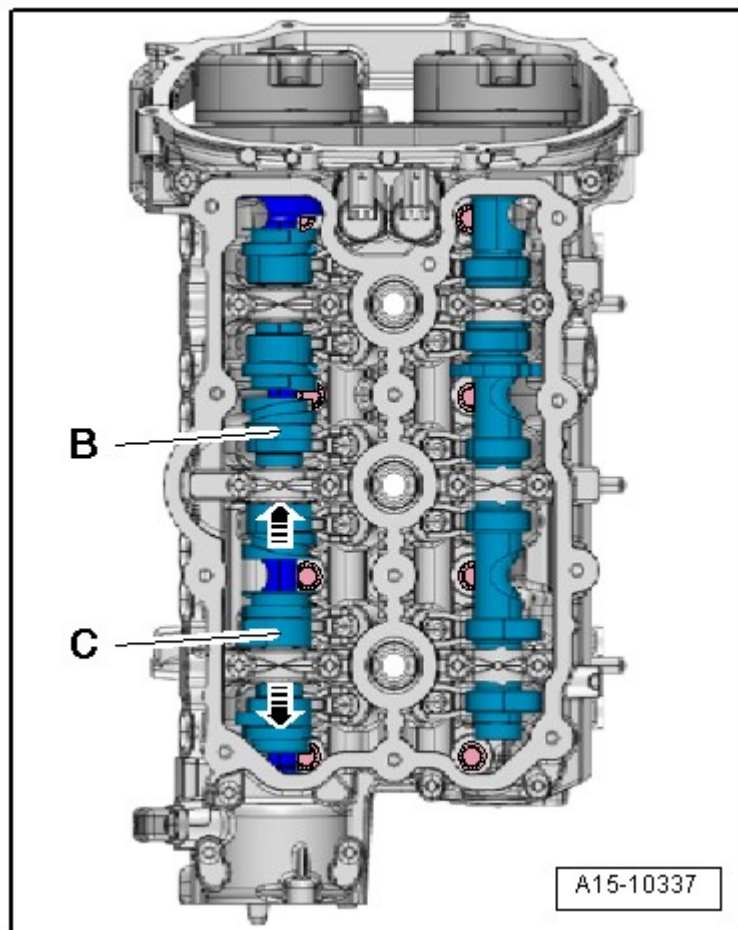


Fig. 170: Sliding Unloaded Camshaft Sliders As Far As The Stop In Direction Of -Arrow-
Courtesy of AUDI OF AMERICA, LLC

Right Cylinder Head

-- Slide unloaded camshaft slider -F- as far as stop in direction of -arrow-.

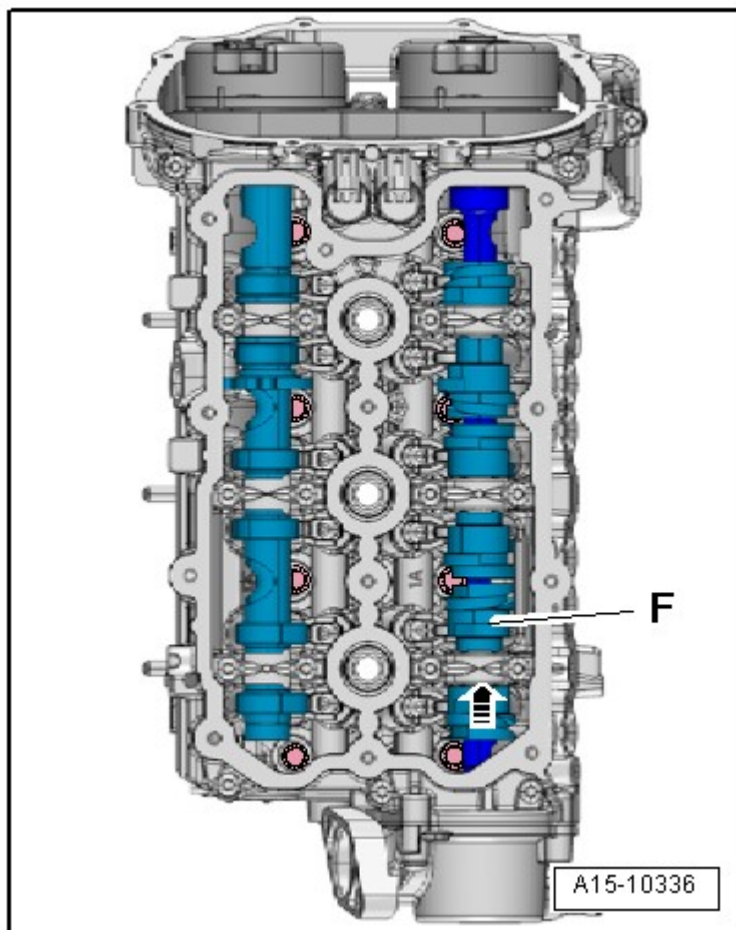


Fig. 171: Sliding Unloaded Camshaft Slide As Far As Stop In Direction
Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder Heads

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

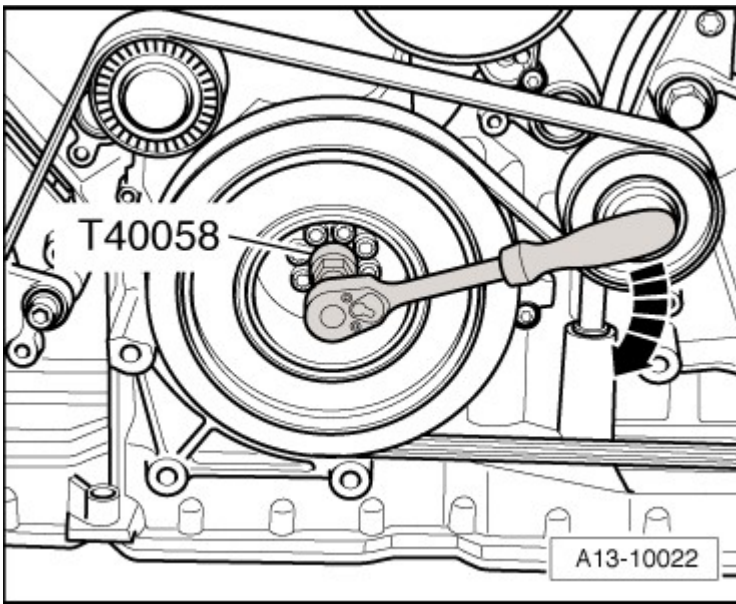


Fig. 172: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

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

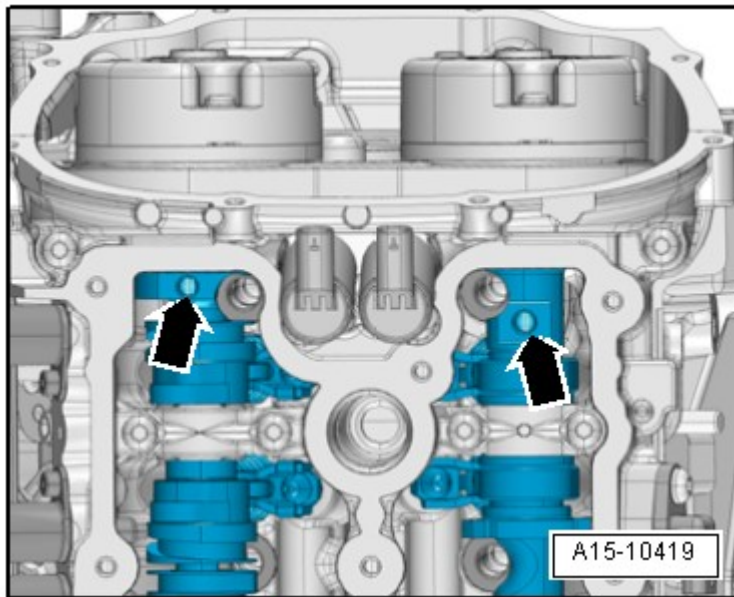


Fig. 173: Identifying Camshaft Threaded Hole Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Insert bolt -15- and tighten it in a total of 3 stages **CYLINDER HEAD ASSEMBLY OVERVIEW.**

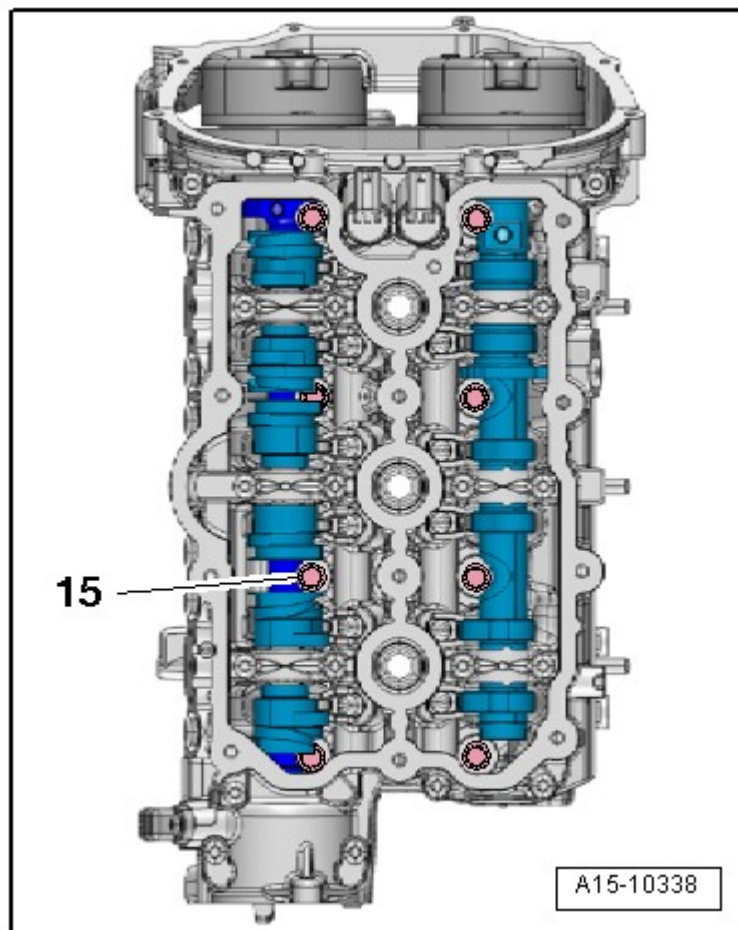


Fig. 174: Identifying Bolt

Courtesy of AUDI OF AMERICA, LLC

Right Cylinder Head

-- Insert bolt -16- and tighten it in a total of 3 stages **CYLINDER HEAD ASSEMBLY OVERVIEW.**

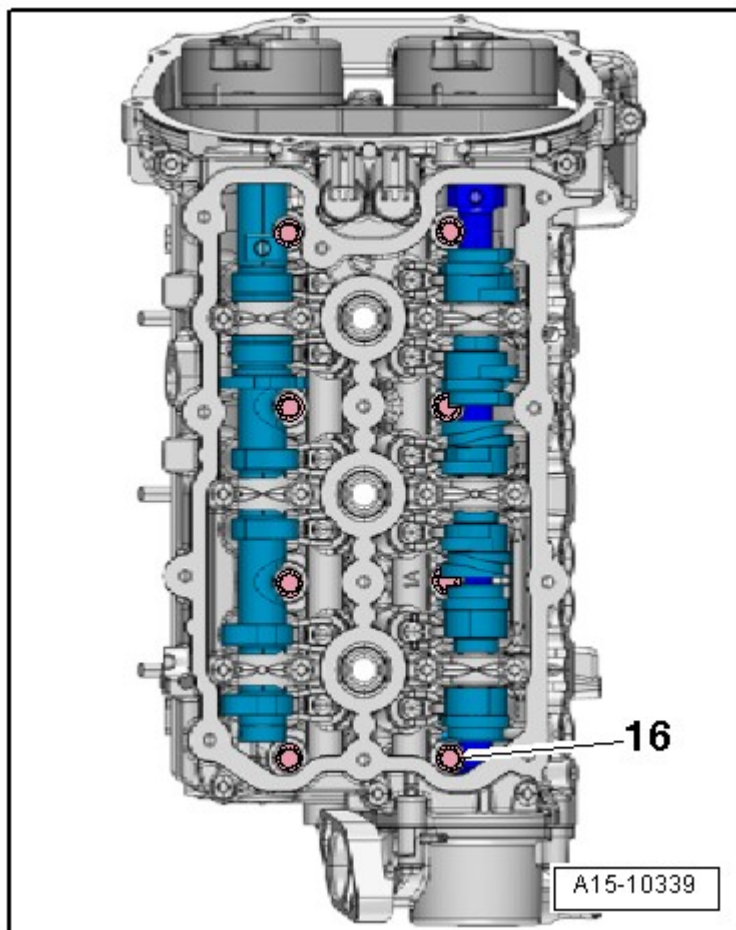


Fig. 175: Identifying Bolt -16-
Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder Heads

-- Turn crankshaft one full revolution (360 degrees) in direction of engine rotation -arrow- using adapter T40058.

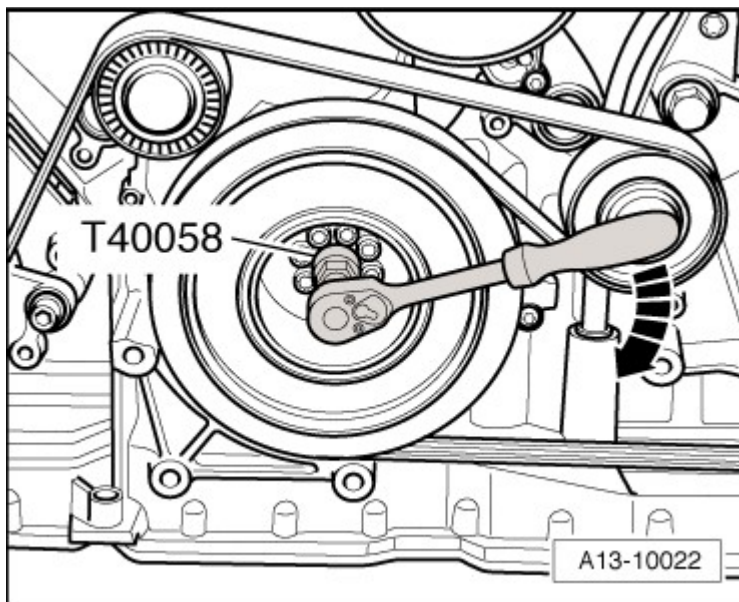


Fig. 176: Identifying TDC With Special Tool Adapter T40058
Courtesy of AUDI OF AMERICA, LLC

- The openings -arrows- on exhaust camshafts must face toward outer side of engine.

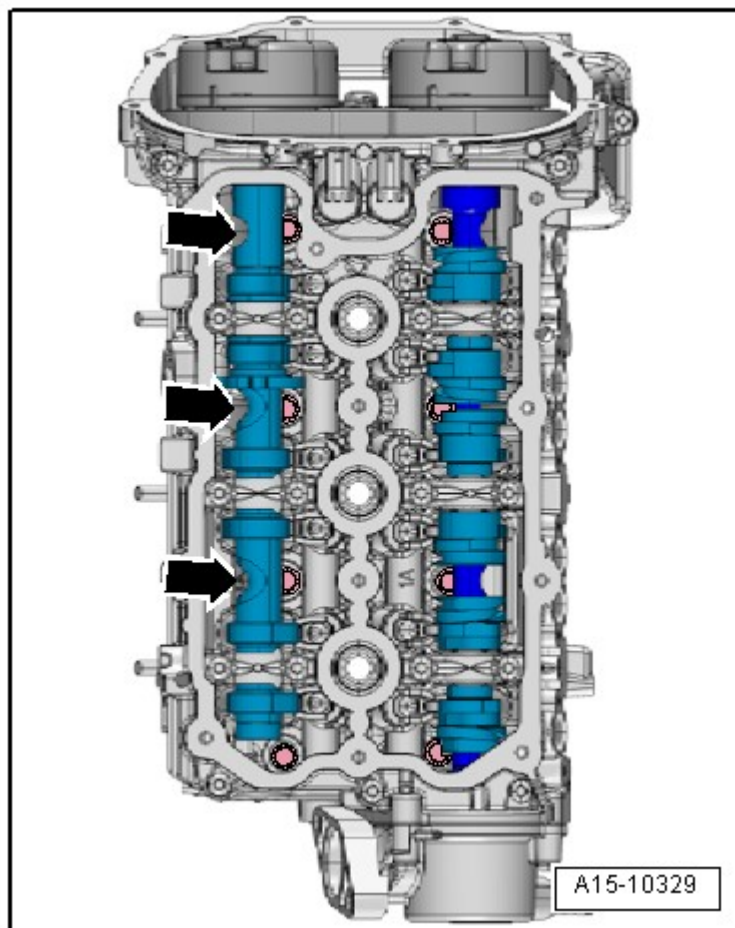


Fig. 177: Identifying Exhaust Camshaft Openings Alignment
Courtesy of AUDI OF AMERICA, LLC

Left Cylinder Head

-- Slide unloaded camshaft slider -B- as far as stop in direction of -arrow-.

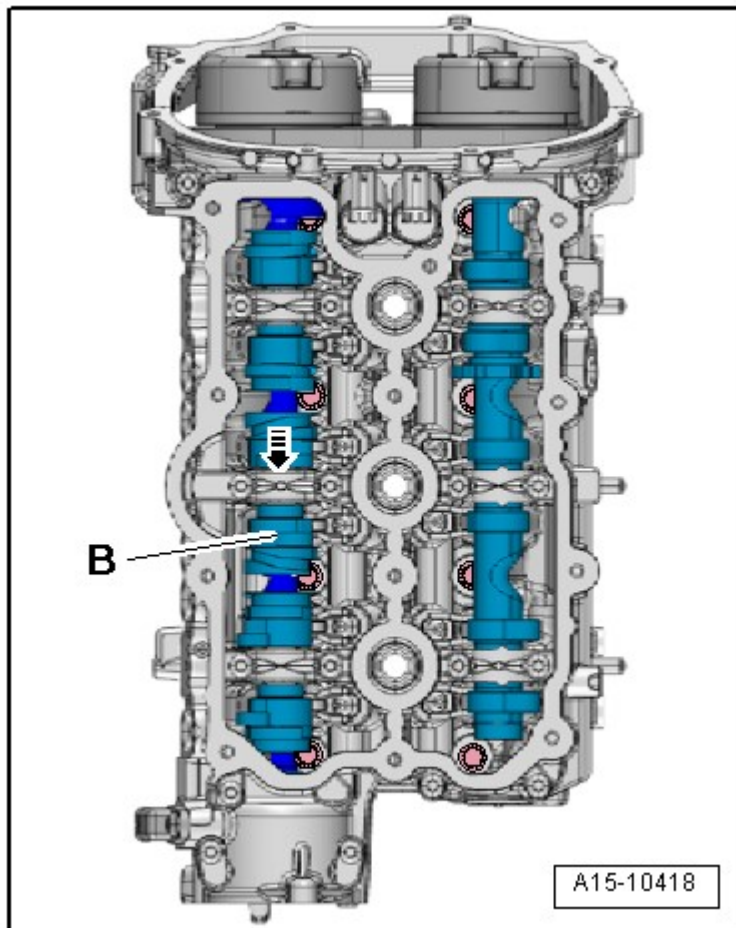


Fig. 178: Sliding Unloaded Camshaft Slider As Far As Stop In Direction Of -Arrow-
Courtesy of AUDI OF AMERICA, LLC

Right Cylinder Head

-- Slide unloaded camshaft slider -F- as far as stop in direction of - arrow-.

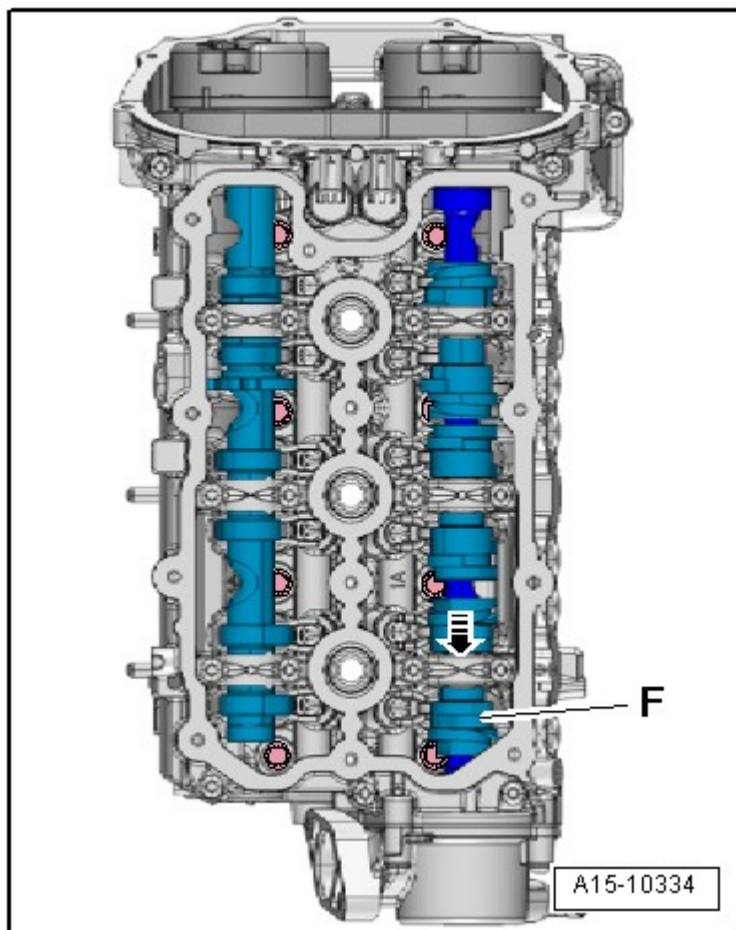


Fig. 179: Sliding Unloaded Camshaft Sliders As Far As The Stop In Direction Of -Arrow-
Courtesy of AUDI OF AMERICA, LLC

Continuation for Both Cylinder Heads

-- Tighten bolts -arrows-.

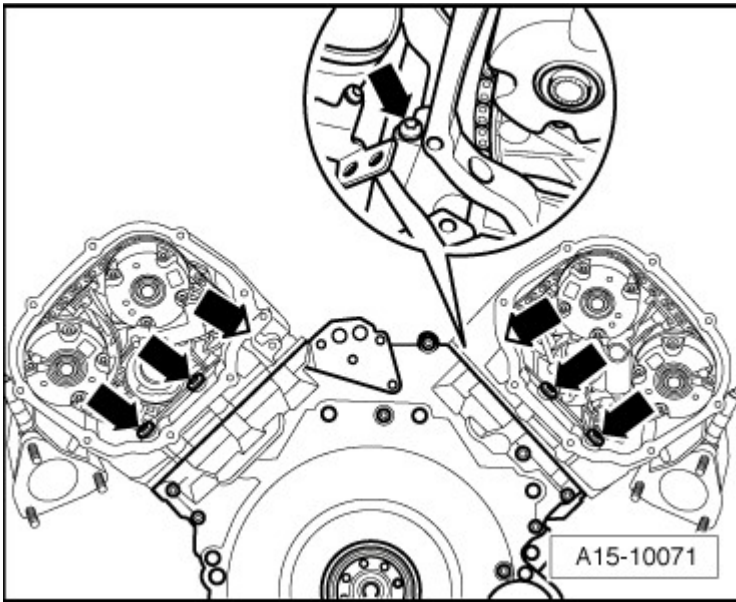


Fig. 180: Identifying Bolts At Rear Of Cylinder Head
Courtesy of AUDI OF AMERICA, LLC

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

NOTE: Do not retighten cylinder head bolts after repairs.

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

- Install oil dipstick guide tube **Fig. 16**
- Install left and right timing chain covers **LEFT AND RIGHT TIMING CHAIN COVERS**.
- Install cylinder head cover: Left **LEFT CYLINDER HEAD COVER**, right **RIGHT CYLINDER HEAD COVER**.
- Install front coolant pipe **FRONT COOLANT PIPE** .
- Install power steering pump **Removal and Installation** .
- Install catalytic converter: Left **LEFT CATALYTIC CONVERTER** , right **RIGHT CATALYTIC CONVERTER** .
- Install front muffler **FRONT MUFFLER** .
- Install plenum chamber bulkhead **Description and Operation** .
- Install fuel supply line and lower section of intake manifold **Removal and Installation** .

- Install ribbed belt **RIBBED BELT** .
- Install upper coolant pipe **UPPER COOLANT PIPE** .
- Change engine oil => 811.
- Replace coolant **COOLING SYSTEM, DRAINING AND FILLING** .

CAMSHAFTS

Special tools and workshop equipment required

- Impact puller T10133/3 from tool set T10133
- Securing pins 1 set = qty. 2 T40116
- Camshaft locator T40133
- Hand drill with plastic brush attachment
- Protective glasses
- Sealant

REMOVING

- Remove camshaft timing chains from camshafts **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS.**
- To remove camshafts in left cylinder head, remove brake booster vacuum pump **Removal and Installation** .
- To remove the camshafts in the right cylinder head, remove the high pressure pump and pump motor housing **Removal and Installation** .
- Remove bolts -arrows- and camshaft adjuster valves.

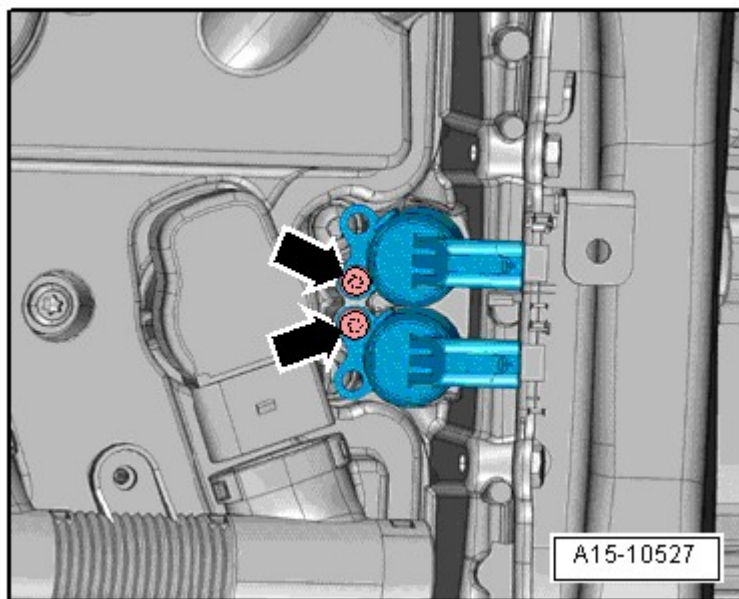


Fig. 181: Identifying Bolts

Courtesy of AUDI OF AMERICA, LLC

-- Loosen guide frame bolts in sequence -21 to 1--.

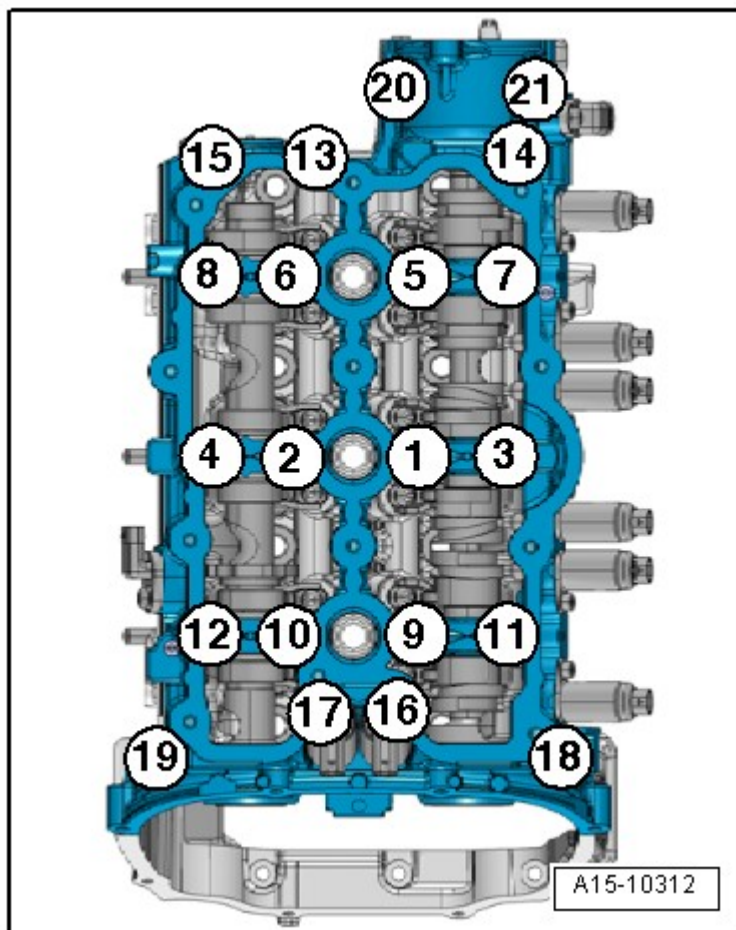


Fig. 182: Guide Frame Bolt, Tightening Sequence

Courtesy of AUDI OF AMERICA, LLC

NOTE: The illustration shows guide frame for left cylinder head.

-- Carefully remove guide frame and lay it on a soft surface on the workbench.

-- Remove locking pin T40133.

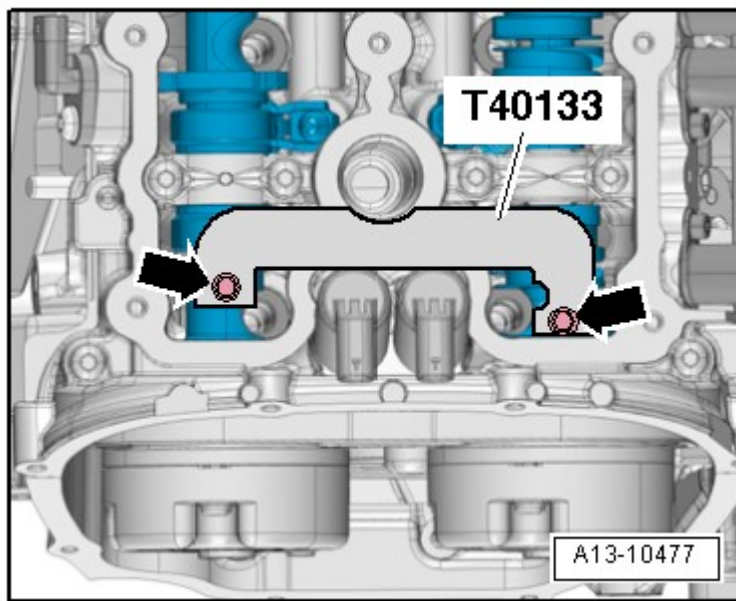


Fig. 183: Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

-- Mark camshafts and remove.

INSTALLING

- Tightening specifications **Fig. 18**
- Secure crankshaft -1- using crankshaft holder T40069.

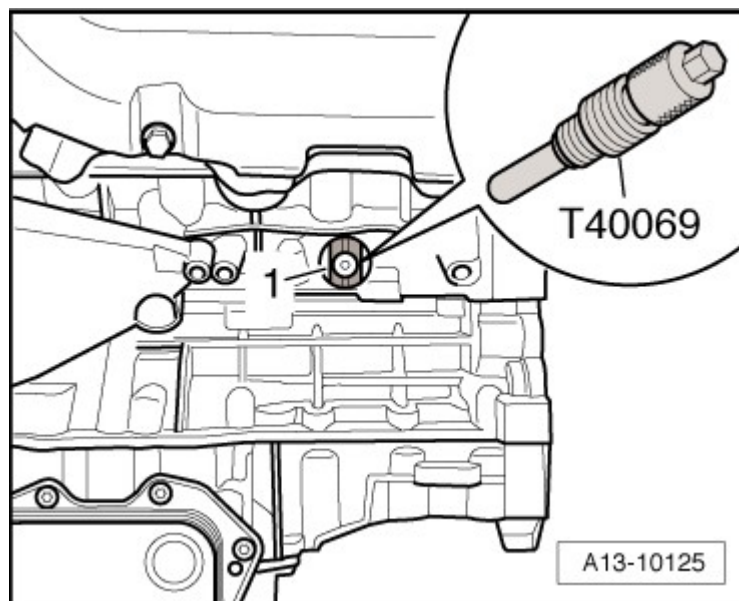


Fig. 184: Identifying Crankshaft Holder T40069 In Hole, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

NOTE: Replace seals and gaskets.

CAUTION: Risk of contaminating lubricating system and bearing.

- Cover open parts of engine.

WARNING: Risk of eye injury.

- Wear safety glasses.

- Using a rotating plastic brush, remove any remaining sealant from cylinder head and guide frame.
- Clean sealing surfaces, must be free of oil and grease.
- Check screen -arrow- for dirt and clean it if necessary.

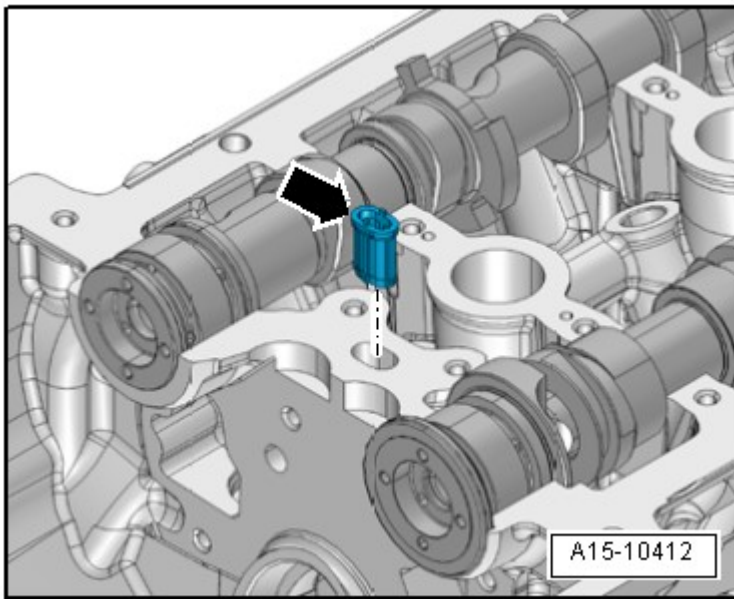


Fig. 185: Identifying Screen

Courtesy of AUDI OF AMERICA, LLC

- Oil running surfaces of both camshafts.
- Insert camshafts in guide frame.

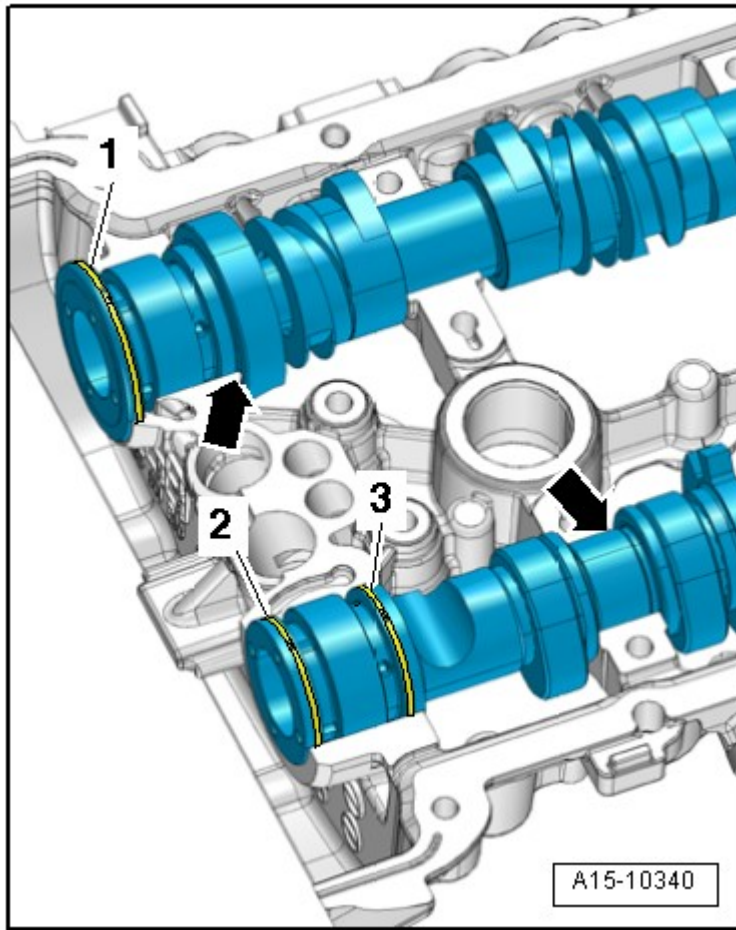


Fig. 186: Compression Ring Ends -1, 2 And 3-
Courtesy of AUDI OF AMERICA, LLC

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

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

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

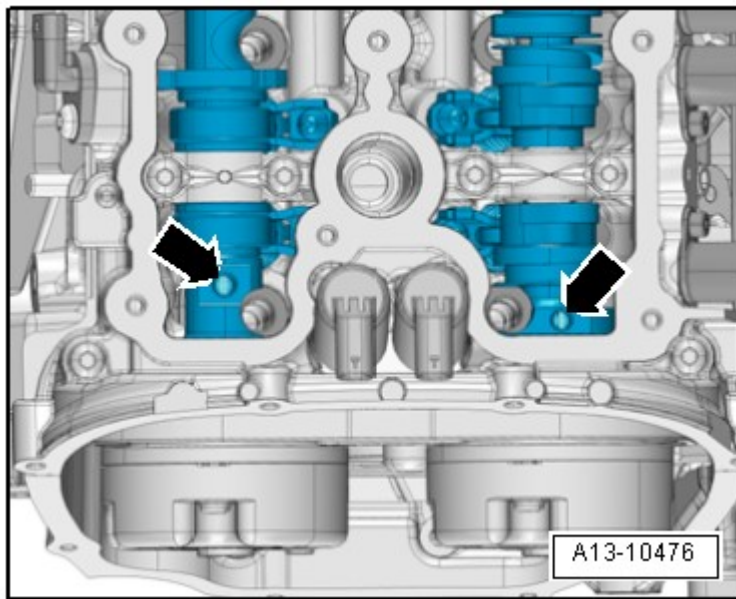


Fig. 187: Rotating Camshafts Until Threaded Holes -Arrows- Face Upward
Courtesy of AUDI OF AMERICA, LLC

- Check if camshafts still lie in guide frame axial bearings.
- Install camshaft locator T40133 and tighten bolts -arrows- to 25 Nm.

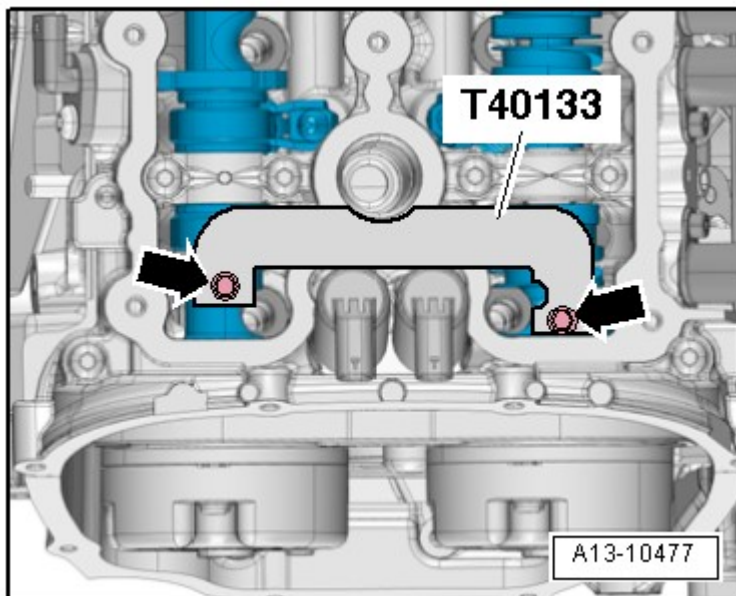


Fig. 188: Camshaft Adjuster T40133
Courtesy of AUDI OF AMERICA, LLC

- Cut tube nozzle at front marking (nozzle diameter approximately 2.0 mm).

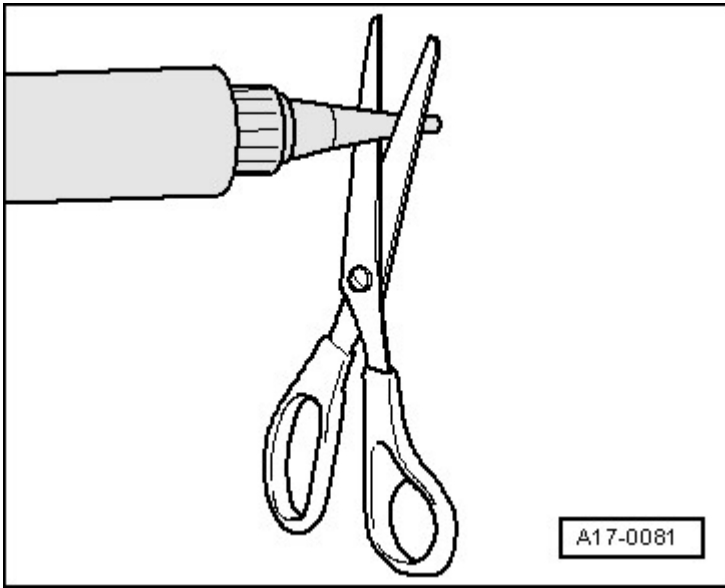


Fig. 189: Cutting Tube Nozzle At Front Marking (Nozzle Diameter Approx. 2 Mm)
Courtesy of AUDI OF AMERICA, LLC

-- Rotate guide frame again.

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

- Do not apply sealant beads thicker than specified.

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

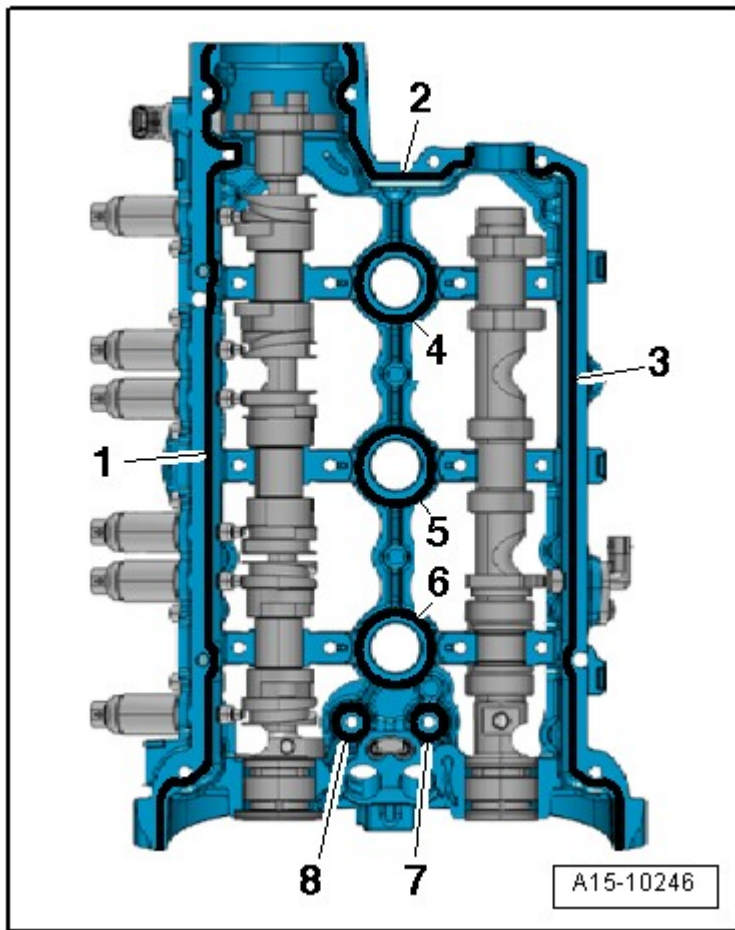


Fig. 190: Applying Sealant Beads -4 Through 8- To Clean Sealing Surfaces On Guide Frame
 Courtesy of AUDI OF AMERICA, LLC

- Thickness of sealant bead: 2.0 mm.

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

- Thickness of sealant bead: 2.5 mm.

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

-- Place guide frame on cylinder head.

-- Insert locating pins T40116 in guide frame and cylinder head.

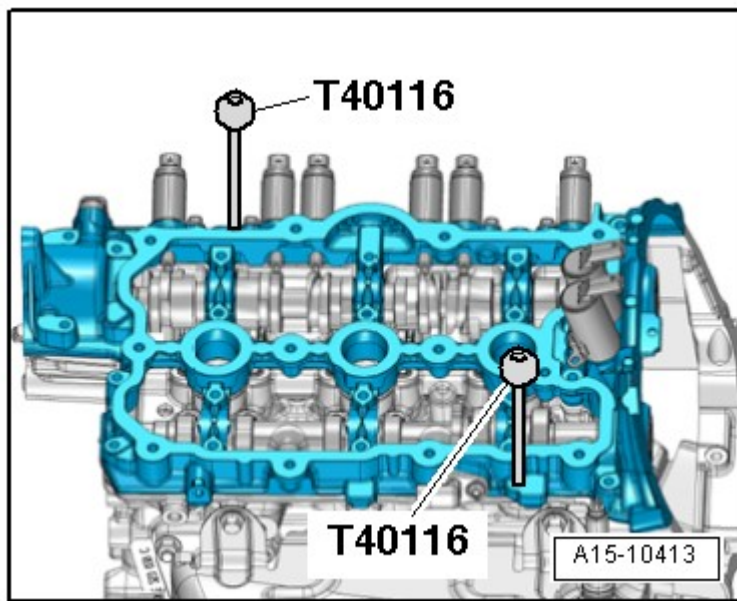


Fig. 191: Identifying T40116

Courtesy of AUDI OF AMERICA, LLC

NOTE: The sealant must dry for approximately 30 minutes after installing guide frame.

-- Tighten guide frame bolts in sequence -1 to 21- **Fig. 18**

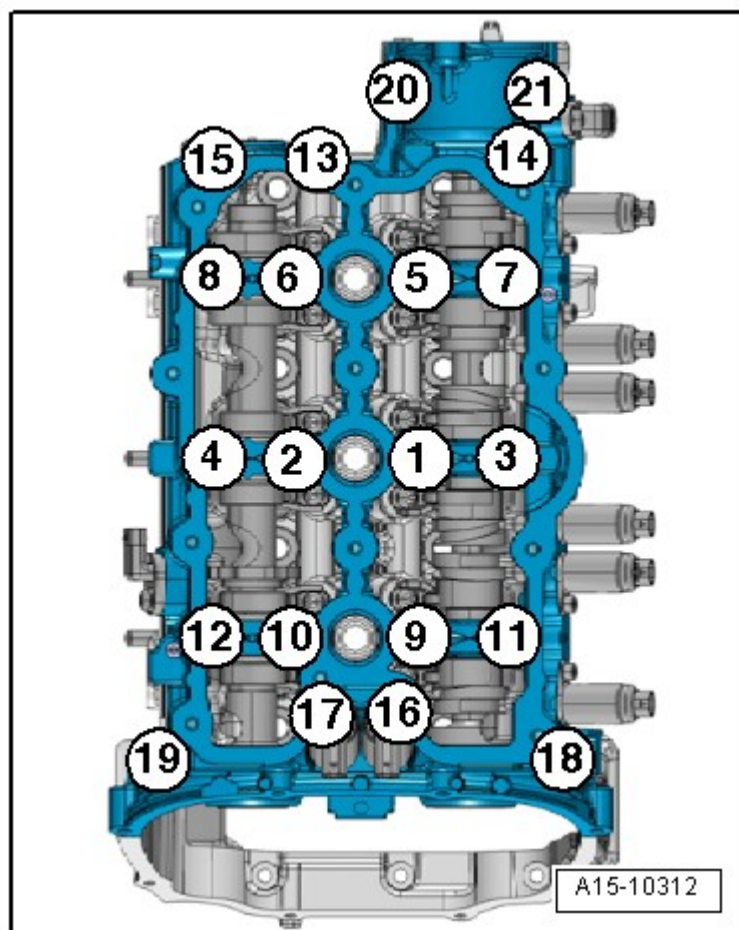


Fig. 192: Guide Frame Bolt, Tightening Sequence
 Courtesy of AUDI OF AMERICA, LLC

-- Clean sealing plug hole in cylinder head. It must be free of oil and grease.

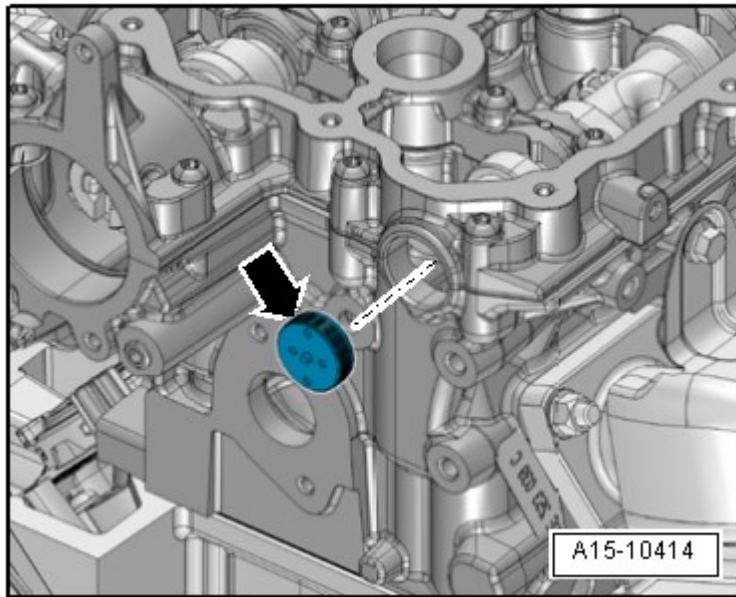


Fig. 193: Identifying Sealing Plug

Courtesy of AUDI OF AMERICA, LLC

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

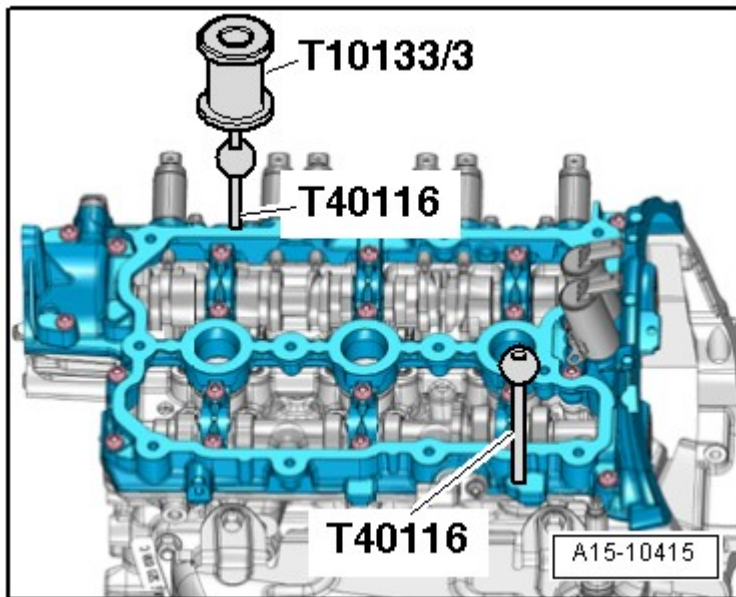


Fig. 194: Removing T40116 Using T10133/3

Courtesy of AUDI OF AMERICA, LLC

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

- Install camshaft adjustment valves **CYLINDER HEAD ASSEMBLY OVERVIEW**.
- Install brake booster vacuum pump **Removal and Installation** .
- Install high pressure pump motor housing and high pressure pump **Removal and Installation** .
- Position camshaft timing chain on camshafts **CAMSHAFT TIMING CHAINS, REMOVING FROM CAMSHAFTS**.

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, WITH CYLINDER HEAD INSTALLED

Special tools and workshop equipment required

- Spark plug removal tool 3122 B
- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve cotter disassembly and assembly device VAS 5161 with guide plate VAS 5161/19B
- Adapter T40012

Procedure

Proceed as follows:

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

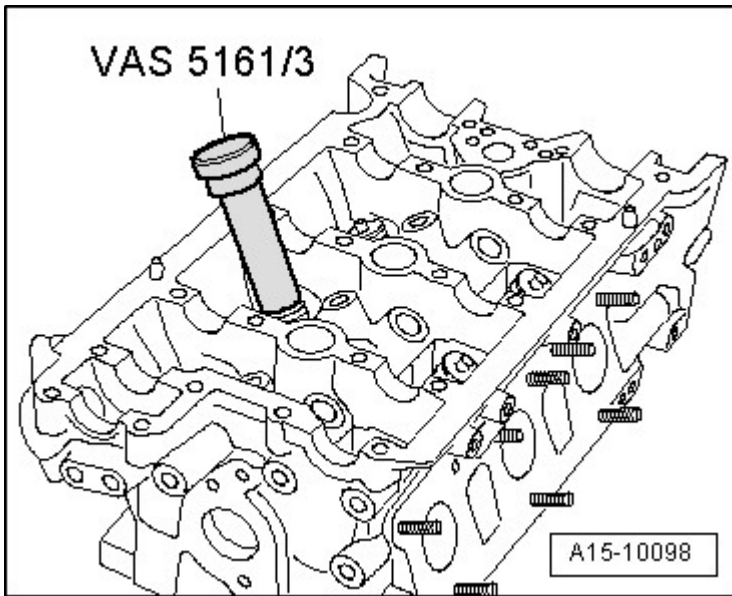


Fig. 195: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

-- Place guide plate VAS 5161/19B from valve cotter assembly/disassembly device VAS 5161 on cylinder head.

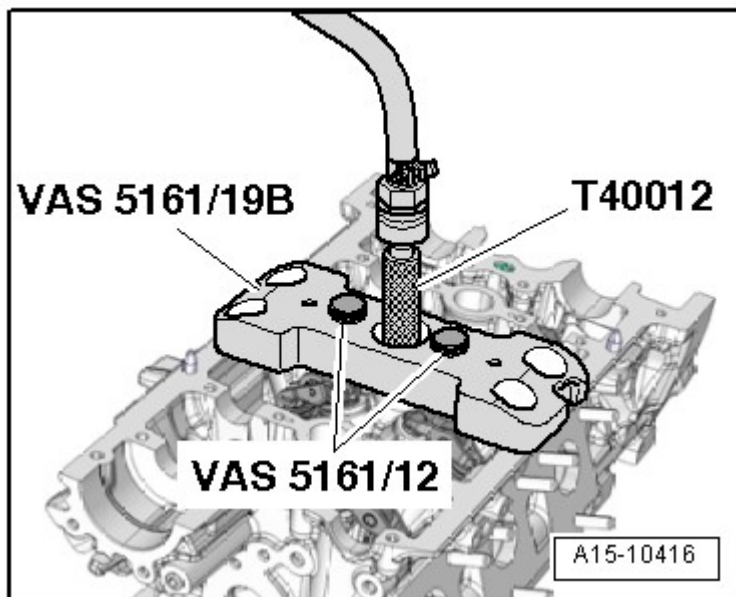


Fig. 196: Identifying Guide Plate For FSI Engine VAS 5161/19B

Courtesy of AUDI OF AMERICA, LLC

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

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

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

- Minimum pressure: 6 bar positive pressure.

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

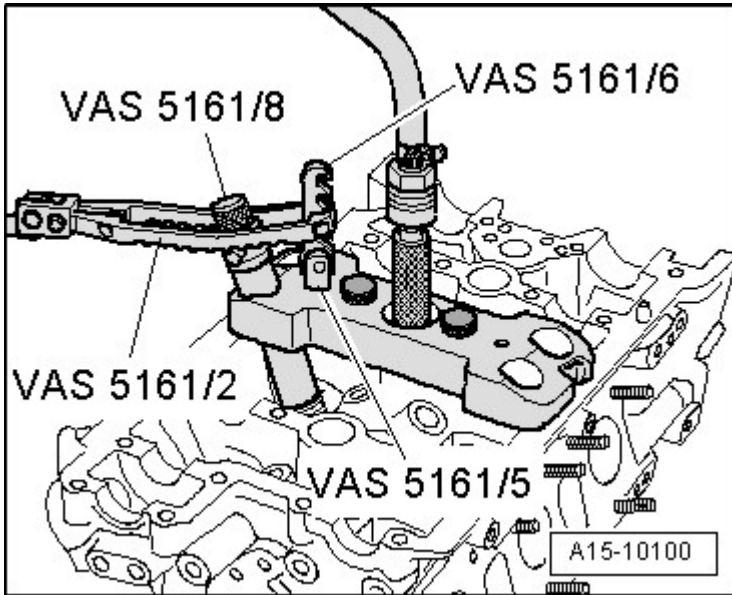


Fig. 197: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

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

-- Release pressure fork.

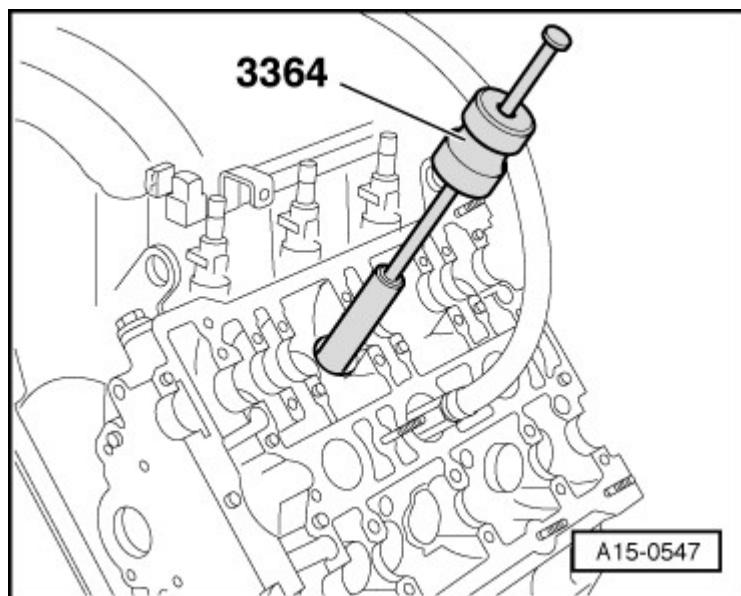
-- Remove installation cartridge.

-- Unfasten guide plate and turn it aside.

- Pressurized air hose remains connected.

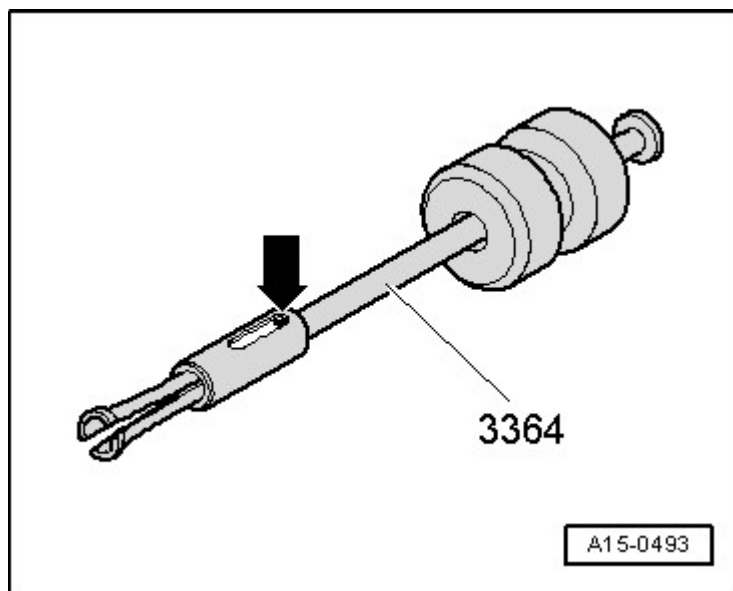
-- Remove valve spring with valve spring plate.

-- Remove valve stem seal using valve seal removal tool 3364.

**Fig. 198: Identifying 3364**

Courtesy of AUDI OF AMERICA, LLC

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

**Fig. 199: Driving Out Roll Pin -Arrow-**

Courtesy of AUDI OF AMERICA, LLC

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

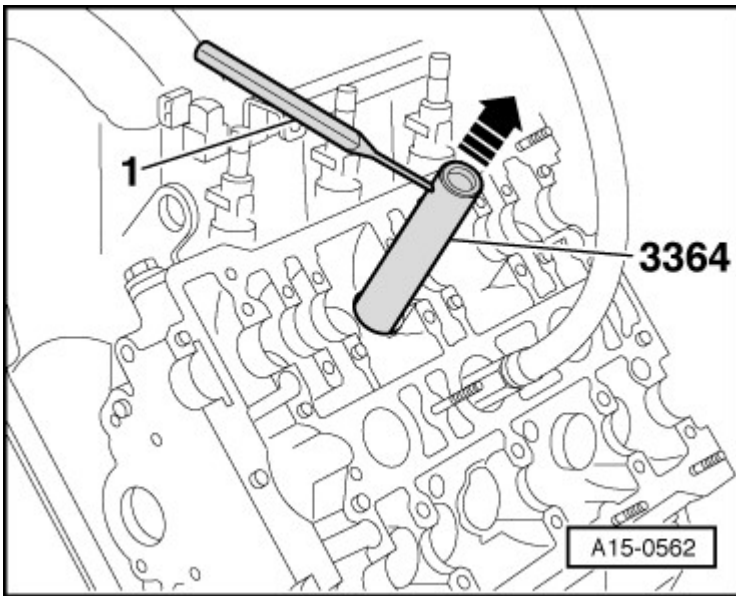


Fig. 200: Positioning Lower Part Of 3364 Valve Stem Removal Tool At Valve Stem Oil Seal
Courtesy of AUDI OF AMERICA, LLC

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

CAUTION: Risk of damage when installing valve stem seals.

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

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

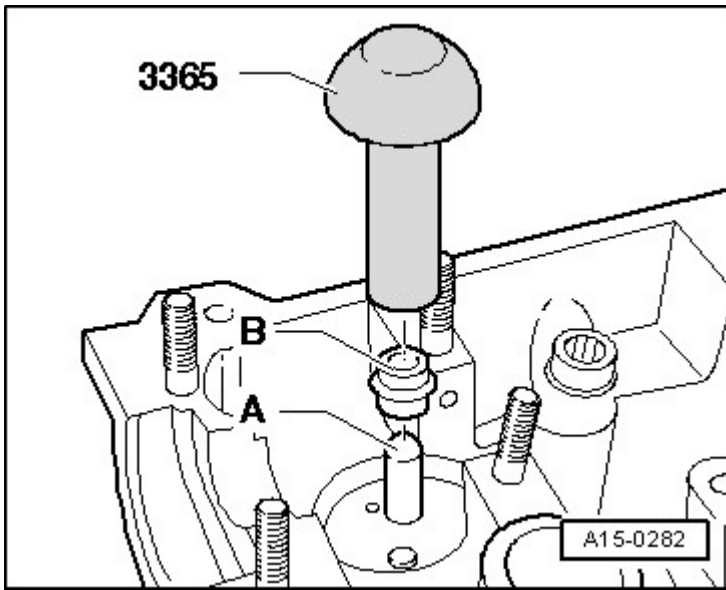


Fig. 201: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
 Courtesy of AUDI OF AMERICA, LLC

-- Remove plastic sleeve again.

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

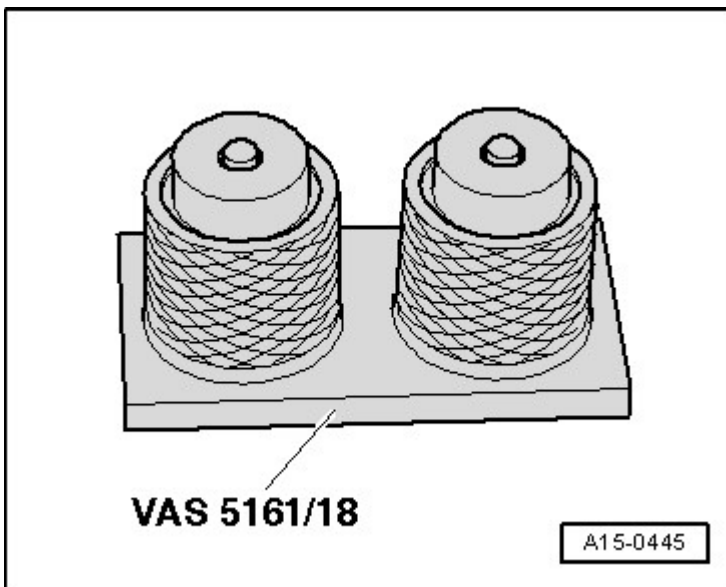


Fig. 202: Identifying Installation Cartridge VAS 5161/8
 Courtesy of AUDI OF AMERICA, LLC

- The large diameter of valve keepers point upward.

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

-- Insert valve spring and valve spring plate.

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

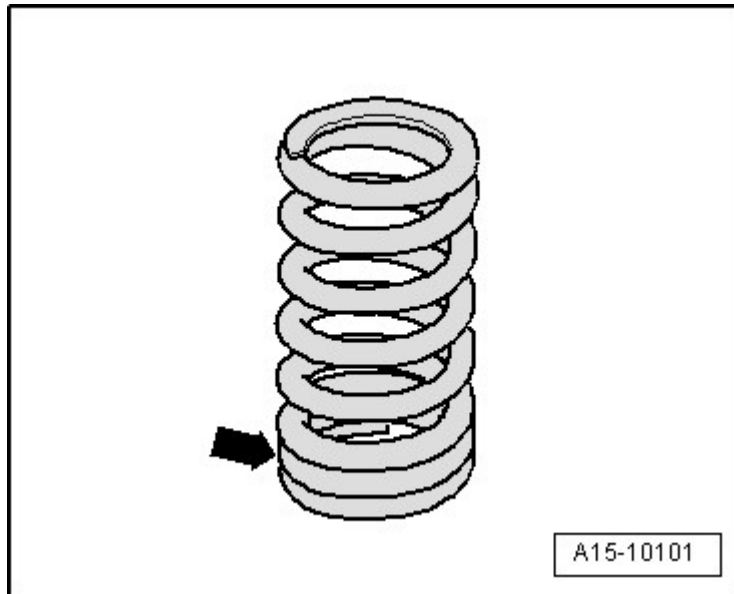


Fig. 203: Identifying Tight Spring Coils
Courtesy of AUDI OF AMERICA, LLC

-- Install guide plate on cylinder head.

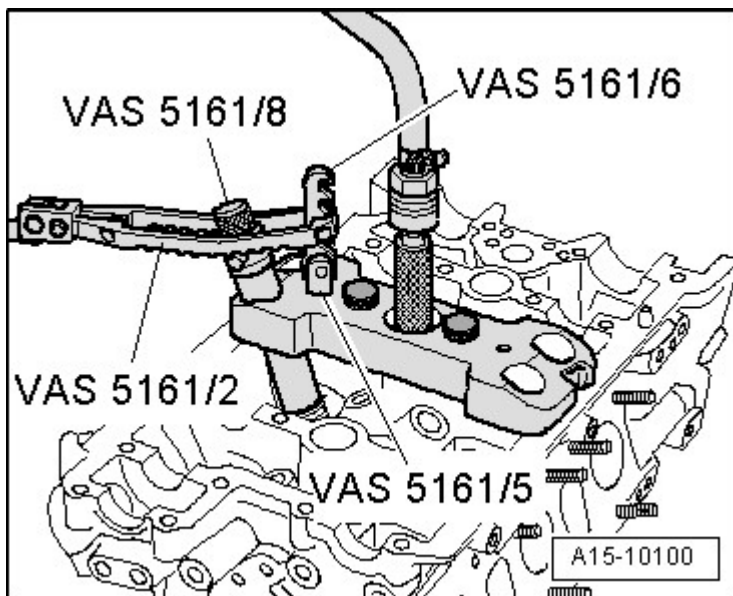


Fig. 204: Identifying Engaging Device VAS 5161/6 With Installation Fork VAS 5161/5 Installed Into Guide Plate

Courtesy of AUDI OF AMERICA, LLC

-- Insert installation cartridge in guide plate.

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

-- Release pressure fork with knurled screw still raised.

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

-- Install camshafts **CAMSHAFTS**.

-- Install spark plugs => 811.

VALVE STEM SEALS, WITH CYLINDER HEAD REMOVED

Special tools and workshop equipment required

- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve cotter disassembly and assembly device VAS 5161 with guide plate VAS 5161/19B
- Engine and transmission holder VAS 6095
- Tensioning element VAS 6419

PROCEDURE

Proceed as follows:

-- Remove camshafts **CAMSHAFTS**.

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

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

-- Insert tensioning element VAS 6419 in engine and transmission holder VAS 6095.

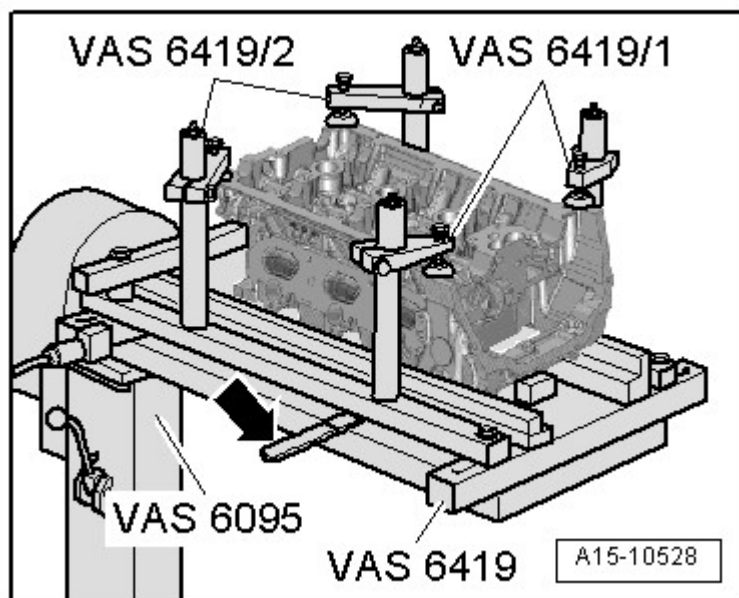


Fig. 205: Tensioning Cylinder Head On Tensioning Element VAS 6419
Courtesy of AUDI OF AMERICA, LLC

- Tension cylinder head on tensioning element VAS 6419 as shown in the illustration.
- Connect tensioning element VAS 6419 to compressed air.
- Slide air cushion with lever -arrow- under cylinder onto valve stem seals that will be removed.
- Let enough compressed air flow into air cushion until it contacts valve plate.
- Position drift VAS 5161/3 on valve spring plate and loosen stuck valve keepers with a plastic mallet.

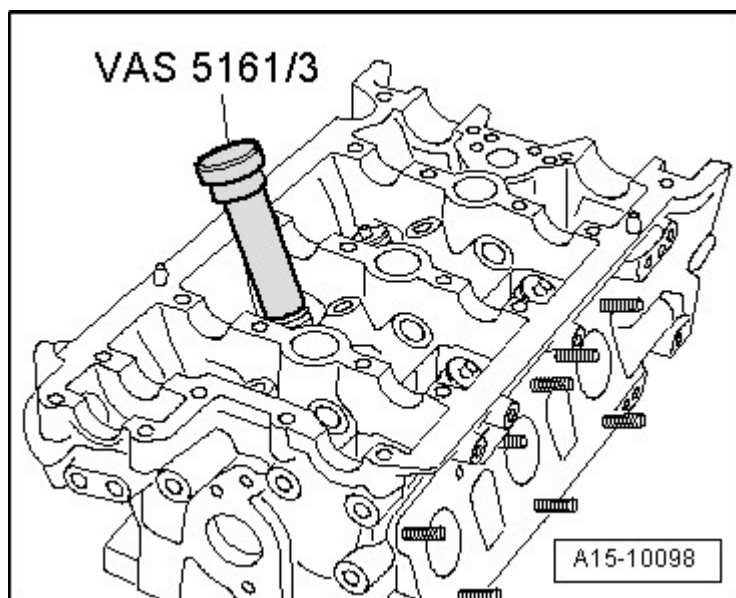


Fig. 206: Placing Drift VAS 5161/3 On Valve Spring Plate And Loosening Stuck Valve Keepers Using Plastic Hammer

Courtesy of AUDI OF AMERICA, LLC

-- Place guide plate VAS 5161/19B from valve cotter assembly/disassembly device VAS 5161 on cylinder head.

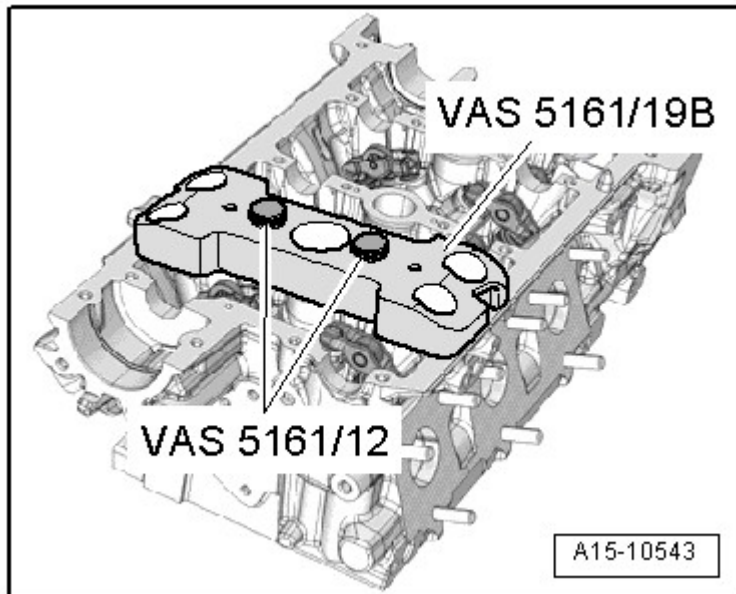


Fig. 207: Identifying Guide Plate VAS 5161/19B Positioned On Cylinder Head

Courtesy of AUDI OF AMERICA, LLC

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

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

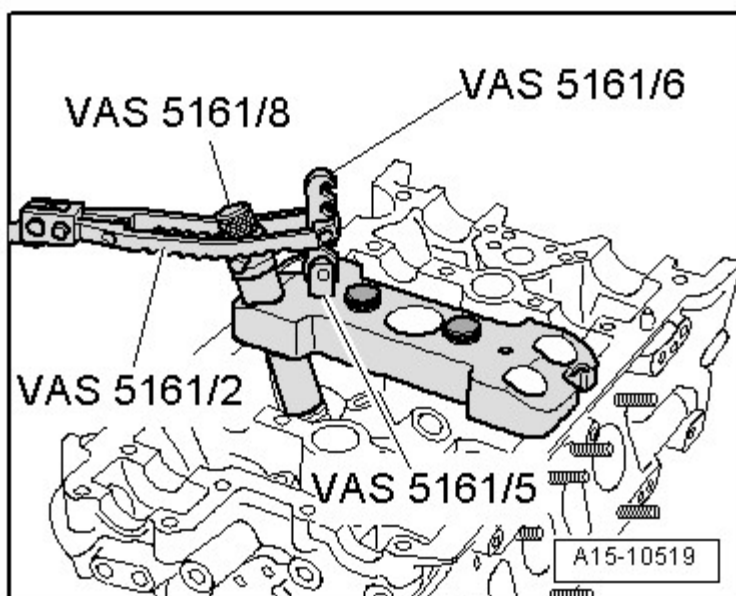


Fig. 208: Identifying Engaging Device VAS 5161/6, Installation Fork VAS 5161/5 And Guide Plate, Removal/Installation
Courtesy of AUDI OF AMERICA, LLC

- 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 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 valve stem seal using valve seal removal tool 3364.

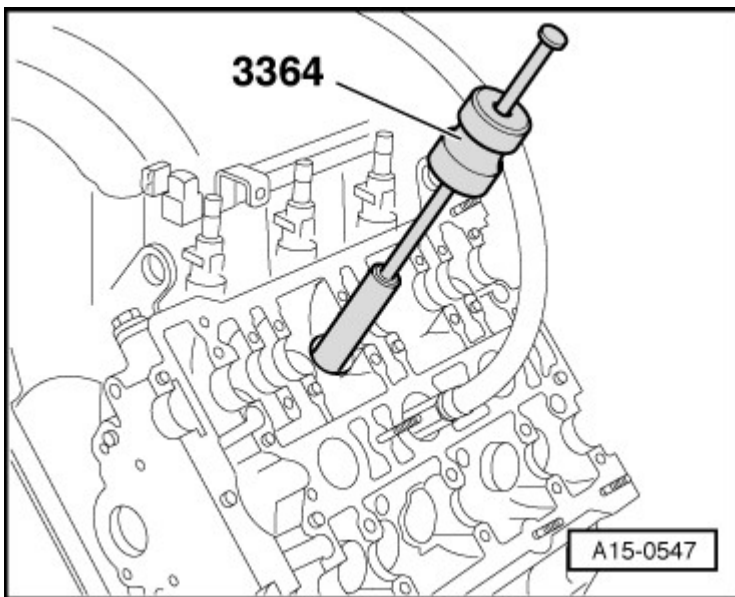


Fig. 209: Identifying 3364
Courtesy of AUDI OF AMERICA, LLC

- Position valve lever on puller and remove valve stem seal.

CAUTION: Risk of damage when installing valve stem seals.

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

-- Lightly oil valve stem seal.

-- Slide valve shaft seal onto plastic sleeve.

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

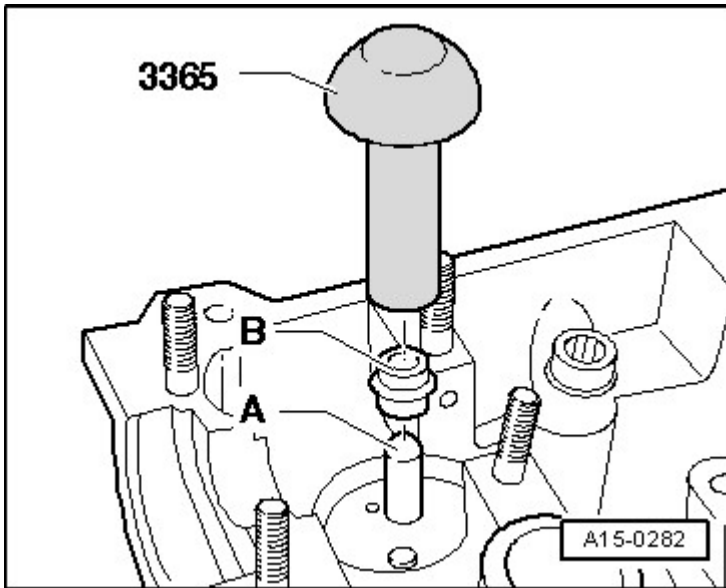


Fig. 210: Identifying Plastic Sleeve, New Valve Stem Oil Seals & Valve Stem Seal Driver 3365
Courtesy of AUDI OF AMERICA, LLC

-- Remove plastic sleeve again.

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

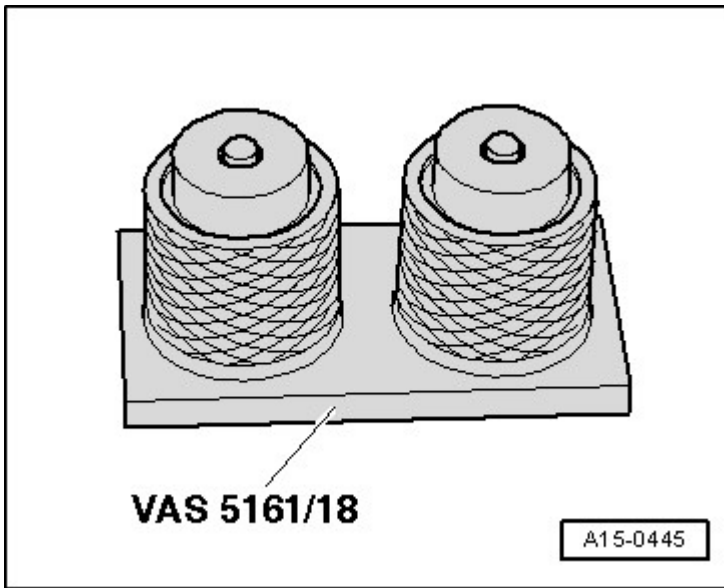


Fig. 211: Identifying Installation Cartridge VAS 5161/8
Courtesy of AUDI OF AMERICA, LLC

- 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.

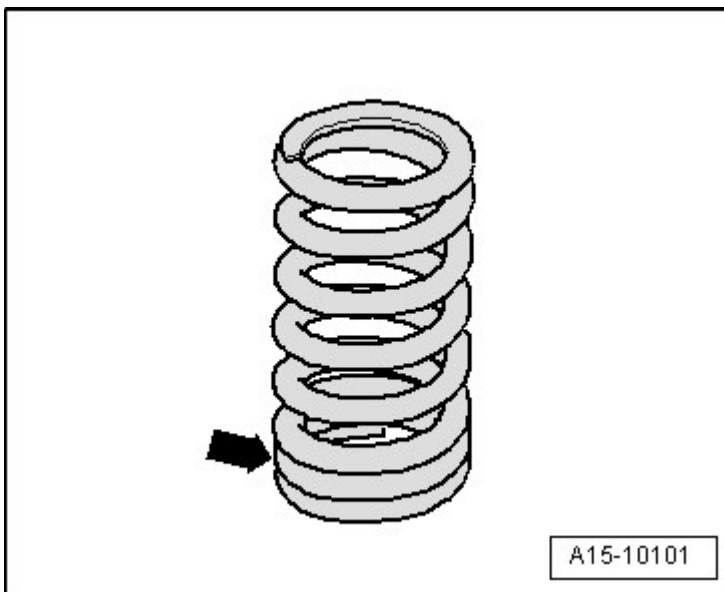


Fig. 212: Identifying Tight Spring Coils
Courtesy of AUDI OF AMERICA, LLC

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

-- Install guide plate on cylinder head.

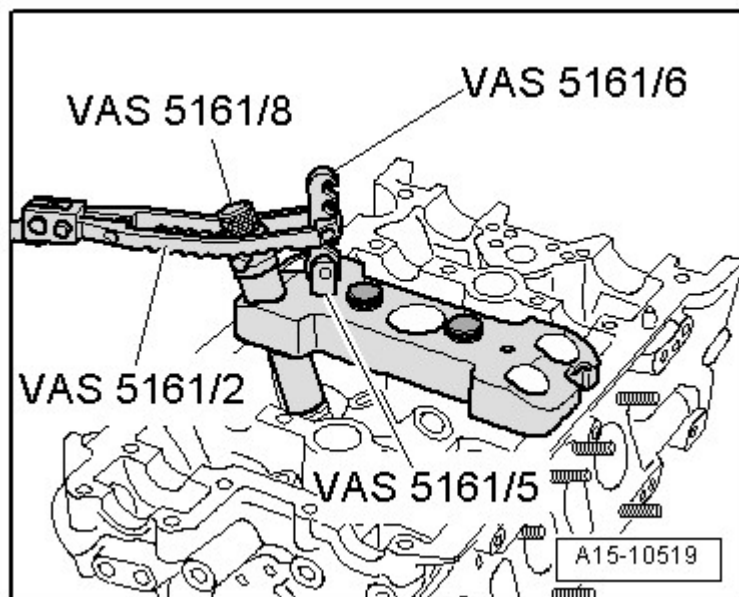


Fig. 213: Identifying Engaging Device VAS 5161/6, Installation Fork VAS 5161/5 And Guide Plate, Removal/Installation

Courtesy of AUDI OF AMERICA, LLC

-- Insert installation cartridge in guide plate.

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

-- Release pressure fork with knurled screw still raised.

-- Repeat procedure on each valve.

ASSEMBLING

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

-- Make sure all roller rocker levers lie on ends of valve stems correctly and are clipped onto respective hydraulic adjusting elements.

-- Install camshafts **CAMSHAFTS**.

SPECIAL TOOLS

Special tools and workshop equipment required

- Tensioning element VAS 6419
- Dial gauge holder VW 387

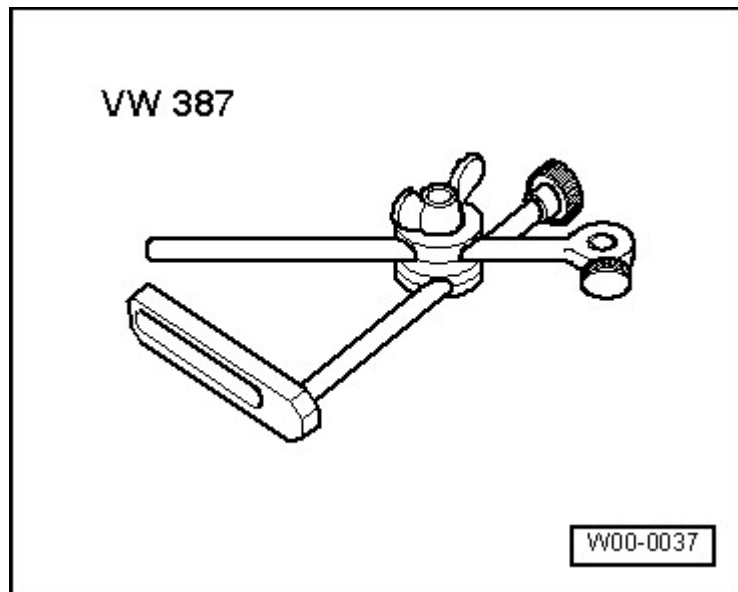


Fig. 214: Dial Gauge Holder VW 387
Courtesy of AUDI OF AMERICA, LLC

- Dial gauge VAS 6080

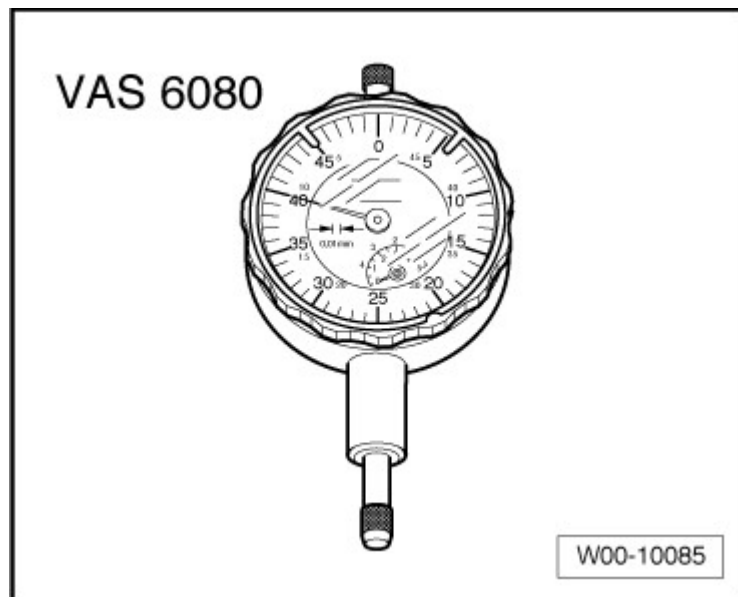


Fig. 215: Dial Gauge VAS 6080
Courtesy of AUDI OF AMERICA, LLC

- Old oil collecting and extracting device V.A.G 1782

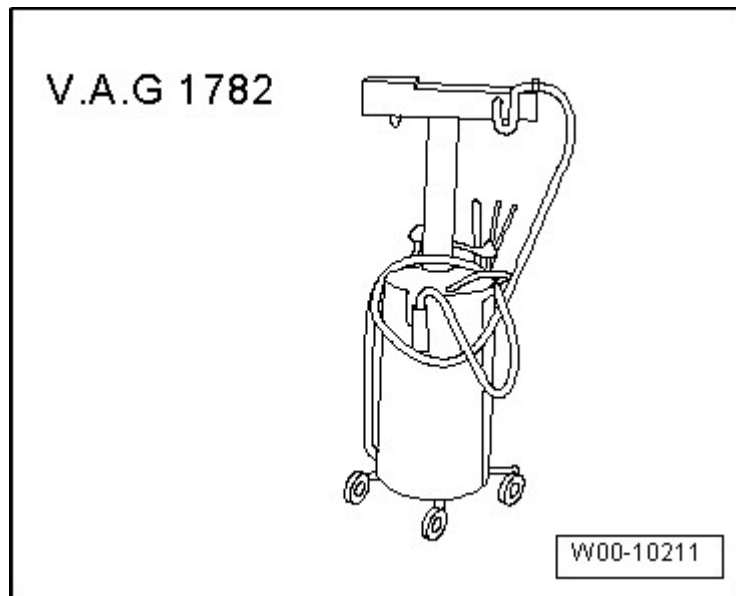


Fig. 216: Old Oil Collecting And Extracting Device V.A.G 1782
Courtesy of AUDI OF AMERICA, LLC

- Locking pin T40071, qty. 2

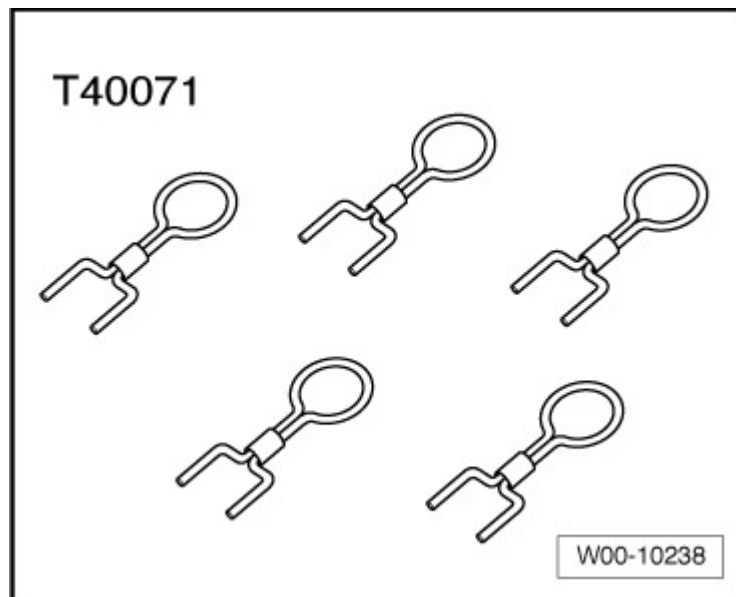


Fig. 217: Identifying Securing Pin T40071
Courtesy of AUDI OF AMERICA, LLC

- Camshaft clamp T40133, qty. 2

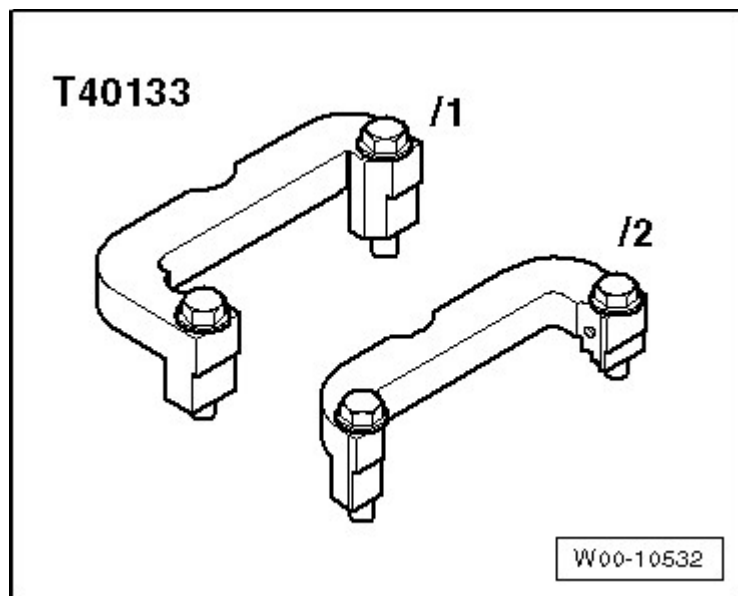


Fig. 218: Camshaft Clamp T40133
Courtesy of AUDI OF AMERICA, LLC

- Wrench T40049

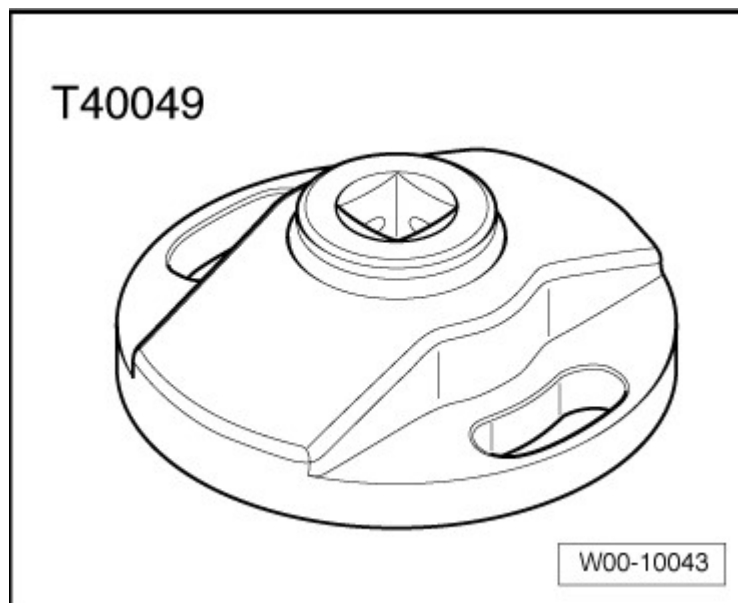


Fig. 219: Identifying Key T40049
Courtesy of AUDI OF AMERICA, LLC

- Pin wrench 3212

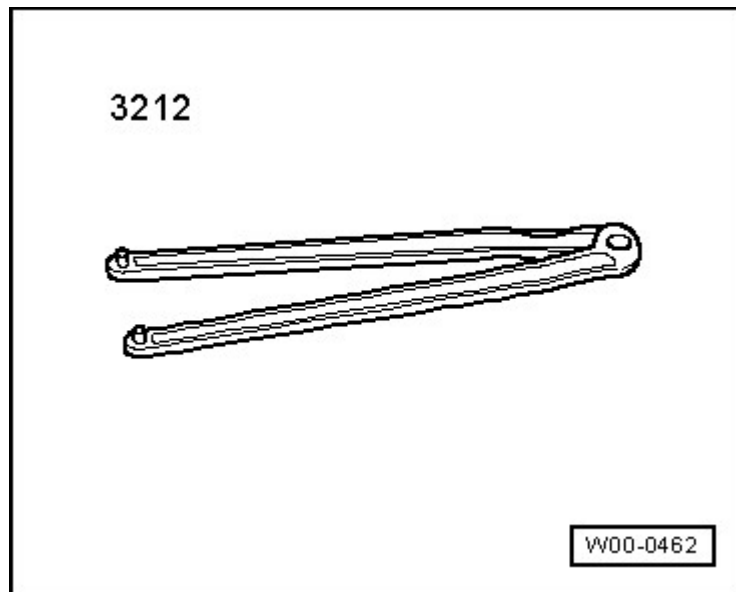


Fig. 220: Identifying Pin Wrench VAS 3212A (Or Equivalent)
Courtesy of AUDI OF AMERICA, LLC

- Impact puller T10133/3 from tool set T10133

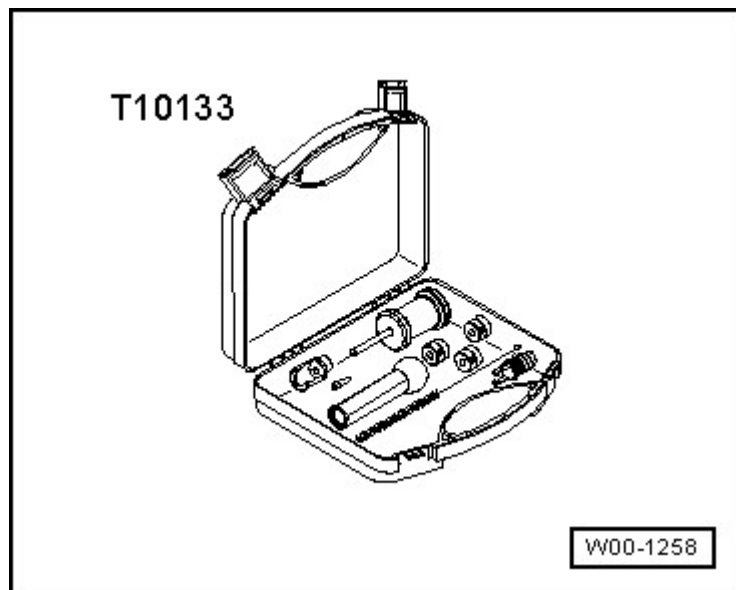


Fig. 221: Identifying Impact Puller T10133/3 From Tool Set T10133
Courtesy of AUDI OF AMERICA, LLC

- Securing pins 1 set = qty. 2 T40116

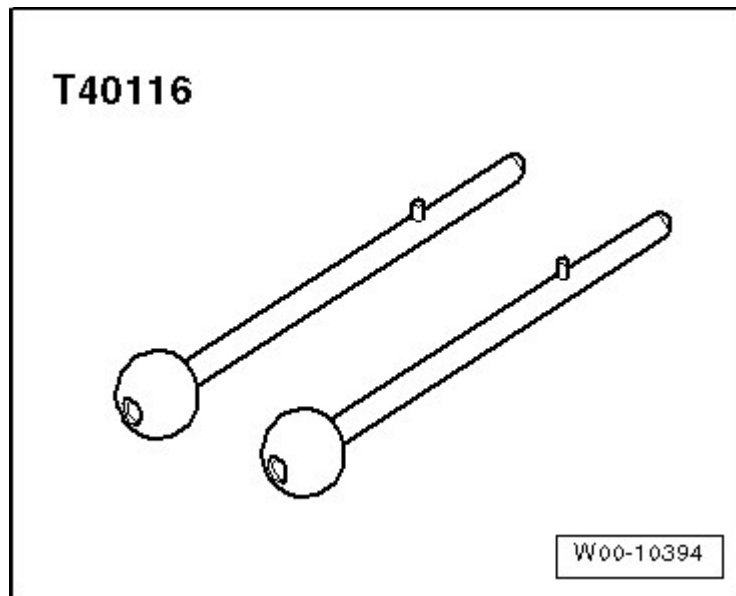


Fig. 222: Identifying Securing Pins 1 Set = Qty. 2 T40116
Courtesy of AUDI OF AMERICA, LLC

- Engine and transmission holder VAS 6095

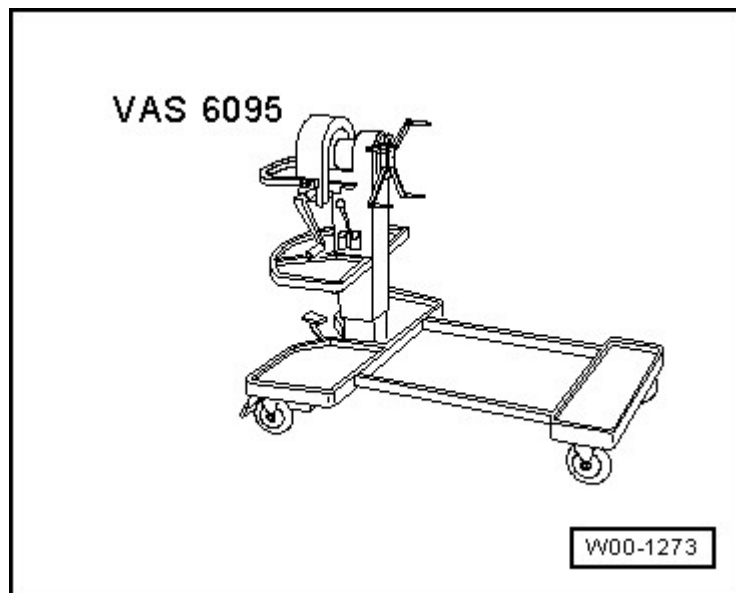


Fig. 223: Engine And Transmission Holder VAS 6095
Courtesy of AUDI OF AMERICA, LLC

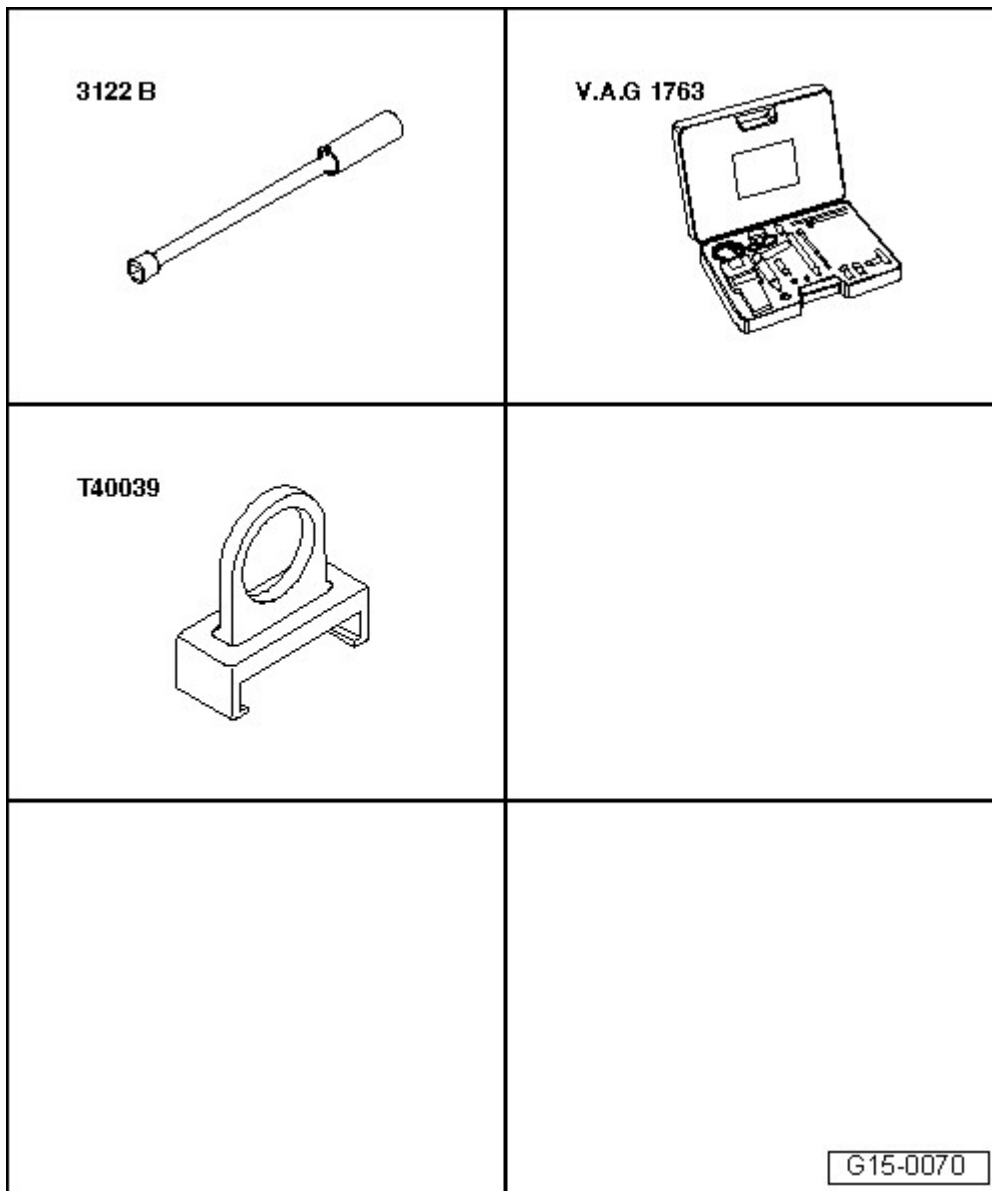


Fig. 224: Identifying Special Tools - Pressures, Checking
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spark plug removal tool 3122 B
- Compression tester V.A.G 1763
- Ignition coil puller T40039

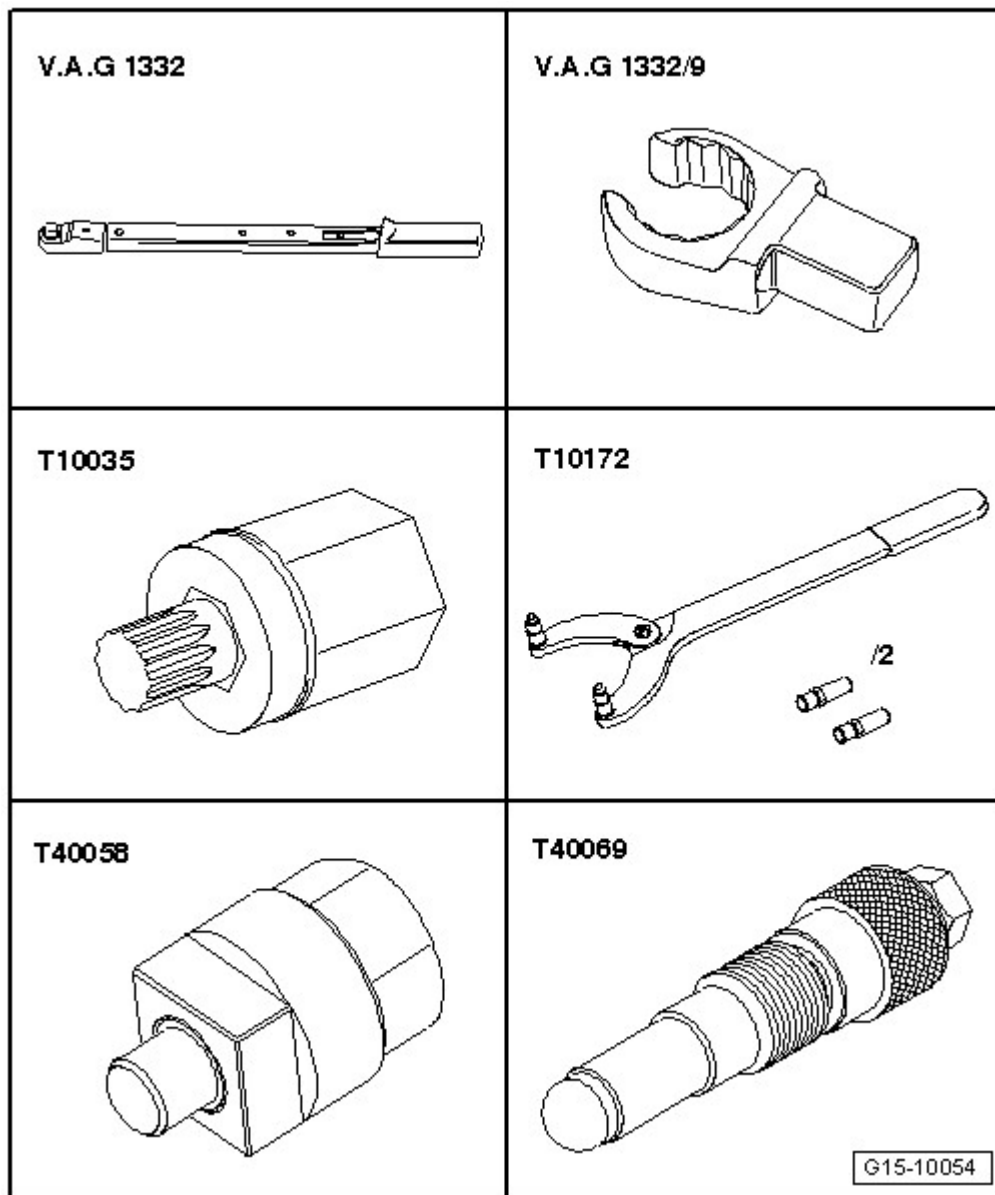


Fig. 225: Identifying Special Tools -- Camshaft Timing Chains, Removing From Camshafts
 Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Torque wrench V.A.G 1332
- Assembly tool V.A.G 1332/9
- Multi-point socket T10035
- Counter-holder tool T10172
- Adapter T40058
- Locking pin T40069

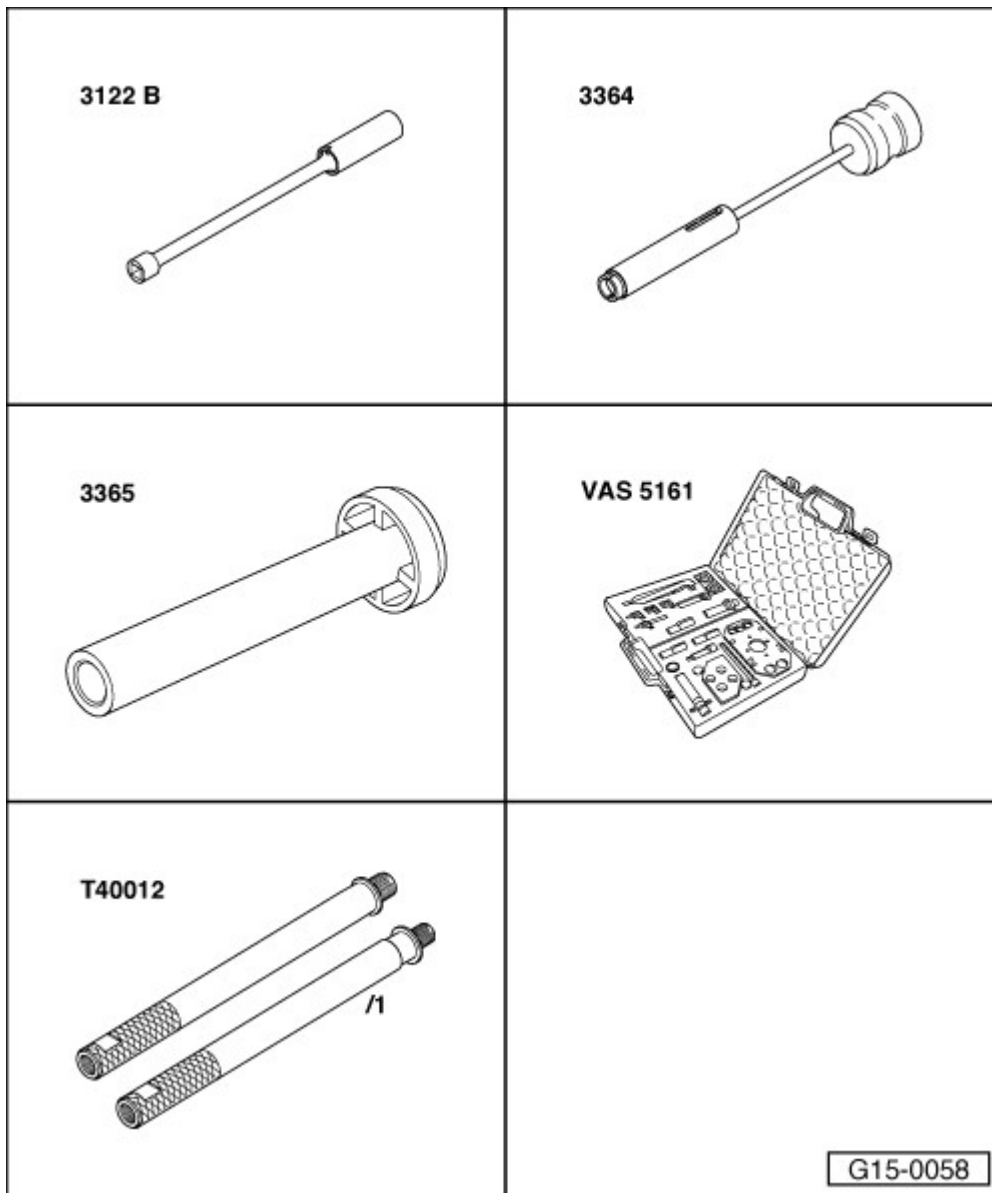


Fig. 226: Identifying Special Tools

Courtesy of AUDI OF AMERICA, LLC

Special tools and workshop equipment required

- Spark plug removal tool 3122 B
- Valve seal removal tool 3364
- Valve stem seal driver 3365
- Valve cotter disassembly and assembly device VAS 5161 with guide plate VAS 5161/19B
- Adapter T40012